1P AND 1R TERMINATING SETS

DESCRIPTION

CONTENTS PAGE

1. GENERAL

1.01 This section describes the 1P and 1R terminating set. These sets, which mount in the 24V4 repeater, are used in the traffic service position system (TSPS), remote trunk arrangement (RTA), coin detection and announcement system, and position subsystem No. 2 (PSS No. 2).

1.02 This section is reissued to include information on the 1R terminating set. Arrows normally used to indicate changes have been omitted.

1.03 The 1P and 1R terminating set 2-wire port is high impedance and may be bridged onto 2-wire 900-ohm trunks or other circuits of similar impedance with a negligible effect on the circuit being bridged.

1.04 Gain in the 227-type amplifiers associated with the 24V4 repeater overcomes the loss of the 1P and 1R terminating set hybrid and sets the levels of the 4-wire 600-ohm circuit connected to the TSPS operator position.

1.05 The 1P and 1R terminating sets consist of a 2-transformer hybrid arrangement and a balancing network which includes a compromise network (COMP NET) and network build-out capacitors (NBOC's).

1.06 An idle circuit termination of 450 ohms + 4.32 μF must be connected to terminate the 1P terminating set 2-wire port when the terminating set is not connected to a trunk. For the 1R terminating set, a termination of 481 ohms + 4.32 μF is required for an idle circuit condition. This is necessary to prevent singing due to the hybrid unbalance that occurs without a termination.

2. EQUIPMENT DESCRIPTION

2.01 The 1P terminating set is shown in Fig. 1. The 1R terminating set is the same in appearance as the 1P set except for the front panel markings. Each set is made up of components mounted on a printed wiring board housed in an aluminum can approximately 5-1/4 inches wide, 1-3/4 inches high, and 7 inches deep.

2.02 This terminating set is a plug-in unit equipped with a 20-pin connector which plugs into the TERM SET position of a 24V4 repeater or other special mountings. Tabs on the faceplate of the unit are available for removing the terminating set using a 602C or 602D tool.

2.03 Mounted on the faceplate are seven screw-type switches for adjusting the NBOC. Turning the screws down, or tightening them, adds the capacitance value indicated.

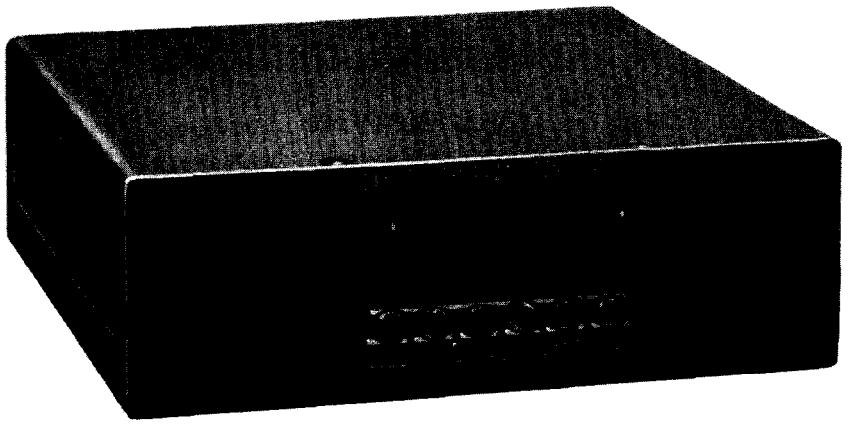


Fig. 1—1P Terminating Set

3. CIRCUIT DESCRIPTION

A. General

3.01 Figure 2 is a schematic of the 1P and 1R terminating sets. The circuit consists of a 2-transformer hybrid circuit, a COMP NET, NBOC, and screw-type switches for adjusting the NBOC.

3.02 Speech signals from the 2-wire circuit at terminals 12 and 13 pass through the windings of transformers T1 and T2 which are in series with the termination resistor R1 and blocking capacitor C1. Approximately one half of the speech signal power is dissipated in R1, and the rest of the signal power passes through the T1 and T2 transformer windings to the 4-wire interface (terminals 2 and 3, and 19 and 20). The power induced at terminals 2 and 3 is blocked by the receive amplifier's output circuit. The power induced at terminals 19 and 20 is transmitted to the transmitting amplifier of the 24V4 repeater and then to the TSPS operator position. The voltages induced across the COMP NET are canceled as the transformer windings are series opposing; therefore, no power is transmitted to the balancing network under ideal conditions.

