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Issue 6 / 6A
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DDM-1000
Dual DS3 Multiplexer for Both Loop and Trunk

User/Service Manual

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Reason for Reissue (Issue 6B)

Issue 6B of this document is released as new and replacement pages to introduce the following:

- Information on a new AEK36C DS1 INTFC2 low-speed pack that is a functional replacement for the preceding AEK36-type packs. The AEK36C pack is the newest of the AEK36 series of packs which incorporates the latest technology for improved performance. The AEK36C offers improved initial clock recovery from low density DS1 signals, such as a 3-in-24 pattern. The new pack is more tolerant of transients at the DSX-1 cross-connection than the preceding AEK36B-type packs.
- A new AEK36B S1:4 DS1 INTFC2 pack is introduced. The AEK36B S1:4 offers improved initial clock recovery from low density DS1 signals, such as a 3-in-24 pattern. The new pack is more tolerant of transients at the DSX-1 cross-connection than the preceding AEK36B-type packs.
- Two new 16-type OLIUs are introduced that replace the 16E, 16F, and 16G-type OLIUs. The 16E2 OLIU replaces the 16E and 16F in maintenance applications. The 16F2 OLIU replaces the 16G-type OLIU in maintenance applications and is recommended for new installations. Both the 16E2 and 16F2 will endure the -40C° to 75C° extended temperature range.
- Other minor text and procedural changes and corrections.

How to Use This Manual

This manual is organized as follows:

- Table of Contents

  This section is a complete table of contents for this manual. Each of the following three sections has an individual Table of Contents: Description, Planning Guidelines, and Specifications.

- About This Document

  This section describes the purpose, audience, reason for reissue, and safety considerations. It also lists related documentation and training, explains how to comment on this document, and provides ordering information.

- Description

  This section provides a functional description of the DDM-1000 and a detailed description of its maintenance features. It is expected that this section will be read in its entirety by all users for general background information.

- Planning Guidelines

  This section describes typical applications of the DDM-1000. It provides detailed information to support the engineering of a DDM-1000 system and the ordering of the required system components. It is expected that this section will be used by planners and engineers.

- Specifications

  This section provides detailed maintenance and interconnection specifications. It is expected that this section will be used as a reference by all users.

- Commands and Reports

  This is a reference section that supports the use of an ASCII terminal for installation and maintenance of the DDM-1000. It is provided with a permuted index to aid the user in locating the desired command or report pages. Also included with this manual is a removable Job Aid which can be used as a quick reference to the commands used with DDM-1000.

- Report Descriptions

  This section contains examples of report commands and the reports they generate under normal and failure conditions. System responses and their meaning are given in a tabular format. The examples were generated by a system configured for end-to-end 90 Mb/s optical operation.

- Installation and Maintenance Procedures

  This section employs a task-oriented format. The user finds the job to be done in the Task Index, TI-001, then goes to the procedure shown and performs the listed items in order. An introduction tells the user, in detail, how to use this section.

Safety Instructions

Product Safety Labels

Important safety instructions are in this section. In addition to the instructions on the following page there are other safety instructions you must follow. These instructions involve lasers, lightwave optical cable and connectors, and precautions when handling circuit packs to prevent damage from electrostatic discharge. This manual also contains admonishments in the form of **DANGERS, WARNINGS,** and **CAUTIONS** which must be followed at all times.

Other important safety instructions that you should read are in the "Installation and Maintenance" section of this manual. Only trained personnel should perform the procedures of that section.

DDM-1000 Description

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DDM-1000 Description

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Functional Description

General

The block diagram for the single-shelf DDM-1000 assembly (Figure 1-1) shows two muldems that share high-speed interfaces, power, and a controller. This simple arrangement leads to a flexible and cost-effective multiplexer (Figure 1-2). If DDM-1000 is configured for DS3 electrical terminations on the high-speed side, each muldem is independent of the other. If it is configured for optical terminations and one muldem is equipped with a DS3U1 pack, the muldem without the DS3U1 is synchronized to the muldem with the DS3U1. If it is configured for optical terminations and no DS3U1 is installed, muldem B is synchronized to muldem A to provide an economical 90 Mb/s optical system.

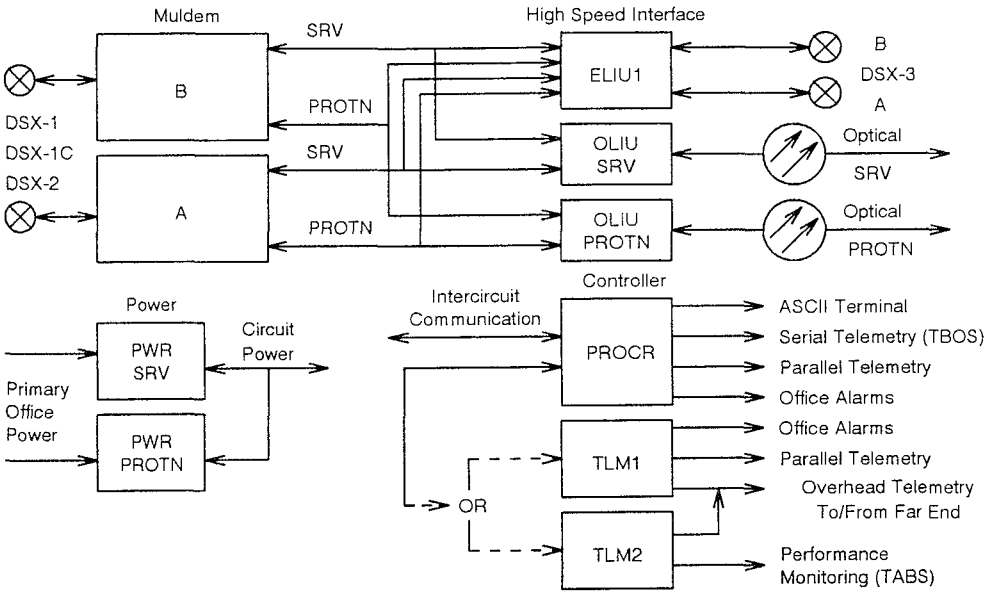

Figure 1-1. DDM-1000 Assembly Block Diagram (Single Shelf)

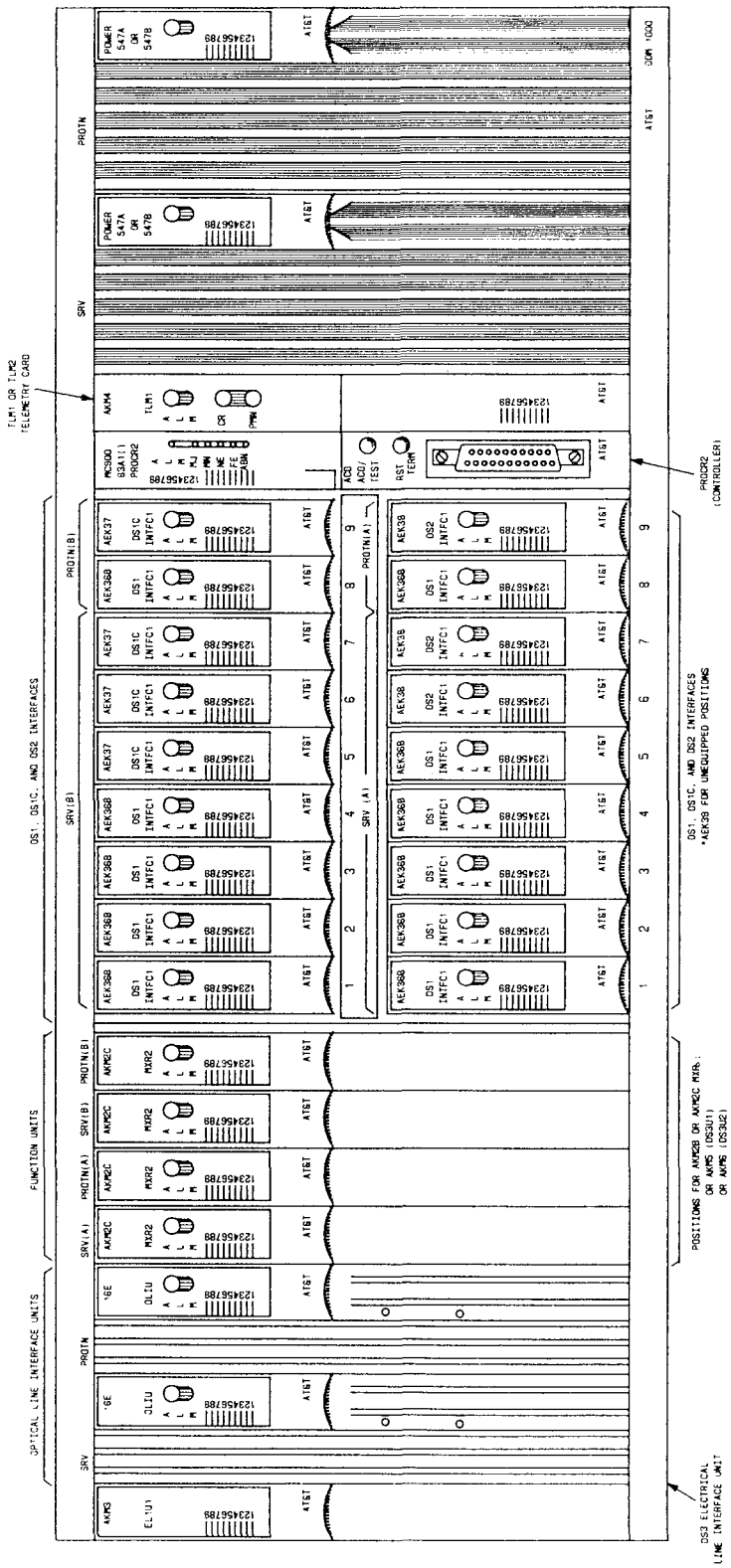

Figure 1-2. DDM-1000 Assembly

The DDM-1000 has the additional capability of 180 Mb/s operation. Two shelves can be connected together to provide up to four equivalent DS3 muldems (Figure 1-3). Any of the four DS3 muldems can be fully or partially equipped providing added flexibility should unexpected growth occur. If you need only one or two DS3s initially, the DDM-1000 can operate at 90 Mb/s and be upgraded in service to 180 Mb/s when required. The two DDM-1000 assemblies are connected together with two cables on the backplane. One service and one protection 20-type optical line interface units (OLIUs) are installed in one of the two assemblies (called the OLIU assembly). The OLIU locations are left empty in the other assembly (the non-OLIU assembly). The backplane cables cause the non-OLIU assembly to behave as if it contained a service (SRV) and a protection (PROTN) OLIU. The system is installed, accepted, and maintained as if there were 16-type OLIUs installed in both assemblies.

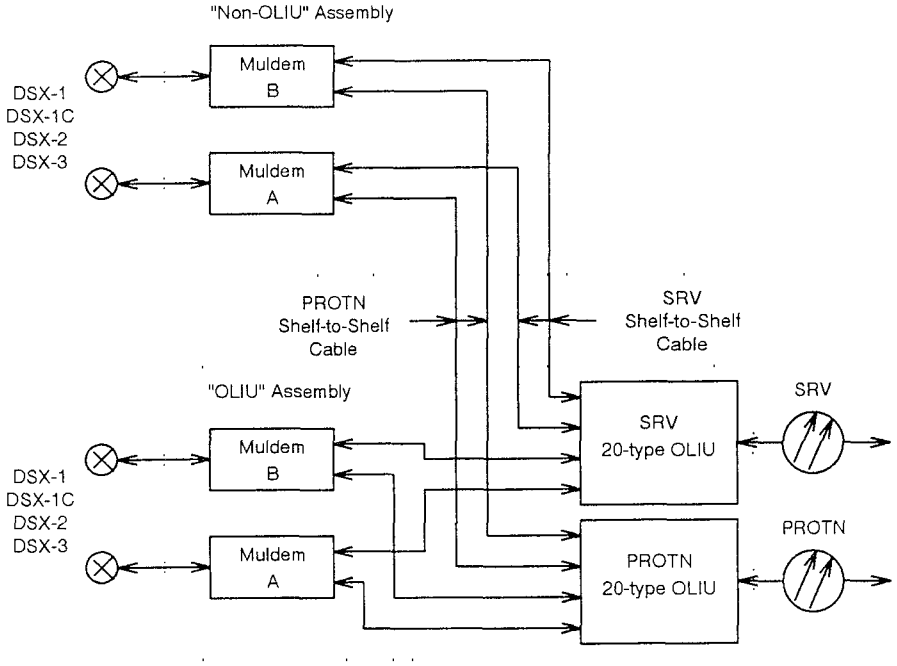

Figure 1-3. DDM-1000 180 Mb/s Assembly Block Diagram (Two Shelves)

The high-speed interface for DDM-1000 consists of either one electrical or up to two optical line interface units. The electrical line interface unit (ELIU) pack (AKM3 ELIU1) terminates two bidirectional DS3 lines. It has no active electrical components so it is not protected. The ELIU1 pack is used when the interface to DDM-1000 is through a DSX-3. The optical OLIU packs [all 16-types (90 Mb/s)] terminate one SRV and one PROTN 90 Mb/s optical line in the transmit and receive directions. The OLIU packs [20E, 20G and 20K (180 Mb/s)] terminate one SRV and one PROTN 180 Mb/s optical line in the transmit and receive directions. The OLIU packs provide a 1:1 protected optical transmission system. The use of the PROTN pack is optional.

The controller for DDM-1000 consists of up to two packs [PROCR (PROCR1 or PROCR2) and TLM pack]. The PROCR pack provides the control for all monitoring, protection switching, alarming, and display within the assembly. In addition, it contains interfaces for an ASCII terminal, office alarms, serial telemetry, and a limited parallel telemetry set. The optional TLM1 pack (AKM4) provides maintenance interfaces. These consist of an extensive parallel telemetry set, additional office alarms, and a 15-port bidirectional overhead telemetry capability. An optional MC90191A1 TLM2 performance-monitoring circuit pack provides performance monitoring [a telemetry asynchronous block serial (TABS) interface] and a 6-port bidirectional overhead telemetry capability.

Power for DDM-1000 is provided by one service and one optional protection pack. Each pack generates both +5 volts and -5 volts from the office power. The PWR1 pack (547A PU) is used with -48 volt office power. The PWR2 pack (547B PU) is used with -24 volt office power. Each unit has a separate primary power input and is capable of supplying power for the entire shelf.

Each muldem in DDM-1000 (Figure 1-4) can be equipped with a maximum of nine low-speed interface packs and two function unit packs. Of the nine low-speed interface packs, seven are equipped as needed to carry traffic. The remaining two are equipped as needed to provide up to 1:7 protection for the service packs. Both protection packs (PROTN 8 and PROTN 9) are equipped when mixing low speed rates within the same muldem. The DS1 INTFC pack (all AEK36-types) terminates up to four bidirectional DS1 lines. The DS1C INTFC1 pack (AEK37) terminates up to two bidirectional DS1C lines. The DS2 INTFC1 pack (AEK38) terminates one bidirectional DS2 line. The BP1 pack (AEK39) protects the low-speed interface switching bus for service positions not filled by packs.

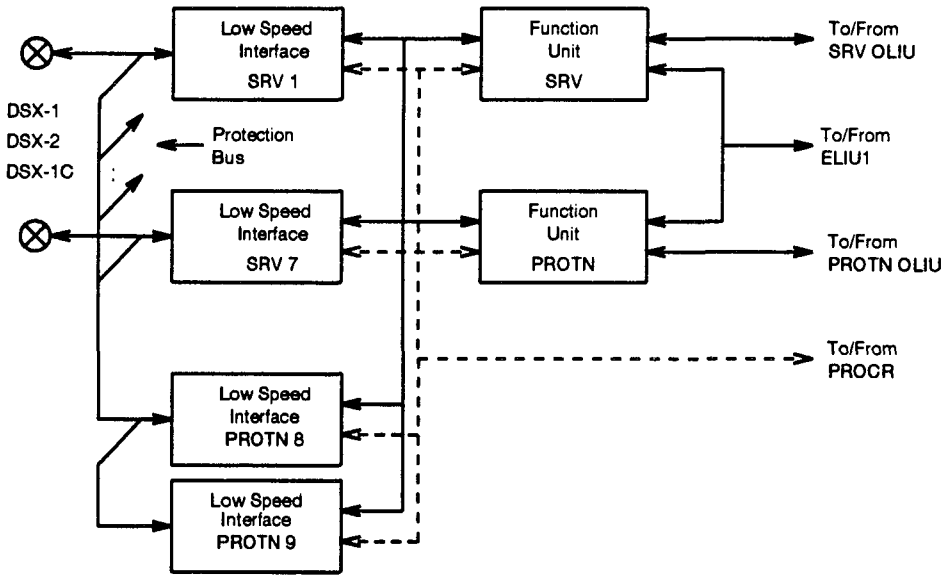

Figure 1-4. DDM-1000 Single Muldem Block Diagram

The function unit pack defines the characteristics of the muldem. The MXR pack (AKM2 MXR1, AKM2B MXR2, or AKM2C MXR3) provides a complete multiplexer from the DS1 rate to the DS3 rate for connection to either the ELIU1 or OLIU. The DS3U2 pack (AKM6) provides a DSX-3 compatible interface to the OLIU for M13 compatible DS3 signals only. (**M13 compatible signals are DSX-3 signals that can be demultiplexed by an M13 multiplexer**). This allows the optical system to carry two externally generated M13 compatible DS3 signals or an externally generated M13 compatible DS3 signal and an internally generated DS3 signal from a MXR pack. The externally generated DS3 signal path cannot be tested with a conventional DS3 test set. The DS3U1 pack (AKM5) provides an interface for an electrical DS3 signal from an ELIU on one side to an OLIU on the other side and can be used in applications requiring non-M13 formatted DS3 transport. It allows a single, bidirectional DS3 clear channel capability for the DDM-1000 multiplexer in the optical transmission mode. This

channel can be tested with a conventional DS3 test set. Only one muldem can be equipped with DS3U1 packs. The function unit pack is duplicated to provide 1:1 protection. The use of the PROTN pack is optional.

The DDM-1000 can be configured to operate in the add/drop mode for applications where access is required for only part of the DS3 stream. In this mode, DS2 bit streams associated with unequipped low-speed interface positions are looped on the MXR circuit pack from the demultiplexer to the multiplexer (Figure 1-5) This digital loop saves the costs of back-to-back low-speed interface circuits. In addition, it avoids the insertion of stuffing jitter. When the DDM-1000 is in this mode, one muldem carries the east-to-west traffic while the other muldem carries the west-to-east traffic. For convenience when connecting the low-speed inputs and outputs at the add/drop site DSX, muldem A inputs should be located next to muldem B outputs and muldem A outputs should be located next to muldem B inputs.

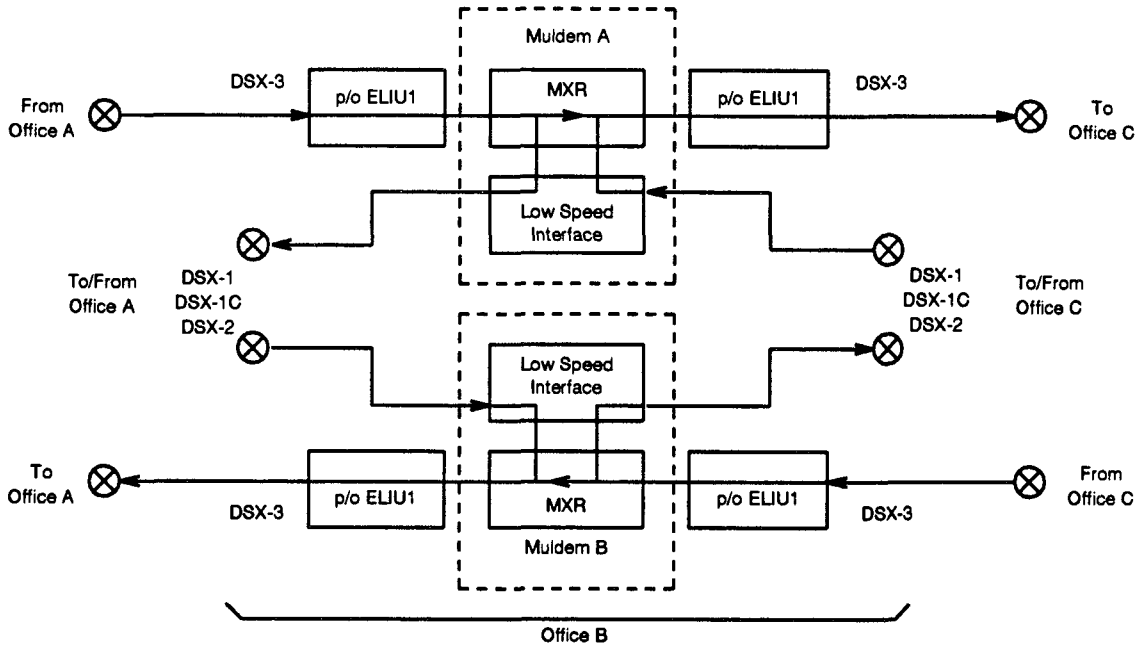

Figure 1-5. DDM-1000 Add/Drop Block Diagram

Low-Speed Interface Circuits

Three low-speed interface packs are available to terminate DS1, DS1C, and DS2 lines. Several combinations of the low-speed packs in the same muldem are possible. Low-speed protection can be provided for two different low-speed packs but only one low-speed pack can be switched to protection at one time. If all three types of low-speed packs are in the same muldem, transmission will be supported for all packs but only two can be protected. If both protection packs

(PROTN 8 and PROTN 9) are equipped when mixing low-speed rates within the same muldem, the lowest rate protection pack must be installed in the PROTN 8 slot. For example, if DS1 and DS2 packs are in the same muldem, then the DS1 protection pack must be installed in the PROTN 8 slot and the DS2 protection pack installed in the PROTN 9 slot.

DS1 INTFC Pack (All AEK36-Types)

The DS1 INTFC pack (all AEK36-types) terminates four bidirectional DS1 lines and is compatible with standard DSX-1 signal specifications, including extended super frame (ESF). The pack also provides a control interface that terminates the internal communications bus. A red LED on the front of the pack indicates alarm conditions.

In the multiplexing direction, the balanced DS1 bipolar receive signal passes through a relay switch (Figure 1-6) Clock is extracted and the data is converted from the bipolar format to a unipolar nonreturn to zero (NRZ) format. The incoming data code can be either alternate mark inversion (AMI) or bipolar 8 zero substitution (B8ZS). If a loss-of-signal condition is detected, an alarm indication signal (AIS) (all ones data) is inserted. Bipolar violations or B8ZS coding violations in the incoming signal do not cause an AIS signal to be inserted. The data errors propagate and result in data errors at the far end. With an AMI formatted signal, bipolar violations are removed but the data errors (also called bit errors) are not removed. If the violations exceed the monitor threshold, appropriate indicators will be raised, but an AIS will not be inserted.

In addition, a test signal can be inserted in the circuit under the control of the PROCR pack. This feature is used during installation for testing and during maintenance activities to eliminate the need for external test sets. The unipolar NRZ data and 1.544-MHz clock are sent to both the SRV and PROTN function unit positions.

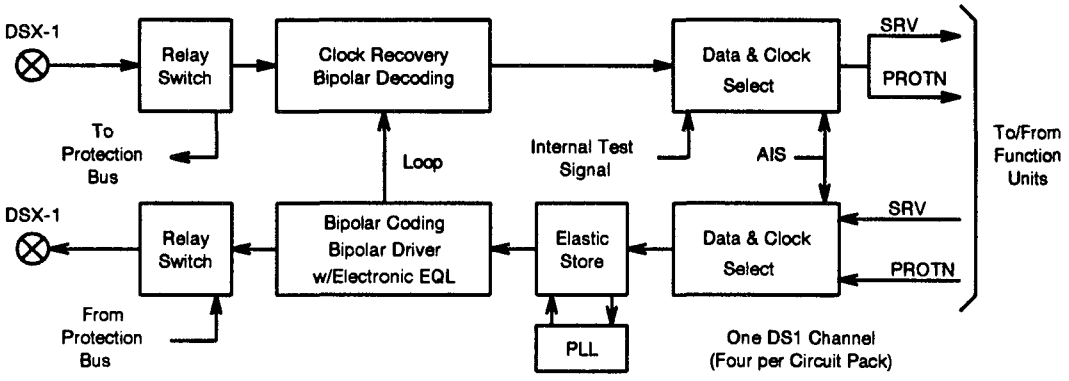

Figure 1-6. DDM-1000 DS1 INTFC (All AEK36-Types)

In the demultiplexing direction, unipolar NRZ data and 1.544-MHz gapped clock are received from both the SRV and PROTN function unit positions. Under control of the PROCR pack, the appropriate signal is selected and checked for integrity. If loss of clock occurs or AMI coding is being used and excessive zeros are detected, an AIS signal is inserted. The circuit attenuates jitter on the signal by using an elastic store and phase-locked loop. This smoothed signal is converted to the bipolar format (AMI or B8ZS), and the driver circuit provides selected line equalization to the signal to meet the DSX-1 signal specifications. The balanced DS1 bipolar signal passes through a relay switch and is then sent to the DSX-1.

To simplify maintenance activities, each DS1 can be looped back toward the high-speed facility under control of the PROCR pack. The looped signal is electronically bridged inside the low speed pack allowing the DS1 signal to remain connected to the low speed facility while the loop is active.

An individual dual in-line package (DIP) switch is provided for each DS1 to select AMI or B8ZS coding of its bipolar input and output. The line equalization (EQL) is selected using DIP switches. The AEK36 differs from the AEK36B and AEK36C in three ways that affect the user:

- The power consumption of the AEK36B and AEK36C packs is substantially lower than that of the AEK36. This allows more flexibility in planning and engineering.
- The PROCR2 pack can override the setting of the DIP switches to control the DS1 code selection (AMI or B8ZS) for the AEK36B and AEK36C packs but not for the AEK36. This means that AEK36B and AEK36C packs in the low-speed protection slot can automatically change code format to agree with the channel it is protecting.
- The arrangement of DIP switch segments that define the line build-out (LBO) settings and the code type is different for the various low-speed packs. This information is provided in the "Specifications" section and in the affected procedures in the "Installation and Maintenance" section.

The MC90083A1D, Iss 4 and later PROCR2 eliminates a problem that sometimes occurs when testing a DS1 channel that is looped at the far end. With prior PROCR versions, when a DS1 channel was tested with the "3 in 24" test pattern, the channel would sometimes make errors until the pattern was changed to something else (such as QRSS or all ones) and then back again. The MC90083A1D, Issue 4 and later PROCR2 packs eliminates this problem when testing with the DS1 channel looped at the far end (single ended testing). The loop must be put up at the far end before the test signal is applied. The problem may still occur if the loop is put up after the signal is applied or if testing end-to-end using a test set at each end.

DS1C INTFC1 Pack (AEK37)

The DS1C INTFC1 pack terminates two bidirectional DS1C mode 2 lines and is compatible with standard DSX-1C mode 2 signal specifications. The pack also provides a control interface that terminates the internal communications bus. A red LED on the front of the pack indicates alarm conditions.

In the multiplexing direction, the balanced DS1C bipolar receive signal passes through a relay switch (Figure 1-7) Clock is extracted and the data is converted from the bipolar format to a unipolar NRZ format. The incoming data code can be either AMI or B8ZS. This signal is demultiplexed to two individual DS1 rate unipolar NRZ signals. If a loss of signal or loss of DS1C frame condition is detected, an AIS signal (all one's data) is inserted on both signals. Bipolar violations or B8ZS coding violations in the incoming signal do not cause an AIS signal to be inserted. The data errors propagate and result in data errors at the far end. If the violations exceed the monitor threshold, appropriate indicators will be raised, but an AIS will not be inserted.

In addition, a test signal can be inserted on either signal in the circuit under the control of the PROCR pack. This feature is used during installation for testing and during maintenance activities to eliminate the need for external test sets. The two unipolar NRZ data and gapped 1.544-MHz clocks are sent to both the SRV and PROTN function unit positions.

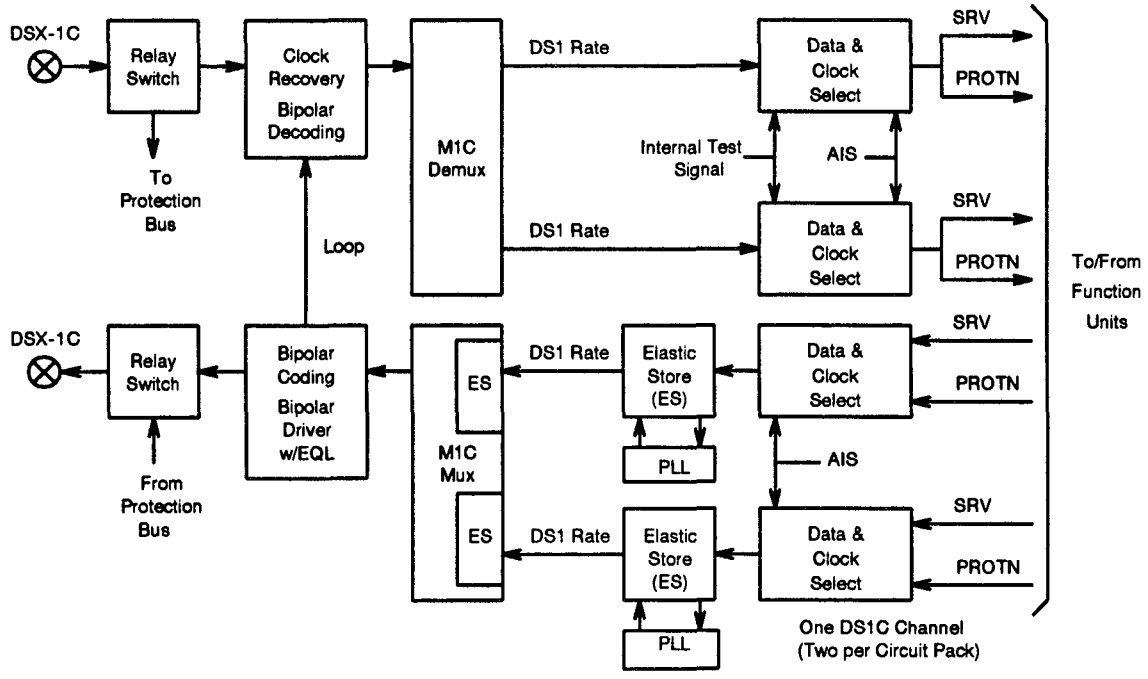

Figure 1-7. DDM-1000 DS1C INTFC1 (AEK37)

In the demultiplexing direction, two unipolar NRZ data and 1.544-MHz gapped clocks are received from both the SRV and PROTN function unit positions. Under control of the PROCR pack, the appropriate signals are selected and checked for integrity. If loss of clock occurs or AMI coding is being used and excessive zeros are detected, an AIS signal is inserted. The circuit attenuates jitter on both of the signals by using elastic stores and phase-locked loops. These smoothed signals are sent to synchronizing elastic stores and then multiplexed up to the DS1C rate. This unipolar NRZ data and 3.152-MHz clock is converted to the bipolar format (AMI or B8ZS), and the driver circuit provides selected line equalization to the signal to meet the DSX-1C signal specifications. The balanced DS1C bipolar signal passes through a relay switch and is then sent to the DSX-1C.

To simplify maintenance activities, each DS1C can be looped back toward the high-speed facility under control of the PROCR pack. The looped signal is electronically bridged inside the low speed pack allowing the DS1C signal to remain connected to the low speed facility while the loop is active.

An individual DIP switch is provided for each DS1C to select AMI or B8ZS coding of its bipolar input and output. The line equalization (EQL) is selected using DIP switches.

DS2 INTFC1 Pack (AEK38)

The DS2 INTFC1 pack terminates a bidirectional DS2 line and is compatible with standard DS2 signal specifications. The pack also provides a control interface that terminates the internal communications bus. A red LED is provided on the front of the pack to indicate alarm conditions.

The AEK38 DS2 INTFC1 pack cannot be used in a muldem provisioned for C-bit parity framing format (performance monitoring.)

Although the DDM-1000 will accept DS1 or DS2 electrical signals from the *SLC*® 96 carrier channel banks, it cannot be used as a DS1-to-DS2 multiplexer for *SLC* 96 Carrier Systems. For example, if a *SLC* 96 carrier DS2 signal is connected at one end of the DDM-1000, then DS1 signals cannot be directly connected at the other end. In this case, an LM12 is required at the DS1 end to do the DS1-to-DS2 conversion.

In the multiplexing direction, the balanced DS2 bipolar B6ZS data signal passes through a relay switch (Figure 1-8) Clock is extracted and the data is converted from the bipolar format to a unipolar NRZ format. If a loss-of-signal condition is detected, a DS2 AIS (all ones data) is inserted. B6ZS coding violations in the incoming signal do not cause an AIS signal to be inserted. The data errors propagate and result in data errors at the far end. If the violations exceed the monitor threshold, appropriate indicators will be raised, but an AIS will not be inserted.

In addition, a test signal can be inserted in the circuit under the control of the PROCR2 pack. This feature is used during installation for testing and during maintenance activities to eliminate the need for external test sets. The unipolar NRZ data and 6.312 MHz clock are sent to both the SVC and PROTN function unit positions.

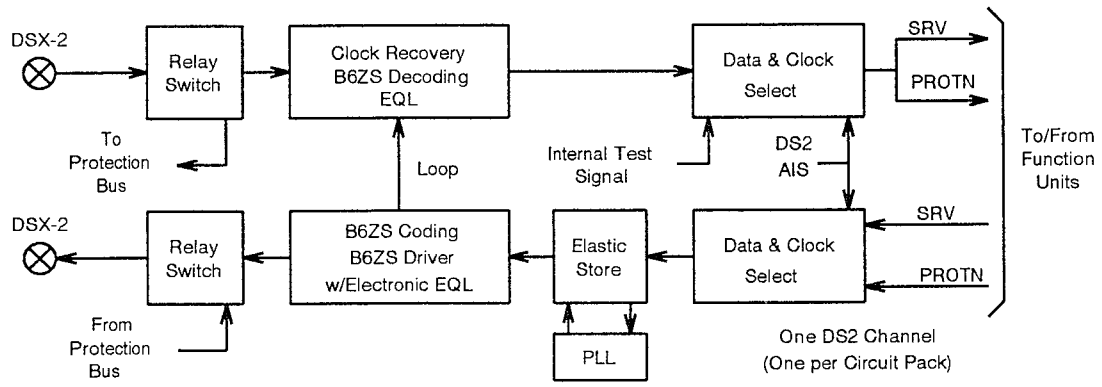

Figure 1-8. DDM-1000 DS2 INTFC1 (AEK38)

In the demultiplexing direction, unipolar NRZ data and 6.312 MHz gapped clock are received from both the SRV and PROTN function unit positions. Under control of the PROCR2 pack, the appropriate signal is selected and checked for integrity. If loss of clock occurs, a DS2 AIS is inserted. The circuit attenuates jitter on the signal by using an elastic store and phase-locked loop. This smoothed signal is converted to the B6ZS bipolar format, and the driver circuit provides selected line equalization to the signal to meet the DS2 output signal specifications. The balanced DS2 bipolar signal passes through a relay switch and then goes to the DSX-2.

To aid in maintenance activities, the DS2 signal can be looped back toward the high-speed facility on the circuit pack under control of the MC90083A1D (or later) PROCR2 pack. The looped signal is electronically bridged inside the low speed pack, allowing the DS2 signal to remain connected to the low speed facility while the loop is active.

The line equalization (EQL) is selected using DIP switches.

BP1 Pack (AEK39)

The BP1 pack protects the low-speed interface switching bus for service low-speed interface positions not filled by packs. All low-speed interface positions contain shorting contacts built into the connector. These contacts electrically connect the input and output signals for the position to the protection bus whenever the pack is removed. When a service position is to be left unequipped, the wiring to the cross-connect point must be electrically disconnected from the protection bus. This can be done in two ways. The simplest method is to install the BP1 pack. This circuit opens the shorting contacts. Another method is to remove the cross-connect wiring connector at the backplane for service low-speed interface positions that are not filled. It is strongly recommended that BP1 packs be inserted into all unequipped slots. **No service LS INTFC slots should be empty in a muldem being provisioned for service.**

Function Unit Circuits

MXR Pack (AKM2, AKM2B or AKM2C)

The MXR pack (AKM2 MXR1, AKM2B MXR2, or AKM2C MXR3) provides a complete multiplexer from the DS1 rate to the DS3 rate for connection to either the ELIU1 or OLIU. The pack also provides a control interface that terminates the internal communications bus. A red LED on the front of the pack indicates alarm conditions.

In the multiplexing direction, four sets of unipolar NRZ data and 1.544-MHz clock are received from each low-speed interface pack (Figure 1-9). These signals are synchronized in elastic stores. The four outputs from the elastic stores are multiplexed to the DS2 rate in an M12 multiplexer. The signals from PROTN 8 and PROTN 9 pass through selectors before entering the elastic stores associated with the eighth M12 multiplexer. At this point, there are eight synchronized DS2 rate signals available. Under direction of the PROCR pack, seven of these signals are multiplexed to the DS3 rate in the M23 multiplexer. The eighth signal is checked for proper operation even though it is not carrying traffic.

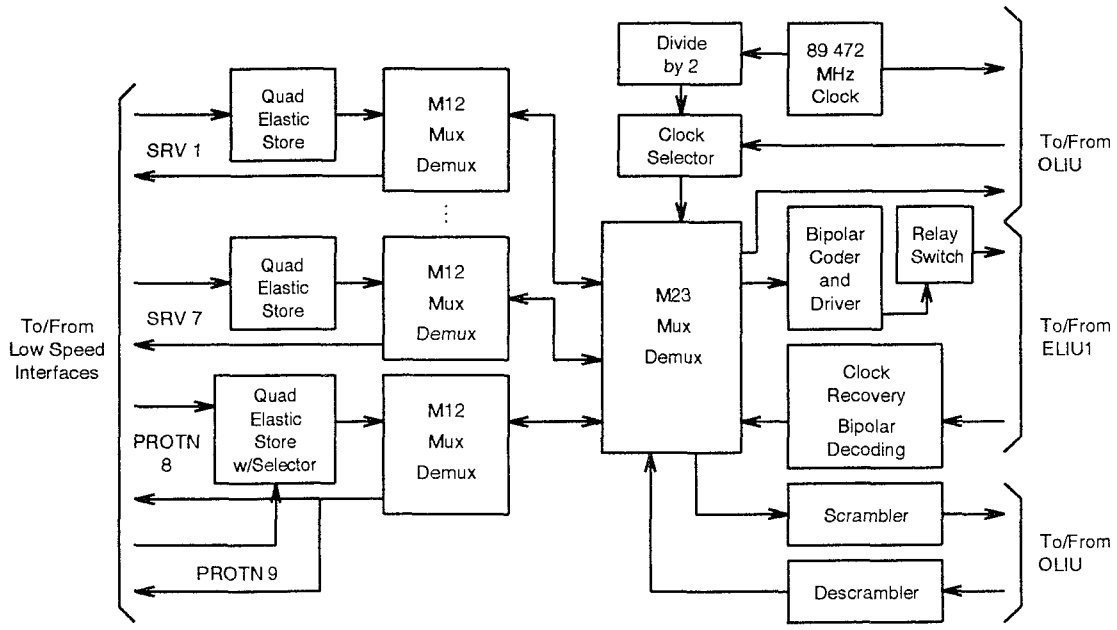

Figure 1-9. DDM-1000 MXR (AKM2, AKM2B, or AKM2C)

The MXR pack is configured at the time of installation for either electrical or optical operation. When operated as an electrical assembly, the 44.736-MHz clock source is the on-board 89.472-MHz clock divided by two. In this mode, the unipolar NRZ data and 44.736-MHz clock are converted to a B3ZS bipolar signal. This signal passes through a relay switch before being sent to the ELIU1

pack. When operated as an optical assembly, the 89.472-MHz clock is sent to the OLIU where it is divided by two. The resulting 44.736-MHz clock is then sent back from the OLIU pack to the MXR. In this mode, the unipolar NRZ data is scrambled and then it and the 44.736-MHz clock are sent back to the OLIU pack. In the demultiplexing direction, the signal source for the M23 demultiplexer depends on the mode of operation. When operated as an electrical assembly, an unbalanced B3ZS signal is received from the ELIU1 pack. Clock is extracted and the data is converted from the bipolar format (B3ZS) to a unipolar NRZ format. When operated as an optical assembly, scrambled NRZ data and 44 736-MHz clock are received from the OLIU pack This data is descrambled to recover the original data.

The recovered unipolar NRZ data and 44.736-MHz clock are demultiplexed into seven DS2 rate unipolar signals by the M23 demultiplexer. Under direction of the PROCR pack, one of these seven signals is selected as the eighth protection signal. Each of these eight signals is demultiplexed into four sets of unipolar NRZ data and gapped 1.544-MHz clock by the M12 demultiplexer. These signals are then sent to the low-speed interface positions. The signals for PROTN 8 and PROTN 9 are dual fed from the eighth M12 demultiplexer. If a loss of signal condition or out-of-frame condition is detected by the M12 demultiplexer, the low-speed interface inserts an AIS signal toward the low speed cross-connect point.

When an AEK38 DS2 INTFC1 pack is used with the MXR pack, the M12 device associated with the DS2 channel is put into "bypass" mode by the PROCR. Therefore, the DS2 signal passes directly through the M12 device to the M23 device.

The MXR pack can be operated in the add/drop mode. When in this mode, the demultiplexed DS2 rate signals can be individually looped back in the M23 multiplexer under control of the PROCR pack. The multiplexer uses the demultiplexer clock for timing and passes the "through" DS2 signals without adding jitter to them.

The second generation AKM2B MXR2 differs from the first generation AKM2 MXR1 in the following four ways that affect the user:

- The AKM2 cannot be used in the same muldem with an AEK37 DS1C INTFC1 pack, AEK38 DS2 INTCF1 pack, or MC90191A1 TLM2 pack.
- The AKM2B is compatible with all other DDM-1000 packs except the MC90191A1 TLM2. The AKM2B provides C-bit framing format but cannot provide performance monitoring data to a TLM2 pack.
- Power consumption of the AKM2B is somewhat lower than that of the AKM2. When combined with the power reductions offered by the other second generation packs, this allows more flexibility in planning and engineering.
- Jumper plugs on the AKM2B control different operating modes. These jumpers are described in the Specifications section and in the affected procedures in the Installation and Maintenance section.

The AKM2C is an enhanced version of the AKM2B and is compatible with all other DDM-1000 circuit packs. It includes circuitry for a performance-monitoring option in which DS3 parity information is carried by stuffing control bits (C-bits). The AKM2C is used with the performance monitoring MC90191A1 TLM2 circuit pack installed in the TLM plug-in location. The AKM2C differs from the AKM2B in the following ways that affect the user:

- The AKM2C provides C-bit framing format, and performance-monitoring data to a TLM2 pack.
- When the AKM2C is used with the MC90191A1 TLM2 pack, it provides performance monitoring data over a TABS interface.
- When the AKM2C is used with the MC90083A1C (or later) PROCR2 pack, it provides DS3 AIS detection on the incoming DS3 signal from the DSX-3 (electrical mode) or from the fiber (optical mode).
- When the AKM2C is used with the MC90083A1E PROCR2 pack in an electrical terminating multiplexer configuration, an office alarm may be provisioned to operate when an incoming DS3 AIS is detected. The `set-dsx-16mb:` command in the Commands and Reports section of this manual provides more information.

An AKM2C MXR pack interprets any signal containing valid DS3 framing and invalid DS2 framing on all seven DS2 groups as a DS3 AIS signal. The `rept-fail:` command on the ASCII terminal will show "**l6mb failure**" (loss of 6 Mb/s DS2 frame). Detection of a DS3 AIS signal will result in telemetry byte-oriented serial (TBOS) scan point 31 or 32 being set.

C-bit parity may be used in either optical mode or electrical mode. In electrical mode the far end shelf must contain an AKM2B or AKM2C pack or, if in optical mode, the far end shelf may contain an AKM2B, AKM2C, or an AKM5 pack. An AKM6 pack cannot be used at the far end shelf with C-bit parity.

DS3U1 Pack (AKM5)

Description

The DS3U1 function unit pack allows a single, bidirectional DS3 clear channel capability for the DDM-1000 multiplexer in the 90 Mb/s optical transmission mode. It interfaces an electrical DS3 signal from an ELIU on one side to a 16-type OLIU on the other side and can be used in applications requiring non-M13 formatted DS3 transport (DS3 clear channel). The DS3U1 can be provisioned to accept either a framed signal or an unframed format independent signal using the `set-frm-ds3u1:` command. If it is provisioned to accept a framed signal, the only format requirement for a DS3 transported by the DS3U1 pack is that it must meet the F-, M-, and P-bit format requirements as specified in CB-119. All information (I) bits, control (C) bits, X bits, and stuff location (S) bits are transported unchanged in value and sequence. Table 1-1 compares the transport capability of the DS3U1, DS3U2, and FT Series G lightwave system.

Table 1-2 compares the compatibility of the DS3U1, DS3U2, and FT Series G lightwave system with various DS3 formats currently in use.

Table 1-1. Comparison of DS3 Clear Channel

Overhead Bits per CB-119	FT Series G	DDM-1000 DS3U2	DDM-1000 DS3U1
F	Unchanged	Changed	Unchanged
M	Unchanged	Changed	Unchanged
X	Unchanged	Changed	Unchanged
P	Changed*	Changed	Changed*
C	Unchanged	Changed	Unchanged
S	Unchanged	Changed	Unchanged
I	Unchanged	Changed†	Unchanged

* FT Series G and the DS3U1 allow users to provision the VMR/AIS feature on or off to provide a true format independent clear channel capability When the DS3U1 is provisioned for format independent capability using the `set-vmr-ds3ul:no` command, protection switching and DS3 monitoring are lost because the P-bit is not monitored. The other muldem must be equipped with an MXR or DS3U2 pack at each end to monitor parity and provide far-end communications (fecom) for full protection switching. (See the "Configurations" heading later in this section for the restrictions on using the DS3U1.)

† 28 DS1s in the M13 format can be transported clear channel.

Table 1-2. DS3 Channel Capability

DS3 Signal Source	FT Series G	DDM-1000 DS3U2	DDM-1000 DS3U1
DS3 Unframed	Yes	No	Yes†
M13 (TR-9)	Yes	Yes*	Yes
M13 (C bit Parity Mode)	Yes	No	Yes
Syntran Mux	Yes	No	Yes
Video Codec	Yes	No	Yes
DS3 AIS (TR-9)	Yes	No‡	Yes
DS3 Test Signal	Yes	No	Yes

* TR-9 uses the DS3 C-bits for a far-end DS2 loopback. The DS3U2 changes the DS3 C-bits and, therefore, will not pass the loopback command.

† The DS3U1 can be provisioned to accept an unframed format independent clear channel signal using the `set-frm-ds3ul:` command

‡ DS3 AIS passes with errors.

Table 1-3 shows the usage of overhead bits in DS3 formats that meet CB-119 requirements.

Table 1-3. DS3 Frame Format Overhead (OH) Usage

OH Bit CB-119	Number of Bits	Application	Customer (Note)	Network Provider (Note)
F	28	Frame	Yes*	No
M	3	Frame	Yes*	No
X	2	Far-end Alarm Loopback	Yes*	No
P	2	Parity	Yes*	Yes
C	21	Stuff Control Parity,CRC Data Link	Yes	No†
S	7	Stuff Location Data	Yes	No‡
I	4697	Data	Yes	No
Total	4760	—	—	—

Note:
Yes: Indicates that customer or network provider can change or generate the bit
No Indicates that customer or network provider can ***not*** change the bit.

* Customer must use these bits consistent with CB-119 to comply with tariffed services such as ***ACCUNET***® T45 digital service

† In the DS3 C-bit parity format mode, a customer may use the DS3 C-bits for end-to-end parity monitoring and for path self-identification

‡ The DDM-1000 MXR and DS3U2 circuit packs use these bits for a data link which can time share the S-bits with the customer data

In the optical transmitting direction, an unbalanced B3ZS signal is received from the ELIU1 pack (Figure 1-10). A 44.736 MHz clock is recovered and the data is converted from the bipolar B3ZS format to a unipolar NRZ format. A violation monitor and remover (VMR) checks and corrects parity (P-bits) in the DS3 frame. If the circuit is unable to frame on the DS3, it inserts a DS3 AIS signal (DS3 framed, 1010 data, C-bits=0, and no DS2 frame) towards the fiber. The data signal is scrambled and written into an elastic store using the recovered clock. The data is then read from the elastic store with a local clock and transmitted to the OLIU.

A phase-locked oscillator in the DS3U1 doubles the frequency of the clock recovered from the DSX-3 input. The resulting 89.472 MHz local clock is sent to the OLIU which uses it as a timing source for the optical transmitter and returns 44.736 MHz clock to each muldem slot.

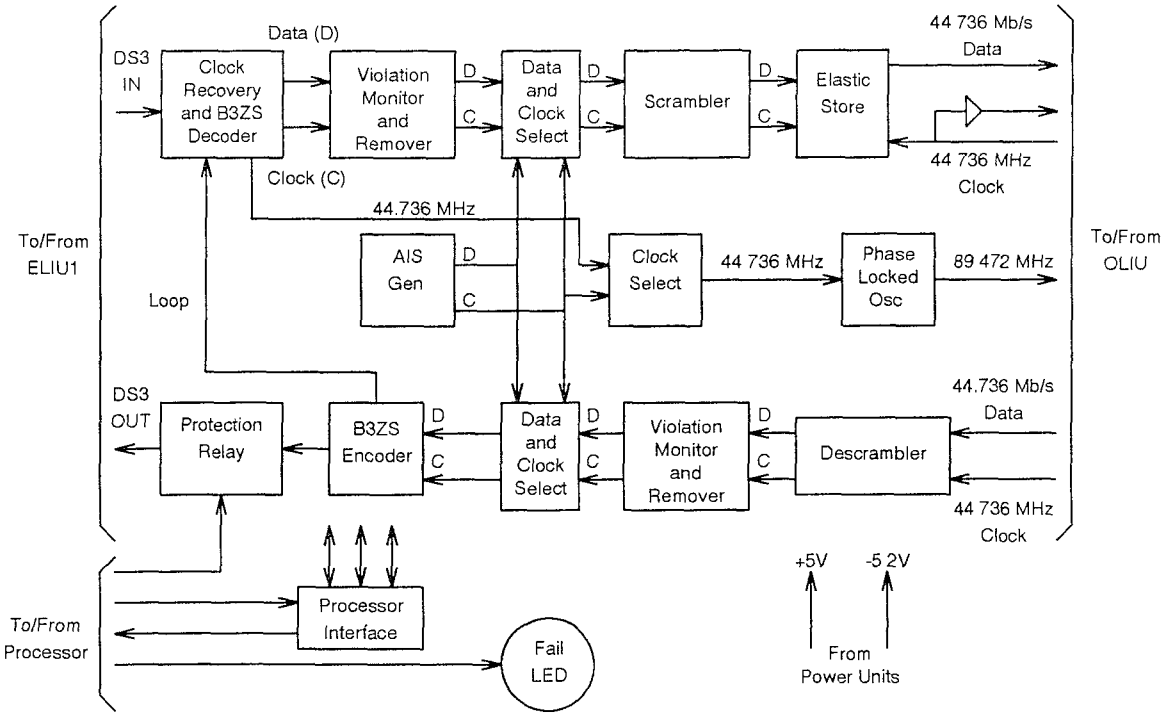

Figure 1-10. DDM-1000 DS3U1 (AKM5)

In the optical receiving direction, scrambled NRZ data and 44.736 MHz clock are received from the OLIU. The data is descrambled and a VMR checks and corrects parity bits. If the VMR is unable to frame on the DS3, it inserts a DS3 AIS towards the DSX. The unipolar NRZ data and 44.736 MHz clock are converted to a B3ZS bipolar signal. This signal passes through a protection relay switch before being sent to the ELIU1 pack.

Protection switching for the DS3U1 occurs in the same way as in the other function units in optical mode. The service and protection DS3U1 packs are dual fed at the source and switched at the receiving end. The protection switch toward the DSX is done by operating the relay on the DS3 output to the ELIU1 pack. Protection switching is done on command from the processor. The switch is maintained from both the PROCR and the DS3U1 pack, which allows the PROCR pack to be removed without affecting the switch. The second muldem must be equipped with an MXR or DS3U2 pack to provide far-end communications (fecom) for a full bidirectional protection switch to occur.

The DS3U1 pack provides DS3 AIS detection on the incoming DS3 signal, not on the incoming fiber signal. The DS3U1 interprets a DS3 AIS signal as any signal that contains valid DS3 framing and no more than two consecutive ones or two consecutive zeroes for the duration of two M-frames. Detection of a DS3 AIS signal results in TBOS scan point 31 or 32 being set.

The DS3U1 pack contains one digital loopback under control of the processor pack using the `exct-loop-ds3u1:` command. The loopback is on the DSX side, and loops the DS3 signal being transmitted towards the DSX back toward the fiber. When the loopback is set, the processor abnormal condition LED is lit and the TBOS scan point for a manual function is set. A red faceplate LED indicates alarm conditions.

A bidirectional processor interface link reports parity violations, out of frames, loss of clock, AIS presence, and other maintenance items from the DS3U1 pack to the processor pack. In the other direction the processor pack controls the DS3 loopback, the protection relay, AIS insertion, parity correction, and the faceplate fail LED on the DS3U1 pack.

A DDM-1000 optical system equipped with a DS3U1 circuit pack will transport unaffected a framed DS3 quasi-random test signal commonly used by DS3 test sets. The DS3 path through a DDM-1000 optical system can be checked by connecting a DS3 test set at the near-end DSX-3 and looping the signal through either the far-end DSX-3 or through the loopback in the far-end DS3U1.

Three new commands available in the MC90083A1D, or later, PROCR2 support the DS3U1 pack. The `set-frm-ds3u1:` command is used to provision the DS3U1 to accept framed or unframed signals. The `set-vmr-ds3u1:` command is used to allow or not allow the VMR functions. This will either allow parity errors to be corrected or pass them unaltered. The `exct-loop-ds3u1:` command controls the loopback on the DSX side of the DDM-1000. It loops (bridges) the DS3 signal being transmitted towards the DSX back toward the optical fiber.

Configurations

The following are restrictions on using the DS3U1:

- The DS3U1 can only be used in the 90 Mb/s optical transmission mode.
- The DS3U1 can be installed in the function unit slots of either muldem A or muldem B.
- Only one DS3U1 service/protection pair can be used.
- To provide an end-to-end overhead communications link when one muldem is equipped with a DS3U1, the other muldem function unit slot must be equipped with either an MXR or DS3U2 circuit pack. Without the other muldem equipped, there can be no far end communications (fecom) and, therefore, no protection switching.
- If a DS3U2 is used in the other muldem, it must be driven from the DSX-3 with a DS3 signal that has a valid DS3 frame format to prevent alarming and AIS insertion. A framed "standard" pseudo-random DS3 test signal or an M13-formatted DS3 may be used, but a DS3 AIS should not be used. If the correct input signal is not provided to the DS3U2, far-end communication is disabled.
- A DDM-1000 shelf equipped with a DS3U1 pack must also be equipped with an MC90083A1D, or later, PROCR2 pack.
- If only one muldem is equipped, it must be provisioned to accept a framed signal.
- If one muldem is equipped with a DS3U1 to accept an unframed signal, the other muldem must be equipped to accept a framed signal. The unframed DS3 signal is neither monitored nor protected for failures in that channel.

When a near-end muldem is equipped with DS3U1 packs, the corresponding muldem at the far-end DDM-1000 shelf can be equipped with a DS3U1, MXR, or a DS3U2 pack. If a MXR or DS3U2 pack is provided at the far-end shelf, far-end communication (fecom) must be turned off in that far-end muldem using the `set-shelf-fecom:` command. The other muldem must be equipped with both a service and protection MXR or DS3U2 pack to provide far-end communication for protection switching even if service is not provided through that function unit.

A DDM-1000 shelf equipped with a DS3U2 pack can be converted to a DS3U1 while in service. Detailed procedures are provided in the INSTALLATION AND MAINTENANCE section of this manual.

DS3U2 Pack (AKM6)

The DS3U2 pack provides a DSX-3 compatible interface to the OLIU. The DS3 signals are required to be M13 compatible. (**M13 compatible signals are DS3 signals that can be demultiplexed by an M13 multiplexer as specified in TR-TSY-000009.**) This allows an optical shelf to carry two externally generated M13 compatible DS3 signals or one externally generated M13 compatible DS3 signal and one internally generated DS3 signal from a MXR pack. The pack also provides a control interface that terminates the internal communications bus. A red LED on the front of the pack indicates alarm conditions.

The DS3U2 pack will not pass an M13 signal formatted for C-bit parity (performance monitoring). This is because the DS3U2 pack, in the multiplexing direction, demultiplexes the incoming M13 DS3 signal down to DS1s and then multiplexes the DS1s back up to an M13 signal. In the process, incoming overhead bits are lost and new overhead bits are inserted.

In the optical transmitting direction, an unbalanced B3ZS signal is received from the ELIU1 pack (Figure 1-11). Clock is extracted and the data is converted from the bipolar format (B3ZS) to a unipolar NRZ format. This signal is monitored for violations and demultiplexed. If loss of clock or DS3 frame is detected, a DS3 AIS signal (DS3 framed, 1010 data, C-bits=0, and no DS2 frame) is inserted. These signals are synchronized in elastic stores and then multiplexed back up to the DS3 rate. The DS3 rate NRZ data is scrambled and then it and the 44.736-MHz and 89.472-MHz clocks are sent to the OLIU pack.

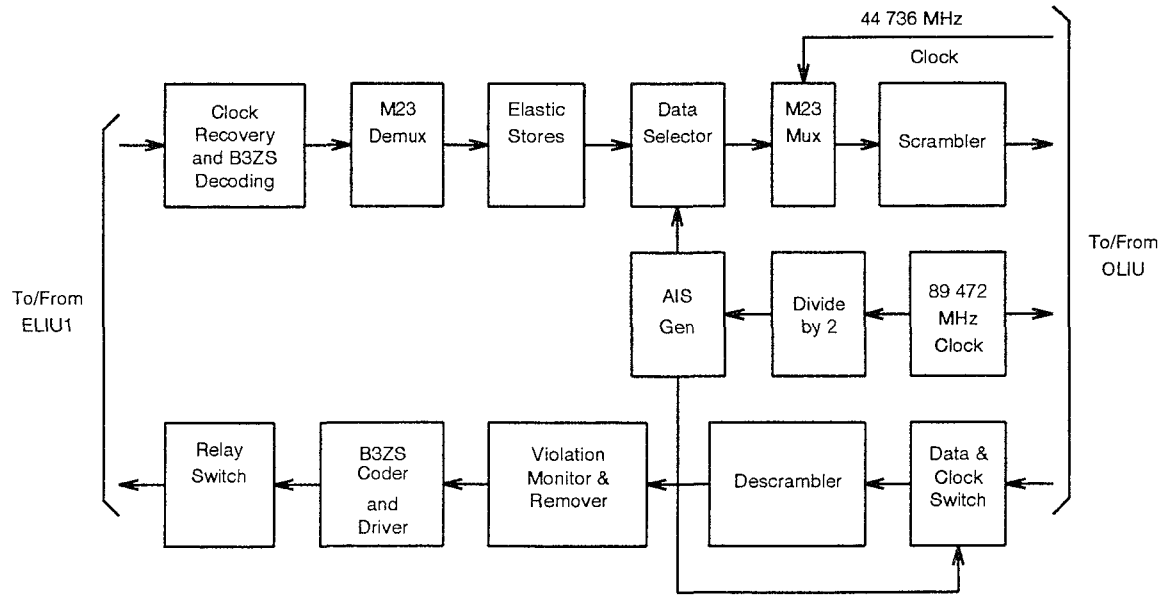

Figure 1-11. DDM-1000 DS3U2 (AKM6)

In the optical receiving direction, scrambled NRZ data and 44.736-MHz clock are received from the OLIU pack. The data is descrambled and monitored for violations. Any violations are removed. If loss of clock or DS3 frame is detected, a DS3 AIS signal is inserted. The unipolar NRZ data and 44.736-MHz clock are converted to a B3ZS bipolar signal. This signal passes through a relay switch before being sent to the ELIU1 pack.

MC90083A1E PROCR2 packs provide detection of incoming DS3 AIS (good DS3 frame and loss of all 7 DS2 frames) and set TBOS scan points 31 and/or 32. The ASCII terminal commands "`rept-fail:`" and "`rept-fail-16mb:`" will show the DS2 failure status. No other alarms or indicators will be raised in an optical configuration. In an electrical configuration office alarms may be provisioned with the `set-dsx-16mb:` command to indicate incoming DS3 AIS. Earlier firmware versions produced unpredictable indications.

BP2 Pack (AKM86)

The AKM86 BP2 pack is required in an optical shelf if only one muldem is equipped in the shelf. In a 180 Mb/s system, an AKM86 pack is required in each shelf if only one muldem is equipped in each shelf.

The BP2 pack prevents a service-affecting condition from occurring. Without the BP2 pack, a failure of the protection fiber or removal of a protection function unit or OLIU will cause a high-speed protection switch to occur. The switch will last for about 10 seconds and then return to the service channel, thus restoring service.

The BP2 pack must be installed in the function unit SRV slot of the unequipped muldem. The pack contains a short, printed path that grounds a lead to prevent the false protection switch.

High Speed Interface Circuits

ELIU1 Pack (AKM3)

The ELIU1 pack terminates two bidirectional DS3 lines. It is used when the interface to DDM-1000 is at a DSX-3. The cables to and from the DSX-3 are terminated in male BNC connectors that mate with female BNC connectors mounted on the ELIU1 pack. The ELIU1 has no active electrical components so it is not protected. A red LED is not provided on the front of the pack since there are no active components to fail.

In the direction to the DSX-3, four unbalanced bipolar DS3 data signals are received from the function units (Figure 1-12). The SRV and PROTN signals for muldem A are wired together and the SRV and PROTN signals for muldem B are wired together. The relays on the function unit packs allow only the SRV or PROTN (but not both) signal to be transmitted. The two unbalanced bipolar DS3 data signals are sent through selectable passive 225-foot line build outs (LBOs) to the DSX-3.

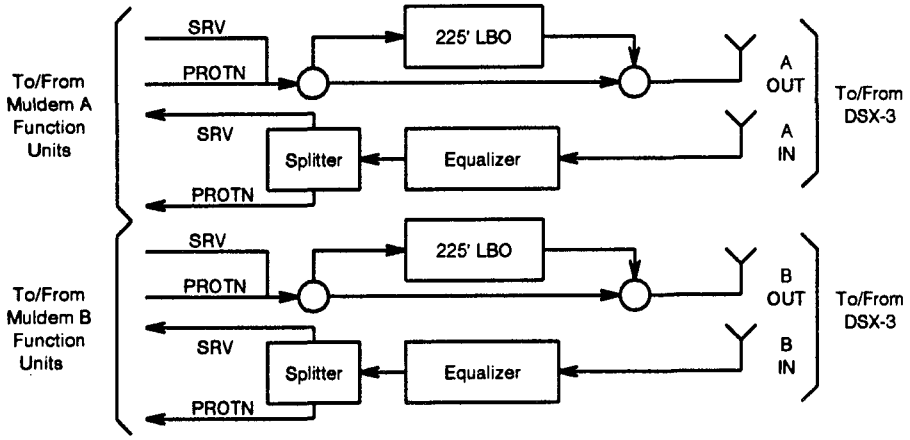

Figure 1-12. DDM-1000 ELIU1 (AKM3)

In the direction from the DSX-3, two unbalanced bipolar DS3 data signals are received from the DSX-3. Each of these signals is equalized and split into SRV and PROTN signals using passive components. Four unbalanced bipolar DS3 data signals are sent to the function units.

OLIU Pack (All 16-Types)

The OLIU packs each terminate one service (SRV) or one protection (PROTN) 90 Mb/s optical line in both the transmit and receive directions. A red LED is provided on the front of the pack to indicate alarm conditions.

A new generation of 16-type OLIU packs has been developed, consisting of OLIU9 (16F2) and OLIU10 (16E2), which supersedes the existing OLIU1, OLIU2, and OLIU3 (16E, 16F, and 16G). The OLIU6 (16K) is not involved in this change.

The OLIU1 pack (16E) can only be used in a controlled environment for short-to-moderate length spans. The OLIU2 pack (16F) can be used in an uncontrolled environment for short-to-moderate length spans. The OLIU10 pack (16E2) can be used in an uncontrolled environment and is backward compatible with all OLIU1 (16E) and OLIU2 (16F) installations. Its primary recommended function is as a maintenance replacement for OLIU1 (16E) and OLIU2 (16F).

The OLIU3 (16G) pack can be used in an uncontrolled environment for moderate-to-long length spans. The OLIU9 pack (16F2) can be used in an uncontrolled environment for moderate-to-long length spans. It is backward compatible with all OLIU3 (16G) installations and is therefore recommended as a maintenance replacement for OLIU3 (16G). The OLIU9 (16F2) is recommended for new installations up to 60.8 km (37.7 miles). The OLIU6 (16K) is recommended for long-span installations up to 73.2km (45.3 miles).

The OLIU specifications are presented in Chapter 2. Manual.

In the optical transmitting direction, an 89.472-MHz clock is received from the function unit (SRV or PROTN as appropriate) in muldem A and muldem B (Figure 1-13). One is selected to be used by the OLIU pack as the clock source. This clock is divided by two and the resulting 44.736-MHz clock is sent to the function units. The 44.736-MHz clock is used by the function units to return synchronous data to the OLIU. The OLIU also receives unipolar scrambled NRZ data and 44.736-MHz clock from each function unit. These synchronized DS3 signals are combined to form the 89.472-Mb/s NRZ data signal. The DS3 signal from muldem B is marked to allow the separator at the far end of the system identify muldem B's signal. The laser transmitter (single mode, 1.3 micron) converts this electrical signal into pulses of light. These pulses of light are coupled into a single mode fiber pigtail for connection to the transmitting single-mode or multimode fiber.

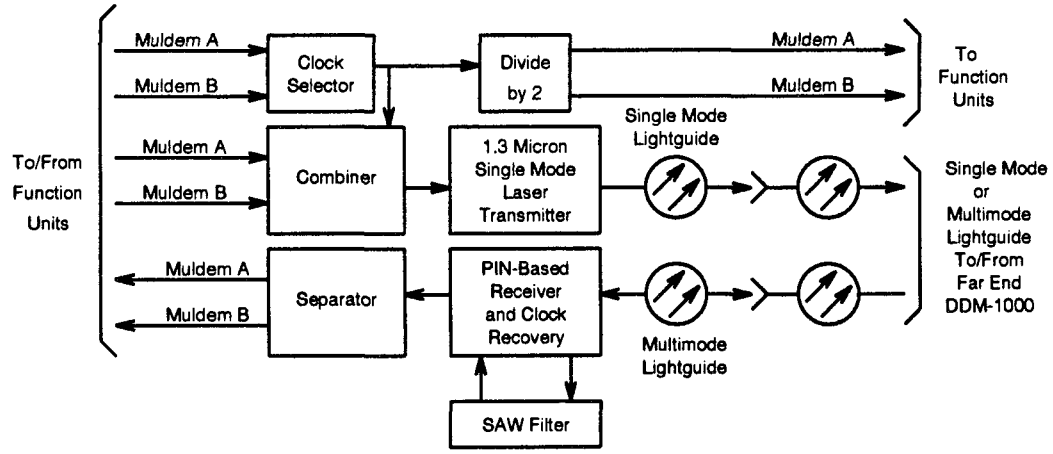

Figure 1-13. DDM-1000 OLIU (All 16-Types)

In the optical receiving direction, the receiving single-mode or multimode fiber is connected to a multimode fiber pigtail. The PIN-based optical receiver converts the pulses of light into electrical pulses. Clock is recovered from this 89.472-Mb/s unipolar NRZ data stream using a surface acoustic wave (SAW) filter. The signal is separated into two unipolar scrambled NRZ data and 44.736-MHz clock streams that are then sent to the appropriate function units.

OLIU Pack (20E, 20G or 20K)

The 180 Mb/s OLIU pack (20E OLIU4, 20G OLIU5 or 20K OLIU7) terminates one service (SRV) or one protection (PROTN) 180 Mb/s optical line in both the transmit and the receive direction. Two OLIUs (one service and one protection) are installed in one of the two connected DDM-1000 assemblies, called the OLIU assembly. Two red LEDs on the front of the OLIU indicate alarm conditions in the two shelves. The OLIU4 pack can be used only in a controlled environment for short-to-moderate span lengths. The OLIU5 and OLIU7 packs can be used in an uncontrolled environment for longer span lengths.

In the optical transmitting direction, an 89.472-MHz clock is received from the function unit (SRV or PROTN as appropriate) in muldem A and muldem B of the OLIU assembly (Figure 1-14). Therefore, at least one function unit must be installed in the OLIU assembly. One clock is selected to be used by the OLIU pack. The frequency is doubled to 178.944-MHz for use as the high-speed clock source. The 89.472-MHz clock from the function unit is also divided by two and the resulting 44.736-MHz clock is sent to the function units in both assemblies. This 44.736-MHz clock is used by the function units to return synchronous data to the OLIU.

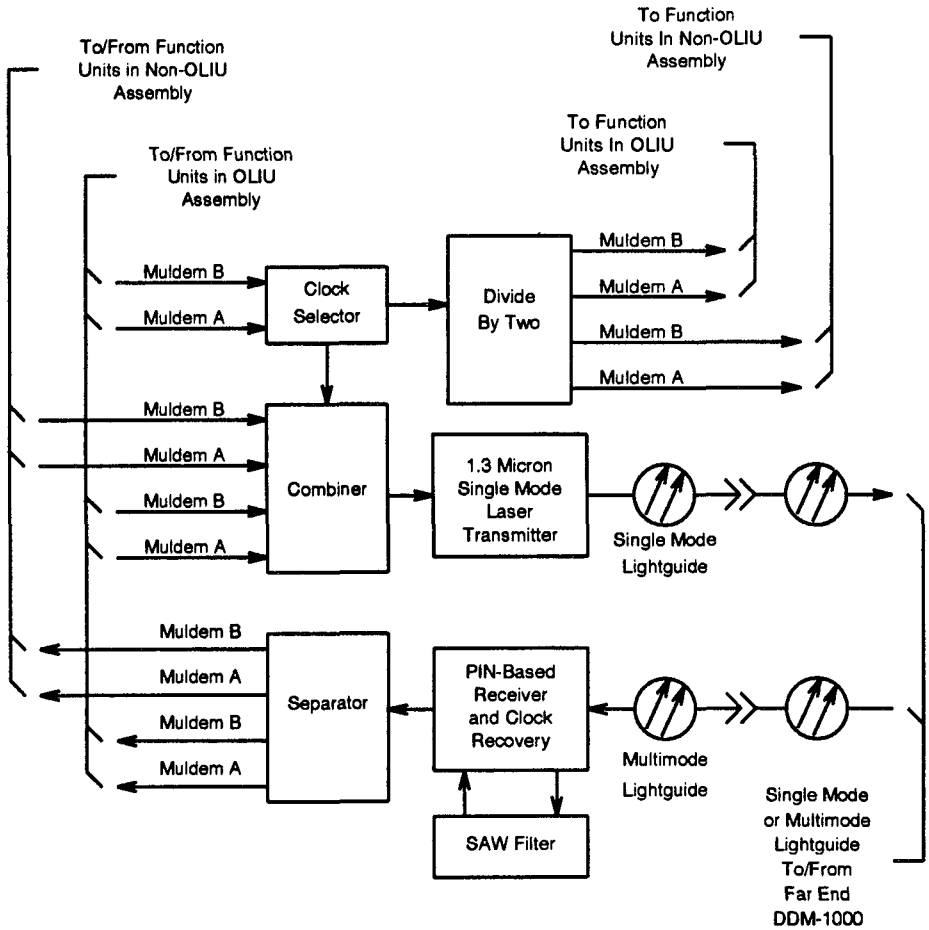

Figure 1-14. DDM-1000 OLIU (20E, 20G, or 20K)

The OLIU receives unipolar scrambled NRZ data and 44.736-MHz clock from each function unit. These synchronized DS3 rate signals are combined to form the 178.944-Mb/s NRZ data signal. The individual DS3 rate signals are marked to allow the separator at the far end of the system to identify the particular DS3 rate signals. The laser transmitter (single mode, 1.3 micron) converts this electrical signal into pulses of light. These pulses of light are coupled into a single-mode optical pigtail for connection to the transmitting single-mode fiber.

In the optical receiving direction, the receiving single-mode fiber is connected to a multimode fiber pigtail. The PIN-based optical receiver converts the pulses of light into electrical pulses. Clock is recovered from this 178.944-Mb/s unipolar NRZ data stream using a surface acoustic wave (SAW) filter. The signal is separated into four unipolar scrambled NRZ data and 44.736-MHz clock streams that are sent to the appropriate function units.

A DDM-1000 optical system can be initially installed with 180 Mb/s OLIU packs in a single shelf configuration and be used to carry two DS3s for 90 Mb/s service. Later, a second shelf can be added (without OLIU packs) and cabled to the first shelf to upgrade easily to four DS3s for 180 Mb/s service. The 20-type 180 Mb/s OLIUs cannot be used with the AKM5 DS3U1 pack.

In 180 Mb/s systems, channels originating in an OLIU shelf in one office terminate in the OLIU shelf in the other office. Channels originating in a non-OLIU shelf in one office terminate in the non-OLIU shelf in the other office. For example, if the OLIU shelf is on the bottom of the 2-shelf pair in one office and on the top of the 2-shelf pair in the other office, channel assignments follow the shelf configuration, not the physical position in the bay.

Controller Circuits

PROCR Pack

The PROCR pack provides the control for all monitoring, protection switching, alarming, and display within the assembly. In addition, it contains interfaces for an ASCII terminal, office alarms, serial telemetry, and limited parallel telemetry set.

The heart of the PROCR pack is a sophisticated microcomputer (Figure 1-15). It is composed of a 16-bit microprocessor with read only memory (ROM) for program storage, random access memory (RAM) for variable storage, electrically erasable programmable read-only memory (EEPROM) for assembly configuration and state information, interrupt controllers, interval timers, intelligent sanity timer, and an operating system designed for real time applications.

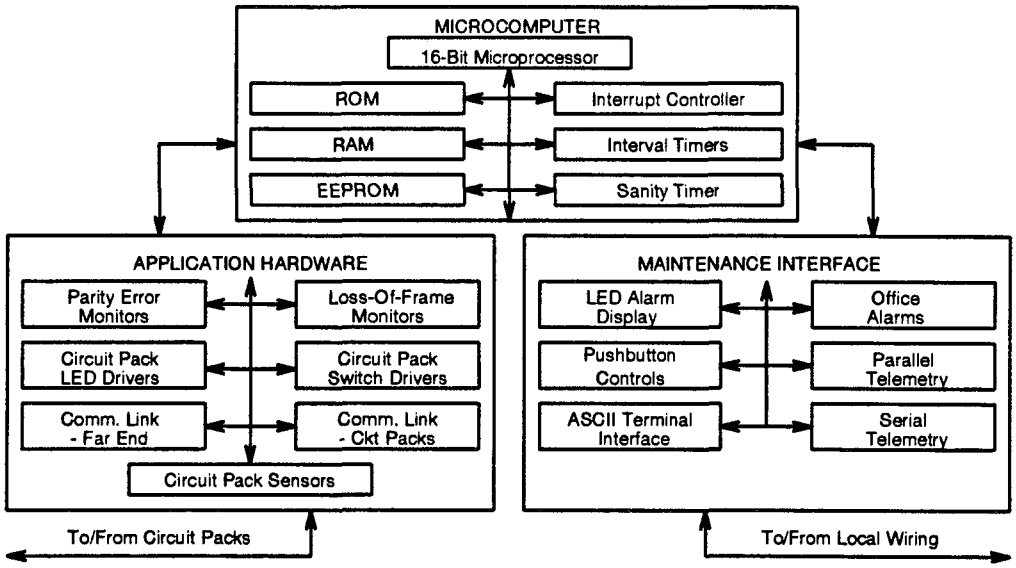

Figure 1-15. DDM-1000 PROCR

Application specific hardware links this microcomputer with the transmission hardware. A high-speed communication link that gives the processor complete status and control of the assembly is provided to each circuit pack. A high-speed communication link embedded in the high-speed bit stream is also provided for each muldem. This link allows access to and control of the far end DDM-1000 terminal for many different features. Dedicated parity error and loss of clock/frame monitors insure quick line switching for the optical option. LED drivers can turn on any LED to provide easy identification of failures. Primary pack switch drivers provide control of the protection switching on all packs. Pack equipped sensors identify new packs as they are added to the assembly.

Several maintenance interfaces to the DDM-1000 are provided by the hardware. Six LEDs are mounted on the PROCR and are used to display the alarm status information locally. A seventh red LED is provided on the front of the pack to indicate pack alarm conditions. An ACO/TEST button that is easily accessible and a recessed RST button (not easily accessed) provide control for minimum operation. An ASCII terminal interface (RS-232 compatible) provides a means of obtaining detailed information and controlling the more advanced features of the DDM-1000. The COMMANDS AND REPORTS section of this manual provides a reference for this interface.

Office audible and office visible outputs for major (MJ) and minor (MN) alarms are available for the office alarm system The DDM-1000 relays are susceptible to large transient currents caused by capacitive loads or by direct connection to aisle pilot lamps. **An alarm isolation unit (AIU) is always required between the first DDM-1000 shelf in a bay and the office alarms in the normal daisy chain fashion described in DP-426 in the Installation and Maintenance section of this manual. One AIU is required per bay.** (See "Alarm Precautions" in the SPECIFICATIONS section of this manual.)

Parallel telemetry outputs for MJ and MN alarms are provided for remoting alarms to maintenance centers. A serial telemetry port that can be shared over eight DDM-1000s is also available for remoting alarms to and controlling the DDM-1000 from maintenance centers.

The different versions of PROCR packs (MC90083A1 PROCR1; MC90083A1B PROCR2; MC90083A1C PROCR2; MC90083A1C, Issue 2, PROCR2; MC90083A1D PROCR2; MC90083A1D, Issue 2, Issue 3, and Issue 4, PROCR2; MC90083A1E PROCR2 and MC90083A1E, Issue 2, PROCR2) differ from each other in several ways that affect the user. These differences are described in detail under "Circuit Pack Compatibility" in the PLANNING GUIDELINES section of this manual.

Briefly, the differences are as follows:

- Each PROCR2 provides support for the AEK37 DS1C INTFC1 and AKM6 DS3U2 packs while the first generation PROCR1 does not. In addition, several maintenance features have been added or enhanced in the PROCR2 because of its increased memory capacity.
- The MC90083A1C, and later, PROCR2 packs support incoming DS3 AIS detection and the DS3 path performance monitoring feature provided by the optional MC90191A1 TLM2 pack.
- The MC90083A1C, Issue 2 PROCR2 was issued to correct minor problems in earlier firmware versions.
- The MC90083A1D, and later, PROCR2 packs support the DS2 interface and the DS3 clear channel interface provided by the AEK38 DS2 INTFC1 and the AKM5 DS3U1 packs, respectively.
- The MC90083A1D, Issue 2 PROCR2 was issued as a class A change to replace all MC90083A1D PROCR2 packs that had self-reset problems.

- The MC90083A1D, Issue 3 PROCR2 was issued as a class A change to replace all previous MC90083A1D and earlier PROCR2 packs. This release corrects some conditions that may occasionally affect service and some other conditions that are non-service-affecting.
- The MC90083A1D, Issue 4 PROCR2 was issued as a class A change to replace all previous MC90083A1D and earlier PROCR2 packs because of a problem in the MC90083A1D, Issue 3, which caused a non-service-affecting cycling of the power minor (PMN) alarm in configurations using a remote terminal.
- The MC90083A1E, and later, PROCR2 provides additional operations and applications features compared with previous PROCR2s, including support of open network architectures and a two-step reset process.
- The MC90083A1E, Issue 2 PROCR2 was issued as a class A change to replace all previous MC90083A1E PROCR2 packs because of a non-service-affecting cycling of the PMN alarm in configurations using a remote terminal. The MC90083A1E, Issue 2 PROCR2 contains all the features of the MC90083A1E, Issue 1 PROCR2 and all the benefits of the MC90083A1D, Issue 4 PROCR2.

The enhancements made are described in greater detail under "Circuit Pack Compatibility" in the PLANNING GUIDELINES section of this manual.

TLM1 Pack (AKM4)

The TLM1 pack (Figure 1-16) provides several maintenance interfaces that consist of additional alarms, an extensive parallel telemetry set, and a bidirectional overhead telemetry capability. The pack also provides a control interface that terminates the internal communications bus to and from the PROCR pack.

Two LEDs on the faceplate of the TLM1 provide a local display of critical (CR) and power minor (PMN) alarm status information. A third red LED on the faceplate of the TLM1 indicates pack alarm conditions. Office-audible and office-visible contact closures in the TLM1 activate the office alarm system. Four alarm and six status contact closures and one system identification closure provide parallel telemetry outputs for remoting information to a maintenance center.

The DDM-1000 relays are susceptible to large transient currents caused by capacitive loads or by direct connection to aisle pilot lamps. **An Alarm Isolation Unit (AIU) is always required between the first DDM-1000 shelf in a bay and the office alarms in the normal daisy chain fashion described in DP-426 in the Installation and Maintenance section of this manual. One AIU is required per bay**. See "Alarm Precautions" in the SPECIFICATIONS section of this manual.

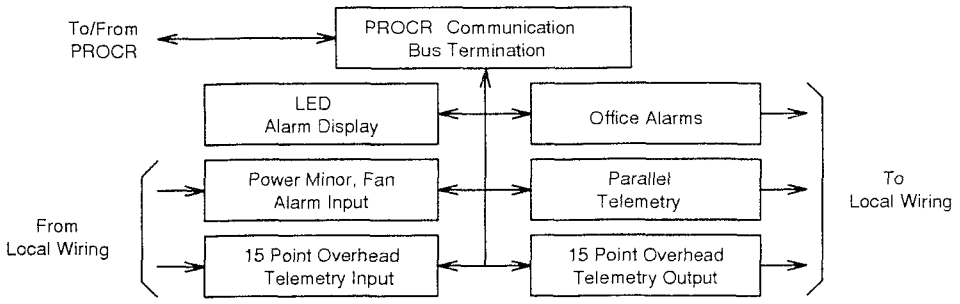

Figure 1-16. DDM-1000 TLM1 (AKM4)

The TLM1 pack provides a 15-port bidirectional overhead telemetry capability. External input conditions that are sensed at the near end terminal are reflected at the output of the far end terminal. Likewise, external input conditions that are sensed at the far end terminal are reflected at the output of the near end terminal. This overhead telemetry capability can also be accessed through the TBOS serial telemetry port at either end of a system.

MC90191A1 TLM2 Pack

The MC90191A1 TLM2 pack (Figure 1-17) is an optional circuit pack that can be used to provide high-speed DS3 path performance monitoring and a bidirectional overhead telemetry capability. There are no additional alarm levels or parallel telemetry provided in this pack.

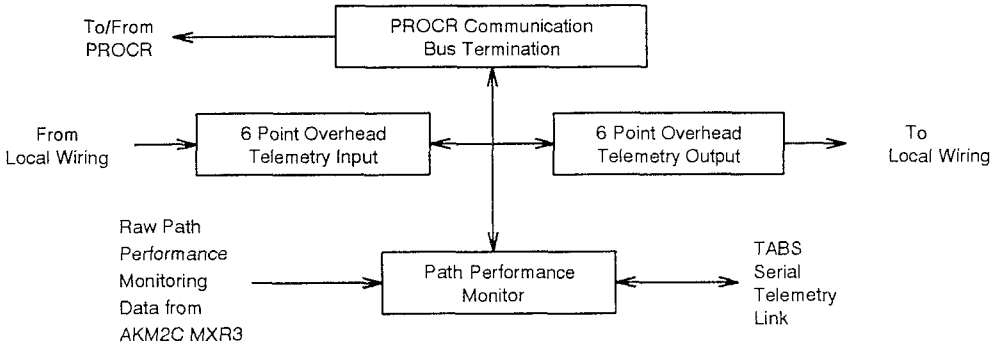

Figure 1-17. DDM-1000 MC90191A1 TLM2 (AKM7)

Path performance-monitoring data can be inserted in the DS3 signal using a newly defined DS3 C-bit parity frame format. The C-bit frame format is different from the standard M13 frame format in that the use of the 21 stuff control bits (C-bits) and two X-bits of each M-frame have been redefined. Three of the C-bits are used to show the parity over the previous M-frame. Another three C-bits are used to show a far-end parity error. The remaining 15 C-bits are not used at this time. The X-bits are used to communicate a far end DS3 out-of-frame condition. The MXR3 circuit pack extracts this raw performance-monitoring data from the DS3 signal and supplies it to the TLM2 pack. The TLM2 processes this information to supply out-of-frame seconds, total parity errors, and type A, B, and C errored seconds for both the near and far end in 1-minute intervals as defined in AT&T Compatibility Bulletin 149 (CB~#149). The DS3 performance-monitoring data can be accessed via a TABS serial telemetry link.

The MC90191A1 TLM2 circuit pack also provides a 6-port bidirectional overhead telemetry capability. Up to six external inputs can be applied to the near end terminal, and the status of these inputs can be sent to the far end terminal via an overhead telemetry channel embedded in the DS3 signal. At the far end terminal, the status of these six signals can be accessed by the TBOS serial telemetry link. In addition, if the far end is equipped with a TLM2, these points are brought out as a set of six contact closures. Similarly, the six output contact closures at the near end terminal reflect the state of the six input overhead telemetry points of the far end terminal. Finally, five of the six overhead telemetry outputs can be operated remotely from the TBOS serial telemetry link at the other end of the system.

The MC90191A1 TLM2 circuit pack communicates with the PROCR pack over an internal communications bus. Shelf information (such as which MXR3 cards are carrying traffic) is passed to the performance-monitoring circuitry so that it can properly process the performance-monitoring data. The status of the six overhead inputs is sent by the overhead telemetry circuitry to the PROCR over the communication bus for transmission to the far end. The state of the six overhead telemetry outputs is sent to the overhead telemetry circuitry by the PROCR over the communication bus based on information sent from the other end.

Two LEDs and two switches are mounted on the faceplate of the TLM2. The RST switch, which is recessed to prevent accidental operation, restarts the operation of the circuit pack. It starts a self-diagnostic test routine to determine the health of the pack, and clears all performance-monitoring data and re-establishes communication with the TABS serial telemetry link. During the restart procedure, the RST/TST LED will blink on and off. When this LED remains off, the restart procedure is completed. The TEST switch will cause the self-diagnostic routine to be executed. This switch can be operated at any time and will not cause the loss of any performance data. This switch will also momentarily turn the RST/TST LED on and off to test its operation. The ALM LED indicates a failed MC90191A1 TLM2 pack. This LED is illuminated if the self-diagnostic routine determines that there is a problem or if the MC90191A1 TLM2 fails to communicate properly with the PROCR pack over the communication bus. The TLM2 does not have a CR LED; therefore 3-level alarm (CR, MJ, MN) option selection cannot be used in the PROCR. If the 3-level alarm option is set and a TLM2 pack is installed, then there will not be any MJ or CR alarm indication when a critical alarm does occur.

Power Circuits

PWR Pack (547A or 547B)

The PWR pack generates +5 volts and -5 volts DC from the primary office power. A service (SRV) and a protection (PROTN) pack are provided for redundancy with each pack having a separate primary power input. The SRV pack is powered from the "A" feeder and the PROTN pack is powered from the "B" feeder. Each pack is capable of supplying power for the entire shelf. The PWR1 (547A PU) pack operates from -48 volt primary power. The PWR2 (547B PU) pack operates from -24 volt primary power. A red LED is provided on the front of the pack to indicate alarm conditions.

The PWR pack is a high-efficiency DC-to-DC power converter (Figure 1-18). The primary office power is fused on board the PWR pack and feeds two DC-to-DC converter sections, one for +5 volts and the other for -5 volts. Remote sensing insures tight control of the voltages generated to power the low-voltage circuitry on the other packs. The PWR packs are designed to share the load since their outputs are diode "ORed." The degree of "sharing" depends on the balance or matching of the DC output voltages. The outputs from the two packs are connected in parallel by the backplane and are equipped with current-limiting circuitry that protects against faults in the backplane while providing enough output current to blow fuses on damaged load packs that may be grounding one or both of the low voltage buses. In addition, each PWR pack contains circuitry to shut itself down if it is generating a high voltage condition. The PWR packs contain a latching shutdown circuit to prevent damage to the system during periods of overvoltage. They must be removed and reseated or repowered to clear the latch. On rare occasions, the latch shutdown has occurred during electrical storms.

To prevent damage to the PWR pack, it should be unseated before applying external power. For example, if a feeder fuse blows, the PWR pack should be unseated first, the fuse replaced, and then the PWR pack seated.

Usually when a converter fails, it turns on its LED and closes an alarm contact. Some converter failures may not light the LED. If series 2 PWR packs are installed and power dissipation is a concern in a particular application, then only series 2 packs should be used as a replacement.

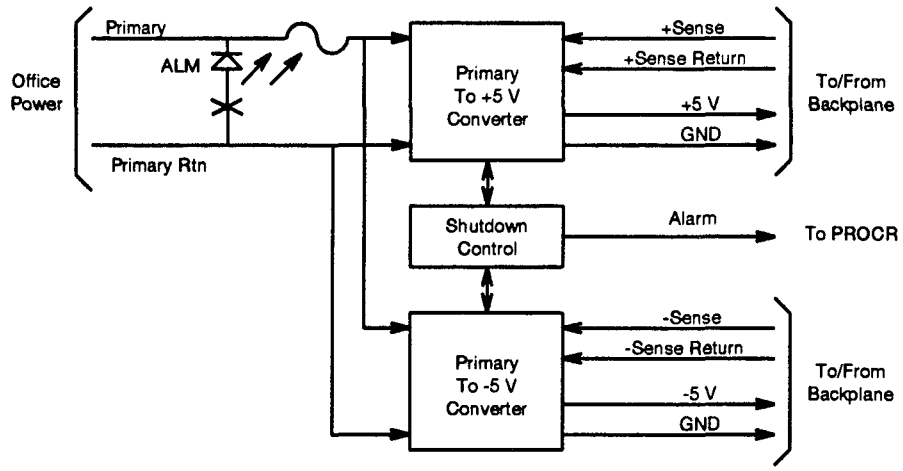

Figure 1-18. DDM-1000 PWR (547A or 547B)

Maintenance Description

Reliability

Past generations of multiplexers with discrete logic designs for multiplexing and demultiplexing use high- and low-speed bit-by-bit checking to verify error-free operation of the equipment. This is necessary because there are many failure modes that cannot be detected easily by other means. These bit-by-bit checks typically detect 90 to 95 percent of the total failures (FITs). Since the circuitry to do the bit-by-bit checking represents a significant portion of the cost of a multiplexer, it is usually time-shared over many inputs.

In DDM-1000, the M13 multiplexing and demultiplexing function is now contained on a single circuit pack that can be 1:1 protected. The earlier assumptions that lead to bit-by-bit checking as the optimum choice for monitoring are no longer valid. The application of very large scale integration (VLSI) circuitry in DDM-1000 leads to the use of new approaches for verifying error-free performance of the equipment.

Analysis of similar VLSI-based systems has shown that most integrated circuit failures are associated with the input/output buffers and connections from the silicon to the carrier. Blocks of continuous monitoring circuitry are distributed in every VLSI device to bridge these areas of potential failure. In addition, other blocks of monitoring circuitry are placed at strategic locations within each VLSI device. Using this approach, the percentage of FITs monitored matches that monitored with bit-by-bit methods in past systems, and the total FITs that are not monitored is reduced substantially. Also, these continuous monitors are not time-shared so service-affecting failures within the equipment are detected more quickly

As a result of these advances in multiplexer design, the DDM-1000 is extremely reliable. Table 1-4 summarizes the reliability parameters for the DDM-1000 multiplexer on a per DS1, DS2, and DS3 basis.

Table 1-4. DDM-1000 Reliability Parameters

Parameter		Configuration (Note)	
		Electrical	Optical (Total - Both Ends)
System Reliability (FITS)	per DS1, DS2	299	224
	per DS3	187	278
MTBF* (hours)	per DS1, DS2	3.34×10^6	4.09×10^6
	per DS3	5.34×10^6	3.59×10^6
Availability†	per DS1, DS2	99.99988%	99.99991%
	per DS3	99.99993%	99.99988%
Outage† (minutes per year)	per DS1, DS2	.63	.47
	per DS3	.39	.58

Note: A system with 1 1 high speed protection and 1·7 low-speed protection is assumed for all parameters

* MTBF Mean Time Between Failures Assuming 4-hour mean time to repair

† Assuming 4-hour mean time to repair

Protection Switching

The use of distributed continuous monitors built into the VLSI circuitry on DDM-1000 leads to precise identification of failures within the equipment. This failure information is used by the microcomputer on the PROCR to isolate faults to a pack and to initiate protection switching. The use of protection switching is an option in DDM-1000 and is available for the low-speed interface or the function unit and high-speed interface.

Low-Speed Interface

The low-speed interface protection switching on DDM-1000 allows a good protection pack to replace a failed service pack. To "make" a low-speed switch, the bipolar signals to and from the low-speed cross-connect point are switched to and from the protection bus by relay switches (Figure 1-19). The protection bus is composed of four transmit signal pairs and four receive signal pairs (one for each channel) that span the service positions and connect to the protection positions. At the same time that the relays are operated, an electronic switch on the MXR pack is thrown to complete the switch around the service low-speed interface pack.

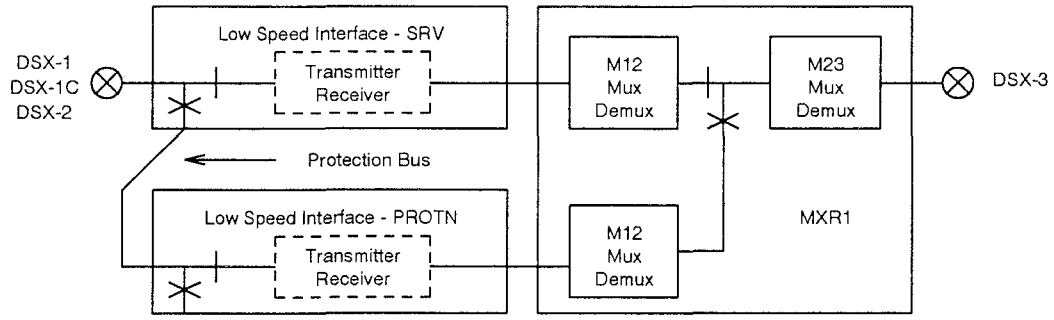

Figure 1-19. DDM-1000 Protection Switching: LS Interface

Several precautions are taken to insure the integrity of this protection switch since a part of the switch is on a pack that potentially is failed. Reliable shorting contacts are placed in the backplane connector at the service position. These allow the protection switch to be maintained while the failed service pack is removed.

CAUTION:
Failure of the protected service will occur if another low-speed pack in the same muldem is removed while a different one is on protection. The service failure is a result of a bridged signal being added to the protection signal via the backplane connector shorting contacts.

The high reliability relays on the low-speed interface are powered separately from the rest of the pack to protect against loss of power on the pack. In addition, the switch can be maintained from both the PROCR pack and the low-speed interface pack. This allows the PROCR pack to be removed without affecting the switch.

The microcomputer on the PROCR pack provides the capability for priority assignment of the low-speed switching. With this feature, the priority for a low-speed interface pack can be specified as high or low. If a high-priority pack should fail while a low-priority pack is using the protection switch, the PROCR will move the protection switch to the high-priority pack. This allows the effective protection ratio of the low-speed interface packs to be varied. If a single pack is specified as high priority, then it is protected 1:1 while the remaining packs are protected 1:7.

With MC90083A1D, Issue 3 and later PROCR2 packs, circuit packs in unmonitored slots are not declared failed until a signal is applied to one or more channels in that slot. This is done to improve the protection switching time of in service channels.

An AEK36B DS1 INTFC2 pack used in the protection slot can protect both AEK36 and AEK36B low-speed packs in the service slots. The PROCR2 pack can override the setting of the DIP switches to control the DS1 line code (AMI or B8ZS). This allows the AEK36B protection pack to automatically change its line code format to that of the service low-speed pack being protected.

Function Unit and High-Speed Interface

The function unit and high-speed interface protection switching on DDM-1000 allows a good protection pack or line to replace a failed service pack or line. The following paragraphs describe this high-speed protection switching with the different options available for the function unit and high-speed interface.

To "make" a high-speed switch in the electrical configuration, switches are thrown on the low- and high-speed sides of the MXR pack (Figure 1-20). In the multiplexing direction, the low-speed signals are continuously dual fed to both the SRV and PROTN MXR packs. The DS3 bipolar signal from the SRV MXR to the ELIU1 is switched off by a relay, and the DS3 bipolar signal from the PROTN MXR to the ELIU1 is switched on by a relay. Since these signals are wired together on the ELIU1, this completes the multiplexing direction switch.

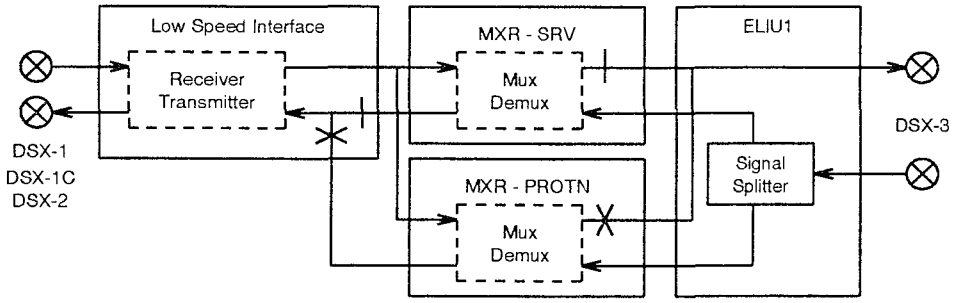

Figure 1-20. DDM-1000 Protection Switching: MXR to DSX-3

In the demultiplexing direction, the DS3 bipolar signal from the DSX-3 is split and always fed to both the SRV and PROTN MXR packs. An electronic switch on the low-speed interface pack is thrown to complete the switch in the demultiplexing direction. Several precautions are taken to insure the integrity of this protection switch since a part of the switch is on a pack that potentially is failed. The DS3 bipolar signals pass through contacts on high reliability relays that are normally energized. If power is lost on the SRV pack, the contact opens automatically allowing the PROTN pack to carry traffic. In addition, the switch can be maintained from both the PROCR and MXR packs. This allows the PROCR pack to be removed without affecting the switch.

In the optical configuration, a high-speed protection switch switches the SRV OLIU and both SRV function units (muldem A and muldem B) to PROTN at both the near end and far end. A high-speed switch will cause a momentary hit on service in muldem A and muldem B.

To "make" a high-speed switch in the optical configuration with MXR packs, switches are thrown on the low-speed side at both ends of the system (Figure 1-21). At office A, the low-speed signals are continuously dual fed to both the service and protection high-speed paths. These high speed signals are received and converted back to low-speed signals. An electronic switch on the low-speed interface pack at office B completes the switch in this direction. Likewise, the low-speed signals are dual fed at office B and switched at office A.

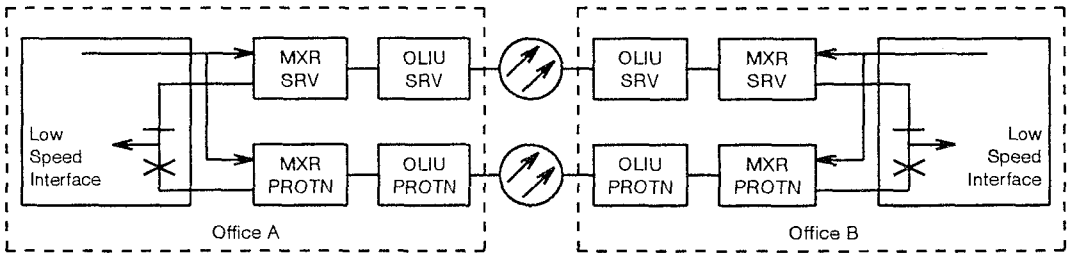

Figure 1-21. DDM-1000 Protection Switching: MXR and OLIU

To "make" a high-speed switch in the optical configuration with DS3U1 or DS3U2 packs, switches are thrown on the high-speed side at both ends of the system (Figure 1-22). At office A, the DS3 bipolar signal is continuously dual fed to both the service and protection high-speed paths. The signals are converted and sent to office B where they are converted back to bipolar signals. At office B, the DS3 bipolar signal from the SRV DS3U( ) to the ELIU1 is switched off by a relay, and the DS3 bipolar signal from the PROTN DS3U( ) to the ELIU1 is switched on by a relay. Since these signals are wired together on the ELIU1, this completes the switch in this direction. Likewise, the DS3 bipolar signal is dual fed at office B and switched at office A.

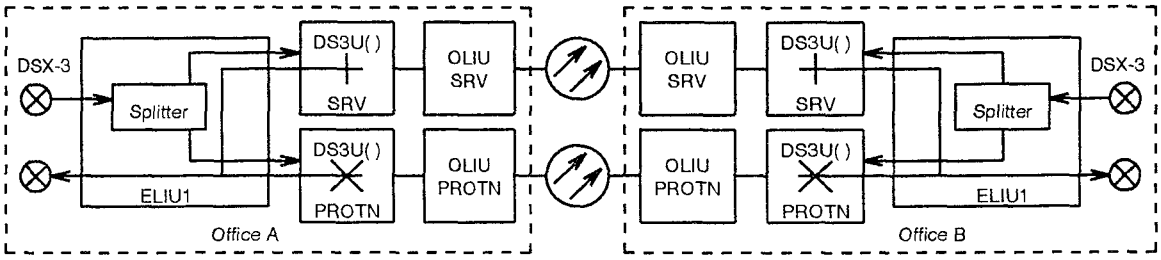

Figure 1-22. DDM-1000 Protection Switching: DS3U1/DS3U2 and OLIU

Several precautions are taken to insure the integrity of this protection switch since a part of the switch is on a pack that potentially is failed. The DS3 bipolar signals pass through contacts on high reliability relays that are normally energized. If power is lost on the SRV pack, the contact opens automatically allowing the PROTN pack to carry traffic. In addition, the switch can be maintained from both the PROCR and DS3U( ) packs. This allows the PROCR pack to be removed without affecting the switch.

Automatic Lock of Protection Switch

By default, if four automatic protection switches are made on the same pack within a 10-minute interval, the service will be automatically locked onto the protection pack. This lock will be automatically retired one hour after it occurs. A new command, "***set-shelf-autolock:***", is available in MC90083A1D (or later) PROCR2s to set the parameters that determine how many automatic protection switches will be allowed in a specified period of time. Also, a third parameter may be set that determines how long the lock will remain on protection before automatically returning to service.

The MN and NE LEDs will light on the PROCR2 packs at both ends if a high-speed autolock is made in an optical mode system. In an electrical mode system, the MN and NE LEDs will light on the PROCR2 pack at one end if a high-speed autolock is made at that end. If a low-speed autolock is made, the MN and NE LEDs will light on the PROCR2 pack at one end in either electrical or optical systems. Using an ASCII terminal, the `rept-fail:` command will report "none." The `rept-hsty:` command will show a record of protection switches, and the `rept-stat-protn:` command will show a protection switch is locked and identify the service pack. The appropriate `exct-sw:` or `exct-lock:` command can be executed to end the holding period.

180 Mb/s Maintenance

The DDM-1000 180 Mb/s optical system is installed, accepted, and maintained just as if it consisted of two totally separate 90 Mb/s end-to-end optical systems. The PROCR packs in the two assemblies at each end of the system do not "know" that they are part of a 180 Mb/s system. Each assembly acts as if it were equipped with two 90 Mb/s OLIU packs. Detailed information about turning up a 180 Mb/s system and upgrading an in-service 90 Mb/s system to 180 Mb/s is provided in the Installation and Maintenance section of this manual. Note that AKM5 DS3U1 packs cannot be used in a 180 Mb/s system.

In 180 Mb/s systems, channels originating in an OLIU shelf in one office terminate in the OLIU shelf in the other office. Channels originating in a non-OLIU shelf in one office terminate in the non-OLIU shelf in the other office. For example, if the OLIU shelf is on the bottom of the 2-shelf pair in one office and on the top of the 2-shelf pair in the other office, channel assignments follow the shelf configuration not the physical position in the bay.

System Testing

Philosophy

DDM-1000 simplifies the installation and testing of the assembly by incorporating test generators and receivers into the design of the VLSI circuitry. This eliminates the need for test sets. Also, advances in the design of the OLIU pack eliminate the need for optical loss test sets and power meters when installing

DDM-1000. However, when installing and looping OLIU packs, 1002A or 1012A lightguide couplings are required to loop the IN and OUT leads.

Automated Turnup Procedures

DDM-1000 provides three automated turnup procedures to reduce the equipment installation time to a minimum. These tests can be initiated using the pushbuttons on the front of the equipment or through the ASCII terminal. The first procedure, referred to as the local test, verifies operation of the assembly as an isolated entity. To use it, a loop is installed on the high-speed side of the equipment (DSX-3 for an electrical assembly, optical loop for an optical assembly). The test data generator and test data receiver are built into the VLSI circuitry on the low-speed interface check transmission. This procedure can be used at add/drop sites.

The second procedure, referred to as the cross-connect test, checks the local wiring to the cross-connect points. It assumes that all low- and high-speed signals have been looped. The test data generator and test data receiver built into the VLSI circuitry on the low-speed interface check the wiring. This procedure can be used at add/drop sites if the appropriate loops are provided.

The third procedure, referred to as the system test, verifies end-to-end operation of the facility from the low-speed input to the low-speed output of the assembly. Here, the near end DDM-1000 is connected to a far end DDM-1000 over a higher order transmission system via the DSX-3 interface or DDM-1000's own optical option. No cross-connect loops are required. This procedure cannot be used in a system that has assemblies configured for add/drop.

Low-Speed Signal Looping

DDM-1000 offers a low-speed loopback capability at either the near or far end terminal. This feature is useful during maintenance of a complete facility. It is also useful during turnup of an assembly-to-assembly facility. This feature is accessed through the ASCII terminal. For systems that are the same low-speed rate at both ends of the system, the loopback is straight forward. For systems with different rates at each end, loopback occurs only when enough signals have been looped such that the terminal can execute the loop. An appropriate signal that can be looped by the system must be provided.

As an example, assume the near end is DS1C and the far end is DS1. All four DS1s are "looped" before loopback occurs. Then a test signal that can be demultiplexed at the far end must be provided because the loopback occurs at the DS1 rate. Only then is the received signal at the near end the same as the signal being transmitted. Note that some T1C line test sets do not provide DS1C framing in the test signals that they generate.

Integral Test Set Operations

DDM-1000 has built-in test signal generators and receivers that can be used to test signal paths within the assembly. The generator and receiver are accessed through the ASCII terminal. On command, an internal test signal generator is placed on line inside the VLSI circuitry of the low-speed interface circuit. This test signal propagates to the far end assembly where a loopback has been previously made. The signal is returned to the near end where it is checked for error free operation by the receiver. Appropriate error information is output to the ASCII terminal during the test. The signal generator and receiver are useful during turnup procedures because it eliminates the need for an external test signal generator and receiver.

Provisioning

DDM-1000 incorporates an automatic scan of its equipment and inputs. The equipment list that is maintained by the PROCR pack is automatically updated as new circuit packs are installed in the assembly. Inputs to the packs are checked for clock and operation at less than the default error rate. When a low-speed input changes state from failed to good, that input is added to the equipment list automatically. Removal of packs and inputs from the equipment list is done by removing the pack or input and then pressing the RST button on the PROCR pack. Manual control of the addition to and deletion from the equipment list for inputs is also provided through the ASCII terminal interface. Low-speed interface circuit packs that are installed in the assembly without any valid inputs are monitored for pack failures only. A minor alarm is raised and protection switching activity is generated for these pack failures.

Alarm, Status, and Control

Several alarm, status, and control options to DDM-1000 are provided. Basic information and control is available locally at the equipment through LEDs and pushbuttons. Office alarm contact closures for several alarms connect to the office alarm system. Parallel telemetry outputs provide alarm and status information to a maintenance center. A serial telemetry interface option provides an economical connection to a maintenance center and at the same time gives enhanced control of the DDM-1000. Alarms and status are generated assuming the DDM-1000 is part of a system with another DDM-1000 at the far end. This allows a system to be maintained from one end. A switch is provided on the PROCR pack to select inclusion or exclusion of the alarms generated at the far end DDM-1000. In addition to alarms generated within the equipment, DDM-1000 provides a 6-point (MC90191A1 TLM2) or 15-point (TLM1) bidirectional overhead telemetry port for reporting alarms from and controlling external equipment at a remote terminal.

Local Equipment

Basic Display and Control

DDM-1000 provides basic display and control that is suitable for all maintenance activities. Each pack, except for the passive ELIU1, has a red ALM LED mounted on the front. This indicator is turned on and remains on when the pack is failed. It is flashed on and off at 1-second intervals when the input signals to the pack are failed. Six LEDs are mounted on the PROCR pack to display the alarm and status information locally. These alarm and status indicators reflect the office alarm contact closures and, consequently, they are delayed if the office alarms are delayed. The following indicators are provided:

- MJ - Major Alarm (indicates a service-affecting failure exists).
- MN - Minor Alarm (indicates a non-service-affecting failure exists).
- NE - Near End Status (identifies near end as location of failure).
- FE - Far End Status (identifies far end as location of failure).
- ABN - Abnormal Status (indicates nonalarmed, nonnominal condition).
- ACO - Alarm Cutoff Status (green LED indicates office audible alarms are silenced).

Two pushbutton switches are mounted on the front of the PROCR pack to provide the minimum required control. The following buttons are provided:

- ACO/TEST Control. This button causes the audible alarms to be silenced and also initiates an LED test in which all the LEDs on the DDM-1000 are lighted. It is easily accessible.
- RST Control. This button causes the microcomputer to reset the assembly configuration information that is stored in EEPROM. It is also used with the ACO/TEST button to initiate automated turnup procedures. This button is recessed to prevent accidental activation of these functions.

Display and Control With TLM1

Two additional alarm LEDs are available in an assembly equipped with an optional TLM1 pack. The LEDs are mounted on the front of the TLM1 pack. They reflect the office alarm contact closures and, consequently, they are delayed if the office alarms are delayed.

- CR - Critical Alarm (indicates failure affecting more than 96 customers).
- PMN - Power Minor Alarm (indicates AC power failure at RT).

The MC90191A1 TLM2 does not provide any additional office-type alarms.

Local ASCII Terminal Interface

DDM-1000 provides an ASCII terminal interface that is used to obtain more detailed status information and to control the more advanced features of the assembly. These include manual switching and locking activity. If the far end terminal is a DDM-1000, an ASCII terminal connected to the near end DDM-1000 through this interface can be used to interrogate and control the far end terminal. A discussion of these capabilities can be found in the COMMANDS AND REPORTS section of this User's Manual. A built-in "help" command is available to assist the craft.

The connector for this interface is mounted on the front of the PROCR pack. The interface is RS-232C compatible and operates at 1200 baud. Output is arranged assuming an 8 line by 40 character per line display window. Many portable terminals and most CRT terminals can be used directly. Installations with more that one DDM-1000 per bay can share a link between shelves that allows the ASCII terminal to communicate with other shelves within the bay even though it is not directly connected to them.

Universal Craft Display Manager

The Universal Craft Display Manager is an optional personal computer (PC)-based software product which may be used to enhance the craft display terminal connected to the DDM-1000 or FT Series G system equipment. It does this by prompting the user with options for command entry in plain English. The user is not required to remember which commands are valid, or the particular syntax for a given command. The software translates the command request into a language that the specific system (DDM-1000 or FT Series G) understands, and transmits the command to the system. Responses are displayed to the user on the PC's display screen. Extensive on-line help is available for all commands, parameters, and options. The PC connects to the DDM-1000 PROCR circuit pack via an RS-232 cable.

The Universal Craft Display Manager displays 15 lines of text at any one time. However, it stores over 100 lines, allowing you to scroll back and review the results of previous commands.

In addition to providing a user-friendly interface to DDM-1000, the Craft Display Manager performs terminal emulation, which transforms your PC into a 24-line ASCII terminal. Baud rates of 1200, 2400, 4800, and 9600 are supported. Additional information, and installation and operating procedures are contained in the CRAFT DISPLAY MANAGER USER'S MANUAL. Copies of the Craft Display Manager User's Manual GENAP Application (AT&T 365-565-300), a 3-½ inch diskette (AT&T 365-565-302), or a 5-¼ inch diskette (AT&T 365-565-301) may be ordered from AT&T Customer Information Center.

The following is needed before running the craft display manager:

- AT&T PC 6300, or equivalent, with:

1. 512 K-bytes random access memory (RAM).
2. *MS-DOS** computer documentation, version 2.0 or later.
3. Time of day clock.

- RS232 cable (connects PC to customer equipment).
- CRAFT DISPLAY MANAGER USER'S MANUAL with the craft display manager diskette.

Office Alarms

Basic Office Alarms

Four office alarm outputs are provided by DDM-1000 without the TLM1. These alarm outputs are normally delayed for 20 seconds. This prevents intermittent failures of incoming signals from causing unnecessary maintenance activity. This delay can be set from 0 to 30 seconds which delays the local office alarms and parallel telemetry alarms. The delay has no effect on the serial port (TBOS) alarms. The following office alarm contact closures are provided by the PROCR pack:

- Major - Visible (cannot be ACO'ed).
- Major - Audible (can be ACO'ed).
- Minor - Visible (cannot be ACO'ed).
- Minor - Audible (can be ACO'ed).

The DDM-1000 relays are susceptible to large transient currents caused by capacitive loads or by direct connection to aisle pilot lamps. **An Alarm Isolation Unit (AIU) is always required between the first DDM-1000 shelf in a bay and the office alarms in the normal daisy chain fashion described in DP-426 in the Installation and Maintenance section of this manual. One AIU is required per bay**. See "Alarm Precautions" in the SPECIFICATIONS section of this manual. (See "Alarm Precautions" in the SPECIFICATIONS section of this manual.)

* Trademark of Microsoft Corporation

Office Alarms With TLM1

Four additional office alarm outputs are provided by a DDM-1000 equipped with the TLM1 pack. No additional office alarm outputs are provided by a DDM-1000 equipped with the MC90191A1 TLM2 pack. The additional alarm outputs provided by the TLM1 are normally delayed for 20 seconds. This prevents intermittent failures of incoming signals from causing unnecessary maintenance activity. This delay can be set from 0 to 30 seconds. The following additional office alarm contact closures are provided by the TLM1:

- Critical - Visible (cannot be ACO'ed).
- Critical - Audible (can be ACO'ed).
- Power Minor - Visible (cannot be ACO'ed).
- Power Minor - Audible (can be ACO'ed).

The DDM-1000 relays are susceptible to large transient currents caused by capacitive loads or by direct connection to aisle pilot lamps. **An Alarm Isolation Unit (AIU) is always required between the first DDM-1000 shelf in a bay and the office alarms in the normal daisy chain fashion described in DP-426 in the Installation and Maintenance section of this manual. One AIU is required per bay**. See "Alarm Precautions" in the SPECIFICATIONS section of this manual.

Parallel Telemetry

Basic Parallel Telemetry

DDM-1000 provides a minimum set of alarm parallel outputs that can be accessed from a maintenance center. These telemetry indicators reflect the office alarm contact closures and, consequently, they are delayed if the office alarms are delayed. Two alarm outputs are provided by DDM-1000: major alarm (visible) and minor alarm (visible); they cannot be ACO'ed.

Parallel Telemetry With TLM1

DDM-1000 equipped with a TLM1 provides additional parallel telemetry outputs. (Equipping the DDM-1000 with an MC90191A1 TLM2 does not provide any additional outputs.) The complete set of alarm and status parallel outputs from the TLM1 can be accessed from a maintenance center. The set is compatible with existing loop multiplexers and may be wired in parallel with them. These alarm and status indicators reflect the office alarm contact closures and, therefore, are delayed if the office alarms are delayed. The following alarm and status outputs are provided:

- Critical Alarm (Visible)—Indicates a failure affecting more than 96 customers.
- Major Alarm (Visible)—Indicates a failure affecting 96 or fewer customers.
- Major Alarm (Audible)—Indicates a failure affecting 96 or fewer customers.
- Minor Alarm (Visible)—Indicates non-service-affecting failure.
- Minor Alarm (Audible)—Indicates non-service-affecting failure.

- Power Minor Alarm (Visible)—Indicates, at CO terminal, loss of AC power at RT.
- Near End Status—Identifies the near end as the location of indicated condition.
- Far End Status—Identifies the far end as the location of indicated condition.
- Carrier Line Failure Status—Indicates failure of optical line.
- High-Speed Status—Indicates a failure affecting more than 96 customers.
- Low-Speed Status—Indicates a failure affecting 96 or fewer customers.
- Incoming Status—Indicates an incoming signal problem.
- System Identification Status—Identifies the system raising alarms.

In addition, an ACO control is accepted from the maintenance center to silence all telemetry outputs except for the major alarm (visible), minor alarm (visible) and the system identification status in systems that are wired in parallel. Use of this remote ACO input will silence the audible office alarms.

TBOS Serial Telemetry

A serial telemetry interface option provides an economical connection to a maintenance center and at the same time gives enhanced control of the DDM-1000. The serial interface is TBOS compatible and one port of the telemetry equipment can be shared by up to eight DDM-1000 shelves in a single frame (Figure 1-23). Each shelf is allocated 63 points of alarm/status and 63 points of control (one "display" per shelf). These alarms are not affected by alarm delay settings.

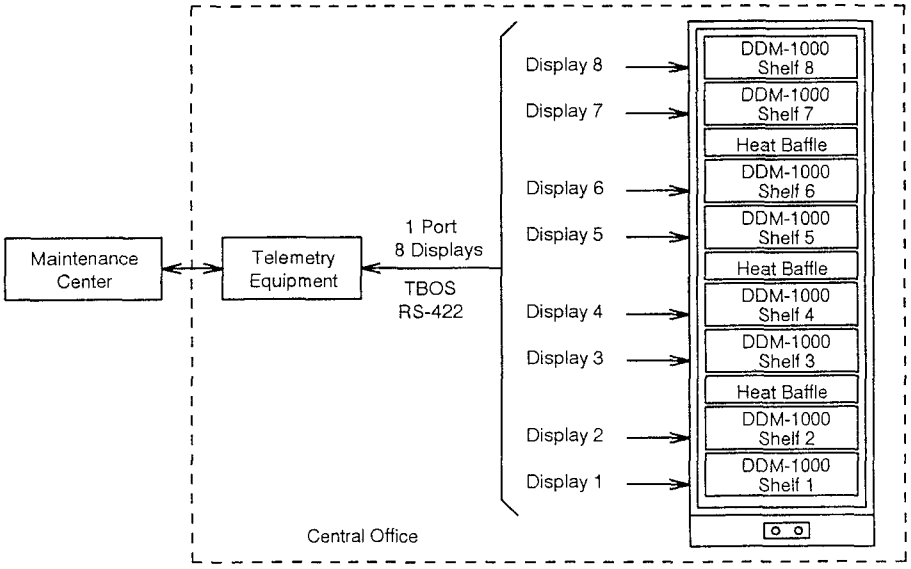

Figure 1-23. DDM-1000 TBOS Serial Telemetry Interface

Overhead Telemetry (With TLM1 or MC90191A1 TLM2)

In addition to alarms generated within the equipment, DDM-1000 provides a 15-point (using TLM1) or a 6-point (using MC90191A1 TLM2) bidirectional overhead telemetry port for reporting alarms from and controlling external equipment at a remote terminal. Inputs to the remote terminal (RT) will result in corresponding outputs at the central office terminal (COT) within 1-second. Likewise, the points that are input at the COT are output at the RT within 1-second. This allows alarms like door open or high temperature to be brought back from the RT site. Controls to the RT site for exercising such things as generators are also provided by the port. All overhead telemetry alarm outputs from the RT and five of the control inputs to the RT are also available at a maintenance center through the TBOS serial telemetry link to the COT DDM-1000 (Figure 1-24).

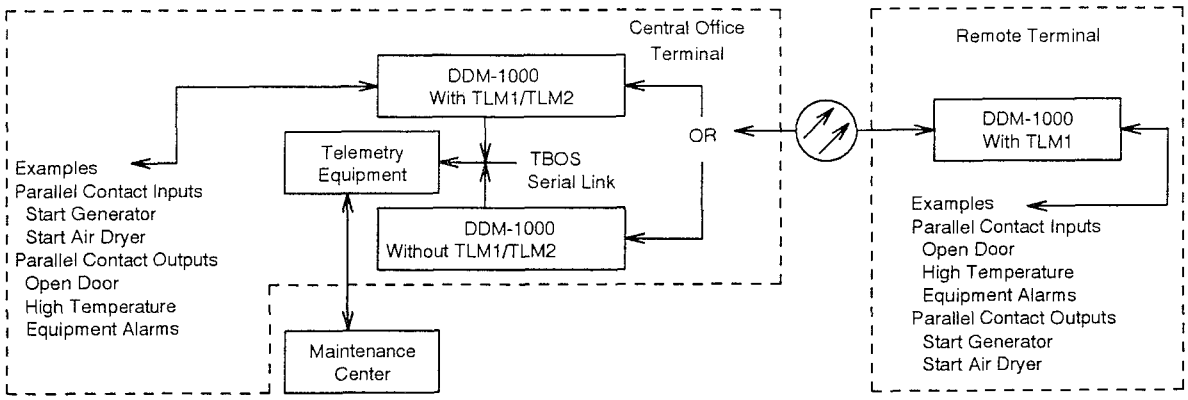

Figure 1-24. DDM-1000 Overhead Telemetry Application

Performance Monitoring

DDM-1000 provides bidirectional performance monitoring for each end that is equipped with an MC90191A1 TLM2 circuit pack providing that both ends are equipped with AKM2C MXR3 and MC90083A1C, or later, PROCR2 circuit pack. Single-ended bidirectional performance monitoring can be obtained with an AKM2C and a TLM2 pack at one end and a AKM2B or AKM2C pack at the other end. C-bit parity (performance monitoring) cannot be enabled if the muldem is equipped with DS2 INTFC1 packs.

In the multiplexing direction, an AKM2C operating in the C-bit mode calculates the parity of the transmitted data over an entire M-frame and sets the transmitted C-bits in the third subframe equal to this parity. When a near end parity error is detected, the AKM2C sets the transmitted C-bits in the fourth subframe. The AKM2C also sets the transmitted X-bits when a near end out-of-frame condition exists or DS3 AIS is detected. The X-bits are set for 1-second or longer, depending on the duration of the condition.

In the demultiplexing direction, an AKM2C operating in the C-bit mode calculates the parity of the received data over an entire M-frame and compares it with the received C-bit in the third subframe. If the parity is different from the C-bit, a near end parity error is indicated. When an AKM2C receives C-bits in the fourth sub frame that have been set, a far end parity error is indicated. The AKM2C also monitors the incoming X-bits for far end out-of-frame or DS3 AIS conditions.

The near end and far end parity errors, and near end and far end out of frame or DS3 AIS information is sent to the MC90191A1 TLM2 pack. The MC90191A TLM2 pack counts the total near end and far end parity errors, the errors in each second of a 1-minute interval, and the seconds during the minute that the near end or far end was out of frame or receiving DS3 AIS. At 1-minute intervals, the pack reports the total parity error count; the type A, type B, and type C errored seconds; the number of out-of-frame or DS3 AIS seconds; the out-of-frame or DS3 AIS status at the end of the interval; and an indication if any data has been missed during this time. The report is formatted, segregated by near end and far end, and made available via the TABS interface.

The MC90191A1 TLM2 pack is only required at one end but may be used at both ends if desired. Also, an MC90191A1 TLM2 pack can be used at one end and a TLM1 pack at the other end (Figure 1-24).

ASCII Terminal Operations

Features Available

DDM-1000 provides an ASCII terminal interface that is used to provide detailed information and control of the DDM-1000. The following paragraphs describe these features.

Low-Speed Loopback

DDM-1000 offers a low-speed loopback capability at either the near or far end terminal. This feature is useful during maintenance of a complete facility. It is also useful during turnup of an assembly-to-assembly facility.

Built-In Test Capabilities

DDM-1000 has built-in test signal generators and receivers that can be used to test signal paths within the assembly. Error rate, errored seconds, total errors, and test duration are provided. In addition, processor self-tests, alarm, telemetry, and LED tests can be initiated from the ASCII terminal.

Low-Speed Interface Protection-Different LBO Settings

Mixing of the same rate signals requiring different LBO settings is permitted in DDM-1000. To accomplish protection switching, each low-speed interface circuit pack is identified as using PROTN 8, PROTN 9, no PROTN, or PROTN 8 or 9 (default). This identification is entered through the ASCII terminal. All signals to and from a given low-speed interface pack must have the same LBO setting.

AMI/B8ZS Control of the DS1 Interface

DDM-1000 provides the ability to manually set the AMI/B8ZS coding option independently for each DS1 on the DS1 interface. For the AEK36B and AEK36B S1:2 DS1 INTFC2 packs, this control can also be set from the ASCII terminal, overriding the switch settings on the pack itself. See the description for the command `set-dsx-code:` in the COMMANDS AND REPORTS section of this manual.

Manual Control of Protection Switching

DDM-1000 provides manual control of the low-speed interface and function unit — high-speed interface protection switching. A manual override for switching is provided along with the ability to lock circuits in or out of service.

Selectable Protection Switching Threshold

DDM-1000 provides optional selection of the optical protection switching threshold. It can be set for loss of clock/frame only or within the range from 10^{-4} to 10^{-8} (default is 10^{-6}) bit error rate (detected by DS3 parity). This threshold can be set through the ASCII terminal using the `set-shelf` command.

Assignable Input Signal Monitor and Alarm Threshold

DDM-1000 provides optional assignment of the input signal monitor threshold to one of two categories. The high category shows failures at 10^{-3} bipolar violation rate for both the low-speed and DS3 signals. The low category shows failures at 10^{-6} bipolar violation rate (DS3 parity for the DS3 input). By default, all inputs are assigned to the high threshold, including the DS3 input from the cross-connect point. DDM-1000 also provides optional assignment of the alarm to be raised for low- and high-speed input signal failures. A low-speed or DS3 failure can raise a CR, MJ, MN, or no alarm. The command `set-dsx-alm:` can be

used to assign the type of alarm. By default, all low-speed input failures will generate no alarm and DS3 input failures will generate a MJ alarm.

Priority Low-Speed Protection Switching

DDM-1000 provides the capability to assign each low-speed interface a high or low priority for protection switching. In the unlikely event of a double failure within the equipment, a failure of a low-speed interface with a high priority will "bump" a switch for a low priority protection switch.

Alarm Delay Setting

DDM-1000 normally delays office alarms and parallel telemetry critical, major, and minor alarms for 20 seconds to suppress spurious alarms. This delay can be set from 0 to 30 seconds. The remaining parallel telemetry points and serial telemetry points are not affected by this setting.

Detailed Reports

DDM-1000 provides detailed failure, history, option setting, and protection status reports through the ASCII terminal.

Single-Ended Maintenance

Complete information about and control of the far end DDM-1000 is available at the near end DDM-1000. Use of the ASCII terminal at the near end is treated like a remote extension of an ASCII terminal at the far end. Hence, everything that is available at the far end terminal is also available at the near end.

Automated Turnup

DDM-1000 provides three automated turnup procedures to reduce the equipment installation time to a minimum. When initiated from the ASCII terminal, these tests can be made separately for muldem A or muldem B if the shelf is configured as an electrical terminal.

Commands and Reports

DDM-1000 uses a simple format for input from the ASCII terminal. The commands are entered on a single line and are composed of a mnemonic for the command followed by a list of parameters. For output, the command and report structure assumes the use of an 8 line by 40 character per line display. Larger displays may be used without penalty.

DDM-1000 provides the ASCII terminal commands and reports described in the COMMANDS AND REPORTS section of this manual. See the Report Descriptions section of this manual for examples of report commands and the reports they generate under normal and failure conditions.

Interprocessor Far End Communications (fecom)

DDM-1000 provides several features that require communication between the PROCR pack in the DDM-1000 at one office and the PROCR pack in the DDM-1000 at another office. This includes the bidirectional overhead telemetry port, single-ended alarming, ASCII terminal operations addressed to the far end terminal, and 2-way optical line protection switching. These features can be used only when a DDM-1000 is used at both ends of the system. The unused stuff bits in the DS3 format provide the communication link to another DDM-1000. These bits occur whenever a pulse stuffing operation takes place on a DS2 rate signal being multiplexed by the M23 multiplexer. Unlike the DS3 X-bits, these bits pass through the DSX-3 cross-connection without restrictions on their rate of change. These bits provide a high bandwidth burst transmission channel to the far end terminal. A proprietary communication protocol is used to guarantee the integrity of communication over this link.

Interprocessor communication is intended to support a simple point-to-point system, that is, two DDM-1000 assemblies communicating only with each other. The optical mode of operation is an example of such a system. For optical operation, one logical link is needed between the DDM-1000 assemblies. By default, the PROCR pack uses muldem A service for the physical link. It searches for a working physical link if the default link is not operational.

The electrical mode of the DDM-1000 can also be used in a simple point-to-point system. In such a system, the two DS3 appearances at one DDM-1000 are connected by an intervening transmission facility to the two DS3 appearances at a second DDM-1000. In such a system the maintenance features employing the interprocessor communication can be used just as if it were an optical system. As in an optical system, by default, the PROCR pack uses muldem A service for the physical link. It searches for a working physical link if the default link is not operational.

In an add/drop electrical system, neither end terminal PROCR can communicate with the PROCR in the add/drop terminal nor with the other end terminal PROCR. Since this is an electrical configuration, interprocessor communication will be disabled by default.

MC90083A1E and later PROCR2 packs are designed to support open network configurations such as shown in (Figure 1-25). In this configuration, muldem A in DDM-1000 #1 can communicate with DDM-1000 #3, and muldem B in DDM-1000 #1 can also communicate with DDM-1000 #2. In addition, if the link is established between muldem A in DDM-1000 #2 and muldem B in DDM-1000 #3, then DDM-1000 #2 can communicate with both DDM-1000 #1 and #3; and DDM-1000 #3 can communicate with DDM-1000 #1 and #2. An extensive description of the open network application may be found in the PLANNING GUIDELINES section of this manual.

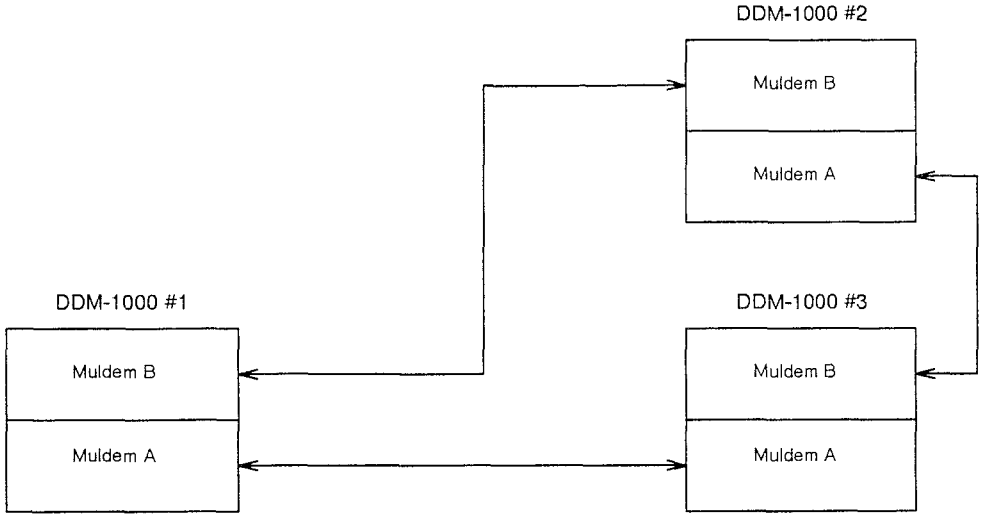

Figure 1-25. Example of Open Network Configuration

With MC90083A1D, Issue 4 and earlier PROCR2 packs, interprocessor communication cannot be used in system configurations such as shown in Figure 25. The system response and the ASCII terminal reports will not be meaningful. Interprocessor communication must be turned off at all three locations using the `set-shelf-fecom:` command.

