

**DIGITAL TRANSMISSION FACILITIES
T1/OS DIGITAL TRANSMISSION SYSTEM
LINE AND TERMINAL EQUIPMENT
EQUIPMENT DESIGN REQUIREMENTS
COMMON SYSTEMS**

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**1. GENERAL
SCOPE**

1.01 This specification, together with the supplementary information listed herein, covers the requirements for design and application of equipment for a T1 outstate (T1/OS) digital transmission sys-

tem. This system is broadly defined by its application in those areas where the metro-oriented T1 system is not an optimal solution to transmission needs. System routes significantly longer than those for which the T1 line was originally intended and route cross sections smaller than those for which T1 equipment was designed are served by the T1/OS system. Other system characteristics to which the T1/OS package is directed include slow circuit growth, unmanned community dial offices (CDOs), interconnection with independent telephone companies and office isolation (geographic).

1.02 This section is reissued to include additional equipment designed for the T1/OS system. This equipment provides more flexibility and broadens the application of the system. An expanded series of line terminating modules (new name) includes existing span terminating modules and new equipment to satisfy the following needs: a larger protection group (PG) (1 for 24), spans where protection switching is not required, and spans requiring intermediate powering. In addition, passive filter fault locating and bay-mounted current/voltage surge protectors are provided. In order to take full advantage of the new equipment, a new series of bays is offered also. In **6. REASONS FOR REISSUE** additional detail and compatibility information between new and existing equipment is provided.

1.03 The T1/OS system is a combination of appropriate engineering rules and equipment from the T1 system and new outstate developments where the need exists. The resulting T1/OS system package contains the following prominent features: engineering rules for transmission links up to 200 repeater sections in length, automatic protection switching for three PG sizes (1 for 5, 1 for 11, 1 for 24) and also nonprotected span arrangements, a mini-telemetry system (SRC), single-end fault locating, and improved order wire. Equipment is provided in

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modular form, ordered as required, and mounted in a T1/OS span terminating bay (STB).

1.04 This specification includes descriptive information for span terminating bay equipment in 11-foot 6-inch, 9-foot 0-inch, and 7-foot 0-inch heights and their component panels and mounting assemblies. Plug-in codes are listed or reference is made to the primary source for such items where appropriate. Information is included for outside plant material within limits of repeater station essentials.

DESCRIPTION

A. Overall System

1.05 The T1/OS system consists of T1 digital lines that interconnect span terminating offices, thus forming maintenance spans. System reliability and maintainability can be enhanced by utilizing the automatic protection switching feature which provides a protection group for the maintenance span. This group is defined as a number of protection lines (P) protecting a number of service lines (N). Currently, three PG sizes (P for N) are available: 1 for 5, 1 for 11, and 1 for 24. Unlike the original T1 spans, more than one powering section may occur within a maintenance span where an intermediate powering site is established to attain the longer reach to be served in the outstate environment. Span lines may be interconnected one to another or to terminal equipment to provide the desired network configuration. Interconnection possibilities include interfaces with any DS-1 facility meeting DSX-1 format, such as all 1.5 Mb D() banks, T1() data banks, M1() muldem, and regular T1 lines. More typically, it is expected that T1/OS will stand on its own, with the usual terminal connection being to D3 channel banks. In some cases, where only two or three D3 banks are required, the banks can be contained in the same bay as the T1/OS line terminating units. Such bay space may also be used for a larger initial complement of D3 banks or spillover of D3 banks beyond their own bay(s).

1.06 The use of the automatic protection switching feature requires an appropriate grouping of lines based primarily upon service needs, reliability, maintenance and future growth considerations. This grouping is provided by any of the span terminating modules (STM) that contain the appropriate PG size. For applications not requiring protection switching, a terminating repeater shelf (TRS) provides the appropriate line terminating function. For T1/OS systems requiring more than one powering section within

a maintenance span, the intermediate powering repeater shelf (IPRS) provides the power span termination and line through-connect. The STMs, TRS, and IPRS form a group of units called line terminating modules (LTM). They form the basis for engineering T1 spans to satisfy outstate transmission needs.

1.07 Powering of T1/OS lines is essentially the same as the regular T1 system. However, because of power dissipation considerations in this equipment relative to the environment provided by the office ventilation system, a -48 volt battery should not be used to power office repeaters separately unless a desired power section length is essential. In addition, odd- and even-numbered lines within an office repeater shelf are wired to separate battery feeds to minimize the effect of a blown main or feeder fuse. Also, the assignment of D3 channel banks to feeders in combined bays is correlated with line powering to minimize loss of service upon failure of a feeder fuse.

1.08 A new T1/OS system feature is the active fault locating line that is made available to improve signal-to-noise (S/N) performance of the line and to permit separation of fault identification for opposite directions of 2-way repeaters. The fault identification separation is made possible by the use of dual-amplifier filters and T1 repeaters having separate fault locating output leads for the two sides of the repeater. With repeater apparatus cases wired to maintain the separation of fault locating outputs, the selection of powering polarity to the line, and thus to the dual-amplifier filters, enables the return of fault locating signals from both repeater directions. When complemented by a loop-back capability in automatic protection switching, the fault identification arrangement permits single-end fault locating for both directions of the 12 repeater locations allowable with 12 filter frequencies. Alternatively, use of a single-amplifier filter and control of powering polarity in conjunction with selected tip/ring reversals in the fault locating line permit extension of nondirective fault identification for up to 24 repeaters.

1.09 The active filters in the 1114 (single) and 1115 (dual) series are mechanically interchangeable with the 1068 type (passive) for insertion into 475-type apparatus cases. New codes of this apparatus case and of the 208- and 209-type repeaters implement the splitting of the fault locating outputs. New codes of the 468C() apparatus case are also arranged for the 1114() and 1115() filters with 205M or 205N repeaters having split fault locating outputs. At span terminating bays, line powering and access to fault lo-

cating lines are provided by a fault locating panel. Up to six fault locating lines may be terminated on this panel and up to three fault locating filters may be inserted to serve office repeaters within the bay. One filter position is arranged to be accessed automatically by filter test jacks on the panel, thus providing for field testing of active filters. Successive pairs of fault locating line ports may be arranged for through connection as desired to permit extension of line(s) through a station. While this panel is intended for use in active fault locating systems, unused line terminating and filter positions may be used for passive systems.

1.10 In addition to the fault locating panel, a filter panel is provided that may be used for active and passive fault locating systems. This panel, however, does not provide line powering or fault locating access for an active filter system. The panel will accept any combination of up to six filters (1114, 1115, and 1068 types) and up to eight fault locate lines (active or passive). For active systems this panel can provide additional filter mounting positions beyond the three provided in the fault locating panel in an STB. The filter panel also meets the requirements of offices that are part of active systems but do not need fault line access or line powering. Two examples are intermediate powering (of T1 systems) sites with a through-fault line and remote end offices with a terminating line. In each case the intended use requires less capability than that provided by the fault locating panel. The filter panel, therefore, complements the fault locating panel and provides a very economical fault locating system. The filter panel is also used for passive fault locating systems providing line jack access, line terminations, and through connections along with filter positions to serve office repeaters in STBs.

1.11 Another new feature of T1/OS is a built-in status reporting and control (SRC) system that operates over T1 protection lines and is incorporated physically into the automatic protection switching shelf. The SRC feature is optional and is provided by equipping the requisite plug-in positions. The SRC system presupposes designation of a master control station to which a number of remotes have been linked via protection line spans cross-connected in tandem. Thus, if the protection line is called to switch over in place of a failed service line, the SRC system is available only to the nearest end of the section in which the failure occurred. The system links one master control to as many as eight remote points, from which six status indications may be received,

and to which two commands may be sent. These remote points are the near-end office and, if required, the far-end office of each protection span linked in tandem. Selection of only the near-end office provides SRC capability to eight remote spans. Each far-end office equipped with an SRC unit will reduce by one the total number of spans able to be included in the SRC system. Thus, the near- and far-end configurations restrict the SRC system to four tandem spans beyond the span containing the master if no remote is used in the far end of the first span.

1.12 An improved 2-wire order wire has been provided consistent with the longer maintenance spans expected for T1/OS. An outgrowth of subscriber loop multiplex (SLM) systems development, the basic system has been reconfigured for use by the T1C system and is adopted directly in the T1C configuration for use by T1/OS. Like the older T1 order wire, the new system remains a dial-loop line but adds a capability for extended range and sensitivity. To improve the balance of battery current drains when two or more line sets are bridged on the order-wire pair, a simple resistance/capacitance (R/C) network has been incorporated at bridge taps in each apparatus case. Office equipment consists of a panel with space for two plug-ins to provide the various features available.

1.13 A "mini-main" frame feature is also available in T1/OS. It provides for direct termination on the T1/OS bay (by passing the main distributing frame [MDF]) of 100 pairs from the cable entrance facility (cable vault). The basis for this feature is a protector panel that contains a 303-type connector currently in use at MDFs. Voltage/current surge protection is provided by the appropriate choice of plug-in protector units. Unlike the 303-type connector, this panel is not provided with a stub and must be engineered to suit the job. By cross-connecting within the panel between entrance cable pairs and LTM repeater positions, flexibility is acquired.

1.14 Provisions have been made for assigning pairs in a T2 LOCAP cable to T1/OS usage. Only general information is covered here since T2 system engineering rules and documentation control this joint application. The LOCAP cable, T2 apparatus and maintenance cases, and T2 protector panels are shared but main station facilities for both systems are not. Those cable pairs to be used for T1/OS systems are cabled from the T2 protector to the T1/OS bay. Then T1/OS rules are followed and existing T1/OS equipment is used except for new codes of office re-

peaters that will match the LOCAP cable impedance. In addition, a new regenerator for T1 signals has been developed to match LOCAP impedance and fit in the T2 apparatus case. This regenerator is basically half a T1 repeater (209 type), providing one-way signal regeneration. A separate fault locate circuit for T1/OS is provided with the filters being mounted in the T2 maintenance cases. Its office termination is to the T1/OS fault locate panel via the T2 protector. A single order-wire is provided for maintenance of both systems.

1.15 An overall block diagram of the T1/OS system showing the general features and layout is shown in Fig. 1. The diagram is intended to show the physical equipment blocks in functional relationship to each other and to clarify the choice of options within the equipment. It is not intended as a substitute for detailed engineering rules, or other BSPs. It is assumed that T1/OS will generally conform to the screened cable, bidirectional apparatus case mode of operation as a standard.

B. Bay Arrangements

1.16 Span terminating bays for T1/OS are available in three standard heights of 11 feet 6 inches, 9 feet 0 inch, and 7 feet 0 inch. The bays are also offered with or without the protector panel. Bays without a panel are coded J98728A,B, and C, respectively, for each height and those with a panel are coded J98728D, E, and F, respectively. All bays are based on 1-inch by 23-inch panel modules on duct-type unequal-flange bay framework. Front mounting on the wide flange, with 5-inch front guardrail and 2-inch rear guardrail, is used throughout (the total depth equals 12 inches). The equipment is arranged in freestanding or self-contained building blocks. The wiring within each building block is completed as far as possible by the factory. This building block approach is taken to maximize flexibility in arrangements and to facilitate field additions to unassigned bay space. Building blocks also help to avoid the use of bay terminal strips for external cabling so that most office cabling to the bays is terminated on the building block terminals. However, standardized local cables (devoted primarily to power and alarm leads) are provided for the bay assemblies in accordance with this specification. Where optional use of bay space for different types of equipment is anticipated (particularly for field additions), these bay local cables provide breakouts to cover the permitted choices. Within such constraints, the customer is able to exercise some latitude in the final makeup of a bay and/or

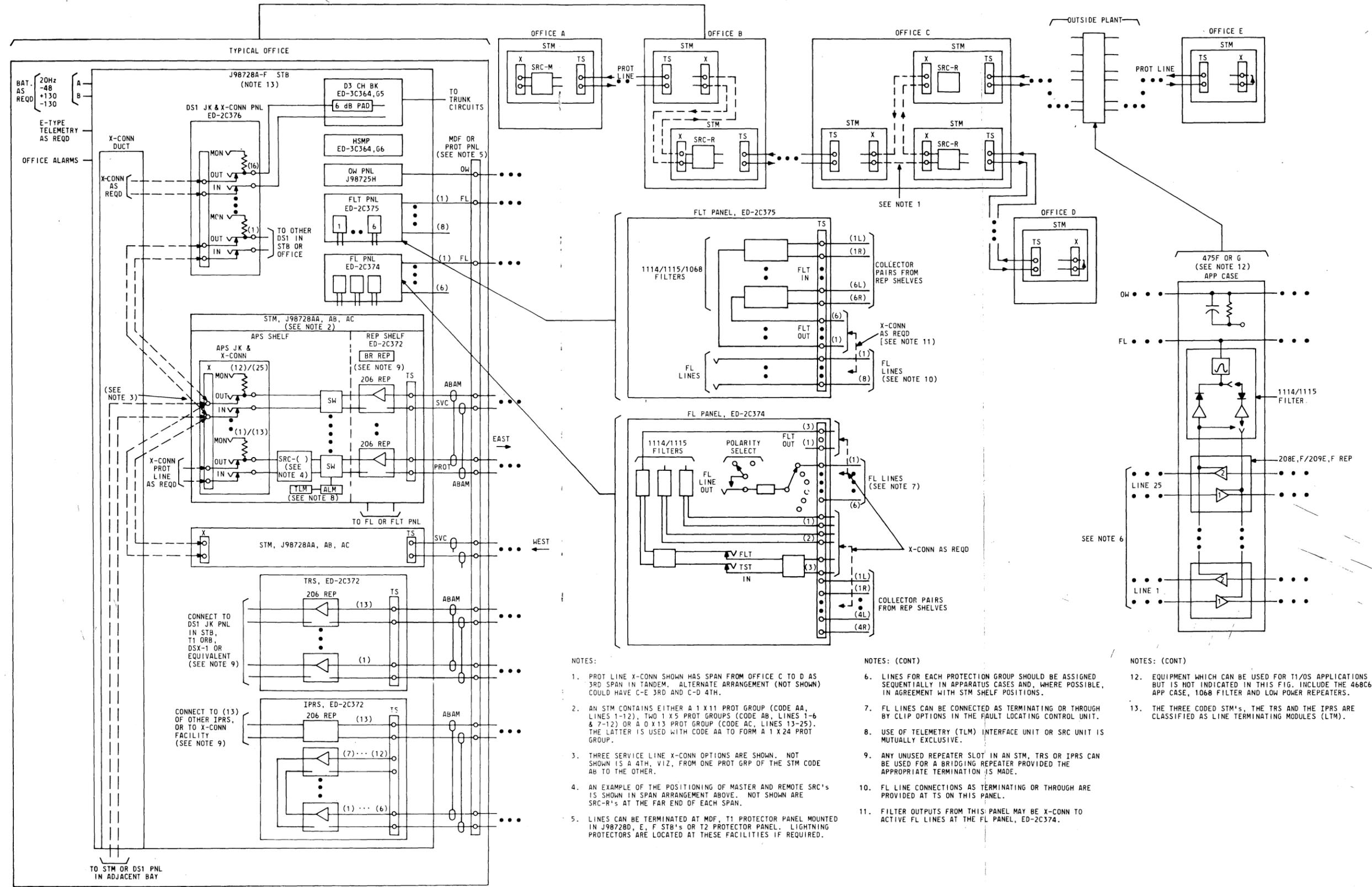
the extent to which it is equipped initially at the factory.

1.17 A typical bay arrangement for a T1/OS STB is shown in Fig. 2. A 9-foot 0-inch combined bay arrangement (without protector panel) with T1 and D3 complements is chosen to show the building blocks used in T1/OS STBs. These building blocks will be described in greater detail in succeeding paragraphs and include:

- (a) Fuse panels
- (b) D3 bank shelf
- (c) Hot spare and maintenance shelf for D3
- (d) DS-1 jack and cross-connect panel
- (e) Span terminating modules (STM) (combining office repeater and APS shelves)
- (f) Terminating repeater shelf (TRS)
- (g) Intermediate powering repeater shelf (IPRS)
- (h) Fault locating and filter panels
- (i) Order-wire panel
- (j) Protector panel.

Note that Fig. 2 exemplifies the optional use of bay space for different types of equipment, since the LTM No. 1 position, which is shown with an STM, may be used for D3 bank No. 3 or other type LTMs. Similar choices arise in other combined bay configurations as shown in Fig. 3 to 8, outlining all six bays.

