

PROTECTIVE CONNECTING ARRANGEMENT CED

1. GENERAL

1.01 This section provides identification, installation, operation, maintenance, and connection information for the 101-type interconnecting unit (IU) and associated 69G apparatus mounting, 604-type panel, or 615A panel when used for Protective Connecting Arrangement (PCA) CED. It also covers the KS-20944 protector used for PCA VCP, which can be associated with PCA CED.

1.02 This section is reissued to:

- Include information on the 101C IU which replaces the 101B (MD)
- Rate the 604B panel MD
- Replace the term Voice Connecting Arrangement (VCA) with Protective Connecting Arrangement (PCA)
- Add comcode numbers to piecepart numbers
- Add new Table A.

1.03 For detailed information on associated apparatus, refer to the following sections:

463-300-101—604A Panel

463-300-102—604B and 604C Panels; 21A Apparatus Unit

463-300-104—615A Panel

463-300-109—KS-20944 Protector

463-300-113—142A Test Set

1.04 ♦The 101C IU (Fig. 1) is an improved version of the 101B (MD) (Fig. 2) and is the preferred unit for new installations and replacements. Existing installations with 101A (MD) and 101B (MD) IUs may be encountered in the field; do not replace these units unless they are defective. Furthermore,

existing stock of these MD IUs should be used if possible. Refer to Table A for a summary of the applications and limitations of the three 101-type IUs.♦

Note: In existing installations using pulse correction, the 103A (MD) pulse corrector must be removed when replacing a 101A with a 101B or C.

1.05 The 604B panel (Fig. 3 and 5) is now rated MD but may be used when available; an installed 604B should be replaced with a 604C (Fig. 3 and 4) only when defective. These conditions also apply to the MD rated 604A-type panel (Fig. 6).

Caution: *When 101A and 101B/C IUs are installed in the same 604B or C panel, do not use a 101A for trunk 9 (position 13) if 101B/Cs are used for trunks 1 or 3 (positions 1 or 4), and do not use a 101A for trunk 14 (position 14) if 101B/Cs are used for trunks 5 or 7 (positions 7 or 10). If these rules are violated, the AGC leads of the 101B/Cs will be shorted.*

1.06 For mounting one to six 101-type IUs, use 615A panels. For over six circuits, use a 604-type panel. Consider both the size of the initial installation and the expected future growth in selecting the proper mounting equipment.



Do not use the 69G apparatus mounting for any new installations. Information is supplied in this practice only for servicing existing installations of the 69G.

1.07 The customer should contact the local Telephone Company Business Office or the Marketing Representative to obtain a copy of the Technical Reference covering this interface specification.

1.08 This issue is based on the following drawings:
SD-1E201-01, Issue 5B (101A IU)

NOTICE

Not for use or disclosure outside the
Bell System except under written agreement

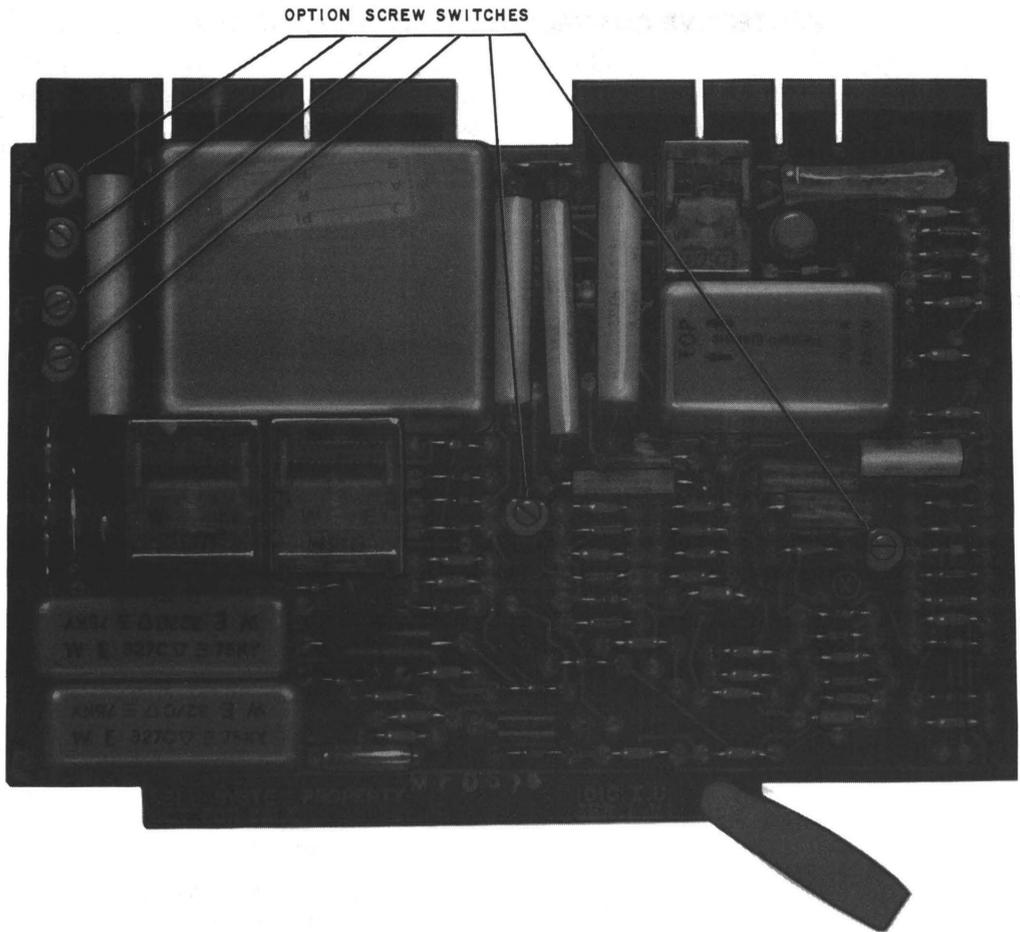


Fig. 1—101C IU

SD-1E238-01, Issue 6B (101B IU)

SD-1E294-01, Issue 2D (101C IU)

SD-1E200-01, Issue 2D (604A Panel)

SD-69599-01, Issue 2A (69G Apparatus Mounting)

If this section is to be used with equipment or apparatus reflecting later issue(s) of the drawing(s),

reference should be made to the SDs and CDs to determine the extent of the changes and the manner in which the section may be affected.

2. IDENTIFICATION

PURPOSE

(a) *PCA CED*

- To provide a means to automatically connect, on a ground start basis, the dial switching equipment of a customer-provided (CP) PBX to a Bell System toll operator for toll terminal service with ringback
- To limit excessive transmission signal levels from customer-provided equipment (CPE) and to provide protection for telephone company personnel against hazardous voltages
- To provide network control signaling functions.

(b) **PCA VCP**

- To provide an interface between CP power supply and PCA CED
- To provide protection for telephone company personnel against hazardous voltages.

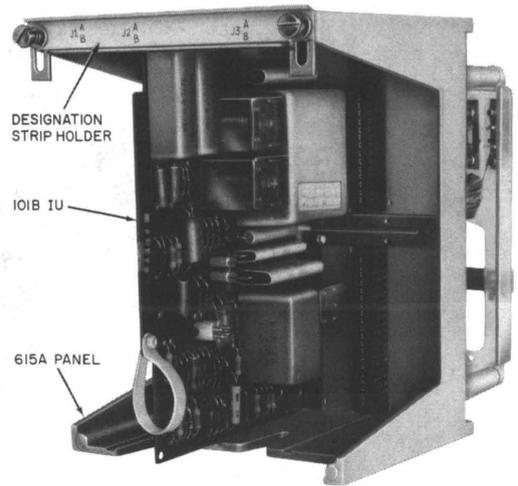


Fig. 2—101B (MD) IU Mounted in 615A Panel

◆ TABLE A ◆

APPLICATIONS OF 101-TYPE IUs

IU	APPLICATIONS/LIMITATIONS
101C	<ul style="list-style-type: none"> ● All applications. ● No limitations.
101B (MD)	<ul style="list-style-type: none"> ● Not recommended for use with panel COs. ● Not recommended for use with CPE equipped with electronic toll restriction circuitry.
101A (MD)	<ul style="list-style-type: none"> ● Not recommended for use with panel COs. ● Cannot be used in conjunction with 75A control units (PCA CBF).

APPLICATION

- PCA CED is intended for use with CP Hotel-Motel dial PBX systems.

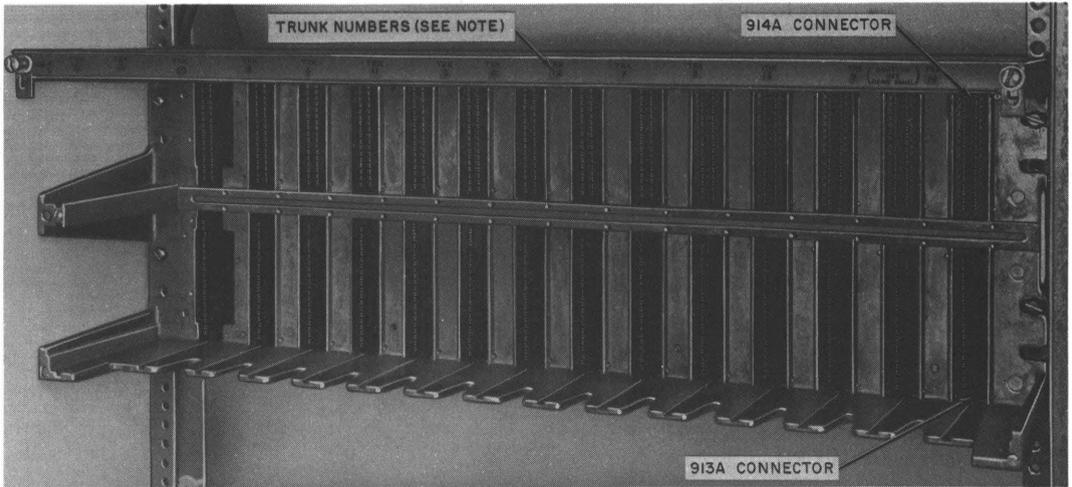
ORDERING GUIDE(a) **For PCA CED**

- Unit, Interconnecting, 101C (one per toll operator access trunk) (Fig. 1).

(b) **Associated Apparatus (Order Separately)**

Note: If a 23-inch relay rack is not provided on customer premises, provide a 16C apparatus mounting or equivalent for the 615A panel or an ED-91180-72 Group 21 cabinet for the 604-type panel, or their local equivalent.

