NITSUKO AMERICA

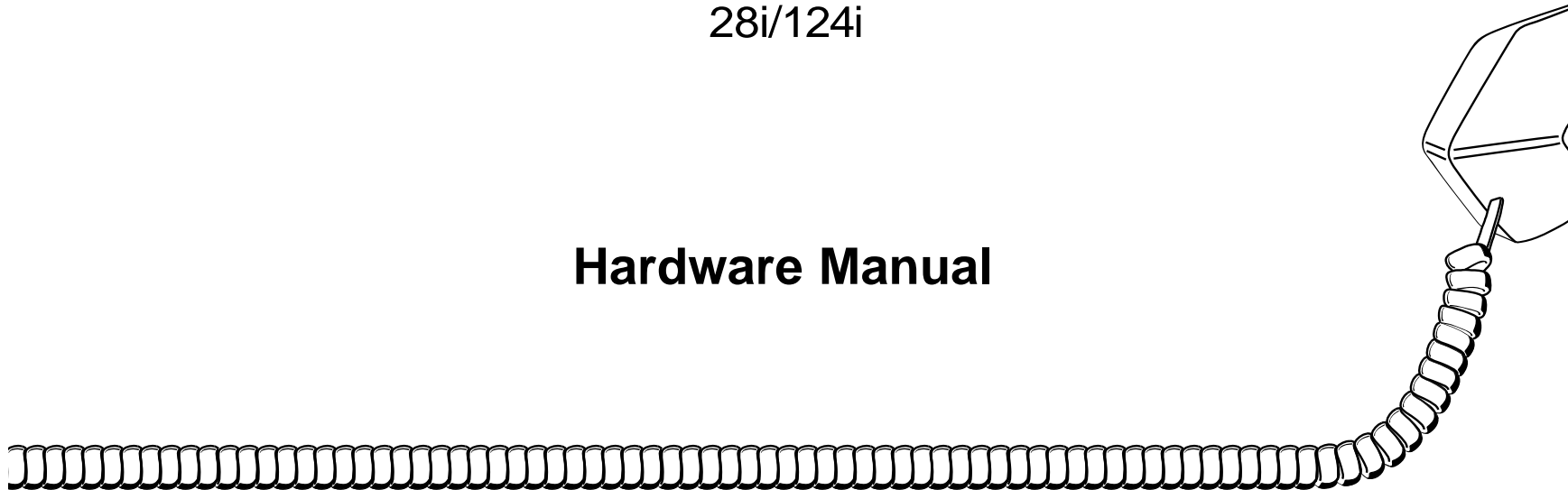# *28i/124i/384i*

Hardware Manual

Nitsuko

28i/124i

Hardware Manual

| 1. Installing Cabinets | 2. PCB Installation and Startup | 3. Installing Extensions and Trunks | 4. Optional Equipment | 5. Data and SMDR | 6. Specifications and Parts |

Section 1, INSTALLING THE MAIN AND EXPANSION CABINETS

1. Installing Cabinets

INSTALLING THE CABINETS

Unpacking

Unpack the equipment and check it against your equipment lists. Inspect for physical damage. If you are not sure about a component's function, review the Product Description Manual. Contact your Sales Representative if you have additional questions.

Have the appropriate tools for the job on hand, including: a test set, a punch down tool and a digital voltmeter.

Before Installing

Make sure you have a building plan showing the location of the common equipment, extensions, the telco demarcation and earth ground. In addition, the installation site must meet the requirements outlined in the Standard Practices Manual.

Site Requirements

The common equipment is contained in three wall-mounted cabinets: the Main Cabinet and two Expansion Cabinets. Choose a central location for the cabinets that allows enough space for the equipment — and provides enough room for you to comfortably work. The Installation Layout (Figure 1-4 and Figure 1-5 on pages 1-6 and 1-7) shows you *about* how much space your system requires.

Each common equipment cabinet requires a three-prong dedicated 110 VAC 60 Hz circuit (NEMA 5-15 receptacle) located within 7 feet of the AC receptacle. You should install the extension and trunk blocks to the right of the Main Cabinet. Telco should also install the RJ21X to the right of the Main Cabinet.

1. Installing Cabinets

**1. Installing
Cabinets**

INSTALLING THE 28i CABINET

Removing the 28i Cover (Figure 1-1)

To make installation easier, remove the cover on the KSU.

1. Unscrew the two captive screws on the front of the cabinet cover.

2. Lift up slightly on the front of the cover – then gently slide the cover back to remove it.
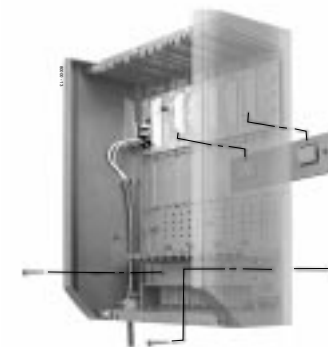

Figure 1-1 REMOVING THE 28i COVER

Mounting the 28i Cabinet (Figure 1-2)

1. Using the screws provided, attach the metal bracket to the Main Distribution Frame (MDF) plywood backboard. Mount the bracket in a convenient location, about 12" higher than where you want the bottom of the cabinet to line up.

2. Hang the KSU on the metal bracket.

3. Install two mounting screws (provided) in the lower left and right hand corners of the KSU to secure it to the plywood backboard.

   The right side panel of the KSU can also be taken off by removing the screws at the top and bottom of the side panel.

Figure 1-2 HANGING THE 28i CABINET   1-4

INSTALLING THE 124i CABINETS

Removing the 124i Covers (Figure 1-3)

To make wall-mounting easier, remove the cover on each common equipment cabinet. This allows you to use the cabinets as a mounting template.

1. Unscrew the two captive screws on the right side of the cabinet cover.

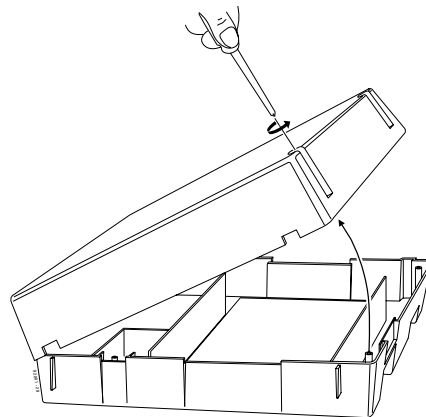2. Lift up the right side of the cover — then slide the cover to the left to remove it.

Figure 1-3 REMOVING THE 124i COVER

Mounting the 124i Cabinets (Figure 1-4 and Figure 1-5)

1. Using suitable fasteners, mount a Main Distribution Frame (MDF) plywood backboard in a centrally located spot.

2. Hold the Main Cabinet against the MDF and mark all four mounting holes.

3. Drill the marked holes using a 1/8" drill bit.

4. Install two mounting screws (provided) in the top two holes, leaving about 3/8" shank exposed.

5. Hang the Main Cabinet on the top two screws and fasten in place.

6. Install the bottom two screws and tighten in place.

7. Following the procedure above, install the expansion cabinets (if required).

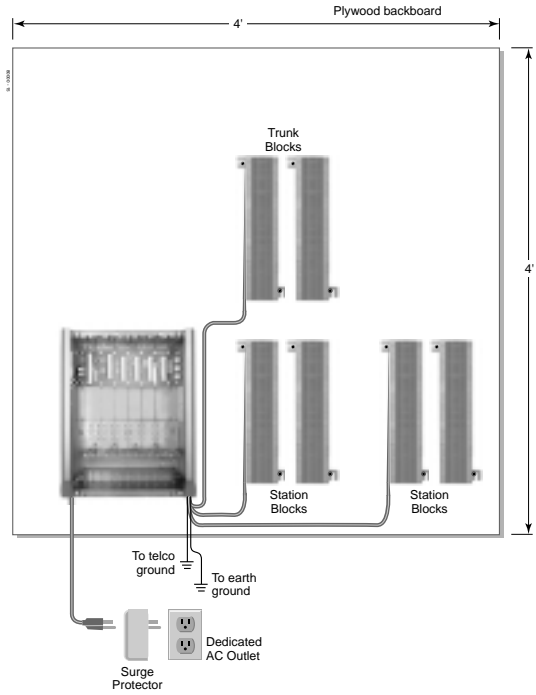**1. Installing Cabinets**

**1. Installing
Cabinets**

INSTALLING THE CABINETS

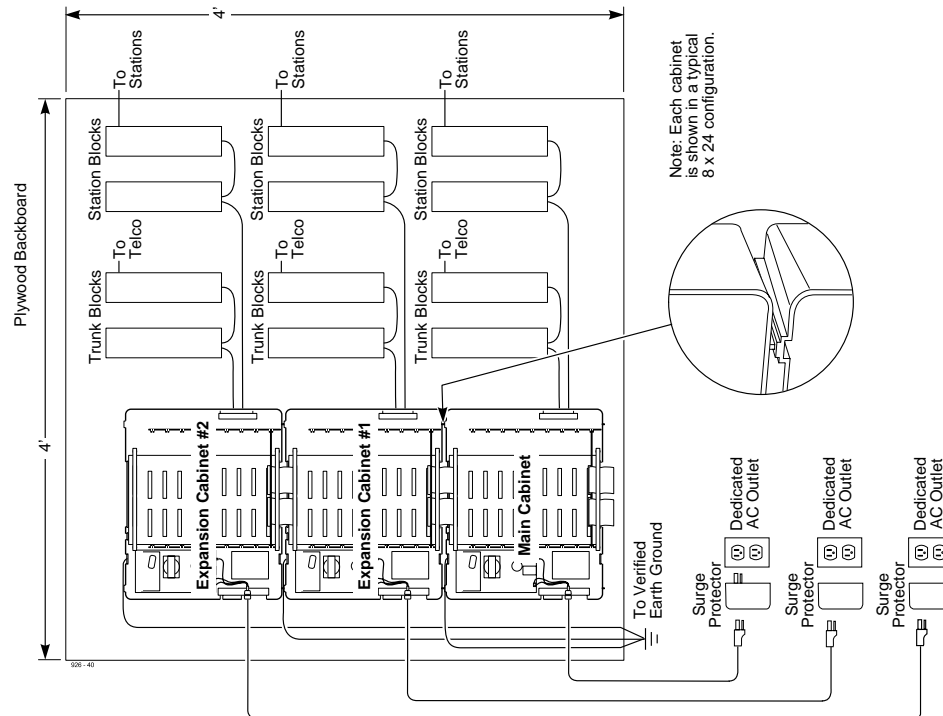**Figure 1-4 28i INSTALLATION LAYOUT**

1-6

INSTALLING THE CABINETS

Figure 1-5 INSTALLATION LAYOUT

1. Installing
Cabinets

CONNECTING EXPANSION CABINETS

Installing EXIFU PCBs on the 124i (Figure 1-6)

Each 124i expansion cabinet requires an EXIFU Expansion Interface PCB.

To connect Expansion Cabinet #1 to the Main Cabinet:

1. In Expansion Cabinet #1, plug the EXIFU PCB into the first (CPRU) slot.

2. Plug the EXIFU PCB ribbon cables into the two connectors at the top of the Main Cabinet backplane.

3. Install the ferrite filters as shown.

4. Install the metal strain reliefs in both the Main and Expansion #1 cabinets.

To connect Expansion Cabinet #1 to Expansion Cabinet #2:

1. In Expansion Cabinet #2, plug the EXIFU PCB into the first (CPRU) slot.

2. Plug the EXIFU PCB ribbon cables into the two connectors at the top of Expansion Cabinet #1.

3. Install the metal strain reliefs in both expansion cabinets.
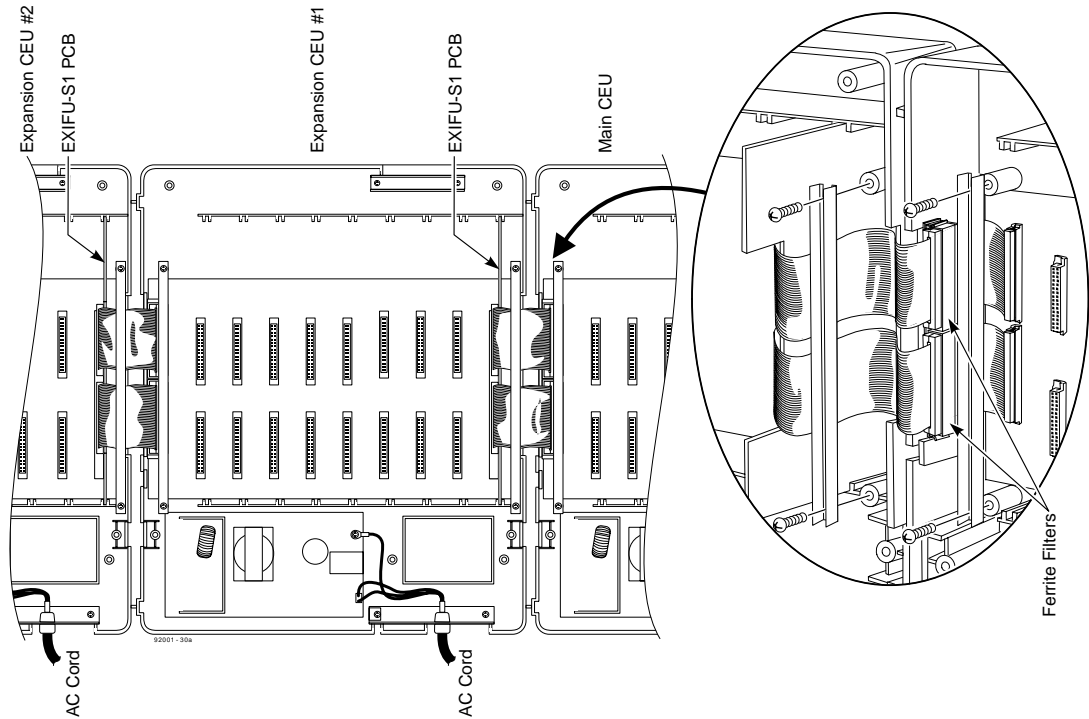
CONNECTING EXPANSION CABINETS

Figure 1-6 CONNECTING EXPANSION CABINETS

**1. Installing
Cabinets**

GROUNDING THE CABINETS

Connecting the Ground Wires on the 28i System
(Figure 1-7)

The 28i cabinet has two ground connections: ETH (Earth Ground) and PBXG (PBX Ground).

1. Using 12 AWG stranded copper wire, wind three turns of the ground wire around the core.

2. Loosen the lugs on both ground connections.

3. Using 12 AWG stranded copper wire, run a short jumper between the ETH and PBXG lugs.

4. Using the piece of 12 AWG stranded copper wire that is wrapped around the core, connect the PBXG connection to a known earth ground.

5. Firmly tighten both the ETH and PBXG connections.

6. Using the plastic strap located at the base of the cabinet, secure the core to the cabinet.

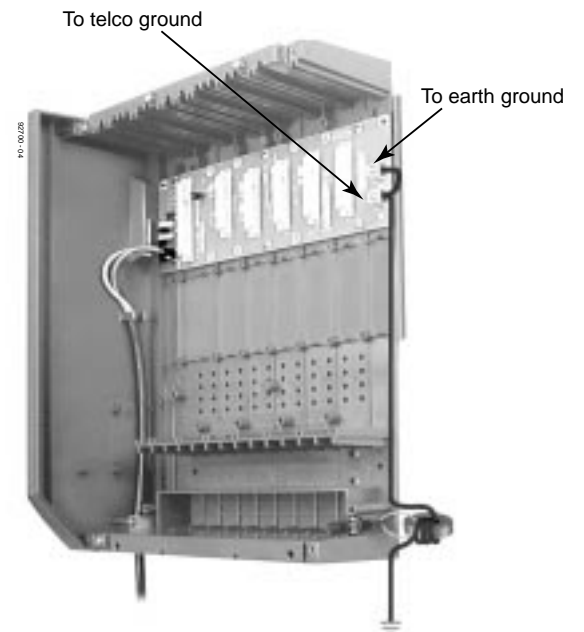**DO NOT PLUG IN THE CABINET POWER CORD WITHOUT FIRST INSTALLING THE PCBS.**

To telco ground

To earth ground

Figure 1-7 GROUNDING A CABINET

GROUNDING THE CABINETS

Connecting the Ground Wires on the 124i System (Figure 1-8)

Each 124i cabinet has two ground connections: ETH (Earth Ground) and PBXG (PBX Ground).

1. Loosen the lugs on both ground connections.

2. Using 12 AWG stranded copper wire, run a short jumper between the ETH and PBXG lugs.

3. Using another piece of 12 AWG stranded copper wire, connect the PBXG connection to a known earth ground.

4. Firmly tighten both the ETH and PBXG connections.

DO NOT PLUG IN THE CABINET POWER CORDS WITHOUT FIRST INSTALLING THE PCBS.

ONCE ALL THE PCB'S HAVE BEEN INSTALLED AND THE CONNECTIONS MADE, YOU MUST REPLACE THE KSU'S COVER IN ORDER TO KEEP THE PCB'S IN PLACE AND TO PREVENT INTERMITTENT RESETS FROM A LOOSE PCB.
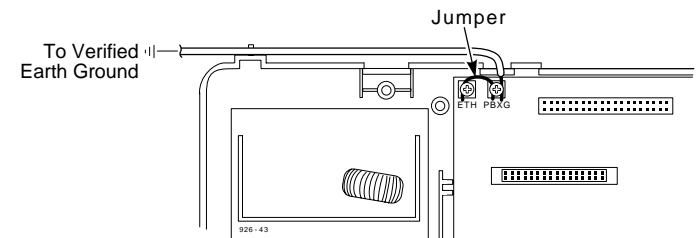
Figure 1-8 GROUNDING A CABINET

Now that your cabinets are installed and grounded, go to *Part 2: PCB Installation and Startup.*

1-11

1. Installing Cabinets

Section 2, PCB INSTALLATION AND STARTUP

Caution

Do not plug in PCBs with the power applied.

Always unplug the cabinet's AC power cord before inserting or removing PCBs.

2-1

**2. PCB Installation
and Startup**

28i Hardware Information

The 28i system uses software comparable to the 124i *base* system. This means that any features that are available in the 124i base system are available in the 28i system as long as the software level is the same. Check with your sales representative for the availability of DID and BRI trunks.

System Load Factors

When connecting equipment to the 28i system, always consider the Load Factor Table. This table shows the relative power requirements for each device that you can connect. The following PCB's have *no* load factor: 24CPRU, 4CIDU, 4DTDU, 4PGDU, 4ATRU, 8DSTU, and LAPB. *In order not to exceed the load factor, the system should not exceed a maximum of two station PCBs (either 8DSTU or 4ASTU).*

To use the Load Factor Table:

1. Multiply the number of devices (column 4) by their load factor (column 3).

   *For example, 16 key telephones plus 1 ASTU have a
   load factor of 23.*

2. Enter the result from step 1 in column 5 (Total Device Load).

3. Add up all the entries in column 5. *Total cabinet load cannot exceed 23*.

Load Factor Table				
**Connected
Device**	**Part
Number**	**Load
Factor**	**Number
Installed**	**Total
Device
Load**
All Key Telephones	----	1		
DSS Console	92555	TBD		
Door Box	88540	TBD		
2DIDU PCB	92016	8		
4ASTU PCB
(includes 4 SLT's)	92040	7		
VAU Module (3 port)	92136	2		
VAU Module and
Expansion (6 port)	92136 +
92137	2.5		
2-OPX Module	92177	4		
ACI Module	92259	.5		
DCI-A/B	92266 or
92267	.5		
3-DCI Module	92258	2		
Total Cabinet Load (23 max.):				

PCB LOCATION

Where to Install the PCBs in a 28i System (Figure 2-1)

Maximum	16 Trunks
Configuration:	20 Extensions (16 digital/8 analog)
	(All configurations are not available at the same time.)

The system's universal architecture gives you flexibility when installing PCBs. You can install a PCB in any slot, provided you follow the guidelines in the chart below and keep within the limits of the load factor. The number of extensions must be limited to 20 due to the load factor for the system.

Item	Description	Location	Max.
24CPRU	Central Processing Unit	CPRU in Slot 1	1
8DSTU	8 Digital Stations	Slot 2	1
4ASTU	4 Analog Stations	Slots 2-5	2 *
*Due to Load Factors, the 4ASTU PCB maximum is limited to 2.			
4ATRU	4 Analog Trunks	Slots 2-5	4
2DIDU	2 DID Trunks	Slots 2-5	4
2BRIU	2 BRI Circuits	Slots 2-5	4
4PGDU	4 Page/Door Box	Slots 2-5	2
4DTDU	Dial Tone Detection	Slots 2-5	2
LAPBU	LAPBU Unit	Installs on CPRU PCB	1
4CIDU	Caller ID	Installs on 4ATRU PCB	4
4GSAU	Ground Start	Installs on 4ATRU PCB	4

CPRU with optional LAPB PCB

4 ASTU (Analog Station)
or
4 ATRU (Analog Trunk)
or
4 PDGU (Page/Door Box)
or
4 DTDU (Dial Tone Det.)
or
2 DIDU (DID)
or
2 BRIU (BRI Trunk)

8 DSTU (Digital Station)
or
4 ASTU (Analog Station)
or
4 ATRU (Analog Trunk)
or
4 PDGU (Page/Door Box)
or
4 DTDU (Dial Tone Det.)
or
2 DIDU (DID)
or
2 BRIU (BRI Trunk)

Figure 2-1 PCB LOCATION

2. PCB Installation and Startup

PCB LOCATION

Where to Install the PCBs in a 124i System
(Figure 2-2)

Maximum Configuration:	52 Trunks
	72 Extensions

The system's universal architecture gives you great flexibility when installing PCBs. You can install a PCB in any slot, provided you follow the guidelines in Figure 2-2 and the chart below.

Item	Description	Location	Max.
32CPRU	Central Processing Unit	CPRU slot in Main	1
8DSTU	8 Digital Stations	Slots 1-3 in any cabinet	3 per cabinet 9 per system
PRIU	24 T1/PRI Trunks/Channels	Slot 3 in any cabinet	1 per cabinet 2 per system
BRIU	2 Two-Channel BRI Circuits	Slots 4-8 in any cabinet	5 per cabinet 13 per system
4ASTU	4 Analog Stations	Slots 1-8 in any cabinet	8 per cabinet 15 (with DSTU) per system 16 (without DSTU) per system
4ATRU	4 Analog Trunks	Slots 1-8 in any cabinet	8 per cabinet 13 per system
2EMTU	2 Tie Line Trunks	Slots 4-8 in any cabinet	5 per cabinet 13 per system
4PGDU	4 Page/Door Box	Slots 4-8 in any cabinet	2 per system
4DTDU	Dial Tone Detection	Slots 4-8 in any cabinet	2 per system
2DIDU	2 DID Trunks	Slots 4-8 in any cabinet	5 per cabinet 13 per system
EXIFU	Expansion Interface	CPRU slot in Expansion Cabinet	1 per cabinet 2 per system
EXCPRU	CPRU Memory Exp.	Installs on CPRU PCB	1 per system
LAPBU	LAPBU Unit	Installs on CPRU PCB	1 per system
4CIDU	Caller ID Daughter Board	Installs on 4ATRU PCB	8 per cabinet 13 per system **OR**
4GSAU	Ground Start Daughter Board	Installs on 4ATRU PCB	8 per cabinet 13 per system

PCB LOCATION

EXIFU Ribbon Cables

2EMTU (Tie line)
or
2DIDU (DID Trunk)
or
4ASTU (Analog Station)
or
4ATRU (Analog Trunk)
or
4PGDU (Page/Door Box)
or
4DTDU (Dial Tone Det.)
or
BRIU (BRI Interface)
or
PRIU (TI/PRI)

8DSTU (Digital Station)
or
4ASTU (Analog Station)
or
4ATRU (Analog Trunk)

⑧
⑦
⑥
⑤
④
③
②
①

32CPRU
or
EXIFU (Expansion Interface)

Figure 2-2 PCB LOCATION

**2. PCB Installation
and Startup**

INSTALLING PCBs

Advanced Feature (EXCPRU) (Figure 2-3)

The Advanced Feature (EXCPRU) Module is available only
for the 124i system. It provides the system with:
● Automatic Call Distribution (ACD)
● ISDN Capability
● E&M Tie Lines
● T1

To install the Advanced Feature (EXCPRU) Module:

1. Plug the Advanced Feature Module into the headers on the
   right side of the CPRU PCB as shown in Figure 2-3.

2. Set the switch on the EXCPRU to position 1.

   To upgrade the EXCPRU software, refer to page 2-35.

Remote Programming (LAPBU) Modules
(Figure 2-3 and 2-4)

You'll need the Remote Programming Module if you want to
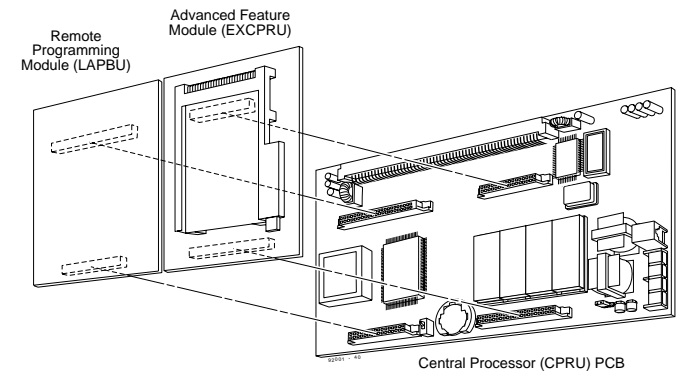use the PC Program with your system.

Figure 2-3 124i EXCPRU AND LAPBU MODULES

INSTALLING PCBs

28i System (Figure 2-4)

The default settings for this card are: 9600 bps, Start bit=1, Stop bit=1, Parity=No, Character=8 bit. The software requires the baud rate be set to 9600 bps, so this item is fixed and can not be changed.

To install the Remote Programming (LAPBU) Module:

1. Plug the Remote Programming Module into the header on the CPRU PCB. The connector labeled CPRU on the LAPBU module plugs into the LAPBU connector on the CPRU.

2. Connect the DIN-to-9 pin RS-232 cable (P/N 92707) to the 28i's LAPB card. Refer to Figure 2-4.

   This card provides an 8-pin connector for the cable.

3. The opposite end of the cable is connected to the COM port on your PC.

Note that for the 28i PC Program, **the modem initialize command must be entered as** *ATD#*#** (The 124i system requires an entry of ATDT#*#*.).
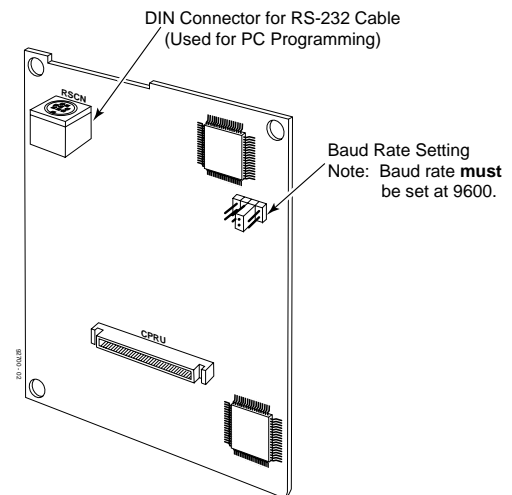

DIN Connector for RS-232 Cable
(Used for PC Programming)

RSCN

Baud Rate Setting
Note: Baud rate **must** be set at 9600.

CPRU

Figure 2-4 28i LAPBU MODULE

2. PCB Installation and Startup

INSTALLING PCBs

8 CPRU PCB

8 DSTU PCB

LAPB PCB

66MI-50
Station Block

9 Pin RS-232 Cable
(P/N 92707)

25-Pair
Cable

9 Pin Male-to-25 Pin
Female Connector

Station
Cable

25 Pin Male-to-Male Connector
(P/N 92268A)

625
Modular
Jack

Modem

124i System

To install the Remote Programming (LAPBU) Module:

1. Plug the Remote Programming Module into the headers on the left side of the CPRU PCB as shown in Figure 2-3.
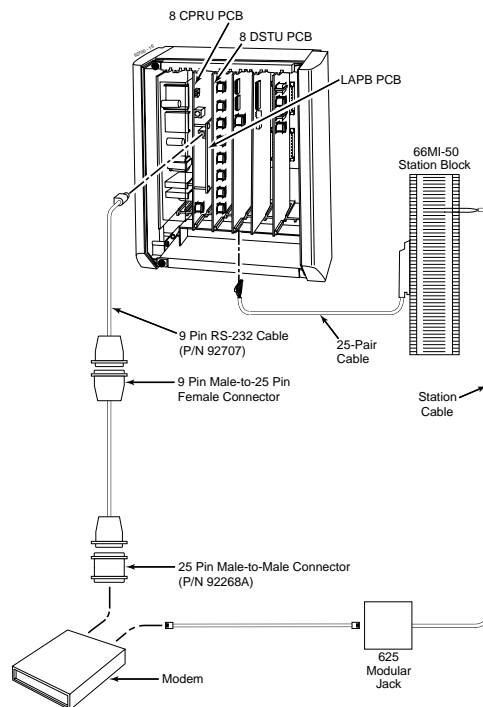
Figure 2-5 Connecting a Modem to LAPBU Module

2-8

INSTALLING PCBs

28i System: Central Processing Unit (CPRU)
PCB (Figure 2-6)

Plug the CPRU PCB into the CPRU slot (Slot 1) in the KSU. The CPRU provides:

● The system's central processing, stored program and memory for the customer's site-specific data.

● Mode switch for cold (default data) start on power-up.

● Reset switch to allow the system to be reset without powering down.

● Battery for short term (14 day) backup of the customer's site-specific data.

● Music on Hold jumper which allows you to select an external or internal source for Music on Hold.

● Volume Control for Music on Hold.

● DDK connectors for external Music on Hold/Background music source. The MOH music source can optionally be internal or connected to a 3-ACI Module. Refer to *Music on Hold* in the Software Manual for more.

● DDK connectors for eight digital telephones, VAU, 3-ACI, 3-DCI, or 2-OPX modules.

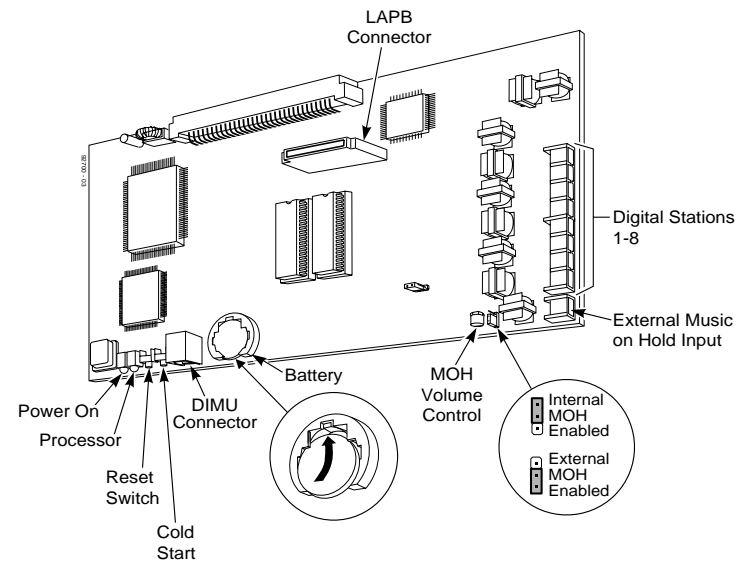● An additional connector for the DIM-U diagnostic unit.

Figure 2-6 CPRU PCB

2-9

2. PCB Installation
and Startup

INSTALLING PCBs

To install the 28i system's CPRU PCB:

1. Insert the battery into the battery clips.

2. Plug the CPRU into KSU CPRU slot (Slot 1).

3. When powering up, hold down the COLD switch on the CPRU.

    This ensures that the system will load the default database on initial power-up.

On initial power up (with a cold startup), the system scans for station ports from the lowest slot to the highest slot, so the first 8 station ports on the 24CPRU are assigned extension numbers 301-308 automatically. The next station card that follows, no matter which slot it's in, starts at extension 309.

Refer to *Part 4, Installing Optional Equipment* for instructions on installing Background Music and Music on Hold.

INSTALLING PCBs

124i System: Central Processing Unit (CPRU)
PCB (Figure 2-7)

Plug the CPRU PCB into the CPRU slot in the Main Cabinet. The CPRU provides:

● The system's central processing, stored program and memory for the customer's site-specific data.

● Mode switch for hot (customer data) or cold (default data) start on power-up.

● Battery for short term (14 day) backup of the customer's site-specific data.

● Music on Hold jumper which allows you to select an external or internal source for Music on Hold.

● Volume Controls for Music on Hold and Background Music.

● DDK connectors for external Background Music or Music on Hold music sources. The MOH music source can optionally be internal or connected to a 3-ACI Module. Refer to *Music on Hold* in the Software Manual for more.

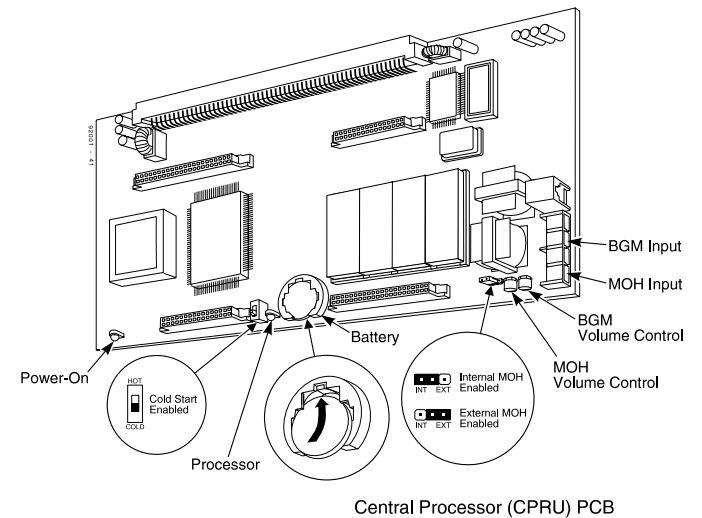● An additional connector for the DIM-U diagnostic unit.

Figure 2-7 CPRU PCB

2-11

2. PCB Installation
and Startup

INSTALLING PCBs

To install the 124i system's CPRU PCB:

1. Slide the Mode Switch to the Cold position.

   This ensures that the system will load the default data-base on initial power-up. After initial power-up, you must change the Mode Switch to Hot.

2. Insert the battery into the battery clips.

3. Plug the CPRU into Main Cabinet CPRU slot.

Refer to *Part 4, Installing Optional Equipment* for instructions on installing Background Music and Music on Hold.

INSTALLING PCBs

Upgrading CPRU Firmware (Figure 2-8, 2-9)

Use these instructions when upgrading the Software EPROMs on the CPRU PCB. The new EPROMs in the upgrade kit are static-sensitive components. Be sure to follow the instructions below carefully. ***Failure to follow proper anti-static precautions could damage your new software.***

To upgrade CPRU Firmware:

1. Attach a grounded wrist strap to your wrist and a grounded metal object (such as CEU ground).
2. If the system is currently powered up, unplug the system in the following order - main cabinet, first expansion cabinet, then the second expansion cabinet.
3. Lay the CPRU PCB on a flat, anti-static surface oriented as shown in Figure 2-8.
4. Using an IC puller, carefully remove the old EPROMs. Be careful not to rock the EPROMs or bend the pins during removal.

    Remove all the EPROMs. Depending on your CPRU, there may be either two or four EPROMs.

5. Remove the new EPROMs from the anti-static sleeve. Save all the packaging.
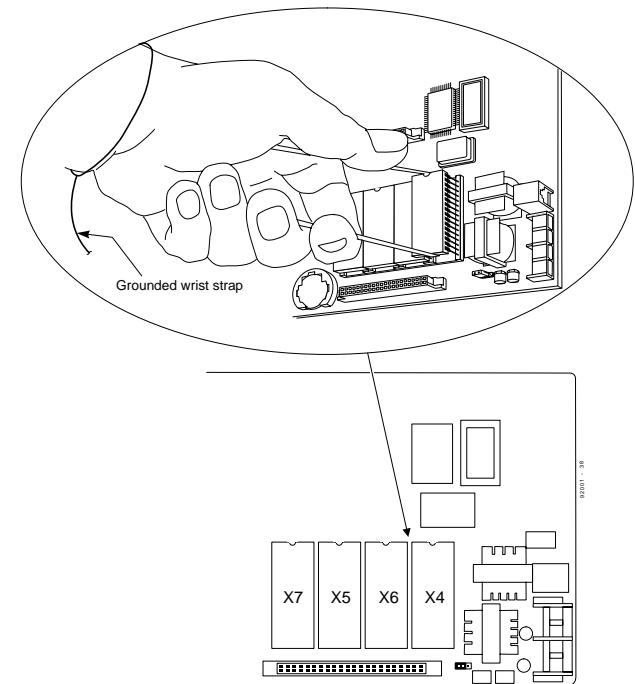

Grounded wrist strap

X7 X5 X6 X4

Figure 2-8 CPRU EPROM REMOVAL   2-13

2. PCB Installation and Startup

INSTALLING PCBs

6. Following Figure 2-9, carefully install the new EPROMs.

- *The EPROMs install in non-consecutive order. Be sure to install all four EPROMs.*

- *Pay careful attention to line up the notch in each EPROM with the notch in its socket.*

- *Do not bend any pins when plugging in the EPROMs.*

7. Reinstall the CPRU PCB. If the system has been previously installed, plug the system back in. Otherwise, continue with the installation.

8. Store old EPROMs in the anti-static sleeve.

9. Insert the sleeve into the upgrade packaging and return to:

Nitsuko America
4 Forest Parkway
Shelton, CT 06484
Attn: Technical Service

Grounded wrist strap

Key

X7 X5 X6 X4
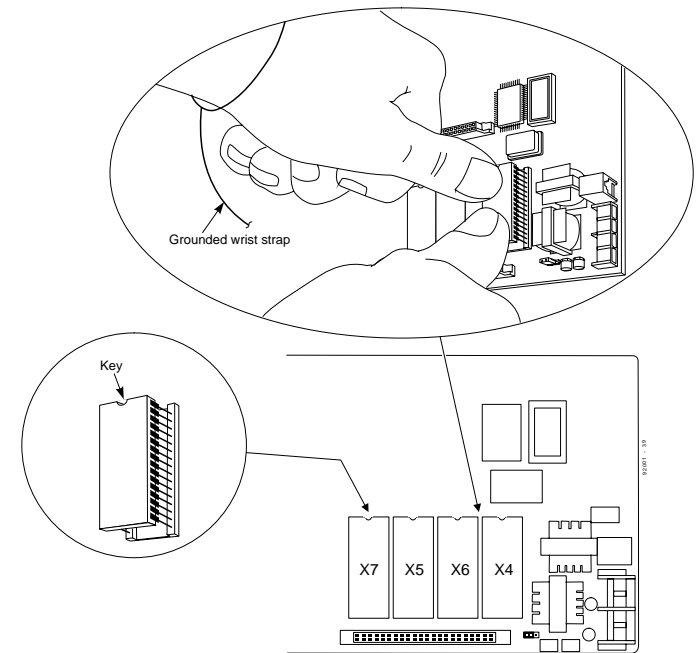
Figure 2-9 CPRU EPROM INSTALLATION

INSTALLING PCBs

Digital Station (DSTU) PCB (Figure 2-10)

The Digital Station (DSTU) PCB provides DDK connectors for
eight digital telephones, VAU, 3-ACI, 2-DCI, or 2-OPX modules.

To install a DSTU PCB:

1. *28i:* Plug a DSTU PCB into slot 2 in the KSU (1 DSTU
   PCB maximum per system).
   124i: Plug DSTU PCBs into slots 1-3 in any installed cabi-
   net (nine maximum).

2. Refer to *Part 3*: *Installing Extensions and Trunks* for cabling
   instructions.

On initial power-up (*28i:* hold down the Cold Start switch /
124i: CPRU Mode Switch set to Cold), the slot into which you
plug a station PCB determines its associated extension num-
bers. The system scans for station PCBs from the lowest slot in
the first cabinet (Main) to the high slot in the last cabinet
(Expansion # 2). The first station PCB the system finds gets
extension numbers 301-308. The next slot gets extension num-
bers 309-316, etc.

After initial power up (28i Hot Start without holding down any
switch / *124i:* CPRU Mode Switch set to Hot), any new station
PCBs you plug in automatically add to the top of your exten-
sion number list. For example, if your highest extension port is
324, any new station PCB you plug in will start with extension
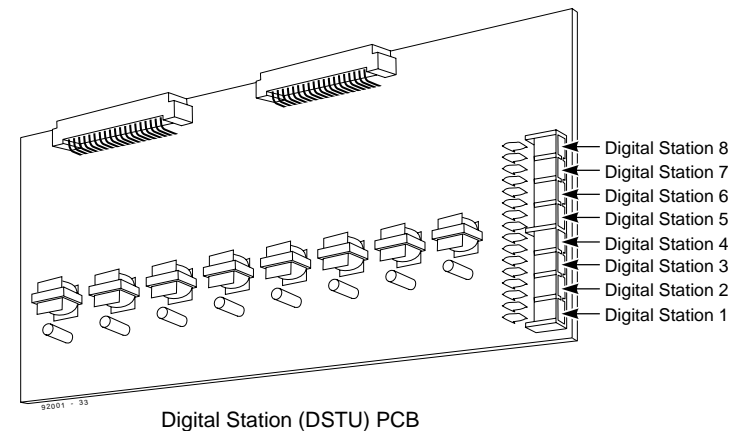number 325. This is true *regardless* of the slot number used.

Digital Station (DSTU) PCB

Figure 2-10 DIGITAL STATION (DSTU) PCB

**2. PCB Installation
and Startup**

INSTALLING PCBs

T1/PRI (PRIU) Interface PCB (Figure 2-11)

> **Note:** *For PRI, please consult with your Nitsuko
> Representative for availability.*

For T1 and ISDN Primary Rate Interface (PRI) applications,
install a T1/PRI Interface PCB. This PCB has a single 24-channel
circuit which can be configured for either T1 trunks or PRI. The
T1/PRI PCB requires an Advanced Features Module (EXCPRU)
and, for DTMF receivers, a Tone Detector (DTDU) PCB.

If set for T1, the T1/PRI PCB provides 24 trunks in a single
slot. These trunks can be one of the following:

- Loop Start
- Ground Start
- DID
- Tie Lines
- ANI/DNIS Tie Lines

If set for PRI, each T1/PRI PCB provides 24 PRI (23 B&D)
channels and supports the following PRI services:

- Basic PRI Call Control (BCC)
- Display of incoming caller's name and number
- Routing based on the number the caller dials

- ISDN maintenance functions (e.g., In Service/Out of Service
  Messaging)
- Speech and 3.1 KHz audio

The T1 feature requires that the *Base* CPU version level must
be one of the following:

3.3B	3.3C	3.4B	3.4C	4.3B	4.3C	4.6C
7.0	7.1	7.2	7.3	8.0 or higher		

The version number should not be confused with the software
revision. This version number will be stamped on the CPU cir-
cuit board. If the Base CPU version level is anything other than
the levels shown above, the T1 will not operate correctly.

The T1/PRI Interface PCB also requires the CSU or CSU/DSU
equipment and interconnecting cables listed below:
- T-Serve II CSU
  consisting of:
  - T-Serve II CSU P/N 85950)
  - T-Serve II Power Supply (P/N 85951)
  - CSU/DSU RJ48-DB15 Cable (P/N 85953)
  - T1/PRI Installation Cable (P/N 92067)

OR

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INSTALLING PCBs

● Quad Datasmart DSU
  consisting of:
  - Quad Datasmart DSU (P/N 85956)
  - CSU/DSU DB15M-DB15F Cable (P/N 85952)
  - CSU/DSU RJ48-DB15 Cable (P/N 85953)
  - T1/PRI Installation Cable (P/N 92067)

The T1/PRI Interface PCB is designed to use the last available group of 24 consecutive trunks.

To install a T1/PRI Interface PCB:

1. Set the switches on the T1/PRI Interface PCB for either PRI Mode or T1 Mode.

2. Plug the T1/PRI Interface PCB into slot 3 of any cabinet (two maximum).

3. Connect the T1/PRI Installation Cable (P/N 92067) to the 4-wire DDK connector on the T1/PRI Interface PCB.

4. If connecting a CSU:
   -- Connect the opposite end of the T1/PRI cable to the DB-15 female connector (J4) on the CSU.
   -- Connect the DB-15 female connector on the RJ48-DB15 Cable (P/N 85953) to the DB-15 male connector (P2) on the CSU.
   -- Connect the opposite end of the RJ48-DB15 cable to the

telco connection.

OR

4. If connecting a DSU:
   -- Connect the opposite end of the T1/PRI cable to the DB-15 female connector (TERMINAL) on the DSU.
   -- Connect the DB-15 female connector on the RJ48-DB15 Cable (P/N 85953) to the DB-15 male connector (NETWORK) on the DSU.
   -- Connect the opposite end of the RJ48-DB15 cable to the telco connection.

2-17

**2. PCB Installation
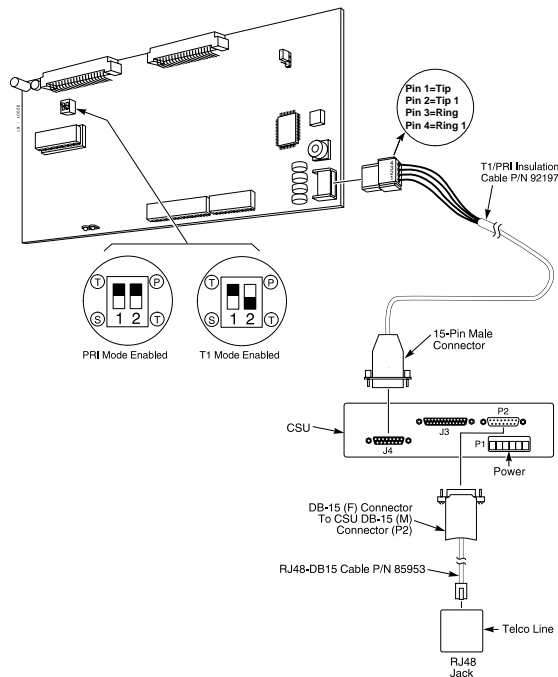and Startup**

INSTALLING PCBs

Figure 2-11 T1/PRI Interface (PRIU) PCB

INSTALLING PCBs

T1 to T1 Cable Pin Out (Figure 2-12)

When making a cable for T1 to T1 connections, using a DB-15 female to DB-15 female cable, the pin out should be made according to the information below. The example is shown with the 384i system, but the pin out information is the same for the 124i system.

The remaining pins have no connection. This cable may only be used in tying two T1 cards together locally. It CAN NOT be used to tie two T1 cards together through the central office.

DB-15 Female Connector

Pin 1
Pin 3   to
Pin 9
Pin 11

DB-15 Female Connector

Pin 3
Pin 1
Pin 11
Pin 9

DB-15 Male Connector
(connects to DB-15 Female Connector)

T1 Card

384i
System

384i
System
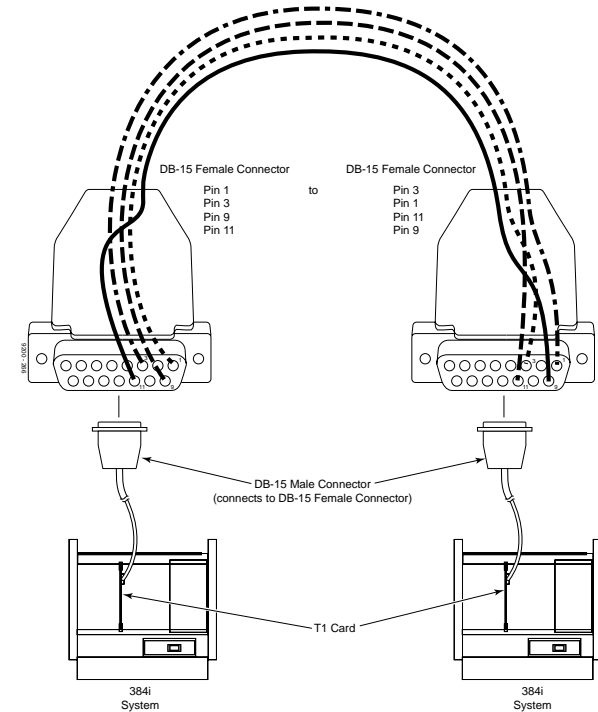
Figure 2-12 T1 to T1 Cable Pin Out

2-19

INSTALLING PCBs

BRI (BRIU) Interface PCB (Figure 2-13, 2-14)

Note: *For BRI, please consult with your Nitsuko
Representative for availability.*

The BRI (BRIU) PCB provides two 2-channel circuits for con-
necting to ISDN BRI services. Supported BRI services are:
● Basic BRI Call Control (BCC)
● Point-to-Point BRI Terminal Connection (no daisy-chaining)
● Multipoint BRI Terminal Connection (daisy-chaining)

The BRI Interface PCB has two circuit status LEDs on the out-
board edge of the card. An additional LED shows when the
PCB is in or out of service.

The BRI Interface PCB connects to the network via an NT1
Network Termination. Each PCB uses up 4 trunk ports.

To install a BRI Interface PCB:

1. Set the switches on the BRI PCB for either S-Bus or T-Bus
   use.

2. *28i:* Plug BRI PCBs into slots 2-5 in the KSU (4 trunk PCBs
   maximum per system).
   124i: Plug the BRI PCB into slots 4-8 slots of any installed

cabinet (15 maximum).

3. Connect an 8-pin line cord to the BRI PCB. See the figure
   below for the line cord connection. Connect the opposite end
   to the NT1 Network Termination Connection.

8-Pin Line Cord Connections

Pin 8 - Grey	Pin 1 - Brown
Pin 7 - Orange	Pin 2 - Blue
Pin 6 - Black	Pin 3 - Yellow
Pin 5 - Red	Pin 4 - Green
Pin 4 - Green	Pin 5 - Red
Pin 3 - Yellow	Pin 6 - Black
Pin 2 - Blue	Pin 7 - Orange
Pin 1 - Brown	Pin 8 - Grey
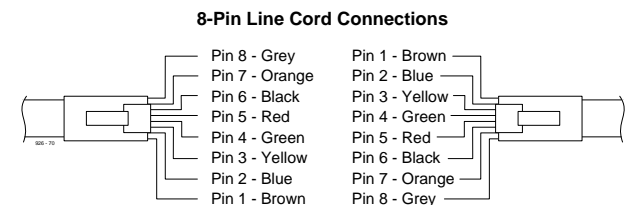
Figure 2-13 8-Pin Line Cord

4. Connect a line cord from the NT1 Network Termination to
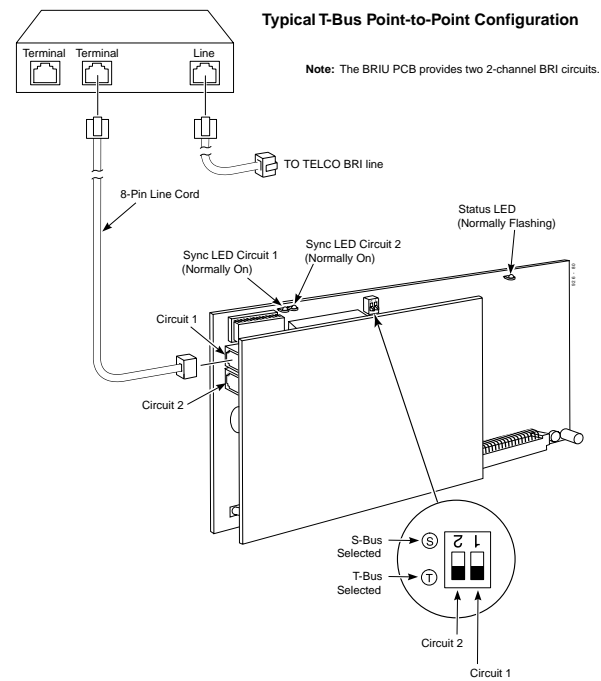   the telco BRI line.

INSTALLING PCBs

Typical T-Bus Point-to-Point Configuration

Note: The BRIU PCB provides two 2-channel BRI circuits.

