DIGITAL TRANSMISSION SYSTEMS
J98728 SPAN TERMINATING MODULE (STM)
GENERAL DESCRIPTION

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1. GENERAL

1.01 This section gives a general description of the J98728AA, AB, and AC span terminating modules (STM). The J98728AA and AB STMs each requires 17 inches of bay space and consists of two associated shelves which are factory wired and joined: a 206-type office repeater shelf with positions for 12 office repeaters and one bridging repeater, and the Lynch B302 automatic protection switch (APS) shelf (Section 365-250-110). The APS shelf consists of a DS-1 jack and cross-connect field and positions for the APS per-line span switch, alarm, and status reporting and control (SRC) system or telemetry interface plug-ins. The J98728AC ***expansion*** span terminating module (ESTM) also consists of two shelves and occupies 17 inches of bay space. It is equipped with a plug which mates with a jack on the J98728AA STM. The 206-type repeater shelf has positions for 13 office repeaters and the APS shelf has a DS-1 jack and cross-connect field and positions for up to 13 span switches plus a telemetry interface unit. These STMs are used as terminating units for the T1 lines serving both directions of transmission within a span of a T1/OS Digital Transmission System and forming a protection group.

1.02 ▶This section has been reissued to include information on span switch units 302SS01B, 302SS01C, and 302SS02. Added coverage is included for telemetry interface unit 302TI01. Revision

arrows are used to indicate the changes. Equipment test list(s) are not affected.◀

2. PHYSICAL DESCRIPTION

A. General

2.01 The front view of the J98728AA STM is shown in Fig. 1, the J98728AB in Fig. 2, and the J98728AC in Fig. 3. The upper shelf of the J98728AA and AB STM contains the plug-ins associated with the APS function and also the DS-1 jack and cross-connect circuits (located on the left side of the shelf) for the STM. The lower shelf contains the 206- or 236-type repeaters and associated powering-circuit resistors. The J98728AC ESTM is different in that the upper shelf contains the the 206- or 236-type repeaters and the lower shelf contains the APS functions and the DS-1 jack and cross-connect circuits. Plug-in units for the STM and ESTM are listed in Tables A and B.

2.02 the J98728AA STM contains a single 1 × 11 protection group (PG), the J98728AB STM has two independent 1 × 5 PGs, and the J98728AC ESTM has a 0 × 13 PG. Either STM can be identified by the PG assignments located on the designation strip at the top of the APS shelf. Figure 1 indicates one PG, Fig. 2 indicates two PGs which are designated PG-L and PG-R, and Fig. 3 indicates an expansion module of up to 13 units.

2.03 A PG designated as 1 × N is defined as a grouping of N service lines (SL), each of which may be automatically switched to the protection line (PL) if monitoring circuits detect unsatisfactory transmission on the SL. The position of the SL plug-in on the shelf determines priority access to the PL, with the highest priority assigned to the left-most plug-in position in a PG. The lower priorities are assigned sequentially to the right for each PG. All lines within a PG must

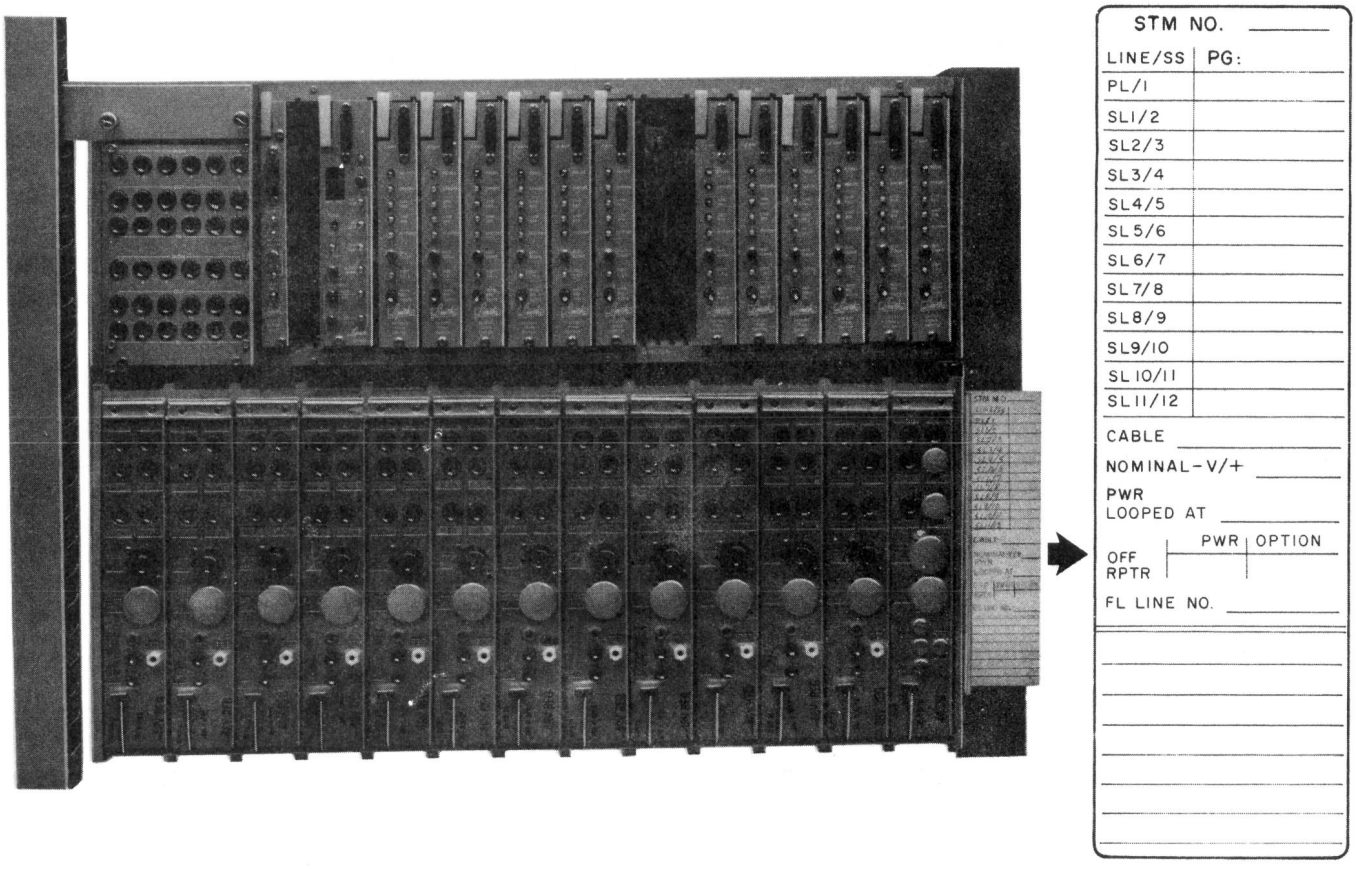


Fig. 1—J98728AA Span Terminating Module

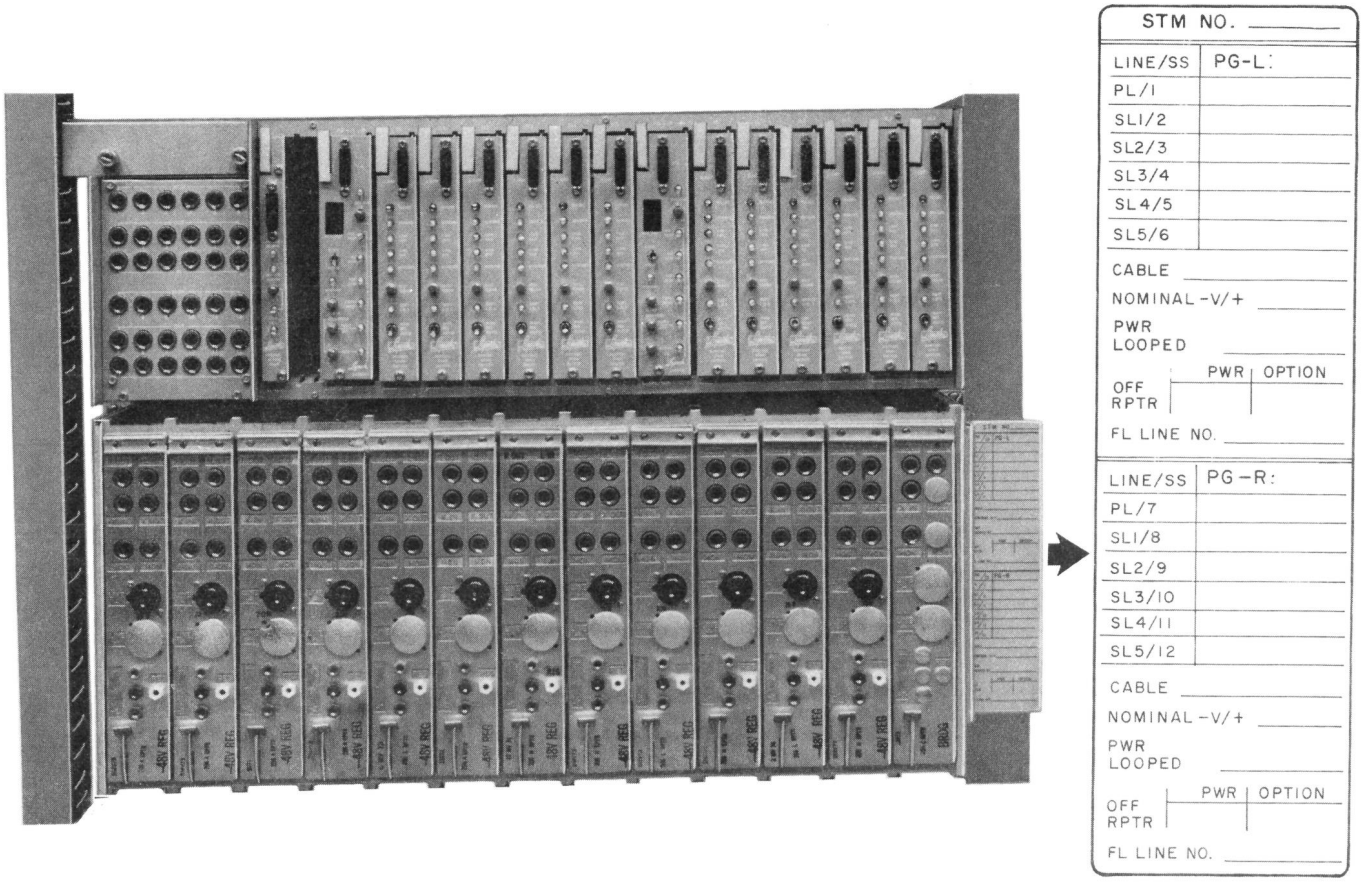


Fig. 2—J98728AB Span Terminating Module

have common APS end points and the lines, together with the APS, comprise a maintenance span.

