D3 CHANNEL BANK
LINEUP PROCEDURES WITH NORTHERN TELECOM DE-3 DIGITAL TRANSMISSION SYSTEMS

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1. GENERAL

1.01 This section includes overall tests with banks out of service and single channel tests with banks in service. Transmission loss and idle channel noise should be measured for all channels added or reassigned to an in-service bank. Distortion should be measured on only one added channel.

1.02 When this section is reissued, the reason for reissue will be listed in this paragraph.

1.03 It is assumed that both banks have been installed and single-end tested per Section 365-150-501 and Section 368-5131-202 (Northern Telecom). For complete information on signaling compatibility, refer to Section 179-100-310. Verify that the proper channel unit options and pad selections have been made in accordance with the circuit layout record card.

1.04 When T1 terminals are to be used for special services (for example, private line data service) and the special service requirements are stricter than those specified for the T1 System, then the more stringent requirements must also be met. See Section 365-010-500.

1.05 When troubleshooting, each board removed because of suspicion of a defective network, but found not to be responsible for the trouble, should be reinserted in the bank into the original slot from which it was removed.

2. APPARATUS

2.01 The following apparatus or the equivalent is required at the Western Electric D3 end:

1—Hot Spare and Maintenance Shelf (Section 365-150-100)

1—J94003A or C Noise Measuring Set (NMS) [Section 103-611-100 (3A) or 103-611-101 (3C)]

1—3-Inch Shorting Strap per Section 365-150-500

1—P6AA Cord or 2—P3BH Cords

2—P3BH Cords

2—262B Plugs (600-ohm termination) for working banks

24—258C Open Plugs for nonworking banks.

2.02 The following apparatus or the equivalent is required at the Northern Telecom DE-3 end:

1—Transmission and Noise Measuring Set (TNMS), Hewlett-Packard HP3555B

1—Signal Source, Office Milliwatt Supply or Hewlett-Packard HP236A

1—QSM33A Test Interface Unit (TIU)

1—Pin-Jack Patch Cord, Pomona P24, (N Tel Part C0046660)

2—Test Cords: P3Q1A (6 foot), or P3Q1B (10 foot), or P3Q1C (15 foot)

2—Test Cords: P3Q3A (6 foot), or P3Q3A (10 foot), or P3Q3C (15 foot).

3. END-TO-END TEST PROCEDURES

STEP	WESTERN ELECTRIC D3 END	NORTHERN TELECOM DE-3 END
A. Preparation for tests		
1	Verify that all trunks to be tested are made busy and special services patched off or turned down for overall tests.	Verify that all trunks to be tested are made busy and special services patched off or turned down for overall tests.
2	Assemble test equipment and establish communication with other end.	Assemble test equipment and establish communication with other end.
3	Verify that all lamps on the alarm and control unit are extinguished.	Verify that all lamps on the alarm unit are extinguished.
B. Transmission Test		
	Receiving End	***Transmitting End***
1	Connect the test circuit for channel to be checked as shown in Fig. 1B. ***Note 1:*** On the P6AA cord, the knurled edge is associated with the red sleeve on the other end. ***Note 2:*** Do not connect NMS at this time.	Connect the test circuit for channel to be checked as shown in Fig. 2A (2-wire access) or Fig. 2B (4-wire access). ***Note:*** Refer to Table A to determine channel unit terminating resistance.
2	Set switches on CAU as follows: REJ FL to OUT SEND LEVEL to OFF TEST to CHAN LINE.	Set switches on receive unit (RU) as follows: 1 kHz/NORM/QUIET to NORM ON HOOK/OFF HOOK to OFF HOOK SHIFT/NORM to either position.
3	No action.	On TIU release all dB selectors.
4	No action.	Set controls on 236A oscillator as follows: POWER to ON OUTPUT LEVEL to 0 dBm (2-wire access) or -16 dBm (4-wire access) FUNCTION to 600 or 900 OHMS per channel unit impedance (see Table A) FREQUENCY TO 1020 Hz. ***Note:*** If a -16 dBm source is not available, use a 0 dBm source and depress the 16 dB attenuator on the TIU.

