DIGITAL CENTRAL OFFICE — PACKET NETWORK INTERFACE

(DCO-PNI)

INSTALLATION AND ACCEPTANCE

*Trademark of MEMOTEC DATA COM, INC.

1. INTRODUCTION

1.01 This section provides the procedures for installing equipment and the initial acceptance tests for the DCO-PNI (Digital Central Office - Packet Network Interface). The DCO-PNI consists of a single

cabinet of equipment which contains the following:

- Power supply
- Circuit cards
- Card cage
- Data connector panel
- Buffer
- Data shelf mounting
- Cooling fans.

1.02 This section is being reissued to include information concerning GMAP (Granger Maintenance, Alarm and Programming) Processor, No. 2 SCCS (No. 2 Switching Control Center System) and MEMOTEC equipment.

1.03 For the central offices with the DOM (Digital Office Manager) arrangement, refer to the DOM Installation Guide for installation and acceptance procedures. The DOM Development Group in Piscataway, New Jersey, produces the installation guide.

1.04 The PAD (Packet Assembly/Disassembly) and DOM boards connect the DCO-PNI to PINET (Packet Internal Network) through the 3B2/400 and MICOM PAD*.

Warning: This equipment generates, uses, and radiates radio frequency energy. If not installed and used in accordance with the instructions manual, this equipment may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference.

*Trademark of MICOM Corp.

2. INSTALLATION REQUIREMENTS

2.01 The following paragraphs describe several items which must be considered when installing the DCO-PNI.

A. Location Requirements

2.02 The DCO-PNI should be located where power and data cables are easily accessible.

Space should be provided for a Memotec switch if the DCO-PNI will be using it. Provisions should be made so that the No. 2 SCCS may be cabled to the MEMOTEC switch.

Caution: The DCO-PNI should not be located near strong electrical, magnetic, or radio fields.

B. Data Cabling Requirements

2.03 All connections to the DCO-PNI use the RS-232C standard connector and termination. Connections to the DACS (Digital Access Cross-Connect System) frame links require RS-449 to RS-232C adapters, ED-2C646-30 Group 1 ST96638-1 for each frame. These adapters are not supplied with the DCO-PNI. The following cables are used for the lengths stated:

- For 1 to 100 feet — use M25B or equivalent cables.
- For 100 to 250 feet — use ED1P123-30 GR6 (male-male) cables.
- Over 250 feet — use a data line extender or modems.

Note: It is recommended that the DCO-PNI be placed as close as possible to the digital equipment to keep cable length to a minimum.

A MEMOTEC switch may be optionally used to connect one or as many as seven DCO-PNIs. In such a case, the MEMOTEC switch is PINET's interface.

Connections to the DACS frames require the following adapters:

- Group 1 adapter when used with modems.
- Group 2 adapter when used with direct cables, type ED1P123-30-GR6.

Connections to GMAP Processor don't need adapters.

C. Power Requirements

2.04 The DCO-PNI equipment requires essential 115-V ac central office supply with engine backup. Connect the power as shown in Fig. 1.

> *Note:* Additional power outlets are required for associated terminals, printers, and modems.

D. I/O (Input/Output) Equipment Requirements

Terminals

2.05 A terminal is used to access all NTE (Network Terminal Equipment) attached to the DCO-PNI. The following are the minimum terminal requirements:

(a) The terminal should be capable of displaying 1920 characters organized as 24 lines of 80 characters each.

(b) The terminal should have a typewriter style keyboard capable of generating all 128 standard ASCII characters. Although the DCO-PNI application uses a limited subset of the ASCII character set, future applications may require the full 128 characters.
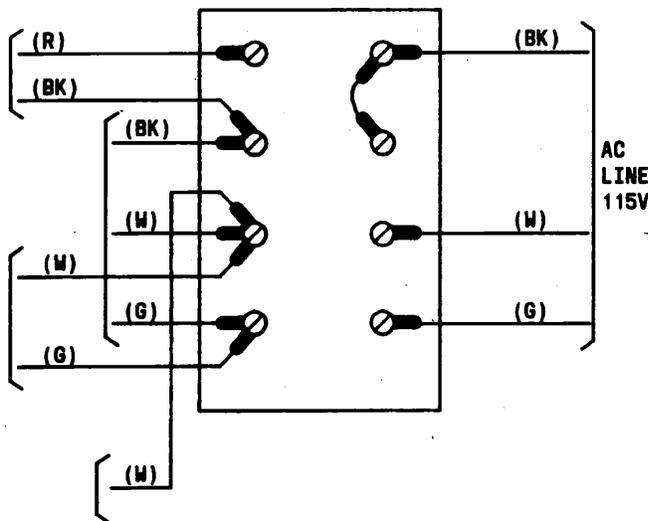

Fig. 1—Line Voltage Connections

(c) The terminal must provide an asynchronous conversational mode, full-duplex operation (character - not block transmission).

