# VOICE CONNECTING ARRANGEMENT CET

## 1. GENERAL

**1.01** This section provides identification, installation operation, maintenance and connection information for the 102-type interconnecting unit (IU) and associated 604-type panel, or 615A panel when used in Voice Connecting Arrangement CET.

**1.02** This section is reissued to:

- Include information on the 615A panel which replaces the 69G apparatus mounting
- Add information on the 604C panel and 21A apparatus unit
- Include information on the 142A test set
- Add note on option W to 1.03
- Show 604A panel rated MD and replaced by 604B panel
- Show 102A IU rated MD and replaced by 102B IU.

**1.03** The 102B IU is an improved version of the 102A (MD) IU and offers the following advantages:

- Line impedance matching terminals (option Y or Z) for 600-ohm or 900-ohm CO line
- Increases range limitation of dial pulsing and supervisory leads (CS and CG) from 18 ohms to 100 ohms maximum

***Note:*** If a problem is encountered in existing installations with the 18-ohm range limitation using a 102A IU, replace with a 102B IU. In existing installations using pulse correction, the 103A pulse corrector must be removed when replacing the 102A IU with a 102B IU.

- Maximum allowable external loop resistance to CO of 2500 ohms with option W

***Note:*** ▶Option W is required when the external circuit loop exceeds 800 ohms (including central office [CO] resistance) to provide sufficient dc loop current for supervision. Option W is not recommended for short loops as high line current may cause poor transmission.◀

- Arranged for data application (covered in other BSPs)
- New transformer with higher breakdown insulation.

**1.04** The 604B and ▶604C◀ panels are improved versions of the 604A(MD)-type panels using less mounting space and featuring 24-volt or 48-volt operation with connections for ringing voltage and optional fuse alarm indicator.

**1.05** ▶The 604C panel should be used if the supply voltage is −24V but can be used with −48V with the addition of a 21A apparatus unit.◀

**1.06** For one to three IUs use the 615A panel. For 4 to 14 IUs use the 604-type panel. The size of the initial installation and the expected growth should be the determining factor in selecting the proper mounting equipment. ▶The 69G apparatus mounting is no longer recommended for use now that the 615A panel is available. The 69G apparatus mounting has the undesirable feature of splitting tip and ring.◀

**1.07** ▶The 142A test set (Fig. 12) is designed to provide a quick field operational test for the 101- and 102-type IUs. The 142A test set uses signal lamps to indicate the correct operation of the IU by simulating the inputs from the customer-provided equipment (CPE).◀

**1.08** ▶For more detailed information on the associated equipment, refer to the following sections:

- 463-300-101—604A-Type Panels
- 463-300-102—604B and 604C Panels
- 463-300-104—615A Panel
- 463-300-109—KS-20944 Protector

- 463-300-102—604C Panel and 21A Apparatus Unit

- 463-300-113—142A Test Set◀

**1.09** If the customer wants a copy of the Technical Reference which covers this interface specification, the customer should contact the local Telephone Company Business Office or the Marketing Representative.

**1.10** This issue of the section is based on the following drawings:

SD-1E238-01, Issue 3A (102B IU)

SD-1E202-01, Issue 3A (102A IU)

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

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

SD-1E258-01, Issue 1 (142A Test Set)

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

- To provide a means to automatically connect, on a loop-start basis, the dial switching equipment of a customer-provided (CP) PBX to a telephone company toll operator for toll terminal service without ringback (has ringback capability but is not used in this application).

- To limit excessive voice levels from CPE and to provide protection for telephone company personnel against hazardous voltages.

- To transmit network control signaling functions.

- ▶To ensure impedance matching between the cable pair and ground.◀

### APPLICATION

- Customer-provided dial Hotel-Motel PBX systems.

### ORDERING GUIDE

- Unit, Interconnecting, 102B (one per toll operator access trunk, Fig. 1).

***Note:*** If 102A IUs are used in position 13 or 14 of a 604B or 604C panel, 102A IUs must also be used in positions 1, 4, 7, and 10.

#### Associated Apparatus (Order Separately)

***Note:*** If a 23-inch relay rack is not provided on customer premises, provide a 16C apparatus mounting for the 69G or ▶615A panel◀ or an ED-91180-72, Group 21 cabinet for the 604-type panel.

- Panel, 604A1 (MD) (fuse panel only, no power unit; mounts up to fourteen 102-type IUs)

or

- Panel 604A2 (MD) (includes 19C2 power unit and fuse panel; mounts up to fourteen 102-type IUs)

or

- Panels, 604B and ▶604C◀ (fuse panel only, no power unit; mounts up to fourteen 102-type IUs, Fig. 2 and 3)

- Unit, Apparatus, 21A (one per 604C when supply voltage is −48V)

or

- ▶Panel, 615A (fuse panel only, no power unit; mounts three 102-type IUs, Fig. 4)◀

- Bracket, 99B (one per twelve 69G; ▶one per three 615As◀)

- Cable, Connector, A25B

  (a) ▶one per 615A panel

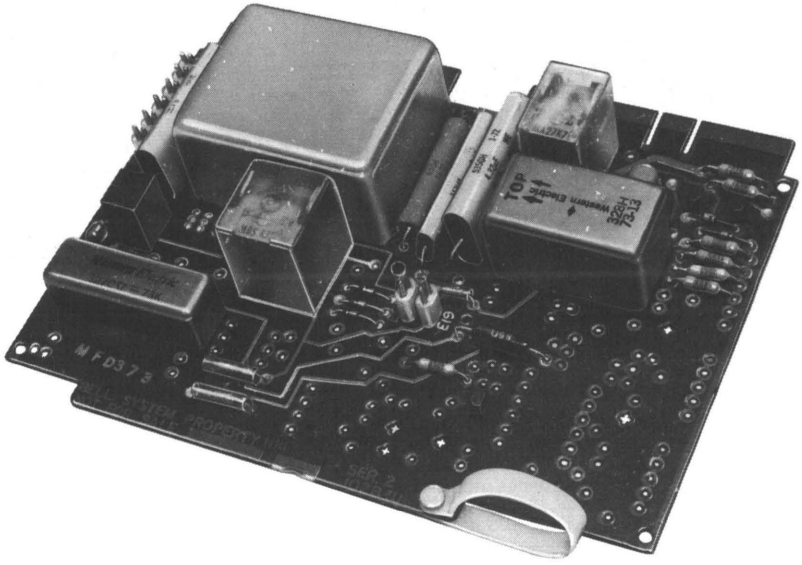


**Fig. 1—102B Interconnecting Unit**

(b) four per 604-type panel or see Table A

- Block, Connecting, 66M1-50 (as required, Fig. 5)
- Block, Connecting, 66B4-25 (as required)
- Clip, Bridging, B (as required, 25 per pkg., Fig. 5)

***Note:*** Other type blocks should not be used for the customer interface due to their incompatibility with the 142A test set connections.