- Panel, 615A (includes fuse panel only, no power unit; mounts up to three 101-type IUs) (Fig. 2)



NOTE: ON OLDER 604B PANELS, POSITION NUMBERS APPEAR INSTEAD OF TRUNK NUMBERS.

INSTALLATION SEQUENCE OF IOI-TYPE INTERCONNECTING UNITS

TRUNK NO.	1	2	10	3	4	11	5	6	12	7	8	13	9	14
POSITION NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14

Fig. 3—604B (MD) or 604C Panel, Front View

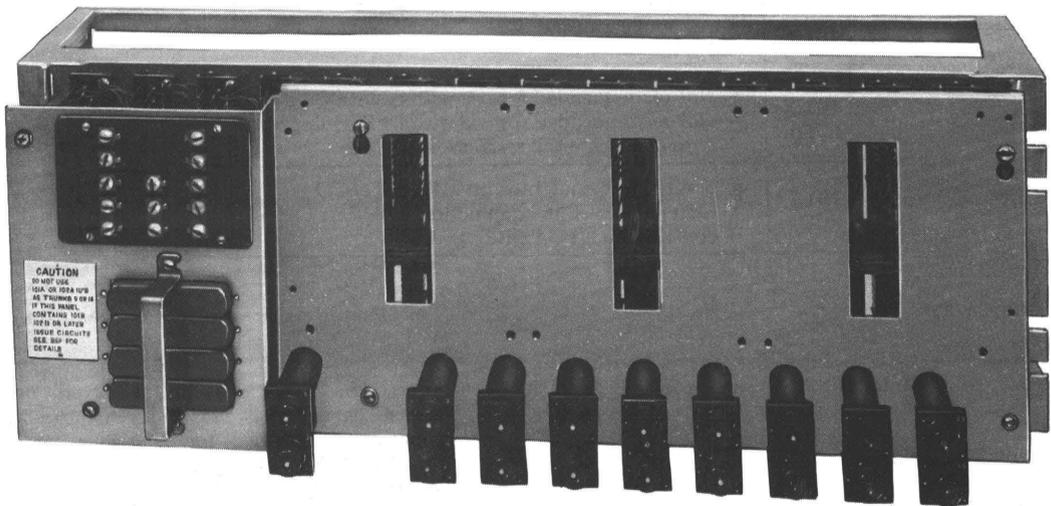


Fig. 4—604C Panel, Rear View (21A Apparatus Unit Not Installed)

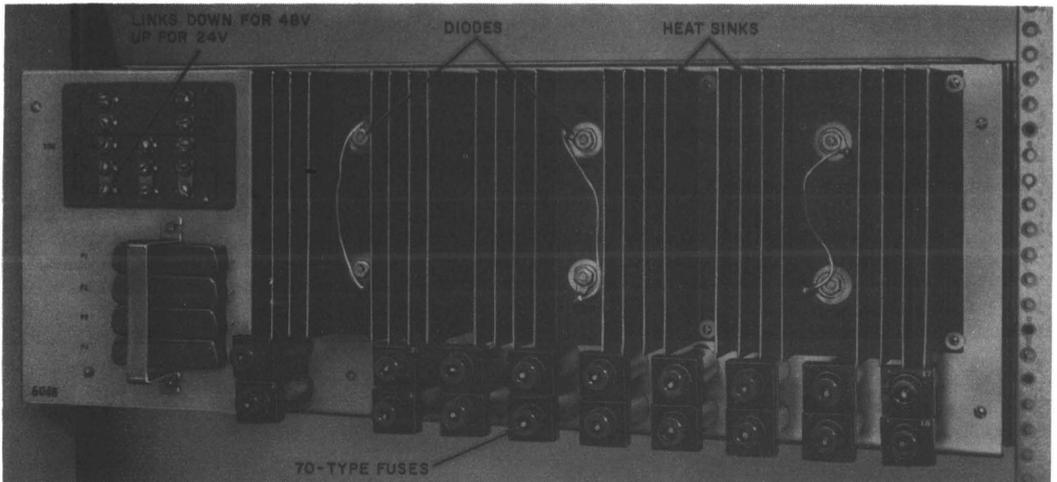


Fig. 5—604B (MD) Panel, Rear View

INSTALLATION
SEQUENCE OF IOI
INTERCONNECTING
UNITS

TRUNK NO.	POSITION NO.
1	1
2	2
3	4
4	5
5	7
6	8
7	10
8	11
9	13
10	3
11	6
12	9
13	12
14	14

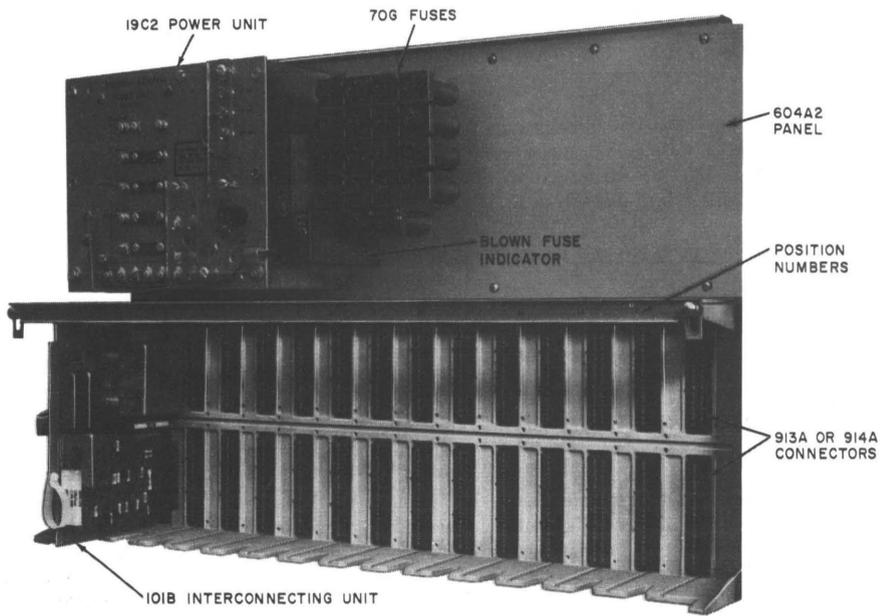


Fig. 6—101B IU Mounted in 604A2 (MD) Panel

- Bracket, 99B (one per one, two, or three 615A panels when mounted in 16C or in relay rack)

- Adapter, 262A (one per 19C2 power unit mounted in 16C)

or

- Panel, 604C (24V operation; includes fuse panel only, no power unit; mounts up to fourteen 101-type IUs) (Fig. 3 and 5)

- Unit, Apparatus, 21A (converts 604C panel to 48V operation)

- Cable, A25B (one per 615A panel or one, two, or four per 604-type panel) (Table B)

- Cable, A50B (one per 604-type panel) (Table B)

- Cable, 475A (one per 604-type panel) (Table B)

- Block, Connecting, 66M1-50 (as required) (Fig. 7, 10, and 11)

- Block, Connecting, 66B4-25 (as required) (Fig. 10 and 11)

Note: Other types of blocks may be used when specified by local engineering. (66M1-50 should be used for interface with CPE to facilitate testing with 142A test set.)

- Clip, Bridging, B (25 per pack, as required) (Fig. 7)

- Cable, D Inside Wiring, or equivalent (for connecting 615A panel to connecting block for CO terminations)

- Wire, 20-gauge (for connecting external power supplies to 604-type or 615A panels)

- Unit, Power, 19C2 or equivalent (for 615A, 604A1, 604B or 604C panels locally engineered and installed when existing PBX power supply is insufficient)

- Cord, Power (for 19C2 power unit)

● 824013262 (P40J326) (1-1/2 feet)

824013270 (P40J327) (2 feet)

824013288 (P40J328) (4 feet)

824013296 (P40J329) (6 feet)

824010995 (P40J099) (12 feet)

(c) **For Power Protection Unit (PCA VCP)**

- KS-20944, L1 Protector (must be provided when a CP dc power supply is used) (Fig. 8).

(d) **Replaceable Components (For 604-Type or 615A Panel)**

- Unit, Power, 19C2 (for 604A2 panel)

- Fuses, 70G (1/2 ampere, 18 per 604A-type panel)

- Fuses, 70F (1/4 ampere, 13 per 604B or 604C panel)

- Fuses, 70G (1/2 ampere, two per 604B or 604C panel)

- Fuses, 70A (1-1/3 ampere, three per 604B or 604C panel)

- Fuses, 24E (1/2 ampere, eight per 615A panel)

- Indicator, 17C-49 (for optional fuse alarm, if required; 604B or 604C panel only).

