

**PERFORMANCE REQUIREMENTS
FOR
T4M DIGITAL COAXIAL LINE
SPAN TERMINATING FRAME
(J98721A, B)
COMMON SYSTEMS**

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1. GENERAL	1	1.01 The performance requirements and tests outlined herein apply to the span terminating frame of the T4M digital coaxial line as described in SD-99613-01.
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place, but *not seated* in their connectors. A minimal protected system consists of a protection channel, a service channel, and all the span terminating frame plug-ins specified in Section 801-523-152; a full complement of plug-ins is essential for the proper testing of the span terminating frame.

(d) All required terminations for clock and data signals on violation monitor and removers (VMRs), the DS4 generator (DS4G), the protection data multiplex (PDM), and regenerator connectors are in place according to FS2, FS3, FS5, and FS12 of SD-99613-01.

(e) KB9 dummy CPs are inserted in each KB1 slot not initially equipped for service in the protection switching shelf.

(f) Channel identification numbers are set on all KB1 CPs equipped initially in the protection switching shelf, according to the T4M Task Oriented Plant Practice (TOPP) for a point-to-point system.

(g) If the protection switching option has not been implemented on the span terminating frame (ie, plug-ins have not been ordered), dummy CPs must be installed in the protection switching shelf as described in SD-99613-01.

1.05 The general sequence of performance tests is:

- (1) Activate alarm circuits on the frame (not office alarms), and associated E-type remoting circuits when equipped.
- (2) Measure and initialize coaxial switches on the protection switching shelf.
- (3) Check out line 1 (protection line), both transmitting and receiving.
- (4) Check out each service line initially equipped, both transmitting and receiving.
- (5) Using a spare set of per-channel plug-ins, check out in succession each of the channel positions not initially equipped.
- (6) Check out the protection switching system, including E-type remoting circuits when equipped.

(7) Check out fault locating and maintenance circuits.

(8) Activate office alarm outputs.

2. TEST EQUIPMENT

2.01 The following test equipment or its electrical equivalent is required.

1—Fault Locating Test Set, J98721E (part of standard span terminating frame equipment).

1—Portable Violation Monitor (PVM), J98721H, equipped with a 22-dB pad.

1—Portable Signal Generator, J98721J.

1—Digital DC Voltmeter, range 0V through 300V, accuracy ± 0.1 percent (eg, HP34702A multimeter with HP34740A display).

1—Ohmmeter (eg, as included in the above multimeter).

1—Audio Attenuator, 600 ohms, 0 through 50 dB in 0.1-dB steps.

1—3C Noise Measuring Set, J94003C.

2—Line Build-Out Networks (LBOs), matching the receiving regenerator equalizer codes equipped in the frame; these can be constructed by using one to four 4248A-type networks in tandem.

1—Zero-Length Build-Out Card, Code KG3.

1—Dummy Load Coil Card, Code KG23.

1—STF Installation Testboard, per Fig. 1.

3—442A Plugs (75-ohm terminations).

3—1-Foot Long Cords, Type P2EB.

2—3-Foot Long Cords, Type P2EB.

2—6-Foot Long Cords, Type P2EB.

2—9-Foot Long Cords, Type P2EB.

1—6-Foot Long Cord, Type 3P17B.

- 1—4-Foot Long Cord, Type 2P4B.
- 1—4-Foot Long Jumper Test Pair (761 type, shielded, twisted pair, or equivalent) equipped with UG246U coaxial connectors on each wire at one end and a WE 310 plug on the other end, per Fig. 1.
- 2—8-Foot Long Jumper Test Pairs (761 type, shielded, twisted pair, or equivalent) equipped with UG246U coaxial connectors on each wire at one end and a double banana plug on the other end.
- 1—Spare Set of Per-Channel and Common Plug-Ins, including:
 - 1—Power Unit (132A or 142A, as appropriate for the battery power used on the frame).
 - 1—4E Transmitting Regenerator.
 - 1—Receiving Regenerator (any of codes 4A through 4D, as required by the installation).
 - 1—404B Transmitting Switch.
 - 1—403B Receiving Switch.
 - 1—402A Selector Switch.
 - 1—KA1 VMR High-Speed CP.
 - 1—KA2 VMR Framing CP.
 - 1—KA3 VMR Evaluation CP.
 - 1—KA4 VMR Protection Evaluation CP.
 - 1—KA5 VMR Line Driver CP.
 - 1—KA6 PDM Multiplexer CP.
 - 1—KA7 PDM Framing CP.
 - 1—KA8 PDM Line Driver CP.
 - 1—KA9 DS4G Scrambler CP.
 - 1—KA10 DS4G Line Driver CP.
 - 1—KA11 DS4G Output Distribution CP.
 - 1—KA12 DS4G Oscillator and Framing CP.
- 1—KB1 Per-Channel Logic CP.
- 1—KB2 VMR-End Timing CP.
- 1—KB3 VMR-End Decision CP.
- 1—KB4 VMR-End Control CP.
- 1—KB5 Head-End Timing CP.
- 1—KB6 Head-End Decision CP.
- 1—KB8 E-Type Interface CP (if equipped).
- 1—KB9 Per-Channel Dummy CP.
- 1—KG1 Fault Locating Pilot Generator CP.
- 1—KG2 Maintenance Unit.
- 1—KC1 Energy Detector CP.
- 1—KG24 Load Coil Card.
- 1—KM1 Fault Locating Pilot Detector CP.
- 1—KN1 Alarm Input Logic A CP.
- 1—KN2 Alarm Input Logic B CP.
- 1—KN3 Alarm Main Logic CP.
- 1—KN4 Alarm Output Logic CP.
- 1—KN5 Alarm Relay Driver CP.

3. ALARM CIRCUIT ACTIVATION

- 3.01** Insert the KA8 and KC1 CPs in the protection switching shelf.
- 3.02** Insert the common power unit in shelf H and turn the power unit on.
- 3.03** Insert the alarm CPs KN1 through KN4. If the E-type remoting option is equipped, insert KN5 CP in alarm shelf positions 6, 7, and 8. Do not insert KN5 for the office alarm outputs (position 5 in the shelf) at this time.

Requirement: The NOP lamp on KA8 should be lit. All alarm lamps should be extinguished on the alarm control panel.

4. COAXIAL REED SWITCH CHECKING AND INITIALIZATION

4.01 Specifications on the 402A coaxial reed switch used in the protection switching shelf require that the switches be shipped with their contacts pulsed to the correct initial states. To be sure of this, an ohmmeter should be used to measure the continuity between pin 1 and the other pins of the 402A switch.

Requirement: Pin 1 should be shorted only to pin 23.

4.02 Turn off the common power unit. The major and the minor alarm lamps will light immediately and remain lit as long as the common power unit is off. Insert all switch CPs for line 1, for all service lines initially equipped, and for the lowest numbered nonequipped service lines which will be checked out using the spare set of plug-ins.

4.03 Insert common control logic circuits KB2 through KB6, KB1 per-channel circuits in equipped service lines, the spare KB1 in the lowest numbered nonequipped service line, and KB9 dummy circuits in all lines not equipped with KB1 units. Turn on the common power unit and immediately and simultaneously depress the MS button on KB2 and the LLO button on each KB1 unit.

Requirement: The LLO, TRMT SW ACT, RCV SW ACT, and HIS lamps on each KB1 unit, the PSA lamp on KB4, the HIS lamp on KB6, and the NOP lamp on KA8 should light. After 24 seconds, all of the above lamps except LLO, HIS, and NOP should be extinguished. The PSF lamp on KB5 and the MN ALM lamp should also light. The PSF lamp on KB4 may or may not light.

4.04 Disengage all KB CPs, except KB2 in the protection switching shelf, to prevent any undesired switches during the following transmission tests. The KB2 CP provides a necessary input to the PDM.

Requirement: The MN ALM lamp should extinguish when KB4 is disengaged.

Note: The MBEA lamp on KC1 may light during the seating and unseating of the CPs.

If the lamp is on, simply depress the RLS button on KC1 to release it.

5. LINE 1 (PROTECTION LINE) TESTS

5.01 This series of tests checks that the transmission path is complete from the DS4G circuit through the line 1 transmitting regenerator, the PDM, the line 1 receiving regenerator and VMR, and the coaxial reed switches in both the transmitting and receiving directions. When the path through the transmitting units has been checked and found satisfactory, a back-to-back patch is performed at the terminal strip on the frame, through a line build-out network, to feed the receiving circuits.

