Section 6

SECTION VI

PERIODIC ALIGNMENT TEST

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Figures

Tables

1. GENERAL

1.01 This section contains stand-alone periodic lineup test procedures for end-to-end validation of B325 channel bank operation. A span line test is also provided to ensure the intervening T-1 outside line is performing within specifications, prior to beginning the test procedures.

1.02 The procedures of this section may be performed, as a final performance verification step after initial installation and on a periodic schedule, by the system repairman. Regularly scheduled end-to-end testing will usually identify a problem area before it becomes service affecting.

1.03 Test equipment required to perform the procedures of this section is listed in Table A. Procedures require like test equipment and a craftsman at each channel bank location. Test circuit connections and test instructions assume use of an external test oscillator and a HP 3555B transmission and noise measuring set. If a hard-wired office milliwatt is used as a tone signal source, disregard external test oscillator connection instructions. If a transmission and noise measuring set is not available, use alternate noise measuring test set for measurements.

CERTIFICATION FORM

1.04 An end-to-end test certification form for recording total test results is provided in Fig. 8. A sample test record form for recording test data for the recommended periodic tests (Paragraph 9) is provided in Fig. 9. Copies of these forms may be obtained from Lynch Customer Service.

TABLE A

TEST EQUIPMENT AND SPECIAL TOOLS

EQUIPMENT	MANUFACTURER	MODEL*
Error Detector	Sierra Electronics	315B
Multimeter	Simpson	260
Transmission and Noise Measuring Set (TNMS)	Hewlett-Packard	3555B
**Noise Measuring Test Set	Northeast Electronics	TTS-37 Series
	Western Electric	Type 3A
Oscillator (Test Tone Generator)	Hewlett-Packard	200CD/236A
Signaling Test Set	Northeast Electronics	TTS-26B
Test and Alignment Panel	Lynch	325TA01
Test Kit (Includes patch cords, plugs and card extenders)	Lynch	325TK01

*Or equivalent

**Alternates for transmission and noise measuring set.

2. SPAN LINE TEST

2.01 The span line test checks that the error rate on the span line is less than approximately 3×10^{-7} errors per time slot.

2.02 To perform the test procedures, an error detector is required. If the span line is protected with a Lynch B302 electronic span line switch (ESLS), the error detection is provided by the B302. Or, a span and repeater test set (Sierra Electronics Model 315B, or equivalent) provides an error detector.

2.03 If any problems are encountered, while performing the span line tests, consult the Lynch ***T-1 PCM Span Line Technical Manual.*** Proceed as follows:

(a) Unloop near end terminal and far end terminal.

(b) Ensure that test equipment indicates pulses and NO errors exist at monitor jacks of the span termination equipment.

(c) Disconnect test equipment.

3. TEST OSCILLATOR ADJUSTMENT

3.01 End-to-end channel gain adjustment tests, distortion tests and crosstalk tests require a distortion free signal from a test oscillator. The following steps provide instructions for adjusting and testing an external test oscillator or hard-wired office milliwatt input. One of these procedures must be performed, prior to connecting the tone signal for the first test.

EXTERNAL TEST OSCILLATOR

3.02 The following steps provide instructions for adjusting the test oscillator frequency and amplitude and for measuring the noise content of its output signal.

(a) Arrange the test and alignment panel (325-TA01), oscillator and transmission and noise measuring set (TNMS), as shown in Fig. 1. Place test and alignment panel switches in positions indicated.

(b) Set controls of the TNMS for a 600-ohm terminated level measurement.

(c) Set the test oscillator frequency control to 1 kHz.

(d) Adjust level control of the test oscillator for a reading of 0 dBm on the level meter of the TNMS.

Note 1: Due to losses in the test and alignment panel, the oscillator may be required to supply as much as +1.5 dB, in order for the level meter of the noise measuring test set to read 0 dBm.

Note 2: Step (e) through (j) of this procedure determines whether the test oscillator is suitable to use in the signal distortion tests.

(e) Change test oscillator input to the RCV test jack on the test and alignment panel.

(f) Change TNMS connection to TEST OUT jack on the test and alignment panel.

(g) On test and alignment panel, place DISTORTION switch in the ON position (up).

(h) Adjust TNMS for a 600-ohm terminated noise measurement through C-message weighting filters.

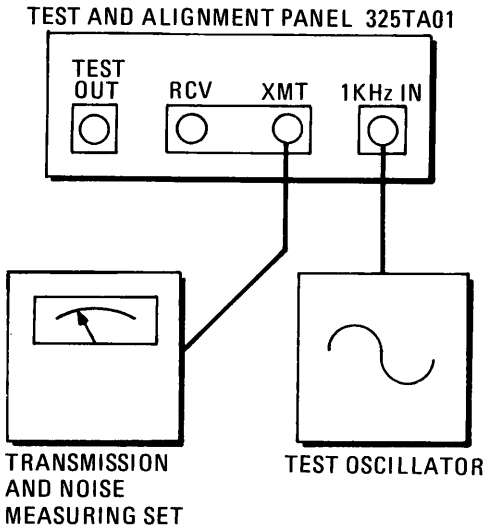
(i) Slightly tune the oscillator frequency, until a null (low dip) is produced in the noise reading.

Note: Null indicates that oscillator frequency corresponds to the stopband of the filter in the test and alignment panel.

Caution: If the meter indicates more than 32 dBrnC, the oscillator is not suitable to perform the tests that follow.

(j) Observe meter on the TNMS. Meter should indicate less than 32 dBrnC.

(k) Disconnect test setup.



325TA01 INITIAL SWITCH SETTINGS

CROSSTALK–	OFF (DOWN)
DISTORTION–	OFF (DOWN)
ATTENUATION–	ALL SWITCHES OUT
2TLP–	OUT
RCV 900/600Ω –	600Ω
XMT 900/600Ω –	600Ω
XMT 4W/2W–	2W

Fig. 1—Test Oscillator Adjustment Test Hookup

HARD-WIRED OFFICE MILLIWATT

3.03 The following steps provide instructions for adjusting the tone generator amplitude and checking the noise content of its output signal.

(a) Connect a transmission and noise measuring set (TNMS) to the XMT jack of the test and alignment panel (325TA01).

(b) Place 325TA01 switches in positions indicated below.

CROSSTALK–OFF (down)

DISTORTION–ON (up)

ATTENUATION–All switches OUT

2TLP–OUT

RCV 900/600 ohm–600 ohm

XMT 900/600 ohm–600 ohm

XMT 4W/2W–2W

(c) Set controls of TNMS for a 600-ohm terminated level measurement.

(d) Adjust 325TA01 GAIN (screwdriver adjustment) for an indication of 0 dBm on the TNMS level meter.

(e) Change TNMS connection from 325TA01 XMT jack to 325TA01 TEST OUT jack.

(f) Connect a patch cord from 325TA01 XMT jack to 325TA01 RCV jack.

(g) Adjust TNMS for a 600-ohm terminated noise measurement through C-message weighting filters.

Caution: If the meter indicates more than 32 dBrnC, the oscillator is not suitable to perform the tests that follow.

(h) Observe that TNMS level indication is less than 32 dBrnC.

(i) Disconnect test setup.

4. END-TO-END GAIN ADJUSTMENT

4.01 End-to-end channel unit gain adjustment procedures are provided in the following paragraphs. The procedures are intended to meet maintenance requirements for periodic channel bank realignment, pair channel unit replacement/new channel activation and single channel unit replacement.

PERIODIC CHANNEL BANK REALIGNMENT

4.02 Perform procedures of Chart 1 periodically to ensure that channel unit gain levels are set to installation requirements. These procedures are the desired method of gain adjustment and should be performed after channel unit replacement when service may be interrupted by operating the channel bank in a looped mode.

