



Bell  
Communications  
Research

Bellcore Practice  
BR 007-560-252  
Issue 2, August 1986

**RECEIVED**

---

AUG 1986

NETWORK INFORMATION CENTER

**INSTALLATION AND TEST  
REMOTE CONSOLE UNIT (RCU) FOR THE  
"PDP\*" 11/70 MINICOMPUTER  
INFORMATION SYSTEMS**

---

---

**PROPRIETARY--BELLCORE AND AUTHORIZED CLIENTS ONLY**

This document contains proprietary information that shall be distributed or routed only within Bell Communications Research (Bellcore) and its authorized clients, except with written permission of Bellcore.

Prepared by the Information Management Services Division,  
Bell Communications Research, Inc., May 1986.

Copyright © 1986 Bell Communications Research, Inc.  
All rights reserved.

CONTENTS

1. INTRODUCTION . . . . .	1
1.01 PURPOSE . . . . .	1
1.02 REASONS FOR REISSUE . . . . .	1
2. GENERAL . . . . .	1
2.01 "KIT OF PARTS" . . . . .	1
2.02 Optional Equipment and Hardware . . . . .	2
3. DESCRIPTION OF TERMS . . . . .	4
4. INSTALLATION PROCEDURE . . . . .	4
4.01 DRAWER COVER REMOVAL . . . . .	4
4.02 MINICOMPUTER CONSOLE REMOVAL . . . . .	5
4.03 POWER SUPPLY ASSEMBLY INSTALLATION . . . . .	5
4.04 COMMUNICATION CABLE INSTALLATION . . . . .	6
4.05 RCU REMOTE TERMINAL COMMUNICATION CONNECTIONS . . . . .	7
4.06 RCU LOCAL TERMINAL COMMUNICATION CONNECTIONS . . . . .	7
4.07 INTERFACE CABLE INSTALLATION . . . . .	9
4.08 MINICOMPUTER CONSOLE REINSTALLATION . . . . .	9
4.09 RCU SWITCH SETTING CONFIGURATION . . . . .	10
4.10 PASSWORD AND PROMPT-ID . . . . .	11
4.11 FINAL RCU SETUP . . . . .	12
5. TEST . . . . .	13
5.01 LOCAL SYSTEM TEST . . . . .	13
5.02 LOCAL TERMINAL TEST . . . . .	13
5.03 RCU TRANSPARENCY TEST . . . . .	15
5.04 RCU CONTROL TEST . . . . .	15
5.05 REMOTE TERMINAL TEST . . . . .	16
5.06 LIGHT AND SWITCH TEST . . . . .	17
5.07 DROP CALLER TEST . . . . .	19
6. TROUBLE LOCATING . . . . .	19

LIST OF FIGURES

Figure 1. Location of Major Components and Assemblies . . . . .	31
Figure 2. RCU Completely Installed Without Front Panel . . . . .	32
Figure 3. RCU CP-1 Layout . . . . .	33
Figure 4. RCU CP-1 Cabling Arrangement . . . . .	34
Figure 5. Processor Mounting Box . . . . .	35
Figure 6. DL11 Connector . . . . .	36
Figure 7. Application of 702-AR Connectors . . . . .	36
Figure 8. Processor Backplane DC Low Termination . . . . .	37
Figure 9. RCU Completely Installed With Front Panel . . . . .	38

LIST OF TABLES

TABLE A. DESIGNATION OF PROCESSOR CABLE(S) . . . . .	21
TABLE B. POWER SUPPLY CONNECTIONS (NOTE) . . . . .	21
TABLE C. SW-4—REMOTE TERMINAL, SW-5—LOCAL TERMINAL . . . . .	21
TABLE D. RECOMMENDED BELL SYSTEM DATA SET TYPES FOR INTERFACE WITH RCU . . . . .	22
TABLE E. CONNECTIONS BETWEEN TTY SECTION OF CABLE AND DL11 PWB . . . . .	22
TABLE F. M7800 BAUD RATE CONFIGURATION . . . . .	23
TABLE G. M7856 BAUD RATE CONFIGURATION . . . . .	23
TABLE H. DC LOW BACKPLANE PIN ASSIGNMENTS . . . . .	24
TABLE I. CABLE CONNECTION BETWEEN RCU CP-1 AND CONSOLE PWB . . . . .	24
TABLE J. RCU COMMUNICATION PORT SIGNALS (Sheet 1 of 2) . . . . .	25
TABLE K. TROUBLESHOOTING GUIDE (Sheet 1 of 4) . . . . .	27

## 1. INTRODUCTION

### 1.01 PURPOSE

This practice describes standard installation and test procedures of the Remote Console Unit (RCU) for the Digital Equipment Corporation PDP 11/70 minicomputers.

### 1.02 REASONS FOR REISSUE

This practice is reissued due to divestiture.

## 2. GENERAL

The RCU is a microprocessor based interface to PDP 11/70 minicomputers that permits remote diagnostic and monitor capability. The RCU was primarily designed as a maintenance tool for the operating telephone company (OTC) Minicomputer Maintenance and Operations Centers (MMOCs) and as an operations tool for software development organizations. Maintenance and operations personnel communicate with the RCU via a dial-up line using a data set and a standard receive/transmit American Standard Code for Information Interchange (ASCII) terminal. Complete PDP 11/70 system switch console and terminal emulation is achieved.

### 2.01 "KIT OF PARTS"

An RCU "kit of parts" consists of: (Refer to FJ81NE0002A.)

1—FE81NE0027 G-1 Display, Mountings, and Printed Wiring Board (PWB) Assembly  
(The following equipment associated with the above assembly has been listed here for reference only.)

- 1 — FE81NE0012 G-1 CP-1 PWB Assembly
- 2 — FP81NE0022 PWB Mounting Brackets
- 1 — FP81NE0023 Switch and Light Emitting Diode (Led) Bracket
- 1 — Chicago Lock Co. #4235-DC SPDT ACE Key Switch Lock E/W 2—2371 Hex Nuts
- 3 — Dialight Co. #250-7438-14-504 Data Lamp Holder
- 3 — Dialight Co. #507-4757-3731-500 LED (red)
- 1 — HeyCo Co. #DC-68-2-2 Terminal Bushing
- 1 — FE81NE0013 G-2 10-Pin Flat Ribbon Cable
- 8 — #6-32X5/16 PHMS
- 1 — 5061-N-140 #6 Nylon Washer
- 2 — T-202-S Terminal (HeyCo Co.)

1—FE81NE0014 G-1 Power Supply Assembly  
(The following equipment associated with the above assembly has been listed here for reference only.)

- 1 — Semiconductor Circuit, Inc. #CME5D30/1-12D2/1 Power Supply
- 2 — FP81NE0024 Figure 1 Power Supply Bracket(s)
- 4 — FP81NE0024 Figure 2 Protection Cover Bracket(s)
- 2 — FP81NE0024 Figure 3 Clear Plastic Cover(s)
- 1 — FP81NE0024 Figure 4 Power Filter Bracket
- 1 — FE81NE0015 G-1 3-Conductor AC Power Cord (10 feet long)
- 1 — Corcom #1R3 1A Power Filter
- 1 — TRW #354-11-03-001 Barrier Bolock
- 1 — TRW #364-14-03-011 Marker Strip
- 4 — #4-40X1/4 PHMS
- 4 — #4-40X7/16 PHMS

PROPRIETARY — BELLCORE AND AUTHORIZED CLIENTS ONLY

See proprietary restrictions on title page.

- 8 — #4 Lockwashers, External Tooth
- 4 — #4-40 Hex Nuts
- 1 — FE81NE0015 G-2 4-Conductor 16-Gauge DC Power Cable (9 feet long)
- 1 — FE81NE0015 G-4 Single Conductor Wire (black) (8 feet long)
- 5 — Flanged Spade Tongue Terminals (AMP) #320862
- 12 — #6-32X5/16 PHMS
- 4 — #6 Plain Washers
- 2 — 811576206 Warning Labels
- 2 — #8-32X1/4 PHMS
- 4 — #6-32X1 1/8 Standoffs
- 4 — #4-40X5/16 PHMS
- 4 — C30110-1032 #10-32 Quick Fastener (Tinnerman)
- 4 — #10-32X1 Slotted Screw With External Lockwasher SEMS

**2.02 Optional Equipment and Hardware**

1—RCU MULT PWB Assembly (for troubleshooting purposes see Section 6)  
(The following equipment associated with the above assembly has been listed here for reference only.)

- 1 — FE81NE0024 G-1 RCU MULT PWB Assembly
- 5 — #6-32X1 1/4 Standoffs

**Cables**

- 3—FE81NE0013 G-1 40-Pin Flat Ribbon Cable (2-foot lengths)
- 1—FE81NE0015 G-3 20-Conductor [TTY/DC LOW/EIA] Cable Assembly

**Miscellaneous Hardware**

1—FE81NE0016 G-1 RCU Drawer Cover Assembly  
(The following equipment associated with the above assembly has been listed here for reference only.)

- 1 — Bezel E/W Red Filter
- 1 — FE81NE0015 G-5 2-Conductor 22-Gauge Stranded Wire (3 feet)
- 1 — FP81NE0025 Drawer Cover
- 1 — SST1M Miniature Cable Tie
- 1 — ABMM-AC Adhesive Back Mount

6—#6-32X1/2 Hex Standoff

4—#6-32X5/8 Hex Standoff

**Screws**

4—#10-32X3/8 PHMS (for executive cabinet only)

**Connectors**

3—702-2AR

**Washers**

6—Nylon Washer(s) (#6 screw)

**Adhesive Mounts and Cable Ties**

5—ABMM-AC Adhesive Back Mounts

5—SST1M Miniature Cable Ties

20—SST2S Standard Cable Ties

**Documentation—Bellcore BRs and User's Manual**

2—Remote Console unit (RCU) PDP 11/70 Minicomputer User's Manual (Select Code 700-367)

1—Method of Operation (BR 007-560-251)

1—Installation and Test (BR 007-560-252)

**Miscellaneous Documentation**

1—FE81NE0012 RCU Interface PWB Assembly Drawing\*

1—FE81NE0013 RCU Ribbon Cable Assembly Drawing\*

1—FE81NE0014 RCU Power Supply Assembly Drawing\*

1—FE81NE0015 RCU Cord Assembly Drawing\*

1—FE81NE0016 RCU Cover Assembly Drawing\*

1—FE81NE0024 RCU Mult Thru Board\*

1—FE81NE0027 RCU Display, Mountings, and PWB Assembly Drawing\*

1—FS81NE0006 RCU Mult Thru Board Schematic

1—FJ81NE0002A RCU Spec. and Assem. for PDP 11 Minicomputer

1—FS81NE0004 RCU for PDP 11/70 Schematic

\* These drawings are not supplied. They can be ordered in the normal manner for obtaining microfilm.

