J99343SC AND SD 4-4 WIRE TERMINAL/INTERMEDIATE REPEATERS

INSTALLATION AND TEST

METALLIC FACILITY TERMINAL

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1. GENERAL

1.01 This practice describes the installation and testing procedures for the MFT (metallic facility terminal) 4-4 Wire Terminal/Intermediate Repeaters (J99343SC and SD).

1.02 Whenever this practice is reissued, the reason(s) for reissue will be listed in this paragraph.

A. J99343SC

1.03 The J99343SC repeater is a low cost alternative for the J99343SA, L3 in terminal applications and the J99343SB, L3 in intermediate applications. The SC repeater provides flat gain or loss and equalization in both directions of transmission for standard gauges of loaded or nonloaded 4-wire cable facilities. The A and B side impedances are switch selectable between 600 or 1200 ohms to match nonloaded and loaded cable facilities respectively.

B. J99343SD

1.04 The J99343SD repeater combines the transmission circuitry of the J99343SC repeater with the capability to sink or provide a balanced sealing current in either or both directions of transmission.

1.05 The J99343SC and SD 4-wire repeaters are compatible with standard 19-, 22-, 24-, and 26-gauge high capacitance (0.083 μF/mile) H88 loaded or nonloaded cable. These repeaters are also compatible with 25-gauge low capacitance (0.064 μF/mile) H88 loaded or nonloaded metropolitan area trunk (MAT®) cable. A detailed description of these repeaters is provided in Section 332-912-136.

2. INSTALLATION

A. Mounting Arrangements

2.01 The J99343SC and SD repeaters are designed for use in the transmission unit slot of any MFT frame. The SC unit is compatible with a companion signaling unit in a double module arrangement. The ***SD does not provide conventional signaling access;*** therefore, the unit is not compatible with a companion signaling unit. Practice 332-912-101 contains additional information on MFT mounting arrangements.

B. Unit Controls

2.02 Figures 1 and 2 show the location of the individual unit controls. These controls must be set properly prior to the installation of these units. The settings are determined by circuit applications and are to be supplied by the local circuit layout organization. This organization can use the following sources to provide this information.

- 332-912-136 (J99343SC and SD)—Description
- 332-912-212 (2-2 wire repeater)—Prescription Settings (Note)
- Universal Cable Circuit Analysis Program (UNICCAP)
- Standard design engineering practices (851-Division).

Note: The equalizer settings for the SC and SD repeaters are in the 2-wire practice because these units use the 2-wire equalizer arrangement.

The manual procedures provided in this practice can also be used to obtain the unit control settings. In addition, the J99343TM Facility Terminal Test Set can be used to determine the equalizer settings. The switches for a particular function are operated when pressed or depressed toward the respective designation of the switch.