DESIGN FEATURES

101-Type Interconnecting Unit

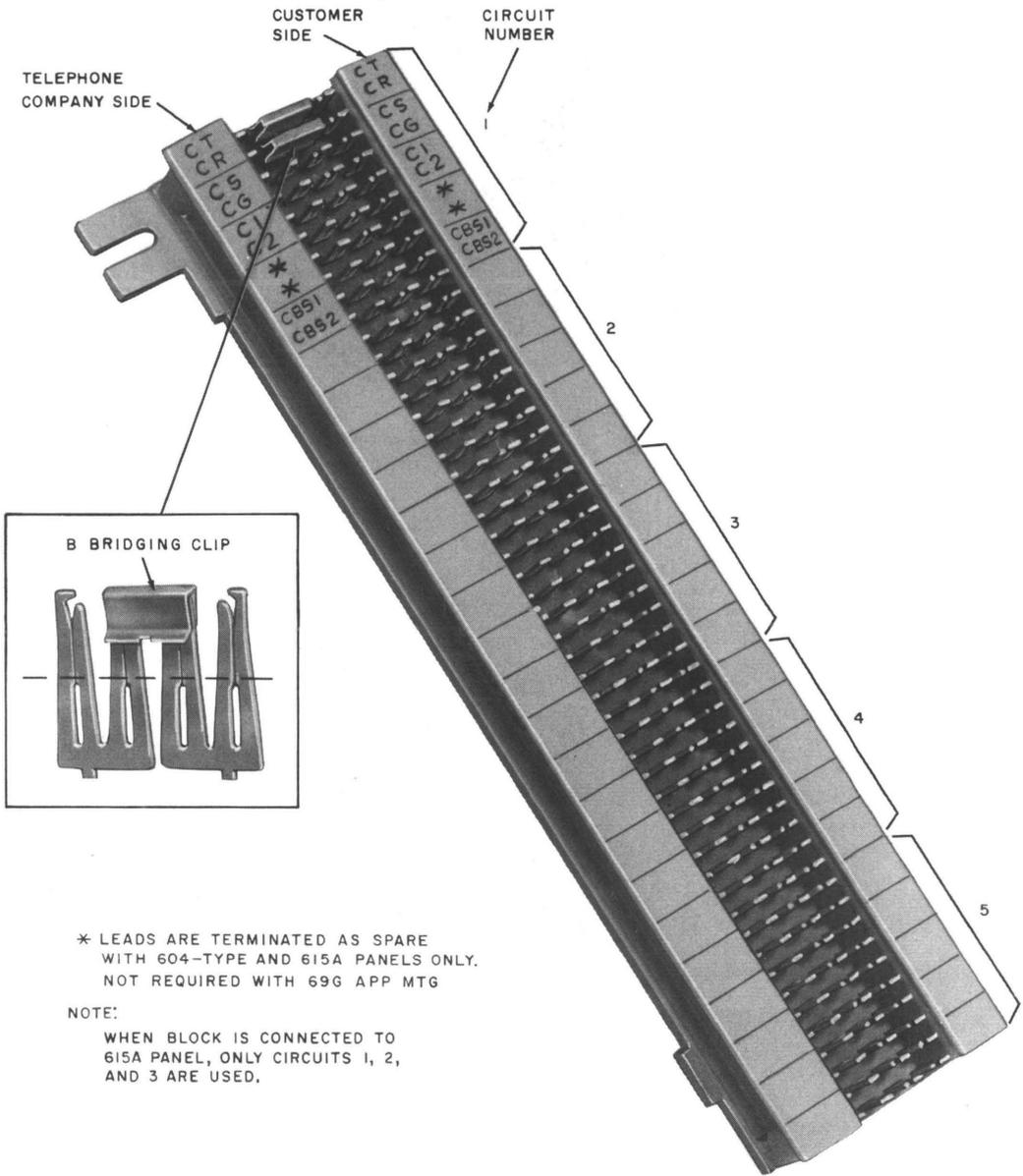
- Components mounted on epoxy coated 8-inch 80-pin board

- Ambient operating temperature range 0°F to 120°F

- Approximate dimensions: 7-1/2 inches by 5-1/2 inches

- Options connected by straps on 101A and 101B; by screw switches on 101C (Fig. 1)

- Features line impedance matching (101B and C only)



* LEADS ARE TERMINATED AS SPARE WITH 604-TYPE AND 615A PANELS ONLY. NOT REQUIRED WITH 69G APP MTG

NOTE:
WHEN BLOCK IS CONNECTED TO 615A PANEL, ONLY CIRCUITS 1, 2, AND 3 ARE USED.

Fig. 7—66M1-50 Interface Connecting Block



Fig. 8—KS-20944 Protector

- Features ground start operation with rering capability
- Maximum current requirement at 26 volts dc: 0.160 ampere (101A); 0.126 ampere (101B); 0.143 ampere (101C).

3. INSTALLATION

69G Apparatus Mounting (Fig. 9 and 10)

3.01 The 69G apparatus mounting should not be used for new installations of PCA CED. Refer to Fig. 10 for connections used in existing installations.

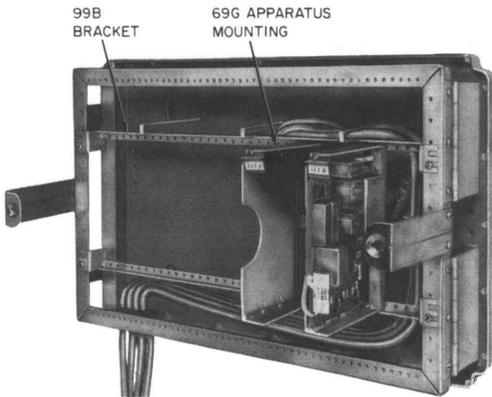


Fig. 9—69G Apparatus Mounting With 101B IU Mounted in 16C Apparatus Mounting

604-Type Panel (Fig. 11 and Tables C, D, E, F, I, J, and K)

3.02 Mount the 604-type panel on a standard relay rack or in an ED-91180-72, Group 21, 18-plate equipment cabinet. Locate the panel within 200 feet (18 ohms loop resistance) of the CPE for the 101A IU or within 1000 feet (100 ohms) for the 101B or C. Connect a separate ground wire to relay rack or cabinet. The ED-91180-72 cabinet will hold a maximum of two 604A-type panels or three 604B or C panels and a power unit when the drawing holder on the lower half of its cover is removed. Mount the 66M1-50 interface connecting block within 25 feet of the panel and in a position

which will facilitate testing between the block and the panel.

3.03 Make connection to the 604-type panel with connector cables. Arrangement of the plugs on the panel restricts plug P1 (CO lines) to an A25B connector cable. Plugs 2 through 4 (CPE connections) are arranged to accept a choice of cable sizes (see Table B). For example, in the first arrangement, an A25B can be used for plug 1 and single A75A for plugs 2 through 4; or a separate A25B can be used for each plug. Plug 5 (604A panel only) is not used with PCA CED.

3.04 Terminate the stub end of the connector cable from P1 on a 66B4-25 connecting block for CO lines (Table C).

3.05 Terminate the stub end of the connector cable from P2, P3, and P4 on the telephone company side of 66M1-50 interface connecting blocks located within 25 feet of the panel (Tables D, E, and F). Stencil lead designations on fanning strips and use B bridging clips to connect columns B and C together on the connecting block (Fig. 7).

3.06 The 604A1, 604B, and 604C panels operate on externally supplied -24 volts. The 604B can be adapted to -48 volt operation by putting the option straps in the down position (Fig. 5). The 604C can be adapted to -48 volt operation by adding a 21A apparatus unit and putting the option straps in the down position. Attach the 21A to the rear of the 604C using the four 8-32 by 3/16-inch screws supplied with the apparatus unit as a loose item. Electrical connection to the 604C is made by attaching each red wire to a 48-volt terminal and each red-black wire to a 24-volt option terminal.

3.07 When a telephone company power unit is used, the customer must provide a separately fused 105- to 130-volt, 60-Hz outlet within reach of available power cords (see ORDERING GUIDE for cord lengths) and not under control of a wall switch. Mount the power unit in the same rack or cabinet with the 604-type panel it supplies, if possible, or in a nearby location. If CP power is used, it must be supplied through a KS-20944 protector (see 3.19).

3.08 Connect external power to terminals on rear of 604-type panel as shown in Table I. Refer to the appropriate section in Division 518 for proper grounding of power plants which is

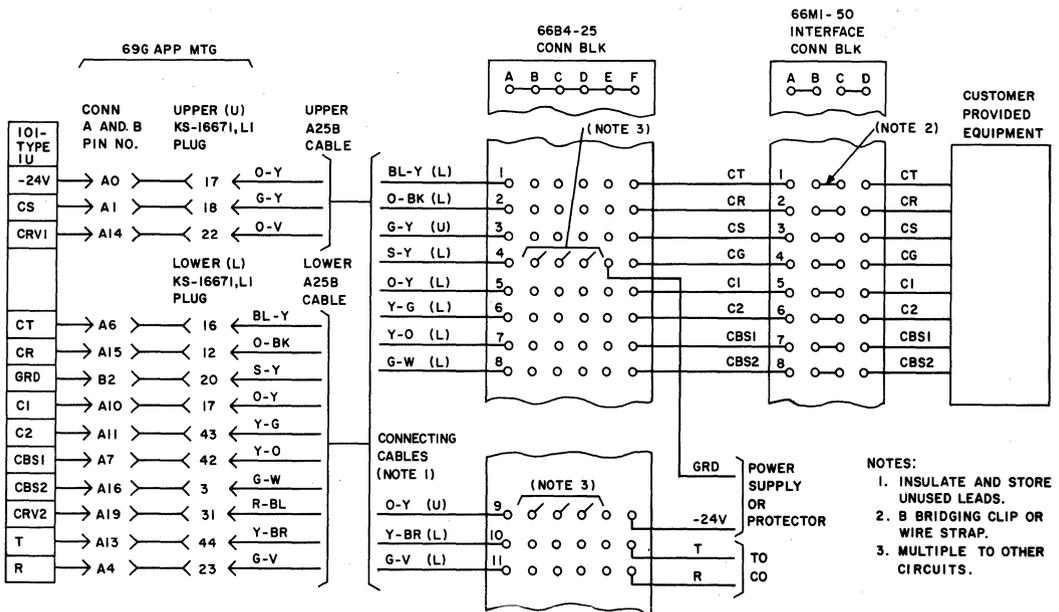


Fig. 10—Connection Diagram—69G Apparatus Mounting With 101-Type IU

important to prevent damage from power line surges.

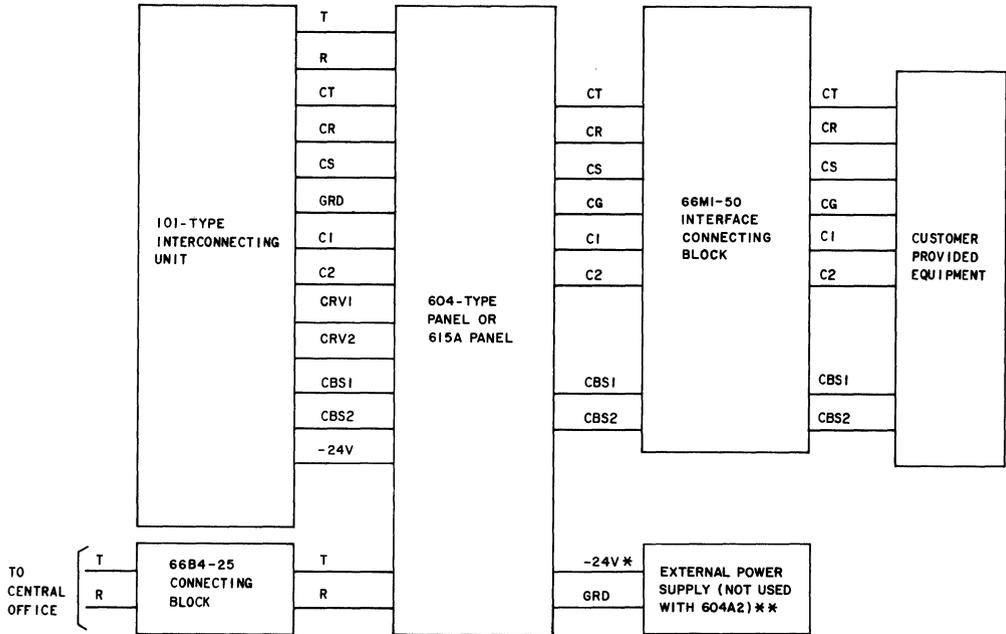
615A Panel (Fig. 11 and Tables G, H, I, and L)

3.09 Mount the 615A panel on a standard relay rack or on a 16C apparatus mounting using a 99B bracket. Remove the center mounting bar from the 16C to allow the 615A to fit on the 99B bracket. The bracket holds up to three 615A panels or two 615A panels and a 19C2 power unit mounted with a 262A adapter; up to three 101-type IUs can be installed in each panel. Locate the panel within 200 feet (18 ohms loop resistance) of the CPE for the 101A IU or within 1000 feet (100 ohms) for the 101B or 101C. Connect a separate ground wire to relay rack or apparatus mounting.

