PERCEPTIONe&ex
DIGITAL PBX

INSTALLATION AND MAINTENANCE MANUAL

SERIAL NO. Pe&ex _____

Perception e&ex

PERCEPTION$_{e\&ex}$
INSTALLATION INSTRUCTIONS
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CHAPTER 1

INTRODUCTION

1. PURPOSE

1.00 This section describes the installation procedures necessary to ensure proper operation of the PERCEPTION$_{e\&ex}$ system.

2. ORGANIZATION

2.00 The organization of this manual is as follows:

1. INTRODUCTION

2. SYSTEM DESCRIPTION

3. INSTALLATION SITE REQUIREMENTS

4. SYSTEM INSTALLATION

5. MDF ARRANGEMENTS

3. REFERENCE DOCUMENTATION

3.00 The PERCEPTION$_{e\&ex}$ system is supported by a complete set of documentation. A list of the reference documentation associated with the PERCEPTION$_{e\&ex}$ system is provided below:

Document	Section Number
Fault Finding	200-255-500
General Description	
Operating Procedures	200-255-400
Programming	200-255-300
System Record	

4. SYSTEM MNEMONICS

4.00 The system is provided with a complete set of mnemonics that relate directly to its operation and features. The following alphabetical list describes the mnemonics used in this manual.

DATT—Attendant Console

DDIU—Digital Data Interface Unit PCB (Electronic Telephone)

DDIU-MA—Digital Data Interface Unit (Stand-alone)

DDIU-MAT—Digital Data Interface Unit (Electronic Telephone)

DDSS—Digital Direct Station Selection Console

DKT—Digital Telephone

DPFT—Power Failure/Emergency Transfer Unit

DSS—Direct Station Selection Console (Electronic Telephone)

DVSU—PCB for Off-hook Call Announce (installed inside the digital telephone)

EKT—Electronic Telephone

FDD0—Floppy Disk Drive 0

FDD1—Floppy Disk Drive 1

GND—Ground

HHEU—Optional Headset Module

HVSI—PCB for Off-hook Call Announce (installed inside the electronic telephone)

HVSU—PCB for Off-hook Call Announce (installed inside the electronic telephone)

LCCU—Central Control Unit

LCD—Liquid Crystal Display

LCEC-M—PERCEPTION$_{ex}$ Basic Cabinet

LCEC-S—PERCEPTION$_{ex}$ Expansion Cabinet

LPSA-M—PERCEPTION$_{ex}$ Main Power Supply

MDF—Main Distribution Frame

NCEC-M—PERCEPTION$_{e}$ Basic Cabinet

NCEC-S—PERCEPTION$_{e}$ Expansion Cabinet

NCOU—Central Office Trunk Unit

NDCU—Data Control Unit

NDKU—Digital Telephone, Digital DSS, PDIU-DI, PDIU-DS Unit

NDSU—DSS Console Controller Unit (Electronic Telephone)

NDTU—Digital Trunk Unit

NEKU—Electronic Telephone Unit

NEMU—E & M TIE Trunk Unit

NFDU—Floppy Disk Drive Unit

NLSU—DID Trunk Interface Unit

NMDU—Modem Pooling Unit

NOCU—Off-hook Call Announce Interface Unit

NPRU—Paging and Music-on-Hold Unit

NPSA-M—PERCEPTION$_e$ Main Power Supply

NPSA-S—PERCEPTION$_{e\&ex}$ Expansion Power Supply

NRCU—Receiver Unit

NSTU—Standard Telephone Unit

NTWU—Time Switch Unit

PCB—Printed Circuit Board

PDIU-DI—Integrated Data Interface Unit (Digital Telephone)

PDIU-DS—Stand-alone Data Interface Unit (Keyboard Dial)

PFT—Power Fail Transfer

SMDR—Station Message Detail Recording

TTY—Teletypewriter

UNA—Universal Night Answer

5. INSPECTION, PACKING and STORAGE

5.00 Inspection

5.01 When the system is received, examine all packages and make careful note of any visible damage. If any damage is found, bring it to the attention of the delivery carrier and make the proper claims.

5.02 Check the system against the purchase order and packing slip. If it is determined that equipment is missing, contact your supplier immediately.

5.03 After unpacking (and before installing), inspect all equipment for damage. If any is detected, contact your supplier immediately.

CAUTION!
When handling (installing, removing, examining, etc.) printed circuit boards (PCBs), do not touch the back (soldered) side or edge connector. Always hold the PCB by its edge whenever handling it.

5.10 Packing and Storage

5.11 When storing or shipping PCBs, be sure they are packed in their original antistatic bags for protection against static discharge.

5.20 Required Tools

5.21 Installation of the PERCEPTION$_{e\&ex}$ systems requires standard telephony tools. A 13mm socket wrench and extension is recommended for ease of expansion cabinet installation.

CHAPTER 2

SYSTEM DESCRIPTION

1. PERCEPTION$_e$

1.00 Basic Equipment Cabinet

1.01 The basic equipment cabinet (NCEC-M) consists of a single, free-standing cabinet mounted on casters for easy movement. Once system installation has been completed and the cabinet has been positioned, the casters can be locked to prevent movement. The interior of the cabinet houses two shelves for printed circuit card installation. A separate area is provided for installation of the power supply and peak load battery. MDF connections are facilitated by amphenol connectors located on the rear of the cabinet (Figure 2-1).
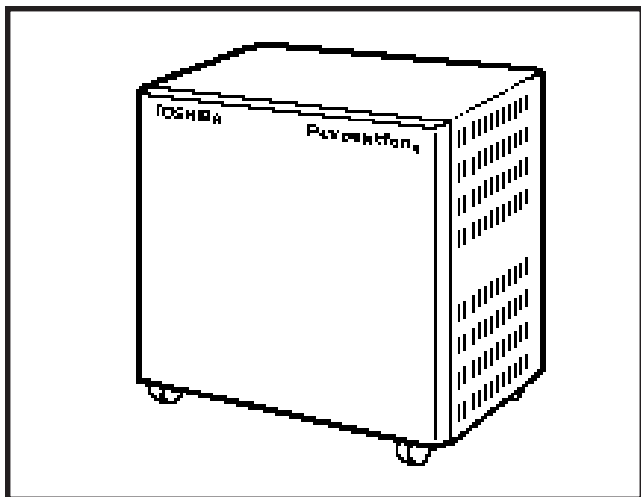
FIGURE 2-1—PERCEPTION$_e$ BASIC CABINET

1.10 Expansion Cabinet

1.11 The expansion cabinet (NCEC-S) is a single cabinet that mounts on top of the basic cabinet and is secured in place with four bolts. The cabinet houses two shelves for printed circuit card installation. MDF connections are facilitated by amphenol connectors located on the rear of the cabinet (Figure 2-2).

1.20 Power Supply

1.21 The Main Power Supply (NPSA-M) consists of a single metal chassis. In addition to the power
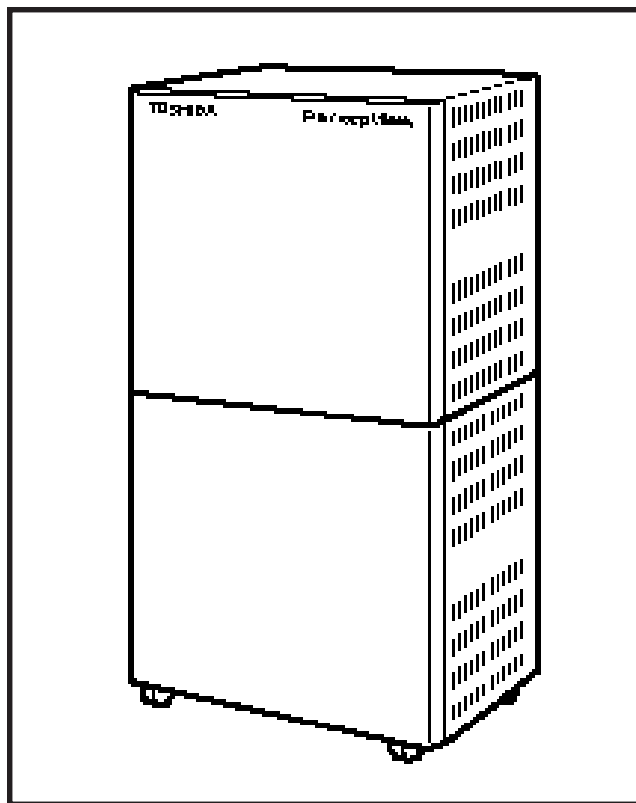
FIGURE 2-2—PERCEPTION$_e$ EXPANSION CABINET

supply, this chassis contains the system ring generator and a charger/inverter for Reserve Power. Located on the front of the chassis are a circuit breaker and LED indicator for each power supply output, and an AC power indicator, and the system power switch. The battery switch is also on the front of the NPSA-M.

2. PERCEPTION$_{ex}$

2.00 Basic Equipment Cabinet

2.01 The basic equipment cabinet (LCEC-M) is a single free-standing cabinet mounted on casters for easy movement. The cabinet contains three shelves for printed circuit card installation. A separate area is provided for power supply and peak load battery installation. MDF connections are facilitated by amphenol connectors located on the rear of the cabinet (Figure 2-3).

2.10 Expansion Cabinet

2.11 The expansion cabinet (LCEC-S) is a single cabinet that houses a single printed circuit card
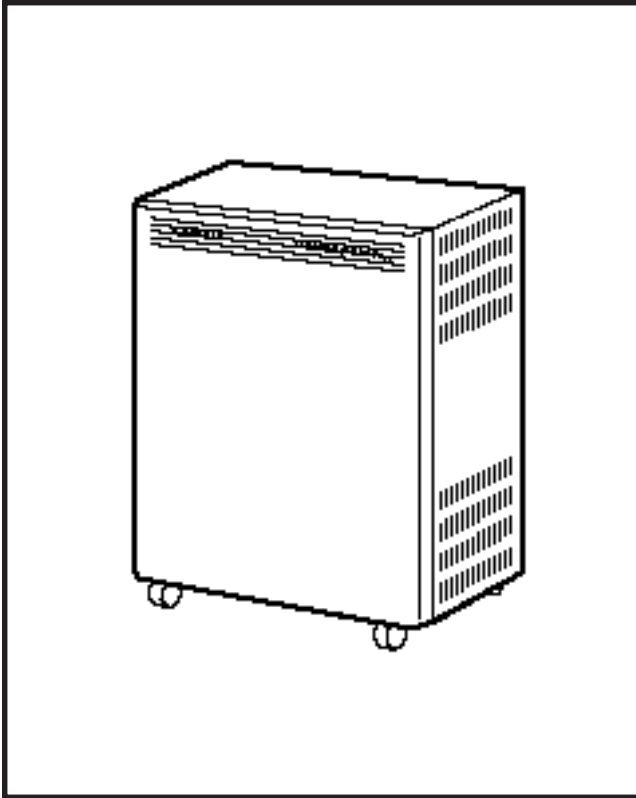
FIGURE 2-3—PERCEPTION$_{ex}$ BASIC CABINET
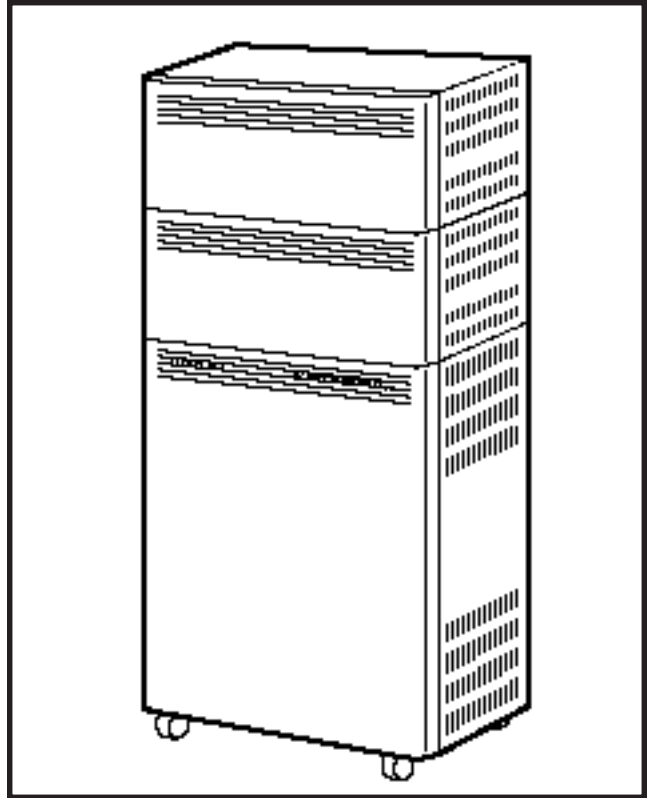
FIGURE 2-4—PERCEPTION$_{ex}$
WITH EXPANSION CABINETS

shelf. MDF connections are facilitated by amphenol connectors located on the rear of the cabinet (Figure 2-4). Up to two expansion cabinets may be added to the PERCEPTION$_{ex}$ basic equipment cabinet.

2.20 Power Supply

2.21 The Main Power Supply (LPSA-M) consists of a single metal chassis which contains the system ring generator and charger/inverter for the Reserve Power. A circuit breaker switch, LED indicators, AC power indicator and system power switch are located on the front of the chassis. For ease in installation a handle is located at the top front of the power supply (Figure 2-5).

3. PEAK LOAD BATTERY

3.00 The peak load battery will maintain call processing for a maximum of two minutes in the event the PERCEPTION$_e$ or PERCEPTION$_{ex}$ experiences a power failure. Additionally, when the system is under heavy usage the peak load battery will
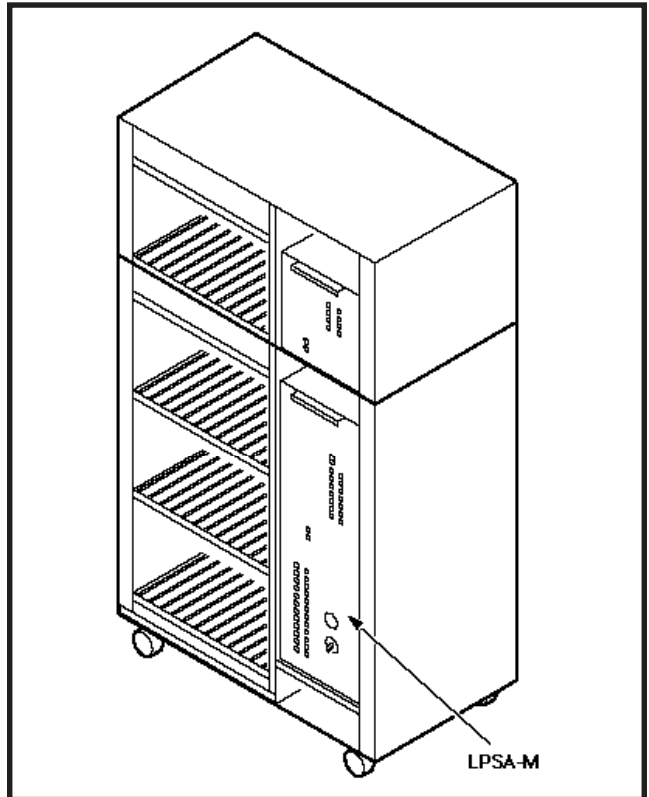
FIGURE 2-5—PERCEPTION$_{ex}$
MAIN POWER SUPPLY

avoid power degradation by supplementing the -24 volts, maintaining a constant power level.

4. EXTENDED RESERVE POWER

4.00 The power supply is equipped, as a standard feature, with an internal battery charger/inverter. Full reserve power can be provided for any system by connecting an appropriate, customer-supplied 24-volt battery pack. During normal operation, the power supply charger/inverter will maintain the proper charge in the battery pack. In the event of an AC power failure, switchover to battery power will be automatic. There will be no loss of system operation as a result of power switchover. When AC power is restored, switchback to the power supply will be automatic.

4.01 Battery selection and size will depend on system size and desired reserve operating time. The maximum power consumption of the basic cabinet is 11.5 amps at -24 VDC. For both a basic and expansion cabinet configuration, the maximum will be 19 amps at -24 VDC. The selected batteries must be compatible with the system's charger float voltage of 27.3 VDC.

5. POWER FAILURE/EMERGENCY TRANSFER

5.00 The function of the Power Failure/Emergency Transfer Unit (DPFT) is to automatically connect selected trunks to selected standard telephones in the event of system failure while permitting normal operation when the system is in service (maximum of 1 per cabinet).

5.01 The DPFT is a self-contained module that mounts externally to the basic cabinet, typically on the MDF. Connections to the trunks, stations and basic cabinet are made via two 50-pin amphenol-type connectors (**J1** and **J2**) on the DPFT (see functional diagram in Figure 2-6).

5.02 The module consists of eight relays that are normally operated, connecting the telephones to NSTU circuits and the trunks to NCOU circuits. If a power failure (or other emergency) occurs, the relays release, connecting the telephones directly to the trunks. Calls can then be placed from the telephones over the CO trunks, bypassing the system (which is out of service).

5.03 Power Fail Transfer (PFT) telephones con-
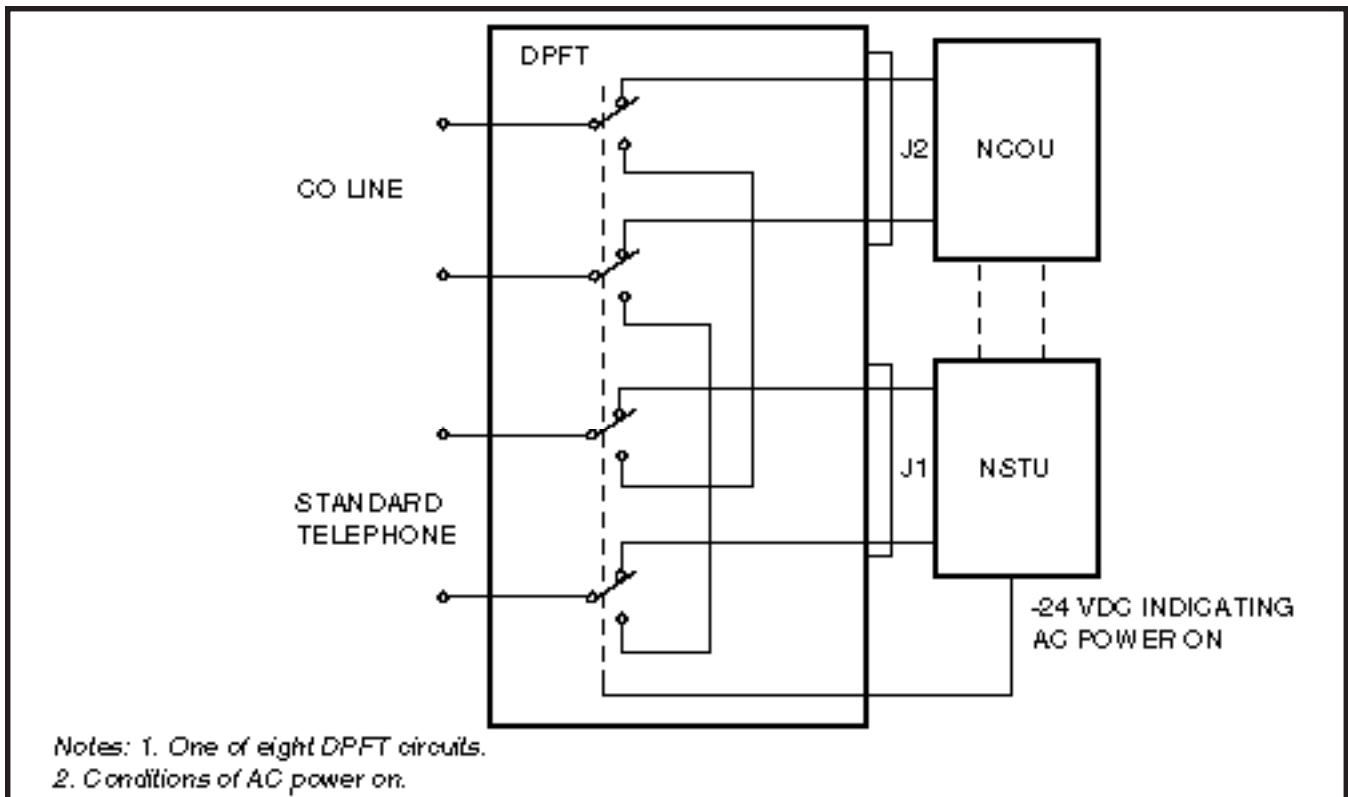
FIGURE 2-6—DPFT FUNCTIONAL DIAGRAM

nected to ground-start trunks must have ground taps (tap buttons) in order to make outgoing calls during power fail transfer conditions.

5.04 A transfer can be caused by a loss of power or triggered manually by either of two buttons, one of which is located on the underside of the attendant console and the other on the front of the NPRU PCB. A transfer that is caused by a power failure will be reset automatically when power is restored; a manual transfer must be reset manually.

5.05 When the DPFT is reset after a transfer, existing PFT conversations will be protected. Individual circuits will be restored only when they become idle.

6. PRINTED CIRCUIT BOARD DESCRIPTION

6.00 Sixteen different types of PCBs are available for use in both PERCEPTION systems (Figures 2-7 & 2-8). The universal port architecture enables multiple installation of trunk cards. The PERCEPTION$_e$ can support a maximum of 16 trunk cards; 8 in the basic cabinet, and 8 in the expansion cabinet. The PERCEPTION$_{ex}$ can support a maximum of 32 trunk cards; 24 in the basic cabinet, and 8 in each expansion cabinet.

NFDU (Floppy Disk Drive Unit)—One or two per system: This card houses a 3.5 inch, 1.2 Mbyte disk drive. One disk contains system program and customer data. The second disk stores the Maintenance and Administration programs. (Two NFDUs are required in **D.02** and later version software using Remote Maintenance.)

LCCU (Central Control Unit)—One per system: The LCCU card contains the circuitry which, under the direction of the system program, provides centralized control for the entire system. Additionally, the LCCU performs data transmission and receiving functions between the central control and all peripheral equipment, including:
- Station PCBs
- Trunk PCBs
- TTY interface
- SMDR interface
- Lodging/Health Care audit interface
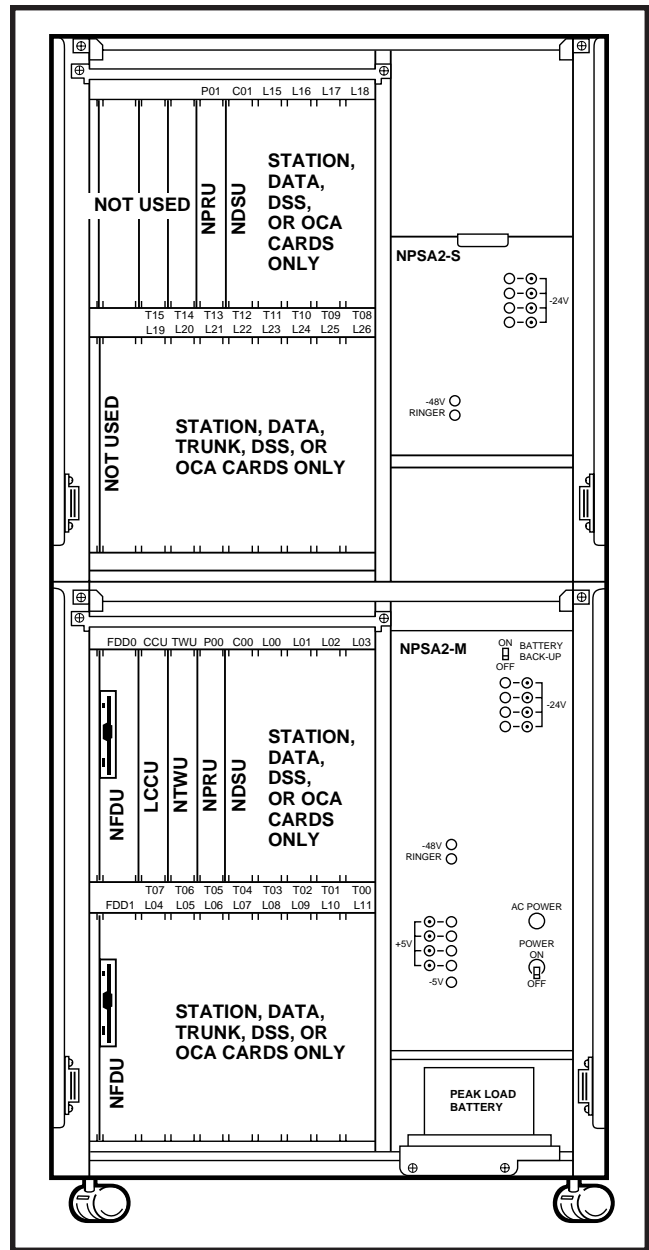
FIGURE 2-7—PERCEPTION$_e$ PCB INSTALLATION

- Modem interface

This circuitry consists of a 16-bit 80C88 main processor, an 8-bit Z-80 secondary processor, and 1Mbyte of memory.

NTWU (Time Switch Unit)—One per system: This card performs the time slot interchange function for call processing and the conference features, provides the digital speech paths with digital padding, timing and control for time slot switching and generates system tones.
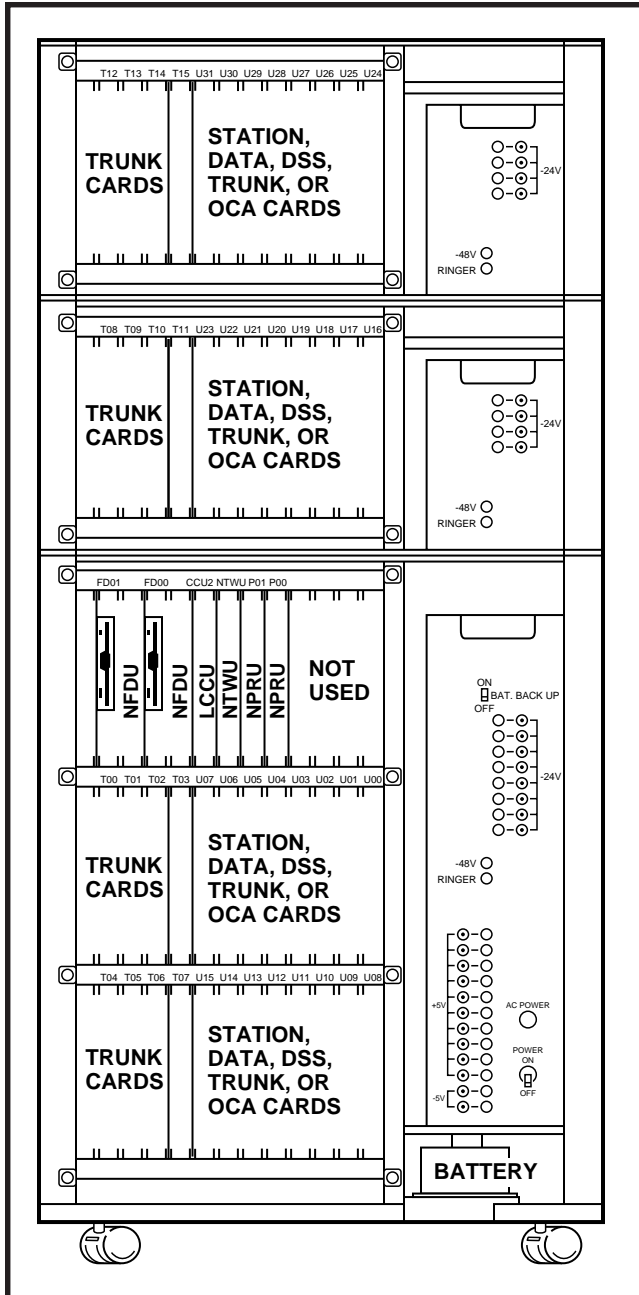
FIGURE 2-8—PERCEPTION$_{ex}$ PCB INSTALLATION

NPRU (Paging and Music-on-hold Unit)—Houses program load and initialization control switches and performs several miscellaneous functions (up to two per system):
- Paging interface and control
- Music-on-hold interface
- UNA control
- Interface for the NRCU
- Attendant Console Functions
- Power Failure/Emergency transfer control

- Digitized voice message for Automatic Wake-up (optional)

NRCU (Receiver Unit)—Two per NPRU (4 per system maximum): This card provides DTMF receivers, which are required for receiving tone dialing from standard telephone ports (including voice mail ports) and some incoming trunk (DID, TIE and CCSA) types. It also provides the capability for remote access to service. It mounts piggy-back on the NPRU PCB, where there is available space for two NRCUs. Each NRCU provides four DTMF receiver circuits, with a system maximum of 16.

NOTE:
When using the Call Forward No Answer to Trunk feature, an NRCU MUST be installed in the system.

NEKU (Electronic Telephone Unit)—One per eight electronic telephones: Interfaces electronic telephone to the system. It also serves as an attendant console interface. Each attendant console requires one electronic telephone circuit.

PERCEPTION$_e$
ATT #0-PCB position **L00** circuit **#1**
ATT #1-PCB position **L15** circuit **#1**

A maximum of 12 NEKU/NDKU PCBs may be installed in each cabinet (24 NEKU/NDKU PCBs maximum per system).

PERCEPTION$_{ex}$
ATT #0-PCB position **U00** circuit **#1**
ATT #1-PCB position **U01** circuit **#1**

A maximum of 16 NEKU/NDKU PCBs can be installed in the PERCEPTION$_{ex}$ basic cabinet, and eight in each expansion cabinet.

NDKU (Digital Telephone Unit)—A 2B+D architecture is used to interface up to 8 or 16 circuits for the Digital Telephone and Integrated Data Interface Unit (PDIU-DI), Stand-alone Data Interface Unit (PDIU-DS), or Digital Direct Station Selection Console. Digital telephones and digital DSS consoles cannot be interfaced to the same NDKU PCB. Four configuration options are switch-selectable as follows:

　　1) Option 1: Eight digital telephones only.

　　2) Option 2: Eight digital telephones with

Integrated Data Interface Unit (PDIU-DI) or Off-hook Call Announce. This position also supports Stand-alone Data Interface Units (PDIU-DS).

3) Option 3: Four digital DSS consoles. In PERCEPTION$_e$ C00 and C01 may be used for this option only.

4) Option 4: Eight digital DSS consoles.

NOTE:
*When using Option 2 or 4, the next **highest** number adjacent card slot **cannot** be used. For example: If an NDKU is installed in L01 or U01, the card slot L02 or U02 respectively, must be left vacant.*

NSTU (Standard Telephone Unit)—Interfaces eight standard telephones (DTMF or rotary dial) to the system.

NDSU (DSS Console Controller Unit)—Interfaces four DSS consoles to the system. The NDSU is installed in the C00 or C01, or any line slot for PERCEPTION$_e$; or in any universal slot for PERCEPTION$_{eX}$. A maximum of two NDSU PCBs are allowed per system, and both can be installed in the same cabinet.

NDCU (Data Control Unit)—Interfaces eight Digital Data Interface Units (DDIUs) to the system. The NDCU controls data transmission between the DDIU and the cabinet. A maximum of four NDCU PCBs may be installed in each PERCEPTION$_e$ cabinet. In the PERCEPTION$_{eX}$, four PCBs per shelf can be installed.

NMDU (Modem Pooling Unit)—Interfaces up to four modems and their associated DDIU-MAs. Any of the four DDIU circuits not required by a modem can be used with a standard DDIU (-MA or -MAT). A maximum of four NMDU PCBs may be installed in each PERCEPTION$_e$ cabinet. In the PERCEPTION$_{eX}$, four PCBs can be installed per shelf.

NOTE:
The system maximum of NDCU or NMDU PCBs consists of any combination of the two PCBs totaling four per cabinet for

PERCEPTION$_e$ *and four per shelf for* PERCEPTION$_{eX}$.

NCOU (Central Office Trunk Unit)—One per four CO trunks: Provides the signaling supervisory functions on loop- and ground-start trunks. Interfaces four CO trunks to the system. These trunks can be incoming, outgoing, or both way CO trunks; WATS trunks, or Foreign Exchange (FX) trunks.

NEMU (E & M TIE Trunk Unit)—One per four E & M TIE trunks: Each TIE trunk can be individually strapped for Type I or II operation with either 2-wire or 4-wire connection.

NLSU (DID Trunk Interface Unit)—One per four DID trunks: Each NLSU connects four Direct Inward Dialing (DID) trunks to the system.

NDTU (T1 Interface)—Maximum of two per system (one in the main cabinet, one in the expansion cabinet): Each NDTU provides a maximum of 24 trunk lines. The Digital Trunk printed circuit card enables the PERCEPTION$_{e\&eX}$ systems to use DS1 signaling to connect directly to either T1 span lines which connect to the telco (through a Channel Service Unit), or to a private network.

NOCU (Off-hook Call Announce Interface Unit)—One per eight electronic telephones. Each NOCU provides eight Off-hook Call Announce circuits for up to eight electronic telephones. Each NOCU takes a station PCB location in the cabinet.

HVSU2 (Off-hook Call Announce PCBs)—Install inside the electronic telephone. The HVSI PCB is installed piggy-back on the HVSU. One unit per electronic telephone is required to receive off-hook call annnounce.

DVSU (Digital Off-hook Call Announce PCB)—Installs inside the digital telephone. One unit per digital telephone is required to receive off-hook call announce.

7. SYSTEM INDICATORS AND CONTROLS

7.00 Several system indicators and controls are located on the various PCBs and assemblies. The locations and functions are:

NFDU
- Disk Drive LED—Will light to indicate when the disk is being accessed.
- PUSH Button—Used to eject the diskette from the drive.

LCCU
- MAJ LED—Lights when a MAJOR alarm exists in the system.
- MDR LED—Lights when the DTR signal from the SMDR device is not present. An MDR alarm on the attendant console lights simultaneously if enabled in programming.
- AUX LED—Lights when the DTR signal from the MIS system is not present.
- TTY switch—Slide switch used to select 300 or 1,200 bps speed for TTY port. This port is used for either programming and maintenance and/or the Lodging/Health Care Audit.
- MDR switch—Slide switch used to select 300 or 1,200 bps speed for the SMDR port. This port is used for SMDR and/or the Lodging/Health Care Audit.
- AUX switch—This switch is used with MIS system. Must be set at 1200 bps.

NTWU
- CLOCK LED—Flashes continuously when the system is functioning as usual.

NPRU
- FALT LED—Indicates software-detected faults concerning MOH or Paging circuits.
- BSY LED 1 & 2
  #1 lights when any page is in progress.
  #2 indicates when MOH is in use (a call is on hold or camp-on).
- MOH volume control—Adjust, Music-on-hold volume level.
- LOAD switch—A momentary switch used in an emergency condition to reload system program and data from disk. All existing calls will be dropped when this switch is pushed.
- INT switch—A momentary switch used in emergency conditions to reset system logic.

All existing calls will be dropped when this switch is pushed.
- PFT switch—A locking switch used to manually activate a transfer with the DPFT unit. A transfer activated by this switch can only be reset by this switch.
- MDM LED—Not currently used.
- PFT LED—LED is **ON** whenever a power fail transfer condition has been manually initiated.
- NRCU FALT LEDs 1, 2, 3 & 4—Used to indicate software-detected faults or a disabled state caused by an input command from the maintenance terminal (**TPER Program**). Each LED indicates two of the four circuits on each of the two NRCUs that can mount on the NPRU.
    FALT #1 = Circuits 1 & 2, NRCU2 1
    FALT #2 = Circuits 3 & 4, NRCU2 1
    FALT #3 = Circuits 1 & 2, NRCU2 2
    FALT #4 = Circuits 3 & 4, NRCU2 2

NCOU/NEMU/NLSU
- FALT LEDs 1 & 2—Indicate software-detected faults or a disabled state caused by an input command from the maintenance terminal (**TPER Program**) or while ports are programmed. Each LED indicates two of the four circuits on the NCOU, NEMU or NLSU:
        FALT #1 = Circuits 1 & 2
        FALT #2 = Circuits 3 & 4
- BSY LEDs 1 ~ 4—Indicate the busy/idle status of each of the four circuits on the NCOU, NEMU or NLSU. LED is **ON** when circuit is busy.

NDTU
- FALT LED—Indicates software-detected faults or a disabled state caused by an input command from the maintenance terminal (**TPER Program**) or while ports are programmed. LED indicates fault occuring in more than one channel.
- BSY LED—Indicates the busy/idle status of the 24 channels on the NDTU. LED is **ON** when more than one channel is busy.
- FALM LED—Indicates NDTU has not achieved Synchronization.
- MFALM LED—Indicates NDTU has not

achieved Frame Synchronization.
- YALM LED—Indicates a Yellow Alarm is detected by the NDTU.
- BALM LED—Indicates a Blue Alarm is detected by the NDTU.
- Signaling Type Selection Switches S4 ~ S11—Six-element DIP switches used to select one of four available signaling modes, on a per channel basis, for each of the 24 NDTU channels. Available signaling modes are:
  CO (Loop Start) mode
  CO (Ground Start) mode
  DID (2-wire signaling)
  TIE Line mode (4-wire E&M)

NEKU/NSTU/NOCU/NDKU
- FALT LEDs 1 & 2—Indicate software-detected faults or a disabled state caused by an input command from the maintenance terminal (**TPER Program**) or while ports are programmed. Each LED indicates four of the eight circuits on the NEKU, NSTU, NOCU, or NDKU:
  FALT #1 = Circuits 1 ~ 4
  FALT #2 = Circuits 5 ~ 8

NDSU
- FALT LEDs 1 & 2—Indicate software-detected faults or a disabled state caused by an input command from the maintenance terminal (**TPER Program**) or while ports are programmed. Each LED represents two of the four ports on the NDSU:
  FALT #1 = Circuits 1 & 2
  FALT #2 = Circuits 3 & 4

NDCU
- FALT LEDs 1 & 2—Indicate software-detected faults or a disabled state caused by an input command from the maintenance terminal (**TPER Program**) and while ports are programmed. Each LED indicates four of the eight circuits on the NDCU:
  FALT #1 = Circuits 1 ~ 4
  FALT #2 = Circuits 5 ~ 8
- NOT READY LEDs DIU 1 ~ 4 and DIU 5 ~ 8— Indicate the DDIU's (-MA or -MAT) power switch is not in the **ON** position or tip and ring line polarity is reversed.

NMDU

- FALT LEDs 1 & 2—Indicate software-detected faults or a disabled state caused by an input command from the maintenance terminal (**TPER Program**) and while ports are programmed:
  FALT #1 = DIU Circuits 1 ~ 4
  FALT #2 = Modem Circuits 1 ~ 4
- NOT READY LEDs DIU 1 ~ 4—Indicate the DDIU's (-MA or -MAT) power switch is not in the **ON** position or tip and ring line polarity is reversed.
- BSY LEDs (Modem) 1 ~ 4—Indicate the busy/idle status of each of the four modem circuits (the LED is **ON** when the circuit is busy).

NPSA-M/LPSA-M
- LEDs indicate the presence of: Ringer and -48, -24, -12, +12, -5, +5 voltages.
- AC Power LED—Indicates the presence of AC power to the NPSA-M.

NPSA-S
- LEDs indicate the presence of: -48 and -24 voltages.

8. PERIPHERAL EQUIPMENT

8.00 Electronic and Digital Telephone

8.01 Four different electronic telephones and two different digital telephones may be used in the system.

8.02 All electronic telephones share the same dimensions:
  Height: 3.7 in. (94mm)
  Width: 7.1 in. (180mm)
  Depth: 9.5 in. (241mm)

8.03 All digital telephones share the same dimensions:
  Height: 3.6 in. (92mm)
  Width: 7.3 in. (184mm)
  Depth: 9.0 in. (229mm)

8.04 Both electronic and digital telephones feature modular handset cords. Electronic telephones are connected to the system via 4-conductor modular line cords. Digital telephones are connected to the

system via 2-conductor modular line cords. In addition, all models may be used at any or all stations.

8.10 Headset Upgrade (HHEU)

8.11 Each electronic/digital telephone may also be upgraded to provide a modular headset jack by installing a headset upgrade assembly. The assembly consists of a small PCB (HHEU) which installs on the main PCB, inside the electronic or digital telephone, with a plug-in connector. Most standard headsets are compatible with the HHEU jack.

8.20 Attendant Console

8.21 The Attendant Console is available with faceplates for the Business and Lodging/Health Care applications. The console consists of a plastic housing with handset/headset modular jacks. Two horizontal rows of non-locking buttons, LEDs and a 12-button dialpad enable call processing.

8.30 DSS Console

8.31 As an option both electronic and digital Direct Station Selection (DSS) consoles can be used with systems that do not require attendant consoles, or require distributed call-handling positions. Two DSS consoles per electronic/digital telephone, up to a system maximum of eight DSS consoles, can be installed.

8.40 Standard Telephone

8.41 Standard telephones can be mixed with electronic telephones as required by the user's application. Standard telephones can access all telephone features using dial code access.

8.50 DDIU/PDIU

8.51 There are four types of Digital Data Interface Units (DDIUs/PDIUs), DDIU-MAT, DDIU-MA, PDIU-DI, and PDIU-DS. The DDIU-MAT is a built-in unit that attaches directly to the bottom of a 10- or 20-button electronic telephone (replacing the base). The PDIU-DI is a built-in unit that attaches directly to the bottom of both digital telephones (replacing the base). The DDIU-MA and PDIU-DS are stand-alone units. Each unit is equipped with a female RS-232C connector and operation switches. Both

the DDIU-MAT and DDIU-MA are equipped with a power supply that connects to the DDIUs via a 6' cord, and plugs into a standard 117 VAC wall outlet.

8.60 Paging Equipment

8.61 A customer-supplied paging amplifier can work in conjunction with the system's paging interface and speaker zone switching to provide a system paging capability.

8.70 Music-on-Hold

8.71 A standard interface enables a customer-provided music source to be connected to the system. This music is connected to all calls placed in the hold, camp-on or call waiting condition by a station or the attendant. The same music source can also be used by the Automatic Wake-up feature for wake-up calls.

8.80 Universal Night Answer

8.81 Incoming calls, when the system is in night operation, can be programmed to go either to a night answer station or to a Universal Night Answer device such as a bell or loud ringer. Any station user can pick up a UNA call by either pressing a **UNA** button on the telephone or by dialing an access code. Up to two UNA zones can be programmed per system, when the system is in tenant service.

8.90 Station Message Detail Recording

8.91 PERCEPTION$_{e\&ex}$ automatically record call data (such as call duration, digits dialed, originating station and account codes) of calls made to and from the system. Lodging/Health Care feature activation (Automatic Wake-up, Message Registration, etc.) is also recorded. This data can then output to a printer, recording device or call accounting system. The Lodging/Health Care feature audit can be combined with SMDR or can be output separately. SMDR helps the user reduce telephone costs and monitor employee telephone usage.

CHAPTER 3

INSTALLATION SITE REQUIREMENTS

1. COMMERCIAL POWER

1.00 The system requires a power source of 100 ~ 120 VAC, 50/60 Hz. The AC outlet *must be dedicated* to system use, grounded and fused. To avoid accidental power turn-off, it is recommended that an ON/OFF wall switch not be used on this dedicated AC circuit.

1.01 If reserve power is to be installed, the battery pack requires a well-ventilated location adjacent to the equipment cabinet.

2. ENVIRONMENTAL REQUIREMENTS

2.00 Humidity at the equipment cabinet should be within 20 ~ 80% (non-condensing), and the temperature should be relatively constant within 32 ~ 104°F (0 ~ 40°C). Exposure to dust and airborne chemicals should be avoided.

3. EQUIPMENT ROOM RECOMMENDATIONS

3.00 The minimum floor and maintenance space required for installation of each of the two equipment cabinets is shown in Figures 3-1 and 3-2.
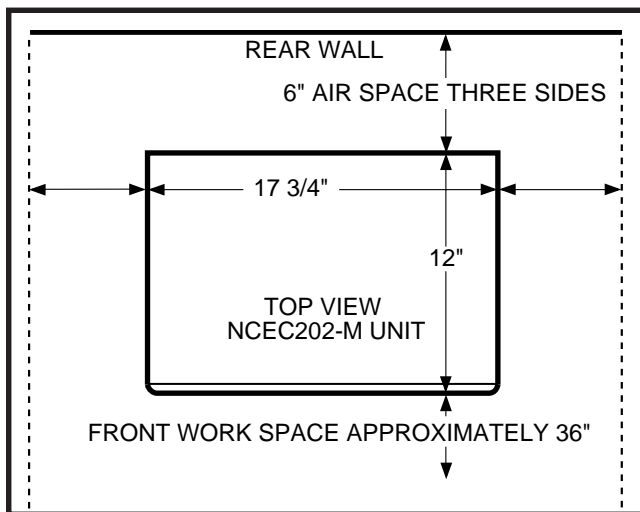
FIGURE 3-1—PERCEPTION$_e$
MINIMUM FLOOR SPACE

3.01 The following requirements must be consid-
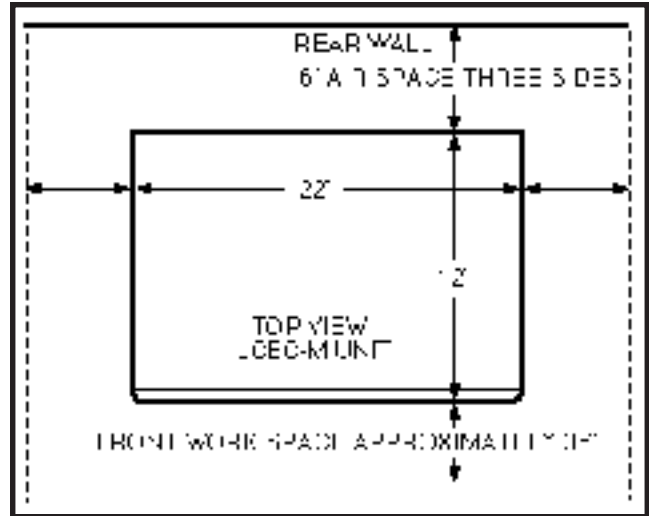
FIGURE 3-2—PERCEPTION$_{ex}$
MINIMUM FLOOR SPACE

ered when selecting a location for the equipment cabinet:

The location MUST BE:
- Dry and clean.
- Well ventilated.
- Well lit.
- Easily accessible.

The location MUST NOT BE:
- Subject to extreme heat or cold.
- Subject to corrosive fumes.
- Next to a reproducing or copying machine.

4. CABLING CONSIDERATIONS

4.00 The equipment cabinet must be located close to the facility Main Distribution Frame (MDF). Maximum house cable run distances for station and peripheral equipment must also be considered when choosing the location of the equipment cabinet. The limit for each type of equipment is:
- Electronic/Digital Telephone - 1,000 cable feet (305 M), 24 AWG
- Standard Telephone - 500-ohms (including telephone)
- Stand-alone DDIU-MA/PDIU-DS - 3, 280 cable feet (1,000 M), 24 AWG
- Attendant Console - 1,000 cable feet (305 M), 24 AWG
- Electronic DSS - 500 cable feet, 24 AWG

● Digital DSS - 1,000 cable feet (305 M), 24 AWG

4.01 Acceptable cable for all telephones is 22 or 24 AWG twisted pair inside telephone station cable (jacketed but not shielded). Two twisted pairs are required for the electronic telephone, one pair for a standard telephone, and one twisted pair for the digital telephone, even if equipped with a PDIU-DI. Three twisted pairs are required for an electronic telephone equipped with a DDIU-MAT. The stand-alone DDIU-MA/PDIU-DS requires one twisted pair.

4.02 A 25-pair cable is required for the attendant console. The console is equipped with a male 50-pin amphenol-type connector.