- Cable, D Inside Wiring (or equivalent), for cabling from the 66B4-25 intermediate connecting block to 66M1-50 interface connecting block (69G only) or for cabling from 615A panel to CO lines
- Unit, Power, for 604A1 (MD), 604B and 604C (locally engineered and installed when existing PBX power supply is insufficient). (A 19C2 will power one panel; a 29C1 will power two panels.)
- Unit, Telephone, Key 201C (if required for fusing 69G) (See 3.01.)
- Cord, Power, for 19C2 power unit
- Unit, Power, 19C2 (for 615A panel)

  P40J326 (1-1/2 ft)

  P40J327 (2 ft)

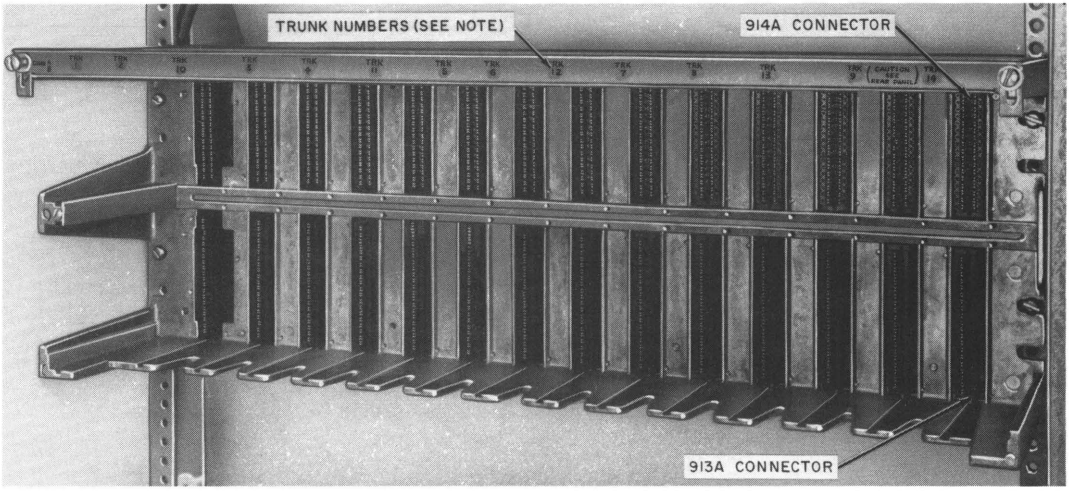
  P40J328 (4 ft)

  P40J329 (6 ft)

  P40J099 (12 ft)

***For Power Protection Unit (Optional)***

- KS-20944, L1 or L2 Protector (Fig. 6). Use the List 1 protector for −24 volts and the List 2 for −48 volts.




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

INSTALLATION SEQUENCE OF 102-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. 2—604B and 604C Panels, Front View**

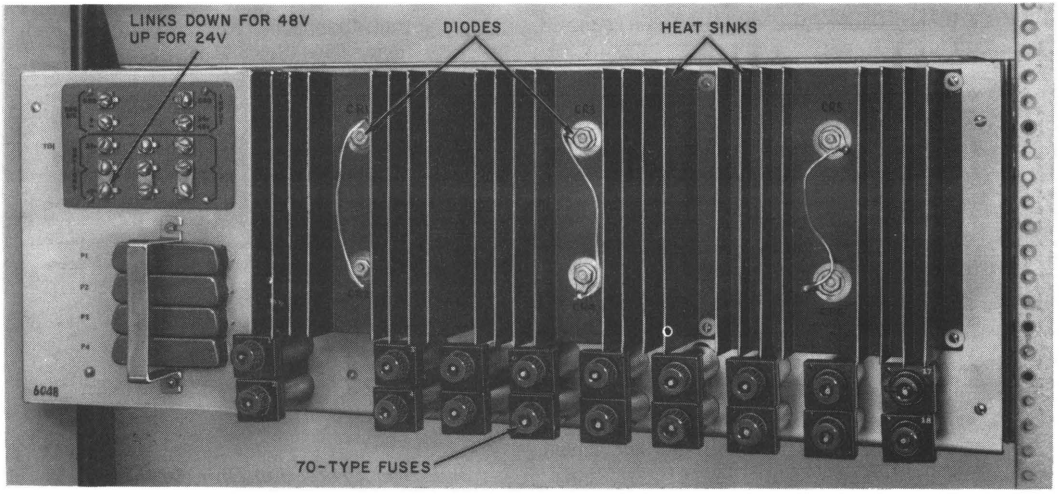



**Fig. 3—604B Panel, Rear View**

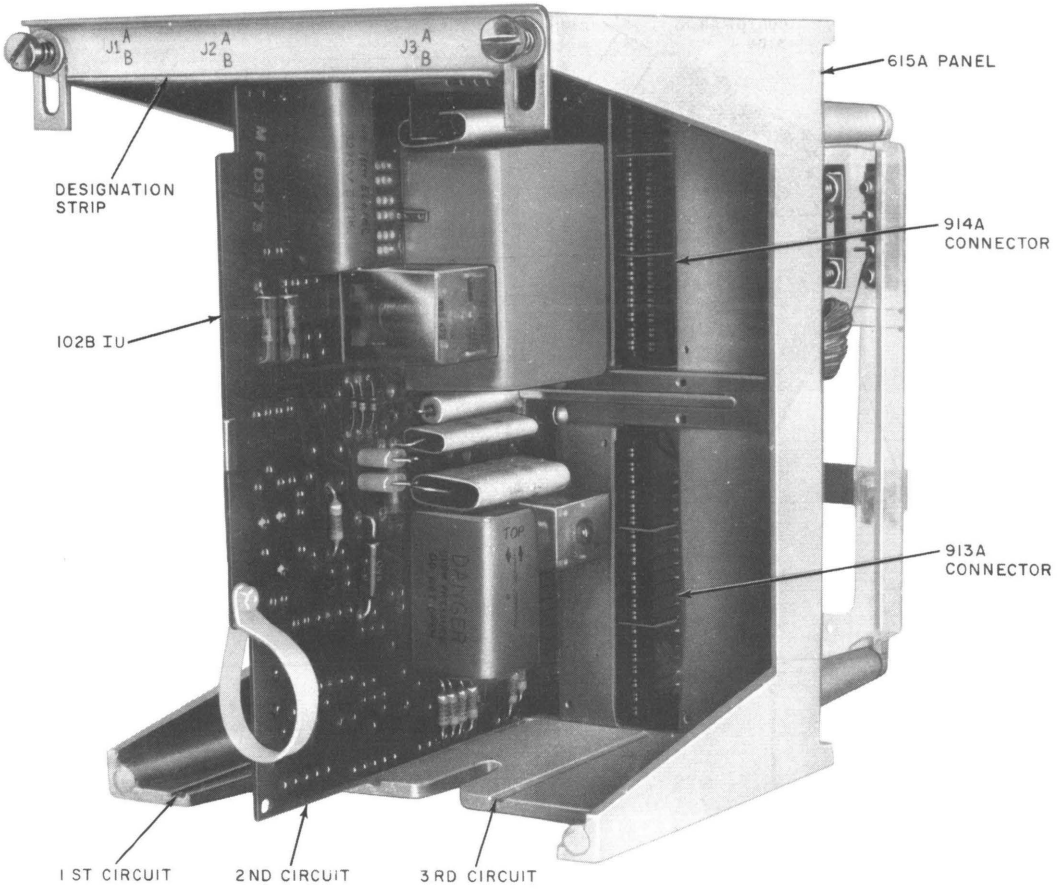



**Fig. 4—102B Interconnecting Unit Mounted in 615A Panel**

**Replaceable Components**

**604-Type Panel**

- Unit, Power, 19C2 (for 604A2)
- Fuse, 70G, 1/2 ampere (18 per 604A-type panel)
- Fuse, 70F, 1/4 ampere (13 per 604B and ▶604C◀ panels)
- Fuse, 70G, 1/2 ampere (two per 604B and ▶604C◀ panels)
- Fuse, 70A, 1-1/3 ampere (three per 604B and ▶604C◀ panels)
- Indicator, 17C-49 for optional fuse alarm (604B and ▶604C◀ panels only).

