TRAFFIC SERVICE POSITION SYSTEM NO. 1 WITH POSITION SUBSYSTEM NO. 2 AND REMOTE TRUNKING ARRANGEMENTS BALANCE TEST EQUIPMENT, TEST CIRCUITS, AND TERMINATIONS

CONTENTS PAGE

Figures

CONTENTS PAGE

Table

1. GENERAL

1.01 The information in this section covers the balance testing applications of the Traffic Service Position System (TSPS) No. 1 and Remote Trunking Arrangement (RTA).

1.02 When this section is reissued, the reason for reissue will be given in this paragraph.

2. TEST EQUIPMENT

2.01 Table A lists the following apparatus and test equipment that are required for balance testing, and adjusting the Network Build-Out capacitors (NBOCs) and Drop Build-Out Capacitors (DBOCs) in the TSPS No. 1 base unit and RTA.

TABLE A

OFFICE BALANCE TEST EQUIPMENT

QUANTITY	TEST SET OR APPARATUS	SECTION
1	KS-20501 Return-Loss Measuring Set (RLMS) or equivalent	103-106-115
1	7A capacitor box or equivalent with appropriate 2-conductor test cord with suitable insulated alligator clips at one end	
1	5A ATTENUATOR or equivalent	
2	Patching test cord assembly (3P15A), consisting of P3K cord 6 feet long, equipped with two 310 plugs	
1	310-type tip-ring shorting plug	
1	J99338CB 3-way, 4-wire bridging repeater test extender	332-121-101
1	ED-1C336-30 extender cable	
8	262B 600-ohm terminating plugs	
1	6-foot, 2-conductor test cord with 354C plug at one end and 310 plug at other end	
1	310-type 450-ohm + 4.32-μF terminating plug. (This termination will have to be fabricated locally.)	

3. GENERAL METHOD AND USE OF EQUIPMENT

3.01 The general method of achieving balance in the TSPS No. 1 is to use the 24V4-type repeaters mounted in the Control Display and Test (CDT), and Test and Display Circuit (TDC) as the balance test circuit since they have access to all Toll Connecting Trunks (TCs) and inward trunks associated with the base TSPS and the RTA, respectively. The CDT also has access to delay call trunks, operator service trunks, base-remote trunks, incoming CAMA transfer trunks, and service-observing access trunks in the base TSPS.

3.02 The configurations of test equipment given in this section may be used in testing for the balance requirements given in Section 660-463-301 and for performing the drop build-out and requirement verification tests in Section 660-463-500 and 660-463-502.

3.03 The test equipment is interconnected as shown in Fig. 1 thru 8 and calibrated by following the procedure in paragraph 3.05.

3.04 The code 959-xxxx must be available in the Class 5 office for access to the Master Test Line in the CDT or TDC.

3.05 The following is the procedure for making return loss tests using the KS-20501 Return Loss Measuring Set (RLMS). The Wiltron Model 9041 Transmission Level and Return Loss Measuring Set can also be used with equivalent switch settings and connections.

EQUIVALENT SWITCHES

KS-20501, L3	WILLTRON MODEL 9041
TEST TYPE	RETURN LOSS TEST TYPE
TEST LOCATION	TEST MODE
NETWORK	NETWORK
THL OR ADD	THL dB
ADD dB	ADD dB
PWR	ON/OFF

STEP	PROCEDURE
1	Set PWR switch to ON.
2	Set TEST TYPE switch to desired test (ERL, SRL-LO, or SRL-HI).
3	Set TEST LOCATION switch to +0 dB.
4	Connect TRMT jack to transmit side of circuit to be tested.
5	Connect RCV jack to receive side of circuit to be tested.
6	Adjust the RLMS for the transhybrid loss (THL). (a) Short the tip and ring on the 2-wire side of the hybrid. (b) Adjust the THL or ADD controls for a 0 dB indication on the meter. (c) If the meter indicates an off-scale reading to the left, connect a 5A attenuator to the transmit side and adjust it and the THL or ADD control for zero dB on the meter. (d) If the meter indicates an off-scale reading to the right, connect a 5A attenuator to the transmit side, set the TEST LOCATION switch to +23 (VFPB) and adjust the 5A attenuator and the THL or ADD control for zero dB on the meter. (e) Remove the short from the 2-wire side.
7	Terminate the distant end of the circuit in the proper impedance.
8	Adjust the ADD dB switch for an on-scale meter indication.
9	The return loss is the sum of the ADD dB setting and meter reading.