STEP	WESTERN ELECTRIC D3 END	NORTHERN TELECOM DE-3 END
5	Measure level on CAU meter. ***Requirement:*** The meter reading is in the green/black range (0.0 dBm ±0.25 dBm). In addition the speaker on the CAU should sound. ***Note 1:*** If meter is not in green/black range, sound will not be heard from speaker. ***Note 2:*** If meter is out of range, an external meter may be used to check the level.	No action.
6	If requirement of Step 5 is met, proceed to Step 8. If requirement is ***not*** met and the Western Electric D3 is suspected, replace the channel unit properly optioned and with proper pad selections.	If requirement at other end is met, proceed to Step 8. If requirement is ***not*** met and the Northern Telecom DE-3 is suspected, replace the channel unit properly optioned and with proper pad selections.
7	If the requirement is still ***not*** met, perform single-ended tests according to Section 365-150-501 and repeat this test.	If the requirement at other end is still ***not*** met, refer to the trouble-locating procedures of Section 368-5131-500 (Northern Telecom) and repeat this test.
8	Repeat Steps 1 through 5 for all channels to be tested.	Repeat Steps 1 through 5 for all channels to be tested.
	Transmitting End	***Receiving End***
9	Connect the test circuit for channel to be checked as shown in Fig. 1A.	Connect the test circuit for channel to be checked as shown in Fig. 3A (2-wire access) or Fig. 3B (4-wire access).
10	Set switches on CAU as follows: REJ FL to OUT SEND LEVEL to 0 TEST to CHAN LINE.	Set switches on TNMS as follows: POWER to ON FUNCTION to 600 or 900 ohms per channel unit impedance (see Table A) INPUT to TMS TERM RANGE as required.
11	No action.	Read the TNMS. ***Requirement:*** −2 ±0.25 dBm (2-wire access) or +7 ±0.25 dBm (4-wire access).

STEP	WESTERN ELECTRIC D3 END	NORTHERN TELECOM DE-3 END
12	If the requirement at other end is met, proceed to Step 14. If the requirement is ***not*** met and the Western Electric D3 is suspected, replace the channel unit properly optioned and with proper pad selections.	If the requirement is met, proceed to Step 14. If the requirement is ***not*** met and the Northern Telecom DE-3 is suspected, replace the channel unit properly optioned and with proper pad selection.
13	If the requirement at other end is still ***not*** met, perform single-ended tests according to Section 365-150-501 and repeat this test.	If the requirement is still ***not*** met, refer to the trouble-locating procedures of Section 368-5131-500 and repeat this test.
14	Repeat Steps 9 through 11 for all channels to be tested.	Repeat Steps 9 through 11 for all channels to be tested.
C. Idle Channel Noise Test		
1	Verify that Preparation for Tests and Transmission Test have been completed.	Verify that Preparation for Tests and Transmission Test have been completed.
2	Connect the test circuit for channel to be checked as shown in Fig. 1B.	Connect the test circuit for channel to be checked as shown in Fig. 3A (2-wire access) or Fig. 3B (4-wire access).
3	Place 258C open plugs in XMT jacks of all channel units not in service.	On the channel unit with 4-wire access, connect the FAC IN jack to the channel attenuator 600-ohm jack on TIU. Depress the 30-dB selector on the TIU. ***Note:*** This terminates the transmit end of the channel for noise measurements at the received end.
4	Set switches on CAU as follows: REJ FL to OUT SEND LEVEL to OFF TEST to CHAN LINE.	Set controls on TNMS as follows: POWER to ON FUNCTION to 600 or 900 OHMS per channel unit impedance (see Table A) INPUT to NOISE TERM NOISE WTG to C-MSG RESPONSE to DAMP RANGE as required.
5	Set switches on NMS as follows: DBRN to on scale WTG to C-MSG FUNCTION to 600/900 NM (3C) or 600 NM (3A) NORM/DAMP to DAMP.	No action.
6	Measure noise. ***Requirement:*** 23 dBrnc or less.	Measure noise. ***Requirement:*** 21 dBrnc or less (2-wire access); 30 dBrnc or less (4-wire access).

