T1 DATA MULTIPLEXER
DESCRIPTION
DIGITAL DATA SYSTEM

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1. GENERAL

1.01 This practice describes the T1DM (T1 data multiplexer).

1.02 This practice is reissued to include information on the new secondary channel HL216 sync circuit pack which does not replace but reduces the demand for the HL16B. Revision arrows are used to emphasize the more significant changes.

1.03 Figure 1 illustrates the relative position of the T1DM with respect to the subrate and transmission facilities. The subrate facilities connect to the T1DM through either the 64-kb/s DSX-0B (digital signal cross-connect) or the M-JCP (multiplexer jack and connector panel). The transmission facilities connect to the T1DM through the T1 ASU (automatic standby unit) and either the 1.544-Mb/s DSX-1 or the ORB (office repeater bay). Clock signals are provided to the T1DM by either the BCPA (bay clock, power, and alarm) circuit or the LTS (local timing supply).

1.04 The T1DM synchronous time division multiplexes 64-kb/s (DS-0B) data into a 1.544-Mb/s (DS-1) signal, and synchronous time division demultiplexes a 1.544-Mb/s (DS-1) signal into 64-kb/s (DS-0B) data. DS-0B data contains information at one of the following subscriber rates: 2.4, 4.8, 9.6, or 56 kb/s. A DS-0B signal contains data from a maximum of one 56-kb/s, five 9.6-kb/s, ten 4.8-kb/s, or twenty 2.4-kb/s customers.

1.05 The T1DM may be used in the DTSS (Digital Transmission Surveillance System). The DTSS is designed to provide statistical performance information of T1 data multiplex facilities and to aid in the maintenance of these facilities as they are used in the DDS (Digital Data System). The DTSS utilizes newly designed circuit packs HL16B and HL95 in existing T1DMs which are linked to a central minicomputer. The DTSS does not interfere with the normal service provided by the T1DM. The usual and customary service of a T1DM has priority over the DTSS when restoring a failed T1DM to service.

2. FUNCTIONAL DESCRIPTION

2.01 The inputs to the T1DM from the DSX-0B or the M-JCP are 64-kb/s bipolar signals arranged in 8-bit groups called bytes (Fig. 2). The eighth bit in each byte is reserved for network control. The other seven bits give a maximum subscriber data rate of 56 kb/s in each byte. Subscriber subrates of 2.4, 4.8, or 9.6 kb/s use bits 2 through 7 for data; the first bit for synchronization; and the eighth bit for control.

2.02 The T1DM converts twenty-three 8-bit, 64-kb/s bytes at its input into a serial bitstream and adds nine bits for synchronization to form a 193-bit frame (Fig. 3). The frame repeats 8000 times a second, generating a 1.544-Mb/s (DS-1) output bitstream which is transmitted over a T1 line or a long-haul facility.

2.03 Bit clock (64 kHz) and byte clock (8 kHz) reference signals are generated by the office timing supply (local, secondary, or nodal). These clocks provide common reference signals for the synchronous operation of all DDS equipment in an office. They are supplied to the T1DM by either the BCPA circuit or the LTS.

2.04 A spare T1DM, which is used to replace a faulty T1DM, is bridged across the T1DMs installed in the bay (Fig. 1).

2.05 A T1DM-PM (T1DM performance monitor) continuously monitors the performance of a maximum of 16 T1DMs, including the spare. If a T1DM fails, the T1DM-PM automatically replaces it with the spare T1DM and generates signals that are transmitted to the BCPA circuit for alarm actuation.

2.06 The T1DM output bitstream is normally sent to another T1DM. However, a T1WB4 data-voice multiplexer or a T1WB5 data-voice multiplexer, equipped with a byte framing generator circuit pack (HL77), can transmit data to and receive data from a T1DM. Figure 4 shows the basic requirements of a T1DM working with a T1WB4 or T1WB5 (Practice 314-900-100).

2.07 ▶Bit 1 of the data byte is the subrate framing bit. For those channels which will be allowed to carry the secondary channel, bit 1 will always be a one. This will always occur as a result of the secondary channel assignment/provisioning function. Table A shows the secondary channel assignments for subrate channels within a DS-0B channel. The remaining channels will be limited to standard DDS format where bit 8 is a one. To allow for secondary channel coding, where bits 2 through 8 may be zeros, the zero detector of the HL16 or HL16B must be modified. This modification allows the zero detector to examine bits 1 through 8, where all 8 bits must be zero for zero suppression to occur. The modified HL16 or HL16B is called the HL216. Modification of the T1DM for secondary channel operation requires coordination with the modification of the spare T1DM and the T1DM-PM. Therefore, the HL216 cannot randomly be used to replace the HL16 or HL16B. The modified version of the HL29, designated as the HL29 series 2, is used whenever a T1DM associated with a T1DM-PM is modified with an HL216.◀

3. DETAILED DESCRIPTION

A. Multiplexing

3.01 The twenty-three 8-bit bytes of DS-0B data are clocked into the 64-kb/s port circuits simultaneously by the 64-kHz bit clock. A block diagram of a working T1DM is shown in Fig. 5.

3.02 The 8-kHz byte clock indicates when the eighth bit of the byte has been clocked in.

3.03 The twenty-three 8-bit bytes of DS-0B data are converted from the bipolar to the unipolar format by the port circuits and are then multiplexed with the 8-bit synchronization byte and with the F-bit (Fig. 3) to form a 193-bit DS-1 signal.

3.04 The zero suppression circuit examines each 8-bit byte before it is transmitted to the T1 facility. A byte with all zeros is replaced by the code 0011000. ▶The data word is passed through the shift register for detection of a zero byte (bits 2 through 8 are all zeros for the HL16 and HL16B; bits 1 through 8 are all zeros for the HL216). For the secondary channel HL216, all eight bits are monitored for a zero for zero suppression.◀

3.05 After going through the zero suppression circuits, the DS-1 bitstream is converted from the unipolar format back to the bipolar format in the T1 interface circuit for transmission over a T1 facility.

B. Demultiplexing

3.06 The input signal to the demultiplexer is a DS-1 bipolar bitstream from the T1 facility. The bipolar pulses are converted to unipolar pulses and a 1.544-MHz clock signal is extracted in the T1 interface circuit. This clock is used to enter data into the elastic store.

3.07 Another 1.544-MHz clock, derived from the 8-kHz byte clock of the office timing supply by a voltage-controlled oscillator, is used to read the data out of the elastic store. The elastic store functions as a variable delay unit that allows alignment of the T1 bitstream with the internal T1 clock.

3.08 Since the input signal to the demultiplexer (output of the elastic store) and the output of the multiplexer are in phase, all clocking and counters can be shared by the multiplexing and demultiplexing sections of the T1DM.

3.09 Data is clocked out of the elastic store and into the sync byte and F-bit detector circuits. The F-bit and the eight bits of the sync byte are extracted from the DS-1 signal. If the T1DM is in an out-of-sync state (paragraph 3.13) for more than 300 milliseconds, each of the 23 data bytes (one from each channel) is replaced with a control code (00011010) by the out-of-sync word inserter, signifying to each of the DS-0B channels that the T1DM is in an out-of-sync state.

3.10 If the T1DM is in an in-sync state (paragraph 3.13), data goes through the out-of-sync word inserter unchanged and is clocked into the DS-0B port circuits.

3.11 The 23 data bytes on the DS-1 bitstream are demultiplexed into 23 DS-0B bitstreams in the port circuits. The DS-0B outputs are transmitted to the DSX-0B or the M-JCP at times defined by the 64-kHz office bit clock.

C. Synchronization

3.12 Two separate synchronization patterns are generated by the T1DM. The first pattern consists of bits 185 through 192 that are repeated every frame along with a yellow alarm bit (Y) and a remote signaling bit (R). This 8-bit byte pattern is 10111YR0. The yellow alarm bit (bit 190) informs the remote T1DM that a trouble is present on its outgoing line. The remote signaling bit (bit 191) is used in the DTSS for communications over DS-1 facilities at an 8 kb/s rate. ▶The DTSS requires CP HL16B/HL216 and not CP HL16.◀ The other pattern, a 12-bit pattern (110111001000) that repeats every 12 frames, is the 193rd or F-bit.

3.13 The T1DM is in an in-sync state if both the 6-bit pattern and the F-bit are detected correctly. The T1DM enters an out-of-sync state if more than 3 out of 12 successive frames contain at least one error in the sync byte or the F-bit.