3.10 Use D station wire or D inside wiring cable to run T and R leads for the 66T1 block on the 615A panel to a 66B4-25 connecting block where CO lines are terminated (Table G).

3.11 Use an A25B connector cable to connect the 615A panel to a 66M1-50 interface connecting block located within 25 feet of the panel. Connect the plug end of the cable to P1 on the 615A panel and terminate the stub end on the telephone company side of the connecting block (Table H). Stencil lead designations on fanning strips and use B bridging clips to connect columns B and C together on the connecting block (Fig. 7).

3.12 When used with PCA CED, the 615A panel operates on -24 volts supplied from associated equipment, a separate telephone company power unit, or from the customer's power supply. When a telephone company unit such as the recommended 19C2 is used, the customer must provide a 105- to 130-volt, 60-Hz outlet within reach of available power cords (see ORDERING GUIDE for cord lengths) and not under the control of a wall switch. Mount the power unit in the same rack or apparatus mounting with the 615A panel it supplies, if possible, or in a nearby location. If CP power is used, it must be supplied through a KS-20944 protector (see 3.19).



* 604B AND C CAN OPERATE ON -48V.
 ** CP POWER MUST COME THROUGH PROTECTOR.

Fig. 11—Block Diagram—PCA CED Using 604-Type or 615A Panel

3.13 Use 20-gauge wire to connect external power to the 66T1 connecting block on the rear of 615A panel as shown in Table I. Strip insulation from wire before placing in terminals. Refer to appropriate section in Division 518 for proper grounding of power plants, which is important to prevent damage from power line surges.

101-Type Interconnecting Unit (Fig. 1, 12, 13, and 14)

3.14 Options—101A IU: Install proper option straps with 24-gauge bare wire (see Fig. 12):

- Option W: Required when CO is step-by-step.
- Option Y: Always required.
- Option Z: Install when CO loop resistance (including resistance of CO) is greater than 500 ohms.



Be sure all option straps have been installed and check continuity of straps after they are in place.

3.15 Options—101B or C IU: Install proper option straps on 101B with 24-gauge bare wire, or by screwing down screw switches on 101C (see Fig. 13 or 14):

- Option W: Install when CO loop resistance (including resistance of CO) is greater than 800 ohms.
- Option X: Required when CO is step-by-step.
- Option Y: Normally required; factory installed. Provides impedance ratio of 600 ohms to 600 ohms between CPE and CO lines.

- Option Z: Provides impedance ratio of 600 ohms to 900 ohms between CPE and CO lines, respectively. Required only when PBX-CO trunk facility is designed with terminating sets or 837-type impedance compensators that have 900 ohms input impedance.



The sequence of installing 101-type IUs in the panels is important. Refer to the table in Fig. 3 for the correct sequence for the 604B or C panels and the table in Fig. 6 for the 604A panel. Note that the trunk number does not necessarily correspond to the position number in the panel. For example, the IU for trunk 3 must be installed in position 4. (The designation strip holders on the 604C panel and on some newer 604B panels show the trunk number associated with each position. The 604A and older 604Bs have only the position number.) In the 615A panel, install the IUs for trunks 1, 2, and 3 in J1, J2, and J3 respectively.

3.16 Refer to CAUTION preceding 1.06 before installing 101A and 101B IUs in the same 604B or 604C panel. When installing the 101-type IU, raise the designation strip holder on the panel, position the board in the guide grooves of the 615A or 604-type panel, and slide the 101-type IU until it is properly seated and electrically connected to the 913A or 914A connectors. The guide grooves prevent improper insertion of the 101-type IUs.

Note: The connectors in the 604B and C panels are equipped with index clips to match the code slots in the 101B and C IUs. When using the 101A IUs, pull out the clips between contacts 9 and 10 in the B connectors.

- 3.17** Make certain designation strip holder is properly positioned to hold the IUs in place.
- 3.18** Perform tests shown in Part 5 after installation.

KS-20944 Protector (Fig. 15)

3.19 When voltage protection is required, the KS-20944 protector must be mounted externally and wired to the power supply terminals of the

615A or 604-type panel (Fig. 11). Refer to Section 463-300-109 for connections to multiple installations.

3.20 Set circuit breaker switch lever to OFF and connect as shown in Fig. 15 following local wiring instructions. The customer must connect his power supply to the red (GRD) and black (-V) wires extending from the unit.

Warning: Voltage will be present on upper terminals of circuit breakers as soon as customer power is connected.



Check for correct polarity and ground before closing circuit breakers.

4. OPERATION

A. 101B or C Interconnecting Unit (Fig. 13 or 14):

4.01 Outgoing Call: When the user of the CP station dials the trunk level associated with PCA CED, the CPE initiates a contact closure between the CS and CG leads. The resulting ground on the CS lead operates the K6 relay of the 101C IU (or relays K5 and K6 of the 101B). Operation of K6 relay grounds the ring side of the trunk circuit to the CO which causes a signal to appear at the toll board. The toll operator plugs the rear cord of a cord pair into the jack associated with the signal and operates the DIAL and TALK key. Ground is returned on the tip and battery on the ring of the trunk circuit. This operates the K4 relay of the 101B IU (or relays K4 and K5 of the 101C) and releases K6 relay. Operation of K4 relay closes a set of supervisory contacts to the CPE over the CBS1 and CBS2 leads and removes the ground detector. With K6 released and K5 operated, ground is removed from ring, and a talking path is established between the toll operator and the CPE. The toll operator requests dialing information and, using the front cord of the same cord pair, dials the requested number and restores the DIAL and TALK key.

4.02 Disconnect and Operate Ringback: When the CP station goes on-hook, the closure between the CS and CG leads is opened and the K5 relay releases opening the loop to the toll operator. If this loop is opened or if the toll connection is opened, the toll operator receives a disconnect signal and may then ring toward the

CP PBX to provide time and charge information to the PBX attendant. Ring relay K1 in the ring detector circuit operates and closes a set of contacts to the CPE over the C1 and C2 leads. The PBX attendant answers the ringing by a contact closure on the CS and CG leads, which operates the K5 relay. K5 relay operated removes the ground detector circuit, trips ringing, and establishes the talking path. When the CP PBX attendant and the toll operator disconnect, the K4 and K5 relays release and the circuit returns to the idle condition.

Note: 101A IU (Fig. 12) operates similarly to the 101B and C IU using different relays.

B. KS-20944 Protector (Fig. 15)

4.03 When the CPE dc power supply is used to operate the telephone company equipment, overcurrent and overvoltage protection is required. The KS-20944 power protector is used to protect the telephone company personnel from hazardous voltages but may not protect equipment from component failures. The KS-20944 protector provides a switch to disconnect dc power when working on interconnecting circuits.

4.04 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 a dc current-operated circuit breaker connected in each side of the line. The contacts on the breaker are connected in series with the coil of the breaker, and they are mechanically coupled together. When any breaker is operated, the line will be opened. The circuit breakers must be manually reset after tripping. They cannot be reset if the fault persists.

4.05 The KS-20944, List 1 protector is designed to trip in 25 milliseconds (maximum) on 38 volts dc, on 18.75 amperes dc, on reversed polarity (or ac) greater than 18 volts, or on incorrect power supply ground.

5. MAINTENANCE

5.01 When trouble is reported, check the CO pair and check for blown fuses and loose or broken connections. If the fault is not found, perform a test of the 101-type IU.

A. Using 1013A Hand Test Set and 81A Test Set

5.02 Prepare the circuit under test as follows:

- (1) Open the eight leads to CPE by removing the B bridging clips (or wire straps) at the 66M1-50 interface block.
- (2) Supply talk battery by connecting a 500-ohm resistor from the -24 volt supply to terminal CR and ground to terminal CT (make all connections on the telephone company side of the interface block). A 2A KTU or 31A KTU may be used for battery feed instead of the resistor. Refer to Section 518-112-421 for KTU connections.
- (3) Connect a 1013A hand test set (or equivalent) across terminals CT and CR.
- (4) Connect an 81A or KS-16990, List 1 test set across terminals CBS1 and CBS2 with the switch in C position.

