METALLIC FACILITIES TERMINAL
LOOP SIGNALING EXTENDER/2-2 WIRE TERMINAL REPEATER (J99343GE)
COMBINED FUNCTION UNIT (CFU)
SD-7C050-( )
INSTALLATION AND TEST

CONTENTS PAGE

1. GENERAL

1.01 This section describes the installation and test procedures for the loop signaling extender/2-2 wire (NL) terminal repeater (J99343GE). This repeater is a combined transmission and signaling unit which provides gain and equalization for 2-wire voice frequency (VF) transmission and battery boost for signaling range extension. Figure 1 shows the component layout of the J99343GE combined function unit (CFU); and Fig. 2 is a block diagram of the CFU, which is mounted in the metallic facility terminal (MFT).

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

1.03 The J99343GE CFU is a single plug-in unit which can be mounted in any existing or future single-module shelf or in the transmission unit slot of the double-module shelf of the MFT.

2. CHARACTERISTICS (J99343GE CFU)

A. General

2.01 The J99343GE CFU incorporates a 2-2 wire terminal (nonloaded) repeater (similar to the J99343PB,L3 repeater) and a battery boost unit for signaling range extension (similar to the J99343CD

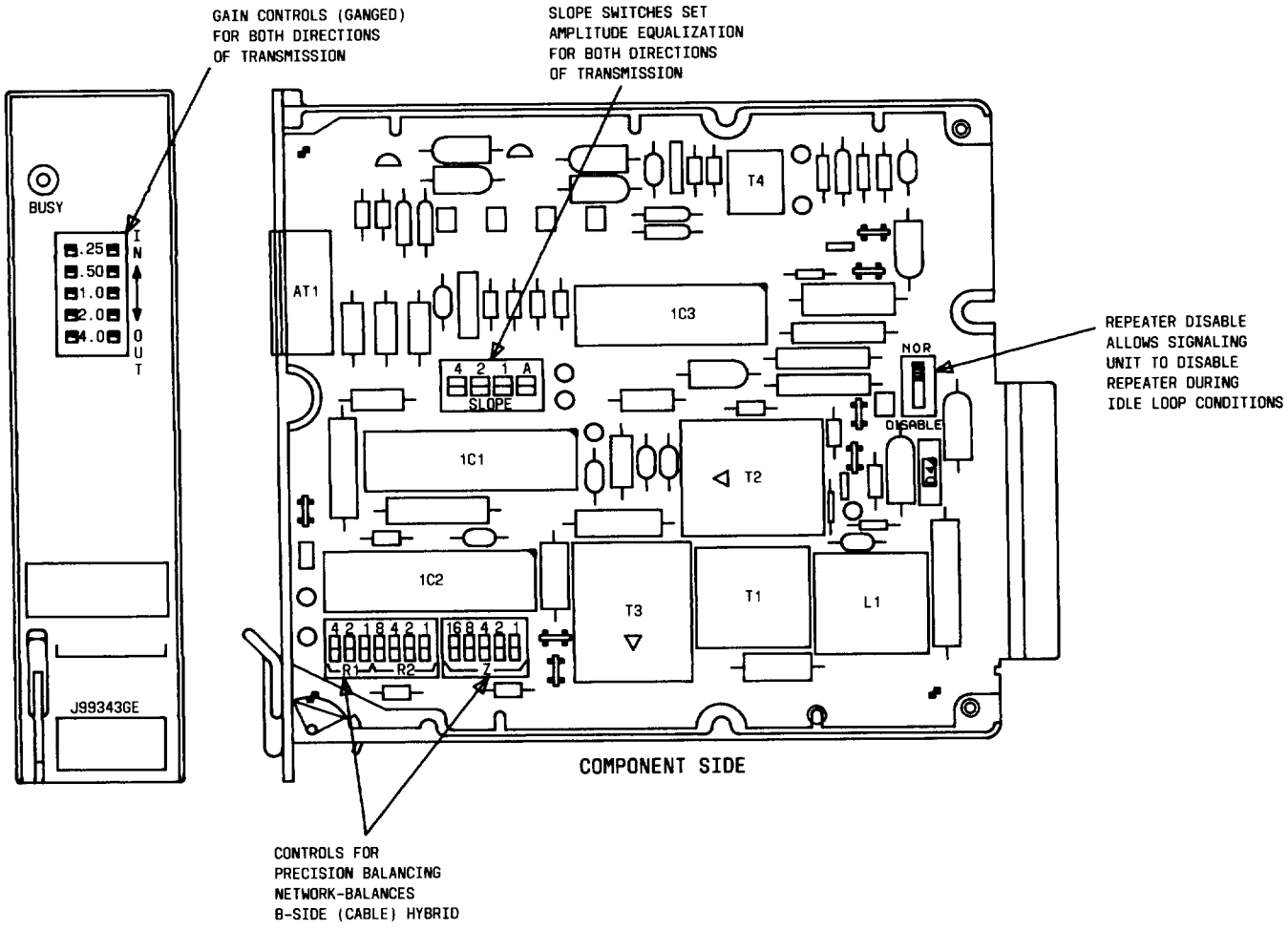


Fig. 1—LSE/2-2 Wire (NL) Terminal Repeater (J99343GE) Component Layout

Loop Signaling Extender II [LSE II]). Descriptions of the J99343PB,L3 repeater and the J99343CD LSE II can be found in Sections 332-912-114 and 332-911-102, respectively.

2.02 Additional details (concerning switches, functions, etc) are included in this section for those components or functions which might need clarifying or have had recent design changes. A complete description including all components/ functions of the J99343GE CFU can be found in Section 332-912-156.

B. Gain and Equalization

2.03 The J99343GE CFU contains a single integrated circuit (IC) to provide gain and equalization for both directions of transmission. Five miniature switches located on the front panel of the GE repeater set gain simultaneously for both directions of transmission. The switches are labeled 4, 2, 1, .5 and .25, which correspond to gain in dB set by operating the switch(es) to on. The total flat gain of the amplifier is the sum of the switches operated and can be a maximum of 7.75 dB (4+2+1+0.5+0.25), which allows up to 6-dB gain for cable loss and up to 1.75-dB gain for equipment.

2.04 The active equalizer of the J99343GE CFU introduces an additional gain or loss for each direction of transmission, which is added to the flat gain of the amplifier. The degree of equalization is set simultaneously for both directions of transmission by a group of rocker switches labeled SLOPE (4, 2, 1, and A). Values for the A switch