3.14 If the T1DM is in an out-of-sync state for less than 300 milliseconds, the data entering from the T1 facility, which may be invalid, is demultiplexed and transmitted from each of the 23 ports. The T1DM searches only for the 6-bit pattern. If five successive good patterns are detected, the T1DM returns to an in-sync state.

3.15 If the T1DM is in an out-of-sync state for more than 300 milliseconds, the out-of-sync word is transmitted from all ports until the T1DM recovers synchronization (five successive good sync patterns detected).

D. Protection Switching

3.16 If a T1DM hardware failure occurs, the T1DM is switched to a protection spare T1DM by relays on the T1DM transmit switch, receive switch, and control switch circuit packs (Fig. 5). These relays are controlled by the T1DM-PM.

4. EQUIPMENT ARRANGEMENTS

A. Shelf Arrangements

4.01 The single-shelf T1DM, J70177AD, is assembled on a shelf that measures 23 inches wide, 12 inches deep, and 8-1/2 inches high (Fig. 6 and 7). It consists of a power unit and a maximum of 16 HL-coded circuit packs. Table B lists the circuit packs by HL code number, function, and shelf position.

> *Note:* All control switch circuit packs in one T1DM bay must be the same code, either HL10 or HL90. If the cable lengths from the T1DMs in a bay arrangement to the DSX-1 or ORB are different, each T1DM in that bay arrangement must use an HL90. If the cable lengths are the same, the T1DMs can use either HL10s or HL90s - but not both.

4.02 The 4-shelf T1DM assembly, J70177AE, is assembled on four shelves and measures 23 inches wide, 12 inches deep, and 32-1/2 inches high (Fig. 8 and 9). Figure 10 shows a 4-shelf T1DM assembly arranged for the DTSS. Each T1DM consists of a power unit and a maximum of 16 HL-coded circuit packs (Table B).

4.03 The LTS and T1DM assembly, J70177AG, measures 23 inches wide, 12 inches deep, and 30-1/2 inches high (Fig. 11 and 12). It consists of an LTS, clock and power distribution, alarm circuitry, and two T1DMs. The working T1DM consists of a power unit and a maximum of 16 HL-coded circuit packs (Table B). The spare T1DM contains exactly 15 HL-coded circuit packs. The upper T1DM of an LTS and T1DM assembly is always a spare (Fig. 11).

B. DTSS T1DM Bay Arrangements

4.04 There are six bay arrangements in which the T1DM can be placed (Table C and Fig. 13 through 18). For the DTSS, equipment and bay wiring additions are required to accommodate the surveillance unit in the 11-foot, 6-inch T1DM bay (J70177C, Lists 1, 2, and 3). Lists 4, 5, and 6 of the J70177C bay have the DTSS modification factory installed. The DTSS applications in other T1DM bays (J70177A, J, and F) are being considered for future use.

4.05 In all bay arrangements, the T1DM below the T1DM-PM is designated and wired as the spare T1DM.

Caution: If the T1DM terminates a T1 facility used to derive timing for an office timing supply, the cable length between the timing supply and that T1DM must be limited to 50 feet.

4.06 The T1DMs are connected by cable to different equipment depending on the type of bay arrangement (Table D). Terminal strips and 36- or 50-pin jacks on the rear of the T1DM are used to interconnect between units. Two terminal strips on top of the J70177C bay arrangement are used to connect the T1DM to the T1 facilities (by means of the DSX-1 or the ORB). The T1 facilities are wired directly to the terminal strips on the rear of the T1DM for all other bay arrangements. Detailed cabling information is contained in SD-73078-01 and SD-73087-01.

Warning: Extreme care should be used when HL19 and HL20 are removed from the shelf to avoid damage to adjacent connectors. Neither circuit pack should be removed until all connector-ended cables on the rear of the circuit pack are disconnected.

4.07 Transmit and receive protective bus cables are connected to 50-pin jacks on the transmit switch, HL19, and on the receive switch, HL20. A cord and plug are used to connect HL19 to another 50-pin jack on the T1DM frame.

4.08 There are two T1DM bay arrangements for use in the DTSS: an SU (signaling unit) equipped bay and a non-SU equipped bay. The SU equipped bay requires CP HL95 to be mounted in an otherwise unoccupied card slot at the protection spare T1DM shelf. This bay requires the use of ▶CP HL16B/HL216, and not CP HL16 in all T1DMs. Also, the HL16B/HL216 must be optioned to the microprocessor (position 1). The non-SU equipped bay does not contain CP HL95. This bay may have a mixture of HL16B/HL216 and HL16 CPs. The HL16Bs/HL216s must be optioned to the loop (position 2) for this bay arrangement. A complete description of how these CPs interact with the DTSS is documented in Practice 314-984-200. A general description of the T1DM bay arrangement modification for the secondary channel HL216 is given in paragraph 2.07.◀

5. MAINTENANCE FEATURES

5.01 Visual alarms from the T1DM bay appear on the alarm display panel of the LTS and T1DM assembly or the BCPA circuit. In the J70177A and F bays, the display is part of the LTS and T1DM assembly (J70177AG). In the J70177C and J bays, the display is part of the BCPA shelf. The T1DM can generate three alarm indications. A fuse alarm indicates the possibility of a blown fuse in the T1DM bay. A minor alarm (visual and audible) initiated by the T1DM-PM indicates that a faulty T1DM has been switched to the spare T1DM or that the spare T1DM itself has failed. A major alarm (visual and audible) initiated by the T1DM-PM indicates either a simultaneous spare T1DM failure and T1DM failure or two T1DM failures with one switched to the spare T1DM. A T1DM option, selected at the BCPA circuit, is available to generate a major alarm during T1 facility failures. An ACO (alarm cutoff) switch on the BCPA shelf (HL50) or the LTS (HL50) can be used to silence a major or minor audible alarm. An ACO lamp lights if the ACO switch is operated and goes off when the alarm clears. If the alarm level changes after the ACO switch has been actuated (minor to major), the audible alarm sounds again and can be silenced by operating the ACO switch again.

5.02 In an office equipped with a T1DM-PM and a spare T1DM, the T1DM-PM detects T1DM failures, replaces the first faulty T1DM with the spare T1DM, transmits alarms to the BCPA circuit or the LTS, and generates an alphanumeric character which is displayed on HL15 of each faulty T1DM. Table E lists the characters by priority and status indicated. The T1DM-PM overrides any fault present if a higher priority fault occurs. As an aid to craft personnel, the display on the faulty T1DM flashes. If more than one T1DM fails, the display flashes on only the faulty T1DM replaced by the spare T1DM.

5.03 After a T1DM trouble is cleared, the flashing character changes to an 8 . The repaired T1DM must be manually returned to service by pushing the RESET button on the T1DM-PM.

Caution: The RESET button on the T1DM-PM should not be pushed unless a flashing 8 appears on a T1DM display. The HL34 CP SER III requires the NORMAL/NO ALARM switch to be in the NO ALARM position for resetting.

5.04 In an office not having a T1DM-PM installed, all T1DM faults or T1 facility faults that cause a loss in incoming line synchronization result in a red alarm character being displayed on the T1DM associated with the fault. If the NORM/NO ALM/LOOP switch, also called a mode switch on HL10 or HL90 (Fig. 19) of this T1DM, is set to the LOOP position; the green LOOP lamp is lighted; and the red alarm character changes to a yellow alarm character only if the T1DM is not faulty.

5.05 If a T1DM failure or a T1 facility failure causes the T1DM, T1WB4, or T1WB5 at the far-end of the T1 facility to lose incoming frame sync, the far-end T1DM, T1WB4, or T1WB5 transmits this information to the near-end T1DM where the yellow alarm character is displayed. If the NORM/NO ALM/LOOP switch is set to the LOOP position, the green LOOP lamp is lighted and the yellow alarm character changes to a red alarm character only if the near-end T1DM is faulty.

5.06 The NO ALM position of the NORM/NO ALM/LOOP switch allows the T1DM-PM to monitor the T1DM and to display test results on HL15. Alarms and protection switching are suppressed. If no T1DM trouble is present, the NO ALM character is displayed on the T1DM. The NORM/NO ALM/LOOP switch on HL10 or HL90 should be in the NO ALM position when a T1DM is not turned up for service.

Caution: All customers associated with the T1DM and T1 line will lose service if the T1DM is used as a detection device.

5.07 The NORM/NO ALM/LOOP switch on HL10 or HL90 is normally kept in the NORM position. Operation of this switch to the LOOP position does not affect a working or spare T1DM unless a red or yellow alarm has occurred, except that T1DM-PM generated alarms and protection switching for that T1DM are suppressed.

