

**IMPEDANCE BALANCING PROCEDURES ON SD-2H182
(CENTREX ATTENDANT TRUNK CIRCUIT) ARRANGED
FOR 4-WIRE TO 2-WIRE CONVERSION—
NO. 2 AND NO. 2B ELECTRONIC SWITCHING SYSTEMS**

CONTENTS	PAGE	FIGURES	CONTENTS	PAGE
1. GENERAL	2		1. CPS—A293 4-Wire Hybrid	2
2. APPARATUS	13		2. CPS—A294 Unity Gain Impedance Isolator	3
3. PRETEST INFORMATION	15		3. Hybrid Balancing Network	3
4. PREPARATION	15		4. Hybrid Test Circuit—Includes Average 2-Wire Cabling to Junctor Grouping Frame	5
A. Calibration of Test Equipment	15		5. Impedance Balance Test Data Work Sheet	7
B. Accessing the Office Loop and Attendant Trunk Circuits	16		6. Converter Balancing Network (4-Wire)	9
5. BALANCE TEST ON 4-WIRE TERMINATING SETS, ATTENDANT TRUNK CIRCUIT	21		7. Attendant Trunk Circuit (4-Wire) Network	11
A. Negative Impedance Converter Balancing	21		8. Centrex Attendant Trunk Unit Arranged for 2-Wire to 4-Wire Conversion	12
B. Send and Receive Amplifier Settings	21		9. Test Configuration Using Trunk Test Panel When Testing an Attendant Loop Circuit	14
C. Hybrid Balancing Network Adjustments and Echo Return Loss (ERL)	22		10. Attendant Trunk Circuit (4-Wire) Hookup Using the TTP and Maintenance TTY	17
D. Singing Return Loss (SRL)	29			
E. Singing Return Loss High Frequency (SRL HI)	29			

NOTICE

Not for use or disclosure outside the
Bell System except under written agreement

CONTENTS	PAGE
11. 4-Wire Attendant Trunk Circuit Transmission Test Set-Up	23
12. 4-Wire Attendant Trunk Circuit ERL, SRL, and SRL HI Test Set-Up	27

ATTACHMENT

CONTENTS	PAGE
1. Impedance Balance Test Data Work Sheet	31

1. GENERAL

1.01 When toll functions are performed, it is required that transmission paths through the office not only be capable of operating at low losses, but also be free of objectionable echo and singing impairments. These impairments are caused by signal reflections due to impedance mismatches. The office return loss balance method presented herein will insure that echo and singing impairments are held to within satisfactory levels.

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

1.03 Whenever the term TOUCH-TONE® telephone service is used, it refers to the equipment required to provide this service to the customer.

1.04 Intertoll trunks are generally 4-wire circuits; a 2-wire intertoll trunk is considered differently. In 2-wire switching offices such as No. 2 and No. 2B ESS, 4-wire circuits must be converted to 2-wire for switching. This is accomplished with a hybrid coil (Fig. 1), unity gain impedance isolator (Fig. 2), and a hybrid balancing network (Fig. 3). A 4-wire hybrid circuit (Fig. 4) is a 4-port circuit where two of the ports are connected to the 4-wire circuit, one to the 2-wire circuit, and one to a balancing network.

1.05 The types of trunks which are interconnected in a switching office determine the degree of echo and singing return loss balance required. An intermediate distributing frame (IDF) serves as the boundary between the switching and transmission equipment (Fig. 4) and any facility

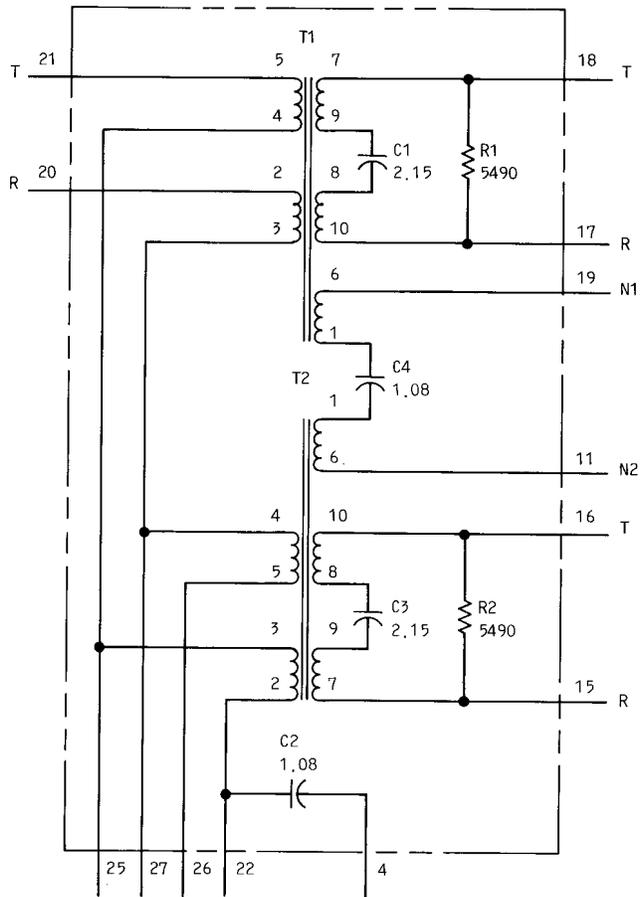


Fig. 1—CPS-A293 4-Wire Hybrid

reassignment which results in changes at the IDF may give cause for rebalancing that office.

1.06 The degree of balance that can be achieved depends on how precisely the impedance of the balancing network in an intertoll trunk (IT) hybrid coil circuit can be adjusted so as to match the impedance presented by the No. 2 and No. 2B ESS switching equipment connecting the IT and the line trunk network.

1.07 A comprehensive system of records is recommended for all balancing work. These records should reflect the initial balancing conditions and any subsequent balancing that is required in circuit order work. Proper records are needed for office certification and are useful during periodic inspections to determine whether the balance conditions within an office or a given trunk group