Terminal   Terminal   Line

TO TELCO BRI line

8-Pin Line Cord

Status LED
(Normally Flashing)

Sync LED Circuit 1
(Normally On)

Sync LED Circuit 2
(Normally On)

Circuit 1

Circuit 2

S-Bus
Selected

T-Bus
Selected

Circuit 2

Circuit 1

Figure 2-14 BRI Interface T-Bus Point-to-Point

**2. PCB Installation
and Startup**

INSTALLING PCBs

Analog Station (ASTU) PCB (Figure 2-15)

The Analog Station (ASTU) PCB provides DDK connectors for four analog telephones, fax machines, voice mail ports, or modems.

28i System

The 28i system allows for a maximum of 2 4ASTU to be installed. The system automatically designates 8 ports for the 4ASTU, but only uses 4 of them. Therefore, the next slot will start with the following group of 8. For example, if the 4ASTU is installed in slot 2 (ports 309-312), slot 3 will start with port 317. This provides the system with a maximum of 8 analog ports.

124i System

When installing an ASTU PCB in slots 1-3 in any cabinet of the 124i system, the system automatically designates 8 ports for the ASTU, but only uses 4 of them. Therefore, the next slot will start with the following group of 8. For example, if the ASTU is installed in slot 2 (ports 309-312) in the first cabinet, slot 3 will start with port 317.

The ASTU PCB can provide a maximum of 72 analog ports. The analog ports can be configured as follows:

14 ASTU's with 2 DSTU's and 8 2-OPX Modules	72 ports
15 ASTU's with a DSTU installed	60 ports
16 ASTU's without a DSTU installed *	64 ports

To reach these maximums, the ASTU's must be installed in slots 4-8 in the three cabinets. If using 16 ASTU's, the last PCB is installed in slots 1, 2, or 3.

* It is possible, but not recommended for most customer sites, to have up to 64 analog ports using 16 ASTU PCBs. With this configuration, there can not be a DSTU PCB installed, which is required for system programming.

INSTALLING PCBs

To install an ASTU PCB:

1. *28i:* Plug 4ASTU PCBs into slots 2-5 in the KSU (2 station PCBs maximum per system).
   124i: Plug ASTU PCBs into slots 1-8 in any installed cabinet (15 maximum with DSTU installed/16 without DSTU installed).

2. Refer to *Part 3: Installing Extensions and Trunks* for cabling instructions.
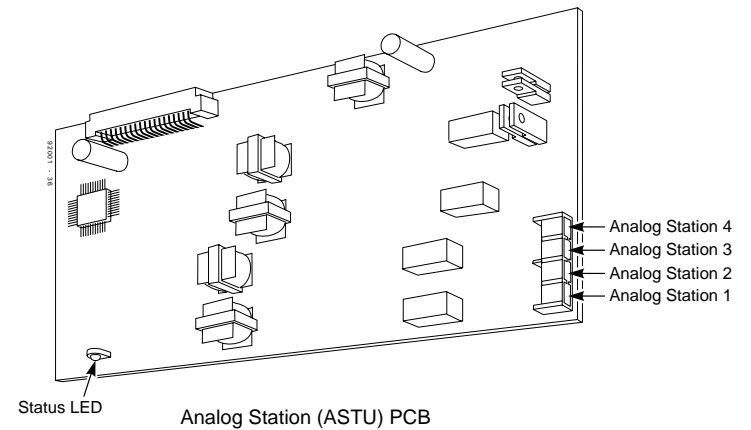

Analog Station (ASTU) PCB

Figure 2-15 ANALOG STATION (ASTU) PCB

2. PCB Installation and Startup

INSTALLING PCBs

Analog Trunk (ATRU) PCB (Figure 2-16)

The Analog Trunk (ATRU) PCB provides DDK connectors for four analog trunks and a Power Failure Telephone.

To install an ATRU PCB:

1. *28i:* Plug 4ATRU PCBs into slots 2-5 in the KSU (4 trunk PCBs maximum per system).
   124i: Plug ATRU PCBs into slots 1-8 in any installed cabinet (13 maximum).

2. Refer to *Part 3: Installing Extensions and Trunks* for cabling instructions. Refer to *Part 4: Installing Optional Equipment* for instructions on connecting the Power Failure Telephone.

On initial power-up with a cold start (*28i:* hold down the Cold Start switch / *124i:* CPRU Mode Switch set to Cold), the slot into which you plug a trunk PCB determines its associated trunk numbers. The system scans for trunk PCBs from the lowest slot in the first cabinet (Main) to the highest slot in the last cabinet (Expansion # 2). The first trunk PCB the system finds gets trunk numbers 1-4. The next slot gets trunk numbers 5-8, etc.

After initial power up (*28i* Hot Start without holding down any switch / *124i:* CPRU Mode Switch set to Hot), any new trunk PCBs you plug in automatically add to the top of your trunk number list. For example, if your highest trunk port is 8, any new trunk PCB you plug in will start with trunk number 9. This is true *regardless* of the slot number used.

Analog Trunk (ATRU) PCB
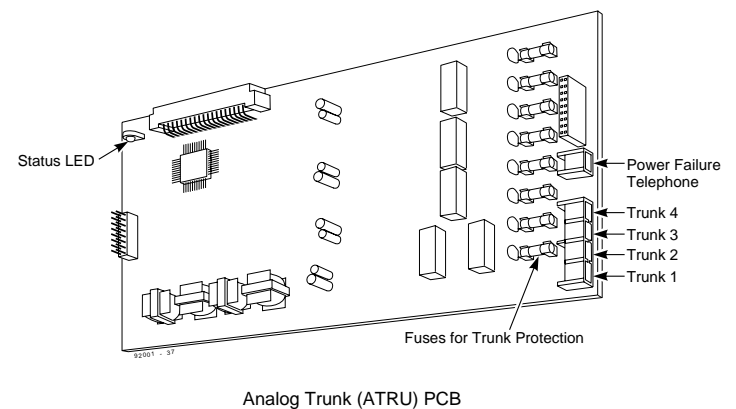
Figure 2-16 ANALOG TRUNK (ATRU) PCB

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INSTALLING PCBs

Caller ID (4CIDU) Daughter Board (Figure 2-17)

The Caller ID daughter board allows the system to display
Caller ID information. Each daughter board is installed on a
4ATRU PCB. The Caller ID PCB provides Caller ID capability
for all four trunk circuits on the 4ATRU PCB. Every 4ATRU
PCB installed in the system can have a Caller ID daughter board
attached. With the Caller ID daughter board plugged in, the
4ATRU PCB can not have ground start operation. On the 28i,
the maximum number of PCBs allowed per system is 4. For the
124i, the maximum number of PCBs per system is 13.

To install an ATRU PCB:

1. Remove the 4ATRU PCB.

2. Align the Caller ID PCB standoffs over the holes located in
   the 4ATRU PCB.

   *The CN2 connector on the Caller ID PCB should be
   above the CN4 connector on the 4ATRU PCB and CN1
   should be above CN5.*

3. Push the PCB down until the standoffs snap into place.

4. Plug the 4ATRU PCB back into the system cabinet.
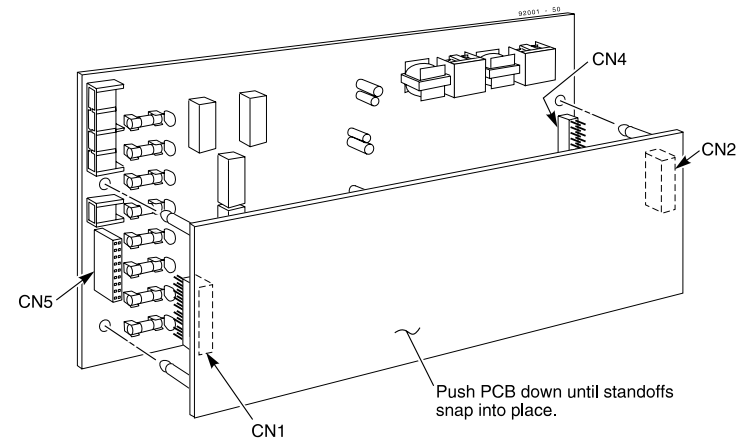
Figure 2-17 CALLER ID (4CIDU) PCB

INSTALLING PCBs

Ground Start (4GSAU) Daughter Board (Figure 2-18)

The Ground Start daughter boards convert the four analog loop trunks on each 4ATRU into ground start trunks. The Ground Start daughter board is installed on the 4ATRU PCB. It is possible, but not required, that every 4ATRU PCB in the system can have a Ground Start PCB.

Important Notes:
- If you install a Ground Start PCB on a 4ATRU PCB, the trunk ports associated with that card can not have Caller ID.
- When a Ground Start PCB is installed on a 4ATRU PCB, all the trunk ports on that card must be ground start trunks. It is not possible to mix loop start and ground start trunks on the same card.
- The Ground Start PCB is polarity sensitive and requires the tip and ring to be connected properly.

To install a Ground Start PCB:

1. Remove the 4ATRU PCB.

2. Align the Ground Start PCB standoffs over the holes located in the 4ATRU PCB.

   The J1 connector on the Ground Start PCB should be above the CN4 connector on the 4ATRU PCB and J3 should be above CN5.

3. Push the PCB down until the standoffs snap into place.

4. Plug the 4ATRU PCB back into the system cabinet.

5. Refer to *Part 3: Installing Extensions and Trunks* for cabling instructions.

INSTALLING PCBs
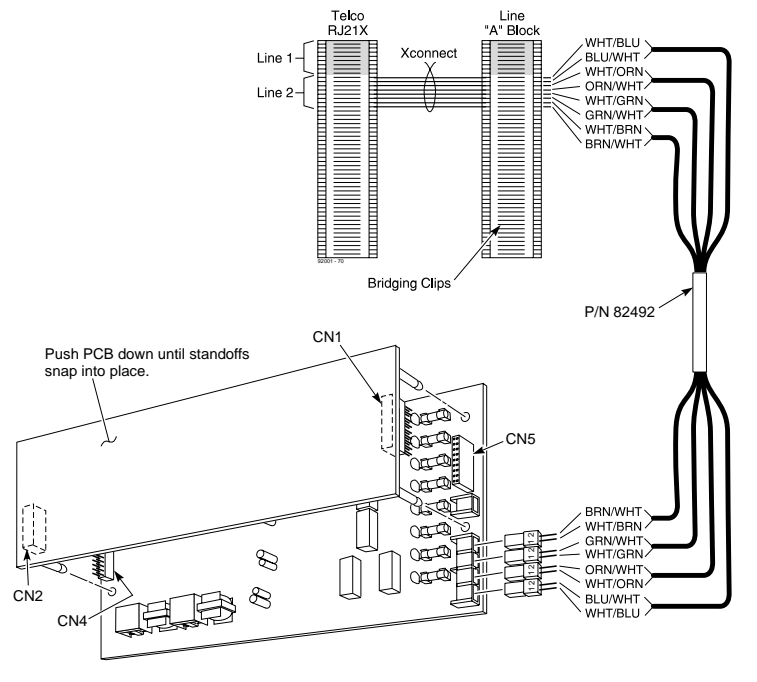
Figure 2-18 GROUND START (4GSAU) PCB

2. PCB Installation and Startup

INSTALLING PCBs

E&M Tie Line (2EMTU) PCB (Figure 2-19)

The Tie Line (2EMTU) PCB supports system connections to 2-wire Type 1 (four conductor), 2-wire Type 2 (6 conductor), or 4-wire (four conductor) E&M signaling tie lines. Each 2EMTU PCB provides two 4-circuit tie line trunk interfaces and an on-board power supply. The strapping option on the PCB allows the use of either Type 1 or Type 2 signaling.

The Tie Line PCB requires the use of an EXCPRU daughter board and a DTDU PCB installed in the first cabinet.

To install a Tie Line PCB:

1. Set the strapping options on the 2EMTU PCB as required (see Figure 2-19).

2. Plug the 2EMTU PCB in slots 4-8 in any installed 124i cabinet (13 maximum).

3. Refer to *Part 3: Installing Extensions and Trunks* for cabling instructions.
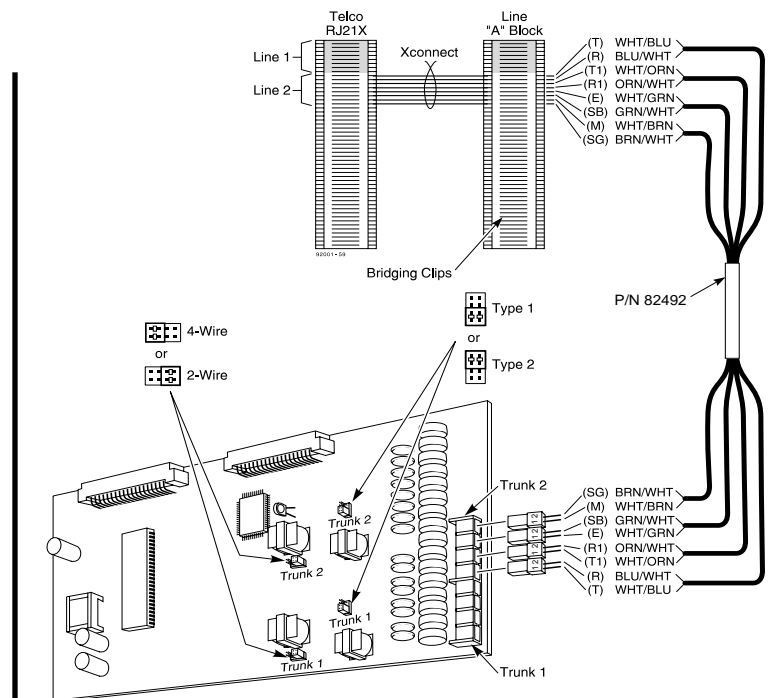
Figure 2-19 TIE LINE (2EMTU) PCB

2-28

INSTALLING PCBs

DID (2DIDU) PCB (Figure 2-20)

The DID (2DIDU) PCB supports two Direct Inward Dialing
(DID) trunk circuits. The PCB has an on-board power supply
and an LED that shows when the PCB is in or out of service.
The DID PCB requires a DTDU PCB for DTMF receivers.

For the 28i system, please check with your Sales Representative
for availability of this feature.

To install a DID PCB:

1. **28i:** Plug DID PCBs into slots 2-5 in the KSU (4 trunk
   PCBs maximum per system).
   124i: Plug the 2DIDU PCB in slots 4-8 in any installed
   cabinet (13 maximum).

2. Refer to *Part 3: Installing Extensions and Trunks* for cabling
   instructions.
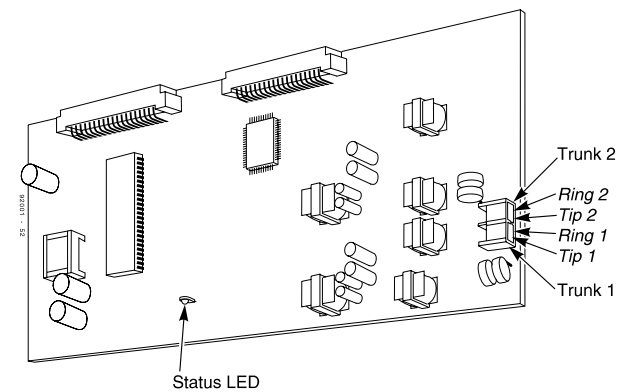
Figure 2-20 DID (2DIDU) PCB

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**2. PCB Installation
and Startup**

INSTALLING PCBs

Page/Door Box (PGDU) PCB (Figure 2-21)

The Page/Door Box (PGDU) PCB provides:

● DDK connectors for four External Paging Zones or Door Boxes.

● Selector switches to enable each port for External Paging or Door Box. Each of the four PCB ports can be either an External Paging port or a Door Box port - not both.

● DDK connectors for four dry contact External Paging control relays (one for each zone). These contacts can control a customer-provided Paging amplifier or an entrance door strike.

● Volume controls for each External Paging/Door Box circuit.

● DDK connectors for four alarm/fax sensors.

To install a PGDU PCB:

1. *28i:* Plug PGDU PCBs into slots 2-5 in the KSU (2 PCBs maximum per system).
   124i: Plug PGDU PCBs into slots 4-8 in any installed cabinet (2 maximum).

2. Refer to *Part 4: Installing Optional Equipment* for more on installing Door Boxes, External Paging equipment and alarm/fax sensors.

Page/Door Box (PGDU) PCB
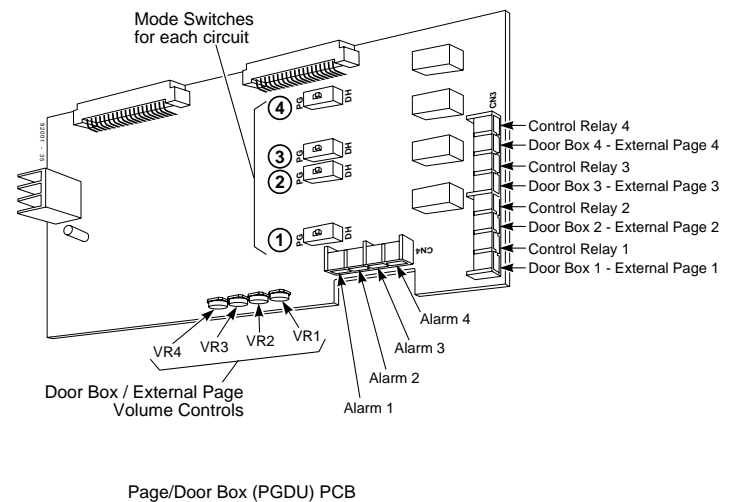
Figure 2-21 PAGE/DOOR BOX (PGDU) PCB

2-30

INSTALLING PCBs

On initial power-up (with the CPRU performing a Cold Start), the slot into which you plug a PGDU PCB determines its associated External Paging and/or Door Box numbers. The system scans the slots in order (Slots 2-5 in the 28i, Slots 4-8 in the 124i) for PGDU PCBs starting with the first cabinet (Main) and ending with the last cabinet (Expansion # 2), if applicable. The first PGDU PCB the system finds gets the lower-numbered External Paging Zones/Door Boxes. For example, if configured for Door Boxes, the first PCB would have Door Boxes 1-4, while the second PCB would have Door Boxes 5-8.

After initial power up (with the CPRU performing a Hot Start), a new PGDU PCB you plug in automatically adds to the top of your External Paging/Door Box list. For example, if you already have Door Boxes 1-4, the new PCB you plug in will start with Door Box 5. This is true regardless of the slot number used.

INSTALLING PCBs

Tone Detector (DTDU) PCB (Figure 2-22)

The Tone Detector (DTDU) PCB provides outbound dial tone
detection for Off Premise Extensions and analog trunks. It also
provides DTMF receivers for certain types of inbound trunks.
These include:

- DTMF DIDs

- DTMF E&M Tie Lines

- DISA

- T1 DNIS

- T1 DID

- T1 Tie Lines

To install a DTDU PCBs:

1. **28i:** Plug DTDU PCBs into slots 2-5 in the KSU (2 trunk
   PCBs maximum per system).
   124i: Plug DTDU PCBs into slots 4-8 in any installed
   cabinet (2 maximum).

Status LED   Tone Detector (DTDU) PCB
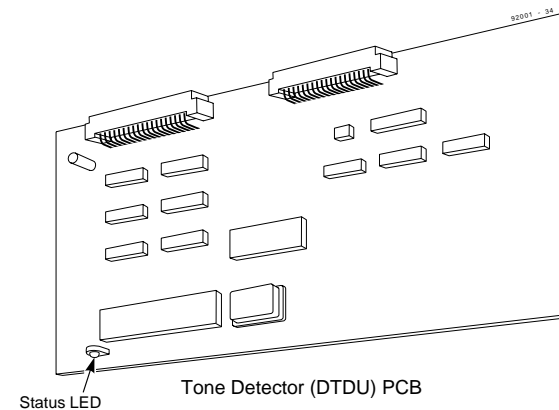
Figure 2-22 TONE DETECTOR (DTDU) PCB

INSTALLING PCBs

28i Power-Up Sequence

Now that all the PCBs you need are installed, you can power-up the system.

1. Install a surge protector in the AC outlet you intend to use for system power.

2. Plug the AC power cord for the KSU into its surge protector.

System LEDs on Power-Up

PCB	LED	Status
CPRU	Power-On	Lights (green) when KSU plugged in
	Processor LED	Flashes slowly (red) about 10 seconds after power-up
ASTU	Status LED	Flashes slowly (red) when PCB activated (on-line)

The system is set up so that when powering up or resetting, the system always performs a Hot Start (retains system programming). To Cold Start the system (default the system), press and hold the COLD switch down for approximately 10 seconds while either turning on the power or pressing the reset switch on the CPRU.

2. PCB Installation and Startup

INSTALLING PCBs

124i Power-Up Sequence

Now that all the PCBs you need are installed, you can power-up the system.

1. Install surge protectors in the AC outlets you intend to use for system power.

2. Plug the AC power cord for Expansion Cabinet # 2 into its surge protector.

3. Plug the AC power cord for Expansion Cabinet # 1 into its surge protector.

4. Plug the AC power cord for the Main Cabinet into its surge protector.

System LEDs on Power-Up

PCB	LED	Status
CPRU	Power-On	Lights (green) when Main Cabinet plugged in
	Processor LED	Flashes slowly (red) about 10 seconds after power-up
ASTU	Status LED	Flashes slowly (red) when PCB activated (on-line)

The power supply in the 124i cabinet uses two 4 amp fast-blow fuses. If the system does not power up at this point, the problem could be with the fuses. The fuses can be replaced by carefully removing them from the holding clips.

4 amp fast blow fuses
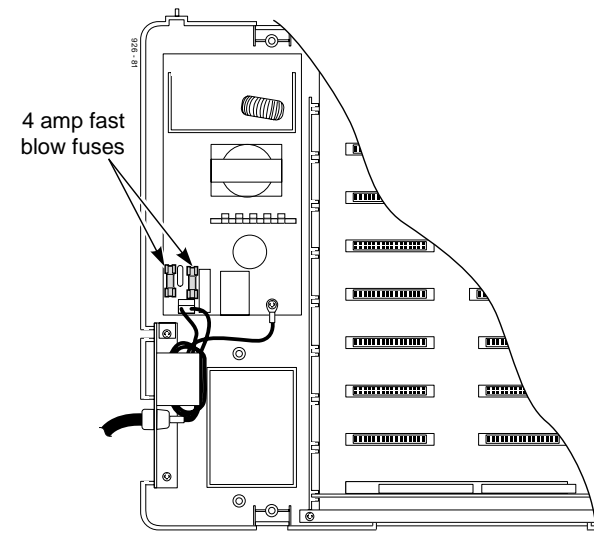
Figure 2-23 FUSE REPLACEMENT

2-34

INSTALLING PCBs

Upgrading the Advanced Feature (EXCPRU) Module Software Version for the 124i System
(Figure 2-24 and 2-25)

The PC Card (P/N 92050xxx) is used to upgrade the 124i EXCPRU. The following instructions should be followed carefully.

Note: To keep the customer's information, set the mode switch on the CPRU to the "HOT" position. Otherwise, the system will default.

1. Make sure the system is unplugged and the cover from the main cabinet has been removed.

2. Attach a grounded wrist strap to your wrist and a grounded metal object (such as the CEU ground).

3. Carefully install the PC card into the designated slot on the EXCPRU.

   Make sure the card is completely installed - it should be flush with the Eject button (see Figure 2-24).

4. Set the switch on the EXCPRU to position 2 and reinstall the CPRU.

5. Power up the system.

6. When the system reset is complete, carefully set the switch on the EXCPRU back to position 1.

   The system will briefly reset (approximately 15 seconds).

7. Unplug the system again and remove the PC Card.

   The CPRU will move and can slip out of it's slot. Make sure the CPRU is installed properly before proceeding.

8. Replace the cover on the main cabinet and power up the system.

9. To make sure the upgrade was successful, enter the programming mode by pressing CALL1 + #*#*. The new software version should appear on the upper right corner of the display keyset.

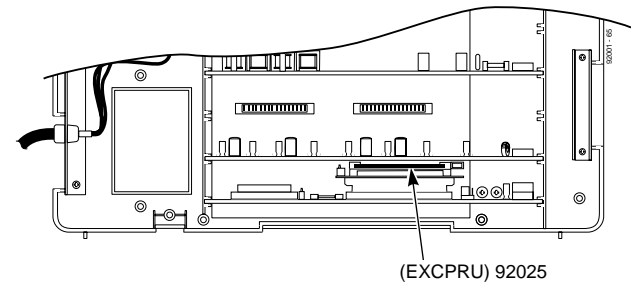10. Place the PC card back into it's original case for storage.

2. PCB Installation and Startup

INSTALLING PCBs

Position 1   Position 2

92001 - 64

92050** PC Card

Insert

PC Card

Should
be flush

Eject Button
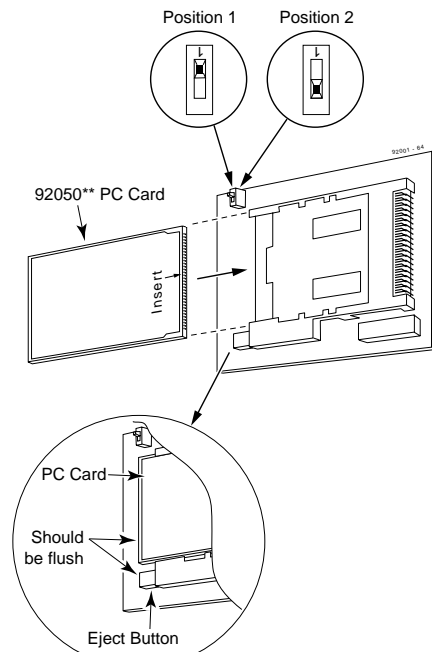
**Figure 2-24 PC CARD
INSTALLATION**

90001 - 65

(EXCPRU) 92025

Figure 2-25 PC CARD AND EXCPRU LOCATION

Section 3, INSTALLING EXTENSIONS AND TRUNKS

**3. Installing
Extensions and Trunks**

CONNECTING BLOCKS

Working With DDK Connectors

The system uses DDK type connectors for extensions, trunks and optional equipment. Using the 25-pair DDK Installation Cables (P/N 93090) that came with your system makes it easy to connect the PCBs to standard 66M1-50 connecting blocks. In general, each cabinet needs:

● One 66M1-50 block and DDK Installation Cable for extensions and optional equipment.

● One 66M1-50 block and DDK Installation Cable for trunks.

Note: Depending on your PCB configuration and local codes, you may need an additional 66M1-50 block and DDK Installation Cable for optional equipment.

Punching Down a DDK Installation Cable
(Figures 3-1, 3-2, 3-3)

The DDK Installation Cables have DDK connectors installed (in pairs) on one end and are unterminated on the other.

1. For each 66M1-50 block, punch down the DDK Installation Cable in standard color-code order.

    Refer to Figure 3-4 if you need help with the color code.

2. As you use the following pages to install extensions, trunks and optional equipment, write down the circuit assignments in Figure 3-4.

    Make additional copies of Figure 3-4 as required.

3. After you have punched down your cables, route them through the side of the cabinet and secure them with the cable tie (on the 28i system) or the strain relief (on the 124i system) (Figures 3-2 and 3-3).
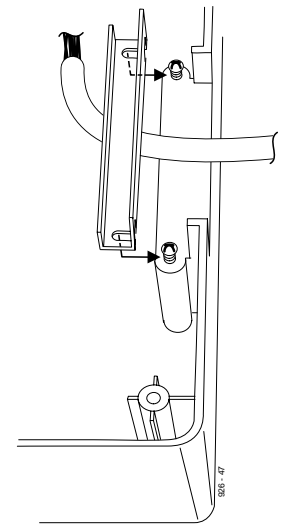
CONNECTING BLOCKS

WHT-BLU
BLU-WHT
WHT-ORN
ORN-WHT
WHT-GRN
GRN-WHT

66M1-50
Connecting
Block

WHT-BLU
BLU-WHT
WHT-ORN
ORN-WHT
WHT-GRN
GRN-WHT

926-38
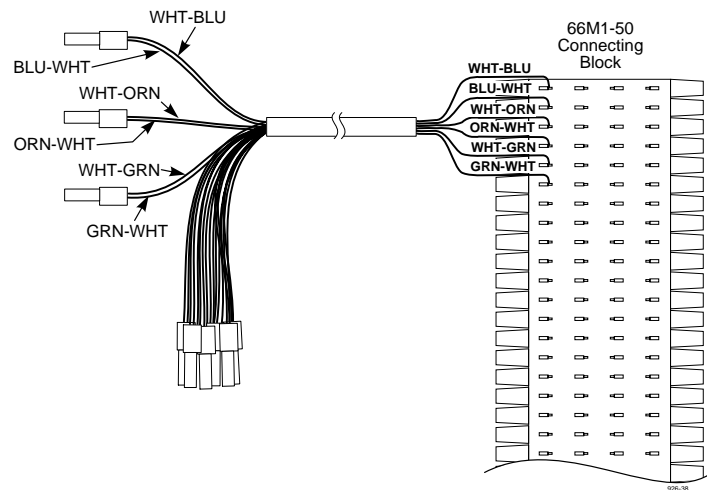
Figure 3-1 PUNCHING DOWN DDK INSTALLATION CABLES

Figure 3-2 SECURING THE CABLES ON THE 28i

Figure 3-3 SECURING THE CABLES ON THE 124i
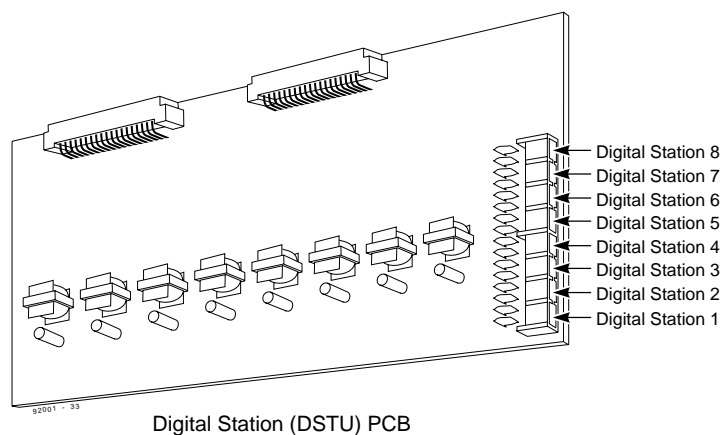
**3. Installing
Extensions and Trunks**

25-PAIR CABLE _____		
BLOCK TERM	**COLOR CODE**	**FUNCTION**
1	WHT-BLU	
2	BLU-WHT	
3	WHT-ORN	
4	ORN-WHT	
5	WHT GRN	
6	GRN-WHT	
7	WHT-BRN	
8	BRN-WHT	
9	WHT-SLT	
10	SLT-WHT	
11	RED-BLU	
12	BLU-RED	
13	RED-ORN	
14	ORN-RED	
15	RED-GRN	
16	GRN-RED	
17	RED-BRN	
18	BRN-RED	
19	RED-SLT	
20	SLT-RED	
21	BLK-BLU	
22	BLU-BLK	
23	BLK-ORN	
24	ORN-BLK	
25	BLK-GRN	
26	GRN-BLK	
27	BLK-BRN	
28	BRN-BLK	
29	BLK-SLT	
30	SLT-BLK	
31	YEL-BLU	
32	BLU-YEL	
33	YEL-ORN	
34	ORN-YEL	
35	YEL-GRN	
36	GRN-YEL	
37	YEL-BRN	
38	BRN-YEL	
39	YEL-SLT	
40	SLT-YEL	
41	VIO-BLU	
42	BLU-VIO	
43	VIO-ORN	
44	ORN-VIO	
45	VIO-GRN	
46	GRN-VIO	
47	VIO-BRN	
48	BRN-VIO	
49	VIO-SLT	
50	SLT-VIO	

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Figure 3-4 CONNECTING BLOCK

CONNECTING EXTENSIONS

Digital Station (DSTU) PCB Connections (Figure 3-5)

The Digital Station PCB has DDK connectors for eight stations.

Figure 3-5 reference labels:
- Digital Station 8
- Digital Station 7
- Digital Station 6
- Digital Station 5
- Digital Station 4
- Digital Station 3
- Digital Station 2
- Digital Station 1

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Digital Station (DSTU) PCB

Figure 3-5 DIGITAL STATION CONNECTIONS

1. Following the conventional color code, insert the DDK connectors into the PCB. For example, the first DSTU in the system would have these connections:

Extension	Port	DDK Conn Pair
301	1	WHT-BLU / BLU-WHT
302	2	WHT-ORN / ORN-WHT
303	3	WHT-GRN / GRN-WHT
304	4	WHT-BRN / BRN WHT
305	5	WHT-SLT / SLT-WHT
306	6	RED-BLU / BLU-RED
307	7	RED-ORN / ORN-RED
308	8	RED-GRN / GRN-RED

Write down the connections for each DSTU PCB in Figure 3-4. Make additional copies of Figure 3-5 as required.

2. Install a modular jack for each digital extension within six feet of the telephone's location. See Figure 3-6.

3. For each digital extension, run one-pair 24 AWG station cable from the cross-connect block to the modular jack.

4. Terminate the station cable WHT/BLU - BLU/WHT leads to the RED and GRN lugs in the modular jack.

**3. Installing
Extensions and Trunks**

CONNECTING EXTENSIONS

Digital Station (DSTU) PCB Connections (Cont'd)

5. Back at the MDF, run one pair of cross-connect wire between the pins on the B block and cross-connect block to complete the connection.

6. Install bridging clips as required.

7. After completing step 6, you should be able to place and answer calls at the extension.
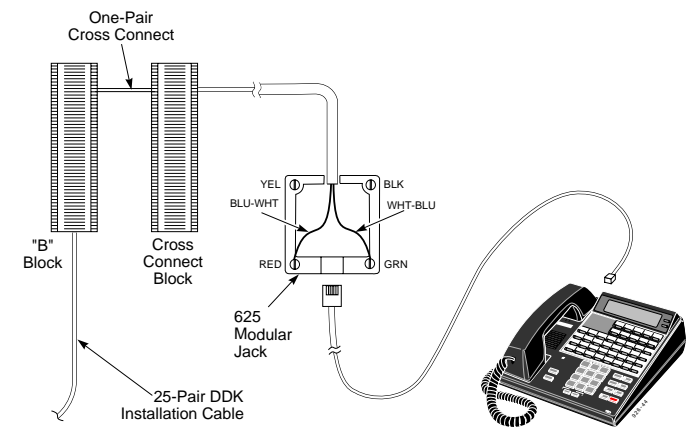
8. Record your entries on Figure 3-4.

One-Pair
Cross Connect

"B"
Block

Cross
Connect
Block

YEL   BLK
BLU-WHT   WHT-BLU
RED   GRN

625
Modular
Jack

25-Pair DDK
Installation Cable

Figure 3-6 CONNECTING DIGITAL TELEPHONES

CONNECTING EXTENSIONS

Analog Station (ASTU) Connections (Figure 3-7)

The Analog Station PCB has DDK connectors for four stations. The 28i system allows for a maximum of 2 ASTU's to be installed. On a 124i system, the maximum allowed is either 15 ASTU PCB's with a DSTU PCB installed in slot 1, 2, or 3 (providing 60 analog station ports and 8 digital station ports) *OR* 16 ASTU PCB's with no DSTU PCB installed in the system (providing 64 analog station ports). Note: A DSTU PCB must be installed when access to system programming is required.

Status LED   Analog Station (ASTU) PCB
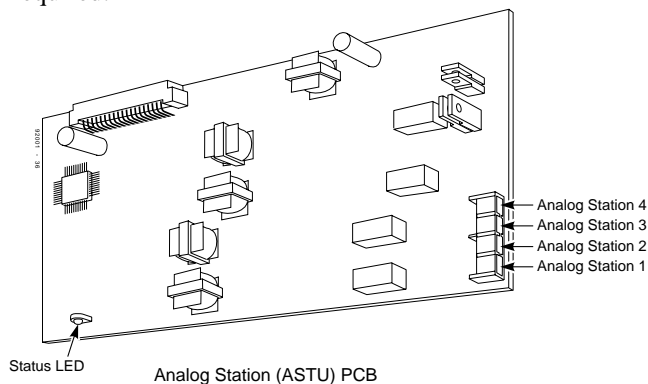
Figure 3-7 Analog Station (ASTU) Connections

1. Following the conventional color code, insert the DDK connectors into the PCB. For example, if the ASTU PCB is the second Station PCB (and a DSTU is the first), the ASTU PCB would have these connections:

Extension	Port	DDK Conn. Pair
309	9	RED-BRN / BRN-RED
310	10	RED-SLT / SLT-RED
311	11	BLK-BLU / BLU-BLK
312	12	BLK-ORN / ORN-BLK

   Write down the connections for each ASTU PCB in Figure 3-4. Make additional copies of Figure 3-4 as required.

2. Install a modular jack for each analog extension within six feet of the telephone's location. See Figure 3-8.

3. For each analog extension, run one-pair 24 AWG station cable from the cross-connect block to the modular jack.

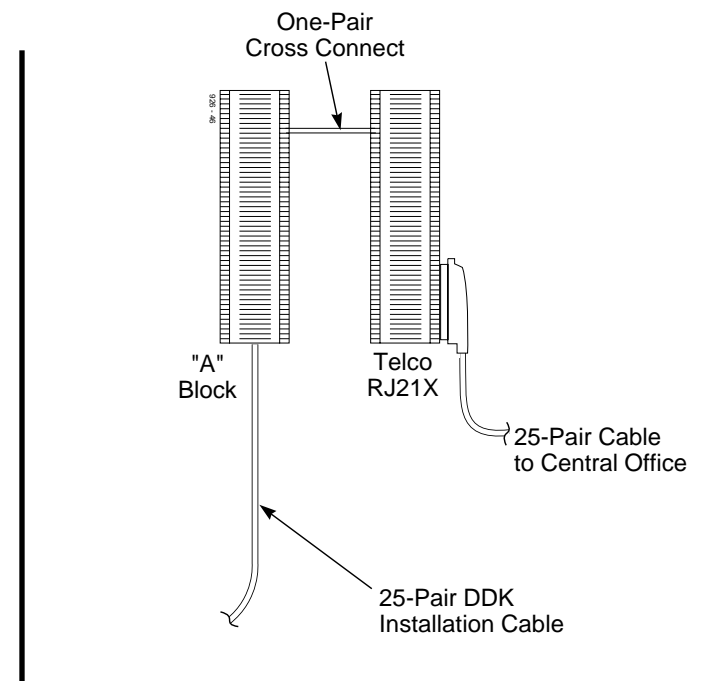4. Terminate the station cable WHT/BLU - BLU/WHT leads to the RED and GRN lugs in the modular jack.

Continued on next page . . .

**3. Installing
Extensions and Trunks**

CONNECTING EXTENSIONS

Analog Station (ASTU) Connections (Cont'd)

5. Back at the MDF, run one pair of cross-connect wire between the pins on the B block and cross-connect block to complete the connection.

6. Install bridging clips as required.

7. After completing step 6, you should be able to place and answer calls at the extension.

8. Record your entries on Figure 3-4.
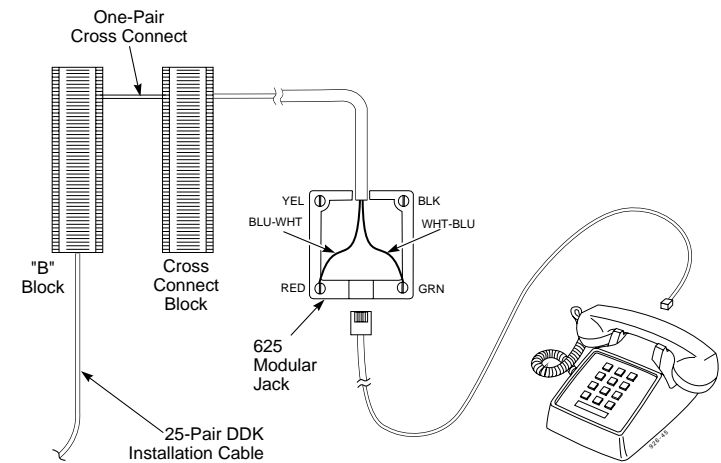
Figure 3-8 CONNECTING ANALOG TELEPHONES

CONNECTING TRUNKS

Analog Trunk (ATRU) PCB Connections (Figure 3-9)
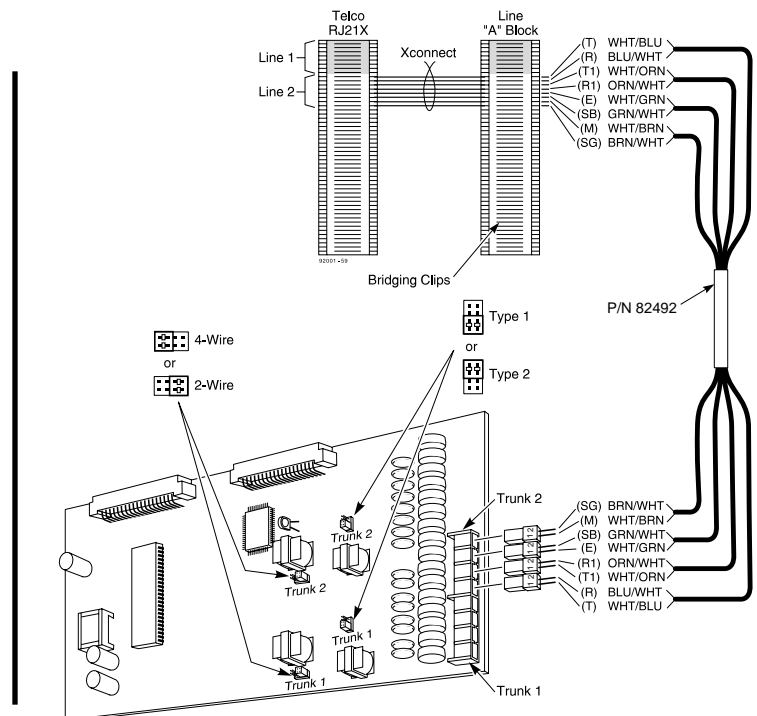
The Analog Trunk PCB has DDK connectors for four loop start CO trunks and a power failure telephone.

Refer to Part 4: Installing Optional Equipment for instructions on connecting a power failure telephone.

Analog Trunk (ATRU) PCB
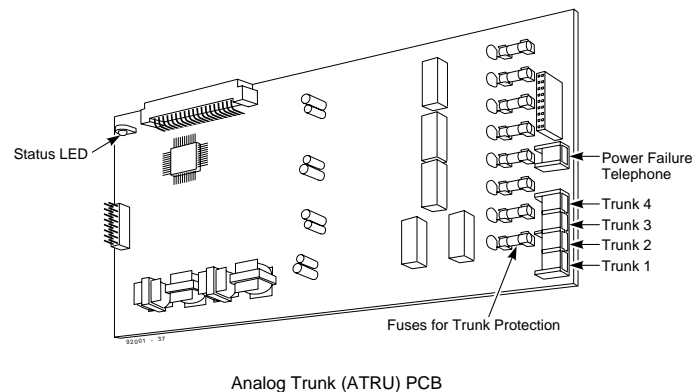
Figure 3-9 ANALOG TRUNK CONNECTIONS

1. Following the conventional color code, insert the DDK connectors into the PCB. For example, the first ATRU in the system would have these connections:

Trunk	DDK Connector Pair
1	WHT-BLU / BLU-WHT
2	WHT-ORN / ORN-WHT
3	WHT-GRN / GRN-WHT
4	WHT-BRN / BRN WHT

Write down the connections for each ATRU PCB in Figure 3-4. Make additional copies of Figure 3-4 as required.

2. For each trunk, run one pair of cross-connect wire between the pins on the cross-connect block and the CPE (customer side) of the telco's RJ21X (Figure 3-10 on the following page).

3. Install bridging clips as required.

**3. Installing
Extensions and Trunks**

CONNECTING TRUNKS

Analog Trunk (ATRU) PCB Connections (Cont'd)

4. After completing step 3, you should be able to place and answer calls over the connected trunk.

5. Record your entries on Figure 3-4.

One-Pair
Cross Connect

"A"
Block

Telco
RJ21X

25-Pair Cable
to Central Office

25-Pair DDK
Installation Cable

Figure 3-10 CONNECTING ANALOG TRUNKS

3-10

CONNECTING TRUNKS

Tie Line Trunk (2EMTU) PCB Connections (Figure 3-11)

The Tie Line PCB has DDK connector for two 2-wire (Type 1) (4-conductor), two 2-wire Type 2 (6 conductor), four 4-wire (4 conductor) tie line trunks.

1. Following the conventional color code, insert the DDK connectors into the PCB. For example, the first 2EMTU PCB in the system would have these connections:

Trunk	DDK Connector Pair
1	WHT-BLU / BLU-WHT / WHT-ORN / ORN-WHT
2	WHT-GRN / GRN-WHT / WHT-BRN / BRN WHT

Write down the connections for each 2EMTU PCB in Figure 3-4. Make additional copies of Figure 3-4 as required.

2. For each trunk, run cross-connect wires between the pins on the cross-connect block and the CPE (customer side) of the telco's RJ21X (Figure 3-11).

3. Install bridging clips as required.

Figure 3-11 ANALOG TRUNK CONNECTIONS   3-11

CONNECTING TRUNKS

DID Trunk (2DIDU) PCB Connections (Figure 3-12)

The DID PCB has DDK connector for two Direct Inward Dial
(DID) trunk circuits.

1. Following the conventional color code, insert the DDK
   connectors into CO1 and CO2 on the PCB. For example,
   the first 2DIDU PCB in the system would have these
   connections:

Trunk	DDK Connector Pair
1	WHT-BLU (tip 1) / BLU-WHT (ring 1)
2	WHT-ORN (tip 2) / ORN-WHT (ring 2)

   *Write down the connections for each 2DIDU PCB in Figure
   3-4. Make additional copies of Figure 3-4 as required.*

2. For each trunk, run one pair of cross-connect wires between
   the pins on the cross-connect block and the CPE (customer
   side) of the telco's RJ21X (Figure 3-12).

3. Install bridging clips as required.
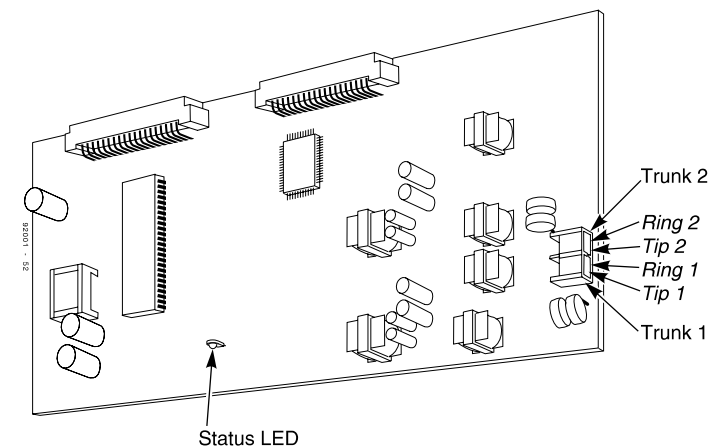
Figure 3-12 DID TRUNK CONNECTIONS

Continued on next page . . .

CONNECTING TRUNKS

One-Pair
Cross Connect

92925 - 46

"A"
Block

Telco
RJ21X

25-Pair Cable
to Central Office

25-Pair DDK
Installation Cable
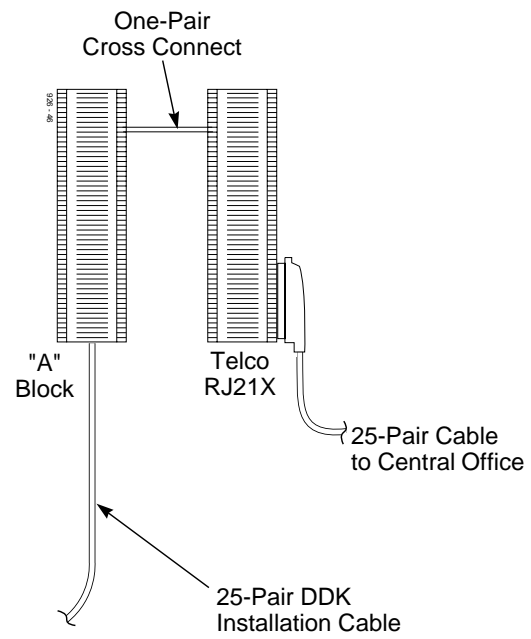
Figure 3-13 DID TRUNK CONNECTIONS

3-13

Section 4, INSTALLING OPTIONAL EQUIPMENT

**4. Optional
Equipment**

ALARM AND FAX SENSORS

Using External Alarm and Fax Sensors

The 4PGDU PCB provides four alarm/fax circuits which you can program to detect a make or break closure from an alarm, fax machine or modem.

When a 4PGDU circuit is used for alarm . . .

An alarm detection causes the system to send a signal to stations programmed to receive the alarms. The alarm signal can also be sent to external paging speakers.

When a 4PGDU is used for fax sharing . . .

Fax sharing allows system users to share a line also used by a fax machine or modem. When a fax machine or modem is using the line, the system detects the line in use, "busies" the line and sends "line busy" status to all stations with a line appearance. This prevents a station from accessing the line while in use by the modem or fax.

Note:

● The PGDU alarm/fax features require a 10-30 VDC power supply installed in series with the alarm/fax circuit.

● The sensors are polarity sensitive and require the tip and ring be connected properly. Refer to Figure 4-2.

ALARM AND FAX SENSORS

Installing an External Alarm or Fax Sensor
Circuit (Figure 4-1)

CAUTION

Be sure the requirements of the fax machine and alarm system sensors do not exceed the system specifications.

Maximum Initial Contact Resistance: 100 mohm

---

1. Locate an available DDK connector in a trunk (A) block or station (B) block.

   Local codes may prevent you from using a DDK connector on the A block for optional equipment.

2. For the DDK connector chosen, cross-connect the associated wire pair from the A or B block to the cross-connect block.

3. Connect two leads from the alarm system or fax machine sensor to the associated terminals on the cross-connect block.

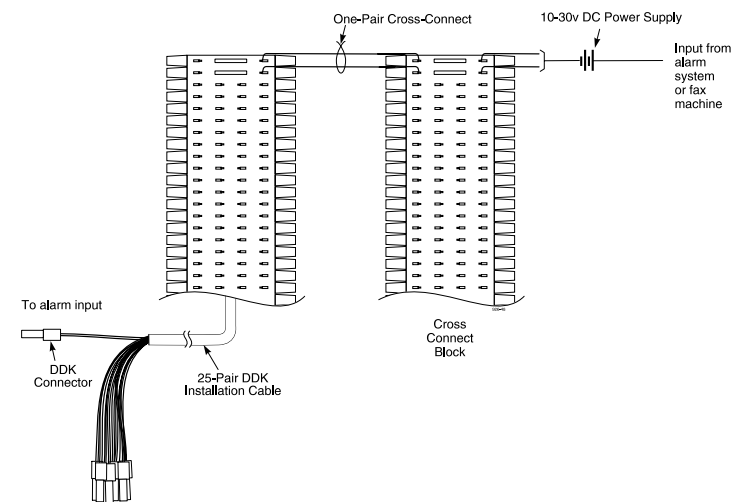4. Plug the DDK connector into the Alarm (1-4) connector on the PGDU PCB (Figure 4-2).

Figure 4-1 CONNECTING AN ALARM OR FAX SENSOR

ALARM AND FAX SENSORS

Installing an External Alarm or Fax Sensor Circuit (Cont'd)

5. Write down your connection on Figure 3-4 (page 3-4).

6. **To program fax sensors .** . .
   With the default settings, fax sensors are disabled.
   0304 - PGDU PCB Alarm/Fax Sensor Setup
   Program the sensor for fax (type 2) and associate it with the trunk.

   Refer to *Fax Machine Compatibility* in the Software Manual for additional details

   To program alarm contacts . . .
   With the default settings, PGDU sensors are alarm sensors set for normally open operation using alarm ring tone 1. Alarms do not alert extensions.
   1010 - External Alarm Extensions
   Determine which alarms should alert which extensions. For each sensor, enter 1 to ring extension or 0 to not ring extension.