5.08 The NORM/LC switch on HL10 or HL90 allows the T1DM to be used as a detection device only for troubleshooting of a faulty T1 line.

5.09 If a red or yellow alarm, caused by a faulty T1 line, occurs in a T1DM and if the NORM/NO ALM/LOOP switch is in the LOOP position and the NORM/LC switch is operated, the white LC lamp is lighted. Alarms and switching by the T1DM-PM (if present) are suppressed, alarms to the BCPA shelf or the LTS are held to their previous condition, and all demultiplexer ports transmit the T1DM out-of-sync code into the DSX-0B. The faulty span is identified by looping the T1 line at successively more remote span terminating points and looking for the red alarm character on the T1DM to change to a yellow alarm character.

5.10 The incoming signal of the first T1 facility is normally connected to the spare T1DM by means of the SPARE jack on the T1DM-PM. The incoming or outgoing DS-1 signal of any working T1DM can be connected to the spare T1DM by patching the IN or OUT jacks on the working T1DM to the SPARE jack on the T1DM-PM. In this condition, the spare T1DM demultiplexes the DS-1 signal, which can be monitored with a KS-20908 data test set (digital receiver).

5.11 Several control switch circuit pack (HL10 or HL90) relay contacts are available on terminals to be used for remote status report and alarm systems. A remote signaling channel that uses the 191st bit of the T1 frame is used in the DTSS.

6. POWERING

6.01 The circuitry of the T1DM requires +5 and −12 V dc. These voltages are provided by the 74A or 78A power unit (Fig. 20). The 74A power unit is used with −48 V dc central office battery; the 78A, with −24 V dc central office battery. The relays of the T1DM require −24 V dc battery.

6.02 The power unit and relays of the T1DM are fused separately at either the BCPA shelf or the LTS.

6.03 In the LTS and T1DM assembly (Fig. 11), the LTS receives its power from the T1DM power units. The spare T1DM power unit feeds the B section of the LTS and the working T1DM power unit feeds the A section. Therefore, T1DM power unit failures in this assembly will affect the operation of the LTS.

7. GLOSSARY OF TERMS

7.01 Most of the acronyms and abbreviations (terms) are explained when they are first used in this practice. However, the following list is provided as a quick reference.

TERM	DEFINITION
ACO	Alarm Cutoff
ASU	Automatic Standby Unit
BCPA	Bay Clock, Power, and Alarm
DDS	Digital Data System
DS-0A	Digital Signal - Zero Level - A Signal
DS-0B	Digital Signal - Zero Level - B Signal
DSX-0B	Digital Signal Cross-Connect - Zero Level - B Signal
DTSS	Digital Transmission Surveillance System
LTS	Local Timing Supply
M-JCP	Multiplexer - Jack and Connector Panel
ORB	Office Repeater Bay
SU	Signaling Unit
T1DM	T1 Data Multiplexer
T1DM-PM	T1 Data Multiplexer - Performance Monitor

8. REFERENCES AND ASSOCIATED DRAWINGS

8.01 The following practices provide additional information on the DDS.

PRACTICE	TITLE
314-900-100	Digital Data System — Private Line Service—Overall Description
314-912-300	T1 Data Multiplexer — Maintenance and Troubleshooting — Digital Data System
314-912-500	T1 Data Multiplexer — Tests—Digital Data System
314-913-110	Digital Data System — Nodal Timing Supply—Description
314-913-120	Digital Data System — Local Timing Supply—Description
314-915-100	Digital Data System — T1WB4 Data-Voice Multiplexer — Description
314-915-110	Digital Data System — T1WB5 Data-Voice Multiplexer Local Office Bay — Description
314-916-100	Digital Data System — Bay Clock, Power, and Alarm Circuit — Description
314-983-100	Digital Data System — T1 Data Multiplexer Performance Monitor — Description
314-984-100	Digital Transmission Surveillance System — General Description—Digital Data System
314-984-101	Digital Transmission Surveillance System — Administrative Procedures—Digital Data System
314-984-200	Digital Transmission Surveillance System — Circuit Pack Installation and Test Procedures — Digital Data System
314-984-300	Digital Transmission Surveillance System — Central Processor Operation and Database Management — Digital Data System
314-984-500	Digital Transmission Surveillance System — Overall System Maintenance Requirements and Test Procedures — Digital Data System
880-605-101	Digital Transmission Surveillance System — Engineering Considerations and Design of Surveillance Network — Digital Data System

8.02 The following schematic drawings and circuit descriptions provide more information on the indicated equipment.

NUMBER	TITLE
SD-73078-01 CD-73078-01	T1 Data Multiplexer
SD-73079-01 CD-73079-01	T1 Data Multiplexer Performance Monitor
SD-73082-01 CD-73082-01	Bay Clock, Power, and Alarms Circuit
SD-73084-01 CD-73084-01	Local Timing Supply
SD-73087-01 CD-73087-01	Digital Data System Interconnection and Application

