

**TELEPHONE TEST METER**  
**HEWLETT-PACKARD MODEL 3555A**  
**MODIFIED FOR PICTUREPHONE USE**  
**DESCRIPTION, OPERATION, AND MAINTENANCE**

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**1. GENERAL**

**1.01** This section contains a general description, method of operation, and the maintenance procedures for the Hewlett-Packard Model 3555A telephone test meter modified for PICTUREPHONE® use. The modified HP3555A is intended for use in the wideband mobile test bay, the 15A local test desk, and the 23A testboard in maintaining PICTUREPHONE trunks and loops.

**1.02** The HP3555A test meter has been modified to restrict its use for making terminated measurements at 100 ohms and to provide results in terms of dBV. The modification consists essentially of the following changes:

- (1) Addition of an impedance matching network to provide 100Ω input impedance
- (2) Disabling of the input and function switches
- (3) Modification of the meter and the RANGE switch scales to read in dBV. The DBRN scale on the meter has been obliterated

- (4) Rearrangement of the input circuit to permit only one input connection to be made at a time
- (5) Addition of a terminal strip, accessible through a hole in the rear of the case, for screw-type input connections
- (6) Disabling of the battery check feature
- (7) Disabling of the weighting switch so that the meter operates in a flat response condition
- (8) Changing the case to facilitate mounting in the testing facilities enumerated in 1.01.

**1.03** The modified HP3555A has a measuring range of -60 to +50 dBV over a frequency range of 30 Hz to 1 MHz.

**1.04** Although the modified HP3555A test meter can be operated from either 48-Vdc central office battery or from 115/230 Vac, it is always operated from 115 Vac when used in the facilities noted in 1.01. A 0.15-A, slow-blow fuse is used to protect the test meter during ac operation.

**Warning:** *To protect operating personnel from possible electrical shock, the test meter case is connected to ground through the ground lead in the 3-conductor power cable. The test meter should never be operated in an ungrounded condition.*

**1.05** Connection to the modified HP3555A is made through a terminal strip (TS-1) mounted on the rear of the test meter. Jacks accepting 241-, 309-, or 310-type plugs are also available for cord connection to the front of the meter.

**Note:** If jacks are used for external connection, the internal connection between TS-1 and the input of the meter will be opened.

**1.06** The discussion in this section is limited primarily to the use of the modified HP3555A in maintenance of PICTUREPHONE trunks and loops. Standard features not affected by the modifications are touched upon only lightly. For a more detailed discussion, reference should be made to the manufacturer's Operating and Service Manual.

## 2. CONTROLS, INDICATORS, AND CONNECTORS

**2.01** Figure 1 illustrates the panel controls, indicators, and connectors on the meter and those items which are affected by the modification and of those whose function may not be clear in the illustration.

**2.02** The meter is a taut-band individually-calibrated meter with shaped pole pieces to provide a linear indication in dBV with a resolution of 0.1 dBV. The green arc marked BAT GOOD is nonfunctional, since the function switch used to check the battery has been disabled during the modification of the set.

**2.03** A set of jacks accepting 241-, 309-, and 310-type plugs is provided following the input terminal strip TS-1. These jacks have been rewired using normalled contacts so that the insertion of a plug in any one disconnects the circuit connected to TS-1. These INPUT jacks provide for external cord connections to be made to the test meter if this should be desirable.

**2.04** A set of multiple jacks accepting 309- or 310-type plugs and a pair of special clip posts marked T and R (DIAL/AC MON) are also provided for monitoring the ac output of the test meter. The dialing function has been made inoperable.

**2.05** The S and G binding posts accept banana plugs, spade lugs, phone tips, or bare wires for connection to case ground (G) and the sleeves (S) of all INPUT and DIAL/AC MON jacks.

## 3. CIRCUIT DESCRIPTION

**3.01** Following is a general description of the circuitry for the modified HP3555A. Detailed

description of the circuit before modification can be found in the Hewlett-Packard Operating and Service Manual supplied with the HP3555A. A block diagram of the circuit is shown in Fig. 2.

**3.02 Input Circuit:** The input circuit provides for connecting the circuit to be tested to terminal strip TS-1 in the rear of the modified HP3555A. TS-1 is connected through contacts of a series of normalled INPUT jacks, designated J1 (309-type); J2 (310-type); and J3, J4 (241-type) to the impedance matching network. This arrangement prevents more than one connection being made to the input circuit and, hence, avoids double terminations.