(d) An automatic new line should not be generated on the receipt of a carriage return.

(e) Communications is via the standard 7-bit ASCII code parity bit set to space (0), 1-stop bit.

(f) Communication connection should be via a female DB25 connector utilizing a standard EIA RS-232C serial interface. Terminal equipment with a male DB25 connector may be utilized with appropriate adapters or proper cabling provisions.

(g) Baud rates may be optional but must include 1200 baud.

(h) Equipment must be configured as DTE (Data Terminal Equipment) using the following RS-232C pinout convention:

PIN	Direction	Designation	Function
1	N/A	AA	Protective Ground
2	From Term	BA	Transmitted Data
3	To Term	BB	Received Data
7	N/A	AB	Signal Ground

(i) Operating temperatures: 10°C to 40°C (50°F to 104°F), ambient.

(j) Power: 115 V ac, 60 Hz.

(k) Must interact with the system one character at a time.

(l) Terminal must be set to send capital letters only.

Printers

2.06 The printers are used to provide a hard-copy record of the events taking place in the DCO-PNI. However, they don't provide a hard copy

of everything. There are two printers attached to the DCO-PNI—an Autonomous Messages (DACS and Granger alarms) Printer and an All Messages Printer. The All Messages Printer records all of the output activity of the DACS Processors or Granger frames attached to the DCO-PNI. The Autonomous Messages Printer records all error and alarm messages. The printer requirements are as follows:

General Printer Requirements

(a) The printer must print 80 characters per line.

(b) The printer must receive asynchronous data in a full-duplex mode.

(c) An automatic new line should not be generated on receipt of a new line.

(d) Communications is via a standard 7-bit ASCII code, parity set to space (0), 1-stop bit.

(e) Communications is via a DB25 connector utilizing standard EIA RS-232C serial interface.

(f) Baud rates may be optional but must include 1200 baud.

(g) Equipment must be configured as DTE using the following RS-232C pinout convention:

PIN	Direction	Designation	Function
1	N/A	AA	Protective Ground
2	From Prtr	BA	Transmitted Data
3	To Prtr	BB	Received Data
7	N/A	AB	Signal Ground

(h) Operating temperatures: 10°C to 40°C (50°F to 104°F), ambient.

(i) Power: 115 V ac, 60 Hz.

(j) The printer must be capable of controlling data flow utilizing hardware and/or software techniques described as follows:

Hardware handshaking - The printer should be capable of being optioned to present one of four different lines as a Busy/Ready signal. These lines should be pin 5, pin 11, pin 19, or pin 20.

Software handshaking:

Character sent by printer	Reason
XON (hex 11)	-Initial power up
-	-Printer reset after a paper out or cover-raised condition
-	-When additional buffer space becomes available after a printer-full condition
-	-Printer placed on-line
XOF (hex 13)	-Paper out or cover raised
-	-Printer incapable of receiving additional data
-	-Printer placed off-line

(k) All Messages Printer must be capable of printing alphanumeric and punctuation characters at a continuous 1200-baud rate. This should not be confused with a buffer input rate which is not a measure of throughput. It must print at least 120 characters per second.

(l) Autonomous Messages Printer may have a lower throughput rate, but must be capable of handling the maximum load of the DACS and Granger frames on the DCO-PNI.

All Message Printer Buffer

2.07 This buffer (required) interfaces the 9600-baud serial output from the DCO-PNI to a 1200-baud printer. The buffer is ordered with a 64 Kilobyte capacity and designed for serial operation. The buffer is a Practical Peripherals Inc. MICROBUFFER. The

following settings must be made on this buffer (see Fig. 2).