B. J98728AA Span Terminating Module

2.04 Plug-in equipment for the J98728AA STM is arranged as shown in Fig. 1 to provide a 1 × 11 protection group. The jack field on the upper shelf contains a DS-1 jack circuit for each of the 12 lines (including the PL) in the configuration. 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 the same or another STM or to other DS-1 distribution points. The ALM plug-in unit is a common equipment unit for the plug-in units in the upper shelf; it indicates and interfaces with the bay fuse and alarm panel, minor and major alarms, and supplies basic timing signals. The SRC/TLM position will accept one of three types of plug-in units: (1) status reporting and control master unit (SRC Master), (2) status reporting and control remote unit (SRC Remote), or (3) telemetry (TLM) interface unit. The SRC and TLM interface units are optional and provide flexible remote monitoring and control capability as needed to administer maintenance in situations where span terminating offices are unattended. Separate connectors are provided in this plug-in position for accommodating the SRC Master or Remote or the TLM units. The PL or SL positions are served by identical plug-in units which perform the failure-monitoring, protection-switching, and local status indication functions. The bottom shelf of the STM contains the 206- or 236-type office repeaters which provide line powering, regeneration, automatic line build-out, and jack access as required for T1 operation. Internal wiring within the STM permanently associates each repeater with a PL or SL plug-in unit on the upper shelf. A jack and associated wiring are provided on the rear of the upper shelf which can be used to connect an

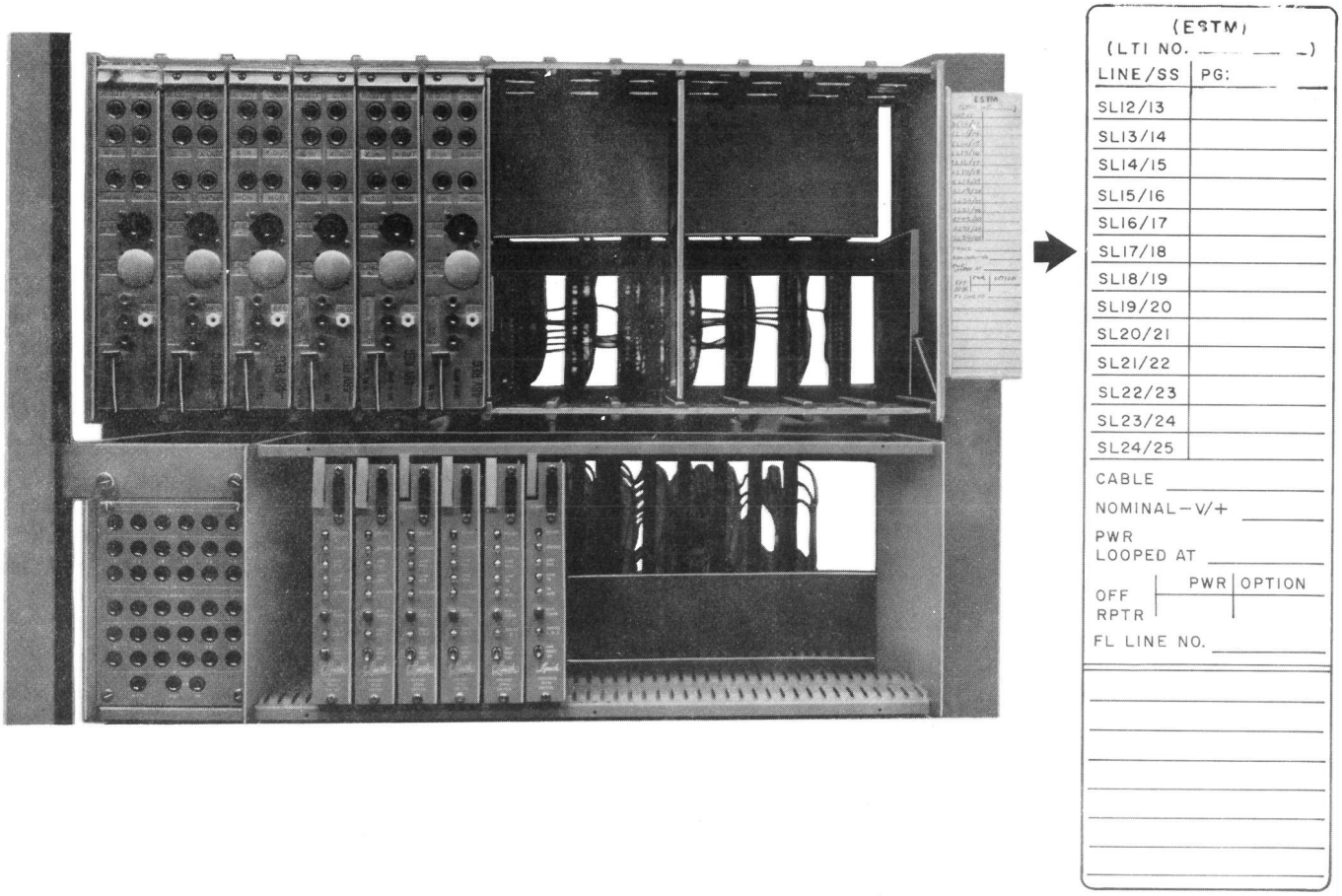


Fig. 3—J98728AC Expansion Span Terminating Module

ESTM, 0 × 13 PG, in order to establish a protection group of 1 × 24. Table C is provided for correlation of the plug-in positions.

C. J98728AB Span Terminating Module

2.05 The plug-in equipment for the J98728AB STM is arranged as shown in Fig. 2 to provide for two independent 1 × 5 PGs. The upper shelf has been configured to include the SRC/TLM option for each PG and the designations at the top of the shelf indicate a protection group-left (PG-L) with associated PL and five SL plug-in units and a protection group-right (PG-R) with associated PL and five SL plug-in units. Only one ALM plug-in unit is required to handle both PGs. Each protection group in this STM functions as described for the 1 × 11 group in 2.04. The bottom shelf contains the 206- or 236-type repeaters. Internal wiring within the STM permanently associates each repeater with a PL or SL plug-in unit on the upper shelf. The correlation of associated plug-in positions is given in Table D.

D. J98728AC Expansion Span Terminating Module

2.06 The plug-in equipment for the J98728AC ESTM is arranged as shown in Fig. 3 to provide for an expansion module of 13 SLs which will be part of a 1 × 24 PG. By means of a plug and the associated wiring on the rear of the ESTM, this module is connected to a J98728AA STM. The PL and ALM units are provided in the J98728AA STM and are not duplicated in the J98728AC. An additional DS-1 jack and cross-connect field is provided. The APS shelf is the lower shelf and the upper shelf contains the office repeaters. Internal wiring within the ESTM permanently associates each repeater with an SL plug-in unit on the lower shelf, 1 to 1, 2 to 2, through 13 to

TABLE A

STM PLUG-IN UNITS

UPPER SHELF (APS)	
302AL01	Alarm Unit (ALM)
302SS01A/B/C	Span Switch Units
302SS02	Span Switch Unit
*302RC01	SRC — Master
*302RC51	SRC — Remote
*302TI01	Telemetry Interface
LOWER SHELF (OR)	
206- or 236-Type Office Repeater and 206- or 236-Type Bridging Repeater	

* Optional

TABLE B

ESTM PLUG-IN UNITS

UPPER SHELF (OR)	
206	Office Repeater
236	Office Repeater
LOWER SHELF (APS)	
302SS01A/B/C	Span Switch Units
302SS02	Span Switch Unit
*302TI01	Telemetry Interface Unit

*Optional

TABLE C

APS/OR NUMBERING (J98728AA)

UPPER SHELF UNIT	SWITCH POSITION	LOWER SHELF UNIT	SWITCH POSITION
PL	1	OR1	1
SL1	2	OR2	2
SL2	3	OR3	3
SL3	4	OR4	4
SL4	5	OR5	5
SL5	6	OR6	6
SL6	7	OR7	7
SL7	8	OR8	8
SL8	9	OR9	9
SL9	10	OR10	10
SL10	11	OR11	11
SL11	12	OR12	12
		Bridging Repeater	13

TABLE D

APS/OR NUMBERING (J98728AB)

PROTECTION GROUP	UPPER SHELF UNIT	SW POS	LOWER SHELF UNIT	OR POS
PG-L	PL	1	OR1	1
PG-L	SL1	2	OR2	2
PG-L	SL2	3	OR3	3
PG-L	SL3	4	OR4	4
PG-L	SL4	5	OR5	5
PG-L	SL5	6	OR6	6
PG-R	PL	7	OR7	7
PG-R	SL1	8	OR8	8
PG-R	SL2	9	OR9	9
PG-R	SL3	10	OR10	10
PG-R	SL4	11	OR11	11
PG-R	SL5	12	OR12	12
			Bridging Repeater	13

13. The correlation of associated plug-in positions is given in Table E.

E. Equipment Designation Labels

2.07 Equipment designation labels are mounted on the right side (facing the unit) of each STM as illustrated in Fig. 1, 2, and 3. These labels provide quick reference data on the T1 system configuration, line powering, and equipment correlation within the STM.

2.08 Label (A), (B), or (C) in Fig. 4 is required for the STM; label (A) for the STM containing

TABLE E

APS/OR NUMBERING (J98728AC)

LOWER SHELF UNIT	SWITCH POSITION	UPPER SHELF UNIT	OFFICE REPEATER POSITION
SL12	13	13	14
SL13	14	14	15
SL14	15	15	16
SL15	16	16	17
SL16	17	17	18
SL17	18	18	19
SL18	19	19	20
SL19	20	20	21
SL20	21	21	22
SL21	22	22	23
SL22	23	23	24
SL23	24	24	25
SL24	25	25	26

the 1 × 11 PG, label (B) for the STM containing the two 1 × 5 PGs, and label (C) for the ESTM containing the 0 × 13 PG. These labels are mounted on the right side (facing STM) of the lower shelf of the STM. Space is provided for an STM or ESTM number. This can be a bay position number (numbers 1 through 4) or any other numbering scheme which might be necessary in offices with more than one bay of STMs. The next section on the label provides space for designating the PG and its associated T1 lines. The PG designation should be a unique span identification such as office designations for the end offices of the PG and a number which distinguishes among PGs when more than one occurs between the same two offices. The example in Fig. 4(A) is "BRGR-LAMR-1." Each T1 line is designated by its terminal points, the office containing the D bank equipment, and a system number (eg, 101-BRGR-LAMR). For bookkeeping purposes, within an STM each T1 line is given a dual designation, X/Y. X defines the status of a line within its PG, whether it is a protection line (PL) or one of the service lines, SL( ). Y is a number, 1 through 12, which is used to associate a repeater slot with its span switch (SS) slot, whether assigned for protection or service, and its jack access and cross-connect terminals. This dual designation is used on the equipment shelves and also on the labels (see Fig. 1 and 2). Space is also provided on the label for entering: an appropriate cable designation, the nominal line voltage (measured between test points "-V" and "+" on the 206-type repeaters), the location of the power loop (if applicable), office repeater powering, whether "local" or in the "loop", and the power conditioning of the office repeater selected at the screw option block. The final entry is one or more fault-locating line number(s) which serves the T1 systems in this PG and which can be accessed from this office.