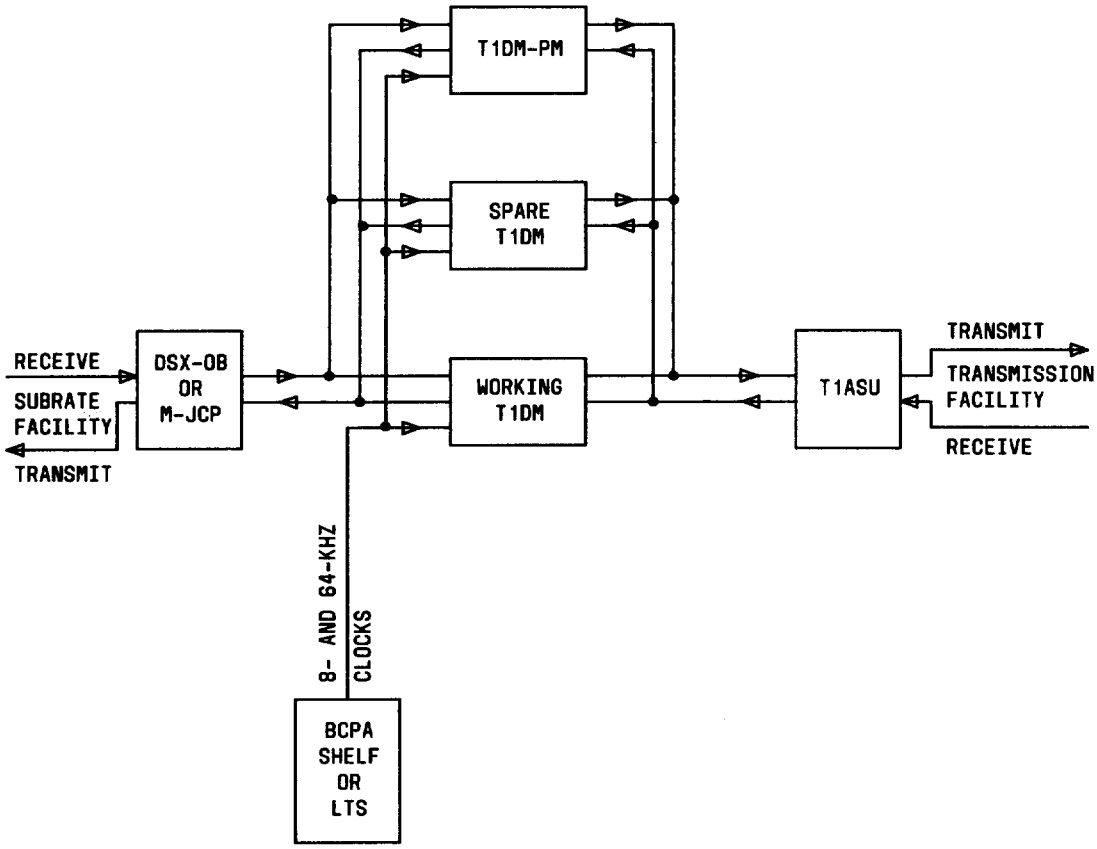


Fig. 1—Block Diagram Showing Interconnection of Working T1DM and Other Equipment

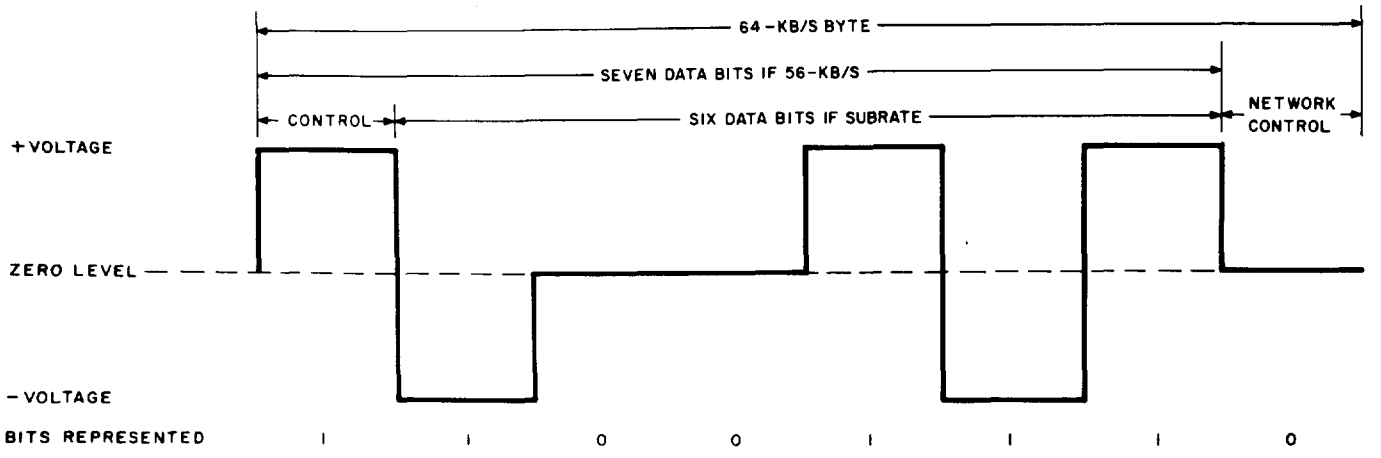


Fig. 2—T1DM 64-kb/s Input Signal Format

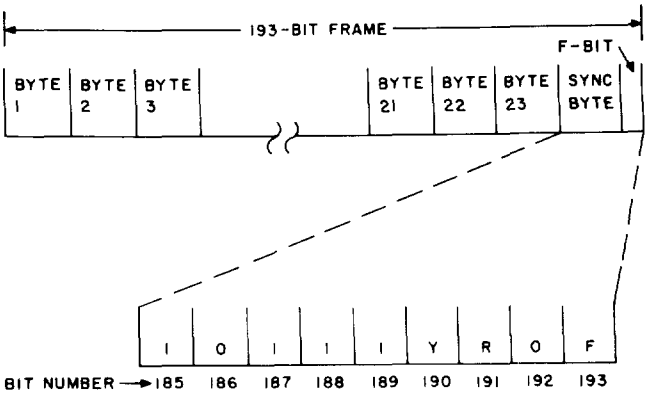


Fig. 3—T1DM Output Signal Format

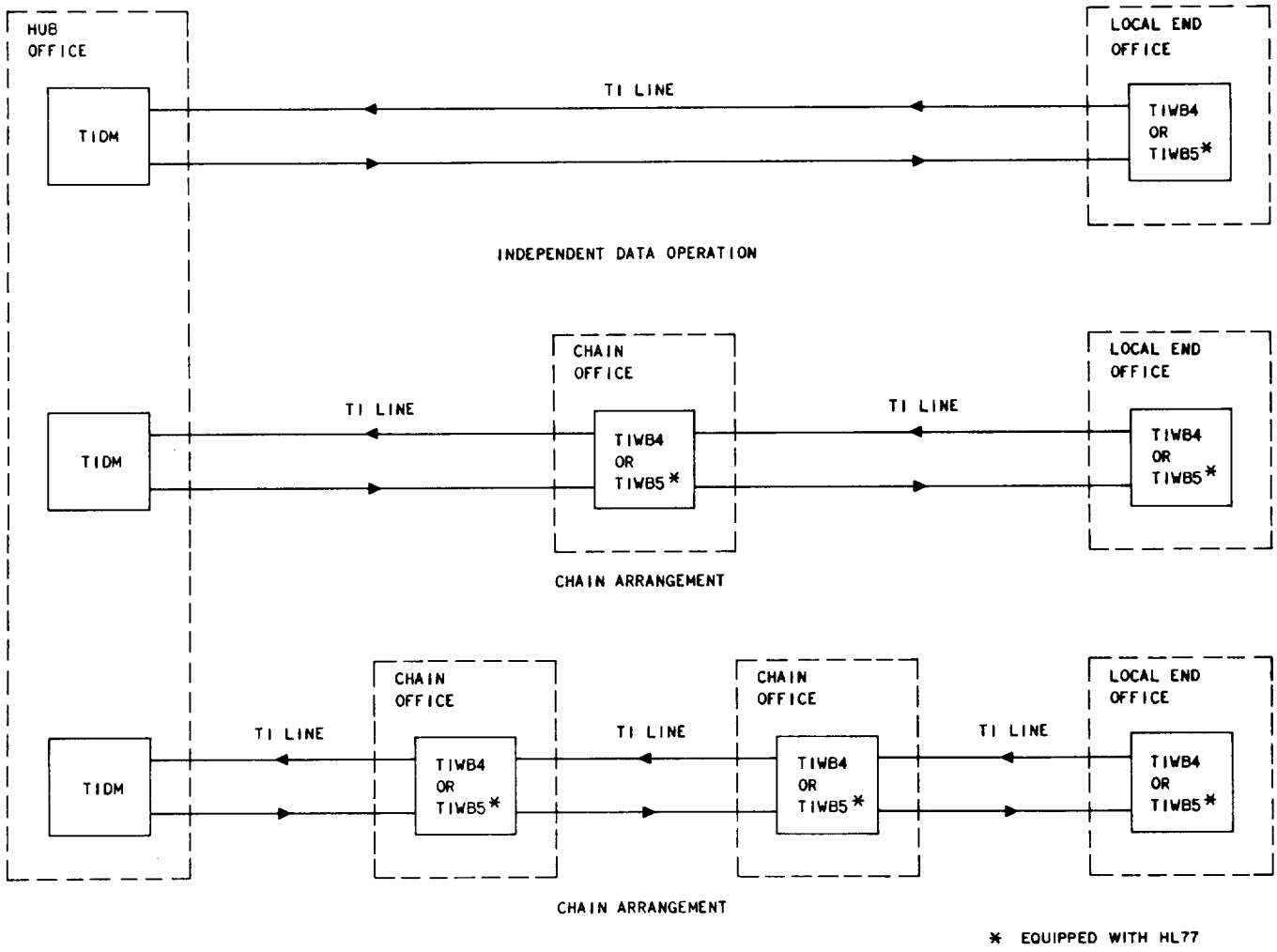


Fig. 4—Arrangements of a T1DM Working with a T1WB4 or T1WB5

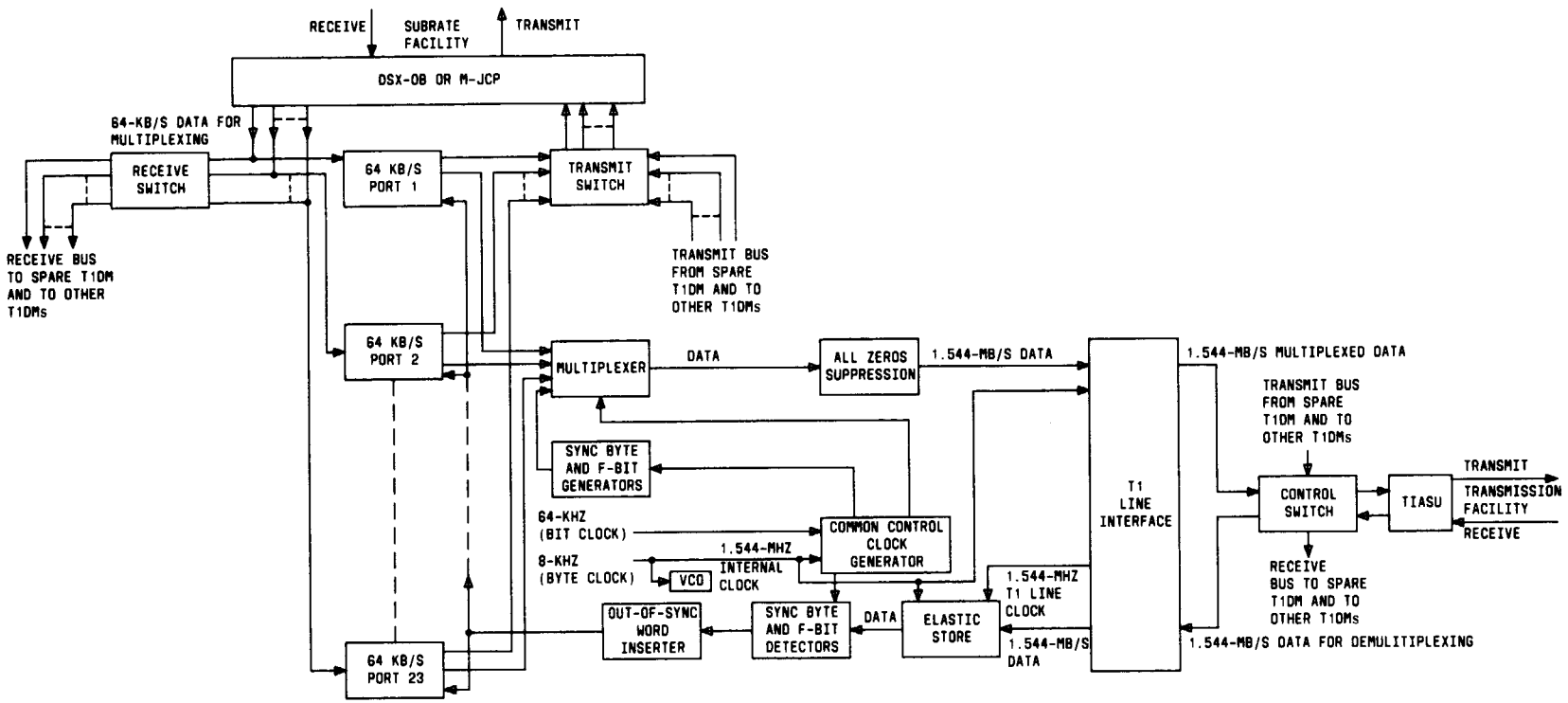
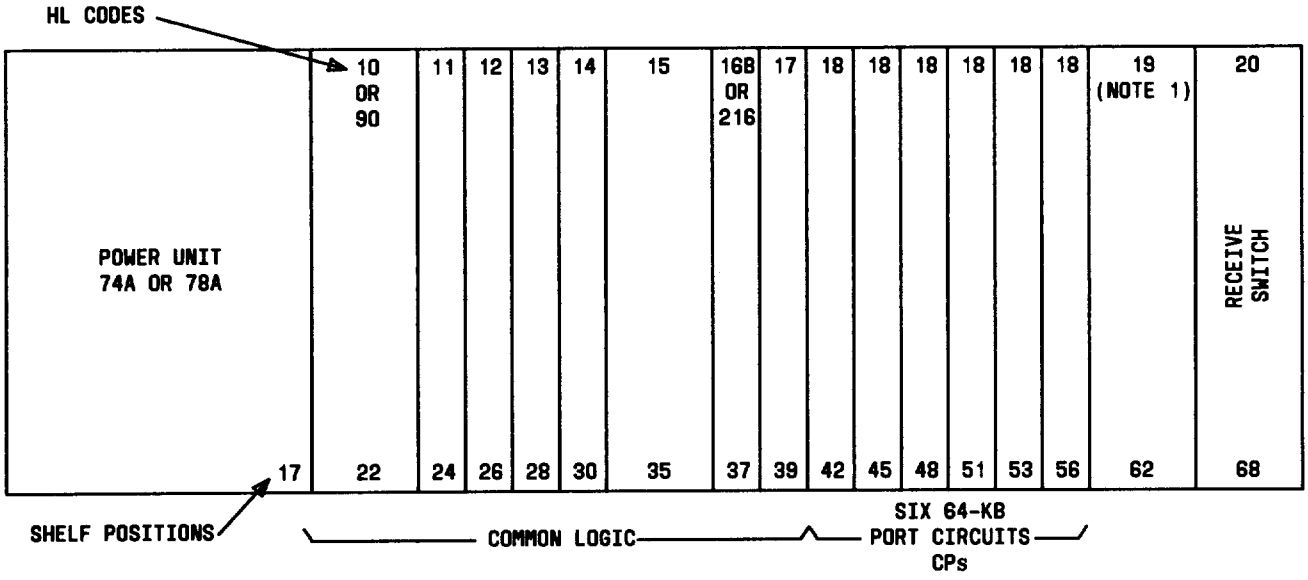


