5-KHZ AND 8-KHZ PROGRAM CHANNEL UNITS
DESCRIPTION, INSTALLATION, AND TESTS
D3 CHANNEL BANKS
DIGITAL TRANSMISSION SYSTEMS

CONTENTS PAGE

1. GENERAL

1.01 This section describes the D3 channel bank program channel units (PGCUs) and provides instructions for setting attenuators and for making installation and channel drop trouble tests. The settings and installation tests are made when program service is being added to a working channel bank. The digital carrier facility must have first passed the turnup tests in the applicable Bell System Practices. Table A lists the PGCUs with reference drawings and equipment codes.

1.02 This section is reissued for the following reasons:

- To correct the test connections in the channel drop test
- To describe compatibility with the D4 channel bank PGCUs
- To give circuit levels in dB as well as in volume units
- To include the use of the channel unit extender, special test cords, and other test equipment.

The format of the section has been changed so that each test is presented in a separate chart along with corrective action if the test fails. Since this is a general revision, change arrows are not used.

2. DESIGN INTENT

2.01 The D3 channel bank program channel units have been developed to provide temporary or permanent service for series 6004, 6005 (5 kHz) and series 6006, 6007 (8 kHz) programming. Such service includes remote-main studio links, secondary studio links, and network access links. PGCUs may also be used to equip AM studio-transmitter links but not FM or TV since these require 15-kHz bandwidth. The PGCUs provide 1-way service without signaling. A transmit PGCU is used at the source and a receive PGCU is used at the other end. PGCUs are only available for D3 and D4 channel banks, and a transmit or receive PGCU at either channel bank is completely compatible with the companion unit at the other channel bank. Sequential sampling is used at the D3 channel bank and no adapters are required in channel cable connectors J30/P30 and J31/P31. If the connecting loop slope exceeds requirements and equalization is required, it must be provided with external equipment (see Section 320-145-500). No equalization is contained in the PGCUs for D3 channel banks.

3. CIRCUIT LEVELS

3.01 Speech and program signals are measured in volume units (VUs) on a VU meter. This meter indicates how loud the signal would be if converted to sound, without registering the high amplitude peaks. Transmission levels in program circuits are given in VUs with the customer sending level of +8 VU defined as the reference point. When the levels are given in dB, this +8 VU point corresponds to 0 TLP, which is defined as a 0-dBm level point. The frequency of the test tone used for checking levels in the circuit is normally 1020 Hz, which is offset from an even 1000 Hz to prevent interference in the digital channel banks. The 0-TLP level must be changed if the customer sending level is different from +8 VU; 1 VU of change equals 1 dB of change. With the normal testing level of 0 dBm applied at the customer sending location, the level at the XMT jack (-7.5 TLP) will be -22.5 dBm and the level at the RCV jack (+2.5 TLP) will be -12.5 dBm. An attenuator in the transmit PGCU adjusts the level at the XMT jack on the unit and the attenuator after the RCV jack on the receive PGCU adjusts the output level of the unit. These measured levels are -15 dBm0 levels; consequently, the levels measured and applied at the D3 CAU external jacks (0 TLP) will be -15 dBm.

4. DESCRIPTION

Physical

4.01 The program channel units physically occupy one channel unit slot in a D3 channel bank. However, the extended bandwidth of the PGCU requires multiple sampling which electrically preempts additional channel unit slots. To ensure that the preempted channel slots are not interfered with, blank channel units are inserted in these locations. One blank channel unit is supplied with the PGCU-5T or PGCU-5R, and two blank units are supplied with PGCU-8T or PGCU-8R. The T or R in the designation indicates that the unit is either a transmit or receive unit, and the 5 or 8 is the bandwidth. Each blank channel unit consists of a specially labeled faceplate attached to a fiber board which has precautionary and maintenance information printed on it.

4.02 The transmit PGCU has a XMT jack and the receive PGCU has a RCV jack. These are standard telephone jacks that accept a 310 plug and allow access toward the line or drop side, depending on whether connection is made to tip or ring.

Transmit Circuit Operation

4.03 Figure 1-A shows a simplified transmit (T) unit diagram for the PGCU. The PGCU-T has a standard 600-ohm balanced T and R input and accepts an input level in the range of +9 through -6 VU (+1 through -14 dBm.) An input slide attenuator has a 15-dB range in 1-dB steps to reduce the higher level signals in the input range to the -6 VU limit. The amount of dB attenuation equals the amount of attenuation in VUs. The -6 VU level out of the attenuator optimizes the signal/noise ratio and allows instantaneous 10-dB program peaks that approach the +3 dBm0 overload point of the D3 channel bank. The input attenuator is transformer coupled to a controlled attenuator circuit which allows the PGCU to bypass the control of the D3 channel bank trunk processing unit (TPU). This bypassing is necessary to reduce program service interruption which is intolerable to the broadcaster.

