Feature Package 3

TRIAD 1/2/3 Installation

TRIAD®

A NEW DIMENSION IN BUSINESS COMMUNICATIONS

STARPLUS™ Triad 1/2/3™

Installation Manual

Part Number: 8050-12

Issue 3.2 - March 2001

Issue	Release Date	Changes
2	8-99	☐ Feature Package 2 {FP2} enhancements have been added. ☐ Manual content contains extensive revisions.
2.1	12-99	Manual content has been revised.
3	5-00	Manual content has been reformatted.
3.1	8-00	Manual content has been revised to clarify Feature Package 3.
3.2	3-01	Manual content has been revised for correctness and clarity.

LIFE SUPPORT APPLICATIONS POLICY

VODAVI Communications Systems products are not authorized for and should not be used within Life Support applications. Life Support systems are equipment intended to support or sustain life and whose failure to perform when properly used in accordance with instructions provided can be reasonably expected to result in significant personal injury or death.

VODAVI Communications Systems warranty is limited to replacement of defective components and does not cover injury to persons or property or other consequential damages.

mlj/2001

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1 Introduction

This manual provides the information necessary to install and maintain the *STARPLUS Triad 1/2/3* Systems. The described features are based on the current software release. If any of these features do not work on your system, call your sales representative regarding upgrading your system.

Regulatory Information (U.S.A.)

The Federal Communications Commission (FCC) has established rules which allow the direct connection of the *Triad 1/2/3* Systems to the telephone network. Certain actions must be undertaken or understood before the connection of customer provided equipment is completed.

Telephone Company Notification

Before connecting the *Triad 1/2/3* Systems to the telephone network, the local serving telephone company must be given advance notice of intention to use customer provided equipment and provided with the following information:

Telephone Numbers

The telephone numbers to be connected to the system.

Triad 1/2 Systems Information

- The Ringer Equivalence Number also located on the KSU: 1.3B
- The USOC jack required for direct interconnection with the telephone network: RJ11C

Triad 3 System Information

- The Ringer Equivalence Number also located on the KSU: 1.3B
- The USOC jack required for direct interconnection with the telephone network: RJ21X

FCC Registration Numbers

- For systems configured as a key system: (button appearances) DLPKOR-24039-KF-E
- For systems configured as a Hybrid system: (dial access codes) DLPKOR-24026-MF-E

Incidence of Harm

If the telephone company determines that the customer provided equipment is faulty and possibly causing harm or interruption to the telephone network, it should be disconnected until repairs can be made. If this is not done, the telephone company may temporarily disconnect service.

Changes in Service

The local telephone company may make changes in its communications facilities or procedures. If these changes should affect the use of the *Triad 1/2/3* Systems or compatibility with the network, the telephone company must give written notice to the user to allow uninterrupted service.

Maintenance Limitations

Maintenance on the *Triad 1/2/3* Systems is to be performed only by the manufacturer or its authorized agent. The user may not make any changes and/or repairs except as specifically noted in this manual. If unauthorized alterations or repairs are made, any remaining warranty and the software license for the system will be voided.

Hearing Aid Compatibility

All *Triad 1/2/3* Digital Telephones are Hearing Aid Compatible, as defined in Section 68.316 of Part 68 FCC Rules and Regulations.

UL/CSA Safety Compliance

The *Triad 1/2/3* Systems have met all safety requirements and were found be in compliance with the Underwriters Laboratories (UL) 1459. The *Triad 1/2/3* Systems are authorized to bear the NRTL/C marking.

Notice of Compliance

The *Triad 1/2/3* Systems comply with rules regarding radiation and radio frequency emissions by Class A computing devices. In accordance with FCC Standard 15 (Subpart J), the following information must be supplied to the end user:

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

Toll Fraud Disclaimer

"While this device is designed to be reasonably secure against intrusions from fraudulent callers, it is by no means invulnerable to fraud. Therefore, no express or implied warranty is made against such fraud including interconnection to the long distance network."

"While this device is designed to be reasonably secure against invasion of privacy, it is by no means invulnerable to such invasions. Therefore, no express or implied warranty is made against unlawful or unauthorized utilization which results in the invasion of one's right of privacy."

2 Triad 1/2 System Installation

This chapter contains the basic system installation and wiring instructions for the *Triad 1/2* Systems, as well as how to install the optional cards and units.

Introduction

As with any sophisticated communications device, installation of the *Triad 1/2* Systems, requires the care and forethought of a competent technician. To assure easy servicing and reliable operation, several factors must be considered when planning the system installation. The installation consists of these major steps:

- Site Preparation
- KSU and Power Supply (PS) Installation
- PCB Installation
- System Wiring
- Keyset and Terminal Installation
- Basic Installation Check-Out
- System Programming and Verification

Installing the *STARPLUS Triad 1/2* System is quick and efficient if these installation instructions are followed.

Site Preparation

General Site Considerations

The first step is to locate an acceptable site for the common equipment (KSUs, boards, etc.). When locating a mounting site for the KSUs, the following points must be considered.

- The KSUs are designed for wall mounting and should not be mounted directly to a masonry or plasterboard wall. It is recommended that a 1/2 inch plywood back board be firmly mounted to the wall, and the KSU and MDF, if other than the MDF, be mounted to the back board.
- The location must have access to a dedicated 110 Volt AC (±10%), 60 Hz, single-phase circuit with a circuit breaker or fuse rated at 15 amps. A 3-wire (parallel blade grounded outlet should be within approximately 6 feet of the lower left rear of the BKSU mounting.
- The location must have access to a good earth ground, such as a metallic cold water pipe with no non-metallic joints. The ground source should be located as close as possible to the system.
- The system should be located in an area which is well ventilated with a recommended temperature range of 68°-78° F and a relative humidity range of 5-60% (non condensing).
- The system should be located within 25 feet of the telephone company's termination point. Also, the location should be within the prescribed station loop lengths for all keysets and terminals. If existing cabling is to be used, the location of existing cabling and conduits should be considered.
- Protection from flooding, flammable materials, excessive dust and vibration.
- The site should be away from radio transmitting equipment, arc-welding devices, copying machines and other electrical equipment that are capable of generating electrical interferences. Operation of this equipment in a residential area is likely to cause interference in which case the user, at their own expense, are required to take whatever measures may be required to correct the interference.

Back-Board Installation

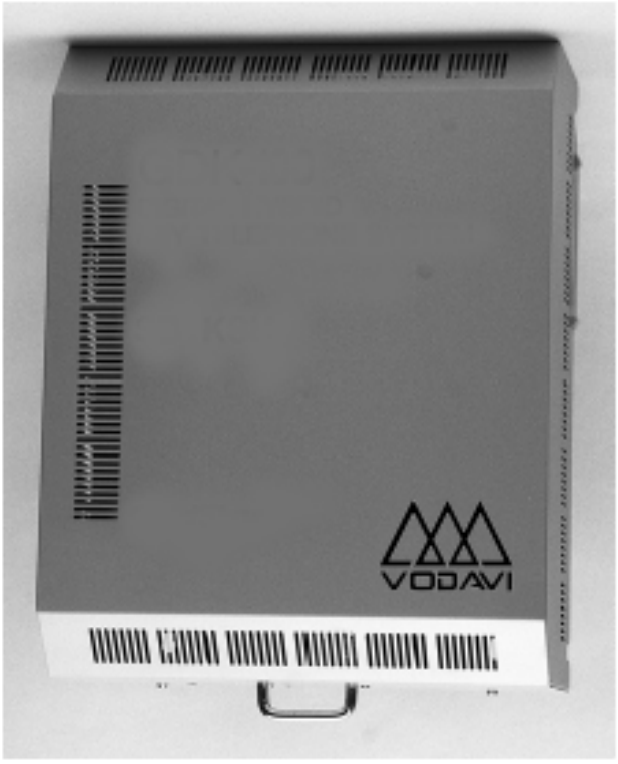
A wooden back-board is recommended for all installations and must be installed when the location has masonry or plasterboard walls. A 1/2 inch plywood material is sufficient for most installations. The back-board should be mounted at a convenient height, about 3 feet above the floor and bolted in a number of places to distribute the weight of the system.

Space should be available on the bottom side of the back-board for the MDF cabling and for optional equipment such as a music source and PFTU, etc. It is recommended the location of each major item be roughly sketched on the back-board as an installation layout.

Verify On-Site Equipment

Once the equipment installation site has been identified and a dedicated AC outlet, earth ground, and lighting and ventilation are available, verify that all equipment required is on-site and has not been damaged during shipment. Unpack the KSUs to assure there is no shipping damage. Note that a mounting template is packed with each KSU and this template is required later in the installation. Check that the type and quantity of boards receive is correct and optional equipment and a Power Line Surge Protector are on-site. Note that the individual boards should NOT be unpacked at this time.

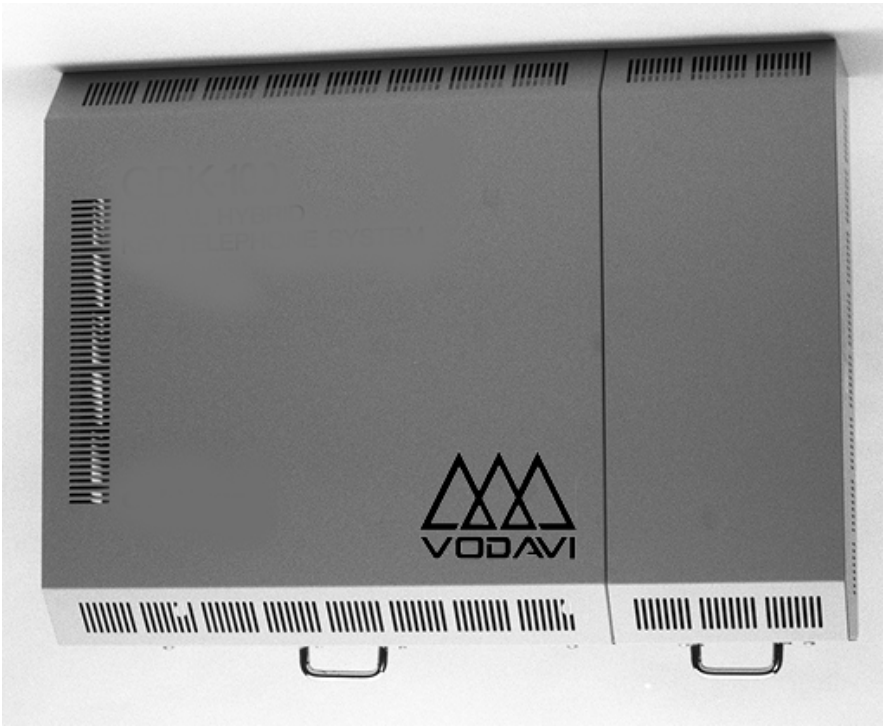
If any equipment is damaged or missing, notify the appropriate personnel to correct the situation.



DEFAULT CARD LAYOUT

SLOTS					
0	1	2	6	7	MPB
DTIB	DTIB	DTIB	LCOB	NONE	MPB

Figure 2-1: *Triad 1* Default Card Layout



DEFAULT CARD LAYOUT

SLOTS												
0	1	2	3	4	5	6	7	MPB	8	9	10	11
DTIB	DTIB	DTIB	DTIB	LCOB	LCOB	LCOB	NONE	MPB	NONE	NONE	NONE	NONE

Figure 2-2: *Triad 2* Key Service Unit (BKSU/EKSU)

In certain configurations, it is possible to not have all card slots utilized due to power supply capacities. Use the Configurator Program to calculate the correct configuration.