4. TEST CIRCUITS AND TEST TERMINATIONS

4.01 To balance a TSPS No. 1 base unit or RTA, balance test circuits are provided. These are 24V4-type repeaters mounted in the CDT and TDC. In the CDT, the 24V4 is associated with the Trunk Access Circuit (TAC) and in the TDC it is associated with the BAL TST circuit. These circuits have access to all toll-connecting (TC) trunks associated with the base TSPS and the RTA.

4.02 The CDT Test Access Circuit should be calibrated according to Section 250-106-303.

4.03 A typical arrangement of the balance test circuit is shown in Fig. 1 and 2. The circuits simulate an operator position circuit at the TSPS base unit and a base-remote trunk at the RTA.

PRELIMINARY TESTING OF BALANCE TEST CIRCUITS

4.04 This procedure is made when initially balancing a TSPS No. 1 base unit or RTA.

STEP	PROCEDURE
1	Modify the 1P 4WTS in the TAC of the CDT or the balance test circuit of the TDC according to Fig. 9.
2	Connect a 7A capacitor box or equivalent across the balance network of the modified 1P 4WTS.
3	Set 7A capacitor box to zero.
4	If testing at an RTA, plug in a 450-ohm + 4.32-μF termination in the 2-WIRE IN jack of the 24V4 repeater.
5	Set up the RLMS according to Fig. 1 or 2 to perform echo return loss (ERL) and singing return loss (SRL) tests.
6.	Measure the ERL and SRL and record.
	Note: The ERL and SRL measurements must meet requirements specified in Section 660-463-301. Measurements greater than 33 dB can be expected in all cases.
7	If testing at an RTA, remove the 450-ohm + 4.32-μF termination.
8	Perform procedures for selecting the NBOC compromise value of the 1P 4WTS according to Section 660-463-500 for a TSPS base unit or Section 660-463-502 for a RTA.

VERIFICATION OF THE SELECTED NBOC VALUE

4.06 This procedure is made after the NBOC value is determined by the transmission engineer.

STEP	PROCEDURE
1	Set up the RLMS to the balance test circuit according to Fig. 1.
2	Connect the 7A capacitor box or equivalent across the balance network of the modified 1P 4WTS.
3	Adjust the 7A capacitor box to the NBOC value selected.
4	Select a TC trunk from the sample used in determining the NBOC.
5	Measure the ERL and SRL and record the results.
6	Remove the 7A capacitor box and adjust the NBOC in the 1P 4WTS to the value in Step 3.
7	Measure the ERL and SRL again and verify that the values are approximately the same as those in Step 5. If not, adjust the NBOC to obtain that value. If large changes are required, investigate the circuits for trouble.
8	Remove test lead from 1P 4WTS.

BUILD-OUT OF THE TEST TERMINATIONS ASSOCIATED WITH ACCESS TRUNK 1 OF THE CDT OR TDC

4.07 This procedure is used to properly build out access Trunk 1 of the CDT or TDC in order to perform verification tests on the 1P 4WTS associated with the Operator Position Trunks and the Base-Remote Trunks.

STEP	PROCEDURE
1	Connect the RLMS to the balance test circuit according to Fig. 1.
2	At a TSPS base unit: Connect a 7A capacitor box or equivalent to the AT1 jack of the CDT. At a RTA concentrator: Connect a 7A capacitor box or equivalent across the BRC capacitor on the back of the TDC.
3	Set 7A capacitor box to zero.
4	Set up a connection from access port 0 to access port 1.

STEP	PROCEDURE
	At a TSPS base unit: Operate TRUNK TRANSMISSION TEST—CAL TAC and TRANSMISSION MEASURING—QUIET TERM keys. At a RTA concentrator: Type on the TTY: TKT-25-048-1-mem*-ACS and operate TRANSMISSION TEST—BAL and QUIET TERM keys. *Member number for Access Port 1
5	Set up the RLMS to measure ERL, SRL-LO, or SRL-HI.
6	Adjust the capacitor decade box in small increments of capacitance and record ERL, SRL-LO, and SRL-HI. Keep repeating until ERL and SRL-HI reach maximum and then start to drop. A trade-off pattern will be found to exist between ERL and SRL-HI.
7	Note and record the value of capacitance.
8	If a DBOC is available on Access Trunk 1, adjust it to the value determined in Step 7. If not available, leave the 7A capacitor box or equivalent connected as in Step 2.
9	Release connection. At TSPS base unit: Release TRUNK TRANSMISSION TEST—CAL TAC and TRANSMISSION MEASURING—QUIET TERM keys. At RTA concentrator: Operate REMOTE TRUNK TEST—TS FRFR and MASTER TEST LINE—MTL RLS keys.
10	Perform verification test as prescribed in Sections 660-463-500 and 600-463-502.