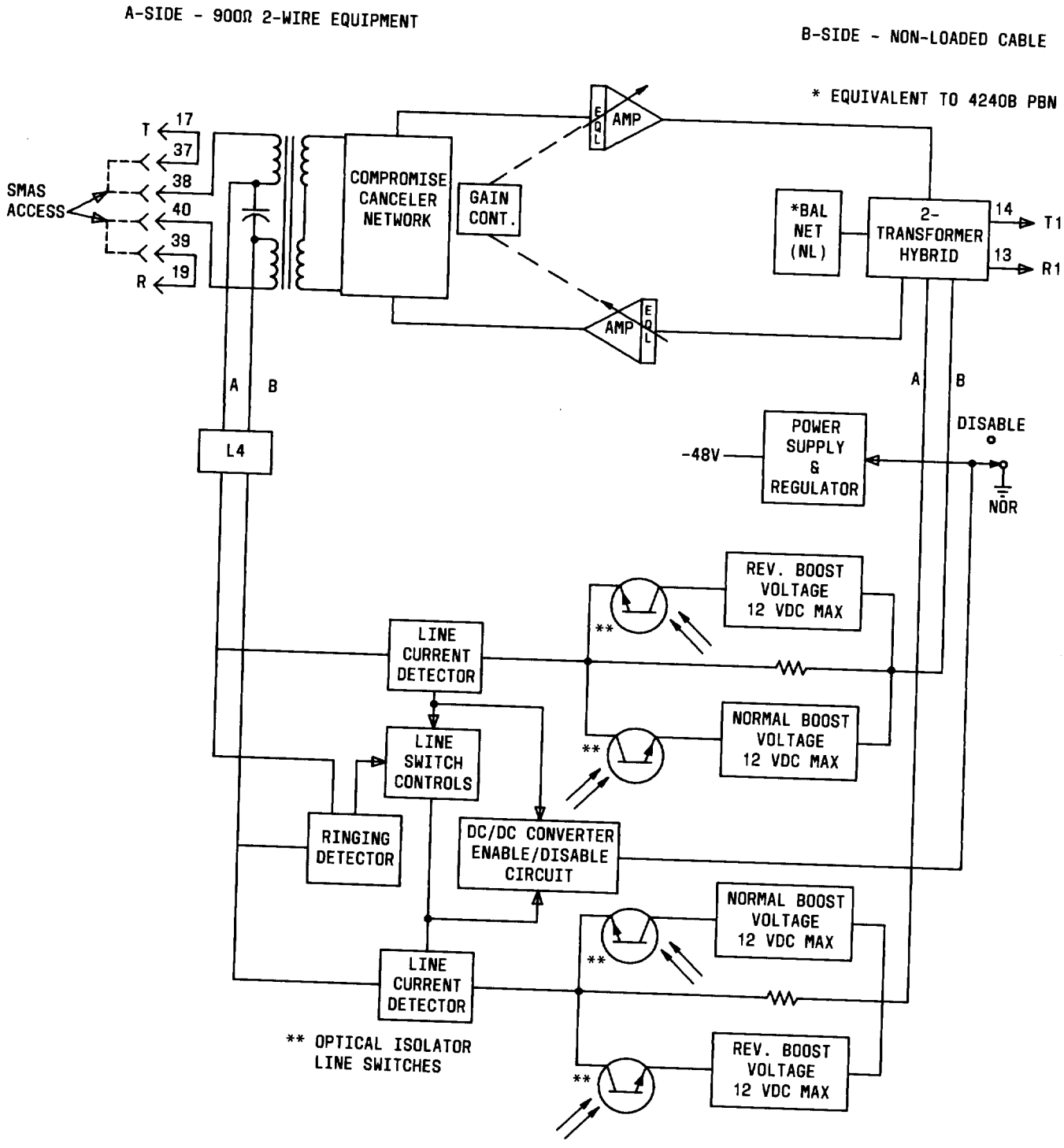


Fig. 2—Block Diagram of the J99343GE Combined Function Unit

setting when operated to the ON position (A=1) are used only to introduce appropriate gain-frequency response for equalization when impedance compensators are used at the far end of nonloaded cable, such as in PBX-CO trunks requiring terminal balance. The rocker switches of the IC equalizer can provide eight different settings for each position of the A switch. Operating the rocker switch toward the numeric/alpha label (4, 2, 1 and/or A) inserts the equalization value.

C. Balancing Networks and Hybrids

2.05 The J99343GE CFU incorporates a compromise canceler circuit on the side interfacing office equipment (A side). The solid-state canceler network is incorporated within integrated circuitry. It performs the same functions as the transformer hybrid by separating the 2-wire VF transmission into a 4-wire operation within the CFU. The canceler circuitry provides an impedance equivalent to 900 ohms in series with 2.15 μF capacitance which will impedance match 2-wire, 900-ohm office equipment.

2.06 The J99343GE CFU incorporates a transformer hybrid on the B side interfacing the 2-wire nonloaded cable facility. An LBOC is not required for the nonloaded 2-wire interface. Balance on the network side of the transformer hybrid is accomplished by IC functions equivalent to a 4240B precision balancing network (PBN). The IC balancing network can impedance match 19-, 22-, 24-, 25-, or 26-gauge nonloaded cable or a combination of these gauges.

D. Signaling

2.07 The J99343GE CFU incorporates the signaling functions of a loop signaling extender (LSE). Signaling operations are passed over the 2-wire facilities via the A and B leads to the LSE which supplements the normal -48 volt (dc) central office (CO) battery by providing a battery boost for signaling range extension. In addition, the LSE has the ability to boost simplex coin control currents.

2.08 The LSE provides signaling range extension using the following methods:

- Boost all dc signaling voltages by the insertion of a 12-volt floating dc source in series with both the tip and ring conductors.
- Senses the loop current change and direction using optical isolators (located in both tip and ring circuits) as current detectors and switches. The optical isolators or line current detectors allow complete isolation between the tip and ring conductors, the control circuitry, and the power sources. A current of 5 mA or more of either polarity in the tip or ring circuits of the LSE will operate the appropriate line current detector(s).
- Maintains the polarities of the floating boost voltage so that they always aid the circuit battery.

2.09 A repeater disable function is incorporated into the LSE section of the J99343GE CFU. This function has two modes of operation and is set by a slide switch, labeled NOR/DISABLE, mounted on the component board. When the switch is operated in the DISABLE position, the LSE section of the unit operates the repeater portion of the J99343GE CFU on or off depending on whether or not loop current is flowing. When no loop current flows (ie, during idle or open circuit condition), no power (off mode) is supplied to the repeater. When loop current is detected by the LSE, power is supplied to the repeater (on mode). This feature decreases power consumption and prohibits repeater singing during idle circuit conditions. When the switch is operated to the NOR position, power is supplied to the repeater portion at all times regardless of the circuit condition. Power supplied to the repeater, activating the VF transmission components, lights an LED lamp (labeled BUSY) located on the front panel of the GE CFU.

3. APPLICATION GUIDELINES

A. General

3.01 The following guidelines are for nominal circuit working conditions and may vary from procedures set forth by Standard Design Practices (851 series) which are applicable to optimum (always works) circuit conditions.

B. Cable Considerations

3.02 The repeater required for a 2-wire circuit will depend on whether the cable facility is loaded or nonloaded. Since the J99343GE CFU interfaces nonloaded cable only, the following general

rules to identify whether the cable facility is loaded or nonloaded may determine if the GE CFU is applicable. (If additional information/procedures are required, consult the 851 sections on standard design).

Rule 1: If the distance from the repeater/CFU to the first load coil (near-end section length) plus the length of any bridged taps in the near-end section exceeds 8000 feet or the cable facility does not contain any load coils, it is nonloaded.

Rule 2: If the near-end section length plus the length of any bridged taps in the end section is less than 8000 feet, the cable facility is loaded.

3.03 Intermediate locations may require a terminal repeater depending on cable parameter as stated in the following rule:

Rule: At an intermediate location, if a cable facility on one side of the repeater does not contain load coils and its 1-kHz loss is less than 1 dB, the cable facility should be connected to the A side of a terminal repeater.

C. Level Requirements

3.04 The following paragraphs discuss the application of circuits which conforms to trunk design requirements and normally results in adequate trunk performance.

3.05 Transmission levels of 2-wire circuits are limited by two factors: crosstalk and stability. Crosstalk objectives determine the following level requirements with respect to the 0 transmission level point (TLP), which will normally meet stability objectives also for terminal repeaters.

Minimum Input Level -9 dB (TLP)

Maximum Output Level +6 dB (TLP)

3.06 The levels in the previous paragraph are based on the assumption that the repeaters are located in the central office. The 2-2 repeaters are not recommended for installation at a customer location due to hybrid balance adjustments which are better controlled at the central office. Also, the impedance of most PBXs is considered to be 600 ohms + 2.15 μF while the repeaters are 900 ohms + 2.15 μF.

3.07 Roll-off objectives at 400 and 2800 Hz for the 2-2 terminal repeaters are shown in Table A. For single repeater 2-wire facilities, the equalization is on an end-to-end basis. Equalization is considered good at 400 and 2800 Hz if the levels of Table A can be achieved.

Note: For additional information concerning "roll-off" or attenuation distortion (Slope) objectives for voice grade switched special services and PBX circuits, see Section 851-300-100.

3.08 The following objectives listed for the J99343GE CFU will, when observed, usually meet trunk requirements for roll-off. Since trunk requirements are more stringent than line requirements, these objectives will normally meet line requirements.

TABLE A

ATTENUATION DISTORTION (SLOPE) OBJECTIVES FOR VOICE GRADE SWITCHED SPECIAL SERVICES AND PBX CIRCUITS

CIRCUIT	ALLOWABLE DEVIATION FROM 1000-HZ LOSS	
	MEASURED AT 400 HZ	MEASURED AT 2800 HZ
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

- Total 1-kHz loss of the facility should not exceed 9 dB.

- There should be no load coils in the facility.

3.09 Additional application guidelines are given in Section 332-910-180.

D. Signaling

3.10 When using the J99343GE CFU, certain equipment arrangements are not permitted due to the principal of the LSE function of the CFU which adds a signaling voltage of up to -24 Vdc to the -48 Vdc on the cable facility. Proper precautions must be taken not to exceed the combined voltage (-72 Vdc) by predetermining station(s) equipment makeup (see cautions).

Caution 1: Hazardous line voltage can occur if two J99343GE CFUs or a J99343GE CFU and an LSE are connected in a tandem arrangement.

Caution 2: The J99343GE CFU must not be used on the B side of a loop signaling repeater (LSR) arranged for 72-volt operation.