2.09 Labels (A) and (B) in Fig. 5 are required, as appropriate, when the SRC option is chosen. The labels are mounted on the right side (facing STM) of the upper shelf of the STM. No label is provided when a TLM unit is used in place of the SRC unit. Either (A) or (B) in Fig. 5 will be used for the J98728AA STM. Two labels (any combination of either (A) or (B) in Fig. 5) will be used for the J98728AB STM as shown in Fig. 2 (1 × 5 PGs). SRC systems consist of a control or master office communicating commands and alarms to and from up to eight remote locations. The eight remote locations can be at either the head-end only (end closest to the control office) or head-end plus tail-end offices of a PG span. Communications between the control office with its SRC Master and each remote location with their SRC Remotes are carried on the protection T1 line using the normal T1 format. The initial entry on the label identifies the SRC system by its control office and an appropriate network identification. Each SRC system or network controlled from a given office should be uniquely identified. The label for a master unit, Fig. 5(A), describes the location of each remote unit by specifying its PG span and its position within the PG; for example, near end (N) or far end (F). The extra relay closure to be monitored and the extra command which may be sent to each remote station are listed under CONT MON and AUX, respectively. In the example, a relay closure from remote No. 1 means the office door has been opened and from No. 2 the smoke sensor has been triggered. The command which can be sent to both locations is transfer off (a protection switch function). This particular command completely defeats the APS system between BRGR and HLLY but can be used only when both ends of the PG span have remote units. The remote SRC label, Fig. 5(B), contains all information pertinent to the local reporting and control plus the appropriate system designator.

F. Rear View of Span Terminating Module

2.10 The rear view of the office repeater portion of an STM is shown in Fig. 6. The power

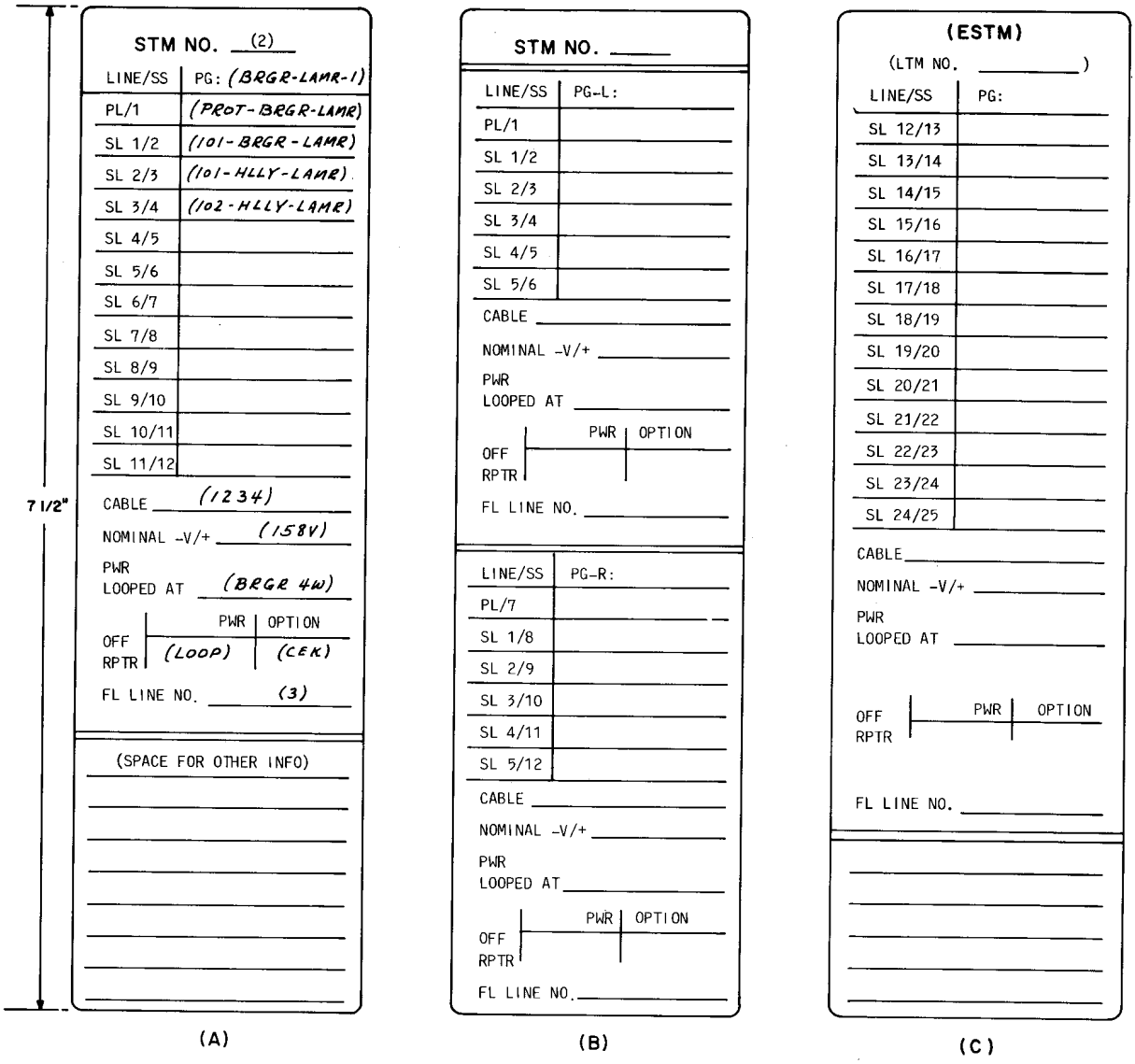


Fig. 4—STM and ESTM Labels

dissipation panel which is part of the repeater shelf contains the power dissipating resistors associated with line and office repeater powering options. The panel is made of aluminum and is mounted directly on the repeater shelf connector flange. The panel also contains a terminal strip which accepts the ABAM cable from the MDF or its equivalent (T1 lines) and the power leads from the fuse panel. Repeater outputs and inputs are wired directly to their associated APS switch units.

3. FUNCTIONAL DESCRIPTION

A. General

3.01 The J98728AA STM, J98728AB STM, and J98728AC ESTM provide line terminating and protection switching functions for T1 lines at the DS-1 digital signal level. The STM serves to physically combine the office repeaters and APS units, and also provides convenient cross-connection

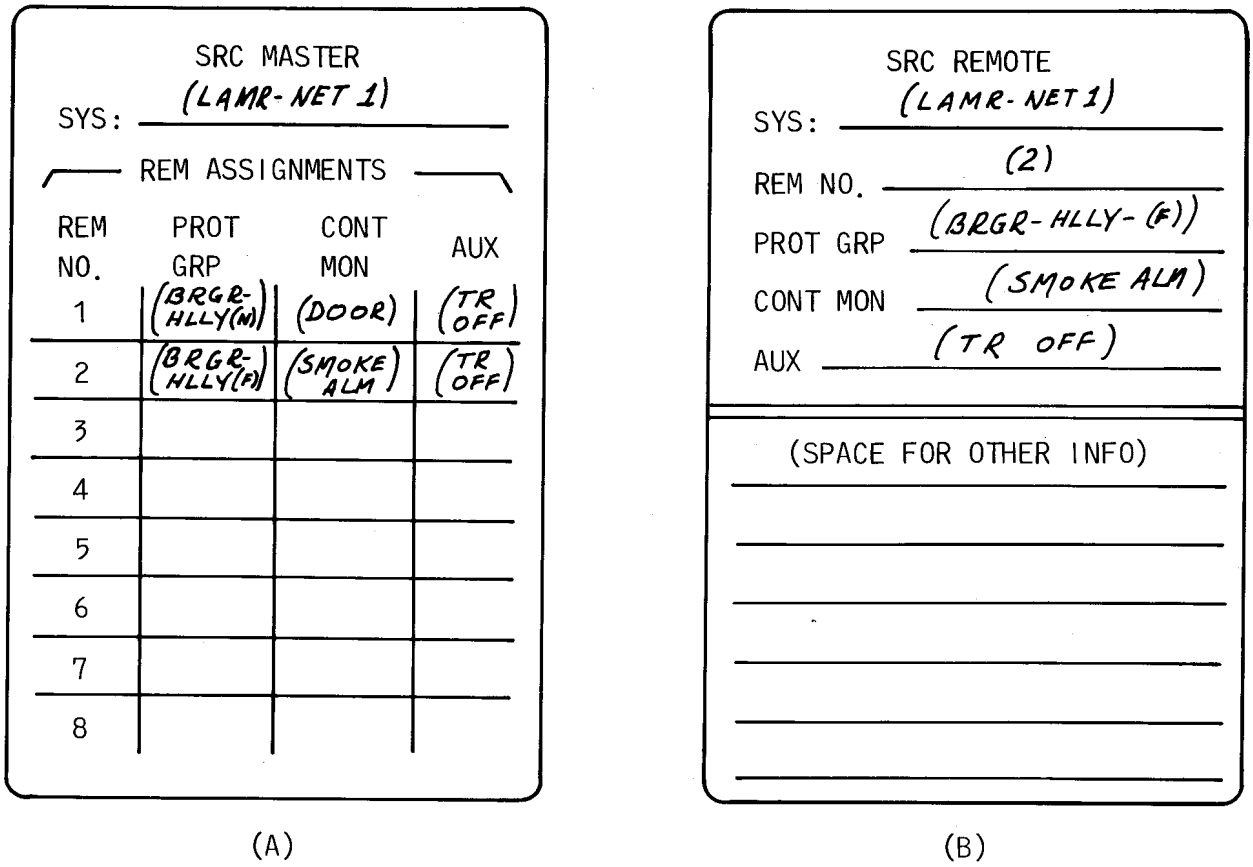


Fig. 5—SRC Labels

and jacking capability. The external connections to the STM consist of: T1 pairs from the outside plant facility, T1 pairs connecting to terminal equipment or other T1 systems, power input, fault-locating collector pairs from office repeaters, and alarm leads to the fuse and alarm panel.

B. APS Shelf Plug-in Units

3.02 The APS shelf of the STM performs the failure monitoring and APS function. The equipment is a B302 electronic span line switch manufactured by Lynch Communication Systems, Inc. (Refer to Section 365-250-110 for a general description and details of operation of this switch.) Table A provides a listing of the plug-in units used in this shelf. A description of the functional operation of these plug-in units is given in 3.03 through 3.09 and in Section 365-250-110.

3.03 Figure 7 is a front view of the 302AL01 alarm plug-in unit. It generates the transfer code, reset code, and clock signals which are used in the 302SS01 plug-ins and provides alarm indications and relay closures for the office alarm circuits in the event of service or protection line failures. The alarm plug-in unit monitors its own performance and the alarm condition of each of the APS switch units in the shelf.