The following tools are needed for proper installation of the RCU:

- Flat blade screwdriver—preferably magnetic
- Phillips screwdriver
- Wire strippers with cutters
- Straight pin
- Pliers
- Polyvinyl Chloride (PVC) electrical tape
- Masking tape
- ASCII terminal
- Data set (or acoustic coupler)
- Ohmmeter.

The following preliminary instructions must be implemented before proceeding:

- (a) In order to log into the RCU, the password device must be programmed and installed.
- (b) The data set assigned to the RCU must be fully installed with an **unpublished** telephone number and its associated RS232 cable run back to the minicomputer.

PROPRIETARY — BELLCORE AND AUTHORIZED CLIENTS ONLY

See proprietary restrictions on title page.

- (c) In order to test the RCU, the installer must be able to boot up an operating system for the minicomputer.

For security purposes, refer to BR 007-560-251 before installation.

### 3. DESCRIPTION OF TERMS

The following is a description of terms used in connection with the RCU PDP 11/70 minicomputer.

- (a) **Remote Terminal:** The standard receive/transmit ASCII terminal located anywhere with a dial-up line and data set (or acoustic coupler).
- (b) **Local Terminal:** The minicomputer "system console." It is the standard ASCII terminal (usually a DECWRITER\* terminal) used by the associated minicomputer.
- (c) **Switch Register:** The bank of switches designated SWR21-SWR00 located on the minicomputer front console.
- (d) **Remote Mode:** The operating state of the RCU when the Local/Remote mode control key switch is in REMOTE.
- (e) **Local Mode:** The operating state of the RCU when the Local/Remote mode control key switch is in LOCAL.
- (f) **Locking Switches:** The switches located on the minicomputer front console that can be locked in two or more positions. They are the HALT/ENABLE, S BUS CYCLE/S INST, Data Select, and Address Select switches.
- (g) **Momentary Switches:** The switches on the minicomputer front console that can be momentarily switched to one additional position. They are the CONT, LOAD, START, EXAM, and DEP switches.

### 4. INSTALLATION PROCEDURE

**NOTE -** Read entire instructions before beginning installation.

#### 4.01 DRAWER COVER REMOVAL

Power down the PDP 11/70 minicomputer. Remove and retain key. Power down the local terminal.

**Standard Cabinet:** Pull out the Central Processing Unit (CPU) mounting box drawer. Remove the drawer cover (located directly below the minicomputer console faceplate) by removing four Phillips head screws at the rear of the cover. Save these screws for later use.

**Executive Style Cabinet** (DEC DATA SYSTEMS—PDP 11/370 has a distinctive blue cover): Remove drawer cover (located directly below the console faceplate) by inserting a screwdriver tip into the rightmost and then the leftmost air slot releasing the spring-loaded latch mechanism. Upon removing the cover, it may become necessary to temporarily remove a ground wire between the cover and the minicomputer chassis. Pull out the CPU mounting box drawer.

Mount the CP-1 PWB assembly (Figures 1 and 2) on the drawer panel by removing the two bottom screws on this panel and loosening the two top screws (about 3/16 inch). Do not remove these screws. Four extra screws are provided in the RCU kit of parts (4—10-32X3/8 PHMS) in the event that the mounting screws do not exist (e.g., the executive cabinet). Slide the upper bracket of the CP-1 under

PROPRIETARY — BELLCORE AND AUTHORIZED CLIENTS ONLY  
See proprietary restrictions on title page.

the two loosened screws and replace the two bottom screws over the lower bracket. Tighten all four screws.

**Standard Cabinet:** Check the alignment of the RCU drawer cover (FE81NE0016 G-1) over the RCU PWB. The Local/Remote mode control key switch must be directly in the center of its associated hole in the RCU drawer cover. Be sure to temporarily install at least two of the four screws that were saved. If a misalignment exists, remove the RCU drawer cover and loosen the four panel screws. Repeat this until the alignment is acceptable. Remove the RCU drawer cover.

#### 4.02 MINICOMPUTER CONSOLE REMOVAL

Remove the minicomputer console bezel. The bezel is removed by unscrewing four Phillips head screws located at the bezel's rear. Save these screws for later use.

Remove the minicomputer console faceplate. The faceplate is removed by unscrewing completely the five plastic screws and lifting off the two plastic knobs. Save these screws and knobs for later use.

Unplug the three 40-pin flat ribbon cables from the console PWB and designate (using the labels provided) according to Table A. Be sure to label the **smooth** side of cable (which should be facing **away** from console PWB) approximately one-half inch up from connector.

Remove the power connector (located in upper right-hand quadrant) of the console PWB. This is accomplished by squeezing together the two plastic tabs of the connector and simultaneously lifting up.

Remove the three metal standoffs and three metal screws that hold the console PWB in place. Be careful not to lose any of the plastic washers. Retain all hardware for later use. Store the console PWB in a safe place for later use.

Run the newly designated J1P cable to the RCU PWB header designated J1P (located in the top left position) making sure to keep the cable flat and without twists. Snap the J3P cable **smooth** side **out** into the J3P header. (Refer to Figures 3 and 4 for location of J1P header.) Be sure ejector tabs are securely locked.

Run the newly designated J3P cable to the RCU PWB header designated J3P (located in the second from the top position) making sure to keep the cable flat and without twists. Snap the J3P cable **smooth** side **out** into the J3P header. (Refer to Figure 3 for location of J3P header.) Be sure ejector tabs are securely locked.

Run the newly designated J2P cable to the RCU PWB header designated J2P (located in the third from the top position) making sure to keep the cable flat and without twists. Snap the J2P cable **smooth** side **out** into the J2P header. (Refer to Figure 3 for location of J2P header.) Be sure ejector tabs are securely locked.

#### 4.03 POWER SUPPLY ASSEMBLY INSTALLATION

Install the power supply assembly on the right-side upright of the minicomputer cabinet (Figure 1). The exact height location of this unit can vary at any given installation. When selecting height, be sure there is no interference with the movement of the drawer. Mount the assembly with the ac power cord towards rear of cabinet. Observe that the holes in the uprights have varying centers as follows:

1/2, 5/8, 5/8, 1/2, 5/8, 5/8, 1/2, etc.

The power supply assembly mounts on 3-inch centers. Therefore, look for a large enough space to mount the top set of holes of the assembly into a bottom set of upright holes on 1/2-inch centers. Then the bottom holes of the assembly will line up with the fifth upright hole(s) down from the top bracket. Use four #10-32X1 slotted screws and four #10-32 fasteners to mount the power supply assembly.

PROPRIETARY — BELLCORE AND AUTHORIZED CLIENTS ONLY

See proprietary restrictions on title page.

**Important:** Do not connect power cord to ac outlet.

Run the 3-conductor ac power cord (part of the power supply assembly) to the bottom of the minicomputer cabinet.

Secure cord to adjacent cables and/or metal uprights within rear of minicomputer cabinet using cable ties (Figure 1). Check drawer movement. Correct cord placement, if necessary.

**Important:** Make sure to run the following cables along the power distribution harness and behind the sliding drawer bracket. (See dotted lines in Figure 1.)

Run the FE81NE0015 G-4 single conductor 16-gauge (black) wire (provided as part of FE81NE0014 power supply assembly) from the power supply (GND terminal) to the minicomputer backplane ground (Figure 1). A backplane ground can be secured by partially unscrewing one of the screws that holds the minicomputer power distribution cable holders in place (Figure 5). Slide the terminal of the 16-gauge wire between the chassis and the holder making sure there is good metal to metal contact. Tighten screw while holding the terminal in place. Secure wire to minicomputer power cable and adjacent metal uprights. Also, secure the excess cable slack to one of the power supply brackets or minicomputer metal uprights. Check drawer movement. Correct conductor placement, if necessary.

Attach the FE81NE0015 G-2 16-gauge 4-conductor dc power cable (provided as part of FE81NE0014 power supply assembly) to the CP-1 interface PWB. This is accomplished by plugging the AMP connector end into the J7 header on the CP-1. (Refer to Figure 3 for the location of the J7 header.) The cable should run up the CPU mounting box (Figure 1). It should be secured behind console PWB location using adhesive back mounts. Be sure to retain excess slack near the power supply end of cable. Secure cable to adjacent cables and/or metal uprights using cable ties. Also, secure the excess cable slack to one of the power supply brackets or minicomputer metal uprights. (See Table B.)

#### 4.04 COMMUNICATION CABLE INSTALLATION

Attach the FE81NE0013 G-3 20-conductor [TTY/DC LOW/EIA] cable assembly to the CP-1 interface PWB. This is accomplished by plugging the BERG connector end into the J4 header on the CP-1. (Refer to Figure 3 for the location of the J4 header.) Be sure ejector tabs are securely locked. The cable should run up the CPU mounting box (use adhesive mounts) according to Figure 1.

- (a) Run the 8-foot Electronic Industries Association (EIA) section of cable (13-conductor with two EIA 25-pin connector terminations) from the CP-1 J4 header to the rear of the minicomputer cabinet. Secure cable to adjacent cables and/or metal uprights. Check drawer movement. Correct cable placement, if necessary.
- (b) Run the 6-foot TTY section of cable (4-conductor with four BERG pin terminations) from the CP-1 J4 header to the left top rear section of the CPU mounting box. Secure cable to adjacent cables and/or metal uprights. Check drawer movement. Correct cable placement, if necessary.
- (c) Run the 4-foot DC LOW section of cable (2-conductor) from the CP-1 J4 header to about the halfway point down the CPU mounting box along the minicomputer power connector (Figure 5). Secure cable to adjacent cables and/or metal uprights. Check drawer movement. Correct cable placement, if necessary. Tape and store cable for possible future use.

**NOTE** - In (a) and (b) above, secure all excess cable at terminating end (**not** at the CP-1) with cable ties.

#### 4.05 RCU REMOTE TERMINAL COMMUNICATION CONNECTIONS

Connect the male connector that is labeled **CONN 1** of the EIA section of cable to a female connector of a cable from the data set earmarked for the RCU. The data set connected to the RCU and also the data set (or acoustic coupler) connected to the remote terminal must have the following features: binary, full duplex, asynchronous, a standard RS232C interface, and be capable of operating within the RCU speed guidelines. (See Table C). Several data set types and their significant operating parameters for interface to the RCU are listed in Table D.