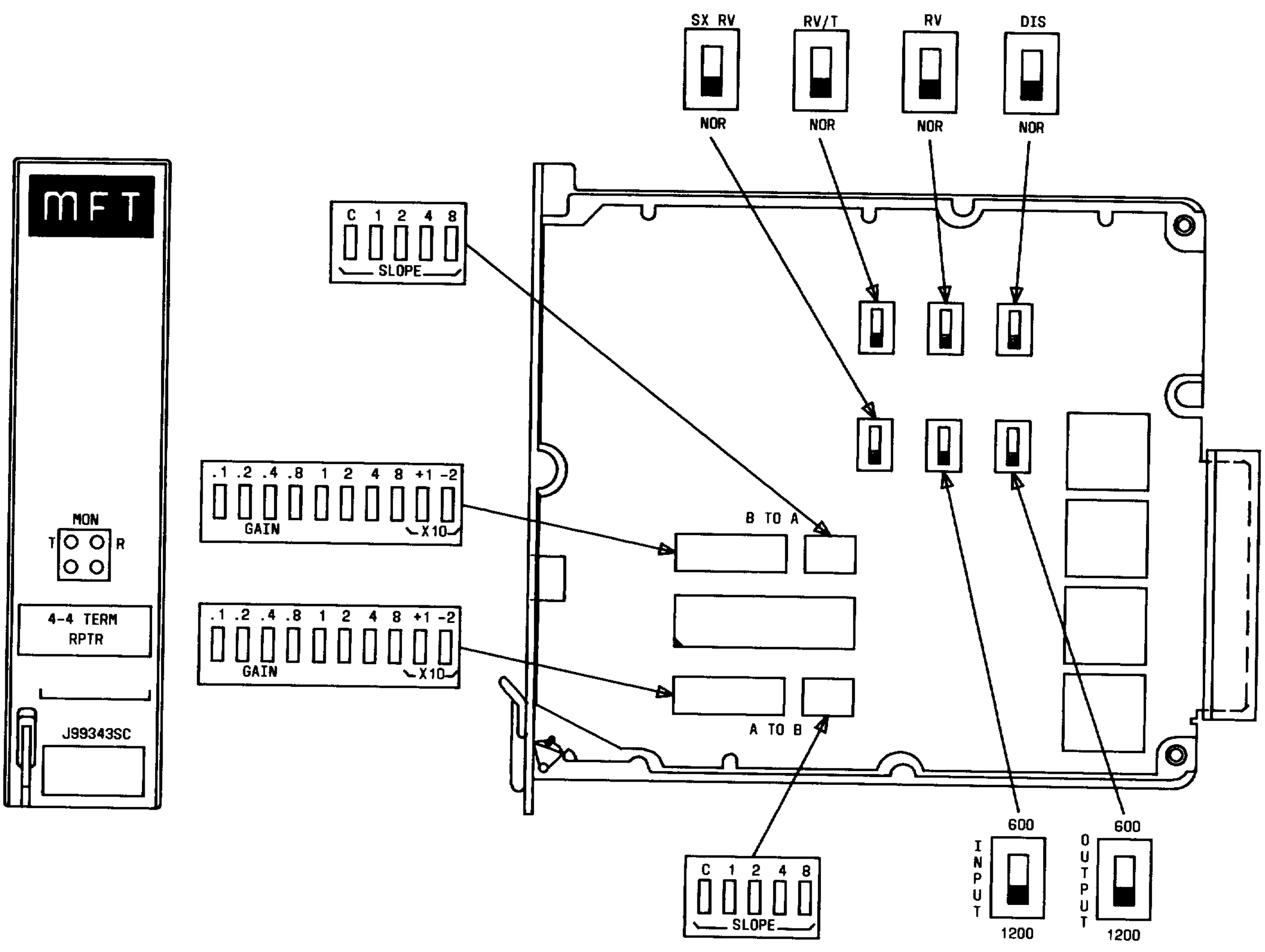


Fig. 1—J99343SC 4-4 Wire Repeater—Switch Layout

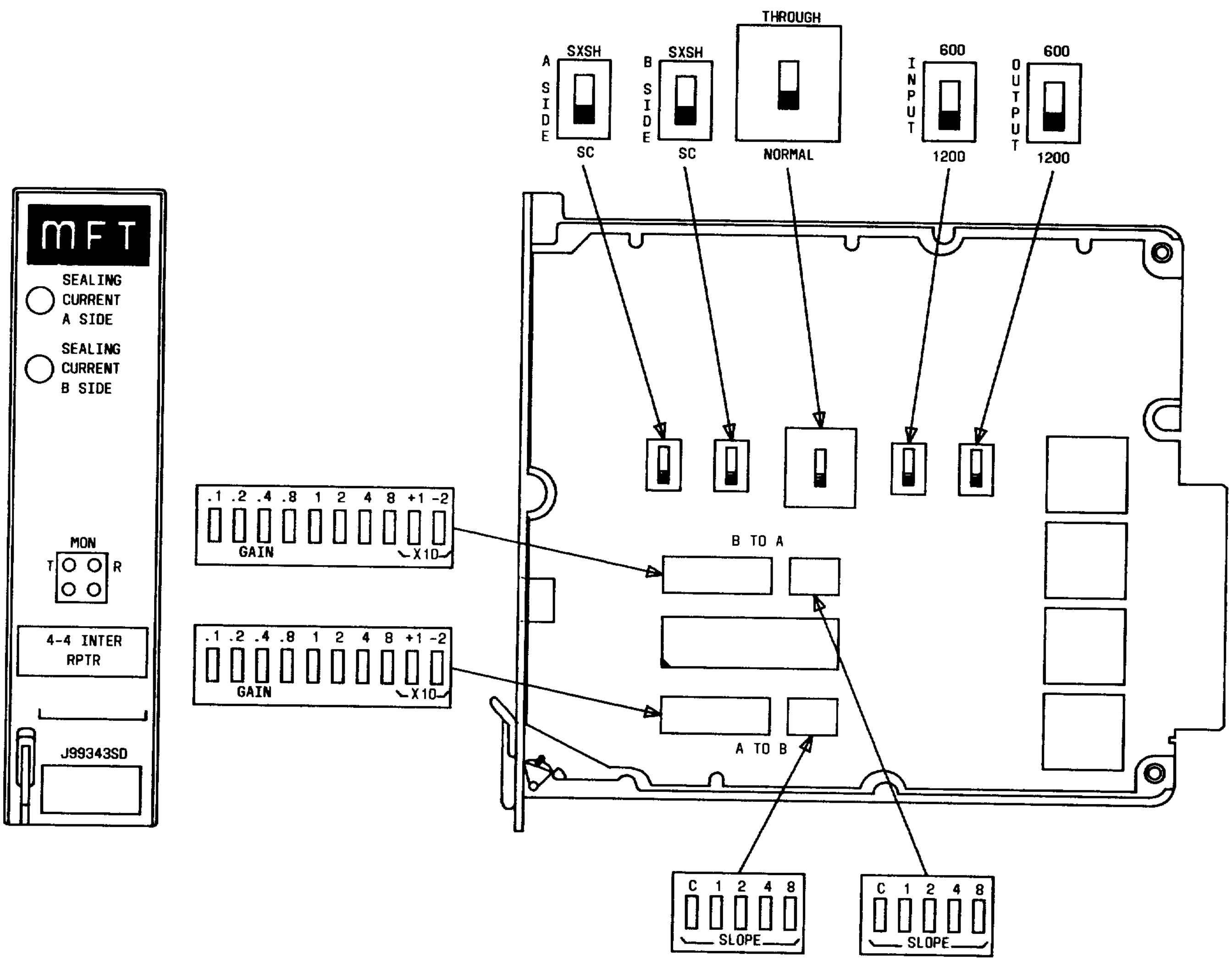


Fig. 2—J99343SD 4-4 Wire Repeater—Switch Layout

3. APPLICATION GUIDELINES

A. General

3.01 The application guidelines in the following paragraphs are for 4-wire repeaters and apply to single-repeater sections as shown in Fig. 3.

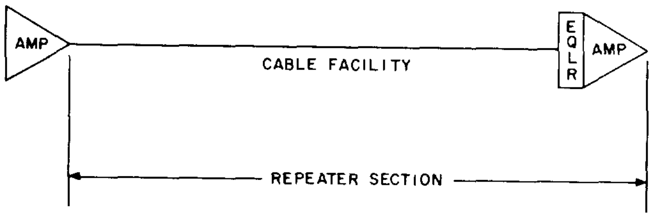


Fig. 3—Repeater Section

3.02 To avoid interference with other circuits, transmission levels at repeater inputs and outputs are restricted to minimum and maximum 1-kHz levels with respect to the TLP (transmission level point) as shown in Table A. When the cable facility adjacent to a PBX or other customer location consists of both loaded and nonloaded cable, levels for nonloaded cable may be used only if there is a minimum of 9 kft of cable between the repeater and the first load coil.

3.03 The maximum lengths of cable allowed for a repeater section in terms of 1-kHz loss are shown in Table B.

3.04 Since selection of either 600- or 1200-ohm impedance is available to match the cable impedance, the following rules should be used to determine the impedance of the 4-wire units:

- Nonloaded cable—600 ohms
- H88 loaded cable—1200 ohms
- Mixed loaded and nonloaded cable (Note)

Note: The selection rule for mixed facilities assumes at least 9 kft of cable between the repeater and the first load coil. If less than 9 kft of nonloaded cable is present, the cable practice should be treated as loaded and 1200 ohms impedance should be used; otherwise, select the 600-ohm impedance.

3.05 For circuit design, the cable makeup must be known and equalizer settings determined before the flat gain of the amplifiers can be computed. Equalizer settings for various gauges and lengths of cable may be found in Practice 332-912-212.

3.06 When cable makeup is not known and the CLR (circuit layout record) does not provide the equalizer setting required for the circuit, equalizer settings may be determined manually in Part 6 by using the actual cable loss data obtained by measurement in Part 5.

B. MFT-V4 Compatibility

3.07 The MFT units and V4 equipment are directly compatible on H88 loaded facilities. The 359-type equalizers used with the V4 equipment should be prescription set as described in Practice 332-116-201 and MFT unit equalizers should be prescription set as described in Practice 332-912-212.

3.08 On nonloaded facilities, V4 equipment uses nonadjustable impedance mismatching for equalization. Some circuit designs which have V4 equipment at one end of long nonloaded cable and an MFT J99343SC or SD repeater at the other end may encounter difficulty in equalization since the V4 equipment is not adjustable. For this situation, equalization is available only from the mismatch of the 150 ohms of the V4 359B equalizer and the 600-ohm impedance of the MFT repeater. The roll-off at 3 kHz relative to 1 kHz for varying gauges and lengths of nonloaded cable is given in Table C.

3.09 Post-equalization offers advantages in crosstalk and other circuit parameters and is the generally preferred method for equalization of all 4-wire facilities. When possible, MFT equipment should be used to terminate both ends of a facility and post-equalization employed for both directions of transmission.

4. TESTS AND ADJUSTMENTS-ALIGNMENT SEQUENCE

4.01 Figure 4 provides a flowchart which presents the overall process for setting up the J99343SC and SD repeaters. The flowchart should be followed when using this practice to install these repeaters. Parts 5 through 8 of this practice supplement Fig. 4

TABLE A

PERMISSIBLE TRANSMITTING AND RECEIVING LEVELS AT 1 KHZ WITH RESPECT TO TRANSMISSION LEVEL POINT (TLP)

REPEATER LOCATION	CABLE TYPE	MINIMUM INPUT LEVEL (DB)	MAXIMUM OUTPUT LEVEL (DB)
Central Office	Nonloaded	−9	+6
	H88 loaded	−9	+6
PBX or other customer location	Nonloaded	−9	+6
	H88 loaded	−6	+3

TABLE B

MAXIMUM LENGTH OF CABLE WITHIN A REPEATER SECTION

REPEATER SECTION	MAXIMUM LENGTH	
	NONLOADED	H88 LOADED
PBX or cust to PBX or cust (through CO wire center)	15 dB	9 dB
PBX or cust to CO	15 dB	12 dB
CO to CO	15 dB	15 dB

TABLE C

3-KHZ ROLL-OFF CAUSED BY IMPEDANCE MISMATCH EQUALIZATION USING V4 AND MFT (150Ω V4 END, 600Ω MFT END)

GAUGE	3-KHZ ROLL-OFF		
	2.0 DB	3.0 DB	4.0 DB
19	20.5 kft	25.3 kft	29.3 kft
22	17.0 kft	20.0 kft	23.3 kft
24	14.5 kft	17.3 kft	20.0 kft
26	12.5 kft	15.0 kft	17.3 kft

where additional information is required to perform the individual transmission tests while Parts 9 and 10 give similar information for setting the signaling lead switches.

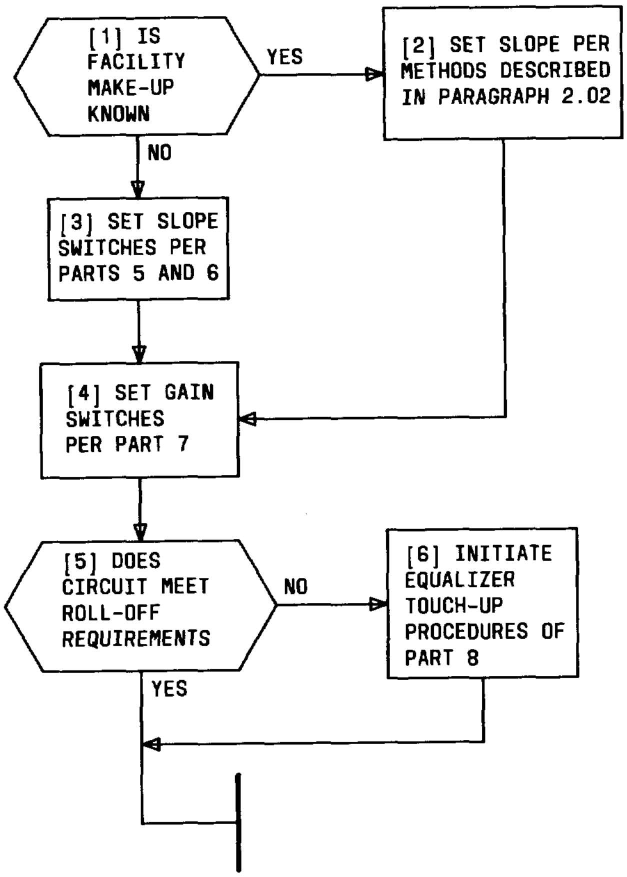


Fig. 4—Transmission Alignment Sequence

5. PROCEDURE FOR FREQUENCY RESPONSE MEASUREMENTS

A. General

5.01 When an MFT unit appears at both ends of the cable section, the test arrangement in Fig. 5 should be used. The jacks in Fig. 5 are provided by the test extenders. Notice that this is only a single link of a 4-wire circuit. However, when determining equalizer settings for each equalizer unit, it becomes necessary to break every circuit down into links like in Fig. 5. Once the proper equalizer settings have been determined and installed, then the overall performance of the circuit can be checked.