3.11 Additional information concerning LSE application can be found in Section 332-911-102, and general application of the J99343GE CFU can be found in Section 332-912-156 or 851-3YY-ZZZ (Standard Design Practices).

4. ADJUSTMENT OF THE J99343GE CFU BALANCING NETWORK ON THE B SIDE

4.01 The balancing network used on the B side of the J99343GE CFU is incorporated into the integrated circuits (IC). The IC balancing network of the GE CFU is equivalent to the 4240B PBN used in previous MFT repeaters to impedance match nonloaded cable facilities. The switches for the IC balancing network, located on the internal component board of the GE CFU, are designated with the same labels as the 4240B PBN. The positions of the switches are shown in Fig. 1.

4.02 The procedures in this section cover the manual adjustments for the IC balancing network which is used to balance the network side of the transformer hybrid on the B side (cable facility) of the J99343GE CFU. These manual adjustments are used when cable facility makeup is unknown. Also, they are used to optimize (if possible) balancing network settings obtained from the prescription setting tables (or charts) of Section 332-912-213 which are based on cable facility values that do not match the table or chart entries closely. Switch values shown in the prescription setting tables/charts for the 4240B PBN are used for the IC balancing network of the J99343GE CFU. When the makeup of the cable facility (such as facility gauge, length, and distant termination) is known, the prescription setting tables in Section 332-912-213 may be used in place of the following manual adjustments. Procedures for using the prescription setting tables can be found in Section 332-912-212.

4.03 The procedures for adjustment of the IC balancing network require successive measurements of echo return loss (ERL), singing return loss-low frequency (SRL-LO), and singing return loss-high frequency (SRL-HI). The three return loss measurements are maximized by adjusting the settings of the balancing network.

Note: It is assumed that application guidelines for the J99343GE CFU have been followed and all functions of the GE CFU are compatible with present applications.

4.04 The J99343TB test extender (Section 332-910-102), a return loss measuring set (RLMS) such as the KS-20501,L3 or equivalent, and a circuit layout record (CLR) will be required for procedures in Chart 1.

Note: When adjusting the B-side PBN of the J99343GE CFU, 900-ohm test equipment ***must*** be used due to no compromise network access connection by the test extender on the A side (station side) of the GE CFU.

4.05 The procedures in Chart 1 are for the initial setup of the test equipment.

CHART 1

INITIAL PROCEDURES FOR ADJUSTMENT OF IC BALANCING NETWORK (4240B EQUIVALENT) OF THE J99343GE CFU

STEP	PROCEDURE
1	Terminate far end of circuit in its normal impedance. If far end is a switch or PBX, a compromise network (600 or 900 ohms + 2.15 μF) should be used. If far end terminates in a telephone set, use off-hook telephone with loop current or a 4066H network.
2	Insert GE CFU into slot on side of J99343TB test extender. Plug cable extender card of J99343TB into mounting slot.
3	Set CFU options as follows: (a) All equalizer switches to off. (b) DISABLE switch to NOR position. (c) Gain switches to approximately midrange. This is done to improve the sensitivity of measurements; the gain setting is not critical.
4	Set switches for adjustment of B-side network on J99343TB test extender as follows (see note): **A SIDE** 2W/4W to 2W 600/900 to 900 **B SIDE** 2W/4W to 2W 600/900 to 900 COMP NET IN/OUT to OUT ***Note:*** When adjusting the B-side balancing network of the J99343GE CFU, 900-ohm test equipment must be used due to no compromise network access connection by the test extender on the A side, ie, the test extender COMP NET IN/OUT switch for the A side has no effect on the canceler circuit.
5	See Section 103-106-115 for operation of KS-20501,L3 RLMS.
6	Set RLMS to 900-ohm, 2-wire and switch in internal network (900 + 2.15 μF).
7	Connect TRMT jack (2-wire) of RLMS to A-side 2W EQUIP jack on J99343TB test extender to set B-side network. See Fig. 3 for example test setup to set B-side balancing network.
8	Follow procedures of Chart 2 (flowchart) to adjust the balancing network. (The use of Chart 2 does not require knowledge of the cable facility makeup).

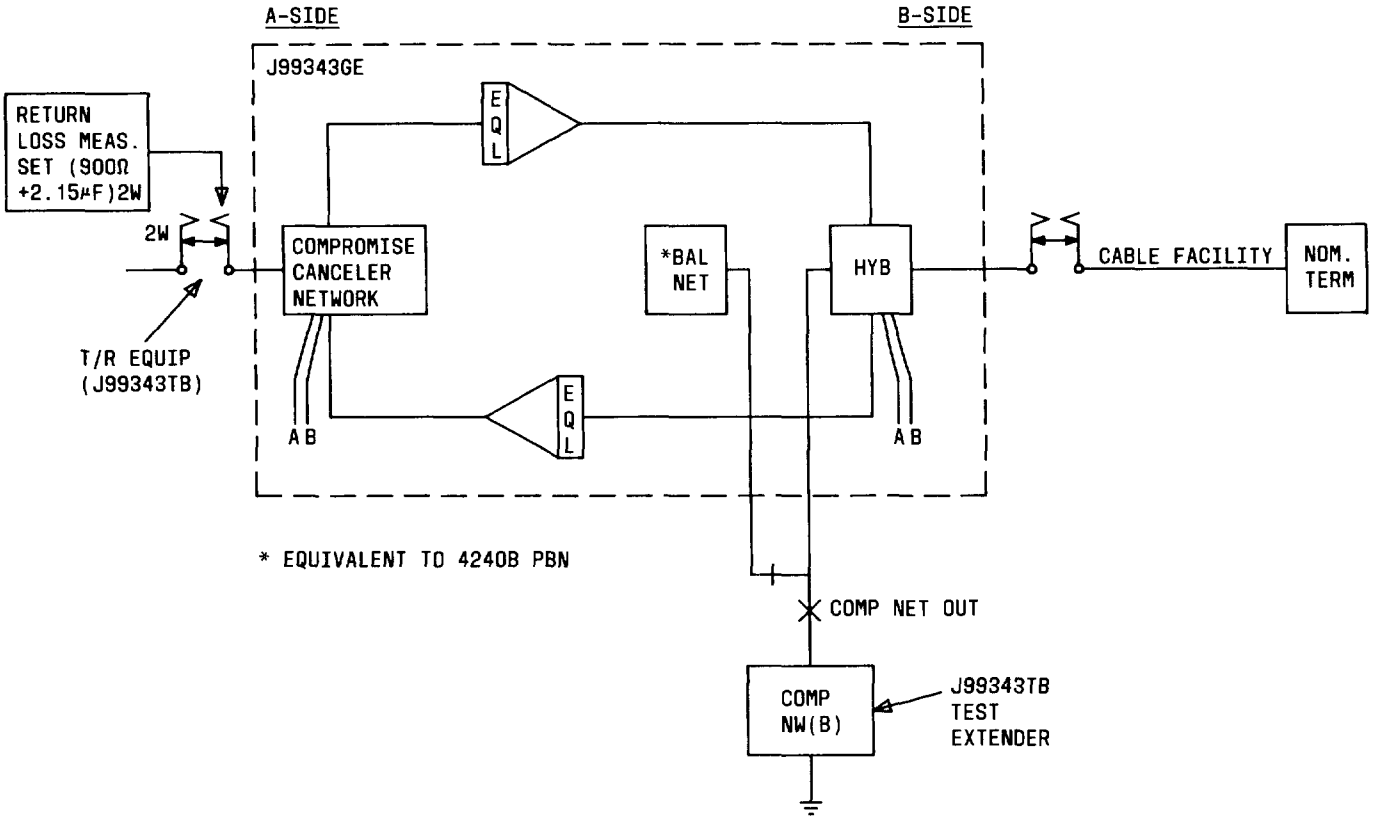


Fig. 3—Test Configuration for Determining IC Balancing Network Settings by Measurement for the J99343GE Combined Function Unit (B-Side)

5. GAIN ADJUSTMENT

5.01 The J99343GE CFU contains a single integrated circuit to provide gain and active equalization for both directions of transmission. The flat gain is controlled by five miniature switches located on the repeater front panel and labeled 4, 2, 1, .5 and .25 (number corresponds to dB). The active equalization is set by a group of rocker switches labeled SLOPE (4, 2, 1, and A) located on the internal printed wiring board. See paragraphs 2.03 and 2.04 for additional information concerning the gain and equalization components.