PAIR CHANNEL UNIT REPLACEMENT

4.03 Perform procedures of Chart 2 or Chart 3 (alternate method) when a new channel is activated or pair channel unit is replaced, and it is not desirable to interrupt service by operating the channel bank in a looped mode.

4.04 The procedures of Chart 2 provide an accurate channel unit XMT potentiometer adjustment by extending the channel unit on a circuit board extender (P/O 325TK01 Test Kit) and measuring the transmit VF signal. The far-end RCV potentiometer may then be adjusted by monitoring the channel unit TIP and RING (TIP 1 and RING 1 on four-wire units) test jacks.

4.05 The procedures of Chart 3 are intended as an interim adjustment where use-requirements necessitate immediate channel use. These procedures mechanically approximate a nominal transmit gain setting then adjust the far-end RCV potentiometer by monitoring the channel unit TIP and RING (TIP 1 and RING 1 on four-wire units) test jacks. If these procedures are used, the adjustment should be checked at the earliest opportunity using the procedures of Chart 1.

SINGLE CHANNEL UNIT REPLACEMENT

4.06 Perform procedures of Chart 4 to adjust a single replacement channel unit transmit and receive gains when it is not desirable to interrupt service by operating the channel bank in a loop mode. These procedures use the existing mate channel unit at the far-end terminal as a reference for setting the new (near-end) channel unit gains. As soon as practicable, the adjustment should be checked using the procedures of Chart 1.

CHART 1

PERIODIC TERMINAL REALIGNMENT GAIN ADJUSTMENTS

APPARATUS:

1—Transmission and Noise Measuring Set (Hewlett-Packard 3555B, or equivalent) at near-end and far-end terminals.

2—Test Oscillator (Hewlett-Packard 200CD, or equivalent) at near-end and far-end terminals.

STEP	PROCEDURE
	Requirement: Near-end and far-end channel banks are operating in the normal (unlooped) mode with no alarm indications.
1	At near-end and far-end channel banks, press in to latch all channel unit BUSY switches.
	Requirement: All channel unit BUSY lights come on.
	Note: BUSY switch does not open TIP and RING lines on 325EM01 channel units.
2	If 325EM01 channel units are to be adjusted, the transmit VF path must be opened. This can be done at the jack field.
3	At near-end and far-end channel banks' 325PA01 alarm and power units, press LOOP switch in to latch, and place the DSG and SHIFT switches to the ON position.
	Requirement: LOOP indicators come on.
4	At near-end and far-end channel banks, connect transmission and noise measuring set (TNMS) or level meter, adjusted for a 600-ohm or 900-ohm terminated level measurement (depending on channel unit type), to TIP and RING test jacks on two-wire channel units or TIP-1 and RING-1 test jacks on four-wire channel units. See Fig. 2 for test jack and adjustment locations.
5	Adjust channel unit RCV potentiometer, until meter indicates proper receive level for channel unit type at this installation. (Refer to Table B.)
6	Record final indication on copy of Certification Form (Fig. 8).
7	Repeat Step 4 and 5 for each channel unit to be adjusted.
8	Ensure test oscillator has been adjusted, according to the procedures of Paragraph 3.
9	At near-end and far-end channel banks' 325AP01 alarm and power unit, press in to unlatch LOOP switch and place DSG and SHIFT switches in OFF position.
	Requirement: LOOP lights go off.

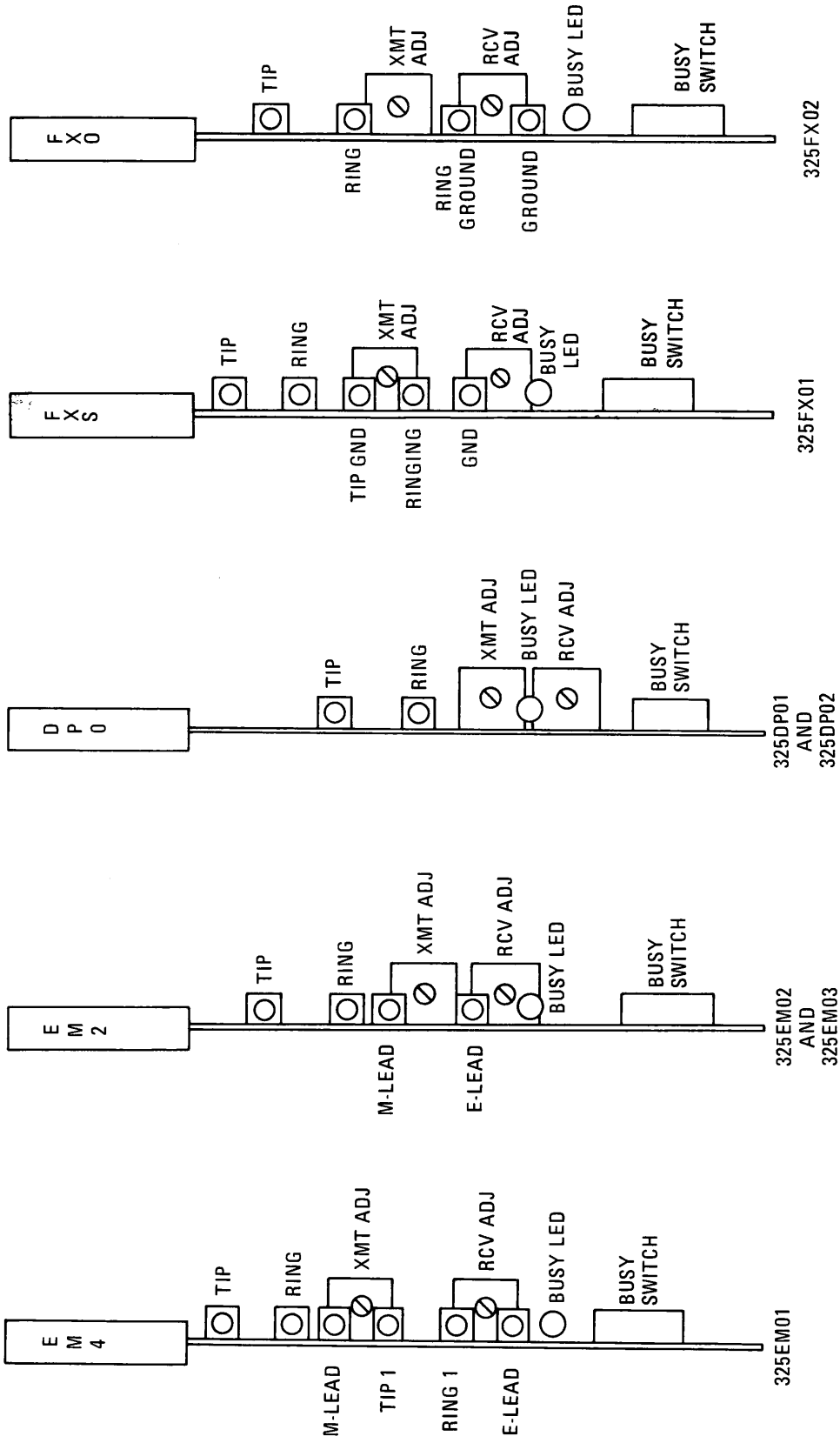
CHART 1 (Cont)

STEP	PROCEDURE
10	At near-end (XMT) and far-end (RCV) channel banks, connect test circuit, as shown in Fig. 3. At near-end channel bank, position switches on 325TA01 test and alignment panel as indicated in Fig. 3.
11	With TNMS adjusted for 600-ohm or 900-ohm terminated level measurement (depending on channel unit type), adjust near-end channel unit XMT potentiometer until meter indicates same value as obtained for RCV adjustment of same channel in Step 5.
12	Record final indication on copy of Certification Form (Fig. 8).
13	Repeat Step 10 through 12 for each channel unit to be adjusted.
14	Repeat Step 10 through 13 for near-end receive and far-end transmit XMT potentiometer adjustments.
15	This completes procedures of Chart 1. Disconnect test setup.