**▶615A Panel**

- Fuse, 24E, 1/2 ampere (8 per panel, Fig. 4).◀

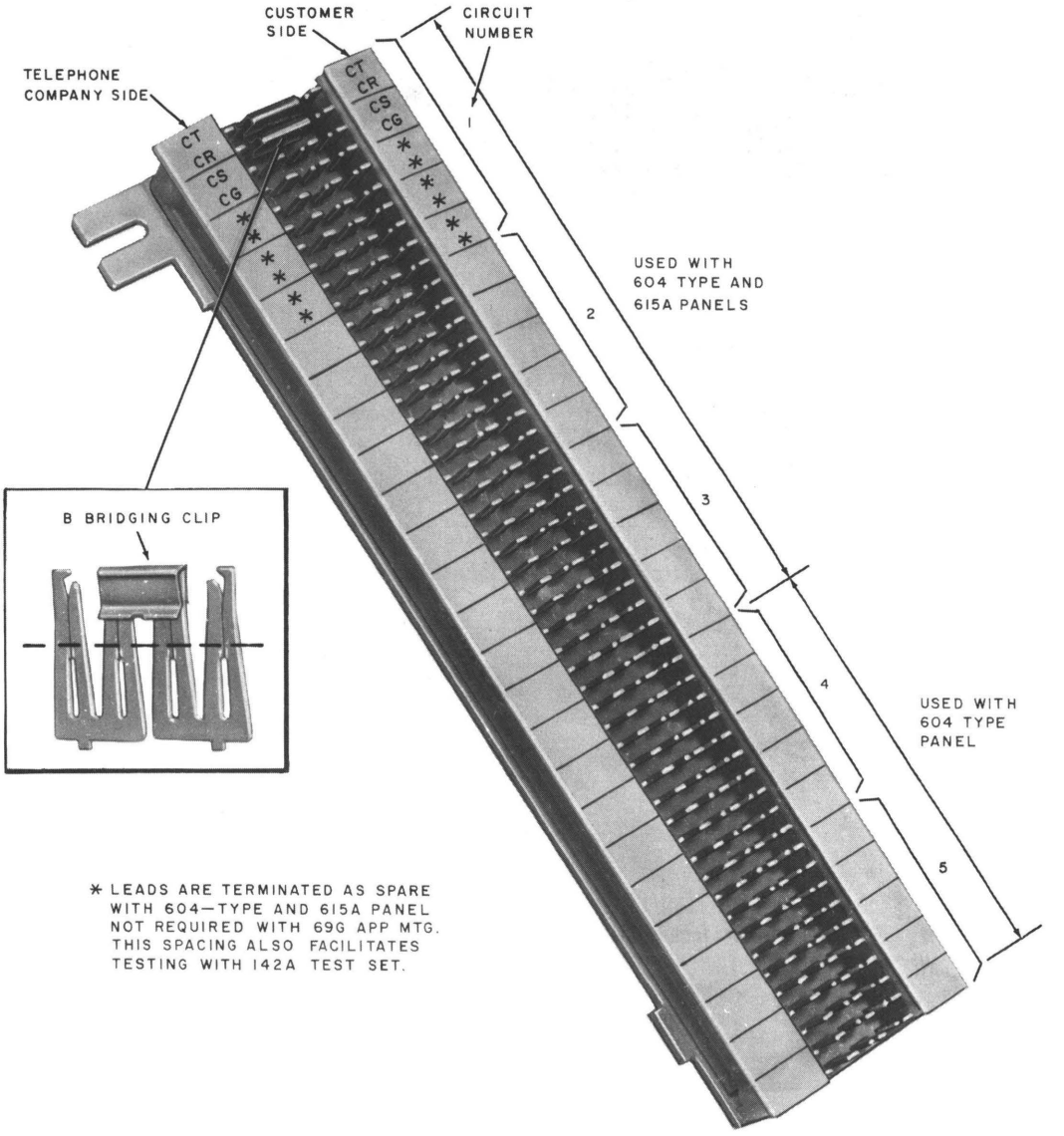



**Fig. 5—66M1-50 Interface Connecting Block**


**Fig. 6—KS-20944 Protector**

## DESIGN FEATURES

### 102-Type Interconnecting Unit

- Approximate dimensions: 7-1/2 inches by 5-1/2 inches
- Components mounted on epoxy coated 8-inch, 80-pin board
- Features loop-start operation with rering capability
- Option terminals
- Features line impedance matching (102B IU only)
- ▶Provides long-loop operation (102B IU only)◀
- Provides voice frequency coupling to CPE
- Provides dc isolation to CPE
- Provides indication of CO battery reversal
- Limits excessive voice signals
- Provides connection between CPE and loop-start CO trunk
- Permits tone address signaling from behind the CP PBX.

### Associated Apparatus

- For design features of the apparatus used with the 102-type IU, refer to the sections listed in 1.08.

### 604-Type Panel

- Approximate dimensions: 604A (MD) panel is 16 inches high, 23 inches wide, and 8-1/2 inches deep; 604B and ▶604C◀ panels are 8 inches high by 23 inches wide and 10 inches deep.
- Equipped with 20-pin 913A and 40-pin 914A connectors which are factory-wired to ▶four KS-16671, L1 plugs◀ and five KS-16671, List 1 plugs.
- The arrangement of 913A and 914A connectors provides for two vertical connectors to accommodate an 8-inch, 80-pin board.
- All 14 positions will accommodate 102-type IUs.

***Caution: ▶102A and 102B IUs will not fit in certain slots. Do not force into slots.◀***

- Fused power protection is provided to all fourteen 102-type IUs.
- Fused power protection is provided for 48-volt talk battery and ring supply (604B and ▶604C◀ only—not used in this application).
- Option terminals to change connections for 24- or 48-volt operation (604B and ▶604C◀ only).
- Mounts on a standard relay rack or in an equipment cabinet.

### ▶615A Panel

- Approximate dimensions: 8 inches high by 6 inches wide by 9-1/4 inches deep.
- Equipped with three 20-pin 913A and three 40-pin 914A connectors, which are factory-wired to one KS-16671, List 1 plug.
- The arrangement of the 913A and 914A connectors provides for two vertical connectors to accommodate an 8-inch, 80-pin board.
- Mounts three 102-type IUs.
- Fused power protection is provided to each 102-type IU.
- Mounts on a standard relay rack or in a 16C apparatus mounting, using 99B brackets.◀

### KS-20944 Protector (Fig. 6)

- Approximate dimensions: 8 inches high, 6-3/8 inches wide, and 3-3/4 inches deep
- Provides protection against excessive dc voltage and dc current, reversed polarity, over 18 volts ac, or incorrect ground from CP power supply

- Provides dc interface to CPE
- Equipped with a 3-pole magnetic circuit breaker mounted on a hinged cover
- Provides disconnect switch for power supply voltage
- 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.
- ▶List 1 for 24 volts at 15 amps; List 2 for 48 volts at 15 amps; List 3 for 24 volts at 30 amps; List 4 for 48 volts at 30 amps.◀

## 3. INSTALLATION

### 69G Apparatus Mounting (Fig. 7)

*Note:* ▶The 69G apparatus mounting is not recommended for new installations. It has been replaced by the 615A panel. The following paragraphs are intended for use as an Additions and Maintenance (A&M) basis only.◀

**3.01** Electrical connection is made to the 69G apparatus mounting through two A25B connector cables. Terminate the stub ends of the two cables on the 66B4-25 intermediate connecting block following the wiring plan shown in Fig. 7. Insulate and store all spare conductors. The CO lines and power supply are also connected to this block.

**3.02** Use the "D" inside wiring cable to extend the four interface leads from the 66B4-25 intermediate connecting block to the 66M1-50 interface connecting block for access to the CPE. Stencil lead designations on the designation strip as shown in Fig. 5.

**3.03** Connect the −24 volt power supply leads from a telephone company-provided power supply, or CP dc power supplied through the KS-20944 protector, to the 66B4-25 connecting block as shown in Fig. 7 and Table H. Multiple through separate fuses to each 102-type IU (201C KTU fuse unit with 24E 1/2-ampere fuses, or equivalent).

**3.04** The relay rack or apparatus mounting should be grounded separately. When a separate power unit is used, refer to the appropriate section in Division 518 for proper grounding of power units. Proper grounding of equipment and power unit is important to prevent damage from power line surges.

### 604-Type Panel (Fig. 8 and Tables B, C, D, E, H, I, and J)

**3.05** The 604-type panel will mount on a standard relay rack, or in an ED-91180-72, 18-plate equipment cabinet. The relay rack or equipment cabinet should be grounded separately.