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DDM-1000 Planning Guidelines

2

Introduction

The DDM-1000 is a compact, highly flexible, and cost-effective multiplexer. This flexibility allows it to be used in many different applications. These include lightwave and radio systems for both the loop and trunk. Examples of these are described under the following heading (APPLICATIONS) of this manual. The engineering part of this section serves as a guideline to the various factors that should be considered when planning a transmission system using DDM-1000 multiplexers. These factors include system capacity, type of transmission facility (such as radio or lightwave), circuit pack compatibility, customer interfaces, operating environment, power consumption, and physical layout. Finally, the ordering part of this section provides information for typical shelf configurations and individual circuit packs by *CLEI** code, COMCODE, and Apparatus Code. In addition, it lists miscellaneous equipment such as installation materials, bay frames, and cable assemblies.

* COMMON LANGUAGE is a registered trademark and CLEI, CLLI, CLCI, and CLFI are trademarks of Bell Communications Research, Inc

Applications

Lightwave Systems

High Capacity

DDM-1000 functions in the electrical mode as a traditional multiplexer accepting DS1, DS1C, or DS2 signals for multiplexing to the DS3 rate when used with high-capacity lightwave systems. A typical application may consist of 5 DDM-1000 shelves accepting 252 DS1 signals for multiplexing to 9 DS3-rate signals (Figure 2-1). The DS3 signals interface through a DSX-3 (not shown) or directly to an FT Series G Lightwave System.

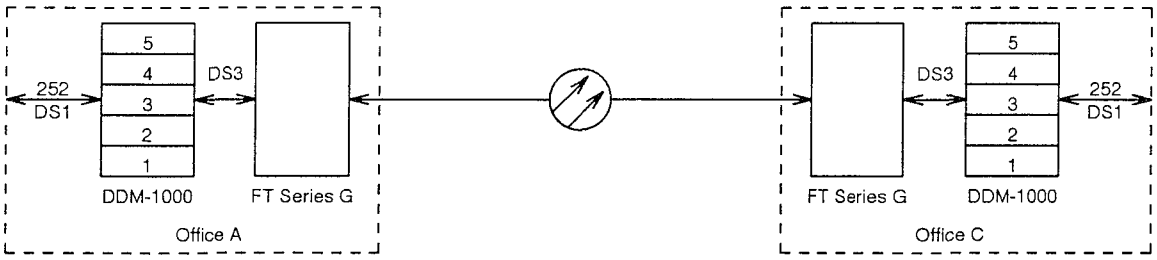


Figure 2-1. DDM-1000 With High-Capacity Lightwave

Low/Medium Capacity

DDM-1000 is an economical solution for low-to-medium capacity lightwave applications when operated with the integrated 90 Mb/s optics in the optical mode. If your needs grow beyond one or two DS3s, the 180 Mb/s optical option gives you the ability to provide up to four DS3s over the same single pair of fibers. This upgrade can be done in service. At any time, the DDM-1000 optical signal can be converted to DS3 electrical signals, in service, for interfacing to higher capacity lightwave systems. This modular growth is very attractive for outstate trunking and suburban loop applications.

The 90 Mb/s optical application of DDM-1000 provides a transmission capacity of 56 DS1, 28 DS1C, or 14 DS2 signals (Figure 2-2). The 180 Mb/s lightwave application doubles the capacity over a single pair of fibers up to 112 DS1s, 56 DS1Cs, or 28 DS2s (Figure 2-3). These basic transmission systems can be used in many applications.

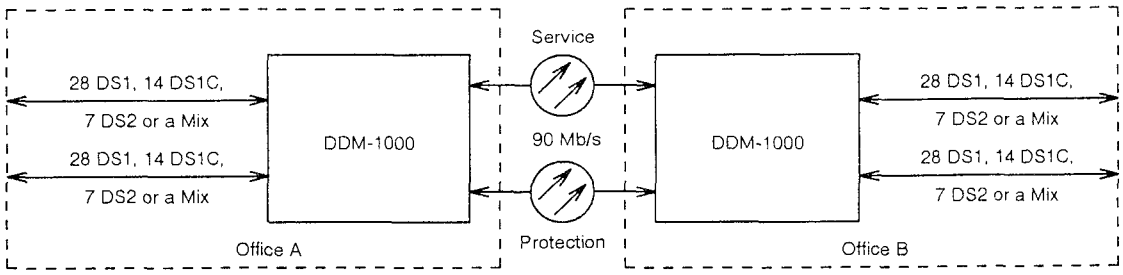


Figure 2-2. DDM-1000 Integrated 90 Mb/s Lightwave

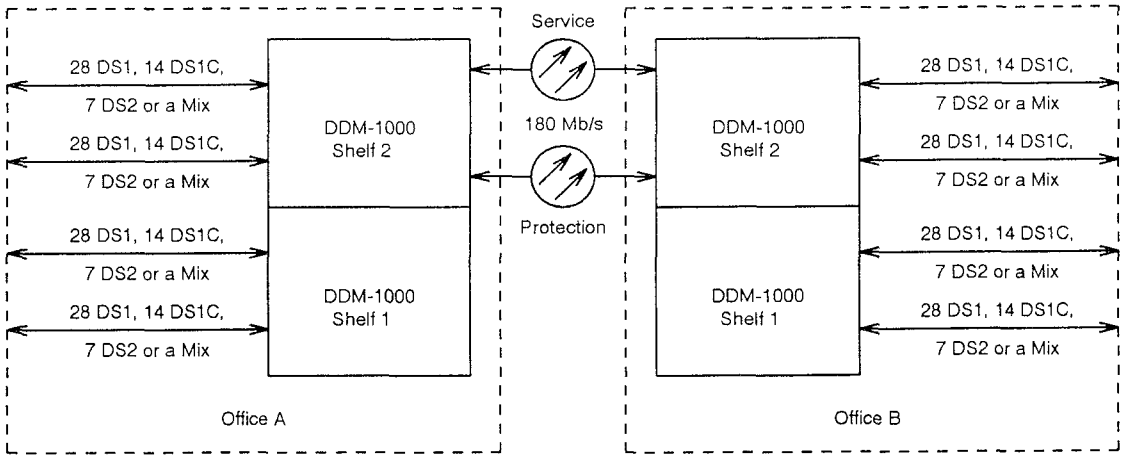


Figure 2-3. DDM-1000 Integrated 180 Mb/s Lightwave

DDM-1000 can be used as a low-to-medium capacity fiber feeder into a high-capacity fiber system (Figure 2-4) such as FT Series G. This is done by equipping the DDM-1000 at the feeder site with DS3U2 or DS3U1 circuit packs. The DDM-1000 may be equipped with two DS3U2 circuit packs (four packs if equipped with protection) which permit the DDM-1000 to accept two M13-formatted DS3 signals on its "low-speed" side when equipped for 90 Mb/s optical transmission. If only one DS3U2 pack (two packs if equipped with protection) is installed, the DDM-1000 may also be equipped with a DS3U1 circuit pack (two packs if equipped with protection) which permits the DDM-1000 to accept a DS3 clear channel signal. The interface at the far end of the system can be DS3 (M13 format), DS3 (clear channel), DS1, DS1C, DS2 or a mix. Note that AKM5 DS3U1 packs cannot be used in 180 Mb/s systems.

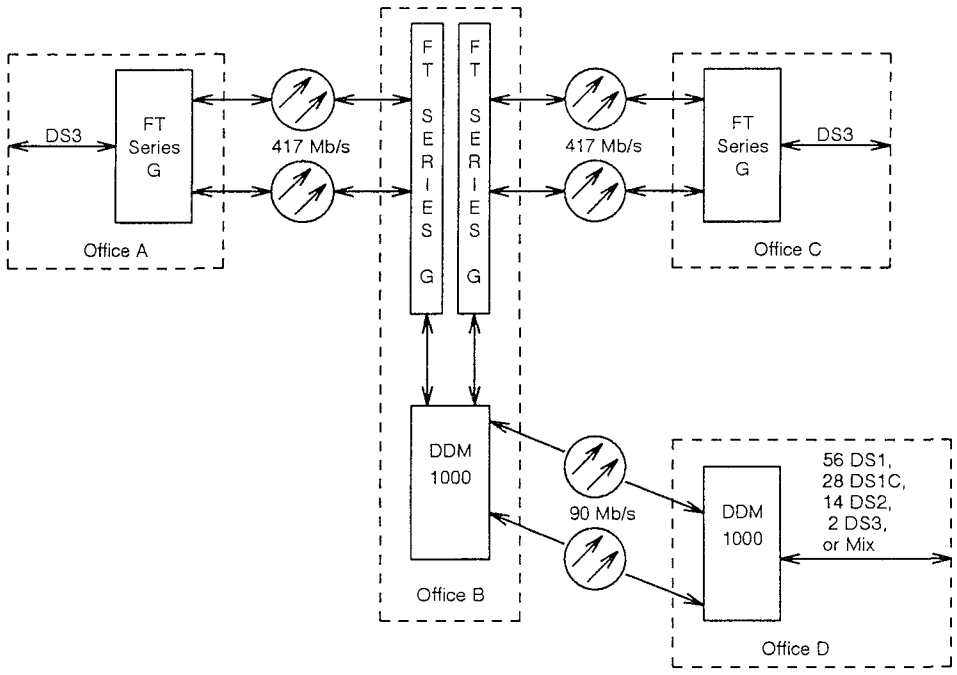


Figure 2-4. DDM-1000 Fiber Feeder

Because of its small size, DDM-1000 fits well into customer premises applications where self-contained single cabinet arrangements are required. A cabinet (EMI shielded) containing a lightguide stranded cable interconnect module (LSCIM), DS1 cross-connects, two fully loaded DDM-1000s, and an AC rectifier with battery back-up can provide a total capacity of 112 DS1 signals. A new miscellaneously mounted shelf assembly (EMI shielded), ED-2C841-30, G3, is also available for applications requiring compliance with FCC electromagnetic interference regulations Part 15, Subpart J, Class A. Other arrangements including T1 extensions and the use of bulk power are possible.

Subscriber Loop

DDM-1000 is well suited to operate in the subscriber loop. It includes automatic fault sectionalization and follows a single-ended maintenance philosophy that is consistent with *SLC*® Carrier systems. The DDM-1000 shelf architecture is economical for transporting a single DS3 The 90 Mb/s optical capacity makes it attractive over 45 Mb/s systems when even a slight possibility exists of exceeding a capacity of 672 voice circuits. Additionally, DDM-1000's ability to operate over an extended temperature range permits outdoor installations in 80D cabinets [-40°F to +120°F (-40°C to +50°C)]. This reduces land acquisition and construction expenses

DDM-1000 is suitable for use in a point-to-point loop carrier system where it is located with either *SLC* 96 or *SLC* series 5 carrier (Figure 2-5). The DDM-1000 is capable of accepting up to 56 DS1 signals (90 Mb/s) or 112 DS1 signals (180 Mb/s) (4 DS1 signals are shown) from *SLC* carrier, Digital Access and Cross-Connect System (DACS), *5ESS*® switches, or other interoffice facilities for 90 Mb/s optical transmission to the remote terminal.

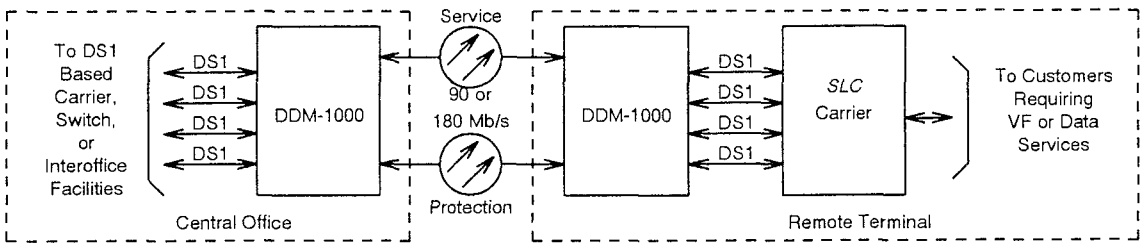


Figure 2-5. DDM-1000 Located With *SLC*® Carrier

Where protected remote extensions are required, the *SLC* series 5 carrier protection line may be implemented end-to-end (Figure 2-6). A T-carrier facility is used to provide the connection from the DDM-1000 remote terminal to the *SLC* carrier. If the protection line is implemented, it reduces the capacity of the DDM-1000 proportionally. For protected remote extensions when using *SLC* 96 carrier, the T-carrier facility at remote terminal A is replaced with a subscriber loop interface module (SLIM). The SLIM terminates the protection T1 line. Here, the capacity of the DDM-1000 is not reduced.

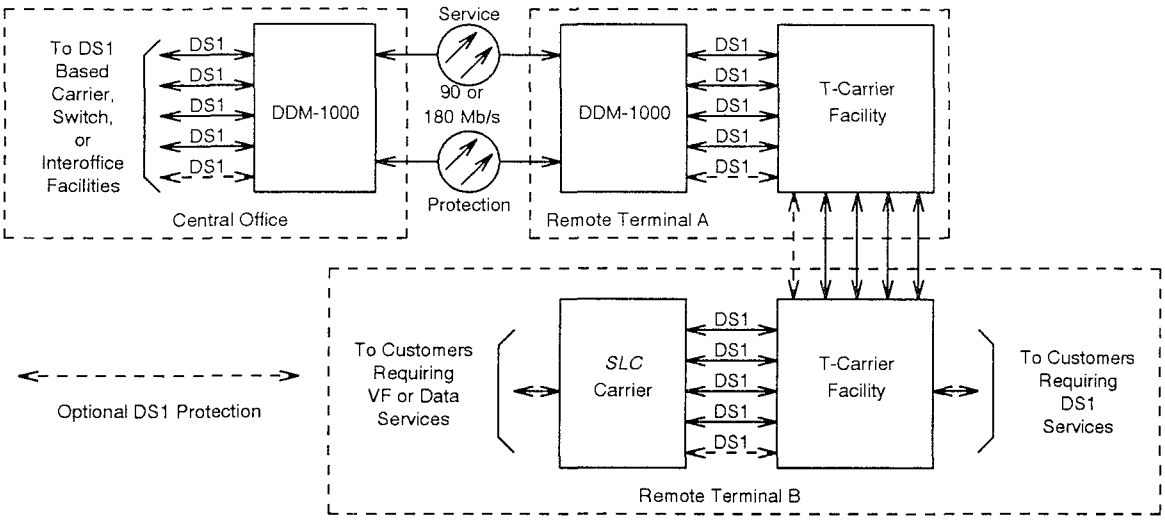


Figure 2-6. DDM-1000 With T1 Extensions to *SLC* Carrier

Various outside plant structures are available to house DDM-1000 and other lightwave equipment. Table 2-1 lists the approximate voice-frequency line capacities of these structures using DDM-1000(s) together with either *SLC* 96 carrier or *SLC* Series 5 carrier system. A range of capacities is shown because of variations in the quantity of T1 extensions and in the use of bulk powering arrangements.

Table 2-1. Line Capacities: DDM-1000 With *SLC*® Carrier

Structure	DDM-1000 With *SLC*® 96	DDM-1000 With *SLC* Series 5
80C / 80D	Up to 288	384-576
Concrete Hut	1300-1400	2600-2800
16 ft. CEV	1500-1700	3200-3400
24 ft. CEV	2600-2800	5200-5600
Maxi-Hut	3400-3500	6800-7000

Installation With *SLC*® Series 5 Carrier System

Installation With Series 5 in 80D Cabinet

The DDM-1000 may be installed in an 80D cabinet with the *SLC* Series 5 Dual Channel Bank Carrier System, a DS1 digital signal cross-connect (DSX), and a small cross-section shelf (SXSS) repeater shelf for T1 extensions (Figure 2-7).

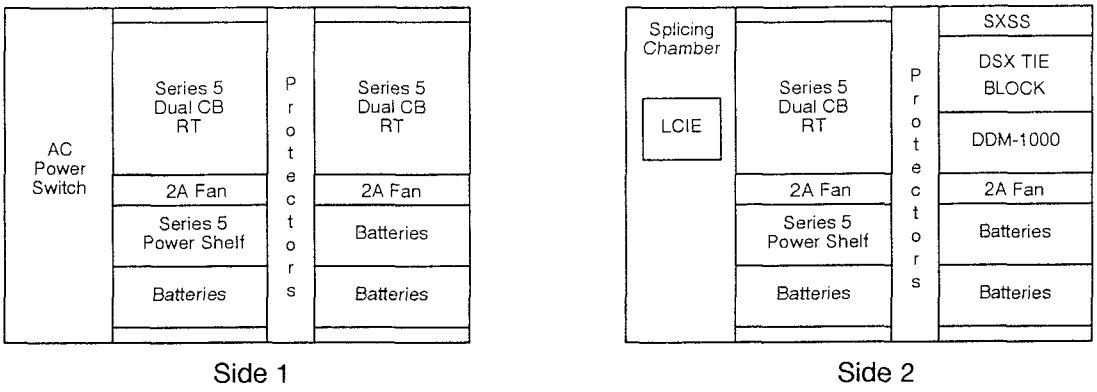


Figure 2-7. DDM-1000 and *SLC* Series 5 in 80D Group 91 Cabinet

The 80D cabinet contains all the cabling and hardware necessary to install the *SLC* Series 5 carrier system, SXSS repeater shelves, and multiplexer equipment needed for the equipment configuration ordered. All digital cables are factory wire-wrapped to the DSX tie block panel. The digital cables from the *SLC* Series 5 Carrier system and the SXSS are wire-wrapped to the back of two tie blocks, and the digital cables from the DDM-1000 are wire-wrapped to the back of the other two tie blocks. Factory-installed jumper wires across the front of the blocks connect the *SLC* Series 5 Carrier system and SXSS DS1 repeater digital lines to the DDM-1000 multiplexer lines. Digital lines from the repeaters allow extensions to *SLC* Series 5 Carrier systems in remote cabinets. Intermediate cables in Groups 90 and 91 cabinets allow connection between the *SLC* Series 5 digital lines of a collocated cabinet and the DDM-1000, if desired.

Descriptive information for the *SLC* Series 5 Carrier System may be found in its supporting documentation: AT&T 363-205-100 "Description"; and 363-205-401 "Acceptance and Turnup." Description, installation, and splicing information for the 80D cabinet containing *SLC* Series 5 carrier systems, SXSS, and DDM-1000 is contained in the 640 Division of AT&T Practices (for example, AT&T 640-250-255). Ordering information for the 80D cabinet is contained in AT&T 626-500-105. The 80D cabinet is ordered via the ED-7C621-30 drawing. The *SLC* Series 5 Ordering Guide (ED-7C628-10) also gives some configurations inside the 80D cabinet.

References for Installation With *SLC* Series 5 Carrier Systems

The following references apply to DDM-1000 and *SLC* Series 5 Carrier Systems:

AT&T 363-205-100	*SLC Series 5 Carrier System* *General Description*
AT&T 363-205-401	*SLC Series 5 Carrier System* *Remote Terminal* *Acceptance and Turnup*
AT&T 640-250-252	*80D Cabinet (Group 80)* *Description, Installation, and Splicing* *SLC Series 5 Carrier System*
AT&T 640-250-254	*80E Cabinet (Group 88)* *Description, Installation, and Splicing* *SLC Series 5 Carrier System and SXSS Repeater Shelf*
AT&T 640-250-255	*80D Cabinet (Fiber) Groups 70-72, 90-92, and 97-99 (Low Bit Rate Voice-Feature Package D)* *Description, Installation, and Splicing* *SLC Series 5 Carrier System and SXSS Repeater Shelf*
AT&T 640-250-256	*80E Cabinet (Fiber) Groups 70, 71, 78, 90, and 91* *Description, Installation, and Splicing* *SLC Series 5 Carrier System and SXSS Repeater Shelf*
AT&T 640-250-257	*80E-BP (Bulk Power) Cabinet (Fiber)* *Splicing and Equipment Installation* *SLC Series 5 Carrier System and SXSS Repeater Shelf*

Other references may apply which are not listed here or are not yet available. See AT&T 640-000-000, *Numerical Index — 640 Division* for other Outside Plant references that may apply. See AT&T 363-000-000, *Numerical Index — 363 Division* for other Loop Transmission Systems references.

Powering DDM-1000 From a *SLC* Series 5 Power Shelf

The J1C182BA Series 5 power shelf in 80D LX5 cabinet applications can be used at the remote terminal to power two Series 5 dual channel banks or one dual channel bank and one DDM-1000 multiplexer (Figure 2-8).

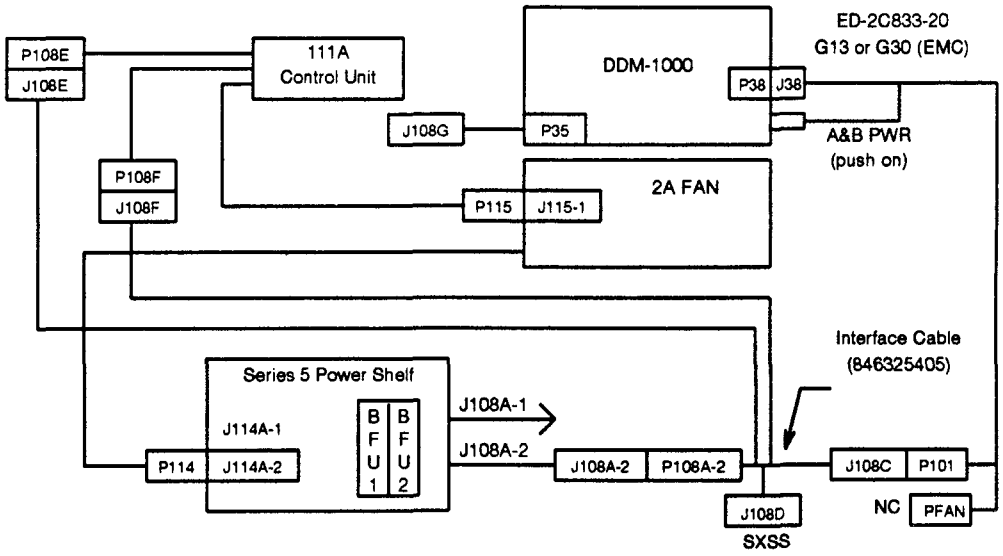


Figure 2-8. DDM-1000 Power Cabling in 80D Cabinet

The Series 5 power shelf cable J108A-2, normally used for the second dual channel bank, is used in the 80D cabinet to power the DDM-1000. The ED-2C833-20, G13 or G30 cable assembly connects the DDM-1000 to the *SLC* Series 5 power shelf via an interface cable. The DDM-1000 ED-2C833-20, G13 or G30 cable is connected to the interface cable through the P101 MATE-N-LOCK connector. (The PFAN fan alarm connector on the G13 or G30 cable is not used in this application. It is used with the ED-2C834-30 DDM-1000 fan unit.) The interface cable provides the powering to the DDM-1000, repeater shelf, and the 111A control unit.

The 111A provides an alarm interface between the Series 5 power shelf and the DDM-1000. It allows alarms for loss of AC power, power shelf fuse failure, and fan failures to be transmitted to the central office (CO) as contact closures by providing the conversion of the –48 volt alarm condition of the power shelf to ground, the alarm condition recognized by DDM-1000. The 111A also controls the activation and deactivation of the 2A fan through P115. The power and alarm terminal connections may be found in the Specifications section of this manual.

The MC90083A1B, or~later, PROCR2 is required in the DDM-1000 to read the power minor (PMN), minor and fan alarms. An AKM4 TLM1 is required at both the central office terminal (COT) and far-end remote terminal (RT) to read the power minor alarm. The TLM1 PMN alarm LED is lighted only at the COT end to indicate that AC power has failed at the RT end.

The 80D cabinet is shipped with connector P108F of the 111A unit connected to J108F from the DDM-1000 power feed cable. This connection is correct if the DDM-1000 is equipped with the PROCR2 processor. But if the DDM-1000 is equipped with the PROCR1 processor, P108F should be disconnected from

J108F and then connected to J108G. This allows the power alarms to reach the CO by a direct backplane connection (J35) to the DDM-1000 overhead telemetry (if provided).

Since the J108A-2 cable is powering the DDM-1000, the second 40D bank fuse unit (BFU) fuses the A and B battery feeds. The fuse marked Blue (Yellow bead) feeds the A battery, and the fuse marked White (Yellow bead) feeds the B battery of the DDM-1000. The CMN and WHX fuses are used to power the SXSS and the 111A, respectively. The BLX fuses are not used for the DDM-1000. Removing these unused fuses will not cause any alarms. The fan A (Green bead) and fan B (Green bead) fuses feed the 2A fan assembly plugged into the J114-2 socket. The fan A fuse feeds the center fan, while the fan B fuse feeds the two outer fans.

DS1 Code

The DS1 code options on the Series 5 AUA61 LIU and the DDM-1000 DS1 INTFC (all AEK36 types) must agree—both AMI (ZCS) or both B8ZS. Until B8ZS capability is required, it is recommended that both be set for AMI (ZCS). Equalizer switch settings for the AUA61 are given in appropriate DLPs in AT&T 363-205-400 (COT) and AT&T 363-205-401 (RT); switch settings for the DS1 INTFC are in DP-425 in the Installation and Maintenance Procedures section of this User's Manual. Also, refer to the description of the "`set-dsx-code:`" command in the Commands and Reports section of this manual.

Protection Switching

Most applications of *SLC* Series 5 collocated with DDM-1000 will *not* include a DS1 protection line. For this no-protection case it should be verified that the Series 5 alarm display unit (ADU) at both the COT (AUB1) and RT (AUB21) have been optioned for no protection: switch S2 position 1 closed (switch toward the number 1).

Pulling the DDM-1000 DS1 INTFC carrying the Series 5 traffic will cause a switch to the protection DS1 INTFC and will not cause any Series 5 alarms. Reinserting the DS1 INTFC may cause temporary Series 5 carrier line failure indications, especially when reinserting the DS1 INTFC at the RT end. Removing or reinserting the DS1 INTFC does not drop established calls. However, removing the DS1 INTFC at the RT during the ring cycle trips ringing, but does not drop the call. But since ringing stops, the called customer may not pick up the phone.

Equipping the DDM-1000

The electrical line interface unit [ELIU1 (AKM3)], OLIU (16-type or 20-type), and MXR (AKM2, AKM2B, or AKM2C) slots must be equally equipped at both ends of the system. If a slot is equipped with one of these packs at one end of the system, the corresponding slot should be equipped at the other end of the system. Having an extra slot equipped at one end will give an ambiguous alarm. This rule applies whether the circuit pack in the slot has a signal applied or does not have a signal applied.

The DS1 INTFC slots can be unequally equipped. Unequally equipped slots will not cause any alarms, but it is not recommended since craft may be confused about which locations are active. Note also that the DS1 cross-connect signals in an empty slot are connected through shorting contacts to the protection bus. Thus, spurious signals or bridged wires will be connected to the protection bus if slots are left empty. It is strongly recommended that AEK39 BP1 cards which open these contacts be inserted into all unequipped slots. **No service LS INTFC locations should be left empty in a muldem being provisioned for service.**

Looping DS1 Signals at the *SLC* Series 5 Channel Bank

To test and troubleshoot, the DS1 signals at the Series 5 bank can be looped back towards the DDM-1000 with an AUA80 card with shorting jacks or an AUA78 card and a short cable having 310 plugs. This card provides access to the Series 5 DS1 pairs at jacks that are recessed behind an opening in the faceplate.

DDM-1000 Self-Tests

Automatic looped-back test: If Series 5 is connected, both COT and RT will show temporary minor and far end alarms until the test ends.

Automatic cross-connect wiring test: AUA80 extenders are required in the Series 5 LIU slots. Four AUA80s are required to test one DS1 INTFC (four DS1s) at a time using the automatic test, or one DS1 at a time can be tested using the `test-ins+mon:` command with the ASCII terminal. If 28 AUA80s are available, all 7 DS1 INTFCs (28 DS1s) can be tested with one automatic test.

Automatic end-to-end test: If Series 5 is connected to the DDM-1000, temporary carrier line failures will occur during the test. At the end of a successful end-to-end test, the ALM LEDs on the far-end DS1 INTFCs that have undriven inputs will be flashing and continue to flash until the PROCR at the far end is restarted ("`rst`"). The PROCR can be restarted remotely with the ASCII terminal using the "`exct-rst:`" command from the Commands and Reports section of this manual.

DDM-1000 Alarms

The alarm option DIP switch on the PROCR should be set to bring far end alarms from the RT to the COT: section 2 open (toward the number).

Digital Radio

DDM-1000 can be used to provide the DS3 signals to feed digital radio systems. In this example, DR6-30-135 or DR6-40-135 (6 or 11 GHz) digital radios (135 Mb/s) are the transmission facility for the DS3 signals generated by DDM-1000 (Figure 2-9). At each terminal station, 84 DS1 signals interface to one fully equipped and one partially equipped DDM-1000 shelf for multiplexing and demultiplexing to and from the DS3 rate. The three resulting DS3 signals interface through a DSX-3 cross-connect point (not shown) to the 135 Mb/s digital radio terminal for transmission at 6 or 11 GHz.

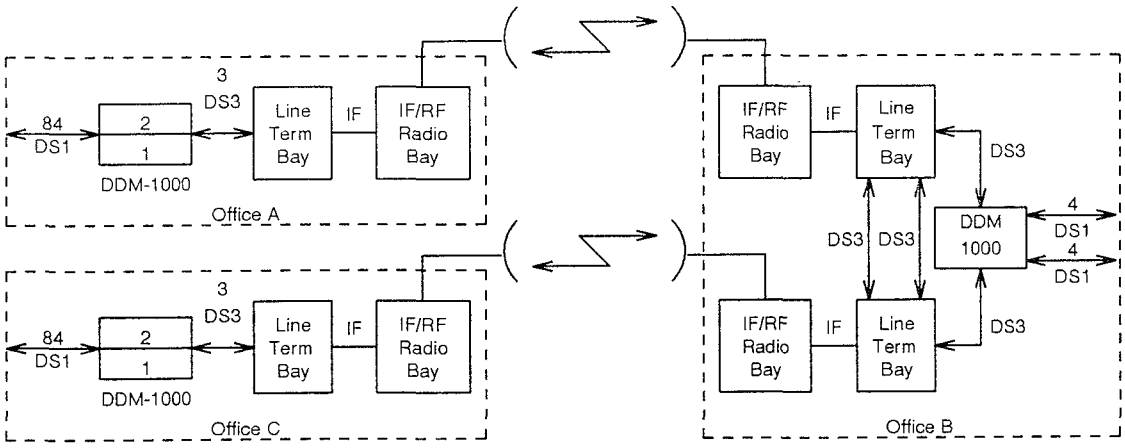


Figure 2-9. DDM-1000 With High Capacity Digital Radio

At the add/drop site in the previous example, the radio signal is demodulated and the three DS3 signals are recovered. Two DS3s in each direction are patched through for transmission to the terminal stations. The third DS3 interfaces with DDM-1000 to enable four DS1 signals to be dropped and four DS1 signals to be added in each direction. If the other 24 DS1 signals must be passed through this site, the DDM-1000 may be arranged in one of two ways. The conventional method uses back-to-back muldems where one muldem is dedicated to carrying the office A traffic while the other muldem is dedicated to carrying the office C traffic. This requires that all low-speed packs be equipped for both muldems.

An alternative is to operate DDM-1000 in the "add/drop" mode (Figure 2-10). In this mode, one muldem receives from office A and transmits to office C while the other muldem receives from office C and transmits to office A. Low-speed interface packs are provided only for those signals being added and dropped. The choice between these two methods is made by considering the total quantity of add/drop signals and the balance of add/drop signals between office A and office C. When the add/drop traffic approaches one half the total shelf capacity in both directions or the add/drop traffic is significantly unbalanced, the use of dedicated muldems is recommended for economic and administrative reasons.

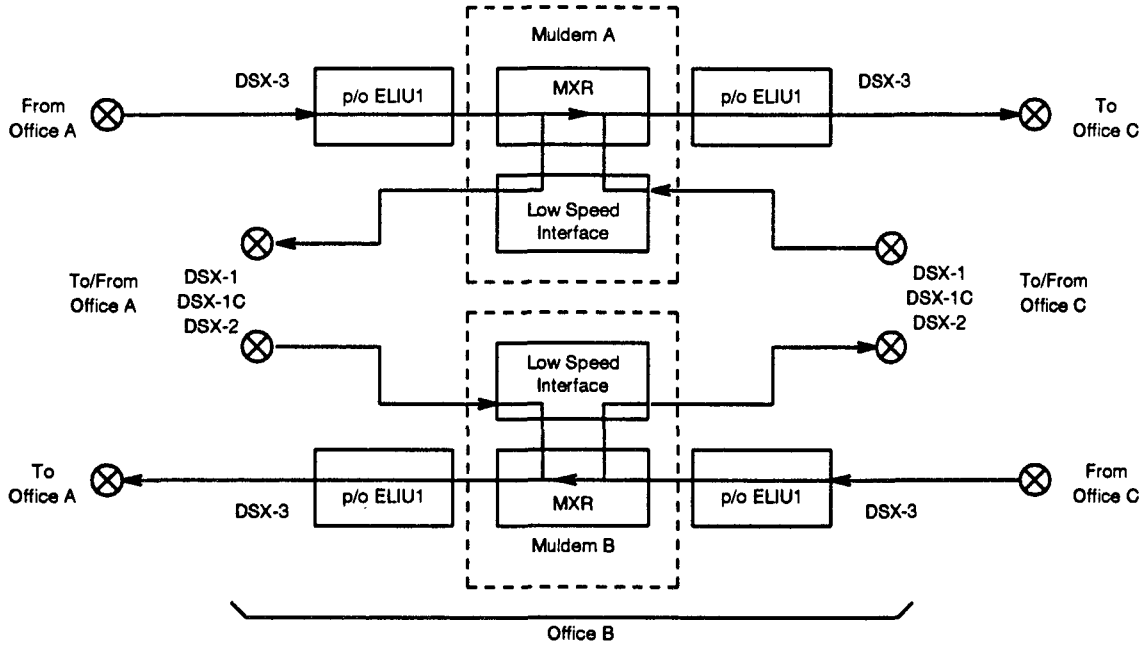


Figure 2-10. DDM-1000 Add/Drop Block Diagram

DDM-1000 is also suitable for use with the DR6-20-45 digital radio terminal for industrial applications. In this application, a partially equipped DDM-1000 mounted below the radio in a 7-foot bay provides a total capacity of 28 DS1 signals.

M1C Multiplexer

A single DDM-1000 shelf can be configured as an M1C multiplexer by equipping one muldem with DS1 INTFC (all AEK36-types) DS1 packs and the other muldem with AEK37 DS1C packs. The function unit slots associated with the DS1 packs may be equipped with AKM2 (or later) MXR packs, but the function unit slots associated with the DS1C packs must be equipped with AKM2B (or later) MXR packs. Any version of PROCR2 may be used and an AKM3 ELIU is required.

The two muldems are connected at the DS3 rate by connecting muldem B output to muldem A input, and muldem A output to muldem B input. The DS3 connections are made at the ELIU using ED-2C833-20, G33 cable assemblies. The DS1 and DS1C connections are made in a conventional manner.

When initially provisioning the shelf, the packs may be tested using the "`test-auto-turnup:local`" and "`test-auto-turnup:lsdsx`" commands described in the Commands and Reports section of this manual. These tests require that the muldems be looped on themselves with muldem A output connected to muldem A input, and muldem B output connected to muldem B input. The ED-2C833-20, G33 cables may also be used for these loopbacks.

After successful completion of the loopback tests, the muldems must be reconnected from A to B. In this configuration the shelf is protected in a normal way against circuit pack failures, and appropriate office alarms and telemetry byte-oriented serial (TBOS) scan points will be raised.

Open Network

Open Network vs. Closed Network - Electrical Mode

Figure 2-11 is an example of a traditional DDM-1000 closed network. Muldems A and B of a NE (near-end) shelf terminate in muldems A and B of a FE (far-end) shelf. All PROCR packs are designed to function in this configuration and support far-end communication (fecom) between the two shelves.

The MC90083A1E PROCR2 supports all existing configurations of DDM-1000 including open network. This firmware is compatible with all previous firmware releases.

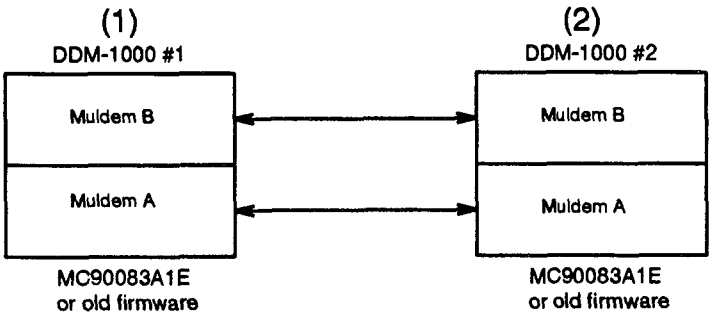
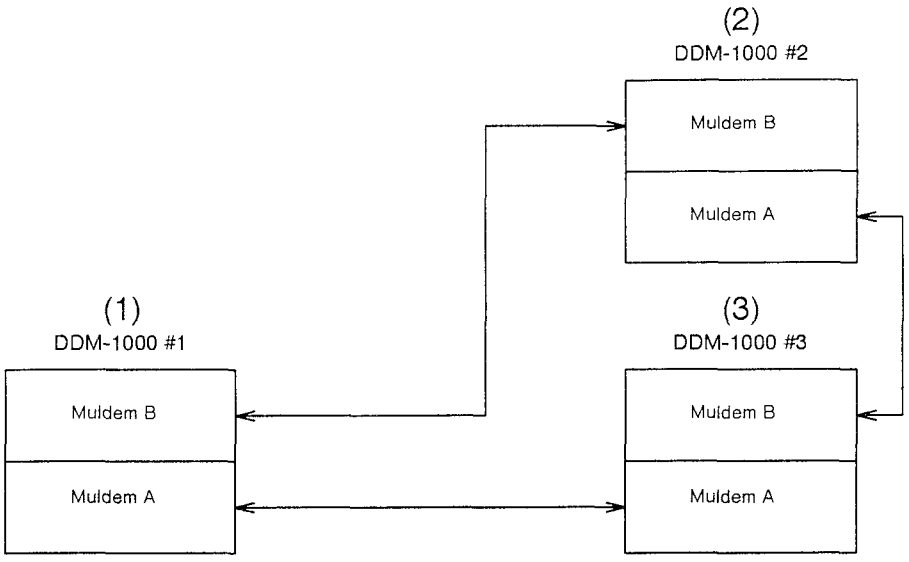


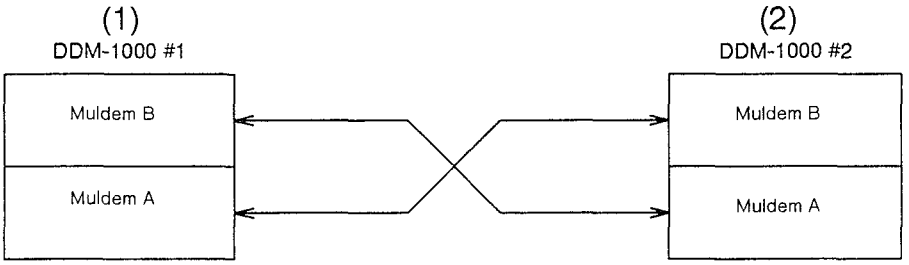
Figure 2-11. DDM-1000 Traditional Closed Network

Figure 2-12 shows examples of open networks. For DDM-1000, an open network exists when fecom is utilized between muldems of a near-end shelf that terminate in different far-end muldems. Prior to the MC90083A1E PROCR2,

fecom could not be used reliably between DDM-1000s operating outside of the traditional closed network configuration. The open network configuration only applies to shelves configured in *electrical mode*.



Example 1 - DDM-1000 Open Network



Example 2 - DDM-1000 Open Network

Figure 2-12. DDM-1000 Open Networks

Far End Communication Settings Retained Across System Reset

The effects of the MC90083A1E PROCR2 firmware described in this section apply whether the system is configured as an open network or closed network.

The FE communication (fecom) default setting remains the same in the MC90083A1E PROCR2 firmware as in previous firmware releases. For electrical systems, the default is NO fecom (fecom off); for optical systems,

fecom defaults to YES (fecom on). As before, the user has the option to change the far-end communication setting with the "`set-shelf-fecom:`" command which can be executed for individual muldems in a shelf or for the entire shelf. The fecom status is stored separately for each muldem in the shelf.

If the "`set-shelf-fecom:`" command has been used to set the fecom opposite to the default, then the effect of this command will be retained in the MC90083A1E processor through power removal and "resets" when the softset options are preserved. See the description for the `exct-reset` command in the COMMANDS and REPORTS section of this manual.

Default values for FE communication settings will automatically be reinstated if a system is converted from optical to electrical, or electrical to optical, using the procedures described in the INSTALLATION AND MAINTENANCE section of this manual.

MC90083A1E PROCR2 Compatibility with Previous Releases

The MC90083A1E PROCR2 is able to tell, via fecom messages, if the shelf operation is open network or closed network. The status is reported on the ASCII terminal using the "`rept-opt-shelf:`" command when fecom is on. If fecom is off, the system is considered a closed network and the status is not reported.

The MC90083A1E PROCR2 will allow FE communication in an open network if a previous firmware release exists at the far ends, but various reports and FE alarms will yield potentially confusing information about unmanaged spans. See Figure 2-13. Correct FE information will be obtained on span "1-2", but site "3" will deliver alarm and TBOS data from both muldem A and B when only data from muldem A is relevant to site "2". Turning fecom "on" in a "mixed span" such as "2-3" is strongly discouraged.

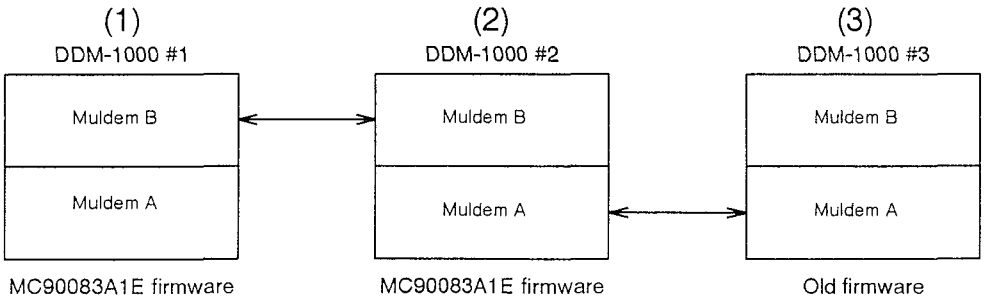


Figure 2-13. Not Recommended With fecom ON (2-3)

Alarms

In open network operation, there may be two FE sources and destinations for alarms. Refer to example 1 in Figure 2-12. The alarms work in the following way for an open network system:

a. If a common pack (PROCR, ELIU, TLM, PWR) fails in a NE shelf, both shelves connected to it will receive FE alarms (for example, if the TLM fails in shelf "1", shelves "2" and "3" will receive an FE alarm).

b. If a high-speed MXR pack fails, the shelf that the MXR services will receive the FE alarms; for example, if the SRV(B) MXR fails in shelf "1", shelf "2" will receive the FE alarm.

c. If a low-speed pack fails, the shelf that is connected to the muldem which contains the failed pack will receive the FE alarms. (For example, if a low-speed pack in muldem A of shelf "1" fails, only shelf "3" will receive the FE alarms. The failure has no effect on shelf "2", therefore it will not receive an alarm.)

In open network operation, the highest alarm type (none, minor, major, or critical) at either FE will be displayed. To be consistent with previous DDM-1000 alarm philosophy in closed network configurations, simultaneous alarms (for example, where both a minor and major exist) will not be displayed. The ASCII command "`rept-fail:e=f`" at the NE will display the reasons for any alarms at both FE terminals.

For open network operation, the command "`exct-aco:e=f`" will not be permitted because it will affect alarms on an unmanaged span.

TBOS Serial Link

TBOS serial telemetry behaves differently in open network operation because there could be two FE sources for scan points. All serial telemetry FE scan points will be combined in the NE shelf, but they may be reported separately, on demand, as described under "TBOS Scan Point Settings and Commands."

Scan points 47 and 48 are assigned to indicate FE alarms on spans associated with NE muldem A and NE muldem B, respectively. Simultaneous FE alarms associated with both muldems will set scan points 47 and 48. This is an unlikely condition, but should it happen, the FE alarms can be isolated to the respective muldems using the two new TBOS commands described below.

Scan points 47 and 48 return to their previous definition (user assigned) if the system is configured as a closed network.

The 15 overhead telemetry scan points will be sent simultaneously to both ends. However, the first five points, which may be controlled by remote operate-release commands, may be individually routed to specific spans via new commands described under "TBOS Overhead Telemetry Settings and Commands."

There is no provision to "shut off" all the FE TBOS scan points. It is assumed that unwanted scan points can be ignored by the operation support data base.

TBOS Scan Point Settings and Commands

To differentiate multiple simultaneous FE scan point settings, two TBOS remote commands (using bits 23 and 24, Reserved for Future Use in Closed Network) select either the A span FE information (bit 23), or the B span FE information (bit 24).

TBOS displays, following one of these commands, will include FE scan points from the selected span for 5 minutes, or until a "cancel" command (bit 20) is given Later scans will then revert to the combined A and B span FE scan points.

To summarize, CMD 23 (CMD 24) will exclusively put A (B) span FE information into the immediately following scan querys for 5 minutes or until a cancel (bit 20) is ordered.

When the system is operating in open network, the new commands will set point 63, Valid Telemetry Command Received, for one scan. For closed network operation, the new commands will set Point 33, Invalid Command Received, for one scan.

TBOS Overhead Telemetry Settings and Commands

Unless specified as described below, commands to operate the first five overhead telemetry scan points (34-38), will be sent via TBOS remote command numbers (53-62) simultaneously to both far ends. Also, user operation of all 15 overhead telemetry scan points (34-48), will be sent simultaneously to both far ends. It is assumed that operation support will administer the assignment of the overhead telemetry control points.

To select the FE routing of TBOS remote commands, two TBOS commands (using bits 21 and 22, Reserved for Future Use in Closed Network) select either the A span only operate-release (bit 21) or the B span only operate-release (bit 22). The FE operate-release routing selection commands (bits 21 and 22) are only effective when they immediately precede TBOS remote commands (bits 53-62). If the "cancel" command (bit 20) immediately follows a routing command (bit 21 or 22), or if any other remote command is entered, the effect of the routing bit is cancelled.

When the system is operating in open network, the new commands will set point 63, Valid Telemetry Command Received, for one scan. For closed network operation, the new commands will set point 33, Invalid Command Received, for one scan.

Craft Commands and Reports

In an open network configuration, the changes listed below are in effect with some exceptions:

- When a command is issued to the FE and the muldem parameter is specified, the command is executed at the FE for the muldem connected to the NE muldem specified in the command line. For example, "`rept-opt-pack:m=a e=f ls`" will report on the low-speed packs for FE muldem B if NE muldem A is connected to FE muldem B.
- When a potentially service-affecting action is specified for FE execution, the "Are you sure?" prompt is displayed for each connected muldem so the user has the opportunity to selectively abort the command on each span.
- All FE reports associated with muldems will specify NE=A, FE=[A|B] for muldem A; and NE=B, FE=[A|B] for muldem B. The notation [A|B] means A or B.
- Commands issued to the FE will only affect the FE muldem connected to the NE. The other half of the FE shelf is unaffected.

Commands that have exceptions to some of the rules listed above are discussed below.

EXCT-RESET	The "`exct-reset:e=f`" command is not allowed in an open network configuration because it is potentially service affecting. A reset at the FE will reset the entire FE shelf including the unmanaged FE muldem. Execution of this command results in the message "Configuration Error."
EXCT-RST	For an open network operation, the "`exct-rst:e=f`" command affects inventories only in the connected muldem at the FE and to settings common to the entire FE shelf. Settings associated solely with the second muldem at the FE will be unaffected.
EXCT-ACO	For open network operation, "`exct-aco:e=f`" is not permitted because the command affects alarms on an unmanaged span. Execution of this command results in the message "Configuration Error."

REPT-HSTY	For open network operation, The "`rept-hsty:e=`*f*" command reports the events for the entire FE shelves, not just for the connected muldems.
REPT-OPT-SHELF	The "`rept-opt-shelf:`" command reports the current configuration as open network or closed network when fecom is ON. When fecom is OFF, the configuration is not displayed.
SET-SHELF-FECOM	For open network operation, The "`set-shelf-fecom:e=`*f*" command displays an "Are you sure?" prompt for each FE connected muldem since it is capable of turning off FE communications at two different connected FE muldems.
TEST-AUTO-TURNUP	The "`test-auto-turnup:system`" command creates loopbacks at the FE on the connected muldems. Since this is service affecting for open network operation, a prompt "Are you sure?" for each span is displayed, instead of one prompt for the entire shelf. This applies to both the "**e=***n*" and "**e=***f*" options.

DACS IV-2000

The DACS IV-2000 supports limited communication with the DDM-1000. Using the S-bit protocol, the DACS IV-2000 can request to operate/release DS1 loopbacks at the DDM-1000. The DDM-1000 can request the same from the DACS IV-2000. Also supported is the reporting of far-end and near-end equipment and facility alarms. See the DACS IV-2000 reference manual and commands and messages manual for details. For the latest manual release numbers, contact your local AT&T representative.

Engineering

DDM-1000 Facility Selection

A major planning consideration when using DDM-1000 is the required initial and final capacity of the system and the type of the facility. In its 90 Mb/s optical mode, a single DDM-1000 assembly provides a 1:1 protected 90 Mb/s optical signal containing one or two DS3 signals. In its 180 Mb/s optical mode, the dual DDM-1000 assembly provides a 1:1 protected 180 Mb/s optical signal containing up to four DS3 signals. In its electrical mode, DDM-1000 provides up to two 45 Mb/s DS3 electrical signals.

If initial transmission requirements are for more than four DS3s and steady growth is projected, it is advisable to use DDM-1000 as an electrical multiplexer with its DS3 electrical outputs interfaced to a high-capacity lightwave system such as FT Series G or digital radio system such as DR6 or DR11. If the required method of transmission is optical, the initial traffic requirement is less than four DS3s, and the projection for growth is slow or unknown, then it is advisable to use DDM-1000 as an optical multiplexer equipped with 90 or 180 Mb/s optical line interface units (OLIUs). Parallel optical DDM-1000 systems can prove more economical than growth to high-capacity transmission systems in many loop applications where span distances are short and traffic capacity is greater than four DS3s. This occurs because the cost of additional fibers for parallel systems is often less than that of adding separate high-capacity lightwave terminals.

New 180 Mb/s Installations

When a new 180 Mb/s optical DDM-1000 system is to be installed, engineering considerations are the same as if two independent 90 Mb/s systems were to be installed, one above the other, separated by no more than the height of a DDM-1000 heat baffle plus a fan unit (6 inches total). Note that AKM5 DS3U1 packs cannot be used with 180 Mb/s systems.

In 180 Mb/s systems, channels originating in an OLIU shelf in one office terminate in the OLIU shelf in the other office. Channels originating in a non-OLIU shelf in one office terminate in the non-OLIU shelf in the other office. For example, if the OLIU shelf is on the bottom of the 2-shelf pair in one office and on the top of the 2-shelf pair in the other office, channel assignments follow the shelf configuration not the physical position in the bay.

When reconfiguring a bay as described here, shelf addresses must be updated as described under "Shelf Addresses" in the SPECIFICATION section of this manual.

90 Mb/s to 180 Mb/s Upgrades

When an optical DDM-1000 system is to be installed initially as a 90 Mb/s system with an upgrade to 180 Mb/s optical operation planned for the future, an initial bay arrangement consisting of odd-numbered shelves is recommended. The upgrade is done by installing the even-numbered shelves and converting the resulting pairs of shelves to 180 Mb/s operation over the existing fibers. Note that AKM5 DS3U1 packs cannot be used with 180 Mb/s systems.

The shelf-to-shelf cables for the ASCII terminal, alarms and telemetry can be used to interconnect the four assemblies as if they were shelves 1 through 4. The ED-2C833-20, G9 serial telemetry and multishelf bus cable is not long enough to connect the shelves in the odd-number shelf arrangement. The longer ED-2C833-20, G901 cable must be used.

Other equipment arrangements to support an upgrade are possible. For example, shelves 1 through 4 could be installed, operating at 90 Mb/s, with locations 5 through 8 left empty. The upgrade would be done by rolling traffic from a lower shelf to a new shelf installed in locations 5 through 8 and then converting the now unused shelf and its neighbor to 180 Mb/s operation.

OLIU Selection

When a decision has been made to order an optical DDM-1000, a particular type of OLIU must be specified. This selection is initially based on consideration of the capacity (in DS3s), the operating environment, and the span length. Table 2-2 provides the operating environment, typical system gain, and span length associated with each 16- and 20-type OLIU on single-mode fiber. Table 2-3 and Table 2-4 provide more detailed information on these OLIUs.

Table 2-2. OLIU Selection

OLIU	Capacity	Outside Plant Environment	Maximum Budget (dB)	Span Length
16E	2 DS3s	Controlled	16.5	29.9 km (18.0 miles)
16F	2 DS3s	Uncontrolled	21.0	46.8 km (29.0 miles)
16E2	2 DS3s	Uncontrolled	21.0	46.8 km (29.0 miles)
16F2	2 DS3s	Uncontrolled	27.4	60.8 km (37.7 miles)
16G	2 DS3s	Uncontrolled	27.0	59.9 km (37.0 miles)
16K	2 DS3s	Uncontrolled	33.0	73.2 km (45.3 miles)
20E	4 DS3s	Controlled	13.5	30.0 km (18.6 miles)
20G	4 DS3s	Uncontrolled	25.0	55.5 km (34.5 miles)
20K	4 DS3s	Uncontrolled	28.3	62.8 km (39.0 miles)

Once the DS3 capacity, operating environment, and approximate span distances have been determined, more detailed consideration must be given to the loss budget. Table 2-3 lists the parameters associated with systems using the 16-type OLIUs. Table 2-4 lists the parameters associated with systems using the 20E, 20G and 20K OLIUs. Calculations in Table 2-3 and Table 2-4 assume nominal TX output power.

All OLIUs have the capability of operating over 1300 nm single-mode or multimode fiber. In addition, the 16E, 16E2, 16F, 16F2, and 20E are capable of being looped back-to-back without the use of attenuators. Systems using the 16G OLIU3, 16K OLIU6, 20G OLIU5, or 20K OLIU7 require a line build-out (LBO) for system acceptance testing and may require an LBO to meet the minimum facility loss parameter. See DP-424 in the "Installation and Maintenance" section of this manual for details on minimum and maximum facility losses with various combinations of OLIUs.

Table 2-3. DDM-1000 16-Type OLIU Loss Budget Parameters

Parameter	16E OLIU	16F OLIU	16G OLIU	16K OLIU
Wavelength	1305 ±20 nm	1305 ±20 nm	1305 ±20 nm	1305 ±20 nm
Type of TX	Single Mode	Single Mode	Single Mode	Single Mode
TX Output Power-HI*	−10.0 dBm ±1dB	−10.0 dBm ±1dB	−4.0 dBm ±1dB	+2.0 dBm ±1dB
TX Output Power-LW*	−16.0 dBm ±1dB	−16.0 dBm ±1dB	−10.0 dBm ±1dB	−4.0 dBm ±1dB
RX Sensitivity for BER=10^{-9}†	−34.5 dBm	−39.0 dBm	−39.0 dBm	−39.0 dBm
Max. RX Input Power	−14.5 dBm	−14.5 dBm	−14.5 dBm	−14.5 dBm
Available System Gain‡	24.5 dB	29.0 dB	35.0 dB	41.0 dB
Eye Margin	3.5 dB	3.5 dB	3.5 dB	3.5 dB
Equipment Margin	3.0 dB	3.0 dB	3.0 dB	3.0 dB
Maximum Facility Loss	18.0 dB	22.5 dB	28.5 dB	34.5 dB
Minimum Facility Loss	0 dB	0 dB	7.0 dB	13.7 dB
Max. Connector Loss (Two)	1.5 dB	1.5 dB	1.5 dB	1.5 dB
Operating Temp. Range	0°C to +50°C	−40°C to +75°C	−40°C to +75°C	−40°C to +75°C
Single-Mode Fiber				
Outside Plant Budget (1305 ±30 nm)	16.5 dB	21.0 dB	27.0 dB	33.0 dB
Span Length§	29.9 km (18 mi)	45.5 km (28.3 mi)	58.9 km (36.6 mi)	73.2 km (45.3 mi)
Multimode Fiber				
Dispersion and Modal Noise Allocation¶	3 dB	3 dB	3 dB	3 dB
Outside Plant Budget (1305 ±30 nm)	13.5 dB	18.0 dB	24.0 dB	30.0 dB
Span Length**	13.5 km (8.37 mi)	18.0 km (11.0 mi)	24.0 km (14.8 mi)	30.0 km (18.6 mi)

Table 2-3. DDM-1000 16-Type OLIU Loss Budget Parameters (Contd)

Parameter	16E2 OLIU	16F2 OLIU
Wavelength	1305 ±20 nm	1305 ±20 nm
Type of TX	Single Mode	Single Mode
TX Output Power-HI*	−10.5 dBm ±1dB	−4.1 dBm ±1dB
TX Output Power-LW*	−15.5 dBm ±1dB	−9.1 dBm ±1dB
RX Sensitivity for BER=10^{-9}†	−39.5 dBm	−39.5 dBm
Max. RX Input Power	−7.0 dBm	−7.0 dBm
Available System Gain‡	29.0 dB	35.4 dB
Eye Margin	3.5 dB	3.5 dB
Equipment Margin	3.0 dB	3.0 dB
Maximum Facility Loss	22.5 dB	28.9 dB
Minimum Facility Loss	0 dB	0 dB
Max. Connector Loss (Two)	1.5 dB	1.5 dB
Operating Temp. Range	−40°C to +75°C	−40°C to +75°C
Single-Mode Fiber		
Outside Plant Budget (1305 ±30 nm)	21.0 dB	27.4 dB
Span Length§	46.8 km (29 mi)	60.8 km (37.7 mi)
Multimode Fiber		
Dispersion and Modal Noise Allocation¶	3 dB	3 dB
Outside Plant Budget (1305 ±30 nm)	18.0 dB	24.4 dB
Span Length**	18.0 km (11.0 mi)	24.4 km (15.0 mi)

* The output power of the optical transmitter (TX) should be measured at the biconic connector at the end of the transmitter pigtail. The power outputs shown in this table are guaranteed values when the transmitter is new. The numbers are based on measurements with a power meter calibrated against the AT&T-TS-RD standard power meter, which can be traced to the National Bureau of Standards. The DDM-1000 TX has a 6 dB switch; power output may be selected as HI or LW based on the installed cable loss.

† To obtain receiver (RX) sensitivity for other BER, use the following corrections:

- From 10^{-7} to 10^{-8}, increase signal level 0.32 dB
- From 10^{-8} to 10^{-9}, increase signal level 0.31 dB
- From 10^{-9} to 10^{-10}, increase signal level 0.23 dB

Table 2-3. DDM-1000 16-Type OLIU Loss Budget Parameters (Contd)

‡ The available system gain is the transmitter power minus the receiver sensitivity. The facility loss includes 3.5 dB for eye degradation (optical receiver variation from ideal) and 3.0 dB for OLIU equipment degradation. Temperature and aging degradations have been included in the OLIU equipment margin of 3.0 dB. The equipment margin for the transmitter is 2.0 dB. The equipment margin for the receiver is 1.0 dB. The loss of two optical connectors is 1.5 dB. This is usually referenced out in a fiber insertion loss measurement; therefore, a span that meets the "Outside Plant Budget" measurement should meet the "Facility Loss" requirement. DP-424 in the "Installation and Maintenance" section contains details on minimum and maximum facility losses with combinations of OLIUs.

§ Assumes 0.55 dB/km cable plus splice loss (medium loss single-mode fiber) for the 16E and 16E2 and 0.45 dB/km cable plus splice loss (low loss single-mode fiber) for the 16F, 16F2, 16G, and 16K.

¶ Assumes 90 MHz end-to-end fiber bandwidth. For 70 MHz bandwidth, increase dispersion and modal noise allocation to 4 dB, decrease outside plant budget 1 dB, and reduce span length by 1 km.

** Assumes 1.0 dB/km average cable plus splice loss (medium loss multimode fiber).

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Table 2-4. DDM-1000 20-Type OLIU Loss Budget Parameters

Parameter	20E OLIU	20G OLIU	20K OLIU
Wavelength	1305 ±20 nm	1305 ±20 nm	1305 ±20 nm
Type of TX	Single Mode	Single Mode	Single Mode
TX Output Power-HI*	−7 dBm ±1 dB	−1.3 dBm ±1 dB	+2.0 dBm ±1 dB
TX Output Power-LW*	−13 dBm ±1 dB	−7.3 dBm ±1 dB	−4.0 dBm ±1 dB
RX Sensitivity for BER=10^{-9}†	−29.0 dBm	−34.8 dBm	−34.8 dBm
Max. RX Input Power	-12.3 dBm	-15.3 dBm	-15.3 dBm
Available System Gain‡	22.0 dB	33.5 dB	36.8 dB
Eye Margin	3.5 dB	3.5 dB	3.5 dB
Equipment Margin	3.5 dB	3.5 dB	3.5 dB
Maximum Facility Loss	15.0 dB	26.5 dB	29.8 dB
Minimum Facility Loss	0 dB	10.0 dB	13.3 dB
Max. Connector Loss (Two)	1.5 dB	1.5 dB	1.5 dB
Operating Temp. Range	0°C to +50°C	−40°C to +75°C	−40°C to +75°C
Single-Mode Fiber			
Outside Plant Budget (1305 ±30 nm)	13.5 dB	25.0 dB	28.3 dB
Span Length§	30.0 km (18.6 mi)	55.5 km (34.5 mi)	62.8 km (39 mi)
Multimode Fiber¶			

* The output power of the optical transmitter (TX) should be measured at the biconic connector at the end of the transmitter pigtail. The power outputs shown in this table are guaranteed values when the transmitter is new. The numbers are based on measurements with a power meter calibrated against the AT&T-TS-RD standard power meter, which can be traced to the National Bureau of Standards. The DDM-1000 TX has a 6 dB switch; power output may be selected as HI or LW based on the installed cable loss.

† To obtain receiver (RX) sensitivity for other BER, use the following corrections:

- From 10^{-7} to 10^{-8}, increase signal level 0.32 dB
- From 10^{-8} to 10^{-9}, increase signal level 0.31 dB
- From 10^{-9} to 10^{-10}, increase signal level 0.23 dB

Table 2-4. DDM-1000 20-Type OLIU Loss Budget Parameters (Contd)

‡ The available system gain is the transmitter power minus the receiver sensitivity The facility loss includes 3 5 dB for eye degradation (optical receiver variation from ideal) and 3 5 dB for OLIU equipment degradation Temperature and aging degradations have been included in the OLIU equipment margin of 3 5 dB The equipment margin for the transmitter is 2.25 dB The equipment margin for the receiver is 1 25 dB The loss of two optical connectors is 1 5 dB This is usually referenced out in a fiber insertion loss measurement, therefore, a span that meets the "outside plant budget" measurement should meet the "facility loss" requirement DP-424 in the INSTALLATION AND MAINTENANCE section contains details on minimum and maximum facility losses with combinations of OLIUs

§ Assumes 0 45 dB/km cable plus splice loss (low loss single-mode fiber)

¶ Multimode Operation — Assumes 1 0 dB/km cable plus splice loss (medium loss multimode fiber) The exit bandwidth of a fiber is determined by sinusoidally modulating the intensity of a light source at one end of the fiber and measuring the output at the other end Exit bandwidth is the value of the lowest sinusoidal modulated frequency, expressed in MHz, at which the optical loss is 3 dB down from the fiber's attenuation (The optical loss of a fiber is a measure of how much light gets lost and is the ratio of the output pulse amplitude to the input pulse amplitude, expressed in dBs. The optical loss obtained when the frequency of the modulating signal is zero is the fiber's attenuation.) Refer to the following table For example, if the exit bandwidth of the fiber being used is 180 MHz, then the maximum path loss should not exceed 10.5 dB [10 5 km (6 5 miles)] when using a 20E OLIU

Minimum	20E OLIU		20G OLIU		20K OLIU	
Exit Bandwidth	Max. Loss	Length	Max. Loss	Length	Max. Loss	Length
180 MHz	10 5 dB	10 5 km (6 5 mi)	22 0 dB	22 0 km (13 7 mi)	25 3 dB	25 3 km (15 7 mi)
150 MHz	9 5 dB	9 5 km (5 9 mi)	21 0 dB	21 0 km (13 0 mi)	24 3 dB	24 3 km (15 1 mi)
120 MHz	8 5 dB	8 5 km (5 3 mi)	20 0 dB	20 0 km (12 4 mi)	23 3 dB	23 3 km (14 5 mi)

Circuit Pack Compatibility

Circuit Packs

This issue of the DDM-1000 User/Service Manual documents the following major circuit pack changes. Note that a class A change means that all indicated circuit packs should be replaced with the designated replacement packs.

- A class A change to replace **all** MC90083A1D PROCR2 and earlier packs with an MC90083A1D, Issue 4 PROCR2 pack.

  ⇒ NOTE:
  An earlier class A change may have resulted in some MC90083A1D PROCR2 and earlier packs being replaced with an MC90083A1D, Issue 3 PROCR2 pack. A subsequent non-service-affecting problem resulted in issuing a class A change to replace all MC90083A1D PROCR2 packs and earlier with an MC90083A1D, Issue 4 PROCR2 pack. The problem encountered was a cycling of the PMN alarm in applications using a remote terminal.

- A class A change to replace **all** MC90083A1E Issue 1 PROCR2 packs with an MC90083A1E, Issue 2 PROCR2 pack to correct a problem involving a cycling of the PMN alarm in some applications using a remote terminal.
- A class A change to replace all AKM5 DS3U1 packs with an AKM5 S3:3 DS3U1 pack.

AEK36B DS1 INTFC2

The AEK36B DS1 INTFC2 is backward compatible with the AEK36 DS1 INTFC1 and differs as follows:

- The power consumption of the AEK36B is substantially lower than that of the AEK36. This allows more flexibility in planning and engineering.
- The PROCR2 (MC90083A1B PROCR2 or later) can override the setting of the DIP switches to control the code setting (AMI or B8ZS) for the AEK36B but not for the AEK36.
- The arrangement of DIP switch segments that define the EQL settings and DS1 code type is different for the two circuit packs.
- AEK36 circuit packs cannot be installed in the DDM-1000 assembly equipped with 20E or 20G OLIUs (the OLIU assembly). AEK36Bs may be installed in the OLIU assembly.

AEK36B S1:2 DS1 INTFC2

The AEK36B S1:2 DS1 INTFC2 pack is backward compatible with the AEK36 and the AEK36B DS1 INTFC1 pack. The AEK36B S1:2 has the same features as the AEK36B. The difference between the S1:2 pack and the older pack is the location of the DIP switch used for LBO and line code settings.

AKM2B MXR2

The AKM2B MXR2 is backward compatible with the AKM2 MXR1 and differs as follows:

- The AKM2 cannot be used in the same muldem as an AEK37 DS1C INTFC1. The AKM2B is compatible with all DDM-1000 circuit packs.
- The power consumption of the AKM2B is lower than that of the AKM2. When combined with the power reductions in the other second generation circuit packs, this allows more flexibility in planning and engineering.
- Jumper plugs have been added to the AKM2B to control various operating modes. These jumpers are described in the Specifications section and in the affected procedures in the Installation and Maintenance section of this manual.
- The AKM2B provides C-bit framing format but cannot provide performance monitoring data to a TLM2 pack.

AKM2C MXR3

The AKM2C MXR3 is compatible with the AKM2 MXR1 if the AKM2C MXR3 is optioned for M13 mode. It is compatible with the AKM2B MXR2 if each MXR is optioned the same (C-bit or M13 mode).

The AKM2C MXR3 pack differs from the AKM2B MXR2 in two ways that affect the user:

- The AKM2C MXR3 provides performance monitoring data over a telemetry asynchronous block serial (TABS) interface when used with the MC90191A1 TLM2 and MC90083A1C, or later, PROCR2.
- The AKM2C provides DS3 AIS (l6mb) detection when used with the MC90083A1C, or later, PROCR2.

AKM5 DS3U1

A class A change replaced all issues of the AKM5 packs prior to S3:3. The previous issues of the AKM5 pack could cause a loss of service if the PROCR pack is removed. The AKM5 S3:3, or later, pack will maintain service if the PROCR is removed.

AEK36B S1:2, 1:3, and 1:4 DS1 INTFC2

The AEK36B S1:2, 1:3, and 1:4 DS1 INTFC2 packs:

- are backward compatible with the AEK36 and the AEK36B DS1 INTFC1 pack
- have the same features as the AEK36B DS1 pack
- have the DIP switch located different from the AEK36B DS1 pack.

The AEK36B S1:4 DS1 pack is more tolerant of transients at the DSX-1 cross-connection than the preceding AEK36B-type packs. The AEK36B S1:4 offers improved initial clock recovery from low density DS1 signals, such as a 3-in-24 pattern.

AEK36C DS1 INTFC2

The AEK36C is backward compatible with all previous AEK36-type DS1 INTFC packs. The AEK36C pack is the newest of the AEK36 series of packs which incorporates the latest technology for improved performance. The AEK36C offers improved initial clock recovery from low density DS1 signals, such as a 3-in-24 pattern. The new pack is more tolerant of transients at the DSX-1 cross-connection than the preceding AEK36B-type packs.

AKM2B MXR2

The AKM2B MXR2 is backward compatible with the AKM2 MXR1 and differs as follows:

- The AKM2 cannot be used in the same muldem as an AEK37 DS1C INTFC1. The AKM2B is compatible with all DDM-1000 circuit packs.
- The power consumption of the AKM2B is lower than that of the AKM2. When combined with the power reductions in the other second generation circuit packs, this allows more flexibility in planning and engineering.
- Jumper plugs have been added to the AKM2B to control various operating modes. These jumpers are described in the Specifications section and in the affected procedures in the Installation and Maintenance section of this manual.
- The AKM2B provides C-bit framing format but cannot provide performance monitoring data to a TLM2 pack.

AKM2C MXR3

The AKM2C MXR3 is compatible with the AKM2 MXR1 if the AKM2C MXR3 is optioned for M13 mode. It is compatible with the AKM2B MXR2 if each MXR is optioned the same (C-bit or M13 mode).

The AKM2C MXR3 pack differs from the AKM2B MXR2 in two ways that affect the user:

- The AKM2C MXR3 provides performance monitoring data over a telemetry asynchronous block serial (TABS) interface when used with the MC90191A1 TLM2 and MC90083A1C, or later, PROCR2.
- The AKM2C provides DS3 AIS (l6mb) detection when used with the MC90083A1C, or later, PROCR2.

AKM5 DS3U1

A class A change replaced all issues of the AKM5 packs prior to S3:3. The previous issues of the AKM5 pack could cause a loss of service if the PROCR pack is removed. The AKM5 S3:3, or later, pack will maintain service if the PROCR is removed.

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MC90083A1B PROCR2

The following description is provided as a reference only since all MC90083A1D, Issue 3 and *earlier* PROCR packs have been replaced with MC90083A1D, Issue 4 packs, and all MC90083A1E, Issue 1 packs have been replaced with MC90083A1E, Issue 2 packs.

The MC90083A1B PROCR2 differed from the MC90083A1 PROCR1 as follows:

- The PROCR2 supports the AKM6 DS3U2 and AEK37 DS1C INTFC1 circuit packs; the PROCR1 does not.
- The PROCR2 supports an in-service conversion from optical to electrical and from electrical to optical operation; the PROCR1 does not.
- The PROCR2 includes the ASCII terminal command `rept-hsty:`; the PROCR1 does not.
- The PROCR2 includes an enhanced version of the ASCII terminal command `test-procr:`
- The PROCR2 supports add/drop operation; the PROCR1 does not.
- The PROCR2 allows the end-to-end maintenance communication (fecom/S-bit signalling) to be explicitly enabled or disabled; the PROCR1 does not. The default states for PROCR2 are "on" for an optical system and "off" for a DS3 electrical system. Fecom is always "on" for PROCR1.
- The PROCR2 indicates an automatic protection switch lock by lighting only the MN and NE LEDs. The PROCR1 indicates an automatic lock by lighting the ABN LED.
- Several other ASCII terminal commands and reports are enhanced in the PROCR2.

See the heading "Incompatible Combinations" for a discussion of some basic guidelines for mixing PROCR packs in a bay.

MC90083A1C PROCR2

The following description is provided as a reference only. All MC90083A1D, Issue 3 and *earlier* PROCR packs have been replaced with MC90083A1D, Issue 4 packs. All MC90083A1E, Issue 1 packs have been replaced with MC90083A1E, Issue 2 packs.

The MC90083A1C PROCR2 supports all the features of the MC90083A1B PROCR2. The MC90083A1C PROCR2 supports PM and DS3 AIS detection; the MC90083A1B PROCR2 and the PROCR1 do not.

See the heading "Incompatible Combinations" for a discussion of some basic guidelines for mixing PROCR packs in a bay.

MC90083A1C Issue 2 PROCR2

The following description is provided as a reference only since all MC90083A1D, Issue 3 and *earlier* PROCR packs have been replaced with MC90083A1D, Issue 4 packs, and all MC90083A1E, Issue 1 packs have been replaced with MC90083A1E, Issue 2 packs.

The MC90083A1C, Issue 2 PROCR2 was released to correct minor problems in the following areas:

- Corrections to "automatic lock to protection switch" to provide an automatic lock to protection after four switches in 10 minutes.
- Correct the automatic monitoring of the DS1 input signal on channel four of low-speed DS1 packs when the monitor threshold is high.
- Correct the 24-hour timer used with the "`rept-hsty:`" command.
- Change firmware to allow, under certain circumstances, ASCII terminal settings of the AMI/B8ZS channel format on DS1 low-speed packs to be unaffected by a "reset", "rst," processor replacement, low-speed pack replacement, or loss of power to the shelf.

MC90083A1D PROCR2

An earlier class A change replaced the MC90083A1D, Issue 2 and earlier PROCR2 packs with the MC90083A1D, Issue 3 PROCR2. A later class A change replaced the MC90083A1D, Issue 3 and earlier PROCR2 packs with the MC90083A1D, Issue 4 PROCR2 because of a problem with a cycling of the PMN alarm when used in applications with a remote terminal. (See the description for the MC90083A1D, Issue 4 PROCR2 for changes and enhancements.)

MC90083A1D Issue 2 PROCR2. The following description is provided as a reference only since all MC90083A1D, Issue 3 and *earlier* PROCR packs have been replaced with MC90083A1D, Issue 4 packs, and all MC90083A1E, Issue 1 packs have been replaced with MC90083A1E, Issue 2 packs.

The MC90083A1D, Issue 2 PROCR2 was released in September 1989 to replace all MC90083A1D PROCR2 packs. The Issue 1 MC90083A1D firmware had a problem that caused the PROCR2 pack to eventually self-reset regardless of shelf configuration. Sometimes, when the shelf was equipped for DS3 clear channel, the resets would cause the AKM5 DS3U1 pack to loop back the DS3 channel.

The MC90083A1D, Issue 2 PROCR2 supports all the features of the MC90083A1C PROCR2 The MC90083A1D, Issue 2 PROCR2 differs from the MC90083A1C PROCR2 as follows:

- The MC90083A1D, Issue 2 PROCR2 supports DS2.
- The MC90083A1D, Issue 2 PROCR2 conditionally supports DS3 clear channel. If a DS3 channel is equipped with DS3U1 packs and the channel is looped at the DSX-3 at both ends, jitter on the signal in the other muldem might be increased. Therefore, if DS3 loopbacks are never applied at both ends of the channel, the MC90083A1D, Issue 2 PROCR2 may be used to support DS3 clear channel. (See the description for the MC90083A1E PROCR2.)
- The MC90083A1D, Issue 2 PROCR2 includes the following new ASCII terminal commands:
  "set-shelf-autolock:",
  "set-dsx-alm: {ds3}",
  "set-frm-ds3u1:",
  "set-vmr-ds3u1:"
  "exct-loop-ds3u1:".

See the heading "Incompatible Combinations" for a discussion of some basic guidelines for mixing PROCR packs in a bay.

MC90083A1D, Issue 3 and Issue 4 PROCR2. The MC90083A1D, Issue 3 and Issue 4 PROCR2 packs support all the features of earlier PROCR packs. A class A change replaced the MC90083A1D, Issue 3 PROCR2 pack with an MC90083A1D, Issue 4 PROCR2 pack because of a problem with a cycling of the PMN alarm when used in applications with a remote terminal. The MC90083A1D, Issue 4 PROCR2 is introduced to obtain improvements in the following areas:

- Potential service-affecting conditions:
  - — Improved protection switch completion to comply with current technical publications.
  - — Procedure added to eliminate jitter introduction into other DS3 signals on the same optical system when a DS3U1 pack encounters a double DS3 loopback condition.
  - — Corrections to prevent possible low-speed switching when the PROCR2, MXR, or OLIU packs are removed and reinserted.
  - — Routine added that will limit out-of-frame conditions caused by autonomous DS3 framing format changes (M13/C-bit) to less than 1 second.
  - — Corrections to identify when an incorrectly optioned AEK36B low-speed circuit pack is replaced.

- Non-service-affecting conditions:
  - Procedure added to assure proper lock of the clock recovery circuit of AEK36( ) packs when low density DS1 signals, such as the "3 in 24" test pattern, are first applied.
  - Corrections to give proper LED indications when M13 to C-bit DS3 frame format conversions are performed on optical DDM-1000s.
  - Routine added to eliminate "stuck" LED alarm indicators that remain lighted after an alarm condition clears.

The AKM86, BP2 pack is required in an optical shelf if only one muldem is equipped in that shelf and if the PROCR2 pack is an MC90083A1D, Issue 3 or Issue 4. In a 180 Mb/s system, an AKM86 is required in each shelf if only one muldem is equipped in each shelf.

The BP2 pack prevents a service-affecting condition from occurring. Without the BP2 pack, a failure of the protection fiber or removal of a protection function unit or OLIU will cause a high-speed protection switch to occur. The switch will last for about 10 seconds and then return to the service channel, thus restoring service.

The BP2 pack must be installed in the function unit SRV slot of the unequipped muldem. The pack contains a short, printed path that grounds a lead to prevent the false protection switch.

See the heading "Incompatible Combinations" for a discussion of some basic guidelines for mixing PROCR packs in a bay.

MC90083A1E PROCR2

The MC90083A1E PROCR2 pack provides enhanced operations and applications features compared with previous PROCR2 processors. The MC90083A1E PROCR2 is backward compatible with previous PROCR packs. The new features are as follows:

- The MC90083A1E PROCR2 packs support open network configurations. Open network is a system configuration where both muldems in an electrically configured shelf may terminate in muldems in separate far-end shelves and have full far-end communication with those muldems. The far-end communications include commands, alarms, overhead telemetry, and TBOS information. This information is transmitted over the embedded communications channel. The shelves must be configured in electrical mode.
- New TBOS scan points and remote commands are provided when the shelf is operating in the open network mode.
- The MC90083A1E PROCR2 allows non-service-affecting parameters that have been set with an ASCII terminal to be saved or returned to default during a two-step reset process.
- The MC90083A1E PROCR2 allows the system to be provisioned to activate a local office alarm or indicator when the incoming DS3 signal is missing all seven 6 Mb/s DS2 frames (l6mb) such as a DS3 AIS signal. The MC90083A1E PROCR2 includes the following new ASCII terminal command:

  `set-dsx-l6mb:` This command allows setting of an indicator or alarm for loss of all seven l6mb (DS2 frames in a DS3 signal).

- In the `rept-opt-dsx:` output display, the MC90083A1E PROCR2 displays an "*" following the code format type to indicate DS1 channels that are soft set.
- The "**s=**" entry is still an option for all commands if there is only one shelf in a bay. When more than one shelf is in a bay, then the "**s=**" entry is required for all commands.
- The MC90083A1E PROCR2 provides enhanced CIT operator warning messages. This feature should reduce service-affecting errors because the user is advised that a service-affecting command is about to be executed.
- With the MC90083A1E PROCR2, high-speed switching activity initiated by optical error rate conditions will be placed into system history reports.

The MC90083A1E firmware is a class M change that may be ordered to upgrade previous versions of PROCRs. All MC90083A1D, Issue 4 and earlier, PROCR packs can be upgraded to an MC90083A1E, Issue 2 by ordering an EPROM upgrade kit [ED-8C719-30, G4 (COMCODE 601301641)].

A class A change replaced the MC90083A1E, Issue 1 PROCR2 pack with an MC90083A1E, Issue 2 PROCR2 pack because of a problem with a cycling of the PMN alarm when used in applications with a remote terminal.

In addition to the feature benefits, the MC90083A1E, Issue 2 firmware contains all the benefits of the MC90083A1D, Issue 4 firmware.

The AKM86, BP2 pack is required in an optical shelf if only one muldem is equipped in that shelf and if the PROCR2 pack is an MC90083A1E, Issue 1 or Issue 2. In a 180 Mb/s system, an AKM86 is required in each shelf if only one muldem is equipped in each shelf.

The BP2 pack prevents a service-affecting condition from occurring. Without the BP2 pack, a failure of the protection fiber or removal of a protection function unit or OLIU will cause a high-speed protection switch to occur. The switch will last for about 10 seconds and then return to the service channel, thus restoring service.

The BP2 pack must be installed in the function unit SRV slot of the unequipped muldem. The pack contains a short, printed path that grounds a lead to prevent the false protection switch.

See the heading "Incompatible Combinations" for a discussion of some basic guidelines for mixing PROCR packs in a bay.

Incompatible Combinations

There are some restrictions on the combinations of circuit packs that can be used in the DDM-1000. Table 2-5 summarizes the incompatible combinations of circuit packs.

Since there are numerous PROCR firmware versions for DDM-1000, basic guidelines must be established for mixing different PROCR versions in a bay. If all shelves in a bay have been interconnected with the multishelf bus cable, an ASCII terminal may be plugged into any PROCR pack in the bay and communicate with any other PROCR in that bay by entering the appropriate shelf number. The protocol for this bus communication is such that the first (bottom) and last (top) PROCR packs in the bay affect the way some commands are executed. It does not matter what PROCR version is between the first and last PROCR.

When a command is entered, all PROCR packs on the bus receive it. The addressed PROCR accepts the command and acts on it. However, the bus protocol is such that each PROCR checks the command syntax and if there is a PROCR above, no action is taken. When this process of checking reaches the last PROCR in the chain, if the PROCR does not recognize the command syntax it responds with "syntax error." This response collides with the response from the addressed PROCR and results in a garbled response on the terminal. This collision may cause the command to not work.

Following are some basic guidelines for mixing PROCR versions in a bay:

a. The commands in all PROCR packs up through MC90083A1C are the same. However, some of the commands are specifically for optical shelves and some are for electrical shelves. For example, assume an optical shelf is the last shelf in the bay and the command "`exct-sw-hs:m=a` **s=*x* make**" is issued to an electrical shelf below it. The electrical shelf might execute the command, but the top optical shelf will respond with "syntax error" since the command syntax is wrong for an optical shelf. This response collides with the response from the addressed PROCR and results in a garbled response on the terminal. This problem may be eliminated by ensuring that there is an MC90083A1C, or later, PROCR2 at the top of the bay.

b. The MC90083A1D PROCR2 supports new commands that previous PROCR packs do not recognize. If one of these commands is addressed to a new PROCR and there is an older PROCR at the top of the chain that will not recognize the command, the older PROCR will respond with "syntax error." This response collides with the response from the addressed PROCR and results in a garbled response on the terminal. Therefore, for proper execution of new commands with MC90083A1D PROCR2 packs in a bay, the top PROCR in the bay must be an MC90083A1D PROCR2 pack or later.

c. MC90083A1E PROCR2 packs require the "**s=*x***" entry if there is more than one shelf in a bay.

   If the first and last shelf has an MC90083A1E PROCR2 installed and the "**s=*x***" entry is omitted from the command, the response will be "syntax error." Without the "**s=*x***" entry, the shelf number will default to "1" and the first shelf will not respond because there is a "syntax error." The checking process continues to the last shelf which will respond with "syntax error" and the command will not execute. If the shelf number is entered, the command will be executed properly.

   If the last shelf does NOT have an MC90083A1E PROCR2 and the first shelf does have an MC90083A1E PROCR2 and the "**s=*x***" entry is omitted from the command, there will be no response to the entered command. The command is a syntax error to the first shelf and there is another shelf above. The syntax will be correct to the last shelf without a shelf number, but the command was not addressed to the last shelf. Therefore, the last shelf does not respond and the command will not execute. If the shelf number is entered, the command will be executed properly.

   If the last shelf has an MC90083A1E PROCR2 and the first shelf does not have an MC90083A1E PROCR2 and the "**s=*x***" entry is omitted, the response will be unpredictable. The command will default to shelf "1" and may execute. The last shelf in the bay will respond with "syntax error" because the shelf number was omitted. This response will collide with the response from the first shelf and the command may or may not execute.

If neither the last shelf nor the first shelf has an MC90083A1E PROCR2, and the "**s=***x*" entry is omitted, the command will default to the first shelf and execute as it always has with previous PROCR packs.

Table 2-5. DDM-1000 Circuit Pack Compatibility

Circuit Pack	May Not Be Used With:
MC90083A1 PROCR1*	AEK37 DS1C INTFC1 AKM5 DS3U1 AKM6 DS3U2 AEK38 DS2 INTFC1 MC90191A1 TLM2
MC90083A1B PROCR2*	MC90191A1 TLM2 AKM5 DS3U1 AEK38 DS2 INTFC1
MC90083A1C PROCR2*†	AKM5 DS3U1 AEK38 DS2 INTFC1
MC90083A1C Issue 2 PROCR2*†	AKM5 DS3U1 AEK38 DS2 INTFC1
MC90083A1D PROCR2*‡	—
MC90083A1D Issue 2 PROCR2*‡	DS3U1§
MC90083A1D Issue 3 PROCR2*	(no restrictions)¶¶¶
MC90083A1D Issue 4 PROCR2	(no restrictions)¶¶¶
MC90083A1E PROCR2¶	(no restrictions)¶¶¶
MC90083A1E Issue 2 PROCR2¶	(no restrictions)¶¶¶
AKM4 TLM1	(no restrictions)
MC90191A1 TLM2†	MC90083A1 PROCR1 MC90083A1B PROCR2 AKM2 MXR1 AKM2B MXR2
AKM2 MXR1**	AEK37 DS1C INTFC1 MC90191A1 TLM2 AEK38 DS2 INTFC1
AKM2B MXR2**,††	MC90191A1 TLM2
AKM2C MXR3†,**,††	(No restrictions.)
AKM5 DS3U1‡‡,§§	MC90083A1 PROCR1 MC90083A1B PROCR2 MC90083A1C PROCR2 MC90083A1C Issue 2 PROCR2 MC90083A1D Issue 2 PROCR2§ any LS INTFC§§ 20-Type OLIUs

See footnotes at the end of the Table.

Table 2-5. DDM-1000 Circuit Pack Compatibility (Contd)

Circuit Pack	May Not Be Used With:
AKM6 DS3U2§§	MC90083A1 PROCR1 any LS INTFC§§
AEK36 DS1 INTFC1¶¶,***	20-Type OLIUs
AEK36B DS1 INTFC2†††	(no restrictions)
AEK36B S1:2 DS1 INTFC2†††	(no restrictions)
AEK36C DS1 INTFC2†††	(no restrictions)
AEK37 DS1C INTFC1‡‡‡	MC90083A1 PROCR1 AKM2 MXR1
AEK38 DS2 INTFC1†,§§§	MC90083A1 PROCR1 MC90083A1B PROCR2 MC90083A1C PROCR2 MC90083A1C Issue 2 PROCR2 AKM2 MXR1
20-Type OLIU***	AEK36 DS1 INTFC1 AKM5 DS3U1‡‡

* All PROCR2 packs prior to MC90083A1D, Issue 4 should be upgraded to MC90083A1D, Issue 4 or later to eliminate potential service-affecting conditions.

All PROCRs are end-to-end compatible. The MC90083A1C PROCR2 and earlier PROCR packs may be mixed in a bay without any restrictions. See the heading "Incompatible Combinations" for basic guidelines in mixing PROCR packs in a bay.

† When you are using the option of C-bit performance monitoring (PM), you must have an MC90083A1C (or later) PROCR2, MC90191A1 TLM2, and AKM2C MXR3 circuit pack installed. **AEK38 DS2 INTFC1 packs cannot be used in a muldem provisioned for C-bit parity framing format (performance monitoring).**

‡ The MC90083A1D PROCR2 pack has been replaced with the MC90083A1D, Issue 2 PROCR2. If MC90083A1D, Issue 2 PROCR2 packs are installed anywhere in the bay, then for proper execution of new commands within those PROCRs, it is necessary that the last PROCR in the bay be an MC90083A1D, Issue 2 or later. See the heading "Incompatible Combinations" for basic guidelines in mixing PROCR packs in a bay.

§ The MC90083A1D, Issue 2 PROCR2 may be used conditionally with the DS3U1 to support DS3 clear channel. If a DS3 channel is equipped with DS3U1 packs and the channel is looped at the DSX-3 at both ends, jitter on the signal in the other muldem might be increased. Therefore, if DS3 loopbacks are never applied at both ends of the channel, the MC90083A1D, Issue 2 PROCR2 may be used to support DS3 clear channel.

¶ The MC90083A1E PROCR2 has a feature that requires a shelf entry for commands. To fully benefit from this feature, both the first and last shelf in a bay must be equipped with the MC90083A1E PROCR2. Then, if the shelf number entry is omitted, the command will be aborted with the response "syntax error." Any PROCR version can be in the other shelf positions and the required shelf entry feature will be in effect.

** The AKM2 MXR1 is compatible with the AKM2B MXR2 or AKM2C MXR3 if the MXR2 or MXR3 is optioned for M13 mode.

Table 2-5. DDM-1000 Circuit Pack Compatibility (Contd)

†† The AKM2B MXR2 and AKM2C MXR3 are end-to-end compatible if each pack is optioned the same. An AKM2C MXR3 in a SRV slot must be protected by another AKM2C MXR3 in the PROTN slot.

‡‡ A class A change replaced all previous AKM5s with AKM5, Issue 3 packs. Only one AKM5 DS3U1 service/protection pair may be used in a shelf, in either muldem A or muldem B of a 90 Mb/s system. The AKM5 cannot be used in a 180 Mb/s system.

§§ With an AKM5 DS3U1 or AKM6 DS3U2 in the function unit slot of a muldem, no LS INTFC circuit packs should be installed in that muldem.

¶¶ An AEK36 DS1 INTFC1 in a SRV slot can be protected by another AEK36 DS1 INTFC1 in a PROTN slot of the same muldem *if the EQL and DS1 code settings on the two circuit packs are identical.* An AEK36 DS1 INTFC1 in a SRV slot can also be protected by an AEK36B-type or an AEK36C DS1 INTFC2 in a PROTN slot of the same muldem *regardless of the DS1 code settings of the SRV or PROTN DS1 packs.* The EQL settings must still be identical and a PROCR2 must be used.

*** The 20-type OLIUs cannot be installed in an assembly equipped with AEK36 INTFC1 circuit packs because of excessive power consumption. If AEK36 DS1 INTFC1 plug-ins are installed in the OLIU assembly of the 180 Mb/s arrangement, they must be replaced with AEK36B-type or AEK36C DS1 INTFC2 plug-ins. The replacement is done in service using the procedures given in DP-441 in the Installation and Maintenance Procedures section of this manual.

††† An AEK36B-type or AEK36C DS1 INTFC2 in a SRV slot can be protected by an AEK36 DS1 INTFC1 in a PROTN slot of the same muldem *if the EQL and DS1 code settings on the PROTN AEK36 DS1 INTFC1 agree with the PROCR's equipment list on the DS1 code settings of the AEK36B-type or AEK36C DS1 INTFC2 being protected.* An AEK36B-type or AEK36C DS1 INTFC2 in a SRV slot can also be protected by another AEK36B-type or AEK36C DS1 INTFC2 in a PROTN slot of the same muldem *regardless of the DS1 code settings of the PROTN AEK36B-type (or AEK36C) DS1 INTFC2,* but the EQL settings must be identical and a PROCR2 must be used.

‡‡‡ An AEK37 DS1C INTFC1 in a SRV slot can be protected by another AEK37 DS1C INTFC1 in a PROTN slot of the same muldem *if the EQL and DS1C code settings on the two circuit packs are identical.*

§§§ An AEK38 DS2 INTFC1 in a SRV slot can be protected by another AEK38 DS2 INTFC1 in a PROTN slot of the same muldem *if the EQL settings on the two circuit packs are identical.*

¶¶¶ An AKM86 BP2 pack is required in an optical shelf with only one muldem equipped if the PROCR2 pack is an MC90083A1D, Issue 3 or Issue 4, or an MC90083A1E, Issue 1 or Issue 2.

Customer Interfaces

Many optional interfaces are available in the DDM-1000. These contribute greatly to its versatility. To insure a simple and efficient installation with these interfaces, all cabling to and from DDM-1000 is fully connectorized. The optical and DS3 signal connections are made from the front of the equipment while the alarm, power, and low-speed signal connections are made from the front or the rear depending on the cabling option that is used.

Lightwave

The optical signal connections to and from DDM-1000 are through a pair of biconic connectors located at the end of short fiber pigtails that exit the lower portion of the OLIU faceplate. These fiber pigtails are similar in appearance to the fiber jumpers used to connect the equipment to an LSCIM (or equivalent). In addition, the pair from each OLIU is wrapped to provide additional protection. These fibers are routed through a channel on the front of the DDM-1000 to the left side of the equipment. Here they connect to fiber jumpers that have been routed down the front of the bay frame from the overhead cable rack. The connector couplings and jumpers that should be used are dependent on the type of the outside plant fiber. If the outside plant fiber is single-mode, then the transmit direction uses a single-mode fiber jumper and coupler. The receive direction uses either a single-mode or multimode fiber jumper and coupler for single mode outside plant fiber. If the outside plant fiber is multimode, then the transmit direction uses a multimode fiber jumper and coupler. A multimode fiber jumper and coupler may be used in the receive direction for both single and multimode outside plant fiber. The transmit and receive pigtails are labeled OUT and IN, respectively.

DS3 Electrical

The DS3 electrical signal connections to and from DDM-1000 are through BNC connectors mounted on the left side of the AKM3 ELIU1. The 728B, 734A, 735A, KS-19224, L2 or equivalent coax is routed down the front of the bay frame from the overhead cable rack to the DDM-1000. These cables may be terminated in straight male or female BNC connectors. **(Note: Right-angled connectors are not recommended for new applications. An ED-2C833-20, G39 cable may be used to replace a right-angled connector.)**

On the DDM-1000 ED-2C841-30, G1 or G2 shelves, the DSX coax cables connect directly to the female connectors on the ELIU pack. On the DDM-1000 ED-2C841-30, G3 EMC shelf assembly, the DSX coax cables connect to ED-2C833-20, G32 coax jumper cables that are mounted in the side panel of the shelf. The male ends of the G32 coax jumper cables are connected to the ELIU1 female BNC connectors, and the female ends are mounted to the access holes in the side panel. Cables that are terminated in male BNC connectors may connect directly to the female BNC connectors from the installed ELIU1 pack.. Cables that are terminated in female BNC connectors connect to ED-2C833-20, G33 DS3 mini-coax jumper cables that are connected to the female BNC

connectors from the installed ELIU1 pack. The BNC connectors on the ELIU1 are identified for IN and OUT for muldem A and muldem B. For a more detailed explanation of DS3 cabling, see the SPECIFICATIONS section of this manual.

DS1, DS1C, and DS2 Electrical

The cabling for the low-speed signals for the DDM-1000 are sized for DS1 operation. When DS1C circuits are being used, wires within the cable associated with channels 3 and 4 are not used. When DS2 circuits are being used, wires within the cable associated with channels 2, 3, and 4 are not used.

DS1 (or DS1C) and DS2 signals cannot be mixed within the same cable. Although DS1 and DS1C signals may be mixed in the same cable, it is not recommended because of the difficulty in keeping accurate office records. The three rates can be mixed within a muldem, but only two rates can be protected. If mixing DS2 with a lower rate within a DS3 is likely, then three cabling options exist to achieve signal separation:

1. Use the wire-wrap assembly option described below for the G1 and G2 shelves.
2. Confine the DS2s to either slots 1-4 OR slots 5-7 and the lower rate packs in the unused group of slots. Separate cables are used for these slot groups.
3. Make custom cables with 963-type connectors and arrange slot groups to meet local needs.

ED-2C841-30, G1 or G2 Shelf

When rear access is provided, the low-speed signal connections are made directly to the backplane using cables (ED-2C833-20, G1, G101, G102, G22, G221, G222, G223 or G224 transmit/receive for muldem A and ED-2C833-20, G2, G201, G202, G23, G231, G232, G233 or G234 transmit/receive for muldem B) that are terminated in 963P1-16 or KS-23478, L1 connectors on the DDM-1000 end and unterminated on the other end. Each connector is stamped with an identification number and the backplane is silk-screened to correspond to that number. Retainers insure accurate placement of the connector while providing a secure connection. A push-on receptacle is provided to terminate the drain wire of the cable to 221-type terminals mounted on the backplane. These are connected via a printed path to the frame ground connector in the backplane of the DDM-1000. After the connections have been made, the cables are dressed and tied to the cable support provided as part of the DDM-1000 shelf.

Where front access is required, two options exist. The first option provides a 3-foot cable assembly equipped with 963P1-16 or KS-23478, L1 connectors on the DDM-1000 end and either 710-SD1-25 or KS-16690, L12 connectors on the other end for the low-speed signals. This cable assembly is installed on the DDM-1000 and dressed up over the top of the shelf before the DDM-1000 is mounted in the front access frame. The 710-SD1-25 or KS-16690, L12 connectors mate with similar connectors in the cable channel of the frame after the DDM-1000 has been installed. The second option for front access provides

a 2.5-inch high wire-wrap assembly including cables with 963P1-16 connectors for the low-speed signals and alarms on the DDM-1000 end. Before mounting the DDM-1000 in the frame, the wire-wrap assembly is attached to the top of it with four screws and the cables are connected, dressed, and tied. Low-speed signals to and from the office wiring are wire-wrapped after the DDM-1000 has been mounted on the frame.

ED-2C841-30, G3 EMC Shelf

When rear access is provided, the low-speed signal connections are made directly to the backplane using the following cables equipped with ferrite beads and 963P1-16 connectors on the DDM-1000 end and unterminated on the other end: ED-2C833-20, G26, G261, G262, or G263 transmit/receive for muldem A; and ED-2C833-20, G27, G271, G272, or G273 transmit/receive for muldem B. After the connections have been made, the cables are dressed and secured with cable ties provided as part of the DDM-1000 shelf.

Where front access is required, low-speed signal connections are made using the following cables equipped with ferrite beads and 963P1-16 connectors on the DDM-1000 end and a 710-SDI-25 connector on the other end: ED-2C833-20, G28 transmit/receive for muldem A; and ED-2C833-20, G29 transmit/receive for muldem B. This cable assembly is installed on the DDM-1000 and dressed up over the top of the shelf before the DDM-1000 is mounted in the front access frame. The 710-SD1-25 connectors mate with similar connectors in the cable channel of the frame after the DDM-1000 has been installed.

Office Alarms

DDM-1000 provides a complete set of visible and audible office alarms. Where rear access is provided, these alarm connections are made to an alarm isolation unit (AIU) and then to the backplane. One AIU is required per bay and is connected using a cable (ED-2C833-20, G6, G601, or G602 office alarms - first shelf) that is terminated in a 963P1-16 or KS-23478, L1 connector on the AIU end and unterminated on the other end. DDM-1000 provides the ability to wire in parallel the alarm outputs from the DDM-1000 above it. This is done by using a short cable (ED-2C833-20, G7 office alarms - additional shelves) with 963P1-16 or KS-23478, L1 connectors on both ends and running this cable between the two assemblies. Each 963P1-16 or KS-23478, L1 connector is stamped with an identification number and the backplane is silk-screened to correspond to that number. Retainers insure accurate placement of the connectors while providing a secure connection. After the connections have been made, the cables are dressed and tied to the cable support provided as part of the DDM-1000 shelf. Where front access is required, the office alarms are available on the wire-wrap assembly (ED-2C841-30, G1 or G2 shelves only). Here, parallel connections from the DDM-1000 above are made by placing a second wrap on the appropriate pins.

See "Alarm Precautions" in the SPECIFICATIONS section of this manual for a more detailed description of the AIU.

Telemetry

DDM-1000 provides five types of telemetry, a simple MJ and MN parallel telemetry contact closure, a more complete (4 alarm, 6 status, 1 system identification (SID), and 1 ACO control) parallel telemetry set, an overhead telemetry port, an RS-422 TBOS serial telemetry port and an RS-485 TABS serial telemetry port. (Also see "Alarm Precautions" in the SPECIFICATIONS section of this manual.) Where rear access is provided, these telemetry connections are made directly to the backplane using a cable that is terminated in a 963P1-16 or KS-23478, L1 connector on the DDM-1000 end and unterminated on the other end. For both the simple and more complete parallel telemetry, this cable is ED-2C833-20, G4, G401, or G402 (parallel telemetry - first shelf). For the overhead telemetry using the TLM1 circuit pack, this cable is ED-2C833-20, G3, G301, or G302 (overhead telemetry - per shelf). For the RS422 TBOS serial telemetry port, this cable is ED-2C833-20, G8, G801, or G802 (serial telemetry - first shelf). For the RS485 TABS serial telemetry port using the TLM2 circuit pack, this cable is ED-2C833-20, G24 or G241 for performance monitoring on a single shelf, and ED-2C833-20, G25 or G251 for performance monitoring on up to eight shelves.

DDM-1000 also provides the ability to wire together the parallel telemetry outputs from the DDM-1000 above it in the frame and the ability to "daisy-chain" the TBOS serial telemetry to and from the DDM-1000 above it in the frame. This is done by using a short cable with 963P1-16 or KS-23478, L1 connectors on both ends and running this cable between the two assemblies. For both the simple and more complete parallel telemetry, this cable is ED-2C833-20, G5 (parallel telemetry - additional shelves). For the TBOS serial telemetry and/or multishelf bus, this cable is ED-2C833-20, G9 or G901 (serial telemetry - additional shelves and multishelf bus). Each 963P1-16 KS-23478, L1 connector is stamped with an identification number and the backplane is silk-screened to correspond to that number. Retainers insure accurate placement of the connectors while providing a secure connection. After the connections have been made, the cables are dressed and tied to the cable support provided as part of the DDM-1000 shelf.

Where front access is required, these telemetry connections are available on the wire-wrap assembly for the ED-2C841-30, G1 or G2 shelves. Here, double wrapping on the appropriate pins is used to connect the DDM-1000 above in parallel with the lower DDM-1000. The TBOS serial telemetry and/or multishelf bus connections to provide the "daisy-chain" are also available on the wire-wrap assembly.

Power

Where rear access is provided, the recommended practice for powering DDM-1000 is to provide two feeders (A and B) for each bay of DDM-1000 multiplexers. Two feeders are used to insure maximum reliability of the DDM-1000. *Each* feeder should be sized to carry the maximum bay power consumption. These are routed through the cable rack above the bay frame and down the vertical bay flanges. Power is connected to each shelf by gutter-tapping from each feeder using 14-gauge copper wire and connecting this wire directly to 221-type

terminals on the backplane of DDM-1000 through push-on flag receptacles (provided with the DDM-1000 installation kit). To ensure access for gutter tapping, it is recommended that the battery and return feeders be placed to the rear of the narrow flange of the bay framework.

A frame ground cable is provided in the installation kit. This frame ground is connected between the frame ground lug on the backplane and the bay frame upright. After the battery, return and frame ground connections have been made, the cables are dressed and tied to the cable support provided as part of the DDM-1000 shelf. A bay fuse panel is not required since each DDM-1000 power unit is individually fused. For proper operation of the fuse within each power supply under failure conditions, each bay feeder should be fused with 15A or larger fuses.

Where front access is required, two options exist. The first option provides a 3-foot cable assembly equipped with push-on receptacles at the DDM-1000 end and a MATE-N-LOCK (Amp) connector on the other end (the mating connector is included). In addition, a second MATE-N-LOCK (Amp) connector is provided to pick up a fan alarm closure from the optional DDM-1000 fan assembly. This cable assembly is installed on the DDM-1000 and dressed up over the top of the shelf before the DDM-1000 is mounted in the front access frame. The second option for front access is to use the wire-wrap assembly (ED-2C841-30, G1 or G2 shelves only). Power connections on the wire-wrap assembly are through a terminal strip (the mating terminals are included).

Physical

ED-2C841-30, G1 or G2 Shelf Assembly

An ED-2C841-30, G1 or G2 DDM-1000 assembly is about 8.5 inches high, 21.5 inches wide and 12 inches deep and weighs 46 pounds when fully equipped. The empty shelf assembly (Figure 2-14) weighs 15 pounds.

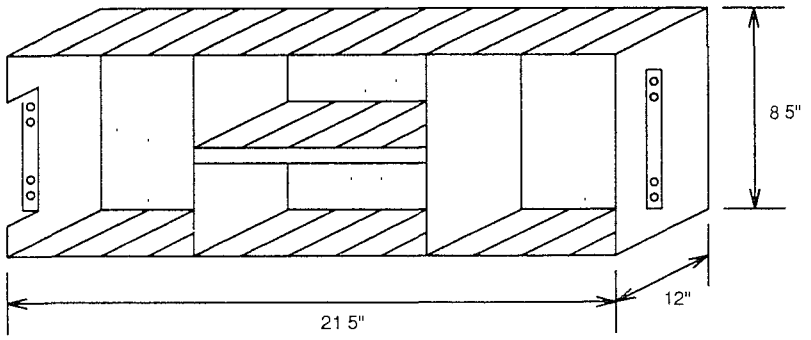


Figure 2-14. DDM-1000 Shelf Assembly

ED-2C841-30, G3 EMC Shelf Assembly

The ED-2C841-30, G3 DDM-1000 EMC (electromagnetic compatible) shelf is used in applications requiring compliance to FCC electromagnetic interference (EMI) regulations Part 15, Subpart J, Class A. The EMC shelf assembly is about 8.5 inches high, 21.5 inches wide and 12 inches deep and weighs almost 48 pounds when fully equipped. The empty shelf assembly (Figure 2-15) weighs about 17 pounds. The shelf assembly is enclosed in metal mesh shielding; equipped with front, rear, and side metal covers; and uses special cables equipped with ferrite beads. The front cover provides for visual LED displays and allows access to the necessary buttons and ASCII terminal interface connector.

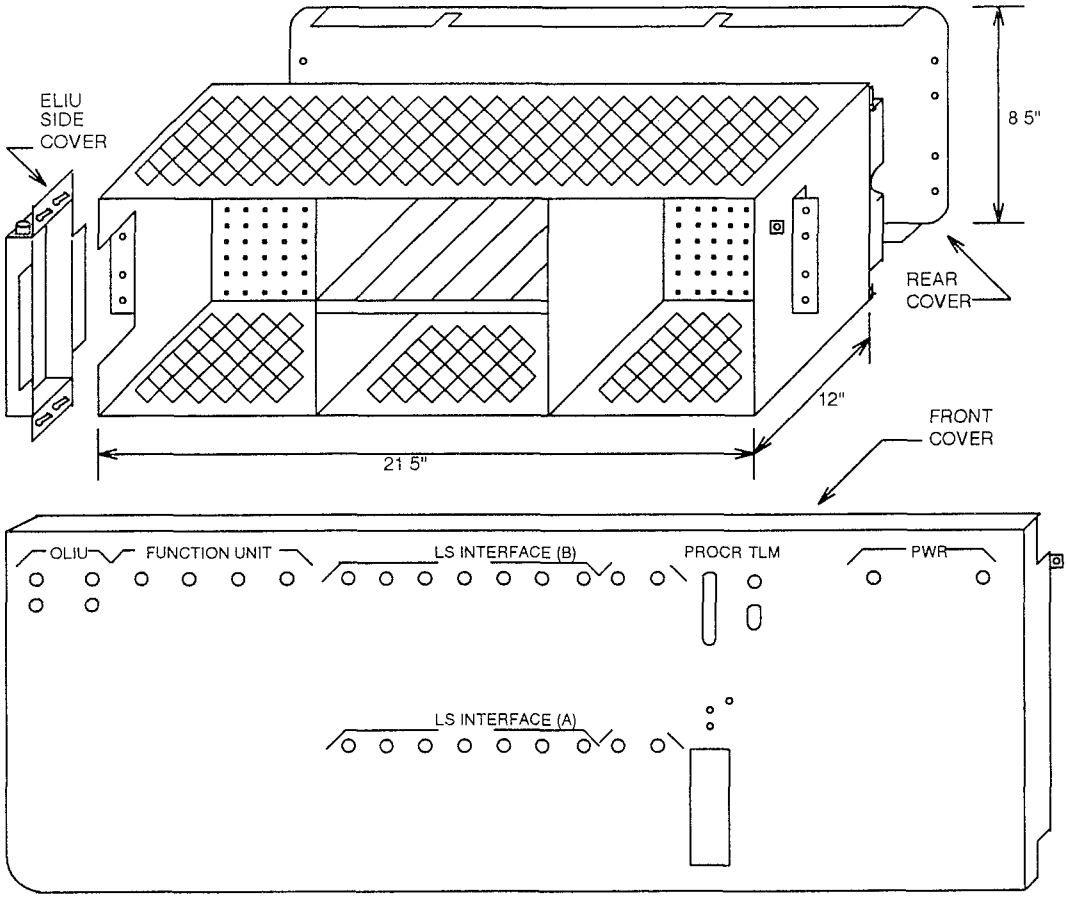


Figure 2-15. DDM-1000 G3 EMC Shelf Assembly

The DDM-1000 is designed for miscellaneous mounting in standard network bay frames (Figure 2-16 and Figure 2-17). ED-8C500-50 is used where "front access" is required. This frame allows the equipment to be mounted close to the wall. In this arrangement, front access cabling is used for the DDM-1000. ED-8C501-50 is used where "rear access" is provided. Here, the cabling to and from

the low-speed cross-connect points terminates directly on the backplane of DDM-1000 through 963P1-16 or KS-23478, L1 connectors.

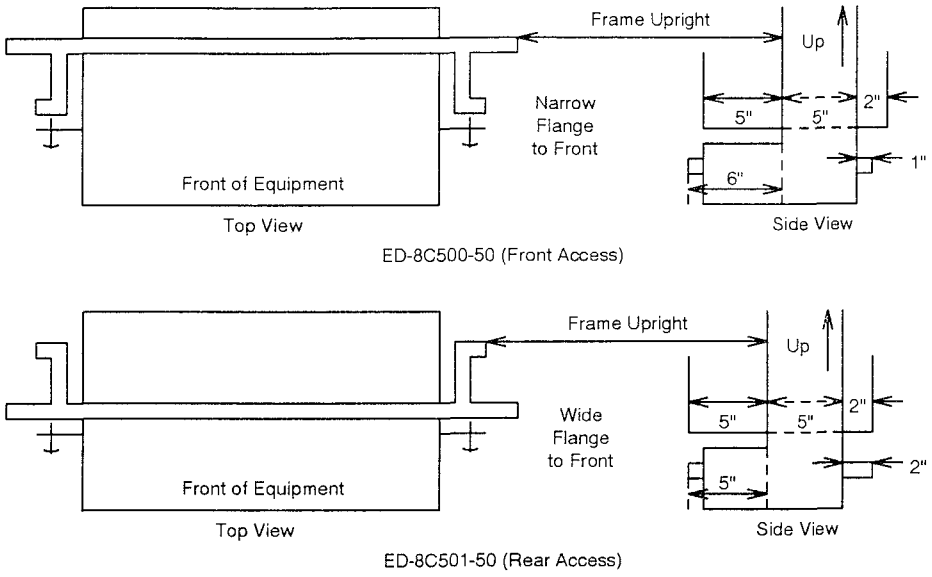
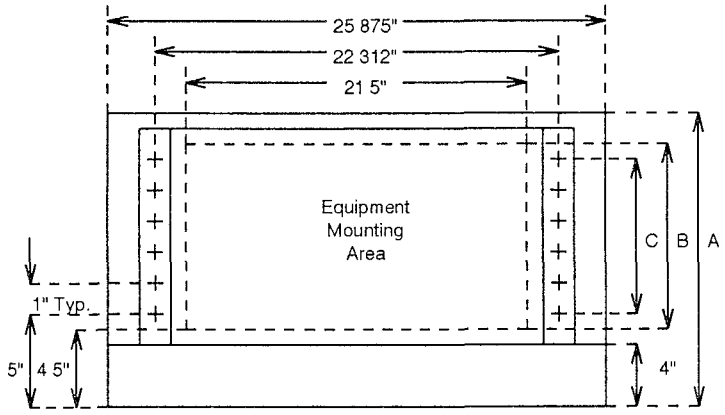


Figure 2-16. Network Bay Frame: Top And Side View



Group Num	A (in)	B (in)	C (in)	Weight (lbs)
G1	84	78	77	74
G2	108	100	99	94
G3	138	130	129	110

ED-8C500-50 and ED-8C501-50

Figure 2-17. Network Bay Frame: Front View

Bay Arrangements

Basic Requirements

The modular design of DDM-1000 allows many different bay arrangements. No more than eight DDM-1000 assemblies may be mounted in a single bay regardless of the height of the bay. When generating these arrangements, the basic requirements outlined below must be met.

In 180 Mb/s systems, channels originating in an OLIU shelf in one office terminate in the OLIU shelf in the other office. Channels originating in a non-OLIU shelf in one office terminate in the non-OLIU shelf in the other office. For example, if the OLIU shelf is on the bottom of the 2-shelf pair in one office and on the top of the 2-shelf pair in the other office, channel assignments follow the shelf configuration not the physical position in the bay.

180 Mb/s Upgrade

For planning an upgrade to 180 Mb/s from the start, the following applications should be considered:

a. The preferred method is to install both shelves and interconnect cabling at one time and operating with 180 Mb/s OLIUs (Figure 2-18, Bay #1). Circuit packs can be added as needed. The user has the option of using 90 Mb/s OLIUs and converting to 180 Mb/s OLIUs only when required. This application is straightforward. Note that AKM5 DS3U1 packs cannot be used in 180 Mb/s systems.

b. To plan for more than one DDM-1000 180 Mb/s application in the same bay, all shelves can be installed and a single shelf can be used with 180 Mb/s OLIUs in each application (Figure 2-18, Bay #2). Circuit packs can be added as needed. The user has the option of using 90 Mb/s OLIUs and converting to 180 Mb/s OLIUs only when required.

   The DDM-1000 provides a serial ASCII terminal interface. When the multishelf bus cables are connected between the DDM-1000 shelves in a bay, the ASCII terminal may be plugged into the connector on the processor in any shelf and used to address any other shelf in that bay. Serial telemetry interfaces are also provided that are TBOS and TABS protocol compatible. When using the intershelf cables as a daisy chain, only one operations system (OS) port is required for the entire bay to be connected to a maintenance center.

   If the TBOS serial alarm bus is required, the user can either install power units and a processor in the second shelf and use the ED-2C833-20, G9 cable assembly, or make the serial telemetry connection with a new longer cable (ED-2C833-20, G901). The G9 cable is only long enough to connect two shelves separated by a heat baffle. The longer G901 cable has been designed to allow for those applications where shelves are not

back-to-back. Once the shelf is upgraded, however, the G901 cable must be replaced by the shorter G9 cable. See "Shelf Addressing" in the SPECIFICATIONS section of this manual.

If a TBOS interface is required, the user also has the option of using one OS port for each shelf. This may be better for a user that has many ports available and does not want to swap cables when growth warrants the second shelf.

If the TABS serial telemetry interface is required for all shelves, the user can install the ED-2C833-20, G25 cable assembly which allows access for up to 8 shelves.

c. A second option to plan for more than one DDM-1000 180 Mb/s application in the same bay is to leave a space for the second shelf and add that shelf and plug-ins only when needed. Figure 2-18, Bay #3 shows an application where a space is left for upgrade. As discussed above, if the serial alarm bus is required, the user must use the longer ED-2C833-20, G901 cable. Once the shelf is upgraded, however, the G901 cable will have to be replaced by the shorter G9 cable. See "Shelf Addressing" in the SPECIFICATIONS section of this manual.

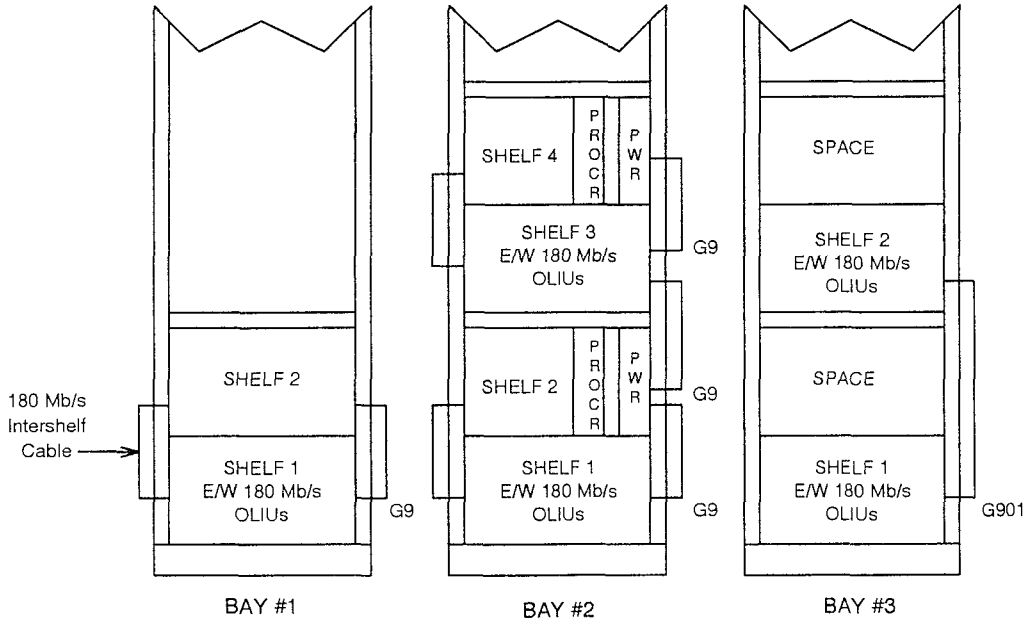


Figure 2-18. 180 Mb/s Applications - Upgrade from the Start

For planning an upgrade to 180 Mb/s from existing shelves operating at 90 Mb/s, the following applications should be considered:

a. Two shelves operating at 90 Mb/s in an existing bay going to the same location (e.g., Loc. A or B), can be upgraded to 180 Mb/s (Figure 2-19, Bay #1). This upgrade is straightforward and can be done in service easily.

b. A shelf operating at 90 Mb/s in an existing bay with other shelves operating in different directions (e.g., Routes A, B, C, and D) can be upgraded to 180 Mb/s (Figure 2-19, Bay #2). If there is no room above or below the 90 Mb/s shelf to be upgraded, service must be rolled to a new shelf to make available adjacent shelves. This procedure for rolling in service is more difficult.

c. DDM-1000 systems that were installed initially as 90 Mb/s systems (Figure 2-19, Bay #3) with an upgrade to 180 Mb/s optical operation planned for the future can be easily converted to 180 Mb/s operation. The upgrade is done by installing the even-numbered shelves and converting the resulting pairs of shelves to 180 Mb/s operation over the existing fibers.

d. AKM5 DS3U1 packs cannot be used in 180 Mb/s systems.

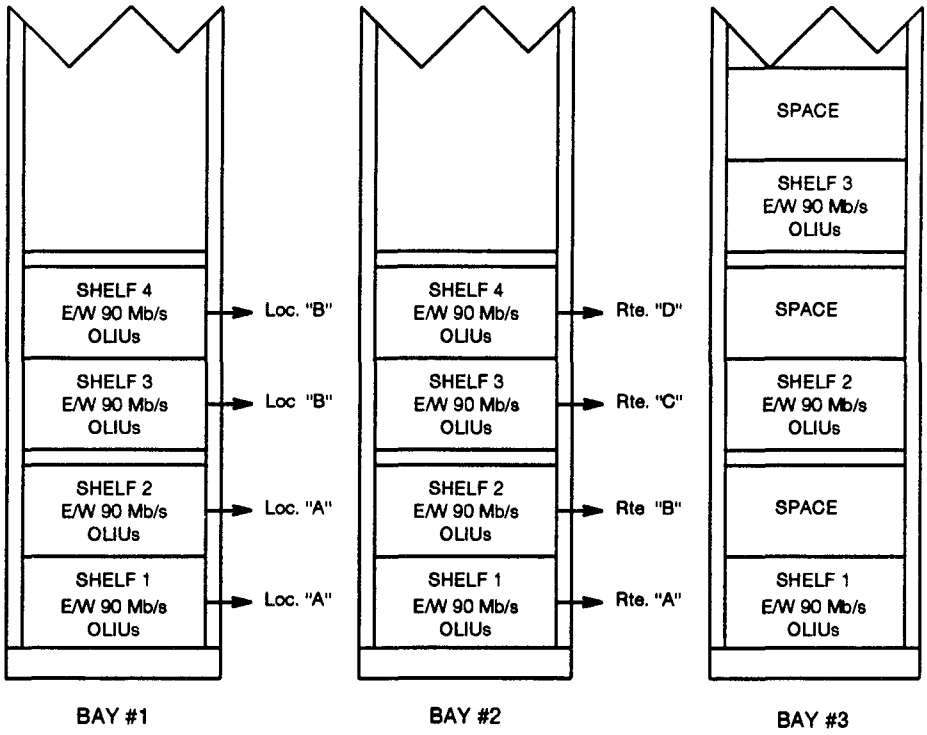


Figure 2-19. 180 Mb/s Applications - Upgrade of Existing 90 Mb/s Shelves

Power

Table 2-6 lists the typical power consumption under nominal operating conditions of various DDM-1000 optical and electrical configurations assuming 1:7 DS1 operation and 1:1 MXR operation. Each assembly is equipped with 2 PWR packs and 1 PROCR pack but no TLM pack. Note that the second generation circuit packs [AEK36B (AEK36B S1:2) DS1 INTFC2, AKM2B MXR2, and MC90083A1B (or later) PROCR2] as described earlier under Circuit Pack Compatibility, resulted in substantially reduced power consumption. The newer AKM2C MXR3 and MC90083A1C (or later) PROCR2s do not result in any further power consumption. Note the increase in power consumption when using the 20-type 180 Mb/s OLIUs.

Table 2-6. DDM-1000 Power Consumption

DDM-1000 Configuration	Capacity (DS3s)	Circuit Packs	
		First Generation	Second Generation (Note 1)
Electrical	1	92W (1.9A @ -48V, 3.8A @ -24V)	50W (1.0A @ -48V, 2.1A @ -24V)
	2	168W (3.5A @ -48V, 7.0A @ -24V)	80W (1.6A @ -48V, 3.3A @ -24V)
Optical 16E, 16E2, or 16F2	1	111W (2.3A @ -48V, 4.6A @ -24V)	67W (1.4A @ -48V, 2.8A @ -24V)
	2	187W (3.9A @ -48V, 7.8A @ -24V)	99W (2.0A @ -48V, 4.1A @ -24V)
Optical 16F, 16G, or 16K	1	116W (2.4A @ -48V, 4.8A @ -24V)	70W (1.4A @ -48V, 2.9A @ -24V)
	2	192W (4.0A @ -48V, 8.0A @ -24V)	102W (2.1A @ -48V, 4.3A @ -24V)
Optical 20E	1	See Note 2	91W (1.8A @ -48V, 3.6 @ -24V)
	2	See Note 2	125W (2.6A @ -48V, 5.2A @ -24V)
	3	See Note 2, 3	172W (3.6A @ -48V, 7.2A @ -24V)
	4	See Note 2, 3	216W (4.5A @ -48V, 9.0A @ -24V)
Optical 20G or 20K	1	See Note 2	87W (1.8A @ -48V, 3.6A @ -24V)
	2	See Note 2	116W (2.4A @ -48V, 4.8A @ -24V)
	3	See Note 2, 3	181W (3.7A @ -48V, 7.4A @ -24V)
	4	See Note 2, 3	207W (4.3A @ -48V, 8.6A @ -24V)

Notes:

1. The values shown for the second generation circuits are contingent on the use of the Series 2 power units. These power units may be identified by the designation "Series 2" stamped on the unit (the location of the stamping may vary).

2. The 20E, 20G, or 20K OLIUs cannot be installed in an assembly equipped with AEK36 DS1 INTFC1 plug-ins because of excessive power consumption. Therefore, the power consumption is not specified for a system employing first generation plug-ins. Note that any other combination of 20-type OLIUs and first and second generation plug-ins is permissible. It is only necessary that AEK36B or AEK36C DS1 INTFC2 plug-ins are installed in the OLIU assembly.

3. Note that the power shown in the table is distributed over the two assemblies required for operation with three or four DS3s.

Table 2-7 shows emergency current drain limits (List 2) for a single shelf. The maximum current drain (List 2) shown assumes typical current values under worst case temperature, minimum office battery voltage, and with the shelf configuration that yields the maximum load. Consult drawing T82046-30 for additional power distribution requirements.

Table 2-7. DDM-1000 Power Requirements for a Single Shelf

	First Generation		Second Generation			
			Optical		Electrical	
Nominal Voltage	-48.0V	-24.0V	-48.0V	-24.0V	-48.0V	-24.0V
Voltage	-42.5V	-20.0V	-42.5V	-20.0V	-42.5V	-20.0V
Maximum DC Current Drain	4.7A	9.4A	4.5A*	9.0A	1.6A†	3.3A
Minimum Feeder Fuse‡	15.0A	15.0A	15.0A	15.0A	15.0A	15.0A

* Maximum case (List 2 bay drains) is for a double-shelf 180 Mb/s optical configuration; i.e., maximum 4 (double shelves) X 4.5A = 18A per bay at -48V.

† Maximum case (List 2 bay drains) is for a single-shelf electrical configuration; i.e., maximum 8 (single shelves) X 1.6A = 12.8A per bay at -48V.

‡ Primary office power is fused at 10.0A on board the 547A PWR1 pack and at 20.0A on board the 547B PWR2 pack.

Controlled Environment Operation

The DDM-1000 is designed to operate in a NEBS-type environment without the need for fan assemblies. To allow for proper cooling of the DDM-1000, enough airflow must be available. If mounted above an airflow restriction, a 1-inch air space must be provided below DDM-1000. If mounted above heat generating equipment, a heat baffle must be mounted below the DDM-1000. If mounted below an airflow restriction, a heat baffle must be mounted above the DDM-1000. When mounting multiple DDM-1000s in a bay, a heat baffle is only required between every other DDM-1000 (Figure 2-20). The heat baffle assembly (COMCODE 846012581) is 3 inches high. If ED-2C841-30, G3 EMC shelves are mounted in the bay, a 0.5-inch space must be provided below each shelf to allow room for installing the front metal cover.

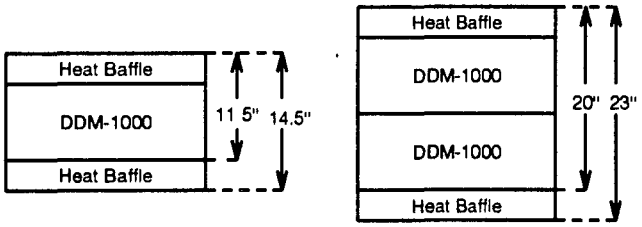


Figure 2-20. DDM-1000 Controlled Environment

Uncontrolled Environment Operation

The DDM-1000 is designed to operate as a line-terminal in an uncontrolled environment [for example, 80-type cabinet: -40°F to +120°F (-40°C to +50°C) outside the cabinet] with the addition of a fan assembly. All plug-in units except the 16E and 20E optical line interface units (OLIU1 and OLIU4) are suitable for operation in this environment. When using DDM-1000 in an extended environment, the 16E2 (OLIU10), 16F (OLIU2), 16F2 (OLIU9), 16G (OLIU3), 16K (OLIU6), 20G (OLIU5), or 20K (OLIU7) must be used. A fan assembly (ED-2C834-30 DDM-1000 fan assembly, 2A fan unit, or equivalent) must be mounted below the DDM-1000. The ED-2C834-30 fan assembly is 2.5 inches high. The 2A fan unit is 3 inches high (Figure 2-21). If DDM-1000 is mounted above an airflow restriction, a 1-inch air space must be provided below the fan assembly. If mounted above heat generating equipment, a heat baffle must be mounted below the fan assembly. If mounted below an airflow restriction, a heat baffle must be mounted above the DDM-1000. If ED-2C841-30, G3 EMC shelves are mounted in the bay, a 0.5-inch space must be provided below each shelf to allow room for installing the front metal cover.

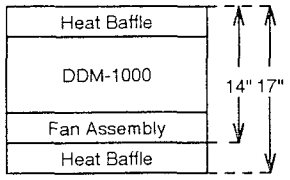


Figure 2-21. DDM-1000 Uncontrolled Environment

Front Access

The DDM-1000 ED-2C841-30, G3 EMC shelf assembly provides front access with cables that terminate in 710-SD1-25 connectors at the front of the equipment. The DDM-1000 ED-2C841-30, G1 or G2 shelf assembly provides two front access options. The first is with cables that terminate in 710-SD1-25 connectors or KS-16690L12 connectors at the front of the equipment. When these arrangements are used, a 0.5-inch space must be provided above the DDM-1000 to route the cables from the back to the front of the equipment (Figure 2-22). The heat baffle (if required) is mounted above the cable assembly. If ED-2C841-30, G3 EMC shelves are mounted in the bay, a 0.5-inch space must be provided below each shelf to allow room for installing the front metal cover.

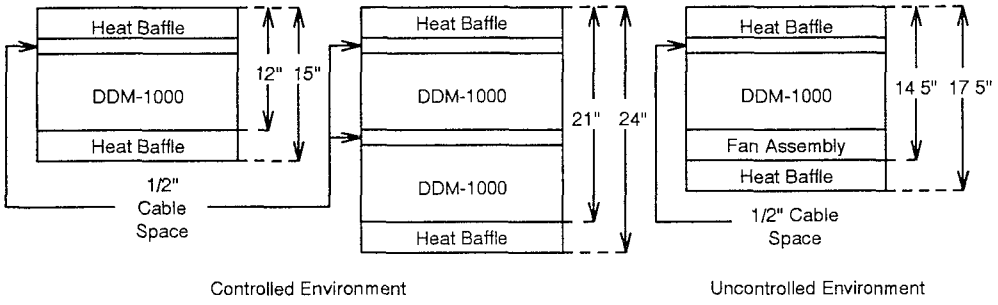


Figure 2-22. DDM-1000 Front Access: 710-SD1-25 or KS-16690L12

The second option for the ED-2C841-30, G1 or G2 shelves provides a wire-wrap assembly that attaches to the top of the DDM-1000 (Figure 2-23). The wire-wrap assembly increases the height of the DDM-1000 by 2.5 inches. The heat baffle (if required) is mounted above the wire-wrap assembly.

