

CONNECTING ARRANGEMENT VCP CUSTOMER-PROVIDED POWER KS-20944 PROTECTOR

1. GENERAL

1.01 This section provides identification, installation, operation, maintenance, and connection information for connecting arrangement (CA) VCP using the KS-20944 protector to connect a customer-provided (CP) dc power supply to Bell System equipment.

1.02 The KS-20944 protector is used with 604-type panels in various voice connecting arrangements. For information on the 604A-type panels, refer to Section 463-300-101. For information on the 604B panel, refer to Section 463-300-102.

1.03 If the customer wants a copy of the Technical Notice which covers this interface unit, the customer should contact the local Telephone Company Business Office or the Marketing Representative.

2. IDENTIFICATION

PURPOSE

The KS-20944 protector is used:

- As an interface between CP dc power and Bell System equipment.
- To limit excessive levels from CP power supplies and to provide protection for personnel against hazardous voltages or currents.

ORDERING GUIDE

- Protector, KS-20944, L1 (for 24V at 15 amp)
- Protector, KS-20944, L2 (for 48V at 15 amp)
- Protector, KS-20944, L3 (for 24V at 30 amp)
- Protector, KS-20944, L4 (for 48V at 30 amp)
- Wire, (P-384614 or equivalent, No. 14 AWG, [No. 10 AWG for 30 amp units] paired red

and black, length as required to connect protector to panel. See 3.01.)

- Block, Connecting, 66C1-16 (or equivalent, if required for multiple connecting arrangements. See 3.01.)
- Cordage, Flexible, KS-15143 (or equivalent, if required for cabling from 66C1-16 connecting block to panels. See 3.01.)

DESIGN FEATURES

- Approximate dimensions: 8 inches high, 6-3/8 inches wide and 3-3/4 inches deep (Fig. 1)
- Provides protection against excessive voltage or current, reversed polarity, incorrect ground or ac voltage from CP power supply
- Provides dc interface to CP equipment
- Equipped with a 3-pole, magnetic-type circuit breaker mounted on a hinged cover
- The breakers act as a switch to disconnect power supply voltage from connecting arrangement
- Equipped with two leads for connection to the CP power supply and a 2-terminal connecting block for connection to the connecting arrangement dc power leads
- Mounts on wall or flat surface.

3. INSTALLATION

3.01 Mount the KS-20944 protector on a wall or suitable flat surface close to the 604-type panel, or where power distribution is required at large installations, close to the 66C1-16 connecting block.



Fig. 1—KS-20944 Protector

3.02 Connect protector using No. 14 AWG wire (or No. 10 AWG for 30 amp units). Insert the conductors through the rubber grommet on top of the protector and connect the red conductor to the positive (+) load terminal and the black to the negative (-) load terminal. Conduit knockouts are provided in the top of the protector box where local code or installation practices require conduit.

3.03 Route the 14-gauge (or 10-gauge) wire pair to the 604-type panel power terminals, or 66C1-16 distribution connecting block. Connect the red wire to the ground terminal and the black to the -24 volt or -48 volt terminal. Follow local wiring instructions and the section for the particular connecting arrangement for power connections.

3.04 When a distribution connecting block is required, KS-15143 flexible cordage (2-conductor, 18-gauge) or equivalent, may be used to cable between the connecting block and the 604-type panels.

3.05 The customer must connect his power supply to the red (GRD) and black (-V) No. 10 or No. 14 gauge wires extending from the nipple in the bottom of the unit.

Caution: *If polarity to the 604B panel should be reversed, the interconnecting units in the panel may be damaged.*

3.06 Always check for correct voltage, polarity, and ground on terminals connected to customer leads before closing circuit breakers.

Warning: *The circuit breakers remove voltage from the load (Bell System side) of the protector. Voltage will still be present on the upper terminals (terminals No. 1) of the three circuit breakers.*

4. OPERATION

4.01 The KS-20944 power protector is used to protect the Bell System personnel from hazardous voltages but may not protect the equipment from component failure. (Separate fuses are required for interconnecting units [IU]). The KS-20944 protector is equipped with a 3-pole magnetic toggle switch type circuit breaker which may be manually operated, without opening the front cover, to supply or remove power to the Bell System equipment as required. The toggle switches are

coupled together with a tie rod to act as a single lever in setting the protector to the ON or OFF position.

4.02 The KS-20944 protector consists of a dc voltage-operated circuit breaker in series with a parallel resistor-diode combination connected across the line and two dc current-operated circuit breakers connected in each side of the line. The contacts on each breaker are connected in series with the coil of that breaker and all three breakers are mechanically interlocked externally by the tie rod and internally by a tripper bar. When any breaker operates all of the breakers are tripped. The breakers are of the trip free type so that the contacts cannot be closed by holding the lever to the ON position if the fault is still on the line.