Fig. 5—Block Diagram of a Working T1DM



NOTE:
1. The working T1DMs use HL19. The spare T1DM of a bay does not use HL19.

Fig. 6—Front View of Single-Shelf T1DM (J70177AD)

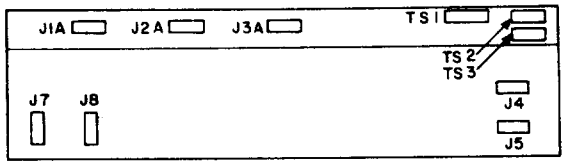


Fig. 7—Rear View of Single-Shelf T1DM (J70177AD)

NOTE:
1. The working T1DMs use HL19. The spare T1DM of a bay does not use HL19. Certain T1DM bays used in DTSS require HL95 in the spare T1DM.

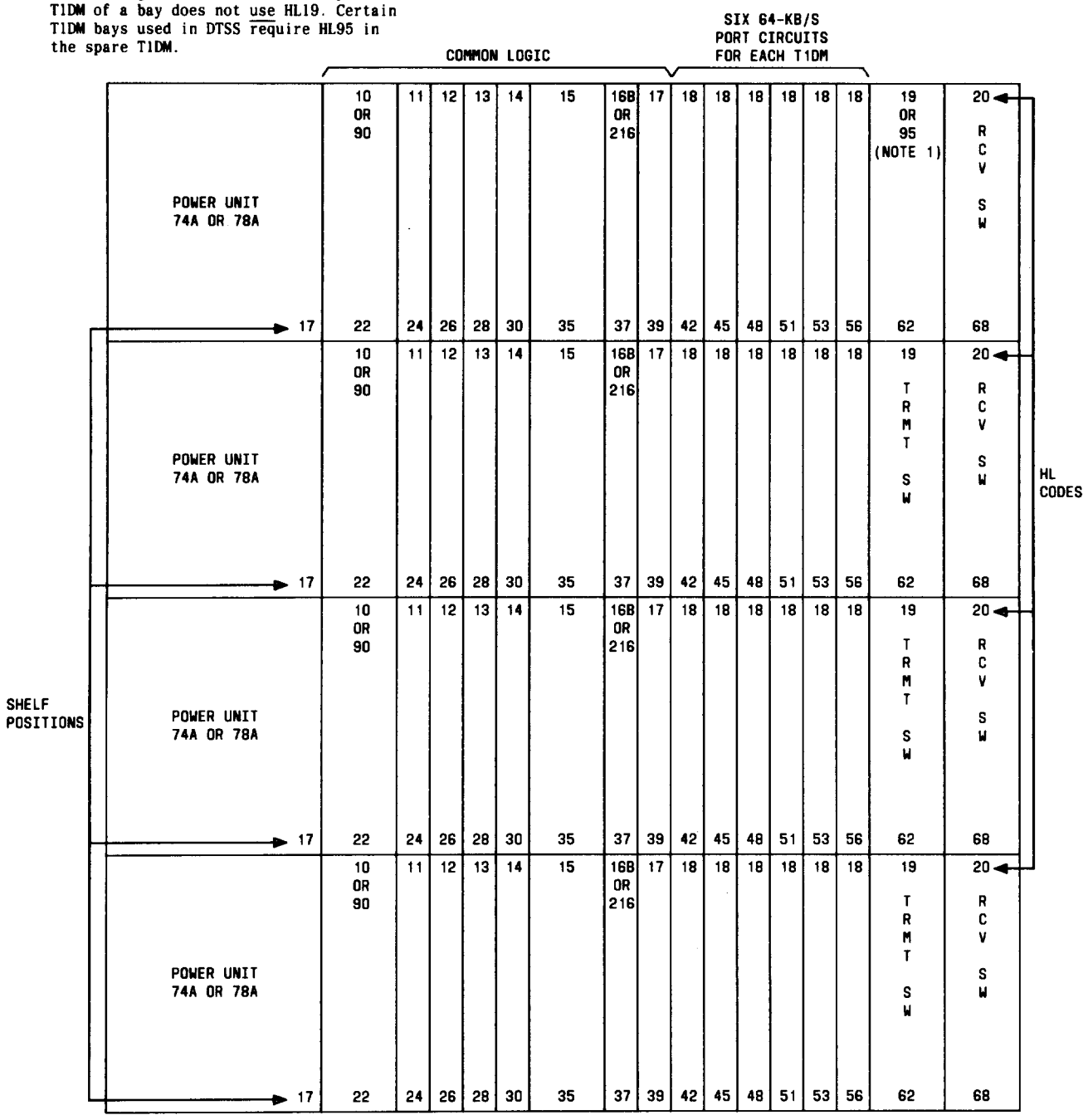


Fig. 8—Front View of 4-Shelf T1DM Assembly (J70177AE)