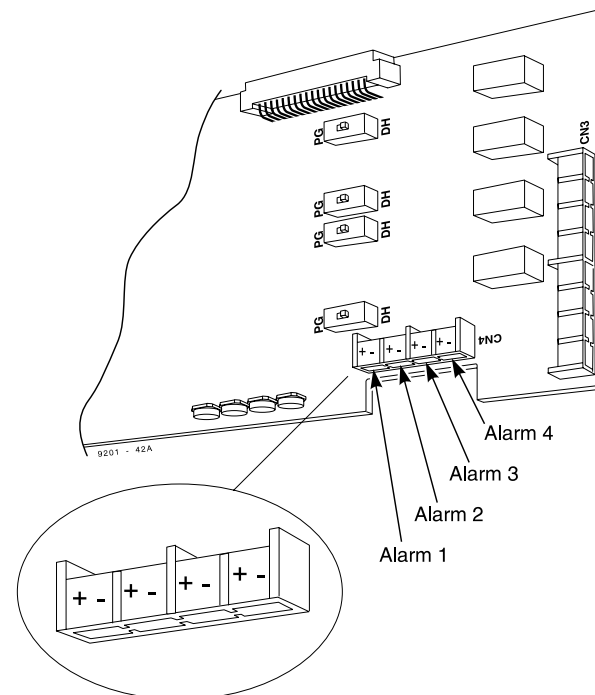   Refer to *External Alarm Sensors* in the Software Manual for additional details.

Figure 4-2 CONNECTING TO THE PGDU PCB

4-5

EXTERNAL PAGING AND PAGE RELAYS

Using External Paging

Each PGDU PCB has four External Paging audio outputs and four associated control relays. You connect the audio outputs to audio inputs on customer provided paging systems. In some paging systems, you can use the control relays to automatically turn the amplifiers on and off. The control relays are normally open and close whenever a user calls the External Paging zone.

Notes: ● The 3-ACI Analog Communications Interface can also provide External Paging. Refer to the page 4-27 for more.

● A PGDU circuit used for External Paging cannot also be used for a Door Box.

Installing External Paging (Figure 4-3)

CAUTION
Be sure the audio input requirements of the paging equipment are compatible with the audio output specifications of the system.

    Output Impedance: 600 Ohm

    Output Level: Nominal 250 mV (-10 dBm)
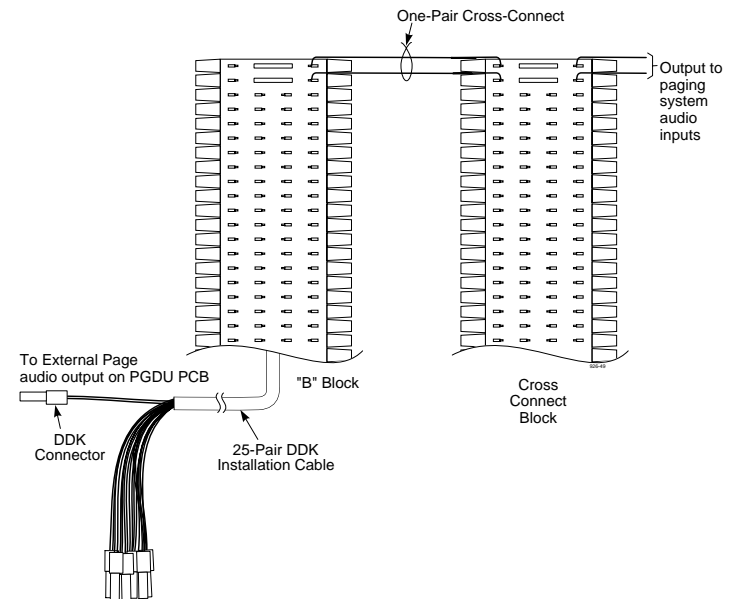
    Maximum Output: 400 mV RMS

Figure 4-3 CONNECTING EXTERNAL PAGING

EXTERNAL PAGING AND PAGE RELAYS

Installing External Paging (Cont'd)

1. Locate an available DDK connector in a trunk (A) block or station (B) block.

   Local codes may prevent you from using a DDK connector on the A block for optional equipment.

2. For the DDK connector chosen, cross-connect the associated wire pair from the A or B block to the cross-connect block.

3. Connect two leads from the paging system audio inputs to the associated terminals on the cross-connect block.

4. Plug the DDK connector into the External Page (1-4) connector in the PGDU PCB (Figure 4-4).

5. Install bridging clips as required.

6. Make sure the switch for the paging circuit is set to PG (not DH).

7. Write down your connection on Figure 3-4.

Mode Switches
for each circuit

Control Relay 4
Door Box 4 - External Page 4
Control Relay 3
Door Box 3 - External Page 3
Control Relay 2
Door Box 2 - External Page 2
Control Relay 1
Door Box 1 - External Page 1

VR4 VR3 VR2 VR1

Door Box / External Page
Volume Controls

Page/Door Box (PGDU) PCB

Figure 4-4 CONNECTING TO THE PGDU

4-7

4. Optional Equipment
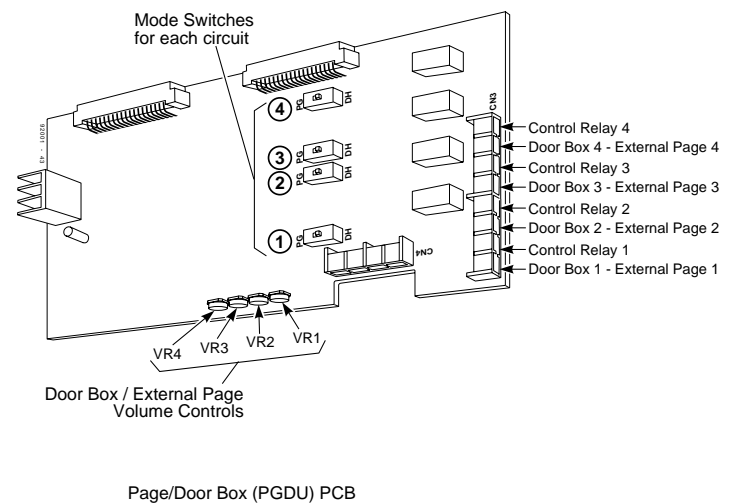
EXTERNAL PAGING AND PAGE RELAYS

Installing External Paging (Cont'd)

8. **To program External Paging .** . .
   With the default settings,
   External Paging is enabled at all extensions. The External
   Paging zone number is the same as the circuit number. For
   example, the lowest numbered paging circuit you set up is
   external zone 1.

   Refer to *Paging, External* in the Software Manual for addi-
   tional details.

9. After programming External Paging, make a test page.

   > *Use VR1-VR4 to adjust the volume of External Paging.
   > (For example, VR1 corresponds to output 1).*

EXTERNAL PAGING AND PAGE RELAYS

Installing External Paging Control Relays (Figure 4-5)

CAUTION
Be sure the control circuit requirements of the paging equipment are compatible with the control relay output specifications of the system.

Contact Configuration: Normally open
Maximum Load: 60 mA @ 30 VDC
                  10 mA @ 90 VDC
Maximum Initial Contact Resistance: 50 mOhms

---

1. Locate an available DDK connector in a trunk (A) block or station (B) block.

   Local codes may prevent you from using a DDK connector on the A block for optional equipment.

2. For the DDK connector chosen, cross-connect the associated wire pair from the A or B block to the cross-connect block.
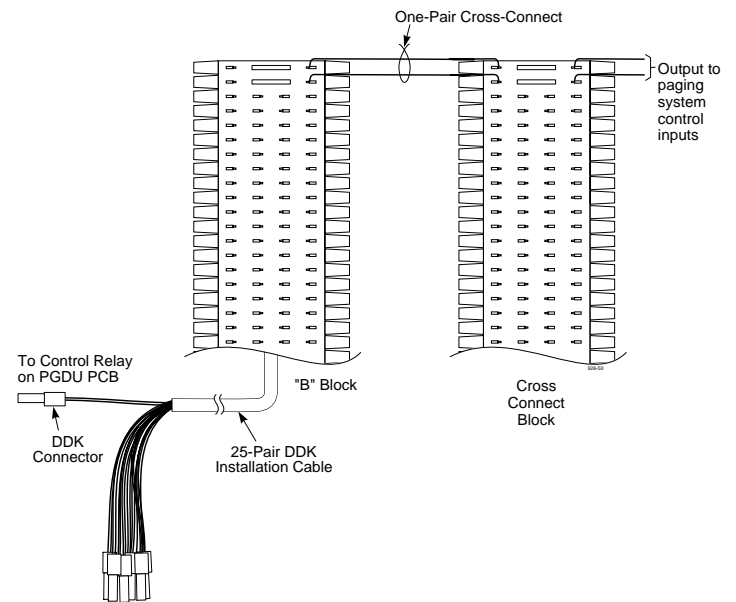

Figure 4-5 CONNECTING CONTROL RELAYS

4-9

4. Optional Equipment

EXTERNAL PAGING AND PAGE RELAYS

Installing External Paging Control Relays (Cont'd)

3. Connect two leads from the paging system control inputs to the associated terminals on the cross-connect block.

4. Plug the DDK connector into the Control Relay (1-4) connector in the PGDU PCB (Figure 4-6).

5. Install bridging clips as required.

   There is no programming required.
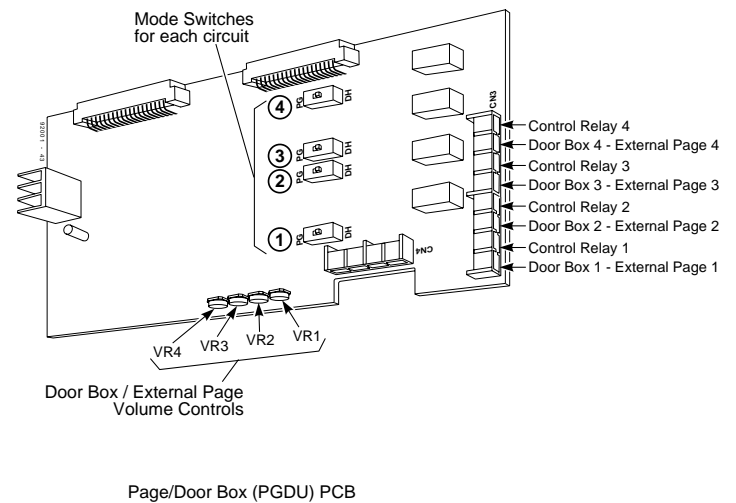
6. Write down your connection on Figure 3-4.

Mode Switches for each circuit

Control Relay 4
Door Box 4 - External Page 4
Control Relay 3
Door Box 3 - External Page 3
Control Relay 2
Door Box 2 - External Page 2
Control Relay 1
Door Box 1 - External Page 1

VR4 VR3 VR2 VR1

Door Box / External Page Volume Controls

Page/Door Box (PGDU) PCB

Figure 4-6 CONNECTING TO THE PGDU

DOOR BOX

Using the Door Box

Each PGDU PCB audio output can optionally support an analog Door Box. In addition, you can connect each circuit's control relay to an electric door strike. This allows an extension user to remotely activate the door strike while talking to a visitor at the Door Box. The control relays are normally open. The system can have up to eight Door Boxes and one Chime Tone.

Note: A PGDU circuit used for an analog Door Box cannot also be used for External Paging.

Installing a Door Box (Figure 4-7)

1. Locate an available DDK connector in a trunk (A) block or station (B) block.

   Local codes may prevent you from using a DDK connector on the A block for optional equipment.

2. For the DDK connector chosen, cross-connect the associated wire pair from the A or B block to the cross-connect block.

3. Connect leads from lugs 1 and 2 on the Door Box to the cross-connect block. Be sure to maintain the proper polarity.
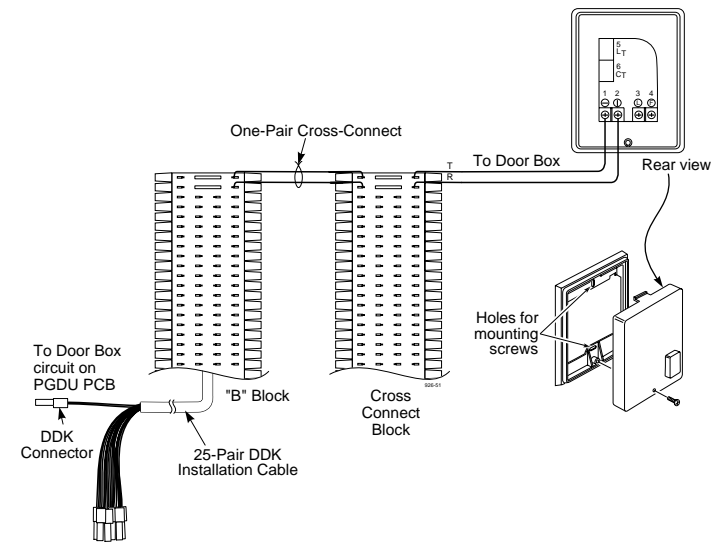

Figure 4-7 CONNECTING A DOOR BOX

4-11

DOOR BOX

Installing a Door Box (Cont'd)

4. Plug the DDK connector into the Door Box (1-4) connector on the PGDU PCB (Figure 4-8).

5. Install bridging clips as required.

6. Make sure the switch for the associated Door Box is set to DH (*not* PG).

7. Write down your connection on Figure 3-4.

8. **To program the Door Box . . .**
   With the default settings,
   The Door Box number is the same as the circuit number (e.g., the lowest numbered circuit you connect is Door Box 1.)
   1502 - Door Box Ring Assignments
   Determine which Door Boxes (1-8) should ring which extensions (0 = no ring, 1 = ring).
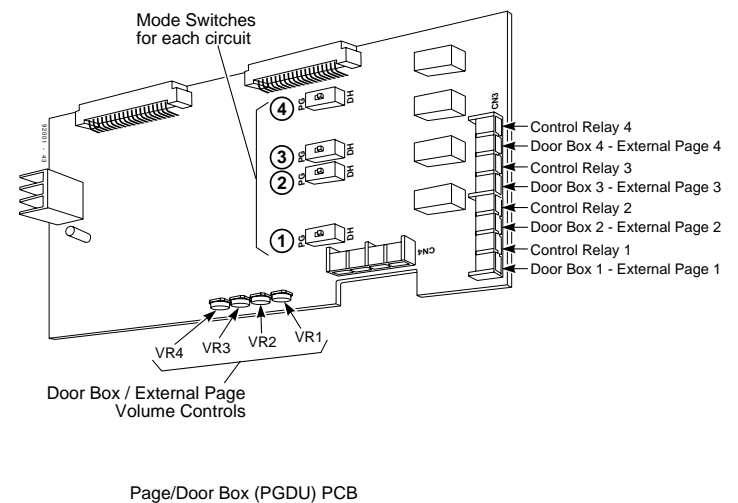   **1503 - Door Box Chime Patterns**
   Set the chime pattern (1) for each Door Box.
   Refer to *Door Box* in the Software Manual for more details.

9. After programming the Door Box, make a test call.

   Use VR1-VR4 to adjust the volume of the Door Box (For example, VR1 corresponds to Door Box 1).

Page/Door Box (PGDU) PCB

Figure 4-8 CONNECTING TO THE PGDU

DOOR BOX

Installing Door Strike Control Relays (Figure 4-9)

CAUTION

Be sure the requirements of the door strike are compatible with the control relay output specifications of the system.

    Contact Configuration: Normally open
    Maximum Load: 60 mA @ 30 VDC
                    10 mA @ 90 VDC
    Maximum Initial Contact Resistance: 50 mOhms

---

1. Locate an available DDK connector in a trunk (A) block or station (B) block.

    Local codes may prevent you from using a DDK connector on the A block for optional equipment.

2. For the DDK connector chosen, cross-connect the associated wire pair from the A or B block to the cross-connect block.
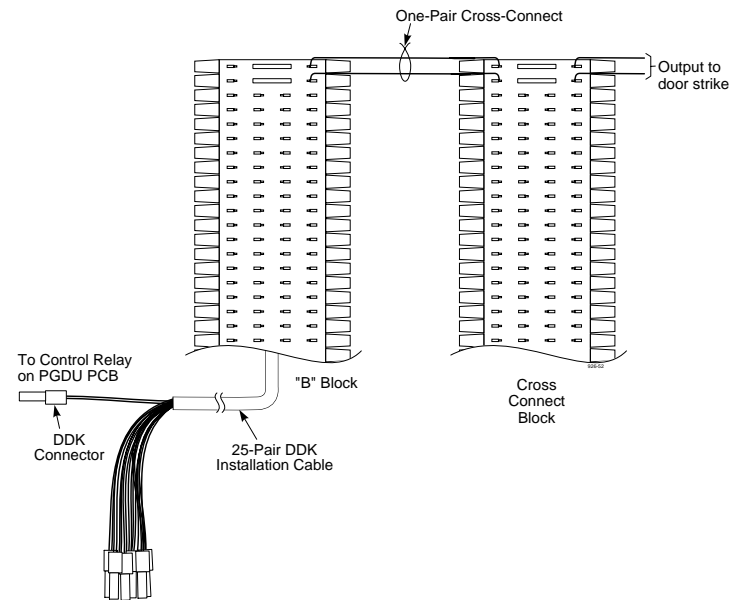

Figure 4-9 CONNECTING TO THE DOOR STRIKE

4. Optional Equipment

DOOR BOX

Installing Door Strike Control Relays (Cont'd)

3. Connect two leads from the door strike to the associated terminals on the cross-connect block.

   If the door strike is a high current device, you may have to install an auxiliary relay that powers the door strike relay.

4. Plug the DDK connector into the Control Relay (1-4) connector on the PGDU PCB (Figure 4-10).

5. Install bridging clips as required.

   The Door Strike control relays do not require any programming.
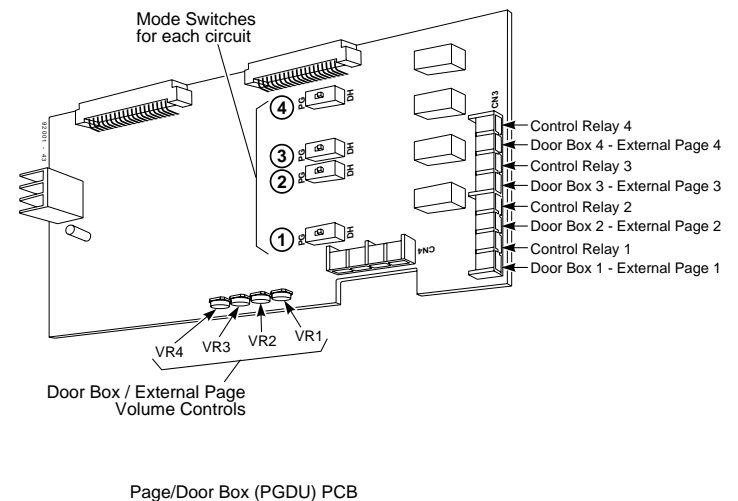
6. Write down your connection on Figure 3-4.

Page/Door Box (PGDU) PCB

Figure 4-10 CONNECTING TO THE PGDU

MUSIC SOURCES

Music on Hold and Background Music

Music on Hold (MOH) provides music to callers on Hold and calls parked in orbit. The MOH music source can be internal (synthesized), from an ACI port (see page 4-28) or via a connector on the CPRU (see below).

On the 28i system, *Background Music* and *Music on Hold* use the same music source. As BGM requires an external music source, MOH must also use the external music source. MOH can only use the internal synthesized music if BGM is not required.

Installing a Music Source on the CPRU PCB
(Figure 4-11)

CAUTION
Be sure the music source is compatible with the MOH and BGM input specifications on the CPRU PCB.

    Input Impedance: 600 Ohm
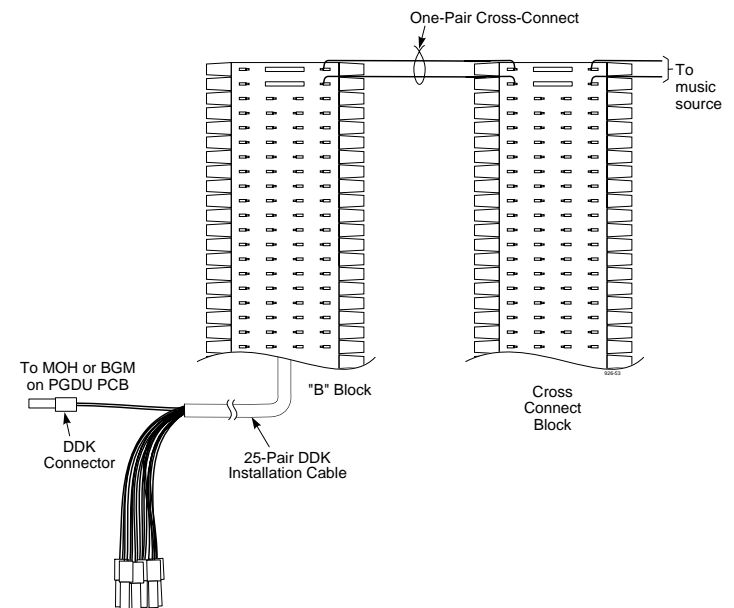   Input Level: Nominal 250 mV (-10 dBm)
    Maximum Input: 1V RMS

Figure 4-11 CONNECTING MUSIC SOURCES

4. Optional Equipment

MUSIC SOURCES

Installing a Music Source on the CPRU PCB
(Cont'd)

1. Locate an available DDK connector in a trunk (A) block or station (B) block.

    Local codes may prevent you from using a DDK connector on the A block for optional equipment.

2. For the DDK connector chosen, cross-connect the associated wire pair from the A or B block to the cross-connect block.

3. Connect two leads from the customer-provided music source to the associated terminals on the cross-connect block.

4. **For Music on Hold .** . .
    Plug the DDK connector into the MOH input on the CPRU PCB (Figure 4-12).
    With the 124i system, for Background Music . . .
    Plug the DDK connector into the BGM input on the CPRU PCB (Figure 4-12).

5. Install bridging clips as required.

6. For Music on Hold only, strap the jumper on the CPRU PCB to enable external MOH.

7. Write down your connections on Figure 3-4.

8. **To program Music on Hold .** . .
    With the default settings,
    Music on Hold uses the internal Minuet selection.
    0302 - Item 1: Music on Hold Tone
    Enter 0 to enable external MOH.
    0914 - Setting the Music on Hold Source
    For each trunk, enter 254 to enable the CPRU MOH source.

Refer to *Music on Hold* in the Software Manual for additional details.

To program Background Music on the 124i . . .
No programming to enable Background Music is required.
Refer to *Background Music* in the Software Manual for additional details.

To program Background Music on the 124i . . .

a. Enter programming mode using the password: 6587846 (This password must also be used if programming the system with the PC Program.)

MUSIC SOURCES

Installing a Music Source on the CPRU PCB
(Cont'd)

    b. Enter **Program 0108 - Service Tone Setup, Item 18: BGM**. Change the TIMESLOT to 28 (the default setting is 29).

    c. Set the MOH pin on the CPRU to EXTERNAL.

    d. Connect an external music source to the External Music on Hold Input on the CPRU.

      Background Music sends music from a customer-provided music source (via a connector on the CPRU) to keyset speakers.

      Note: ACI and CPRU MOH installations require a customer-provided music source.

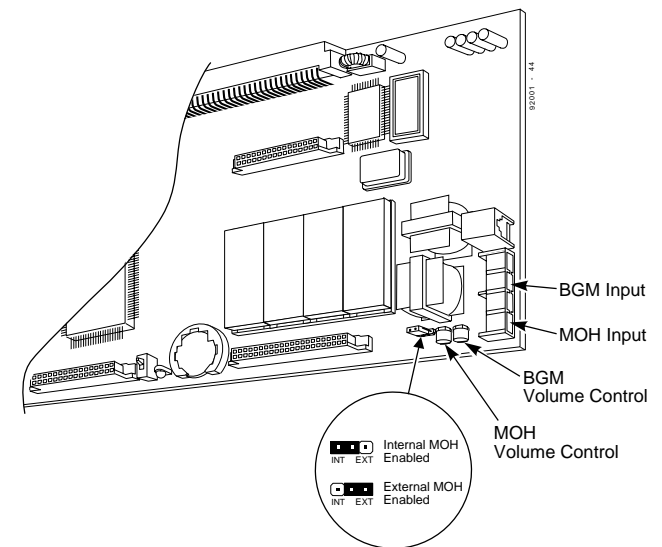9. Use the MOH and BGM volume controls on the CPRU PCB to adjust the music volume, if required.

BGM Input

MOH Input

BGM
Volume Control

MOH
Volume Control

| | Internal MOH Enabled |
INT EXT

| | External MOH Enabled |
INT EXT

Figure 4-12 CONNECTING TO THE CPRU

4-17

**4. Optional
Equipment**

POWER FAILURE TELEPHONES

Power Failure Cut-Through (Figure 4-13)

When system AC power fails, the ATRU PCB automatically cuts through trunk 1 to the Power Failure Telephone connection.

1. Locate an available DDK connector in a trunk (A) block or station (B) block.

   Local codes may prevent you from using a DDK connector on the A block for optional equipment.

2. For the DDK connector chosen, cross-connect the associated wire pair from the A or B block to the cross-connect block.

3. Install a modular jack for the Power Failure Telephone within six feet of the telephone's location.

4. Run one-pair of 24 AWG station cable from the cross-connect block to the Power Failure Telephone modular jack.

5. Terminate the station cable WHT/BLU - BLU/WHT leads to the RED and GRN lugs in the modular jack.
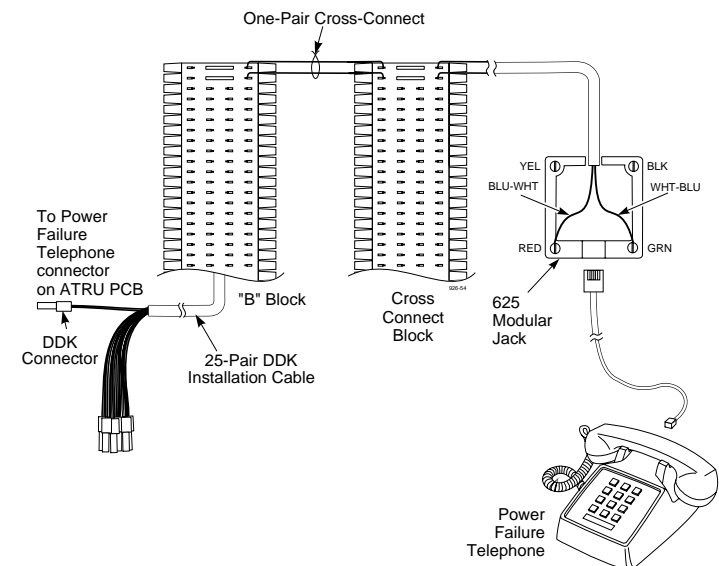
6. Install bridging clips as required.

Figure 4-13 CONNECTING A POWER FAILURE TELEPHONE

4-18

POWER FAILURE TELEPHONES

Power Failure Cut-Through (Cont'd)

7. Plug a line cord into the Power Failure Telephone and the phone's modular jack.

    No programming is required to enable the Power Failure Telephone.

8. Plug the DDK connector chosen in step 1 into the power failure jack on the ATRU PCB (Figure 4-14).

To test the Power Failure Telephone:

1. Make sure the Mode Switch on the CPRU PCB is set to Hot.

    This ensures that your programming and configuration is retained when you power down the system.

2. Power down the system.

3. At the Power Failure Telephone, lift the handset and place a test call.

    The call will go out on the first trunk in the ATRU PCB to which the telephone is connected.

Power Failure Telephone
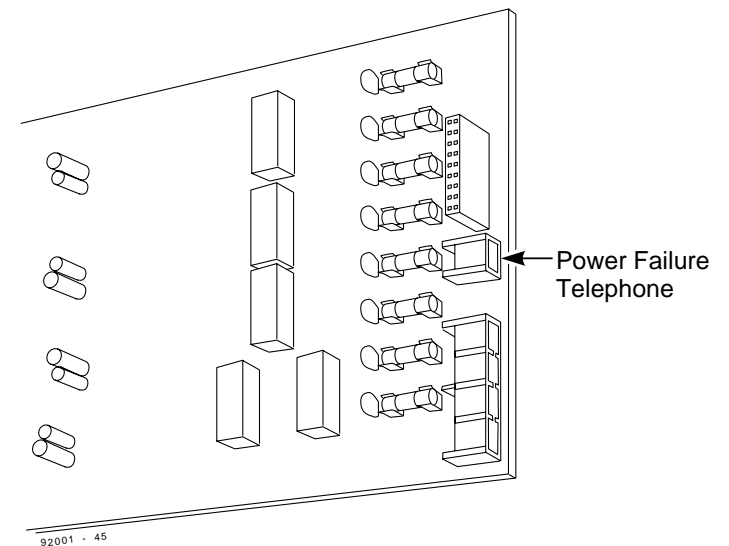
92001 - 45

Figure 4-14 CONNECTING TO THE ATRU PCB

4-19

DSS CONSOLE

Using a DSS Console

The DSS Console gives a keyset user a Busy Lamp Field (BLF)
and one-button access to extensions, trunks and system features.
Keep the following in mind when installing DSS Consoles:

● <u>**92555x DSS Consoles: ***</u>
You can only connect DSS Consoles to Super Display, 32-,
or 34-Button Display telephones.
<u>**i-Series DSS Console: ***</u>
You can only connect DSS Consoles to Super Display, 32-,
34-, or 28-Button telephones.

 *** Note: The phone styles and DSS consoles are inter-
changeable following the above restrictions.**

● A DSS Console does not require a separate station port – it
connects directly to the keyset.

● Each extension can have up to two DSS Consoles. The sec-
ond DSS Console daisy chains to the first. However, the sec-
ond DSS Console requires its own power supply.

● Four extensions can have up to two DSS Consoles, for a sys-
tem maximum of 8.

● If an i-Series phone has a DSS Console and a DCI-L1 (analog)
module installed, the DSS Console must have a separate AC/DC
adapter, even if it is the only DSS connected to the phone.

Installing a DSS Console (Figure 4-15, 4-16)

1. <u>**92555x DSS Consoles:**</u>
Turn the telephone upside down and remove the plastic filler
plug from the DSS modular connector marked LINE.
<u>**i-Series DSS Console:**</u>
Turn the telephone upside down. With a flat-head screwdriv-
er, *carefully* pry the plastic knockout piece *UP* from the
DSS module connector marked LINE. *Do Not push this
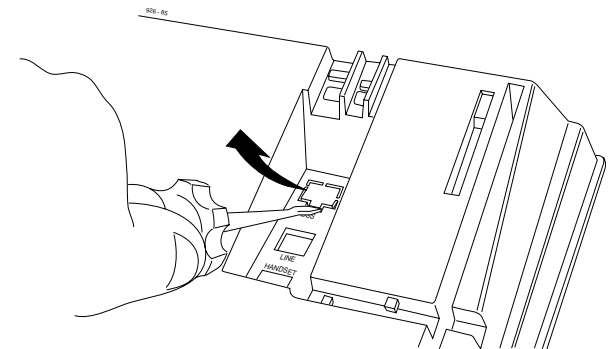piece down into the phone as it can cause damage to the
DSS connector.*

Figure 4-15 REMOVING i-SERIES KNOCKOUT

4-20

DSS CONSOLE

Installing a DSS Console (Cont'd)

2. Plug the DSS Console's 8-pin modular line cord into the telephone's DSS connector.

3. Plug the other end of the 8-pin line cord into the DSS Console's LINE IN connector.

   If daisy-chaining two consoles, connect the line cord from LINE OUT in the first DSS in the chain to LINE IN in the second DSS in the chain. Repeat this procedure for the third and fourth consoles.

4. **To program a DSS Console** . . .
   With the default settings there are no DSS Consoles assigned.
   1101 - DSS Console Extension Assignment
   Designate the extensions that have DSS Consoles connected to them.
   1103 - DSS Console Key Assignment
   Customize the functions of the DSS Console keys.

   For additional information, refer to Direct Station Selection (DSS) Console in the Software Manual.
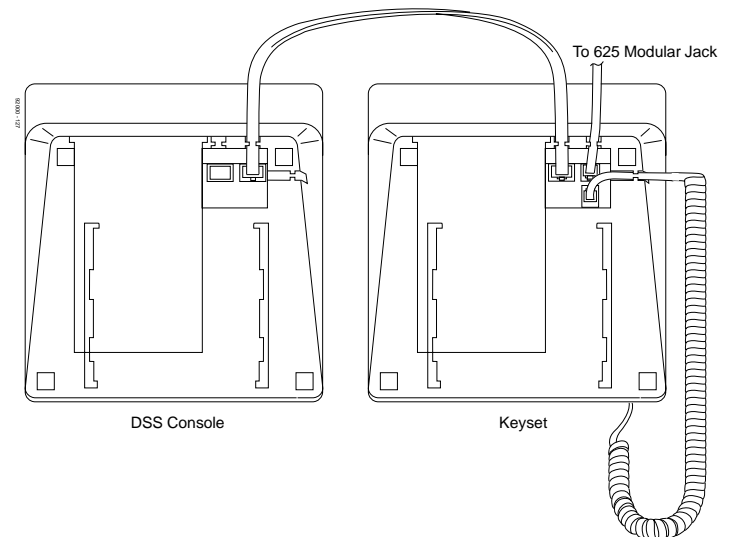
To 625 Modular Jack

DSS Console   Keyset

Figure 4-16 INSTALLING A DSS CONSOLE

4-21

2-OPX MODULE

Using the 2-OPX Module

The 2-OPX Module provides two 2500 type analog circuits for connection to on-premise 2500 type single line devices (i.e., telephones, fax machines, modems, etc.) and to telco OL13B/C OPX circuits. *The 2-OPX Module must be connected to an odd port.* Although it uses a single digital extension circuit for power and signaling, the 2-OPX Module disables the next consecutive (even) port.

Installing the 2-OPX Module (Figure 4-17)

1. Locate an available DDK connector connected to an odd port in a trunk (A) block or station (B) block.

   Local codes may prevent you from using a DDK connector on the A block for optional equipment.

2. For the DDK connector chosen, cross-connect the associated wire pair from the A or B block to the cross-connect block.

3. Install a modular jack for the 2 OPX Module within six feet of the module's location.

4. Run one-pair 24 AWG station cable from the cross-connect block to the modular jack.

5. Terminate the station cable WHT/BLU - BLU/WHT leads to the RED and GRN lugs in the modular jack.
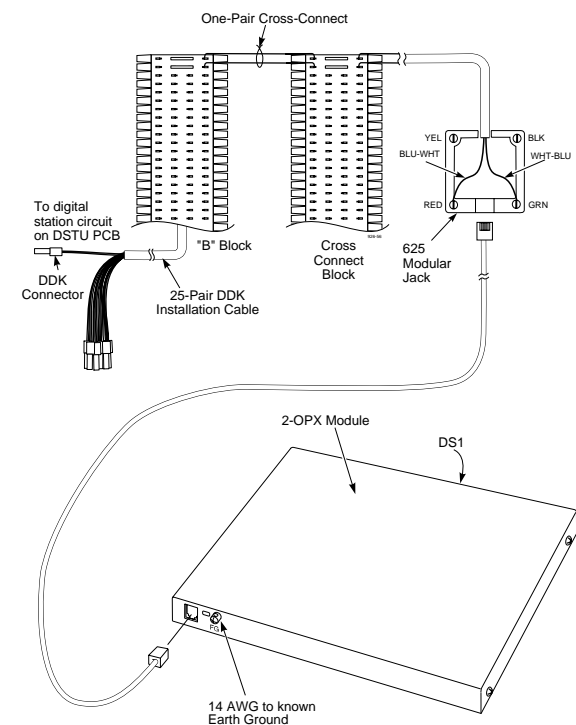

Figure 4-17 CONNECTING THE 2-OPX MODULE   4-22

2-OPX MODULE

Installing the 2-OPX Module (Cont'd)

6. Install bridging clips as required.

7. Ground the 2-OPX Module by connecting a 14 AWG ground wire from the FG lug to a known earth ground.

8. Plug a line cord into the 2-OPX unit and the 2-OPX's modular jack.

    The DS1 Sync Power LED on the 2-OPX Module lights steadily.

9. **To program the 2-OPX Module . . .**
    With the default settings, no 2-OPX Modules are programmed.
    0005 - Extension Circuit Type
    (This program is not required for 28i/124i - the system auto id's the circuit type)

    Program all 2-OPX Modules with circuit type 9. Enter 2 for Order Number.

    Refer to *Single Line Telephones* in the Software Manual for additional details.

4-23

VAU AND EXPANSION MODULES

Using the VAU Module

The VAU Module gives the system voice recording and playback capability for Personal Greeting, Automated Attendant Greetings, Park and Page, Voice Prompting Messages, the 900 Preamble, Time/Date/Extension Number Check and the General Message. The Main VAU has three channels, 128 seconds of VAU Message storage and 256 seconds of Personal Greeting storage. By adding the Plug-in Expansion Board, the VAU capacity increases to six channels and 512 seconds of Personal Greeting storage capacity.

Notes:
- The VAU Module has a rechargeable NICAD battery to backup system messages (excluding Personal Greetings). Once the battery is fully charged, it will retain the messages for up to 14 days.
- The VAU Module must be connected to an odd port (e.g., 303). The VAU uses a single digital extension circuit for power and signaling and will reserve the next adjacent (even) port for the expansion module (if installed). If no expansion module is used, the adjacent port is disabled or any other use.

Installing the VAU Module (Figure 4-18)

1. Locate two available DDK connectors in a trunk (A) block or station (B) block.
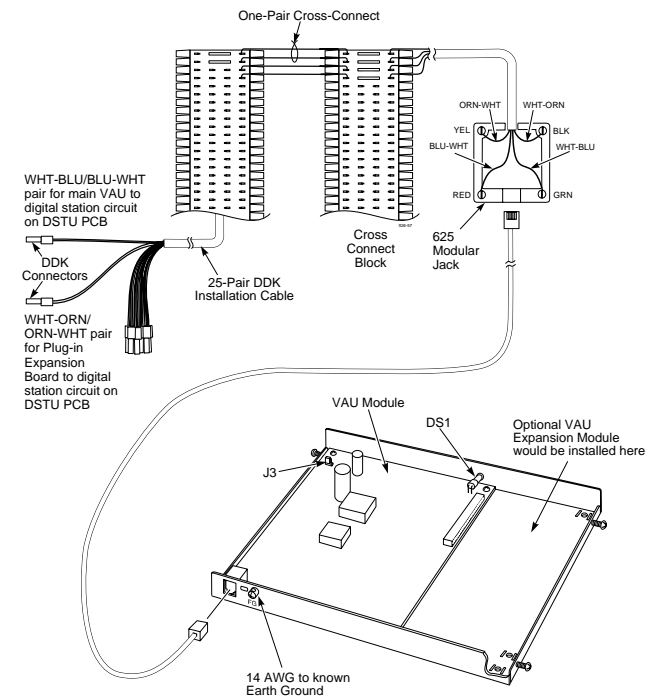
Figure 4-18 CONNECTING THE VAU MODULE

4-24

VAU AND EXPANSION MODULES

Installing the VAU Module (Cont'd)

One connector will be for the Main VAU Module – the other will be for the Plug-in Expansion Board.

Local codes may prevent you from using a DDK connector on the A block for optional equipment.

2. For the DDK connectors chosen, cross-connect the associated wire pairs from the A or B block to the cross-connect block.

3. Install a modular jack for the VAU Module within six feet of the module's location.

4. Run two-pair 24 AWG station cable from the cross-connect block to the modular jack.

5. For the Main VAU, terminate the station cable WHT/BLU - BLU/WHT leads to the RED and GRN lugs in the modular jack.

6. For the Plug-in Expansion board, terminate the WHT/ORN - ORN/WHT leads to the BLK and YEL lugs in the same modular jack.

7. Install bridging clips as required.

8. Ground the VAU Module by connecting a 14 AWG ground wire from the FG lug to a known earth ground.

9. Plug a line cord into the VAU unit and the VAU's modular jack.

The DS1 LED on the VAU Module lights steadily.

10. **To program the VAU Module . . .**
With the default settings, no VAU Modules are programmed.
0005 - Extension Circuit Type
For the Main VAU port, enter circuit type 8 and use Order Number 1. For the Plug-in Expansion Board, enter circuit type 8 and use Order Number 2.
2201 - VAU Initialization
For a first time installation, use option 1 to initialize all VAU Messages and Personal Greetings. *You do not have to initialize when adding the Expansion PCB to a previously-installed Main Module.*

Refer to *Voice Announce Unit* in the Software Manual for additional details.

4-25

VAU AND EXPANSION MODULES

Installing the Plug-in Expansion Board (Figure 4-19)

CAUTION

Always unplug the VAU Module's line cord before installing the Plug-in Expansion Board.

1. Loosen the VAU Module's cover screws (4) and remove the cover.

2. Install a plastic screw mount (2) inside the VAU Module on the right above each cover screw.

3. Tilt and insert the VAU Plug-in Expansion Board's P1 connector into the VAU Module's J1 connector.

4. Install screws in the upper and lower screw mounts on the right side of the Expansion Board.

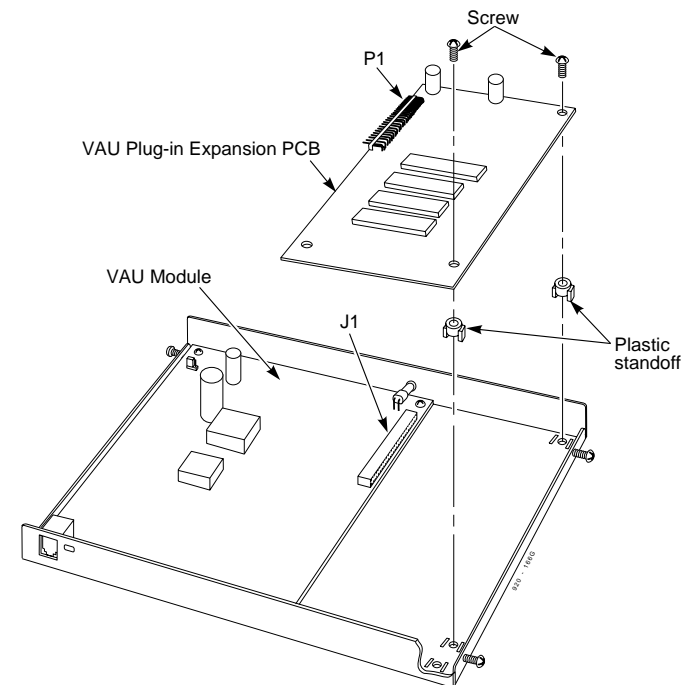5. Plug the modular line cord into the VAU Module and its associated modular jack.

Figure 4-19 INSTALLING THE PLUG-IN EXPANSION BOARD

4-26

3-ACI MODULE

Using the 3-ACI Module

The 3-ACI Analog Communications Interface (ACI) provides three analog ports (with associated relays) for Music on Hold, External Paging or auxiliary devices such as loud bells and tape recorders (Call Recording allows only incoming calls to be recorded). The 3-ACI uses a single digital extension circuit for power and signaling and provides 3 ACI software ports. You can have a maximum of two 3-ACI's in the system (which provides 6 ACI software ports).

Installing the 3-ACI Module (Figure 4-20)

1. Locate an available DDK connector in a trunk (A) block or station (B) block.

   Local codes may prevent you from using a DDK connector on the A block for optional equipment.

2. For the DDK connector chosen, cross-connect the associated wire pair from the A or B block to the cross-connect block.

3. Install a modular jack for the 3-ACI within six feet of the unit.

4. Run one-pair 24 AWG station cable from the cross-connect block to the modular jack.

5. Terminate the station cable WHT/BLU - BLU/WHT leads to the RED and GRN lugs in the modular jack.
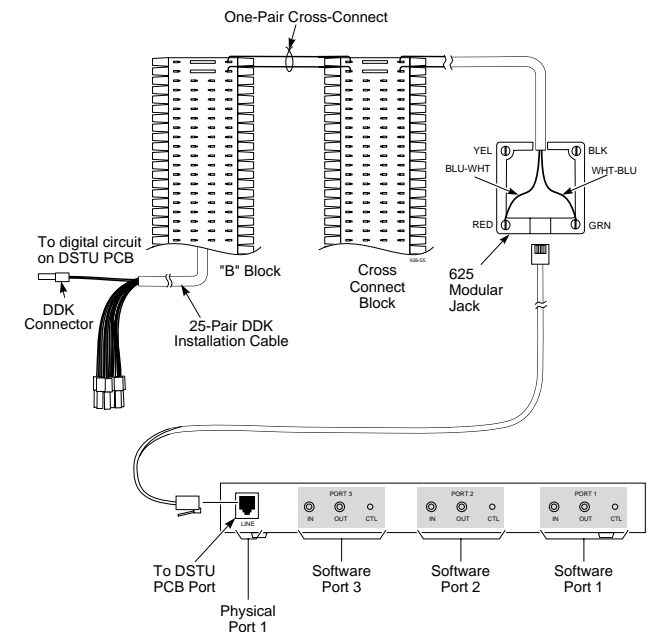

Figure 4-20 CONNECTING THE 3-ACI MODULE

4-27

4. Optional Equipment

3-ACI MODULE

Installing the 3-ACI Module (Cont'd)

6. Install bridging clips as required.

7. Plug a line cord into the 3-ACI and the 3-ACI's modular jack.

8. **To program the 3-ACI Module . . .**
   With the default settings, no 3-ACI Modules are programmed.
   0504 - ACI Extension Number
   To allow users to dial ACI ports directly, assign extension numbers to the ACI software ports (1-6). You should use extension numbers higher than 372.
   1301 - ACI Port Function
   Assign each ACI software port for input (1) or output (2). Use input (1) if the ACI is an MOH source. Use output (2) if the ACI is for External Paging/ringing control.

   Refer to *Analog Communications Interface* in the Software Manual for additional details.

Installing the 3-ACI Module for Music On Hold and External Paging (Figure 4-21)

The 3-ACI Module provides three RCA jacks to which you can connect customer-provided external Music On Hold sources and External Paging systems. Each RCA jack has an associated normally open dry relay contact. The contact automatically closes when a user makes an External Page through the ACI. You can use this contact to turn the paging system on and off. With no audio connected, you can optionally use the contact to control a customer-provided loud bell.

CAUTION
Be sure the connected devices are compatible with the 3-ACI specifications.
Audio/Music Input
   Input Impedance: 47 KOhm @ 1 KHz
Audio/Paging Output
   Output Impedance: 600 Ohms @ 1 KHz
   Maximum Output: +3 dBm
Relay Contacts
   Configuration: Normally open
   Maximum Contact Ratings: 30 VDC @ 60 mA
                                     90 VAC @ 10 mA
   Minimum Application Load: 1 VDC @ 1 mA

3-ACI MODULE

To connect a MOH source to a 3-ACI Module:

1. Plug the music source audio output into an available RCA jack on the 3-ACI.

2. **To program Music on Hold** . . .
   With the default settings,
   Music on Hold uses the internal Minuet selection.
   0302 - Item 1: Music on Hold Tone
   Enter 0 to enable external MOH.
   0914 - Setting the Music on Hold Source
   For each trunk, enter the ACI port number (1-6) to enable the CPRU MOH source.

   Refer to *Music on Hold* in the Software Manual for additional details.

3. Place a call into the system and put it on Hold to verify Music On Hold.

4. Adjust the volume at the MOH source, if necessary.

To connect to the 3-ACI Module relay contacts:

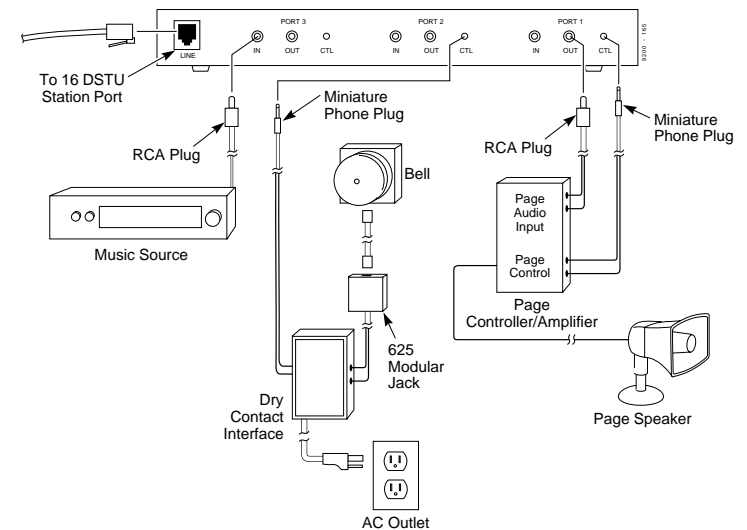1. Plug the paging system's audio output into an available RCA jack on the 3-ACI.

Figure 4-21 CONNECTING A 3-ACI FOR MUSIC ON HOLD

4-29

4. Optional Equipment

3-ACI MODULE

Installing the 3-ACI Module for Music On Hold and External Paging (Cont'd)

2. **To program the 3-ACI Module for External Paging . . .**
   With the default settings, no 3-ACI Modules are programmed.
   0504 - ACI Extension Number
   To allow users to dial ACI ports directly, assign extension numbers to the ACI software ports (1-6). You should use extension numbers higher than 372.
   1301 - ACI Port Function
   Assign each ACI software port for output (2).

   Refer to *Analog Communications Interface* in the Software Manual for additional details.

3. After programming External Paging, make a test page by dialing the ACI software port's extension number

   The associated relay automatically closes when you call the ACI port.

4. Adjust the volume at the paging system, if necessary.

To connect to the 3-ACI Module relay contacts:

1. Connect a dry contact sensor/power supply to the miniature phone jack on the back of the 3-ACI Module.

2. Connect a device to the power supply side of the relay sensor.

   No additional programming is required activate the 3-ACI contacts.

3. Test the relay contacts by calling the associated 3-ACI software port's extension number.

REJ RECORDING JACK

Using the REJ Recording Jack

Use the REJ Recording Jack to connect a telephone to an external tape recorder or speaker. There are two versions of the REJ recording jack. The REJ P/N 92265 can only be connected to a Super Display Telephone (P/N 92663 or 92283x), while P/N 80175 (for the i-Series phones) can be connected to 28- or 34-Button i-Series phones. The REJ output is a standard RCA jack which you can connect directly to an AUX level input on a recorder or page amplifier.
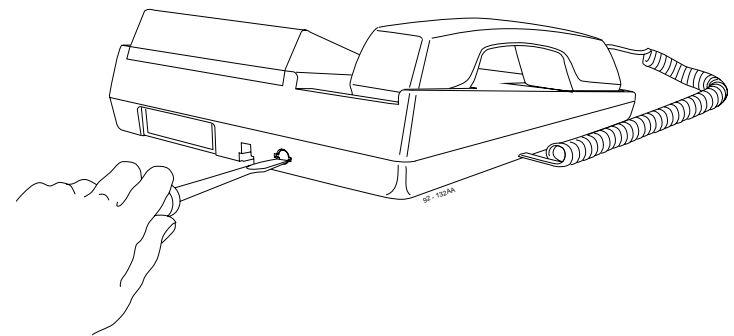
Installing the REJ (Figures 4-22 - 4-26)

CAUTION
Be sure the connected audio device provides a standard AUX level input.

The handset is ***always*** recording, even when the handset is idle and in the cradle. This may result in recording undesired conversations.