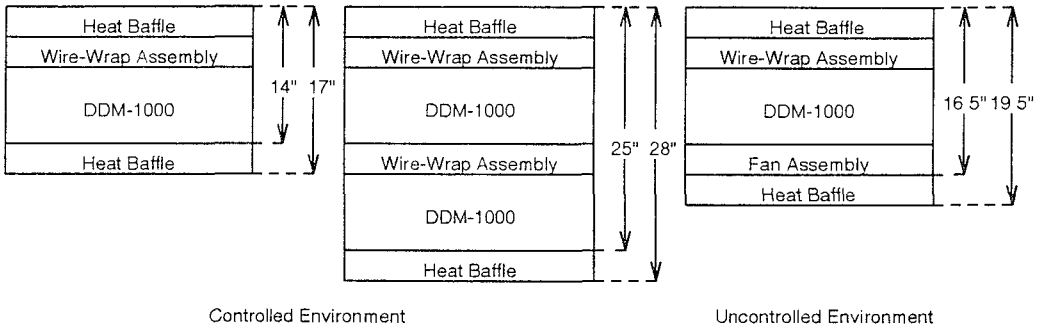


Figure 2-23. DDM-1000 Front Access: Wire-Wrap Assembly

Bulk Power Bay Arrangements

There are many bay arrangements possible when using bulk power. These vary in the type of access provided (front or rear), type of connector used on the low-speed cabling (963P1-16 or KS-23478, L1; 710-SD1-25; or KS-16690L12), and the operating environment (controlled or uncontrolled) (Figure 2-24). For ED-2C841-30, G1 or G2 shelves, a density of 16 DS3 multiplexers per 7-foot frame can be realized when rear access is provided. In addition to this high density, connectorized cabling is available to link the assemblies together to provide a common appearance for office alarms and parallel or serial telemetry from all eight assemblies on the first DDM-1000. If ED-2C841-30, G3 EMC shelves are mounted in the bay, a 0.5-inch space must be provided below each shelf to allow room for installing the front metal cover. Cabling constraints on the G3 EMC shelf dictate a maximum of four G3 shelves per bay (front or rear access).

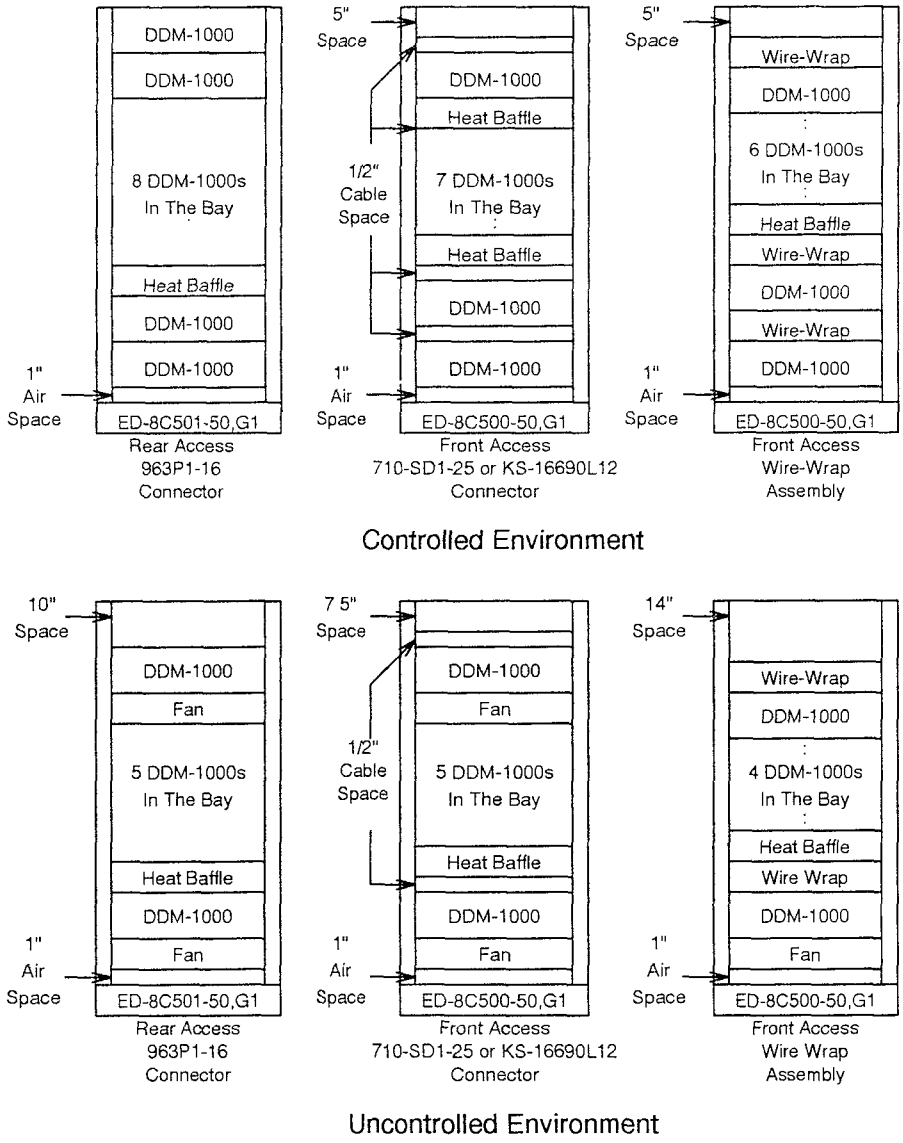


Figure 2-24. Bulk Power

Distributed Power Arrangements

DDM-1000 can be operated with distributed power (Figure 2-25). In 80-type cabinet installations, it connects easily to the J1C182BA-( ) power shelf used in powering the *SLC* Series 5 Carrier system. For some frame installations, it may require local job engineering for power cabling and fusing. The power shelf and battery shelf (181A Apparatus Mounting with KS-21906, L4 Battery) are each 8 inches high. The front access arrangements shown provide an 8-hour battery reserve when second generation circuit packs are used. For systems using first generation circuit packs, one DDM-1000 should be removed from each bay to maintain an 8-hour battery reserve. An additional DDM-1000 may be mounted in the space at the top of Bay #1 as long as the additional battery is mounted elsewhere and connected to the power shelf. If ED-2C841-30, G3 EMC shelves are mounted in the bay, a 0.5 inch space must be provided below each shelf to allow room for installing the front metal cover.

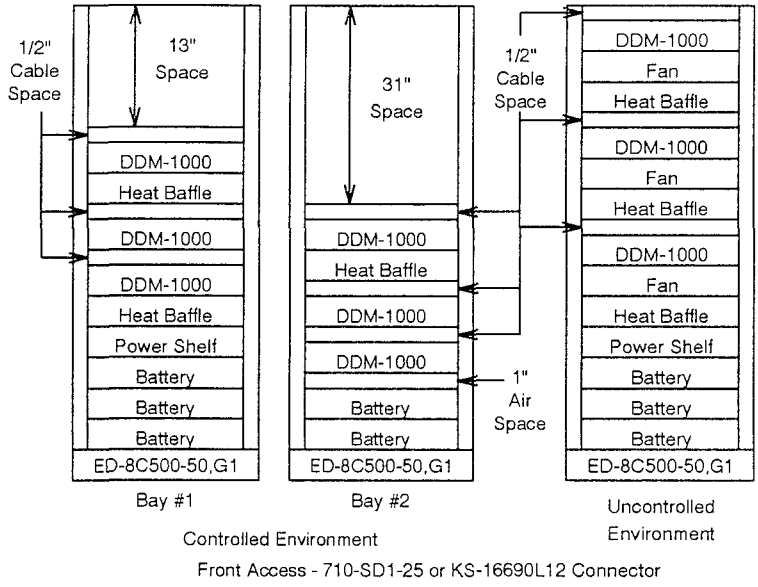


Figure 2-25. Distributed Power

In addition to these arrangements that concentrate DDM-1000s and power in a bay, there are arrangements that provide a Lightguide Stranded Cable Interconnect Module (LSCIM), DDM-1000s, DSX-1s, and power in a single bay (Figure 2-26). DDM-1000 also fits well into customer premises applications where self-contained, single cabinet arrangements are required. The customer premises cabinet shown consists of an electromagnetic interference (EMI) shielded cabinet with fans containing an LSCIM, two fully loaded DDM-1000 dual multiplexers, DS1 cross-connect points, a power shelf (AC rectifier), and battery back-up. The total capacity is 112 DS1 signals. Other cabinet arrangements can be obtained through your AT&T account representative.

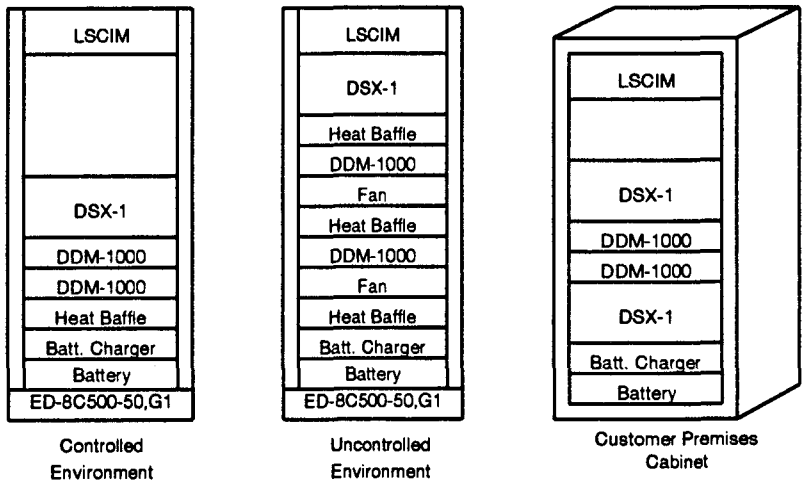


Figure 2-26. Single Frame Arrangements

Ordering

Standard Configurations

The DDM-1000 may be ordered in standard configurations or by individual units. The standard DDM-1000 configurations offer 28 or 56 DS1 capacity per shelf, DS3 electrical, 90 Mb/s or 180 Mb/s lightwave interface, and -48 volt power. These standard configurations can be ordered by either the J98769A-1 list numbers or by COMCODE. Each standard configuration is equipped with 1:7 protected DS1 low-speed interface packs, 1:1 protected -48 volt power units,

1:1 protected MXR cards, and the appropriate high-speed interface packs (1 ELIU1 or 1:1 protected OLIU). Table 2-8 lists items that have been rated discontinued availability (DA). The following tables list the standard configurations:

- Table 2-9 provides a list of the DDM-1000 90 Mb/s standard configurations that can be ordered with the ED-2C841-30, G2 shelves and Table 2-10 provides a list of the items included in each standard configuration.
- Table 2-11 provides a list of the DDM-1000 90 Mb/s standard configurations that can be ordered with the ED-2C841-30, G3 EMC shelves and Table 2-12 provides a list of the items included in each standard configuration.
- Table 2-13 provides a list of the DDM-1000 180 Mb/s standard configurations can be ordered with the ED-2C841-30, G2 shelves and Table 2-14 provides a list of the items included in each standard configuration.
- Table 2-15 provides a list of the DDM-1000 180 Mb/s standard configurations that can be ordered with the ED-2C841-30, G3 shelves and Table 2-16 provides a list of the items included in each standard configuration.

Table 2-8. Components Rated DA (Discontinued Availability) or Unavailable

Comcode	App., MC or Eqpt. Code	Unit Description
601048127	ED-2C841-30,G1	Shelf Assembly
104172333	AKM2	MXR1
104376280	AKM2B	MXR2
105008718	MC90083A1	PROCR1
105179345	MC90083A1B	PROCR2
105524748	MC90083A1C	PROCR2
105639819	MC90083A1C Issue 2	PROCR2
105581482	MC90083A1D Issue 1	PROCR2
106046238	MC90083A1D Issue 2	PROCR2
106393770	MC90083A1D Issue 3	PROCR2
106073091	MC90083A1E Issue 1	PROCR2
104172275	AEK36	DS1 INTFC1
104171509	16E	OLIU1
104171517	16F	OLIU2
104369525	16G	OLIU3
104375936	AEK36B	DS1 INTFC2

Table 2-9. 90 Mb/s Optical and DS3 Electrical Standard Configuration Using G2 Shelves

J98769B-1	Description
List 47	DS3 Electrical Termination - One Muldem (28 DS1s)
List 48	DS3 Electrical Termination - Two Muldems (56 DS1s)
List 76	Lightwave Termination - 16E2 - One Muldem (28 DS1s)
List 77	Lightwave Termination - 16E2 - Two Muldems (56 DS1s)
List 72	Lightwave Termination - 16F2 - One Muldem (28 DS1s)
List 73	Lightwave Termination - 16F2 - Two Muldems (56 DS1s)
List 51	Second Muldem Growth Group (28 DS1s)

Table 2-10. 90 Mb/s Optical and DS3 Electrical Standard Configuration Components Using G2 Shelves

J98769B-1 (Kits)			List Number 47	48	76	77	72	73	51
	App., MC or	Unit	DS3 Electrical		Lightwave 16E2		Lightwave 16F2		Second Muldem
COMCODE	Eqpt. Code	Description	1 DS3	2 DS3	1 DS3	2 DS3	1 DS3	2 DS3	Growth
601124159	ED-2C841-30,G2	Shelf Assy	1	1	1	1	1	1	—
104187794	547A	PWR1	2	2	2	2	2	2	—
104440474	AKM2C	MXR3	2	4	2	4	2	4	2
106455884	MC90083A1E Issue 2	PROCR2	1	1	1	1	1	1	—
105510895	AEK36C	DS1 INTFC2	8	16	8	16	8	16	8
104172341	AKM3	ELIU1	1	1	—	—	—	—	—
106901101	16E2	OLIU10	—	—	2	2	—	—	—
106849029	16F2	OLIU9	—	—	—	—	2	2	—
106691629	AKM86	BP2	—	—	1	—	1	—	—

Table 2-11. 90 Mb/s Optical and DS3 Electrical Standard Configuration Using G3 EMC Shelves

J98769B-1	Description
List 52	EMC, DS3 Electrical Termination - One Muldem (28 DS1s)
List 53	EMC, DS3 Electrical Termination - Two Muldems (56 DS1s)
List 78	EMC, Lightwave Termination - 16E2 - One Muldem (28 DS1s)
List 79	EMC, Lightwave Termination - 16E2 - Two Muldems (56 DS1s)
List 74	EMC, Lightwave Termination - 16F2 - One Muldem (28 DS1s)
List 75	EMC, Lightwave Termination - 16F2 - Two Muldems (56 DS1s)

Table 2-12. 90 Mb/s Optical and DS3 Electrical Standard Configuration Components Using G3 EMC Shelves

J98769B-1 (Kits)			List Number 52	53	78	79	74	75
	App., MC or	Unit	EMC DS3 Electrical		EMC Lightwave 16E2		EMC Lightwave 16F2	
COMCODE	Eqpt. Code	Description	1 DS3	2 DS3	1 DS3	2 DS3	1 DS3	2 DS3
601223332	ED-2C841-30,G3	EMC Shelf Assy	1	1	1	1	1	1
104187794	547A	PWR1	2	2	2	2	2	2
104440474	AKM2C	MXR3	2	4	2	4	2	4
106455884	MC90083A1E Issue 2	PROCR2	1	1	1	1	1	1
105510895	AEK36C	DS1 INTFC2	8	16	8	16	8	16
104172341	AKM3	ELIU1	1	1	—	—	—	—
106901101	16E2	OLIU1	—	—	2	2	—	—
106849029	16F2	OLIU2	—	—	—	—	2	2
	ED-2C833-20, G32	G32 Cable	2	4	—	—	—	—
106691629	AKM86	BP2	—	—	1	—	1	—

Table 2-13. 180 Mb/s Optical Standard Configuration Using G2 Shelves

J98769B-1	Description
List 56	Lightwave Termination - 20E - One Muldem (28 DS1s)
List 57	Lightwave Termination - 20E - Two Muldems (56 DS1s)
List 58	Lightwave Termination - 20E - Three Muldems (84 DS1s)
List 59	Lightwave Termination - 20E - Four Muldems (112 DS1s)
List 60	Lightwave Termination - 20G - One Muldem (28 DS1s)
List 61	Lightwave Termination - 20G - Two Muldems (56 DS1s)
List 62	Lightwave Termination - 20G - Three Muldems (84 DS1s)
List 63	Lightwave Termination - 20G - Four Muldems (112 DS1s)

Table 2-14. 180 Mb/s Optical Standard Configuration Components Using G2 Shelves

J98769B-1 (180 Mb/s Kits)			List Number							
			56	57	58	59	60	61	62	63
			180 Mb/s Lightwave 20E OLIU				180 Mb/s Lightwave 20G OLIU			
COMCODE	APP., MC or Eqpt. Code	Unit Description	1 DS3	2 DS3	3 DS3	4 DS3	1 DS3	2 DS3	3 DS3	4 DS3
601124159	ED-2C841-30, G2	Shelf Assy	2	2	2	2	2	2	2	2
104187794	547A	PWR1	2	2	4	4	2	2	4	4
104440474	AKM2C	MXR3	2	4	6	8	2	4	6	8
106455884	MC90083A1E Issue 2	PROCR2	1	1	2	2	1	1	2	2
105510895	AEK36C	DS1 INTFC2	8	16	24	32	8	16	24	32
105576896	20E	OLIU4	2	2	2	2	—	—	—	—
106548357	20G	OLIU5	—	—	—	—	2	2	2	2
	ED-2C833-20, G17	G17 CABLE	1	1	1	1	1	1	1	1
106691629	AKM86	BP2	1	—	1	—	1	—	1	—

Table 2-15. 180 Mb/s Optical Standard Configuration Using G3 EMC Shelves

J98769B-1	Description
List 64	EMC, Lightwave Termination - 20E - One Muldem (28 DS1s)
List 65	EMC, Lightwave Termination - 20E - Two Muldems (56 DS1s)
List 66	EMC, Lightwave Termination - 20E - Three Muldems (84 DS1s)
List 67	EMC, Lightwave Termination - 20E - Four Muldems (112 DS1s)
List 68	EMC, Lightwave Termination - 20G - One Muldem (28 DS1s)
List 69	EMC, Lightwave Termination - 20G - Two Muldems (56 DS1s)
List 70	EMC, Lightwave Termination - 20G - Three Muldems (84 DS1s)
List 71	EMC, Lightwave Termination - 20G - Four Muldems (112 DS1s)

Table 2-16. 180 Mb/s Optical Standard Configuration Components Using G3 Shelves

J98769B-1 (180 Mb/s Kits)			List Number 64	65	66	67	68	69	70	71
			180 Mb/s Lightwave 20E OLIU				180 Mb/s Lightwave 20G OLIU			
COMCODE	APP., MC or Eqpt. Code	Unit Description	1 DS3	2 DS3	3 DS3	4 DS3	1 DS3	2 DS3	3 DS3	4 DS3
601124159	ED-2C841-30, G3	Shelf Assy	2	2	2	2	2	2	2	2
104187794	547A	PWR1	2	2	4	4	2	2	4	4
104440474	AKM2C	MXR3	2	4	6	8	2	4	6	8
106455884	MC90083A1E Issue 2	PROCR2	1	1	2	2	1	1	2	2
105510895	AEK36C	DS1 INTFC2	8	16	24	32	8	16	24	32
105576896	20E	OLIU4	2	2	2	2	—	—	—	—
106548357	20G	OLIU5	—	—	—	—	2	2	2	2
	ED-2C833-20, G17	G17 CABLE	1	1	1	1	1	1	1	1
106691629	AKM86	BP2	1	—	1	—	1	—	1	—

Individual Units

In addition to the standard configurations, any DDM-1000 configuration may be obtained by specifying the individual shelf and plug-in COMCODE numbers. Table 2-17 lists the DDM-1000 shelf assembly and circuit packs by the corresponding COMCODES. It is used to order individual circuit packs for partially equipped systems, -24 volt powering, or other packs such as the TLM1 or DS3U2 packs. This ordering method is also used to order unequipped DDM-1000 shelf assemblies for delivery to a specific site while ordering packs separately from a product inventory control system (PICS) center.

Table 2-17. DDM-1000 Codes

COMCODE	*CLEI* Code (Note)	App., MC, or Eqpt. Code	Description	Maximum Per Shelf	Notes
601048127	DMM14A0H	ED-2C841-30,G1	DDM-1000 Shelf Assembly	—	(DA)
601124159	DMM14A4J	ED-2C841-30,G2	DDM-1000 Shelf Assembly*	—	—
601223332	DMM14A7J	ED-2C841-30,G3	DDM-1000 Shelf Assembly*	—	—
104187794	PWPQ96AAXX	547A PU	PWR1 Power Unit (-48V)	2	1 SRV, 1 PROTN
104208400	PWPQ96CAXX	547B PU	PWR2 Power Unit (-24V)	2	1 SRV, 1 PROTN
105008718	DMCBAL2GXX	MC90083A1	PROCR1 Circuit Pack†	—	(DA)
105179345	DMCBAN0GXX	MC90083A1B	PROCR2 Circuit Pack†	1	(DA)
105524748	DMCBAN3GXX	MC90083A1C	PROCR2 Circuit Pack†	1	(DA)
105639819	DMCBAN5GXX	MC90083A1C Issue 2	PROCR2 Circuit Pack†	1	(DA)
105581482	DMCBAN4GXX	MC90083A1D Issue 1	PROCR2 Circuit Pack†	1	(DA)
106046238	DMCBANDGAA	MC90083A1D Issue 2	PROCR2 Circuit Pack†	1	(DA)
106393770	DMCBANSGAA	MC90083A1D Issue 3	PROCR2 Circuit Pack†	1	(DA)
106073091	DMPQ04XAAA	MC90083A1E Issue 1	PROCR2 Circuit Pack†	1	(DA)
106455900	DMCBANLGAA	MC90083A1D Issue 4	PROCR2 Circuit Pack†	1	—
106455884	DMPQ041AAA	MC90083A1E Issue 2	PROCR2 Circuit Pack†	1	—
105424469	DMCBACAEXX	AKM4	TLM1 Circuit Pack	1	—
105364509	DMCBAF0EXX	MC90191A1	TLM2 Circuit Pack‡	1	
104172341	DMCBAB0EXX	AKM3	ELIU1 Circuit Pack	1	DS3 Electrical Only
106901101	M3RGZ2TDAA	16E2	OLIU10 (90 Mb/s)	2	1 SRV, 1 PROTN
106849029	M3RGZ0TDAA	16F2	OLIU9 (90 Mb/s)	2	1 SRV, 1 PROTN
104369525	M3RG320DXX	16G	OLIU3 (90 Mb/s)	2	1 SRV, 1 PROTN
105588453	M3RG330DXX	16K	OLIU6 (90 Mb/s)	2	1 SRV, 1 PROTN
105576896	M3RG400EXX	20E	OLIU4 (180 Mb/s)§	2	
106548357	M3RG414EAA	20G	OLIU5 (180 Mb/s)§	2	
106548340	M3RG415EAA	20K	OLIU7 (180 Mb/s)§	2	
104172333	DMCBAM0EXX	AKM2	MXR1 Circuit Pack	—	(DA)
104376280	DMCBAP0GXX	AKM2B	MXR2 Circuit Pack¶	4	(DA)
104440474	DMCBAS0EXX	AKM2C	MXR3 Circuit Pack¶	4	2 SRV, 2 PROTN
106258429	DMCBADDEAB	AKM5	DS3U1 Circuit Pack	2	1 SRV, 1 PROTN**
104188941	DMCBAE0EXX	AKM6	DS3U2 Circuit Pack	4	2 SRV, 2 PROTN

See Note and footnotes at the end of the Table.

Table 2-17. DDM-1000 Codes (Contd)

COMCODE	*CLEI* Code (Note)	App., MC, or Eqpt. Code	Description	Maximum Per Shelf	Notes
104172275	DMCBAG0FXX	AEK36	DS1 INTFC1 Circuit Pack	—	(DA)
105510895	DMCBARCGXX	AEK36C	DS1 INTFC2 Circuit Pack††	18	14 SRV, 4 PROTN
106548324	DMCBAHUFAA	AEK37	DS1C INTFC1 Circuit Pack	18	14 SRV, 4 PROTN
104172291	DMCBAJ0FXX	AEK38	DS2 INTFC1 Circuit Pack	18	14 SRV, 4 PROTN
104172309	DMCBAK0FXX	AEK39	BP1 Circuit Pack††	12	
106691629	DMPQ004AAA	AKM86	BP2 Circuit Pack§§	1	

Note:

COMMON LANGUAGE is a registered trademark and CLEI,CLLI, CLCI, and CLFI are trademarks of Bell communication Research, Inc.

* The G2 shelf assembly differs from the G1 shelf assembly [rated Discontinued Availability (DA)] in having gold pins in the backplane behind the OLIU locations. The G3 shelf assembly is used in applications requiring compliance with FCC electromagnetic interference (EMI) regulations Part 15, Subpart J, Class A.

† The MC90083A1B, MC90083A1C, or MC90083A1D PROCR2 provided extended memory for using DS1C and DS3U2 features. An MC90083A1C or later PROCR2 is required for performance monitoring (PM). An MC90083A1D or later PROCR2 is required to support the functions of the AEK38 DS2 INTFC1 and AKM5 DS3U1 packs. A Class A change replaced all MC90083A1D, Issue 3 and previous PROCR2 packs with MC90083A1D, Issue 4 PROCR2 packs. A Class A change replaced all MC90083A1E, Issue 1 PROCR2 packs with MC90083A1E, Issue 2 PROCR2 packs. An MC90083A1E or later PROCR2 is required for open network configurations using electrically configured shelves. MC90083A1D, Issue 4 and earlier PROCR2 packs can be upgraded to MC90083A1E, Issue 2 PROCR2 packs with an EPROM upgrade kit [ED-8C719-30, G4 (COMCODE 601324908)].

‡ The TLM2 circuit pack is required to implement the PM option.

§ 180 Mb/s operation requires two 20E OLIU4s or 20G OLIU5s or 20K OLIU7s in one shelf with both shelves cabled together.

¶ The AKM2B MXR2 is a lower power version of the AKM2 MXR1 with enhanced maintenance capabilities. An AKM2B or later MXR is required for DS1C operation with the AEK37 DS1C INTFC1. An AKM2C or later circuit pack is required to implement the PM option using a TLM2 pack.

** Only one DS3 channel per system may be equipped with AKM5 packs. (AKM5s are no longer used in 180 Mb/s systems.) A Class A change replaced all previous AKM5s with an AKM5 S3:3.

†† The AEK36B-type and AEK36C DS1 INTFC2 packs are lower power versions of the AEK36 DS1 INTFC1. The PROCR2 can control the DS1 code settings on the AEK36B-type and AEK36C DS1 INTFC2 packs.

‡‡ The AEK39 BP1 provides a method of preventing crosstalk and reflections from entering the protection bus. Another method is to disconnect the cabling to unequipped slots. If this card is chosen, the sum of service low-speed circuit packs plus BP1 circuit packs should total seven per muldem.

§§ An AKM86 BP2 pack is required in an optical shelf if only one muldem is equipped and the shelf contains MC90083A1D, Issue 3 or Issue 4, or MC90083A1E, Issue 1 or Issue 2, PROCR2 packs. In a 180 Mb/s system, an AKM86 BP2 pack is required in each shelf if only one muldem is equipped in each shelf.

Miscellaneous Equipment

DDM-1000 can be configured in many ways. Some of these configurations require miscellaneous equipment to complete the installation. Table 2-18 provides a list of this miscellaneous equipment.

Table 2-18. Miscellaneous Equipment

Item	Equipment Code or Commercial Code			COMCODE
	Height	Rear Access	Front Access	
Network Bay Frame	7 feet	ED-8C501-50,G1	ED-8C500-50,G1	—
	9 feet	ED-8C501-50,G2	ED-8C500-50,G2	
	11.5 feet	ED-8C501-50,G3	ED-8C500-50,G3	
Stile Cover Assemblies*	—			846108843
Stile Cover Brackets*	—			846170017
DDM-1000 Fan Assembly†	Complete Unit (ED-2C834-30, G1)			601065642
	Replacement Fan (WP-90798L1)			—
	Replacement Controller (WP-90798L2)			—
2A Fan Unit‡	—			104028758
111A Control Unit§	—			104409776
Fuse Alarm Adapter Board (FAAB)¶	—			105350839
Backplane Cover**	Cover			845763267
Heat Baffle Assembly				846012581
DDM-1000 Wire-Wrap Assembly	ED-2C843-30, G1			—
ESD Wrist Strap	EN 5616B from Semtronics or equivalent			093101970
TLM Slot Edge Protector††				405986670
EPROM Kits to Upgrade PROCR2 packs	ED-8C719-30, G4 Upgrade to MC90083A1E Iss 2			601324908
Alarm Isolation Unit (AIU)	Kit with AIU, cable, screws, retainers, and instruction sheet			406389528
Lightguide Connector Coupling	Multimode 1002A			103239836
	Multimode 1002AK			105264592
	Single-Mode 1012A			103878310
	Single-Mode 1012AK			105264642
Lightguide Cable Jumper	Multimode LA1A-()			—
	Multimode LA1K-K-()			—
	Single-Mode LS1A-()			—
	Single-Mode LS1K-K-()			—

See footnotes at end of Table.

Table 2-18. Miscellaneous Equipment (Contd.)

Item	Equipment Code or Commercial Code				COMCODE
	OLIU	Min. Atten Reqd.	Attenuator	Attenuation	
Lightguide Build Out	16G	7.0 dB	602D	9.0 ±1.0dB	105167910
	16K	13 7 dB	602G	17 5 ±1.5 dB	105167969
	20G	10.0 dB	602F	14 5 ±1.5 dB	105167944
	20K	13 3 dB	602G	17.5 ±1.5 dB	105167969
Microduster Air (Clean)	Texwipe TX-104 (12 Cans/Case)				900709361
Microduster Nozzle Assembly	Texwipe TX-600				900709338
Absorbond Cleaner	Texwipe TX-404 (300 Wipes/Pkg)				900709379
DDM-1000 Cable Assemblies	ED-2C833-20				—
Coaxial Cable	728B‡‡, 734A§§ or Equivalent				—
Mini-Coax Cable	KS-19224, L2 or Equivalent				—
Straight Male BNC	31-70013-1000 Amphenol¶¶ or equivalent				—
Straight Female BNC (728B coax)	330879 from Amp, Inc. or equivalent				—
Straight Male BNC (728B coax)	31-70022-1000 Amphenol or equivalent				—
R-5531 Crimping Tool	69652-H from Amp, Inc. or equivalent				—
Connector	219H connector for splicing KS-19224, L2 mini-coax to 728B coax				101385318
ED-2C833-20, G36 Cable Termination	963PX Contact Cable Assembly Heat Shrink Tubing				845575125 845850593 900419490
Cable Assembly	ED-2C943-20, G7 (8 feet) for ED-2C833-20, G38 cable				—
Cable Assembly	ED-2C943-20, G8 (15 feet) for ED-2C833-20, G37 cable				—
Insertion/Removal Tool For 10A Retainer	1005A Tool***				104371604
Replacement 10A Retainer	10A Retainer				104197280
Replacement 13A Retainer	13A Retainer				104371596
710 Mating Connector	710-BD1-25				103274569
KS Mating Connector	KS-16689, L3 for Solder Connection KS-16689, L18 for Wire-Displacement Connection				996975892 401529342
Contacts	963PH-22 Contacts for 963P Connector on ED-2C833-20 G1, G2, G13, G21-G23, G26, G27, G101, G102, and G201, G202, G221-G224, G231-G234, G261-263, G271-G273 Cables				845576297
Contacts	963PH Contacts for 963P Connector on ED-2C833-20, G3-G12, G14-G17, G19, G20, G24, G25, G28-G31, G301, G302, G401, G402, G601, G602, G801, G802, and G901 Cables				845576263

See footnotes at end of Table.

Table 2-18. Miscellaneous Equipment (Contd.)

Item	Equipment Code or Commercial Code	COMCODE
Contacts	963PS Contacts for 963P Connector on ED-2C833-20, G18-G20 Cables	845852243
963P Connector Housing	963P1-16 Insulator	843939430
963P Connector Housing	963P10-2 Insulator (ED-2C833-20, G17-G20 Cables)	845379411
963P Connector Housing	963P10-16 Insulator (ED-2C833-20, G17-G20 Cables)	845379551
963P10	Staple (ED-2C833-20, G17-G20 cable connectors)	845383975
Connector	KS-23478, L1	405468380
KS-23478, L1 Connector Tools from TRW Cinch, Inc.	599-11-11-516 Contact Terminating Tool 599-11-11-517 Contact Removal Tool	
963PH Contact Hand Tool	1000A Hand Tool	104186994
TBOS Connector Assembly	9822C	105775936

* Two front stile cover assemblies and six brackets form a hardware package that provides a flush-look appearance for DDM-1000 when mounted in a 7-foot network bay frame

† The ED-2C834-30 DDM-1000 Fan Assembly is a self-contained unit with four cooling fans. An internal thermostat turns the fans on when the incoming air temperature reaches +35°C. Four red LEDs on the front of the assembly indicate failures of the individual fans.

‡ The 2A Fan Unit provides stronger air flow and is recommended for 80D LX5 applications. The fan is controlled by the 111A Control Unit.

§ A 111A in an 80-type cabinet requires an interface cable (Comcode 846325405) to power the DDM-1000, 111A, and repeater shelf.

¶ For those ED-2C833-20, G13 cables that need to be modified to provide the power minor alarms, this kit contains an opto-isolator board to convert -48V to ground. The kit is sourced from the Atlanta CSC.

** This is a backplane cover for DDM-1000 assemblies shipped before the cover became standard equipment.

†† The TLM slot edge protector provides protection from accidental insertion of a PROCR pack into an unequipped TLM slot.

‡‡ An ED-2C833-20, G39 cable is required for connections.

§§ The 734A cable has equivalent transmission characteristics to the 728B and a much smaller diameter. It is intended as a replacement for 728B cable.

¶¶ The 31-70013-1000 Amphenol straight BNC connector is used on ED-2C833-20, G34-G38 DSX3 and DACS III cables.

*** One tool recommended for each maintenance area or office environment.

Cable Assemblies

Tables 2-19 through 2-22 provide a list of ED-2C833-20 cable group numbers and their corresponding backplane interfaces.

Table 2-19. ED-2C833-20 DS1, DS1C AND DS2 Cable Assemblies

Description	ED-2C833-20, G( ) Cable Assemblies (Note 1)			DDM-1000 Backplane Connections
	Rear Access	Front Access		
	963P1-16 and Unterminated (Note 2)	963P1-16 and 710-SD1-25 (Note 3)	963P1-16 and KS-16690, L12 (Note 4)	
ED-2C841-30, G1 or G2 Shelf TX and RX: LS Intfc 1-7 Muldem A	G1, G101, or G102; G22, G221, G222, G223 or G224	G10	G14	P1-P14
ED-2C841-30, G1 or G2 Shelf TX and RX: LS Intfc 1-7 Muldem B	G2, G201, or G202; G23, G231, G232, G233 or G234	G11	G15	P15-P28
ED-2C841-30, G3 EMC Shelf TX and RX: LS Intfc 1-7 Muldem A	G26, G261, G262, or G263	G28	Not Available	P1-P14
ED-2C841-30, G3 EMC Shelf TX and RX: LS Intfc 1-7 Muldem B	G27, G271, G272, or G273	G29	Not Available	P15-P28

Notes:

1. The color code on Groups G1, G101, G102, G2, G201, and G202 cables *do not* agree with industry convention. These cable Groups are discontinued [Discontinued Availability (DA)] and replaced by the following, respectively: G22, G221, G222, G23, G231, and G232.

2. Cables are terminated in 963P1-16 or KS-23478, L1 connectors at the DDM-1000 end and unterminated at the other end for wire-wrap installation. Cable Groups specified for the G3 EMC Shelf are equipped with ferrite beads.

   These Groups are 75 feet long: G223, G233; G263, and G273.
   These Groups are 133 feet long: G1, G2; G22, G23; G26, and G27.
   These Groups are 266 feet long: G101, G201; G221, G231; G261 and G271.

   The length of these Groups is specified by the customer (267 feet minimum): G102, G202; G222, G232; G262 and G272.

   The length (less than 75 feet) of these Groups is specified by the customer: Groups G224 and G234.

3. Groups G10 and G11 are 2 feet long. These cables are terminated in 963P1-16 or KS-23478, L1 connectors at the DDM-1000 end and terminated at the other end in 710-SD1-25 connectors The mating connectors (710-BD1-25) *are not* supplied with this cable assembly

4. Groups G14 and G15 are 2 feet long These cables are terminated in 963P1-16 or KS-23478, L1 connectors at the DDM-1000 end and terminated at the other end in KS-16690, L12 connectors. The mating connectors (KS-16689, L3 or KS-16689, L18) *are not* supplied with this cable assembly

Table 2-20. ED-2C833-20 Telemetry Cable Assemblies

Description	ED-2C833-20, G( ) Cable Assemblies			DDM-1000 Backplane Connections
	Rear Access	Front Access		
	963P1-16 and Unterminated	963P1-16 and 710-SD1-25	963P1-16 and KS-16690, L12	
Overhead Telemetry - Per Shelf (15 miscellaneous I/O)	G3, G301 or G302*	G12†	G16†	P35 (In) P37 (Out)
Parallel Telemetry - First Shelf (11 alm/sts pts, System ID No. 1)	G4, G401 or G402*	Not Applicable	P31, P36	
Parallel Telemetry - Additional Shelves (11 alm/sts pts, System IDs No. 2-8)	G5	Not Applicable	P34	P38
TBOS Serial Telemetry - First Shelf	G8, G801 or G802*	Not Applicable	P29	
TBOS Serial Telemetry Additional Shelves and/or Multishelf Bus	G9 or G901‡	Not Applicable	P32	
TABS Serial Telemetry - First Shelf Performance Monitoring (PM)	G24 or G241§	Not Applicable	P35	
TABS Serial Telemetry - 8 Shelves Performance Monitoring (PM)	G25 or G251§	Not Applicable	P35	

* Groups G3, G4, and G8 are 133 feet long. Groups G301, G401, and G801 are 266 feet long. The length of Groups G302, G402, and G802 is specified by the customer (267 feet minimum, 4000 feet maximum). These cables are terminated in 963P1-16 or KS-23478, L1 connectors at the DDM-1000 end and unterminated at the other end for wire-wrap installation.

† Groups G12 and G16 are 2 feet long. Group 12 is terminated in 963P1-16 or KS-23478, L1 connectors at the DDM-1000 end and terminated at the other end in 710-SD1-25 connectors. The mating connectors (710-BD1-25) *are not* supplied with this cable assembly. Group G16 is terminated in 963P1-16 or KS-23478, L1 connectors at the DDM-1000 end and terminated at the other end in KS-16690L12 connectors. The mating connectors (KS-16689L3 or KS-16689L18) *are not* supplied with this cable assembly.

‡ Group G9 is 10 inches long and Group G901 is 1 ft. 10 inches long. This cable is used as a daisy chain so only one OS port is required for an entire bay to be connected to a maintenance center. It is also used as a multishelf bus to allow an ASCII terminal plugged into the PROCR on any shelf to address any other shelf in the bay. The G9 serial telemetry cable is only long enough to connect two shelves separated by a heat baffle. In those applications that are not back-to-back and require a single OS port, a G901 cable should be ordered.

§ Group G24 (G241) and Group G25 (G251) are equipped with a 963P1-16 or KS-23478, L1 connector(s) at the DDM-1000 end and unterminated at the other end. Groups G24 and G25 are 133 feet long. The length of G241 and G251 is specified by the customer and may be ordered in lengths from 133 feet to 1000 feet. These cables connect the MC90191A1 TLM2 pack with a GTP remote or equivalent. Group G24 (G241) is for performance monitoring on a single shelf. Group G25 (G251) is for performance monitoring on up to 8 shelves.

Table 2-21. ED-2C833-20 Power and Alarm Cable Assemblies

Description	ED-2C833-20, G( ) Cable Assemblies			DDM-1000 Backplane Connections
	Rear Access	Front Access		
	963P1-16 and Unterminated	963P1-16 and 710-SD1-25	963P1-16 and KS-16690, L12	
Office alarms First Shelf (MJ, MN, CRIT, PWR MN)	G6, G601 or G602*	—	—	P30
Office Alarms Additional Shelves	G7	—	—	P33
Power, Fan Alarm per Shelf†	G13 (G30) or G21 (G31)‡	G13 or G21‡	—	221-Type Term. P38

* Group G6 is 133 feet long.
Group G601 is 266 feet long.
The length of Group G602 is specified by the customer (267 feet minimum, 4000 feet maximum)
These cables are terminated in 963P1-16 or KS-23478, L1 connectors at the DDM-1000 end and unterminated at the other end for wire-wrap installation.

† Where rear access is provided, the power connections are made to the 221-type terminals on the backplane using receptacles provided in the installation kit. The fan alarm connection is not required in this application.

‡ Cable Groups G30 and G31 are the same as Groups G13 and G21 respectively, except that G30 and G31 are equipped with ferrite beads and intended for use with the ED-2C841-30, G3 EMC shelf. Groups G13 (G30) and G21 (G31) power and fan alarm cables are 2 feet long. At the DDM-1000 end, they are terminated in push-on flag receptacles for battery and return, and in a 963P1-16 connector (J38) for fan and battery alarms. They are terminated at the non-DDM-1000 end in a MATE-N-LOCK (AMP) connector for battery and return, and the power alarm. (The mating connector is supplied with this cable.) They are also terminated at the non-DDM-1000 end in a MATE-N-LOCK (AMP) connector (PFAN) for a fan alarm. The mating connector for the fan alarm is supplied with the fan assembly.

A G13 (G30) cable assembly should be ordered for applications with bulk power or when the DDM-1000 is not required to carry the power minor alarm in distributed power applications.

When no 2A fan unit is provided, a G21 (G31) cable assembly [or modified G13 (G30) cable assembly] is required in distributed power applications. G21 and G31 contain an opto-isolator board to convert –48V to ground to provide the power minor alarm. G13 (G30) cables must be modified using the FAAB kit from the MISCELLANEOUS EQUIPMENT Table.

If a 2A fan unit is used, provide a G13 (G30) cable assembly, an 845861327 cable assembly, and a 111A control unit. Either cable will interface the PMN and MN alarms from the *SLC*® Series 5 carrier system power shelf to the DDM-1000 shelf TLM1 pack. In addition, the 111A control unit has thermostats for operating the 2A fan unit

DS3 cabling to and from the DSX-3 cross-connect point or DACS frames may be 728B, 734A, 735A, or KS-19224, L2 coaxial cables as shown in the two cable assemblies (ED-2C833-20 and ED-8C724-20) in the following table. ED-2C833-20 assemblies are the original cable assemblies established for DDM-1000 and are still technically acceptable. However, the use of 728B and KS-19224, L2 cable has declined since the introduction of the 734A and 735A cables. Some groups of the ED-8C724-20 cable assemblies established for DDM-2000 are compatible and recommended for use with DDM-1000 as the preferred cable assemblies. The ED-8C724-20 cable assemblies are *UL* approved and contain 734A or 735A cables.

734A cable is the preferred replacement for 728B cable. 734A cable has the same loss as 728B cable but is smaller in diameter and more flexible. 735A cable is the preferred replacement for KS-19224, L2 cable. 735A cable is about the same diameter as the KS-19224, L2 cable but has significantly less loss. 735A cable length can be 250 feet to a DSX-3 cross-connect point (500 feet equipment to equipment), whereas KS-19224, L2 cable is limited to 150 feet (300 feet equipment to equipment).

Each ED-2C833-20 cable assembly group number provides only one cable (1/2 of a DS3) to be used as an input or an output cable. The ED-8C724-20 cable assembly group numbers provide two cables (one DS3) and include the proper connectors for the input and output ports.

Table 2-22. ED-2C833-20 and ED-8C724-20 DS3 Cable Assemblies

ED-2C833-20, G( ) Rear Access DS3 Jumper Cable Assemblies

Description	Rear Access	Front Access		DDM-1000 Backplane Connections
	963P1-16 and Unterminated	963P1-16 and 710-SD1-25	963P1-16 and KS-16690, L12	
Mini-Coax DS3 Jumpers	G32*, G33†, and G39‡	—	—	—

* Group G32 cable is a coax jumper cable terminated at each end with a BNC connector. It is used within the EMC shelf to connect the ELIU to the shelf side panel coax connector which connects to the DSX DS3 cable.

† Group G33 cable is a 1-foot coax jumper terminated at each end with a straight male BNC connector. It is used to connect the ELIU to the coax cable from the DSX-3 when the cable is terminated in a straight female BNC connector. It can also be used to loop back the DS3 signal when DDM-1000 is used as a DS1-DS1C multiplexer.

‡ Group G39 cable is a 2-foot KS-19224, L2 mini-coax cable terminated with a straight male BNC connector on the DDM-1000 end, and with a 219H connector on the other end. It may be used as an alternative to right-angled connectors.

Table 2-22 ED-2C833-20 and ED-8C724-20 DS3 Cable Assemblies (Contd)

ED-8C724-20 Group Structure DS3 Interface Cables

Cable Description	Number of DS3	Group Number	Length (feet)	Cable Type	See Note
DS3 Interface Groups to DSX-3/4	1	333	150	735A	1
		334	As reqd., 250 max.		2
	1	337	As reqd., 450 max.	734A	2
		338	150	KS-19224, L2 mini-coax	1
DS3 Interface Groups to DACS III-2000	1	328	150	735A	1
		329	As reqd., 500 max.		2
	1	332	As reqd., 900 max.	734A/735A	2,3
DS3 Interface Groups to DACS IV-2000	1	323	150	735A	1
		324	As reqd., 500 max.		2
	1	327	As reqd., 900 max.	734A/735A	2,3
DS3 Interface Groups to DACS III-2000 or DACS IV-2000 equipped with BNC I/O panel	1	333	150	735A	1
		334	As reqd., 500 max.		2
	1	337	As reqd., 900 max.	734A	2
		338	150	KS-19224, L2 mini-coax	1

See Notes at end of Table.

Table 2-22 ED-2C833-20 and ED-8C724-20 DS3 Cable Assemblies (Contd)

ED-2C833-20 Group Structure DS3 Interface Cables

Cable Description	Number of DS3	Group Number	Length (feet)	Cable Type	See Note
DS3 Interface Groups to DSX-3 ED-2C667-30 panel	1/2	34	150	KS-19224, L2 mini-coax	1
		35	As reqd., 450 max.	KS-19224, L2 mini-coax/728B	2,3
		44	As reqd., 450 max.	734A	2
DS3 Interface Groups to DACS III-2000	1/2	36	As reqd., 300 max.	KS-19224, L2 mini-coax	2
		37	As reqd., 900 max.	KS-19224, L2 mini-coax/728B	2,3,4
		38	As reqd., 900 max.	KS-19224, L2 mini-coax/728B	2,3,4
		45	As reqd., 900 max.	KS-19224, L2 mini-coax/734A	2,3,4
		46	As reqd., 900 max.	KS-19224, L2 mini-coax/734A	2,3,4
DS3 Interface Groups to DACS IV-2000	1/2	40	As reqd., 300 max.	KS-19224, L2 mini-coax	2,5
		41	As reqd., 300 max.	KS-19224, L2 mini-coax	2,5
		42	As reqd., 900 max.	KS-19224, L2 mini-coax/734A	2,3,5
		43	As reqd., 900 max.	KS-19224, L2 mini-coax/734A	2,3,5

Notes:

1. Cable stocked for reduced order interval (1-2 weeks). Group 34 cables have a BNC connector installed on one end and are unterminated at the other end. All other fixed length cables have connectors installed on both ends.
2. Order must specify cable length. Order interval is about 4 weeks. Group 35 and Group 44 cables have a BNC connector installed on one end and are unterminated on the other end. All other variable length cables have a BNC connector installed on one end and have a connector for the other end shipped loose for field installation.
3. Each cable has a short length of 735A or KS-19224, L2 cable as specified.
4. Group 37 or Group 46 cable is used when the DACS III-2000 is cabled from below the frame. Group 38 or Group 45 cable is used when the DACS III-2000 is cabled from above the frame.
5. Group 40 and Group 42 cables are input cables to the DACS IV-2000. Group 41 and Group 43 cables are output cables from the DACS IV-2000.

Table 2-23. ED-2C833-20 180 Mb/s Cable Assemblies

Description	Rear Access	Front Access		DDM-1000 Backplane Connections
	963P1-16 and Unterminated	963P1-16 and 710-SD1-25	963P1-16 and KS-16690, L12	
180 Mb/s Intershelf Cable*	G17†, G18‡, G19‡ or G20‡	—	—	P39-P44

* Intershelf cables connecting two shelf assemblies for 180 Mb/s operation are 2 feet 11 inches long.

† The ED-2C833-20, G17 cable assembly consists of two shelf-to-shelf cables, one SRV and one PROTN. It is to be used for all 180 Mb/s DDM-1000 systems using the second generation ED-2C841-30, G2 or G3 shelf assemblies. These shelf assemblies have gold-plated pins and retainers, for use with the shelf-to-shelf cable assemblies, and have the corresponding plug numbers printed on the backplane.

‡ The earlier ED-2C841-30, G1 shelf assemblies may also be used for 180 Mb/s optical operation. They require different metalization in the shelf-to-shelf cable connectors. The intershelf cable assembly is selected according to the types of shelf assemblies to be interconnected and the location of the 180 Mb/s OLIUs. Each group number ordered includes two cable assemblies — one to connect the service OLIU slots on the backplane and the other for the protection OLIU slots. The cable assemblies are packed with installation templates and cable retainers as appropriate — no additional hardware is required. The following shows the cable assemblies to be used for the various possible configurations:

OLIU Assembly	Non-*OLIU* Assembly	Cable Code
ED-2C841-30, G2	ED-2C841-30, G2	ED-2C833-20, G17
ED-2C841-30, G3	ED-2C841-30, G3	ED-2C833-20, G17
ED-2C841-30, G1	ED-2C841-30, G1	ED-2C833-20, G18
ED-2C841-30, G1	ED-2C841-30, G2	ED-2C833-20, G19
ED-2C841-30, G2	ED-2C841-30, G1	ED-2C833-20, G20

Installation Kit

An installation kit is included with each DDM-1000 Shelf Assembly. Table 2-24 lists the items included in the kit.

Table 2-24. Installation Kit Contents

Qty.	Description	Function	COMCODE
1	Label	Office Records Label	845452259
1	Label	ESD (Warning) Label	845694983
1	KKL-8 Kwik Klip, Richco Plastics, Inc.	Clip to Secure Fiber Pigtails to Shelf	901005223
2	Plug	Spare Suitcase Plugs Cambridge Thermionics 461-2872-01-03-16	402200687
2	Berg Mini-Jump 65966-001	Jumper for Add/Drop Mode Selection	403763618
1	Berg 65771-001 Connector	Spare Jumpers	403574783
8	SPL HM SCR 0.216-24x1/4	Screws to Mount Shelf and Heat Baffle to Frame	801486341
5	T&B RB14-250A Flag Receptacle	Receptacle for Battery and Return Lugs	403062789
1	Cable Assembly	Rear Access Frame Ground	840456792
2	12-24x1/2 Pan Head Taptite Screws	Screws for Frame Ground	900020041
2	E.T.T. .475 Lockwasher	Washer for Frame Ground	801831496
1	I.T.T. .475 Lockwasher	Alternative Washer for Frame Ground	803881440
7	Cable Tie Mounting Pad	Backplane Cable Tie Pads for G3 EMC Shelf	403434830
7	Cable Tie	Backplane Cable Ties for G3 EMC Shelf	400718284

Test Equipment

No external test equipment is required for installation, maintenance, or operation of the DDM-1000. The DDM-1000 is equipped with built-in test signal generators and receivers that complete both shelf and system tests in a matter of minutes under control of the assembly processor. See Table 2-18 in this section for recommended LBOs for testing.

User's Manual

This DDM-1000 User's Manual is shipped with each DDM-1000 shelf assembly. Additional manuals may be ordered as AT&T 363-206-100. See the Ordering section at the front of this Manual.

ASCII Terminal

DDM-1000 provides an interface for connecting an ASCII terminal that enables the user to obtain detailed alarm information and to control the more advanced features of the DDM-1000 The Specifications section of this document provides a list of the physical and electrical requirements for connection to this interface.

DDM-1000 Specifications

3

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DDM-1000 Specifications

3

Introduction

This section provides detailed specifications for the maintenance interfaces and interconnections of DDM-1000. A summary of the specifications is included at the end of the section. The maintenance specifications describe LEDs, office alarms, parallel telemetry, overhead telemetry, serial telemetry, and ASCII terminal interfaces as well as control switches and option settings. Table 3-1 lists some fault conditions and the alarms they generate. The interconnection specifications provide complete cabling information for the DDM-1000. Additional interconnection information may be found in T-99396-30.

Maintenance Specifications

LEDs

All Circuit Packs

Each circuit pack, except the ELIU1, has a red alarm (ALM) indicator. This LED is turned on and remains on when the pack fails. It flashes on and off at 1-second intervals if the input signal to the pack fails.

PROCR

The following indicators are provided on the front of the PROCR pack:

- MJ - Major Alarm. This red LED indicates that a service-affecting failure exists in the DDM-1000.
- MN - Minor Alarm This amber LED indicates that a non-service-affecting failure exists in the DDM-1000.
- NE - Near End Status. This green LED identifies the near end as the location for the indicated condition.
- FE - Far End Status. This green LED identifies the far end as the location for the indicated condition. Its use is optional and available only when the far end terminal is a DDM-1000.
- ABN - Abnormal Status. This amber LED indicates that a nonalarmed non-nominal condition exists in the DDM-1000. This includes manual switches, manual locks, etc.
- ACO - Alarm Cutoff Status. This green LED indicates that the office audible alarms are silenced.

These indicators convey different information when the automated turnup procedures are begun and when the system is first powering up. During these times, the MJ indicator turns on and off rapidly.

TLM1 (AKM4)

The following indicators are provided on the front of the TLM1 pack:

- CR - Critical Alarm. This red LED indicates that a failure affecting more than 96 customers exists in the DDM-1000. It may optionally indicate an incoming signal failure affecting fewer customers. The use of the critical alarm is optional and depends on the switch setting on the PROCR pack.
- PMN - Power Minor Alarm. This amber LED indicates that AC power has failed at the remote terminal (RT) end of the system and the RT is operating on battery backup. This is not accompanied by either NE or FE indicators. Its use is optional and available only when the far end terminal central office terminal (COT) is a DDM-1000 and the appropriate connections to the power plant at the RT site have been made. The PMN alarm is visible only at the COT.

MC90191A1 TLM2

In addition to the ALM LED, the TLM2 also has restart/test status (RST/TEST) indicator located on the faceplate. This LED indicates the status of the restart and test operations of the TLM2 circuit pack. It blinks on and off during the restart procedure and then remains off when the procedure is completed. The TLM2 does not have a CR or PMN LED.

OLIU (20E, 20G or 20K)

Each OLIU4 (20E), OLIU5 (20G) and OLIU7 (20K) is equipped with two red LEDs on the faceplate. One LED is controlled by each of the two DDM-1000 assemblies making up the 180 Mb/s terminal. The upper assembly controls the upper LED and the lower assembly controls the lower LED. This is true regardless of which is the OLIU assembly.

Alarm Precautions

The DDM1000 relays are susceptible to large transient currents caused by capacitive loads or by direct connection to aisle pilot lamps. In addition, the PROCR pack, which contains the office alarm relays, is susceptible to voltage spikes which can occur on the alarm leads. The DDM-1000 relays are rated at a maximum open circuit voltage of 60 volts and a closed circuit current of 0.1 amps. If these limits are exceeded, the result is stuck relays or improper PROCR operation.

To prevent the voltage and current rating from being exceeded in the PROCR, an alarm isolation unit (AIU) is required between the first DDM-1000 shelf in a bay and the office alarm system. Office alarms for subsequent DDM-1000 shelves in a bay are connected in the normal daisy chain fashion described in DP-426 in the Installation and Maintenance section of this manual. One AIU is required per bay. The relay contacts in the AIU are rated at 50 VA which means that they are capable of switching 1 amp at 50 volts, or 2 amps at 24 volts. Their ability to switch large transient currents means that the visual alarm relays can, if necessary, switch up to ten 5-watt aisle pilot lamps.

The AIU contains six relays. Four of the relays are driven by the PROCR pack: the major and minor visible and the major and minor audible alarms. The remaining two relays are driven by the TLM1 pack. They are the critical and power minor visible alarms. The critical and power minor audible alarms are carried straight through the AIU unbuffered from the TLM1 pack. The rating and design of the two audible alarm relays on the TLM1 pack are adequate to directly drive office audible alarms and do not require buffering. The office alarm pinout connections on the AIU are the same as described in Table 3-34.

The AIU is designed to mount on the left bay upright as viewed from the rear. It requires at least a 3-½ inch space which is available in the space occupied by a normal air baffle. The AIU can be mounted between the second and third shelves in some bays but the cable is long enough to allow mounting between the fourth and fifth shelves if the baffle space is not adequate above the second shelf.

The –5 volt power for the AIU is obtained from the PWR SRV slot on the bottom DDM-1000 shelf via the connector labeled PWR. The 16-pin PWR connector must be installed as shown in Figure 3-1. The location for installing the PWR connector is not identified on the backplane and the pins must be carefully counted. The backplane pins are numbered from 49 beginning at the top right. The columns are numbered 000, 100, 200, 300 from right to left as viewed from the rear. The upper left pin (number 349) is missing. The 13A retainers must be installed spanning pins 243 and 343 and spanning pins 234 and 334. This will ensure proper alignment and retention of the PWR connector from the AIU on pins 242 and 342 and on pins 235 and 335. The locking tabs on the PWR connector must face to the left and the lettering on the PWR connector must face to the right.

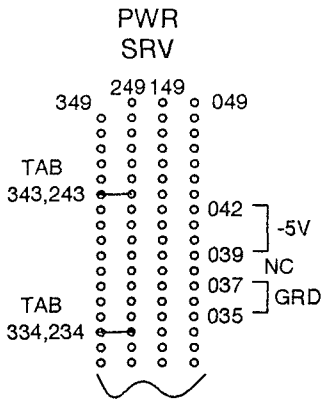

Figure 3-1. 16-Pin PWR Connector

The alarm inputs and outputs to the AIU are connectorized and the alarm input cable is provided with the unit. The connections are made by disconnecting the G6 (or G601 or G602) cable from the office alarm system from the bottom DDM-1000 shelf and connecting it to P30 on the AIU. The end of the input cable from the AIU (designated J30) is connected to P30 on the bottom DDM-1000 shelf.

The AIU can be tested with the "`test-alm:`" command described in the Commands and Reports section of this manual.

Office Alarms

PROCR

Four office alarm relay contacts are provided by the PROCR pack. Each closure includes a signal and a signal return.

See "Alarm Precautions" in this section.

The following office alarm contacts are provided by the PROCR pack:

- MJV - MJVR: Major Visible. This contact closes when a service-affecting failure exists in the DDM-1000. It closes if a complete power failure occurs. It cannot be ACO'ed.
- MJ - MJR: Major Audible. This contact closes when a service-affecting failure exists in the DDM-1000. It closes if a complete power failure occurs. It can be ACO'ed.
- MNV - MNVR: Minor Visible. This contact closes when a non-service-affecting failure exists in the DDM-1000. It cannot be ACO'ed.
- MN - MNR: Minor Audible. This contact closes when a non-service-affecting failure exists in the DDM-1000. It can be ACO'ed.

TLM1 (AKM4)

Four office alarm contact closures are provided by the TLM1 pack. Each closure includes a signal and a signal return.

CAUTION:
The open circuit voltage across the contacts must be less than 60 volts and the closed circuit current must be limited to less than 0.1 amps.

See "Alarm Precautions" in this section.

The following office alarm contact closures are provided by the TLM1 pack:

- CRV - CRVR: Critical Visible. This contact closes when a failure affecting more than 96 customers exists in the DDM-1000. It may optionally close for an incoming signal failure affecting fewer customers. It closes if a complete power failure occurs. The use of the critical alarm is optional and depends on the switch setting on the PROCR pack. It cannot be ACO'ed. This contact is isolated from the office alarm system by the alarm isolation unit (AIU).
- CR - CRR: Critical Audible. This contact closes when a failure affecting more than 96 customers exists in the DDM-1000. It may optionally close for an incoming signal failure affecting fewer customers. It closes if a complete power failure occurs. The use of the critical alarm is optional and depends on the switch setting on the PROCR pack. It can be ACO'ed.
- PMNV - PMNVR: Power Minor Visible. This contact closes when AC power has failed at the RT end of the system and the RT is operating on battery backup. Its use is optional and available only when the far end terminal is a DDM-1000, and the appropriate connections to the power plant at the RT site have been made. It cannot be ACO'ed. This contact is isolated from the office alarm system by the alarm isolation unit (AIU).
- PMN - PMNR: Power Minor Audible. This contact closes when AC power has failed at the RT end of the system and the RT is operating on battery backup. Its use is optional and available only when the far end terminal is a DDM-1000, and the appropriate connections to the power plant at the RT site have been made. It can be ACO'ed.

Parallel Telemetry

PROCR

The following parallel telemetry relay contact closures are provided by the PROCR1 or PROCR2 packs. Each closure includes a signal [SI1( )] and one common return (SI1R). They cannot be ACO'ed. They may be connected to any equipment capable of accepting polarized closures between individual SI1( ) wires and SI1R. SI1R is positive with respect to SI1( ). The open circuit voltage across the contacts must be less than 60 volts and the closed circuit current must be limited to less than 0 035 amps

- SI1(MJ): Major Visible Alarm. This contact closes when a service-affecting failure exists in the DDM-1000. It closes if a complete power failure occurs.
- SI1(MN): Minor Visible Alarm. This contact closes when a non-service-affecting failure exists in the DDM-1000.

TLM1 (AKM4)

The following parallel telemetry outputs are provided by the TLM1 pack. There are 11 outputs [SI1( )] and one common return (SI1R). Except for the SI1(IDx) closure, they may be ACO'ed. They may be connected to any equipment capable of accepting polarized closures between individual SI1( ) wires and SI1R. SI1R is positive with respect to SI1( ). Some of these outputs are optical isolators and some are relays. See "Low-Speed DSX and AS&C Cabling" later in this section.

The open circuit voltage across the output must be less than 60 volts and the closed circuit current must be limited to less than 0.035 amps. If transient voltages or currents would otherwise exceed these limits, transient noise-suppressing devices such as diodes or contact protection networks must be used

- SI1(CR): Critical Alarm. This output indicates a failure affecting more than 96 customers. It may optionally indicate an incoming signal failure affecting fewer customers. It is activated by a complete power failure. The use of the critical alarm is optional depending on the PROCR switch settings.
- SI1(MJA): Major Audible Alarm. This output indicates a failure affecting 96 or fewer customers.
- SI1(MNA): Minor Audible Alarm. This output indicates a non-service-affecting failure.
- SI1(PMN): Power Minor Alarm. This output indicates that AC power has failed at the RT end of the system and that the RT is operating on battery backup. Its use is optional and available only when the far end terminal is a DDM-1000, and the appropriate connections to the power plant at the RT site are made.
- SI1(NE): Near End Status. This output identifies the near end as the location for the indicated condition.
- SI1(FE): Far End Status. This contact identifies the far end as the location for the indicated condition. Its use is optional depending on the PROCR switch settings and available only when the far end terminal is a DDM-1000.
- SI1(CLF): Carrier Line Failure Status. This output indicates a failure of the optical line.
- SI1(HS): High-Speed Status. This output indicates a function unit pack failure.
- SI1(LS): Low-Speed Status. This output indicates a low speed pack failure.
- SI1(INC): Incoming Status. This output indicates an incoming signal problem from the DSX.
- SI1(IDx): System Identification Status. This output identifies the system raising alarms when alarms are paralleled among several systems. The value of x is from 1 to 8.

The TLM1 pack provides an alarm cutoff parallel telemetry input [RS(ACO)]. This input is used to turn off all parallel telemetry alarm and status points except for the SI1(MJ) and SI1(MN) from the PROCR and SI1(IDx) from TLM1. It is latched in the equipment. This is used when the parallel telemetry points are wired in "parallel" for multiple shelves in a single bay. Use of the remote ACO, the local equipment ACO button, or the `exct-aco:` command will ACO the audible office alarms and the parallel telemetry contacts.

There is one signal [RS( )] and one return (BAT.A RTN). They may be connected to any equipment providing closures between RS( ) and BAT.A RTN. BAT.A RTN is to be positive with respect to RS( ). The open circuit voltage across the input to this optical isolator must be less than 60 volts and the closed circuit current must be limited to less than 0.01 amps. If transient voltages or currents would otherwise exceed these limits, transient noise-suppressing devices such as diodes or contact protection networks must be used.

Table 3-1. Alarm Table

CONDITION	OFFICE ALARMS						PARALLEL TELEMETRY										LEDs									
	WITH PROCR2				WITH TLM1		WITH PROCR2		WITH TLM1								CP	WITH PROCR2						TLM1		
	MJ VIS	MJ AUD	MN VIS	MN AUD	CR VIS	CR AUD	MJ	MN	CR	MJA	MNA	NE	FE	CLF	HS	LS	INC	ALM	MJ	MN	NE	FE	ABN	ACO	CR	SEND AIS	PROT SW
LOSS OF INCOMING DS1 OR DS1C OR DS2 SIGNAL	NOTE 1		NOTE 1		NOTE 1		NOTE 1		SEE NOTE 1			*	*				/	FL	NOTE 1		*	*			NOTE 1	/	
DS1 OR DS1C OR DS2 B.E.R. >ALM THRESHOLD (SEE NOTE 2)	NOTE 1		NOTE 1		NOTE 1		NOTE 1		SEE NOTE 1			*	*				/	FL	NOTE 1		*	*			NOTE 1		
LOSS OF FRAME ON INCOMING OPTICAL SIGNAL			/	/				/			/	*	*	/				FL		/	*	*					/
LOSS OF FRAME ON BOTH INCOMING OPTICAL SIGNALS	NOTE 4				NOTE 4		NOTE 4		NOTE 4			*	*	/				FL	NOTE 4		*	*			NOTE 4	/	
LOSS OF INCOMING OPTICAL SIGNAL			/	/				/			/	*	*	/				FL		/	*	*					/
LOSS OF BOTH INCOMING OPTICAL SIGNALS	NOTE 4				NOTE 4		NOTE 4		NOTE 4			*	*	/				FL	NOTE 4		*	*			NOTE 4	/	
OPTICAL B.E.R. >ALM THRESHOLD (SEE NOTE 3)			/	/				/			/	*	*	/				FL		/	*	*					/
BOTH OPTICAL B.E.R. > ALM THRESHOLD (SEE NOTE 3)	NOTE 4				NOTE 4		NOTE 4		NOTE 4			*	*	/				FL	NOTE 4		*	*			NOTE 4		
LOSS OF BOTH -48V INPUT	/	/			/	/	/		/																		
SINGLE CP FAILURE			/	/				/			/	*	*		#	#		/		/	*	*					/
FAILURE OF DS1 INTFC SERVICE & PROT CP'S	NOTE 4						NOTE 4			NOTE 4		*	*			/		/	NOTE 4		*	*					
FAILURE OF SERVICE & PROT CP'S ALL OTHER	NOTE 4				NOTE 4		NOTE 4		NOTE 4			*	*		#			/	NOTE 4		*	*			NOTE 4		
ACTIVE ACO		X		X		X																		/			
NON-ALARMED NON-NOMINAL																							/				

Table 3-1. Alarm Table (Contd)

Notes:

1. Can be provisioned to raise CR, MJ, MN, or NO ALARM The default is NO ALARM
2. A threshold can be provisioned to be 10^{-3} or 10^{-6}.
3. Protection switching threshold can be set between 10^{-3} and 10^{-8}
4. Can be provisioned to be MJ or CR

LEGEND:

/ : Indicator active under given condition.
Indicator will retire when condition goes away.

* : Near end or far end or neither, as appropriate.

FL : Flashing.

X : Clear alarm status.

: As appropriate

LEDs:

ALM	: On circuit pack alarm (Red)	MJ	: Major alarm (Red)
MN	: Minor alarm (Amber)	NE	: Near-end status (Green)
FE	: Far-end status (Green)	ABN	: Abnormal status (Amber)
ACO	: Alarm cutoff status (Green)	CR	: Critical alarm (Red)

OFFICE ALARMS:

MJ VIS	: Major Visible	MJ AUD	: Major Audible
MN VIS	: Minor Visible	MN AUD	: Minor Audible
CR VIS	: Critical Visible	CR AUD	: Critical Audible

PARALLEL TELEMETRY:

MJ	: Major alarm	MN	: Minor alarm
CR	: Critical alarm	MJA	: Major alarm
MNA	: Minor alarm	NE	: Near-end status
FE	: Far-end status	CLF	: Carrier line failure status
HS	: High-speed status	LS	: Low-speed status
INC	: Incoming status	PMN[1]	: Power Minor
ID(x)[2]	: System identification		

[1] A power minor (PMN) will appear at the COT when an AC power failure occurs in an RT.

[2] With a TLM1 pack, any active parallel telemetry alarm will have an associated ID(x) with it.

Overhead Telemetry

TLM1 (AKM4)

The following overhead telemetry alarm relay contact closures are provided by the TLM1 pack. Each closure includes a signal [SI2( )] and one common return (SI2R). They may be connected to any equipment capable of accepting polarized closures between individual SI2( ) wires and SI2R. SI2R is positive with respect to SI2( ). The open circuit voltage across the contacts must be less than 60 volts, and the closed circuit current must be limited to less than 0.035 amps. If transient voltages or currents are above these limits, transient noise-suppressing devices such as diodes or contact protection networks must be used to keep within the voltage and current limits. For increased reliability of these closures, the contacts should normally be in the open state.

- SI2(x): Output x. This contact closes when the corresponding RS(x) input at the far end terminal is closed. The value of x is from 1 to 15.

The following overhead telemetry inputs are provided by the TLM1 pack. These inputs include the signals [RS( )] and one common source (BAT.A). They may be connected to any equipment-providing closures between RS( ) and BAT.A RTN. BAT.A RTN is positive with respect to RS( ). The open circuit voltage across the input to the optical isolators must be less than 60 volts, and the closed circuit current limited to less than 0.01 amps. If transient voltages or currents are above these limits, transient noise-suppressing devices such as diodes or contact protection networks must be used to keep within the voltage and current limits.

- RS(x): Input x. A closure across this input causes the corresponding SI2(x) output at the far end terminal to close. The value of x is from 1 to 15.

If a serial link is provided, remote commands 53-62 (Table 3-3) may be used to operate the first five overhead telemetry outputs on a remote TLM pack. The remote command inputs are "ORed" with the discrete inputs so either source can control the outputs on the remote TLM pack.

MC90191A1 TLM2

Six overhead telemetry alarm relay contact closures are provided by the TLM2 pack. Each closure includes a signal [SI2( )] and one common return (SI2R). They may be connected to any equipment capable of accepting polarized closures between individual SI2( ) wires and SI2R. In addition, five of the six outputs can be operated remotely from the TBOS serial telemetry link at the other end of the system.

SI2R is positive with respect to SI2( ). The open circuit voltage across the contacts must be less than 60 volts and the closed circuit current must be limited to less than 0.035 amps. If transient voltages or currents are above these limits, transient noise-suppressing devices such as diodes or contact protection networks must be used to keep within the voltage and current limits. For increased reliability of these closures, the contacts should normally be in the open state. The following outputs are provided:

- SI2(x): Output x. This contact closes when the corresponding RS(x) input at the far end terminal is closed. The value of x is from 1 to 6.

Six overhead telemetry inputs are provided by the TLM2 pack. These inputs include the signals [RS( )] and one common source (BAT.A). They may be connected to any equipment providing closures between RS( ) and BAT.A RTN. BAT.A RTN is positive with respect to RS( ). The open circuit voltage across the input to the optical isolators must be less than 60 volts, and the closed circuit current limited to less than 0.01 amps. If transient voltages or currents are above these limits, transient noise-suppressing devices such as diodes or contact protection networks must be used to keep within the voltage and current limits. The following inputs are provided:

- RS(x): Input x. Closing this contact causes the corresponding SI2(x) output at the far end terminal to close. The value of x is from 1 to 6.

If a serial link is provided, remote commands 53-62 (Table 3-3) may be used to operate the first five overhead telemetry outputs on a remote TLM pack. The remote command inputs are "ORed" with the discrete inputs so either source can control the outputs on the remote TLM pack.

Serial Telemetry

PROCR

The following serial telemetry connections are provided by the PROCR1 (MC90083A1) or PROCR2 (MC90083A1B, MC90083A1C or MC90083A1D) pack.

- TDP - TDN: Transmitted Data. This RS-422 compatible differential pair carries data from DDM-1000 to the telemetry equipment.
- RDP - RDN: Received Data. This RS-422 compatible differential pair carries data from the telemetry equipment to DDM-1000.

The DDM-1000 serial telemetry interface provided by the PROCR is telemetry byte-oriented serial (TBOS) protocol compatible. The mode of communication is asynchronous serial half-duplex transmission of each word in an ASCII format (start bit, eight data bits, odd parity, and two stop bits). Data is transmitted at 2400 baud. Each DDM-1000 shelf is allocated one "display" of 63 scan points and 63 remote commands. Up to eight shelves in a single bay may be wired together to use a single serial port on the telemetry equipment. The attributes associated with the scan points correspond to assignment number L123 (bits 1-48 = alarms, bits 49-64 = status). Table 3-2 defines the scan points. Table 3-3 defines the remote commands. Execution of a remote command (25-63) causes scan point 63 to be raised if it is accepted and scan point 33 to be raised if it is rejected. These last two scan points reset after being reported once.

If a serial link is provided, remote commands 53-62 (Table 3-3) may be used to operate the first five overhead telemetry outputs on a remote TLM pack. The remote command inputs are "ORed" with the discrete inputs so either source can control the outputs on the remote TLM pack.

MC90191A1 TLM2

The following serial telemetry connections are provided by the MC90191A1 TLM2 pack:

- TABOP - TABON· Transmitted Data This RS-485 compatible differential pair carries data from DDM-1000 to the telemetry equipment.
- TABIP - TABIN: Received Data. This RS-485 compatible differential pair carries data from the telemetry equipment to DDM-1000.

This serial telemetry interface is telemetry asynchronous block serial (TABS) protocol compatible. It is used to provide high-speed DS3 path performance monitoring (PM) which gives a measure of the quality of service and identifies degrading of marginally operating systems. The MXR3 (AKM2C) circuit pack extracts the raw PM data from the DS3 signal and supplies it to the TLM2 pack. The TLM2 processes this information to supply out-of-frame seconds; total errored seconds; and type A, B, and C errored seconds as defined in AT&T Compatibility Bulletin No. 149 (CB #149), for both the near and far end in 1-minute intervals. The DS3 performance-monitoring data is sent to the telemetry system via a TABS serial link.

The mode of communication between DDM-1000 and the telemetry remote is asynchronous serial with transmission of each word as follows: one start bit, eight data bits, one odd parity bit, and one stop bit. Data is transmitted at 2400 baud. Up to eight shelves in a single bay may be wired together to use a single serial port on the telemetry equipment.

If a serial link is provided, remote commands 53-62 (Table 3-3) may be used to operate the first five overhead telemetry outputs on a remote TLM pack. The remote command inputs are "ORed" with the discrete inputs so either source can control the outputs on the remote TLM pack.

Table 3-2. DDM-1000 Serial Telemetry Scan Points

No.	Scan Point Bit Name (Note)	Scan Point Description (Note)	Type
1	PWR UNIT FAIL NSA (NE)	Power Unit Failure NSA (NE)	Alarm
2	PWR UNIT FAIL NSA (FE)	Power Unit Failure NSA (FE)	Alarm
3	AC PWR FAIL NSA (FE)	AC Power Failure NSA (FE)	Alarm
4	FAN FAIL NSA (FE)	Fan Fail Or Power Plant Minor Fail NSA (FE)	Alarm
5	CONTROLLER FAIL (NE)	Controller or TLM pack Failure (NE)	Alarm
6	CONTROLLER FAIL (FE)	Controller or TLM pack Failure (FE)	Alarm
7	HS FAIL SA (NE)	Function Unit Or HS Interface Fail SA (NE)	Alarm
8	HS FAIL SA (FE)	Function Unit Or HS Interface Fail SA (FE)	Alarm
9	HS FAIL NSA (NE)	Function Unit Or HS Interface Fail NSA (NE)	Alarm
10	HS FAIL NSA (FE)	Function Unit Or HS Interface Fail NSA (FE)	Alarm
11	LS FAIL SA (NE)	LS Interface Failure SA (NE)	Alarm
12	LS FAIL SA (FE)	LS Interface Failure SA (FE)	Alarm
13	LS FAIL NSA (NE)	LS Interface Failure NSA (NE)	Alarm
14	LS FAIL NSA (FE)	LS Interface Failure NSA (FE)	Alarm
15	INC FIBER FAIL SA (NE)	Incoming Fiber Failure SA (NE)	Alarm
16	INC FIBER FAIL SA (FE)	Incoming Fiber Failure SA (FE)	Alarm
17	INC FIBER FAIL NSA (NE)	Incoming Fiber Failure NSA (NE)	Alarm
18	INC FIBER FAIL NSA (FE)	Incoming Fiber Failure NSA (FE)	Alarm
19	INC DS3 FAIL MULDEM A SA (NE)	Incoming DS3 Fail - Muldem A SA (NE)	Alarm
20	INC DS3 FAIL MULDEM A SA (FE)	Incoming DS3 Fail - Muldem A SA (FE)	Alarm
21	INC DS3 FAIL MULDEM B SA (NE)	Incoming DS3 Fail - Muldem B SA (NE)	Alarm
22	INC DS3 FAIL MULDEM B SA (FE)	Incoming DS3 Fail - Muldem B SA (FE)	Alarm
23	SIG FAIL MULDEM A	Signaling Failure - Muldem A	Alarm
24	SIG FAIL MULDEM B	Signaling Failure - Muldem B	Alarm
25	HS AUTO LOCK NSA (NE)	Function Unit & HS Interface - Auto Switch Lock NSA (NE)	Alarm
26	HS AUTO LOCK NSA (FE)	Function Unit & HS Interface - Auto Switch Lock NSA (FE)	Alarm
27	LS AUTO LOCK NSA (NE)	LS Interface Auto Switch Lock NSA (NE)	Alarm
28	LS AUTO LOCK NSA (FE)	LS Interface Auto Switch Lock NSA (FE)	Alarm
29	MAN FUNCTION INITIATED (NE)	User Initiated Abnormal Condition (NE)	Alarm
30	MAN FUNCTION INITIATED (FE)	User Initiated Abnormal Condition (FE)	Alarm
31	INC DS3 AIS MULDEM A (NE)*	Incoming DS3 AIS-Muldem A (NE)	Alarm
32	INC DS3 AIS MULDEM B (NE)*	Incoming DS3 AIS-Muldem B (NE)	Alarm

See Notes and Footnotes at the end of the Table

Table 3-2. DDM-1000 Serial Telemetry Scan Points (Contd)

No.	Scan Point Bit Name	Scan Point Description	Type
33	INVALID COMMAND RECD	Invalid Telemetry Command Received	Alarm
34-46	(USER ASSIGNED)†	Overhead Telemetry Outputs 1-13 (from RT)	Alarm
47	(USER ASSIGNED)‡	Overhead Telemetry Output 14 (from RT)	Alarm
48	(USER ASSIGNED)§	Overhead Telemetry Output 15 (from RT)	Alarm
49	HS SW MULDEM A (NE)	Function Unit & HS Interface Switch - Muldem A (NE)	Status
50	HS SW MULDEM A (FE)	Function Unit & HS Interface Switch - Muldem A (FE)	Status
51	HS SW MULDEM B (NE)	Function Unit & HS Interface Switch - Muldem B (NE)	Status
52	HS SW MULDEM B (FE)	Function Unit & HS Interface Switch - Muldem B (FE)	Status
53	LS SW MULDEM A (NE)	LS Interface Switch - Muldem A (NE)	Status
54	LS SW MULDEM A (FE)	LS Interface Switch - Muldem A (FE)	Status
55	LS SW MULDEM B (NE)	LS Interface Switch - Muldem B (NE)	Status
56	LS SW MULDEM B (FE)	LS Interface Switch - Muldem B (FE)	Status
57	HS MAN LOCK (NE)	Function Unit & HS Interface - Manual Switch Lock (NE)	Status
58	HS MAN LOCK (FE)	Function Unit & HS Interface - Manual Switch Lock (FE)	Status
59	LS MAN LOCK (NE)	LS Interface Manual Switch Lock (NE)	Status
60	LS MAN LOCK (FE)	LS Interface Manual Switch Lock (FE)	Status
61	INC LS SIG FAIL (NE)	Incoming LS Signal Fail (NE)	Status
62	INC LS SIG FAIL (FE)	Incoming LS Signal Fail (FE)	Status
63	VALID COMMAND RECD	Valid Telemetry Command Received	Status
64	TELEMETRY LINK FAIL	Telemetry Link Failure	—

Note:

SA - Service Affecting NSA - Non Service Affecting NE - Near End FE - Far End
RT - Remote Terminal

* See Glossary section for definition of DS3 AIS

† The TLM1 uses telemetry outputs 1-15 (scan points 34-48) The MC90191A1 TLM2 uses outputs 1-6 (scan points 34-39).

‡ When operating in an open network configuration, scan point 47 indicates a far-end (FE) condition associated with near-end (NE) muldem A

§ When operating in an open network configuration, scan point 48 indicates a far-end (FE) condition associated with near-end (NE) muldem B

Table 3-3. DDM-1000 Serial Telemetry Remote Commands

No.	Remote Command Bit Name (Note)	Remote Command Description (Note)
1-19	—	Reserved For Future Use
20	Cancel*	Cancel Previous Command 21-24
21	Route M-A*	Route Command 53-62 to RT associated with NE Muldem A
22	Route M-B*	Route Command 53-62 to RT associated with NE Muldem B
23	Select M-A* †	Select Scan Point data to only display points associated with NE Muldem A
24	Select M-B* †	Select Scan Point data to only display points associated with NE Muldem B
25	MK HS M-A NE	Make Function Unit & HS Interface SW Muldem A (NE)
26	BRK HS M-A NE	Break Function Unit & HS Interface SW Muldem A(NE)
27	MK HS M-B NE	Make Function Unit & HS Interface SW Muldem B (NE)
28	BRK HS M-B NE	Break Function Unit & HS Interface SW Muldem B(NE)
29	MK LS M-A1 NE	Make LS Interface Switch, Group 1, Muldem A (NE)
30	MK LS M-A2 NE	Make LS Interface Switch, Group 2, Muldem A (NE)
31	MK LS M-A3 NE	Make LS Interface Switch, Group 3, Muldem A (NE)
32	MK LS M-A4 NE	Make LS Interface Switch, Group 4, Muldem A (NE)
33	MK LS M-A5 NE	Make LS Interface Switch, Group 5, Muldem A (NE)
34	MK LS M-A6 NE	Make LS Interface Switch, Group 6, Muldem A (NE)
35	MK LS M-A7 NE	Make LS Interface Switch, Group 7, Muldem A (NE)
36	BRK LS M-A NE	Break LS Interface Switch, Muldem A (NE)
37	MK LS M-B1 NE	Make LS Interface Switch, Group 1, Muldem B (NE)
38	MK LS M-B2 NE	Make LS Interface Switch, Group 2, Muldem B (NE)
39	MK LS M-B3 NE	Make LS Interface Switch, Group 3, Muldem B (NE)
40	MK LS M-B4 NE	Make LS Interface Switch, Group 4, Muldem B (NE)
41	MK LS M-B5 NE	Make LS Interface Switch, Group 5, Muldem B (NE)
42	MK LS M-B6 NE	Make LS Interface Switch, Group 6, Muldem B (NE)
43	MK LS M-B7 NE	Make LS Interface Switch, Group 7, Muldem B (NE)
44	BRK LS M-B NE	Break LS Interface Switch, Muldem B (NE)
45	LK HS M-A NE	Lock Function Unit & HS Interface, Muldem A (NE)
46	UNLK HS M-A NE	Unlock Function Unit & HS Interface, Muldem A (NE)
47	LK HS M-B NE	Lock Function Unit & HS Interface, Muldem B (NE)
48	UNLK HS M-B NE	Unlock Function Unit & HS Interface, Muldem B (NE)

See Notes and Footnotes at the end of the Table

Table 3-3. DDM-1000 Serial Telemetry Remote Commands (Contd)

No.	Remote Command Bit Name (Note)	Remote Command Description (Note)
49	LK LS M-A NE	Lock LS Interface, Group 1-9, Muldem A (NE)
50	UNLK LS M-A NE	Unlock LS Interface, Group 1-9, Muldem A (NE)
51	LK LS M-B NE	Lock LS Interface, Group 1-9, Muldem B (NE)
52	UNLK LS M-B NE	Unlock LS Interface, Group 1-9, Muldem B (NE)
53	(USER ASSIGNED)	Operate Overhead Telemetry Input 1 (to RT)
54	(USER ASSIGNED)	Release Overhead Telemetry Input 1 (to RT)
55	(USER ASSIGNED)	Operate Overhead Telemetry Input 2 (to RT)
56	(USER ASSIGNED)	Release Overhead Telemetry Input 2 (to RT)
57	(USER ASSIGNED)	Operate Overhead Telemetry Input 3 (to RT)
58	(USER ASSIGNED)	Release Overhead Telemetry Input 3 (to RT)
59	(USER ASSIGNED)	Operate Overhead Telemetry Input 4 (to RT)
60	(USER ASSIGNED)	Release Overhead Telemetry Input 4 (to RT)
61	(USER ASSIGNED)	Operate Overhead Telemetry Input 5 (to RT)
62	(USER ASSIGNED)	Release Overhead Telemetry Input 5 (to RT)
63	COMPLETE RESET‡	Execute Complete Reset

Note:

NE - Near End FE - Far End RT - Remote Terminal

* These command are only active if the DDM-1000 is operating in an "open network" configuration.

† The span selector will time out 5-15 minutes after it is activated, or sooner if Command 20 is sent

‡ With an MC90083A1E PROCR2 pack, a remote reset will *not* restore soft set non-service-affecting parameters to default values.

ASCII Terminal Interface

The DDM-1000 provides a serial ASCII terminal interface through a 25-pin female connector mounted on the faceplate of the PROCR1 or PROCR2 pack. This connector provides RS-232C compatible signals suitable for use with most common terminals and is configured as data communication equipment (DCE). The interface operates full duplex at 1200 baud using one start bit, seven data bits, one parity bit, and one stop bit. The parity bit may be either even or odd. (It is recommended that it be set to odd parity for compatibility with other AT&T products.) The following circuits are provided by the connection:

- Circuit BA - Pin Number 2 - Transmitted Data. This circuit carries data from the terminal to DDM-1000.
- Circuit BB - Pin Number 3 - Received Data. This circuit carries data from DDM-1000 to the terminal.
- Circuit CA - Pin Number 4 - Request To Send. This circuit is connected to Clear To Send of the terminal (DTE).
- Circuit CB - Pin Number 5 - Clear To Send. This circuit is connected to Request To Send of the terminal (DTE).
- Circuit AB - Pin Number 7 - Signal Ground. This circuit provides a common return.

Pins 4 and 5 above are shorted together in the DDM-1000 and do not connect to any internal circuitry.

The following terminals are compatible with this interface. It is not an exhaustive list of terminals that are compatible.

AT&T PC6300 Computer
ADM5A Terminal
Radio Shack Model 200 Portable Computer
HP 110 Portable Computer
Teletype 5420 (ATTIS 4420) Terminal
HP 2621 Terminal
Epson HX40 Terminal
TEC Datapad Portable LCD Terminal
NEC PC8201A Portable Computer
Teletype 5410 (ATTIS 4410) Terminal
Teletype 5425 (ATTIS 4425) Terminal
HP 2623 Terminal

Note that if multishelf bus cables (ED-2C833-20, G9) are connected between the DDM-1000 shelves in a bay, the ASCII terminal may be plugged into the connector on the PROCR in any shelf and used to address any other shelf in that bay.

Craft Interface, TBOS and Parallel Telemetry Addresses

Craft Interface and TBOS Addresses

A processor's (PROCR) identity [shelf number (**s=**)] is determined by a hardware interconnection between adjacent processors. The Group 9 (or Group 901) cable provides the interconnection between shelves. The hardware is read by the processor every time the RST button is pressed or when the "`exct-rst:`" command is executed. The hardware address is stored in nonvolatile memory in the processor pack until the next RST is done.

ALL shelves in a bay that have been interconnected with the Group 9 (Group 901) cables must be equipped with a PROCR and power unit to read the correct address of the PROCR. For example, assume a shelf with a PROCR "n" installed is located above other shelves and some (or all of) the shelves have been interconnected with the Group 9 (Group 901) cables. For the correct address of PROCR "n" to be read, the shelves that have been interconnected must have a PROCR and power unit installed, and an RST must be performed. It is only necessary to insert all processors and power units below a given processor for the correct identity to be established when the RST is done. When an RST is performed, the shelf addresses are numbered sequentially. If some shelves have been left empty and not interconnected, then the PROCR addresses will change when the empty shelves are connected, the PROCRs are installed, and an RST is performed. The RSTs do not need to be done in sequential order.

When installing a new processor from the factory or a spare processor whose previous history is unknown, a "RESET" must be done. The RESET procedure is detailed in DP-404 in the INSTALLATION AND MAINTENANCE section of this manual.

When equipping a bay of up to eight shelves, empty shelves or shelf positions may be skipped by using the Group 901 cable. The Group 901 cable is longer than the Group 9 cable and is designed to allow skipping an empty shelf that is usually designated for a future 180 Mb/s shelf. Once the cables are connected, RSTs must be performed as described above. DP-409 describes how to connect the Group 8 and Group 9 (or Group 901) cables.

If it is desired later to include the skipped shelf in the chain, then reconnect the Group 901 (or replace it with a Group 9 cable) from the lower shelf to the skipped shelf and add another Group 9 cable from the skipped shelf to the one above it. It will then be necessary to do an RST on the now included shelf and all shelves above it. With the MC90083A1E PROCR2 pack, when the second shelf is added above the first shelf, it is necessary to press the RST button on the first shelf. It is not necessary to press the RST button on the lower shelves when additional shelves above the second are added.

The above procedures will result in identical shelf addresses for the craft interface commands and the TBOS.

Parallel Telemetry Addresses

The proper cabling procedure for parallel telemetry is described in DP-408 in the INSTALLATION AND MAINTENANCE section of this manual. If the cables are connected to each shelf in the same sequence as the Group 9 (or Group 901) cables, then the parallel telemetry system IDs will coincide with the shelf number for the craft interface and TBOS. The system IDs are determined solely by the cables and the PROCR pack is not involved. Therefore, RSTs have no effect on the system ID numbers.

Control Switches

PROCR

The following pushbutton switches are provided at the front of the PROCR pack:

- ACO/TEST (Alarm Cutoff/LED Test) Control. This switch causes the parallel telemetry points on TLM1 and the office audible alarms to be silenced. The parallel telemetry points on PROCR are not affected. It also initiates an LED test for all packs (except the RST/TST LED on the TLM2 pack) and is easily accessible.
- RST Control. This button can have two effects (reset and restart) depending on when it is pressed.

  1. If the RST button is pressed soon after the PROCR pack is powered, then elapsed time becomes the critical factor in deciding the button's effect. When the PROCR pack is inserted, all the LEDs in the shelf light for about 5 seconds. They will then go off and the MJ LED on the PROCR will flash for 10 seconds. If the RST button is pressed during this 10 second period, then a "reset" is performed. The "reset" clears ALL information stored in EEPROM and forces the microcomputer to completely reinitialize itself.
  2. If the RST button is pressed anytime after the 10 second interval mentioned above (after the MJ LED stops flashing), then a restart (rst) is performed. The PROCR updates its equipment list to reflect the hardware plugged in at the time the RST button is pressed.

  Both of the functions above can be performed from an ASCII terminal using the commands "`exct-reset:`" and "`exct-rst:`" described in the Commands and Reports section of this manual. If these functions are activated while input signals are "failed" or while packs are removed, they will be removed from the list of things to be monitored. This button is also used with the ACO/TEST button to initiate automated turnup procedures. It is recessed to prevent its accidental operation.

MC90191A1 TLM2

The following pushbutton switches are provided at the front of the TLM2 (MC90191A1) pack:

- TEST switch. This switch causes the self-diagnostic routine to be executed on the TLM2. It may be operated at any time and will not cause the loss of any performance data. The switch will also momentarily turn the RST/TST LED (on the TLM2 pack only) on and off to test its operation.
- RST switch. This switch is recessed to prevent accidental operation. It is used to restart the operation of the TLM2 circuit pack. It starts a self-diagnostic test routine to determine the health of the pack, clears all performance-monitoring data, and re-establishes communication with the TABS serial telemetry link. During the restart procedure, the RST/TST LED will blink on and off. When this LED remains off, the restart procedure is completed.

Option Settings

Backplane

For a system operating in the *electrical* mode, a jumper is provided in the installation kit to set the shelf mode of operation to add/drop. The jumper is placed vertically over two pins at the left top of position 59 (labeled "PROCR") of the backplane to identify an Add/Drop terminal (Figure 3-2). If the jumper is on the pins, it must be removed to identify an end-terminal.

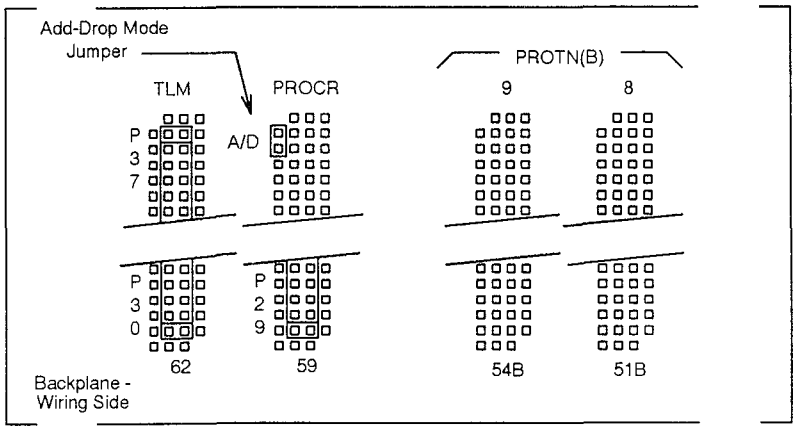

Figure 3-2. DDM-1000 Add/Drop Identification Jumper

DS1 INTFC1 (AEK36)

Several option switches are provided on the DS1 INTFC1 pack to control the electronic line build-out (LBO) function and the pulse format (Figure 3-3). The LBO switches are set based on the length of cable from the DDM-1000 to the DSX-1 (Table 3-4). The pulse format switches are set to either alternate mark inversion (AMI) or B8ZS on a per channel basis (Table 3-5).

Table 3-4. DS1 INTFC1 (AEK36) LBO DIP Switch Settings

LBO Selection					
Cable Length (ft)	Sec. 1	Sec. 2	Sec. 3	Sec. 4	Sec. 5
0 to 133	Closed	Open	Open	Open	Open
>133 to 267	Open	Closed	Open	Open	Open
>267 to 400	Open	Open	Closed	Open	Open
>400 to 533	Open	Open	Open	Closed	Open
>533 to 655	Open	Open	Open	Open	Closed

Table 3-5. DS1 INTFC1 (AEK36) Pulse Format DIP Switch Settings

Pulse Format Selection				
Pulse Format	Sec. 6 Chan. 1	Sec. 7 Chan. 2	Sec. 8 Chan. 3	Sec. 9 Chan. 4
AMI	Closed	Closed	Closed	Closed
B8ZS	Open	Open	Open	Open

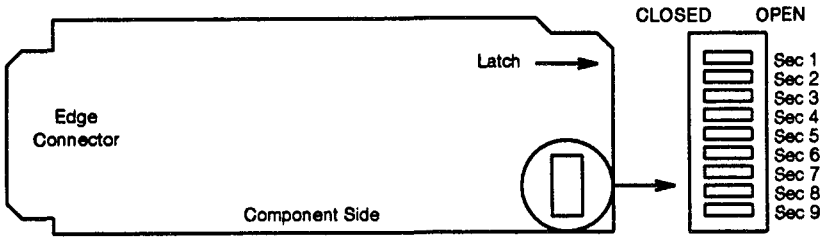

Figure 3-3. DS1 INTFC1 (AEK36) Option Switches

The switches are set by depressing the rocker or moving the slide toward the desired side. For example, to set Chan 1 to AMI code, depress Sec 6 toward the side labeled "CLOSED" in the figure above.

DS1 INTFC2 (AEK36B-Types and AEK36C)

Several option switches are provided on the DS1 INTFC2 packs to control the electronic line build-out function and the pulse format (see Figure 3-4 and) Figure 3-5. The LBO switches are set based on the length of cable from the DDM-1000 to the DSX-1 (Table 3-6). The pulse format switches are set to either AMI or B8ZS on a per channel basis (Table 3-7). Note that switch section 8 is not used. The pulse format on the DS1 INTFC2 packs may also be selected using an ASCII terminal. See description of the "`set-dsx-code:`" command in the "Commands and Reports" section of this manual.

Table 3-6. DS1 INTFC2 (AEK36B-Types and AEK36C) LBO DIP Switch Settings — LBO Selection

Cable Length (ft)	Sec. 1	Sec. 2	Sec. 3
0 to 133	Open	Open	Open
>133 to 267	Open	Open	Closed
>267 to 400	Open	Closed	Open
>400 to 533	Open	Closed	Closed
>533 to 655	Closed	Open	Open

Table 3-7. DS1 INTFC2 (AEK36B-Types and AEK36C) Pulse Format DIP Switch Settings — Pulse Format Selection

Pulse Format	Sec. 4 Chan. 1	Sec. 5 Chan. 2	Sec. 6 Chan. 3	Sec. 7 Chan. 4
AMI	Closed	Closed	Closed	Closed
B8ZS	Open	Open	Open	Open

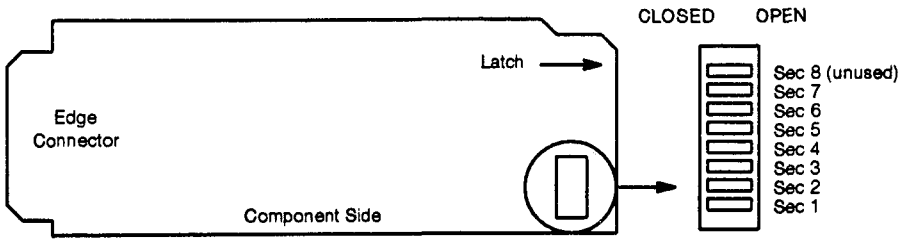

Figure 3-4. DS1 INTFC2 (AEK36B) Option Switches with Option Switch Location

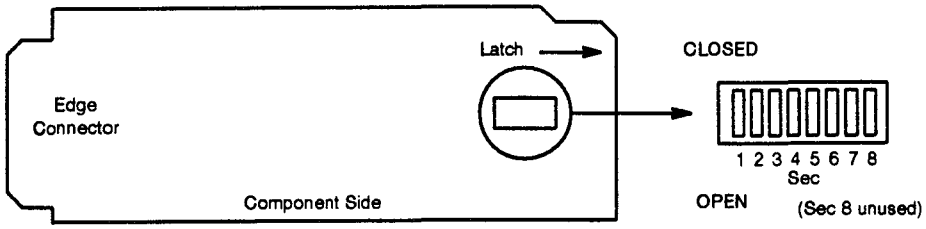

Figure 3-5. DS1 INTFC2 (AEK36B S1:2, S1:3, S1:4 and AEK36C) Option Switches with Option Switch Location

The switches are set by moving the slide toward the desired side. For example, to set Chan 1 to AMI code, slide Sec 4 toward the side labeled "CLOSED" in the figure above.

DS1C INTFC1 (AEK37)

Several option switches are provided on the DS1C INTFC1 pack to control the electronic line build-out function and the pulse format (Figure 3-6). The LBO switches are set based on the length of cable from the DDM-1000 to the DSX-1C (Table 3-8). The pulse format switches are set to either AMI or B8ZS on a per channel basis (Table 3-9). Note that switch section 8 is not used.

Table 3-8. DS1C INTFC1 (AEK37) LBO DIP Switch Settings

LBO Selection					
Cable Length (ft)	Sec. 1	Sec. 2	Sec. 3	Sec. 4	Sec. 5
0 to 133	Closed	Open	Open	Open	Open
>133 to 267	Open	Closed	Open	Open	Open
>267 to 400	Open	Open	Closed	Open	Open
>400 to 533	Open	Open	Open	Closed	Open
>533 to 655	Open	Open	Open	Open	Closed

Table 3-9. DS1C INTFC1 (AEK37) Pulse Format DIP Switch Settings

Pulse Format Selection		
Pulse Format	Sec. 6 Chan. 1	Sec. 7 Chan. 2
AMI	Closed	Closed
B8ZS	Open	Open

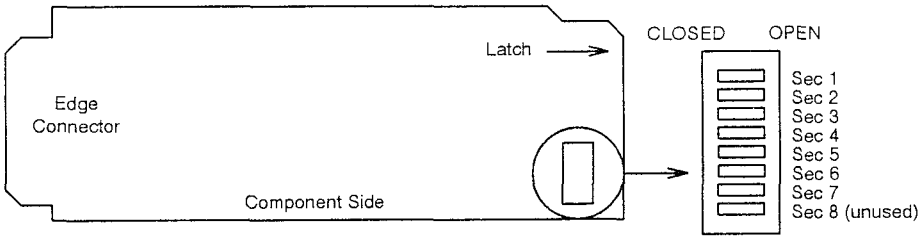

Figure 3-6. DS1C INTFC1 (AEK37) Option Switches

The switches are set by depressing the rocker toward the desired side. For example, to set Chan 1 to AMI code, depress Sec 6 toward the side labeled "CLOSED" in the figure above.

DS2 INTFC1 (AEK38)

An option switch is provided on the DS2 INTFC1 pack to control the electronic line build-out function (Figure 3-7). The LBO switches are set based on the length of cable from the DDM-1000 to the DSX-2 (Table 3-10).

Table 3-10. DS2 INTFC1 (AEK38) LBO DIP Switch Settings

LBO Selection			
Cable Length (ft)	Sec. 1	Sec. 2	Sec. 3
0 to 150	Closed	Closed	Closed
>150 to 300	Open	Closed	Closed
>300 to 450	Closed	Open	Closed
>450 to 600	Open	Open	Closed
>600 to 750	Closed	Closed	Open
>750 to 900	Open	Closed	Open
>900 to 1050	Closed	Open	Open

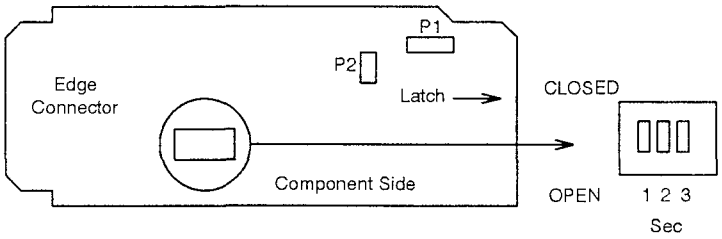

Figure 3-7. DS2 INTFC1 (AEK38) Option Switch

The switch is set by moving the slide toward the desired side, either OPEN or CLOSED, as shown in the above figure. **Plugs P1 and P2 are used for factory testing only and must be present for normal operation.**

MXR1 (AKM2)

Several option switches are provided on the MXR1 pack to control the high-speed multiplex/demultiplex signal format (Figure 3-8). DIP switch 1 controls the demultiplex input format and DIP switch 2 controls the multiplex output format (Table 3-11).

Table 3-11. MXR1 (AKM2) Input/Output Format Selection

	Electrical		Optical	
Switch	S1	S2	S1	S2
Sec 1	Open	Open	Closed	Closed
Sec 2	Open	Open	Closed	Open
Sec 3	Open	Open	Open	Closed
Sec 4	Closed	Closed	Open	Open

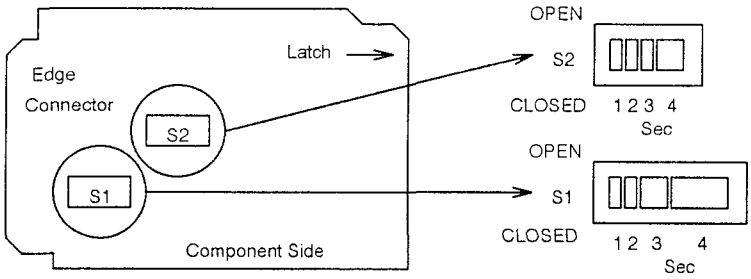

Figure 3-8. MXR1 (AKM2) Input/Output Option Switches

MXR2 (AKM2B)/MXR3 (AKM2C)

Option switches are provided on the MXR2 pack to control the high-speed multiplex/demultiplex signal format (Figure 3-9). DIP switch 1 controls the demultiplex input format and DIP switch 2 controls the multiplex output format (Table 3-12).

Table 3-12. MXR2 (AKM2B)/MXR3 (AKM2C) Input/Output Format Selection

	Electrical		Optical	
Switch	S1	S2	S1	S2
Sec 1	Open	Open	Closed	Closed
Sec 2	Open	Open	Closed	Open
Sec 3	Open	Open	Open	Closed
Sec 4	Closed	Closed	Open	Open

In addition, jumper plugs are provided to activate or deactivate portions of the circuitry for optical or electrical operation (Table 3-13).

Table 3-13. MXR2 (AKM2B)/MXR3 (AKM2C) Option Jumpers

	Install A Jumper Between Pins	
Plug	Electrical	Optical
P1	(none)	1 and 2

Jumper plugs are also provided to activate C-bit mode or M13 mode of operation (Table 3-14).

Table 3-14. MXR2 (AKM2B)/MXR3 (AKM2C) Option Jumpers

	Install A Jumper Between Pins	
Plug	C-Bit Mode	M13 Mode
P3	2 and 3	1 and 2
P4	1 and 2	(none)

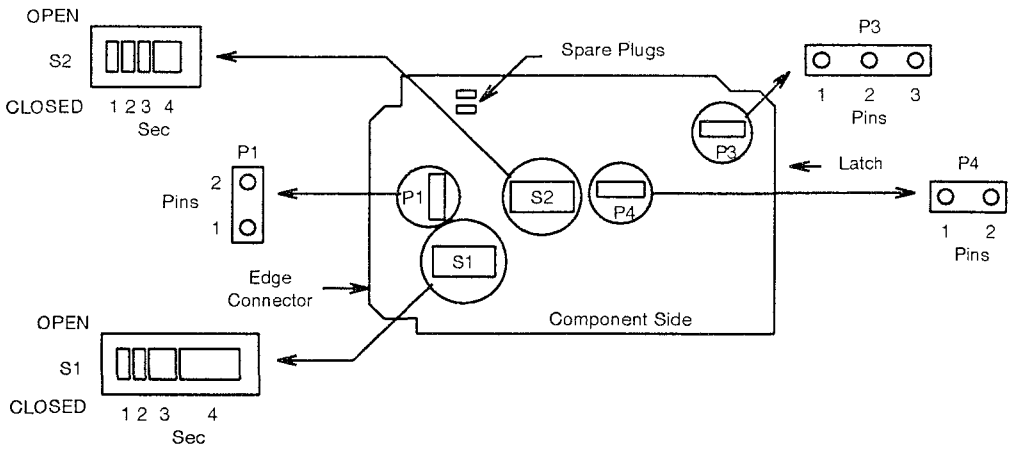

Figure 3-9. MXR2 (AKM2B)/MXR3 (AKM2C) Input/Output Option Switches

DS3U2 (AKM6)

Option switches are provided on the DS3U2 pack for use with future features. (Figure 3-10). The switches must be set as shown. (Table 3-15).

Table 3-15. DS3U2 (AKM6) Option Switch Setting

Switch	Setting
Sec 1	Closed
Sec 2	Closed
Sec 3	Open
Sec 4	Open
Sec 5	Open
Sec 6	Open
Sec 7	Closed
Sec 8	Closed

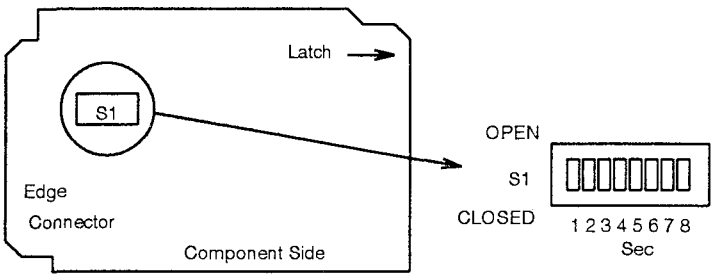

Figure 3-10. DS3U2 (AKM6) Option Switches

ELIU1 (AKM3)

Four option plugs are provided on the ELIU1 pack to control the line build-out function for both muldem A and muldem B (Figure 3-11). The setting of these plugs is based on the length of cable connected to the DDM-1000. (Table 3-16).

Table 3-16. ELIU1 (AKM3) LBO Selection

Cable Length (ft.)			
728B, 734A	KS-19224, L2 Mini-coax	735A	Plug Settings
0 to 225	0 to 75	0 to 125	LBO
>225	>75	>125	NO LBO

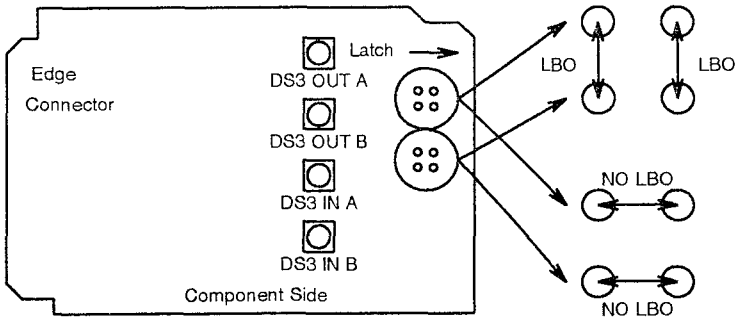

Figure 3-11. ELIU1 (AKM3) LBO Option Switches

OLIU (16E, 16F, 16G or 16K)

Each OLIU pack has an option switch to adjust the output power of the laser (Figure 3-12). This switch is set based on the optical signal loss from the transmit plug to the receive plug (optical facility loss). Table 3-17 lists the switch points for the various combinations of transmitters and receivers. Table 3-18 specifies attenuators that can be used to insert at the receive end of the fiber to build out facility losses between 0 dB and the minimum losses specified under the LW switch settings.

Table 3-17. OLIU (16-Type) Output Level Setting Option Switch

		Transmitter Switch	
		LW	HI
Transmitter	Receiver	Facility Loss	
16E or 16F	16E	0 to 9 dB	9 to 17.5 dB
16E or 16F	16F, 16G or 16K	0 to 11 dB	11 to 22.0 dB
16G	16E	7 to 15 dB	15 to 23.5 dB
16G	16F, 16G or 16K	7 to 16 dB	16 to 28.0 dB
16K	16E	13 to 21 dB	21 to 29.5 dB
16K	16F, 16G, or 16K	13 to 22 dB	22 to 34.0 dB

Table 3-18. Attenuators

In-line type		Barrel Build-outs	
SM to MM (Note)	MM to MM	SM to MM	MM to MM
602A 3 dB	502A 5 dB	601A1 3 dB	501A1 5dB
602B 5 dB	502B 7 dB	601B1 5 dB	501B1 7dB
602C 7 dB	502C 9 dB	601C1 7 dB	501C1 9dB
602D 9 dB	502D 11 dB	601D1 9 dB	501D1 11dB
602E 11 dB	502E 13 dB	601E1 11 dB	501E1 13dB
602F 14.5 dB	502F 15 dB	601F1 14.5 dB	501F1 15dB

Note:

SM - single-mode MM - multimode

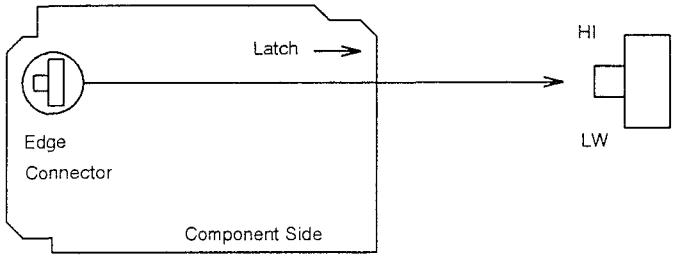

Figure 3-12. OLIU (16E, 16F, 16G or 16K) Option Switch

OLIU (All 16-Type OLIUs)

Each OLIU pack has an option switch to adjust the output power of the laser (Figure 3-12). This switch is set based on the optical signal loss from the transmit plug to the receive plug (optical facility loss). Table 3-17 lists the switch points for the various combinations of transmitters and receivers. Table 3-18 specifies attenuators that can be used to insert at the receive end of the fiber to build out facility losses between 0 dB and the minimum losses specified under the LW switch settings.

Table 3-17. OLIU (16-Type) Output Level Setting Option Switch

		Transmitter Switch	
		LW	HI
Transmitter	Receiver	Facility Loss	
16E or 16F	16E	0 to 9 dB	9 to 18.0 dB
16E or 16F	16E2, or 16F2	0 to 11 dB	11 to 23.0 dB
16E or 16F	16F,16G or 16K	0 to 11 dB	11 to 22.5 dB
16E2	16E	0 to 9 dB	9 to 17.5 dB
16E2	16E2 or 16F2	0 to 11 dB	11 to 22.5 dB
16E2	16F, 16G, or 16K	0 to 11 dB	11 to 22.0 dB
16F2	16E	8 to 15 dB	15 to 23.9 dB
16F2	16E2 or 16F2	0 to 15 dB	15 to 28.9 dB
16F2	16F, 16G, or 16K	8 to 15 dB	15 to 28.4 dB
16G	16E	7 to 15 dB	15 to 24.0 dB
16G	16E2 or 16F2	0 to 11 dB	11 to 29.0 dB
16G	16F, 16G or 16K	7 to 15 dB	15 to 28.5 dB
16K	16E	13 to 21 dB	21 to 30.0 dB
16K	16E2 or 16F2	7 to 15 dB	15 to 35.0 dB
16K	16F, 16G, or 16K	13 to 22 dB	22 to 34.5 dB

Table 3-18. Attenuators

In-Line Type		Barrel Build-Outs	
SM to MM (Note)	MM to MM	SM to MM	MM to MM
602A 3 dB	502A 5 dB	601A1 3 dB	501A1 5dB
602B 5 dB	502B 7 dB	601B1 5 dB	501B1 7dB
602C 7 dB	502C 9 dB	601C1 7 dB	501C1 9dB
602D 9 dB	502D 11 dB	601D1 9 dB	501D1 11dB
602E 11 dB	502E 13 dB	601E1 11 dB	501E1 13dB
602F 14.5 dB	502F 15 dB	601F1 14.5 dB	501F1 15dB

Note: SM - single-mode MM - multimode

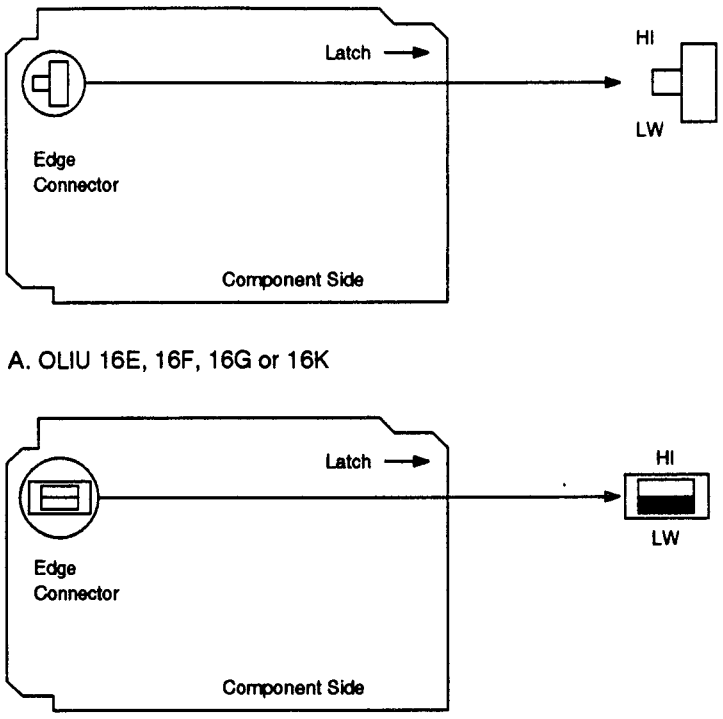

Figure 3-12. OLIU (All 16-Type) Option Switches

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OLIU (20E, 20G or 20K)

Each 20-type OLIU is equipped with an option switch to adjust the output power of the laser (Figure 3-13). This switch is set based on the optical signal loss from the transmit plug to the receive plug (optical facility loss). Table 3-19 lists the OLIU switch settings for the indicated facility loss. Table 3-20 specifies attenuators that can be used to insert at the receive end of the fiber to build out facility losses between 0 dB and the minimum losses specified under the LW switch settings.

Each 20-type OLIU is also equipped with a toggle switch, located under the ejector lever, to permit each of the two DDM-1000 assemblies to control the appropriate LED on the faceplate of the OLIU (Figure 3-14). The switch is in the "up" position if the upper assembly is the OLIU assembly and in the "down" position if the lower assembly is the OLIU assembly.

Table 3-19. OLIU (20-Type) Output Level Setting Option Switch

		Transmitter Switch	
		LW	HI
Transmitter	Receiver	Facility Loss	
20E	20E	0 to 9.0 dB	9 to 15.0 dB
20E	20G or 20K	4.3 to 14.8 dB	14.8 to 20.8 dB
20G	20E	7 to 14.5 dB	14.5 to 20.7 dB
20G	20G or 20K	10 to 20.5 dB	20.5 to 26.5 dB
20K	20E	10 to 17.5 dB	17.5 to 24.0 dB
20K	20G or 20K	13 to 23.5 dB	23.5 to 29.8 dB
20E	20G or 20K	4.3 to 14.8 dB	14.8 to 20.8

Table 3-20. Attenuators

In-line type		Barrel Build-outs	
SM to MM (Note)	MM to MM	SM to MM	MM to MM
602A 3 dB	502A 5 dB	601A1 3 dB	501A1 5dB
602B 5 dB	502B 7 dB	601B1 5 dB	501B1 7dB
602C 7 dB	502C 9 dB	601C1 7 dB	501C1 9dB
602D 9 dB	502D 11 dB	601D1 9 dB	501D1 11dB
602E 11 dB	502E 13 dB	601E1 11 dB	501E1 13dB
602F 14.5 dB	502F 15 dB	601F1 14.5 dB	501F1 15dB

Note: SM - single-mode MM - multimode

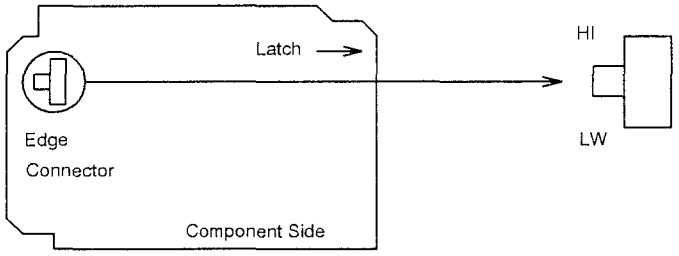

Figure 3-13. OLIU (20-Type) Output Level Setting Option Switch

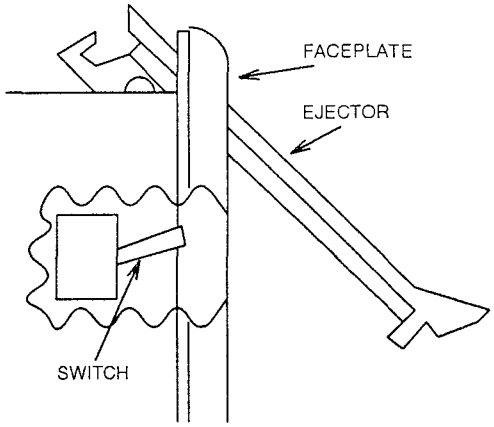

Figure 3-14. OLIU (20-Type) LED Option Switch

PROCR

A switch is provided on the PROCR pack to select alarm options (Figure 3-15). This switch is used to select the alarm levels and to select merging of the far end alarms with the near end alarms (Table 3-21). Section 2 (SEC 2) of this switch has no effect on interprocessor communications (fecom). It only controls whether alarms are to be reported to the far end. Fecom must be separately enabled (turned on) and switch section 2 (SEC 2) must be open for the far end alarms to be reported to the near end. See description of the "`set-shelf-fecom:`" command in the Commands and Reports section.

If the three level alarm option is desired, a TLM1 pack is required because it contains the critical (CR) alarm LED. If the three level alarm option is chosen and a TLM1 pack is not installed, a CR alarm will automatically be downgraded to a MJ. If a TLM2 pack is installed and the three level option is chosen, there will be no alarm indication (CR or MJ); only the NE or FE LED will be lighted.

Table 3-21. PROCR Option Selection

Alarms	DIP Switch Settings	
	Sec. 1	Sec. 2
Two Level (MJ, MN) Near-End Only	Closed	Closed
Two Level (MJ, MN) Near-End OR Far-End*	Closed	Open
Three Level (CR, MJ, MN) Near-End Only	Open	Closed
Three Level (CR, MJ, MN) Near-End OR Far-End*	Open	Open

* In optical mode, near-end and far-end alarming should be enabled (that is, section 2 should be OPEN).

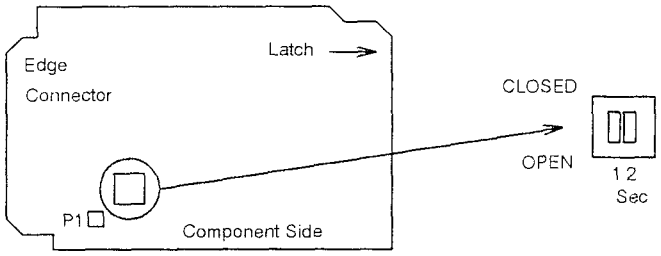

Figure 3-15. PROCR Option Switch

One factory-installed option plug (P1) is on the PROCR pack. This plug is used for factory test purposes and should be left installed for normal operations.

MC90191A1 TLM2

A switch is provided on the TLM2 to select the shelf address (shelf position in bay) for the TABS telemetry link (Figure 3-16). This switch is used to assign the order that the TLM2 (shelf) appears in the TABS link (first shelf, second shelf, etc.) (Table 3-22).

Table 3-22. TLM2 (MC90191A1) Shelf (TABS) Address Selection

	Switch S3		
	Switch Section		
Shelf Address	Sec. 1	Sec. 2	Sec. 3
Shelf 1	Closed	Closed	Closed
Shelf 2	Open	Closed	Closed
Shelf 3	Closed	Open	Closed
Shelf 4	Open	Open	Closed
Shelf 5	Closed	Closed	Open
Shelf 6	Open	Closed	Open
Shelf 7	Closed	Open	Open
Shelf 8	Open	Open	Open

Table 3-23 lists option jumper plugs to be set. Plugs P1 and P3 must always have the factory jumpers connected between pins 1 and 2. Plugs P2 and P4 are set based on whether the TLM2 is the last (highest shelf address) TLM2 on the TABS link (bus).

Table 3-23. TLM2 (MC90191A1) Option Jumpers

	Install A Jumper Between Pins	
Plug	Last TLM2 on TABS Link	*NOT* Last TLM2 on TABS Link
P1	Pins 1 and 2	Pins 1 and 2
P2	Pins 2 and 3	Pins 1 and 2
P3	Pins 1 and 2	Pins 1 and 2
P4	Pins 2 and 3	Pins 1 and 2

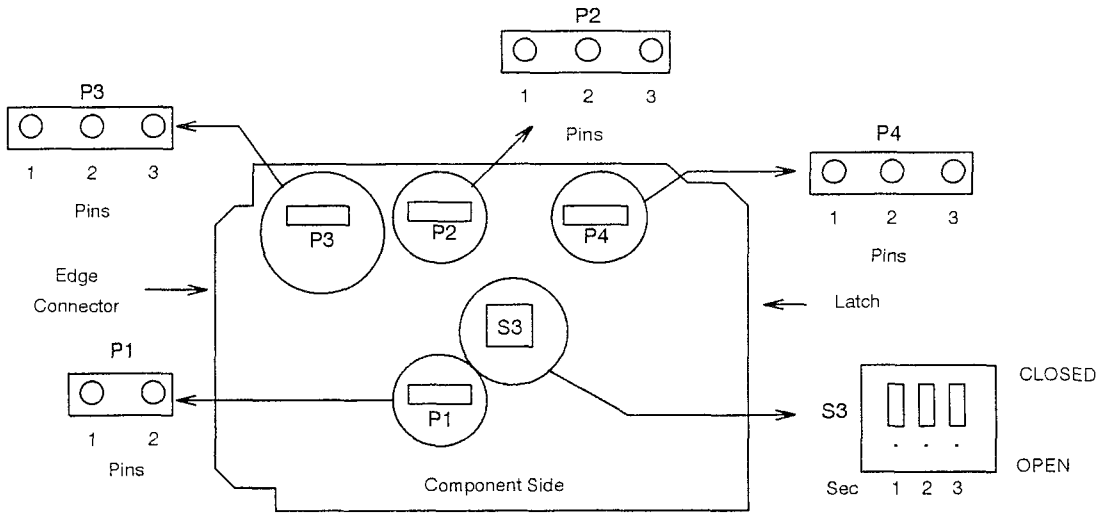

Figure 3-16. TLM2 (MC90191A1) Option Switches

Interconnection Specifications

DC Power, Power Alarm, and Fan Alarm Cabling

The DDM-1000 has two DC power inputs (BAT.A and BAT A RTN, BAT.B and BAT.B RTN) that are used in almost all applications. Each of these inputs must be capable of supplying the power for a complete DDM-1000 if a DDM-1000 power unit fails. If the DDM-1000 is being operated without protection for the power unit, a single DC power input is provided. For this application, the SRV power unit position must be used and the DC power input must be connected to the BAT.A and BAT.A RTN input.

For rear access applications, the DC power connections to DDM-1000 are made using push-on receptacles that are provided with the installation kit for each DDM-1000 shelf. These receptacles are crimped onto 14-gauge stranded wire (KS-13385L1 or equivalent) These wires are connected to bay feeders using "gutter taps" or they are connected directly to the office DC distribution circuit. The bay feeder or the direct connection should be fused for a minimum of 15A for -48V and -24V operation. The recommended gauge wire for the bay feeder will vary depending on the particular application but should not be less than 14 gauge. Each bay feeder should be engineered to carry the maximum DC current that the bay will require when operating at minimum voltage from the office DC distribution circuit. Under this condition, the voltage at the DDM-1000 must be greater than –42.5V for –48V operation and 20V for -24V operation. In rear access applications, the power and fan alarm inputs are not used.

For front access applications using the DDM-1000 wire-wrap assembly, DC power, power alarm, and fan alarm connections for the DDM-1000 are provided on the front of the wire-wrap assembly. For front access applications not using the DDM-1000 wire-wrap assembly, DC power, power alarm, and fan alarm connections for the DDM-1000 are provided through MATE-N-LOCK (AMP) connectors. The mating MATE-N-LOCK (AMP) connectors are supplied with the cable assembly. The numbering of terminals for these connectors is shown in Figure 3-17.

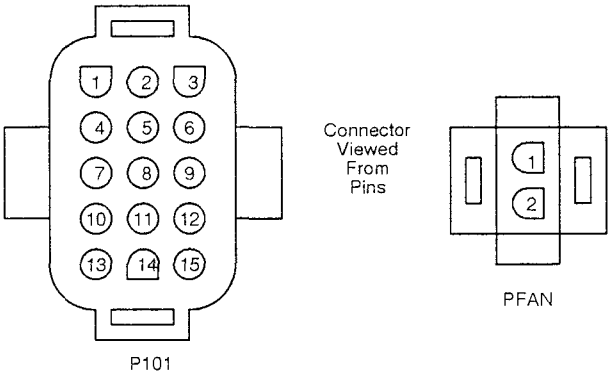

Figure 3-17. MATE-N-LOCK (AMP) Terminal Numbering

Table 3-24 lists the DC power, power alarm and fan alarm connections. The power and alarm connections for the ED-2C841-30, G1 or G2 shelf assemblies are provided by the ED-2C833-20, G13 or G21 cable assemblies. The power and alarm connections for the ED-2C841-30, G3 EMC shelf assembly are provided by the ED-2C833-20, G30 or G31 cable assemblies.

Table 3-24. MATE-N-LOCK (AMP) Power and Alarm Connections

			MATE-N-LOCK End		DDM-1000 End	
Name	Designation	Wire Gauge	Connector	Terminal	Connector	Terminal
DC Power Inputs	BAT A	14	P101	1	BAT A	LUG
	BAT A RTN			3	BAT A RTN	LUG
	BAT B			4	BAT.B	LUG
	BAT.B RTN			6	BAT B RTN	LUG
Power Alarm	RS(PMN)	22		8	J38	A4
	RS(MN)			2		A6
Fan Alarm	BAT A RTN	22	PFAN	1		A7
	RS(FAN)			2		A8

Optical Cabling

The DDM-1000 provides front access for the cabling to and from the cable interconnection point (lightguide stranded-cable interconnect module—LSCIM or equivalent) as a standard offering. Short fiber pigtails exit the lower portion of the OLIU faceplate. The transmit direction pigtail is labeled "OUT." The receive direction pigtail is labeled "IN." These are routed through a channel on the front of the DDM-1000 to the left side of the equipment. Here they connect to fiber jumpers that have been routed down the front of the bay frame from the overhead cable rack. The connector couplings and jumpers that should be used are dependent on the type of the outside plant fiber. If the outside plant fiber is single-mode, then the transmit direction uses a single-mode fiber jumper (LS1A-A or LS1K-K) and coupler (1012A or 1012AK). If the outside plant fiber is multimode, then the transmit direction uses a multimode fiber jumper (LA1A-A or LA1K-K) and coupler (1002A or 1002AK). The receive direction uses a multimode fiber jumper and coupler for both single and multimode outside plant fiber. If the outside plant fiber is single-mode, the receive direction could use a single-mode fiber jumper and coupler.

DSX-3, DACS III, and DACS IV Cabling

The DDM-1000 provides front access for the cabling to and from the DS3 cross-connect (DSX-3), DACS III or DACS IV frames, or other systems with a DS3 interface as a standard offering. The left side of the ED-2C841-30, G1 and G2 shelf assembly has a cutout opening that allows the coaxial cable to be connected to the ELIU1 circuit pack. LBO settings for muldem A or B can be changed through this cutout without removing the ELIU1 circuit pack. Female BNC connectors are mounted on the ELIU1 circuit pack.

The left side of the ED-2C841-30, G3 EMC shelf assembly provides access to the ELIU through mini-coax cable jumpers that are retained on a removable side panel. Each female end of four ED-2C833-20, G32 mini-coax jumper cables is mounted to an access hole in the side panel and the other end is connected to the associated BNC connector on the ELIU1 pack. DSX DS3 cables terminating in female BNC connectors connect to G33 coax jumpers that mate with the G32 cables from the ELIU1. Cables terminating in male BNC connectors connect directly to the G32 cable ELIU connectors. LBO settings for muldem A or B can be changed by carefully removing the side panel without removing the ELIU1 circuit pack.

Cabling to and from the DSX-3 or DACS frames may be 728B, 734A, 735A, or KS-19224,L2 coaxial cables. 734A cable is the preferred replacement for 728B cable. 734A cable is smaller in diameter, more flexible, and has the same loss as 728B cable. 735A cable is the preferred replacement for KS-19224, L2 cable. 735A cable is similar in diameter than the KS-19224 cable and has significantly less loss. 735A cable length can be 250 feet to a DSX-3 cross-connect point (500 feet equipment to equipment) whereas KS-19224, L2 cable is limited to 150 feet (300 feet equipment to equipment).

The designations on the ELIU pack for DS3 connections from the DDM-1000 to the connecting equipment is DS3 OUT A for muldem A and DS3 OUT B for muldem B. The designations on the ELIU pack for DS3 connections from the connecting equipment to the DDM-1000 is DS3 IN A for muldem A and DS3 IN B for muldem B.

The following groups of coaxial cables are available to connect the ELIU pack to a DSX-3 panel. There are two types of AT&T DSX-3 cross-connect panels available. The older ED-2C667-30 panel requires that the cable end be crimped and soldered to the jacks. The newer DSX-3/4 panel requires that the cable end be equipped with a male BNC plug.