5.02 It is very important to have the proper terminating impedance of the repeater selected as loss-frequency measurements are heavily influenced by terminating impedance. The following procedure is for the 4-4 type repeaters interfacing nonloaded cable facilities. It is assumed that the measurements are being made to determine the equalizer settings discussed in Part 6. A similar arrangement may be used with equalizer settings installed for gain-frequency response tests.

5.03 It should be noted that Fig. 5 shows the inclusion of two amplifiers in a typical test when only one section of cable is being equalized. This may seem strange since only one of the equalizer-amplifiers should contain settings for that section of cable. However, for frequency response tests, it is better to have the generator looking through a repeater at the cable rather than into the cable directly. Since this amplifier (transmit end) is set to zero for equalization and gain, then it does not have to be included in any of the calculations in the procedure. For more information on the guidelines of equalization of complete circuits containing not only 4-4 repeaters but also 2-4 and 4-2 repeaters, refer to Practice 332-912-221.

5.04 Because "pre-equalization" is possible in many situations involving the 4-4 repeaters, it is recommended that the standard 0-dBm generator signal not be used in these tests. An input signal of 0-dBm magnitude can cause an excessively high signal level at the output of the repeaters, especially at higher frequencies. Therefore, for frequency response tests of this part, the generator output will be set to −10 dBm.

5.05 One final note on the setup procedure for these tests, make certain that the link being tested includes all the cable facility that the equalizer in question is expected to equalize. Remember these equalizers are capable of "pre-" and "post" equalization. They can also equalize section of cables through nonequalizing amplifiers as well. The principles are illustrated in Fig. 6.

5.06 The information and procedures in this part determine manually the loss measurements of a cable facility circuit. These loss values are used in determining the equalizer settings described in Part

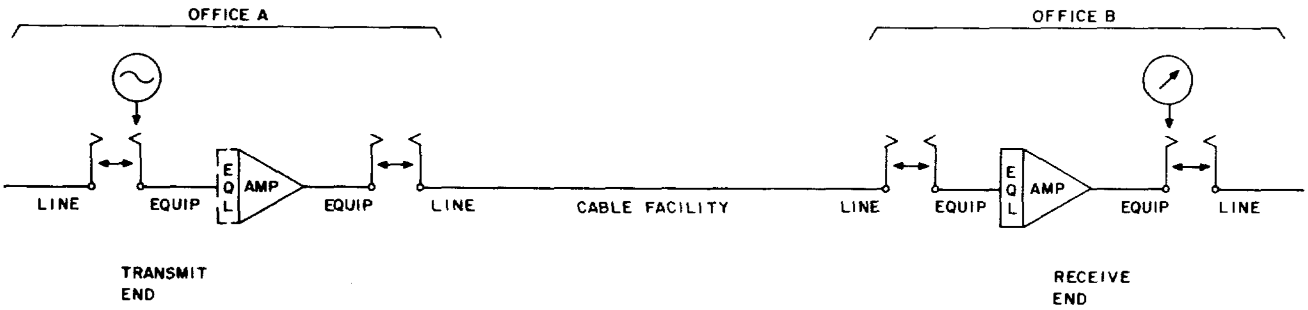


Fig. 5—Typical Test Configuration for Cable Loss Frequency Measurements Using Multiple Repeater Section

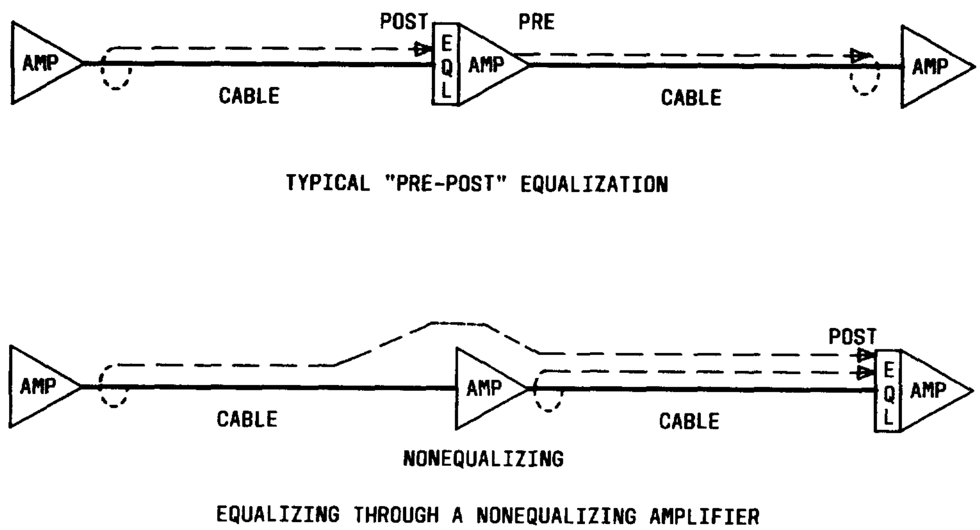


Fig. 6—Examples of Equalizing Two Sections of Cable

6 for the J99343SC and SD repeaters. These procedures are normally used when equalizer settings cannot be determined from any other source, such as the prescription setting tables (Practice 332-912-212) or any of the various mechanized provisioning systems such as TIRKS (Trunk Integrated Record Keeping System) or UNICCAP.

5.07 Two procedures are given in the following paragraphs. The first procedure is used for terminal application and the second is for intermediate application.

B. Terminal Application

5.08 For the following procedure, test tones are transmitted from a far-end office (transmitting location) and the repeater under adjustment is located at the receiving office. The test cable facility is nonloaded. A typical single repeater test setup is shown in Fig. 7.

5.09 Test equipment required for the 4-wire terminal repeater cable loss measurement is as follows:

(a) Receiving Location:

- J99343TB test extender
- CLR (Circuit Layout Record)
- Transmission Measuring Set (TMS) with 600-ohms input impedance

(b) Transmitting Location:

- Oscillator with output impedance of 600 and selectable output frequency of 400, 1000, and 2800 Hz.

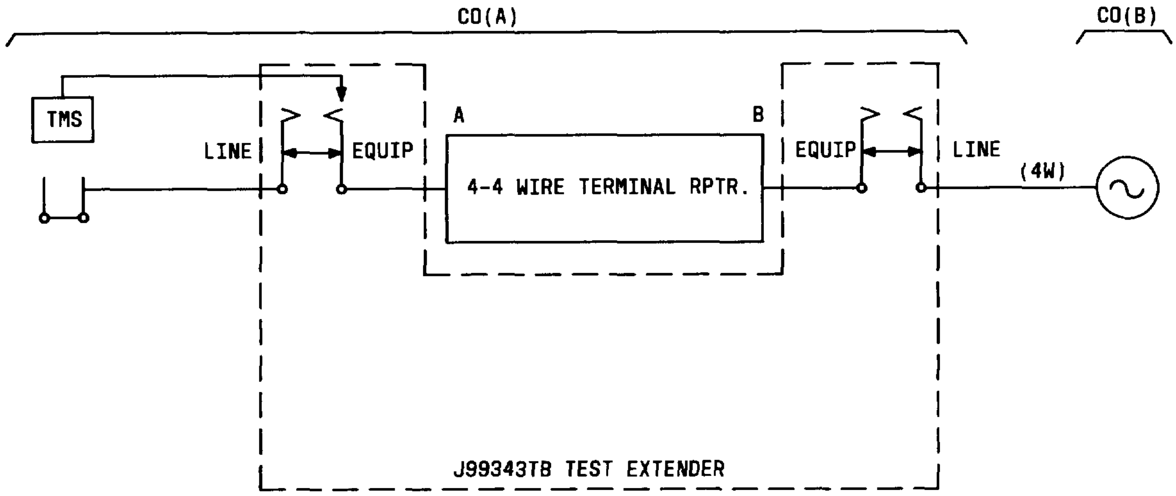


Fig. 7—Typical Test Configuration for Cable Loss—Terminal Repeaters

STEP	PROCEDURE
1	At the receiving location remove repeater associated with circuit under test from its shelf location.
2	Insert repeater into test extender and connect test extender into the repeater's shelf location slot.
3	Adjust repeater controls as follows: (a) Set equalizer switches labeled SLOPE away from switch designations or off (see Note). *Note:* If circuit to be measured is arranged as described in paragraph 5.03, SLOPE switches for the transmit and receive repeaters must be set to "off." (b) Set gain switches to the no-gain positions. (c) Set signaling switches to positions specified on the CLR. (d) Set DIS/NOR switch to NOR position. (e) If the B-side cable facility is nonloaded, set the OUTPUT switch to 600 or if loaded set to 1200. (f) Set the INPUT switch to 600.
4	Set the switches on the J99343TB test extender at the receive location as follows: **A-SIDE** / **B-SIDE** 2W/4W to 4W / 2W/4W to 4W 600/900 to 600 / 600/900 to 600
5	At the receive location connect the TMS to the A-side T1/R1 EQUIP jack of the test extender.
6	At the receive location connect a 600-ohm terminating plug to the A-side T1/R1 LINE jack of the test extender.
7	Instruct the transmitting location to send a 1-kHz tone at −10 dBm.
8	Measure the 1-kHz level and adjust the B to A direction gain for a suitable output level (e.g., −5 dBm) and record this value.
9	Instruct the transmitting location to send 400 Hz.
10	Instruct the transmitting location to send 2800 Hz.
11	Use levels to compute equalizer settings for the receive direction as described in Part 6 of this section.
12	If required, to set the equalizer for the transmit (A to B) direction for the repeater-under-adjustment, make loss measurements in the opposite direction using the same procedures.
13	If required, compute equalizer setting for the transmit direction as described in Part 6.

