50-KILOBIT WIDEBAND LOOP
1 THROUGH 50 KHZ
WLR-5 REPEATER
LINEUP AND TEST PROCEDURES

CONTENTS PAGE

1. GENERAL 1

2. TEST EQUIPMENT 3

3. REPEATER PREPARATION 3

A. Terminal Repeater at Wideband Service Bay 3

B. Intermediate Repeater at Central Office, Manhole, or Pole 4

C. Customer Repeater 4

4. TEST FOR TIP AND RING TURNOVER ON LOOP 4

5. LOOP LINEUP PROCEDURE 7

6. REFERENCES 15

7. SUPPLEMENTARY INFORMATION . . . 15

1. GENERAL

1.01 This section describes the lineup and test procedures performed by central office and data telco employees on a 4-wire wideband data loop (hereafter referred to as loop). This section is used when a loop is out of service. This is at initial service installation (company order) and during trouble clearing activity. Trouble clearing requires the customer to release the loop from service. The loop may consist of one section, or a maximum recommendation of three sections as shown in Fig. 1. Each section is equipped with WRL-5 repeaters which are equalized from 1 through 50 kHz, thereby accommodating data transmission speeds of 19.2 kb/s up to 56 kb/s. The voice coordination circuit provided with wideband data services is assumed to be established separately from the loop since different geographical cable routing may exist.

1.02 This section is reissued to correct and clarify the procedures required to accomplish lineup. Since substantial format and text changes have been made, revision arrows are not used.

1.03 The following is a chart listing of step procedures contained in this Section. Only selected charts will be used during lineup for a particular loop.

1—Test for Tip and Ring Turnover on Loop - **Page 7**

2—Energize Remotely Powered Repeater - **Page 8**

3—Set 25-kHz Test Tone Level - **Page 9**

4—Set 60-kHz Oscillator Pilot Level - **Page 11**

5—Make Gain Frequency Measurement - **Page 11**

6—Adjust Receive Pilot Level at GR CONT - **Page 12**

7—Make Gain Frequency Measurement in DIR 2 for Very Short Loop - **Page 13**

8—Set 25-kHz Test Tone Level in DIR 2 for Very Short Loop - **Page 13**

9—Make Gain Frequency Measurement in DIR 1 for Very Short Loop - **Page 13**

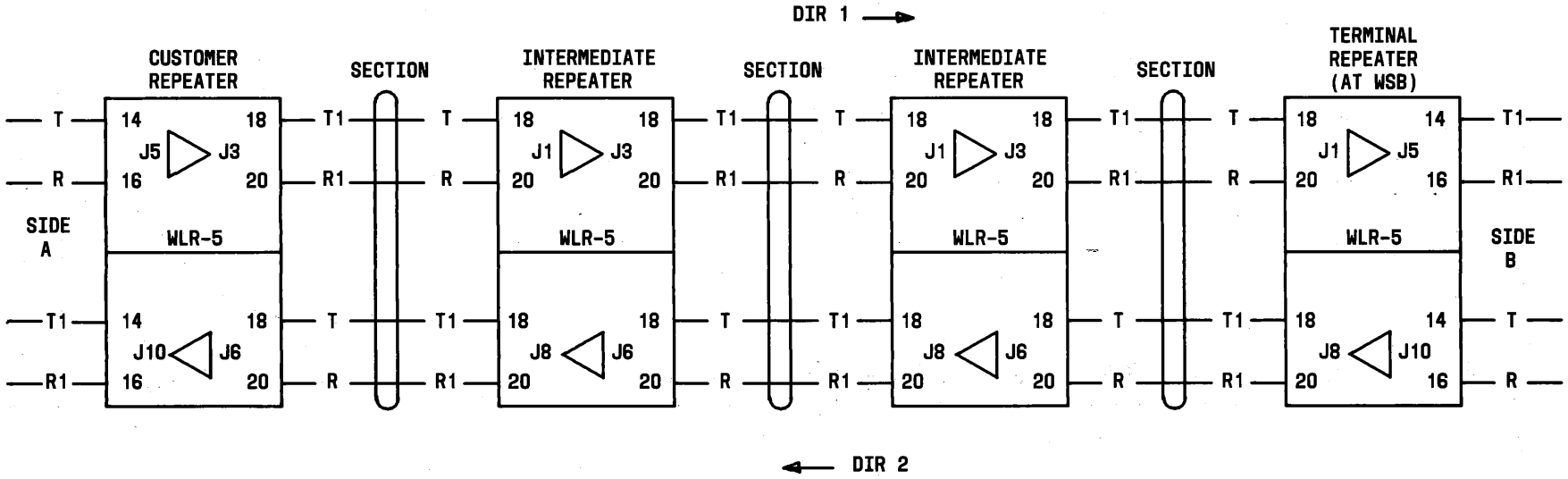


Fig. 1—Typical Three Section Wideband Data Loop

10—Set 25-kHz Test Tone Level in DIR 1 for Very Short Loop - **Page 14**

11—Test Pilot Alarm on Loop - **Page 14**

1.04 ***How to Use This Section:*** Read and become familiar with this section before attempting to use the procedures in Parts 3, 4, and 5. The GENERAL and TEST EQUIPMENT Parts are self-explanatory. REPEATER PREPARATION (Part 3) provides a list of steps to be performed for each repeater. After the data telco employee completes REPEATER PREPARATION, voice contact must be established with the central office telco employee to facilitate the performance of Parts 4 and 5. Part 4, TEST FOR TIP AND RING TURNOVER ON LOOP is optional based on the fact that this test should be made only if there is some reason to suspect that tip and ring continuity is not correct. The steps in Part 5, LOOP LINEUP PROCEDURE must be performed in both directions (see Fig. 1). Lineup of a multisection loop in direction 2 (Wideband Service Bay (WSB) towards customer) must be completed before direction 1 lineup (customer towards WSB) is started. After loop lineup is completed, a reference (benchmark) measurement of impulse noise and/or dynamic error-run test must be made and the results recorded.

1.05 This section is specifically written for services that use a restored polar line signal. One such service (using Data Set (DS) 303C types and a loop bandwidth of 48 kHz) requires a transmission plan of a 0-dBm data level at the customer and WSB. However, another service (using DS 301B or 303B/809B and a loop bandwidth of 16 kHz) requires a -10 dBm data level only at the WSB. Therefore, a -10 dBm level must be substituted for the 0-dBm level at the WSB when using the latter service.