To connect the REJ Recording Jack:

1. Turn the telephone upside down and remove the four screws from each corner of the telephone set.

2. Lift the upper housing off of the telephone base.

3. On the side of the lower housing, use a blunt object to remove the plastic molding that covers the hole for the REJU connector.
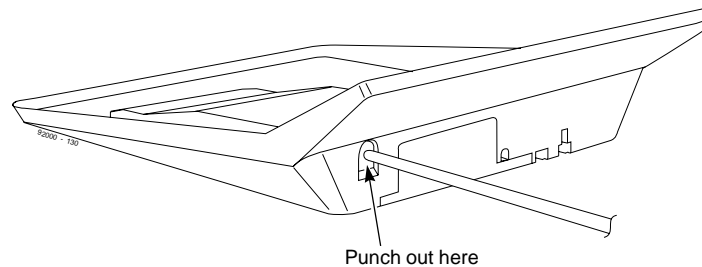

Figure 4-22 PUNCHING OUT FOR THE REJ (926xx SERIES and i-SERIES PHONES)

4-31

4. Optional Equipment

REJ RECORDING JACK

Installing the REJ (Cont'd)

Punch out here

**Figure 4-23 PUNCHING OUT FOR THE REJ
(PHONE SERIES 922xx)**

4. Install the REJ as shown with the components facing down. Refer to Figures 4-24, 4-25, and 4-26.

5. Use the screw supplied with the REJ to secure it to the lower telephone housing.

6. Insert the connector on the REJ's cable into the matching connector on the PCB in the telephone's upper housing.

    To ensure the proper polarity, the connector is keyed (The red wire is on top on the 926/922 phones and to the left (away from the display) on the i-Series phones.)

7. Reassemble the telephone and reinsert the four screws you removed in step 1.

8. Using a standard audio cable with an RCA plug, connect the recording device to the REJ.
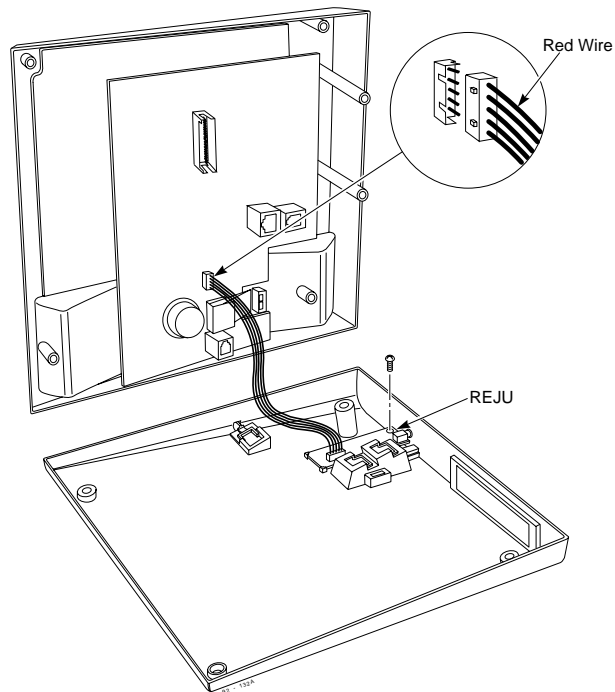
REJ RECORDING JACK

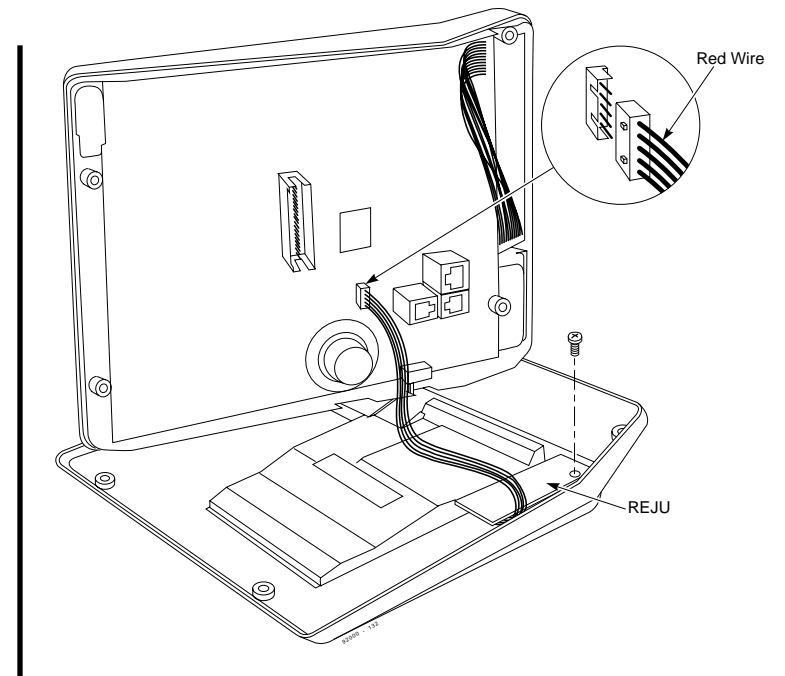**Figure 4-24 INSTALLING THE REJ (PHONE SERIES 926)**

Figure 4-25 INSTALLING THE REJ (PHONE SERIES 922xx)
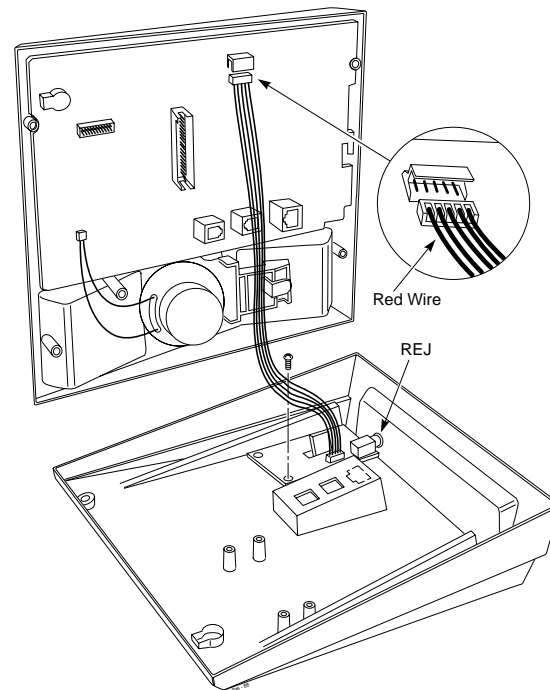
4. Optional Equipment

REJ RECORDING JACK

**Figure 4-26 INSTALLING THE REJ
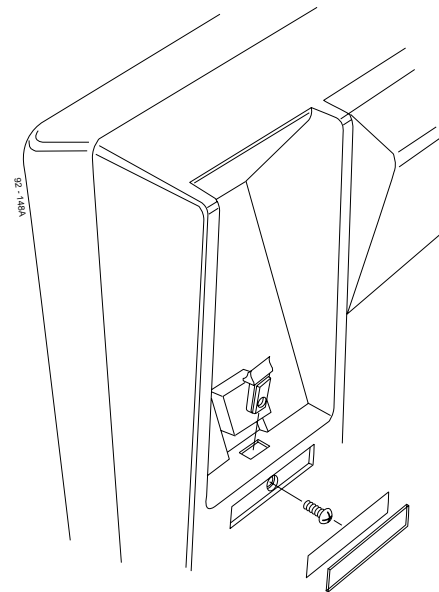(i-SERIES PHONES)**

Red Wire

REJ

WALL-MOUNT KIT

Using the Wall-Mount Kit

Any key telephone can be equipped with a wall-mount kit for attachment to a wall. The wall-mount kit includes a mounting bracket, wall-mount screws, washer, and handset hangers. Each i-Series phone has an integrated wall/desk bracket. Optionally, you may also be able to install the bracket on the phone so that the phone can be placed on the desk. This angles the phone to provide easier viewing of the keys and the display.

Note: The wall-mount kit currently does not accommodate installing on an AT&T wall plate.

Installing the Wall-Mount Handset Hanger For 926 Series Phones (Figure 4-27)

1. *Two different types of handset hangers may be included in your kit. To ensure that you are using the correct hanger, refer to Figure 4-27.* Insert the handset hanger in the slot provided beneath the telephone's hookswitch.

2. Remove the plastic insert beneath the hookswitch to expose the hanger screw hole.

3. Use the machine screw provided to fasten the hanger in place.

4. Replace the plastic insert.

92 - 148A

Figure 4-27 INSTALLING THE WALL-MOUNT HANGER (PHONE SERIES 926)

4-35

4. Optional Equipment

WALL-MOUNT KIT

Installing the Wall-Mount Handset Hanger For 922xx Series Phones (Figure 4-28)

1. *Two different types of handset hangers may be included in your kit. To ensure that you are using the correct hanger, refer to Figure 4-28.* Insert the handset hanger in the slot provided beneath the telephone's hookswitch. Make sure the clip snaps into place.

    If necessary, use a screwdriver to remove the handset hanger.

Note: The handset hanger must be installed as shown, with the hook pointing upward.
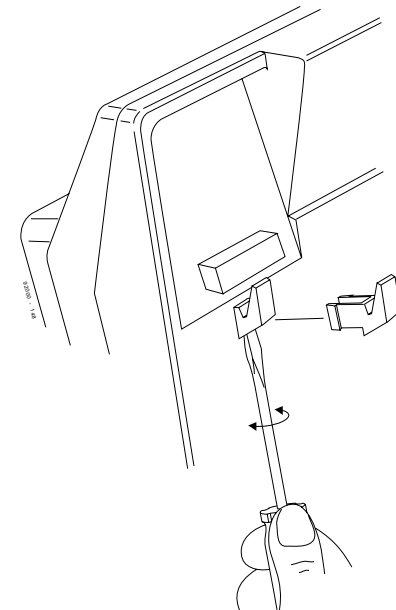
**Figure 4-28 INSTALLING THE WALL-MOUNT HANGER
(PHONE SERIES 922xx)**

WALL-MOUNT KIT

Wall-Mounting a 926/922 Series Key Telephone
(Figure 4-29)

1. **Installing Over a Wall Plate:**
   Slide the metal bracket down over the retaining screw heads on the wall plate until secure. Note that the dimpled outdents in the bracket should be against the wall.
   Installing Over a Modular Jack:
   Skip to Step 2.

2. Depending on your installation, attach the wall-mount kit's plastic bracket to either the metal bracket or directly to the wall using the screws provided.

3. Insert the telephone's line cord from the 625 modular jack through the plastic bracket into the phone. Secure the cord using the clips provided on the bracket.

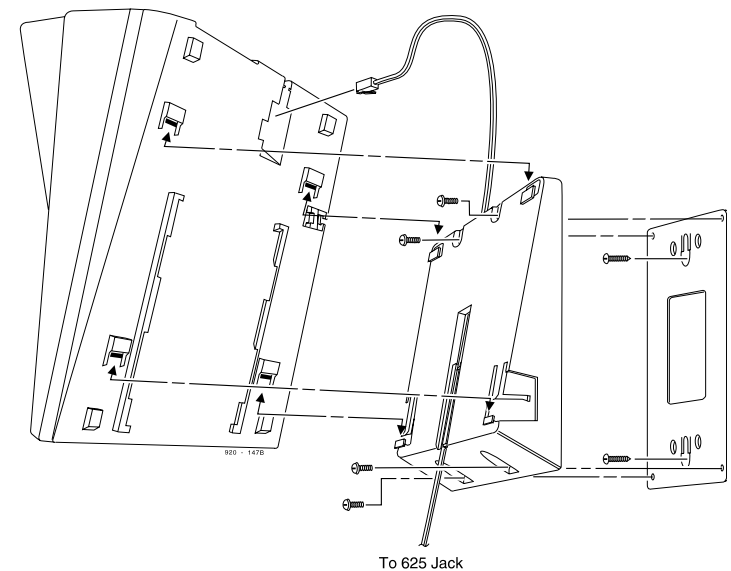4. Place the telephone on top of the plastic bracket on the clips provided.

To 625 Jack

Figure 4-29 INSTALLING THE WALL-MOUNT BRACKETS (PHONE SERIES 926/922)

4. Optional Equipment

WALL-MOUNT KIT

Using the Desk Stand on 926/922 Series Phones
(Figure 4-30)

1. Place the rubber feet provided in the kit on the bottom of the plastic bracket. Place a rubber foot on each corner.

2. Insert the telephone's line cord from the 625 modular jack through the plastic bracket using the clips provided on the bracket.

3. Place the telephone on top of the plastic bracket on the clips provided. Slide the telephone down until it snaps into place.

To 625 Jack
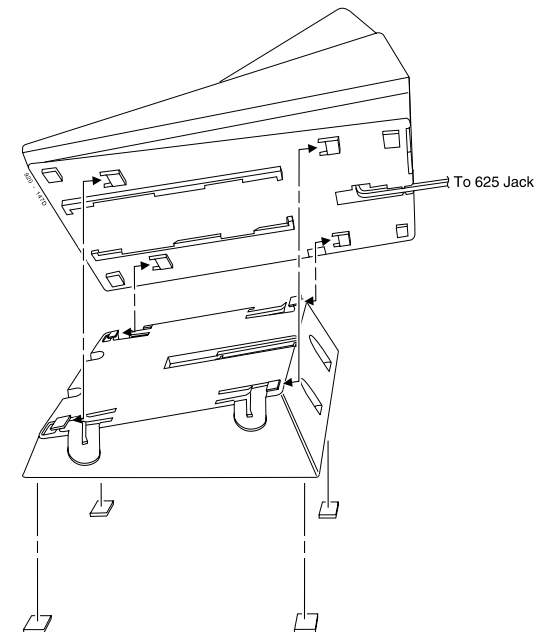
**Figure 4-30 ATTACHING AS A DESK STAND
(PHONE SERIES 926/922)**

WALL-MOUNT KIT

Installing the Wall-Mount Handset Hanger For i-Series Phones (Figure 4-31, Figure 4-32)

1. Remove the integrated wall/desk bracket from the bottom of the phone. Refer to Figure 4-31.

   - From the top, right-hand side of the wall/desk bracket, pull up slightly until the corner lifts up.

   - Gently pull the bracket to the right and pull up. This allows the left-hand side to release.

2. Break off one of the wall-mount hookswitch tabs located on the bracket.

3. To allow for easier installation, gently push a small flat-head screwdriver in the slot below the hookswitch until the handset hanger pushes up.

   There will be a slight snap as it releases.

4. Insert the wall-mount hookswitch tab in the slot below the hookswitch. The tab should be pushed in until it's flush with the base (Figure 4-32).
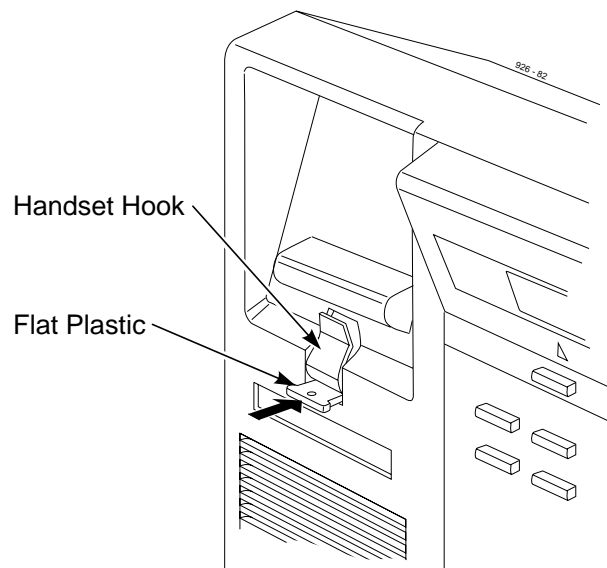
Wallmount hookswitch tabs

Break off piece if **wall mounting**
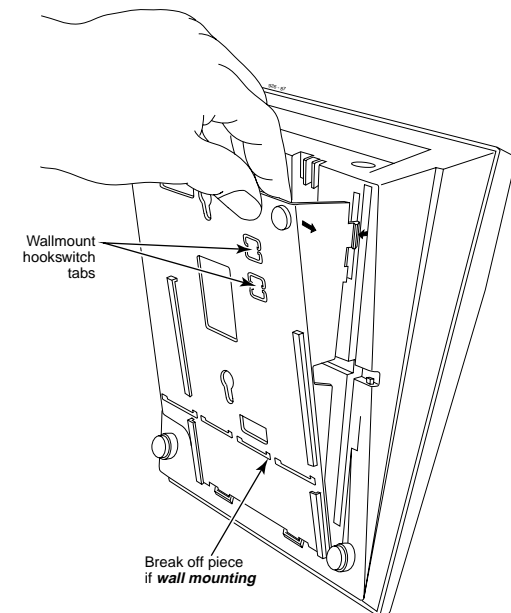
Figure 4-31 INSTALLING THE WALL-MOUNT HANGER (i-SERIES PHONES)

4-39

4. Optional Equipment

WALL-MOUNT KIT

Handset Hook

Flat Plastic

926 - 82

Figure 4-32 INSTALLING THE WALL-MOUNT HANGER (i-SERIES PHONES)

Wall-Mounting i-Series Telephones (Figure 4-33)

1. After removing the integrated wall/desk bracket from the bottom of the phone. (Figure 4-31), break off the 1 1/2" section of the bracket as indicated in Figure 4-31 and discard this piece.

   After breaking this section off, the bracket can not be used in the future as a desk stand.

2. Depending on your installation, attach the wall-mount kit's plastic bracket to either a metal wall plate or directly to the wall (Figure 4-33).

3. Insert the telephone's line cord from the 625 modular jack through the plastic bracket and into the phone.

4. Place the telephone on top of the plastic bracket on the hook provided.

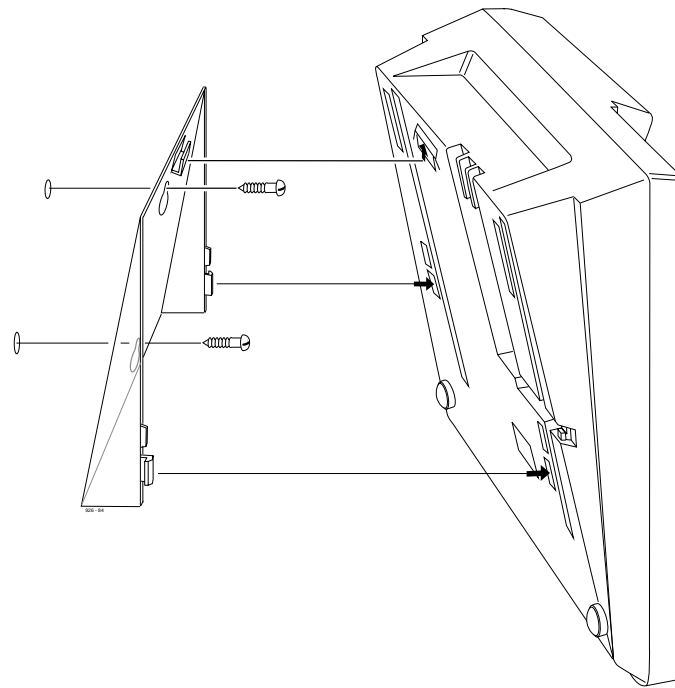   *The hook on the bracket slides into the slot on the back of the phone.*

5. Push the bottom of the phone until both the left and right sides snap into place.

   To remove the phone from the wall-mount bracket if needed, push in on the left and right sides of the bracket while lifting the phone up off the bracket.

WALL-MOUNT KIT

**Figure 4-33 INSTALLING THE WALL-MOUNT HANGER
(i-SERIES PHONES)**

4. Optional
Equipment

WALL-MOUNT KIT

Using the Desk Stand on i-Series Phones (Figure 4-34)

1. Remove the integrated wall/desk bracket from the bottom of the phone. Refer to Figure 4-31.

   - From the top, right-hand side of the wall/desk bracket, pull up slightly until the corner lifts up.

   - Gently pull the bracket to the right and pull up. This allows the left-hand side to release.

2. Without releasing the bottom hooks, slide the base to the left and snap into place.

   > *To remove the desk stand, push in on the left and right sides of the bracket while lifting up the phone off the bracket.*
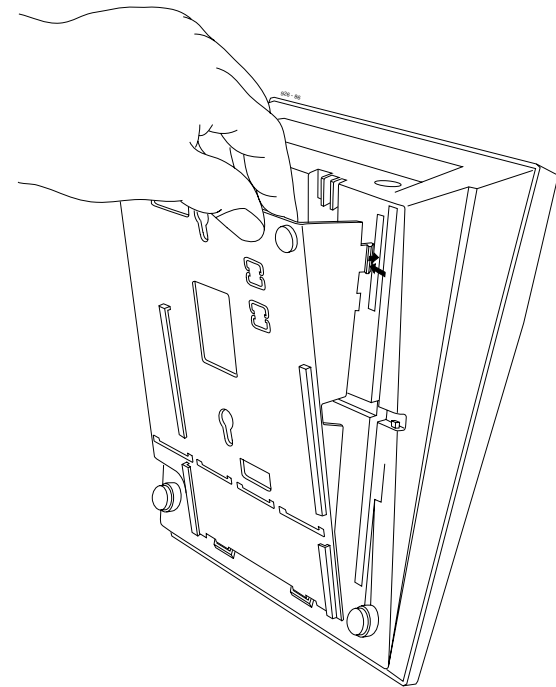
**Figure 4-34 INSTALLING BRACKET AS DESK STAND
(i-SERIES PHONES)**

Section 5, DATA AND SMDR

**5. Data
and SMDR**

DATA OVERVIEW

The System's Data Communications Capabilities
(Figure 5-1)

The system provides data device interfaces for data communications. Using data devices allows a network to share a limited number of business resources such as modems, printers, and PC's. The system's DCI devices can switch asynchronous RS-232-C data at speeds from 300 to 19.2K.

There are currently three types of data devices available: DCI-A, DCI-B and the 3-DCI Module.

DCI-A
The DCI-A is a single port data module that provides a serial RS-232-C port. The DCI-A is installed in a key telephone, but has a unique extension number. DCIs can be installed in any Super Display or 32-Button Display telephone within the P/N 926xx/922xx series of phones. With the i-Series phones (P/N 927xx), the DCI can only be installed in the Super Display, 28- or 34-button key phones. Each DCI-A requires one data (software) port, which has the same number as the DSTU station port. You can install up to 72 DCI units – one in each telephone.

DCI-B
The DCI-B is a single port data module that provides a parallel (Centronics type) port. The DCI-B is installed in a key telephone, but has a unique extension number. DCIs can be installed in any Super Display or 32-Button Display telephone within the P/N 926xx/922xx series of phones. With the i-Series phones (P/N 927xx), the DCI can only be installed in the Super Display, 28- or 34-button key phones. Each DCI-B requires one data (software) port, which has the same number as the DSTU station port. You can install up to 72 DCI units – one in each telephone.

3-DCI Module
The 3-DCI Module is a stand-alone data module which provides three RS-232-C serial ports, each port requiring one system data (software) port. The 3-DCI derives power and signaling from one 8DSTU circuit. Each cabinet can support three 3-DCI Modules. With the 28i system, this can provide up to 9 ports. On the 124i system, you can install up to nine 3-DCI Modules per system providing 27 ports.

DATA OVERVIEW

The 3-DCI Module uses a single digital station port on a DSTU
PCB. The module's data ports have the same numbers as the
DSTU PCB port **and** the next two DSTU PCB ports. When you
plug a 3-DCI into a DSTU port, the system disables the data
capabilities for any devices connected to the next two consecu-
tive ports. For example, if you plug a 3-DCI into port 1, you can
plug in keysets in ports 2 and 3, but you cannot plug DCI units
or another 3-DCI Module into ports 2 and 3. The data ports for
the 3-DCI plugged into DSTU port 1 are numbered 1-3.

DCI-L1 (Future Item)

The DCI-L1 will supply two additional channels to the single
channel i-Series phones.

If an i-Series phone has a DSS Console and a DCI-L1 (analog)
module installed, the DSS Console must have a separate
AC/DC adapter, even if it is the only DSS connected to the
phone.

DATA OVERVIEW
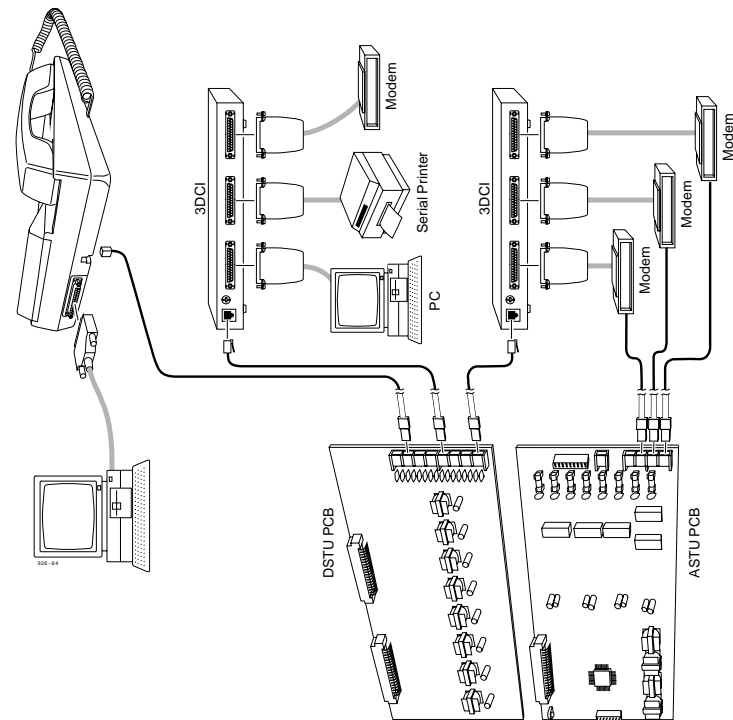
Figure 5-1 TYPICAL DATA INSTALLATION

DCI-A AND DCI-B UNITS

Using the DCI-A and DCI-B Units (Figure 5-2)

The DCI is a single port DCE data module that installs in a multibutton telephone. DCIs can be installed in any Super Display or 32-Button Display telephone within the P/N 926xx/922xx series of phones. With the i-Series phones (P/N 927xx), the DCI can only be installed in the Super Display, 28- or 34-button key phones.

The DCI provides the system with the ability to share common data communications resources such as printers, modems or PCs in a data network. The DCI can switch data at speeds from 300 to 19.2 K baud. Refer to *Data Communications Interface* in the software manual for additional details.

The DCI also provides remote (via modem) and on-site maintenance capability. This capability includes reports on system alarms, port identification, PCB status and other system configuration data. For maintenance purposes, you should always install one DCI unit or a 3-DCI Module in every system.

RS-232-C Pin Out Information

Direction of Signal Flow (→output or ←— input)

RS-232-C Connector	Description	DCE (3-DCI, DCI-A or Modem)	DTE (PC or Printer)
8	DCD	→	←
3	RXD	→	←
2	TXD	←	→
20	DTR	←	→
6	DSR	→	←
4	RTS	←	→
5	CTS	→	←
7	GND		

25-Pin RS-232-C Connector

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
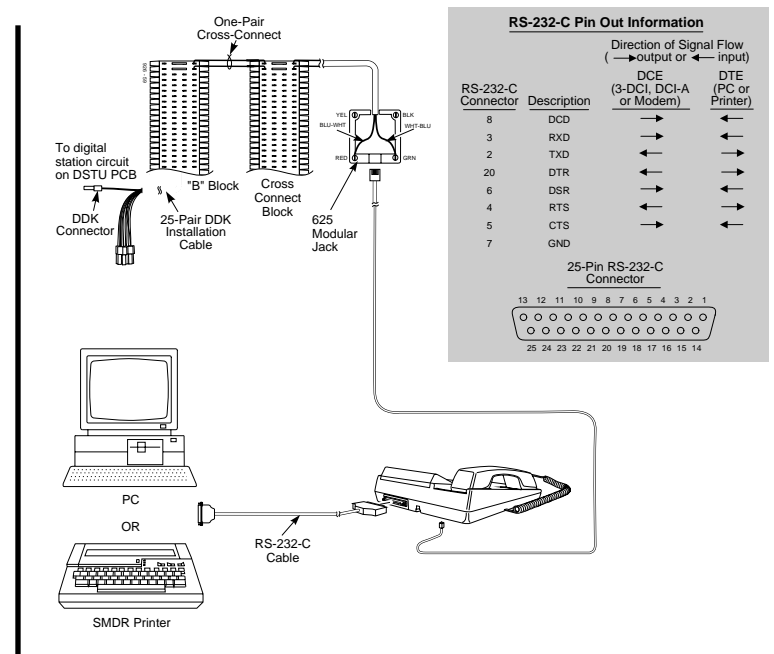
Figure 5-2 TYPICAL DCI INSTALLATION   5-5

5. Data and SMDR

DCI-A AND DCI-B UNITS

Installing the DCI Unit (Figures 5-3 through 5-9)

You can only install a DCI Unit in a Super Display or 32-Button Display telephone within the P/N 926xx/922xx series of phones. With the i-Series phones (P/N 927xx), the DCI can only be installed in the Super Display, 28- or 34-button key phones.

1. Turn the telephone upside down and remove the directory card.

2. Remove the screws that secure the telephone base or DCI cover, depending on the model of the phone.

3. Remove the telephone base or DCI cover.
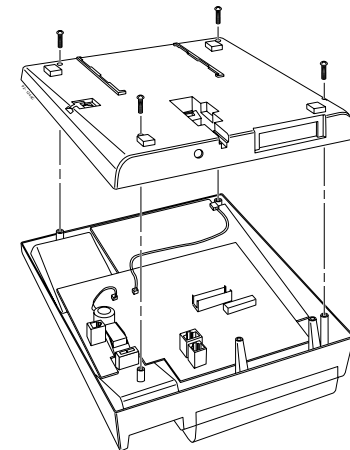
**Figure 5-3 REMOVING THE TELEPHONE BASE
(926xx and i-SERIES PHONES)**

Continued on next page . . .

DCI-A AND DCI-B UNITS

Installing the DCI Unit (Cont'd)
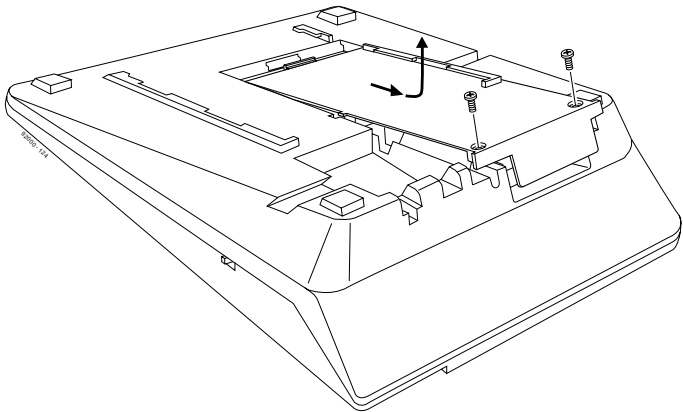
Figure 5-4 REMOVING THE TELEPHONE BASE (PHONE SERIES 922xx)

4. Peel the adhesive backing off of the DCI spacer and attach it as shown to the DCI Module. This spacer keeps small objects from falling into the telephone.
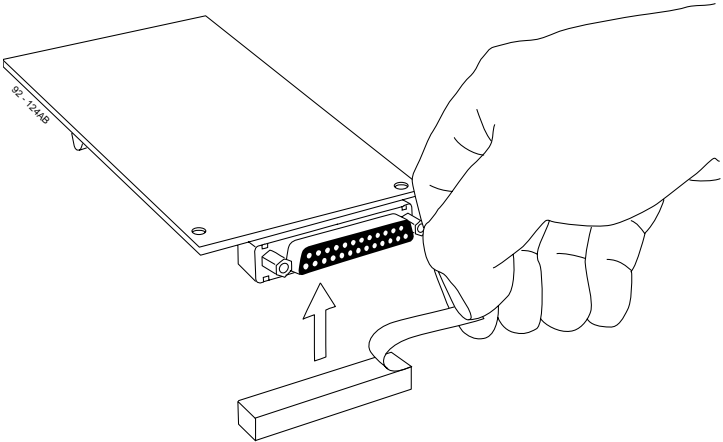
FIGURE 5-5 INSTALLING THE SPACER

5. Data and SMDR

DCI-A AND DCI-B UNITS

Installing the DCI Unit (Cont'd)

For 926xx and i-Series Phones:

5. Using a flat-blade screwdriver, carefully pry out the filler piece on the telephone base. This exposes the cutout in the base.
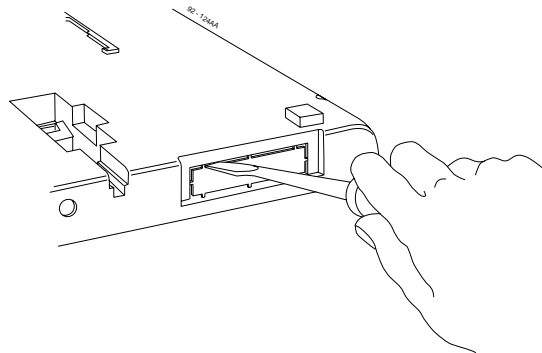
Figure 5-6 REMOVING THE FILLER PIECE

6. Plug the DCI into the connector in the telephone's upper housing and secure in place with the two screws provided.

7. Reinstall the telephone base and secure it with the four screws.

    Make sure the DCI Unit is correctly oriented in the cutout in the telephone base.

8. Connect the data device to the DCI.
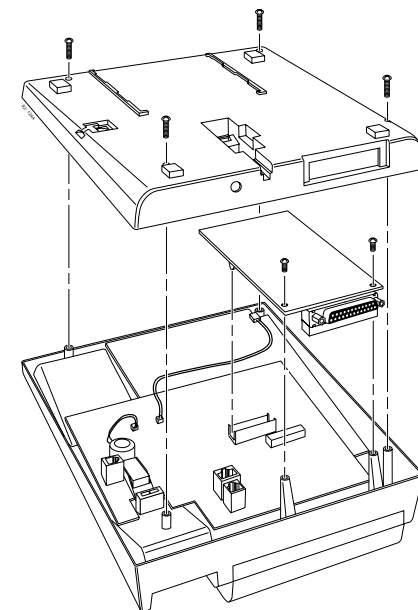
**Figure 5-7 INSTALLING THE DCI
(926xx and i-Series Phones)**

DCI-A AND DCI-B UNITS

Installing the DCI Unit (Cont'd)

For Phone Series 922xx:

5. Plug the DCI into the telephone's 20 pin connector on the bottom of the telephone.

6. Secure the DCI to the base by reinstalling the four screws.

7. Connect the data device to the DCI.
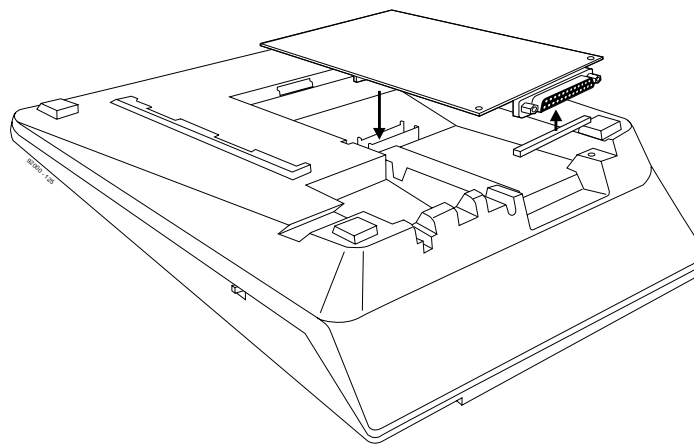
**Figure 5-8 PLUGGING IN THE DCI'S CONNECTOR
(PHONE SERIES 922xx)**
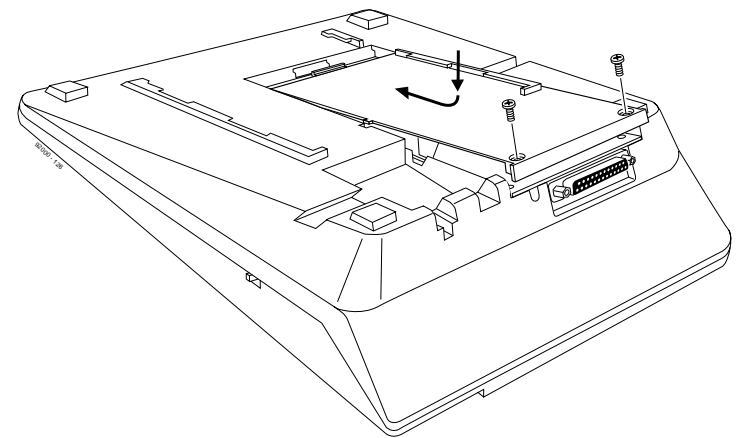
**Figure 5-9 INSTALLING THE DCI
(PHONE SERIES 922xx)**

**5. Data
and SMDR**

DCI-A AND DCI-B UNITS

Connecting the DCI Unit (Figure 5-10)

1. Locate an available DDK connector in a station (B) block.

2. For the DDK connector chosen, cross-connect the associated wire pair from the A or B block to the cross-connect block.

3. Install a modular jack for the DCI unit's telephone within six feet of the telephone's location.

4. Run one pair of 24 AWG station cable from the cross-connect block to the telephone's modular jack.

5. Terminate the station cable WHT/BLU - BLU/WHT leads to the RED and GRN lugs in the modular jack.

6. Install bridging clips as required.

7. Plug a line cord into the telephone and the modular jack.

8. Plug the RS-232-C cable into the data device.

   With a DCI-A, for example, this could be a PC serial port or serial SMDR printer.

RS-232-C Pin Out Information

Direction of Signal Flow
(⟶ output or ⟵ input)

RS-232-C Connector	Description	DCE (3-DCI, DCI-A or Modem)	DTE (PC or Printer)
8	DCD	⟶	⟵
3	RXD	⟶	⟵
2	TXD	⟵	⟶
20	DTR	⟵	⟶
6	DSR	⟶	⟵
4	RTS	⟵	⟶
5	CTS	⟶	⟵
7	GND		
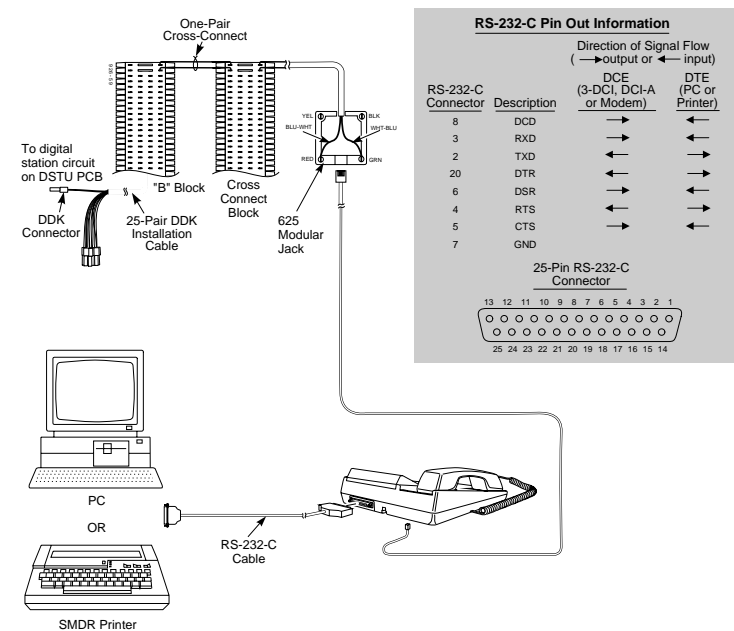
Figure 5-10 CONNECTING TO A DCI UNIT   5-10

3-DCI MODULE

Using the 3-DCI Module

The 3-DCI is a stand-alone three-port DCE data module. Each port functions identically to the DCI-A unit. For example, you can use it for networking printers, PCs and other data equipment.

Installing the 3-DCI Module (Figure 5-11)

1. Locate an available DDK connector in a station (B) block.

2. For the DDK connector chosen, cross-connect the associated wire pair from the A or B block to the cross-connect block.

3. Install a modular jack for the 3-DCI Module within six feet of the module.

4. Run one pair of 24 AWG station cable from the cross-connect block to the 3-DCI's modular jack.

5. Terminate the station cable WHT/BLU - BLU/WHT leads to the RED and GRN lugs in the modular jack.

6. Install bridging clips as required.

RS-232-C Pin Out Information

Direction of Signal Flow
(→output or ←— input)

RS-232-C Connector	Description	DCE (3-DCI, DCI-A or Modem)	DTE (PC or Printer)
8	DCD	→	←
3	RXD	→	←
2	TXD	←	→
20	DTR	←	→
6	DSR	→	←
4	RTS	←	→
5	CTS	→	←
7	GND		

Figure 5-11   CONNECTING THE 3-DCI

3-DCI MODULE

7. Ground the 3-DCI Module by connecting a 14 AWG ground
   wire from the FG lug to a known earth ground.

8. Plug a line cord into the back of the 3-DCI Module and
   the module's modular jack.

9. Plug the RS-232-C cables into the data device (e.g., PC serial
   port or serial SMDR printer.

PROGRAMMING

Basic Programming
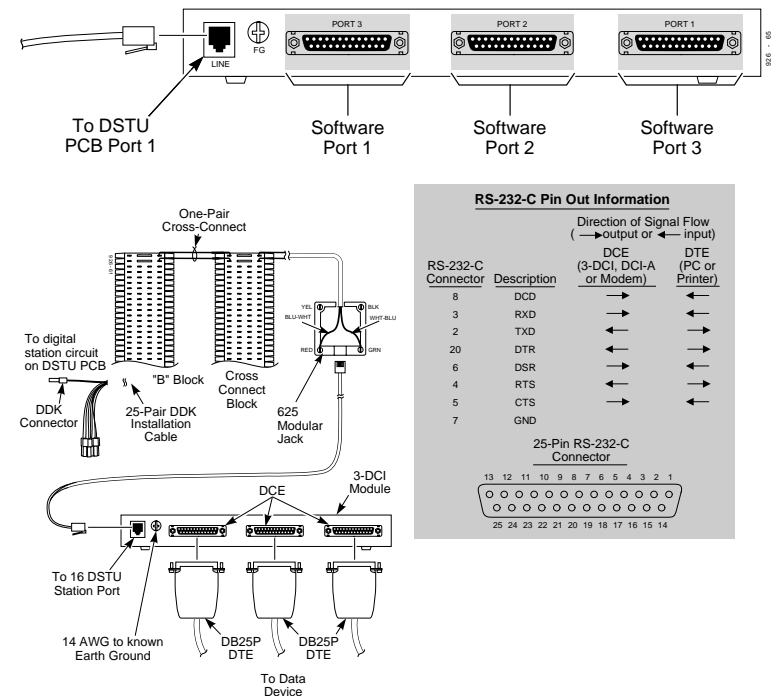
Note: For DCI units, the data (software) port number is the same as the extension's port number. DCI Modules use the extension's port number and the next two port numbers for data (software) port numbers.

0503 - DCI Extension Number
Assign an unused extension number to each DCI data (software) port.

1006 - Programming Function Keys
Assign a data key (code 1029) at each keyset with a DCI unit.

1201 - DCI Setup
For each of the DCI sub-types (1-10 set in Program 1202), set the values for the modem S-registers (Register Type 1) and X.25 packet switching (LAPB) registers (Register Type 2).

1202 - DCI Port Type
Assign a DCI port type (1 for RS-232-C, 2 for Centronics, or 4 for DCE port [modem]) to each DCI data (software) port installed. Also, assign the sub-type (1-10 used in Program 1201) to each software port

1206 - Initialize DCI
After changing register values in Program 1201, be sure to use this program to initialize each DCI software port. *You must initialize a DCI software port before any changes made in Program 1201 will take effect.*

Programming for System and Alarm Reports

0007 - System Report Setup
If the device connected to the DCI will also be for system reports, enter the DCI software port number as the system report port number.

0008 - Alarm Report Port Setup
If the device connected to the DCI will also be for alarm reports, enter the DCI software port number as the alarm report port number.

Refer to *Data Communications Interface* (DCI) in the Software Manual for additional details.

5. Data and SMDR

SOME TYPICAL DATA APPLICATIONS

Non-Dedicated 3-DCI Modem Pooling Network
(Figure 5-12)

In this application, a data port on the 3-DCI connects to a modem which in turn connects to an available circuit on an ASTU PCB. To place a data call through this network, an extension user places a call from their PC or terminal using the following ATDT dial string:

ATDT + (first 3-DCI data port's extension number) + (code for accessing outside line) + (destination's telephone number) + Enter

For example: ATDT 310 9 926 5400

RS-232-C Pin Out Information

RS-232-C Connector	Description	DCE (3-DCI, DCI-A or Modem)	DTE (PC or Printer)
8	DCD	→	←
3	RXD	→	←
2	TXD	←	→
20	DTR	←	→
6	DSR	→	←
4	RTS	←	→
5	CTS	→	←
7	GND		
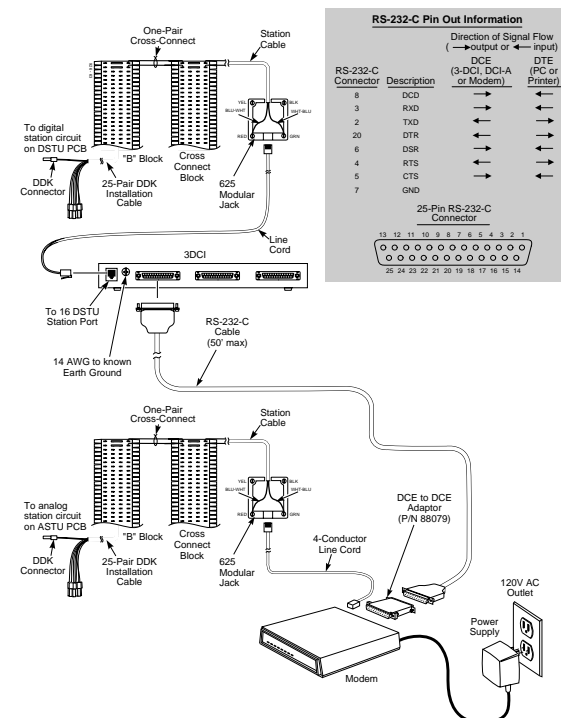
Figure 5-12 A NON-DEDICATED 3-DCI MODEM POOL 5-14

SOME TYPICAL DATA APPLICATIONS

Dedicated 3-DCI Modem Pooling (Figure 5-13)

In this application, a data port on the 3-DCI connects to a modem, which in turn directly connects to a dedicated outside line. This application is also useful for incoming remote maintenance calls. To place a data call through this network, an extension user places a call from their PC or terminal using the following ATDT dial string:

ATDT + (destination's telephone number) + Enter

For example: ATDT 1 203 926 5400

RS-232-C Pin Out Information

RS-232-C Connector	Description	DCE (3-DCI, DCI-A or Modem)	DTE (PC or Printer)
8	DCD	→	←
3	RXD	→	←
2	TXD	←	→
20	DTR	←	→
6	DSR	→	←
4	RTS	←	→
5	CTS	→	←
7	GND		

Direction of Signal Flow (→ output or ← input)

25-Pin RS-232-C Connector
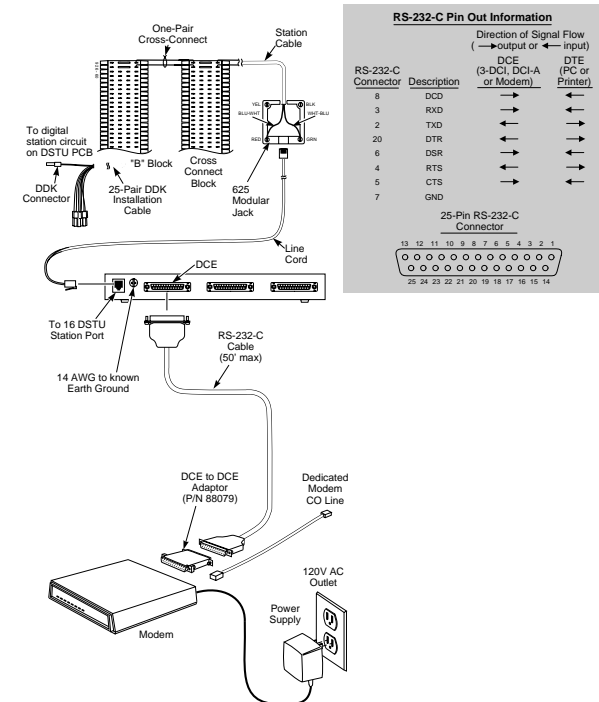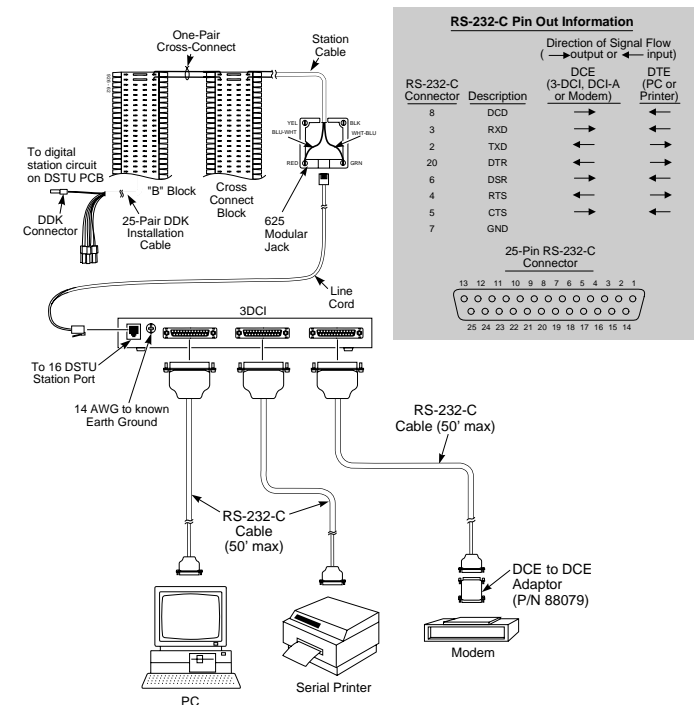
Figure 5-13 DEDICATED 3-DCI MODEM POOLING

5-15

5. Data and SMDR

SOME TYPICAL DATA APPLICATIONS

3-DCI Data Network (Figure 5-14)

This application uses all three data ports on the 3-DCI Module for various data applications. To access a device, an extension user just places a data call to the 3-DCI port's extension number.

Figure 5-14 CONNECTING A 3-DCI DATA NETWORK

SMDR

Using SMDR

Station Message Detail Recording (SMDR) provides a record of the system's outside calls. Typically, the record outputs to a customer-provided printer, terminal or SMDR data collection device. Use SMDR when you need to monitor the usage at each extension and trunk.

Installing SMDR (Figure 5-15)

1. Locate an available DDK connector in a station (B) block.

2. For the DDK connector chosen, cross-connect the associated wire pair from the A or B block to the cross-connect block.

3. Install a modular jack within six feet of the 3-DCI Module or telephone with the DCI unit.

4. Run one pair of 24 AWG station cable from the cross-connect block to the modular jack.

5. Terminate the station cable WHT/BLU - BLU/WHT leads to the RED and GRN lugs in the modular jack.

6. Install bridging clips as required.

7. If installing a 3-ACI Module, ground the module by connecting a 14 AWG ground wire from the FG lug to a known earth ground.
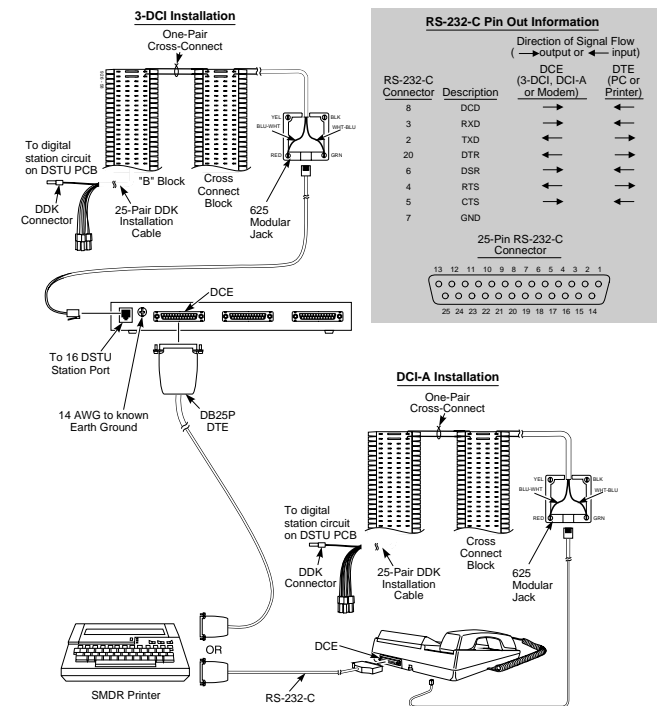

Figure 5-15 CONNECTING AN SMDR DEVICE

SMDR

8. Plug a line cord into the modular jack and the telephone or module.

9. Plug the RS-232-C cable into the SMDR and the DCI/3-DCI port.

Programming SMDR

Note: For DCI units, the data (software) port number is the same as the extension's port number. DCI Modules use the extension's port number and the next two port numbers for data (software) port numbers.