STEP	PROCEDURE
14	Install equalizer settings.
15	After setting equalizer(s) to the values determined in Part 6, remeasure the circuit at the three frequencies to verify the accuracy of the setting and to evaluate the roll-off against trunk or line requirements. Refer to Table D for requirements. Use touch-up procedures found in Part 8 of this practice if circuit does not meet requirements.
16	Refer to Part 7 for appropriate gain setting using equalizer values.
17	Set the DISABLE switch to the position specified on the CLR.
18	Remove test cords from test extender.
19	Remove test extender card from MFT mounting shelf.
20	Remove repeater from test extender and insert into the proper MFT shelf.
21	Record the final equalizer settings in the appropriate plant records.
22	This completes the frequency response measurement procedure for the terminal repeater. Go to Step 4 of Fig. 4.

TABLE D

ATTENUATION DISTORTION ROLL-OFF OBJECTIVES FOR VOICEGRADE SWITCHED SPECIAL SERVICES CIRCUITS

CIRCUIT	ALLOWABLE DEVIATION FROM 1000-HZ LOSS	
	MEASURED AT 400 HZ (NOTE)	MEASURED AT 2800 HZ (NOTE)
Trunks	Within 3.0 dB more loss or 1.0 dB less loss	Within 4.5 dB more loss or 1.0 dB less loss
Lines	Within 5.0 dB more loss or 1.0 dB less loss	Within 7.5 dB more loss or 1.0 dB less loss

Note: Relative to 1-kHz loss

C. Intermediate Application

5.10 The following test arrangement for intermediate applications involves three locations as shown in the typical test setup of Fig. 8. This arrangement for the following procedure has the transmitting location on the B-side of the repeater.

5.11 The following test equipment will be required for the location involved:

(a) Transmitting Location:

- Voice frequency oscillator with 600-ohm output impedance and variable frequency selection for 400, 1000, and 2800 Hz.

(b) Receiving Location:

- Transmission measuring set (detector) with 600-ohm input impedance.

(c) Intermediate (repeater) Location:

- J99343TB test extender.

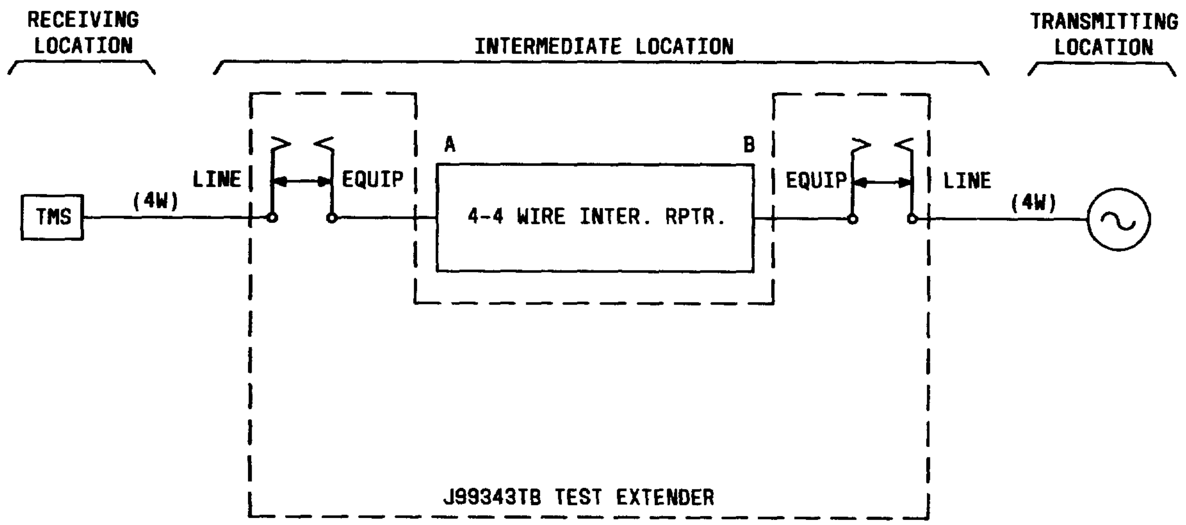


Fig. 8—Typical Test Configuration for Cable Loss Measurement —Intermediate Repeater

STEP	PROCEDURE

At the Transmitting Location:

1 Connect oscillator to line with an output of 1 kHz at −10 dBm and the oscillator impedance set as follows. (See note.)

TRANSMITTING LOCATION	OSCILLATOR IMPEDANCE
Central Office	900 ohms
600-ohm PBX	600 ohms
900-ohm PBX	900 ohms
Station Set	600 ohms

Note: Actual transmission of 1-kHz tone will be initiated in Step 6.

At the Receiving Location:

2 Connect the TMS to the line with the input impedance determined by the receiving location (see Step 1).

At the Intermediate Location:

3 Remove intermediate repeater associated with circuit under test from its shelf location.

4 Insert repeater into test extender and connect test extender into the repeater's shelf location slot.

5 Adjust repeater controls as follows:

(a) Set SLOPE switches for both directions of transmission away from the switch designations (off).

(b) Set gain switches for both directions of transmission away from the switch designations.

(c) Set signaling switches to positions specified on the CLR.

(d) Set INPUT and OUTPUT switches to match A- and B-side cable interfaces, i.e., 600 for nonloaded cable and 1200 for loaded.

Note: The switches on the TB test extender do not require setting at this time. The test extender is used mainly for monitoring the transmission lines using the jacks labeled MON to verify tone(s) are being transmitted. It is also used to provide access to the internal repeater switches.

6 Instruct the transmitting location to send a 1-kHz tone at 0 dBm (setup of Step 1) and adjust the B to A gain switches (repeater at intermediate location) until receiving location receives −5 dBm.

7 After adjusting the gain, have the transmitting location send 400 Hz at −10 dBm and record the level read at the receiving location.

STEP	PROCEDURE
8	Have the transmitting location send 2800 Hz at −10 dBm and record the level read at the receiving location.
9	For calculation of equalizer settings, use the received levels for 400, 1000, and 2800 Hz in the procedures in Part 6.
10	Repeat Steps 6 through 9 for the A to B direction of transmission (transmit and receive offices are reversed).
11	After computing the equalizer settings, they should be installed in both equalizers.
12	Readjust the gain for both directions of transmission to the level specified on the CLR or follow the procedures in Part 7.
13	Remeasure the circuit at 400, 1000, and 2800 Hz, and compare the results to the circuit objectives as shown in Table D.
14	Set the DISABLE switch to the position specified on the CLR.
15	Disconnect test extender from shelf and remove repeater from test extender.
16	Insert the repeater back into its proper shelf location.
17	Have transmitting and receiving locations remove the test equipment, and restore the circuit to the normal condition.
18	Record the equalizer and gain settings in the appropriate plant records.
19	This completes the procedure for frequency response measurements for intermediate repeaters. Go to Step 4 of Fig. 4.

6. EQUALIZER SETTINGS FROM CABLE LOSS MEASUREMENTS

6.01 The procedures in Fig. 9 are used to obtain equalizer settings by actual circuit loss measurements at 400, 1000, and 2800 Hz when the facilities do not fit the prescription settings tables in Practice 332-912-212. The circuit loss measurements are made using the procedures in Part 5B or 5C.

6.02 The differences computed in Fig. 9 are rounded to the nearest 0.5 dB and located in Table E. Table E also indicates whether the facility will meet trunk or line objectives.

6.03 The use of Table E to find equalizer settings is straightforward. Locate the 400-Hz difference on the left side and read across to the column that contains the 2800-Hz difference. The values in the block represent the equalizer settings; the first is the C switch position, C=0 (off) or C=1 (on), and the second is the sum of the operated numerical switches.

6.04 After setting the equalizer to the values determined in the procedures, the 1-kHz gain must be readjusted to correct for the additional gain (or loss) introduced by the equalizer.

