D3 CHANNEL BANK
GENERAL DESCRIPTION
DIGITAL TRANSMISSION SYSTEMS

CONTENTS PAGE

1. GENERAL

1.01 This section provides a functional description of the D3 channel bank, a description of the mounting arrangements, and a discussion of the maintenance features. Special D3 channel bank arrangements, namely the unitized bay, portable bay, and the D3B channel bank, are covered in separate documents listed in the references portion of this section. Broad schematic coverage is given in the application schematic SD-3C104-( ), and the bay and plug-in equipment is coded in the J98718 series.

1.02 The reasons for reissuing this section are to re-rate certain D3 equipment as A&M only and to make minor corrections. Revision arrows are used to emphasize the more significant changes.

1.03 The D3 channel bank (Fig 1) is a carrier terminal used for processing 24 voice-frequency channels into a 1.544-Mb/s bitstream, using pulse code modulation (PCM). Transmission between terminals is over a digital transmission facility such as the T1 digital line. The D3B channel bank is a D3 channel bank that has been equipped for dataport operation either within or outside the digital data system (DDS). For more information on any related T1 carrier topics, see the referenced practices in Part 6 of the section.

1.04 Only compatible terminals can be used at the ends of the digital facility. Along with a D3 to D3 connection, the D3 channel bank is compatible with a D1D, D2, or D4 channel bank, or a digroup terminal for No. 4 ESS. When a D1D or D2 channel bank is used at the other end with a D3 channel bank, plug-in adapters must be installed in the D3 channel bank bay to preserve channel identity at both ends. The D3 channel bank is suitable for use in direct, tandem, toll-connecting, and intertoll trunks.

1.05 The D3 channel bank is designed to operate in the normal office ambient temperature of +32°F to +120°F. Higher reliability of equipment is obtained by engineering the office so that the ambient temperature does not approach the upper limit.

2. EQUIPMENT DESCRIPTION

Bay Arrangements

2.01 The channel bank equipment is contained in 23-inch wide shelves and panels which are mounted in various frameworks called bays (Fig. 2). Fixed bays are available in 11-foot 6-inch, 9-foot, and 7-foot heights. There is also a portable bay which is used for quick service restoration and temporary services. This bay contains one channel bank and office repeater equipment.

2.02 There are two vintages of bays; the J98718A, B, and C bays ◗(A&M only)◖ and the now standard J98718J, K, and L bays. The three codes in each group are for 11 foot 6 inch, 9 foot and 7 foot sizes, respectively. The differences in the two vintages of bays are the power distribution panel, the channel bank output equalizer, and the arrangement for connecting cable wiring to the channel banks. The J, K and L bays have a smaller power panel and a different equalizer which allows mounting one more channel bank in the 11 foot 6 inch bay. The ED-3C615-30 power distribution panel and the 998A equalizer are used on the J, K, and L bays; whereas the ED-3C352 power distribution panel ◗(A&M only)◖ and a top-bay equalizer panel are used on the A, B and C bays. An optional 20-Hz module can be installed in the ED-3C615-30 panel, this circuitry was included in the ED-3C352 panel. The 998A equalizer consists of a printed board with strapping options to select the equalization for the length of office cabling. This equalizer board is factory-mounted behind channel position number one for each channel bank. On the J, K, and L bays, voice and the incoming T1 line leads terminate on a 94-type connector block which has squeeze-type terminals that cut through the wire insulation to make contact. No wire stripping is required; wires are pushed between terminals. On A, B, and C bays, voice cable wiring to channel banks is connectorized. Connectors on the voice cables are coupled to connectors at the channel banks.

2.03 Variations in the bay arrangements are due to the placement of the hot spare and maintenance (HS&M) panel (Fig. 2), the ED-3C370-30 TEL SET panel, writing shelf, and a miscellaneous jack field. The HS&M panel need not be mounted in every bay, but it is to be shared. The number of bays over which it is to be shared depends on where the J98718AJ channel access unit (CAU) is located. When the CAU is mounted in the HS&M panel, the sharing is one per three bays. When the CAU is mounted in the J98718AL portable test set, the sharing is one per five bays. The ED-3C370-30 TEL SET panel can be mounted in J98718A, B, and C bays instead of the HS&M panel, but there is additional space in the J, K, and L bays to mount both the HS&M panel and TEL SET panel. The 2-inch miscellaneous jack panel mounts above the writing shelf for access to interbay lines and displaces the TEL SET panel in the J, K, and L bays. The B and C bays have sufficient space for mounting the miscellaneous jacks without losing the TEL SET panel.

2.04 In the J98718 bay equipment list, some of the bays are listed as equipped with shelves for mounting the HS&M equipment and some without the shelves. A bay with the shelves will have a different list number than one without the shelves. Moreover a bay listed as equipped with the shelves will not have the channel bank capability as one without the shelves.

2.05 The J98718J bays can mount 6 channel banks (144 channels) with the shelves and 7 channel banks (168 channels) without the shelves. Whereas, the J98718A bays without the shelves can only mount 6 channel banks because this bay is equipped with a larger power distribution panel and an equalizer panel. Both the B and K codes of the 9-foot bays mount 4 or 5 channel banks (96 to 120 channels) depending on provision of the HS&M panel; similarly both the C and L codes of the 7-foot bays mount 2 or 3 channel banks. The C codes are installed in 3-bay complexes in order to share the power distribution and equalizer panels.

Channel Bank

2.06 The following two general categories of plug-in units make up the channel bank: common units and channel units. Common units have those functions which are common to 24 channels and which have characteristics that do not vary with the types of trunk circuits assigned to the channels. Channel units serve individual trunk circuits. Each D3 channel bank consists of three shelves. There are two rows of channel units, between which is located the common equipment shelf (Fig. 1).

Common Units

2.07 The common equipment shelf (Fig. 2) is 6 inches high and 12 inches deep and mounts the following plug-in units:

(a) Transmit Unit (TU)

(b) Alarm Control Unit (ACU)

(c) Receive Unit (RU)

(d) Interface Unit (IU)

(e) Power Converter Unit (PCU)

(f) Trunk Processing Unit (TPU)

(g) Data Logic Unit (DLU). This unit occupies the IU and transmission monitor unit (TMU) slots in the D3B channel bank.

Note: The development of the TMU was canceled and a dummy faceplate is available to fill the TMU opening in a conventional D3 channel bank.

Channel Units

2.08 The channel units are listed and described in Section 365-150-101. There is a variety of units providing the basic types (E&M, dial pulse, and revertive pulse) as well as special services such as foreign exchange lines, PBX lines, etc.

