

CARRIER ENGINEERING
SYSTEM APPLICATION
BROADBAND INTERCONNECTION INTERIM LINKS
SUPERGROUP ENTRANCE LINK PER SD-50700-01

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1. GENERAL

A. Introduction

1.01 Supergroup entrance links, special type-B wire line entrance links per SD-50700-01, provide two-way supergroup (312 to 552 kHz) interconnection between telephone company toll facilities and record (common) carriers, or between the main offices of record carriers and their satellite (subsidiary) offices. Multiplexed voice, voiceband data or telegraph, or wideband data may be transmitted over the links. The links provide record carriers with:

- (a) Connections between overseas gateway locations and record carrier terminal offices

- (b) Backup facilities for domestic broadband network operation by record carriers
- (c) Connections between record carrier main and satellite offices.

1.02 Supergroup entrance links, though always designated as entrance links, are used in two basic applications. The first, shown in Fig. 1A, is a *connecting link* for interconnecting telephone company supergroup transmission facilities and remotely located record carrier equipment. The second application, shown in Fig. 1B, is an *entrance link* for interconnecting two remote record carrier offices.

B. Components and Specifications

1.03 Supergroup entrance links consist of a near-end terminal, a far-end terminal, and interconnecting cable. The cable may be 0.375-inch serrated-seam coaxial cable or 16 PSV-L or 16 PEV-L shielded video pairs. Coaxial cables are 75-ohm unbalanced facilities and video pairs are approximately 135-ohm (at supergroup frequencies) balanced facilities. The maximum length of a supergroup entrance link using coaxial cable is 7 miles; the maximum length using video pairs is 3.5 miles.

1.04 Supergroup entrance link terminals provide cable equalization, level adjustment, pilot insertion, and impedance matching as required. They may be conditioned to transmit wideband data by application of delay, as well as slope, equalization. A 64-kHz out-of-band pilot is inserted at the telephone company near-end location on connecting links. By looping the pilot at the far-end terminal, the gain and stability of the loop may

be monitored at the near-end location. Pilot insertion is not provided for entrance link applications. The normal 315.92-kHz inband pilot is also present in connecting link applications but not in entrance link usage. Basic interface specifications for supergroup entrance links are summarized in Table A.

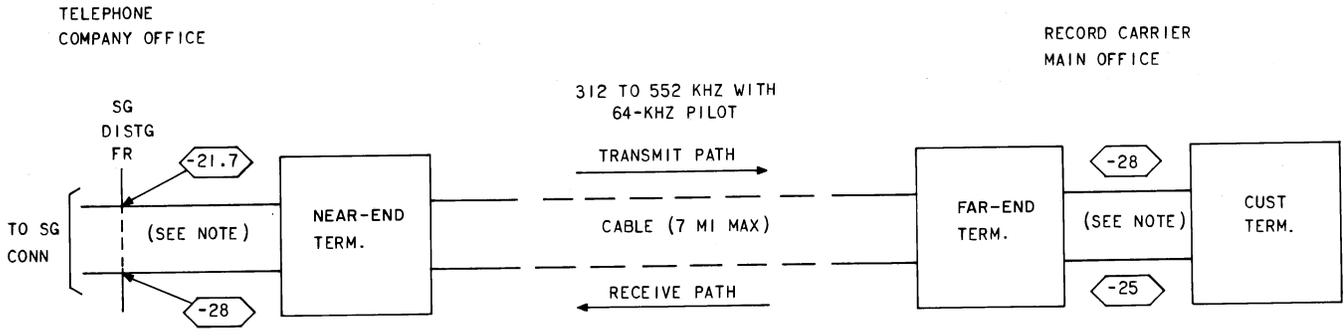
2. TERMINAL DESCRIPTION

2.01 Two types of terminals are required in a supergroup entrance link. The J68874D terminal, normally located in the telephone company office (or the main office of a record-carrier-main-office-to-satellite link), is called the near-end terminal. The far-end J68874E terminal is located at the record carrier office (or satellite office). The transmit path is from the near-end to the far-end terminal; the receive path is in the reverse