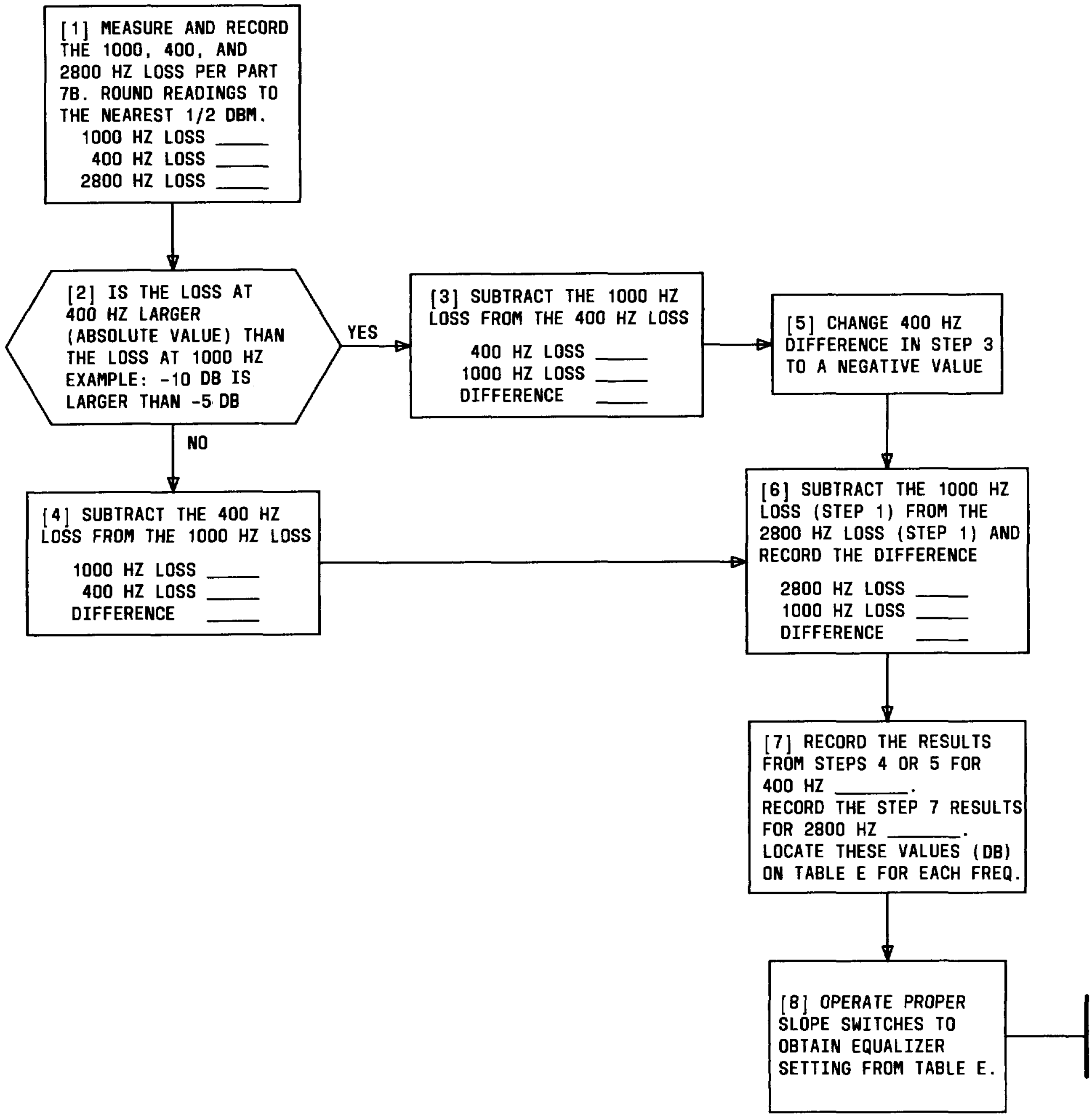


Fig. 9—Obtaining Equalizer Setting By Measurement

TABLE E

INTERMEDIATE REPEATERS
EQUALIZER SETTINGS FROM CABLE LOSS DATA
2800-HZ DIFFERENCE

400-HZ DIFFERENCE	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0
−1.0	0,0	0,0	0,0	0,1	0,1	0,2	0,2	0,3	0,3	0,4	0,4	0,5	0,6	0,7	0,7
− .5	0,0	0,0	0,1	0,1	0,2	0,2	0,3	0,3	0,4	0,4	0,5	0,6	0,7	0,7	0,8
0	0,0	0,1	0,1	0,2	0,2	0,3	0,3	0,4	0,4	0,5	0,6	0,7	0,7	0,8	0,9
.5					0,3	0,3	0,4	0,4	0,5	0,6	0,7	0,7	0,8	0,9	0,10
1.0								0,5	0,6	0,7	0,7	0,8	0,9	0,10	0,11
1.5								0,6	0,7	0,7	0,8	0,9	0,10	0,11	0,12
2.0								1,1	1,1	0,8	0,9	0,10	0,11	0,12	0,14
2.5								1,1	1,2	1,2	0,10	0,11	0,12	0,14	0,15
3.0											1,3	0,12	0,14	0,15	0,15
3.5												0,14	0,15	0,15	0,15
4.0													1,6	1,6	1,7
4.5															1,8
5.0															
5.5															
6.0															

400-HZ DIFFERENCE	8.5	9.0	9.5	10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0
−1.0	0,7	0,7	0,7	0,8	0,9	0,9	0,10	0,11	0,12	0,13	0,14					
− .5	0,9	0,9	0,9	0,9	0,10	0,11	0,11	0,12	0,13	0,15	0,15	1,6				
0	0,10	9,11	0,11	0,11	0,11	0,12	0,13	0,14	0,15	1,6	1,6	1,7	1,7	1,8		
.5	0,11	0,12	0,13	0,13	0,13	0,13	0,15	0,15	0,15	1,6	1,7	1,8	1,8	1,9	1,10	
1.0	0,12	0,14	0,15	0,15	0,15	0,15	0,15	0,15	0,15	1,7	1,8	1,9	1,10	1,10	1,11	1,12
1.5	0,14	0,15	0,15	0,15	0,15	1,7	1,7	0,15	0,15	1,8	1,9	1,10	1,11	1,12	1,13	1,14
2.0	0,15	0,15	0,15	0,15	0,15	1,9	1,9	1,9	0,15	1,10	1,10	1,11	1,12	1,13	1,14	1,15
2.5	0,15	0,15	0,15	0,15	0,15	1,10	1,11	1,11	1,11	1,11	1,12	1,13	1,14	1,15	1,15	1,15
3.0	0,15	0,15	0,15	0,15	0,15	1,11	1,12	1,13	1,13	1,13	1,13	1,14	1,15	1,15	1,15	1,15
3.5	0,15	0,15	0,15	0,15	0,15	1,12	1,13	1,15	1,15	1,15	1,15	1,15	1,15	1,15	1,15	1,15
4.0	1,8	1,9	1,10	1,11	1,12	1,13	1,15	1,15	1,15	1,15	1,15	1,15	1,15	1,15	1,15	1,15
4.5	1,9	1,10	1,11	1,12	1,13	1,15	1,15	1,15	1,15	1,15	1,15	1,15	1,15	1,15	1,15	1,15
5.0	1,10	1,11	1,12	1,13	1,15	1,15	1,15	1,15	1,15	1,15	1,15	1,15	1,15	1,15	1,15	1,15
5.5		1,12	1,13	1,15	1,15	1,15	1,15	1,15	1,15	1,15	1,15	1,15	1,15	1,15	1,15	1,15
6.0			1,15	1,15	1,15	1,15	1,15	1,15	1,15	1,15	1,15	1,15	1,15	1,15	1,15	1,15
			MEET ***TRUNK*** REQUIREMENTS								MEET ***LINE*** REQUIREMENTS					

7. GAIN ADJUSTMENT

A. Setting Gain Specified By CLR

7.01 The total gain provided by the J99343SC and SD repeaters is the combination of the gain provided by the amplifier and equalizer units. In order to determine the proper setting of the gain switches, the equalizer switch settings must first be determined. The manual method(s) of Part 5 may be used to determine the equalizer settings; or if the cable facility makeup is known, the prescription setting tables of Practice 332-912-212 may be used. Once the equalizer settings have been determined, Table F will give the 1-kHz gain associated with each equalizer setting. The difference resulting from the total gain required (shown on the CLR) minus the equalizer gain, is the gain value to be provided by the amplifier units of the repeater. The gain switches of the repeater being adjusted should be set to this value.

7.02 The gain switches for the J99343SC and SD repeaters are located on the internal printed wiring board as shown in Fig. 1 and 2. These switches are designated .1, .2, .4, and .8 (fine adjust); 1, 2, 4, and 8 (coarse adjust), and +10 and −20 (range select). All switch values are in dBs and are additive. The −20 range select should only be used when the repeater is to provide loss instead of gain.

> ***Note:*** The sum of the .1, .2, .4, .8, 1, 2, 4, and 8 gain switches should not exceed +12 dB to minimize accumulated gain errors. Use the +10 range to provide values above this range.