The male connector labeled **CONN 2** of the EIA section of cable is normally not used. This connector provides the following signals from the RCU local terminal communications port: GND, RTS, DTR, TXD, DSR, and CTS. This connector can only be used in conjunction with special DL11 connections (e.g., with the TTY section of cable) and special system setup desired by the users installed system. These special connections are beyond the scope of this practice and will not be covered.

#### 4.06 RCU LOCAL TERMINAL COMMUNICATION CONNECTIONS

**Important:** The DL11 Asynchronous Serial Interface PWBs may be different from one another. Therefore, careful attention should be paid to the version and issue of the PWB.

To install the four conductors of the TTY section of the cable, refer to Table E.

- (a) Remove side panel that covers access to CPU modules (PWBs) and remove the top panel that covers the flat ribbon cables.
- (b) Remove the DL11 PWB (normally slot 40, rows C through F) making sure to maintain the integrity of its associated BERG-type connector. It may become necessary to remove this connector; therefore, be sure to mark it as to facilitate correct alignment when replacing.
- (c) Locate the shorting wire on the DL11 PWB BERG-type connector. Note that this shorting wire corresponds to the Transistor Transistor Logic (TTL) in/TTL out pin terminations (Table E).
- (d) Remove the shorting wire noting its location by removing the two associated pins in the connector (Figure 6). This is accomplished by lifting the small plastic flaps associated with each pin with a straight pin (or safety pin) and simultaneously pulling the pin out. Retain this wire for possible future use.
- (e) Insert the BK-W conductor of the TTY section of cable into the pin hole of the shorting wire designated "TTL in" (Table E). Be sure the pin at the end of the conductor seats properly and securely in the DL11 connector.
- (f) Insert the BK-R conductor of the TTY section of cable into the pin hole of the "TTL out" (slot E). Be sure the pin at the end of the conductor seats properly and securely in the DL11 connector.
- (g) Locate the RXD terminating pin hole (either EIA or TTL level) (Table E).
- (h) Locate the corresponding W-BK or R-BK conductor (part of TTY section of cable) for either the EIA or TTL RXD terminating pin, respectively.
  - (1) **DL11 PWB is the 7800 version:**
    - If the shorting wire mentioned above is located between pin H and pin E, then the TTL RXD conductor (R-BK) can go directly into pin SS (using terminal provided).
    - If the shorting wire is located between pin M and pin E, then there should already exist a conductor in pin SS. Cut the TTL RXD conductor (R-BK) to the proper

PROPRIETARY – BELLCORE AND AUTHORIZED CLIENTS ONLY

See proprietary restrictions on title page.

length without stripping it. Connect it to the existing conductor in pin SS using a 702-2AR connector (provided) according to Figure 7.

(2) **DL11 PWB is the 7856 version:**

- If the shorting wire mentioned above is located between pin H and pin E, then the EIA RXD conductor (W-BK) can go directly into pin F (using terminal provided).
  - If the shorting wire is located between pin M and pin E, then there should already exist a conductor in pin F. Cut the EIA RXD conductor (W-BK) to the proper length without stripping it. Connect it to the existing conductor in pin F using a 702-2AR connector (providing) according to Figure 7.
- (3) Tape the extra conductor (W-BK or R-BK) with PVC electrical tape and isolate it from the rest of the conductors.

**NOTE** - Step (i) is only necessary when there exists a speed incompatibility between the RCU and the local terminal.

- (i) The following describes steps required to change the local terminal speed, if necessary. To determine or change the minicomputer local terminal baud rate, refer to (1) or (2), depending on which DL11 PWB (M7800 or M7856, respectively) exists.
- (1) If the installed DL11 PWB version is the M7800 type, refer to Table F. Holding the PWB with the handle to left and fingers to the right, locate switches S1 (located to right) and S2 (located to left). The switches S1 and S2 are the transit and receive baud rate switches, respectively. One crystal, located below the switches, is stamped with a clock frequency. This frequency determines which column in Table F the local terminal speed can be found. Each switch turn refers to the position column in Table F. To precisely determine the switch position, rotate the screwdriver actuated switch counter-clockwise and count the amount of positions rotated (clicks). The amount of clicks corresponds to a number in the switch position column. Record this number for both the S1 and S2 switch positions. Return switches S1 and S2 to their original positions by rotating clockwise and counting the appropriate number of clicks. Line up the clock frequency and the corresponding switch positions for S1 and S2 to determine their associated baud rates. If S1 is not equal to S2 or if the baud rate is not compatible with the RCU arrangement of possible switch settings (Table C), then the RCU cannot operate properly. To alleviate the problem, the DL11 board and the local terminal (if possible) will have to be reconfigured to the desired speed settings.
  - (2) If the installed DL11 PWB version is the M7856 type, then refer to Table G. The S3 and S4 are multiposition Dual In-Line Package (DIP) switches located on the M7856. The receive and transit baud rates can be determined by matching the switch settings with the noted table values (Table G). If the receiver and transmitter baud rates of the DL11 PWB are not equal, the RCU cannot operate properly. To alleviate the problem, the DL11 PWB and the local terminal (if possible) will have to be reconfigured to the desired speed settings.
- (j) Plug the DL11 PWB back into its slot.
- (k) Connect cable back into the DL11 board. Close side and top panels making sure integrity of all its associated wires is maintained.

- (1) Check drawer movement. Correct cable placement, if necessary.

**Important:** The DC LOW terminations are **not** recommended at this time. Notice for the implementation of DC LOW terminations will be given at a later date.

The DC LOW section of the cable is terminated according to Table H.

The DC LOW conductors will be terminated using two 702-2AR connectors. Locate on the upper part of the processor backplane (Figures 5 and 8) the minicomputer power supply plug-pin conductor (purple wire) according to Table H. Cut the corresponding DC LOW conductor (part of the DC LOW section of cable) to the proper length **without** stripping it. Attach and connect according to Figure 7 the DC LOW conductor to its respective power supply plug-pin conductor. Repeat procedure for the other DC LOW conductor and corresponding plug-pin conductor.

#### 4.07 INTERFACE CABLE INSTALLATION

Install six #6-32X1/2 hex standoffs (provided) into the mounting holes of the three standoffs and three screws removed while removing the console PWB. These standoffs will provide a 1/2-inch gap between the rear of the console PWB and its mounting bracket.

On the minicomputer console PWB, connect according to Table I the three 40-pin flat ribbon cables (provided) beginning with the cable designated with the prefix J1.

**Important:** Be sure to keep the cable drain wire to the **left** as you face the minicomputer cabinet for all cables. Also be sure the rib sides of the new cables face **away** from the console PWB (Figure 4).

Each cable is stamped at one end with an identical designation corresponding to the cable header location designation (Table I). This cable must be connected to its corresponding header.

Repeat procedure for the two other cables. Fold these three 40-pin flat ribbon cables up and over the back of the console PWB (Figure 4). Be sure that the console PWB solder side does not puncture or scratch the flat ribbon cables.

**Important:** Be sure that the console PWB does not puncture or scratch any of the cables.

Using the six nylon washers for the #6 screw (provided) and the three standoffs and screws removed previously, reinstall the console PWB. Be sure to place the nylon washer(s) between the hex standoff(s) and the solder (back side) side of the console PWB (Figure 1).

Begin fastening the PWB using the screws at the top and bottom middle positions first and then work toward the sides. This will make it easier to install the six nylon washers mentioned above.

Connect the 40-pin flat ribbon cable stamped J3C to the J3C header on the CP-1 PWB. (Refer to Figures 3 and 4 for the location of the headers.) Be sure ejector tabs are securely locked. Repeat for cable(s) stamped 2JC and then J1C. Fold back and secure excess cable into cable trough.

#### 4.08 MINICOMPUTER CONSOLE REINSTALLATION

Reconnect the console PWB power connector previously removed. Be sure it is correctly aligned when reconnecting.

Be sure all cables and connectors are secured properly and are not accessible to damage by drawer movement.

Reinstall the minicomputer console faceplate using the five plastic screws. Tighten when all five screws are installed. Also replace the two plastic knobs removed previously from the console faceplate.

Install four #6-32X5/8 hex standoffs (provided) into the mounting holes of the console bezel. Do not overtighten.

Reinstall the minicomputer console bezel using the four Phillips head screws.

#### 4.09 RCU SWITCH SETTING CONFIGURATION

**Important:** The remote terminal speed must be greater than or equal to the local terminal speed. The SW-4 switch should never be set to a baud rate lower than SW-5.

Using the two baud rate switches and a small flat blade screwdriver, adjust the RCU speed options. The SW-4 and SW-5 are two 10-position thumbwheel switches located in the upper right-hand quadrant of CP-1 (Figure 3). The two baud rate switches SW-4 and SW-5 correspond to the speed options for the remote and local terminals, respectively. Set the local terminal speed option switch (SW-5) to the appropriate speed determined previously. If the receive or transmit baud rate is incompatible with the RCU and the local terminal is the type that can be adjusted or that can be replaced, then change the DL11 PWB switch settings to accommodate the RCU. Be sure the local terminal is adjusted accordingly. Set the RCU remote terminal speed option switch (SW-4) to a speed that follows RCU guidelines (e.g., the baud rate of SW-4 must be greater than or equal to that of SW-5). Be sure the connecting data set can accommodate the desired speed. Table C lists the switch positions and their respective speeds.

The modem option switches SW-2 and SW-3 are two quad Single-Pole Double Throw (SPDT) DIP switches located directly to the right of SW-4 and SW-5 (Figure 3). Table J describes the various switch positions and their respective connections.

- (a) Switch position SW-2 C1 is used in conjunction with the TTL out conductor. This switch either inverts or passes the RCU transmit data signal to the minicomputer (TTL out). If the DL11 PWB version is the M7856 type, then this switch must be placed in the normally connected position.
- (b) Switch position SW-2 C2 is used for test purposes only and shall **always** be put in the normally connected position.
- (c) Switch position SW-2 C3 is used in conjunction with the Request To Send (REM RTS) and Clear To Send (REM CTS) leads of the remote terminal. This switch either passes both leads to the CONN 1 connector (SW-2 C3 normally connected) or straps both leads together (SW-2 C3 normally open). The REM RTS lead is always passed to the CONN 1 connector regardless of the position of SW-2 C3. If the connecting equipment does not provide CTS, the switch must be placed in the normally open position.
- (d) Switch position SW-2 C4 is not used.
- (e) Switch position SW-3 C1 is used in conjunction with the Received Data (RXD) lead of the local terminal. This lead either permits the TTL level RXD (SW-3 C1 normally connected) or the EIA level RXD (SW-3 C1 normally open) to pass through. This switch must accommodate the RXD lead selected (Table E).
- (f) Switch position SW-3 C2 is used in conjunction with the Data Terminal Ready (DTR) and Data Set Ready (DSR) leads of the local terminal. When CONN 2 connector is not used, SW-3 C2 must be in the normally connected position. This switch either straps both leads together (SW-3 C2 normally connected) or passes both leads to the CONN 2 connector (SW-3 C2 normally open). The DSR lead is always passed to the CONN 2 connector regardless of the position of SW-3 C2. If the CONN 2 connector is used and if the connecting equipment does provide DSR,

PROPRIETARY – BELLCORE AND AUTHORIZED CLIENTS ONLY

See proprietary restrictions on title page.

then the switch may be placed in the normally open position.