**3.03 Impedance Matching Network:** The impedance matching network is added to the HP3555A to provide a balanced 100 $\Omega$  input impedance required for PICTUREPHONE tests. It also reduces the effects of high longitudinal voltages on the accuracy of the test meter and provides dc blocking. The network is shown in Fig. 3.

**3.04** C1 and C2 are provided to block dc voltage from the network. R5, R6, R7, and R8 form a pad which is used to mask impedance irregularities caused by the transformer and equalizer circuit which follows. The equalizer circuit (R1, L1, R2, R3, C3, and C4) is used to equalize the frequency characteristic of the transformer (T1). T1 isolates the input to the test meter from the effects of values of longitudinal noise to prevent overloading of these circuits. R4 is added to the output to provide a 100 $\Omega$  load.

**3.05** By locking the input switch in the bridging position (see 1.02), the impedance bridged across R4 is approximately 100 k $\Omega$ . The design of the impedance matching network is such that, with the function switch locked in the 600 position the meter reads the voltage impressed across the input of the network directly in dBV.

**3.06 Input Attenuator, Differential Amplifiers, and Post Attenuator:** The RANGE switch in the modified HP3555A provides twelve steps from -60 dBV to +50 dBV. This switch controls the loss of the input attenuator, the gain of the differential amplifier, and the loss of the post attenuator as shown in Table A.

**3.07 Filter Assembly:** Part of the modification of the HP3555A consists of locking the

**TABLE A**  
**ATTENUATION AND DIFFERENTIAL AMPLIFIER GAIN**

RANGE (dBV)	INPUT ATTEN (dB)	DIFF AMPL GAIN (dB)	POST ATTEN (dB)
-60	0	40	0
-50	0	30	0
-40	0	20	0
-30	0	10	0
-20	0	0	0
-10	0	0	10
0	0	0	20
10	30	0	0
20	30	0	10
30	30	0	20
40	30	0	30
50	30	0	40

weighting switch in the flat response position. In this position, the output of the post attenuator is connected directly to the input of the meter amplifier. Therefore, there is no weighting of the signal and the entire passband of the modified HP3555A is utilized.

**3.08 Meter Amplifier:** The meter amplifier consists of an average detector amplifier, an average detector, a peak detector amplifier, a peak detector, and a meter driver. The input to the meter amplifier comes from the output of the filter assembly. In the meter amplifier, both the peak and the average of the signal are detected, amplified, and then combined and applied to the meter as an rms response. The peak detector of the meter amplifier also supplies a signal through the function switch to the DIAL jacks and can be used as an ac monitor.

**3.09 Meter (M-1):** The meter uses shaped pole pieces to provide a linear scale, which is calibrated to read in dBV. A damping circuit is provided to minimize meter variations when rapidly fluctuating signals are being measured.

#### 4. OPERATING INSTRUCTIONS

**4.01** Connection of the circuit to be tested to the input of the modified HP3555A is made by operating the appropriate keys or switches in the facility in which the test meter is mounted (refer to descriptive section covering the particular facility involved).

**4.02** The POWER switch should be operated to ON. A 15-minute warmup period is recommended.

4.03 The RESPONSE switch is operated to NORM.

4.04 Operate the RANGE switch to obtain an on-scale reading on the meter. The measurement result in dBV is the algebraic sum of the RANGE switch and the meter reading.

5. MAINTENANCE

5.01 The modified HP3555A is inspected, internally calibrated, and tested by the Hewlett-Packard Company before it is shipped for modification and incorporation into the PICTUREPHONE maintenance facilities. The test set is of a solid-state design and is expected to be extremely stable; therefore, frequent calibration is not required.

5.02 If maintenance is required at any time, the manufacturer's Operating and Service Manual should be consulted for maintenance, calibration,

or troubleshooting methods, however, it should be pointed out that the manufacturer's manual was written for the Model 3555A and not the modified version. Should field maintenance be required, it will be necessary to disconnect the impedance matching network and connect the INPUT jacks to the function switch assembly. The procedures in the Operating and Service Manual may then be used taking into account the difference in the RANGE switch of the modified meter as compared with that shown in the manual. Also, with the impedance matching network removed, readings will be in dBm instead of dBV.

5.03 The modified HP3555A test meter may be sent to Western Electric Service Centers for necessary repairs if desired. It is recommended that the test meter be returned to the service center every 24 months for calibration under the Red Ball plan.