KSU & Power Supply (PSU) Installation

The *Triad 1* System consists of a Basic KSU (BKSU) cabinet. The basic exterior of the *Triad 1* System is shown in *Figure 2-2*.

Mounting the Triad 1 Basic KSU

The Basic KSU is a metal frame cabinet designed for wall mounting. Employing the KSU mounting template provided with the BKSU, mark the location of the two screws to mount the BKSU. Again, the KSU must NOT be mounted on a masonry or dry-wall surface, in this case a wooden back-board is required. Refer to the next diagram for the distance between mounting holes.

The BSKU is mounted with four #10 or larger, 1 ½ inch or longer screws.

1. Drill pilot holes in the two locations marked, insert the screws and tighten leaving about ½ inch exposed.
2. Mount the Basic KSU on the screws and tighten the screws securely.
3. Remove the front cover by turning the two cover screws counter clockwise.
4. Tilt and lift the cover to remove.
5. Insert the screws to the mounting holes of the BKSU and tighten the screws as shown.

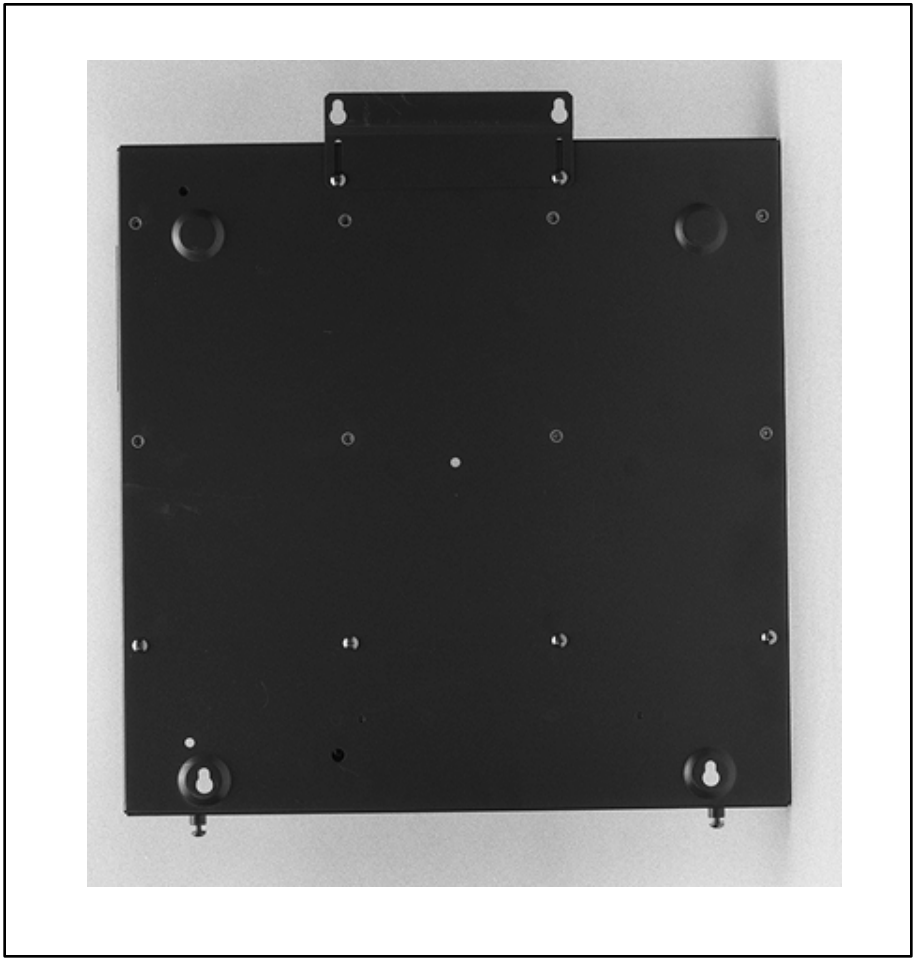


Figure 2-3: *Triad 1* Unit Basic KSU Back w/Mounting Plate Extended

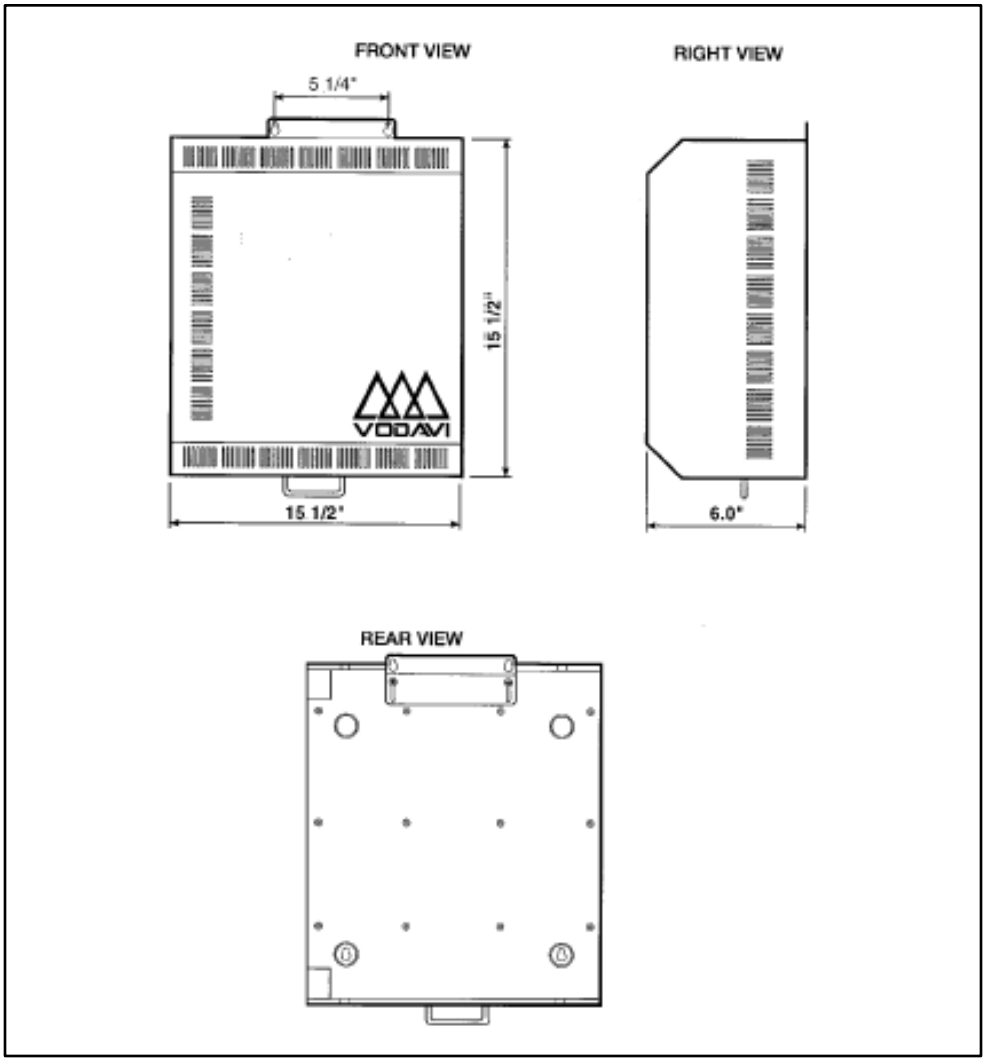


Figure 2-4: *Triad 1* KSU Mounting Holes and Installation Layout

KSU and Power Supply (PS) Installation

The *Triad 2* System consists of a Basic KSU (BKSU) and Expansion KSU (EKSU). The basic exterior of the *Triad 2* System is shown in *Figure 2-2*.

Mounting the Triad 2 Basic KSU

The Basic KSU is a metal frame cabinet designed for wall mounting. Employing the KSU mounting template provided with the BKSU, mark the location of the two screws to mount the BKSU. Again, the KSU must NOT be mounted on a masonry or dry-wall surface, in this case a wooden back-board is required. Refer to *Figure 2-2* for the distance between mounting holes.

The BSKU is mounted with four #10 or larger, 1 ½ inch or longer screws.

1. Drill pilot holes in the two locations marked, insert the screws and tighten leaving about ½ inch exposed.
2. Mount the Basic KSU on the screws and tighten the screws securely.
3. Remove the front cover by turning the two cover screws counter clockwise.
4. Tilt and lift the cover to remove.
5. Insert the screws to the mounting holes of the BKSU and tighten the screws securely.