5.02 Insert the remaining PDM CPs, KA6 and KA7. (At this point, there is still no signal into the PDM.)

Requirement: The NOP lamp on the PDM KA8 circuit should be lit; NIF on KA7 may or may not be lit. The MN ALM lamp on the alarm control panel should light. If the KN5 CPs are in place in the alarm shelf, a relay contact closure should be measured with an ohmmeter across the SI(MN)-SIR(MN) leads and also across the SI(PDMA)-SIR(PDMA) leads at the terminal strip (see SD-99613-01, CAD3, for terminal numbers).

5.03 Insert the line 1 transmitting and receiving regenerators in their connectors in the regenerator shelf. Also, insert VMR No. 1 CPs KA1, KA2, KA3, and KA5 in the VMR shelf.

5.04 Insert power unit No. 1 in shelf B and turn it on.

Requirement: The NO FR, NO LD, BS, NOP, and ALM lamps on VMR No. 1 should light at once. The NIF and NOP lamps on the PDM and the MN ALM lamp should still be lit. A relay contact closure should be measured across the SI(V1)-SIR(V1) leads at the terminal strip, if the KN5 CPs are in place.

5.05 Using the dc voltmeter, measure the -5.2 and ± 8.5 voltages at the connectors of each of the plug-ins that have been inserted. ($-5.2V$ power is connected to all circuits except the regenerators; $\pm 8.5V$ power is connected only to KA5, KA8, and the regenerators.)

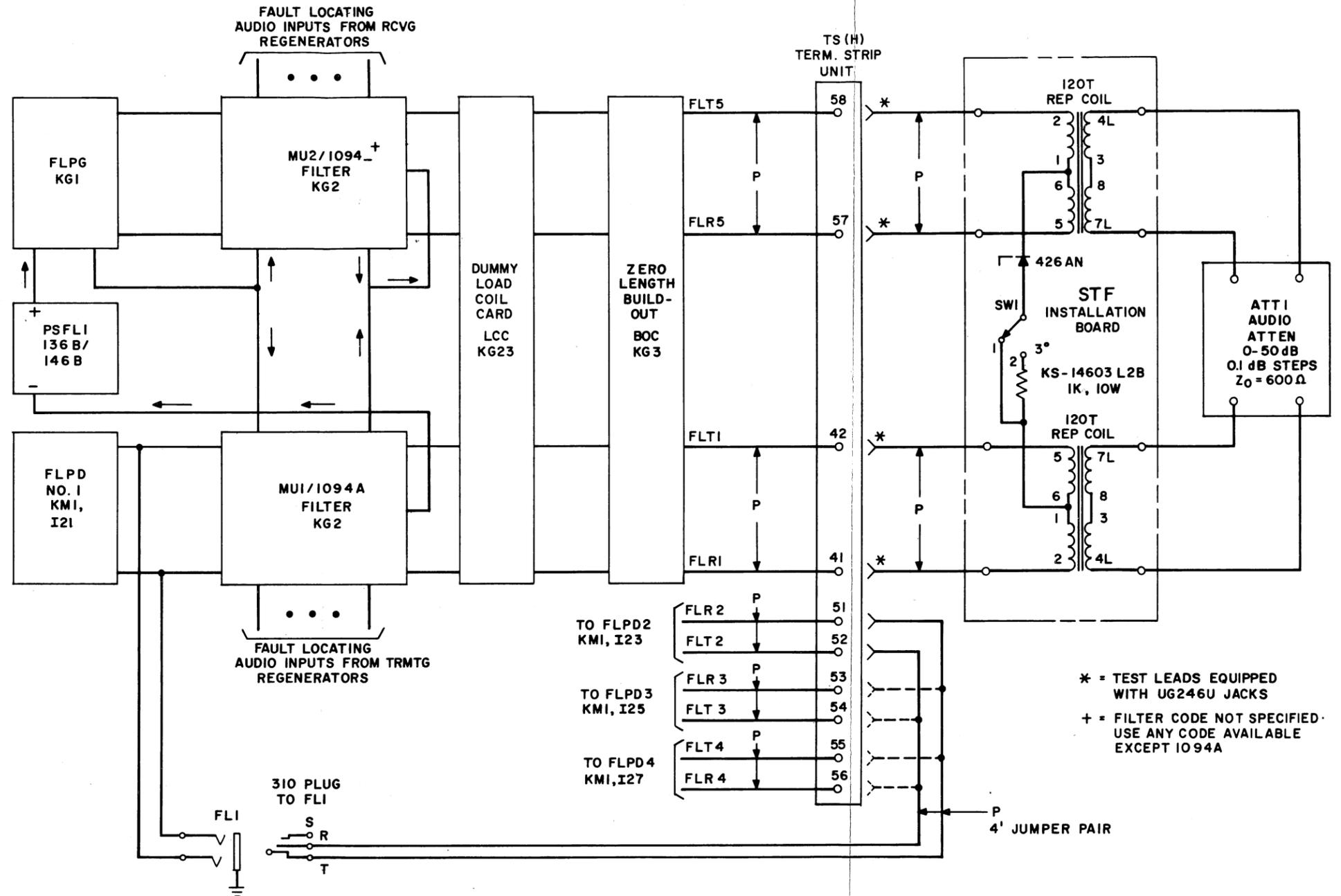


Fig. 1—Interconnection of Span Terminating Frame Installation Board

Requirement: -5.2V should read between -5.2V and -5.4V. $\pm 8.5V$ should read between $\pm 8.0V$ and $\pm 9.0V$.

5.06 Insert the DS4G KA10 CP in the VMR shelf of bay No. 1. With no signal into this board, it should generate an output failure alarm.

Requirement: The NOP lamp on KA10 should light immediately. A relay contact closure should be measured across the SI(DSA)-SIR(DSA) leads at the terminal strip, when KN5 circuits are equipped.

5.07 Insert the remaining DS4G CPs KA9, KA11, and KA12. This should result in a valid DS4G signal being transmitted through the head-end switch network, through the transmitting regenerator, and through the PDM to the terminal strip at the top of the bay. (Also, the "blue" signal from the DS4G now is applied to VMR No. 1.) Temporarily insert a 75-ohm termination in the CH1 LINE OUT jack on the terminal strip in order to terminate the PDM output.

Requirement: The NOP lamp on KA10 should extinguish. The NIF and NOP lamps on the PDM should extinguish. The MN ALM lamp on the alarm control panel should remain lit due to a continuing alarm signal from the line 1 VMR, which does not yet have an input signal. All VMR No. 1 lamps except NOP should remain lit.

5.08 Using the PVM, check the parity error rate at the following jacks:

- (a) RCVG O/P on the DS4G KA10 circuit (through the 22-dB pad of the PVM).
- (b) TRMTG O/P on the DS4G KA10 circuit (through the 22-dB pad of the PVM).
- (c) CH1 T OFC OUT jack on the jack and hybrid unit (through the 22-dB pad of the PVM).
- (d) PVM jack of the transmitting regenerator (direct).
- (e) PVM jack of the PDM KA8 (direct).

(f) PVM jack on KA5 of VMR No. 1. (The "blue" signal should be present at this jack.)

Requirement: No error should be recorded at any jack.

5.09 Remove the termination from the CH1 LINE OUT jack on the terminal strip at the top of the bay. Then, patch from this jack, through a line build-out network, matching the code of the receiving regenerator in line 1 to the CH 1 LINE IN jack on the terminal strip. This establishes a back-to-back patch on line 1, feeding the DS4 signal back into the line 1 receiving regenerator and the VMR. Insert a 75-ohm termination in the CH1 OFC OUT jack on the terminal strip in order to terminate the VMR output.

Requirement: All lamps on VMR No. 1 should extinguish. The MN ALM lamp on the alarm shelf also should extinguish.

5.10 Using the PVM, check the parity error rate at the PVM jacks of the line 1 receiving regenerator and the VMR KA5 CP.

Requirement: No error should be recorded at either jack.