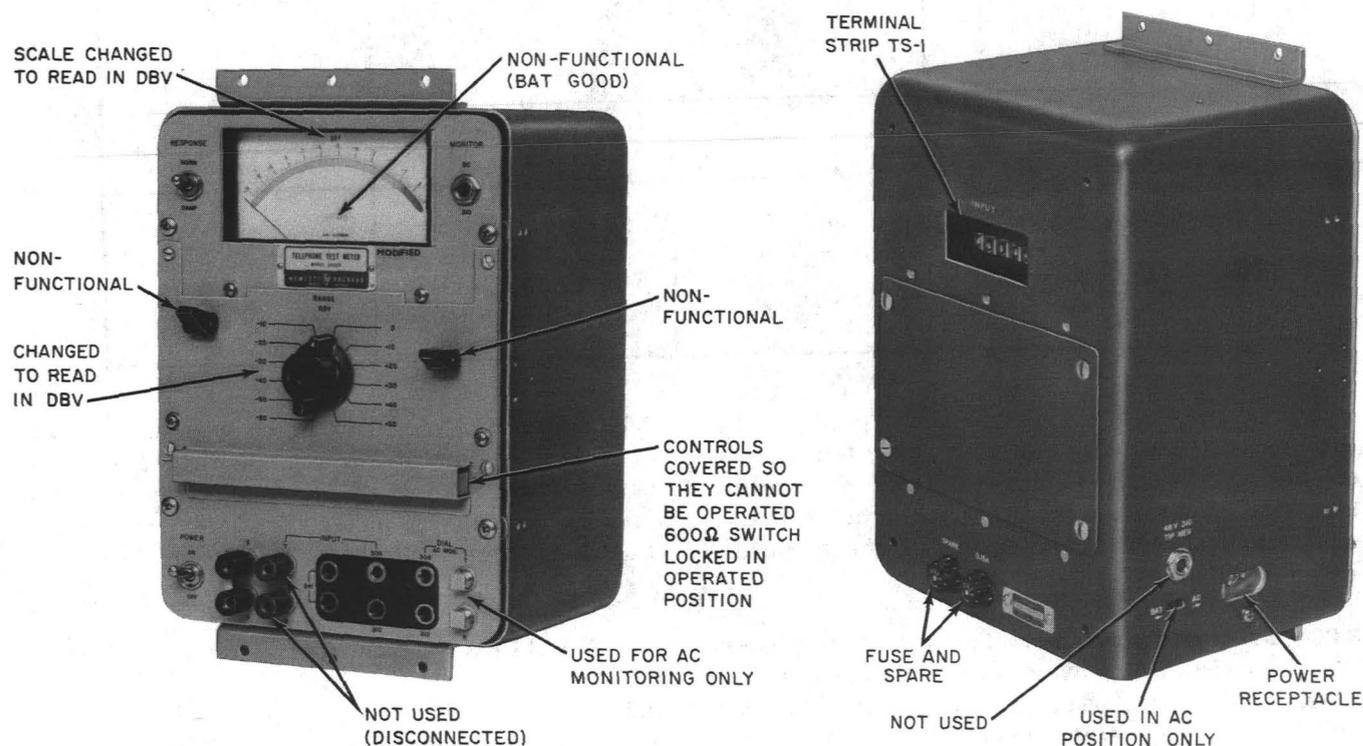


Fig. 1—Front and Rear View of Modified HP3555A

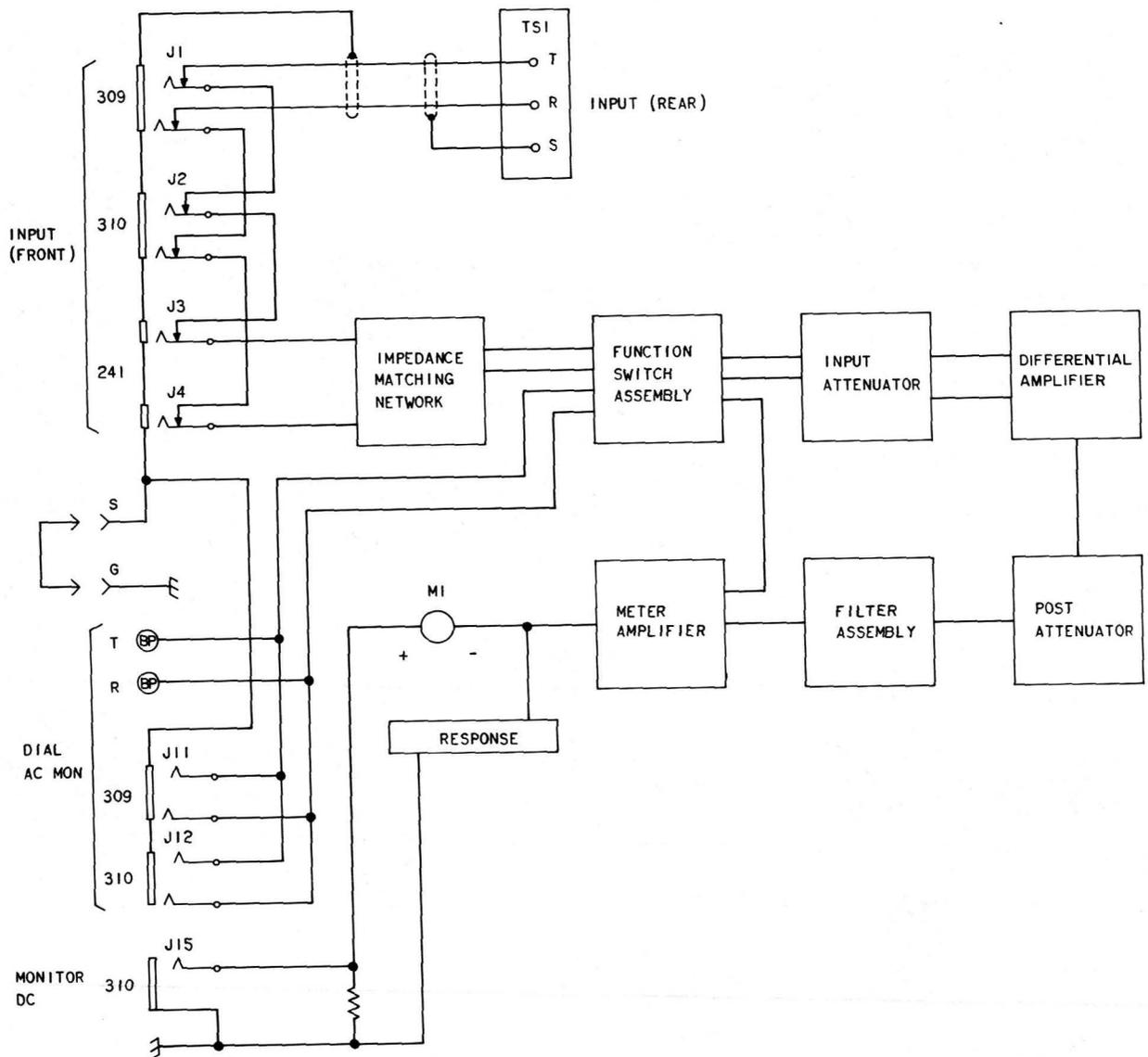