TABLE B

CHANNEL UNIT GAIN ADJUSTMENT DATA

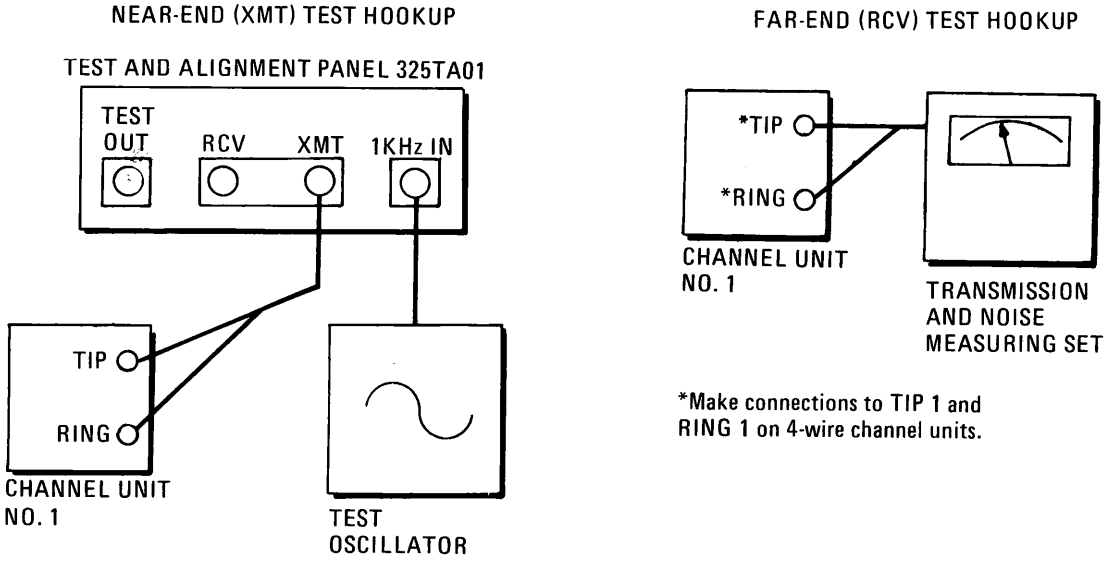
CHANNEL UNIT TYPE	RECEIVE ADJUSTMENT		TRANSMIT ADJUSTMENT	
	RANGE	NOMINAL	RANGE	NOMINAL
2-WIRE UNITS 325EM02, 325EM03, 325DP01, 325FX01, 325FX02	0 dBm to -6.5 dBm	-2 dBm	-3 dBm to +3 dBm	0 dBm
4-WIRE UNITS 325EM01	+4 dBm to +10 dBm	+7 dBm	-13 dBm to -19 dBm	-16 dBm
325VF01	To be Supplied		To be Supplied	



NOTE 1: Tip and ring test jacks are colored red and E-lead and M-lead test jacks are colored green.

NOTE 2: 325VF01 test jack and adjustment locations to be supplied.

Fig. 2—Test Jack and Adjustment Locations



325TA01 SWITCH SETTINGS

CROSSTALK–	N/A (Not in test circuit)
DISTORTION–	N/A (Not in test circuit)
ATTENUATION–	ALL SWITCHES OUT
2TLP–	IN for 2TLP OFFICE ONLY
RCV 900/600Ω –	N/A (Not in test circuit)
XMT 900/600Ω –	600Ω for 325EM01, 325EM02, and VF CHANNEL UNITS. ALL OTHERS 900Ω.
XMT 4W/2W–	4W for 325EM01 and 325VF01 CHANNEL UNITS. ALL OTHERS 2W.

Fig. 3—Gain Adjust Test Hookup

CHART 2

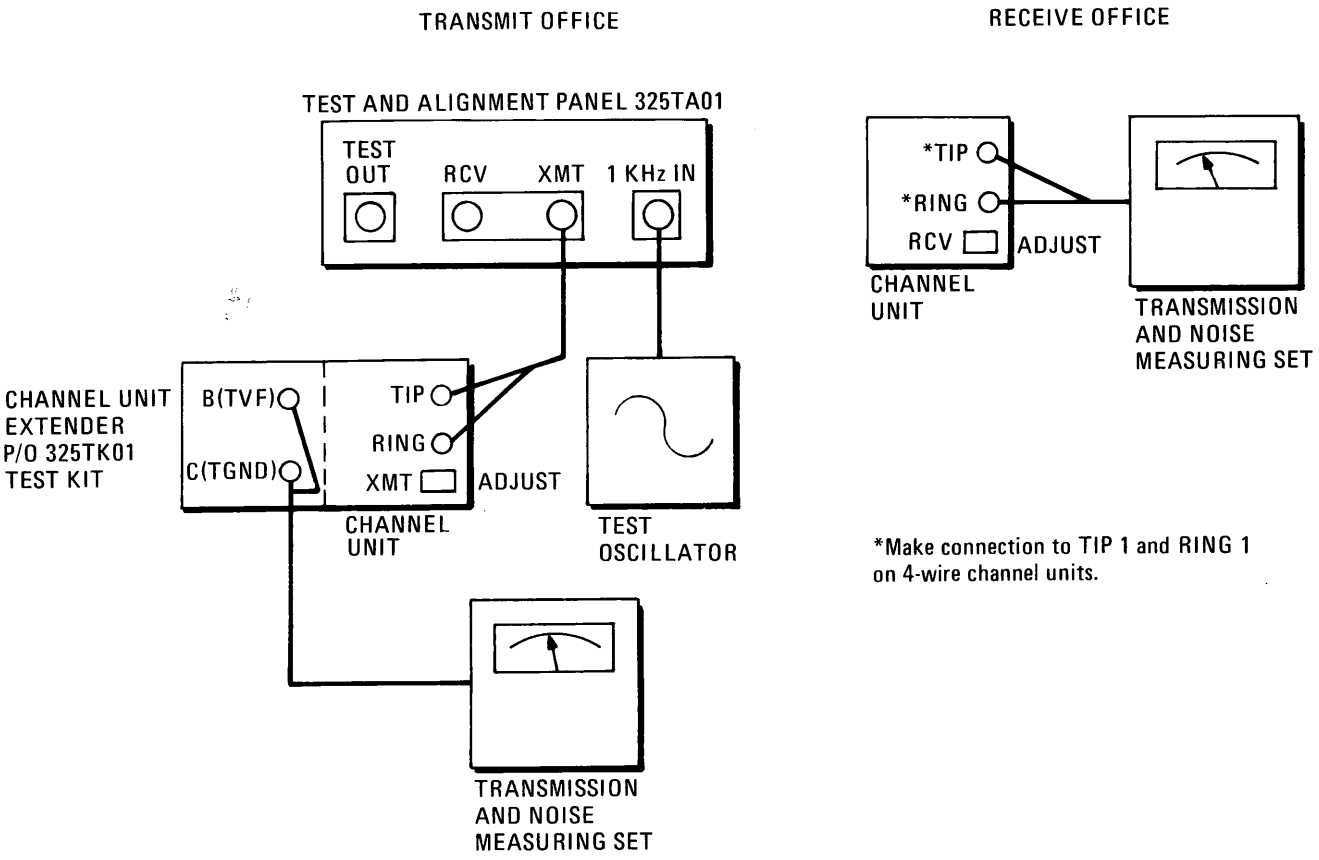
PAIR CHANNEL UNIT REPLACEMENT GAIN ADJUSTMENTS

APPARATUS:

1–Transmission and Noise Measuring Set (Hewlett-Packard 3555B, or equivalent) at near-end and far-end terminals.