5.11 Using the PVM, check the parity error rate at the CH1 R HYB OUT and the CH1 R LINE OUT jacks on the jack and hybrid unit and at the CH1 OFC OUT jack on the terminal strip. In each case, the measurement must be made through the 22-dB pad of the PVM.

Requirement: No error should be recorded at any jack.

5.12 Set the L-BIT switch of the portable signal generator to L-BITS ABSENT. Patch from the TRMT HYB OUT jack of the portable signal generator to the CH1 T LINE IN jack of the jack and hybrid unit.

Requirement: The NO LD lamp on the VMR KA3 CP should be lit.

5.13 Perform the following in the sequence given. Disengage the line 1 receiving regenerator. Disengage the DS4G KA9 CP. Reinsert the line 1 receiving regenerator.

Requirement: The NO LD lamp on the VMR KA3 CP and the NOP lamp on the DS4G KA10 CP should be lit. The MN ALM lamp on the alarm shelf should light.

5.14 Reinsert the KA9 CP. Disconnect the patch from the CH1 T LINE IN jack to the portable signal generator.

Requirement: The NO LD lamp on the KA3 CP and the NOP lamp on the KA10 CP should extinguish. The MN ALM lamp should extinguish.

This completes the check of line 1 transmission units. Leave the back-to-back patch and the 75-ohm termination for line 1 in place.

5.15 Check alarm operation for a loss of power condition in line 1 units by temporarily turning off power unit No. 1.

Requirement: The NIF lamp on KA7 may or may not light, the NOP lamp on KA8 should light, and the MN ALM lamp should light. A relay contact closure should be measured across the SI(PA1)-SIR(PA1) leads at the terminal strip.

Turn power unit No. 1 back on.

Requirement: The NIF, NOP, and MN ALM lamps should extinguish immediately; after a possible transient lighting of the VMR No. 1 lamps, they also should be extinguished.

5.16 Check alarm operation for a loss of power condition from the common power unit by temporarily turning off that unit.

Requirement: The MJ ALM and the MN ALM lamps on the alarm shelf should light immediately. A relay contact closure should be measured across the SI(PACOM)-SIR(PACOM) leads at the terminal strip. Ignore any lamp indications at the VMR shelf.

Restore the common power unit to on.

Requirement: The alarm lamps should extinguish.

5.17 Check the alarm test connections from the alarm shelf to VMR No. 1 and the DS4G

by depressing the LT button on the alarm shelf control panel.

Requirement: All light emitting diodes (LEDs) on VMR No. 1 and the DS4G and MN ALM and MJ ALM lamps on the alarm control panel should light while the button is depressed.

6. SERVICE LINE TESTS

6.01 The following sequence of tests applies to each of the service lines. For lines not initially equipped, the spare set of per-channel units indicated under 2. TEST EQUIPMENT must be used, inserted successively in each of the unequipped lines.

6.02 Insert the line 2 transmitting and receiving regenerators and VMR CPs. Then, insert power unit No. 2 and turn it on. (At this point there is no signal entering either the transmitting or receiving regenerators.)

Requirement: The NO FR, BS, and ALM lamps on VMR No. 2 should light at once. The MJ ALM lamp on the alarm shelf should light after inserting the KA4 CP. A relay contact closure should be measured across the SI(MJ)-SIR(MJ) leads and across the SI(V2)-SIR(V2) leads at the terminal strip, if KN5 circuits are equipped. When the PVM is connected to the VMR KA5 PVM jack, no error should be recorded.

6.03 Using the dc voltmeter, measure the -5.2 and ± 8.5 voltages at the connectors of KA5 and the regenerators for line 2. (-5.2V power is connected to all circuits except the regenerators; ± 8.5 V power is connected to KA5 of the VMR and the regenerators.)

Requirement: -5.2V should read between -5.2V and -5.4V. ± 8.5 V should read between ± 8.0 V and ± 9.0 V.

6.04 Patch from the RCV HYB OUT jack of the portable signal generator to the CH2 OFC IN jack on the terminal strip; this feeds the signal to the line 2 transmitting regenerator through the line 2 transmitting hybrid on the jack and hybrid unit. Temporarily insert a 75-ohm termination in the CH2 LINE OUT jack on the terminal strip to provide a termination for the transmitting regenerator output.

6.05 Connect the PVM, through its 22-dB pad, to the CH2 T HYB OUT jack and then to the CH2 T OFC OUT jack, both on the jack and hybrid unit.

Requirement: No error should be recorded at either jack.

6.06 Using the PVM, check the parity error rate at the PVM jack of the line 2 transmitting regenerator.

Requirement: No error should be recorded.

6.07 Remove the 75-ohm termination from the CH2 LINE OUT jack and insert it in the CH2 OFC OUT jack on the terminal strip to provide a termination for the line 2 VMR output. Next, patch from the CH2 LINE OUT jack, through a line build-out network matching the code of the receiving regenerator in line 2, to the CH2 LINE IN jack on the terminal strip. This establishes a back-to-back patch on line 2, feeding the DS4 signal from the transmitting regenerator back into the line 2 receiving regenerator and VMR.

Requirement: All lamps on VMR No. 2 should extinguish. The MJ ALM lamp on the alarm shelf should extinguish also.

6.08 Using the PVM, check the parity error rate at the PVM jacks of the line 2 receiving regenerator and the VMR KA5 CP.

Requirement: No error should be recorded at either jack.

6.09 Using the PVM, check the parity error rate at the CH2 HYB OUT and CH2 R LINE OUT jacks on the jack and hybrid unit and at the CH2 OFC OUT jack on the terminal strip; in each case, the measurement must be made through the 22-dB pad of the PVM.

Requirement: No error should be recorded at any jack.

6.10 Check the lamp test connections to VMR No. 2 by depressing the LT button on the alarm shelf control panel.

Requirement: All LEDs on VMR No. 2 should light while the button is depressed.

(LEDs on VMR No. 1 and the DS4G and all lamps on the alarm shelf will light also.)

6.11 Perform the following in the sequence given. Pull out the line 2 receiving regenerator. Disengage the DS4G KA9 CP. Reinsert the line 2 receiving regenerator.

Requirement: All lamps on VMR No. 2 should be off.

Ignore all other lamp indications.

6.12 Reinsert the DS4G KA9 CP.

Requirement: All lamps should extinguish.

6.13 Check alarm operation for a loss of power condition in line 2 units by turning off power unit No. 2.

Requirement: The MJ ALM lamp should light. A relay contact closure should be measured across the SI(PA2)-SIR(PA2) leads at the terminal strip.

6.14 Leave power unit No. 2 off while the remaining service lines are being tested. Also, disengage the VMR No. 2 KA4 circuit during these tests to avoid masking alarm indications from other units. The MJ ALM indication should extinguish when KA4 is disengaged. This completes the check of line 2 except for protection switching tests in 7.

6.15 Repeat 6.02 through 6.12 for each remaining service line, using the spare set of transmission units indicated in 2.01 to test any service line not initially equipped.

6.16 Note that when an installation includes the 2-bay span terminating frame, J98721B, lines 7 through 11 are equipped in the second (right-hand) bay. All patches to and from the units on this bay are made through the terminal strip and the jack and hybrid unit on this bay. The KA11 CP of the second bay is powered by the power unit for line 7.

6.17 When the checkout of the last service line is complete (line 6 in single-bay frames, line 11 in double-bay frames), the spare set of test plug-ins should be left inserted in that line with

the power unit turned off for the following protection switching tests.

6.18 To check the transmission path of the spare trunk cabling in bay No. 2 when equipped, first patch directly from the CH1 OFC OUT jack on the terminal strip of bay No. 1 to the SP OFC IN jack on the terminal strip of bay No. 2. Using the PVM, check the error rate at the CH SPARE T OFC OUT and CH SPARE T HYB OUT jacks on the bay No. 2 jack and hybrid unit, in each case through the 22-dB pad of the PVM.

Requirement: No error should be recorded at either jack.

Next, patch from the CH SPARE T OFC OUT jack to the CH SPARE R OFC IN jack on the jack and hybrid unit. Connect the PVM, through its 22-dB pad, to the SP OFC OUT jack on the terminal strip.

Requirement: No error should be recorded.

Remove the spare trunk connections on the terminal strip and jack and hybrid unit.