WARNING!
1. **Never install telephone wiring during a lightning storm.**
2. **Never install telephone jacks in wet locations, unless the jacks are specifically designed for wet locations.**
3. **Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the interface.**
4. **Use caution when installing or modifying telephone lines.**

5. GROUNDING

5.00 The following grounding directions are required in order to comply with the Underwriters' Laboratories' Standard 1459 2nd edition:

1) Redundant and independent equipment grounding conductors are to be installed between the product and the wiring system ground.

2) One of the equipment grounding conductors (ground 1) shall be an insulated grounding conductor. Its size shall not be smaller than the size of the grounded and ungrounded branch-circuit supply conductors. It shall also have their equivalent insulation material and thickness, except that it is green with, or wilthout, one or more yellow stripes. This
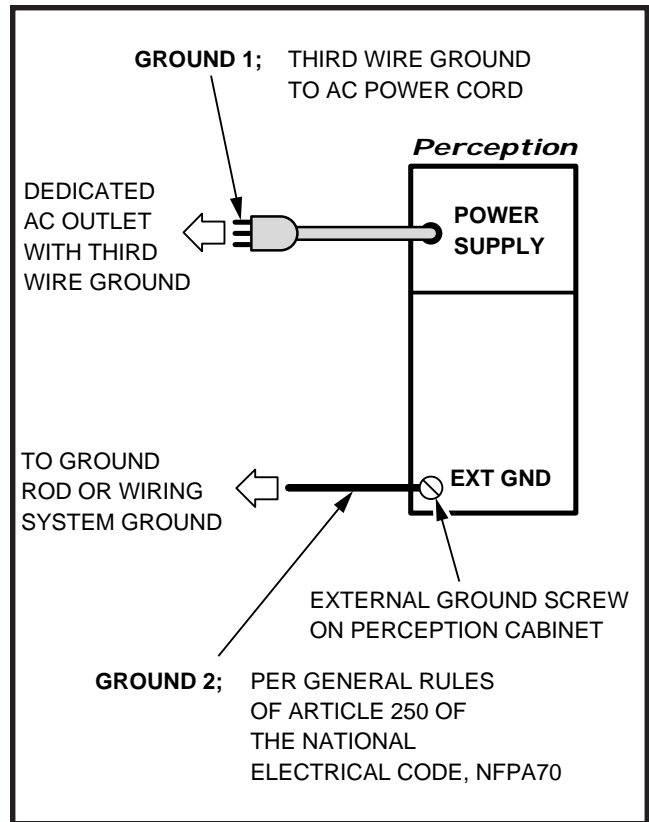
FIGURE 3-3—UL GROUNDING DIAGRAM

insulated grounding conductor is to be installed as part of the circuit that supplies the system, and it is to be connected to ground at the service equipment.

3) The other conductor (ground 2) shall comply with the general rules for grounding contained in Article 250 of the National Electrical Code, NFPA 70, but shall not depend on the cord and plug of the product.

CHAPTER 4

SYSTEM INSTALLATION

1. PERCEPTION$_e$

1.00 Power Supply Installation

1.01 Install the main power supply as follows:

1) Remove the two screws securing the basic cabinet front cover. Lift the cover off the cabinet.

2) Loosen two screws, remove and retain four screws securing the basic cabinet rear cover plate, and remove the rear cover plate (Figure
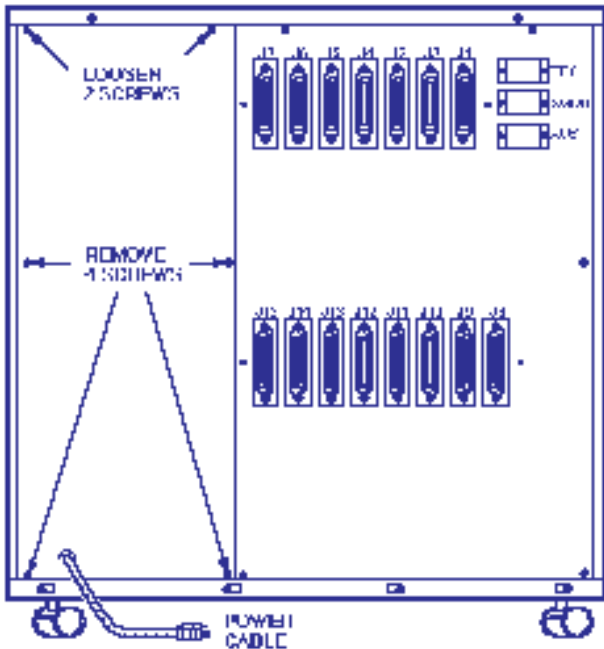
FIGURE 4-1—PERCEPTION$_e$
BASIC CABINET REAR COVER

4-1).

3) Unpack the main power supply and inspect it carefully for any visible damage. Verify that all connectors are securely attached.

4) Remove and retain the three corner screws from the back of the main power supply.

5) Slide the main power supply into the basic cabinet from the front and secure in place with three screws at the rear.

6) Check the 15-amp fuse (F1) located at the top of the power supply to verify that it is in working order.

7) Remove plastic cover from AC connection terminal TB1 by removing two screws.

8) Connect the white and black leads to the **AC** terminal (black to **L** and white to **N**) and the green lead (ground) to the **GND** screw on the main power supply (Figure 4-2). Replace the plastic cover and secure with two screws.
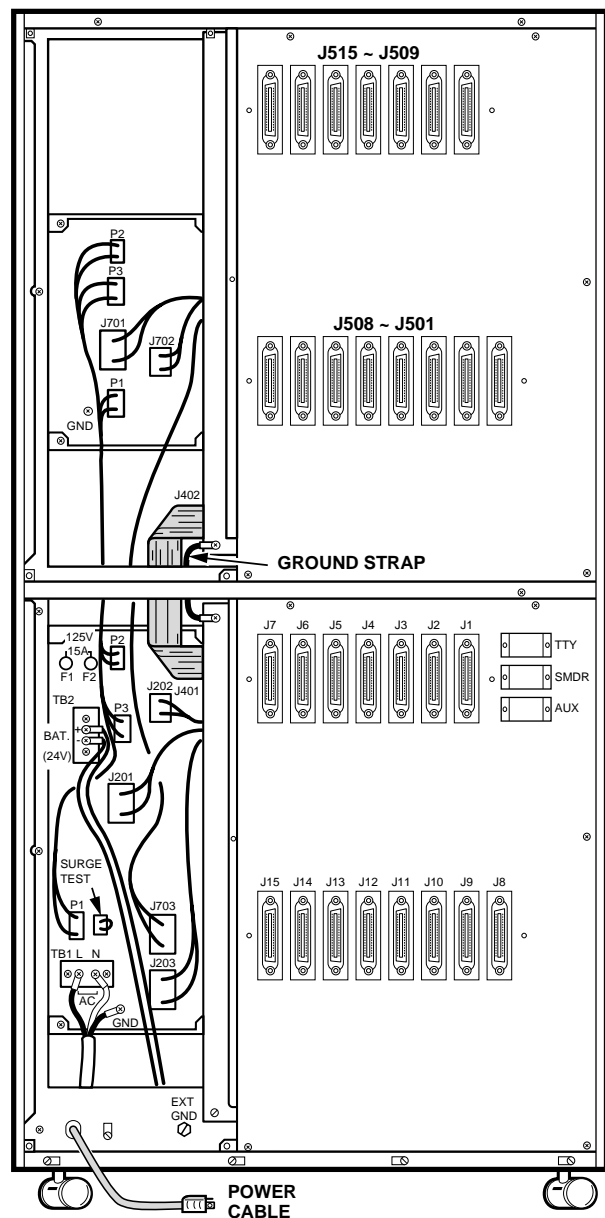
FIGURE 4-2—PERCEPTION$_e$
CABLE CONNECTIONS

9) With the main power supply turned **OFF**, plug the AC power cord into the AC outlet.

10) Momentarily press each circuit breaker to verify that it is not tripped.

11) Place the main power supply power switch in the **ON** position.

WARNING!
Hazardous voltage that may cause death or injury is exposed at the power supply AC terminal.

12) Verify that all main power supply power indicator LEDs are on (**RINGER** LED should be pulsating rapidly). If any of the LEDs are **not** on, replace the main power supply.

13) Using a multimeter (set to the appropriate ranges), check the pins on connectors **J201**, **J202**, **J203** and **J703** for the voltages shown in Figure 4-3. (The connectors are on the rear of the power supply chassis.) Measure between the voltage pin and a ground pin. (All ground leads are tied to a single point, so any can be used.) Figure 4-3 also shows the acceptable range for each output voltage. If a measured voltage falls outside of the acceptable range, replace the main power supply.

14) Turn the power supply **OFF** and then connect **J201**, **J202** and **J203,** respectively, as shown in Figure 4-2.

15) Remove and retain the two screws securing the peak load battery mounting bracket and slide the bracket out the front of the basic cabinet.

16) Install the peak load battery as shown in Figure 4-4. Secure the battery to the mounting bracket with the retaining strap and a single screw.

WARNING!
Hazardous voltage that may cause death or injury is exposed at the peak load battery cables. DO NOT touch wires together.

17) Connect the peak load battery cables to TB2 on the rear of the basic power supply (see Figure 4-2). Ensure that the correct polarity is observed as follows:

blue to positive (+)
yellow to negative (-)

EXPANSION CABINET

J701

-24V	□ □	G
-24V	□ □	G
	□	G
-24V	□ □	G
-24V	□ □	G

J702

SIG2	□ □	SIG 1
RNG CK	□	
-48V	□ □	G

BASIC CABINET

J201

BACK UP	□ □	PS ALM
AC DOWN	□ □	G
-24V	□ □	G
	□	G
-24V	□ □	G
-24V	□ □	-24V

J202

SIG2	□ □	SIG 1
RNG CK	□	
-48V	□ □	G

J703

-5V	□ □	G
-5V	□	
+5V	□ □	G
+5V	□ □	G

J203

-5V	□ □	G
-5V	□ □	G
+5V	□ □	
+5V	□ □	G
+5V	□ □	G

FPSA ACCEPTABLE VOLTAGE RANGES	
NOMINAL (VDC)	RANGE (VDC)
-48	-47.52 ~ -48.96
-24	-26.75 ~ -28.12
+12	+11.76 ~ +12.48
-12	-11.76 ~ -12.48
+5	+5.0 ~ +5.4
-5	-5.0 ~ -5.4
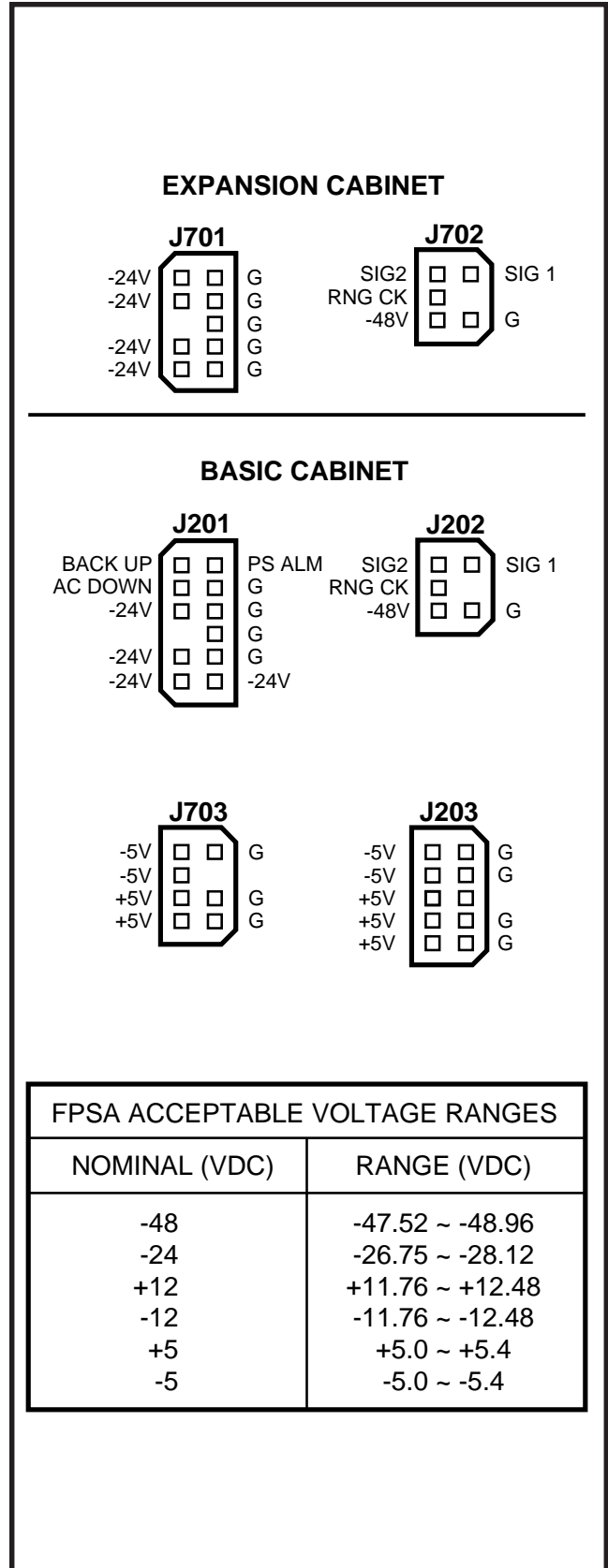
FIGURE 4-3—PERCEPTION$_e$ VOLTAGE CHECKS
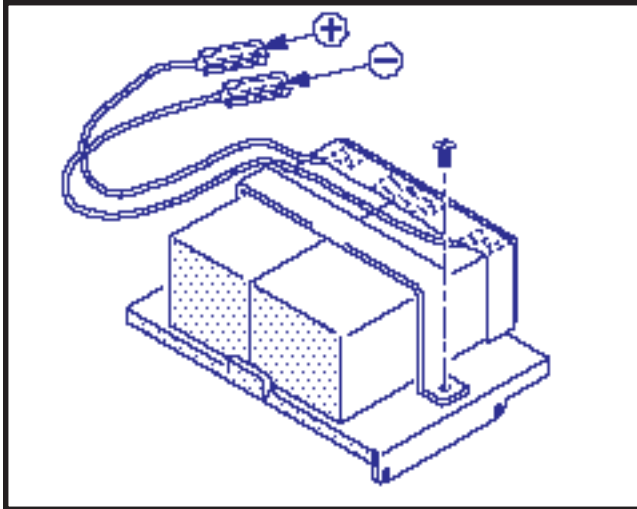
FIGURE 4-4—PEAK LOAD BATTERY

18) Slide the mounting bracket/battery assembly in place and secure with two screws.

19) Set the **BATTERY BACKUP** switch to **ON** (Figure 4-5).

1.10 Expansion Cabinet Installation

WARNING!
Hazardous voltage that may cause death or injury is present in the system during operation. Ensure that AC power to both cabinets is turned off prior to performing this procedure.

NOTE:
A 13mm socket wrench and extension is recommended for ease of expansion cabinet installation.

1) Remove and retain the four screws securing the basic cabinet top cover and lift the cover off the cabinet (Figure 4-6).

2) Remove and retain the two screws securing each of the expansion cabinet side panels. Pull the side panels off.

3) Place the four casters on the basic cabinet in the lock position to ensure cabinet stability during the expansion cabinet installation.

4) On both the basic and expansion cabinets, remove and retain two screws securing the cabinet doors. Remove and retain the six screws securing the rear panel on each cabinet.

FIGURE 4-5—PERCEPTION_e
POWER SUPPLY CONTROLS AND INDICATORS
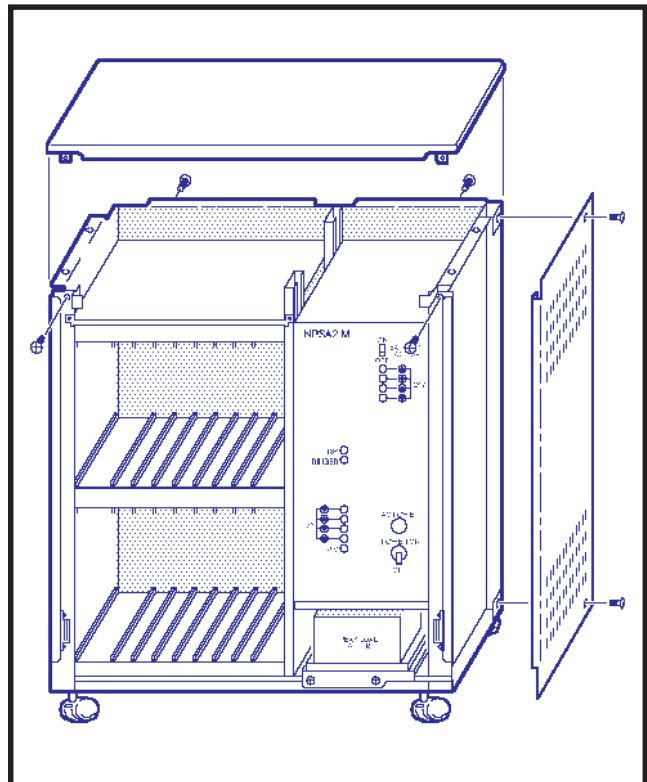
FIGURE 4-6—PERCEPTION_e
EXPANSION CABINET INSTALLATION

5) Place the expansion cabinet on top of the basic cabinet, ensuring proper alignment of the four mounting holes. Secure in place with four metric bolts, flat washers and lockwashers.

6) Reinstall the two side covers on the expansion cabinet and secure in place using four screws (two per side).

7) Install the top cover on the expansion cabinet and secure with four screws.

8) Connect the intercabinet ground wire in accordance with Figure 4-2.

9) Route the expansion cabinet ribbon cable from **J402** in the expansion cabinet through the opening provided in the cabinet bottom and connect to the basic cabinet backplane at **J401**.

10) Remove three screws from the secondary power supply. From the front of the expansion cabinet slide the power supply into the rack and secure in place with the three rear screws.

NOTE:
Prior to routing intercabinet cabling, check the 15-amp fuse (F2) located at the top of the main power supply to verify that it is in working order.

11) Route the power supply cabling through the hole in the expansion cabinet and connect both power supplies at the **P1**, **P2** and **P3** receptacles.

12) With the main power supply turned **OFF**, plug the AC power cord into the AC outlet.

13) Momentarily press each secondary power supply circuit breaker to verify that it is not tripped.

14) Place the main power supply power switch in the **ON** position.

15) Verify that all secondary power supply power indicator LEDs are on. If any of the LEDs are **not** on, replace the NPSA-S (**RINGER** LED should be pulsating rapidly).

16) Using a multimeter (set to the appropriate ranges), check the pins on connectors **J701** and **J702** on the secondary power supply for the voltages shown in Figure 4-3. (The connectors are on the rear of the power supply chassis.) Measure between the voltage pin and a ground pin. (All ground leads are tied to a single point, so any can be used.) Figure 4-3 also shows the acceptable range for each output voltage. If a measured voltage falls outside of the acceptable range, replace the secondary power supply.

17) Turn the power supply **OFF**.

18) Plug in connectors **J701** and **J702**.

19) Route cable **J703** into the basic cabinet and plug it into connector **J703**.

20) Reinstall the rear panels and doors on both cabinets and secure in place with screws.

2. PERCEPTION$_{ex}$

2.00 Power Supply Installation

2.01 Install the main power supply as follows:

1) Remove the two screws securing the basic cabinet front cover. Lift the cover off the cabinet.

2) Remove and retain six screws securing the basic cabinet rear cover plate and remove the rear cover plate (Figure 4-7).

3) Unpack the main power supply and inspect it carefully for any visible damage. Verify that all connectors are securely attached.

4) Remove and retain the three corner screws from the back of the main power supply.

5) Slide the main power supply into the basic cabinet from the front and secure in place with three screws at the rear.

6) Check the two 30-amp fuses (F1 and F2) located at the top of the power supply to verify that they are in working order.

7) Remove plastic cover from AC connection terminal TB1 by removing two screws.

8) Connect the white and black leads to the **AC** terminal (black to **L** and white to **N**) and the
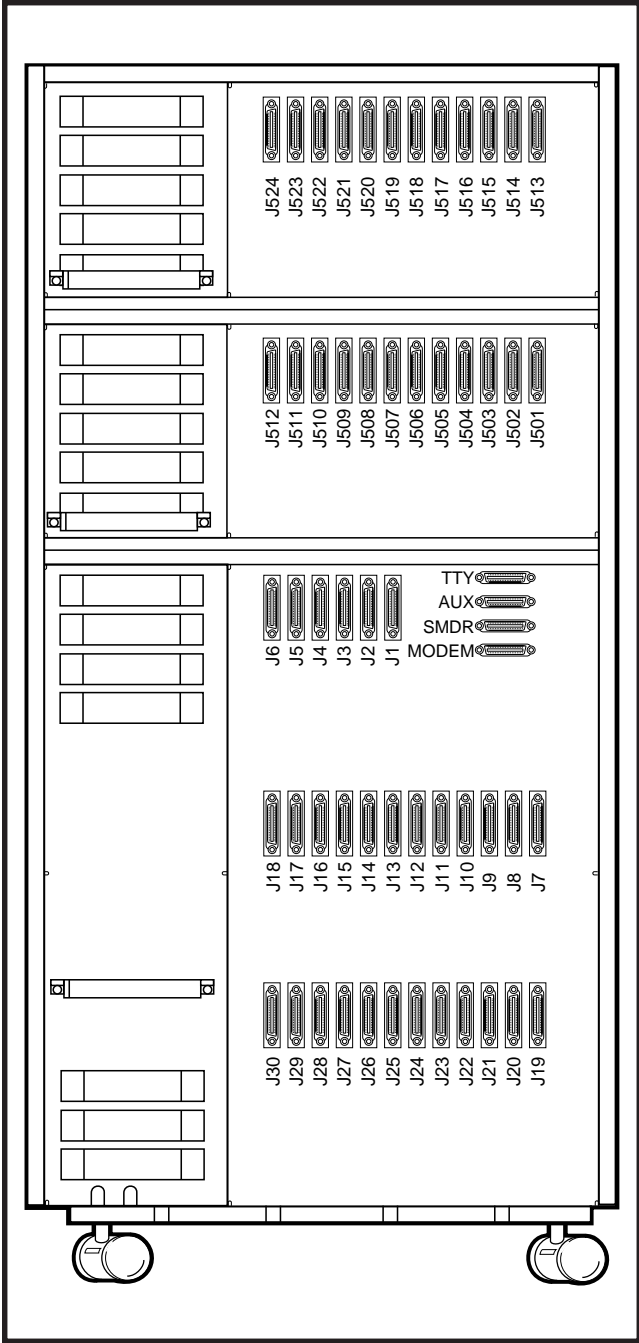
FIGURE 4-7—PERCEPTION$_{ex}$
BASIC CABINET REAR COVER
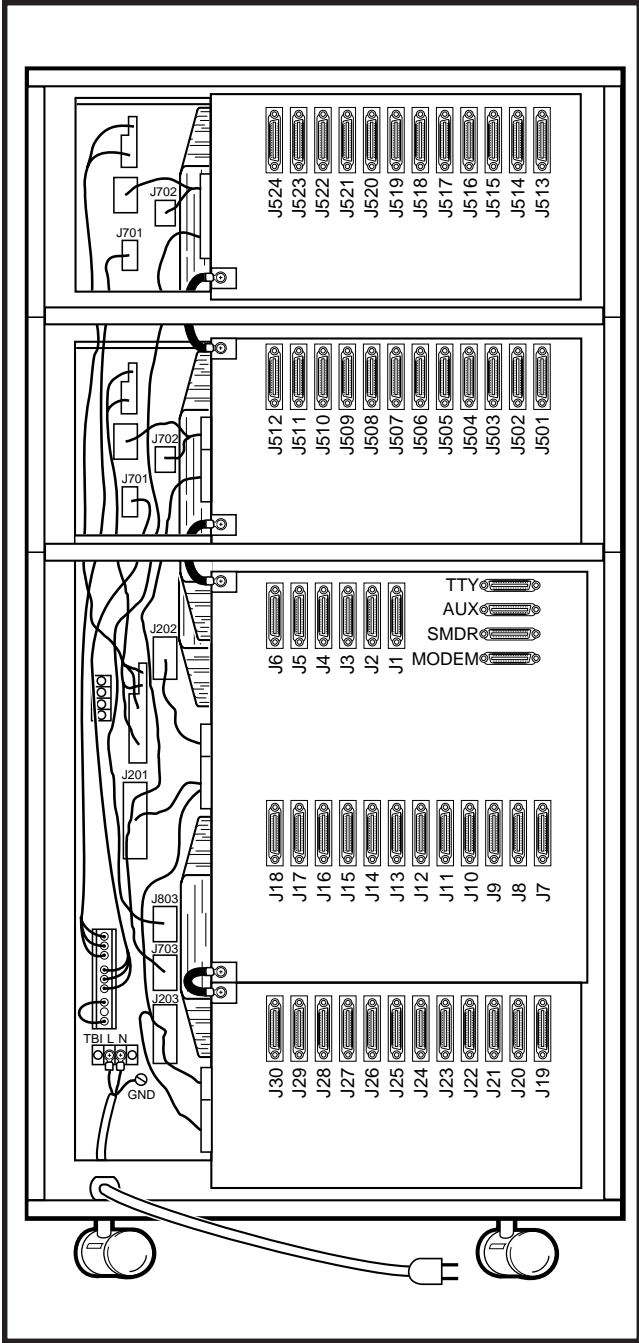
FIGURE 4-8—PERCEPTION$_{ex}$
CABLE CONNECTIONS

green lead (ground) to the **GND** screw on the main power supply (Figure 4-8). Replace the plastic cover and secure with two screws.

9) With the main power supply turned **OFF**, plug the AC power cord into the AC outlet.

10) Momentarily press each circuit breaker to verify that it is not tripped.

11) Place the main power supply power switch in the **ON** position.

WARNING!
Hazardous voltage that may cause death
or injury is exposed at the power supply
AC terminal.

12) Verify that all main power supply power indicator LEDs are on (**RINGER** LED should be pulsating rapidly). If any of the LEDs are **not** on, replace the main power supply.

13) Using a multimeter (set to the appropriate ranges), check the pins on connectors **J201**, **J202**, **J203, J703** and **J803** for the voltages shown in Figure 4-9. (The connectors are on the rear of the power supply chassis.) Measure between the voltage pin and a ground pin. (All ground leads are tied to a single point, so any can be used.) Figure 4-9 also shows the acceptable range for each output voltage. If a measured voltage falls outside of the acceptable range, replace the main power supply.

14) Turn the power supply **OFF** and then connect **J201**, **J202** and **J203,** respectively, as shown in Figure 4-9.

15) Remove and retain the two screws securing the peak load battery mounting bracket and slide the bracket out the front of the basic cabinet.

16) Install the peak load battery as shown in Figure 4-4. Secure the battery to the mounting bracket with the retaining strap and a single screw.

WARNING!
Hazardous voltage that may cause death or injury is exposed at the peak load battery cables. DO NOT touch wires together.

17) Connect the peak load battery cables to TB2 on the rear of the basic power supply (see Figure 4-4). Ensure that the correct polarity is observed as follows:

> blue to positive (+)
> yellow to negative (-)

18) Slide the mounting bracket/battery assembly in place and secure with two screws.

19) Set the **BATTERY BACKUP** switch to **OFF** Figure 4-10.

2.10 First Expansion Cabinet Installation

WARNING!
Hazardous voltage that may cause death or injury is present in the system during
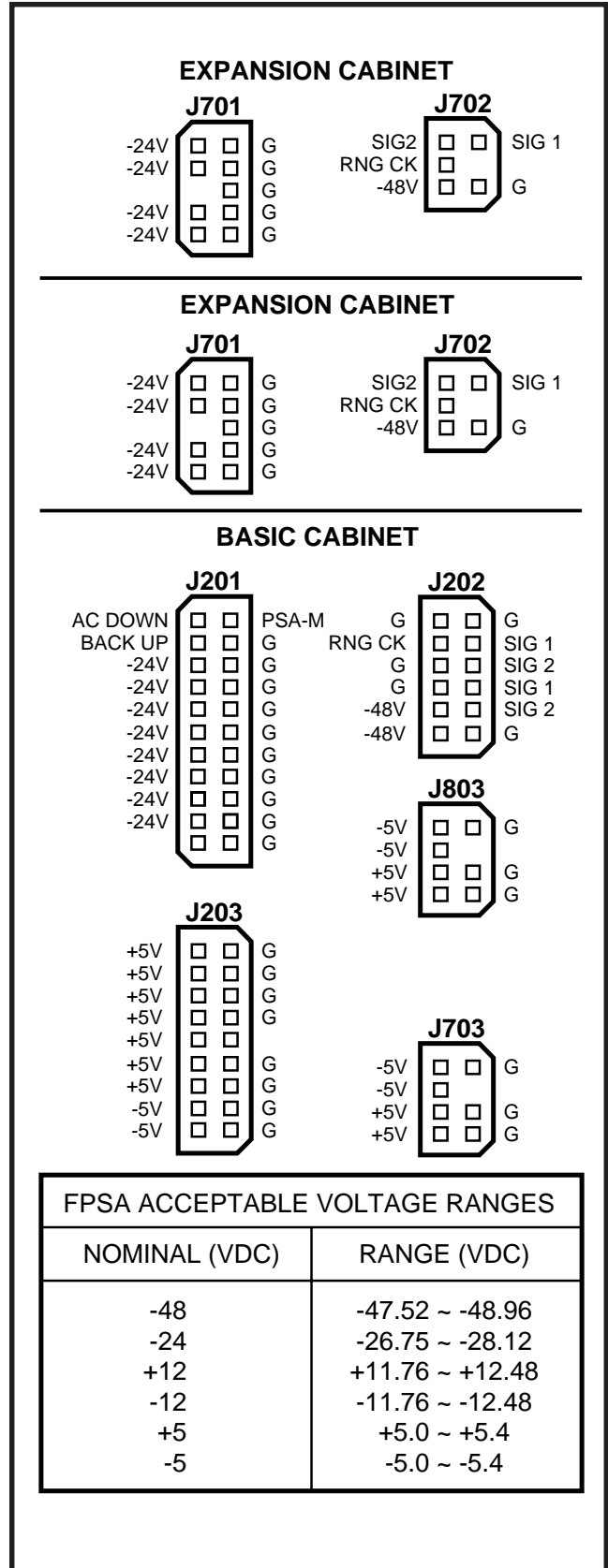
FIGURE 4-9—PERCEPTION$_{ex}$ VOLTAGE CHECKS

FPSA ACCEPTABLE VOLTAGE RANGES	
NOMINAL (VDC)	RANGE (VDC)
-48	-47.52 ~ -48.96
-24	-26.75 ~ -28.12
+12	+11.76 ~ +12.48
-12	-11.76 ~ -12.48
+5	+5.0 ~ +5.4
-5	-5.0 ~ -5.4

**FIGURE 4-10—PERCEPTION$_{ex}$
POWER SUPPLY CONTROLS AND INDICATORS**

operation. Ensure that AC power to both cabinets is turned off prior to performing this procedure.

NOTE:
A 13mm socket wrench and extension is recommended for ease of expansion cabinet installation. Two expansion cabinets can be installed.

1) Remove and retain the four screws securing the basic cabinet top cover and lift the cover off the cabinet (Figure 4-11).

2) Remove and retain the two screws securing each of the expansion cabinet side panels. Pull the side panels off.

3) Place the four casters on the basic cabinet in the lock position to ensure cabinet stability during the expansion cabinet installation.

4) On both the basic and expansion cabinets, remove and retain two screws securing the cabinets doors. Remove and retain the six screws securing the rear panel on each cabinet.

5) Place the expansion cabinet on top of the basic cabinet, ensuring proper alignment of the four mounting holes. Secure in place with four metric bolts, flat washers and lockwashers.

6) Reinstall the two side covers on the expansion cabinet and secure in place using four screws (two per side).

7) Install the top cover on the expansion cabinet and secure with four screws.

8) Connect the intercabinet ground wire in accordance with Figure 4-8.

9) Route the expansion cabinet ribbon cable from **J405** in the expansion cabinet through the opening provided in the cabinet bottom and connect to the basic cabinet backplane at **J402.**

10) Remove three screws from the secondary power supply. From the front of the expansion cabinet, slide the power supply into the rack and secure in place with the three rear screws.

FIGURE 4-11—PERCEPTION$_{ex}$
EXPANSION CABINET INSTALLATION

NOTE:
Prior to routing intercabinet cabling, check the 15-amp fuse (F2) located at the top of the main power supply to verify that it is in working order.

11) Route the power supply cabling through the hole in the expansion cabinet and connect both power supplies to the lower connectors at the **P1**, **P2** and **P3** receptacles.

12) With the main power supply turned **OFF**, plug the AC power cord into the AC outlet.

13) Momentarily press each secondary power supply circuit breaker to verify that it is not tripped.

14) Place the main power supply power switch in the **ON** position.

15) Verify that all secondary power supply power indicator LEDs are on. If any of the LEDs are *not* on, replace the NPSA-S (**RINGER** LED should be pulsating rapidly).

16) Using a multimeter (set to the appropriate ranges), check the pins on connectors **J701** and **J702** on the secondary power supply for the voltages shown in Figure 4-9. (The connectors are on the rear of the power supply chassis.) Measure between the voltage pin and a ground pin. (All ground leads are tied to a single point, so any can be used.) Figure 4-9 also shows the acceptable range for each output voltage. If a measured voltage falls outside of the acceptable range, replace the secondary power supply.

17) Turn the power supply **OFF**.

18) Plug in connectors **J701** and **J702**.

19) Route cable **J703** into the basic cabinet and plug it into connector **J703**.

20) Reinstall the rear panels and doors on both cabinets and secure in place with screws.

2.20 Second Expansion Cabinet Installation

WARNING!
Hazardous voltage that may cause death or injury is present in the system during operation. Ensure that AC power to both cabinets is turned off prior to performing this procedure.

NOTE:
A 13mm socket wrench and extension is recommended for ease of expansion cabinet

installation. Two expansion cabinets can be installed.

1) Remove and retain the four screws securing the basic cabinet top cover and lift the cover off the cabinet (Figure 4-11).

2) Remove and retain the two screws securing each of the expansion cabinet side panels. Pull the side panels off.

3) Place the four casters on the basic cabinet in the lock position to ensure cabinet stability during the expansion cabinet installation.

4) On both the basic and expansion cabinets, remove and retain two screws securing the cabinets' doors. Remove and retain the six screws securing the rear panel on each cabinet.

5) Place the expansion cabinet on top of the basic cabinet, ensuring proper alignment of the four mounting holes. Secure in place with four metric bolts, flat washers and lockwashers.
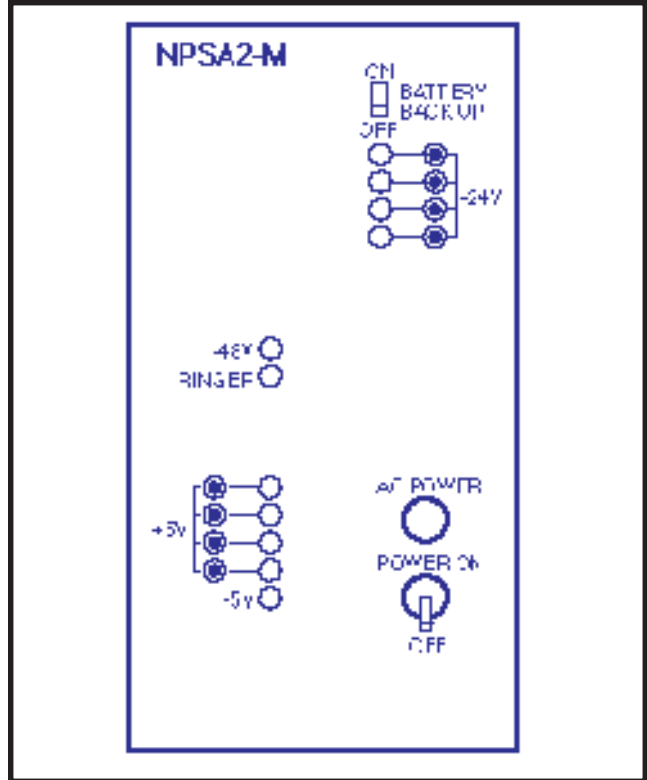
6) Reinstall the two side covers on the expansion cabinet and secure in place using four screws (two per side).

7) Install the top cover on the expansion cabinet and secure with four screws.

8) Connect the intercabinet ground wire in accordance with Figure 4-8.

9) Route the expansion cabinet ribbon cable from **J406** in the expansion cabinet through the opening provided in the cabinet bottom and connect to the basic cabinet backplane at **J403.**

10) Remove three screws from the secondary power supply. From the front of the expansion cabinet, slide the power supply into the rack and secure in place with the three rear screws.

NOTE:
Prior to routing intercabinet cabling, check the 15-amp fuse (F2) located at the top of the main power supply to verify that it is in working order.

11) Route the power supply cabling through the hole in the expansion cabinet and connect both power supplies to the upper connectors at the **P1**, **P2** and **P3** receptacles.

12) With the main power supply turned **OFF**, plug the AC power cord into the AC outlet.

13) Momentarily press each secondary power supply circuit breaker to verify that it is not tripped.

14) Place the main power supply power switch in the **ON** position.

15) Verify that all secondary power supply power indicator LEDs are on. If any of the LEDs are *not* on, replace the NPSA-S (**RINGER** LED should be pulsating rapidly).

16) Using a multimeter (set to the appropriate ranges), check the pins on connectors **J701** and **J702** on the secondary power supply for the voltages shown in Figure 4-9. (The connectors are on the rear of the power supply chassis.) Measure between the voltage pin and a ground pin. (All ground leads are tied to a single point, so any can be used.) Figure 4-9 also shows the acceptable range for each output voltage. If a measured voltage falls outside of the acceptable range, replace the secondary power supply.

17) Turn the power supply **OFF**.

18) Plug in connectors **J701** and **J702**.

19) Route cable **J703** into the basic cabinet and plug it into connector **J803**.

20) Reinstall the rear panels and doors on both cabinets and secure in place with screws.

3. PRINTED CIRCUIT BOARD INSTALLATION

3.00 NFDU

3.01 Install an NFDU in the FDD0 slot in the basic cabinet. If the system uses **D.02** or later version software and Remote Maintenance, a second NFDU must be installed in the FDD1 slot in the basic cabinet. There is one strap selection on the NFDU, depending on the slot in which the PCB is installed. The jumper block on the rear of the NFDU must be
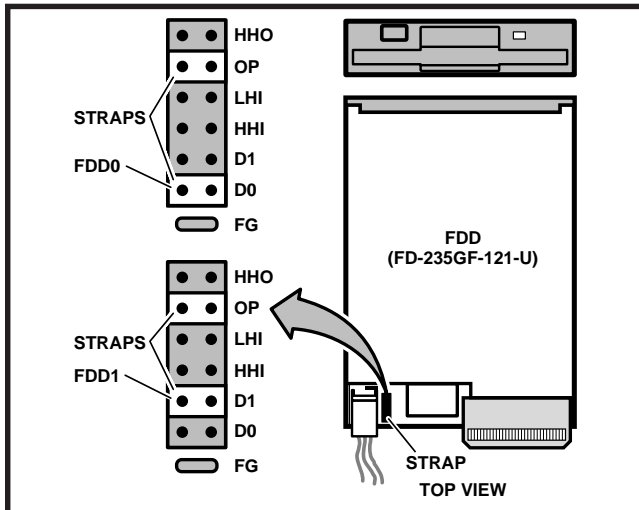
FIGURE 4-12—NFDU STRAPPING

set as shown in Figure 4-12.

3.10 LCCU

3.11 Install the LCCU in the CCU slot of the basic cabinet. There are no straps on this PCB; however, there is a plug (**P5**). Verify that the connection plug is in place in accordance with Figure 4-13.

3.20 NTWU
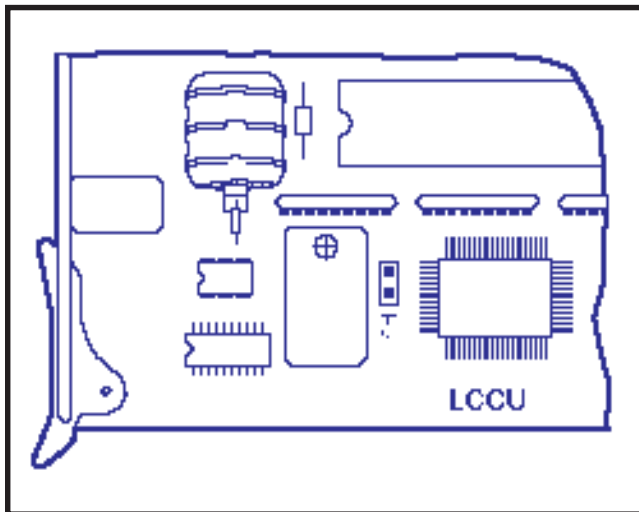
FIGURE 4-13—LCCU STRAPPING

3.21 The NTWU has one strap that must be verified before installation (Figure 4-14). Install the NTWU in the TWU slot of the basic cabinet. Ensure that the strap is as follows:

TBC5: pins 1 & 2 must be strapped

3.30 NPRU

3.31 The NPRU has one strap that requires verification before installation (Figure 4-15). If Automatic Wake-up is required, verify that the DROM is installed in the **IC15** socket. Install the NPRU in the **P00** slot. (An NPRU must be installed in the **P00** card slot.) If a second NPRU PCB is used, install it in the **P01** slot in the PERCEPTION$_e$ expansion cabinet. In PERCEPTION$_{ex}$, both NPRUs are installed in the basic cabinet. Verify that **TB1** is strapped as follows:

TB1: pins 1 and 2 must be strapped.

NOTE:
DROM only required for digitized voice on automated wake-up calls.

3.32 If NRCUs are to be installed, mount them on the NPRU. The first NRCU mounts on connector **J3**, the second on **J4** (see Figure 4-16).

3.40 NEKU, NDKU, and NOCU

3.41 Install the NEKU in any of the line designated slots **L00 ~ L11** or **L15 ~ L26** in PERCEPTION$_e$. If an attendant console is used, an NEKU must be installed in slot **L00**. If a second attendant console is installed, a second NEKU must be installed in slot **L15**. Attendant consoles must be installed on circuit 1 in both slots.

3.42 For PERCEPTION$_{ex}$, install the NEKU in any designated slot **U00 ~ U31**. To utilize attendant consoles, install NEKUs in the following slots:

ATT#0-PCB position **U00** Circuit **#1**
ATT#1-PCB position **U01** Circuit **#1**

3.43 There are no straps on the NEKU PCB for either system.

3.44 Install the NDKU in any of the line designated slots **L00 ~ L11** or **L15 ~ L26** in PERCEPTION$_e$. For PERCEPTION$_{ex}$, install the NDKU in any designated slots **U00 ~ U31**. Some options require adjacent PCB slots be left vacant.

3.45 The NDKU employs a 2B+D architecture for each circuit that must be configured for one of four different operating options using the dip switch S1 (Figure 4-17) as follows:

1) OPTION 1; Eight digital telephones only: this
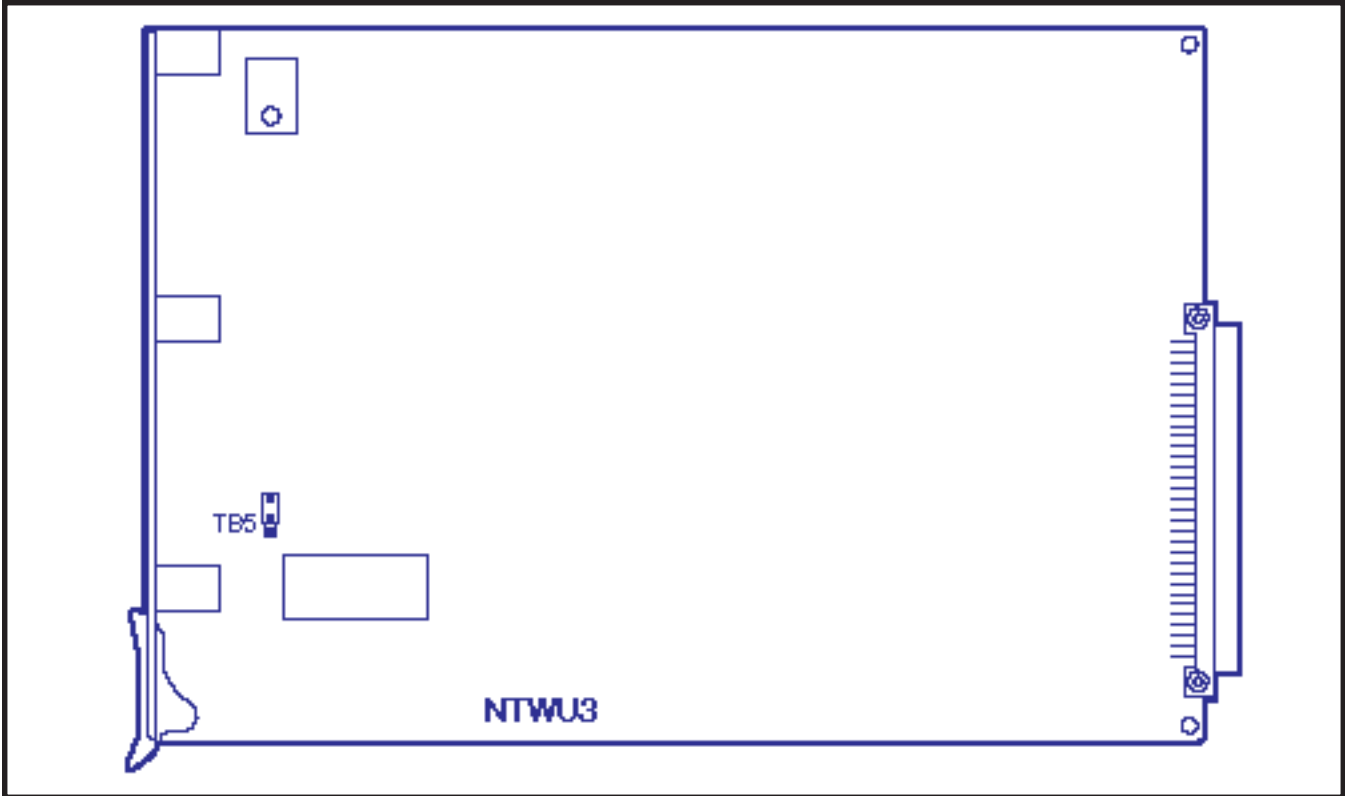
FIGURE 4-14—NTWU STRAPPING
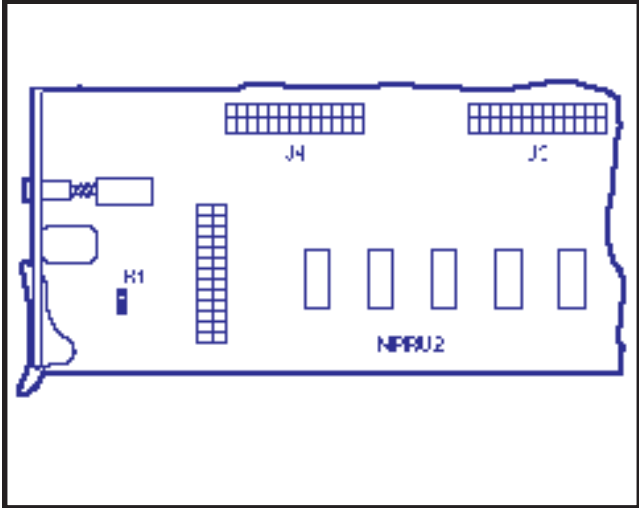
FIGURE 4-15—NPRU STRAPPING
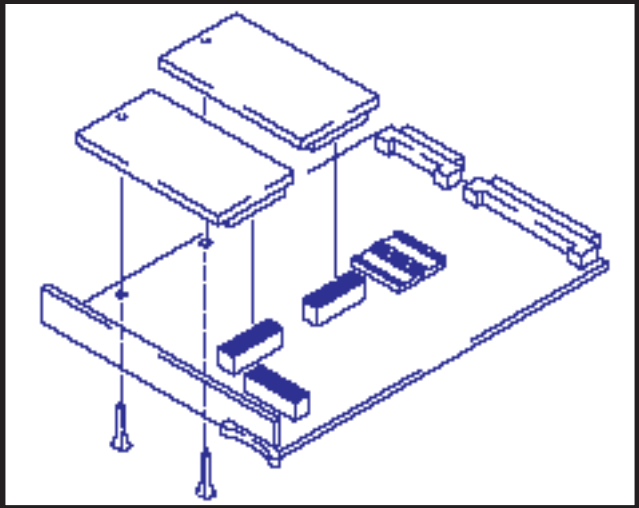
FIGURE 4-16—NRCU MOUNTING

OPTION	S-1 POSITION	OPERATION
1	DIP switches 1 ~ 4: ON	DKT only
2	DIP switches 2 ~ 4: ON DIP switch 1: OFF	DKT with DIU or OCA
3	DIP switches 1, 3, and 4: ON DIP switch 2: OFF	4 DSS
4	DIP switches 1 and 2: OFF DIP switches 3 and 4: ON	8 DSS

option uses one of the two B channels for each circuit to interface up to eight 1000-series digital telephones.