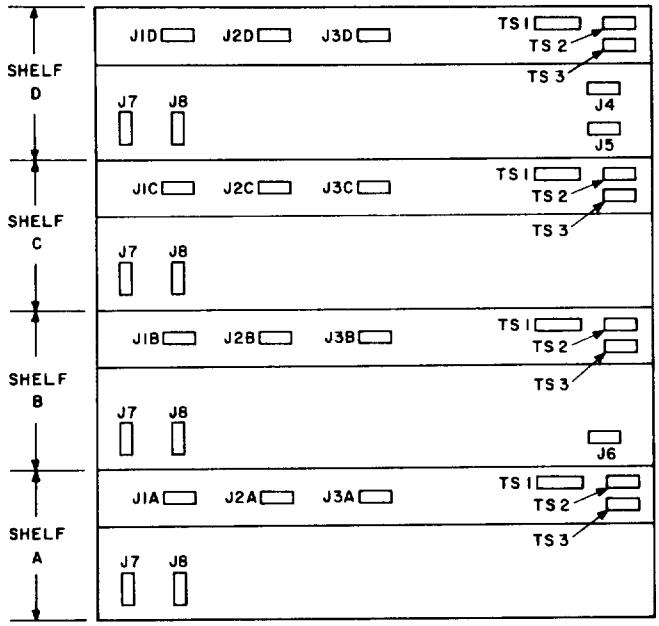


Fig. 9—Rear View of 4-Shelf T1DM Assembly (J70177AE)

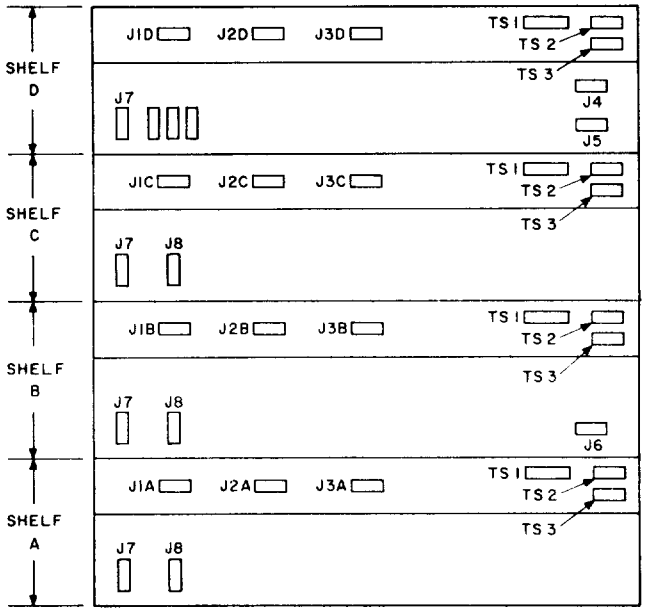


Fig. 10—Rear View of 4-Shelf T1DM Assembly (J70177AE) Arranged For DTSS

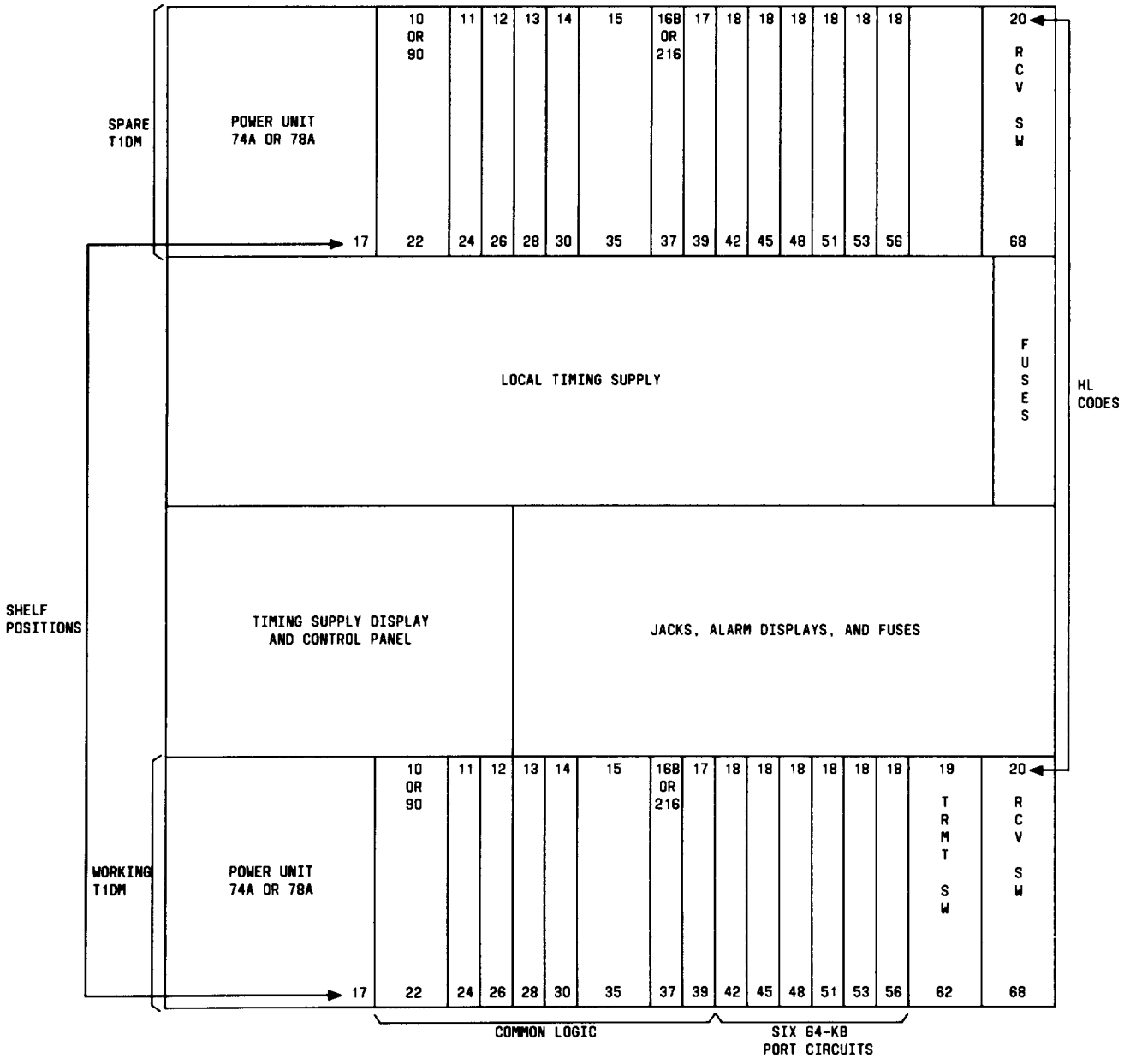


Fig. 11—Front View of LTS and T1DM Assembly (J70177AG)

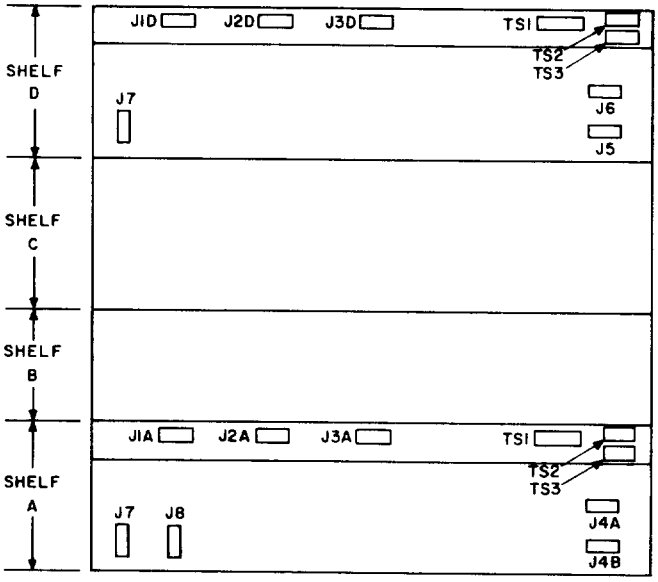


Fig. 12—Rear View of LTS and T1DM Assembly (J70177AG)