Hot Spare and Maintenance Panel (HS&M)

2.09 The HS&M panel (Fig. 2) contains a set of spare common equipment plug-ins that are powered, operated in a looped condition, and monitored for alarms. This arrangement ensures that known good spare plug-ins are available for restoral of service in the event of channel bank equipment failures. It also has provisions for maintenance and testing plug-in equipment as described in Part 5. Each HS&M panel contains the following plug-in units.

(a) Transmit Unit (TU)

(b) Alarm Control Unit (ACU)

(c) Receive Unit (RU)

(d) Code Generator Unit (CGU)

(e) Power Converter Unit (PCU)

(f) Channel Unit (CU)

(g) Channel Access Unit (CAU).

Channel Bank Output Equalizer

2.10 To obtain a standard level digital signal at the 1.544-Mb/s cross-connecting point, it is necessary to equalize or pad the cable loss between the transmit output of the D3 channel bank and the cross-connecting point. This equalization or padding depends upon the cable length. Normally the equalizer is located at the channel bank, but if an equalizer is already provided in the channel bank terminating assembly of a 201 repeater bay, the equalizer must be strapped out at the channel bank bay. When the distance between the channel bank and the repeater bay is changed because of office rearrangements, a different equalizer or pad may be required. The selection on the 998A equalizer for J98718J, K, and L bays is made by option strapping (A, B, or C) on the equalizer wiring board. Table A lists the equalizers required for lengths of cable.

TABLE A

EQUALIZERS PER CABLE LENGTH

BAY EQUIPMENT CODE	CABLE LENGTH (FT) *	EQUALIZER
J98718A, B, C	0 — 150 150 — 450 450 — 750	ED-97079-30, G6 358D 358E
J98718J, K, L	0 — 220 220 — 440 440 — 750	988A, "A" Strap 988A, "B" Strap 988A, "C" Strap

* At cable length transition point, use equalizer for the shorter length *(Do Not Overequalize).*

Power Distribution Panel

2.11 The power distribution panel, mounted at the top of the bay (Fig. 2), is the connecting point for the feeder from the -48 volt central office battery. The panel provides fusing, filtering, and distributing of power in the D3 channel bank bay. Indicator fuses are provided for -48 signaling, -48 filter, -48 volt office battery, and 20-Hz ringing. With the ED-3C615-30 PWR DIST panel, ringing voltage is distributed to the channel banks when the 20-Hz module (ED-3C617-30) is installed and fused. Ringing is only required when foreign exchange station-end (FXS) units are used in the bay. Filtering in the power panel minimizes noise transfer in both directions for the -48 filtered talking battery. The red bay alarm lamp lights when there is an alarm in any of the associated channel banks. Alarm outputs are also available at the panel for connection to remote and office audible and visual alarms.

2.12 The placement of a mounting bolt at the top of the 11-foot, 6-inch bay can interfere with the insertion or removal of the ED-3C617-30, 20-Hz distribution module. If this occurs, the bolt will have to be removed and then replaced after the 20-Hz module is installed or removed.

2.13 The number of fuses on the power distribution panel depends on the number of channel banks in the bay. Table B gives the fusing per channel bank and the assignment of other fuses, ballast lamps, and relays on the panel.

TABLE B

POWER DISTRIBUTION PANEL ASSIGNMENTS

−48V FLT MN	−48V for filter	1 fuse/panel
−48F	Filter talking battery	1 fuse/bank
−48S	Signaling battery	1 fuse/bank
−48V	Power converter input voltage	1 fuse/bank
−48F	Hot spare and maintenance panel	1 fuse/panel
−48S	Hot spare and maintenance panel	1 fuse/panel
−48V	Hot spare and maintenance panel	1 fuse/panel
−48ABS	Alarm battery supply	1 fuse/power feed*
Main fuse	(not indicator type)	1 fuse/power feed*
Ballast lamp	Variable resistance	1 lamp/bank †
Filter panel	Filters for −48F	1 filter/power feed*
20 Hz	For foreign exchange ringing	1 fuse/3 banks 1 fuse/bank‡
Relays	For alarm control signals	2 relays/bay

* J98718C 7-foot bays use two power feeders.

† First prototype panels had 2 lamps/bank.

‡ Later designs.

3. POWER DISSIPATION AND CURRENT DRAIN

3.01 The power converter unit for each D3 channel bank obtains input power from the −48 volt central office battery.

3.02 Power dissipation in the bay depends on the number of channel banks, on the vintage of the common equipment installed, and on the number and type of channel units. The power consumption can be substantially reduced by using the latest vintage plug-in units in the J98718J, K, and L bays. Sleeve dial-pulse originating (SDPO) and special service channel units serving short loops add to the power dissipation. Therefore, the actual channel unit mix and loop lengths must be used by engineering to calculate the office air conditioning requirements.

3.03 Each channel bank dissipates a fixed amount of power in the common equipment plus an incremental power for each channel unit. Affecting the fixed power to the greatest extent is the code of the power converter unit. The fixed power is 58 watts with the J87380A L1 through L4 units, 44 watts with the J87380A L5, and 34 watts with the J87380B L1 power converter. The power dissipation of the HS&M panel falls in the range of 37 to 57 watts depending on the vintage of plug-ins. In determining the fixed power for a channel bank, a portion of the HS&M power is added since the HS&M panel serves several bays. The following example shows how the power would be estimated for a channel bank with twenty-four, 4 E&M units (off-hook); the channel unit power dissipation must be obtained from engineering information or calculated from current drains (D3 application schematic).

EXAMPLE:

Fixed power (J87380B, L1 PCU)	34.0 watts
HS&M Power (1 per 3 sharing, 11' 6" bays, latest units)	2.5 watts
Dissipation in channel units (24 x 1.0W)	24.0 watts
Total	60.5 watts/bank

3.04 The current drain on the 48-volt supply for a channel bank is from 2 to 4 amps max. The 2 amps is for a typical mix of channel units and the maximum is for high load conditions. Current drain for the HS&M panel ranges from 1.1 to 1.5 amps.

4. FUNCTIONAL DESCRIPTION

A. General

4.01 A block diagram of the conventional D3 channel bank is shown in Fig. 3. When the channel bank is equipped for dataport operation, it is called a D3B channel bank and the block diagram is different. The voice-frequency (VF) signals enter the channel units where they are sampled sequentially (1, 2, 3, 4...) at an 8-kHz rate. These are sent to the transmit unit via the transmit pulse amplitude modulation (TPAM) bus where they are encoded by the nonlinear $\mu = 255$, 15-segment coder. All digitally coded voice signals plus signaling and framing are combined to form the 1.544-Mb/s bit stream in the format of Fig. 4. The framing is a repeating 010101 pattern of pulses which keeps the terminals at each end in sync. The bit stream is sent to the T1 line via the alarm control unit and the line equalizer as a bipolar signal. At the distant end, the bipolar signal enters the channel bank via the interface unit and is fed to the receive unit which extracts timing information from the incoming bit stream, separates the signaling bits and decodes the VF bits into time division multiplexed analog samples. These in turn are fed to the respective channel units on the receive pulse amplitude modulation (RPAM) bus for demultiplexing and reconstruction by the channel unit filters.