- (g) Switch position SW-3 C3 is used in conjunction with the RTS and CTS leads of the local terminal. When CONN 2 connector is not used, SW-3 C3 must be in the normally connected position. This switch either straps both leads together (SW-3 C3 normally connected) or passes both leads to the CONN 2 connector (SW-3 C3 normally opened). The RTS lead is always passed to the CONN 2 connector regardless of the position of SW-3 C3. If the CONN 2 connector is used **and** if the connecting equipment does provide CTS, then the switch may be placed in the normally open position.
- (h) Switch position SW-3 C4 is not used.

#### 4.10 PASSWORD AND PROMPT-ID

In order to set the password and prompt-ID, follow the instructions below. Refer to Figure 3 for the location of IC39.

- (a) Instructions must be followed in order.
- (b) Follow programmer manufacturer's instructions when programming or copying Ultraviolet Erasable Programmable Read-Only Memory (UVERPROM).\*

\* Typical programmers: Data I/O Model 19  
or  
Pro-Log M900B  
etc.,

with associated 2716-type personality module.

**Important:** The last character entered of the password must be 00H. The password entered must be a minimum of six characters, difficult to guess, and unique to the processor of which the RCU is installed, e.g., password entered on UVERPROM:

DEVICE HEX ADDRESS	ASCII HEX CODE ENTERED	ASCII CHARACTER
000H	65H	e
001H	78H	x
002H	61H	a
003H	6dH	m
004H	70H	p
005H	6cH	l
006H	65H	e
007H	00H	

Password entered at remote terminal:

*"example"* (nonechoing)

(followed by the RETURN key).

- (c) For security reasons, the RCU is not provided with a login password at the manufacturing location. The password must be programmed by the installation personnel before installation. The password is physically located on a 2000- by 8-bit UVEPROM integrated circuit (IC39) (similar to the Intel Co. 2716). The IC39 is a DIP located in a zero-insertion socket on CP-1 (Figure 3). The device (IC39) has the password loaded in memory locations (addresses) 000H through 3ffH.\* The password characters must conform to the ASCII format. [DEL(7fH), @(40H), DC3(13H), CR(0dH), and LF(0aH) are all exceptions in the ASCII format and should not be used in the password.] The parity bit or the most significant bit must be left as zero. There should be no hexadecimal character code greater than 7eH entered. The password may be up to 1000 characters but **not** less than 6 with an additional last character entered being 00H. A recommended practice is to keep the character count within a reasonable range to allow time to type in characters before the login period times out. (Refer to BR 007-560-251.)

\* An "H" following a number signifies that the number is hexadecimal.

Follow the steps given below to set password and prompt-ID:

- (a) If the RCU is to be provided with a password only (not a prompt-ID) then:
- (1) Remove IC39.
  - (2) Copy device (IC39) to temporary memory.
  - (3) Change locations 000H to XXXH (maximum XXXH=3feH, minimum XXXH=005H) to password desired.
  - (4) Change next location (XXXH + 1) to 00H code.
  - (5) Check location 400H. If not ffH, then change it to ffH.
  - (6) Program new chip (2716).
  - (7) Reinstall IC39 (new chip).\*
- (b) If the RCU is also to be provided with a new prompt then:
- (1) Perform step(s) (a)(1) to (a)(4).
  - (2) Change locations 400H to YYYYH (maximum YYYY=408H) to prompt-ID desired.
  - (3) Change next location (YYYYH + 1) to 00H code.
  - (4) Program new chip.
  - (5) Reinstall IC39 (new chip).\*

\* When reinstalling IC39, be sure to align pin 1 with its proper designation on the RCU CP-1.

#### 4.11 FINAL RCU SETUP

Before reattaching the RCU drawer cover (FE81NE0016 G-1) to the minicomputer cabinet, make sure that the switch terminals of the DISCONNECT CARRIER pushbutton switch are **not** shorted to each other or the RCU drawer cover. Using an ohmmeter:

- (a) Check the continuity between the first and second terminal.
- (b) Check the continuity between the first terminal and bare metal on the RCU drawer cover.

If a short exists (e.g., zero resistance reading), then carefully separate the terminals from each other and/or the RCU drawer cover. Then repeat steps (a) and (b) above until a continuity test reveals an

PROPRIETARY - BELLCORE AND AUTHORIZED CLIENTS ONLY

See proprietary restrictions on title page.

open (or extremely high) resistance reading.

Connect the two terminals of the 3-foot 2-conductor cable (part of the RCU drawer cover) to the terminal bushing (HeyCo Co. #DC-68-2-2). The two conductors can be flip-flopped to either side of the terminal bushing.

For a standard cabinet, place the RCU drawer cover (FE81NE0016 G-1) over the RCU PWB. Using the screws saved previously mount the RCU drawer cover. Tighten all four screws.

The RCU has now been completely installed (Figure 9). Refer to RCU system test.

## 5. TEST

**Important:** If there is a problem (e.g., expected results are not achieved), immediately refer to Table K. Once the problem is thought to be corrected, restart procedure.

### 5.01 LOCAL SYSTEM TEST

**Important:** Do not plug RCU ac plug into ac outlet.

Be sure local console HALT/ENABLE switch is in the HALT position. Make sure **all** minicomputer associated circuit breakers are ON. Power up minicomputer. Power up local terminal. Be sure the Address and Data Select switches (rotary switches) are in the CONS PHY and DATA PATHS positions, respectively. (Refer to Figure 5 for the location of the Address and Data Select switches.) Be sure that the console key switch is **not** in the PANEL LOCK position. Also note that the RCU drawer cover may be temporarily removed to facilitate more working space during the beginning of the TEST procedure.

Test the address bus lights and switch register.

**Important:** Depress the START key. This will clear the computer system.

- (a) Set the local console switch register (SWR) = 1.\* (All keys down except rightmost key is up.)
- (b) Depress LOAD ADDRESS key.
- (c) Verify contents of the address bus display (ADRS). They should be equal to the SWR (e.g., if SWR = 1, then ADRS = 1).
- (d) Repeat for each SWR key (e.g., test SWR2, SWR4, SWR10, etc.) repeating steps (b) and (c) until SWR = 10000000 is reached. (All keys down except leftmost key is up.)
- (e) Repeat steps (b) and (c) for SWR = 0 (all keys down).
- (f) Repeat steps (b) and (c) for SWR = 17777777 (all keys up).\*

\* The switch register (SWR), address bus (ADRS), and data (DATA) are arranged in octal format. The octal numbers given must be translated to binary when evaluating ON/OFF states of the switches and LEDs (e.g., SWR10 signifies that the first group of three switches on the right of the switch register should be OFF,OFF,OFF (left to right); the second group of three should be OFF,OFF,ON (left to right); and so on, the rest of the switches being OFF).

### 5.02 LOCAL TERMINAL TEST

Boot up minicomputer using appropriate operating system.

NOTE - [ ] denotes variable information.

- (a) Set HALT switch.
- (b) Depress START switch.
- (c) Set SWR = [X]. (X is the system boot address, e.g., SWR = 17765000.)
- (d) Depress LOAD ADDRESS switch.
- (e) Set ENABLE switch.
- (f) Depress START switch.
- (g) Enter appropriate code at local terminal (e.g., <0><a><CR>).
- (h) Verify that the RUN light is on.
- (i) Set S INST switch.
- (j) Set HALT switch.
- (k) Verify that the MASTER light is on.
- (l) Set ENABLE switch.
- (m) Depress CONT switch.
- (n) Verify that the RUN light is on.
- (o) Set S BUS CYCLE switch.
- (p) Set HALT switch.
- (q) Verify that the PAUSE light is on.
- (r) Set S INST switch.

**Test remaining console switches and lights.**

- (a) Depress START switch.
- (b) Set SWR = 0.\*
- (c) Depress LOAD ADDRESS switch.
- (d) Verify contents of ADRS = 0.\*
- (e) Set SWR = 1.\*
- (f) Lift DEP switch.
- (g) Verify contents of DATA lights. (They should be equal to SWR.)
- (h) Increase the SWR by shifting the lifted key to the left by one. Repeat for each SWR increment steps (g) and (h) until SWR = 00100000.
- (i) Set SWR = 0.\*
- (j) Depress LOAD ADRS switch.
- (k) Depress EXAM switch
- (l) Verify contents of DATA = 1.

- (m) Depress EXAM switch.
  - (n) Verify contents of DATA. They should be equal to previous DATA lights except the previous LED (bit position) that was lit has been shifted to left.
  - (o) Repeat steps (n) and (o) until DATA = 100000.
- \* The switch register (SWR), address bus (ADRS), and data (DATA) are arranged in octal format. The octal numbers given must be translated to binary when evaluating ON/OFF states of the switches and LEDs.

Test the Address Select switch.

- (a) Set HALT switch.
- (b) Set Address Select switch (rotary switch) to ADRS FPP/CPU.
- (c) Verify contents of DATA = XXXX70 (X - don't care).
- (d) Set the Address Select switch to DATA PATHS.

Power down minicomputer by switching the console key switch to OFF.

### 5.03 RCU TRANSPARENCY TEST

Plug the RCU ac plug into the **unswitched** ac outlet located on the front 861 power control (Figures 1 and 5). Check to make sure the RCU ACTIVE LED is blinking. Make sure the RCU Local/Remote mode control key switch (Figure 3) is in LOCAL. If it is not, place it in that position. (The REMOTE LED should go off.)

Move the RCU ac plug from the unswitched ac outlet to the switched ac outlet located in the back of the 861 power control (Figure 1). The RCU ACTIVE LED should stop blinking.

Power up the minicomputer. Check to make sure the RCU ACTIVE LED is blinking.

Repeat paragraphs 5.01 and 5.02.

### 5.04 RCU CONTROL TEST

Set up communication with the RCU.