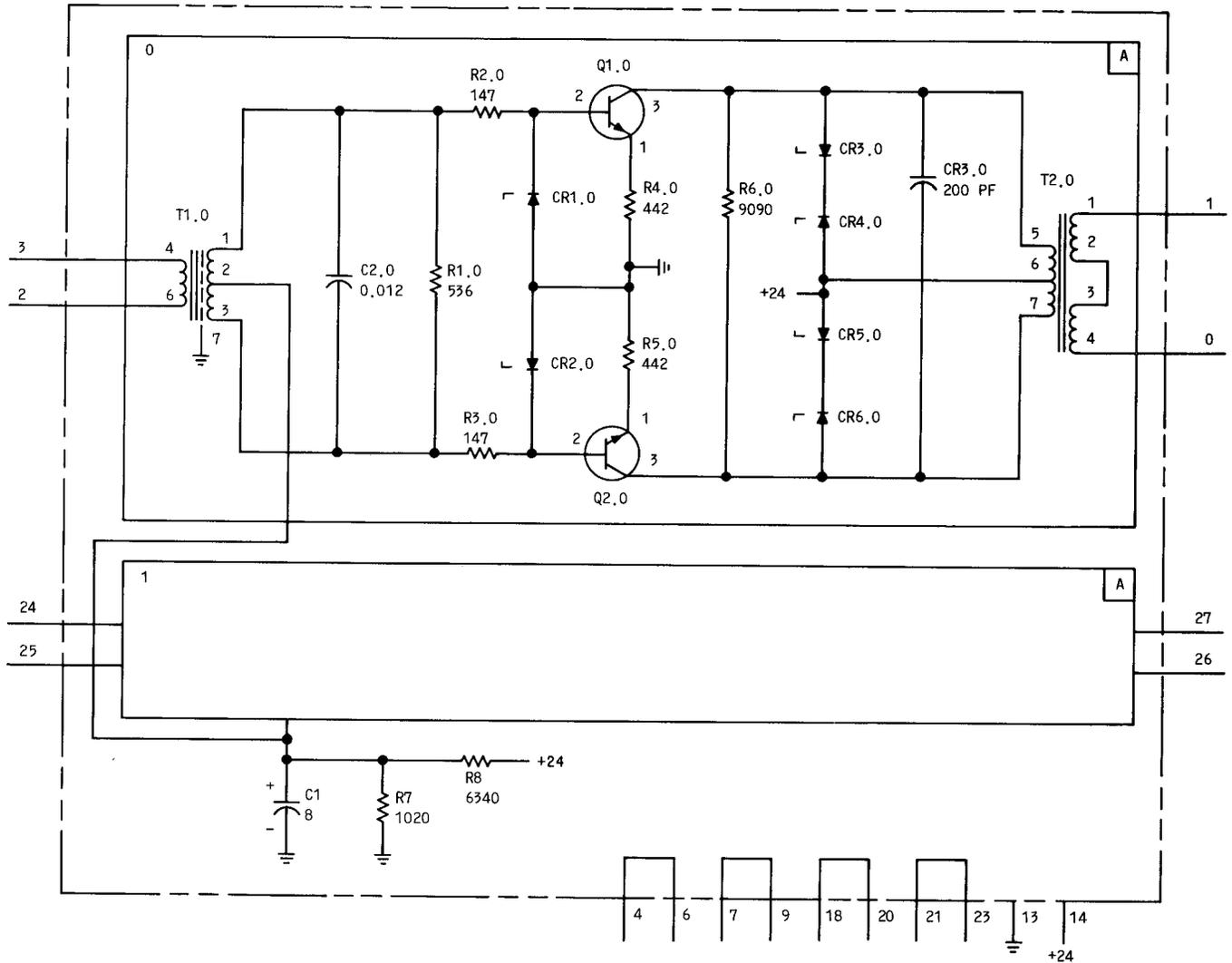


Fig. 2—CPS-A294 Unity Gain Impedance Isolator

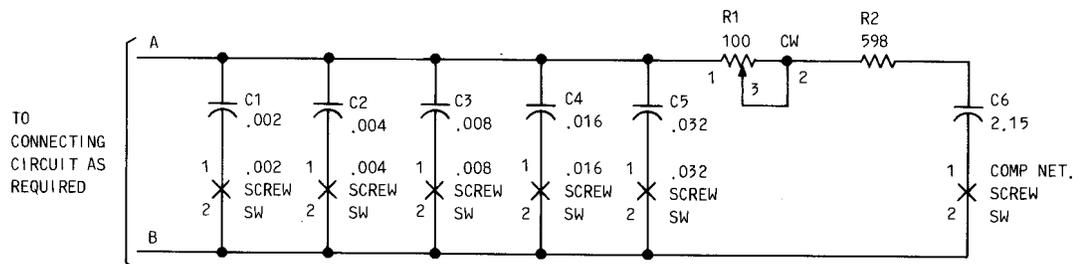


Fig. 3—Hybrid Balancing Network

SECTION 232-208-301

have been disturbed by transition work or by modifications to the trunk equipment.

1.08 Section 660-476-010, No. 1 ESS Offices Through and Terminal Balance Records, provides a suggested method for organization and will prove useful as a guide to establishing a complete self-contained record of all balancing information pertaining to an office. The Impedance Balance Test Data Work Sheet may be used when balancing the No. 2 and No. 2B ESS offices (Fig. 5). The impedance Balance Test Data Work Sheet is used to record the following tests:

- (a) Converter Balancing Network Adjustments (Fig. 6), Attendant Trunk Circuit
- (b) Send and Receive Amplifier (227D) settings, for trunk under test.
- (c) Hybrid Balancing Network Adjustments Attendant Trunk Circuit.
- (d) Echo Return Loss (ERL)
- (e) Singing Return Loss (SRL)
- (f) Singing Return Loss High Frequency (SRL HI)

1.09 This section describes and specifies methods of adjusting balancing networks and making balance tests in No. 2 and No. 2B ESS centrex offices where 4-wire via net loss (VNL) circuits are switched on a 2-wire basis (Fig. 7). In addition, the procedures necessary to align the Attendant Trunk Circuit (4-wire) so that its bridging effect is negligible are provided.

1.10 The adjustments of the Hybrid Balancing Network Capacitance (C) and variable resistor (R1) on each 4-wire trunk (Fig. 3) are necessary to control echo and stability (singing) when 4-wire circuits are interconnected through a 2-wire ESS office. When the impedance of the Hybrid Balancing Network is adjusted to match the drop impedance as seen from one trunk through the office path to any other trunk, the trunk is said to be "balanced." Practically, a perfect balance is not possible. The procedures described herein are designed to provide the degree of balancing required for satisfactory transmission performance.