SW1 Settings

INPUT BAUD RATE	H3 JUMPER POSITION	POSITION	OPEN/OFF CLOSED/ON
9600	8	1	closed
OUTPUT BAUD	H4 JUMPER	2	open
RATE JUMPER	POSITION	3	closed
1200	5	4	closed
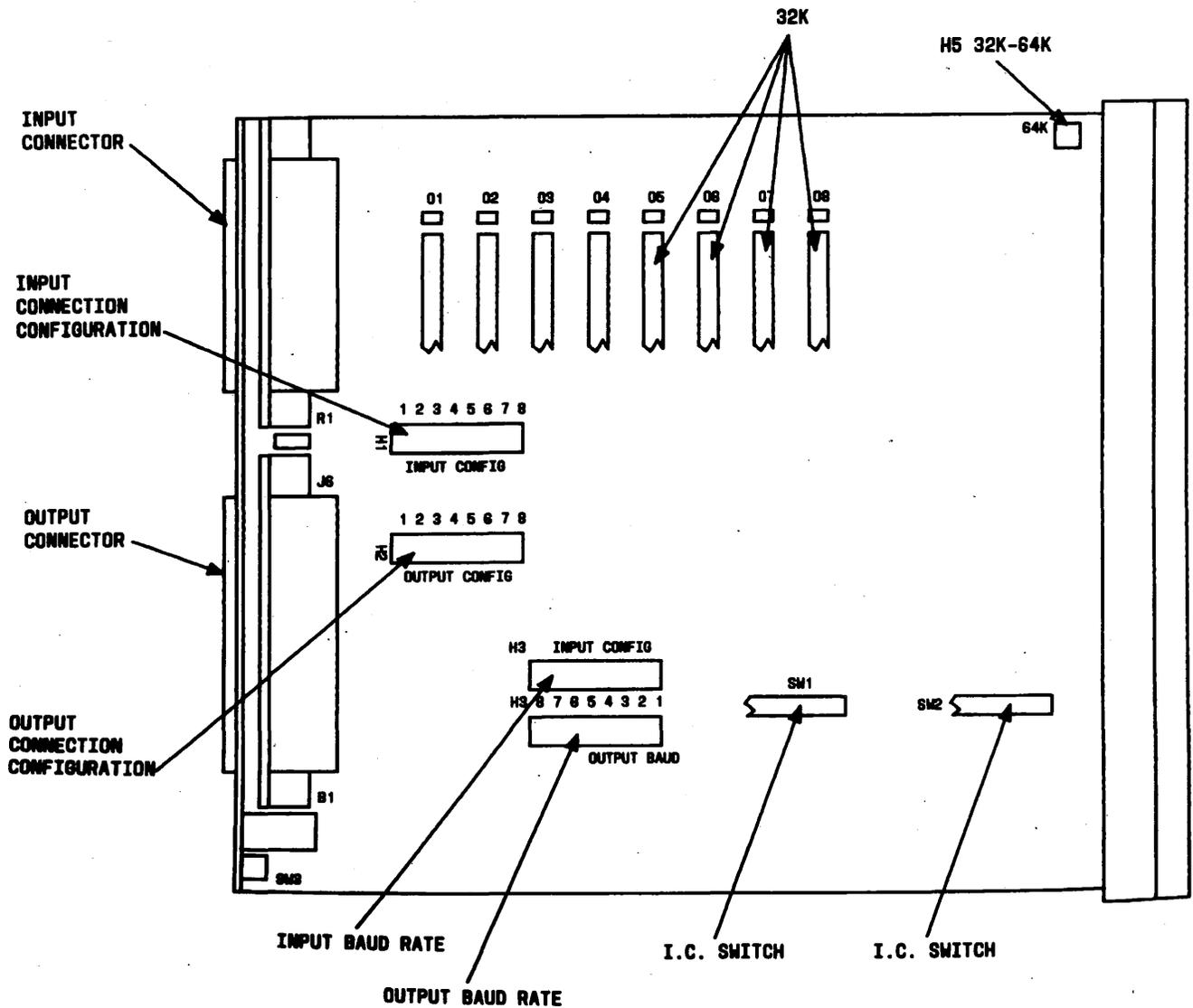
Fig. 2—All Messages Buffer Settings

POSITION	CLOSED/ON
5	closed
6	closed

SW2 Settings

POSITION	OPEN/OFF CLOSED/ON
1	closed
2	closed
3	not used
4	not used
5	closed
6	closed

Option Setting Procedure

2.08 Perform the following steps:

1. Remove power.

2. Remove four screws from the cover of the unit.

3. Carefully slide the cover off the back of the unit.

4. Set switches and jumpers as described.

5. Reassemble by sliding cover back on and securing screws.

No. 2 SCCS

2.09 Presently the DCO-PNI communicates with the No. 2 SCCS by sending it all DACS frame and GMAP processor output messages through an interface attached to the All Messages Printer port on the DCO-PNI. This interface is provided by half-tapping a cable between the All Messages Printer and the DCO-PNI. The No. 2 SCCS can also perform demand requests to all DACS frames and GMAP processor through the DCO-PNI's terminal board. Refer to the DOM Installation Guide for detailed installation and acceptance procedures.