1.18 An important point in the bay arrangement is the provision for cross-connecting DS-1 interfaces. These DS-1 interfaces occur between span line sections, or between span lines and D3 banks, or other DS-1 facilities. Cross-connection jumpers are run in the vertical ducts, appearing at the face of the left upright as shown in Fig. 2. If the cross-connection is to be made to an adjacent STB, the horizontal duct at the base of the bay permits such an extension. On the T1/OS STB, external DS-1 facilities can be made to appear on the DS-1 jack and cross-connect panel. Such external sources are then cross-connected via the vertical duct. In each instance, terminals for jumpers are positioned in compartments adjacent to the vertical duct and at the left end of affected panel



NOTES:

1. PROT LINE X-CONN SHOWN HAS SPAN FROM OFFICE C TO D AS 3RD SPAN IN TANDEM. ALTERNATE ARRANGEMENT (NOT SHOWN) COULD HAVE C-E 3RD AND C-D 4TH.
2. AN STM CONTAINS EITHER A 1 X 11 PROT GROUP (CODE AA, LINES 1-12), TWO 1 X 5 PROT GROUPS (CODE AB, LINES 1-6 & 7-12) OR A 0 X 13 PROT GROUP (CODE AC, LINES 13-25). THE LATTER IS USED WITH CODE AA TO FORM A 1 X 24 PROT GROUP.
3. THREE SERVICE LINE X-CONN OPTIONS ARE SHOWN. NOT SHOWN IS A 4TH, VIZ, FROM ONE PROT GRP OF THE STM CODE AB TO THE OTHER.
4. AN EXAMPLE OF THE POSITIONING OF MASTER AND REMOTE SRC'S IS SHOWN IN SPAN ARRANGEMENT ABOVE. NOT SHOWN ARE SRC-R'S AT THE FAR END OF EACH SPAN.
5. LINES CAN BE TERMINATED AT MDF, T1 PROTECTOR PANEL MOUNTED IN J98728D, E, F STB'S OR T2 PROTECTOR PANEL. LIGHTNING PROTECTORS ARE LOCATED AT THESE FACILITIES IF REQUIRED.

NOTES: (CONT)

6. LINES FOR EACH PROTECTION GROUP SHOULD BE ASSIGNED SEQUENTIALLY IN APPARATUS CASES AND, WHERE POSSIBLE, IN AGREEMENT WITH STM SHELF POSITIONS.
7. FL LINES CAN BE CONNECTED AS TERMINATING OR THROUGH BY CLIP OPTIONS IN THE FAULT LOCATING CONTROL UNIT.
8. USE OF TELEMETRY (TLM) INTERFACE UNIT OR SRC UNIT IS MUTUALLY EXCLUSIVE.
9. ANY UNUSED REPEATER SLOT IN AN STM, TRS OR IPRS CAN BE USED FOR A BRIDGING REPEATER PROVIDED THE APPROPRIATE TERMINATION IS MADE.
10. FL LINE CONNECTIONS AS TERMINATING OR THROUGH ARE PROVIDED AT TS ON THIS PANEL.
11. FILTER OUTPUTS FROM THIS PANEL MAY BE X-CONN TO ACTIVE FL LINES AT THE FL PANEL, ED-2C374.

NOTES: (CONT)

12. EQUIPMENT WHICH CAN BE USED FOR T1/OS APPLICATIONS BUT IS NOT INDICATED IN THIS FIG. INCLUDE THE 468C6 APP CASE, 1068 FILTER AND LOW POWER REPEATERS.
13. THE THREE CODED STM'S, THE TRS AND THE IPRS ARE CLASSIFIED AS LINE TERMINATING MODULES (LTM).

Fig. 1—T1/OS System Diagram

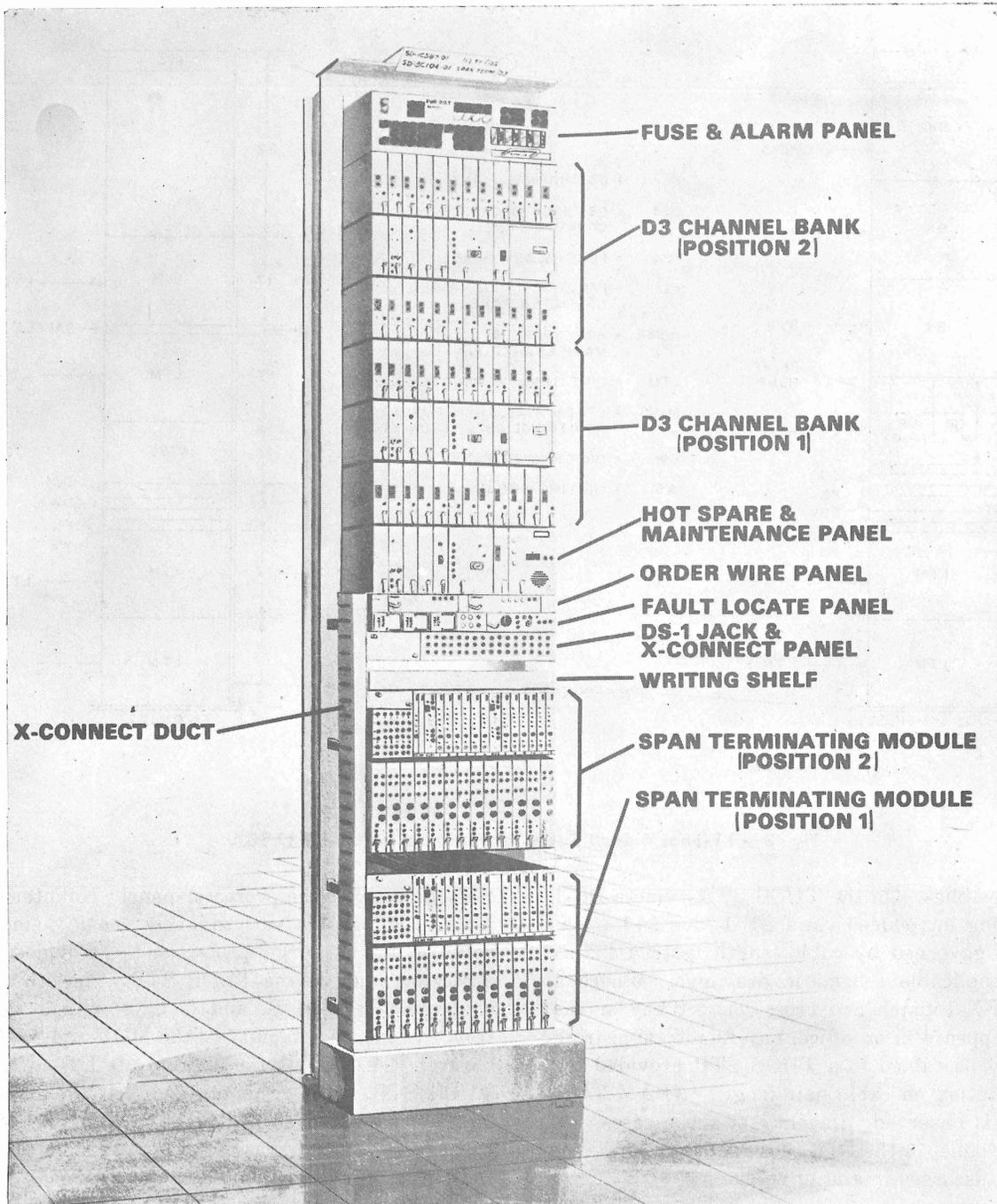


Fig. 2—T1/OS Span Terminating Bay—9-Foot 0-Inch STM/D3 Combined

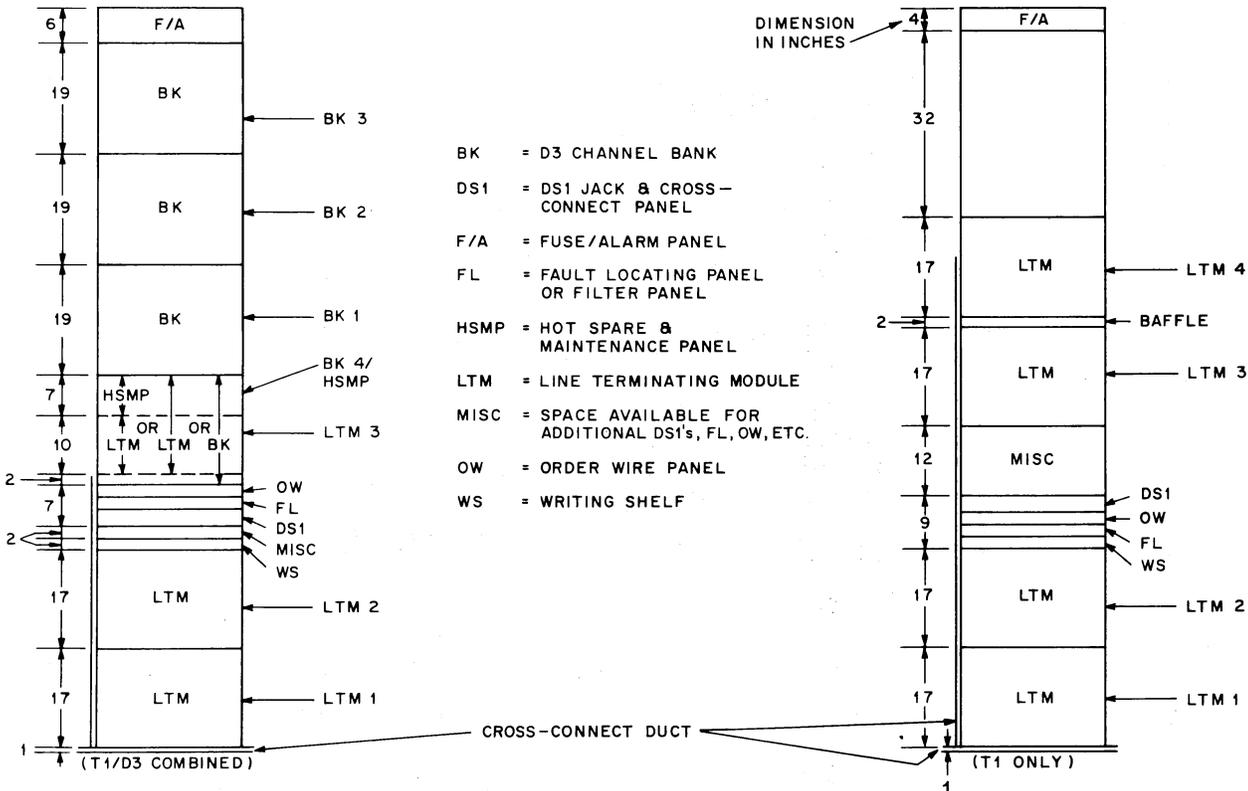


Fig. 3—11-Foot 6-Inch Span Terminating Bays—J98728A

or shelf assemblies. On the T1/OS STB, remote DS-1 facilities being introduced via a DS-1 jack and cross-connect are governed by cable length restrictions as stated on applicable schematic drawings. Where a standard DSX-1 patch and cross-connect bay or the equivalent appears in an office, any facility appearing thereon may be cabled to a T1/OS STB provided the 85-foot limitation on cable pair length (ABAM-22 or equivalent) is observed. In many of these cases, use of the DS-1 panel in the STB is redundant. These instances are discussed in a later section.

1.19 Office cabling for T1/OS STBs will generally terminate on terminal strips of the appropriate building block or, as in the case of D3 bank shelves, via connector interfaces at the position on the bay. Attention is drawn specifically to line connections for T1/OS transmission pairs between LTMs and the cable entrance facility vault. Two options exist. The first option requires use of the J98728D, E, and F bays containing the protector panel and entails running ABAM tip cable(s) from the cable entrance fa-

cility directly to the protector panel. No intermediate access is permitted to this cable since the voltage/current surge protection is provided at the protector panel in the T1/OS STB. The other option uses the J98728A, B, and C bays with a tip cable from the entrance facility to the MDF and ABAM cable from the MDF to the appropriate LTM within the T1/OS STB. It is recommended that the ABAM cable be terminated on the MDF vertical but if cross-connect flexibility is desired, ie, if the MDF horizontal receives the ABAM, then cross-connections must be shielded.

1.20 Essentially, all of the T1/OS building blocks involve supplementary notation of plant assignment information. This information is intended to be entered on designation strips affixed to the right side of each building block. Plug-in slots or switch positions, which are numbered or designated in arbitrary sequence, can be correlated with actual service assignments and/or office line and bay locations.