7. PROTECTION SWITCHING TEST

A. Initial Conditions

7.01 Following completion of the transmission tests on the protection and service lines according to 5. and 6., all plug-ins shall be inserted except the following:

- (a) KB1 per-channel and KB3 through KB6 common logic CPs in the protection switching shelf.
- (b) KB8 E-type remoting CPs in the protection switching shelf.
- (c) KN5 office alarm CP in position 5 in the alarm shelf.
- (d) KM1 pilot tone detector in the alarm shelf.
- (e) Fault locating and maintenance shelf plug-ins.
- (f) KA4 evaluation CPs for all VMRs in service lines.

7.02 Set the channel identification switch, on the KB1 CP of the spare set of plug-ins being used to test nonequipped service lines, to a number higher than that of any of the equipped service lines according to the T4M TOPP. Then, as the spare set of plug-ins is moved from one line to the next among the nonequipped service lines, it will be unnecessary to reset the ID number.

7.03 Turn off the common power unit at the protection switching shelf. Ignore any light indications.

7.04 Insert the following CPs in the protection switching shelf:

- (a) Common logic KB3 through KB6.
- (b) Per-channel logic KB1 for all service lines equipped.
- (c) The spare KB1 in the last nonequipped service line tested in 6.
- (d) Dummy KB9 in all other service lines not equipped.
- (e) KB8, if the E-type remoting option has been equipped.

After these CPs are inserted, turn on the common power unit. Operate the LLO button on each KB1 simultaneously with the MS button on KB2.

Requirement: The following evidence of correct initialization should be:

- (a) The LLO lamp on each KB1 should light.
- (b) The TRMT SW ACT, RCV SW ACT, and HIS lamps on each KB1 circuit, the PSA lamp on KB4, and the HIS lamp on KB6 should light as soon as the power unit is turned on.
- (c) Within 24 seconds from the time the lamps come on, all TRMT SW ACT and RCV SW ACT lamps and the PSA lamp should extinguish. The PSF lamp on KB4 should light. The MJ ALM lamp on the alarm panel should light.

7.05 Simultaneously operate the MS button on KB2 and the RST buttons on KB6 and KB4

to reset the HIS lamps and the PSF lamp, respectively.

Requirement: All lamps on the PSC shelf should extinguish except the LLO lamp on each KB1.

Note: During the switching tests outlined below, the HIS lamps will light repeatedly. In each case, unless otherwise specified, they should be extinguished by simultaneously operating the MS button on KB2 and the RST button on KB6.

7.06 Check the PSC lamp test function by operating the LP TST button on KB5.

Requirement: All of the lamps on the PSC shelf should light while the button is depressed.

B. Protection Switching -Tests

7.07 The following tests are required for each service line. While the particular sequence followed in the detailed description below is recommended, it is not mandatory.

- (a) Automatic switch (minor alarm).
- (b) Manual lock line in (forced switch, no alarm); leave switch intact for (c).
- (c) Manual lock bridge (head-end bridge remains after manual lock line in is released, no alarm).
- (d) Manual lock line out (no switch when transmission is interrupted; major alarm results).

Following this sequence of tests for each service line, certain general functions of the protection switching circuit (eg, PSC failure, two-or-more switch request operation, etc) are checked.

7.08 To check line 2, patch from the RCV HYB OUT jack of the portable signal generator to the CH2 OFC IN jack at the terminal strip, thereby supplying an input signal to the line 2 transmitting regenerator. Next, patch from the CH2 LINE OUT jack, through a line build-out network matching the code of the line 2 receiving regenerator, to the CH2 LINE IN jack; this

establishes a back-to-back patch from the transmitting regenerator to the receiving regenerator in line 2. Finally, insert a 75-ohm termination in the CH2 OFC OUT jack on the terminal strip to terminate the line 2 VMR.

7.09 Insert the VMR No. 2 KA4 evaluation CP and turn on power unit No. 2.

Requirement: All VMR No. 2 and all alarm shelf lamps should be extinguished.

7.10 Check that the entire transmissin path for line 2 is satisfactory from the DS4G input at the CH2 OFC IN jack on the terminal strip, through the transmitting circuits, the back-to-back patch, and the receiving circuits to the CH2 OFC OUT jack on the terminal strip. This overall check is made by connecting the PVM to the CH2 OFC OUT jack through the 22-dB pad of the PVM.

Requirement: No error should be recorded.

Leave the PVM connected.

7.11 Release the lock line out function on the channel being tested by operating simultaneously the MS button on KB2 and the RLS button on KB1. Then, initiate an automatic switch of line 2 by inserting a 75-ohm termination in the CH2 T LINE IN jack on the jack and hybrid unit; this breaks the path into the transmitting regenerator.

Requirement: The following lamps should light immediately: MN ALM on the alarm shelf; NO FR, BS, and ALM on VMR No. 2; NO LD on VMR No. 1; TRMTG SW ACT, RCVG SW ACT, and HIS on the line 2 KB1 CP; PSA on KB4 CP; HIS on KB6 CP. LLO on other KB1s should still be lit. The PVM should indicate no errors.

When KB8 circuits are equipped, relay contact closures should be measured across the following pairs of leads at the terminal strip.

SI(V2)-SIR(V2)

SI(L2SWV)-SIR(L2SWV)

SI(L2SWH)-SIR(L2SWH)

SI(COMHIS)-SIR(COMHIS)

7.12 Disengage the KA2 CP of VMR No. 1.

Requirement: The BS and ALM lamps on VMR No. 1 should light, the MN ALM lamps should extinguish, and the MJ ALM lamp should light. After 20 seconds, the PSF lamp on KB5 should light.

7.13 Reinsert the KA2 CP of VMR No. 1.

Requirement: The BS and ALM lamps on VMR No. 1 should extinguish, the MJ ALM lamp should extinguish, and the MN ALM lamp should light. All other lamps should remain unchanged.

7.14 Remove the termination from the CH2 T LINE IN jack to restore line 2.

Requirement: After about 1 second, all lamps on VMR No. 2 and the MN ALM lamp on the alarm shelf should extinguish. About 12 seconds after line 2 is restored, the RCV SW ACT and PSA lamps should extinguish, indicating release of the receive-end switch. The PVM should indicate no errors. About 24 seconds after the line is restored, the transmit switch should release, the TRMT SW ACT lamp should extinguish, and the NO LD lamp on VMR No. 1 should extinguish. The latter action indicates that the line drive signal is back on the protection line.

7.15 Release the HIS lamps on KB1 and KB6. This completes the automatic switch test of line 2.

7.16 To check the manual lock line in function for line 2, simultaneously operate the MS button on KB2 and the LLI button on KB1 for line 2.

Requirement: The following lamps should light immediately.

- (a) The NO LD lamp on VMR No. 1.
- (b) The LLI, TRMTG SW ACT, RCVG SW ACT, and HIS lamps on the line 2 KB1 CP.
- (c) The PSA lamp on the KB4 CP and the HIS lamp on the KB6 CP.

The PVM should indicate no error. When K8 circuits are equipped, a relay contact closure should be measured across the SI(L2LI)-SIR(L2LI) leads at the terminal strip.

7.17 Release the lock line in function temporarily by simultaneously operating the MS button on KB2 and the RLS button on KB1 for line 2. About 12 seconds later, the RCV SW ACT lamp on KB1 and the PSA lamp on KB4 should extinguish. Immediately after these two lamps extinguish and before the TRMTG SW ACT lamp on KB1 extinguishes, simultaneously operate the MS button on KB2 and the LLI button on KB1 for line 2.

Requirement: The TRMTG SW ACT lamp on KB1 will extinguish in 12 seconds. Within 5 seconds after that happens, the following lamps should light.

- (a) The NO LD lamp on VMR No. 1.
- (b) The LLI, TRMTG SW ACT, RCVG SW ACT, and HIS lamps on the line 2 KB1 CP.
- (c) The PSA lamp on the KB4 CP and the HIS lamp on the KB6 CP.

7.18 To check the manual lock bridge function for line 2, operate the MS button on KB2 and the LBRDG button on KB6.

Requirement: The LBRDG lamp on KB6 should light; other lamps should remain lit. When KB8 circuits are equipped, a relay contact closure should be measured across the SI(LBRDG)-SIR(LBRDG) leads at the terminal strip.

