KS-20159 EQUALIZER-AMPLIFIER
INSTALLATION AND MAINTENANCE

1. GENERAL

1.01 Equipment options and circuit options for this equipment should be specified on the circuit or service order.

1.02 This section is reissued for the following reasons:

- To add the KS-20159 L2 equalizer-amplifier which replaces the KS-20159 L1 equalizer-amplifier
- To add notes in Fig. 9 to turn the amplifier OFF when patching to AMPL IN jacks.

1.03 The KS-20159 L5 carrying case is used for portable applications only and is not equipped for rack mounting.

2. MOUNTING

2.01 ▶The KS-20159 L1 equalizer-amplifier has been Manufacture Discontinued and replaced by the KS-20159 L2 equalizer-amplifier.◀ Figure 1 shows the equalizer-amplifier and KS-20159 L6 power supply assembly, which can be mounted on either 19- or 23-inch racks. Two KS-20159 equalizer-amplifiers can be mounted on a 19-inch rack with or without two KS-20159 L6 power supply assemblies.

2.02 Figure 2 shows the KS-20159 equalizer-amplifier without cover. Three of these equalizer-amplifiers can be mounted on a 23-inch rack without power supply assemblies.

2.03 Figure 3 shows the KS-20159 equalizer-amplifier and KS-20159 L6 power supply assembly mounted in a KS-20159 L5 carrying case. It is intended only for portable use and is not equipped for rack mounting.

2.04 Whenever it becomes necessary to mount the KS-20159 equalizer-amplifier on a pole or in a manhole, ▶a 467-type apparatus case, as shown in Fig. 4, is used.◀ A KS-20159 L7 mounting plate must be ordered ▶and used in place of the supplied mounting bracket.◀

2.05 The 467A apparatus case, as shown in Fig. 4, is designed for use in manholes and will house two KS-20159 equalizer-amplifiers, three 60A1A-3 connecting blocks, and two DPST power switches for the cable pair used for battery feed. The mounting bracket supplied with the 467A apparatus case should be replaced by a KS-20159 L7 mounting plate.

2.06 The 467C apparatus case is designed for pole-mounted applications and is the same as the 467A apparatus case, except that it is also equipped with power outlets for the L6 power supply assembly and heaters. The mounting bracket supplied with the 467C apparatus case should be replaced by a KS-20159 L7 mounting plate.

2.07 When the 467C apparatus case is required for pole-mounted applications, the heaters are provided. It is not expected that these apparatus cases will be mounted in manholes since it is difficult to provide ac power in those situations. It is felt that in manhole applications the heat dissipated inside the apparatus case will be sufficient, in most cases, to keep the operating temperature within the case above the recommended minimum operating temperature. Therefore, provision for ac power is not made for manhole applications.

2.08 The 467C apparatus case comes equipped with three 60A1A-3 connecting blocks, two DPST power switches for the battery feed cable pair, an 8-pair 10-foot shielded cable stub, and two power outlets for the L6 power supply assembly. The apparatus cases are also equipped with two heaters (Firerod Cartridge Heater #JSA3A-115V-250W) and two thermostats (Fenwal Thermoswitch Company), head-type #48000-0 with modifications 3 and 4 preset to close contacts at 40°F. Also included is one Fenwal surface-mounted Thermoswitch #30000-0 with modification 52 preset to open contacts at 125°F. This is provided to minimize the possibility of excessive internal temperatures if the thermoswitch fails.