1.11 This issue is based on the SD-2H182-01 Centrex Attendant Trunk Circuit (Fig. 8).

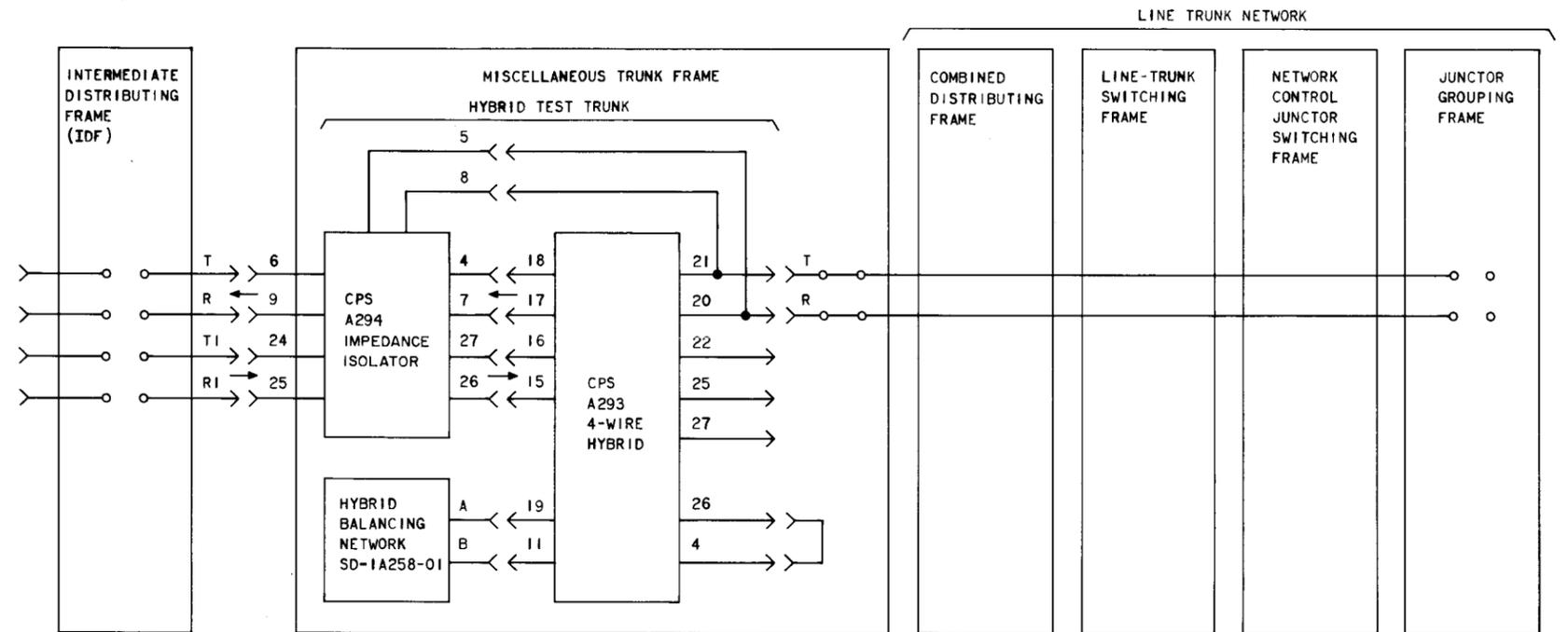


Fig. 4—Hybrid Test Circuit—Includes Average 2-Wire Cabling to Junctor Grouping Frame

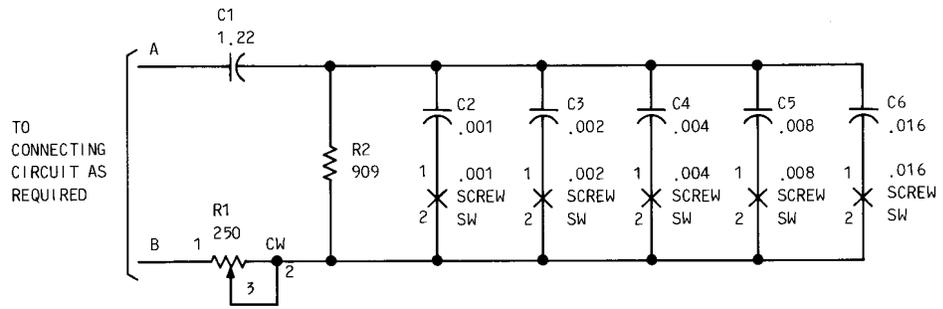


Fig. 6—Converter Balancing Network (4-Wire)