ED-2C833-20 cables required for terminating DDM-1000 to an ED-2C667-30 panel are as follows:

- The G34 cable is KS-19224, L2 mini-coax that terminates at the DDM-1000 end with a straight male BNC plug and is unterminated at the other end. G34 cable is fixed length, 150 feet long and consists of one cable assembly.
- The G35 cable is 728B coax cable that terminates at the DDM-1000 end with a short length of KS-19224, L2 mini coax and a straight male BNC plug, and is unterminated at the other end. G35 is ordered to length (maximum 450 feet) and consists of one cable assembly.
- The G44 cable is 734A coax cable that terminates at the DDM-1000 end with a straight male BNC plug and is unterminated at the other end. G44 is ordered to length (maximum 450 feet) and consists of one cable assembly.

If 728B coax is used, it may be terminated in one of the following ways:

- In a straight female BNC connector (330879 from Amp, Inc.). This termination will require the use of an ED-2C833-20, G33 jumper that is terminated at each end with a straight male BNC connector.
- In a G39 cable which is a 2-foot section of KS-19224, L2 mini-coax terminated in a straight male BNC connector on the DDM-1000 end and a 219H splice connector on the other end.
- In right-angled male BNC connectors (28P149-11 from Specialty Connector Co. or 50635 from Amp, Inc. or equivalent) in older installations. **Right-angled connectors are not recommended for any new installations**. (Note that if Specialty Connector's 28P149-11 is used, the sleeve supplied with the connector must be discarded and a KS-15712, L5 sleeve must be used in its place.)

ED-8C724-20 cables required for terminating DDM-1000 to a DSX-3/4 panel are as follows:

- The G333 cable is 735A coax cable that terminates at both ends with a straight male BNC plug. The G333 is fixed length, 150 feet long and includes two cable assemblies, one for the transmit direction and one for the receive direction.
- The G334 cable is 735A coax cable that terminates at both ends with a straight male BNC plug. The G334 is ordered to length (maximum 250 feet) and includes two cable assemblies, one for the transmit direction and one for the receive direction.

ED-2C833-20 cables required for terminating DDM-1000 to DACS III-2000 frames are as follows:

- The G36 cable is KS-19224, L2 mini-coax that terminates on one end with a straight male BNC plug for connecting to the DDM-1000, and terminates on the other end in a 963P connector for connecting to a DACS III-2000. G36 cable is ordered to length (maximum 300 feet) and consists of one cable assembly.
- The G37 cable consists of a short length of KS-19224, L2 mini- coax cable, with a straight male BNC plug for connection to the DDM-1000, that splices to a length of 728B coax cable using a 219H splice connector. The other end of the G37 cable splices to a short length of KS-19224, L2 mini-coax cable that terminates in a 963P connector for connection to a DACS III-2000. The G37 cable is used when the DACS III-2000 is cabled from **below the frame.** G37 is ordered to length (maximum 900 feet) and consists of one cable assembly.
- The G38 cable consists of a short length of KS-19224, L2 mini- coax cable, with a straight male BNC plug for connection to the DDM-1000, that splices to a length of 728B coax cable using a 219H splice connector. The other end of the G38 cable splices to a short length of KS-19224, L2 mini-coax cable that terminates in a 963P connector for connection to a DACS III-2000. The G38 cable is used when the DACS III-2000 is cabled from **above the frame.** G38 is ordered to length (maximum 900 feet) and consists of one cable assembly.
- The G45 cable consists of 734A coax cable that terminates at the DDM-1000 end with a straight male BNC plug and on the other end with a short length of KS-19224, L2 mini-coax, a 219N splice, and a 963P connector. The G45 cable is used to connect the DDM-1000 to the DACS III-2000 when the DACS III-2000 is cabled from **above the frame.** G45 is ordered to length (maximum 900 feet) and consists of one cable assembly.
- The G46 cable is 734A coax cable that terminates at the DDM-1000 end with a straight male BNC plug and on the other end with a short length of KS-19224, L2 mini-coax, a 219N splice, and an 963P connector. The G46 cable is used to connect the DDM-1000 to the DACS III-2000 when the DACS III-2000 is cabled from **below the frame.** G46 is ordered to length (maximum 900 feet) and consists of one cable assembly.

ED-8C724-20 cables required for terminating DDM-1000 to DACS III-2000 frames are as follows:

- The G328 cable is 735A coax that terminates on the DDM-1000 end with a straight male BNC plug and on the other end with a 9821AE connector for terminating in a DACS III-2000. The G328 is fixed length, 150 feet long and includes two cable assemblies, one for the transmit direction and one for the receive direction.
- The G329 cable is 735A coax that terminates on the DDM-1000 end with a straight male BNC plug and on the other end with a 9821AE connector for terminating in a DACS III-2000. The G329 is ordered to length (maximum 500 feet) and includes two cable assemblies, one for the transmit direction and one for the receive direction.
- The G332 cable consists of 734A coax that terminates at the DDM-1000 end with a straight male BNC connector and on the other end with a short length of 735A coax, a 219P splice, and a 9821AE connector for terminating in a DACS III-2000. The G332 is ordered to length (maximum 900 feet) and includes two cable assemblies, one for the transmit direction and one for the receive direction.

ED-2C833-20 cables required for terminating DDM-1000 to DACS IV-2000 frames are as follows:

- The G40 cable is KS-19224, L2 mini-coax that terminates at the DDM-1000 end with a straight male BNC plug and on the other end with a 9821F connector. G40 cable is ordered to length (maximum 300 feet) and consists of one cable assembly.
- The G41 cable is KS-19224, L2 mini-coax that terminates at the DDM-1000 end with a straight male BNC plug and on the other end with a 9821E connector. G41 cable is ordered to length (maximum 300 feet) and consists of one cable assembly.
- The G42 cable is 734A coax cable that terminates at the DDM-1000 end with a straight male BNC plug and on the other end with a short length of KS-19224, L2 mini-coax, a 219N splice, and an 9821F connector. G42 is ordered to length (maximum 900 feet) and consists of one cable assembly.
- The G43 cable is 734A coax cable that terminates at the DDM-1000 end with a straight male BNC plug and on the other end with a short length of KS-19224, L2 mini-coax, a 219N splice, and an 9821E connector. G43 is ordered to length (maximum 900 feet) and consists of one cable assembly.

ED-8C724-20 cables required for terminating DDM-1000 to DACS IV frames are as follows:

- The G323 cable is 735A coax that terminates on the DDM-1000 end with a straight male BNC plug and on the other end with a 9821FA (CA1) connector or a 9821EA (CA2) connector for terminating in a DACS IV. The G323 is fixed length, 150 feet long and includes two cable assemblies, one for the transmit direction and one for the receive direction.
- The G324 cable is 735A coax that terminates on the DDM-1000 end with a straight male BNC plug and on the other end with a 9821FA (CA1) connector or a 9821EA (CA2) connector for terminating in a DACS IV. The G324 is ordered to length (maximum 500 feet) and includes two cable assemblies, one for the transmit direction and one for the receive direction.
- The G327 cable consists of a 9821FA connector, a short length of 735A coax, and a 219P splice that connects to a length of 734A coax and a 9821EA connector, a short length of 735A coax, and a 219P splice that connects to a length of 734A coax. The 9821FA (CA1) connector and the 9821EA (CA2) connector are for terminating in a DACS IV. The 734A coax has a straight male BNC plug for terminating in the DDM-1000. The G327 is ordered to length (maximum 900 feet) and includes two cable assemblies, one for the transmit direction and one for the receive direction.

Low-Speed DSX and AS&C Cabling

Rear Access: 963P1-16 Connector

The DDM-1000 provides rear access connections through 963P1-16 or KS-23478, L1 connectors for all low-speed cross-connect, processor, telemetry, and alarm signals. Power connections are made using push-on receptacles for 221-type terminals on the backplane. The cable assemblies described here are terminated in 963P1-16 or KS-23478, L1 connectors at one end and are unterminated at the other end for wire-wrap installation. The numbering of terminals for the connectors is shown in Figure 3-18.

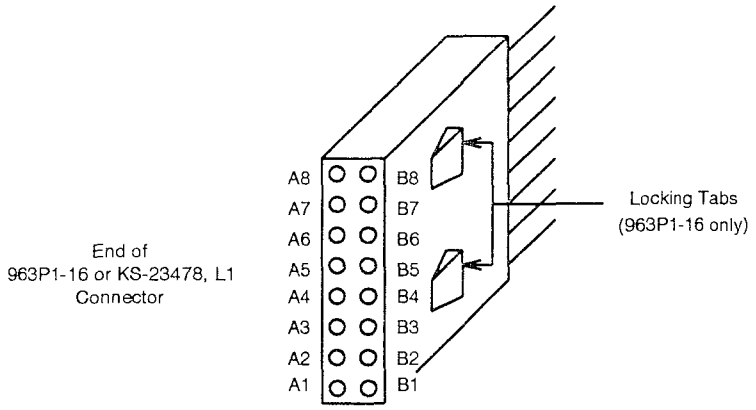

Figure 3-18. 963P1-16 or KS-23478, L1 Terminal Numbering

Low-Speed Signal Connections

Table 3-25 through Table 3-28 list the muldem A and muldem B low-speed signal connections. The tables contain color code information for the wiring within the cable assemblies. The color code on cable groups G1, G101, G102, G2, G201, and G202 is not the same as industry standard; however, the color code on newer cable groups agrees with the standard color code. T and R designate the tip and ring signal pairs. IN and OUT designate the input from and output to the cross-connect. GR x and CHAN y designate the DS2 group and channel for the 28 DS1 signals of each muldem. For DS1C signals, CHAN 3 and CHAN 4 are not used. For DS2 signals, CHAN2, CHAN 3 and CHAN 4 are not used.

The muldem A connections for the ED-2C841-30, G1 or G2 shelves are provided by ED-2C833-20 G1, G101, G102; or G22, G221, G222, G223, or G224 cable assemblies. The muldem B connections for the ED-2C841-30, G1 or G2 shelves are provided by ED-2C833-20 G2, G201, G202; or G23, G231, G232, G233, or G234 cable assemblies.

The muldem A connections for the ED-2C841-30, G3 EMC shelf are provided by ED-2C833-20 G26, G261, G262, or G263 cable assemblies. The muldem B connections for the ED-2C841-30, G3 EMC shelf are provided by ED-2C833-20 G27, G271, G272, or G273 cable assemblies.

For convenience, when connecting the low-speed inputs and outputs at an add/drop site DSX, muldem A inputs should be located next to muldem B outputs and muldem A outputs should be located next to muldem B inputs.

CAUTION:
When installing the low-speed connectors on the backplane, be careful not to bend the pins. Bent pins on low-speed slots may cause service outages on the entire shelf when a low-speed protection switch is activated.

Table 3-25. Muldem A Low-Speed Signal Connections Using ED-2C833-20 G1, G101, G102 and G2, G201, G202 Cable Assemblies (Note)

Muldem A Low-Speed Connections

		In		Out		T/R	T/R	Cable	
Gr	Chan	Designation	Jack	Designation	Jack	Term	Color	In	Out
1	1	1T(1A), 1R(1A)	J8	1T1(1A), 1R1(1A)	J1	B8, B7	W-BR, BR-W	CA3	CA1
	2	2T(1A), 2R(1A)		2T1(1A), 2R1(1A)		B6, B5	W-G, G-W		
	3	3T(1A), 3R(1A)		3T1(1A), 3R1(1A)		B4, B3	W-O, O-W		
	4	4T(1A), 4R(1A)		4T1(1A), 4R1(1A)		B2, B1	W-BL, BL-W		
2	1	1T(2A), 1R(2A)	J9	1T1(2A), 1R1(2A)	J2	B8, B7	R-G, G-R		
	2	2T(2A), 2R(2A)		2T1(2A), 2R1(2A)		B6, B5	R-O, O-R		
	3	3T(2A), 3R(2A)		3T1(2A), 3R1(2A)		B4, B3	R-BL, BL-R		
	4	4T(2A), 4R(2A)		4T1(2A), 4R1(2A)		B2, B1	W-S, S-W		
3	1	1T(3A), 1R(3A)	J10	1T1(3A), 1R1(3A)	J3	B8, B7	BK-O, O-BK		
	2	2T(3A), 2R(3A)		2T1(3A), 2R1(3A)		B6, B5	BK-BL, BL-BK		
	3	3T(3A), 3R(3A)		3T1(3A), 3R1(3A)		B4, B3	R-S, S-R		
	4	4T(3A), 4R(3A)		4T1(3A), 4R1(3A)		B2, B1	R-BR, BR-R		
4	1	1T(4A), 1R(4A)	J11	1T1(4A), 1R1(4A)	J4	B8, B7	Y-BL, BL-Y		
	2	2T(4A), 2R(4A)		2T1(4A), 2R1(4A)		B6, B5	BK-S, S-BK		
	3	3T(4A), 3R(4A)		3T1(4A), 3R1(4A)		B4, B3	BK-BR, BR-BK		
	4	4T(4A), 4R(4A)		4T1(4A), 4R1(4A)		B2, B1	BK-G, G-BK		
1-4	GRD	GRD 5	J8-J11	GRD 1	J1-J4	SHLD	BK		
5	1	1T(5A), 1R(5A)	J12	1T1(5A), 1R1(5A)	J5	B8, B7	W-BR, BR-W		
	2	2T(5A), 2R(5A)		2T1(5A), 2R1(5A)		B6, B5	W-G, G-W		
	3	3T(5A), 3R(5A)		3T1(5A), 3R1(5A)		B4, B3	W-O, O-W		
	4	4T(5A), 4R(5A)		4T1(5A), 4R1(5A)		B2, B1	W-BL, BL-W		
6	1	1T(6A), 1R(6A)	J13	1T1(6A), 1R1(6A)	J6	B8, B7	R-G, G-R		
	2	2T(6A), 2R(6A)		2T1(6A), 2R1(6A)		B6, B5	R-O, O-R		
	3	3T(6A), 3R(6A)		3T1(6A), 3R1(6A)		B4, B3	R-BL, BL-R	CA4	CA2
	4	4T(6A), 4R(6A)		4T1(6A), 4R1(6A)		B2, B1	W-S, S-W		
7	1	1T(7A), 1R(7A)	J14	1T1(7A), 1R1(7A)	J7	B8, B7	BK-O, O-BK		
	2	2T(7A), 2R(7A)		2T1(7A), 2R1(7A)		B6, B5	BK-BL, BL-BK		
	3	3T(7A), 3R(7A)		3T1(7A), 3R1(7A)		B4, B3	R-S, S-R		
	4	4T(7A), 4R(7A)		4T1(7A), 4R1(7A)		B2, B1	R-BR, BR-R		
5-7	GRD	GRD 6	J12-J14	GRD 2	J5-J7	SHLD	BK		

Note:

These cables have been discontinued [Discontinued Availability (DA)]. They are replaced by G22, G23, G221, G222, G231, and G232, respectively.

Table 3-26. Muldem B Low-Speed Signal Connections Using ED-2C833-20 G1, G101, G102 and G2, G201, G202 Cable Assemblies (Note)

Muldem B Low-Speed Connections

		In		Out		T/R	T/R	Cable	
Gr	Chan	Designation	Jack	Designation	Jack	Term	Color	In	Out
1	1	1T(1B), 1R(1B)	J22	1T1(1B), 1R1(1B)	J15	B8, B7	W-BR, BR-W	CA3	CA1
	2	2T(1B), 2R(1B)		2T1(1B), 2R1(1B)		B6, B5	W-G, G-W		
	3	3T(1B), 3R(1B)		3T1(1B), 3R1(1B)		B4, B3	W-O, O-W		
	4	4T(1B), 4R(1B)		4T1(1B), 4R1(1B)		B2, B1	W-BL, BL-W		
2	1	1T(2B), 1R(2B)	J23	1T1(2B), 1R1(2B)	J16	B8, B7	R-G, G-R		
	2	2T(2B), 2R(2B)		2T1(2B), 2R1(2B)		B6, B5	R-O, O-R		
	3	3T(2B), 3R(2B)		3T1(2B), 3R1(2B)		B4, B3	R-BL, BL-R		
	4	4T(2B), 4R(2B)		4T1(2B), 4R1(2B)		B2, B1	W-S, S-W		
3	1	1T(3B), 1R(3B)	J24	1T1(3B), 1R1(3B)	J17	B8, B7	BK-O, O-BK		
	2	2T(3B), 2R(3B)		2T1(3B), 2R1(3B)		B6, B5	BK-BL, BL-BK		
	3	3T(3B), 3R(3B)		3T1(3B), 3R1(3B)		B4, B3	R-S, S-R		
	4	4T(3B), 4R(3B)		4T1(3B), 4R1(3B)		B2, B1	R-BR, BR-R		
4	1	1T(4B), 1R(4B)	J25	1T1(4B), 1R1(4B)	J18	B8, B7	Y-BL, BL-Y		
	2	2T(4B), 2R(4B)		2T1(4B), 2R1(4B)		B6, B5	BK-S, S-BK		
	3	3T(4B), 3R(4B)		3T1(4B), 3R1(4B)		B4, B3	BK-BR, BR-BK		
	4	4T(4B), 4R(4B)		4T1(4B), 4R1(4B)		B2, B1	BK-G, G-BK		
1-4	GRD	GRD 7	J22-J25	GRD 3	J15-J18	SHLD	BK		
5	1	1T(5B), 1R(5B)	J26	1T1(5B), 1R1(5B)	J19	B8, B7	W-BR, BR-W	CA4	CA2
	2	2T(5B), 2R(5B)		2T1(5B), 2R1(5B)		B6, B5	W-G, G-W		
	3	3T(5B), 3R(5B)		3T1(5B), 3R1(5B)		B4, B3	W-O, O-W		
	4	4T(5B), 4R(5B)		4T1(5B), 4R1(5B)		B2, B1	W-BL, BL-W		
6	1	1T(6B), 1R(6B)	J27	1T1(6B), 1R1(6B)	J20	B8, B7	R-G, G-R		
	2	2T(6B), 2R(6B)		2T1(6B), 2R1(6B)		B6, B5	R-O, O-R		
	3	3T(6B), 3R(6B)		3T1(6B), 3R1(6B)		B4, B3	R-BL, BL-R		
	4	4T(6B), 4R(6B)		4T1(6B), 4R1(6B)		B2, B1	W-S, S-W		
7	1	1T(7B), 1R(7B)	J28	1T1(7B), 1R1(7B)	J21	B8, B7	BK-O, O-BK		
	2	2T(7B), 2R(7B)		2T1(7B), 2R1(7B)		B6, B5	BK-BL, BL-BK		
	3	3T(7B), 3R(7B)		3T1(7B), 3R1(7B)		B4, B3	R-S, S-R		
	4	4T(7B), 4R(7B)		4T1(7B), 4R1(7B)		B2, B1	R-BR, BR-R		
5-7	GRD	GRD 8	J26-J28	GRD 4	J19-J21	SHLD	BK		

Note:

These cables have been discontinued [Discontinued Availability (DA)]. They are replaced by G22, G23, G221, G222, G231, and G232, respectively

Table 3-27. Muldem A Low-Speed Connections [ED-2C833-20 G22 (G26), G221 (G261), G222 (G262), G223 (G263), G224 and G23 (G27), G231 (G271), G232 (G272), G233 (G273), G234 Cables]

Muldem A Low-Speed Connections

		In		Out		T/R	T/R	Cable	
Gr	Chan	Designation	Jack	Designation	Jack	Term	Color	In	Out
1	1	1T(1A), 1R(1A)	J8	1T1(1A), 1R1(1A)	J1	B8, B7	W-BL, BL-W	CA3	CA1
	2	2T(1A), 2R(1A)		2T1(1A), 2R1(1A)		B6, B5	W-O, O-W		
	3	3T(1A), 3R(1A)		3T1(1A), 3R1(1A)		B4, B3	W-G, G-W		
	4	4T(1A), 4R(1A)		4T1(1A), 4R1(1A)		B2, B1	W-BR, BR-W		
2	1	1T(2A), 1R(2A)	J9	1T1(2A), 1R1(2A)	J2	B8, B7	W-S, S-W		
	2	2T(2A), 2R(2A)		2T1(2A), 2R1(2A)		B6, B5	R-BL, BL-R		
	3	3T(2A), 3R(2A)		3T1(2A), 3R1(2A)		B4, B3	R-O, O-R		
	4	4T(2A), 4R(2A)		4T1(2A), 4R1(2A)		B2, B1	R-G, G-R		
3	1	1T(3A), 1R(3A)	J10	1T1(3A), 1R1(3A)	J3	B8, B7	R-BR, BR-R		
	2	2T(3A), 2R(3A)		2T1(3A), 2R1(3A)		B6, B5	R-S, S-R		
	3	3T(3A), 3R(3A)		3T1(3A), 3R1(3A)		B4, B3	BK-BL, BL-BK		
	4	4T(3A), 4R(3A)		4T1(3A), 4R1(3A)		B2, B1	BK-O, O-BK		
4	1	1T(4A), 1R(4A)	J11	1T1(4A), 1R1(4A)	J4	B8, B7	BK-G, G-BK		
	2	2T(4A), 2R(4A)		2T1(4A), 2R1(4A)		B6, B5	BK-BR, BR-BK		
	3	3T(4A), 3R(4A)		3T1(4A), 3R1(4A)		B4, B3	BK-S, S-BK		
	4	4T(4A), 4R(4A)		4T1(4A), 4R1(4A)		B2, B1	Y-BL, BL-Y		
1-4	GRD	GRD 5	J8-J11	GRD 1	J1-J4	SHLD	BK		
5	1	1T(5A), 1R(5A)	J12	1T1(5A), 1R1(5A)	J5	B8, B7	W-BL, BL-W		
	2	2T(5A), 2R(5A)		2T1(5A), 2R1(5A)		B6, B5	W-O, O-W		
	3	3T(5A), 3R(5A)		3T1(5A), 3R1(5A)		B4, B3	W-G, G-W		
	4	4T(5A), 4R(5A)		4T1(5A), 4R1(5A)		B2, B1	W-BR, BR-W		
6	1	1T(6A), 1R(6A)	J13	1T1(6A), 1R1(6A)	J6	B8, B7	W-S, S-W		
	2	2T(6A), 2R(6A)		2T1(6A), 2R1(6A)		B6, B5	R-BL, BL-R		
	3	3T(6A), 3R(6A)		3T1(6A), 3R1(6A)		B4, B3	R-O, O-R	CA4	CA2
	4	4T(6A), 4R(6A)		4T1(6A), 4R1(6A)		B2, B1	R-G, G-R		
7	1	1T(7A), 1R(7A)	J14	1T1(7A), 1R1(7A)	J7	B8, B7	R-BR, BR-R		
	2	2T(7A), 2R(7A)		2T1(7A), 2R1(7A)		B6, B5	R-S, S-R		
	3	3T(7A), 3R(7A)		3T1(7A), 3R1(7A)		B4, B3	BK-BL, BL-BK		
	4	4T(7A), 4R(7A)		4T1(7A), 4R1(7A)		B2, B1	BK-O, O-BK		
5-7	GRD	GRD 6	J12-J14	GRD 2	J5-J7	SHLD	BK		

Table 3-28. Muldem B Low-Speed Connections [ED-2C833-20 G22 (G26), G221 (G261), G222 (G262), G223 (G263), G224 and G23 (G27), G231 (G271), G232 (G272), G233 (G273), G234 Cables]

Muldem B Low-Speed Connections

		In		Out		T/R	T/R	Cable	
Gr	Chan	Designation	Jack	Designation	Jack	Term	Color	In	Out
1	1	1T(1B), 1R(1B)	J22	1T1(1B), 1R1(1B)	J15	B8, B7	W-BL, BL-W	CA3	CA1
	2	2T(1B), 2R(1B)		2T1(1B), 2R1(1B)		B6, B5	W-O, O-W		
	3	3T(1B), 3R(1B)		3T1(1B), 3R1(1B)		B4, B3	W-G, G-W		
	4	4T(1B), 4R(1B)		4T1(1B), 4R1(1B)		B2, B1	W-BR, BR-W		
2	1	1T(2B), 1R(2B)	J23	1T1(2B), 1R1(2B)	J16	B8, B7	W-S, S-W		
	2	2T(2B), 2R(2B)		2T1(2B), 2R1(2B)		B6, B5	R-BL, BL-R		
	3	3T(2B), 3R(2B)		3T1(2B), 3R1(2B)		B4, B3	R-O, O-R		
	4	4T(2B), 4R(2B)		4T1(2B), 4R1(2B)		B2, B1	R-G, G-R		
3	1	1T(3B), 1R(3B)	J24	1T1(3B), 1R1(3B)	J17	B8, B7	R-BR, BR-R		
	2	2T(3B), 2R(3B)		2T1(3B), 2R1(3B)		B6, B5	R-S, S-R		
	3	3T(3B), 3R(3B)		3T1(3B), 3R1(3B)		B4, B3	BK-BL, BL-BK		
	4	4T(3B), 4R(3B)		4T1(3B), 4R1(3B)		B2, B1	BK-O, O-BK		
4	1	1T(4B), 1R(4B)	J25	1T1(4B), 1R1(4B)	J18	B8, B7	BK-G, G-BK		
	2	2T(4B), 2R(4B)		2T1(4B), 2R1(4B)		B6, B5	BK-BR, BR-BK		
	3	3T(4B), 3R(4B)		3T1(4B), 3R1(4B)		B4, B3	BK-S, S-BK		
	4	4T(4B), 4R(4B)		4T1(4B), 4R1(4B)		B2, B1	Y-BL, BL-Y		
1-4	GRD	GRD 7	J22-J25	GRD 3	J15-J18	SHLD	BK		
5	1	1T(5B), 1R(5B)	J26	1T1(5B), 1R1(5B)	J19	B8, B7	W-BL, BL-W	CA4	CA2
	2	2T(5B), 2R(5B)		2T1(5B), 2R1(5B)		B6, B5	W-O, O-W		
	3	3T(5B), 3R(5B)		3T1(5B), 3R1(5B)		B4, B3	W-G, G-W		
	4	4T(5B), 4R(5B)		4T1(5B), 4R1(5B)		B2, B1	W-BR, BR-W		
6	1	1T(6B), 1R(6B)	J27	1T1(6B), 1R1(6B)	J20	B8, B7	W-S, S-W		
	2	2T(6B), 2R(6B)		2T1(6B), 2R1(6B)		B6, B5	R-BL, BL-R		
	3	3T(6B), 3R(6B)		3T1(6B), 3R1(6B)		B4, B3	R-O, O-R		
	4	4T(6B), 4R(6B)		4T1(6B), 4R1(6B)		B2, B1	R-G, G-R		
7	1	1T(7B), 1R(7B)	J28	1T1(7B), 1R1(7B)	J21	B8, B7	R-BR, BR-R		
	2	2T(7B), 2R(7B)		2T1(7B), 2R1(7B)		B6, B5	R-S, S-R		
	3	3T(7B), 3R(7B)		3T1(7B), 3R1(7B)		B4, B3	BK-BL, BL-BK		
	4	4T(7B), 4R(7B)		4T1(7B), 4R1(7B)		B2, B1	BK-O, O-BK		
5-7	GRD	GRD 8	J26-J28	GRD 4	J19-J21	SHLD	BK		

Telemetry and Office Alarm Connections

The following tables list the telemetry and office alarm connections:

- Table 3-29 lists the overhead telemetry connections when using a TLM1 (AKM4) circuit pack. The overhead telemetry connections for shelves equipped with a TLM1 are provided by the ED-2C833-20 G3, G301, or G302 cable assembly.
- Table 3-30 lists the overhead telemetry connections when using an MC90191A1 TLM2 circuit pack. No cable is provided for the TLM2 connections and, if used, they must be locally wired.
- Table 3-31 lists the parallel telemetry connections. Parallel telemetry connections are provided by the ED-2C833-20 G4, G401, or G402 cable assembly.
- Table 3-32 and Table 3-33 list the serial telemetry connections. The TBOS serial telemetry connections are provided by the ED-2C833-20 G8, G801, or G802 cable assembly. The TABS serial telemetry connections are provided by the ED-2C833-20 G24 (G241) or G25 (G251) cable assembly.
- Table 3-34 lists the office alarm connections. The office alarm connections are provided by the ED-2C833-20 G6, G601, or G602 cable assembly. An alarm isolation unit (AIU) must be provided between the bay and the office alarms. See "Alarm Precautions" in this section of the manual.

Table 3-29. Rear Access Overhead Telemetry Connections Using TLM1 (AKM4)

	Input (Optical Isolators) (From Local Wiring)			Output (Relays) (To Local Wiring)			
Name	Desig	Color	Conn	Desig	Color	Conn	Term
Common	BAT. A RTN	W-BL	J35	SI2RR	R-BR	J37	A1
1	RS(1)	BL-W		SI2(1)	BR-R		A2
2	RS(2)	W-O		SI2(2)	R-S		A3
3	RS(3)	O-W		SI2(3)	S-R		A4
4	RS(4)	W-G		SI2(4)	BK-BL		A5
5	RS(5)	G-W		SI2(5)	BL-BK		A6
6	RS(6)	W-BR		SI2(6)	BK-O		A7
7	RS(7)	BR-W		SI2(7)	O-BK		A8
8	RS(8)	W-S		SI2(8)	BK-G		B1
9	RS(9)	S-W		SI2(9)	G-BK		B2
10	RS(10)	R-BL		SI2(10)	BK-BR		B3
11	RS(11)	BL-R		SI2(11)	BR-BK		B4
12	RS(12)	R-O		SI2(12)	BK-S		B5
13	RS(13)	O-R		SI2(13)	S-BK		B6
14	RS(14)	R-G		SI2(14)	Y-BL		B7
15	RS(15)	G-R		SI2(15)	BL-Y		B8

Table 3-30. Rear Access Overhead Telemetry Connections Using TLM2 (MC90191A1)

	Input (Optical Isolators) (From Local Wiring)		Output (Relays) (To Local Wiring)		
Name	Desig	Conn	Desig	Conn	Term
Common	BAT. A RTN	J35	SI2R	J37	A1
1	RS(1)		SI2(1)		A2
2	RS(2)		SI2(2)		A3
3	RS(3)		SI2(3)		A4
4	RS(4)		SI2(4)		A5
5	RS(5)		SI2(5)		A6
6	—		SI2(6)[1]		A7
7	RS(6)*		—		A8

* With a TLM2 pack, an input on RS(6) (terminal A8) at one end produces an output on SI2(6) (terminal A7) at the other end.

Table 3-31. Rear Access Parallel Telemetry Connections (Outputs)

Name	Desig	Conn	Term	Color	Type Closure (Note)
ACO Control Common	BAT. A RTN	J31	A1	W-BL	—
ACO Control	RS(ACO)		A2	BL-W	O - TLM1
Alarm & Status Common	SI1R		B7	R-G	—
Critical Alarm	SI1(CR)		B5	R-O	R - TLM1
Major Alarm Visible	SI1(MJ)		B8	G-R	R - PROCR
Major Alarm Audible	SI1(MJA)		B4	BL-R	O - TLM1
Minor Alarm Visible	SI1(MN)		A8	BR-W	R - PROCR
Minor Alarm Audible	SI1(MNA)		B3	R-BL	O - TLM1
Power Minor Alarm	SI1(PMN)		B2	S-W	R - TLM1
Near End Status	SI1(NE)		B1	W-S	O - TLM1
Far End Status	SI1(FE)		B6	O-R	O - TLM1
Carrier Line Failure Status	SI1(CLF)		A7	W-BR	O - TLM1
High-Speed Status	SI1(HS)		A6	G-W	O - TLM1
Low-Speed Status	SI1(LS)		A5	W-G	O - TLM1
Incoming Status	SI1(INC)		A4	O-W	O - TLM1
System Identification - Shelf 1	SI1(ID1)		A3	W-OR	R - TLM1
System Identification - Shelf 2	SI1(ID2)	J36	B8	BL-Y	
System Identification - Shelf 3	SI1(ID3)		B7	S-BK	
System Identification - Shelf 4	SI1(ID4)		B6	BK-S	
System Identification - Shelf 5	SI1(ID5)		B5	BR-BK	R - TLM1
System Identification - Shelf 6	SI1(ID6)		B4	BK-BR	
System Identification - Shelf 7	SI1(ID7)		B3	G-BK	
System Identification - Shelf 8	SI1(ID8)		B2	BK-G	

Note:

R = Relay
O = Optical Isolator

Table 3-32. TBOS Serial Telemetry Connections [MC90083A( ) PROCR]

Name	Desig	Conn	Term	Color
Transmitted True Data To Telemetry Equipment	TDP	J29	A6	G-W
Transmitted Inverted Data To Telemetry Equipment	TDN		A5	W-G
Received True Data From Telemetry Equipment	RDP		B6	BR-W
Received Inverted Data From Telemetry Equipment	RDN		B5	W-BR

Table 3-33. TABS Serial Telemetry Connections (MC90191A1 TLM2)

Name	Desig	Conn	Term	Color
Transmitted True Data To Telemetry Equipment	TABOP	J35	B6	W-O
Transmitted Inverted Data To Telemetry Equipment	TABON		B7	O-W
Received True Data From Telemetry Equipment	TABIP		B2	W-BL
Received Inverted Data From Telemetry Equipment	TABIN		B3	BL-W

Table 3-34. Rear Access Office Alarm Connections (Outputs)

Name	Desig	Conn	Term	Color	Type of Closure
Critical Alarm Visible Return	CRVR	J30	B5	R-O	Relays
Critical Alarm Visible	CRV		B6	O-R	on
Critical Alarm Audible Return	CRR		B7	R-G	
Critical Alarm Audible	CR		B8	G-R	TLM1
Major Alarm Visible Return	MJVR		A5	W-G	
Major Alarm Visible	MJV		A6	G-W	Relays
Major Alarm Audible Return	MJR		A7	W-BR	
Major Alarm Audible	MJ		A8	BR-W	
Minor Alarm Visible Return	MNVR		A1	W-BL	on
Minor Alarm Visible	MNV		A2	BL-W	PROCR
Minor Alarm Audible Return	MNR		A3	W-O	
Minor Alarm Audible	MN		A4	O-W	
Power Minor Alarm Visible Return	PMNVR		B1	W-S	Relays
Power Minor Alarm Visible	PMNV		B2	S-W	on
Power Minor Alarm Audible Return	PMNR		B3	R-BL	
Power Minor Alarm Audible	PMN		B4	BL-R	TLM1

Front Access: 710-SD1-25 Connector

The DDM-1000 provides front access connections through 710-SD1-25 connectors for all low-speed cross-connect and overhead telemetry signals that would be used at a remote terminal site. The mating connectors (710-BD1-25) are not supplied with the cable assemblies. The numbering of terminals for this connector is shown in Figure 3-19.

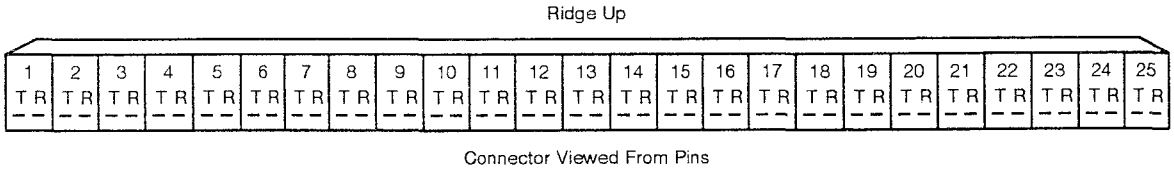

Figure 3-19. 710-SD1-25 Terminal Numbering

Table 3-35 and Table 3-36 lists the muldem A and muldem B low-speed signal connections. The muldem A connections for the ED-2C841-30, G1 or G2 shelf assembly are provided by the ED-2C833-20, G10 cable assembly. The muldem B connections for the ED-2C841-30, G1 or G2 shelf assembly are provided by the ED-2C833-20, G11 cable assembly. The muldem A connections for the ED-2C841-30, G3 EMC shelf assembly are provided by the ED-2C833-20, G28 cable assembly. The muldem B connections for the ED-2C841-30, G3 EMC shelf assembly are provided by the ED-2C833-20, G29 cable assembly. T and R designate the tip and ring signal pairs. IN and OUT designate the input from and output to the cross-connect. GR x and CHAN y designate the DS2 group and channel for the 28 DS1 signals of each muldem. For DS1C signals, CHAN 3 and CHAN 4 are not used. For DS2 signals, CHAN 2, CHAN 3, and CHAN 4 are not used. Table 3-37 and Table 3-38 list the overhead telemetry connections. The overhead telemetry connections are provided by the ED-2C833-20, G12 cable assembly.

Table 3-35. 710-SD1-25 Muldem A Low-Speed Signal Connections

Muldem A Low-Speed Connections

Gr	Chan	In		Out		T/R
		Designation	Conn	Designation	Conn	Term
1	1	1T(1A), 1R(1A)		1T1(1A), 1R1(1A)		1T, 1R
	2	2T(1A), 2R(1A)		2T1(1A), 2R1(1A)		2T, 2R
	3	3T(1A), 3R(1A)		3T1(1A), 3R1(1A)		3T, 3R
	4	4T(1A), 4R(1A)		4T1(1A), 4R1(1A)		4T, 4R
2	1	1T(2A), 1R(2A)		1T1(2A), 1R1(2A)		5T, 5R
	2	2T(2A), 2R(2A)		2T1(2A), 2R1(2A)		6T, 6R
	3	3T(2A), 3R(2A)		3T1(2A), 3R1(2A)		7T, 7R
	4	4T(2A), 4R(2A)		4T1(2A), 4R1(2A)		8T, 8R
3	1	1T(3A), 1R(3A)	JD3	1T1(3A), 1R1(3A)	JD1	9T, 9R
	2	2T(3A), 2R(3A)		2T1(3A), 2R1(3A)		10T, 10R
	3	3T(3A), 3R(3A)		3T1(3A), 3R1(3A)		11T, 11R
	4	4T(3A), 4R(3A)		4T1(3A), 4R1(3A)		12T, 12R
4	1	1T(4A), 1R(4A)		1T1(4A), 1R1(4A)		13T, 13R
	2	2T(4A), 2R(4A)		2T1(4A), 2R1(4A)		14T, 14R
	3	3T(4A), 3R(4A)		3T1(4A), 3R1(4A)		15T, 15R
	4	4T(4A), 4R(4A)		4T1(4A), 4R1(4A)		16T, 16R
1-4	GRD	GRD 5		GRD 1		17T
5	1	1T(5A), 1R(5A)		1T1(5A), 1R1(5A)		1T, 1R
	2	2T(5A), 2R(5A)		2T1(5A), 2R1(5A)		2T, 2R
	3	3T(5A), 3R(5A)		3T1(5A), 3R1(5A)		3T, 3R
	4	4T(5A), 4R(5A)		4T1(5A), 4R1(5A)		4T, 4R
6	1	1T(6A), 1R(6A)		1T1(6A), 1R1(6A)		5T, 5R
	2	2T(6A), 2R(6A)		2T1(6A), 2R1(6A)		6T, 6R
	3	3T(6A), 3R(6A)	JD4	3T1(6A), 3R1(6A)	JD2	7T, 7R
	4	4T(6A), 4R(6A)		4T1(6A), 4R1(6A)		8T, 8R
7	1	1T(7A), 1R(7A)		1T1(7A), 1R1(7A)		9T, 9R
	2	2T(7A), 2R(7A)		2T1(7A), 2R1(7A)		10T, 10R
	3	3T(7A), 3R(7A)		3T1(7A), 3R1(7A)		11T, 11R
	4	4T(7A), 4R(7A)		4T1(7A), 4R1(7A)		12T, 12R
5-7	GRD	GRD 6		GRD 2		13T

Table 3-36. 710-SD1-25 Muldem B Low-Speed Signal Connections

Muldem B Low-Speed Connections

		In		Out		T/R
Gr	Chan	Designation	Conn	Designation	Conn	Term
1	1	1T(1B), 1R(1B)		1T1(1B), 1R1(1B)		1T, 1R
	2	2T(1B), 2R(1B)		2T1(1B), 2R1(1B)		2T, 2R
	3	3T(1B), 3R(1B)		3T1(1B), 3R1(1B)		3T, 3R
	4	4T(1B), 4R(1B)		4T1(1B), 4R1(1B)		4T, 4R
2	1	1T(2B), 1R(2B)		1T1(2B), 1R1(2B)		5T, 5R
	2	2T(2B), 2R(2B)		2T1(2B), 2R1(2B)		6T, 6R
	3	3T(2B), 3R(2B)		3T1(2B), 3R1(2B)		7T, 7R
	4	4T(2B), 4R(2B)		4T1(2B), 4R1(2B)		8T, 8R
3	1	1T(3B), 1R(3B)	JD7	1T1(3B), 1R1(3B)	JD5	9T, 9R
	2	2T(3B), 2R(3B)		2T1(3B), 2R1(3B)		10T, 10R
	3	3T(3B), 3R(3B)		3T1(3B), 3R1(3B)		11T, 11R
	4	4T(3B), 4R(3B)		4T1(3B), 4R1(3B)		12T, 12R
4	1	1T(4B), 1R(4B)		1T1(4B), 1R1(4B)		13T, 13R
	2	2T(4B), 2R(4B)		2T1(4B), 2R1(4B)		14T, 14R
	3	3T(4B), 3R(4B)		3T1(4B), 3R1(4B)		15T, 15R
	4	4T(4B), 4R(4B)		4T1(4B), 4R1(4B)		16T, 16R
1-4	GRD	GRD 7		GRD 3		17T
5	1	1T(5B), 1R(5B)		1T1(5B), 1R1(5B)		1T, 1R
	2	2T(5B), 2R(5B)		2T1(5B), 2R1(5B)		2T, 2R
	3	3T(5B), 3R(5B)		3T1(5B), 3R1(5B)		3T, 3R
	4	4T(5B), 4R(5B)		4T1(5B), 4R1(5B)		4T, 4R
6	1	1T(6B), 1R(6B)		1T1(6B), 1R1(6B)		5T, 5R
	2	2T(6B), 2R(6B)		2T1(6B), 2R1(6B)		6T, 6R
	3	3T(6B), 3R(6B)	JD8	3T1(6B), 3R1(6B)	JD6	7T, 7R
	4	4T(6B), 4R(6B)		4T1(6B), 4R1(6B)		8T, 8R
7	1	1T(7B), 1R(7B)		1T1(7B), 1R1(7B)		9T, 9R
	2	2T(7B), 2R(7B)		2T1(7B), 2R1(7B)		10T, 10R
	3	3T(7B), 3R(7B)		3T1(7B), 3R1(7B)		11T, 11R
	4	4T(7B), 4R(7B)		4T1(7B), 4R1(7B)		12T, 12R
5-7	GRD	GRD 8		GRD 4		13T

Table 3-37. 710-SD1-25 Overhead Telemetry Connections Using TLM1 (AKM4)

	Input (Optical Isolators)			Output (Relays)		
Name	Designation	Conn	Term	Designation	Conn	Term
Common	BAT. A RTN	JD9	1T	SI2R	JD9	9T
1	RS(1)		1R	SI2(1)		9R
2	RS(2)		2T	SI2(2)		10T
3	RS(3)		2R	SI2(3)		10R
4	RS(4)		3T	SI2(4)		11T
5	RS(5)		3R	SI2(5)		11R
6	RS(6)		4T	SI2(6)		12T
7	RS(7)		4R	SI2(7)		12R
8	RS(8)		5T	SI2(8)		13T
9	RS(9)		5R	SI2(9)		13R
10	RS(10)		6T	SI2(10)		14T
11	RS(11)		6R	SI2(11)		14R
12	RS(12)		7T	SI2(12)		15T
13	RS(13)		7R	SI2(13)		15R
14	RS(14)		8T	SI2(14)		16T
15	RS(15)		8R	SI2(15)		16R

Table 3-38. 710-SD1-25 Overhead Telemetry Connections Using TLM2 (MC90191A1)

	Input (Optical Isolators)			Output (Relays)		
Name	Designation	Conn	Term	Designation	Conn	Term
Common	BAT.A RTN	JD9	1T	SI2R	JD9	9T
1	RS(1)		1R	SI2(1)		9R
2	RS(2)		2T	SI2(2)		10T
3	RS(3)		2R	SI2(3)		10R
4	RS(4)		3T	SI2(4)		11T
5	RS(5)		3R	SI2(5)		11R
6	RS(6)		4T	SI2(6)		12T

Front Access: KS-16690, L12 Connector

The DDM-1000 ED-2C841-30, G1 or G2 shelf assembly provides front access connections through KS-16690, L12 connectors for all low-speed cross-connect and overhead telemetry signals that would be used at a remote terminal site. The mating connectors (KS-16689, L3 or KS-16689, L18) are not supplied with the cable assemblies. The numbering of terminals for this connector is shown in Figure 3-20.

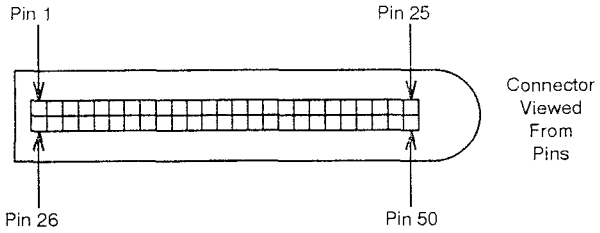

Figure 3-20. KS-16690, L12 Terminal Numbering

Table 3-39 and Table 3-40 lists the muldem A and muldem B low-speed signal connections. The muldem A connections are provided by the ED-2C833-20, G14 cable assembly. The muldem B connections are provided by the ED-2C833-20, G15 cable assembly. T and R designate the tip and ring signal pairs. IN and OUT designate the input from and output to the cross-connect. GR x and CHAN y designate the DS2 group and channel for the 28 DS1 signals of each muldem. For DS1C signals, CHAN 3 and CHAN 4 are not used. For DS2 signals, CHAN 2, CHAN 3, and CHAN 4 are not used. Table 3-41 lists the overhead telemetry connections. The overhead telemetry connections are provided by the ED-2C833-20,G16 cable assembly. No office alarm connections are provided with the KS-16690, L12 connector.

Table 3-39. KS-16690, L12 Muldem A Low-Speed Signal Connections

Muldem A Low-Speed Connections

Gr	Chan	In		Out		T/R
		Designation	Conn	Designation	Conn	Term
1	1	1T(1A), 1R(1A)		1T1(1A), 1R1(1A)		1, 26
	2	2T(1A), 2R(1A)		2T1(1A), 2R1(1A)		2, 27
	3	3T(1A), 3R(1A)		3T1(1A), 3R1(1A)		3, 28
	4	4T(1A), 4R(1A)		4T1(1A), 4R1(1A)		4, 29
2	1	1T(2A), 1R(2A)		1T1(2A), 1R1(2A)		5, 30
	2	2T(2A), 2R(2A)		2T1(2A), 2R1(2A)		6, 31
	3	3T(2A), 3R(2A)		3T1(2A), 3R1(2A)		7, 32
	4	4T(2A), 4R(2A)		4T1(2A), 4R1(2A)		8, 33
3	1	1T(3A), 1R(3A)	JB3	1T1(3A), 1R1(3A)	JB1	9, 34
	2	2T(3A), 2R(3A)		2T1(3A), 2R1(3A)		10, 35
	3	3T(3A), 3R(3A)		3T1(3A), 3R1(3A)		11, 36
	4	4T(3A), 4R(3A)		4T1(3A), 4R1(3A)		12, 37
4	1	1T(4A), 1R(4A)		1T1(4A), 1R1(4A)		13, 38
	2	2T(4A), 2R(4A)		2T1(4A), 2R1(4A)		14, 39
	3	3T(4A), 3R(4A)		3T1(4A), 3R1(4A)		15, 40
	4	4T(4A), 4R(4A)		4T1(4A), 4R1(4A)		16, 41
1-4	GRD	GRD 5		GRD 1		17
5	1	1T(5A), 1R(5A)		1T1(5A), 1R1(5A)		1, 26
	2	2T(5A), 2R(5A)		2T1(5A), 2R1(5A)		2, 27
	3	3T(5A), 3R(5A)		3T1(5A), 3R1(5A)		3, 28
	4	4T(5A), 4R(5A)		4T1(5A), 4R1(5A)		4, 29
6	1	1T(6A), 1R(6A)		1T1(6A), 1R1(6A)		5, 30
	2	2T(6A), 2R(6A)		2T1(6A), 2R1(6A)		6, 31
	3	3T(6A), 3R(6A)	JB4	3T1(6A), 3R1(6A)	JB2	7, 32
	4	4T(6A), 4R(6A)		4T1(6A), 4R1(6A)		8, 33
7	1	1T(7A), 1R(7A)		1T1(7A), 1R1(7A)		9, 34
	2	2T(7A), 2R(7A)		2T1(7A), 2R1(7A)		10, 35
	3	3T(7A), 3R(7A)		3T1(7A), 3R1(7A)		11, 36
	4	4T(7A), 4R(7A)		4T1(7A), 4R1(7A)		12, 37
5-7	GRD	GRD 6		GRD 2		13

Table 3-40. KS-16690, L12 Muldem B Low-Speed Signal Connections

Muldem B Low-Speed Connections

Gr	Chan	In		Out		T/R
		Designation	Conn	Designation	Conn	Term
1	1	1T(1B), 1R(1B)	JB7	1T1(1B), 1R1(1B)	JB5	1, 26
	2	2T(1B), 2R(1B)		2T1(1B), 2R1(1B)		2, 27
	3	3T(1B), 3R(1B)		3T1(1B), 3R1(1B)		3, 28
	4	4T(1B), 4R(1B)		4T1(1B), 4R1(1B)		4, 29
2	1	1T(2B), 1R(2B)		1T1(2B), 1R1(2B)		5, 30
	2	2T(2B), 2R(2B)		2T1(2B), 2R1(2B)		6, 31
	3	3T(2B), 3R(2B)		3T1(2B), 3R1(2B)		7, 32
	4	4T(2B), 4R(2B)		4T1(2B), 4R1(2B)		8, 33
3	1	1T(3B), 1R(3B)		1T1(3B), 1R1(3B)		9, 34
	2	2T(3B), 2R(3B)		2T1(3B), 2R1(3B)		10, 35
	3	3T(3B), 3R(3B)		3T1(3B), 3R1(3B)		11, 36
	4	4T(3B), 4R(3B)		4T1(3B), 4R1(3B)		12, 37
4	1	1T(4B), 1R(4B)		1T1(4B), 1R1(4B)		13, 38
	2	2T(4B), 2R(4B)		2T1(4B), 2R1(4B)		14, 39
	3	3T(4B), 3R(4B)		3T1(4B), 3R1(4B)		15, 40
	4	4T(4B), 4R(4B)		4T1(4B), 4R1(4B)		16, 41
1-4	GRD	GRD 7		GRD 3		17
5	1	1T(5B), 1R(5B)	JB8	1T1(5B), 1R1(5B)	JB6	1, 26
	2	2T(5B), 2R(5B)		2T1(5B), 2R1(5B)		2, 27
	3	3T(5B), 3R(5B)		3T1(5B), 3R1(5B)		3, 28
	4	4T(5B), 4R(5B)		4T1(5B), 4R1(5B)		4, 29
6	1	1T(6B), 1R(6B)		1T1(6B), 1R1(6B)		5, 30
	2	2T(6B), 2R(6B)		2T1(6B), 2R1(6B)		6, 31
	3	3T(6B), 3R(6B)		3T1(6B), 3R1(6B)		7, 32
	4	4T(6B), 4R(6B)		4T1(6B), 4R1(6B)		8, 33
7	1	1T(7B), 1R(7B)		1T1(7B), 1R1(7B)		9, 34
	2	2T(7B), 2R(7B)		2T1(7B), 2R1(7B)		10, 35
	3	3T(7B), 3R(7B)		3T1(7B), 3R1(7B)		11, 36
	4	4T(7B), 4R(7B)		4T1(7B), 4R1(7B)		12, 37
5-7	GRD	GRD 8		GRD 4		13

Table 3-41. KS-16690, L12 Overhead Telemetry Connections

	Input (Optical Isolators)			Output (Relays)		
Name	Designation	Conn	Term	Designation	Conn	Term
Common	BAT.A RTN	JB9	1	SI2R	JB9	9
1	RS(1)		26	SI2(1)		34
2	RS(2)		2	SI2(2)		10
3	RS(3)		27	SI2(3)		35
4	RS(4)		3	SI2(4)		11
5	RS(5)		28	SI2(5)		36
6	RS(6)		4	SI2(6)		12
7	RS(7)		29	SI2(7)		37
8	RS(8)		5	SI2(8)		13
9	RS(9)		30	SI2(9)		38
10	RS(10)		6	SI2(10)		14
11	RS(11)		31	SI2(11)		39
12	RS(12)		7	SI2(12)		15
13	RS(13)		32	SI2(13)		40
14	RS(14)		8	SI2(14)		16
15	RS(15)		33	SI2(15)		41

Front Access: DDM-1000 Wire-Wrap Assembly

The DDM-1000 wire-wrap assembly (ED-2C843-30) provides front access wire-wrap connections for all low-speed cross-connect, processor, TBOS and parallel telemetry, and alarm signals for the ED-2C841-30, G1 or G2 shelf assemblies. It also provides DC power connections for the DDM-1000. (The wire-wrap assembly is not used for the ED-2C841-30, G3 EMC shelf assembly.) The low-speed cross-connect signals for muldem A are provided on the left; the low-speed cross-connect signals for muldem B are provided in the center; and the remaining signals and power are provided on the right of the wire-wrap assembly (Figure 3-21).

The muldem A and muldem B connections to the pin field are self-explanatory. T and R designate the tip and ring signal pairs. IN and OUT designate the input from and output to the cross-connect. GR x and CHAN y designate the DS2 group and channel for the 28 DS1 signals of each muldem. For DS1C signals, CHAN 3 and CHAN 4 are not used. For DS2 signals, CHAN 2, CHAN 3, and CHAN 4 are not used. The power connections are also self-explanatory. A and A RTN connect to the SRV power unit and B and B RTN connect to the PROTN power unit. GRD 1 through GRD 12 connect to the shield wire for the ABAM cabling as required. The black 20-gauge wire exiting on the right side of the wire-wrap assembly is connected to the network bay frame after DDM-1000 has been mounted in it. This provides an earth ground connection for the DDM-1000. Table 3-42 lists the telemetry pin field connections; Table 3-43 lists the processor pin field connections; and Table 3-44 lists the alarm pin field connections provided on the wire-wrap assembly.

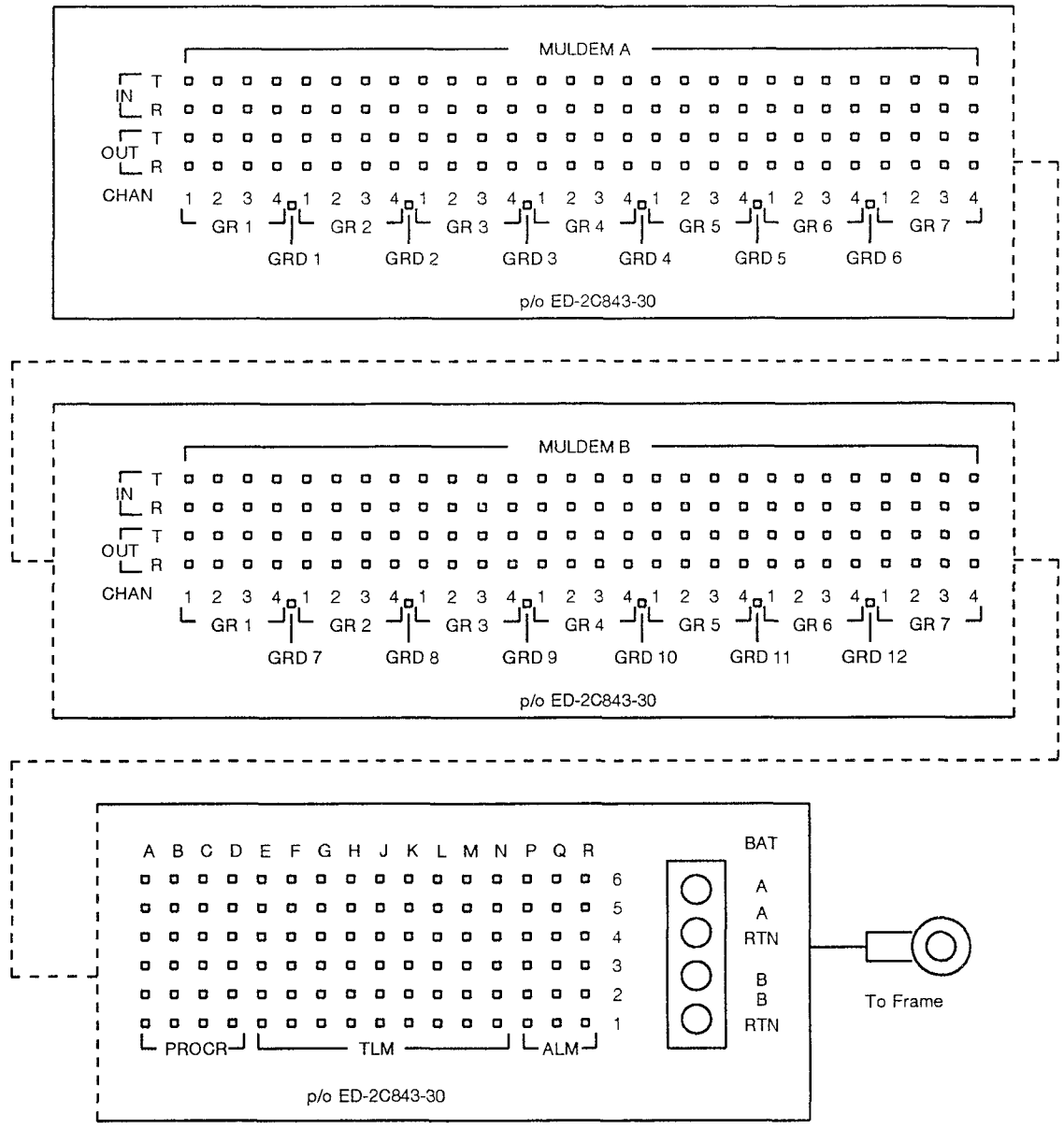

Figure 3-21. DDM-1000 Wire-Wrap Assembly Pin Field

Table 3-42. TLM Pin Fields

Description	Lead Desig	Panel Desig	Connect To	Type of Closure (Note)
Parallel Telemetry: ACO Input*	RS(ACO)	M1		O - TLM1
Parallel Telemetry: ACO Return*	BAT A RTN	L1		—
Parallel Telemetry: Alarm - Critical*	SI1(CR)	E2		R - TLM1
Parallel Telemetry: Alarm - Major*	SI1(MJ)	F1		R - PROCR
Parallel Telemetry: Alarm - Major*	SI1(MJA)	H2		O - TLM1
Parallel Telemetry: Alarm - Minor*	SI1(MN)	K1		R - PROCR
Parallel Telemetry: Alarm - Minor*	SI1(MNA)	G2		O - TLM1
Parallel Telemetry: Alarm - Power Minor*	SI1(PMN)	K2		R - TLM1
Parallel Telemetry: Status - Near End*	SI1(NE)	J2	Office Wiring	O - TLM1
Parallel Telemetry: Status - Far End*	SI1(FE)	F2		O - TLM1
Parallel Telemetry: Status - Carrier Line Failure*	SI1(CLF)	J1		O - TLM1
Parallel Telemetry: Status - High-Speed*	SI1(HS)	H1		O - TLM1
Parallel Telemetry: Status - Low-Speed*	SI1(LS)	G1		O - TLM1
Parallel Telemetry: Status - Incoming Signal*	SI1(INC)	M2		O - TLM1
Parallel Telemetry: Status - System Identification	SI1(ID1)	L2		O - TLM1
Parallel Telemetry: Common Return*	SI1R	E1		R - TLM1
Alarm Input: Power Minor	RS(PMN)	N3	Power Shelf	
Alarm Input: Minor	RS(MN)	N4	Power Shelf	
Alarm Input: Fan	RS(FAN)	N6	Fan Assembly	
Alarm Input: Common Return	BAT.A RTN	N5	Power Shelf & Fan Assembly	

See Notes and Footnotes at the end of the Table.

Table 3-42. TLM Pin Fields (Contd)

Description	Lead Desig	Panel Desig	Connect To	Type of Closure (Note)
Overhead Telemetry: Output 1†	SI2(1)	F4		
Overhead Telemetry Output 2†	SI2(2)	G4		
Overhead Telemetry: Output 3†	SI2(3)	H4		
Overhead Telemetry Output 4†	SI2(4)	J4		
Overhead Telemetry Output 5†	SI2(5)	K4		
Overhead Telemetry Output 6	SI2(6)	L4		
Overhead Telemetry Output 7†	SI2(7)	M4		Relays
Overhead Telemetry. Output 8	SI2(8)	E3	Office Wiring	on
Overhead Telemetry· Output 9	SI2(9)	F3		TLM
Overhead Telemetry Output 10	SI2(10)	G3		
Overhead Telemetry Output 11	SI2(11)	H3		
Overhead Telemetry Output 12	SI2(12)	J3		
Overhead Telemetry Output 13	SI2(13)	K3		
Overhead Telemetry Output 14	SI2(14)	L3		
Overhead Telemetry Output 15	SI2(15)	M3		
Overhead Telemetry Common Return	SI2R	E4		

See Note and Footnotes at the end of the Table

Table 3-42. TLM Pin Fields (Contd)

Description	Lead Desig	Panel Desig	Connect To	Type of Closure (Note)
Overhead Telemetry Input 1†	RS(1)	F6		
Overhead Telemetry Input 2†	RS(2)	G6		
Overhead Telemetry Input 3†	RS(3)	H6		
Overhead Telemetry. Input 4†	RS(4)	J6		
Overhead Telemetry Input 5†	RS(5)	K6		
Overhead Telemetry: Input 6†	RS(6)	L6		
Overhead Telemetry Input 7	RS(7)	M6		Optical
Overhead Telemetry Input 8	RS(8)	E5	Office Wiring	Isolators
Overhead Telemetry Input 9	RS(9)	F5‡		on
Overhead Telemetry Input 10	RS(10)	G5‡		TLM
Overhead Telemetry Input 11	RS(11)	H5		
Overhead Telemetry. Input 12	RS(12)	J5		
Overhead Telemetry: Input 13	RS(13)	K5‡		
Overhead Telemetry· Input 14	RS(14)	L5‡		
Overhead Telemetry Input 15	RS(15)	M5		
Overhead Telemetry Common Return	BAT.A RTN	E6		
—	—	E1, E2	No Connect	—

Note:

R = relay O = Optical isolator

* These signals may also be connected to the DDM-1000 mounted above by double wrapping on the pins.

† Only Outputs 1-6 and Inputs 1-6 are available on the TLM2 pack

‡ Active TABS data leads when TLM2 is installed (see below)

Description	Lead Desig	Panel Desig	Connect To
Serial Telemetry Transmit true data	TABOP	K5	TLM equip and/or K5 of adj DDM-1000
Serial Telemetry. Transmit inverted data	TABON	L5	TLM equip and/or L5 of adj DDM-1000
Serial Telemetry Receive true data	TABIP	F5	TLM equip and/or F5 of adj DDM-1000
Serial Telemetry Receive inverted data	TABIP	G5	TLM equip and/or G5 of adj DDM-1000

Table 3-43. PROCR Pin Fields

Description	Lead Desig	Panel Desig	Connect To
Serial Telemetry Transmit - True Data	TDP	A1	Telemetry Equipment Or RUP Of DDM-1000 Below
Serial Telemetry Transmit - Inverted Data	TDN	B1	Telemetry Equipment Or RUN Of DDM-1000 Below
Serial Telemetry Receive - True Data	RDP	A2	Telemetry Equipment Or TUP Of DDM-1000 Below
Serial Telemetry Receive - Inverted Data	RDN	B2	Telemetry Equipment Or TUN Of DDM-1000 Below
Shelf Identification Bit 1 Input	ID1	A3	No Connect Or ID1O Of DDM-1000 Below
Shelf Identification Bit 2. Input	ID2	B3	No Connect Or ID2O Of DDM-1000 Below
Shelf Identification Bit 3 Input	ID3	D2	No Connect Or ID3O Of DDM-1000 Below
Shelf Identification Bit 4 Input	ID4	C2	No Connect Or ID4O Of DDM-1000 Below
Shelf Equipped Input	DNEQP	D1	No Connect Or UPEQP Of DDM-1000 Below
ASCII Terminal Bus	HHTDD	C1	No Connect Or HHTUD Of DDM-1000 Below
ASCII Terminal Bus	HHTUD	D5	No Connect Or HHTDD Of DDM-1000 Above
Shelf Equipped Output	UPEQP	D6	No Connect Or DNEQP Of DDM-1000 Above
Shelf Identification Bit 1 Output	ID1O	A6	No Connect Or ID1 Of DDM-1000 Above
Shelf Identification Bit 2 Output	ID2O	B6	No Connect Or ID2 Of DDM-1000 Above
Shelf Identification Bit 3 Output	ID3O	C6	No Connect Or ID3 Of DDM-1000 Above
Shelf Identification Bit 4 Output	ID4O	C5	No Connect Or ID4 Of DDM-1000 Above
Serial Telemetry Transmit - True Data	TUP	A4	No Connect Or RDP Of DDM-1000 Above
Serial Telemetry Transmit - Inverted Data	TUN	B4	No Connect Or RDN Of DDM-1000 Above
Serial Telemetry Receive - True Data	RUP	A5	No Connect Or TDP Of DDM-1000 Above
Serial Telemetry: Receive - Inverted Data	RUN	B5	No Connect Or TDN Of DDM-1000 Above
—	—	C3, C4 D2, D4	No Connect

Table 3-44. ALM Pin Fields

Description	Lead Desig	Panel Desig	Connect To	Type Closure
Office Alarm. Critical Audible	CR	P1	Office Wiring	Relays on TLM1
Office Alarm Critical Audible Return	CRR	P2		
Office Alarm Critical Visible	CRV	Q1		
Office Alarm Critical Visible Return	CRVR	Q2		
Office Alarm Major Audible	MJ	P3		Relays on PROCR
Office Alarm. Major Audible Return	MJR	P4		
Office Alarm· Major Visible	MJV	Q3		
Office Alarm Major Visible Return	MJVR	Q4		
Office Alarm Minor Audible	MN	P5		
Office Alarm: Minor Audible Return	MNR	P6		
Office Alarm Minor Visible	MNV	Q5		
Office Alarm· Minor Visible Return	MNVR	Q6		
Office Alarm· Power Minor Audible	PMN	R1		Relays on TLM1
Office Alarm· Power Minor Audible Return	PMNR	R2		
Office Alarm· Power Minor Visible	PMNV	R3		
Office Alarm Power Minor Visible Return	PMNVR	R4		
—	—	R5, R6	No Connect	—

Specification Summary

The DS1, DS1C, DS2, and DS3 interfaces of DDM-1000 conform to the North American standards for the digital hierarchy and specifically to Bell Communications Research Technical Advisory TR-TSY-000009.

DS1 Interface

Number of Lines ..... Up to 56 per shelf
Data Rate ..... 1.544 Mb/s ± 130 ppm asynchronous
Line Code (#1) ..... Bipolar (Alternate Mark Inversion)
Line Code (#2) ..... Bipolar 8 Zero Substitution (B8ZS)
Line Impedance ..... 100 ohms ± 5% balanced
Jitter ..... The multiplexer will add not more than 0.3 time slot of rms jitter (<1 unit interval p/p) to a DS1 signal when looped at the DS3 point.
Maximum Distance to Cross-Connect ..... 200 m (655 ft)

DS1C Interface

Number of Lines ..... Up to 28 per shelf
Data Rate ..... 3.152 Mb/s ± 30 ppm
Format ..... DS1C Mode 2
Line Code (#1) ..... Scrambled Bipolar (Alternate Mark Inversion)
Line Code (#2) ..... Bipolar 8 Zero Substitution (B8ZS)
Line Impedance ..... 100 ohms ± 5% balanced
Maximum Distance to Cross-Connect ..... 200 m (655 ft)

DS2 Interface

Number of Lines ..... Up to 14 per shelf
Data Rate ..... 6.312 Mb/s ± 30 ppm
Line Code ..... Bipolar 6 Zero Substitution (B6ZS)
Line Impedance ..... 110 ohms ± 5% balanced
Maximum Distance to Cross-Connect ..... 320 m (1050 ft)

DS3 Interface

Number of Lines ..... 2 per shelf
Data Rate ..... 44.736 Mb/s ± 20 ppm asynchronous
Line Code ..... Bipolar 3 Zero Substitution (B3ZS)
Line Impedance ..... 75 ohms ± 5% unbalanced
Maximum Distance to Cross-Connect with 728B or 734A cable .... 137.2 m (450 ft)
Maximum Distance to Cross-Connect with mini-coax cable ..... 45.7 m (150 ft)

90 Mb/s Optical Interface

Bit Rate.....89.472 Mb/s
Line Code .....Scrambled NRZ

Table 3-45 lists the 16-type OLIU loss budget parameters.

Table 3-45. DDM-1000 16-Type OLIU Loss Budget Parameters

Parameter	16E OLIU	16F OLIU	16G OLIU	16K OLIU
Wavelength	1305 ±20 nm	1305 ±20 nm	1305 ±20 nm	1305 ±20 nm
Type of TX	Single Mode	Single Mode	Single Mode	Single Mode
TX Output Power-HI*	-10 0 dBm ±1dB	-10 0 dBm ±1dB	-4 0 dBm ±1dB	+2 0 dBm ±1dB
TX Output Power-LW*	-16.0 dBm ±1dB	-16 0 dBm ±1dB	-10 0 dBm ±1dB	-4 0 dBm ±1dB
RX Sensitivity for BER=10^{-9}†	-34 0 dBm	-38 5 dBm	-38 5 dBm	-38 5 dBm
Max RX Input Power -15 3 -15.0 -15 0 -15 0				
Available System Gain‡	24 0 dB	28 5 dB	34 5 dB	40 5 dB
Eye Margin	3 5 dB	3 5 dB	3 5 dB	3.5 dB
Equipment Margin	3.0 dB	3 0 dB	3 0 dB	3 0 dB
Maximum Facility Loss	17 5 dB	22.0 dB	28 0 dB	34 0 dB
Minimum Facility Loss	0 dB	0 dB	7 0 dB	13.7 dB
Max. Connector Loss (Two)	1.5 dB	1.5 dB	1.5 dB	1.5 dB
Operating Temp Range	0° C to +50° C	-40° C to +75° C	-40° C to +75° C	-40° C to +75° C
Single-Mode Fiber				
Outside Plant Budget (1305 ±30 nm)	16 dB	20 5 dB	26 5 dB	32.5 dB
Span Length§	29 km (18 mi)	45 5 km (28.3 mi)	58 9 km (36 6 mi)	72.2 km (44.8 mi)
Multimode Fiber				
Dispersion and Modal Noise Allocation¶	3 dB	3 dB	3 dB	3 dB
Outside Plant Budget (1305 ±30 nm)	13 dB	17 5 dB	23.5 dB	29.5 dB
Span Length**	13 km (8 mi)	17 5 km (10.8 mi)	23 5 km (14.6 mi)	29 5 km (18.3 mi)

* The output power of the optical transmitter (TX) should be measured at the biconic connector at the end of the transmitter pigtail. The power outputs shown in this table are guaranteed values when the transmitter is new The numbers are based on measurements with a power meter calibrated against the AT&T-TS-RD standard power meter, which can be traced to the National Bureau of Standards The DDM-1000 TX has a 6 dB switch, power output may be selected as HI or LW based on the installed cable loss

90 Mb/s Optical Interface

Bit Rate.....89.472 Mb/s
Line Code .....Scrambled NRZ

Table 3-45 lists the 16-type OLIU loss budget parameters.

Table 3-45. DDM-1000 16-Type OLIU Loss Budget Parameters

Parameter	16E OLIU	16F OLIU	16G OLIU	16K OLIU
Wavelength	1305 ±20 nm	1305 ±20 nm	1305 ±20 nm	1305 ±20 nm
Type of TX	Single Mode	Single Mode	Single Mode	Single Mode
TX Output Power-HI*	−10.0 dBm ±1dB	−10.0 dBm ±1dB	−4.0 dBm ±1dB	+2.0 dBm ±1dB
TX Output Power-LW*	−16.0 dBm ±1dB	−16.0 dBm ±1dB	−10.0 dBm ±1dB	−4.0 dBm ±1dB
RX Sensitivity for BER=10^{-9}†	−34.5 dBm	−39.0 dBm	−39.0 dBm	−39.0 dBm
Max. RX Input Power	−14.5 dBm	−14.5 dBm	−14.5 dBm	−14.5 dBm
Available System Gain‡	24.5 dB	29.0 dB	35.0 dB	41.0 dB
Eye Margin	3.5 dB	3.5 dB	3.5 dB	3.5 dB
Equipment Margin	3.0 dB	3.0 dB	3.0 dB	3.0 dB
Maximum Facility Loss	18.0 dB	22.5 dB	28.5 dB	34.5 dB
Minimum Facility Loss	0 dB	0 dB	7.0 dB	13.7 dB
Max. Connector Loss (Two)	1.5 dB	1.5 dB	1.5 dB	1.5 dB
Operating Temp. Range	0°C to +50°C	−40°C to +75°C	−40°C to +75°C	−40°C to +75°C
Single-Mode Fiber				
Outside Plant Budget (1305 ±30 nm)	16.5 dB	21.0 dB	27.0 dB	33.0 dB
Span Length§	29.9 km (18 mi)	45.5 km (28.3 mi)	58.9 km (36.6 mi)	73.2 km (45.3 mi)
Multimode Fiber				
Dispersion and Modal Noise Allocation¶	3 dB	3 dB	3 dB	3 dB
Outside Plant Budget (1305 ±30 nm)	13.5 dB	18.0 dB	24.0 dB	30.0 dB
Span Length**	13.5 km (8.37 mi)	18.0 km (11.0 mi)	24.0 km (14.8 mi)	30.0 km (18.6 mi)

See footnotes at end of table.

Table 3-45. DDM-1000 16-Type OLIU Loss Budget Parameters (Contd)

Parameter	16E2 OLIU	16F2 OLIU
Wavelength	1305 ±20 nm	1305 ±20 nm
Type of TX	Single Mode	Single Mode
TX Output Power-HI*	−10.5 dBm ±1dB	−4.1 dBm ±1dB
TX Output Power-LW*	−15.5 dBm ±1dB	−9.1 dBm ±1dB
RX Sensitivity for BER=10^{-9}†	−39.5 dBm	−39.5 dBm
Max. RX Input Power	−7.0 dBm	−7.0 dBm
Available System Gain‡	29.0 dB	35.4 dB
Eye Margin	3.5 dB	3.5 dB
Equipment Margin	3.0 dB	3.0 dB
Maximum Facility Loss	22.5 dB	28.9 dB
Minimum Facility Loss	0 dB	0 dB
Max. Connector Loss (Two)	1.5 dB	1.5 dB
Operating Temp. Range	−40°C to +75°C	−40°C to +75°C
Single-Mode Fiber		
Outside Plant Budget (1305 ±30 nm)	21.0 dB	27.4 dB
Span Length§	46.8 km (29 mi)	60.8 km (37.7 mi)
Multimode Fiber		
Dispersion and Modal Noise Allocation¶	3 dB	3 dB
Outside Plant Budget (1305 ±30 nm)	18.0 dB	24.4 dB
Span Length**	18.0 km (11.0 mi)	24.4 km (15.0 mi)

* The output power of the optical transmitter (TX) should be measured at the biconic connector at the end of the transmitter pigtail. The power outputs shown in this table are guaranteed values when the transmitter is new. The numbers are based on measurements with a power meter calibrated against the AT&T-TS-RD standard power meter, which can be traced to the National Bureau of Standards. The DDM-1000 TX has a 6 dB switch; power output may be selected as HI or LW based on the installed cable loss.

† To obtain receiver (RX) sensitivity for other BER, use the following corrections:

- From 10^{-7} to 10^{-8}, increase signal level 0.32 dB
- From 10^{-8} to 10^{-9}, increase signal level 0.31 dB
- From 10^{-9} to 10^{-10}, increase signal level 0.23 dB

Table 3-45. DDM-1000 16-Type OLIU Loss Budget Parameters (Contd)

‡ The available system gain is the transmitter power minus the receiver sensitivity. The facility loss includes 3.5 dB for eye degradation (optical receiver variation from ideal) and 3.0 dB for OLIU equipment degradation. Temperature and aging degradations have been included in the OLIU equipment margin of 3.0 dB. The equipment margin for the transmitter is 2.0 dB. The equipment margin for the receiver is 1.0 dB. The loss of two optical connectors is 1.5 dB. This is usually referenced out in a fiber insertion loss measurement; therefore, a span that meets the "Outside Plant Budget" measurement should meet the "Facility Loss" requirement. DP-424 in the "Installation and Maintenance" section contains details on minimum and maximum facility losses with combinations of OLIUs.

§ Assumes 0.55 dB/km cable plus splice loss (medium loss single-mode fiber) for the 16E and 16E2 and 0.45 dB/km cable plus splice loss (low loss single-mode fiber) for the 16F, 16F2, 16G, and 16K.

¶ Assumes 90 MHz end-to-end fiber bandwidth. For 70 MHz bandwidth, increase dispersion and modal noise allocation to 4 dB, decrease outside plant budget 1 dB, and reduce span length by 1 km.

** Assumes 1.0 dB/km average cable plus splice loss (medium loss multimode fiber).

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180 Mb/s Optical Interface

Bit Rate 178.944
Line Code .....Scrambled NRZ

Table 3-46 lists the 20-type OLIU loss budget parameters.

Table 3-46. DDM-1000 20-Type OLIU Loss Budget Parameters

Parameter	20E OLIU	20G OLIU	20K OLIU
Wavelength	1305 ±20 nm	1305 ±20 nm	1305 ±20 nm
Type of TX	Single-Mode	Single-Mode	Single-Mode
TX Output Power-HI*	–7 dBm ±1 dB	–1.3 dBm ±1 dB	+2.0 dBm ±1 dB
TX Output Power-LW*	–13 dBm ±1 dB	–7.3 dBm ±1 dB	–4.0 dBm ±1 dB
RX Sensitivity for BER=10^{-9}†	–29.0 dBm	–34.8 dBm	–34.8 dBm
Max. RX Input Power	-12.3 dBm	-15.3 dBm	-15.3 dBm
Available System Gain‡	22.0 dB	33.5 dB	36.8 dB
Eye Margin	3.5 dB	3.5 dB	3.5 dB
Equipment Margin	3.5 dB	3.5 dB	3.5 dB
Maximum Facility Loss	15.0 dB	26.5 dB	29.8 dB
Minimum Facility Loss	0 dB	10.0 dB	13.3 dB
Max. Connector Loss (Two)	1.5 dB	1.5 dB	1.5 dB
Operating Temp. Range	0° C to +50° C	–40° C to +75° C	–40° C to +75° C
Single-Mode Fiber			
Outside Plant Budget (1305 ±30 nm)	13.5 dB	25.0 dB	28.3 dB
Span Length§	30.0 km (18.6 mi)	55.5 km (34.5 mi)	62.8 km (39 mi)
Multimode Fiber¶			

* The output power of the optical transmitter (TX) should be measured at the biconic connector at the end of the transmitter pigtail. The power outputs shown in this table are guaranteed values when the transmitter is new. The numbers are based on measurements with a power meter calibrated against the AT&T-TS-RD standard power meter, which can be traced to the National Bureau of Standards. The DDM-1000 TX has a 6 dB switch; power output may be selected as HI or LW based on the installed cable loss.

† To obtain receiver (RX) sensitivity for other BER, use the following corrections:

— From 10^{-7} to 10^{-8}, increase signal level 0.32 dB

— From 10^{-8} to 10^{-9}, increase signal level 0.31 dB

— From 10^{-9} to 10^{-10}, increase signal level 0.23 dB

Table 3-46. DDM-1000 20-Type OLIU Loss Budget Parameters (Contd)

‡ The available system gain is the transmitter power minus the receiver sensitivity The facility loss includes 3 5 dB for eye degradation (optical receiver variation from ideal) and 3 5 dB for OLIU equipment degradation. Temperature and aging degradations have been included in the OLIU equipment margin of 3 5 dB The equipment margin for the transmitter is 2 25 dB The equipment margin for the receiver is 1 25 dB The loss of two optical connectors is 1 5 dB This is usually referenced out in a fiber insertion loss measurement, therefore, a span that meets the "Outside Plant Budget" measurement should meet the "Facility Loss" requirement DP-424 in the INSTALLATION AND MAINTENANCE section contains details on minimum and maximum facility losses with combinations of OLIUs

§ Assumes 0 45 dB/km cable plus splice loss (low loss single-mode fiber)

¶ Multimode Operation — Assumes 1 0 dB/km cable plus splice loss (medium loss multimode fiber) The exit bandwidth of a fiber is determined by sinusoidally modulating the intensity of a light source at one end of the fiber and measuring the output at the other end. Exit bandwidth is the value of the lowest sinusoidal modulated frequency, expressed in MHz, at which the optical loss is 3 dB down from the fiber's attenuation (The optical loss of a fiber is a measure of how much light gets lost and is the ratio of the output pulse amplitude to the input pulse amplitude, expressed in dBs The optical loss obtained when the frequency of the modulating signal is zero is the fiber's attenuation) Refer to the following table For example, if the exit bandwidth of the fiber being used is 180 MHz, then the maximum path loss should not exceed 10.5 dB [10.5 km (6 5 miles)] when using a 20E OLIU

Minimum	20E OLIU		20G OLIU		20K OLIU	
Exit Bandwidth	Max. Loss	Length	Max. Loss	Length	Max. Loss	Length
180 MHz	10 5 dB	10 5 km (6 5 mi)	22.0 dB	22 0 km (13 7 mi)	25 3 dB	25 3 km (15 7 mi)
150 MHz	9 5 dB	9 5 km (5 9 mi)	21 0 dB	21 0 km (13 0 mi)	24 3 dB	24 3 km (15 1 mi)
120 MHz	8 5 dB	8 5 km (5 3 mi)	20 0 dB	20 0 km (12 4 mi)	23 3 dB	23 3 km (14 5 mi)

Synchronization

Maximum Average Reframe Time

DS3 to 6.312 Mb/s	less than 1.5 ms
6.312 Mb/s to DS1	less than 7 ms
6.312 Mb/s to DS1C	less than 15 ms
Mean-Time-to-Detect Loss of Frame	less than 1 ms

Power Requirements

Voltage	–21 to –28 V DC or –42 to –60 V DC
Power/DS3 (fully protected)	40 Watts* (with second generation circuit packs) 84 Watts (with first generation circuit packs)
Battery Options	Separate A and B battery inputs for redundant power sources

* See the **PLANNING GUIDELINES** section (under *ENGINEERING, Bay Arrangements, Basic Requirements, Power*) for a more detailed discussion of the power consumption of the DDM-1000.

Equipment Connections and Dimensions

Standard Connections Provided on Equipment:

Optical	Biconic Connection
DS3	BNC, Female
DS1, DS1C, DS2	Connectorized
Alarm and Telemetry	Connectorized

Optional Connections:

DS1, DS1C, DS2	Wire-Wrap
Alarm and Telemetry	Wire-Wrap

Shelf Dimensions	8.5" High, 21.5" Wide, 12.0" Deep
Shelf Weight (G1 or G2)	46 lbs.
Shelf Weight (G3)	Approximately 48 lbs.

Environment

Controlled (NEBS):

Temperature Range	+40°F to +100°F/+4°C to +38°C long term +35°F to +120°F/0°C to +50°C short term
Humidity	55% long term 80% short term

Uncontrolled[†]:

Temperature Range .....–40°F to +120°F/–40°C to +50°C (outside)[‡]
Humidity .....Up to 100% noncondensing
Altitude (operating) .....Up to 4,572m (15,000 ft) above sea level
(storage/shipment) ..... Up to 12,191m (40,000 ft) above sea level

[†] The 16E OLIU1 and 20E OLIU4 are restricted from operating in uncontrolled environments See *OLIU Selection* in the **PLANNING GUIDELINES** section of this manual.

[‡] The temperature range specified applies to DDM-1000 when housed in an outside plant enclosure The temperatures are measured outside the enclosure For specific OLIU operating temperature ranges, see *OLIU Selection* in the **PLANNING GUIDELINES** section of this manual

DDM-1000 Commands and Reports

4

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DDM-1000 Commands and Reports

4

Introduction

This section describes the command and report features of the ASCII terminal interface to DDM-1000. It provides detailed information about each available command. The section consists of alphabetized (except for the introduction) entries of a page or so each. The name of each entry appears in the upper corners of its pages. Where several commands are closely related through a common name, a single entry under the common name is made.

Each entry is based on a common format:

- The **NAME** part gives the common name of the entry and summarizes its function.
- The **SYNOPSIS** part provides the syntax for each command. Each command begins with a mnemonic followed by a colon. Parameters follow the colon. Optional parameters are enclosed in square brackets **[ ]**. Required parameters are enclosed in braces { }. If an entry for a parameter is conditional, it is enclosed in a combination of braces and brackets {[ ]}. Choices for parameter values are separated by a vertical bar.
- The **DESCRIPTION** part provides the detailed information about each command.

Each command is based on a common format:

Mnemonic for command:[**m**=*c*] {[**s**=*x*]} [**e**=*y*] [*Additional Parameters*]

This format has the following features:

- The command is entered on a single line.
- The first parameter is entered immediately (no space) after the colon ":".
- Parameters are separated by spaces and must be entered in the order shown.
- Brackets [ ] and braces { } are ***not*** part of the command line.
- The command and any user responses are terminated by a carriage return.
- The backspace character (^H - control H) is used to erase single characters at a time.
- The @ character is used to delete a complete line of input.
- The muldem [**m=***c*], shelf {[**s=***x*]}, and end [**e=***y*] parameters can always be specified even if the command does not require them.
- Defaults usually exist for all parameters.
- When the parameter **e=***f* is entered, use the **near-end** shelf number to access the associated far-end shelf.
- All "Set" parameters remain set if power is removed from the PROCR, or the PROCR is removed and reinserted without being reset.

All commands are echoed on a new line after the syntax of the command has been checked. The report structure assumes the use of an 8 line by 40 character per line display. When multiple displays of information are required, the message "**More? (Y/N)**" is given. If a **Y** or **y** is received within 60 seconds for the PROCR2 (20 seconds for the PROCR1), then the report continues. If not, the report is terminated.

CAUTION:
Some commands can be service affecting if their default parameters are ignored.

For example, with an MC90083A1D and earlier PROCR2, assume shelf number 1 is in service and shelf number 2 is being turned up. If a local automatic looped transmission test is being performed using the **test-auto-turnup:** command, and **local** is entered without specifying which shelf (**s=2**), then the command will be executed on shelf 1 (default parameter) and up to 2 DS3s will be dropped.

Since there are many PROCR firmware versions, some basic guidelines should be followed with respect to mixing PROCRs within a bay. See "Incompatible Combinations" in the PLANNING GUIDELINES section of this manual.

A response such as "Configuration error" may appear when the command parameter "**m=***c*" (*c*=muldem) is entered for the wrong type of system configuration (electrical or optical).

Other responses depend on the PROCR firmware version and include numbered "trap" messages or "System Malfunctions". Both of these may occur on rare occasions if the PROCR pack becomes "insane" and cannot function. In most cases, a "reset" will clear the PROCR.

DDM-1000 provides the following ASCII terminal commands and reports:

Execute - Alarm Cutoff	This command causes the current audible alarms to be silenced.
Execute - Clear Failures	This command causes the PROCR to clear failures that no longer meet the failure criterion.
Execute - Lock	This command controls locking of the protection switching for circuit packs. Make and break for each pack are provided.
Execute - Loop DS3U1	This command controls the loopback on the DSX side of the DDM-1000. It loops the DS3 signal being transmitted towards the DSX back toward the fiber.
Execute - Low-Speed Loop	This command controls low-speed loops in the DDM-1000. Make and break for each low-speed input are provided.
Execute - Reset	This command causes the PROCR to execute a complete reset. This clears the electrical erasable read only memory (EEROM) and random access memory (RAM). In MC90083A1E PROCR2 packs, an option allows saving non service affecting parameters in EEPROM.
Execute - RST	This command causes PROCR to update its equipment list to reflect the hardware plugged in at the time. This is used when removing packs from the list or unequipping DSX channels. Packs are added to the list automatically when inserted.
Execute - Switch	This command controls the protection switches in the DDM-1000. Make and break for the high-speed and low-speed switch are provided.

Help	This request provides a complete synopsis of commands. In the MC90083A1E PROCR2, the synopsis of commands applies specifically to the shelf configuration (optical or electrical).
Report - Failures	This report lists the current failures in the DDM-1000. Information may be requested about packs, fiber, internal DS2 failures, and cross-connect failures.
Report - History	This report lists the last 30 events that have occurred in the assembly. Since the errored seconds count for the incoming fiber line is placed in history each day, a 30-day picture of the line performance is available if no other activity has occurred.
Report - Options	This report lists information about the options within the DDM-1000. Information is available for the shelf, cross-connects, low-speed protection, and packs.
Report - Protection Status	This report lists the protection status of the DDM-1000.
Set - DSX Options	This command is used to specify characteristics of the cross-connect inputs and outputs. This includes specifying monitoring points, type of alarm, and coding (B8ZS/AMI) overrides.
Set - Frame DS3U1	This command is used to control whether the DS3U1 pack will accept a framed or an unframed signal.
Set - Low-Speed Protection Options	This command is used to specify low-speed protection options. This includes specifying the protection group and priority.
Set - Shelf Options	This command is used to specify shelf options. This includes specifying the alarm delay and fiber switching threshold.

Set - VMR DS3U1	This command is used to control the altering of the P-bit in the DS3 frame. It enables or disables the violation monitor and remover in the DS3U1.
Test - Alarms	This command is used to test the office alarms. They may be exercised individually or as a group.
Test - Automated Turnup	This command is used to initiate the automated turnup procedures. This includes the local, cross-connect, and system test.
Test - Insert Signal and Monitor	This command controls the built-in test signal generators and receivers. Only one path may be tested at a time.
Test - LED	This command is used to test the pack LEDs. They may be exercised individually or as a group.
Test - Processor Self-Test	This command is used to initiate the self test of PROCR. This self-test is done automatically by PROCR at regular intervals.
Test - Telemetry	This command is used to test the parallel telemetry alarm and status points and the overhead telemetry outputs. They may be exercised individually or as a group.

NAME

exct-aco: silence the current audible alarms

SYNOPSIS

exct-aco:{[**s=***x*]} [**e=***y*]

DESCRIPTION

EXCT-ACO causes the current audible alarms to be silenced. It performs an analogous function to the ACO/TEST button on the PROCR except that it does not test the LEDs.

The parameters are defined below:

s=*x* Identifies the shelf for this command. If there is only one shelf in the bay, this entry is optional and the default value is **1**. If there is more than one shelf in the bay, then the value of *x* is from **1** to **8** and is required.

e=*y* Identifies the system end for this command. The value of *y* is either **n** for the near end (default) or **f** for the far end.

NAME

exct-clear-fail: clear failures quickly

SYNOPSIS

exct-clear-fail:{[**s=***x*]} [**e=***y*]

DESCRIPTION

EXCT-CLEAR-FAIL causes the PROCR to clear failures that no longer meet the failure criterion. Normally, circuits are not restored until they satisfy the restoration criterion that is more stringent than the failure criterion. This can be used to speed up the restoration process when failures have been cleared. Circuits are not placed back into service until they have passed a nominal test.

On MC90083A1D PROCR2 and later packs, the "**exct-clear-fail:**" command is executed when the ACO/TST button is depressed.

The parameters are defined below:

s=*x* Identifies the shelf for this command. If there is only one shelf in the bay, this entry is optional and the default value is **1**. If there is more than one shelf in the bay, then the value of *x* is from **1** to **8** and is required.

e=*y* Identifies the system end for this command. The value of *y* is either **n** for the near end (default) or **f** for the far end.

NAME

exct-lock: make and break hs and ls protection switch locks

SYNOPSIS

exct-lock-hs:{m=*c***}** {**[s=***x***]**} **[e=***y***]** {**make** | **break**} (electrical)

exct-lock-hs:[m=*c***]** {**[s=***x***]**} **[e=***y***]** {**make** | **break**} (optical)

exct-lock-ls:{m=*c***}** {**[s=***x***]**} **[e=***y***]** {**make** | **make=***z* | **break** | **break=***z*}

DESCRIPTION

EXCT-LOCK controls locking of the protection switching for circuit packs. A lock forces an individual circuit to remain in its current state (in or out of service).

exct-lock-hs: is the function unit / high-speed interface lock. It applies to both directions of the SRV and PROTN circuits. On 180 Mb/s configurations, a high-speed lock will still be made on a 90 Mb/s entity (that is, on the circuits associated with one of the two assemblies.) To lock service completely onto the SRV or PROTN 180 Mb/s optical line, the command must be individually executed for each of the two assemblies.

exct-lock-ls: is the low-speed interface lock. It applies to both directions of the low-speed interface circuits.

Make causes a lock to be put up. **Break** causes a lock to be taken down. Breaks issued for in-service PROTN circuits take down locks on the corresponding SRV circuit. Breaks issued for out-of-service SRV circuits take down locks on the corresponding PROTN circuits. **Break** will also cause an automatic lock of protection switch to be taken down (see description of "Automatic Lock of Protection Switch" in the Description section of this manual).

The parameters are defined below:

m=*c* Identifies the muldem within a shelf for this command. For **lock-hs**, the value of *c* is either **a** for muldem A or **b** for muldem B when the DDM-1000 is an electrical terminal and it is a required parameter. For **lock-hs**, the value of *c* is **ab** for both muldems A and B when the DDM-1000 is an optical terminal and it is an optional parameter. For **lock-ls**, the value of *c* is either **a** for muldem A or **b** for muldem B and it is a required parameter.

s=*x* Identifies the shelf for this command. If there is only one shelf in the bay, this entry is optional and the default value is **1**. If there is more than one shelf in the bay, then the value of *x* is from **1** to **8** and is required.

e=*y* Identifies the system end for this command. The value of *y* is either **n** for the near end (default) or **f** for the far end.

make Causes a lock to be put up. If used with the **ls** command, then all low-speed interface circuit locks are put up.

break Causes a lock to be taken down. If used with the **ls** command, then all low-speed interface circuit locks are taken down.

make=*z* Causes a lock to be put up for low-speed interface *z*. The value of *z* is from **1** to **9**.

break=*z* Causes a lock to be taken down for low-speed interface *z*. The value of *z* is from **1** to **9**.

NAME

exct-loop-ds3u1: make and break DS3 loop

SYNOPSIS

exct-loop-ds3u1:{[**s=***x*]} [**e=***y*] {**make** | **break**}

DESCRIPTION

CAUTION:
This command may be service affecting. If optional parameters are not set properly, the default value may cause service interruption.

EXCT-LOOP-DS3U1 controls the loopback on the DSX side of the DDM-1000 muldem containing the DS3U1 pack. It loops the DS3 signal being transmitted towards the DSX back toward the fiber.

This command requires two entries from the terminal to cause execution. On entry of the command, the PROCR2 responds with a question to verify that the right command has been entered. If a **Y** or **y** is received from the terminal within 60 seconds then the PROCR executes the process. If a **Y** or **y** is not received from the terminal, then the process is aborted.

The parameters are defined below:

s=*x* Identifies the shelf for this command. If there is only one shelf in the bay, this entry is optional and the default value is **1**. If there is more than one shelf in the bay, then the value of *x* is from **1** to **8** and is required.

e=*y* Identifies the system end for this command. The value of *y* is either **n** for the near end (default) or **f** for the far end.

make Causes a loop to be put up for the DS3U1 pack.

break Causes a loop to be taken down for the DS3U1 pack.

NAME

exct-loop-ls: make and break low-speed loops

SYNOPSIS

exct-loop-ls:[**m=***c*] {[**s=***x*]} [**e=***y*] {**make** | **break**}

exct-loop-ls:{**m=***c*} {[**s=***x*]} [**e=***y*] {**make=***r-t* | **break=***r-t*}

DESCRIPTION

CAUTION:
This command may be service affecting. If optional parameters are not set properly, the default value may cause service interruption.

EXCT-LOOP controls the low-speed loops in the DDM-1000.

This command requires two entries from the terminal to cause execution. On entry of the command, the PROCR responds with a question to verify that the right command has been entered. If a **Y** or **y** is received from the terminal within 60 seconds for the PROCR2 (10 seconds for the PROCR1), then the PROCR executes the process. If a **Y** or **y** is not received from the terminal, then the process is aborted.

The parameters are defined below:

m=*c* — Identifies the muldem within a shelf for this command. The value of *c* is either **a** for muldem A, **b** for muldem B, or **ab** (default) for both muldems A and B. The **ab** option can be selected only when **make** or **break** is being applied to all low-speed signals.

s=*x* — Identifies the shelf for this command. If there is only one shelf in the bay, this entry is optional and the default value is **1**. If there is more than one shelf in the bay, then the value of *x* is from **1** to **8** and is required.

e=*y* — Identifies the system end for this command. The value of *y* is either **n** for the near end (default) or **f** for the far end.

make — Causes a loop to be put up for all low-speed signals.

break — Causes a loop to be taken down for all low-speed signals.

make=*r-t* — Causes a loop to be put up for signal *r-t*. The value of *r* is from **1** to **7** and refers to the DS2 group. The value of *t* refers to the channel (See Table 4-1).

break=*r-t* Causes a loop to be taken down for signal *r-t*. The value of *r* is from **1** to **7** and refers to the DS2 group. The value of *t* refers to the channel (See Table 4-1).

Table 4-1.

Board Type	Value of *t*
DS1 (AEK36B or AEK36B S1:2)	1-4
DS1C (AEK37)	1-2
DS2 (AEK38)	1

NAME

exct-reset: completely reset the processor

SYNOPSIS

exct-reset:{[**s=***x*]} [**e=***y*]

DESCRIPTION

CAUTION:
A service interruption will occur if this command is executed when a protection switch is "up".

CAUTION:
This command may be service affecting if optional parameters are not set properly. The default value may cause service interruption.

CAUTION:
*If optional parameter "***e***" is set to "f" (that is, e=f") when using this command in the electrical mode with MC90083A1D, and earlier, PROCR2 packs, the far-end communication will be turned off at the far end terminal. It will be necessary to dispatch someone to the far end to turn on far-end communications.*

NOTE:
"Set" parameters are not affected by PROCR power removal or PROCR removal and reinsertion if a "reset" is not done. If a reset is done, all service-affecting "set" parameters still remain set and non-service-affecting parameters return to default if the PROCR is other than an MC90083A1E or later PROCR2. In an MC90083A1E or later PROCR2 the exct-reset command contains an option to allow you to preserve non-service-affecting parameters or return to default values. When this command is executed, an "`Are you sure`" prompt will appear. If the response is "yes", a second prompt will appear "`Initialize non-service-affecting parameters to default? Y/N.`" If the answer is "Y", then the PROCR2 will return all non service affecting parameters to default. If the answer is "N", the parameters will be saved. A yes ("Y") response will have no effect on DS1 alternate mark insertion (AMI) or B8ZS soft sets or DS3U1 "frm" and "vmr" soft sets since those are service-affecting parameters. See DP-404 for a description of the reset process when inserting a PROCR pack.

EXCT-RESET causes the processor to execute a complete reset. As such, it clears the nonvolatile and volatile memory and starts over. This is used to completely reinitialize a controller when it is placed in a shelf. This command is analogous to pressing the RST button during the 10-second interval while the Major alarm LED is flashing. The flashing of the Major alarm occurs about 5 seconds after the PROCR is powered. (See DP-404 in the INSTALLATION AND MAINTENANCE section of this manual.) If this command is executed while low-speed input signals are "failed" or circuit packs are removed, they will be dropped from the list of things to be monitored. This command may restore craft set options to default values depending on the PROCR version and will be service affecting if protection switches are active. It will *not* affect DS1 channel code format provisioning (see the description for the "`set-dsx-code:`" command.) or the DS3U1 "frm" and "vmr" options (See the description for the "`set-frm-ds3u1:`" and "`set-vmr-ds3u1:`" command.).

This command requires two entries from the terminal to cause execution. On entry of the command, the PROCR responds with a question to verify that the right command has been entered. If a **Y** or **y** is received from the terminal within 60 seconds for the PROCR2 (10 seconds for the PROCR1), then the PROCR executes the process. If a **Y** or **y** is not received from the terminal, then the process is aborted.

The parameters are defined below:

s=*x* Identifies the shelf for this command. If there is only one shelf in the bay, this entry is optional and the default value is **1**. If there is more than one shelf in the bay, then the value of *x* is from **1** to **8** and is required.

e=*y* Identifies the system end for this command. The value of *y* is either **n** for the near end (default) or **f** for the far end. If the command is executed with the e=f option a "RESET Executed" message will be received followed by "far end command aborted". This is the normal response.

NAME

exct-rst: update the equipment list to reflect the hardware

SYNOPSIS

exct-rst:{[**s=***x*]} [**e=***y*]

DESCRIPTION

EXCT-RST (restart) causes the PROCR to update its equipment list to reflect the hardware plugged in at the time of execution. Anytime a circuit pack option switch setting is changed, "rst" must be done to update the PROCR inventory. With one exception (see "***set-dsx:***" command description), "rst" does not override or alter system options set through the ASCII terminal (for example, "**exct-** and **set-**"). It does not change the state of protection switches and does not delete history.

This command is analogous to depressing the RST button on the PROCR anytime AFTER 10 seconds have elapsed (Major alarm LED not flashing) since powering the shelf or PROCR pack. If this command is executed while low-speed input signals are "failed" or circuit packs are removed, they will be dropped from the list of things to be monitored.

This command requires two entries from the terminal to cause execution. On entry of the command, the PROCR responds with a question to verify that the right command has been entered. If a **Y** or **y** is received from the terminal within 60 seconds for the PROCR2 (10 seconds for the PROCR1), then the PROCR executes the process. If a **Y** or **y** is not received from the terminal, then the update process is aborted.

The parameters are defined below:

s=*x* Identifies the shelf for this command. If there is only one shelf in the bay, this entry is optional and the default value is **1**. If there is more than one shelf in the bay, then the value of *x* is from **1** to **8** and is required.

e=*y* Identifies the system end for this command. The value of *y* is either **n** for the near end (default) or **f** for the far end.

NAME

exct-sw: make and break hs and ls protection switches

SYNOPSIS

exct-sw-hs:{**m=***c*} {[**s=***x*]} [**e=***y*] {**make** | **break**} (electrical)

exct-sw-hs:[**m=***c*] {[**s=***x*]} [**e=***y*] {**make** | **break**} (optical)

exct-sw-ls:{**m=***c*} {[**s=***x*]} [**e=***y*] {**make=***z* | **break**}

DESCRIPTION

CAUTION:
This command may be service affecting. If optional parameters are not set properly, the default value may cause service interruption.

EXCT-SW controls the protection switches in the DDM-1000.

In an optical system, an **exct-sw** command at one end will switch both directions of transmission on both muldems within a shelf assembly. In 180 Mb/s configurations, a high-speed switch will still be made on a 90 Mb/s entity, that is, on the circuits associated with one of the two assemblies. To switch service completely off of a 180 Mb/s optical line, the command must be individually executed for each of the two shelf assemblies.

exct-sw-hs: is the function unit / high-speed interface switch.

exct-sw-ls: is the low-speed interface switch.

Automatic "make" switch requests caused by failures override manual switches. Automatic "break" switch requests do not override manual switches. If locks are made after manual switches, then these switch requests do not override.

The command is not executed if service will be affected. Instead, PROCR responds with a message stating that service will be affected and asking if an override is desired. If a **Y** or **y** is received from the terminal within 60 seconds for the PROCR2 (10 seconds for the PROCR1), then the PROCR makes or breaks the switch. Immediately after the switch has been made or broken, a lock is put up to prevent the switch from reverting back to its state before the override command was given. The ABN LED will be lighted to indicate the locked condition, and the command "***exct-lock:***" must be used to release the lock when required. If a **Y** or **y** is not received from the terminal, then the process is aborted.

The parameters are defined below:

m=*c* Identifies the muldem within a shelf for this command. For **sw-hs**, the value of *c* is either **a** for muldem A or **b** for muldem B when the DDM-1000 is an electrical terminal and it is a required parameter. For **sw-hs**, the value of *c* is **ab** for both muldems A and B when the DDM-1000 is an optical terminal and it is an optional parameter. For **sw-ls**, the value of *c* is either **a** for muldem A or **b** for muldem B and it is a required parameter.

s=*x* Identifies the shelf for this command. If there is only one shelf in the bay, this entry is optional and the default value is **1**. If there is more than one shelf in the bay, then the value of *x* is from **1** to **8** and is required.

e=*y* Identifies the system end for this command. The value of *y* is either **n** for the near end (default) or **f** for the far end.

make Causes a function unit/OLIU switch to be put up.

break Causes a switch to be taken down.

make=*z* Causes a low-speed interface switch to be put up for low-speed interface *z*. The value of *z* is from **1** to **7**.

NAME

help: provide command string examples

SYNOPSIS

help:[*string*]

h:[*string*]

?:[*string*]

DESCRIPTION

HELP runs through a complete synopsis list of commands. They are scrolled as described in the generic description. In the MC90083A1E PROCR2, this request provides a complete synopsis of commands which are specific to the shelf configuration (optical or electrical).

NOTE:
[string] must follow immediately after the colon with no space. Otherwise the command will search for [space-string].

The optional argument is defined below.

string When specified, all synopsis lines matching *string* anywhere within the line are output. Only the first five characters of *string* are used for matching purposes.

NAME

rept-fail: list the current failures

SYNOPSIS

rept-fail:{[**s=***x*]} [**e=***y*]

rept-fail-all:{[**s=***x*]} [**e=***y*]

rept-fail-dsx:[**m=***c*] {[**s=***x*]} [**e=***y*] [**hs** | **ls=***r*]

rept-fail-l6mb:{[**s=***x*]} [**e=***y*]

rept-fail-16mb:{[**s=***x*]} [**e=***y*]

rept-fail-fiber:{[**s=***x*]} [**e=***y*]

rept-fail-pack:{[**s=***x*]} [**e=***y*] [**common** | **hs** | **ls**]

DESCRIPTION

REPT-FAIL lists the current failures in the DDM-1000. The information is scrolled out as described in the generic description. The **l6mb** and **16mb** report are the same since l (el) and 1 (one) are easily mistaken for each other.

rept-fail: lists signaling failures to the far end terminal, pack failures, fan failure, incoming optical fiber and cross-connect failures, and local loss of DS2 frame. Specific failure information is not given.

rept-fail-all: yields a concatenation of the **fail-dsx: hs**, **fail-dsx: ls=***r* (**1** to **7**), **fail-l6mb**, **fail-fiber**, and **fail-pack** reports.

rept-fail-dsx:, with no signal specified, lists incoming DSX-3 failures and gives a specific listing of all low-speed cross-connect inputs with **f** for failed, **g** for good, and **—** for not applicable.

rept-fail-dsx: hs lists a specific DSX-3 signal as not monitored, no failure, failed by parity errors (10^{-6}), failed by bipolar violations (10^{-3}), or failed by loss of signal / out of frame.

rept-fail-dsx: ls=*r* lists a specific DSX signal as not monitored, no failure, failed by bipolar violations (10^{-6}), failed by bipolar violations (10^{-3}), failed by loss of signal, or failed by loss of frame (DS1C only) for each channel.

rept-fail-l6mb: lists the specific DS2 groups that have a local (L6MB) loss of DS2 frame indication. A channel equipped with AEK38 DS2 INTFC1 packs with no DS2 input signal will produce an "l6mb" failure indication.

rept-fail-fiber: lists the SRV and PROTN optical input as not monitored, no failure, failed by parity errors or failed by loss of signal / out of frame. In addition, the current error rate (down to 10^{-12}), errored seconds [up to 86,400 seconds (24 hours)], and seconds counting (up to 86,400 seconds) information is listed. At the end of 24 hours, the errored seconds count is transferred into history (**rept-hsty**), the counter is cleared, and a new 24-hour cycle begins. In 180 Mb/s configurations, incoming optical line failures are reported on a 90 Mb/s basis, that is, a complete failure of the line will result in a failure report from each of the two assemblies.

rept-fail-pack:, with no group specified, yields a concatenation of the **fail-pack: common**, **fail-pack: hs**, and **fail-pack: ls** reports. A complete failure of a 20-type OLIU will be reported by each of the two assemblies in a 180 Mb/s configuration.

rept-fail-pack: common lists specific failures of the PROCR, TLM1, or PWR packs.

rept-fail-pack: hs lists specific failures of the ELIU1, SRV and PROTN OLIU, muldem A SRV and PROTN function units, and muldem B SRV and PROTN function units. Service-affecting failures are marked with an asterisk.

rept-fail-pack: ls lists specific failures of each low-speed interface. Service-affecting failures are marked with an asterisk.

The parameters are defined below:

m=*c* Identifies the muldem within a shelf for this command. For **fail-dsx**, the value of *c* is either **a** for muldem A, **b** for muldem B, or **ab** (default) for both muldems A and B.

s=*x* Identifies the shelf for this command. If there is only one shelf in the bay, this entry is optional and the default value is **1**. If there is more than one shelf in the bay, then the value of *x* is from **1** to **8** and is required.

e=*y* Identifies the system end for this command. The value of *y* is either **n** for the near end (default) or **f** for the far end.

ls=*r* Identifies the low-speed group for this command. The value of *r* is from **1** to **7**. If no value is specified, the default is **all** low-speed groups.

common Identifies a request for information on the PROCR, TLM1, and PWR packs.

hs Identifies a request for information on the ELIU1, OLIU and MXR packs.

ls Identifies a request for information on the low-speed interface packs.

NAME

rept-hsty: list the last items that have occurred

SYNOPSIS

rept-hsty:{[**s=***x*]} [**e=***y*]

DESCRIPTION

REPT-HSTY is supported by the PROCR2 but not by the PROCR1. In 180 Mb/s configurations, the 24-hour errored seconds count will be reported by each of the two assemblies.

REPT-HSTY lists the last 30 items that have occurred. They are scrolled out in last in first out (LIFI) order in MC90083A1C and later PROCR2s, and in first in first out (FIFO) in previous version PROCRs. If the information does not fit in the display window, then it is scrolled out as described in the generic description. Items are displayed in the following format:

-*XX* Days *YY* Hours *ZZ* Minutes:
Item description.

Each item is given a time stamp. The number of days, hours, and minutes since the event was recorded is given by *XX*, *YY*, and *ZZ*. There is a 30-day maximum on the time stamp. In MC90083A1C (or earlier) PROCR2 packs, after the last item has been reported, the PROCR asks if the history should be deleted. If a **Y** or **y** is received from the terminal within 60 seconds, then the PROCR clears all history entries. If a **Y** or **y** is not received from the terminal, then the history information is not deleted. In MC90083A1D (or later) PROCR2 packs, after the last item has been reported, the PROCR asks if the history should be saved. If a **N** or **n** is received from the terminal within 60 seconds, then the PROCR clears all history entries. If a **N** or **n** is not received from the terminal, then the history information is saved.

CAUTION:
A PROCR "reset" or power removal will erase history from memory, "rst" will not.

NOTE:
If an optical fiber failure occurs, it will be recorded in history. With the fiber failure, a high speed protection switch will automatically occur but it will not be recorded in history. The switch will occur if there are no manual locks invoked at the time of failure.

The following items are included in the history report:

RST button operation
circuit pack removal
end/add-drop conversion
exct-clear-fail
exct-lock-hs
exct-lock-ls
exct-loop-ds3u1
exct-loop-ls
exct-rst
exct-sw-hs
exct-sw-ls
optical/electrical conversion
set-dsx-alm
set-dsx-code
set-dsx-l6mb
set-dsx-mon
set-frm-ds3u1
set-lsprotn-gr
set-lsprotn-prior
set-shelf-almdel
set-shelf-autolock
set-shelf-fbrth
set-shelf-fecom
set-vmr-ds3u1
specific DSX, fiber, & pack failures
test-auto-turnup
test-ins+mon
test-procr
24-hour errored seconds (fiber)

The parameters are defined below:

s=*x* Identifies the shelf for this command. If there is only one shelf in the bay, this entry is optional and the default value is **1**. If there is more than one shelf in the bay, then the value of *x* is from **1** to **8** and is required.

e=*y* Identifies the system end for this command. The value of *y* is either **n** for the near end (default) or **f** for the far end.

NAME

rept-opt: list current option settings

SYNOPSIS

rept-opt-shelf:{[**s=***x*]} [**e=***y*]

rept-opt-dsx:[**m=***c*] {[**s=***x*]} [**e=***y*] [**ds3** | **ls=***r*]

rept-opt-lsprotn:{[**s=***x*]} [**e=***y*] [**ls=***r*]

rept-opt-pack:{[**s=***x*]} [**e=***y*] [**common** | **hs**]

rept-opt-pack:[**m=***c*] {[**s=***x*]} [**e=***y*] [**ls**]

DESCRIPTION

REPT-OPT lists information about the options within the DDM-1000. If the information does not fit in the display window, then it is scrolled out as described in the generic description.

rept-opt-shelf: lists general information about the type of terminal (optical/electrical, end/add-drop); high and low DSX alarm thresholds; optical line alarm threshold; alarm delay; near end only (near end plus far end) alarming; two (three) level alarming; DS3U1 frame and VMR option settings; the autolock parameters; and whether the system is connected as an "open network" or as a "closed network". The report also lists information about the enabling/disabling of far-end communication and DS3 performance monitoring. The optical line alarm threshold will be reported individually for each shelf in 180 Mb/s configurations.

rept-opt-dsx: yields a concatenation of the **opt-dsx: ds3** and **opt-dsx: ls=***r* (**1** to **7**) reports.

rept-opt-dsx: ds3 lists information about the DSX-3 inputs (monitored - yes or no, threshold - high or low, and alarm - no, MN, MJ, CR, DS3 L6mb).

rept-opt-dsx: ls=*r* lists information about each input into the specified (r) low-speed interface (code - AMI or B6ZS or B8ZS, monitored - yes or no, threshold - high or low, and alarm - no, MN, MJ, CR).

rept-opt-lsprotn: lists specific information about each low-speed interface (switching priority and protection group).

rept-opt-pack: yields a concatenation of the **opt-pack: common**, **opt-pack: hs**, and **opt-pack: ls** reports.

rept-opt-pack: common lists specific information about the PROCR (firmware version), TLM (present), and PWR (protected or unprotected).

rept-opt-pack: hs lists specific information about the ELIU1 (present), SRV and PROTN OLIU (present), and the muldem A and B SRV and PROTN function units (DS3U2, MXR1, or MXR2). In 180 Mb/s configurations, each of the two shelves will indicate that it is equipped with OLIUs.

rept-opt-pack: ls lists specific information about the rate (DS1, DS1C, or DS2) and generation of each low-speed interface.

The parameters are defined below:

m=*c* Identifies the muldem within a shelf for this command. For **opt-dsx** and **opt-pack: ls**, the value of *c* is either **a** for muldem A, **b** for muldem B, or **ab** (default) for both muldems A and B.

s=*x* Identifies the shelf for this command. If there is only one shelf in the bay, this entry is optional and the default value is **1**. If there is more than one shelf in the bay, then the value of *x* is from **1** to **8** and is required.

e=*y* Identifies the system end for this command. The value of *y* is either **n** for the near end (default) or **f** for the far end.

ds3 Identifies the DS3 signal for this command.

ls=*r* Identifies the specific low-speed interface pack for this command. The value of *r* is from **1** to **7**. When specified without the **ls** parameter, this command applies to all low-speed packs.

common Identifies a request for information on options in the PROCR, TLM1, and PWR packs.

hs Identifies a request for information on options in the ELIU1, OLIU and MXR packs.

ls Identifies a request for information on options in the low-speed interface packs.

NAME

rept-stat-protn: list the current protection status

SYNOPSIS

rept-stat-protn:[**m=***c*] {[**s=***x*]} [**e=***y*]

DESCRIPTION

REPT-STAT-PROTN gives the protection status of the DDM-1000. If the information does not fit in the display window, then it is scrolled out as described in the generic description.

The report lists specific information about the high-speed (on SRV or on PROTN, no lock or locked) and low-speed (no switch or switched to PROTN, no locks or individual locks, no loops or individual loops) switch status for both muldem A and B. In addition, if a switch or lock exists, the origin of the request (AUTO or NE or FE or TLM) is given. In 180 Mb/s configurations, the optical line protection status (switched/unswitched, locked/unlocked) will be reported individually for each of the two assemblies.

The parameters are defined below:

m=*c* Identifies the muldem within a shelf for this command. The value of *c* is either **a** for muldem A, **b** for muldem B, or **ab** (default) for both muldems A and B.

s=*x* Identifies the shelf for this command. If there is only one shelf in the bay, this entry is optional and the default value is **1**. If there is more than one shelf in the bay, then the value of *x* is from **1** to **8** and is required.

e=*y* Identifies the system end for this command. The value of *y* is either **n** for the near end (default) or **f** for the far end.

NAME

set-dsx: set cross-connect options

SYNOPSIS

set-dsx-alm:[**m=***c*] {[**s=***x*]} [**e=***y*] {**no** | **mn** | **mj** | **cr**} {**ds3**} for framed DS3

set-dsx-alm:[**m=***c*] {[**s=***x*]} [**e=***y*] {**no** | **mn** | **mj** | **cr**} [**ls=***r-t*]

set-dsx-code:[**m=***c*] {[**s=***x*]} [**e=***y*] {**no** | **ami** | **b8zs**} [**ls=***r-t*]

set-dsx-l6mb:[**m=***c*] {[**s=***x*]} [**e=***y*] {**led** |**no** | **mn** | **mj** | **cr**} for DS3 AIS

set-dsx-16mb:[**m=***c*] {[**s=***x*]} [**e=***y*] {**led** |**no** | **mn** | **mj** | **cr**}

set-dsx-mon:[**m=***c*] {[**s=***x*]} [**e=***y*] {**no** | **yes-high** | **yes-low**} {**ds3**}

set-dsx-mon:[**m=***c*] {[**s=***x*]} [**e=***y*] {**no** | **yes-high** | **yes-low**} [**ls=***r-t*]

DESCRIPTION

SET-DSX is used to specify characteristics of the cross-connect inputs and outputs. The alarm and switch algorithms for the circuit packs associated with these signals are determined from this list of characteristics. Either an l6mb or 16mb entry is acceptable since an "l" (el) and 1 (one) are easily mistaken for each other.

This series of "set" commands allows the shelf to be provisioned (soft set) via an ASCII terminal. In some cases the settings will be affected by a "reset." In all PROCR2 versions, "`set-dsx-code:`" parameters are not affected by a "reset." In all PROCR versions prior to MC90083A1E, all other non service-affecting "set" parameters will be returned to default values by a reset. In MC90083A1E PROCR2 packs, an option is provided to save the soft set parameters during a "reset." See the "`exct-reset:`" command description in this section and DP-404 in the Installation and Maintenance section of this manual.

set-dsx-alm: specifies whether a low-speed input is to be alarmed (default is no), and if a DS3 input is to be alarmed other than **MJ** (default).

⚠ CAUTION:
This command may be service affecting. If optional parameters are not set properly, the default value may cause service interruption.

set-dsx-code: specifies the coding type (AMI/B8ZS) to be selected on AEK36B-type and AEK36C DS1 INTFC2 circuit packs. If specified for first generation (AEK36 DS1 INTFC1) circuit packs while using a PROCR2, the command is rejected and a diagnostic message appears on the ASCII terminal

screen. If a PROCR1 and either an AEK36, AEK36B-type, or an AEK36C is used, no diagnostic message will appear. **In both cases, the "`rept-opt-dsx:`" command will show the code format changed but the format did not actually change.** The coding type command operates on inputs even if they are not monitored or are not present. This command is not applicable to the DS3 signal.

Channel formats may be determined in two ways: manual switch setting and using this command from an ASCII terminal. When the channel formats are determined solely by the switch option on the low-speed packs, the format is unaffected by "reset", "rst", processor replacement, low-speed pack replacement, or loss of power to the shelf. But when the channel formats are set using this ASCII terminal command (soft set) the system relies on electronic memory instead of hardware (switch) memory to determine the channel formats.

MC90083A1C and later PROCR2

In MC90083A1C and later, PROCR2s, soft set channel formats will remain unchanged for the following:

- If a PROCR2 is "reset" or restarted ("rst").
- If a low-speed pack is replaced and the same PROCR2 is used.
- If a new PROCR2 is installed and a "reset" is done, which causes the PROCR to learn the current channel line code settings.
- If power is lost to the shelf, the PROCR2 stores channel provisioning in nonvolatile memory and restores the contents to the pack when power is restored.

Manually setting the channel formats requires the circuit pack to be switched to protection, removed, switches set, the pack reinserted, and then switched back to service. Each switch to protection causes a "hit" on all four channels. Soft setting the channel formats does not cause any "hits" on the other service channels within the DS1 pack.

When using manual switch settings to determine channel formats, as each low-speed pack is installed the PROCR2 learns the code format from the switch settings and adds them to its inventory list. Later, if you decide to change the format, you must remove the pack, reset the switches, reinsert the pack, and do a "rst" to update the processor inventory. If you don't do a "rst", then the transmission format *will* be changed but the PROCR2 won't know it. If the processor doesn't know the format, the low-speed protection pack cannot be automatically formatted when a protection switch is required, and the response from the command "**rept-opt-dsx:**" will be wrong.

If you prefer to soft set channel formats using "**set-dsx-code:**", it is recommended that they always be set this way to avoid confusion, because the channel formats may be provisioned opposite to the switch setting. **Once the channel is "soft set", future switch setting changes will have no effect.**

In MC90083A1C and MC90083A1D PROCR2 versions, soft sets may be cleared in three ways:

1. The preferred way to clear soft sets is to use the command "**set-dsx-code:no.**" The "**set-dsx-code:no**" command will override channel code format soft sets and restore the channel transmission to the code format switch settings. However, on the MC90083A1C and MC90083A1D PROCR2 packs, subsequent switch changes will not be effective unless the soft set history is removed from the low-speed pack with the "**exct-reset:**" command.

2. ⚠ CAUTION:
   The "reset" will cause some previously soft-set shelf parameters to be erased and restored to their default values. Check office records and use other commands (for example, `rept-opt-shelf:`*) to determine other shelf parameters that may be set.*

   Use the command "`rept-opt-dsx:` to determine the code format setting. Remove the low-speed pack and set the code format switches to agree with the setting shown on the terminal. Reseat the pack and execute the command "**exct-reset:**". This action will remove the soft set history from that pack and allow the switches to control the code format.

3. ⚠ CAUTION:
   Service must be removed from the pack, not protection switched. If switched to protection and "rst" is done with the service pack removed, the PROCR2 will drop the service pack from its inventory and the protection switch will be dropped.

   The least preferred way to clear "soft sets" is to remove service from the low-speed pack, remove the pack, do an "rst" to remove the pack from the PROCR2 inventory, and then reseat the pack. The PROCR2 learns the switch settings and the soft-set history is gone.

MC90083A1E PROCR2 Firmware

In MC90083A1E PROCR2 firmware, the "**rept-opt-dsx:**" display indicates DS1 channels that are soft set by an "*" following the code format type. When the code format is soft set back to be the same as the switch setting, the "*" is not displayed and the channel format may be controlled by the switches. This enhancement provides identification for channels that are soft set, and does not require an "rst" or "reset" to clear soft-set history as described in the three steps above for earlier PROCR2 versions.

In MC90083A1E PROCR2 packs, **set-dsx-l6mb:** specifies whether to indicate the loss of all seven l6mb (DS2 frames) in a DS3 signal with valid DS3 frame (default is **no**). This signal condition is most likely caused by an incoming DS3 AIS signal but is not restricted to only a DS3 AIS signal. The terms DS3 AIS and "l6mb" are sometimes used to mean the same thing. This feature applies to a DDM-1000 shelf used as a terminating DS3 multiplexer in the electrical configuration. This feature will work only if the muldem receiving the DS3 signal contains AKM2C MXR packs and AEK36( ) or AEK37 packs. The detection of l6mb will not work if the receiving muldem contains AEK38 packs, and is unpredictable if the muldem contains AKM2 or AKM2B packs.

The default mode after a two-step "reset" will provide no visual indication of "l6mb". When the parameter "**led**" is entered, incoming DS3 AIS produces an indication by flashing the ALM LED on the in-service MXR pack with the incoming AIS. When the parameter "**mn, mj,** or **cr**" is entered, incoming DS3 AIS will produce an indication by (1) flashing the ALM LED on the in-service MXR pack with the incoming AIS and (2) activating the selected office alarms. The PROCR will have the selected alarm level and NE LEDs lighted, and the selected alarm level and FE LED will be lit if "fecom" is on and the FE alarm option switch is provisioned in the PROCR. When the parameter "**no**" is entered, the DS3 AIS indication will return to the default setting (no alarms).

If the alarm level is provisioned for "**mj, mn,** or **cr**" using the "**set-dsx-l6mb:**" command, the parallel telemetry alarms will be the same for both "loss of all seven l6mb" and incoming DS3 signal failures. The "**rept-fail:**" command will indicate "L6MB failure" and TBOS points 31 and 32 will be activated regardless of the setting of the "l6mb" parameter.

The DS3 AIS (l6mb) indicator feature applies only to DDM-1000 shelves equipped with MXR packs, not with DS3U1 or DS3U2 packs. This DS3 AIS (l6mb) feature is functional in both open and closed networks.

set-dsx-mon: specifies whether to monitor, and at what threshold to monitor, an input and output. When specified without the **ls** parameter, this command applies to all low-speed signals. If the **no** parameter is selected, service on that pack will still switch to protection if necessary, and the appropriate alarms will activate.

Low-speed provisioning — Both **set-dsx-mon:** and **set-dsx-alm:** commands interact with DDM-1000's low-speed provisioning feature as follows: If neither command is executed, low-speed provisioning functions as described in the DESCRIPTION section of this manual. With no low-speed signal applied, the monitor mode is **no-high** and the alarm mode is **no**[1]. Applying a valid low-speed input will change the monitor mode to **yes-high** and will leave the alarm mode set to **no**. At any time, **set-dsx-mon:** will change the monitor mode to **no**, **yes-high**, or **yes-low** depending on the argument selected. At any time, **set-dsx-alm:** will change the alarm mode according to the argument selected, that is, to **no**, **mn**, **mj** or **cr**. Removing a low-speed input and pressing the **RST** button (or removing the input and using the **exct-rst:** command) will return the monitor mode to **no-high** and the alarm mode to **no**[2] even if "**set-dsx-mon:**" and "**set-dsx-alm:**" have been used to provision a channel.

DS3 provisioning — Both **set-dsx-mon:** and **set-dsx-alm:** interact with DDM-1000's DS3 provisioning feature as follows: If neither command is executed, the DS3 channel is monitored "**yes-high**" and alarmed at the "**MJ**" level. These are default values after a system "reset" whether a DS3 input signal is present or not. At any time, "**set-dsx-mon:**" can change the DS3 monitor mode to "**no, yes-high, or yes-low**" depending on the argument chosen. At any time, "**set-dsx-alm:**" can change the alarm mode to "**no, mn, mj, or cr**" depending on the argument chosen. Removing the DS3 input and pressing the **RST** button (or removing the input and executing the "**exct-rst:**" command) will return the monitor mode to "**yes-high**" and the alarm mode to "**MJ**".

1. With the PROCR2, these states are reported by the command "**rept-opt-dsx:**" With the MC90083A1 PROCR1, the report generated by "**rept-opt-dsx:**" contains blanks for the threshold and alarm states, although the actual states are as indicated above

2. With the MC90083A1 PROCR1, and with the threshold set to **low**, it is necessary to use the command "**set-dsx-mon:no**" to return to the non-monitored state

The parameters are defined below:

m=*c* Identifies the muldem within a shelf for this command. The value of *c* is either **a** for muldem A, **b** for muldem B, or **ab** (default) for both muldems A and B. The **ab** option can only be used when the command is used for all low-speed signals.

s=*x* Identifies the shelf for this command. If there is only one shelf in the bay, this entry is optional and the default value is **1**. If there is more than one shelf in the bay, then the value of *x* is from **1** to **8** and is required.

e=*y* Identifies the system end for this command. The value of *y* is either **n** for the near end (default) or **f** for the far end.

no For **set-dsx-mon:**, specifies that the PROCR is NOT to monitor the identified signals. This is the default value for a DS1, DS1C, or DS2 input with no signal applied. For **set-dsx-alm:**, specifies that the PROCR is NOT to alarm the identified signals. This is the default value for DS1, DS1C, or DS2 inputs. For **set-dsx-code:**, specifies that the channel code format that is soft set will be returned to the switch settings. On MC90083A1C and MC90083A1D PROCR2 packs, subsequent switch changes will not be effective unless the soft set history is removed from the low-speed pack with the "**exct-reset:**" command. For **set-dsx-l6mb:**, specifies no office alarm or visual indication for incoming DS3 AIS.

yes-high Specifies that the PROCR is to monitor the identified signals at the high (10^{-3}) threshold. This is the default value for DS1, DS1C, or DS2 inputs with valid signals applied and for all DS3 inputs. At "high" threshold, bi-polar violations (BPVs) are monitored at the low-speed rates and at DS3.

yes-low Specifies that the PROCR is to monitor the identified signals at the low (10^{-6}) threshold. At "low" threshold, BPVs are monitored at the low-speed rates and parity errors are monitored at DS3.

mn Specifies that the PROCR is to raise a minor alarm for failures of the identified DS1, DS1C, DS2, or DS3 signals. When this parameter is entered for the **set-dsx-l6mb:** command, the ALM LED on the in-service MXR pack also flashes with the incoming AIS.

mj Specifies that the PROCR is to raise a major alarm for failures of the identified DS1, DS1C, DS2, or DS3 signals. This is the default value for DS3. When this parameter is entered for the **set-dsx-l6mb:** command, the ALM LED on the in-service MXR pack also flashes with the incoming AIS.

cr Specifies that the PROCR is to raise a critical alarm for failures of the identified DS1, DS1C, DS2, or DS3 signals. When this parameter is entered for the **set-dsx-l6mb:** command, the ALM LED on the in-service MXR pack also flashes with the incoming AIS.

ami Specifies that the PROCR is to override the coding selected by DIP switches on the board so that the identified signals are AMI coded.

b8zs Specifies that the PROCR is to override the coding selected by DIP switches on the board so that the identified signals are B8ZS coded.

ds3 Identifies the DS3 signal for this command.

ls=*r-t* Identifies low-speed signal group and channel for this command. The value of *r* is from **1** to **7** and refers to the DS2 group. The value of *t* is from **1** to **4** and refers to the channel. If the "**ls**" parameter is not specified, the default is **all** low-speed signals.

led For the **set-dsx-l6mb:** command. When the option "**led**" is entered, incoming DS3 AIS produces an indication by flashing the ALM LED on the in-service MXR pack with the incoming AIS.

NAME

set-frm-ds3u1: allow DS3U1 to accept or not accept framed signal

SYNOPSIS

set-frm-ds3u1:{[**s=***x*]} [**e=***y*] {**no** | **yes**}

DESCRIPTION

SET-FRM-DS3U1 is used to control whether the DS3U1 will accept a framed or an unframed signal.

NOTE: If the DS3U1 pack is inserted *before* the PROCR is inserted, the DS3U1 pack will be provisioned to accept an *unframed* signal. If the DS3U1 pack is inserted *after* the PROCR is inserted and "reset", the DS3U1 pack will be provisioned to accept a *framed* signal.

set-frm-ds3u1: This command will allow the DS3U1 to accept either an unframed ("no") or a framed ("yes") DS3 signal. There is no default value, but once this command is executed it will remain in that state until commanded to the other state. The setting is immune to "reset", power failure, PROCR2 change, or DS3U1 change (the latter two not at the same time). If the DS3U1 is set in the unframed mode, the firmware will not perform a protection switch based on bit errors received from the fiber. If the DS3U1 is set to the framed mode, the signal to the DS3U1 must have a DS3 frame as specified in CB-119. When **set-frm-ds3u1:** is executed to either state ("yes" or "no"), **set-vmr-ds3u1:** is also automatically executed to the same state. The command **rept-opt-shelf:** will display these settings.