5.02 The total 1-kHz gain available from the IC amplifier of the J99343GE CFU is the sum of the flat gain and the gain of the active equalization. The equalizer settings must be installed before adjusting the gain of the IC amplifier. If the equalizer settings are unknown, they may be determined by using the procedures in Parts 6 and 7; or if the cable makeup is known, the prescription setting tables in Section 332-912-213 can be used. Procedures for using the prescription setting tables can be found in Section 332-912-212. The additional 1-kHz gain (or loss) for all equalizer settings is listed in Table B.

5.03 The gain switch settings of the J99343GE CFU are accurate to within a fine accuracy range of ±2%. Therefore no formal test procedures are required to ensure a correct gain/output level which is specified in the CLR.

6. FREQUENCY RESPONSE MEASUREMENTS

6.01 Frequency response measurements as described in Chart 3 are used to check circuit frequency response against requirements or as an input for the procedures in Part 7 for determining the equalizer settings of the J99343GE CFU by measurement.

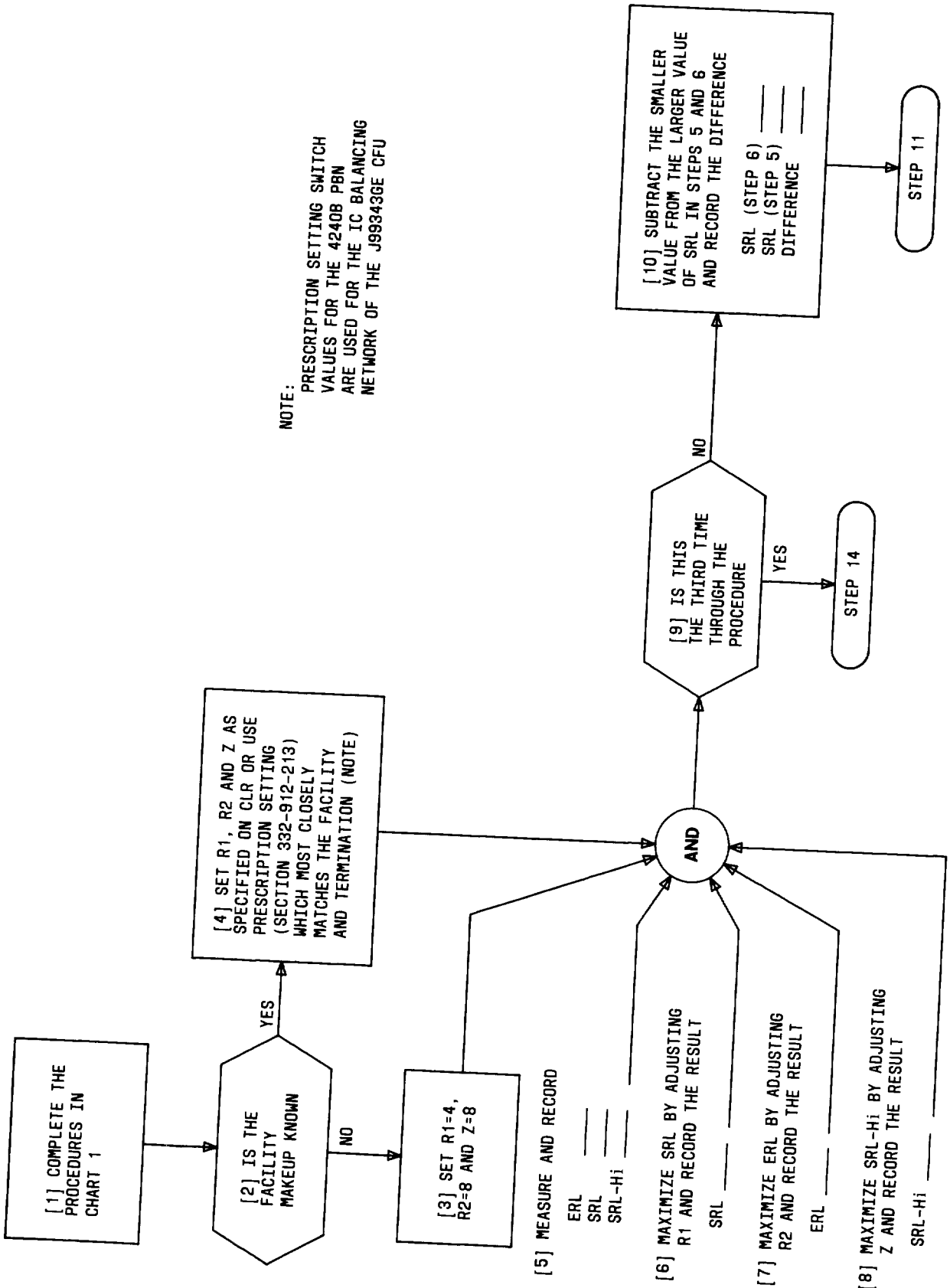


Chart 2—Adjustment of IC Balancing Network Used in the J99343GE Combined Function Unit (Sheet 1 of 2)

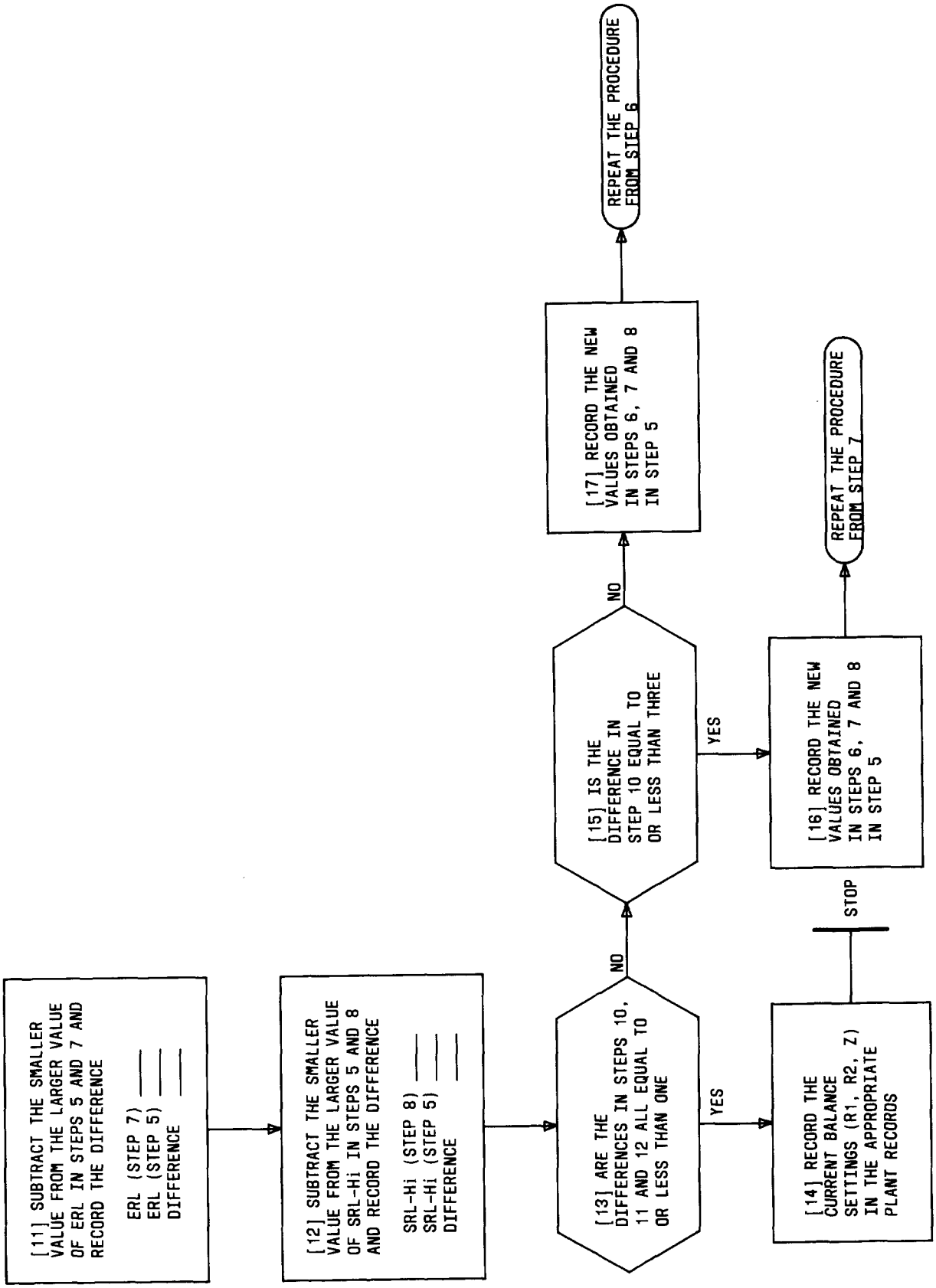


Chart 2—Adjustment of IC Balancing Network Used in the J99343GE Combined Function Unit (Sheet 2 of 2)

TABLE B

EQUALIZER GAIN OR LOSS AT 1 KHZ

SWITCH SETTING	IC EQUALIZER (J99343GE)	
	A=0	A=1
0	0	−0.5
1	+0.2	−0.3
2	+0.5	+0.2
3	+0.8	+0.5
4	+1.1	+0.8
5	+1.5	+1.2
6	+1.9	+1.6
7	+2.3	+2.0

6.02 Test equipment required for frequency response tests of the J99343GE CFU is as follows:

(a) Receiving Location:

- J99343TB test extender
- Transmission measuring set (TMS)

Note: Test equipment used with the J99343GE CFU must be 900 ohm due to no compromise network access connection by the test extender on the A side of the GE CFU.

