359F EQUALIZER

DESCRIPTION

1. GENERAL

1.01 This section describes the 359F equalizer, which is a plug-in unit designed to provide amplitude equalization in V4 telephone repeater applications.

1.02 This section is reissued to add Part 4, Application, and make other minor changes. Arrows normally used to indicate changes have been omitted.

1.03 The 359F equalizer is designed for use between 600-ohm transmitting and receiving repeater equipment and either 600-ohm circuits or short lengths of nonloaded cable where gain may or may not be required and where loop signaling arrangements are required. The 359F equalizer places on each line and equipment side of the repeater a 600:600-ohm transformer which is centertapped on the line side to derive a simplex leg of the cable pair. A small amount of loss equalization is produced by the variations (with frequency) of the impedance mismatch between the cable and the repeater circuit at the line junction and by the low-frequency loss in the transformer. The 1000-Hz power loss of each transformer is 0.5 dB.

1.04 Voiceband data systems have more stringent equalization requirements than voiceband message systems and should use the 359N equalizer instead of the 359F equalizer. See Section 332-116-113 for a description of the 359N equalizer.

2. EQUIPMENT DESCRIPTION

2.01 The 359F equalizer (Fig. 1) is a plug-in unit equipped with a 20-pin connector plug and can be plugged directly into the equalizer socket of the repeater mounting shelf.
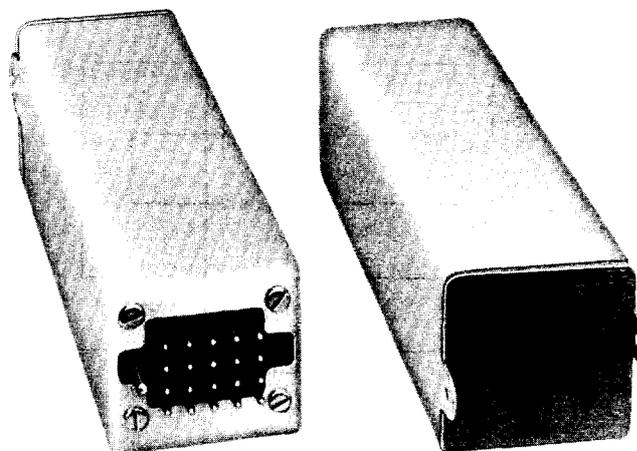

Fig. 1—359F Equalizer

2.02 The 359F equalizer consists of two transformers mounted on a printed wiring board housed in a metal can approximately 1-3/4 inches wide by 1-3/4 inches high by 7 inches long. Tabs on the front of the unit permit removal of the equalizer from the repeater mounting shelf by the use of a 602C or a 602D tool.

3. CIRCUIT DESCRIPTION

3.01 Figure 2 is a schematic illustrating typical circuit connections when the 359F equalizer is plugged into the equalizer socket of a 24V4 or

44V4 repeater. The transmitting side of the 359F equalizer connects the 600-ohm transmitting amplifier circuit output to the 4-wire line (600-ohm circuit or short lengths of nonloaded cable). The transmitting side is strapped to provide connections to the AMPL OUT and MON jacks and contains a 2586H 600:600-ohm transformer T1. The centertap of transformer T1 on the line side is brought out to terminal 10 to derive a simplex leg of the transmitting cable pair.

3.02 On the receiving side, transmission signals from the 4-wire line (600-ohm circuit or short lengths of nonloaded cable) enter the equalizer on terminals 2 and 4 and pass through the 600:600-ohm transformer T2 to the receiving amplifier circuit

input on terminals 1 and 3. The line side of transformer T2 (2586H) is centertapped and brought out to terminal 5 to derive a simplex leg of the receiving cable pair. The strap between terminals 6 and 9 in the equalizer provides the required circuit continuity in the receiving amplifier circuit to give an amplifier input impedance of 600 ohms.

3.03 Typical loss-frequency and delay-frequency characteristics of each transformer in the equalizer as measured between 600-ohm terminations are given in Table A.