3.04 Figure 8 is a front view of the 302SS01 span switch plug-in unit. It performs line monitoring, failure detection, and automatic protection switching, and provides local status indications and some local control functions. The span switch plug-in is interchangeable in all slot locations that have been wired to provide a service or a protection line (SL or PL). Shelf wiring alone determines whether the span switch card performs as the switch for a service line or protection line.

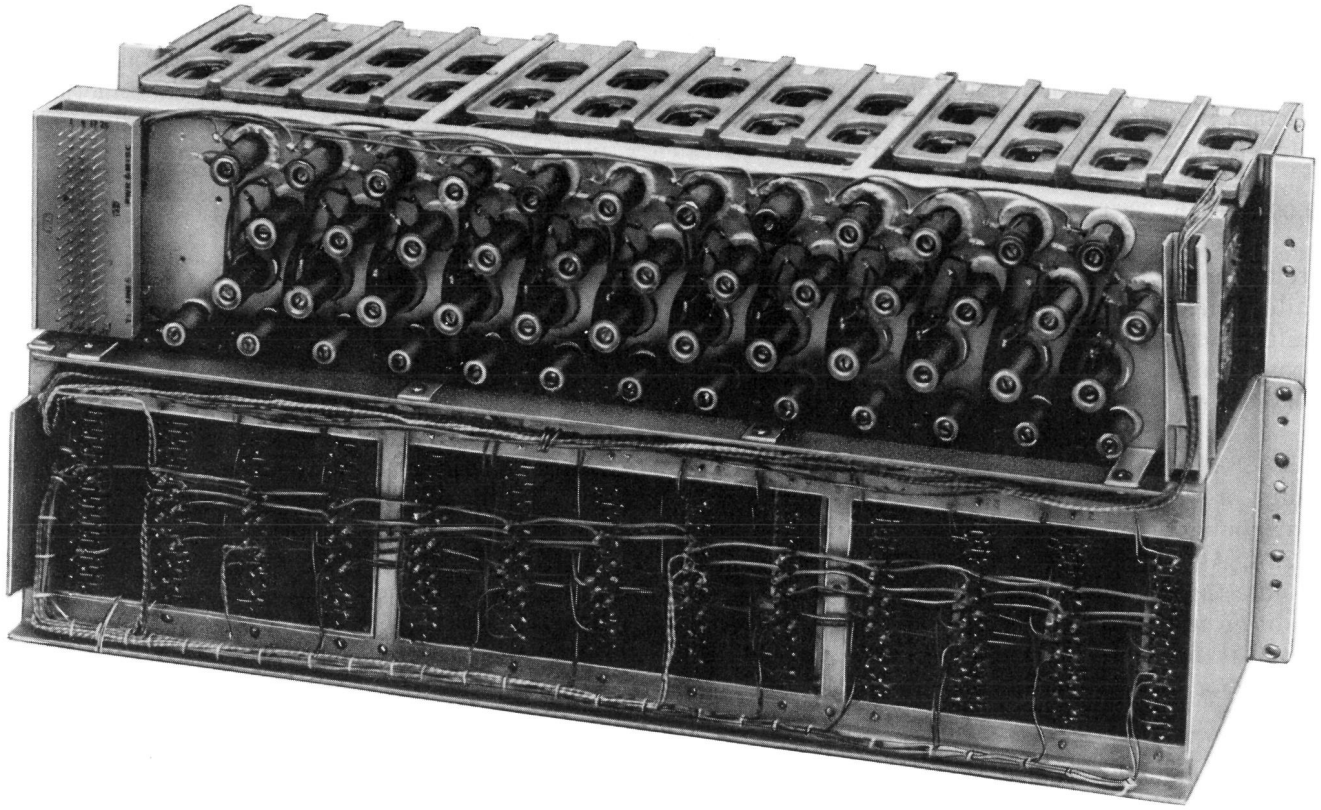


Fig. 6—Span Terminating Module (Rear View) Lower Shelf for 206-Type Repeaters

3.05 ▶There are several versions of the span switch plug-in unit: 302SS01A, B, and C; and 302SS02. The 302SS01A, B, and C are mechanically and electrically interchangeable except for strapping options as shown in Fig. 9. The 302SS02 is for use in subscriber loop carrier (SLC-40) system applications only. Except for a different PCM format, the 302SS02 performs the same function as 302SS01A, B, and C units.◀

3.06 Figure 10 is a front view of the 302RC01 SRC Master. It is a part of an internal telemetry system designed to provide limited reporting and control capability to a maximum of eight SRC Remote units. The system operates over the PL and is designed so that the master unit can receive status indications from and send commands to each remote unit. In any SRC system configuration, there would be only one master unit and it would be located in the office designated as the control point, which is typically a manned office.

3.07 Figure 11 is a front view of the 302RC51 SRC Remote unit. This is the slave unit to the SRC Master described in 3.06. At least one of these units is in each of the unmanned offices to be monitored. The combination of SRC Master and Remote provides a system for reporting the remote office alarms to the master unit. The alarms reported are the span line failure or span line transfer associated with the APS system. Provisions for reporting and controlling one unrelated function exist in each of the remote SRCs. Additionally, the unit provides for remote control of the APS ***reset off*** function when both ends of the maintenance span are equipped with a remote SRC. This capability reduces the maximum number of remote spans included in the SRC system. Locating remote units only at the near-end office of each span permits the SRC system to monitor eight remote spans. Each far-end office equipped reduces this number by one.

3.08 ▶Figure 12 is a front view of the 302TI01 telemetry interface unit. It is basically a

relay unit that connects the per-line alarm signals from the span line plug-in units to a relay closure for an external telemetry system. The particular telemetry system is selected by the user; it is not part of the telemetry interface option.

3.09 Each 302TI01 unit has twelve inputs that report line failures. If a line fails, an output (relay contact closure) is generated for the particular failed line. The twelve inputs provide for reporting failure on up to eleven service lines and one protection line (J98728AA shelf). The 302TI01 also serves for a configuration of two groups of five service lines, each group with one protection line (J98728AB shelf). In the latter case, two 302TI01 units are required per shelf, with only the first six inputs being used on each unit. For the ESTM (J98728AC shelf), one 302TI01 unit is required to handle the thirteen service lines on that shelf. In addition to the twelve regular inputs, an additional input is used which would normally be used for the minor alarm function but not required on the ESTM.◀

C. Repeater Shelf Plug-in Units

3.10 The repeater shelf of the STM or ESTM contains the office repeaters which provide line powering, regeneration, and automatic line build-out as required for T1 operation. The 206- or 236-type repeater is used as the office repeater. Figure 13 shows the front panel controls and indicators of a 206 repeater. Refer to Section 365-200-101 for the general description and details of operation of the 206- and 236-type repeaters.

D. Functional Diagram of J98728AA Span Terminating Module

3.11 Figure 14 illustrates the interconnection of the plug-in units that can be installed in the J98728AA STM and the external connections required in normal system operation. This STM provides the 1×11 protection group.

3.12 Figure 14 shows the T1 signal flow from the main distributing frame (MDF), or equivalent, through the repeater shelf, through the APS shelf, normalled through the jack field of the APS shelf and terminated on the terminal strip associated with the jack field. This terminal strip is provided for cross-connection to terminal equipment (such as D3 banks) or to other DS-1 signals. Use of the SRC plug-in units within the protection line is illustrated and it should be noted that use of this line as a protection or maintenance line for the SLs has priority over the SRC function. If the PL switches in place of a failed line, SRC is available only to the nearest end of the section in which the failure occurs. (Refer to Section 365-250-110.) Each half of the repeater shelf is provided with its own fault-locating collector pair, as shown, and both must be connected to the fault-locating panel if the office repeaters in this STM are included in the fault-location system. Repeater position 13 is provided with the termination and powering required for a bridging repeater.

3.13 Figure 14 illustrates the use of two sources of power that divide the STM plug-in equipment into two groups. These sources are identified with the odd- and even-numbered repeater positions. Repeaters and their corresponding hard-wired APS slots are on the same power source. This arrangement is sometimes referred to as the "odd" and "even" groupings of T1 lines and minimizes the effect of a blown main or feeder fuse. The SRC plug-in unit is powered from power bus A and the ALM and TLM plug-ins are powered from power bus B. Dual connectors are used in the SRC/TLM slot for either the SRC or TLM plug-in. T1 span line powering is accomplished using the two power sources and the concept of odd- and even-numbered lines.

3.14 The flexibility of obtaining four different voltage magnitudes is provided to accommodate the varying lengths of span lines. However, the selected voltages would be applied to all T1 lines within the 1 × 11 PG since PGs are arranged in a maintenance span in which all lines would be the same length (Section 365-010-110). Powering flexibility is obtained by using options provided within the proper code of office repeaters and on the terminal strip on the rear of the STM (Section 365-224-600). Operation using 48 volts is obtained by selecting the 206H or L repeater and proper option selection that returns the -48 volt source to GRD. Operation using 130 volts is obtained by selecting the 206J or M repeater and proper option selection that returns the +130 volt source to GRD. Operation using 178 volts is obtained by selecting the 206J or M repeater and proper option selection that returns the +130 volt source to the -48 volt source on the same power bus. Operation using 260 volts is obtained by selecting the 206J or M repeater and proper option selection that