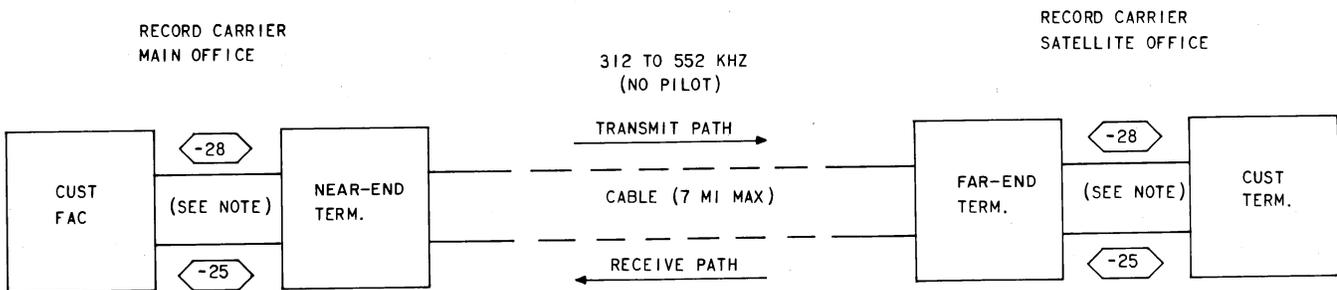
direction. Terminals are shown in simplified form and are briefly described here. For a full description, see Section 357-312-100.

A. Near-End Terminal

2.02 The transmit path of a J68874D near-end terminal (Fig. 2) contains a hybrid, pads and amplifiers for gain adjustment, and two pre-equalization networks. Equalizer 1 provides slope equalization for either 0 or 2 miles of coaxial facility (see note below). Equalizer 2 provides adjustable slope equalization for 0 to 3 miles of coaxial facility in steps of 0.5 mile. The input transmission level point for test and alignment purposes is normally -25 dB TLP although other levels can be accommodated. The input to the equalizers and cable facility is nominally -10 dB TLP. When the near-end terminal is used in a



A. TELEPHONE COMPANY-RECORD CARRIER CONNECTING LINK



B. RECORD CARRIER MAIN OFFICE-SATELLITE OFFICE ENTRANCE LINK

NOTE:
INTERFACE TRANSMISSION LEVELS ADJUSTED TO OTHER VALUES IF REQUIRED (SEE SD-50700-01).

Fig. 1—Basic Supergroup Entrance Link Arrangements

connecting link application, a 64-kHz out-of-band pilot at a level of -64 dBm is applied to the hybrid to provide monitoring and test capability.

Note: In this section, slope equalization provided by the various equalizer networks is given with respect to lengths of 0.375-inch

coaxial cable. The slope of 16-type shielded video pairs is almost twice that of the coaxial cable. If 16-type video pairs are used as the cable facility, the slope equalization capability of the networks is only one-half any stated length and the maximum system length is also one-half the stated maximum.

TABLE A
SUPERGROUP BAND INTERFACE SPECIFICATIONS

INTERFACE ITEM	SPECIFICATION
Frequency band	312 to 552 kHz (Note 1)
Impedance	75 ohms unbalanced
Transmit TLP (telephone company to customer)	-28 dB TLP (Note 2)
Receive TLP (customer to telephone company)	-25 dB TLP (Note 2)
Average long term power (≥ 30 seconds)	$+2$ dBm ₀
Instantaneous peak power	$+19$ dBm ₀
Power in any 4-kHz segment averaged over 3-second interval	-13 dBm ₀ (Note 3)
Short term (< 5 minutes) test tone level	-10 dBm ₀ maximum
Long term (≥ 5 minutes) test tone level	-16 dBm ₀ maximum
Out-of-band power density	\leq inband power density (Notes 4 and 5)
Nominal pilot level	-20 dBm ₀

Notes:

1. Slots reserved for 315.92- and 547.92-kHz telephone company pilots.
2. When supergroup link is used as entrance link, same TLP levels may be used at each customer location, i.e., -25 dB TLP for one direction and -28 dB TLP for the other direction. Other levels can be accommodated.
3. Average long term power requirement must also be met.
4. Except tones < -75 dBm₀ in 308 to 312 and 552 to 555 kHz to permit out-of-band testing.
5. Total out-of-band power no greater than total inband power.