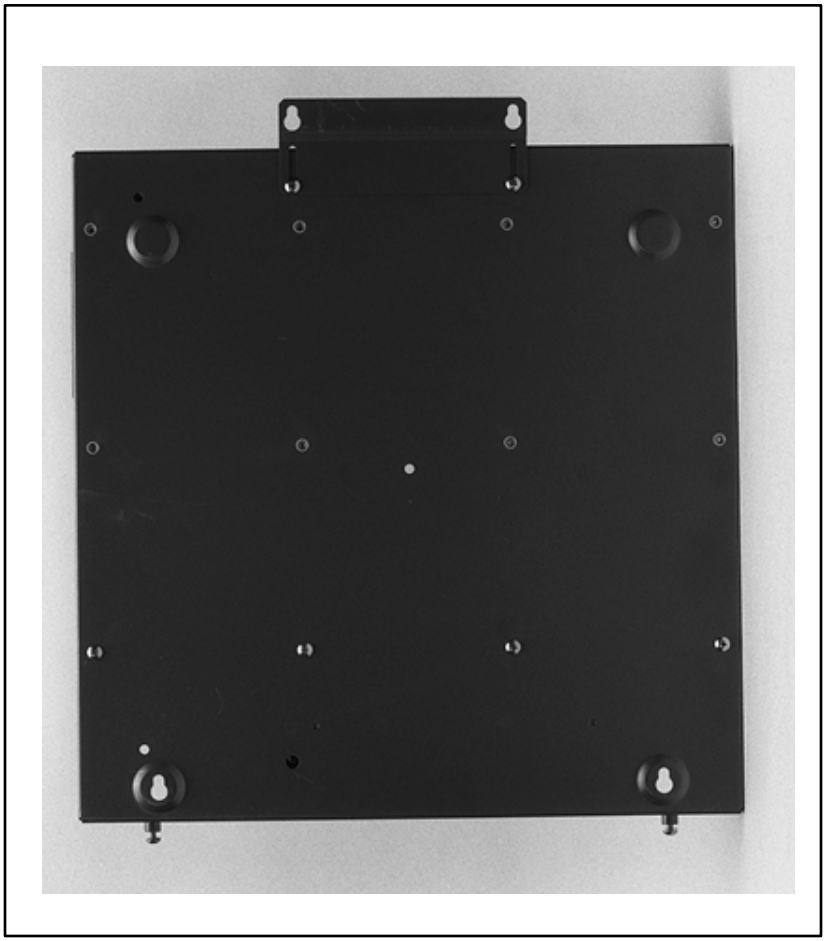


Figure 2-5: *Triad 2* Basic KSU Back w/Mounting Plate Extended

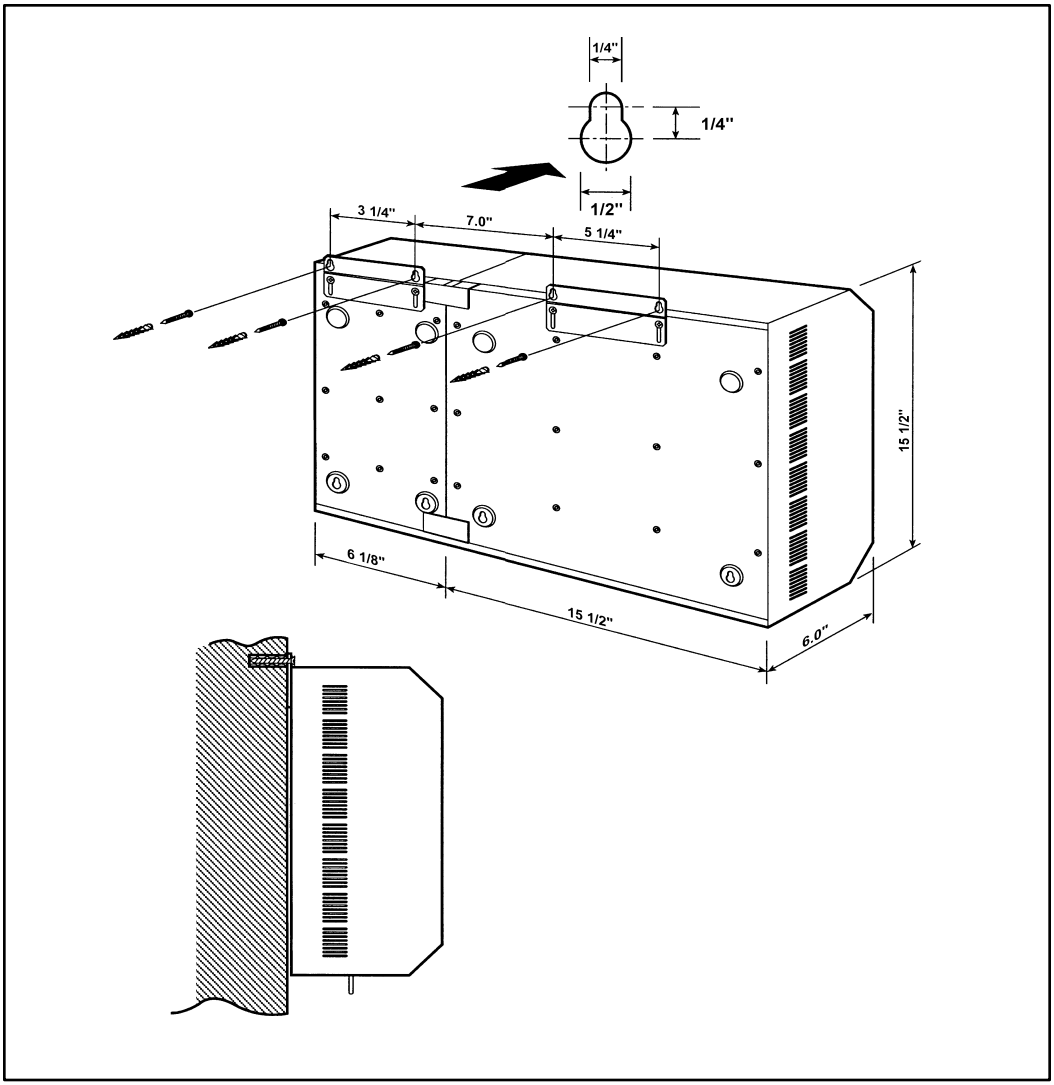


Figure 2-6: *Triad 2* KSU Mounting Holes and Installation Layout

Mounting the Expansion KSU (EKSU)

The Expansion KSU is a metal housing designed for wall mount installation. If required, an EKSU is mounted on the right side of the BKSU.

1. Before mounting the Expansion KSU, remove the KSU Interconnection Cover on the right side of the Basic KSU.
2. Mount the Expansion KSU on the screws and tighten the screws securely.
3. Mount the 2 side brackets between the Basic and Expansion KSUs.
4. Remove the front cover by turning the two front cover screws counter clockwise.
5. Tilt and lift the cover to remove.
6. Interconnection is achieved via a amphenol type connector. No cable is used to connect the BKSU and the EKSU together. Refer to *Figure 2-8.*

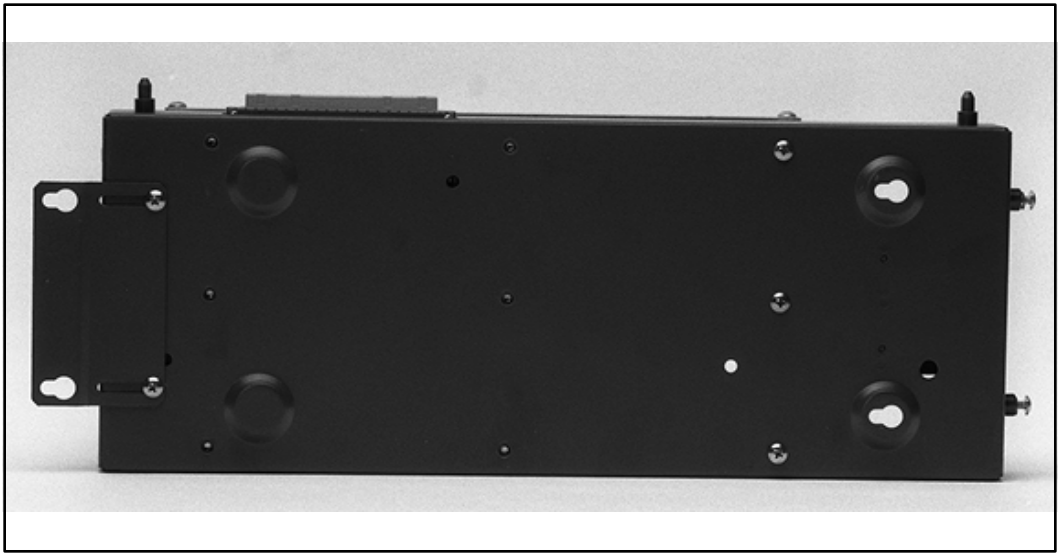


Figure 2-7: Expansion KSU Back w/Mounting Plate Extended

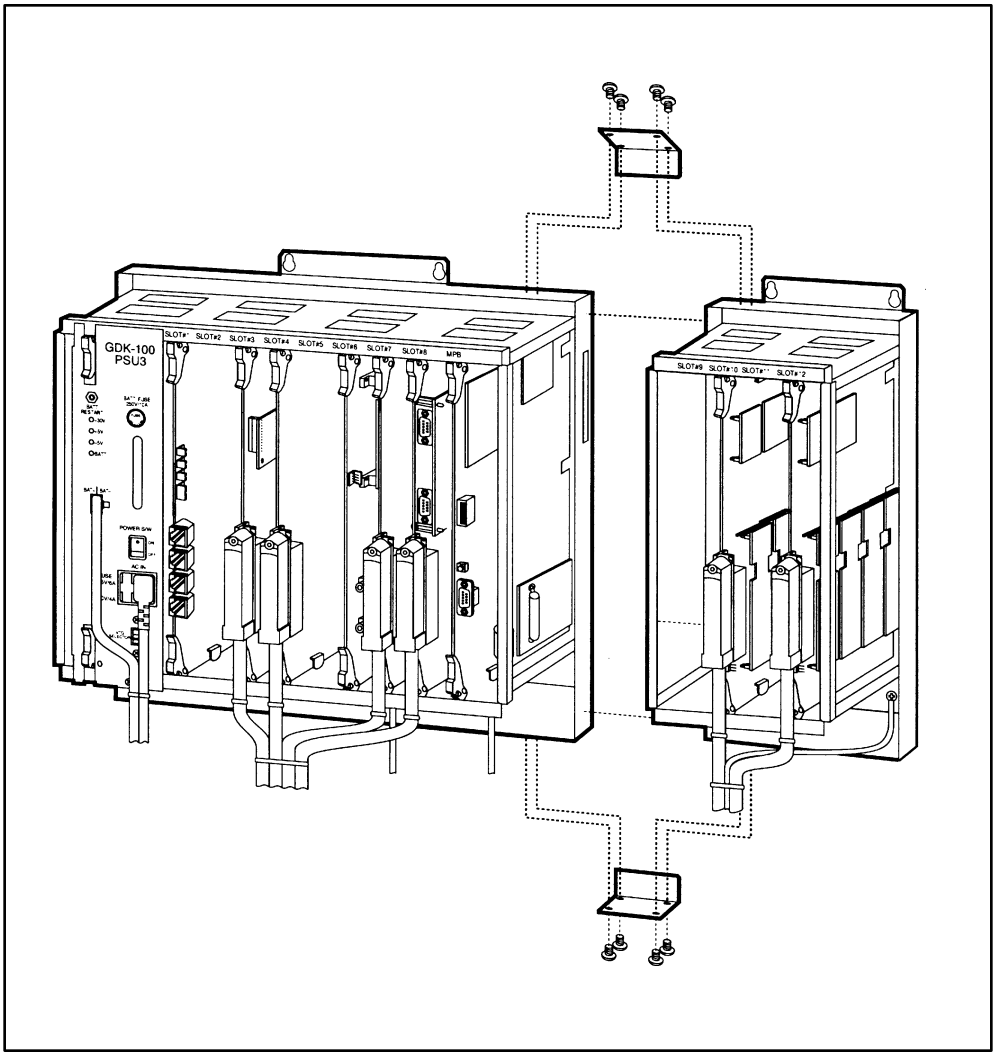


Figure 2-8: Connection of BKSU and EKSU

Ring Generator Installation (RGU)

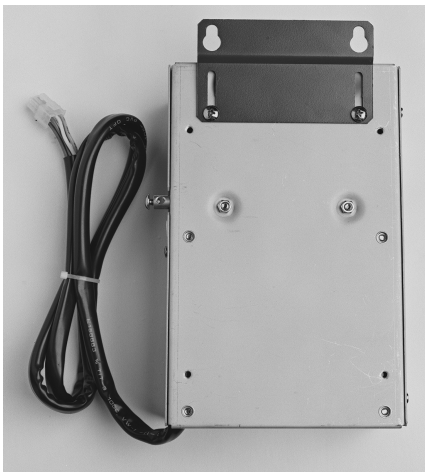
The Ring Generator Unit is needed in the BKSU where a SLIB is to be installed, to provide ring voltage and Message Wait source power.

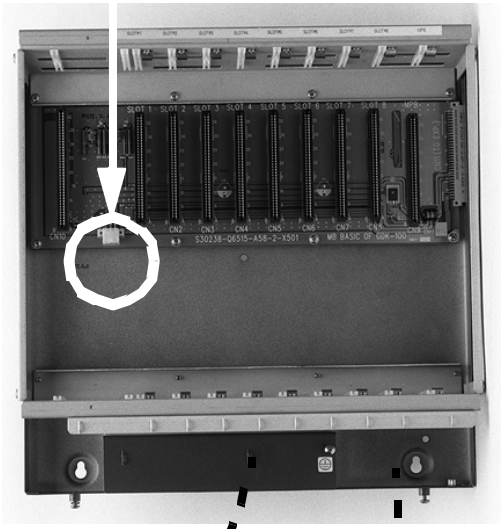
According to the installation site, two types of RGUs are available: External and Internal.