The parameters are defined below:

s=*x* — Identifies the shelf for this command. If there is only one shelf in the bay, this entry is optional and the default value is **1**. If there is more than one shelf in the bay, then the value of *x* is from **1** to **8** and is required.

e=*y* — Identifies the system end for this command. The value of *y* is either **n** for the near end (default) or **f** for the far end.

no — Specifies that the DS3U1 is to accept an unframed signal. The "**rept-opt-shelf:**" command will show "frame disabled."

yes — Specifies that the DS3U1 is to accept a framed signal. The "**rept-opt-shelf:**" command will show "frame enabled."

NAME

set-lsprotn: set low-speed protection options

SYNOPSIS

set-lsprotn-gr:[**m=***c*] {[**s=***x*]} [**e=***y*] {**no** | **8** | **9** | **8+9**} [**ls=***r*]

set-lsprotn-prior:[**m=***c*] {[**s=***x*]} [**e=***y*] {**low** | **high**} [**ls=***r*]

DESCRIPTION

SET-LSPROTN is used to set low-speed protection options.

This series of "set" commands allow the shelf to be provisioned (soft set) via an ASCII terminal. In some cases the settings will be affected by a "reset."

In all PROCR2 versions, "`set-dsx-code:`" parameters are not affected by a "reset".

In all PROCR versions prior to MC90083A1E, all other non service-affecting "set" parameters will be returned to default values by a reset.

In MC90083A1E PROCR2 packs, an option is provided to save the soft set parameters during a "reset". See the "`exct-reset:`" command description in this section and DP-404 in the Installation and Maintenance section of this manual.

set-lsprotn-gr: specifies the protection slot to be used to protect a low-speed interface circuit. This command is valid at any time, even if there are different speeds in the protection slots. The firmware verifies that the selected option is appropriate before actually using it when protection switching.

set-lsprotn-prior: assigns a priority to a low-speed interface circuit pack for switching purposes. There are two levels that can be specified, high and low. If a double failure exists, the high-priority pack is protected instead of the low priority pack. All automatic switches (high- or low-priority) bump manual switches unless there is a lock.

The parameters are defined below:

m=*c* Identifies the muldem within a shelf for this command. The value of *c* is either **a** for muldem A, **b** for muldem B, or **ab** (default) for both muldems A and B. The **ab** option is valid only when the LS group is not identified.

s=*x* Identifies the shelf for this command. If there is only one shelf in the bay, this entry is optional and the default value is **1**. If there is more than one shelf in the bay, then the value of *x* is from **1** to **8** and is required.

e=*y* Identifies the system end for this command. The value of *y* is either **n** for the near end (default) or **f** for the far end.

no Specifies that the PROCR is NOT to protect this circuit.

8 Specifies that the PROCR is to use slot 8 only for protecting this circuit.

9 Specifies that the PROCR is to use slot 9 only for protecting this circuit.

8+9 Specifies that the PROCR is to use slot 8 or 9 for protecting this circuit. This is the default value if **no**, **8**, or **9** is not specified. When the value is **8+9**, the firmware selects the appropriate slot based on the speed and B8ZS/AMI options available in the protection slots. If AEK36B or AEK36B S1:2 packs are used in the protection slot and PROCR2 is used, then the B8ZS/AMI option will be automatically selected.

low Specifies that the identified circuit has a low switching priority. This is the default value.

high Specifies that the identified circuit has a high switching priority.

ls=*r* Identifies the low-speed interface circuit for this command. The value of *r* is from **1** to **7**. If no value is specified, then this command is applied to **all** low-speed interface circuits.

NAME

set-shelf: set shelf options

SYNOPSIS

set-shelf-almdel:{[**s=***x*]} [**e=***y*] [**d=***z*]

set-shelf-autolock:{[**s=***x*]} [**e=***y*] [**p=***n*] [**i=***i*] [**l=***d*]

set-shelf-fbrth:{[**s=***x*]} [**e=***y*] [**t=***v*]

set-shelf-fecom:[**m=***c*] {[**s=***x*]} [**e=***y*] {**no** | **yes**}

DESCRIPTION

SET-SHELF is used to set the alarm delay and the incoming optical switching threshold for the shelf. With the PROCR2 it is also used to enable or disable far-end maintenance.

This series of "set" commands allow the shelf to be provisioned (soft set) via an ASCII terminal. In some cases the settings will be affected by a "reset."

In all PROCR2 versions, "`set-dsx-code:`" parameters are not affected by a "reset".

In all PROCR versions prior to MC90083A1E, all other non service-affecting "set" parameters will be returned to default values by a reset.

In MC90083A1E PROCR2 packs, an option is provided to save the soft set parameters during a "reset". See the "`exct-reset:`" command description in this section and DP-404 in the Installation and Maintenance section of this manual.

set-shelf-almdel: sets the delay between the onset of a trouble condition and the activation of the appropriate office alarms and parallel telemetry. Serial telemetry (TBOS) is not affected.

set-shelf-autolock: sets the parameters that determine how many automatic protection switches (both low-speed and high-speed) will be allowed within a specified period of time before automatically applying a lock onto protection. A third parameter may be set that determines how long the lock will remain on protection before automatically returning to service. If this command is entered with all maximum length parameters, a "syntax error" will result because the maximum number of forty characters on the command line will be exceeded. If this happens, enter the command once for some of the parameters, then repeat the command for the remaining desired parameters.

set-shelf-fbrth sets the threshold[1] at which an incoming optical signal will be considered to have failed and will be protected. The incoming optical signal failure threshold is set individually for each of the two assemblies in a 180 Mb/s configuration.

set-shelf-fecom: enables or disables the far-end maintenance communication channel.

⚠ CAUTION:
If far-end communication **(fecom)** *is turned off in a far-end muldem from the near end (that is,* **e**=*f), it can be turned back on only by dispatching someone to the far end to turn communications (fecom) on.*

This command is recognized only by the PROCR2. By default, fecom is ON for an optical system and OFF for an electrical system. Far end maintenance communication is turned on or off individually for each of the two assemblies in a 180 Mb/s configuration. With MC90083A1E PROCR2 packs and the shelf in electrical mode, "fecom" is not affected by a "reset" or PROCR removal and reinsertion when "fecom" is set opposite to the default. For example, in an electrical shelf, if "fecom" is turned on (yes), it will stay on although the shelf is "reset" or the PROCR2 is removed and reinserted. In optical mode, a "reset" will restore "fecom" to the default value (ON).

The parameters are defined below:

m=*c* — Identifies the muldem within a shelf for this command. The value of *c* is either **a** for muldem A, **b** for muldem B, or **ab** (default) for both muldems A and B. This parameter would be specified if a DDM-1000 muldem equipped with AKM2( ) MXR packs interfaces with another DDM-1000 equipped with a DS3U1 clear channel pack in the same muldem. Fecom can not be used with a DS3U1 and is automatically turned off in that muldem. It must be turned off manually in the interfacing muldem.

s=*x* — Identifies the shelf for this command. If there is only one shelf in the bay, this entry is optional and the default value is **1**. If there is more than one shelf in the bay, then the value of *x* is from **1** to **8** and is required.

e=*y* — Identifies the system end for this command. The value of *y* is either **n** for the near end (default) or **f** for the far end.

1. The threshold selection will affect the length of time required to declare an incoming fiber signal good again after a failure

d=*z* Sets the number of seconds of delay from discovery of a failure until the office alarm and MJ, MN, and CR parallel telemetry alarms are raised. This does not affect the protection switching time or the serial telemetry (TBOS). The value of *z* is from **0** to **30** (default = **20**).

t=*v* Sets the order of magnitude (interpreted as a negative number) to be used as the switching threshold for the optical line. The value of *v* is from **3** to **8** (default = **6**). When *v*=**3**, out of frame/loss of clock is used as the switching threshold. For *v* from **4** to **8**, the switching threshold is based on parity monitoring of the incoming line signals. The choice of switching thresholds will affect the time to declare the incoming line signal good again once a failure condition has cleared.

no Specifies that end-to-end maintenance communication with the far-end DDM-1000 (or other multiplex) is to be disabled. This is the default value for an electrical DDM-1000. This value should be selected for an add/drop system or for a system incorporating more than two interconnected DDM-1000 terminals.

yes Specifies that end-to-end maintenance communication with the far-end DDM-1000 (or other multiplex) is to be enabled. This is the default value for an optical DDM-1000. This value should **not** be selected for an add/drop system or for a system incorporating more than two interconnected DDM-1000 terminals.

p=*n* Sets the number of protection switches allowed before the autolock is invoked. The value of *n* may be set from **3** to **7**. The default value is **4**.

i=*t* Sets the number of 10-minute intervals over which the number of protection switches will be accumulated before the autolock is invoked. The value of *t* is from **1** to **144**. For example, 1=10 minutes, 2=20 minutes, 6=1 hour and 144=24 hours. The default value is **1** (10 minutes).

l=*d* Sets the length of time in hours that the autolock will hold before automatically releasing and returning from protection to service. The value of *d* is from **1** to **24**. The default is **1** (1 hour).

NAME

set-vmr-ds3u1: enables or disables violation monitor and remover (VMR) in the DS3U1 pack.

SYNOPSIS

set-vmr-ds3u1:{[**s=***x*]} [**e=***y*] {**no** | **yes**}

DESCRIPTION

SET-VMR-DS3U1 is used to control the altering of the P-bit in the DS3 frame.

NOTE:
If the DS3U1 pack is inserted *before* the PROCR is inserted, the DS3U1 pack will be provisioned to "*not alter the P-bit*" (**no**). If the DS3U1 pack is inserted *after* the PROCR is inserted and "reset", the DS3U1 pack will be provisioned to "*alter the P-bit*" (**yes**).

set-vmr-ds3u1: allows parity errors in the DS3 signal received in either direction (from the DSX3 or the fiber) to pass unaltered (**no**) or corrected (**yes**). There is no default value, but once this command is executed it will remain in that state until commanded to the other state. The setting is immune to "reset", power failure, PROCR2 change, or DS3U1 change, but not a PROCR2 change and a DS3U1 change at the same time. If the VMR is set to "no", parity errors will not be corrected but will continue to be monitored and reported. The VMR cannot be set to "yes" if the "**set-frm-ds3u1:**" is set to "no". The command "**rept-opt-shelf:**" will display the settings.

The parameters are defined below:

s=*x* Identifies the shelf for this command. If there is only one shelf in the bay, this entry is optional and the default value is **1**. If there is more than one shelf in the bay, then the value of *x* is from **1** to **8** and is required.

e=*y* Identifies the system end for this command. The value of *y* is either **n** for the near end (default) or **f** for the far end.

no Specifies that the parity errors are to pass unaltered and are not to be corrected. The "**rept-opt-shelf:**" command will display that the VMR is "disabled."

yes Specifies that parity errors are to be corrected. The "**rept-opt-shelf:**" command will display that the VMR is "enabled."

NAME

test-alm: test the office alarms

SYNOPSIS

test-alm:{[**s=***x*]} [**e=***y*] [**i=***z*]

DESCRIPTION

TEST-ALM is used to test the audible and visible office alarms. There is a general test of office alarms that is a sequential test. Individual office alarms may also be tested.

The general office alarm test command cycles through no alarm, critical alarm, major alarm, minor alarm, and then the power minor alarm at 4-second intervals. The critical alarm is tested only if three level alarms have been selected and the TLM1 is installed. The power alarm is tested only if the TLM1 is installed. *

The specific office alarm test command turns on an individual office alarm for 20 seconds. One and only one office alarm is on at a time. The interval may be shortened by sending another command to turn on another office alarm. The interval may be lengthened by sending another command to turn on the same office alarm. The office alarm remains on for 20 seconds from the time of the last command. If the command is called with **off**, then the specific alarm test is terminated without waiting for 20 seconds. *

The parameters are defined below:

s=*x* Identifies the shelf for this command. If there is only one shelf in the bay, this entry is optional and the default value is **1**. If there is more than one shelf in the bay, then the value of *x* is from **1** to **8** and is required.

e=*y* Identifies the system end for this command. The value of *y* is either **n** for the near end (default) or **f** for the far end.

NOTE:
If this command is executed for **e=***f*, the audible and visible office alarms will be activated at the far-end office.

i=*z* Identifies the specific alarm to be tested. The value of *z* is **no** for no alarm, **cr** for critical, **mj** for major, **mn** for minor, **pmn** for power minor, or **off**. If a value is not specified, then the general alarm test is done.

NAME

test-auto-turnup: run the automated turnup tests

SYNOPSIS

test-auto-turnup:[**m=***c*] {[**s=***x*]} [**e=***y*] {**local** | **lsdsx** | **system**}

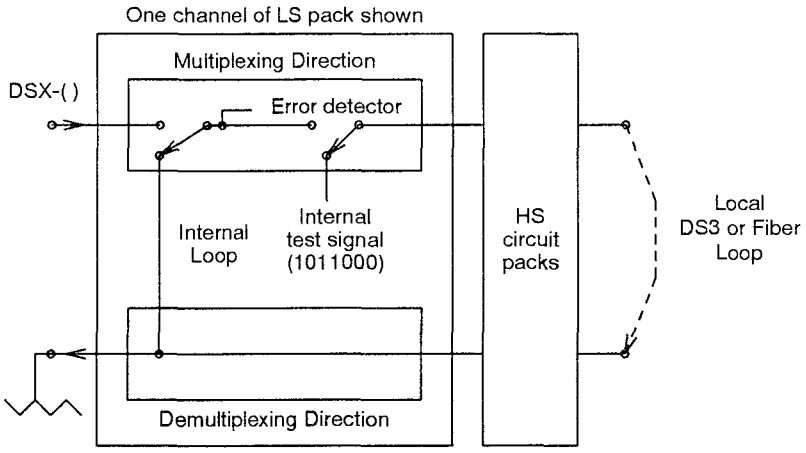
DESCRIPTION

CAUTION:
This command may be service affecting. If optional parameters are not set properly, the default value may cause service interruption.

TEST-AUTO-TURNUP is used to do the turnup testing of the DDM-1000 in an automated manner. Low-speed tests for DS1, DS1C, and DS2 are fully automated and require no external test equipment. When testing a shelf containing DS3U1 or DS3U2 packs, a framed DS3 signal must be externally supplied to the inputs. For this test, you may supply a test signal from a conventional test set at one end, and do a DS3 loop at the other end. Do not loop the DS3 signals at both ends at the same time or when the fiber is looped back.

This command requires two entries from the terminal to cause execution. On entry of the command, the PROCR responds with a question to verify that the right command has been entered. If a **Y** or **y** is received from the terminal within 60 seconds for the PROCR2 (10 seconds for the PROCR1), then the PROCR executes the process. If a **Y** or **y** is not received from the terminal, then the process is aborted.

The **local** test is an internal test of the local equipment. (See Figure 4-1.) It assumes an external high-speed loop of the equipment. This test makes combinations of loopback commands and test signal insertion commands to provide a functional test of all transmission paths that are equipped within the shelf. Failures and best estimates of the trouble location are provided through messages to the terminal and through the LEDs. Low-speed service slot one in both muldems must be equipped with any type of low-speed pack to test the protection slots.

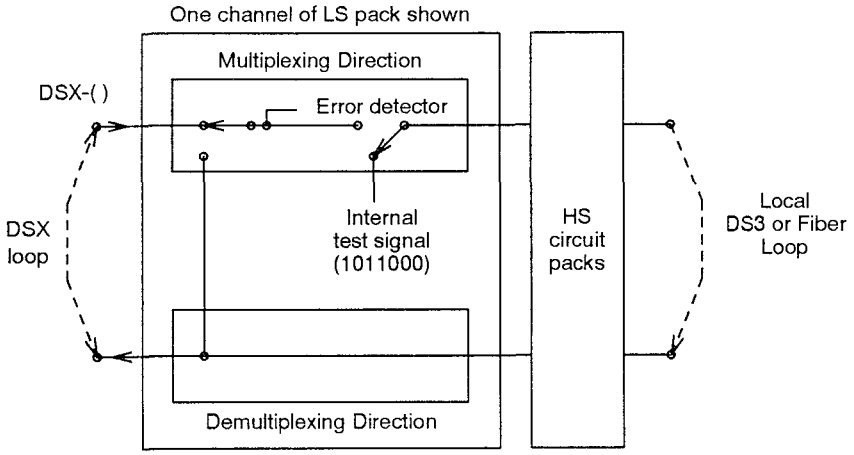


- All channels are tested at the same time.
- Requires a local high-speed (HS) loopback.
- Output to the DSX( ) must be terminated.
- Switches shown are electronic, not mechanical.

Figure 4-1. Automated Internal Test of Local Equipment (test-auto-turnup:local)

The **lsdsx** test is a test of the local wiring to the cross-connect point. (See Figure 4-2.) It assumes loops of all low- and high-speed signals. Again, the test makes combinations of loopback commands and test signal insertion commands to provide a complete check of the wiring to and from the local cross-connect points for all equipped low-speed interfaces. The **lsdsx** test is not functional for the AEK38 DS2 pack. The displayed result will contain an "**X**" in those groups equipped with DS2 packs. Failures are reported through the terminal and the LEDs.

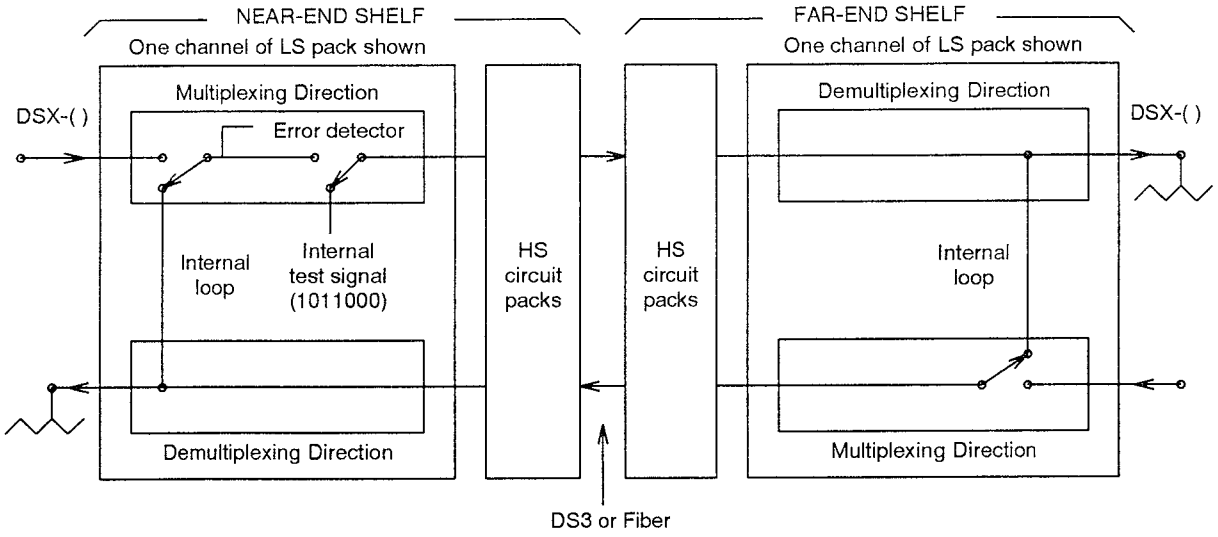
It is recommended that the **lsdsx** test be performed first with all low-speed slots looped back. All slots should test good. Next, remove the looping devices in the odd numbered slots and repeat the test. All the even numbered slots should test good and the odd numbered slots should report fail. Note which slots report fail. Replace the looping devices in the odd numbered slots and remove all of the ones from the even numbered slot. Repeat the test and note which slots show fail. All the odd numbered slots should show good and the even ones should show fail.



- All channels are tested at the same time.
- Requires a local high-speed (HS) loopback.
- Requires local low-speed (LS) loopbacks at the DSX( ).
- Switches shown are electronic, not mechanical.

Figure 4-2. Automated Test of Local Wiring to Cross-Connect Point (test-auto-turnup:lsdsx)

The **system** test is a test of the end-to-end system. (See Figure 4-3.) No low-speed loops are required of any inputs or outputs. This test makes near-end and far-end low-speed loopbacks and near-end low-speed test signal insertions in a sequence to check the end-to-end operation of the system. Far end communication (fecom) must be turned on (enabled) to do this test. Failures are reported through the terminal and the LEDs In a 180 Mb/s configuration, the end-to-end system test is performed at the 90 Mb/s level, that is, to completely test the optical line, the test is performed individually for each of the two assemblies. Low-speed service slot one in both muldems must be equipped with any type of low-speed pack to test the protection slots.



- All channels are tested at the same time.
- Output to the DSX( ) at both ends must be terminated.
- Far-end (FE) low-speed (LS) loop is put up automatically when the command is executed at the near end (NE).
- Switches shown are electronic, not mechanical.

Figure 4-3. Automated End-to-End System Test (test-auto-turnup:system)

The parameters are defined below:

m=*c* Identifies the muldem within a shelf for this command. The value of *c* is either **a** for muldem A, **b** for muldem B, or **ab** (default) for both muldems A and B. The tests may be initiated separately for muldem A and muldem B only if the shelf is being used as an electrical assembly. If the shelf is being used as an optical assembly, then muldems A and B cannot be tested separately.

s=*x* Identifies the shelf for this command. If there is only one shelf in the bay, this entry is optional and the default value is **1**. If there is more than one shelf in the bay, then the value of *x* is from **1** to **8** and is required.

e=*y* Identifies the system end for this command. The value of *y* is either **n** for the near end (default) or **f** for the far end.

local Identifies the test as a local test.

lsdsx Identifies the test as a low-speed cross-connect test.

system Identifies the test as a system test.

NAME

test-ins+mon: insert test signal and monitor the results

SYNOPSIS

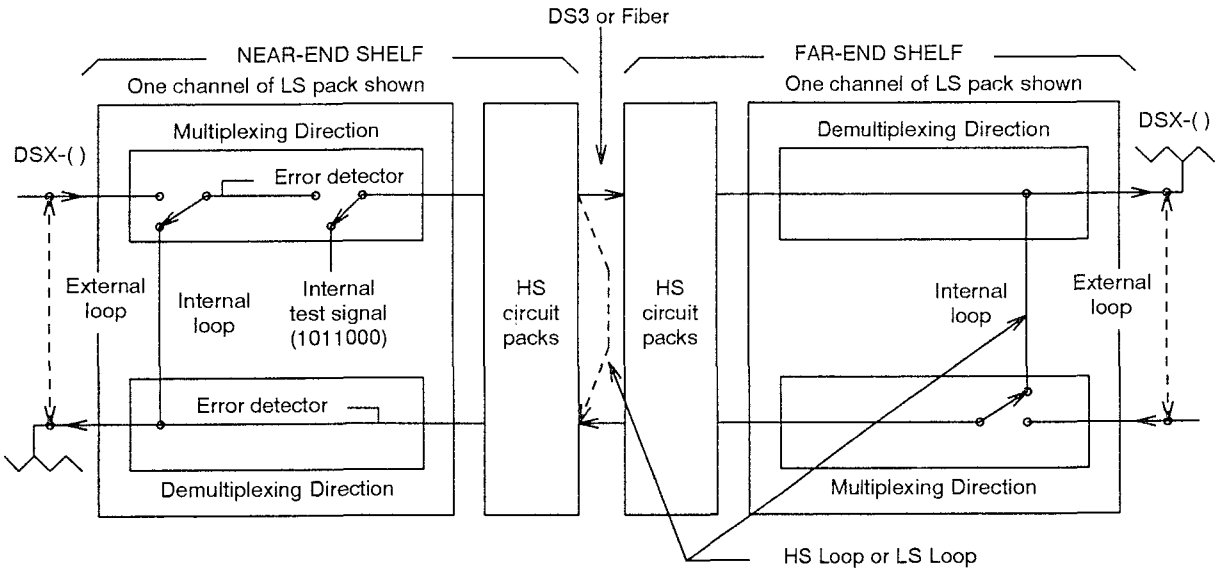
test-ins+mon:{m=*c***}** {**[s=***x***]**} **[e=***y***]** {**ls=***r-t***}** **[d=z]** for PROCR2

test-ins+mon:{m=*c***}** {**[s=***x***]**} **[e=***y***]** {**ls=***r-t***}** **{d=z}** for PROCR1

DESCRIPTION

CAUTION:
This command may be service affecting. If optional parameters are not set properly, the default value may cause service interruption.

TEST-INS+MON is used to insert an internal test signal onto a data path within DDM-1000. (See Figure 4-4.) It requires an external high-speed loop of the equipment, or a far-end loop of the low-speed channel being tested. The return signal is then monitored with an internal test signal receiver for errors. The return signal monitor is nominally in the demux direction. However, the mux direction (for DS1 and DS1C only) may be specified for use when the low-speed signals are looped back on themselves at the near end either at the cross-connect or internally, using the **exct-loop-ls:** command.



- Tests one channel at a time.
- Output to DSX( ) at both ends must be terminated.
- Done with high-speed (HS) or low-speed (LS) loop.
- Switches shown are electronic, not mechanical.

Figure 4-4. Test Signal Insertion and Monitoring (test-ins+mon:)

The test is performed at the DS1 level regardless of whether the DDM-1000 is equipped for DS1, DS1C or DS2 operation.

This command requires two entries from the terminal to cause execution. On entry of the command, the PROCR responds with a question to verify that the right command has been entered. If a **Y** or **y** is received from the terminal within 60 seconds for the PROCR2 (10 seconds for the PROCR1), then the PROCR executes the process. If a **Y** or **y** is not received from the terminal, then the process is aborted.

The results of the test (test duration, errored seconds, total errors, and error rate) are displayed on a terminal and updated every 5 seconds. This test automatically terminates 1 minute after starting. The test may be extended by typing an **R** or **r** and carriage return during the existing test. The test is terminated 1 minute after the last command has been issued or when a different command, or a simple carriage return is issued.

NOTE:
If this test is performed in the **mux** direction with a PROCR1 and there is no signal at all from the DSX-1 cross-connect, no errors will be counted. Under the same conditions, the PROCR2 will count no errors and will display the message "no incoming low-speed signal".

The parameters are defined below:

m=*c* Identifies the muldem within a shelf for this command. The value of *c* is either **a** for muldem A or **b** for muldem B. This is a required parameter.

s=*x* Identifies the shelf for this command. If there is only one shelf in the bay, this entry is optional and the default value is **1**. If there is more than one shelf in the bay, then the value of *x* is from **1** to **8** and is required.

e=*y* Identifies the system end for this command. The value of *y* is either **n** for the near end (default) or **f** for the far end.

ls=*r-t* Identifies low-speed signal group and DS1 channel for this command. The value of *r* is from **1** to **7** and refers to the DS2 group. The value of *t* is from **1** to **4** and refers to the DS1 channel. *Note that when AEK37 DS1C INTFC1 plug-ins are being tested, DS1 channels 1 and 2 comprise DS1C channel 1, and DS1 channels 3 and 4 comprise DS1C channel 2. When AEK38 DS2 INTFC1 plug-ins are tested, DS1 channel 1 comprises the DS2 channel.*

d=*z* Identifies the direction for the receiver to monitor. The value of *z* is **mux** for the multiplexing direction and **demux** for the demultiplexing direction. The PROCR2 will default to the **demux** value. The PROCR1 requires that this argument be entered. For AEK38 DS2 packs, only the demux value can be entered.

NAME

test-led: test the circuit pack leds

SYNOPSIS

test-led:{[**s=***x*]} [**e=***y*]

test-led:[**m=***c*] {[**s=***x*]} [**e=***y*] [**i=***z*]

DESCRIPTION

TEST-LED is used to test the LEDs. There is a general test that tests LEDs on all packs (except the RST/TST LED on the TLM2 pack) at the same time. There is also a specific test that can be used to test individual LEDs.

The general LED test command turns on all LEDs for 10 seconds followed by turning all LEDs off for 10 seconds. After the 20 seconds have passed, the LEDs revert to normal operation.

The specific LED test command turns on an individual LED for 20 seconds. One and only one LED is on at a time except for the PWR LEDs where both are on at the same time for this test and for failed PWR packs that turn on their ALM LED automatically. The interval may be shortened by sending another command to turn on another LED. The interval may be lengthened by sending another command to turn on the same LED. The LED remains on for 20 seconds from the time of the last command. If the command is called with **off**, then the specific LED test is terminated without waiting for 20 seconds.

The parameters are defined below:

m=*c* Identifies the muldem within a shelf for this command. The value of *c* is either **a** for muldem A or **b** for muldem B. This is a required parameter if testing an LED on a pack in a specific muldem (for example, if **i=*srv-mxr***, then "**m**" must be entered; if **i=*mj***, then "**m**" is not required).

s=*x* Identifies the shelf for this command. If there is only one shelf in the bay, this entry is optional and the default value is **1**. If there is more than one shelf in the bay, then the value of *x* is from **1** to **8** and is required.

e=*y* Identifies the system end for this command. The value of *y* is either **n** for the near end (default) or **f** for the far end.

i=*z* Identifies the specific LED to be tested. The value of *z* is **cr**, **mj**, **mn**, **pmn**, **aco**, **ne**, **fe**, **abn**, **procr**, **tlm**, **pwr**, **srv-oliu**, **protn-oliu**, **srv-mxr**, **protn-mxr**, **srv-ds3u**, **protn-ds3u**, **ls-**[**1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9**], or **off**. If a value is not specified, then the general LED test is done.

NAME

test-procr: run the processor self-test

SYNOPSIS

test-procr:{[**s=***x*]} [**e=***y*]

DESCRIPTION

TEST-PROCR causes the processor to do a self-test. This test checks the EPROM, EEPROM, and RAM. If the test failed for any reason, a message indicating the need for replacing the PROCR is given. If this happens, the PROCR does not resume normal monitoring.

The parameters are defined below:

s=*x* Identifies the shelf for this command. If there is only one shelf in the bay, this entry is optional and the default value is **1**. If there is more than one shelf in the bay, then the value of *x* is from **1** to **8** and is required.

e=*y* Identifies the system end for this command. The value of *y* is either **n** for the near end (default) or **f** for the far end.

NAME

test-tlm: test the telemetry

SYNOPSIS

test-tlm:{[**s=***x*]} [**e=***y*] [**i=***z*]

DESCRIPTION

CAUTION:
Overhead telemetry outputs connected to external equipment will be operated during this test.

TEST-TLM is used to test the parallel telemetry alarm and status points and overhead telemetry outputs. There is a general test that tests all outputs in a parallel manner. There is also a specific test that can be used to test individual outputs.

The general telemetry test command turns all parallel telemetry alarm and status point outputs except for **MJ** and **MN** and all local overhead telemetry point outputs on for 10 seconds and then off for 10 seconds. The parallel telemetry points **MJ** and **MN** remain on for the complete 20-second test cycle. The remote ACO input can be exercised during this test. If exercised, all parallel telemetry alarm and status point outputs except the system identification point are turned off for the duration of the test.

The specific telemetry test command turns on an individual telemetry point for 20 seconds. One and only one telemetry point is on at a time. The interval may be shortened by sending another command to turn on another telemetry point. The interval may be lengthened by sending another command to turn on the same telemetry point. The telemetry point remains on for 20 seconds from the time of the last command. If the command is called with **off**, then the specific telemetry test is terminated without waiting for 20 seconds.

Testing the **mj** or **mn** telemetry points using either the general or the specific telemetry test will also activate the corresponding office visible alarms for the duration of the test. The office audible alarms are not affected.

The parameters are defined below:

s=*x* Identifies the shelf for this command. If there is only one shelf in the bay, this entry is optional and the default value is **1**. If there is more than one shelf in the bay, then the value of *x* is from **1** to **8** and is required.

e=*y* Identifies the system end for this command. The value of *y* is either **n** for the near end (default) or **f** for the far end.

i=*z* Identifies the specific telemetry output to be tested. The value of *z* is **cr**, **mj**, **mn**, **pmn**, **ne**, **fe**, **clf**, **hs**, **ls**, **inc**, **sid**, **oht**[**1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15**], or **off**. If a value is not specified, then the general telemetry test is done.

Report Descriptions

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Report Descriptions

5

Introduction

This section presents examples of the DDM-1000 report commands and the reports they generate under normal and failure conditions. All the examples were generated by a system configured for end-to-end 90-Mb/s optical operation. Some of the reports generated by add/drop configurations and by electrical and 180-Mb/s optical systems will differ in some areas. However, the examples given here represent most of the messages encountered in normal operations.

For each example, a synopsis of the command is given listing optional arguments in square brackets ([ ]). Where an argument is used to pass a parameter, a prototype name for the parameter is given in italics. The examples are arranged in alphabetical order by command name. In some cases, several examples of the same command have been included to show the use of optional arguments.

The configuration selected for the examples illustrates a mixture of DS1, DS1C, and DS2 interfaces, as well as the optional telemetry circuit pack. The example system was equipped as follows:

- Muldem A
  - — Low-Speed Interfaces
    AEK36, AEK36B-type, or AEK36C packs in slots 1 through 5 and slot 8 (protection)
    AEK39 BP1 packs in slots 6 and 7; slot 9 unequipped
  - — Function Units
    AKM2B MXR2 or AKM2C MXR3 packs in both SRV(A) and PROTN(A) slots
- Muldem B
  - — Low-Speed Interfaces
    AEK37 DS1C INTFC1 packs in slots 1 through 3 and slot 8 (protection)
    AEK38 DS2 INTFC1 packs in slots 4 and 9 (protection)
    AEK39 BP1 packs in slots 5, 6, and 7
  - — Function Units
    AKM2B MXR2 or AKM2C MXR3 packs in both SRV(B) and PROTN(B) slots
- Common
  - — Controller
    MC90083A1D PROCR2 pack
  - — Telemetry Unit
    AKM4 TLM1 pack
- Optical Line Interfaces

  16G OLIU packs in SRV and PROTN Optical Line Interface Unit slots
- Power Units
  547A PWR1 units (–48 volts) in SRV and PROTN

REPT-FAIL Commands

REPT-FAIL commands list current failures in the DDM-1000. This section presents examples of system responses to the following REPT-FAIL commands:

rept-fail:[s=*shelf*] **[e**=*end*]

rept-fail-all:[s=*shelf*] **[e**=*end*]

rept-fail-dsx:[m=*muldem*] **[s**=*shelf*] **[e**=*end*]

rept-fail-dsx:[m=*muldem*] **[s**=*shelf*] **[e**=*end*] **[hs]**

rept-fail-dsx:[m=*muldem*] **[s**=*shelf*] **[e**=*end*] **[ls**=*group*]

rept-fail-l6mb:[s=*shelf*] **[e**=*end*]

rept-fail-16mb:[s=*shelf*] **[e**=*end*]

rept-fail-fiber:[s=*shelf*] **[e**=*end*]

rept-fail-pack:[s=*shelf*] **[e**=*end*]

rept-fail-pack:[s=*shelf*] **[e**=*end*] **[common]**

rept-fail-pack:[s=*shelf*] **[e**=*end*] **[hs]**

rept-fail-pack:[s=*shelf*] **[e**=*end*] **[ls]**

The optional arguments are:

m=*muldem*	Identifies muldem, where *muldem* is **a** for muldem A or **b** for muldem B or **ab** for both muldems. The default value of this argument is **m=ab**.
s=*shelf*	Identifies shelf, where *shelf* is a number from **1** to **8**. The default is **s=1**.
e=*end*	Identifies end, where *end* is **n** for near or **f** for far. The default is **e=n**.
ls=*group*	Identifies which low-speed group, where *group* is a number from **1** to **7** for low-speed groups 1 to 7, respectively. There is no default parameter for *group*.

common	Limits the report to information concerning the PROCR, TLM, and PWR circuit packs.
hs	Limits the report to information concerning the ELIU1, OLIU, and MXR circuit packs.
ls	Limits the report to information concerning the low-speed interface circuit packs.

Command: `rept-fail:`

rept-fail:[s=*shelf*] [e=*end*]

The rept-fail: command lists failures of

— signaling to the far-end terminal
— circuit packs
— fan
— incoming optical fiber signal
— incoming digital cross-connect signal
— local DS2 framing

in a report on the craft interface terminal. The report does not provide specific information (see rept-fail-all for specifics).

Table 5-1. User Input Example `rept-fail:`

System Response	Meaning
`rept-fail:` `Current Failures: None`	No alarms, no failures.

`rept-fail:`
`Current Failures:`
`TLM`
	Failure of AKM4 TLM1 or AKM7 TLM2 circuit pack.

`rept-fail:`
`Current Failures:`
`Muldem B -`
`LS INTFC 1`
	Failure of the low-speed interface circuit pack in position 1.

`rept-fail:`
`Current Failures:`
`Muldem B -`
`LS INTFC 1,8`
	Failure of both a service low-speed interface (position 1) and protection low-speed interface (position 8).

`rept-fail:`
`Current Failures:`
`Muldem A - SRV MXR`
	Failure of MXR function unit.

Table 5-1. User Input Example `rept-fail:` (Contd)

System Response	Meaning

`rept-fail:`
`Current Failures:`
`Muldem A - SRV+PROT MXR`
	Failure of both the service and protection MXR function units within the same muldem.

`rept-fail:`
`Current Failures:`
`PWR`
	Failure of one power unit.

`rept-fail:`
`Current Failures:`
`Muldem B - Inc LS`
	Loss of incoming low-speed signal or BER exceeding alarm threshold.

`rept-fail:`
`Current Failures:`
`Inc Fiber`
	Incoming fiber failure caused by loss of signal, loss of framing, or BER exceeding alarm threshold.

`rept-fail:`
`Current Failures:`
`Signaling-Muldem A+B`
`Inc Fiber`
	Loss of both incoming fibers.

`rept-fail:`
`Current Failures:`
`Muldem B - L6MB`
	Internal 6-Mb/s (L6MB) failure.

`rept-fail:`
`Current Failures:`
`Signaling-Muldem A+B`
	Loss of far-end communication. Service and protection fibers reversed.

Table 5-1. User Input Example `rept-fail:` (Contd)

System Response	Meaning

`rept-fail:`
`Current Failures:`
`Fan Failure`
	Shorted leads to PFAN connector (no DDM-1000 ED-2C834-30, G1 Fan Assembly).
	Failed DDM-1000 ED-2C834-30, G1 Fan Assembly.

`rept-fail:`
`Current Failures:`
`Fan Minor`
	Failure of fuses (Fan H, Fan L, BLX, or WHX) in 40D BFU.
	No FAAB or 111A Control Unit.
	FAAB installed backwards.
	No FAAB or 111A in Shelf 2 of 180 Mb/s system with P38 plugged in.
	Rectifier or Battery Charger failure.

Command: rept-fail-all:

rept-fail-all:[s=*shelf*] [e=*end*]

The DDM-1000 responds to the rept-fail-all: command by displaying the full failure reports of each of the following other REPT-FAIL commands:

rept-fail-dsx:
rept-fail-l6mb:
rept-fail-fiber:
rept-fail-pack:

Examples of the individual reports are presented in the sections that follow. If the reason for the failure does not appear in this display, then try entering the "rept-fail:" command described on the previous page.

Table 5-2. User Input Example: rept-fail-all:

System Response	Meaning
rept-fail-all: Muldem A not configured for DSX-hs Muldem B not configured for DSX-hs More? (Y/N) y Muldem A - Group 1 Current DS1 Input Failures Chan 1: No Failure - Good Signal Chan 2: Not Monitored Chan 3: No Failure - Good Signal Chan 4: Not Monitored More? (Y/N) y Muldem A - Group 2 Current DS1 Input Failures Chan 1: No Failure - Good Signal Chan 2: Not Monitored Chan 3: No Failure - Good Signal Chan 4: Not Monitored More? (Y/N) y Muldem A - Group 3 Current DS1 Input Failures	No alarms, no failures. The "not configured for DSX-hs" message is displayed because of the rept-fail-dsx command in the rept-fail-all command concatenation. The example system was configured for optical transmission, rather than electrical, hence the "not configured" message. The rept-fail-fiber command applies to optical systems.

Table 5-2. User Input Example: `rept-fail-all:` (Contd)

System Response	Meaning
Chan 1: No Failure - Good Signal Chan 2: No Failure - Good Signal Chan 3: Not Monitored Chan 4: Not Monitored More? (Y/N) y	Channels 1 and 2 have good DS1 signals on them. Channels 3 and 4 have no DS1 signals on them from the DSX.
Muldem A - Group 4 Current DS1 Input Failures Chan 1: No Failure - Good Signal Chan 2: No Failure - Good Signal Chan 3: Not Monitored Chan 4: Not Monitored More? (Y/N) y Muldem A - Group 5 Current DS1 Input Failures Chan 1: Not Monitored Chan 2: Not Monitored Chan 3: Not Monitored Chan 4: Not Monitored More? (Y/N) y Muldem B - Group 1 Current DS1C Input Failures Chan 1: No Failure - Good Signal Chan 2: No Failure - Good Signal More? (Y/N) y Muldem B - Group 2 Current DS1C Input Failures Chan 1: No Failure - Good Signal Chan 2: Not Monitored More? (Y/N) y Muldem B - Group 3 Current DS1C Input Failures Chan 1: No Failure - Good Signal Chan 2: Not Monitored More? (Y/N) y Muldem B - Group 4	

Table 5-2. User Input Example: `rept-fail-all:` (Contd)

System Response	Meaning
Current DS2 Input Failure	
Chan 1: No Failure - Good Signal	
More? (Y/N) y	
Current L6MB Failures:None	
More? (Y/N) y	
Current Fiber Input Failure	
Service Fiber:	
Failure = No Failure - Good Signal	No incoming errors on the fiber.
Current Error Rate: 0	Had no errored seconds.
Errored Seconds: 0	
Seconds Counting: 2087	Has been counting for 2087 seconds since last reset.
More? (Y/N) y	
Protection Fiber:	
Failure = No Failure - Good Signal	
Current Error Rate: 0	
Errored Seconds: 0	
Seconds Counting: 2090	
More? (Y/N) y	
Current HS Pack Failures	
*=Service Affecting	
None	
Current LS Pack Failures	
*=Service Affecting	
None	
More? (Y/N) y	
Current Common Pack Failures	
None	

Command: rept-fail-dsx:

rept-fail-dsx:[m=*muldem*] [s=*shelf*] [e=*end*]

The DDM-1000 responds to the rept-fail-dsx: command by displaying the full failure reports of each of the following other REPT-FAIL-DSX commands:

rept-fail-dsx:[m=*muldem*] [s=*shelf*] [e=*end*] hs
rept-fail-dsx:[m=*muldem*] [s=*shelf*] [e=*end*] ls=1
rept-fail-dsx:[m=*muldem*] [s=*shelf*] [e=*end*] ls=2
rept-fail-dsx:[m=*muldem*] [s=*shelf*] [e=*end*] ls=3
rept-fail-dsx:[m=*muldem*] [s=*shelf*] [e=*end*] ls=4
rept-fail-dsx:[m=*muldem*] [s=*shelf*] [e=*end*] ls=5
rept-fail-dsx:[m=*muldem*] [s=*shelf*] [e=*end*] ls=6
rept-fail-dsx:[m=*muldem*] [s=*shelf*] [e=*end*] ls=7

Examples of the reports produced by the rept-fail-dsx: command with the optional **hs** or **ls**=*group* arguments are presented in the sections that follow.

Table 5-3. User Input Example: rept-fail-dsx:

System Response	Meaning
rept-fail-dsx: Current DSX Failures: None	No alarms, no failures.
rept-fail-dsx: Current DSX Failures: LS Muldem A Muldem B Group 1 2 3 4 5 6 7 1 2 3 4 5 6 7 Chan 1 g g g g - - - g g g F - - - Chan 2 - - g g - - - g - - - - - - Chan 3 g g - - - - - - - - - - - - Chan 4 - - - - - - - - - - - - - - More Detailed Report? (Y/N) y Muldem A - Group 1 Current DS1 Input Failures Chan 1: No Failure - Good Signal Chan 2: Not Monitored Chan 3: No Failure - Good Signal Chan 4: Not Monitored More? (Y/N) y	Loss of incoming low-speed signal on channel 1 of muldem B group 4, where. g indicates "good" F indicates "Failed" — indicates "not monitored" Expands above summary table.

Table 5-3. User Input Example: `rept-fail-dsx:` (Contd)

System Response	Meaning
Muldem A - Group 2 Current DS1 Input Failures Chan 1: No Failure - Good Signal Chan 2: Not Monitored Chan 3: No Failure - Good Signal Chan 4: Not Monitored More? (Y/N) y Muldem A - Group 3 Current DS1 Input Failures Chan 1: No Failure - Good Signal Chan 2: No Failure - Good Signal Chan 3: Not Monitored Chan 4: Not Monitored More? (Y/N) y Muldem A - Group 4 Current DS1 Input Failures Chan 1: No Failure - Good Signal Chan 2: No Failure - Good Signal Chan 3: Not Monitored Chan 4: Not Monitored More? (Y/N) y Muldem A - Group 5 Current DS1 Input Failures Chan 1: Not Monitored Chan 2: Not Monitored Chan 3: Not Monitored Chan 4: Not Monitored More? (Y/N) y Muldem B - Group 1 Current DS1C Input Failures Chan 1: No Failure - Good Signal Chan 2: No Failure - Good Signal More? (Y/N) y Muldem B - Group 2 Current DS1C Input Failures Chan 1: No Failure - Good Signal Chan 2: Not Monitored More? (Y/N) y	

Table 5-3. User Input Example: `rept-fail-dsx:` (Contd)

System Response	Meaning
Muldem B - Group 3 Current DS1C Input Failures Chan 1: No Failure - Good Signal Chan 2: Not Monitored More? (Y/N) y Muldem B - Group 4 Current DS2 Input Failure Chan 1: Loss of Signal More? (Y/N) y	Loss of DS2 input signal in muldem B
rept-fail-dsx: Current DSX Failures: LS Muldem A Muldem B Group 1 2 3 4 5 6 7 1 2 3 4 5 6 7 Chan 1 g g g g - - - g g g g - - - Chan 2 - - g g - - - g - - - - - - Chan 3 F F - - - - - - - - - - - - Chan 4 - - - - - - - - - - - - - - More Detailed Report? (Y/N) y Muldem A - Group 1 Current DS1 Input Failures Chan 1: No Failure - Good Signal Chan 2: Not Monitored Chan 3: BPV Rate > 10E-3 Chan 4: Not Monitored More? (Y/N) y Muldem A - Group 2 Current DS1 Input Failures Chan 1: No Failure - Good Signal Chan 2: Not Monitored Chan 3: BPV Rate > 10E-3 Chan 4: Not Monitored More? (Y/N) y Muldem A - Group 3 Current DS1 Input Failures Chan 1: No Failure - Good Signal Chan 2: No Failure - Good Signal Chan 3: Not Monitored Chan 4: Not Monitored More? (Y/N) y	Channel 3 in muldem A group 1 and channel 3 in muldem A group 2 both have bipolar violations in excess of the alarm threshold

Table 5-3. User Input Example: `rept-fail-dsx:` (Contd)

System Response	Meaning
Muldem A - Group 4 Current DS1 Input Failures Chan 1: No Failure - Good Signal Chan 2: No Failure - Good Signal Chan 3: Not Monitored Chan 4: Not Monitored More? (Y/N) y Muldem A - Group 5 Current DS1 Input Failures Chan 1: Not Monitored Chan 2: Not Monitored Chan 3: Not Monitored Chan 4: Not Monitored More? (Y/N) y Muldem B - Group 1 Current DS1C Input Failures Chan 1: No Failure - Good Signal Chan 2: No Failure - Good Signal More? (Y/N) y Muldem B - Group 2 Current DS1C Input Failures Chan 1: No Failure - Good Signal Chan 2: Not Monitored More? (Y/N) y Muldem B - Group 3 Current DS1C Input Failures Chan 1: No Failure - Good Signal Chan 2: Not Monitored More? (Y/N) y Muldem B - Group 4 Current DS2 Input Failure Chan 1: No Failure - Good Signal More? (Y/N)	

Command: `rept-fail-dsx: hs`

rept-fail-dsx:[m=*muldem*] [s=*shelf*] [e=*end*] [hs]

When the rept-fail-dsx: command is used with the optional **hs** argument, the report is limited to DSX-3 failure information about the high-speed circuit packs (DS3U2, DS3U1, and MXR).

Table 5-4. User Input Example: `rept-fail-dsx: hs`

System Response	Meaning

`rept-fail-dsx:hs`
`Muldem A not configured for DSX-hs`
`Muldem B not configured for DSX-hs`
	No alarms, no failures. The "not configured for DSX-hs" message is displayed because the example system was configured for DS1 to optical transmission, rather than DS3 electrical. For an optical system, the rept-fail-fiber command applies.

Command: rept-fail-dsx: ls=*group*

rept-fail-dsx:[m=*muldem*] [s=*shelf*] [e=*end*] [ls=*group*]

When the rept-fail-dsx: command is used with the optional **ls** argument, the number of a low-speed group (**1** to **7**) is a required parameter. This usage of the command limits the dsx failure report to information about the low-speed group specified in the *group* parameter passed by the **ls** argument.

Table 5-5. User Input Example: rept-fail-dxs: ls=1

System Response	Meaning
rept-fail-dsx:ls=1 Muldem A - Group 1 Current DS1 Input Failures Chan 1: No Failure - Good Signal Chan 2: Not Monitored Chan 3: No Failure - Good Signal Chan 4: Not Monitored More? (Y/N) y Muldem B - Group 1 Current DS1C Input Failures Chan 1: No Failure - Good Signal Chan 2: No Failure - Good Signal	In this example, group 1 was specified. The report covers both muldem A group 1, which comprises four DS1 channels, and muldem B group 1, which comprises two DS1C channels.
rept-fail-dsx:ls=1 Muldem A - Group 1 Current DS1 Input Failures Chan 1: No Failure - Good Signal Chan 2: Not Monitored Chan 3: BPV Rate > 10E-3 Chan 4: Not Monitored More? (Y/N) y Muldem B - Group 1 Current DS1C Input Failures Chan 1: No Failure - Good Signal Chan 2: No Failure - Good Signal	The DS1 signal on channel 3 of muldem A group 1 has a bipolar violation rate exceeding the alarm threshold.

Table 5-5. User Input Example: `rept-fail-dxs: ls=1` (Contd)

System Response	Meaning

`rept-fail-dsx:ls=4`
`Muldem A - Group 4`
`Current DS1 Input Failures`
`Chan 1: No Failure - Good Signal`
`Chan 2: No Failure - Good Signal`
`Chan 3: Not Monitored`
`Chan 4: Not Monitored`
`More? (Y/N) y`
`Muldem B - Group 4`
`Current DS2 Input Failure`
`Chan 1: No Failure - Good Signal`
	No alarms or failures in muldem A group 4 (four DS1 channels) or muldem B group 4 (one DS2 channel).

`rept-fail-dsx:ls=4`
`Muldem A - Group 4`
`Current DS1 Input Failures`
`Chan 1: No Failure - Good Signal`
`Chan 2: No Failure - Good Signal`
`Chan 3: Not Monitored`
`Chan 4: Not Monitored`
`More? (Y/N) y`
`Muldem B - Group 4`
`Current DS2 Input Failure`
`Chan 1: Loss of Signal`
	Loss of DS2 signal in muldem B.

Command: `rept-fail-l6mb:`
`(rept-fail-16mb:)`

rept-fail-l6mb:[s=*shelf*] [e=*end*]

The rept-fail-l6mb: command lists DS2 groups that have an internal DS2 loss of frame (L6MB) indication. Because l (the letter el) is frequently misread as 1 (the number one), the rept-fail-16mb: command is provided. This produces the same report as the rept-fail-l6mb: command.

Table 5-6. User Input Example: `rept-fail-l6mb:`

System Response	Meaning
`rept-fail-16mb:` `Current L6MB Failures: None`	No alarms, no failures.

`rept-fail-16mb:`
`Current L6MB Failures:`
`Muldem A Muldem B`
`Group: 1 2 3 4 5 6 7 1 2 3 4 5 6 7`
`Status: g g g g g g g g g g F g g g`
	Failure of the local 6-Mb/s signal in muldem B group 4 where:
	g indicates "good"
	F indicates "Failed"

Command: rept-fail-fiber:

rept-fail-fiber:[s=*shelf*] [e=*end*]

The rept-fail-fiber: command lists the status of the SRV and PROT optical inputs in terms of the following states:

NOT MONITORED
NO FAILURE
FAILED BY PARITY ERRORS (PE)
FAILED BY LOSS OF SIGNAL/OUT OF FRAME

Additionally, the command lists error information about the most recent 24 hours since the last reset:

Current short-term error rate average (down to 10^{-12})
Errored seconds (up to 86,400)
Seconds counting (up to 86,400)

In 180-Mb/s configurations, incoming optical line failures are reported on a 90-Mb/s basis, that is, a complete failure of the line results in a failure report from each of the two assemblies.

Table 5-7. User Input Example: rept-fail-fiber:

System Response	Meaning
rept-fail-fiber: Current Fiber Input Failure Service Fiber : Failure = No Failure - Good Signal Current Error Rate: 0 Errored Seconds: 0 Seconds Counting: 2195 More? (Y/N) y Protection Fiber : Failure = No Failure - Good Signal Current Error Rate: 0 Errored Seconds: 0 Seconds Counting: 2198	No alarms, no failures.

Table 5-7. User Input Example: `rept-fail-fiber:` (Contd)

System Response	Meaning
rept-fail-fiber: Current Fiber Input Failure Service Fiber: Failure = No Failure - Good Signal Current Error Rate: 0 Errored Seconds: 0 Seconds Counting: 20010 More? (Y/N) y Protection Fiber: Failure = Loss of Signal/Out of Frame Current Error Rate: 10E-4 Errored Seconds: 3623 Seconds Counting: 20014	Loss of signal on incoming protection fiber. This indication is caused by the incoming signal falling below a minimum threshold, whether because of attenuation or because of a break in the fiber.
rept-fail-fiber: Current Fiber Input Failure Service Fiber: Failure = Loss of Signal/Out of Frame Current Error Rate: 10E-4 Errored Seconds: 326 Seconds Counting: 20644 More? (Y/N) y Protection Fiber: Failure = Loss of Signal/Out of Frame Current Error Rate: 10E-4 Errored Seconds: 4188 Seconds Counting: 20647	Loss of signal on incoming service and protection fibers.

Table 5-7. User Input Example: `rept-fail-fiber:` (Contd)

System Response	Meaning

`rept-fail-fiber:`
`Current Fiber Input Failure`
`Service Fiber:`
`Failure = PE Rate > 10E-6`
`Current Error Rate: 10E-5`
`Errored Seconds: 624`
`Seconds Counting: 1738`
`More? (Y/N) y`
`Protection Fiber:`
`Failure = No Failure - Good Signal`
`Current Error Rate: 10E-10`
`Errored Seconds: 0`
`Seconds Counting: 1741`
	Long-term average parity error rate on incoming service fiber exceeds alarm threshold, which is currently set to 10^{-6}.

`rept-fail-fiber:`
`Current Fiber Input Failure`
`Service Fiber:`
`Failure = PE Rate > 10E-6`
`Current Error Rate: 10E-4`
`Errored Seconds: 1969`
`Seconds Counting: 3188`
`More? (Y/N) y`
`Protection Fiber:`
`Failure = PE Rate > 10E-6`
`Current Error Rate: 10E-4`
`Errored Seconds: 829`
`Seconds Counting: 3191`
	Parity error rate on both incoming fibers exceeds alarm threshold.

Command: rept-fail-pack:

rept-fail-pack:[s=*shelf*] [e=*end*]

The DDM-1000 responds to the rept-fail-pack: command by displaying the full failure reports of each of the following other REPT-FAIL-PACK commands:

rept-fail-pack: common
rept-fail-pack: hs
rept-fail-pack: ls

In each of these reports, lines reporting service-affecting failures start with an asterisk.

Examples of the reports produced by the rept-fail-pack: command with the optional **common**, **hs**, or **ls** arguments are presented in the sections that follow.

Table 5-8. User Input Example: `rept-fail-pack`

System Response	Meaning

`rept-fail-pack:`
`Current HS Pack Failures`
`*=Service Affecting`
`None`
`Current LS Pack Failures`
`*=Service Affecting`
`None`
`Current Common Pack Failures`
`None`
	No alarms, no failures.

Command: `rept-fail-pack: common`

rept-fail-pack:[s=*shelf*] [e=*end*] common

When the rept-fail-pack: command is used with the optional **common** argument, the circuit pack failure report is limited to information about the circuit packs that are common to both the high-speed and low-speed groups. These are the PROCR, TLM, and PWR circuit packs.

Lines reporting service-affecting failures begin with an asterisk.

Table 5-9. User Input Example: `rept-fail-pack: common`

System Response	Meaning

`rept-fail-pack:common`
`Current Common Pack Failures`
`None`
	No alarms, no failures.

`rept-fail-pack:common`
`Current Common Pack Failures`
`TLM: Pack Failed`
	Failure of AKM4 TLM1 or AKM7 TLM2 circuit pack.

`rept-fail-pack:common`
`Current Common Pack Failures`
`PWR: Pack Failed`
	Failure of a single PWR power unit.

Command: `rept-fail-pack: hs`

rept-fail-pack:[s=*shelf*] [e=*end*] hs

When the rept-fail-pack: command is used with the optional **hs** argument, the circuit pack failure report is limited to information about the high-speed circuit packs (ELIU1, OLIU, and MXR).

Lines reporting service-affecting failures begin with an asterisk.

Table 5-10. User Input Example: `rept-fail-pack: hs`

System Response	Meaning

`rept-fail-pack:hs`
`Current HS Pack Failures`
`*=Service Affecting`
`None`
	No alarms, no failures.

`rept-fail-pack:hs`
`Current HS Pack Failures`
`*=Service Affecting`
`Muldem A- SRV MXR:`
	Failure of service MXR function unit.

`rept-fail-pack:hs`
`Current HS Pack Failures`
`*=Service Affecting`
`*Muldem A- SRV MXR:`
`*Muldem A- PROT MXR:`
	Failure of both the service and protection MXR function units within the same muldem.

Command: `rept-fail-pack: ls`

rept-fail-pack:[s=*shelf*] [e=*end*] ls

When the rept-fail-pack: command is used with the optional **ls** argument, the circuit pack failure report is limited to information about the low-speed circuit packs.

Lines reporting service-affecting failures begin with an asterisk.

Table 5-11. User Input Example: `rept-fail-pack: ls`

System Response	Meaning

`rept-fail-pack:ls`
`Current LS Pack Failures`
`*=Service Affecting`
`None`
	No alarms, no failures.

`rept-fail-pack:ls`
`Current LS Pack Failures`
`*=Service Affecting`
`Muldem A -`
`None`
`Muldem B -`
` LS intfc1`
`More? (Y/N) y`
	Failure of the low-speed interface circuit pack in position 1.

`rept-fail-pack:ls`
`Current LS Pack Failures`
`*=Service Affecting`
`Muldem A -`
`None`
`Muldem B -`
`*LS intfc1`
`More? (Y/N) y`
`*LS intfc8`
	Failure of both a service low-speed interface (position 1) and the protection low-speed interface (position 8) within the same muldem.

REPT-HSTY Command

The rept-hsty command lists the last 30 system events that have occurred within the last 30 days. The format of the command is

rept-hsty:[s=*shelf*] [e=*end*]

The optional arguments are:

s=*shelf* Identifies shelf, where *shelf* is a number from **1** to **8**. The default is **s=1**.

e=*end* Identifies end, where *end* is **n** for near or **f** for far. The default is **e=n**.

Events reported by the command are listed, starting with the most recent, in the format

-*xx* Days *yy* Hours *zz* Minutes:
<event description>

where *xx, yy* and *zz* are days, hours, and minutes since the event occurred. The event described can be:

24-hour errored second count
Execution of exec, set, or test commands
Circuit pack removal
RST button operation
End/add/drop conversion
Optical/electrical conversion
Miscellaneous specific failures

After the report is displayed, the user is asked if the history should be saved. Entering **Y** or **y** causes the system to save the history. Entering **N**, **n**, or a carriage return causes the system to delete the history.

Caution: PROCR reset erases the history from memory.

The rept-hsty command is supported by the PROCR2 circuit pack, but not by the PROCR1. In 180-Mb/s configurations, the 24-hour errored second count is reported by each of the two assemblies.

Command: `rept-hsty:`

rept-hsty:[s=*shelf*] [e=*end*]

The rept-hsty: command is supported by the PROCR2, but not the PROCR1. In 180-Mb/s configurations, the 24-hour errored seconds count will be reported by each of the two assemblies.

Table 5-12. User Input Example: `rept-hsty:`

System Response	Meaning

`rept-hsty:`
`-0 Days 0 Hours 25 Minutes:`
`Muldem B LS INTFC7  Removed`
`-0 Days 0 Hours 30 Minutes:`
`test procr executed`
`Save History? (Y/N) y`
`History has been saved`
	No alarms, no failures.

REPT-OPT Commands

REPT-OPT commands list current options in the DDM-1000. This section presents examples of system responses to the following REPT-OPT commands:

rept-opt-dsx:[m=*muldem*] [**s**=*shelf*] [**e**=*end*]

rept-opt-dsx:[m=*muldem*] [**s**=*shelf*] [**e**=*end*] **[ds3]**

rept-opt-dsx:[m=*muldem*] [**s**=*shelf*] [**e**=*end*] [**ls**=*group*]

rept-opt-lsprotn:[s=*shelf*] [**e**=*end*]

rept-opt-pack:[s=*shelf*] [**e**=*end*]

rept-opt-pack:[s=*shelf*] [**e**=*end*] **[common]**

rept-opt-pack:[s=*shelf*] [**e**=*end*] **[hs]**

rept-opt-pack:[m=*muldem*] [**s**=*shelf*] [**e**=*end*] **[ls]**

rept-opt-shelf:[s=*shelf*] [**e**=*end*]

where:

m=*muldem*	Identifies muldem, where *muldem* is **a** for muldem A or **b** for muldem B or **ab** for both muldems. The default value of this argument is **m=ab**.
s=*shelf*	Identifies shelf, where *shelf* is a number from **1** to **8**. The default is **s=1**.
e=*end*	Identifies end, where *end* is **n** for near or **f** for far. The default is **e=n**.
ls=*group*	Identifies which low-speed group, where *group* is a number from **1** to **7** for low-speed groups 1 to 7, respectively. There is no default parameter for *group*.
ds3	Limits the report to information concerning the DSX-3 input.
common	Limits the report to information concerning the PROCR, TLM, and PWR circuit packs.
hs	Limits the report to information concerning the ELIU1, OLIU, DS3U2, DS3U1, and MXR circuit packs.
ls	Limits the report to information concerning the low-speed interface circuit packs.

REPT-OPT commands display selected portions of the current equipment list. Note that this differs from the REPT-FAIL commands, which display the current status of the equipment itself. The equipment list is updated each time the exct-rst command is sent, the RST button on the PROCR circuit pack is pushed or when a pack is installed in a previously unequipped slot. If a failure has occurred or a circuit pack has been removed since the last reset, it will appear on the corresponding failure report, but not on the optioning report.

Command: rept-opt-dsx:

rept-opt-dsx:[m=*muldem*] [s=*shelf*] [e=*end*]

The DDM-1000 responds to the rept-opt-dsx: command by displaying the full reports of each of the following other REPT-OPT-DSX commands:

rept-opt-dsx:[m=*muldem*] [s=*shelf*] [e=*end*] ds3
rept-opt-dsx:[m=*muldem*] [s=*shelf*] [e=*end*] ls=1
rept-opt-dsx:[m=*muldem*] [s=*shelf*] [e=*end*] ls=2
rept-opt-dsx:[m=*muldem*] [s=*shelf*] [e=*end*] ls=3
rept-opt-dsx:[m=*muldem*] [s=*shelf*] [e=*end*] ls=4
rept-opt-dsx:[m=*muldem*] [s=*shelf*] [e=*end*] ls=5
rept-opt-dsx:[m=*muldem*] [s=*shelf*] [e=*end*] ls=6
rept-opt-dsx:[m=*muldem*] [s=*shelf*] [e=*end*] ls=7

Examples of the reports produced by the rept-opt-dsx: command with the optional **ds3** or **ls**=*group* arguments are presented in the sections that follow.

Table 5-13. User Input Example: rept-opt-dsx:

System Response	Meaning
rept-opt-dsx: Muldem Monitored Threshold Alarm A No B No Muldem A, Low-Speed 1 Chan Code Monitored Threshold Alarm 1 AMI Yes Low MN More? (Y/N) y 2 AMI No High No 3 AMI Yes High No 4 AMI No High No Muldem A, Low-Speed 2 Chan Code Monitored Threshold Alarm 1 AMI Yes Low MN 2 AMI No High No More? (Y/N) y 3 AMI Yes High No 4 AMI No High No	(See following page for complete meaning message.)

Table 5-13. User Input Example: `rept-opt-dsx:` (Contd)

System Response	Meaning

`Muldem A, Low-Speed 3`
`Chan Code Monitored Threshold Alarm`
`1 AMI Yes High MN`
`2 AMI Yes High MN`
`3 AMI No High No`
`More? (Y/N) y`
`4 AMI No High No`
`Muldem A, Low-Speed 4`
`Chan Code Monitored Threshold Alarm`
`1 AMI Yes High No`
`2 AMI Yes High No`
`3 AMI No High No`
`4 AMI No High No`
`More? (Y/N) y`
`Muldem A, Low-Speed 5`
`Chan Code Monitored Threshold Alarm`
`1 AMI No High No`
`2 AMI No High No`
`3 AMI No High No`
`4 AMI No High No`
`Muldem B, Low-Speed 1`
`More? (Y/N) y`
`Chan Code Monitored Threshold Alarm`
`1 B8ZS Yes High MN`
`2 B8ZS Yes High No`
`Muldem B, Low-Speed 2`
`Chan Code Monitored Threshold Alarm`
`1 B8ZS Yes High No`
`2 B8ZS No High No`
`More? (Y/N) y`
`Muldem B, Low-Speed 3`
`Chan Code Monitored Threshold Alarm`
`1 B8ZS Yes High No`
`2 B8ZS No High No`
`Muldem B, Low-Speed 4`
`Chan Code Monitored Threshold Alarm`
`1 B6ZS Yes High MJ`
	This example shows all possible equipment settings. The settable parameters are as follows:
	
	Code
	AMI — Alternate Mark Inversion line code
	B8ZS — Bipolar 8 Zero Suppression line code
	
	Monitored
	
	Yes
	When monitoring is enabled, the system checks for the presence of a signal from the DSX. When it detects a signal, it adds the channel to the equipment list and continues to monitor it. If the signal is lost, the system takes the action specified by the Alarm parameter.
	
	No Channel not monitored.
	
	Threshold
	Specifies the threshold at which the processor sets an alarm:
	
	High — 10^{-3} (default)
	Low — 10^{-6}
	
	Alarm
	Specifies what type of office alarm is to be set if the signal is lost:
	
	CR — Critical
	MJ — Major alarm
	MN — Minor alarm
	No — No alarm (default)

Command: `rept-opt-dsx: ds3`

rept-opt-dsx:[m=*muldem*] [s=*shelf*] [e=*end*] [ds3]

When the rept-opt-dsx: command is used with the optional **ds3** argument, the dsx option report is limited to information about the DS3 input, including:

Monitored — Yes or No
Threshold — High or low
Alarming level — CR or MJ.

Table 5-14. User Input Example: `rept-opt-dsx: ds3`

System Response	Meaning

`rept-opt-dsx: ds3`
`Muldem  Monitored  Threshold  Alarm`
`A  No`
`B  No`
	This report does not apply to an optical system. It only applies when the shelf is provisioned for DS3 transmission (ELIU, DS3U1, DS3U2).

Command: rept-opt-dsx: ls=*group*

rept-opt-dsx:[m=*muldem*] [s=*shelf*] [e=*end*] [ls=*group*]

When the rept-opt-dsx: command is used with the optional **ls** argument, the number of a low-speed group (**1** to **7**) is a required parameter. This usage of the command limits the dsx option report to information about the low-speed group specified in the *group* parameter passed by the **ls** argument. The report includes:

Code — AMI or B6ZS or B8ZS
Monitored — Yes or No
Threshold — High or low
Alarming level — CR, MJ, MN, or No

Table 5-15. User Input Example: rept-opt-dsx: ls=1

System Response	Meaning
rept-opt-dsx: ls=1 Muldem A, Low-Speed 1 Chan Code Monitored Threshold Alarm 1 B8ZS No High No 2 B8ZS No High No 3 B8ZS No High No 4 B8ZS No High No More? (Y/N) y Muldem B, Low-Speed 1 Chan Code Monitored Threshold Alarm 1 AMI No High No 2 AMI No High No	No alarms, no failures.

Command: `rept-opt-lsprotn:`

rept-opt-lsprotn:[s=*shelf*] [e=*end*]

The rept-opt-lsprotn: command lists the protection switching priority and protection group for each low-speed group. Possible parameters are as follows:

Sw Priority — The set-lsprotn: command is used to set each low-speed interface circuit pack to either high ("Hgh") or low priority. This determines which pack is to be protected in the event that more than one fails.

- If more than one low priority pack fails, the one that failed first is protected.
- If more than one high priority pack fails, the one that failed first is protected.
- If a high priority pack fails after a low priority pack has already failed and been switched out, the protection pack is switched away from the low priority pack and onto the high priority pack.

Protn Group — The set-lsprotn-gr: command is used to assign each low-speed interface to one of the two protection slots as follows:

- 8 — Service pack protected by the protection pack in slot 8 only
- 9 — Service pack protected by the protection pack in slot 9 only
- 8+9 — (Default). Service pack protected by the protection pack in slot 8, if present. If there is no pack in slot 8, then the service pack is protected by the pack in slot 9, if present.
- No — Service pack is not protected

Table 5-16. User Input Example: `rept-opt-lsprotn:`

System Response	Meaning

`rept-opt-lsprotn:`
`Low Speed: 1 2 3 4 5 6 7`
`Muldem A -`
`Sw Priority Hgh Hgh Low Low Low Low Low`
`Protn Group 8/9 8/9 8/9 8/9 8/9 8/9 8/9`
`Muldem B -`
`Sw Priority Low Low Low Hgh Low Low Low`
`Protn Group 8/9 8/9 8/9 8/9 8/9 8/9 8/9`
	In this example, muldem A groups 1 and 2 have high priority protection, while groups 3 through 7 have low priority protection. If, for example, the low-speed interface circuit pack in muldem A slot 6 fails, group 6 will be switched to the protection pack in slot 8 (or 9, if 8 is unequipped). If the pack in slot 2 then fails, group 6 will be switched back to the failed pack in slot 6, and group 2 will be switched onto the protection pack.

Command: rept-opt-pack:

rept-opt-pack:[s=*shelf*] [e=*end*]

The DDM-1000 responds to the rept-opt-pack: command by displaying the full option reports of each of the following other REPT-OPT-PACK commands:

rept-opt-pack: common
rept-opt-pack: hs
rept-opt-pack: ls

Examples of the reports produced by the rept-opt-pack: command with the optional **common**, **hs**, or **ls** arguments are presented in the sections that follow.

Table 5-17. User Input Example: rept-opt-pack:

System Response	Meaning
rept-opt-pack: Muldem A - LS 1: DS1 Gen 2; LS 2: DS1 Gen 2; LS 3: DS1 Gen 2; LS 4: DS1 Gen 2; LS 5: DS1 Gen 2; LS 6: None; LS 7: None; LS 8: DS1 Gen 2; LS 9: None. More? (Y/N) y Muldem B - LS 1: DS1C Gen 1; LS 2: DS1C Gen 1; LS 3: DS1C Gen 1; LS 4: DS2 Gen 2; LS 5: None; LS 6: None; LS 7: None; LS 8: DS1C Gen 1; LS 9: DS2 Gen 2. More? (Y/N) y ELIU: None; SRV OLIU: Present; PROTN OLIU: Present; Muldem A SRV Function Unit: MXR; PROTN Function Unit: MXR; Muldem B SRV Function Unit: MXR; More? (Y/N) y PROTN Function Unit: MXR. PROCR2: Version ddm.R2V3.b; TLM: Present; Protected PWR.	This message shows the present equipment list.

Command: `rept-opt-pack: common`

rept-opt-pack:[s=*shelf*] [e=*end*] common

When the rept-opt-pack: command is used with the optional **common** argument, the circuit pack option report is limited to information about the circuit packs that are common to both the high-speed and low-speed groups. These are the PROCR, TLM, and PWR circuit packs.

Table 5-18. User Input Example: `rept-opt-pack: common`

System Response	Meaning

`rept-opt-pack:common`
`PROCR2: Version ddm.R2V3.b;`
`TLM: Present;`
`Protected PWR.`
	No alarms, no failures. AKM4 TLM1 or AKM7 TLM2 present. Cannot distinguish between AKM4 and AKM7.

The firmware versions for all PROCR packs up through MC90083A1E are listed below:

Table 5-19. PROCR Packs Firmware Versions (Through MC90083A1E)

PROCR	Firmware Version
MC90083A1 PROCR1	ddm.R1V3.a (DA)
MC90083A1B PROCR2	ddm.R2V0.b (DA)
MC90083A1C PROCR2	ddm.R2V1.a (DA)
MC90083A1C, Issue 2 PROCR2	ddm.R2V1.b (DA)
MC90083A1D PROCR2	ddm.R2V2.a (DA)
MC90083A1D, Issue 2 PROCR2	ddm.R2V2.b (DA)
MC90083A1D, Issue 3 PROCR2	ddm.R2V2.c (DA)
MC90083A1D, Issue 4 PROCR2	ddm.R2V2.d
MC90083A1E PROCR2	ddm.R2V3.a (DA)
MC90083A1E, Issue 2 PROCR2	ddm.R2V3.b

Command: `rept-opt-pack: hs`

rept-opt-pack:[s=*shelf*] [e=*end*] hs

When the rept-opt-pack: command is used with the optional **hs** argument, the circuit pack option report is limited to information about the high-speed circuit packs (ELIU1, OLIU, DS3U2, DS3U1, and MXR). It lists the presence or absence of the ELIU and the SRV and PROTN OLIU, DS3U2, and DS3U1 circuit packs. In 180-Mb/s configurations, each of the two shelves reports being equipped with OLIUs.

Table 5-20. User Input Example: `rept-opt-pack: hs`

System Response	Meaning

`rept-opt-pack:hs`
`ELIU: None;`
`SRV OLIU: Present;`
`PROTN OLIU: Present;`
`Muldem A SRV Function Unit: MXR;`
`PROTN Function Unit: MXR;`
`Muldem B SRV Function Unit: MXR;`
`More? (Y/N) y`
`PROTN Function Unit: MXR.`
	No alarms, no failures.

Command: `rept-opt-pack: ls`

rept-opt-pack:[s=*shelf*] [e=*end*] ls

When the rept-opt-pack: command is used with the optional **ls** argument, the circuit pack option report is limited to information about the low-speed circuit packs.

Table 5-21. User Input Example: `rept-opt-pack: ls`

System Response	Meaning

`rept-opt-pack:ls`
`Muldem A -`
`LS 1: DS1 Gen 2; LS 2: DS1 Gen 2;`
`LS 3: DS1 Gen 2; LS 4: DS1 Gen 2;`
`LS 5: DS1 Gen 2; LS 6: None;`
`LS 7: None; LS 8: DS1 Gen 2;`
`LS 9: None.`
`More? (Y/N) y`
`Muldem B -`
`LS 1: DS1C Gen 1; LS 2: DS1C Gen 1;`
`LS 3: DS1C Gen 1; LS 4: DS2 Gen 2;`
`LS 5: None; LS 6: None;`
`LS 7: None; LS 8: DS1C Gen 1;`
`LS 9: DS2 Gen 2.`
	Gen 1 — First generation packs.
	Gen 2 — Second generation packs.

Command: rept-opt-shelf:

rept-opt-shelf:[s=*shelf*] [e=*end*]

The rept-opt-shelf command lists:

Terminal type — optical or electrical; end or add/drop
Optical line alarm threshold
Alarm delay
Alarm reporting — near-end only or near-end plus far-end
Alarming level — 2-level (MJ/MN) or 3-level (CR/MJ/MN)
Far-end communication — ON or OFF
DS3 performance monitoring — C-bit parity enabled/disabled

Table 5-22. User Input Example: rept-opt-shelf:

System Response	Meaning
rept-opt-shelf: DDM-1000: Fiber line, End terminal Fiber line alarm threshold = 10E-6 20-second alarm delay Autolock Parameter Settings: 4 switchbacks in 1 10 minute intervals: 1 hour autolock duration. near-end plus far-end alarms CR/MJ/MN alarms More? (Y/N) y Mul A C-bit parity enabled Mul B C-bit parity disabled Mul A FE communication ON Mul B FE communication ON	Default parameter settings. ON — Default for optical system. OFF — Default for electrical system.
rept-opt-shelf:e=f DDM-1000: Fiber line, End terminal Fiber line alarm threshold = 10E-6 20-second alarm delay near-end plus far-end alarms CR/MJ/MN alarms More? (Y/N) y Mul A C-bit parity enabled Mul B C-bit parity disabled Mul A FE communication ON Mul B FE communication ON	The second message is for the same configuration as the first, but with the far end specified
rept-opt-shelf:e=f fe cmd not run: signaling failure	Loss of communication with the far end. This results from the loss of the far-end signaling function (as when FE communication is off) or the loss of both incoming fibers.

REPT-STAT-PROTN Command

The rept-stat-protn command lists the current status of switches, locks, and loops in the DDM-1000. The format of this command is as follows:

rept-stat-protn:[m=*muldem*] [s=*shelf*] [e=*end*]

The optional arguments are:

m=*muldem*	Identifies muldem, where *muldem* is **a** for muldem A or **b** for muldem B or **ab** for both muldems. The default value of this argument is **m=ab**.
s=*shelf*	Identifies shelf, where *shelf* is a number from **1** to **8**. The default is **s=1**.
e=*end*	Identifies end, where *end* is **n** for near or **f** for far. The default is **e=n**.

Command: rept-stat-protn:

rept-stat-protn:[m=*muldem*] [s=*shelf*] [e=*end*]

The DDM-1000 responds to the rept-stat-protn: command by listing:

High-speed protection status:

SRV and PROTN — no lock or locked
Origin of request for lock — AUTO or NE, or FE or TLM
DS3U1 loopback — No loop or looped..

Low-speed protection status:

Switched or no switch to PROTN
No locks or individual locks
No loops or individual loops

The low-speed switch and loop status is reported for both muldems A and B. In 180-Mb/s configurations, the optical line protection status is reported individually for each of the two assemblies.

Table 5-23. User Input Example: rept-stat-protn:

System Response	Meaning
rept-stat-protn: Muldem A - HS on SRV, No Lock No LS Switch, No Locks No LS Loops Muldem B - HS on SRV, No Lock No LS Switch, No Locks No LS Loops	No active protection switches. No manual loops, locks or switches specified.
rept-stat-protn: Muldem A - HS on SRV, No Lock No LS Switch, No Locks No LS Loops Muldem B - HS on SRV, No Lock LS 1 SW to PROTN 8-AUTO, No Locks No LS Loops	Failure of the low-speed interface circuit pack in position 1. An automatic protection switch has routed the signal through the protection low-speed interface in position 8.
rept-stat-protn: Muldem A - HS on PROT-AUTO, No Lock No LS Switch, No Locks No LS Loops Muldem B - HS on PROT-AUTO, No Lock No LS Switch, No Locks No LS Loops	Failure of MXR function unit. This has caused an automatic protection switch of both high-speed groups to their respective protection paths.

How to Use This Section

Caution: These instructions are to be followed and performed by trained personnel only.

IMPORTANT INSTALLATION SAFETY INSTRUCTIONS

1. Read and understand all instructions.
2. Installation and maintenance procedures must be followed and performed by trained personnel only.
3. All DS1, DS1C, DS2, and DS3 interfaces should not leave the building premises unless connected to telecommunication devices providing primary or secondary protection, as applicable.
4. For information on proper mounting instructions, consult the PLANNING GUIDELINES section of this User/Service Manual under Physical and Bay Arrangements.
5. Never install telecommunication wiring during an electrical storm.
6. Never install telecommunication connections in wet locations.
7. Never touch uninsulated telecommunication wires or terminals unless the telecommunication line has been disconnected at the DS1, DS1C, DS2, or DS3 interface.
8. Use caution when installing or modifying telecommunication lines.

SAVE THESE INSTRUCTIONS

To find the instructions for performing installation, circuit order or trouble clearing tasks, proceed as follows:

1. Find your task in the TASK INDEX (TI-001).

2. Turn to the indicated director-level or detail-level procedure. All procedures in this section are in numerical order, regardless of type. (See Table A.) Director-level procedures are of three types:

   a. Installation procedures **IP-( )** - used to install both individual DDM-1000 assemblies and end-to-end systems.

   b. Service procedures **SP-( )** - used to establish or to discontinue service and to transfer service from one type of facility to another.

   c. Trouble procedures **TP-( )** - used to clear the indicated alarm or trouble report conditions.

3. Perform all the steps in the director-level procedure in the indicated order unless it sends you to another director-level procedure. When you complete a director-level procedure you have finished the task. Where more detailed information is required you will be sent to a detail-level procedure **DP-( ).** You may also be sent to a detail-level procedure by another detail-level procedure.

4. **IMPORTANT:** When you complete a detail-level procedure you **MUST** return to the procedure which sent you there.

5. **IMPORTANT:** If one director-level procedure sends you to another director-level procedure **DO NOT** return to the first director-level procedure after you complete the second.

6. From time to time you will be asked to verify that things have occurred. This will sometimes take the form of a formal statement of the expected response. At other times, the instructions will merely state "verify that ... ". In either case, the expected response is not the subject of the test at hand, i.e., it is not expected to fail. If the expected response is not observed, reference should be made to the trouble clearing procedures of this section to clear the trouble.

7. Circuit packs being returned for repair should be sent to the following address:

   AT&T Network Systems
   Returned Goods Dept.
   Dept. 11MV287122
   1600 Osgood Street
   North Andover, Massachusetts 01845

Table A. List of Procedures

Number	Title
TI-001	TASK INDEX
TP-101	CLEAR MJ (MAJOR) OR CR (CRITICAL) ALARM
TP-102	CLEAR MN (MINOR) ALARM
TP-103	CLEAR MULTIPLE FAILURE
TP-104	CLEAR PMN (POWER MINOR) ALARM
TP-105	CLEAR TROUBLE REPORT
TP-106	ISOLATE AND CLEAR FAILURE
TP-107	CLEAR ALARM USING ASCII TERMINAL
TP-108	CLEAR AMBIGUOUS FAILURE CONDITION
TP-109	CLEAR ABN (ABNORMAL) INDICATION
TP-110	CLEAR FLASHING ALM INDICATION
IP-200	TEST (ACCEPT) DDM-1000
IP-201	PREPARE ASSEMBLY FOR INSTALLATION
IP-202	INSTALL DDM-1000 (LOOPED-BACK) - DS3 OPERATION
IP-203	INSTALL DDM-1000 (LOOPED-BACK) - 90 Mb/s OR 180 Mb/s OPTICAL OPERATION
IP-204	INSTALL END-TO-END SYSTEM - DS3 FACILITY
IP-205	INSTALL END-TO-END SYSTEM - OPTICAL FACILITY
IP-206	CONFIGURE FOR ADD/DROP
IP-207	INSTALL FAN ASSEMBLY
IP-208	TEST (ACCEPT) DDM-1000 (LOOPED-BACK) - DS3 OPERATION
IP-209	TEST (ACCEPT) DDM-1000 (LOOPED-BACK) - 90 Mb/s OR 180 Mb/s OPTICAL OPERATION
IP-210	TEST (ACCEPT) END-TO-END SYSTEM - DS3 FACILITY
IP-211	TEST (ACCEPT) END-TO-END SYSTEM - OPTICAL FACILITY
IP-212	INSTALL END-TO-END SYSTEM - DS3 FACILITY
IP-213	INSTALL END-TO-END SYSTEM - DS3 FACILITY
IP-214	TEST (ACCEPT) END-TO-END SYSTEM - DS3 FACILITY
SP-301	ESTABLISH END-TO-END SERVICE
SP-302	ESTABLISH END-TO-END SERVICE
SP-303	DISCONTINUE END-TO-END SERVICE
SP-304	TRANSFER SERVICE FROM 90 Mb/s OPTICAL FACILITY TO DS3 FACILITY
SP-305	TRANSFER SERVICE FROM DS3 FACILITY TO OPTICAL FACILITY
SP-306	TRANSFER SERVICE FROM 180 MB/S OPTICAL TO DS3 FACILITY

Table A. List of Procedures (Continued)

Number	Title
DP-401	ATTACH WIRE-WRAP ASSEMBLY
DP-402	UPDATE DDM-1000 INTERNAL EQUIPMENT LIST
DP-403	PERFORM LED TEST
DP-404	INSTALL, REPLACE, OR RESET PROCR
DP-405	CONNECT TO LOW SPEED CROSS-CONNECT
DP-406	CONNECT TO DSX-3 CROSS-CONNECT
DP-407	CONNECT BATTERY TO FAN ASSEMBLY
DP-408	CONNECT PARALLEL TELEMETRY
DP-409	CONNECT TBOS SERIAL TELEMETRY
DP-410	CONNECT OVERHEAD TELEMETRY
DP-411	CONNECT OFFICE BATTERY AND BATTERY RETURN
DP-412	INSTALL PLUG-INS
DP-413	PERFORM AUTOMATIC LOOPED TRANSMISSION TEST
DP-414	PERFORM AUTOMATIC CROSS-CONNECT WIRING TEST
DP-415	CONNECT OPTICAL LOOP
DP-416	PERFORM AUTOMATIC END-TO-END TRANSMISSION TEST
DP-417	REPLACE PLUG-IN
DP-418	ACTUATE OPTIONAL FEATURES
DP-419	CHECK OFFICE ALARMS
DP-420	CHECK PARALLEL TELEMETRY
DP-421	CHECK TBOS SERIAL TELEMETRY
DP-422	CHECK OVERHEAD TELEMETRY
DP-423	CONNECT FAN ASSEMBLY
DP-424	SET OLIU ATTENUATION
DP-425	SET LS INTFC OPTIONS
DP-426	CONNECT OFFICE ALARMS
DP-427	CONNECT FRAME GROUND
DP-428	ATTACH FRONT-ACCESS CABLE ASSEMBLY
DP-429	CONNECT DDM-1000 TO OPTICAL FACILITY
DP-430	ATTACH ESD WARNING LABEL
DP-431	ROUTE CABLES TO TOP OF BAY
DP-432	PERFORM DS3U2 LOOPED-BACK TEST (OPTICAL)
DP-433	PERFORM DS3U2 END-TO-END TEST (OPTICAL)
DP-434	PERFORM DS1, DS1C OR DS2 END-TO-END TEST

Table A. List of Procedures (Continued)

Number	Title
DP-435	ENABLE OR DISABLE FAR-END MAINTENANCE
DP-436	CLEAN OPTICAL CONNECTIONS
DP-437	PERFORM END-TO-END LOW SPEED TRANSMISSION TEST
DP-438	INSTALL 20-TYPE OLIUs AND ASSOCIATED CABLES
DP-439	UPGRADE END-TO-END 90 MB/S OPTICAL SYSTEM TO 180 Mb/s (ONE DDM-1000 ASSEMBLY AT EACH END)
DP-440	UPGRADE END-TO-END 90 MB/S OPTICAL SYSTEM TO 180 Mb/s (TWO DDM-1000 ASSEMBLIES AT EACH END)
DP-441	REPLACE AEK36 DS1 INTFC1 WITH AEK36B DS1 INTFC2
DP-442	TEST PROTECTION SWITCHING FUNCTION
DP-443	CONNECT TABS SERIAL TELEMETRY
DP-444	PERFORM DS3U1 LOOPED-BACK TEST (OPTICAL)
DP-445	PERFORM DS3U1 END-TO-END TEST (OPTICAL)
DP-446	CONVERT IN-SERVICE DS3U2 TO DS3U1
DP-447	UPGRADE DDM-1000 FOR C-BIT PARITY (PERFORMANCE MONITORING)
DP-448	CHANGE LOW SPEED CHANNEL CODE FORMAT
DP-449	EQUIP DDM-1000 SECOND MULDEM
DP-450	INSTALL DDM-1000 SECOND SHELF FOR 180 Mb/s SYSTEM
DP-451	CONVERT IN-SERVICE DS1 OPTICAL SYSTEM [AKM2( )] TO DS3U2
DP-452	CONVERT IN-SERVICE DS1 OPTICAL SYSTEM [AKM2( )] TO DS3U1

Task Index

FIND YOUR JOB IN THE LIST BELOW	THEN GO TO
ABN Indication - Clear	TP-109
ALM Indication (Flashing) - Clear	TP-110
Accept (Test) DDM-1000	IP-200
Alarm - Critical - Clear	TP-101
Alarm - Major - Clear	TP-101
Alarm - Minor - Clear	TP-102
Alarm - Power Minor - Clear	TP-104
Change Low Speed Channel Code Format	DP-448
Convert In-Service DS3U2 to DS3U1 - Optical Facility	DP-446
Convert In-Service DS1 Optical System to DS3U2	DP-451
Convert In-Service DS1 Optical System to DS3U1	DP-452
Discontinue End-to-End Service	SP-303
Equip DDM-1000 Second Muldem - In-Service	DP-449
Establish End-to-End Service - Muldem In-Service	SP-302
Establish End-to-End Service - Muldem Out-of-Service	SP-301

FIND YOUR JOB IN THE LIST BELOW . . . . . THEN GO TO

Install DDM-1000 - Configure for Add/Drop IP-206

Install DDM-1000 - Prepare Assembly for Installation IP-201

Install DDM-1000 (Looped Back) - DS3 Operation IP-202

Install DDM-1000 (Looped Back) -
90 Mb/s or 180 Mb/s Optical Operation IP-203

Install DDM-1000 Second Shelf for 180 Mb/s Optical Operation DP-450

Install End-to-End System - DS3 Facility (Without Add/Drop) IP-204

Install End-to-End System - DS3 Facility (With Add/Drop) IP-212

Install End-to-End System -
DS3 Facility (With Non-DDM-1000 Multiplex) IP-213

Install End-to-End System - Optical Facility IP-205

Install Fan Assembly IP-207

Option Settings - Check (Set) DP-412

Replace Plug-In (Reference Only) DP-417

Test (Accept) DDM-1000 . . . . . IP-200

Test (Accept) DDM-1000 (Looped Back) - DS3 Operation IP-208

Test (Accept) DDM-1000 (Looped Back) - Optical Operation IP-209

Test (Accept) End-to-End System - DS3 Facility (Without Add/Drop) . . . IP-210

Test (Accept) End-to-End System - DS3 Facility (With Add/Drop) IP-214

Test (Accept) End-to-End System - Optical Facility IP-211

FIND YOUR JOB IN THE LIST BELOW	THEN GO TO
Transfer Service - From 90 Mb/s Optical to DS3 Facility	SP-304
Transfer Service - From DS3 to Optical Facility	SP-305
Transfer Service - From 180 MB/S Optical to DS3 Facility	SP-306
Trouble Report - Clear	TP-105
Upgrade - 90 Mb/s Optical to 180 Mb/s (One Assembly)	DP-439
Upgrade - 90 Mb/s Optical to 180 Mb/s (Two Assemblies)	DP-440
Upgrade DDM-1000 for C-bit Parity (Performance Monitoring)	DP-447

Clear MJ (MAJOR) or CR (Critical) Alarm

1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

2. Is the **MJ** LED on the **PROCR** or the **CR** LED on the **AKM4 TLM1** lighted?

   If **YES,** then continue with **Step 3.**
   If **NO,** then proceed to **Step 19.**

3. On the **PROCR** momentarily depress the **ACO/TEST** pushbutton.

   Response: The audible alarm is silenced.

4. On the **PROCR** is the **NE** LED lighted?

   If **YES,** then continue with **Step 5.**
   If **NO,** then proceed to **Step 11.**

5. Is the **ALM** LED on the faceplate of one or more plug-ins flashing?

   If **YES,** then continue with **Step 6.**
   If **NO,** then proceed to **Step 17.**

6. Find the plug-in(s) with the flashing LED(s) in **Table A** below and go to the indicated step.

Table A. Plug-in With Flashing LED

Plug-in With Flashing LED	Go To
AEK36-type DS1 INTFC1	Step 7
AEK37 DS1C INTFC1	Step 7
AEK38 DS2 INTFC1	Step 7
AKM2 MXR1 (SRV or PROTN)	Step 9
AKM2B MXR2 (SRV or PROTN)	Step 9
AKM2C MXR3 (SRV or PROTN)	Step 9
AKM5 DS3U1 (SRV or PROTN)	Step 9
AKM6 DS3U2 (SRV or PROTN)	Step 9
OLIU	Step 17

7. Issue a trouble report of a bad incoming signal at the input to the **LS INTFC(s)** with the flashing LED(s).

8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

9. Issue a trouble report of a bad incoming DS3 signal from the DSX-3 cross-connect.

   If using an MC90083A1E PROCR2 or later, the flashing LED could be caused by an incoming DS3 AIS (l6mb) signal. This may be verified by using an ASCII terminal and the **rept-fail:** command.

10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

11. On the **PROCR**, is the **FE** LED lighted?

    If **YES,** then continue with **Step 12.**
    If **NO,** then proceed to **Step 19.**

12. Is an ASCII terminal (extended craft interface) available?

    If **YES,** then continue with **Step 13.**
    If **NO,** then proceed to **Step 15.**

13. Refer to **TP-107** and use the ASCII terminal to further isolate and clear the alarm condition.

14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

15. Issue a trouble report of a major or critical alarm condition at the far-end DDM-1000 terminal.

16. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

17. **Note**: There is a multiple failure condition.

    Refer to **TP-103** to clear the multiple failure.

18. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

19. **Note**: There is an inconsistent combination of alarms and diagnostic indications.

    Refer to **TP-108** and determine the true status of the system.

20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear MN (Minor) Alarm

1. ***Caution 1: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

   Caution 2: When removing service function unit and service OLIU circuit packs, if an ASCII terminal is available, use the command "exct-sw-hs:s=( ) make" to switch service to the protection pack not being removed, then use the command "exct-lock-hs:s=( ) make" to lock service onto protection pack. To remove the lock use the command "exct-lock-hs:s=( ) break".

2. On the **PROCR**, is the **MN** LED lighted?

   If **YES**, then continue to **Step 3.**
   If **NO**, then proceed to **Step 58.**

3. On the **PROCR**, momentarily depress the **ACO/TEST** pushbutton.

   Response: The audible alarm is silenced.

4. On the **PROCR**, is the **NE** LED lighted?

   If **YES**, then continue to **Step 5.**
   If **NO**, then do **Step 27.**

5. Is the **ALM** LED on the faceplate of one and only one plug-in of the **DDM-1000** lighted (not flashing)?

   If **YES**, then continue to **Step 6.**
   If **NO**, then do **Step 10.**

6. ***Caution: Replacement plug-ins may have option switches which must be properly set before the plug-in is installed.***

   Refer to **DP-417** and replace the plug-in with the lighted **ALM** LED.

7. On the **PROCR**, is the **MN** LED off?

   If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
   If **NO**, then continue to **Step 8.**

8. Is the **ALM** LED lighted on the faceplate of the replacement plug-in just installed?

   If **YES**, then continue to **Step 9**.
   If **NO**, then return to **Step 4**.

9. The failure is not in the plug-in just replaced. Refer to **TP-106** to isolate and clear the failure. Do **NOT** return to this procedure.

10. Is the **ALM** LED on the faceplate of one or more plug-ins flashing?

    If **YES**, then continue to **Step 11**.
    If **NO**, then do **Step 33**.

11. Find the plug-in(s) with the flashing LED(s) in **Table A** below and go to the indicated step.

Table A. Plug-in With Flashing LED

Plug-in With Flashing LED	Go To
AEK36-type DS1 INTFC1	Step 12
AEK37 DS1C INTFC1	Step 12
AEK38 DS2 INTFC1	Step 12
AKM2 MXR1 (SRV or PROTN)	Step 16
AKM2B MXR2 (SRV or PROTN)	Step 16
AKM2C MXR3 (SRV or PROTN)	Step 16
AKM5 DS3U1 (SRV or PROTN)	Step 16
AKM6 DS3U2 (SRV or PROTN)	Step 16
OLIU	Step 18

12. There is an incoming LS signal failure. This failure can be further isolated using an ASCII terminal.

    Is an ASCII terminal (extended craft interface) available?

    If **YES**, then continue to **Step 13**.
    If **NO**, then do **Step 14**.

13. Refer to the "Commands and Reports" section of this manual under REPT-FAIL and use the command **rept-fail-dsx:** to isolate the particular incoming signal failure.

14. Issue a trouble report of a bad incoming signal at the input to the **LS INTFC(s)** with the flashing LED(s).

15. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

16. Issue a trouble report of a bad incoming DS3 signal from the DSX-3. If the PROCR2 is an MC90083A1D or later, the alarm level could be provisioned to be "MN". If the PROCR2 is an MC90083A1E or later, this alarm could be indicating incoming DS3 AIS (l6mb). With an ASCII terminal, use the command **rept-fail:** to verify the alarm.

17. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

18. **NOTICE:** Unterminated optical connectors may emit laser radiation.

19. ***Warning: Open optical connectors may emit invisible laser radiation. Do not view beam with optical instruments. Avoid direct exposure to the beam.***

20. ***Warning: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.***

21. Replace the **OLIU** with the flashing LED at the near-end (NE) terminal.

22. Is the **ALM** LED still flashing?

    If **YES**, then continue to **Step 23.**
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

23. Replace the corresponding **OLIU** at the far-end (FE) terminal.

24. Is the **ALM** LED still flashing?

    If **YES**, then continue to **Step 25.**
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

25. The trouble is in the optical fiber. Issue a trouble report of a bad fiber.

26. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

27. On the **PROCR**, is the **FE** LED lighted?

    If **YES**, then continue to **Step 28**.
    If **NO**, then do **Step 58**.

28. Is an ASCII terminal (extended craft interface) available?

    If **YES**, then continue to **Step 29**.
    If **NO**, then do **Step 31**.

29. Refer to **TP-107** and use the ASCII terminal to further isolate and clear the alarm condition.

30. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

31. Issue a trouble report of a minor alarm condition at the far-end **DDM-1000**.

32. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

33. On the **PROCR**, depress and hold the **ACO/TEST** pushbutton.

    Response: LEDs on service and protection **547( ) PWR** units light.

34. Did the LED light on the service and protection **PWR** units?

    If **YES**, then proceed to **Step 38**.
    If **NO**, then continue with **Step 35**.

35. ***Caution: When installing, or reseating, a plug-in in the* DDM-1000, *take care to avoid damaging the LEDs that protrude through the opening in the faceplate of the plug-in.***

    Replace the **PWR** unit *without* lighted LED.

36. On the **PROCR**, depress and hold the **ACO/TEST** pushbutton.

    Response: LEDs on service and protection **547( ) PWR** units light.

37. Did the LED light on the service and protection **PWR** units?

    If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO**, then proceed to **Step 58**.

38. **Note:** On rare occasions the **PROCR** may report a failed **PWR** unit but the LEDs on the service and protection units still light.

    Under this condition try to determine if one of the **PWR** units has failed by measuring the current in the **A** and **B** shelf power feeders with a clip-on DC current meter. The feeder with no current indication indicates a failed **PWR** unit. The normal current drain for a shelf depends on how the shelf is equipped. Refer to the Power Consumption table in the PLANNING GUIDELINES section of this manual.

39. Was any trouble found?

    If **YES** then continue to **Step 40**.
    If **NO** then do **Step 42**.

40. Replace **PWR** unit associated with power feeder with no current drain.

41. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

42. Is an ASCII terminal available?

    If **YES** then continue to **Step 43**.
    If **NO** then do **Step 52**.

43. Connect the ASCII terminal to the connector on the faceplate of the **PROCR**.

44. **Note 1**: The ASCII terminal report will indicate if an automatic lock has occurred and which plug-in is locked out of service.

    Note 2: By default, an automatic lock occurs when an automatic protection switch is made and then broken four times within a 10-minute interval. This lock is automatically broken (taken down) 1 hour after it occurs. A new command in MC90083A1D (or later) PROCR2s allows these parameters to be changed. See the description for the command "***set-shelf-autolock:***" in the Commands and Reports section of this manual.

    Refer to the Commands and Reports section of this manual under REPT-STAT and enter the command: "**rept-stat-protn:**".

45. Is there an automatic lock?

    If **YES** then continue to **Step 46**.
    If **NO** then proceed to **Step 48**.

46. It is recommended that the plug-in be replaced. It should then be further evaluated and, if appropriate, returned for repair.

47. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

48. **Note:** The **rept-opt-shelf:** report will indicate if far end communication (fecom) has been turned off at one end of an optical system.

    Refer to the Commands and Reports section of this manual under REPT-OPT and enter the command: "**rept-opt-shelf:**".

49. Is fecom turned off?

    If **YES** then continue to **Step 50**.
    If **NO** then proceed to **Step 52**.

50. Use the ASCII terminal command **set-shelf-fecom:** to turn fecom back on.

51. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

52. Perform the following:

    1. Check if there is a flop in the fiber pairs of an optical system.

    2. If **AKM2B**or **AKM2C MXR** packs are installed, a mismatch of options may be present. Check if one end is set for M13 mode and the other end for C-bit mode.

    3. Check if there are more function units installed at one end than at the other.

53. **Note:** Without an ASCII terminal there is no way to determine if a plug-in has been locked out of service except by putting it back into service. The following procedure will identify an affected plug-in but it will cause one or more "hits" on the service going through the affected plug-in. You may wish to wait for a low-traffic time of day before proceeding.

54. ***Caution: When installing, or reseating, a plug-in in the* DDM-1000, *take care to avoid damaging the LEDs that protrude through the opening in the faceplate of the plug-in.***

55. Refer to **DP-404** and reset the **PROCR**.

    Note: The above action resets the PROCR and releases any automatic lock.

56. **Note:** A failure condition that could cause an automatic lock should now occur again.

    Observe the **DDM-1000** to see if a failure condition occurs again. If an affected plug-in is identified it is recommended that it be replaced. It should then be further evaluated and, if appropriate, returned for repair.

57. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

58. **Note:** There is an inconsistent combination of alarms and diagnostic indications.

    Refer to **TP-108** and determine the true status of the system.

59. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Multiple Failure

1. ***Caution 1: Whenever working with the* DDM-1000*, you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

   Caution 2: Do not "reset" the* PROCR *before troubleshooting a shelf. Resetting the* PROCR *will cause valuable diagnostic information to be lost and may cause circuit packs to be incorrectly declared failed.

2. **Note:** A multiple failure condition exists when one or more service (SRV) plug-in(s) and their associated protection (PROTN) plug-in(s) appear failed or when two or more service LS INTFC plug-ins in the same muldem appear failed.

3. Are the **ALM** LEDs on a **SRV** and a **PROTN** plug-in of the same type lighted (not flashing)?

   If **YES,** then continue to **Step 4.**
   If **NO,** then do **Step 9.**

4. ***Caution: Replacement plug-ins may have option switches which must be properly set before the plug-in is installed.***

   Refer to **DP-417** and replace the **SRV** plug-in(s) with the lighted **ALM** LED.

5. Is the **ALM** LED on the plug-in just replaced off?

   If **YES,** then continue to **Step 6.**
   If **NO,** then do **Step 15.**

6. ***Caution: Replacement plug-ins may have option switches which must be properly set before the plug-in is installed.***

   Refer to **DP-417** and replace the **PROTN** plug-in with the lighted **ALM** LED.

7. Is the **ALM** LED on the plug-in just replaced off?

   If **YES,** then continue to **Step 8.**
   If **NO,** then do **Step 15.**

8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

9. Are the **ALM** LEDs on two (or more) **SRV LS INTFC** plug-ins lighted (not flashing)?

   If **YES,** then continue to **Step 10.**
   If **NO,** then do **Step 17.**

10. ***Caution: The* LS INTFC *plug-ins have option switches which must be set to the correct position before installing the plug-ins.***

    Refer to **DP-417** and replace either of the **SRV LS INTFC** plug-ins with the lighted **ALM** LEDs.

11. Is the **ALM** LED on the **LS INTFC** plug-in just replaced off?

    If **YES,** then continue to **Step 12.**
    If **NO,** then do **Step 15.**

12. ***Caution: The* LS INTFC *plug-ins have option switches which must be set to the correct position before installing the plug-ins.***

    Refer to **DP-417** and replace the remaining **SRV LS INTFC** plug-in with the lighted **ALM** LED.

13. Is the **ALM** LED on the **LS INTFC** plug-in just replaced off?

    If **YES,** then continue to **Step 14.**
    If **NO,** then do **Step 15.**

14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

15. The failure is not in the plug-in just replaced. Refer to **TP-106** to isolate and clear the trouble.

16. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

17. Is the **ALM** LED on the **SRV OLIU** and **PROT OLIU**s flashing?

    If **YES**, then continue to **Step 18.**
    If **NO**, then do **Step 20.**

18. The trouble is either both **SRV** and **PROTN OLIU**s have failed or the optical fibers have failed. Try the following:
    1. Replace the **SRV** and **PROTN OLIU**s, one at a time, at the NE terminal.
    2. Replace the **SRV** and **PROTN OLIU**s, one at a time, at the FE terminal.
    3. Check the optical fibers.
19. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
20. **Note:** There is an inconsistent combination of alarms and diagnostic indications.

    Refer to **TP-108** and determine the true status of the system.
21. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear PMN (Power Minor) Alarm

1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

2. On the **AKM4 TLM1** is the **PMN** LED lighted?

   If **YES,** then continue to **Step 3.**
   If **NO,** then do **Step 6.**

3. On the **PROCR** momentarily depress the **ACO/TEST** pushbutton.

   Response: The audible alarm is silenced.

4. ***Caution: There is an AC power failure at the remote DDM-1000 terminal. This will result in a service interruption if it is not restored.***

   Issue a trouble report of an AC power failure at the remote **DDM-1000** terminal.

5. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

6. Is there a Power Minor office alarm?

   If **YES,** then continue to **Step 7.**
   If **NO,** then do **Step 8.**

7. **Note:** There is an inconsistent combination of alarms and diagnostic indications.

   Determine the true status of the system using **TP-106.**

8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Trouble Report

1. ***Caution: Whenever working with the* DDM-1000, *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

2. Is the **MJ** LED on the **PROCR** or the **CR** LED on the **AKM4 TLM1** (if installed) lighted?

   If **YES,** then continue to **Step 3.**
   If **NO,** then do **Step 5.**

3. Refer to **TP-101** and clear the Major or Critical Alarm condition.

4. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

5. Is the **MN** LED on the **PROCR** lighted?

   If **YES,** then continue to **Step 6.**
   If **NO,** then do **Step 8.**

6. Refer to **TP-102** and clear the Minor Alarm condition.

7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

8. Is the **ALM** LED on the faceplate of an **LS INTFC** plug-in (**AEK36-type DS1 INTFC, AEK37 DS1C INTFC1,** or **AEK38 DS2 INTFC1**) flashing?

   If **YES**, then continue to **Step 9.**
   If **NO**, then do **Step 11.**

9. There appears to be an incoming low speed signal failure. Refer to **TP-110** and clear the condition.

10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

11. Is the **ALM** LED on the faceplate of any plug-in in the **DDM-1000** lighted (not flashing)?

    If **YES,** then continue to **Step 12.**
    If **NO,** then do **Step 14.**

12. **Note:** There is an inconsistent combination of alarms and diagnostic indications.

    Refer to **TP-108** and determine the true status of the system.

13. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

14. Refer to **DP-403** and perform an LED test.

15. Did all the plug-ins pass the LED test?

    If **YES,** then continue to **Step 16.**
    If **NO,** then do **Step 18.**

16. **Note:** The DDM-1000 appears to be operating correctly with no failures present.

17. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

18. Refer to **DP-417** and replace the plug-in that failed the LED test.

19. Repeat the LED test.

20. Did all the plug-ins pass the LED test?

    If **YES,** then continue to **Step 21.**
    If **NO,** then do **Step 22.**

21. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

22. **Note:** The failure is not in the plug-in just replaced.

    Refer to **TP-106** to isolate and clear the failure.

23. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Isolate and Clear Failure

1. ***Caution: Whenever working with the* DDM-1000, *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

2. **Note:** It is assumed that the ALM LED on a plug-in is lighted or that the plug-in has failed an LED test. It is further assumed that replacing the plug-in did not clear the problem.

3. Is the plug-in with the lighted LED an LS INTFC (**AEK36-type DS1 INTFC, AEK37 DS1C INTFC1**, or **AEK38 DS2 INTFC1**)?

   If **YES,** then continue to **Step 4.**
   If **NO,** then do **Step 6.**

4. Refer to **DP-417** and replace the **MXR( )** in the **SRV** location for the muldem **(A** or **B)** containing the LS INTFC with the lighted LED.

5. Is the **ALM** LED on the affected LS INTFC plug-in still lighted?

   If **YES,** then continue to **Step 6.**
   If **NO,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

6. ***Caution: Replacing the* PROCR *involves updating the internal memory on the plug-in.* DP-404 *describes this procedure.***

   Refer to **DP-404** and replace the **PROCR.**

7. Is the **ALM** LED on the affected plug-in still lighted?

   If **YES,** then continue to **Step 8.**
   If **NO,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

8. **Note:** The problem appears to be in the backplane of the DDM-1000. One way to verify this is to swap the PROCR and the plug-in with the lighted ALM LED with the corresponding plug-ins in another DDM-1000 assembly. If the problem moves with the plug-ins, it means that one or both of the plug-ins is defective. If the problem stays with the assembly, inspect the backplane for bent pins. If no defects are found, the entire assembly must be replaced — it has a printed backplane and cannot be repaired in the field.

Clear Alarm Using ASCII Terminal

1. ***Caution: Whenever working with the* DDM-1000, *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

2. **Note:** It is assumed that there is a failure at the far end DDM-1000 (as indicated by a FE LED on the local PROCR), and that an ASCII terminal is available.

3. Connect the ASCII terminal to the connector on the faceplate of the **PROCR**.

4. On the ASCII terminal enter the following command, followed by a carriage return:

   rept-fail:e=f

5. Refer to the Commands and Reports section of this User's Manual under **REPT-FAIL** to interpret the resulting display on the ASCII terminal. Also, see the Report Descriptions section of this manual for sample report commands and the reports they generate.

   Is the displayed information adequate to issue a trouble report?

   If **YES,** then continue to **Step 6.**
   If **NO,** then do **Step 8.**

6. Issue a trouble report of the specific failure condition at the far end **DDM-1000**

7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

8. Refer to the Commands and Reports section of this User's Manual and use the **REPT-FAIL** function of the ASCII terminal to further isolate the far end failure.

9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Ambiguous Failure Condition

1. ***Caution: Whenever working with the* DDM-1000*, you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

2. **Note:** It is assumed that there is an inconsistent set of alarms and diagnostic indications.

3. Refer to **DP-403** and perform an LED test.

4. Did any plug-in fail the LED test?

   If **YES**, then continue to **Step 5**.
   If **NO**, then do **Step 10**.

5. Did all of the LEDs in the **DDM-1000** fail to light?

   If **YES**, then continue to **Step 6**.
   If **NO**, then do **Step 9**.

6. Is the **DDM-1000** equipped with one or two **547-Type PWR** plug-ins?

   If **ONE** then continue to **Step 7**.
   If **TWO** then do **Step 11**.

7. Replace the **547-Type PWR** plug-in and repeat the LED test.

8. Did all of the LEDs in the **DDM-1000** fail to light again?

   If **YES**, then do **Step 11**.
   If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

9. ***Caution: Replacement plug-ins may have option switches which must be properly set before the plug-in is installed.***

   Refer to **DP-417** and replace the plug-in that failed the LED test.

10. Is the inconsistent set of alarms and diagnostic indications still present?

    If **YES**, then continue to **Step 11**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

11. ***Caution: Replacing the* PROCR *involves updating the internal memory on the plug-in.* DP-404 *describes this procedure.***

    Refer to **DP-404** and replace the **PROCR**.

12. Is the inconsistent set of alarms and diagnostic indications still present?

    If **YES**, then continue to **Step 13**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

13. Is the inconsistency associated with an **AKM4 TLM1** or **MC90191A1 TLM2** plug-in?

    If **YES**, then continue to **Step 14**.
    If **NO**, then do **Step 16**.

14. Replace the **AKM4 TLM1** or **MC90191A1 TLM2**.

15. Is the inconsistent set of alarms and diagnostic indications still present?

    If **YES**, then continue to **Step 16**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

16. **Note:** The problem appears to be in the backplane of the DDM-1000. One way to verify this is to swap the PROCR and the plug-in with the lighted ALM LED with the corresponding plug-ins in another DDM-1000 assembly. If the problem moves with the plug-ins, it means that one or both of the plug-ins is defective. If the problem stays with the assembly, inspect the backplane for bent pins. If no defects are found, the entire assembly must be replaced — it has a printed backplane and cannot be repaired in the field.

Clear ABN (Abnormal) Indication

1. Is the **PROCR** plug-in a **PROCR1** or **PROCR2**?

   If **PROCR1**, then continue to **Step 2**.
   If **PROCR2**, then do **Step 25**.

2. **Note:** The ABN indicator on a PROCR1 indicates either a manually caused non-nominal condition or an automatic lock. The non-nominal condition could be a manual protection switch, lock or low-speed loop. The switch, lock or loop may have been initiated locally, from another DDM-1000 at the other end of the facility or through telemetry. An automatic lock occurs when a plug-in fails and is switched out of service four times within a ten-minute interval. Automatic locks are broken (taken down) 1 hour after they are made.

3. Is the **MJ** or the **MN** LED on the **PROCR1** or the **CR** LED on the **AKM4 TLM1** lighted?

   If **YES,** then continue to **Step 4.**
   If **NO,** then do **Step 6.**

4. Refer to the Task Index **TI-001** and clear the indicated alarm.

5. Is the **ABN** indicator on the **PROCR1** still lighted?

   If **YES,** then continue to **Step 6.**
   If **NO,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

6. ***Caution: You must determine the reason for the* ABN *indication before attempting to clear it.***

7. Is an ASCII terminal available?

   If **YES,** then continue to **Step 8.**
   If **NO,** then do **Step 11.**

8. ***Caution: Whenever working with the* DDM-1000*, you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

9. Connect the ASCII Terminal to the connector on the faceplate of the **PROCR1.**

10. Refer to the Commands and Reports section of this user's manual for the complete syntax and use the command **rept-stat-protn:** to determine the condition associated with the **ABN** indication.

11. Contact the appropriate personnel at your location, at the far-end location and at any central maintenance location. You **MUST** determine the reason for the **ABN** indication before clearing it, because a service interruption may result if a protection switch is in effect.

12. Have you determined that it is appropriate for you to clear the condition causing the **ABN** indication?

    If **YES,** then continue to **Step 13.**
    If **NO,** then do **Step 23.**

13. Is an ASCII Terminal available?

    If **YES,** then continue to **Step 14.**
    If **NO,** then do **Step 18.**

14. Refer to the Commands and Reports section of this user's manual and use the appropriate command to clear the underlying condition. The command will be **exct-sw:, exct-lock,** or **exct-loop:.**

15. Is the **ABN** indicator on the **PROCR1** still lighted?

    If **YES,** then continue to **Step 16.**
    If **NO,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

16. There appears to be an inconsistency in the indications. Refer to **TP-108** and clear the ambiguous condition.

17. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

18. ***Caution: Whenever working with the* DDM-1000, *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

19. Refer to **DP-404** and reset the PROCR1 pack.

20. Is the **ABN** indicator on the **PROCR1** still lighted?

    If **YES,** then continue to **Step 21.**
    If **NO,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

21. There appears to be an inconsistency in the indications. Refer to **TP-108** and clear the ambiguous condition.

22. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

23. There is nothing more to be done.

24. **STOP, YOU HAVE COMPLETED THIS PROCEDURE.**

25. **Note:** The ABN indicator on a PROCR2 indicates a manually caused non-nominal condition. The non-nominal condition could be a manual protection switch, lock, or loopback.. The switch, lock or loop may have been initiated locally, from another DDM-1000 at the other end of the facility or through telemetry.

26. Is the **MJ** or the **MN** LED on the **PROCR2** or the **CR** LED on the **AKM4 TLM1** lighted?

    If **YES,** then continue to **Step 27.**
    If **NO,** then do **Step 29.**

27. Refer to the Task Index **TI-001** and clear the indicated alarm.

28. Is the **ABN** indicator on the **PROCR2** still lighted?

    If **YES,** then continue to **Step 29.**
    If **NO,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

29. ***Caution: You must determine the reason for the* ABN *indication before attempting to clear it.***

30. Is an ASCII Terminal available?

    If **YES,** then continue to **Step 31.**
    If **NO,** then do **Step 34.**

31. ***Caution: Whenever working with the* DDM-1000*, you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

32. Connect the ASCII Terminal to the connector on the faceplate of the **PROCR2.**

33. Refer to the Commands and Reports section of this user's manual for the complete syntax and use the command **rept-stat-protn:** to determine the condition associated with the **ABN** indication.

34. Contact the appropriate personnel at your location, at the far-end location and at any central maintenance location. You **MUST** determine the reason for the **ABN** indication before clearing it.

35. Have you determined that it is appropriate for you to clear the condition causing the **ABN** indication?

    If **YES,** then continue to **Step 36.**
    If **NO,** then do **Step 46.**

36. Is an ASCII Terminal available?

    If **YES,** then continue to **Step 37.**
    If **NO,** then do **Step 41.**

37. Refer to the Commands and Reports section of this user's manual and use the appropriate command to clear the underlying condition. The command will be **exct-sw:, exct-lock:,** or **exct-loop:.**

38. Is the **ABN** indicator on the **PROCR2** still lighted?

    If **YES,** then continue to **Step 39.**
    If **NO,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

39. There appears to be an inconsistency in the indications. Refer to **TP-108** and clear the ambiguous condition.

40. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

41. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

42. Refer to **DP-404** and reset the PROCR2 pack.

43. Is the **ABN** indicator on the **PROCR2** still lighted?

    If **YES,** then continue to **Step 45.**
    If **NO,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

44. There appears to be an inconsistency in the indications. Refer to **TP-108** and clear the ambiguous condition.

45. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

46. There is nothing more to be done.

47. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Flashing ALM Indication

1. ***Caution: Whenever working with the* DDM-1000, *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

2. On the **PROCR**, is the **MN** LED lighted?

   If **YES**, then go to **TP-102. DO NOT RETURN TO THIS PROCEDURE.**
   If **NO**, then continue to **Step 3.**

3. On the **PROCR**, is the **MJ** LED lighted?

   If **YES**, then go to **TP-101. DO NOT RETURN TO THIS PROCEDURE.**
   If **NO**, then continue to **Step 4.**

4. On the **AKM4 TLM1**, is the **CR** LED lighted?

   If **YES**, then go to **TP-101. DO NOT RETURN TO THIS PROCEDURE.**
   If **NO**, then continue to **Step 5.**

5. Is the **ALM** LED on the faceplate of one or more **LS INTFC** plug-ins flashing?

   If **YES**, then continue to **Step 6.**
   If **NO**, then do **Step 11.**

6. There is an incoming LS signal failure. This failure can be further isolated using an ASCII terminal.

   Is an ASCII terminal (extended craft interface) available?

   If **YES**, then continue to **Step 7.**
   If **NO**, then do **Step 9.**

7. Connect the ASCII terminal to the connector on the faceplate of the **PROCR**.

8. Refer to the Commands and Reports section of this manual under REPT-FAIL and use the command **rept-fail-dsx:** to further isolate the particular incoming LS signal failure.

9. Issue a trouble report of a bad incoming signal at the input to the **LS INTFC(s)** with the flashing LED(s).

10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

11. Is the **ALM** LED on the faceplate of one or more function units flashing?

    If **YES**, then continue to **Step 12.**
    If **NO**, then do **Step 14.**

12. Issue a trouble report of a bad incoming DS3 signal from the DSX-3. If the PROCR2 is an MC90083A1E or later, this alarm could be indicating incoming DS3 AIS (I6mb). With an ASCII terminal, use the command **rept-fail:** to verify the alarm.

13. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

14. **Note:** There is an inconsistent combination of alarms and diagnostic indications.

    Refer to **TP-108** and determine the true status of the system.

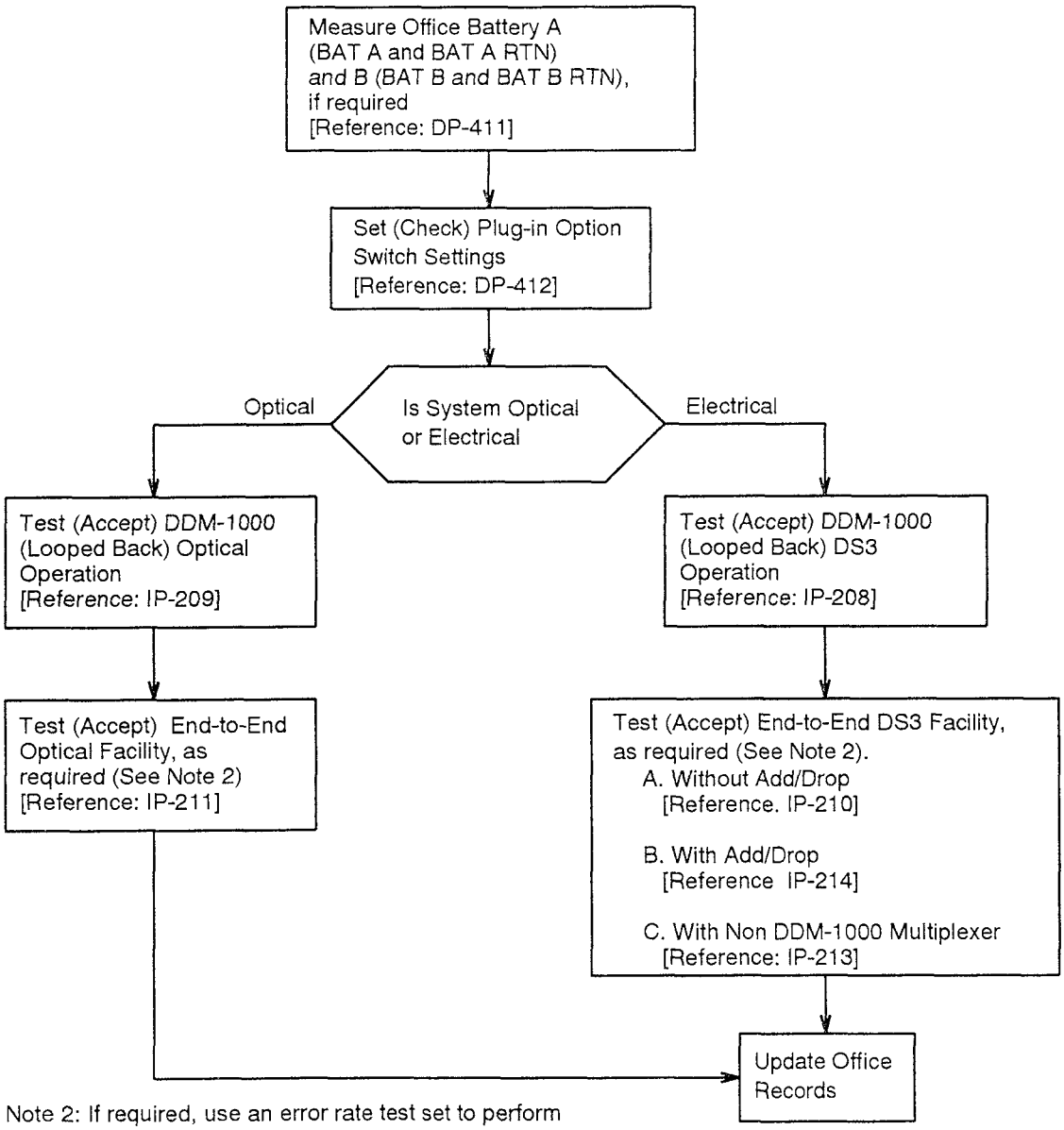
15. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Test (Accept) DDM-1000

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

1. **Note 1:** This procedure assumes that DDM-1000 installation is complete and the system is being tested (accepted) by an organization that did not install it.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO



Note 2: If required, use an error rate test set to perform low-speed transmission tests on each low-speed channel slot.

Prepare Assembly for Installation

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
1. Remove the **DDM-1000** from the shipping carton and inspect for visible damage.	
2. **Note:** If ED-2C841-30, G3 EMC shelf is being installed, remove front, rear, and left side covers. The covers must be reinstalled later to assure compliance with EMI requirements. Determine if the **DDM-1000** is to be installed with a wire-wrap panel or with a front-access cable assembly.	
3. Attach **ED-2C843-30** wire-wrap panel (ED-2C841-30, G1 or G2 shelves only), if required.	**DP-401**
4. Attach **ED-2C833-20** front-access cable assembly, if required.	**DP-428**
5. The **DDM-1000** is now ready to be installed.	

Install DDM-1000 (Looped-Back) - DS3 Operation

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
1. ***Caution: Whenever working with the* DDM-1000*, you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***	
2. **Note:** If, at any point in this procedure, the DDM-1000 fails to respond in the indicated manner, you should refer to **TP-105** and clear the trouble.	**TP-105**
3. **Note:** If the DDM-1000 is to be installed with an ED-2C843-30 wire wrap assembly or with an ED-2C833-20 front access cable assembly refer to **IP-201** to prepare the assembly for installation.	
4. **Note:** Refer to the Planning Guidelines section of this user's manual for information concerning the mounting of the DDM-1000. If the shelf is an ED-2C841-30, G3 EMC shelf, remove the rear, front, and left side covers before mounting. The covers must be reinstalled after system installation to assure compliance with EMI requirements. Using the hardware provided, mount the **DDM-1000** in the framework.	
5. Attach the **ESD Warning Label** to the framework.	**DP-430**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
6. Make connections to the **DSX-1, DSX-1C or DSX-2** cross-connect.	**DP-405**
7. Connect the office alarms.	**DP-426**
8. Make connections to the telemetry system(s) as required.	
A. Parallel telemetry	**DP-408**
B. TBOS Serial telemetry	**DP-409**
C. Overhead telemetry	**DP-410**
D. TABS Serial telemetry	**DP-443**
9. Connect the **ED-2C834-30** Fan Assembly, if installed.	**DP-423**
10. Connect the -48 volt or -24 volt office battery and battery return.	**DP-411**
11. Connect the -48 volt or -24 volt office battery and battery return to the Fan Assembly, if installed.	**DP-407**
12. Connect the frame ground.	**DP-427**
13. Install the **547-Type PWR** plug-ins. The order in which they are installed does not matter.	

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
14. ***Caution: Ensure the* PROCR *is installed in the correct slot (*PROCR*). Inserting the* PROCR *in the* TLM *slot will damage the* PROCR. Install the **PROCR2** plug-in. **Note:** The **MC90083A1 PROCR1** plug-in has been rated **DA**.	**DP-404**
15. ***Caution: Inserting an* AKM4 TLM1 *in a DDM-1000 shelf that is cabled for* MC90191A1 TLM2 *performance monitoring may damage any* TLM2 *plug-ins that are installed in other DDM-1000 shelves in the same bay. It may also damage the telemetry remote monitoring system (such as the GTP).*** Remove the TLM slot edge protector, then install the **AKM4 TLM1** or **MC90191A1 TLM2** plug-in (if applicable).	**DP-412**
16. Install the **AKM3 ELIU1** plug-in.	**DP-412**
17. **Note:** As additional plug-ins are installed, office alarms may be activated, accompanied by flashing LEDs on some of the plug-ins. This is a normal condition at this stage of the procedure. You should ACO the office alarms as appropriate.	
18. Install the **AKM2B MXR2 or AKM2C MXR3** plug-ins. **Note:** The **AKM2 MXR1** plug-in has been rated **DA**.	**DP-412**

DO ITEMS BELOW IN ORDER LISTED	**FOR DETAILS, GO TO**
19. Install the low speed interface plug-ins (**AEK36-type DS1 INTFC**, **AEK37 DS1C INTFC1**, or **AEK38 DS2 INTFC1**).	**DP-412**
20. Make connections to the **DSX-3** cross-connect.	**DP-406**
21. Perform automatic looped-back installation test.	**DP-413**
22. Perform automatic cross-connect wiring test.	**DP-414**
23. Test protection switch function, if required.	**DP-442**
24. **Note:** An ASCII terminal is required to access the optional features of the DDM-1000. Activate optional features as required.	**DP-418**
25. The **DDM-1000** is now ready for end-to-end testing.	

Install DDM-1000 (Looped-Back) 90 Mb/s OR 180 Mb/s Optical Operation

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

1. **NOTICE:** Unterminated optical connectors may emit laser radiation. Do not view beam with optical instruments.

2. ***Warning 1: Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam.***

3. ***Warning 2: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.***

4. Verify that the **Laser Danger Label** as shown in **Figure 1** is attached to the left side of the assembly.

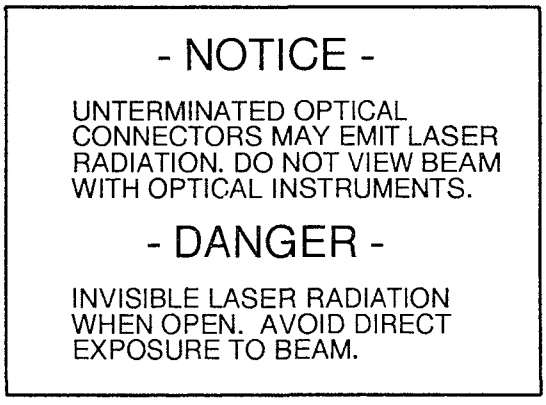


Figure 1. Laser Danger Label

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
5. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***	
6. **Note:** If, at any point in this procedure, the DDM-1000 fails to respond in the indicated manner, you should refer to **TP-105** and clear the trouble.	**TP-105**
7. **Note:** If the DDM-1000 is to be installed with an ED-2C843-30 wire-wrap panel or with an ED-2C833-20 front access cable assembly, refer to IP-201 to prepare the assembly for installation.	
8. Attach the **ESD Warning Label** to the framework.	**DP-430**
9. If the system type is 180 Mb/s optical with two shelves, continue with Step 10. If the system type is 90 Mb/s optical or 180 Mb/s optical with only one shelf, go to Step 13.	
10. It is assumed that the two shelf assemblies are to be installed one above the other separated by no more than the height of one heat baffle. Determine which shelf will be the OLIU assembly. (Either one can be used.)	

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

11. **Note**: Refer to the PLANNING GUIDELINES section of this User's Manual for information concerning the mounting of the DDM-1000. If the shelf is an ED-2C841-30, G3 EMC shelf, remove the rear, front, and left side covers before mounting. The covers must be reinstalled after system installation to assure compliance with EMI requirements.

12. The following steps in this section apply to both shelves, except for installation of the OLIU packs. The DDM-1000 180 Mb/s optical system is installed, accepted, and maintained as if it consisted of two totally separate 90 Mb/s optical systems. The PROCR packs in the two shelf assemblies do not "know" that they are part of a 180 Mb/s system. Each shelf assembly acts as if it were equipped with two 90 Mb/s OLIU packs.

    Using the hardware provided, mount the **DDM-1000** in the framework.

13. Locate the plastic retaining clip **(KKL-8 Kwik Klip)** in the installation kit. Peel the protective paper from the adhesive on the back and apply the retaining clip to the left side of the **DDM-1000** assembly, as low as possible and oriented so that the optical pigtails of the OLIUs can pass horizontally through the clip.

14. Make connections to the electrical cross connect as appropriate:

    Make connections to the **DSX-1**, **DSX-1C** or **DSX-2** cross-connect if the assembly is to be equipped with **MXR( )** function units. **DP-405**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
15. Connect the office alarms.	**DP-426**
16. Connect the appropriate telemetry system(s) as required.	
A. Parallel telemetry	**DP-408**
B. TBOS Serial telemetry	**DP-409**
C. Overhead telemetry	**DP-410**
D. TABS Serial telemetery	**DP-443**
17. Connect the **ED-2C834-30** fan assembly if installed.	**DP-423**
18. Connect the -48 volt or -24 volt office battery and battery return.	**DP-411**
19. Connect the frame ground.	**DP-427**
20. Install the **547-Type PWR** plug-ins. The order in which they are installed does not matter.	
21. ***Caution: Ensure the* PROCR *is installed in the correct slot (*PROCR*). Inserting the* PROCR *in the* TLM *slot will damage the* PROCR.	
Install the **MC90083A1( ) PROCR2** plug-in.	**DP-404**
Note: The **MC90083A1 PROCR1** plug-in has been rated **DA**.	