4.02 When the D3 channel bank is to be used with a D1D or D2 channel bank, bay wiring adapters must be inserted at the D3 end. These adapters change the D3 channel bank sampling sequence to that of the D1D or D2 channel bank in order to preserve channel identity at both ends. The adapters are placed between the channel units and common units by inserting them between connector pairs P30 and J30 and P31 and J31 on the rear of the bay. The adapters are keyed to fit only one way and are coded as follows:

D3 to D3 or D3 to D4: adapters not required

D3 to D2: ED-3C363-30, G2 (2 each bank)

D3 to D1D: ED-3C363-30, G1 (2 each bank)

B. Channel Bank Timing

4.03 Clock circuits in the transmit and receive sections of the D3 channel bank accomplish channel bank timing. The transmit clock is located in the TU and consists of a nominal 6-MHz voltage-controlled crystal oscillator. The oscillator control allows looped and external timing which are required for No. 4 ESS and data applications (eg, wideband, DDS). For looped timing, the transmit clock is locked to the receive section, and for external timing, it is locked to the clock signal obtained by connection to office nodal timing supply. For local timing, the transmit clock generates the timing from the natural frequency of the crystal oscillator. The receive clock is always derived from the incoming bitstream. Framing circuits in each receiver unit maintain the overall synchronization of the system.

4.04 Loop timing is selected by options on the IU or DLU (for dataport). However, the wiring for looped timing is incorrect on many early bays and must be corrected per CN6482MV. This change is done on a class B billable basis without removing service. Installation of the modification can be verified by inspecting the wiring behind the IU slot using Fig. 5.

4.05 Externally supplied composite clock is terminated in a resistor-capacitor network on the equalizer panel or the power distribution panel (J98718J, K, and L bays) at the top of the bay. Early D3 channel bank bays (J98718A-1 List 1, J98718B-1 List 1 or 2, and J98718C-1 List 1) must be modified to provide the proper termination and shield connections. The components and wiring are obtained for the bays by ordering List 5, List 7 or List 6, respectively. For the later J98718A-2, B-2, and C-2 bays, the components must be ordered separately and the wiring added during installation. The proper components are included in the J98718J, K, and L bays and the wiring is added during installation.

C. Channel Bank Common Units

Transmit Unit (TU)

4.06 The TU unit performs the functions of directing the channel sampling, encoding, and inserting framing pulses for a digroup. Encoder

circuitry in the unit produces the PCM word for each channel sample and another circuit in this unit produces signaling bits. The channel counter circuitry produces control pulses for obtaining channel voice (or data) and signaling samples. Finally, circuits in the unit insert framing bits into the bit stream to synchronize the far terminal and to identify signaling information.

Receive Unit (RU)

4.07 The RU unit performs the functions of decoding the PCM signal, demultiplexing the channel information; and extracting the timing, framing, and signaling information. Decoder circuitry produces the corresponding pulse for each PCM word and another circuit in this unit demultiplexes the signaling pulses. The channel counter circuit sends control pulses to channel units for demultiplexing the decoded pulse information.

> ***Note:*** For looped timing application with No. 4 ESS, the J98718AB-3, L4 (or later) or others with L5 modification should be used to avoid signaling trouble caused by false synchronization.

Alarm Control Unit (ACU)

4.08 The ACU unit, recognizes alarm conditions appearing on various leads within the D3 channel bank for the purpose of lighting alarm lamps, initiating office alarms, trunk processing, and sending an alarm to other end. The control signal to activate the trunk processing unit after an incoming alarm follows the incoming condition alarm by 300 milliseconds or 2 seconds depending on the vintage of alarm unit. While the original design incorporated a 300 milliseconds delay, the J98718AD-1 List 4 and all subsequent units have a 2-second delay and also hit integration for improved operation. The 2-second initiate time eliminates system outages due to isolated hits. Hit integration causes TPU operation for a series of hits that are close together but not of 2-second duration. These newer units are compatible with alarm units in other channel banks and can be used with another vintage unit at the other end. In systems with different alarm units at the ends, it is the end where the alarm condition was first sensed that controls the trunk process initiate time in the system. Controls on the units allow cutting off the office alarms and looping the bank.

Trunk Processing Unit (TPU)

4.09 Once activated by the alarm unit, the TPU unit undergoes a 100 millisecond delay. If the alarm remains, the TPU releases established connections, makes trunks appear busy via contact closures on the switch make-busy lead, and prevents noise from entering office trunk circuits. The amber TPU lamp lights and a count is registered on the message register. In addition, an amber memory (MEM) on J98718AD-2 and -3 units remains lighted (under control of the RESET button) after the alarm clears to call attention to the counter. Twenty-four EG option screws, one for each channel, make ground available in the TPU for application to the channel E-leads during a carrier failure. The option is used with all duplex (DX) and tandem (TDM) channel units and E&M units (one-way outgoing and two-way trunks) whenever switch make-busy leads are not connected. The J98718AD-3 TPU unit has also twenty-four EL option screws which connect the EB loop signaling leads inside the unit to provide a closure between the EB and E(EA) leads during a carrier failure. This EL option is used instead of the EG option for type II E&M signaling arrangements. The relay operation for the ground connection or the closure occurs 10 seconds after trunk processing was initiated. A control signal to the channel units disables the receive gate in the units to block noise from the carrier during a falure. The LINE LOOP CONTROL on the TPU permits sending an AY alarm signal for line looping or for holding a system in an alarm condition as described in Part 5.

Interface Unit (IU)

4.10 The IU unit provides a through connection for the incoming line signal, produces control signals, and contains options for controlling the channel bank timing. The J98718AF and AK units have a CODE IN jack on the front to insert the output of the code generator unit into the receive section of the channel bank. This jack is not provided on the J98718AM unit and it must be replaced by the code generator unit when tests are to be made. When the CODE IN jack is being used, the IU produces control signals to sync the receiver with the digital test signal, inhibit alarms, and keep the trunk processor operated. LOCAL and LOOP option screws inside the units select either local or looped operation of the transmit clock in the TU unit. For external timing, the J98718AK unit is used and an office clock signal

is wired to the IU. In addition, all the IUs provide connections for the E2 status reporting system. Another function of the IUs is to produce a signal during receiver reframing that causes the receive unit to force off-hook signaling at the channel units in order to prevent dropping existing calls. This signal is connected by means of the C option which is selected for normal operation.