(b) Transmitting Location:

- Oscillator with selectable output impedance of 600 or 900 ohms and output frequencies of 400, 1000, and 2800 Hz.

6.03 The test setup configuration for the procedures in Chart 3 is shown in Fig. 4.

CHART 3

J99343GE CFU FREQUENCY RESPONSE MEASUREMENTS

STEP	PROCEDURE
1	At the transmitting location, connect the oscillator to the line with the output set at 1 kHz with 0 dBm and the impedance set as follows (see note):

LOCATION	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 7.

2 At the receiving location, remove the J99343GE CFU associated with circuit under test from its shelf location.

CHART 3 (Contd)

STEP	PROCEDURE
3	Insert CFU into test extender and connect test extender into the shelf location slot of the CFU.
4	Set the CFU controls as follows: (a) Equalizer switches to OFF (b) B-side balancing network to proper value (as shown on CLR or as determined in Chart 1) (c) Gain switches to OUT (d) DISABLE/NOR switch to NOR position.
5	For 900-ohm TMS, set switches on the J99343TB test extender as follows (see note): A SIDE: 2W/4W to 2W; 600/900 to 900 B SIDE: 2W/4W to 2W; 600/900 to 900; COMP NET IN/OUT to OUT ***Note:*** Test equipment used for interconnection on the station side (A) of the J99343GE CFU via the J99343TB test extender must be 900 ohms because the compromise network of the test extender has no access test connection to the canceler circuit, ie, the COMP NET IN/OUT switch of the test extender has no effect in connection with the A-side canceler circuit of the GE CFU.
6	Connect the TMS to the 2W jack on the A side of the test extender.
7	Instruct the transmitting location to send a 1-kHz tone using oscillator arrangement setup in Step 1.
8	Measure the 1-kHz level and adjust the B- to A-direction gain for a suitable output level (eg, -5 dBm) and record this value.
9	Instruct the transmitting location to send 400 and 2800 Hz at 0 dBm and record the levels received.
10	Use the levels recorded in Steps 8 and 9 for computation of the equalizer settings as described in Chart 4.
11	After setting both equalizers to the values determined in Chart 4, 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 A for requirements.

CHART 3 (Contd)

STEP	PROCEDURE
12	Adjust the gain switches of the IC amplifier to give the output level specified on the CLR. (Gain switches set on the IC amplifier adjust gain simultaneously for both directions of VF transmission.)
13	Record the final gain and equalizer settings in the appropriate plant records.
14	Set the DISABLE/NOR switch to the DISABLE position.
15	Disconnect test extender from shelf and remove CFU from test extender.
16	Insert CFU into its proper shelf location.
17	This completes the procedure for the frequency response measurements of the J99343GE CFU.

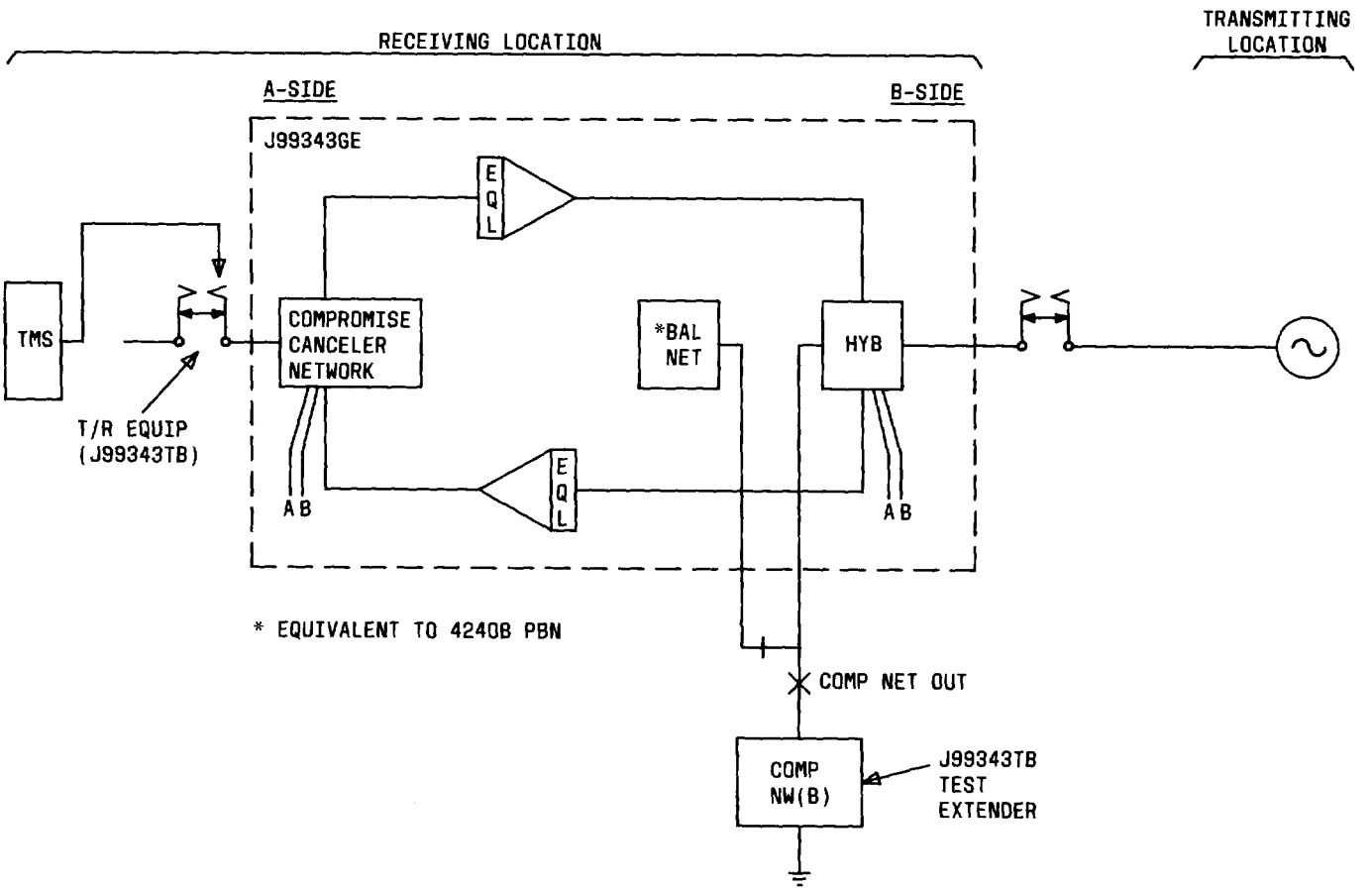


Fig. 4—Test Configuration for Frequency Response Measurements of the J99343GE Combined Function Unit

7. EQUALIZER SETTINGS FROM CABLE LOSS DATA

7.01 The procedures in Chart 4 are used to obtain the equalizer settings of the J99343GE CFU by actual circuit loss measurements at 400, 1000, and 2800 Hz when the facilities do not fit the prescription setting tables in Section 332-912-213. The circuit loss measurements are made using the procedures in Chart 3.

7.02 The differences computed in Chart 4 are rounded to the nearest 0.5 dB and located in Table C.

7.03 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.

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

7.05 The value A=1 (on) is normally applicable to short nonloaded cables containing impedance compensators. When the J99343GE CFU is used in conjunction with short lengths of cable incorporating the 837D impedance compensator, equalizer improvements may be possible using the value A=1 (on) with a resultant slope setting of 1,0 or 1,1.