7.03 After gain switches have been set, go to Step 5 of Fig. 4.

B. Setting Output Level

7.04 If output level only is shown on the CLR or if the VF circuit does not fall within acceptable transmission levels after setting the specified gain, the alternate procedure of this part for setting the output level should be followed.

7.05 The test configuration shown in Fig. 8 for cable loss can also be applied to level adjustments. Test equipment required for the level measurement procedure is listed as follows:

- J99343TB test extender
- VF oscillator with adjustable output power and a 600-ohm output impedance
- Transmission measuring set (detector) with a 600-ohm input impedance

Note: The oscillator and measuring set may be combined in a single test instrument.

- CLR

TABLE F

EQUALIZER GAIN OR LOSS IN DB AT 1 KHZ

SWITCH SETTING	C=OFF	C=ON
0	0	−3.5
1	+0.2	−3.3
2	+0.5	−3.0
3	+0.8	−2.7
4	+1.2	−2.3
5	+1.5	−2.0
6	+1.9	−1.6
7	+2.3	−1.2
8	+2.7	−0.8
9	+3.1	−0.4
10	+3.6	+0.1
11	+4.0	+0.5
12	+4.4	+0.9
13	+4.7	+1.2
14	+5.1	+1.6
15	+5.5	+2.0

- Appropriate test cords.

The following procedure assumes the repeater being adjusted interfaces with a nonloaded cable facility.

STEP	PROCEDURE
1	Remove repeater under adjustment from its shelf location and turn appropriate test circuits down from service.
2	Install equalizer settings. If equalizer settings are unknown, determine them by using the procedures in Parts 5 and 6.
3	Install proper signaling options as specified on CLR.
4	Operate all gain switches away from switch designations (off).
5	If the J99343SC is being adjusted, set the DIS/NOR switch to the NOR position.
6	If the J99343SD is being adjusted, set the sealing current switches as specified on CLR.
7	Set INPUT and OUTPUT switches to 600 (ohm).
8	For level adjustment on the A-side (output of B-side to A-side), set switches on the J99343TB test extender as follows:

A-SIDE	B-SIDE
2W/4W to 4W	2W/4W to 4W
600/900 to 600	600/900 to 600

STEP	PROCEDURE
9	Insert repeater into test extender and connect cable extender card into proper slot of MFT shelf.
10	Note output level specified on CLR for direction of transmission being adjusted. Call this level L.
11	Have a 1-kHz tone at 0 dBm applied to the circuit at 0 TLP for the side being adjusted from a far-end office. *Note:* Input level to the side being adjusted for this test is assumed to be within CLR requirements.
12	If setting the output level for the B to A direction of transmission, connect the TMS to the A-side T1/R1 EQUIP jack on the test extender. If setting the output level for the A to B direction of transmission, connect the TMS to the B-side T1/R1 EQUIP jack on the test extender.
13	Set appropriate gain switches for a reading of L on the TMS.

STEP	PROCEDURE
14	After amplifiers have been adjusted, set the DIS/NOR switch to position specified on CLR.
15	Disconnect test extender from shelf and remove repeater from test extender.
16	Insert repeater into its proper shelf location.
17	Go to Step 5 of Fig. 4.

8. GUIDELINES FOR EQUALIZER TOUCH-UP

8.01 These touch-up procedures assume that the initial slope settings were determined and did not meet roll-off objectives. When the procedure calls for increasing or decreasing the SLOPE setting, it refers to the numerical sum of the operated switches. All measurements in the procedures are end-to-end as in Part 5 and Fig. 5.

8.02 The procedures for equalizer touch-up assume that all options, balancing network settings, and 1-kHz levels have been set to their proper values. It is also assumed that frequency response measurements have been made and circuit requirements are ***not*** met.

> *Note:* The facility is considered to be properly equalized when the 2800-Hz loss is slightly more but as close as possible to the 400-Hz loss. Over equalization at either high or low frequencies could cause the circuit to become unstable.

8.03 The procedure for equalizer touch-up is given in Fig. 10. If Step 11 of Fig. 10 is repeated twice without satisfactory result, the circuit cannot be properly equalized and should be referred to the proper personnel.

8.04 Figure 10 assumes the roll-off requirements are to be measured at 400 and 2800 Hz. However, if the roll-up requirements are at different frequencies, they can be substituted for the 400 and 2800 Hz in Fig. 10.

9. SIGNALING SWITCH ADJUSTMENTS

A. J99343SC

9.01 *NOR-RV/T, NOR-RV:* These switches shown in Fig. 11 are used to establish the normal, reverse, or through signaling mode. Figure 11 gives the required switch positions to achieve a prescribed mode. These switches only affect the dc path to the signaling section.

> *Note:* If no companion signaling unit is used, these switches should be set for the ***through*** mode.

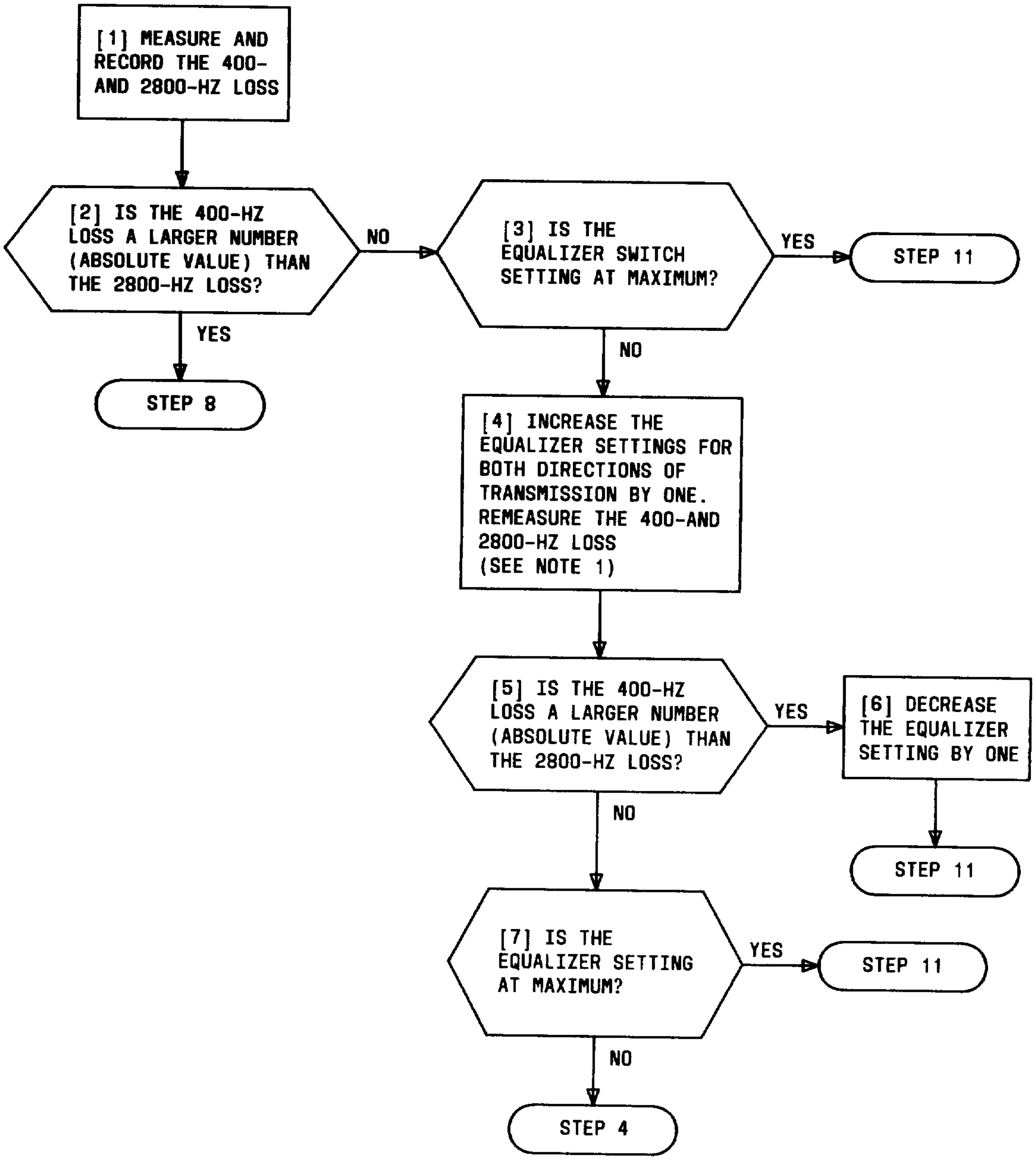
9.02 *NOR-SX RV:* This switch is used to reverse the simplex signaling leads (SX and SX1) on the B-side of the repeater.

9.03 *NOR-DISABLE:* The NOR-DISABLE slide switch permits the −48 Vdc power supply to the repeaters to be controlled by the companion signaling unit. When the NOR-DISABLE switch is in the DISABLE position, the companion signaling unit disconnects power to the repeater while the circuit is idle or open. In the NOR position, battery is supplied continuously to the terminal repeater.