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
22. ***Caution: Inserting an* AKM4 TLM1 *in a DDM-1000 shelf that is cabled for* MC90191A1 TLM2 *performance monitoring may damage any* TLM2 *plug-ins that are installed in other DDM-1000 shelves in the same bay. It may also damage the telemetry remote monitoring system (such as the GTP).*** Remove the TLM slot edge protector, then install the **AKM4 TLM1** or **MC90191A1 TLM2** plug-in (if applicable).	**DP-412**
23. **Note:** As additional plug-ins are installed, office alarms may be activated, accompanied by flashing ALM LEDs on some of the plug-ins. This is a normal condition at this stage of the procedure. You should ACO the office alarms as appropriate.	
24. Install **OLIU** plug-ins [16-Type (90 Mb/s) or 20-Type (180 Mb/s)]. A. 16-Type OLIUs B. 20-Type OLIUs	 **DP-412** **DP-438**
25. If the **DDM-1000** is to be equipped with **AKM5 DS3U1s** or **AKM6 DS3U2s**, install the **AKM3 ELIU1** plug-in. Note that **AKM5 DS3U1** packs cannot be used with 20-type OLIUs.	**DP-412**
26. If the **DDM-1000** is to be equipped with an **AKM5 DS3U1** or **AKM6 DS3U2s**, make connections to the **DSX-3** cross-connect.	**DP-406**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
27. Install the function units (**AKM2B MXR2** or **AKM2C MXR3, AKM5 DS3U1** or **AKM6 DS3U2**). **Note:** The **AKM2 MXR1** plug-in has been rated **DA**.	**DP-412**
28. **Note:** One AKM86 BP2 pack is required in an optical shelf if only one muldem is equipped in that shelf. In a 180 Mb/s system, an AKM86 is required in each shelf if only one muldem is equipped in each shelf. Install AKM86 BP2 pack(s), if required. (Follow instructions printed on the AKM86 pack.)	**DP-412**
29. Install the low-speed interface plug-ins (**AEK36-type DS1 INTFC, AEK37 DS1C INTFC1** or **AEK38 DS2 INTFC1**) (no low speed interface plug-ins are installed in a muldem equipped with an **AKM5 DS3U1** or **AKM6 DS3U2**). **Note:** The **AEK36 DS1 INTFC1** plug-in has been rated **DA**.	**DP-412**
30. Install the optical loops.	**DP-415**
31. Perform a looped-back transmission test for each muldem as appropriate:	
A. Perform the automatic looped-back test if the muldem is equipped with **MXR( )** function units.	**DP-413**
B. Perform the DS3U2 looped-back test if the muldem is equipped with **AKM6 DS3U2** function units.	**DP-432**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
C. Perform the DS3U1 looped-back test if the muldem is equipped with **AKM5 DS3U1** function units.	**DP-444**
32. Perform automatic cross-connect wiring test for each muldem that is equipped with **MXR( )** function units.	**DP-414**
33. **Note:** An ASCII terminal is required to access the optional features of the DDM-1000. Activate optional features as required.	**DP-418**
34. The **DDM-1000** is now ready for end-to-end testing.	

Install End-to-End System - DS3 Facility (Without Add/Drop)

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***	
2. **Note:** If, at any point in this procedure, the DDM-1000 fails to respond in the indicated manner, you should refer to **TP-105** and clear the trouble.	**TP-105**
3. **Note:** It is assumed that the DDM-1000 assembly at each end of the system has been installed and tested in a looped-back configuration. If this has not been done, refer to **IP-202**.	
4. Verify that each **DDM-1000** assembly is connected to the DS3 facility at its respective **DSX-3** cross-connect.	**DP-406**
5. Perform automated end-to-end test.	**DP-416**
6. Check office alarm interface as required.	**DP-419**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
7. Check telemetry interface as required.	
A. Parallel telemetry	DP-420
B. TBOS Serial telemetry	DP-421
C. Overhead telemetry	DP-422
8. Test protection switching function, if required.	DP-442
9. The end-to-end system is now ready for service to be established.	

Install End-to-End System - Optical Facility

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
1. **NOTICE:** Unterminated optical connectors may emit laser radiation. Do not view beam with optical instruments.	
2. ***Warning 1: Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam.***	
3. ***Warning 2: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.***	
4. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***	
5. **Note:** If, at any point in this procedure, the DDM-1000 fails to respond in the indicated manner, you should refer to **TP-105** and clear the trouble.	**TP-105**
6. **Note:** It is assumed that the DDM-1000s at both ends of the system have passed the automatic looped transmission test. If not, refer to **IP-203**.	

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
7. Determine the optical loss of the optical facility from office records or by making the required measurements.	
8. Set the option switch on the **OLIU** to agree with the loss of the optical facility.	**DP-424**
9. Connect each **DDM-1000** to the optical facility.	**DP-429**
10. Perform an end-to-end transmission test for each muldem as appropriate:	
A. Perform an automated end-to-end test if the muldems under test in both **DDM-1000s** are equipped with **MXR( )** function units.	**DP-416**
B. Perform a DS3U2 end-to-end test if the muldem under test in either **DDM-1000** is equipped with **AKM6 DS3U2** function units.	**DP-433**
C. Perform a DS3U1 end-to-end test if the muldem under test in either **DDM-1000** is equipped with **AKM5 DS3U1** function units.	**DP-445**
11. Check office alarm interface as required.	**DP-419**
12. Check telemetry interface as required.	
A. Parallel telemetry	**DP-420**
B. TBOS Serial telemetry	**DP-421**
C. Overhead telemetry	**DP-422**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
13. Test protection switching function, if required.	DP-442
14. The end-to-end system is now ready for service to be established.	

Configure Electrical System for Add/Drop

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

2. **Note:** When a DDM-1000 is to be used in an add/drop configuration, it is installed just as if it were an end terminal except that it is set for add/drop operation.

3. Refer to **Figure 1** and verify that the jumper is installed vertically over the two pins labeled **A/D** at the top left of position 59 (labeled **PROCR**) of the backplane.

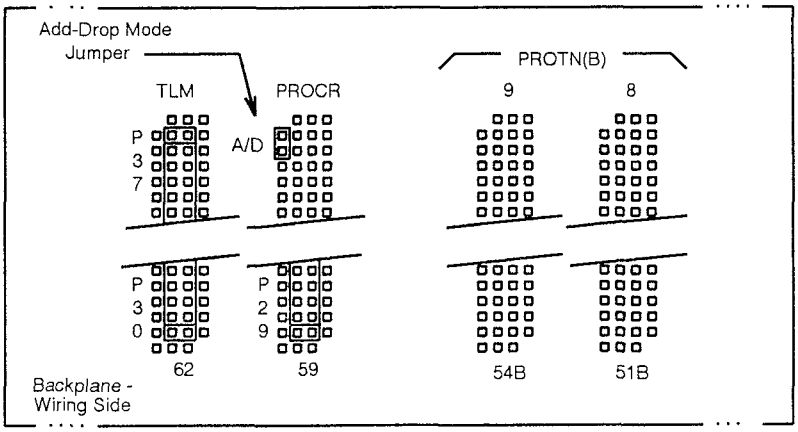


Figure 1. Add/Drop Identification Jumper

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
4. Refer to **IP-202** and continue with the installation. Do **NOT** return to this procedure.	**IP-202**

Install Fan Assembly

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***	
2. Remove the **ED-2C834-30** fan assembly from the shipping carton and inspect for visible damage.	
3. Using the hardware provided, mount the fan assembly in the framework below the associated **DDM-1000.**	
4. Connect power to the fan assembly.	**DP-407**
5. Connect the fan assembly to the **DDM-1000.**	**DP-423**

Test (Accept) DDM-1000 (Looped-Back) - DS3 Operation

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

2. **Note**: This test is to be performed if the DDM-1000 is being tested or accepted by an organization that did not install it.

3. **Note**: It is assumed that the DDM-1000 is installed, powered, and running. If it was not left in that condition, notify the organization that installed the DDM-1000 that they have not completed the installation.

4. **Note**: If, at any point in this procedure, the DDM-1000 fails to respond in the indicated manner, you should refer the trouble to the organization that installed the DDM-1000.

5. At the **DSX-3** cross-connect, verify that a jumper cable is installed between the **OUT** jack and the **IN** jack for **Muldem A** of the **DDM-1000.** Verify that another jumper is installed between the **OUT** jack and the **IN** jack for **Muldem B** of the **DDM-1000.**

6. Verify all plug-in option switches have been set correctly. **DP-412**

DO ITEMS BELOW IN ORDER LISTED	**FOR DETAILS, GO TO**
7. Depress and hold the **TEST/ACO** pushbutton on the **PROCR** plug-in. Verify that all the LEDs on all the plug-ins in the **DDM-1000** are lighted.	
8. Release the **TEST/ACO** pushbutton. Verify that all LEDs on the **DDM-1000** are extinguished.	
9. Perform the automatic looped-back test. Refer any failures to the organization that installed the **DDM-1000.**	**DP-413**
10. Perform the automatic cross-connect wiring test. Refer any failures to the organization that installed the **DDM-1000.**	**DP-414**
11. **Note**: An ASCII terminal is required to access the optional features of the DDM-1000. Activate optional features as required.	**DP-418**
12. The **DDM-1000** is now ready for end-to-end testing.	**IP-210**

Test (Accept) DDM-1000 (Looped-Back) 90 Mb/s OR 180 Mb/s Optical Operation

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

1. **NOTICE:** Unterminated optical connectors may emit laser radiation. Do not view beam with optical instruments.

2. ***Warning: Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam.***

3. ***Caution: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.***

4. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

5. **Note:** This test is to be performed if the DDM-1000 is being tested or accepted by an organization that did not install it.

6. **Note:** It is assumed that the DDM-1000 is installed, tested, powered, and running. If it was not left in that condition, notify the organization that installed the DDM-1000 that they have not completed the installation.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
7. **Note:** If, at any point in this procedure, the DDM-1000 fails to respond in the indicated manner, you should refer the trouble to the organization that installed the DDM-1000.	
8. Verify all plug-in option switches have been set correctly.	**DP-412**
9. Verify that both the **SRV** and the **PROTN OLIUs** have optical loops installed between their respective **IN** and **OUT** leads.	**DP-415**
10. Depress and hold the **TEST/ACO** pushbutton on the **PROCR** plug-in. Verify that all the LEDs on all the plug-ins in the **DDM-1000** are lighted.	
11. Release the **TEST/ACO** pushbutton. Verify that all LEDs on the **DDM-1000** are extinguished.	
12. Perform looped-back transmission test for each muldem as appropriate. Refer any failures to the organization that installed the **DDM-1000**:	
A. Perform the automatic looped-back test if the muldem is equipped with **MXR( )** function units.	**DP-413**
B. Perform the DS3U2 looped-back test if the muldem is equipped with **AKM6 DS3U2** function units.	**DP-432**
C. Perform the DS3U1 looped-back test if the muldem is equipped with **AKM5 DS3U1** function units. Note that **AKM5 DS3U1** packs cannot be used with 180 Mb/s systems.	**DP-444**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
13. Perform the automatic cross-connect wiring test if the assembly is equipped with **MXR( )** function units. Refer any failures to the organization that installed the **DDM-1000.**	**DP-414**
14. **Note**: An ASCII terminal is required to access the optional features of the DDM-1000. Activate optional features as required.	**DP-418**
15. The **DDM-1000** is now ready for end-to-end testing.	**IP-211**

Test (Accept) End-to-End System - DS3 Facility (Without Add/Drop)

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***	
2. **Note:** It is assumed that the DDM-1000 assembly at each end of the system has been tested (accepted) in a looped-back configuration. If this has not been done refer to **IP-208** and test (accept) each DDM-1000 assembly in a looped-back configuration.	**IP-208**
3. **Note:** If, at any point in this procedure, the DDM-1000 fails to respond in the indicated manner, you should refer the trouble to the organization that installed the DDM-1000.	
4. Connect each **DDM-1000** assembly to the DS3 facility at its respective **DSX-3** cross-connect.	**DP-406**
5. Perform automated end-to-end test.	**DP-416**
6. Check office alarm interface as required.	**DP-419**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
7. Check telemetry interface as required.	
A. Parallel telemetry	DP-420
B. TBOS Serial telemetry	DP-421
C. Overhead telemetry	DP-422
8. Test protection switching function, if required.	DP-442
9. The end-to-end system is now ready for service to be established.	

Test (Accept) End-to-End System - Optical Facility

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

1. **NOTICE:** Unterminated optical connectors may emit laser radiation. Do not view beam with optical instruments.

2. ***Warning 1: Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam.***

3. ***Warning 2: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.***

4. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

5. **Note:** It is assumed that the DDM-1000s at both ends of the system have been tested (accepted) in a looped-back configuration. If this has not been done refer to **IP-209** and test (accept) each DDM-1000 assembly in a looped-back configuration. **IP-209**

6. **Note:** If, at any point in this procedure, the DDM-1000 fails to respond in the indicated manner, you should refer the trouble to the organization that installed the DDM-1000.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
7. Determine the optical loss of the optical facility from office records or by making the required measurements.	
8. Set the option switch on the **OLIU** to agree with the loss of the optical facility.	**DP-424**
9. Connect each **DDM-1000** to the optical facility.	**DP-429**
10. Perform an end-to-end test as appropriate. Report any failures to the organization that installed the **DDM-1000**:	
A. Perform an automatic end-to-end transmission test if both assemblies are equipped with **MXR( )** function units.	**DP-416**
B. Perform a DS3U2 end-to-end test if either assembly is equipped with **AKM6 DS3U2** function units.	**DP-433**
C. Perform a DS3U1 end-to-end test if either assembly is equipped with **AKM5 DS3U1** function units. Note that **AKM5 DS3U1** packs cannot be used with 180 Mb/s systems.	**DP-445**
11. Check office alarm interface as required.	**DP-419**
12. Check telemetry interface as required.	
A. Parallel telemetry	**DP-420**
B. TBOS Serial telemetry	**DP-421**
C. Overhead telemetry	**DP-422**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
13. Test protection switching function, if required.	DP-442
14. The end-to-end system is now ready for service to be established.	

Install End-to-End System
DS3 Facility (With Add/Drop)

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

2. **Note**: It is assumed that both of the terminating DDM-1000 assemblies and the intermediate (add/drop) DDM-1000 assembly have been installed and tested in a looped-back configuration. If this has not been done, refer to **IP-202**.

3. **Note**: If, at any point in this procedure, the DDM-1000 fails to respond in the indicated manner, you should refer to **TP-105** and clear the trouble. **TP-105**

4. **Note**: The system will first be turned up as if it were two separate systems, both terminating at the add/drop assembly. This will require some temporary rearrangements at the DSX-3 cross-connect associated with the add/drop assembly.

5. Verify that each **DDM-1000** assembly is equipped with the configuration of **LS INTFC** plug-ins that will be put into service, i.e., the associated muldems in the terminating **DDM-1000s** have **LS INTFC** plug-ins in both the "through" and the "add/drop" **LS INTFC** locations and the intermediate (add/drop) **DDM-1000** has **LS INTFC** plug-ins in only the "add/drop" **LS INTFC** locations of both of its muldems.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

6. At the **DSX-3** cross-connect associated with the intermediate (add/drop) **DDM-1000** assembly, temporarily connect one of the muldems (it does not matter which one you connect) of the **DDM-1000** to each of the terminating **DDM-1000s**, [that is, **Muldem A** of the intermediate **DDM-1000** is connected (both XMT and RCV) to one of the terminating **DDM-1000s**, and **Muldem B of the intermediate DDM-1000** is connected (both XMT and RCV) to the other terminating **DDM-1000**]. See **Figure 1**.

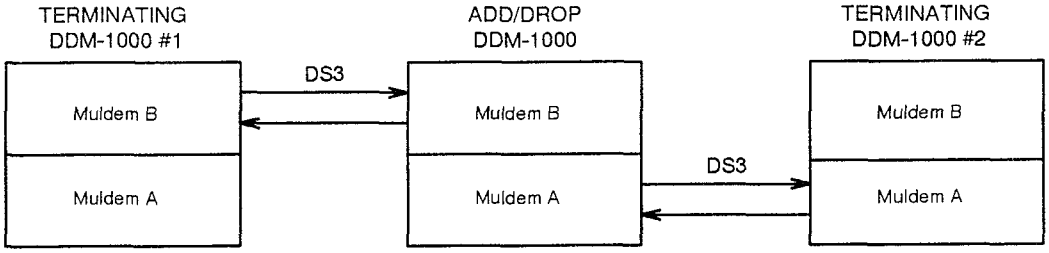


Figure 1. Example of Temporary Connection as Two Separate Systems

7. At each of the terminating **DDM-1000s**, temporarily unseat the **LS INTFC** plug-ins associated with the through circuits. Momentarily depress the **RST** pushbutton on the **PROCR** to remove the unseated plug-ins from the **PROCR**'s internal equipment list.

8. At the backplane of the intermediate **DDM-1000**, temporarily remove the add/drop jumper from the two pins labeled **A/D** at the top of position 59 (labeled **PROCR**) as shown in **Figure 2**.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

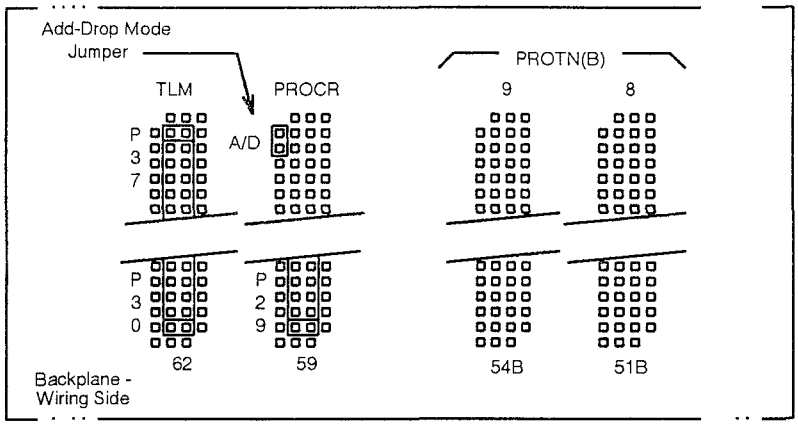


Figure 2. Add/Drop Identification Jumper

9. Refer to **DP-402** and update the intermediate **PROCR**'s internal equipment list. **DP-402**

10. At **ALL THREE** of the **DDM-1000** assemblies, enable far-end maintenance. **DP-435**

11. Perform an automated end-to-end test from each terminal location. **DP-416**

12. Check the office alarm interface at each site, as required. **DP-419**

13. Check the telemetry interfaces at each site, as required.

    A. Parallel telemetry **DP-420**
    B. Serial telemetry **DP-421**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

14. Test protection switching function at each site, if required. **DP-442**

15. At the **DSX-3** cross-connect associated with the intermediate (add/drop) **DDM-1000**, reconfigure the system for add/drop operation: The **OUT** jack from one of the terminating **DDM-1000s** is connected to the **IN** jack of **Muldem A** of the intermediate **DDM-1000**; the **OUT** of **Muldem A** of the intermediate **DDM-1000** is connected to the **IN** jack of the other terminating **DDM-1000**. **Muldem B** of the intermediate **DDM-1000** is connected in the same manner between the two terminating **DDM-1000s** to provide communication in the other direction. See **Figure 3**.

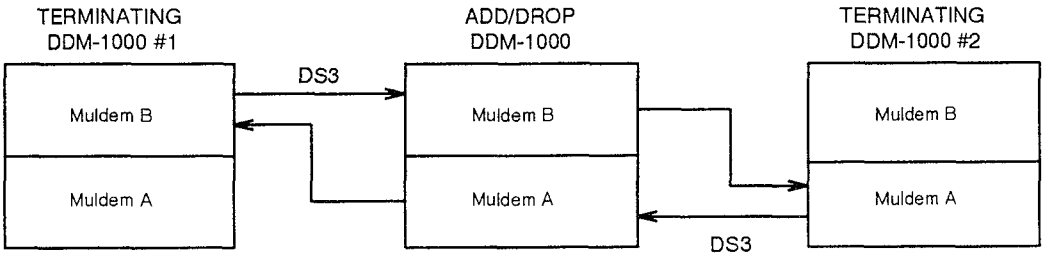


Figure 3. Example of Final Connection as an Add/Drop System

16. At each of the terminating **DDM-1000s**, reseat the **LS INTFC** plug-ins associated with the through circuits.

17. At the backplane of the intermediate **DDM-1000**, replace the add/drop jumper between the two pins labeled **A/D** at the top of position 59 (labeled **PROCR**) as shown in **Figure 2**.

18. Refer to **DP-402** and update the intermediate **PROCR's** internal equipment list. **DP-402**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
19. At **ALL THREE** of the **DDM-1000** assemblies, disable far-end maintenance.	**DP-435**
20. **Note:** It is not possible to use the automatic end-to-end test to check the transmission of the through circuits. Perform DS1, DS1C or DS2 end-to-end test.	**DP-434**
21. The add/drop system is now ready for service.	

Install End-to-End System - DS3 Facility (With a Far-End Non DDM-1000 Multiplex)

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***	
2. **Note:** It is assumed that the DDM-1000 assembly at one end of the system has been installed and tested in a looped-back configuration. If this has not been done refer to **IP-202**.	
3. **Note**: If, at any point in this procedure, the DDM-1000 fails to respond in the indicated manner, you should refer to **TP-105** and clear the trouble.	**TP-105**
4. Connect the **DDM-1000** assembly and the other M13-type multiplex to the DS3 facility at the respective **DSX-3** cross-connects.	**DP-406**
5. Disable far-end maintenance at the **DDM-1000**.	**DP-435**
6. **Note**: The automated end-to-end test cannot be performed if the far-end M13-type multiplex is not a DDM-1000.	
Perform DS1, DS1C or DS2 end-to-end test.	**DP-434**
7. Check the office alarm interface at the **DDM-1000** as required.	**DP-419**

DO ITEMS BELOW IN ORDER LISTED	**FOR DETAILS, GO TO**
8. Check the telemetry interface at the **DDM-1000** as required.	
A. Parallel telemetry	**DP-420**
B. Serial telemetry	**DP-421**
9. The end-to-end system is now ready for service to be established.	

Test (Accept) End-to-End System - DS3 Facility (With Add/Drop)

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

2. **Note**: It is assumed that both of the terminating DDM-1000 assembles and the intermediate (add/drop) DDM-1000 assembly have been tested (accepted) in a looped-back configuration. If this has not been done, refer to **IP-202**.

3. **Note**: If, at any point in this procedure, the DDM-1000 fails to respond in the indicated manner, you should refer the trouble to the organization that installed the DDM-1000.

4. **Note**: The system will first be tested (accepted) as if it were two separate systems, both terminating at the add/drop assembly. This will require some temporary rearrangements at the DSX-3 cross-connect associated with the add/drop assembly.

5. Verify that each **DDM-1000** assembly is equipped with the configuration of **LS INTFC** plug-ins that will be put into service, i.e., the associated muldems in the terminating **DDM-1000s** have **LS INTFC** plug-ins in both the "through" and the "add/drop" **LS INTFC** locations and the intermediate (add/drop) **DDM-1000** has **LS INTFC** plug-ins in only the "add/drop" **LS INTFC** locations of both of its muldems.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

6. At the **DSX-3** cross-connect associated with the intermediate (add/drop) **DDM-1000** assembly, temporarily connect one of the muldems (it does not matter which one you connect) of the **DDM-1000** to each of the terminating **DDM-1000s**, i.e., **Muldem A** of the intermediate **DDM-1000** is connected (in both directions) to one of the terminating **DDM-1000s** and **Muldem B of the intermediate DDM-1000** is connected (in both directions) to the other terminating **DDM-1000**. See **Figure 1**.

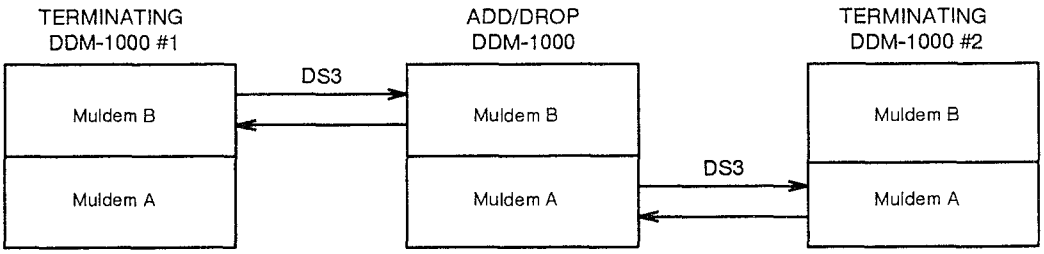


Figure 1. Example of Temporary Connection as Two Separate Systems

7. At each of the terminating **DDM-1000s**, temporarily unseat the **LS INTFC** plug-ins associated with the through circuits. Momentarily depress the **RST** pushbutton on the **PROCR** to remove the unseated plug-ins from the **PROCR**'s internal equipment list.

8. At the backplane of the intermediate **DDM-1000**, temporarily remove the add/drop jumper from the two pins labeled **A/D** at the top of position 59 (labeled **PROCR**) as shown in **Figure 2**.

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

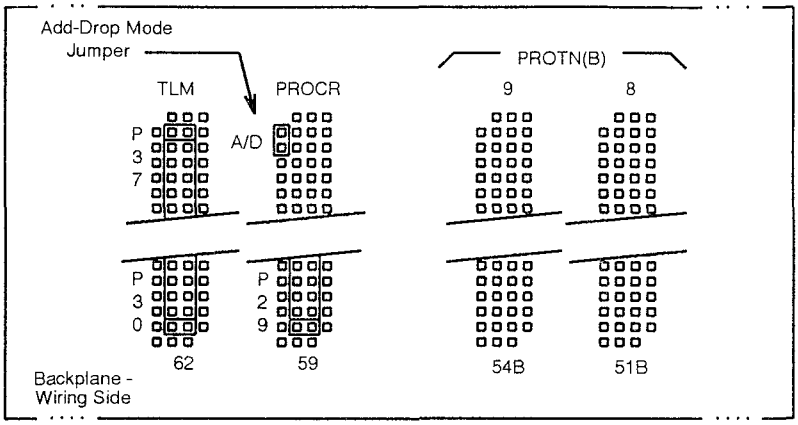


Figure 2. Add/Drop Identification Jumper

9. Refer to **DP-402** and update the **PROCR**'s internal equipment list. **DP-402**

10. At **ALL THREE** of the **DDM-1000** assemblies, enable far-end maintenance. **DP-435**

11. Perform an automated end-to-end test from each terminal location. (It is not necessary to do this test from the add/drop site) **DP-416**

12. Check the office alarm interface at each site, as required. **DP-419**

13. Check the telemetry interfaces at each site, as required.

    A. Parallel telemetry **DP-420**
    B. Serial telemetry **DP-421**

14. Test protection switching function at each site, if required. **DP-442**

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

15. At the **DSX-3** cross-connect associated with the intermediate (add/drop) **DDM-1000**, reconfigure the system for add/drop operation: The **OUT** jack from one of the terminating **DDM-1000s** is connected to the **IN** jack of **Muldem A** of the intermediate **DDM-1000**; the **OUT** of **Muldem A** of the intermediate **DDM-1000** is connected to the **IN** jack of the other terminating **DDM-1000**. **Muldem B** of the intermediate **DDM-1000** is connected in the same manner between the two terminating **DDM-1000s** to provide communication in the other direction. See **Figure 3**.

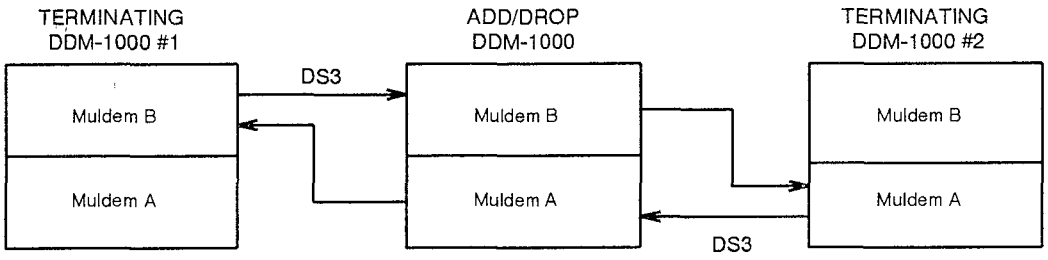


Figure 3. Example of Final Connection as an Add/Drop System

16. At each of the terminating **DDM-1000s**, reseat the **LS INTFC** plug-ins associated with the through circuits.

17. At the backplane of the intermediate **DDM-1000**, replace the add/drop jumper between the two pins labeled **A/D** at the top of position 59 (labeled **PROCR**) as shown in **Figure 2** above.

18. Use the **RST** button to update the intermediate **PROCR's** internal equipment list. **DP-402**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
19. At **ALL THREE** of the **DDM-1000** assemblies, disable far-end maintenance.	**DP-435**
20. **Note:** It is not possible to use the automatic end-to-end test to check the transmission of the through circuits. Perform DS1, DS1C or DS2 end-to-end test.	**DP-434**
21. The add/drop system is now ready for service.	

Establish End-to-End Service (Muldem Out-of-Service)

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***	
2. **Note**: The end-to-end installation procedure must be performed before continuing with this procedure. If this has not been done, refer to **TI-001** and perform the required installation procedure.	
3. **Note**: If, at any point in this procedure, the DDM-1000 fails to respond in the indicated manner, refer to **TP-105** and clear the trouble.	**TP-105**
4. Determine which low speed circuits are to be put into service and what operating options are to be selected.	
5. Set the option switches on the **LS INTFC** plug-in(s) as required.	**DP-425**
6. Verify that the appropriate service **LS INTFC** plug-ins are installed in the muldem being put into service.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

7. **Note:** If only one type of LS INTFC plug-in is installed in a muldem, the protection plug-in(s) may be installed in either protection location (PROTN 8, PROTN 9 or both). But if any combination of DS1, DS1C and DS2 plug-ins are installed, the lower speed plug-in must be installed in PROTN 8 location. [For example, if a muldem contains DS1s and DS1Cs (or DS2s), the DS1 protection plug-in must be installed in PROTN 8 and the DS1C (or DS2) is installed in PROTN 9 location.] Muldems with a combination of all three LS INTFC plug-ins will support transmission for all three types, but only two can be protected.

   Verify that the appropriate protection **LS INTFC** circuit(s) is/are installed in the Muldem being put into service.

8. ***Caution: No service LS INTFC locations should be left empty or connected to the external cross-connect wiring.***

   Note: BP1 plug-ins are used to disconnect the cross-connect wiring associated with unused service LS INTFC locations from the DDM-1000's internal protection bus. As an alternative to installing the BP1s, it is also possible to disconnect the wiring by unplugging the appropriate connectors on the backplane.

   Install **BP1** plug-ins in all unused service **LS INTFC** locations **OR** unplug the **963P** connectors associated with those locations on the backplane.

9. Wait approximately 1 minute to allow the **PROCR** to identify the **LS INTFC** plug-in(s) just installed.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
10. Select and note any options involving the use of the ASCII terminal, if required.	**DP-418**
11. Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **TI-001** and follow the appropriate trouble clearing procedure.	
12. Perform an LED test. During the test verify that the **ALM** LED on the **LS INTFC(s)** just installed is lighted.	**DP-403**
13. Perform an end-to-end low speed transmission test for each low speed circuit being put into service.	**DP-437**

Establish End-to-End Service (Muldem In-Service)

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***	
2. **Note**: If, at any point in this procedure, the DDM-1000 fails to respond in the indicated manner, you should refer to **TP-105** and clear the trouble.	**TP-105**
3. Determine which low speed circuits are to be put into service and what operating options are to be selected.	
4. Make the appropriate connection(s) to the low speed cross-connect or equivalent connection point for the circuit(s) being added.	**DP-405**
5. Set the option switches on the **LS INTFC** plug-in(s) as required.	**DP-425**
6. Remove **BP1** plug-in(s), as required, from the location(s) for the **LS INTFC** plug-in(s) being installed or reconnect the **963P** connectors at the backplane if they were disconnected.	
7. Install the appropriate service **LS INTFC** plug-in(s) for the circuit(s) being added.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

8. **Note:** If only one type of LS INTFC plug-in is installed in a muldem, the protection plug-in(s) may be installed in either protection location (PROTN 8, PROTN 9 or both). But if any combination of DS1, DS1C and DS2 plug-ins are installed, the lower speed plug-in must be installed in PROTN 8 location. [For example, if a muldem contains DS1s and DS1Cs (or DS2s), the DS1 protection plug-in must be installed in PROTN 8 and the DS1C (or DS2) is installed in PROTN 9 location.] Muldems with a combination of all three LS INTFC plug-ins will support transmission for all three types, but only two can be protected.

   Install the appropriate protection **LS INTFC** plug-in(s).

9. Wait approximately 1 minute to allow the **PROCR** to identify the **LS INTFC** plug-in(s) just installed.

10. Select and note any options involving the use of the ASCII terminal if required. **DP-418**

11. Verify that no LEDs or alarms are activated. If any LEDs or alarms are activated, refer to **TI-001** and follow the appropriate trouble clearing procedure.

12. Perform an LED test. During the test verify that the **ALM** LED on the **LS INTFC(s)** just installed is(are) lighted. **DP-403**

13. Perform an end-to-end low speed transmission test for each low speed circuit being put into service. **DP-437**

Discontinue End-to-End Service

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
1. ***Caution 1: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***	
2. **Note**: If, at any point in this procedure, the DDM-1000 fails to respond in the indicated manner, you should refer to **TP-105** and clear the trouble.	**TP-105**
3. Determine which channel(s) is to be discontinued.	
4. **Note**: The following operation will activate the office minor alarm. The audible alarm may be suppressed by momentarily depressing the ACO/TEST pushbutton. Remove the **LS INTFC** plug-in(s) associated with the channel(s) being discontinued.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

5. ***Caution: No service LS INTFC locations should be left empty or they should be disconnected from the external cross-connect wiring.***

   Note: BP1 plug-ins are used to disconnect the cross-connect wiring associated with unused service LS INTFC locations from the DDM-1000's internal protection bus. As an alternative to installing the BP1s, it is also possible to disconnect the wiring by unplugging the appropriate connectors on the backplane.

   Install **BP1** plug-in(s) as required in the location(s) for the **LS INTFC** plug-in(s) just removed, **OR** unplug the **963P** connectors associated with those **LS INTFC** locations being removed from service.

6. ***Caution: If removing function units from an optical system equipped with a*** **PROCR 2** pack **MC90083A1D**, Issue 3 or 4, or **MC90083A1E**, Issue 1 or 2, be sure to add an **AKM86 BP2** pack to the service slot and momentarily depress the **RST** button.

   If an entire muldem is being removed from service, remove function unit plug-ins (**AKM-2** types, **AKM-5**, or **AKM-6**) associated with that muldem, if required.

7. **Note:** After removing any plug-ins, the DDM-1000 equipment list must be updated using the **RST** button.

   Use the **RST** button to update the **DDM-1000's** internal equipment list. **DP-402**

Transfer Service From 90 Mb/s Optical Facility to DS3 Facility

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

1. **NOTICE:** Unterminated optical connectors may emit laser radiation. Do not view beam with optical instruments.

2. ***Warning 1: Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam.***

3. ***Warning 2: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.***

4. ***Caution 1: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

5. ***Caution 2: The* PROCR1 *pack,* MC90083A1, *will not support an in-service conversion from optical to DS3 electrical mode. The* PROCR1 *pack will work in either optical or electrical mode, but a conversion must be made out of service.***

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

6. **Note**: If, at any point in this procedure, the DDM-1000 fails to respond in the indicated manner, you should refer to **TP-105** and clear the trouble.

7. **Note**: This transfer will require coordination between personnel at the two ends of the system. Reference will be made to the "near end" and the "far end". These designations are completely arbitrary. The only distinction is that the transfer activity will be directed by personnel at the near end.

8. At the far end **DSX-3** cross-connect, connect a jumper cable from the **OUT** jack to the **IN** jack of each of the DS3 facilities to be placed into service.

9. At the near end **DSX-3** cross-connect, use a DS3 test set to verify good end-to-end DS3 facilities.

   Note: This type of looped-back test can fail to detect some types of system problems such as an IN and OUT jack reversal at the far-end DSX-3 cross-connect. A more thorough test procedure would be to use a DS3 test set transmitter at one end of the DS3 facility and a DS3 test set receiver at the other end of the facility. After error-free transmission is verified in one direction, the test sets would be moved to the other ends, respectively, of the system and the test repeated.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
10. Install **AKM3 ELIU1** plug-ins in the **DDM-1000** assemblies at both ends of the system.	**DP-412**
11. Connect each **DDM-1000** assembly to the DS3 facility at its respective **DSX-3** cross-connect.	**DP-406**
12. If an ASCII terminal is available, use the command **exct-sw-hs:s=( ) make** to switch service to protection. Use the command **exct-lock-hs:s=( ) make** to lock service to protection.	
13. At the **DDM-1000** at each end of the system, remove the **MXR** from the **Muldem A SRV** location and from the **Muldem B SRV** location. Carefully note where each plug-in was installed.	
14. The **MN** office alarm will be activated and the **MN, NE** and possibly the **FE** LEDs on the **PROCR** will be lighted at both ends of the system. Verify that no other LEDs are lighted on either **DDM-1000.**	
15. Set the option switches (and plugs if working with an **AKM2B or AKM2C**) on each of the **SRV MXR** plug-ins just removed for electrical operation, and reinstall the plug-ins. Be careful to put each plug-in back where it was previously installed. Take care to avoid damaging the LEDs protruding through the openings in the faceplates of the **MXRs.**	**DP-417**
16. The **ALM** LED on each of the **SRV MXR** plug-ins in both **DDM-1000s** will be lighted in addition to the **MN, NE** and possibly the **FE** LEDs.	

DO ITEMS BELOW IN ORDER LISTED	**FOR DETAILS, GO TO**
17. Remove any AKM86 BP2 plug-ins.	
18. At the near end only, momentarily depress the **RST** button **on the PROCR.** **Note:** In this step the **RST** is automatically sent to the far end and automatically releases the manual lock and switch if both muldems are equipped with **MXR** plug-ins. If only one muldem is equipped, the **RST** button must be pressed at the near end and the far end. The **ALM** LEDs on the **SRV MXR** plug-ins will go off. The **ALM** LEDs on the **PROTN MXR** plug-ins will be lighted.	**DP-402**
19. Traffic is now being carried over the DS3 facilities.	
20. At the **DDM-1000** at each end of the system remove the **MXR** from the **Muldem A PROTN** location and from the **Muldem B PROTN** location. Carefully note where each plug-in was installed.	
21. The **MN** office alarm will be activated and the **MN, NE** and possibly the **FE** LEDs on the **PROCR** will be lighted at both ends of the system. Verify that no other LEDs are lighted on either **DDM-1000.**	

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
22. Set the option switches (and plugs if working with an **AKM2B or AKM2C**) on each of the **PROTN MXR** plug-ins just removed for electrical operation, and replace the plug-ins. Be careful to put each plug-in back where it was previously installed. Take care to avoid damaging the LEDs protruding through the openings in the faceplates of the **MXRs.**	**DP-417**
23. All office alarms and LEDs will be extinguished. You have completed the transfer of service from the optical to the electrical facility.	
24. At the **DDM-1000** at each end of the system disconnect and remove the **16-Type OLIUs.**	
25. At each **DDM-1000,** momentarily depress the **RST** control on the **PROCR.** This will delete the OLIUs from the **PROCR's** internal equipment list.	**DP-402**

Transfer Service From DS3 Facility to Optical Facility

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

1. **NOTICE:** Unterminated optical connectors may emit laser radiation. Do not view beam with optical instruments.

2. ***Warning 1: Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam.***

3. ***Warning 2: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.***

4. ***Caution 1: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

5. ***Caution 2: The* PROCR1 *pack,* MC90083A1, *will not support an in-service conversion from optical to DS3 electrical mode. The* PROCR1 *pack will work in either optical or electrical mode, but a conversion must be made out of service.***

DO ITEMS BELOW IN ORDER LISTED	**FOR DETAILS, GO TO**
6. **Note**: If, at any point in this procedure, the DDM-1000 fails to respond in the indicated manner, you should refer to **TP-105** and clear the trouble.	**TP-105**
7. **Note**: This transfer will require coordination between personnel at the two ends of the system. Reference will be made to the "near end" and the "far end". These designations are completely arbitrary. The only distinction is that the transfer activity will be directed by personnel at the near end.	
8. **Note**: This transfer requires that far-end maintenance be enabled between the DDM-1000 assemblies at the two ends of the DS3 facility. This can only be done with an ASCII terminal using the command **set-shelf-fecom:yes**.	
9. Use the ASCII terminal command **set-shelf-fecom:yes** to enable far-end maintenance at each end of the DS3 facility. This command must be directly entered into the **DDM-1000** at each end of the DS3 facility.	
10. At the near end, use the ASCII terminal command **test-led:e=f** to verify that the far-end maintenance is working. (All of the LEDs on the far end **DDM-1000** will be lighted for 10 seconds and then extinguished for 10 seconds.)	
11. Verify that the **SRV** and **PROTN** optical facilities are good.	

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
12. Determine the optical loss of the optical facilities from office records or by making the required measurements.	
13. Set the option switches on the **OLIU** plug-ins to agree with the loss of the optical facilities, and install the **SRV** and the **PROTN OLIU** plug-ins in the **DDM-1000** assemblies at both ends of the system. Take care to avoid damaging the LED that protrudes through the opening in the faceplate of the plug-in.	**DP-424**
14. Connect each **DDM-1000** assembly to the optical facility.	**DP-429**
15. At the **DDM-1000** at each end of the system, remove the **muldem A SRV MXR** and **muldem B SRV MXR.** Carefully note where each plug-in was installed.	
16. The **MN** office alarm will be activated and the **MN, NE** and possibly the **FE** LEDs on the **PROCR** will be lighted at both ends of the system. Verify no other LEDs are lighted on either **DDM-1000.**	
17. Set the option switches (and plugs if working with an **AKM2B or AKM2C**) on each of the **SRV MXR** plug-ins just removed for optical operation, and replace the plug-ins. Be careful to put each plug-in back where it was previously installed. Take care to avoid damaging the LEDs that protrude through the openings in the faceplates of the **MXRs.**	**DP-417**
18. The **ALM** LED on each **SRV MXR** plug-in in both **DDM-1000s** will be lighted in addition to the **MN, NE** and possibly the **FE** LEDs.	
19. If only one muldem is equipped with **MXR** plug-ins, install an **AKM86 BP2** plug-in into the **SRV MXR** slot of the unequipped muldem.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

20. At the near end, momentarily depress the **PROCR RST** button. **DP-402**

    Note: In this step the **RST** is automatically sent to the far end and automatically releases the manual lock and switch if both muldems are equipped with **MXR** plug-ins. If only one muldem is equipped, the **RST** button must be pressed at the near end and the far end.

    The **ALM** LEDs on the **SRV MXR** plug-ins will go off. The **ALM** LEDs on the **PROTN MXR** plug-ins will be lighted.

21. Traffic is now being carried over the optical facilities.

22. At the **DDM-1000** at each end of the system remove the **MXR** from the **Muldem A PROTN** location and from the **Muldem B PROTN** location. Carefully note where each plug-in was installed.

23. The **MN** office alarm will be activated and the **MN, NE** and possibly the **FE** LEDs on the **PROCR** will be lighted at both ends of the system. Verify that no other LEDs are lighted on either **DDM-1000.**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
24. Set the option switches (and plugs if working with an **AKM2B or AKM2C**) on each of the **PROTN MXR** plug-ins just removed for optical operation, and replace the plug-ins. Be careful to put each plug-in back where it was previously installed. Take care to avoid damaging the LEDs that protrude through the openings in the faceplates of the **MXRs**.	**DP-417**
25. All office alarms and LEDs will be extinguished. You have completed the transfer of service from the DS3 to the optical facility.	
26. At the **DDM-1000** at each end of the system disconnect and remove the **AKM3 ELIU1.**	
27. At each **DDM-1000** momentarily depress the **RST** pushbutton on the **PROCR.** This will delete the ELIU1 from the **PROCR's** internal equipment list.	**DP-402**

Transfer Service From 180 Mb/s Optical to DS3 Facility

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

1. **NOTICE:** Unterminated optical connectors may emit laser radiation. Do not view beam with optical instruments.

2. ***Warning 1: Open optical connectors may emit invisible laser radiation. Avoid direct exposure to beam.***

3. ***Warning 2: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.***

4. ***Caution 1: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

5. ***Caution 2: The* PROCR1 *pack,* MC90083A1, *will not support an in-service conversion from optical to DS3 electrical mode. The* PROCR1 *pack will work in either optical or electrical mode, but a conversion must be made out of service.***

DO ITEMS BELOW IN ORDER LISTED	**FOR DETAILS, GO TO**
6. **Note**: If, at any point in this procedure, the DDM-1000 fails to respond in the indicated manner, refer to **TP-105** and clear the trouble.	
7. **Note**: This transfer will require coordination between personnel at the two ends of the 180 Mb/s optical system. Reference will be made to the "near end" and to the "far end". These designations are completely arbitrary. The only distinction is that the transfer activity will be directed by personnel at the near end.	
8. **Note**: It is assumed that the same muldem-to-muldem association is to be maintained after the conversion. That is, **Muldem A** in the **Non-OLIU Assembly** at one end of the 180 Mb/s optical system will still be communicating with **Muldem A** in the **Non-OLIU Assembly** at the other end of the system, and so forth.	
9. Install an **AKM3 ELIU1** in each of the **DDM-1000** assemblies at each end of the 180 Mb/s optical system (four **ELIU1s** in all).	**DP-412**
10. Connect each **DDM-1000** assembly to the appropriate DS3 facility at its respective **DSX-3** cross-connect.	**DP-406**
11. If an ASCII terminal is available, perform the following on both shelf assemblies: Use the command **exct-sw-hs:s=( ) make** to switch service to protection. Use the command **exct-lock-hs:s=( ) make** to lock service to protection.	

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
12. At each **DDM-1000** at each end of the 180 Mb/s optical system remove the **Muldem A SRV MXR** and the **Muldem B SRV MXR** (eight **MXRs** in all). Carefully note where each plug-in was installed.	
13. The **MN** office alarm will be activated and the **MN**, **NE** and, possibly, the **FE** LEDs on all four of the **PROCRs** will be lighted. Verify that no other LEDs are lighted on any of the **DDM-1000s**.	
14. ***Caution: To prevent service interruption, be very careful to remove the* SRV *and not the* PROTN *cable.*** Refer to **Figure 1** and remove the **SRV ED-2C833-20, G17-G20** cable assembly from the **DDM-1000** backplanes at each end of the system.	
15. Set the option switches (and plugs if working with an **AKM2B or AKM2C**) on each of the **SRV MXR** plug-ins just removed for electrical operation, and replace the plug-ins. Be careful to put each plug-in back where it was previously installed. Take care to avoid damaging the LEDs protruding through the openings in the faceplates of the **MXRs**. Response: The **ALM** LED on each of the **SRV MXR** plug-ins in both assemblies at each end of the system will be lighted. In addition, the **MN**, **NE** and **FE** LEDs indicated in **Step 12** will still be lighted.	**DP-417**
16. If either muldem is equipped with an **AKM86 BP2** plug-in, remove the **AKM86 BP2** plug-in at this time.	

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
17. **Note:** In this step the **RST** is automatically sent to the far end and automatically releases the manual lock and switch if both muldems are equipped with **MXR** plug-ins. If only one muldem is equipped, the **RST** button must be momentarily depressed at the near end and the far end. The **RST** button must be momentarily depressed at the near end and the far end on the non-OLIU shelves. At the near end, momentarily depress the **RST** pushbutton on both **PROCRs**. Response: The **ALM** LEDs on the **SRV MXR** plug-ins will go off. The **ALM** LEDs on the **PROTN MXR** plug-ins will be lighted. Traffic is now being carried over the DS3 facilities.	**DP-402**
18. At each **DDM-1000** at each end of the 180 Mb/s optical system remove the **MXR** from the **Muldem A PROTN** location and from the **Muldem B PROTN** location (eight **MXRs** in all). Carefully note where each plug-in was installed.	
19. The **MN** office alarm will be activated and the **MN** and **NE** LEDs on all four of the **PROCRs** will be lighted. Verify that no other LEDs are lighted on any of the **DDM-1000s**.	
20. Refer to **Figure 1** and remove the **PROTN ED-2C833-20, G17-G20** cable assembly from the **DDM-1000** backplanes at each end of the system.	

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
21. Set the option switches (and plugs if working with an **AKM2B or AKM2C**) on each of the **PROTN MXR** plug-ins just removed for electrical operation, and replace the plug-ins. Be careful to put each plug-in back where it was previously installed. Take care to avoid damaging the LEDs protruding through the openings in the faceplates of the **MXR**s. Response: All office alarms and LEDs will be extinguished. You have completed the transfer of service from the 180 Mb/s optical facility to the DS3 electrical facility.	**DP-417**
22. At each end of the system, disconnect and remove the **20-Type OLIU**s (four **OLIU**s in all).	
23. At both assemblies at each end of the system, momentarily depress the **RST** pushbutton on the **PROCR**. This will delete the **OLIU**s from the **PROCR**'s internal equipment list.	

DO ITEMS BELOW IN ORDER LISTED . . . . FOR DETAILS, GO TO

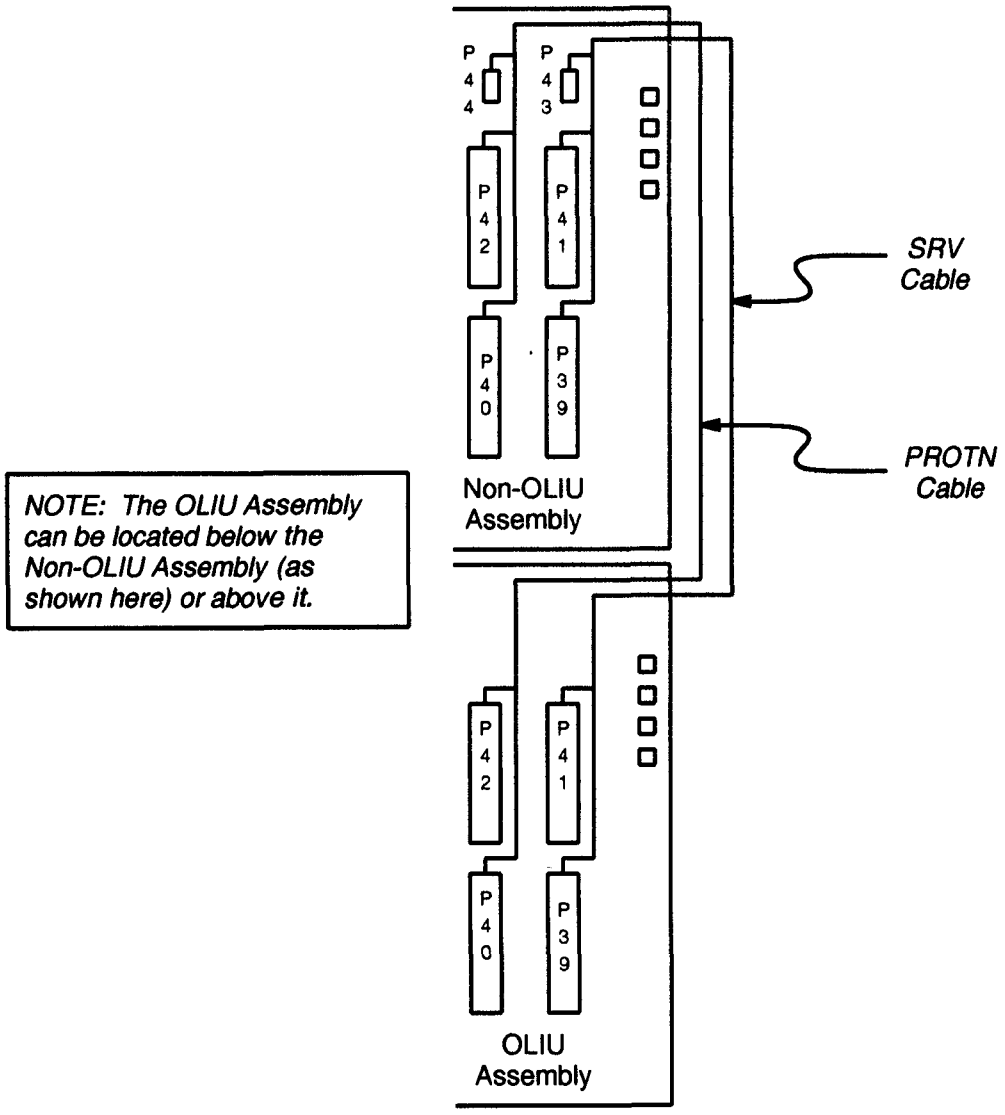


Figure 1. Location of ED-2C833-20, G17-G20 Cables

Attach Wire-Wrap Assembly

1. Remove the **ED-2C843-30** wire-wrap assembly from its shipping carton and inspect for visible damage.

2. Attach the wire-wrap assembly to the top of the **DDM-1000** ED-2C841-30, G1 or G2 shelf with the four 6-24x1/4 screws provided.

   Note: The wire-wrap assembly is not used with the ED-2C841-30, G3 EMC shelf. The ED-2C841-30, G1 shelf is rated DA.

3. Connect jacks **J1** through **J32, J35, J37** and **J38** on the wire-wrap assembly to plugs **P1** through **P32, P35, P37** and **P38** on the backplane of the **DDM-1000,** respectively. It is necessary to push the retainer slightly to the side to align the jack with the backplane pins. The jacks will snap solidly into place when they are properly seated.

4. Dress and tie the cabling along the horizontal and vertical protecting bars attached to the backplane. **DO NOT** tie down the individual wires terminating in slip-on connectors.

5. **Note:** At this time each of the remaining individual wires fans out of the cable bundles alongside the appropriate lug on the backplane.

6. Connect the slip-on lugs on the individual wires to the terminals on the DDM-1000 backplane in the following order: **FRGRD1, GRD8, GRD7, GRD6, GRD5, BAT B, BAT B RTN, BAT A, BAT A RTN, GRD4, GRD3, GRD2** and **GRD1.**

7. Verify that a **RED** wire is connected to **BAT A** and to **BAT B** and that a **BLACK** wire is connected to **BAT A RTN** and to **BAT B RTN.**

8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Update DDM-1000 Internal Equipment List

1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

2. **Note**: The PROCR maintains an internal list of all the plug-ins in the DDM-1000 that are to be monitored and the setting of any applicable options. This procedure is used to update that internal list when changes are made to the DDM-1000 configuration.

3. **Note**: The **RST** pushbutton on the **PROCR** is recessed to prevent its accidental operation. You will need a small pointed object, such as a straightened paper clip to operate it.

4. Press the **RST** pushbutton on the **PROCR**.

   Response: The **MJ** LED on the **PROCR** will flash for several seconds. When it stops flashing, all the LEDs on all the plug-ins in the **DDM-1000** should be off. Any LEDs remaining on represent a failure condition.

5. Are all alarms or LEDs off?

   If **YES,** then continue to **Step 6.**
   If **NO,** then do **Step 7.**

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. Refer to **TI-001** and use the appropriate trouble clearing procedure to clear the failure indication.

8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform LED Test

1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

2. On the **PROCR**, depress and hold the **ACO/TEST** pushbutton.

3. When the **ACO/TEST** pushbutton is depressed, are all the LEDs on all the plug-ins in the DDM-1000 lighted?

   If **YES,** then continue to **Step 4.**
   If **NO,** then do **Step 6.**

4. The DDM-1000 has passed the LED test.

5. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

6. Were you sent here by another procedure to perform an LED test?

   If **YES,** then continue to **Step 7.**
   If **NO,** then do **Step 9.**

7. Record the plug-in(s) that failed the LED test and return to the other procedure.

8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

9. Refer to **DP-417** and replace the plug-in that failed the LED test. Repeat the LED test (depress and hold the ACO/TEST pushbutton).

10. Did the same plug-in fail the LED test again?

    If **YES,** then continue to **Step 11.**
    If **NO,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

11. Refer to **TP-106** and clear the failure condition.

12. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install, Replace, or Reset PROCR

1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

   Are you installing (initial installation), replacing, or resetting PROCR?

   If **RESETTING**, then continue with **Step 2**.
   If **INSTALLING** or **REPLACING**, then proceed to **Step 5**.

2. **Note:** When "resetting" a **PROCR** without an ASCII terminal, you must unseat and then reseat the **PROCR** to do the "reset". None of the "set" parameters are affected if power is removed from the **PROCR**, or if the **PROCR** is simply removed and reinserted. All service-affecting parameters (AMI/B8ZS and DS3U1 FRM and VMR) remain set even if a "reset" is done. In processors prior to MC90083A1E, all non service-affecting parameters that may have been "set" with an ASCII terminal (such as shelf options, dsx options, and low speed protection options) return to default values during a "reset". In MC90083A1E PROCR2, and later, non service-affecting parameters that have been "set" may be initialized to default values or saved during a reset. The commands "**rept-opt-dsx:**", "**rept-opt-shelf:**", and "**rept-opt-pack:**" may be used to list information about DDM-1000 options.

   Is an ASCII terminal available?

   If **YES**, then continue with **Step 3**.
   If **NO**, then unseat the **PROCR** and proceed to **Step 7**.

3. ***Caution: Resetting (reset) the* PROCR *using the "*exct-reset:*" command will momentarily interrupt service if protection switches are activated.***

   Note: If the processor is an MC90083A1E or later, the prompt "Initialize non service-affecting parameters to default? (Y/N)" will appear before the reset is executed. A "Y" reply will cause all non service affecting parameters that may have been previously set to be returned to default values. An "N" or any other character will save any non-service affecting parameters that may have been previously set.

   Use the "`exct-reset:`" command to "reset" the **PROCR**.

4. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

5. If a new **PROCR** is being installed, determine the desired option switch settings from office records. If you are replacing a **PROCR**, inspect the plug-in being replaced for proper option switch settings. The commands "**rept-opt-dsx:**", "**rept-opt-shelf:**" and "**rept-opt-pack:**" may be used to list information about DDM-1000 options.

   Note 1: The option switches on the **PROCR** control the type of office alarms provided by the **DDM-1000**. These switches must be set correctly when the **PROCR** is installed.

   Note 2: See "Circuit Pack Compatibility, *Incompatible Combinations*" in the PLANNING GUIDELINES section of this manual. An **MC90083A1C** (or later) **PROCR2** is required if the Performance Monitoring (PM) option is being used. If an **MC90083A1C** (or later) **PROCR2** is to be replaced in the DDM-1000 and PM is being used, you must replace the **PROCR** with another **MC90083A1C** (or later) **PROCR2**. An **MC90083A1D, Issue 2 (or later) PROCR2** is required if DDM-1000 is equipped with DS2 or DS3U1 plug-ins. If an **MC90083A1D, Issue 2** (or later) **PROCR2** is to be replaced in the DDM-1000 and DS2 or DS3U1 plug-ins are installed, you must replace the **PROCR** with another **MC90083A1D, Issue 2** (or later) **PROCR2**. An **MC90083A1E PROCR2** is required if DDM-1000 is being used in an Open Network configuration.

6. Refer to **Table A** and set the option switches as indicated. See **Figure 1**.

Note 1: The option plug **P1** is for factory test purposes only. It must be left in place for normal operations.

Note 2: To set the switch to "open", depress the rocker or slide the switch toward the side labeled **OPEN** in the figure. To set the switch to "closed", depress the rocker or slide the switch toward the side labeled **CLOSED** in the figure.

Note 3: Section 2 (SEC 2) has no effect on interprocessor communications (fecom). It only controls whether or not alarms are to be reported to the far-end. Fecom must be separately enabled (turned on) using the "**set-shelf-fecom:**" command, and switch section 2 must be open for the far-end alarms to be reported to the near-end.

Note 4: If the three level alarm option is desired, a TLM1 pack is required because it contains the Critical (CR) alarm LED and relay. If the three level alarm option is chosen and a TLM1 pack is not installed, a CR alarm will automatically be downgraded to a MJ and the NE or FE led will be lighted. If a TLM2 pack is installed and the three level option is chosen, there will be no alarm indication (CR or MJ), only the NE or FE LED will be lighted.

Table A. PROCR Switch Settings

Alarms	DIP Switch Settings	
	Sec. 1	Sec. 2
Two Level (MJ, MN) Near-End Only	Closed	Closed
Two Level (MJ, MN) Near-End OR Far-End*	Closed	Open
Three Level (CR, MJ, MN) Near-End Only	Open	Closed
Three Level (CR, MJ, MN) Near-End OR Far-End*	Open	Open

* In Optical Mode, Near-End and Far-End alarming should be enabled (that is, Section 2 should be OPEN).

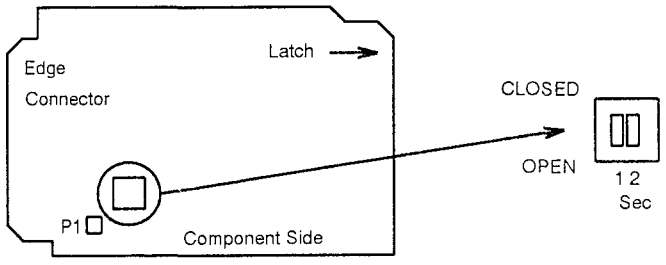


Figure 1. PROCR Option Settings

7. Is **PROCR** an **MC90083A1E** or later?

   If **NO**, then continue with **Step 8**.
   If **YES**, then proceed to **Step 14**.

8. ***Caution: When the* PROCR *is installed, you* MUST** "reset" the **PROCR** ***per Steps 9, 10, and 11 to prevent service interruption or incorrect alarms.***

   Note 1: The **PROCR** pack "remembers" critical parameters about its previous environment. If the previous environment was the same shelf, a "reset" should not be necessary, but it will not hurt to do it. If the previous environment was another shelf or the **PROCR** is new from the factory, a "reset" **MUST** be done. If it is not "reset" after insertion, it may affect service or cause incorrect alarms. Therefore, it is recommended that the **PROCR** pack **ALWAYS** be "reset" after insertion. By doing the "reset", the **PROCR** "learns" all the critical parameters about its new environment and will not affect service.

   Note: 2 The **RST** pushbutton on the **PROCR** is recessed to prevent its accidental operation. You will need a small pointed object, such as a straightened paper clip to operate it.

   Note: 3 The following three steps (9, 10 and 11) must be performed without unnecessary delays. Familiarize yourself with these steps before continuing with the procedure.

   Read Steps 9, 10, and 11 before proceeding.

9. ***Caution: Ensure that you install the* PROCR *in the correct slot (*PROCR*). Installing the* PROCR *in the* TLM *slot will damage the* PROCR.

   ***Caution: Take care to avoid damaging the LEDs that protrude through the opening in the faceplate of the* PROCR.

   Caution: Resetting (reset) the* PROCR *in the following steps will momentarily interrupt service if protection switches are activated.

   Seat the **PROCR**.

   Response: All the **ALM** LEDs on all plug-ins installed in the **DDM-1000** are lighted. Only the **ABN** LED is lighted on the **PROCR**.

   Note: If all of the LEDs are **NOT** lighted, and if the DDM-1000 is equipped with only one 547-Type PWR plug-in, the PWR plug-in has failed.

10. Wait approximately 5 seconds.

    Response: The **MJ** LED on the **PROCR** is flashing. All other LEDs on all plug-ins are off.

11. Momentarily depress the **RST** button on the **PROCR** while the **MJ** LED is flashing (**you have 10 SECONDS** to do this).

    Response: The **MJ** LED on the **PROCR** stops flashing when the **RST** button is pressed. After several seconds, it will begin to flash again. It will flash for several more seconds and then stop. When the **MJ** LED stops flashing this second time all the LEDs on all plug-ins in the **DDM-1000** should be off. Any LEDs remaining on represent a failure condition.

    Note: If a **PROCR1** is being "reset", the **MJ** LED on the **PROCR1** will flash for several seconds before stopping after the **RST** button is pressed. The **MJ** LED on the **PROCR2** stops flashing as soon as the **RST** button is pressed.

12. **Note**: If you are using this procedure to replace a PROCR that was already in service there may have been some options set using the ASCII terminal. The commands "**rept-opt-dsx:**", "**rept-opt-shelf:**" and "**rept-opt-pack:**" may be used to list information about DDM-1000 options.

    Refer to **DP-418** and set any required options.

13. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

14. ***Caution: When the* PROCR *is installed, you MUST* "reset" *the* PROCR *per Steps 15, 16, and 17 to prevent service interruption or incorrect alarms.***

Note 1: The MC90083A1E PROCR2 pack has a 2-step "reset" procedure that makes it different from previous PROCR packs. During the reset procedure described below, when the **RST** button is pressed the first time, any non service-affecting parameters that may have been "set" with an ASCII terminal (such as shelf options, dsx options, and low speed protection options) are saved. If the button is pressed a second time within 3 seconds then the parameters are initialized to their default values.

Note 2: The **PROCR** pack "remembers" critical parameters about its previous environment. If the previous environment was the same shelf, a "reset" should not be necessary, but pressing the **RST** button once will not hurt anything. If the previous environment was another shelf or the **PROCR** is new from the factory, a "reset" **MUST** be done by pressing the **RST** button twice. If it is not "reset" after insertion, it may affect service or cause incorrect alarms. Therefore, it is recommended that the **PROCR** pack **ALWAYS** be "reset" after insertion. By doing the "reset", the **PROCR** "learns" all the critical parameters about its new environment and will not affect service.

Note: 3 The **RST** pushbutton on the **PROCR** is recessed to prevent its accidental operation. You will need a small pointed object, such as a straightened paper clip to operate it.

Note: 4 The following three steps (15, 16, and 17) must be performed without unnecessary delays. Familiarize yourself with these steps before continuing with the procedure.

Read Steps 15, 16, and 17 before proceeding.

15. ***Caution: Ensure that you install the* PROCR *in the correct slot (*PROCR*). Installing the* PROCR *in the* TLM *slot will damage the* PROCR.

    ***Caution: Take care to avoid damaging the LEDs that protrude through the opening in the faceplate of the* PROCR.

    Caution: Resetting (reset) the* PROCR *in the following steps will momentarily interrupt service if protection switches are activated.

    Seat the **PROCR**.

    Response: All the **ALM** LEDs on all plug-ins installed in the **DDM-1000** are lighted. Only the **ABN** LED is lighted on the **PROCR**.

    Note: If all of the LEDs are **NOT** lighted, and if the DDM-1000 is equipped with only one 547-Type PWR plug-in, the PWR plug-in has failed.

16. Wait approximately 5 seconds.

    Response: The **MJ** LED on the **PROCR** is flashing. All other LEDs on all plug-ins are off.

17. Momentarily depress the **RST** button on the **PROCR** while the **MJ** LED is flashing (**you have 10 SECONDS** to do this).

    Response: The **MJ** LED on the **PROCR** stops flashing when the **RST** button is pressed.

    The **MN** LED on the **PROCR** will light for 3 seconds or until the **RST** button is pressed again. Pressing the **RST** button during this 3 second interval will return all non service-affecting parameters to their default values. **NOT** pressing the **RST** button during this 3 second interval will save any previously set non service-affecting parameters.

    Several seconds after the **MN** LED extinguishes, the **MJ** will begin to flash again. It will flash for several more seconds and then stop. When the **MJ** LED stops flashing this second time all the LEDs on all plug-ins in the **DDM-1000** should be off. Any LEDs remaining on represent a failure condition.

18. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Connect to Low Speed Cross-Connect

1. ***Caution: When installing the low speed connectors on the backplane, be careful not to bend the pins. Bent pins on low speed slots may cause service outages on the entire shelf when a low speed protection switch is activated.***

   Note 1: For convenience when connecting the low speed inputs and outputs at an add/drop site **DSX**, Muldem A inputs should be located next to Muldem B outputs, and Muldem A outputs should be located next to Muldem B inputs.

   Note 2: On the **DDM-1000** backplane (**Figure 1**), plugs **P1-P7** and **P15-P21** are the transmit pairs. **P8-P14** and **P22-P28** are the receive pairs.

   Is the DDM-1000 shelf an ED-2C841-30, G3 EMC shelf?

   If **NO**, then continue with **Step 2.**
   If **YES**, then proceed to **Step 24.**

2. Is the **DDM-1000** equipped with an **ED-2C843-30** wire-wrap assembly or an **ED-2C833-20** front access cable assembly?

   If **NEITHER,** then continue with **Step 3.**
   If **ED-2C843-30** wire wrap assembly, then proceed to **Step 10.**
   If **ED-2C833-20** front access cable assembly, then proceed to **Step 15.**

3. **Note**: For ED-2C841-30, G1 or G2 shelves, cables ED-2C833-20 G1, G101, G102 or G22, G221, G222, G223 or G224 are used to connect Muldem A to the LS cross-connect. Cables ED-2C833-20 G2, G201, G202 or G23, G231, G232, G233 or G234 are used to connect Muldem B to the LS cross-connect.

4. ***Caution: There are three horizontal protection bars on each DDM-1000. These are located at the top, in the middle, and at the bottom of the backplane. Cables tied to the*** **top protection bar** ***must be positioned*** **lower than the bar.** ***If cables are positioned above or at the same level as the*** **top protection bar,** ***the backplane cover will not fit properly. Cables tied along the*** **bottom protection bar** ***must be positioned*** **above the bar.** ***If cables are postioned below or level to the bottom protection bar, the backplane cover will not fit properly.***

   Note: To ensure cables are positioned properly, it is recommended that the backplane cover be placed on after each cable has been tied to the horizontal protection bars. If the backplane cover does not fit, the cables have not been positioned properly and cable positioning must be corrected immediately.

   Refer to **Figure 1** for the G1 or G2 shelf. Dress and tie the cables along the horizontal and vertical protecting bars attached to the backplane. **DO NOT** tie down the individual ground wires terminating in slip-on connectors.

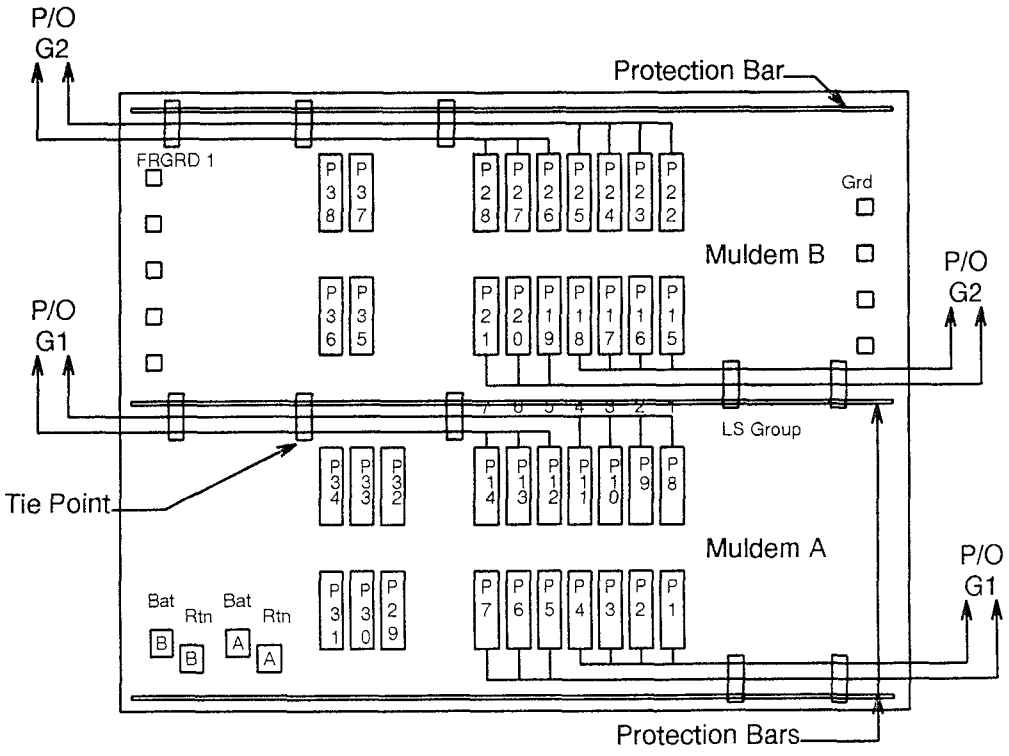


Figure 1. ED-2C841-30, G1 or G2 Shelf Low Speed I/O Cabling

5. **Note:** The cable connector jacks are stamped **J1 - J28** and mate with the backplane plugs **P1 - P28**. The jacks should be installed in the following order for ease in installation: **J1 - J7, J14 - J8, J15 - J21, J28 - J22**.

   Connect jacks **J1** through **J28** on the **ED-2C833-20** cables to plugs **P1** through **P28** on the **DDM-1000** backplane, respectively. It is necessary to push the retainer slightly to the side to align the jack with the backplane pins. The jacks will snap solidly into place when they are properly seated.

6. **Note:** At this time each of the remaining individual ground wires fans out of the cable bundles alongside the appropriate lug on the backplane.

7. Connect the slip-on connectors on the individual ground wires to the terminals on the **DDM-1000** backplane in the sequence **GRD8** to **GRD1**.

8. Refer to **DP-431** and route the cables up the back of the frame uprights to the top of the bay.

9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

10. **Note:** The ED-2C843-30 wire-wrap assembly is labeled to indicate the pins for each of the LS inputs and outputs.

11. Make connections as appropriate from the **ED-2C843-30** wire wrap assembly to the low speed cross-connect or other interconnection point.

12. Connect the shield of the cross-connect cable to the pins labeled **GR** on the wire-wrap assembly.

13. Dress the cross-connect wires to the plastic cable ties on the front of the **ED-2C843-30** wire-wrap assembly.

14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

15. Are the **ED-2C833-20** front access cables equipped with **710-SD1-25** connectors or **KS-16690 L12** connectors?

    If **710-SD1-25,** then continue to **Step 16.**
    If **KS-16690 L12,** then do **Step 20.**

16. **Note:** Cable ED-2C833-20, G10 is used to connect Muldem A to the LS cross-connect. Cable ED-2C833-20, G11 is used to connect Muldem B to the LS cross-connect.

17. Route the cables over the top of the **DDM-1000** and bring them over to the bay frame uprights where they will be connected to the cross-connect cables.

18. Refer to the tables under INTERCONNECTION SPECIFICATIONS in the **SPECIFICATIONS** section of this user's manual for information about the cross-connect cables.

19. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

20. **Note**: Cable ED-2C833-20, G14 is used to connect Muldem A to the LS cross-connect. Cable ED-2C833-20, G15 is used to connect Muldem B to the LS cross-connect.

21. Route the cables over the top of the **DDM-1000** and bring them over to the bay frame uprights where they will be connected to the cross-connect cables.

22. Refer to the tables under INTERCONNECTION SPECIFICATIONS in the **SPECIFICATIONS** section of this user's manual for information about the cross-connect cables.

23. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

24. Is the **DDM-1000** G3 EMC shelf equipped with **ED-2C833-20, G28 and G29** front access cable assemblies?

    If **YES**, then proceed to **Step 35**.
    If **NO**, then continue with **Step 25**.

25. See **Figure 2**. Mount cable tie mounting pads to the backplane in the approximate positions (5) shown in Figure 2.

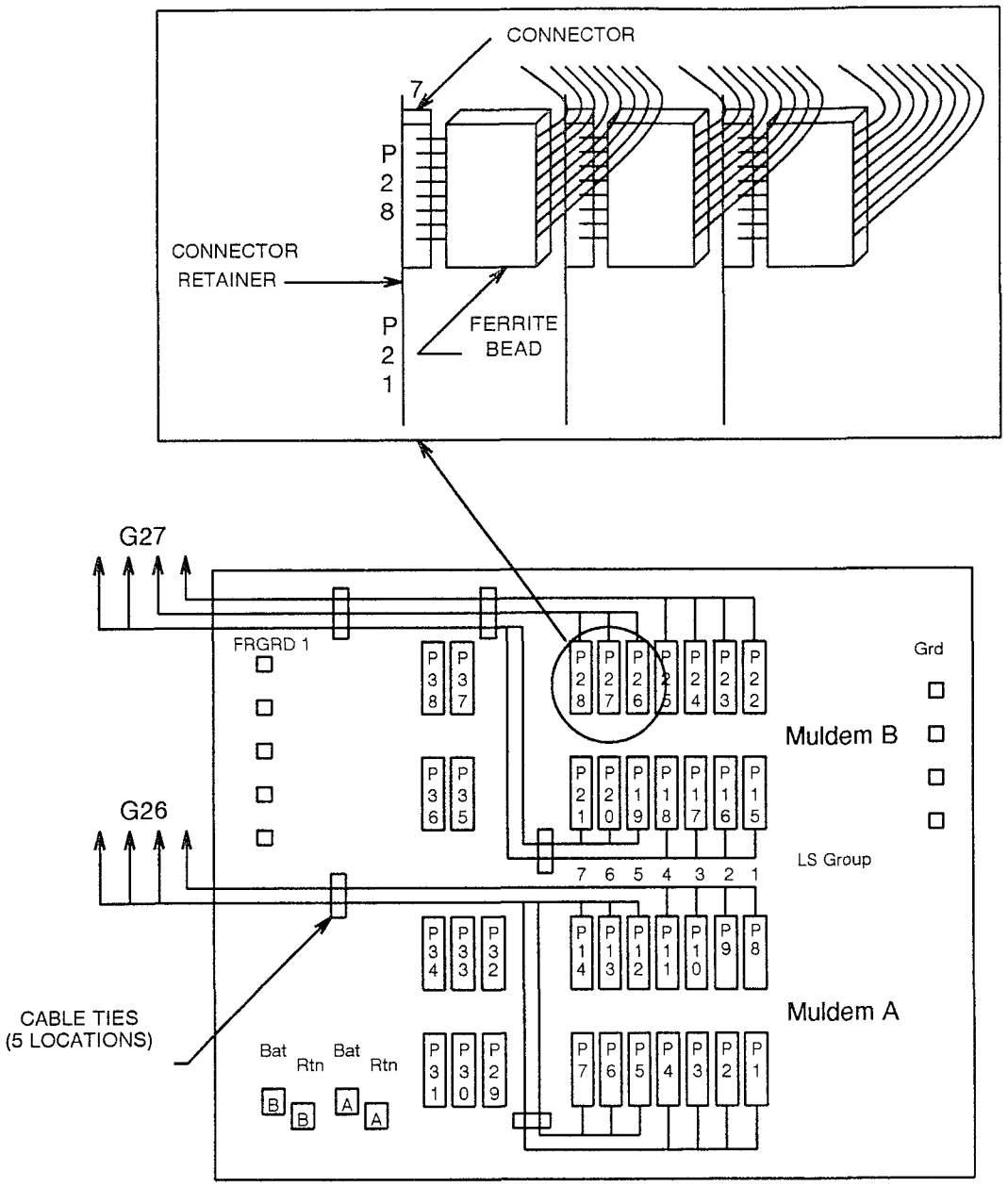


Figure 2. ED-2C841-30, G3 Shelf Low Speed I/O Cabling

26. **Note:** For ED-2C841-30, G3 EMC shelves, cables ED-2C833-20 G26, G261, G262 or G263 are used to connect Muldem A to the LS cross-connect. Cables ED-2C833-20 G27, G271, G272, or G273 are used to connect Muldem B to the LS cross-connect.

27. Connect jacks **J1** through **J28** on the **ED-2C833-20** cables to plugs **P1** through **P28** on the **DDM-1000** backplane, respectively. It is necessary to push the retainer slightly to the side to align the jack with the backplane pins. The jacks will snap solidly into place when they are properly seated.

28. ***Caution: The ferrite beads must be placed as close as possible to the backplane to ensure compliance with EMI requirements and for easy installation of the backplane cover.***

    At each connector, place the ferrite beads as close as possible to the backplane. Position them as shown in **Figure 2** (parallel or flat to the backplane and to the right side open space from the connector retainer).

29. On the middle left side of the backplane, ensure that dummy 963P-type connectors are placed on the unused pins that will be under the cables which exit center left.

30. See **Figure 2**. Dress the cables in the positions shown. Use cable ties to tie the cables to the cable tie mounting pads. Take care to keep the cables close to the backplane so they do not project too far back and interfere with the backplane cover. **DO NOT** tie down the individual ground wires terminating in slip-on connectors.

31. **Note**: At this time each of the remaining individual ground wires fans out of the cable bundles alongside the appropriate lug on the backplane.

32. Connect the slip-on connectors on the individual ground wires to the terminals on the **DDM-1000** backplane in the sequence **GRD8 to GRD1**.

33. Position the round ferrite beads on each cable outside the shelf and as close as possible to the cable exit. Refer to **DP-431** and route the cables up the back of the frame uprights to the top of the bay.

34. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

35. **Note:** Cable ED-2C833-20, G28 is used to connect Muldem A to the LS cross-connect. Cable ED-2C833-20, G29 is used to connect Muldem B to the LS cross-connect. These cables should have previously been connected to the backplane using the procedures of **IP-201** and **DP-428**.

36. Route the cables over the top of the **DDM-1000** and bring them over to the bay frame uprights where they will be connected to the cross-connect cables.

37. Refer to the tables under INTERCONNECTION SPECIFICATIONS in the **SPECIFICATIONS** section of this user's manual for information about the cross-connect cables.

38. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Connect to DSX-3 Cross-Connect

1. The coaxial cables connecting the DDM-1000 to the DSX-3 cross-connect are to be terminated at the DDM-1000 end with **75 ohm** BNC connectors. Refer to the SPECIFICATIONS section of this manual, under "Interconnection Specifications", for information on DSX-3 cabling. Numerous BNC connectors and jumpers are available to terminate either 728B or 734A coax; or KS-19224, L2 minicoax; or equivalent.

2. **NOTICE:** Right angled connectors are not recommended for any new DDM-1000 installations.

3. Refer to **Figure 1.** Set the option plugs on the **AKM3 ELIU1** according to the length of the cabling to the cross-connect as indicated in **Table A**, if not already performed.

Table A. ELIU1 (AKM3) LBO Selection

Cable Length (ft.)			Plug Settings
728B, 734A	KS-19224, L2 Mini-coax	735A	
0 to 225	0 to 75	0 to 125	LBO
>225	>75	>125	NO LBO

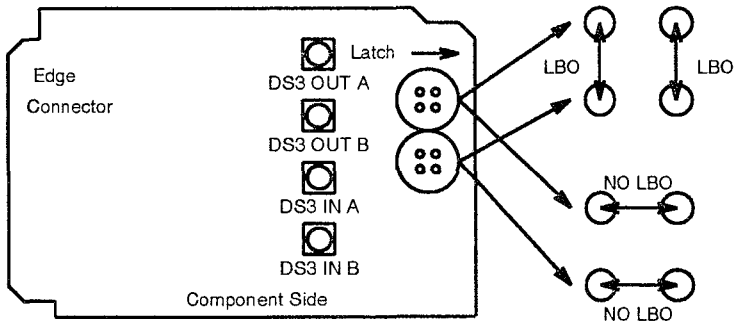


Figure 1. AKM3 ELIU1 Option Switches and Connectors

4. Install the **AKM3 ELIU1**, if not already installed.

5. **Note:** The connectors for the DSX-3 cross-connect cables appear on the left side of the AKM3 ELIU1 and are accessible from the front of the assembly on the left side of the AKM3 ELIU1. The jacks labeled **OUT** are for signals going from the DDM-1000 to the DSX-3 cross-connect. The jacks labeled **IN** are for signals going from the DSX-3 cross-connect to the DDM-1000. The **A** and **B** refer to Muldems A and B, respectively.

6. Is the DDM-1000 shelf an ED-2C841-30, G3 EMC shelf?

   If **YES**, then proceed to **Step 10**.
   If **NO**, then continue with **Step 7**.

7. Refer to **Figure 1** and connect the cross-connect cables to the BNC connectors on the left side of the **AKM3 ELIU1** according to the labels on the plug-in.

8. The cables are to be routed along the front of the frame upright to the top of the bay. Secure them to the bay framework following local practices.

9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

10. If the ELIU side cover is installed on the G3 EMC shelf, remove it by removing the four screws securing the cover.

11. Connect ED-2C833-20, G32 minicoax jumper cables from the ELIU **OUT** and **IN** jacks to the associated **OUT** and **IN** jacks on the ELIU side cover (i.e., ELIU **DS3 OUT A** to side cover **DS3 OUT A**, etc.).

12. Position the G32 cables and install the side cover using 4 screws provided.

13. **Note**: If cross-connect cables are terminated in male connectors, they may be connected directly to the ELIU side cover connectors. If the cables are terminated in female type connectors, an ED-2C833-20, G33 minicoax jumper cable may be used to connect the cross-connect cables to the ELIU side cover.

    Connect cross-connect cables to the BNC connectors on top of ELIU side cover.

14. The cables are to be routed along the front of the frame upright to the top of the bay. Secure them to the bay framework following local practices.

15. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Connect Battery to Fan Assembly

1. **Note 1:** For more information on installation of DDM-1000 and ***SLC***® Series 5 Carrier in outside enclosures and cabinets, refer to the 640 Division of outside plant AT&T Practices (for example, AT&T 640-250-255).

   Note 2: For more information on installation of ***SLC*** Series 5 Carrier systems, refer to AT&T 363-205-401.

   Is the DDM-1000 being installed in an 80D (Group 90, 91, or 92) type cabinet with a Series 5 Remote Terminal (RT)?

   If **YES**, then proceed to **Step 7**.
   If **NO**, then continue with **Step 2**.

2. **Note 1**: It is assumed that the ED-2C834-30 fan assembly is mounted in the framework below the DDM-1000.

   Note 2: The short length of power cable described in earlier issues of the User's Manual is no longer supplied with the fan assembly.

3. Locate the unassembled power plug packed with the fan assembly.

4. Connect this power plug to the office battery and battery return using 14 AWG wire. When the power plug is connected to the **BAT A** jack dangling from the fan assembly, the power must be connected as follows:

   The **RED** conductor in the **BAT A** jack is connected to the **-48V or -24V OFFICE BATTERY**.

   The **BLACK** conductor in the **BAT A** jack is connected to the **BATTERY RETURN.**

5. Connect the power plug (just assembled) to jack **BAT A** dangling from the fan assembly.

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. **Note:** It is assumed that the DDM-1000 is installed in a Group 90, 91 or 92 80-Type cabinet using the ***SLC*** Series 5 carrier system 2A FAN and 111A control unit.

   Ensure that 111A control unit plug **P115** is connected to 2A FAN jack **J115-1**. (See **Figure 1**).

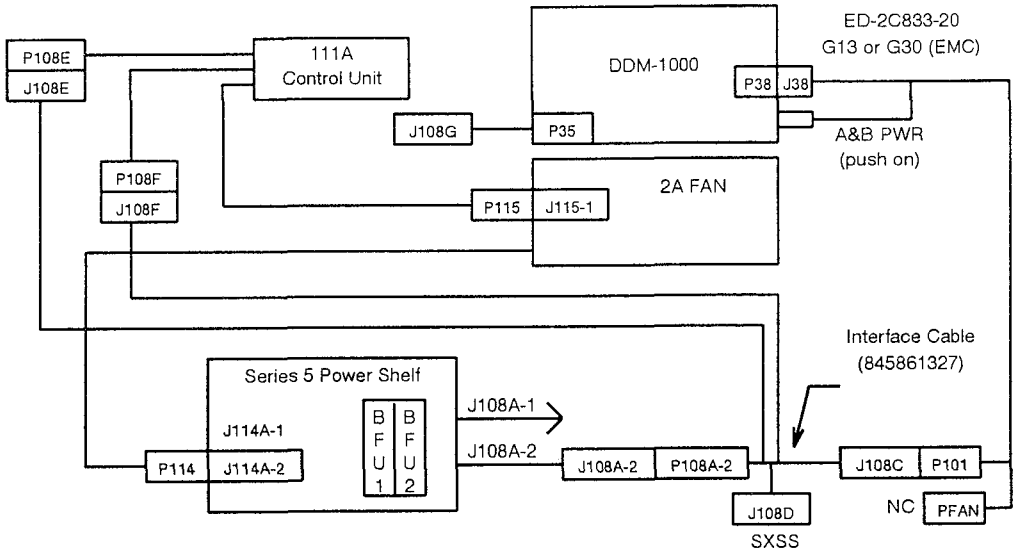


Figure 1. DDM-1000 Power Cabling in 80D Cabinet

8. Ensure that 2A FAN plug **P114** is connected to the SERIES 5 POWER SHELF jack **J114-2**.

9. Ensure that POWER SHELF jack J108A-2 is connected to the Interface Cable (comcode 845861327) P108A-2.

10. If PROCR1 is being used, disconnect plug **P108F** from jack **J108F**. Connect 111A plug **P108F** to jack **J108G** to allow the power alarms to reach the CO by a direct backplane connection to the DDM-1000 overhead telemetry.

11. Connect DDM-1000 cable ED-2C833-20, G13 (G1 or G2 shelf) or G30 (G3 EMC shelf) plug **P101** to jack **J108C** of the 80D Interface Cable Assembly.

12. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Connect Parallel Telemetry

1. **Note:** Parallel telemetry is provided with the AKM4 TLM1 to be used in applications with either rear cable access for the DDM-1000 or with the ED-2C843-30 wire-wrap panel. There is no provision for connecting to the parallel telemetry points if the ED-2C833-20 front access cable assemblies are installed. Parallel telemetry is not provided by the MC90191A1 TLM2.

2. **Note**: When more than one DDM-1000 in a framework is to be connected to a parallel telemetry system, the bottom DDM-1000 is connected to the telemetry system and the other DDM-1000s are connected in a daisy chain arrangement to this first DDM-1000.

3. Refer to the **SPECIFICATIONS** section of this user's manual, under INTERCONNECTION SPECIFICATIONS for a listing of the parallel telemetry points.

4. Is the **DDM-1000** equipped with the **ED-2C843-30** wire-wrap assembly?

   If **YES,** then continue to **Step 5.**
   If **NO,** then do **Step 11.**

5. Connect the first **DDM-1000** to the office telemetry system by wire-wrapping to the appropriate pins on the right side of the **ED-2C843-30** wire-wrap assembly. See **Table 3-43** in the SPECIFICATIONS section of this manual.

6. Are there other **DDM-1000s** in the same framework to be connected to the parallel telemetry system?

   If **YES,** then continue to **Step 7.**
   If **NO,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. Wire wrap from each pin connected to the telemetry system in **Step 5** to the same pin on the next **DDM-1000.**

8. The **SI1(ID1)** lead on pin **M2** is to be connected directly to the office telemetry equipment.

9. Repeat **Steps 7 and 8** for any additional **DDM-1000s** in the same framework to be connected to the parallel telemetry system.

10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

11. Connect the jacks **J31** and **J36** on the **ED-2C833-20, G4, G401 or G402** cables to plugs **P31** and **P36** on the backplane of the first **DDM-1000,** respectively. It is necessary to push the retainer slightly to the side to align the jack with the backplane pins. The jacks will snap solidly into place when they are properly seated.

12. Referring to **Figure 1,** dress and tie the cabling along the horizontal and vertical protecting bars attached to the backplane.

13. Refer to **DP-431** and route the cables along the back of the frame upright to the top of the bay.

14. Are there other **DDM-1000s** in the same framework to be connected to the parallel telemetry system?

    If **YES,** then continue to **Step 15.**
    If **NO,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

15. Remove the temporary tie holding together the two **ED-2C833-20, G5** cables. Connect the cables between the first and second **DDM-1000s** as follows: **J34** and **J38** on the cables are connected to **P34** and **P38,** respectively, on the backplane of the lower (first) **DDM-1000. J31** and **J36** on the cables are connected to **P31** and **P36,** respectively, on the backplane of the upper (second) **DDM-1000.**

16. Referring to **Figure 1,** dress and tie the cabling to the horizontal and vertical protecting bars attached to the backplane.

17. Repeat **Steps 15** and **16** for any further **DDM-1000s** in the same framework to be connected to the parallel telemetry system.

18. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

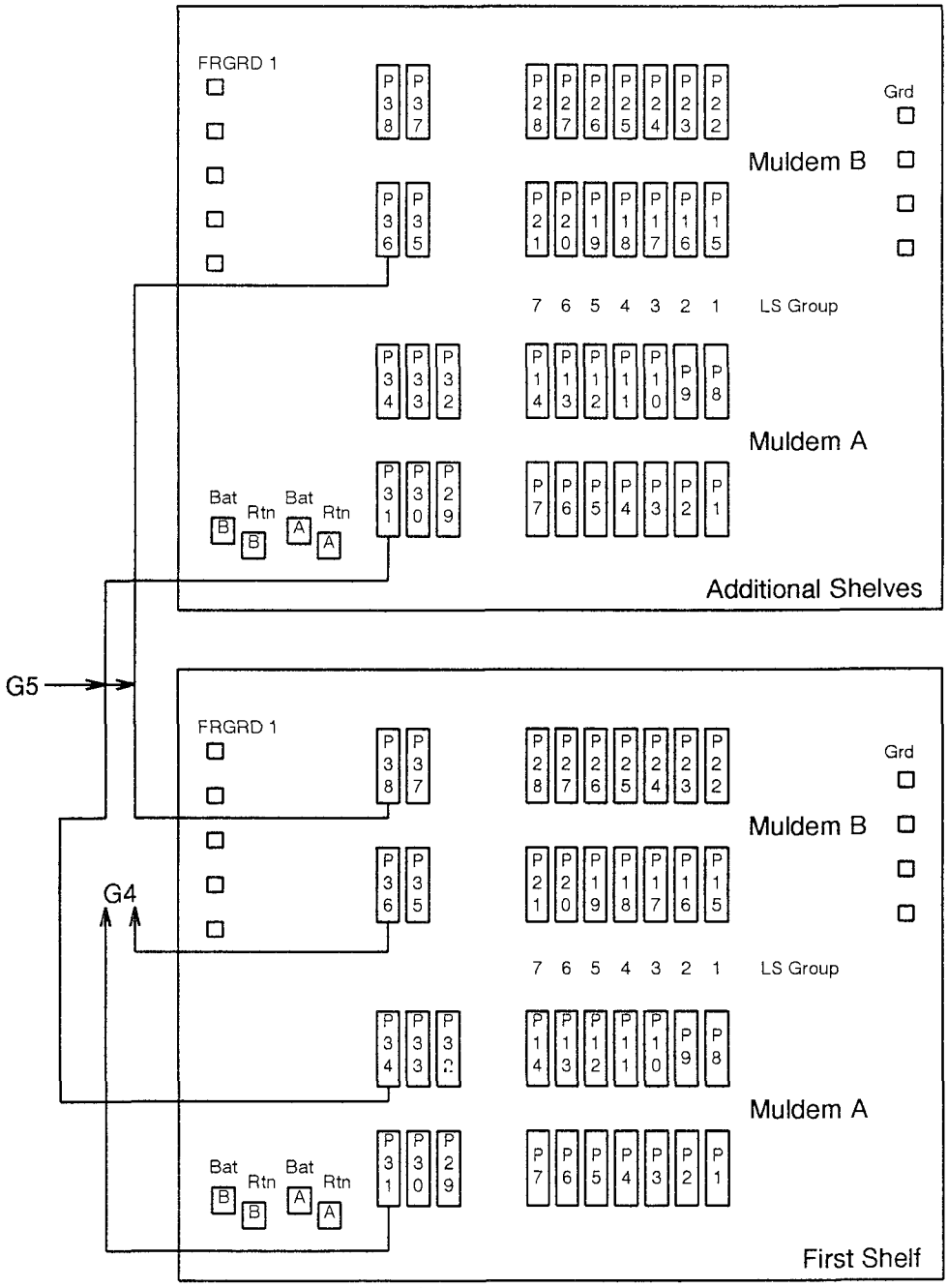


Figure 1. Parallel Telemetry Cabling

Connect TBOS Serial Telemetry

1. **Note:** Refer to the Specifications section of this user's manual for a description of serial telemetry. Serial telemetry is intended to be used in applications with either rear cable access for the DDM-1000 or with the ED-2C843-30 wire-wrap panel. There is no provision for connecting to the serial telemetry points if the ED-2C833-20 front access cable assemblies are installed.

2. **Note**: When more than one DDM-1000 in a framework is to be connected to a serial telemetry system, the bottom DDM-1000 is connected to the telemetry system and the other DDM-1000s are connected to this first DDM-1000 in a bottom-to-top daisy chain arrangement.

3. Refer to the **SPECIFICATIONS** section of this user's manual under INTERCONNECTION SPECIFICATIONS for the listing of the serial telemetry connections.

4. Is the **DDM-1000** equipped with the **ED-2C843-30** wire-wrap assembly?

   If **YES,** then continue to **Step 5.**
   If **NO,** then do **Step 11.**

5. Connect the first (bottom) **DDM-1000** to the serial telemetry system by wire wrapping to each of the pins on the right side of the **ED-2C843-30** wire-wrap assembly as listed in **Table 3-44** in the SPECIFICATIONS section of this manual.

6. Are there other **DDM-1000s** in the same framework to be connected to the serial telemetry system?

   If **YES,** then continue to **Step 7.**
   If **NO,** then proceed to **Step 9.**

7. Wire wrap from each of the pins just connected on the first DDM-1000 to the same pin on the next DDM-1000.

8. Repeat **Step 7** for any additional **DDM-1000s** in the same framework to be connected to the serial telemetry system.

9. **Note:** After adding the last DDM-1000 in the daisy chain, you must press the **RST** button on the **PROCR** on each new shelf added to the daisy chain. This is necessary for each new shelf to recognize its unique identity (address). The sequence in which the **RST** buttons are pressed is not important.

Momentarily depress the **RST** button on the **PROCR** plug-in on each new shelf added to the telemetry daisy chain.

10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

11. **Note:** A 9822C connector assembly (COMCODE 105775936) is recommended between the **ED-2C833-20, G8, G801 or G802** cable assembly and **P29** on the first shelf to reduce the TBOS output level for compliance with RS-422 specifications. The TBOS level is 6 dB higher than recommended in RS-422 specifications. AT&T GTP, ATP, and ACORN® systems will tolerate the increased level. Some non-AT&T telemetry equipment may not perform correctly with the higher level and the attenuator may be necessary.

    Connect jack **J29** of the **ED-2C833-20, G8, G801 or G802** cable to plug **P29** of the 9822C TBOS connector assembly (Comcode 105775936) and then connect jack **J29** of the connector assembly to plug **P29** on the backplane of the first **DDM-1000.**

12. Referring to **Figure 1,** dress and tie the cabling along the horizontal and vertical protecting bars attached to the backplane.

13. Refer to **DP-431** and route the cables along the back of the frame upright to the top of the bay.

14. Are there other **DDM-1000s** in the same framework to be connected to the serial telemetry system?

    If **YES,** then continue to **Step 15.**
    If **NO,** then do **Step 18.**

15. Connect the **ED-2C833-20, G9 or G901** cable between the first and second **DDM-1000s** as follows: **J32** on the cable is connected to **P32** on the backplane of the lower (first) **DDM-1000. J29** on the cable is connected to **P29** on the backplane of the upper (second) **DDM-1000.**

16. Refer to **Figure 1.** Dress and tie the cable to the horizontal and vertical protecting bars attached to the backplane.

17. Repeat **Steps 15** and **16** for any further **DDM-1000s** in the same framework to be connected to the serial telemetry system.

18. **Note:** After adding the last DDM-1000 in the daisy chain, you must press the **RST** button on the **PROCR** on each new shelf added to the daisy chain. Pressing the **RST** button allows each new shelf to recognize its unique identity (address). Adding new shelves without pressing the **RST** button will result in two or more shelves on the common address bus with the same address. The sequence in which the **RST** buttons are pressed is not important.

    Momentarily depress the **RST** button on the **PROCR** plug-in on each new shelf added to the telemetry daisy chain.

19. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

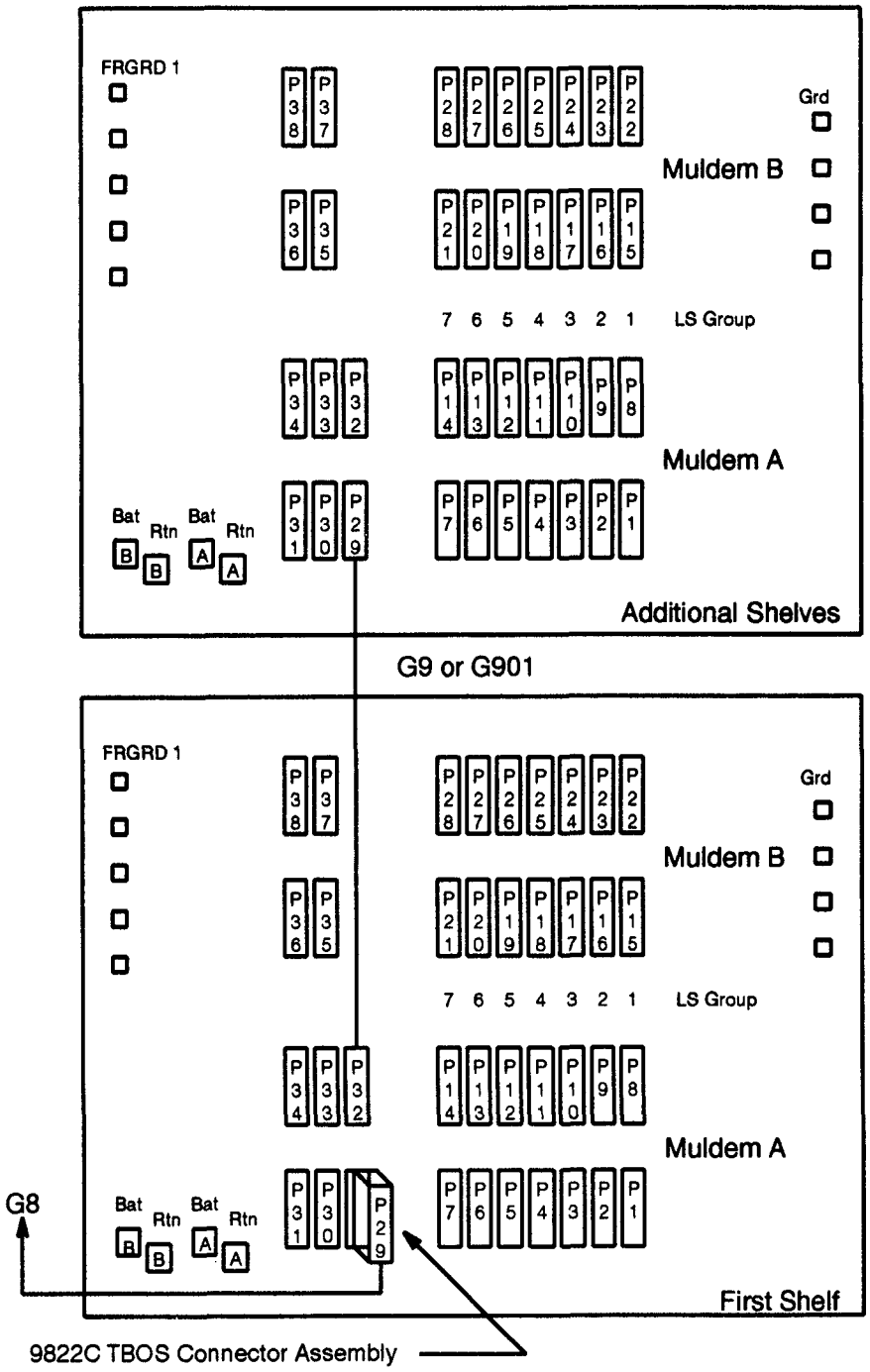


Figure 1. Serial Telemetry Cabling

Connect Overhead Telemetry

1. **Note**: Each DDM-1000 is to be individually connected to the overhead telemetry equipment points at its respective end of the transmission system.

2. Refer to the **SPECIFICATIONS** section of of this user's manual under INTERCONNECTION SPECIFICATIONS for the listing of the overhead telemetry connections.

3. ***Caution: Inserting an* AKM4 TLM1 *in a DDM-1000 shelf that is cabled for* MC90191A1 TLM2 *performance monitoring may damage any* TLM2 *plug-ins that are installed in other DDM-1000 shelves in the same bay. It may also damage the telemetry remote monitoring system (such as the GTP).***

   Is the **DDM-1000** to be equipped with an **AKM4 TLM1** or **MC90191A1 TLM2**?

   If **AKM4 TLM1**, continue with **Step 4.**
   If **MC90191A1 TLM2**, proceed to **Step 17.**

4. Is the **DDM-1000** equipped with the **ED-2C843-30** wire-wrap assembly?

   If **YES,** then continue to **Step 5.**
   If **NO,** then do **Step 7.**

5. Connect the **DDM-1000** to the overhead telemetry system by wire wrapping to the appropriate pins on the right side of the **ED-2C843-30** wire-wrap assembly. See **Table 3-43** in the SPECIFICATIONS section of this manual.

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. Is the **DDM-1000** to be equipped with **ED-2C833-20** front access cables?

   If **YES,** then continue to **Step 8.**
   If **NO,** then do **Step 13.**

8. Are the **ED-2C833-20** front access cables equipped with **710 Type** connectors or with **KS-16689** connectors?

   If **710 Type,** then continue to **Step 9.**
   If **KS-16689,** then do **Step 11.**

9. Use cable **ED-2C833-20, G12** to connect the overhead telemetry to the **DDM-1000.**

10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE**

11. Use cable **ED-2C833-20, G16** to connect the overhead telemetry to the **DDM-1000.**

12. **STOP. YOU HAVE COMPLETED THIS PROCEDURE**

13. Connect jacks **J35** and **J37** on the **ED-2C833-20, G3, G301 or G302** cable to plugs **P35** and **P37** on the backplane of the **DDM-1000.** It is necessary to push the retainer slightly to the side to align the jack with the backplane pins. The jacks will snap solidly into place when they are properly seated.

14. Referring to **Figure 1,** dress and tie the cabling along the horizontal and vertical protecting bars attached to the backplane.

15. Refer to **DP-431** and route the cables along the back of the frame upright to the top of the bay.

16. **STOP. YOU HAVE COMPLETED THIS PROCEDURE**

17. **Note:** The following connection provides the overhead telemetry **outputs** from the **DDM-1000**. If overhead telemetry **inputs** are required, these must be field wired to the ED-2C833-20, G24 or G25 cable assembly connector (J35) used for the TABS serial telemetry connection (J35).

    Connect jack **J37** on the **ED-2C833-20, G3, G301 or G302** cable to plug **P37** on the backplane of the **DDM-1000**. Do not connect **J35** of the cable assembly to the backplane! It is necessary to push the retainer slightly to the side to align the jack with the backplane pins. The jack will snap solidly into place when they are properly seated.

18. Referring to **Figure 1**, dress and tie the cabling along the horizontal and vertical protecting bars attached to the backplane.

19. Refer to **DP-431** and route the cables along the back of the frame upright to the top of the bay.

20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE**

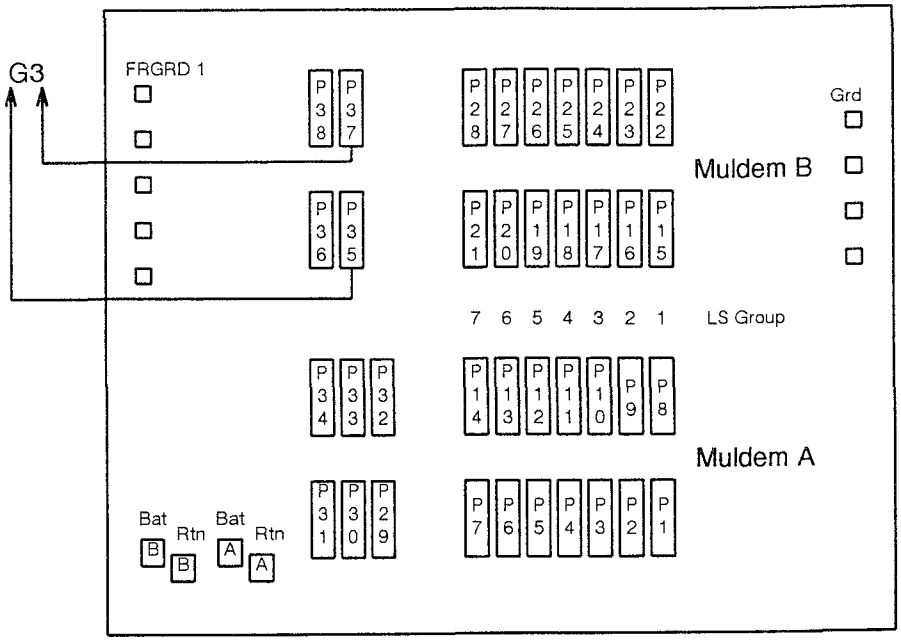


Figure 1. Overhead Telemetry Cabling

Connect Office Battery and Battery Return

1. Is the **DDM-1000** equipped with an **ED-2C843-30** wire-wrap assembly or an **ED-2C833-20** front access cable assembly?

   If **NEITHER,** then continue to **Step 2.**
   If **ED-2C843-30** wire-wrap assembly, then do **Step 9.**
   If **ED-2C833-20** front access cable assembly, then do **Step 16.**

2. **Note**: The office battery and battery return connections to the DDM-1000 are made with push-on connectors that are field installed on the 14AWG power cables.

3. Locate the four **T&B RB14-250A** flag receptacles in the installation kit packed with the **DDM-1000.**

4. Crimp these connectors onto the 14AWG battery and battery return cables.

5. Connect the battery and battery return cables as appropriate to the lugs on the backplane of the **DDM-1000** labeled **BAT A, BAT A RTN, BAT B** and **BAT B RTN**.

6. Connect the other ends of the power cables to the office battery and battery return at the top of the bay.

7. Use multimeter to measure DC voltage on **BAT A and BAT A RTN, and BAT B** and **BAT B RTN**. Voltage should measure between –42 V DC to –60 V DC for –48 V (–21 V DC to –28 V DC for – 24 V).

8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

9. **Note:** The office battery and battery return connections to the DDM-1000 are made with push-on connectors that are field installed on the 14AWG power cables.

10. Locate the four **T&B RB14-250A** flag receptacles in the installation kit packed with the **DDM-1000.**

11. Crimp these connectors onto the 14AWG battery and battery return cables.

12. Connect the battery and battery return cables as appropriate to the terminals on the wire-wrap assembly labeled **BAT A, BAT A RTN, BAT B** and **BAT B RTN.**

13. Connect the other ends of the power cables to the office battery and return at the top of the bay.

14. Use multimeter to measure DC voltage on **BAT A and BAT A RTN, and BAT B** and **BAT B RTN.** Voltage should measure between –42 V DC to –60 V DC for –48 V (–21 V DC to –28 V DC for – 24 V).

15. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

16. **Note:** The office battery and battery return connections to the DDM-1000 are made with a MATE-N-LOK connector on the ED-2C833-20 front access cable assembly.

17. Is the DDM-1000 being installed in an 80D (Group 90, 91, or 92) type cabinet and powered from a ***SLC***® Series 5 power shelf (**Figure 1**)?

    If **YES**, then continue with **Step 18.**
    If **NO**, then proceed to **Step 22.**

18. **Note 1:** For more information on installation of DDM-1000 and ***SLC*** Series 5 Carrier in outside enclosures and cabinets, refer to the 640 Division of outside plant AT&T Practices (for example, AT&T 640-250-255).

    Note 2: For more information on installation of ***SLC*** Series 5 Carrier systems, refer to the 363 Division of loop transmission systems AT&T Practices (for example, AT&T 363-205-401).

    Ensure that plug **J108C** of the interface cable is connected to **P101** on the ED-2C833-20, G13 (G30) cable.

19. Ensure the G13 (G30) battery and battery return cables are connected, as appropriate, to the lugs on the backplane of the **DDM-1000** labeled **BAT A, BAT A RTN, BAT B** and **BAT B RTN.**

20. Use multimeter to measure DC voltage on **BAT A and BAT A RTN, and BAT B** and **BAT B RTN.** Voltage should measure between –42 V DC to –60 V DC for –48 V (–21 V DC to –28 V DC for – 24 V).

21. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

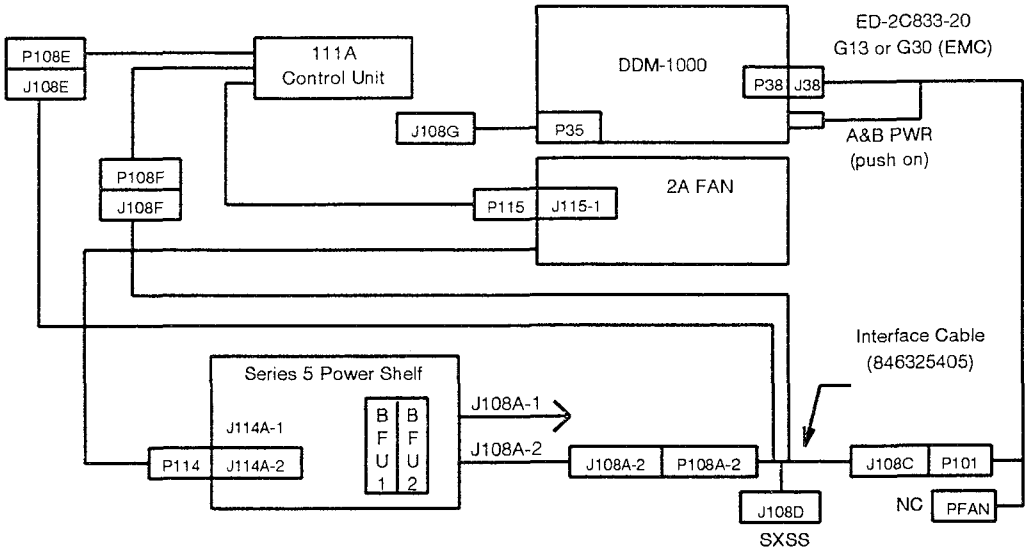


Figure 1. DDM-1000 Power Cabling in 80D Cabinet

19. Locate the **AMP MATE-N-LOK** connector packed with the **ED-2C833-20** front access cable assembly.

20. Connect the office battery and battery return to the **MATE-N-LOK** connector as indicated in **Table A.**

Table A. Battery and Return Connections

Pin	Connection
1	BAT A
3	BAT A RTN
4	BAT B
6	BAT B RTN

21. Plug the **MATE-N-LOK** connector wired in **Step 20** to the mating connector on the **ED-2C833-20** front access cable assembly.

22. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install Plug-Ins

1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

2. **Note**: It is assumed that you have been sent here by another procedure with instructions to install a plug-in in the DDM-1000. This procedure provides instructions for installing that plug-in. It does not tell you which plug-in to install. You should install the plug-in indicated by the procedure that sent you here.

3. Find the plug-in to be installed in **Table A** and go to the indicated step.

Table A. Plug-ins Being Installed

Plug-in To Be Installed	Go To
MC90083A1( ) PROCR	Step 6
AKM2 MXR1 (rated DA)	Step 9
AKM2B MXR2	Step 15
AKM2C MXR3	Step 15
AKM3 ELIU1	Step 23
AKM4 TLM1	Step 4
MC90191A1 TLM2	Step 46
AKM5 DS3U1	Step 57
AKM6 DS3U2	Step 41
AEK36-type DS1 INTFC1	Step 29
AEK37 DS1C INTFC1	Step 29
AEK38 DS2 INTFC1	Step 29
16- and 20-Type OLIU	Step 34
AKM86 BP2	Step 59

4. ***Caution: Inserting an* AKM4 TLM1 *in a DDM-1000 shelf that is cabled for* MC90191A1 TLM2 *performance monitoring may damage any* TLM2 *plug-ins that are installed in other DDM-1000 shelves in the same bay. It may also damage the telemetry remote monitoring system (such as the GTP).***

   Note 1: To utilize the remote capabilities of the TLM( ) pack, far-end communications (fecom) must be enabled (**DP-435**).

   There are no options to be set on this plug-in. Remove and discard the TLM slot edge protector, then seat the plug-in.

5. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

6. **Note**: When the **PROCR** is installed, it is necessary to update the DDM-1000's internal equipment list. This equipment list determines which plug-ins will be monitored.

7. Refer to **DP-404** and install the **PROCR.**

8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

9. **Note**: The option switches on the **AKM2 MXR1** must be set correctly when the plug-in is installed.

10. Determine from office records the desired settings of the option switches on the **AKM2 MXR1.**

11. **Table B** indicates the option switch settings for the **AKM2 MXR1.**

Table B. AKM2 MXR1 Option Switches

Switch	Electrical Operation		Optical Operation	
	S1	S2	S1	S2
Sec 1	Open	Open	Closed	Closed
Sec 2	Open	Open	Closed	Open
Sec 3	Open	Open	Open	Closed
Sec 4	Closed	Closed	Open	Open

12. Refer to **Figure 1** and set the option switches on the **AKM2 MXR1.**

    Note: To set the switch to "open" depress the rocker toward the side labeled **OPEN** in the figure. To set the switch to "closed" depress the rocker toward the side labeled **CLOSED** in the figure.

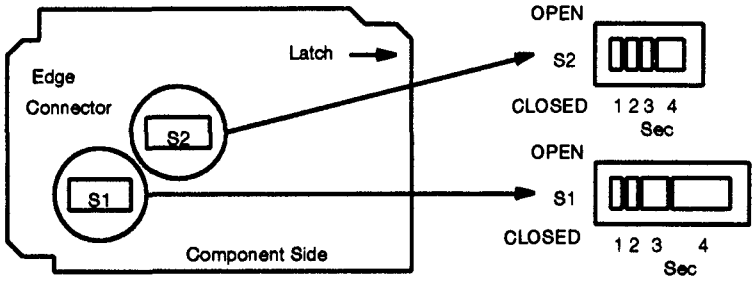


Figure 1. AKM2 MXR1 Option Settings

13. ***Caution: Damage to the shelf and plug-ins will occur if an* MXR *pack is inserted in an* OLIU *slot. Ensure the* MXR *pack is inserted in the correct slot.***

    Seat the **AKM2 MXR1.** Take care to avoid damaging the LED that protrudes through the opening in the faceplate of the plug-in.

14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

15. **Note**: The option switches on the **AKM2B MXR2** or **AKM2C MXR3** must be set correctly when the plug-in is installed.

16. Determine from office records the desired settings of the option switches on the **AKM2B MXR2** or **AKM2C MXR3.**

    Note: If an **MC90191A1 TLM2** is being installed and PM is being used, the **AKM2C MXR3** must be used and option plugs **P3** and **P4** must be set for **C-Bit Mode.**

17. **Table C** indicates the option switch settings for the **AKM2B MXR2 or AKM2C MXR3.**

Table C. MXR2 (AKM2B)/MXR3 (AKM2C) Option Switches

Switch	Electrical Operation		Optical Operation	
	S1	S2	S1	S2
Sec 1	Open	Open	Closed	Closed
Sec 2	Open	Open	Closed	Open
Sec 3	Open	Open	Open	Closed
Sec 4	Closed	Closed	Open	Open

18. Refer to **Figure 2** and set the option switches on the **AKM2B MXR2 or AKM2C MXR3.**

Note: To set the switch to "open" depress the rocker or slide the switch toward the side labeled **OPEN** in the figure. To set the switch to "closed" depress the rocker or slide the switch toward the side labeled **CLOSED** in the figure.

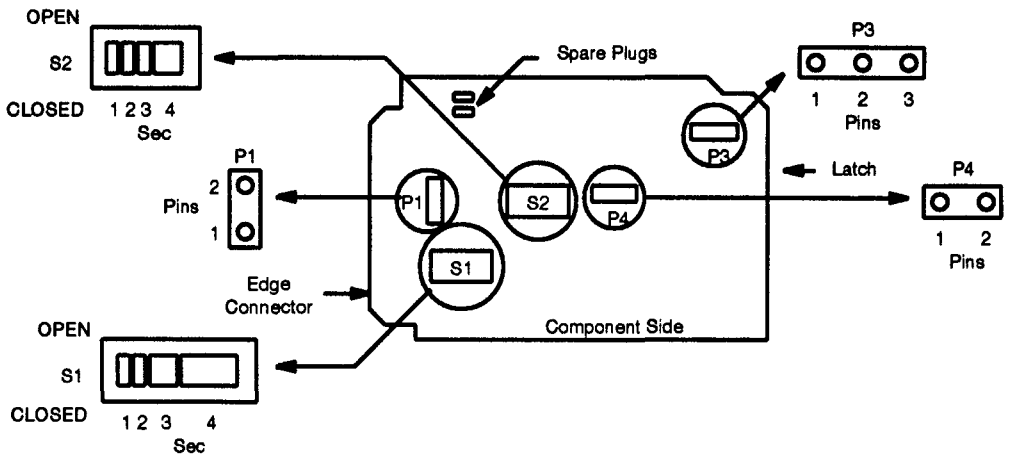


Figure 2. MXR2 (AKM2B)/MXR3 (AKM2C) OPTION SETTINGS

19. **Table D** and **Table E** indicate the option plug settings for the **AKM2B MXR2** or **AKM2C MXR3**.

Table D. MXR2 (AKM2B)/MXR3 (AKM2C) Option Plugs

Plug	Install a Jumper Between Pins	
	Electrical	Optical
P1	(none)	1 and 2

Table E. MXR2 (AKM2B)/MXR3 (AKM2C) Option Plugs

Plug	Install a Jumper Between Pins	
	C-BIT Mode	M13 Mode
P3	2 and 3	1 and 2
P4	1 and 2	(none)

20. Refer to **Figure 2** and install the option plugs on the **AKM2B MXR2 or AKM2C MXR3**.

21. ***Caution: Damage to the shelf and plug-ins will occur if an* MXR *pack is inserted in an* OLIU *slot. Ensure the* MXR *pack is inserted in the correct slot.***

    Seat the **AKM2B MXR2 or AKM2C MXR3**. Take care to avoid damaging the LED that protrudes through the opening in the faceplate of the plug-in.

22. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

23. **Note**: The option plugs must be set correctly when the **AKM3 ELIU1** is installed.

24. Determine from office records the length of the DS3 cabling between the **DDM-1000** and the **DSX-3** cross-connect point.

25. **Table F** indicates the required LBO settings for the **AKM3 ELIU1**

Table F. ELIU1 (AKM3) LBO Selection

Cable Length (ft.)			Plug Settings
728B, 734A	KS-19224, L2 Mini-coax	735A	
0 to 225	0 to 75	0 to 125	LBO
>225	>75	>125	NO LBO

26. Refer to **Figure 3** and set the option plugs according to the table above.

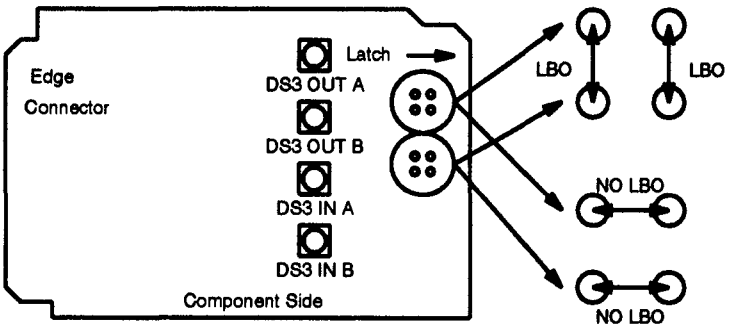


Figure 3. AKM3 ELIU1 Option Settings

27. Seat the **AKM3 ELIU1**.

28. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

29. **Note**: When an **LS INTFC** is installed, the option switches on the plug-in must be set correctly.

30. Refer to **DP-425** and set the option switches on the **LS INTFC.**

31. ***Caution 1: If a mix of* DS1, DS1C *and* DS2 LS INTFC *plug-ins are installed in one muldem of the* DDM-1000, *the lowest rate protection pack must be installed in the PROTN 8 slot.***

    Caution 2:* AEK38 DS2 LS INTFC *packs cannot be used in a muldem provisioned for C-bit perfomance monitoring.

32. Seat the **LS INTFC.** Take care to avoid damaging the LED that protrudes through the opening in the faceplate of the plug-in.

33. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

34. **NOTICE:** Unterminated optical connectors may emit laser radiation. Do not view beam with optical instruments.

35. ***Warning 1: Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam.***

36. ***Warning 2: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.***

37. **Note**: When an **OLIU** is installed, the option switch on the plug-in must be set correctly.

38. Refer to **DP-424** and set the option switch on the **OLIU.**

39. Seat the **OLIU.** Take care to avoid damaging the optical cable and the LED that protrudes through the opening in the faceplate of the plug-in.

40. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

41. **Note**: The option switches on the **AKM6 DS3U2** must be set correctly when the plug-in is installed. All current applications of the **DS3U2** use the same option switch settings.

42. **Table G** indicates the option switch settings for the **AKM6 DS3U2.**

Table G. AKM6 DS3U2 Option Switches

Switch	Setting
Sec 1	Closed
Sec 2	Closed
Sec 3	Open
Sec 4	Open
Sec 5	Open
Sec 6	Open
Sec 7	Closed
Sec 8	Closed

43. Refer to **Figure 4** and set the option switches on the **AKM6 DS3U2.**

    Note: To set the switch to "open" depress the rocker toward the side labeled **OPEN** in the figure. To set the switch to "closed" depress the rocker toward the side labeled **CLOSED** in the figure.

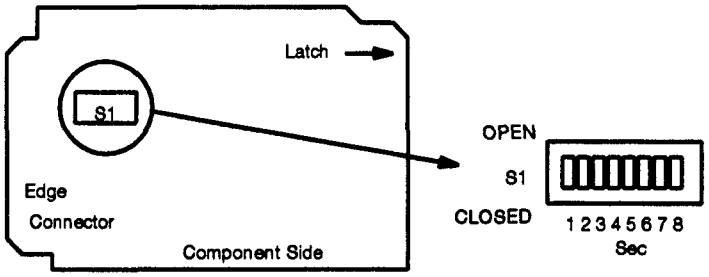


Figure 4. AKM6 DS3U2 Option Settings

44. Seat the **AKM6 DS3U2.** Take care to avoid damaging the LED that protrudes through the opening in the faceplate of the plug-in.

45. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

46. ***Caution: Inserting an* AKM4 TLM1 *in a DDM-1000 shelf that is cabled for* MC90191A1 TLM2 *performance monitoring may damage any* TLM2 *plug-ins that are installed in other DDM-1000 shelves in the same bay. It may also damage the telemetry remote monitoring system (such as the GTP).***

    Note: The option switches on the **MC90191A1 TLM2** must be set correctly before the plug-in is installed.

47. From office records, determine the TABS address of the **MC90191A1 TLM2** on the TABS serial telemetry link.

    Note: The addresses should be assigned in the order that the shelves appear in the bay (i.e., shelf 1, TABS address 1; shelf 2 TABS address 2; etc.).

48. **Table H** indicates the address selection switch settings for the **MC90191A1 TLM2.**

Table H. TLM2 (MC90191A1) Shelf (TABS) Address Selection

		Switch S3		
		Switch Section		
Shelf	TABS Address	1	2	3
Shelf 1	1	Closed	Closed	Closed
Shelf 2	2	Open	Closed	Closed
Shelf 3	3	Closed	Open	Closed
Shelf 4	4	Open	Open	Closed
Shelf 5	5	Closed	Closed	Open
Shelf 6	6	Open	Closed	Open
Shelf 7	7	Closed	Open	Open
Shelf 8	8	Open	Open	Open

49. Refer to **Figure 5** and set the address selection switches on the **MC90191A1 TLM2.**

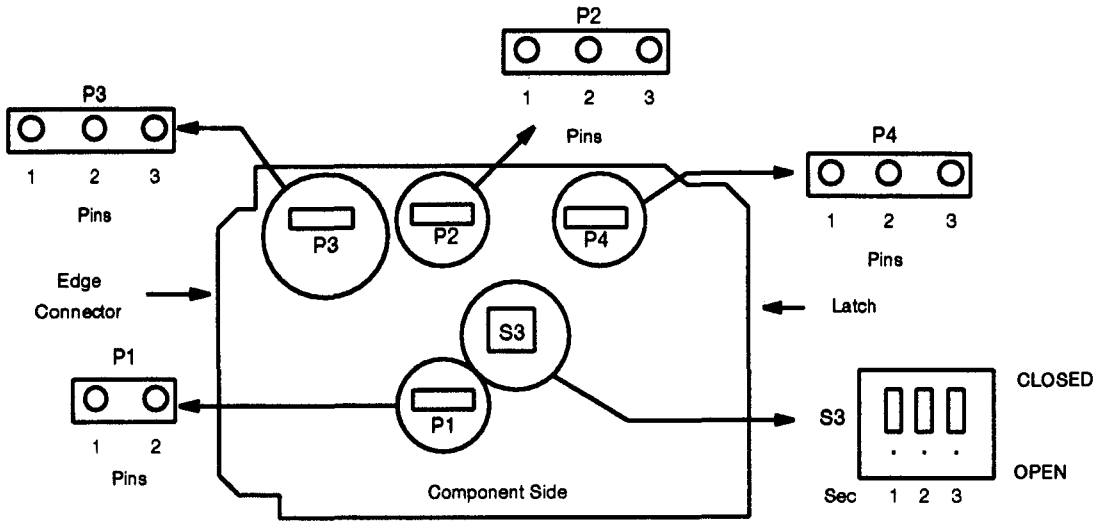


Figure 5. TLM2 (MC90191A1) Option Switches

50. **Note:** The TABS serial telemetry link must be terminated by the TLM2 with the highest (or only) TABS address in the bay. The remaining TLM2s in the bay must not terminate the link. For example, if the bay contains three TLM2s with shelf 1 having TABS address 1, shelf 2 having TABS address 2, and shelf 3 having TABS address 3, then the TLM2 in shelves 1 and 2 would be optioned not to terminate the link (not highest TABS address) and the TLM2 in shelf 3 would be optioned to terminate the link (highest TABS address).

    Note: If a fourth TLM2 is later added to the bay in the example above, the TLM2 option settings in shelf 3 must be changed to remove the termination (no longer the highest TABS address). The TLM2 in shelf 4 must then be optioned to terminate the link (highest TABS address).

    Table I indicates the option plug settings for the **TLM2** address in the TABS link.

Table I. TLM2 (MC90191A1) Option Plugs

Plug	Install a Jumper Between Pins	
	TLM2 (Highest TABS Address)	TLM2 (*Not* Highest TABS Address)
P2	2 and 3	1 and 2
P4	2 and 3	1 and 2

51. Refer to **Figure 5** and set **P2** and **P4** option plugs on the **MC90191A1 TLM2.**

52. **Note:** Option plug **P1** always has a jumper connected between pins 1 and 2. Option plug **P3** always has a jumper connected between pins 1 and 2 which causes **TLM2** failures to be reported to the local **PROCR.**

    Refer to **Figure 5.** Install jumper between pins 1 and 2 on **P1.** Install jumper between pins 1 and 2 on **P3.**

53. ***Caution: Take care to avoid damaging the LEDs that protrude through the opening in the faceplate of the plug-in.***

    Remove and discard the TLM slot edge protector, then seat the **MC90191A1 TLM2.**

    Response: The **RST/TEST** LED flashes on and off approximately five times and the **ALM** LED lights momentarily.

54. Momentarily depress the **RST** button on the TLM2 pack.

    Response: The **RST/TEST** LED flashes on and off approximately 7 seconds and then goes off.

55. Momentarily depress the **TEST** button on the TLM2 pack.

    Response: The **RST/TEST** LED flashes once and then goes off.

56. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

57. **Note 1:** One factory-installed option plug is on the DS3U1. This plug must be installed in the socket holes nearest the gold fingers. Two other options for setting parity and framing parameters are available through the ASCII terminal using the commands "**set-vmr-ds3u1:**" and "**set-frm-ds3u1:**".

    Note 2: The DS3U1 plug-in cannot be used with 180 Mb/s optical systems.

    There are no other option plugs to be set on this plug-in. Seat the plug-in.

58. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

59. **Note:** The **AKM86 BP2** pack is required in an optical shelf if only one muldem is equipped in that shelf. In a 180 Mb/s system, one **AKM86 BP2** pack is required in each shelf that has only one muldem equipped.

    Insert the **AKM86 BP2** pack into the **SRV** slot of the empty muldem.

60. Momentarily depress the **RST** button on the PROCR2 pack.

61. When the **AKM86 BP2** pack is to be replaced by a function unit, remove the **BP2** pack, insert the function units, then momentarily depress the **RST** button on the PROCR2 pack.

62. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform Automatic Looped Transmission Test

1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

2. ***Caution: This test may only be performed with the* DDM-1000 *out of service.***

3. ***Caution: Reflections from unterminated low-speed cross connects can cause low speed packs to incorrectly appear failed. It is recommended that unterminated ports either be terminated, looped back, or disconnected from the backplane before performing the following test.***

   Note 1: It is assumed that the DDM-1000 is installed, connected to the cross-connects, powered and running, and that no alarms or LED indicators are activated.

   Note 2: When testing a shelf containing DS3U1 or DS3U2 packs, a framed DS3 signal must be externally supplied to the inputs. For this test, you may supply a test signal from a conventional test set at one end, and do a DS3 loop at the other end. Do not loop the DS3 signals at both ends at the same time or when the fiber is looped back.

   Note 3: If the shelf is configured for optical use, this test is automatically performed on both muldems and cannot be done on an individual muldem. If the shelf is configured for electrical use, this test may be performed on both muldems or on an individual muldem using the ASCII terminal command "**test-auto-turnup:m=( ) s=( ) local**".

   Note 4: It is recommended that both muldems be equipped and tested before the shelf is put into service. If packs are not available for both muldems, test one muldem, move the packs to the other muldem and do an RST, then repeat this test on the second muldem.

   Note 5: Low speed service slot one (1) in both muldems must be equipped with any type of low speed pack to test the protection slots.

4. Is the **DDM-1000** equipped for electrical operation **(AKM3 ELIU1** installed) or optical operation **(OLIU** installed)?

   If **ELECTRICAL** operation, then continue to **Step 5.**
   If **OPTICAL** operation, then do **Step 7.**

5. At the DSX-3 cross-connect, connect a jumper cable between the **OUT** jack and the **IN** jack for **Muldem A** of the **DDM-1000.** Connect another jumper cable between the **OUT** jack and the **IN** jack for **Muldem B** of the **DDM-1000.**

6. Do **Step 11,** bypassing **Steps 7** through **10**.

7. **NOTICE:** Unterminated optical connectors may emit laser radiation. Do not view beam with optical instruments.

8. ***Warning 1: Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam.***

9. ***Warning 2: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.***

10. Refer to **DP-415** and install an optical loop.

11. Is an ASCII terminal available?

    If **YES,** then continue to **Step 12.**
    If **NO,** then do **Step 16.**

12. Connect the ASCII terminal to the connector on the faceplate of the **PROCR**.

13. ***Caution: This command may be service affecting. If optional parameters are not set properly, the default value may cause service interruption. Ensure the command you enter is for the correct muldem and the correct shelf.***

    Enter the command: **test-auto-turnup:m=( ) s=( ) local**

14. The ASCII terminal report will indicate the status of the equipment. It should indicate that there are no **HS** failures and each equipped **LS** location should be indicated **G** for "good".

15. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

16. **Note**: The RST pushbutton on the PROCR is recessed to prevent its accidental operation. You will need a small pointed object such as a straightened paper clip to depress it.

17. **Note**: The following three steps (**18** through **20**) must be performed with no unnecessary delays. Read through them to familiarize yourself with the sequence of operations and the expected responses.

    Read Steps **18** through **22** before continuing.

18. On the **PROCR** depress and hold the **ACO/TEST** pushbutton.

    Response: All LEDs on the DDM-1000 are lighted.

19. With the **TEST/ACO** pushbutton still depressed, momentarily depress the **RST** pushbutton. Then release both pushbuttons.

    Response: All LEDs on the DDM-1000 remain lighted.

20. **WITHIN ONE MINUTE** momentarily depress the **RST** pushbutton one time.

    Response: On the **PROCR** the red **MJ** LED is flashing, the yellow **MN** LED is lighted and all other LEDs on the **DDM-1000** are extinguished.

21. **Note**: Ten seconds after the RST pushbutton is pushed the last time the red MJ LED will stop flashing and remain lighted, the yellow MN LED will also remain lighted. This indicates the beginning of the automatic looped transmission test. The test may take as long as 5 minutes.

22. **Note**: During the test, any failure will be indicated by a lighted ALM LED on the affected plug-in. This indication will remain on for up to 1 minute. If no failures are detected, the green ACO LED on the PROCR will be lighted. This indication will remain on for up to 1 minute.

23. Wait until the test ends as described above. Was the green **ACO** LED lighted?

    If **YES,** then continue to **Step 24.**
    If **NO,** then do **Step 26.**

24. The **DDM-1000** has passed the automatic looped transmission test.

25. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

26. Was any LED on the **DDM-1000** besides the red **MJ,** the yellow **MN** and the green **ACO** LEDs on the **PROCR** lighted?

    If **YES,** then continue to **Step 27.**
    If **NO,** then do **Step 29.**

27. The lighted LED(s) in addition to the red **MJ** and yellow **MN** LEDs on the **PROCR** indicate the plug-in(s) that failed the automatic looped transmission test. Go to **TP-105** and clear the failure condition.

28. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

29. There is an inconsistent set of diagnostic indications. Refer to **TP-108** to clear the failure condition.

30. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform Automatic Cross-Connect Wiring Test

1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

2. ***Caution: This test may only be performed with the* DDM-1000 *out of service.***

3. **Note 1**: It is assumed that the DDM-1000 has passed the automatic looped transmission test. If this test has not been completed, refer to the appropriate installation procedure and perform that test.

   Note 2: When testing a shelf containing DS3U1 or DS3U2 packs, a framed DS3 signal must be externally supplied to the inputs. For this test, you may supply a test signal from a conventional test set at one end, and do a DS3 loop at the other end. Do not loop the DS3 signals at both ends at the same time or when the fiber is looped back.

   Note 3: If the shelf is configured for optical use, this test is automatically performed on both muldems and cannot be done on an individual muldem. If the shelf is configured for electrical use, this test may be performed on both muldems or on an individual muldem using the ASCII terminal command "**test-auto-turnup:m=( ) s=( ) lsdsx**".

   Note 4: It is recommended that both muldems be equipped and tested before the shelf is put into service. If packs are not available for both muldems, test one muldem, move the packs to the other muldem and do an RST, then repeat this test on the second muldem.

4. Verify that the high-speed loop at the **DSX-3** cross-connect or at the **16-Type or 20-Type OLIU** is still in place.

5. At the low-speed cross-connect, install a patch cord from the **OUT** jack to the **IN** jack for each low speed circuit associated with the **DDM-1000** under test.

6. Is an ASCII terminal available?

   If **YES,** then continue to **Step 7.**
   If NO, then do Step 11.

7. Connect the ASCII terminal to the connector on the faceplate of the **PROCR**.

8. ***Caution: This command may be service affecting. If optional parameters are not set properly, the default value may cause service interruption. Ensure the command you enter is for the correct muldem and the correct shelf.***

   Note: This test is not functional for AEK38 DS2 packs. The displayed result will contain an "**X**" in those groups equipped with DS2 packs.

   Enter the command: **test-auto-turnup:m=( ) s=( ) lsdsx**

9. The ASCII terminal report will indicate the status of the equipment.

   It is recommended that this test be repeated as follows to detect wiring errors that might occur during installation:

   1. Remove the looping devices in the odd-numbered slots and repeat the test. Note which slots report fail. All the odd-numbered slots should fail.

   2. Replace all of the looping devices removed above, then remove all the looping devices in the even-numbered slots. Repeat the test and note which slots show fail. This time all of the even-numbered slots should show fail.

10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

11. **Note**: The RST pushbutton on the PROCR is recessed to prevent its accidental operation. You will need a small pointed object such as a straightened paper clip to depress it.

12. **Note**: The following four steps (13 through 16) must be performed with no unnecessary delays. Read through them to familiarize yourself with the sequence of operations and the expected responses.

    Read **Steps 13** through **16** before continuing.

13. On the **PROCR** depress and hold the **ACO/TEST** pushbutton.

    Response: All LEDs on the DDM-1000 are lighted.

14. With the **TEST/ACO** pushbutton still depressed, momentarily depress the **RST** pushbutton. Then release both pushbuttons.

    Response: All LEDs on the DDM-1000 remain lighted.

15. **WITHIN ONE MINUTE** momentarily depress the **RST** pushbutton one time.

    Response: On the PROCR the red **MJ** LED is flashing, the yellow **MN** LED is lighted and all other LEDs on the **DDM-1000** are extinguished.

16. **WITHIN 10 SECONDS** momentarily depress the **RST** pushbutton one more time.

    Response: On the **PROCR** the red **MJ** LED is flashing, the yellow **MN** LED and the green **NE** LED are lighted, and all other LEDs on the **DDM-1000** are extinguished.

17. **Note**: 10 seconds after the RST pushbutton is pushed the last time the red MJ LED will stop flashing and remain lighted, the yellow MN LED and the green NE LED will also remain lighted. This indicates the beginning of the automatic cross-connect wiring test. The test may take as long as 5 minutes.

18. **Note**: During the test, any failure will be indicated by a lighted ALM LED on the affected plug-in. This indication will remain on for up to one minute. If no failures are detected, the green ACO LED on the PROCR will be lighted. This indication will remain on for up to 1 minute.

    Note: This test is not functional for **AEK38 DS2** packs. A failure in the DSX-2 cross-connect wiring will not be indicated on the associated DS2 pack.

19. Wait until the test ends as described above. Was the green **ACO** LED lighted?

    If **YES,** then continue to **Step 20.**
    If **NO,** then do **Step 22.**

20. The **DDM-1000** has passed the automatic cross-connect wiring test.

21. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

22. Was any LED on an **LS INTFC** plug-in flashing?

    If **YES,** then continue to **Step 23.**
    If **NO,** then do **Step 25.**

23. The flashing LED(s) on the **LS INTFC** plug-in(s) indicate channels which have failed the automatic cross-connect wiring test. Disconnect the cross-connect cables from the **DDM-1000** and use an ohmmeter to further isolate the failure.

24. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

25. There is an inconsistent set of diagnostic indications. Refer to **TP-108** to clear the failure condition.

26. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Connect Optical Loop

1. **NOTICE:** Unterminated optical connectors may emit laser radiation. Do not view beam with optical instruments.

2. ***Warning 1: Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam.***

3. ***Warning 2: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.***

4. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

5. What type of OLIU is to be looped on itself?

   If **16E OLIU1, 16E2 OLIU10, 16F OLIU2, 16F2 OLIU9,** or **20E OLIU4**, then continue to **Step 6.**

   If **16G OLIU3, 20G OLIU5, 16K OLIU6** or **20K OLIU7**, then do **Step 11.**

6. **Note**: The level control on the **16E OLIU1, 16E2 OLIU10, 16F OLIU2, 16F2 OLIU9,** and **20E OLIU4** must be set to the **LW** position when it is looped on itself.

7. Refer to **Figure 1** and set the option switch on the **16E OLIU1, 16E2 OLIU10, 16F OLIU2, 16F2 OLIU9,** or **20E OLIU4** to the **LW** position.

8. ***Caution: When handling the optical pigtails take care to minimize the bending radius.***

9. Use a **1002A** or **1012A** coupling to connect the **IN** and **OUT** leads of the OLIU to each other.

10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

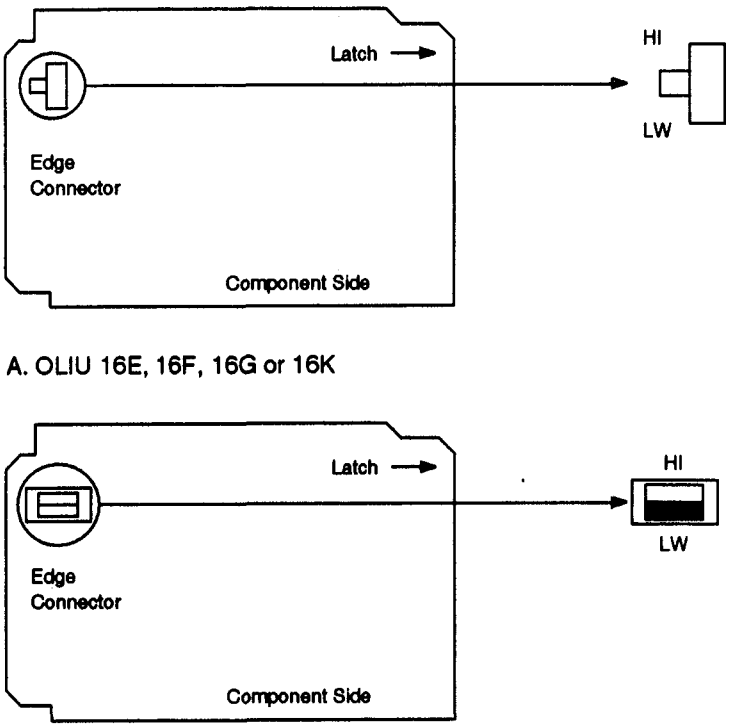


Figure 1. OLIU (All 16-Type) Option Switches

11. **Note**: The **16G OLIU3, 20G OLIU5, 16K OLIU6 and 20K OLIU7** must be looped with an attenuator coupling. See **Table A.** In addition, the level control on these OLIUs must be set to the **LW** position when it is looped on itself.

12. Refer to **Figure 1** and set the option switch on the **OLIU** to the **LW** position.

13. ***Caution: When handling the optical pigtails take care to minimize the bending radius.***

14. See **Table A.** Use recommended attenuator coupling (or a 602G) to connect the **IN** and **OUT** leads of the OLIUs.

15. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Table A. Recommended OLIU Attenuators

	OLIU	Min. Atten. Reqd.	Attenuator	Attenuation
Lightguide Build Out	16G	7.0 dB	602D	9.0 ±1.0dB
	16K	13.7 dB	602G	17.5 ±1.5 dB
	20G	10.0 dB	602F	14.5 ±1.5 dB
	20K	13.3 dB	602G*	17.5 ±1.5 dB

* The 602G may be used on all OLIUs, if desired.

Perform Automatic End-to-End Transmission Test

1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

2. ***Caution: This test may only be performed with the complete end-to-end system, including both muldems in each* DDM-1000, *out of service. Remove any loopbacks made at the DSX.***

   Caution: Reflections from unterminated low-speed cross connects can cause low speed packs to incorrectly appear failed. It is recommended that unterminated ports either be terminated or disconnected from the backplane before performing the following test.

3. **Note 1**: It is assumed that the DDM-1000s at each end of the system have both passed their individual looped transmission tests. If these tests have not been completed, refer to the appropriate installation procedure and perform those tests.

   Note 2: When testing a shelf containing DS3U1 or DS3U2 packs, a framed DS3 signal must be externally supplied to the inputs. For this test, you may supply a test signal from a conventional test set at one end, and do a DS3 loop at the other end. Do not loop the DS3 signals at both ends at the same time or when the fiber is looped back.

   Note 3: Low speed service slot one (1) in both muldems must be equipped with any type of low speed pack to test the protection slots.

4. Is the end-to-end system equipped for electrical operation (**AKM3 ELIU1** installed) or optical operation (**OLIU** installed)?

   If **ELECTRICAL** operation, then continue to **Step 5.**
   If **OPTICAL** operation, then do **Step 7.**

5. At the **DSX-3** cross-connect, connect the DS3 channels of each **DDM-1000** (a total of up to four connections at each end of the system) to the DS3 facility.

6. Do **Step 11,** bypassing **Steps 7** through **10**.

7. **NOTICE:** Unterminated optical connectors may emit laser radiation. Do not view beam with optical instruments.

8. ***Warning 1: Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam.***

9. ***Warning 2: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.***

10. At each end of the end-to-end system, connect both the **SRV** and **PROTN OLIUs** to the optical facility (a total of four connections at each end of the system).

11. Is an ASCII terminal available?

    If **YES,** then continue to **Step 12.**
    If **NO,** then do **Step 16.**

12. Connect the ASCII terminal to the connector on the faceplate of the **PROCR**.

13. **Note:** Far end communications (fecom) is "on" by default in an optical system and "off" by default in an electrical system. It can only be turned "on" locally using the following command.

    Enable far-end communications channel using the following command:
    set-shelf-fecom:s=( ) yes

14. ***Caution: This command may be service affecting. If optional parameters are not set properly, the default value may cause service interruption. Ensure the command you enter is for the correct muldem and the correct shelf.***

    Perform end-to-end test using the following command:
    test-auto-turnup:m=( ) s=( ) system

    Note: The ASCII terminal report will indicate the status of the system.

15. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

16. **Note**: The RST pushbutton on the PROCR is recessed to prevent its accidental operation. You will need a small pointed object such as a straightened paper clip to depress it.

17. ***Caution: This procedure will interrupt service on both muldems. Therefore, both muldems must be out of service before this test is performed.***

    Note: The following five steps (**18** through **22**) must be performed with no unnecessary delays.

    Read **Steps 18** through **22** to familiarize yourself with the sequence of operations and the expected responses.

18. On the **PROCR** depress and hold the **ACO/TEST** pushbutton.

    Response: All LEDs on the **DDM-1000** are lighted.

19. With the **TEST/ACO** pushbutton still depressed, momentarily depress the **RST** pushbutton. Then release both pushbuttons.

    Response: All LEDs on the **DDM-1000** remain lighted.

20. **WITHIN ONE MINUTE** momentarily depress the **RST** pushbutton one time.

    Response: On the **PROCR** the red **MJ** LED is flashing, the yellow **MN** LED is lighted, and all other LEDs on the **DDM-1000** are extinguished.

21. **WITHIN 10 SECONDS** momentarily depress the **RST** pushbutton again.

    Response: On the **PROCR** the red **MJ** LED is flashing, the yellow **MN** LED and the green **NE** LED are lighted, and all other LEDs on the **DDM-1000** are extinguished.

22. **WITHIN 10 SECONDS** momentarily depress the **RST** pushbutton again.

    Response: On the **PROCR** the red **MJ** LED is flashing, the yellow **MN** LED, green **NE** LED and green **FE** LED are lighted, and all other LEDs on the **DDM-1000** are extinguished.

23. **Note**: 10 seconds after the RST pushbutton is pushed the last time the red MJ LED will stop flashing and remain lighted, the yellow MN LED, the green NE LED and the green FE LED will also remain lighted. This indicates the beginning of the automatic end-to-end transmission test. The test may take as long as 5 minutes.

24. **Note**: During the test, any failure will be indicated by a lighted ALM LED on the affected plug-in. This indication will remain on for up to 1 minute. If no failures are detected, the green ACO LED on the PROCR will be lighted. This indication will remain on for up to 1 minute.

25. Wait until the test ends as described above. Was the green **ACO** LED lighted?

    If **YES,** then continue to **Step 26.**
    If **NO,** then do **Step 28.**

26. The **DDM-1000** has passed the automatic end-to-end transmission test.

27. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

28. Was any LED on the **DDM-1000** besides the red **MJ,** yellow **MN,** and the green **NE, FE** and **ACO** LEDs on the **PROCR** lighted?

    If **YES,** then continue to **Step 29.**
    If **NO,** then do **Step 31.**

29. The lighted LED(s) in addition to the red **MJ,** yellow **MN** and green **NE, FE** and **ACO** LEDs on the **PROCR** indicate the plug-in(s) that failed the automatic end-to-end transmission test. Go to **TP-105** and clear the failure condition.

30. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

31. There is an inconsistent set of diagnostic indications. Refer to **TP-108** to clear the failure condition.

32. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Replace Plug-In

1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

2. **Note 1**: It is assumed that you have been sent here by another procedure with instructions to replace a particular plug-in, or that you are experienced with the system.

   Note 2: When a replacement pack (except for PROCR packs) is configured the same as the original pack, it may be inserted with no further action. When a replacement pack is different (different code or different switch options) from the original, the **PROCR** RST button must be pressed to update the inventory. (See **DP-402** for RST details.)

3. Find the plug-in to be replaced in **Table A** and go to the indicated step.

Table A. Plug-ins Being Replaced

Plug-in To Be Replaced	Go To
MC90083A1( ) PROCR	Step 6
AKM2 MXR1 (rated DA)	Step 9
AKM2B MXR2	Step 15
AKM2C MXR3	Step 15
AKM3 ELIU1	Step 23
AKM4 TLM1	Step 4
MC90191A1 TLM2	Step 48
AKM5 DS3U1	Step 59
AKM6 DS3U2	Step 43
AEK36-type DS1 INTFC	Step 29
AEK37 DS1C INTFC1	Step 29
AEK38 DS2 INTFC1	Step 29
547 TYPE PWR	Step 4
16- and 20-Type OLIU	Step 34

4. ***Caution: To prevent damage to the* PWR *pack, it should be unseated before applying external power.***

   There are no options to be set on this plug-in. Seat the plug-in.

5. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

6. ***Caution: When the* PROCR *is installed, it is necessary to RESET the* PROCR.**

7. Refer to **DP-404** to replace and "reset" the **PROCR.**

8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

9. **Note 1**: These steps apply only if the installed **AKM2 MXR1** is to be replaced by another **AKM2 MXR1.** If the installed **MXR1** is to replaced by an **AKM2B (MXR2)** or **AKM2C (MXR3)**, find the plug-in to be used in **Table A** and go to the indicated step.

   Note 2: The option switches on the replacement **AKM2 MXR1** must be set correctly when the plug-in is installed.

10. Determine from office records the desired settings of the option switches on the **AKM2 MXR1.**

11. **Table B** indicates the option switch settings for the **AKM2 MXR1.**

Table B. AKM2 MXR1 Option Switches

Switch	ElectricaL Operation		Optical Operation	
	S1	S2	S1	S2
Sec 1	Open	Open	Closed	Closed
Sec 2	Open	Open	Closed	Open
Sec 3	Open	Open	Open	Closed
Sec 4	Closed	Closed	Open	Open

12. Refer to **Figure 1** and set the option switches on the **AKM2 MXR1.**

    Note: To set the switch to "open" depress the rocker toward the side labeled **OPEN** in the figure. To set the switch to "closed" depress the rocker toward the side labeled **CLOSED** in the figure.

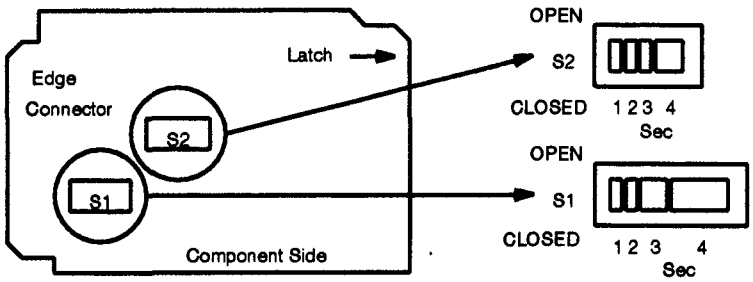


Figure 1. AKM2 MXR1 Option Settings

13. Remove the **AKM2 MXR1** to be replaced and install the replacement plug-in. Take care to avoid damaging the LED that protrudes through the opening in the faceplate of the plug-in.

14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

15. **Note:** The option switches on the replacement **AKM2B MXR2** or **AKM2C MXR3** must be set correctly when the plug-in is installed.

16. Determine from office records the desired settings of the option switches on the **AKM2B MXR2** or **AKM2C MXR3.**

    Note: If an **MC90191A1 TLM2** is installed and PM is being used, an **AKM2C MXR3** must be installed and option plugs **P3** and **P4** must be set for **C-Bit Mode.**

17. **Table C** indicates the option switch settings for the **AKM2B MXR2** or **AKM2C MXR3.**

Table C. MXR2 (AKM2B)/MXR3 (AKM2C) Option Switches

Switch	Electrical Operation		Optical Operation	
	S1	S2	S1	S2
Sec 1	Open	Open	Closed	Closed
Sec 2	Open	Open	Closed	Open
Sec 3	Open	Open	Open	Closed
Sec 4	Closed	Closed	Open	Open

18. Refer to **Figure 2** and set the option switches on the **AKM2B MXR2** or **AKM2C MXR3** as indicated in **Table C.**

    Note: To set the switch to "open" depress the rocker or slide the switch toward the side labeled **OPEN** in the figure. To set the switch to "closed" depress the rocker or slide the switch toward the side labeled **CLOSED** in the figure.

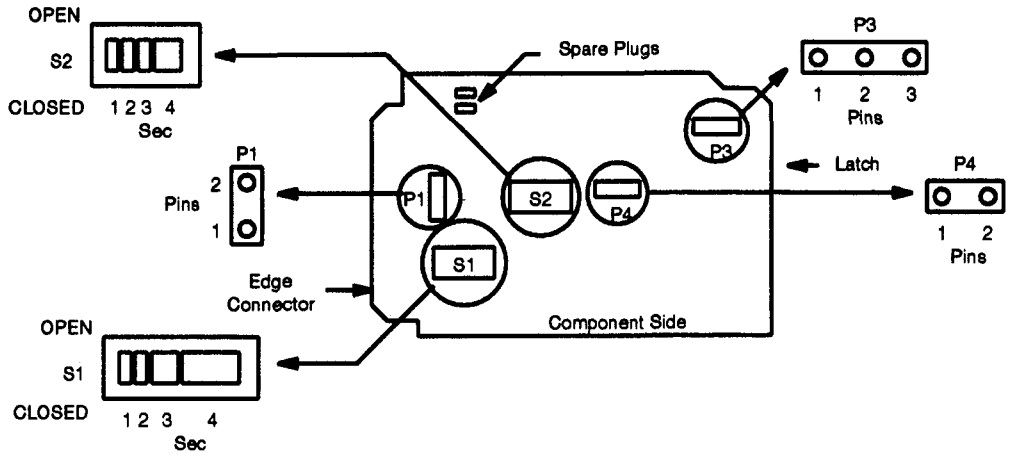


Figure 2. MXR2 (AKM2B)/MXR3 (AKM2C) OPTION SETTINGS

19. **Table D** and **Table E** indicate the option plug settings for the **AKM2B MXR2** or **AKM2C MXR3.**

Table D. MXR2 (AKM2B)/MXR3 (AKM2C) Option Plugs

Plug	Install a Jumper Between Pins	
	Electrical	Optical
P1	(none)	1 and 2

Table E. MXR2 (AKM2B)/MXR3 (AKM2C) Option Plugs

Plug	Install a Jumper Between Pins	
	C-BIT Mode	M13 Mode
P3	2 and 3	1 and 2
P4	1 and 2	(none)

20. Refer to **Figure 2** and install the option plugs on the **AKM2B MXR2 or AKM2C MXR3.**

21. Remove the **AKM2B MXR2 or AKM2C MXR3** to be replaced and install the replacement plug-in. Take care to avoid damaging the LED that protrudes through the opening in the faceplate of the plug-in.

22. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

23. **Note**: The option plugs on the replacement **AKM3 ELIU1** must be set correctly when the plug-in is installed.

24. Determine from office records the length of the DS3 cabling between the **DDM-1000** and the **DSX-3** cross-connect point.

25. **Table F** indicates the required LBO settings for the **AKM3 ELIU1**

Table F. ELIU1 (AKM3) LBO Selection

Cable Length (ft.)			Plug Settings
728B, 734A	KS-19224, L2 Mini-coax	735A	
0 to 225	0 to 75	0 to 125	LBO
>225	>75	>125	NO LBO

26. Refer to **Figure 3** and set the option plugs according to **Table F.**

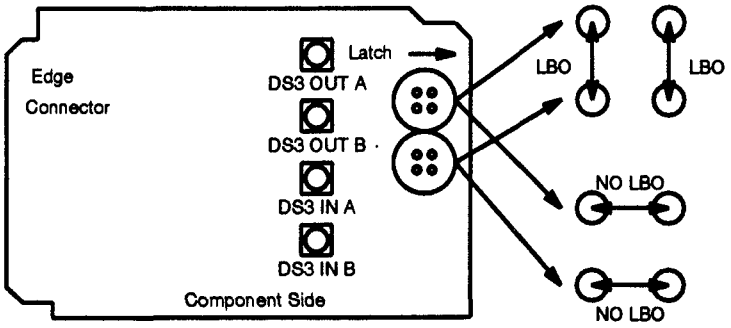


Figure 3. AKM3 ELIU1 Option Settings

27. **Note:** If **ELIU** is installed in an ED-2C841-30, G3 EMC shelf, the side cover must be removed, and the G32 mini-coax jumper cables must be disconnected from the **ELIU** before the **ELIU** is removed. Install the replacement **ELIU** in the reverse order. Ensure the G32 cables are connected to the proper connectors on the **ELIU.**

    Remove the **AKM3 ELIU1** to be replaced and install the replacement plug-in.

28. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

29. **Note**: The option switches on the replacement **LS INTFC** plug-in must be set correctly when the plug-in is installed.

30. Refer to **DP-425** and set the option switches on the **LS INTFC.**

31. ***Caution: It is important that you remove the* LS INTFC *to be replaced in one quick continuous motion to avoid an excessive interruption of the transmission path. The replacement plug-in should also be seated in one quick continuous motion for the same reason.***

    Remove the **LS INTFC** to be replaced.

32. Seat the replacement **LS INTFC.** Take care to avoid damaging the LED that protrudes through the opening in the faceplate of the plug-in.

33. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

34. **NOTICE:** Unterminated optical connectors may emit laser radiation. Do not view beam with optical instruments.

35. ***Warning 1: Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam.***

36. ***Warning 2: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.***

37. **Note 1**: When an OLIU is installed, the option switch(es) on the plug-in must be set correctly.

    Note 2: The 16E2 (OLIU10) can be used as a direct replacement for the 16E (OLIU1) and the 16F (OLIU2) providing the option switch is set the same as the OLIU being replaced. The 16F2 (OLIU9) can be used as a direct replacement for the 16G (OLIU3) providing the laser option switch is set the same as the OLIU being replaced.

38. Refer to **DP-424** and set the option switch(es) on the **OLIU.**

39. Disconnect the optical cables from the **OLIU** to be replaced.

40. Remove the **OLIU** to be replaced and install the replacement plug-in. Take care to avoid damaging the optical cable and the LED that protrudes through the opening in the faceplate of the plug-in.

41. Connect the optical cables to the replacement **OLIU.**

42. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

43. **Note**: The option switches on the replacement **AKM6 DS3U2** must be set correctly when the plug-in is installed. All current applications of the **DS3U2** use the same option switch settings.

44. **Table G** indicates the option switch settings for the **AKM6 DS3U2.**

Table G. AKM6 DS3U2 Option Switches

Switch	Setting
Sec 1	Closed
Sec 2	Closed
Sec 3	Open
Sec 4	Open
Sec 5	Open
Sec 6	Open
Sec 7	Closed
Sec 8	Closed

45. Refer to **Figure 4** and set the option switches on the replacement **AKM6 DS3U2.**

Note: To set the switch to "open" depress the rocker toward the side labeled **OPEN** in the figure. To set the switch to "closed" depress the rocker toward the side labeled **CLOSED** in the figure.

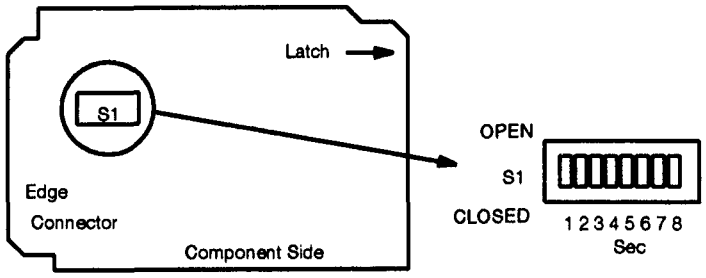


Figure 4. AKM6 DS3U2 Option Settings

46. Remove the **AKM6 DS3U2** and install the replacement **AKM6 DS3U2**. Take care to avoid damaging the LED that protrudes through the opening in the faceplate of the plug-in.

47. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

48. ***Caution: Inserting an* AKM4 TLM1 *in a DDM-1000 shelf that is cabled for* MC90191A1 TLM2 *performance monitoring may damage any* TLM2 *plug-ins that are installed in other DDM-1000 shelves in the same bay. It may also damage the telemetry remote monitoring system (such as the GTP).***

    Note: The option switches on the replacement **MC90191A1 TLM2** must be set correctly before the plug-in is installed.

49. From office records, determine the TABS address of the MC90191A1 TLM2 on the TABS serial telemetry link.

    Note: The addresses should be assigned in the order that the shelves appear in the bay (i.e., shelf 1, TABS address 1; shelf 2 TABS address 2; etc.).

50. **Table H** indicates the address selection switch settings for the MC90191A1 TLM2.

Table H. TLM2 (MC90191A1) Shelf (TABS) Address Selection

		Switch S3		
		Switch Section		
Shelf	TABS Address	1	2	3
Shelf 1	1	Closed	Closed	Closed
Shelf 2	2	Open	Closed	Closed
Shelf 3	3	Closed	Open	Closed
Shelf 4	4	Open	Open	Closed
Shelf 5	5	Closed	Closed	Open
Shelf 6	6	Open	Closed	Open
Shelf 7	7	Closed	Open	Open
Shelf 8	8	Open	Open	Open

51. Refer to **Figure 5** and set the address selection switches on the replacement **MC90191A1 TLM2**.

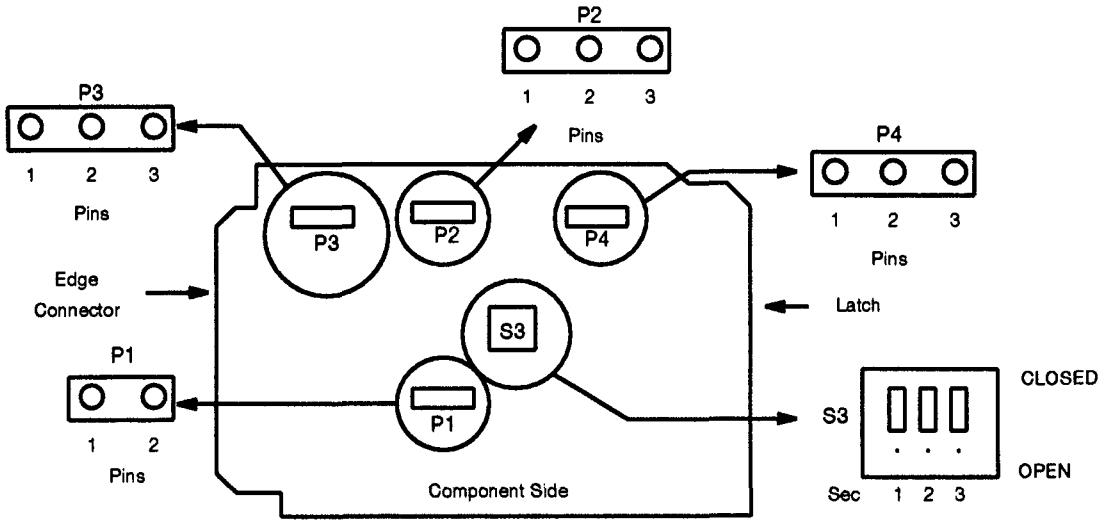


Figure 5. TLM2 (MC90191A1) Option Switches

52. **Note:** The TABS serial telemetry link must be terminated by the TLM2 with the highest (or only) TABS address in the bay. The remaining TLM2s in the bay must not terminate the link. For example, if the bay contains three TLM2s with shelf 1 having TABS address 1, shelf 2 having TABS address 2, and shelf 3 having TABS address 3, then the TLM2 in shelves 1 and 2 would be optioned not to terminate the link (not highest TABS address) and the TLM2 in shelf 3 would be optioned to terminate the link (highest TABS address).

Note: If a fourth TLM2 is later added to the bay in the above example, the TLM2 option settings in shelf 3 must be changed to remove the termination (no longer the highest TABS address). The TLM2 in shelf 4 must then be optioned to terminate the link (highest TABS address).

Table I indicates the option plug settings for the TLM2 address in the TABS link.

Table I. TLM2 (MC90191A1) Option Plugs

Plug	Install a Jumper Between Pins	
	TLM2 (Highest TABS Address)	TLM2 (*Not* Highest TABS Address)
P2	2 and 3	1 and 2
P4	2 and 3	1 and 2

53. Refer to **Figure 5** and set **P2** and **P4** option plugs on the **MC90191A1 TLM2**.

54. **Note:** Plugs P1 and P3 must always have the factory-installed jumpers connected between pins 1 and 2.

    Refer to **Figure 5**. Install jumper between pins 1 and 2 on **P1**. Install jumper between pins 1 and 2 on **P3**.

55. ***Caution: Take care to avoid damaging the LEDs that protrude through the opening in the faceplate of the plug-in.***

    Remove **MC90191A1 TLM2** and install replacement **MC90191A1 TLM2**.

    Response: The **RST/TEST** LED flashes on and off approximately five times and the **ALM** LED lights momentarily.

56. Momentarily depress the **RST** button on the TLM2 pack.

    Response: The **RST/TEST** LED flashes on and off approximately 7 seconds and then goes off.

57. Momentarily depress the **TEST** button on the TLM2 pack.

    Response: The **RST/TEST** LED flashes once and then goes off.

58. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

59. **Note:** One factory-installed option plug is on the DS3U1. This plug must be installed to cover the white portion of the socket. Two other options for setting parity and framing parameters are available through the ASCII terminal using the commands "**set-vmr-ds3u1:**" and "**set-frm-ds3u1:**".

    There are no other option plugs to be set on this plug-in. Seat the plug-in.

60. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Actuate Optional Features

1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

2. **Note:** It is assumed that an ASCII terminal is available.

3. Connect the ASCII terminal to the connector on the faceplate of the **PROCR**.

4. Refer to the Commands and Reports section of this User's Manual for the descriptions and syntax of the various optional features of the DDM-1000 available through the ASCII terminal. They can be found under the following listings:
   - **SET-DSX**
   - **SET-LSPROTN**
   - **SET-SHELF**

5. Determine from office records what options are required.

6. Set the options using the syntax of the Commands and Reports section of this User's Manual.

7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Check Office Alarms

1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

2. **Note**: It is assumed that you were sent here by another procedure to test the DDM-1000 alarms. These tests are intended to be performed with the DDM-1000 out of service.

3. Is an ASCII terminal available?

   If **YES,** then continue to **Step 4.**
   If **NO,** then do **Step 9.**

4. Connect the ASCII terminal to the connector on the faceplate of the **PROCR**.

5. Refer to the Commands and Reports section of this user's manual under **Test-Alarms** for a description of the tests.

6. Perform the alarm tests as described in the Commands and Reports section of this manual.

7. Did the **DDM-1000** pass the alarm tests?

   If **YES,** then continue to **Step 8.**
   If **NO,** then do **Step 20.**

8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

9. **Note**: It is assumed that the DDM-1000 is powered and running with loops at the low speed cross-connect and that the high speed terminations are either looped on themselves or connected in an end-to-end looped configuration. It is further assumed that no alarms or other diagnostic indications are activated.

10. Unseat the **MXR** in location **MULDEM A, SRV.**

11. Wait 30 seconds.

12. Is the minor **(MN)** alarm activated?

    If **YES,** then continue to **Step 13.**
    If **NO,** then do **Step 19.**

13. Leave the **MXR** in location **MULDEM A, SRV** unseated and now unseat the **MXR** in location **MULDEM A, PROTN.**

14. Wait 30 seconds.

15. Is the major **(MJ)** or critical **(CR)** alarm activated?

    If **YES,** then continue to **Step 16.**
    If **NO,** then do **Step 19.**

16. Reseat both the **SRV** and **PROTN MXRs** in **MULDEM A**. Take care to avoid damaging the LEDs protruding through the openings in the faceplates of the **MXRs**.

17. **Note**: Without an ASCII terminal, it is not possible to test the power minor (PMN) alarm.

18. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

19. Reseat both the **SRV** and **PROTN MXRs** in **MULDEM A**. Take care to avoid damaging the LEDs protruding through the openings in the faceplates of the **MXRs**.

20. The **DDM-1000** has failed the alarm test. The most likely source of the problem is the alarm wiring, itself. Check that the alarms are connected correctly. If the wiring is correct and the failure persists, refer to **TP-108** to clear the failure.

21. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Check Parallel Telemetry

1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

2. **Note**: It is assumed that you were sent here by another procedure to test the DDM-1000 parallel telemetry. These tests are intended to be performed with the DDM-1000 out of service.

3. Is an ASCII terminal available?

   If **YES,** then continue to **Step 4.**
   If **NO,** then do **Step 9.**

4. Connect the ASCII terminal to the connector on the faceplate of the **PROCR**.

5. Refer to the Commands and Reports section of this user's manual under **TEST-TLM** for a description of the tests.

6. Perform the parallel telemetry tests as described in the Commands and Reports section of this user's manual under

7. Did the **DDM-1000** pass the parallel telemetry tests?

   If **YES,** then continue to **Step 8.**
   If **NO,** then do **Step 19.**

8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

9. **Note**: It is assumed that the DDM-1000 is powered and running with loops at the low speed cross-connect and that the high speed terminations are either looped on themselves or connected in an end-to-end looped configuration. It is further assumed that no alarms or other diagnostic indications are activated.

10. **Note**: It is assumed that the DDM-1000 is connected to a telemetry system and that the state of the telemetry inputs and outputs to that system can be determined.

11. Unseat the **MXR** in location **MULDEM A, SRV.**

12. Is the minor **(MN)** alarm telemetry point activated?

    If **YES,** then continue to **Step 13.**
    If **NO,** then do **Step 18.**

13. Leave the **MXR** in location **MULDEM A, SRV** unseated and now unseat the **MXR** in location **MULDEM A, PROTN.**

14. Is the major **(MJ)** or critical **(CR)** alarm telemetry point activated?

    If **YES,** then continue to **Step 15.**
    If **NO,** then do **Step 18.**

15. Reseat both the **SRV** and **PROTN MXRs** in **MULDEM A**. Take care to avoid damaging the LEDs that protrude through the openings in the faceplates of the **MXRs**.

16. The remaining telemetry points can be tested in the same manner. For example, to check the **LS** telemetry point an **LS INTFC** plug-in can be unseated, and so forth.

17. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

18. Reseat both the **SRV** and **PROTN MXRs** in **MULDEM A**. Take care to avoid damaging the LEDs that protrude through the openings in the faceplates of the **MXRs**.

19. The **DDM-1000** has failed the parallel telemetry test. The most likely source of the problem is the telemetry wiring, itself. Check that the telemetry is connected correctly. If the wiring is correct and the failure persists, refer to **TP-108** to clear the failure.

20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Check TBOS Serial Telemetry

1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

2. **Note**: It is assumed that the DDM-1000 under test is powered and running in a looped-back configuration and that no alarms or other diagnostic indicators are activated.

3. **Note**: It is assumed that the DDM-1000 under test is connected to a serial telemetry system and that access to the central telemetry equipment is available.

4. At the central telemetry equipment send a message to the DDM-1000 to "Lock Function Unit & HS Interface Switch, Muldem A (NE)" **(Command 45).**

5. Is scan point **63 (VALID COMMAND RECD)** raised?

   If **YES,** then continue to **Step 6.**
   If **NO,** then do **Step 12.**

6. **Note:** Verify that the correct shelf, in the correct bay, is responding with a lighted **ABN** LED.

   Are scan points **29 [MAN FUNCTION INITIATED (NE)]** and **57 [HS MAN LOCK (NE)]** raised?

   If **YES,** then continue to **Step 7.**
   If **NO,** then do **Step 12.**

7. At the central telemetry equipment send a message to the DDM-1000 to "Unlock Function Unit & HS Interface Switch, Muldem A (NE)" **(Command 46).**

8. Is scan point **63 (VALID COMMAND RECD)** raised?

   If **YES,** then continue to **Step 9.**
   If **NO,** then do **Step 12.**

9. Are scan points **29 [MAN FUNCTION INITIATED (NE)]** and **57 [MAN HS LOCK (NE)]** retired?

   If **YES,** then continue to **Step 10.**
   If **NO,** then do **Step 12.**

10. The **DDM-1000** has passed the serial telemetry test.

11. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

12. The **DDM-1000** has failed the serial telemetry test. A likely source of the trouble is the telemetry wiring. Check the connections. If the wiring is correct and the trouble persists, refer to **TP-108** to clear the failure condition.

13. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Check Overhead Telemetry

1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

2. **Note:** It is assumed that an end-to-end DDM-1000 system is powered and running and that no alarms or other diagnostic indicators are activated.

3. **Note:** It is assumed that the equipment and/or indicators that are to be used with the overhead telemetry system are connected to the DDM-1000s at each end of the system.

   Ensure far-end communications (fecom) is enabled (**DP-435**).

4. At the equipment providing each input to the DDM-1000, activate the function that should cause a response at the far-end equipment.

5. At the far-end equipment, was the expected response received?

   If **YES,** then continue to **Step 6.**
   If **NO,** then do **Step 9.**

6. Repeat **Steps 4 and 5** for each of the overhead telemetry circuits used in this application.

7. The DDM-1000 has passed the overhead telemetry tests.

8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

9. The DDM-1000 has failed the overhead telemetry tests. The most likely source of the problem is the telemetry wiring, itself. Check that the telemetry is connected correctly. If the wiring is correct and the failure persists, refer to **TP-108** to clear the failure condition.

10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Connect Fan Assembly

1. Is the DDM-1000 being installed in an 80-type cabinet with a Series 5 Power Shelf, 2A FAN, and 111A control unit?

   If **YES**, then proceed to **Step 10**.
   If **NO**, then continue with **Step 2**.

2. **Note**: It is assumed that the ED-2C834-30 fan assembly has been installed below the DDM-1000 (per **IP-207**) and that the office battery and battery return have been connected to the fan assembly.

3. Is the **DDM-1000** equipped with an **ED-2C833-20** front access cable assembly or an **ED-2C843-30** wire-wrap assembly?

   If **ED-2C833-20** front access cable assembly, then continue with **Step 4.**
   If wire-wrap assembly, then proceed to **Step 7.**

4. Locate the plug **PFAN** on the **ED-2C833** front access cable assembly.

5. Connect the plug **PFAN** to the jack **JFAN** on the **ED-2C834-30** fan assembly.

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. Locate the jack **JFAN** on the end of a cable connected to the **ED-2C834-30** fan assembly. Cut the jack from the end of the cable and discard it.

8. Wire wrap the remaining cable to **Pins N5** and **N6** on the **ED-2C843-30** wire-wrap assembly. The polarity does not matter.

9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

10. **Note 1:** It is assumed that the DDM-1000 is installed in an 80-Type cabinet using the ***SLC***® Series 5 carrier system 2A FAN and 111A control unit.

    Note 2: For more information on installation of DDM-1000 and ***SLC*** Series 5 Carrier in outside enclosures and cabinets, refer to the 640 Division of outside plant AT&T Practices (for example, AT&T 640-250-255).

    Note 3: For more information on installation of ***SLC*** Series 5 Carrier systems, refer to the 363 Division of loop transmission systems AT&T Practices (for example, AT&T 363-205-401).

    Ensure 111A control unit plug **P115** is connected to 2A FAN jack **J115-1**. See **Figure 1**.

11. Ensure 2A FAN plug **P114** is connected to the SERIES 5 POWER SHELF jack **J114-2**.

12. Ensure POWER SHELF jack **J108A-2** is connected to the Interface Cable (comcode 845861327) plug **P108A-2**.

13. If **PROCR1** is being used, disconnect plug **P108F** from jack **J108F**. Connect 111A plug **P108F** to jack **J108G** to allow the power alarms to reach the CO by a direct backplane connection to the DDM-1000 overhead telemetry.

14. Connect DDM-1000 cable ED-2C833-20, G13 (G1 or G2 shelf) or G30 (G3 EMC shelf) plug **P101** to jack **J108C** of the 80-type cabinet Interface Cable Assembly.

15. If this is a 180 Mb/s system with both shelves powered from the same Series 5 Power Shelf and sharing the same 2A FAN, unplug **P38** at the second shelf of the 180 Mb/s DDM-1000 shelf.

16. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

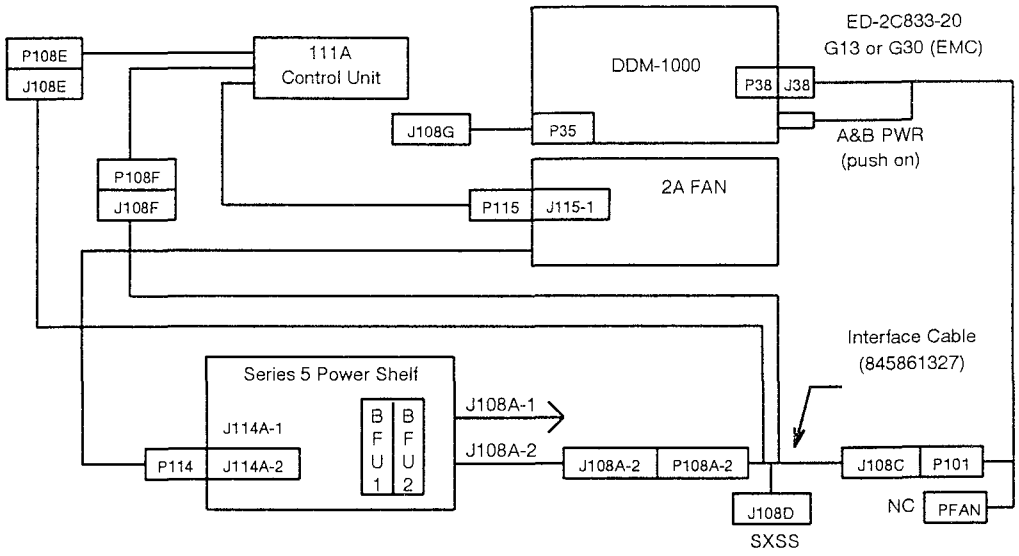


Figure 1. DDM-1000 Power Cabling in 80-Type Cabinet

Set OLIU Attenuation

1. **NOTICE:** Unterminated optical connectors may emit laser radiation. Do not view beam with optical instruments.
2. ***Warning 1: Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam.***
3. ***Warning 2: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.***
4. **Note 1:** It is assumed that the loss of the optical facility is known from office records or that a measurement has been made.
5. From office records, or by measurement, determine the loss of the optical facility.
6. Determine the code of OLIU installed at each end of the facility.
7. Determine setting of the option switch for the OLIU. **Table A** and **Table B** specify the setting of the option switch for the 16-Type and 20-Type OLIU at the **HEAD END** of the facility. **Table C** specifies attenuators that can be used to insert at the receive end of the fiber to build out facility losses between 0 dB and the minimum losses specified under the **LW** switch settings.

Table A. 16-Type OLIU Option Switch Settings

		Transmitter Switch	
		LW	HI
Transmitter	Receiver	Facility Loss	
16E or 16F	16E	0 to 9 dB	9 to 18.0 dB
16E or 16F	16E2, or 16F2	0 to 11 dB	11 to 23.0 dB
16E or 16F	16F,16G or 16K	0 to 11 dB	11 to 22.5 dB
16E2	16E	0 to 9 dB	9 to 17.5 dB
16E2	16E2 or 16F2	0 to 11 dB	11 to 22.5 dB
16E2	16F, 16G, or 16K	0 to 11 dB	11 to 22.0 dB
16F2	16E	8 to 15 dB	15 to 23.9 dB
16F2	16E2 or 16F2	0 to 15 dB	15 to 28.9 dB
16F2	16F, 16G, or 16K	8 to 15 dB	15 to 28.4 dB
16G	16E	7 to 15 dB	15 to 24.0 dB
16G	16E2 or 16F2	0 to 11 dB	11 to 29.0 dB
16G	16F, 16G or 16K	7 to 15 dB	15 to 28.5 dB
16K	16E	13 to 21 dB	21 to 30.0 dB
16K	16E2 or 16F2	7 to 15 dB	15 to 35.0 dB
16K	16F, 16G, or 16K	13 to 22 dB	22 to 34.5 dB

Table B. 20-Type OLIU Output Level Switch Settings

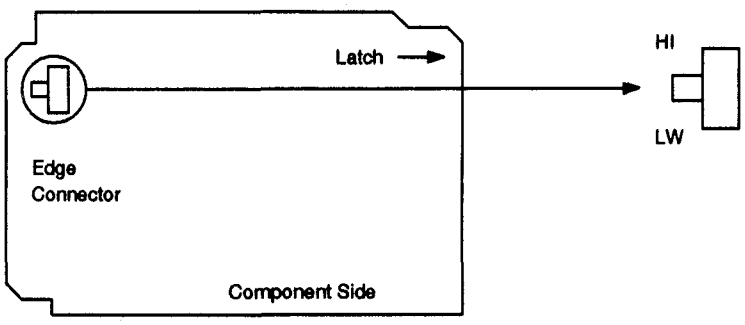
		Transmitter Switch	
		LW	HI
Transmitter	Receiver	Facility Loss	
20E	20E	0 to 9.0 dB	9 to 15.0 dB
20G	20E	7 to 14.5 dB	14.5 to 20.7 dB
20G	20G or 20K	10 to 20.5 dB	20.5 to 26.5 dB
20K	20E	10 to 17.5 dB	17.5 to 24.0 dB
20K	20G or 20K	13 to 23.5 dB	23.5 to 29.8 dB
20E	20G or 20K	4.3 to 14.8	14.8 to 20.8

Table C. Attenuators

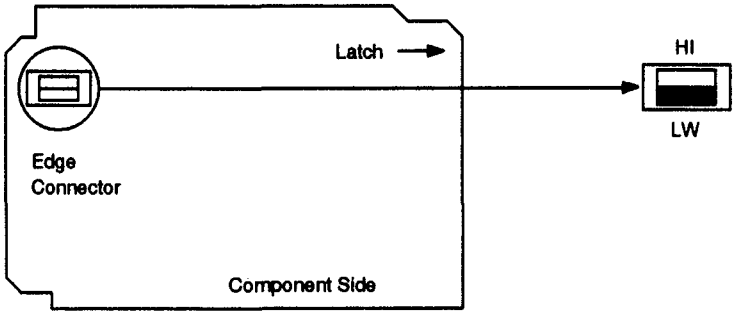
In-line Build-outs (Note)		Barrel Build-outs (Note)	
SM to MM	MM to MM	SM to MM	MM to MM
602A 3 dB	502A 5 dB	601A1 3 dB	501A1 5dB
602B 5 dB	502B 7 dB	601B1 5 dB	501B1 7dB
602C 7 dB	502C 9 dB	601C1 7 dB	501C1 9dB
602D 9 dB	502D 11 dB	601D1 9 dB	501D1 11dB
602E 11 dB	502E 13 dB	601E1 11 dB	501E1 13dB
602F 14.5 dB	502F 15 dB	601F1 14.5 dB	501F1 15dB

Note: SM-single mode MM-multimode

8. Refer to **Figure 1** and set the option switch as indicated in **Table A** or **Table B.**



A. OLIU 16E, 16F, 16G or 16K



B. OLIU 16E2 or 16F2

Figure 1. OLIU (All 16-Type) Option Switches

9. Is OLIU a 20-Type OLIU?

   If **YES**, then continue with **Step 10.**
   If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

10. **Figure 2** is a cutaway illustration showing the LED option switch in the **20-Type OLIU**. Access to the switch is gained by raising the ejector lever. The switch is illustrated in the **UP** position.

11. Is the **OLIU** to be installed in the upper or the lower **DDM-1000** assembly?

    If **UPPER**, then set the LED option switch on the replacement **20-Type OLIU** to the **UP** position.
    If **LOWER**, then set the LED option switch on the replacement **20-Type OLIU** to the **DOWN** position.

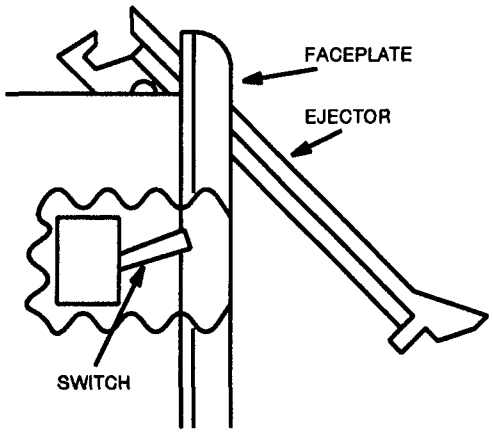


Figure 2. 20-Type OLIU LED Option Switch

12. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Set LS INTFC Options

1. **Note**: It is assumed that you have been sent here by another procedure with instructions to set the option switches on an LS INTFC plug-in **AEK36**-type, **AEK37**, or **AEK38**.

2. What type of LS INTFC plug-in are you working with?

   If **AEK36 DS1 INTFC1**, then continue with **Step 3**.
   If **AEK36B**-type or **AEK36C DS1 INTFC2**, then proceed to **Step 6**.
   If **AEK37 DS1C INTFC1**, then proceed to **Step 9**.
   If **AEK38 DS2 INTFC1**, then proceed to **Step 12**.

3. **Note**: The **AEK36 and AEK36B-type DS1 INTFC1** are rated DA.

   The settings for the option switches on the **AEK36 DS1 INTFC1** are indicated in **Tables A** and **B.** Sections 1 through 5 are set according to the length of DS1 cabling between the **DDM-1000** and the **DSX-1** cross-connect. Sections 6 through 9 are set for the type of coding of the DS1 signal required (B8ZS or AMI).

Table A. AEK36-type LBO Settings

Cable Length (ft)	DIP Switch Settings				
	Sec 1	Sec 2	Sec 3	Sec 4	Sec 5
0 to 133	Closed	Open	Open	Open	Open
>133 to 267	Open	Closed	Open	Open	Open
>267 to 400	Open	Open	Closed	Open	Open
>400 to 533	Open	Open	Open	Closed	Open
>533 to 655	Open	Open	Open	Open	Closed

Table B. AEK36 Code Settings

Format	DIP Switch Settings			
	Sec 6 (Chan 1)	Sec 7 (Chan 2)	Sec 8 (Chan 3)	Sec 9 (Chan 4)
B8ZS	Open	Open	Open	Open
AMI	Closed	Closed	Closed	Closed

4. Refer to **Figure 1** and set the option switches according to **Tables A and B.**

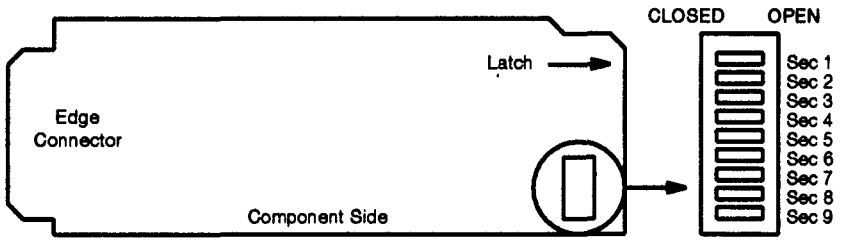


Figure 1. AEK36 DS1 INTFC1 Option Settings

Note: To set the switch to "open" depress the rocker toward the side labeled **OPEN** *in the figure. To set the switch to "closed" depress the rocker toward the side labeled* **CLOSED** *in the figure.*

5. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

6. The settings for the option switches on the **AEK36B**-type and **AEK36C DS1 INTFC2** are indicated in **Tables C** and **D.** Sections 1 through 3 are set according to the length of DS1 cabling between the **DDM-1000** and the **DSX-1** cross-connect. Sections 4 through 7 are set for the type of coding of the DS1 signal required (B8ZS or AMI). Switch section 8 is unused.

Table C. AEK36B-types and AEK36C LBO Settings

Cable Length (ft)	DIP Switch Settings		
	Sec 1	Sec 2	Sec 3
0 to 133	Open	Open	Open
>133 to 267	Open	Open	Closed
>267 to 400	Open	Closed	Open
>400 to 533	Open	Closed	Closed
>533 to 655	Closed	Open	Open

Table D. AEK36B-types and AEK36C Code Settings

Format	DIP Switch Settings			
	Sec 4 (Chan 1)	Sec 5 (Chan 2)	Sec 6 (Chan 3)	Sec 7 (Chan 4)
B8ZS	Open	Open	Open	Open
AMI	Closed	Closed	Closed	Closed

7. Refer to **Figure 2** for the **AEK36B** or **Figure 3** for the **AEK36B S1:2, S1:3, S1:4,** or the **AEK36C** and set the option switches according to **Tables C and D.** Note that the eighth switch section is unused.

   Note: To set the switch to "open" move the slide toward the side labeled **OPEN** in the figure. To set the switch to "closed" move the slide toward the side labeled **CLOSED** in the figure.

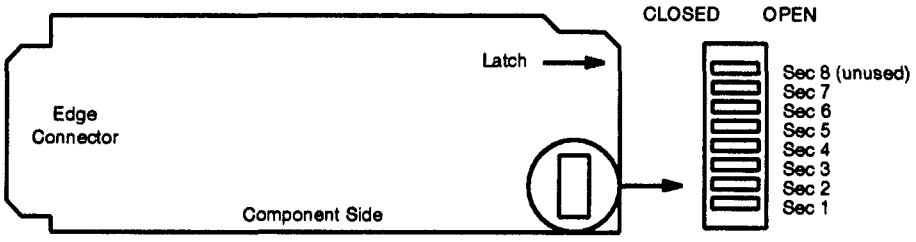


Figure 2. AEK36B DS1 INTFC2 Option Switch Location

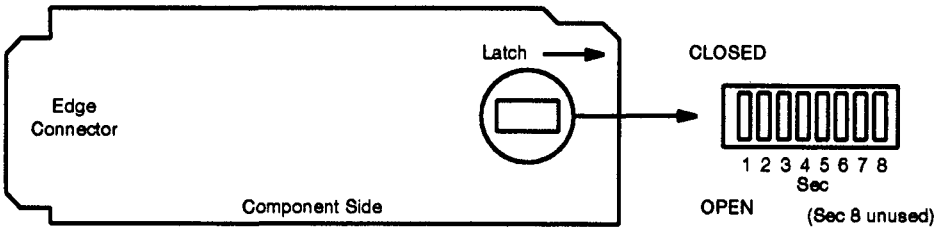


Figure 3. DS1 INTFC2 (AEK36B S1:2, S1:3, S1:4 and AEK36C) Option Switch Location

8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

9. The settings for the option switches on the **AEK37 DS1C INTFC1** are indicated in **Tables E** and **F** below. Sections 1 through 5 are set according to the length of DS1C cabling between the **DDM-1000** and the **DSX-1C** cross-connect. Sections 6 and 7 are set for the type of coding of the DS1C signal required (B8ZS or AMI). Switch section 8 is unused.

Table E. AEK37 LBO Settings

Cable Length (ft)	DIP Switch Settings				
	Sec 1	Sec 2	Sec 3	Sec 4	Sec 5
0 to 133	Closed	Open	Open	Open	Open
>133 to 267	Open	Closed	Open	Open	Open
>267 to 400	Open	Open	Closed	Open	Open
>400 to 533	Open	Open	Open	Closed	Open
>533 to 655	Open	Open	Open	Open	Closed

Table F. AEK37 Code Settings

Format	DIP Switch Settings	
	Sec 6 (Chan 1)	Sec 7 (Chan 2)
B8ZS	Open	Open
AMI	Closed	Closed

10. Refer to **Figure 4** and set the option switches according to **Tables E and F. Note that switch section 8 is unused.**

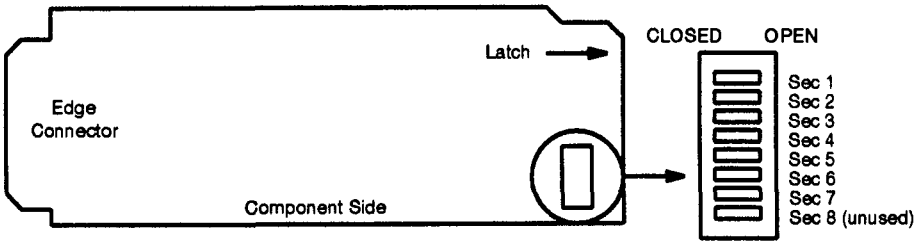


Figure 4. AEK37 DS1C INTFC1 Option Settings

Note: To set the switch to "open" depress the rocker toward the side labeled **OPEN** in the figure. To set the switch to "closed" depress the rocker toward the side labeled **CLOSED** in the figure.

11. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

12. The settings for the option switches on the **AEK38 DS2 INTFC1** are indicated in **Table G.** Sections 1 through 3 are set according to the length of DS2 cabling between the **DDM-1000** and the **DSX-2** cross-connect.

Table G. AEK38 LBO Settings

LBO Selection			
Cable Length (ft)	Sec. 1	Sec. 2	Sec. 3
0 to 150	Closed	Closed	Closed
>150 to 300	Open	Closed	Closed
>300 to 450	Closed	Open	Closed
>450 to 600	Open	Open	Closed
>600 to 750	Closed	Closed	Open
>750 to 900	Open	Closed	Open
>900 to 1050	Closed	Open	Open

13. Refer to **Figure 5** and set the option switches according to **Table G.**

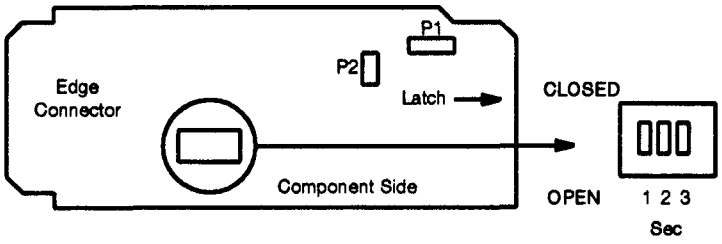


Figure 5. AEK38 DS2 INTFC1 Option Settings

Note: Factory installed plugs **P1** and **P2** should be present.

14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Connect Office Alarms

1. **Note:** Office alarms are intended to be used in applications with either rear cable access for the DDM-1000 or with the ED-2C843-30 wire-wrap panel. There is no provision for connecting to office alarm points if the ED-2C833-20 front access cable assemblies are installed.

2. **Note:** When more than one DDM-1000 in a framework is to be connected to an office alarm system, the bottom DDM-1000 is connected to the alarm system and the other DDM-1000s are connected in a daisy chain arrangement to this first DDM-1000.

   Caution: An Alarm Isolation Unit (AIU) is required between the bottom (first) shelf and the office alarm system. For information and mounting arrangements see "Alarm Precautions" in the SPECIFICATIONS section of this manual.

   Install an AIU on the left bay upright in the baffle space above the second or fourth DDM-1000 shelf.

3. Is the **DDM-1000** equipped with the **ED-2C843-30** wire-wrap assembly?

   If **YES,** then continue to **Step 4.**
   If **NO,** then do **Step 10.**

4. Refer to the tables under INTERCONNECTION SPECIFICATIONS in the **SPECIFICATIONS** section of this user's manual for the listing of the office alarm connections.

5. Connect the first **DDM-1000** to the office alarm system by wire-wrapping to the appropriate pins on the right side of the **ED-2C843-30** wire-wrap assembly.

6. Are there other **DDM-1000s** in the same framework to be connected to the office alarm system?

   If **YES,** then continue to **Step 7.**
   If **NO,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. Wire-wrap from each pin connected to the office alarm system in **Step 5** to the same pin on the next **DDM-1000.**

8. Repeat **Step 7** for any additional **DDM-1000s** in the same framework to be connected to the office alarm system.

9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

10. Is an AIU being added to an existing alarm connection?

    If **YES**, then continue to **Step 11.**
    If **NO**, then proceed to **Step 12.**

11. See **Figure 1.** Disconnect jack **J30** of the **G6** (**G601** or **G602**) alarm cable from **P30** of the bottom (first) DDM-1000 shelf.

12. ***Caution: Use care when installing the power connector to DDM-1000 backplane. Wiring errors may be service affecting. To avoid short circuits, use a non-metallic tool (such as an orange stick) when installing the 13A retainers on the backplane.***

    Note 1: Power should be connected to the AIU before installing the input/output cables. Otherwise, the critical and major alarms may be activated.

    Note 2: Refer to "Alarm Precautions" in the SPECIFICATIONS section of this manual for connection and descriptive information on the AIU.

    See **Figure 2.** Connect AIU power cable to bottom (first) shelf backplane **PWR SRV** connector.

13. Connect jack **J30** of the **ED-2C833-20, G701** cable from the AIU to plug **P30** on the backplane of the bottom (first) shelf. It is necessary to push the retainer slightly to the side to align the jack with the backplane pins. The jack will snap solidly into place when it is properly seated.

14. Refer to **Figure 2.** Dress and tie the cabling along the horizontal and vertical protecting bars attached to the backplane.

15. See **Figure 1.** Connect the **G6** (**G601** or **G602**) alarm cable jack **J30** to **P30** on the AIU.

16. Refer to **DP-431** and route the cable along the back of the frame upright to the top of the bay.

17. Are there other **DDM-1000s** in the same framework to be connected to the office alarm system?

    If **YES,** then continue to **Step 18.**
    If **NO,** then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

18. Connect the **ED-2C833-20, G7** cable between the first and second **DDM-1000's** as follows: **J33** on the cable is connected to **P33** on the backplane of the lower (first) **DDM-1000 J30** on the cable is connected to **P30** on the backplane of the upper (second) **DDM-1000.**

19. Refer to **Figure 1.** Dress and tie the cabling to the horizontal and vertical protecting bars attached to the backplane.

20. Repeat **Steps 18** and **19** for any further **DDM-1000s** in the same framework to be connected to the office alarm system.

21. **STOP. YOU HAVE COMPLETED THIS PROCEDURE**

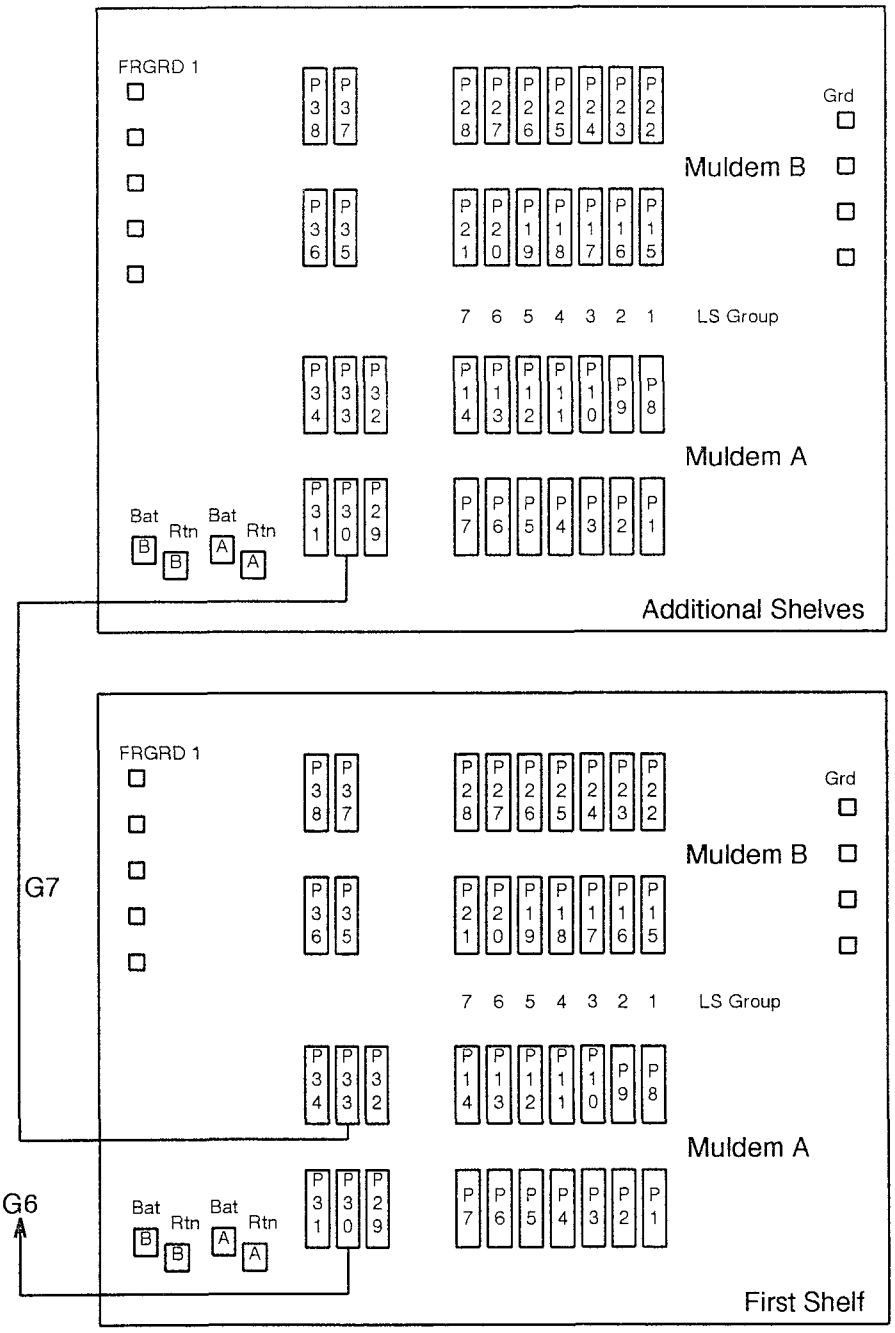


Figure 1. Intershelf Office Alarm Cabling

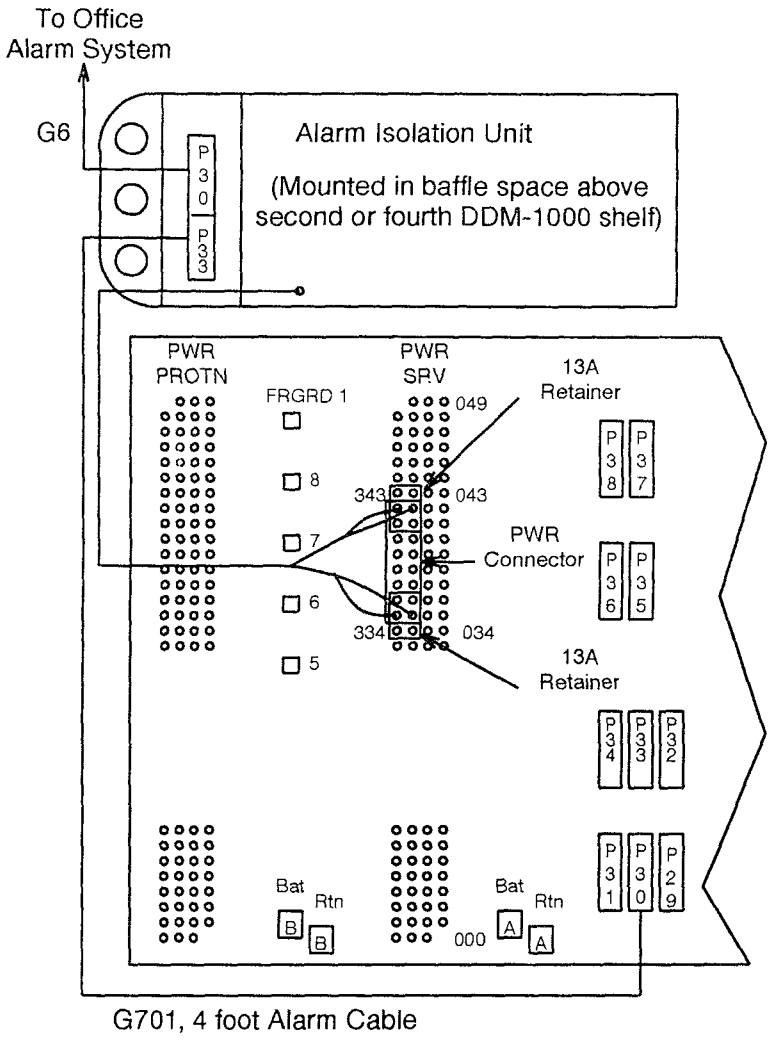


Figure 2. Alarm Isolation Unit Cabling to First Shelf

Connect Frame Ground

1. Is the **DDM-1000** equipped with an **ED-2C843-30** wire-wrap assembly or an **ED-2C833-20** front access cable assembly?

   If **NEITHER,** then continue to **Step 2.**
   If **ED-2C843-30** wire-wrap assembly, then do **Step 7.**
   If **ED-2C833-20** front access cable assembly, then do **Step 10.**

2. Locate one 12-24 X 1/2" machine screw, lockwashers, and the frame ground cable supplied in the installation kit packed with the **DDM-1000.** This is the short cable with a slip-on receptacle on one end and a ring lug on the other end.

3. Connect the slip-on receptacle of the frame ground cable to the **FR GRD** lug on the backplane of the **DDM-1000.** This lug is located near the upper left corner of the backplane.

4. Use the 12-24 X 1/2" screw and lockwasher to secure the ring lug on the other end of the frame ground cable to the back of the bay frame upright. Take care to ensure a good electrical connection.

   Note: It is recommended to slide the external star washer on the screw first and then the ground lug. Local practices may be different; therefore, an internal star washer is also provided. Also, it is acceptable to make the ground connection to the front of the bay frame upright, if required, although this may detract from the appearance of the installation.

5. If you have an ED-2C841-30 G3 EMC shelf and no further access is required to the backplane, install the rear cover. Ensure ferrite beads on the low speed cable connections are placed flat as possible and to the right side of the connector retainers. Attach the cover and secure to the shelf side brackets with 4 screws on each side.

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

7. **Note**: The ED-2C843-30 wire-wrap assembly is equipped with a black 20AWG wire terminated with a lug. This wire is located at the right side of the assembly.

8. Solidly attach this lug to the bay frame upright taking care to ensure a good electrical connection.

9. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

10. **Note**: The ED-2C833-20, G13 front access cable assembly is equipped with connections for the frame ground.

11. At the front of the **DDM-1000** connect the black lead with the ring lug to the bay frame upright taking care to ensure a good electrical connection.

12. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Attach Front-Access Cable Assembly

1. Is shelf an ED-2C841-30, G3 EMC shelf?

   If **YES**, then proceed to **Step 9**.
   If **NO**, then continue with **Step 2**.

2. Remove the **ED-2C833-20, G10 (G14) and G11 (G15)** front-access cable assemblies from its shipping carton and inspect for visible damage.

3. Connect jacks **J1** through **J32, J35, J37** and **J38** on the front-access cable assembly to plugs **P1** through **P32, P35, P37** and **P38** on the backplane of the **DDM-1000,** respectively.

4. Dress the cabling along the horizontal and vertical protecting bars attached to the backplane. **DO NOT** tie down the individual wires terminating in slip-on connectors.

5. **Note:** At this time each of the remaining individual wires fans out of the cable bundles alongside the appropriate lug on the backplane.

6. Connect the slip-on lugs on the individual wires to the terminals on the DDM-1000 backplane in the following order: **FRGRD1, GRD8, GRD7, GRD6, GRD5, BAT B, BAT B RTN, BAT A, BAT A RTN, GRD4, GRD3, GRD2** and **GRD1.**

7. Verify that a **RED** wire is connected to **BAT A** and to **BAT B** and that a **BLACK** wire is connected to **BAT A RTN** and to **BAT B RTN.**

8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

9. Remove the **ED-2C833-20, G28 and G29** front-access cable assemblies from the shipping carton and inspect for visible damage.

10. Attach cable tie mounting pads to the backplane at locations (6) shown in **Figure 1**.

11. Connect jacks **J1** through **J32, J35, J37** and **J38** on the front-access cable assembly to plugs **P1** through **P32, P35, P37** and **P38** on the backplane of the **DDM-1000,** respectively.

12. **Note:** The following is necessary to assure compliance with EMI requirements and to allow easy installation of the rear cover.

    Position the square ferrite beads on the ends of the cable assembly as close as possible to the backplane (**Figure 1**). Place the beads flat (parallel to the backplane) in the open space to the right of the connector retainers.

13. On the unused pins in the center left of the backplane, ensure dummy 963P-type connectors are installed on the pins which will be under the cables that exit center left.

14. Dress the cabling as shown in **Figure 1**. Use cable ties on the cable tie mounting pads to secure the cable to the backplane. Position the round ferrite beads just outside the shelf exit as close as possible to the shelf. **DO NOT** tie down the individual wires terminating in slip-on connectors.

15. **Note**: At this time each of the remaining individual wires fans out of the cable bundles alongside the appropriate lug on the backplane.

16. Connect the slip-on lugs on the individual wires to the terminals on the DDM-1000 backplane in the following order: **FRGRD1, GRD8, GRD7, GRD6, GRD5, BAT B, BAT B RTN, BAT A, BAT A RTN, GRD4, GRD3, GRD2** and **GRD1.**

17. Verify that a **RED** wire is connected to **BAT A** and to **BAT B** and that a **BLACK** wire is connected to **BAT A RTN** and to **BAT B RTN.**

18. ***Caution: When installing the rear cover, ensure cables are properly placed in the shelf exits. Take care not to pinch or bind the cable assemblies.***

    If no further access is required to the backplane, install the rear cover. Ensure ferrite beads on the low speed cable connections are placed flat as possible and to the right side of the connector retainers. Attach the cover and secure to the shelf side brackets with 4 screws on each side.

19. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

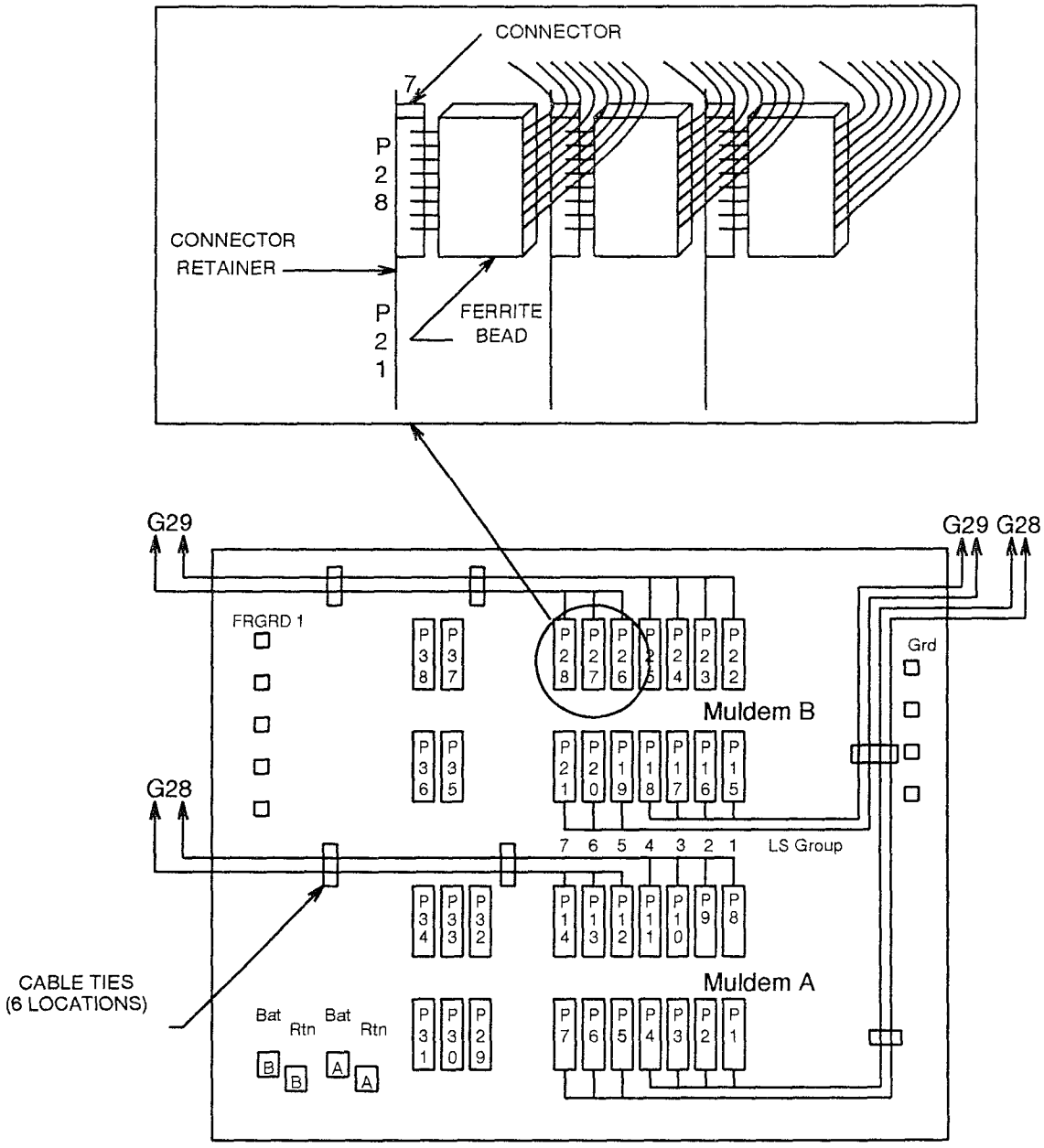


Figure 1. ED-2C841-30, G3 EMC Shelf Front Access Cabling

Connect DDM-1000 to Optical Facility

1. **NOTICE:** Unterminated optical connectors may emit laser radiation. Do not view beam with optical instruments.
2. ***Warning 1: Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam.***
3. ***Warning 2: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.***
4. **Note**: It is assumed that the OLIUs are installed in the DDM-1000. It is further assumed that optical jumpers will be used to connect the DDM-1000 to an optical interconnection point.
5. Locate the plastic retaining clip **(KKL-8 Kwik Klip)** included in the installation kit. Peel the protective paper from the adhesive on the back and apply the retaining clip to the left side of the **DDM-1000** assembly, level with the bottom of the OLIUs, and oriented so that the optical pigtails of the OLIUs can pass horizontally through the clip.
6. ***Caution: When handling the optical pigtails or jumpers take care to minimize the bending radius.***
7. Route the optical pigtails through the projecting bracket at the lower, left, front corner of the **DDM-1000** and up through the retaining clip just installed.
8. **Note**: The optical pigtail labeled **OUT** is the output from the OLIU. The pigtail labeled **IN** is the input to the OLIU.
9. Using a **1012A** Single-Mode Lightguide Connector Coupling, connect the output pigtail (labeled **OUT**) to a **LS1A-( )** Single-Mode Optical Jumper.
10. Using a **1002A** Multimode Lightguide Connector Coupling, connect the input pigtail (labeled **IN**) to a **LA1A-( )** Multimode Optical Jumper.

11. **Note**: The input connections may also be made with the equivalent single-mode coupling and jumper. However, these components are considerably more expensive than their multimode counterparts and offer no performance advantage on the input side. The output connections MUST be made using the single-mode coupling and jumper.

12. Route the optical jumpers up along the front of the bay framework. Secure them to the bay framework following local practices.

13. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Attach ESD Warning Label

1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

2. Locate the ESD Warning Label included in the installation kit. The label is shown in **Figure 1.**

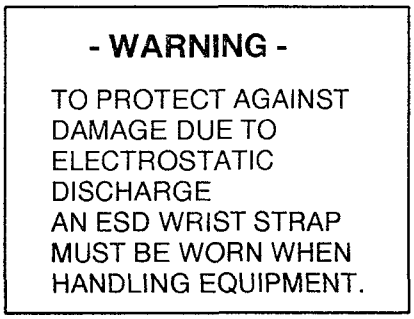


Figure 1. ESD Warning Label

3. Peel the protective paper from the back of the label and attach the label to the front of the bay frame upright immediately above the right hand mounting bracket of the **DDM-1000** as shown in **Figure 2** on the next page.

4. **Note**: In some front-access configurations it will not be possible to attach the ESD warning label to the front of the bay frame upright. As an alternative, the label may be attached to the side of the assembly in a position where a user will see it.

5. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

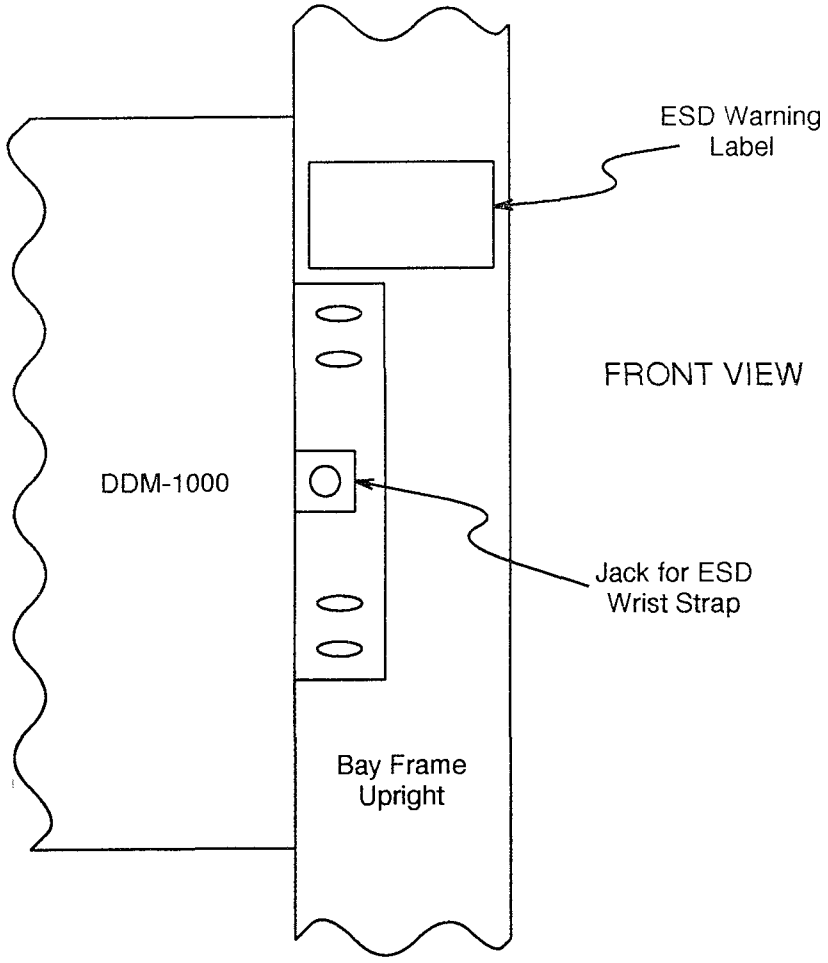


Figure 2. ESD Warning Label Location

Route Cables to Top of Bay

1. **Note**: Care in cable routing and placement is necessary when a full complement of eight DDM-1000 assemblies is to be installed in a bay. The first DDM-1000 assembly is to be installed at the bottom of the bay. Additional assemblies are to be installed sequentially, from bottom to top. The low speed I/O and the alarm and telemetry cables should be dressed tightly in the flange duct area. The cable stacking order (as shown in **Figure 1** should be:
   - — Low speed, alarm and telemetry cables nearest the wide flange.
   - — Battery and return feeders and the inter-shelf cabling to the rear of the narrow flange. Clear access to the power and ground feeders is necessary if they are to be gutter tapped for powering each assembly.
2. **Note**: If a bay is not precabled it is recommended that, as additional assemblies are added, previously installed cable ties be cut away and new cabling added to the existing cable bundle. This will allow the maximum packing in the cabling duct.
3. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

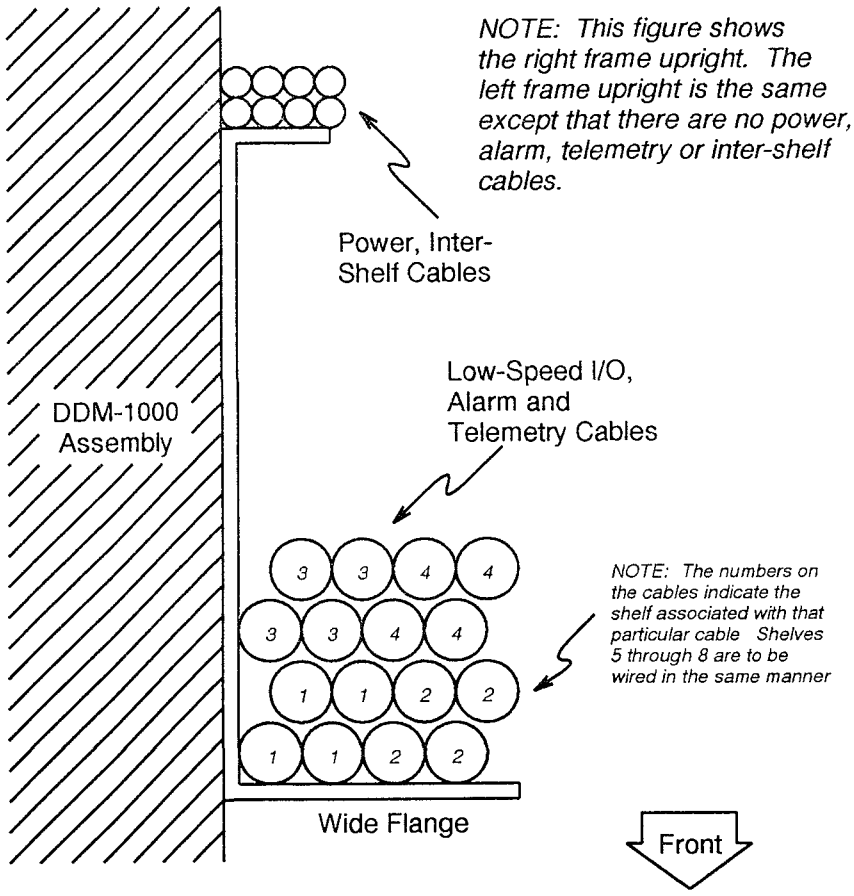


Figure 1. Cable Placement

Perform DS3U2 Looped-Back Test (Optical)

1. **NOTICE:** Unterminated optical connectors may emit laser radiation. Do not view beam with optical instruments.

2. ***Warning 1: Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam.***

3. ***Warning 2: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.***

4. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.*** **Note:** In a DDM-1000 optical system, to make a high speed switch properly, both a **SRV** and **PROTN** function unit must be present in a muldem. A high speed switch will not occur if one muldem contains only a **SRV** function unit.

5. **IMPORTANT:** The **AKM6 DS3U2** pack will only accept a DS3 input signal that has M13 formatting. This means that the signal must be of the type generated by an M13 multiplexer which contains DS2 framing bits. DS3 test sets are now available that generate an M13 formatted signal. The following test can be performed if one of the following is available:
   - Another **DDM-1000** assembly (with at least one muldem out of service) operating in the DS3 (rather than optical) mode and equipped with at least one **547-type PWR**, one **PROCR**, one **AKM3 ELIU1**, one **MXR** (optioned for M13 mode), and one **LS INTFC** (**AEK36-type DS1 INTFC1**, **AEK37 DS1C INTFC1** or **AEK38 DS2 INTFC1**)
   - An out-of-service M13-type multiplexer and an appropriate low speed test set (such as a **KS-20775,L1 Error Rate Test Set**).
   - DS3 test set which can produce an M13 formatted signal.

6. Will the test be performed with a test **DDM-1000** muldem, with an M13-type multiplexer and a DS1 test set, or with a DS3 test set?

   If with a test **DDM-1000** muldem, then continue to **Step 7.**
   If with an M13-type multiplexer and a DS1 test set, then proceed to **Step 26.**
   If with a DS3 test set, then proceed to **Step 46.**

7. **Note**: The following test (**Steps 8** through **20**) will be performed for one muldem of the DDM-1000 under test. This means only one muldem in the test DDM-1000 is required. Either muldem may be used. The MXR must be optioned for M13 mode.

8. At the **DSX-3** cross-connect appearances for the test muldem (not the **DDM-1000** under test), install a temporary loop from the **DS3 OUT** jack to the **DS3 IN** jack.

9. Refer to **DP-413** and perform an automatic looped transmission test for the test muldem.

10. Did the test muldem pass the automatic looped transmission test?

    If **YES**, then continue to **Step 11.**
    If **NO**, then refer to **TI-001** and repair the test **DDM-1000** as required.

11. Connect the system as shown in **Figure 1.** Connect only one DS3 path in each direction. Loop both the **SRV** and **PROTN OLIUs** back on themselves.

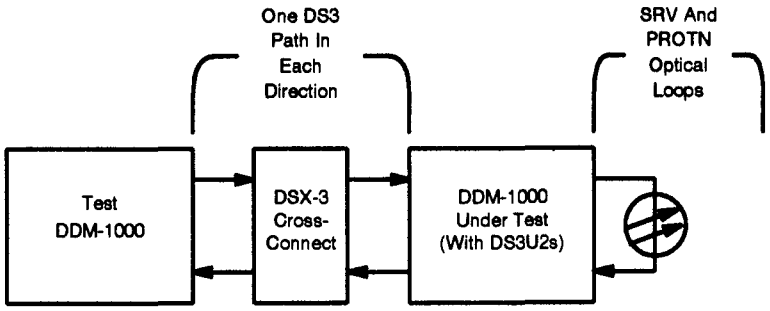


Figure 1. Test Setup with Test DDM-1000

12. Wait approximately 1 minute to give the LED indicators and alarms a chance to retire.

    Are any LED indicators lighted or alarms activated on the **DDM-1000** under test?

    If **YES**, then continue to **Step 13.**
    If **NO**, then do **Step 14.**

13. Refer to **TI-001** and clear the failure in the **DDM-1000** under test.

14. Repeat the automatic looped transmission test of the test muldem. This tests the Service (SRV) channel of the muldem under test.

15. Did the test muldem pass the automatic looped transmission test?

    If **YES**, then continue to **Step 16**.
    If **NO**, then do **Step 23**.

16. In the **DDM-1000** under test, unseat the **OLIU** in the **SRV** location.

    Response: On the **PROCR** plug-in of the **DDM-1000** under test, the **MN**, **NE** and **FE** LEDs should be lighted.

17. Repeat the automatic looped transmission test of the test muldem. This tests the Protection (PROTN) channel of the muldem under test.

18. Did the test muldem pass the automatic looped transmission test again?

    If **YES**, then continue to **Step 19**.
    If **NO**, then do **Step 23**.

19. The first muldem of the **DDM-1000** under test has passed the **DS3U2** looped transmission test.

20. Reseat the **OLIU** in the **SRV** location.

21. Repeat **Steps 11** through **20** for the second muldem in the **DDM-1000** under test (if it is equipped with **DS3U2** plug-ins).

22. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

23. The **DDM-1000** under test has failed the **DS3U2** looped transmission test.

24. The failure can be in either the **OLIU** or the **DS3U2** being tested. Replacement of the suspect plug-ins, one at a time, with spare units (and repeating **Steps 11** through **20**) will isolate the failed plug-in.

25. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

26. **Note**: The following test (Steps 27 through 40) will be performed for one muldem of the DDM-1000 under test.

27. Connect the system as shown in **Figure 2**. Connect only one DS1 path in each direction. Connect only one DS3 path in each direction. At the **DDM-1000** under test, loop both the **SRV** and **PROTN OLIUs** back on themselves.

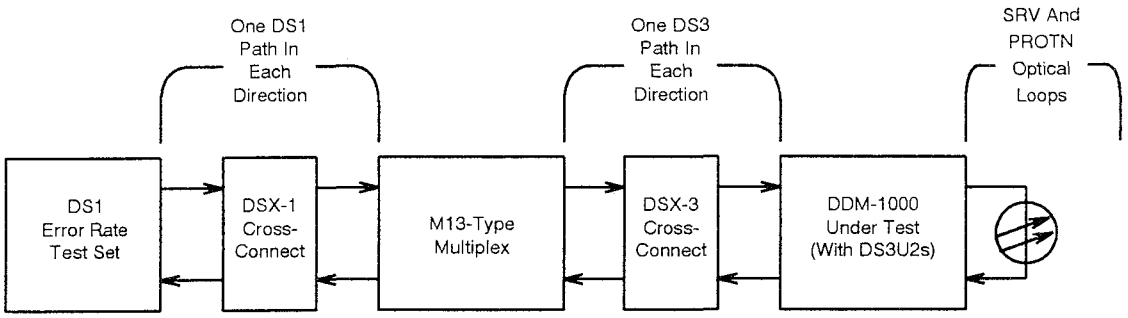


Figure 2. Test Setup Without Test DDM-1000

28. Wait approximately 1 minute to give the LED indicators and alarms a chance to retire.

    Are any LED indicators lighted or alarms activated on the **DDM-1000** under test?

    If **YES**, then continue to **Step 29**.
    If **NO**, then do **Step 30**.

29. Refer to **TI-001** and clear the failure in the **DDM-1000** under test.

30. At the **DSX-3** cross-connect appearances for the test muldem (not the **DDM-1000** under test), temporarily remove the connections to the **DDM-1000** under test and loop the test muldem on itself by connecting a loop from the **DS3 OUT** jack to the **DS3 IN** jack.

31. Use the DS1 test set to check for error-free transmission through the single DS1 channel under test.

32. Was error-free transmission observed?

    If **YES**, then continue to **Step 33**.
    If **NO**, then refer to the appropriate supporting documentation and repair the test muldem as required.

33. Reconnect the system as shown in **Figure 2**.

34. Use the DS1 test set to check for error-free transmission through the single DS1 channel under test. This tests the service channel of the DDM-1000 under test.

35. Was error-free transmission observed.

    If **YES**, then continue to **Step 36**.
    If **NO**, do **Step 43**.

36. In the **DDM-1000** under test, unseat the **OLIU** in the **SRV** location.

37. Use the DS1 test set to check for error-free transmission through the single DS1 channel under test. This tests the protection channel of the DDM-1000 under test.

38. Was error-free transmission observed?

    If **YES**, then continue to **Step 39**.
    If **NO**, do **Step 43**.

39. The first muldem of the **DDM-1000** under test has passed the **DS3U2** looped transmission test.

40. Reseat the **OLIU** in the **SRV** location.

41. Repeat **Steps 27** through **40** for the second muldem in the **DDM-1000** under test (if it is equipped with **DS3U2** plug-ins).

42. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

43. The **DDM-1000** has failed the **DS3U2** looped transmission test.

44. The failure can be in either the **OLIU** or the **DS3U2** being tested. Replacement of the suspect plug-ins, one at a time, with spare units (and repeating **Steps 27** through **40**) will isolate the failed plug-in.

45. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

46. **Note**: The following test will be performed for the muldem of the DDM-1000 equipped with the DS3U2.

    Set the DS3 test set to produce an M13 formatted signal.

47. Loop the DS3 test set on itself and verify that it is running error free.

48. Connect the system as shown in **Figure 3**. Connect only one DS3 path in each direction. Loop both the **SRV** and **PROTN OLIUs** back on themselves.

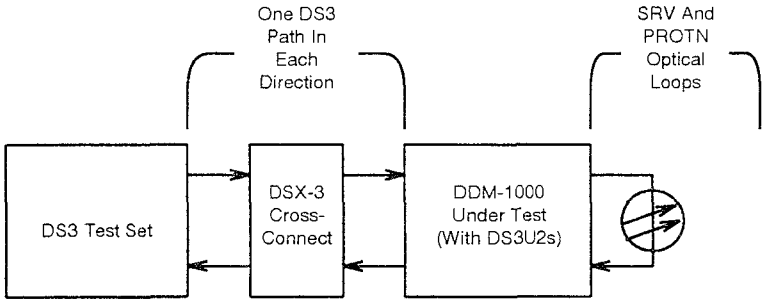


Figure 3. Test Setup With DS3 Test Set

49. Wait approximately 1 minute to give the LED indicators and alarms a chance to retire.

    Are any LED indicators lighted or alarms activated on the **DDM-1000** under test?

    If **YES**, then continue with **Step 50**.
    If **NO**, then proceed to **Step 51**.

50. Refer to **TI-001** and clear the failure in the **DDM-1000** under test.

51. Use the DS3 test set to check for error-free transmission through the DS3 channel under test. This tests the service channel of the DDM-1000 under test.

52. Was error-free transmission observed.

    If **YES**, then continue with **Step 53**.
    If **NO**, then proceed to **Step 60**.

53. In the **DDM-1000** under test, unseat the **OLIU** in the **SRV** location.

54. Use the DS3 test set to check for error-free transmission through the DS3 channel under test. This tests the protection channel of the DDM-1000 under test.

55. Was error-free transmission observed?

    If **YES**, then continue with **Step 56**.
    If **NO**, then proceed to **Step 60**.

56. The muldem of the **DDM-1000** equipped with the DS3U2 has passed the looped transmission test.

57. Reseat the **OLIU** in the **SRV** location.

58. Return to the procedure that sent you here and test the other muldem as required, if not already performed.

59. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

60. The **DDM-1000** has failed the **DS3U2** looped transmission test.

61. The failure can be in either the **OLIU** or the **DS3U2** being tested. Replacement of the suspect plug-ins, one at a time, with spare units (and repeating **Steps 47** through **57**) will isolate the failed plug-in.

62. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform DS3U2 End-to-End Test (Optical)

1. **NOTICE:** Unterminated optical connectors may emit laser radiation. Do not view beam with optical instruments.

2. ***Warning 1: Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam.***

3. ***Warning 2: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.***

4. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

5. Is the muldem at either end of the system equipped with a **MXR** rather than **AKM6 DS3U2** function units?

   If **YES**, then continue to **Step 6**.
   If **NO**, then do **Step 21**.

6. **Note**: Although an optical DDM-1000 system operates at 90 or 180 MB/s, the following procedures refer to a 45 MB/s end-to-end system, i.e., a muldem-to-muldem system, rather than a shelf-to-shelf system.

7. Verify that the end-to-end optical connections are in place.

8. At the **DSX-3 Cross-Connect** associated with the **DDM-1000** that is equipped with **DS3U2s**, connect a patch cord from the **OUT** jack to the **IN** jack for the muldem to be tested.

9. At the **DDM-1000** equipped with **MXR** function units, perform the automatic looped-back test, following the procedures of **DP-413**. This tests the Service channel of both the Near End and Far End DDM-1000s.

10. Did the automatic looped-back test pass?

    If **YES**, then continue to **Step 11**.
    If **NO**, then do **Step 18**.

11. At the **DDM-1000** equipped with **MXR** function units, unseat the **OLIU** in the **SRV** location.

    Response: At each **DDM-1000**, the **MN**, **NE** and **FE** LEDs will be lighted.

12. Repeat the automatic looped-back test. This tests the Protection channel of both the Near End and Far End DDM-1000s.

13. The **SRV HS** unit will fail this test - this is normal for the test conditions.

    Did the automatic looped-back test pass for the **PROTN HS** and all of the low speed units?

    If **YES**, then continue to **Step 14**.
    If **NO**, then do **Step 18**.

14. The circuit under test has passed the **DS3U2** end-to-end test.

15. Reseat the **OLIU** in the **SRV** location.

16. Repeat **Steps 8** through **15** for the second muldem-to-muldem system if it is equipped with **DS3U2s** at one end and **MXRs** at the other end.

17. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

18. The circuit under test has failed the **DS3U2** end-to-end test.

19. The failure can be in the **AKM6 DS3U2** or the **OLIU**. The failed plug-in may be identified by replacing the suspect units, one at a time, with spare plug-ins and repeating **Steps 8** through **15**.

20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

21. **IMPORTANT:** The **AKM6 DS3U2** will only accept a DS3 input with M13-Type framing. DS3 test sets are now available that can produce an M13 formatted DS3 signal. The following test can be performed if one of the following is available:

    A. Another **DDM-1000** assembly (with at least one muldem out-of-service) operating in the DS3 (rather than optical) mode and equipped with at least one **547-Type PWR**, one **PROCR**, one **AKM3 ELIU1**, one **MXR** (optioned for M13 mode) and one **LS INTFC** [**AEK36 DS1 INTFC1** (rated DA), **AEK36B DS1 INTFC2**, **AEK36B S1:2 DS1 INTFC2 AEK37 DS1C INTFC1** or **AEK38 DS2 INTFC1**]

    B. An out-of-service M13-Type multiplexer and an appropriate low-speed test set (such as a **KS-20775, L1 Error Rate Test Set**).

    C. DS3 test set which can produce an M13 formatted signal.

22. Will the test be performed with a test **DDM-1000** muldem, an M13-Type multiplexer and a DS1 test set, or with a DS3 test set?

    If with test **DDM-1000** muldem, then continue to **Step 23**.
    If with **M13-Type Multiplexer and DS1 test set**, then proceed to **Step 42**.
    If with **DS3 test set**, then proceed to **Step 62**.

23. **Note**: Although the Optical transmission of the DDM-1000 is at 90 or 180 MB/s, the following procedures will refer to a 45 MB/s end-to-end system, i.e., to a muldem-to-muldem system rather than a shelf-to-shelf system. This means only one muldem in the test DDM-1000 is required. Either muldem may be used. The MXR in the muldem being used must be optioned in M13 mode.

24. At the **DSX-3** cross-connect appearances for the test muldem (not either of the **DDM-1000s** under test), install a temporary loop from the **DS3 OUT** jack to the **DS3 IN** jack.

25. Refer to **DP-413** and perform an automatic looped transmission test for the test muldem.

26. Did the test muldem pass the automatic looped transmission test?

    If **YES**, then continue to **Step 27**.
    If **NO**, then refer to **TI-001** and repair the test **DDM-1000** as required.

27. Connect the system as shown in **Figure 1**. Connect only one DS3 path in each direction. Verify that both the **SRV** and **PROTN** Optical paths are connected from end to end.

28. Wait approximately 1 minute to give the LED indicators and alarms a chance to retire.

    Are any LED indicators lighted or alarms activated on either **DDM-1000** under test?

    If **YES**, then continue to **Step 29**.
    If **NO**, then do **Step 30**.

29. Refer to **TI-001** and clear the failure in the **DDM-1000** under test.

30. Repeat the automatic looped transmission test of the test muldem. This tests the Service channel of the DDM-1000 under test.

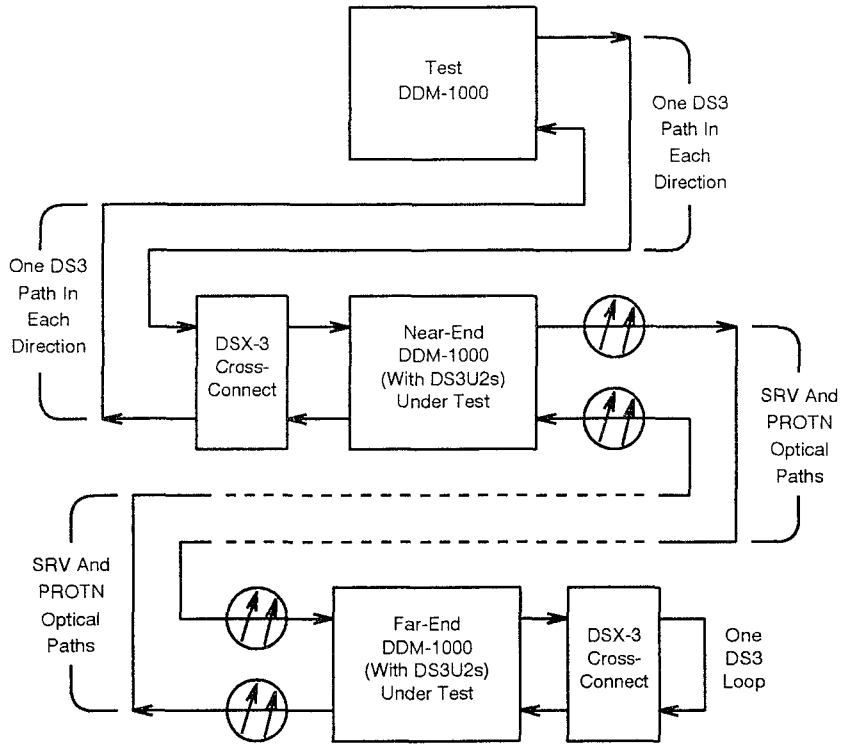


Figure 1. Test Setup With Test DDM-1000

31. Did the test muldem pass the automatic looped transmission test?

    If **YES**, then continue to **Step 32**.
    If **NO**, then do **Step 39**.

32. In the near-end **DDM-1000** under test, unseat the **OLIU** in the **SRV** location.

    Response: On the **PROCR** plug-in of each of the **DDM-1000s** under test, the **MN**, **NE** and **FE** LEDs will be lighted.

33. Repeat the automatic looped transmission test of the test muldem. This tests the Protection channel of the DDM-1000 under test.

34. Did the test muldem pass the automatic looped transmission test again?

    If **YES**, then continue to **Step 35**.
    If **NO**, then do **Step 39**.

35. The first muldem-to-muldem system of the **DDM-1000** under test has passed the **DS3U2** end-to-end transmission test.

36. Reseat the **OLIU** in the **SRV** location.

37. Repeat **Steps 27** through **36** for the second muldem-to-muldem system if it is equipped with **DS3U2** plug-ins at both ends.

38. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

39. The system under test has failed the **DS3U2** end-to-end transmission test.

40. The failure can be in either the **OLIU** or the **DS3U2** plug-ins being tested. Replacement of the suspect plug-ins, one at a time, with spare units (and repeating **Steps 27** through **36**) will isolate the failed plug-in.

41. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

42. **Note**: Although the optical transmission of the DDM-1000 is at 90 or 180 Mb/s, the following procedures will refer to a 45 Mb/s end-to-end system, i.e., to a muldem-to-muldem system rather than a shelf-to-shelf system. This means only one muldem in the test M13 multiplexer is required. Either muldem may be used.

43. Connect the system as shown in **Figure 2**. Connect only one DS1 path in each direction. Connect only one DS3 path in each direction. At the far-end **DDM-1000** under test, loop the DS3 output back into the DS3 input.

44. Wait approximately 1 minute to give the LED indicators and alarms a chance to retire.

    Are any LED indicators lighted or alarms activated on either of the **DDM-1000s** under test?

    If **YES**, then continue to **Step 45**.
    If **NO**, then do **Step 46**.

45. Refer to **TI-001** and clear the failure in the **DDM-1000** under test.

46. At the **DSX-3** cross-connect appearances for the test muldem (not the **DDM-1000s** under test), temporarily remove the connections to the near-end **DDM-1000** under test and loop the test muldem on itself by connecting a loop from the **DS3 OUT** jack to the **DS3 IN** jack.

47. Use the DS1 test set to check for error-free transmission through the single DS1 channel under test.

48. Was error-free transmission observed?

    If **YES**, then continue to **Step 49**.
    If **NO**, then refer to the appropriate supporting documentation and repair the test muldem as required.

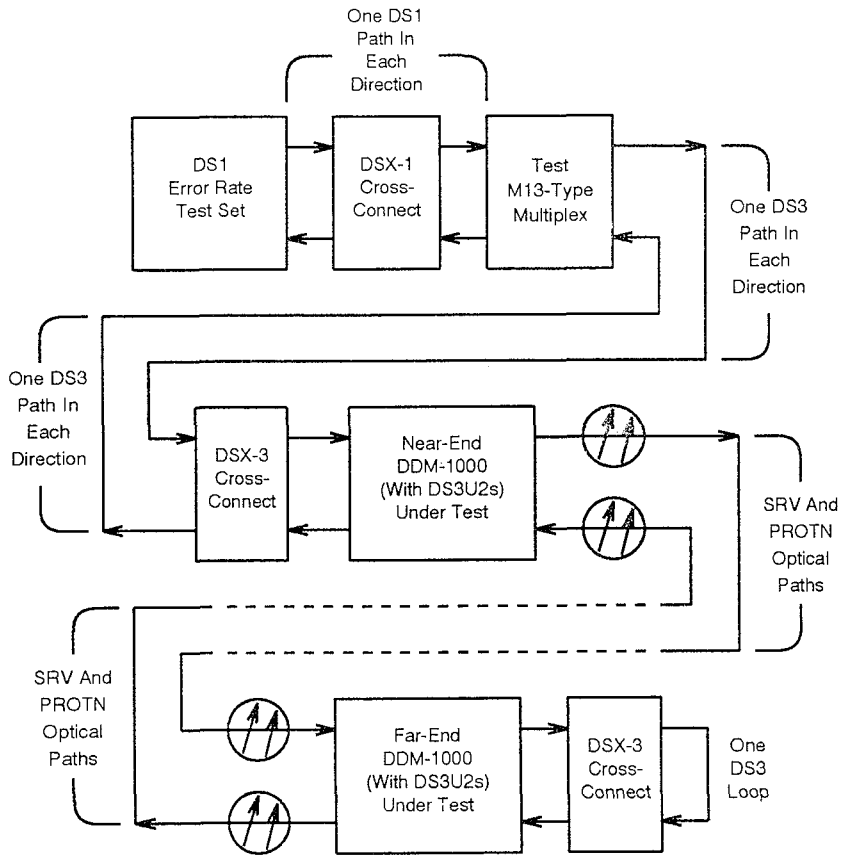


Figure 2. Test Setup Without Test DDM-1000

49. Reconnect the system as shown in **Figure 2**.

50. Use the DS1 test set to check for error-free transmission through the single DS1 channel under test. This tests the Service channel of the DDM-1000 under test.

51. Was error-free transmission observed.

    If **YES**, then continue to **Step 52**.
    If **NO**, do **Step 59**.

52. In the near-end **DDM-1000** under test, unseat the **OLIU** in the **SRV** location.

53. Use the DS1 test set to check for error-free transmission through the single DS1 channel under test. This tests the Protection channel of the DDM-1000 under test.

54. Was error-free transmission observed?

    If **YES**, then continue to **Step 55**.
    If **NO**, do **Step 59**.

55. The first muldem-to muldem system has passed the **DS3U2** end-to-end transmission test.

56. Reseat the **OLIU** in the **SRV** location.

57. Repeat **Steps 43** through **56** for the second muldem-to-muldem system if it is equipped with **DS3U2** plug-ins at both ends.

58. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

59. The system has failed the **DS3U2** end-to-end transmission test.

60. The failure can be in either the **OLIUs** or the **DS3U2s** being tested. Replacement of the suspect plug-ins, one at a time, with spare units (and repeating **Steps 43** through **56**) will isolate the failed plug-in.

61. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

62. **Note**: Although the Optical transmission of the DDM-1000 is at 90 or 180 Mb/s, the following procedures will refer to a 45 Mb/s end-to-end system, i.e., to a muldem-to-muldem system rather than a shelf-to-shelf system. This means that only one "standard" DS3 test set is required to test the DS3U2 channel(s).

    Set the DS3 test set to produce an M13 formatted signal.

63. Loop the DS3 test set on itself and verify that it is running error free.

64. Connect the system as shown in **Figure 3**. Connect only one DS3 path in each direction. Verify that both the **SRV** and **PROTN** Optical paths are connected from end to end.

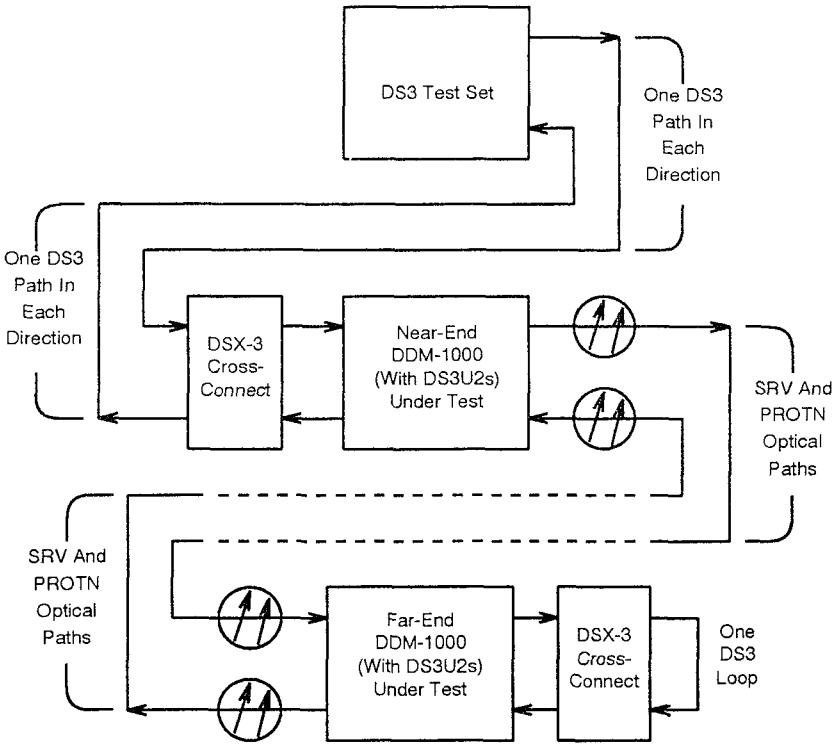


Figure 3. Test Setup With DS3 Test Set

65. Wait approximately one minute to give the LED indicators and alarms a chance to retire.

    Are any LED indicators lighted or alarms activated on either **DDM-1000** under test?

    If **YES**, then continue with **Step 66**.
    If **NO**, then proceed to **Step 67**.

66. Refer to **TI-001** and clear the failure in the **DDM-1000** under test.

67. Use the DS3 test set to check for error-free transmission through the Service channel in the muldem equipped with the DS3U2.

68. Was error-free transmission observed?

    If **YES**, then continue to **Step 69**.
    If **NO**, then do **Step 76**.

69. In the near-end **DDM-1000** under test, unseat the **OLIU** in the **SRV** location.

    Response: On the **PROCR** plug-in of each of the **DDM-1000s** under test, the **MN**, **NE** and **FE** LEDs will be lighted.

70. Use the DS3 test set to check for error-free transmission through the Protection channel in the muldem equipped with the DS3U2.

71. Was error-free transmission observed?

    If **YES**, then continue to **Step 72**.
    If **NO**, then do **Step 76**.

72. The first muldem-to-muldem system of the **DDM-1000** under test has passed the **DS3U2** end-to-end transmission test.

73. Reseat the **OLIU** in the **SRV** location.

74. Return to the procedure that sent you here to test the other muldem as required, if not already performed.

75. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

76. The system under test has failed the **DS3U2** end-to-end transmission test.

77. The failure can be in either the near-end or far-end muldem. Retest each muldem locally with a fiber loopback; then repeat **Steps 64** through **73**) to isolate the failure.

78. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform DS1, DS1C, or DS2 End-to-End Test

1. **Note:** It is assumed that you have been sent here by another procedure to perform a DS1, DS1C, or DS2 end-to-end test on a system that **cannot** be tested using the **DDM-1000** built-in end-to-end automatic system test. Examples of such systems are the "through" circuits in an add/drop system or a system with a **DDM-1000** at one end and a non-DDM-1000 M13-Type multiplexer at the other end.

2. This procedure can only be performed if you have available either an ASCII terminal (extended craft interface) or a suitable low-speed test set (such as a **KS-20775, L1 DS1 Error Rate Test Set** or a **KS-22331, L1/KS-22332, L1 DS1/1C/2 Error Rate Test Set**).

3. Will the test be performed with the ASCII terminal or with the low speed test set?

   If with the **ASCII Terminal**, then continue to **Step 4**.
   If with the **Low Speed Test Set**, then do **Step 14**.

4. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the equipment.***

5. **Note:** This procedure will refer to one DDM-1000 as the near end and to the other DDM-1000 (or other multiplexer) as the far end. If the two end terminals are both DDM-1000s, this designation is entirely arbitrary. If, on the other hand, one of the multiplexers is not a DDM-1000, then the near end is the DDM-1000 and the far end is the other multiplexer.

6. Verify that both the near-end and the far-end multiplexers are connected to the DS3 facility.

7. At the low speed cross-connects associated with both the near end and the far end multiplexers, connect a patch cord from the **OUT** jack to the **IN** jack for each low speed path to be tested.

8. At the near end **DDM-1000**, connect the ASCII terminal to the jack on the faceplate of the **PROCR**.

9. Refer to the Commands and Reports section of this manual under TEST-INS+MON and use the command **test-ins+mon:s=( ) d=mux** to verify error-free end-to-end transmission.

10. Repeat **Steps 7** through **9** for the remaining end-to-end low-speed channels to be tested.

11. At both the near-end and the far-end **DSX-1**, **DSX-1C** or **DSX-2** cross-connect, remove all patch cords from the **IN** and **OUT** jacks of the DS1, DS1C or DS2 channels just tested.

12. Refer to **DP-402** and update the **PROCR's** internal equipment list at both the near-end and the far-end **DDM-1000**.

13. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

14. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

    Note: The MC90083A1D, Iss 4 and later PROCR2 eliminates a problem that sometimes occurs when testing a DS1 channel that is looped at the far end. With prior PROCR versions, when a DS1 channel was tested with the "3 in 24" test pattern, the channel would sometimes make errors until the pattern was changed to something else (such as QRSS or all ones) and then back again. The MC90083A1D, Issue 4 and later PROCR2 packs eliminates this problem when testing with the DS1 channel looped at the far end (single ended testing). The loop must be put up at the far end before the test signal is applied. The problem may still occur if the loop is put up after the signal is applied or if testing end-to-end using a test set at each end.

15. Obtain and condition a low-speed test set that operates at the required rate. Examples of such a set are the **KS-20775, L1 DS1 Error Rate Test Set** for the DS1 rate and the **KS-22331, L1/KS-22332, L1 DS1/1C/2 Error Rate Test Set** for either the DS1, DS1C, or the DS2 rate.

16. **IMPORTANT:** A DS1C test set **must** produce an output signal incorporating M1C-Type framing information. Not all DS1C test sets produce such an output.

17. Verify that both the near-end and the far-end **DDM-1000s** are connected to the DS3 facility.

18. At the far-end **DSX-1**, **DSX-1C** or **DSX-2** cross-connect, install a patch cord from the **OUT** jack to the **IN** jack for each DS1, DS1C or DS2 channel to be tested. (See **Figure 1**.)

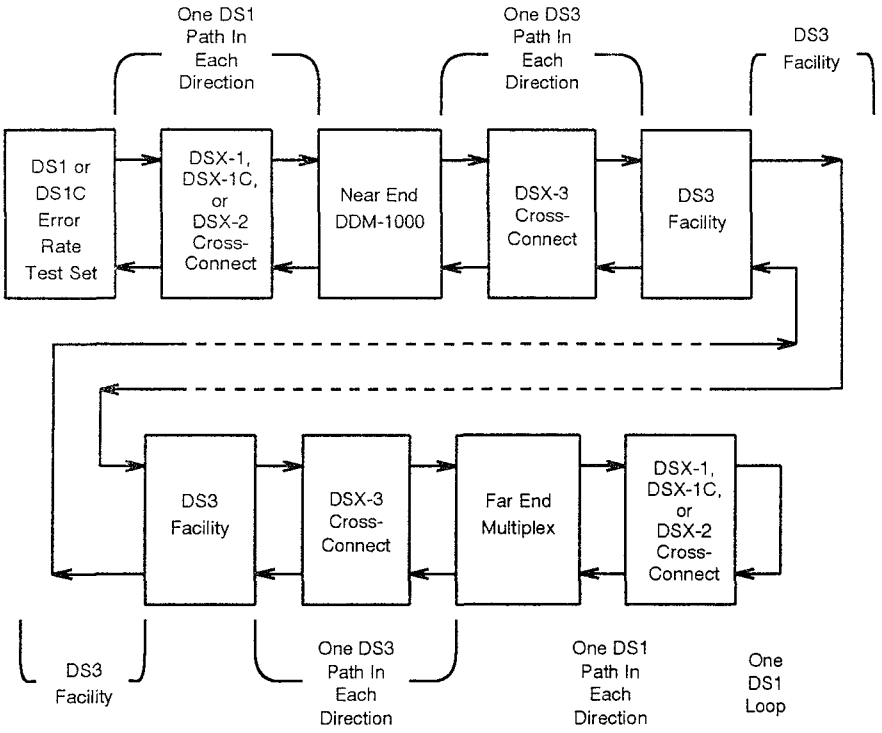


Figure 1. Test Setup for DS1, DS1C or DS2 End-to-End Test

19. At the near-end **DSX-1**, **DSX-1C** or **DSX-2** cross-connect, connect an output from the low speed test set transmitter to the **IN** jack for the first DS1, DS1C or DS2 channel to be tested. (See **Figure 1**.)

20. At the near-end **DSX-1**, **DSX-1C** or **DSX-2** cross-connect, connect the **OUT** jack from the first DS1, DS1C or DS2 channel to be tested to the input to the low speed test set receiver. (See **Figure 1**.)

21. Use the low-speed test set to verify error-free transmission.

22. At the near-end **DSX-1**, **DSX-1C** or **DSX-2** cross-connect, move the patch cords to the **IN** and **OUT** jacks associated with the next DS1, DS1C or DS2 channel to be tested.

23. Use the low-speed test set to verify error-free transmission.

24. Repeat **Steps 22** and **23** for all of the remaining DS1 or DS1C channels to be tested.

25. At both the near-end and the far-end **DSX-1**, **DSX-1C** or **DSX-2** cross-connect, remove all patch cords from the **IN** and **OUT** jacks of the DS1, DS1C or DS2 channels just tested.

26. At both the near-end and the far-end **DDM-1000**, momentarily depress the **RST** button on the **PROCR** to update the **PROCR's** internal equipment list. Refer to **DP-402** for details.

27. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Enable or Disable Far-End Maintenance

1. **Note:** It is assumed that you were sent here by another procedure with instructions to enable or disable far-end maintenance.
2. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the equipment.***
3. Is the **DDM-1000** equipped with a **PROCR1** or with an **PROCR2**?

   If a **PROCR1**, then continue to **Step 4**.
   If a **PROCR2**, then proceed to **Step 13**.
4. Do you wish to enable or disable far-end maintenance?

   If **ENABLE** far-end maintenance, then continue to **Step 5**.
   If **DISABLE** far-end maintenance, then proceed to **Step 9**.
5. Unseat the **PROCR** (**MC90083A1 PROCR1**).
6. Refer to **Figure 1** and set **Section 2** on the DIP switch on the **PROCR** to the "open" position, i.e., depress it toward the bottom of the plug-in.

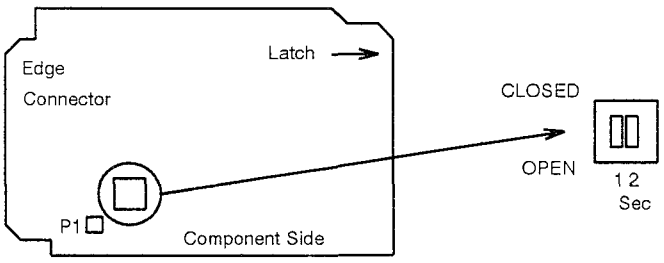


Figure 1. PROCR Option Switch

7. Refer to **DP-404** for proper procedures, then "reset" **PROCR**.
8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
9. Unseat **PROCR1**.
10. Refer to **Figure 1** and set **Section 2** on the DIP switch on the **PROCR** to the "closed" position, i.e., depress it toward the top of the plug-in.

11. Refer to **DP-404** for proper procedures, then "reset" **PROCR**.

12. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

13. Do you wish to enable or disable far-end maintenance?

    If **ENABLE** far-end maintenance, then continue to **Step 14**.
    If **DISABLE** far-end maintenance, then do **Step 21**.

14. Unseat **PROCR2**.

15. Refer to **Figure 1** and set **Section 2** on the DIP switch on the **PROCR** to the "open" position, i.e., depress it toward the bottom of the plug-in.

16. Refer to **DP-404** for proper procedures, then "reset" **PROCR**.

17. Is an ASCII terminal available?

    If **YES**, then continue to **Step 18**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

18. Connect the ASCII terminal to the faceplate of the **MC90083A1( ) PROCR2**.

19. Refer to the **COMMANDS AND REPORTS** section of this user's manual under **SET-SHELF** and use the command **set-shelf-fecom:s=( ) yes** to enable far-end maintenance.

20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

21. Unseat **PROCR2**.

22. Refer to **Figure 1** and set **Section 2** on the DIP switch on the **PROCR** to the "closed" position, i.e., depress it toward the top of the plug-in.

23. Refer to **DP-404** for proper procedures, then "reset" **PROCR**.

24. Is an ASCII terminal available?

    If **YES**, then continue with **Step 25**.
    If **NO**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

25. Connect the ASCII terminal to the faceplate of the **MC90083A1( ) PROCR2**.

26. Refer to the **COMMANDS AND REPORTS** section of this user's manual under **SET-SHELF** and use the command **set-shelf-fecom:s=( ) no** to disable far-end maintenance.

27. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clean Optical Connections

1. **Note**: It is assumed that you were sent here by another procedure with instructions to clean the optical connectors on an OLIU plug-in or on the optical cables to be connected to the OLIU.

2. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the equipment.***

3. Remove the **1002A** or **1012A** couplings, if present, from the connectors.

4. With isopropyl alcohol-dampened optical quality lint-free tissue (such as Texwipe's TX-404), carefully wipe the plug (end face and cone).

5. Carefully wipe the plug again with clean, dry, optical quality lint-free tissue.

6. Finally, blow any lint or dust from the plug, using a compressed air duster (such as Texwipe's TX-600) 3 inches from the plug as shown in **Figure 1**.

7. Blow any lint or dust from the internal surfaces of the coupling using the compressed air duster 3 inches from the coupling as shown in **Figure 1**.