- (a) Call up the RCU using an ASCII terminal and a data set (or acoustic coupler). Be sure the speed of this remote terminal is equal to the local set.
- (b) When a connection is established, the RCU types *login.*; then the user (in this case, the installer) must type the password followed by a carriage return (CR) or line feed (LF).
- (c) The RCU will then type to the user on the remote terminal:

*RCU System—ADE release 1.0.2—[\*]  
Remote Console Unit for the PDP 11/70*

*<CONSOLE UNDER LOCAL CONTROL>*

*All Users: type "table"*

*[Command]:*

\* Prompt-ID is printed if option was chosen in paragraph 4.10.

Check to make sure the CARRIER DETECT LED is on.

Turn the RCU Local/Remote mode key switch to REMOTE. The REMOTE LED should light.

#### 5.05 REMOTE TERMINAL TEST

The following entries are to be performed on the remote terminal via the RCU. In response to all of the command entries, the RCU will provide some indication of switch activation. (Refer to BR 007-560-253.)

- (a) Type "switches" followed by a carriage return. The RCU should respond with:

*< CONSOLE UNDER REMOTE CONTROL >*

<i>LOCAL</i>	<i>REMOTE</i>
<i>S INST</i>	<i>S INST</i>
<i>HALT</i>	<i>HALT</i>
<i>CONS PHY</i>	<i>CONS PHY</i>
<i>DATA PATHS</i>	<i>DATA PATHS</i>

*REMOTE SWR = 00000000*

- (b) Type "enable" followed by a carriage return.  
(c) Type "s bus cycle" followed by a carriage return.  
(d) Type "super d" followed by a carriage return.  
(e) Type "display reg" followed by a carriage return.  
(f) Type "switches" followed by a carriage return. The RCU should respond with:

*< CONSOLE UNDER REMOTE CONTROL >*

<i>LOCAL</i>	<i>REMOTE</i>
<i>S INST</i>	<i>S BUS CYCLE</i>
<i>HALT</i>	<i>ENABLE</i>
<i>CONS PHY</i>	<i>SUPER D</i>
<i>DATA PATHS</i>	<i>DISP REG</i>

*REMOTE SWR = 00000000*

- (g) Type "halt" followed by a carriage return. The RCU should respond with:  
*Are you sure? (y or n):*  
(h) Type "y".  
(i) Type "start" followed by a carriage return. The RCU should respond with:

*< INIT >*

- (j) Type "swrY" followed by a carriage return. (Y is the system boot address, e.g., type "SWR17765000".)

PROPRIETARY — BELLCORE AND AUTHORIZED CLIENTS ONLY

See proprietary restrictions on title page.

- (k) Type "load adrs" followed by a carriage return. The RCU should respond with:

*ADRS = Y*  
*DATA = XXXXXX*

*REMOTE SWR = Y*

(X—don't care, Y—system boot address [e.g., 17765000])

- (l) Type "enable" followed by a carriage return.

- (m) Type "start" followed by a carriage return. The RCU should respond with:

*\*START switch depressed <LISTENING*  
*MODE> (use <CR>%<BEL> to exit)*

- (n) The Remote terminal is now the effective Local terminal. The information from the minicomputer should be printed on both the local and remote terminals.

- (o) Enter the appropriate code (e.g., type "0a" followed by a carriage return).

- (p) Verify that the RUN light is on. Type "<CR>%<BEL>" to exit the Listening mode. The RCU should again prompt for a command.

- (q) Type "s inst" followed by a carriage return.

- (r) Type "halt" followed by a carriage return. The RCU should respond with:

*Are you sure? (y or n):*

- (s) Type "y".

- (t) Type "misc lmp" followed by a carriage return. The RCU should respond with:

*MASTER etc.*

- (u) Type "enable" followed by a carriage return.

- (v) Type "cont" followed by a carriage return.

- (w) Verify that the processor is running (e.g., RUN light is ON).

- (x) Type "s bus cycle" followed by a carriage return.

- (y) Type "halt" followed by a carriage return. The RCU should respond with:

*Are you sure? (y or n):*

- (z) Type "y".

- (aa) Type "misc lmp". The RCU should respond with:

*PAUSE etc.*

- (ab) Type "s inst" followed by a carriage return.

## 5.08 LIGHT AND SWITCH TEST

Test RCU control of a switch register.

- (a) Type "start" followed by a carriage return.

- (b) Type "swr0" followed by a carriage return.
- (c) Type "load adrs" followed by a carriage return. The RCU should respond with:

*ADRS = 00000000*  
*DATA = XXXXXX*

*REMOTE SWR = 00000000*

(X—don't care)

- (d) Type "swr1" followed by a carriage return.
- (e) Type "dep" followed by a carriage return. The RCU should respond with:

*ADRS = XXXXXXXX*  
*DATA = y*

*REMOTE SWR = y*

(X—don't care)

- (f) Increment SWR (e.g., type "SWR2" followed by carriage return) according to the information below. Repeat step (e) above, each time verifying the DATA contents.

SWITCH REGISTER	DATA (AFTER "DEP" TYPED)
SWR1	DATA = 000001
SWR2	DATA = 000002
SWR4	DATA = 000004
SWR10	DATA = 000010
SWR20	DATA = 000020
SWR40	DATA = 000040
SWR100	DATA = 000100
SWR200	DATA = 000200
SWR400	DATA = 000400
SWR1000	DATA = 001000
SWR2000	DATA = 002000
SWR4000	DATA = 004000
SWR10000	DATA = 010000
SWR20000	DATA = 020000
SWR40000	DATA = 040000
SWR100000	DATA = 100000
SWR200000	DATA = 200000
SWR400000	DATA = 400000

- (g) Type "swr0".
- (h) Type "load adrs" followed by a carriage return.
- (i) Type "exam" followed by a carriage return. The RCU will respond according to the following:

ACTION	RESULT
Type exam	DATA = 000001
Type exam	DATA = 000002
Type exam	DATA = 000004
Type exam	DATA = 000010
Type exam	DATA = 000020
Type exam	DATA = 000040
Type exam	DATA = 000100
Type exam	DATA = 000200
Type exam	DATA = 000400
Type exam	DATA = 001000
Type exam	DATA = 002000
Type exam	DATA = 004000
Type exam	DATA = 010000
Type exam	DATA = 020000
Type exam	DATA = 040000
Type exam	DATA = 100000
Type exam	DATA = 200000
Type exam	DATA = 400000

Test RCU control of the Address Select switch.

- (a) Type "uadr f/c" followed by a carriage return.
- (b) Type "lights" followed by a carriage return. The RCU should respond with:

*ADRS = XXXXXXXX*  
*DATA = XXXX70*

*REMOTE SWR = 00000000*

(X—don't care)

#### 5.07 DROP CALLER TEST

**Important:** Be sure that the two terminals (part of the FE81NE0015 2-conductor cable) are properly connected to the terminal bushings before proceeding.

Depress the DISCONNECT CARRIER button on the RCU drawer cover.

The remote terminal should now lose carrier signal.

Turn the RCU Local/Remote mode control key switch to the LOCAL position. The REMOTE LED should go dim.

Disconnect the remote terminal from the telephone line. The RCU is ready for application.

#### 6. TROUBLE LOCATING

If no problems are encountered, this section may be disregarded.

Refer to Table K, Troubleshooting Guide, when problems are encountered with the RCU. The guide is useful during RCU testing, after installation, and while the RCU is in field use.

If it becomes necessary to remove or bypass the RCU, then install the RCU MULT PWB\* (FE81NE0024 G-1) as follows:

- (a) Remove RCU drawer cover.
- (b) Eject and/or unplug all cables attached to the RCU CP-1.
- (c) Remove the two screws that hold the Switch and LED bracket (FE81NE0023) in place. Save these screws. Remove and store bracket in a safe place.
- (d) Remove the three adjacent screws to the right of the **top** screw previously removed in (c). Save these screws.
- (e) Remove the one adjacent screw to the right of the **bottom** screw previously removed in (c). Save these screws.
- (f) Screw the six #6-32X1 1/4 standoffs (provided as part of the RCU MULT PWB assembly) into the screw holes made available in steps (c) to (e).
- (g) Attach the RCU MULT PWB to the standoffs using the screws saved in steps (c) to (e).
- (h) Attach all cables removed in step (b) to the RCU MULT PWB. Be sure ejector tabs are securely locked.

\* The RCU MULT PWB assembly may be ordered as follows:

(quantity) FJ81NE0002A List B  
RCU MULT Printed Wiring Board  
Assembly

(material to be supplied by the New  
England Service Center).

**TABLE A. DESIGNATION OF PROCESSOR CABLE(S)**

CONSOLE PWB CABLE LOCATION	MINICOMPUTER PWB-CONNECTOR (DO NOT REMOVE)	NEW DESIGNATION
Upper left corner	8134-J1	J1P
Lower left (below [J1P])	8140-J1	J2P
Lower right (right of [J2P])	8140-J2	J3P

**TABLE B. POWER SUPPLY CONNECTIONS (NOTE)**

POWER SUPPLY TERMINATIONS	DESIGNATION	TRANSIENT SUPPRESSOR CONDUCTOR COLOR	DC POWER CABLE CONDUCTOR COLOR
1	AC	Brown	—
2	AC	Blue	—
3	+12V	—	White
4	GND	—	Black
5	-12V	—	Green
6	+5V	—	Red
7	-5V	—	—
8	—	—	—
9	—	—	—

NOTE - This table is for reference only. All cable terminations are part of FE81NE0014 assembly.

**TABLE C. SW-4—REMOTE TERMINAL, SW-5—LOCAL TERMINAL**

SWITCH POSITION	BAUD RATE
5	110
6	150
7	300
8	600
9	1200
0	1800
1	2400
2	3600
3	4800
4	9600

PROPRIETARY - BELLCORE AND AUTHORIZED CLIENTS ONLY  
See proprietary restrictions on title page.

TABLE D. RECOMMENDED BELL SYSTEM DATA SET TYPES FOR INTERFACE WITH RCU

DATA SET TYPES	103J	113D	202T	212A
Data Rates (BPS) for RCU Operation*	110, 150, 300	110, 150, 300	110, 150, 300, 600, 1200,1800	110, 150, 300, 1200
Channel Types	2-Wire	2-Wire	4-Wire	2-Wire
Line Interface	Switched	Switched	Private	Switched

\* The RCU remote terminal speed must be greater than or equal to the local terminal speed.