Power Converter Unit (PCU)

4.11 Each D3 channel bank is equipped with its own PCU unit. This prevents the possibility of disabling a complete bay of D3 channel bank equipment because of a single power converter failure. The primary purpose of the PCU is to provide three regulated dc voltages (+4, -12, and +12 volt) for the channel bank logic circuitry from the -48 volt office battery supply. Office battery is fed to the individual channel bank converter through a fuse located on the power distribution panel. Along with the different lists of J87380A converters, there is the more efficient J87380B converter which occupies about one third of the PCU slot (Fig. 1). Two separate red alarms are provided on each converter to furnish indications of a fuse failure (FUSE ALM) and a power converter failure (CONV FAIL). The CONV FAIL lights and an electrical shutdown circuit operates for a converter overvoltage or overcurrent condition. The shutdown circuit must be reset by moving the power switch off, the on. A mechanical interlock on the J87380B PCU flips the switch OFF whenever the unit is removed or installed. The ALM CUTOFF lamp lights when the power switch is off because the alarm lead from the ACU is opened by the switch. This alarm cutoff is provided in case of a -5 volt power trouble which renders the ACO (on the ACU) ineffective.

5. TEST AND MAINTENANCE FEATURES

A. Terminal Alarms

5.01 To facilitate locating systems that have failed, there is a red bay alarm lamp on the power distribution panel. This lamp lights when any system associated with the panel fails. To further identify the trouble, the power converter and ACU have alarm lamps.

5.02 Each D3 channel bank contains an ACU with the following features. The red AR alarm is lighted by an incoming failure or a local receiver or powering failure, and the yellow AY alarm is lighted by an alarm signal received from the far end. This yellow alarm signal is transmitted automatically from any bank which has a red AR alarm. Either of these alarms will initiate trunk processing as indicated by the TPU lamp on the TPU. The alarm cutoff (ACO) button silences the audible alarms and energizes a white lamp when operated. In this way, the audible alarms can be cut off, while maintaining an indication that the system is still in an alarm state. The ACU also features a loop terminal (LT) control and an associated green lamp. The LT control when operated during an alarm condition loops the transmit unit output to the receive unit. This looped condition is indicated by a lighted green lamp and is used for testing the channel bank.

5.03 A plug-in unit, called the reframe counter unit (RCU), can be placed in the D3 channel bank to detect and record bank reframing. Reframing is a receiver function that occurs if the incoming PCM signal contains framing code errors or if the receiver is out of sync with the framing code. This unit is useful for identifying systems with intermittent troubles or hits which do not initiate trunk processing. The unit is connected by a test lead to the receive not frame alarm (RNFAL) jack on the RU.

5.04 For out-of-service tests, a red alarm condition can be forced in order to loop the channel bank with the LT control on the ACU. The alarm is produced by strapping between the RNFAL and GRD jacks on the RU. The TPU is held operated while the channel bank is looped.

5.05 Pin jacks on the ACU allow testing. During the initial alarm checks, the LP and GRD jacks are connected together to directly operate the channel bank looping relay without first producing an alarm on the alarm unit. With the looping operated in this manner, red and yellow alarms can be obtained simultaneously while the channel bank is looped with these jacks. The TST jacks allow measuring of the dc output of a bridge rectifier connected across the outgoing line.

5.06 The LINE LOOP CONTROL on the TPU provides one input to a circuit in the ACU which causes the transmit unit to send an AY alarm signal. The other input is associated with a terminal alarm. Setting the switch to ON during a carrier failure allows using the channel bank for

loop-back testing of the T1 line without releasing trunk conditioning. When the AY alarm signal is looped back over a good section of line, the terminal alarm changes from red to yellow. Another application of this switch is to retain the terminal alarms and service outage until the alarms can be interpreted. For this, the LINE LOOP CONTROL at both ends of the system are set to ON to disable automatic restoral after a carrier failure.

5.07 The following paragraphs outline briefly the procedure to isolate trouble conditions.

5.08 When a major alarm is received, the appropriate combination of red and/or yellow lamp(s) light on the ACU. The TPU operates as shown by the lighted TPU lamp and the count on the message register. When the alarm clears, the lights on the ACU extinguish and within 20 seconds the TPU returns to its normal state, extinguishing the TPU light. On J98718AD-2 and -3 TPUs, the amber MEM (memory) lamp remains lighted until reset.

5.09 On the ACU unit the ACO button when depressed silences the audible alarms and lights the white lamp. The LT control is used to loop the channel bank. The green lamp when lighted signifies the channel bank is looped. For a detailed procedure to isolate a trouble condition see Section 365-150-502.

B. Hot Spare and Maintenance Panel (HS&M)

General

5.10 The HS&M panel (Fig. 2) permits fast restoral of service and efficient testing of the D3 channel bank plug-ins suspected of being defective. The panel contains a complete set of spare common equipment plug-in units except for the TPU and IU. The space normally occupied by these two units is used to mount the code generator unit (CGU) and channel access unit (CAU), and a channel unit (CU). All the equipment in the HS&M shelf is powered and the bank common equipment plug-ins are also operated in a looped (wire strap) condition and monitored for alarms. Loss of power or looped signal will cause an alarm on the ACU and activate an office alarm. Thus, the plug-ins that were tested during installation are continuously monitored to ensure the availability of known good replacements. The channel unit position in the HS&M panel allows channel access to the common equipment which has the transmitter looped to the receiver. This access is needed for doing looped tests (except crosstalk) and to ensure that a channel unit to be added to service does not have a major problem that will interrupt service. The looped tests are used to test the HS&M plug-ins initially and to verify that common equipment plug-ins removed from service are defective. Both the CGU and CAU are needed to turn up D3 channel banks, and the CAU is needed for any subsequent tests.

Code Generator Unit (CGU)

5.11 The CGU unit is provided to allow precise checking of the complete receive portion of a D3 channel bank. This signal source is capable of generating three different digital signals. One of the signals is a precise digital code designed to represent exactly a 0-dBm0, 1-kHz analog signal. The other two signals permit testing of idle circuit noise and crossover distortion. The output signal from the CGU can be either patched directly into the channel bank IU (or to the DLU in the D3B channel bank), or the CGU can be plugged directly into the channel bank to be tested in place of the IU.

Channel Access Unit (CAU)

5.12 The CAU is a highly accurate, test unit with features which provide rapid and precise transmission performance testing of the D3 channel bank. The critical test which the CAU performs is the measurement of the gain of the D3 channel bank from the input of the CU transmit active filter through the D3 channel bank common equipment to the output of the CU receive active filter. This measurement can be made either end-to-end or with the channel bank looped. If the gain is more than ±0.25 dB from nominal (10 dB), the channel bank is considered to have failed. By checking the gain through several channel units, the cause of the failure can be isolated to either a channel unit or to the common equipment. This test is critical because neither the channel units nor the common units are adjustable. Therefore, the failed units must be replaced and returned to a service center for repair.