4.03 The KS-20944 protector trips in 25 milliseconds on dc overvoltage, current overload, reversed dc voltage, incorrect power supply ground, or ac voltage greater than 18 volts. It is available in four list numbers, physically alike, differing only in the trip rating of the coils.

4.04 Complete ratings for the protectors are shown in Table A. The series connected (current) breakers are designed to carry rated current continuously and to trip in 25-milliseconds at 125 percent of rated current. The shunt connected (voltage) breakers will hold continuously at rated voltage and will trip in 0.1 second at the voltages shown in Table A.

4.05 Common fault conditions are shown in Fig. 4. Protector operation is as follows:

- (a) Fig. 4A shows the normal protector connections. High voltage will cause CB3 to operate or high current would cause either CB1 or CB2 to operate.
- (b) Fig. 4B shows conditions where the polarity from the CP supply is correct but the wrong lead is grounded. The reversed ground effectively connects CB2 across the input voltage to the protector. Current will flow through CB2 and the two grounds causing CB2 to operate.
- (c) Fig. 4C shows conditions where the polarity of voltage from CP power supply is reversed and the wrong lead is grounded. This condition effectively connects CB2 across the input voltage

to the protector. Current will flow through CB2 and the two grounds causing CB2 to operate.

(d) Fig. 4D shows conditions where the polarity of the voltage from the CP power supply is reversed and the ground is correct. On reversed polarity or ac voltage, diode CR1 will conduct, shorting resistor R1 to increase current through CB3 causing CB3 to operate.

5. MAINTENANCE

5.01 When the circuit breaker switch lever has tripped to the OFF position, reset lever to the ON position. If the fault is still on the line, the breakers will not reset to the ON position. In this case, the fault must be located and corrected as follows:

(a) **Determine Direction of Trouble:** Disconnect the CP power by operating lever switch to OFF position.

Warning: Use proper safety precautions as voltage will still be present on terminals 1 (upper terminals) of circuit breakers.

Open cover and disconnect black lead from the - load terminal. Do not disconnect the red lead from the + load terminal. Close cover and reset breaker switch lever to ON position. If breakers remain in ON position, trouble is indicated on the loadside; proceed to test (c). If breakers will still not reset to the ON position, trouble is indicated in the CP power supply; proceed to test (b).

(b) **Input Power Tests:** Open cover and check the CP power for the following on terminals No. 1 of the breakers (customer red and black leads) using an approved volt/ohm meter:

- Correct amount of voltage per list number of protector (between red and black leads)
- Correct polarity (black negative, red positive)
- Correct ground (red lead grounded)
- Correct type of voltage (ac or dc).

The dc input voltage should meet the requirements per list number of the protector as shown on Fig. 2 and Table A.

(c) **Output Power (Load) Tests:** Proceed to further isolate trouble between the IUs, the mounting, and the leads to the mounting by operating the protector lever switch to the OFF position and reconnecting the -V black lead to the - load terminal at the protector. Remove the IUs from the mounting and reset the lever switch to the ON position. If breakers hold, trouble is indicated in the IUs. Refer to the section for the particular connecting arrangement in use for tests on the IUs. If breakers do not reset, trouble is indicated in the mounting panel or the leads to the panel. Isolate the panel by disconnecting the black lead from -V terminal on rear of mounting and reset lever switch to ON position. If breakers hold, trouble is indicated in the mounting panel. Refer to the section for the type of mounting in use for further tests. If breakers do not reset, trouble is indicated in the leads to the mounting panel. Check the leads to the mounting panel for shorts between leads, correct ground, and correct polarity of connections to the power supply terminals on rear of panel.

5.02 If trouble is suspected in the KS-20944 protector, replace with a new protector.

5.03 If trouble is indicated in the CPE, follow local reporting procedures for trouble in CP equipment.



Do not attempt any tests or repairs to the customer-provided equipment.

5.04 When in the repairman's judgment the trouble is located in the CPE, the Repair Service Bureau should be notified so that proper Maintenance of Service Charge billing can be initiated as outlined in BSP 660-101-312 entitled Maintenance of Service Charge on Services with Customer-Provided Equipment.