Memotec

2.10 MEMOTEC is a mini-node X.25 protocol packet switch that can optionally be used to connect PINET to one or up to seven DCO-PNIs.

3. INSTALLATION PROCEDURE

3.01 Use the following steps to install the DCO-PNI cabinet:

1. Inspect the DCO-PNI equipment for obvious physical damage.

2. Check the rear of the cabinet backplane for bent or shorted pins.

3. Place the cabinet in the desired location. Open rear and front doors. Mount the cabinet as described in ED3B062-10.

4. See NT08576-31 requirements for 115 V ac, data, ground connections, and cable routing.

   Caution: Data cables must be long enough to reach any connector on the EIA connector panel. Cables are to be marked with the identity of the equipment to which they are connected, i.e., DACS 01, X.25 TRUNK, etc.

   DANGER: Do not turn on to the ac supply circuit at this time.

5. Verify that the power cable is connected to the DCO-PNI 115-V ac connector block. (See NT08576-31 and Fig. 1.)

6. Connect data cables to DACS frames.

   Note 1: Verify that the proper DACS adapter is installed; Group 1 for use with a modem and Group 2 for use without a modem.

   Note 2: Verify that the correct daughter board is in place on the DCO-PNI DACS board(s). See NJ08576-01 drawings.

7. Connect data cables to GMAP processors.

   • Up to four ports may be used for Master M4-GMAPs.

   • Up to two ports may be used for Master M2/M3-GMAPs.

Note: Verify that the correct daughter board is in place on the DCO-PNI's GMAP board. See NJ08576-01 drawings.

8. Connect data cables to the DCO-PNI EIA connector panel. (See Fig. 3.)

Note 1: DACS cables may be connected to any properly optioned port on the DACS board.

Note 2: GMAP cables may be connected to any properly optioned port on the GMAP board.

Warning: Use the antistatic wrist strap whenever inserting or removing circuit-boards.

9. Check each DCO-PNI circuit board to verify that it is optioned correctly. See NJ08576-01 drawings.

Note: Verify that the correct daughter board and group connector type are used on the DACS connections.

Return incorrectly optioned boards to vendor.

10. Slide each DCO-PNI circuit card into place (see Fig. 4). Do not seat the cards at this time. Leave 1-1/2 inches of circuit card extending from the card cage at this time.

Note 1: Verify that the proper DACS adapter is installed; Group 1 for use with a modem, and Group 2 for use without a modem.

Note 2: Verify that the correct daughter board is in place on the DCO-PNI DACS board(s) and the DCO-PNI GMAP board.