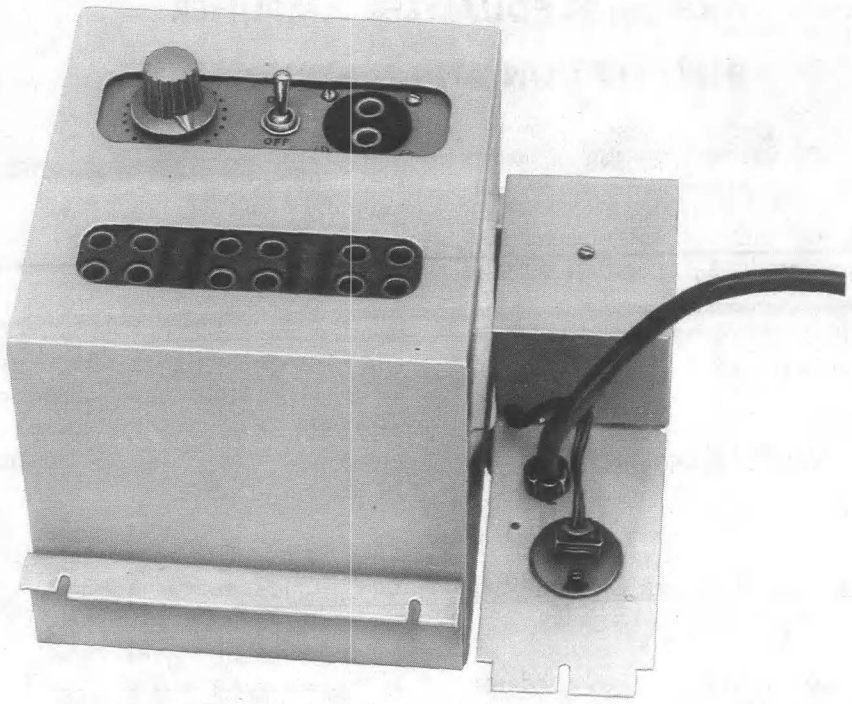


Fig. 1—KS-20159 Equalizer-Amplifier With Cover and L6 Power Supply Assembly

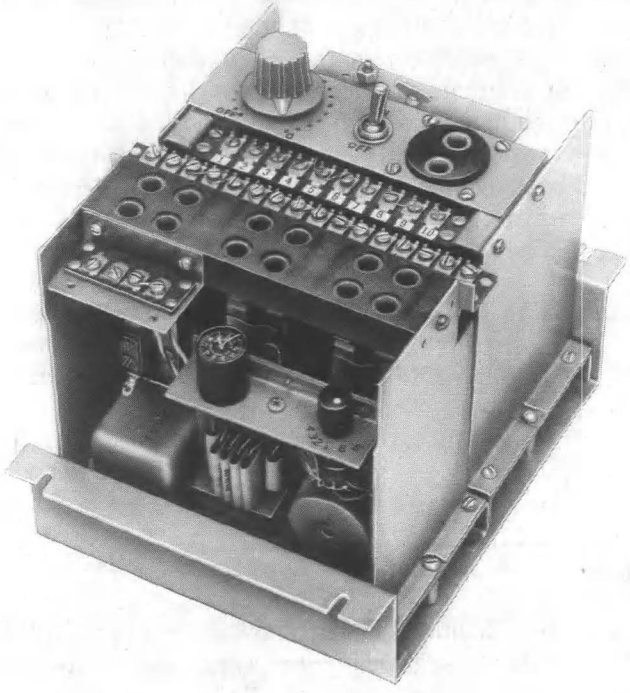


Fig. 2—KS-20159 Equalizer-Amplifier Without Cover

2.09 The apparatus cases are designed to mount horizontally in the manhole and vertically on the pole. Approximately 90 inches of wall space is required in the manhole. Approximately 30 inches of this is required to remove the cover from the case, and 30 inches is required for the cable stub. The apparatus cases are about 10 inches in diameter.

2.10 In order to make the testing of circuits possible from the location of the apparatus case, access to a talking circuit is provided. A sealed terminal is provided on the outside of the case so preliminary tests can be made with the central office or some other remote location prior to opening the apparatus case.

2.11 Connections to the three 60A1A-3 connecting block terminals should be made as shown in Table A. The blocks are placed on the apparatus case so that block A is on the left, facing the front, and block C is on the right. Figure 5 shows the terminals and their designations.

