

WESTERN ELECTRIC COMPANY MODEL KS-20501
RETURN LOSS MEASURING SET
DESCRIPTION AND OPERATION

	CONTENTS	PAGE
1. GENERAL	1
2. EQUIPMENT DESCRIPTION	1
3. OPERATION	4

1. GENERAL

1.01 This section describes the KS-20501 List 3 and 4 return loss measuring sets (RLMS).

1.02 This section is reissued to include detailed operating and calibration instructions. Due to the extensive revision, arrows ordinarily used to denote changes are not shown.

1.03 More detailed information and circuit descriptions not covered by this section may be found in the instruction manual. Manuals may be purchased from:

Bowmar/ALI, Incorporated
531 Main Street
Acton, Massachusetts 01720

1.04 Defective sets should be returned to the nearest Western Electric Service Center for repair.

2. EQUIPMENT DESCRIPTION

2.01 The KS-20501 RLMS is available in two configurations. The KS-20501 List 3 (Fig. 1) is a portable unit designed to measure either 2-wire or 4-wire return loss and requires 115 volt, 60-Hz power. The KS-20501 List 4, (Fig. 2) is a rack mounted unit for 4-wire return loss measurements only and requires -48 volt battery for operation.

2.02 The KS-20501, List 3 unit measures 8-3/4 inches high, 12 inches wide and 7-5/8 inches deep. With the cover, it weighs approximately 15 pounds. The KS-20501, List 4 unit measures 10 inches high, 11 inches wide, 6-1/4 inches deep and weighs approximately 12 pounds.

2.03 The control functions, except where noted, are identical for both units. The controls and their functions are listed below.

TEST TYPE—Allows selection of three internal filters for measuring return loss in three frequency bands or an external oscillator for measuring the unweighted return loss at a single frequency. The positions are designated ERL (Echo Return Loss for measurements between 560 Hz and 1965 Hz); SRL (Singing Return Loss for measurements between 260 and 500 Hz); SRL-HI (Singing Return Loss—High Frequency for measurements between 2200 Hz and 3400 Hz); and EXT OSC (External Oscillator for using an external signal source between 200 and 15 kHz).

TEST LOCATION—Configures the set for type of circuit being tested (2-wire or 4-wire) and permits compensation for level differences (transmit and receive) and line losses. Positions are: +23 dB, for voice frequency patch bays

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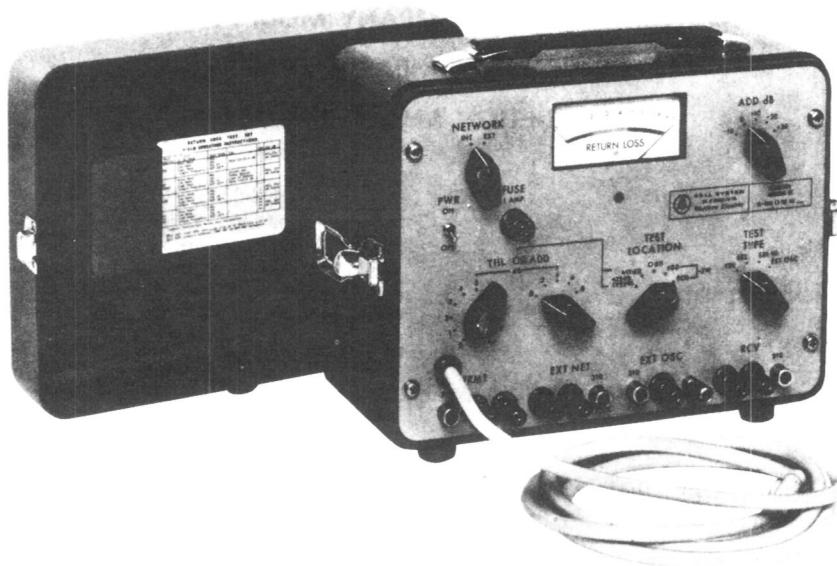


Fig. 1—KS-20501, List 3 Return Loss Measuring Set

(VFPB); +0 dB, for testing 4-wire terminating sets when line loss and transhybrid loss compensation is required; 0 dB, for testing 4-wire circuits when loss compensation is not required (4-type crossbar test frames); 600/900 2-WIRE for measuring return loss on 2-wire circuits with either 600 or 900 ohm impedance. The 2-WIRE positions are *not* available on the List 4 model.