TABLE E. CONNECTIONS BETWEEN TTY SECTION OF CABLE AND DL11 PWB

DL11 CPU MODULE (SLOT 40)		TERMINATING PIN ON DL11 CONNECTOR*			
TYPE (INTERFACE)	MODULE NUMBER	TTL IN (BK-W)†	TTL OUT (BK-R)†	EIA RXD (W-BK)†	TTL RXD (R-BK)†
DL11-W(EIA)‡	M7856-00	Pin M or H	Pin E	Pin F	—
DL11-A(RS232)	M7800-00	Pin M	Pin E	—	Pin SS
DL11-B(RS232)	M7800-00	Pin M	Pin E	—	Pin SS
DL11-C(RS232)	M7800-00	Pin M	Pin E	—	Pin SS
DL11-D(RS232)	M7800-00	Pin M	Pin E	—	Pin SS
DL11-E(RS232)	M7800-00	Pin M	Pin E	—	Pin SS
DL11-A(RS232)	M7800-YA	Pin M	Pin E	—	Pin SS
DL11-C(RS232)	M7800-YA	Pin M	Pin E	—	Pin SS
DL11-A(20mA)	M7800-00	Pin H	Pin E	—	Pin SS
DL11-B(20mA)	M7800-00	Pin H	Pin E	—	Pin SS
DL11-C(20mA)	M7800-00	Pin H	Pin E	—	Pin SS
DL11-D(20mA)	M7800-00	Pin H	Pin E	—	Pin SS
DL11-E(20mA)	M7800-00	Pin H	Pin E	—	Pin SS
DL11-A(20mA)	M7800-YA	Pin H	Pin E	—	Pin SS
DL11-C(20mA)	M7800-YA	Pin H	Pin E	—	Pin SS

\* Refer to Figure 6 for DL11 connector pin orientation.

† All wires are paired. (For example, W-BK denotes the white wire of the white and black wire pair). Wire color is designated by (color of wire)-(color of paired wire).

‡ Transmit lead for the DL11-W(M7856-00) must be inverted.

TABLE F. M7800 BAUD RATE CONFIGURATION

SWITCH POSITION	CLOCK FREQUENCY (STAMPED ON CRYSTAL)			
	844.8 KHz	1.03296 MHz	1.152 MHz	4.608 MHz
1	36.7 BPS	44.8	50	200
2	55	67.3	75	300
3	110	134.5	150	600
4	220	269	300	1200
5	440	538	600	2400
6	880	1076	1200	4800
7	1320	1614	1800	7200
8	1760	2152	2400	9600
9	—	—	—	—
10	—	—	—	—

TABLE G. M7856 BAUD RATE CONFIGURATION

BAUD RATE	RECEIVER			TRANSMITTER		
	S3-2	S3-3	S3-5	S4-10	S3-1	S3-4
110	OFF	OFF	OFF	ON	ON	ON
150	ON	OFF	OFF	OFF	ON	ON
300	OFF	ON	ON	ON	OFF	OFF
600	OFF	ON	OFF	ON	OFF	ON
1200	OFF	OFF	ON	ON	ON	OFF
2400	ON	ON	ON	OFF	OFF	OFF
4800	ON	ON	OFF	OFF	OFF	ON
9600	ON	OFF	ON	OFF	ON	OFF

PROPRIETARY — BELLCORE AND AUTHORIZED CLIENTS ONLY  
See proprietary restrictions on title page.

TABLE H. DC LOW BACKPLANE PIN ASSIGNMENTS

DC LOW CONDUCTOR COLOR	DESIGNATION	BACKPLANE PLUG-PIN (FIGURE 8)
X	Main DC LOW	P3-8 or P7-4
Y	Bus DC LOW	P6-1 or P4-3

TABLE I. CABLE CONNECTION BETWEEN RCU CP-1 AND CONSOLE PWB

CONSOLE PWB* CABLE HEADER LOCATION	DESIGNATION
Upper left corner	J1
Lower left (below {J1})	J2
Lower right (right of {J2})	J3

\* Refer to Figure 4.

**TABLE J. RCU COMMUNICATION PORT SIGNALS (Sheet 1 of 2)**

<b>TO DATA SET (SW-2)</b>		
<b>SW-POSITION</b>	<b>NORMALLY CONNECTED (DOWN TOWARDS RIGHT)</b>	<b>NORMALLY OPEN (DOWN TOWARDS LEFT)</b>
C1	Noninverted*	Inverted
C2	Connects CD from data set	Straps DSR to DTR
C3	Connects CTS from data set	Straps CTS to RTS
C4	(not used)	(not used)
<b>TO MINICOMPUTER TERMINAL (DL11 PWB) (SW-3)</b>		
<b>SW-POSITION</b>	<b>NORMALLY CONNECTED (DOWN TOWARDS RIGHT)</b>	<b>NORMALLY OPEN (DOWN TOWARDS LEFT)</b>
C1	TTL input	EIA input
C2	Straps DSR to DTR	Connects DSR from terminal
C3	Straps CTS to RTS	Passes CTS from terminal
C4	(not used)	(not used)

\* Used in DL11W(M7856) printed wiring board only.

TABLE J. RCU COMMUNICATION PORT SIGNALS (Sheet 2 of 2)

Example 1: M7856-type printed wiring boards

SWITCH POSITION	ACTUATION
SW-2 C1	Normally connected (down towards right)
SW-2 C2	Normally connected (down towards right)
SW-2 C3	Normally connected (down towards right)
SW-2 C4	Not used
SW-3 C1	Normally open (down towards left)
SW-3 C2	Normally connected (down towards right)
SW-3 C3	Normally connected (down towards right)
SW-3 C4	Not used

Example 2: M7800-type printed wiring boards

SWITCH POSITION	ACTUATION
SW-2 C1	Normally open (down towards left)
SW-2 C2	Normally connected (down towards right)
SW-2 C3	Normally connected (down towards right)
SW-2 C4	Not used
SW-3 C1	Normally connected (down towards right)
SW-3 C2	Normally connected (down towards right)
SW-3 C3	Normally connected (down towards right)
SW-3 C4	Not used

TABLE K. TROUBLESHOOTING GUIDE (Sheet 1 of 4)

SYMPTON (PROBLEM)	PROBABLE CAUSE	REMEDY	PARAGRAPH REFERENCE
Console Switch Keys Stuck	Console bezel unaligned	Loosen four Phillips head mounting screws and realign. Retighten four screws.	4.02
Incorrect Display	Console key switch in PANEL LOCK position	Turn console key switch to POWER position.	5.01
	Loose cables	Make sure all ejector tabs on the RCU board are locked and that all cables are seated properly. Check processor end of 40-pin cables (e.g., cables that connect to J1P, J2P, and J3P headers on RCU CP-1) to make sure that they were not loosened during installation. Also make sure cables attached to console PWB are securely connected.	4.02
	Improperly positioned cables	Make sure that the drain wire is to left on all cables. Also make sure the <b>smooth</b> side of the three 40-pin cables leading to the processor faces <b>away</b> from the RCU CP-1 and the three 40-pin cables leading back to the console PWB must have their <b>smooth</b> side facing away from the RCU CP-1.	4.02 4.07
	No power on console PWB	Make sure power connector on console PWB is securely connected. Make sure all breakers are in the ON position unless otherwise mandated.	4.08

TABLE K. TROUBLESHOOTING GUIDE (Sheet 2 of 4)

SYMPTON (PROBLEM)	PROBABLE CAUSE	REMEDY	PARAGRAPH REFERENCE
Inoperative LED on RCU	No power to RCU CP-1	Make sure RCU ac cord is plugged in and that circuit is live. Make sure all connections to and from the RCU power supply are secure and correct.	4.03
	Loose or misaligned cable to J6 header	Secure connection of 10-pin cable into J6 header. Make sure the pin 1 indicator (triangle) on connector corresponds to the CP-1 designation (Figure 3).	
	Bulb burnt out	Replace bulb.* (#507-4757-3731-500)	
Inoperative Local Terminal	Loose or improperly placed connector pins	Make sure all connections to the DL11 connector are secure and correct.	3.24
	No power on terminal	Turn ON/OFF switch to ON position. Make sure that fuses and breakers are live and in the ON position.	
	Incorrect speed	Make sure that the speed of the local terminal corresponds to that set on the DL11 PWB and that its speed is less than or equal to the remote terminal.	4.06(i)
	Loose DL11 PWB	Make sure that the DL11 PWB is securely locked into its correct slot.	4.06(b)
Cannot Log Onto RCU	Incorrect password used	Make sure that the password is valid and properly entered, e.g., "example" followed by a carriage return.	4.10

\* All replacement parts may be ordered from the manufacturing location, the New England Service Center, Watertown, Massachusetts. Please provide part numbers and quantities when ordering.

TABLE K. TROUBLESHOOTING GUIDE (Sheet 3 of 4)

SYMPTON (PROBLEM)	PROBABLE CAUSE	REMEDY	PARAGRAPH REFERENCE
No login: Prompt or Carrier Present	IC39 incorrectly placed or missing	Make sure IC39 (Figure 3) is properly aligned.	4.10
	No power to remote terminal	Turn ON/OFF switch to ON position on remote terminal. Make sure all associated breakers and/or fuses are live.	
	Incorrect speed	Make sure that the speed of the remote terminal corresponds to that as set on the RCU board (e.g., SW-4). Also make sure that SW-4 is equal to or greater than SW-5.	4.09
	No power to data set associated with the RCU	Turn on power to data set and make sure all connections to the RCU are secure.	4.04
Cannot Issue RCU Switch Control Commands	Improper options selected during installation on the RCU modem switches	Correct any speed and/or signal requirements needed for the data set.	4.09
	Local/Remote mode control key switch in the LOCAL position.	Switch the Local/Remote mode control key switch to the REMOTE position.	
	Loose or misaligned cable to J6 header	Secure connection of 10-pin cable into J6 header. Make sure the pin 1 indicator (triangle) on connector corresponds to the CP-1 designation (Figure A).	