4.04 The controlled attenuator is activated by the alarm control unit (ACU) via a lead which must be added for program service. This lead carries a control signal [transmit outgoing alarm (TOGA)] which causes the D3 channel bank

transmit unit to produce a yellow alarm signal when a local alarm occurs. On nonprogram channels, the TPU removes service and makes the channel appear busy, but the transmit PGCU is not removed from service for a carrier failure in either direction. For a local alarm, the controlled attenuator in the transmit PGCU inserts 24 dB of loss to compensate for the yellow alarm signal in with the channel information. Although the transmission quality suffers during the alarm condition, program service is maintained and the 15-second TPU operation that occurs after any carrier hit is avoided.

4.05 Following the attenuator control circuit is a preemphasis amplifier which boosts the gain (18.5-dB range) at higher frequencies to reduce the effect of quantization noise at high frequencies. The XMT jack bridges the preemphasis amplifier to a program filter (for flat 5-kHz or 8-kHz response) which feeds the transmit gate. The transmit gate and its associated logic circuitry connect to the D3 channel bank common equipment and provide the double sampling rate required for the 5-kHz PGCU or triple sampling for the 8-kHz PGCU. These circuits also reduce in-band distortion by inserting segments of delay in the audio signal. This delay compensates for the nonuniform sampling, resulting from time gaps in the outgoing signal for insertion of D3 framing pulses.

Receive Circuit Operation

4.06 Refer to Fig. 1-B. The PGCU-R connects to the D3 channel bank common equipment through receiving logic circuits which provide a double sampling rate for the 5-kHz PGCU or a triple rate for the 8-kHz PGCU. This circuitry also delays appropriate sampling pulses to compensate for received signal samples nonuniformly spaced, due to the time gap required in the D3 channel bank format for the framing pulse. Enabled by the logic gates is a program filter which reconstructs the audio signal from the received samples. The RCV jack bridges the reconstructed audio to the de-emphasis amplifier which compensates for the transmit PGCU preemphasis and thereby enhances the signal-to-quantizing-noise ratio when measured with a program-weighted noise meter. The de-emphasis amplifier is transformer coupled to a 0- to 15-dB output attenuator which provides levels to the T and R leads of -6 through -21 VU (-14 through -29 dBm) at 600 ohms.

4.07 The receive PGCU is not removed from service by the TPU for a carrier hit or during a failure in either direction. At some time during the failure the channel will be unusable but program service is still applied to permit transmission as soon as possible. The controlled attenuator in the transmit PGCU compensates for the yellow alarm sent from the transmit end if a local alarm occurs there.

5. INSTALLATION CONSIDERATONS AND RESTRICTIONS

D3/T Carrier Failure Rate Restrictions

5.01 The D3/T Carrier facility selected for PGCU installation should not have a history of excessive TPU operations (alarm rates) or have a history of excessive errors. The scale described in engineering letter EL3791 for comparing alarm rates to identify systems that require maintenance can also be used for selecting a system. With this scale, systems with less than five alarms per week do not require maintenance and are considered to have a low alarm rate. Systems with five or more alarms per week must be observed further to determine if the trouble persists or is intermittent, or is due to work on the line. Five or more alarms in two successive weeks constitute a high alarm condition that requires corrective action. Error-rate objectives for program service via T Carrier have not yet been established; however, in the interim, higher quality T1 facilities can be selected using the procedures in Section 365-228-500.

5-kHz Service

5.02 PGCU-5 units may be installed in any or all of D3 channel unit slots 2 through 11 with the restriction that any channel unit, 12 slots numerically greater, must be removed. For example, if a PGCU-5 is installed in slot 2, slot 14 must be vacant due to the double sampling of PGCU-5.

8-kHz Service

5.03 PGCU-8 units may be installed in any or all of D3 channel unit slots 2 through 7 with the restriction that any channel unit which is 8 and 16 slots numerically higher in value be removed. For example, if a PGCU-8 is installed in slot 7, slots 15 and 23 must be vacant due to the triple sampling of PGCU-8.

Combined 5-kHz and 8-kHz Service

5.04 PGCU-5 and PGCU-8 transmitting units installed in the same channel bank should ***never*** be installed ***exactly*** four slots apart or distortion and interference will occur in both program circuits. The receive units would naturally follow this 4-slot restriction.

Blank Units

5.05 Blank units are supplied along with PGCUs to fill the vacant channel slots preempted by program service. The blank units also have precautionary and maintenance information printed on them. If preempted channel units are not removed (or are inadvertently reinstalled), interference in both the program and message channels will result. In addition, if a PGCU is installed in slots other than those prescribed above, distortion will result due to nonuniform sampling introduced by loss of framing integrity.

T1 Facilities in Tandem

5.06 Operation using T1 facilities in tandem is not recommended for other than part-time or occasional service and even then should be limited to one tandem point to prevent noise and distortion difficulties. At the tandem point, the PGCU-R in one channel bank must be connected to the PGCU-T in the other channel bank. The channel banks must be D3 or D4 since PGCUs are only available for those D channel banks.