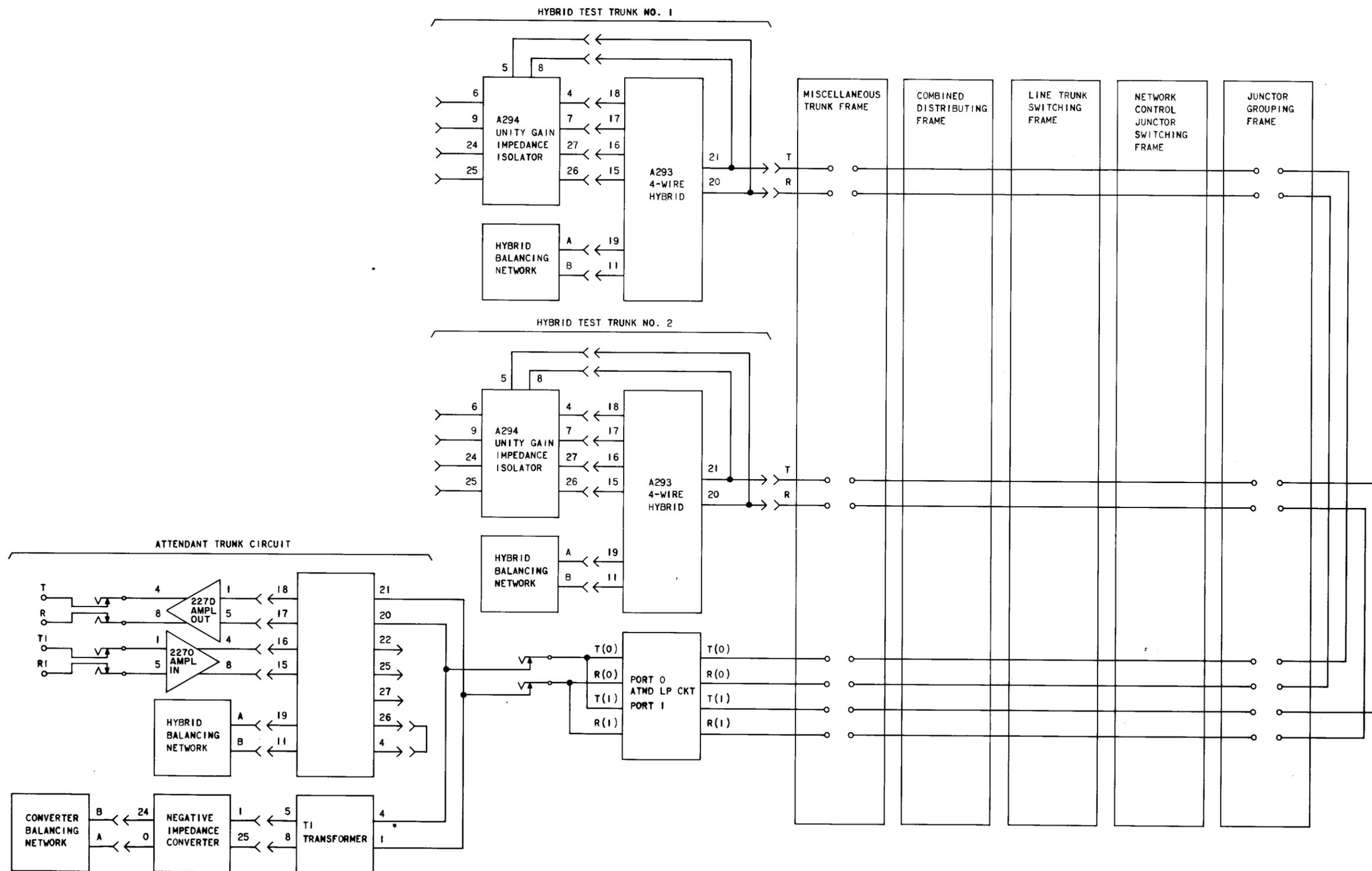


Fig. 7—Attendant Trunk Circuit (4-Wire) Network

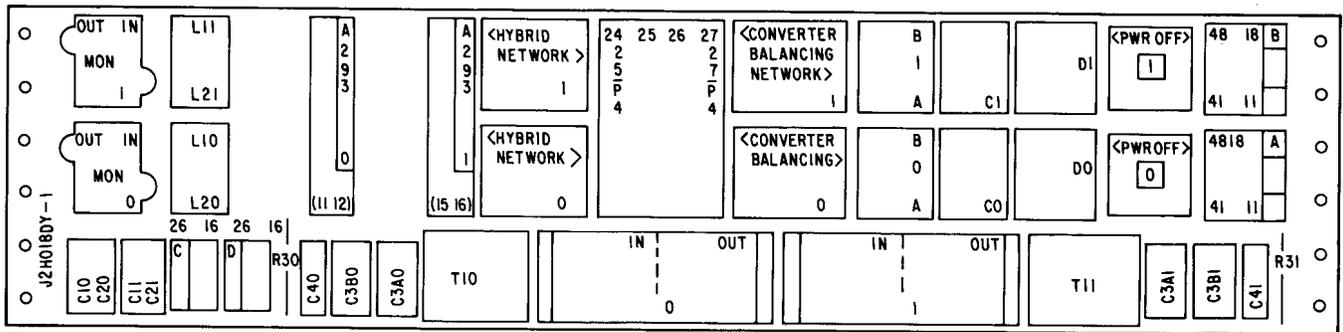


Fig. 8—Centrex Attendant Trunk Unit Arranged for 2-Wire to 4-Wire Conversion

1.12 The test objectives have been established as follows:

	<u>50% above</u>	<u>None below</u>
Echo Return Loss (ERL)	33 db	27 db
Singing Return Loss (SRL)	33 db	27 db
Singing Return Loss High Frequency (SRL HI)	33 db	27 db

1.13 The centrex attendant trunk circuit is accessed for the test by connecting it to the TTP.

1.14 The TTP has three access trunks. Each access trunk is assigned a directory number and has appearances on the line trunk network (LTN). The access trunks are given a unique class code which defines them as TTP test lines. In addition, the access trunks 1 and 2 may be used to receive incoming calls and all 3 access trunks may be used to make outgoing calls.

1.15 Operating specific keys on the panel sends test call information to the central processor.

1.16 Lamps on the TTP indicate the type of test being performed and the success or failure of a request for system action.

1.17 Test paths to lines and trunks are established through network paths which connect the circuit to be tested to one of three access trunks

(Fig. 9). Once the path to a line or trunk circuit is established, proper operation of the TTP switches and keys allows for connection of optional test equipment mounted in the TTP to the circuit under test. If the optional test equipment is not mounted in the TTP, ACCESS TRK-1, ACCESS TRK-2 and ACCESS TRK-3 jacks located in the front of the writing shelf provide a means of connecting portable test equipment to the circuit under test.

1.18 The TEL SET jacks located at the front of the writing shelf on the TTP allow for the use of a telephone handset or headset in place of the panel-mounted telephone handset. The transfer of control from the panel-mounted telephone set to the TEL SET jacks is accomplished by operating the TRFR key.

2. APPARATUS

2.01 The following test equipment or its equivalent, will be required for making balance test on the Attendant Trunk Circuit 4-wire terminating sets.

2.02 Transmission measuring set (TMS) 23D, or equivalent with appropriate test leads. Equivalent apparatus must be capable of measuring power in 600- and 900-ohm circuits at 1 kHz. The accuracy must be ± 0.1 dBm at 1 kHz at normal room temperature and the range must be from -15 dBm to +10 dBm.

2.03 KS-14510 L1, volt-ohm-milliammeter (VOM) or equivalent.

2.04 No. 132A Test Set—Impedance Adapter. Because the test equipment has impedances

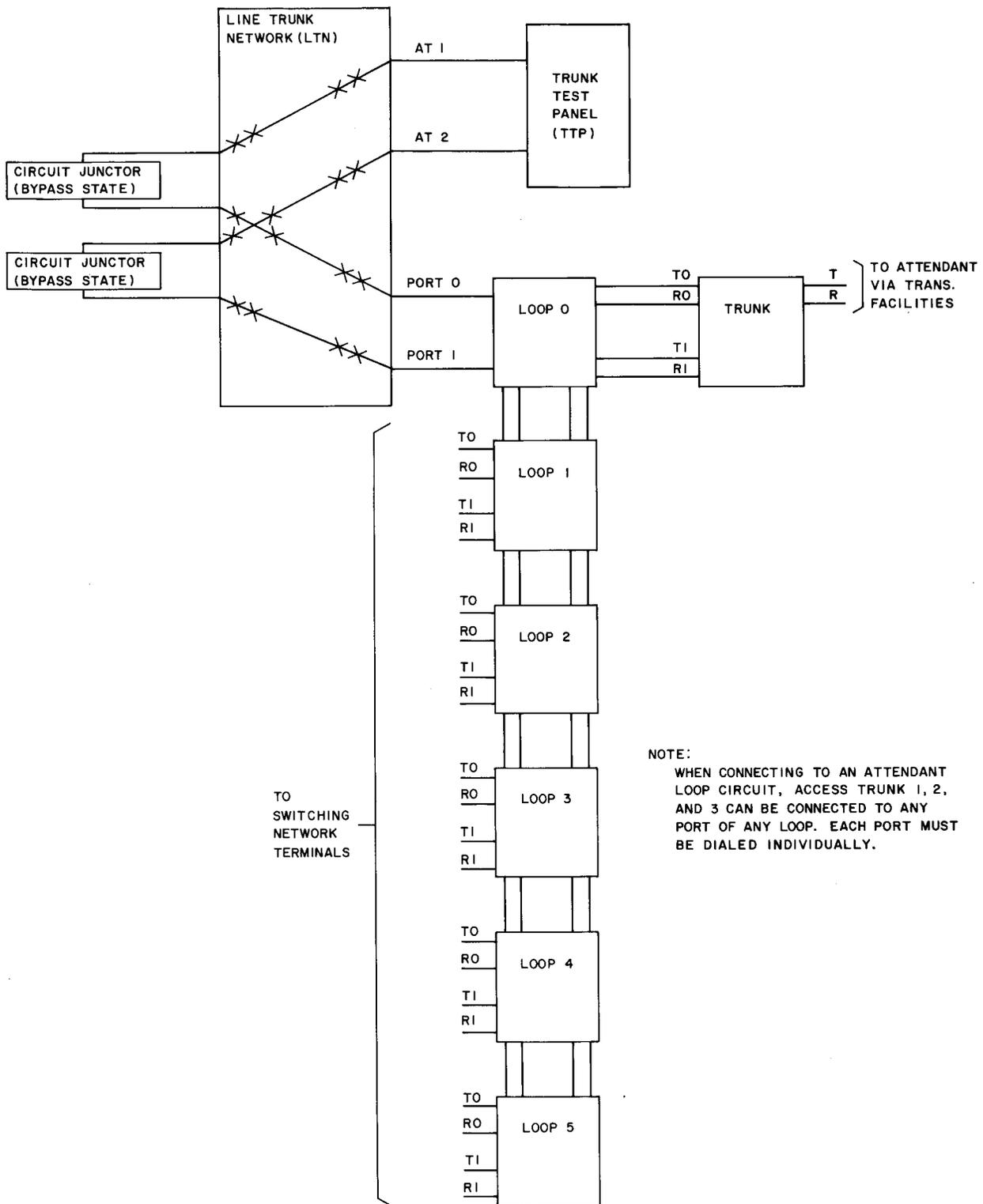


Fig. 9—Test Configuration Using Trunk Test Panel When Testing an Attendant Loop Circuit

of 600 ohms, and the impedances of the transmitting and receiving paths of the console are 70 ohms and 300 ohms, respectively, it is desirable to build out the console for impedances of 600 ohms and a constant 2.0 dB loss. The 132A test set was designed specifically for this application.