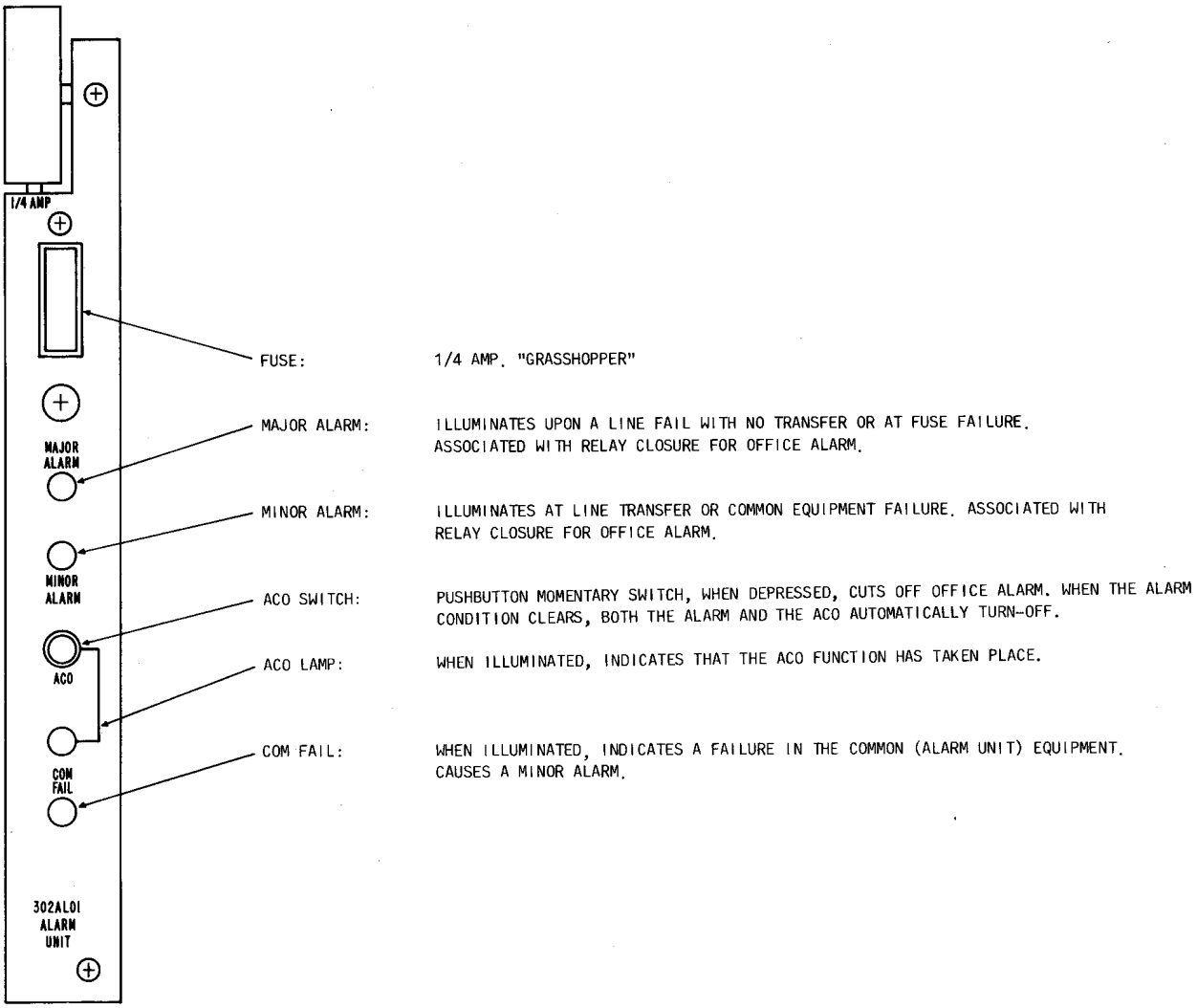


Fig. 7—302AL01 Alarm Plug-in Unit, Front Panel Controls and Indicators

returns the +130 volt source to the -130 volt source on the same power bus.

> ***Note:*** An equivalent powering flexibility can be obtained by selecting the proper codes of 236-type office repeaters from Table A of 365-200-101.

E. Functional Diagram of J98728AB Span Terminating Module

3.15 Figure 15 illustrates the interconnection of the plug-in units that can be installed in the J98728AB STM and the external connections required in normal system operation. This STM provides two 1 × 5 PGs as illustrated in the diagram. (Note the provision for two protection lines and associated SRC/TLM plug-in units). The protection groups are designated PG-L and PG-R. The switching action of the APS for each group is independent of the other and each group can be a part of different maintenance spans (Section 365-010-110). Each SRC/TLM position and associated protection line is used for monitoring and control of only the five service lines within the protection group.

3.16 Figure 15 shows the T1 signal flow for both PGs as flowing from the MDF, or equivalent, through the repeater shelf, through the APS shelf, normalled through the jack field of the APS shelf, and terminated on the terminal strip associated

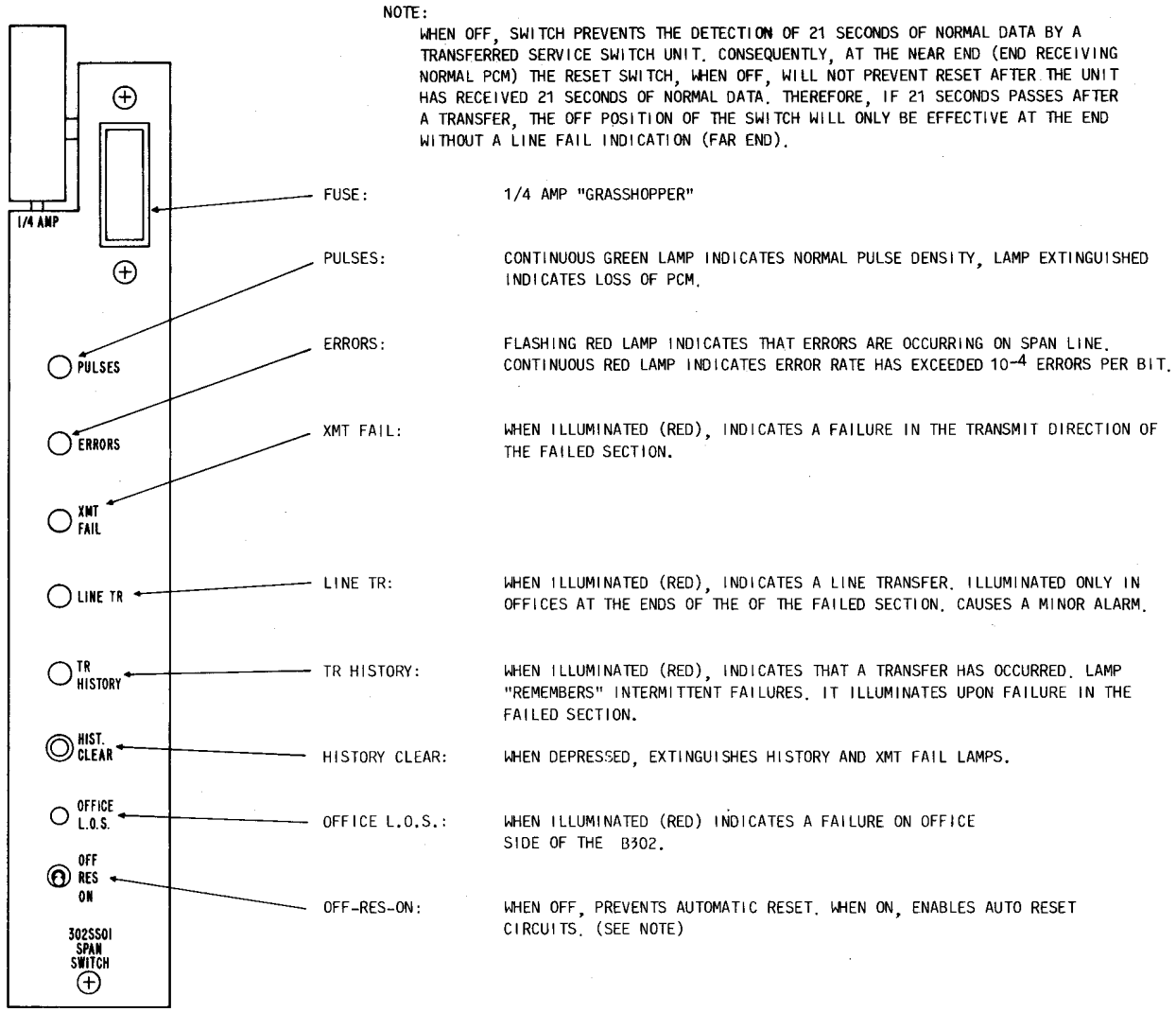
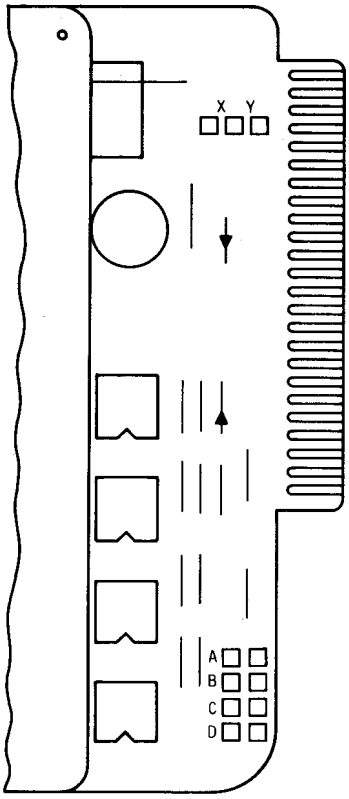


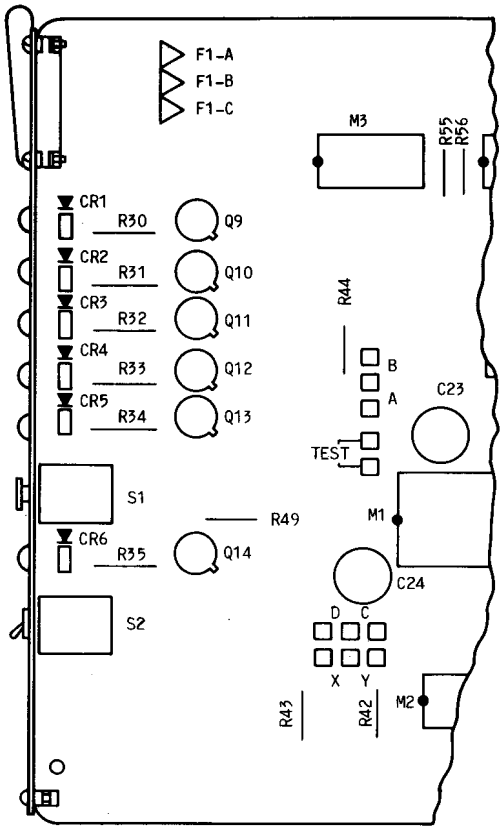
Fig. 8—302SS01 Span Switch Unit, Front Panel Controls and Indicators

with the jack field. This terminal strip is provided for cross-connection to terminal equipment (such as D3 banks) or to other DS-1 signals. Use of the SRC plug-in units within either PL is illustrated, and it should be noted that use of this line as a protection or maintenance line for the associated SLs has priority over the SRC function. If the PL switches in place of a failed line, SRC is available only to the nearest end of the section in which the failure occurs (refer to Section 365-250-110). Each half of the repeater shelf is provided with its own fault-locating collector pair, as shown, and both must be connected to the fault-locating panel if the office repeaters in this STM are included in the fault-location system. Repeater position 13 is provided with the termination and powering required for a bridging repeater.

3.17 Figure 15 illustrates the use of two sources of power that divide the STM plug-in equipment into two groups. These sources are identified with the odd- and even-numbered repeater positions. Repeaters and their corresponding hard-wired APS slots are on the same power source. This arrangement is sometimes referred to as the "odd" and "even" groupings of T1 lines and minimizes the effect of a blown main or feeder fuse. The PG-R SRC and PG-L SRC are powered from power bus A. Both the TLM plug-in unit and the ALM are powered from power bus B.