Wiring Modification Required

5.07 A wire must be added from pin 34 of the D3 channel bank alarm control unit (ACU) connector to pin 10 of the PGCU-T connector (shown as ZY option on SD-3C104). This connection enables the operation of the controlled attenuator in the transmit PGCU. If this connection is made on an in-service basis, care must be exercised to avoid bridging contacts during any part of the operation. Before adding the new wire, however, remove any previous optional connection to pin 10 which may have been required for other applications (such as No. 2 ESS direct interface channel unit), or select a different channel assignment. When more than one PGCU-T is installed in a D3 channel bank, only one connection to the ACU is required, and then pin 10 of all PGCU-T connectors is strapped together.

Cabling

5.08 External equalization/amplification as described in Section 320-145-500 may be required due to the length of cabling between the broadcast equipment and office equipment. PGCUs for the D3 channel bank provide no cable equalization but have adjustable attenuation which allows them to directly drive (or be driven by) nearby broadcast equipment. A program amplifier can be used to boost the output (-14 dB) to a standard +8 VU level in order to maintain a good signal-to-noise ratio over a long loop. For cabling inside the office, standard D3 connectorized cable pairs may be used between the channel bank and the connectorized cable termination at the distributing frame.

Service Protection

5.09 In order to prevent plant personnel from accidentally monitoring or otherwise disturbing working PGCU circuits, they should be treated with the same restrictions and cautions as special service circuits (Section 460-110-100). ***In no case should the channel bank be looped before patching the program channel(s) to another suitable circuit.***

6. SERVICE LIMITATIONS

6.01 PGCUs are not used for establishing FM or TV-aural studio-transmitter links because they do not meet FCC bandwidth requirements for that service. Furthermore, when PGCUs are used to provide an AM studio-transmitter link, extra care should be taken to maintain the transmission requirements (based on FCC requirements) specified in this document. ***PGCUs cannot be used in a D3 channel bank with dataport channel units because channels 4, 5, 16, and 17 are allocated to the dataports and cannot be preempted for program service.***

6.02 Although program service is not removed for carrier hits or during a failure, the transmission quality is slightly degraded during hits and the channel may become unusable during a failure. Consequently, program channels should not be assigned to T1 facilities which historically experience excessive hits, especially those which cause TPU operation. Likewise, systems with a history of trouble reports (noise, distortion, crosstalk, etc) must not be used.

6.03 Although the digital carrier program channel meets the test requirements of this section which relate to digital conditioning, the channel may not meet customer expectations which are based upon years of experience with analog facilities. This may be a result of using measurement techniques not directly applicable to digital facilities, as explained in paragraphs 9.02 and 9.03.

7. ATTENUATION SELECTION

7.01 Attenuation values for PGCUs are selected by operating slide-switch attenuators mounted on the PGCU circuit board. The appropriate sliders are set so that the sum of the digits exposed equals the desired attenuation value in dB. This value is calculated as shown in Fig. 2. If the level at T and R terminals of the distributing frame (DF) is not available from office records, it can be calculated by subtracting the amount of equalized line loss (at 1020 Hz) from the customer output level. The attenuator in the PGCU-T can also be adjusted to obtain the XMT jack level when the normal level is applied at the customer sending location (see paragraph 3.01). The attenuator in the PGCU-R is set to produce the required level at the DF either by the calculations of Fig. 2 or by measurement with the normal sending level applied at the sending customer location. For tandem operation, both PGCU attenuators at the tandem point of the carrier systems should be set to 0 dB.

8. INSTALLATION TESTS

8.01 Program channels should be treated as channels added to an operating channel bank. During initial channel bank turnup, the standard D3 channels are tested on a looped terminal basis, and the program channels are tested end to end (since separate transmit and receive channel units prevent looped program testing). Except for the carrier test, which is done at the channel unit jacks, the installation tests are done at the T and R appearances in order to include the preemphasis and de-emphasis circuits. The nonstandard levels encountered in these tests require that an external oscillator and detector be used. Jack access (at a testboard, program amplifier, or equalizer) may be used for tests instead of the T and R appearances at the DF if allowances are made for any additional attenuation or amplification.

CHART 1

CARRIER TEST

APPARATUS:

1—J98718AJ Channel Access Circuit (CAU in Maintenance and Hot Spare Panel)

1—3P6D Cord

STEP	PROCEDURE
1	On the CAU, check calibration at both carrier ends by operating the CAU TEST switch to CAL and observing that the CAU meter reads within the raised black index.
2	At the transmit end, connect the XMT jack of the PGCU-T to the XMT jack of the CAU using a 3P6D cord, and set the CAU SEND LEVEL switch to 0 and the TEST switch to CHAN LINE.
3	At the receive end, connect the RCV jack of the PGCU-R to the RCV jack of the CAU using a 3P6D cord, and set the CAU REJ FLT switch to OUT and the TEST switch to CHAN LINE.