2) OPTION 2; Eight digital telephones with DIU or OCA: this option uses both B channels for each circuit to interface up to eight 1000-series digital telephones; plus each telephone may have an integrated Data Interface Unit (PDIU-DI) or Off-hook Call Announce PCB (DVSU) installed. In addition, this option sup-

4-11
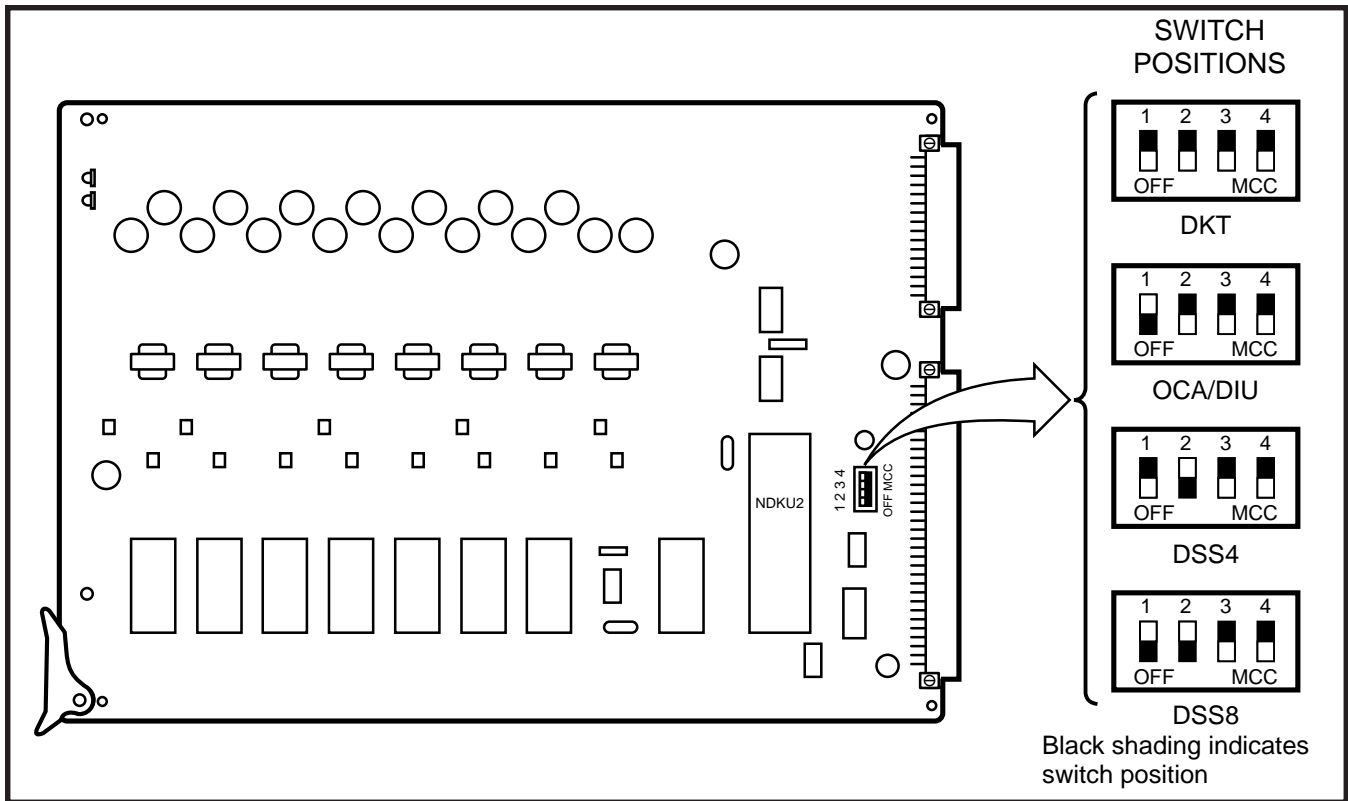
FIGURE 4-17—NDKU SWITCH OPTIONS

ports the Stand-alone Data Interface Unit (PDIU-DS). One B channel for each circuit interfaces a single PDIU-DS. The other B channel of this circuit **cannot** be used. A single PDIU-DS **only** may be installed per each circuit.

3) OPTION 3; Four digital DSS consoles: this option uses one of the B channels for each of the two circuits to interface up to four 1000-series digital DSS consoles.

4) OPTION 4; Eight digital DSS consoles: this option uses both B channels for each of the two circuits to interface up to eight 1000-series digital DSS consoles.

NOTE:

*1. When using option 2 or 4, the next highest number adjacent PCB slot **cannot** be used. For example, if an NDKU is installed in **L01** or **U01**, the PCB slot **L02** or **U02** respectively, must be left vacant.*

2. When using option 4, program the first four DDSSs on circuits 1, 3, 5 and 7 on the NDKU PCB. Program the second four

DDSSs on cirucits 1, 3, 5 and 7 on the adjacent slot next to the NDKU PCB.

3. When using option 4, wire the first four DDSSs to circuits 1, 2, 3 and 4 on the NDKU PCB (these are the NDKU assigned DDSSs) and the second four DDSSs to circuits 5, 6, 7 and 8 (these are the DDSSs assigned to the adjacent slot) on the NDKU PCB.

3.46 The NOCU PCB is installed at a rate of one PCB for each group of eight electronic telephones. There are no strapping options on this PCB. The NOCU is installed in any of the line designated slots **L00 ~ L11** and/or **L15 ~ L26** in PERCEPTION$_e$, and in any designated slots **U00 ~ U31** in PERCEPTION$_{ex}$. If any of the eight circuits is not used for Off-hook Call Announce, the remaining circuits *CANNOT* be used for other electronic telephone assignments.

3.50 NSTU

3.51 Install the NSTU in any of the line designated slots **L00 ~ L11** or **L15 ~ L26** in the PERCEPTION$_e$ system. The designated slots in PERCEPTION$_{ex}$

are **U00 ~ U31**. There are no straps on the PCB for either system.

3.60 NDSU

3.61 Install the NDSU PCB either in the **C00** or **C01** slots or in any of slots **L00 ~ L11** or **L15 ~ L26** in the PERCEPTION$_e$ system. Two NDSUs can be installed in the same cabinet. There are no straps on this PCB. There are no **C** slots resident within the PERCEPTION$_{ex}$ system so NDSU PCB installation will be in any **U** slot .

3.70 NEMU, NCOU, and NLSU

3.71 Trunk PCBs (NEMU, NCOU, and NLSU) may be installed in any **T** slot. Additionally, up to 16 **U** slots may also be used for trunk PCBs.

3.72 There are four circuits on the NEMU PCB, and each circuit has its own set of straps (Figure 4-18). On a circuit-by-circuit basis, strap the PCB as follows:

1) For Type I/II operation:
2) For 2-wire/4-wire connection:

CIRCUIT	STRAPS	OPERATION	
		TYPE I	TYPE II
1	TB 101 TB 102 TB 106		
2	TB 201 TB 202 TB 206	1 ~ 2	2 ~ 3
3	TB 301 TB 302 TB 306		
4	TB 401 TB 402 TB 406		

3) For 600-/900-ohm operation:

CIRCUIT	STRAPS	CONNECTION	
		2-WIRE	4-WIRE
1	TB 103 TB 107		
2	TB 203 TB 207	2 ~ 3	1 ~ 2
3	TB 303 TB 307		
4	TB 403 TB 407		

CIRCUIT	STRAPS	OPERATION	
		600 ohm	900 ohm
1	TB 104 TB 105		
2	TB 204 TB 205	A ~ B	B ~ C
3	TB 304 TB 305		
4	TB 404 TB 405		

3.73 The NCOU PCBs have Ground-/Loop-start, 600/900-ohm termination, and 2dB pad strap selections that must be made before they are installed (Figure 4-19).

1) Each NCOU circuit is individually strapped for either Ground Start or Loop Start operation. The strapping location and options for each circuit are shown as follows:

CIRCUIT	STRAPS	OPERATION			
		GND ST		LP ST	
		Extend	No Extend	Normal	Reverse
1	TB 104				
2	TB 204	B ~ C	D ~ E	C ~ D	A ~ B
3	TB 304				
4	TB 404				

NOTES:
1. The GROUND START "EXTEND/NO EX-TEND" options refer to "loop extenders" on long trunk loops. If a battery boost is used on the trunk, select EXTEND, otherwise NO EXTEND should be selected.
2. The LOOP START "NORMAL/REVERSE" options refer to the system's ability to detect a pre-ring supervision signal in the form of a battery polarity reversal on the CO TIP and RING.
   - If NORMAL is selected, the system will not be sensitive to CO trunk polarity.
   - If REVERSE is selected, the CO circuit will be "made busy" when the CO reverses polarity prior to ringing on an incoming call.

2) Determine the proper impedance for each trunk and then strap its NCOU circuit for either 600- or 900-ohm operation. Install the short-
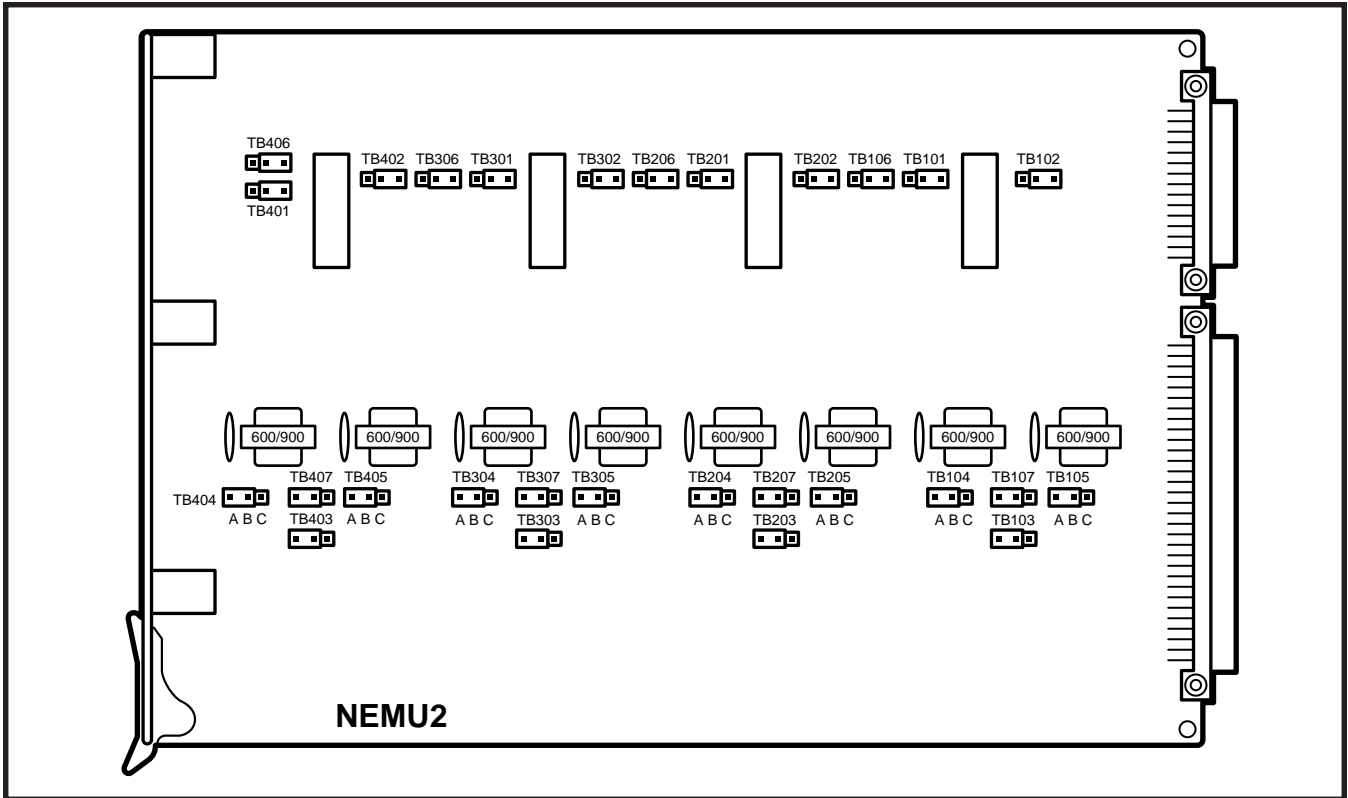
FIGURE 4-18—NEMU STRAPPING
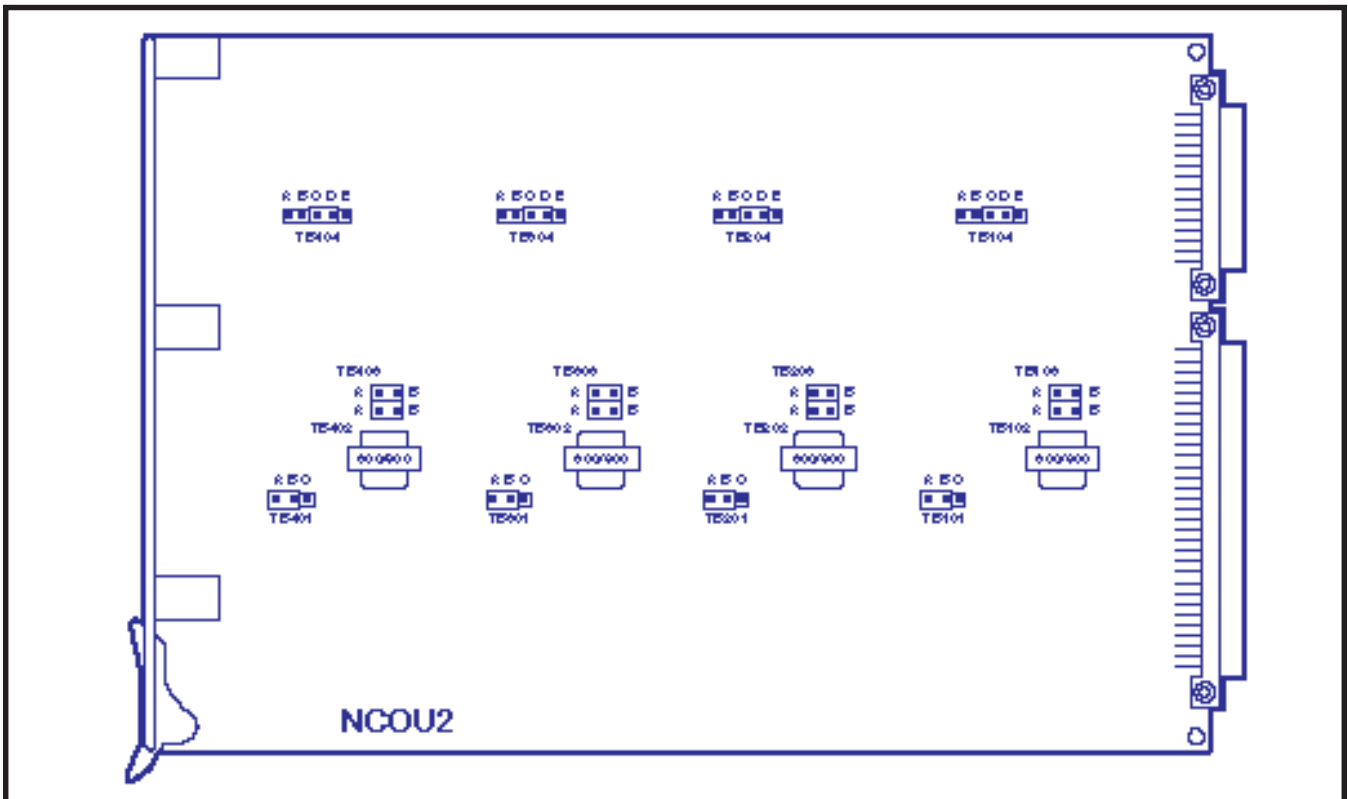
FIGURE 4-19—NCOU STRAPPING

ing bar across the center pin and the outer pin labeled either 600 or 900 at each strapping location (Figure 4-19). Each circuit's strapping location is shown as follows:

3) In some installations, particularly those near the serving Central Office, noise may be intro-

CIRCUIT	STRAPS	OPERATION	
		600 ohm	900 ohm
1	TB 101		
2	TB 201	A ~ B	B ~ C
3	TB 301		
4	TB 401		

sidetone at the telephone. In such situations, a 2dB pad can be inserted into the line to reduce the sidetone. The following table shows the strapping position for each circuit to either insert or remove the 2dB pad.

3.74 Three separate strappings must be made for each of the four circuits on the NLSU PCB (Figure

CIRCUIT	STRAPS	OPERATION	
		OPEN	2 dB PAD
1	TB 102	A ~ B	
	TB 103		A ~ B
2	TB 202	A ~ B	
	TB 203		A ~ B
3	TB 302	A ~ B	
	TB 303		A ~ B
4	TB 402	A ~ B	
	TB 403		A ~ B

1) Determine the proper impedance for the trunk line to be used, and then set the 600-ohm/900-ohm loop termination for each circuit as follows:

2) When the CO distance exceeds 2,000-ohm

CIRCUIT	STRAPS	OPERATION	
		600 ohm	900 ohm
1	TB 101		
2	TB 201	A ~ B	B ~ C
3	TB 301		
4	TB 401		

ing should be used. For a distance of less than 2,000-ohm loop resistance, use Loop Dial Pulsing. Strap each circuit as follows:

3) Each NLSU circuit must be adjusted for CO

CIRCUIT	STRAPS	OPERATION	
		BAT-GND DP	LOOP DP
1	TB 103	A ~ B	B ~ C
2	TB 203		
3	TB 303	E ~ F	D ~ E
4	TB 403		

tion of incoming digits. Each circuit adjustment is made by strapping as follows:

NOTE:

CIRCUIT	STRAPS	OPERATION		
		LEAST	MID	MOST
1	TB 102			
2	TB 202	c ~ d	b ~ c	a ~ b
3	TB 302			
4	TB 402			

appropriate CO distance strapping (step 2) has been made. The CO trunk loop resistance values are arbitrary and are used as an initial strapping guide. If the incoming digits are not being detected properly, move the strap to the next most sensitive position and test again for proper operation.

3.80 NDTU

3.81 A maximum of two NDTU PCBs (Figure 4-21) may be installed. The system must be equipped with an NTWU-3 to ensure proper operation of the NDTU. The NDTU is connected to the telco through a customer-supplied Channel Service Unit (CSU). A separate CSU is required for each NDTU. Each NDTU has 11 DIP switches and 8 strapping options, which must be verified before installation.

NOTE:
The factory-default switch settings and strapping options are indicated by an asterisk (*).

1) Select the desired operating mode using mode selection switch **S1** (4-element DIP switch) as follows:
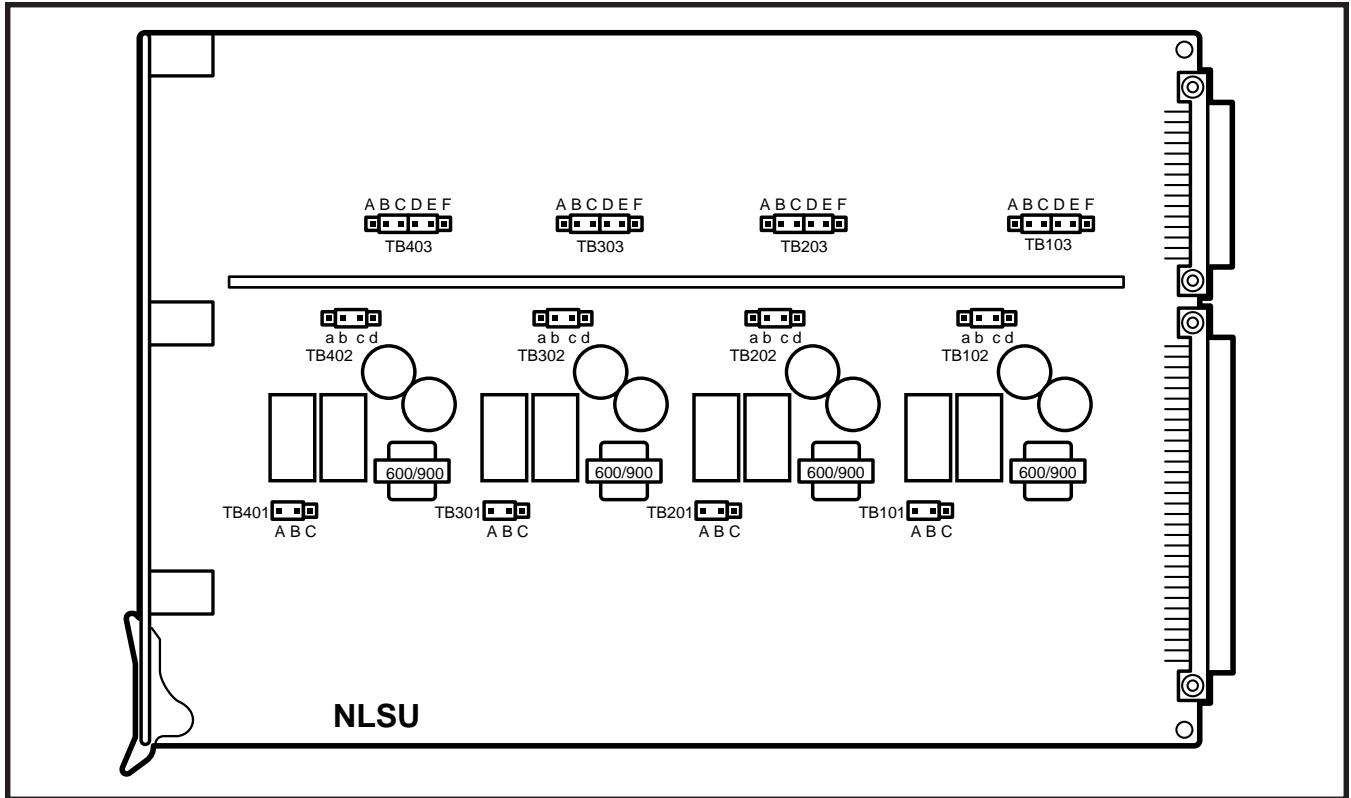
FIGURE 4-20—NLSU STRAPPING
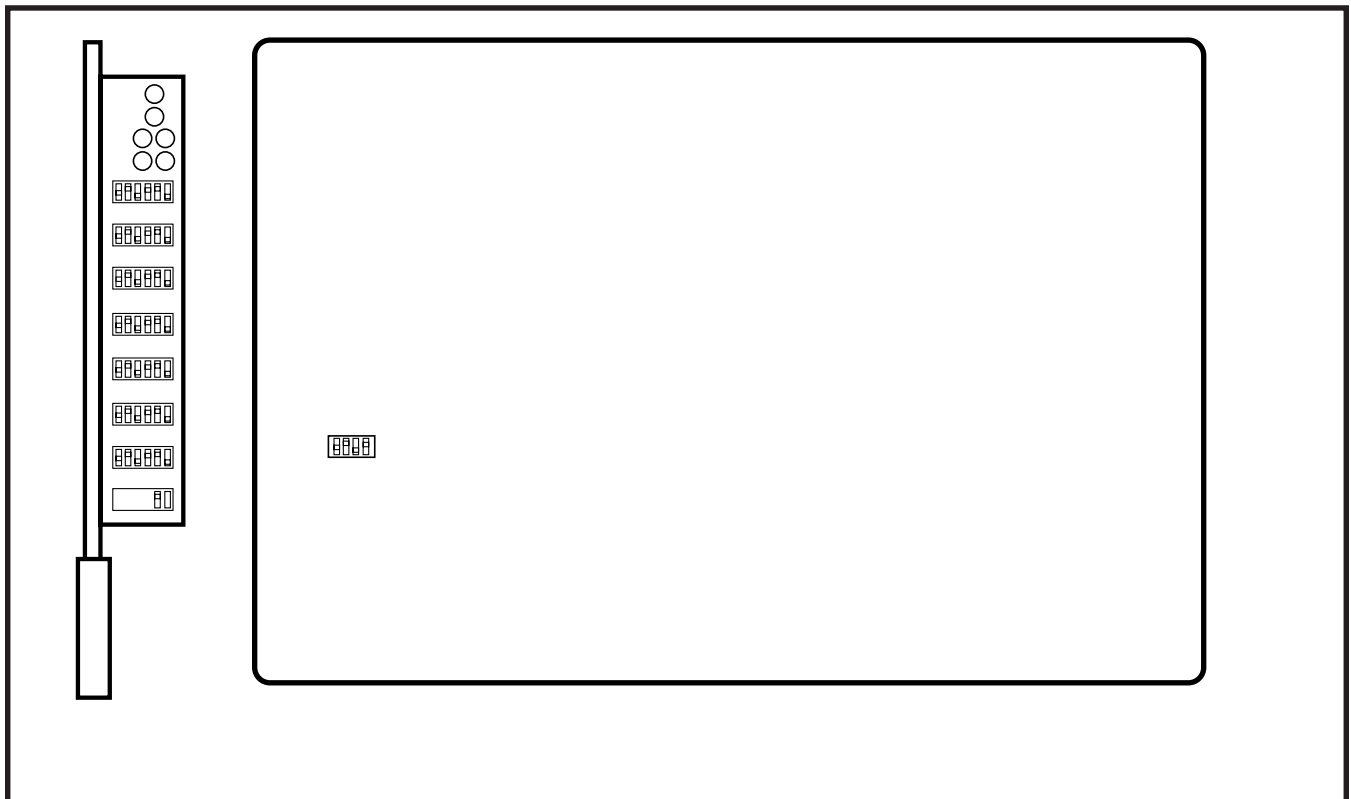
FIGURE 4-21—NDTU STRAPPING

ping options are indicated by an asterisk (*).

ELEMENT	POSITION	MODE
s1	ON *	12 Multi (Robbed bit signaling)
s1	OFF	24 Multi (Common channel signaling)
s2	ON	Zero Code Suppression (ZCS)
s2	OFF*	Binary Eight Zero Suppression (B8ZS)
s3	ON	DMI Bit Oriented Signaling format (Note 1)
s3	OFF*	Normal Operation
s4	Not used	

selection switch **S1** (4-element DIP switch) as follows:

NOTE:
Digital Multiplexed Interface BOS.

2) Determine the proper transmit equalizer setting; either short (0 ~ 150 feet), medium (150 ~ 450 feet), or long (450 ~ 655 feet); then

ELEMENT	SETTING		
	SHORT*	MEDIUM	LONG
s1	ON	OFF	OFF
s2	OFF	ON	OFF
s3	OFF	OFF	ON
s4	OFF	ON	OFF
s5	OFF	OFF	ON
s6	OFF	ON	OFF
s7	OFF	OFF	ON
s8	Not used		

equalizer setting switch **S2** (8-element DIP switch) as follows:

3) The NDTU is installed in the T00 slot. A second NDTU may be installed in the T08 slot. Each NDTU provides a maximum of 24 channels, divided into groups consisting of four channels each. The first group would fill trunk slot T00, the second T01 with the remaining four groups occupying trunk slots T02 ~ T05 for a total of six groups. For example, if eight channels are active on the NDTU then slots T00 and T01 are active i.e., no PCB may be installed in slot T01. However, PCBs may be installed in slots T02 ~ T05. Enable the appro-

ELEMENT	POSITION	CHANNELS	SLOT POSITION	
			MAIN	EXPANSION
s1	ON*	1 ~ 4	T00	T08
s1	OFF	1 ~ 4	T00	T08
s2	ON*	5 ~ 8	T01	T09
s2	OFF	5 ~ 8	T01	T09
s3	ON*	9 ~ 12	T02	T10
s3	OFF	9 ~ 12	T02	T10
s4	ON*	13 ~ 16	T03	T11
s4	OFF	13 ~ 16	T03	T11
s5	ON*	17 ~ 20	T04	T12
s5	OFF	17 ~ 20	T04	T12
s6	ON*	21 ~ 24	T05	T13
s6	OFF	21 ~ 24	T05	T13

priate channels using slot enable/disable switch **S3** (6-element DIP switch) as follows:

NOTE:
*Set switch element to **ON** to enable associated digital trunk channels; **OFF** to disable channels.*

4) Signaling modes are individually selectable for each active channel. Determine the appropriate signaling mode for each channel; either CO (Loop Start) mode, CO (Ground Start) mode, DID (2-wire loop signaling), or TIE trunk (Type II 4-wire E&M) mode; then assign the selected signaling modes using signaling type selection switches **S4 ~ S11** (6-element DIP switches) see Loop/Ground Start Mode.

5)

STRAPS	ROM TYPE	
	64K BIT	256K BIT
TB1 and TB2	1 ~ 2*	2 ~ 3

type, either 64 Kbit or 256 Kbit, using the strappings shown below.

6) When configured for normal operation, the NDTU is in the slave mode, and the central office serves as the master clock. For CO testing purposes, the NDTU may be config-

STRAPS	OPERATING MODE		LOOPBACK OPTION	
	SLAVE	MASTER	MASTER	SLAVE
TB3 and TB4	1 ~ 2*	2 ~ 3		
TB5 and TB6			1 ~ 2	2 ~ 3*

Loop/Ground Start Mode

CHANNEL	SWITCH	ELEMENT	MODE CO (Loop)	CO (Ground)	DID	TIE
CH1	S4	s1	OFF	ON	ON	OFF
		s2	OFF	ON	OFF	ON
CH2	S4	s3	OFF	ON	ON	OFF
		s4	OFF	ON	OFF	ON
CH3	S4	s5	OFF	ON	ON	OFF
		s6	OFF	ON	OFF	ON
CH4	S5	s1	OFF	ON	ON	OFF
		s2	OFF	ON	OFF	ON
CH5	S5	s3	OFF	ON	ON	OFF
		s4	OFF	ON	OFF	ON
CH6	S5	s5	OFF	ON	ON	OFF
		s6	OFF	ON	OFF	ON
CH7	S6	s1	OFF	ON	ON	OFF
		s2	OFF	ON	OFF	ON
CH8	S6	s3	OFF	ON	ON	OFF
		s4	OFF	ON	OFF	ON
CH9	S6	s5	OFF	ON	ON	OFF
		s6	OFF	ON	OFF	ON
CH10	S7	s1	OFF	ON	ON	OFF
		s2	OFF	ON	OFF	ON
CH11	S7	s3	OFF	ON	ON	OFF
		s4	OFF	ON	OFF	ON
CH12	S7	s5	OFF	ON	ON	OFF
		s6	OFF	ON	OFF	ON
CH13	S8	s1	OFF	ON	ON	OFF
		s2	OFF	ON	OFF	ON
CH14	S8	s3	OFF	ON	ON	OFF
		s4	OFF	ON	OFF	ON
CH15	S8	s5	OFF	ON	ON	OFF
		s6	OFF	ON	OFF	ON
CH16	S9	s1	OFF	ON	ON	OFF
		s2	OFF	ON	OFF	ON
CH17	S9	s3	OFF	ON	ON	OFF
		s4	OFF	ON	OFF	ON
CH18	S9	s5	OFF	ON	ON	OFF
		s6	OFF	ON	OFF	ON
CH19	S10	s1	OFF	ON	ON	OFF
		s2	OFF	ON	OFF	ON
CH20	S10	s3	OFF	ON	ON	OFF
		s4	OFF	ON	OFF	ON
CH21	S10	s5	OFF	ON	ON	OFF
		s6	OFF	ON	OFF	ON
CH22	S11	s1	OFF	ON	ON	OFF
		s2	OFF	ON	OFF	ON
CH23	S11	s3	OFF	ON	ON	OFF
		s4	OFF	ON	OFF	ON
CH24	S11	s5	OFF	ON	ON	OFF
		s6	OFF	ON	OFF	ON

the appropriate operating mode using the strapping options shown below.

7) In some installations, particularly those near the serving Central Office, noise may be introduced over the CO trunk that will appear as sidetone at the telephone. In such situations, a 2dB pad can be inserted into the line, for

STRAPS	OPERATION INCOMING		OUTGOING	
	OPEN	2dB PAD	OPEN	2dB PAN
TB7	1 ~ 2^	2 ~ 3		
TB8			1 ~ 2^	2 ~ 3

reduce the sidetone. Strapping options for the 2dB pad are shown below.

8) Install the NDTU in the T00 slot in the main cabinet. If applicable, install a second NDTU in the T08 slot. Connect the NDTU to the CSU using the Toshiba-supplied cable.

9) The NDTU contains an on-board 12.288 MHz clock used to synchronize the NDTU with the NTWU-3. Connect a coaxial clock cable from NDTU connector **J3** to NTWU connector **J2**.

3.90 NMDU and NDCU

3.91 The NMDU (Figure 4-22) must be strapped for operation with either a one-pair or two-pair

CIRCUIT	STRAPS	OPERATION One-pair	Two-pair
1	TB 501 TB 502	B ~ C	A ~ B
2	TB 601 TB 602		
3	TB 701 TB 702		
4	TB 801 TB 802		

modem connection. The two strapping positions for each modem are shown below.

3.92 To change the strap positions on TB 801/802 it is necessary to lift the small piggy-back PCB off the NMDU. Replace the PCB once the straps have been changed.
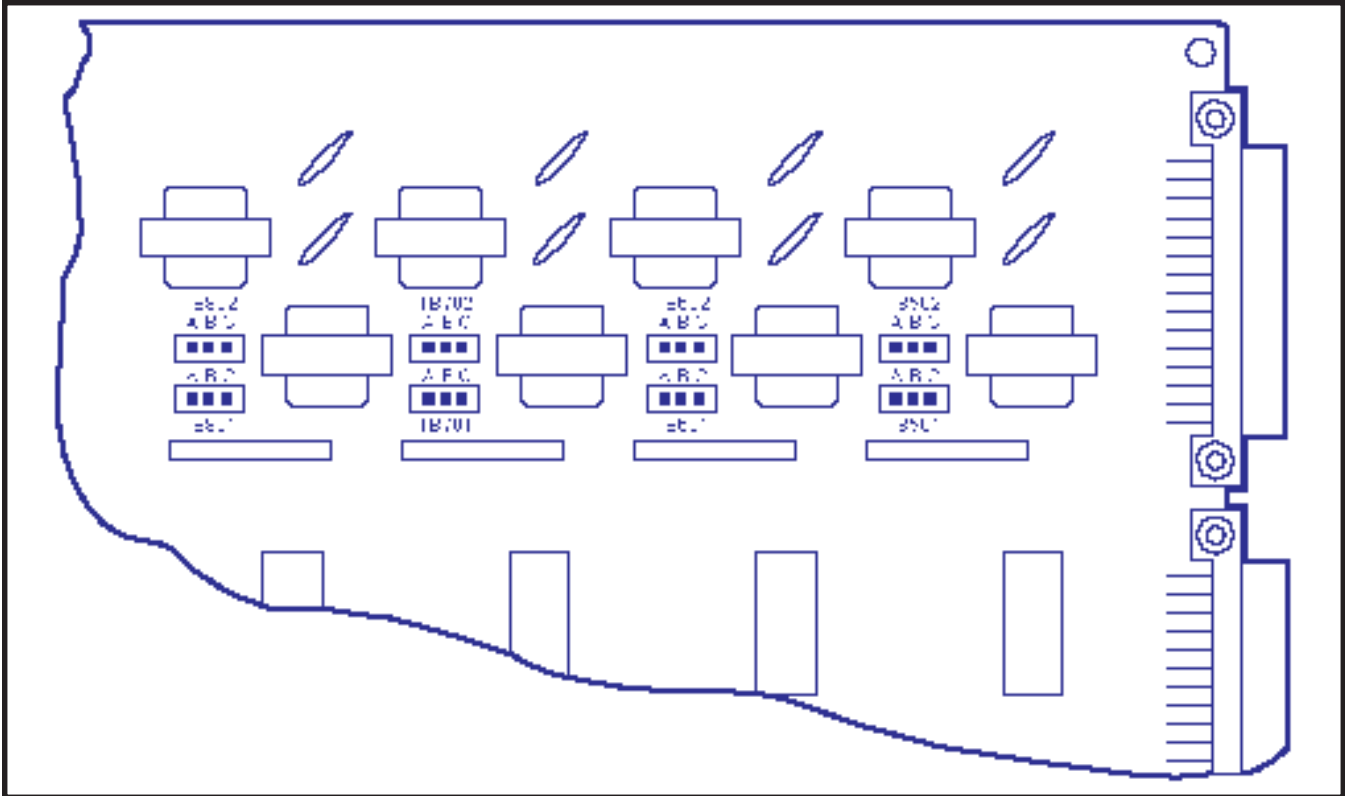
FIGURE 4-22—NMDU STRAPPING

3.93 If any of the first four NMDU circuits are not used for Modem Pooling, the corresponding DDIU circuit may be used for a DDIU (-MA or -MAT) connection. Use the **DDIU Program** in Section **200-255-300**, *Programming*, to assign the desired port (1 ~ 4) on the NMDU.

3.94 The NDCU PCB is installed at a rate of one PCB for each group of eight DDIUs. There are no strapping options on this PCB.

NOTE:
The NMDU and NDCU PCBs are not used with the PDIUs. PDIUs use the NDKU PCB.

4. CABLE CONNECTIONS

4.00 All connections to the system are made on the rear of the basic and expansion cabinets and on the Power Failure Transfer Unit. Cables with standard male 25-pair amphenol-type connectors are used for everything except the TTY, SMDR and MODEM connectors (which require male RS-232C DB25-pin connectors).

4.01 Detailed connection information for each cable is shown in Chapter 5.

IMPORTANT!
Note the station, trunk, DSS console, and DDIU/PDIU connections are identified by the PCB location and circuit number on that PCB. These numbers combine to form a Port Number and are used in the programming section as the station, DSS console, or trunk circuit's identifier when directory numbers and features are assigned.

4.02 Determine the station and DSS console (or

PCB LOCATION	PCB CIRCUIT	PORT NO.
P_c L00 ~ L26 or C00	1 ~ 8	
P_x U00 ~ U31	1 ~ 8	
Example: L01	2	L012

data) port numbers as follows (DSS consoles assigned to L or U slots use circuits 1, 3, 5, & 7):

PCB LOCATION	PCB CIRCUIT	PORT NO.
P₆ T00 ~ T15	1 ~ 4	
P₆ₓ T00 ~ T15 U00 ~ U31	1 ~ 4	
Example: T02	3	T023

4.03 Determine trunk port numbers as follows:

5. ELECTRONIC TELEPHONE STATION EQUIPMENT INSTALLATION

5.00 Electronic Telephone Connections

5.01 See the **DEKT Program** in Section **200-255-300**, *Programming*, for instructions on programming electronic telephones. The system must be told which type of electronic telephone (10- or 20-button, LCD) and what button assignment is required.

5.02 Electronic telephones are connected to the MDF via standard twisted-pair jacketed telephone cable. (Two-pair wiring is required; however, 3-pair wiring is strongly recommended to permit future upgrades, such as data, etc.) To accommodate the electronic telephone line cord, terminate the cable in a modular station connector block (RJ25) at the station location. The standard modular electronic telephone cord length is 7 feet (the maximum allowed length is 25 feet).

5.03 The overall length of the electronic telephone cable run from equipment cabinet to phone must not exceed 1,000 feet (305 M), 24 AWG cable.

IMPORTANT!
When installing the electronic telephone cable, do not run parallel to and within 3 feet of an AC power line. Such power lines should be crossed at right angles (90°) only.

5.04 Electronic telephone connection details are shown in Figure 4-23.

5.10 Electronic Telephone Wall Mounting

5.11 All electronic telephones are wall-mounted in the same manner, and they may be mounted on a wall or any other flat, vertical surface to which the base can be secured. When selecting the mounting site, consider the electronic telephone's weight and the additional stresses to which the mounting will be subjected.

5.12 Loosen the four captive screws securing the electronic telephone's base, and remove the base (Figure 4-24).

5.13 Using a cutter, remove the handset hanger from the base. Insert the handset hanger in the slot provided on the front of the telephone (Figure 4-25). The hanger fits in the notch on the handset.

5.14 Rotate the mounting base 180° and secure to the telephone with the four captive screws (Figure 4-26).

5.15 Connect the electronic telephone to the wall modular connector with a short cord (approximately 3 inch length). Route the cord into the hollow portion of the base, then mount the electronic telephone on the wall mounting connector. Test each electronic telephone using the **TTRM Program**, Section **200-255-300**, *Programming*.

5.20 Off-hook Call Announce

5.21 The Off-hook Call Announce (OCA) feature enables an electronic telephone to originate and receive voice announcement when the station's handset is off-hook. Standard telephones can originate off-hook call announces, however, it cannot receive them. A station user is allowed or denied the ability to originate the Off-hook Call Announce feature in the **DCOS Program**. In order to receive the Off-hook Call Announce feature, PCBs are required to be installed in each affected electronic telephone and the cabinet.

5.22 A PCB called NOCU is required to be installed in the cabinet. Each NOCU provides eight Off-hook Call Announce circuits. This PCB takes up a station slot. Therefore, for each NOCU installed, station capacity is decreased by eight stations.

5.23 HVSU and HVSI PCBs inside a 6500-series electronic telephone allow the electronic telephone
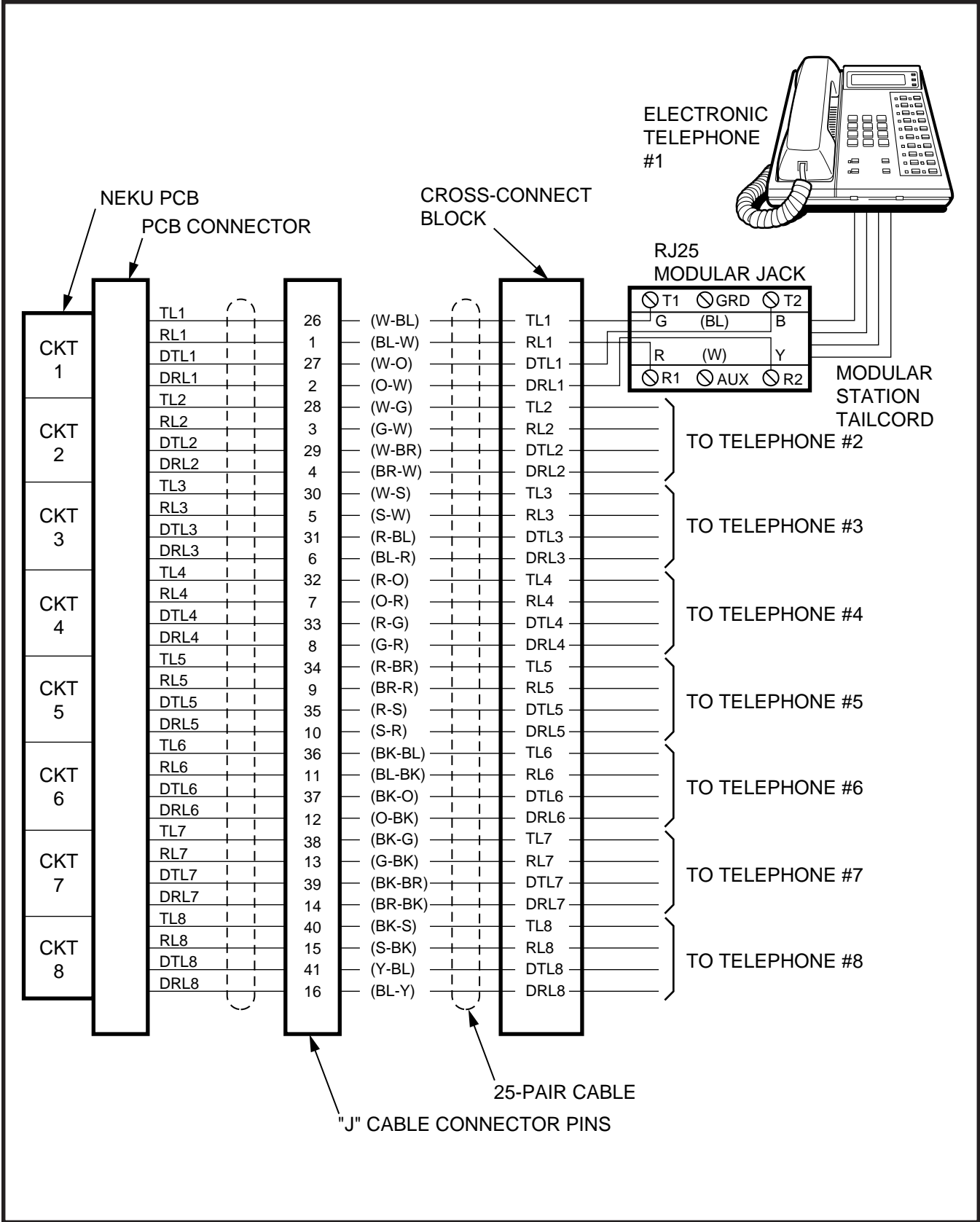
FIGURE 4-23—ELECTRONIC TELEPHONE CONNECTION
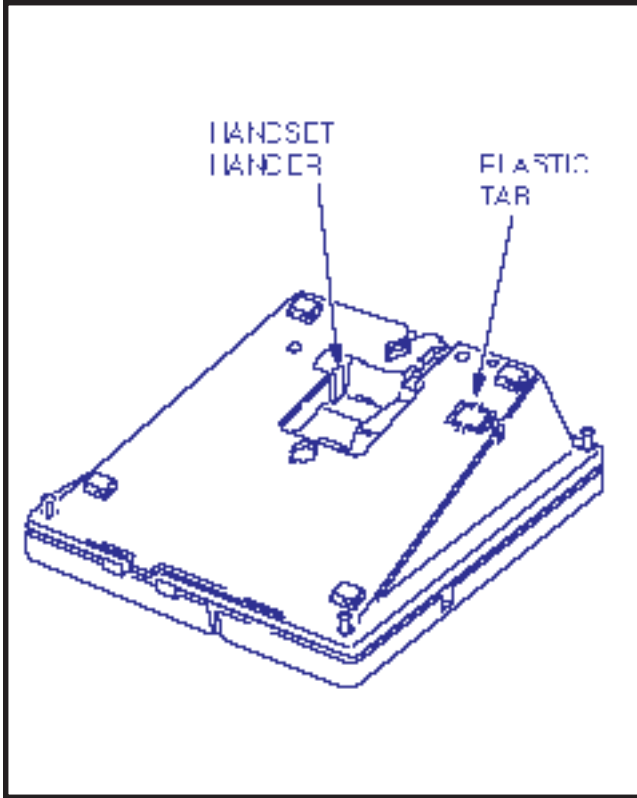
**FIGURE 4-24—REMOVAL OF
ELECTRONIC TELEPHONE BASE**
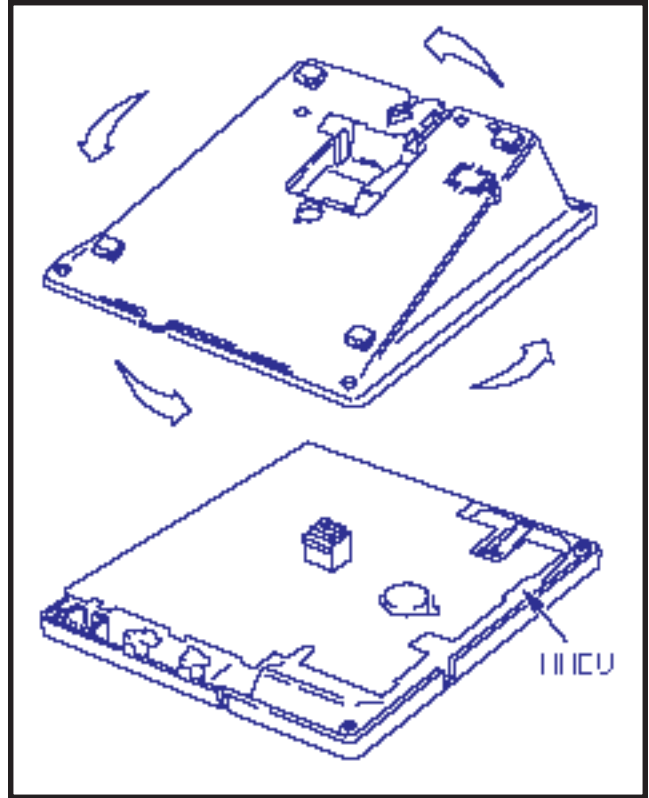
**FIGURE 4-26—INSTALLATION OF
MOUNTING BASE FOR WALL-MOUNT INSTALLATION**
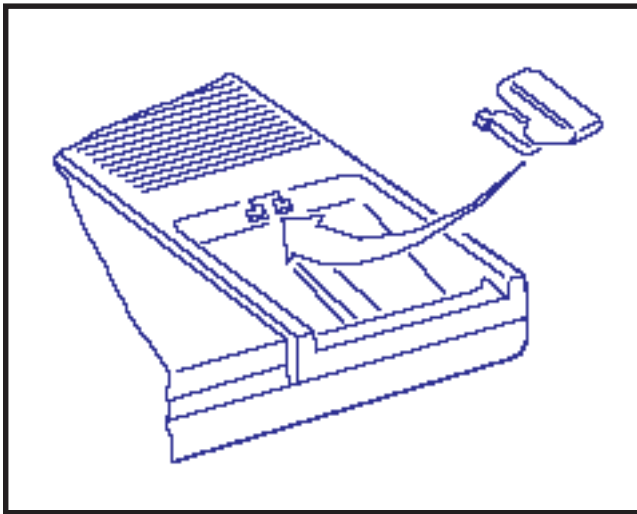
FIGURE 4-25—REMOVAL OF HANDSET HANGER

to receive the Off-hook Call Announce feature.