2.12 In some cases a 10-foot cable stub may not be long enough to meet field conditions.

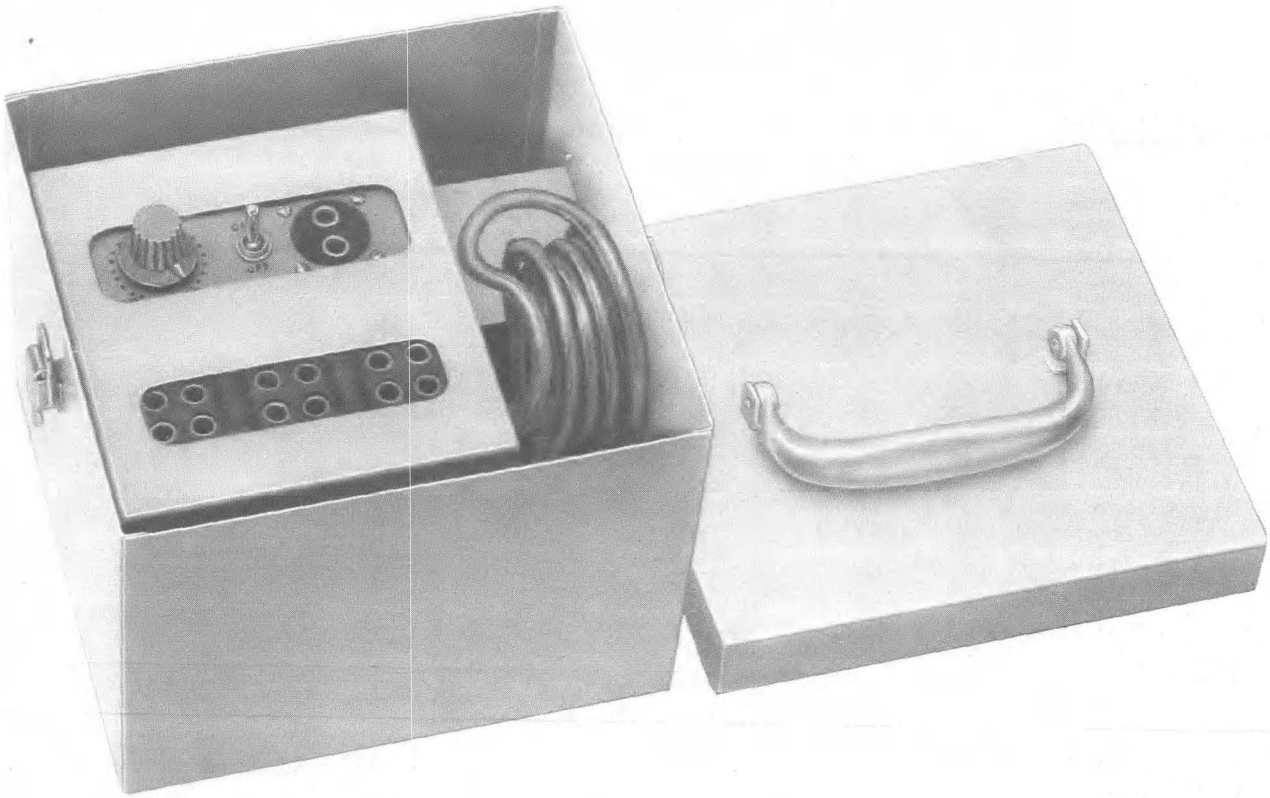


Fig. 3—KS-20159 Equalizer-Amplifier and L6 Power Supply Assembly in an L5 Carrying Case

Additional lengths of shielded cable (type CA561) may be purchased in increments of 5 feet up to 20 feet. The total length of cable required should be specified when ordering the 467A or C apparatus case. The cable stub is partially plugged to prevent excessive loss of air when the case is opened.

2.13 When the apparatus case is pole-mounted and ac power is required to operate the amplifier, it is important that proper bonding be provided to avoid differences in potential between telephone protector ground and power-neutral ground. Figure 6 shows a suggested method for installation and protection of the ac power supply. The power should be wired in accordance with local code requirements.

2.14 The General Electric 9L15 CCB001 secondary arrester is required where lightning or power surge exposures are expected to exceed 2500 volts. In shielded urban areas or in temporary installations, the pellet arrester may not be required.

2.15 This equalizer-amplifier will deliver full output in an ambient temperature range of −25 to 130°F. When completely pole mounted, heaters may be required in certain latitudes if the internal temperature is expected to be lower than −25°F.

2.16 To ensure satisfactory margin in operation of the amplifier on a pole or in a manhole, the dc voltage at terminals 4 and 6 of TB101 on the amplifier should be 53 volts. For these types of operation, the strap between terminals 5 and 6 of TB101 on the amplifier should be removed.

2.17 Table B shows the approximate maximum spacing in miles and the dc loop resistance for the KS-20159 equalizer-amplifier using single-gauge cable. The lengths shown are based on the dc voltage drop of the battery feed cable pair. The table can be used to compute the dropping resistor required to reduce the +130 volt supply at the central office to approximately 53 volts at 100 ma at terminals 4 and 6 on TB101 of the amplifier when mounted on a pole or in a manhole. The voltage at terminals 4 and 6 on TB101 is approximately 48 volts at 100 ma when the strap, option (S) Fig. 9, is installed. The computed resistance is in addition to the 130 ohms required to protect the power supply at the central office and the 47-ohm