CHART 1 (Contd)

STEP	PROCEDURE
	Requirement: The CAU meter at the receive end indicates within green-black-green area and tone is heard as VOL is adjusted clockwise.
4	Disconnect 3P6D cords at the transmit and receive ends.

CHART 2

CIRCUIT LOSS AND FREQUENCY RESPONSE TEST

APPARATUS:

Transmit End

1—Hewlett-Packard 3551A Transmission Test Set, HP 200CD Audio Oscillator, or equivalent oscillator with frequency range from 50 Hz to 10 kHz and less than -46 dB harmonic distortion

Receive End

1—J94021A Transmission Measuring Set (TMS), Northeast Electronics TTS 4BNH TMS or equivalent with frequency response to 10 kHz

Each End—Optional

1—ED-3C424 Channel Unit Extender (for jack access to T and R leads)

Cords

1—3P6D (for extender) or 3W14B (310 Plug with test clips for connections at frame)

1—3P17B (for TMS with double jack input)

1—Pomona 2977-J-60 or 2P-type Cord with General Radio 274MB Plug added (for HP 200CD)

STEP	PROCEDURE
1	At the transmit end, set the VF oscillator to 1020 Hz at -10 dBm and connect it to the channel unit T and R appearances on the DF (or via T/R LINE jack or channel unit extender). See Fig. 3.

CHART 2 (Contd)

STEP	PROCEDURE
2	At the receive end, connect the TMS to the channel unit T and R appearances on the DF (or via the T/R LINE jack on a channel unit extender) and record the circuit loss power indication. ***Requirement:*** -10 dBm ±0.5 dB decreased by channel unit attentuator settings of both ends. ***Example:*** If the transmit attenuator is set to 4 and the receive attenuator is set to 2, the received power will be -16 dBm or -10 dBm - (4 dB + 2 dB).
3	If the requirement is not met, check the attenuator settings per Part 7. If trouble persists, attempt to locate trouble by replacing one PGCU, then the other, or further isolate the trouble with tests of Part 9.
4	At the transmit end, perform a frequency response test by maintaining a -10 dBm power level while sending the following tones one at a time: 50 Hz, 3000 Hz, and 5000 Hz for PGCU-5 50 Hz, 3000 Hz, 5000 Hz, and 8000 Hz for PGCU-8. ***Requirement:*** The receive end power measurement shall agree within 1 dB of the 1020-Hz power measurement of Step 2.
5	At the transmit end, send a 6200-Hz (-10 dBm) tone for PGCU-5 or a 9400-Hz (-10 dBm) tone for PGCU-8. ***Requirement:*** The receive end power measurement shall drop 1 to 5 dB below the 1-kHz power measurement of Step 2.
6	If the requirement is not met, check the attenuator settings per Part 7 (too high a level can overdrive the preemphasis amplifier at the high frequencies). If requirement cannot be met, clear trouble by PGCU replacement.
7	Remove test conditions.

CHART 3

IDLE CIRCUIT NOISE AND NOISE IDENTIFICATION

APPARATUS:

1—J94003C Noise Measuring Set (NMS) with 497B Program Weighting Network or equivalent set having program weighting

CHART 3 (Contd)

APPARATUS(Contd)

1—ED-3C424 Channel Unit Extender (optional for jack access to T and R leads)

1—3P6D Patch Cord (if extender is used) or 3W14B (310 Plug with test clips for connections at frame)

1—600-ohm Resistor Termination at transmit end (262B Plug if extender is used)

STEP	PROCEDURE
	Note: The following tests should be made for at least 10 minutes during the office busy hour.
1	At the transmit end, terminate the T and R pair on the DF (or via T/R LINE jack on channel unit extender) with a 600-ohm resistor (see Fig. 3 for circuit noise connections).
2	At the receive end, check calibration of the 3C NMS (having 497B program weighting network) by patching it to the CAU EXT DETR jack and setting the CAU TEST switch to CAL. The NMS should indicate 90 ±0.2; otherwise, calibrate NMS or replace batteries according to NMS operating manual.
3	At the receive end, connect the NMS to the PGCU-R T and R appearance at the DF (or T/R LINE jack on channel unit extender).
	Requirement: Less than 22 dBrn - receive attenuator setting.
	Note: This requirement is equivalent to overall program requirement of less than 36 dBrn with program weighting at a +8 VU point.
4	If the requirement is not met and the channel unit extender is being used, the extender may be picking up noise from fluorescent lamps, etc; retest at the DF or other jack appearance. If requirement cannot be met, PGCU replacement or selection of another channel or one in a different D3 channel bank must be done to meet the requirement.
5	Using the NMS monitoring receiver, adjust for an on-scale meter indication and listen for noise and crosstalk.
	Requirement: No voice (words or syllables) or other program degrading transients should be heard.