2–Test Oscillator (Hewlett-Packard 200DC, or equivalent) at near-end and far-end terminals.

STEP	PROCEDURE
	Note: Steps of this procedure assume new channel activation or pair channel unit replacement at near-end and far-end channel banks.
	Requirement: Near-end and far-end channel banks are operating in the normal (unlooped) mode with no alarm indications.
1	Ensure test oscillator has been adjusted and tested in accordance with procedures of Paragraph 3.
2	At near-end and far-end channel banks, press in to latch BUSY switches on channel units to be adjusted.
	Requirement: BUSY lights will come on.
	Note: BUSY switch does not open TIP and RING lines on 325EM01 channel units.
3	If 325EM01 channel units are to be adjusted, the transmit VF path must be opened. This can be done at the jack field.
4	At near-end channel bank, install channel unit extender board (part of 325TK01 Test Kit) between channel unit to be adjusted and channel bank connector.
5	At near-end channel bank, position switches on 325TA01 test and alignment panel and connect test circuit shown in Fig. 4 for transmit office.
6	Adjust transmission and noise measuring set (TNMS) for a 600-ohm bridged level measurement.
	Caution: During XMT or RCV level adjustments, inadvertent shorting of channel unit circuitry could cause equipment damage. Use nonmetalic or insulated screwdriver to make adjustments.
7	Adjust near-end channel unit XMT potentiometer for an indication of 5 dBm (1.78 volts RMS) on the TNMS. This establishes the required transmission level output of the channel unit.
8	At far-end channel bank, connect test circuit shown in Fig. 4 for receive office and adjust TNMS for a terminated level measurement at 600 or 900 ohms, depending on channel unit type.
9	Adjust far-end channel unit RCV potentiometer for a TNMS indication of nominal value in Table B.
	Note: Particular use requirements may dictate RCV level adjustment to other than nominal value. Refer to Table B for receive adjustment range.
10	Repeat Step 4 through 9, reversing near-end and far-end connections to achieve far-end transmit and near-end receive adjustments.
11	This completes the procedures of Chart 2. Disconnect test setups.



325TA01 INITIAL SWITCH SETTINGS

CROSSTALK–	N/A (Not in test circuit)
DISTORTION–	N/A (Not in test circuit)
ATTENUATION–	ALL SWITCHES OUT
2TLP–	IN for 2TLP OFFICES
RCV 900/600Ω –	N/A (Not in test circuit)
XMT 900/600Ω –	900Ω for 325EM03, 325DP01, 325DP02, 325FX01 and 325FX02 CHANNEL UNITS. 600Ω for 325EM01, 325EM02 and 325VF01 CHANNEL UNITS.
XMT 4W/2W –	4W for 325EM01 and 325VF01 CHANNEL UNITS. ALL OTHERS 2W.

Fig. 4—Gain Adjust (XMT Monitor) Test Hookup

CHART 3

PAIR CHANNEL UNIT REPLACEMENT ALTERNATE GAIN ADJUSTMENTS

APPARATUS:

1—Transmission and Noise Measuring Set (Hewlett-Packard 3555B, or equivalent) at near-end and far-end terminals.

2—Test Oscillator (Hewlett-Packard 200CD, or equivalent) at near-end and far-end terminals.

STEP	PROCEDURE
	Note: Steps of this procedure assume new channel activation or pair channel unit replacement at near-end and far-end terminals.
	Requirement: Near-end and far-end channel banks are operating in the normal (unlooped) mode with no alarm indications.
1	Ensure test oscillator has been adjusted and tested in accordance with procedures of Paragraph 3.
2	At near-end (transmit) and far-end (receive) terminals, press in to latch BUSY switch on channel unit to be adjusted.
	Requirement: Channel unit BUSY lights come on.
	Note: BUSY switch does not open TIP and RING lines on 325EM01 channel units.
3	If 325EM01 channel units are to be adjusted, the transmit VF path must be opened. This can be done at the jack field.
	Caution: During XMT or RCV level adjustment, inadvertent shorting of channel unit circuitry could cause equipment damage. Use nonmetalic or insulated screwdriver to make adjustments.
4	At near-end and far-end terminals, set channel unit XMT potentiometer to center of adjustment range. See Fig. 2 for potentiometer location.
5	At near-end and far-end terminals, connect test circuits as shown in Fig. 3 for channel units to be adjusted. At near-end terminal, position test and alignment panel control as indicated in the figure.
6	Adjust transmission and noise measuring set (TNMS) for a transmission level measurement at 600 or 900 ohms terminated, depending on channel unit type.
	Requirement: TNMS indicates nominal receive level indication for channel unit type.
7	If necessary, adjust far-end channel unit RCV potentiometer to achieve proper level.
8	Reverse test circuits of Fig. 3 to achieve far-end transmit and near-end receive condition.
9	Repeat Step 6 and 7 for near-end channel unit RCV potentiometer adjustment.
10	This completes the procedures of Chart 3. Disconnect test setups.

CHART 4

SINGLE CHANNEL UNIT REPLACEMENT GAIN ADJUSTMENTS

APPARATUS:

1–Transmission and Noise Measuring Set (Hewlett-Packard 3555B, or equivalent) at near-end and far-end terminals.

2–Test Oscillator (Hewlett-Packard 200CD, or equivalent) at near-end and far-end terminals.

STEP	PROCEDURE
	Note: Steps of this procedure assume single channel unit replacement at near-end terminal.
	Requirement: Near-end and far-end channel banks are operating in the normal (unlooped) mode with no alarm indications.
1	Ensure test oscillator has been adjusted and tested in accordance with procedures of Paragraph 3.
2	At near-end (transmit) and far-end (receive) terminals, press in to latch BUSY switches on channel unit to be tested.
	Requirement: Channel unit BUSY lights come on.
	Note: BUSY switch does not open TIP and RING lines on 325EM01 channel units.
3	If 325EM01 channel units are to be adjusted, the transmit VF path must be opened. This can be done at the jack field.
4	See Fig. 2 for channel unit test jack locations. At near-end and far-end terminals, connect test circuits shown in Fig. 3 for channel units to be tested. At near-end terminal, position test and alignment panel controls as indicated in the figure.
5	Adjust transmission and noise measuring set (TNMS) for a transmission level measurement at 600 or 900 ohms terminated, depending on channel unit type.
	Requirement: TNMS indicates proper receive level indication for channel unit type. (Refer to Table B.)
	Caution: During XMT or RCV level adjustments, inadvertent shorting of channel unit circuitry could cause equipment damage. Use nonmetalic or insulated screwdriver to make adjustments.
6	If necessary, adjust near-end (replacement) channel unit XMT potentiometer to achieve proper level.
7	Record indication on copy of Certification Form (Fig. 8).
8	Reverse connections and switch setting of Fig. 3 to achieve a far-end transmit and near-end receive condition.

CHART 4 (Cont)

STEP	PROCEDURE
9	At near-end (receive) terminal, adjust TNMS for a transmission level measurement at 600 or 900 ohms terminated, depending on channel unit type. ***Requirement:*** TNMS indicates proper receive level indication for channel unit type. (Refer to Table B.)
10	If necessary, adjust near-end (replacement) channel unit RCV potentiometer to achieve proper level.
11	Record indication on copy of Certification Form (Fig. 8).
12	This completes the procedures of Chart 4. Disconnect test setups and unlatch BUSY switches to make channel available for use.

5. END-TO-END IDLE CHANNEL NOISE TESTS

5.01 End-to-end idle channel noise test procedures are provided in the steps of Chart 5. A test is performed by making the near end and far end of a particular channel busy, by opening the TIP and RING connections then measuring the noise level at each end.

Note: In some cases, it may be necessary to place a termination on the opposite end from the one at which the measurement is taken.