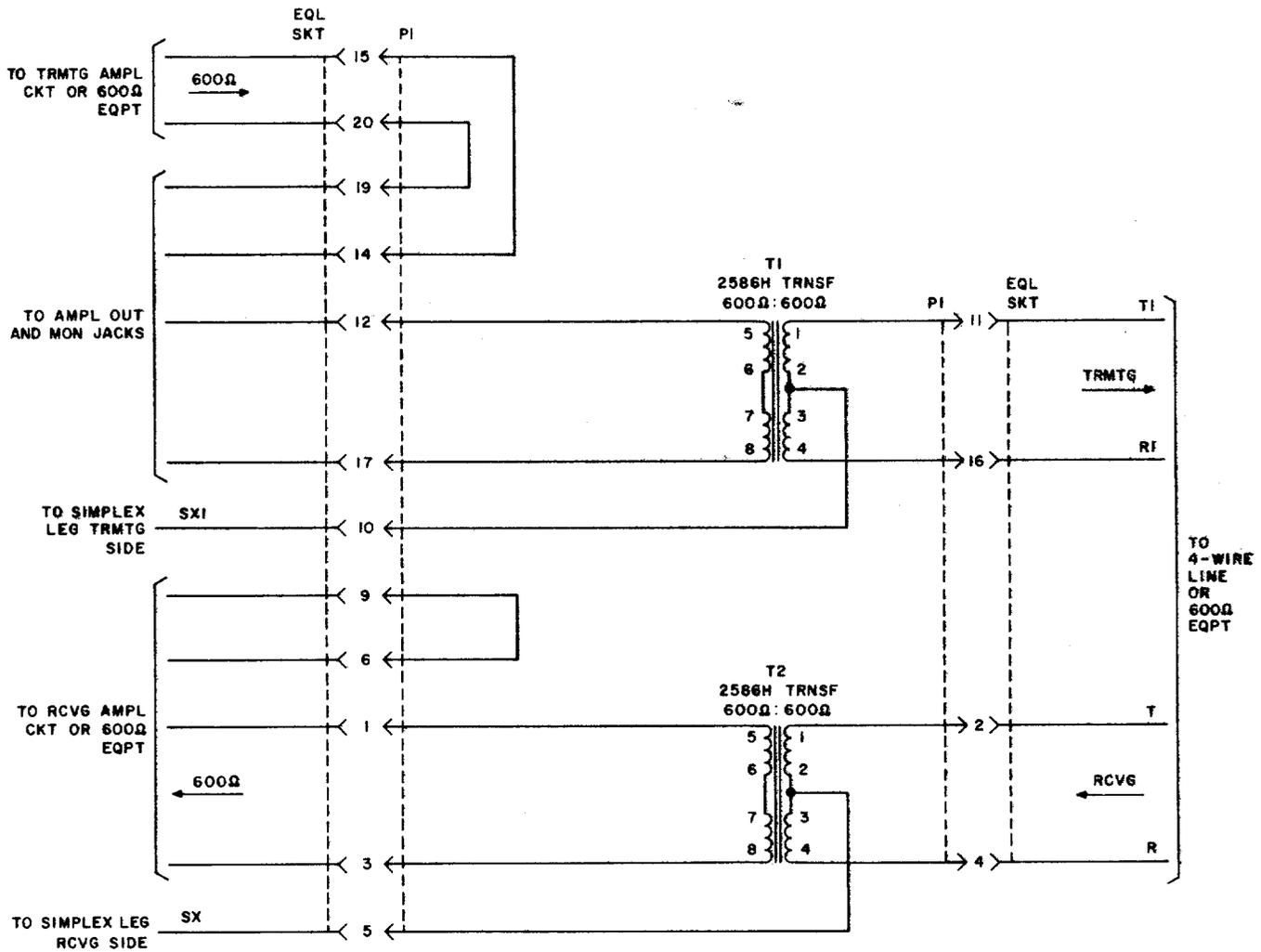**3.04** Cable transducer losses for the various gauges of nonloaded cable terminated in the

Fig. 2—359F Equalizer—Schematic and Typical Circuit Connections

TABLE A

FREQUENCY (Hz)	LOSS* (DB)	DELAY (Microseconds)
100	0.7	300
200	0.3	110
300	0.2.	50
400	0.1	32
500	0.1	20
700	0.1	13
1000	0.0	8
2000	—0.1	3
3000	—0.1	3

* Relative to 1000 Hz.

standard impedances are given in Section 304-305-100, Charts 1 through 5.