NOTE:
It is not recommended to equip electronic telephones with both Off-hook Call Announce and the headset option at the same time.

5.24 The installation of the HVSU/HVSI PCBs has

to be done in accordance with the following steps:

1) Remove the base as described in Paragraph **5.12**.

   NOTE:
   Exercise care when assembling the HVSU PCB to the HVSI PCB to prevent damage to the connector pins.

2) Align the P5 connector on the HVSI PCB with its receptacle on the HVSU PCB (Figure 4-27). Apply firm, even pressure to the PCBs to ensure that the connectors mate properly (they click when mated properly).

3) Position the HVSU/HVSI assembly on the standoffs inside the base, and secure with the two screws provided.

4) Connect the HVSU/HVSI PCBs to the electronic telephone PCB as shown in Figure 4-28.

5) Reinstall the electronic telephone base and
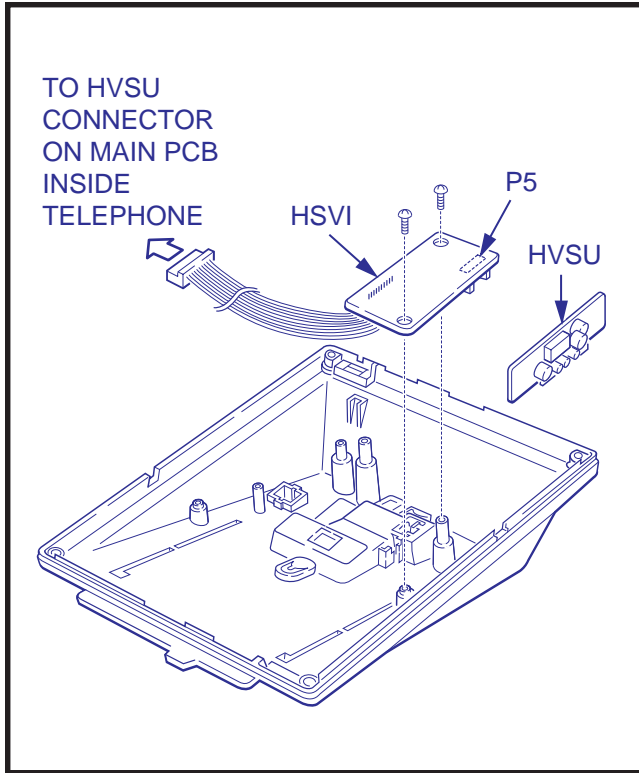
FIGURE 4-27—HVSI/HVSU INSTALLATION
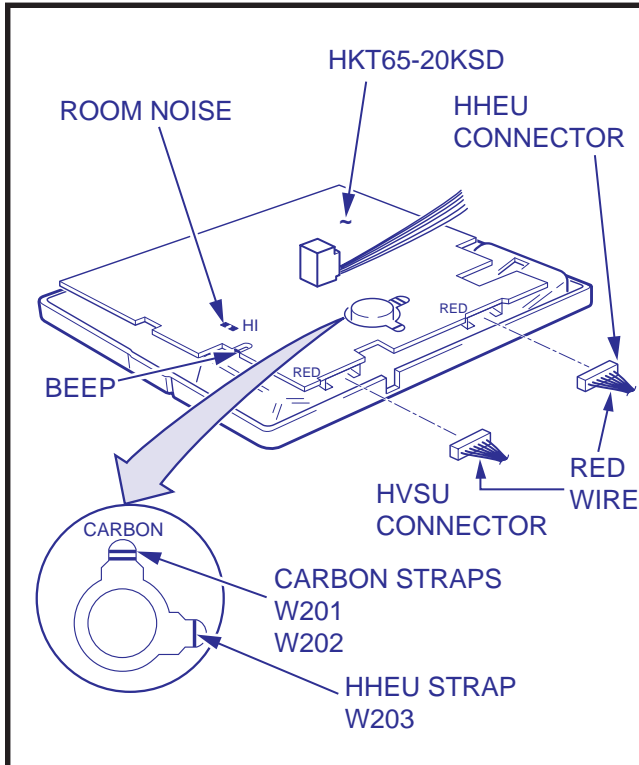
**FIGURE 4-28
ELECTRONIC TELEPHONE PCB CONNECTIONS**

secure it with its four captive screws.

5.25 Two pairs of the provided 3-pair modular line connector connect the electronic telephone to the DEKT port, and the other pair connects it to the NOCU PCB.

5.26 NOCU connection details are shown in Figure 4-29.

5.30 Carbon Handset Transmitter Installation

5.31 If a customer-supplied carbon-type handset is used with the 6500-series electronic telephone, it is necessary to cut two jumper straps located on the main PCB inside the telephone. Cut the jumpers as follows:

5.32 Loosen the four captive screws securing the electronic telephone's base, and remove the base (Figure 4-24).

5.33 Locate the two carbon straps **W201** and **W202** (Figure 4-30). Cut both straps.

5.34 Cut the **W401** strap for proper LCD functions in **A.05** (and below) software.

5.35 Reinstall the electronic telephone's base and secure using the four captive screws.

5.36 Remove the Toshiba handset and connect the carbon-type handset.

5.40 HHEU Installation

5.41 The HHEU option provides the interface and control for a customer-supplied headset.

5.42 Loosen the four captive screws securing the electronic telephone's mounting base, and remove the base as shown in Figure 4-24.

5.43 Using a screwdriver or other suitable tool, remove the plastic access tab located on the back of the mounting base (Figure 4-31). The HHEU modular connector is accessed through this opening.

5.44 Set **HEADSET/EXT IO** switch **SW601** on the HHEU PCB (Figure 4-32) to the **HEADSET**

4-23

NOCU PCB			CROSS-CONNECT BLOCK					
CKT 1	TL1	26	(W-BL)	TL1	*			
	RL1	1	(BL-W)	RL1				
CKT 2	TL2	28	(W-G)	TL2	*	} TO EKT #2		
	RL2	3	(G-W)	RL2				
CKT 3	TL3	30	(W-S)	TL3	*	} TO EKT #3		
	RL3	5	(S-W)	RL3				
CKT 4	TL4	32	(R-O)	TL4	*	} TO EKT #4		
	RL4	7	(O-R)	RL4				
CKT 5	TL5	34	(R-BR)	TL5	*	} TO EKT #5		
	RL5	9	(BR-R)	RL5				
CKT 6	TL6	36	(BK-BL)	TL6	*	} TO EKT #6		
	RL6	11	(BL-BK)	RL6				
CKT 7	TL7	38	(BK-G)	TL7	*	} TO EKT #7		
	TL8	13	(G-BK)	RL7				
CKT 8	RL7	40	(BK-S)		*	} TO EKT #8		
	RL8	15	(S-BK)					

"J" CABLE CONNECTOR PINS

25-PAIR CABLE

* CORRECT POLARITY

EKT WITH HVSU

3 PAIR:
2 PAIR FOR EKT
1 PAIR FOR OCA

R   G

BL   W

Y   B

RJ-25
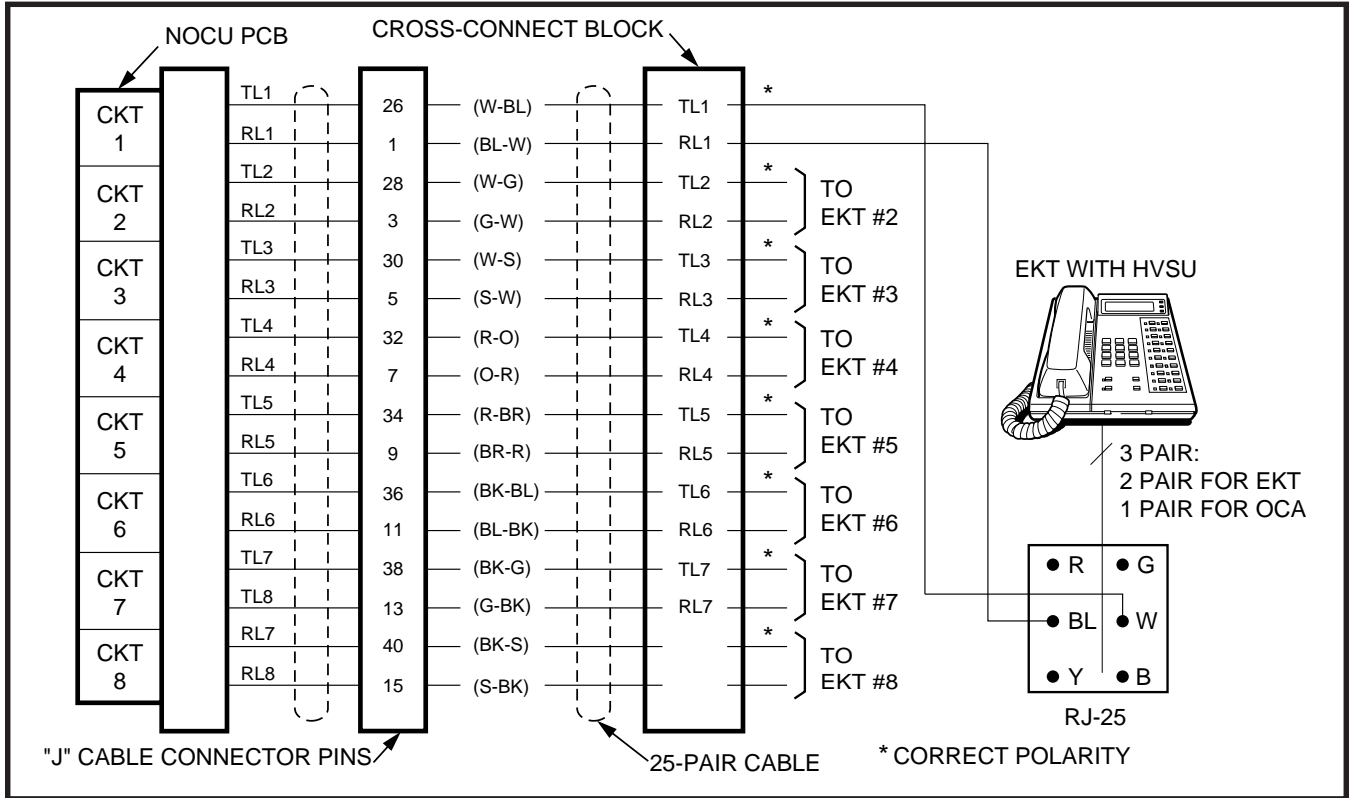
FIGURE 4-29—OFF-HOOK CALL ANNOUNCE CONNECTION (NOCU)
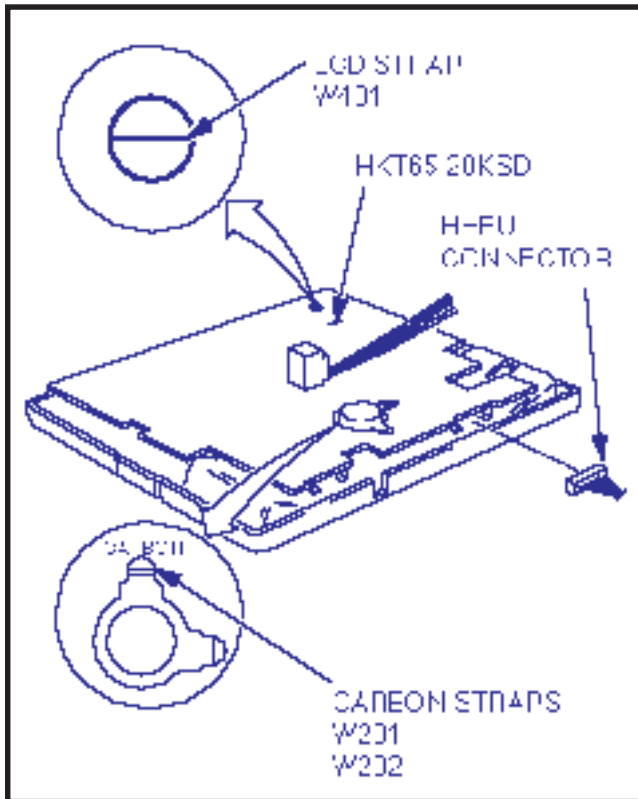
FIGURE 4-30—LOCATION OF CARBON STRAPS
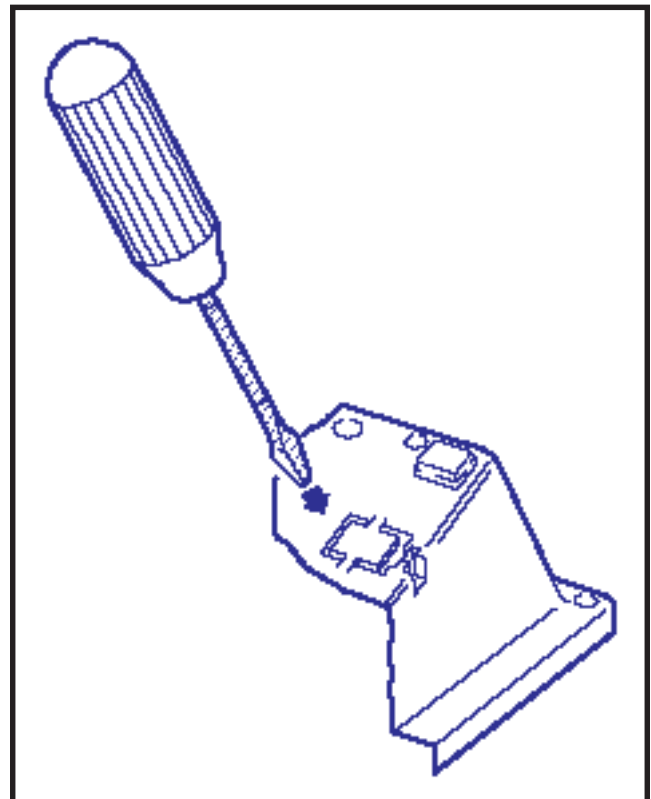
**FIGURE 4-31—REMOVAL OF
HHEU MODULAR CONNECTOR ACCESS TAB**
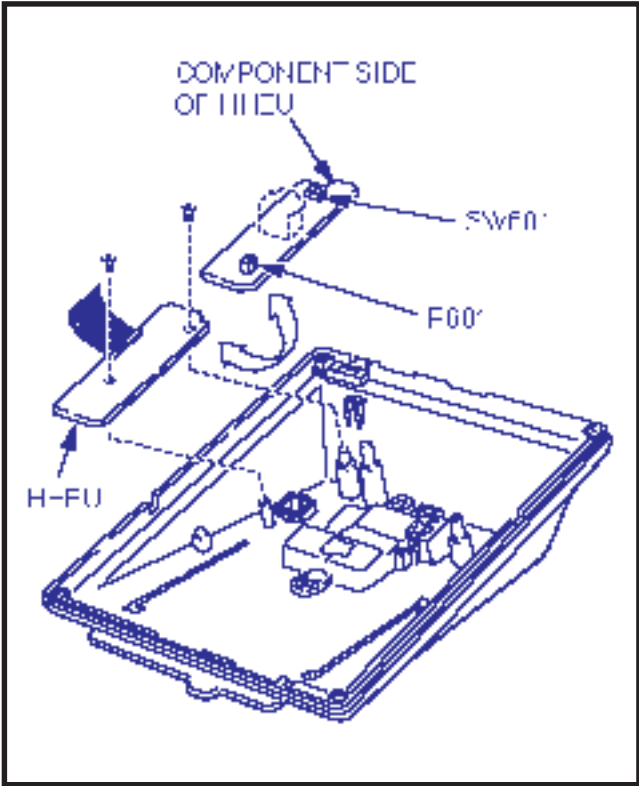
FIGURE 4-32—INSTALLATION OF
HHEU UPGRADE OPTION

position.

5.45 Position the HHEU PCB on the standoffs inside the mounting base, and secure in place using the two screws provided.

5.46 Connect the HHEU PCB to the electronic telephone PCB (Figure 4-30).

5.47 Connect the headset modular cord through the access hole created in Paragraph **5.43** of this procedure.

5.48 Reinstall the electronic telephone's base and secure in place using the four captive screws.

5.50 Attendant Console Connection

5.51 The attendant console is connected to the MDF via an industry-standard 25-pair cable equipped with a female amphenol-type connector at the console location.

5.52 Connection details for the attendant console(s) are shown in Figures 4-33 and 4-34.
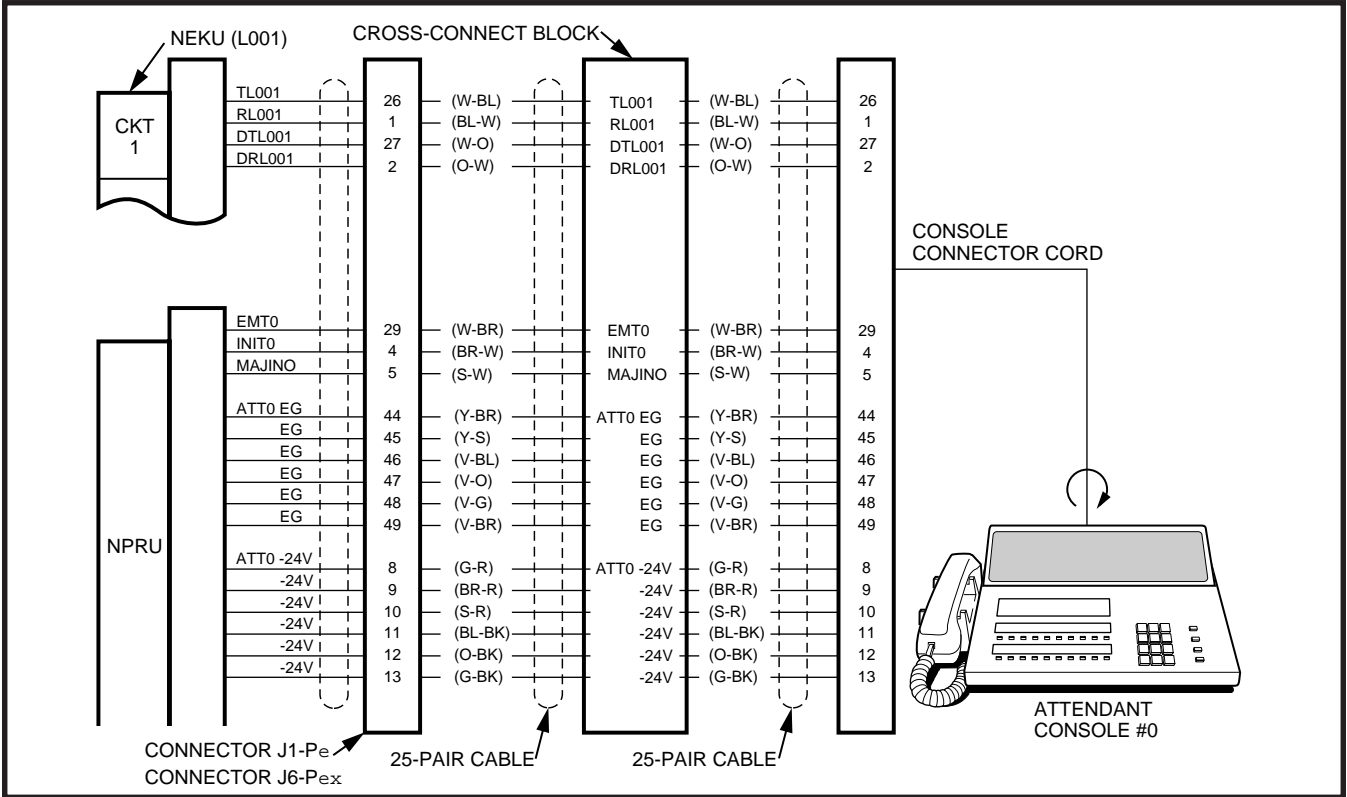
FIGURE 4-33—ATTENDANT CONSOLE #0 CONNECTION
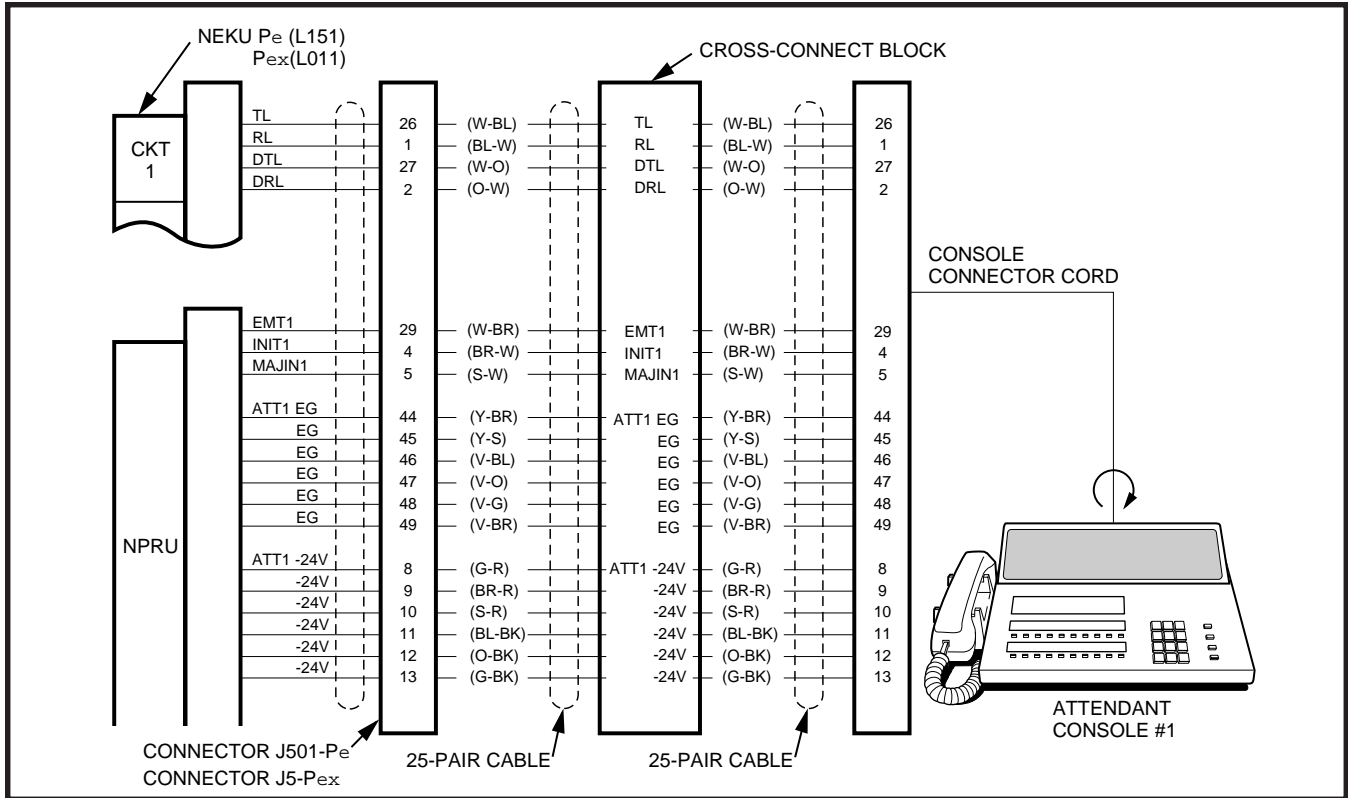
FIGURE 4-34—ATTENDANT CONSOLE #1 CONNECTION

5.53 Each attendant console requires a port on an NEKU PCB to provide a speech path. The NEKUs must be installed as follows:

PERCEPTION$_e$
Att#0-PCB position **L00** Circuit **#1**
Att#1-PCB position **L15** Circuit **#1**

PERCEPTION$_{ex}$
Att#0-PCB position **L00** Circuit **#1**
Att#1-PCB position **L01** Circuit **#1**

> NOTE:
> **DO NOT** cross connect an electronic telephone with either of these ports if the associated attendant console is installed.

5.60 DSS Console Connections

5.61 See the **DSS Program** in Section **200-255-300**, *Programming*, to input information concerning the electronic DSS consoles.

5.62 The DSS console must be positioned adjacent to an electronic telephone (preferably an LCD model). DSS consoles use 2-pair wiring and are connected to the MDF via standard twisted-pair telephone cables. The console connection is made using only the data pair. An RJ25 modular connector should be attached to the instrument-end of the telephone cable to permit connection to the DSS console.

5.63 The overall length of the DSS console cable run from the equipment cabinet must not exceed 500 feet (152.5 M), 24 AWG cable.

> ***IMPORTANT!***
> ***When installing the DSS console cable, do not run parallel to and within 3' of an AC power line. Such power lines should be crossed at right angles (90°) only.***

5.64 DSS console(s) connection details are shown in Figures 4-35 and 4-36, PERCEPTION$_e$ and $_{ex}$, respectively.

5.70 Digital Data Interface Unit Connections (DDIU)
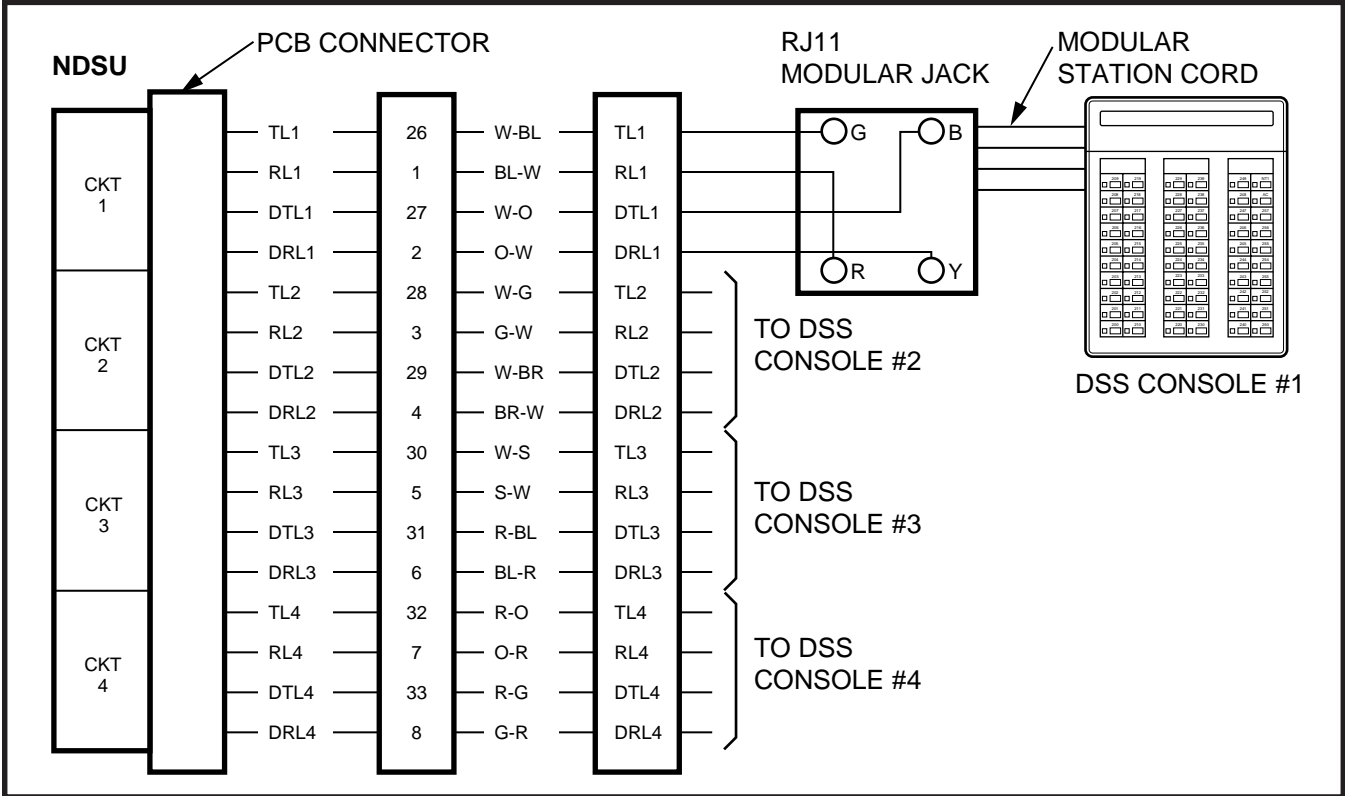
FIGURE 4-35—DSS CONSOLE CONNECTION FOR PERCEPTION$_e$ "C" SLOT
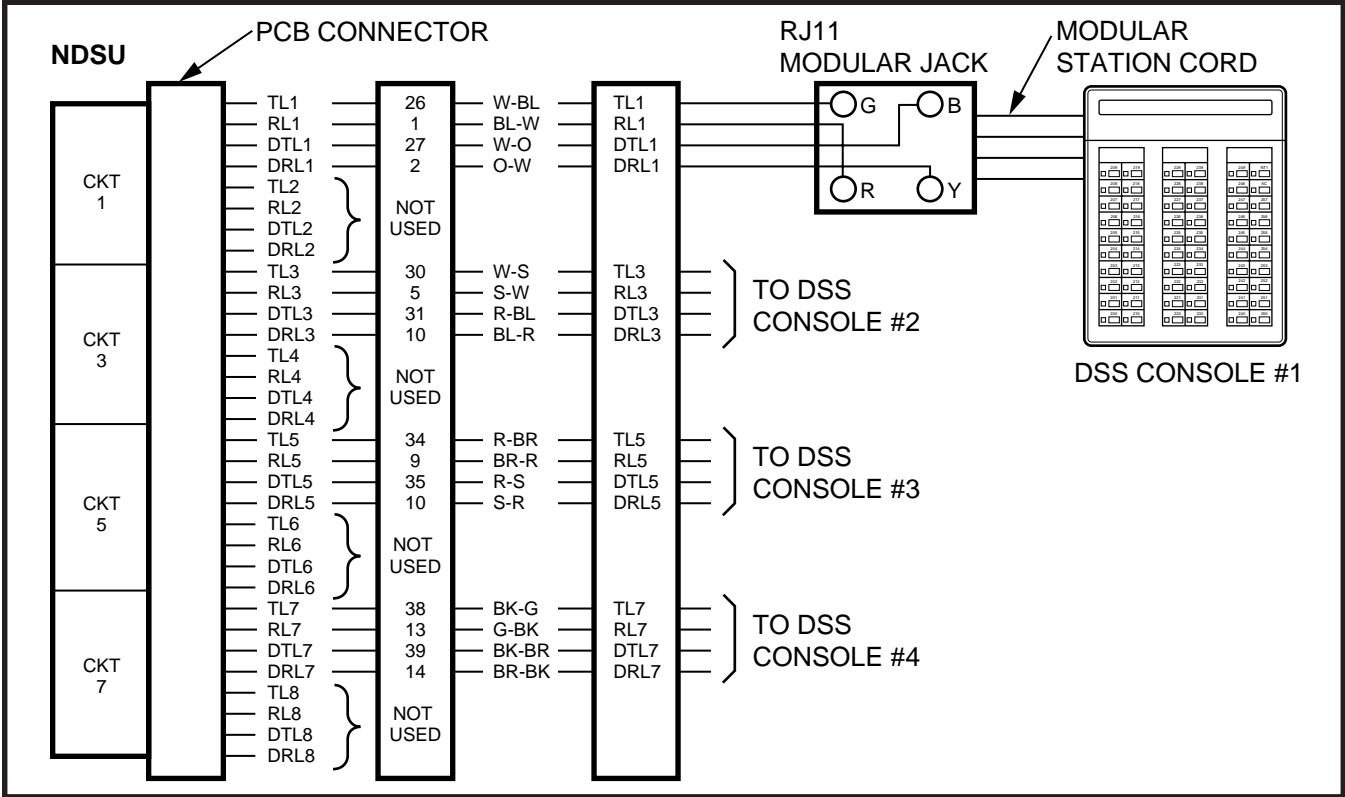
FIGURE 4-36—DSS CONSOLE CONNECTION FOR PERCEPTION$_{ex}$ "U" SLOTS AND PERCEPTION$_e$ "L" SLOTS

5.71 See the **DDIU Program** in Section **200-255-300**, *Programming*, to input information concerning Digital Data Interface Units. The system *must* be told which type of DDIU (-MA or -MAT) is installed at each location.

5.72 Digital Data Interface Units require only single-pair wiring and are connected to the MDF via standard twisted-pair telephone cables.

> NOTE:
> *The DDIU-MAT requires an additional two-pair for electronic telephone operation. (For this reason, three-pair cable should be used at locations where a DDIU-MAT may be installed.)*

5.73 Digital Data Interface Unit connection details are shown in Figure 4-37.

5.80 DDIU-MAT

5.81 The DDIU-MAT (Figure 4-38) mounts directly on the bottom of an electronic telephone (forming a single unit) as follows:

1) Remove the electronic telephone base (see Paragraph **5.12**).

2) Replace the telephone base with the DDIU-MAT.

> NOTE:
> *An electronic telephone with a DDIU-MAT attached cannot be wall-mounted.*

5.82 The DDIU-MAT requires four types of connections for proper operation.
- Power supply (to power outlet).
- 25-pin female RS-232C connector (to data device).
- 2-pair modular line cord (to electronic telephone).
- 3-pair modular connector (to LCEC/NCEC).

5.83 The power supply (provided) connects the DDIU-MAT to a 117 VAC wall outlet. The 25-pin female RS-232C connector interfaces with the customer-supplied Data Terminal Equipment (DTE)
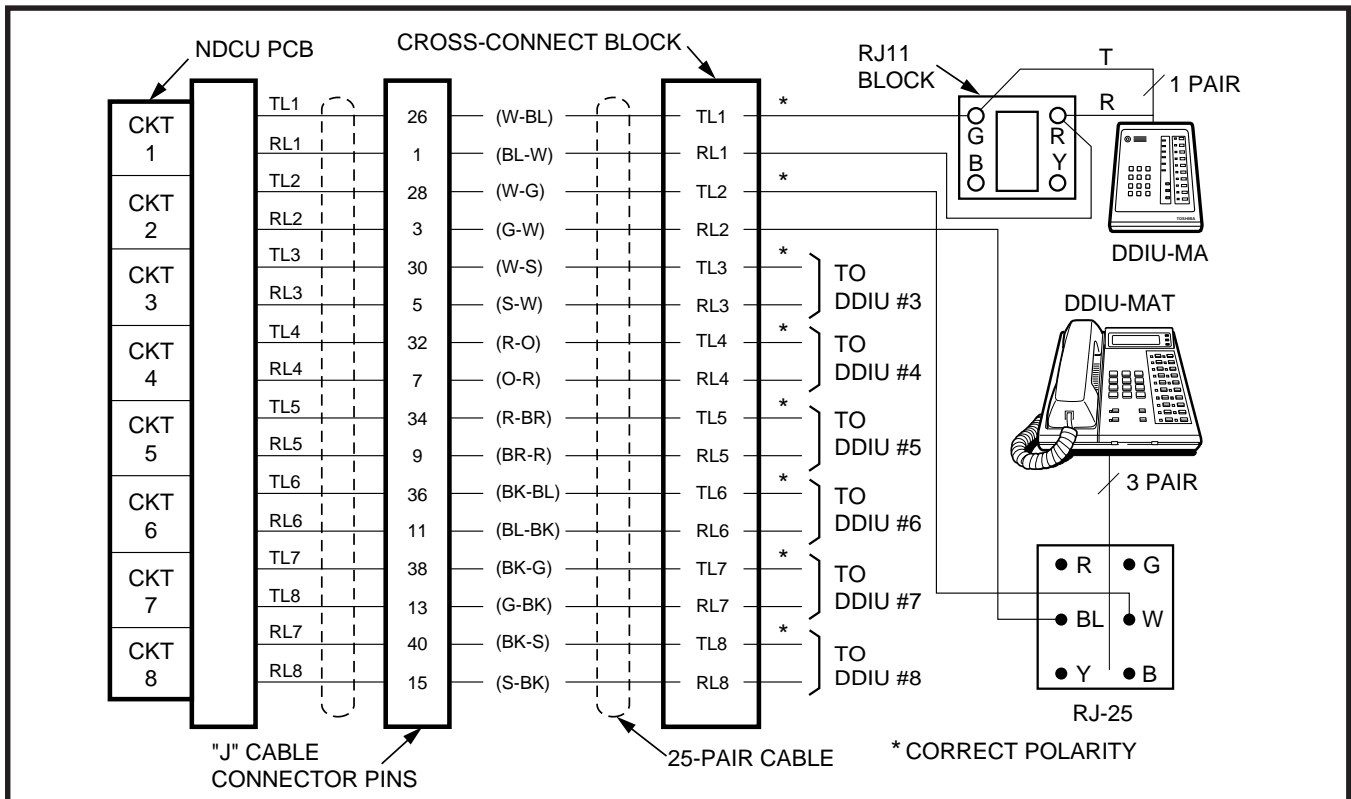
FIGURE 4-37—DIGITAL DATA INTERFACE UNIT CONNECTION (DDIU-MA and DDIU-MAT)
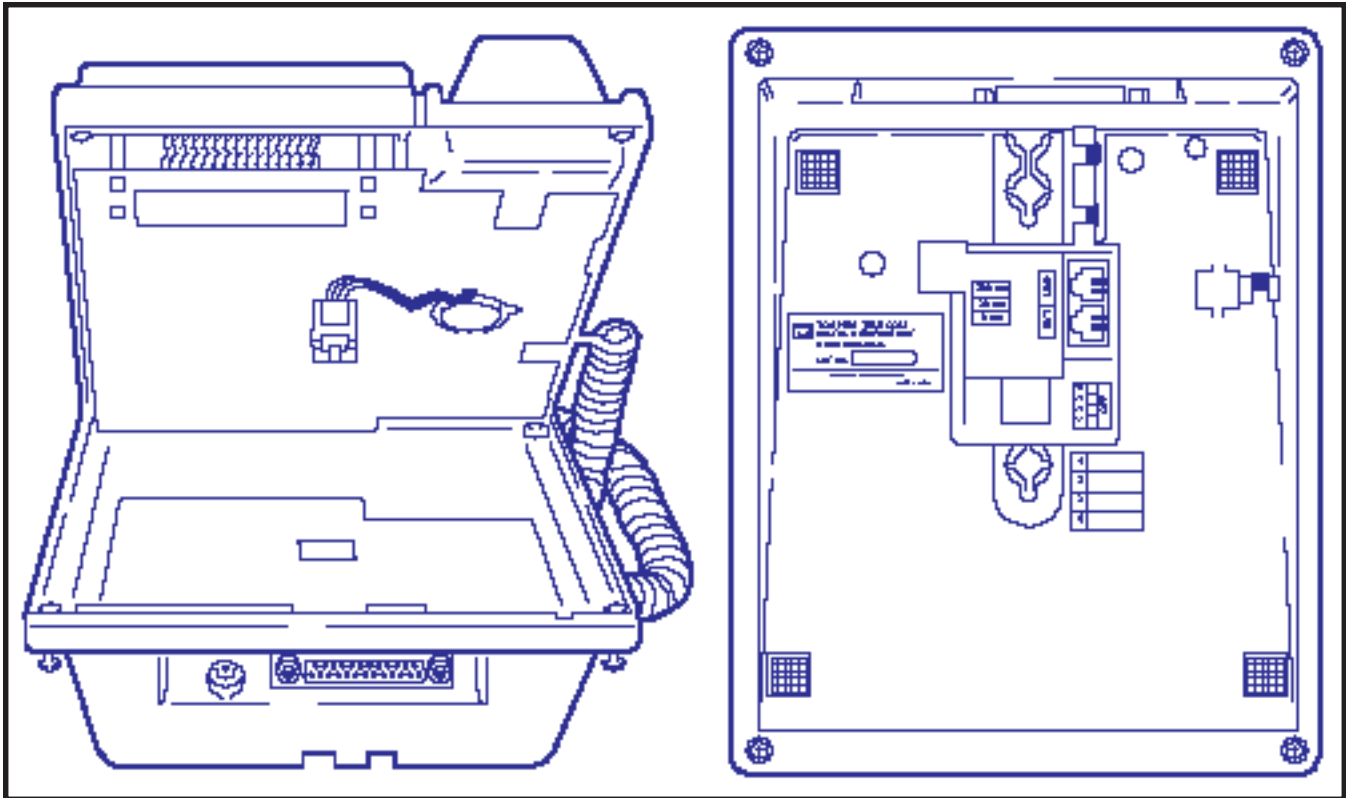
FIGURE 4-38—INSTALLING DDIU-MAT

Pin No.		Designation
1	FG	Protective Ground/Frame
2	SD	Transmitted Data (to DDIU)
3	RD	Receive Data (from DDIU)
4	RTS	Request to Send (to DDIU)
5	CTS	Clear to Send (from DDIU)
6	DSR	Data Set Ready (from DDIU)
7	SG	Signal Ground/Common Return
8	RCD	Receive Carrier Detect (from DDIU)
15	ST2	Transmission Signal Element Timing (from DDIU)
17	RT	Transmission Signal Element Timing (from DDIU)
20	DTR	Data Terminal Ready/Equipment Ready (to DDIU)
22	CI	Ring Indicator (from DDIU)

and uses the following pins:

5.84 The provided 2-pair modular line cord connects the DDIU-MAT to the electronic telephone line connector. The 3-pair modular line connector connects to the 3-pair house cable run from the LCEC/NCEC (see Digital Data Interface Unit Con-

nections, Paragraph **5.70**).

5.85 Several DIP switches found on the bottom of the DDIU-MAT must be set for proper operation
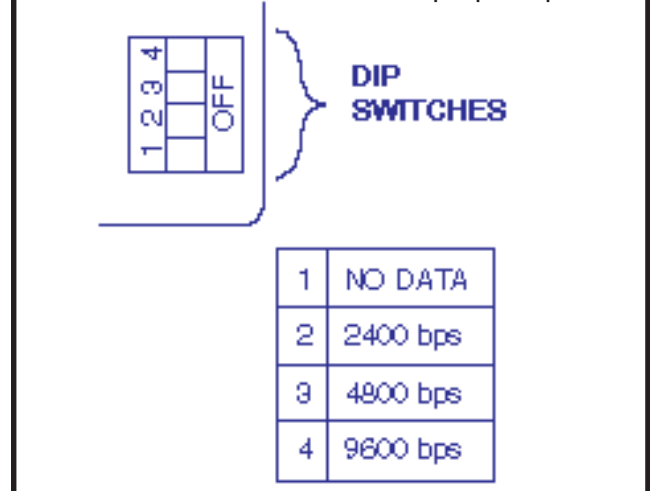
FIGURE 4-39—DDIU-MAT DIP SWITCHES

(Figure 4-39).

5.86 When the **DATA DETECTION** switch (**Switch 1**) is placed in the **ON** position, the automatic data release feature will be activated (data connection is automatically released if no data is transmitted for

4-29

5.87 Switches 2, **3**, and **4** select the data speed for synchronous transmission only.

Switch 2 = 2400 bps
Switch 3 = 4800 bps
Switch 4 = 9600 bps

5.88 If asynchronous operation is used, the switches will have no effect and the data speed will self-adjust to a maximum speed of 19.2 kbps or less.

5.89 A power **ON/OFF** switch that appears on some early DDIU-MAT models controls power to the DDIU-MAT from the power supply. If the switch is **OFF**, the DDIU-MAT will not function, but the electronic telephone will continue functioning normally. When the switch is **ON**, both DDIU-MAT and electronic telephone are functional. In later models, the DDIU-MAT is operational when the power supply is plugged in.

IMPORTANT!
All connections to DDIUs (-MA or -MAT) must observe correct tip and ring polarity for proper operation.

5.90 DDIU-MA

5.91 The DDIU-MA is a stand-alone unit that incorporates both the manual dialing and auto-answering features of the DDIU-MAT, but is used as a data transceiver only.

5.92 The DDIU-MA has several internal and external switches that must be set for proper operation.

5.93 The power **ON/OFF** switch, on the bottom of the DDIU-MA, must be turned **ON** for the DDIU-MA to operate. When the switch is **ON**, an LED on the front faceplate will light.