302SS01A AND 302SS02

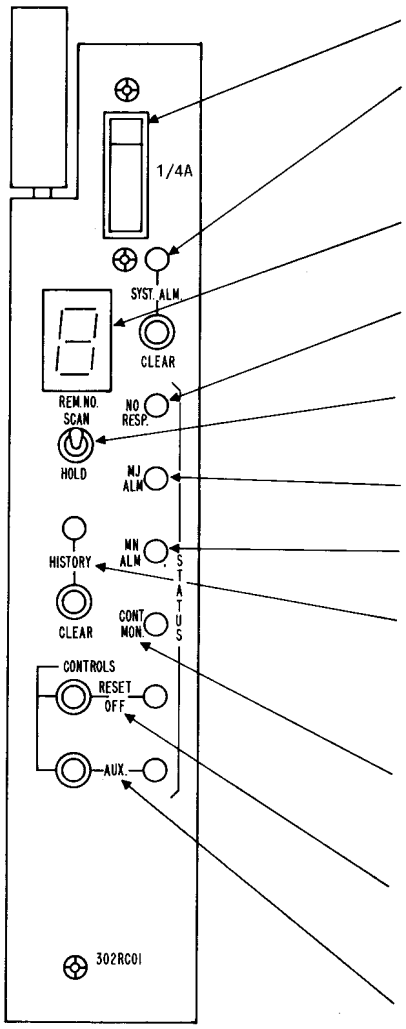


302SS01B AND 302SS01C

NOTES:

1. OPTIONS FOR 302SS01A AND 302SS02
   X PERMITS FAULT-LOCATE LOOPING
   Y INHIBITS FAULT-LOCATE LOOPING
   A SELECTS BIPOLAR VIOLATION RATE OF 10^{-3} (NOT USED)
   B SELECTS BIPOLAR VIOLATION RATE OF 10^{-4} (VOICE)
   C SELECTS BIPOLAR VIOLATION RATE OF 10^{-5} (NOT USED)
   D SELECTS BIPOLAR VIOLATION RATE OF 10^{-6} (DATA)
   P SELECTS RESET THRESHOLD FOR 10^{-4} BIPOLAR VIOLATION RATE
   Q SELECTS RESET THRESHOLD FOR 10^{-6} BIPOLAR VIOLATION RATE
2. OPTIONS P AND Q ARE LOCATED BETWEEN THE TWO BOARDS, TO SELECT THE P OR Q OPTION; REMOVE THE THREE SCREWS, BACK THE SHORTER BOARD OUT, AND SEPARATE THE BOARDS TO EXPOSE THE P AND Q OPTIONS. REVERSE THE PROCEDURE TO REASSEMBLE THE PLUG-IN.
3. OPTIONS FOR 302SS01B AND 302SS01C
   X PERMITS FAULT-LOCATE LOOPING
   Y INHIBITS FAULT-LOCATE LOOPING
   B&D SELECTS BIPOLAR VIOLATION RATE OF 10^{-3} (NOT USED)
   A&D SELECTS BIPOLAR VIOLATION RATE OF 10^{-4} (VOICE)
   B&C SELECTS BIPOLAR VIOLATION RATE OF 10^{-5} (NOT USED)
   A&C SELECTS BIPOLAR VIOLATION RATE OF 10^{-6} (DATA)
   P&Q ARE NOT AVAILABLE

Fig. 9—APS Options on Span Switch Units

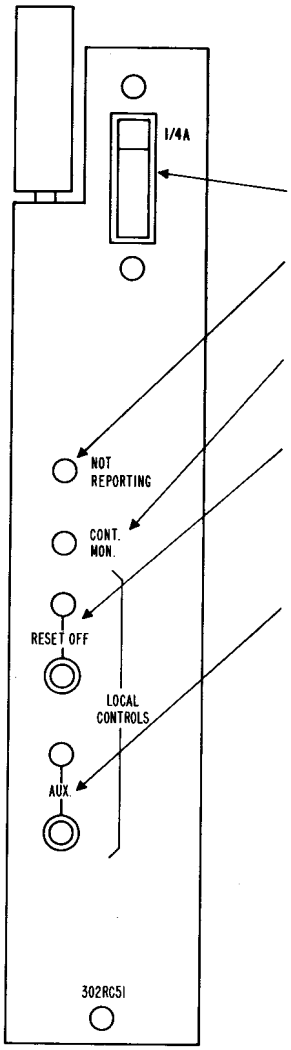


FUSE:	1/4 AMP "GRASSHOPPER"
SYS ALM:	SYSTEM MONITOR FOR THE FOUR STATUS LIGHTS (NO RESP., MJ ALM, MN ALM, CONT. MON). LIGHT COMES ON AND BLINKS FOR 30 SECONDS AFTER ANY OF THE ALARMS REPORT FROM ANY SRC-REMOTE WHEN THE SRC-MASTER IS AUTOMATICALLY SCANNING. LIGHT STAYS ON CONSTANTLY UNTIL ITS "CLEAR" BUTTON IS PUSHED.
REM. NO.:	INDICATES SRC-REMOTE UNIT BEING INTERROGATED. LIGHTS IN "STATUS" SECTION ARE CONTROLLED BY SRC-REMOTE UNIT BEING INTERROGATED.
NO RESP.	LIGHT COMES ON WHEN THE UNIT RECEIVES NO RESPONSE OF EITHER MJ ALM, MN ALM, CONT. MON., OR AN "OK" INDICATION FROM INTERROGATED SRC-REMOTE.
SCAN/HOLD:	AUTOMATIC SCAN FOR INTERROGATING SRC-REMOTES WITH FACILITY FOR STOPPING ON SELECTED REMOTE BY DEPRESSING SWITCH.
MJ ALM:	SRC-REMOTE MAJOR ALARM AS DETERMINED BY APS.
MN ALM:	SRC-REMOTE MINOR ALARM AS DETERMINED BY APS.
HISTORY/CLEAR:	LIGHT HARDWIRED TO THE FOUR STATUS LIGHTS (NO RESP., MJ ALM, MN ALM, CONT. MON.) AND IS RESPONSIVE ON AN INDIVIDUAL SPAN BASIS. LIGHT COMES ON DURING THE INTERROGATION INTERVAL FOR A PARTICULAR SPAN THAT REPORTS AN ALARM AND CONTINUES TO RESPOND DURING THIS INTERVAL FOR THAT SPAN, REGARDLESS OF WHETHER OR NOT THE ALARM REMAINS, UNTIL THE "CLEAR" SWITCH IS PUSHED.
CONT. MON.:	THIS INDICATOR MONITORS THE STATUS OF A SET OF CONTACTS IN THE REMOTE LOCATION THAT ARE SENSING A DESIRED LOCAL ALARM FUNCTION (SUCH AS SMOKE ALARM, ENTRANCE PENETRATION, ETC.)
RESET OFF:	DISPLAYS STATUS OF IDENTICAL INDICATOR ON A SRC-REMOTE (FIG. 10) INTERROGATED. PUSHBUTTON REVERSES SWITCH ON REMOTE UNIT WHEN ASSOCIATED SPAN SWITCH UNIT IS IN AUTOMATIC MODE (FIG. 7).
AUX:	DISPLAYS STATUS OF IDENTICAL INDICATOR ON A SRC-REMOTE (FIG. 10) INTERROGATED. PUSHBUTTON REVERSES SWITCH (CONTACT PAIR) ON REMOTE UNIT WHEN ASSOCIATED SPAN SWITCH UNIT IS IN AUTOMATIC MODE (FIG. 7). WHEN SRC'S ARE USED AT BOTH ENDS OF THE REMOTE APS MAINTENANCE SPAN THIS CONTROL WOULD NORMALLY BE TRANSFER OFF.

Fig. 10—302RC01 Status Reporting and Control Master Unit (SRC Master), Front Panel Controls and Indicators

3.18 Four voltage magnitudes are provided for span line powering. The selected voltage is applied to all T1 lines within a 1 × 5 PG since each PG can be assigned to a different maintenance span in which all powering loops would be the same length (Section 365-010-110). The span line powering magnitude can be the same or different for each of the PGs within the STM. Powering flexibility is obtained by utilizing options provided within the proper code of office repeaters and on the terminal strip on the rear of the STM (refer to Section 365-224-600). Operation using 48 volts is obtained by selecting the 206H or L repeater and proper option selection that returns the -48 volt source to GRD. Operation using 130 volts is obtained by selecting the 206J or M repeater and proper option selection that returns the +130 volt source to GRD. Operation using 178 volts is obtained by selecting the 206J or M repeater and proper option selection that returns the +130 volt source to the -48 volt source on the same power bus. Operation using 260 volts is obtained by selecting the 206J or M repeater and proper option selection that returns the +130 volt source to the -130 volt source on the same power bus.

Note: An equivalent powering flexibility can be obtained by selecting the proper codes



FUSE: 1/4 AMP. "GRASSHOPPER"

NOT REPORTING: LAMP COMES ON WHEN UNIT IS NOT BEING INTERROGATED AT LEAST ONCE EVERY 30 SECONDS. (IN AUTO MODE, UNIT IS NORMALLY INTERROGATED ONCE EVERY 20 SECONDS).

CONT. MON.: THIS LAMP MONITORS A SET OF SWITCH CONTACTS THAT SENSE A LOCAL ALARM FUNCTION THAT IS ASSIGNABLE AS DESIRED.

RESET OFF: APS FUNCTION THAT MAY BE REMOTELY CONTROLLED BY THE SRC-RESET (ON/OFF) AS DEFINED IN SECTION 365-250-110. OPERATION IS BY PUSHBUTTON LOCALLY OR RECEPTION OF THE CORRECT COMMAND AND FROM AN SRC-MASTER UNIT, AND IS INDICATED BY A READOUT ON THE SRC-REMOTE WHICH LIGHTS FOR ABNORMAL CONDITION (FUNCTION OFF). RESET ON/OFF CONTROL ON ASSOCIATED SPAN SWITCH UNIT MUST BE ON (FIG. 8).

AUX: MONITORS AND CONTROLS A SET OF SWITCH CONTACTS. OPTION SELECTION ON THE SRC CARD PROVIDES FOR INCORPORATION OF THIS CONTROL WITH A SIMILAR CONTROL AT FAR APS SPAN, AND TO ESTABLISH THE "TRANSFER OFF" FUNCTION FOR A MAINTENANCE SPAN. WHEN "TRANSFER OFF" FUNCTION IS NOT DESIRED OR 302RC51'S ARE NOT INSTALLED AT BOTH ENDS, THE SWITCH CONTACTS MAY BE USED TO MONITOR A DESIRED LOCAL ALARM FUNCTION.

Fig. 11—302RC51 Status Reporting and Control Remote Unit (SRC Remote), Front Panel Controls and Indicators

of 236-type office repeaters from Table A of Section 365-200-101.

F. Functional Diagram of J98728AC Expansion Span Terminating Module

3.19 Figure 16 illustrates the interconnection of the plug-in units that may be installed in the J98728AC ESTM and the external connections required in normal system operation. This ESTM provides one 0 × 13 protection group in the form of an expansion module. All 13 plug-in units are SLs. The module is wired so that it can be plugged into a J98728AA STM to expand its 1 × 11 capacity to 1 × 24. The function of the J98728AC ESTM is similar to the J98728AA as described in 3.12 through 3.14.

4. POWER DISSIPATION AND CURRENT DRAIN REQUIREMENTS

4.01 A fully equipped APS shelf in either the J98728AA or J98728AB span terminating module, or J98728AC ESTM, will dissipate approximately 120 watts of power. This power is obtained from the -48 volt (nominal) source at approximately 170 mA per T1 line (2.5A per shelf maximum).