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2.03 Signal level received at a near-end terminal from the far-end depends on cable loss. Equalizer 3 provides slope equalization for 0 to 3 miles of cable in 0.5-mile steps. This post-equalization, coupled with a maximum pre-equalization for 2.7 miles of cable at the far-end terminal, provides for a cable facility length of 5.7 miles (more conservatively taken as 5.0 miles with an allowance for office cable and slope variations with temperature).

If the cable facility is between 5 and 7 miles in length, option W is employed to provide additional slope equalization (EQL 4). Additional gain is provided by amplifier 10 to compensate for flat loss through the added equalizer. The remainder of the circuit adjusts the signal to a nominal output level of -28 dB TLP and allows for insertion of a 315.92-kHz pilot toward the carrier line (supergroup connector) in connecting link applications.

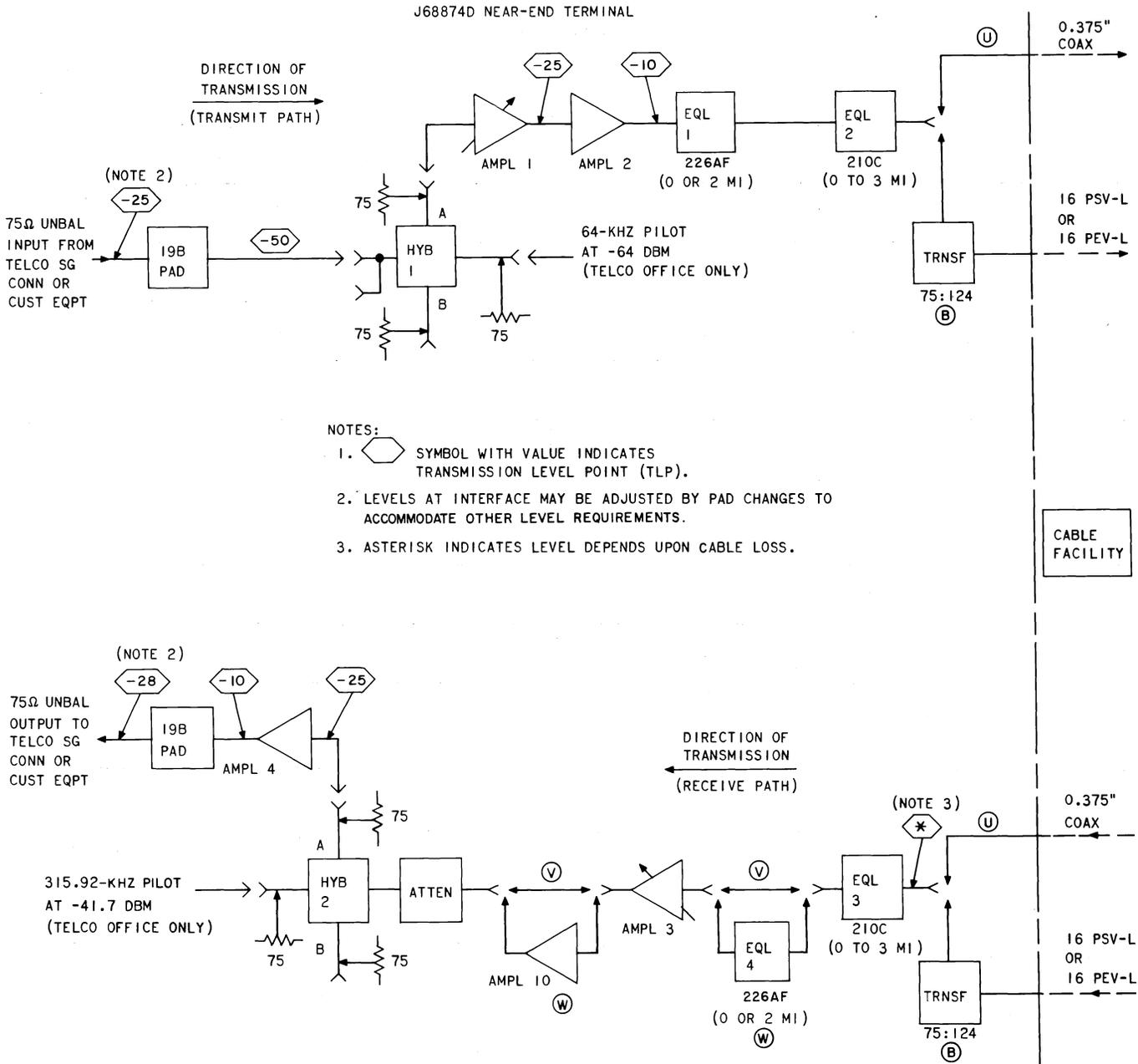


Fig. 2—Near-End Terminal Simplified Block Diagram

B. Far-End Terminal

2.04 Input power to the transmit path of the far-end J68874E terminal (Fig. 3) is dependent

on cable loss between the two terminals. Post-equalization for about 0.7 mile of cable (in 150-foot steps) is provided by equalizer 6. Again option W should be installed if the cable facility