STEP	WESTERN ELECTRIC D3 END	NORTHERN TELECOM DE-3 END
7	If requirement of Step 6 is met, proceed to Step 8. If the requirement is ***not*** met, perform idle channel noise measurements single-ended per Section 365-150-501 and repeat this test.	If requirement of Step 6 is met, proceed to Step 8. If the requirement is ***not*** met, refer to the trouble-locating procedures of Section 368-5131-500 and repeat this test.
8	Repeat Steps 1 through 7 for all channels to be tested.	Repeat Steps 1 through 7 for all channels to be tested.
9	Remove 258C open plugs.	Release the 30-dB selector on the TIU.
10	When the requirement is met for all channels tested, proceed to the next test or remove test connections.	When the requirement is met for all channels tested, proceed to the next test and remove test connections.
D. Quantizing Distortion Test		
1	Verify that Preparation for Tests and Transmission Test have been completed.	Verify that Preparation for Tests and Transmission Test have been completed.
	Transmitting End	***Receiving End***
2	Connect the test circuit for channel to be checked as shown in Fig. 1A.	Connect the test circuit for channel to be checked as shown in Fig. 4A (2-wire access) or Fig. 4B (4-wire access).
3	Set switches on CAU as follows: REJ FL to IN SEND LEVEL to 0 TEST to CHAN LINE.	Set controls on TNMS as follows: POWER to ON FUNCTION to 600 or 900 OHMS per channel unit impedance (see Table A) INPUT to NOISE TERM NOISE WTG to C-MSG RESPONSE to DAMP RANGE as required.
4	No action.	Set the filter switch (BP/BR) on the TIU to BR.
5	Select 0, 10, 20, 30, and 40 dB attenuation, one at a time, by setting SEND LEVEL switch on CAU as follows:	Read the noise level on TNMS for each attenuation selected at transmitting end.

Requirement:

	2-WIRE ACCESS	4-WIRE ACCESS
0	48 dBrnc or less	51 dBrnc or less
-10	38 dBrnc or less	47 dBrnc or less
-20	28 dBrnc or less	37 dBrnc or less
-30	18 dBrnc or less	27 dBrnc or less
-40	14 dBrnc or less	23 dBrnc or less

STEP	WESTERN ELECTRIC D3 END	NORTHERN TELECOM DE-3 END
6	If requirements at other end are ***not*** met, perform distortion measurements single-ended per Section 365-150-501 and repeat this test.	If requirements are ***not*** met, refer to the trouble-locating procedures of Section 368-5131-500 and repeat this test.
	Receiving End	***Transmitting End***
7	Connect the test circuit for channel to be checked as shown in Fig. 1B.	Connect the test circuit for channel to be checked as shown in Fig. 2A (2-wire access) or Fig. 2B (4-wire access).
8	Set switches on CAU as follows: REJ FL to IN SEND LEVEL to OFF TEST to CHAN LINE.	Set controls on 236A oscillator as follows: POWER to ON OUTPUT LEVEL to 0 dBm (2-wire access) or -16 dBm (4-wire access) FUNCTION to 600 or 900 OHMS per channel unit impedance (see Table A) FREQUENCY to 1020 Hz. ***Note:*** If a -16 dBm source is not available, use a 0 dBm source and depress the 16-dB attenuator on the TIU.
9	Set switches on NMS as follows: DBRN to 85 WTG to C-MSG FUNCTION to 600/900 NM (3C) or 600 NM (3A) NORM/DAMP or DAMP.	No action.
10	Adjust DBRN control on NMS as required and read meter for each attenuation selected at transmitting end. ***Requirement:*** 56 dBrnc or less 46 dBrnc or less 36 dBrnc or less 26 dBrnc or less 22 dBrnc or less	Select 0, 10, 20, 30, and 40 dB attenuation, one at a time, on the TIU. 0 10 20 30 40 ***Note:*** Select 40 dB by depressing both the 10 and 30 dB selectors on TIU.

STEP	WESTERN ELECTRIC D3 END	NORTHERN TELECOM DE-3 END
11	If requirements are ***not*** met, perform distortion measurements single-ended per Section 365-150-501 and repeat this test.	If requirements at other end are ***not*** met, refer to the trouble-locating procedures of Section 368-5131-500 and repeat this test.
12	Disconnect test setup and turn off power on test sets as applicable.	Disconnect test setup and turn off power on test sets as applicable.

E. Alarm Tests

Caution: This test should not be performed on working banks until all circuits have been made busy or removed from service.