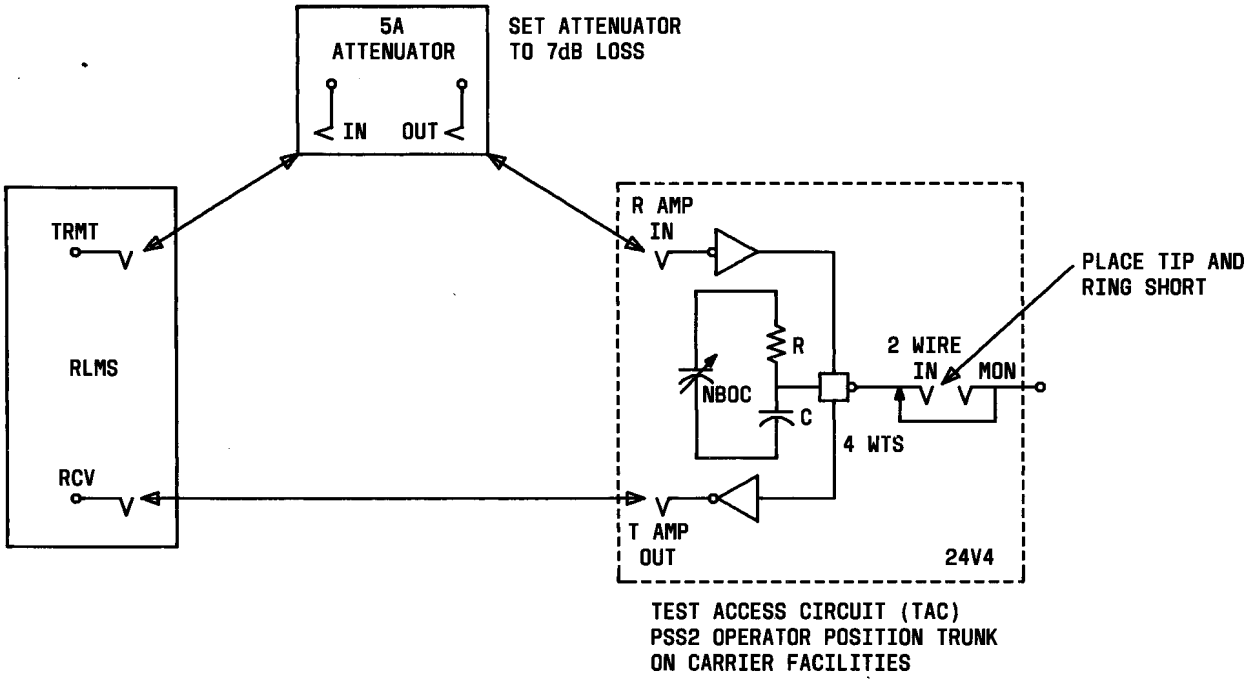

Fig. 1—Test Connection To A 24V4-Type Repeater With 1P 4WTS At A TSPS Location

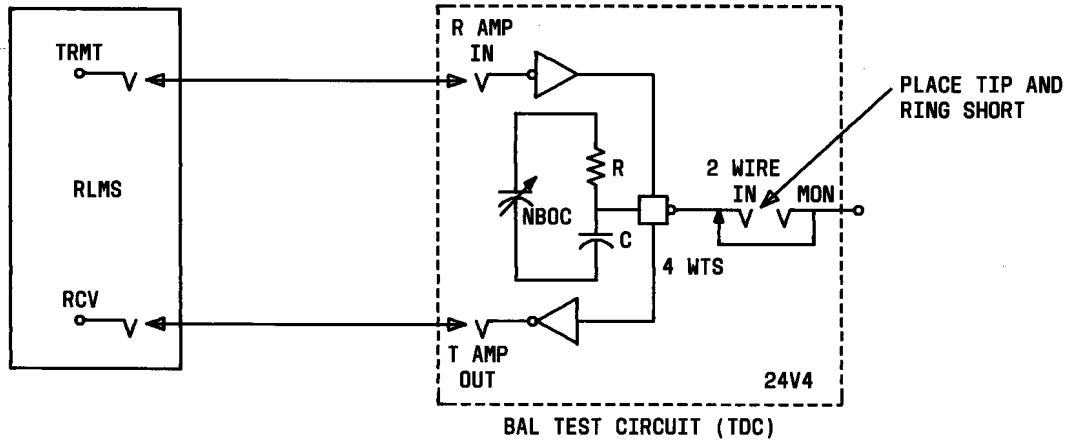

Fig. 2—Test Connection to a 24V4-Type Repeater With 1P 4WTS At A RTA Location

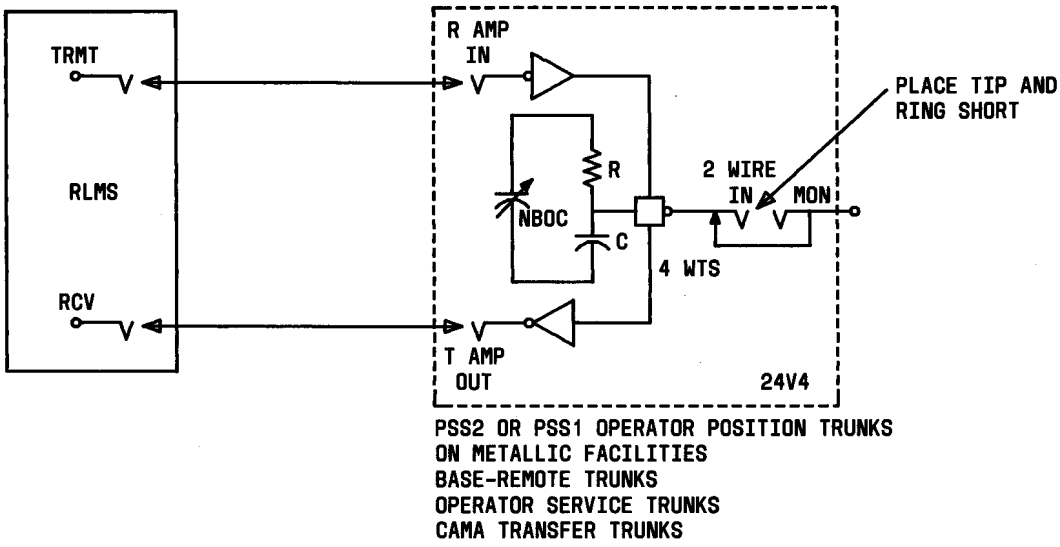

Fig. 3—Test Connection To A 24V4-Type Repeater With 900 Ohm 4WTS At A TSPS Location