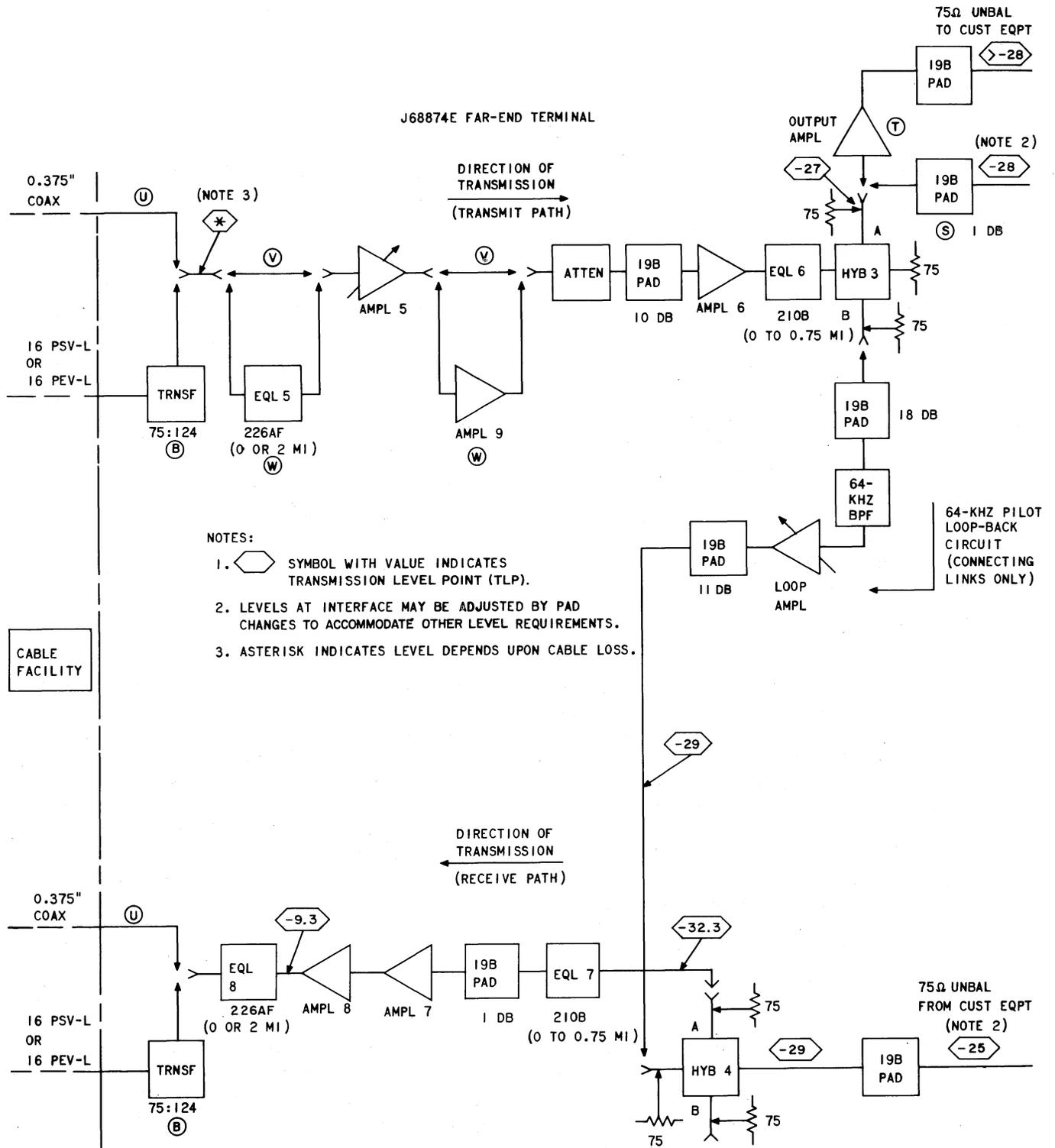


Fig. 3—Far-End Terminal Simplified Block Diagram

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is between 5 and 7 miles in length and more slope equalization is required. The pads, attenuator, and amplifiers adjust the output to a nominal level of -28 dB TLP. If greater output is required, option T should be used.

2.05 A 64-kHz pilot loop-back circuit is used in a connecting link far-end terminal to feed the out-of-band pilot back toward the near-end terminal. A 64-kHz bandpass filter greatly attenuates signals other than the pilot, and the level is adjusted to -29 dB TLP for application to the receive path.

2.06 The input power to the receive path is normally -25 dB TLP, and the output to the last equalizer and cable is approximately -9 dB TLP. Pre-equalization of 0 to 2.7 miles of cable can be provided by equalizers 7 and 8.

2.07 An inband 315.92-kHz pilot slot is reserved for telephone company use to permit automatic regulation of receiving supergroup amplifiers. Since no suitable 315.92-kHz band elimination filter is currently available, it is necessary to restrict customer signal levels in and around the pilot slot. The restrictions are given in Fig. 4. Measurement of pilot slot signal level is made at the near-end terminal (HYB2 OUTB jack).