2. TEST EQUIPMENT

2.01 The following test equipment or an equivalent substitute is required.

- Two 386B terminating plugs consisting of 310-type plug equipped with 135-ohm resistor. Used in Charts 1 and 6.

- One KS-14510-L1 meter (volt-ohm-milliammeter) (VOM). Used in Charts 1 and 2.

- Two Hewlett-Packard (HP) 3550-type portable test sets consisting of 204C oscillator, 403B voltmeter, and 353A patch panel. Used in Charts 3 through 10.

Note: A Hewlett-Packard E18-204B or E60-204B rack-mounted test set may be installed at the WSB. When available, it should be used for measurements at the WSB.

- Two ED-73285 test connectors. Used in Charts 3 through 6.

- Two 2W42A cords consisting of W2DL cord equipped with 310-type plug on one end and two spade lugs on the other end. Used in Charts 3 through 10.

3. REPEATER PREPARATION

3.01 The telco employee selects the appropriate procedure based on repeater location.

A. Terminal Repeater at Wideband Service Bay

3.02 Perform the following steps.

(1) Terminate loop from carrier at WSB by inserting 386B terminating plugs (135 ohms) into transmit to carrier jack and into receive from carrier jack (Fig. 2).

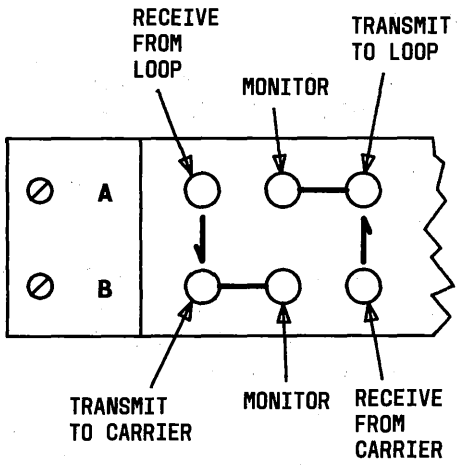


Fig. 2—Jack Strip in Wideband Service Bay

(2) Set SX PWR A and B ADJ controls Counterclockwise (CCW) at simplex power panel. See Fig. 3.

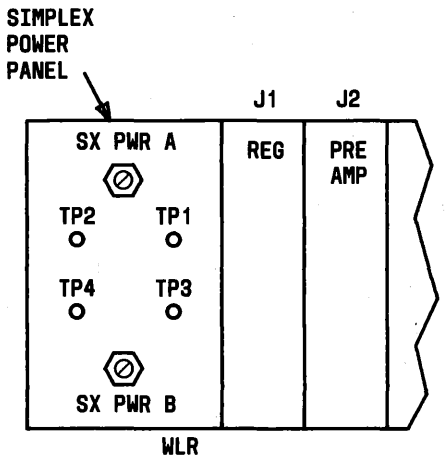


Fig. 3—J70171AA Repeater Shelf (Partial View)

(3) Measure -48 dc source voltage at locally powered repeater. See ***Fig. 4*** and ***Table A.***

(4) Make preliminary adjustments on CPs. See ***Table B.***

(5) Insert Circuit Packs (CPs) per ***Table C.***

(6) Measure dc bias voltage at CP test points. See ***Table D.***

(7) Proceed to Part 4, TEST FOR TIP AND RING TURNOVER ON LOOP.

B. Intermediate Repeater at Central Office, Manhole, or Pole

3.03 If there are two intermediate repeaters, the preparation procedure must be performed at each location. Determine from Circuit Layout Record Card (CLRC) if repeater is to be powered locally or remotely.

Locally Powered (C.O.)

(1) Measure -48 dc source voltage. See Fig. 4 and Table A.

(2) Make preliminary adjustments on CPs. See Table B.

(3) Insert CPs per Table C.

(4) Measure dc bias voltage at CP test points. See Table D.

(5) Proceed to Part 4, TEST FOR TIP AND RING TURNOVER ON LOOP.

Remotely Powered

Note: Remote powering a repeater requires two telco employees; therefore, the procedure is documented in Part 5, LOOP LINEUP PROCEDURE.

C. Customer Repeater

3.04 Verify ac power cord to DS is unplugged. Determine from CLRC if repeater is to be powered locally or remotely.

Locally Powered

(1) Measure -48 dc source voltage per Fig. 4 and Table A.

(2) Make preliminary adjustments on CPs per Table B.

(3) Insert CPs per Table C.

(4) Measure dc bias voltage at CP test points per Table D.

(5) Proceed to Part 4, TEST FOR TIP AND RING TURNOVER ON LOOP.

Remotely Powered

Note: Remote powering a repeater requires two telco employees; therefore, the procedure is documented in Part 5, LOOP LINEUP PROCEDURE.

4. TEST FOR TIP AND RING TURNOVER ON LOOP

4.01 It is vitally important that tip and ring turnovers be avoided in the loop (or at any other restored polar baseband point). The simplest and most positive method of doing this is careful checking during installation. If doubt exists about tip and ring connections, a test, given in Chart 1, must be performed on ***all*** sections ***prior*** to beginning the lineup procedure. It ensures that

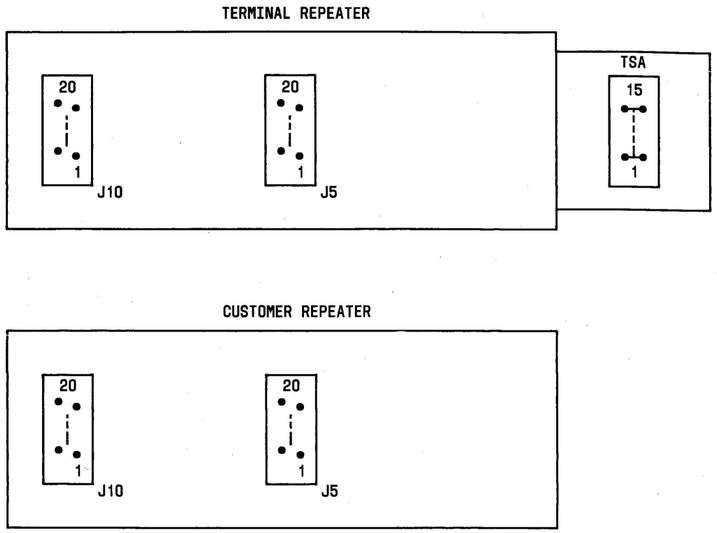


Fig. 4—Power Selector Connectors at Rear of Repeaters

TABLE A

DC SOURCE VOLTAGE REQUIREMENT

CONNECTOR OR TERMINAL STRIP	PINS		MEASURE REQUIRED DC VOLTS
	NEGATIVE	POSITIVE	
J5	10	7	−48
J10	10	7	−48
TSA	9	8	−48
TSA	12	7	−130
TSA	7	14	+130