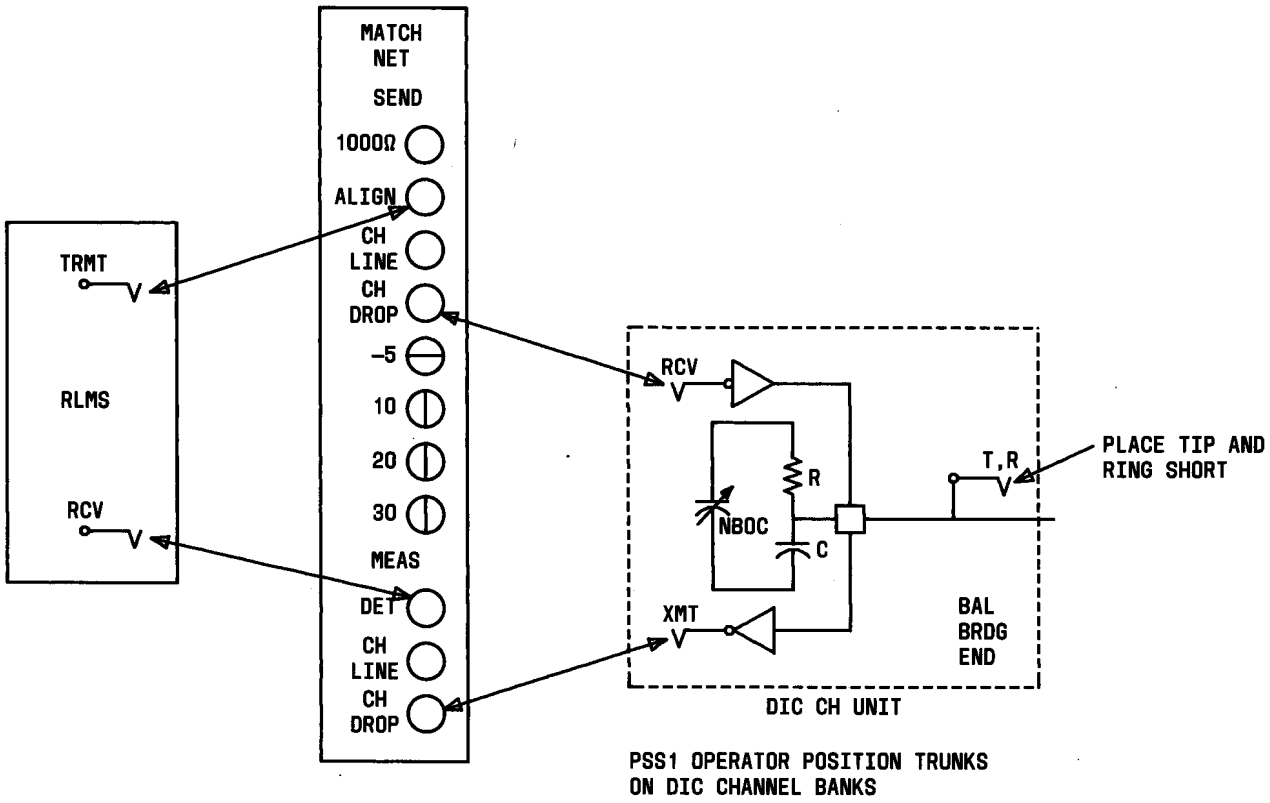

Fig. 4—Test Connection To A D1C Channel Unit (Bal. Brdg. End)