TABLE K. TROUBLESHOOTING GUIDE (Sheet 4 of 4)

SYMPTON (PROBLEM)	PROBABLE CAUSE	REMEDY	PARAGRAPH REFERENCE
Remote Terminal Receives or Transmits Improperly in Listening Mode	Receive and transmit signals improperly terminated	Make sure the RXD and TXD leads are securely connected and not shorted to adjacent terminals. Make sure that if the DL11 PWB type is the M7856 that the modem option switch (SW-3 C1) is in the nor- mally open position. Make sure that the remote terminal speed is greater than or equal to the local terminal speed. Make sure that the local terminal and its speed are properly set up.	4.06 4.09 4.09(a)
DISCONNECT CARRIER Button Inoperative	Loose or missing 2-conductor cable	Make sure both leads of the pushbutton switch are securely attached to the terminal bush- ing.	4.11
	Loose or misaligned cable to J6 header	Secure connection of 10-pin cable into J6 header. Make sure the pin 1 indicator (tri- angle) on connector corresponds to the CP-1 designation (Figure 3).	
	Missing DTR signal from RCU to the data set	Make sure that the data set has a DSR input signal that is operating. Also make sure that the cable connecting the RCU [TTY/DC LOW/EIA] cable and the data set passes pin 20. Make sure that this connecting cable connects to the connect- ing designated "CONN 1" of the [TTY/DC LOW/EIA] cable. Make sure that the connector into the J4 header on the CP-1 is secure.	4.04 4.05



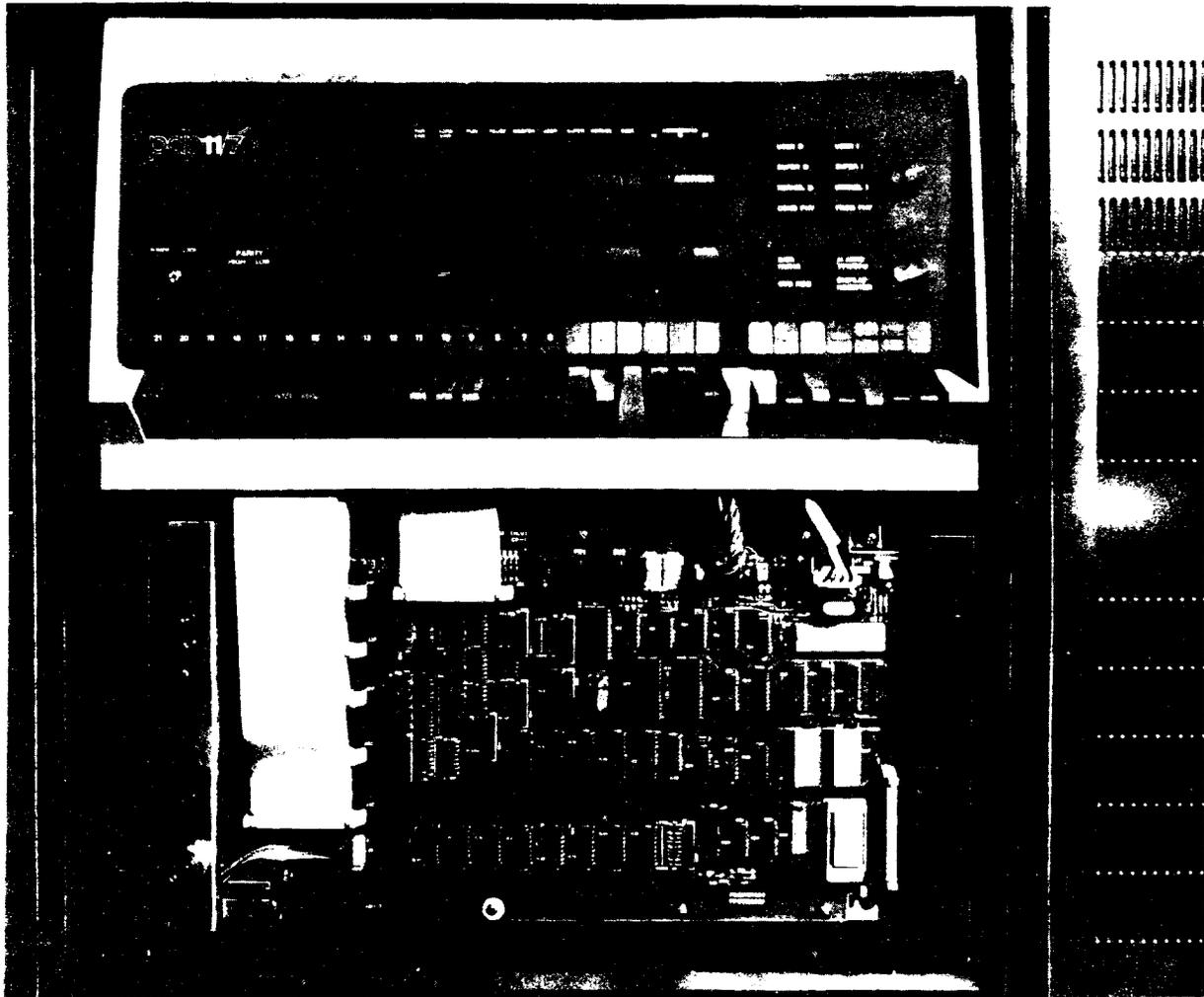


Figure 2. RCU Completely Installed Without Front Panel

PROPRIETARY — BELLCORE AND AUTHORIZED CLIENTS ONLY  
See proprietary restrictions on title page

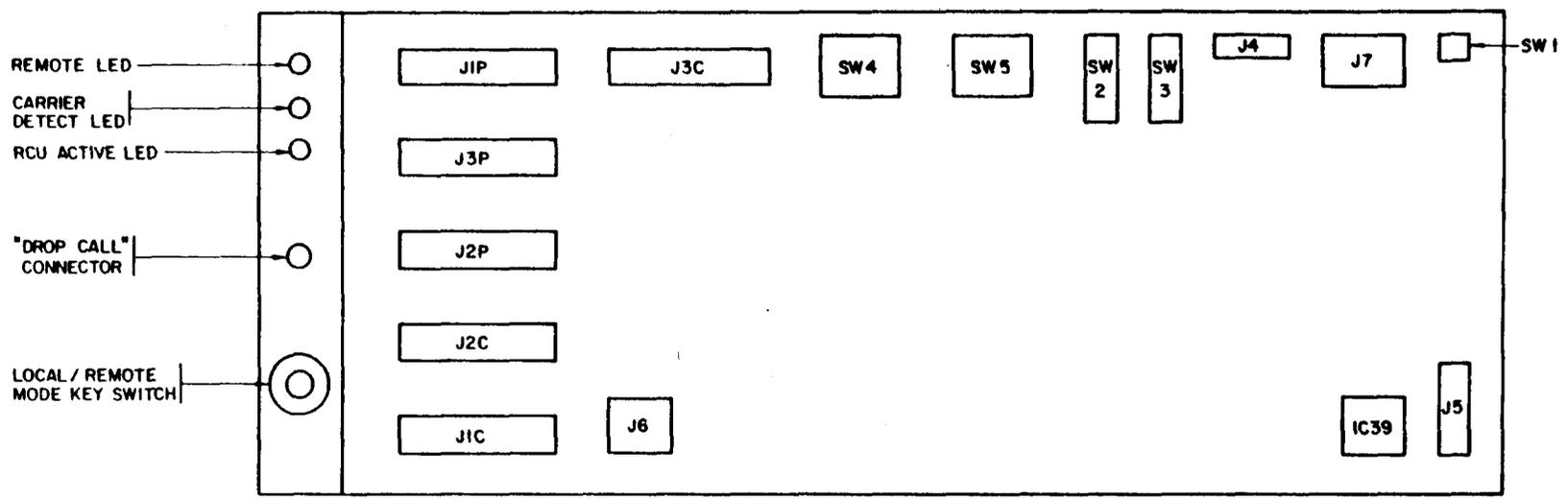


Figure 3. RCU CP-1 Layout

PROPRIETARY - BELLCORE AND AUTHORIZED CLIENTS ONLY  
See proprietary restrictions on title page.

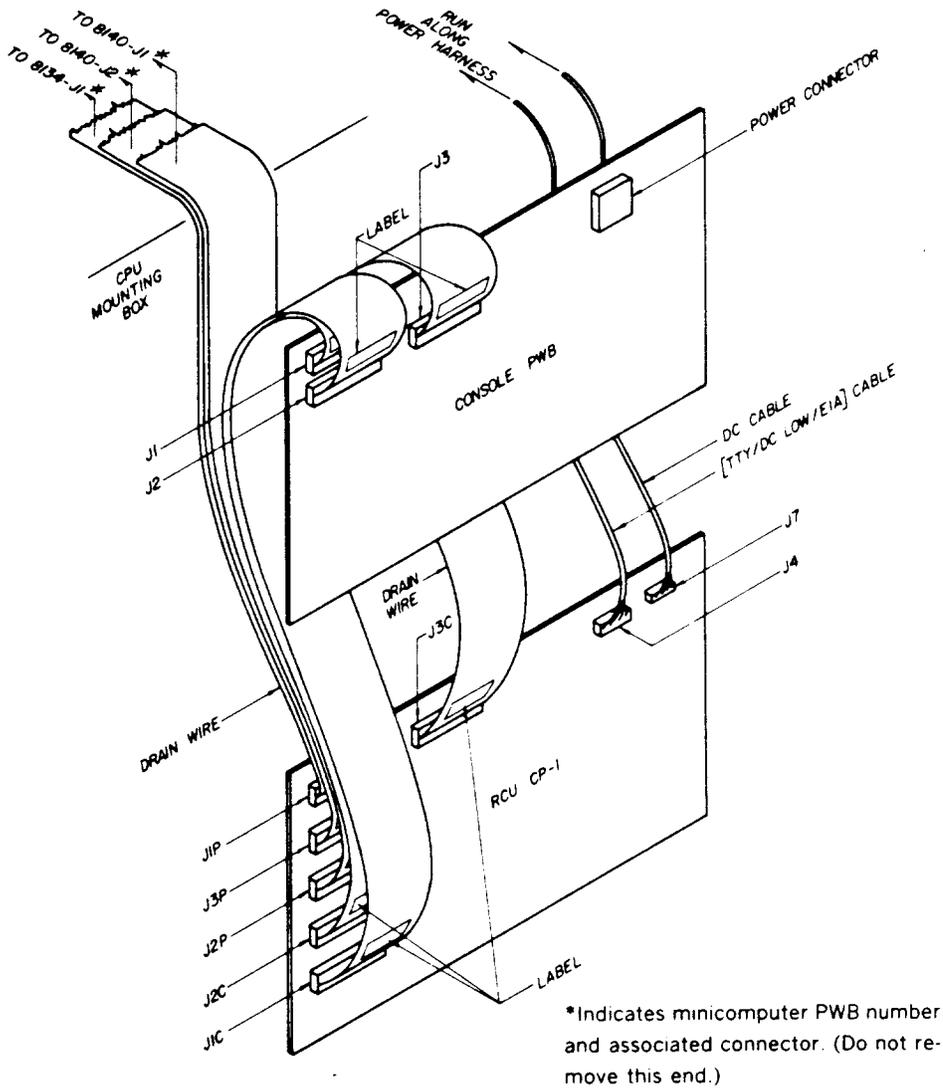


Figure 4. RCU CP-1 Cabling Arrangement

PROPRIETARY – BELLCORE AND AUTHORIZED CLIENTS ONLY  
 See proprietary restrictions on title page.