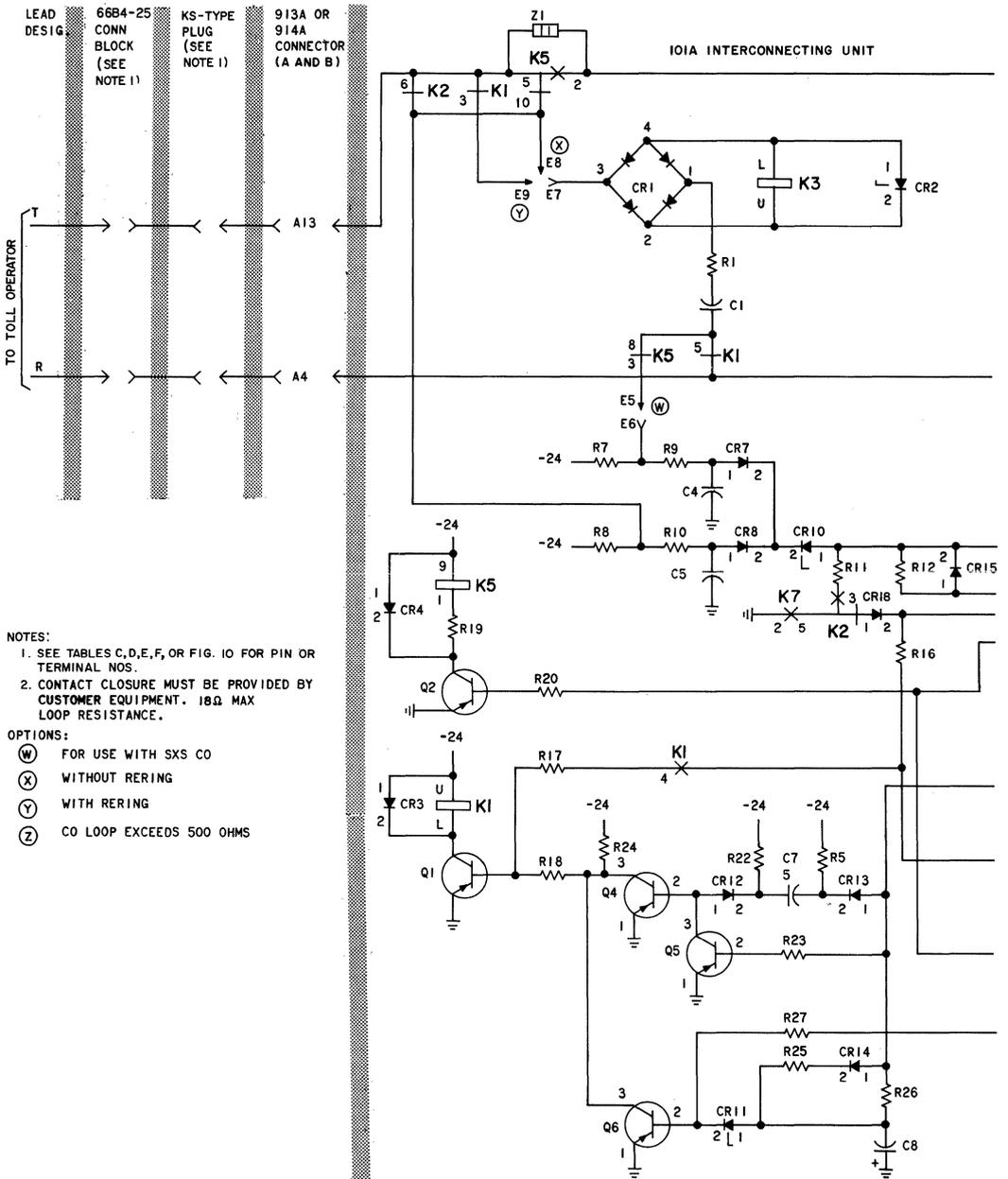
5.03 Perform the following tests:

- (a) **Transmission Path:** Connect a strap across the CS and CG terminals. When the toll operator answers the call, there should be continuity across the CBS1 and CBS2 terminals as indicated by the 81A test set. Remove the test set from the CBS1 and CBS2 terminals.
- (b) **Disconnect and Operator Ringback:** Connect the 81A (or KS-16990, List 1) test set across the C1 and C2 terminals. Remove the strap across the CS and CG terminals. The toll operator will receive a disconnect signal and may ring back causing a contact closure across the C1 and C2 terminals. Answer the call by strapping the CS and CG terminals. Remove the strap and the circuit returns to idle.

B. Using 142A Test Set (Fig. 16)

5.04 Prepare the circuit under test as follows:

- (1) Disconnect the CPE by removing the B bridging clips or wire straps at the interface block.
- (2) Select the proper interface cord from the three available 10-conductor cords and connect to the proper terminals on the telephone company side of the block.



- NOTES:
1. SEE TABLES C, D, E, F, OR FIG. 10 FOR PIN OR TERMINAL NOS.
 2. CONTACT CLOSURE MUST BE PROVIDED BY CUSTOMER EQUIPMENT. 18Ω MAX LOOP RESISTANCE.

- OPTIONS:
- (W) FOR USE WITH SXS CO
 - (X) WITHOUT RERING
 - (Y) WITH RERING
 - (Z) CO LOOP EXCEEDS 500 OHMS

Fig. 12—Schematic—101A (MD) IU (Sheet 1)

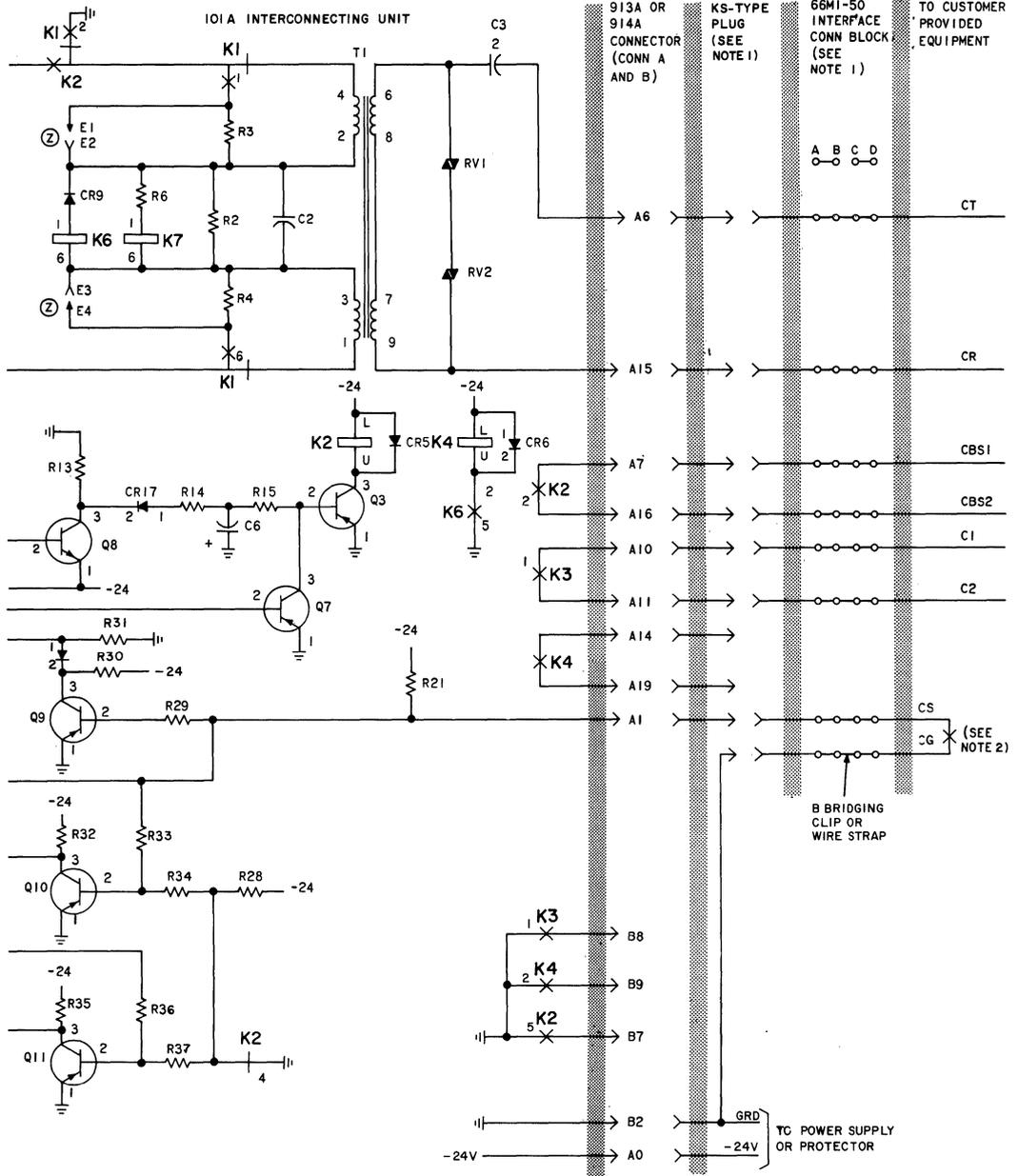
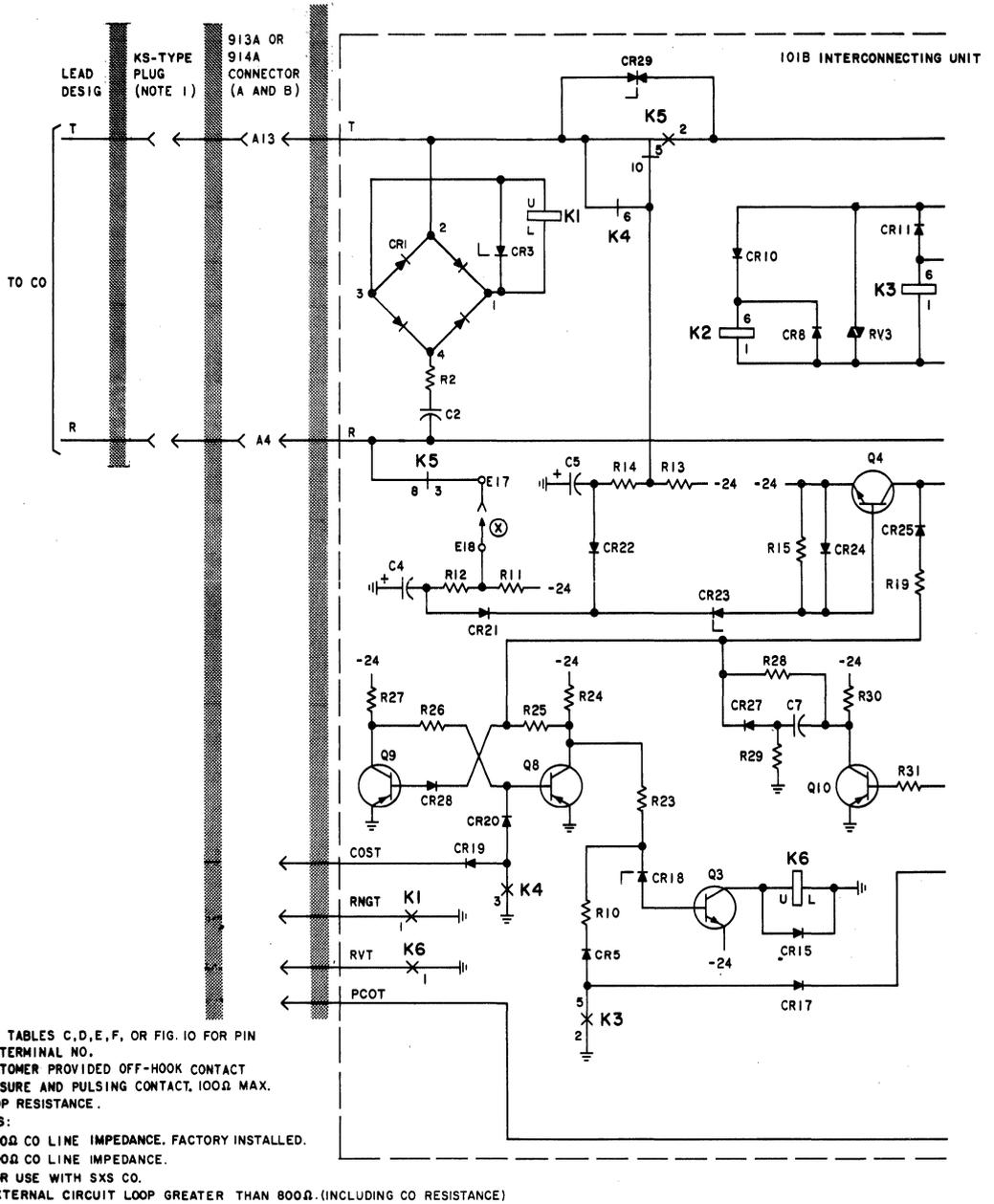