7.19 Release the lock line in function by simultaneously operating the MS button on KB2 and the RLS button on KB1 for line 2.

Requirement: The LLI lamp on KB1 should extinguish. About 12 seconds after the release operation, the RCV SW ACT lamp on KB1 and the PSA lamp on KB4 should extinguish, indicating release of the receive-end switch. The PVM should indicate no error. After 24 seconds from the release operation, the LBRDG, TRMTG SW ACT, and HIS lamps should still be lit.

7.20 Release the lock bridge function by operating simultaneously the MS button on KB2 and the RLS button on KB6.

Requirement: The LBRDG lamp should extinguish immediately. Within 24 seconds, the transmit switch should release and the TRMTG SW ACT lamp should extinguish.

Release the HIS lamps on KB1 and KB6.

7.21 To check the manual lock line out function for line 2, simultaneously operate the MS button on KB2 and the LLO button on KB1 for line 2.

Requirement: The LLO lamp on KB1 should light immediately. When KB8 circuits are equipped, a relay contact closure should be measured across the SI(L2LO)-SIR(L2LO) leads at the terminal strip.

7.22 Attempt to initiate an automatic switch by inserting a 75-ohm termination in the CH2 T LINE IN jack on the jack and hybrid unit.

Requirement: The NO FR, BS, and ALM lamps on VMR No. 2 should light. No switching action or change in lamp indications should result on the protection switching shelf; however, the MJ ALM lamp should light on the alarm shelf, indicating loss of service due to the failure to switch.

7.23 Remove the 75-ohm termination from the CH2 T LINE IN jack, restoring transmission on line 2 to normal.

Requirement: All lamps on VMR No. 2 should extinguish, the LLO lamp on KB1 should remain lit, and the MJ ALM lamp should extinguish.

7.24 Simultaneously operate the MS button on KB2 and the RLS button on KB1, thereby releasing the lock line out function.

Requirement: The LLO lamp on KB1 should extinguish immediately.

7.25 This completes the sequence of switching tests for the line 2. To prevent undesired switching of line 2 and alarms from VMR No. 2 while the remaining service lines are being checked,

operate the LLO button on KB1 and the MS button on KB2 and then disengage KA4 for VMR No. 2 from its connector.

7.26 Repeat 7.08 through 7.25 for each remaining service line, using the spare set of plug-ins to check those lines that are not initially equipped for service. To remove the spare plug-ins from channel to channel in the protection switching shelf, it is important to first move the 403B transmit switch and the 404B receive switch before moving the KB1 CP to prevent accidental switching caused by transients. When the last line has been checked, leave its input signal connected to the terminal strip, back-to-back patch in place, and KA4 CP inserted in its connector for the remaining protection switching tests. Operate the MS button on KB2 and the RLS button on KB1 of the last service line tested to release the LLO button and extinguish the LLO lamp for that line.

7.27 To check the two-or-more switch request operation of the protection switching system, two service lines must be failed simultaneously. To initiate the first failure, insert a 75-ohm termination in the T LINE IN jack of the last service line checked, which should still have signal input and back-to-back connections in place as instructed in 7.26.

Requirement: As indicated in 7.11.

7.28 To initiate a second switch request, seat the KA4 CP of VMR No. 2, line 2. Release the LLO function for line 2. This line does not have a signal input, so it should immediately register a switch request.

Requirement: The NO FR, BS, and ALM lamps on VMR No. 2 should light. The PB lamp on KB5 should light, indicating that the protection line is busy. The MN ALM lamp on the alarm shelf should extinguish immediately and the MJ ALM lamp should light, indicating a service failure on line 2. If KB8 circuits are equipped, a relay contact closure should be measured across the SI(PRTBSY)-SIR(PRTBSY) leads at the terminal strip.

7.29 Release the line 2 switch request by disengaging the KA4 circuit pack from the line 2 VMR and operating the LLO function for line 2.

Requirement: All lamps on VMR No. 2 should extinguish except NO FR. The MJ ALM lamp on the alarm shelf should extinguish, and then the MN ALM lamp should light, indicating that the switch request but no service failure still exists on the first service line failed. The LLO lamp should be on for line 2.

7.30 Restore the first service line failed by removing the termination from the jack and hybrid unit.

Requirement: Within 24 seconds, all lamp indications on the service line VMR should extinguish. Also, all lamp indications on the protection switching shelf except HIS, PB and LLO should extinguish and the MN ALM lamp on the alarm shelf should also extinguish.

7.31 Release the HIS lamps on KB1 and KB6. Release the PB lamp by simultaneously operating the MS button on KB2 and the RST button on KB5.

7.32 To check the receiving end switch inhibiting function, depress the MS button on KB2 and the RSI button on KB4. While these two switches remain depressed, operate the LLI button of the last service line checked. Then, release all three buttons.

Requirement: The LLI, TRMTG SW ACT, and HIS lamps should light on KB1 for the last service line tested. The HIS lamp should light on KB6. The NO LD lamp should light on VMR No. 1. Ignore the lamp indications after 24 seconds.

7.33 Release the LLI button on KB1.

Requirement: The LLI lamp should extinguish immediately. About 24 seconds later, the TRMTG SW ACT lamp on KB1 and the NO LD lamp on VMR No. 1 should go off.

Release the HIS lamps on KB1 and KB6.

7.34 To check the upstream failure operation of the protection switching system, a failure must be initiated ahead of the transmitting hybrid in a service line. To initiate such a failure, disconnect the portable signal generator from the terminal strip input to the service line used in the

preceding test. A head-end switch will result, but failure of the protection line VMR to indicate a good signal at the receiving end should prevent the receiving end switch.

Requirement: The NO FR, BS, and ALM lamps on the service line VMR should light. The NO FR, BS, ALM, and NO LD lamps on VMR No. 1 should light. The TRMTG SW ACT and HIS lamps on KB1 should light. The USF lamp on KB3 and the HIS lamp on KB6 should light. The MJ ALM lamp on the alarm shelf should light. (After 17 seconds, ignore all changes in protection switching and VMR lamp indications. If KB8 circuits are equipped, a relay contact closure should be measured across the SI(UPSTRF)-SIR(UPSTRF) leads at the terminal strip.

7.35 To release the upstream failure condition, restore the DS4 signal input to the service line at the terminal strip.

Requirement: Within 24 seconds, all lamps on the protection switching shelf should extinguish except HIS, USF, and the LLO lamps of channels locked out. The NO FR lamp on the VMR used in this test should also extinguish.

Release the HIS lamps on KB1 and KB6. Release the USF lamp by simultaneously operating the MS button KB2 and the RST button on KB3.

7.36 To check the protection switching lockout (PSLO) function, simultaneously operate the MS button on KB2 and the PSLO button on KB4.

Requirement: The PSLO lamp on KB4 should light. When KB8 circuits are equipped, a relay contact closure should be measured across the SI(PSCLOV)-SIR(PSCLOV) leads at the terminal strip.

7.37 Attempt to initiate an automatic switch of the service line used in 7.22 by inserting a 75-ohm termination in the T LINE IN jack for that line on the jack and the hybrid unit.

Requirement: The NO FR, BS, and ALM lamps on the service line VMR should light. The MJ ALM lamp should light, indicating loss of service because the protection line was locked out.

7.38 To release the PSLO function, simultaneously operate the MS button on KB2 and the RLS button on KB4. Since the failure condition still exists, an automatic switch should result within 5 seconds.

Requirement: Immediately upon releasing the PSLO function, the PSLO lamp on KB4 should extinguish. Within 5 seconds, the NO LD lamp on VMR No. 1 should light, as well as all the PSC lamps for a normal protection switch of the failed service line. The NO FR, BS, and ALM lamps of the service line VMR should remain lit, the MJ ALM lamp should extinguish, and the MN ALM lamp should light.

7.39 Restore the failed service line and the protection switching system to normal by removing the termination from the jack and hybrid unit.

Requirement: Within 24 seconds, all lamp indications on the service line VMR, all lamp indications on the PSC shelf except HIS, and the MN ALM lamp should extinguish.

Release the HIS lamps on KB1 and KB6.