4.02 A fully equipped STM office repeater shelf requires about 20 watts of power for the thirteen 206-type office repeaters. This is based

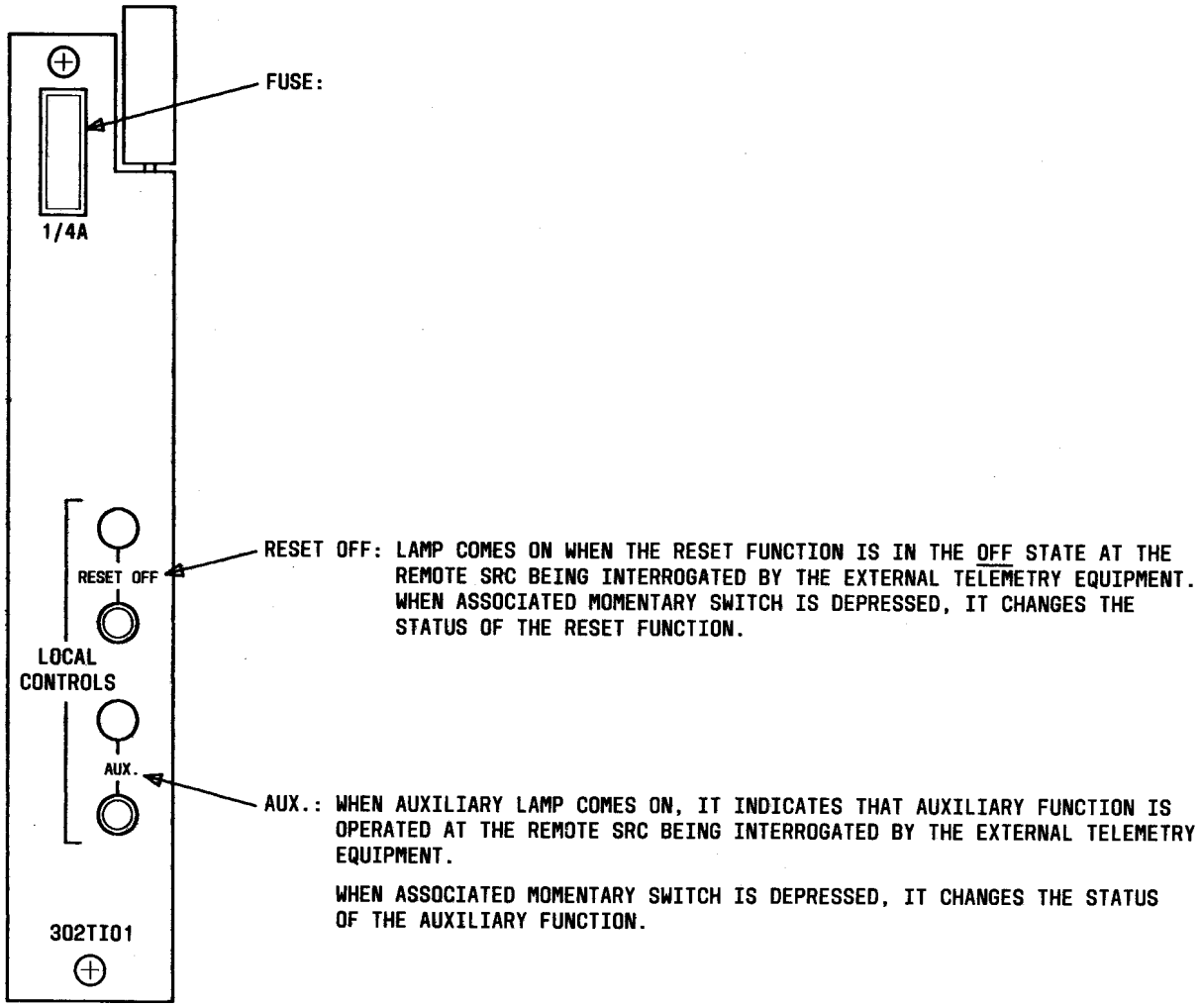


Fig. 12—302TI01 Telemetry Interface, Front Panel Controls and Indicators

on a repeater voltage drop of approximately 10.6 volts for each repeater at a constant current of 140 mA. When low-power 236-type office repeaters are used, about 5 watts of power are required. This is based on a repeater voltage drop of approximately 6.8 volts and a constant current of 60 mA. The dissipation resistors at the rear of the shelf will dissipate heat, dependent upon the length of the powering loop and the source voltage. Office repeaters powered independently from the line can generate another source of heat. In the worst cases, total dissipations over 200 watts can be generated by the repeater shelf. Independent (-48 volt) powering of the office repeaters is not recommended except when the voltage requirement for the line makes it necessary.

5. INITIAL TESTS

5.01 The span terminating modules provide the framework for integrating the functions of a variety of plug-in units. Initial tests for the modules consist of verifying the required power inputs and continuity testing to the individual jack connectors. Signal path continuity and protection switching action is verified per appropriate Bell System Practices for each application. The turnup

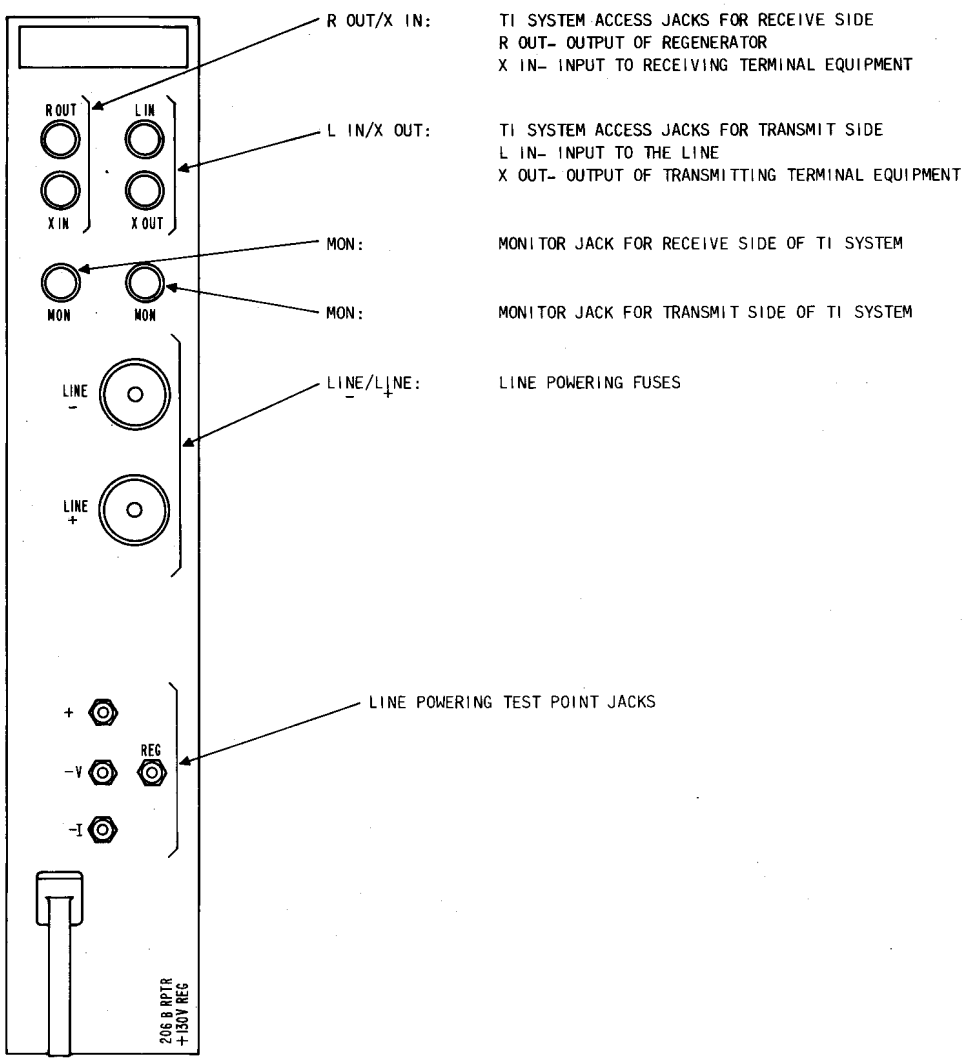


Fig. 13—206-Type Repeater, Front Panel Controls and Indicators

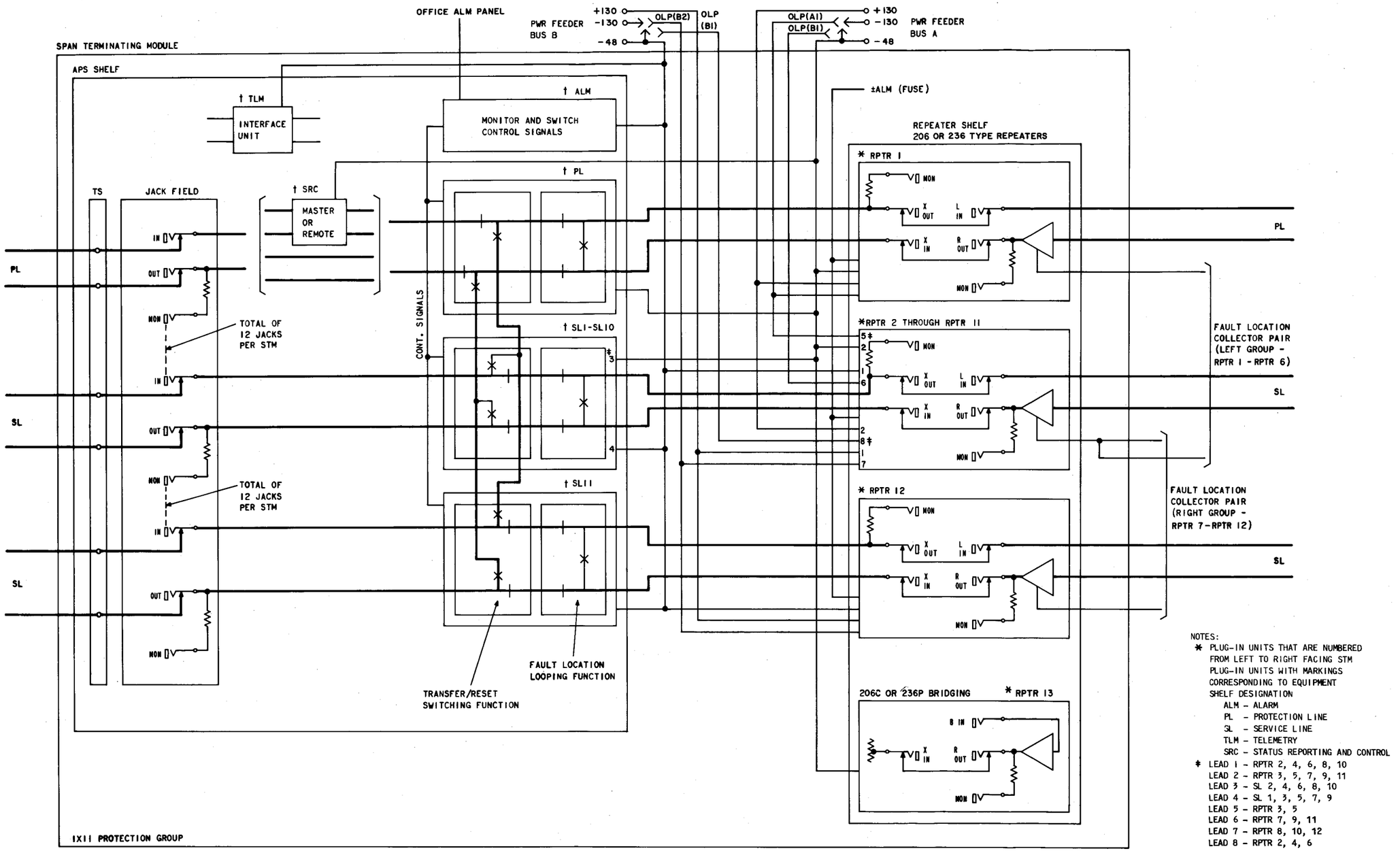
tests for the T1/OS application are provided in Section 365-224-600.