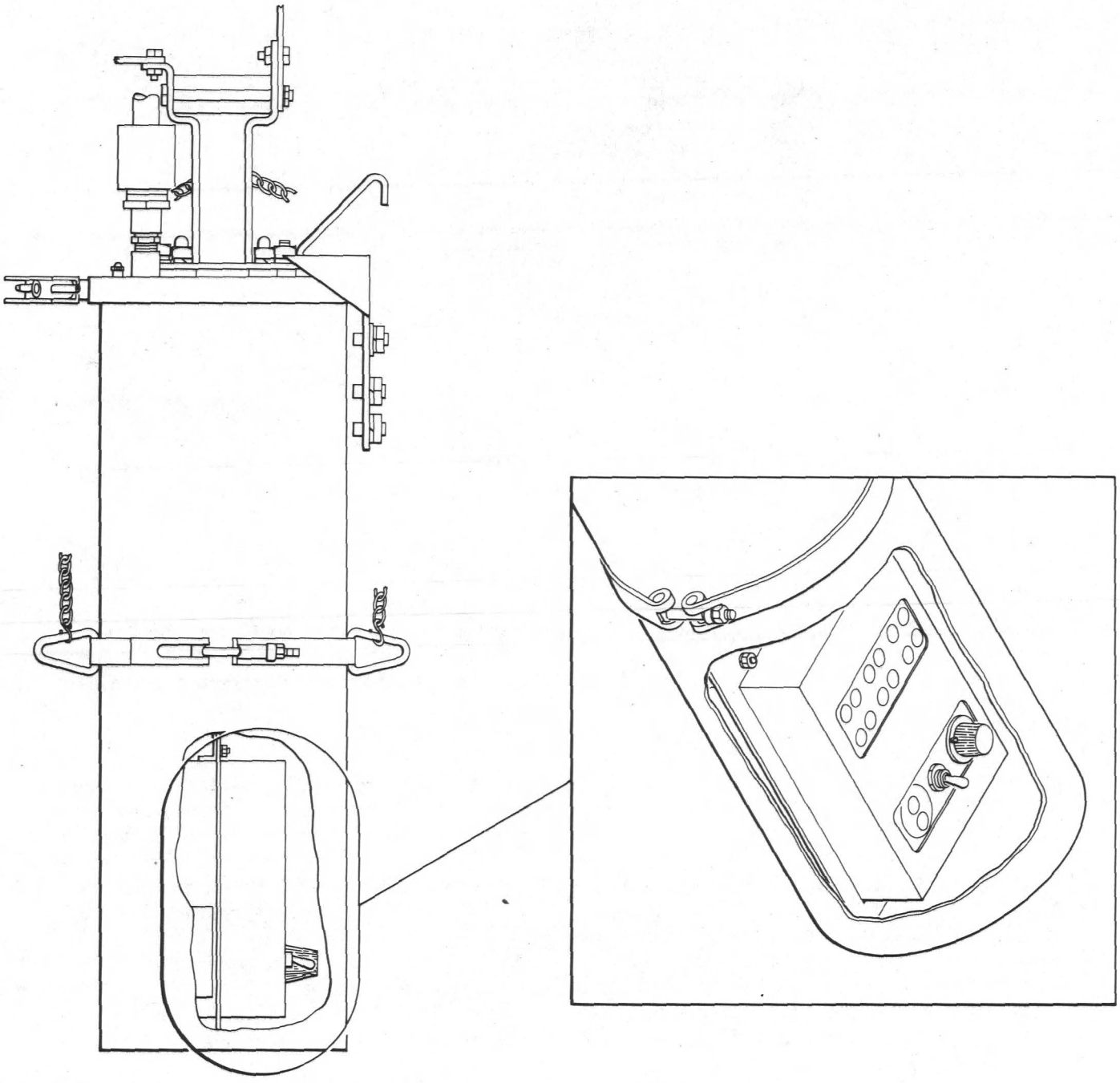


Fig. 4—467A Apparatus Case Equipped With KS-20159 Equalizer-Amplifier

TABLE A

STUD CABLE PAIR* (See Also A-569483)		60 A1A-3 PROTECTOR BINDING POSTS	TERMINATION
COND. INS.	WRAPPER		(See Field Instructions for Apparatus Terminations)
OR-OR	WH-R	A — 1, 2	Talking Circuit
BL-BL	WH-WH	3, 4	Spare Stub Pair
		5, 6	Not Used
WH-WH	WH-WH	B — 1, 2	Equalizer Amplifier #1 Input Terminals
R-R	WH-WH	3, 4	Equalizer Amplifier #1 Output Terminals
BL-BL	WH-WH	5, 6	Sw. 1, 1-2: Sw. 1, 3-4 to Amplifier 1
WH-WH	WH-WH	C — 1, 2	Equalizer Amplifier #2 Input Terminals
R-R	WH-WH	3, 4	Equalizer Amplifier #2 Output Terminals
WH-WH	WH-WH (Center)	5, 6	Sw. 2, 1-2: Sw. 2, 3-4 to Amplifier 2

* Looking at inner (case) end of cable stub, start with OR-OR pair and go in a clockwise direction, i.e., BL-BL, WH-WH, etc.