5.13 The CAU oscillator produces a -7.5 dBm (0 dBm0) sinusoidal signal at an output impedance of 600 ohms with a frequency of 1020 Hz. To prevent interference with the D3 channel bank 8 kHz sampling rate, the oscillator frequency

is offset from 1000 Hz. The CAU detector produces both an audible tone and a visual output via a faceplate mounted speaker and meter to indicate when the measured signal is within 0.25 dB of nominal. The overall range of the CAU scale is ±0.5 of the TLP being measured and levels outside this range must be measured at the EXT DET jack. The EXT OSC jack allows connecting another signal source to the CAU. Both external jacks are at a 0 TLP which simplifies measurements and test tone connections.

5.14 A set of attenuators is provided which can reduce the CAU output level by 0 to 40 dB in 10-dB steps. A 1020-Hz rejection filter can be switched into the detector input path to remove the test tone. These features enable signal-to-distortion measurements to be made in the D3 channel bank.

5.15 Figure 6 is a simplified block diagram of the CAU circuits with the TEST switch in the different positions. Figure 6A shows the calibration circuit which couples the test signal generated internally or externally into either the internal detector or an external detector. This feature checks calibration of both the internal 1020-Hz oscillator and the detector, and can also be used to calibrate external equipment. Figure 6B is a block diagram of the internal detector circuit with input and output levels shown.

5.16 Figure 6C shows the CAU in the CHAN LINE position and the CAU connected to the channel unit jacks. In this position, connection is made to the tip contacts of the channel unit jacks to access the CU line side. The internal oscillator and detector is connected through the normal contacts of the EXT jacks. When external equipment is connected, the normal connections are broken.

5.17 Figure 6D shows the CAU in the CHAN DROP position and the CAU connected to the channel unit jacks. In the position, connection is made to the ring contacts of the channel unit jacks to access the CU drop side. An amplifier is inserted to raise the output of the internal oscillator to the RCV jack (+2.5 TLP). Also, an amplifier offsets the 10 dB loss in the path from the XMT jack (-7.5 TLP).

Portable Test Set Assembly

5.18 This assembly is basically a power supply which permits portable operation of the CAU. The output is -48 volts and the assembly has a fuse, power switch, and pilot lamp on the front panel. Inserting the CAU in the assembly closes an interlock switch which makes power available at the power switch. This interlock removes power to prevent sparking if the CAU is removed without first turning the assembly off. The D4 TST CKT portion of the portable test set is only used for testing at the D4 channel bank to adapt the CAU for different channel levels.

6. REFERENCES AND ASSOCIATED DRAWINGS

6.01 Following is a list of general reference practices and other D3 channel bank practices.

SECTION	TITLE
365-010-100	Type T1 Carrier System—Overall System—General Description
365-150-101	Channel Unit Description—D3 Channel Bank
365-150-102	J98718BR D3 Channel Test Unit Circuit—Signaling and Transmission—Description
365-150-103	Channel Unit Extender—Description
365-150-104	D3 Channel Bank Portable Bay—General Description
365-150-105	Reframe Counter Unit—Description
365-150-107	Dataport Operation — Description, Installation and Tests
365-150-110	D3 Channel Bank Unitized Bay — Description
365-150-500	Maintenance Considerations
365-150-501	Equipment Installation and Tests
365-150-502	Initial and Circuit Order D3 Tests With D3, D2 and D1D
365-150-503	Channel Option and Pad Selection

SECTION	TITLE
365-150-504	Signaling Tests and Trouble Location
365-150-505	Maintenance and Trouble Location Procedures
365-200-100	T1 Digital Line—General Description
365-800-001	D1, D2, & D3 Channel Banks—Routine, Acceptance, Company Order Tasks (TOP)
365-800-002	T1 Line—Routine, Acceptance, Company Order Tasks (TOP)
365-800-003	D1, D2, & D3 Channel Banks—T1 Line—Trouble Clearing Tasks (TOP)
801-505-153	J98718 Equipment

8.02 The following drawings (not attached) provide additional information:

SD/CD	TITLE
82099	J87380A or B Power Converter Unit (PCU)
3C104	Application Schematic (J98718A, B, C, J, K, L Bays)
3C105	J98718AA Transmit Unit (TU)
3C106	J98718AB Receive Unit (RU)
3C107	J98718AC Alarm Control Unit (ACU)
3C109	J98718AF Interface Unit (IU)
3C110	J98718AE Code Generator Unit (CGU)
3C111	J98718AD Trunk Processing Unit (TPU)
3C112	J98718AJ Channel Access Unit (CAU)
3C113	J98718AL Portable Test Set Assembly
3C114	J98718AK External Clock Interface Unit
3C119	J98718AN Reframe Counter Unit (RCU)
3C120	J98718AM Interface Unit—Optional
3C121	ED-3C424 Channel Unit Extender
—	J98718AN Reframe Counter Unit (RCU)
3C140	J98718BR Signaling Test Unit
3C410	J98718AH Data Logic Unit (DLU)
3C115-01	ED-3C352 Power Distribution Panel
3C115-02	ED-3C615-30 Power Distribution Panel
3C115-02	ED-3C617-30 20 Hz Distribution Unit