NETWORK—This switch is on the List 3 model only and is used in conjunction with the 2-WIRE positions of the TEST LOCATION switch. Allows selection of an

internal balance network or the use of an external network while testing 2-wire circuits.

THL OR ADD—Two rotary switches which are used to compensate for up to 10.8 dB of line or transhybrid loss when the TEST LOCATION switch is in the +23 dB or +0 dB positions only.

ADD dB—Five-position rotary switch designated -10, 0, +10, +20, and +30 to allow on-scale meter readings. The switch setting is added to the meter reading for return loss measurements. Negative values indicate return gain.

PWR—Two-position toggle switch for connecting power to the set. Designated ON/OFF.

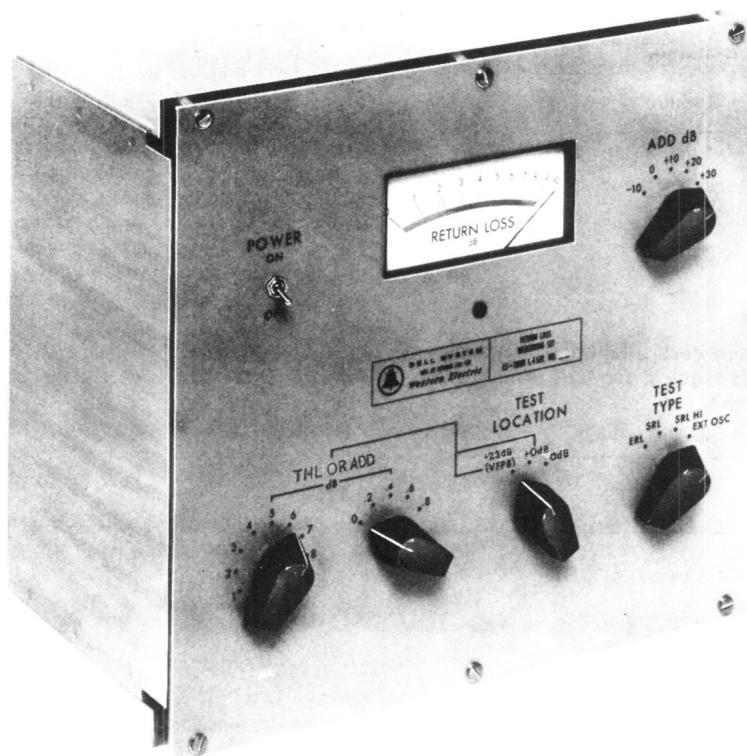


Fig. 2—KS-20501, List 4 Return Loss Measuring Set

2.04 Circuits are connected to the KS-20501, List 3 set for tests through jacks or binding posts on the front panel. The jacks accept 310-type plugs and the binding posts accept General Radio 938-type plugs or equivalent or spade lugs. The jack groups are designated as follows:

TRMT—Output signal for 4-wire tests and the only connection required for 2-wire tests.

RCV—Receives the test signal on 4-wire circuits.

EXT OSC—Used to connect an external signal source for return loss measurements when the TEST

TYPE switch is in the EXT OSC position. Input level of the source should be approximately -3 dBm with an impedance of 600 ohms.

EXT NET—Permits substitution of an external network in place of the internal network for 2-wire measurements. NETWORK switch must be in the EXT position.

2.05 All connections to the rack-mounted KS-20501, List 4 RLMS are made via an Amphenol connector on the back panel. The connections serve the same functions as in the List 3 model

except 2-wire functions are not provided. Pin connections are as follows:

Function	Pin Numbers
RCV	1 and 5
TRMT	4 and 8
Ground	6 and 7
-48 volts	2
EXT OSC input	3

2.06 A bay framework adapter assembly per ED-99987 is required for rack mounting the KS-20501, List 4 unit.

3. OPERATION

3.01 Operation of the KS-20501 RLMS is straight forward. Fig. 3 is a block diagram of the List 3 or 4 unit set up for 4-wire measurements. Fig. 4 is a block diagram of the List 3 unit set up for 2-wire measurements. Three procedures are described for return loss tests. The first describes testing 4-wire circuits; the second is for testing 2-wire circuits; and the third is for tests using an external signal source. Procedures for the List 3 and List 4 models are identical. (2-wire tests cannot be made with the List 4 RLMS).