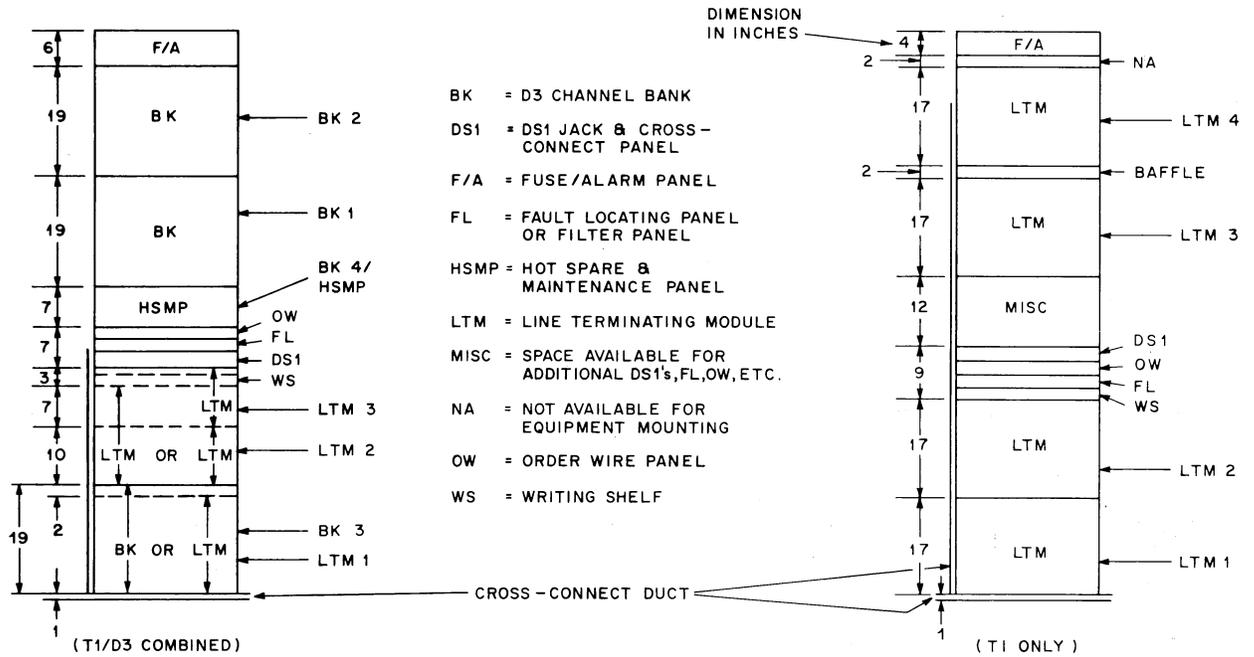


Fig. 4 - 9-Foot 0-Inch Span Terminating Bays - J98728B

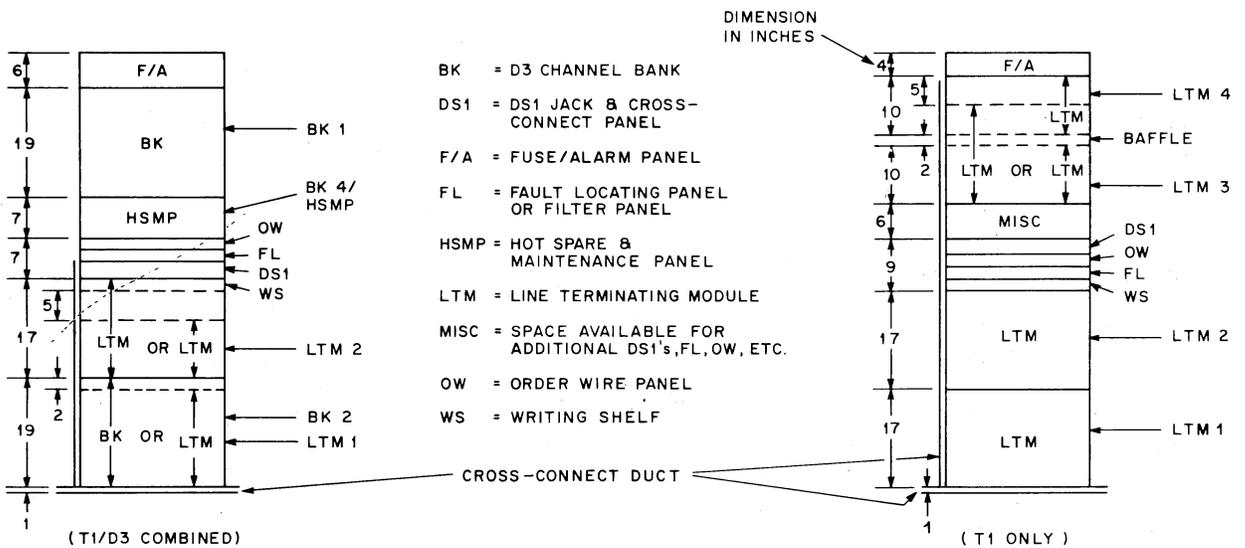


Fig. 5 - 7-Foot 0-Inch Span Terminating Bays - J98728C

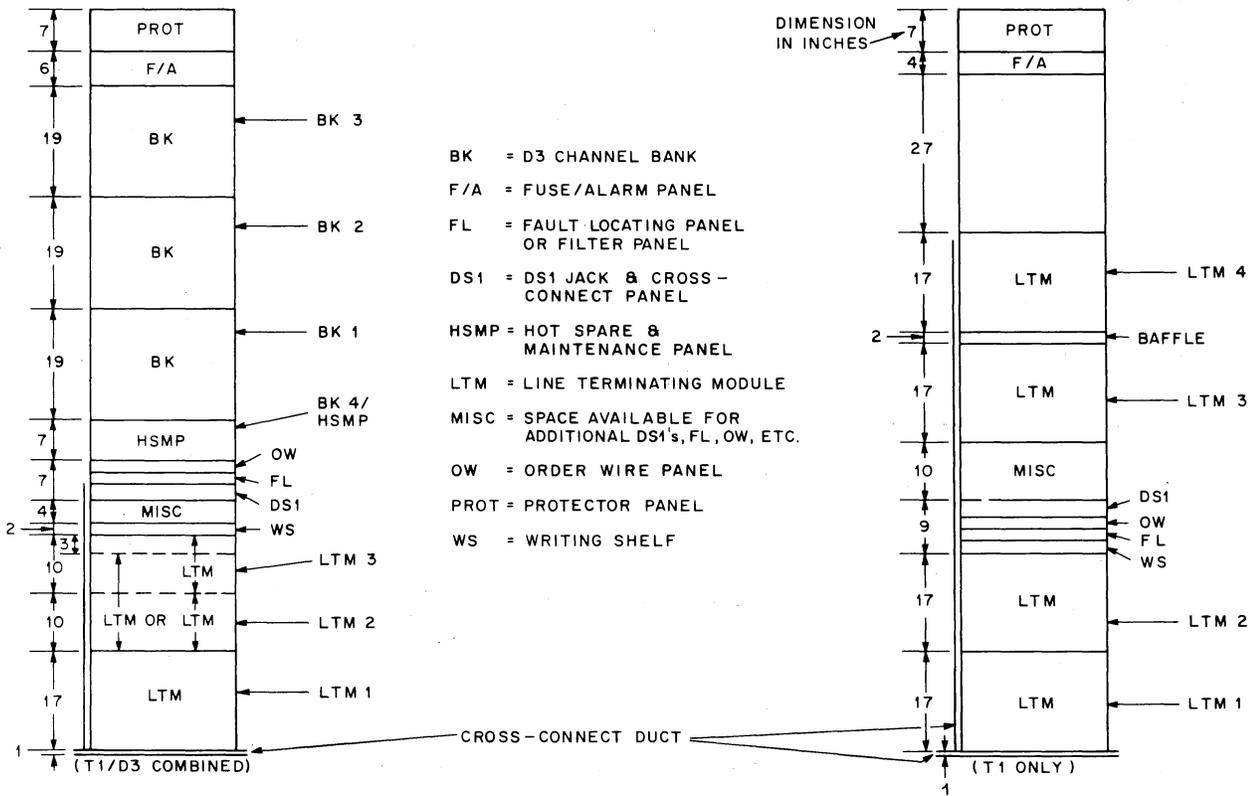


Fig. 6 - 11-Foot 6-Inch Span Terminating Bay

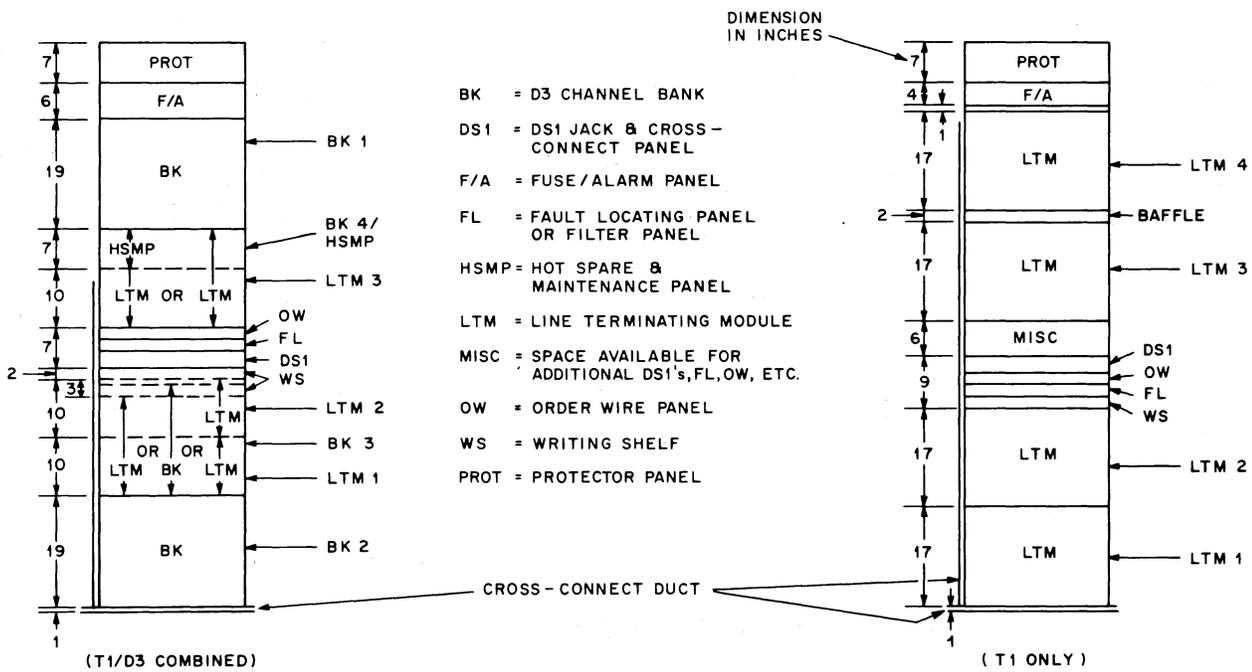


Fig. 7 - 9-Foot 0-Inch Span Terminating Bay With Protector Panel

C. T1/OS Building Blocks For STBs

1.21 Fuse Panels: Two fuse panel designs per ED-2C373-() are used on STBs, one for T1-only complements and the other for T1 combined with D3 banks. The designs are shown in Fig. 9 and 10, respectively. The T1-only bay utilizes the group 1 panel, which contains fuse positions to supply +130 volt, -130 volt, and -48 volt power for up to four LTMs, and associated order-wire and fault locating equipment. The group 1 panel also contains fuse and transmission alarm relays for interfacing with central office alarm systems and/or reporting systems, as required. The group 1 panel occupies 4 inches of bay space. Terminal strips on the rear of the panel receive wiring for power feeders and the bay local cable. The second panel for combined T1 and D3 uses 6 inches of bay space and is covered by group 2 for the basic panel plus group 3 for an associated plug-in. The plug-in contains miscellaneous components associated with alarm relay circuits on the panel. The group 2 panel provides fuse positions for -48 volt signal, filtered battery, and 20-Hz ringing supply for up to four D3 banks, or three D3 banks and a hot spare and maintenance panel. Also provided are +130 volt, -130 volt, and -48 volt fuses for up to three LTMs and associated order-wire and fault locating equipment. Alarm interfaces and terminal block arrangements are similar to those for the group 1 panel. For either of the panels, some bay configurations will result in surplus fuse positions. Where they occur, it may be desirable to use the fuse positions for T1/OS building blocks in an adjacent bay and wire the equipment on a job basis. This is most pertinent to 7-foot 0-inch bay layouts, where the fuse panel capacities can never be fully utilized in the basic J98728C and F bays.

1.22 D3 Channel Bank Shelf Assembly: A free-standing shelf assembly for the D3 bank, requiring 19 inches of bay space, is added as group 5 on ED-3C364-(). Features of this assembly are basically the same as those of standard D3 bank shelves for their own unitized bay, except that tie bars are added to hold shelf castings together and a top casting is made an integral part of the assembly. Terminal blocks are provided for all intrabay wiring (power, DS-1 signals, alarms, etc) and connectors are incorporated on the shelf local cable to receive external office cabling for the D3 bank. Plug-ins and their application are documented in the parent specifications for D3 banks. While the fully wired shelf assembly can be shipped and field installed in designated spaces on combined T1/D3 bays, it is recommended that bays

be initially ordered with the expected final D3 shelf complement. Although not mandatory, this procedure allows D3 shelf assemblies to be fully shop tested in place before shipment to the field. This shelf assembly is not arranged for general usage in that a 6-dB pad has been made part of the output DS-1 leg. Usage other than in T1/OS STBs may require removal of this pad and external provision of the proper network.

1.23 Hot Spare and Maintenance Shelf Assembly:

This assembly is added as group 6 on ED-3C364-(). The shelf requires 7 inches of bay space, is unitized with top and bottom castings and tie bars, and terminal blocks are included for bay cabling connections. The unit is fully shop wired. As with the D3 shelf, the parent specification covers plug-ins and their application.

1.24 DS-1 Jack and Cross-Connect Panel:

This panel, requiring 3 inches of bay space, is covered by ED-2C376-() and is shown in Fig. 11. Group 1 provides the basic panel with full wiring for 16 jack circuits, where each jack circuit to be provided is covered by one group 2. Space is provided for one or more panels in each bay. It is expected that bays will be ordered with the number of jack circuits that will ultimately be required on each panel. Jack circuits may be added in the field if necessary. The number of circuits required depends upon the desired cross-connect flexibility, whether or not a DSX-1 facility is to be used and, of course, span cross-section. The panel design is basically that of standard DSX-1 panels, except that the front panel portion has been shortened to permit provision of a frontfacing cross-connect terminal strip and no tracer lamps are provided. The back of this strip is wired to tip and ring normals of IN and OUT jacks, such that jumper connections described previously tie these normals to span lines OUT and IN, as desired. Bridging resistors from OUT jack tip and ring, connect to a third jack designated MON. Each 3-jack circuit, with tip and ring proper of the IN and OUT jacks cabled as required, provide access for patching open or bridged (OUT only) on the connecting DS-1 facility. Cabling of pairs in suitable EU- or ABAM-type cables will be brought directly to the appropriate jack panel and enter via the rear shelf and fanning strip on the back of the panel. A designation strip on the face of the panel provides job identification of jack assignments.

1.25 Span Terminating Modules: The STM, as shown in Fig. 12, forms the line terminating and protection switching assembly for the T1/OS

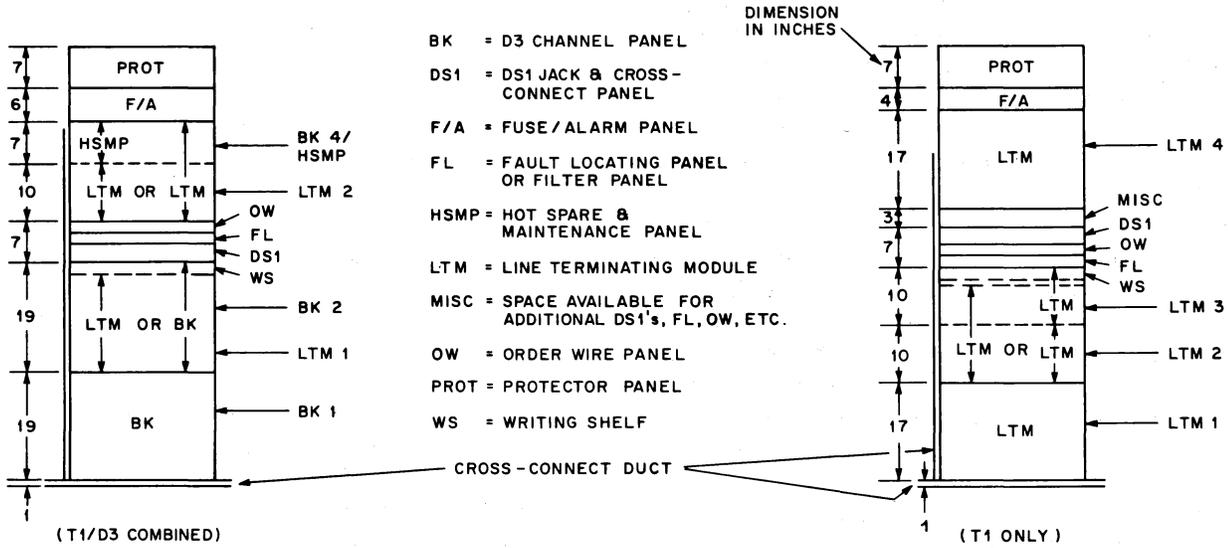


Fig. 8—7-Foot 0-Inch Span Terminating Bay With Protector Panel

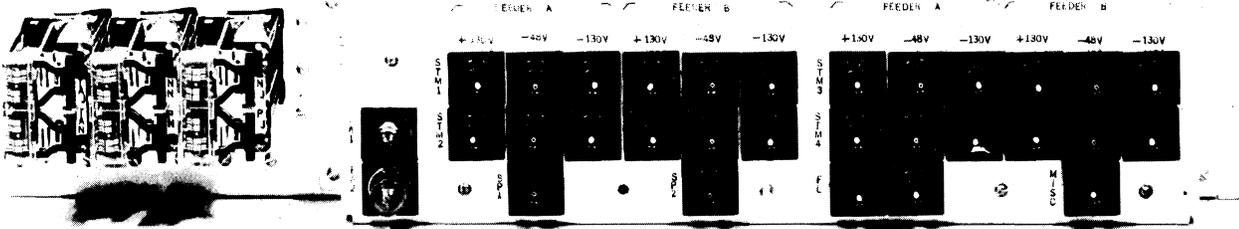


Fig. 9—Fuse Panel for T1-Only Equipment

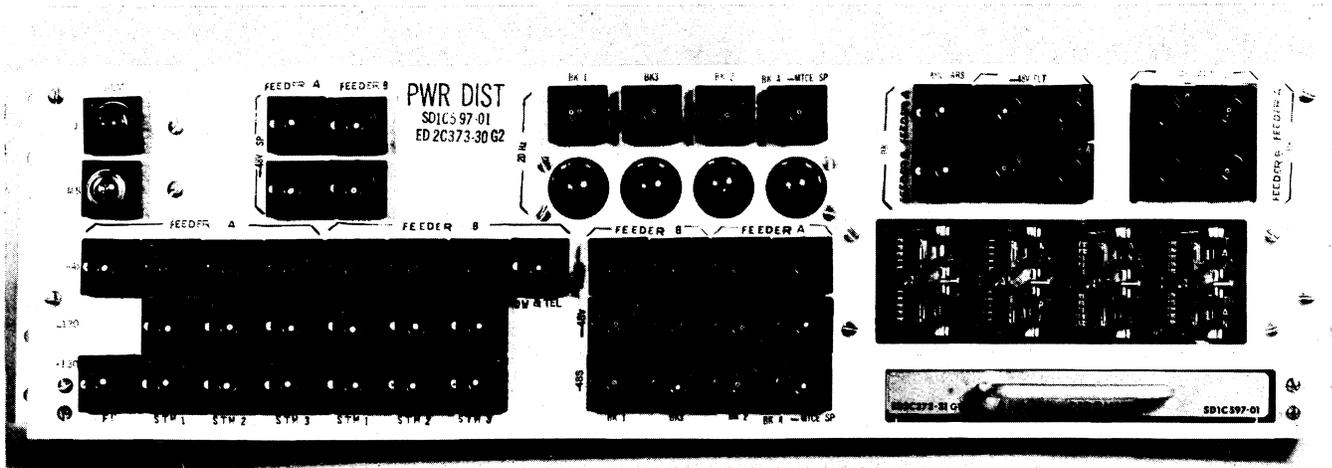


Fig. 10—Combined Fuse Panel for T1 and D3 Equipment

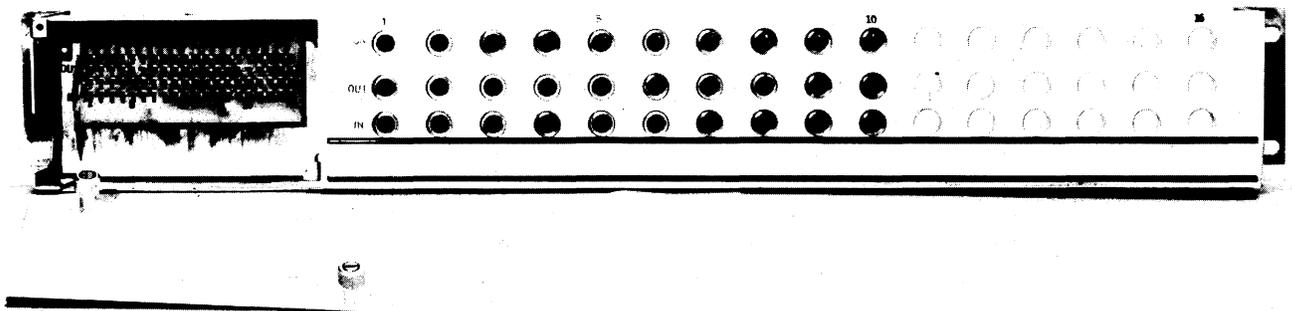


Fig. 11—DS-1 Jack and Cross-Connect Panel

lines. Power dissipating resistors associated with line and office repeater powering are contained on the unit. Requiring 17 inches of bay space, the STM consists of two major shelf assemblies; an office repeater (OR) shelf (essentially the standard 206 OR shelf) per ED-2C372-() (shown in Fig. 13 and 14) and an

automatic protection switching (APS) shelf. The two are joined on unit mounting bars and are provided with a wired interconnection between ORs and the APS. The APS contains DS-1 jack circuits for each line in the configuration. These circuits are identical to those already described for the DS-1 jack and

cross-connect panel. The jacks are permanently wired to a cross-connect terminal strip facing forward and positioned behind an access cover. This terminal strip provides connecting points for jumpers running to another STM or to the DS-1 jack panels). Connector pins on the rear of the STM accept bay or office cabling connections. Strapping provisions are also made on the rear of the STM to select the battery option required for line powering.

