1J TERMINATING SET
DESCRIPTION

CONTENTS PAGE

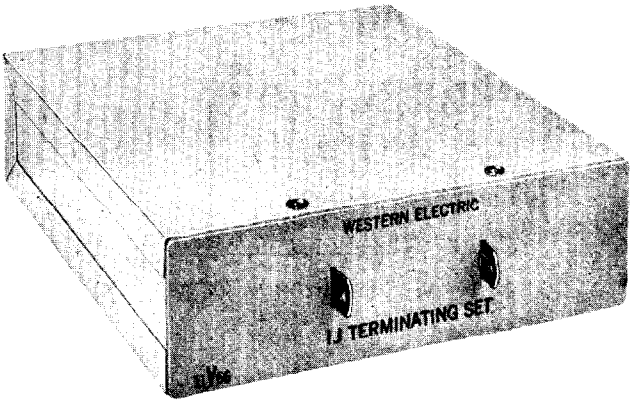

Fig. 1—1J Terminating Set—Front View

1. GENERAL

1.01 This section describes the 1J terminating set for use in the 424V4A repeater as part of the Traffic Service Position System (TSPS) No. 1 operator cut-through circuit. The 1J terminating set and the associated 424V4A repeater provide means for connecting a 4-wire TSPS trunk circuit to the trunk link of the TSPS switching network. The amplifiers in the repeater provide gain to compensate only for the bridging loss of the hybrid.

1.02 The 1J terminating set consists of a 2-transformer hybrid, a resistive balancing network, and on the 2-wire side, wired-in resistive termination.

2. EQUIPMENT DESCRIPTION

2.01 The 1J terminating set (Fig. 1) consists of components mounted on a printed-wiring board and housed in an aluminum can. The terminating set is approximately 5-1/4 inches wide, 1-3/4 inches high, and 7 inches deep.

2.02 The terminating set is a plug-in unit equipped with a 20-pin connector which plugs into a socket on the 424V4A repeater mounting shelf (J98615BK). Tabs are provided on the faceplate so that the terminating set may be removed from the shelf by means of a 602C or 602D tool.

3. CIRCUIT DESCRIPTION

A. General

3.01 The schematic of the 1J terminating set is given in Fig. 2. The circuit consists of a 2-transformer hybrid, a resistive balancing network, and on the 2-wire side, a resistive termination.

3.02 Speech signals from the 2-wire circuit enter the terminating set at terminals 12 and 13. Approximately one-third of the power is dissipated in resistor R1 with the remainder passing through the 5-7 windings of tranformers T1 and T2 and dividing equally in the two 4-wire loads connected to terminals 19 and 20 (transmit) and 2 and 3 (receive). Identical voltages are induced in each 6-8 winding of transformers T1 and T2. No signal enters the balancing resistor R2 because the windings are connected series opposing.