3.02 The procedure for testing 4-wire circuits is as follows:

STEP	PROCEDURE
1	Set PWR switch to ON.
2	Set TEST TYPE switch to desired test (ERL, SRL, SRL-HI, or EXT OSC); for EXT OSC position see procedure in 3.06.
3	Set TEST LOCATION switch to proper position (+23 dB for VFPB; +0 dB for hybrid tests; or 0 dB when testing from 4-type crossbar test frames).
4	Set ADD dB switch to 0.
5	Connect TRMT jack to transmit side of circuit to be tested (see Fig. 5).
6	Connect RCV jack to receive side of circuit to be tested (see Fig. 5).
7	When using the +23 dB or +0 dB position on the TEST LOCATION switch: <ol style="list-style-type: none"> Short the tip and ring on the 2-wire side of the hybrid. Adjust the THL OR ADD controls for a 0 dB indication on the meter. If a 0 dB indication cannot be obtained in (b), set the ADD dB switch to the -10 position and readjust THL OR ADD controls. Return loss measurements must be reduced by 10 dB for correct readings. Remove short from 2-wire side.
8	Terminate the distant end of the circuit in the proper impedance.
9	Adjust the ADD dB switch for an on-scale meter indication.

STEP

PROCEDURE

- 10 Read the corrected return loss by adding the meter reading to the ADD dB switch setting.

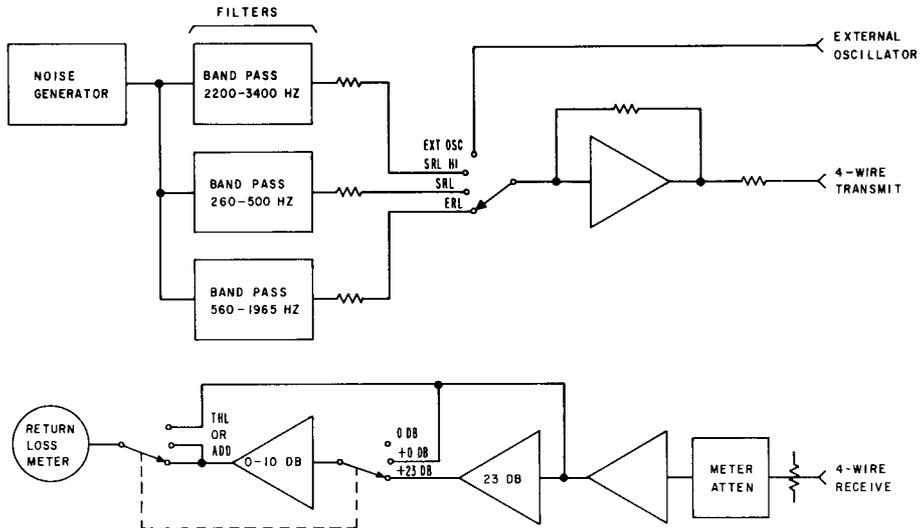


Fig. 3—Block Diagram of KS-20501 List 3 or 4 Setup for 4-Wire Measurements

3.03 This completes the procedures for measuring the return loss on 4-wire circuits. If other tests are required in addition to the original selection in Step 2, select the next test desired and read the return loss as described in Steps 9 and 10.

3.04 The following procedure is used when making 2-wire return loss tests with the KS-20501 List 3 RLMS.

STEP

PROCEDURE

- 1 Set PWR switch to ON.
- 2 Set TEST LOCATION switch to 2W/600 or 900 depending on impedance of the circuit being tested.
- 3 Set TEST TYPE switch to test desired. (ERL, SRL, SRL-HI, or EXT OSC).