2.05 J94071B (71B) Milliwatt Reference Generator—The frequency of the 71B is 1000 Hz \pm 1 percent under the following environmental conditions:

- (a) temperatures between 32 to 120 F.
- (b) battery voltage between 47 to 35 volts.

Because of warm-up time of semiconductor devices, measurements where maximum accuracy is desired should not be made during the first 90 seconds after the generator has been turned on.

2.06 KS-20501 L3, Return Loss Measuring Set—

- Impedances, 4-wire: 600 ohms
- Return Loss Range: -10 dB to +40 dB
- Accuracy: \pm 4 dB, all test types

2.07 Two 2P4A cord assemblies. Each assembly consisting of a P2B cord 3 feet in length or longer, with a 310 plug on each end.

3. PRETEST INFORMATION

3.01 The attendant trunk circuit (4-wire) is used to bridge an attendant trunk across a connection. Negative effect on transmission and minimum loss is accomplished by using a negative impedance converter to balance out the attendants circuit. The negative impedance converter is designed to act as a bridge lifter when a third party is bridged on an existing connection. It puts a negative impedance in parallel with the third party making the net bridging impedance very high, thus, minimizing transmission degradation.

3.02 To bridge the circuit with negligible loss, two balance adjustments are required. The first is made on the converter balancing network to tune the negative impedance converter, and the second is the adjustment of the hybrid balancing network in the attendant trunk circuit.

3.03 The hybrid balancing network adjustment of each 4-wire terminating set is made using the test configuration shown in Fig. 10. Optimum R1 and C adjustments are determined by making return loss measurements at 1000 Hz.

3.04 During these hybrid test circuit adjustments, consider the test circuit to be the "trunk under test." After the adjustments and tests are performed on the first circuit, change the test set-up to make the second trunk test circuit the "trunk under test," and adjust and test the second circuit. These adjustments on all test circuits should be performed prior to putting any centrex trunk in service.

4. PREPARATION

A. Calibration of Test Equipment

4.01 All test equipment should be calibrated in accordance with Bell System Practices or other appropriate instructions.

4.02 The calibration of the 71B reference generator should be verified according to Section 103-326-100. The 71B reference generator may then be used as a 0 dBm reference for calibration of the 23C TMS, with Section 103-223-100.

4.03 Unless otherwise indicated, all keys are locking keys. When the locking key is operated and released, the key remains closed until operated and released again. The nonlocking key remains closed only during the time the key is held operated.

4.04 The TTP keys are either locking or nonlocking types. All locking type keys contain lamps which are lighted when the key is operated. Many of the nonlocking keys contain lamps which are lighted when the TTP is in the test state controlled by that key. Some key lamps are lighted as a result of the operation of an associated relay.

4.05 In order to differentiate between locking and nonlocking type keys, the use of a locking type key shall be identified by the words "operate" and "release" and the use of the nonlocking type key shall be identified by the word "depress."

SECTION 232-208-301

Note: Nonlocking keys require a depression of at least one-half second to ensure system recognition.

with it. The loop circuits are tested one-at-a-time. Therefore, the same test procedure is repeated on each attendant loop circuit.

B. Accessing the Office Loop and Attendant Trunk Circuits

4.06 Refer to office records to obtain the following information about the circuits to be tested:

- (a) circuit identifying digit (CID)
- (b) centrex group number (CTX)
- (c) attendant number (AT No.)
- (d) loop number (LOOP)
- (e) port number (PORT)
- (f) scan point number (SPN).

Note: Each centrex attendant trunk circuit has six (6) attendant loop circuits associated

4.07 Prior to performing any tests on the centrex attendant loop or trunk circuits, the attendant console operator should be notified. Make the circuit under test maintenance busy as follows:

At maintenance TTY type in:

M AC:RMV:f d c!

f = frame number

d = data link number

c = attendant console number.

4.08 For all tests, use the following procedure for gaining access to the circuit under test:

STEP	ACTION	VERIFICATION
1	At telephone set on TTP— Operate access trunk 1 key.	
2	Lift handset off-hook or operate TRFR key at TEL CKT on TTP if using headset.	At telephone set— Dial tone returned. Access trunk 1 lamp lighted. At ACCESS TRUNK 1 CONTROL— SUPV lamp lighted. At TEL CKT— TRFR lamp lighted if TRFR key is operated.
3	At TOUCH-TONE dial— Dial 5 + CTX + AT No. + LOOP + PORT + ST to gain access to port 0 of selected attendant loop circuit.	At ACCESS TRUNK 1 CONTROL— EQPT ST lamp lighted steadily or flashing at a rate of 120 interruptions per minute. At MISC TEST CONTROL— P & E lamp lighted if connection was successful.
4a	If the P & E lamp is not lighted steadily— At ACCESS TRUNK 1 CONTROL— Depress RLS key.	

Note: If the EQPT ST lamp is flashing and the P & E lamp is not lighted steadily, the TTP is not connected to the circuit to be tested.