- The external RGU is mounted outside the KSU to the wall with the two screws provided and is connected to the system backplane via the CN12 (PCB lettering) connector.
- The internal RGU is mounted inside the BKSU to the bottom side panel with the two screws provided and is connected to the system backplane via the CN12 (PCB lettering) connector.

EXTERNAL RGU

CN12 CONNECTOR





INTERNAL RGU

Internal RGU supports up to two (2) SLIB Boards.

Beyond two boards requires the External RGU in place of the Internal RGU.

Figure 2-9: Ring Generator Installation

Power Supply Unit Installation

The Power Supply Unit provides power for the system boards and telephones, converting AC voltage input to appropriate DC voltages.

Before Installation:

- Assure that the AC plug connected to the BKSU is NOT plugged into the AC outlet.
- Place the PSU in the left most slot in the BKSU, aligning the card guides with the PSU PCB and PSU frame flanges.

The PSU can operate from either 115 or 220 volts AC based on the setting of the VTG Selector Switch on the lower front of the PSU.

- If local AC is 110 volts, move the switch to the upper position to display 115V.
- If local AC is 220 volts, move the switch to the lower position to display 220V.

Although, the *Triad 2* System PSUs are equipped with power-line transient protection, an external Power Line Surge Protector should be installed at the AC outlet to give additional protection, especially during violent thunderstorm activity. Refer to *Lightning Protection*.

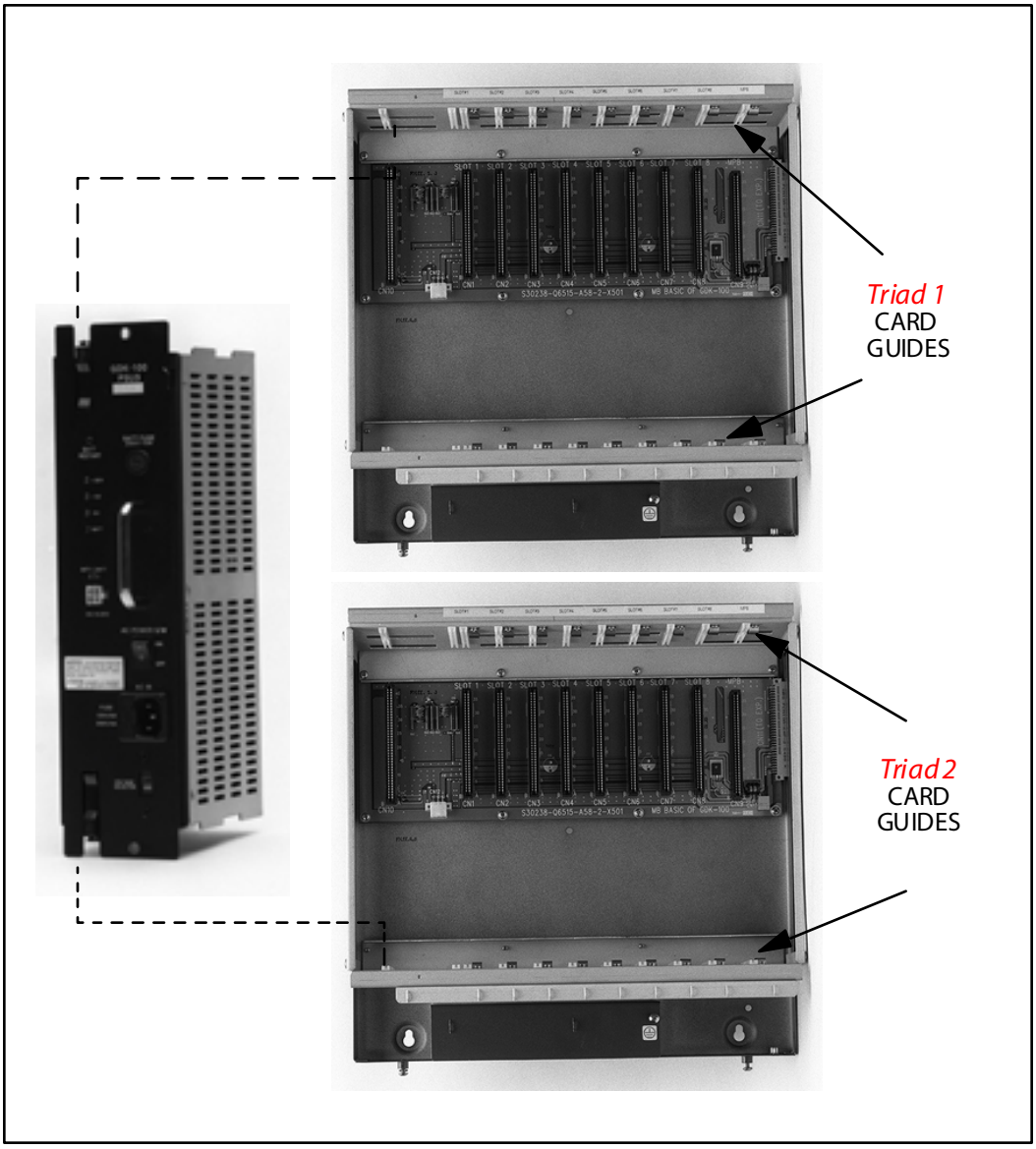


Figure 2-10: Installation of Power Supply Unit (PSU)

KSU Grounding

To ensure proper system operation and for safety purposes, a good earth ground is required. A metallic COLD water pipe usually provides a reliable ground. Carefully check that the pipe does not contain insulated joints that could isolate the ground. In the absence of the COLD water pipe, a ground rod or other source may be used.

A #14 insulated AWG or larger copper wire should be used between the ground source and the KSU. The wire should be kept as short as possible, it is recommended that the wire be no longer than 25 feet.

Grounding Instructions

1. Remove about 1½ inches of insulation from both ends. Attach one end of the wire to the Ground Lug on the lower left side of the Basic KSU by inserting the wire under the lug screw and tighten the screw securely.
2. Attach the other end of the wire as appropriate to the ground source.
3. Take a DC resistance reading and an AC Volt reading between the chassis ground point (cold water pipe) and AC ground (third wire AC ground). The limit is 5V AC and 5 Ohms DC resistance. If a higher reading is obtained, choose a different chassis ground point and repeat this step until a suitable ground point is found.

Grounding to an electrical conduit is NOT considered a good ground!

Power Line Surge Protection

The AC outlet should be equipped with an additional power line transient surge protection device. Systems using such devices are more resistant to damage from power line surges than unprotected systems. Power line surges often occur during switching operations and especially during violent thunderstorm activity.

Installation of a surge protector meeting the specifications described in the follow paragraph prevents or minimizes the damage resulting from power line surges.

The isolation transformer/surge protector shall be a 15 amp self contained unit that plugs into a standard grounded 117 VAC wall outlet. The wall outlet must be designed to accept a 3-prong plug (2 parallel blades and ground pin). The protector should be fast operating and capable of protecting transients greater than 200 volts.

It is recommended that the AC outlet be equipped with an isolation transformer/surge protection device that utilized MOV protection.

Lightning Protection

The system provides secondary protection per UL 1459 Specifications. Primary protection circuitry is the installers responsibility and should be installed per the National Electric Code (NEC).

KSU AC Power Plug

Before plugging the KSU power cord into the AC source, verify that the Power switch on the AC/DC front panel is off.

Plug the KSU power cord into the AC outlet and turn the AC/DC Power switch on. The red/green LED on the PSUs should illuminate.

PCB Installation

PCB Handling & General Installation

All Boards SHOULD NOT be Installed or Removed with Power Applied.

Power must be turned off prior to insertion or removal of the PCBs.

The system PCBs contain digital circuitry which, while extremely reliable, can be damaged by exposure to excessive static electricity. When handling PCBs, a grounded wrist strap should be used to protect the boards from static discharges. Also, use common sense when handling PCBs. For example, do not place a PCB in locations where heavy objects might fall on the PCB and damage components.

Only DTIB type stations can be used for Database programming.

Inserting a PCB

1. Hold the PCB by the injector tabs and, with the components facing right, align the top and bottom edge of the PCB in the card guides.
2. Slide the card into the system and use the injectors to seat the PCB firmly into the backplane connector.

Removing a PCB

Reverse the *Inserting a PCB* procedure. Installation method of PCB is shown in *Figure 2-11*.

There is a ground tab located on the top and bottom of each PCB toward the front end of the card. There is also a ground tab located to the right of each card guide in each cabinet. Make sure when the PCBs are inserted into the card guide and secured in their respective card slots, that the ground tab on each card mates with the ground tab on each card guide. This ensure a good ground potential to reduce RFI and EMI interference possibilities.

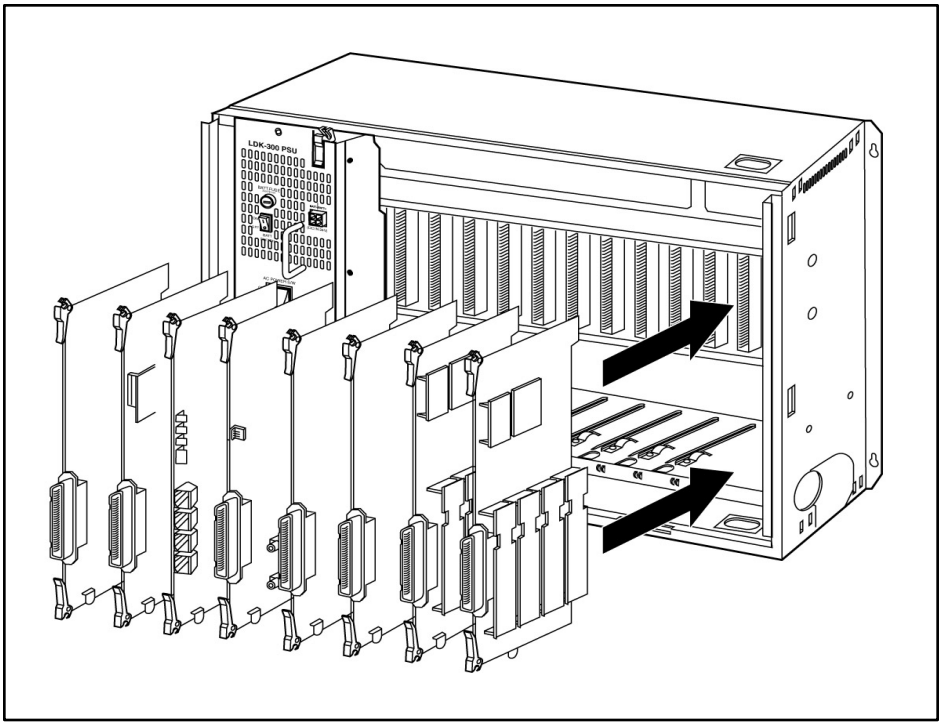


Figure 2-11: PCB Installation

Main Processor Board (MPB) Installation

The MPB is installed in the right most PCB card slot (slot MPB) of the BKSU. The MPB contains a lithium dry-cell to maintain memory and real-time clock functions. The battery is soldered to the MPB and connected to the circuitry by an On-Off DIP switch. Make sure the DIP switch is ON before the MPB installation.