11. For the DOM interface, read the DOM Installation Guide before connecting the MICOM PAD
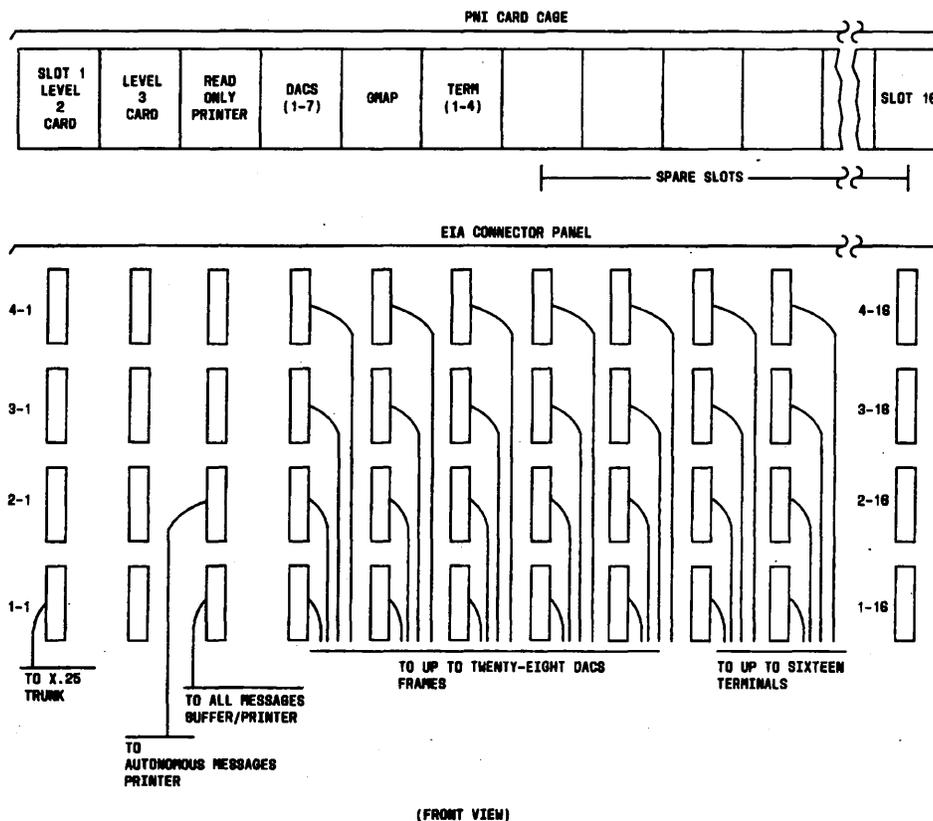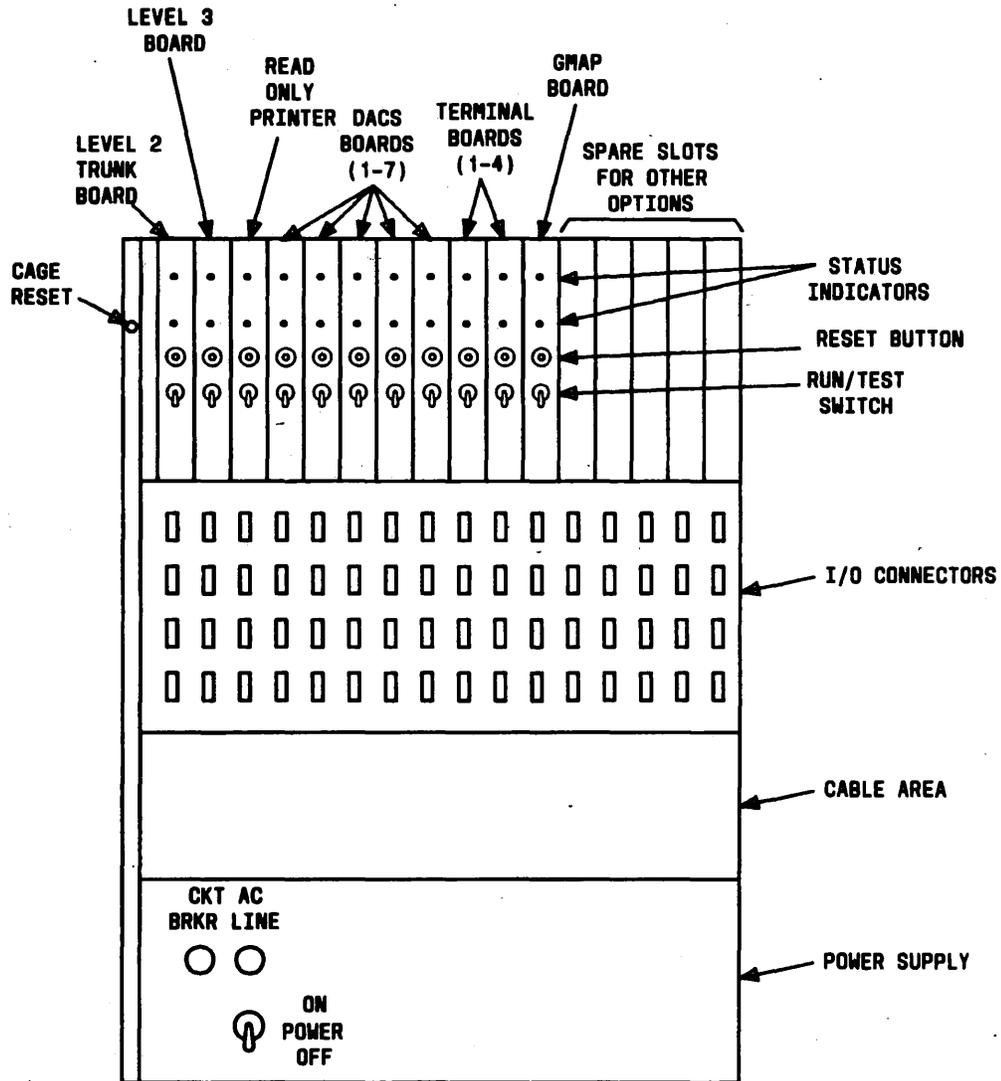

Fig. 3—EIA Connections

Fig. 4—DCO-PNI Front View

to the PAD board and DOM to the DOM board. Fig. 5 shows the DOM installation schematic.

Installation Inspection

3.02 At this point, the DCO-PNI has power and data cable connections completed. Perform the following inspection steps before proceeding to power and acceptance tests:

1. Inspect the DCO-PNI cabinet for tools, bits of wire, or other foreign objects.

2. Verify that all power and data cable connections are correct, and the connections are tight (see Fig. 3) for placement of data cables.