4. APPLICATION

4.01 The 359F equalizer is used to equalize short lengths of nonloaded 19, 22, 24, 25 (MAT), and 26 gauge cable. The equalizer may be used:

(a) At one end of the facility only

(b) At both ends of the facility

(c) At one end of the facility with a 359B equalizer at the other end.

4.02 The recommended applications for the 359F equalizer are given in Table B. The equalizer selection is based on the cable gauge, length, and desired equalization.

4.03 The cable lengths specified in Column 2 of Table B may be equalized with a 359F at only one end, assuming the other end is terminated in 600-ohm equipment. Slightly better equalization, however, is obtained by using equalizers at both ends.

4.04 With equalizers at both ends of the cable, as recommended in Table B, the net losses relative to the 1000-Hz loss can be kept between -0.5 dB and +1.0 dB for frequencies in the 300- to 3000-Hz band.

TABLE B

359F EQUALIZER APPLICATION CHART

NONLOADED CABLE TYPE	COLUMN 1 EQUALIZER LOSS (dB) REFLECTION LOSS (dB)		COLUMN 2 359F EQUALIZER ONE END OR BOTH ENDS OF FACILITY CABLE LENGTH (NOTES 1, 2, 4)		COLUMN 3 359F EQUALIZER ONE END 359B EQUALIZER OTHER END CABLE LENGTH (NOTES 1, 2)	
	359F	359B	FROM	TO	FROM	TO
All 19 gauge low capacitance	EQL 0.5 REFL 0.0	EQL 0.5 REFL 1.8	8.1 kft 1.5 MI 1.6 dB	10.0 kft 1.9 MI 2.1 dB	10.1 kft 1.9 MI 2.1 dB	20.0 kft 3.8 MI 4.3 dB
All 19 gauge high capacitance	EQL 0.5 REFL 0.1	EQL 0.5 REFL 1.8	7.1 kft 1.3 MI 1.6 dB	8.0 kft 1.5 MI 1.9 dB	8.1 kft 1.5 MI 1.9 dB	16.0 kft 3.0 MI 3.8 dB
All 22 gauge	EQL 0.5 REFL 0.0	EQL 0.5 REFL 1.8	4.1 kft 0.8 MI 1.4 dB	8.0 kft 1.5 MI 2.7 dB	8.1 kft 1.5 MI 2.7 dB	14.0 kft 2.7 MI 4.8 dB
All 24 gauge	EQL 0.5 REFL 0.0	EQL 0.5 REFL 2.5	3.1 kft 0.6 MI 1.4 dB	7.5 kft 1.4 MI 3.2 dB	7.6 kft 1.4 MI 3.2 dB	12.0 kft 2.3 MI 5.3 dB
All 25 gauge (MAT)	EQL 0.5 REFL 0.0	EQL 0.5 REFL 3.2	3.1 kft 0.6 MI 1.3 dB	8.0 kft 1.5 MI 3.5 dB	8.1 kft 1.5 MI 3.5 dB	12.5 kft 2.4 MI 4.4 dB
All 26 gauge	EQL 0.5 REFL 0.0	EQL 0.5 REFL 3.4	2.1 kft 0.4 MI 1.1 dB	7.0 kft 1.3 MI 3.7 dB	7.1 kft 1.3 MI 3.7 dB	10.0 kft 1.9 MI 5.4 dB
Mixed gauge nonloaded (Note 3)	EQL 0.5 REFL 0.0	EQL 0.5 REFL 2.7	1.0 dB	3.3 dB	3.4 dB	5.3 dB

Notes:

1. In computing the length of the facility, include the length of all bridged taps. The gauge of the taps is immaterial.

2. When 359B or 359F equalizers are used at both ends of a facility, coil and reflection loss should be considered for each end.

3. To find the loss for mixed gauge cable, add the 1000-Hz attenuation of all facilities present, making no adjustment for reflection loss but including the attenuation of bridged taps as if they were in tandem with the other facilities.

4. The use of an equalizer at one end of a facility only assumes an approximate impedance match (600 ohms) at the other end. Slightly better equalization is accomplished by using equalizers at both ends.