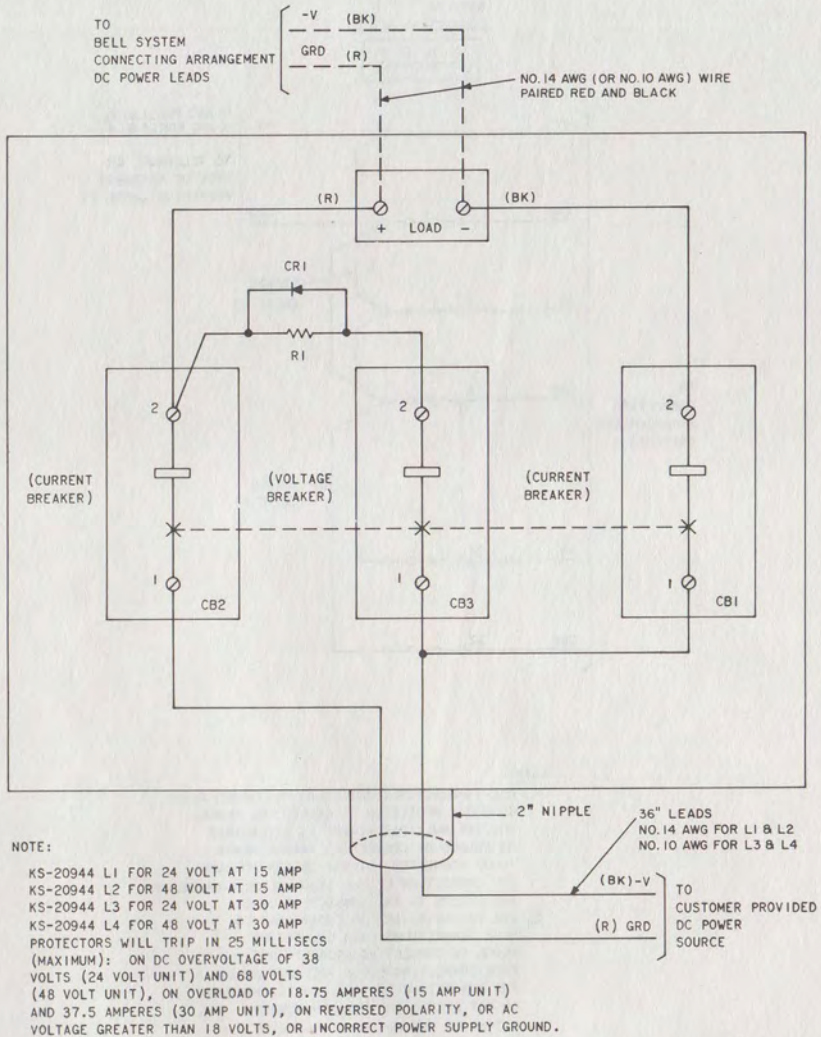
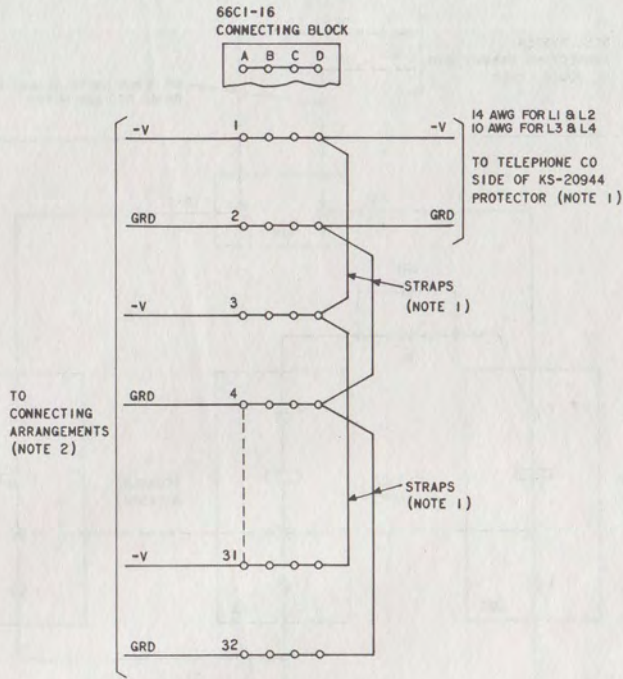


Fig. 2—Schematic - KS-20944 Protector



NOTES:

1. USE 14-GAUGE (OR 10-GAUGE) WIRE TO CONNECT FROM KS-20944 PROTECTOR TO CONNECTING BLOCK; PROVIDE MULTIPLE STRAPS AS DETERMINED BY NUMBER OF CONNECTING ARRANGEMENTS TO BE CONNECTED TO. USE SOLDER TO MAKE THE CONNECTION OF THE 14-GAUGE (OR 10-GAUGE) WIRE AND STRAPS TO THE CONNECTING BLOCK.
2. USE 18-GAUGE WIRE OR EQUIVALENT TO MAKE CONNECTIONS FROM CONNECTING BLOCK TO CONNECTING ARRANGEMENTS. EACH CONNECTING BLOCK PROVIDES MEANS FOR CONNECTING TO 16 CIRCUITS, HOWEVER, DO NOT EXCEED THE MAXIMUM CURRENT RATING OF THE KS-20944 PROTECTOR.