7.40 To check the transmit switch lockout (TSLO) function, simultaneously operate the MS button on KB2 and the PSLO button on KB6. Then, repeat the same procedure and check the same requirements as in the sequence above for the VMR-end circuit PSLO function. However, in this case, the TSLO lamp will light on KB6 and the relay contact closure at the terminal strip should be across the SI(PSCLOH)-SIR(PSCLOH) leads. Also, the TSLO lamp is extinguished by simultaneously operating the RLS button on KB6 (instead of KB4) and the MS button.

7.41 There are three failure conditions on the protection switching circuit (PSC) that can be detected by its own circuitry:

- (a) Scanner failure.
- (b) Reappearance of the line drive signal on the protection line before a switch is released.
- (c) Loss of the switch request signaling channel between VMR and head ends.

7.42 To check the scanner failure detection circuit, disengage the KB1 CP of the last service line checked from its connector. This breaks the scanner cycle of the PSC.

Requirement: The PSF lamp on KB4 should light within 2 seconds. The MN ALM lamp on the alarm shelf should light. About 20 seconds after breaking the scanner cycle, the PSF lamp on KB5 also should light. When the KB8 circuits are equipped, a relay contact closure should be measured across the SI(PSCFV)-SIR(PSCFV) leads at the terminal strip.

7.43 Reinsert the KB1 CP in its connector. Operate the MS button on KB2 and the RST button on KB4.

Requirement: After 24 seconds, the PSF and MN ALM lamps should extinguish. The HIS lamps on KB1 and KB6 should be lit. The PB lamp on KB5 and the USF lamp on KB3 may or may not be lit. Restore the PB and USF lamps, if lit, by operating the MS button on KB2 and the RST button on KB5, and then operating the MS button on KB2 and the RST button on KB3. Restore the HIS lamps also.

7.44 To check the line drive signal reappearance failure mode, initiate an automatic switch of the service line used in 7.22 by inserting a 75-ohm termination in the T LINE IN jack for that line on the jack and hybrid unit.

Requirement: The normal automatic switch lamp indications on the service line VMR, VMR-No. 1, the protection switching CPs, and the alarm shelf should light.

7.45 Patch the signal from the TRMTG OP jack on KA10 of DS4G in the bay to the CH1 T LINE IN jack for line 1 on the jack and hybrid unit. This places a line drive signal back on the protection line while the preceding switches are still operated.

Requirement: The NO LD lamp on VMR No. 1 should extinguish immediately. (Ignore any momentary flickering of other VMR No. 1 lamps.) The PSF lamp on KB4 should light. Within 5 seconds, the RCV SW ACT lamp on KB1 and the PSA lamp on KB4 should extinguish,

indicating release of the receiving end switches only. The MN ALM lamp should extinguish and the MJ ALM lamp should light.

7.46 The transmitting switches should remain operated and all lamp indications should remain as described as long as the service line failure remains, or until the service line is locked out by means of a manual lock line out operation. Release the service line failure condition by removing the termination from the jack and hybrid unit.

Requirement: All VMR lamps should extinguish; within 24 seconds, all protection switching lamps should extinguish except HIS, PSF, and LLO of the service lines that are locked out. The MJ ALM lamp should extinguish.

7.47 Release the HIS lamps on KB1 and KB6. Release the PSF lamp by simultaneously operating the MS button on KB2 and the RST button on KB4. Remove the patch from DS4G to the jack and hybrid unit.

7.48 To check the protection switching failure indication due to loss of the signaling channel, temporarily disengage the KB2 CP on which switch request messages originate. (This breaks the scanner cycle as well as the signaling channel.)

Requirement: Within 2 seconds, the PSF lamp on KB4 should light. In approximately 20 seconds, the PSF lamp on KB5 and the MN ALM lamp should light. When KB8 circuits have been equipped, a relay contact closure should be measured across the SI(HPSCF)-SIR(HPSCF) leads at the terminal strip.

7.49 Release the failure condition by inserting the KB2 CP. Release the PSF lamp on KB4 by operating the RST button on KB4 simultaneously with the MS button on KB2. The MN ALM lamp should extinguish.

7.50 The remaining checks of the protection switching system involve testing the E-type remote control functions. (If the E-type remoting option is not equipped, these requirements do not apply.) Each of the functions can be tested by attaching a jumper wire across the designated RS()-RSR() leads at the terminal strip, thereby simulating a contact closure in an E-remoting terminal. The functions to be checked are indicated

in Table A. Since remote operation of each of these functions has the same result as operating the equivalent manual control locally, the required results are indicated in the table by reference to the previous paragraphs where the same function was tested locally. The individual line operations, indicated by reference to line N, must be checked for each line.

7.51 The last test checks the operation of the KC1 energy detector CP. Patch from the RCV HYB OUT jack of the portable signal generator to the CH1 OFC IN jack at the terminal strip.

Requirement: The NO LD lamp on channel 1 VMR KA3 should be lit.

7.52 Operate the MBEA buttons on KC1.

Requirement: The MBEA lamp on KC1 should be lit but the NO LD lamp on KA3 should extinguish.

7.53 Operate the RLS button on KC1.

Requirement: The MBEA lamp on KC1 should extinguish. The NO LD lamp on KA3 should light.

7.54 Disconnect the signal from the portable signal generator to the CH1 OFC IN jack.

Requirement: The NO LD lamp on KA3 should extinguish.

7.55 This completes the tests of the PCS.

8. FAULT LOCATING AND MAINTENANCE TESTS

8.01 The circuits to be tested in this section include the following:

KG1—Fault locating pilot generator (FLPG).

MU1—Maintenance unit equipped with 1094A filter.

MU2—Maintenance unit equipped with 1094* filter.

* Filter code depends on the number of repeater stations in a span. It also is used to enter Table B or C to determine certain attenuator settings.

TABLE A

E-TYPE REMOTE CONTROL FUNCTION TESTING

FUNCTION	LEADS JUMPERED AT TERMINAL STRIP	PARAGRAPH GIVING REQUIRED PROCEDURE AND REQUIREMENTS
LL“N”I (Lock Line “N” In)	RS(LL“N”I)- RSR(LL“N”I)	7.16 Restore by removing LL“N”I jumper and attaching jumper across RS(RLS“N”)-RSR(RLS“N”) leads at the terminal strip.
LL“N”O (Lock Line “N” Out)	RS(LL“N”O)- RSR(LL“N”O)	7.21 Restore by removing LL“N”O jumper and attaching jumper across RS(RLS“N”)-RSR(RLS“N”) leads at the terminal strip.
LPSCOV (Lock PSC OUT, VMR end)	RS(LPSCOV)- RSR(LPSCOV)	7.36 Restore by removing LPSCOV jumper and attaching jumper across RS(PLORLS)-RSR(PLORLS) leads at the terminal strip.
RESET (Resets any or all of the common HIS PB, USF, or PSF lamps)	RS(RESET)- RSR(RESET)	This operation should turn off the common HIS lamp turned on above. (It will <i>not</i> turn off HIS lamps on KB1s; these can only be turned off locally.)

PSFL1—Fault locating power supply—current source of 50 mA nominal. Terminal voltage ranges from 20 through 270 Vdc.

KM1—Fault locating pilot detectors (FLPD).

21E—Fault locating test set. This set provides a pulse density modulated 274-Mb/s data transmitter and receiver for fault locating office and line regenerators.

KG3-18, KG25-39, KG40-55, KG24—Build-out card (BOC) for 19 AWG, 0.083 μ F per mile wire pairs; BOC for 22 AWG, 0.083 μ F per mile wire pairs; BOC for 19 AWG, 0.062 μ F per mile wire pairs, and load coil card (LCC), respectively. No tests are specified in these requirements for these circuits. Instead, a zero-length build-out (KG3) is used for the BOC and a special card without load coils (KG23) is used for the LCC as shown in Fig. 1.

All of the units listed above except PSFL1 and KM1 are located in the maintenance shelf. PSFL1

is located in the right-hand position of the power shelf above the PSCs. KM1 is located in the alarm shelf.