5.94 The DDIU-MA's faceplate must be removed to set the internal DIP switches. Remove the faceplate by carefully lifting the lower right corner and then pulling the faceplate away from the base. Set the following parameters as required at switch **S26** on the internal DIUA PCB (Figure 4-40):

Switch 1* = Equipment Ready Supervision

ON-Data device provides an Equipment Ready signal to the DDIU (the Terminal Ready LED will light only when the signal is received).
OFF-Data device does not provide an Equipment Ready signal to the DDIU (the Terminal Ready LED will remain lit continuously).
Switch 2 = not used.
Switch 3 = not used.
Switch 4 = **ON** (Enables automatic answer mode of operation.)
Switch 5 = **ON** (Activates Automatic Data Release feature. The data connection is automatically released if no data is transmitted for a period of 18 minutes.)
Switch 6 = 2400 BPS **
Switch 7 = 4800 BPS **
Switch 8 = 9600 BPS **

*A data path cannot be established if the Terminal Ready light is **OFF** (even though a DDIU-MA can be answered manually). The Terminal Ready light **must** be **ON** to establish a data path when answering manually.
**Select the appropriate speed for synchronous data transmission. If the asynchronous mode of operation is used, these switches have no effect and the DDIU-MA will automatically adjust to the appropriate speed (to a maximum of 19.2 kbps).

5.95 Two switches on the DIUB PCB must be set for either DTE or MODEM (DCE) operation. The pin assignments shown in Paragraph **5.83** explain the RS-232C cable signaling differences between DTE and DCE devices. (Typically, a DTE is a terminal device such as a personal computer or printer, while a DCE is an intermediate device such as a modem or protocol converter connected to a host. Refer to the data device manufacturer's documentation for its signaling information.) Set the DIUB PCB switches as follows:

1) Loosen the two screws found under the DDIU-MA's faceplate on the right side (top and bottom) of the DIUA PCB (Figure 4-40).
2) Carefully separate the two halves of the DDIU-
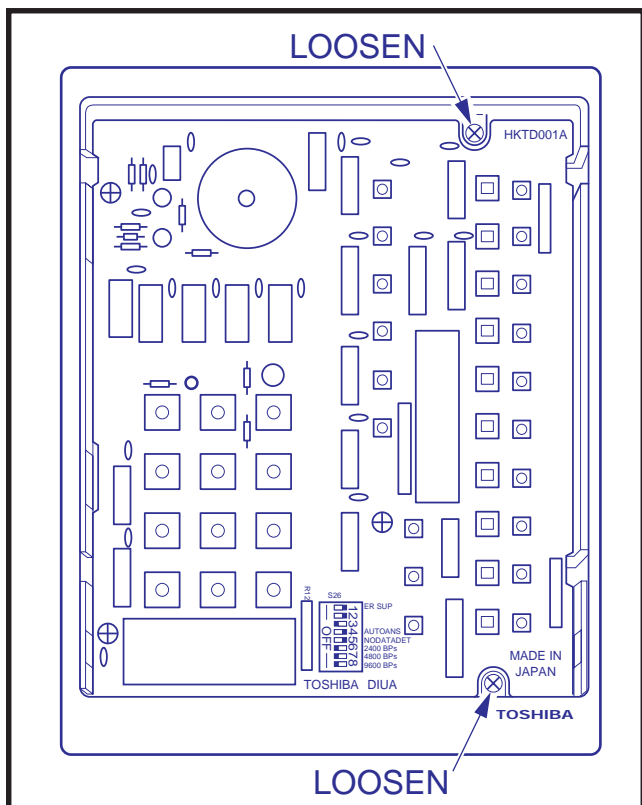
FIGURE 4-40—DDIU-MA DIUA PCB
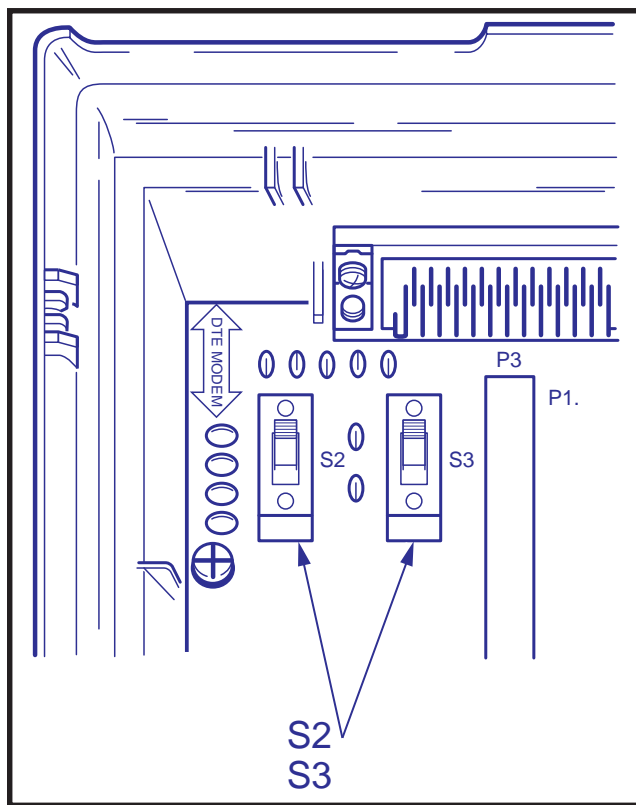
FIGURE 4-41—DIUB PCB

MA to expose the **S2** and **S3** (DTE/MODEM) switches (Figure 4-41) in the upper left corner of the DIUB PCB.

3) If the DDIU-MA is to be connected to a **DTE**, both switches must be in the DTE position. If it will be connected to a DCE, both switches must be in the **MODEM** position.

4) Reassemble the DDIU-MA.

5.96 See *Operating Procedures* or DDIU-MA and Electronic Telephone *User Guides* for information on the DDIU dialpad, LED/button operation and functions.

5.97 The DDIU-MA requires three types of con-

nections for proper operation:
- Power supply (to facility power).
- 25-pin female RS-232C connector (DDIU-MA to LCEC/NCEC).
- Single-pair modular connector (DDIU-MA to LCEC/NCEC).

5.98 The power supply (provided) connects the DDIU-MA to a 117 VAC wall outlet. The 25-pin female RS-232C connector connects to the customer-supplied data device and is configured for either DTE or DCE operation as follows:

5.99 The DDIU-MA connects to the LCEC/NCEC

DTE Position:

Pin No.		Designation
1	FG	Protective Ground/Frame
2	SD	Transmitted Data (to DDIU)
3	RD	Receive Data (from DDIU)
4	RTS	Request to Send (to DDIU)
5	CTS	Clear to Send (from DDIU)
6	DSR	Data Set Ready (from DDIU)
7	SG	Signal Ground/Common Return
8	RCD	Receive Carrier Detect (from DDIU)
15	ST2	Transmission Signal Element Timing 2 (from DDIU)
17	RT	Transmission Signal Element Timing 2 (from DDIU)
20	DTR	Data Terminal Ready/Equipment Ready (to DDIU)
22	CI	Ring Indicator (from DDIU)

DCE (MODEM) Position:

Pin No.		Designation
1	FG	Protective Ground/Frame
2	TD	Transmitted Data (from DDIU)
3	RD	Receive Data (to DDIU)
4	RTS	Request to Send (from DDIU)
5	CTS	Clear to Send (to DDIU)
6	DSR	Data Set Ready (to DDIU)
7	SG	Signal Ground/Common Return
20	ER	Data Terminal Ready/Equipment Ready (from DDIU)
24	ST1	Transmit Signal Element Timing 1 (to DDIU)

with a single-pair station line cable that plugs into the modular connector on the back of the base (see Digital Data Interface Unit Connections, Paragraph **5.70**).

IMPORTANT!
All connections to DDIUs (-MA or -MAT) must observe correct tip and ring polarity for proper operation.

6. DIGITAL TELEPHONE STATION

EQUIPMENT INSTALLATION

6.00 Digital Telephone Connections

6.01 See the **DEKT Program** in Section **200-255-300**, *Programming*, for instructions on programming digital telephones. When installing digital telephones, digital DSS consoles, PDIU-DI, or PDIU-DS, Version **D.04** software or higher must be installed. The system must be told the type of digital telephone (20-button, or 20-button with LCD) and what button assignment is required.

6.02 Digital telephones are connected to the MDF via standard twisted-pair jacketed telephone cable. (Single-pair wiring is required; however, 2- or 3-pair wiring is strongly recommended to permit expected distances for data, spare pair, etc.) To accommodate the digital telephone line cord, terminate the cable in a modular station connector block (RJ25) at the station location. The standard modular digital telephone cord length is 7 feet (the maximum allowed length is 25 feet).

6.03 The overall length of the digital telephone cable run from equipment cabinet to phone must not exceed 1,000 feet (305 M), 24 AWG cable.

IMPORTANT!
When installing the digital telephone cable, do not run parallel to and within 3 feet of an AC power line. Such power lines should be crossed at right angles (90°) only.

6.04 Digital telephone connection details are shown in Figure 4-42.

6.10 Digital Telephone Wall Mounting

6.11 Both telephones are wall-mounted in the same manner, and they may be mounted on a wall or any other flat, vertical surface to which the base can be secured. When selecting the mounting site, consider the digital telephone's weight and the additional stresses to which the mounting will be subjected.

6.12 Loosen the four captive screws securing the

NOTE:
Digital Telephones with Data Interface Units (PDIU-DI) or Off-hook Call Announce (DVSU), and Stand-alone Data Interface Units (PDIU-DS) are connected, per Figure 4-42, using single-pair wiring.
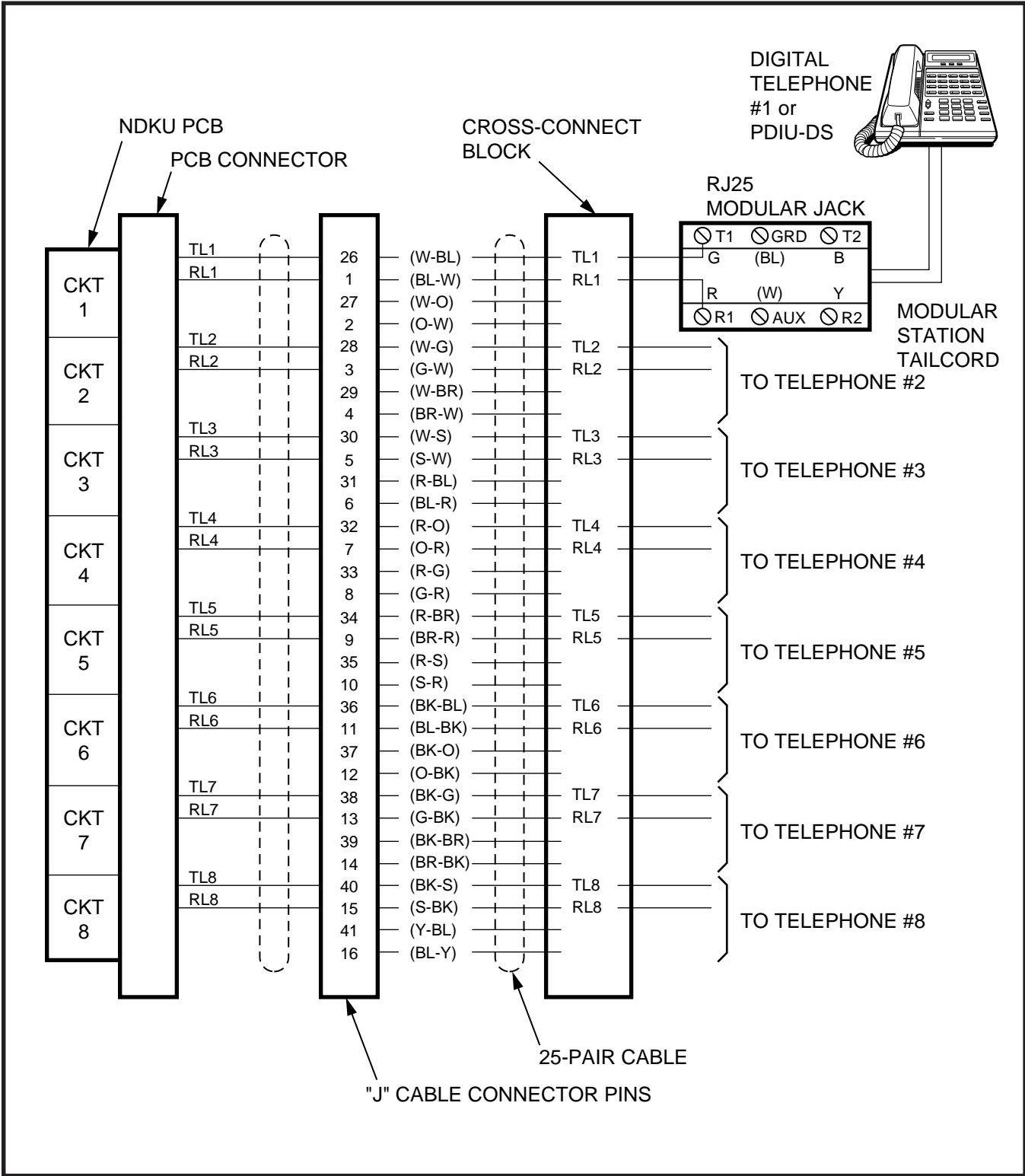
FIGURE 4-42—DIGITAL TELEPHONE CONNECTION

digital telephone's base, and remove the base (Figure 4-43).

6.13 Using a cutter, remove the handset hanger from the base. Insert the handset hanger in the slot provided on the front of the telephone (Figure 4-44). The hanger fits in the notch on the handset.

6.14 Rotate the mounting base 180° and secure to the telephone with the four captive screws (Figure 4-45).

6.15 Connect the electronic telephone to the wall modular connector with a short cord (approximately 3 inch length). Route the cord into the hollow portion of the base, then mount the digital telephone on the wall mounting connector. Test each digital telephone using the **TTRM Program**, Section **200-255-300**, *Programming*.

6.20 Off-hook Call Announce

6.21 The Off-hook Call Announce (OCA) feature enables a digital telephone to originate and receive voice announcement when the station's handset is
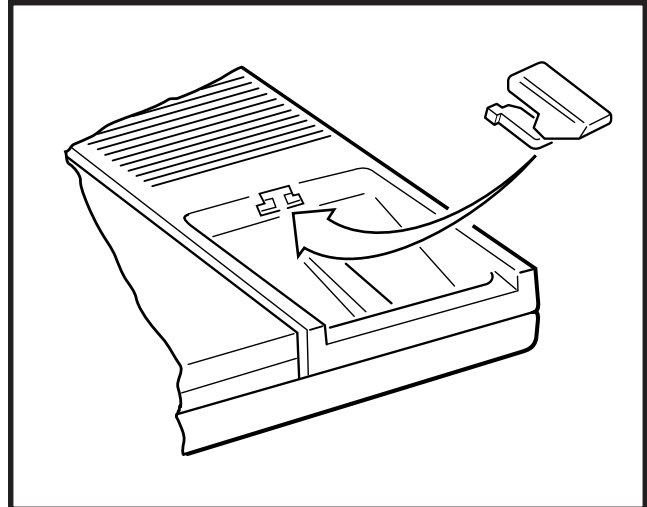
FIGURE 4-44—REMOVAL OF HANDSET HANGER
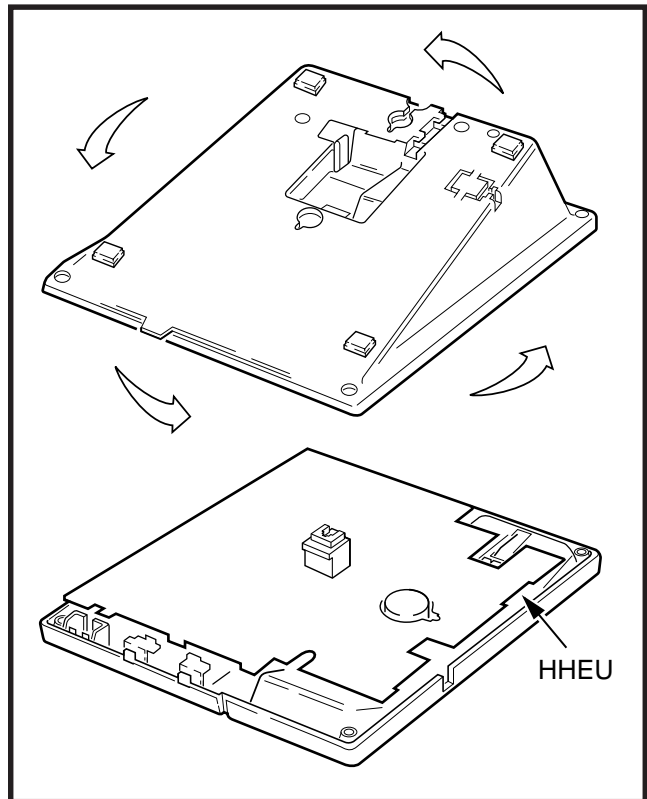
FIGURE 4-45—INSTALLATION OF
MOUNTING BASE FOR WALL-MOUNT INSTALLATION

off-hook. Standard telephones can originate off-hook call announces, however, it cannot receive them. A station user is allowed or denied the ability to originate the Off-hook Call Announce feature in the **DCOS Program**. In order to receive the Off-hook Call Announce feature, a PCB (DVSU) is required to be installed in each affected digital telephone, and the NDKU must be set for option 2
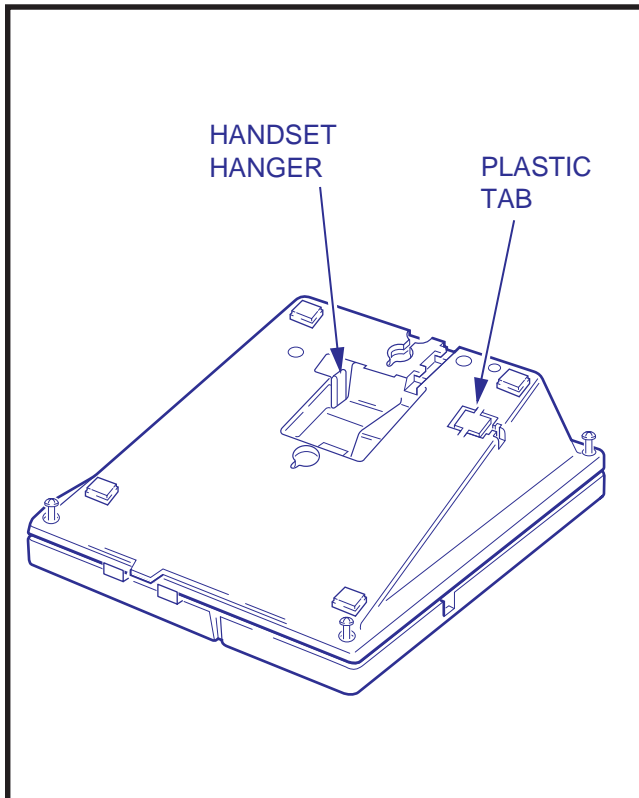
FIGURE 4-43—REMOVAL OF
DIGITAL TELEPHONE BASE

(see Paragraph **3.45** of this chapter).

6.22 A DVSU PCB inside a 1000-series digital telephone allows the digital telephone to receive the Off-hook Call Announce feature.

NOTE:
It is not recommended to equip digital telephones with both Off-hook Call Announce and the headset option at the same time.

6.23 The installation of the DVSU PCB must be done in accordance with the following steps:

1) Loosen the four captive screws securing the telephone's mounting base (Figure 4-43), and remove the base.

2) Loosen the four captive screws securing the metal plate to the standoffs inside the base where the DVSU PCB will be installed (Figure 4-46). Remove the metal plate and discard it.

3) Position the DVSU PCB on the standoffs (Figure 4-46), and secure it with the four

screws provided.

4) Connect the DVSU wire plugs to the connectors labelled "DVSU" on both telephone's PCBs (Figures 4-46 and 4-47).

IMPORTANT NOTE!
Make sure that the DVSU wire plugs are connected to the proper connectors.

5) Reinstall the telephone's mounting base (Figure 4-43), and secure it with its four captive screws.

6.24 A single pair of wires are required to connect the digital telephone to the NDKU port. OCA connection details are shown in Figure 4-42, the Digital Telephone Connection diagram.

6.30 Carbon Handset Transmitter Installation

6.31 If a customer-supplied carbon-type handset is used with the 1000-series digital telephone, the two jumper straps on the telephone's upper PCB, labelled "PERCEPTION-SUB (SPF)," must be cut. To cut the straps:

1) Loosen the four captive screws securing the telephone's mounting base (Figure 4-43), and remove the base.

2) Refer to Figure 4-47, and locate the CARBON straps, **W301** and **W302**, and cut them.

IMPORTANT!
Make sure that the DVSU wire plugs are inserted into the correct UPPER and LOWER PCB connectors of the telephone. Do not plug DVSU into HHEU connector.

TO DVSU CONNECTOR ON **UPPER** PCB INSIDE TELEPHONE

TO DVSU CONNECTOR ON **LOWER** PCB INSIDE TELEPHONE
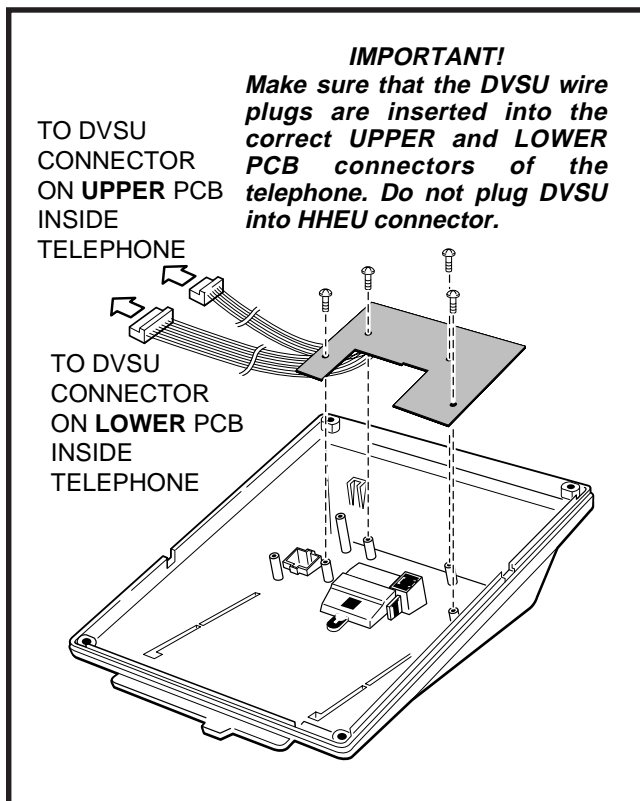
FIGURE 4-46—DVSU INSTALLATION
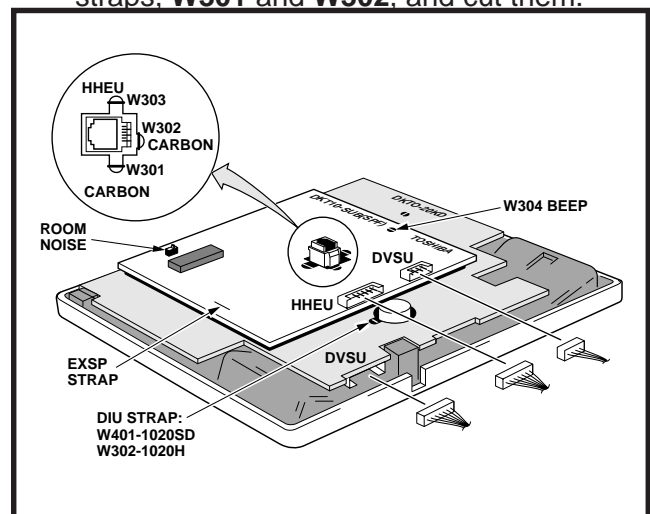
**FIGURE 4-47
TELEPHONE PCB CONNECTIONS AND STRAPS**

3) Reinstall the telephone base (Figure 4-43), and secure it with its four captive screws.

6.40 Beep Strap Removal

6.41 A beep is emitted whenever a dialpad button or flexible button is pressed. This beep can be eliminated if the beep strap is cut. To cut the strap:

1) Loosen the four captive screws securing the telephone's mounting base (Figure 4-43), and remove the base.

2) Refer to Figure 4-47, and locate the BEEP strap, **W304**, labelled "PERCEPTION10-SUB (SPF)" on the telephone's upper PCB, and cut it.

3) Reinstall the telephone's mounting base (Figure 4-43), and secure it with its four captive screws.

6.50 Microphone/Speaker Threshold Adjustment (Speakerphone only)

6.51 If the speaker frequently cuts off during handsfree operation, because of high ambient noise levels, set the **ROOM NOISE** switch to the high position. To set the switch:

1) Loosen the four captive screws securing the telephone's mounting base (Figure 4-43), and remove the base.

2) Refer to Figure 4-47, and locate the **ROOM NOISE** switch, labelled "PERCEPTION10-SUB (SPF)" on the telephone's upper PCB. Carefully push the switch to the **HIGH** (H) position.

3) Reinstall the telephone's mounting base (Figure 4-43), and secure it with its four captive screws.

6.60 HHEU Installation

6.61 The HHEU option provides the interface and control for a customer-supplied headset. It is installed in accordance with the following steps:

1) Loosen the four captive screws securing the telephone's mounting base (Figure 4-43), and remove the base.

2) Using a screw driver or other suitable tool, remove the plastic tab located on the back of the mounting base (Figure 4-43). The HHEU modular connector for the headset is accessed through this opening.

3) Set the **SW601** switch on the HHEU PCB to the **HEADSET** position (Figure 4-48).

4) If the headset receiver is not to receive OCA caller voice announcements, cut both sides of the **R607** resistor on the HHEU PCB (Figure 4-48), then remove the resistor.

5) Position the HHEU PCB on the standoffs inside the base (Figure 4-48), and secure with the two screws provided.

6) Connect the HHEU PCB to the telephone's upper PCB, labelled "PERCEPTION10-SUB (SPF)." See Figure 4-47.

7) Refer to Figure 4-47, and locate the HHEU strap, **W303**, on the upper PCB. Cut the strap if the HHEU PCB is to be connected to
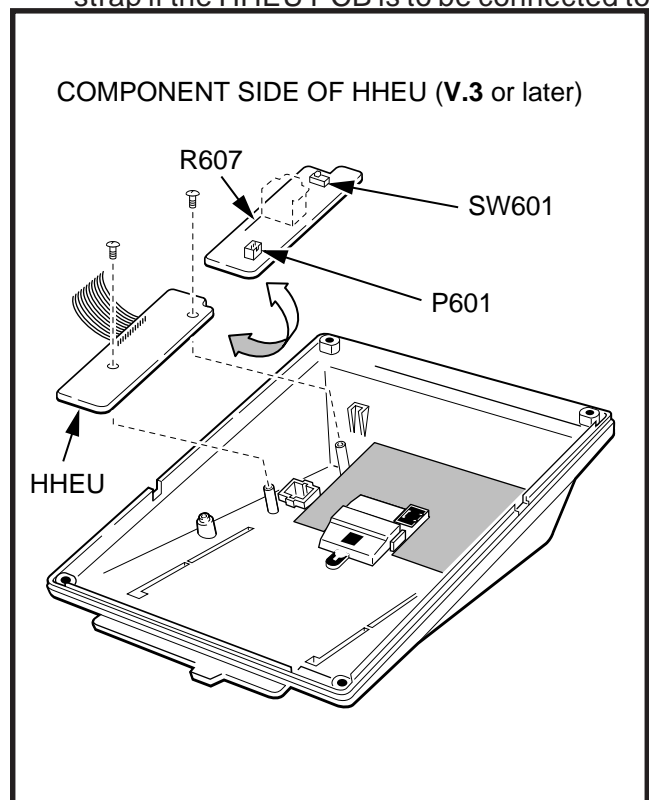
FIGURE 4-48
HHEU INSTALLATION FOR DIGITAL TELEPHONE

a headset.

8) Reinstall the telephone's mounting base and secure it with its four captive screws.

6.70 Attendant Console Connection

6.71 See Paragraph **5.50** for the attendant console connection.

6.80 DSS Console Connections

6.81 See the **DSS Program** in Section **200-255-300**, *Programming*, to input information concerning the digital DSS consoles.

6.82 The DSS console must be positioned adjacent to a digital telephone (preferably an LCD model). DSS consoles use 2-pair wiring and are connected to the MDF via standard twisted-pair telephone cables. An RJ25 modular connector should be attached to the instrument-end of the telephone cable to permit connection to the DSS console.

6.83 The overall length of the DSS console cable run from the equipment cabinet must not exceed 1000 feet (304 M), 24 AWG cable.

IMPORTANT!
When installing the DSS console cable, do not run parallel to and within 3' of an AC power line. Such power lines should be crossed at right angles (90°) only.

6.84 DSS console(s) connection details are shown in Figures 4-49 and 4-50, for both PERCEPTION$_e$ and $_{ex}$.

6.90 DIGITAL DATA INTERFACE UNIT (PDIU)

6.91 The Perception$_{e \& ex}$ with D.04 software provides two new style digital Data Interface Units (DIUs) that enable digital telephone users to simultaneously transmit and receive data on the same NDKU station port and wire pair while communicating on a voice call. One unit, called the integrated DIU (PDIU-DI) replaces the digital

telephone's base; the other unit is a small self-contained box called the stand-alone DIU (PDIU-DS). Each DIU is powered by the NDKU PCB it is connected to; therefore, no external power is required.

6.92 Both PDIUs can be connected to standard Electronic Industries Association (EIA) RS-232 asynchronous serial data devices. EIA devices are divided into two categories:
- Data communication equipment (DCE). Common DCE devices are modems and some printers.
- Data terminal equipment (DTE). Common DTE devices are personal computers, ASCII terminals, and some printers.

The PDIU-DI operates like a DCE, and it connects directly to DTE devices using standard RS-232 cables. Depending on how its internal jumper plugs are configured, the PDIU-DS can either operate like a DTE and connect to DCE devices, or operate like a DCE device and connect to a DTE device. In most applications, DTE and DCE devices exchange data between each other via the standard RS-232 cable connection.

6.93 PDIUs can function with DCE and DTE devices at data speeds of up to 19.2kbps; however, keyboard dialing using AT commands (from a PC or a terminal connected to a PDIU) is limited up to 9.6kbps. PDIU data transmission speed is set by the first AT command that the PDIU receives once it is in the command mode. The transmission speed is transparent to the PDIU if data is being sent via manual dialing or if the PDIU is receiving calls.

NOTES:
*1. See the **DDIU Program** in **Section 200-255-300** for information on programming the Digital Data Interface Units. The system must be told which type of PDIU (-DI or -DS) is installed at each location.*
2. Digital Data Interface Unit (PDIU-DI and PDIU-DS) connection details are shown in Figure 4-42, the Digital Telephone Connection diagram.
IMPORTANT NOTE!
To use the PDIU-DI or PDIU-DS with AT
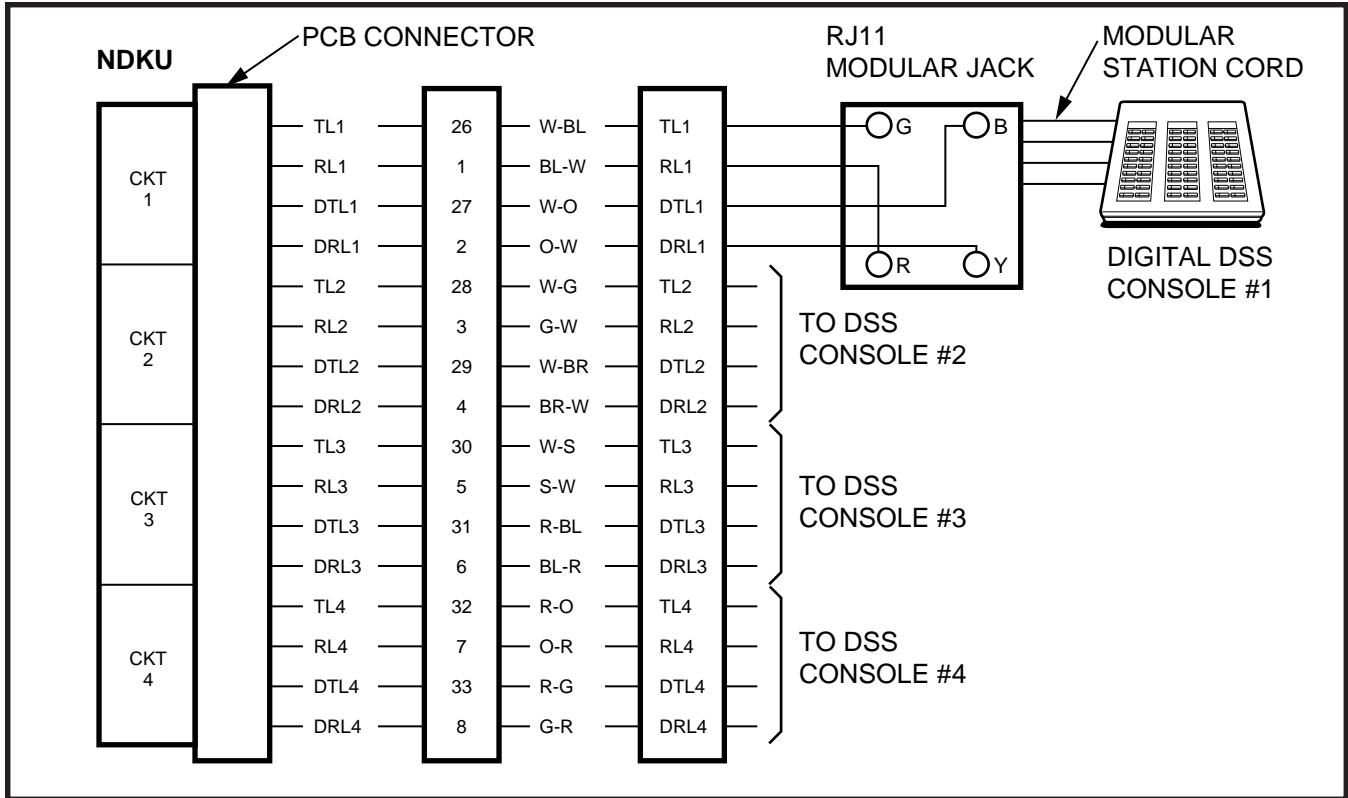
FIGURE 4-49—DIGITAL DSS CONSOLE CONNECTION FOR PERCEPTION$_e$ "C" SLOT
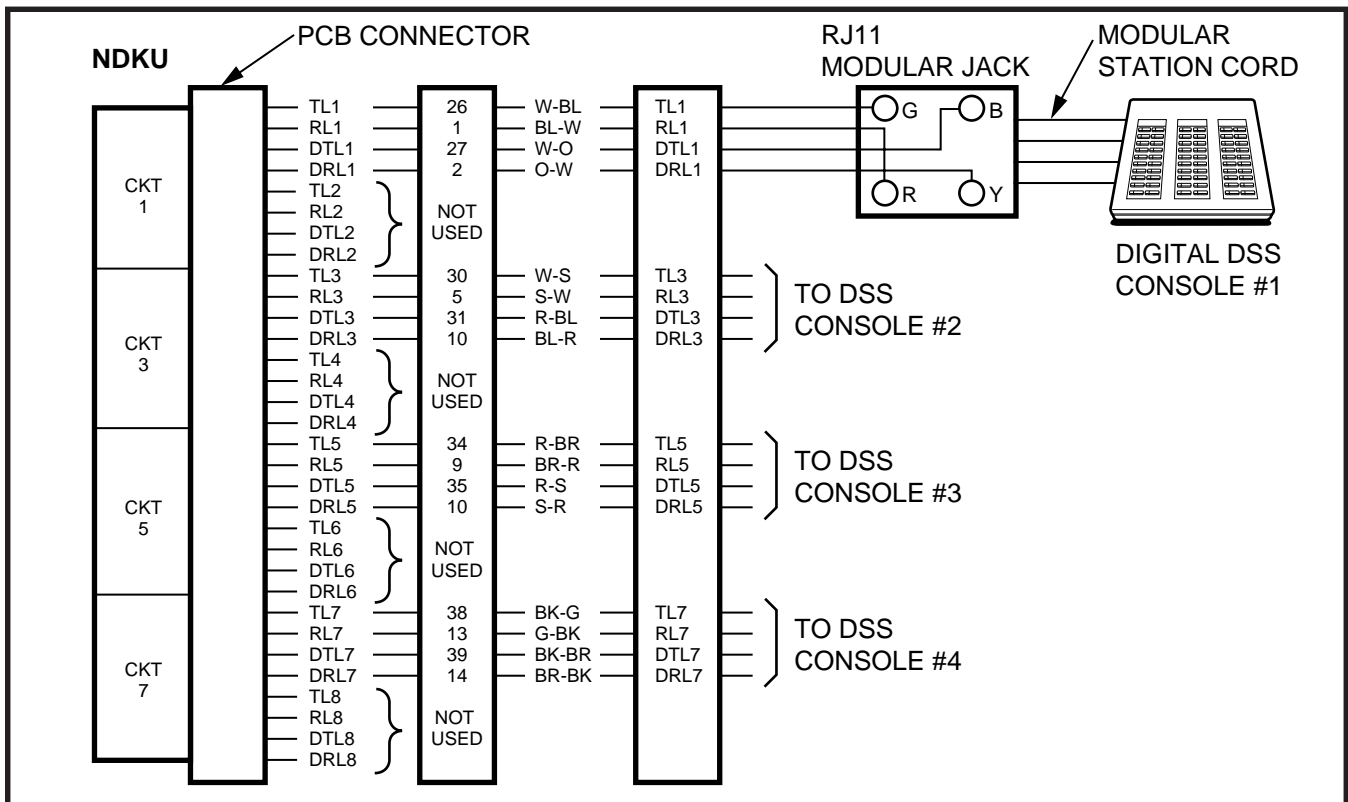
FIGURE 4-50
DIGITAL DSS CONSOLE CONNECTION FOR PERCEPTION$_{ex}$ "U" SLOTS AND PERCEPTION$_e$ "L" SLOTS

commands, communications software or some program that performs "terminal emulation" must be loaded in the computer. The AT commands cannot be issued from the computer's operating system prompt.

6.100 Common DIU Connections

6.101 The block diagram in Figure 4-51 illustrates common DIU connections. In this example, PDIU-DIs are connected to laptop personal computers (PC1 and PC2), and the PDIU-DS's are connected to a serial printer and modems. The PC users can transfer files internally, print files on the same printer, and access the modem to send/receive data to/from an external personal computer, or dial up a data service.

6.102 To access these devices, a data call connection must be established between the DIUs. This is accomplished by dialing the destination DIU from a digital telephone dialpad or from a PC keyboard using standard AT dial commands. PDIU-DIs have port and DATA DN assignments adjacent to the digital telephones that they are connected to, while PDIU-DS's have separate port and DATA DN assignments. The **DN** and **DATA** buttons on the digital telephone tell the system whether a voice or data call is being made: The **DN** button indicates voice calls, and the **DATA** button indicates data calls. When dialing from a keyboard with AT commands, enter **ATD** for data calls. Only DATA calls can be made through keyboard dialing.

6.103 Installation instructions for these devices are provided in Paragraphs **6.140 ~ 6.160**. Call paths and scenarios for four types of data calls are provided in Paragraphs **6.181 ~ 6.185**. Step-by-step data calling procedures are provided in the *PDIU User Guide*.

6.110 EIA Interface Leads (Signals)

6.111 Both DIUs operate with the ten standard EIA RS-232 interface leads (signals) on which signaling data is transmitted and received. DIUs connect to serial data devices' signals with standard RS-232 cables, available from telephone supply stores.

The PDIU-DI/PDIU-DS Data Units require ten signals for some applications, but can function with eight, using modular cords and connectors with RJ45/DB25 adapters for other applications (Figures 4-52 and 4-53). If uncertain which signals are necessary for an application, all ten should be connected.

IMPORTANT NOTES!
1. *The PDIU-DI is always a DCE device; the PDIU-DS may be a DTE or DCE, depending on how its internal jumpers (1 ~ 9) are configured (see Figure 4-54).*
2. *In the descriptions below, when a signal is ON, its potential is about seven volts positive, relative to signal ground (pin 7); when a signal is OFF, it is about 7 volts negative, relative to the signal ground (pin 7).*

- **Frame Ground (FG, Pin 1):** The FG signal (EIA circuit AA) is a protective or safety ground which is bonded to the PDIU-DI/PDIU-DS. If required by local codes, the FG may be connected to external ground.
- **Transmit Data (TD, Pin 2):** DTE devices transmit, and DCE devices receive data on the TD lead (EIA circuit BA). Before the DTE device can transmit the TD signal, the RTS, CTS, DSR, and DTR signals (all discussed later in this section) must be **ON**. The TD signal is **OFF** in the idle state.
- **Receive Data (RD, Pin 3):** The DCE device transmits data to the DTE device on the RD lead (EIA circuit BB).
- **Request to Send (RTS, Pin 4):** Some DTE devices send an RTS signal (EIA circuit CA) to the DCE device when they are ready to transmit data on the TD lead. If the DTE device generates the RTS signal, the DIU DIP switch **SW1-4** should be set to **ON** to inform the PDIU. Sometimes, the DTE/DCE device may use RTS/CTS for Ready/Busy-type flow control. In these cases, DIP switch **SW1-4** should be set to **OFF** (see Figure 4-55 for the DIP switch information).

FIGURE 4-52—PDIU-DI/PDIU-DS MODULAR CABLE/

NOTES:
1. RS-232 cable and connector information is provided in Figures 4-53 to 4-54.

2. PDIU-DI/PDIU-DS MDF station wiring to NDKU is in Section 200-255-205.

3. Modem MDF station wiring to NSTU is in Section 200-255-205.
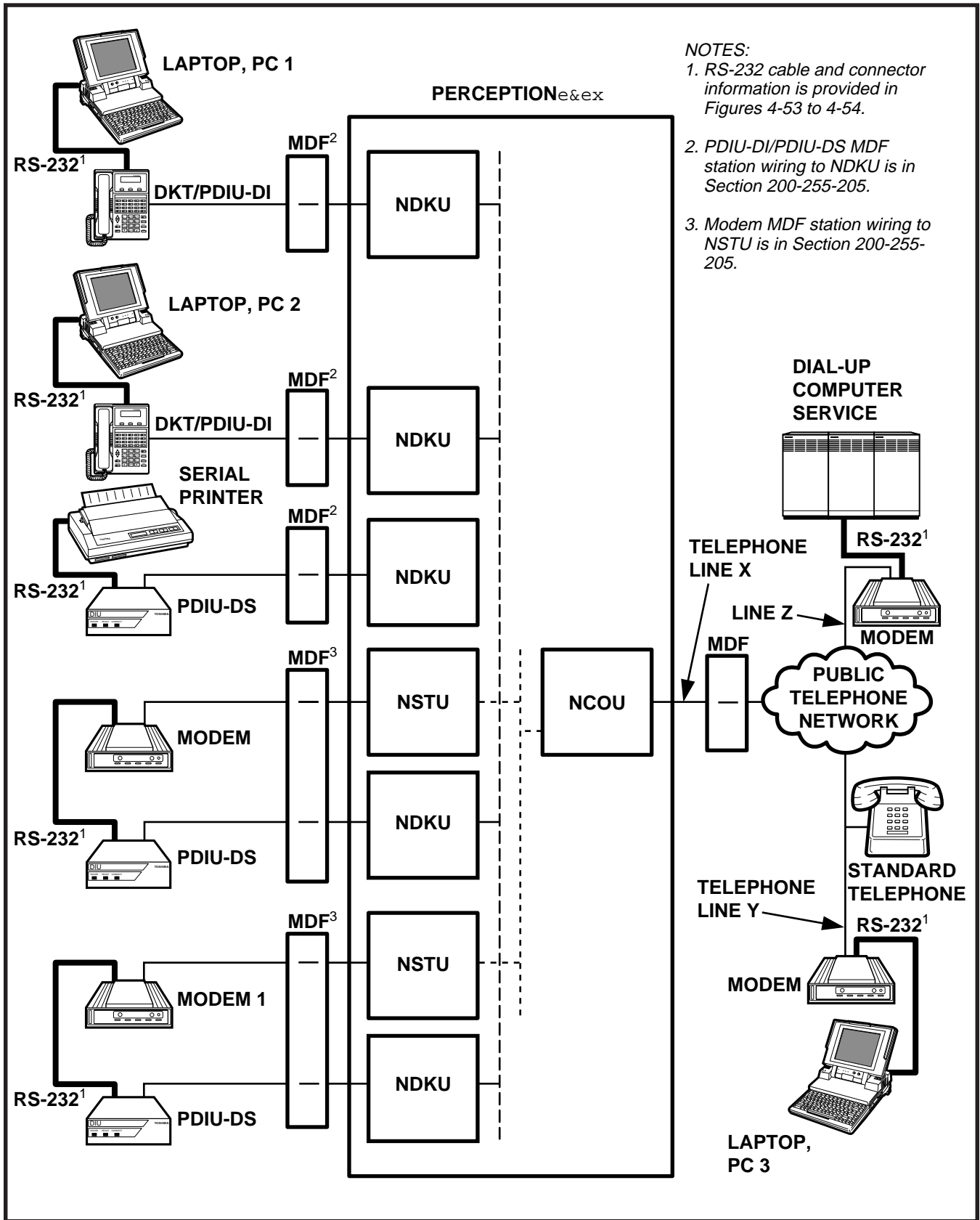
FIGURE 4-51—PERCEPTION DATA INSTALLATION EXAMPLE BLOCK DIAGRAM

CONNECTION EXAMPLE 1
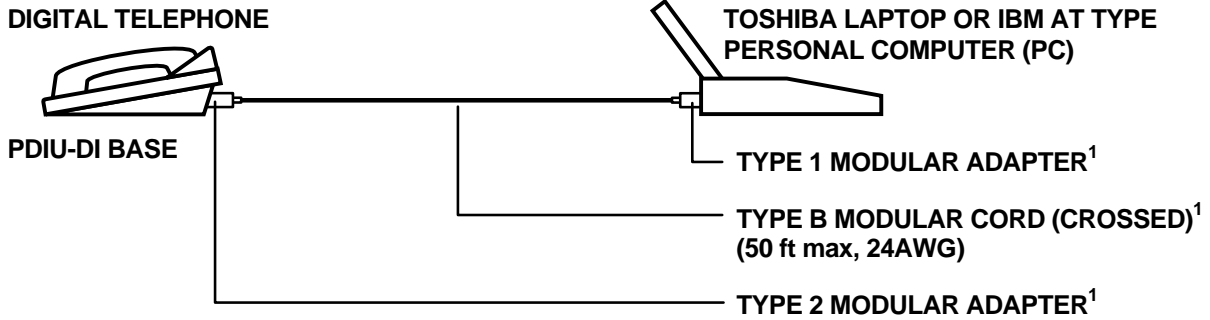
DIGITAL TELEPHONE

TOSHIBA LAPTOP OR IBM AT TYPE PERSONAL COMPUTER (PC)

PDIU-DI BASE

TYPE 1 MODULAR ADAPTER[1]

TYPE B MODULAR CORD (CROSSED)[1]
(50 ft max, 24AWG)

TYPE 2 MODULAR ADAPTER[1]

IMPORTANT!
Will not function with applications that require the Ring Indicator signal to PC.

CONNECTION EXAMPLE 2

DIGITAL TELEPHONE

IBM PC OR XT TYPE PERSONAL COMPUTER (PC)

PDIU-DI BASE

TYPE 3 MODULAR ADAPTER[1]

TYPE A MODULAR CORD (STRAIGHT)[1]
(50 ft max, 24AWG)

TYPE 2 MODULAR ADAPTER[1]

IMPORTANT!
Will not function with applications that require the Ring Indicator signal to PC.