CHART 5

END-TO-END IDLE CHANNEL NOISE

APPARATUS:

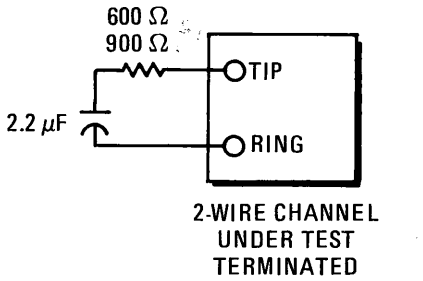
1–Transmission and Noise Measuring Set (Hewlett-Packard 3555B, or equivalent) at near-end and far-end terminals.
2–Channel Unit Terminations

(a) 900-ohm resistor and 2.2 μF capacitor series connected to dual pin plug (2 required).

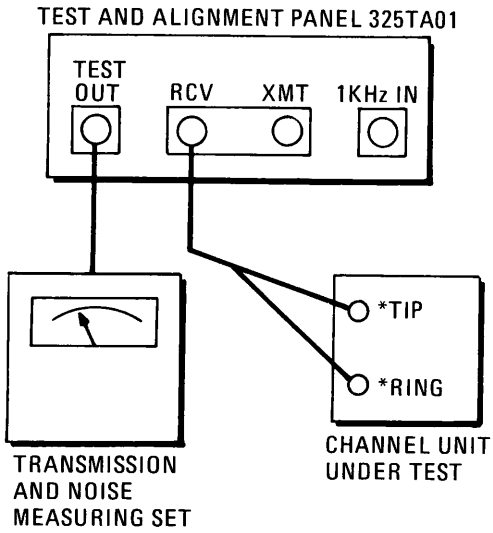
(b) 600-ohm resistor and 2.2 μF capacitor series connected to dual pin plug (2 required).

Note: If required capacitor is not immediately available, a purely resistive termination may be substituted to facilitate testing.

STEP	PROCEDURE
	Requirement: Near-end and far-end channel banks are operational, with no alarm indications. Channel bank is operating in normal (unlooped) mode.
1	At near-end and far-end channel bank, press in to latch channel unit BUSY switches for channel to be tested (i.e., channel unit Number 1 at near end and channel unit Number 1 at far end). ***Requirement:*** Channel unit BUSY light comes on. *Note:* BUSY switch does not open TIP and RING lines on 325EM01 channel units.
2	If 325EM01 channel units are to be checked, the transmit VF path must be opened. This can be done at the jack field.
3	Adjust transmission and noise measuring set (TNMS) for a 600-ohm terminated noise measurement through C-message weighting filters.
4	Connect test circuit and position controls on 325TA01 test and alignment panel as shown in Fig. 5. If necessary, terminate 2-wire channel units on the XMT side. ***Requirement:*** TNMS indication ***must not*** exceed applicable noise limit of Table C.
5	Record indication on a copy of Certification Form at end of this section (Fig. 8).
6	Disconnect test circuits and, if appropriate, unlatch channel unit BUSY switches to make channel available for use.
7	Repeat Step 1 through 6 for each channel unit in the channel banks.
8	This completes the procedures of Chart 5.



XMT SIDE TERMINATION
(IF REQUIRED)



RCV SIDE TEST HOOKUP

*Make connections to TIP-1 and RING-1 jacks on 4-wire channel units.

325TA01 SWITCH SETTINGS

CROSSTALK–	OFF (DOWN)
DISTORTION–	OFF (DOWN)
ATTENUATION–	N/A (Not in test circuit)
2TLP–	N/A (Not in test circuit)
RCV 900/600Ω–	600Ω for 325EM01, 325EM02, and 325VF01 CHANNEL UNITS; 900Ω for 325EM03, 325DP01, 325DP02, 325FX01, and 325FX02 CHANNEL UNITS.
XMT 900/600Ω –	N/A (Not in test circuit)
XMT 4W/2W–	N/A (Not in test circuit)

Fig. 5—Idle Channel Noise Test Hookup

TABLE C

MAXIMUM TEST LIMITS

CHANNEL UNIT TYPE*	IDLE NOISE	DISTORTION				CROSSTALK	
		0 dB	10 dB	20 dB	30 dB	I	II
2-Wire Units 325DP01 325DP02 325EM02 325EM03 325FX01 325FX02	19.7 dBrnC	46 dBrnC	36 dBrnC	26 dBrnC	16 dBrnC	18.4 dBrnC	14.4 dBrnC
4-Wire Units 325EM01 325VF01	28.7 dBrnC	55 dBrnC	45 dBrnC	35 dBrnC	25 dBrnC	27.4 dBrnC	23.4 dBrnC

*Refers to receive channel unit (connected to RCV jack on test and alignment unit).

Note:

(1) If 2-wire units are aligned for receive levels other than -2 TLP, the noise reading shown above must be corrected. For example, a -3 channel must meet noise levels 1 dB lower than shown in this table.

(2) Values listed in this table are corrected for insertion loss in test and alignment unit.

6. END-TO-END DISTORTION TESTS

6.01 End-to-end signal distortion test procedures are provided in the steps of Chart 6. Each test is performed by transmitting a fundamental test frequency from one channel bank to the other. The receive side output is then applied through a blocking filter in the test and alignment panel to a noise measuring device.

CHART 6

END-TO-END DISTORTION TESTS

APPARATUS:

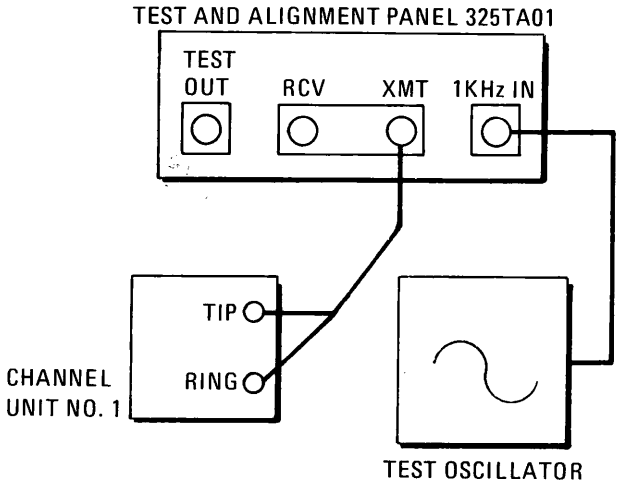
1—Transmission and Noise Measuring Set (Hewlett-Packard 3555B, or equivalent) at near-end and far-end terminals.

1—Test Oscillator (Hewlett-Packard 200CD, or equivalent) at near-end and far-end terminals.