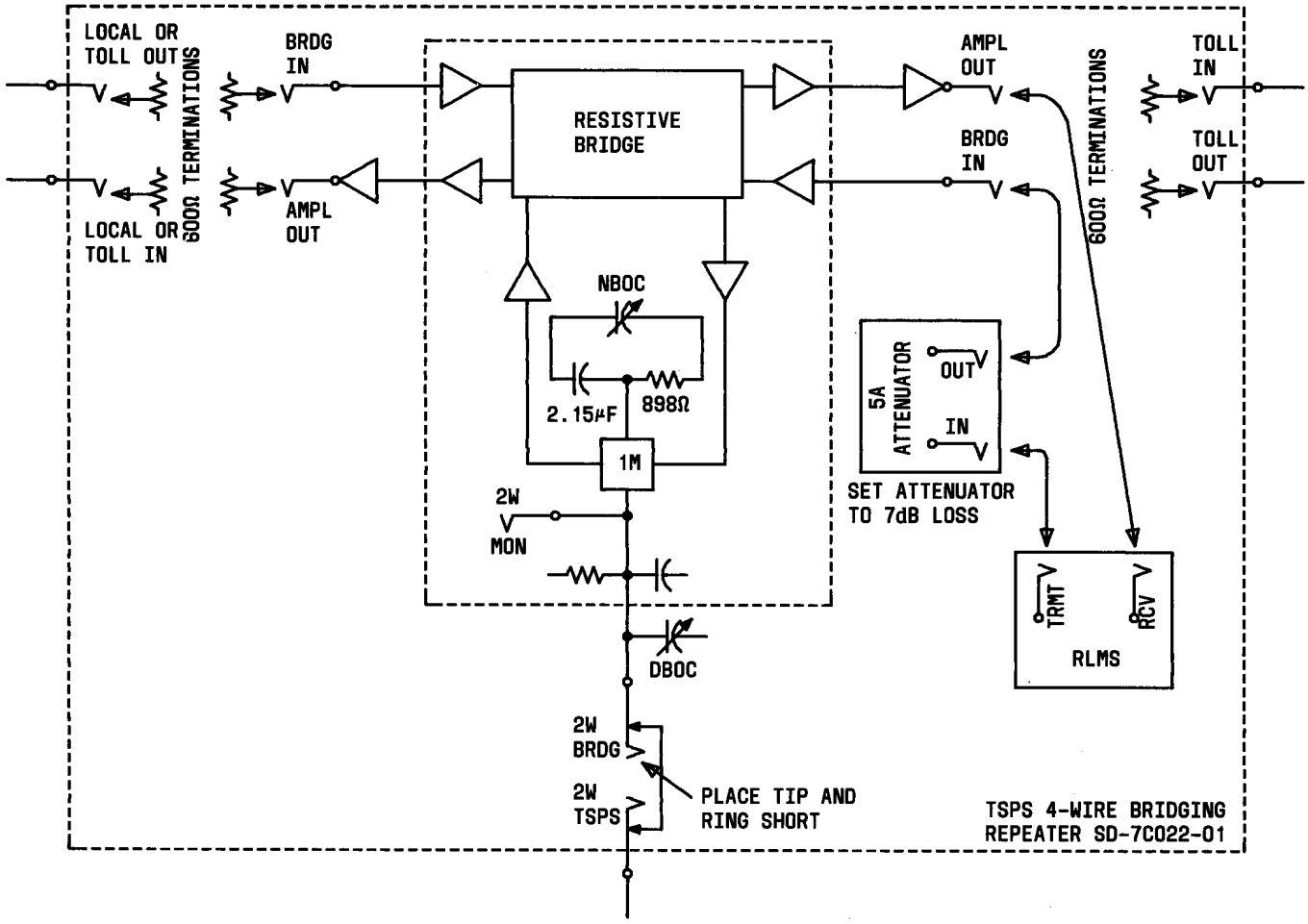

Fig. 5—Test Connection To A TSPS 4-Wire Bridging Repeater

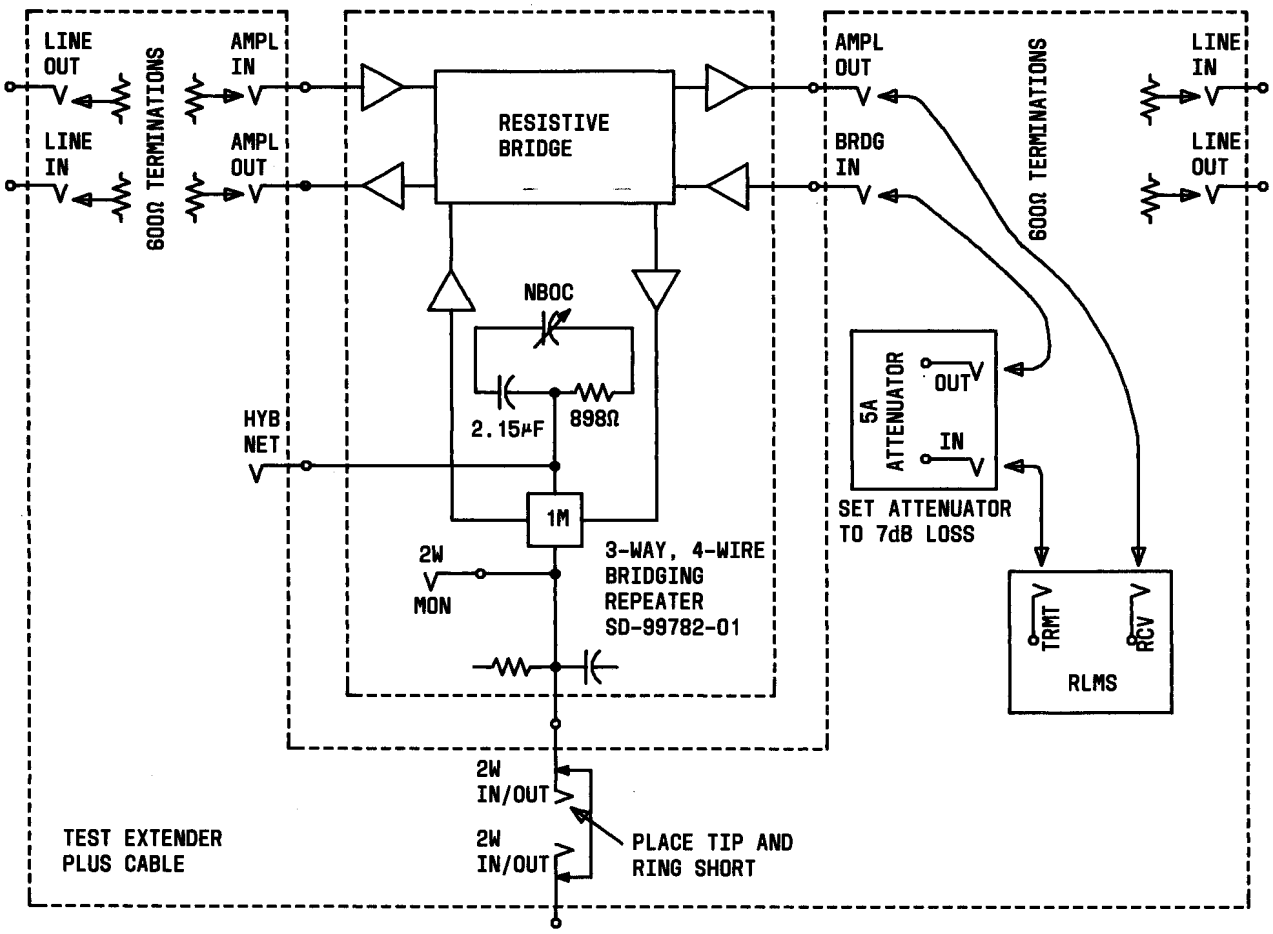