CONNECTION EXAMPLE 3

STAND-ALONE DIU

TOSHIBA P321SL OR SIMILAR STANDARD TYPE SERIAL PRINTER

PDIU-DS

TYPE 2 MODULAR ADAPTER[1]

TYPE A MODULAR CORD[1]
(50 ft max, 24AWG)

TYPE 2 MODULAR ADAPTER[1]
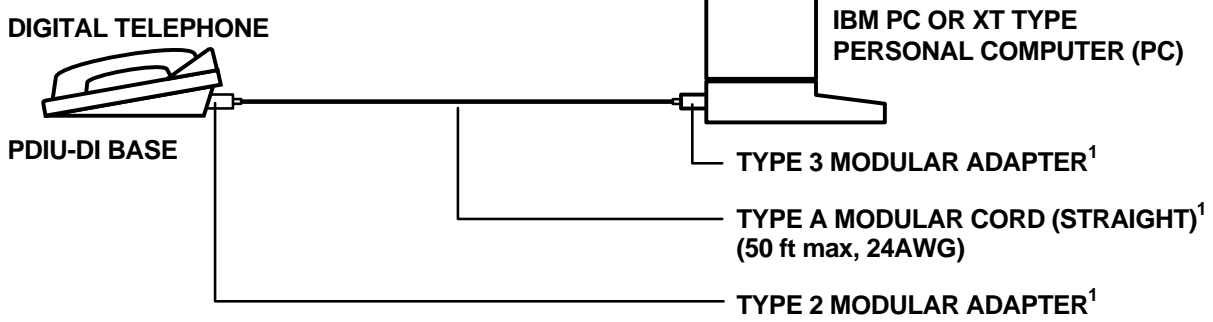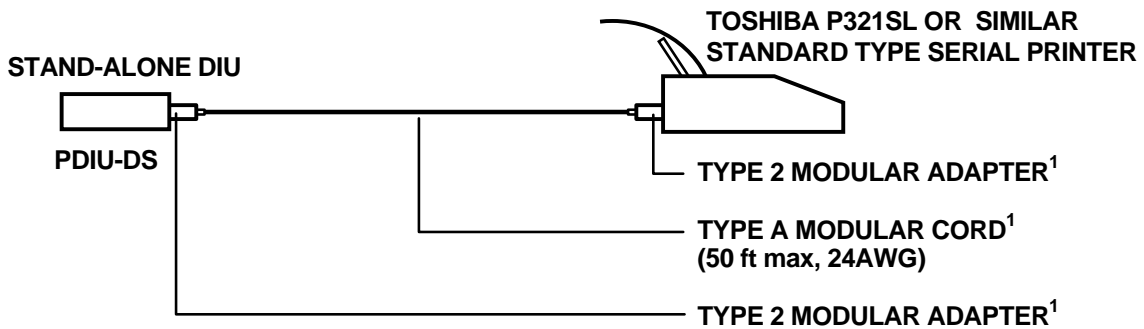
NOTES:
1. See Figure 4-53 for detailed pin out information of modular cords and adapters.
2. Never use modular cords and adapters when connecting a PDIU-DI/PDIU-DS to a modem.
3. Connection examples 1 and 2 work when using the PDIU-DI to make calls with personal computer applications (printer sharing, outgoing modem calls, etc). If the PC PDIU-DI must receive calls, the RI lead is normally required; therefore, a standard RS-232 cable must be used (see Figures 4-54 and 4-55).
4. In Connection example 3, PDIU-DS must be in the "connect to DTE mode" (P1 ~ P9, strapped A-B).
5. All modular cords and adapters are customer-supplied.

RJ-45 ADAPTER CONNECTIONS

TYPE 1
RJ45 TO DB9 (FEMALE) ADAPTER
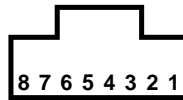
8	7	6	5	4	2	1	N/C	RJ45
DSR	RTS	RD	DCD	TD	GND	CTS	RI	LEAD NAME
6	7	2	1	3	5	8	9	DB9
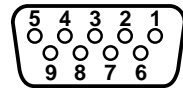
TYPE 2
RJ45 TO DB25 (MALE) ADAPTER
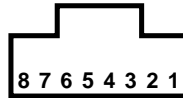
8	7	6	5	4	3	2	1	N/C	RJ45
CTS	SG	DTR	TD	DCD	RD	RTS	DSR	RI	LEAD NAME
5	7	20	2	8	3	4	6	22	DB25
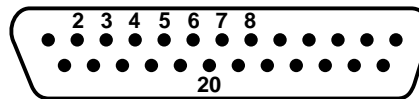
TYPE 3
RJ45 TO DB25 (FEMALE) ADAPTER

8	7	6	5	4	3	2	1	N/C	RJ45
CTS	SG	DTR	TD	DCD	RD	RTS	DSR	RI	LEAD NAME
5	7	20	2	8	3	4	6	22	DB25

RJ45 STRAIGHT THROUGH

TYPE A
RJ45 FLAT MODULAR CORD (STRAIGHT)

FRONT

RJ45 CROSS PINNING

TYPE B
RJ45 FLAT MODULAR CORD (CROSSED)

FRONT
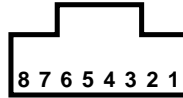
Modular Cords (50 ft max, 24AWG; customer supplied)

FIGURE 4-53—PDIU-DI/PDIU-DS MODULAR CORDS AND RJ-45/RS-232 ADAPTER PIN CONNECTIONS

PDIU-DS (FRONT VIEW)

PDIU-DS (REAR VIEW)

**MODULAR JACK
FOR CONNECTING
1- OR 2-PAIR
TO NDKU CIRCUIT**

DIU

POWER READY CONNECT

CONNECT LED
READY LED
POWER LED

**SW1: SEE FIGURE 4-55 FOR
SWITCH (1 ~ 4) OPTIONS
INFORMATION**

CTS
DSR
SG
DCD

RTS
RD
TD
FG

13 12 11 10 9 8 7 6 5 4 3 2 1

25 24 23 22 21 20 19 18 17 16 15 14

RI
DTR

**RS-232, DB25
(FEMALE) CONNECTOR**

B-C A-B

MODEM DTE

P9 P8 P6 P3 P4 P7 P2 P1 P5   A B C

**P1 ~ P9 LOCATED ON PCB INSIDE
OF PDIU-DS UNIT (SEE NOTES)**

			SIGNAL DIRECTION AND FUNCTION OF P1 ~ P9			
			PDIU-DS CONNECTED TO DTE		PDIU-DS CONNECTED TO DCE	
SIGNAL ABBREVIATON	**SIGNAL NAME/ FUNCTION**	**PDIU-DS PIN NO.**	**SIGNAL DIRECTION**	**FUNCTION: A-B (DTE MODE)**	**SIGNAL DIRECTION**	**FUNCTION: B-C (MODEM MODE)**
FG	FRAME GROUND	1				
SG	SIGNAL GROUND	7				
TD	TRANSMIT DATA	2	DTE ➡ DIU	P1	MODEM ⬅ DIU	P1
RD	RECEIVE DATA	3	DTE ⬅ DIU	P2	MODEM ➡ DIU	P2
RTS	REQUEST TO SEND	4	DTE ➡ DIU	P6	MODEM ⬅ DIU	P6
CTS	CLEAR TO SEND	5	DTE ⬅ DIU	P7/P5	MODEM ➡ DIU	P7/P5
DSR	DATA SET READY	6	DTE ⬅ DIU	P4	MODEM ➡ DIU	P4
DTR	DATA TERMINAL READY	20	DTE ➡ DIU	P3	MODEM ⬅ DIU	P3
DCD	DATA CARRIER DETECT	8	DTE ⬅ DIU	P8	MODEM ➡ DIU	P8
RI	RING INDICATOR	22	DTE ⬅ DIU	P9	MODEM ➡ DIU	P9

NOTES:
1. Mode select (P1 ~ P9) "A-B" if PDIU-DS is connected to a terminal-type device (DTE).
2. Mode select (P1 ~ P9) "B-C" if PDIU-DS is connected to a modem-type device (DCE).
3. See Figure 4-61 to disassemble/assemble PDIU-DI.
4. Some RS-232 leads go by different names depending on the equipment manufacturer.

FIGURE 4-54—PDIU-DS JUMPER PLUG OPTIONS/RS-232 CONNECTOR INFORMATION

PDIU-DI AND -DS SW1 DIP SWITCH (1 ~ 4) FUNCTIONS

SWITCH	FUNCTION	INITIAL POSITION
SW1 (1)	Forced hang up when DIU does not detect space signal on TD or RD for about 9 minutes ON: enable (auto-disconnect) OFF: disable	OFF
SW1 (2)	DCD, DSR control ON: continuous on OFF: DSR depends on DTR (DCD is on during communication state)	OFF
SW1 (3)	RI control ON: RI is on continuously during ringing state OFF: RI is 1 sec ON/3 sec OFF during ringing state	OFF
SW1 (4)	RTS control ON: DTE doesn't have RTS signal OFF: DTE has RTS signal (ready/busy flow control: RTS/CTS:DCD)	OFF

FIGURE 4-55—PDIU-DI/PDIU-DS SW1 DIP SWITCH INFORMATION

- **Clear to Send (CTS, Pin 5):** The DCE device sends the CTS signal (EIA circuit CB) which indicates that it is prepared to transmit data to the DTE device. The DCE device sends this signal, only when it receives the RTS signal from the DTE device. Sometimes, the DTE/DCE device may use RTS/CTS for Ready/Busy-type flow control; in these cases, dip switch **SW1-4** should be set to **OFF** (see Figure 4-55 for the DIP switch information).

- **Data Set Ready (DSR, Pin 6)**: When connected to the communication channel and prepared to exchange control characters to initiate data transmission, the DCE device sends the DSR signal (EIA circuit CC) to the DTE device. If the PDIU DIP switch **SW1-1** is set to **OFF**, DSR and DCD (see DCD description below) will be **ON** continuously; if the switch is set to **ON**, the PDIU generates DSR only after receiving the DTR signal. Sometimes, DTE/DCE devices use DTR/DSR for Ready/Busy flow control; in these cases, DIP switch **SW1-2** should be set to **OFF** (see Figure 4-55 for the DIP switch information).

- **Signal Ground (SG, Pin 7):** The SG signal (EIA circuit AB) establishes the common ground reference for all other PDIU and data device signals, and must be wired for all applications.

- **Data Carrier Detect (DCD, Pin 8):** The DCE device sends the DCD signal (DCD, Pin 8) when receiving the carrier signal on the line side. Before transmitting or receiving data, most DTE devices require that the DCD be **ON**. If the carrier signal is removed by the remote end or lost due to a fault condition on the line, the DCE notifies the DTE device by an **OFF** condition with the DCD signal. To set the DCD on continuously, PDIU DIP switch **SW1-2** is set to **ON**; if set to **OFF**, the DCD signal will be on during the communication state only. **SW1-2** is set to **OFF** when the DTE/DCE uses the DTR/DSR signals for Ready/Busy flow control (see Figure 4-55 for the DIP switch information).

- **Data Terminal Ready (DTR, Pin 20):** The DTE device sends the DTR signal (EIA circuit CD) to the DCE device, prompting the DCE device to open the communication line. The line is closed and the call disconnected when the DTE device quits sending the DTR signal. DTR may be sent any time to indicate that the DTE is ready to transmit or receive data. Sometimes, DTE/DCE devices use DTR/DSR for Ready/Busy flow control; in these cases, DIP switch **SW1-2** should be set to **OFF** (see Figure 4-55 for the DIP switch information).

- **Ring Indicator (R1, Pin 22):** The RI signal (EIA circuit CE) is sent by the DCE device to the DTE device. Whenever the DCE device receives a ringing signal on the line side, it turns the RI signal on. If PDIU DIP switch **SW1-3** is set to **ON**, the RI signal will be on continuously; if the switch is set to **OFF**, the RI signal will be one second on/three seconds off.

Pin No.		Designation
1	FG	Protective Ground/Frame
2	SD	Transmitted Data (to PDIU)
3	RD	Receive Data (from PDIU)
4	RTS	Request to Send (to PDIU)
5	CTS	Clear to Send (from PDIU)
6	DSR	Data Set Ready (from PDIU)
7	SG	Signal Ground/Common Return
8	RCD	Receive Carrier Detect (from PDIU)
15	ST2	Transmission Signal Element Timing (from PDIU)
17	RT	Transmission Signal Element Timing (from PDIU)
20	DTR	Data Terminal Ready/Equipment Ready (to PDIU)
22	CI	Ring Indicator (from PDIU)

6.120 DIP Switch Options

6.121 Each of the PDIU-DI and the PDIU-DS data units has a four-control DIP switch which can be configured for signaling options. The switch is located on the bottom of the PDIU-DI, and on the back panel of the PDIU-DS (see Figure 4-55).

- **SW1-1:** Normally, this switch is set to **OFF.** When set to **ON**, it automatically disconnects devices from the PDIUs if no data is exchanged between the devices and PDIU for an interval of eight to nine minutes.

- **SW1-2:** This switch is placed in the **ON** position when the PDIU-DI (or PDIU-DS configured like a DCE) must hold DCD and DSR on continuously. Sometimes, a computer may use DTR/DSR for Ready/Busy flow control; in these cases, this switch should be **OFF**. Consult the DTE/DCE device or application software documentation to determine which type of flow control is required.

- **SW1-3:** The PDIU-DI (or PDIU-DS configured as a DCE) sends the Ring Indicate signal (RI) to the computer to tell the computer (DTE) that the PDIU is receiving an incoming call. **SW1-3** should be set to **ON** for the DCE to send RI continuously, and **OFF** to send at one-second-ON/three-seconds-OFF intervals. Consult the DTE/DCE device or application software documentation to determine which type of flow control is required.

- **SW1-4:** This switch is placed in the **ON** position if the computer does not output the RTS signal. Sometimes, the computer may use RTS/CTS for Ready/Busy flow control; in these cases, **SW1-4** should be **OFF**. Consult the DTE/DCE device or application software documentation to determine which type of flow control is required.

6.130 PDIU-DI INSTALLATION

6.131 The PDIU-DI (Figure 4-56) mounts directly on the bottom of a digital telephone (forming a single unit) as follows:

1) Remove the digital telephone base (see Paragraph **6.12**).

2) Replace the telephone base with the PDIU-DI.
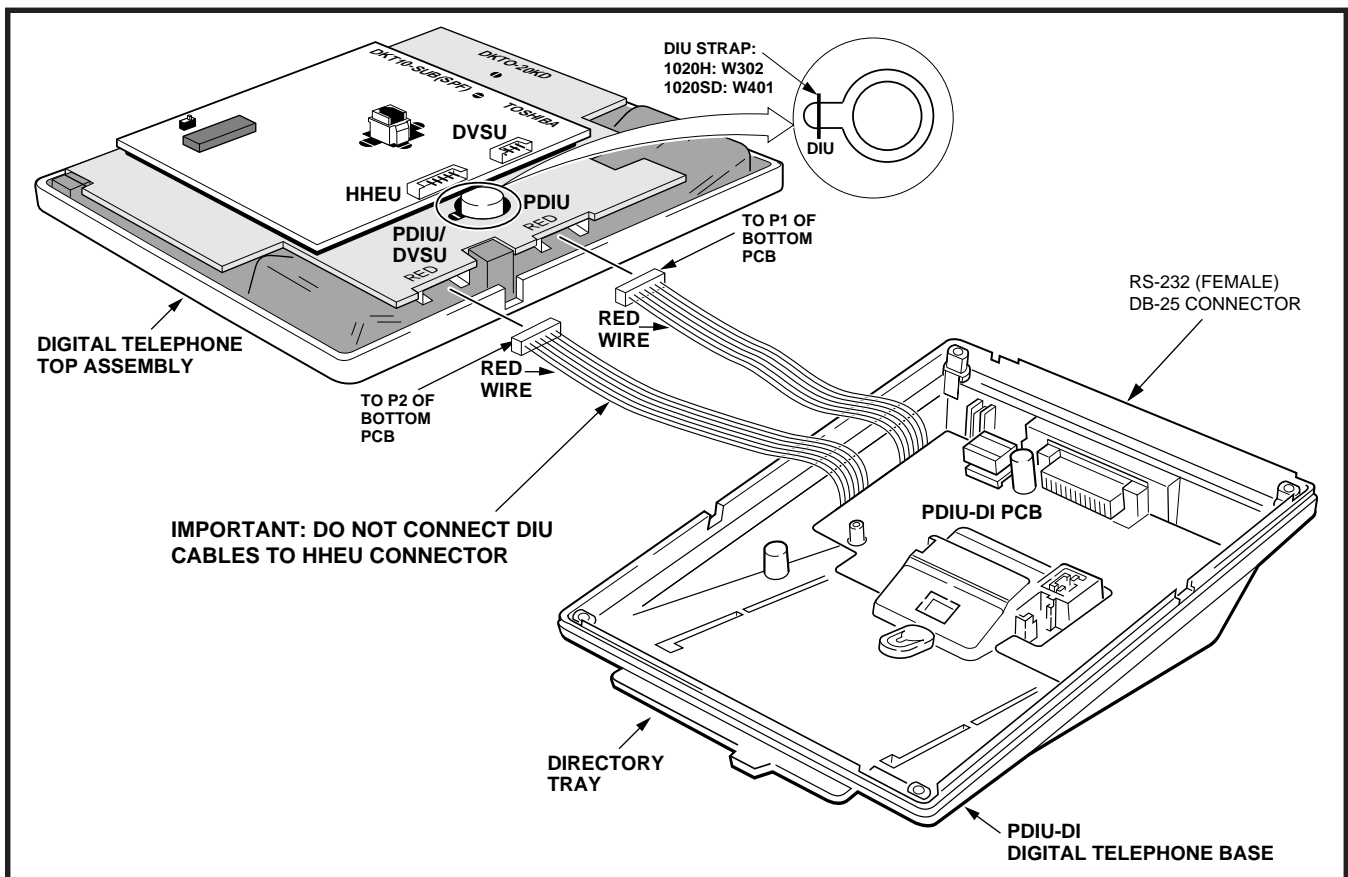
FIGURE 4-56—PDIU-DI PCB/DIGITAL TELEPHONE INSTALLATION

NOTE:
A digital telephone with a PDIU-DI attached cannot be wall-mounted.

6.140 PDIU-DI to Personal Computer (PC) Installation

6.141 The PDIU-DI always functions as a DCE device; it transmits data on the Receive Data lead (RD) and receives data on the Transmit Data lead (TD). Most personal computers function as DTE devices; PCs transmit data on the TD lead and receive data on the RD lead. Follow the steps below to install the PDIU-DI to a DTE or DCE PC:

NOTES:
1. *Use the steps below when installing an ASCII terminal, or any other DTE device to a PDIU-DI.*
2. *The PDIU-DI can connect to a DCE computer or any other DCE-type device using a specially configured RS-232 cable or adapter; however, this application is rarely required.*

1) Install the digital telephone that is to be equipped with PDIU-DI in accordance with the instructions in Section 200-255-205, MDF Arrangement, Paragraph **1.01** and in Figure 5-2.

2) Install the PDIU-DI in the digital telephone's base in accordance with the instructions in Paragraph **6.130**.

NOTE:
The PDIU-DI operates only as a DCE device; therefore, unlike the PDIU-DS, it has no internal jumpers.

3) Connect the appropriate RS-232 cable between the PDIU-DI DB-25 female connector and the PC's appropriate asynchronous serial communications port connector.

IMPORTANT NOTE!
Check the PC manufacturer's serial communication port interface documentation for correct RS-232 pin requirements; requirements vary with each manufacturer. The number of EIA RS-232 signals required (8, 9, or 10 wires) will depend on the application. When EIA signal requirements are not known, connect the 10 EIA signals listed in Paragraph 6.110. Figures 4-57, 4-58, and 4-59 provide diagrams for connecting RS-232 cables between PDIU-DIs and a Toshiba printer and laptop computer, IBM XT-type and AT-type personal computers.

4) Set the PDIU-DI/PDIU-DS DIP switch (**SW1-1 ~ 4**) for the desired application. Figure 4-55 shows the DIP switch locations and Paragraph 6.120 describes the switch functions.

5) Access the DEKT and DDIU Programs for PDIU port connection and data button assignments.
   - The port number entered for the PDIU-DI in the DDIU Program is the adjacent port number of the digital telephone.

     Example: DKT port number = L024, PDIU-DI port number = L034

IMPORTANT NOTE!
The eighth port (circuit) of the NDKU cannot be used for data switching connections (PDIU-DI or PDIU-DS).

6.150 PDIU-DS To Printer Installation

6.151 PERCEPTION$_{e\&ex}$ enables serial printers (laser, dot matrix, or other types) to be connected to stand-alone data interface units (PDIU-DS). Digital telephones equipped with PDIU-DI and Electronic Telephones equipped with DDIU-MAT can share access to these printers. Serial printers operate as DCE or DTE devices, depending on the vendor. The PDIU-DS can be connected to either type, since it can be configured as a DTE or DCE device. (The PDIU-DS comes from the factory configured as a DCE device.) Follow the steps below to install the PDIU-DS to a serial printer.

TOSHIBA PS321SL PRINTER
(FUNCTIONS LIKE A DTE)

DB25 PIN DESIGNATIONS

PRINTER PIN #	1	2	3	4	5	6	7	8	20	22
NAME	FG	TD	RD	RTS	N/C	DSR	SG	DCD	DTR	RI

PDIU-DS
(CONFIGURED IN THE "CONNECT TO DTE" MODE:
P1 ~ P9 = A-B SO PDIU FUNCTIONS LIKE A DCE)

DB25 PIN DESIGNATIONS

PDIU-DS PIN #	1	2	3	4	5	6	7	8	20	22
NAME	FG	TD	RD	RTS	CTS	DSR	SG	DCD	DTR	RI

DB25 PIN #	NAME	DB25 PIN #
8	DCD	8
3	RD	3
2	TD	2
20	DTR	20
7	SG	7
6	DSR	6
4	RTS	4
N/C	CTS	5
N/C	RI	22
1	FG	1

Rear view of printer or ASCII terminal DB25, RS-232 connector.

Rear view of PDIU-DI DB25, RS-232 female connector

DB25 FEMALE CONNECTOR

DB25 MALE CONNECTOR

RS-232 CABLE

(50 ft max, 24 AWG; customer supplied).

NOTES:
1. The printer receives data on pin 3 (RD) and transmits data on pin 2 (TD).
*2. The PDIU-DS should be in the connect to DTE mode (**P1 ~ P9** are strapped A-B), so that it transmits data on pin 3 (RD) and receives data on pin 2 (TD).*

FIGURE 4-57—PDIU-DS TO TOSHIBA PRINTER, RS-232 CONNECTOR/CABLE CONNECTIONS

**IBM XT PERSONAL COMPUTER
OR ASCII TERMINAL
(FUNCTIONS LIKE A DTE)**

DB25 PIN DESIGNATIONS

PDIU-DI PIN #	1	2	3	4	5	6	7	8	20	22
NAME	FG	TD	RD	RTS	CTS	DSR	SG	DCD	DTR	RI

**PDIU-DI
(FUNCTIONS LIKE A DCE)**

DB25 PIN DESIGNATIONS

PDIU-DI PIN #	1	2	3	4	5	6	7	8	20	22
NAME	FG	TD	RD	RTS	CTS	DSR	SG	DCD	DTR	RI

Rear view of personal computer or ASCII terminal DB25, RS-232 connector

DB25 MALE CONNECTOR

Rear view of PDIU-DI DB25, RS-232 female connector

DB25 FEMALE CONNECTOR

DB25 FEMALE CONNECTOR

DB25 MALE CONNECTOR

RS-232 CABLE

DB25 PIN #	NAME	DB25 PIN #
8	DCD	8
3	RD	3
2	TD	2
20	DTR	20
7	SG	7
6	DSR	6
4	RTS	4
5	CTS	5
22	RI	22
1	FG	1

IBM PC XT modem style (serial) DB25 to DB25 (M/F) RS-232 cable (50 ft max, 24 AWG, customer supplied).

NOTE:
The PC/ASCII terminal receives data on pin 3 (RD) and transmits data on pin 2 (TD).

FIGURE 4-58—PDIU-DI TO IBM XT-TYPE COMPUTER, RS-232 CONNECTOR/CABLE CONNECTIONS

TOSHIBA LAPTOP OR IBM AT-TYPE
PERSONAL COMPUTER (DTE)
PIN DESIGNATIONS

COM PORT PIN #	1	2	3	4	5	6	7	8	9
NAME	DCD	RD	TD	DTR	SG	DSR	RTS	CTS	RI

PDIU-DI
(FUNCTIONS LIKE A DCE)
PIN DESIGNATIONS

PDIU-DI PIN #	1	2	3	4	5	6	7	8	20	22
NAME	FG	TD	RD	RTS	CTS	DSR	SG	DCD	DTR	RI

Rear view of asynchronous (serial) communication interface connector (DB9) of Toshiba laptop or IBM AT personal computer

Rear view of PDIU-DI DB25, RS-232 female connector

DB25 FEMALE CONNECTOR

DB25 MALE CONNECTOR

DB9 MALE CONNECTOR

DB9 FEMALE CONNECTOR

DB9 PIN #	NAME	DB25 PIN #
1	DCD	8
2	RD	3
3	TD	2
4	DTR	20
5	SG	7
6	DSR	6
7	RTS	4
8	CTS	5
9	RI	22

IBM PC AT modem style (serial) DB25 to DB9, RS-232 cable. Pin to pin connections are configured as a straight cable, not as a null modem cable (50 ft max, 24AWG; customer supplied).

NOTES:
1. Some RS-232 EIA leads may be called by other names by some manufacturers.
2. The computer receives data on pin 2 (RD) and sends data on pin 3 (TD).

FIGURE 4-59—PDIU-DI TO IBM AT-TYPE COMPUTER, RS-232 CONNECTOR/CABLE CONNECTIONS

NOTES:

1. *Only serial printers that conform to EIA RS-232 signaling requirements can be connected to PDIU-DS units.*

2. *In rare applications, printers can be connected to PDIU-DIs. Refer to the printer's installation instructions.*

1) Consult the serial printer's documentation, and determine if the printer operates as a DCE or DTE device:

   - As a DCE device:
     a) Disassemble the PDIU-DS, and configure it to operate like a DTE device by placing the jumper plugs **P1 ~ P9** in the "B-C" (MODEM) position.
     b) Reassemble the PDIU-DS, and mark "B-C" on the bottom identification label for future reference. (Paragraph 6.170 provides PDIU-DS disassembly/assembly instructions, and Figure 4-54 provides jumper plug information).

   - As a DTE device:
     It may not be necessary to disassemble the PDIU-DS, since it comes direct from the factory configured as a DCE device. However, if uncertain,
     a) Disassemble the PDIU-DS, and verify that jumper plugs **P1 ~ P9** are in the "A-B" (DTE) position for DTE operation.
     b) Reassemble the PDIU-DS and mark "A-B" on the bottom identification label for future reference. (Paragraph **6.170** provides PDIU-DS disassembly/assembly instructions, and Figure 4-54 provides jumper plug information).

2) Connect the PDIU-DS to the appropriate NDKU circuit in accordance with the wiring diagrams in Section 200-255-205.

3) Connect the appropriate RS-232 cable between the printer and the PDIU-DS.

4) If steps 2 and 3 are properly done, the POWER and READY LEDs on the PDIU-DS should light when the printer is turned on.

IMPORTANT NOTE!
Check the printer's serial documentation for correct RS-232 pin requirements. The requirements vary with each manufacturer.

5) Refer to the **DDIU Program** for PDIU-DS data assignments.

IMPORTANT NOTE!
The eighth port (circuit) of the NDKU cannot be used for data switching connection (PDIU-DI or PDIU-DS).

6.160 PDIU-DS To Modem Installation

6.161 With **D.04** software, PERCEPTION$_{e\&ex}$ enables asynchronous-type (**not** synchronous) modems to be connected to PDIU-DS's. This allows PDIU-DI-equipped digital telephones that are connected to PCs, terminals, and other devices to share access to a modem.

6.162 Modems can be accessed internally for outgoing data calls or externally for incoming data calls. Modems operate as DCE devices, so the PDIU-DS must be configured to operate like DTE devices. The installation example in Figure 4-51 shows that two modems are connected to NSTU ports; however, the line side of modems can be directly connected to a dedicated CO line. The modem connects to the PDIU-DS with a standard RS-232 connector; the PDIU-DS line side (RJ-11 connector) always connects to its own individual NDKU port. Use the following instructions to connect modems to PDIU-DS's.

1) Configure the PDIU-DS as a DTE device:
   a) Disassemble the PDIU-DS, and place jumper plugs **P1 ~ P9** in the "B-C" position (MODEM).
   b) Reassemble the PDIU-DS, and mark "B-C" on the bottom identification label for future reference (Paragraph **6.170** provides

PDIU-DS disassembly/assembly instructions, and Figure 4-54 provides jumper plug information).

2) Connect the PDIU-DS to the appropriate NDKU circuit in accordance with the wiring diagrams in Section 200-255-205.

3) Connect the appropriate RS-232 cable between the modem and the PDIU-DS. Figure 4-60 shows an example of PDIU-DS to a Hayes modem RS-232 connection.

IMPORTANT NOTE!
All ten PDIU-DS EIA leads (signals) should be connected to the modem. Consult the modem's documentation for correct RS-232 pin requirements. The requirements may vary with each manufacturer.

4) Connect the line side of the modem to a NSTU standard telephone circuit, or a dedicated CO line (Consult the modem's documentation to connect it to a CO line). Section 200-255-205 provides NSTU station port wiring information.

5) Refer to the **DDIU Program** for PDIU-DS connection assignments.

IMPORTANT NOTE!
The eighth port (circuit) of the NDKU cannot be used for data switching connections (PDIU-DI or PDIU-DS).

6.170 PDIU-DS Disassembly and Assembly

6.171 To set the jumper plugs **P1 ~ P9** on the subassembly inside the PDIU-DS for DCE or DTE operation, the PDIU-DS must be disassembled (Figure 4-61). Disassemble the PDIU-DS in accordance with the steps in Paragraph **6.172**.

6.172 Disassembling the PDIU-DS

1) Remove the four screws securing the bottom

panel to the rest of the unit. These screws are not captive, so place them together where they can be easily accessed.

2) Remove the bottom panel.

3) Remove the PCB by lifting the back panel from its side grooves.

4) Turn the PCB over and set jumper plugs **P1 ~ P9** as follows:
   - If the PDIU-DS is connected to a DTE, set the plugs to the "A-B" position.
   - If the PDIU-DS is connected to a DCE device, set the plugs to the "B-C" position.

6.173 Assembling the PDIU-DS

1) Position the back panel to the PCB.

2) Slide the back panel down into its side grooves.

3) Attach the bottom panel, and secure it with the four noncaptive screws.

6.180 PDIU-DI/PDIU-DS Installation Tests

6.181 Figures 4-62 ~ 4-65 provide tests for four PDIU call applications. The telephone and port numbers used in these figures are provided for explanation purposes only. When actually testing, use port and telephone numbers appropriate for the system. Each of these tests can be conducted with either manual dialing from a telephone dialpad, or AT dialing from a personal computer keyboard; however, only the preferred method of dialing for the application is presented. The *PDIU User Guide* has additional information on the tests, which are listed below:
- Figure 4-62—PC to PC Test Call Using AT Commands
- Figure 4-63—PC to Printer Test Call Using Manual Dialing
- Figure 4-64—Internal PC to External PC Test Call Using AT Commands
- Figure 4-65—External PC to Internal PC Test

HAYES-TYPE SMART MODEM
(FUNCTIONS LIKE A DCE)

PDIU-DS
(CONFIGURED IN THE "CONNECT TO MODEM"
MODE, P1 ~ P9 = B-C, SO IT FUNCTIONS LIKE A DTE)

MODEM PIN #	1	2	3	4	5	6	7	8	20	22
NAME	FG	TD	RD	RTS	CTS	DSR	SG	DCD	DTR	RI

PDIU-DS PIN #	1	2	3	4	5	6	7	8	20	22
NAME	FG	TD	RD	RTS	CTS	DSR	SG	DCD	DTR	RI

Rear view of modem DB25 connector

Rear view of PDIU-DS DB25, connector

DB25 FEMALE CONNECTOR

DB25 FEMALE CONNECTOR

DB25 MALE CONNECTOR

DB25 MALE CONNECTOR

RS-232 CABLE

(50 ft max, 24 AWG; customer supplied)

DB25 PIN #	NAME	DB25 PIN #
8	DCD	8
3	RD	3
2	TD	2
20	DTR	20
7	SG	7
6	DSR	6
4	RTS	4
5	CTS	5
22	RI	22
1	FG	1
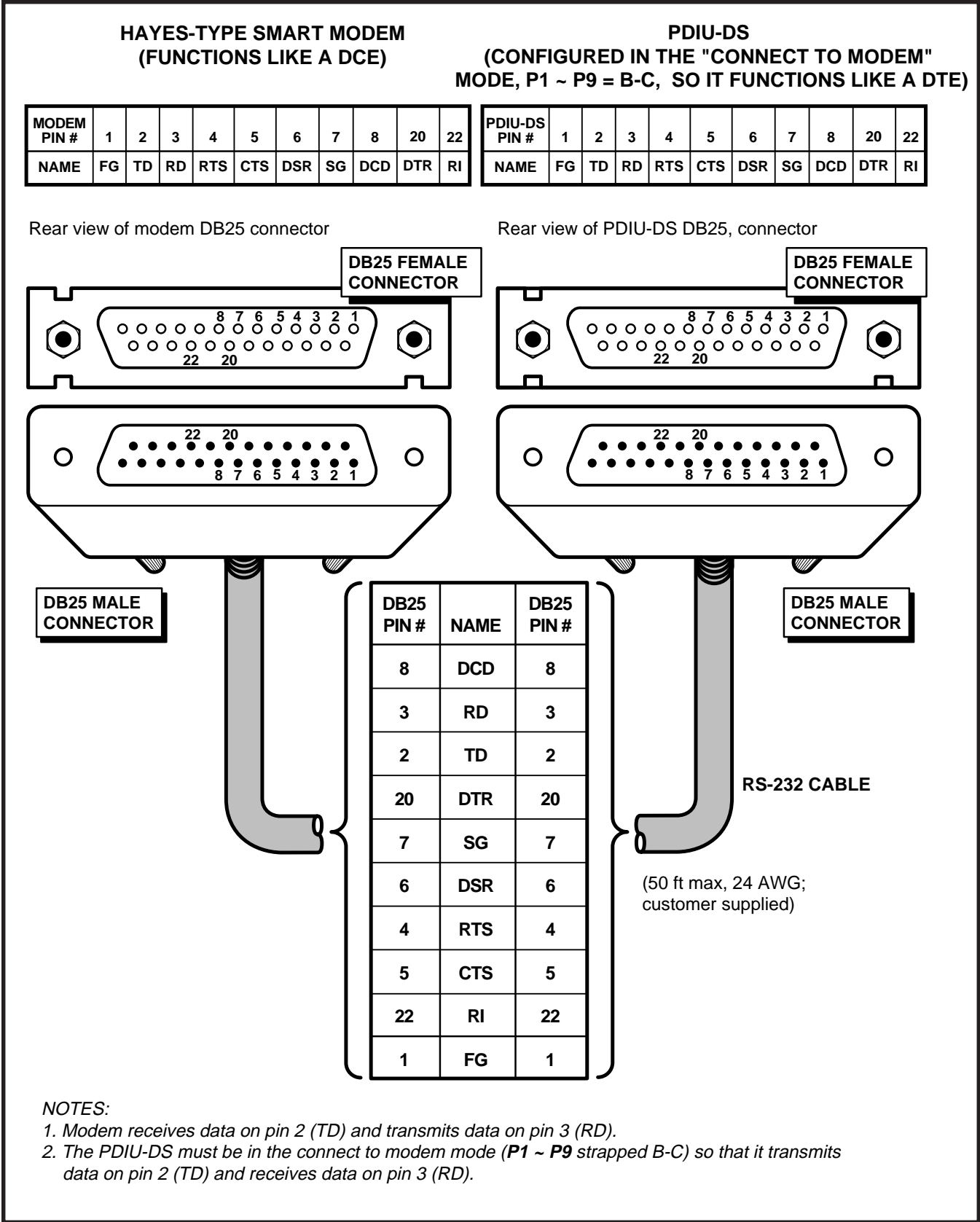
NOTES:
1. Modem receives data on pin 2 (TD) and transmits data on pin 3 (RD).
*2. The PDIU-DS must be in the connect to modem mode (**P1 ~ P9** strapped B-C) so that it transmits data on pin 2 (TD) and receives data on pin 3 (RD).*

FIGURE 4-60—PDIU-DS TO HAYES-TYPE SMART MODEM, RS-232 CONNECTOR/CABLE CONNECTIONS

SIDE
GROOVES

SW-1

DTE/MODEM
JUMPER PLUGS
P1~P9

PDIU-DS
PCB

BOTTOM
PANEL
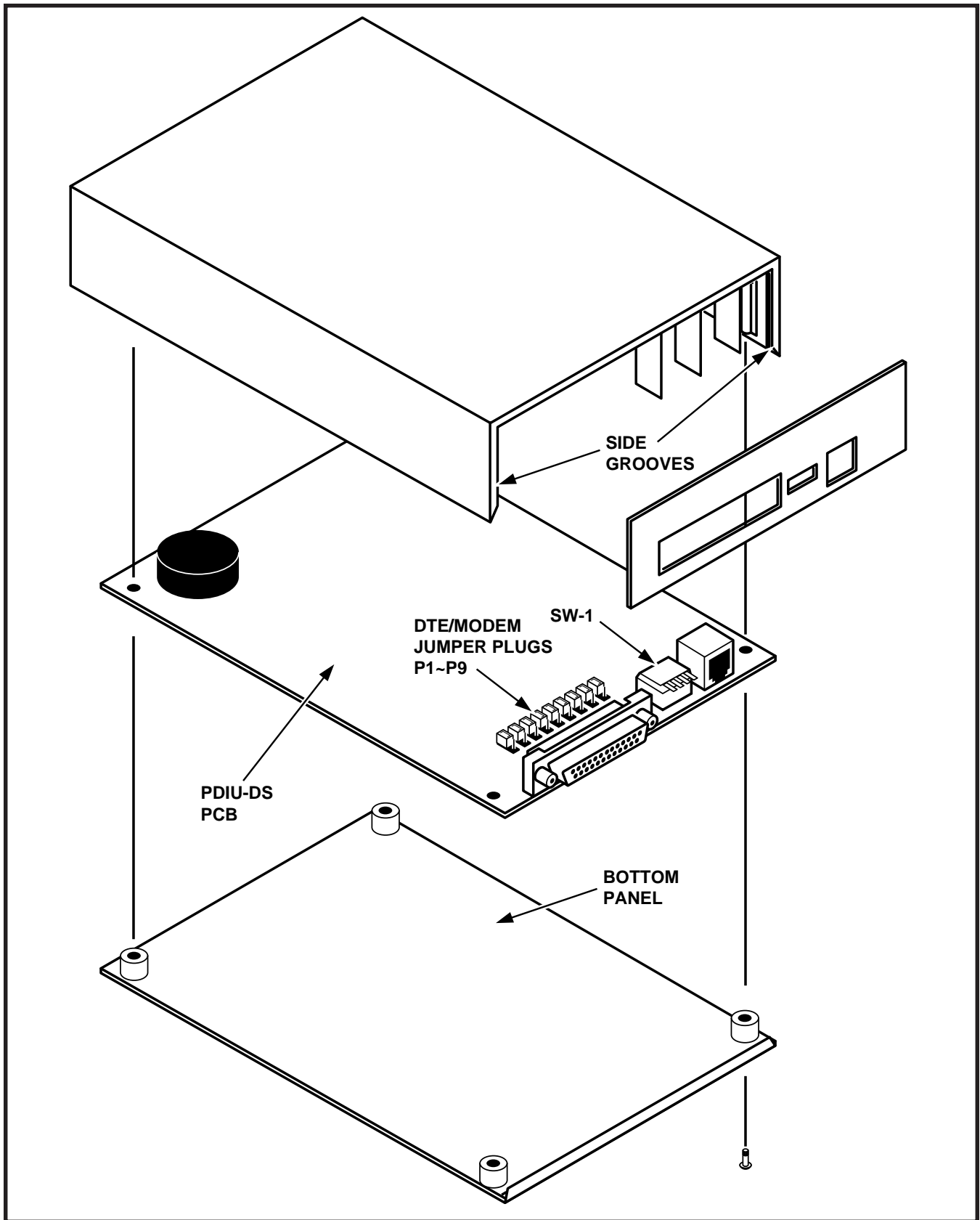
FIGURE 4-61—PDIU-DS DISASSEMBLY/ASSEMBLY DIAGRAM
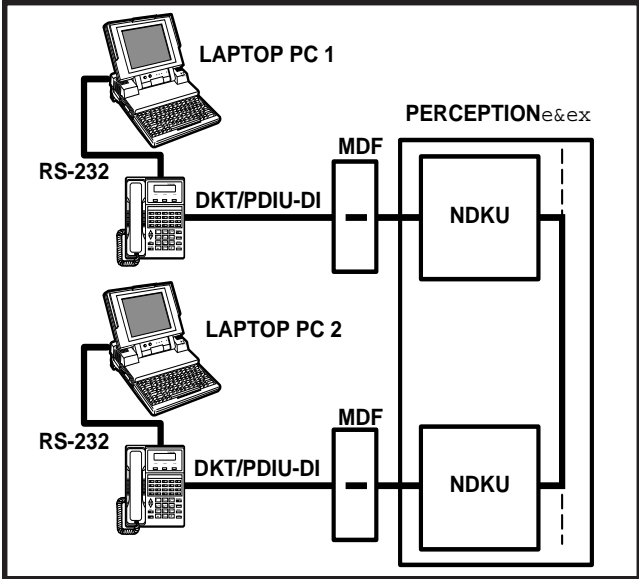
FIGURE 4-62
PC TO PC TEST CALL USING AT COMMANDS
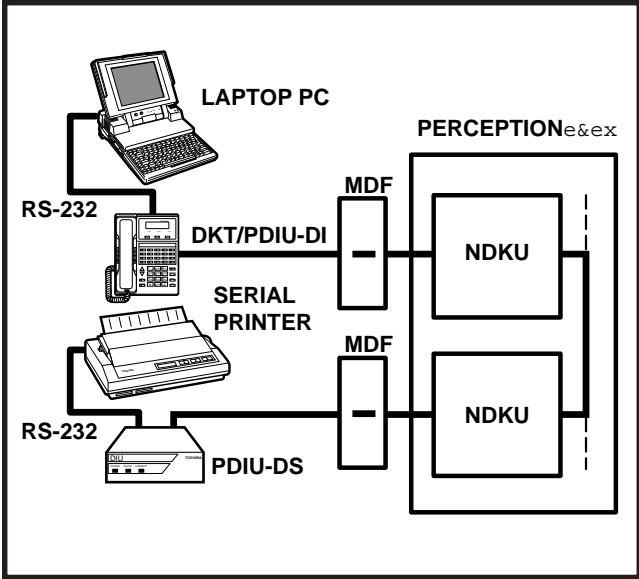
FIGURE 4-63
PC TO PRINTER TEST CALL USING MANUAL DIALING
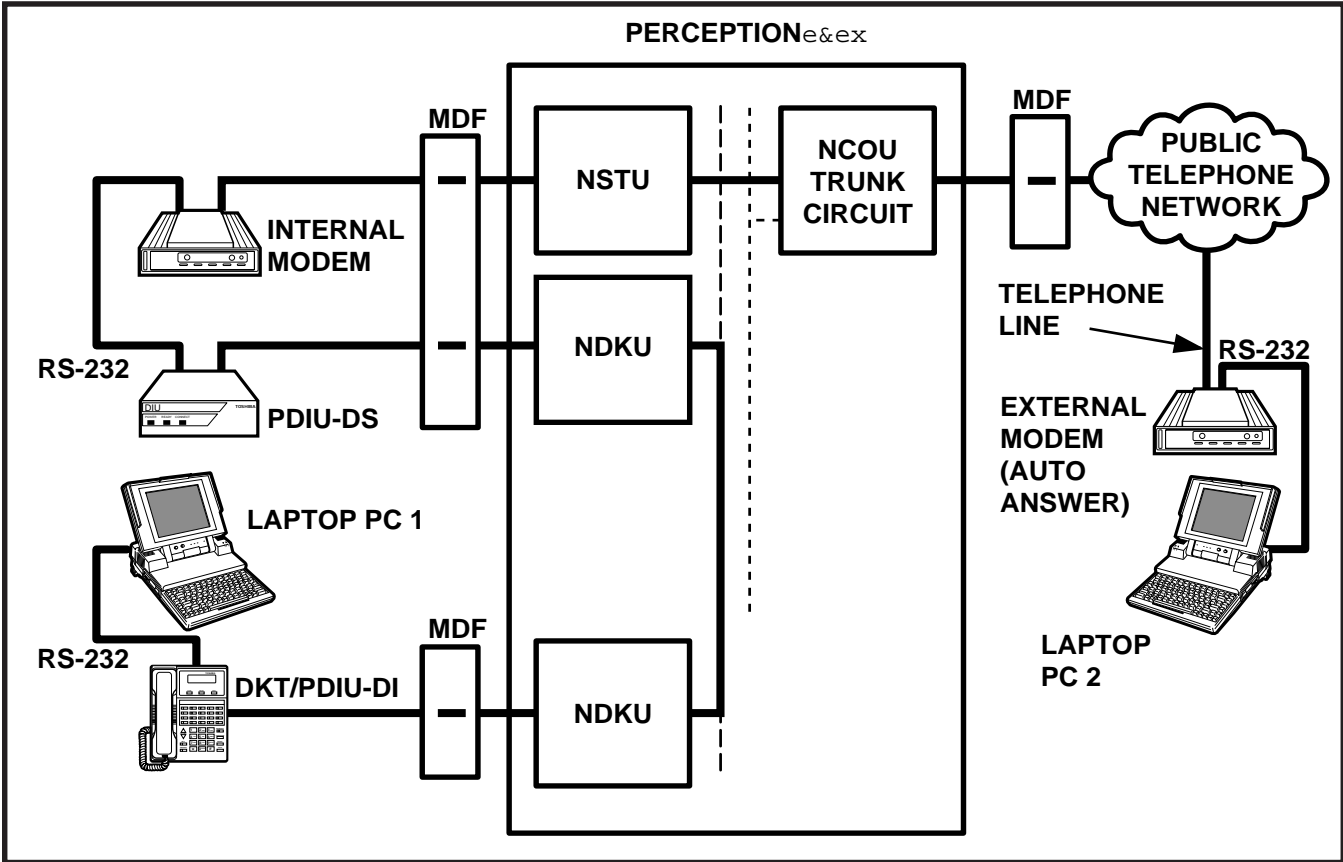
FIGURE 4-64—INTERNAL PC TO EXTERNAL PC TEST CALL USING AT COMMANDS
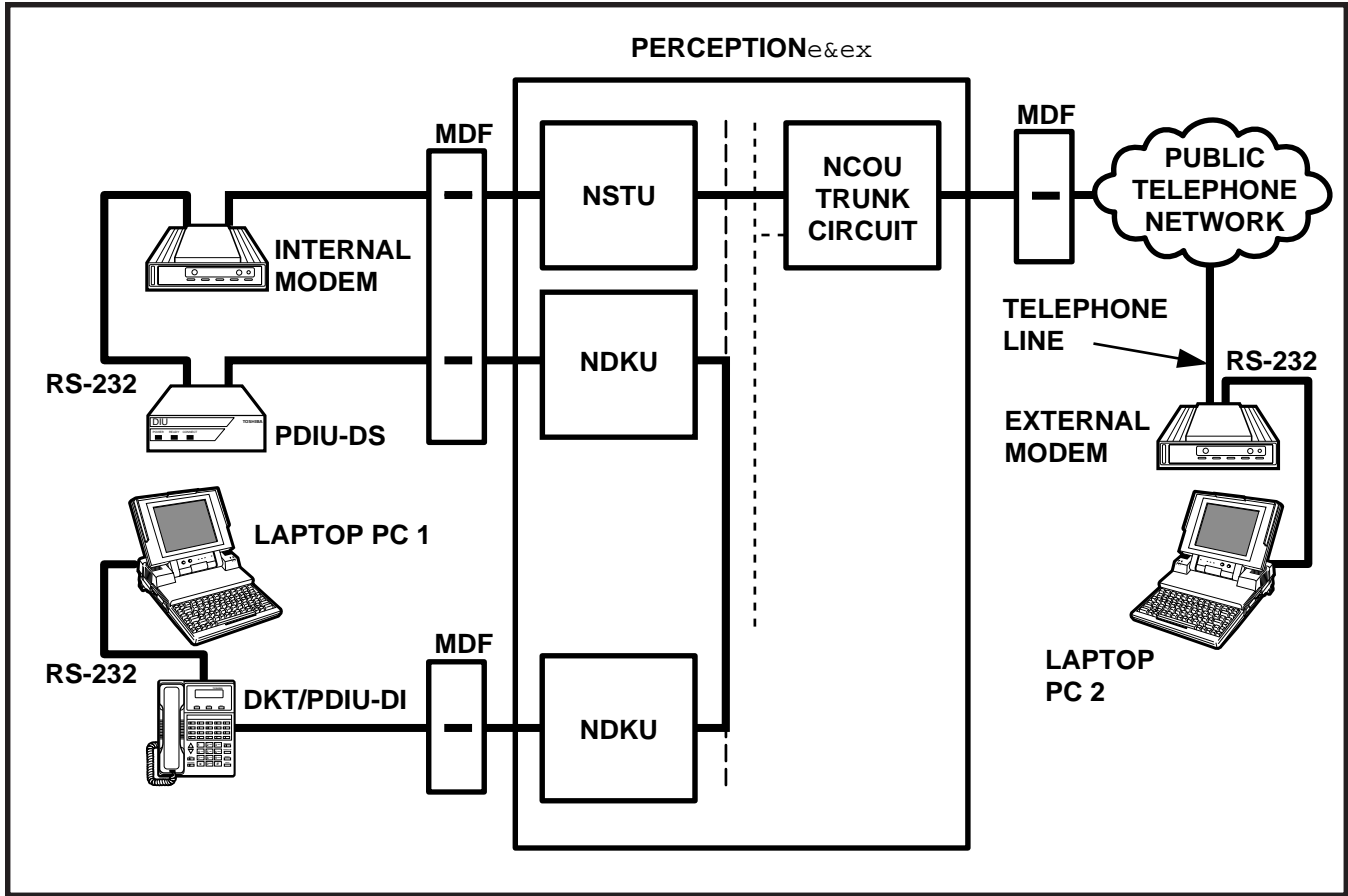
FIGURE 4-65—EXTERNAL PC TO INTERNAL PC TEST CALL USING AT COMMANDS

Call Using AT Commands

6.182 PC to PC Test Call Using AT Commands

1) Make sure that PC 1 and PC 2 are equipped with a communication software package, and that the communication parameters of each PC and the communication software package are set to the same values (data transmission rate, flow control, etc.).