***The 18-plate equipment cabinet will house two 604A-type panels, three 604B and ▶604C◀ panels, or two 604B and ▶604C◀ panels with a 29C1 power unit, when the drawing holder (P423968 clips) on the lower half of the equipment cabinet cover is removed (to allow clearance for IUs in lower panel).***

Mount the 66M1-50 interface connecting block within 200 feet of the 604-type panel for the 102A; for the 102B, the range may be longer.

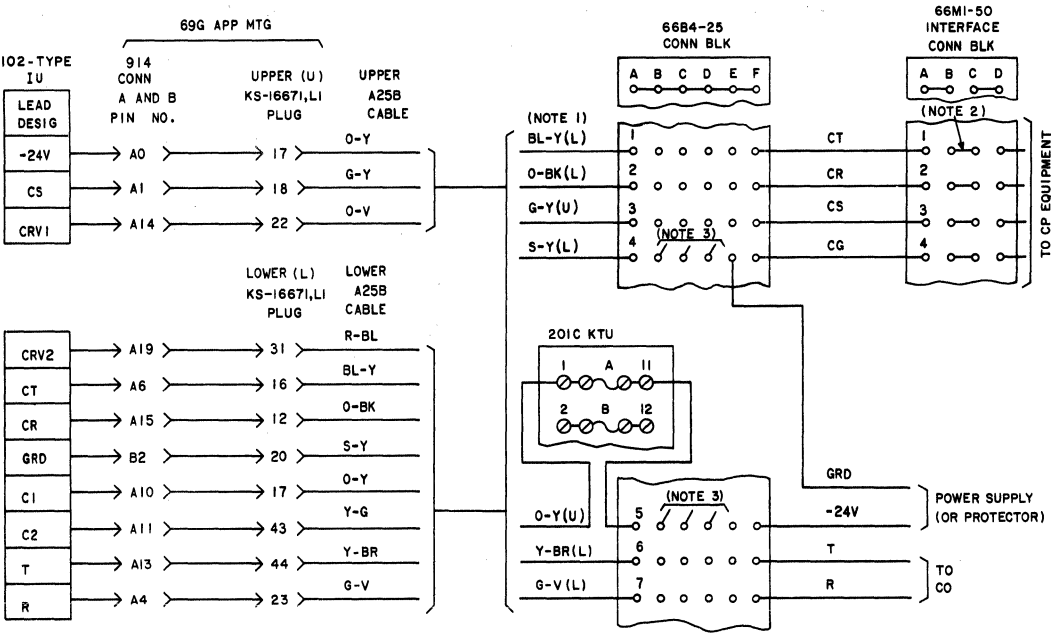
**3.06** Electrical connection is made to the 604-type panel through connector cables. Arrangement of the plugs on the panel restricts the first plug to an A25B connector cable (to CO lines). Plugs 2 through 4 are arranged to adapt to a choice of cable sizes (see Table A). Plug 5 (604A-type only) is used only for one-way incoming trunks and is not used in this voice connecting arrangement.

**3.07** Terminate the stub end of connector cable 1 on the 66B4-25 connecting block for CO lines.

**3.08** Terminate the stub end of connector cables 2, 3, and 4 at the customer end on 66M1-50 interface connecting blocks (stencil lead designations on designation strip, Fig. 5).

**3.09** The customer must provide a 105- to 130-volt, 60-Hz outlet within reach of available power cords (see ORDERING GUIDE for cord lengths). This outlet should ***not*** be under control of a wall switch.

**3.10** When using an external telephone company-provided power supply (604A1, 604B or 604C only) or CP dc power supplied through the KS-20944 protector, connect to fuse panel on




NOTES:
1. INSULATE AND STORE SPARE LEADS.
2. B BRIDGING CLIPS OR WIRE STRAPS.
3. MULTIPLE TO OTHER CIRCUITS.

**Fig. 7—Connection Diagram—102-Type Interconnecting Unit With 69G Apparatus Mounting**

rear of panel as shown in Table H (use 16-gauge or equivalent twisted pair). Maximum current drain per 102B IU is 0.090 ampere, and 102A (MD) IU is 0.110 ampere. Refer to the appropriate section in Division 518 for proper grounding of power plants. Proper grounding of equipment and power unit is important to prevent damage from power line surges.

**615A Panel (Fig. 8 and Tables F, G, and H)**

**3.11** Install the 615A panel on a 23-inch relay rack or in a 16C apparatus mounting using the 99B bracket. Remove the center mounting bar from the 16C apparatus mounting to avoid cover interference. The 99B bracket will hold three 615A panels. Each 615A panel mounts three 102-type IUs. Mount the 66M1-50 connecting block within 25 feet of the 615A panel (for an A25B connector cable).

**3.12** Mount a 66B4-25 connecting block, if required, for connecting the CO lines to the 615A panel. Where conditions permit, the CO lines can be terminated directly on the 66T1 connecting block on the rear of the panel (Table F).

**3.13** Connections to the CPE are made to the 615A panel through an A25B connector cable. Terminate the stub end of the A25B connector cable at the customer end on the 66M1-50 interface connecting block. Stencil lead designations on the designation strip as shown in Fig. 5.

**3.14** Connect the −24 volt power leads from a separate telephone company-provided power

unit, or CP dc power supplied through the KS-20944, List 1 protector, to the 66T1 connecting block on the rear of the 615A panel as shown in Fig. 8 and Table H. Connect a separate ground wire to the rack or 16C apparatus mounting. Refer to the appropriate section in Division 518 for proper grounding of power plants. Proper grounding of equipment and power unit is important to prevent damage from power line surges.◀

**102-Type Interconnecting Unit (Fig. 1, 9, or 10)**


***To protect transistors and other electrical components of 102-type interconnecting units, remove fuses associated with that particular circuit before installing or replacing a unit. See Table I, J, or K for fuse location.***

**3.15** Provide proper option straps using 24-gauge ***bare wire*** for options W, Y, and Z from Fig. 9 or 10 for local conditions. Always use option Z for the 102A IU. The toll operator should be instructed not to rering on these PBX lines. For the 102B IU, provide option Y or Z for proper line impedance matching; and ▶when the external loop exceeds 800 ohms (including CO resistance), provide option W.◀ Check straps for continuity after placing.

**3.16** When installing the 102-type IU, raise and secure the card retainer (69G) or designation strip holder (604 and 615A panel) and then position the board in the guide grooves of the 69G apparatus mounting, 604-type panel or 615A panel, and slide the IU in until it is properly seated and electrically connected to the 913A or 914A connectors.


***The connectors in the 604B and ▶604C◀ panels are equipped with index clips to match the code slots in the 102B IU. When using 102A IUs it will be necessary to remove the clips between contacts 9 and 10 in the panel B connectors.***

**3.17** Make certain the card retainer or designation strip holder is properly positioned and locked down to hold the 102-type IUs in place.