Fig. 6—Test Connection Via Test Extender For A 3-Way, 4-Wire Bridging Repeater

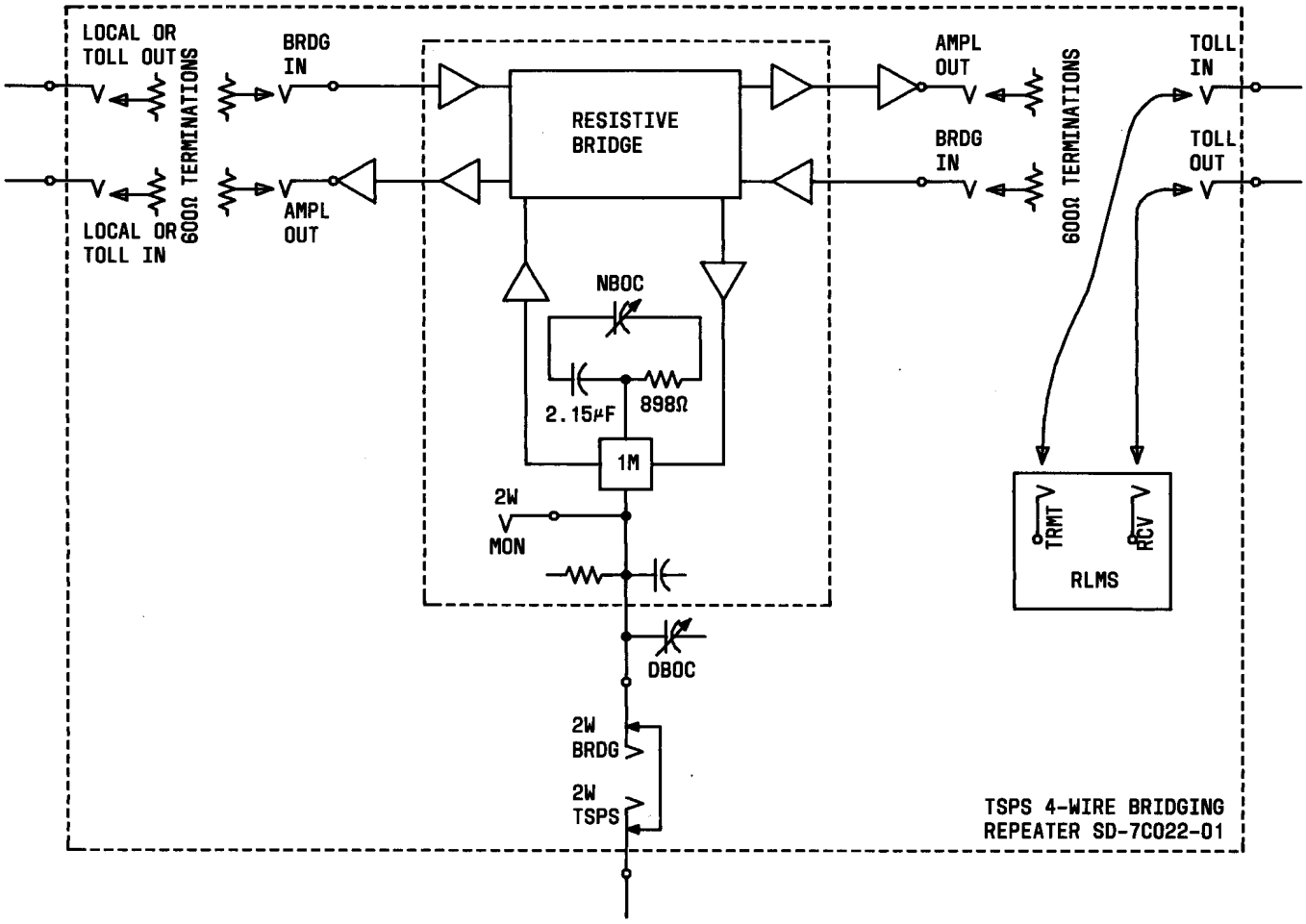