2) From either PC keyboard, type **A T D X X X X** and press **ENTER**, where XXXX is the Data Extension number. (AT commands must be capital letters.)

3) To terminate the call:
   a) Type **+ + +** from either PC keyboard.
      ● The PC screen displays "OK."
   b) Type **A T H** from the PC keyboard used in step 3a.

● PC 1 and PC 2 screens both display "NO CARRIER."
● The DATA LED on each DKT will be off.

6.183 PC to Printer Test Call Using Manual Dialing

1) Make sure that the PC is configured to print data from its serial COM port (the PC COM port is connected to DKT/PDIU-DI). This is normally accomplished using the DOS and MODE commands.

2) Using the manufacturer's documentation, make sure that the communication parameters (data speed, data bits, etc.) of the PC COM port match the printer's serial interface parameters.

3) To connect the PC to the printer, press the

DKT's **DATA** button and dial **X X X**, where XXX is the Data Extension number.

- The CONNECT LED on the PDIU-DS will light.
- The connection between the PC and the printer is complete.
- If busy tone is sent to the DKT, the connection is not complete. Try step 3 again.

4) Operate the PC to print data as required.

5) To terminate the call, press the DKT's **DRS** button.

6.184 Internal PC to External PC Test Call Using AT Commands

1) Make sure PC 1 and PC 2 are equipped with a communication software package, and that the communication parameters of each PC and communication software package are set to the same values (data transmission rate, flow control, etc.).

2) From PC 1's keyboard, type **A T D X X X X** and press **ENTER**, where XXXX is Data Extension number. (AT commands must be capital letters.)
   - The DATA LED on the DKT will light.
   - The CONNECT LED on the PDIU-DS will light.
   - The screen on PC 1 displays "CONNECT XXXX," where XXXX is the data transmission speed set by the communication software.
   - At this time, PC 1 and the PDIU-DS are connected.

3) From PC 1's keyboard, type **A T D T X X X X X X X X X X** and press **ENTER**, where XXXXXXXXXXX is the trunk access code and modem telephone number.
   - The internal modem goes off-hook, dials the access code to seize the trunk, and then dials the external modem's telephone number.

- The external modem rings and auto answers, the modems handshake and establish communications.
- If the external modem sends result codes, the screen on PC 1 displays "CONNECT XXXX," where XXXX is the data transmission speed set by the communication software.
- At this time PC 1 and PC 2 are connected, and can exchange data (file transfers, type messages, etc.).

4) To terminate the call:
   a) Type **+ + +** from either PC keyboard.
      - The PC screen displays "OK."
   b) Type **A T H** from the PC keyboard used in step 5a.
      - PC 1 and PC 2 screens both display "NO CARRIER."
      - The DATA LEDs on each DKT will go out.

6.185 External PC to Internal PC Test Call Using AT Commands

1) Make sure PC 1 and PC 2 are equipped with a communication software package, and that the communication parameters of each PC and communication software package are set to the same values (data transmission rate, flow control, etc.).

2) From PC 2's keyboard, type **A T D X X X X X X X** and press **ENTER**, where XXXXXXX is telephone number.
   - The external modem originates the call.
   - Trunk rings incoming call to the internal modem.
   - The internal modem rings and auto answers, the modems handshake and establish communications.
   - If the internal modem sends result codes, PC 2's screen displays "CONNECT XXXX," where XXXX is the data transmission speed set by the communication software.

- At this time, PC 2 is connected to the PDIU-DS.

3) From PC 2's keyboard, type **A T D X X X X** and press **ENTER**, where XXXX is the Data Extension number. (AT commands must be capital letters.) This prompts the PDIU-DS to dial and connect to the PDIU-DI.
   - The CONNECT LED on the PDIU-DS will light, the DATA LED on the DKT will also light.
   - The screens on PC 1 and PC 2 display "CONNECT XXXX," where XXXX is the data transmission speed set by the communication software.
   - At this time PC 1 and PC 2 are connected and they exchange data (file transfers, typed messages, etc.).

4) To terminate the call:
   a) Type **+ + +** from either PC keyboard.
      - The PC screen displays "OK."
   b) Type **A T H** from the PC keyboard used in step 5a.
      - PC 1's and PC 2's screens both display "NO CARRIER."
      - The DATA LED on each DKT will go out.

7. STANDARD TELEPHONE EQUIPMENT INSTALLATION

7.00 Standard Telephone Connections

7.01 See the **DSTT Program** in Section **200-255-300**, *Programming*, for instructions on programming standard telephones. The system must be told at which ports standard telephones are installed.

7.02 Standard telephones require single-pair wire and are connected to the MDF via standard twisted-pair telephone cables.

7.03 Standard telephone connection details are shown in Figure 4-66.

8. TRUNK CONNECTIONS

8.10 Connections from the telephone company jack (RJ21X for CO/FX/WATS/DID trunks and RJ2EX for E & M TIE trunk) should be terminated on a 66-block, and then cross-connected to the

DESIGNATOR	FUNCTION	TRUNK TYPE
T	Tip	CO, DID, TIE
R	Ring	CO, DID, TIE
T1	Tip 1	TIE (4-wire)
R1	Ring 1	TIE (4-wire)
E	E	TIE
SG	Sig. Gnd.	TIE (Type II)
M	M	TIE
SB	Sig. Bat.	TIE (Type II)

appropriate leads on the CO portion of the MDF, using the Tables 5-7, 5-8, and 5-13 ~ 5-15 as guides. Connection requirements for each type of trunk are shown below.

9. PERIPHERAL EQUIPMENT INSTALLATION

9.00 Modem Pooling Connections (DDIU-MA only)

9.01 See the **NMDM Program** in Section **200-255-300,** *Programming*, to input information concerning *Modem Pooling for the DDIU-MA only*.

9.02 Most modems require only single-pair wiring and are connected to the MDF via standard twisted-pair telephone cables. However, some modems may require a two-pair connection (one for transmit—one for receive). For this type of connection, use the next wire pair (which is not normally used). Modem Pooling Connection details are shown in Figure 4-67.

IMPORTANT!
All connections to DDIUs (-MA or -MAT) must observe correct tip and ring polarity for proper operation.

9.10 Power Failure/Emergency Transfer

9.11 One DPFT can be installed in a two-cabinet system. Install the DPFT as follows:

1) Mount the DPFT near the MDF.

NMDU PCB				CROSS-CONNECT BLOCK	RJ11 BLOCK	500/2500-TYPE TELEPHONE #1

CKT 1 — TL1 — 26 — (W-BL) — TL1
RL1 — 1 — (BL-W) — RL1

CKT 2 — TL2 — 28 — (W-G) — TL2
RL2 — 3 — (G-W) — RL2

CKT 3 — TL3 — 30 — (W-S) — TL3
RL3 — 5 — (S-W) — RL3

CKT 4 — TL4 — 32 — (R-O) — TL4
RL4 — 7 — (O-R) — RL4

CKT 5 — TL5 — 34 — (R-BR) — TL5
RL5 — 9 — (BR-R) — RL5

CKT 6 — TL6 — 36 — (BK-BL) — TL6
RL6 — 11 — (BL-BK) — RL6

CKT 7 — TL7 — 38 — (BK-G) — TL7
TL8 — 13 — (G-BK) — RL7

CKT 8 — RL7 — 40 — (BK-S) — TL8
RL8 — 15 — (S-BK) — RL8

TO TELEPHONE #2
TO TELEPHONE #3
TO TELEPHONE #4
TO TELEPHONE #5
TO TELEPHONE #6
TO TELEPHONE #7
TO TELEPHONE #8

T
R
G B O R Y O

25-PAIR CABLE

"J" CABLE CONNECTOR PINS

FIGURE 4-66—STANDARD TELEPHONE CONNECTION
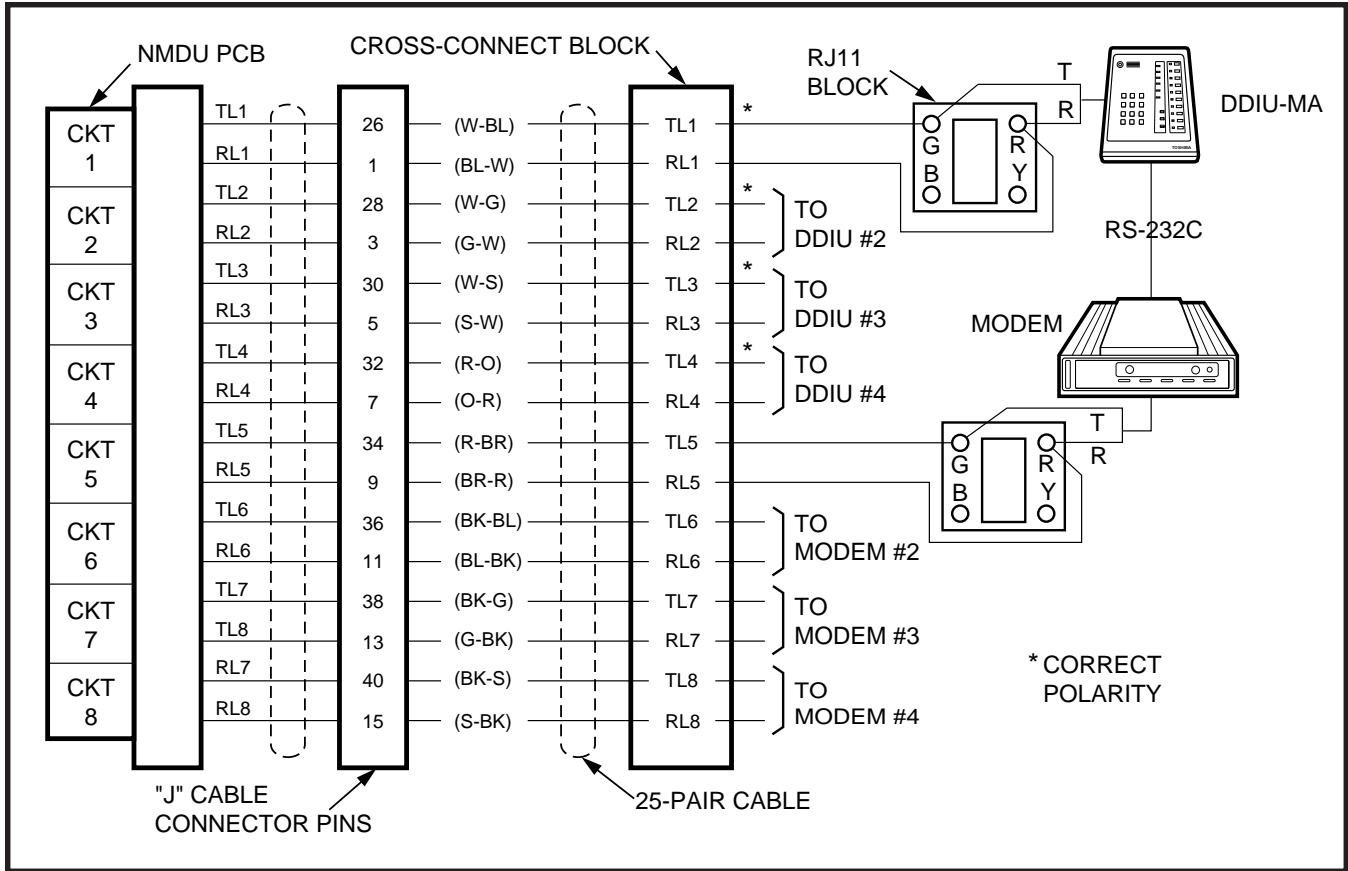
FIGURE 4-67—MODEM POOLING CONNECTION (DDIU-MA ONLY)

2) Using 25-pair cables with amphenol-type connectors (female for **J1**, male for **J2**), connect the DPFT to two 66-type cross-connect blocks.

3) Using Tables 5-8 and 5-15 for guides:
   - Connect the trunks selected for emergency use to the **J1** block "CO Tip" and "CO Ring" terminals.
   - Connect the NCOU circuits supporting the emergency trunks to the **J1** block "NCOU Tip" and "NCOU Ring" terminals.

4) Using Tables 5-6, 5-7, 5-9, 5-14 and 5-16 for guides:
   - Connect the standard telephone stations, designated for emergency use, to the proper terminals on the **J2** block "TEL Tip" and "TEL Ring" terminals.

5) At the MDF, connect the DPFT to the system as follows:

   PERCEPTION$_e$
   DPFT **J1** (trunk) = LCEC/NCEC-M & S **J8-J15**/**J508**-**J515**
   Pin 25 (S-V) = Pin 25 (S-V)*
   Pin 50 (V-S) = Pin 50 (V-S)*
   DPFT **J2** (station) = LCEC/NCEC-M & S **J4-J15**/**J504**-**J515**

   PERCEPTION$_{ex}$
   Any trunk position

   *On the **J1** connector, the pin 25 connection provides the -24 VDC input required to drive the DPFT and the pin 50 connection provides ground. There are no power connections on connector **J2.**

9.20 Reserve Power

9.21 Install Reserve Power as follows (Figure 4-68):

1) Place the customer-supplied battery pack where it will be located.

CAUTION!
Batteries can emit fumes that are poisonous to people, potentially explosive, and corrosive to electronic components. Locate batteries so that any fumes are adequately vented per local fire codes.

2) Place the **POWER** switch (on the front of the main power supply) in the **OFF** position and remove the AC power cable from the outlet.

PEAK LOAD BATTERY CABLES

24 VDC BATTERY PACK

POWER CABLE

NOTE:
Ensure that the correct polarity is maintained.
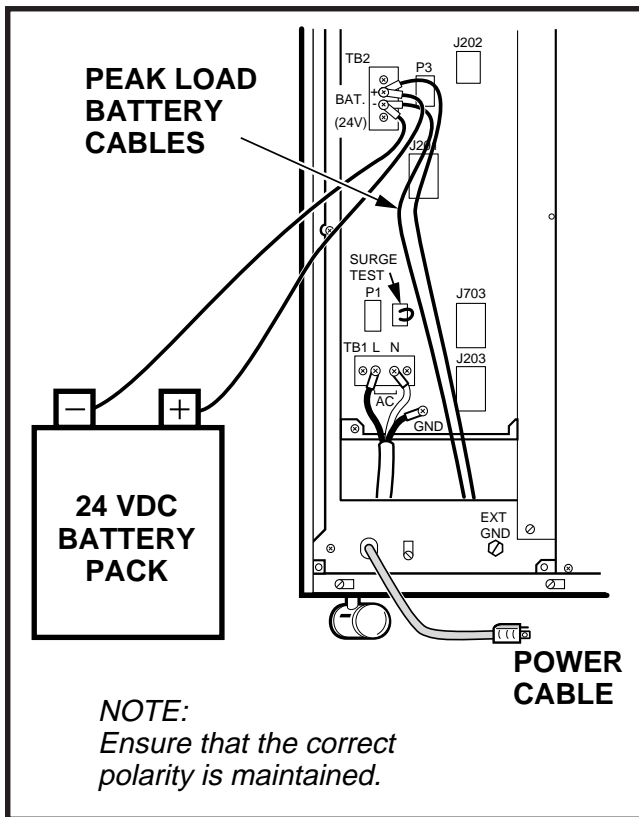
FIGURE 4-68—RESERVE POWER INSTALLATION

3) Connect the battery pack leads (customer-supplied) to **TB2 BAT** on the NPSA-M or LPSA (Figure 4-68). Observe the correct polarity. Leave the leads from the peak load battery connected.

4) Connect the leads to the battery pack (Figure 4-67). Observe the correct polarity. Fix battery leads to the cabinet using the clamp.

5) Place the **BAT BACK UP** switch on the front of the main power supply in the **ON** position.

6) Plug the AC cable into the outlet and turn the **POWER** switch **ON**.

9.30 Paging Equipment

9.31 By combining a single customer-supplied paging amplifier with the system's paging interface and speaker zone switching, it is possible to provide a paging system of up to five zones with All Zone Page capability.

9.32 Figures 4-69, 4-70 and 4-71 show possible paging arrangements. As a standard feature (part of the NPRU PCB), the system provides a 600-ohm output to a paging amplifier. If more than one paging zone is required, the output of the amplifier can be routed back to the NPRU PCB where it will be switched to one of five sets of speakers. The speaker operated is determined by the access code dialed by the station user. The actual access code is assigned in software (see Section **200-255-300**, *Programming*).

9.33 An All Page code can also be defined in software. When that code is dialed, all relays will be activated simultaneously to permit paging to all speaker zones.

9.34 If the power loads of the different zones are such that a single amplifier is not suitable, multiple amplifiers (up to one for each zone) can be connected as shown in Figure 4-71.

9.35 If music is to be broadcast over the paging system, two arrangements are possible:

1) If the music is supplied from a separate amplifier (as in Figures 4-70 and 4-71), it can be connected between the speaker common line and the **PG GND** input to the NPRU (PERCEPTION$_e$ **J2/J502** and pin 2 or PERCEPTION$_{ex}$ **J1/J2** and pin 2). The music will be connected to all speaker zones when no page is in progress. When a page access
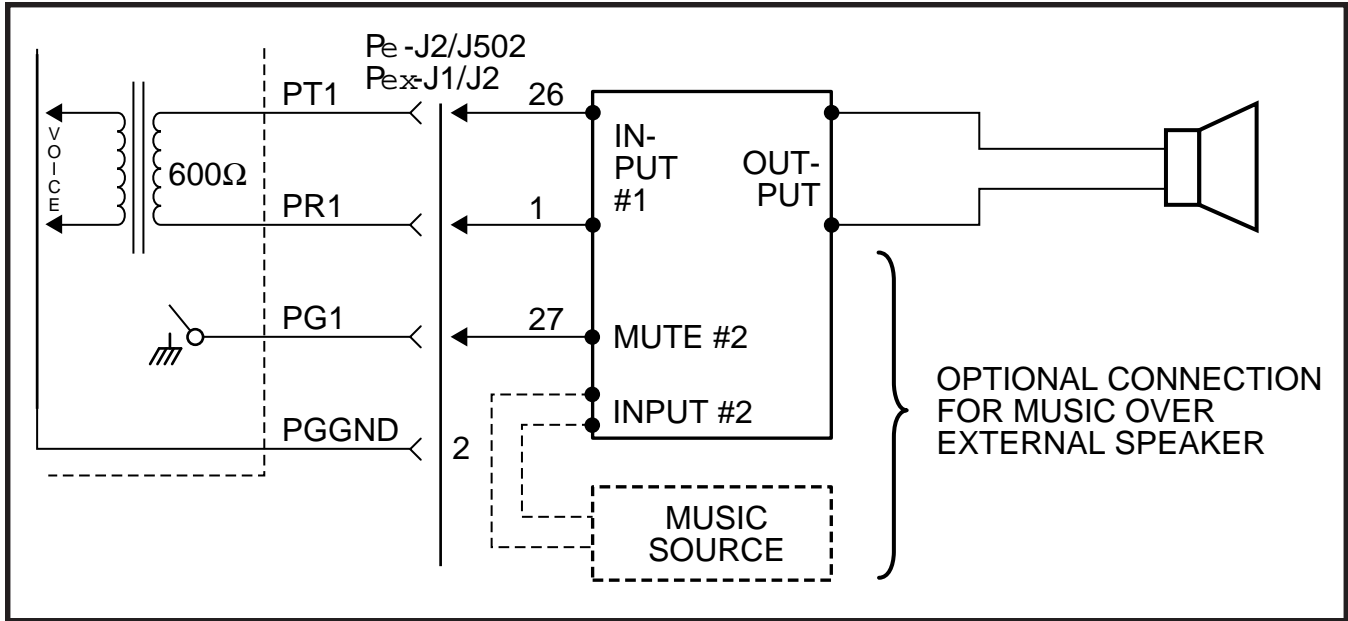
FIGURE 4-69—PAGING WITH MUSIC OVER EXTERNAL SPEAKER FROM SAME AMPLIFIER

code is dialed, the music is disconnected from the zone and the page amplifier output is connected.

2) If the music is connected to a second input of the paging amplifier (Figure 4-69), the PG1 control lead (**J2** and **J502** pin 27 or **J1** and **J2** for PERCEPTION$_{e\&ex}$, respectively) can be connected to the MUTE terminal of the page amplifier music channel. When any page access code is dialed, a ground output is applied to the **PG1** lead to mute the music.

9.36 All paging connections are made at the **J2** and **J502** or **J1** and **J2** connectors on the PERCEPTION$_{e\&ex}$ systems, respectively. The connectors are located on the rear of the basic and expansion cabinets. See Tables 5-4 and 5-10 for details.

9.40 Music-on-Hold

9.41 A Music-on-Hold (MOH) interface is a standard feature on the system. The circuitry occupies part of the NPRU PCB. If MOH is equipped, it will be heard by any station or trunks on-hold in the system, or by any trunk put into the camp-on state.

9.42 A tuner or other program source, supplied by the customer, is connected to the MOH input via pins 4 and 29 (Br-W and W-BR) of **J2** or **J502** / **J1** or **J2** for the PERCEPTION$_{e\&ex}$ systems, respectively (see Tables 5-4 and 5-10). The input impedance is 600 ohms. (This cannot be the same source used to provide music over external speakers.)

9.43 Adjust the MOH volume with the MOH volume control on the front of the NPRU PCB. Maximum volume is limited by internal circuits in order to comply with FCC regulations.

9.50 Universal Night Answer

9.51 The Universal Night Answer (UNA) feature provides an output of interrupted ringing voltage (85 $\pm$10 VRMS, 20 Hz superimposed on -24 VDC) whenever the system is in Night Service and an incoming call is received by a trunk designated for UNA. Any station user, upon hearing the chime or bell, can dial the UNA access code and be connected to the caller.

9.52 The ringing voltage output is intended to control a strategically located chime or loud ringing bell. The available power is five ringer equivalents.

9.53 Two UNA zones can be installed in tenant systems. Either zone can be assigned in pro-
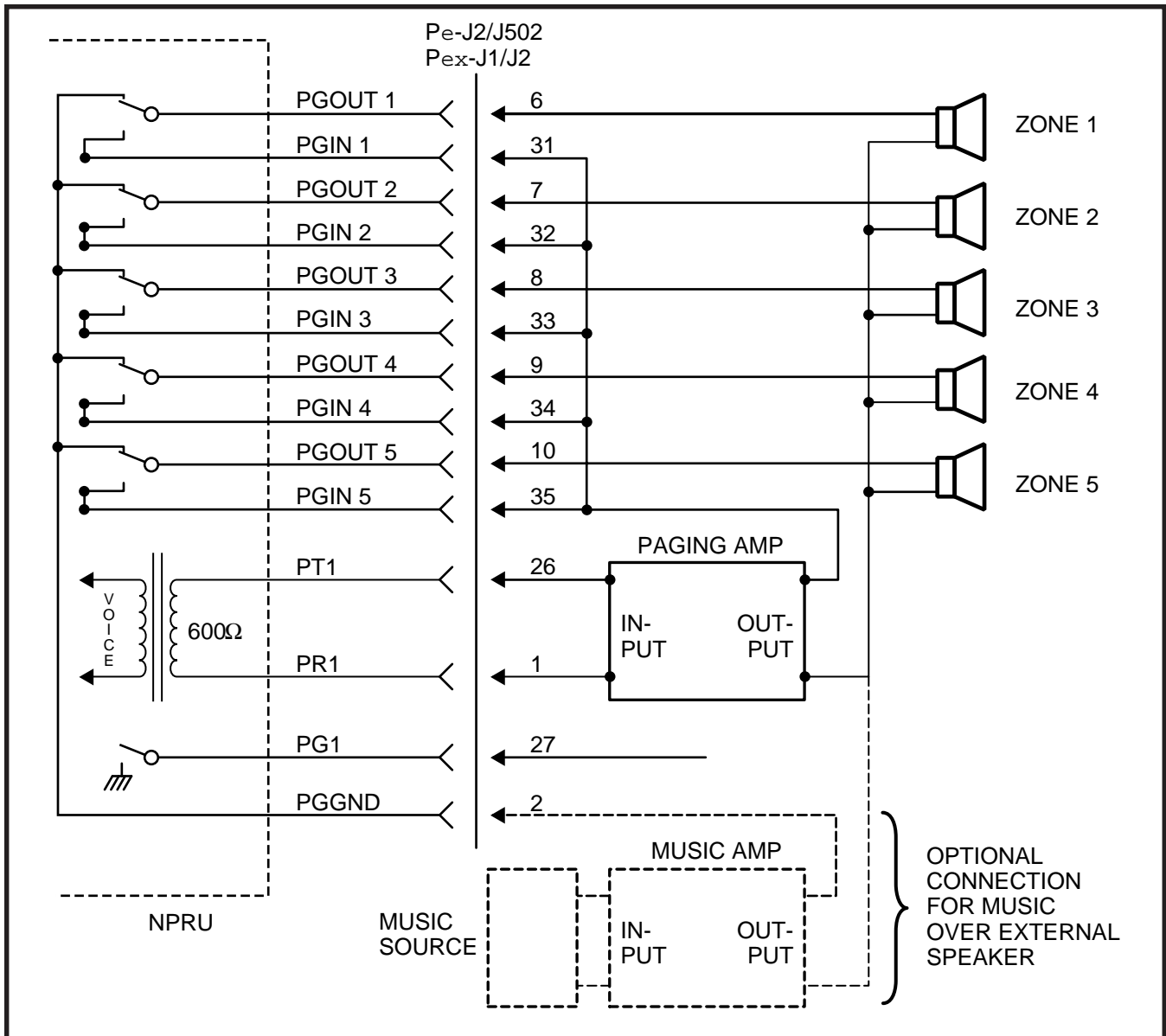
FIGURE 4-70—PAGING WITH ONE AMPLIFIER

gramming to either tenant. For PERCEPTION$_e$, connections to the UNA ringing signal are via pins 12 and 37 (O-BK, BK-O) of **J2**. This connection is to **J502** in the expansion cabinet for UNA Zone 1 (see Tables 5-4 and 5-10). UNA zone 1 requires a second NPRU PCB in the expansion cabinet.

9.54 UNA connections for PERCEPTION$_{ex}$ are made at pins 12 and 37 connectors **J1** and **J2** on the basic cabinet. A second UNA device requires a second NPRU to be installed in the basic cabinet.

9.60 Station Message Detail Recording

9.61 The Station Message Detail Recording (SMDR) feature enables a business to monitor and control its telephone costs. Data can be collected for each outgoing and/or incoming trunk call. Each such call generates a call record that is output at the SMDR connector on the connector panel at the upper rear of the LCEC-M or NCEC-M. (In Lodging/ Health Care applications, data specific to those applications are included in the SMDR output.)

9.62 SMDR output can be connected to a variety of
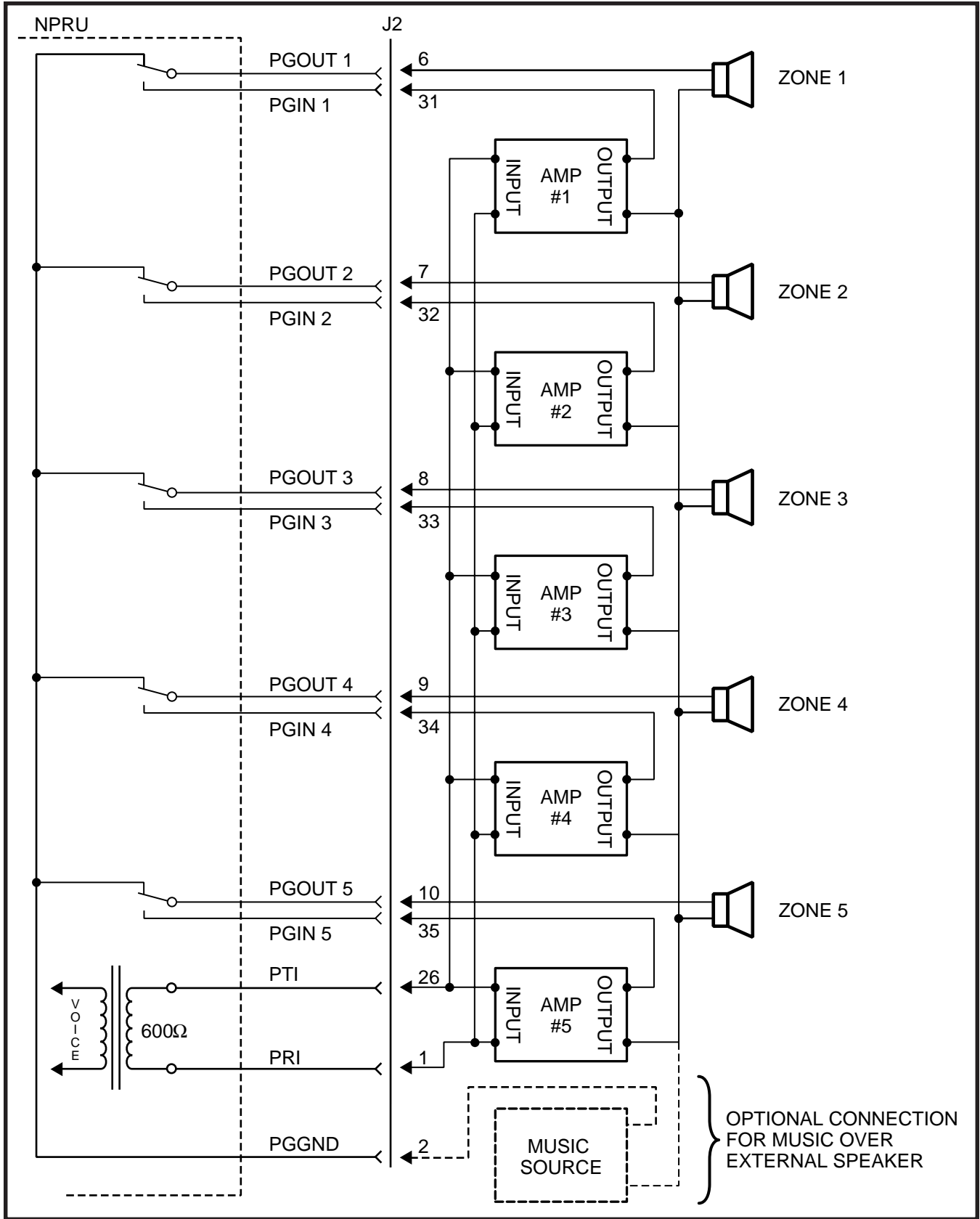
FIGURE 4-71—PAGING WITH MULTIPLE AMPLIFIERS

customer-provided equipment:
- A local 80-column printer for an on-line printout at the termination of each trunk call.
- A recording device to store data for subsequent processing, either on-site or by a service bureau.
- Call accounting equipment to provide customized call reports.

9.63 Refer to the external device manufacturer's
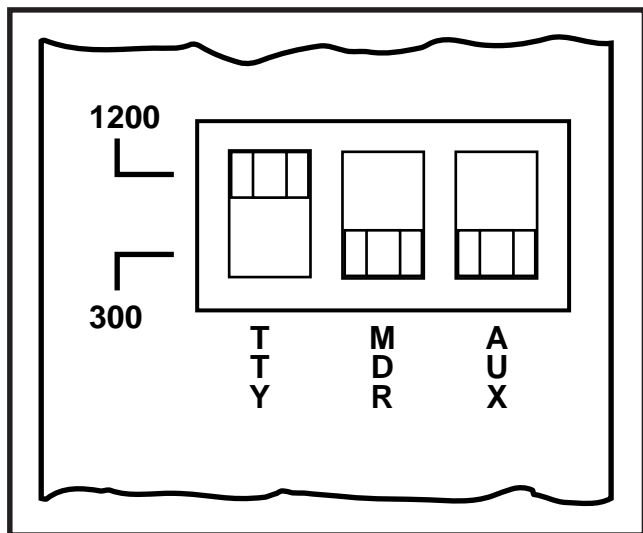
FIGURE 4-72—LCCU SWITCHES

PIN	SIGNAL
2	Receive Data (from SMDR device)
3	Transmit Data (to SMDR device)
4	Request to Send (to SMDR device)
5	Clear to Send (to SMDR device)
6	Data Set Ready
7	Signal Ground
8	Carrier Detect
20	Data Terminal Ready (from SMDR device)

documentation for information on its SMDR connector pin assignments.

9.64 The SMDR output speed can be set for either 300 bps or 1200 bps by the MDR switch on the front panel of the LCCU PCB (Figure 4-72). SMDR pin assignments are as follows:

9.65 The code used by SMDR is standard 7-level ASCII using one start bit, one stop bit and one parity bit (even parity).

9.66 SMDR can be programmed to record data under any one of the following conditions:
- Incoming calls only.
- Outgoing calls only.
- Incoming and outgoing calls.
- Outgoing toll calls only.
- All incoming calls and outgoing toll calls.

9.67 When outgoing calls are chosen, all calls seizing a trunk will be recorded regardless of duration. On incoming calls, all answered calls will be recorded. Calls disconnected by Toll or Code Restriction features are not recorded.

9.68 Timing for recorded calls will start as follows (Figure 4-73):
- Outgoing—when trunk is seized.
- Incoming to attendant only—when attendant answers.
- Incoming and extended by the attendant—when attendant answers.
- Incoming to a station—when answered.

9.69 A station user can enter a charge account code of up to 12 digits for each call. This code is included in the SMDR output.

9.70 The recording criteria and account code length are defined in **DMDR Program** (see Section **200-255-300**, *Programming*).

9.71 Each time a trunk is seized, data is collected for that call until the trunk is released. This data is output at the SMDR port in the following format (see Figure 4-73).
- Time
  - Start of Call Hour - tens - units
    Minute - tens - units
  - Call Duration Hour - units
    Minute - tens- units
    Seconds - tens - units
  - Condition Code (see table)
    - A = Attendant handled
    - D = Call > 10 hours
    - E = Maintenance (SMDR port)
    - F = Maintenance (trunk test)
    - I = Incoming call
    - K = Outgoing call
    - L = Conference Attendant or 3-party
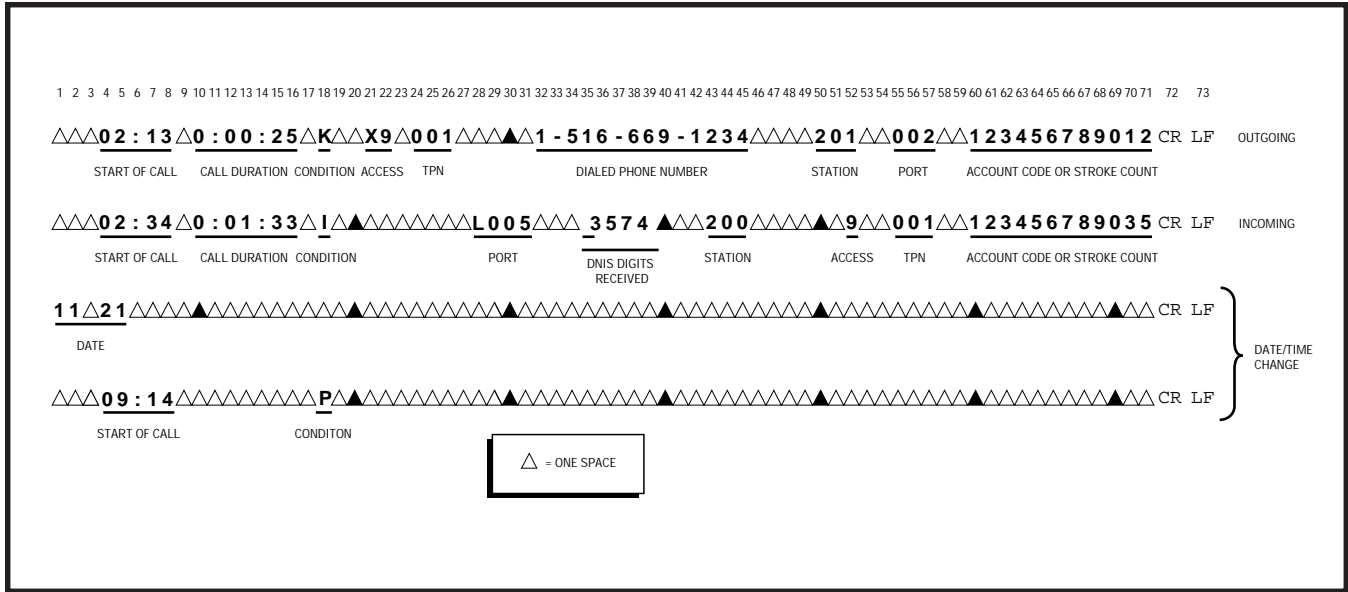
FIGURE 4-73—EXAMPLE: SMDR CALL RECORD

M = Transfer or Call Forward
N = SPCC #1
O = SPCC #2
P = Date/Time change
Q = System Initialize
R = Incomplete call
S = Date printed (every hour)

- Access Code   3 digits maximum
- Dialed Number   15 digits maximum
- Calling DN   4 digits maximum
- Trunk Port   3 digits maximum
- DNIS Digits   4 digits maximum
- Calling Port No.   3 digits maximum
- Account Code   12 digits maximum
              or
- Stroke Count   4 digits maximum

9.72 The format of the special record, for Initialize/ Reload and Time Change, is as follows:
Initialize/Reload:
    NNNN etc. (previous records-usual call)
    00 (initialize or reload)

9.73 Any record printed after the initialize record will appear on the same line and be offset three columns from the usual record.

    Example:
        NNNN (previous record)
        00 NNNNN (initialize and next record)

NNNNNN

Time Change:
    MM DD (old date)
    HH : MM (old time)
    MM DD (new date)
    HH : MM (new time)

9.74 Some complex calls will cause multiple call records (CR) for the same station or trunk.

Examples:
    1) Station 1 transfers Trunk 1 to Station 2
       CR for Station 1 ~ Trunk 1
       = Condition Code I or K
       CR for Station 2 ~ Trunk 1
       = Condition Code M

    2) Station 1 transfers Trunk 1 to Trunk 2
       CR for Station 1 ~ Trunk 1
       = Condition Code I or K
       CR for Station 1 ~ Trunk 2
       = Condition Code L
       CR for Trunk 1 ~ Trunk 2
       = Condition Code M

    3) Station 1 holds Trunk 1 and calls Trunk 2
       CR for Station 1 ~ Trunk 1
       = Condition Code I or K

CR for Station 1 ~ Trunk 2
= Condition Code K

9.75 All connections to miscellaneous equipment are made via **J2**, **J1**, **TTY**, **SMDR**, and **MODEM** connectors on the connector panels of the system.

9.80 Lodging/Health Care Data Audit

9.81 The Lodging/Health Care Data Audit feature enables the user to record and analyze the registration and operation of specific features in Lodging/Health Care applications.

9.82 Lodging/Health Care audit data is output at either the **SMDR** (as part of the **SMDR** printout) or the **TTY** (as a separate report) connector on the upper rear of the basic cabinet. (Because the **TTY** connector is required for on-site programming and maintenance procedures, it is recommended that the **SMDR** port be used.) The selection of data to be output and the connector choice (**TTY** or **SMDR**) are software-controlled (see **DHMF Program** in Section **200-255-300**, *Programming*).

9.83 The **SMDR** or **TTY** output can be connected to either:
- A local 80-column printer for an on-line printout.
- Compatible call accounting or property management interface equipment, supplied by another vendor.

9.84 The audit pin-out assignments at the **SMDR** or the **TTY** connector are not identical. Refer to Paragraph **9.64** for the pin-out assignments of each connector. For instruction on connecting equipment provided by other vendors, refer to the manufacturer's documentation.

9.85 The audit data output rate can be set for either 300 bps or 1200 bps (depending on the configuration of the receiving equipment) at either the **SMDR** switch or the **TTY** switch on the front panel of the LCCU PCB.

CAUTION!

If the TTY connector is used for programming and maintenance operations, (either with an on-site teleprinter or remotely via a modem) be careful not to change the data rate setting of the TTY switch so that it is incompatible with programming equipment.

9.86 Figure 4-74 shows a typical Lodging/Health Care audit printout. Notes on the figure explain the possible value for each column.

10. SYSTEM POWER UP

10.00 General

10.01 Upon initial power up, the system will automatically load its operating system and customer data from the disk. Two sets of disks are provided with each system; one set should always be mounted in the drive, the other kept as a spare.

10.02 Activate the system as follows:

1) Be sure the main power switch on the NPSA-M is in the **OFF** position, and plug the AC cord into the outlet.

2) If the system uses **D.02** or later version software, insert the **SYSTEM** disk in **FDD0.** If two drives are used, insert the **MAINTENANCE** disk (Figure 4-75) in **FDD1**. If the system uses **D.01** software, insert the program disk in **FDD0**.

3) Turn the main power switch on the NPSA-M to the **ON** position.

4) The floppy disk will run: LED will come on.
   - LCCU MAJ ALARM LED will be on.
   - NPRU PFT LED will be on.

ROOM/DIRECTORY NUMBER

FEATURE [1]

OPERATION [2]

TIME FEATURE WAS REGISTERED/ACTIVATED

DATE

ROOM STATUS CODE [3]

TELEPHONE SET STATUS/AGENT REGISTERING OR CANCELLING FEATURE[4]

△△△△△△202△AWU△ CANCEL △△△14:40△030786△△△△△△△△△△△ CR LF

△△△△△400△MW△ON△△△△△△△△△14:45△030786△△△△△△△△△△△ CR LF

△△△△△400△MW△OFF△△△△△△△△14:50△030786△△△△△MC△△△△△ CR LF

△△△△△△202△AWU△ SET △△△△△△15:11△030786△△△△△15:15△△ CR LF

△△△△△△202△ROOM△STATUS △△10:18△031086△ 4 △△△M△D△△△△ CR LF

△ = ONE SPACE

NOTES:
1. FEATURE
   MW = Message Waiting
   AWU = Automatic Wake-up
   MRA = Message Registration Audit
   Room Status = Room Status Audit

2. OPERATION
   ON = Set at Attendant Console
   OFF = Cancelled at either Attendant Console or Station
   SET = Set at either Attendant Console or Station
   CANCEL = Cancelled at either Attendant Console or Station

3. ROOM STATUS CODE
   1 = Vacant and clean
   2 = Occupied and clean
   3 = Vacant and needs cleaning
   4 = Occupied and needs cleaning

4. This column shows either the status of the station accessed for feature operation (for example, a wake-up call) or the agent who registered the feature.