8. STABILITY TESTS

8.01 After the J99343GE CFU has been installed and lined up, stability tests can be used as an indicator of circuit performance.

8.02 The talk and idle state performances are examined for stability tests which can be made using nominal terminations on both ends of the circuit under test. Table D compares actual and nominal terminations for use in stability testing.

8.03 The idle-state stability tests are described in this part. The tests are made with all switching and signaling equipment in the circuit. The stability test procedures are outlined in Chart 5. An example test setup is shown in Fig. 5.

8.04 The extent of these tests will depend on whether the circuit is equipped with idle circuit terminations at neither end, at one end, or at both ends or with a repeater disabler. The CLR will specify whether the stability checks are to be made from frame to frame or on an overall basis, including office equipment at both ends.

8.05 It is assumed that the CFU has been adjusted to its final settings and all options are set as specified on the CLR. The following equipment is required for the stability tests in Chart 5:

- J99343TB test extender
- High impedance monitoring device (1014A handset, or equivalent, or a high impedance meter).

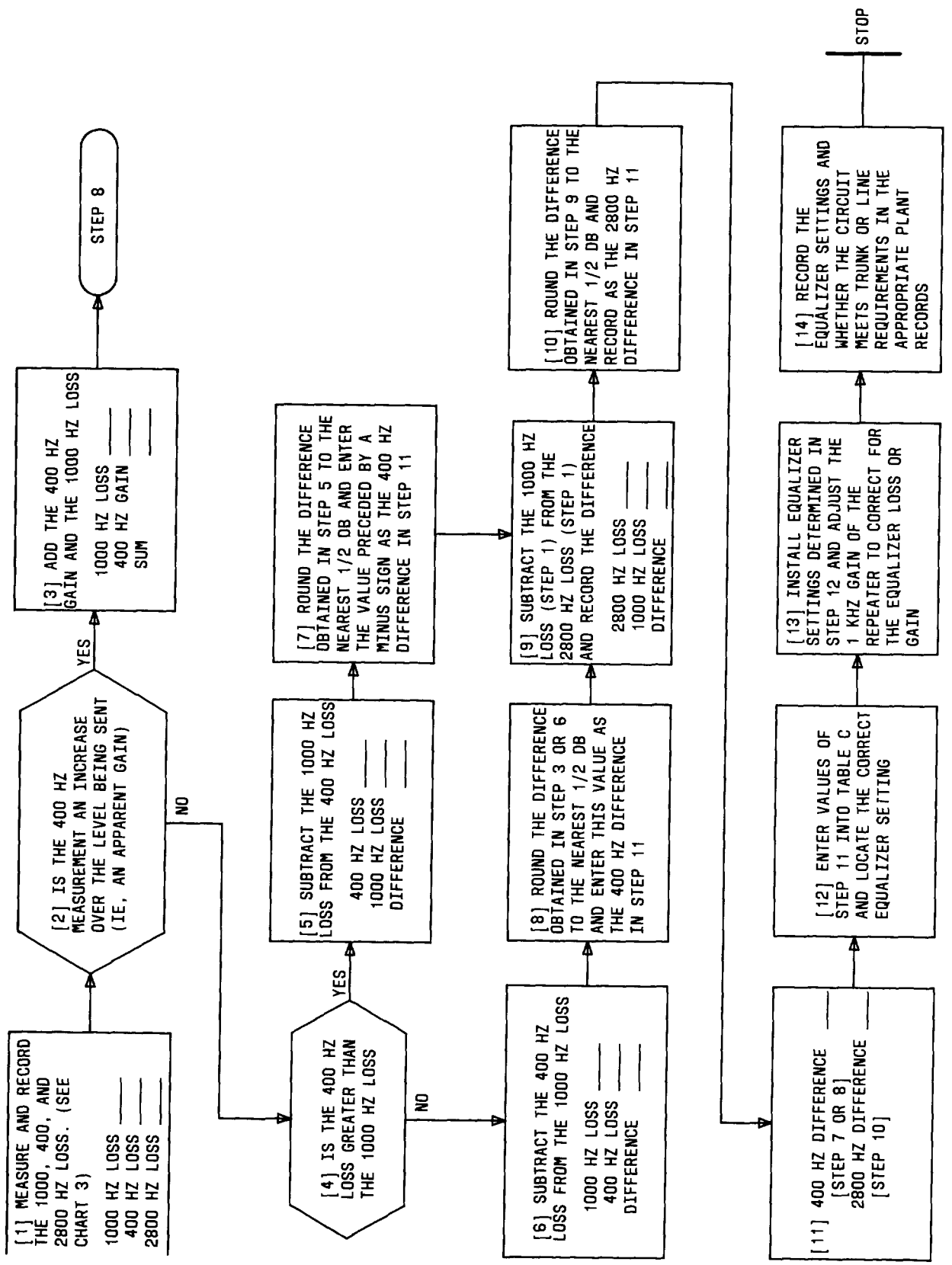


Chart 4—Manual Method to Determine Equalizer Settings From Frequency Response Measurements

TABLE C

TERMINAL REPEATERS (NOTES 1 AND 2)

400 Hz DIFFERENCE

2800 Hz DIFFERENCE	−1,0	−,5	0	,5	1,0	1,5	2,0	2,5	3,0	3,5
1.0	0,0	0,0	0,0							
1.5	0,0	0,0	0,1							
2.0	0,0	0,1	0,1							
2.5	0,1	0,1	0,2							
3.0	0,1	0,2	0,2	0,3						
3.5	0,2	0,2	0,3	0,3						
4.0	0,2	0,3	0,3	0,4						
4.5	0,3	0,3	0,4	0,4	0,5	0,6				
5.0	0,3	0,4	0,4	0,5	0,6	0,7				
5.5	0,4	0,4	0,5	0,6	0,7	0,7	0,7			
6.0	0,4	0,5	0,6	0,7	0,7	0,7	0,7	0,7		
6.5	0,5	0,6	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7
7.0	0,6	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7
7.5	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7
8.0	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7
8.5	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7
9.0	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7
9.5	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7
10.0	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7
10.5	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7
11.0	0,7	0,7	0,7	0,7	0,7					
11.5	0,7	0,7	0,7	0,7	0,7					
12.0	0,7	0,7	0,7	0,7	0,7	0,7				
12.5	0,7	0,7	0,7	0,7	0,7	0,7	0,7			

Note 1: The first digit of the values shown represent the A switch setting. The second digit represents the sum of the numerical switch setting(s), ie. 0,7 is A = 0 (off) and 7 equals the sum of numerical switches 4, 2, and 1.

Note 2: The switch value for A = 1 (on) is used with short nonloaded cable circuits containing impedance compensators. See paragraph 2.04 for additional information concerning equalizer switch functions.

TABLE D

COMPARISON OF ACTUAL vs NOMINAL TERMINATIONS

ACTUAL TERMINATION	NOMINAL TERMINATION
Central Office (switch)	900 ohms + 2.15 μF
600 ohm PBX (switch)	600 ohms + 2.15 μF
900 ohm PBX (switch)	900 ohms + 2.15 μF
Station Set (Telephone)	Off-hook station set with loop current or 4066H network

CHART 5

STABILITY TEST (Idle State)

STEP	PROCEDURE
1	Remove CFU under test from its shelf location.
2	Insert CFU into test extender and connect test extender into the CFU shelf location.
3	Set DISABLE/NOR switch on the CFU to NOR position.
4	Set switches on J99343TB test extender as follows: **A SIDE**: 2W/4W to 2W; 600/900 to 900; COMP NET IN/OUT to OUT **B SIDE**: 2W/4W to 2W; 600/900 to 900; COMP NET IN/OUT to OUT
5	Connect high impedance monitoring device to monitor jack (MON) on the B side of J99343TB test extender. (See Fig. 5.)
6	Monitor CFU for singing using high impedance monitoring device with the following combinations of terminations: ***Note:*** With the monitoring device connected as shown in Fig. 5, no sound other than battery noise should be audible.

Circuit not equipped with idle-circuit terminations or repeater disabler (Far-end)

	ORIGINATING END	TERMINATING END
(1)	900 (600) ohms	900 (600) ohms
(2)	Open circuit	Open circuit
(3)	Open circuit	Short circuit
(4)	Short circuit	Open circuit
(5)	Short circuit	Short circuit

Circuit equipped with idle-circuit terminations at both ends or repeater disabler (Far-end)

	ORIGINATING END	TERMINATING END
(1)	900 (600) ohms	900 (600) ohms
(2)*	Idle condition	Idle condition
(3)	900 (600) ohms	Open circuit

*For circuit with idle-circuit terminations

Circuit with idle-circuit terminations at one end

	ORIGINATING END	TERMINATING END
(1)	900 (600) ohms	900 (600) ohms
(2)*	Idle condition	Idle condition
(3)	900 (600) ohms	Open circuit

*Either open circuit or with idle-circuit termination at end equipped with idle-circuit termination.