Fig. 12—Schematic—101A (MD) IU (Sheet 2)



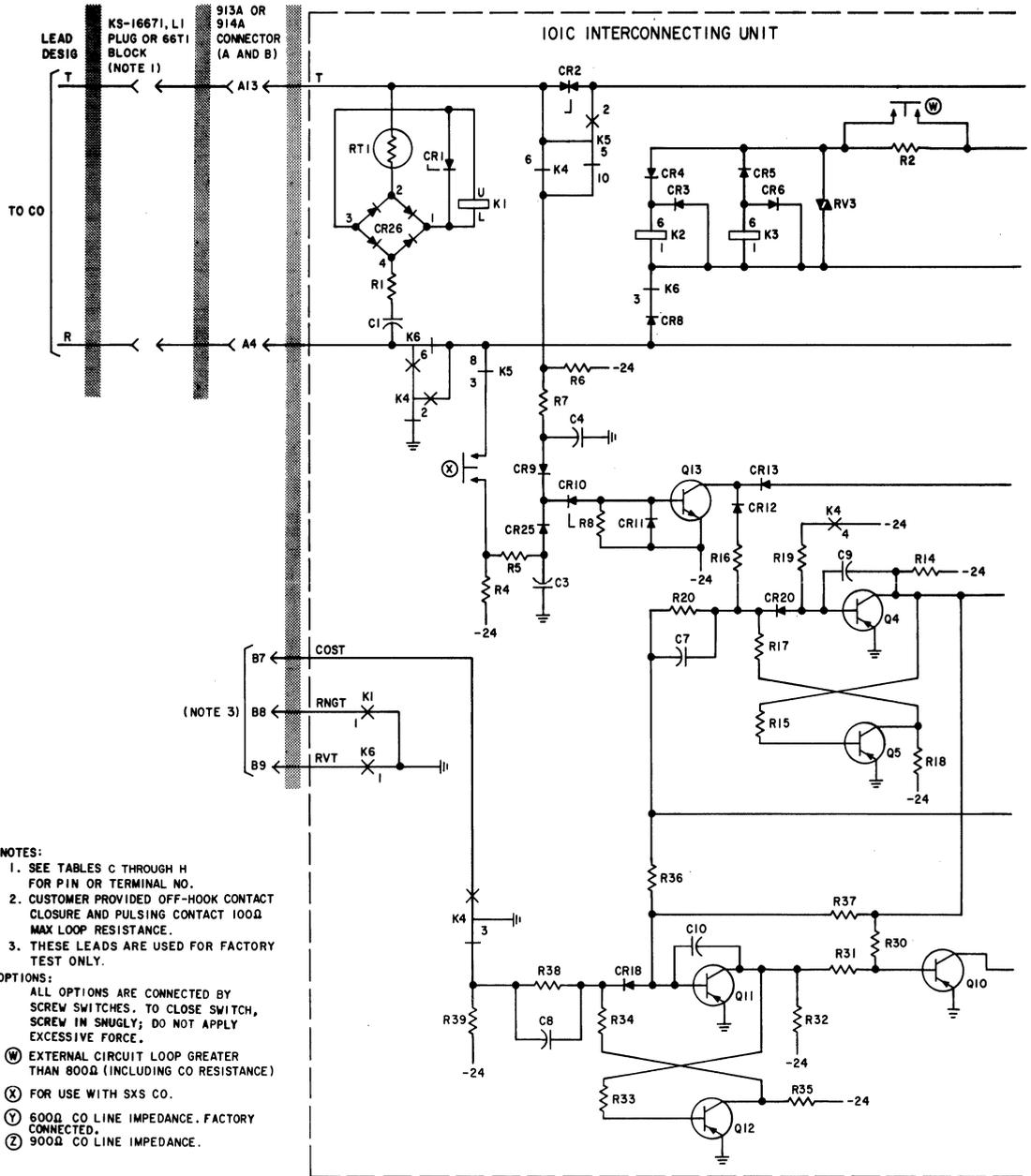
NOTES:

1. SEE TABLES C, D, E, F, OR FIG. 10 FOR PIN OR TERMINAL NO.
2. CUSTOMER PROVIDED OFF-HOOK CONTACT CLOSURE AND PULSING CONTACT, 100Ω MAX. LOOP RESISTANCE.

OPTIONS:

- ① 600Ω CO LINE IMPEDANCE, FACTORY INSTALLED.
- ② 900Ω CO LINE IMPEDANCE.
- ③ FOR USE WITH SXS CO.
- ④ EXTERNAL CIRCUIT LOOP GREATER THAN 800Ω. (INCLUDING CO RESISTANCE)

Fig. 13—Schematic—101B (MD) IU (Sheet 1)



- NOTES:**
1. SEE TABLES C THROUGH H FOR PIN OR TERMINAL NO.
 2. CUSTOMER PROVIDED OFF-HOOK CONTACT CLOSURE AND PULSING CONTACT 100Ω MAX LOOP RESISTANCE.
 3. THESE LEADS ARE USED FOR FACTORY TEST ONLY.
- OPTIONS:**
- ALL OPTIONS ARE CONNECTED BY SCREW SWITCHES. TO CLOSE SWITCH, SCREW IN SNUGLY; DO NOT APPLY EXCESSIVE FORCE.
- (W) EXTERNAL CIRCUIT LOOP GREATER THAN 800Ω (INCLUDING CO RESISTANCE)
 - (X) FOR USE WITH SXS CO.
 - (Y) 600Ω CO LINE IMPEDANCE. FACTORY CONNECTED.
 - (Z) 900Ω CO LINE IMPEDANCE.

Fig. 14—Schematic—101C IU (Sheet 1)

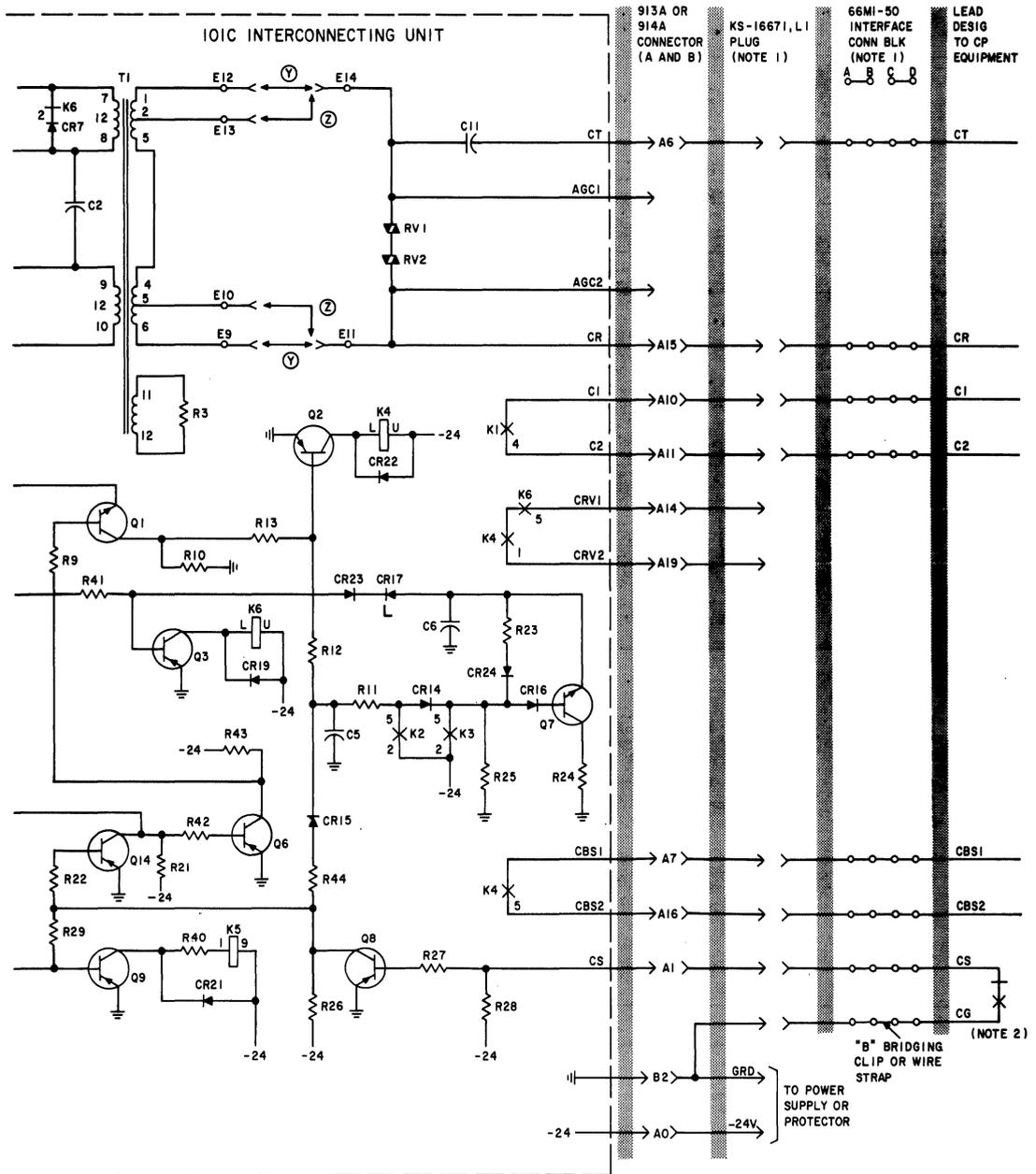


Fig. 14—Schematic—101C IU (Sheet 2)