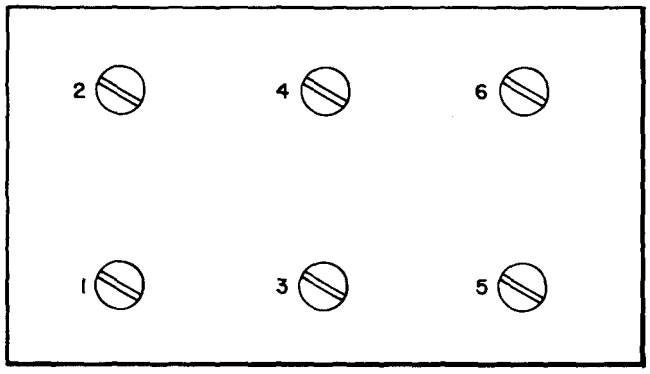


Fig. 5—Terminal Designations for 60A1A-3 Connecting Block

protective resistor in series with the ON-OFF power switch S101 on the amplifier. A simplified diagram showing application of a pole-mounted KS-20159 equalizer-amplifier is shown in Fig. 7. A simplified diagram of protection required on a cable pair used to feed a remote KS-20159 equalizer-amplifier is shown in Fig. 8.

3. MAINTENANCE

3.01 The tests in Section 024-175-510 should be made to determine the performance of the equalizer-amplifier when clearing troubles. If trouble in the equalizer or the amplifier is indicated by the tests, the printed circuit board for the circuit suspected should be replaced.

3.02 If replacing the printed circuit board does not clear the trouble, the entire equalizer-amplifier should be replaced.