CHART 4

UNWEIGHTED SIGNAL/DISTORTION

APPARATUS:

Transmit End

1—Hewlett-Packard 3551A Transmission Test Set, HP 200CD Audio Oscillator, or equivalent with frequency range from 50 Hz to 10 kHz and less than -48 dB harmonic distortion

Receive End

1—Hewlett-Packard 334A Distortion Analyzer or equivalent with externally connected 600-ohm Carbon Resistor and 111C Repeat Coil

Note: The 334A set does not give absolute readings at the receive end level (-14 to -29 dBm), but the distortion measurement is accurate since it is determined by the difference in readings.

Each End—Optional

1—ED-3C424 Channel Unit Extender (for jack access to T and R leads)

Cords

1—3P6D (for extender) or 3W14B (310 Plug with test clips for connections at frame)

1—Pomona 2977-J-60 or 2P-type Cord with General Radio 274MB Plug added (for HP 200CD and HP 334A)

STEP	PROCEDURE
	Note: This test is a measurement of total distortion, including that from quantizing, spurious responses, and from the harmonics present. The ***repeating coil must be connected*** as shown in Fig. 3 to reduce the effect of longitudinal noise on the unbalanced analyzer input.
1	At the transmit end, set the VF oscillator to 1020 kHz at 0 dBm and connect the OSC output to the T and R pair at the DF (or via T/R LINE jack on channel unit extender).
2	At the receive end, connect the distortion analyzer (with repeating coil and 600-ohm termination) to the T and R pair at the DF.
3	Adjust the analyzer to measure the received test tone level and record the indication.
4	Adjust the analyzer to reject the test tone and measure the distortion level.

CHART 4 (Contd)

STEP	PROCEDURE
	Requirement: Test tone level - distortion level = 35 dB or (numerically) greater.
5	If the requirement is not met, verify that the signal-to-distortion ratio of the transmit end oscillator is greater than 46 dB by having it measured with distortion analyzer. If trouble persists, PGCU replacement or selection of another channel or one in a different D3 channel bank must be done to meet the requirement.
6	Remove all test connections and equipment from the program circuit.
7	Make final DF connections to both the sending and receiving metallic broadcast facilities. Section 460-110-100 gives service protection and handling information for special service circuits.

9. MAINTENANCE/TROUBLE TESTS

9.01 No routine maintenance is required for D3 channel bank program channel units. Maintenance for the overall program facility is covered in Section 320-135-300. In the event of reported program trouble, ensure that the program service is patched to another suitable facility or turned down before the installation tests of this document are performed to identify the trouble. ***In no case should the channel bank be looped before patching or turning down the program channel(s).*** Failure of the carrier test indicates problems in either the T Carrier facility, channel bank common equipment (refer to Section 365-150-505), or PGCU.

9.02 Failure of noise and distortion tests directly relates to the type of trouble reported (noise, distortion, crosstalk, etc). A report of excessive distortion (particularly by the customer) may be an indication of incorrect adjustment of PGCU-T attenuator which is checked by using the following channel drop test. A report of excessive harmonic or total harmonic distortion may result from the incorrect measurement with an analyzer such as the HP334A. Such an analyzer indicates quantizing distortion and spurious responses in addition to harmonics. Harmonic distortion objectives can be met by measuring individual harmonics with a 4A frequency analyzer or HP302A wave analyzer and then combining the harmonic measurements to derive total harmonic distortion.

9.03 The customer may report excessive noise as a result of a measurement of "noise in the presence of signal." This is the D3 channel bank quantizing noise which is greater than idle circuit noise (steady noise without tone) and not considered to be a significant impairment to program quality.

9.04 The tests in Charts 5 and 6 check the transmission paths in the channel units from the jack back toward the drop. This circuitry is included in the circuit loss installation test but not in the carrier test. Thus these channel drop tests are used to isolate the trouble to one end. The requirements are based on the levels expected at the DF and will only be met if the attenuators are set correctly (Part 7). Normally, the metallic facility is disconnected at the DF or by patching to the channel unit extender, but these tests may be extended to include the metallic facility. A 1020-Hz, 0-dBm tone applied at the sending customer +8 VU point should produce a -15 ±0.5 dBm level measured through the CAU (EXT DET jack) to the XMT jack of the PGCU-T. Likewise, a -15 dBm tone applied through the CAU (EXT OSC jack) to the RCV jack of the PGCU-R should produce a test level (±0.5 dBm) required at the receiving customer location. Alternatively, the signal applied at the sending location can be measured at the receiving location.