3. Verify that terminals and printers are optioned to meet all requirements outlined in paragraphs 2.05 and 2.06.

4. Verify that the All Messages Printer buffer is optioned correctly. See All Message Printer buffer in Part 2.

5. If not already connected, connect cables to data terminals, printers, and DACS frames and GMAP processors.
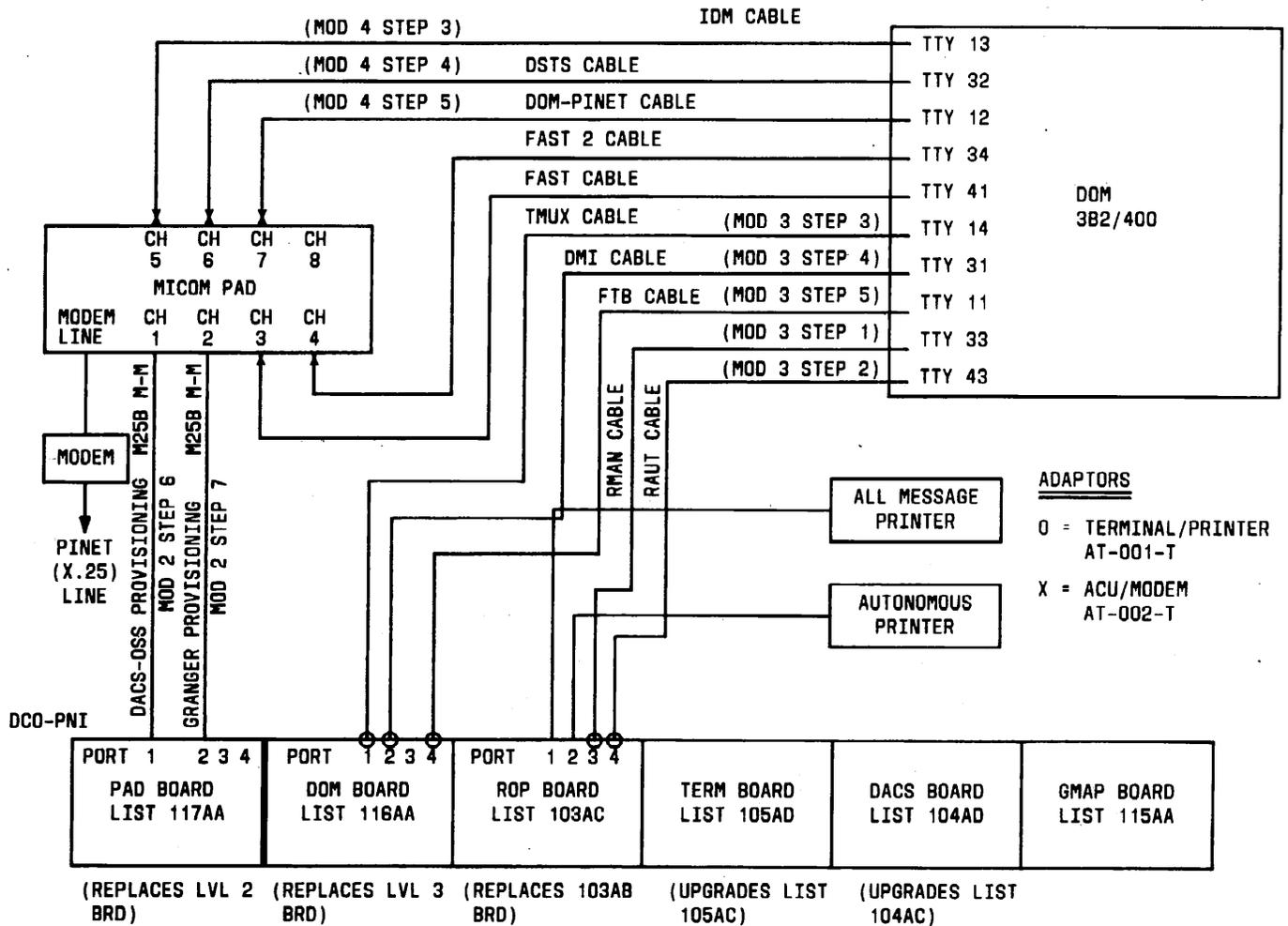
Fig. 5—DOM Installation Schematic

At this time, the physical installation is complete. Proceed to the initial power-up procedure (Part 4).

4. INITIAL POWER-UP PROCEDURE

4.01 This part describes the procedure for initial power-up application to the DCO-PNI. This procedure ensures that the power supply is functioning, and the wiring is correctly connected.