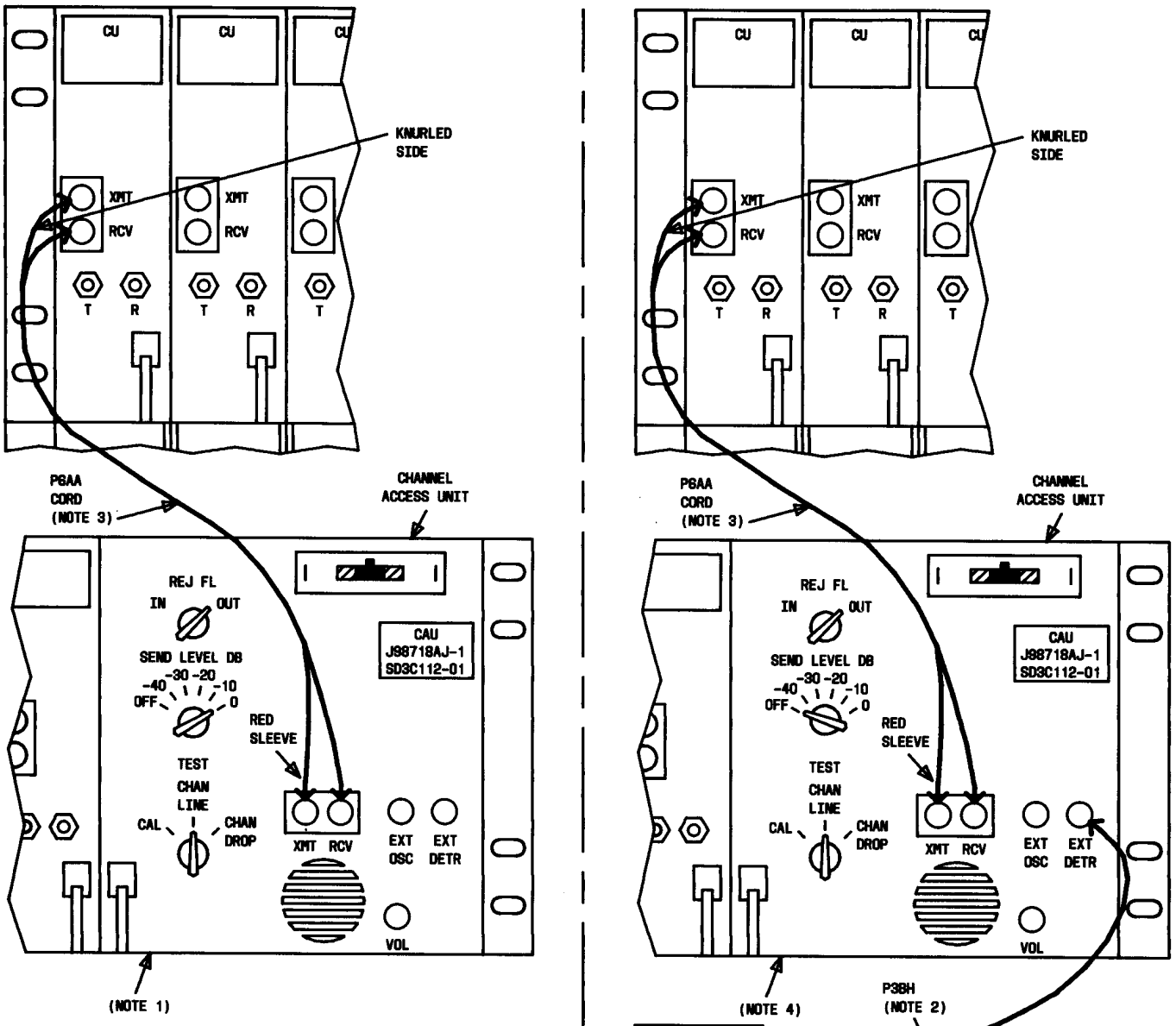
Note: Disregard the lighting or extinguishing of lamps not specifically referred to in this test.