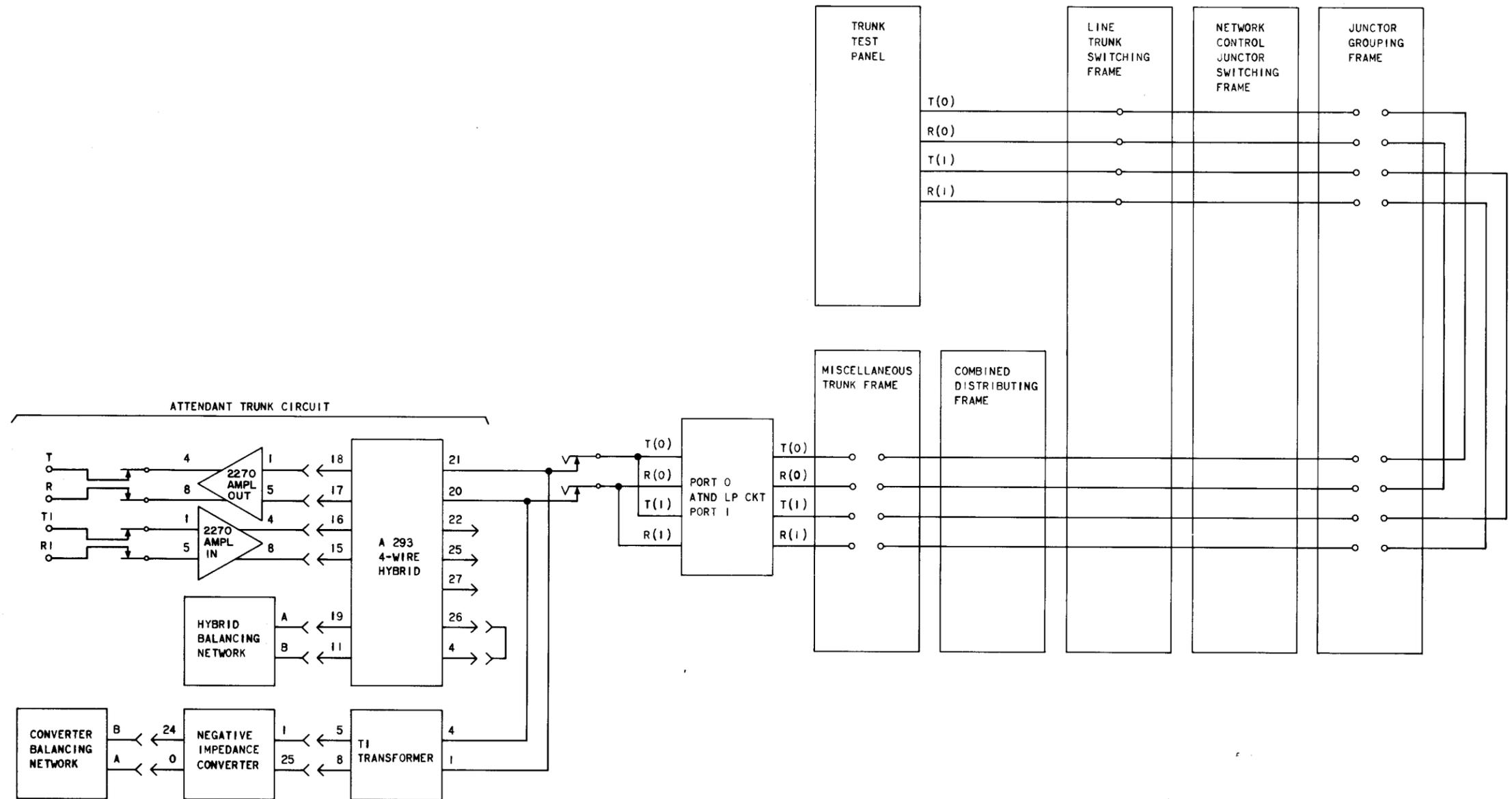


Fig. 10—Attendant Trunk Circuit (4-Wire) Hookup Using the TTP and MC TTY

STEP	ACTION	VERIFICATION
5a	Repeat Steps 3 and 4a until connection is successful.	
6	Place handset on-hook or release TRFR key.	At telephone set— Access trunk 1 lamp extinguished. At TEL CKT— TRFR lamp extinguished.
7	At telephone set— Operate access trunk 2 key.	At MISC TEST CONTROL— P & E lamp remains lighted.
8	Lift handset off-hook or operate TRFR key at TEL CKT on TTP if using headset.	At telephone set— Dial tone returned. Access trunk 2 lamp lighted. At ACCESS TRUNK 2 CONTROL— SUPV lamp lighted. At TEL CKT— TRFR lamp lighted if TRFR key is operated.
9	At TOUCH-TONE dial— Dial 5 + CTX + AT No. + LOOP + PORT + ST to gain access to port 1 of the selected attendant loop circuit.	At ACCESS TRUNK 2 CONTROL— EQPT ST lamp lighted steadily or flashing at a rate of 120 interruptions per minute. <i>Note:</i> If the EQPT ST lamp and the P & E lamp are flashing, the TTP is not connected to the circuit to be tested.
10b	If the P & E lamp is flashing— At ACCESS TRUNK 2 CONTROL— Depress RLS key.	
11b	Repeat Step 9 and 10b until connection is successful.	
12	Place handset on-hook or release TRFR key.	At telephone set— Access trunk 2 lamp extinguished. At TEL CKT— TRFR lamp extinguished.
13	At the TTY at ACCESS TRUNK 1 CONTROL— Operate the XMSN key.	
14	At test and control unit— Set PD GROUP switch to 0-5 position.	
15	At PERIPHERAL DECODER POINTS— Operate 0 key.	At PERIPHERAL DECODER POINTS— 0 lamp lighted.
16	Depress AT 1 and AT 2 key.	Relay A0 operated. Relay A1 operated.

SECTION 232-208-301

STEP	ACTION	VERIFICATION
17	At front of writing shelf on TTP— Plug in test telephone "A" or 262C plug into ACCESS TRK-1 jack. If test telephone is used, lift receiver off-hook.	At DISPLAY BUFFER— Lamp associated with ferrod sensor 0 extinguished.
18	At front of writing shelf on TTP— Remove test telephone "A" or 262C plug.	At DISPLAY BUFFER— Lamp associated with ferrod sensor 0 lighted.
19	At front of writing shelf on TTP— Plug in test telephone "B" or 262C plug into ACCESS TRK-2 jack. If test telephone is used, lift receiver off-hook.	At DISPLAY BUFFER— Lamp associated with ferrod sensor 1 extinguished.
20	At front of writing shelf on TTP— Remove test telephone "B" or 262C plug.	At DISPLAY BUFFER— Lamp associated with ferrod sensor 1 lighted.
21	At maintenance TTY— Type in: UB SY:CLB!	At DISPLAY BUFFER— Scanner row display is removed.
22	At PERIPHERAL DECODER POINTS— Operate 1 key.	At PERIPHERAL DECODER POINTS— 1 lamp lighted.
23	Depress AT 1 and AT 2 keys.	Relay B0 operated. Relay B1 operated.
24	Set PD GROUP switch to the 12-17 position.	
25	At PERIPHERAL DECODER POINTS— Operate appropriate key for attendant loop circuit under test as follows:	At PERIPHERAL DECODER POINTS— Lamp for selected attendant loop circuit lighted.