A. Power-Up Tests

4.02 A DVM (Digital Voltmeter) is required in this procedure.

Procedure

DANGER: During the following procedure, the equipment will be powered while access panels are removed. Do not come in contact with the 115-V ac power input terminals.

1. Verify that the power switch on the left front of the DCO-PNI is in the off position. (See Fig. 4.)

2. Apply power to the 115-V ac circuit supplying the DCO-PNI.

3. Before boards are fully seated, measure voltages at the card cage backplane. The voltages are

labeled on the backplane. The voltages are as follows:

Red lead	5 V dc
Black lead	Ground
Dark red lead	12 V dc
Yellow lead	-12 V dc

Caution: Verify that circuit boards are placed into the slot guides before being inserted (board should be vertical, not slanted).

If the voltages are not present on the backplane, check the ac line indicator on the front panel. Turn the power switch off and then back on. This resets the circuit breaker. If the circuit breaker indicator is on but the voltages are not present at the backplane, then replace the power supply.

DANGER: Do not remove the power supply protective cover while power is applied to the cabinet.

.4. Turn off power and insert one circuit board. Apply power and check voltages as in Step 3.

Note: The card extractor lever at the bottom of each circuit board must be placed in the fully up position to apply power to the board.

5. Turn off power and insert two more circuit boards. Apply power and check voltages as in Step 3.

6. Turn power off and insert the remaining circuit boards and check voltages as in Step 3. If the voltages are incorrect, see trouble procedures in Section 365-680-365AC.

7. Unplug all circuit boards, and leave them extending from the card cage 1 to 1-1/2 inches. See Section 365-680-304AC for circuit board test procedures. ·

B. Power Supply Removal

1. See NJ08576-30 for power supply removal procedures.

Warning: Label wires before removing them from the power supply terminals.

2. Power supplies have a warranty. Send defective units back to the originator.

5. ACCEPTANCE TESTS

5.01 At this time, all connections to the DCO-PNI should have been made and the power supply test completed. The acceptance test will verify the operation of the DCO-PNI circuit boards.

A. Required Equipment

5.02 To perform the acceptance test, the following equipment must be available:

- At least one terminal which meets the option requirements

- At least one printer which meets the option requirements

- At least one DACS frame.

B. Circuit Board Test Procedure

1. Place the toggle switch located on the front panel of the card in the "down" or "test" position. (See Fig. 6.) Perform this step for each circuit board in the DCO-PNI.

2. Press the RESET button on the card front panel. Wait a few seconds and press it again. The front panel indicator will be green or red. If the card indicates green (GOOD), go to Step 3. If the card indicates red (FAIL), go to Step 4.

3. Place the toggle switch in the up position. Press the RESET button. The card is now ready for operation. During normal operation, the yellow LED (Fig. 6) flashes each time a packet is transferred to the backplane bus.

4. When a defective card is located, order a replacement from the vendor.

C. Terminal and Printer Test Procedure

1. Apply power to the printers and terminals associated with the DCO-PNI. See the operation manual for the printers and terminals for operating procedures.

2. Press several letters on the keyboard, and then the key marked ENTER or RETURN. A response will be displayed indicating an invalid command was entered. This indicates the terminal is communicating with the DCO-PNI. Perform this step with each terminal. The same response will be printed on each printer.

   When all the terminals and printers are functioning, the acceptance test is complete. If the devices do not respond, go to Step 3.

3. Locate defective terminals, DACS connections, printers, cables, or DCO-PNI boards by substitution. Replace any defective devices. The cables on the EIA connector panel may be connected as necessary during substitution testing, i.e., terminals placed on any terminal port, DACS frames connected to any similarly optioned port.

   Note: Problems may occur on the DCO-PNI if defective circuit boards are located between functioning circuit boards. Be sure that all correctly functioning circuit boards are loaded in the slots from left to right (facing front) with no vacant ports (or ports with defective cards) interspersed between them.