1	Connect a 3-inch wire equipped with pin plugs between the RNFAL and GRD jacks on the receiver unit. ***Requirement:*** The red AR lamp on the alarm control unit lights.	Observe the alarm unit. ***Requirement:*** The yellow REM and orange CGA lamps light on the alarm unit.
2	Depress ACO button. ***Requirement:*** The ACO lamp lights and the audible alarms silence.	Depress ACO switch. ***Requirement:*** The ACO lamp lights and the audible alarms silence.
3	If the lamp does not light, remove the lamp and check it with an ohmmeter. If there is continuity, replace the alarm control unit.	If any one of the requirements in Steps 1 and 2 are ***not*** met, refer to the trouble-locating procedures of Section 368-5131-500.
4	Remove the wire from between RNFAL and GRD jacks. ***Requirement:*** The red AR lamp extinguishes.	Observe the alarm unit. ***Requirement:*** After 10 seconds the yellow REM lamp and white ACO lamp extinguish.
5	No action.	Depress CGA button. ***Requirement:*** Orange CGA lamp extinguishes.
6	If the requirement is ***not*** met, replace the alarm control unit.	If the requirement is ***not*** met, refer to the trouble-locating procedures of Section 368-5131-500.
7	Disengage the transmit unit. ***Requirement:*** The yellow AY lamp on the alarm control unit lights.	Observe the alarm unit. ***Requirement:*** The red LOC and orange CGA lamps light on the alarm unit.
8	Depress ACO button. ***Requirement:*** The ACO lamp lights and the audible alarms silence.	Depress ACO switch. ***Requirement:*** The ACO lamp lights and the audible alarms silence.

STEP	WESTERN ELECTRIC D3 END	NORTHERN TELECOM DE-3 END
9	Reinsert transmit unit. ***Requirement:*** Yellow AY lamp on the alarm control unit extinguishes.	Observe the alarm unit. ***Requirement:*** LOC and ACO lamps extinguish 10 seconds later.
10	If requirements are ***not*** met, replace the alarm control unit.	If requirements are ***not*** met, refer to the trouble-locating procedures of Section 368-5131-500.
11	Depress MEM RESET button on TPU if provided.	Depress CGA button on the alarm unit; orange CGA lamp extinguishes.

TABLE A

TEST ACCESS TERMINATION	CHANNEL UNIT TYPE
600 ohms	QPP457A 4W T.O. QPP465A 4W T.O. QPP357-type 4W E&M QPP365-type 4W E&M QPP358-type 2W E&M QPP366-type 2W E&M QPP367-type 2W E&M QPP370-type SAS QPP371-type SAO QPP470-type FXS QPP471-type FXO
900 ohms	QPP354-type DPO QPP355-type SDPO QPP356-type DPT QPP359-type 2W E&M



A. TRANSMITTING END

B. RECEIVING END

NOTES:

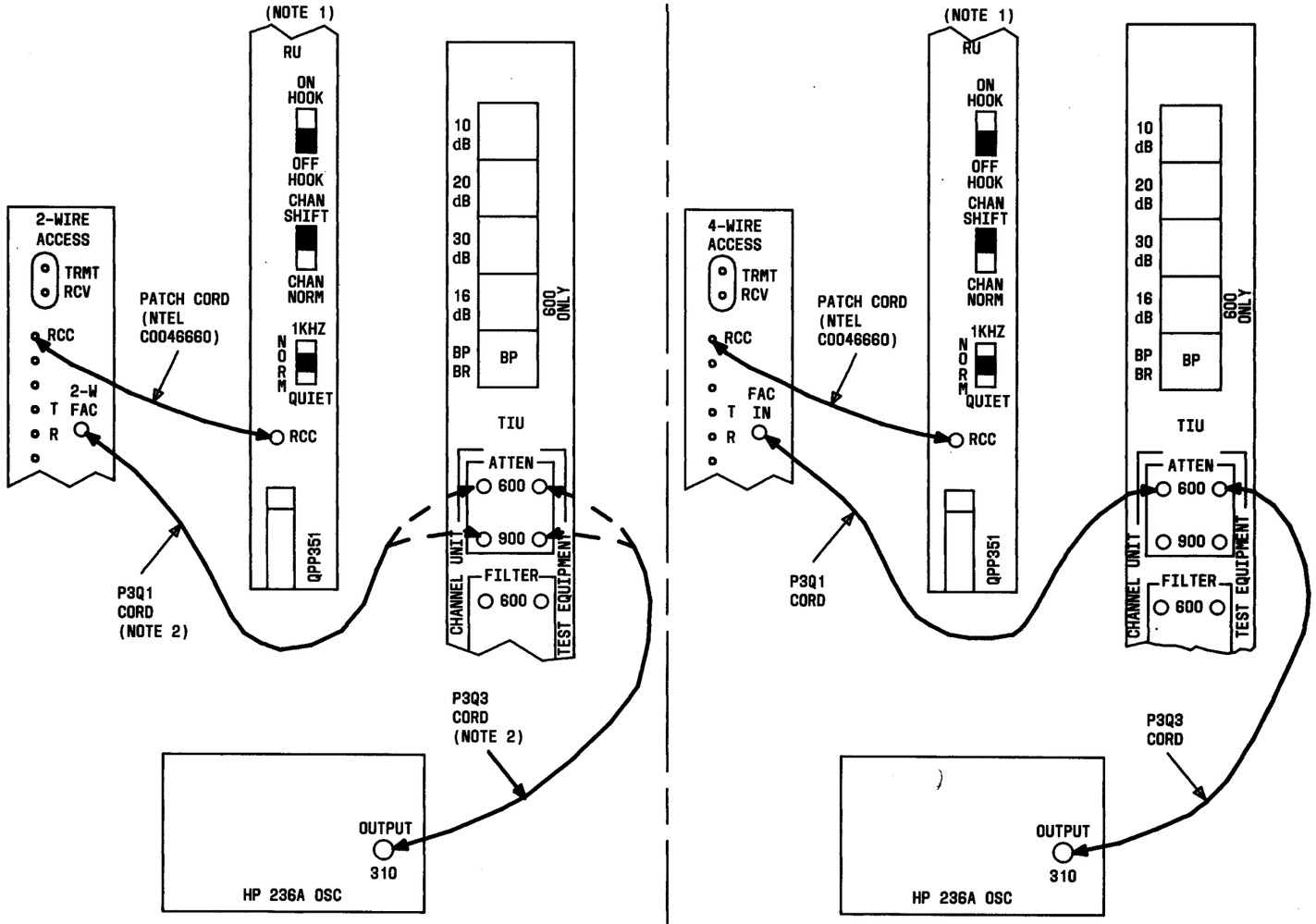
1. SET THE SWITCHES ON THE CAU AS FOLLOWS:

TEST	CAU SWITCHES		
	REJ FL	SEND LEVEL	TEST
NET LOSS	OUT	0	CH LINE
NOISE	OUT	OFF	CH LINE
DISTORTION	IN	0 TO 40	CH LINE

2. NMS REQUIRED FOR NOISE AND DISTORTION TEST.
3. PATCH KNURLED SIDE OF DOUBLE PLUG TO XMT JACK. PATCH RED 310 PLUG TO XMT AND BLACK 310 PLUG TO RCV.
4. SET THE SWITCHES ON THE CAU AS FOLLOWS:

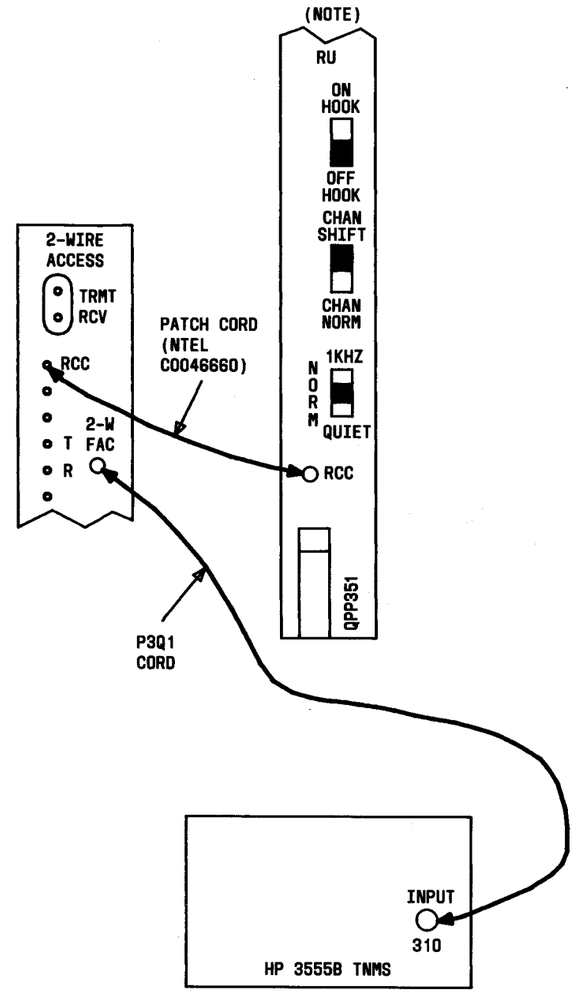
TEST	CAU SWITCHES		
	REJ FL	SEND LEVEL	TEST
NET LOSS	OUT	OFF	CH LINE
NOISE	OUT	OFF	CH LINE
DISTORTION	IN	OFF	CH LINE