TABLE C

WLR-5 REPEATER COMPONENTS BY LOCATION

LOCATION	PWR	REG	DIRECTION 1					DIRECTION 2				
			J1	J2	J3	J4	J5	J6	J7	J8	J9	J10
TERMINAL	LOC	PILOT	AE	AD	AC	AG	AJL2	AF	AL	AC	AH	AJL2
		NON	AF *	AD	AC	AM	AJL1	AF	AM	AC	AM	AJL1
	REM	PILOT	AE	AD	AC	AG	AKL2	AF	AL	AC	AH	AKL2
		NON	AF *	AD	AC	AM	AKL1	AF	AM	AC	AM	AKL1
INTERMEDIATE †	LOC	PILOT	AE	AD	AC	AG	AJL1	AE	AD	AC	AG	AJL1
		NON	AF	AD	AC	AM	AJL1	AF	AD	AC	AM	AJL1
	REM	PILOT	AE	AD	AC	AG	AKL1	AE	AD	AC	AG	AKL1
		NON	AF	AD	AC	AM	AKL1	AF	AD	AC	AM	AKL1
CUSTOMER	LOC	PILOT	AF	AL	AC	AH	AJL2	AE	AD	AC	AG	AJL2
		NON	AF *	AM	AC	AM	AJL1	AF	AD	AC	AM	AJL1
	REM	PILOT	AF	AL	AC	AH	AKL2	AE	AD	AC	AG	AKL2
		NON	AF *	AM	AC	AM	AKL1	AF	AD	AC	AM	AKL1
SHORT LOOP TERMINAL	LOC	NON	AF	AD	AC	AM	AJL1	AF	AD	AC	AM	AJL1

Note: The suffixes in this table pertain to J70171.

* Or J70171BC Low Frequency Compensated Regulator

† ED-73208-50 Spacer

TABLE B

PRELIMINARY ADJUSTMENTS

REPEATER LOCATION			CIRCUIT PACK OR PANEL	CONTROL OR SWITCH	ROTATE OR SET
C	I	T			
√	√	√	FLAT REG	GAIN	CCW
√		√	ALM	ACO	Up
√		√	GR PIL OSC	PIL LEV	CCW
√	√	√	GR REG	GAIN REG IN/OUT GA STD/19	CCW OUT STD or CLRC
√	√	√	GR CON	LP GAIN	CW
√	√	√	GR PREAMP	3, 5.5, 10, 18, 32, 50 GA STD/19	CCW CCW STD or CLRC
	√	√	Simplex Power Panel	SX PWR A ADJ SX PWR B ADJ	CCW CCW
√	√	√	LF COMP REG	COMP A/B	per CLRC
√	√	√	LF COMP REG	GAIN	CCW

C = Customer Repeater
I = Intermediate Repeater
T = Terminal Repeater
CLRC = Circuit Layout Record Card

TABLE D

DC BIAS VOLTAGE REQUIREMENT

CIRCUIT PACK† TEST POINT	REQUIRED DC BIAS VOLTAGE
PWR SEL (LOC or REM)	19 to 25
GR PREAMP	7 to 14
AMPL	11 to 14
GR REG	7 to 12
GR CON	11 to 15

†Replace CP that does not meet requirements.

tip and ring continuity is maintained through each section of the loop. If a turnover exists in a wideband data system using 303-type DSs, the systems will produce total errors (customer data will not be passed).

5. LOOP LINEUP PROCEDURE

5.01 Lineup of the loop requires two telco employees, one located at the terminal repeater and the other located at a distant repeater. The distant repeater is either an intermediate or customer repeater depending on which section is being lined up. Lineup is performed section by section until it is completed in DIR 2. Then, lineup is performed in DIR 1 on a separate pair of wires, thus completing lineup of a 4-wire loop. During the lineup for each section, voice contact must be maintained.

5.02 Paragraphs 5.03 through 5.06 provide additional information on Chart 2 (Energize Remotely Powered Repeater), Chart 5 (Make Gain Frequency Measurement) and making a reference measurement on the loop after lineup.

5.03 A telco employee determines the polarity of the simplex voltage at every remotely powered repeater. After the polarity has been checked at the last remotely powered repeater on a loop, the telco employee at the terminal repeater adjusts for sending simplex power to the entire loop. For example, a loop contains two sections with the intermediate and customer repeaters being remotely powered and the terminal repeater being locally powered. The polarity is checked at the intermediate and customer repeaters. The simplex power adjustment is not performed at the intermediate repeater, but when the telco employee is at the customer repeater (last repeater to be remotely powered).

5.04 Chart 2 is a procedure that a telco employee performs to energize a remote intermediate or customer repeater. Therefore, Chart 2 is specifically written to send simplex power towards A which is DIR 2. This chart may also be used to send simplex power towards B which is DIR 1 by adjusting SX PWR B pot. and using TP3 and TP4 at the terminal repeater. Also, different tip and ring connection points must be used as shown in Fig. 1.

> ***Note:*** A customer and/or intermediate repeater may be remotely powered by an intermediate repeater located in a central office.

5.05 The gain-frequency procedure requires one telco employee to adjust the oscillator at the transmit end and a second employee to measure tones and adjust the preamplifier at the receive end. This equalizes the loop from 1 through 50 kHz.

5.06 ***Make Reference Measurement of Loop:*** A dynamic test is preferred over a noise test because the dynamic test simulates actual customer conditions. A noise test can be made as a benchmark reference on a looped or preferred end-to-end basis. Both tests are documented in other sections; therefore, reference will be made to the appropriate section for the specific procedure.