The MPB may be equipped with three daughter boards: A MEMU for memory expansion, a MODU for modem access to the system, and a PLLU for T-1 synchronization. Refer to *Figure 2-12*. The MEMU is not utilized at this time.

The MPB also has an eight position dip switch. The following is the function of each switch position:

Table 2-1: MPB Switch Positions

Switch 1	Not Used
Switch 2	Not Used
Switch 3	Not Used
Switch 4 Handshaking	ON: XOFF/XON OFF: CTS/RTS
Switch 5	Not Used
Switch 6 Tests	ON: Execute H/W tests at start up OFF: Skip H/W tests at start-up
Switch 7 Status	ON: Display start up status at start-up. OFF: No start-up display status
Switch 8 DB Flush	ON: Flush the database OFF: Retain the database

Use extra care when removing RS232 cables from the Triad 1/2/3 MPB or SIU boards. Hold the MPB/MISU card in the card slot before removing the RS232 cable. Failure to perform this action may result in the MPB/MISU card being pulled from its' slot.

Before programming the system, switch 8 should be placed in the ON position and power cycled off and on to initialize the system database to default. Once the database has been initialized, switch 8 should be placed in the OFF position so as to protect the database.

Software for the system is contained on two chips, labeled U1 and U3. The MPB is shipped with these chips in place so you should not have to install the software. However, if a software upgrade is purchased, you must replace the existing chips.

Removing Existing Software

Before starting this procedure, you must have an Integrated Circuit (IC) Extractor tool to remove the current EPROMs from the Printed Circuit Board.

1. Locate and remove EPROMs U1 and U3 on the MPB board. These EPROMs must be removed and replaced with EPROMs labeled U1 and U3. Using the IC tool, gently pull upwards until the EPROM lifts free of the socket. Be careful not to bend or break the pins of the EPROMs.
2. Place the EPROMs on a non-static, non-conductive surface until the new software is installed. Then place the EPROMs into the packaging tube and put this into the packing box.

Installing New Software

1. Remove the EPROMs from the packing tube.
2. Install EPROMs U1 and U3 onto the Master Processor Unit. Be sure the notched end (end with cutout) is aligned with the notched end of the socket(s).
3. When the EPROMS are installed, check for bent pins on the EPROMs and correct any found.
4. With the lithium batteries and daughter boards installed, insert the MPB in slot MPB of the BKSU. Refer to *Figure 2-12*.

Phase Lock Loop Unit (PLLU)

The Phase Locked Loop Unit (PLLU) is an option board which generates a 32.768MHz clock synchronized to 1.544MHz from the T-1 interface board or internal clock. This board is required whenever a T-1 card is installed in the system. The 32.768MHz clock is provided to CGMD on MPB. It consists of a PLL circuit, PLL Monitoring circuit and clock (from T-1 interface board) monitoring circuit.

Installing the PLLU

1. Unpack the PLLU from its antistatic conductive bag in the packing box.
2. Locate CONN5 and CONN6 (outlined) on the MPB board.
3. Remove the jumper from pins 12 and 13 on CONN5. **This jumper is very important, so don't lose it. LOSS OF JUMPER ON CONN5 12 & 13 WILL PREVENT SYSTEM FROM OPERATION.** If the PLLU is removed from the MPB board, this jumper needs to be put back onto pins 12 and 13 of this connector or the MPB does not operate properly.
4. Locate the CON1 and CON2 connectors on the PLLU board.
5. Position the PLLU so that CON2 and CON1 match up with CONN5 and CONN6 respectively. Push the PLLU onto their respective connectors and make sure the PLLU is seated correctly.

   Refer to *Figure 2-12*. *This completes the installation procedure for the PLLU.*

Modem Unit (MODU)

The Modem Unit provides an asynchronous modem for access to the system database and fault reporting features from a remote site. The Module is optionally installed on the MPB and incorporates a 2400 Baud modem. The modem may be connected to a pre-selected CO Line through the system switching matrix.

The local port may be connected to any CO Line via an external modem or to a terminal. The MODU port is independent of the SIU standard RS232C port, allowing system database access, etc. without the need to interrupt the SMDR output.

Installing the MODU

1. Unpack the MODU from its antistatic conductive bag in the packing box.
2. Locate the CONN9 and CONN10 connectors (outlined) on the MPB. Locate the CON1 and CON2 connectors on the MODU.
3. Position the MODU so that CON2 and CON1 match up with CONN9 and CONN10 respectively on the MPB. Push the MODU onto their respective connectors and make sure it is seated properly.

   Refer to *Figure 2-12*. *This completes the installation procedure for the MODU.*

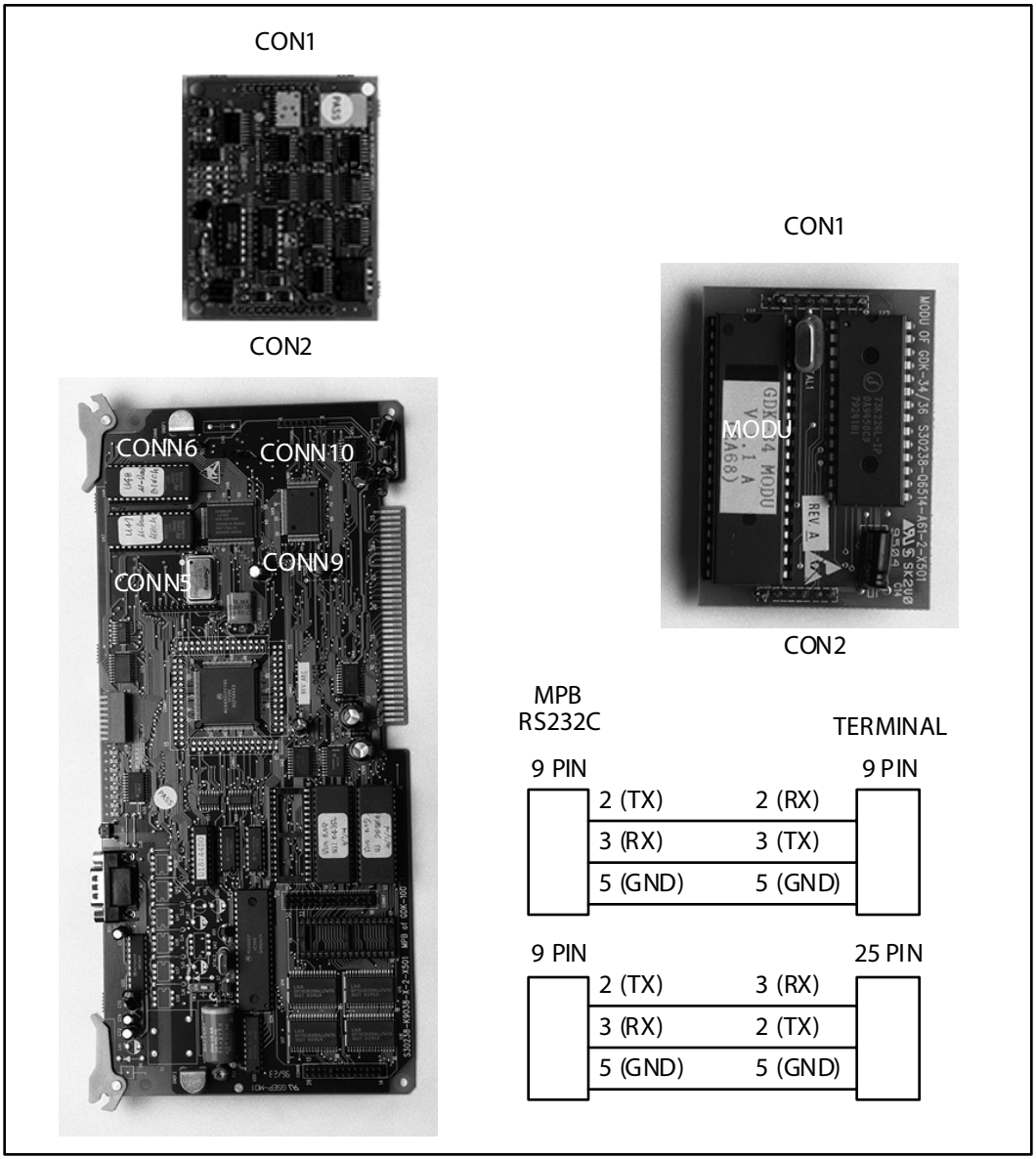


Figure 2-12: MPB w/PLLU and MODU Installation

Miscellaneous Interface Unit (MISU) Installation

The Miscellaneous Unit (MISU) contains two External Music Sources (MOH/BGM), an External paging port, and four dry contacts. Optionally, the MISU is equipped with two serial interface ports by installing the Serial Interface Unit (SIU) daughter board. The SIU should be installed if more than two serial communication devices are to be connected to the system. If required, install the SIU as shown in *Figure 2-14*.

When using CO Lines as additional music inputs, keep in mind that the music source may require a talk battery in series with either TIP or Ring. This talk battery boosts the signal level sufficiently so that the CO Line interface can read the signal.

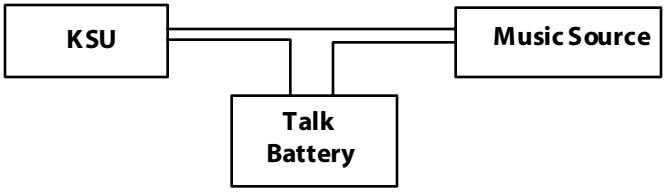


Figure 2-13: Talk Battery

The MISU should be inserted into slot #7.

Use extra care when removing RS232 cables from the MPB or SIU boards. Hold the MPB/MISU card in the card slot before removing the RS232 cable. Failure to perform this action may result in the MPB/MISU card being pulled from its' slot.

The MISU consists of:

- The External page ports are provided from the amphenol connector on the front edge of the MISU. These ports are connected to transformers, providing a 600 ohm impedance.
- Music inputs are provided from the amphenol connector on the front edge of the card.
- Four independent relay contacts are provided through the amphenol connector on the front edge of the MISU. These contacts are controlled by software from entries in the system database. Control signals are sent by the MPB. The output drives the relay coils, controlling the state of the 1 amp, 24V relay contacts.