CHART 5

TRANSMIT END CHANNEL DROP

APPARATUS:

1—J98718AJ Channel Access Unit (CAU)

1—Hewlett-Packard 3551A Transmission Test Set, HP 200CD Audio Oscillator or equivalent

1—J94021A Transmission Measuring Set (TMS), Northeast Electronics TTS4BNH TMS or equivalent

1—ED-3C424 Channel Unit Extender (optional for jack access to T and R leads)

1—3P6D Cord for CAU

1—3P6D Cord (for extender) or 3W14B (310 Plug with test clips for connections at frame)

1—3P6D Cord or 3P17B (for TMS with double jack input)

STEP	PROCEDURE
1	At the transmit end of the carrier system, connect a 600-ohm, 1020-Hz oscillator to the PGCU T and R appearances at the DF (or via T/R LINE jack on channel unit extender). See Fig. 4.
2	Condition the oscillator to send a power level consistent with the VU level (from office records) expected at the DF. Figure 4 provides a list of test power levels for the range of VU levels applicable.
3	On the CAU, set the REJ FLT switch to OUT, the TEST switch to CHAN DROP, and connect the XMT jack to the PGCU-T XMT jack using a 3P6D cord.
4	Connect a TMS to the EXT DETR jack of the CAU and observe the power indication. ***Requirement:*** -15 ±0.5 dBm on the TMS.
5	If the requirement is not met, check the attenuator setting in the PGCU-T. If trouble persists, replace the PGCU-T.

CHART 6

RECEIVE END CHANNEL DROP

APPARATUS:

1—J98718AJ Channel Access Unit (CAU)

1—Hewlett-Packard 3551A Transmission Test Set, HP 200CD Audio Oscillator or equivalent

1—J94021A Transmission Measuring Set (TMS), Northeast Electronics TTS4BNH TMS or equivalent

1—ED-3C424 Channel Unit Extender (optional for jack access to T and R leads)

1—3P6D Cord for CAU

1—3P6D Cord (for extender) or 3W14B (310 Plug with test clips for connections at frame)

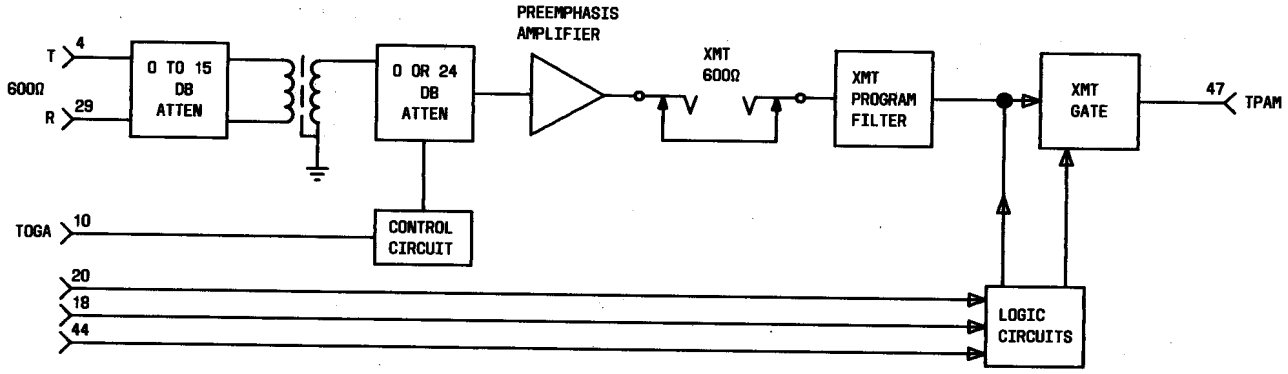
1—3P6D Cord or Pomona 2977-J-60 or 2P-type Cord with General Radio 274MB Plug added (for HP 200CD)

STEP	PROCEDURE
1	At the receive end of the carrier system, set the CAU SEND LEVEL switch to 0, the TEST switch to CHAN DROP, and connect the CAU RCV jack to the PGCU-R RCV jack using a 3P6D cord.
2	Connect a 1020-Hz oscillator (set to -15 dBm) to the CAU EXT OSC jack using a 3P6D cord (Fig. 4).
3	Connect a 600-ohm TMS to the PGCU-R T and R appearances at the DF (for T/R LINE jack on channel unit extender) and observe the power indication (Fig. 4). ***Requirement:*** Power (in dBm) within ±0.5 dB of test power value indicated in Fig. 4 tabulation (VU level from office records at receive end DF must be known in order to determine test power level).
4	If the requirement is not met, check the attenuator setting in the PGCU-R. If the trouble persists, replace the PGCU-R.
5	Remove all test connections and equipment from the program circuit and reconnect any program connections removed to facilitate testing.