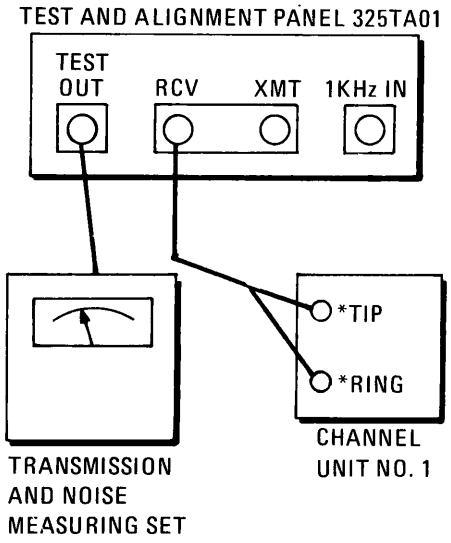
STEP	PROCEDURE
	Requirement: Near-end and far-end channel banks are operating in the normal (unlooped) mode with no alarm indications.
1	At near-end and far-end channel banks, press to latch channel unit BUSY switches for channel to be tested (i.e., channel unit Number 1 at near end and channel unit Number 1 at far end). ***Requirement:*** Channel unit BUSY light comes on. ***Note:*** BUSY switch does not open TIP and RING lines on 325EM01 channel units.
2	If 325EM01 channel units are to be adjusted, the transmit VF path must be opened. This can be done at the jack field.
3	Ensure test oscillator has been adjusted and tested in accordance with procedures of Paragraph 3.
4	At near-end (XMT) and far-end (RCV) channel banks, position test and alignment panel controls and connect test circuits shown in Fig. 6 for channel units to be tested.
5	At far-end (RCV) channel bank, adjust transmission and noise measuring set (TNMS) for a 600-ohm terminated noise measurement through C-message weighting filters. ***Requirement:*** TNMS indication ***must not*** exceed applicable 0-dB distortion limit of Table C.
6	Record indication on a copy of Certification Form (Fig. 8) at end of this section.
7	At near-end (XMT) channel bank test and alignment panel, press in to latch 10-dB ATTENUATION switch. ***Requirement:*** At far-end (RCV) channel bank, TNMS indication ***must not*** exceed applicable 10-dB distortion limit of Table C.
8	Record indication on a copy of Certification Form (Fig. 8) at end of this section.
9	At near-end (XMT) channel bank test and alignment panel, release 10-dB ATTENUATION switch and press in to latch 20-dB ATTENUATION switch. ***Requirement:*** At far-end (RCV) channel bank, TNMS indication ***must not*** exceed applicable 20-dB distortion limit of Table C.

CHART 6 (Cont)

STEP	PROCEDURE
10	Record indication on a copy of Certification Form (Fig. 8) at end of this section.
11	At near-end (XMT) channel bank test and alignment panel, release 20-dB ATTENUATION switch and press in to latch 30-dB ATTENUATION switch. ***Requirement:*** At far-end (RCV) channel bank, TNMS indication ***must not*** exceed applicable 30-dB distortion limit of Table C.
12	Record indication on a copy of Certification Form (Fig. 8) at end of this section.
13	Disconnect test leads and, if appropriate, unlatch channel unit BUSY switches to make channel available for use.
14	Repeat Step 1 through 13 for each channel-unit pair installed in the two channel banks.
15	Reverse test circuits of Fig. 6 and repeat entire sequence for near-end receive and far-end transmit checks.
16	This completes the procedures of Chart 6.



NEAR-END (XMT) TEST HOOKUP



*TIP 1 and RING 1 on 4-wire channel units.

FAR-END (RCV) TEST HOOKUP

325TA01 SWITCH SETTINGS

CROSSTALK–	N/A (Not in test circuit)
DISTORTION–	N/A (Not in test circuit)
ATTENUATION–	ALL SWITCHES OUT
2TLP–	IN FOR 2TLP OFFICES ONLY
RCV 900/600Ω–	N/A (Not in test circuit)
XMT 900/600Ω –	600Ω for 325EM01, 325EM02, 325VF01 CHANNEL UNITS. ALL OTHERS 900Ω.
XMT 4W/2W–	4W for 325EM01 and 325VF01 CHANNEL UNITS. ALL OTHERS 2W.

325TA01 SWITCH SETTINGS

CROSSTALK–	OFF (DOWN)
DISTORTION–	ON (UP)
ATTENUATION–	N/A (Not in test circuit)
2TLP–	N/A (Not in test circuit)
RCV 900/600Ω –	600Ω for 325EM01, 325EM02, and 325VF01 CHANNEL UNITS. ALL OTHERS 900Ω.
XMT 900/600Ω –	N/A (Not in test circuit)
XMT 4W/2W–	N/A (Not in test circuit)

Fig. 6—Distortion Test Hookup

7. END-TO-END CROSSTALK TESTS

7.01 End-to-end crosstalk test procedures are provided in the steps of Chart 7. The test is accomplished by alternately transmitting a standard test signal to the two channels that operate immediately before the test channel. The test channel is monitored through a bandpass filter, during each of these transmissions, to detect stray components of the test signal.

7.02 During each crosstalk test, any 2-wire channel units installed in the two test-related channel unit slots must be terminated to their characteristic impedance. Test-related channel units are defined as the receive mate to the interfering channel excited with a test tone and the transmit mate to the test channel.

CHART 7

END-TO-END CROSSTALK TESTS

APPARATUS:

1–Transmission and Noise Measuring Set (Hewlett-Packard 3555B, or equivalent) at near-end and far-end terminals.

2–Test Oscillator (Hewlett-Packard 200CD, or equivalent) at near-end and far-end terminals.

3–Channel Unit Terminations

(a) 900-ohm resistor and 2.2 μF capacitor series connected to dual pin plug (2 required).

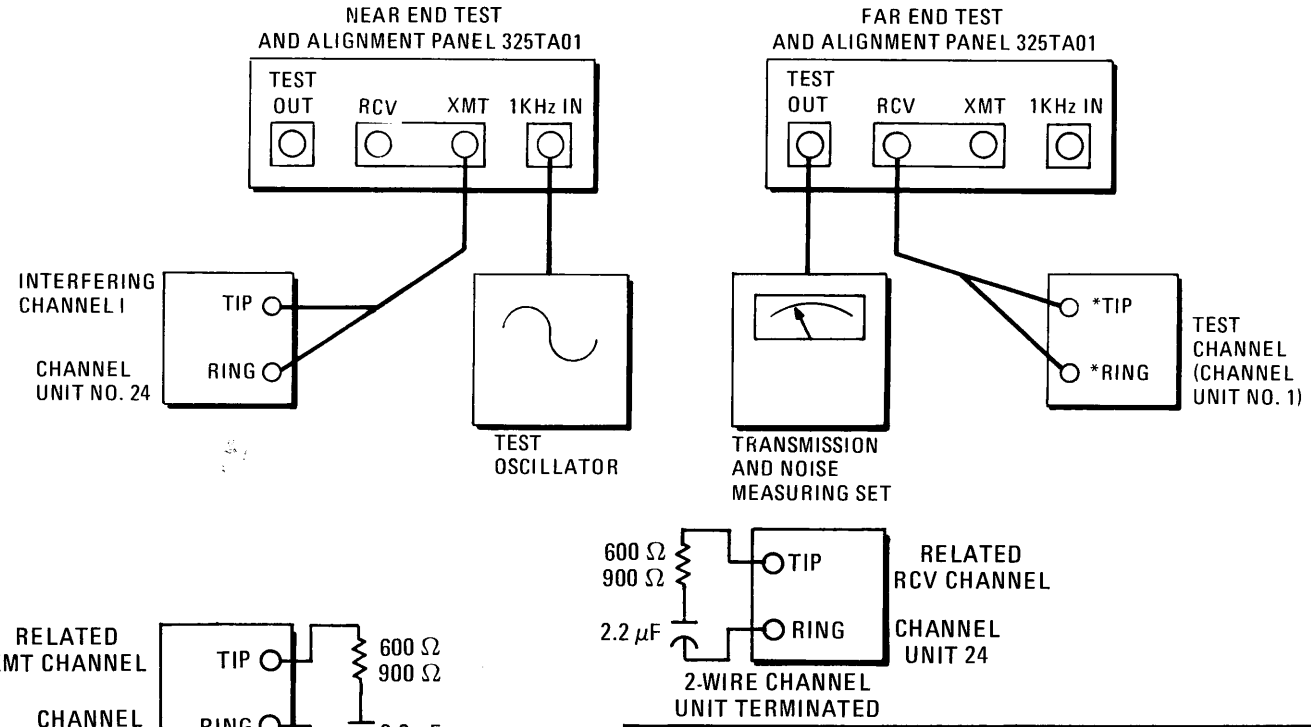
(b) 600-ohm resistor and 2.2 μF capacitor series connected to dual pin plug (2 required).

Note: If required capacitor is not immediately available, a purely resistive termination may be substituted to facilitate testing.