Table 2-2: MISU Wiring

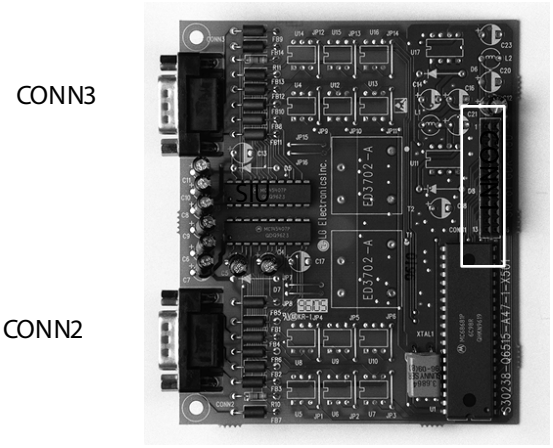
Pair	PIN #	Color	Description
1	26 1	WH/BL BL/WH	RELAY1T RELAY1R
2	27 2	WH/OR OR/WH	RELAY2T RELAY2R
3	28 3	WH/GN GN/WH	RELAY3T RELAY3R
4	29 4	WH/BN BN/WH	RELAY4T RELAY4R
5	30 5	WH/SL SL/WH	
6	31 6	RD/BL BL/RD	
7	32 7	RD/OR OR/RD	
8	33 8	RD/GN GN/RD	
9	34 9	RD/BN BN/RD	
10	35 10	RD/SL SL/RD	
11	36 11	BK/BL BL/BK	BGM/MOH1T BGM/MOH1R
12	37 12	BK/OR OR/BK	BGM/MOH2T BGM/MOH2R
13	38 13	BK/GN GN/BK	EXP1T EXP1R

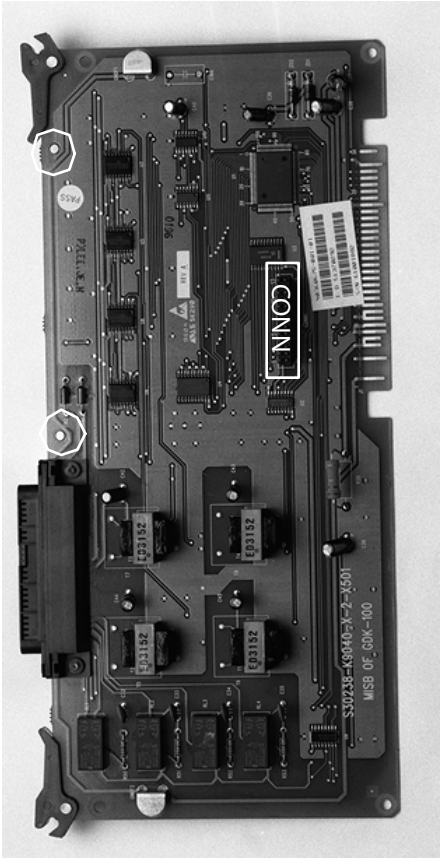
Pair	PIN #	Color	Description
14	39 14	BK/BN BN/BK	EXP2T EXP2R
15	40 15	BK/SL SL/BK	
16	41 16	YL/BL BL/YL	
17	42 17	YL/OR OR/YL	
18	43 18	YL/GN GN/YL	
19	44 19	YL/BN BN/YL	
20	45 20	YL/SL SL/YL	
21	46 21	VI/BL BL/VI	
22	47 22	VI/OR OR/VI	
23	48 23	VI/GN GN/VI	
24	49 24	VI/BN BN/VI	
25	50 25	VI/SL SL/VI	

Installing the Serial Interface Unit (SIU)

1. Unpack the SIU from its antistatic conductive bag in the packing box. There should also be a plastic bag with two plastic standoffs and two metal screws.
2. Push the two standoffs into the holes on the SIU board. (Refer to *Figure 2-14*.)
3. Locate the CONN1 connector and the two screw holes (outlined) on the MISU.
4. Push the SIU board onto the CONN1 connector and be sure it is seated correctly.
5. From the back side of the MISU board, insert the two metal screws into the holes and tighten them into the bottom of each standoff to secure.

   This completes the installation procedure for the SIU.





SIU RS232C — TERMINAL

9 PIN		9 PIN
2 (TX)	2 (RX)	
3 (RX)	3 (TX)	
5 (GND)	5 (GND)	

9 PIN		25 PIN
2 (TX)	3 (RX)	
3 (RX)	2 (TX)	
5 (GND)	5 (GND)	

Figure 2-14: MISU w/SIU Installation

CO/PBX Connections

There are two types of analog CO/PBX Line interface boards available. These boards include the Loop Start CO Line Interface Board (LCOB), Direct In-Dial Interface Board (DIDB).

Loop Start CO Interface Board (LCOB)

The Loop Start CO Interface Board supports up to six (6) Loop Start Central Office Lines and can be optionally equipped with a DTMF Receive Unit (DTRU) daughter board to detect DTMF for Single Line devices.

Installing the DTRU Module

1. Unpack the DTRU Module from its antistatic conductive bag in the packing box.
2. Locate the CON1 and CON2 connectors on the DTRU module.
3. Locate the CN1 and CN2 connectors on the LCOB (outlined).
4. Position the DTRU module so that the CON2 and CON1 connectors match up with the CN1 and CN2 connectors on the LCOB respectively.
5. Push the DTRU module onto these connectors making sure it is seated properly.

   Refer to *Figure 2-15*. *This completes the installation procedure for the DTRU Module.*

Table 2-3: LCOB Wiring

LCOB Connector		LCOB Designation
Connector	**Pin #**	
J2	3	Tip 1
	2	Ring 1
	4	Tip 2
	1	Ring 2
J3	3	Tip 3
	2	Ring 3
	4	Tip 4
	1	Ring 4
J4	3	Tip 5
	2	Ring 5
	4	Tip 6
	1	Ring 6

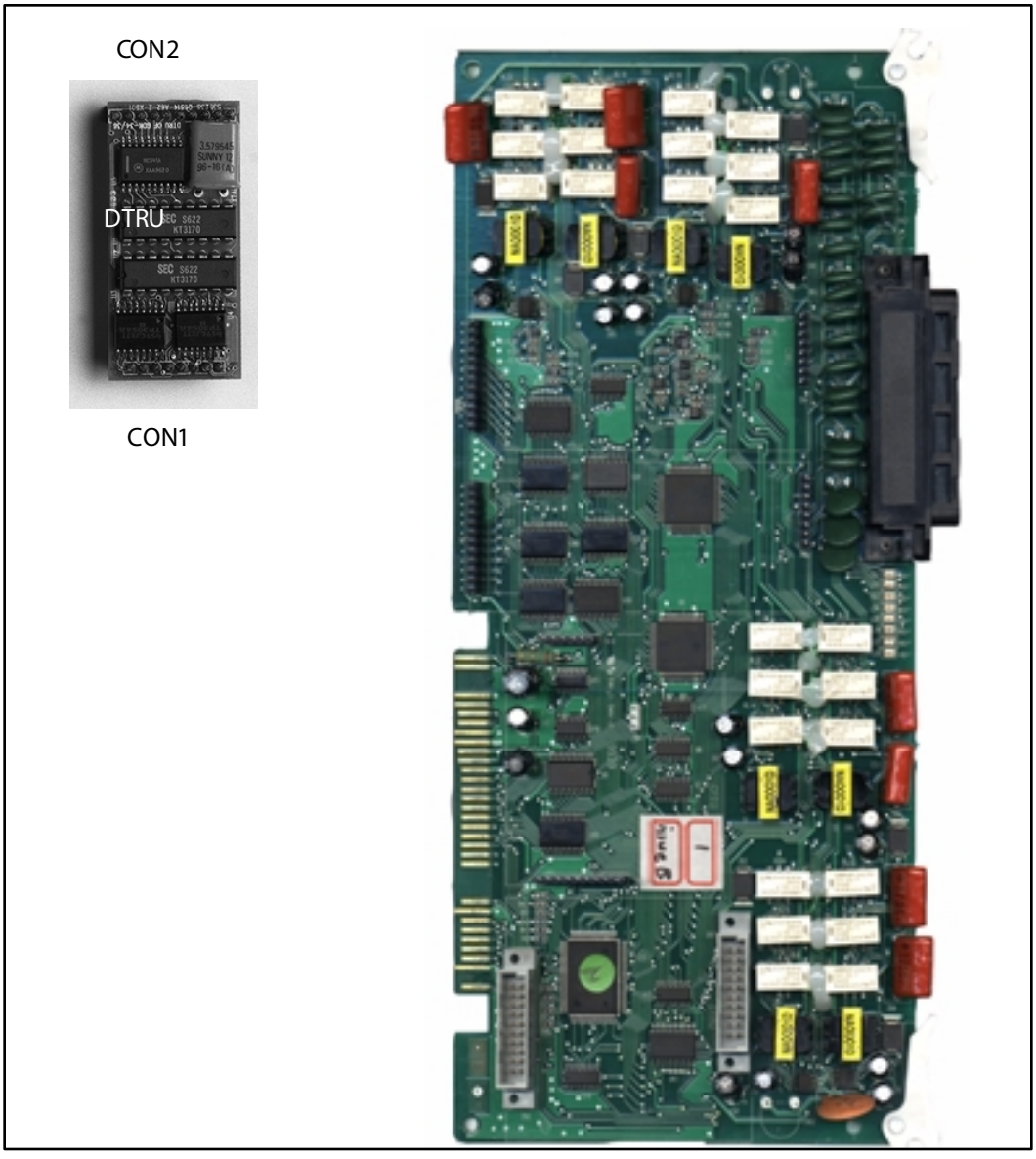


Figure 2-15: LCOB w/DTRU Installation

DID Interface Board (DIDB)

The Direct In-Dial Interface board (DIDB) provides four (4) analog DID CO interface ports. The DIDB can be optionally equipped with a DTMF Receiver Unit (DTRU) daughter board to detect DTMF tones.

Installing the DTRU Module

1. Unpack the DTRU Module from its antistatic conductive bag in the packing box.
2. Locate the CON1 and CON2 connectors on the DTRU module.
3. Locate the CN1 and CN2 connectors on the LCOB (outlined).
4. Position the DTRU module so that the CON2 and CON1 connectors match up with the CN1 and CN2 connectors on the LCOB respectively.
5. Push the DTRU module onto these connectors making sure it is seated properly.

   Refer to *Figure 2-16*. This completes the installation procedure for the DTRU Module.

Table 2-4: DIDB Wiring

Connections		Designation
Connector	**Pin #**	
J3	3	Tip 1
	2	Ring 1
	1	Tip 2
	4	Ring 2
J4	3	Tip 3
	2	Ring 3
	1	Tip 4
	4	Ring 4