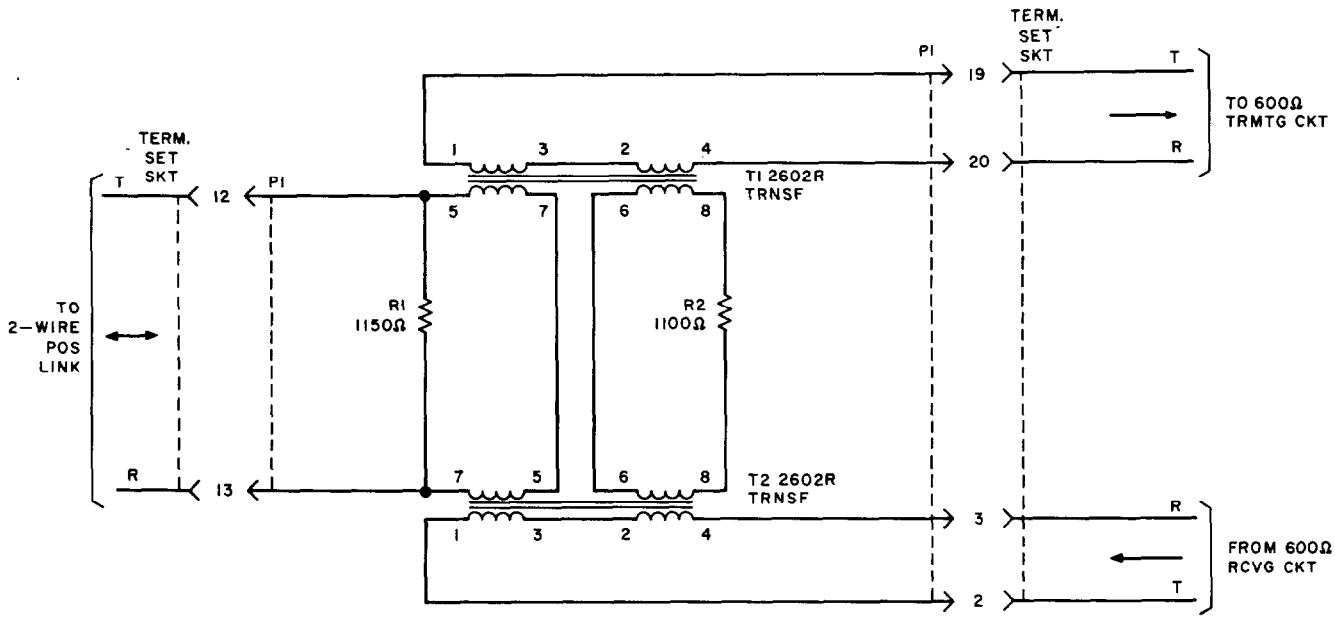

Fig. 2—1J Terminating Set—For Bridging on 600-Ohm 4-Wire Trunks—Schematic

3.03 Speech signals from the 4-wire receiving trunk circuit enter the terminating set at terminals 2 and 3. The signals pass through the series-connected 1-3 and 2-4 windings of transformer T2. Signal power divides, with half entering the balancing network (R2) and half entering the 2-wire circuit and wired-in termination R1. The useful power is delivered to the 2-wire load connected to terminals 12 and 13. Flux in the core of transformer T1 caused by current flow in the 6-8 winding is equal and opposite to the flux caused by current flow in the 5-7 winding. Thus, no voltage is induced in the transmit circuit (terminals 19 and 20). This ideal condition results when the impedance of the balancing network (R2) exactly matches the impedance connected to terminals 12 and 13 (including R1). The transhybrid loss from terminals 2, 3 to terminals 19, 20 is a measure of this balance and will be discussed in the transmission performance section.

B. Hybrid Circuit

3.04 The hybrid circuit consists of two 2602R transformers. With the two 4-wire legs terminated in 300 ohms (bridged on 600-ohm circuits), the 2-wire input impedance is required to be 450 ohms (so that the 4-wire trunk circuit will present the same impedance to the position link of TSPS No. 1 as the 2-wire trunk circuit). To meet this requirement, resistor R1 must be 1150 ohms. The balancing resistor R2 is set at 1100 ohms. This is a compromise value picked to give an acceptable transhybrid loss whether the 2-wire terminals 12 and 13 are open-circuited (as on standby), connected to the operator trunk via the position link, or connected with an assistance operator trunk also added to the position link. The actual values of transhybrid loss realized are given in the performance section.

4. TRANSMISSION PERFORMANCE

A. 2-Wire, 4-Wire Impedance and Bridging Loss

4.01 The 2-transformer type balanced hybrid has an impedance ratio of 1800:900 + 900 ohms. Designed to bridge on 600-ohm 4-wire trunks, the 2-wire side (terminals 12 and 13) has a nominal input impedance of 450 ohms, including the wired-in 1150-ohm resistor R1. When the 4-wire trunk circuit is on standby (not connected through link), terminals 12 and 13 are open-circuited. Under this condition the 4-wire impedance looking into either terminals 2 and 3 or 19 and 20 is 625 ohms, which gives a bridging loss in each side of the 600-ohm 4-wire circuit of 3.4 dB. The 4-wire input impedances of the 1J terminating set are 600 ohms when the 1J terminating set and the 1H terminating set (11,600 ohms) are connected together by the

TSPS switching network (see Fig. 3). The bridging loss to each side of the 4-wire TSPS trunk is 3.5 dB in this condition. If the assistance operator trunk (6800-ohm impedance) is added to this circuit across the 2-wire leg of the 1J terminating set, the 4-wire input impedances of the 1J terminating set become 570 ohms and the bridging loss to each side of the 4-wire TSPS trunk is 3.7 dB. These impedances, and the bridging losses, are essentially constant over the 300- to 3000-Hz frequency range.

B. Terminating Set Losses

4.02 Transformer losses add 1.0 dB of loss to the 2-wire to 4-wire transmission loss. When measured with a 600-ohm transmission measuring set, the transmission loss from the 2-wire side (terminals 12 and 13) to either 4-wire side (terminals 19 and 20 or 2 and 3) is 7.2 dB at 1000 Hz with no more than 0.1-dB loss variation over the 100- to 5000-Hz frequency range.