8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

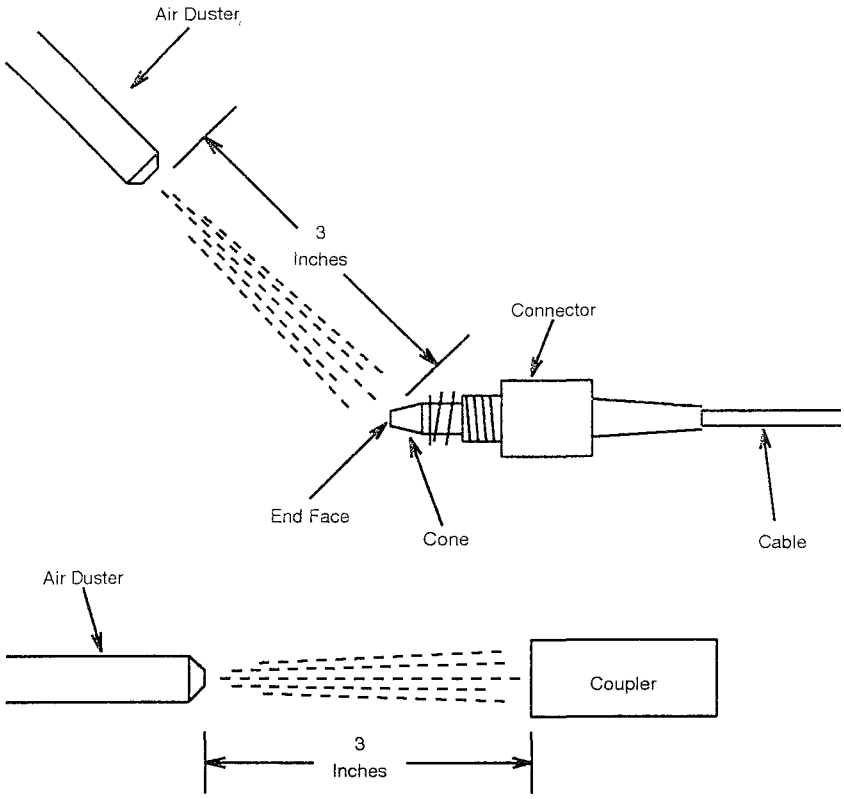


Figure 1. Using Compressed Air to Clean Optical Connectors

Perform End-to-End Low Speed Transmission Test

1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

2. **Note**: It is assumed that you were sent here by another procedure to perform an end-to-end low speed transmission test. It is further assumed that the complete end-to-end system has already been tested and that only a particular low speed circuit is to be tested at this time.

3. This test can be performed only if you have one of the following available:

   An ASCII terminal (extended craft interface)

   OR

   A suitable low speed test set (such as a **KS-20775, L1 DS1 Error Rate Test Set** or a **KS22331, L1/KS-22332, L2 DS1/1C/2 Error Rate Test Set**)

4. Is an ASCII terminal (extended craft interface) available?

   If **YES**, then continue to **Step 5.**
   If **NO**, then do **Step 28.**

5. **Note**: This procedure will refer to one DDM-1000 assembly as the near end and the other assembly as the far end. These designations are completely arbitrary, either assembly can be the near end or the far end assembly.

6. At the **DSX-1, DSX-1C, or DSX-2** cross-connects associated with both the near end and the far end **DDM-1000**, connect a patch cord from the **OUT** jack to the **IN** jack for the low speed channel to be tested.

7. At the near end **DDM-1000** connect the ASCII terminal to the jack on the faceplate of the **PROCR**.

8. Refer to the "Commands and Reports" section of this manual, under TEST-INS+MON, and use the command **test-ins+mon:s=( ) d=mux** to perform a test of the complete DS1 loop.

9. Was the test successful (error free)?

   If **YES**, then continue to **Step 10.**
   If **NO**, then do **Step 25.**

10. At the **DDM-1000** at each end of the system, unseat the **SRV LS INTFC (AEK36-type, AEK37, or AEK38)** plug-in associated with the circuit under test.

11. Repeat the test using the command **test-ins+mon:s=( ) d=mux**

12. Was the test successful (error free)?

    If **YES**, then continue to **Step 13.**
    If **NO**, then do **Step 25.**

13. At the **DDM-1000** at each end of the system, unseat the **SRV LS INTFC (AEK36-**type, **AEK37,** or **AEK38**) plug-in associated with the circuit under test.

14. Repeat the test using the command **test-ins+mon: d=mux**

15. Was the test successful (error free)?

    If **YES**, then continue to **Step 16.**
    If **NO**, then do **Step 25.**

16. At the **DDM-1000** at each end of the system, reseat the **SRV LS INTFC** plug-in associated with the circuit under test.

17. Repeat the test using the command **test-ins+mon:s=( ) d=mux**

18. Was the test successful (error free)?

    If **YES**, then continue to **Step 19.**
    If **NO**, then do **Step 25.**

19. The low speed circuit under test has passed the end-to-end low speed transmission test.

20. At the **DDM-1000** at each end of the system, reseat the **SRV MXR** plug-in associated with the circuit under test.

21. Remove the looping patch cords from the **cross-connects.**

22. At both the near-end and the far-end **DDM-1000**, momentarily depress the **RST** button on the **PROCR** to update the **PROCR's** internal equipment list. Refer to **DP-402** for details.

23. Repeat **Steps 6** through **22** for any additional low speed circuits to be tested.

24. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

25. The low speed circuit under test has **failed** the end-to-end low speed transmission test.

26. Since the high speed circuits are, presumably, operating error-free, the problem is probably in the **LS INTFC** circuits. The failed plug-in may be isolated by replacing the suspect units, one at a time, with spare circuits and repeating test **Steps 6** through **22.** (There is a slight chance that the failure is in the **MXR** plug-ins in the **SRV** locations.)

27. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

28. **Note**: This procedure will refer to one DDM-1000 assembly as the near end and the other assembly as the far end. These designations are completely arbitrary, either assembly can be the near end or the far end assembly.

29. At the **DSX-1**, **DSX-1C** or **DSX-2 Cross-Connect** associated with the far end **DDM-1000**, connect a patch cord from the **OUT** jack to the **IN** jack for the low speed channel to be tested.

30. At the **Cross-Connect** associated with the near end **DDM-1000** connect the low speed test set to the **IN** and **OUT** jacks associated with the circuit under test.

31. Use the low speed test set to test for error-free transmission.

32. Was the test successful (error free)?

    If **YES**, then continue to **Step 33.**
    If **NO**, then do **Step 48.**

33. At the **DDM-1000** at each end of the system, unseat the **SRV LS INTFC** (**AEK36**-type **DS1 INTFC1**, **AEK37 DS1C INTFC1** or **AEK38 DS2 INTFC1**) plug-in associated with the circuit under test.

34. Repeat the low speed transmission test with the low speed test set.

35. Was the test successful (error free)?

    If **YES**, then continue to **Step 36.**
    If **NO**, then do **Step 48.**

36. At the **DDM-1000** at each end of the system, unseat the **SRV MXR** plug-in associated with the circuit under test.

37. Repeat the low speed transmission test with the low speed test set.

38. Was the test successful (error free)?

    If **YES**, then continue to **Step 39.**
    If **NO**, then do **Step 48.**

39. At the **DDM-1000** at each end of the system, reseat the **SRV LS INTFC** plug-in associated with the circuit under test.

40. Repeat the low speed transmission test with the low speed test set.

41. Was the test successful (error free)?

    If **YES**, then continue to **Step 42.**
    If **NO**, then do **Step 48.**

42. The low speed circuit under test has passed the end-to-end low speed transmission test.

43. At the **DDM-1000** at each end of the system, reseat the **SRV MXR** plug-in associated with the circuit under test.

44. Remove the looping patch cords from the **cross-connects.**

45. Refer to **DP-402** and update the **PROCR's** internal equipment list at both the near-end and the far-end **DDM-1000.**

46. Repeat **Steps 29** through **44** for any additional low speed circuits to be tested.

47. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

48. The low speed circuit under test has **failed** the end-to-end low speed transmission test.

49. Since the high speed circuits are, presumably, operating error-free, the problem is probably in the **LS INTFC** circuits. The failed plug-in may be isolated by replacing the suspect units, one at a time, with spare circuits and repeating test **steps 29** through **44.** (There is a slight chance that the failure is in the **MXR** plug-ins in the **SRV** locations.)

50. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install 20-Type OLIUs and Associated Cables

1. **NOTICE:** Unterminated optical connectors may emit laser radiation. Do not view beam with optical instruments.

2. ***Warning 1: Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam.***

3. ***Warning 2: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.***

4. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

5. **Note**: It is assumed that the installation procedure **IP-203** has been completed up to the point of installing the OLIUs in **Step 21**. If not, refer to **IP-203**, and perform the installation procedure.

6. Will the 180 Mb/s optical system have two **DDM-1000** assemblies or one **DDM-1000** assembly at this end?

   If **TWO assemblies**, then continue to **Step 7**.
   If **ONE assembly**, then do **Step 15**.

7. **Note**: It is assumed that neither of the two DDM-1000 assemblies is in service. It is further assumed that the two assemblies are installed one above the other separated by no more than the height of a heat baffle.

8. **Note**: The two OLIUs will be installed in one of the two assemblies. The assembly with the OLIUs will be referred to here as the "OLIU assembly". The assembly without the OLIUs will be referred to here as the "Non-OLIU Assembly".

9. Determine which is to be the **OLIU Assembly**. Either assembly can be used. Make sure that the optical cables to be used for 180 Mb/s operation are long enough to reach the assembly selected.

10. Refer to **Figure 1** and install the **SRV ED-2C833-20, G(17-20)** cable assembly on the backplane as follows:

    Note: The "J" numbers stamped on the cable connectors **must always face to the right** where the "P" numbers are stamped on the backplane.

    The end of the cable with three connectors (two large and one small) is connected to locations **P39**, **P41** and **P43** on the **Non-OLIU Assembly**. The mating connectors on the cable are labeled **J39**, **J41** and **J43**, respectively.

    The end of the cable with two large connectors is connected to locations **P39** and **P41** on the **OLIU Assembly**. The mating connectors on the cable are labeled **J39** and **J41**, respectively.

11. Refer to **Figure 1** and install the **PROTN ED-2C833-20, G(17-20)** cable assembly on the backplane as follows:

    Note: The "J" numbers stamped on the cable connectors **must always face to the right** where the "P" numbers are stamped on the backplane.

    The end of the cable with three connectors (two large and one small) is connected to locations **P40**, **P42** and **P44** on the **Non-OLIU Assembly**. The mating connectors on the cable are labeled **J40**, **J42** and **J44**, respectively.

    The end of the cable with two large connectors is connected to locations **P40** and **P42** on the **OLIU Assembly**. The mating connectors on the cable are labeled **J40** and **J42**, respectively.

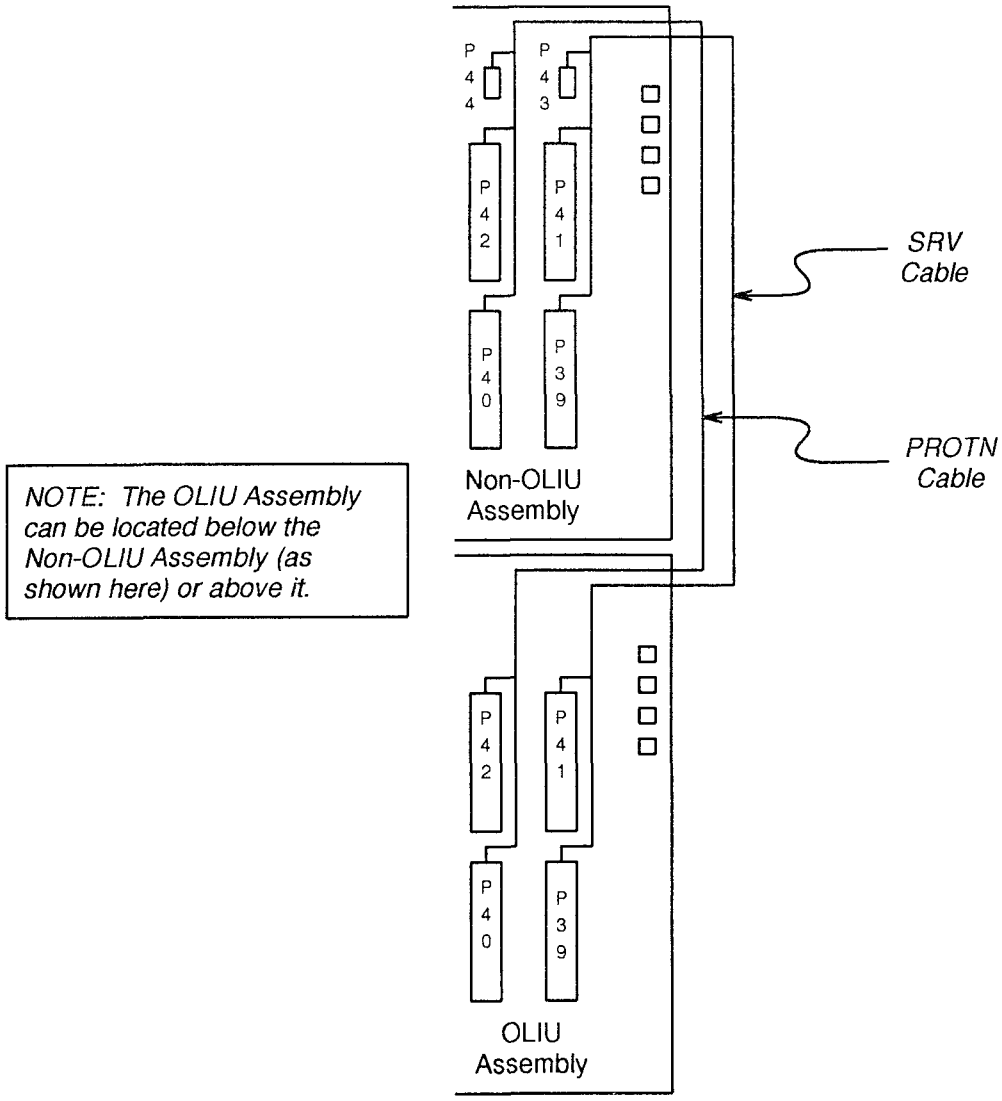


Figure 1. Installation of ED-2C833-20, G(17-20) Cables

12. **Figure 2** is a cutaway illustration showing the LED option switch in the **20-Type OLIU**. Access to the switch is gained by raising the ejector lever. The switch is illustrated in the **UP** position.

13. Are the **OLIU**s to be installed in the upper or the lower **DDM-1000** assembly?

    If **UPPER**, then set the LED option switch on both **20-Type OLIU**s to the **UP** position.

    If **LOWER**, then set the LED option switch on both **20-Type OLIU**s to the **DOWN** position.

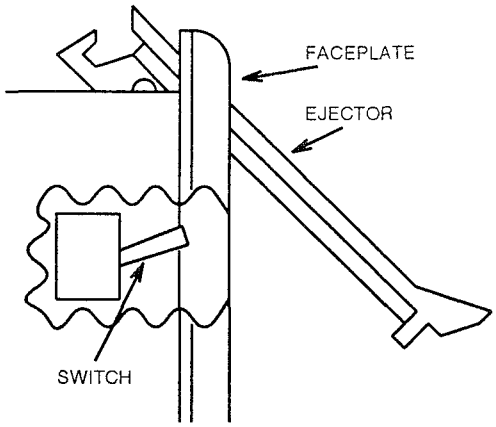


Figure 2. 20-Type OLIU LED Option Switch

14. Do **Step 19**, skipping **Step 15** through **Step 18**.

15. **Note**: It is assumed that the DDM-1000 is not in service.

16. **Note**: The DDM-1000 will be referred to here as the "OLIU Assembly".

17. **Figure 2** is a cutaway illustration showing the LED option switch in the **20-Type OLIU**. Access to the switch is gained by raising the ejector lever. The switch is illustrated in the **UP** position.

18. Set the LED option switch on both **20-Type OLIU**s to the **UP** position.

19. **Note**: It is assumed that the loss of the optical facility is known from office records or that a measurement has been made.

20. From office records, or by measurement, determine the loss of the optical facility.

21. **Table A** specifies the setting of the output level option switch on the **20-Type OLIU**.

Table A. 20-Type OLIU Output Level Switch Settings

		Transmitter Switch	
		LW	HI
Transmitter	Receiver	Facility Loss	
20E	20E	0 to 9.0 dB	9 to 15.0 dB
20G	20E	7 to 14.5 dB	14.5 to 20.7 dB
20G	20G or 20K	10 to 20.5 dB	20.5 to 26.5 dB
20K	20E	10 to 17.5 dB	17.5 to 24.0 dB
20K	20G or 20K	13 to 23.5 dB	23.5 to 29.8 dB
20E	20G or 20K	4.3 to 14.8 dB	14.8 to 20.8 dB

22. Refer to **Figure 3** and set the output level option switch on both **20-Type OLIU**s as indicated in **Table A**.

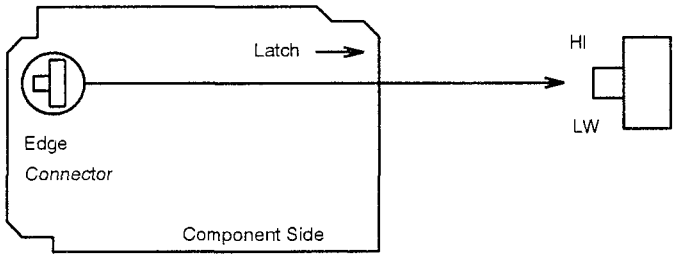


Figure 3. 20-Type OLIU Output Level Option Switch

23. Install the **20-Type OLIUs** in the **SRV** and **PROTN OLIU** locations of the **OLIU Assembly**.

24. Return to **IP-203** and complete the installation procedure.

Upgrade End-to-End 90 Mb/s Optical System to 180 Mb/s (One DDM-1000 Assembly at Each End)

1. **NOTICE:** Unterminated optical connectors may emit laser radiation. Do not view beam with optical instruments.

2. ***Warning 1: Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam.***

   Warning 2: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

3. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

   Note 1: AKM5 DS3U1 circuit packs cannot be used with 180 Mb/s systems.

   Note 2: In 180 Mb/s systems, channels originating in an **OLIU** shelf in one office terminate in the **OLIU** shelf in the other office. Channels originating in a non **OLIU** shelf in one office terminate in the non **OLIU** shelf in the other office. For example, if the **OLIU** shelf is on the bottom of the two-shelf pair in one office and on the top of the two-shelf pair in the other office, channel assignments follow the shelf configuration, not the physical position in a bay.

4. Are **AEK36B-type or AEK36C DS1 INTFC2** plug-ins installed in the **DDM-1000** assembly?

   If **YES**, then continue to **Step 5.**
   If **NO**, then do **Step 6.**

5. Refer to **DP-441** and replace the **AEK36 DS1 INTFC1** plug-ins with **AEK36B**-type or **AEK36C DS1 INTFC2** plug-ins. **THEN RETURN TO THIS PROCEDURE.**

6. Temporarily label the **SRV** and **PROTN IN** and **OUT** optical cables to be used for 180 Mb/s operation near the end where they will connect to the optical pigtails of the **20-Type OLIUs**. They should be labeled **SRV IN, SRV OUT, PROTN IN** and **PROTN OUT**, respectively. This will prevent errors in connecting them later.

7. At each end of the system, disconnect the **PROTN** optical cables from the **IN** and **OUT** optical pigtails on the **PROTN 16-Type OLIU**. Wait 20 seconds.

   Response: At each end of the system, the **MN** alarm will be activated and the **ALM** LED will be flashing on the **PROTN 16-Type OLIU**.

8. At each end of the system, unseat and remove the **PROTN 16-Type OLIU**.

   Response: At each end of the system, the **MN** alarm will remain activated.

9. **Figure 1** is a cutaway illustration showing the LED option switch in the **20-Type OLIU**. Access to the switch is gained by raising the ejector lever. The switch is illustrated in the **UP** position.

10. At each end of the system, set the LED option switches on both the **SRV** and **PROTN 20-Type OLIUs** to the **UP** position.

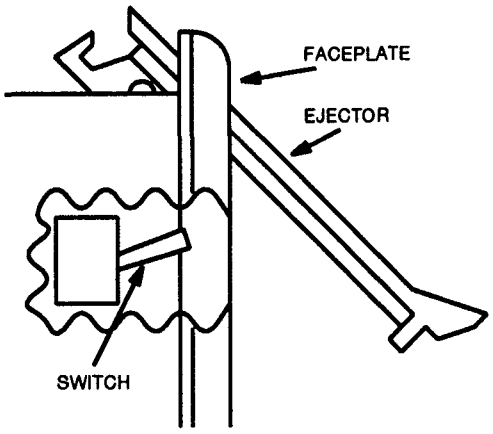


Figure 1. 20-Type OLIU LED Option Switch

11. **Note**: It is assumed that the loss of the optical facility is known from office records or that a measurement has been made.

12. From office records, or by measurement, determine the loss of the optical facility.

13. **Table A** specifies the setting of the output level option switch on the **20-Type OLIU.**

Table A. 20-Type OLIU Output Level Switch Settings

		Transmitter Switch	
		LW	HI
Transmitter	Receiver	Facility Loss	
20E	20E	0 to 9.0 dB	9 to 15.0 dB
20G	20E	7 to 14.5 dB	14.5 to 20.7 dB
20G	20G or 20K	10 to 20.5 dB	20.5 to 26.5 dB
20K	20E	10 to 17.5 dB	17.5 to 24.0 dB
20K	20G or 20K	13 to 23.5 dB	23.5 to 29.8 dB
20E	20G or 20K	4.3 to 14.8 dB	14.8 to 20.8 dB

14. Refer to **Figure 2** and, at each end of the system, set the output level option switch on both the **SRV** and **PROTN 20-Type OLIUs** as indicated in **Table A.**

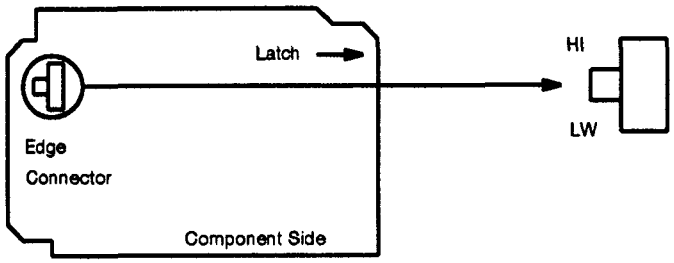


Figure 2. 20-Type OLIU Output Level Option Switch

15. At each end of the system, install a **20-Type OLIU** in the **PROTN OLIU** location.

    After several seconds, the upper **ALM** LED will be flashing on the **PROTN 20-Type OLIU** at each end of the system.

16. At each end of the system, reconnect the **PROTN** optical cables to the **IN** and **OUT** optical pigtails on the **PROTN 20-Type OLIU.**

    Response: At each end of the system, the **MN** alarm and all LEDs are extinguished.

17. At each end of the system, are all alarms and LEDs extinguished?

    If **YES**, then continue to **Step 18.**
    If **NO**, then refer to **TI-001** and clear the indicated condition.

18. Is an **ASCII terminal** available?

    If **YES**, then continue to **Step 19.**
    If **NO**, then do **Step 28.**

19. At the near end use the **ASCII terminal** to make a high speed switch to protection using the command **exct-sw-hs:s=( ) make.** Use the command **exct-lock-hs:s=( ) make** to lock to the protection line.

    Response: The **ASCII terminal** will report that the switch and lock were executed. The **ABN** LED will be lighted on the **PROCR** at each end of the system.

20. At each end of the system, are all LEDs and alarms extinguished except for the **ABN** LEDs?

    If **YES**, then continue with **Step 21.**
    If **NO**, then refer to **TI-001** and clear the indicated condition.

21. At each end of the system, disconnect the **SRV** optical cables from the **IN** and **OUT** optical pigtails on the **SRV 16-Type OLIU.** Wait 20 seconds.

    Response: At each end of the system, the **MN** alarm will be activated and the **ALM** LED will be flashing on the **SRV 16-Type OLIU.** The **ABN** LEDs will remain lighted.

22. At each end of the system, unseat and remove the **SRV 16-Type OLIU.**

    Response: At each end of the system, the **MN** alarm will remain activated. The **ABN** LEDs will remain lighted.

23. At each end of the system, install a **20-Type OLIU** in the **SRV OLIU** location.

    After several seconds, the upper **ALM** LED will be flashing on the **20-Type OLIU** at each end of the system.

24. At each end of the system, reconnect the **SRV** optical cables to the **IN** and **OUT** optical pigtails on the **SRV 20-Type OLIU.**

    After several seconds, the **MN** alarm and all indicators except for the **ABN** LEDs will be extinguished at each end of the system.

25. At each end of the system, are all LEDs and alarms extinguished except for the **ABN** LEDs?

    If **YES**, then continue to **Step 26.**
    If **NO**, then refer to **TI-001** and clear the indicated condition.

26. At the near end, use the **ASCII terminal** command **exct-lock-hs:s=( ) break** to break the lock. Use the command **exct-sw-hs:s=( ) break** to break the high speed switch.

    Response: The **ASCII terminal** will report that the lock and switch were taken down. At each end of the system, the **ABN** LEDs will be extinguished.

27. At each end of the system, are all LEDs and alarms extinguished?

    If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO**, then refer to **TI-001** and clear the indicated condition.

28. At each end of the system, disconnect the **SRV** optical cables from the **IN** and **OUT** optical pigtails on the **SRV 16-Type OLIU**. Wait 20 seconds.

    Response: At each end of the system, the **MN** alarm will be activated and the **ALM** LED will be flashing on the **SRV 16-Type OLIU**.

29. At each end of the system, unseat and remove the **SRV 16-Type OLIU**.

    Response: At each end of the system, the **MN** alarm will remain activated.

30. At each end of the system, install a **20-Type OLIU** in the **SRV OLIU** location.

    After several seconds, the upper **ALM** LED will be flashing on the **20-Type OLIU** at each end of the system.

31. At each end of the system, reconnect the **SRV** optical cables to the **IN** and **OUT** optical pigtails on the **SRV 20-Type OLIU**.

    After several seconds, the **MN** alarm and all indicators will be extinguished at each end of the system.

32. At each end of the system, are all LEDs and alarms extinguished?

    If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE**
    If **NO**, then refer to **TI-001** and clear the indicated condition.

Upgrade End-to-End 90 Mb/s Optical System to 180 Mb/s (Two DDM-1000 Assemblies at Each End)

1. **NOTICE:** Unterminated optical connectors may emit laser radiation. Do not view beam with optical instruments.

2. ***Warning 1: Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam.***

   Warning 2: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

3. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

   Note 1: AKM5 DS3U1 circuit packs cannot be used with 180 Mb/s systems.

   Note 2: In 180 Mb/s systems, channels originating in an **OLIU** shelf in one office terminate in the **OLIU** shelf in the other office. Channels originating in a non **OLIU** shelf in one office terminate in the non **OLIU** shelf in the other office. For example, if the **OLIU** shelf is on the bottom of the two-shelf pair in one office and on the top of the two-shelf pair in the other office, channel assignments follow the shelf configuration, not the physical position in a bay.

4. Are **AEK36 DS1 INTFC1** plug-ins installed in the assembly in which the **20-Type OLIU** plug-ins are to be installed (the OLIU Assembly)?

   If **YES**, then continue to **Step 5.**
   If **NO**, then do **Step 6.**

5. Refer to **DP-441** and replace the **AEK36 DS1 INTFC1** plug-ins with **AEK36B**-type or **AEK36C INTFC2** plug-ins. **THEN RETURN TO THIS PROCEDURE.**

6. Temporarily label the **SRV** and **PROTN IN** and **OUT** optical cables to be used for 180 Mb/s operation near the end where they will connect to the optical pigtails of the **20-Type OLIUs.** They should be labeled **SRV IN, SRV OUT, PROTN IN** and **PROTN OUT**, respectively. This will prevent errors in connecting them later.

7. **Note**: It is assumed that both DDM-1000 assemblies at each end of the system are powered, equipped with plug-ins, and running. If not, refer to the Task Index,**TI-001**, and complete the appropriate installation procedure.

8. **Note**: It is assumed that at least one of the two DDM-1000 assemblies at each end of the system is in service. It is further assumed that the two assemblies at each end of the system are installed one above the other separated by no more than the height of a heat baffle plus a fan unit.

9. **Note**: At each end of the system, the two 20-Type OLIUs will be installed in one of the two assemblies. The assembly with the OLIUs will be referred to here as the "OLIU assembly". The assembly without the OLIUs will be referred to here as the "Non-OLIU Assembly".

10. At each end of the system, determine which is to be the **OLIU Assembly**. Either assembly can be used. Make sure that the optical cables to be used for 180 Mb/s operation are long enough to reach the assembly selected.

11. At each end of the system, disconnect the **PROTN** optical cables from the **IN** and **OUT** optical pigtails on each of the **PROTN 16-Type OLIUs**. Wait 20 seconds.

    Response: At each end of the system, the **MN** alarm will be activated by each **DDM-1000** assembly and the **ALM** LED will be flashing on each of the **PROTN 16-Type OLIUs**.

12. At each end of the system, unseat and remove each of the **PROTN 16-Type OLIUs**.

    Response: At each end of the system, the **MN** alarm will remain activated by each assembly.

13. Refer to **Figure 1** and, at each end of the system, install the **PROTN ED-2C833-20, G(17-20)** cable assembly on the backplane as follows:

    Note: The "J" numbers stamped on the cable connectors **must always face to the right** where the "P" numbers are stamped on the backplane.

    The end of the cable with three connectors (two large and one small) is connected to locations **P40**, **P42** and **P44** on the **Non-OLIU Assembly**. The mating connectors on the cable are labeled **J40**, **J42** and **J44**, respectively.

    The end of the cable with two large connectors is connected to locations **P40** and **P42** on the **OLIU Assembly**. The mating connectors on the cable are labeled **J40** and **J42**, respectively.

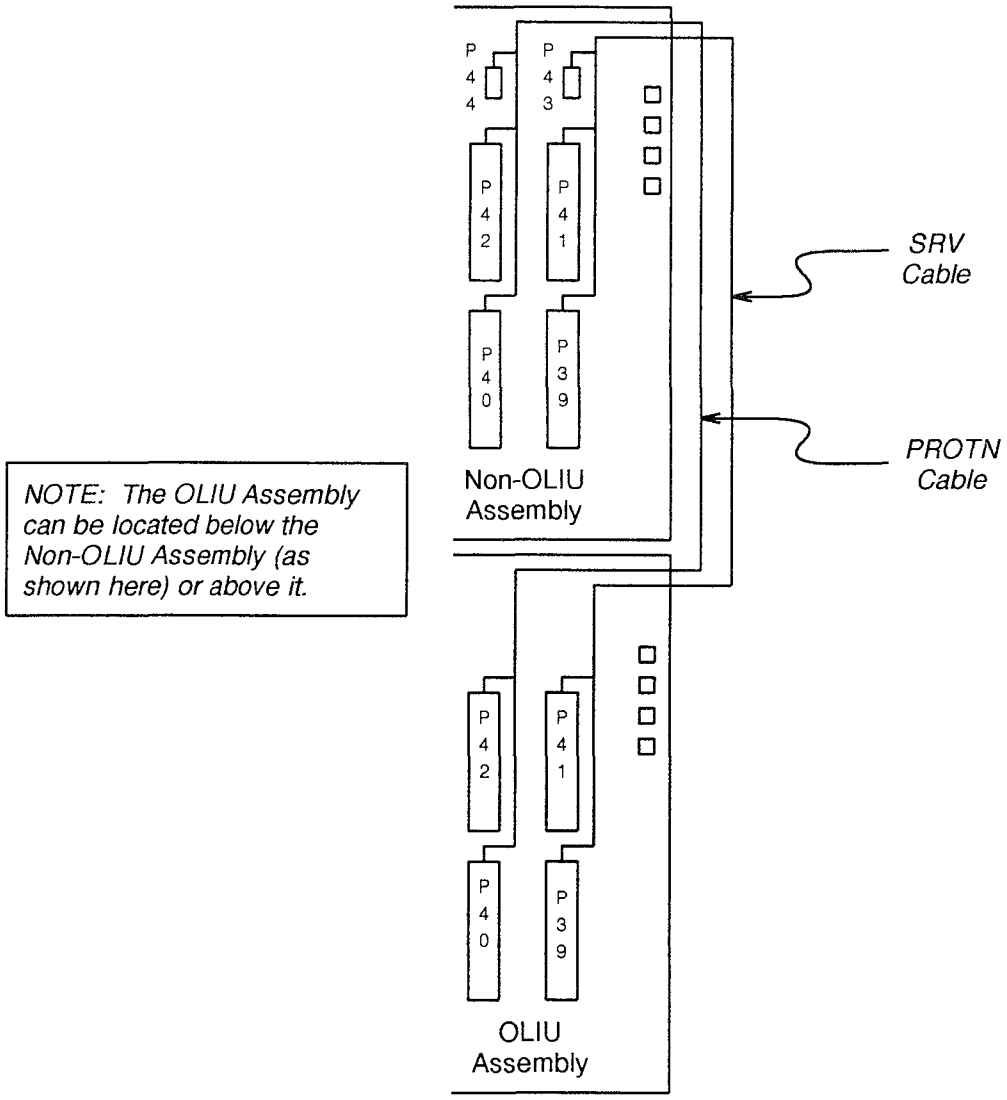


Figure 1. Installation of ED-2C833-20, G(17-20) Cables

14. **Figure 2** is a cutaway illustration showing the LED option switch in the **20-Type OLIU**. Access to the switch is gained by raising the ejector lever. The switch is illustrated in the **UP** position.

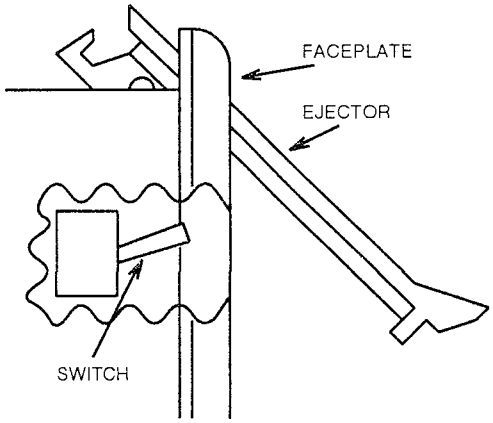


Figure 2. 20-Type OLIU LED Option Switch

15. Are the **20-Type OLIU**s to be installed in the upper or the lower **DDM-1000** assembly?

    If **UPPER**, then set the LED option switch on both **20-Type OLIU**s at this end of the system to the **UP** position.

    If **LOWER**, then set the LED option switch on both **20-Type OLIU**s at this end of the system to the **DOWN** position.

16. **Note**: It is assumed that the loss of the optical facility is known from office records or that a measurement has been made.

17. From office records, or by measurement, determine the loss of the optical facility.

18. **Table A** specifies the setting of the output level option switch on the **20-Type OLIU**.

Table A. 20-Type OLIU Output Level Switch Settings

		Transmitter Switch	
		LW	HI
Transmitter	Receiver	Facility Loss	
20E	20E	0 to 9.0 dB	9 to 15.0 dB
20G	20E	7 to 14.5 dB	14.5 to 20.7 dB
20G	20G or 20K	10 to 20.5 dB	20.5 to 26.5 dB
20K	20E	10 to 17.5 dB	17.5 to 24.0 dB
20K	20G or 20K	13 to 23.5 dB	23.5 to 29.8 dB
20G	20G or 20K	4.3 to 14.8 dB	14.8 to 20.8 dB

19. Refer to **Figure 3** and, at each end of the system, set the output level option switch on both the **SRV and PROTN 20-Type OLIUs** as indicated in **Table A**.

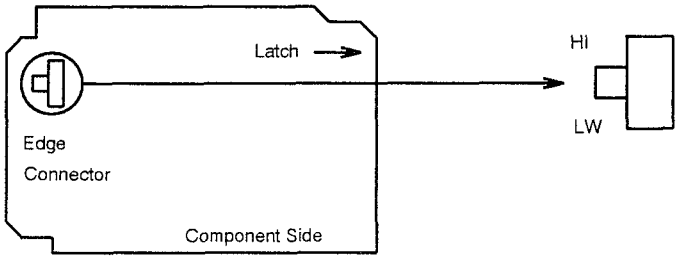


Figure 3. 20-Type OLIU Output Level Option Switch

20. At each end of the system, install a **20-Type OLIU** in the **PROTN OLIU** location of the **OLIU Assembly**.

    After several seconds, both **ALM** LEDs will be flashing on the **PROTN 20-Type OLIU** at each end of the system.

21. At each end of the system, connect the **PROTN** 180 Mb/s optical cables to the **IN** and **OUT** optical pigtails on the **PROTN 20-Type OLIU**.

    Response: At each end of the system, the **MN** alarm and all LEDs are extinguished.

22. At each end of the system, are all alarms and LEDs extinguished?

    If **YES**, then continue to **Step 23**.
    If **NO**, then refer to **TI-001** and clear the indicated condition.

23. Is an **ASCII terminal** available?

    If **YES**, then continue to **Step 24**.
    If **NO**, then do **Step 34**.

24. At each of the two near end assemblies use the **ASCII terminal** to make a high speed switch using the command **exct-sw-hs:s=( ) make**. Use the command **exct-lock-hs:s=( ) make** on both assemblies to lock to the protection line.

    Response: The **ASCII terminal** will report that the switches and locks were executed. At each end of the system, the **ABN** LED will be lighted on the **PROCR** in each assembly.

25. At each end of the system, are all LEDs and alarms except for the **ABN** LEDs extinguished?

    If **YES**, then continue to **Step 26**.
    If **NO**, then refer to **TI-001** and clear the indicated condition.

26. At each end of the system, disconnect the **SRV** optical cables from the **IN** and **OUT** optical pigtails on each of the **SRV 16-Type OLIUs**. Wait 20 seconds.

    Response: At each end of the system, the **MN** alarm will be activated and the **ALM** LED will be flashing on each of the **SRV 16-Type OLIUs**. The **ABN** LEDs will remain lighted.

27. At each end of the system, unseat and remove each of the **SRV 16-Type OLIUs**.

    Response: At each end of the system, the **MN** alarm will remain activated. The **ABN** LEDs will remain lighted.

28. Refer to **Figure 1** and, at each end of the system, install the **SRV ED-2C833-20, G(17-20)** cable assembly on the backplane as follows:

    Note: The "J" numbers stamped on the cable connectors **must always face to the right** where the "P" numbers are stamped on the backplane.

    The end of the cable with three connectors (two large and one small) is connected to locations **P39**, **P41** and **P43** on the **Non-OLIU Assembly**. The mating connectors on the cable are labeled **J39**, **J41** and **J43**, respectively.

    The end of the cable with two large connectors is connected to locations **P39** and **P41** on the **OLIU Assembly**. The mating connectors on the cable are labeled **J39** and **J41**, respectively.

29. At each end of the system, install a **20-Type OLIU** in the **SRV OLIU** location of the **OLIU Assembly**.

    After several seconds, both **ALM** LEDs will be flashing on the **20-Type OLIU** at each end of the system.

30. At each end of the system, connect the **SRV** optical cables to the **IN** and **OUT** optical pigtails on the **SRV 20-Type OLIU**.

    After several seconds, the **MN** alarm and all indicators except for the **ABN** LEDs will be extinguished at each end of the system.

31. At each end of the system, are all LEDs and alarms except for the **ABN** LEDs extinguished?

    If **YES**, then continue to **Step 32.**
    If **NO**, then refer to **TI-001** and clear the indicated condition.

32. At each assembly at the near end use the **ASCII terminal** to **exct-lock-hs:s=( ) break** to break the lock. Use the command **exct-sw-hs:s=( ) break** break the high speed switch.

    Response: The **ASCII terminal** will report that the lock and switches were taken down. At each end of the system, the **ABN** LEDs will be extinguished.

33. At each end of the system, are all LEDs and alarms extinguished?

    If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO**, then refer to **TI-001** and clear the indicated condition.

34. At each end of the system, disconnect the **SRV** optical cables from the **IN** and **OUT** optical pigtails on each of the **SRV 16-Type OLIUs**. Wait 20 seconds.

    Response: The **MN** alarm will be activated and the **ALM** LED will be flashing on both **SRV 16-Type OLIUs** at each end of the system.

35. At each end of the system, unseat and remove each of the **SRV 16-Type OLIUs**.

    Response: At each end of the system, the **MN** alarms will remain activated.

36. Refer to **Figure 1** and, at each end of the system, install the **SRV ED-2C833-20, G(17-20)** cable assembly on the backplane as follows:

    Note: The "J" numbers stamped on the cable connectors must always face to the right where the "P" numbers are stamped on the backplane.

    The end of the cable with three connectors (two large and one small) is connected to locations **P39**, **P41** and **P43** on the **Non-OLIU Assembly**. The mating connectors on the cable are labeled **J39**, **J41** and **J43**, respectively.

    The end of the cable with two large connectors is connected to locations **P39** and **P41** on the **OLIU Assembly**. The mating connectors on the cable are labeled **J39** and **J41**, respectively.

37. At each end of the system, install a **20-Type OLIU** in the **SRV OLIU** location of the **OLIU Assembly**.

    After several seconds, both **ALM** LEDs will be flashing on the **20-Type OLIU** at each end of the system.

38. At each end of the system, connect the **SRV** optical cables to the **IN** and **OUT** optical pigtails on the **SRV 20-Type OLIU**.

    After several seconds, the **MN** alarm and all indicators will be extinguished on each assembly at each end of the system.

39. At each end of the system, are all LEDs and alarms extinguished?

    If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE**
    If **NO**, then refer to **TI-001** and clear the indicated condition.

Replace AEK36 DS1 INTFC1 With AEK36B-type or AEK36C DS1 INTFC2

1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

   Note: The **AEK36 DS1 INTFC1** plug-in has been rated DA.

2. Is an **AEK36 DS1 INTFC1** plug-in installed in the **PROTN 8** location?

   If **YES**, then continue to **Step 3.**
   If **NO**, then do **Step 6.**

3. Unseat and remove the **AEK36 DS1 INTFC1** in the **PROTN 8** location. Carefully note the settings of the option switches on the plug-in.

4. **Note**: The option switches on the **AEK36B-type DS1 INTFC1** and **AEK36C** DS1 INTFC2 plug-ins are set differently to provide the same function.

   Refer to **DP-425** and set the option switches on the replacement **AEK36B-type** or **AEK36C DS1 INTFC2** plug-in *to provide the same function* as the option settings on the **AEK36 DS1 INTFC1** being replaced.

5. Install and seat the replacement **AEK36B**-type or **AEK36C DS1 INTFC2** plug-in in the **PROTN 8** location.

6. Is an **AEK36B**-type or **AEK36C DS1 INTFC2** plug-in installed in the **PROTN 9** location?

   If **YES**, then continue to **Step 7.**
   If **NO**, then do **Step 10.**

7. Unseat and remove the **AEK36 DS1 INTFC1** in the **PROTN 9** location. Carefully note the settings of the option switches on the plug-in.

8. **Note**: The option switches on the **AEK36B**-type or **AEK36C DS1 INTFC2** and plug-ins are set differently to provide the same function.

   Refer to **DP-425** and set the option switches on the replacement **AEK36B-type** or **AEK36C DS1 INTFC2** plug-ins *to provide the same function* as the option settings on the **AEK36 DS1 INTFC1** being replaced.

9. Install and seat the replacement **AEK36B**-type or **AEK36C DS1 INTFC2** plug-in in the **PROTN 9** location.

10. Unseat and remove the first **SRV AEK36 DS1 INTFC1** plug-in. Carefully note the settings of the option switches on the plug-in.

11. **Note**: The option switches on the **AEK36 DS1 INTFC1** and **AEK36B**-type and **AEK36C DS1 INTFC2** plug-ins are set differently to provide the same function.

    Refer to **DP-425** and set the option switches on the replacement **AEK36B**-type or **AEK36C DS1 INTFC2** plug-in *to provide the same function* as the option settings on the **AEK36 DS1 INTFC1** being replaced.

12. Install and seat the replacement **SRV AEK36B**-type and **AEK36C DS1 INTFC2** plug-in.

13. Repeat **Steps 10** through **12** for the remaining **SRV AEK36 DS1 INTFC1** plug-ins.

14. At both the near-end and far-end **DDM-1000**, momentarily depress the **RST** button on the **PROCR** to update the **PROCR's** internal equipment list. Refer to **DP-402** for details.

Test Protection Switching Function

1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

   Note 1: If far-end communication (fecom) is enabled and if the far-end alarm reporting option is enabled in the **PROCR** pack, the following tests will cause alarms in the far-end office.

   Note 2: Sometimes, when testing a low speed protection switch, one or both muldems may completely fail. This problem may be caused by bent pins associated with the low speed DS1 connectors. If a failure occurs, carefully check that all backplane pins associated with the low speed connectors are contained within the connectors and that none are bent and touching adjacent pins.

2. To test a low speed switch to protection, unplug one of the low speed plug-ins (AEK36, AEK36B (AEK36B S1:2), AEK37 or AEK38).

   Response: **MN** and **NE** LEDs on PROCR light after approximately 20 seconds.

3. ***Caution: If system is in service, unplugging a second service plug-in in the same muldem will cause a service interruption on both low speed plug-ins.***

   To test for a Major Alarm, unplug another low speed plug-in. After about 20 seconds the PROCR **MJ** (or **CR**) light will be turned ON, the **NE** light will remain ON and the **MN** light will go OFF.

   Response: After approximately 20 seconds, PROCR **MJ** (or **CR**) LED lights; **MN** LED goes OFF; **NE** LED remains ON.

4. Reseat the plug-ins that were removed.

   Response: All LEDs go OFF after approximately 20 seconds.

5. Repeat **Steps 2, 3** and **4** for each muldem.

6. In a DDM-1000 optical system, to make a high speed switch properly, both a **SRV** and **PROTN** function unit must be present in a muldem. A high speed switch will not occur if one muldem contains only a **SRV** function unit. If only one muldem is equipped, install an **AKM86 BP2** pack if required. See DP-412.

   To test a high speed switch to protect, unplug one of the service function units [**MXR( )** or **DS3U( )**].

   Response: After approximately 20 seconds, **MN** and **NE** LEDs on PROCR light. In a DDM-1000 optical system, the **FE** LED will also light.

7. ***Caution: If system is in service, unplugging the protection plug-in associated with the removed service plug-in will cause a service interruption.***

   To test a Major or Critical Alarm, unplug the protection plug-in associated with the removed service function unit.

   Response: After approximately 20 seconds, **MJ** (or **CR**) LED on PROCR lights; **MN** LED goes OFF, and **NE** LED remains lighted.

8. Reseat the plug-ins that were removed.

   Response: After approximately 20 seconds, all LEDs go OFF.

9. To test for a switch to protection using an ASCII terminal, connect the terminal, if necessary, to the connector on the **PROCR**. Enter the command: "**rept-stat-protn:**". The terminal will display the current protection status.

10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Connect TABS Serial Telemetry

1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

2. **Note**: Each DDM-1000 is to be individually connected to the TABS serial telemetry equipment at its respective end of the transmission system. When more than one DDM-1000 in a framework is to be connected to a serial telemetry system, the bottom DDM-1000 is connected to the telemetry system and the other DDM-1000s are connected to the first through a special cable.

   Refer to the SPECIFICATIONS section of this user's manual under "Interconnection Specifications" for a listing of the TABS serial telemetry connections.

3. If more than one DDM-1000 in the same framework is to be connected to the TABS serial telemetry system, use ED-2C833-20, G25 (G251) cable assembly. If only one DDM-1000 is to be connected, use the ED-2C833-20, G24 (G241) cable.

   Note: If overhead telemetry is required, the wiring must be added in the field to the **J35** connector on the **ED-2C833-20, G24 (G241) or G25 (G251)** cable assembly. Refer to **DP-410** and the SPECIFICATIONS section of this manual under "Interconnection Specifications" for a listing of the overhead telemetry connection using an MC90191A1 TLM2.

4. ***Caution 1: Inserting an* AKM4 TLM1 *in a DDM-1000 that is cabled for* MC90191A1 TLM2 *performance monitoring may damage other TLM2s installed in DDM-1000 shelves in the same bay. It may also damage the telemetry remote monitoring system (such as the GTP).***

   Caution 2: Connecting the G25 (G251) cable to a DDM-1000 with an* AKM4 TLM1 *and to a DDM-1000 with an* MC90191A1 TLM2 *in the same framework may damage the TLM2s. It may also damage the telemetry remote monitoring system (such as the GTP). Do not connect the G25 (G251) cable to DDM-1000s with a* TLM1 *installed.

   Connect jack **J35** on the **ED-2C833-20, G24 (G241) or G25 (G251)** cable assembly to plug **P35** on the backplane of the **DDM-1000**. It is necessary to push the retainer slightly to the side to align the jack with the backplane pins. The jacks will snap solidly into place when they are properly seated.

5. **Note**: A ground connection is required only on the transmitting end of the cable. Therefore, a ground connection is required at the DDM-1000 and also on the transmitting cable at the telemetry remote equipment.

   Connect the ground pigtail to one of the unused ground lugs on the DDM-1000 backplane.

   Note: If all the ground lugs are used, remove one of the ground connections and connect the cable assembly ground pigtail in its place. Reconnect the removed ground connection to the piggy-back terminal on the cable assembly ground pigtail.

6. Refer to **Figure 1**. Dress and tie the cabling along the horizontal and vertical protecting bars attached to the backplane. Dress the TABS cables from shelf to shelf by passing them under the tie bars or by cutting notches in the backplane cover.

7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

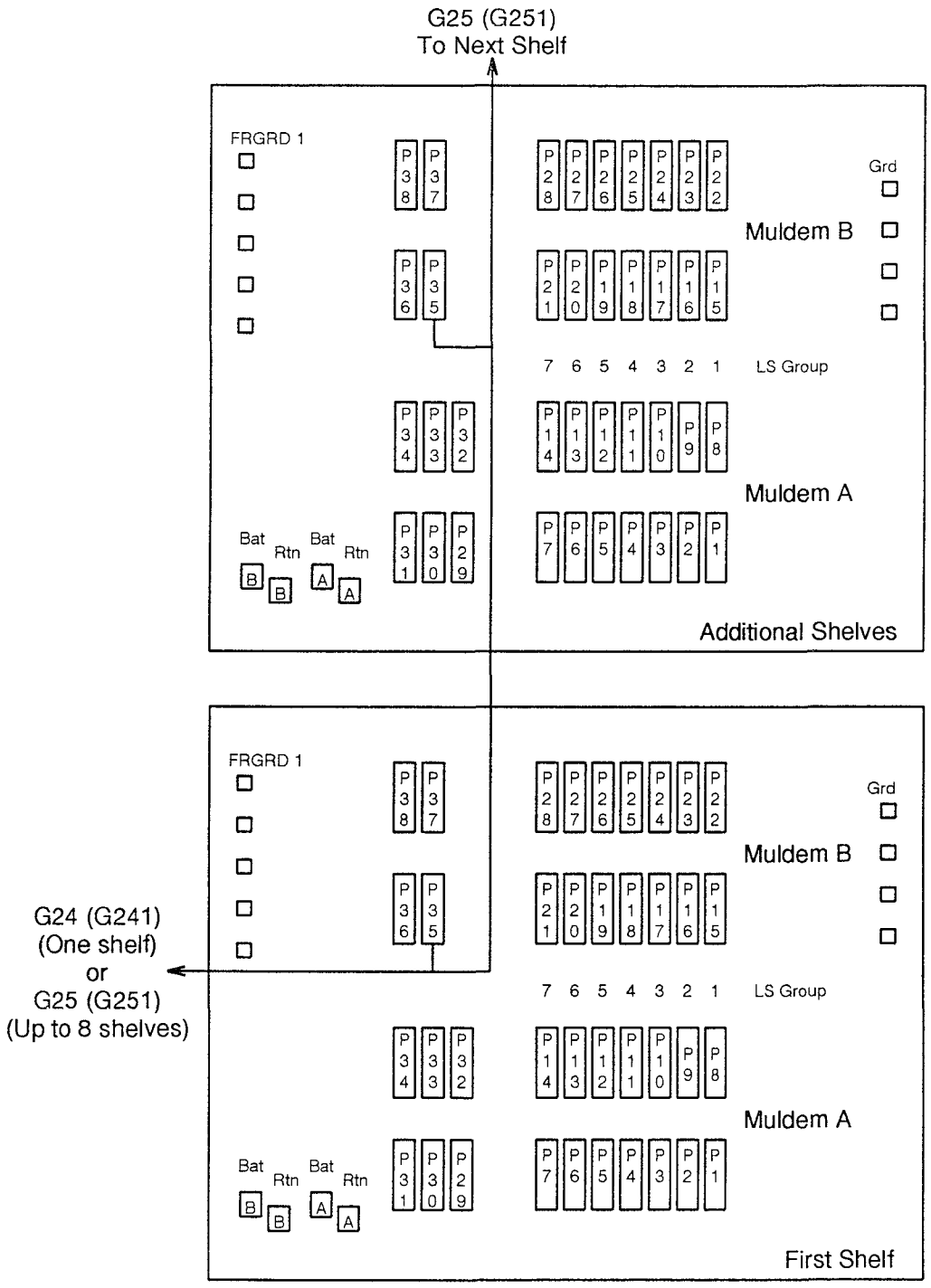


Figure 1. TABS Serial Telemetry Connection

Perform DS3U1 Looped-Back Test (Optical)

1. **NOTICE:** Unterminated optical connectors may emit laser radiation. Do not view beam with optical instruments.

2. ***Warning 1: Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam.***

3. ***Warning 2: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.***

4. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

5. **IMPORTANT:** The **AKM5 DS3U1** will accept a "standard" DS3 input or a DS3 input with M13-Type framing. Currently available DS3 test sets can be used to produce a "standard" DS3 output or the following test can be performed if one of the following is available:

   Another **DDM-1000** assembly (with at least one muldem out-of-service) operating in the DS3 (rather than optical) mode and equipped with at least one **547-Type PWR**, one **PROCR**, one **AKM3 ELIU1**, one **MXR** (optioned for M13 mode or C-bit parity), and one **LS INTFC** (**AEK36-type DS1 INTFC, AEK37 DS1C INTFC1** or **AEK38 DS2 INTFC1**)

   OR

   An out-of-service M13-Type multiplexer and an appropriate low speed test set (such as a **KS-20775, L1 Error Rate Test Set**).

6. Will the test be performed with a test **DDM-1000** muldem, an M13-Type multiplexer and a DS1 test set, or with a "standard" DS3 test set?

   If with a test **DDM-1000 muldem**, then continue with **Step 7.**
   If with **M13-Type multiplexer and DS1 test set**, then proceed to **Step 26.**
   If with a "standard" **DS3 test set**, then proceed to **Step 46.**

7. **Note**: The following test (**Steps 8** through **20**) will be performed for one muldem of the DDM-1000 under test. This means only one muldem in the test DDM-1000 is required. Either muldem may be used. The MXR may be optioned for either M13 mode or C-bit parity mode.

8. At the **DSX-3** cross-connect appearances for the test muldem (not the **DDM-1000** under test), install a temporary loop from the **DS3 OUT** jack to the **DS3 IN** jack.

9. Refer to **DP-413** and perform an automatic looped transmission test for the test muldem.

10. Did the test muldem pass the automatic looped transmission test?

    If **YES**, then continue to **Step 11.**
    If **NO**, then refer to **TI-001** and repair the test **DDM-1000** as required.

11. Connect the system as shown in **Figure 1.** Connect only one DS3 path in each direction. Loop both the **SRV** and **PROTN OLIUs** back on themselves.

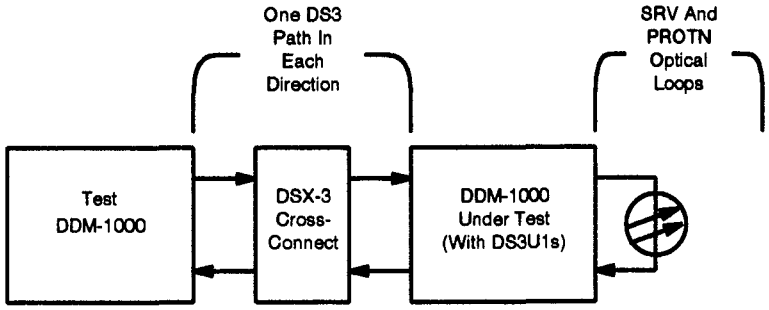


Figure 1. Test Setup With Test DDM-1000

12. Wait approximately 1 minute to give the LED indicators and alarms a chance to retire.

    Are any LED indicators lighted or alarms activated on the **DDM-1000** under test?

    If **YES**, then continue to **Step 13.**
    If **NO**, then do **Step 14.**

13. Refer to **TI-001** and clear the failure in the **DDM-1000** under test.

14. Repeat the automatic looped transmission test of the test muldem. This tests the Service (SRV) channel of the **DDM-1000** under test.

15. Did the test muldem pass the automatic looped transmission test?

    If **YES**, then continue to **Step 16**.
    If **NO**, then do **Step 23**.

16. In the **DDM-1000** under test, unseat the **OLIU** in the **SRV** location.

    Response: On the **PROCR** plug-in of the **DDM-1000** under test, the **MN**, **NE** and **FE** LEDs should be lighted.

17. Repeat the automatic looped transmission test of the test muldem. This tests the Protection (PROTN) channel of the **DDM-1000** under test.

18. Did the test muldem pass the automatic looped transmission test again?

    If **YES**, then continue to **Step 19**.
    If **NO**, then do **Step 23**.

19. The muldem of the **DDM-1000** equipped with the **DS3U1** has passed the looped transmission test.

20. Reseat the **OLIU** in the **SRV** location.

21. Return to procedure that sent you here and test other muldem as required, if not already performed.

22. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

23. The **DDM-1000** under test has failed the **DS3U1** looped transmission test.

24. The failure can be in either the **OLIU** or the **DS3U1** being tested. Replacement of the suspect plug-ins, one at a time, with spare units (and repeating **Steps 11** through **20**) will isolate the failed plug-in.

25. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

26. **Note**: The following test (**Steps 27** through **40**) will be performed for one muldem of the **DDM-1000** under test.

27. Connect the system as shown in **Figure 2**. Connect only one DS1 path in each direction. Connect only one DS3 path in each direction. At the **DDM-1000** under test, loop both the **SRV** and **PROTN OLIUs** back on themselves.

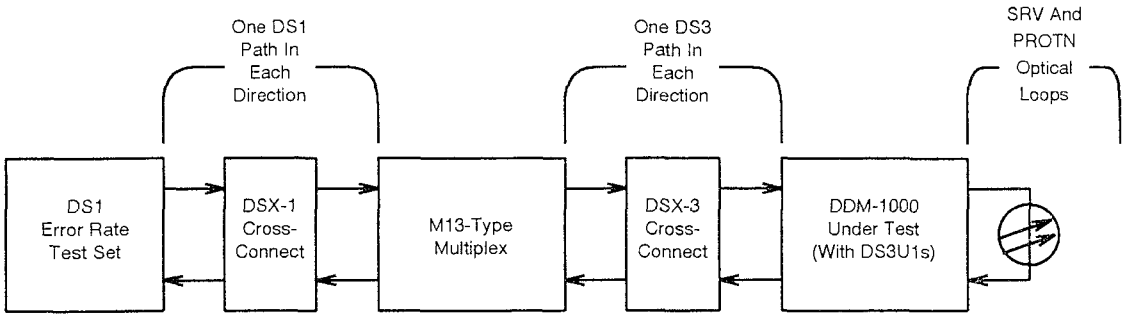


Figure 2. Test Setup Without Test DDM-1000

28. Wait approximately 1 minute to give the LED indicators and alarms a chance to retire.

    Are any LED indicators lighted or alarms activated on the **DDM-1000** under test?

    If **YES**, then continue to **Step 29**.
    If **NO**, then do **Step 30**.

29. Refer to **TI-001** and clear the failure in the **DDM-1000** under test.

30. At the **DSX-3** cross-connect appearances for the test muldem (not the **DDM-1000** under test), temporarily remove the connections to the **DDM-1000** under test and loop the test muldem on itself by connecting a loop from the **DS3 OUT** jack to the **DS3 IN** jack.

31. Use the DS1 test set to check for error-free transmission through the single DS1 channel under test.

32. Was error-free transmission observed?

    If **YES**, then continue to **Step 33**.
    If **NO**, then refer to the appropriate supporting documentation and repair the test muldem as required.

33. Reconnect the system as shown in **Figure 2**.

34. Use the DS1 test set to check for error-free transmission through the single DS1 channel under test. This tests the service channel of the **DDM-1000** under test.

35. Was error-free transmission observed.

    If **YES**, then continue to **Step 36**.
    If **NO**, do **Step 43**.

36. In the **DDM-1000** under test, unseat the **OLIU** in the **SRV** location.

37. Use the DS1 test set to check for error-free transmission through the single DS1 channel under test. This tests the protection channel of the **DDM-1000** under test.

38. Was error-free transmission observed?

    If **YES**, then continue to **Step 39**.
    If **NO**, do **Step 43**.

39. The muldem of the **DDM-1000** equipped with the **DS3U1** has passed the looped transmission test.

40. Reseat the **OLIU** in the **SRV** location.

41. Return to the procedure that sent you here and test the other muldem as required, if not already performed.

42. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

43. The **DDM-1000** has failed the **DS3U1** looped transmission test.

44. The failure can be in either the **OLIU** or the **DS3U1** being tested. Replacement of the suspect plug-ins, one at a time, with spare units (and repeating **Steps 27** through **40**) will isolate the failed plug-in.

45. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

46. **Note**: The following test (**Steps 47** through **57**) will be performed for the muldem of the **DDM-1000** equipped with the **DS3U1**.

47. Loop the DS3 test set on itself and verify that it is running error free.

48. Connect the system as shown in **Figure 3**. Connect only one DS3 path in each direction. Loop both the **SRV** and **PROTN OLIUs** back on themselves.

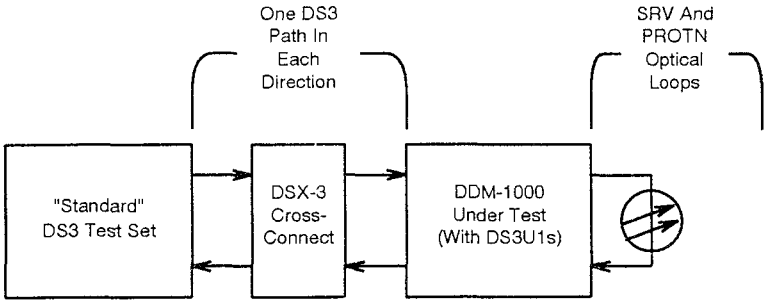


Figure 3. Test Setup With Standard DS3 Test Set

49. Wait approximately 1 minute to give the LED indicators and alarms a chance to retire.

    Are any LED indicators lighted or alarms activated on the **DDM-1000** under test?

    If **YES**, then continue with **Step 50**.
    If **NO**, then proceed to **Step 51**.

50. Refer to **TI-001** and clear the failure in the **DDM-1000** under test.

51. Use the DS3 test set to check for error-free transmission through the DS3 channel under test. This tests the service channel of the **DDM-1000** under test.

52. Was error-free transmission observed.

    If **YES**, then continue with **Step 53**.
    If **NO**, then proceed to **Step 60**.

53. In the **DDM-1000** under test, unseat the **OLIU** in the **SRV** location.

54. Use the DS3 test set to check for error-free transmission through the DS3 channel under test. This tests the protection channel of the **DDM-1000** under test.

55. Was error-free transmission observed?

    If **YES**, then continue with **Step 56**.
    If **NO**, then proceed to **Step 60**.

56. The muldem of the **DDM-1000** equipped with the **DS3U1** has passed the looped transmission test.

57. Reseat the **OLIU** in the **SRV** location.

58. Return to the procedure that sent you here and test the other muldem as required, if not already performed.

59. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

60. The **DDM-1000** has failed the **DS3U1** looped transmission test.

61. The failure can be in either the **OLIU** or the **DS3U1** being tested. Replacement of the suspect plug-ins, one at a time, with spare units (and repeating **Steps 47** through **57**) will isolate the failed plug-in.

62. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform DS3U1 End-to-End Test (Optical)

1. **NOTICE:** Unterminated optical connectors may emit laser radiation. Do not view beam with optical instruments.

2. ***Warning 1: Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam.***

3. ***Warning 2: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.***

4. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

5. Is the muldem at either end of the system equipped with a **MXR** rather than **AKM5 DS3U1** function units?

   If **YES**, then continue to **Step 6**.
   If **NO**, then do **Step 21**.

6. **Note**: Although an optical DDM-1000 system operates at 90 or 180 Mb/s, the following procedures refer to a 45 Mb/s end-to-end system, i.e., a muldem-to-muldem system, rather than a shelf-to-shelf system.

7. Verify that the end-to-end optical connections are in place.

8. At the **DSX-3 Cross-Connect** associated with the **DDM-1000** that is equipped with **DS3U1s**, connect a patch cord from the **OUT** jack to the **IN** jack for the muldem to be tested.

9. At the **DDM-1000** equipped with **MXR** function units, perform the automatic looped-back test, following the procedures of **DP-413**. This tests the Service channel of both the Near End and Far End DDM-1000s.

10. Did the automatic looped-back test pass?

    If **YES**, then continue to **Step 11**.
    If **NO**, then do **Step 18**.

11. At the **DDM-1000** equipped with **MXR** function units, unseat the **OLIU** in the **SRV** location.

    Response: At each **DDM-1000**, the **MN**, **NE** and **FE** LEDs will be lighted.

12. Repeat the automatic looped-back test. This tests the Protection channel of both the Near End and Far End DDM-1000s.

13. The **SRV HS** unit will fail this test - this is normal for the test conditions.

    Did the automatic looped-back test pass for the **PROTN HS** and all of the low speed units?

    If **YES**, then continue to **Step 14**.
    If **NO**, then do **Step 18**.

14. The circuit under test has passed the **DS3U1** end-to-end test.

15. Reseat the **OLIU** in the **SRV** location.

16. Return to the procedure that sent you here to test the other muldem as required, if not already performed.

17. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

18. The circuit under test has failed the **DS3U1** end-to-end test.

19. The failure can be in either the near-end or far-end muldem. Retest each muldem locally with a fiber loopback, then repeat **Steps 8** through **15**.

20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

21. **IMPORTANT:** The **AKM5 DS3U1** will accept a "standard" DS3 input or a DS3 input with M13-Type framing. Currently available DS3 test sets can be used to produce a "standard" DS3 output or the following test can be performed if one of the following is available:

    Another **DDM-1000** assembly (with at least one muldem out-of-service) operating in the DS3 (rather than optical) mode and equipped with at least one **547-Type PWR**, one **PROCR**, one **AKM3 ELIU1**, one **MXR** (optioned for M13 mode or C-bit parity) and one **LS INTFC** [**AEK36 DS1 INTFC** (rated DA), **AEK36B DS1 INTFC2**, **AEK36B S1:2 DS1 INTFC2 AEK37 DS1C INTFC** or **AEK38 DS2 INTFC**]]

    OR

    An out-of-service M13-Type multiplexer and an appropriate low-speed test set (such as a **KS-20775, L1 Error Rate Test Set**).

22. Will the test be performed with a test **DDM-1000** muldem, an M13-Type multiplexer and a DS1 test set, or with a DS3 test set?

    If with a test **DDM-1000** muldem, then continue with **Step 23**.
    If with an M13-Type multiplexer and a DS1 test set, then proceed to **Step 42**.
    If with a DS3 test set, then proceed to **Step 62**.

23. **Note**: Although the Optical transmission of the DDM-1000 is at 90 or 180 Mb/s, the following procedures will refer to a 45 Mb/s end-to-end system, i.e., to a muldem-to-muldem system rather than a shelf-to-shelf system. This means only one muldem in the test DDM-1000 is required. Either muldem may be used. The MXR may be optioned for either M13 mode or C-bit parity mode.

24. At the **DSX-3** cross-connect appearances for the test muldem (not either of the **DDM-1000s** under test), install a temporary loop from the **DS3 OUT** jack to the **DS3 IN** jack.

25. Refer to **DP-413** and perform an automatic looped transmission test for the test muldem.

26. Did the test muldem pass the automatic looped transmission test?

    If **YES**, then continue to **Step 27**.
    If **NO**, then refer to **TI-001** and repair the test **DDM-1000** as required.

27. Connect the system as shown in **Figure 1**. Connect only one DS3 path in each direction. Verify that both the **SRV** and **PROTN** Optical paths are connected from end to end.

28. Wait approximately 1 minute to give the LED indicators and alarms a chance to retire.

    Are any LED indicators lighted or alarms activated on either **DDM-1000** under test?

    If **YES**, then continue to **Step 29**.
    If **NO**, then do **Step 30**.

29. Refer to **TI-001** and clear the failure in the **DDM-1000** under test.

30. Repeat the automatic looped transmission test of the test muldem. This tests the Service channel of the DDM-1000 under test.

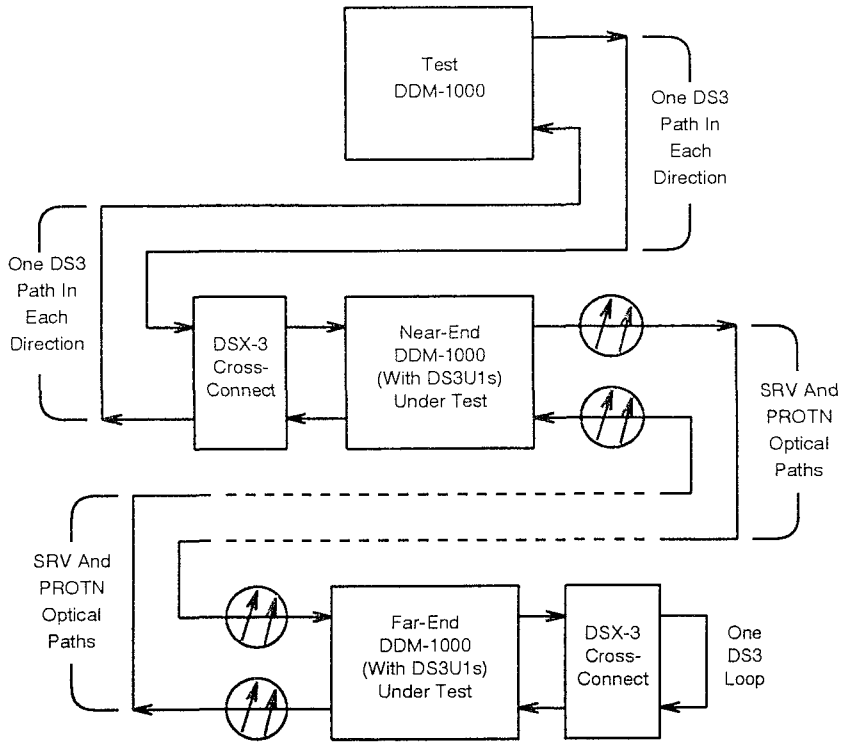


Figure 1. Test Setup With Test DDM-1000

31. Did the test muldem pass the automatic looped transmission test?

    If **YES**, then continue to **Step 32**.
    If **NO**, then do **Step 39**.

32. In the near-end **DDM-1000** under test, unseat the **OLIU** in the **SRV** location.

    Response: On the **PROCR** plug-in of each of the **DDM-1000s** under test, the **MN**, **NE** and **FE** LEDs will be lighted.

33. Repeat the automatic looped transmission test of the test muldem. This tests the Protection channel of the DDM-1000 under test.

34. Did the test muldem pass the automatic looped transmission test again?

    If **YES**, then continue to **Step 35**.
    If **NO**, then do **Step 39**.

35. The first muldem-to-muldem system of the **DDM-1000** under test has passed the **DS3U1** end-to-end transmission test.

36. Reseat the **OLIU** in the **SRV** location.

37. Return to the procedure that sent you here to test the other muldem as required, if not already performed.

38. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

39. The system under test has failed the **DS3U1** end-to-end transmission test.

40. The failure can be in either the near-end or far-end muldem. Retest each muldem locally with a fiber loopback; then repeat **Steps 27** through **36**) to isolate the failure.

41. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

42. **Note**: Although the optical transmission of the DDM-1000 is at 90 or 180 Mb/s, the following procedures will refer to a 45 Mb/s end-to-end system, i.e., to a muldem-to-muldem system rather than a shelf-to-shelf system. This means only one muldem in the test M13 multiplexers is required.

43. Connect the system as shown in **Figure 2**. Connect only one DS1 path in each direction. Connect only one DS3 path in each direction. At the far-end **DDM-1000** under test, loop the DS3 output back into the DS3 input.

44. Wait approximately 1 minute to give the LED indicators and alarms a chance to retire.

    Are any LED indicators lighted or alarms activated on either of the **DDM-1000s** under test?

    If **YES**, then continue to **Step 45**.
    If **NO**, then do **Step 46**.

45. Refer to **TI-001** and clear the failure in the **DDM-1000** under test.

46. At the **DSX-3** cross-connect appearances for the test muldem (not the **DDM-1000s** under test), temporarily remove the connections to the near-end **DDM-1000** under test and loop the test muldem on itself by connecting a loop from the **DS3 OUT** jack to the **DS3 IN** jack.

47. Use the DS1 test set to check for error-free transmission through the single DS1 channel under test.

48. Was error-free transmission observed?

    If **YES**, then continue to **Step 49**.
    If **NO**, then refer to the appropriate supporting documentation and repair the test muldem as required.

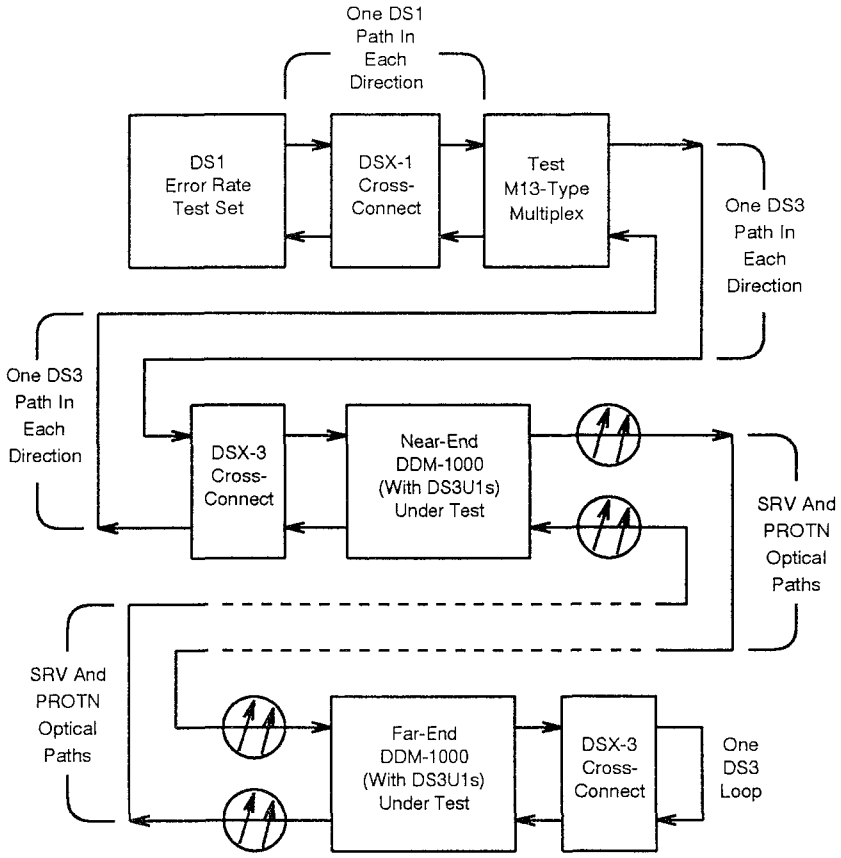


Figure 2. Test Setup Without Test DDM-1000

49. Reconnect the system as shown in **Figure 2**.

50. Use the DS1 test set to check for error-free transmission through the single DS1 channel under test. This tests the DS3U1 Service channel of the DDM-1000 under test.

51. Was error-free transmission observed.

    If **YES**, then continue to **Step 52**.
    If **NO**, do **Step 59**.

52. In the near-end **DDM-1000** under test, unseat the **OLIU** in the **SRV** location.

53. Use the DS1 test set to check for error-free transmission through the single DS1 channel under test. This tests the DS3U1 Protection channel of the DDM-1000 under test.

54. Was error-free transmission observed?

    If **YES**, then continue to **Step 55**.
    If **NO**, do **Step 59**.

55. The first muldem-to muldem system has passed the **DS3U1** end-to-end transmission test.

56. Reseat the **OLIU** in the **SRV** location.

57. Return to the procedure that sent you here to test the other muldem as required, if not already performed.

58. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

59. The system has failed the **DS3U1** end-to-end transmission test.

60. The failure can be in either the near-end or far-end muldem. Retest each muldem locally with a fiber loopback; then repeat **Steps 43** through **56**) to isolate the failure.

61. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

62. **Note**: Although the Optical transmission of the DDM-1000 is at 90 or 180 Mb/s, the following procedures will refer to a 45 Mb/s end-to-end system, that is, to a muldem-to-muldem system rather than a shelf-to-shelf system. This means that only one "standard" DS3 test set is required to test the DS3U1 channel.

63. Loop the DS3 test set on itself and verify that it is running error free.

64. Connect the system as shown in **Figure 3**. Connect only one DS3 path in each direction. Verify that both the **SRV** and **PROTN** Optical paths are connected from end to end.

65. Wait approximately 1 minute to give the LED indicators and alarms a chance to retire.

    Are any LED indicators lighted or alarms activated on either **DDM-1000** under test?

    If **YES**, then continue with **Step 66**.
    If **NO**, then proceed to **Step 67**.

66. Refer to **TI-001** and clear the failure in the **DDM-1000** under test.

67. Use the DS3 test set to check for error-free transmission through the Service channel in the muldem equipped with the DS3U1.

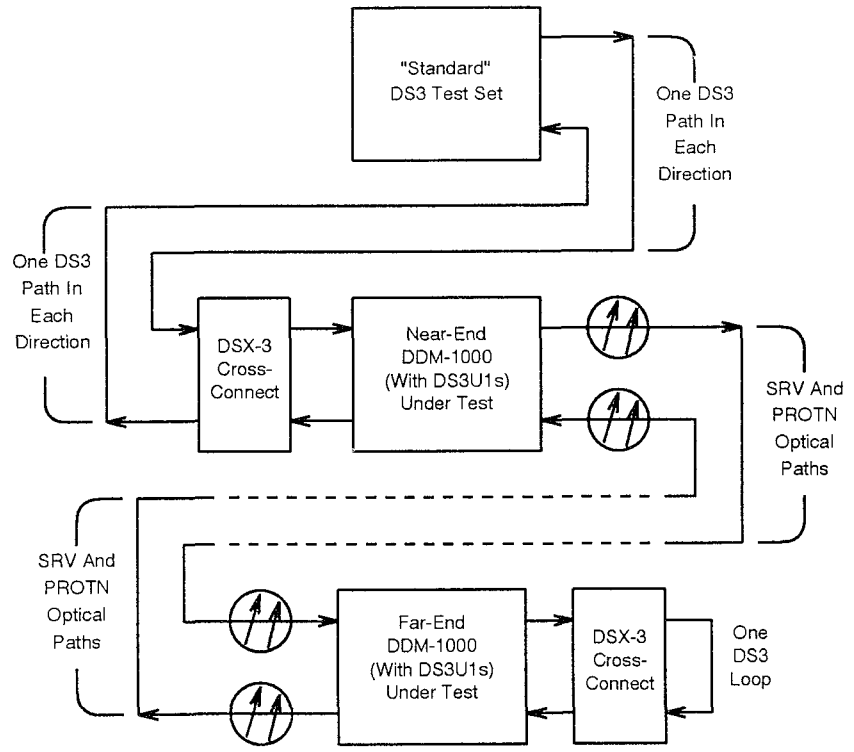


Figure 3. Test Setup With Standard DS3 Test Set

68. Was error-free transmission observed?

    If **YES**, then continue to **Step 69**.
    If **NO**, then do **Step 76**.

69. In the near-end **DDM-1000** under test, unseat the **OLIU** in the **SRV** location.

    Response: On the **PROCR** plug-in of each of the **DDM-1000s** under test, the **MN**, **NE** and **FE** LEDs will be lighted.

70. Use the DS3 test set to check for error-free transmission through the Protection channel in the muldem equipped with the DS3U1.

71. Was error-free transmission observed?

    If **YES**, then continue to **Step 72**.
    If **NO**, then do **Step 76**.

72. The first muldem-to-muldem system of the **DDM-1000** under test has passed the **DS3U1** end-to-end transmission test.

73. Reseat the **OLIU** in the **SRV** location.

74. Return to the procedure that sent you here to test the other muldem as required, if not already performed.

75. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

76. The system under test has failed the **DS3U1** end-to-end transmission test.

77. The failure can be in either the near-end or far-end muldem. Retest each muldem locally with a fiber loopback; then repeat **Steps 64** through **73**) to isolate the failure.

78. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Convert In-Service DS3U2 To DS3U1

1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

   Note 1: AKM5 DS3U1 packs cannot be used in 180 Mb/s systems.

   Note 2: This procedure requires coordination between personnel at the two ends (near and far) of the system.

   Note 3: DS3U2 or MXR packs must be installed in the other muldem of the shelves being converted to DS3U1 packs. This is necessary to provide far end communications during and after the conversion.

   Notify personnel at the "far end". Also, notify maintenance center personnel that alarms will be generated.

2. **Note:** The ASCII terminal command **test-led:s=( )** may be used to identify the shelf.

   Identify the shelf equipped with the DS3U2 to be converted.

3. **Note:** The ASCII terminal commands **rept-fail:s=( )** and **rept-stat-protn:s=( )** may be used to report current failures and protection status.

   Verify that there are no active alarms or protection switches.

4. Refer to **DP-404** and install an **MC90083A1D** (or later) **PROCR2** at both the near end and far end. Ensure that the new **PROCR2** is "reset" properly per **DP-404**.

5. ***Caution 1: This command may be service affecting. If optional parameters are not set properly, the default value may cause service interruption. Ensure the command you enter is for the correct shelf.***

   Caution 2: This command will result in a momentary "hit" on service.

   Use the following ASCII terminal command at one end to switch service to protection: **exct-sw-hs:s=( ) make**

6. Use the following ASCII terminal command at one end to lock service to protection: **exct-lock-hs:s=( ) make**

   Response: On the **PROCR** plug-in at both ends, the **ABN** LED is lighted.

7. **Note:** There are no option switch settings on the **DS3U1** pack.

   At both ends of the system, change the service (**SRV**) unit from **DS3U2** to a **DS3U1**.

   Response: On the **PROCR** plug-in at both ends, the **ABN**, **NE**, **FE**, and **MN** LEDs are lighted and the SRV **OLIU** LED flashes. On the SRV **DS3U1** pack at each end, the **FAIL** LED is lighted.

8. At both ends, enter the following command: **exct-rst:s=( )** or momentarily depress the **RST** button. (See **DP-402** for details.)

   Response: On the **PROCR** plug-in at both ends, the **ABN**, **NE**, **FE**, and **MJ** (or **CR**) LEDs are lighted. On the SRV **DS3U1** pack at each end, the **FAIL** LED goes off. On the PROTN **DS3U2** pack at each end, the **FAIL** LED is lighted.

   Note: The **MJ** (or **CR**) LED lights because service is locked on protection and the **PROCR** "thinks" that the protection channel has failed.

9. Use the following ASCII terminal command to force the channel from the protection slot to the service slot: **exct-sw-hs:s=( ) break**

   Response: ASCII terminal displays this prompt: "Switch may cause service outage. Do you want to override?"

10. **Note:** The following action forces the channel from protection to service and automatically locks it.

    Enter "**y**" or "**Y**".

    Response: On the **PROCR** plug-in at both ends, the **ABN** LED will be lighted.

11. At both ends of the system, change the PROTN **DS3U2** to a **DS3U1**.

12. Enter the following command: **exct-lock-hs:s=( ) break**

    Response: On the **PROCR** plug-in at both ends, the **ABN** LED goes off.

    Note: The muldem is now converted to DS3 clear channel.

13. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Upgrade DDM-1000 for C-Bit Parity (Performance Monitoring)

1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.***

   Caution:* AEK38 DS2 LS INTFC *packs cannot be used in a muldem provisioned for C-bit parity framing format (performance monitoring).

   Note: This procedure is used to convert a DDM-1000 shelf from "M13 mode" to "C-bit parity mode" for DS3 performance monitoring. This procedure applies to shelves configured as a multiplexer operating in electrical or optical mode.

   Note: If new packs are being installed, a "spare" DDM-1000 that has been tested and not yet in service may be used to test the new packs. Procedures for testing are found in the IP installation procedures for installing DDM-1000 in looped-back operation.

   Obtain and inspect the following equipment necessary to perform this upgrade procedure:

   4 - **AKM2C MXR3** packs (2 packs per muldem)
   1 - **AKM7 TLM2** pack
   1 - **MC90083A1C** (or later) **PROCR2** pack
   ED-2C833-20, G24 or **G25** TABS cable
   Error Rate Test Set (ERTS)

2. **Note:** This procedure requires coordination between personnel at the two ends (near and far) of the system.

   Notify personnel at the "far end". Also, notify maintenance center personnel that alarms will be generated.

3. **Note:** The ASCII terminal command **test-led:s=( )** may be used to identify shelves being upgraded for PM.

   Identify the shelf (shelves) being upgraded.

4. Is system in optical or electrical mode of operation?

   If **ELECTRICAL**, continue with **Step 5**.
   If **OPTICAL**, proceed to **Step 25**.

5. **Note:** The ASCII terminal commands **rept-fail:s=( )**, **rept-stat-protn:s=( )**, and **rept-opt-shelf:s=( )** may be used to determine shelf options, and report current failures and protection status. The ASCII terminal command **rept-opt-shelf:s=( )** may be used to ensure "fecom" is off. If "fecom" is not off, it may be turned off with the command "**set-shelf-fecom:s=( ) no**" at each end of the system.

   Verify that there are no active alarms or failures, protection switches or locks, and ensure "fecom" is off.

6. Record (print) options for shelf that have previously been set using the ASCII terminal.

7. ***Caution: Damage to* TLM2 *packs and equipment may result if the TABS cable is connected to any shelf equipped with a* TLM1 *pack.***

   Refer to **DP-443** and perform the following:

   1. Verify that the ED-2C833-20 TABS cable is connected to **P35** on each shelf that will be equipped with the PM feature.

   2. Ensure that the shield wire is connected to the **GRD 5** lug on the DDM-1000 backplane.

   3. Verify that the TABS cable is connected to the telemetry remote monitoring system (such as GTP).

8. ***Caution: Ensure you install the* PROCR *in the correct slot* (PROCR). *Installing the* PROCR *in the* TLM *slot will damage the* PROCR.**

   Refer to **DP-404**. At both ends, option and install **MC90083A1C** (or later) **PROCR2**s.

9. **Note:** If you are installing PM in a shelf located above a shelf that already has PM, then you must change the **TLM2** option plugs P2 and P4 in the lower shelf so it is "*NOT* HIGHEST TABS ADDRESS".

   Refer to **DP-412**. At both ends, option and install the **TLM2** packs.

10. ***Caution: If the* DDM-1000 *feeds digital radio, lockout the radio channel prior to* MXR *pack switches. Inform maintenance and control center personnel.***

    Contact far-end terminal and establish an end-to-end service monitor at DS1 level in both directions.

11. At both ends, remove **PROTN MXR** from muldem that is being upgraded.

    Response: On the **PROCR** plug-in, the **MN** and **NE** LEDs are lighted.

12. The **AKM2C PROTN MXR** must be optioned for C-Bit mode. Refer to **DP-412**. At both ends, option and install an **AKM2C MXR** into the **PROTN MXR** slot.

    Response: The **ALM** LED is lighted on the **PROTN MXR** pack.

    Note: The **ALM** LED is lighted because the **MXR** pack was set for M13 format when the **PROCR** was previously reset. Now the **PROCR** "sees" the **PROTN MXR** pack in C-Bit mode with a **SRV MXR** pack in M13 format and "thinks" the **PROTN MXR** pack should be the same.

13. ***Caution 1: The following procedures may cause service interruption. The high-speed switches performed in this procedure may cause momentary "hits" on service. Notify appropriate personnel.***

    Caution 2: The following procedures must be performed at the same time at both the near-end and far-end terminals.

    Read **Steps 14** through **22** before proceeding.

14. ***Caution 1: This command may be service affecting. If optional parameters are not set properly, the default value may cause service interruption. Ensure the command you enter is for the correct shelf.***

    Caution 2: This command will result in a momentary "hit" on service.

    Caution 3: A delay between making the switches at both ends may result in excessive errors on the low speed service. If one fails to do the switch, the PROCR2 will automatically switch in about 8 seconds.

    Note: The following action forces the channel from service to protection and automatically locks it.

    Enter the following ASCII terminal command at both ends to switch to the **PROTN MXR**:
    exct-sw-hs:m=( ) s=( ) make

    Response: ASCII terminal displays this prompt:

    Switch may cause a service outage
    Do you want to override? (Y/N)

    Caution 4: Enter "y or Y", but* DO NOT PRESS RETURN (ENTER) *key until told to do so. Do not leave the command qued for greater than 1 minute or it will time out.

15. Ensure a "**y or Y**" is typed in at both ends, then on the count of three, hit the RETURN (ENTER) key at both ends.

    Response: Both ends switch to **PROTN MXR**. On the **PROCR** plug-in at both ends, the **ABN**, **MN**, **NE** LEDs are lighted, and the **MJ** LED may light. The **ALM** LED on the **PROTN MXR** remains lighted for approximately 20 seconds then goes off, and the **ALM** LED on the **SRV MXR** lights.

16. **Note:** The path is now working in C-bit format on the **PROTN MXR** packs. The **ALM** LED on the **SRV MXR** pack is lighted because service is working in C-bit format on the **PROTN MXR** and the **PROCR** "thinks" the **SRV MXR** should be the same format.

    Check the DS1 monitor test set and reset ERTS. Errors may have occurred during the switch, but the path should now be error-free.

17. At both ends, remove the **SRV MXR** from the muldem(s) being upgraded.

    Response: On the **PROCR** plug-in, the **ABN, MN, NE,** and **FE** LEDs are lighted.

18. The **AKM2C SRV MXR** must be optioned for C-Bit mode. Refer to **DP-412**. At both ends, option and install an **AKM2C MXR** into the **SRV MXR** slot.

    Response: The **SRV MXR** pack **ALM** LED goes off after a slight delay. **MN** and **NE** LEDs go off.

19. ***Caution 1: This command may be service affecting. If optional parameters are not set properly, the default value may cause service interruption. Ensure the command you enter is for the correct shelf.***

    Caution 2: This command will result in a momentary "hit" on service.

    Caution 3: A delay between making the switches at both ends may result in excessive errors on the low speed service. If one fails to do the switch, the PROCR2 will automatically switch in about 8 seconds.

    Note: The following action forces the channel from protection to service and automatically locks it.

    Enter the following ASCII terminal command at both ends to switch back to the **SRV MXR**:
    exct-sw-hs:m=( ) s=( ) e=( ) break

    Response: ASCII terminal displays this prompt:

    Switch may cause a service outage
    Do you want to override? (Y/N)

    Caution 4: Enter "y or Y", but* DO NOT PRESS RETURN (ENTER) *key until told to do so. Do not leave the command qued for greater than 1 minute or it will time out.

20. Ensure a "**y or Y**" is typed in at both ends, then on the count of three, hit the RETURN (ENTER) key at both ends.

    Response: On the **PROCR** plug-in at both ends, the **ABN** LED is still lighted because a lock-hs was executed.

21. **Note:** The path is now working in C-bit format on the **SRV MXR** packs.

    Check the DS1 monitor test set and verify it is error-free.

22. Enter the following command at both ends to remove the lock:
    exct-lock-hs:m=( ) s=( ) break

    Response: On the **PROCR** plug-in at both ends, the **ABN** LED goes off.

23. Restore shelf options recorded earlier. Restore radio channel, if previously locked out.

24. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

25. **Note:** The ASCII terminal commands **rept-fail:s=( )**, **rept-stat-protn:s=( )**, and **rept-opt-shelf:s=( )** may be used to determine shelf options, and report current failures and protection status. The ASCII terminal command **rept-opt-shelf:s=( )** may be used to ensure "fecom" is ON. If "fecom" is not ON, it may be turned on with the command "**set-shelf-fecom:s=( ) yes**" at each end of the system.

    Verify that there are no active alarms or failures, protection switches or locks, and ensure "fecom" is ON.

26. Record (print) options for shelf that have previously been set using the ASCII terminal.

27. ***Caution: Damage to* TLM2 *packs and equipment may result if the TABS cable is connected to any shelf equipped with a* TLM1 *pack.***

    Refer to **DP-443** and perform the following:

    1. Verify that the ED-2C833-20 TABS cable is connected to **P35** on each shelf that will be equipped with the PM feature.

    2. Ensure that the shield wire is connected to the **GRD 5** lug on the DDM-1000 backplane.

    3. Verify that the TABS cable is connected to the telemetry remote monitoring system (such as GTP).

28. ***Caution: Ensure you install the* PROCR *in the correct slot* (PROCR). *Installing the* PROCR *in the* TLM *slot will damage the* PROCR.**

    Note: In optical mode, the **MC90083A1C** and later **PROCR2** packs support operation in C-bit parity mode for DS3 performance monitoring (PM) but do not provide useful visual indicators during the upgrade conversion process. The **MC90083A1D Issue 4** and later **PROCR2** provides the visual indicators during the upgrade.

    Refer to **DP-404**. At both ends, option and install **MC90083A1C** (or later) **PROCR2**s.

29. **Note:** If you are installing PM in a shelf located above a shelf that already has PM, then you must change the **TLM2** option plugs P2 and P4 in the lower shelf so it is "*NOT* HIGHEST TABS ADDRESS".

    Refer to **DP-412**. At both ends, option and install the **TLM2** packs.

30. Contact far-end terminal and establish an end-to-end service monitor at DS1 level in both directions.

31. At both ends, remove **PROTN MXR** from muldem(s) that is being upgraded.

    Response: On the **PROCR** plug-in, the **MN**, **NE**, and **FE** LEDs are lighted. The **PROTN OLIU** LED may also flash for a short time at one end.

32. The **AKM2C PROTN MXR** must be optioned for C-bit mode. Refer to **DP-412**. At both ends, option and install an **AKM2C MXR** into the **PROTN MXR** slot.

    Response: With **MC90083A1C** or **MC90083A1D Issue 2 PROCR2** all alarms go off. With **MC90083A1D, Issue 4** and **MC90083A1E PROCR2** packs, the **ALM** LED is lighted on the **PROTN MXR** pack, and the **MN**, **NE**, and **FE** LEDs are lighted on the **PROCR2** pack.

    Note: With **MC90083A1D, Issue 4** and **MC90083A1E PROCR2** packs, the **ALM** LED is lighted because the **MXR** pack was set for M13 format when the **PROCR** was previously reset. Now the **PROCR** "sees" the **PROTN MXR** pack in C-bit mode with a **SRV MXR** pack in M13 format and "thinks" the **PROTN MXR** pack should be the same.

33. ***Caution 1: The following procedures may cause service interruption. The high-speed switches performed in this procedure may cause momentary "hits" on service. Notify appropriate personnel.***

    Caution 2: The following procedures must be performed at the same time at both the near-end and far-end terminals.

    Read **Steps 34** through **46** before proceeding.

34. ***Caution 1: This command may be service affecting. If optional parameters are not set properly, the default value may cause service interruption. Ensure the command you enter is for the correct shelf.***

    Caution 2: This command will result in a momentary "hit" on service.

    Is **PROCR** an **MC90083A1C**, **MC90083A1D, Issue 4**, or **MC90083A1E** pack?

    If **MC90083A1C** or **MC90083A1D, Issue 2**, continue with **Step 35**.
    If **MC90083A1D, Issue 4**, or **MC90083A1E**, proceed to **Step 38**.

35. Enter the following ASCII terminal command at both ends to switch to the **PROTN MXR**: **exct-sw-hs:s=( ) make**. **DO NOT PRESS RETURN (ENTER)** ***key until told to do so.***

36. **Note:** The following action forces the channel from service to protection. If one end delays more than the other end, the end with the delay will get the prompt "Switch may cause a service outage. Do you want to override? (Y/N)". Enter a "Y" immediately to complete the switch and initiate an automatic lock.

    At both ends, on the count of three, press the RETURN (ENTER) key.

    Response: Both ends switch to **PROTN MXR**. On the **PROCR** plug-in at both ends, the **ABN** LEDs are lighted, and the **MJ** LED may light.

37. **Note:** The path is now working in C-bit format on the **PROTN MXR** packs.

    Proceed to **Step 40**.

38. Enter the following ASCII terminal command at both ends to switch to the **PROTN MXR**: **exct-sw-hs:s=( ) make**

    Response: ASCII terminal displays this prompt:

    Switch may cause a service outage
    Do you want to override? (Y/N)

    Caution: Enter "y or Y", but* DO NOT PRESS RETURN (ENTER) *key until told to do so.

39. **Note:** The following action forces the channel from service to protection and automatically locks it.

    Ensure a "**y or Y**" is typed in at both ends, then on the count of three, hit the RETURN (ENTER) key at both ends.

    Response: Both ends switch to **PROTN MXR**. On the **PROCR** plug-in at both ends, the **ABN**, **MN**, **NE** and **FE** LEDs are lighted, and the **MJ** LED may light. The **ALM** LED on the **PROTN MXR** remains lighted for approximately 20 seconds then goes off, and the **ALM** LED on the **SRV MXR** lights.

40. **Note:** The path is now working in C-bit format on the **PROTN MXR** packs. The **ALM** LED on the **SRV MXR** pack is lighted because service is working in C-bit format on the **PROTN MXR** and the **PROCR** "thinks" the **SRV MXR** should be the same format.

    Check the DS1 monitor test set and reset ERTS. Errors may have occurred during the switch, but the path should now be error-free.

41. At both ends, remove the **SRV MXR** from the muldem(s) being upgraded.

    Response: On the **PROCR** plug-in, the **ABN, MN, NE,** and **FE** LEDs are lighted. The **SRV OLIU** may also flash for a short time at one end.

42. The **AKM2C SRV MXR** must be optioned for C-bit mode. Refer to **DP-412.** At both ends, option and install an **AKM2C MXR** into the **SRV MXR** slot.

    Response: With **MC90083A1C** or **MC90083A1D, Issue 2 PROCR2** packs all alarms go off, but the **ABN** LED remains on. With **MC90083A1D, Issue 4** or **MC90083A1E PROCR2** packs, the **ALM** LED on the **SRV MXR** pack, and the **MN**, **NE**, and **FE** LEDs on the **PROCR2** pack will go off after about 20 seconds. The **ABN** LED will remain on.

43. At one end, enter the following ASCII terminal command to remove the high speed lock: "**exct-lock-hs:s=( ) break**".

44. ***Caution 1: This command may be service affecting. If optional parameters are not set properly, the default value may cause service interruption. Ensure the command you enter is for the correct shelf.***

    Caution 2: This command will result in a momentary "hit" on service.

    Note: The following action forces the channel from protection to service.

    Enter the following ASCII terminal command at one end to switch back to the **SRV MXR**: **exct-sw-hs:s=( ) break**

    Response: On the **PROCR** pack at both ends, the **ABN** LED goes off.

45. **Note:** The path is now working in C-Bit format on the **SRV MXR** packs.

    Check the DS1 monitor test set and verify it is error-free.

46. Restore shelf options recorded earlier.

47. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Change Low Speed Channel Code Format

1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the equipment.***

   Note 1: This procedure contains two ways to change low speed channel code formats: (1) by changing option switches, and (2) by using an ASCII terminal and appropriate commands. It also includes a section on how to restore channel code formats to the switch settings after the code formats have been "soft set" using the ASCII terminal. Channel code format may be changed only on DS1 and DS1C packs. There are no code options on the DS2 packs.

   Note 2: The ASCII terminal may be used to change the channel code format on a single channel, one muldem, or both muldems depending on the command options selected. This procedure is called "soft setting" a channel. Soft sets can be done only on **AEK36B**-type or **AEK36C DS1** packs using any version of **PROCR2** pack. Service on the other channels within a pack is not affected if the ASCII terminal is used for single channel code format changes.

   Note 3: If you prefer to "soft set" the code format by using the ASCII terminal command "**set-dsx-code:**", it is recommended that you adopt an office policy to always change the channel code formats using the ASCII terminal. Because the channel format may be provisioned opposite to the physical switch setting, confusion may result if both the ASCII terminal and option switches are used. Once a channel is "soft set", the switch setting for that channel no longer has any effect. Even if the channel is "soft set" opposite to the switch setting and then "soft set" back to the same as the switch setting, a later manual switch change may not work depending on the PROCR2 version. (See the procedure in this DP for restoring channel code formats to the switch settings.)

   Note 4: One way to determine if a channel is "soft set" is to compare the output from the "**rept-opt-dsx:**" command with the actual switch setting. If they are opposite, then the channel(s) are "soft set". In MC90083A1E PROCR2 firmware, the "**rept-opt-dsx:**" display shows DS1 channels that are soft set by an "*" following the code format type.

2. **Note:** If a muldem contains a mixture of channel code formats, the following rules apply:
   - If you are using a **PROCR1** pack and **AEK36 DS1 INTFC1** packs, or a **PROCR2** pack and **AEK37 DS1C INTFC1** packs, the code formats within a muldem are restricted to two groups of settings. This is because there are only two protection packs and each pack will be automatically selected to protect a low speed service pack that matches the code format switch settings on the protection pack. For example, if service slots 1-3 in muldem A are set to AMI and slots 4-7 are set to B8ZS, then protection slot 8 (if set to AMI) will protect slots 1-3 and protection slot 9 (if set to B8ZS) will protect slots 4-7. Any combination of code formats may be selected within the DS1( ) packs in the service slots if the protection packs match those settings and the combinations do not exceed two. The **PROCR** pack will automatically select the matching protection pack.
   - If you are using a **PROCR2** pack and any **AEK36**-type **DS1 INTFC** pack in the service slots, there are no restrictions to the channel code format combinations within a muldem if the protection pack (only one required) is an **AEK36B**-type or **AEK36C DS1 INTFC2** pack. The **PROCR2** pack will automatically provision the protection **AEK36B**-type or **AEK36C** to match the channel code format of the service pack that it is protecting.

3. Are you changing low speed channel code formats or restoring "soft-set" channel code formats to switch settings?

   If **CHANGING**, continue with **Step 4.**
   If **RESTORING**, proceed to **Step 23.**

4. Are you using the DIP switches or an ASCII terminal to change the code formats?

   If **DIP SWITCHES**, continue with **Step 5.**
   If **ASCII TERMINAL**, proceed to **Step 15.**

5. Identify the working pack and low speed slot to be optioned.

6. Ensure that service is removed from the channel to be changed.

7. Is an ASCII terminal available?

   If **YES**, continue with **Step 8.**
   If **NO**, proceed to **Step 9.**

8. Perform a low speed switch to protection using the ASCII terminal and the command "**exct-sw-ls:m=( ) s=( ) make=( )**".

9. ***Caution: Some errors will be produced when the pack is removed from the slot because of interruption of the shorting contacts on the backplane. The errors may be minimized by removing the pack quickly.***

   Note: If an ASCII terminal was not used to perform a low speed switch to protection, removing the low speed pack will cause a switch to protection. This switch may produce more errors than if the ASCII terminal was used to perform the switch.

   Remove the low speed pack. Refer to **DP-425** and option the pack as required.

10. ***Caution: Some errors will be produced when the pack is reinserted in the slot because of interruption of the shorting contacts on the backplane. The errors may be minimized by reinserting the pack quickly and carefully.***

    Reinsert the low speed pack.

11. Momentarily depress the **RST** button on the **PROCR**. Refer to **DP-402** for details.

12. **Note:** If the protection switch was done automatically by removing the low speed pack, it will take several seconds for the switch to release.
    If the protection switch was done with the ASCII terminal, use the command "**exct-sw-ls:m=( ) s=( ) break=( )**" to release the switch.

13. ***Caution: The channel code format should be verified. The channel code format may not have changed if the channel was previously "soft set" using an ASCII terminal.***

    Is an ASCII terminal available?

    If **YES**, then use the **rept-opt-dsx:** command to verify the channel format.
    If **NO**, then it is recommended to use a DS1 test set to verify the channel code format.

14. Did the channel code format change?

    If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO**, then proceed to **Step 23.**

15. **Note 1:** This procedure applies only to **AEK36B**-type or **AEK36C DS1 INTFC2** packs and shelves equipped with a **PROCR2** pack. (For a detailed discussion of the "**set-dsx-code:**" command, see the "Commands and Reports" section of this manual.) If the pack receiving the command is not an **AEK36B**-type or **AEK36C**, the message "request denied on 1 or more boards" will result.

    Note 2: The protection slot of each muldem being changed must be equipped with an **AEK36B**-type or an **AEK36C DS1 INTFC2** pack.

    Note 3: The "**rept-opt-dsx:**" command may be used to review the channel code format settings. With **MC90083A1B PROCR2** packs, if a "reset" is done after channel code formats are changed with the "**set-dsx-code:**" command, the channel formats will be set as commanded but the "**rept-opt-dsx:**" command will show that the channels are provisioned per the switch setting. If you reenter the "**set-dsx-code:**" command, the "**rept-opt-dsx:**" command will show the correct settings. In MC90083A1E PROCR2 firmware, the "**rept-opt-dsx:**" display indicates DS1 channels that are soft set by an asterisk (*) following the code format type.

    Note 4: These procedures may be performed from one end of the system using the "**e=***y*" command parameter to identify the system end. The value of *y* is either **n** for the near end (default) or **f** for the far end.

    Caution: When using* MC90083A1D, *and earlier,* PROCR2 *packs, the "*set-dsx-code:*" command will execute without warning when you hit the "return" key. The* MC90083A1E PROCR2 *pack will prompt with a warning message requiring a "*Y/N*" entry to complete the command.

    Are you changing the channel code formats on one channel, one muldem, or both muldems (shelf)?

    If **ONE CHANNEL**, continue with **Step 16.**
    If **ONE MULDEM**, proceed to **Step 19.**
    If **BOTH MULDEMS**, proceed to **Step 21.**

16. ***Caution: Ensure service is removed from the channel to be changed.***

    Identify the working pack and low speed slot and channel to be changed.

17. Enter the command "**set-dsx-code:m=( ) s=( ) e=( ) no|ami|b8zs ls=(slot-channel)**" to change the channel code format.

18. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

19. ***Caution: Ensure service is removed from all channels in the muldem to be changed.***

    Enter the command "**set-dsx-code:m=( ) s=( ) e=( ) no|ami|b8zs**" to change the channel code format for all channels in the specified muldem.

20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

21. ***Caution: Ensure service is removed from all channels in the shelf to be changed.***

    Enter the command "**set-dsx-code:s=( ) e=( ) no|ami|b8zs**" to change the channel code format for all channels in the shelf.

22. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

23. Do you have an **MC90083A1E**, or later, **PROCR2**?

    If **YES**, proceed to **Step 26**.
    If **NO**, continue with **Step 24**.

24. Use ONE of the following three procedures to override channel code format soft sets and restore the channel transmission to the code format switch settings:

    A. Procedure 1 (Preferred):

        1. **Note:** The "**set-dsx-code: no**" command will restore the channel transmission to the *present* channel code format switch setting. Later switch changes will not be effective unless the soft set history is removed with the "**exct-reset:**" command.

           Use one of the following commands to override channel code format softsets:
           "**set-dsx-code:m=( ) s=( ) no ls=(slot-channel)**" (for one channel).
           "**set-dsx-code:m=( ) s=( ) no**" (for one muldem).
           "**set-dsx-code:s=( ) no**" (for both muldems).

        2. ***Caution: A "reset" will erase some previously soft-set non service-affecting parameters and restore them to the default value. Before doing a reset, check office records and use the*** "**rept-opt-( ):**" ***commands (for example,*** "**rept-opt-shelf:**"***) to determine other shelf parameters that may be set.***

           If required, use the "**exct-reset:**" command to remove the soft-set history and allow channel code format settings to be made using switch settings.

    B. Procedure 2:

        1. Use the command "**rept-opt-dsx:**" to determine the code format settings.

        2. Remove the low speed pack and set the code format switches to agree with the setting shown on the terminal.

        3. ***Caution: A "reset" will erase some previously soft-set non service-affecting parameters and restore them to the default value. Before doing a reset, check office records and use the*** "**rept-opt-( ):**" ***commands (for example,*** "**rept-opt-shelf:**"***) to determine other shelf parameters that may be set.***

           Reseat the pack and enter the "**exct-reset:**" command to remove the soft-set history.

C. Procedure 3 (Least preferred):

1. ***Caution: Service must be removed from the pack(s), not protection switched. If switched to protection and an "rst" is done with the service pack removed, the PROCR2 will drop the service pack from its inventory and the protection switch will be dropped.***

   Remove service from the low speed pack(s) being changed.

2. Remove the pack(s) and set the switches to the required channel code format.

3. Enter the command "**exct-rst:**", or momentarily depress the **RST** button on the **PROCR**, to remove the pack(s) from the **PROCR2** inventory.

4. **Note:** After the pack is reseated, the **PROCR2** will "learn" the switch settings, and the soft-set history will be gone.

   Reseat the low speed pack.

25. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

26. **Note:** The "**set-dsx-code: no**" command will restore the channel transmission to the *present* channel code format switch setting. When the code format is soft set back to the same as the switch setting, the asterisk (*) is not displayed in the "**rept-opt-dsx:**" command display and the channel format may be controlled by the switches.

    Use one of the following commands to override channel code format softsets:
    "**set-dsx-code:m=( ) s=( ) no ls=(slot-channel)**" (for one channel).
    "**set-dsx-code:m=( ) s=( ) no**" (for one muldem).
    "**set-dsx-code:s=( ) no**" (for both muldems).

27. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Equip DDM-1000 Second Muldem

1. ***Caution: Whenever working with the* DDM-1000 *you must wear an ESD wrist strap plugged into the grounding jack on the right side of the equipment.***

   Note: If, at any point in this procedure, the DDM-1000 fails to respond in the indicated manner, you should refer to **TP-105** to clear the trouble.

2. Verify that no alarms, locks, loops, or switches are present. Refer to **TP-106/107** if alarms are present. No alarm LEDs should be lighted on any circuit pack. Be sure to check both ends of the system.

3. **Note:** Either end may be designated as the NEAR END or FAR END.

   Designate one end of the system as the NEAR END.

4. Refer to **DP-412**. At the NEAR END, verify that the new function units (SERVICE AND PROTECTION) are optioned properly (optical or electrical, M13 or C-bit, etc).

5. At the **NEAR END** only, insert the function unit plug-ins into the proper slots. In an optical system, if only one muldem is to be equipped, install an **AKM86 BP2** pack into the **SRV MXR** slot of the empty muldem.

   Response (**Optical Systems**):

   The alarm LEDs are flashing on the SERVICE and PROTECTION OLIUs. After several seconds, the processor will report a NEAR END and MAJOR alarm. If you have a TLM1 card and the 3-level alarm option is set in the processor, the CRITICAL alarm will be active instead of the MAJOR. Also, with far end communication enabled and the far end alarm option set in the processor, the far end DDM will report a FAR END and MAJOR alarm.

Response (**Electrical Systems**):

If there is no incoming DS3 signal, the alarm LED on the SERVICE function unit will be flashing. After several seconds, the processor will report a NEAR END and MAJOR alarm. If you have a TLM1 card and the 3-level alarm option is set in the processor, the CRITICAL alarm will be active instead of the MAJOR. Also, with far end communication enabled and the far end alarm option set in the processor, the far end DDM will report a FAR END and MAJOR alarm. If far end communication is disabled, no alarms will be present at the FAR END of the system.

6. Refer to **DP-412** and verify that the Low Speed cards are optioned properly (pulse format and LBO).

7. Insert the Low Speed cards into their slots at the NEAR END of the system.

8. Refer to **DP-412**. At the FAR END, verify that the new function units (SERVICE AND PROTECTION) are optioned properly (optical or electrical, M13 or C-bit, etc).

9. At the **FAR END**, insert the new function unit cards into their proper slots. In an optical system, if only one muldem is to be equipped, install an **AKM86 BP2** pack into the **SRV MXR** slot of the empty muldem.

   Response (**Optical Systems**):

   After about 20 seconds, all ALM LEDs will extinguish and the system will be running ERROR FREE.

   Response (**Electrical Systems**):

   After about 20 seconds, if installing AKM2, 2B, 2C function units, all ALM LEDs will extinguish. If installing AKM5 or AKM6 function units, all ALM LEDs will extinguish when a DS3 input is supplied to the system.

10. At the FAR END of the system, verify that the Low Speed cards are optioned properly (pulse format and LBO)

11. Insert the Low Speed cards into their slots at the FAR END of the system.

12. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install DDM-1000 Second Shelf for 180 Mb/s System

1. **NOTICE:** Unterminated optical connectors may emit laser radiation. Do not view beam with optical instruments.

   Warning: Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam.

   Caution 1: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

   Caution 2: Whenever working with the DDM-1000 you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.

   Note 1: It is assumed that one shelf is installed and in service.

   Note 2: In a 180 Mb/s optical system, an **AKM86 BP2** pack is required in each shelf that only has one muldem equipped.

2. **Note:** It is recommended that the new shelf be fully tested using the procedures of **IP-203** before placing in service. This may require additional plug-ins, such as **OLIU**s, to complete the tests. After the tests are completed, the plug-ins may be removed.

   Install second shelf either just above or just below the existing shelf per **IP-203**.

3. Remove all plug-ins from added shelf.

4. Is in-service shelf operating at 90 Mb/s or 180 Mb/s.

   If **90 Mb/s**, continue with **Step 5.**
   If **180 Mb/s**, proceed to **Step 6.**

5. Use the procedures of **DP-439** to upgrade the single 90 Mb/s shelf to 180 Mb/s.

6. **Note:** It is assumed that the existing shelf contains 20-type **OLIU**s and that the LED Option Switches have been set.

   Ensure the optical cables to be used for 180 Mb/s operation are long enough to reach the added shelf.

7. Refer to **Figure 1** and install the **SRV ED-2C833-20, G(17-20)** cable assembly on backplane as follows:

   Note: The "**J**" numbers stamped on the cable connectors **must always face to the right** where the "**P**" numbers are stamped on the backplane.

   The end of the cable with three connectors (two large and one small) is connected to locations **P39**, **P41** and **P43** on the added (**Non-OLIU**) Assembly. The mating connectors on the cable are labeled **J39**, **J41** and **J43**, respectively.

   The end of the cable with two large connectors is connected to locations **P39** and **P41** on the existing (**OLIU**) Assembly. The mating connectors on the cable are labeled **J39** and **J41**, respectively.

8. Refer to **Figure 1** and install the **PROTN ED-2C833-20, G(17-20)** cable assembly on backplane as follows:

   The end of the cable with three connectors (two large and one small) is connected to locations **P40**, **P42** and **P44** on the added (**Non-OLIU**) Assembly. The mating connectors on the cable are labeled **J40**, **J42** and **J44**, respectively.

   The end of the cable with two large connectors is connected to locations **P40** and **P42** on the existing (**OLIU**) Assembly. The mating connectors on the cable are labeled **J40** and **J42**, respectively.

9. Add required plug-ins to second shelf per **DP-412.**

10. The end-to-end system is now ready for service to be established.

11. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

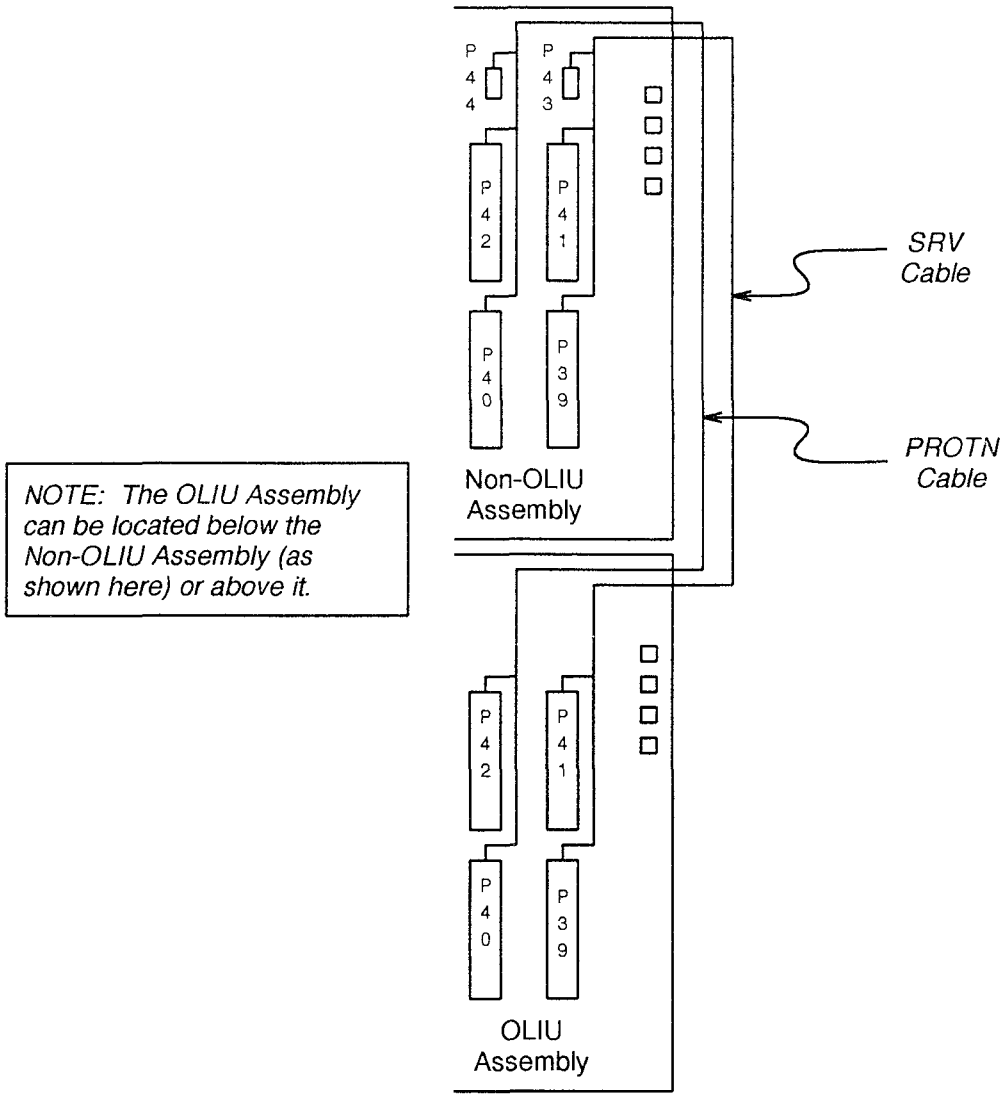


Figure 1. Installation of ED-2C833-20, G(17-20) Cables

Convert In-Service DS1 Optical System [AKM2( )] to DS3U2

1. ***Caution: Whenever working with the DDM-1000 you must wear an ESD wrist strap plugged into the grounding jack located on the right side of the assembly.***

   Note: Notify maintenance center personnel that alarms will be generated.

2. Identify the shelf equipped with **AKM2( )** to be converted.

   Note: The ASCII terminal command **test-led:s=( )** may be used to identify the shelf.

3. Verify that there are no active alarms or protection switches.

   Note: The ASCII terminal commands **rept-fail:s=( )** and **rept-stat-protn:s=( )** may be used to report current failures and protection status.

4. Verify that the shelf is equipped with an **MC90083A1D**, Issue 4 (or later), **PROCR 2** processor circuit pack. **AKM6** (**DS3U2**) circuit packs are not compatible with **MC90083A1 PROCR1**. Refer to **DP-404** if shelf is equipped with an **MC90083A1 PROCR1** processor circuit pack.

5. ***Caution 1: This command may be service affecting. If optional parameters are not set properly, the default value may cause service interruption. Ensure the command you enter is correct for the shelf.***

   Caution 2: This command will result in a momentary "hit" on service.

   Use the following ASCII terminal command to switch service to protection:
   exct-sw-hs:s=( ) make

   Response: On the **PROCR** circuit pack the **ABN** led is lighted.

6. Use the following ASCII terminal command to lock service to protection:
   exct-lock-hs:s=( ) make

7. Install an **AKM3 (ELIU)** circuit pack into the shelf. Ensure that the **LBO** switch settings are correct. Refer to **DDM-1000** User's Manual **DP-417**.

8. Connect the DS3 cables to the **AKM3 (ELIU)** circuit pack. Ensure the cables are connected to the correct muldem being converted.

9. Remove the service (**SRV**) **AKM2( )** circuit pack that is associated with the muldem being converted.

10. **Note:** The option switches on the **AKM6 (DS3U2)** must be set correctly when the circuit pack is installed. All current applications of the **DS3U2** circuit pack use the same option switch settings. Refer to **DP-417**.

    Install the **AKM6** (**DS3U2**) circuit pack into the previously vacated slot.

    Response: On the **PROCR** circuit pack, the **ABN, NE, FE**, and **MN** LEDs are lighted. On the **SRV DS3U2** circuit pack the **FAIL** LED is lighted.

11. At both ends, enter the following ASCII terminal command: **exct-rst:s=( )** or press the **RST** button on the processor.

    Response: On the **PROCR** circuit pack, the **ABN, NE, FE,** and **MJ** (or **CR**) LEDs are lighted. On the **SRV DS3U2** circuit the **FAIL** LED goes off. On the **PROTN AKM2( )** circuit pack the **FAIL** LED is lighted.

    Note: The **MJ** (or **CR**) LED lights because service is locked on protection and the **PROCR** "thinks" that the protection channel has failed.

12. Use the following ASCII terminal command to force the channel from the protection slot to the service slot: **exct-sw-hs:s=( ) break**

    Response: The ASCII terminal displays this prompt: "Switch may cause service outage. Do you want to override?". Enter "Y" or "y".

    Response: On the processor circuit pack, the ABN will be lighted.

13. Service is now on the **DS3U2 (AKM6)** circuit pack and locked. Roll and bridge the DS1 circuits in the DACS-IV to the DDM-1000 DS3 port.

14. At both ends, change the **PROTN AKM2( )** to an **AKM6**.

15. At both ends, remove all **LS INTFC** circuit packs from the muldem being upgraded.

16. At both ends, enter the following ASCII terminal command: **exct-rst:s=( )** or press the **RST** button on the processor.

17. Enter the following ASCII terminal command: **exct-lock-hs:s=( ) break**

    Response: On the **PROCR** circuit pack the **ABN** LED goes off.

18. The muldem is now converted to **AKM6 DS3U2** service.

19. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Convert In-Service DS1 Optical System [AKM2( )] to DS3U1

1. ***Caution: Whenever working with the DDM-1000 you must wear an ESD wrist strap plugged into the grounding jack located on the right side of the assembly.***

   Note 1: AKM5 DS3U1 packs cannot be used in 180 Mb/s systems.

   Note 2: This procedure requires coordination between personnel at the two ends (near and far) of the system.

   Note 3: DS3U2 or **MXR** packs must be installed in the other muldem of the shelves being converted to **DS3U1** packs. This is necessary to provide far end communications during and after the conversion.

   Note 4: Notify maintenance center personnel that alarms will be generated.

2. Identify the shelf equipped with **AKM2( )** to be converted.

   Note: The ASCII terminal command **test-led:s=( )** may be used to identify the shelf.

3. Verify that there are no active alarms or protection switches.

   Note: The ASCII terminal commands **rept-fail:s=( )** and **rept-stat-protn:s=( )** may be used to report current failures and protection status.

4. Verify that the shelf is equipped with an **MC90083A1D**, Issue 4 (or later) **PROCR2** circuit pack. **AKM5** (**DS3U1**) circuit packs are not compatible with earlier **PROCR** versions. Refer to **DP-404** if the shelf is equipped with an earlier version **PROCR** circuit pack.

5. ***Caution 1: This command may be service affecting. If optional parameters are not set properly, the default value may cause service interruption. Ensure the command you enter is correct for the shelf.***

   Caution 2: This command will result in a momentary "hit" on service.

   Use the following ASCII terminal command to switch service to protection:
   exct-sw-hs:s=( ) make

   Response: On the **PROCR** circuit pack the **ABN** LED is lighted.

6. Use the following ASCII terminal command to lock service to protection:
   exct-lock-hs:s=( ) make

7. Install an **AKM3 (ELIU)** circuit pack into the shelf. Ensure that the **LBO** switch settings are correct. Refer to **DP-417.**

8. Connect the DS3 cables to the **AKM3 (ELIU)** circuit pack. Ensure the cables are connected to the correct muldem being converted.

9. **Note:** There are no field option switch settings on the **DS3U1.**

   At both ends of the system, change the service (**SRV**) unit from **AKM2( )** to **DS3U1.**

   Response: On the **PROCR** plug-in at both ends, the **ABN, NE, FE,** and **MN** LEDs are lighted and the **SRV OLIU** LED flashes. On the **SRV DS3U1** pack at each end, the **FAIL** LED is lighted.

10. At both ends, enter the following command: **exct-rst:s=( )** or momentarily depress the **RST** button. (See **DP-402** for details.)

    Response: On the **PROCR** plug-in at both ends, the **ABN, NE, FE,** and **MJ** (or **CR**) LEDs are lighted. On the **SRV DS3U1** pack at each end, the **FAIL** LED goes off. On the **PROTN AKM2( )** pack at each end, the **FAIL** LED is lighted.

    Note: The **MJ** (or **CR**) LED lights because service is locked on protection and the **PROCR** "thinks" that the protection channel has failed.

11. Use the following ASCII terminal command to force the channel from the protection slot to the service slot: **exct-sw-hs:s=( ) break**

    Response: ASCII terminal displays this prompt:
    "Switch may cause service outage. Do you want to override?"

12. **Note:** The following action forces the channel from protection to service and automatically locks it.

    Enter "**y**" or "**Y.**"

    Response: On the **PROCR** plug-in at both ends, the **ABN** LED is lighted.

13. At both ends of the system, change the **PROTN AKM2( )** to a **DS3U1**.

14. At both ends, remove all **LS INTFC** circuit packs from the muldem being upgraded.

15. At both ends, enter the following ASCII terminal command: **exct-rst:s=( )** or press the **RST** button on the processor.

16. Enter the following command: **exct-lock-hs:s=( ) break**

    Response: On the **PROCR** plug-in at both ends, the **ABN** LED goes off.

17. The muldem is now converted to DS3 clear channel.

18. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Glossary

A

ABN
Abnormal (alarm status).

ACO
Alarm Cut Off.

AIS
Alarm Indication Signal. Formerly called a "Blue Signal". A signal that replaces the normal traffic signal when a maintenance alarm indication has been activated. (CCITT 85) A signal transmitted downstream, in a digital network, informing that a system failure has been detected.

AIS (DS3)
Alarm Indication Signal (DS3). A MXR( ) pack interprets any signal as a DS3 AIS if the signal contains valid DS3 framing and invalid DS2 framing on all seven DS2 groups. A DS3U1 pack interprets any signal as a DS3 AIS if the signal contains valid DS3 framing and, for two consecutive M-frames, no more than two consecutive ones or two consecutive zeroes. A valid DS3 AIS meets both of these criteria.

Alarm
Signals BER thresholds.

AMI
Alternate Mark Inversion. A line code that employs a ternary signal to convey binary digits, in which successive binary ones are represented by signal elements that are normally of alternating positive and negative polarity but equal in amplitude, and in which binary zeros are represented by signal elements that have zero amplitude.

ASCII
American Standard Code for Information Interchange.

AS&C
Alarm Surveillance and Control.

B

B3ZS
Bipolar 3-Zero Substitution.

B8ZS
Bipolar 8-Zero Substitution.

BER
Bit Error Rate.

C

CR
Critical (alarm status). Indicates a failure affecting more than 96 customers.

D

DA
Discontinued Availability.

DCE
Data Circuit-Terminating Equipment. In a data station, the equipment that provides the signal conversion and coding between the data terminal equipment (DTE) and the line. The DCE may be separate equipment or an integral part of the DTE or of intermediate equipment. A DCE may perform other functions that are usually performed at the network end of the line.

Demultiplexing
A process applied to a multiplex signal for recovering signals combined within it and for restoring the distinct individual channels of these signals.

Digital Multiplexer
Equipment that combines by time-division multiplexing several digital signals into a single composite digital signal.

DIP switch
Small switch which allows selection of various options (e.g., allows format selection of the incoming DS1 signal from B8ZS or AMI).

DSX
Digital Cross-Connect.

DTE
Data Terminal Equipment. That part of a data station that serves as a data source (originates data for transmission), a data sink (accepts transmitted data), or both.

E

ELIU
Electrical Line Interface Unit.

EMC
Electromagnetic Compatible.

EMI
Electromagnetic Interference.

ESD
Electrostatic Discharge.

F

FL
Fault Locating.

FMAS
Facility Maintenance and Administration System

G

GTP
General Telemetry Processor—An E-telemetry remote for use in terminal offices as the interface to OSs. It provides AS&C, PM, and FL for several systems, including DDM-1000.

H

High speed signal
Signal traveling at the DS3 rate of 44.736 Mb/s or at either 90 Mb/s or at 180 Mb/s (optical mode).

I

INTFC
Interface.

K

kb/s
Kilobits per second.

L

LA1A-A
Multimode Single Fiber Interconnection Cable.

Laser
Light Amplification by Stimulated Emission of Radiation.

LBO
Electrical Line Build Out.

LED
Light-Emitting Diode.

Low speed loopback
A closed circuit feature useful for maintenance or testing.

Low speed signal
Signal traveling at the DS1 rate of 1.544 Mb/s or at the DS1C rate of 3.152 Mb/s.

LS1A-A
Single-Mode, Single-Fiber Interconnection Cable.

LSCIE
Lightguide Stranded-Cable Interconnect Equipment.

LSCIM
Lightguide Stranded-Cable Interconnect Module.

LSCIT
Lightguide Stranded-Cable Interconnect Terminal.

M

Mb/s
Megabits per second.

MJ
Major (alarm status).

MN
Minor (alarm status).

MXR
Multiplexer.

N

NEBS
New Equipment Building Systems.

NRZ
Non-Return to Zero.

O

OLIU
Optical Line Interface Unit.

OS
Operations System—Includes SCOTS, FMAS, etc.

P

PC
Personal Computer.

PICS
Product Inventory Control System.

PIN
Photodetectors used in some lightwave receiving devices.

PM
Performance Monitoring — Gives a measure of the quality of service and identifies degrading or marginally operating systems (before an alarm would be generated). Digital signal parameters, including *errored seconds* and *out of frame*, measure the integrity of a communication channel as defined in AT&T Compatibility Bulletin 149 (CB 149).

PMN
Indicates loss of AC power at the far-end terminal.

PROCR
Processor.

PROTN
Protection.

PWR
Power.

S

SCOTS
Surveillance and Control of Transmission Systems.

SID
System IDentification.

T

TABS
Telemetry Asynchronous Block Serial protocol. A polled point-to-point or multipoint "master-slave" (remote-monitored equipment) communication protocol that supports moderate data transfer rates over intraoffice wire pairs. The remotes send "requests", or "polls", to monitored equipment; the monitored equipment answers the request with "responses." Defines two physical interfaces for direct connection between the telemetry remote and the monitored equipment:

- RS422 Point-to-Point.
- RS485 Point-to-Point or Multi-Point.

Four wire, two to Tx (remote to monitored) and two to Tx (monitored to remote), 22- or 24-gauge twisted pair, max 4 kft remote-to-monitored.

TBOS
Telemetry Byte Oriented Serial protocol. Defines one physical interface for direct connection between the telemetry remote and the monitored equipment. This is a point-to-point communication, RS 422A modified. Four wire, two to Tx (remote to monitored) and two to Tx (monitored to remote), 26 gauge, max 4 kft remote-to-monitored. Remote sees a 100 to 180 ohms resistor at monitored terminal.

V

VLSI
Very Large Scale Integrated.

VMR
Violation Monitoring and Removal. The process of removing all violations which are detected, so that violations do not propagate beyond the maintenance span.

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