STEP

PROCEDURE

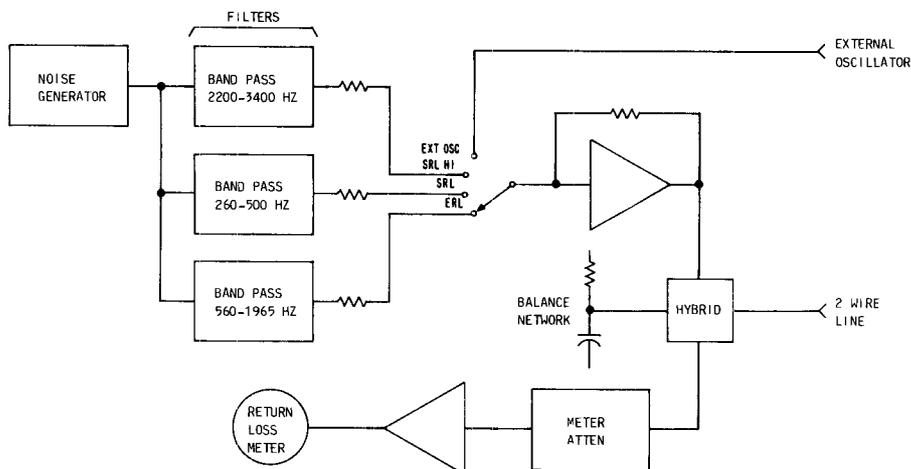


Fig. 4—Block Diagram of the KS-20501 List 3 RLMS Setup for 2-Wire Measurements

Note: If the EXT OSC position is selected, follow procedures in 3.06.

- 4 Set the NETWORK switch to the INT position to use the internal balance network for measurements. If an external network is to be used set the NETWORK switch to EXT and connect the network to be used to the EXT NET jacks with the appropriate cords.
- 5 Connect the 2-wire circuit to be tested to the TRMT jacks with the appropriate cord.
- 6 Adjust the ADD dB switch for an on-scale meter reading.
- 7 Read the return loss by adding the setting of the ADD dB switch to the meter reading.

3.05 This completes the procedures for 2-wire return loss measurements. If tests other than the one originally selected in Step 3 are required, select the test desired with the TEST TYPE switch and read the result as in Step 7.

3.06 The following procedure is to be used any time an external signal source is used for return loss tests. It is necessary to calibrate the KS-20501 RLMS for the signal source used to prevent inaccurate measurements.

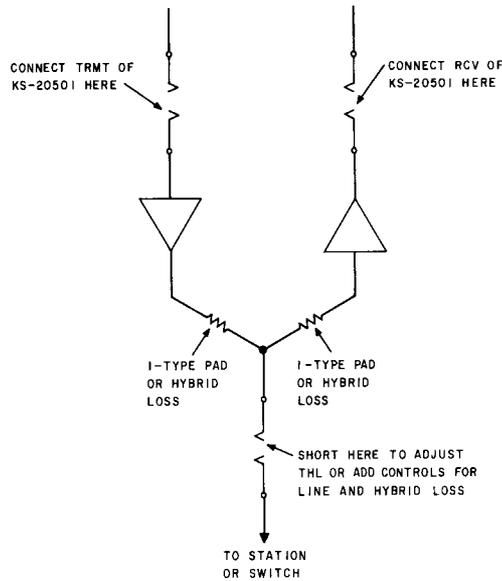


Fig. 5—Test Configuration for 4-Wire Circuits

STEP	PROCEDURE
1	Set PWR switch to ON.
2	Set TEST TYPE switch to EXT OSC.
3	Set ADD dB switch to 0.
4	Go to Step 5 for 4-wire tests; for 2-wire tests, go to Step 10.
5	Set the TEST LOCATION switch to the 0 dB position.
6	Connect the TRMT jack to the RCV jack with the appropriate cord.
7	Connect the external signal source (600 ohm impedance) to the EXT OSC jack with the appropriate cord (approximately -3 dBm level).
8	Adjust the signal source output level for a 0 dB meter indication.
9	The KS-20501 RLMS is now calibrated for 4-wire tests using an external signaling source. Remove the connection between the TRMT and RCV jacks and perform the tests as described in 3.02.

STEP	PROCEDURE
10	Set the NETWORK switch to the INT position or if an external network is to be used, set the switch to EXT and connect the network to the EXT NET jack with the appropriate cord.
11	Set the TEST LOCATION switch to the 600 or 900 position depending on the circuit impedance.
12	Connect the external source to the EXT OSC jacks with the appropriate cords (600-ohm impedance and approximately -3 dBm level).
13	Adjust the external source output level for a 0 dB meter indication.
14	The KS-20501, List 3 RLMS has now been calibrated for 2-wire tests using an external signal source. Perform tests as described in 3.04.