STATUS
   RNA = Ring No-Answer
   Bsy = Busy
   $XXX.XX = Total call charges for this station
   M = Maid in Room
   XX:XX = Time Wake-up Call Scheduled for
AGENT
   MC = Message Center
   EXT = Station

FIGURE 4-74—EXAMPLE: AUDIT PRINTOUT (LODGING/HEALTH CARE)
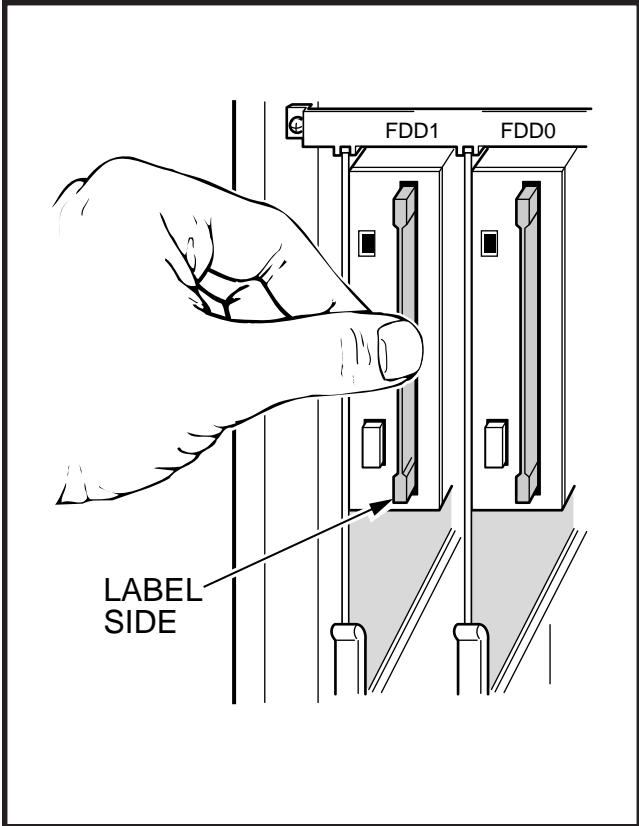
FIGURE 4-75—INSERTING DISK
(PERCEPTION$_{ex}$ ONLY)
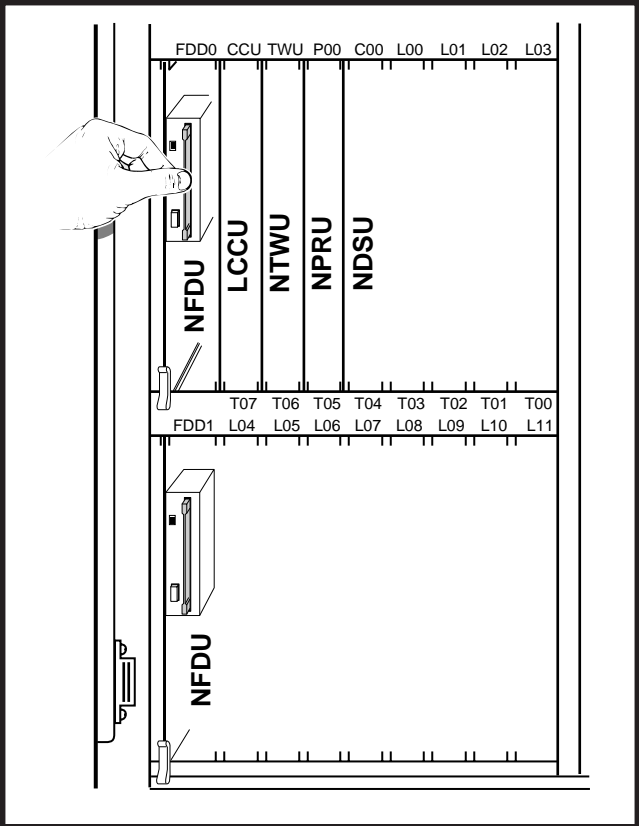
FIGURE 4-76—INSERTING DISK
(PERCEPTION$_{e}$ ONLY)

CHAPTER 5

MDF ARRANGEMENT

1.00 All connections from the system to external equipment, such as trunks, stations, data interface units, etc., are made via a customer-provided main distribution frame (MDF).

1.01 Cables with male amphenol-type connectors are attached to the connector panels of the basic and expansion cabinets and secured with the connector locking bar (Figure 5-1). Plastic cable clamps are provided along the base of the basic cabinet to secure cables. The opposite ends of the cables are then terminated on 66-type quick-connect terminal blocks on the MDF (split blocks with bridging clips should be used to allow for fault isolation). A typical MDF layout is shown in Figure 5-2. Connect each cable from the basic and expansion cabinets to one side of the block and external equipment cables to the other side. Use bridge clips to make the connections.

1.02 FCC regulations prohibit unregistered equipment from being terminated on the same block as CO trunks. It is good practice to separate trunks from all other equipment at the MDF.

1.03 Table 5-1 shows the connector-card slot match-up. Table 5-2 lists the connector cables required for the system. Each connector provides the interface for only a single card slot.

1.04 To protect against transient voltages and currents beyond what is provided by simple primary protectors, the Underwriters' Laboratories' Standard 1459 2nd edition lists secondary protectors that should be installed if there are outside leads. See Figure 5-3 for these conditions.
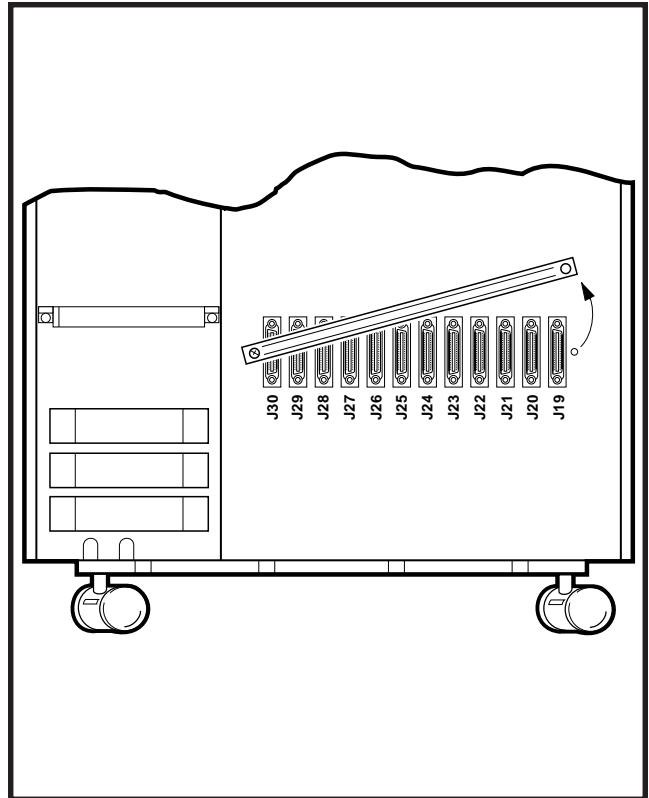
FIGURE 5-1—CONNECTOR LOCKING BAR

Install and test the secondary protectors per the installation instructions of the applicable U.L. listed manufacturers:

- Centron Corp., Anaheim, California 92807: Model 08450.
- Curtis Mfg. Co. Inc., Jaffrey, New Hampshire 03452: Model Diamond Chip.
- Oneac Corp., Libertyville, Illinois 60048: Models OnLine 614 and OnLine DG/S.
- Siemon Co., Watertown, Connecticut 06795: Models PM-2305 and CPM-2 Plus.
- Simplex Time Recorder Co., Gardener, Massachusetts 01440: Models 2081-9027 and 2081-9028.

PERCEPTION_{e&ex} CABINETS

TO T1 LINE

MODEM

TTY → TTY (P_e ONLY)

MDF B

NDTU

CSU

NCOU
NEMU   16
NLSU

TO CO, DID, OR TIE TRUNK

CALL ACCOUNTING   SMDR

MIS   AUX

NSTU
NEKU
NOCU   24
NDKU
NDCU
NMDU

EXTERNAL BATTERY

POWER SUPPLY

−24V

117 VAC

117 VAC POWER

CHARGER

EXT GND

RINGING GENERATOR

NPRU   2

DATT   2

NDSU   2

J2 J1

PFT

EXTERNAL GROUND

2-PAIR

MDF A

ELECTRONIC DSS CONSOLES

UNA BELL

PAGING EQUIP.

25-PAIR

MUSIC SOURCE

POWER FAILURE/ EMERGENCY TELEPHONE

1-PAIR

ATTENDANT CONSOLE

1-PAIR   2-PAIR   3-PAIR   1-PAIR   1-PAIR   1-PAIR   3-PAIR   2-PAIR   1-PAIR

DDIU-MAT

LCD ELECTRONIC TELEPHONE

RS-232C

STANDARD TELEPHONE

EKT W/OCA

DIGITAL TELEPHONE WITH PDIU-DI OR OCA

RS-232

VOICE MAIL/ AUTOMATED ATTENDANT

DATA EQUIPMENT

PDIU-DS

RS-232

DDIU-MA

RS-232

DIGITAL DSS CONSOLE

DATA EQUIPMENT

FIGURE 5-2—MAIN DISTRIBUTION FRAME LAYOUT
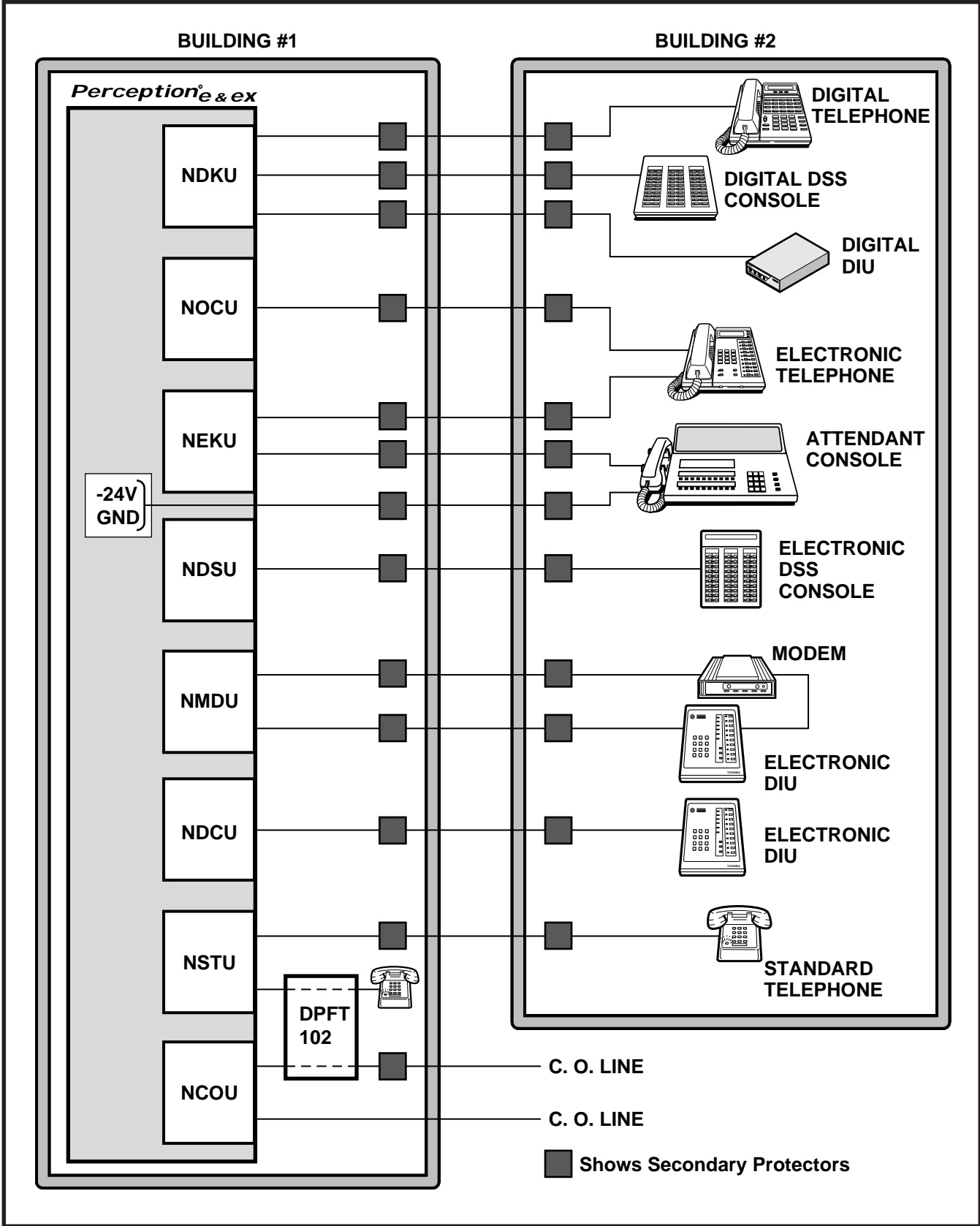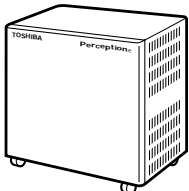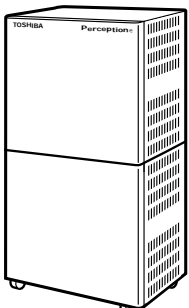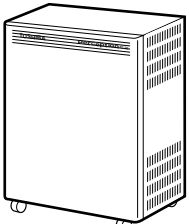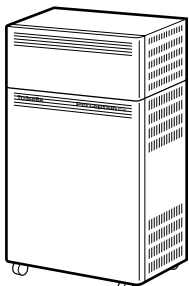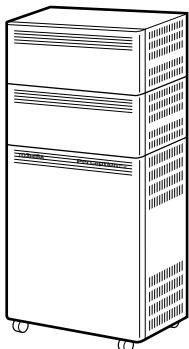
FIGURE 5-3—SECONDARY PROTECTOR DIAGRAM

TABLE 5-1
CARD SLOT/CABLE CONNECTOR MATRIX

CONFIGURATION		CARD SLOT	CONNECTOR	CARD SLOT	CONNECTOR
PERCEPTION e	BASIC	C00 L00 L01 L02 L03 L04/T07 L05/T06	J3 J4 J5 J6 J7 J8 J9	L06/T05 L07/T04 L08/T03 L09/T02 L10/T01 L11/T00	J10 J11 J12 J13 J14 J15
	EXPANDED	C01 L15 L16 L17 L18 L19/T15 L20/T14	J503 J504 J505 J506 J507 J508 J509	L21/T13 L22/T12 L23/T11 L24/T10 L25/T09 L26/T08	J510 J511 J512 J513 J514 J515
PERCEPTION ex	BASIC	U00 U01 U02 U03 U04 U05 U06 U07 T03 T02 T01 T00	J18 J17 J16 J15 J14 J13 J12 J11 J10 J09 J08 J07	U08 U09 U10 U11 U12 U13 U14 U15 T07 T06 T05 T04	J30 J29 J28 J27 J26 J25 J24 J23 J22 J21 J20 J19
	EXPANDED (ONE EXPANSION UNIT)	U16 U17 U18 U19 U20 U21	J512 J511 J510 J509 J508 J507	U22 U23 T11 T10 T09 T08	J506 J505 J504 J503 J502 J501
	EXPANDED (TWO EXPANSION UNITS)	U24 U25 U26 U27 U28 U29	J524 J523 J522 J521 J520 J519	U30 U31 T15 T14 T13 T12	J518 J517 J516 J515 J514 J513

TABLE 5-2
LIST OF CONNECTOR CABLES

CARD SLOT	CONN. NO.	CONTENT OF CONNECTOR	DESC. TABLE
PERCEPTIONe			
MDF	J1 & J501	ATT0 & ATT1	5-3
MDF	J2 & J502	Paging, Music & UNA Ringing	5-4
MDF	J3 & J503	NDSU	5-5
MDF	J4~J7 & J504~J507	NDSU/NEKU/NDKU/NSTU/NDCU/NMDU/NOCU [1]	5-6
MDF	J8~J15 & J508~J515	NDSU/NEKU/NDKU/NSTU/NDCU/NMDU/NOCU or NCOU/NLSU/NEMU/NDTU [1]	5-7
From PFT to MDF	PFT Conn. No.	CO Line & NCOU 00~07 (Maximum: 8) (Maximum: 8)	5-8
From PFT to MDF	PFT Conn. No.	STT Line & NSTU 00~14 (Maximum: 8) (Maximum: 8)	5-9
PERCEPTIONex			
MDF	J1 & J2	Paging, Music & UNA Ringing	5-11
MDF	J6	ATT0	5-10
	J5	ATT1	5-10
MDF	J07~J10/J19~J22/ J501~J504/J513~J518	NCOU/NEMU/NLSU/NDTU [2]	5-12
MDF	J11~J18/J23~J30/ J505~J512/J517~J524	NDSU/NEKU/NDKU/NSTU/NDCU/NMDU/NOCU or NCOU/NEMU/NLSU	5-13
From PFT to MDF	PFT Conn. No.	CO Line & NCOU 00~07 (Maximum: 8) (Maximum: 8)	5-14
From PFT to MDF	PFT Conn. No.	STT Line & NSTU 00~14 (Maximum: 8) (Maximum: 8)	5-15

NOTES:

1. In PERCEPTION$_e$ the J connector cabinet is determined by 1- and 2-digit numbers indicating the basic cabinet. Three-digit number connectors are located in the expansion cabinet.

2. In PERCEPTION$_{ex}$ the J connector cabinet is determined by 1- and 2-digit numbers indicating the basic cabinet. Three-digit numbers J501 ~ J512 identify expansion cabinet #1. Three-digit numbers J513 ~ J524 identify expansion cabinet #2.

PERCEPTION$_e$
CONNECTOR TABLES

TABLE 5-3
TERMINAL SEQUENCE & DESIGNATIONS
CONNECTOR NO. J1/J501
ATTENDANT CONSOLE #0 & #1

PAIR	PIN	COLOR CODE	LEAD DESIGNATION	FUNCTION		PCB POSITION
1T	26	W-Bl	TL 001/151	Tip-Line	CKT 001	NEKU L00/L15
R	1	Bl-W	RL 001/151	Ring-Line	CKT 001	NEKU L00/L15
2T	27	W-O	DTL 001/151	Data Tip-Line	CKT 001	NEKU L00/L15
R	2	O-W	DRL 001/151	Data Ring-Line	CKT 001	NEKU L00/L15
3T	28	W-G	Spare			
R	3	G-W	Spare			
4T	29	W-Br	EMT 0	Emergency Transfer SWT		NPRU
R	4	Br-W	INIT 0	Initialize Switch		NPRU
5T	30	W-S	Spare			
R	5	S-W	MAJ IN 0	Major Alarm		NPRU
6T	31	R- Bl	Spare			
R	6	Bl-R	Spare			
7T	32	R-O	Spare			
R	7	O-R	Spare			
8T	33	R-G	Spare			
R	8	G-R	ATT0-24V	-24V		NPRU
9T	34	R-Br	Spare			
R	9	Br-R	ATT0-24V	-24V		NPRU
10T	35	R-S	Spare			
R	10	S-R	ATT0-24V	-24V		NPRU
11T	36	Bk-Bl	Spare			
R	11	Bl-Bk	ATT0-24V	-24V		NPRU
12T	37	Bk-O	Spare			
R	12	O-Bk	ATT0-24V	-24V		NPRU
13T	38	Bk-G	Spare			
R	13	G-Bk	ATT0-24V	-24V		NPRU
14T	39	Bk-Br	Spare			
R	14	Br-Bk	Spare			
15T	40	Bk-S	Spare			
R	15	S-Bk	Spare			
16T	41	Y-Bl	Spare			
R	16	Bl-Y	Spare			
17T	42	Y-O	Spare			
R	17	O-Y	Spare			
18T	43	Y-G	Spare			
R	18	G-Y	Spare			
19T	44	Y-Br	ATT0 EG	Ground		NPRU
R	19	Br-Y	Spare			
20T	45	Y-S	ATT0 EG	Ground		NPRU
R	20	S-Y	Spare			
21T	46	V-Bl	ATT0 EG	Ground		NPRU
R	21	Bl-V	Spare			
22T	47	V-O	ATT0 EG	Ground		NPRU
R	22	O-V	Spare			
23T	48	V-G	ATT0 EG	Ground		NPRU
R	23	G-V	Spare			
24T	49	V-Br	ATT0 EG	Ground		NPRU
R	24	Br-V	Spare			
25T	50	V-S	Spare			
R	25	S-V	Spare			

TABLE 5-4
TERMINAL SEQUENCE & DESIGNATIONS
CONNECTOR NO. J2/J502
PAGING, MUSIC & UNA RINGING

PAIR	PIN	COLOR CODE	LEAD DESIGNATION	FUNCTION	PCB POSITION
1T	26	W-Bl	PT 1	Paging Tip	NPRU
R	1	Bl-W	PR 1	Paging Ring	NPRU
2T	27	W-O	PG 1	Paging Equip. Control	NPRU
R	2	O-W	PG Gnd	Paging Equip. Common	NPRU
3T	28	W-G	Spare		
R	3	G-W	Spare		
4T	29	W-Br	MT	MOH Source Tip	NPRU
R	4	Br-W	MR	MOH Source RIng	NPRU
5T	30	W-S	Spare		
R	5	S-W	Spare		
6T	31	R- Bl	PG In 1	Paging Amp #1 Out	NPRU
R	6	Bl-R	PG Out 1	Page Zone #1 Out	NPRU
7T	32	R-O	PG In 2	Paging Amp #2 Out	NPRU
R	7	O-R	PG Out 2	Page Zone #2 Out	NPRU
8T	33	R-G	PG In 3	Paging Amp #3 Out	NPRU
R	8	G-R	PG Out 3	Page Zone #3 Out	NPRU
9T	34	R-Br	PG In 4	Paging Amp #4 Out	NPRU
R	9	Br-R	PG Out 4	Page Zone #4 Out	NPRU
10T	35	R-S	PG In 5	Paging Amp #5 Out	NPRU
R	10	S-R	PG Out 5	Page Zone #5 Out	NPRU
11T	36	Bk-Bl	Spare		
R	11	Bl-Bk	Spare		
12T	37	Bk-O	UNA B	UNA Ringing Ground	NPRU
R	12	O-Bk	UNA A	UNA Ringing 20 Hz	NPRU
13T	38	Bk-G	Spare		
R	13	G-Bk	Spare		
14T	39	Bk-Br	Spare		
R	14	Br-Bk	Spare		
15T	40	Bk-S	Spare		
R	15	S-Bk	Spare		
16T	41	Y-Bl	Spare		
R	16	Bl-Y	Spare		
17T	42	Y-O	Spare		
R	17	O-Y	Spare		
18T	43	Y-G	Spare		
R	18	G-Y	Spare		
19T	44	Y-Br	Spare		
R	19	Br-Y	Spare		
20T	45	Y-S	Spare		
R	20	S-Y	Spare		
21T	46	V-Bl	Spare		
R	21	Bl-V	Spare		
22T	47	V-O	Spare		
R	22	O-V	Spare		
23T	48	V-G	Spare		
R	23	G-V	Spare		
24T	49	V-Br	Spare		
R	24	Br-V	Spare		
25T	50	V-S	Spare	PFT-24 Volts (Ground)	NPRU
R	25	S-V	Spare	(Power)	NPRU

TABLE 5-5
TERMINAL SEQUENCE & DESIGNATIONS FOR PERCEPTION$_e$ ONLY
CONNECTOR NO. J3.503
NDSU/NDKU (DSS CONSOLES) "C" SLOT

PAIR	PIN	COLOR CODE	STATION FUNCTION	LINE CIRCUIT
1T	26	W-Bl	Tip-Line	
R	1	Bl-W	Ring-Line	CXX1
2T	27	W-O	Data Tip-Line	
R	2	O-W	Data Ring-Line	
3T	28	W-G	Tip-Line	
R	3	G-W	Ring-Line	CXX2
4T	29	W-Br	Data Tip-Line	
R	4	Br-W	Data Ring-Line	
5T	30	W-S	Tip-Line	
R	5	S-W	Ring-Line	CXX3
6T	31	R- Bl	Data Tip-Line	
R	6	Bl-R	Data Ring-Line	
7T	32	R-O	Tip-Line	
R	7	O-R	Ring-Line	CXX4
8T	33	R-G	Data Tip-Line	
R	8	G-R	Data Ring-Line	

TABLE 5-6
TERMINAL SEQUENCE & DESIGNATIONS
CONNECTOR NO. J4 ~ J7/J504 ~ J507
NDSU/NEKU/NDKU/NSTU/NDCU/NMDU/NOCU (L00 ~ L03/L15 ~ L18)

PAIR	PIN	COLOR CODE	STATION FUNCTION	LINE CIRCUIT
1T	26	W-Bl	Tip-Line	
R	1	Bl-W	Ring-Line	LXX1
2T	27	W-O	Data Tip-Line	
R	2	O-W	Data Ring-Line	
3T	28	W-G	Tip-Line	
R	3	G-W	Ring-Line	LXX2
4T	29	W-Br	Data Tip-Line	
R	4	Br-W	Data Ring-Line	
5T	30	W-S	Tip-Line	
R	5	S-W	Ring-Line	LXX3
6T	31	R- Bl	Data Tip-Line	
R	6	Bl-R	Data Ring-Line	
7T	32	R-O	Tip-Line	
R	7	O-R	Ring-Line	LXX4
8T	33	R-G	Data Tip-Line	
R	8	G-R	Data Ring-Line	
9T	34	R-Br	Tip-Line	
R	9	Br-R	Ring-Line	LXX5
10T	35	R-S	Data Tip-Line	
R	10	S-R	Data Ring-Line	
11T	36	Bk-Bl	Tip-Line	
R	11	Bl-Bk	Ring-Line	LXX6
12T	37	Bk-O	Data Tip-Line	
R	12	O-Bk	Data Ring-Line	
13T	38	Bk-G	Tip-Line	
R	13	G-Bk	Ring-Line	LXX7
14T	39	Bk-Br	Data Tip-Line	
R	14	Br-Bk	Data Ring-Line	
15T	40	Bk-S	Tip-Line	
R	15	S-Bk	Ring-Line	LXX8
16T	41	Y-Bl	Data Tip-Line	
R	16	Bl-Y	Data Ring-Line	

TABLE 5-7
TERMINAL SEQUENCE & DESIGNATIONS
CONNECTOR NO. J8 ~ J15/J508 ~ J515
NDSU/NEKU/NDKU/NSTU/NDCU/NMDU/NOCU (L04 ~ L11/L19 ~ L26)
or NCOU/NLSU/NEMU (T07 ~ T00/T15 ~ T08)

PAIR	PIN	COLOR CODE	STATION FUNCTION	LINE CIRCUIT	TRUNK FUNCTION	TRUNK CIRCUIT
1T	26	W-Bl	Tip-Line		T	
R	1	Bl-W	Ring-Line	LXX1	R	
2T	27	W-O	Data Tip-Line		T1	
R	2	O-W	Data Ring-Line		R1	TXX1
3T	28	W-G	Tip-Line		E	
R	3	G-W	Ring-Line	LXX2	SG	
4T	29	W-Br	Data Tip-Line		M	
R	4	Br-W	Data Ring-Line		SB	
5T	30	W-S	Tip-Line		T	
R	5	S-W	Ring-Line	LXX3	R	
6T	31	R- Bl	Data Tip-Line		T1	
R	6	Bl-R	Data Ring-Line		R1	TXX2
7T	32	R-O	Tip-Line		E	
R	7	O-R	Ring-Line	LXX4	SG	
8T	33	R-G	Data Tip-Line		M	
R	8	G-R	Data Ring-Line		SB	
9T	34	R-Br	Tip-Line		T	
R	9	Br-R	Ring-Line	LXX5	R	
10T	35	R-S	Data Tip-Line		T1	
R	10	S-R	Data Ring-Line		R1	TXX3
11T	36	Bk-Bl	Tip-Line		E	
R	11	Bl-Bk	Ring-Line	LXX6	SG	
12T	37	Bk-O	Data Tip-Line		M	
R	12	O-Bk	Data Ring-Line		SB	
13T	38	Bk-G	Tip-Line		T	
R	13	G-Bk	Ring-Line	LXX7	R	
14T	39	Bk-Br	Data Tip-Line		T1	
R	14	Br-Bk	Data Ring-Line		R1	TXX4
15T	40	Bk-S	Tip-Line		E	
R	15	S-Bk	Ring-Line	LXX8	SG	
16T	41	Y-Bl	Data Tip-Line		M	
R	16	Bl-Y	Data Ring-Line		SB	

TABLE 5-8
TERMINAL SEQUENCE & DESIGNATIONS
CENTRAL OFFICE LINE CONNECTION & PFT CONTROL
J1

PAIR	PIN	COLOR CODE	LEAD DESIGNATION	FUNCTION	PCB POSITION
1T	26	W-Bl	T	Tip-CO #1	
R	1	Bl-W	R	Ring-CO #1	
2T	27	W-O	T	Tip-NCOU #1	
R	2	O-W	R	Ring-NCOU #1	
3T	28	W-G	T	Tip-CO #2	
R	3	G-W	R	Ring-CO #2	
4T	29	W-Br	T	Tip-NCOU #2	
R	4	Br-W	R	Ring-NCOU #2	
5T	30	W-S	T	Tip-CO #3	
R	5	S-W	R	Ring-CO #3	
6T	31	R- Bl	T	Tip-NCOU #3	
R	6	Bl-R	R	Ring-NCOU #3	
7T	32	R-O	T	Tip-CO #4	
R	7	O-R	R	Ring-CO #4	
8T	33	R-G	T	Tip-NCOU #4	
R	8	G-R	R	Ring-NCOU #4	
9T	34	R-Br	T	Tip-CO #5	
R	9	Br-R	R	Ring-CO #5	
10T	35	R-S	T	Tip-NCOU #5	
R	10	S-R	R	Ring-NCOU #5	
11T	36	Bk-Bl	T	Tip-CO #6	
R	11	Bl-Bk	R	Ring-CO #6	
12T	37	Bk-O	T	Tip-NCOU #6	
R	12	O-Bk	R	Ring-NCOU #6	
13T	38	Bk-G	T	Tip-CO #7	
R	13	G-Bk	R	Ring-CO #7	
14T	39	Bk-Br	T	Tip-NCOU #7	
R	14	Br-Bk	R	Ring-NCOU #7	
15T	40	Bk-S	T	Tip-CO #8	
R	15	S-Bk	R	Ring-CO #8	
16T	41	Y-Bl	T	Tip-NCOU #8	
R	16	Bl-Y	R	Ring-NCOU #8	
17T	42	Y-O	Spare		
R	17	O-Y	Spare		
18T	43	Y-G	Spare		
R	18	G-Y	Spare		
19T	44	Y-Br	Spare		
R	19	Br-Y	Spare		
20T	45	Y-S	Spare		
R	20	S-Y	Spare		
21T	46	V-Bl	Spare		
R	21	Bl-V	Spare		
22T	47	V-O	Spare		
R	22	O-V	Spare		
23T	48	V-G	Spare		
R	23	G-V	Spare		
24T	49	V-Br	Spare		
R	24	Br-V	Spare		
25T	50	V-S	PFT EG	PFT Ground (Input)	NPRU
R	25	S-V	PFT -24V	PFT -24V (Input)	NPRU

TABLE 5-9
TERMINAL SEQUENCE & DESIGNATIONS
STATION LINE CONNECTION
J2

PAIR	PIN	COLOR CODE	LEAD DESIGNATION	FUNCTION		PCB POSITION
1T	26	W-Bl	T	Tip-TEL	#1	
R	1	Bl-W	R	Ring-TEL	#1	
2T	27	W-O	T	Tip-NSTU2	#1	
R	2	O-W	R	Ring-NSTU2	#1	
3T	28	W-G	T	Tip-TEL	#2	
R	3	G-W	R	Ring-TEL	#2	
4T	29	W-Br	T	Tip-NSTU2	#2	
R	4	Br-W	R	Ring-NSTU2	#2	
5T	30	W-S	T	Tip-TEL	#3	
R	5	S-W	R	Ring-TEL	#3	
6T	31	R- Bl	T	Tip-NSTU2	#3	
R	6	Bl-R	R	Ring-NSTU2	#3	
7T	32	R-O	T	Tip-TEL	#4	
R	7	O-R	R	Ring-TEL	#4	
8T	33	R-G	T	Tip-NSTU2	#4	
R	8	G-R	R	Ring-NSTU2	#4	
9T	34	R-Br	T	Tip-TEL	#5	
R	9	Br-R	R	Ring-TEL	#5	
10T	35	R-S	T	Tip-NSTU2	#5	
R	10	S-R	R	Ring-NSTU2	#5	
11T	36	Bk-Bl	T	Tip-TEL	#6	
R	11	Bl-Bk	R	Ring-TEL	#6	
12T	37	Bk-O	T	Tip-NSTU2	#6	
R	12	O-Bk	R	Ring-NSTU2	#6	
13T	38	Bk-G	T	Tip-TEL	#7	
R	13	G-Bk	R	Ring-TEL	#7	
14T	39	Bk-Br	T	Tip-NSTU2	#7	
R	14	Br-Bk	R	Ring-NSTU2	#7	
15T	40	Bk-S	T	Tip-TEL	#8	
R	15	S-Bk	R	Ring-TEL	#8	
16T	41	Y-Bl	T	Tip-NSTU2	#8	
R	16	Bl-Y	R	Ring-NSTU2	#8	
17T	42	Y-O	Spare			
R	17	O-Y	Spare			
18T	43	Y-G	Spare			
R	18	G-Y	Spare			
19T	44	Y-Br	Spare			
R	19	Br-Y	Spare			
20T	45	Y-S	Spare			
R	20	S-Y	Spare			
21T	46	V-Bl	Spare			
R	21	Bl-V	Spare			
22T	47	V-O	Spare			
R	22	O-V	Spare			
23T	48	V-G	Spare			
R	23	G-V	Spare			
24T	49	V-Br	Spare			
R	24	Br-V	Spare			
25T	50	V-S	Spare			
R	25	S-V	Spare			

PERCEPTION_{ex}
CONNECTOR TABLES

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TABLE 5-10
TERMINAL SEQUENCE & DESIGNATIONS
CONNECTOR NO. J6/J5
ATTENDANT CONSOLE #0 & #1

PAIR	PIN	COLOR CODE	LEAD DESIGNATION	FUNCTION	PCB POSITION
1T	26	W-Bl	TL 001	Tip-Line CKT 001	NEKU U00/U01
R	1	Bl-W	RL 001	Ring-Line CKT 001	NEKU U00/U01
2T	27	W-O	DTL 001	Data Tip-Line CKT 001	NEKU U00/U01
R	2	O-W	DRL 001	Data Ring-Line CKT 001	NEKU U00/U01
3T	28	W-G	Spare		
R	3	G-W	Spare		
4T	29	W-Br	EMT 0	Emergency Transfer SWT	NPRU
R	4	Br-W	INIT 0	Intialize Switch	NPRU
5T	30	W-S	Spare		
R	5	S-W	MAJ IN 0	Major Alarm	NPRU
6T	31	R- Bl	Spare		
R	6	Bl-R	Spare		
7T	32	R-O	Spare		
R	7	O-R	Spare		
8T	33	R-G	Spare		
R	8	G-R	ATT0 -24V	-24V	NPRU
9T	34	R-Br	Spare		
R	9	Br-R	ATT0 -24V	-24V	NPRU
10T	35	R-S	Spare		
R	10	S-R	ATT0 -24V	-24V	NPRU
11T	36	Bk-Bl	Spare		
R	11	Bl-Bk	ATT0 -24V	-24V	NPRU
12T	37	Bk-O	Spare		
R	12	O-Bk	ATT0 -24V	-24V	NPRU
13T	38	Bk-G	Spare		
R	13	G-Bk	ATT0 -24V	-24V	NPRU
14T	39	Bk-Br	Spare		
R	14	Br-Bk	Spare		
15T	40	Bk-S	Spare		
R	15	S-Bk	Spare		
16T	41	Y-Bl	Spare		
R	16	Bl-Y	Spare		
17T	42	Y-O	Spare		
R	17	O-Y	Spare		
18T	43	Y-G	Spare		
R	18	G-Y	Spare		
19T	44	Y-Br	ATT0 EG	Ground	NPRU
R	19	Br-Y	Spare		
20T	45	Y-S	ATT0 EG	Ground	NPRU
R	20	S-Y	Spare		
21T	46	V-Bl	ATT0 EG	Ground	NPRU
R	21	Bl-V	Spare		
22T	47	V-O	ATT0 EG	Ground	NPRU
R	22	O-V	Spare		
23T	48	V-G	ATT0 EG	Ground	NPRU
R	23	G-V	Spare		
24T	49	V-Br	ATT0 EG	Ground	NPRU
R	24	Br-V	Spare		
25T	50	V-S	Spare		
R	25	S-V	Spare		

TABLE 5-11
TERMINAL SEQUENCE & DESIGNATIONS
CONNECTOR NO. J1 & J2
PAGING, MUSIC & UNA RINGING

PAIR	PIN	COLOR CODE	LEAD DESIGNATION	FUNCTION	PCB POSITION
1T	26	W-Bl	PT 1	Paging Tip	NPRU
R	1	Bl-W	PR 1	Paging Ring	NPRU
2T	27	W-O	PG 1	Paging Equip. Control	NPRU
R	2	O-W	PG Gnd	Paging Equip. Common	NPRU
3T	28	W-G	Spare		
R	3	G-W	Spare		
4T	29	W-Br	MT	MOH Source Tip	NPRU
R	4	Br-W	MR	MOH Source Ring	NPRU
5T	30	W-S	Spare		
R	5	S-W	Spare		
6T	31	R-Bl	PG In 1	Paging Amp #1 Out	NPRU
R	6	Bl-R	PG Out 1	Paging Zone #1 Out	NPRU
7T	32	R-O	PG In 2	Paging Amp #2 Out	NPRU
R	7	O-R	PG Out 2	Paging Zone #2 Out	NPRU
8T	33	R-G	PG In 3	Paging Amp #3 Out	NPRU
R	8	G-R	PG Out 3	Paging Zone #3 Out	NPRU
9T	34	R-Br	PG In 4	Paging Amp #4 Out	NPRU
R	9	Br-R	PG Out 4	Paging Zone #4 Out	NPRU
10T	35	R-S	PG In 5	Paging Amp #5 Out	NPRU
R	10	S-R	PG Out 5	Paging Zone #5 Out	NPRU
11T	36	Bk-Bl	Spare		
R	11	Bl-Bk	Spare		
12T	37	Bk-O	UNA B	UNA Ringing Ground	NPRU
R	12	O-Bk	UNA A	UNA Ringing 20 Hz	NPRU
13T	38	Bk-G	Spare		
R	13	G-Bk	Spare		
14T	39	Bk-Br	Spare		
R	14	Br-Bk	Spare		
15T	40	Bk-S	Spare		
R	15	S-Bk	Spare		
16T	41	Y-Bl	Spare		
R	16	Bl-Y	Spare		
17T	42	Y-O	Spare		
R	17	O-Y	Spare		
18T	43	Y-G	Spare		
R	18	G-Y	Spare		
19T	44	Y-Br	Spare		
R	19	Br-Y	Spare		
20T	45	Y-S	Spare		
R	20	S-Y	Spare		
21T	46	V-Bl	Spare		
R	21	Bl-V	Spare		
22T	47	V-O	Spare		
R	22	O-V	Spare		
23T	48	V-G	Spare		
R	23	G-V	Spare		
24T	49	V-Br	Spare		
R	24	Br-V	Spare		
25T	50	V-S	Spare	PFT-24 Volts (Ground)	NPRU
R	25	S-V	Spare	(Power)	NPRU

TABLE 5-12
TERMINAL SEQUENCE & DESIGNATIONS
CONNECTOR NO. J07 ~ J10/J19 ~ J22/J501 ~ J504/J513 ~ J518
NCOU/NEMU/NLSU/NDTU   (T00 ~ T15)

PAIR	PIN	COLOR CODE	TRUNK FUNCTION	TRUNK CIRCUIT
1T	26	W-Bl	T	
R	1	Bl-W	R	
2T	27	W-O	T1	
R	2	O-W	R1	TXX1
3T	28	W-G	E	
R	3	G-W	SG	
4T	29	W-Br	M	
R	4	Br-W	SB	
5T	30	W-S	T	
R	5	S-W	R	
6T	31	R- Bl	T1	
R	6	Bl-R	R1	TXX2
7T	32	R-O	E	
R	7	O-R	SG	
8T	33	R-G	M	
R	8	G-R	SB	
9T	34	R-Br	T	
R	9	Br-R	R	
10T	35	R-S	T1	
R	10	S-R	R1	TXX3
11T	36	Bk-Bl	E	
R	11	Bl-Bk	SG	
12T	37	Bk-O	M	
R	12	O-Bk	SB	
13T	38	Bk-G	T	
R	13	G-Bk	R	
14T	39	Bk-Br	T1	
R	14	Br-Bk	R1	TXX4
15T	40	Bk-S	E	
R	15	S-Bk	SG	
16T	41	Y-Bl	M	
R	16	Bl-Y	SB	

NOTE:

The NDTU may be installed in T00 or T08, connectors J07 and J501 respectively. It may not be used in universal slots.

TABLE 5-13
TERMINAL SEQUENCE & DESIGNATIONS
CONNECTOR NO. J11 ~ J18/J23 ~ J30/J505 ~ J512/J517 ~ J524
NDSU/NEKU/NDKU/NSTU/NDCU/NMDU/NOCU (U00 ~ U31) or NCOU/NEMU/NLSU (T16 ~ T31)

PAIR	PIN	COLOR CODE	STATION FUNCTION	LINE CIRCUIT	TRUNK FUNCTION	TRUNK CIRCUIT
1T	26	W-Bl	Tip-Line		T	
R	1	Bl-W	Ring-Line	LXX1	R	
2T	27	W-O	Data Tip-Line		T1	
R	2	O-W	Data Ring-Line		R1	TXX1
3T	28	W-G	Tip-Line		E	
R	3	G-W	Ring-Line	LXX2	SG	
4T	29	W-Br	Data Tip-Line		M	
R	4	Br-W	Data Ring-Line		SB	
5T	30	W-S	Tip-Line		T	
R	5	S-W	Ring-Line	LXX3	R	
6T	31	R- Bl	Data Tip-Line		T1	
R	6	Bl-R	Data Ring-Line		R1	TXX2
7T	32	R-O	Tip-Line		E	
R	7	O-R	Ring-Line	LXX4	SG	
8T	33	R-G	Data Tip-Line		M	
R	8	G-R	Data Ring-Line		SB	
9T	34	R-Br	Tip-Line		T	
R	9	Br-R	Ring-Line	LXX5	R	
10T	35	R-S	Data Tip-Line		T1	
R	10	S-R	Data Ring-Line		R1	TXX3
11T	36	Bk-Bl	Tip-Line		E	
R	11	Bl-Bk	Ring-Line	LXX6	SG	
12T	37	Bk-O	Data Tip-Line		M	
R	12	O-Bk	Data Ring-Line		SB	
13T	38	Bk-G	Tip-Line		T	
R	13	G-Bk	Ring-Line	LXX7	R	
14T	39	Bk-Br	Data Tip-Line		T1	
R	14	Br-Bk	Data Ring-Line		R1	TXX4
15T	40	Bk-S	Tip-Line		E	
R	15	S-Bk	Ring-Line	LXX8	SG	
16T	41	Y-Bl	Data Tip-Line		M	
R	16	Bl-Y	Data Ring-Line		SB	

TABLE 5-14
TERMINAL SEQUENCE & DESIGNATIONS
CENTRAL OFFICE LINE CONNECTION & PFT CONTROL
J1

PAIR	PIN	COLOR CODE	LEAD DESIGNATION	FUNCTION		PCB POSITION
1T	26	W-Bl	T	Tip-CO	#1	
R	1	Bl-W	R	Ring-CO	#1	
2T	27	W-O	T	Tip-NCOU	#1	
R	2	O-W	R	Ring-NCOU	#1	
3T	28	W-G	T	Tip-CO	#2	
R	3	G-W	R	Ring-CO	#2	
4T	29	W-Br	T	Tip-NCOU	#2	
R	4	Br-W	R	Ring-NCOU	#2	
5T	30	W-S	T	Tip-CO	#3	
R	5	S-W	R	Ring-CO	#3	
6T	31	R- Bl	T	Tip-NCOU	#3	
R	6	Bl-R	R	Ring-NCOU	#3	
7T	32	R-O	T	Tip-CO	#4	
R	7	O-R	R	Ring-CO	#4	
8T	33	R-G	T	Tip-NCOU	#4	
R	8	G-R	R	Ring-NCOU	#4	
9T	34	R-Br	T	Tip-CO	#5	
R	9	Br-R	R	Ring-CO	#5	
10T	35	R-S	T	Tip-NCOU	#5	
R	10	S-R	R	Ring-NCOU	#5	
11T	36	Bk-Bl	T	Tip-CO	#6	
R	11	Bl-Bk	R	Ring-CO	#6	
12T	37	Bk-O	T	Tip-NCOU	#6	
R	12	O-Bk	R	Ring-NCOU	#6	
13T	38	Bk-G	T	Tip-CO	#7	
R	13	G-Bk	R	Ring-CO	#7	
14T	39	Bk-Br	T	Tip-NCOU	#7	
R	14	Br-Bk	R	Ring-NCOU	#7	
15T	40	Bk-S	T	Tip-CO	#8	
R	15	S-Bk	R	Ring-CO	#8	
16T	41	Y-Bl	T	Tip-NCOU	#8	
R	16	Bl-Y	R	Ring-NCOU	#8	
17T	42	Y-O	Spare			
R	17	O-Y	Spare			
18T	43	Y-G	Spare			
R	18	G-Y	Spare			
19T	44	Y-Br	Spare			
R	19	Br-Y	Spare			
20T	45	Y-S	Spare			
R	20	S-Y	Spare			
21T	46	V-Bl	Spare			
R	21	Bl-V	Spare			
22T	47	V-O	Spare			
R	22	O-V	Spare			
23T	48	V-G	Spare			
R	23	G-V	Spare			
24T	49	V-Br	Spare			
R	24	Br-V	Spare			
25T	50	V-S	PFT EG	PFT Ground (Input)		NPRU
R	25	S-V	PFT -24V	PFT -24V (Input)		NPRU

TABLE 5-15
TERMINAL SEQUENCE & DESIGNATIONS
STATION LINE CONNECTION
J2

PAIR	PIN	COLOR CODE	LEAD DESIGNATION	FUNCTION		PCB POSITION
1T	26	W-Bl	T	Tip-TEL	#1	
R	1	Bl-W	R	Ring-TEL	#1	
2T	27	W-O	T	Tip-NSTU2	#1	
R	2	O-W	R	Ring-NSTU2	#1	
3T	28	W-G	T	Tip-TEL	#2	
R	3	G-W	R	Ring-TEL	#2	
4T	29	W-Br	T	Tip-NSTU2	#2	
R	4	Br-W	R	Ring-NSTU2	#2	
5T	30	W-S	T	Tip-TEL	#3	
R	5	S-W	R	Ring-TEL	#3	
6T	31	R- Bl	T	Tip-NSTU2	#3	
R	6	Bl-R	R	Ring-NSTU2	#3	
7T	32	R-O	T	Tip-TEL	#4	
R	7	O-R	R	Ring-TEL	#4	
8T	33	R-G	T	Tip-NSTU2	#4	
R	8	G-R	R	Ring-NSTU2	#4	
9T	34	R-Br	T	Tip-TEL	#5	
R	9	Br-R	R	Ring-TEL	#5	
10T	35	R-S	T	Tip-NSTU2	#5	
R	10	S-R	R	Ring-NSTU2	#5	
11T	36	Bk-Bl	T	Tip-TEL	#6	
R	11	Bl-Bk	R	Ring-TEL	#6	
12T	37	Bk-O	T	Tip-NSTU2	#6	
R	12	O-Bk	R	Ring-NSTU2	#6	
13T	38	Bk-G	T	Tip-TEL	#7	
R	13	G-Bk	R	Ring-TEL	#7	
14T	39	Bk-Br	T	Tip-NSTU2	#7	
R	14	Br-Bk	R	Ring-NSTU2	#7	
15T	40	Bk-S	T	Tip-TEL	#8	
R	15	S-Bk	R	Ring-TEL	#8	
16T	41	Y-Bl	T	Tip-NSTU2	#8	
R	16	Bl-Y	R	Ring-NSTU2	#8	
17T	42	Y-O	Spare			
R	17	O-Y	Spare			
18T	43	Y-G	Spare			
R	18	G-Y	Spare			
19T	44	Y-Br	Spare			
R	19	Br-Y	Spare			
20T	45	Y-S	Spare			
R	20	S-Y	Spare			
21T	46	V-Bl	Spare			
R	21	Bl-V	Spare			
22T	47	V-O	Spare			
R	22	O-V	Spare			
23T	48	V-G	Spare			
R	23	G-V	Spare			
24T	49	V-Br	Spare			
R	24	Br-V	Spare			
25T	50	V-S	Spare			
R	25	S-V	Spare			