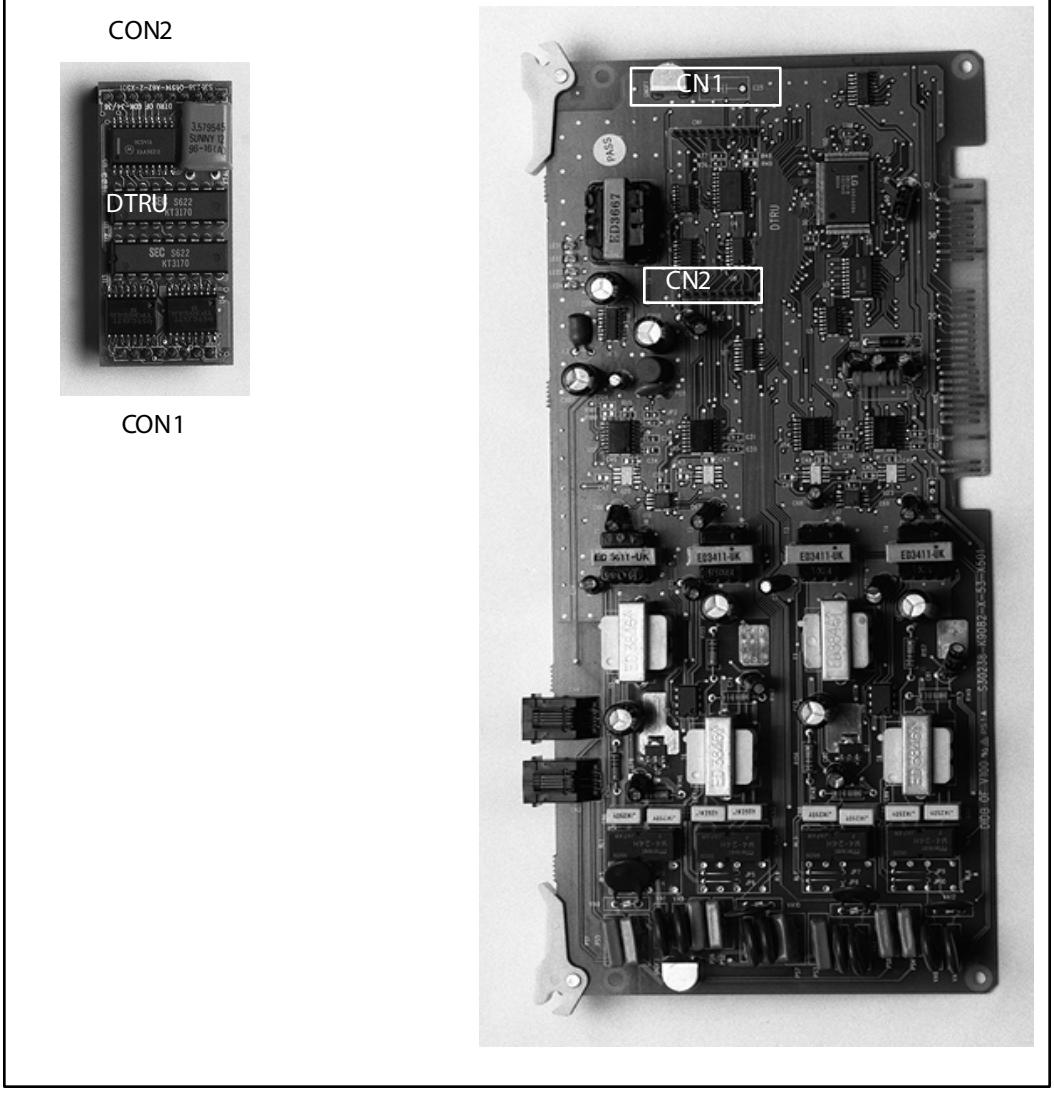


Figure 2-16: DIDB w/DTRU Installation

T-1 Interface Board (T1IB)

The T1IB provides the T-1 (1.544Mbps, 24-Voice Channel) digital interface circuit, control circuitry, and synchronous clock control circuits. DTMF tone detection units can be installed optionally on the T1IB. The T1IB has 8 LEDs on the front edge of the PCB which indicates errors of T-1 line, in-use status, and synchronous clock enable status.

The PLLU must be installed on the MPB for the T-1 card to operate properly.

Software 2.1G or newer is needed when using any T-1 card that contains 1.0G Firmware. Without the newer software, the T-1 card will not work.

Table 2-5: T-1 Board LEDS

LED #	Function
1	IN USE. At least one of the 24 circuits is in use.
2	RED. T1IB is in REd alarm due to any alarm.
3	H/W TEST. Normal call processing is not available.
4	BLUE. T1IB has detected RX_BLUE alarm.
5	YELLOW: T1IB has detected RX_YELLOW alarm.
6	OOF. T1IB is Out of Frame synchronization.
7	RCL. T1IB receives Carrier Loss (unplugged from the cable)
8	CLOCK. Clock Enable/Disable

The T1IB contains 2 switches (SW1 and SW3) and 3 connectors (CON1, CON2 and CON3). The clock selection switch is used for control synchronous clock. The Line Build-Out switch is controlled by distance between the *Triad 1/2* Systems and a CSU and SW1 #4 is used for loopback control.

The system can be equipped with two (2) T-1 Interface Boards and the T1IB can be installed in Slots 0 thru 2 in the *Triad 1* Basic KSU, while the T1IB can be installed in Slots 0 thru 5 in the *Triad 2* Basic KSU. The Phase Locked Loop Unit (PLLU) must be installed on the MPB when the T1IB is installed. The DTMF4-A board which contains 4 DTMF receivers can be optionally installed on the T1IB.

The clock control cable should be connected by daisy-chain method like *Figure 2-18* when more than one T1IB boards are installed. When the clock control cable of the T1IB is connected by daisy-chain method, the clock selection switch of the first T1IB must be placed in the Enable position and the other board should be placed in the Disable position. The Line Build-Out switch must be selected by distance between the *Triad 1/2* Systems and a CSU and the switch selection as indicated in the following chart. If the CSU is located near the KSU, all LBO switches should be ON.

The SW1 switch #4 of the Line Build-Out switch is used for Loop Back control. Its switch is used only for hardware test and must be placed in the ON position for normal operation.

Table 2-6: T-1 Ordering Information

T-1 Ordering Information	
Ringer Equivalent Number:	6.0P
Facility Line Interface:	04DU9-B
Jack Type:	RJ48C

Table 2-7: T-1 Switch Positions

Distance	Switch #			
	1	2	3	4
0 to 133 feet	on	on	on	on
133 to 266 feet	off	on	on	on
266 to 399 feet	on	off	on	on
399 to 533 feet	off	off	on	on
533 to 655 feet	on	on	off	on

- This board supports standard D4 framing format with robbed bit signaling. Extended Super Frame (ESF) format is also supported.
- The board requires an external CSU unit.
- The T-1 board can accept two (2) DTMF4-A units in a daughter board type arrangement. Each unit has 4 DTMF Receivers installed on it. This board can be installed on the SLIB, and T1IB boards.
- The board has a 15-pin D Sub connector for connection to a CSU unit.
- The card ejector tabs are color coded white.

Functionality Description

- **Automatic Number Identification (ANI)** information from the carrier is treated exactly the same as an inbound ICLID (Caller ID) number. Calls can be routed, placed in the Unanswered Call Table, sent out to the CTI Module port on a keyset, and run through the Number To Name Translation Table. The *Triad 2* system provides call progress tones in the same manner as ICLID.
- **Dialed Number Identification Service (DNIS)** information from the carrier is treated using DID line rules. DNIS calls are routed based on the DID Routing Table.
- **ANI/DNIS** is a combined format, where the system waits for the ANI/DNIS information from the carrier. When it is received, the system routes the call using ICLID processing. If this information is not found in the ICLID Route Tables, the DNIS information is compared to the DID table for a match. The call is then routed based on the DID tables. If a match is not found on either the ANI or DNIS number, the call is routed based on normal CO line operation (CO Ringing Assignments).

The following table summarizes the operation of the system.

Table 2-8: Call Routing Criteria

ANI	DNIS	Operation
N	N	Calls routed based on normal CO operation (CO Ring Assignments.
N	Y	Calls routed based on DID tables with DID operation.
Y	N	Calls routed based on ICLID routing and ICLID operation.
Y*	Y	Calls routed on ICLID first, if no route is found, the DNIS digits are compared to the DID table. If no route is found in the DID table the call is routed based on CO line Ringing Assignments.

**If both ANI and DNIS calls are routed -- the following table summarizes what is displayed at the phone.*

The T-1 card accepts ANI/DNIS information in a DTMF format only. Some carriers do not provide ANI or ANI/DNIS in a DTMF format. Consult your local carrier for available options.

Table 2-9: Call Routing Display Format

Route Found	Type of Display	Format
ICLID	ICLID	ANI number placed in the 14-character number field, the DNIS number followed by the name programmed in ICLID translation table placed in the 24-character name field.
DID	ICLID	ANI number placed in 14-character number field. DNIS number followed by programmed name from the DID tables in 24-character name field.
NONE	ICLID	ANI number placed in 14-character number field and the DNIS number is placed in the 24-character name field.

T-1 Ordering Information: When ordering a T-1 circuit from a carrier, request either D4 framing and Alternate Mark Inversion (AMI) Line coding using the superframe (SF) or the Extended Superframe (ESF-B8ZS) format. The following are additional ordering information specifications:

Table 2-10: T-1 Ordering Specifications

If ordering...	ANI/DNIS/ DID/TIE	Loop Start/ Ground Start Signaling*
Circuit Information	2 wire	2 wire
Supervisory Signaling	TIE	Loop or Ground
Address Signaling	DTMF	DTMF
Start Dial Indicator	Wink Start	Dial Tone

** ANI/DNIS not available on Loop/Ground start signaling. If Loop Start signaling protocol is ordered, the Central Office does not provide Disconnect Supervision. However if TIE signaling protocol is ordered, disconnect supervision is provided. The switching equipment processes DNIS numbers received from the T-1 circuit depending on the trunk simulation.*

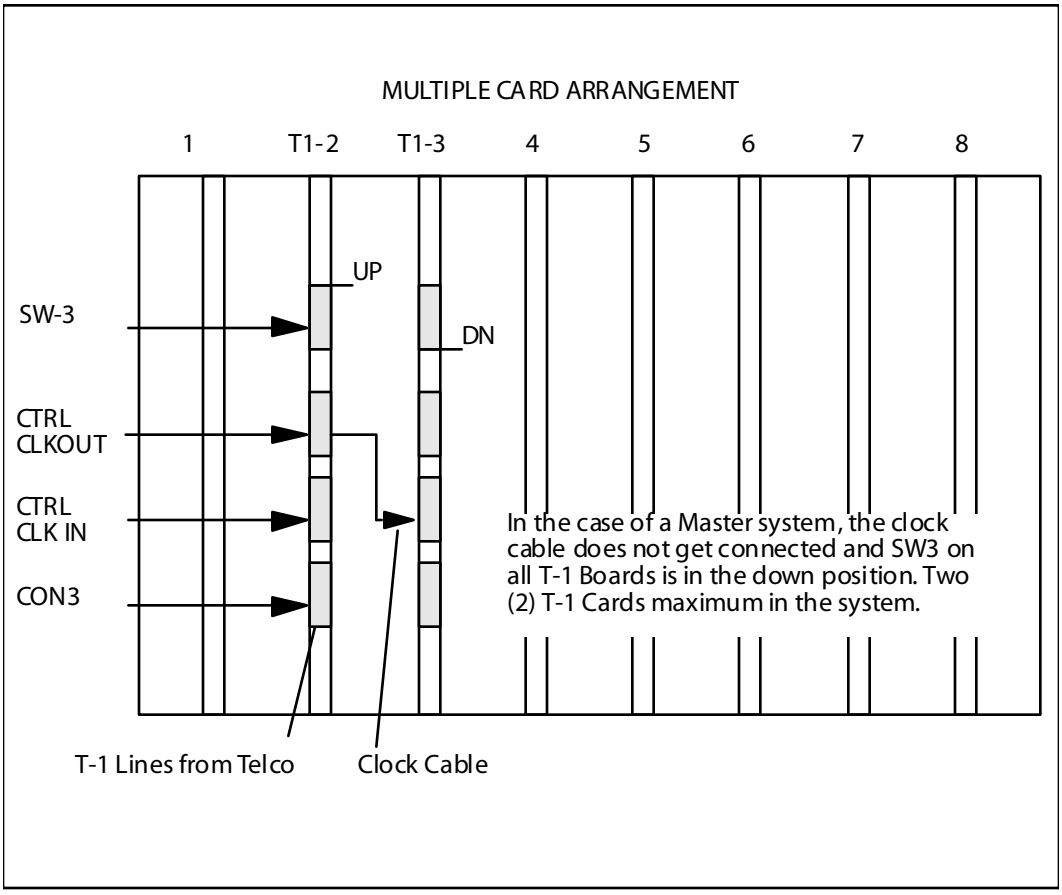


Figure 2-17: T-1 Clock Connect Cable Installation (Multiple Cards)