Dynamic Test

Data Set 301B—593-011-500
Data Set 303-Type—593-800-500

Noise Test

Half-Group Data Systems—314-608-500
Groupband Data Systems—314-609-512

5.07 Perform the appropriate lineup procedure according to flowchart 1. **The step numbers in the flowchart are for reference only and do not indicate sequence of use.**

CHART 1—TEST FOR TIP AND RING TURNOVER ON LOOP

STEP	TERMINAL OR INTERMEDIATE REPEATER	INTERMEDIATE OR CUSTOMER REPEATER
1	Disengage CPs from shelf approximately 2 inches.	←Same

STEP	TERMINAL OR INTERMEDIATE REPEATER	INTERMEDIATE OR CUSTOMER REPEATER
2	Connect negative lead of VOM to terminal E3 (ground shield). See Fig. 1.	Connect wire strap between terminal E3 (ground shield) and pin 18 of connector J6. See Fig. 1.
3	Connect positive lead of VOM to pin 18 of connector J8.	No action.
4	Does VOM indicate continuity? Yes - Go to next step. No - Open or wrong wire which requires locating trouble.	No action.
5	Remove positive lead and connect to pin 20 of connector J8.	Remove wire strap from pin 18 and connect to pin 20 of connector J6.
6	Does VOM indicate continuity? Yes - Go to next step. No - Open or wrong wire which requires locating trouble.	No action.
7	Remove positive lead and connect to pin 18 of connector J1.	Remove wire strap and connect between terminal E2 (ground shield) and pin 18 of connector J3.
8	Does VOM indicate continuity? Yes - Go to next step. No - Open or wrong wire which requires locating trouble.	No action.
9	Remove positive lead and connect to pin 20 of connector J1.	Remove wire strap from pin 18 and connect to pin 20 of connector J3.
10	Engage CPs into shelf.	Disengage CPs from shelf approximately 2 inches.

CHART 2—ENERGIZE REMOTELY POWERED REPEATER

DANGER: Hazardous voltage is present.

STEP	TERMINAL REPEATER	INTERMEDIATE OR CUSTOMER REPEATER
1	Connect VOM between TP1(+) and TP2(-) at simplex power panel.	Using VOM, connect positive lead to pin 18 of connector J6. See Fig. 1.
2	Wait until telco employee at intermediate repeater indicates to proceed and go to Step 11.	Connect negative lead to pin 18 of connector J3. ***Requirement:*** Measure dc voltage between 48 and 260 volts.
3	No action.	Remove and connect positive lead to pin 20 of connector J6.

STEP	TERMINAL REPEATER	INTERMEDIATE OR CUSTOMER REPEATER
4	No action.	Remove and connect negative lead to pin 20 of connector J3. ***Requirement:*** Measure dc voltage between 48 and 260 volts.
5	No action.	Make preliminary adjustments on CPs. See Table B.
6	No action.	Insert CPs into shelf per Table C.
7	No action.	Set SX L/T switch on REM PWR SEL per CLRC. See Table E and Fig. 5.
8	No action.	Notify telco employee at terminal or intermediate repeater to adjust simplex power if this is the last repeater on the loop to be remotely powered. See 5.03 and 5.04.
9	Adjust SX PWR A pot. to voltage value given below.	No action.

REPEATER POWERED	SENDING SX PWR	VOLTS
Remotely	Pilot Regulated	11.0
Remotely	Nonregulated	7.5
Locally	Sealing Current Only	3.0

10	Notify telco employee at intermediate or customer repeater location that simplex power is adjusted.	No action.
11	No action.	Measure dc bias voltage at CP test points. See Table D.

TABLE E

REMOTE POWER SELECTOR

POWER CONDITION	SX L/T SWITCH POSITION FOR UNIT IN LOCATION	
	J5	J10
Receive DC PWR from A Send DC PWR to B	T (THRU)	T (THRU)
Receive DC PWR from B Send DC PWR to A	T (THRU)	T (THRU)
Receive DC PWR from A Loop Sealing Current from B	T (THRU)	L (LOOP)
Receive DC PWR from B Loop Sealing Current from A	L (LOOP)	T (THRU)

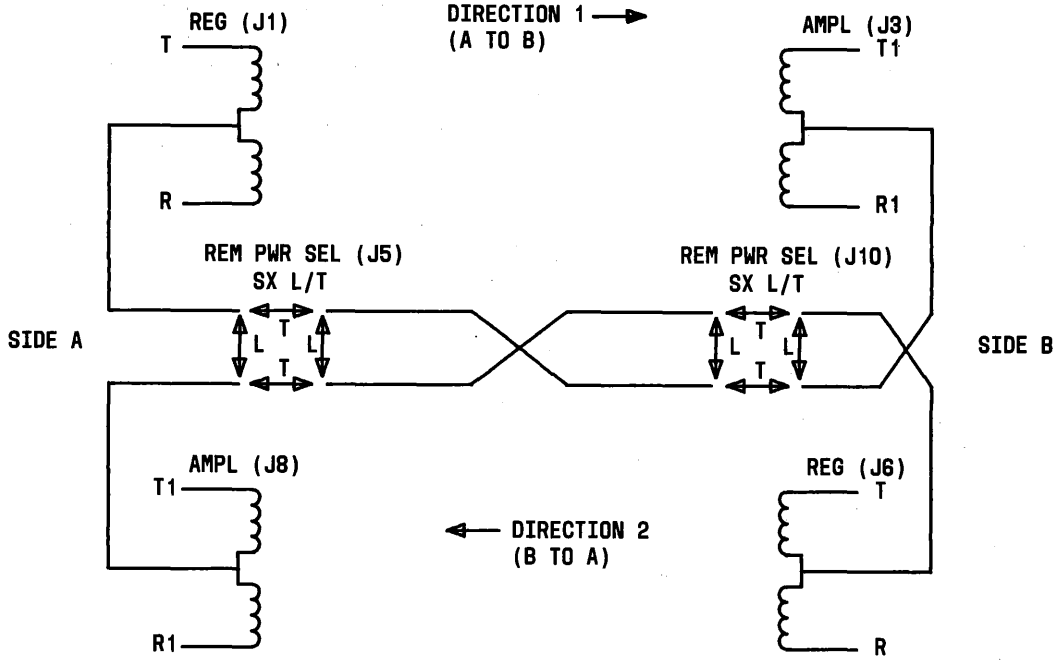


Fig. 5—Simplified Drawing of Remotely Powered Repeater

CHART 3—SET 25-KHZ TEST TONE LEVEL

STEP	TERMINAL OR CUSTOMER REPEATER	CUSTOMER OR TERMINAL REPEATER
1	Set 3550 test set to transmit 25 kHz at 0 dBm.	No action. Wait until telco employee at customer or terminal repeater has adjusted

STEP	TERMINAL OR CUSTOMER REPEATER	CUSTOMER OR TERMINAL REPEATER
		25-kHz test tone and 60-kHz pilot oscillator levels (as required).
2	Set REJ FLT switch to GR at ED-73285 test connector.	No action.
3	Adjust either or both GAIN pot. at FLAT REG. ***Requirement:*** Meter indicates +6 dBm.	No action.