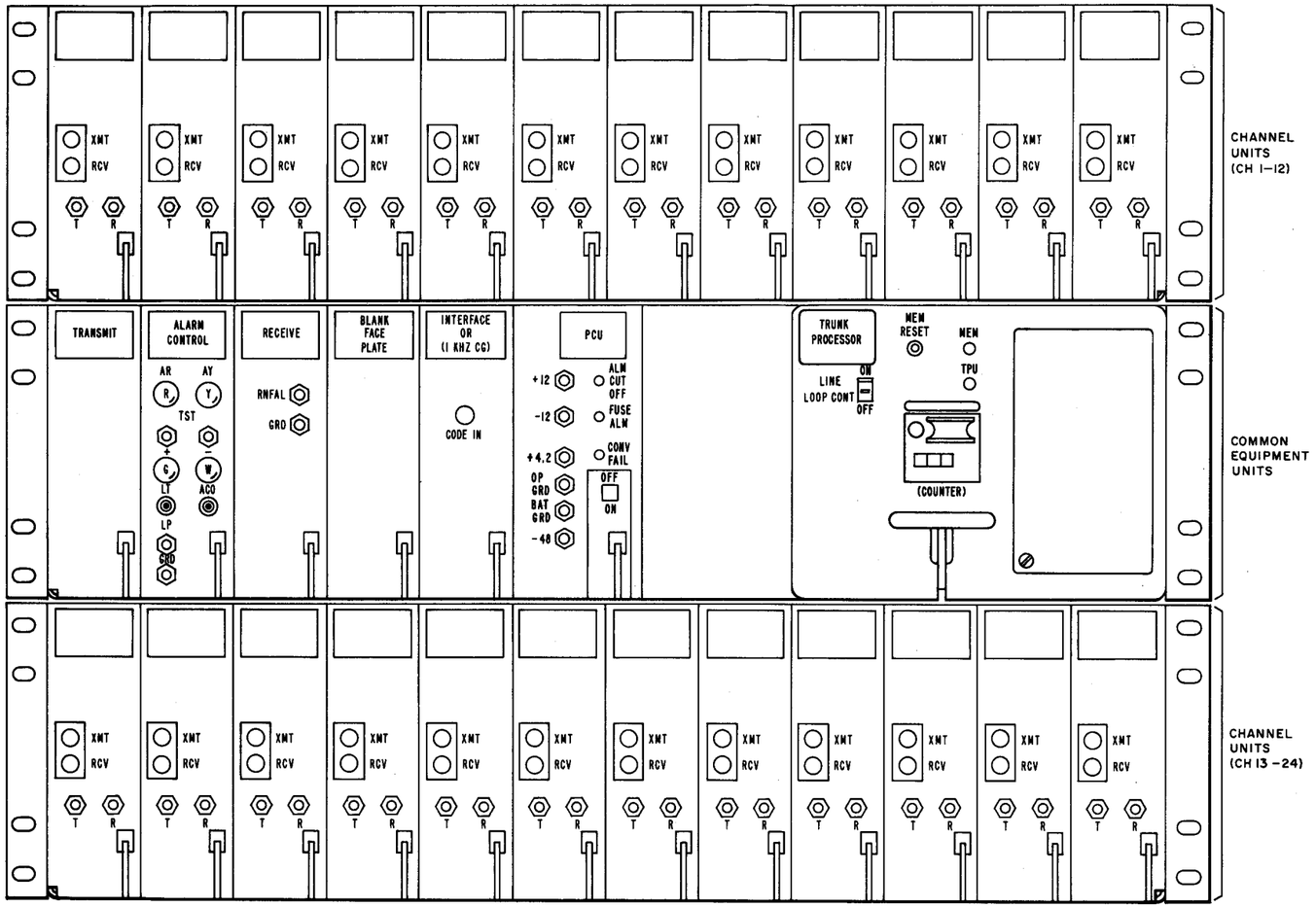


Fig. 1—D3 Channel Bank

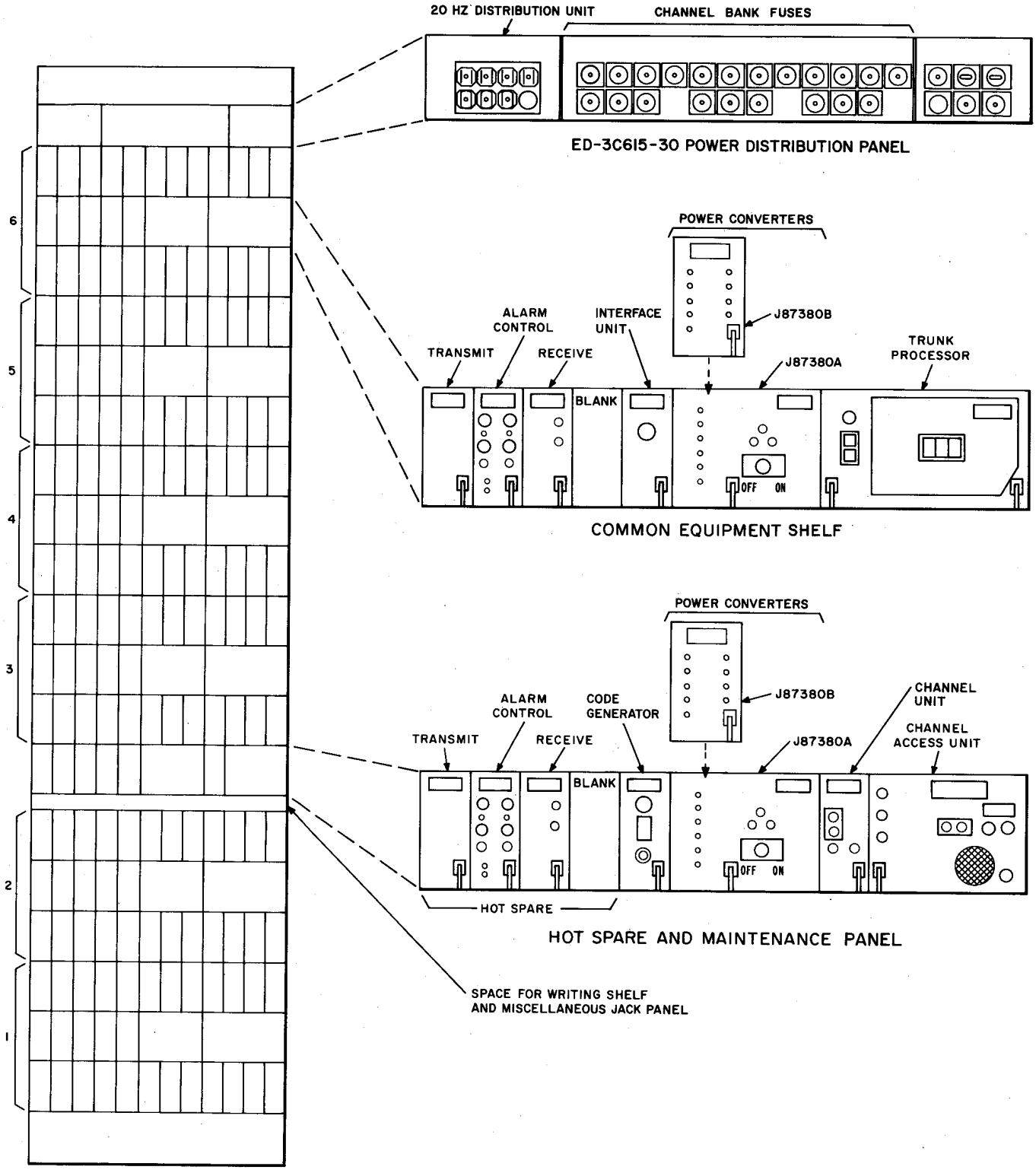


Fig. 2—J98718J List 1 Bay Layout

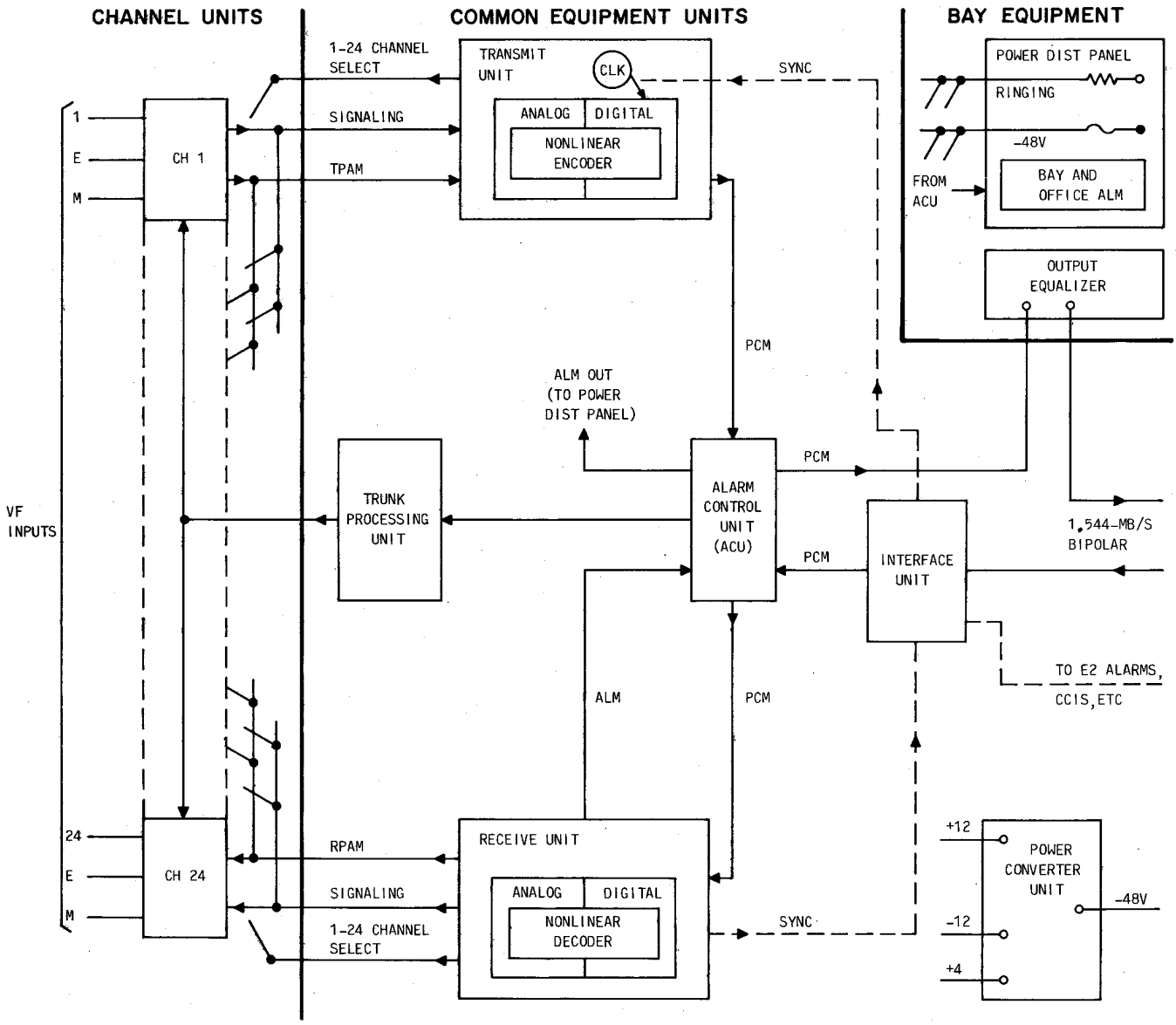


Fig. 3—D3 Channel Bank Block Diagram

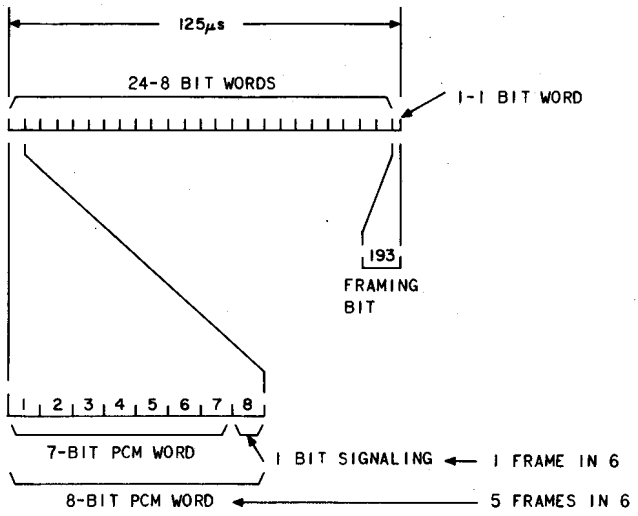


Fig. 4—D3 Channel Bank Frame Format