0404 - SMDR Options, Items 1, 2, 4-6
Set the various print options for SMDR.

0404 - SMDR Options, Item 3: SMDR Printer Output Port
Enter the software port number of the DCI port assigned to the SMDR printer.

0503 - DCI Extension Number
Assign an unused extension number to each DCI data (software) port.

0901 - Basic Trunk Port Setup (Part A), Item 13: SMDR Print Out
For each trunk, enter 0 if trunk's calls should appear on the SMDR report. Enter 1 if the trunk's calls should not appear on the SMDR report.

1008 - Basic Extension Port Setup (Part B), Item 1: SMDR Printout
For each extension, enter 1 if extension's calls should appear on the SMDR report. Enter 0 if extension's calls should not appear on the SMDR report.

1201 - DCI Setup
Set the DCI port parameters to match the SMDR device.

1202 - DCI Port Type
Assign a DCI port type (1 for RS-232-C or 2 for Centronics) to each DCI data (software) port installed. Also, assign the sub-type (1-10 used in Program 1201) to each software port.

1206 - Initialize DCI
After changing register values in Program 1201, be sure to use this program to initialize each DCI software port. *You must initialize a DCI software port before any changes made in Program 1201 will take effect.*

Refer to *Station Message Detail Recording* in the Software Manual for additional details.

Section 6, SPECIFICATIONS AND PARTS LIST

**6. Specifications
and Parts**

SPECIFICATIONS

28i System Capacities	
Cabinets:	1
Talk Timeslots (Intercom/line):	Non-blocking
Not all configurations are available with the following capacities:	
Analog Trunks (CO/PBX lines):	16
Digital Telephones:	16
Analog Telephones:	8
DSS Consoles:	2 max. per extension – 8 max. per system
DCI A/B Units:	16 (one per digital telephone)
3-DCI Modules:	3
3-ACI Modules:	2
Power Failure Telephones:	4 (one per 4ATRU PCB)
VAU Module:	1
VAU Plug-In Expansion Board:	1 (installs in VAU module)
Door Boxes:	8 (4 per 4PGDU PCB)
Door Box/External Paging Contacts:	8 (4 per 4PGDU PCB)
Alarm/Fax Sensors:	8 (4 per 4PGDU PCB)
External Paging Zones:	8 (4 per 4PGDU PCB)
Internal Paging Zones:	8
Conference Circuits:	8 four-party or 4 eight-party conferences per system. Conference circuits provided on CPRU PCB)

28i PCBs Capacities	
4ATRU Analog Trunk PCB:	4
8DSTU Digital Station PCB:	1 *
4ASTU Analog Station PCB:	2 *
4CIDU Caller ID Daughter Board:	4 (mounts on 4ATRU)
4GSAU Ground Start Daughter Board:	4 (mounts on 4ATRU)
4PGDU 4 Page/Door Box PCB:	2
4DTDU Dial Tone Detection PCB:	2
24CPRU Central Processing Unit:	1
LAPBU Unit:	1 (mounts on 24CPRU)
REJ Recording Jack Unit:	20 (either 92265 or 80175)

∗ Due to the system load factors, no more than two station PCBs (8DSTU or 4ASTU) should be installed in a system.

SPECIFICATIONS

124i System Capacities	
Cabinets:	3 (Main and up to 2 Expansion Cabinets)
Talk Timeslots (Intercom/line):	Non-blocking
Analog Trunks (CO/PBX lines):	52
Digital and/or Analog Telephones:	72
DSS Consoles:	2 max. per extension – 8 max. per system
DCI A/B Units:	72 (one per digital telephone)
3-DCI Modules:	9 (3 per cabinet)
3-ACI Modules:	2
Power Failure Telephones:	13 (one per 4ATRU PCB)
VAU Module:	1
VAU Plug-In Expansion Board:	1 (installs in VAU module)
Door Boxes:	8 (4 per 4PGDU PCB)
Door Box/External Paging Contacts:	8 (4 per 4PGDU PCB)
Alarm/Fax Sensors:	8 (4 per 4PGDU PCB)
External Paging Zones:	8 (4 per 4PGDU PCB)
Internal Paging Zones:	8
Conference Circuits:	8 four-party or 4 eight-party conferences per system. Conference circuits provided on CPRU PCB) (Main Cabinet only)

124i PCBs Capacities	
4ATRU Analog Trunk PCB:	13 (8 max. per cabinet)
8DSTU Digital Station PCB:	9 (3 max. per cabinet)
4ASTU Analog Station PCB:	16 if no DSTU PCB installed 15 with DSTU PCB installed (8 max. per cabinet)
2EMTU E&M Tie Line PCB:	13 (5 max. per cabinet)
2DIDU DID Trunk PCB:	13 (5 max. per cabinet)
BRIU BRI Interface PCB:	13 (5 max. per cabinet)
PRIU T1/PRI Interface PCB:	2
4CIDU Caller ID Daughter Board:	13 (mounts on 4ATRU)
4GSAU Ground Start Daughter Board:	13 (mounts on 4ATRU)
4PGDU 4 Page/Door Box PCB:	2
4DTDU Dial Tone Detection PCB:	2
32CPRU Central Processing Unit:	1 (Main Cabinet only)
EXIFU Expansion Interface PCB:	2 (1 in each Expansion Cabinet)
EXCPRU CPRU Memory Expansion:	1 (mounts on 32CPRU)
LAPBU Unit:	1 (mounts on 32CPRU)
REJ Recording Jack Unit:	72 (either 92265 or 80175)

SPECIFICATIONS

Environmental Requirements

Meeting established environmental standards maximizes the life of the system. Refer to the Standard Practices Manual for further information. Be sure that the site is not:
1. In direct sunlight or in hot, cold or humid places.
2. In dusty areas or in areas where sulfuric gases are produced.
3. In places where shocks or vibrations are frequent or strong.
4. In places where water or other fluids comes in contact with the main equipment.
5. In areas near high-frequency machines or electric welders.
6. Near computers, telexes, microwaves, air conditioners, etc.
7. Near radio antennas (including shortwave).

Power Requirements

A dedicated 110 VAC 60 Hz circuit located within seven feet of the cabinet is required. You should install a separate dedicated outlet for each cabinet.

Environmental Specifications

Cabinets and Key Telephones
Temperature: 0-45°C (32-113°F)
Humidity: 10-95% (non-condensing)
Door Box
Temperature: -20-60°C (-4-140°F)
Humidity: 10-95% (non-condensing)

External Paging

Output Impedance:	600 Ohm
Output Level:	Nominal 250 mV (-10 dBm)
Maximum Output:	400 mV RMS

SPECIFICATIONS

28i Power Supply Specifications (cont.)

Parameter	KSU
Output Power Watts @ full load % of Total	42.2W 100
AC Input I @ full load	0.66A @ 120V
VA @ 120V	79.2VA
Avg. Input Power	(TBD) @ 120V
KWh AC Input I x 120V/1000	.0792 KWh
BTU KWh x 3413	270btu
System Name Plate Rating:	120V, 50/60 Hz, 2.5A
Fuses:	Two 4 amp fast blow fuses
Grounding Requirements:	14 AWG copper wire

124i Power Supply Specifications (cont.)

Parameter	Main Equipment	Exp. Cabinet 1	Exp. Cabinet 2	3 Cabinet Total
Output Power Watts @ full load % of Total	106W 33.3%	106W 33.3%	106W 33.3%	318W
AC Input I @ full load	1.53A	1.53A	1.53A	4.59A
VA @ 120V	184VA	184VA	184VA	551VA
Avg. Input Power @ 120V	120W	120W	120W	360W
KWh @ AC Input Ix120V	.184KWh	.184KWh	.184KWh	.551KWh
BTU KWh x 3413	628btu	628btu	628btu	1884btu

System Name Plate Rating:	120V, 50/60 Hz, 2.5A
Fuses:	Two 4 amp fast blow fuses
Grounding Requirements:	14 AWG copper wire

SPECIFICATIONS

28i Mechanical Specifications

Equipment	Width	Depth	Height	Weight
KSU Cabinet	10 3/4"	6 1/8"	13 13/16"	4 lbs 5 oz.
22/28/34 Button Keyset	7 7/8"	9 1/4"	3 10/16"	2 lbs 4 oz
22 Button Keyset	7 7/8"	9 1/4"	3 10/16"	2 lbsz
Super Display	7 7/8"	9 1/4"	4 1/8"	2 lbs 16 oz
DSS Console (110 but.)	7 7/8"	9 1/4"	3 3/16"	1 lb 64 oz
Digital Single Line	6 3/4"	8 5/8"	3 3/4"	1 lb 7 oz
Door Box	4"	1 1/2"	5 3/16"	10 oz
3-ACI/3-DCI/2-OPX Module	9 3/8"	7 3/8"	1 1/4"	3 lbs

124i Mechanical Specifications

Equipment	Width	Depth	Height	Weight
Cabinet	16.5"	6"	13.5"	7 lbs
16/32 Button Keyset	8 5/8"	9 3/8"	3 1/4"	2 lbs 2 oz
Super Display	8 5/8"	9 3/8"	3 7/8"	2 lbs 8 oz
DSS Console	7 13/16"	8 7/8"	2 3/4"	1 lb 6 oz
Digital Single Line	6 3/4"	8 5/8"	3 3/4"	1 lb 7 oz
Door Box	4"	1 1/2"	5 3/16"	10 oz
3-ACI/3-DCI/2-OPX Module	9 3/8"	7 3/8"	1 1/4"	3 lbs

Door Box/External Paging Contacts

Output Impedance:	600 Ohm
Output Level:	Nominal 250 mV (-10 dBm)
Maximum Output:	400 mV RMS
Configuration:	Normally open

SPECIFICATIONS

Alarm/Fax Sensors

Maximum Initial Contact Resistance:50 mohm
Requires a 10-30VDC power supply installed in series with the alarm/fax circuit.

ACI Module Input/Output

Audio/Music Input
Input Impedance: 47 KOhm @ 1Khz

Audio/Paging Output
Output Impedance: 600 Ohms @ 1 KHz
Maximum Output: +3 dBm

Relay Contacts
Configuration: Normally Open
Maximum Contact Ratings: 30 VDC @ 60 mA
                          90 VAC @ 10 mA
Minimum Application Load: 1 VDC @ 1 mA

BGM/MOH Music Source Input

Input Impedance: 600 Ohm
Input Level: Nominal 250 mV (-10 dBm)
Maximum Input: 1V RMS
Inputs for MOH and BGM are located on the CPRU PCB.

FCC Registration Information

Model: 28i and 124i
Manufacturer: Nitsuko America
FCC Part 15 Registration: Class A
Sample FCC Registration Number: 1ZDTHA-21819-KF-E
(Refer to the label on the Main Cabinet for the FCC Registration Number.)

Reg. Status	MTS/WATS Interfaces	Mfrs. Port Identifier	Ringer Eq. Number	SOC	Network Jacks
Original	02LS2	4ATRU	0.9B	9.0FAS26.0P	RJ11C

PARTS LIST

FCC DID Requirements

This equipment must operate in a manner that is not in violation of Part 68 rules. This equipment returns answer supervision to the Public Switched Network when the DID trunk is: (1) answered by the called station; (2) answered by the attendant; (3) routed to a recorded announcement that can be administered by the CPE user; (4) routed to a dial prompt.

The equipment returns answer supervision on all DID calls forwarded back to the Public Switched Telephone Network except when: (1) a call is unanswered; (2) a busy tone is received; (3) a reorder tone is received.

When ordering DID Service, provide the telco with the following information:

FCC Registration Number: 1ZDJPN-nnnnn-KF-E
DID Facility Interface Code: 02RV2-T
DID Service Order Code: 9.0F
DID Answer Supervision Code A S.2
DID USOC Jack Type: RJ21X

Please note the following:
1. DID services must be purchased from the local telephone company.
2. Each 2DIDU provides two DID trunk circuits and utilizes two consecutive software ports.
3. Refer to the Software Manual for detailed DID description, conditions, and programming instructions.

Cabling Requirements

1. Do not run station cable in parallel with the AC source, telex or computer, etc. If the cables are near cable runs to those devices, use shielded cable with grounded shields or install the cable in conduit.
2. When cables must be run on the floor, use cable protectors.
3. Cable runs for key telephones, single line telephones, Door Boxes and 3-ACI Modules must be a dedicated, isolated cable pair.

Device	Cable Type	Cable Run Length (ft)	Notes
Key Telephone,	2-wire 26 AWG	650	
3-ACI Module,	2-wire 24 AWG	1000	
3-DCI Module	2-wire 22 AWG	1300	
2-OPX Module &			
VAU Module			
Single Line	2-wire 26 AWG	13,100	at constant 20 mA
Telephone		6,500	at constant 35 mA
	2-wire 24 AWG	21,000	at constant 20 mA
		10,500	at constant 35 mA
	2-wire 22 AWG	34,750	at constant 20 mA
		17,400	at constant 35 mA
Door Box	2-wire 26 AWG	200	
	2-wire 24 AWG	330	
	2-wire 22 AWG	550	

PARTS LIST

Station Equipment	
Description	**Part Number**
926 PHONE SERIES:	
Super Display Telephone	92663
32-Button Display Telephone	92673
32-Button Telephone	92670
16-Button Display Telephone	92573
16-Button Display Telephone (w/o One Touch)	92563
16-Button Telephone	92570
16-Button Telephone (w/o One Touch)	92560
Digital Single Line Telephone	92550
DSS Console	92555
DSS Console Power Supply	92556
Wall-Mount Kit	92579
Analog Telephones (customer provided)	
922xx PHONE SERIES:	
Super Display Telephone	92283B/92283W
32-Button Display Telephone	92293B/92293W
32-Button Telephone	92290B/92290W
16-Button Display Telephone	92373C/92373W

Station Equipment (Cont'd)	
Description	**Part Number**
16-Button Telephone	92370B/92370W
Digital Single Line Telephone	92550/92250W
DSS Console	92555B/92555W
DSS Console Power Supply	92556
Wall-Mount Kit	92279
Analog Telephones (customer provided)	
i-Series PHONES:	
Super Display Telephone	92773
34-Button Display Telephone	92783
28-Button Display Telephone	92763
28-Button Telephone	92760
22-Button Display Telephone	92753
22-Button Display Telephone (w/o One Touch)	92750
110-Button DSS Console	92755
DSS Console Power Supply	92556
Off-Hook Voice Announce with Handsfree Answerback Module	92765
Analog Telephones (customer provided)	

PARTS LIST

Peripheral Station Equipment	
Description	**Part Number**
Door Box	88540
DCI-A (Serial Data Module)	92266
DCI-B (Parallel Data Module)	92267
3-DCI (3-Port Data Module)	92258
Main VAU Module	92136
VAU Plug-in Expansion Board	92137
2-OPX Module	92177
3-ACI (3-Port Analog Interface)	92259
Recording Jack Module (REJ)	92265
Recording Jack Module (REJ) for *i-Series* phones	80175

Common Equipment	
Description	**Part Number**
28i KSU	92700
28i CPRU	92705
28i Power Supply	92701
28i Remote Programming Software	92796
124i Cabinet (used for both Main and Expansion)	92000A
124i Remote Programming Software	92216
Modem Kit, including:	92366
Boca Fax/Modem (P/N 85862A)	
DCI to Modem Adapter (P/N 92268)	
Remote Programming Software (P/N 92216)	
DDK Installation Cable	82492
T-Serve II CSU	85950
T-Serve II Power Supply	85951
CSU/DSU RJ48-DB 15 Cable (P/N 85953)	85953
T1/PRI Installation Cable	92067
Quad Datasmart DSU	85956
CSU/DSU DB15M-DB15F Cable	85952

Parts List

PCBs	
Description	**Part Number**
32CPRU Central Processing Unit	92005
EXIFU Expansion Interface	92029
EXCPRU Memory Expansion	92025
28i LAPBU Unit	92706
28i LAPBU DIN Connector-to-RS-232 Cable	92707
124i LAPBU Unit	92006
8DSTU Digital Station PCB	92021
4ASTU Analog Station PCB	92040
4ATRU Analog Trunk PCB (loop start)	92011
4PGDU Page/Door Box PCB	92030
4DTDU Dial Tone Detection PCB	92035
BRIU BRI Interface PCB	92061
PRIU T1/PRI Interface PCB	92060
2EMTU E&M Tie Line PCB	92017
2DIDU DID Trunk PCB	92016
4CIDU Caller ID Daughter Board PCB	92012
4GSAU Ground Start Daughter Board PCB	92015

Replacement Parts	
Description	**Part Number**
Handset and Cord Assembly	92595
Handset and Cord Assembly (for i-Series phones and 922xx phones) - Black	92296
Handset Coil Cord - Black 6'	85326
Handset Coil Cord - Black 9'	85323
Handset Coil Cord - Black 13'	85324
16 Button Telephone Plastic C.O. Cover	92600-16
24 Button Telephone Plastic C.O. Cover	92600-24
32 Button Telephone Plastic C.O. Cover	92600-32
16 Button Designation Strip	92605-16
24 Button Designation Strip	92605-24
32 Button Designation Strip	92605-32
DSS Console Designation Strip	92605-DSS
Two-pin DDK connectors (pkg of 25)	85993
i-Series Phone Wall/Desk Mounting Bracket	92830

NITSUKO AMERICA

Nitsuko America, Telecom Division
4 Forest Parkway
Shelton, CT 06484

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FAX: 203-929-0535

Other Important Telephone Numbers

Sales: 203-926-5450
Customer Service: 203-926-5444
Customer Service FAX: 203-926-5454
Technical Service: 203-925-8801
Discontinued Product Service: 900-990-2541
Technical Training: 203-926-5430
Emergency Technical Service (After hours) 203-929-7920
    (Excludes discontinued products)

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Nitsuko

384i

Hardware Manual

Section 1, INSTALLING THE MAIN AND EXPANSION CABINETS

1. Installing Cabinets

Section 1, INSTALLING THE MAIN AND EXPANSION CAINETS (cont'd)

INSTALLING THE MAIN CABINET

Unpacking

Unpack the equipment and check it against your equipment lists. Inspect for physical damage. If you have questions about the quantity or function of the equipment, consult your sales representative.

Make sure you have appropriate tools for the job, including: a test set, a punch down tool, and a digital voltmeter.

Before Installing

Make sure you have a building plan showing common equipment, extensions, the telco demarcation, and earth ground location. The installation site must meet Nitsuko America specifications in the Standard Practices Manual (P/N N27010STD**).

Site Requirements

The system must be floor-mounted and is equipped with brackets to secure each cabinet to a wall. Ensure that enough space is available to allow the installation of expansion cabinets above the Main Cabinet.

The system requires a three-prong dedicated 110 VAC 60 Hz circuit (NEMA 5-15 receptacle) located within 7 feet of the AC receptacle. Telco should install the RJ21X to the right of the Main Cabinet. Extension blocks should be installed to the left of the Main Cabinet.

The Main Cabinet is shipped fully assembled. The following is enclosed with the Main Cabinet:
- 1 ferrite bead (2 tie wraps) packed outside the cabinet
- 4 wall-mounting brackets packed outside the cabinet
- 1 green 14AWG ground wire (factory-installed to the backplane)
- 1 red 9-stranded power cable (factory-installed to the backplane)
- 1 red 4-stranded power diagnostic cable for top cover (factory-installed to the backplane)
- 1 tie wrap (factory-installed)

INSTALLING THE MAIN CABINET

Environmental Requirements

Meeting and maintaining established environmental standards maximizes the life of the system. Be sure that the site selected for the Main Cabinet is not:

1. In direct sunlight or in hot, cold, or humid places.
2. In dusty areas or in areas where sulfuric gases are produced.
3. In places where shocks or vibrations are frequent or strong.
4. In placed where water or oil comes in contact with the unit.
5. In areas near high-frequency machines or electric welders.
6. Near computers, telexes, microwaves, air conditioners, etc.
7. Near radio antennas (including shortwave).

Removing the Front Cover (Figure 1-1)

1. Position the Main Cabinet on the floor near the MDF within 7 feet of the dedicated AC outlet. (Do not secure the cabinet to the wall at this time).
2. Loosen four front panel retaining screws. Remove the front panel cover of the Main Cabinet.
3. Remove the Main Cabinet rubber gaskets.
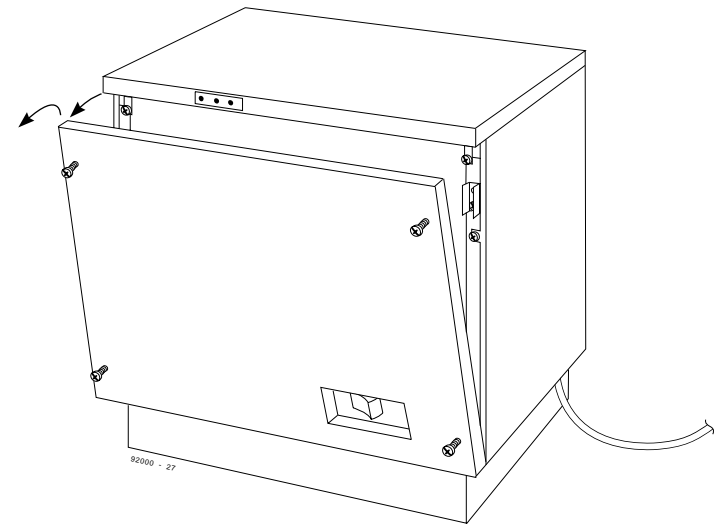
Figure 1-1 REMOVING THE FRONT COVER

INSTALLING THE MAIN CABINET

Removing the Top Cover (Figure 1-2)

1. Disconnect the top cover alarm cable.
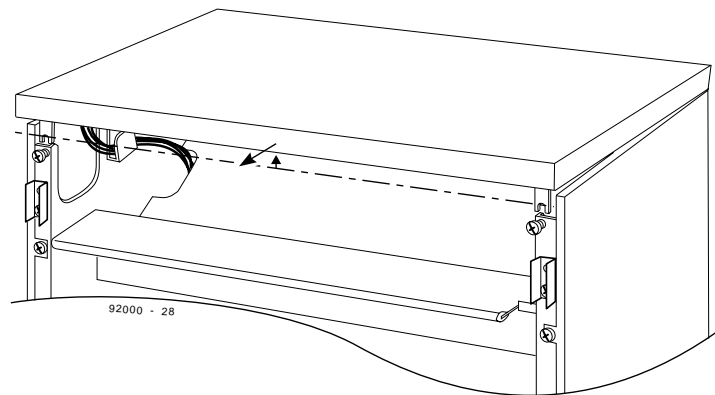2. Loosen the top cover retaining screws. Remove the top cover.

Figure 1-2 REMOVING THE TOP COVER

Removing the Side Panels (Figure 1-3)

1. Loosen upper and lower side panel retaining screws. Remove side panel covers of the Main Cabinet.
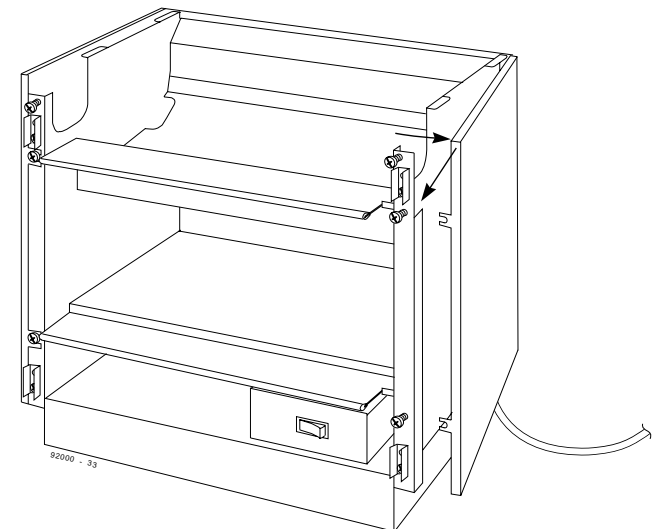2. Remove any packing materials.

Figure 1-3 REMOVING THE SIDE PANELS

INSTALLING THE MAIN CABINET

Removing the Back Cover (Figure 1-4)

The back cover needs to be removed when installing an Expansion Cabinet.

1. Remove the Main Cabinet back panel. Refer to steps 1, 2, and 3.
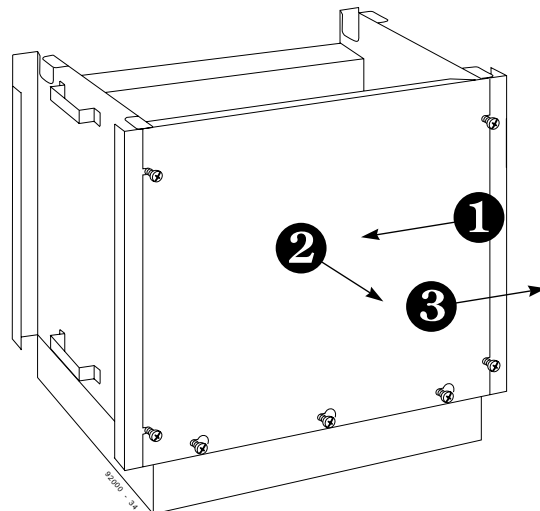

Figure 1-4 REMOVING THE BACK COVER

Securing the System to a wall (Figure 1-5)

1. Install wall brackets on the top corners of the Main Cabinet.

Note: Wall brackets are located on the side and bracket retaining screws are located on the back of the Main Cabinet.
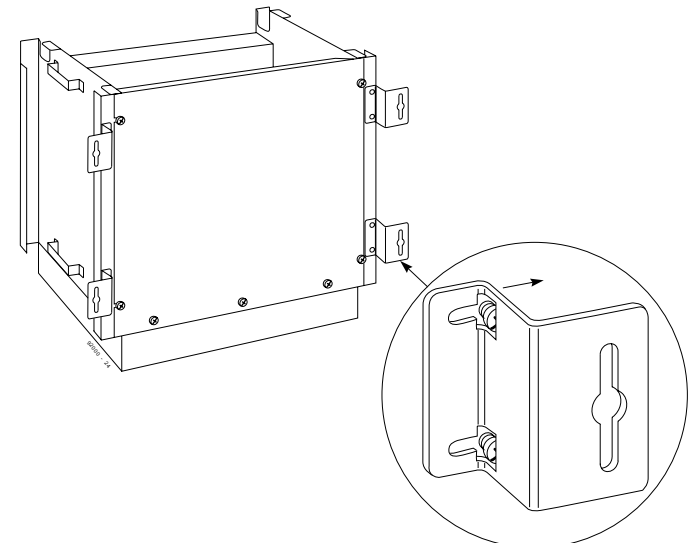

Figure 1-5 INSTALLING WALL BRACKETS

INSTALLING THE MAIN CABINET

Securing the Main Cabinet (Figure 1-6)

1. Secure the Main Cabinet to a wall using appropriate hardware.

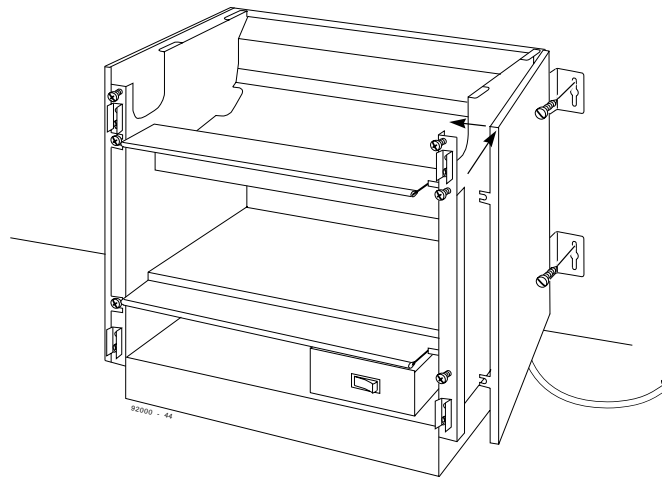**Note: If an Expansion Cabinet is required, do not secure the Main Cabinet to the wall at this time.**

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Figure 1-6 SECURING THE MAIN CABINET TO A WALL

Grounding the Main Cabinet (Figure 1-7)

1. Strap the SG (signal ground) lug to the FG (frame ground) lug using 14 AWG.
2. Strap the PBXG (CO/PBX ground start trunk ground) lug to the ETH (earth ground) lug using 14 AWG.
3. Strap the FG (frame ground) lug to the ETH (earth ground) lug using 14 AWG.
4. Ground the Main Cabinet by connecting a 14 AWG wire from the ETH lug on the right side of the Main Cabinet to a known earth ground.
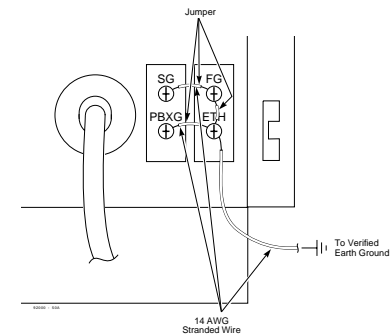

Jumper

SG   FG
PBXG ETH

To Verified
Earth Ground

14 AWG
Stranded Wire

Figure 1-7 GROUNDING THE MAIN CABINET

1-7

1. Installing Cabinets

INSTALLING THE MAIN CABINET

Installing/Removing the Power Supply
(Figures 1-8 and 1-9)

The Power Supply is factory-installed to the right of PCB slot 7 in the Main Cabinet. Four screws secure the power supply to the Main Cabinet. Enclosed with the Power Supply:
● 1 3-stranded power cable (BLK-WHT-GRN)
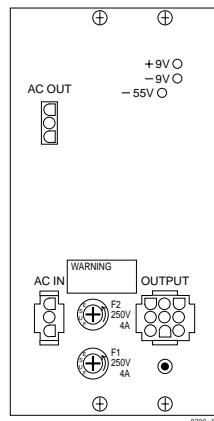● 1 6.3 amp 250 volt spare fuse

To install/replace the Power Supply:
1. Unplug AC power cable from the AC receptacle. Remove AC ring generator cable, if installed.
2. Remove four mounting screws from the Power Supply.
3. Insert the Power Supply into the Main Cabinet and secure by re-inserting and tightening all four screws.
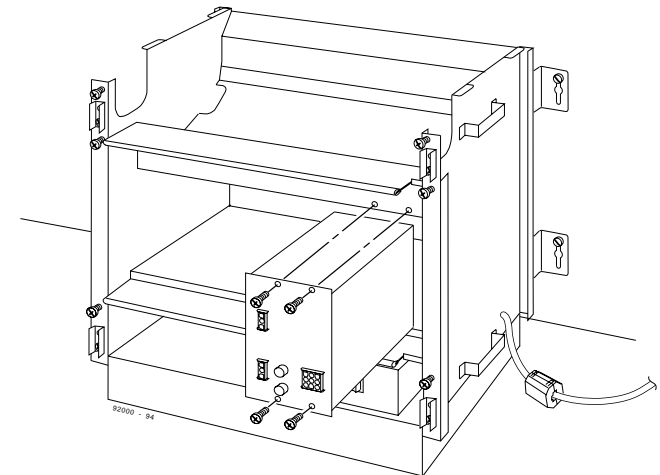
Figure 1-8 MAIN CABINET POWER SUPPLY

Figure 1-9 REPLACING THE MAIN CABINET POWER SUPPLY

1-8

INSTALLING THE MAIN CABINET

Installing Main Cabinet Power Supply Cables
(Figure 1-10)

1. Unplug AC power cord, if necessary.
2. Plug in the red 9-conductor power cable connected from the Main Cabinet backplane connectors CN1 and CN2 to the Main Cabinet Power Supply OUTPUT connector.
3. Insert the Main Cabinet Power Supply's 3-pin to 4-pin cable (BLK,WHT,GRN) through the tie wrap on the right side of the Main Cabinet. The 3-pin cable installs to the right.
4. Plug in the Main Cabinet Power Cable's 4-conductor end to the 4-pin connector on the left side of the Main Cabinet power panel.
5. Plug in the Main Cabinet Power cable's other end (3-conductor) to the Main Cabinet Power Supply's AC IN connector.
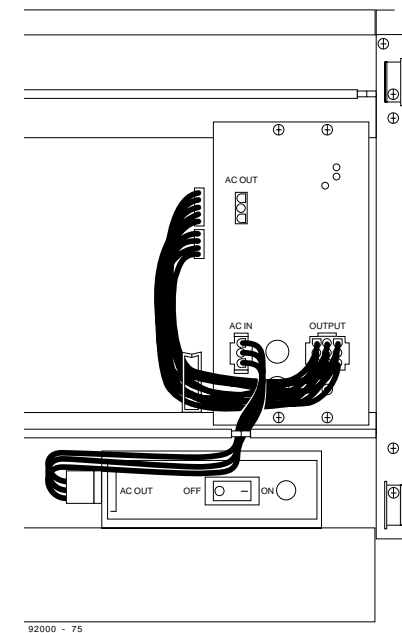

Figure 1-10 INSTALLING MAIN CABINET POWER SUPPLY CABLES

INSTALLING AN EXPANSION CABINET

An Expansion Cabinet is shipped fully assembled. The Expansion Cabinet uses the top cover of the Main Cabinet.

The following is shipped with an Expansion Cabinet:
- 1 Expansion Cabinet Power Supply DC power cable (RED/BLU)
- 1 Expansion Cabinet Power Supply AC power cable (BLU/BRN/YEL/GRN)
- 2 ferrite beads
- 2 wall brackets
- 2 spare fuses For the Expansion Cabinet Power Supply
- 3 tie wraps

Before Installing an Expansion Cabinet

1. Power down the Main Cabinet.
2. Remove the Main Cabinet from the wall (if necessary).
3. Disconnect the diagnostic LED power cable from the Main Cabinet's top cover.
4. Remove the top, front, and back covers from the Main Cabinet. Refer back to Figures 1-1,1-2, 1-3, and 1-4 if necessary.
5. Remove the front, back, and side covers of the Expansion Cabinet.

Installing an Expansion Cabinet
(Figures 1-11 and 1-12)

1. Place the Expansion Cabinet on top of the Main Cabinet.
2. Remove two screws from the top of each side panel of the Main Cabinet.
3. Loosen retaining bracket screws (4) on the Expansion Cabinet. The bracket slides into position for securing the Expansion Cabinet to the Main Cabinet. Tighten the screws.
4. Install two wall brackets on the Expansion Cabinet.
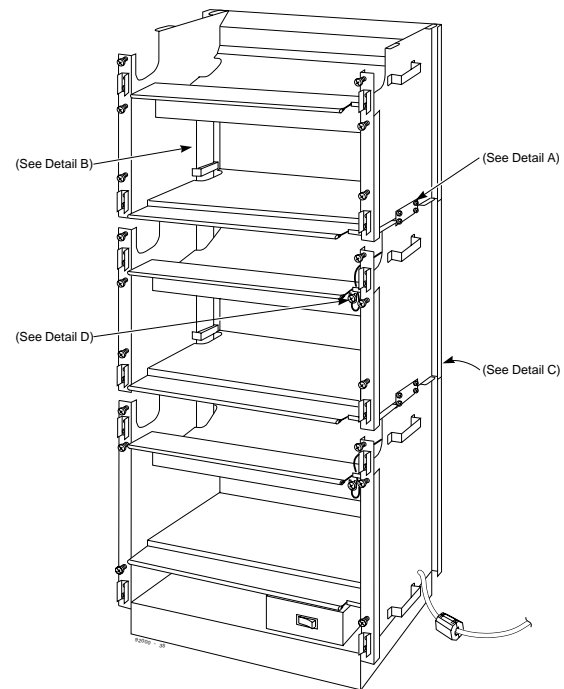
INSTALLING AN EXPANSION CABINET

(See Detail B)

(See Detail A)

(See Detail D)

(See Detail C)

Figure 1-11 INSTALLING AN EXPANSION CABINET
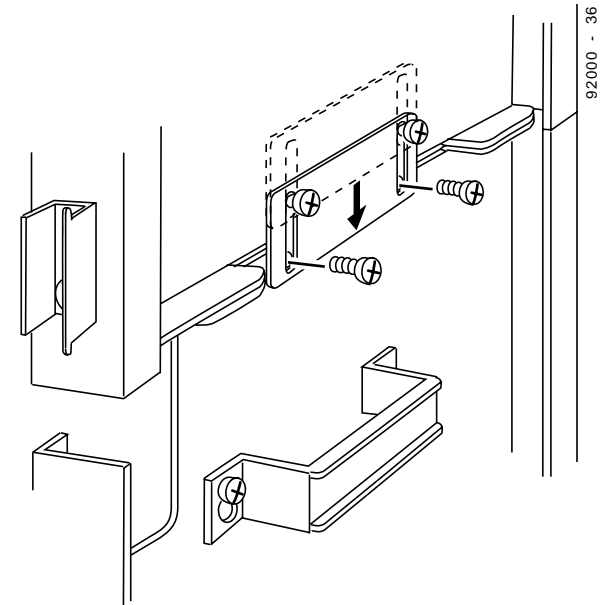

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Figure 1-12 INSTALLING RETAINING BRACKETS (DETAIL A)

1-11

1. Installing Cabinets

INSTALLING AN EXPANSION CABINET

Grounding an Expansion Cabinet
(Figures 1-13 and 1-14)

1. Route the ground wire from the back of the cabinet out through the front.
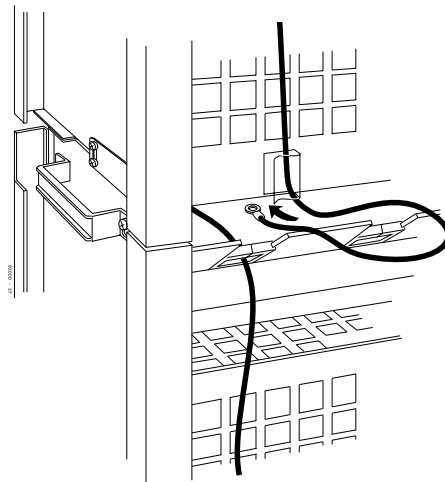

**Figure 1-13 ROUTING THE GROUND WIRE
(DETAIL C)**

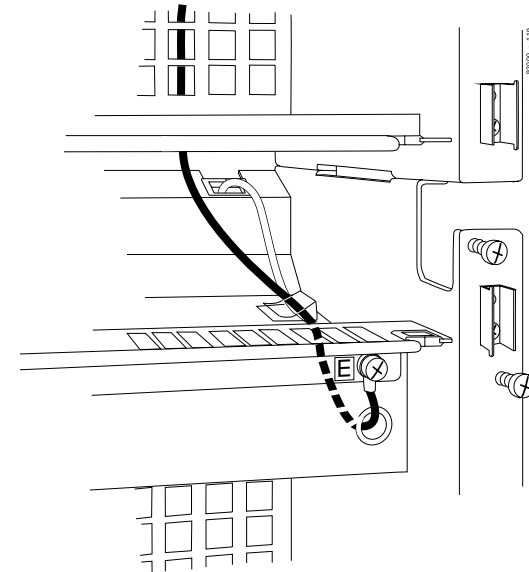2. Connect the Expansion Cabinet ground wire to the ground lug on the front of the Main Cabinet.

**Figure 1-14 CONNECTING TO THE GROUND LUG
(DETAIL D)**

1-12

INSTALLING AN EXPANSION CABINET

Connecting Expansion Cabinet Filter Cables
(Figure 1-15)

1. Loosen packing from filter cables. Remove filter units (if necessary).
2. Connect filter cables from the Expansion Cabinet to the Main Cabinet with the red wire installed at the top of the connector.

Note: Filter cable connectors have push-in tabs to eject the filter cable if it becomes necessary to remove the filter cables.
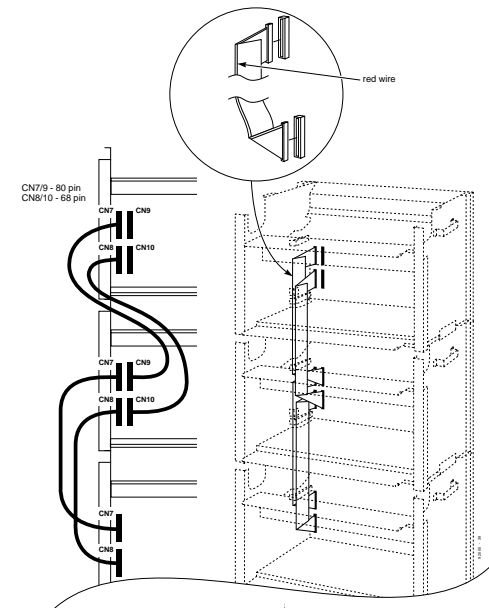

Figure 1-15 FILTER CABLING THE CABINETS (DETAIL B)

1-13

INSTALLING AN EXPANSION CABINET

Installing the Expansion Cabinet Power Supply
(Figure 1-16)

The Expansion Cabinet Power Supply is installed to the right of PCB slot 16/25 in an Expansion Cabinet. The four screws used to secure the power supply are factory-installed on the Expansion Cabinet.

The following are enclosed with the Expansion Cabinet Power Supply:
● 1 3-stranded power cable (BLK-WHT-GRN)
● 1 6.3 amp 250 volt spare fuse

To install/replace the Expansion Cabinet Power Supply:

Note: Remove the Main Cabinet's AC power cord from the AC receptacle.

1. Remove the four power supply mounting screws from the Expansion Cabinet.
2. Insert the Expansion Cabinet power supply into the Expansion Cabinet. Secure the power supply to the Expansion Cabinet by re-inserting and tightening all four screws.
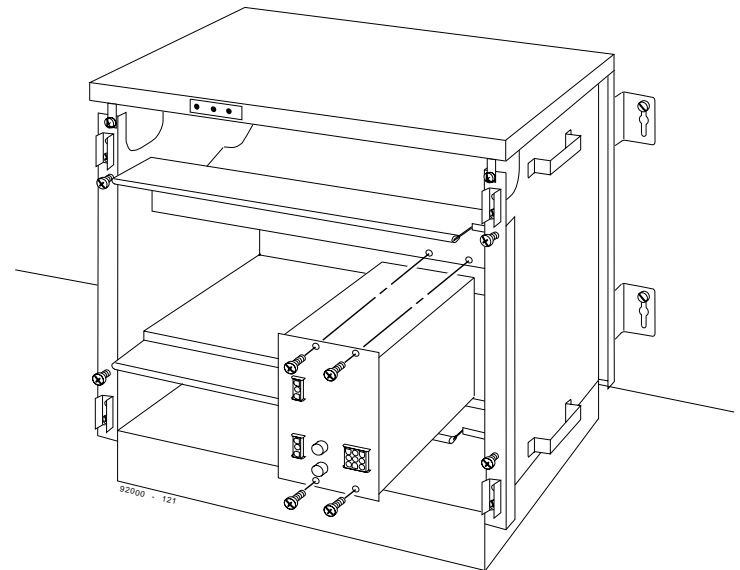

Figure 1-16 INSTALLING THE EXPANSION CABINET POWER SUPPLY

1-14

INSTALLING AN EXPANSION CABINET

Installing Expansion Cabinet Power Supply Cables (Figure 1-17)

Note: Remove the Main Cabinet's AC power cord from the AC receptacle.

1. Plug in the red 9-conductor power cable connected from the Expansion Cabinet backplane connectors CN1 and CN2 to the power supply OUTPUT connector.
2. Insert the Expansion Cabinet Power Supply's 3-pin to 3-pin cable (BLK, WHT, GRN) through the tie wrap on the right side of the Expansion Cabinet.
3. Plug in the Expansion Cabinet power cable's 3-pin cable to the AC IN connector on the Expansion Cabinet power supply.
4. Plug in the Expansion Cabinet power cable's 3-connector end to the Main Cabinet power supply's AC OUT connector.
5. Install ferrite beads (2) on the Expansion Cabinet power supply power cables.
6. Install Expansion Cabinet power supply cable restraint (self-stick adhesive) where needed.
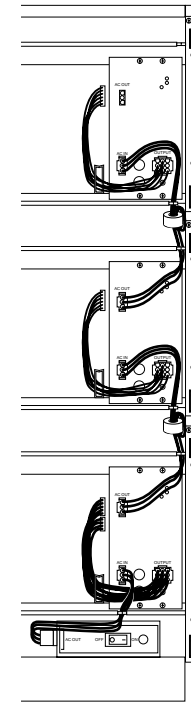

Figure 1-17 INSTALLING POWER SUPPLY CABLES 1-15

1. Installing Cabinets

INSTALLING AN EXPANSION CABINET

Connecting the Expansion Cabinet 5V Power Cable (Figure 1-18)

> **Note:** Remove the Main Cabinet's AC power cord from the AC receptacle.

1. Remove the back cover from the Main Cabinet.
2. Remove the back cover from the Expansion Cabinet.
3. Connect the red 9-conductor power cable to the top 9-pin connector on the back of the Main Cabinet.
4. Connect the other end of the power cable to the lower 9-pin connector on the back of the Expansion Cabinet.
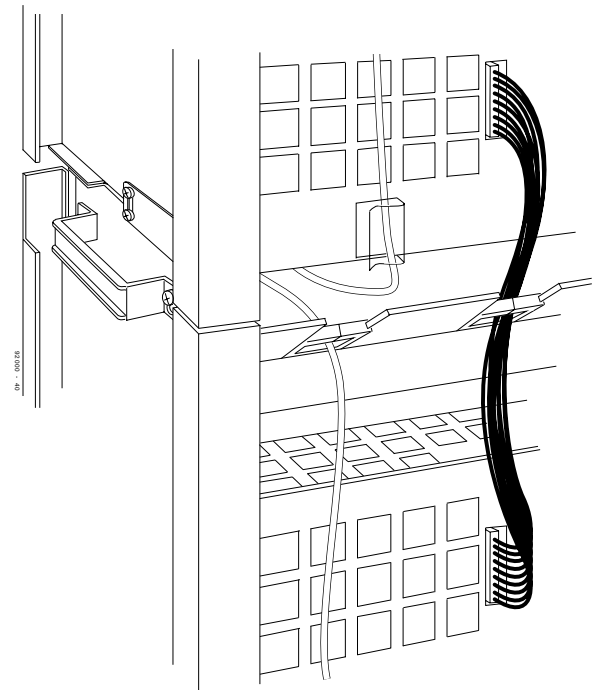

Figurre 1-18 INSTALLING EXPANSION CABINET 5V POWER CABLES   1-16

INSTALLING A RING GENERATOR

Installing a 90V Ring Generator (Figure 1-19)

When installing 8/16ASTU single line circuit PCBs to support the installation of 2500-type analog devices, a 90 VAC ring generator must be connected to the Main Cabinet. The ring generator must be mounted on the MDF within 4 feet of the Main Cabinet.

The ring generator cable (P/N 92111) is terminated with a 4-pin molex connector on one end and has two unterminated leads (RED/BLK) at the other end.

Note: When installing a ring generator cable to a working system, note that the ring generator's unterminated leads have 48 volts AC between them.

To install a ring generator:

1. Install the ring generator according to the manufacturer's instructions.
2. Busy out and remove any PCBs from slots 6 and 7 of the Main Cabinet.
3. Connect the cable's Black lead to the COM terminal of the ring generator.

Figure 1-19 TYPICAL RING GENERATOR CONNECTIONS

1. Installing Cabinets

INSTALLING A RING GENERATOR

Installing a 90V Ring Generator (Cont'd)

4. Connect the cable's Red lead to the +105V terminal of the ring generator.
5. Install the ring generator cable to the CN5 connector on the backplane of the Main Cabinet. The pinch on the system's ring generator cable connector faces the installer's left.
6. Power up the ring generator.
7. Install PCBs to slots 6 and 7 of the Main Cabinet, if necessary.

COMPLETING THE INSTALLATION

Reinstalling the Top Cover (Figure 1-20)

1. Connect the top cover alarm cable.
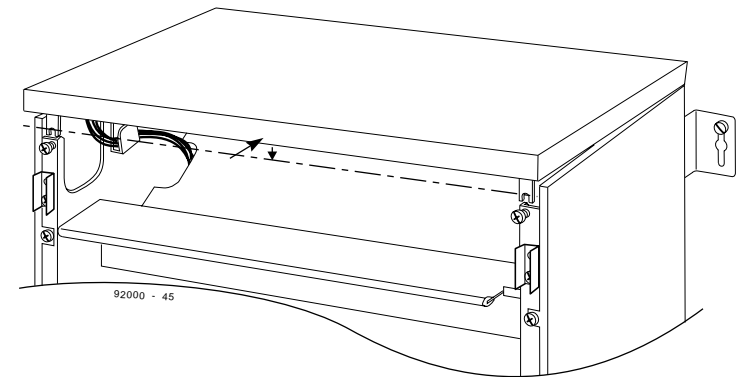2. Install the top cover. Tighten the top cover retaining screws.


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Figure 1-20 RE-INSTALLING THE TOP COVER   1-18

Section 2, PCB INSTALLATION AND STARTUP

**2. PCB Installation
and Startup**

Section 2, PCB INSTALLATION AND STARTUP (cont'd)

PCB LAYOUT

PCB Location (Figure 2-1)

Determine the slot position for each PCB. In the Main Cabinet:
- CPU slot - dedicated for the CPRU
- Slot 1 - dedicated for a 16DSTU

The Main and Expansion Cabinets:
- Slots 2-25 are universal (any type of PCB can be installed)

Use the table below to determine the PCB for each slot.

17	18	19	20	21	22	23	24	25
8	9	10	11	12	13	14	15	16
CPRU	DSTU	2	3	4	5	6	7

Order of Installing Extension PCBs

The order that 8ASTU/16ASTU and 16DSTU PCBs are physically inserted determines the numbering plan.

For example, with a 16DSTU in slot #1 (ext. 301-316), when 3 additional 16DSTU PCBs are installed *in the following order,* the numbering plan below applies:

Order of Install	PCB Slot #	Ext Numbers
1	1	301-316
2	2	317-332
3	4	333-348
4	3	349-364

2. PCB Installation and Startup

PCB LAYOUT

Order of Installing Trunk PCBs

The order that 8ATRU PCBs are physically inserted deter-mines the line circuit numbering plan.

For example, if four 8ATRU's were installed in the Main Cabinet in the following order, the numbering plan below applies:

Order of Install	PCB Slot #	Line Circuits
1	4	1-8
2	5	9-16
3	7	17-24
4	6	25-32

Order of Installing 4ATRU-EMI or 4ATRU-LD PCBs

The order in which the 4ATRU-EMI or 4ATRU-LD1 PCBs are installed determines the assigned line circuit number.