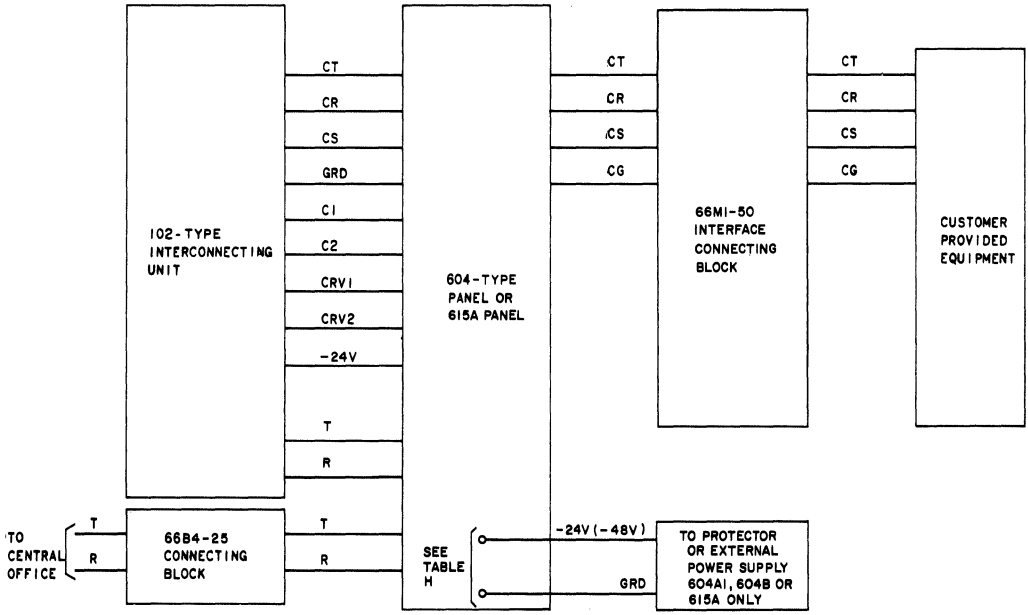
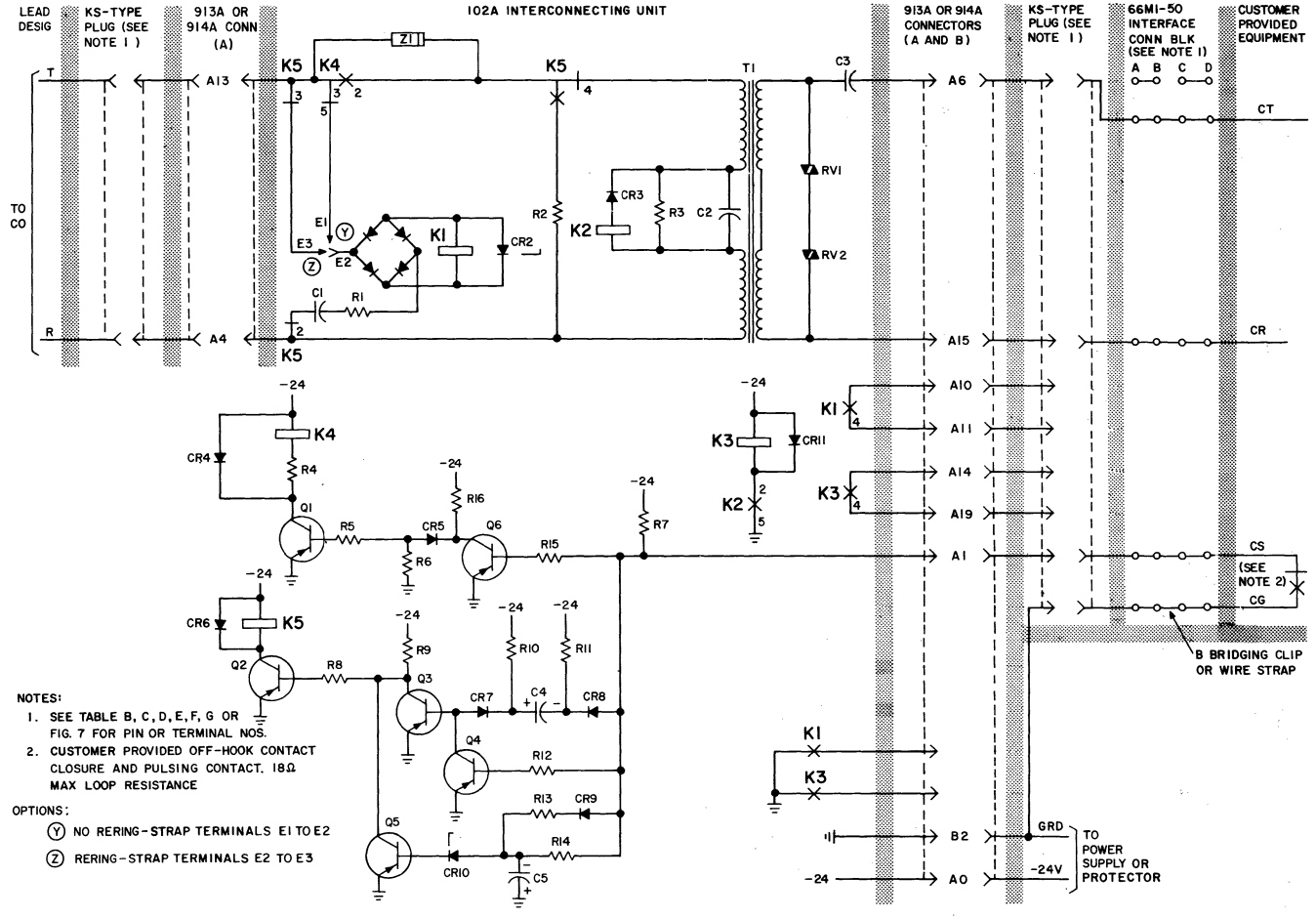



**Fig. 8—Block Diagram—102-Type Interconnecting Unit With 604-Type or 615A Panel**




NOTES:

1. SEE TABLE B, C, D, E, F, G OR FIG. 7 FOR PIN OR TERMINAL NOS.
2. CUSTOMER PROVIDED OFF-HOOK CONTACT CLOSURE AND PULSING CONTACT. 18Ω MAX LOOP RESISTANCE

OPTIONS:

Ⓨ NO RERING-STRAP TERMINALS E1 TO E2

Ⓩ RERING-STRAP TERMINALS E2 TO E3

**Fig. 9—Schematic—102A Interconnecting Unit**

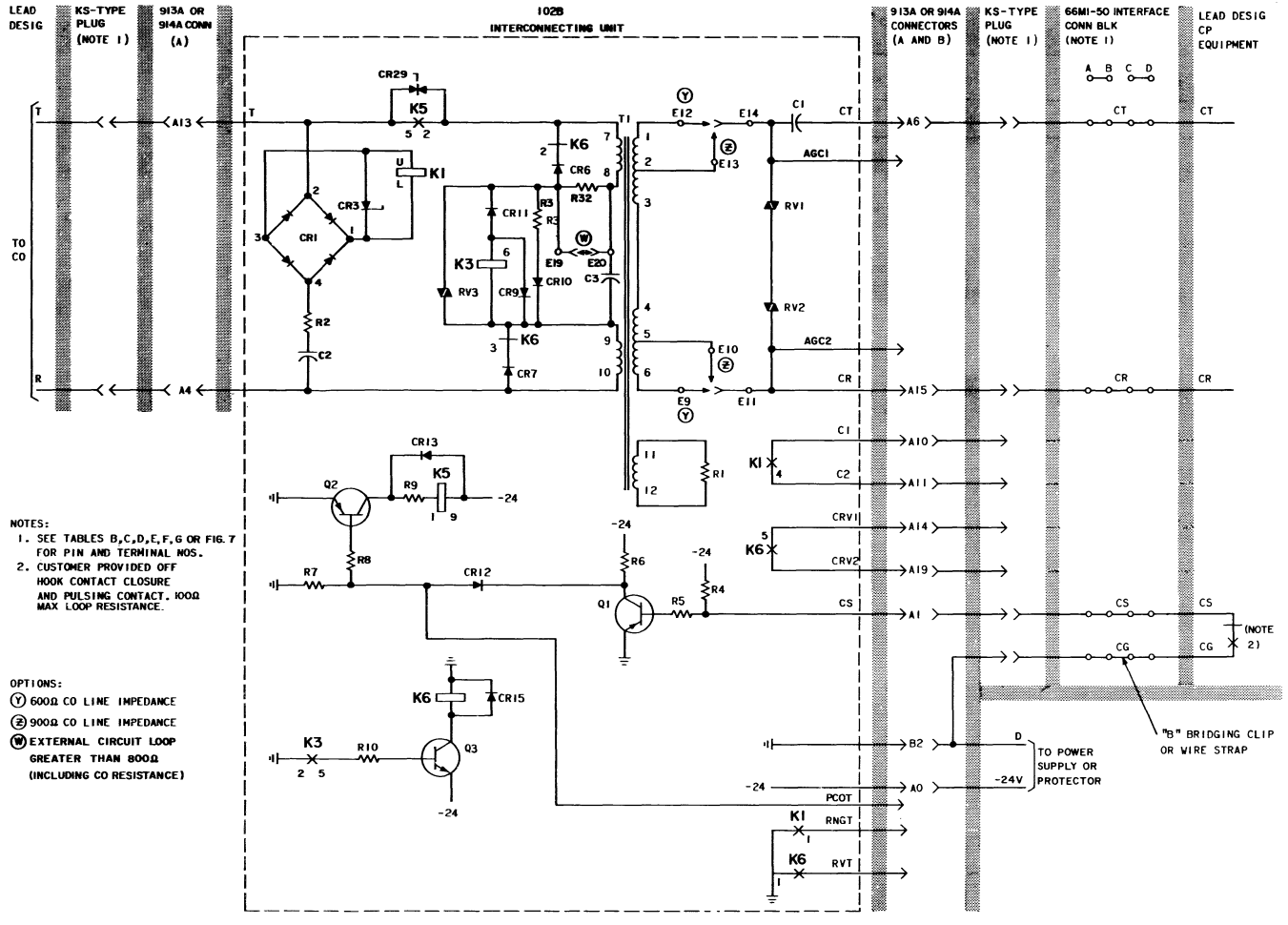



**Fig. 10—Schematic—102B Interconnecting Unit**

**3.18** The CO trunks are not wired to the IU positions in numerical order in the 604-type panels. On earlier production of the 604B panel, the ***position*** number is shown on the designation strip. On current production of the 604B and 604C, the ***trunk*** number is shown. Refer to Fig. 2 for installation sequence of 102-type IUs. This suggested sequence is established to correspond to the plug wiring arrangement. The installation sequence for the 615A panel is in the same numerical order as the connectors (J1, J2, J3) from left to right.

**3.19** Perform the tests shown in Part 5 after installation.

**KS-20944 Protector (Fig. 11)**

**3.20** When voltage protection is required, the KS-20944 protector must be mounted externally and wired to the power supply terminals of the 69G apparatus mounting (Fig. 7) or the 604-type and 615A panel (Fig. 8).

**3.21** Connect as shown in Fig. 11 following local wiring instructions. The customer must connect his power supply to the red (GRD) and black (−V) 14-gauge leads extending from the unit.

***CAUTION: Voltage will be present on (upper) terminals 1 of circuit breakers.***


***Check for correct polarity and ground before closing switch.***

## 4. OPERATION

### A. 102B Interconnecting Unit (Fig. 10)

**4.01** ***Outgoing Call:*** When the user of the CP PBX station dials the trunk level associated with Voice Connecting Arrangement CET, the CPE closes a contact which connects the CS lead to the CG lead which operates K5 relay of the 102B IU. K5 relay operated closes the loop to the toll switchboard and cuts through the transmission path over CT and CR leads to the CPE. The toll subscriber line circuit associated with the line lights a lamp at the switchboard jack assigned to the line. An audible ringing signal is not returned to the calling party. 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 establishing a talk path between the toll operator and CP station. The toll operator requests dialing information and, using the front cord of the same pair, dials the requested number and restores the DIAL and TALK key.

**4.02** ***Disconnect:*** When the CP station goes on-hook, the closure is removed from across the CS and CG leads, releasing the K5 relay and opening the loop toward the CO. If the CP station goes on-hook or if the toll connection is opened, the toll operator receives a disconnect signal by cord lamp supervision and removes the cord. Time and charge information is passed on to the customer over another circuit, eg, calling the listed directory number or via teletype.

***Note:*** The 102A IU (Fig. 9) operates similarly to the 102B IU but uses different relays.

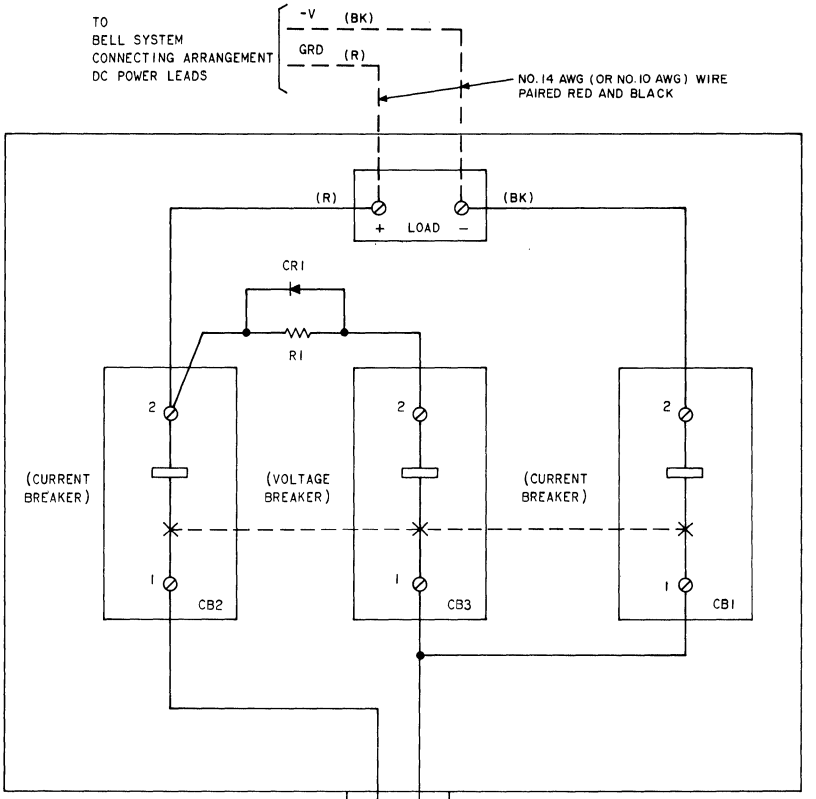
### B. KS-20944 Protector (Fig. 11)

**4.03** The KS-20944 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 two dc current-operated circuit breakers connected in each side of the line. The contacts on the breakers are connected in series with their own coil and mechanically coupled together. When any breaker is operated, the line will be opened. The circuit breakers must be manually reset by the customer after tripping. They cannot be reset if the fault persists.

**4.05** The KS-20944, List 1 and List 2 protectors are designed to trip in 25 milliseconds (maximum):

- 24 volts dc (List 1) or 48 volts dc (List 2)
- 15 amps dc (List 1) or 15 amps (List 2)
- Reversed polarity or ac greater than 18 volts
- Incorrect power supply ground.




NOTE:

KS-20944 L1 FOR 24 VOLT AT 15 AMP
KS-20944 L2 FOR 48 VOLT AT 15 AMP
KS-20944 L3 FOR 24 VOLT AT 30 AMP
KS-20944 L4 FOR 48 VOLT AT 30 AMP
PROTECTORS WILL TRIP IN 25 MILLISECS
(MAXIMUM): ON DC OVERVOLTAGE OF 38
VOLTS (24 VOLT UNIT) AND 68 VOLTS
(48 VOLT UNIT), ON OVERLOAD OF 18.75 AMPERES (15 AMP UNIT)
AND 37.5 AMPERES (30 AMP UNIT), ON REVERSED POLARITY, OR AC
VOLTAGE GREATER THAN 18 VOLTS, OR INCORRECT POWER SUPPLY GROUND.

**Fig. 11—Schematic—KS-20944 Protector**

## 5. MAINTENANCE

**5.01** When trouble is reported, check the CO pair, check for blown fuses, loose or broken connections, and the power supply.

**5.02** Open the four leads to the circuit under test by removing the B bridging clips (or wire straps) at the 66M1-50 interface connecting block and verify in which direction trouble exists by performing the following tests:

### A. Without 142A Test Set

***Transmission Path***

(1) Supply talk battery by connecting a 500-ohm resistor from the −24V supply to terminal CR and strap terminal CT to ground. (Make all connections on the telephone company side of the interface connecting block, Fig. 8.) A 2A KTU or 31A KTU may be used for battery feed instead of the 500-ohm resistor. Refer to Section 518-112-421 for connections. Connect a 1013A (or equivalent) hand test set to terminals CT and CR.