CHART 5 (Contd)

STEP	PROCEDURE

If the CFU sings, check the following items for possible troubles:

(a) Improper test connections

(b) Insertion loss incorrectly measured and is less than permissible.

(c) Makeup of the facility is outside limits

(d) CFU incorrectly set for facility it interfaces and should be manually optimized

(e) Repeater disabler (far end) not operating.

7 Disconnect test extender from shelf and remove CFU from test extender.

8 Insert CFU back into its proper shelf location.

9 Restore circuit under test to pretest state.

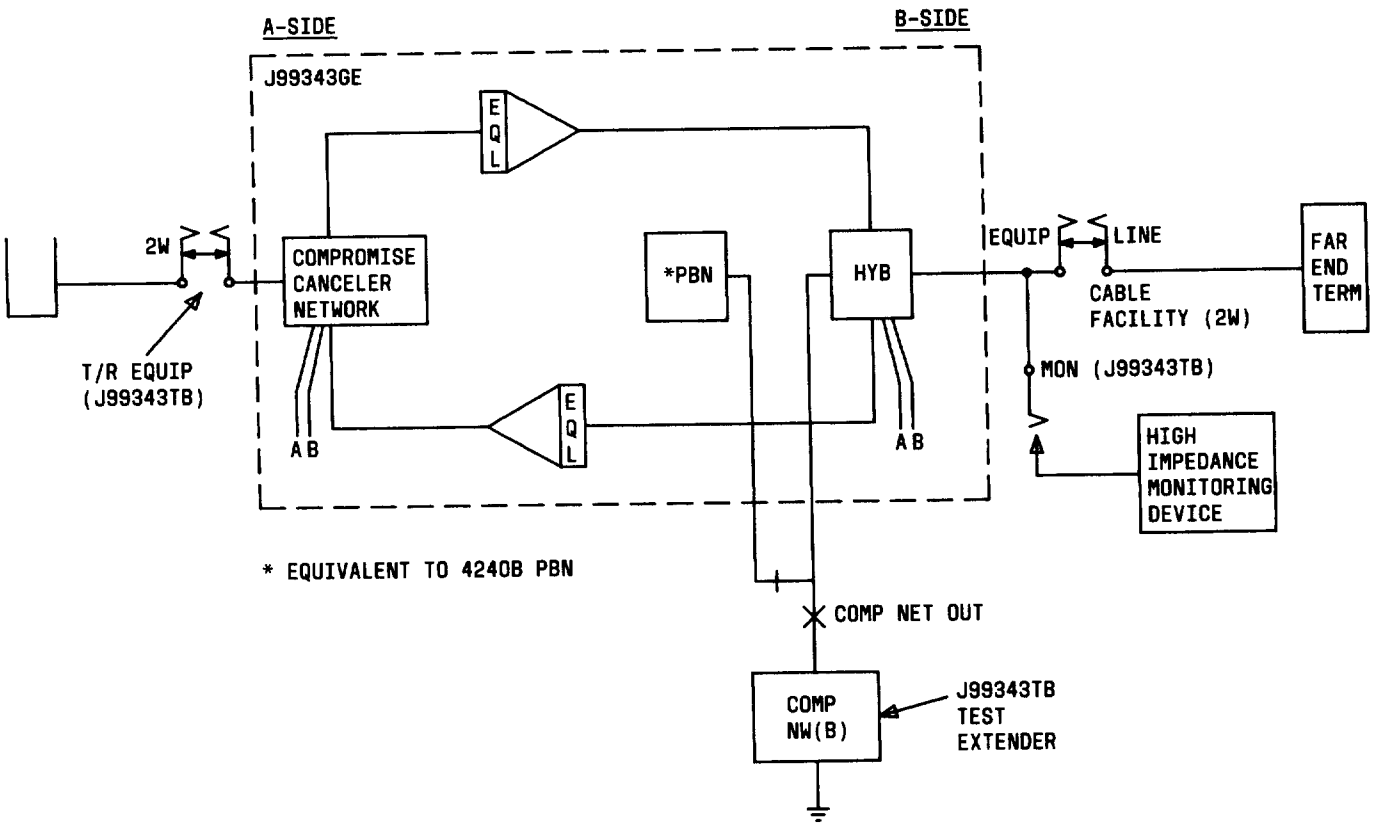


Fig. 5—In-Circuit Configuration for Stability Tests of the J99343GE Combined Function Unit

9. GUIDELINES FOR EQUALIZER TOUCH-UP

9.01 The touch-up procedures for the J99343GE CFU are used to improve the equalizer settings assuming the initial equalizer setting(s) has been determined using the prescription setting tables in Section 332-912-213.

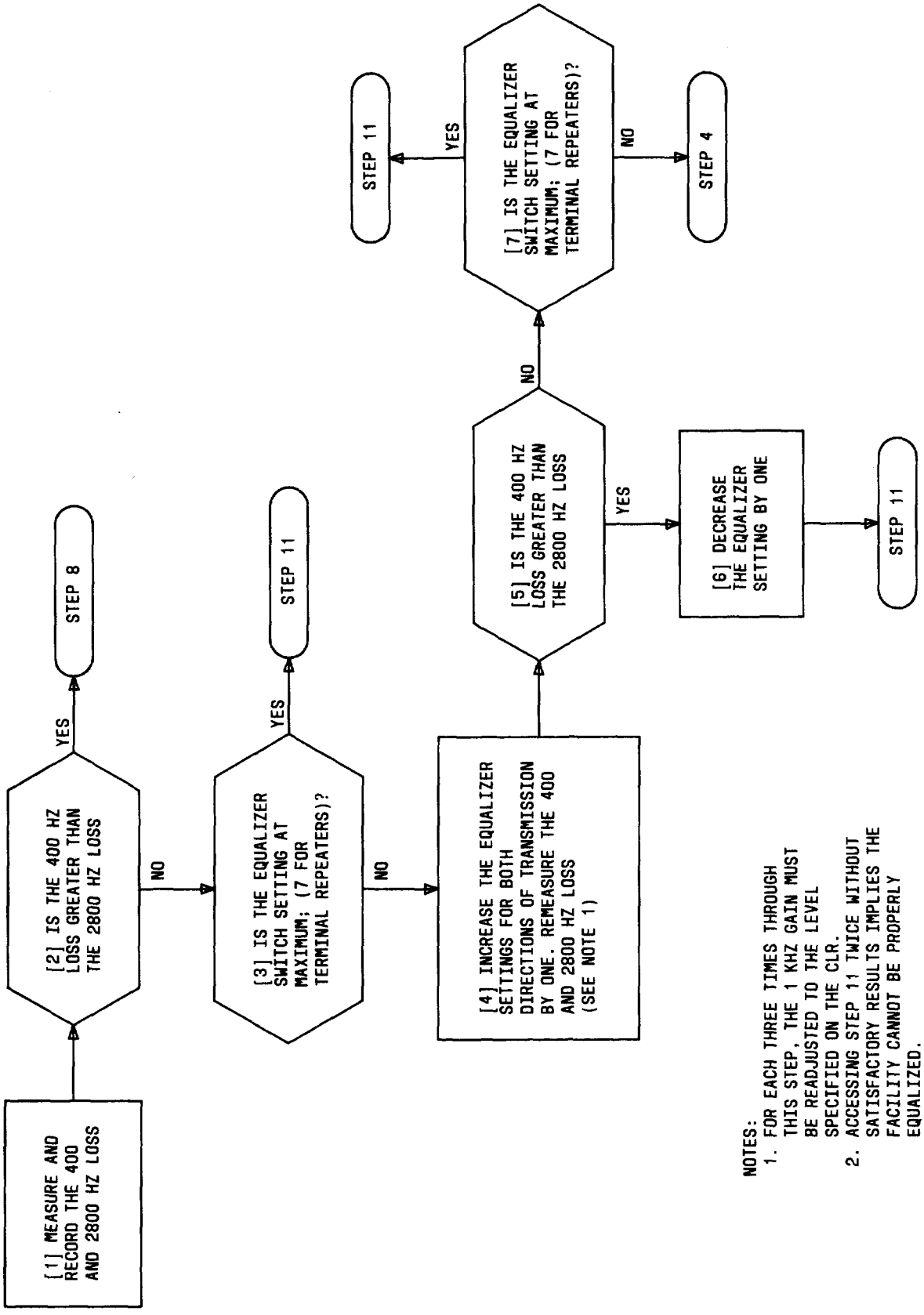
9.02 When the procedure calls for increasing or decreasing an equalizer setting, it refers to only the sum of the operated numerical switches. The position of the A switch should not be changed once it has been set except as directed by a step in the procedure. All equalizer settings are written as two values. The first is the A switch value which can be set to either off (0) or on (1). The second is the sum of the numercial switches operated.