Fig. 3—Typical Power Distribution for Multiple Connecting Arrangements

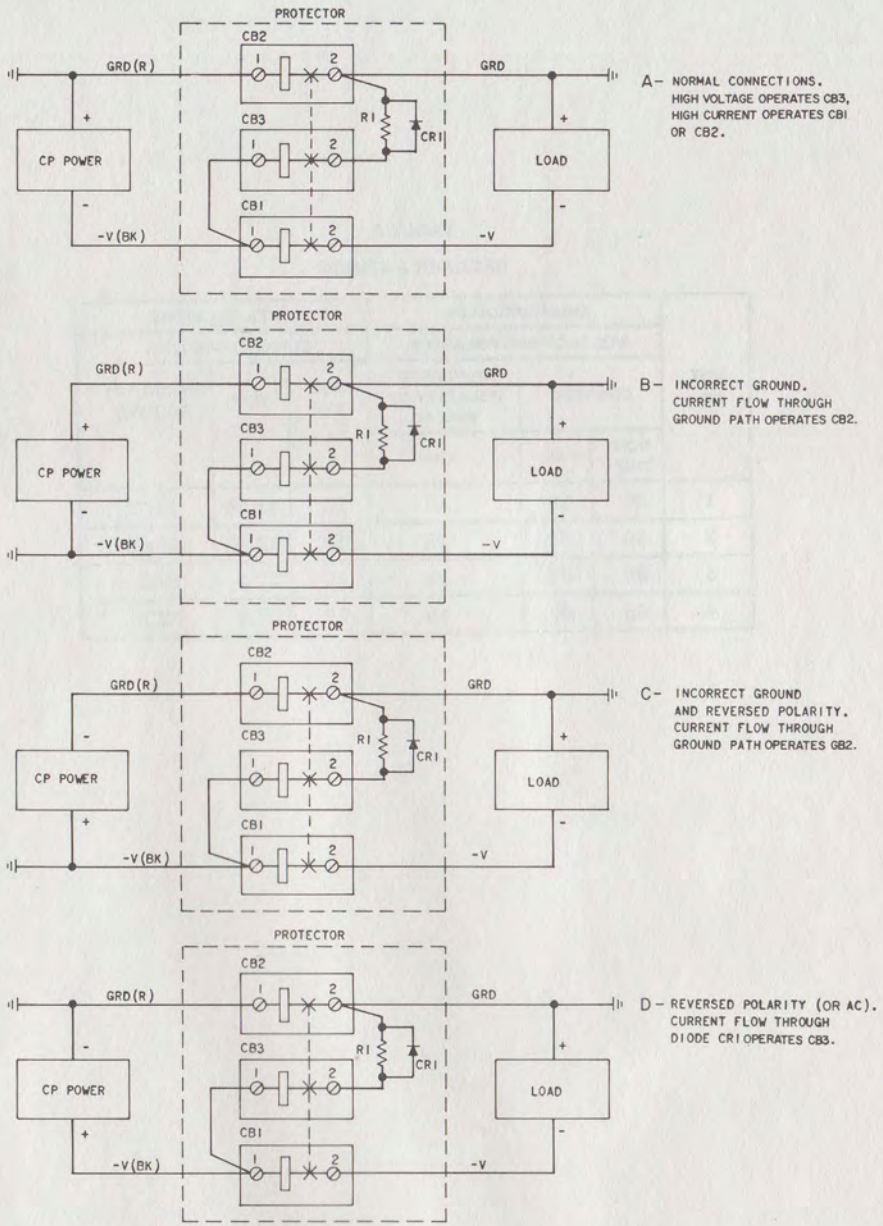


Fig. 4—Typical Protector Fault Conditions

TABLE A
BREAKER RATINGS

LIST NO.	SHUNT BREAKER			SERIES BREAKERS		
	VOLTAGE AND POLARITY			CURRENT AMPERES		
	CORRECT		REVERSED POLARITY OR 60Hz AC	NON TRIP	TRIP	INCORRECT GROUND
	NON TRIP	TRIP	TRIP			
1	30	38	18	15	18.75	18.75
2	56	68	18	15	18.75	18.75
3	30	38	18	30	37.5	37.5
4	56	68	18	30	37.5	37.5