(2) Connect a wire strap across terminals CS and CG. K5 relay will operate completing the talk path, and the toll operator will answer the call. Verify satisfactory transmission.

### B. ▶With 142A Test Set (Fig. 12)

(1) Connect the power cord of the 142A test set to the −24V power supply (same supply as for IU) as follows:

- Black lead to ground
- Red lead to −24V
- PWR lamp should light.

(2) Connect the interface cord of the 142A test set to the telephone company side of the interface block as follows:

- Black lead to terminal CT
- Red lead to terminal CR
- White lead to terminal CS
- Green lead to terminal CG.

(3) Connect a 1013A (or equivalent) hand test set to the HNDR and HNDT terminals of the 142A test set with the MON-TALK switch in the MON position. Set the CS-CG LOOP switch to the 18-ohm position for a 102A IU or the 100-ohm position for the 102B IU.

(4) Operate the switch on the hand set to the TALK position. CS lamp on 142A test set should light and toll operator answer. Check for satisfactory transmission.

***Note:*** If IU does not seize the trunk, move CS-CG loop switch to lower value. If IU now operates properly, it is marginal. Circuits which only operate on the 0 position should be replaced.◀

**5.03** When trouble is suspected in the 102-type IU, exchange it with another unit known to be operating properly.


***Never replace an interconnecting unit in apparatus mounting or panel without first removing the fuse for that circuit. See Table I, J, or K for fuse location.***

**5.04** Remove all test connections and replace the B bridging clips (or wire straps) on the 66MI-50 interface connecting block.


***Do not attempt any tests or repairs to the CPE.***

**5.05** 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 (CPE).

## 6. CONNECTIONS

**6.01** For connection information using the 69G apparatus mounting, refer to Fig. 5, 6 and 7.

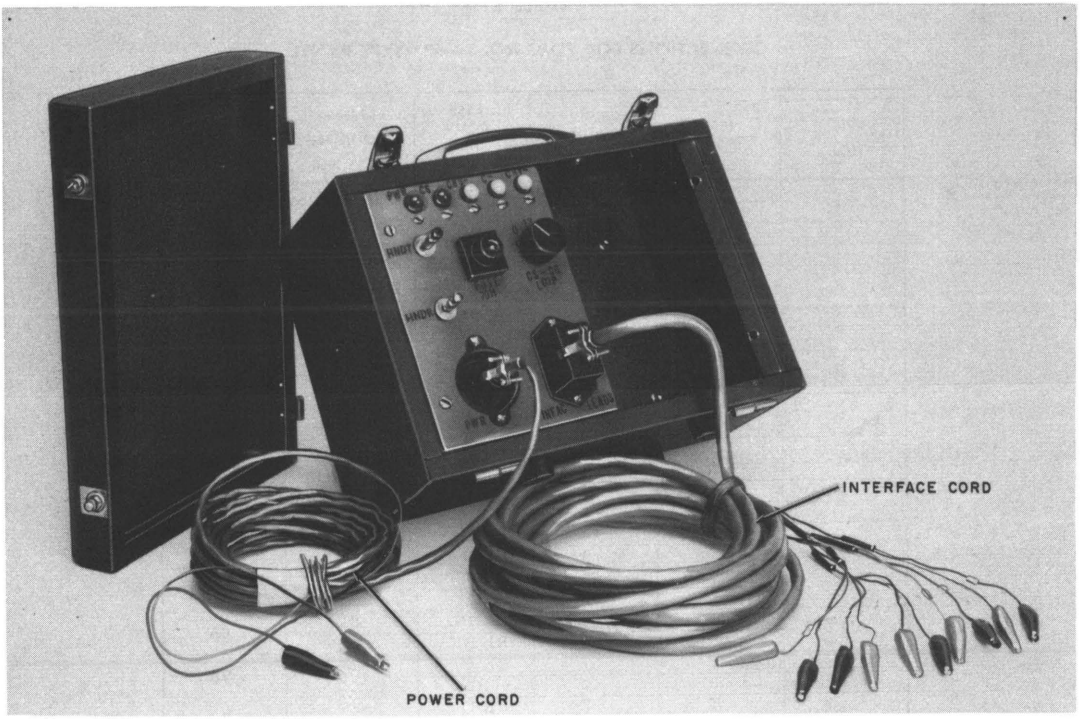



**Fig. 12—►142A Test Set◄**

**6.02** For connection information using the 604A-type panel, refer to Fig. 5 and 8 and Tables A, B, C, D, E, H and I.

**6.03** For connection information using the 604B and ►604C◄ panels, refer to Fig. 5 and 8 and Tables A, B, C, D, E, H and J.

**6.04** ►For connection information using the 615A panel, refer to Fig. 5 and 8 and Tables F, G and H.◄

**6.05** For connection information using the KS-20944 protector, refer to Fig. 11.

**TABLE A**

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

| CABLE DESIGNATION (NOTE) | MAXIMUM NO. OF CABLES REQUIRED | | |
|---|---|---|---|
| | ARRANGEMENTS (SEE 3.06) | | |
| | 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 B

## CONNECTIONS FOR PLUG NO. 1—604-TYPE PANEL

| LINE NO. | LEAD DESIG* | CONN PIN NO. | A25B CONN CABLE COLOR | 66B4-25 CONN BLK ROW NO. | POS. IN 604-TYPE PANEL |
|---|---|---|---|---|---|
| 1 | T | 26 | W-BL | 1 | 1A |
| | R | 1 | BL-W | 2 | |
| 2 | T | 27 | W-O | 3 | 2A |
| | R | 2 | O-W | 4 | |
| 3 | T | 28 | W-G | 5 | 4A |
| | R | 3 | G-W | 6 | |
| 4 | T | 29 | W-BR | 7 | 5A |
| | R | 4 | BR-W | 8 | |
| 5 | T | 30 | W-S | 9 | 7A |
| | R | 5 | S-W | 10 | |
| 6 | T | 31 | R-BL | 11 | 8A |
| | R | 6 | BL-R | 12 | |
| 7 | T | 32 | R-O | 13 | 10A |
| | R | 7 | O-R | 14 | |
| 8 | T | 33 | R-G | 15 | 11A |
| | R | 8 | G-R | 16 | |
| 9 | T | 34 | R-BR | 17 | 13A |
| | R | 9 | BR-R | 18 | |
| 10 | T | 35 | R-S | 19 | 3A |
| | R | 10 | S-R | 20 | |
| 11 | T | 36 | BK-BL | 21 | 6A |
| | R | 11 | BL-BK | 22 | |
| 12 | T | 37 | BK-O | 23 | 9A |
| | R | 12 | O-BK | 24 | |
| 13 | T | 38 | BK-G | 25 | 12A |
| | R | 13 | G-BK | 26 | |
| 14 | T | 39 | BK-BR | 27 | 14A |
| | R | 14 | BR-BK | 28 | |
| † | † | 40 | BK-S | 29 | 10B‡ |
| | | 15 | S-BK | 30 | |
| | | 41 | Y-BL | 31 | 11B‡ |
| | | 16 | BL-Y | 32 | |
| | | 42 | Y-O | 33 | 13B‡ |
| | | 17 | O-Y | 34 | |
| | | 43 | Y-G | 35 | 14B‡ |
| | | 18 | G-Y | 36 | |
| SPARE | SPARE | 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.

† Dedicated to 1-way incoming trunks. (See BSP 463-350-105 for connecting arrangement CD6.)

‡ 604A-type only.