A. Initial Conditions

8.02 It is assumed that the span terminating frame has successfully passed all preceding tests. All plug-ins listed in 8.01 should be installed in their assigned slots, but should not be inserted in their connectors. It is also assumed that no external wiring to the outside plant wire pairs exists on terminal strip TSH. If any wiring exists on terminals 41, 42, 51, 52, 53, 54, 55, 56, 57, or 58 on TSH, the wires should be tagged and removed during the fault locating and maintenance tests. The following initial conditions then should be set up:

- (a) Substitute cards KG3 and KG23 for the BOC and LCC plug-ins, respectively.
- (b) Remove KG1, the fault locating pilot generator, and set the attenuator on KG1 to the value given in Table B or C using the letter code

TABLE B
FILTER CODES

19 AWG, 0.083 AND 0.062 μ F PER MILE WIRE PAIR SYSTEMS				
MU2 FILTER CODE	KG1 ATTENUATOR SETTING	KG1 MONITOR OUTPUT (MO)	ATT1 SETTING	RECEIVING REGENERATOR RS NUMBER
	dB	dBRN 15 kHz FLAT	dB	
B	26.3	41.1	2.4	1
C	25.8	41.6	2.9	2
D	26.0	41.4	2.7	3
E	24.6	42.8	4.1	4
F	23.3	44.1	5.4	5
G	23.0	44.4	5.7	6
H	22.0	45.4	6.7	7
J	20.8	46.6	7.9	8
K	20.1	47.3	8.6	9
L	19.3	48.1	9.4	10
M	18.2	49.2	10.5	11
N	17.4	50.0	11.3	12
P	16.6	50.8	12.1	13
R	15.6	51.8	13.1	14
S	14.7	52.7	14.0	15
T	13.9	53.5	14.8	16
V	12.9	54.5	15.8	17
W	12.0	55.4	16.7	18
Y	11.1	56.3	17.6	19
AA	10.2	57.2	18.5	20
AB	9.3	58.1	19.4	21
AC	8.5	58.9	20.2	22
AD	7.6	59.8	21.1	23
AE	6.7	60.7	22.0	24
AF	5.8	61.6	22.9	25
AG	4.9	62.5	23.8	26
AH	4.0	63.4	24.7	27
AJ	3.1	64.3	25.6	28
AK	2.2	65.2	26.4	29

TABLE C
FILTER CODES

22AWG, 0.083 μ F PER MILE WIRE PAIR SYSTEMS				
MU2 FILTER CODE	KG1 ATTENUATOR SETTING	KG1 MONITOR OUTPUT (MO)	ATT1 SETTING	RECEIVING REGENERATOR NUMBER
	dB	dBRN 15kHz FLAT	dB	
AL	26.3	41.1	2.4	1
AM	25.1	42.3	3.6	2
AN	24.5	42.9	4.2	3
AP	22.9	44.5	5.8	4
AR	21.3	46.1	7.4	5
AS	20.2	47.2	8.5	6
AT	18.9	48.5	9.8	7
AU	17.4	50.0	11.3	8
AW	16.1	51.3	12.6	9
AY	14.8	52.6	13.9	10
BA	13.4	54.0	15.3	11
BB	12.1	55.3	16.6	12
BC	10.7	56.7	18.0	13
BD	9.4	58.0	19.3	14
BE	8.0	59.4	20.7	15
BF	6.7	60.7	22.0	16
BG	5.4	62.0	23.3	17
BH	4.0	63.4	24.7	18
BJ	2.7	64.7	26.0	19
BK	1.3	66.1	27.4	20
BL	0	67.4	28.7	21
BM	1.4*	68.8	30.1	22
BN	2.7*	70.1	31.4	23

* The correction attenuation value printed on KG1 should be decreased by this amount.

designation of the 1094-type filter located in the maintenance unit MU2 in slot F6 on the maintenance shelf. Add the attenuation value printed on KG1 to the attenuator setting given in Table B or C to get the corrected attenuator setting. For the special cases where the KG1 attenuator setting in Table C is marked with an asterisk (*), subtract the KG1 attenuator setting from the attenuation value printed on KG1. Place KG1 back into its correct slot but do not insert it into its connector.

(c) Connect attenuator ATT1 and the span terminating frame installation testboard (test circuit) together as shown in Fig. 1 and then connect one pair from the test circuit to terminals 57 and 58 on terminal strip TSH at the top of bay No. 1. Connect the second pair from the test circuit to terminals 41 and 42 on TSH.

(d) Set switch SW1 on the test circuit to position 1.

(e) Set the video attenuator (ATT1, Fig. 1) to the nominal loss setting according to Table B or C by using the letter code designation of the 1094-type filter located in the maintenance unit MU2 in slot F6. Make a note of this nominal loss for later use.

(f) Check that PSFL1 and the 21E FLTS are turned off.

(g) Check that the common power unit is still turned on, following the tests of 7. (This unit supplies power to the fault locating test set, the pilot detector, and the alarm circuitry.)

(h) Insert all plug-ins into the maintenance shelf and insert PSFL1 in its power supply shelf. The CUR ALM and ALM lamps on PSFL1 should light and the MINOR lamp on the alarm shelf should light 10 seconds later. Finally, insert KM1 in slot I-21 of the alarm shelf; its PLT FAIL lamp should light.

B. Tests of Fault Locating Line Powering and Alarm Operation

8.03 Turn on PSFL1.

Requirement: The PLT FAIL lamp on KM1, the ALM and CUR ALM lamps on PSFL1, and the MINOR lamps should extinguish.

8.04 Using the digital voltmeter, measure current on each side of PSFL1 by measuring the voltage from (Io+) to (Io-) and then from (IoRTN+) to (IoRTN-).

Requirement: The readings should be 165 mVdc \pm 10 mV.

Caution: The next measurements can and will involve voltages ranging from 30 to 300 Vdc. Check voltmeter range and voltage limits before proceeding and after reading the instructions completely to determine expected voltage range.

8.05 Measure the PSFL1 terminal voltage by connecting the + voltmeter lead to (Io+) and the - voltmeter lead to (IoRTN-).

Requirement: Reading should be 44.5 \pm 2.8 Vdc.

8.06 Measure the PSFL1 terminal voltage balance by connecting the + voltmeter lead to (Io+) and the - voltmeter lead to (COM) to measure the voltage on one side of the supply. Then, measure the voltage on the other side of the supply by connecting the + voltmeter lead to the COM terminal and the - lead to (IoRTN-).

Requirement: The two voltages should be equal to within 13 volts.

8.07 Set switch SW1 on the test circuit to position No. 2, and then repeat the current and voltage measurements on PSFL1 in 8.04 through 8.06.

Requirement: The voltage measured as in 8.04 corresponding to the line current should remain 165 mVdc \pm 10 mV. The terminal voltage should be 97 \pm 7 Vdc. The terminal voltage should remain balanced as in 8.06.

8.08 Set switch SW1 on the test circuit to position No. 3. PSFL1 now is open circuited. Measure the PSFL1 terminal voltage by connecting the + voltmeter lead to (Io+) and the - voltmeter lead to (IoRTN-).

Requirement: Terminal voltage should be 280 \pm 4 Vdc, current should be zero, the terminal voltage should remain balanced as in

8.06, the CUR ALM lamp on PSFL1 should light, the PLT FAIL lamp on KM1 should light, and the MINOR alarm lamp on the alarm shelf should light 10 seconds later.

- 8.09 Reset switch SW1 on the test circuit to position No. 1.

Requirement: The CUR ALM, PLT FAIL, and MINOR alarm lamps should extinguish.

- 8.10 Using a 6-foot long ITF 9885 patch cord, measure the pilot level from the fault locating pilot generator monitor output (MO) on KG1, using the 3C noise measuring set with the 15-kHz FLAT WTG network, making the measurement with FUNCTION switch set to BRDG.

Requirement: Reading should correspond to values in Table B to within ± 1 dB.

- 8.11 Increase the setting of attenuator ATT1 to the nominal loss setting determined in 8.02(e) plus 16.3 dB.

Requirement: The PLT FAIL lamp on KM1 should light with the MINOR alarm lamp on the alarm shelf lighting 10 seconds later.

- 8.12 Decrease the setting of attenuator ATT1 to the nominal loss setting determined in 8.02(e) plus 8.7 dB.

Requirement: The PLT FAIL lamp on KM1 and the MINOR alarm lamp on the alarm shelf should extinguish.

- 8.13 Using the special test leads shown in Fig. 1, interconnect jack FL1 on the jack and hybrid panel with terminals 51 and 52 of TSH at the top of bay No. 1. Disengage the KM1 CP in slot I-21 and either insert the KM1 CP into slot I-23 or move the KM1 CP in slot I-21 to slot I-23.