C. Transhybrid Loss

4.03 The transhybrid loss is measured using a 600-ohm transmission measuring set with the oscillator output connected to terminals 2 and 3 and the detector connected to terminals 19 and 20. To simulate standby circuit operating conditions, terminals 12 and 13 are open-circuited. The 1000-Hz transhybrid loss under these conditions is nominally 41.4 dB. With extreme combinations of the ±1 percent resistors R1 and R2, the 1000-Hz transhybrid loss can be 38.0 dB or 46.6 dB. When the TSPS operator circuit is used, a nominal impedance of 11,600 ohms is connected to terminals 12 and 13. Under these conditions the nominal 1000-Hz transhybrid loss is 40.4 dB. With a ±1 percent variation in resistors R1 and R2, the transhybrid loss can be 37.5 dB or 44.7 dB. When the assistance operator trunk is also connected, an additional nominal impedance of 6800 ohms is connected to terminals 12 and 13. Under these conditions the nominal 1000-Hz transhybrid loss is 28.7 dB. With a ±1 percent variation in resistors R1 and R2, the transhybrid loss can be 27.9 dB or 29.6 dB. When measuring transhybrid losses, measuring circuit and termination inaccuracies will modify the above computed losses. These should be taken into account in determining the acceptability of the terminating set. The variation of the transhybrid loss with frequency is less than 1 dB over the 200- to 5000-Hz frequency range for any of the above loads on terminals 12 and 13.

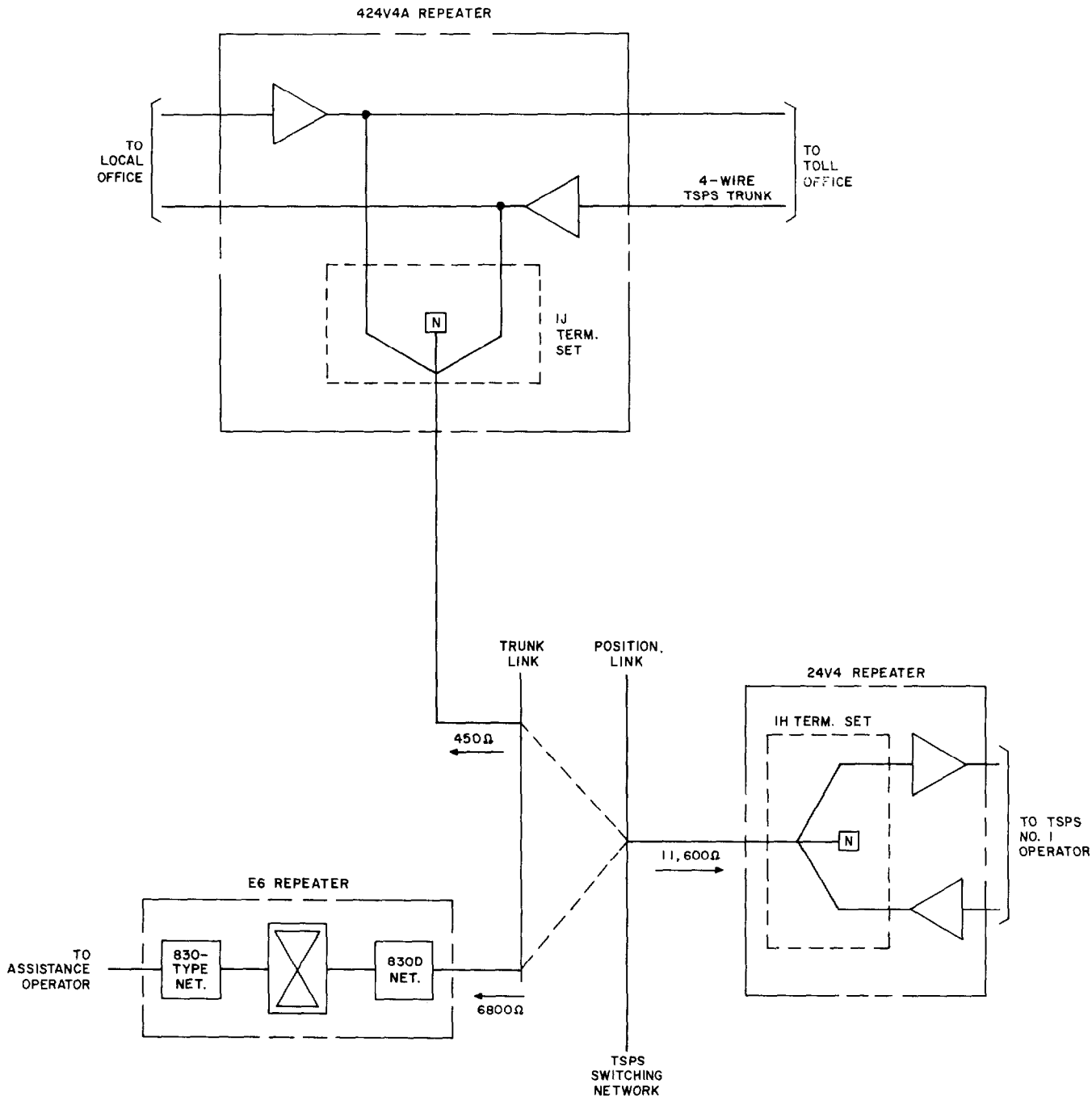

Fig. 3—TSPS No. 1 System—Block Diagram of Transmission Circuit