1.26 Three STMs are coded: J98728AA, J98728AB, and J98728AC. J98728AA places 12 lines in a single protection group with one protection line able to serve up to 11 service lines (ie, a 1-for-11 PG). J98728AB divides the STM into two complements of six lines each to provide two 1-for-5 PG, each essentially independent of the other. Slot 13 of the OR shelf provides for a bridging repeater, the output of which is terminated on the slot 13 connector. In any STM a fixed, wired APS priority is provided and depends upon the physical position of the switch plug-in with successively lower priority as one proceeds from left to right in the shelf. Note that use of the DS-1 jack panel, APS jacks, and two bridging repeaters per office permits changing of priority without interruption of service. In addition to plug-in switch cards and a common alarm card, positions are provided in the APS for one or two SRC plug-ins, depending on whether one or two protection groups are involved. Where individual alarm and status information is to be provided via an external telemetry system, an optional plug-in can be used in place of the SRC to provide contact closure outputs and remote control inputs. The 206-type repeaters are used in the STMs, and the type chosen should satisfy line powering and pad or build-out options, as in the standard T1 systems. Where the split (1-for-5 PG) STM is chosen, the design permits use of different line powering options for the two halves. Similarly, the fault locating outputs of the ORs are multiplied in two groups (left and right halves) to be assigned to fault locating filters, as required. The assignment of these collector pairs is administered at the fault locating panel.

1.27 J98728AC is an expansion STM (ESTM), which, together with J98728AA, provides a protection group of one protection line and up to 24 service lines. The ESTM is similar to the previously described STMs in that it contains an OR shelf with associated power dissipation resistors, an APS shelf with DS-1 jack circuits, and a cross-connect terminal strip. However, the APS shelf is mounted below the OR shelf to facilitate the switch-related interconnec-

tions between the 1-for-11 PG in the J98728AA STM and the 13 additional service lines provided by the ESTM. With the ESTM position directly above the STM in a bay, the APS shelves are always adjacent. They are connected by inserting the plug provided on the rear of the ESTM switch shelf into the connector mounted behind the jack field of the STM switch shelf. This connection contains only those leads associated with the operation of the APS. Power, T1 lines, alarm, and fault locate collector leads are connected to the ESTM and administered in the same manner as on any STM. The wired priority is continued through the 13 service lines with the last line having the lowest priority in the PG. Between the jack field and the 13 switch plug-in positions is a slot for the plug-in, which provides the contact closures for these 13 lines for the external telemetry system option. No additional plug-in is required in this shelf for the SRC option which is accomplished by the SRC plug-in in the 1 for 11 STM switch shelf via the connectorized interface between shelves. The OR shelf used in the ESTM is used for the TRS described below.

1.28 Terminating Repeater Shelf: The TRS (essentially the standard 206 OR shelf) per ED-2C372-(), GR2 and GR4 is designed to occupy 10 inches of bay space. This shelf is used alone to terminate up to 13 T1 lines when protection switching is not required. The shelf does not contain DS-1 jack circuits but two alternatives exist. One requires cabling the office side of the repeaters (from connectors on the rear of the OR shelf) to a DS-1 panel in an STB. This provides maintenance and cross-connect access consistent with using the STB as the maintenance center for outstate systems. The other option utilizes a DSX-1 or equivalent facility in an office as the maintenance/cross-connect center and requires cabling to same. In either case repeater positions not used for terminating lines can be cross-connected in pairs and used to provide power for lines through an office. Also, unused slots may be used for bridging repeaters (BR) provided the appropriate line termination is added (not provided with shelf). The TRS is identical to the 206 OR shelf used for the STMs (Fig. 13 and 14) except that no BR termination is provided in slot 13 and a full complement (4) of power dissipation resistors is provided for slot 13. Power, T1 lines, alarm, and fault locate collector leads are connected to this shelf as they are at the OR shelf used in the STMs. Fault locate collector pairs and power options are independent for each half (lines 1 through 6 and lines 7 through 13) of the shelf and must be administered accordingly.

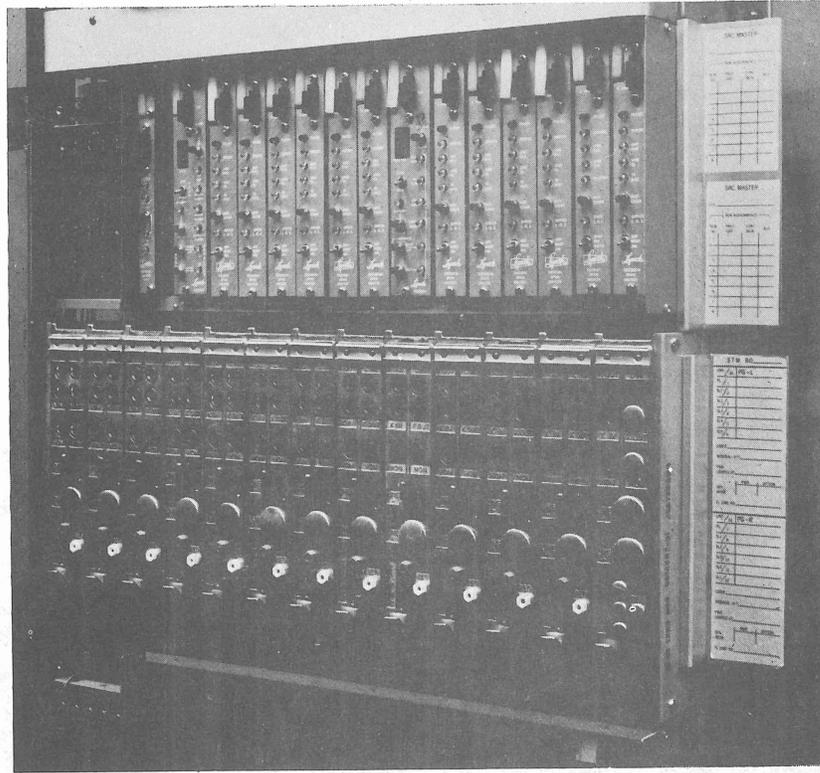


Fig. 12—Span Terminating Module, J98728AB

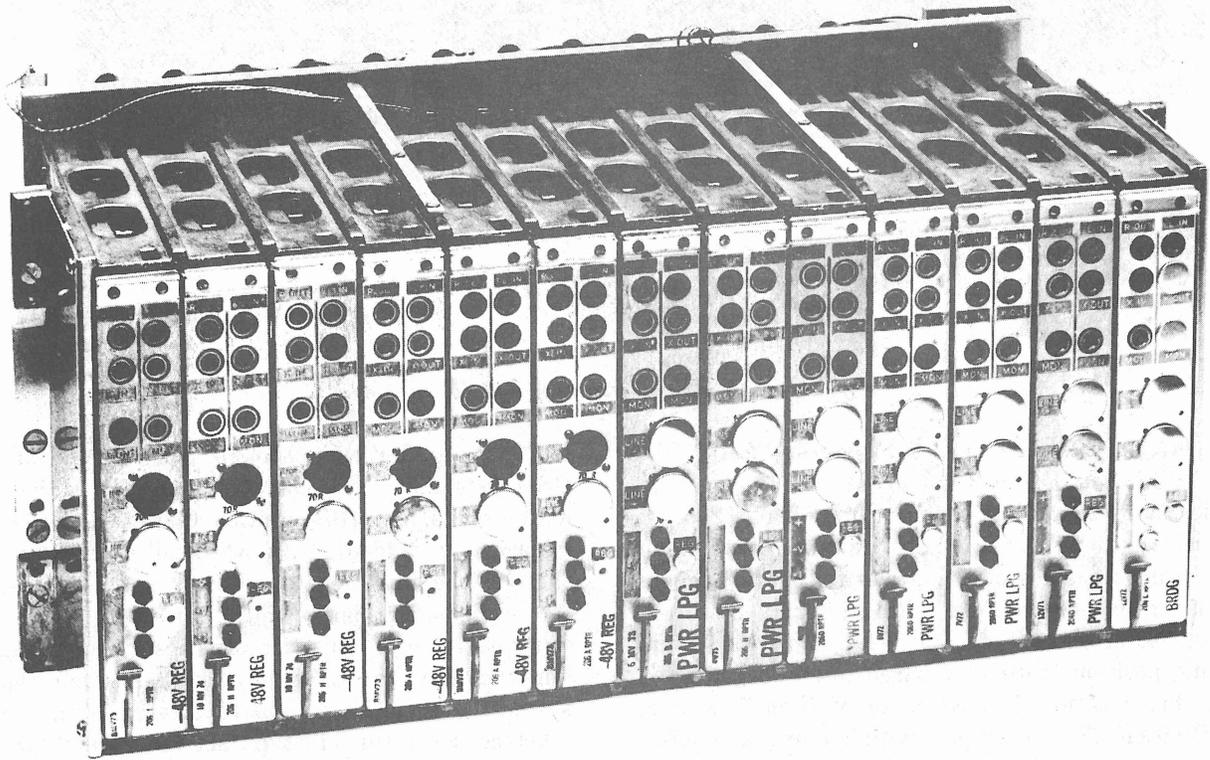


Fig. 13—206 Office Repeater Shelf (Front View)

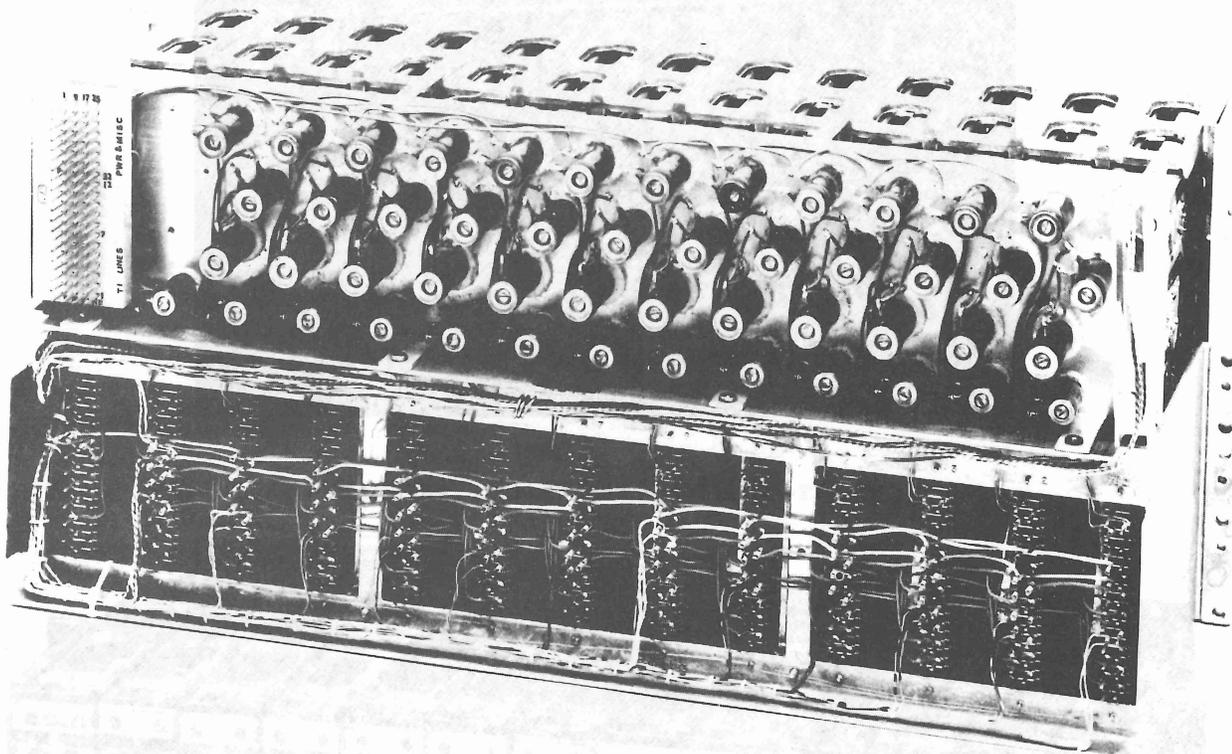


Fig. 14—206 Office Repeater Shelf (Rear View)

1.29 Intermediate Powering Repeater Shelf: The IPRS per ED-2C372-(), GR2, GR4, and GR5 occupies 10 inches of bay space. The unit is a 206 OR shelf wired to power six lines passing through an office with both sides of the powering point independent, in order to permit selecting different powering options. No cross-connect capability is provided as an incoming position is directly wired to an outgoing position, thus position 1 is wired to position 7, 2 to 8, etc. Position 13 is provided with all line and office power dissipation resistors and can be used in any of three ways: (1) connected to another position 13 in an

IPRS as an additional through line, (2) connected to a DS-1 jack and cross-connect circuit for a line termination or (3) as a BR position (provided the line termination is added). As with all T1/OS repeater shelves, the fault locate collector pairs are separate for each shelf half, which for the IPRS means separate for each direction of transmission. This permits including the IPRS in a single-end fault locating system using 115-type active filters. Fault locating schemes using the 114-type active or 1068-type passive filters can also be used.

1.30 Fault Locating Panel: The fault locating panel per ED-2C374-(),GR1 is designed to occupy a space of 1-3/4 by 23 inches, with provisions for mounting on bays drilled for either 1-3/4 or 2-inch mounting plates. The panel, as shown in Fig. 15, provides front access plug-in positions for three 1114-, 1115- or 1068-type filters and a fault locate control unit (FLCU) per ED-2C374-(),GR2. The 1114- and 1115-type active filters are shown in Fig. 16. A 6-position jack mounting is provided in the center of the panel, with two jacks equipped for test battery (-48 volt) and two jacks providing access to a 25-dB pad for use in conjunction with the fault locating test sets on active lines. The remaining two positions are available for miscellaneous jacks that may be implemented on a job basis. On the rear of the panel, a terminal block is provided for connecting circuits, and as a cross-connect block for assignment of connecting facilities, as required. Provision is made for terminating inputs and outputs of the three filters, eight fault locate collector pairs (from office repeater groups), and six fault locating lines. Strapping at the terminal block ties the fault locate collectors to the selected filter inputs, and the filter outputs to the selected fault locating lines. Collector pairs that are not to be assigned to filter positions may be shorted at this terminal block. Those which are assigned to a filter position will be automatically shorted by micro switches when the associated filter is not in place.

1.31 The FLCU plug-in per ED-2C374-(),GR2 as shown in Fig. 17, is a printed wiring board assembly containing power supply, control, and busy detection circuitry for up to six fault locating lines at one panel. The front panel provides switches for selecting one of six lines and choosing the polarity of power applied to the selected line. When plugged into, a single fault locating line jack is automatically connected to the selected line unless inhibited because the busy detector found voltage on the line from a distant point. The line inhibit sequence will also light the BUSY lamp. Jack positions designated FLT TST IN and FL LINE OUT provide access to power fault locating test position FU3 when it is to be used for verifying performance of active filters to be tested. Selected pairs of fault locating lines may be connected through the office, but constrained to pairings of ports 1 and 2, 3 and 4, and 5 and 6. Clip options within the FLCU, placed on pairs of terminals designated THRU or TERM, determine this mode condition. Two clips are involved in each pairing. Relay circuits are arranged so that use of one leg of a pair of lines will cut a through-mode path and terminate the unused leg. A voltage is applied to the unused leg to busy out the

far end. The line powering circuitry in the FLCU is supplied by +130 volts via the fuse panel in the bay.

1.32 Filter Panel: A filter panel per ED-2C375-() occupies a 2-inch by 23-inch mounting plate and is shown in Fig. 18. This panel provides for mounting up to six filters of the following types: the 1114- or 1115-type active filters and the 1068-type passive filters. The right-side of the panel contains a 10-position jack field that provides access up to a maximum of eight fault locate lines and a -48 volt battery (two jacks). No provisions are made in this panel for providing line powering for active fault locate systems. A terminal block on the rear provides access to the various functions of this panel. Fault locate lines and OR collector pairs are connected here. Provisions are made for both through-connecting lines and terminating lines. In the latter case up to two active lines can be terminated while all eight line appearances can be terminated for passive systems. Any combination of active, passive, through, and terminating lines within the constraints mentioned can be accommodated. In addition, filter outputs are strapped to the desired fault locate lines on this terminal block. Upon removal of a filter, collector pairs connected at each filter position will be shorted by microswitches.

1.33 Order-Wire Equipment: Order-wire equipment consists of a panel (J98725H) occupying a 2- by 23-inch mounting plate and providing two identical plug-in positions. Four plug-in units are available for use, as desired, and any practical combination of two plug-ins of the same or different types can be implemented provided wiring arrangements to the rear-side terminal blocks are provided as required. The four plug-ins are:

- (a) Telephone set plug-in, per ED-3C556-(),GR1, to provide a talking circuit that is wired to an order-wire line, and which can be patched to a bridging and coupling circuit.
- (b) Order-wire and telephine set plug-in, per ED-3C556-(),GR2, containing circuits to access an order-wire line to a dial line at the office or to permit signaling an office via an audible alarm activation. A quiet termination may be affected from a field appearance or by operating an alarm cutoff (ACO) key on the unit while maintaining dial line capability. The telephone set circuit in this plug-in is normally connected to the associated order-wire line but may be patched off to another line if desired.