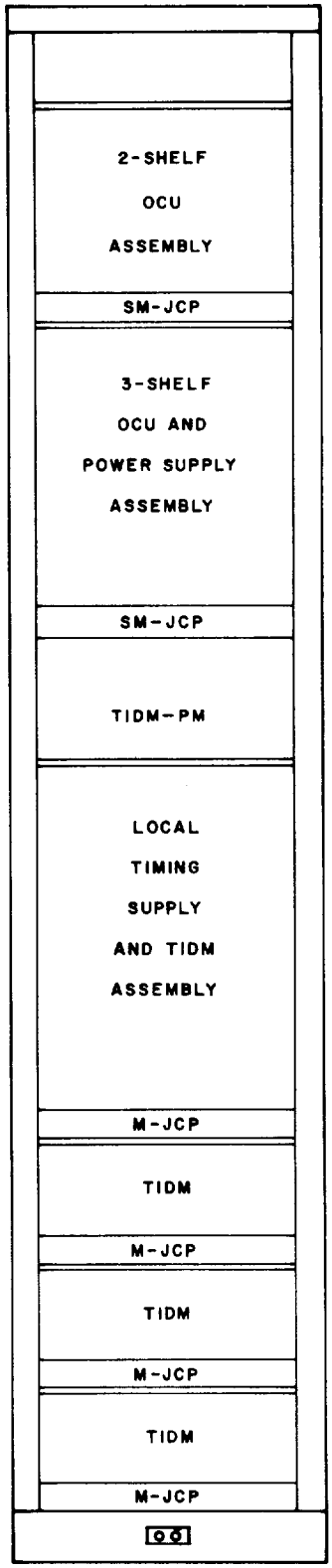


Fig. 13—J70177A—11-Foot 6-Inch Local Office Initial Bay

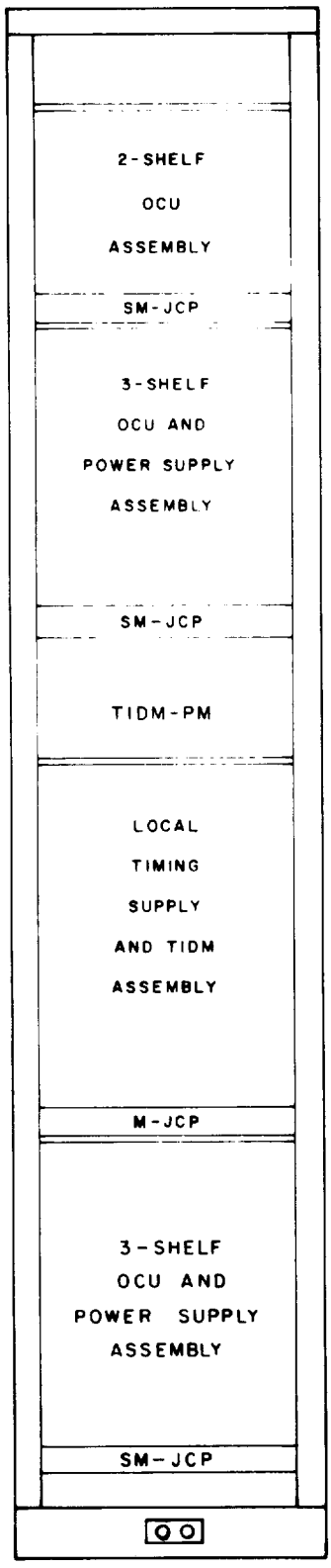


Fig. 14—J70177A—11-Foot 6-Inch Local Office Initial Bay with 3-Shelf OCU and Power Supply Assembly