3.03 Figure 9 shows the schematic diagram of the equalizer-amplifier.

3.04 Refer to CD-99383-01 for detailed description of operation of the equalizer-amplifier.

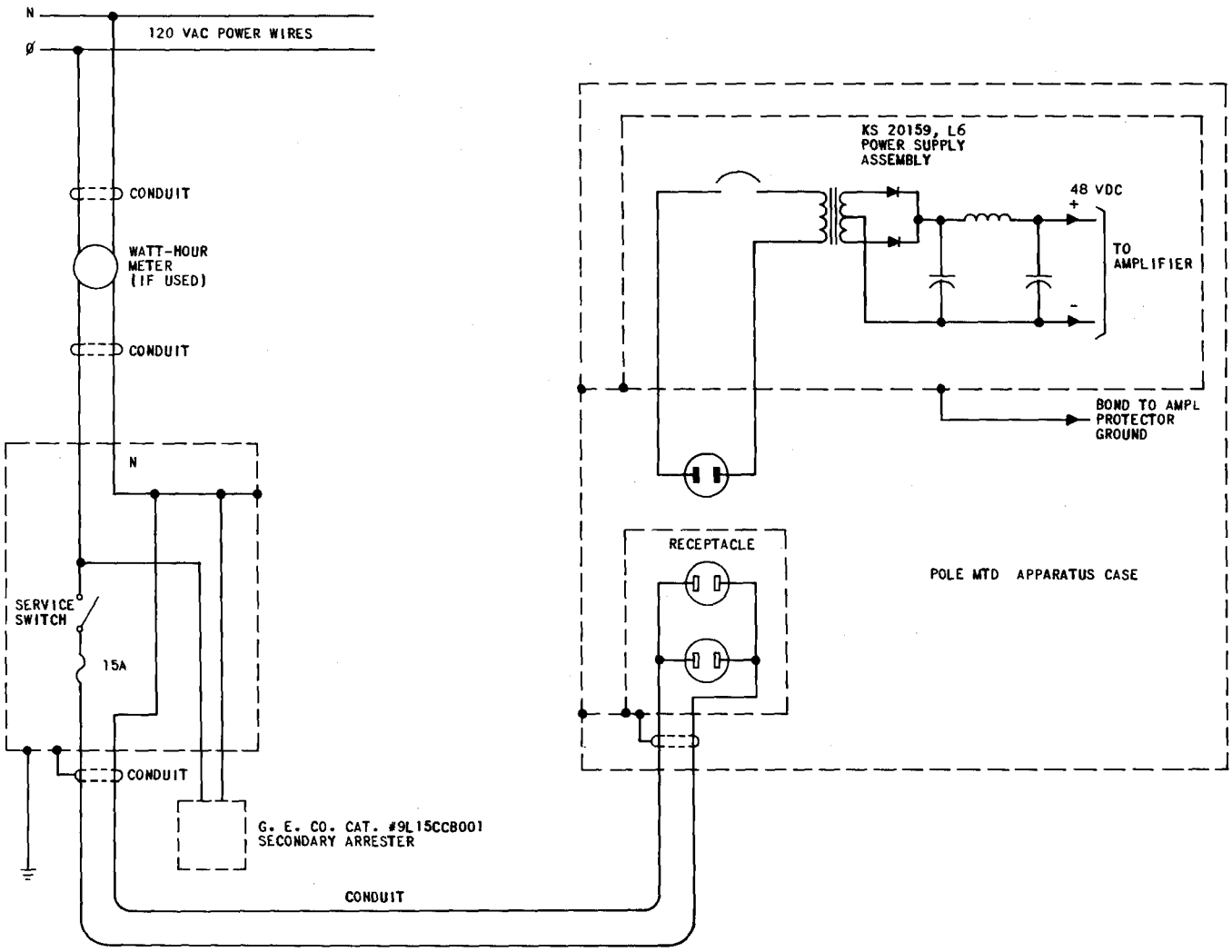
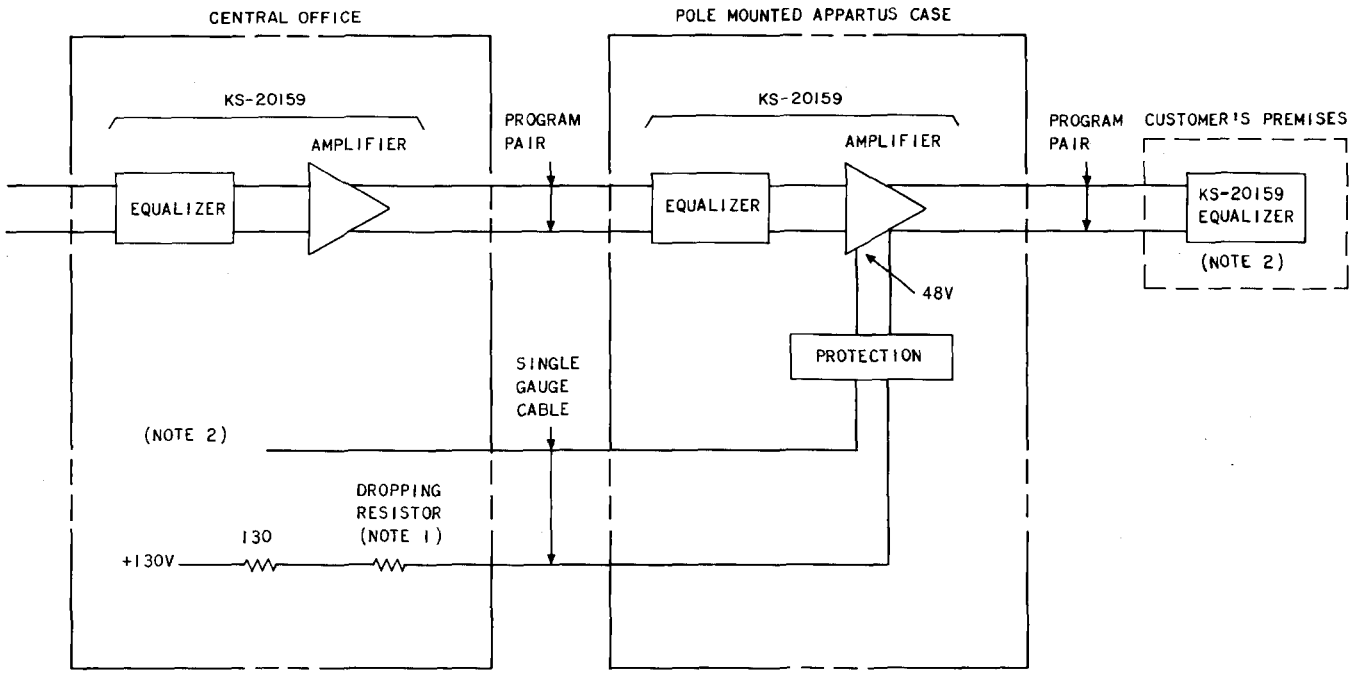