CHART 4—SET 60-KHZ OSCILLATOR PILOT LEVEL

STEP	TERMINAL OR CUSTOMER REPEATER	CUSTOMER OR TERMINAL REPEATER
1	Unplug output cord at WSB transmit line jack or at DAS 806 TRANS LN jack.	No action.
2	Set REJ FLT switch to NO at ED-73285 test connector.	No action.
3	Adjust PIL LEV pot. at GR OSC. ***Requirement:*** Meter indicates -4 dBm.	No action.
4	Unplug cord 1 of ED-73285 test connector from TST OUT jack of AMPL and replace shorting plug (P-480314).	No action.
5	Notify telco employee at customer or terminal repeater that test tone and pilot oscillator levels are set.	No action.

CHART 5—MAKE GAIN FREQUENCY MEASUREMENT

STEP	TRANSMIT REPEATER	RECEIVE REPEATER
1	Set patch panel FREQ switch to <5KC.	Unplug ac power to DS 303-type at customer location.
2	Set 3550 test set to transmit 1 kHz 0 dBm.	Set 3550 test set to measure 1-kHz tone.
3	No action.	Adjust either or both GAIN pot. at GR or FLAT REG in slot J6. ***Requirement:*** Meter indicates +6 dBm at intermediate, 0.0 dBm at customer, 0.0 dBm at terminal.
4	No action.	Notify telco employee at terminal or intermediate repeater to transmit 3-kHz tone.

STEP	TRANSMIT REPEATER	RECEIVE REPEATER
5	Transmit 3 kHz at 0 dBm.	Adjust 3 pot. (3 kHz) at GR PREAMP in slot J7. ***Requirement:*** Meter indicates +6 dBm at intermediate, 0.0 dBm at customer, 0.0 dBm at terminal.
6	No action.	Notify telco employee to transmit 5.5-kHz tone.
7	Transmit 5.5 kHz at 0 dBm.	Adjust 5.5 pot. at GR PREAMP in slot J7. ***Requirement:*** Meter indicates +6 dBm at intermediate, 0.0 dBm at customer, 0.0 dBm at terminal.
8	No action.	Notify telco employee to transmit next tone.
9	Set patch panel FREQ switch to >5KC.	←Same
10	Repeat Steps 8 and 9 for 10-, 18-, 32-, and 50-kHz tones.	←Same
11	Repeat procedure (steps 3 through 10) because of interaction at GR PREAMP pot.	←Same

CHART 6—ADJUST RECEIVE PILOT LEVEL AT GR CONT

STEP	TERMINAL OR CUSTOMER REPEATER	CUSTOMER, INTERMEDIATE, OR TERMINAL REPEATER
1	Unplug output cord at WSB transmit line jack or at DAS 806 TRANS LN jack.	Set REJ FLT to NO at ED-73285 test connector.
2	Insert 386B terminating plug into transmit line jack at WSB or DAS 806 TRANS LN jack.	Measure and record reading indicated at meter (example, -6.8 dB).
3	No action.	Set REG IN/OUT switch to IN at GR REG. ***Note:*** Meter reading will change to a higher or lower reading.
4	No action.	Adjust either or both LP GAIN pot. at GR CONT to reading obtained in Step 2 (example, -6.8 dB). ***Note:*** There is a delay of 30 to 60 seconds before a change is indicated at the meter.
5	No action.	Unplug test equipment and replace shorting plug at AMPL.

CHART 7—MAKE GAIN FREQUENCY MEASUREMENT IN DIR 2 FOR VERY SHORT LOOP

STEP	TERMINAL REPEATER	DATA AUXILIARY SET AT CUSTOMER LOCATION
1	Set patch panel FREQ switch to <5KC.	No action.
2	Set 3550 test set to transmit 3 kHz at 0 dBm.	No action.
3	Transmitting 3-kHz tone at 0 dBm.	Have telco employee at terminal repeater to adjust 3 pot. at GR PREAMP in slot J7 until meter indicates 0 dBm.
4	No action.	Notify telco employee at terminal repeater to transmit 5.5 kHz.
5	Transmitting 5.5-kHz tone at 0 dBm.	Have telco employee at terminal repeater adjust 5.5 pot. at GR PREAMP in slot J7 until meter indicates 0 dBm.
6	No action.	Notify telco employee at terminal repeater to transmit next tone.
7	Set patch panel FREQ switch to >5KC.	←Same
8	Repeat Steps 5, 6, and 7 for 10, 18, 32, and 50-kHz tones.	←Same
9	Repeat procedure (Steps 1 through 8) because of interaction of GR PREAMP pot.	←Same

CHART 8—SET 25-KHZ TEST TONE LEVEL IN DIR 2 FOR VERY SHORT LOOP

STEP	TERMINAL REPEATER	DATA AUXILIARY SET AT CUSTOMER LOCATION
1	Set REJ FLT switch to GR at ED-73285 test connector.	No action.
2	Set 3550 test set to transmit 25 kHz at 0 dBm.	Have telco employee at terminal repeater adjust either or both GAIN pot. at FLAT REG in slot J6 until meter indicates 0 dBm.

CHART 9—MAKE GAIN FREQUENCY MEASUREMENT IN DIR 1 FOR VERY SHORT LOOP

STEP	TERMINAL REPEATER	DATA AUXILIARY SET AT CUSTOMER LOCATION
1	No action.	Set patch panel FREQ switch to <5KC.
2	No action.	Set 3550 test set to transmit 3 kHz at 0 dBm.

STEP	TERMINAL REPEATER	DATA AUXILIARY SET AT CUSTOMER LOCATION
3	Adjust 3 pot. at GR PREAMP in slot J2. ***Requirement:*** Meter indicates 0 dBm.	Transmitting 3 kHz at 0 dBm.
4	Notify telco employee at customer location to transmit 5.5 kHz.	Transmitting 5.5 kHz at 0 dBm.
5	Adjust 5.5 pot. at GR PREAMP in slot J2. ***Requirement:*** Meter indicates 0 dBm.	No action.
6	Notify telco employee at customer location to transmit next tone.	No action.
7	Set patch panel FREQ switch to >5KC.	←Same
8	Repeat Steps 5, 6, and 7 for 10-, 18-, 32-, and 50-kHz tones.	←Same
9	Repeat procedure (Steps 1 through 8) because of interaction of GR PREAMP pots.	←Same

CHART 10—SET 25-KHZ TEST TONE LEVEL IN DIR 1 FOR VERY SHORT LOOP

STEP	TERMINAL REPEATER	DATA AUXILIARY SET AT CUSTOMER LOCATION
1	No action.	Set 3550 test set to transmit 25 kHz at 0 dBm.
2	Set REJ FLT switch to GR at ED-73285 test connector.	No action.
3	Adjust either or both GAIN pot. at FLAT REG in slot J1. ***Requirement:*** Meter indicates 0 dBm.	No action.