Fig. 1—Channel Net Loss, Noise, and Distortion Test—Western Electric D3 Terminals



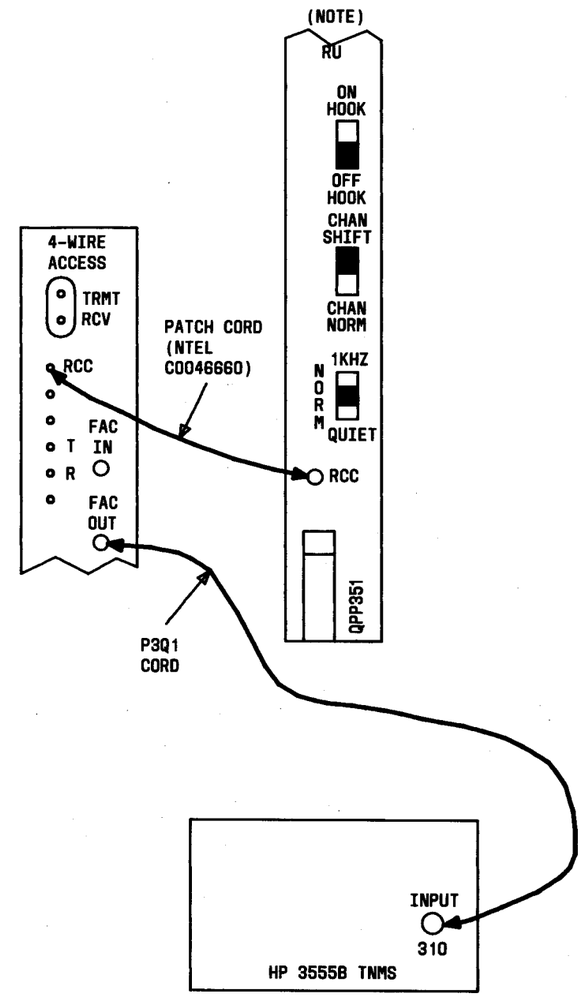
NOTES:
1. SET SWITCHES ON RU AS FOLLOWS:
   1KHZ/NORM/QUIET TO NORM
   ON HOOK/OFF HOOK TO OFF HOOK
   SHIFT/NORM TO EITHER POSITION.
2. REFER TO TABLE A TO DETERMINE CHANNEL UNIT TERMINATING RESISTANCE THEN PATCH TO THE APPLICABLE 600 OR 900 OHM JACK ON THE TIU.

Fig. 2—Channel Net Loss, Noise, and Distortion Test—Northern Telecom DE-3 Terminals (Transmitting End)