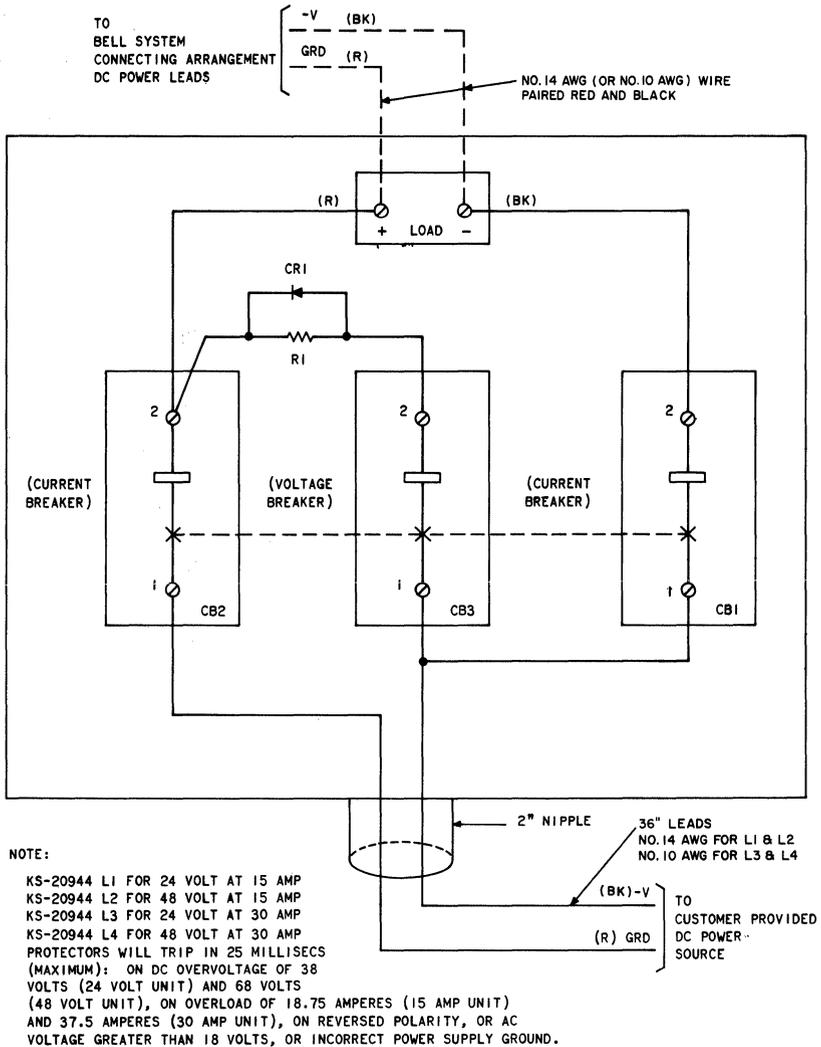


Fig. 15—Schematic—KS-20944 Protector

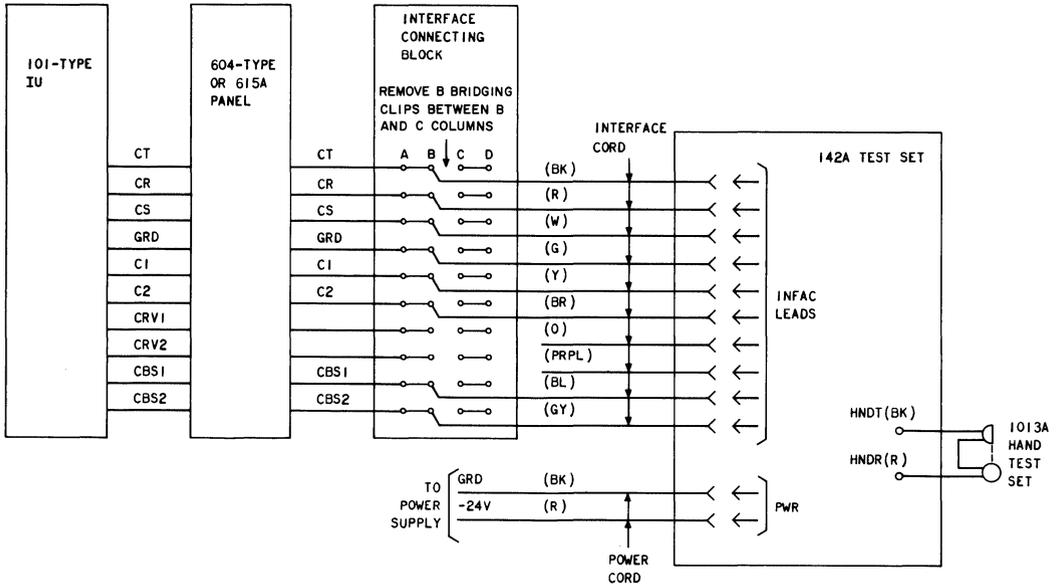


Fig. 16—Connections for Testing 101-Type IU With 142A Test Set

(3) Connect the leads from the 2-conductor power cord to -24 volts and ground. This voltage should be obtained from the same source used to power the IU under test. The PWR lamp on the test set should light.

(4) Connect a 1013A hand test set to the HNDR and HNDT terminals on the test set with the MON-TALK switch in the MON position.

(5) Set the CS-CG loop switch in the 18-ohm position for a 101A IU or in the 100-ohm position for a 101B or C IU.

◆ **Note:** This is a slide switch on current production; earlier models used a rotary switch.◆

5.05 After circuit preparation, proceed as follows:

(1) Operate switch on 1013A hand test set to the TALK position. The S relay in the 142A test set will operate, lighting the CS lamp and providing signal ground on the CS lead through the selected resistance on the CS-CG loop switch.

Ground on the CS lead causes the IU to ground the ring of the trunk and signal the toll operator. A ground hum may be heard in the hand test set during this period. This is a normal condition caused by the ground placed on the ring passing through the coupling transformer.

Note: If the IU fails to seize the CO trunk, move the CS-CG loop switch to a lower value. If the IU now operates properly, it is considered marginal. Circuits which operate only in the 0 position should be replaced.

(2) When the toll operator answers, battery and ground are placed on the ring and tip to the IU, which provides a closure on CBS1 and CBS2 which lights the CBS-lamp. Conversation with the operator should now be possible.

(3) Request operator to observe for a disconnect and then rering. Operate hand test set switch to MON. CS lamp should be extinguished.

- (4) When operator rerings, the IU should function to provide a contact closure on C1 and C2 to light the C- lamp.
- (5) Operate switch to TALK. The C- lamp should be extinguished; the CS lamp relights, and transmission is reestablished.
- (6) Have operator release trunk. Operate switch to MON. The CS and CBS- lamps should be extinguished and IU should be in the idle condition.

5.06 When all testing is complete, remove power and interface cords. Connect CPE by restoring B bridging clips or wire straps at interface connecting block.

5.07 When trouble is suspected in the IU, exchange it with another unit known to be functioning properly.

5.08 If the above tests are satisfactory, remove all connections to restore the circuit to normal and replace the B bridging clips (or wire straps) on the 66M1-50 interface connecting block.

5.09 When trouble is suspected in the CPE, notify the Repair Service Bureau 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 (CPE).



Do not attempt any tests or repairs to the CPE.

6. CONNECTIONS

6.01 For connection information using the 69G apparatus mounting, refer to Fig. 10.

6.02 For connection information using the 604A-type panel, refer to Fig. 6 and 11 and Tables B, C, D, E, F, I, and J.

6.03 For connection information using the 604B and 604C panels, refer to Fig. 3, 4, 5 and 11 and Tables B, C, D, E, F, I, and K.

6.04 For connection information using the 615A panel, refer to Fig. 2 and 11 and Tables G, H, I, and L.

6.05 For connection information using the KS-20944 protector, refer to Fig. 15.

TABLE B

OPTIONAL CABLE ARRANGEMENTS TO PROVIDE CONNECTIONS FOR FOUR PLUGS ON 604-TYPE PANEL

CABLE DESIGNATION (NOTE)	MAXIMUM NO. OF CABLES REQUIRED		
	ARRANGEMENTS (SEE 3.03)		
	Arrangement 1	Arrangement 2	Arrangement 3
A25B	1	4	2
A50B			1
A75A	1		

Note: Arrangement of interconnecting units and local requirements will determine the size and maximum length of cable required.

◆ TABLE C ◆

CONNECTIONS FOR PLUG NO.1 – 604-TYPE PANEL

TRUNK NO.	LEAD DESIG*	CONN PIN NO.	A258 CONN CABLE COLOR	6684-25 CONN/BLK ROW NO.	POS. IN 604-TYPE PANEL
1	T	26	W-BL	1	1
	R	1	BL-W	2	
2	T	27	W-O	3	2
	R	2	O-W	4	
3	T	28	W-G	5	4
	R	3	G-W	6	
4	T	29	W-BR	7	5
	R	4	BR-W	8	
5	T	30	W-S	9	7
	R	5	S-W	10	
6	T	31	R-BL	11	8
	R	6	BL-R	12	
7	T	32	R-O	13	10
	R	7	O-R	14	
8	T	33	R-G	15	11
	R	8	G-R	16	
9	T	34	R-BR	17	13
	R	9	BR-R	18	
10	T	35	R-S	19	3
	R	10	S-R	20	
11	T	36	BK-BL	21	6
	R	11	BL-BK	22	
12	T	37	BK-O	23	9
	R	12	O-BK	24	
13	T	38	BK-G	25	12
	R	13	G-BK	26	
14	T	39	BK-BR	27	14
	R	14	BR-BK	28	
SPARE	SPARE	40	BK-S	29	
		15	S-BK	30	
		41	Y-BL	31	
		16	BL-Y	32	
		42	Y-O	33	
		17	O-Y	34	
		43	Y-G	35	
		18	G-Y	36	
		44	Y-BR	37	
		19	BR-Y	38	
		45	Y-S	39	
		20	S-Y	40	
		46	V-BL	41	
		21	BL-V	42	
		47	V-O	43	
		22	O-V	44	
		48	V-G	45	
		23	G-V	46	
		49	V-BR	47	
		24	BR-V	48	
		50	V-S	49	
		25	S-V	50	

* Stencil lead designations on fanning strip.