STEP	PROCEDURE
	Requirement: Near-end and far-end channel banks are operating in the normal (unlooped) mode with no alarm indications.
1	On near-end and far-end 325AP01 alarm and power units, ensure that LOOP switch is out (normal), loop indicator is off and no alarm indicators are on.
2	Ensure test oscillator has been adjusted, according to the procedures of Paragraph 3.
3	At near-end and far-end channel banks, press to latch channel unit BUSY switches on channels to be tested. ***Requirement:*** Channel unit BUSY indicators come on. *Note:* BUSY switch does not open TIP and RING lines on 325EM01 channel units.
4	If 325EM01 channel units are to be adjusted, the transmit VF path must be opened. This can be done at the jack field.
5	Position switches on 325TA01 test and alignment panels and connect test circuits for TEST CHANNEL (RCV) and first INTERFERING CHANNEL (XMT) at far-end and near-end channel banks as shown in Fig. 7. First interfering channels are listed in column I of the provided table.

CHART 7 (Cont)

STEP	PROCEDURE
6	Terminate 2-wire channel units listed in the RELATED CHANNELS, XMT END and RCV END I columns of the provided table.
7	At receive end, adjust transmission and noise measuring set (TNMS) for a 600-ohm terminated noise measurement through C-message weighting filters. ***Requirement:*** TNMS indication ***must not*** exceed applicable crosstalk (I) limit of Table C.
8	Record indication on a copy of Certification Form (Fig. 8) at end of this section.
9	If 2-wire channel units are installed at receive end, change termination from RELATED CHANNELS, RCV END I channel unit to RELATED CHANNELS RCV END II channel unit.
10	Change XMT patch cable to second interfering channel unit (listed in column II of the provided table). ***Requirement:*** TNMS indication must not exceed applicable crosstalk (II) limit of Table C.
11	Record indication on a copy of the Certification Form (Fig. 8) at end of this section.
12	Disconnect test cables and terminations from channel units and, if appropriate, unlatch channel unit BUSY switches.
13	Repeat Steps 3 through 11 for each channel unit (receive side) in the far-end channel bank.
14	Reverse test circuits of Fig. 7 and repeat entire sequence for near-end receive and far-end transmit checks.
15	This completes the procedures of Chart 7.



NEAR-END (XMT) 325TA01 SWITCH SETTINGS

CROSSTALK–	N/A (Not in test circuit)
DISTORTION–	N/A (Not in test circuit)
ATTENUATION–	ALL SWITCHES OUT
2TLP–	IN for 2TLP OFFICES ONLY
RCV 900/600Ω–	N/A (Not in test circuit)
XMT 900/600Ω–	600Ω for 325EM01, 325EM02, and 325VF01 CHANNEL UNITS. ALL OTHERS 900Ω.
XMT 4W/2W–	4W for 325EM01 and 325VF01 CHANNEL UNITS. ALL OTHERS 2W.

FAR-END (RCV) 325TA01 SWITCH SETTINGS

CROSSTALK–	ON (UP)
DISTORTION–	OFF (DOWN)
ATTENUATION–	N/A (Not in test circuit)
2TLP–	N/A (Not in test circuit)
RCV 900/600Ω–	600Ω for 325EM01, 325EM02, and 325VF01 CHANNEL UNITS. ALL OTHERS 900Ω.
XMT 900/600Ω–	N/A (Not in test circuit)
XMT 4W/2W	N/A (Not in test circuit)

TEST CHANNEL (RCV)	INTERFERING CHANNEL (XMT)		RELATED CHANNELS (Terminate if 2-Wire)		
			XMT END	RCV END	
	I	II		I	II
1	24	23	1	24	23
2	1	24	2	1	24
3	2	1	3	2	1
4	3	2	4	3	2
5	4	3	5	4	3
6	5	4	6	5	4
7	6	5	7	6	5
8	7	6	8	7	6
9	8	7	9	8	7
10	9	8	10	9	8
11	10	9	11	10	9
12	11	10	12	11	10
13	12	11	13	12	11
14	13	12	14	13	12
15	14	13	15	14	13
16	15	14	16	15	14
17	16	15	17	16	15
18	17	16	18	17	16
19	18	17	19	18	17
20	19	18	20	19	18
21	20	19	21	20	19
22	21	20	22	21	20
23	22	21	23	22	21
24	23	22	24	23	22

Fig. 7—Crosstalk Test Hookup

8. SIGNALING TESTS

8.01 Signaling test for the B325 E&M channel units (325EM01, 325EM02 and 325EM03) is presented in Chart 8.

8.02 Signaling test for the dial pulse channel units (325DP01 and 325DP02) is presented in Chart 9.

8.03 A signaling test set (Northeast Electronics TTS-26B, or equivalent) is required to perform the signaling tests. For detailed operational procedures for the signaling test set, consult the applicable technical manual.

8.04 Record signaling test set test indications in the appropriate columns on the Certification Form (Fig. 8).

CHART 8

SIGNALING TEST FOR E&M CHANNEL UNITS

APPARATUS:

1–Signaling Test Set (Northeast Electronics TTS-26B, or equivalent) at near-end and far-end terminals.

STEP	PROCEDURE
	Requirement: Near-end and far-end channel banks are operating in the normal (unlooped) mode with no alarm indications. BUSY switches are out (normal), and equipment drops are opened.
1	At near-end channel bank, connect signaling test set channel unit under test M-lead test jack, and office ground.
2	Adjust signaling test set to output a test signal at -50 (±6) volts, 10-pps with 50% break.
3	At far-end channel bank, connect signaling test set between corresponding channel unit E-lead test jack and office ground.
4	Adjust signaling test set to measure percent break of input signal.
	Requirement: Far-end signaling test set indicates keying at 45% to 55% break, and channel unit BUSY light pulses ON and OFF.
5	Record indication in appropriate column of a copy of Certification Form (Fig. 8) at end of this section.
6	Repeat Steps 1 through 5 for each additional E&M channel unit installed in the channel bank.
7	Repeat Steps 1 through 6 for the reverse direction of transmission.
8	This completes signaling tests for E&M channel units. Disconnect test setup.

CHART 9

SIGNALING TEST FOR DIAL PULSE CHANNEL UNITS

APPARATUS:

1—Signaling Test Set (Northeast Electronics TTS-26B, or equivalent) at near-end and far-end terminals.

STEP	PROCEDURE
	Requirement: Near-end and far-end channel banks are operating in the normal (unlooped) mode with no alarm indications. BUSY switches are out (normal), and equipment drops are opened.
1	At the near-end channel bank, connect a signaling test set adjusted for 10-PPS, 60% break, dry-contact relay signal to the two-wire side of a 325DP01 channel unit.
2	Connect a signaling test set to the two-wire side of the corresponding 325DP02 channel unit at the far end.
	Requirement: Receive keying is between 45% and 70% break, and BUSY light pulses ON and OFF.
3	Enter signaling test set indication in the appropriate column of a copy of Certification Form (Fig. 8) at end of this section.
4	Repeat Steps 1 through 3 for each 325DP01 dial pulse channel unit installed in the near-end channel bank.
5	Reversing near-end and far-end roles, perform Steps 1 through 4 for 325DP01 channel units installed at the far-end channel bank mating with 325DP02 channel units at the near end.
6	This completes the signaling test for dial pulse channel units. Disconnect test setup.

9. RECOMMENDED PERIODIC TESTS

9.01 To minimize equipment down time and still maintain optimum carrier system performance, Lynch recommends using the 6-and 12-month periodic test schedules presented below:

(a) 6-month checks:

1. End-to-end net loss test of all channels.

2. End-to-end idle channel noise test on 10 percent of equipped channels. If any channel fails to meet specifications, all active channels are checked.