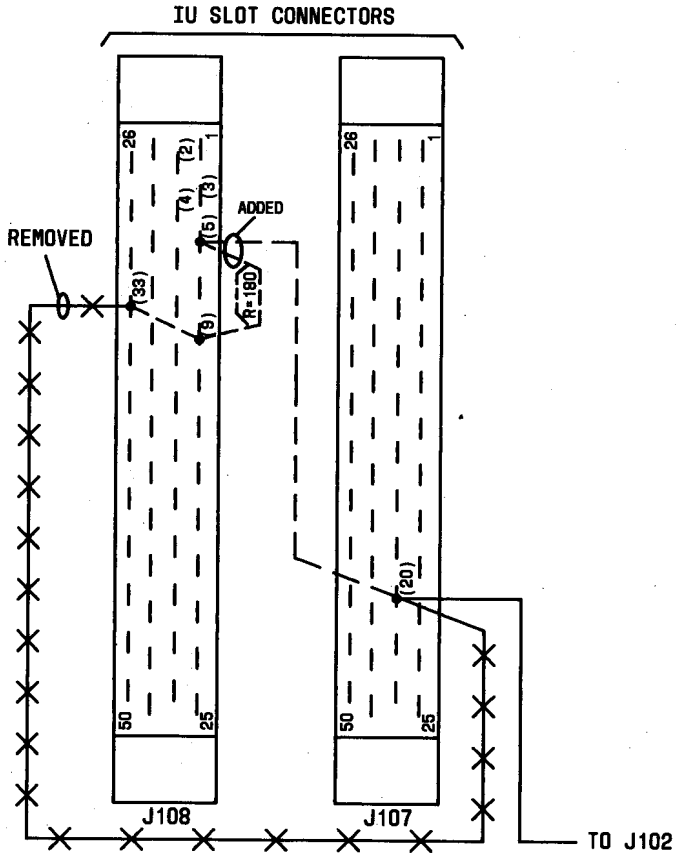
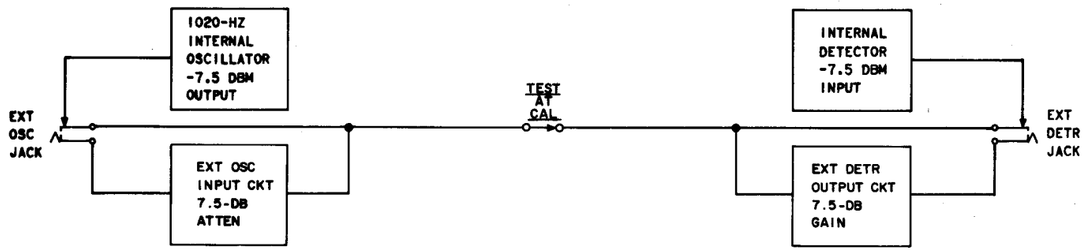
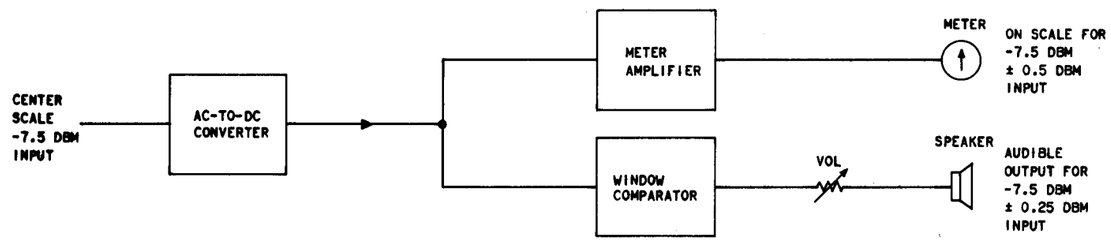


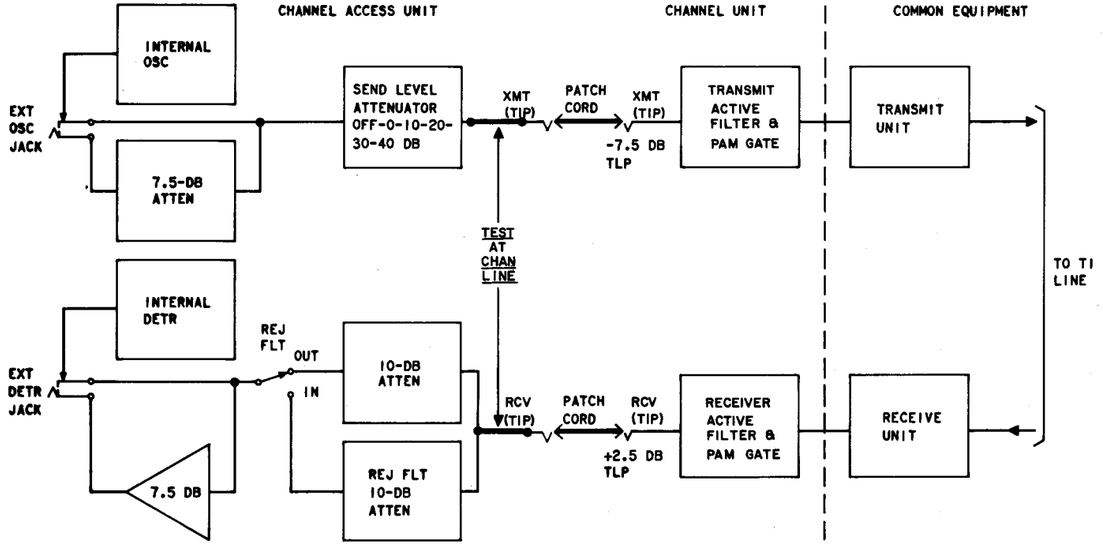
Fig. 5—CN6482MV Loop Timing Modification



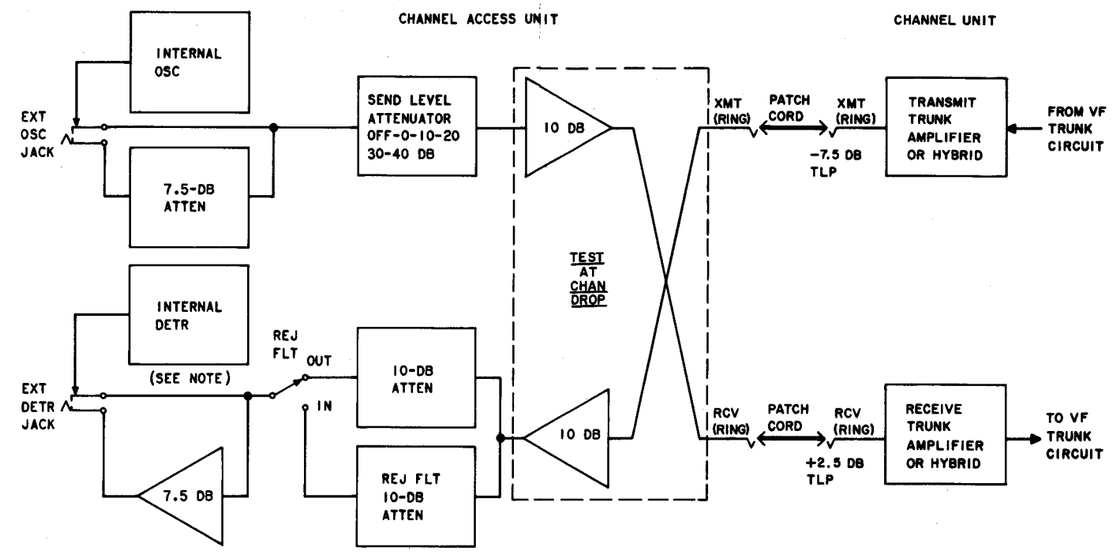
A. TEST SWITCH AT CAL



B. INTERNAL DETECTOR CIRCUIT



C. TEST SWITCH AT CHAN LINE



NOTE:
BECAUSE OF ITS NARROW INPUT LEVEL CHARACTERISTICS, IT IS NOT ANTICIPATED THAT THE INTERNAL DETECTOR WILL BE USED WITH THE TEST SWITCH IN THE CHAN DROP POSITION. AN EXTERNAL DETECTOR SHOULD BE USED IN THIS APPLICATION.

D. TEST SWITCH AT CHAN DROP

Fig. 6—CAU Block Diagram