For example, if four 4ATRU-EMI or 4ATRU-LD's are installed in the Main Cabinet *in the following order,* the numbering plan applies:

Order of Install	PCB Slot #	Line Circuits
1	4	1-4
2	5	9-12
3	7	17-20
4	6	25-28

PCB LAYOUT
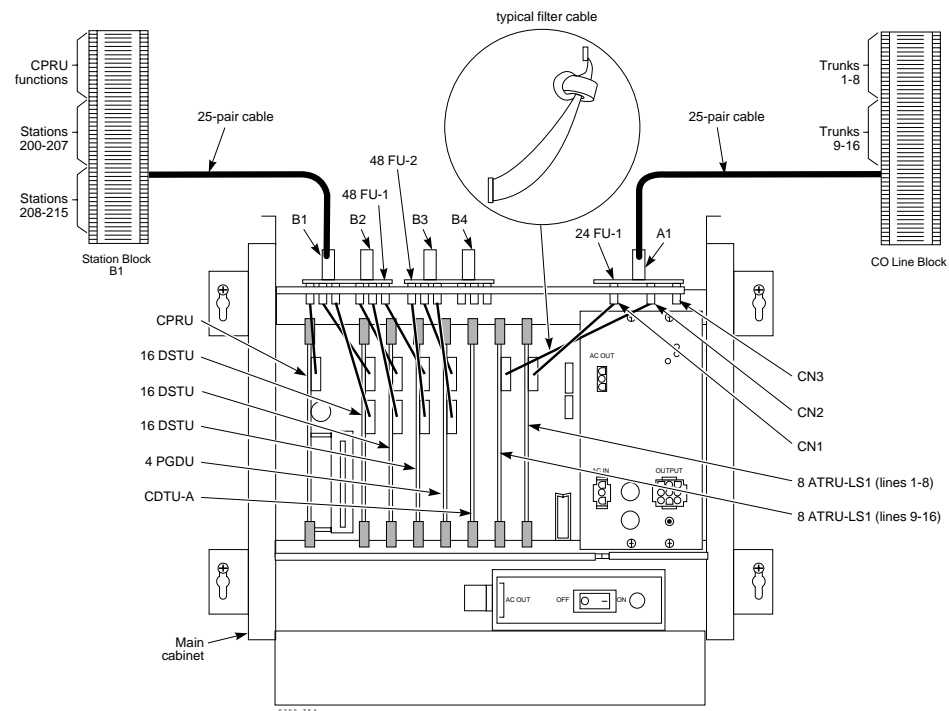
Figure 2-1 TYPICAL PCB LAYOUT

PCB INSTALLATION

Handling the PCBs

The PCBs are sensitive to static discharge. To minimize static discharge, keep PCBs in static free bags when not installed. Observe the following when installing or removing a PCB:
● Ground Main Cabinet and Expansion Cabinets
● Wear a grounded wrist strap to install/remove any PCBs
● Do not touch PCB components. Handle with white pulls.
● All PCBs can be installed hot (*except the CPRU*)

"Busying out" Extension/Line PCBs

The run/block switch on extension/trunk PCBs "busies out" idle circuits. Extensions/lines cannot make a call or be called. The PCB can be pulled out without interrupting a call in progress. Calls in progress before the PCB is "made-busy" are not affected.

An extension/line PCB - PLT status LED:
● Normally flashes
● Lights steady when "made-busy" with an extension/line in use
● Goes out when the all extensions/lines are "made-busy" (idle)

Installing an Extension or Trunk PCB

To install an extension/trunk PCB with the system running:
● Set the run/block switch **DOWN**
● Insert the PCB
● Set the run/block switch **UP**. The PLT status LED starts flashing when the PCB starts processing (15 seconds).

Removing an Extension or Trunk PCB

To remove an extension/trunk PCB with the system running:
● Set the run/block switch **DOWN**
● When the PLT LED stops flashing, all extensions/trunks are idle. Remove the PCB.

Uninstalling a PCB Slot through Software

The installer can turn off (busy out) and delete (remove from software) PCB slots in the Main and Expansion Cabinets in programming for port re-numbering purposes. Deleting a PCB may effect PCB slot programming capability. Refer to Program 0006 in the Software Manual for further details.

PCB INSTALLATION

CPRU Description (Figure 2-2)

One CPRU PCB must be installed in the CPU slot in the Main Cabinet.

The CPRU provides the following:
● Eight diagnostic LEDs
● Two DIP switches- one for data loading (RAM or disk)
                    - one not used
● One relay for Night Mode Switch
● One 10-pin connector (CN2) for CPRU to 48FU connection
● One 3V lithium non-rechargeable battery - RAM backup
● One 6-pin connector for terminal programming (future)
● One MOH source "S" jumper (internal/external)
● One BGVR potentiometer for BGM volume control
● One HTVR potentiometer for MOH volume control
● One RES reset switch (warm boot)
● One factory-installed 3 1/2" disk drive for the system software disk
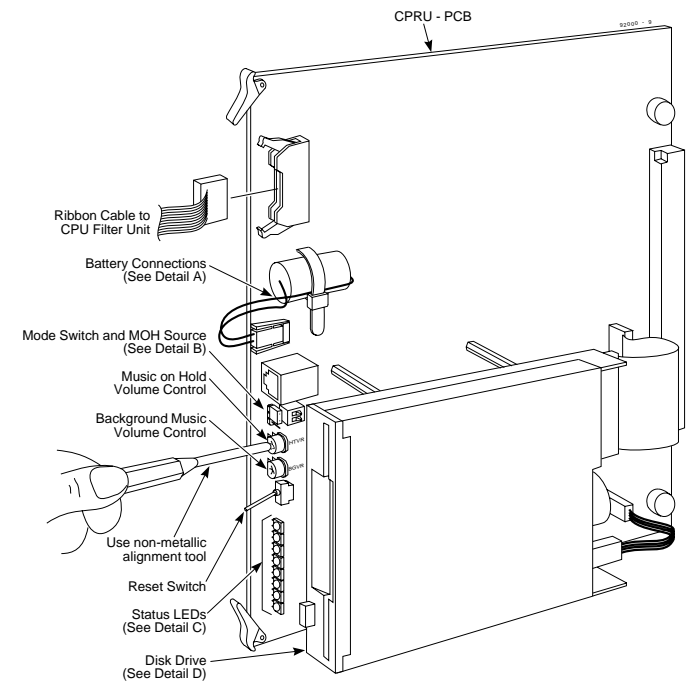
Figure 2-2 CPRU PCB

2. PCB Installation and Startup

PCB INSTALLATION

CPRU Installation (Figures 2-3 through 2-7)

1. Install the battery on the CPRU using the tie wrap.
2. Connect the battery to the BAT connector with the red wire up (Figure 2-3).
3. Insert the CPRU into the CPU slot in the Main Cabinet (Figure 2-4).

4. Set the MOH jumper for internal/external MOH source (Figure 2-5). Use the HTVR potentiometer to adjust MOH volume.

Note: When the S jumper is set for internal MOH, and an external MOH source is connected to the MISC block or to a 3ACI, external MOH is sent to trunks programmed to receive external MOH.

Red

BAT

Snap into ridges

Black
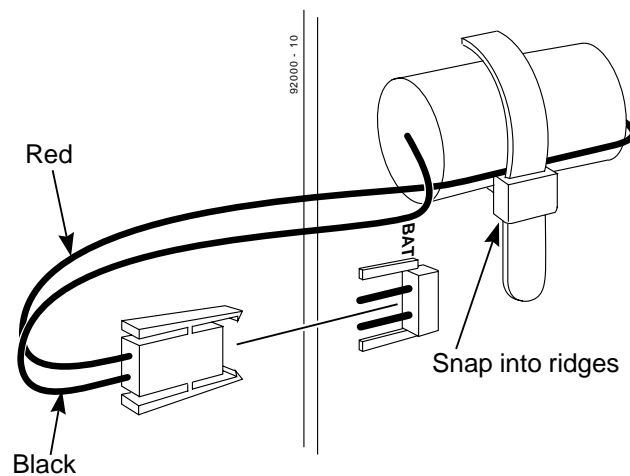
Figure 2-3 CPRU BATTERY INSTALLATION
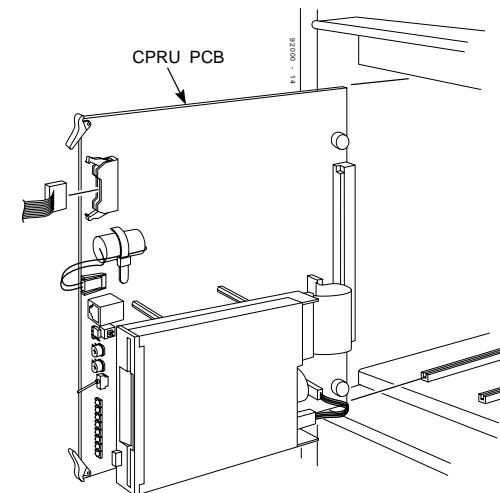
CPRU PCB

Figure 2-4 INSERTING THE CPRU

2-8

PCB INSTALLATION

5. Set DIP switch 1 **ON** for system data and customer programming data loaded from the disk. Set DIP switch 1 **OFF** for system data from disk and customer programming data loaded from RAM.
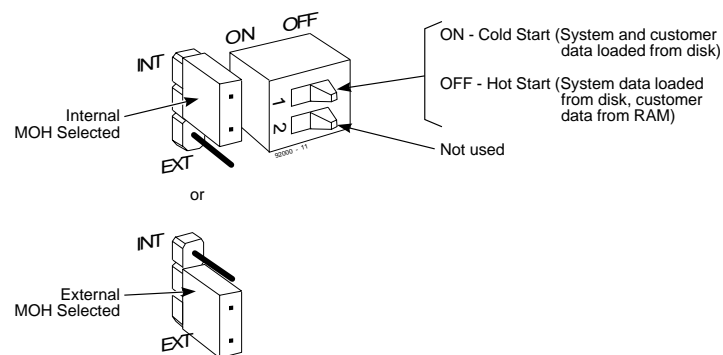
Figure 2-5 SETTING MOH SOURCE AND SYSTEM DATA SOURCE

6. Insert the software disk into the disk drive (Figure 2-6).
7. Install the 10-pin to 16-pin filter cable after 48FU installation.
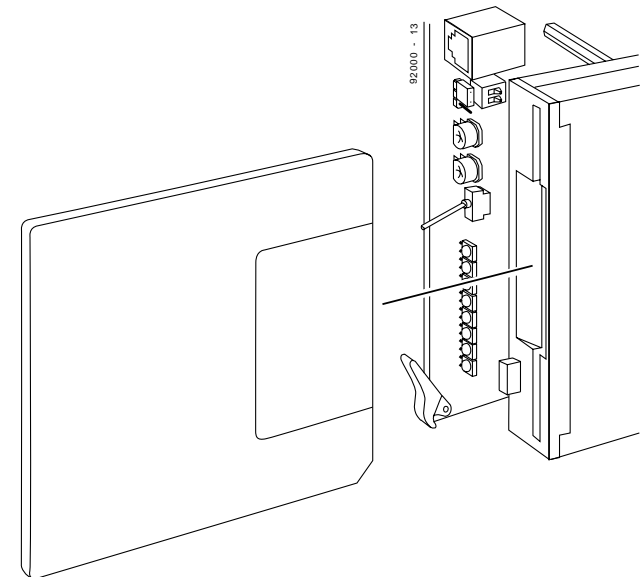
Figure 2-6 INSTALLING THE SYSTEM DISK

2. PCB Installation and Startup

PCB INSTALLATION

16DSTU Description

The 16DSTU PCB provides:
- 16 digital extension circuits
- 16 extension status LEDs
- One 16-pin connector(s) for 48FU filter unit connection
- One PCB status LED
- One run/block switch

16DSTU Installation (Figure 2-7)

To install a 16DSTU PCB:

1. Set the run/block switch **DOWN.**
2. Install the 16DSTU into a slot.
3. Install the 16-pin filter cable(s) after 48FU installation.
4. Set the 16DSTU run/block switch **UP**.

16 Digital Station Card

CN2

Circuits for
Stations 1-8

To 48FU
Filter Unit

Circuits for
Stations 9-16

To 48FU
Filter Unit

CN3

Status LED
(Normally flashing)

RUN

Switch Up - PCB On Line

Switch Down - PCB Off Line
(Blocked)

Station 1

Station 16

If LED is...	Associated Station is...
Off	Connected and idle
Flashing	Not installed
On	Off hook
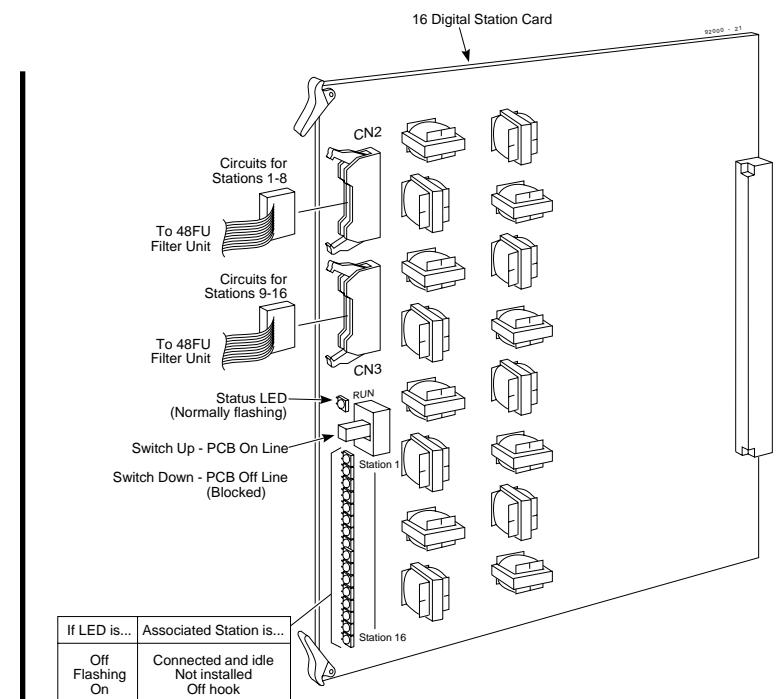
Figure 2-7 16DSTU INSTALLATION

2-10

PCB INSTALLATION

8ASTU/16ASTU Description

The ASTU PCB provides:

- 8/16 analog extension circuits
- 8/16 extension status LEDs
- one/two 16-pin connectors for 48FU filter unit connection
- one PCB status LED
- one run/block switch

8ASTU/16ASTU Installation (Figure 2-8)

1. Set the run/block switch **DOWN.**
2. Install the ASTU into the slot.
3. Install the 16-pin filter cable(s) after 48FU installation.
4. Set the ASTU's run/block switch **UP.**

Analog Station PCB

Circuits for
Stations 1-8

To 48FU
Filter Unit

CN2

Status LED
(Normally flashing)

RUN

Switch Up - PCB On Line

Switch Down - PCB Off Line
(Blocked)

Station 1   BLK

Station 8

If LED is...	Associated Station is...
Off	Connected and idle
Flashing	Not installed
On	Off hook

92000 - 57

Figure 2-8 ASTU INSTALLATION

2-11

**2. PCB Installation
and Startup**

PCB INSTALLATION

8ATRU-LS1 Description

The 8ATRU-LS1 PCB provides:
- 8 analog loop start line/trunk circuits
- 8 trunk status LEDs
- Six 2/3 pin jumpers for ground start or PF operation
- One 16-pin connector for 24FU filter unit connection
- One PCB status LED
- One run/block switch

8ATRU-LS1 Installation (Figure 2-9)

Note: Refer to instructions for the GSAU (ground start) or PFTU (power failure) PCBs if either is required before installing the 8ATRU.

1. Set the run/block switch **DOWN**.
2. Install the 8ATRU-LS1 into a slot.

Note: Jumpers on connectors CN4 and CN5 must be installed when ground start operation or PF operation is not required.

3. Install the 16-pin filter cable(s) after 24FU installation.
4. Set the 8ATRU-LS1 run/block switch **UP.**

Analog Trunk PCB

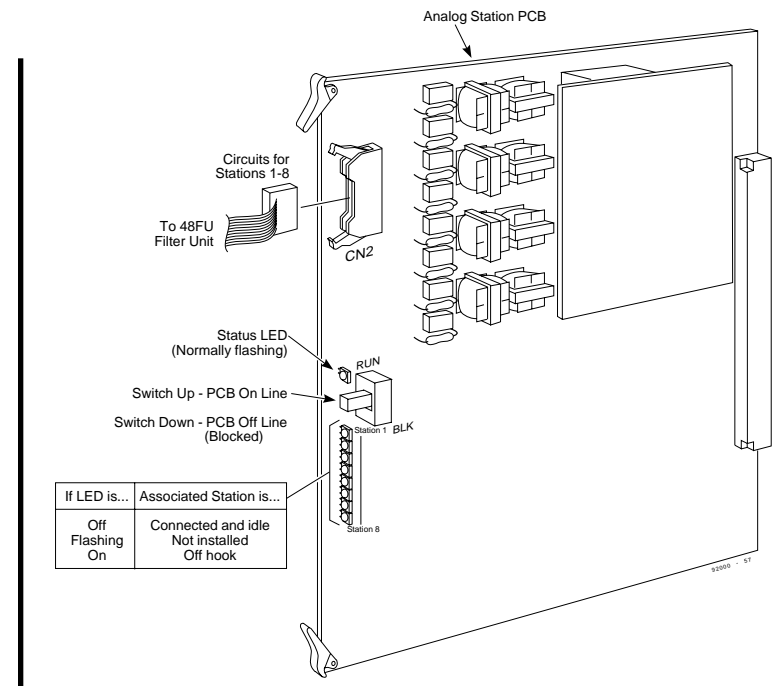Circuits for Trunks 1-8

To 24FU Filter Unit

CN1

Status LED (Normally flashing)

RUN

Switch Up - PCB On Line

Switch Down - PCB Off Line (Blocked)

BLK

Trunk 1

Trunk 8

If LED is...	Associated Trunk is...
On	In use
Off	Idle
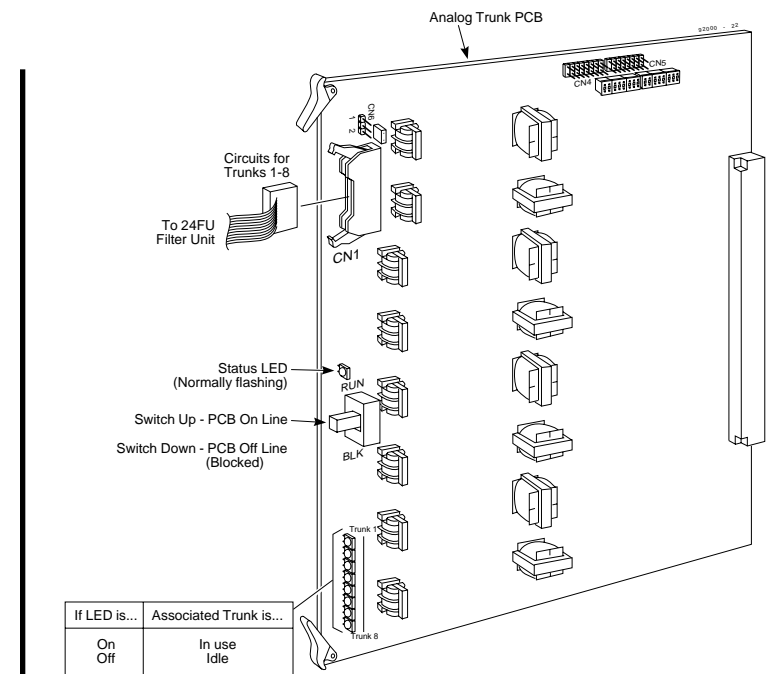
Figure 2-9 8ATRU-LS1 INSTALLATION

PCB INSTALLATION

8GSAU Description

The GSAU PCB provides 8 analog ground start line/trunk circuits.

Note: When a GSAU PCB is installed, loop start operation and PF operation cannot be used.

8GSAU Installation (Figures 2-10 and 2-11)

1. If the 8ATRU-LS1 is installed: Set the 8ATRU-LS1 run/block switch UP, remove the 16-pin filter cable(s) from the 8ATRU-LS1, and remove the PCB from the cabinet.
2. Remove all six jumpers from connectors CN4 and CN5 from the 8ATRU-LS1.

Ground Start
Module

J2

J1

92000 - 22B
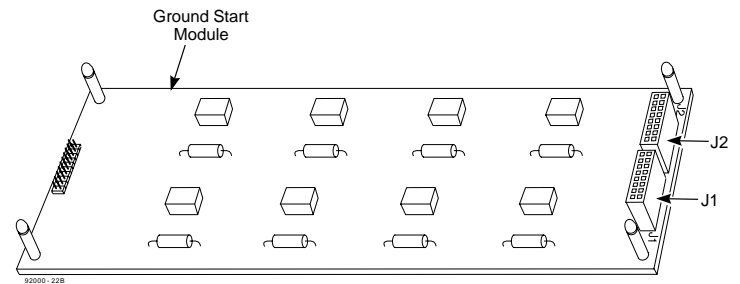
Figure 2-10 THE GSAU GROUND START TRUNK PCB

**2. PCB Installation
and Startup**

PCB INSTALLATION

8GSAU Installation (cont'd)

3. Install the GSAU on the 8ATRU-LS1. GSAU jumper J1 (female) plugs into 8ATRU-LS1 CN4 (male). GSAU jumper J2 (female) plugs into 8ATRU-LS1 CN5 (male). GSAU jumper J3 (male) plugs into 8ATRU-LS1 CN3 (female).
4. Install the 8ATRU-LS1 into a PCB slot.
5. Set the run/block switch UP.
6. Install the filter cable to the 24FU.

8ATRU

Circuits for Trunks 1-8

To 24FU Filter Unit

CN1

Status LED (Normally flashing)

Switch Up - PCB On Line

Switch Down - PCB Off Line (Blocked)

RUN

BLK

Trunk 1

Trunk 8

If LED is...	Associated Trunk is...
On	In use
Off	Idle

GSAU

Figure 2-11 INSTALLING THE GSAU

PCB INSTALLATION

4ATRU-LD1 Direct Inward Dial (DID) PCB Description

The 4ATRU-LD1 DID Trunk PCB provides:
- 4 DID trunk circuits
- 4 DID trunk status LEDs
- One 16-pin connector for 24FU filter unit connection
- One PCB status LED
  One run/block switch

4ATRU-LD1 Installation (Figure 2-12)

1. Set the run/block switch **DOWN.**
2. Install the 4ATRU-LD1 into a slot.
3. Install the 16-pin filter cable after 24FU installation.
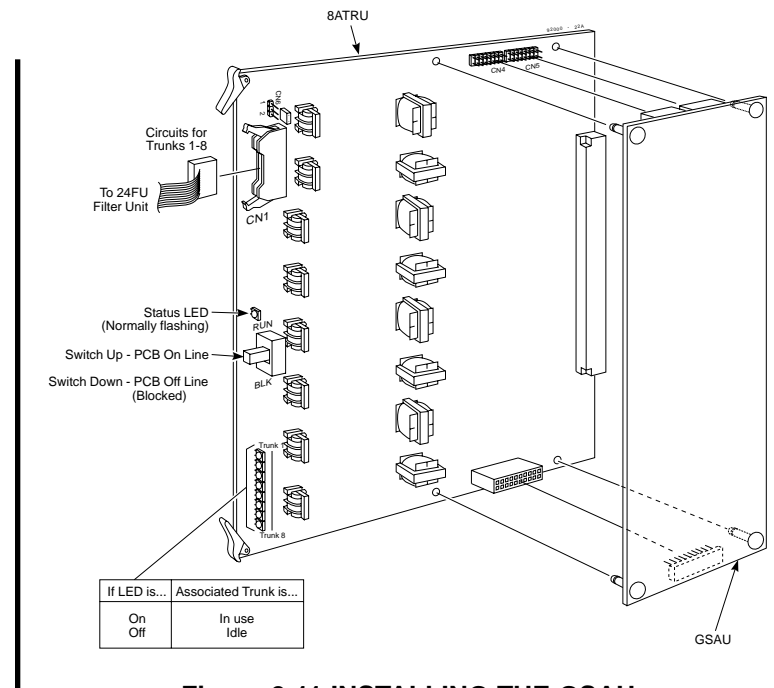4. Set the run/block switch **UP.**

DID Trunk PCB

920 - 163a

Circuits for
DID Trunks 1-4

To 24FU
Filter Unit

CN2

Status LED
(Normally flashing)

Switch Up - PCB On Line

Switch Down - PCB Off Line
(Blocked)

RUN

BLK

Trunk 1

Trunk 4

If LED is...	Associated Trunk is...
On	In use
Off	Idle

Figure 2-12 4ATRU-LD1 INSTALLATION

2. PCB Installation and Startup

PCB INSTALLATION

4ATRU-EMI Tie Line PCB Description

The 4ATRU-EMI Tie Line PCB provides:
- 4 Tie line circuits
- 4 Tie line status LEDs
- One 16-pin connector for 24FU filter unit connection
- One PCB status LED
- One run/block switch

4ATRU-EMI Installation (Figure 2-13)

1. Set the run/block switch **DOWN**.
2. Install the 4ATRU-EMI into a slot.
3. Install the 16-pin filter cable after 24FU installation.
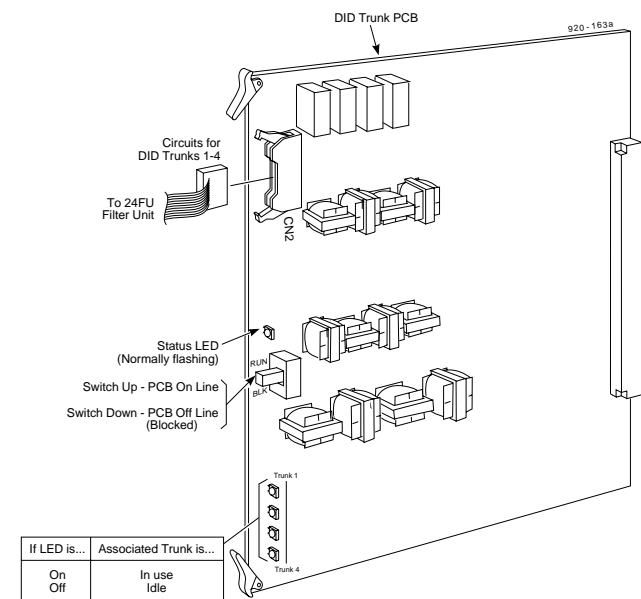4. Set the run/block switch **UP.**

If LED is...	Associated Trunk is...
On	In use
Off	Idle

Tie Trunk PCB

Circuits For
Tie Trunks 1-4

Status LED
(Normally Flashing)

Switch Up - PCB On Line
Switch Down - PCB Off Line
(Blocked)

Trunk 1

Trunk 4

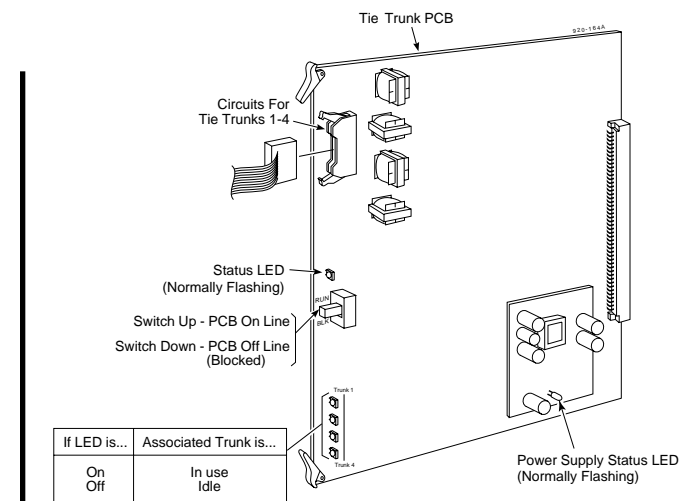Power Supply Status LED
(Normally Flashing)

Figure 2-13 4ATRU-EMI TIE LINE PCB INSTALLATION

PCB INSTALLATION

4PGDU Description

- 8 alarm/fax sensors
- 4 external page or door box circuits
- 4 potentiometers for External Page/Door Box volume control
- 4 switches to determine page/door box circuit function
- 4 dedicated dry relay contacts for page/door box operation
- Two 16-pin connectors for 48FU filter unit connection
- One PCB status LED

4PGDU Installation (Figure 2-14)

1. Set switches SW1-4 according to circuit type required.

Note: Dip switches are read top (1) to bottom (4) upon power up.

2. Install the 4PGDU into the slot.
3. Install the 16-pin filter cable(s) after 48FU installation.

Note: Use VR1-VR4 to adjust volume Door Box/Ext Page volume.
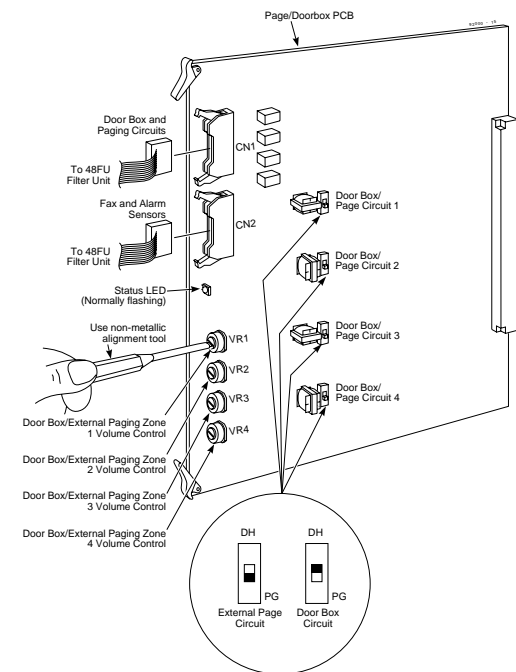
Figure 2-14 4PGDU INTALLATION

PCB INSTALLATION

CDTU Description

The CDTU-A PCB provides:
- 16 DTMF receiver/dialtone detection circuits
- Conference circuits to allow 4 four-party or 2 eight-party conferences
- One PCB status LED

The CDTU-B PCB provides:
- 16 DTMF receiver/dialtone detection circuits
- One PCB status LED

The CDTU-C PCB provides:
- Conference circuits to allow 4 four-party or 2 eight-party conferences
- One PCB status LED

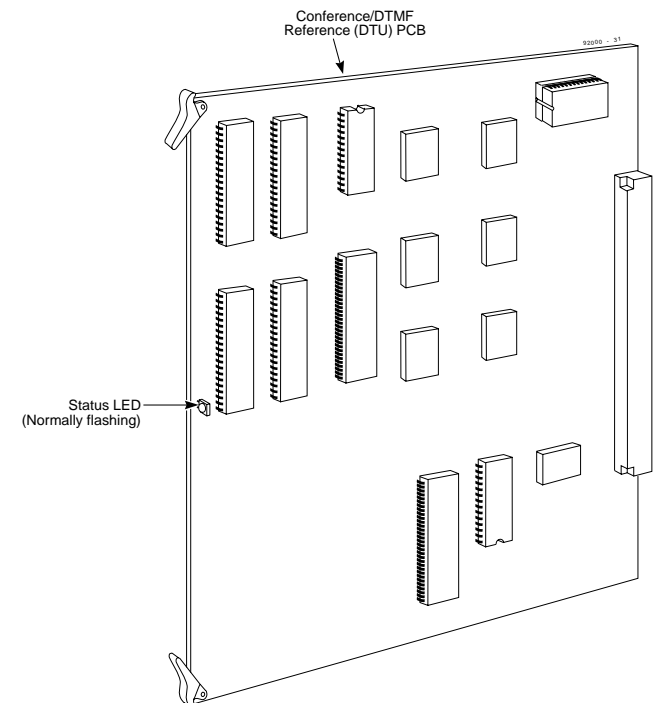## CDTU Installation (Figure 2-15)

1. Install the CDTU into any slot.

Conference/DTMF
Reference (DTU) PCB

92000 - 31

Status LED
(Normally flashing)

Figure 2-15 CDTU INSTALLATION

PCB INSTALLATION

4PFTU Description

When commercial power fails, the 4PFTU automatically bridges four lines from an 8ATRU to a designated 48FU PF block. The PF block must be equipped with single line telephones. One 4PFTU can be installed per cabinet.

Note: When a PFTU PCB is installed, ground start operation cannot be used.

4PFTU Installation (Figure 2-16)

To install the 4PFTU PCB:
1. Remove the filter cable from the 8ATRU PCB to be equipped with the 4PFTU (if necessary).
2. Remove the 8ATRU from the cabinet (if necessary).
3. Remove the 3 jumper straps from the CN4 connector on the 8ATRU.
4. Install the 4PFTU on the 8ATRU.
5. Install the 8ATRU into the cabinet.
6. Connect the 4PFTU filter to the corresponding 48FU filter unit.
7. Install the filter cable from the 8ATRU to a 24FU.
8. Install a single line set to each power failure output on the 48FU filter unit.

Power Failure Card

Figure 2-16 4PFTU INSTALLATION

2-19

2. PCB Installation and Startup

PCB STARTUP

Initial PCB Installation

When first installing the system:

1. Insert the CPRU PCB into the CPU slot.
2. Insert the software disk into the CPRU PCB.
3. Insert a 16DSTU PCB in slot 1 of the Main Cabinet.
4. Power up the system.
5. Set the run/block switch **UP** on the DSTU in slot 1.
6. After setting the run/block switch **DOWN** for all ASTU/DSTU PCBs, insert ASTU/DSTU PCBs in the Main Cabinet in sequential order.

   The order that 8ASTU/16ASTU and 16DSTU PCBs are physically inserted determines the numbering plan. *The installer must install extension PCBs in order (ie; slot 1 first, slot 2 next, slot 3 next, etc.) for a sequential numbering plan.*

For example, with a 16DSTU in slot #1 (ext. 301-316), when 3 more 16DSTU PCBs are installed in the following order, the numbering plan below would apply:

Order of Install	PCB Slot #	Ext Numbers
1	1	301-316
2	2	317-332
3	4	333-348
4	3	349-364

7. Set the run/block switch **UP** on each PCB.

PCB STARTUP

Initial Installation of Trunk PCBs
When first installing the system:

1. Set the run/block switch **DOWN** on all 8ATRU, 4ATRU-EM, or/4ATRU-LD PCBs.

2. Insert all other ATRU PCBs in sequential order. *The installer must install trunk PCBs in order (ie; slot 5 first, slot 6 next, slot 7 next, etc.) for a sequential numbering plan*

   The order that 8ATRU PCBs are physically inserted determines the numbering plan. For example, if four 8ATRU's are installed *in the following order,* the numbering plan below would apply:

Order of Install	PCB Slot #	Line Circuits
1	4	1-8
2	5	9-16
3	7	17-24
4	6	25-32

3. Set the run/block switch UP on each ATRU PCB.

Installing 4ATRU-EMI or 4ATRU-LD PCBs

The order in which the 4ATRU-EMI or 4ATRU-LD1 PCBs are installed determines the assigned line circuit number. Installing a 4ATRU-EMI or 4ATRU-LD in slot 7 first provides tie lines or DID circuits 1-4.

For example, if four 4ATRU-EMI or 4ATRU-LD's are installed *in the following order*, the numbering plan below would apply:

Order of Install	PCB Slot #	Line Circuits
1	4	1-4
2	5	9-12
3	7	17-20
4	6	25-28

2. PCB Installation and Startup

INSTALLING FILTER UNITS

48FU Filter Unit Description

The 48FU filter unit provides:
- Six 16-pin connectors for CPRU, ASTU, DSTU, and PGDU connection
- Two 50-pin amphenol-type connectors for extension, auxiliary equipment, and page/door box/alarm connection

Note: Only internal devices may be connected to this connector.

48FU Installation (Figures 2-17 and 2-18)

1. Install a 25-pair cable(s) into the 48FU amphenol connector(s).
2. Secure the 25-pair cable(s) using a tie wrap.
3. Insert the 48FU into the appropriate slot on top of the cabinet. Push the 48FU down onto the plastic standoffs.
4. Install filter cables to CPRU, DSTU, ASTU, and PGDU PCBs as needed.

Insert tab into slot.

Close ejector tabs before inserting through slots.
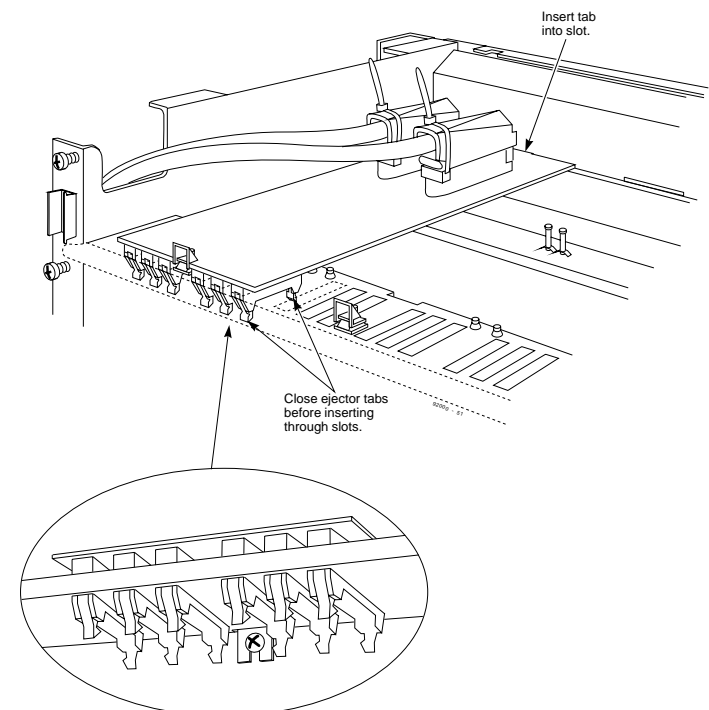
Figure 2-17 TYPICAL 48FU INSTALLATION

INSTALLING FILTER UNITS

Removing a 48FU (Figure 2-18)

1. Remove all filter cables from the 48FU.
2. Remove amphenol cables from the 48FU.
3. Pinch the plastic standoff on each side of 48FU using needlenose pliers.
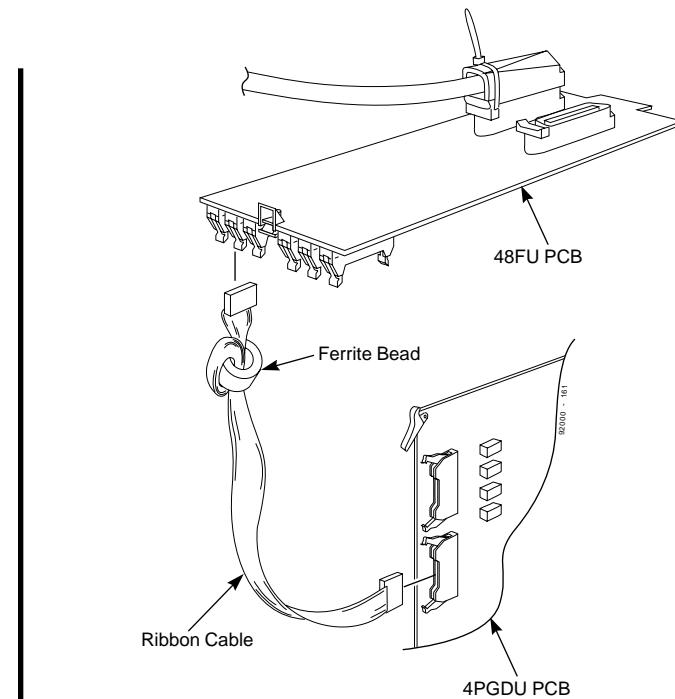4. Pull the board gently off the standoffs and out of the cabinet.

48FU PCB

Ferrite Bead

Ribbon Cable

4PGDU PCB

Figure 2-18 48FU FILTER CABLE INSTALLATION

INSTALLING FILTER UNITS

24FU Filter Unit Description

The 24FU filter unit provides:
- Three 16-pin connectors for 8ATRU, 4PFTU, 4ATRU-EM, or 4ATRU-LD connection
- One 50-pin amphenol connector for CO/PBX line connection

24FU Installation (Figures 2-19 and 2-20)

1. Insert the 24FU into the appropriate slot on top of the cabinet. Push the 24FU down onto the plastic standoffs.
2. Install a 25-pair CO/PBX line cable into 24FU amphenol connector.
3. Secure the 25-pair cable using a tie wrap.

Note: When a 24FU filter unit must be installed or removed, use needlenose pliers to pinch the plastic standoff on each side of 24FU, and pull the board gently off the standoffs and out of the cabinet.
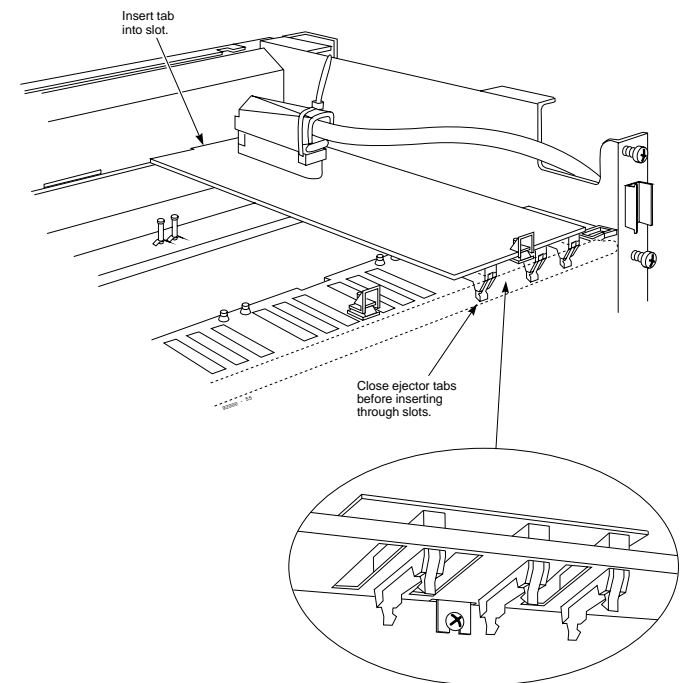
Figure 2-19 TYPICAL 24FU FILTER UNIT INSTALLATION

INSTALLING FILTER UNITS

4. Install filter cables to 8ATRU, 4PFTU, 4ATRU-EM, and
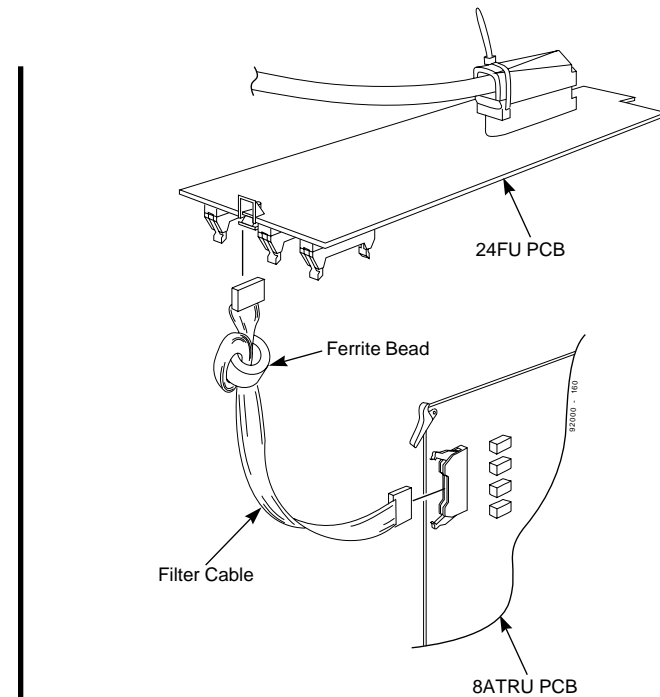   4ATRU-LD PCBs as needed.

24FU PCB

Ferrite Bead

Filter Cable

8ATRU PCB

Figure 2-20 24FU FILTER CABLE INSTALLATION

Section 3, INSTALLING EXTENSIONS AND TRUNKS

**3. Installing
Extensions and Trunks**

INSTALLING 25-PAIR CABLES

Installing 25-Pair Cable Guides (Figure 3-1)

The Main Cabinet is equipped with two 25-pair cable guides on the right side. When installing a single cabinet system, remove the 25-pair cable guide and screws on the top right side and install it on the lower left side of the Main Cabinet.

Each Expansion Cabinet is equipped with one 25-pair cable guide on top of the right side. The first Expansion Cabinet's cable guide should remain as is.

Remove the second Expansion Cabinet's cable guide and screws and install on the top left side of the first Expansion Cabinet.

Routing 48FU 25-pair Cables (Figure 3-1)

It is recommended to install extension blocks to the left of each cabinet to allow access to 48FU filter units, 25-pair cables, filter cables, and extension PCBs for expansion or troubleshooting. Run 25-pair cables from 48FU filter units over plastic protectors on the left side of the cabinet and through 25-pair cable guides on the lower left side of the cabinets.

Routing 24FU 25-pair Cables (Figure 3-1)

It is recommended to install trunk blocks to the right of each cabinet to allow full access to 24FU filter units, and 25-pair cables, filter cables, and PCBs for expansion or troubleshooting. Run 25-pair cables from 24FU filter units over plastic protectors on the right side of the cabinet and through 25-pair cable guides on the lower right side of the cabinets.

Installing Extension Cross-Connect Blocks

It is also recommended to install cross-connect blocks for each of the system's major extension port device groups (16 pins). Cross-connect blocks provide an easy way to troubleshoot, determine port identification numerically, and determine port utilization.

All major extension port devices must be bridged from the cross-connect blocks to station (B) blocks in groups of eight (16 pins). Each 48FU trunk filter unit interfaces with 8ASTU, 16ASTU, or 16DSTU extension PCBs using a 16-pin filter cable.

Install cross-connect blocks for the following 48FU interfaces:
- All digital extension circuits
- CPRU functions (ie; BGM, MOH, Night mode switch, relay 1)
- External page
- External alarms
- Data devices

3-2

INSTALLING 25-PAIR CABLES

Installing Trunk Cross-Connect Blocks

It is also recommended to install cross-connect blocks for each of the system's major trunk device groups. Cross-connect blocks provide an easy way to troubleshoot, determine port identification numerically, and determine trunk port utilization.

All major trunk port devices must be bridged from the RJ21X to trunk cross connect blocks in groups of eight (16 pins). Each 24FU trunk filter unit interfaces with 8ATRU trunk port PCBs using a 16-pin filter cable.

Install cross-connect from the RJ21X to the trunk cross-connect blocks for the following in groups of eight:
- analog loop start lines
- analog ground start trunks
- DID trunks (four circuits per PCB)
- Tie lines (four circuits per PCB)

Note: The system's DID trunk and Tie line PCBs interface four DID or Tie line circuits per PCB. The remaining four circuits from the trunk port slot are not used.
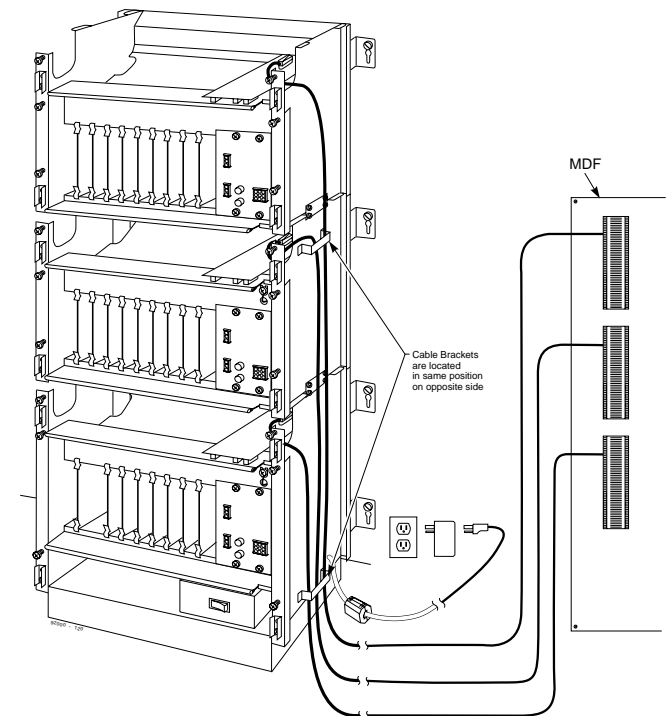

MDF

Cable Brackets are located in same position on opposite side

Figure 3-1 TYPICAL TRUNK CABLING LAYOUT

3-3

INSTALLING EXTENSIONS

Key Extension Cabling (Figure 3-2)

Each key extension requires one-pair twisted station cable from the MDF to the modular jack. A maximum of 48 extensions can be installed per 50-pin connector on each 48FU filter unit.

To connect key station cabling:
1. Punch down one pair 24 AWG station cable for each key telephone to a cross-connect block.
2. Run one-pair cross-connect from the cross-connect block to the extension (B) block for each extension.
3. Connect the extension (B) block's 25-pair cable to he corresponding 48FU filter unit.
4. Install bridging clips on the extension (B) block.

Installing a Key Telephone (Figure 3-2)

1. Install a modular jack for each extension. The modular jack should be within six feet of the phone.
2. For each extension, run one-pair 24 AWG station cable from the cross-connect block to a modular jack. Ground the unused pair.
3. Terminate the extension leads to GRN/RED of the modular jack. Terminate the unused leads to the jack.
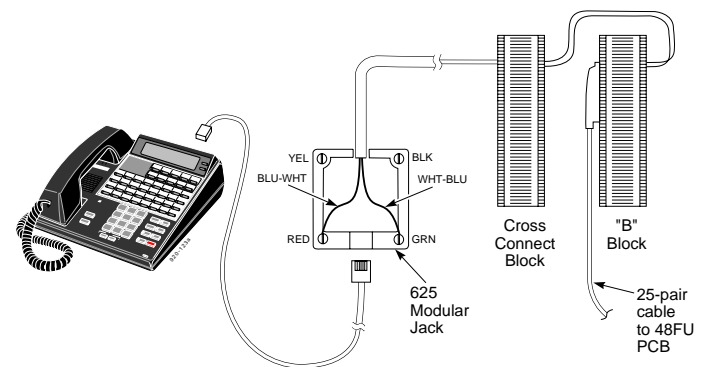

Figure 3-2 INSTALLING A KEY TELEPHONE

3-4

INSTALLING SINGLE LINE TELEPHONES

Single Line Extension Cabling

Each single line extension requires one-pair twisted station cable from the MDF to the modular jack. A maximum of 48 extensions can be installed per 50-pin connector on each 48FU.

A 90-105 VAC ring generator must be connected to the Main Cabinet to provide ringing to single line sets.

To connect station cabling:
1. Punch down one pair 24 AWG station cable for each single line telephone to a cross-connect block.
2. Punch down cross-connect from the clips on the cross-connect block to their corresponding clips on the extension (B) block.
3. Connect the extension (B) block's 25-pair cable to the corresponding 48FU filter unit.
4. Install bridging clips on the extension (B) block.

Installing a Single Line Telephone

To install a single line telephone:
1. Install a modular jack for each single line telephone. The modular jack should be within six feet of the phone.
2. For each extension, run one-pair 24 AWG station cable from the cross-connect block to a modular jack.
3. Terminate the extension leads to GRN/RED of the modular jack. Terminate the unused leads to the jack.
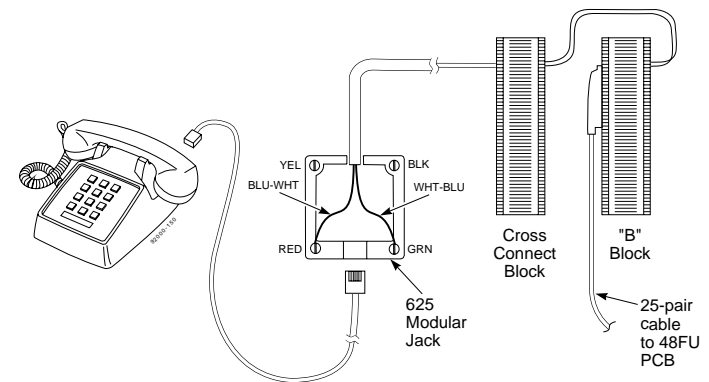

Figure 3-3 INSTALLING A SINGLE LINE TELEPHONE

EXTENSION CUTDOWN SHEET

Extension Cutdown Sheet Configuration
(Figure 3-4 and 3-5)

Due to the inherent flexibility of the universal PCB slot configuration, standard cutdown sheets for extension cabling do not apply.

Note: The order that the extension PCBs (8/16ASTU, 16DSTU) are installed determines the assigned extension number.

For example, given that a 16DSTU is installed in slot #1 and uses extension numbers 301-316, if three 16D/ASTU PCBs were installed in the Main Cabinet in the order below, the numbering plan would correspond as follows:

Order of Install	PCB Slot #	Ext Numbers
1	1	301-316
2	2	317-332
3	4	333-348
4	3	349-364

To determine extension assignments for the system cutdown, the installer must identify the following in order:

- Order of installation
- Cabinet (Main, Exp1, Exp2)
- Slot used
- PCB type (8ASTU, 16ASTU, 16DSTU, PGDU)
- 48FU filter unit
- 48FU 16-pin connector (upper, lower)
- Amphenol connector (B1, B2)

To determine where any group of eight extensions is installed, note the order of install, cabinet, slot, filter unit, amphenol (B) connector used, and PCB type.

On the following page is the extension cutdown sheet (Figure 3-4). Make as many copies as you need. Be sure to keep careful records of your installation. Refer to the sample extension cutdown sheet (Figure 3-5) if you need help completing Figure 3-4.