9.03 The procedure for equalizer touch-up is in Chart 6 (flowchart form). All measurements in the procedure are end-to-end as described in Part 6. If Step 11 of Chart 6 is accessed twice without satisfactory results, the circuit cannot be properly equalized and should be referred to the circuit designer.

Note 1: It is assumed that all options, balancing network settings, and 1-kHz levels of the J99343GE CFU have been set to their proper values before using the procedures of Chart 6. It is also assumed that frequency response measurements have been made and circuit requirements are ***not*** met.

Note 2: Over equalization at either high or low frequencies could cause the circuit to become unstable/sing.

Note 3: 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.



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.

Chart 6—IC Equalizer Touch-Up Procedures for J99343GE Combined Function Unit (Sheet 1 of 2)

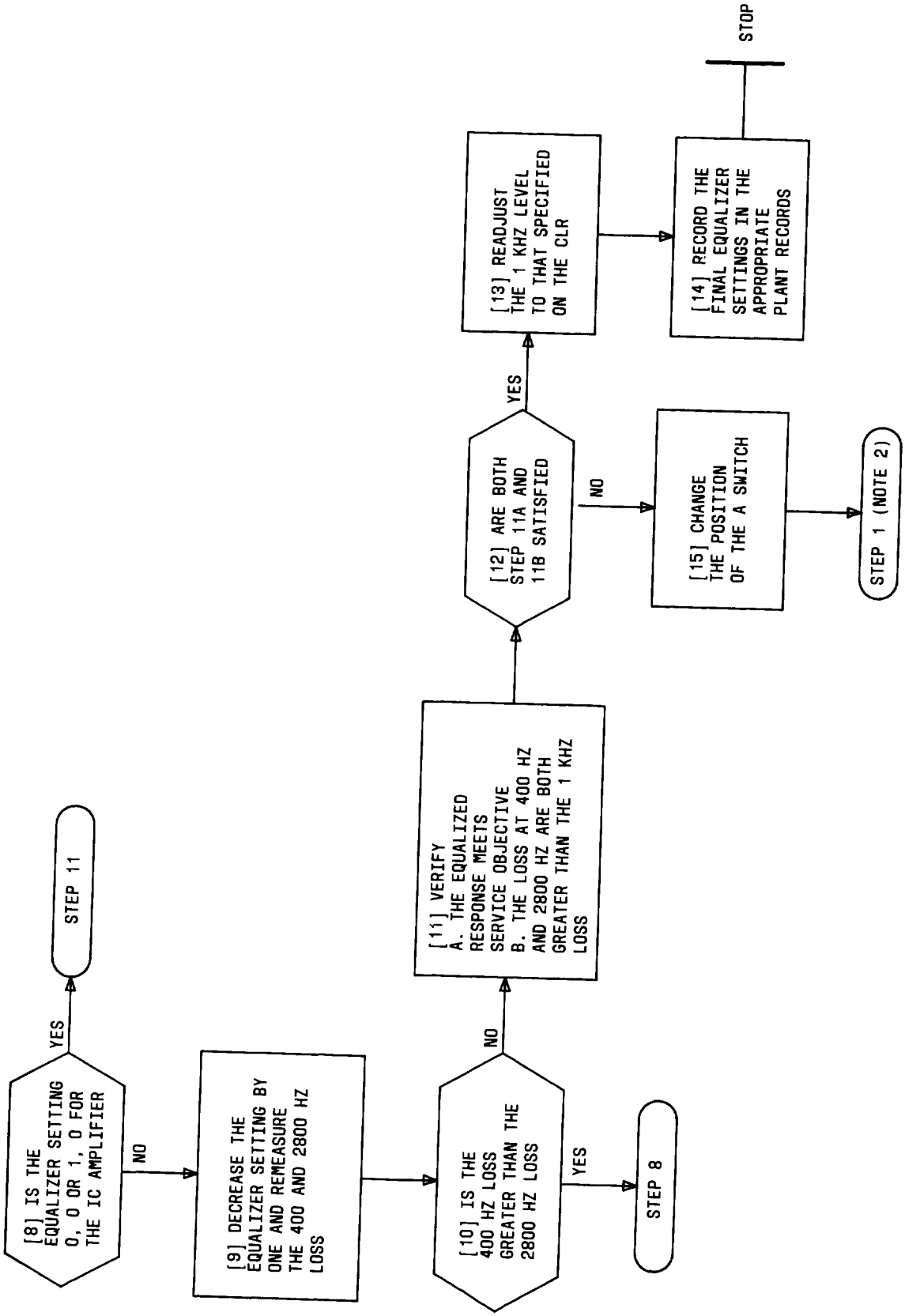


Chart 6—IC Equalizer Touch-Up Procedures for the J99343GE Combined Function Unit (Sheet 2 of 2)

10. PROCEDURES FOR CIRCUITS REQUIRING TERMINAL BALANCE

10.01 The J99343GE CFU can be used in combination with 837- or J99380-type impedance compensators for circuits requiring additional terminal balance treatment.

10.02 Prescription settings listed in Section 332-912-213 for circuits containing the J99343PB,L3 repeater and impedance compensators (837D/J99380AA) can be used for settings of the J99343GE CFU when used in conjunction with the 837D/J99380AA impedance compensator. However, if the cable makeup does not fit the prescription setting tables, ie, bridge taps or more than two-gauges, the following manual adjustment procedures of Chart 7 can be used for the GE CFU.

CHART 7

ADJUSTMENT OF J99343GE CFU (NL) AND 837D OR J99380AA NETWORK

STEP	PROCEDURE
1	If the facility does not fit the prescription setting tables, choose initial settings using an equivalent gauge and length which most closely resemble the actual facility. (See Section 332-912-212 for procedures and Section 332-912-213 for tables.)
2	Remove the J99343GE CFU under adjustment from its shelf location.
3	Connect test extender into the CFU shelf location.
4	Set switches on J99343TB test extender as follows: **A SIDE** 2W/4W to 2W 600/900 to 900 COMP NET IN/OUT to OUT **B SIDE** 2W/4W to 2W 600/900 to 900 COMP NET IN/OUT to OUT
5	Insert a 310 dummy plug into T1R1 2W EQUIP jack on the B side of J99343TB test extender to terminate the cable facility in 900 ohms + 2.15 μF. This termination will permit positive identification of the 2-wire pair under adjustment at the impedance compensator (see Section 332-205-500).
6	Have 837D or J99380AA settings optimized using procedures in Section 332-205-500 or 311-100-551.
7	After obtaining satisfactory terminal balance on the drop side of 837D or J99380AA: (a) Remove 310 dummy plug from J99343TB test extender. (b) Insert CFU into test extender. (c) Terminate drop side of 837D or J99380AA in the proper impedance (600 or 900 ohms + 2.15 μF).

CHART 7 (Contd)

STEP	PROCEDURE
8	Optimize the B-side balancing network using procedures in Part 4 (Chart 1).
9	Determine IC equalizer settings using procedures in Parts 6 and 7 (Charts 3 and 4).
10	After installing equalizer settings, set levels of the amplifier units from CLR requirements (see paragraph 5.03).
11	Ensure that circuit requirements are met, and touch up the 837D or J99380AA R potentiometer as required to improve the terminal balance.

11. REFERENCES

11.01 The following sections contain additional information which may be helpful.

SECTION	TITLE
103-106-115	WE Model KS-20501 RLMS Description and Operation
332-912-114	2-2 Wire Terminal Repeaters, Nonloaded (J99343PB,L3)—Description
332-911-102	Loop Signaling Extender (J99343CA, CB, CC, CD)—Description
332-910-180	General Application Information for MFT
332-910-181	Metallic Facility Terminal—Installation Data Sheets
332-910-102	MFT Test Extender
332-912-156	MFT Loop Signaling Extender/2-2 Wire (NL) Terminal Repeater (J99343GE) Combined Function Unit (CFU)