ATTENDANT LOOP CIRCUIT	PERIPHERAL DECODER POINTS KEY	OPERATED RELAY
0	12	E0
1	13	E1
2	14	E2
3	15	E3
4	16	E4
5	17	E5

STEP	ACTION	VERIFICATION
26	At PERIPHERAL DECODER POINTS— Depress AT 1 key.	At circuit under test— E relay operated.
4.09	If the verification procedure fails or if a malfunctioning circuit is indicated during any part of these tests, proceed as follows.	(4) At the converter balancing network rotate the .004 screw switch fully clockwise (tightened). Attach the VOM to the .004 screw switch and terminal 16 on back side of converter balancing network. Adjust resistor R1 of converter balancing network to read 100 ohms on the VOM.
	(1) Discontinue the test.	
	(2) Troubleshoot the circuit which failed.	
	(3) Replace faulty circuit components using standard repair procedures.	(5) Disconnect VOM from test circuit.
	(4) Repeat the test that failed. If verification is successful, continue the test.	(6) Record the capacitance (C) value in column (A) on data worksheet, Fig. 5.
5. BALANCE TEST ON 4-WIRE TERMINATING SETS, ATTENDANT TRUNK CIRCUIT		(7) Record the resistance (R) value in column (B) on data worksheet, Fig. 5.
	<i>Note 1:</i> Two test positions are required; one at the central office and one at the attendant console on customer premises.	
	A. Negative Impedance Converter Balancing	B. Send and Receive Amplifier Settings
5.01 Negative Impedance Converter Balancing Network Adjustments.		5.02 The send and receive amplifier (227D) settings are made as follows:
	(1) On the attendants trunk circuit (4-wire), adjust the gain of the 227D receive and send amplifiers as follows: 0-13 screw tighten, (10-24, 21-36) screws open, potentiometer fully counterclockwise. These settings should deliver 0-db gain at the outputs of the receive and send amplifiers.	(1) At the attendant console connect the 132A test set to the operator telephone jack and operate the BOTH pushbutton switch on 132A test set.
	(2) On the attendants trunk circuit (4-wire), adjust the converter balancing network (Fig. 6) so that all screw switches are opened (loosened) and rotate the variable resistor (R) to the extreme counterclockwise position (minimum resistance).	(2) At 23A TMS set ADD DBM switch to -10 and INPUT switch to 600.
	(3) On the attendants trunk circuit (4-wire), adjust the hybrid balancing network (Fig. 3) so that all screw switches are opened (loosened) except the switch designated COMP NET, which should be closed (tightened). Set the potentiometer (R) to the extreme counterclockwise position (minimum resistance).	(3) Patch 23A TMS—310 MEAS jack to the 132A TMS—310 MEAS jack.
		(4) At the attendant console operate KL key associated with the lighted SCR lamp.
		(5) Patch 71B Reference Generator—600-ohm 310 jack to the OSC jack on the 123A test set.
		<i>Note:</i> See Fig. 11 for correct test hookup.
		(6) At TTP TRANSMISSION MEASURING CONTROL—Set SEND switch to 0 DBM 1 kHz and verify signal present on 23A TMS meter at attendant console.
		(7) At attendant trunk circuit adjust send amplifier (227D) of trunk under test for a reading of -11.9 dBm on the 23A TMS

SECTION 232-208-301

- (8) Record the SEND amplifier (227D) dBm level setting in column (c) on data work sheet, Fig. 5.
- (9) At attendant trunk circuit adjust receive amplifier (227D) of trunk under test for the following readings on the TRANSMISSION MEASURING SET on the TTP.
 - (a) Adjust for -8.4 dBm if 60A, 61A, or modified KS-20778 headset is used at operator position.
 - (b) Adjust for -4.0 dBm if G3CR headset is used
- (11) Record the RECEIVE amplifier (227D) dBm level setting in column (D) on data work sheet, Fig. 5.
- (12) At test and control unit set the PD GROUP switch to 0-5 position.
- (13) At PERIPHERAL DECODER POINTS, release 0 and 1 keys and verify 0 and 1 lamps are extinguished.
- (14) Depress AT1 and AT2 keys and verify A0, B0, A1, B1 relays are released.
- (15) Set PD GROUP switch to the 12-17 position.
- (16) At PERIPHERAL DECODER POINTS release lighted key and verify lamp for selected circuit extinguished.
- (17) At PERIPHERAL DECODER POINTS depress AT 1 key and verify lamp for selected attendant loop circuit extinguishes. Also at circuit under test verify E relay is released.

C. Hybrid Balancing Network Adjustments and Echo Return Loss (ERL)

5.03 The Hybrid Balancing Network Adjustments are made as follows:

STEP	ACTION	VERIFICATION
1	At telephone set on TTP— Operate access trunk 1 key.	
2	Lift handset off-hook or operate TRFR key at TEL CKT on TTP is using headset.	At telephone set— Dial tone returned. Access trunk 1 lamp lighted. At ACCESS TRUNK 1 CONTROL— SUPV lamp lighted. At TEL CKT— TRFR lamp lighted if TRFR key is operated.
3	At TOUCH-TONE dial— Dial 5 + CTX + AT No. + LOOP + PORT + ST to gain access to port 0 of selected attendant loop circuit.	At ACCESS TRUNK 1 CONTROL— EQPT ST lamp lighted steadily or flashing at a rate of 120 interruptions per minute. At MISC TEST CONTROL— P & E lamp lighted if connection was successful.
4a	If the P & E lamp is not lighted steadily— At ACCESS TRUNK 1 CONTROL— Depress RLS key.	
5a	Repeat Steps 3 and 4a until connection is successful.	

Note: If the EQPT ST lamp is flashing and the P&E lamp is not lighted steadily, the TTP is not connected to the circuit to be tested.