Figure 3-4

☐ MAIN ☐ EXP 1 ☐ EXP 2
☐ 48 FU1 ☐ 48 FU2 ☐ 48 FU3 ☐ 48 FU4
☐ B1 ☐ B2

CONN PIN	BLOCK TERM	COLOR CODE	FUNCTION	PCB ID
26	1	WHT-BLU		——— Order Of Install
1	2	BLU-WHT		
27	3	WHT-ORN		——— Slot #
2	4	ORN-WHT		
28	5	WHT GRN		☐ 8 ASTU UPPER
3	6	GRN-WHT	PLACE	
29	7	WHT-BRN	STICKER	☐ 16 ASTU LOWER
4	8	BRN-WHT	HERE	
30	9	WHT-SLT		☐ 16 ASTU UPPER
5	10	SLT-WHT		
31	11	RED-BLU		☐ 16 DSTU LOWER
6	12	BLU-RED		
32	13	RED-ORN		☐ 16 DSTU UPPER
7	14	ORN-RED		
33	15	RED-GRN		☐ PG LOWER
8	16	GRN-RED		☐
34	17	RED-BRN		——— Order Of Install
9	18	BRN-RED		
35	19	RED-SLT		——— Slot #
10	20	SLT-RED		
36	21	BLK-BLU		☐ 8 ASTU UPPER
11	22	BLU-BLK	PLACE	
37	23	BLK-ORN	STICKER	☐ 16 ASTU LOWER
12	24	ORN-BLK	HERE	
38	25	BLK-GRN		☐ 16 ASTU UPPER
13	26	GRN-BLK		
39	27	BLK-BRN		☐ 16 DSTU LOWER
14	28	BRN-BLK		
40	29	BLK-SLT		☐ 16 DSTU UPPER
15	30	SLT-BLK		
41	31	YEL-BLU		☐ PG LOWER
16	32	BLU-YEL		☐
42	33	YEL-ORN		——— Order Of Install
17	34	ORN-YEL		
43	35	YEL-GRN		——— Slot #
18	36	GRN-YEL		
44	37	YEL-BRN		☐ 8 ASTU UPPER
19	38	BRN-YEL	PLACE	
45	39	YEL-SLT	STICKER	☐ 16 ASTU LOWER
20	40	SLT-YEL	HERE	
46	41	VIO-BLU		☐ 16 ASTU UPPER
21	42	BLU-VIO		
47	43	VIO-ORN		☐ 16 DSTU LOWER
22	44	ORN-VIO		
48	45	VIO-GRN		☐ 16 DSTU UPPER
23	46	GRN-VIO		
49	47	VIO-BRN		☐ PG LOWER
24	48	BRN-VIO		☐
50	49	VIO-SLT		NOT USED

48 FU CN1, 48 FU CN4, 48 FU CN2, 48 FU CN5, 48 FU CN3, 48 FU CN6

Figure 3-4 EXTENSION CUTDOWN SHEET

Figure 3-5

☑ MAIN ☐ EXP 1 ☐ EXP 2
☐ 48 FU1 ☑ 48 FU2 ☐ 48 FU3 ☐ 48 FU4
☑ B1 ☐ B2

CONN PIN	BLOCK TERM	COLOR CODE	FUNCTION	PCB ID
26	1	WHT-BLU		——— Order Of Install
1	2	BLU-WHT		
27	3	WHT-ORN		——— Slot #
2	4	ORN-WHT		
28	5	WHT GRN		☐ 8 ASTU UPPER
3	6	GRN-WHT	PLACE	
29	7	WHT-BRN	STICKER	☐ 16 ASTU LOWER
4	8	BRN-WHT	HERE	
30	9	WHT-SLT		☐ 16 ASTU UPPER
5	10	SLT-WHT		
31	11	RED-BLU		☑ 16 DSTU LOWER
6	12	BLU-RED		
32	13	RED-ORN		☐ 16 DSTU UPPER
7	14	ORN-RED		
33	15	RED-GRN		☐ PG LOWER
8	16	GRN-RED		☐

☑ 48 FU CN1, ☐ 48 FU CN4

Station Block   ☑ 48 FU2   ☑ B1   ☑ MAIN   ☑ CN1   ☑ 16 DSTU LOWER

Figure 3-5 SAMPLE EXTENSION CUTDOWN SHEET 3-7

INSTALLING CO/PBX LINES

Ground Start/Loop Start Line Cabling

Ground start trunks/loop start lines must be bridged from the telco RJ21X to a line cross-connect block (A). Each ground/loop start CO/PBX line requires one-pair cross-connect cable from the RJ21X to the line (A) block.

The A block connects to the 24FU filter unit with a 25 pair cable. The line (A) block(s) should be arranged in groups of 8 lines (16 pins) to correspond to the 24FU PCB, filter cable and PCB slot.

8ATRU-LS1	8 loop start lines
8ATRU-LS1 with a GSAU	8 ground start trunks

Installing Ground Start Trunks/Loop Start Lines
(Figures 3-6 and 3-7)

To install a ground start trunk/loop start line:

1. Punch down one pair cross-connect to the tip and ring leads for each line on the telco RJ21X CPE (customer) side of the block, (Figure 3-6).
2. Punch down the other end of the cross-connect to the line (A) block (in groups of 8 lines of the same line type).
3. Punch down a 25-pair cable to the opposite side of the line (A) block.
4. Plug a 25-pair connector into the corresponding 24FU filter unit (Figure 3-7).
5. Install bridging clips on the A block.
6. Plug in the filter cables as required.

Note: Repeat steps 1-5 for each ground start trunk/loop start line. Label cross-connect blocks A2, A3, etc.
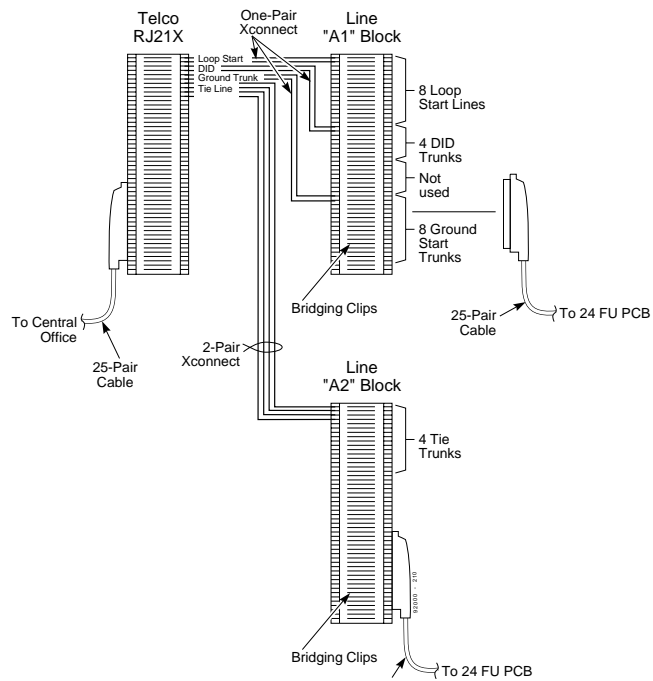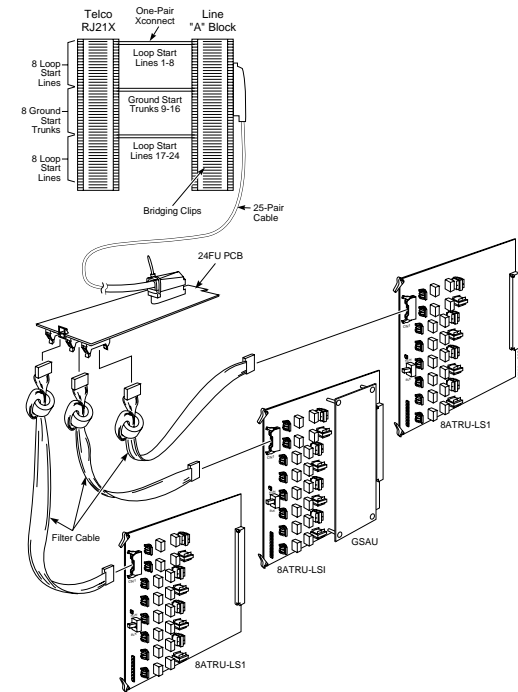
INSTALLING CO/PBX LINES

Telco RJ21X
One-Pair Xconnect
Line "A1" Block

Loop Start
DID
Ground Trunk
Tie Line

8 Loop Start Lines

4 DID Trunks

Not used

8 Ground Start Trunks

Bridging Clips

25-Pair Cable → To 24 FU PCB

To Central Office

25-Pair Cable

2-Pair Xconnect

Line "A2" Block

4 Tie Trunks

Bridging Clips → To 24 FU PCB

Figure 3-6 TYPICAL TRUNK/LINE INSTALLATION

Telco RJ21X
One-Pair Xconnect
Line "A" Block

8 Loop Start Lines

Loop Start Lines 1-8

8 Ground Start Trunks

Ground Start Trunks 9-16

8 Loop Start Lines

Loop Start Lines 17-24

Bridging Clips

25-Pair Cable

24FU PCB

Filter Cable

8ATRU-LS1

8ATRU-LSI

GSAU

8ATRU-LS1

Figure 3-7 INSTALLING GROUND START TRUNK/LOOP START LINES

3-9

INSTALLING DID TRUNKS

DID Trunk Description

Direct Inward Dialing trunks must be bridged from the telco RJ21X to a line cross-connect (A) block. Each DID Trunk requires one-pair cross-connect from the RJ21X to the line (A) block.

The A block connects to the 24FU filter unit with a 25-pair cable. The line (A) block should be arranged in groups of 4 DID trunks (8 pins) to correspond with the 24FU PCB, filter cable, and cabinet slot equipped with a 4ATRU-LD1.

Note: The 4ATRU-LD1 PCB interfaces 4 DID trunks to the system but uses 8 system line ports per PCB.

Installing DID Trunks (Figure 3-8)

1. Punch down one pair cross-connect to the tip and ring leads for each DID trunk on the CPE (customer) side of the RJ21X.
2. Punch down the other end of the cross-connect to the line (A) block tip and ring leads (in groups of 4 DID trunks).
3. Punch down a 25-pair cable to the opposite side of the line (A) block.
4. Plug in a 25-pair connector to the corresponding 24FU filter unit.
5. Install bridging clips on the A block.

Note: Repeat steps 1-5 for each DID trunk. Label cross-connect blocks A2, A3, etc.
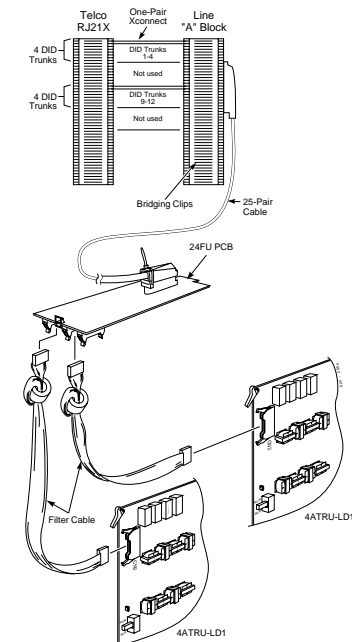

Figure 3-8 INSTALLING DID TRUNKS

INSTALLING TIE LINES

Tie Line Description

Tie lines (Type I E&M 4-conductor) must be bridged from the telco RJ21X to a line cross-connect (A) block. Each tie line requires two-pair cross-connect from the RJ21X to the line (A) block.

The A block connects to the 24FU filter unit with a 25-pair cable. The line (A) block must be arranged in groups of 4 tie lines (16 pins) to correspond with the 24FU PCB, filter cable, and cabinet slot equipped with a 4ATRU-EMI.

Note: The 4ATRU-EMI PCB interfaces 4 tie lines to the system but uses 8 system line ports per PCB.

Installing Tie Lines (Figure 3-9)

1. Punch down two pair cross-connect on the tip, ring, E and M leads for each tie line on the CPE (customer) side of the RJ21X.
2. Punch down the other end of the cross-connect to the line (A) block tip ring, E and M leads (in groups of 4 lines).
3. Punch down a 25-pair cable to the opposite side of the line (A) block.
4. Plug a 25-pair connector into the corresponding 24FU filter unit.
5. Install bridging clips on the A block.

Note: Repeat steps 1-5 for each Type I 4-conductor line. Label cross-connect blocks A2, A3, etc.
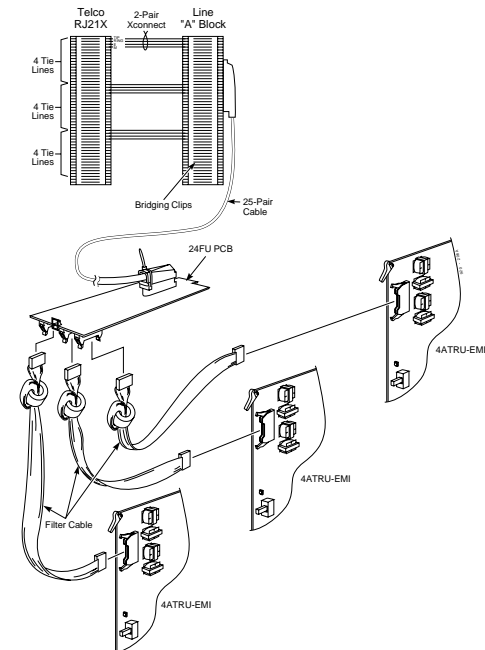

Figure 3-9 INSTALLING TIE LINES   3-11

LINE/TRUNK CUTDOWN SHEET

CO/PBX Line Cutdown Sheet Configuration
(Figures 3-10 and 3-11)

Due to the flexibility of the system universal PCB slot configuration, standard cutdown sheets for CO/PBX line cabling do not apply.

Note: The order in which the 8ATRU PCBs are installed determines the assigned line circuit number.

For example, if four 8ATRU's are installed in the Main Cabinet in the following order, the following numbering plan would be in effect:

Order of Install	PCB Slot #	Line Circuits
1	4	1-8
2	5	9-16
3	7	17-24
4	6	25-32

To determine extension assignments for the system cutdown, the installer must identify the following in order:

● Order of installation
● Cabinet (Main, Exp1, Exp2)
● Slot used
● 24FU filter unit
● 24FU 16-pin connector (upper, lower)

To determine where any group of lines are installed, note the order of install, cabinet, slot, and filter unit.

On the following page is the line cutdown sheet (Figure 3-10). Make as many copies as you need. Be sure to keep careful records of your installation. Refer to the sample line cutdown sheet (Figure 3-11) if you need help completing Figure 3-10.

LINE/TRUNK CUTDOWN SHEET

☐ MAIN ☐ EXP 1 ☐ EXP 2

☐ 24 FU1 ☐ 24 FU2 ☐ 24 FU3 ☐ 24 FU4

A1

CONN PIN	BLOCK TERM	COLOR CODE	FUNCTION	PCB ID
26	1	WHT-BLU		——— Order Of Install
1	2	BLU-WHT		
27	3	WHT-ORN		——— Slot #
2	4	ORN-WHT		
28	5	WHT GRN		☐ 8 ATRU-LS1
3	6	GRN-WHT	PLACE STICKER HERE	
29	7	WHT-BRN		☐ 4 ATRU-EMI
4	8	BRN-WHT		
30	9	WHT-SLT		☐ 4 ATRU-LD1
5	10	SLT-WHT		
31	11	RED-BLU		
6	12	BLU-RED		
32	13	RED-ORN		
7	14	ORN-RED		
33	15	RED-GRN		
8	16	GRN-RED		
34	17	RED-BRN		——— Order Of Install
9	18	BRN-RED		
35	19	RED-SLT		——— Slot #
10	20	SLT-RED		
36	21	BLK-BLU		☐ 8 ATRU-LS1
11	22	BLU-BLK	PLACE STICKER HERE	
37	23	BLK-ORN		☐ 4 ATRU-EMI
12	24	ORN-BLK		
38	25	BLK-GRN		☐ 4 ATRU-LD1
13	26	GRN-BLK		
39	27	BLK-BRN		
14	28	BRN-BLK		
40	29	BLK-SLT		
15	30	SLT-BLK		
41	31	YEL-BLU		
16	32	BLU-YEL		
42	33	YEL-ORN		——— Order Of Install
17	34	ORN-YEL		
43	35	YEL-GRN		——— Slot #
18	36	GRN-YEL		
44	37	YEL-BRN		☐ 8 ATRU-LS1
19	38	BRN-YEL	PLACE STICKER HERE	
45	39	YEL-SLT		☐ 4 ATRU-EMI
20	40	SLT-YEL		
46	41	VIO-BLU		☐ 4 ATRU-LD1
21	42	BLU-VIO		
47	43	VIO-ORN		
22	44	ORN-VIO		
48	45	VIO-GRN		
23	46	GRN-VIO		
49	47	VIO-BRN		
24	48	BRN-VIO		
50	49	VIO-SLT	NOT USED	
25	50	SLT-VIO		

(24 FU CN1, 24 FU CN2, 24 FU CN3)

Figure 3-10 LINE CUTDOWN SHEET

☑ MAIN ☐ EXP 1 ☐ EXP 2

☑ 24 FU1 ☐ 24 FU2 ☐ 24 FU3 ☐ 24 FU4

A1

CONN PIN	BLOCK TERM	COLOR CODE	FUNCTION	PCB ID
26	1	WHT-BLU		1 ——— Order Of Install
1	2	BLU-WHT		
27	3	WHT-ORN		7 ——— Slot #
2	4	ORN-WHT		
28	5	WHT GRN		☑ 8 ATRU-LS1
3	6	GRN-WHT	PLACE STICKER HERE	
29	7	WHT-BRN		☐ 4 ATRU-EMI
4	8	BRN-WHT		
30	9	WHT-SLT		☐ 4 ATRU-LD1
5	10	SLT-WHT		
31	11	RED-BLU		
6	12	BLU-RED		
32	13	RED-ORN		
7	14	ORN-RED		
33	15	RED-GRN		
8	16	GRN-RED		

(CN1)

☑ MAIN   ☑ 24 FU1   ☑ A1   CO Line Block   CN1   ☑ 8 ATRU-LS1

Figure 3-11 SAMPLE LINE CUTDOWN SHEET   3-13

3. Installing Extensions and Trunks

Section 4, INSTALLING OPTIONAL EQUIPMENT

**4. Optional
Equipment**

4. Optional Equipment

Section 4, INSTALLING OPTIONAL EQUIPMENT

ALARM/FAX SENSORS

Alarm/Fax Sensor Description

The 4PGDU PCB provides four alarm/fax circuits which can be programmed to detect a make or break closure from an alarm, fax machine or modem.

A 4PGDU circuit can be used for alarm purposes. When an alarm is detected, a signal is sent to stations programmed to receive the alarm signal. The alarm signal can also be sent to external paging speakers.

A 4PGDU circuit can be used for fax purposes. This allows a line to be shared by the system users and by a fax machine or modem. When a fax machine or modem is using the line, the system detects line in use, "busies" the line, and sends "line busy" status to all stations with a line appearance. This prevents a station from accessing the line while in use by the modem or fax.

Note: The 4PGDU alarm/fax features require a 10-30 VDC power supply installed in series to the alarm/fax circuit.

Installing an External Alarm (Figure 4-1)

1. Run two-conductor cross-connect cable from the 4PGDU alarm block to the 4PGDU cross-connect block for each external alarm input.
2. Terminate the other end of the cross-connect cable to the alarm tip and ring leads of the alarm system.
3. Plug the other end of the 16-pin filter cable into the 4PGDU-A1 CN1 lower 16-pin connector.
4. Plug a 16-pin filter cable into a 48FU connector.

Programming an External Alarm

1. Program the circuit to detect a make or break (Program 0306).
2. Program the stations which should receive the alarm signal.
3. Program an alarm tone for each input.

Refer to *External Alarm Sensors* in the Software Manual for additional details.

4. Optional Equipment

ALARM/FAX SENSORS

Installing an External Fax/Modem (Figure 4-1)

1. Run two-conductor cross-connect cable from the 4PGDU alarm block to the 4PGDU cross-connect block for each external fax/modem.
2. Terminate the other end of the cross-connect cable to the tip and ring contact closure leads of the fax machine or modem.
3. Plug the other end of the 16-pin filter cable into the 4PGDU's CN1 lower 16-pin connector.
4. Plug a 16-pin filter cable into a 48FU connector.
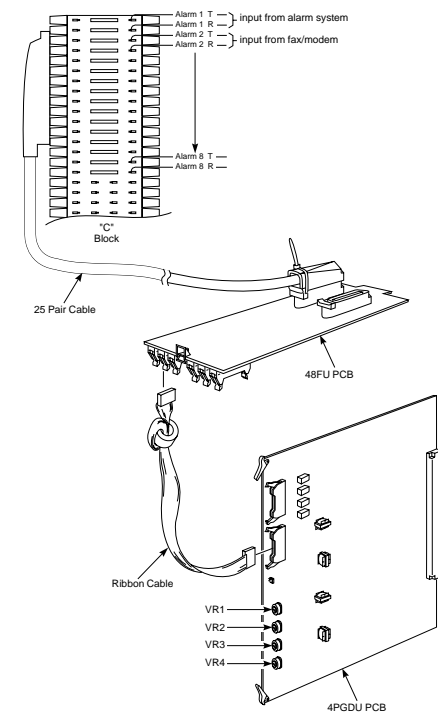
Figure 4-1 INSTALLING AN EXTERNAL ALARM   4-4

BACKGROUND MUSIC

Installing Background Music (Figure 4-2)

1. Run two-conductor station cable to the BGM input terminals of the MISC block.
2. Terminate the other ends of the station cable to the Background Music source output leads.

Note: BGM volume is increased by turning the BGVR potentiometer on the CPRU clockwise.

Refer to *Background Music* in the software manual for additional

Figure 4-2 INSTALLING BACKGROUND MUSIC   4-5

DSS CONSOLE

DSS Console Description

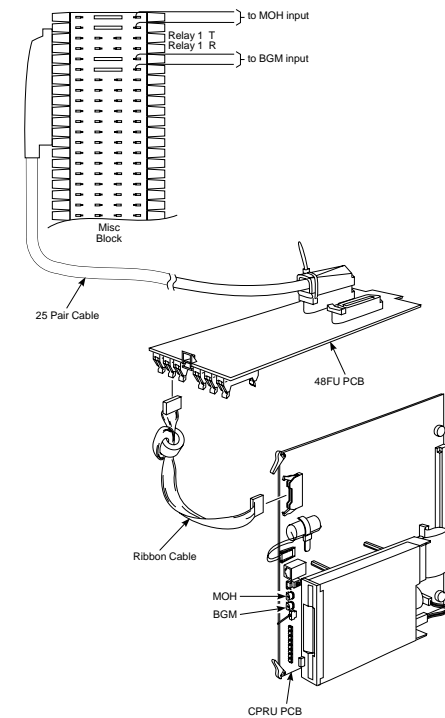The DSS console provides 100 Direct Station Selection/Busy Lamp Field keys and 10 fixed one-button feature keys for allowing one-touch calling and transfer. A shift key allows the console to provide DSS/BLF for 200 extensions.

Keep the following in mind when installing DSS Consoles:
● You can only connect DSS Consoles to Super Display or 32-Button Display telephones
● A DSS Console does not require a separate station port - it connects directly to the keyset.
● Each extension can have up to four DSS Consoles. The second, third and fourth DSS Consoles daisy chain to the first. However, the second, third and fourth DSS Consoles require their own power supply.
● Eight extensions can have up to four DSS Consoles, for a system maximum of 32.

Refer to *Direct Station Selection (DSS) Console* in the Software Manual for additional details.

Installing a DSS Console (Figure 4-3)

1. Turn the key telephone upside down. Remove the plastic filler plug from the DSS modular connector.
2. Plug the DSS console's modular line cord into the telephone's 8-pin DSS connector.

To 625 Modular Jack

DSS Console   Keyset
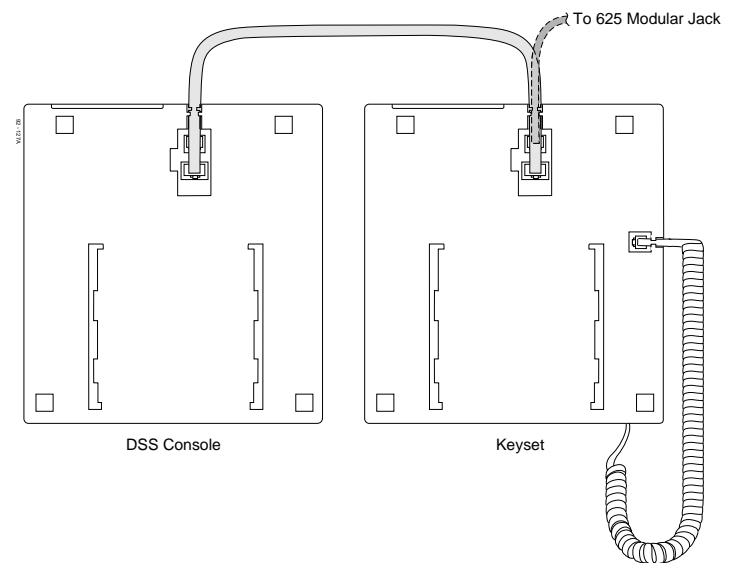
Figure 4-3 INSTALLING A DSS CONSOLE

DOOR CHIME BOX

Installing a Door Chime Box (Figure 4-4)

1. Set the dip switch on the 4PGDU to be used for Door Chime Box connection to DH.
2. Punch down a two-conductor station cable to the corresponding terminals on the 4PGDU upper connecting block.
3. Terminate the other end of the station cable leads to the Door Chime Box according to Figure 4-4.

Note: Door Chime Box volume is increased by turning the corresponding potentiometer VR1-VR4 on the 4PGDU clockwise.

Refer to *Door Box* in the Software Manual for additional details.

Figure 4-4 INSTALLING A DOOR CHIME BOX   4-7

MUSIC ON HOLD

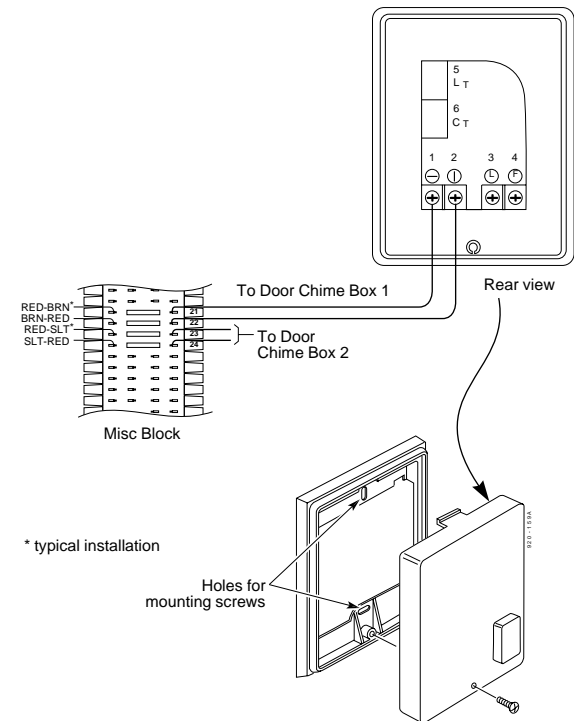## Music on Hold Description

The system provides Music on Hold from either an internally synthesized source on the CPRU or from an external source. The external MOH can be a tuner, tape deck, CD player, etc. The CPRU's "S" jumper determines the source for either internal or external MOH.

Note: When the S jumper is set for internal MOH, and an external MOH source is connected to the MISC block or to a 3ACI, external MOH is sent to trunks programmed to receive external MOH.

In addition, up to three different external MOH sources can be installed per 3ACI. When using a 3ACI for external MOH, programming determines the MOH source for each trunk.

Refer to *Music on Hold* in the Software Manual for additional details.

Installing External Music on Hold (Figure 4-5)

1. Run two-conductor station cable to the MOH input terminals of the MISC block.

2. Terminate the other ends of the station cable to the Music on Hold source output leads.

Note: MOH volume is increased by turning the HTVR potentiometer on the CPRU clockwise.

CPRU Music on Hold Contact Description

The CPRU provides a dry relay that activates when a call is placed on Hold. When an external MOH source is connected to the MOH relay, and a call is placed on Hold, the MOH relay is activated. This allows an external relay sensor/power supply to turn on the MOH source.

This arrangement allows the MOH source (e.g., a tape deck) to run only when a call is placed on Hold. The maximum applied voltage for the relay is 24vDC at .5A.

Using CPRU Music on Hold Contacts (Figure 4-5)

1. Run two-conductor station cable to the MOH input terminals of the MISC block.
2. Terminate the other ends of the station cable to the Music on Hold source output leads.

MUSIC ON HOLD
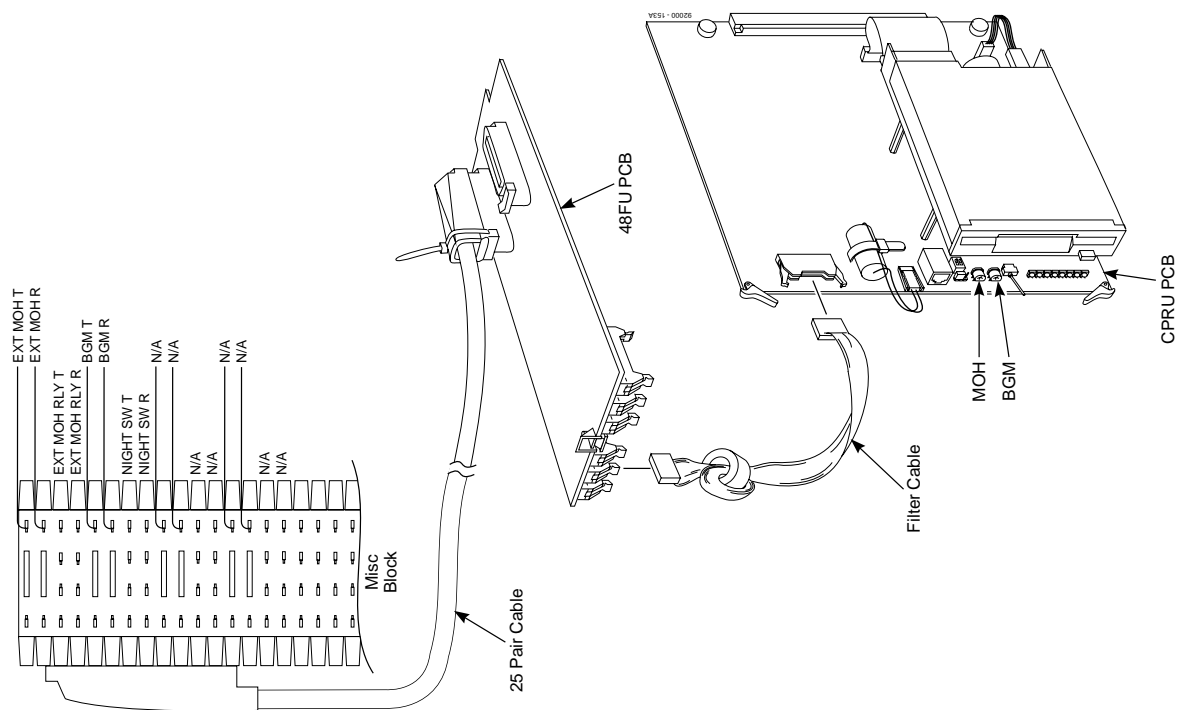
Figure 4-5 THE CPRU MISC BLOCK CUTDOWN

4-9

4. Optional Equipment

NIGHT MODE SELECTION

Night Mode Selector Switch Description

The Night Mode Switch relay closes when the system detects either an open or closure on the MISC block NIGHT SW terminals. System programming determines whether the contact is normally open or normally closed. Maximum 9v DC is output to the switch when open, and 5mA DC when shorted.

Refer to *Night Service* in the Software Manual for additional details.

Connecting a Night Mode Selector Switch
(Figure 4-5)

1. Run two-conductor station cable to NIGHT SW input terminals of the MISC block.
2. Terminate the other ends of the station cable to the night switch mechanism output leads.

OPA/VAU

OPA/VAU Description

OPA/VAU provides three voice channels to allow the system to automatically answer calls on designated trunks, play a greeting, and provide dialing options to the callers. Refer to Voice Announce Unit in the Software Manual for a detailed description of OPA operation.

The three-channel OPA/VAU requires one digital extension circuit. A second three-channel expansion PCB requires a second digital extension circuit.

Station Cabling for the OPA/VAU

1. Punch down one-pair 24 AWG station cable to a cross-connect block.
2. Run one-pair cross-connect from the cross-connect block to the extension (B) block.
3. Connect the (B) block's 25-pair cable to the a 48FU filter unit.
4. Install bridging clips on the extension (B) block.

Installing an OPA/VAU (Figure 4-6)

1. Install a modular jack within six feet of the OPA/VAU.
2. Terminate the other end of the 24 AWG station cable from the cross-connect block to the GRN/RED leads of a modular jack.
3. Plug one end of a modular line cord into the modular jack. Plug the other end into the OPA/VAU.
4. Strap jumper J3 to the 1-2 position to activate battery backup.
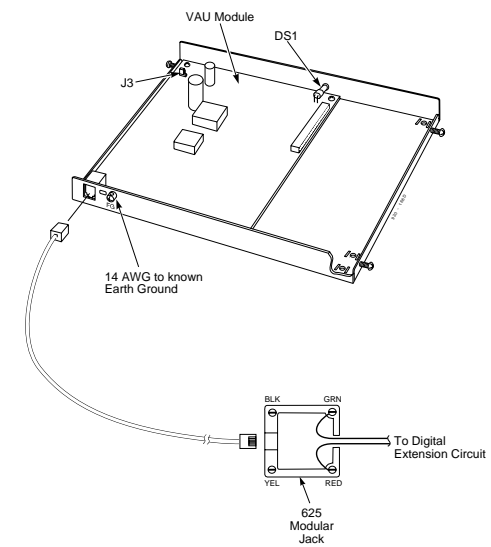
Figure 4-6 OPA/VAU INSTALLATION

4-11

OPA/VAU

Installing an Expansion PCB (Figure 4-7)

1. Punch down one-pair station cable to a cross-connect block.
2. Run one-pair cross-connect from the cross-connect block to the extension (B) block.
3. Terminate the station cable to the BLK/YLW leads of the OPA/VAU modular jack.
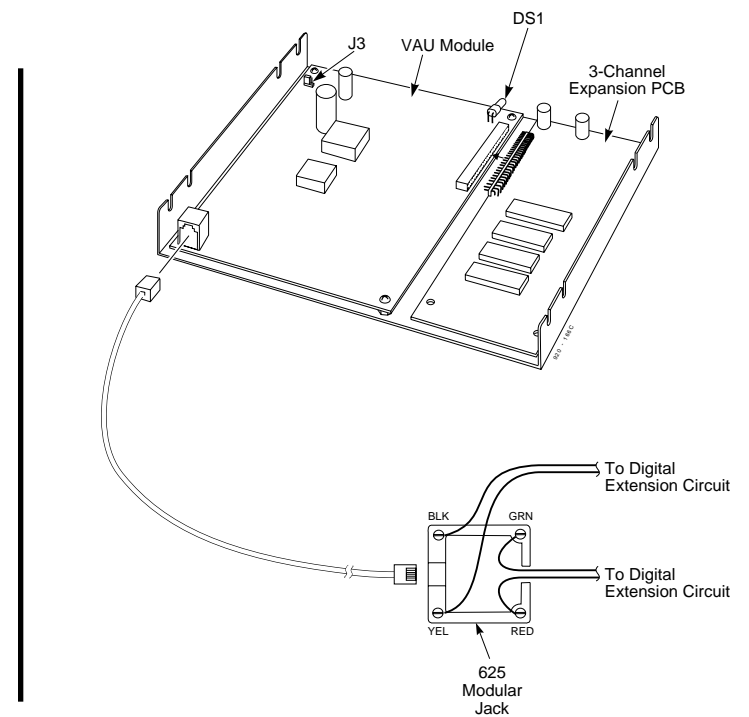4. Install bridging clips on the extension (B) block.

Figure 4-7 OPA/VAU EXPANSION PCB INSTALLATION 4-12

2-OPX MODULE

2-OPX Description

The 2-OPX Module provides two 2500 type analog circuits for connection to on-premise 2500 type single line devices (i.e., telephones, fax machines, modems, etc.) and to telco OL13B/C OPX circuits.

Refer to *Single Line Telephones* in theSoftware Manual for more details.

Station Cabling for the 2-OPX Module

The 2-OPX Module connects to a single digital extension circuit for power/signaling. However, the 2-OPX automatically disables the next adjacent port.

1. Punch down 1-pair of 24 AWG station cable to an extension cross-connect block.
2. Run 1-pair cross-connect from the cross-connect block to an extension (B) block.
3. Connect the extension (B) block's 25-pair cable to a 48FU filter unit.
4. Install bridging clips as needed

2-OPX Module

DS1

14 AWG to known Earth Ground

BLK   GRN

To Digital Extension Circuit

YEL   RED
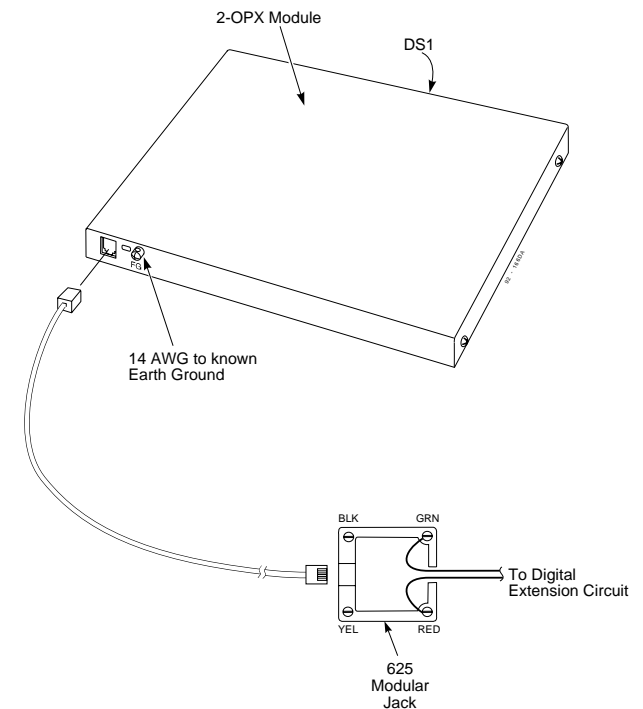
625 Modular Jack

Figure 4-8 INSTALLING THE 2-OPX

4-13

4. Optional Equipment

2-OPX MODULE

2-OPX Installation (Figure 4-8)

The 2-OPX is designed for desk/shelf mounting. A 625 modular jack is required for the 2-OPX.

1. Ground the 2-OPX Module by connecting a 14 AWG ground wire from the FG lug to a known earth ground.
2. Install a 625 modular jack near the 2-OPX module.

3. Terminate the station cable from the cross-connect block to GRN/RED of the 2-OPX's 625 modular jack.
4. Plug a 4-conductor line cord into the jack. Plug the other end into the modular jack on the back of the 2-OPX Module. DS1 LED lights steady.

POWER FAILURE

Power Failure Description

The system allows 4 loop start lines per cabinet to be bridged to designated extensions for basic telephone service during a power failure. The power failure operation occurs during a commercial power failure, and is not affected by PCB failure. Refer to the chart below for PF cross-connections.

CO line	PF station
1	1
2	2
3	3
4	4

Note: An 8ATRU-LS1 equipped with an 8GSAU ground start PCB cannot be equipped for power failure operation. In addition, 4ATRU-EMI and 4ATRU-LD1 PCBs cannot be configured for power failure operation.

Power Failure Connections (Figure 4-9)

To install a 4PFTU on an 8ATRU-LS1 for power failure operation:

1. Remove jumpers on connector CN4 on an 8ATRU-LS1.
2. Install the 4PFTU-C1 to connectors CN3/CN4 on an 8ATRU-LS1. The 4PFTU filter cable faces toward the left of the 8ATRU-LS1.
3. Connect the top filter cable on the 4PFTU to a 48FU filter unit supporting single telephones for PF operation.
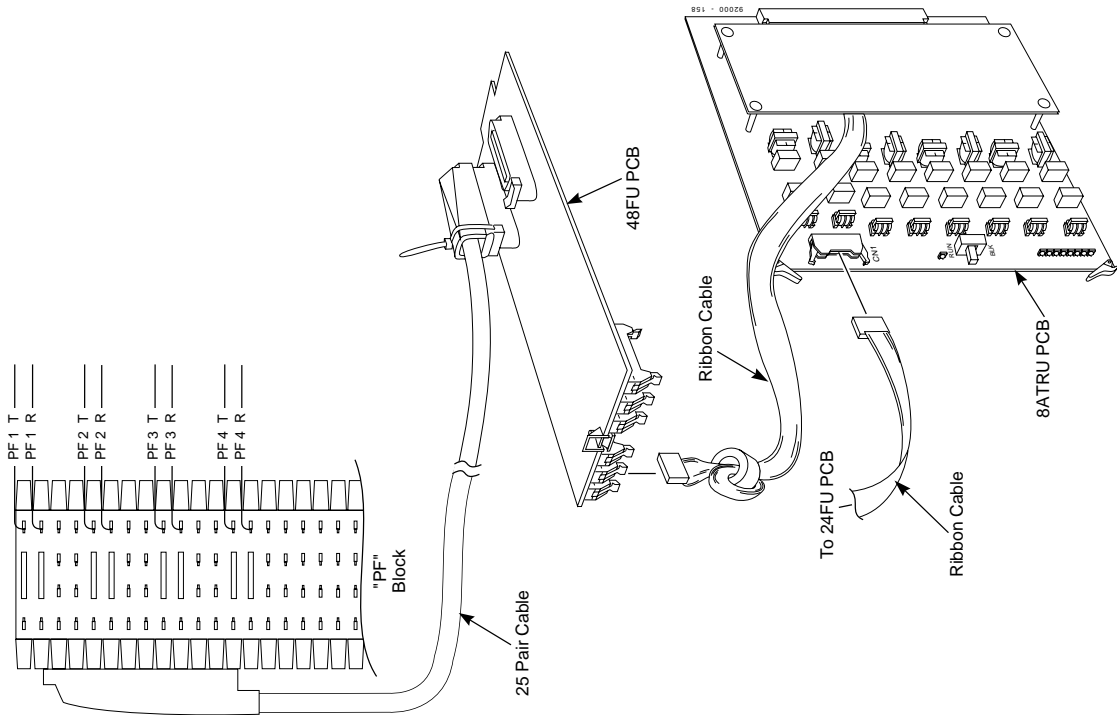
Note: For PF operation, the 16-pin filter cable from the 8ASTU/16ASTU single line telephone PCB to a 48FU is not installed.

4. Connect the filter cable on the 4PFTU to a 48FU filter unit supporting single telephones for PF operation.

4. Optional Equipment

POWER FAILURE

Figure 4-9 4PFTU POWER FAILURE CONNECTIONS

EXTERNAL PAGING

External Page Description

Four external page zone/door box circuits are provided by each 4PGDU installed. Each Door Chime Box/external page circuit provides a dry relay contact. Refer to *Paging, External* in the Software Manual for additional details.

Note: External paging can also be provided using a 3-ACI. Refer to page 4-21 for more on the 3-ACI Module.

Installing an External Page System
(Figures 4-10 and 4-11)

1. Set the dip switch on the 4PGDU for external paging to PG.
2. Terminate one end of a one-pair 24 AWG station cable to the PG1 T/R leads on the PGU1 block. (Up to 4 paging zones can be installed. Use PG2-PG4 T/R leads for other zones).

3. Terminate the other end of the station cable to the tip and ring leads of the paging system.
4. Plug a filter cable into the 48FU. The ferrite bead is placed closer to the 48FU filter unit.
5. Plug the other end into the upper connector on the 4PGDU.
6. Install bridging clips to the PG1 T/R leads on the PGU1 block.
7. Adjust volume to the page system using the corresponding potentiometer VR1-VR4 on the 4PGDU PCB.

Note: Page amplification is not provided by the 4PGDU PCB and must be accommodated by using an external page amplifier.

4. Optional Equipment
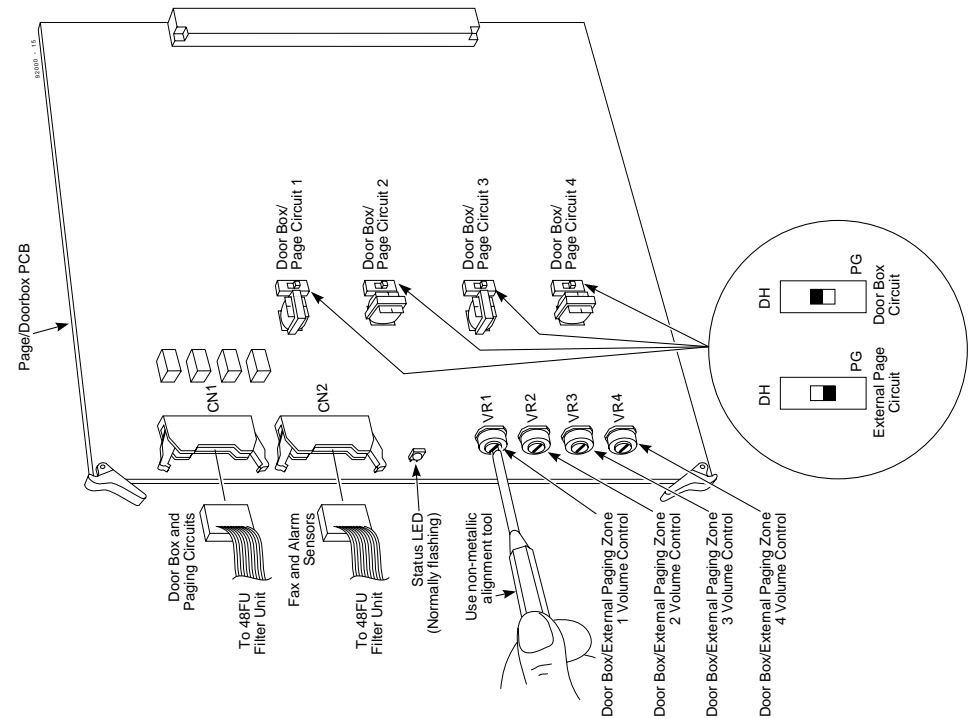
EXTERNAL PAGING

Figure 4-10 4PGDU SWITCH SETTINGS

4-18
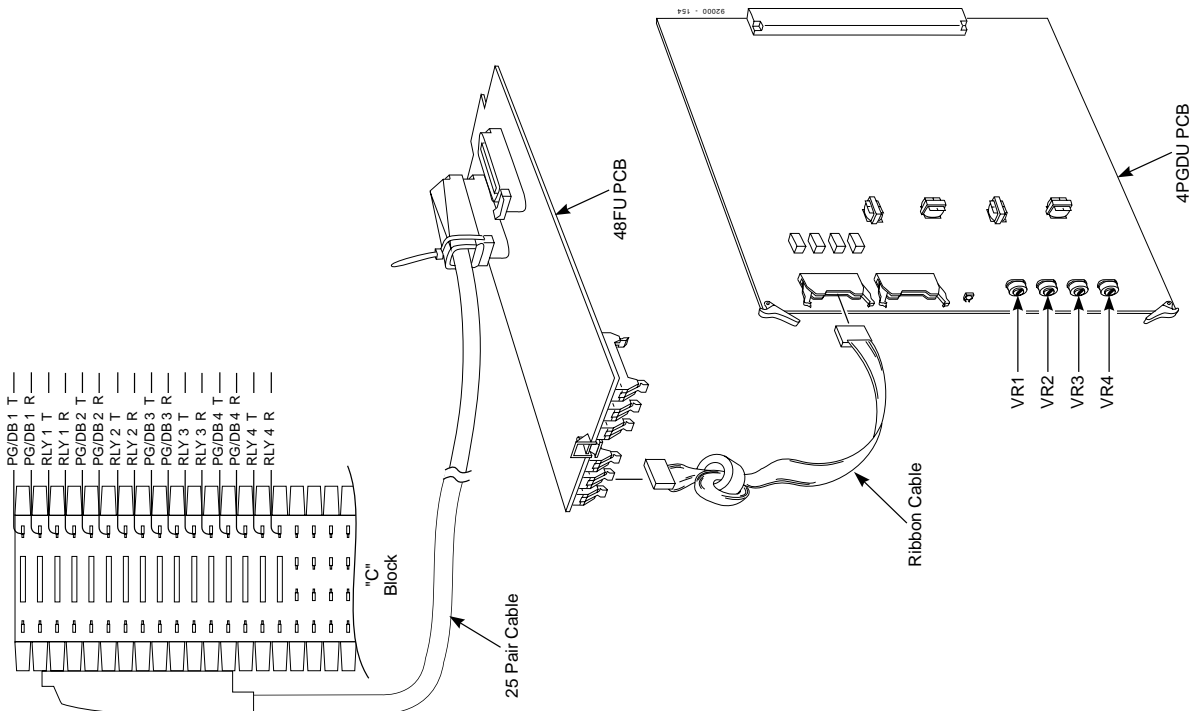
EXTERNAL PAGING

Figure 4-11 PGU BLOCK CUTDOWN

4. Optional
Equipment

EXTERNAL PAGING

External Page Relays Description

Four external dry contact relays are available when a 4PGDU is installed which can be used to activate ancillary devices (i.e. door unlock devices). Each Door Chime Box/external page circuit provides a dry relay contact.

Note: External page relays can be provided by a 3ACI. Refer to page 4-21 for more on the 3-ACI module.

Door Chime Box /External Page Relay Contacts
(Figure 4-11)

To connect a dry contact relay device to a Door Chime Box/external page relay:
1. Set a dip switch on the 4PGDU to the DH position for Door Chime Box control. Set the dip switch on the 4PGDU to the PG position for external page control.
2. Terminate one end of a one-pair 24 AWG station cable to the RLY1 T/R leads on the PGU1 block. (Up to 4 paging zones can be installed. Use RLY2-RLY4 T/R leads for other relays).

3. Terminate the other end of the station cable to the T/R leads of the relay sensor.
4. Plug a filter cable into the 48FU. The ferrite bead is placed closer to the 48FU filter unit.
5. Plug the other end into the upper connector on the 4PGDU.
6. Install bridging clips to the RLY1 T/R leads on the PGU1 block.

Note: The relay closes when the Door Chime Box/external page zone is called. The maximum applied voltage is 24vDC at .5A for each contact.

3-ACI MODULE

3-ACI Description

The 3-ACI provides three analog ports which can be used for external Music on Hold source input or external page connection in any combination. The 3-ACI also provides a dry relay for each analog port. The 3-ACI requires one 16DSTU station circuit for operation. Refer to *Analog Communications Interface* in the Software Manual for more details.

Music on Hold

The 3-ACI provides three RCA plugs for external MOH sources (e.g. tuner, tape deck, CD player, etc.). A dry relay used with a relay sensor/power supply can be used to turn the MOH source on/off.

External Paging

The 3-ACI allows three external page systems to be connected. A dry relay used with a relay sensor/power supply can to turn the paging system on/off.

Contact Closure

The 3-ACI provides a dry relay, and when equipped with a relay sensor/power supply, closes the relay when the extension assigned to the 3-ACI software port is dialed.

Note: External paging and external relays can also be provided using a 4PDGU. Refer to External Paging on page 4-17 for more.

Installing an External Music on Hold Source
(Figures 4-12 and 4-13)

1. Connect the 3-ACI to a 16DSTU extension circuit using the modular connector provided.
2. Connect a music source to the RCA jack on the 3-ACI PCB.

Note: MOH volume is adjusted from the MOH source.
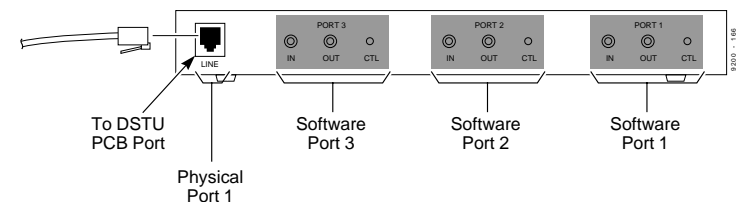
Figure 4-12 INSTALLING A 3-ACI MOH/BGM SOURCE

4. Optional Equipment

3-ACI MODULE

Installing an External Paging System
(Figures 4-12 and 4-13)

1. Connect the 3-ACI to a 16DSTU extension circuit using the modular connector provided.
2. Connect a paging system to the RCA jack on the 3-ACI PCB.