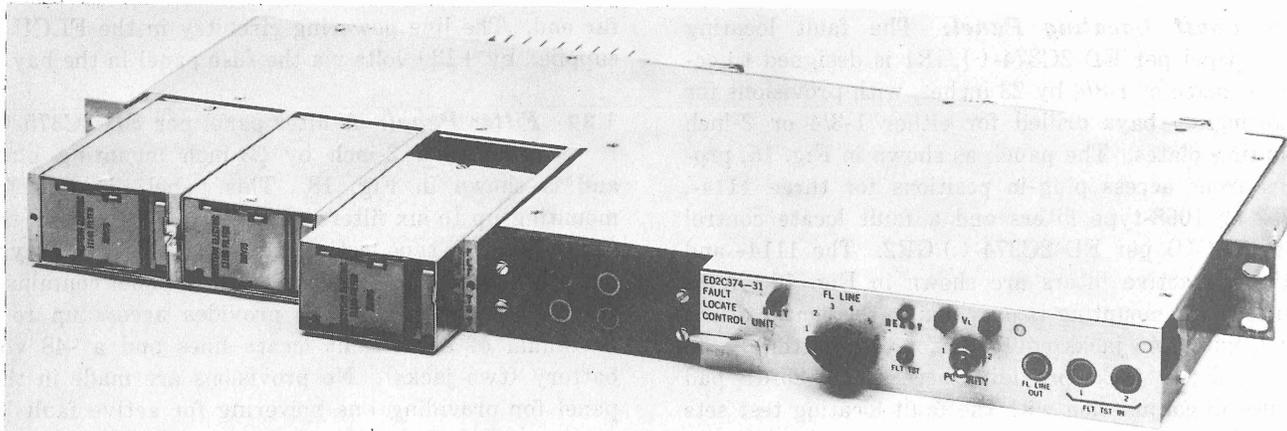


Fig. 15—Fault Locate and Miscellaneous Jack Panel

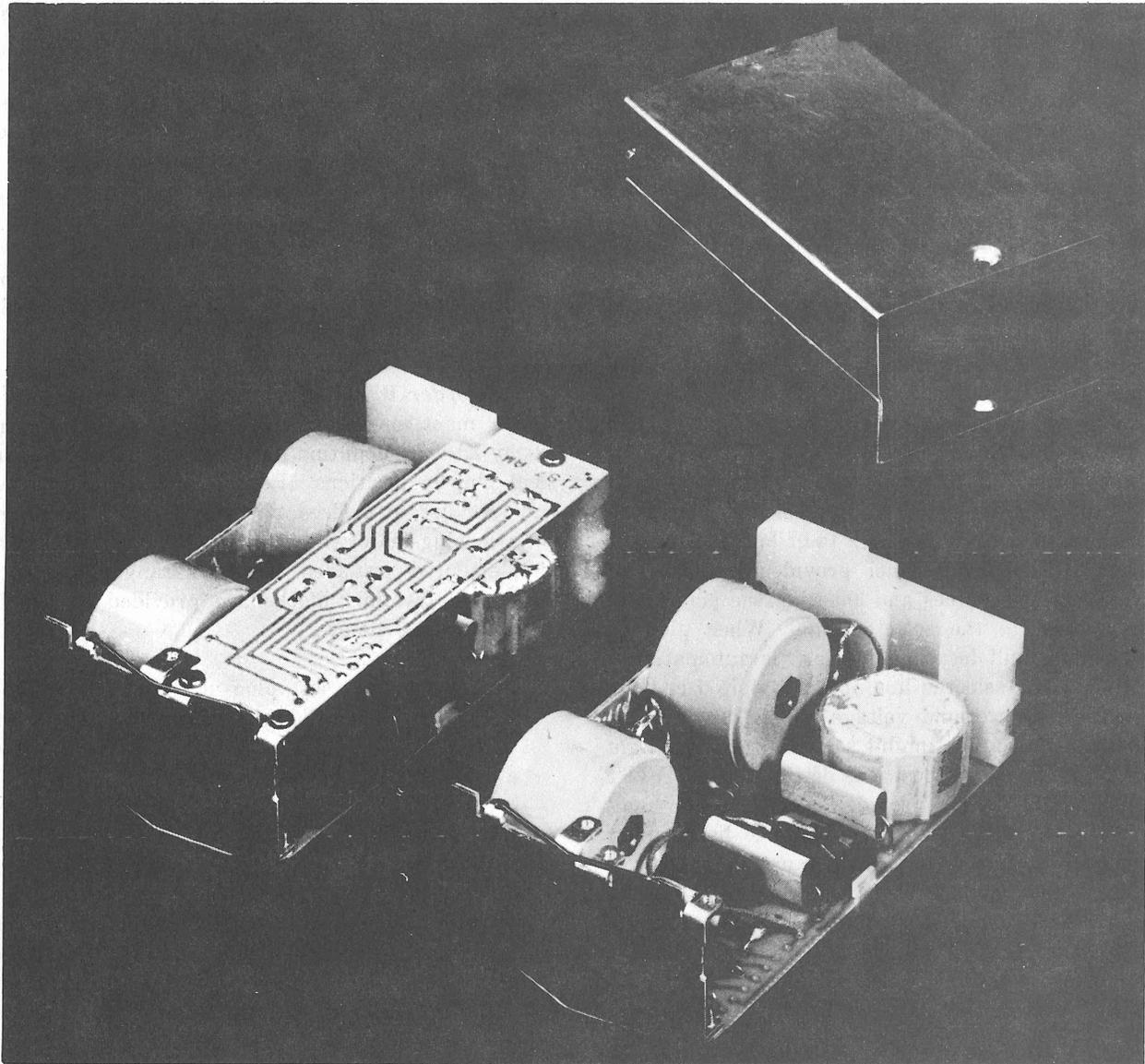


Fig. 16—114- and 115-Type Active Filters

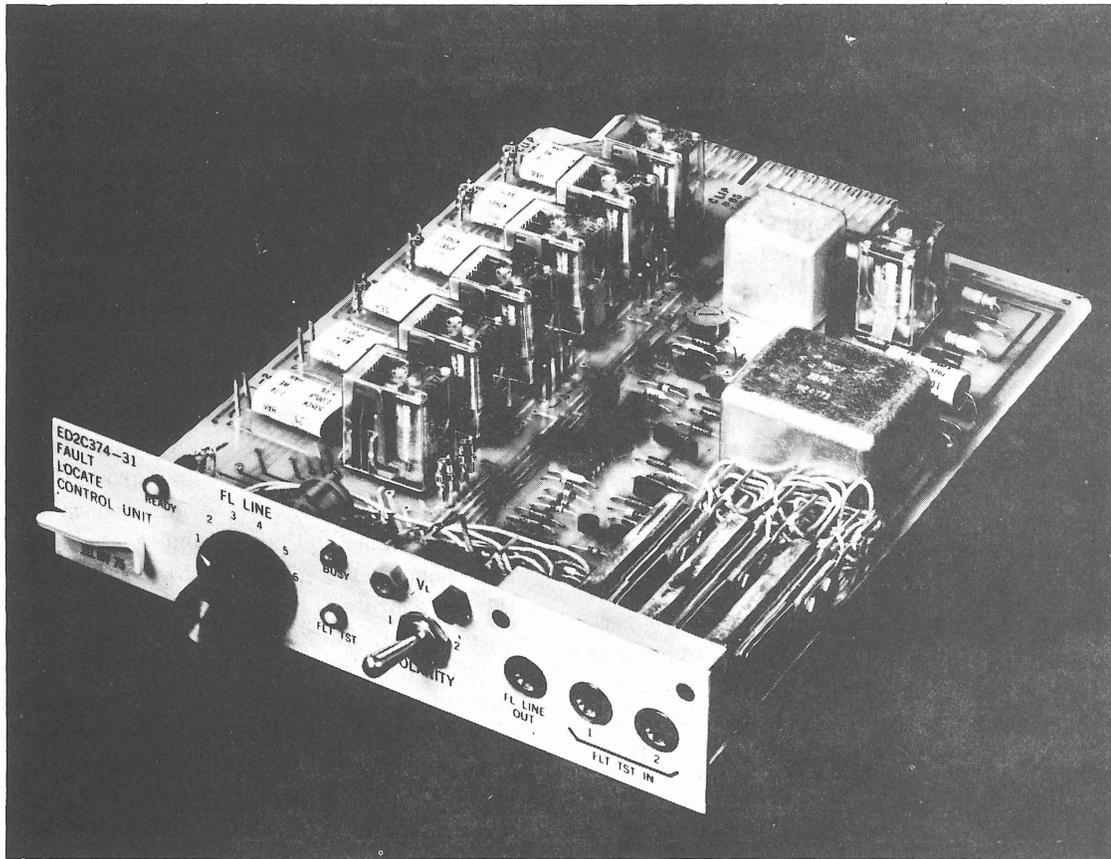


Fig. 17—Fault Locate Control Unit (FLCU)

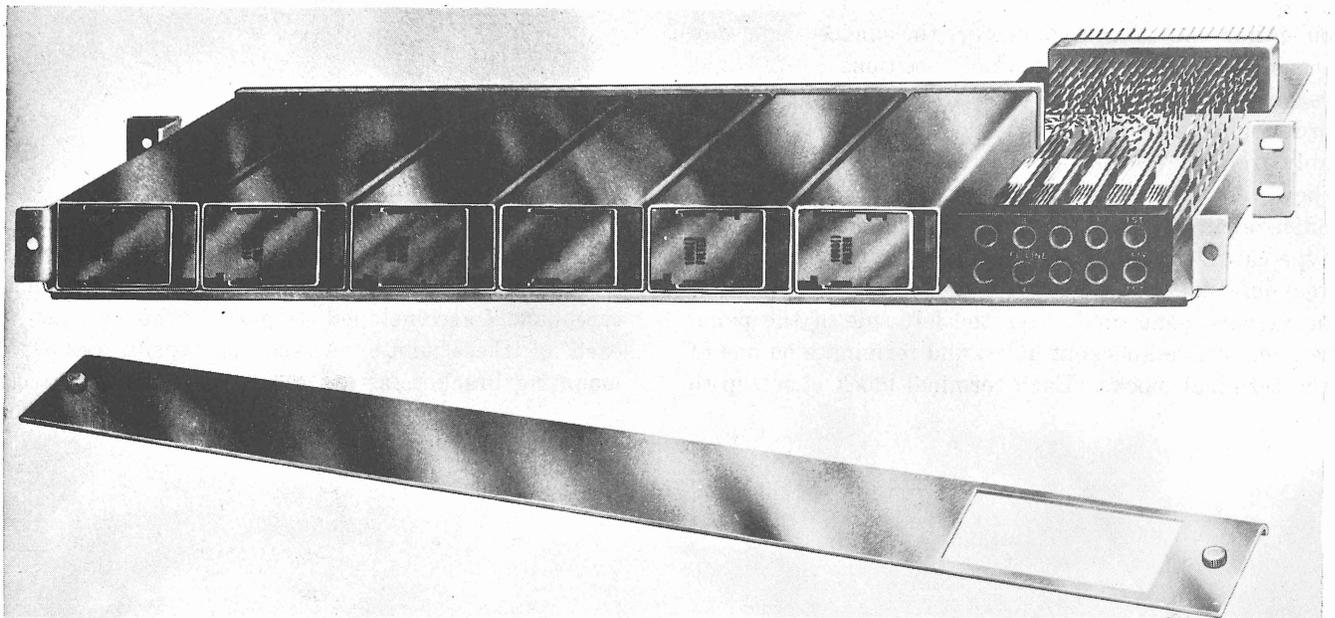


Fig. 18—Filter Panel

(c) Multiple unit plug-in, per ED-3C557-(),GR1 to provide remote access to a telephone set circuit.

(d) Bridging and coupling unit, per ED-3C557-(),GR2, to provide ac coupling of two order-wire pairs. Order-wire line jacks for each of the coupled order wires provide bridge taps for local access via a telephone set circuit.

1.34 Protector Panel: The protector panel per ED-2C499-() occupies 7-inches of vertical space on a bay designed for 23-inch wide mounting plates. The panel, shown in Fig. 19, provides for termination of up to 100 pairs cabled directly (bypassing the MDF) from the cable entrance facility. The panel contains a 303-type connector and two terminal blocks. The connector is the same one that is used at MDFs except that it is not provided with a stub. Voltage/current surge protection is obtained by using the appropriate plug-in protector units as described in 303-type connector documentation. The terminal blocks provide cross-connect flexibility between the tip cable and the STB equipment. The tip cable(s), a suitable size ABAM type, enters the top rear of the panel via one of four knockout holes and is terminated on either end of the connector, the choice being for transmit signals (protector unit positions 1 - 50) and receive signals (positions 51 - 100). Fault locate and order-wire pairs are terminated on either end, preferably from the bottom (positions 50, 49,...100, 99,...) so they will not prevent orderly growth. In the bay, the office equipment cable(s), also suitable size ABAM-type cable (or individual shielded pairs) run along the rear left side of the bay from an LTM, fault panel, or order-wire panel and enter the left side of the panel via one of five knockout holes, and terminate on one of the terminal blocks. Each terminal block is set up to

accept two 12-line LTMs, or equivalent, with provisions for one 13th line or two miscellaneous pairs (FL and OW). The front side of either terminal block is then cross-connected to the appropriate tip cable pair whose terminal appearance is on the front of the 303-connector below the protector unit plug-in positions.

1.35 Since the possibility of high voltage and current surges exist in this panel, certain precautions must be taken. The ground wire provided with the panel must be terminated to a direct, very low impedance office ground connection. This may have some bearing on the office location of a bay containing a protector panel. Knockouts are provided for both the tip cable and office cable entrances to the panel. Knock out only those holes required for current installation and provide a reasonably snug cable feed-through interface by using the heat shrinkable seal provided for the tip cable and by taping together the ABAM pairs from the bay equipment and force-fitting them into the holes provided. In minimizing the number of openings in the panel, the ability of a fire (in the unlikely event one should start) to sustain itself is greatly reduced. In addition, front and rear covers are to be removed for installation and maintenance only.

1.36 Equipment Designation Labels: Designation labels and mounting brackets needed for the LTMs, D3 channel bank, protector panel, and fault locate panels are included as part of the bay list for each of these units. A snap-on, easily removable mounting bracket fastens the labels to the right side

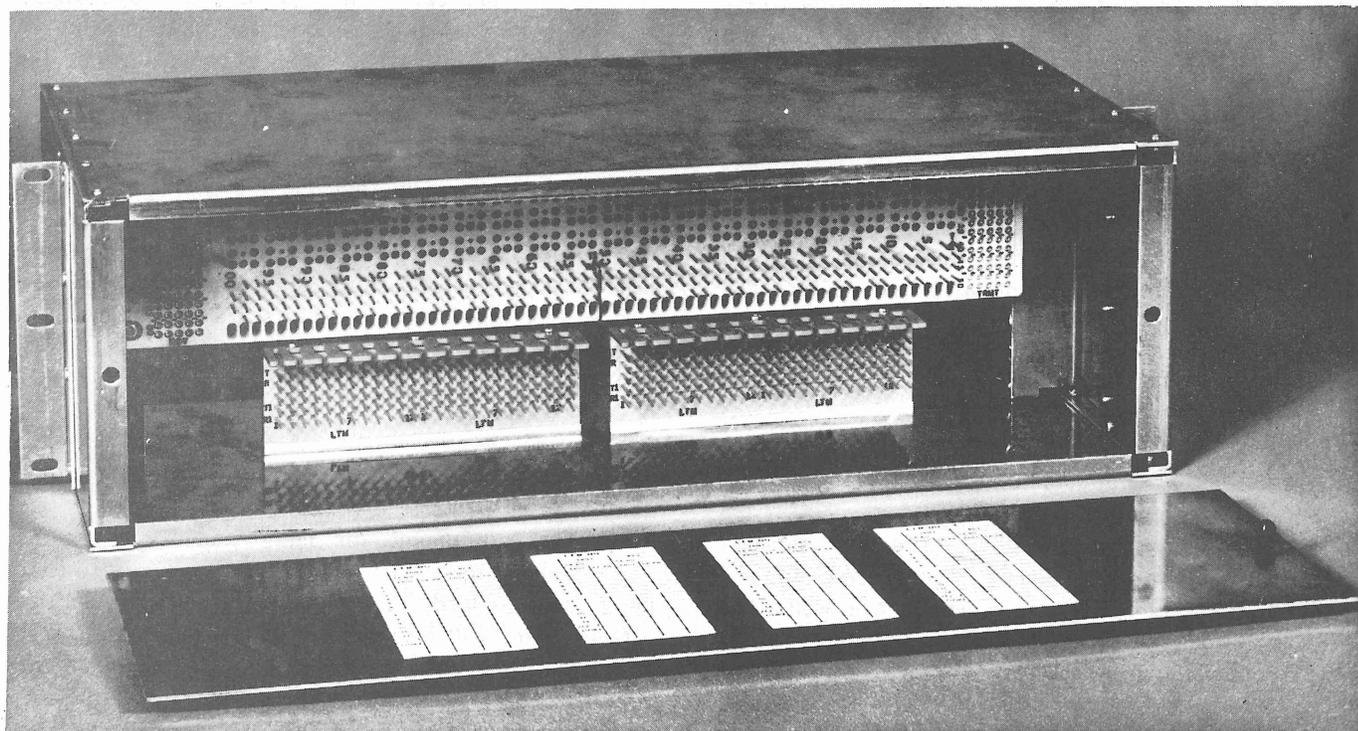


Fig. 19—Protector Panel

of each unit (except the protector panel) and forward of the bay upright. The adhesive backing on the label permits easy attachment to the mounting bracket, and the aluminized front permits modification of label entries. The label formats are represented in Fig. 20 and are referred to below as labels A through J. Typical entries are included in parentheses. Either label A (1-for-11 PG) or B (2, 1-for-5 PGs) and one each (1-for-11 PG) or two each (2, 1-for-5 PGs) of labels C and D are included with each STM. Labels C and D are required if the SRC feature is equipped, with the label choice depending upon whether the

STM is designated a master or remote point. Each ESTM is provided with label G, and each TRS or IPRS with label H. Each D3 includes one label F, and each FL panel includes six labels E. The latter has two mounting bracket arrangements: for mounting only one label as in the case of end offices, and for mounting up to six labels, as would be required to cover up to the six fault locating lines that might be terminated by one fault locating panel. The protector panel is provided with label J which is mounted inside the front cover.