CHART 11—TEST PILOT ALARM ON LOOP

STEP	TERMINAL REPEATER	CUSTOMER REPEATER
1	Set ACO switch down at ALM.	←Same
2	Disengage GR OSC approximately 1 inch.	After 1 minute, the PIL ALM lamp lights if locally powered. If remotely powered, the PIL ALM lamp does not light.
3	After 1 additional minute, the PIL ALM lamp lights.	No action.

STEP	TERMINAL REPEATER	CUSTOMER REPEATER
	Note: If equipped with fuse and alarm panel at bay, the red and white lamps light and minor alarm is activated. The loop is locked out of service.	
4	Set ACO switch to up position. ***Requirement:*** Red and white lamps and audible alarm go off.	No action.
5	Engage GR OSC into shelf.	No action.
6	Set ACO switch to down position. ***Requirement:*** PIL ALM lamp goes off.	Verify PIL ALM lamp goes off for locally powered repeater.

6. REFERENCES

6.01 The following references provide additional and more detailed information on a WLR-5 repeatered wideband data loop.

NUMBER	TITLE
CD- & SD-73051-01	Data Systems—Central Offices—WLR-4 and WLR-5 Wideband Data Repeater
314-643-100	50-Kilobit Wideband Loop, 1 Through 50 kHz, WLR-5 Repeater, Description
314-643-200	50-Kilobit Wideband Loop, 1 Through 50 kHz, WLR-5 Repeater, Installation and Connection
314-643-300	50-Kilobit Wideband Loop, 1 Through 50 kHz, WLR-5 Repeater, Maintenance
807-125-152	WLR-4 and WLR-5 Wideband Loop Repeater Equipment Design Requirements Data Systems
880-530-110	Groupband Data Systems (Restored Polar) Engineering Considerations General
880-530-115	Wideband Data Transmission System Group Bandwidth Nonrepeatered and WLR-5 Repeatered Loop Design

7. SUPPLEMENTARY INFORMATION

7.01 ***Frequency Response Measurement of 3550A Test Set:*** The Hewlett-Packard 3550A test set contains two input transformers, one for measuring frequencies of 5 kHz or less and the other for measuring frequencies above 5 kHz. A FREQ switch on the 353A patch panel of the 3550A test set should be set to the <5KC (less than 5 kHz) or >5KC (greater than 5 kHz) position, depending upon the input signal to be measured. The FREQ switch connects the input signal to the proper transformer. However, response tests of several 3550A test sets show that the crossover point for the use of one transformer or the other is more closely centered at 10 kHz rather than 5 kHz. The crossover point can be seen in Fig. 6, which shows the two response curves. The first curve was made with the input frequency varied over a range of from 2 through 30 kHz with the FREQ switch in the <5KC position. The second curve was made with the input varied from 3 through 50 kHz with the FREQ switch in the >5KC position. The curves were developed by measuring the insertion loss of a 135-ohm, 20-dB balanced pad, which is also shown in Fig. 6.

7.02 Since proper equalization of the line is so dependent on the frequency response of the VTVM (including, of course, the input transformer selected by the FREQ switch), the choice of the proper point at which to switch input transformers becomes of considerable importance. It is

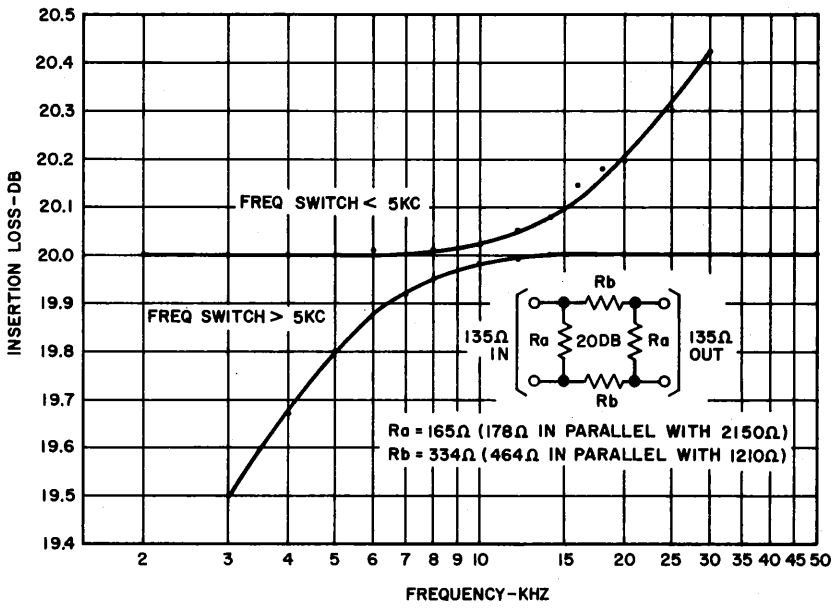


Fig. 6—Response of 3550A Test Set

recommended that a 135-ohm, 20-dB pad be constructed and the frequency response of the 3550A test set(s) be determined prior to use. Note that the lineup steps of this section contain reminders to change the FREQ switch setting when going from the 5.5- to 10-kHz measurement points rather than between the 3- and 5.5-kHz points. If the measured response of a 3550A test set shows that the crossover point does occur at 5 kHz rather than at 10 kHz, the 5.5-kHz measurement (as well as all higher frequency measurements) should be made with the FREQ switch in the <5KC position.