Note: Page volume is adjusted from the paging equipment.

Installing a Dry Contact Closure Device
(Figures 4-12 and 4-13)

1. Connect the 3-ACI to a 16DSTU extension circuit using the modular connector provided.
2. Connect a dry contact sensor/power supply to the RCA jack on the 3-ACI PCB.
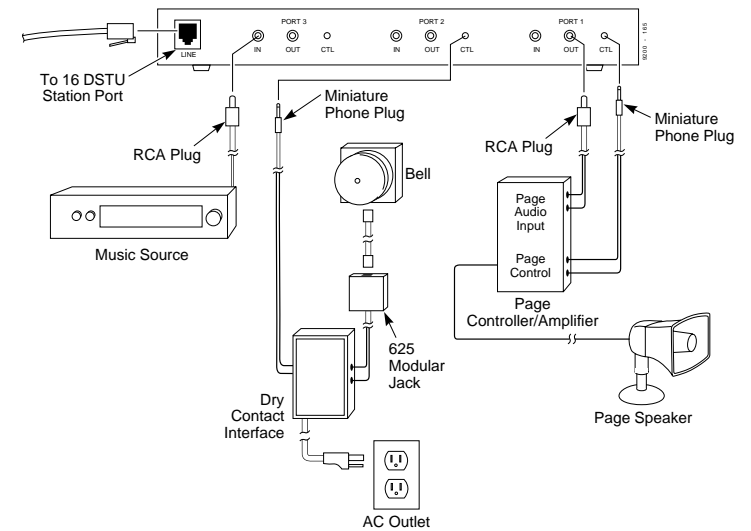3. Connect a device to the power supply side of the relay sensor.

Figure 4-13 INSTALLING BGM/MOH AND EXT PAGING TO A 3-ACI

4-22

REJU RECORDING JACK

REJU Description

A Super Display telephone can be equipped with an REJU recording jack PCB. The REJU provides an RCA plug allowing the telephone to be connected to a tape recorder. The REJU is equipped with a 5-pin molex connector and a securing screw.

Installing an REJU (Figures 4-14 and 4-15)

1. Turn the Super Display telephone upside down and remove four screws from each corner of the telephone set. Remove the upper housing from the lower housing.
2. Lift the upper housing off of the telephone base.
3. On the right side of the telephone's lower housing, use a blunt object to remove the plastic molding (Figure 4-14).
4. Install the REJU with the REJU components facing down (Figure 4-15).
5. Use the screw supplied with the REJU to secure the PCB to the lower housing.
6. Insert the REJU modular connector into the RECCN connector on the telephone's ANUI PCB on the upper housing. To ensure the proper polarity, make sure the red wire is on top.
7. Reassemble the telephone and reinsert the four screws you removed in step 1.

8. Using a standard audio cable with an RCA plug, connect the recording device to the REJ.
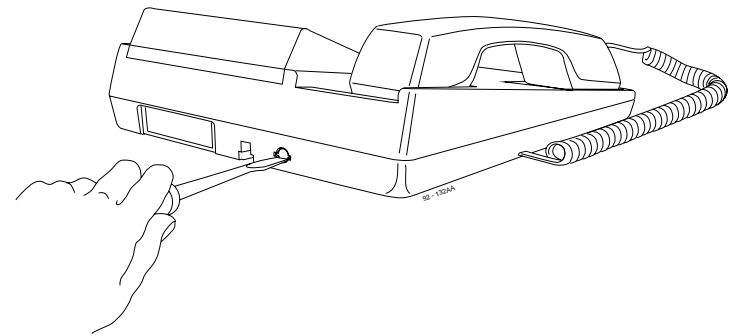
Figure 4-14 REMOVING PLASTIC MOLDING

4. Optional Equipment
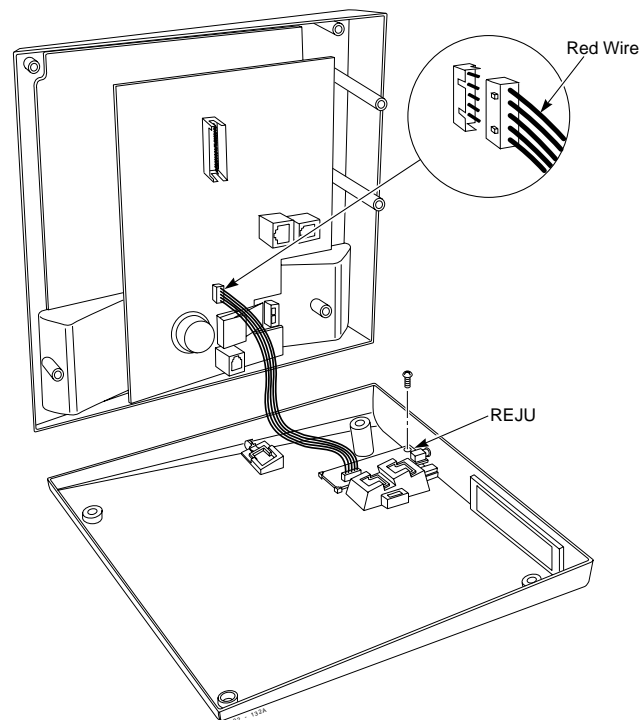
REJU RECORDING JACK

SMDR

Figure 4-15 INSTALLING THE REJU

Station Message Detail Recording Description

A terminal can be connected to a multibutton telephone
equipped with a DCI-A (serial port) or a DCI-B (parallel port)
for Station Message Detail Recording purposes. The SMDR
terminal receives data on every incoming and outgoing call in
the system, detailing time of call, class of call, line used, dura-
tion, etc. Refer to *Station Message Detail Recording* in the
Software Manual for more details.

Connecting an SMDR Terminal (Figure 4-16)

1. Install the DCI to a multibutton telephone. Refer to Section
   3, Data Products for specific DCI installation procedures.
2. Install the SMDR recording device according to manufactur-
   er instructions.
3. Connect the SMDR recording device to the telephone's DCI.

Note: When using a DCI-A, a standard RS-232-C 25-pin cable
terminated with a 25-pin male connector is required. The DCI is
configured for 2400 baud, 8 bits, no stop bits, no parity checking.

Note: When using a DCI-B, a standard Centronics 14-pin cable
terminated with a 14-pin female connector is required.

SMDR

4. Complete SMDR programming. Refer to *Station Message Detail Recording* in the Software Manual for more details on programming SMDR.

RS-232-C Cable

DCI-A

As required

RS-232-C Pin Out Information

Direction of Signal Flow
(⟶ output or ⟵ input)

RS-232-C Connector	Description	DCE (3-DCI, DCI-A or Modem)	DTE (PC or Printer)
8	DCD	⟶	⟵
3	RXD	⟶	⟵
2	TXD	⟵	⟶
20	DTR	⟵	⟶
6	DSR	⟶	⟵
4	RTS	⟵	⟶
5	CTS	⟶	⟵
7	GND		

25-Pin RS-232-C Connector

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

OR

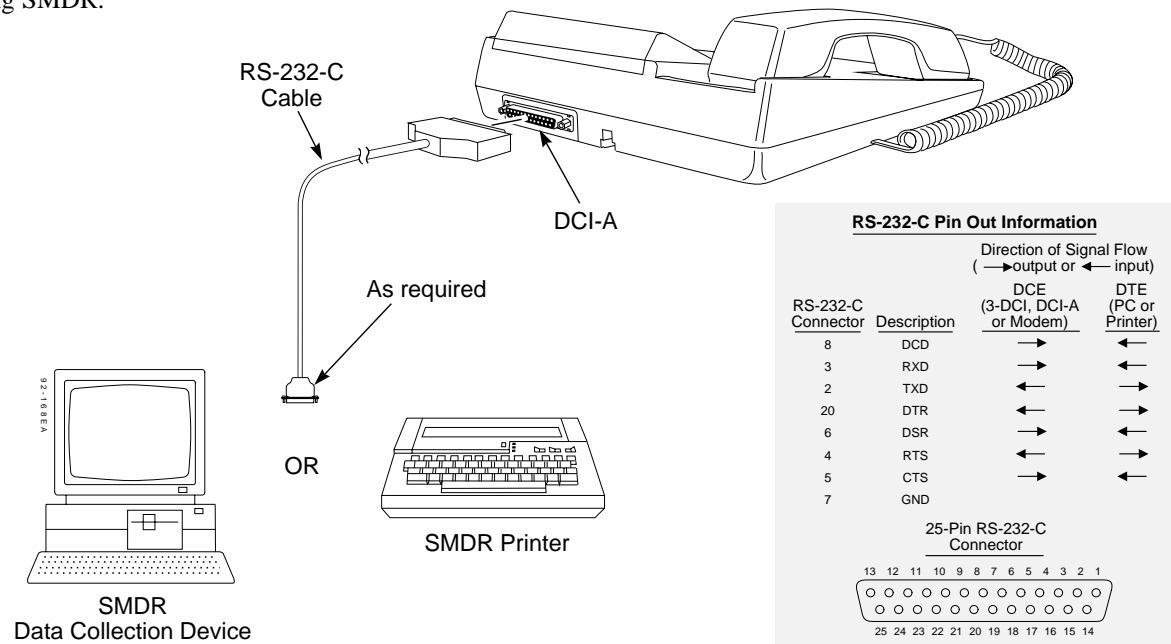SMDR Printer

92-168EA

SMDR
Data Collection Device

Figure 4-16 CONNECTING AN SMDR TERMINAL

4. Optional Equipment

WALL-MOUNT KIT

Wall-Mount Description

You can use a wall-mount to attach any key telephone to a wall.
The wall-mount kit includes a mounting bracket, wall-mount
screws and a handset hanger.

Note: The wall-mount kit currently does not accommodate an
AT&T wall plate.

Installing the Wall-Mount Handset Hanger
(Figure 4-17)

1. Insert the handset hanger in the slot provided beneath the
   telephone's hookswitch.
2. Remove the plastic insert beneath the hookswitch to expose
   the hanger screw hole.
3. Use the machine screw provided to fasten the hanger in
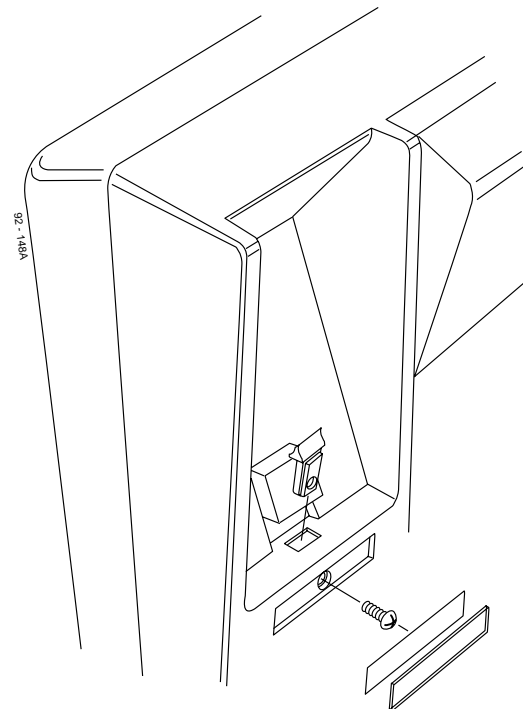   place.
4. Replace the plastic insert.

Figure 4-17 INSTALLING THE HANDSET HANGER   4-26

WALL-MOUNT KIT

Wall-Mounting a Key Telephone (Figure 4-18)

1. Mount the wall-mount kit's metal bracket in the desired location using the screws provided.
2. Mount the wall-mount kit's plastic bracket to the wall-mount kit's metal bracket using the screws provided.
3. Insert the telephone's line cord from the 625 modular jack through the plastic bracket using the clips provided on the bracket.
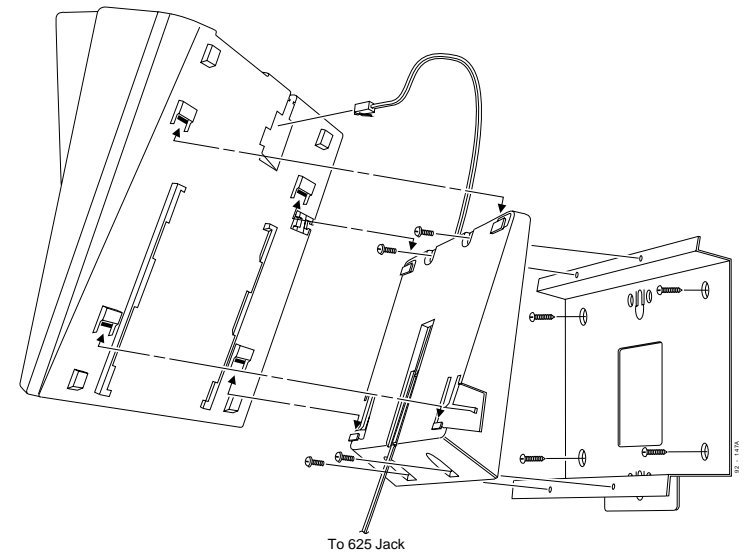4. Place the telephone on top of the plastic bracket on the clips provided.

To 625 Jack

Figure 4-18 WALL-MOUNTING A KEY TELEPHONE 4-27

4. Optional Equipment

Section 5, SYSTEM STARTUP AND DATA

**5. System Startup
and Data**

POWERING UP AND TESTING THE SYSTEM

Basic Troubleshooting

To troubleshoot extensions:

1. Check and verify extension. The voltages at the extension's modular jack should be:

Meter Lead	Jack Terminal	Voltages1
Black lead to . . . . . . .GRN	. . . .+27 V DC	
Red lead to . . . . .RED		

2. Check and verify programming. Refer to the Software Manual if necessary.
3. Check and verify extension wiring.
4. Check and verify 48FU filter unit installation.
5. Check and verify extension PCB installation.

Troubleshooting Lines

To troubleshoot lines:

1. Check and verify each line before the system with a test set.
2. Measure loop current on each line with a digital voltmeter.
3. Check and verify programming. Refer to the Software Manual if necessary.
4. Check and verify line PCB installation.
5. Check and verify CN4/CN5 jumpers, GSAU installation, or PFTU installation.
6. Check and verify 24FU filter unit installation.
7. Check and verify filter unit cable installation.

PORT IDENTIFICATION

Identifying Port Location

Port information such as PCB type, number of installation (ID), port numbers, PCB status, and individual port status can be derived from the system. To obtain a System Report containing PCB information, a DCI must be connected to the system and equipped with a terminal.

Running program 0007 in MAINTENANCE OPTIONS prints a system PCB report. Refer to *Program 0007-System Report Port Setup* in the Software Manual.The following is a typical report:

```
                         << SYSTEM INFORMATION >>

                    03/22/93   09:49

                                   Last System Data Modify  :
                                   Last System Data Save      :

03/19/93          14:25  by  JONES TREE FARM
03/19/93          14:19  by  JONES TREE FARM

Slot Type         ID Port         Condition       Note
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

1 DSTU - 3B      1  001-106      Running         16 ports connected
2 DSTU - 3B      2  017-032      Running          4 ports connected
3 ASTU -16       3  033-048      Running
4 PGDU           1               Running       SPK:  4  DPN:  0  ALM:  8  FAX:8
5 ATRU - C1      2  009-016      Not Install
6 CDTU - A1      1               Running
7 ATRU - L2      1  001-008      Running
8 -  none -
9 -  none -
10 -  none -
11 -  none -
12 -  none -
13 -  none -
14 -  none -
15 -  none -
16 -  none -
17 -  none -
18 -  none -
19 -  none -
20 -  none -
21 -  none -
22 -  none -
23 -  none -
24 -  none -
25 -  none -
```

SYSTEM START-UP

System Start-up

You can now power up the system and briefly check its operation. Before proceeding, be sure that:
● The common equipment is installed correctly.
● All extensions are cabled correctly.
● All earth ground and telco connections are installed correctly.
● PCBs are configured, equipped, and strapped correctly.
● The ferrite beads are installed.

Powering up the System

1. Install the CPRU in the CPU slot and one 16DSTU in slot 1. PCBs for slots 2-25 are not installed at this time.
2. Plug in all system telephones. A display telephone must be plugged into port 001 (extension 301).
3. Turn the AC Power Panel switch to ON. Refer to the chart at right for CPRU LED status.
4. Wait about three minutes for the system to boot. The telephone display at extension 301 will show the Time/Date and extension number when the boot sequence completes.
5. Plug in the remaining PCBs into each cabinet slot in numerical order (ie; slot 3, followed by slot 4, slot 5, etc.). This sets up the system port sequence.

Note: Refer to Powering Up and Testing the System on page 5-2 if the system does not boot.

MAJ	MIN	RUN	ALM1	ALM2	ALM3	ALM4	ALM5	Description
ON	ON	ON	ON	ON	ON	ON	ON	Reset state
OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	Memory Check state
OFF	OFF	ON	OFF	OFF	OFF	OFF	ON	Memory Check End
OFF	OFF	ON	OFF	OFF	OFF	ON	ON	Downloading System data
OFF	OFF	ON	OFF	OFF	ON	ON	ON	Loading Main Program
OFF	OFF	ON	OFF	ON	ON	ON	ON	Initializing Main Program
ON	ON	ON	OFF	OFF	OFF	OFF	ON	Memory Error (D-RAM)
ON	ON	ON	OFF	OFF	OFF	ON	OFF	Memory Error (S-RAM)
ON	ON	ON	ON	OFF	OFF	OFF	ON	Empty Disk
ON	ON	ON	ON	OFF	OFF	ON	OFF	Disk is not a system disk
ON	ON	ON	ON	OFF	OFF	ON	ON	Disk does not contain system information
ON	ON	ON	ON	ON	OFF	OFF	OFF	Disk I/O Error
ON	ON	ON	OFF	ON	OFF	OFF	OFF	80286 Protect Mode Error
OFF	OFF	FLASH	OFF	OFF	OFF	OFF	OFF	Normal Operating Mode

SYSTEM START-UP

Initial Programming (Figure 5-1)

Entering the Programming Mode

Enter the system programming mode at extension 301:

1. Press CALL1. (You hear dialtone).
2. Dial # * # *.
3. Dial the system password.

Password	Level	Tenant
123456789	2(IN)	0
0000	3(SA)	1
9999	4(SB)	1

4. Press HOLD.
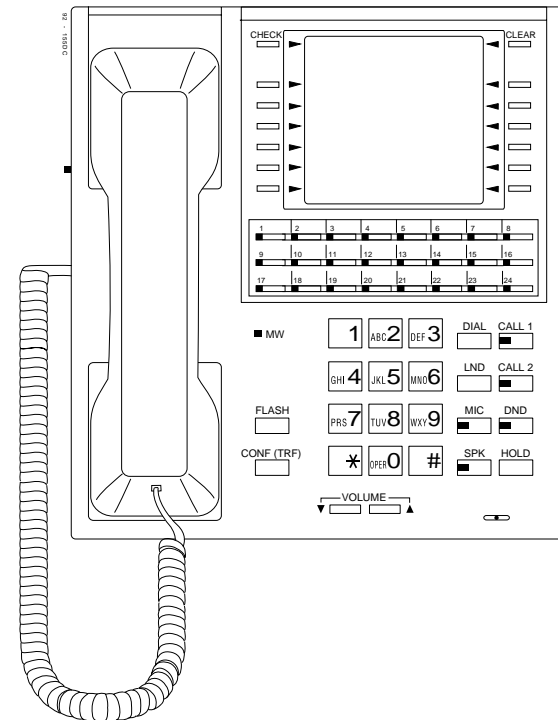
Figure 5-1 TELEPHONE KEY LAYOUT

5. System Startup
   and Data

SYSTEM START-UP

Setting Up Extension Circuit Types

Run program 0004 to automatically set up extension circuit types.
Refer to the Software Manual for programming information.

1. Dial 0004.
2. Press HOLD.
3. When you see, "Set UP? (Yes:1)," dial 1.
4. Press HOLD twice.

Saving and Backing Up Your Configuraton

When you are done programming, be sure to save the data to
disk.Use the extra disk shipped with your system to make an
additional backup copy.

1. Press DC. You see, "Data save? (Yes:1)"
2. Dial 1.
3. Press HOLD. You see, "Data Saving..." while the system
   saving the data.

4. When you see, "Data Save Complete!," press HOLD to exit
   the programming mode.
    OR
   Re-enter the programming mode and repeat from step 1 to
   make an additional backup copy.
5. To ensure that the system reloads your saved data on reboot
   or power-up, set switch SW1 on the CPRU to OFF.

Making Test Calls.

In the initial configuration:
● All Programmable Function keys are line keys (e.g., key 1 is
  line 1).
● All trunks are loop start DTMF.

DATA OVERVIEW

Data Communications Description

The system provides up to 144 data device interfaces for data communications. Using data devices allows a network to share a limited number of business resources such as modems, printers, and PC's. The system's DCI devices can switch asynchronous RS-232-C data at speeds from 300 to 19.2K.

Data Device Description (Figure 5-2)

There are three types of data devices:

The DCI-A is a single port data module that provides a serial RS-232-C port. The DCI-A is installed in a key telephone, but has a unique extension number. Each DCI-A requires one data port.

The DCI-B is a single port data module that provides a parallel RS-232-C port. The DCI-A is installed in a key telephone, but has a unique extension number. Each DCI-B requires one data port.

The 3DCI-A is a standalone data module which provides three RS-232-C serial ports, each port requiring one system data port. The 3DCI derives power and signaling from one 16DSTU circuit.
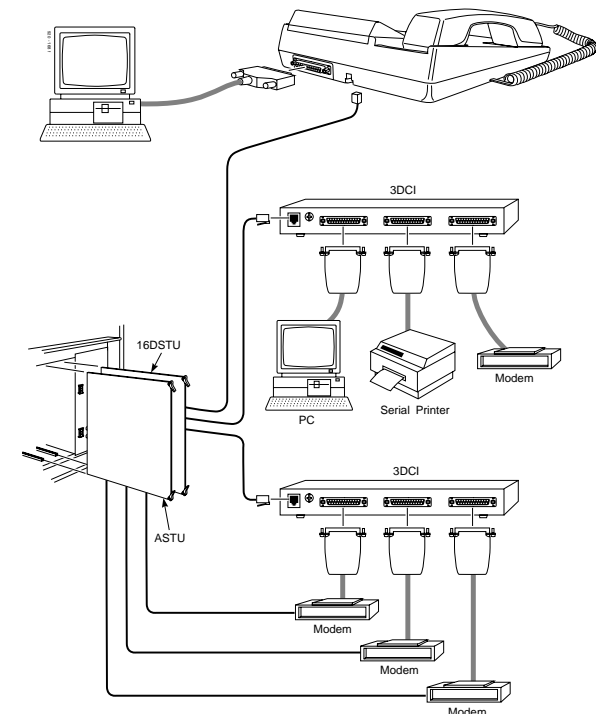

Figure 5-2 TYPICAL DATA NETWORK

5. System Startup and Data

DATA OVERVIEW

Physical Ports and Software Ports

DCI's use physical hardware ports and software ports. Hardware ports for a DCI-A or DCI-B use the number corresponding to the port where the device is physically connected.

Software ports are used during system programming. The software port (1-144) depends on the installation order set in Program 0005.

For most installations, assign DCI Order 1 to the first DCI Module installed and DCI Order 144 to the last DCI installed. Order 1 specifies software port 1; Order 144 specifies software port 144.

Each 3-DCI requires one physical port connected to the 16DSTU (002-256) and three software ports (145-288). The 3-DCI uses a different numbering plan also determined by Program 0005.

For most installations, 3-DCI Order 1 assigns software ports 145, 146, and 147 to the first 3-DCI-A installed. The last 3-DCI installed uses 3-DCI-A Order 48 for ports 286, 287, 288.

Device	Total Number of Physical Ports	Installation Order Numbers	Software Ports
DCI Modules	144 (in phone)	1-144	1-144
3DCI Units	48	1-48	145-288

DATA OVERVIEW

3-DCI Port Assignments (Figure 5-3)

Figure 5-3 below shows typical 3DCI-A port assignments.
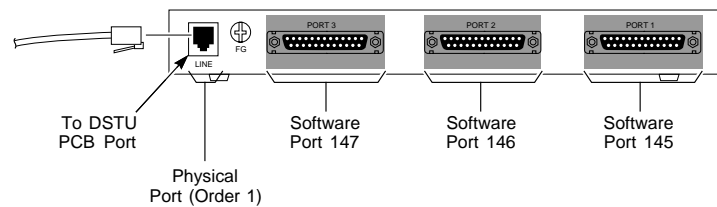
Figure 5-3 TYPICAL 3DCI-A PORT ASSIGNMENTS

Non-dedicated Modem Pooling Network (Figure 5-4)

The illustration on the following page shows a typical data communications network with a 3DCI-A connected to a 16DSTU extension circuit supporting a modem. The modem is not equipped with a dedicated CO line, but can access an outside line via an 8/16ASTU PCB.

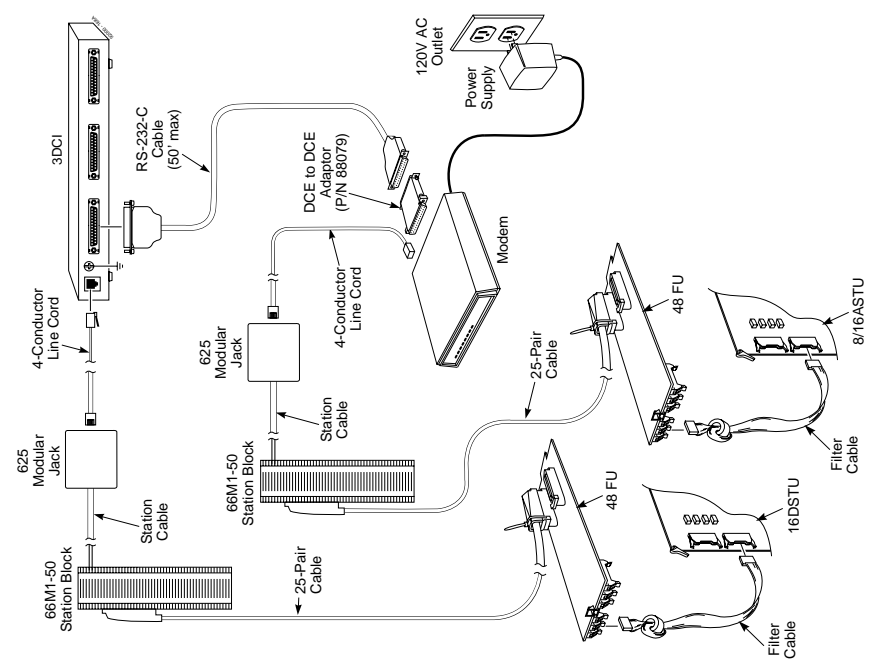## Dedicated Modem Pooling Network (Figure 5-5)

The illustration on the following page shows a typical data communications network with a 3DCI-A connected to a 16DSTU extension circuit supporting a modem. The modem is equipped with a dedicated CO line for outside dialing purposes.

5. System Startup and Data

DATA OVERVIEW

Figure 5-4 NON-DEDICATED MODEM POOLING
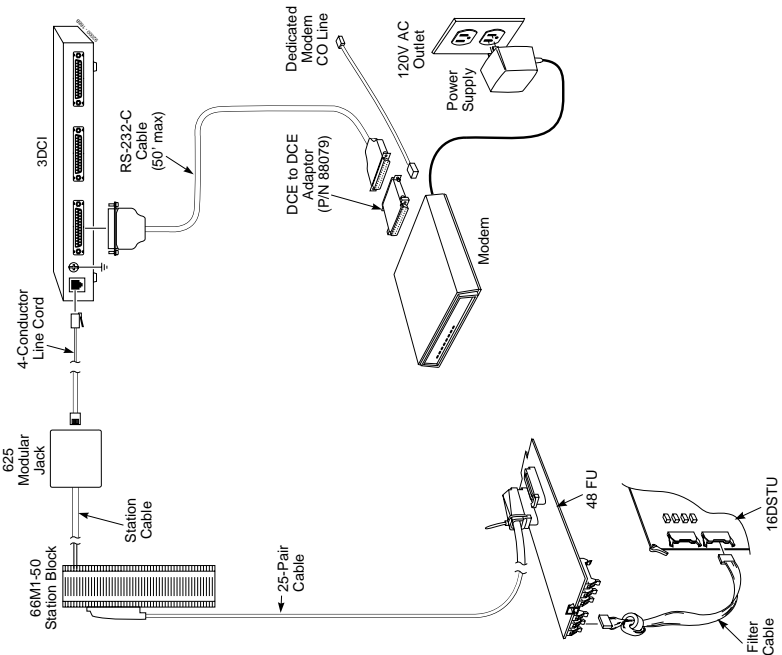
5-10

DATA OVERVIEW

**Figure 5-5 TYPICAL DEDICATED MODEM POOLING/REMOTE
MAINTENANCE INSTALLATION**

DCI-A AND DCI-B MODULES

DCI-A and DCI-B Description (Figure 5-6)

The DCI is a single port data module (DCE port) installed in a multibutton telephone. The DCI can switch data at speeds from 300 to 19.2K baud. Refer to *Data Communications Interface* in the Software Manual for detailed Data Communications parameters.

The DCI also provides remote maintenance capability and alarm reports for the system if connected to a modem. When connected to a terminal, port identification, PCB status, and system configuration data is provided. One DCI (or 3DCI) should be installed per system for maintenance and alarm purposes.

There are two types of single port DCI devices. The DCI-A provides one RS-232-C serial port. The DCI-B provides one RS-232-C parallel port. Each DCI utilizes one data port in the system (max. 144).

RS-232-C Cable

DCI-A

As required

SMDR Printer

OR

SMDR Data Collection Device

RS-232-C Pin Out Information

RS-232-C Connector	Description	DCE (3-DCI, DCI-A or Modem)	DTE (PC or Printer)
8	DCD	→	←
3	RXD	→	←
2	TXD	←	→
20	DTR	←	→
6	DSR	→	←
4	RTS	←	→
5	CTS	→	←
7	GND		

Direction of Signal Flow (→ output or ← input)

25-Pin RS-232-C Connector

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
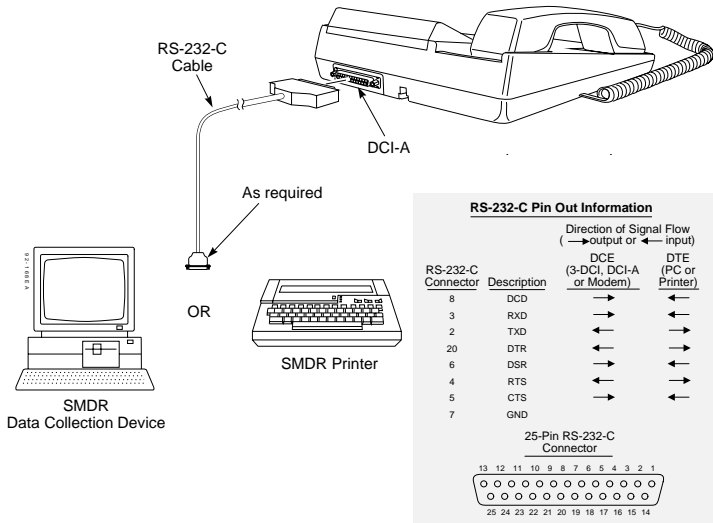
Figure 5-6 TYPICAL DCI INSTALLATION

DCI-A AND DCI-B MODULES

Installing a DCI (Figures 5-7 through 5-11)

1. Turn the telephone upside down and remove the speed dial card.
2. Remove the four screws that secure the telephone base and remove the base.
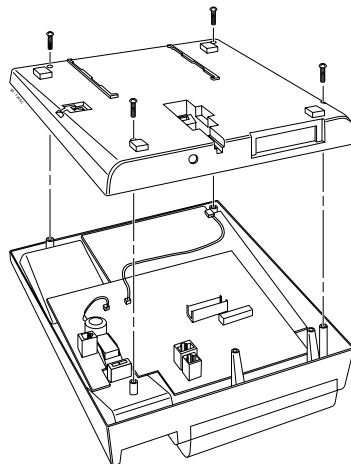
Figure 5-7 REMOVING THE TELEPHONE BASE

3. Peel the adhesive backing off of the DCI spacer and attach it as shown to the DCI Module. This spacer keeps small objects from falling into the telephone.
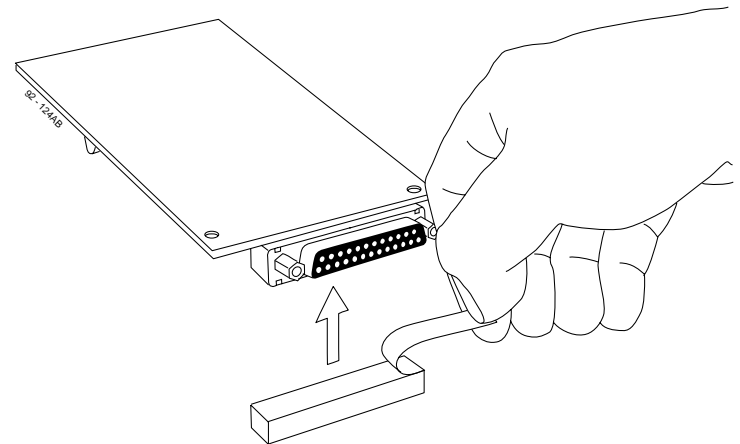
Figure 5-8 INSTALLING THE SPACER

5-13

5. System Startup and Data

DCI-A AND DCI-B MODULES

Installing a DCI (cont'd)

4. Using a flat-blade screwdriver, carefully pry out the filler piece on the telephone base. This will expose the cutout in the base.
5. Plug the DCI into the connector in the telephone's upper housing and secure in place with the two screws provided (Figure 5-10).
6. Reinstall the telephone base and secure it with the four screws. Make sure the DCI is correctly oriented in the cutout in the telephone base.
7. Connect the data device to the DCI.
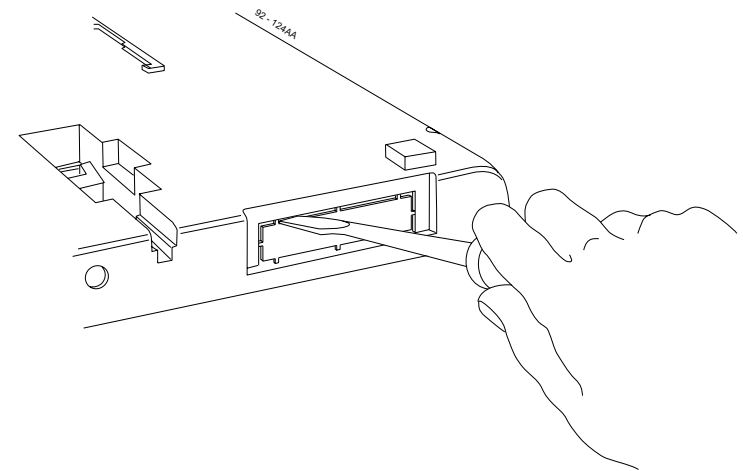
Figure 5-9 REMOVING THE FILLER PIECE

DCI-A AND DCI-B MODULES
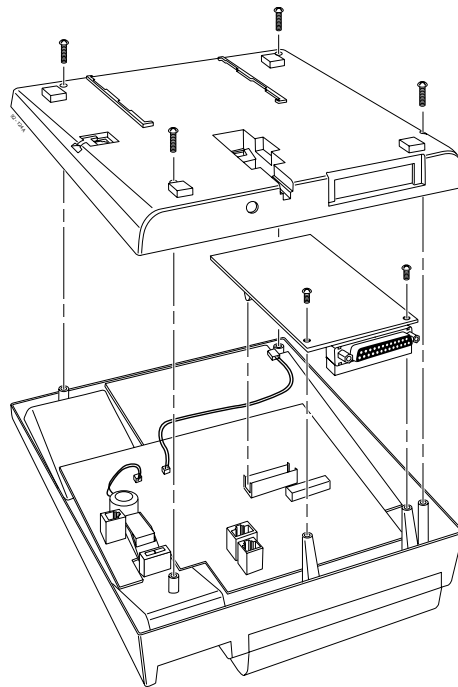
Figure 5-10 INSTALLING THE DCI

RS-232-C Pin Out Information

Direction of Signal Flow
(——▶output or ◀—— input)

RS-232-C Connector	Description	DCE (3-DCI, DCI-A or Modem)	DTE (PC or Printer)
8	DCD	——▶	◀——
3	RXD	——▶	◀——
2	TXD	◀——	——▶
20	DTR	◀——	——▶
6	DSR	——▶	◀——
4	RTS	◀——	——▶
5	CTS	——▶	◀——
7	GND		

25-Pin RS-232-C Connector

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
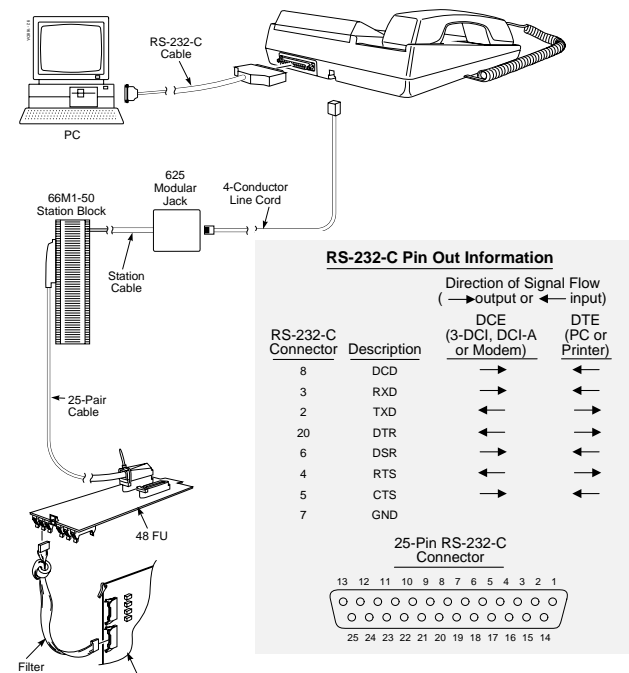
Figure 5-11 TYPICAL DCI DATA INTERFACE/SMDR RECORDING INSTALLATION

5. System Startup and Data

3-DCI MODULE

3DCI Description

The 3-DCI is a stand-alone three port data module (DCE ports) which provides three RS-232-C serial ports to network three different data devices. Each data device connected to the 3-DCI uses one system data port (max. 144).

The 3-DCI also provides remote maintenance capability and alarm reports for the system if connected to a modem. When connected to a terminal, port identification, PCB status, and system configuration data is provided. One 3-DCI (or a DCI-A/B) should be installed per system for maintenance and alarm purposes.

The 3-DCI module derives its power and signaling from a 16DSTU extension circuit. The 3-DCI provides one power status LED and three port status LEDs.

3DCI-A to 16DSTU Cabling (Figure 5-12)

1. Punch down one pair 24 AWG station cable for each the 3-DCI-A to a cross-connect block.
2. Run one-pair cross-connect from the cross-connect block to the extension (B) block.
3. Connect the B block's 25-pair cable to the a 48FU filter unit.
4. Install bridging clips on the B block.
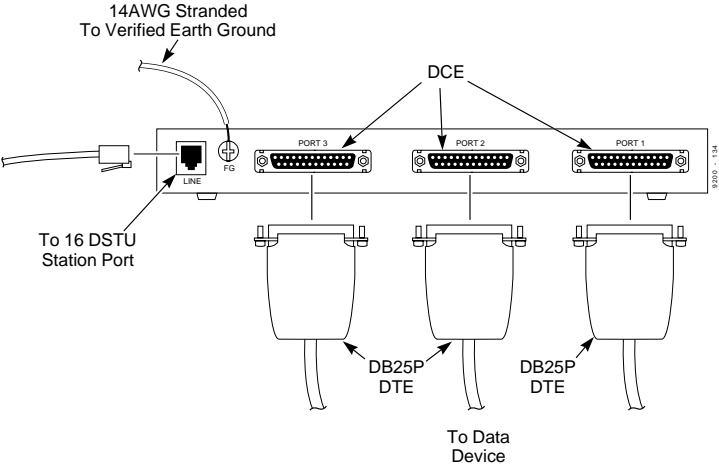
Figure 5-12 INSTALLING A 3-DCI

14AWG Stranded
To Verified Earth Ground

DCE

PORT 3   PORT 2   PORT 1

FG

LINE

To 16 DSTU
Station Port

DB25P
DTE

DB25P
DTE

To Data
Device

3-DCI MODULE

Connecting a 3-DCI-A to a Digital Extension Circuit (Figures 5-13)

1. Install a modular jack for the 3-DCI-A. The modular jack should be within six feet of the 3-DCI-A.
2. For each 3-DCI-A, run one-pair 24 AWG station cable from the cross-connect block to a modular jack. Ground the unused pair.
3. Terminate the extension leads to GRN/RED of the modular jack. Terminate the unused leads to the jack.

4. Install a data device into any one of the 3-DCI-A serial ports.
5. Ground the 3-DCI to a known earth ground.
6. Program the 3-DCI-A. Refer to Data Communications *Interface* in the Software Manual for programming instructions.

5. System Startup and Data

3-DCI MODULE

Figure 5-13 TYPICAL 3-DCI-A DATA NETWORK

Section 6, SPECIFICATIONS AND PARTS LIST

**6. Specifications
and Parts**

SYSTEM SPECIFICATIONS

Specifications

Talk Timeslots (Intercom/line)	non-blocking	
Analog trunks (CO/PBX lines)	128*	
Digital key telephones	256*	combined
Analog single line telephones	240*	total to
DSS Console	8*	256
DCI-A/B	144*	one req'd
3DCI-A adaptors	48*	per system
3ACI-A adaptors	64*	256
Alarm Circuits	16*	
Door Chime Box/Door Unlock Contacts	8	combined total
Internal Page Zones	128	32 per tenant
External Page Zones	8	
Dial Tone Detector Circuits	128*	combined total
DTMF Receiver Circuits	128*	to 128
Tenants	4	
Universal PCB slots		
Main Cabinet	1-7	
	(Not including CPU slot)	
1st Expansion Cabinet	9-16	
2nd Expansion Cabinet	17-25	

* NOTE: Maximum capacities above are determined by maximum PCB configuration allowed. When installing single line sets, DISA, or tie lines, CDTU-A/B circuits must be allocated for DTMF receivers. To install single line sets with CO/PBX line access, or when installing immediate-start tie lines, CDTU-A/B circuits must be allocated for dialtone detection.

Environmental Requirements

Meeting established environmental standards maximizes the life of the system. Refer to the Standard Practices Manual for further information. Be sure that the site is not:

1. In direct sunlight or in hot, cold, or humid places.
2. In dusty areas or in areas where sulfuric gases are produced.
3. In places where shocks or vibrations are frequent or strong.
4. In places where water or other fluids comes in contact with the main equipment.
5. In areas near high-frequency machines or electric welders.
6. Near computers, telexes, microwaves, air conditioners, etc.
7. Near radio antennas (including shortwave).

Power Requirements

A dedicated 110 VAC 60 Hz circuit located within 7 feet of the Main Cabinet Power Supply is required.

Site Requirements

The system must be floor-mounted. Brackets secure each cabinet to a wall.

SYSTEM SPECIFICATIONS

Environmental Specifications

	Temperature		Temperature
Cabinet and Keysets	0º to 40º C (-4º to 140º F)	Door Chime Box	-20º to 60º C (32º to 104º F)
	Humidity 20 to 80% non-condensing		**Humidity** 20 to 80% non-condensing

Electrical Specifications   External Zone Paging

Power Supply:	110 VAC +/-10% @ 57/63H +/- 1Hz dedicated 15 Amp circuit	Output Impedance:	600 OHMs
Power Requirements:	75 VA to 6A Main Cab	Maximum Output:	+ 3 dBM
Grounding Requirements:	No. 14 AWG copper wire		

External Control Relay Contact

Maximum Load:	60mA @ 30VDC 10mA @ 90VDC	Maximum Initial Contact Resistance:	50 mOHMS

Mechanical Specifications

Type of Equipment	Width	Depth	Height	Weight
Main Cabinet	23 1/4"	13 1/4"	26 1/2"	66 lbs
Expansion Cabinet	23 1/4"	13 1/4"	15 3/4"	44 lbs
16/32 Button Keyset	8 5/8"	9 3/8"	3 1/4"	2 lbs 2 oz
Super Display	8 5/8"	9 3/8"	3 7/8"	2 lbs 8 oz
Digital Single Line	6 3/4"	8 5/8"	3 3/4"	1 lb 7 oz
DSS Console	7 13/16"	8 7/8"	2 3/4"	1 lb 6 oz
Door Box	4"	1 1/2	5 3/16"	
3-ACI-A, 3-DCI-A. & 2-OPX Module	9 3/8"	7 3/8"	1 1/4"	3 lbs

Cabling Requirements

1. Do not run station cable in parallel with the AC source, telex, or computer, etc. If the cables runs are near cable runs to those devices, use shielded cable with grounded shields or install the cable in conduit.
2. When cables must be run on the floor, use cable protectors.
3. Cable runs for key telephones, single line telephones, Door Chime Boxes, 3DCI-A adaptors, and 3ACI-A adaptors must be a dedicated, isolated cable pair.
4. The Telco RJ21X and cross-connect blocks should install to the the right of the Main Cabinet. Extension blocks and cross-connect blocks should be installed to the left of the Main Cabinet.

SYSTEM SPECIFICATIONS

Maximum Cable Runs

Device	Cable type	Cable run length (ft)	Notes
Key Telephone	2-wire 26 AWG	1300	
	2-wire 24 AWG	2000	
	2-wire 22 AWG	2600	
Single line telephone	2-wire 26 AWG	13,100	at constant 20 Ma
	2-wire 24 AWG	21,000	at constant 20 Ma
	2-wire 22 AWG	34,750	at constant 20 Ma
Single line telephone	2-wire 26 AWG	6,500	at constant 35 Ma
	2-wire 24 AWG	10,500	at constant 35 Ma
	2-wire 22 AWG	17,400	at constant 35 Ma
3DCI-A adaptor	2-wire 26 AWG	1300	
	2-wire 24 AWG	2000	
	2-wire 22 AWG	2600	
3ACI-A adaptor	2-wire 26 AWG	1300	
	2-wire 24 AWG	2000	
	2-wire 22 AWG	2600	
Door Chime Box	2-wire 26 AWG	200	
	2-wire 24 AWG	330	
	2-wire 22 AWG	550	

FCC Registration Information:

Model:	384i
Manufacturer:	Nitsuko America
Load number (DOC)	20
FCC Part 15 Registration:	Class A
Sample FCC Registration Number:	1ZDTHA-65325-MF-E

(Refer to the label on the Main Cabinet for FCC Registration number).

Reg. Status	MTS/WATS Interfaces	Mfrs. Port Identifier	Ringer Eq. Number	SOC	Network Jacks
Original	02LS2	4ATRU-LS1	0.9B (ac); 0.1 (dc)	---	RJ21X
Original	02LS2	8ATRU-LS1	0.9B (ac); 0.1 (dc)	---	RJ21X
Original	02GS2	8GSAU-A1	4.0B (ac)	---	RJ21X
Original	02RV2-T	4ATRU-LD1	0.0B	AS.2	RJ21X

Reg. Status	Analog Private Line Interfaces	Mfrs. Port Identifier	---	SOC	Network Jacks
Original	TL11M	4ATRU-EMI	---	9.0F	RJ2EX

Federal Communications Commission DID Requirements

This equipment must operate in a manner that is not in violation of Part 68 rules. This equipment returns answer supervision to the Public Switched Network when the DID trunk is: (1) answered by the called station; (2) answered by the attendant; (3) routed to a recorded announcement that can be administered by the CPE user; (4) routed to a dial prompt.

SYSTEM SPECIFICATIONS

The equipment returns answer supervision on all DID calls forwarded back to the Public Switched Telephone Network except when: (1) a call is unanswered; (2) a busy tone is received; (3) a reorder tone is received.

When ordering DID Service, provide the telco with the following information:

FCC Registration Number	1ZDJPN-nnnnn-KF-E
DID Facility Interface Code	02RV2-T
DID Service Order Code	9.0F
DID Answer Supervision Code	A S.2
DID USOC Jack Type	RJ21X

Please note the following:

1. DID services must be purchased from the local telephone company.
2. Each 4ATRU-LD1 provides four DID trunk circuits and utilizes eight consecutive software ports. For example, a 4ATRU-LD1 providing DID circuits 9-12 uses ports 9-16.
3. Refer to the Software Manual for detailed DID description, conditions, and programming instructions.

LIST OF COMPONENTS

List of components	Part Number
Common Equipment	
Main Cabinet	.92100
Expansion Cabinet	.92120
Main Power Supply	.92105
Expansion Power Supply	.92125
90V/AC Ring Supply Cable	.92111
Common Cards	
Central Processor with System Software	.92130
14.4 KBPS Modem Kit	.92366
Includes:	
Zoom Fax/Modem	.85862
DCI to Zoom Modem Adaptor Plug	.92268
PC Programming Software	.92216
4 Circuit Page/Doorbox Card	.92135
4 x 4 Conference/16 DTMF	.92140
DTMF Receiver Card	.92145
4 x 4 Conference Card	.92150
Trunk Interfaces	
8 Circuit C.O. Loop Start Card	.92170
4 Power Failure Unit	.92174
8 Circuit Ground Start Board	.92185
E & M TIE Line Interface	.92186

List of components	Part Number
DID Interface	.92186
8 Circuit Caller I.D. Board	.92188
Station Interfaces	
16 Circuit Analog Station Card	.92175
8 Circuit Analog Station Card	.92176
16 Circuit Digital Station Card	.92180
Filter Units	
24 C.O. Filter Unit	.92160
48 Station Filter	.92165
Station Equipment	
16 Button Standard Tel (NHF)	.92560
16 Button Dual LED Display Tel (HF)	.92563
16 Button Dual LED Standard Tel (NHF)	.92570
16 Button Dual LED Display Tel (HF)	.92573
24 Button Super Display Tel (HF)	.92663
32 Button Dual LED standard Tel (NHF)	.92670
32 Button Dual LED Display Tel (HF)	.92673
110 Button DSS Console	.92555
Digital Single Line Telephone	.92550
Wall Mounting Kit	.92579

LIST OF COMPONENTS

List of components	Part Number	List of components	Part Number
Peripheral Station Equipment		**Replacement Parts**	
OPA/VAU Base Unit	92136	Handset and Cord Assembly	92595
OPA/VAU Expansion Unit	92137	Handset Coil Cord - Black 6'	85326
Dual OPX Unit	92177	Handset Coil Cord - Black 9'	85323
Analog Door Chime Box	88540	Handset Coil Cord - Black 13'	85324
3 Port Data Module	92258	16 BTN Tel Plastic C.O. Cover	92600-16
1 Port Data Module	92266	24 BTN Tel Plastic C.O. Cover	92600-24
1 Port Data Module	92267	32 BTN Tel Plastic C.O.Cover	92600-32
3 Port Analog Interface	92259	16 BTN Designation Strip	92605-16
Telephone Recording Jack Module	92265	24 BTN Designation Strip	92605-24
		32 BTN Designation Strip	92605-32
		DSS Console Designation Strip	92605-DSS

6. Specifications and Parts

NITSUKO AMERICA

**Nitsuko America, Telecom Division
4 Forest Parkway
Shelton, CT 06484**

TEL: 203-926-5400
FAX: 203-929-0535

Other Important Telephone Numbers

Sales: 203-926-5450
Customer Service: 203-926-5444
Customer Service FAX: 203-926-5454
Technical Service: 203-925-8801
Discontinued Product Service: .900-990-2541
Technical Training: 203-926-5430
Emergency Technical Service (After hours) 203-929-7920
    (Excludes discontinued products)

| 1. Installing Cabinets | 2. PCB Installation and Startup | 3. Installing Extensions and Trunks | 4. Optional Equipment | 5. System Startup and Data | 6. Specifications and Parts |