> *Note:* If no companion signaling unit is used or if the signaling unit does not have the disabling function, the switch must be in the NOR position.

B. J99343SD

9.04 *NORMAL THROUGH:* The normal/through switch controls the routing of the simplex leads. In the ***normal*** mode, the



NOTES:

1. FOR EACH THREE TIMES THROUGH THIS STEP, THE 1-KHZ GAIN MUST BE READJUSTED TO THE LEVEL SPECIFIED ON THE CLR.
2. ACCESSING STEP 11 TWICE WITHOUT SATISFACTORY RESULTS IMPLIES THE FACILITY CANNOT BE PROPERLY EQUALIZED.

Fig. 10—Procedure for Equalizer Touch-Up (Sheet 1 of 2)

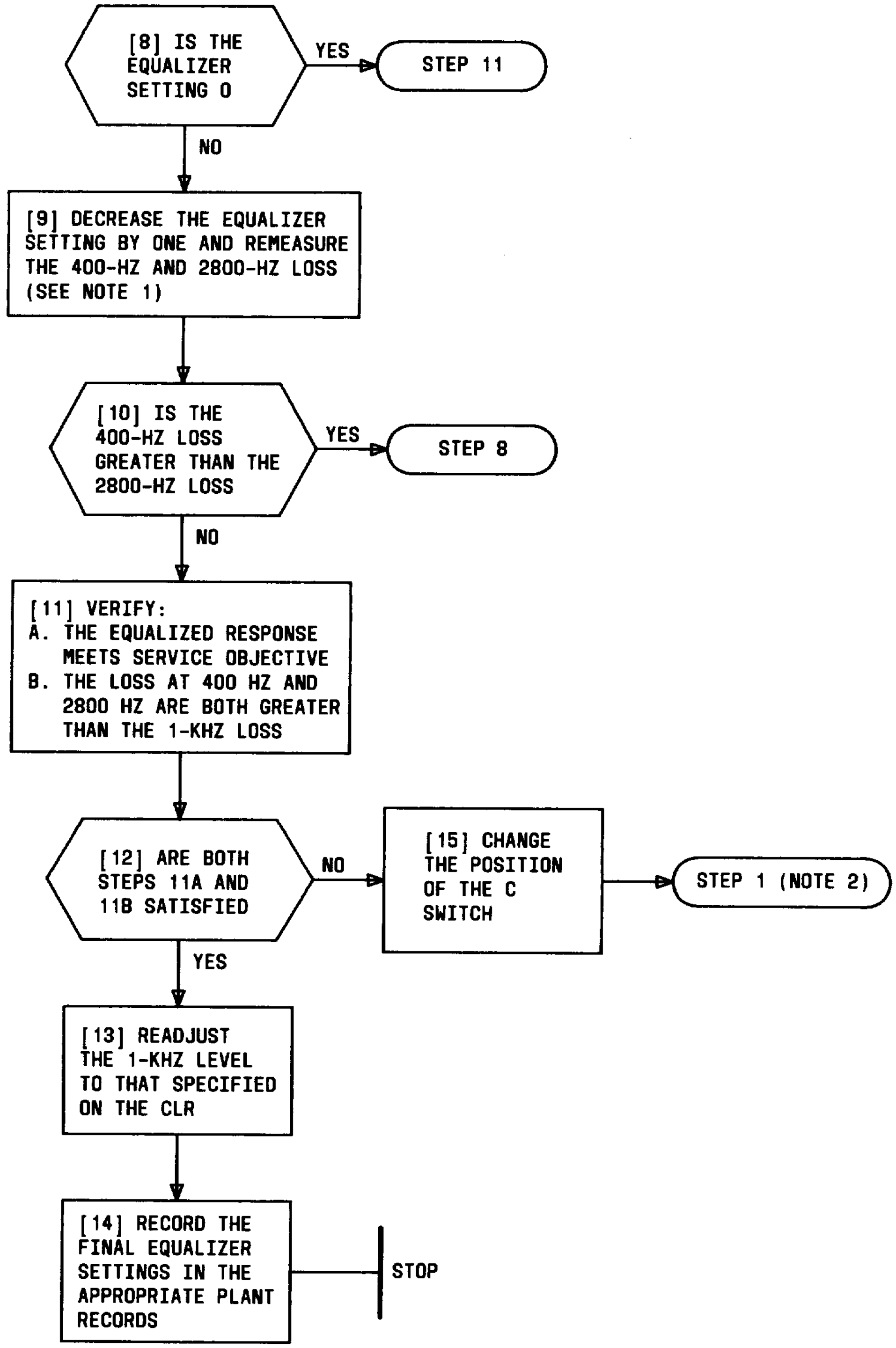


Fig. 10—Procedure for Equalizer Touch-Up (Sheet 2 of 2)

simplex leads are connected to the SC (sealing current) function. In the ***through*** mode, the sealing current is removed from the 4-wire ports and the unit is connected in the conventional through signaling mode. In the ***through*** mode, the SC current functions are available on the external signaling leads.

> ***Note:*** The J99343SD repeater does not provide lead access for a companion signaling unit. Therefore, the SD repeater cannot be used with a companion signaling unit in a double module MFT frame.

10. J99343SD SEALING CURRENT ADJUSTMENTS

10.01 The J99343SD repeater provides SC (sealing current) to help prevent the buildup of high resistance film which can occur at unsoldered splices in a telephone loop. This film can degrade transmission performance of the circuit. Sealing current is applied across the simplex leads of either the A-Side and/or B-Side line transformers.

10.02 The SD unit provides sealing current in excess of 10 milliamperes for simplex loop resistances of up to 3000 ohms. If the sealing current exceeds 10 milliamperes, two LEDs on the front panel, designated Sealing Current A-Side and Sealing Current B-Side, will be activated. The sealing current options are illustrated in Fig. 12 through 16. Also see paragraph 9.04.

10.03 A potential problem in the use of sealing current on 4-wire circuits should be noted. If one conductor in a pair has a higher dc resistance than the other conductor, the conductor with the lower resistance will tend to draw more current. This will cause an imbalance between the tip and ring conductors. Take appropriate measures to ensure that each conductor in a pair has the same dc resistance to prevent this condition.

10.04 A typical example of a sealing current arrangement using the J99343SD repeater is shown in Fig. 17. In order for sealing current to flow in the loop, the equipment on the distant end of the loop must have the capability of shorting the associated simplex leads as shown in Fig. 17.

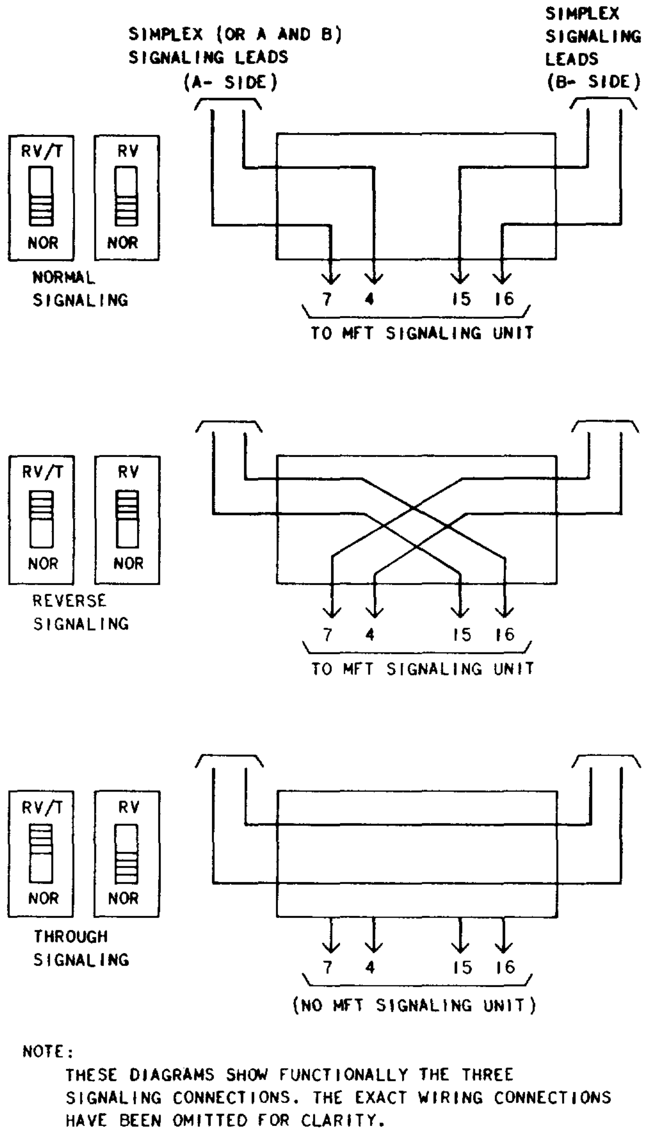


Fig. 11—Signaling Options for the J99343SC Repeater

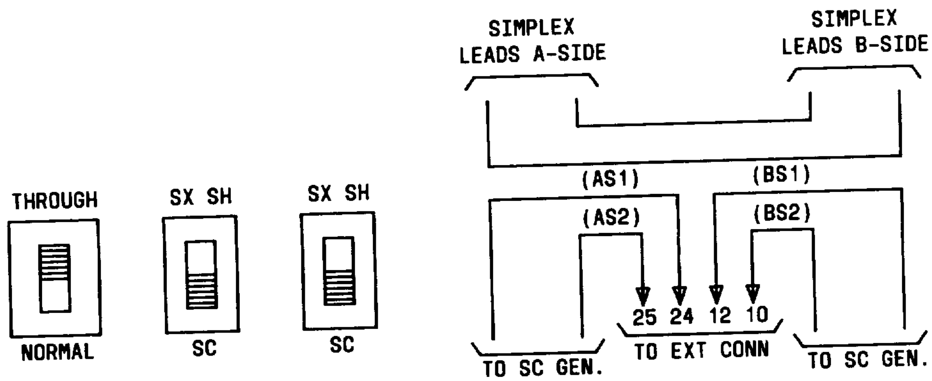


Fig. 12—Switch Settings for SD Repeater to Furnish a Sealing Current to External Circuits Only