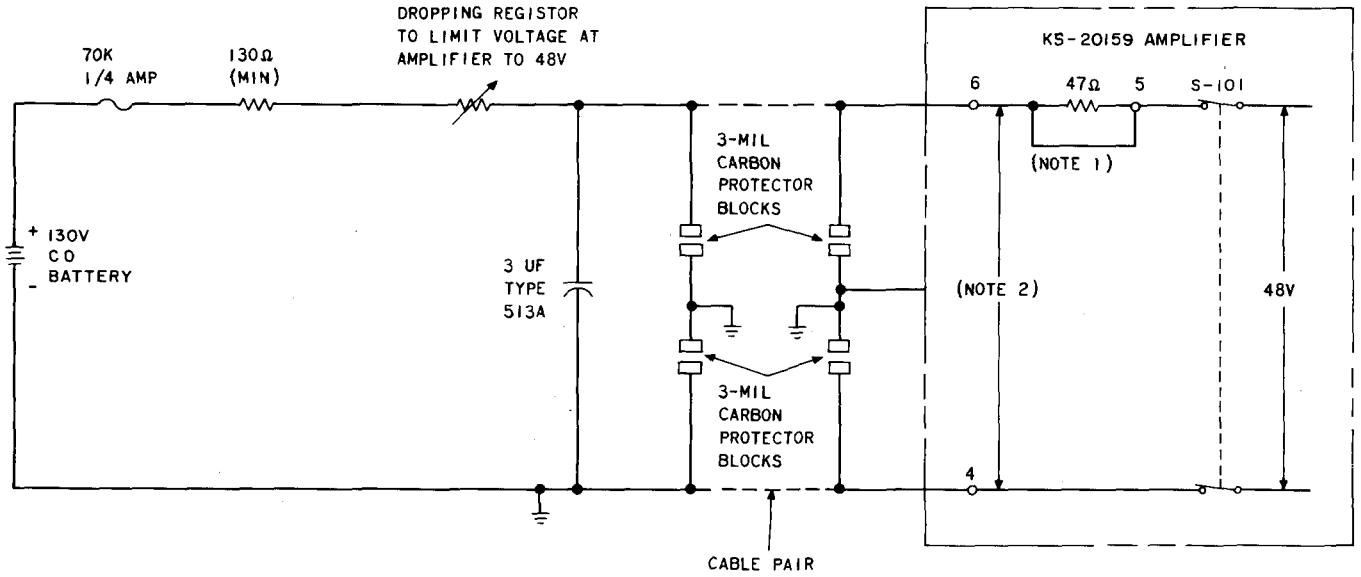
Fig. 6—Bonding of Pole-Mounted Equipment

TABLE B		
APPROXIMATE MAX SPACING USING SINGLE GAUGE CABLE		
GAUGE CABLE	SPACING (MILES)	DC LOOP RESISTANCE
19	7.5	645 Ω
22	3.7	650 Ω
24	2.3	635 Ω
26	1.4	630 Ω



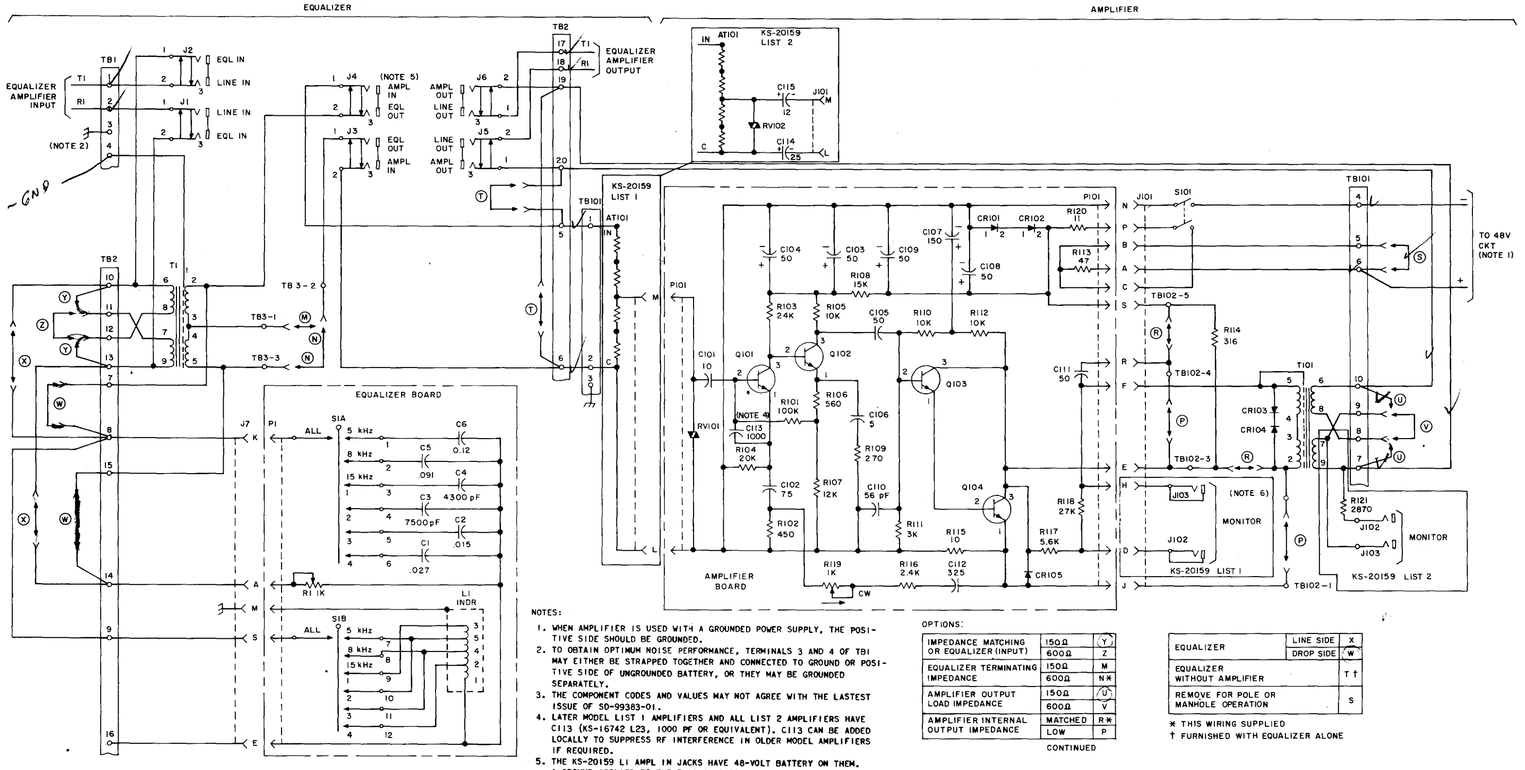
NOTES:
1. VALUE DEPENDS ON LENGTH OF SINGLE GAUGE CABLE REQUIRED. THE DROPPING RESISTOR IS NOT REQUIRED IF CABLE IS AT MAXIMUM SPACING SHOWN IN TABLE B.
2. STANDARD ELECTRICAL PROTECTION REQUIRED AT CENTRAL OFFICE AND CUSTOMER'S PREMISES.