Requirement: Following a possible momentary lamp indication, the PLT FAIL lamp on KM1 should extinguish.

- 8.14 Increase attenuator ATT1 to the nominal loss determined in 8.02(e) plus 16.3 dB.

Requirement: The PLT FAIL lamp on KM1 should light with the MINOR alarm

lamp on the alarm shelf lighting 10 seconds later.

- 8.15 Decrease attenuator ATT1 to the nominal loss determined in 8.02(e) plus 8.7 dB.

Requirement: The PLT FAIL lamp on KM1 and the MINOR alarm lamp on the alarm shelf should extinguish.

- 8.16 Repeat 8.13, 8.14, and 8.15 with the leads on terminals 51 and 52 of TSH on the terminal strip unit moved to 53 and 54 on TSH and disengage the KM1 CP in slot I-23 and either move or insert the KM1 CP into slot I-25 of the alarm shelf. Then, repeat 8.13, 8.14, and 8.15 with the leads on terminals 53 and 54 of TSH moved to 55 and 56 of TSH and disengage the KM1 CP in slot I-25 and either move or insert the KM1 CP into slot I-27 of the alarm shelf. When all of these steps are completed, disengage the KM1 CP in slot I-27, either move or reinsert the KM1 CP into slot I-21 of the alarm shelf, and remove the test leads between TSH on the terminal strip unit and the test lead in jack FL1 on the jack and hybrid unit. Set the attenuator ATT1 to the nominal loss determined in 8.02(e). This completes the tests of fault locating line powering and alarm operation.

C. Fault Locating Tests of Office Regenerators

- 8.17 The following paragraphs cover tests of the interaction of the fault locating system and the office regenerators. To complete these tests, it will be necessary to operate the 21E fault locating test set (21E FLTS). Operating instructions are contained in Section 103-486-101 and will not be repeated here.

- 8.18 The back-to-back patch from the line 1 transmitting regenerator to the line 1 receiving regenerator should still be in place as originally set up in 5.09. If it is not, complete the patch as called for there. Also, the line 1 power unit PS1 should still be on.

- 8.19 Using a 3-foot long P2EB cord, patch from TRMT on the 21E FLTS to CH1 T LINE IN on the jack and hybrid unit of bay jack No. 1. Using a 2P4B audio patch cord, patch from RCV on the 21E FLTS to FL1 on the jack and hybrid unit. Then, turn on the 21A FLTS and set the RS' selector of the set to RSN 0.

8.20 Fault locate the transmitting regenerator in line 1.

Requirement: Proper response per Section 103-486-101. Note that MU1 and the 1094A filter have also been checked by this test.

8.21 Determine the RS number corresponding to the line 1 receiving regenerator from Table B. The entry to the table is the code of the 1094-type filter associated with MU2. Set the RS selector on the 21E FLTS to the number indicated by the table.

8.22 Fault locate the receiving regenerator in line 1.

Requirement: Proper response per Section 103-486-101.

8.23 Advance the manual gain control on the 21E FLTS fully clockwise. Then, step the RS selector through values 1 through 29.

Requirement: No upscale responses higher than -25 dB should be observed except for the RS determined in 8.21.

8.24 Repeat 8.18 through 8.23 for all service lines, using the spare set of transmitting and receiving regenerators to check those lines not initially equipped. In each case, the back-to-back patch from the transmitting regenerator to the receiving regenerator must be made through a line build-out network matching the code of receiving regenerator.

D. Maintenance and Order Circuit Tests

8.25 Turn off PSFL1 and test for continuity between the following pairs of terminals on terminal strips TSH and TSG:

FROM TSH TERMINAL	TO TSG TERMINAL
38	38
37	37
36	36
35	35
14	14
13	13
12	12
11	11

FROM TSH TERMINAL	TO TSG TERMINAL
18	24
17	23
16	22
15	21
22	32
21	31

Requirement: Resistance between the terminals should be less than 1 ohm.

8.26 This completes the fault locating and maintenance tests. Turn off the 21E FLTS. Disengage KM1 and PSFL1 to avoid alarms during tests in 9. Remove the KG3 BOC and KG23 LCC cards and insert the proper BOC and KG24 LCC cards in their assigned slots. Disconnect the span terminating frame installation testboard. If any wire is removed from terminal strip TSH for the fault locating and maintenance tests, it should be reconnected.

9. ACTIVATION OF OFFICE ALARMS

9.01 Insert the KN5 alarm relay CP in position 05 of the alarm shelf. At this time, there should be no alarms, as all VMR evaluation circuits should still be disengaged except for line 1 and the service line last checked. These two lines should still be receiving valid DS4 signals. Also, the alarm connections from the terminal strip to the office alarm system should not yet be made.

9.02 Turn off the power unit feeding the last service line checked. This should initiate an automatic switch.

Requirement: The usual lamp indications for an automatic switch should light immediately; the MN ALM lamp should light; and simultaneously, a relay contact closure should be measured across the MNV-MNRV leads. Ten seconds later, a relay contact closure should be measured across MN-MNR leads.

9.03 Operate the alarm cutoff (ACO) button on the alarm control panel.

Requirement: There should no longer be a relay contact closure across audible alarm output leads MN-MNR at the terminal strip; however, the closure across MNV-MNVR should remain. The MN ALM lamp should remain lit.

9.04 Temporarily disconnect the back-to-back patch for line 1 at the terminal strip to initiate a protection failure while the switch is still up, thereby causing a loss of service condition.

Requirement: The NO FR, NO LD, BS, and ALM lamps on VMR No. 1 should light, and 20 seconds later, PSF on KB5 should light, indicating loss of the protection switching signaling channel. The MN ALM lamp should extinguish and be replaced by the MJ ALM lamp. Also at that time, the relay contact closure across leads MNV-MNVR at the terminal strip should disappear and relay contact closures should appear across leads MJV-MJRV. Ten seconds later, a relay contact closure should be measured across MJ-MJR leads.

9.05 Operate the ACO button on the alarm control panel.

Requirement: There should no longer be a relay contact closure across audible alarm output leads MJ-MJR at the terminal strip; however, the closure across MJV-MJVR should remain. The MJ ALM lamp should remain lit.

9.06 Restore the back-to-back patch for line 1. The switch should still be active because the service line KA4 evaluation circuit is still issuing a switch request. The MJ ALM lamp should extinguish and be replaced by an MN ALM lamp indication. The evaluation circuit should now be disengaged, which will remove the switch request. The protection switching system and alarms should return to normal, and all contact closures at the terminal strip should disappear. Reset the HIS lamps and any PSF lamps on the protection switching shelf, if the latter are lit.

9.07 To check the line feed converter alarm (LCA) lamp on the alarm control panel, jumper across the CSV-CSV terminals at the terminal strip.

Requirement: The LCA lamp should light.

Remove the jumper to extinguish the lamp.

9.08 To check the fuse alarm for the A battery bus on the fuse and filter unit, remove indicator fuse LA1 and temporarily replace it with a shorted fuse.

Requirement: Relay FAU should operate, causing lamp FA to light; and a relay contact closure should be measured across the fuse alarm remoting leads SI(FA1)-SIR(FA1) at the terminal strip.

Replace fuse LA1 to release the FAU relay and extinguish the FA lamp.

9.09 To check the fuse alarm for the B battery bus on the fuse and filter unit, remove indicator fuse LA2 and temporarily replace it with a shorted fuse.

Requirement: Relay FAL should operate, causing lamp FA to light, and a relay contact closure should be measured across the fuse alarm remoting leads SI(FA2)-SIR(FA2) at the terminal strip.

Replace fuse LA2 to release the FAL relay and extinguish the FA lamp.

9.10 Repeat 9.08 and 9.09 for the fuses in the second bay, when equipped.

9.11 This completes the performance tests of the span terminating frame. Remove the spare set of test plug-ins from their positions in the last service line checked. Insert a KB9 dummy board in place of the KB1 per-channel circuit removed as part of this spare set. Turn off all power units. Remove the back-to-back patches and all 75-ohm terminations that may remain on the terminal strip or the jack and hybrid unit. The span terminating frame is now ready for connection to office and line circuits.