## TABLE C
## CONNECTIONS FOR PLUG NO. 2 – 604-TYPE PANEL

| CIRCUIT NO. | LEAD DESIG* | CONN PIN NO. | CONN CABLE COLOR | 66M1-50 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 | |
| | SPARE | 28 | W-G | 5 | |
| | | 3 | G-W | 6 | |
| | | 29 | W-BR | 7 | |
| | | 4 | BR-W | 8 | |
| | | 30 | W-S | 9 | |
| | | 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 | |
| | SPARE | 33 | R-G | 15 | |
| | | 8 | G-R | 16 | |
| | | 34 | R-BR | 17 | |
| | | 9 | BR-R | 18 | |
| | | 35 | R-S | 19 | |
| | | 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 | |
| | SPARE | 38 | BK-G | 25 | |
| | | 13 | G-BK | 26 | |
| | | 39 | BK-BR | 27 | |
| | | 14 | BR-BK | 28 | |
| | | 40 | BK-S | 29 | |
| | | 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 | |
| | SPARE | 43 | Y-G | 35 | |
| | | 18 | G-Y | 36 | |
| | | 44 | Y-BR | 37 | |
| | | 19 | BR-Y | 38 | |
| | | 45 | Y-S | 39 | |
| | | 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 | |
| | SPARE | 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. 3 – 604-TYPE PANEL

| CIRCUIT 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 | |
| | SPARE | 28 | W-G | 5 | |
| | | 3 | G-W | 6 | |
| | | 29 | W-BR | 7 | |
| | | 4 | BR-W | 8 | |
| | | 30 | W-S | 9 | |
| | | 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 | |
| | SPARE | 33 | R-G | 15 | |
| | | 8 | G-R | 16 | |
| | | 34 | R-BR | 17 | |
| | | 9 | BR-R | 18 | |
| | | 35 | R-S | 19 | |
| | | 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 | |
| | SPARE | 38 | BK-G | 25 | |
| | | 13 | G-BK | 26 | |
| | | 39 | BK-BR | 27 | |
| | | 14 | BR-BK | 28 | |
| | | 40 | BK-S | 29 | |
| | | 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 | |
| | SPARE | 43 | Y-G | 35 | |
| | | 18 | G-Y | 36 | |
| | | 44 | Y-BR | 37 | |
| | | 19 | BR-Y | 38 | |
| | | 45 | Y-S | 39 | |
| | | 20 | S-Y | 40 | |
| | 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(FA) |
| GRD | G1 † | 24 | BR-V | 48 | TS1(15) |
| -48V | FAL2 † | 50 | V-S | 49 | F16(FA) |
| GRD | G2 † | 25 | S-V | 50 | TS1(16) |

* Stencil lead designations on fanning strip.

† Optional attendant alarm indicator on 604B panel only.

## TABLE E

## CONNECTIONS FOR PLUG NO. 4 – 604-TYPE PANEL

| CIRCUIT NO. | LEAD DESIG* | CONN PIN NO. | CONN CABLE COLOR | 66M1-50 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 | |
| | SPARE | 28 | W-G | 5 | |
| | | 3 | G-W | 6 | |
| | | 29 | W-BR | 7 | |
| | | 4 | BR-W | 8 | |
| | | 30 | W-S | 9 | |
| | | 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 | |
| | SPARE | 33 | R-G | 15 | |
| | | 8 | G-R | 16 | |
| | | 34 | R-BR | 17 | |
| | | 9 | BR-R | 18 | |
| | | 35 | R-S | 19 | |
| | | 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 | |
| | SPARE | 38 | BK-G | 25 | |
| | | 13 | G-BK | 26 | |
| | | 39 | BK-BR | 27 | |
| | | 14 | BR-BK | 28 | |
| | | 40 | BK-S | 29 | |
| | | 15 | S-BK | 30 | |
| 13 | CT | 41 | Y-BL | 31 | 12 |
| | CR | 16 | BL-Y | 32 | |
| | CS | 42 | Y-O | 33 | |
| | CG | 17 | O-Y | 34 | |
| | SPARE | 43 | Y-G | 35 | |
| | | 18 | G-Y | 36 | |
| | | 44 | Y-BR | 37 | |
| | | 19 | BR-Y | 38 | |
| | | 45 | Y-S | 39 | |
| | | 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 | |
| | SPARE | 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 F

### CONNECTIONS FOR CO LINES – 615A PANEL

| LINE NO. | LEAD DESIG | 914A CONN PIN NO. | 66T1 CONN BLOCK | 66B4-25 CONN BLK ROW NO. |
|---|---|---|---|---|
| 1 | T | J1A (13) | A1 | 1 |
| | R | J1A (4) | A2 | 2 |
| 2 | T | J2A (13) | A3 | 3 |
| | R | J2A (4) | A4 | 4 |
| 3 | T | J3A (13) | A5 | 5 |
| | R | J3A (4) | A6 | 6 |

TABLE G

CONNECTIONS FOR PLUG P1 – 615A PANEL

| CIRCUIT NO. | LEAD* DESIG | CONN PIN NO. | CONN CABLE COLOR | 66M1-50 CONN BLK ROW NO. | POS. IN 615A PANEL |
|---|---|---|---|---|---|
| 1 | CT | 26 | W-BL | 1 | J1 |
| | CR | 1 | BL-W | 2 | |
| | CS | 27 | W-O | 3 | |
| | CG | 2 | O-W | 4 | |
| | SPARE | 28 | W-G | 5 | |
| | | 3 | G-W | 6 | |
| | | 29 | W-BR | 7 | |
| | | 4 | BR-W | 8 | |
| | | 30 | W-S | 9 | |
| | | 5 | S-W | 10 | |
| 2 | CT | 31 | R-BL | 11 | J2 |
| | CR | 6 | BL-R | 12 | |
| | CS | 32 | R-O | 13 | |
| | CG | 7 | O-R | 14 | |
| | SPARE | 33 | R-G | 15 | |
| | | 8 | G-R | 16 | |
| | | 34 | R-BR | 17 | |
| | | 9 | BR-R | 18 | |
| | | 35 | R-S | 19 | |
| | | 10 | S-R | 20 | |
| 3 | CT | 36 | BK-BL | 21 | J3 |
| | CR | 11 | BL-BK | 22 | |
| | CS | 37 | BK-O | 23 | |
| | CG | 12 | O-BK | 24 | |
| | SPARE | 38 | BK-G | 25 | |
| | | 13 | G-BK | 26 | |
| | | 39 | BK-BR | 27 | |
| | | 14 | BR-BK | 28 | |
| | | 40 | BK-S | 29 | |
| | | 15 | S-BK | 30 | |

TABLE G (Cont)

| CIRCUIT NO. | LEAD* DESIG | CONN PIN NO. | CONN CABLE COLOR | 66M1-50 CONN BLK ROW NO. | POS. IN 615A PANEL |
|---|---|---|---|---|---|
| | SPARE | 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 | |
| | 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 | |
| | | 49 | V-BR | 47 | |
| | | 24 | BR-V | 48 | |
| | | 50 | V-S | 49 | |
| | | 25 | S-V | 50 | |

* Stencil lead designations on designation strip.

**TABLE H**

**POWER CONNECTIONS**

| INPUT VOLTAGE* | 69G APP MTG (NOTE 1) | 604B PANEL (NOTE 2) | 615A PANEL (NOTE 3) |
|---|---|---|---|
| −24V | 5 | INPUT −24V | D2 |
| −48V | — | INPUT −48V | — |
| GRD | 4 | INPUT GRD | D4 |

*Notes:*

1. Terminals on 66B4-25 connecting block.
2. Terminals on rear of panel stamped as shown. Position option straps for −24V or −48V.
3. Terminals on 66T1 connecting block on rear of panel.

* 48 volts not used with 102 IUs.

**TABLE I**

**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 J

### 604B OR 604C PANEL 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 K

615A PANEL FUSE ASSIGNMENT

| VOLTAGE | FUSE NO.* | PANEL POSITION |
|---|---|---|
| −24V | F1 | J1A, J1B |
| | F2 | J2A, J2B |
| | F3 | J3A, J3B |
| −48V | F4† | J1A |
| | F5† | J2A |
| | F6† | J3A |
| ±105V | F7† | J1A, J2A, J3A |
| SPARE | F8 | SPARE |

* Fuses are 24E 1/2-ampere.
† Not used in this application.