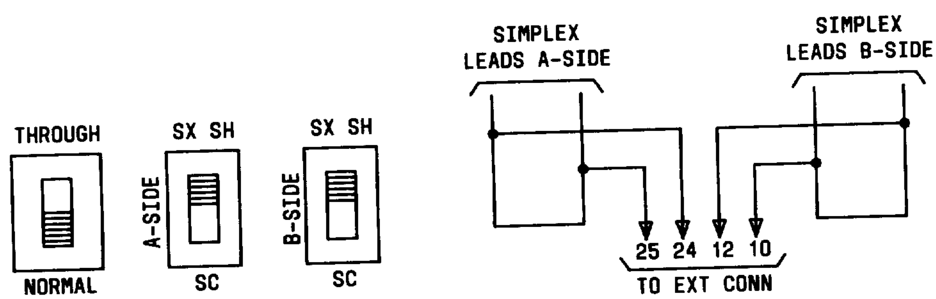


Fig. 13—Switch Settings for SD Repeater to Furnish a Sealing Current Sink

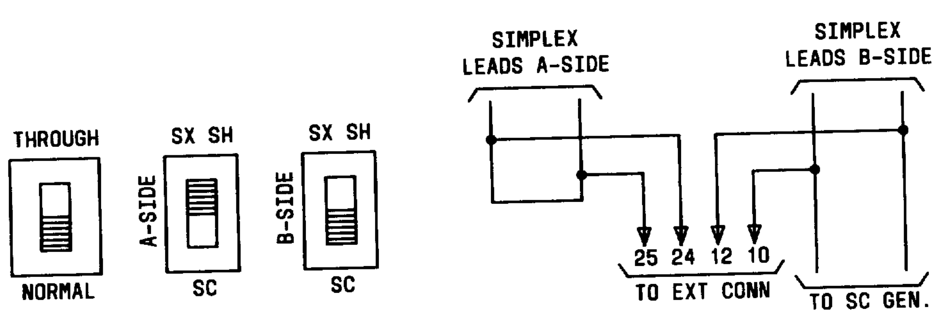


Fig. 14—Switch Settings for SD Repeater to Furnish B-Side Sealing Current

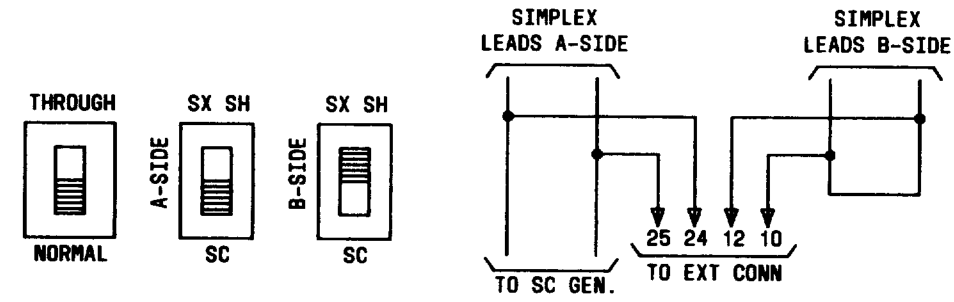


Fig. 15—Switch Settings for SD Repeater to Furnish A-Side Sealing Current

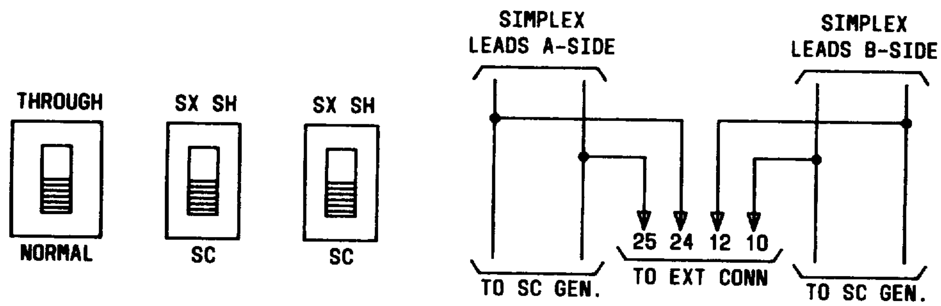


Fig. 16—Switch Settings for SD Repeater to Furnish A- and B-Side Sealing Current

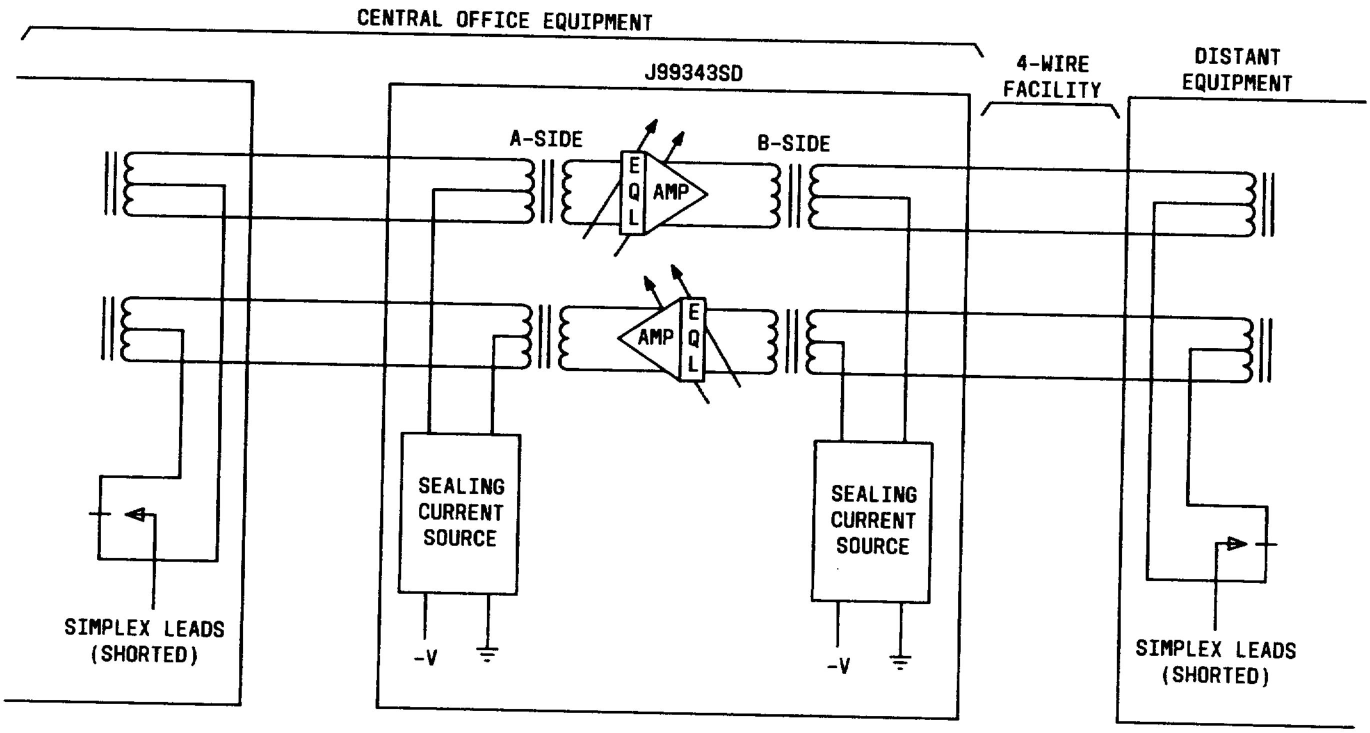


Fig. 17—Typical Application of the J99343SD 4-4 Wire Repeater With Sealing Current