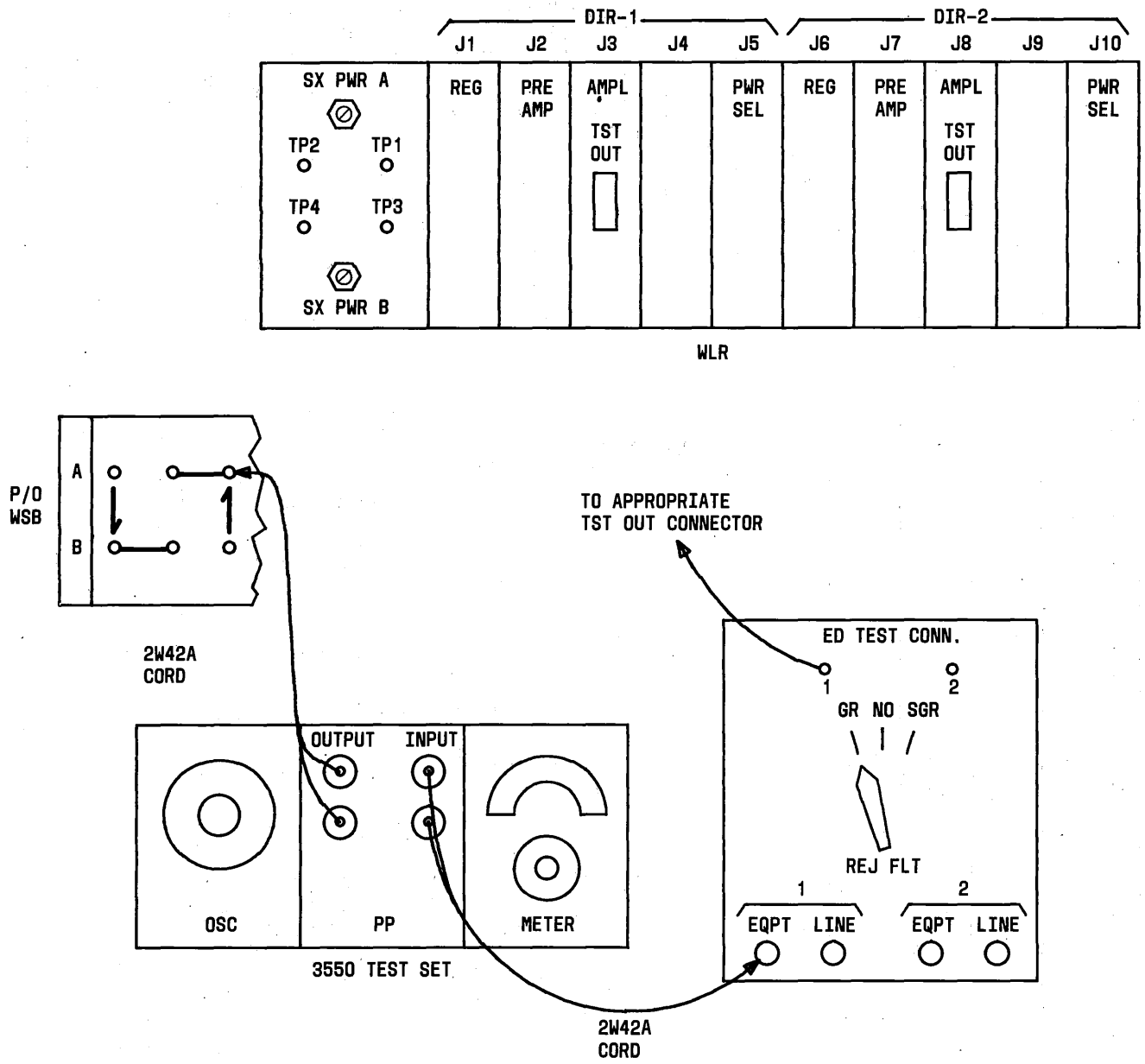


Fig. 7—Terminal Repeater Connections

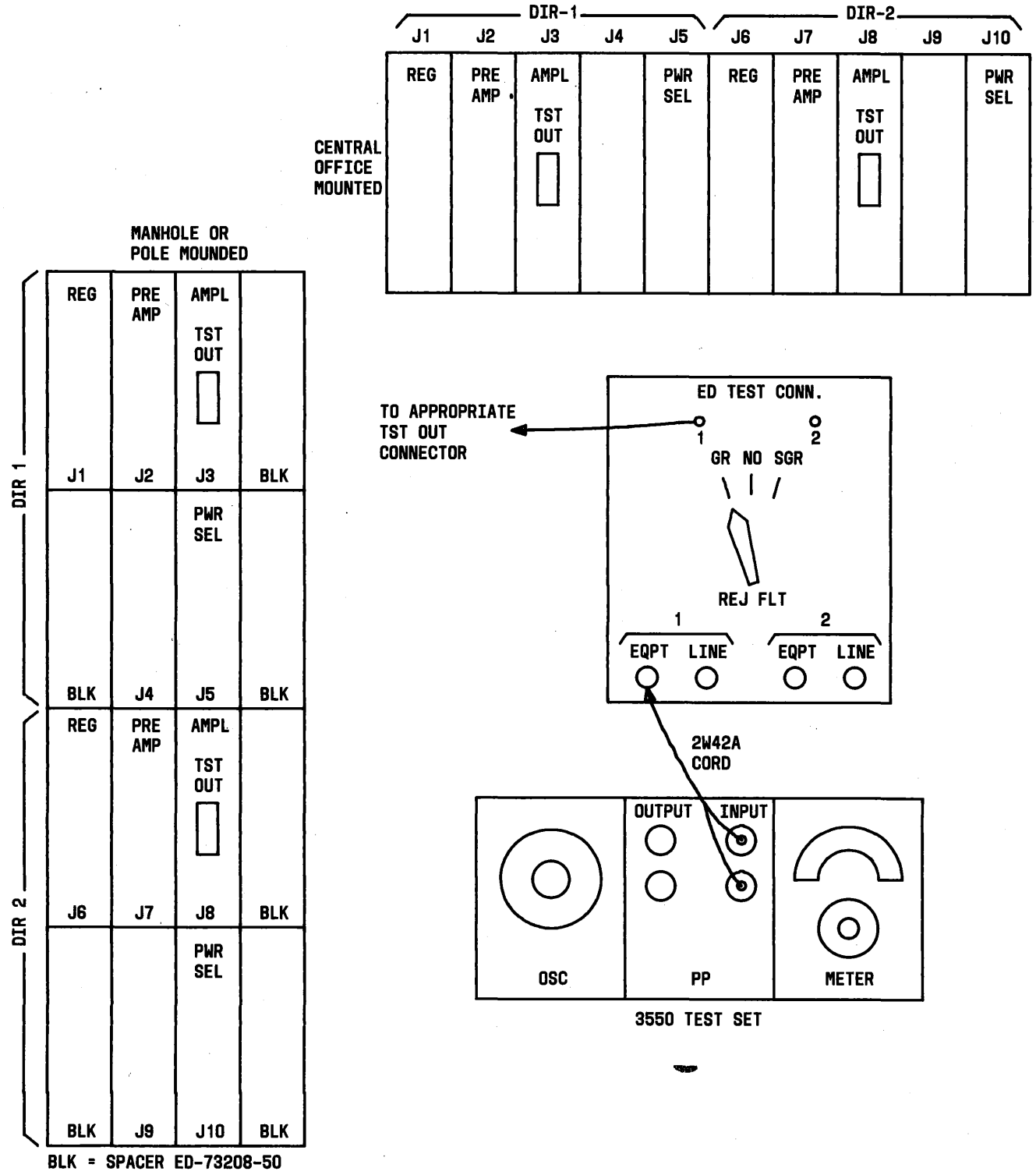


Fig. 8—Intermediate Repeater Connections