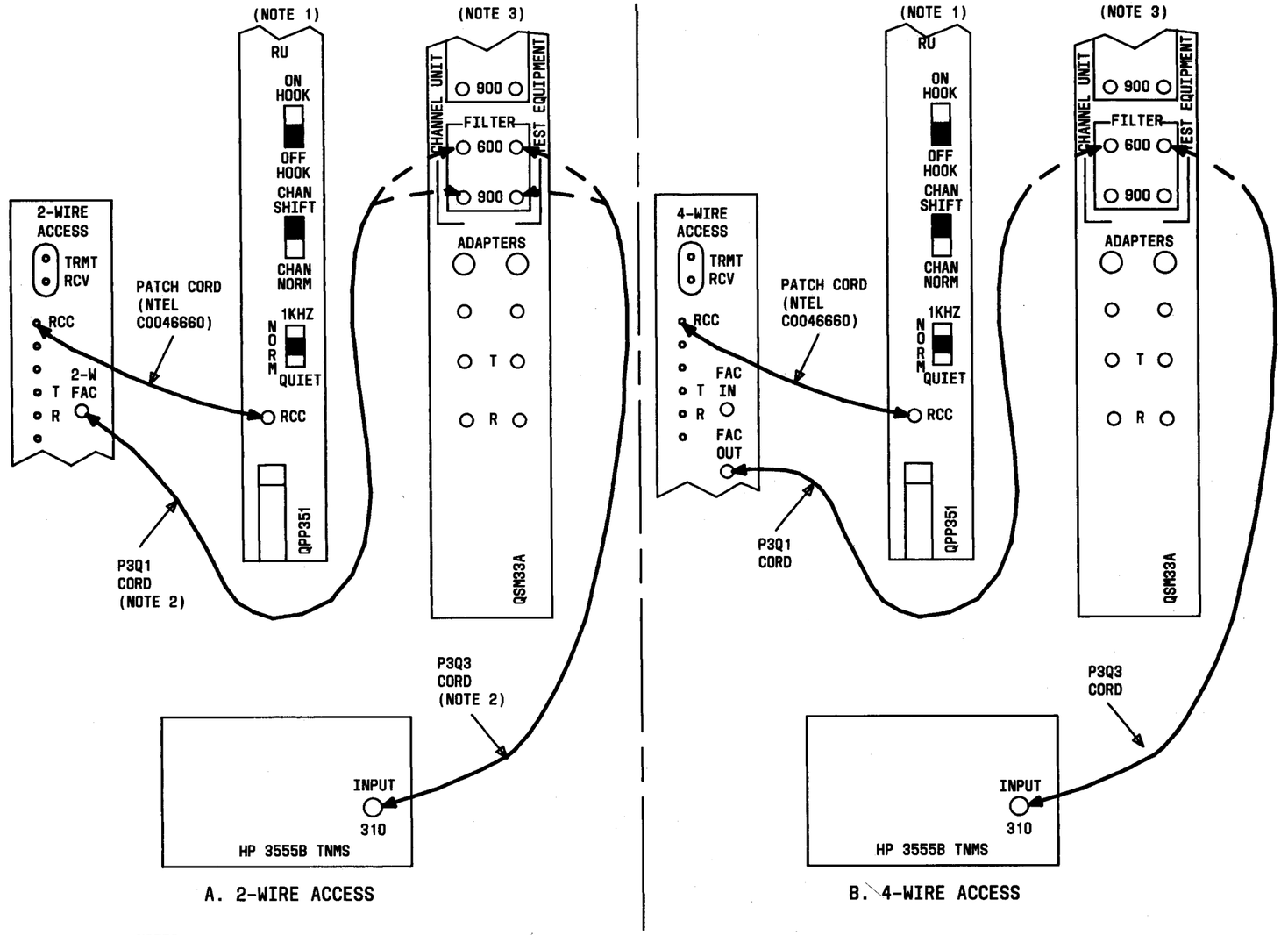
A. 2-WIRE ACCESS

NOTE:
SET SWITCHES ON RU AS FOLLOWS:
1KHZ/NORM/QUIET TO NORM
ON HOOK/OFF HOOK TO OFF HOOK
SHIFT/NORM TO EITHER POSITION.



B. 4-WIRE ACCESS

Fig. 3—Channel Net Loss and Noise Test—Northern Telecom DE-3 Terminals (Receiving End)



NOTES:
1. SET SWITCHES ON RU AS FOLLOWS:
   1KHZ/NORM/QUIET TO NORM
   ON HOOK/OFF HOOK TO OFF HOOK
   SHIFT/NORM TO EITHER POSITION.
2. REFER TO TABLE A TO DETERMINE CHANNEL UNIT TERMINATING RESISTANCE THEN PATCH TO THE APPLICABLE 600 OR 900 OHM JACK ON THE TIU.
3. SET BP/BR SWITCH ON TIU TO BR.

Fig. 4—Distortion Test—Northern Telecom DE-3 Terminals (Receiving End)