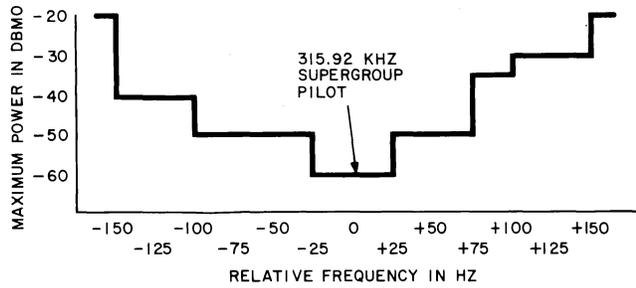


Fig. 4—Maximum Allowable 315.92-kHz Pilot Slot Power

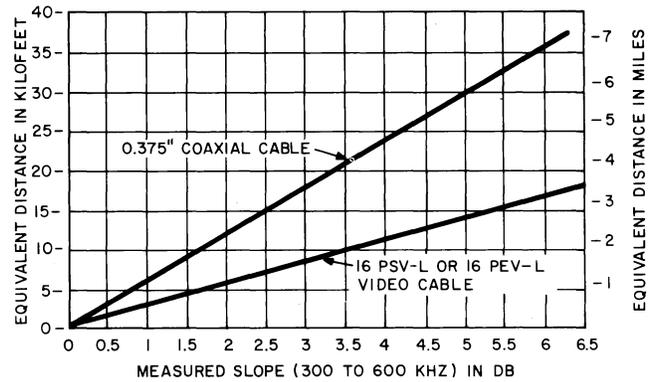


Fig. 5—Conversion of Measured Slope to Equivalent Cable Length

3. CABLE FACILITIES

3.01 Two outside plant cable facilities may be used in supergroup entrance link service: 0.375-inch serrated-seam coaxial cable or 16-type shielded video pairs. A typical installation may include some office cabling as well although this should be minimized because the loss is considerably higher than that of outside plant facilities.

3.02 Cable facilities, which appear by cable records to be usable for supergroup band service, should be tested prior to assignment to such service. The test consists of cable loss measurements at 300 and 600 kHz and should include all cabling between intended equipment locations. The difference between the two attenuation measurements is the slope of the facility and is expressed in dB. Notes 109 and 110 of SD-50700-01 tabulate the adjustment of slope equalizers as a function of cable length in feet or in miles. Figure 5 facilitates conversion between measured slope and the equivalent lengths of coaxial cable or video pairs.

3.03 Two methods of measuring facility loss with 600-ohm test equipment are shown in Fig. 6. In method 1, the oscillator power is adjusted at each measurement frequency with the oscillator output terminated in a 600-ohm resistive load. After each frequency and power adjustment, the oscillator output is switched to the cable under measurement through an impedance matching transformer. At the receiving end, a terminated electronic voltmeter (calibrated in dBm) is connected to the cable through a second impedance matching transformer. Received power at each frequency (300 and 600 kHz) is measured and recorded. Method 2 is similar to method 1 except a 15-dB pad is inserted between the oscillator and the impedance matching transformer or cable. The pad isolates the oscillator from the effects of cable impedance variations with frequency so that the variations do not influence the sending power adjustment. This permits the electronic voltmeter at the sending end to be connected continuously while measurements are underway.