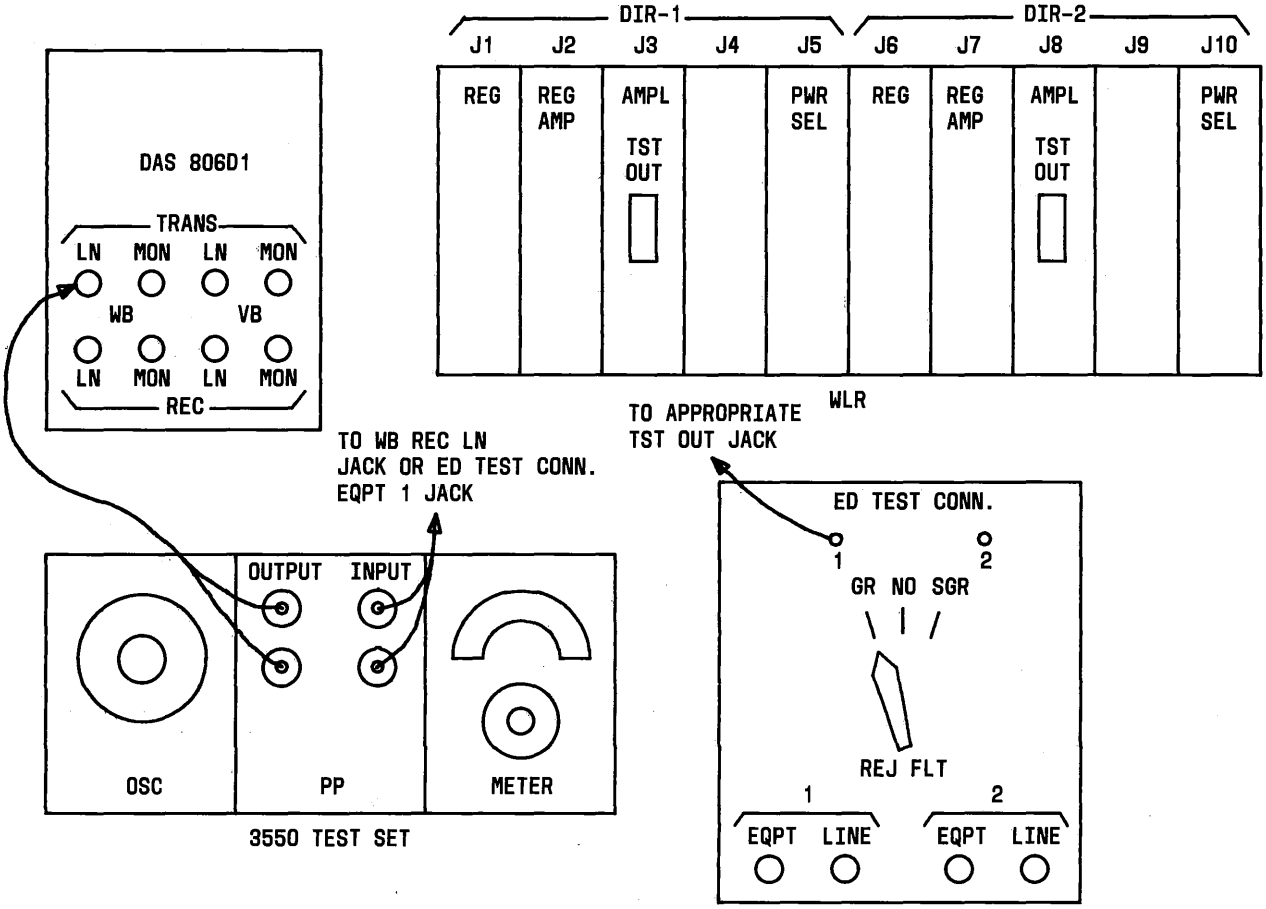
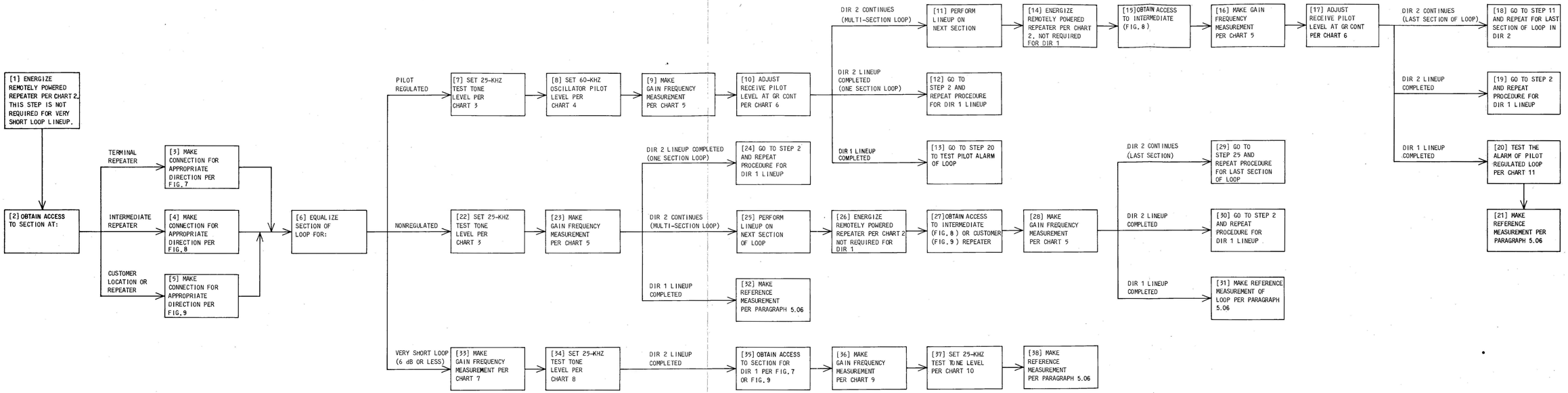


Fig. 9—Customer Repeater or Customer Location Connection



Flowchart 1—Loop Lineup Procedure