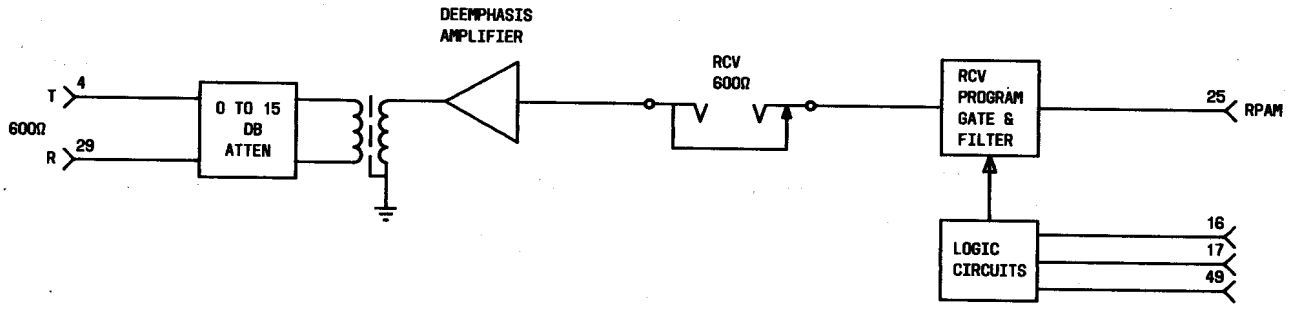
TABLE A

PROGRAM CHANNEL UNITS

SD/CD	J98718	PGCU
3C269	CA	2-Wire 5-kHz Transmit Unit (PGCU-5T)
3C270	CB	2-Wire 5-kHz Receive Unit (PGCU-5R)
3C271	CC	2-Wire 8-kHz Transmit Unit (PGCU-8T)
3C272	CD	2-Wire 8-kHz Receive Unit (PGCU-8R)

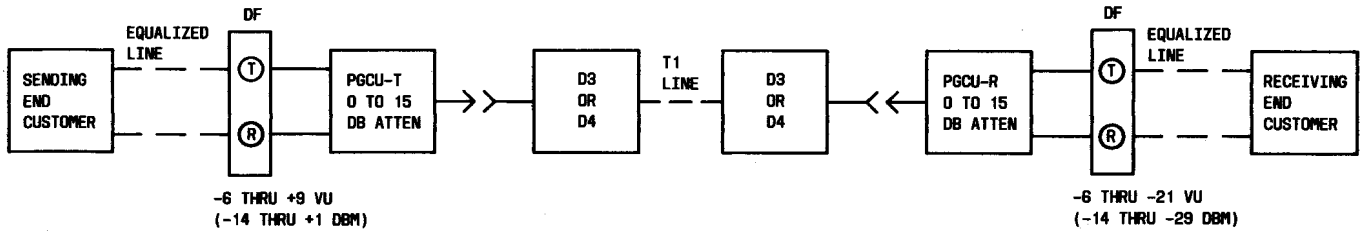


A. PGCU-T



B. PGCU-R

Fig. 1—PGCU Block Diagram



TRMT ATTEN = 6 DB + VU LEVEL AT T&R
OR
= 14 DB + DB LEVEL AT T&R*
EXAMPLE: 6 DB + (-2 VU) = 4 DB
OR
14 DB + (-10 DB) = 4 DB

*T&R LEVEL FROM RECORDS OR CALCULATED PER FOLLOWING EXAMPLE:
CUSTOMER SENDING LEVEL 0 DBM
-EQUALIZED LINE LOSS -10 DB
T&R LEVEL -10 DBM

RCV ATTEN = 6 DB + VU LEVEL REQ'D AT T&R
OR
= 14 DB + DB LEVEL REQ'D AT T&R†
EXAMPLE: 6 DB + (-6 VU) = 0 DB
OR
14 DB + (-14 DB) = 0 DB

†T&R LEVEL FROM RECORDS OR CALCULATED PER FOLLOWING EXAMPLE:
CUSTOMER SENDING LEVEL -30 DBM
+ EQUALIZED LINE LOSS +16 DB
T&R LEVEL -14 DBM