TABLE D

CONNECTIONS FOR PLUG NO.2 – 604-TYPE PANEL

TRUNK NO.	LEAD DESIG*	CONN PIN NO.	CONN CABLE COLOR	604M1-50 INTERFACE CONN BLK ROW NO.	POS. IN 604-TYPE PANEL
1	CT	26	W-BL	1	1
	CR	1	BL-W	2	
	CS	27	W-O	3	
	CG	2	O-W	4	
	C1	28	W-G	5	
	C2	3	G-W	6	
	SPARE	29	W-BR	7	
	SPARE	4	BR-W	8	
	CBS1	30	W-S	9	
	CBS2	5	S-W	10	
2	CT	31	R-BL	11	2
	CR	6	BL-R	12	
	CS	32	R-O	13	
	CG	7	O-R	14	
	C1	33	R-G	15	
	C2	8	G-R	16	
	SPARE	34	R-BR	17	
	SPARE	9	BR-R	18	
	CBS1	35	R-S	19	
	CBS2	10	S-R	20	
3	CT	36	BK-BL	21	4
	CR	11	BL-BK	22	
	CS	37	BK-O	23	
	CG	12	O-BK	24	
	C1	38	BK-G	25	
	C2	13	G-BK	26	
	SPARE	39	BK-BR	27	
	SPARE	14	BR-BK	28	
	CBS1	40	BK-S	29	
CBS2	15	S-BK	30		
4	CT	41	Y-BL	31	5
	CR	16	BL-Y	32	
	CS	42	Y-O	33	
	CG	17	O-Y	34	
	C1	43	Y-G	35	
	C2	18	G-Y	36	
	SPARE	44	Y-BR	37	
	SPARE	19	BR-Y	38	
	CBS1	45	Y-S	39	
CBS2	20	S-Y	40		
5	CT	46	V-BL	41	7
	CR	21	BL-V	42	
	CS	47	V-O	43	
	CG	22	O-V	44	
	C1	48	V-G	45	
	C2	23	G-V	46	
	SPARE	49	V-BR	47	
	SPARE	24	BR-V	48	
	CBS1	50	V-S	49	
CBS2	25	S-V	50		

* Stencil lead designations on fanning strip.

TABLE E
CONNECTIONS FOR PLUG NO.3 – 604-TYPE PANEL

TRUNK NO.	LEAD DESIG*	CONN PIN NO.	CONN CABLE COLOR	66M1-50 INTERFACE CONN BLK ROW NO.	POS. IN 604-TYPE PANEL
6	CT	26	W-BL	1	8
	CR	1	BL-W	2	
	CS	27	W-O	3	
	CG	2	O-W	4	
	C1	28	W-G	5	
	C2	3	G-W	6	
	SPARE	29	W-BR	7	
	SPARE	4	BR-W	8	
	CBS1	30	W-S	9	
	CBS2	5	S-W	10	
7	CT	31	R-BL	11	10
	CR	6	BL-R	12	
	CS	32	R-O	13	
	CG	7	O-R	14	
	C1	33	R-G	15	
	C2	8	G-R	16	
	SPARE	34	R-BR	17	
	SPARE	9	BR-R	18	
	CBS1	35	R-S	19	
	CBS2	10	S-R	20	
8	CT	36	BK-BL	21	11
	CR	11	BL-BK	22	
	CS	37	BK-O	23	
	CG	12	O-BK	24	
	C1	38	BK-G	25	
	C2	13	G-BK	26	
	SPARE	39	BK-BR	27	
	SPARE	14	BR-BK	28	
	CBS1	40	BK-S	29	
	CBS2	15	S-BK	30	
9	CT	41	Y-BL	31	13
	CR	16	BL-Y	32	
	CS	42	Y-O	33	
	CG	17	O-Y	34	
	C1	43	Y-G	35	
	C2	18	G-Y	36	
	SPARE	44	Y-BR	37	
	SPARE	19	BR-Y	38	
	CBS1	45	Y-S	39	
	CBS2	20	S-Y	40	
SPARE	SPARE	46	V-BL	41	
		21	BL-V	42	
		47	V-O	43	
		22	O-V	44	
		48	V-G	45	
		23	G-V	46	
-24V	FAL1 †	49	V-BR	47	F2
GRD	G1 †	24	BR-V	48	TS1-15
-48V	FAL2 †	50	V-S	49	F16
GRD	G2 †	25	S-V	50	TS1-16

* Stencil lead designations on fanning strip.

† Optional attendant alarm indicator on 604B or 604C panel only.

TABLE F
CONNECTIONS FOR PLUG NO. 4 – 604-TYPE PANEL

TRUNK NO.	LEAD DESIG*	CONN PIN NO.	CONN CABLE COLOR	68M1-50 INTERFACE CONN BLK ROW NO.	POS. IN 604-TYPE PANEL
10	CT	26	W-BL	1	3
	CR	1	BL-W	2	
	CS	27	W-O	3	
	CG	2	O-W	4	
	C1	28	W-G	5	
	C2	3	G-W	6	
	SPARE	29	W-BR	7	
	SPARE	4	BR-W	8	
	CBS1	30	W-S	9	
	CBS2	5	S-W	10	
11	CT	31	R-BL	11	6
	CR	6	BL-R	12	
	CS	32	R-O	13	
	CG	7	O-R	14	
	C1	33	R-G	15	
	C2	8	G-R	16	
	SPARE	34	R-BR	17	
	SPARE	9	BR-R	18	
	CBS1	35	R-S	19	
	CBS2	10	S-R	20	
12	CT	36	BK-BL	21	9
	CR	11	BL-BK	22	
	CS	37	BK-O	23	
	CG	12	O-BK	24	
	C1	38	BK-G	25	
	C2	13	G-BK	26	
	SPARE	39	BK-BR	27	
	SPARE	14	BR-BK	28	
	CBS1	40	BK-S	29	
	CBS2	15	S-BK	30	
18	CT	41	Y-BL	31	12
	CR	16	BL-Y	32	
	CS	42	Y-O	33	
	CG	17	O-Y	34	
	C1	43	Y-G	35	
	C2	18	G-Y	36	
	SPARE	44	Y-BR	37	
	SPARE	19	BR-Y	38	
	CBS1	45	Y-S	39	
	CBS2	20	S-Y	40	
14	CT	46	V-BL	41	14
	CR	21	BL-V	42	
	CS	47	V-O	43	
	CG	22	O-V	44	
	C1	48	V-G	45	
	C2	23	G-V	46	
	SPARE	49	V-BR	47	
	SPARE	24	BR-V	48	
	CBS1	50	V-S	49	
	CBS2	25	S-V	50	

* Stencil lead designations on fanning strip.

TABLE G

CONNECTIONS FOR CENTRAL OFFICE TRUNKS AT 615A PANEL

TRUNK NO.	LEAD DESIG	TERMINAL ON 66T1 CONN BLOCK	66B4-25 CONN BLOCK ROW NO.
1	T	1A	1
	R	2A	2
2	T	3A	3
	R	4A	4
3	T	5A	5
	R	6A	6

◆ TABLE H ◆

CONNECTIONS FROM PLUG P1 ON 615A PANEL TO INTERFACE CONNECTING BLOCK

TRUNK NO.	LEAD DESIG	P1 PIN NO.	A25B CONN CABLE	66M1-50 CONN BLOCK (TELCO SIDE) ROW NO.
1	CT	26	W-BL	1
	CR	1	BL-W	2
	CS	27	W-O	3
	CG	2	O-W	4
	C1	28	W-G	5
	C2	3	G-W	6
	Spare	29	W-BR	7
	Spare	4	BR-W	8
	CBS1	30	W-S	9
	CBS2	5	S-W	10
2	CT	31	R-BL	11
	CR	6	BL-R	12
	CS	32	R-O	13
	CG	7	O-R	14
	C1	33	R-G	15
	C2	8	G-R	16
	Spare	34	R-BR	17
	Spare	9	BR-R	18
	CBS1	35	R-S	19
	CBS2	10	S-R	20
3	CT	36	BK-BL	21
	CR	11	BL-BK	22
	CS	37	BK-O	23
	CG	12	B-BK	24
	C1	38	BK-G	25
	C2	13	G-BK	26
	Spare	39	BK-BR	27
	Spare	14	BR-BK	28
	CBS1	40	BK-S	29
	CBS2	15	S-BK	30

TABLE I
POWER CONNECTIONS

INPUT VOLTAGE	66G APP MTG (NOTE 1)	604B OR C PANEL (NOTE 2)	604A1 PANEL (NOTE 3)	615A PANEL (NOTE 4)
-24V	9	INPUT -24V	14	2D
-48V	—	INPUT -48V	—	—
GRD	4	INPUT GRD	13	4D

Notes:

1. Terminals on 66B4-25 connecting block. Connect as shown in Fig. 10.
2. Terminals on rear of panel stamped as shown. Position option straps for -24V or -48V.
3. Terminals on terminal strip TSA on rear of panel.
4. Terminals on 66T1 connecting block on rear of panel.

TABLE J

604A-TYPE PANEL FUSE ASSIGNMENT

VOLTAGE	FUSE NO.*	PANEL POSITION
-24V	F1	J1A
	F2	J2A
	F3	J3A
	F4	J4A
	F5	J5A
	F6	J6A
	F7	J7A
	F8	J8A
	F9	J9A
	F10	J10A
	F11	J11A
	F12	J12A
	F13	J13A
	F14	J14A
	F15	J10B†
	F16	J11B†
	F17	J13B†
	F18	J14B†

* Fuses are 70G 1/2-ampere.

† Plug. No. 5 dedicated to one-way incoming trunks not used in this application.

TABLE K

604B AND 604C PANELS FUSE ASSIGNMENT

VOLTAGE	FUSE NO.	PANEL POSITION
±105V (Note)	F1*	J1A thru J14A
-24V	F2*	J1A
	F3*	J2A
	F4*	J3A
	F5*	J4A
	F6*	J5A
	F7*	J6A
	F8*	J7A
	F9*	J8A
	F10*	J9A
	F11*	J10A
	F12*	J11A
	F13*	J12A
	F14†	J13A
	F15†	J14A
-48V (Note)	F16‡	J1A thru J5A
	F17‡	J6A thru J10A
	F18‡	J11A thru J14A

Note: ±105V and -48V not used in this application.

* 70F Fuse 1/4 Ampere.

† 70G Fuse 1/2 Ampere.

‡ 70A Fuse 1-1/3 Ampere.

TABLE L

615A PANEL FUSE ASSIGNMENTS

VOLTAGE	FUSE NO. †	CONNECTOR
-24V	F1 F2 F3	J1A,B J2A,B J3A,B
-48V*	F4 F5 F6	J1A J2A J3A
±105V*	F7	J1A,J2A,J3A
	F8	SPARE

* Not used with PCA CED.

† All fuses 24E, 1/2 ampere.