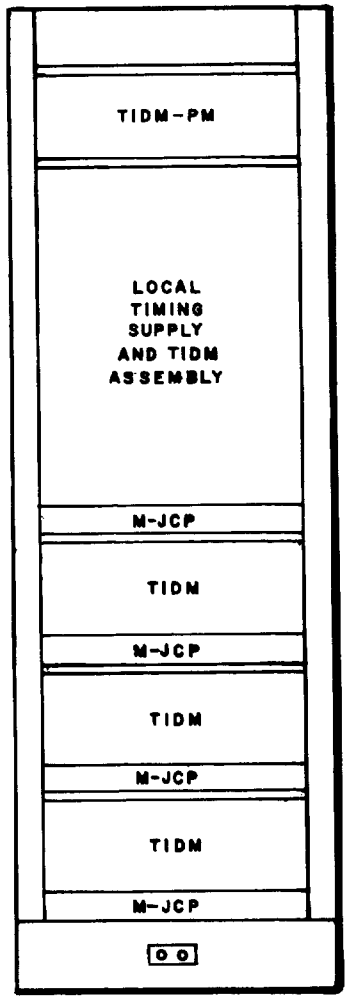


Fig. 15—J70177F—7-Foot Local Office Initial Bay

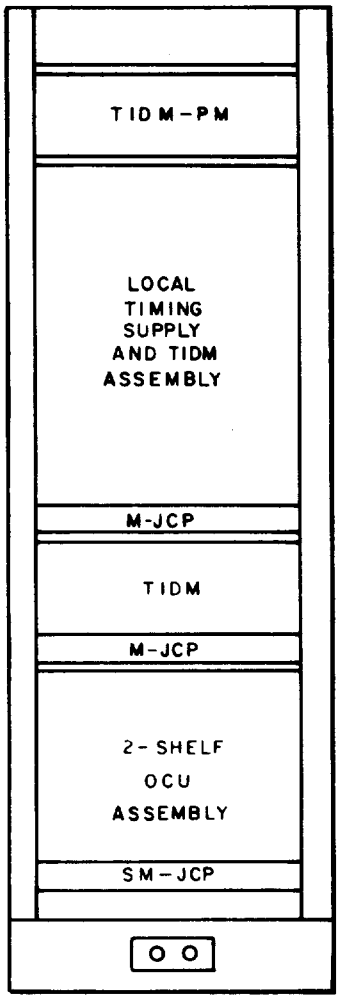


Fig. 16—J70177—7-Foot Local Office Initial Bay with 2-Shelf OCU Assembly

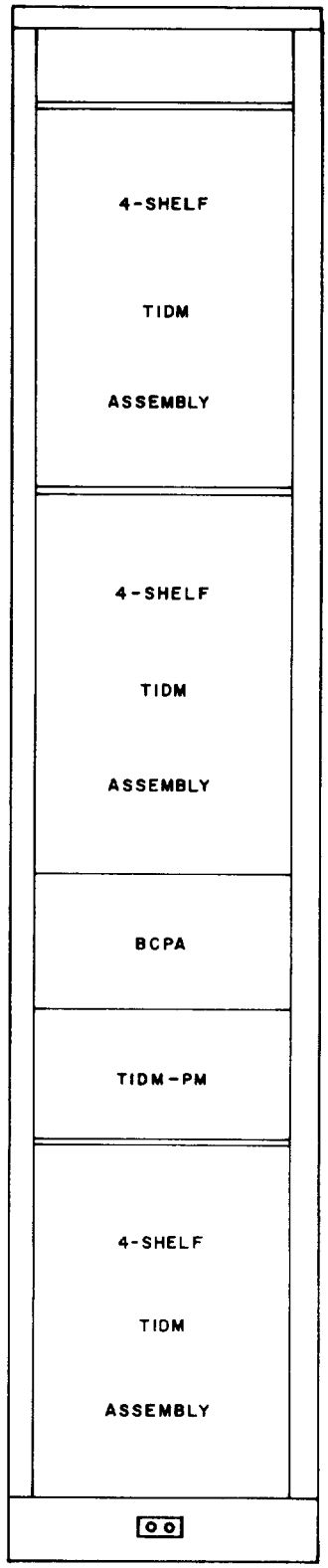


Fig. 17—J70177C—11-Foot 6-Inch T1DM Bay

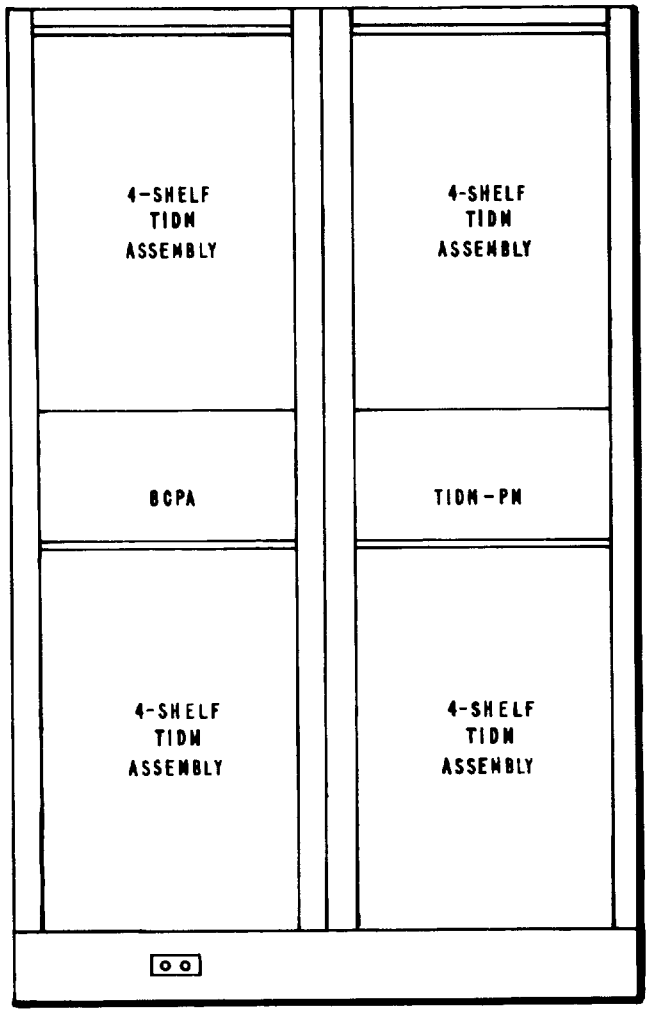


Fig. 18—J70177J—7-Foot T1DM Double Bay

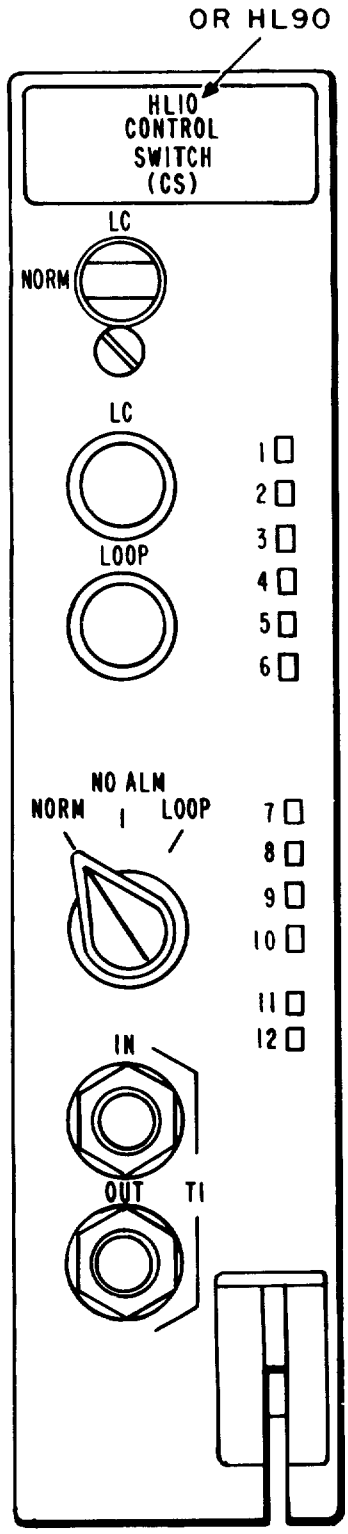


Fig. 19—T1DM Control Switch Panel (HL10 or HL90)

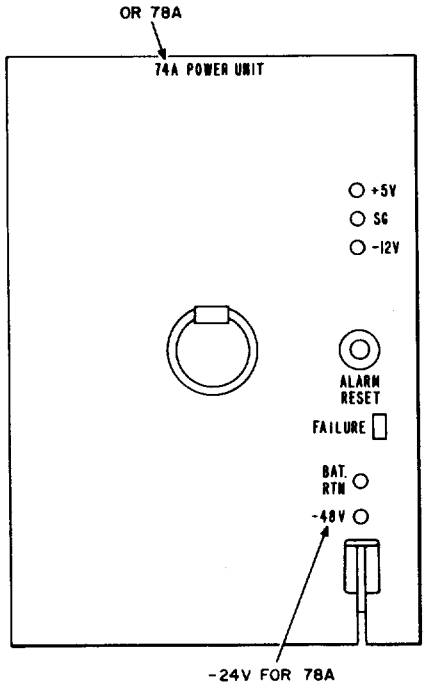


Fig. 20—74A or 78A Power Unit for T1DM

▶TABLE A◀

SECONDARY CHANNEL ASSIGNMENT OF SUBRATE CHANNELS (NOTE 1)

SUBRATE (kb/s)	DS-0B CHANNELS	ASSIGNMENT OF SUBRATE CHANNELS
2.4	20	2, 3, 6, 8, 11, 12, 13, and 18
4.8	10	2, 3, 6, and 8
9.6	5	2 and 3

Note:

1. Assignments can only be made to subrate channels (within DS-0B channels) that have a "1" in the first (subrate framing) bit position.

▶TABLE B◀

T1DM HL-CODED CIRCUIT PACK FUNCTIONS

CIRCUIT PACK DESIGNATION	CIRCUIT PACK FUNCTION	SHELF POSITION
74A or 78A	Power Unit	17
	Common Logic Circuits	
HL10 or HL90	Control Switch	22
HL11	Elastic Store Short Register	24
HL12	Elastic Store Long Register	26
HL13	Elastic Store Counter	28
HL14	Elastic Store Control	30
HL15	T1 Interface Circuit	35
HL16, HL16B, or HL216	Sync Circuit	37
HL17	Clock Circuit	39
	Protection Switching Circuits	
HL19*	Transmit Switch	62
HL20	Receive Switch	68
	Port Circuits	
HL18†	64-kb Port Circuits	42, 45, 48, 51, 53, 56
	Digital Transmission Surveillance System	
HL95‡	Surveillance Unit	58, 60, 62

* The spare T1DM bay is not equipped with an HL19.

† One HL18 is required for each four ports. The fourth port of HL18 in shelf position 56 is not used.

‡ Required at certain T1DM bays arranged for DTSS operation.

TABLE C

T1DM BAY ARRANGEMENTS

EQUIPMENT CODE	BAY ARRANGEMENT	WORKING T1DMs	SPARE T1DMs	FIGURE
J70177A	11-Foot 6-inch local office initial bay	1 to 4	1	13
	11-Foot 6-inch local initial bay with 3-shelf OCU and power supply assembly	1	1	14
J70177F	7-Foot local office initial bay	1 to 4	1	15
	7-Foot local office initial bay with 2-shelf OCU assembly	1 or 2	1	16
J70177C	11-Foot 6-inch T1DM bay	1 to 11	1	17
J70177J	7-Foot T1DM double bay	1 to 15	1	18

TABLE D

BAY CODES AND T1DM EQUIPMENT INTERCONNECTIONS

BAY ARRANGEMENT EQUIPMENT CODE	EQUIPMENT WITH WHICH THE T1DMs INTERCONNECT
J70177A and J70177F	T1DM-PM,LTS, and M-JCP; DSX-1, ORB, or T1ASU
J70177C and J70177J	T1DM-PM, BCPA, and DSX-0B; DSX-1, ORB, or T1ASU

TABLE E

T1DM ALARM CHARACTERS BY PRIORITY AND STATUS

ALPHANUMERIC CHARACTER	PRIORITY	STATUS INDICATED	BAY ALARM
J	1	Failure in 1.544-MHz clock generation circuitry	Yes
F	2	Failure in T1DM frame sync generation circuitry	Yes
0	3	Red alarm—frame transmission failure on incoming T1 line	Depends on T1DM option*
E	4	Failure in elastic store	Yes
P	5	Failure in sync recovery circuit	Yes
C	6	Failure in certain common circuits	Yes
R	7	Ambiguous condition—T1DM can recover sync but T1DM-PM cannot	No
1,2,3,4,5,6	8	Single port failure of HL18 circuit pack indicated	Yes
o	9	Yellow alarm—frame transmission failure on incoming T1 line of remote T1DM	Depends on T1DM option*
H	10	T1DM-PM can test T1DM but does not alarm or switch	No
B		Flashing—T1DM operational but not returned to service	

* These options are selected with screw switches located in HL51 of the BCPA circuit.