Fig. 7—Application of a Pole-Mounted KS-20159 Equalizer-Amplifier



NOTES:
1. REMOVE STRAP WHEN AMPLIFIER IS MOUNTED ON POLE OR IN MANHOLE.
2. APPROXIMATELY 53V 100 MA WHEN AMPLIFIER IS MOUNTED ON POLE OR IN MANHOLE. 48V 100 MA WHEN STRAP IS INSTALLED AS SHOWN.

Fig. 8—Protection Required on a Cable Pair Used to Feed a Remote KS-20159 Equalizer-Amplifier



NOTES:

1. WHEN AMPLIFIER IS USED WITH A GROUNDED POWER SUPPLY, THE POSITIVE SIDE SHOULD BE GROUNDED.
2. TO OBTAIN OPTIMUM NOISE PERFORMANCE, TERMINALS 3 AND 4 OF TB1 MAY EITHER BE STRAPPED TOGETHER AND CONNECTED TO GROUND OR POSITIVE SIDE OF UNGROUNDED BATTERY, OR THEY MAY BE GROUNDED SEPARATELY.
3. THE COMPONENT CODES AND VALUES MAY NOT AGREE WITH THE LASTEST ISSUE OF SD-99383-01.
4. LATER MODEL LIST 1 AMPLIFIERS AND ALL LIST 2 AMPLIFIERS HAVE C113 (KS-16742 L23, 1000 PF OR EQUIVALENT). C113 CAN BE ADDED LOCALLY TO SUPPRESS RF INTERFERENCE IN OLDER MODEL AMPLIFIERS IF REQUIRED.
5. THE KS-20159 L1 AMPL IN JACKS HAVE 48-VOLT BATTERY ON THEM. A GROUND APPLIED TO THE TIPS OF THESE JACKS WILL BLOW THE OFFICE FUSE. TURN THE AMPLIFIER OFF BEFORE PATCHING INTO AMPL IN JACKS TO AVOID BLOWING THE OFFICE FUSE.
6. THE KS-20159 L1 MONITOR JACKS HAVE 30 VOLTS ON THEM IN NORMAL OPERATION. A GROUND APPLIED TO THE UPPER MONITOR JACK (J103) WILL BLOW THE OFFICE FUSE.

OPTIONS:

IMPEDANCE MATCHING OR EQUALIZER (INPUT)	150Ω	Y
	600Ω	Z
EQUALIZER TERMINATING IMPEDANCE	150Ω	M
	600Ω	N*
AMPLIFIER OUTPUT LOAD IMPEDANCE	150Ω	U
	600Ω	V
AMPLIFIER INTERNAL OUTPUT IMPEDANCE	MATCHED	R*
	LOW	P

CONTINUED

EQUALIZER	LINE SIDE	X
	DROP SIDE	W
EQUALIZER WITHOUT AMPLIFIER		T†
REMOVE FOR POLE OR MANHOLE OPERATION		S

* THIS WIRING SUPPLIED
† FURNISHED WITH EQUALIZER ALONE

Fig. 9—KS-20159 Equalizer-Amplifier, Typical Schematic Diagram