Fig. 2—Block Schematic of Modified HP3555A

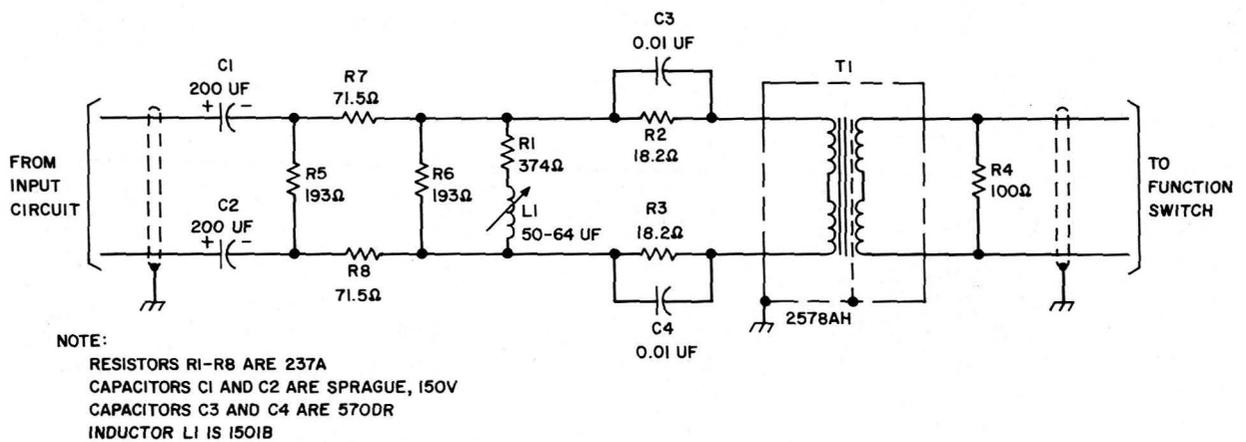


Fig. 3—Impedance Matching Network—Schematic Diagram