1.37 The descriptive BSPs provide guidelines for making entries on STM- (including SRC), FL- and D3-designation labels. The IPRS/TRS format is similar to the STM format and follows the same rules, except the lower common information section on the label is used for IPRS and those TRSs that are split between two maintenance spans. Guidelines for the protector panel label are given here. The grouping is on an LTM basis as indicated by the provision (first entry) for an LTM number conforming to its position within the bay. The label is then divided into a transmit (TRMT) and a receive (RCV) half with provisions for an outside plant cable identification, together with the pair numbers and protector unit numbers (1 to 100). These latter two entries are to be placed in the row corresponding to their line number in the LTM. Additional rows are provided for a 13th line, fault locate, or order-wire pairs. The space between rows 6 and 7 can be used for cable identification when required for the dual 1-by-5 STM, IPRS, or TRS.

D. Outside Plant Arrangements

1.38 Apparatus cases for T1/OS are new codes of the 475-type previously standardized for T1 where the 208- and 209-type repeaters are used. The 475F() (unprotected) and 475G() (protected) apparatus cases include revised wiring to provide for new active- and directive-type 1115 filters in the fault locating line. The direction of transmission being fault located is determined by voltage polarity on the fault locating line. These cases are also equipped with the R/C network for the order-wire tap. Identical provisions are found in the recently coded 468C6 apparatus case with capacity for five 205-type repeaters. The 1115-type filter is a dual input filter for which a companion single input code (1114 type) is also available. The 1114-type filter permits only non-directional fault location, but allows double use of the amplitude modulated frequencies, through choice of polarity and proper placement of a tip/ring reversal in the fault locating line pair. It is also possible to use the passive 1068-type filters in the new 475F() and 475G() apparatus cases and the new 468C6 apparatus case under the same guidelines applied to standard T1, but a mixture of passive and active filters on a fault locating line is not permitted.

1.39 Complementary to the 475F() and 475G() apparatus cases are 208- and 209-type repeaters having fault locate outputs separated for the two sides. The new codes are 208E and 208F, and 209E

and 209F, with the E codes used for through powering and the F codes for loop powering. For the 468C6 case, the 205M for through powering and 205N for loop powering include the separate fault locate outputs. When using E and F code repeaters in the 475F() and 475G() apparatus cases with single input 1114-type filters, the result is as if the A and B code predecessors had been used. In fact, either A or E, or B or F codes can be used in such an application. Note that one-end and two-direction fault locating is not available. Further, E and F repeaters cannot be properly checked by 1068-type filters on the fault locating line since, unlike the 1114-type filter, the 1068-type filter does not recombine the separated fault locate outputs of the E and F repeaters to restore them to the single output mode. Similar statements apply to 205M and 205N repeaters and to their predecessors, the 205G and 205H codes. Plug-ins for load coils and blocking capacitors are the same as for standard T1 usage.

E. Test Equipment

1.40 Test equipment for maintenance and troubleshooting of T1/OS conforms generally to that used for standard T1. Thus, the sets covered by J98710 codes will be applicable. The only added test equipment is a new error rate test set required for overall tests of span lines in the presence of automatic protection switching. This set can be obtained as KS-20775,L2, error rate test set. The number of sets required to serve an area will be determined by the customer by evaluation of cost and convenience. However, it is expected that at least one such set will be placed at each control office, with additional sets to serve outlying span terminating offices as needed. Since T1/OS will not require routine tests, the principal use of test sets will be to turn up added lines or to clear faults on lines in trouble.

F. Plug-Ins

1.41 Bays for T1/OS will be shipped without plug-ins, except the one contained in the T1/D3 fuse panel. D3 plug-ins are covered in J98718 and T1 office repeaters (206 type) in J98710. All plug-ins, except those for the APS shelf, have been discussed in the preceding sections and are summarized in **5. GENERAL NOTES AND INDEXES**. The plug-ins for the APS, as supplied by Lynch Communication Systems, Inc., and their usage requirements, are as follows:

STM NO. (2)

LINE/SS	PG: (BRGR-LAMR-I)
PL/1	(PROT-BRGR-LAMR)
SL1/2	(101-BRGR-LAMR)
SL2/3	(101-HLLY-LAMR)
SL3/4	(102-HLLY-LAMR)
SL4/5	
SL5/6	
SL6/7	
SL7/8	
SL8/9	
SL9/10	
SL10/11	
SL11/12	

CABLE (1234)

NOMINAL -V/+ (158V)

PWR LOOPED AT (BRGR4W)

OFF RPTR	PWR	OPTION
	(LOOP)	(CEK)

FL LINE NO. (3)

(SPACE FOR OTHER INFO)

A

STM NO. _____

LINE/SS	PG-L:
PL/1	
SL1/2	
SL2/3	
SL3/4	
SL4/5	
SL5/6	

CABLE _____

NOMINAL -V/+ _____

PWR LOOPED AT _____

OFF RPTR	PWR	OPTION

FL LINE NO. _____

LINE/SS	PG-R:
PL/7	
SL1/8	
SL2/9	
SL3/10	
SL4/11	
SL5/12	

CABLE _____

NOMINAL -V/+ _____

PWR LOOPED AT _____

OFF RPTR	PWR	OPTION

FL LINE NO. _____

B

SRC MASTER

SYS: (LAMR-NET 1)

(REM ASSIGNMENTS)

REM NO.	PROT GRP	CONT MON	AUX
1	(BRGR-HLLY(N))	(DOOR)	(TR OFF)
2	(BRGR-HLLY(F))	(SMOKE ALM.)	(TR OFF)
3			
4			
5			
6			
7			
8			

C

SRC REMOTE

SYS: (LAMR-NET 1)

REM NO. (2)

PROT GRP (BRGR-HLLY-N)

CONT MON (DOOR)

AUX (TR OFF)

(SPACE FOR OTHER INFO)

D

Fig. 20(A-D) — Equipment Designation Labels

TABLE A

PLUG-INS

IDENTIFICATION	USAGE
302AL01 Alarm Unit	One per APS shelf
302TI01 Telemetry Interface Unit	One per APS protection group when E2 or equivalent reporting is required
302RC01 Status Report & Control Unit (Master)	One per APS protection group at SRC control office, if status is to be received from a remote span
302RC51 Status Report & Control Unit (Remote)	One per APS protection group at SRC remote
302SS01 Span Switch Unit	One per APS per T1 line

FLOOR PLAN AND CABLING

1.42 Bay Placement and Cross-Connecting:

Since T1/OS is directed primarily to light route applications, it is not expected that large bay groupings will occur. However, when two or more span terminating bays are to be installed, it is recommended that they be placed in adjacent positions to allow straightforward cross-connection of T1 spans within the group. When cross-connecting between nonadjacent STBs is necessary, such lines should be cabled to the DS-1 jack and cross-connect panel of either bay to permit straightforward cross-connection. If STBs containing STMs are placed in an office with other T1 equipment, and cross-connection to it or to other DS-1 facilities is required, the preferred arrangement is to cable the STM signals via the DS-1 jack and cross-connect panel to the office DS-1 cross-connect or to cross-connects within the T1 bays. When routing to a DSX-1, T1 central cross connect, or T1 office repeater bay (ORB), the 85-foot limitation between these and the STMs will apply. If STBs containing TRSs are placed in the above environment, cabling directly from the TRS to a T1 ORB, DSX-1, or equivalent is permitted in addition to cabling via a DS-1 jack and cross-connect panel. Distance limitations depend upon DS-1 facilities being used, eg, standard or extended cross-connect repeaters, APS, etc, and are covered in the appropriate schematic.

1.43 It must be recognized that DSX-1 facilities cannot be utilized as a centralized maintenance facility for T1/OS bays containing STMs or a fault locating panel. Basically, this results from the fact that the APS position in the STB forces this bay to be the control and access point for lines within each automatic protection group. Also, fault locate panel access and control cannot be remoted to a DSX-1. To keep interfaces between non-T1/OS DS-1 facilities consistent with the T1/OS maintenance plan, such DS-1 access to T1/OS must be via DS-1 jack and cross-connect panel(s) within the STBs if patching provisions within T1/OS are to be utilized as intended.

1.44 As previously noted, D3 banks may be provided in some STB configurations without inclusion of a hot spare and maintenance shelf. The implication is that the space has been used as a spillover from a larger group of D3 banks. If this choice is used in an STB floor plan, layouts should place the standard D3 bay with a hot spare and maintenance shelf adjacent to the STB involved. As previously stated, one side of the STB should not be blocked such that orderly growth of STBs cannot continue.

1.45 Floor Plans: Floor plan details found in the data sheets cannot account for the entire range of office conditions to be encountered. Since STBs are principal maintenance and control points for T1/OS spans, the allowance for front aisle space requires broader consideration. The provision of writing shelves and use of portable test equipment makes spacious front aisles more desirable than the 2-foot 6-inch minimum requirement. When practicable, especially in large offices, front aisles of 3 feet 0 inch or 3 feet 6 inches are recommended. The wider aisle also reduces power dissipation per unit area (see X-74500, Section 3). In small offices, where heat dissipation and aisle congestion are less critical, the narrower 2-foot 6-inch aisle is more acceptable.

1.46 Cabling Requirements: As with conventional T1 bays, line output and line input cabling is run in ABAM-type cables. When using separate cables, output cables are run as high level and input cables as low level relative to general routing requirements on overhead racks. They are to be separated at least 3 inches from other carrier system cables on common runs; they need not be separated from each other or from voice-frequency cabling. For small cross-section installations (less than 100 pairs) a single cable may be used for both input and output provided bidirectional cable rules covered in T1/OS en-

engineering practices are followed. The maximum allowances are a cable length of 100 feet, cross-section of 100 prs. and adjacent unit separation with high and low level signals placed in separate cable units. End-section engineering of the T1/OS system is also modified for this bidirectional use (see Engineering Practices). Line cabling to the T1/OS bay will come either from the MDF and be terminated on the appropriate LTM terminal block or from the cable entrance facility (CEF) and be terminated on the bay mounted protector panel. In the former, it is recommended that the MDF vertical be used but if cross-connect flexibility is required, ie, if the horizontal is used, cross-connections must be shielded. In the latter case no access to the tip cable is permitted between the protector panel and the CEF. In both cases the ABAM cable size should be appropriate for present needs and future growth. ABAM cable may also be used for connection of fault locating line pairs to the MDF. The run is made directly from the terminal block on the panels to the MDF. Maximum pair capacity for the panels are: six for the fault locating panel and eight for the filter panel. If fewer fault locating line ports are to be used at the panels, individual shielded pairs can be used.

1.47 For bays containing the protector panel, only four input ports (knockouts) are available for line cabling (ie, the tip cable). Each port will accept one cable, ABAM-6, -11, -16, or -25 size. Mechanical attachment is provided by a heat-shrinkable feed-through seal that adheres to the ABAM sheath. Four ABAM-25 cables provide maximum panel capacity of 100 pairs. It is permissible to put low (RCV) and high (TRMT) level signals in the same ABAM-16 or -25 provided the distance between the CEF and protector panel does not exceed 100 feet and end-section engineering rules are followed. This one-cable operation is ideal for offices with only one LTM. The cable may also contain fault locate and order-wire pairs. On the office side of the panel, five ports (knockouts) are available to run cables into the bay. Four ports are used for LTM cabling and one for fault locate and order-wire cable. Again, cable sizes up to ABAM-25 with low and high level signals in the same cable are permitted. These cables are provided and terminated by the shop for all LTMs in the initial order and must be installer added for future LTM additions. Note that those applications which may require 26 cable pairs (ESTM, TRS, and IPRS) will need a single shielded pair along with the ABAM-25. Alternatively, TRMT and RCV signals can be placed in separate cables. Mechanical attachment for office side cabling at the panel is provided by taping together all

individual and ABAM pairs (excluding shields), force-fitting them through the port and tying the bundle to the bay upright.

1.48 For D3 banks mounted in an STB, shielded pairs run as intrabay cabling will provide DS-1 connections to the jack and cross-connect panel. For banks outside the STB, ABAM or shielded pair office cabling is to be run to a DS-1 jack and cross-connect panel on the STB where the initially assigned T1/OS line appears. The ABAM or shielded pair complement shall be sized in accordance with the number of banks involved, and as governed by the applicable D3 specifications. The same approach shall be taken for other groups of DS-1 signal sources, such as part of a DSX-1 panel. All transmission cabling to terminal equipment from STBs is high level and can be grouped together on cable racks.

POWER AND HEAT DISSIPATION

1.49 Bay fuse panels are arranged to divide odd and even circuits on separate battery feeders. To preserve the reliability inherent in this arrangement, it is necessary to maintain odd-to-odd or even-to-even assignment in cross-connection layouts.

1.50 Schematic documentation for the T1/OS digital transmission system and its associated units consists of the following:

CIRCUIT DRAWING	TITLE
SD-1C597-01	T1/OS Span Terminating Circuits
SD-1C603-01	T1/OS Fault Locate Circuit
SD-3C104-01	D3 Channel Bank Application Schematic
SD-3C254-01	T1C Digital Line Order-Wire Circuit

2. SUPPLEMENTARY INFORMATION

- 801-000-000—Numerical Index—Common Systems
- 800-600-000—Checking List—General Equipment Requirements
- 103-493-109—KS-20775 Bowmar Test Set
- 201-208-101—302- and 303-Type Connectors and Associated Protector Units—Description
- 365-010-110—T1 Outstate System—General Description

365-010-111—T1 Outstate Engineering and Implementation Methods System (EIMS)
 365-150-100—D3 Channel Bank—General Description
 365-200-100—T1 Digital Line—General Description
 365-200-101—T1 and T1 Outstate Repeater Description and Use
 365-200-160—Active T1 Digital Line Fault Locate System—Description and Operation
 365-200-170—Span Terminating Module—General Description
 365-200-410—T1 Outstate Line and System Maintenance Considerations and Tests
 365-224-600—T1 Outstate Initial Line Tests
 365-250-110—Lynch B302 Automatic Protection Switch Description and Use
 365-325-100—T1 Outstate Order Wire Description, Initial Tests, Maintenance, and Utilization
 640-525-107—475 Apparatus Case—Description and Installation
 640-525-211—475 Apparatus Case—Splicing and Maintenance
 640-525-215—Installation and Replacement of T1 Repeaters
 801-523-182—T1/OS Span Terminating Bay Circuits—Performance Requirements
 855-350-104—T1, T1C, and T1 Outstate Design and Engineering of Fault Locate Facilities
 855-350-107—T1, T1C, and T1 Outstate Design and Engineering of Order Wire Facilities
 855-351-200—T1 Outstate System Design
 919-240-310—Manholes and Service Boxes for T1 Carrier Apparatus Cases
 J98710—801-523-150—T1 Carrier — Equipment Design Requirements
 J98713—801-438-152—Wideband Data Banks and Modems
 J98718—801-505-153—D3 Channel Bank—Equipment Design Requirements
 J98725—801-523-123—T1C—Equipment Design Requirements (Consult for information on order wire)
 X-18172—Active Fault Locate Filters
 X-74500—Equipment Building Interrelations
 X-78956—Fault Locate Control Unit Plug-In
 KS-20775—Test Set—Error Rate
 Floor Plan Data—801-523-156-1 to -6

3. DRAWINGS

For additional drawings forming a part of this specification, see listing under Subdivisions of Equipment and Detailed Index.

Circuits

SD-3C254-01—T1C Digital Line Order-Wire Circuit

Equipment

ED-3C556-()—Order-Wire and Telephone Set Plug-ins

ED-3C557-()—Bridging, Coupling, and Multiple Circuit Plug-ins

ED-3C369-()—Writing Shelf

4. EQUIPMENT

ED-2C372-()—AT&T Co Std—Office Repeater and Power Distribution Mounting for 206-Type Repeaters

Group 2—Basic equipment, assembly, and wiring for one office repeater mounting and power distribution panel for 12 office repeaters, per SD-1C597-01, Fig. 1.

Group 3—Equipment, assembly, and wiring required in addition to group 2 to provide a wiring duct and one terminated bridging repeater position, per SD-1C597-01, Fig. 1, option S.

Group 4—Equipment, assembly, and wiring required in addition to group 2 to provide one terminating repeater shelf assembly for 13 office repeaters, per SD-1C597-01, Fig. 1, option M.

Group 5—Wiring required in addition to groups 2 and 4 to provide one intermediate powering repeater shelf for six through-lines, per SD-1C597-01, Fig. 1, option Q.

ED-2C373-()—AT&T Co Std—Fuse and Alarm Panels for T1/OS Span Terminating Bays

Group 1—Assembly and wiring for one fuse and alarm panel arranged to supply up to four T1/OS line terminating modules, per SD-1C597-01, Fig. 3, and up to eight, Fig. 4. (See 5.01.)