3.03 Speech signals from the TSPS operator are amplified by the receive amplifier of the 24V4 repeater and conducted to terminals 2 and 3 of the 1P/1R terminating set and then to receiving windings of transformer T2. The signal is induced into the windings of transformers T1 and T2. The signal is then induced into the 2-wire load connected to terminals 12 and 13, and the COMP NET. Assuming that the balancing network impedance is the same as the 2-wire line impedance, the signal at terminals 19 and 20 is zero. Therefore, under ideal conditions, one half of the power received by the 1P/1R terminating set from the TSPS position is dissipated in the 2-wire circuit and the other half is dissipated in the balancing network, with no power being transmitted to the 4-wire transmit path.

B. Hybrid Circuit

3.04 The hybrid circuit is composed of transformers T1 and T2, resistors R1 and R2, and capacitors C1 and C2. The impedance of the hybrid coils on the 2-wire side is approximately 6000 ohms. The impedances of the 4-wire transmit and receive legs of the terminating set are 600 ohms.

C. Balancing Network Circuit

3.05 For the 1P terminating set, the balancing networks include a fixed COMP NET made up of R3, C3, C4, and C5. The COMP NET of the 1R terminating set differs from the 1P in that the COMP NET resistance consists of a resistor (R3) and a factory adjusted potentiometer (R4). The R3-R4 combination in the factory manufactured version of the 1R terminating set has a total resistance of 481 ohms. The 1R terminating set can also be a field modification of the 1P terminating set in which the 450-ohm COMP NET resistor, R3, is replaced by a 481-ohm resistor. The COMP NET is designed to match the 450 ohms (1P) or 481 ohms (1R) + 4.32 μF impedance of the connecting trunk circuit or the idle circuit termination,

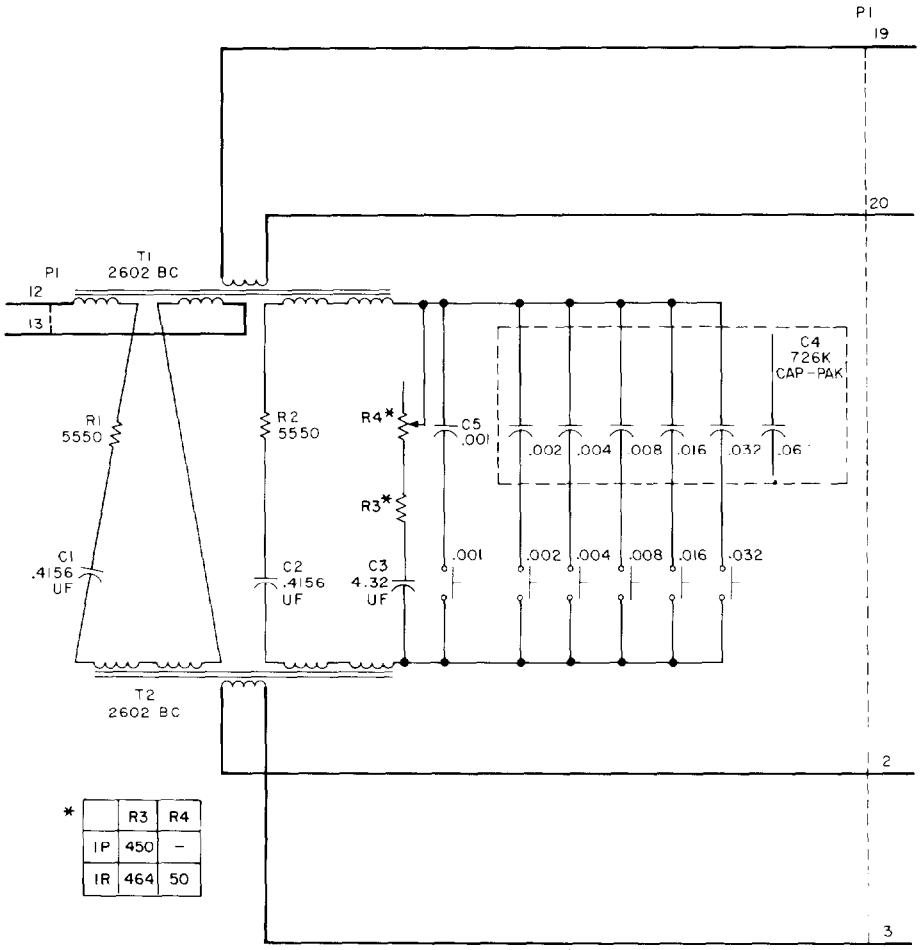


Fig. 2—1P/1R Terminating Set Schematic

whichever is connected. The NBOC, which is the same in both the 1P and 1R, is adjustable from 0 to .063 μF in .001 μF steps. It is used to balance office cabling between the terminatng set and the bridging point or other connected equipment.