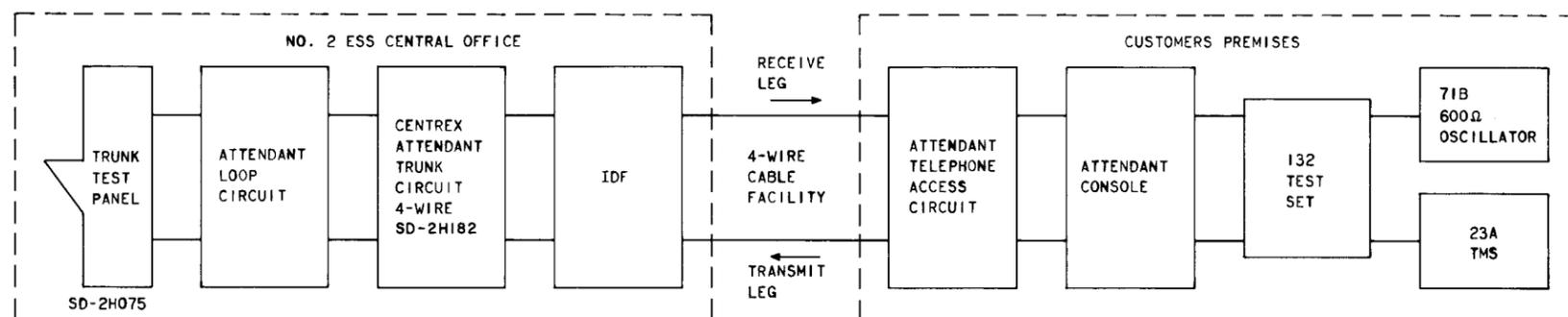


Fig. 11—4-Wire Attendant Trunk Circuit Transmission Test Set-Up

STEP	ACTION	VERIFICATION
6	Place handset on-hook or release TRFR key.	At telephone set— Access trunk 1 lamp extinguished. At TEL CKT— TRFR lamp extinguished.
7	At telephone set— Operate access trunk 2 key.	At MISC TEST CONTROL— P & E lamp remains lighted.
8	Lift handset off-hook or operate TRFR key at TEL CKT on TTP is using headset.	At telephone set— Dial tone returned. Access trunk 2 lamp lighted. At ACCESS TRUNK 2 CONTROL— SUPV lamp lighted. At TEL CKT— TRFR lamp lighted if TRFR key is operated.
9	At TOUCH-TONE dial— Dial 5 + CTX + AT No. + LOOP + PORT + ST to gain access to port 1 of the selected attendant loop circuit.	At ACCESS TRUNK 2 CONTROL— EQPT ST lamp lighted steadily or flashing at a rate of 120 interruptions per minute. Note: If the EQPT ST lamp and the P & E lamp are flashing, the TTP is not connected to the circuit to be tested.
10b	If the P & E lamp is flashing— At ACCESS TRUNK 2 CONTROL— Depress RLS key.	
11b	Repeat Steps 9 and 10b until connection is successful.	
12	Place handset on-hook or release TRFR key.	At telephone set— Access trunk 2 lamp extinguished. At TEL CKT— TRFR lamp extinguished.
13	Set PD GROUP switch to the 12-17 position.	
14	At PERIPHERAL DECODER POINTS— Operate appropriate key for attendant loop circuit under test as follows:	At PERIPHERAL DECODER POINTS— Lamp for selected attendant loop circuit lighted.

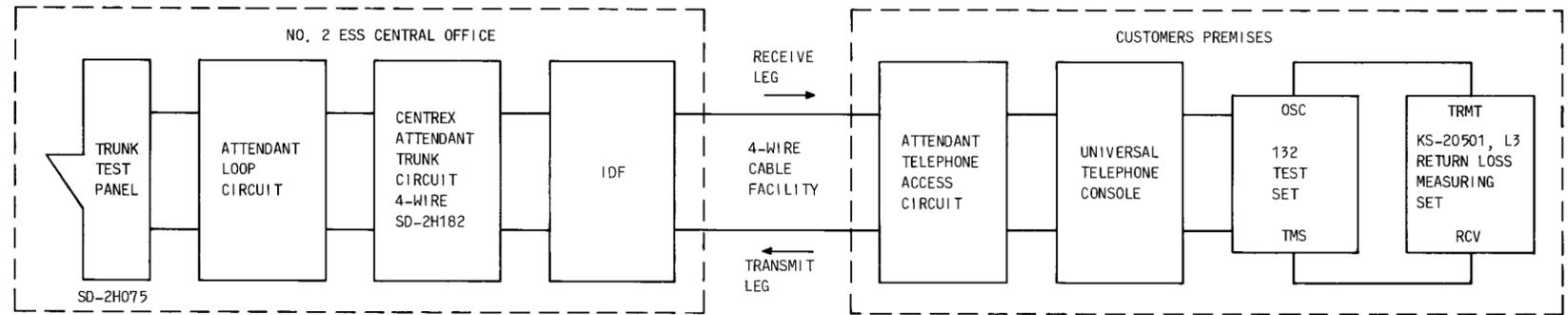


Fig. 12—4-Wire Attendant Trunk Circuit ERL, SRL, and SRL HI Test Set-Up

STEP	ACTION	VERIFICATION						
21	Record the hybrid balancing network capacitance (C) value in column (E) on data work sheet, Fig. 5.							
22	Record the echo return loss (ERL) reading (THL or ADD switch setting plus meter reading) in column (F) of data work sheet, Fig. 75.							
	Note: The reading obtained represents the TRANS HYBRID LOSS plus the ERL.							
23	Compare the echo return loss reading with the objectives listed to determine if corrective measures are required.	<table border="0" style="margin-left: 200px;"> <tr> <td></td> <td style="text-align: center;"><u>50% above</u></td> <td style="text-align: center;"><u>None below</u></td> </tr> <tr> <td>Echo Return Loss</td> <td style="text-align: center;">33</td> <td style="text-align: center;">27</td> </tr> </table>		<u>50% above</u>	<u>None below</u>	Echo Return Loss	33	27
	<u>50% above</u>	<u>None below</u>						
Echo Return Loss	33	27						
D. Singing Return Loss (SRL)								
5.04	The sending return loss (SRL) measurement is made as follows:	(3) Compare the singing return loss high frequency reading with the objectives listed to determine if corrective measures are required.						
	(1) On the KS-20501 L3 (RLMS) move the TEST TYPE switch to the (Singing Return Loss) SRL position.	<table border="0" style="margin-left: 200px;"> <tr> <td></td> <td style="text-align: center;"><u>50% above</u></td> <td style="text-align: center;"><u>None below</u></td> </tr> <tr> <td>Singing Return Loss High Frequency</td> <td style="text-align: center;">33</td> <td style="text-align: center;">27</td> </tr> </table>		<u>50% above</u>	<u>None below</u>	Singing Return Loss High Frequency	33	27
	<u>50% above</u>	<u>None below</u>						
Singing Return Loss High Frequency	33	27						
	(2) Record the SRL reading (THL or ADD switch settings plus meter reading in column (G) at data work sheet, Fig. 5.	(4) At attendant console disconnect the 132A Test Set and KS-20501 L3 (RTMS).						
	(3) Compare the singing return loss measurements with the objectives listed to determine if corrective measures are required.	(5) At ACCESS TRUNK 2 CONTROL—Depress RLS key.						
	<table border="0" style="margin-left: 200px;"> <tr> <td></td> <td style="text-align: center;"><u>50% above</u></td> <td style="text-align: center;"><u>None below</u></td> </tr> <tr> <td>Singing Return Loss</td> <td style="text-align: center;">33</td> <td style="text-align: center;">27</td> </tr> </table>		<u>50% above</u>	<u>None below</u>	Singing Return Loss	33	27	(6) At ACCESS TRUNK 1 CONTROL—Depress RLS key.
	<u>50% above</u>	<u>None below</u>						
Singing Return Loss	33	27						
		(7) At telephone set on TTP—Operate green release key.						
		(8) Set PD GROUP switch to the 0-5 position, at test and control unit. Release 0 and 1 keys at PERIPHERAL DECODER POINTS. Depress AT1 and AT2 keys at test and control unit.						
E. Singing Return Loss High Frequency (SRL HI)								
5.05	The singing return loss high frequency measurement is made as follows:	(9) Verify 0 and 1 lamps are extinguished at PERIPHERAL DECOER POINTS.						
	(1) On the KS-20501 L3 (RLMS) move the TEST TYPE switch to the singing return loss high frequency (SRL HI) position.	(10) Verify at the circuit under test that relays A0, A1 and B0, B1 are released.						
	(2) Record the SRL HI reading (THL or ADD switch setting plus meter reading) in column (H) of data work sheet, Fig. 5.							

SECTION 232-208-301

(11) Set PD GROUP switch to the 12-17 position and release the lighted PD point key. Depress AT 1 key at PERIPHERAL DECODER POINTS.

(12) Verify that lamp for selected attendant loop circui is extinguished and the E relay is released at circuit under test.