Group 2—Assembly and wiring for one fuse and alarm panel arranged to supply up to three T1/OS line terminating modules and up to four D3 channel banks, or three D3 channel banks and one hot spare and maintenance panel, per SD-1C597-01, Fig. 2 (except CP1 components), up to six Fig. 4, and up to four Fig. 6. (See 5.01.)

Group 3—Apparatus and assembly for one alarm circuit plug-in required in addition to group 2, per SD-1C597-01, Fig. 2 (CP1 components only). (See 5.02.)

ED-2C374-()—AT&TCo Std—Fault Locating Panel and Plug-In Control Unit for T1 Fault Locating Lines Using Active Filters

Group 1—Assembly and wiring for one fault locating panel arranged for up to six fault locating line ports and up to three fault locating filters, per SD-1C603-01, Fig. 1 (except FLCU components and fault unit [FU] filters).

Group 2—Assembly and wiring for one fault locating control unit for use with group 1, per SD-1C603-01, Fig. 1 (FLCU components only). (See 5.03.)

ED-2C375-()—AT&TCo Std—Filter Panel for T1 Fault Locating Lines Using Active or Passive Filters

Group 1—Equipment, assembly, and wiring for one filter panel arranged for up to eight fault locating lines and up to six fault locating filters for use in passive or active (limited use) fault locating systems, per SD-1C597-01, Fig. 11.

ED-2C376-()—AT&TCo Std—DS-1 Jack and Cross Connect Panel for T1/OS Span Terminating Bays

Group 1—Assembly and wiring for one DS-1 jack and cross-connect panel with capacity for 16 jack circuits per SD-1C597-01.

Group 2—Apparatus required in addition to group 1 for each jack circuit, per SD-1C597-01, Fig. 7.

ED-2C499-()—AT&TCo Std—Protector Panel Assembly for T1/OS Span Terminating Bays

Group 1—Equipment and assembly for one protector panel with the capacity for terminating 100 tip cable pairs per SD-1C597-01.

ED-3C364-()—AT&TCo Std—Mounting Shelf Assemblies for D3 Channel Banks and Hot Spare and Maintenance

Groups 1 Through 4—Not available with J98728.

Group 5—Assembly and wiring for one D3 channel bank mounting shelf arranged for front mounting on 23-inch duct-type bay framework in 19-inch vertical space, per SD-1C597-01, Fig. 5. (See 5.04.)

Group 6—Assembly and wiring for one hot spare and maintenance shelf for D3 channel banks arranged for front mounting on 23-inch duct-type bay framework in 7-inch vertical space, per SD-1C597-01, Fig. 8. (See 5.04.)

J98728A—AT&TCo Std—T1/OS Digital Transmission System Span Terminating Bay for Mounting T1, D3, and Maintenance Equipment on 11-Foot 6-Inch by 23-Inch Duct-Type Bay

List 101—Framework, common equipment, and bay local cable for one span terminating bay, per SD-1C597-01, arranged for a maximum of four T1/OS line terminating modules. (See 5.12.)

List 102—Framework, common equipment, and bay local cable for one span terminating bay, per SD-1C597-01, arranged for four banks with two LTMs (not hot spare and maintenance panel), or three banks with three LTMs (with space for a hot spare and maintenance panel). (See 5.12.)

List 3—Equipment, assembly, and wiring required in addition to list 101 or list 102 to provide one span terminating module arranged for one 1-for-11 PG, per SD-1C597-01. (See 5.05, 5.07, and 5.16.)

List 4—Equipment, assembly, and wiring required in addition to list 101 or list 102 to provide one span terminating module arranged for two 1-for-5 PGs, per SD-1C597-01. (See 5.05 and 5.07.)

List 5—Equipment, assembly, and wiring required in addition to list 102 to provide one D3 channel bank shelf assembly, per SD-1C597-01. (See 5.06 and 5.07.)

List 6—Equipment, assembly, and wiring required in addition to list 102 to provide one hot spare and maintenance shelf assembly for D3 channel banks, per SD-1C597-01. (See Note A.)

- List 7**—Equipment, assembly, and wiring required in addition to list 101 or list 102 to provide one order-wire panel, per SD-1C597-01. (See 5.08.)
- List 8**—Equipment and assembly required in addition to list 101 or list 102 for each DS-1 jack and cross-connect panel, per SD-1C597-01. (See 5.09.)
- List 9**—Apparatus, assembly, and wiring required in addition to list 8 for each jack circuit to be equipped on the DS-1 jack and cross-connect panel, per ED-2C376-(),GR2. (See 5.09.)
- List 10**—Equipment and assembly required in addition to list 101 or list 102 for one writing shelf, per ED-3C369-().
- List 11**—Equipment, assembly, and wiring required in addition to list 101 or list 102 to provide one fault locate panel for active filters, per SD-1C597-01. (See 5.03 and 5.17.)
- List 12**—Equipment, assembly, and wiring required in addition to list 101 or list 102 to provide one filter panel, per SD-1C597-01.
- List 13**—Equipment, assembly, and wiring required in addition to list 101 or list 102 and list 3 to provide one expansion span terminating module arranged for up to 13 additional service lines, thus forming a 1-for-24 PG, per SD-1C597-01. (See 5.15 and 5.16.)
- List 14**—Equipment, assembly, and wiring required in addition to list 101 or list 102 to provide one terminating repeater shelf for up to 13 office repeaters (with no protection switching), per SD-1C597-01.
- List 15**—Equipment, assembly, and wiring required in addition to list 101 or list 102 to provide one intermediate powering repeater shelf for powering up to six through lines, per SD-1C597-01.
- List 102**—Framework, common equipment, bay local cable for one span terminating bay, per SD-1C597-01, arranged for three line terminating modules and two D3 banks, or two line terminating module and three D3 banks, both groupings allowing space for a hot spare and maintenance panel. (See 5.12.)
- List 3**—Equipment, assembly, and wiring required in addition to list 101 or list 102 to provide one span terminating module arranged for one 1-for-11 protection group, per SD-1C597-01. (See 5.05, 5.07, and 5.16.)
- List 4**—Equipment, assembly, and wiring required in addition to list 101 or list 102 to provide one span terminating module arranged for two 1-for-5 protection groups, per SD-1C597-01. (See 5.05 and 5.07.)
- List 5**—Equipment, assembly, and wiring required in addition to list 102 to provide one D3 channel bank shelf assembly, per SD-1C597-01. (See 5.06 and 5.07.)
- List 6**—Equipment, assembly, and wiring required in addition to list 102 to provide one hot spare and maintenance shelf assembly for D3 channel banks, per SD-1C597-01.
- List 7**—Equipment, assembly, and wiring required in addition to list 101 or list 102 to provide one order-wire panel, per SD-1C597-01. (See 5.08.)
- List 8**—Equipment and assembly required in addition to list 101 or list 102 for each DS-1 jack and cross-connect panel, per SD-1C597-01. (See 5.09.)
- List 9**—Apparatus, assembly, and wiring required in addition to list 8 for each jack circuit to be equipped on the DS-1 jack and cross-connect panel, per ED-2C376-(),GR2. (See 5.09.)
- List 10**—Equipment and assembly required in addition to list 101 or list 102 for one writing shelf, per ED-3C369-().
- List 11**—Equipment, assembly, and wiring required in addition to list 101 or list 102 to provide one fault locate panel for active filters, per SD-1C597-01. (See 5.03 and 5.17.)
- List 12**—Equipment, assembly, and wiring required in addition to list 101 or list 102 to provide one filter panel, per SD-1C597-01.
- List 13**—Equipment, assembly, and wiring required in addition to list 101 or list 102 and list 3 to provide one expansion span terminating module arranged for up to 13 additional ser-

Note

- A. Where D3 banks in a list 102 bay can be served by a hot spare and maintenance panel in an adjacent D3 bay, list 6 may be omitted.

J98728B—AT&T Co Std—T1/OS Digital Transmission System Span Terminating Bay for Mounting T1, D3, and Maintenance Equipment on 9-Foot 0-Inch by 23-Inch Duct-Type Bay

- List 101**—Framework, common equipment, and bay local cable for one span terminating bay per SD-1C597-01, arranged for a maxi-

vice lines, thus forming a 1-for-24 PG, per SD-1C597-01. (See 5.15 and 5.16.)

List 14—Equipment, assembly, and wiring required in addition to list 101 or list 102 to provide one terminating repeater shelf for up to 13 office repeaters (with no protection switching), per SD-1C597-01.

List 15—Equipment, assembly, and wiring required in addition to list 101 or list 102 to provide one intermediate powering repeater shelf for powering up to six through lines, per SD-1C597-01.

J98728C—AT&T Co Std—T1/OS Digital Transmission System Span Terminating Bay for Mounting T1, D3, and Maintenance Equipment on 7-Foot 0-Inch by 23-Inch Duct-Type Bays

List 101—Framework, common equipment, and bay local cable for one span terminating bay, per SD-1C597-01, arranged for a maximum of four line terminating modules. (See 5.12.)

List 102—Framework, common equipment, and bay local cable for one span terminating bay, per SD-1C597-01, arranged for two line terminating modules and one D3 bank, or one line terminating module and two D3 banks; both groupings allow space for a hot spare and maintenance panel. (See Note A and 5.12.)

List 3—Equipment, assembly, and wiring required in addition to list 101 or list 102 to provide one span terminating module arranged for one 1-for-11 PG, per SD-1C597-01. (See 5.05, 5.07, and 5.16.)

List 4—Equipment, assembly, and wiring required in addition to list 101 or list 102 to provide one span terminating module arranged for two 1-for-5 PGs, per SD-1C597-01. (See 5.05 and 5.07.)

List 5—Equipment, assembly, and wiring required in addition to list 102 to provide one D3 channel bank shelf assembly, per SD-1C597-01. (See 5.06 and 5.07.)

List 6—Equipment, assembly, and wiring required in addition to list 102 to provide one hot spare and maintenance shelf assembly for D3 channel banks, per SD-1C597-01. (See Note A.)

List 7—Equipment, assembly, and wiring required in addition to list 101 or list 102 to provide one order-wire panel, per SD-1C597-01. (See 5.08.)

List 8—Equipment and assembly required in addition to list 101 or list 102 for each DS-1 jack and cross-connect panel, per SD-1C597-01. (See 5.09.)

List 9—Apparatus, assembly, and wiring required in addition to list 8 for each jack circuit to be equipped on the DS-1 jack and cross-connect panel, per ED-2C376-(),GR2. (See 5.09.)

List 10—Equipment and assembly required in addition to list 101 or list 102 for one writing shelf, per ED-3C369-().

List 11—Equipment, assembly, and wiring required in addition to list 101 or list 102 to provide one fault locate panel for active filters, per SD-1C597-01. (See 5.03 and 5.17.)

List 12—Equipment, assembly, and wiring required in addition to list 101 or list 102 to provide one filter panel, per SD-1C597-01.

List 13—Equipment, assembly, and wiring required in addition to list 101 or list 102 and list 3 to provide one expansion span terminating module arranged for up to 13 additional service lines, thus forming a 1-for-24 PG, per SD-1C597-01. (See 5.15 and 5.16.)

List 14—Equipment, assembly, and wiring required in addition to list 101 or list 102 to provide one terminating repeater shelf for up to 13 office repeaters (with no protection switching), per SD-1C597-01.

List 15—Equipment, assembly, and wiring required in addition to list 101 or list 102 to provide one intermediate powering repeater shelf for powering up to six through lines, per SD-1C597-01.

Note

A. If two channel banks are equipped, no space will be available for a writing shelf unless the hot spare and maintenance panel can be omitted and the units above the writing shelf position are moved up 2 inches. This may be done if a hot spare and maintenance panel can be utilized from an adjacent D3 bay.

J98728D—AT&T Co Std—T1/OS Digital Transmission System Span Terminating Bay With Protector Panel for Mounting T1, D3, and Maintenance Equipment on 11-Foot 6-Inch by 23-Inch Duct-Type Bay

List 1—Framework, common equipment, and bay local cable for one span terminating bay, per SD-1C597-01, arranged for a maximum of

- four T1/OS line terminating modules. (See 5.18.)
- List 2**—Framework, common equipment, and bay local cable for one span terminating bay, per SD-1C597-01, arranged for three banks, three LTMs, and a hot spare and maintenance panel. (See 5.18.)
- List 3**—Equipment, assembly, and wiring required in addition to list 1 or list 2 to provide one span terminating module arranged for one 1-for-11 PG, per SD-1C597-01. (See 5.05, 5.07, and 5.16.)
- List 4**—Equipment, assembly, and wiring required in addition to list 1 or list 2 to provide one span terminating module arranged for two 1-by-5 PGs, per SD-1C597-01. (See 5.05 and 5.07.)
- List 5**—Equipment, assembly, and wiring required in addition to list 2 to provide one D3 channel bank shelf assembly, per SD-1C597-01. (See 5.06 and 5.07.)
- List 6**—Equipment, assembly, and wiring required in addition to list 2 to provide one hot spare and maintenance shelf assembly for D3 channel banks, per SD-1C597-01.
- List 7**—Equipment, assembly, and wiring required in addition to list 1 or list 2 to provide one order-wire panel, per SD-1C597-01. (See 5.08.)
- List 8**—Equipment and assembly required in addition to list 1 or list 2 for each DS-1 jack and cross-connect panel, per SD-1C597-01. (See 5.09.)
- List 9**—Apparatus, assembly, and wiring required in addition to list 8 for each jack circuit to be equipped on the DS-1 jack and cross-connect panel, per ED-2C376-(),GR2. (See 5.09.)
- List 10**—Equipment and assembly required in addition to list 1 or list 2 for one writing shelf, per ED-3C369-().
- List 11**—Equipment, assembly, and wiring required in addition to list 1 or list 2 to provide one fault locate panel for active filters, per SD-1C597-01. (See 5.03 and 5.17.)
- List 12**—Equipment, assembly, and wiring required in addition to list 1 or list 2 to provide one filter panel, per SD-1C597-01.
- List 13**—Equipment, assembly, and wiring required in addition to list 1 and list 3 to provide one expansion span terminating module arranged for up to 13 additional service lines, thus forming a 1-for-24 protection group, per SD-1C597-01. (See 5.15, 5.16, and 5.19.)
- List 14**—Equipment, assembly, and wiring required in addition to list 1 or list 2 to provide one terminating repeater shelf for up to 13 office repeaters (with no protection switching), per SD-1C597-01.
- List 15**—Equipment, assembly, and wiring required in addition to list 1 or list 2 to provide one intermediate powering repeater shelf for powering up to six through lines, per SD-1C597-01.
- J98728E—AT&T Co Std—T1/OS Digital Transmission System Span Terminating Bay With Protector Panel for Mounting T1, D3, and Maintenance Equipment on 9-Foot 0-Inch by 23-Inch Duct-Type Bay**
- List 1**—Framework, common equipment, and bay local cable for one span terminating bay per SD-1C597-01, arranged for a maximum of four T1/OS line terminating modules. (See 5.18.)
- List 2**—Framework, common equipment and bay local cable for one span terminating bay, per SD-1C597-01, arranged for three D3 banks and one LTM, or two D3 banks and three LTMs, both groupings allowing space for a hot spare and maintenance panel. (See 5.18.)
- List 3**—Equipment, assembly, and wiring required in addition to list 1 or list 2 to provide one span terminating module arranged for one 1-for-11 PG, per SD-1C597-01. (See 5.05, 5.07, and 5.16.)
- List 4**—Equipment, assembly, and wiring required in addition to list 1 or list 2 to provide one span terminating module arranged for two 1-for-5 PGs, per SD-1C597-01. (See 5.05 and 5.07.)
- List 5**—Equipment, assembly, and wiring required in addition to list 2 to provide one D3 channel bank assembly, per SD-1C597-01. (See 5.06 and 5.07.)
- List 6**—Equipment, assembly, and wiring required in addition to list 2 to provide one hot spare and maintenance shelf assembly for D3 channel banks, per SD-1C597-01.
- List 7**—Equipment, assembly, and wiring required in addition to list 1 or list 2 to provide one order-wire panel, per SD-1C597-01. (See 5.08.)
- List 8**—Equipment and assembly required in addition to list 1 or list 2 for each DS-1 jack and cross-connect panel, per SD-1C597-01. (See 5.09.)

List 9—Apparatus, assembly, and wiring required in addition to list 8 for each jack circuit to be equipped on the DS-1 jack and cross-connect panel, per ED-2C376-(),GR2. (See 5.09.)

List 10—Equipment and assembly required in addition to list 1 or list 2 for one writing shelf, per ED-3C369-().

List 11—Equipment, assembly, and wiring required in addition to list 1 or list 2 to provide one fault locate panel for active filters, per SD-1C597-01. (See 5.03 and 5.17.)

List 12—Equipment, assembly, and wiring required in addition to list 1 or list 2 to provide one filter panel, per SD-1C597-01.

List 13—Equipment, assembly, and wiring required in addition to list 1 and list 3 to provide one expansion span terminating module arranged for up to 13 additional service lines, thus forming a 1-for-24 PG, per SD-1C597-01. (See 5.15, 5.16, and 5.19.)

List 14—Equipment, assembly, and wiring required in addition to list 1 or list 2 to provide one terminating repeater shelf for up to 13 office repeaters (with no protection switching), per SD-1C597-01.

List 15—Equipment, assembly, and wiring required in addition to list 1 or list 2 to provide one intermediate powering repeater shelf for powering up to six through lines, per SD-1C597-01.