Fig. 2—PGCU Attenuator Settings

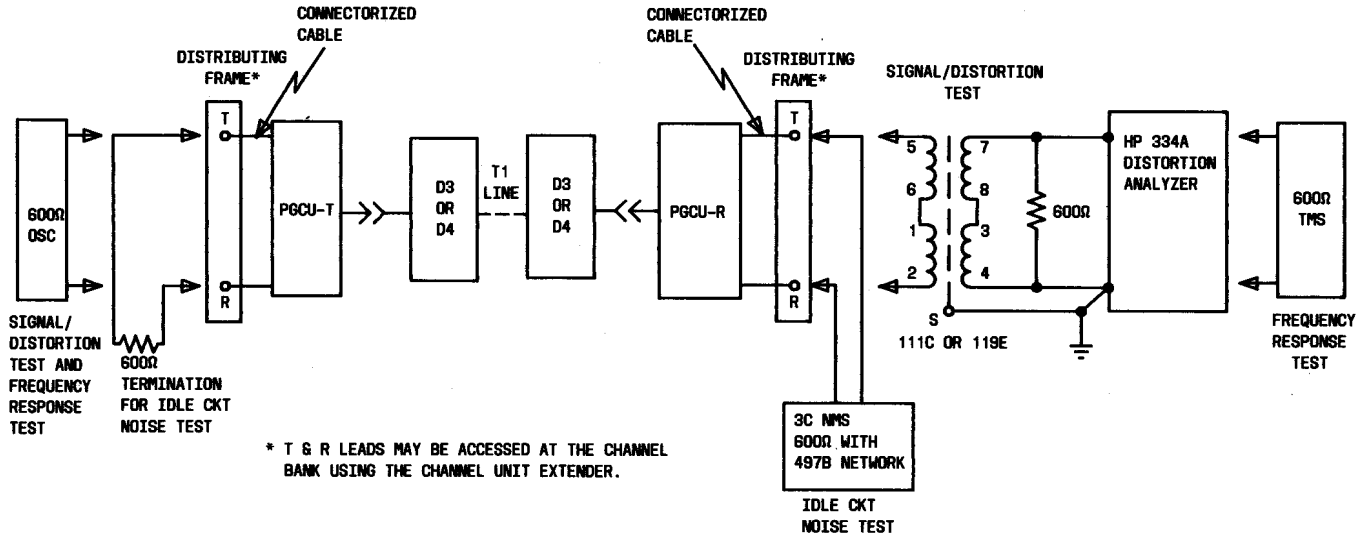
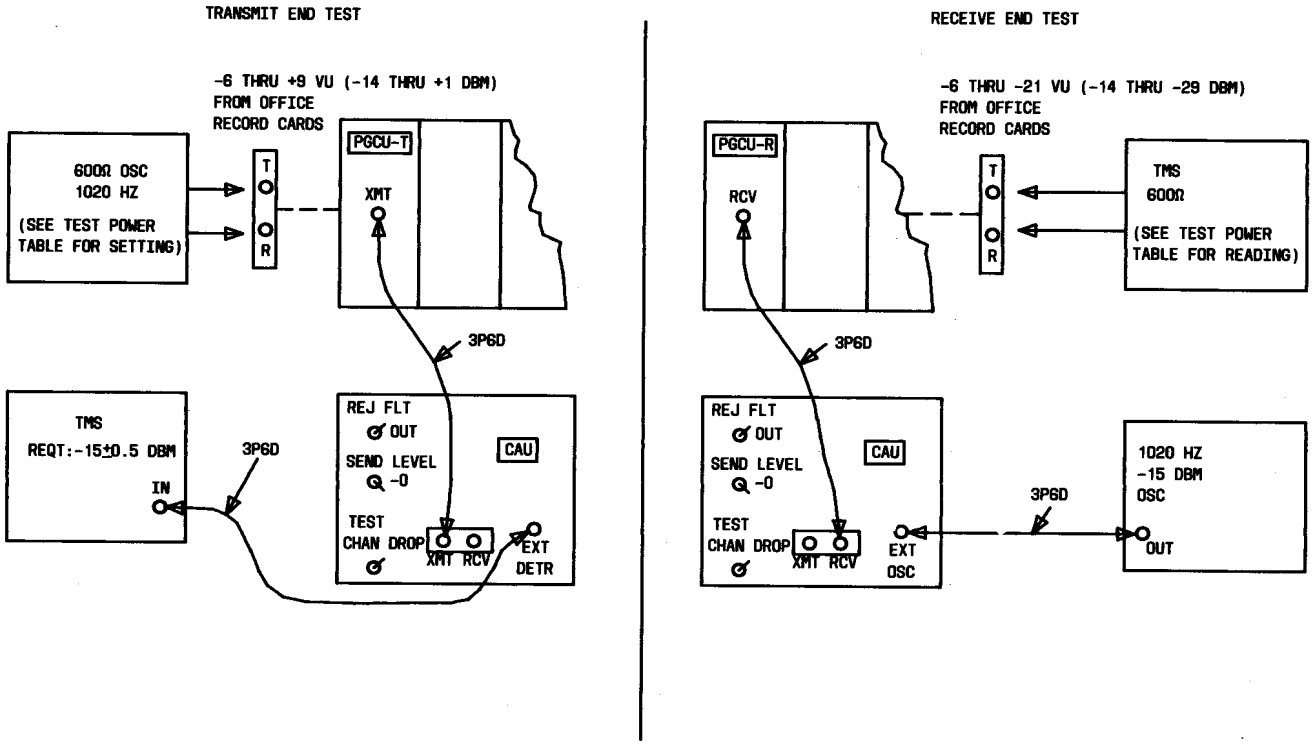


Fig. 3—End-to-End Tests



VU AT TRANSMIT END	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	+7	+8	+9
T&R DBM TEST POWER	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	+1

VU AT RECEIVE END	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21
T&R DBM TEST POWER	-14	-15	-16	-17	-18	-19	-20	-21	-22	-23	-24	-25	-26	-27	-28	-29

Fig. 4—Channel Drop Tests