Fig. 7—Test Connection Via a TSPS 4-Wire Bridging Repeater To A Toll Office

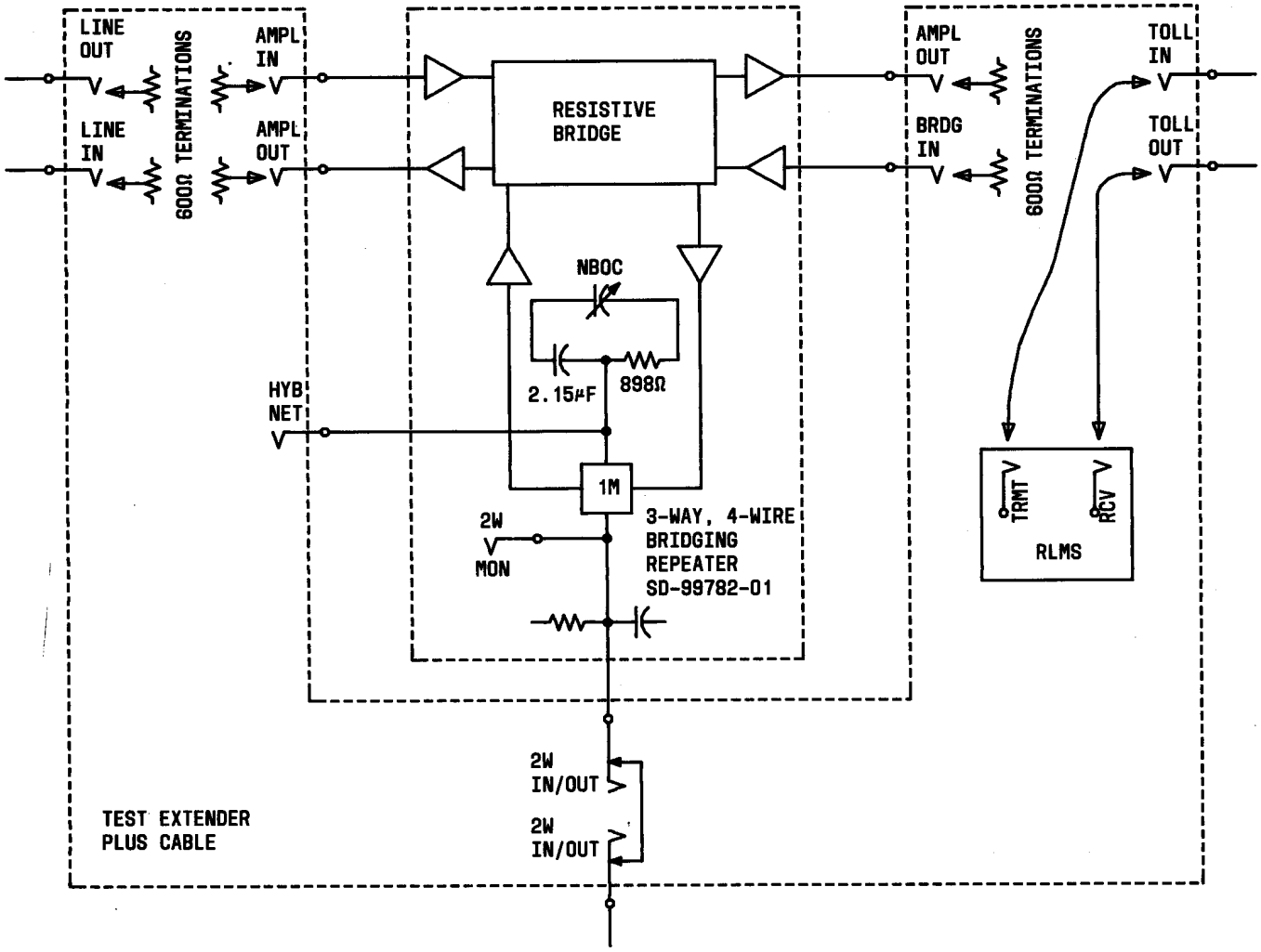