J98728F—AT&T Co Std—T1/OS Digital Transmission System Span Terminating Bay With Protector Panel for Mounting T1, D3, and Maintenance Equipment on 7-Foot 0-Inch by 23-Inch Duct-Type Bays

List 1—Framework, common equipment, and bay local cable for one span terminating bay, per SD-1C597-01, arranged for a maximum of four line terminating modules. (See 5.18.)

List 2—Framework, common equipment, and bay local cable for one span terminating bay, per SD-1C597-01, arranged for two line terminating modules and one D3 bank, or one line terminating module and two D3 banks, both groupings allowing space for a hot spare and maintenance panel. (See Note A and 5.18.)

List 3—Equipment, assembly, and wiring required in addition to list 1 or list 2 to provide one span terminating module arranged for one 1-for-11 PG, per SD-1C597-01. (See 5.05, 5.07, and 5.16.)

List 4—Equipment, assembly, and wiring required in addition to list 1 or list 2 to provide one span terminating module arranged for two 1-for-5 PGs, per SD-1C597-01. (See 5.05 and 5.07.)

List 5—Equipment, assembly, and wiring required in addition to list 2 to provide one D3 channel bank shelf assembly, per SD-1C597-01. (See 5.06 and 5.07.)

List 6—Equipment, assembly, and wiring required in addition to list 2 to provide one hot spare and maintenance shelf assembly for D3 channel banks, per SD-1C597-01. (See Note A.)

List 7—Equipment, assembly, and wiring required in addition to list 1 or list 2 to provide one order-wire panel, per SD-1C597-01. (See 5.08.)

List 8—Equipment and assembly required in addition to list 1 or list 2 for each DS-1 jack and cross-connect panel, per SD-1C597-01. (See 5.09.)

List 9—Apparatus, assembly, and wiring required in addition to list 8 for each jack circuit to be equipped on the DS-1 jack and cross-connect panel, per ED-2C376-(),GR2. (See 5.09.)

List 10—Equipment and assembly required in addition to list 1 or list 2 for one writing shelf, per ED-3C369-().

List 11—Equipment, assembly, and wiring required in addition to list 1 or list 2 to provide one fault locate panel for active filters, per SD-1C597-01. (See 5.03 and 5.17.)

List 12—Equipment, assembly, and wiring required in addition to list 1 or list 2 to provide one filter panel, per SD-1C597-01.

List 13—Equipment, assembly, and wiring required in addition to list 1 and list 3 to provide one expansion span terminating module arranged for up to 13 additional service lines, thus forming a 1-by-24 PG, per SD-1C597-01. (See 5.15 and 5.16.)

List 14—Equipment, assembly, and wiring required in addition to list 1 or list 2 to provide one terminating repeater shelf for up to 13 office repeaters (with no protection switching), per SD-1C597-01.

List 15—Equipment, assembly, and wiring required in addition to list 1 or list 2 to provide one intermediate powering repeater shelf for powering up to 6 through lines, per SD-1C597-01.

J98728AA—AT&TCo Std—T1/OS Digital Transmission System Span Terminating Module Shelf Assembly for Office Repeaters and Automatic Protection Switching for a Protection Group of One Protection Line and a Maximum of 11 Service Lines, per SD-1C597-01

List 1—Assembly, wiring, and equipment for one span terminating module for one protection line and a maximum of 11 service lines, per SD-1C597-01.

J98728AB—AT&TCo Std—T1/OS Digital Transmission System Span Terminating Module Shelf Assembly for Office Repeaters and Automatic Protection Switching for Two Protection Groups Each With One Protection Line and a Maximum of Five Service Lines

List 1—Assembly, wiring, and equipment for one span terminating module for two protection groups, each with one protection line and a maximum of five service lines, per SD-1C597-01.

J98728AC—AT&TCo Std—T1/OS Digital Transmission System Expansion Span Terminating Module Shelf Assembly for Office Repeaters and Automatic Protection Switching Providing 13 Additional Service Lines

List 1—Assembly, wiring, and equipment for one expansion span terminating module providing 13 additional service lines, per SD-1C597-01.

5. GENERAL NOTES AND INDEXES

5.01 Fuse panels shall not be equipped with fuses until assembled on bays and installed, at which point fuses shall be provided only for circuit positions that have been equipped.

5.02 One plug-in per ED-2C373-(),GR3 is required for each group 2 fuse panel and is included in list 2 or list 102 of bay codes.

5.03 One plug-in to be ordered separately, per ED-2C374-(),GR2, is required for each group 1 fault locating panel. Option clips provide for through or terminating conditions of fault locating lines,

although the unit is shipped with clips set in the terminating mode for all lines.

5.04 D3 bank and hot spare shelves, per ED-3C364-(), are provided with top castings and tie bars to permit shipment as freestanding assemblies. It is preferred that the units be shop mounted whenever possible.

5.05 Orders must specify the bay position for each list 3, 4, 13, 14 or 15 module. When positions are not equipped for use, certain leads must be sleeved at bay cable break outs to avoid shorting problems, as covered on applicable schematic drawings.

5.06 Orders must specify the bay position(s) at which D3 banks are to be equipped. It is recommended that all D3 shelves anticipated for a bay be equipped initially. Bank positions not equipped require sleeving of certain leads, as covered by schematic drawings.

5.07 It may be desirable on partially equipped bays to choose the more convenient position heights for D3 and LTM equipments. This is readily done on T1-only bays (LTMs), but must be decided carefully on combined bays (D3/T1) to avoid blocking a future addition at a position which can be used for either D3 or LTM.

5.08 Plug-ins must be ordered in accordance with job requirements to implement the order-wire layout selected.

5.09 Each DS-1 jack and cross-connect panel has a capacity of 16 jack circuits per list 9, and each jack circuit terminates one DS-1 facility (D bank, M1-2 port, etc). The panels are provided with wiring for 16 circuits with jacks to be added as required and assigned on a job basis. It is recommended that jacks be provided initially for the final expected utilization of each panel.

5.10 Span powering options are covered by applicable schematic drawings and are administered for T1/OS on the terminal block of the office repeater shelf of the LTM. For STMs, protection groups will have the same powering for all lines within a group. When an STM has two 1-for-5 PGs, the two halves (left and right) may be strapped for different powering options.

5.11 Plug-ins and their functions for use in T1/OS STBs are listed in Table B.

5.12 The common equipment included in all list 101 and list 102 bays is a fuse and alarm panel.

5.13 Codes J98728G through J98728Y are unassigned.

5.14 Field additions to basic list 1 or list 2 (rated Mfr Disc.) can include units provided by lists 12, 13, (also see 5.15 and 5.16) 14, and 15 in addition to list 3 through 11 previously included.

5.15 The ESTM is always mounted directly above its associated STM in a bay (maximum vertical separation between STM and ESTM is 2-inches.)

5.16 Early versions of the APS shelf used in the list 3 STM do not have expansion (to a 1-for-24 PG) capability. However, shelves indicated as Issue 3

or later (on Lynch shelf code 302MA03) can be expanded by providing a list 13 ESTM.

5.17 The filter panel (list 12) will provide additional filter capacity beyond the three positions provided in the fault locate panel (list 11).

5.18 The common equipment included in all list 1 and list 2 bays comprises a fuse and alarm panel and a protector panel.

5.19 ESTM cannot be ordered with basic list 2 bays.

List of A&M Only and Mfr Disc. Equipment

EQUIPMENT	RATING	DETAILS LAST SHOWN IN ISSUE	REPLACING EQUIPMENT
ED-2C372-(),GR1	Mfr Disc.	1	ED-2C372-(),GR2,3
J98728A,L1	Mfr Disc.	1	J98728A,L101
L2		1	L102
J98728B,L1	Mfr Disc.	1	J98728B,L101
L2		1	L102
J98728C,L1	Mfr Disc.	1	J98728C,L101
L2		1	L102

The above equipment has been replaced as indicated. Where A&M Only items appear, the issue numbers shown are those of the issue in which the rating was first applied.

SUBDIVISIONS OF EQUIPMENT AND DETAILED INDEX

WE J drawings should be ordered by referring to the prefix and base number and requesting the current dash (-) number.

EQUIPMENT CODE	AT&T RATING OF UNIT	TITLE	EQUIPMENT DRAWING	CIRCUIT DRAWING	2-INCH MTG PLTS PER UNIT
ED-2C372-()	Std	Office Repeater and Power Distribution Mounting for 206-Type Repeaters	ED-2C372-()	SD-1C597-01	5
ED-2C373-()	Std	Fuse and Alarm Panels for T1/OS Span Terminating Bays	ED-2C373-()	SD-1C597-01	—
ED-2C374-()	Std	Fault Locating Panel and Plug-Control Unit for T1 Fault Locating Lines Using Active Filters	ED-2C374-()	SD-1C503-01	1*
ED-2C375-()	Std	Filter Panel for T1 Fault Locating Lines Using Active or Passive Filters	ED-2C375-()	SD-1C597-01	1
ED-2C376-()	Std	DS1 Jack and Cross Connect Panel for T1/OS Span Terminating Bays	ED-2C376-()	SD-1C597-01	1-1/2
ED-2C499-()	Std	Protector Panel Assembly for T1/OS Span Terminating Bays	ED-2C499-()	SD-1C597-01	3-1/2
ED-3C364-()	Std	Mounting Shelf Assemblies for D3 Channel Banks and Hot Spare and Maintenance	ED-3C364-()	SD-1C597-01 SD-3C104-01	9-1/2 (D3) 3-1/2 (HS&M)
J98728A	Std	T1/OS Digital Transmission System Span Terminating Bay for Mounting T1, D3, and Maintenance Equipment on 11-Foot 6-Inch by 23-Inch Duct-Type Bay	J98728A-()	SD-1C597-01	—
J98728B	Std	T1/OS Digital Transmission System Span Terminating Bay for Mounting T1, D3, and Maintenance Equipment on 9-Foot 0-Inch by 23-Inch Duct-Type Bay	J98728B-()	SD-1C597-01	—

* Panel is actually 1-3/4 inches nominal.

EQUIPMENT CODE	AT&T RATING OF UNIT	TITLE	EQUIPMENT DRAWING	CIRCUIT DRAWING	2-INCH MTG PLTS PER UNIT
J98728C	Std	T1/OS Digital Transmission System Span Terminating Bay for Mounting T1, D3, and Maintenance Equipment on 7-Foot 0-Inch by 23-Inch Duct-Type Bay	J98728C-()	SD-1C597-01	—
J98728D	Std	T1/OS Digital Transmission System Span Terminating Bay With Protector for Mounting T1, D3, and Maintenance Equipment on 11-Foot 6-Inch by 23-Inch Duct-Type Bay	J98728D-()	SD-1C597-01	—
J98728E	Std	T1/OS Digital Transmission System Span Terminating Bay With Protector Panel for Mounting Equipment on 9-Foot 0-Inch by 23-Inch Duct-Type Bay	J98728E-()	SD-1C579-01	—
J98728F	Std	T1/OS Digital Transmission System Span Terminating Bay With Protector Panel for Mounting T1, D3, and Maintenance Equipment on 7-Foot 0-Inch by 23-Inch Duct-Type Bay	J98728F-()	SD-1C579-01	—
J98728AA	Std	T1/OS Digital Transmission System Span Terminating Module Shelf Assembly for Office Repeaters and Automatic Protection Switching for a Protection Group of One Protection Line and Eleven or Less Service Lines	J98728AA-()	SD-1C597-01	8-1/2
J98728AB	Std	T1/OS Digital Transmission System Span Terminating Module Shelf Assembly for Office Repeaters and Automatic Protection Switching for Two Protection Groups, Each With One Protection Line and Five or Less Service Lines	J98728AB-()	SD-1C597-01	8-1/2

EQUIPMENT CODE	AT&T RATING OF UNIT	TITLE	EQUIPMENT DRAWING	CIRCUIT DRAWING	2-INCH MTG PLTS PER UNIT
J98728AC	Std	T1/OS Digital Transmission System Expansion Span Terminating Module Shelf Assembly for Office Repeaters and Automatic Protection Switching Providing 13 Additional Service Lines	J78728AC-()	SD-1C597-01	8-1/2

Circuit Schematic Index

CIRCUIT DRAWING	J98728 EQPT CODE
SD-1C597-01	ED-2C372-(), ED-2C373-(), ED-2C375-(), ED-2C376-(), ED-2C499-(), ED-3C364-(), A,B,C,AA,AB
SD-1C603-01	ED-2C374-()
SD-3C104-01	ED-3C364-()

TABLE B
T1/OS PLUG-INS FOR STBs

CODE	FUNCTION	REQUIRED
206H or 206L or EXCP or LP Repeaters*	OR for lines with -48 volt line	1 per T1 line
206J or 206M or EXCP or LP Repeaters*	OR for lines with 130-, 178-, 260-volt line power	1 per T1 line
206K or 206N or EXCP or LP Repeaters*	OR for lines with power looping in the STB	1 per T1 line
206P, 206R or 236P Repeaters*	Bridging repeater	1 per LTM**
Plug-ins ordered from Lynch Communication Systems, Inc.		
302AL01 Alarm Unit	Alarm interface for APS	1 per STM
302TI01 Telemetry Interface Unit	Alarm and status outputs to external telemetry system	1 per protection group except 1-for-24 PG which requires 2†
302RC01 Status Report and Control Unit (Master)	Receives status and sends commands for SRC system	1 per protection group at SRC control office†
302RC51 Status Report and Control Unit (Remote)	Sends status and receives commands for SRC system	1 per protection group at SRC remote office†
302SS01() Span Switch Unit	Line switching unit	1 per T1 line equipped for either service or protection
ED-2C374-(),GR2 Fault Locate Control Unit	Access and control for up to six fault locating lines	1 per fault locate panel
ED-3C556-(),GR1 Telephone Set Unit	Talk circuit patchable to order wire	Any combination of two ED-3C556-(),GR1 or GR2 or ED-3C557-(),GR1 or GR2, as required.
ED-3C556-(),GR2 Order Wire and Telephone Set	Talk and order-wire circuits	
ED-3C557-(),GR1 Multiple Unit	Remote access on order-wire or telephone set	Any combination of two ED-3C556-(),GR1 or GR2 or ED-3C557-(),GR1 or GR2, as required.
ED-3C557-(),GR2 Bridging and Coupling Unit	AC coupling of two order-wire pairs	
D3 Channel Bank and HS & M Plug-Ins	Various	See J98718—801-505-153

* Consult SD-1C597-01 and Section 365-200-101 for use of EXCP (six volt output—extended cross connect) and LP (low power repeaters).

** Two 206P or 206S repeaters are required per office to perform operations such as traffic polling and priority changing within a PG. This second repeater can be utilized by placing it in an unused position within the repeater shelf together with a 100-ohm termination for its output.

† Telemetry interface unit and status report and control units are mutually exclusive in their use.

6. REASONS FOR REISSUE

6.01 This section has been reissued to include the following additional equipment designed for T1/OS. An intermediate powering repeater shelf (IPRS) is available to provide line powering for 6 lines in a maintenance span that is too long to be powered from both ends. A terminating repeater shelf (TRS) provides T1 line terminations for maintenance spans not requiring automatic protection switching. Thirteen lines are available in a TRS. An expansion span terminating module (ESTM) provides for thirteen additional service lines to be added to the 1-for-11 PG STM (J98728AA), thus forming a 1-for-24 PG. These three units, in addition to the existing STMs (1-for-11 and dual 1-for-5 PGs), form a group called line terminating modules (LTM). Better utilization of bay space necessitated by the introduction of the new LTMs has been provided by new basic lists for bays J98728A, B, and C. These lists 101 and 102 replace L1 and L2 rated Mfr Disc. A filter panel is also available to provide for passive fault locating systems and for additional active filter capacity in a bay and the three filter positions currently provided in the fault locating panel.

6.02 A new series of bays containing a protector panel has been introduced. These bays, J98728D, E, and F, provide the same features as the J98728A, B, and C bays but, in addition, have the capabilities (on a small scale) of the main distributing frame (MDF). They permit direct termination of a tip cable (bypassing the MDF) on the protector panel mounted the bay. Current and/or voltage surge pro-

tection is provided as well as cross-connect flexibility between tip cable pairs and LTM equipment.

6.03 Use of new equipment in existing bays (J98728A, B, and C, basic list 1 and list 2) is discussed here. The protector panel is part of the basic list of new bays and hence is not applicable to this discussion. The filter panel can be mounted in available space and depending upon the application would need the following connections: active and passive fault locate lines, -48 volt to provide jack access power to test sets, and repeater shelf fault locate collector pairs. If this panel is used to provide additional filter capacity for the fault locating panel, it should be located close to same to facilitate filter output connections to fault locate line appearances on the fault locating panel.

6.04 Both the IPRS and the TRS can be mounted where space for STMs is provided. All bay local cable connections are identical to STM connections except the transmission alarm pairs (two) that are not required and must remain sleeved. Use of the ESTM is available only with the J98728AA STM that contains an APS shelf (Lynch code 302MA03) indicated as Issue 3 or later. In addition, the ESTM is always mounted in an STM position above the 1-for-11 STM (no more than 2 inches separating the modules) because of the interconnection between APS shelves. All other ESTM connections (bay local cable and T1 lines) are identical to STM connections except the transmission alarm pairs (two) that are not connected and must remain sleeved (alarm is provided by a 1-for-11 STM).