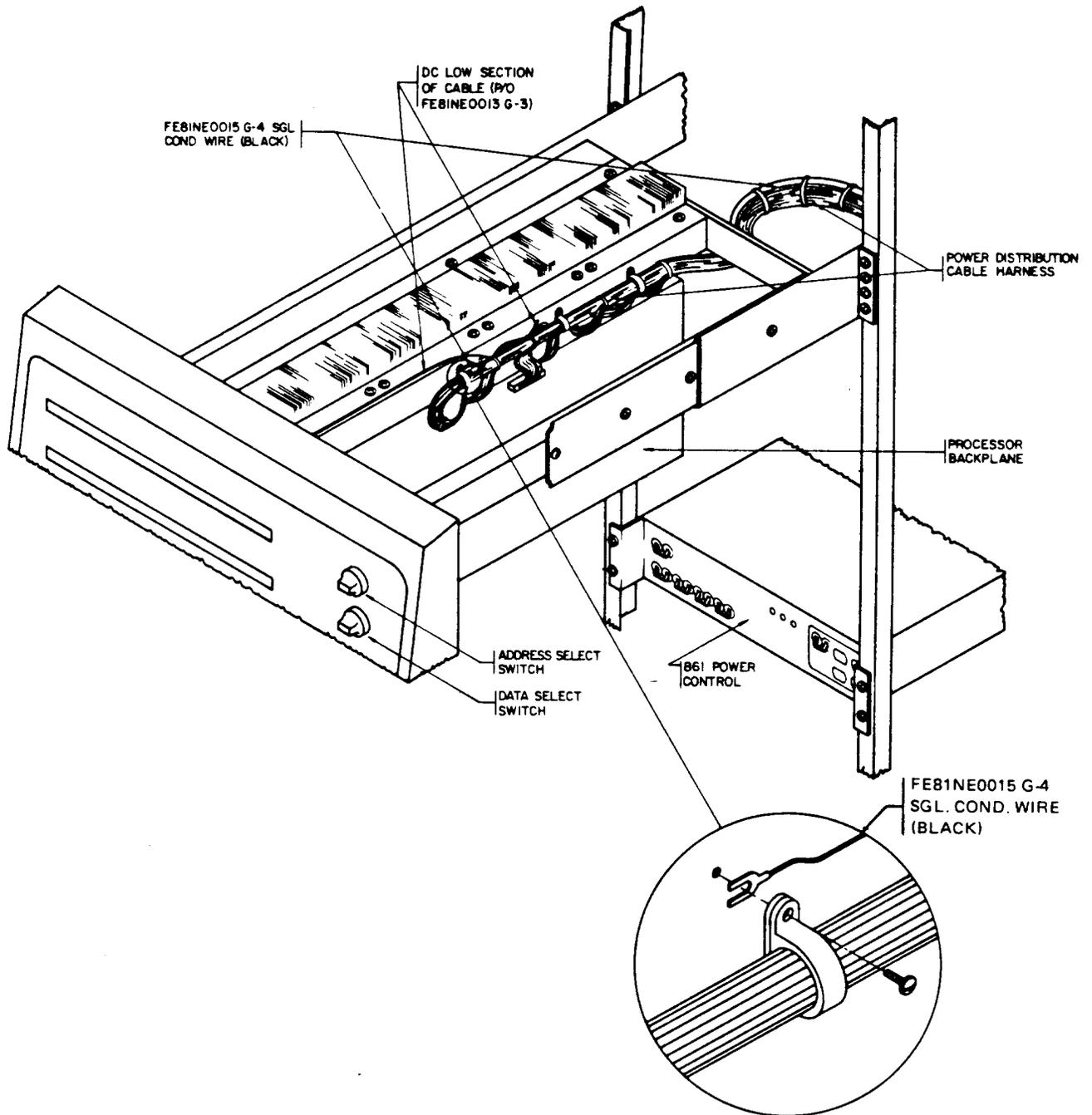


Figure 5. Processor Mounting Box

PROPRIETARY – BELLCORE AND AUTHORIZED CLIENTS ONLY  
See proprietary restrictions on title page.

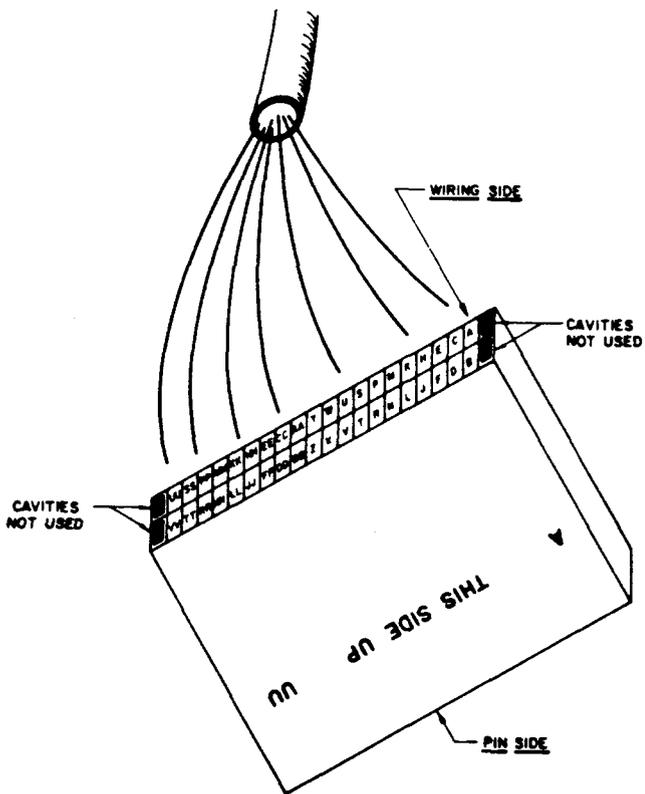
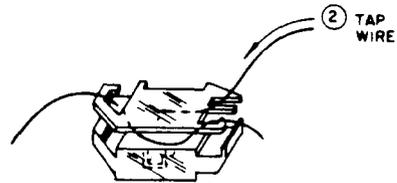


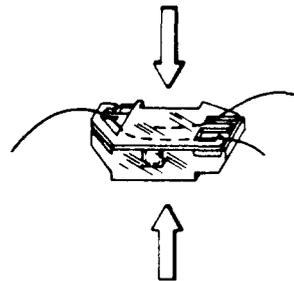
Figure 6. DL11 Connector



1. PUT THRU-WIRE IN SLOT AND IN CONNECTOR GRIPS.



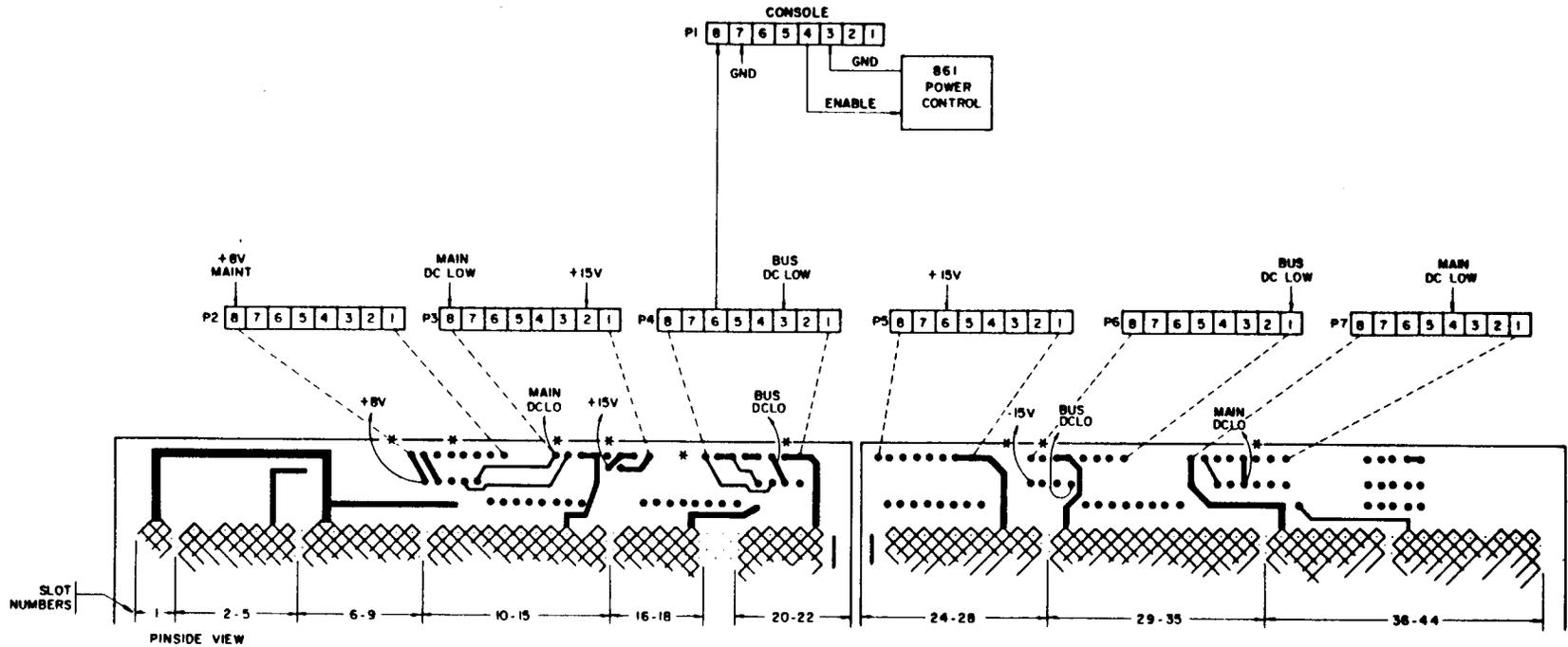
2. INSERT TAP WIRE FULLY INTO BLIND HOLE.



3. WITH CONDUCTORS IN PLACE, CENTER CONNECTOR IN PLIERS AND PRESS USE ADEQUATE PRESSURE TO ASSURE A PROPER CONNECTION.

Figure 7. Application of 702-AR Connectors

PROPRIETARY – BELLCORE AND AUTHORIZED CLIENTS ONLY  
 See proprietary restrictions on title page.



- NOTES
1. \* DENOTES ELECTRICAL CONNECTION.
  2. P25 THROUGH P28 ARE GROUND CONNECTIONS.
  3. SHADED ETCH CONNECTIONS ARE ON CONNECTOR SIDE.

Figure 8. Processor Backplane DC Low Termination



Figure 9. RCU Completely Installed With Front Panel

PROPRIETARY – BELLCORE AND AUTHORIZED CLIENTS ONLY  
See proprietary restrictions on title page.