4. TRANSMISSION PERFORMANCE

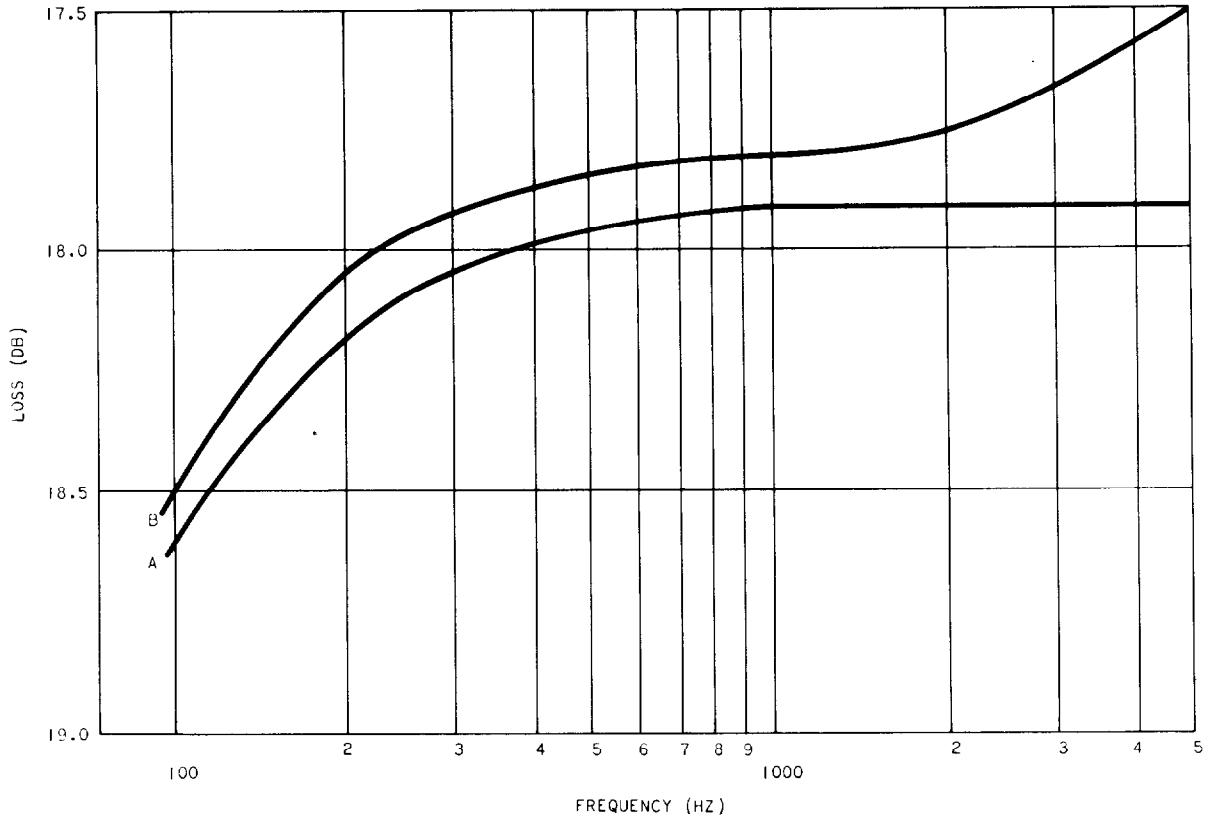
A. 1P/1R Terminating Set Transducer Loss

4.01 Typical loss/frequency transmission characteristics are shown in Fig. 3. Curve A displays the losses from the 2-wire port to the 4-wire transmit port. Curve B displays the losses from the 4-wire receive port to the 2-wire port. The small difference in loss between the two directions of transmission is caused by winding capacitance differences in the transformers and is not objectionable from a transmission standpoint. The loss frequency curves shown are representative of an average 1P/1R terminating set. Individual unit loss frequency characteristics may vary slightly from those shown in Fig. 3.