Fig. 8—Test Connection Via Test Extender To A Toll Office

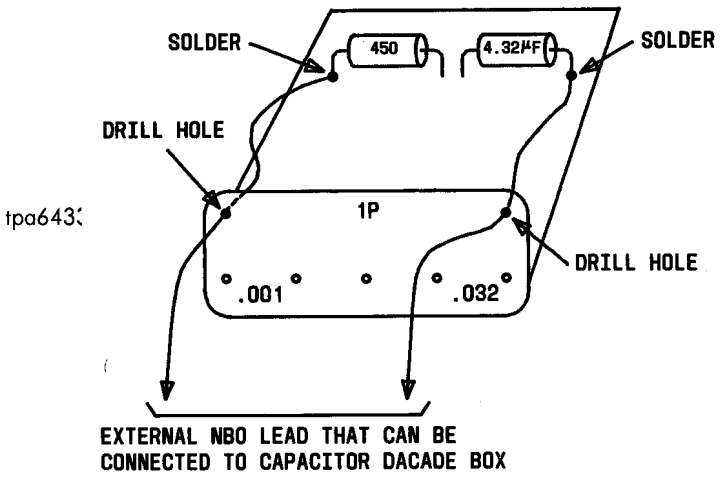

Fig. 9—Modification of A 1P 4WTS