(b) 12-month checks:

1. All 6-month checks are performed.

2. End-to-end distortion and crosstalk tests of 10 percent of equipped channels. If any channel fails to meet specifications, all active channels are checked.

9.02 Chart 10 provides instructions for performing the 6-month tests. Chart 11 provides instructions for performing the 12-month tests. Figure 9 is a sample form (two sheets) which may be used for recording test data.

END TO END B325 CHANNEL TESTS

RECEIVED AT (OFFICE): _____

CHAN NO.	CHANNEL TYPE	2W/4W	GAIN ADJUSTMENT		IDLE CHANNEL NOISE	DISTORTION				INTERCHANNEL CROSSTALK		% BREAK SIGNALING DISTORTION SEE NOTE 1
			RCV	XMT		0 dB	10 dB	20 dB	30 dB	INTERFERING CHANNEL I	INTERFERING CHANNEL II	
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												

RECEIVED AT (OFFICE): _____

CHAN NO.	CHANNEL TYPE	2W/4W	GAIN ADJUSTMENT		IDLE CHANNEL NOISE	DISTORTION				INTERCHANNEL CROSSTALK		% BREAK SIGNALING DISTORTION SEE NOTE 1
			RCV	XMT		0 dB	10 dB	20 dB	30 dB	INTERFERING CHANNEL I	INTERFERING CHANNEL II	
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												

NOTES

*Assumed: 2W channels measured at – 2TLP

1. Signaling distortion:

E&M– Received pulses on the 'E' lead must be between 45%–55% when 10 pps at 50% break are applied to the 'M' lead.

Loop dial–Received pulses measured at the incoming loop shall be within 45%–70% break when 10 pps at 60% break are applied to the outgoing loop dial unit.

Fig. 8–Certification Form

CHART 10

SIX-MONTH PERIODIC TEST

APPARATUS:

1—Transmission and Noise Measuring Set (Hewlett-Packard 3555B, or equivalent) at near-end and far-end terminals.

2—Test Oscillator (Hewlett-Packard 200CD, or equivalent) at near-end and far-end terminals.

3—Channel Unit Terminations

(a) 900-ohm resistor and 2.2 μF capacitor series connected to dual pin plug (2 required).

(b) 600-ohm resistor and 2.2 μF capacitor series connected to dual pin plug (2 required).

Note: If required capacitor is not immediately available, a purely resistive termination may be substituted to facilitate testing.

STEP	PROCEDURE
	Requirement: Near-end and far-end channel banks are operating in the normal (unlooped) mode with no alarm indications.
1	At near-end and far-end office, adjust test oscillator for a 1-kHz, 0-dBm test signal according to the procedures of Paragraph 3.
	Requirement: Noise level of oscillator test signal is less than 32 dBrnC.
2	At near-end and far-end channel banks, press in to latch channel unit 1 (or other channel to be tested) BUSY switches.
	Requirement: BUSY lights come on.
3	Connect test circuit shown in Fig. 3 for a near-end transmit, transmission level test.
4	At RCV end, adjust transmission and noise measuring set (TNMS) for a 600-ohm or 900-ohm terminated level measurement (depending on channel unit type).

CHART 10 (Cont)

STEP	PROCEDURE
	Requirement: TNMS indication compares with indication recorded during initial installation or last RCV/XMT level adjustment within ±0.5 dB. If correct indication is not obtained, perform gain adjustment procedures of Paragraph 4.
	Note: Channel gain variations do not accurately reflect channel-to-channel level stability if a channel unit at either end has been changed since last end-to-end gain adjustment data was recorded.
5	Using a copy of the test record form provided in Fig. 9, date the first available NET LOSS column and enter the channel gain deviation.
6	Reverse connections of Fig. 3, and repeat Steps 4 and 5 for far-end transmit check.
7	Disconnect test leads and unlatch channel unit BUSY switches.
8	Repeat Steps 2 through 7 for each channel unit installed.
9	Select 10 percent of the installed channels (3 channel units in a 24-channel equipped bank) for a random-sampling idle channel noise test.
10	Referring to Paragraph 5 and Chart 5, test the selected channel units at the near-end and far-end channel banks for excessive end-to-end idle channel noise.
	Requirement: Selected channel units meet the idle channel noise requirements of Table C. If any channel unit fails the test, test all installed channel units to eliminate common equipment as the noise source.
11	Date the next available IDLE CHANNEL NOISE column on the test record form, and enter noise levels received on the selected channel units.
12	This completes the recommended six-month periodic test.

CHART 11

TWELVE-MONTH PERIODIC TEST

APPARATUS:

1–Transmission and Noise Measuring Set (Hewlett-Packard 3555B, or equivalent) at near-end and far-end terminals.

2–Test Oscillator (Hewlett-Packard 200CD, or equivalent) at near-end and far-end terminals.

3–Channel Unit Terminations

(a) 900-ohm resistor and 2.2 μF capacitor series connected to dual pin plug (2 required).

(b) 600-ohm resistor and 2.2 μF capacitor series connected to dual pin plug (2 required).

Note: If required capacitor is not immediately available, a purely resistive termination may be substituted to facilitate testing.

STEP	PROCEDURE
	Requirement: Near-end and far-end channel banks are operating in the normal (unlooped) mode with no alarm indications.
1	Perform procedures of Chart 10. *Note:* Indicate 12-month check by placing asterisk by date on six-month periodic test record form.
2	Select 10 percent of the installed channels (3 channel units in a 24-channel equipped bank) for a random-sampling distortion test.
3	Referring to Paragraph 6 and Chart 6, test the selected channel units at the near-end and far-end channel banks for excessive end-to-end signal distortion. ***Requirement:*** Selected channel units meet the distortion requirements of Table C. If any channel unit fails the test, test all channels to validate remaining channel units and common equipment integrity.
4	Record channels tested and pass/fail data on a copy of the 12-month periodic test record form (Fig. 9, Sheet 2).
5	Referring to Paragraph 7 and Chart 7, test the selected channel units at the near-end and far-end channel banks for excessive end-to-end crosstalk. ***Requirement:*** Selected channel units meet the distortion requirements of Table C. If any channel unit fails the test, test all channels to validate remaining channel units and common equipment integrity.
6	Record channels tested and pass/fail data on a copy of the 12-month periodic test record form (Fig. 9, Sheet 2).
7	This completes the recommended 12-month periodic test.

B325 CHANNEL BANK PERIODIC TEST RECORD

SIX MONTH PERIODIC TESTS

RECEIVED AT (OFFICE): _____

CHAN NO.	CHANNEL TYPE	INITIAL RCV LEVEL	NET LOSS					IDLE CHANNEL NOISE				
			DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												

RECEIVED AT (OFFICE): _____

CHAN NO.	CHANNEL TYPE	INITIAL RCV LEVEL	NET LOSS					IDLE CHANNEL NOISE				
			DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												

NOTES

1. Transcribe initial RCV level from initial installation or last gain adjustment record.
2. Indicate yearly checks by placing an asterisk (*) by the date.

Fig. 9 Periodic Test Record Form (Sheet 1)

B325 CHANNEL BANK PERIODIC TEST RECORD

12 MONTH PERIODIC TESTS

RECEIVED AT (OFFICE): _____ DATE _____

CHAN NO.	CHANNEL TYPE	DISTORTION 0 dB	DISTORTION 10 dB	DISTORTION 20 dB	DISTORTION 30 dB	CROSSTALK I	CROSSTALK II
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							

RECEIVED AT (OFFICE): _____ DATE _____

CHAN NO.	CHANNEL TYPE	DISTORTION 0 dB	DISTORTION 10 dB	DISTORTION 20 dB	DISTORTION 30 dB	CROSSTALK I	CROSSTALK II
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							

Fig. 9—Periodic Test Record Form (Sheet 2)