4.02 The loss frequency measurements are made with 900-ohm test equipment bridged with a 900-ohm resistor at the 2-wire port (450-ohm effective impedance) and 600-ohm test equipment at the 4-wire ports.

B. Transhybrid Loss

4.03 Transhybrid loss is the loss between the 4-wire receive and transmit ports of the terminating set, with the 3-wire port terminated in 450 ohms (1P) or 481 ohms (1R) in series with a 4.32 μF



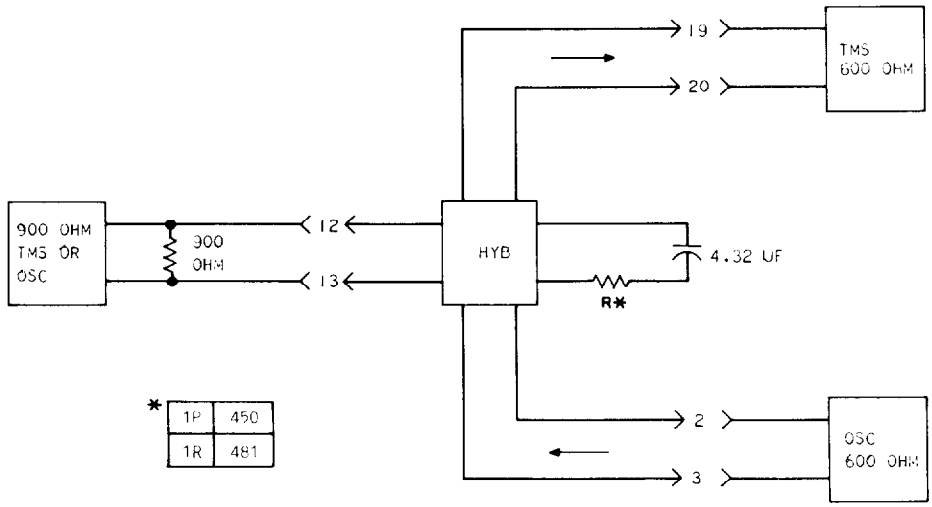


Fig. 3—1P/1R Terminating Set Transducer Characteristics

capacitor. The testing arrangement for measuring transhybrid loss is shown in Fig. 4.

4.04 The transhybrid loss of the 1P/1R terminating set is greater than 63 dB throughout the 200- to 3400-Hz frequency band.

C. Longitudinal Balance

4.05 The 2-wire windings of transformers T1 and T2 are accurately balanced to suppress the generation of metallic noises induced by longitudinal currents in the cable connected to the 2-wire port.

4.06 Longitudinal balance of the 1P/1R terminating set is typically greater than 70 dB.

D. 2-Wire Impedance and Bridging Loss

4.07 The hybrid of the 1P/1R terminating set has a nominal 2-wire impedance of 6000 ohms. The 5550-ohm resistor R1 and .4156 μF capacitor C1, in series with the 2-wire circuit, raise the 2-wire port impedance at terminals 12 and 13 to approximately 11,550 ohms, when the 4-wire transmit and receive ports are terminated in 600 ohms.

4.08 The 1P/1R terminating set causes 0.3 dB or less bridging loss when bridged on a 900-ohm 2-wire circuit.

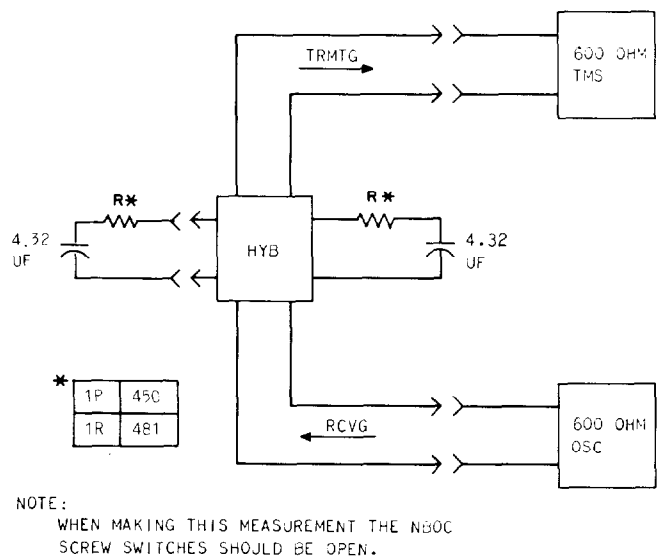


Fig. 4—Transhybrid Loss Measurement of 1P/1R Terminating Set