6. MAINTENANCE

6.01 Maintenance requirements for the span terminating modules are provided in appropriate Bell System Practices for each application. The maintenance considerations and tests for the T1/OS application are provided in Section 365-200-410.

7. REFERENCES (NOT ATTACHED)

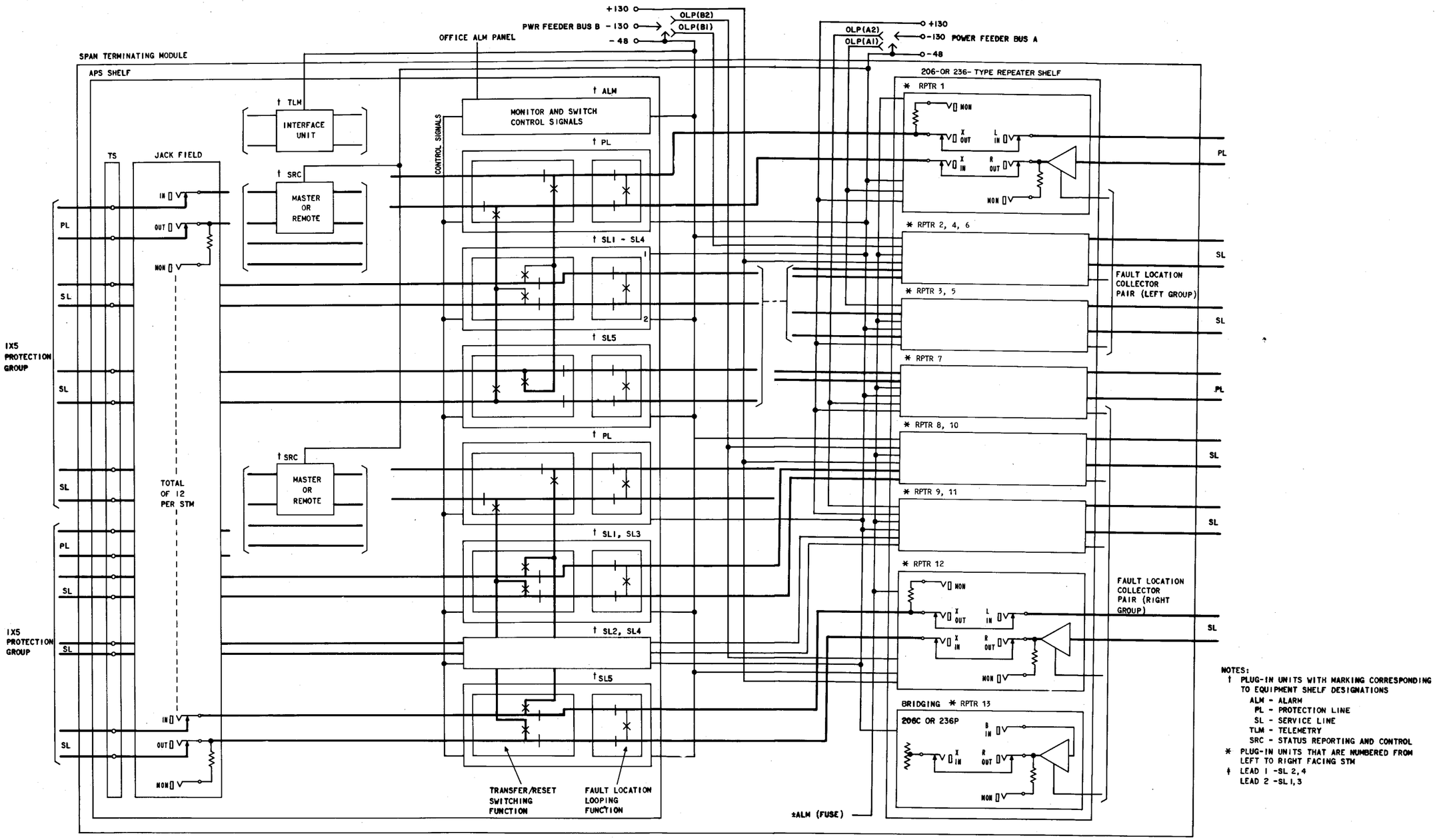
7.01 SD-1C597-01
CD-1C597-01
SD-97095-02
CD-97095-02
Section 365-250-110
Section 365-224-600
Section 365-200-410
Section 365-200-101



NOTES:
* PLUG-IN UNITS THAT ARE NUMBERED FROM LEFT TO RIGHT FACING STM PLUG-IN UNITS WITH MARKINGS CORRESPONDING TO EQUIPMENT SHELF DESIGNATION
  - ALM - ALARM
  - PL - PROTECTION LINE
  - SL - SERVICE LINE
  - TLM - TELEMETRY
  - SRC - STATUS REPORTING AND CONTROL

‡ LEAD 1 - RPTR 2, 4, 6, 8, 10
LEAD 2 - RPTR 3, 5, 7, 9, 11
LEAD 3 - SL 2, 4, 6, 8, 10
LEAD 4 - SL 1, 3, 5, 7, 9
LEAD 5 - RPTR 3, 5
LEAD 6 - RPTR 7, 9, 11
LEAD 7 - RPTR 8, 10, 12
LEAD 8 - RPTR 2, 4, 6

Fig. 14—Functional Diagram of J98728AA Span Terminating Module



NOTES:
† PLUG-IN UNITS WITH MARKING CORRESPONDING TO EQUIPMENT SHELF DESIGNATIONS
ALM - ALARM
PL - PROTECTION LINE
SL - SERVICE LINE
TLM - TELEMETRY
SRC - STATUS REPORTING AND CONTROL
* PLUG-IN UNITS THAT ARE NUMBERED FROM LEFT TO RIGHT FACING STM
ǂ LEAD 1 -SL 2,4
LEAD 2 -SL 1,3

Fig. 15—Functional Diagram of J98728AB Span Terminating Module

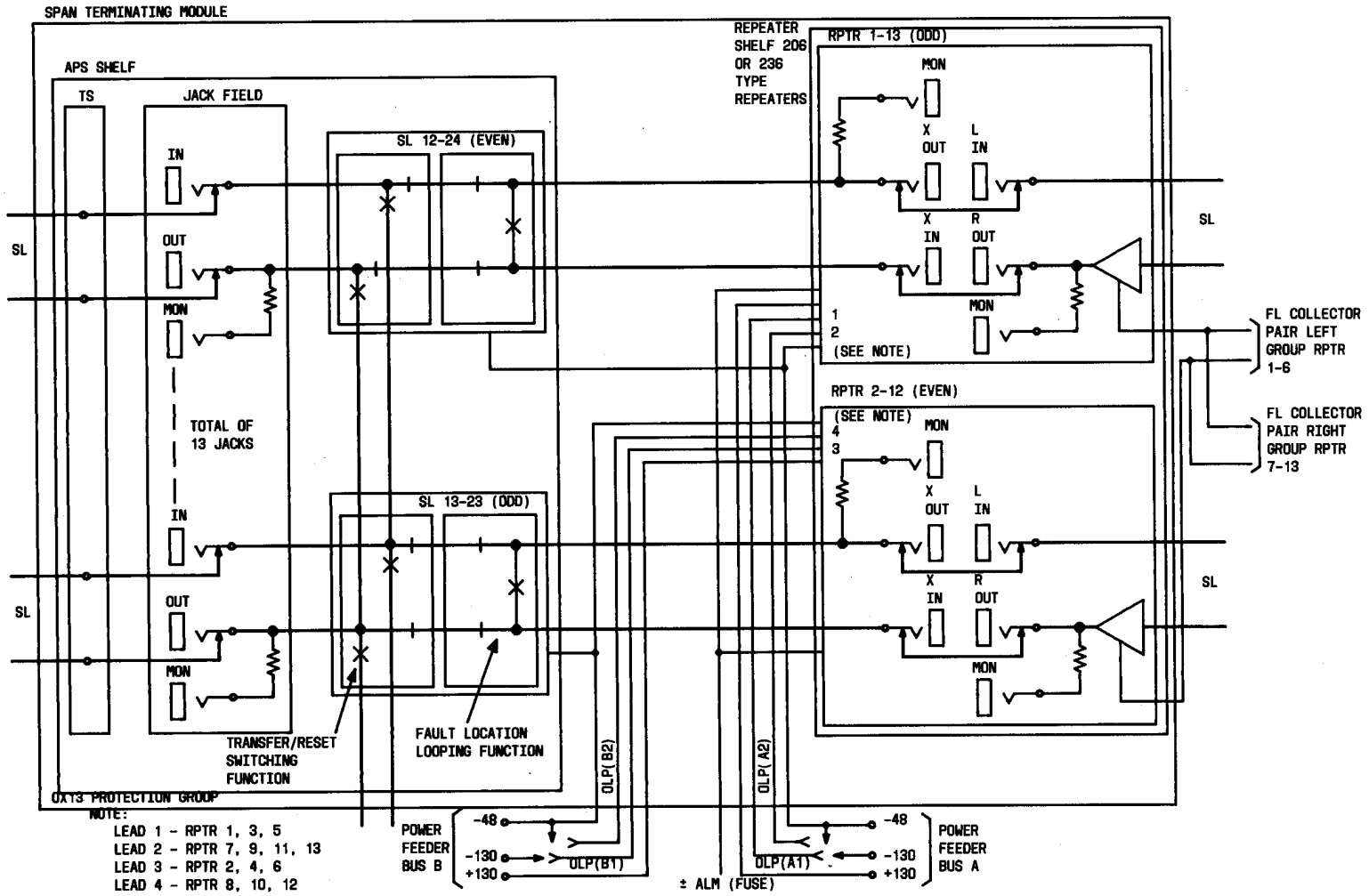


Fig. 16—Functional Diagram of J98728AC Expansion Span Terminating Module