D. IS (In-Service) Command Results

The DCO-PNI will respond to an IS command by printing the configuration of the equipment on the printer. The In-Service command can be submitted by keying in IS followed by a carriage return from any control terminal connected to the DCO-PNI. The results should be exactly as shown in the DCO-PNI command results.
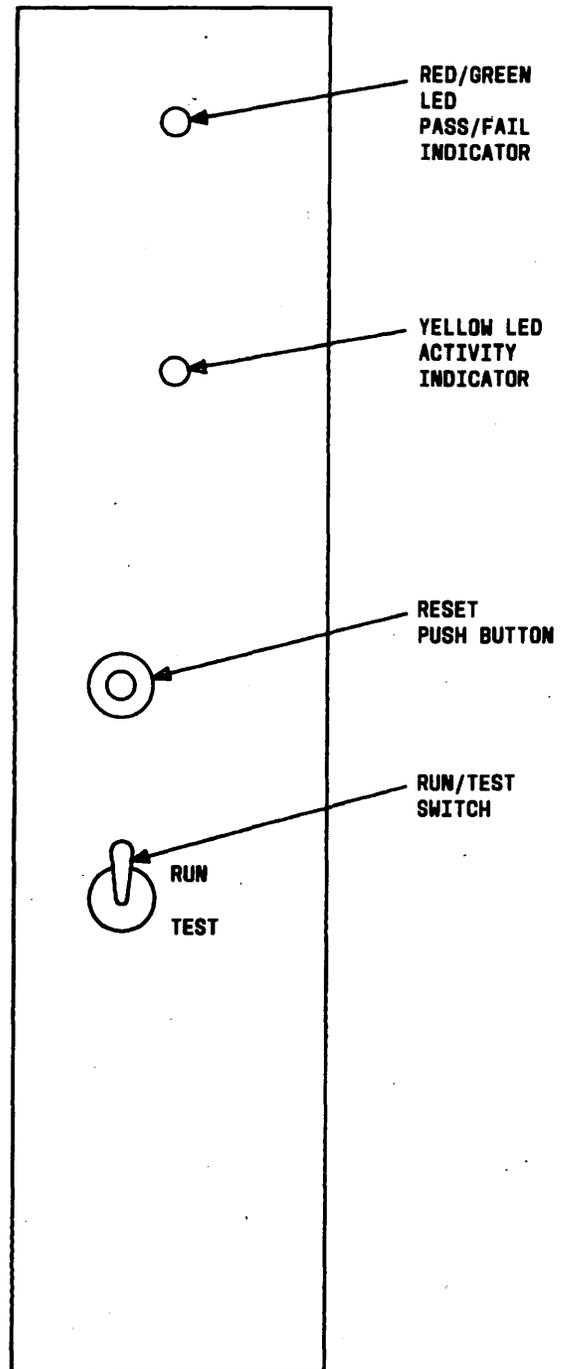

Fig. 6—DCO-PNI Board Front Panel

LATEST VERSION

DCO-PNI IS COMMAND RESULTS

Board Type	Version	# of Proms	Positions	Chksum
Level 2	101 C	3	4, 5, 6	6E68
Level 3	102 B	3	4, 5, 6	8A4E
Printer	103 C	1	4	5D83
DACS	104 D	3	4, 5, 6	1653
Terminal	105 D	3	4, 5, 6	ODEF
GMAP	115 A	2	4, 5	5DC8
PAD	117 A	2	4, 5	
DOM	116 /	2	4, 5	
TABS	118 A	3	4, 5, 6	

6. ACRONYMS

6.01 The acronyms located throughout this document have been consolidated and defined for easy reference.

ACRONYM	DEFINITION
DACS	Digital Access Cross-Connect System
DCO-PNI	Digital Central Office - Packet Network Interface
DOM	Digital Office Manager
DTE	Digital Terminal Equipment
DVM	Digital Voltmeter
EIA	Electronic Industries Association
GMAP	Granger Maintenance, Alarm and Programming
IS	In Service
NTE	Network Terminal Equipment
PAD	Packet Assembly/Disassembly
PINET	Packet Internal Network
No. 2 SCCS	No. 2 Switching Control Center System

7. REFERENCES

7.01 The following sections should be referenced for specific information:

SECTION	TITLE
365-181-918AC	Terminal Operation Granger TM7400-M4
365-181-921AC	Terminal Operation Granger TM7400-M2/M3
365-680-300	PC-MUX System Description
365-680-365AC	-
MC-90017-09	DACS Input/Output Message Manual
365-680-301AC	DCO-PNI Description
365-680-303AC	DCO-PNI Operation
365-680-304AC	DCO-PNI Maintenance
-	DOM Installation Guide
SM-20763	PC-MUX Application Schematic (Circuit Board Options and Wiring)
NJ08576A1	Specifications for a Protocol Converting Multiplexer (PC-MUX) Cabinet Arranged for Digital Control Office-Packet Network Interface (DCO-PNI) Application.
NT08576-30	Operating Support Systems PC-MUX for DCO-PNI Unit Wiring
NT08576-31	Operating Support Systems PC-MUX for DCO-PNI Interconnect Circuit
ED3B062-10	Method of Installing Computer Cabinets
WS08576-01	Application Schematic