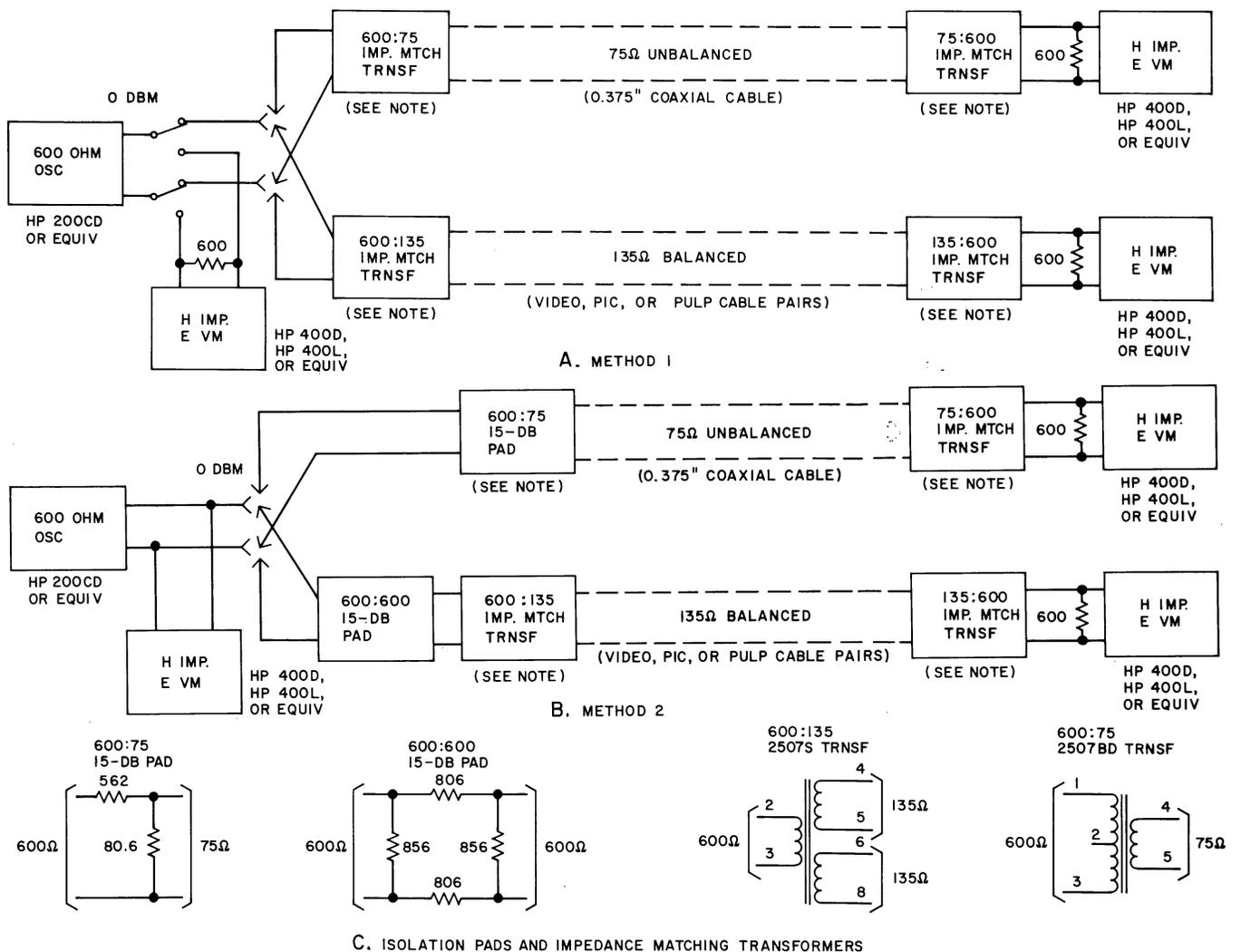
4. POWER AND MOUNTING ARRANGEMENTS

4.01 Power requirements are -24 Vdc at 0.5 ampere maximum (W option) for a J68874D near-end terminal and -24 Vdc at 0.7 ampere maximum (W and T options and 64-kHz pilot loop-back circuit) for a J68874E far-end terminal. If the customer cannot provide suitable -24 Vdc quiet battery, power may be supplied by a KS-15894, List 2 Rectifier. This rectifier provides 22 or 24 Vdc at 6.0 amperes and can readily power two or more supergroup entrance links.

4.02 Equipment at a customer location may be mounted in a customer-provided relay rack or in a cabinet provided by the telephone company. Mounting facilities for several supergroup entrance links, along with the power supplies when required, will be provided at customer locations where suitable relay rack space is not available.

5. REFERENCES

5.01 Detailed information on the supergroup entrance link may be found in SD-50700-01 and in Section 357-312-100. Lineup and trouble location information is provided in Sections 357-312-501 and 357-312-502, respectively.



NOTE: EMPLOY SUITABLE MATCHING DEVICE, SHOWN AT C, WHEN REQUIRED. IMPEDANCE MATCHING NOT REQUIRED WHEN CABLE IMPEDANCE IS DIRECTLY MATCHED BY OSCILLATOR AND ELECTRONIC VOLTMETERS. (ASSUME 75 OHMS IMPEDANCE FOR 0.375" COAXIAL CABLE. ASSUME 135 OHMS IMPEDANCE FOR 16-TYPE VIDEO PAIRS AND FOR PIC AND PULP CABLE PAIRS.)

Fig. 6—Insertion Loss Measurements