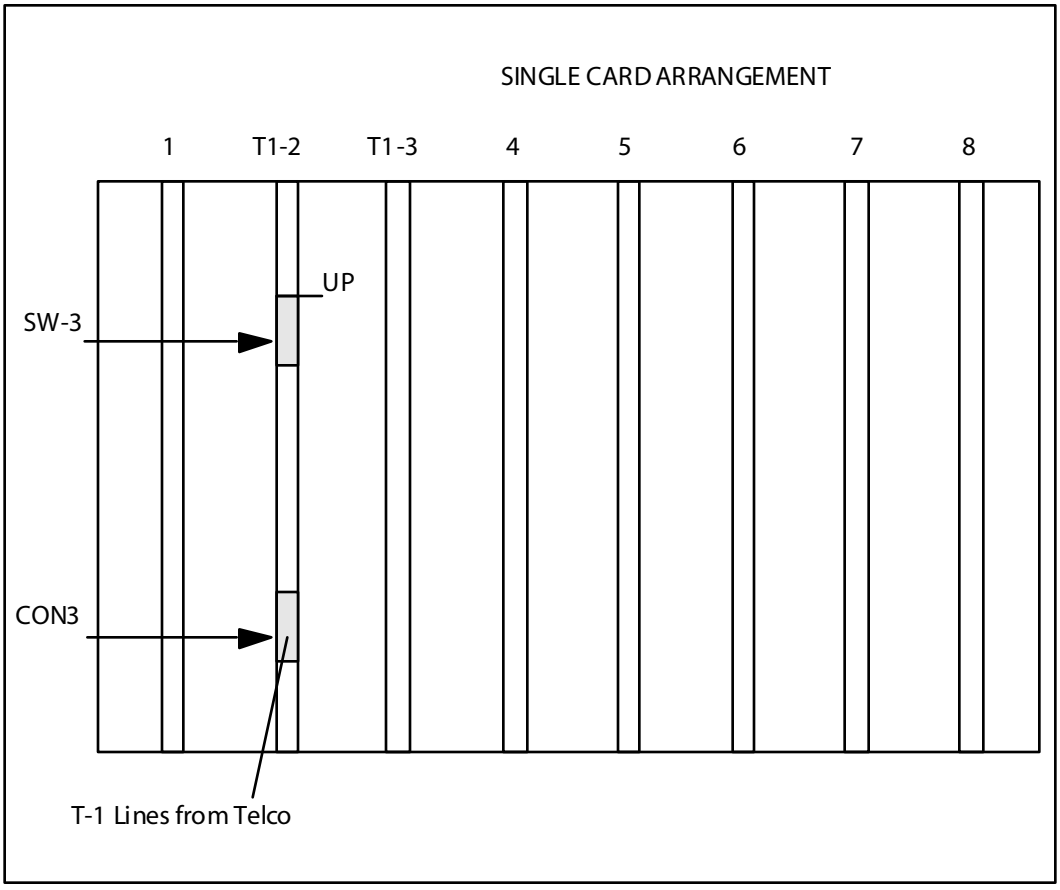


Figure 2-18: T-1 Clock Connect Cable Installation (Single Card)

Installing the DTMF-A Modules

1. Unpack the DTMF-A Modules from their antistatic conductive bags in the packing boxes.
2. Locate the CONN5 and CONN6 connectors on the DTMF-A modules.
3. Locate the CON4, CON5, CON8 and CON9 connectors on the T1IB (outlined).
4. Position one of the DTMF-A modules so that the CONN5 and CONN6 connectors match up with the CON8 and CON9 connectors on the T1IB respectively.
5. Push the DTMF-A module onto these connectors making sure it is seated properly.
6. Position the second DTMF-A module so that the CONN5 and CONN6 connectors match up with the CON4 and CON5 connectors on the T1IB respectively.
7. Push the DTMF-A module onto these connectors making sure it is seated properly.

   Refer to *Figure 2-19*. *This completes the installation procedure for the DTMF-A Modules.*

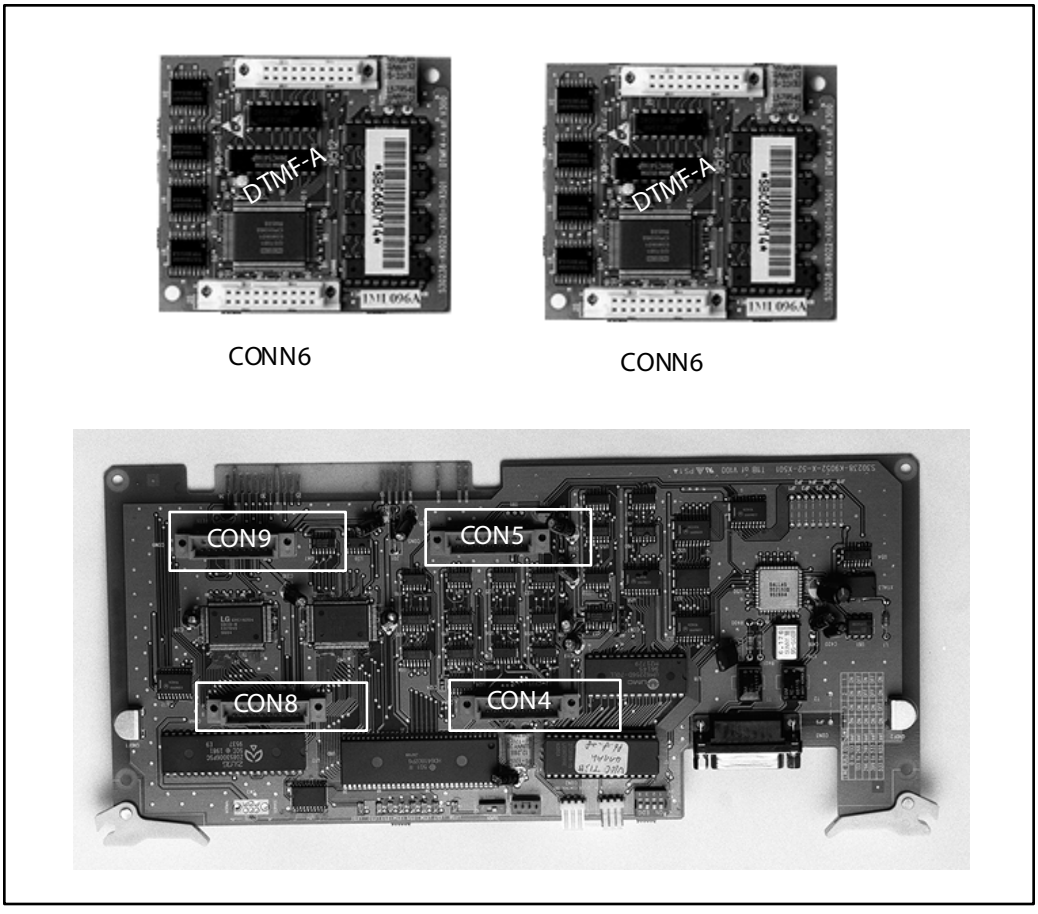


Figure 2-19: T1IB w/DTMF4_A Module Installation

Primary Rate Interface Board (PRIB)

This interface provides one Primary Rate Interface circuit. Each circuit contains 23 bearer and one data channel (23B+D). When a PRIB card is programmed into the *Triad 1/2* system, the system interprets all B channels as trunks. Thus, one PRIB which contains 23B+D circuits provides 23 line appearances to the *Triad 1/2* system. A maximum of two PRIB boards may be installed into the system. The PRIB card uses 24 time slots when installed.

The PRIB must be used in conjunction with a Channel Service Unit (CSU). Connection is made via a DB15 from the PRIB to the CSU.

The PRIB accepts two DTMF-A boards.

When ordering PRI lines from the telephone company, specify ESF framing and B8ZS line coding. PRI only supports National ISDN 2 (NI-2). No other standards are supported.

Vodavi has successfully integrated its PRI ISDN with the Lucent 5 ESS, Siemens, Stromburg Carlson, and the DMS100 Central Offices. Vodavi ISDN should work with all Central Office switches, but this has not been verified. Therefore, some delays in service may be experienced.

Installation

1. Insert the PRIB card(s) into the desired BKSU card slot(s). Up to two PRIB cards can be installed in a system (Slots 1 and 2 on *Triad 1* and slots 1-5 on *Triad 2*).
2. If installing a single PRIB, set SW2 to the ON position.

   If multiple PRIBs are being installed, set SW2 to the ON position on the first card and SW2 on all other cards to the OFF position.

   The PRIB comes with a clock cable. This cable is used when multiple PRIB and/or digital trunk cards are to be installed in the system. The clock cable is supplied with each PRIB.
3. Connect the DB15 cable from the PRIB to the channel service unit (CSU).
4. Connect the network cable from the channel service unit to the network.
5. Refer to ISDN and T1 Clocking (later in this section) for clarification on clocking and cabling when combining BRIB, PRIB, and T1 cards in one KSU.

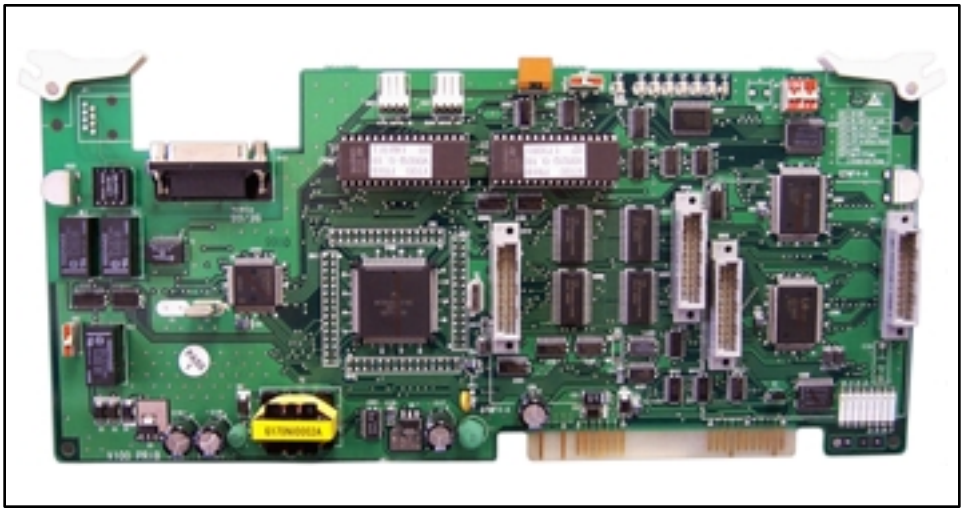


Figure 2-20: PRIB (Primary Rate Interface Board)

The PRIB is offered as a stand-alone card or as a kit which includes the PRIB, CSU, and cables.

Basic Rate Interface Board (BRIB)

This interface provides four Basic Rate Interface circuits. Each circuit is comprised of two bearer (64Kbps each) and one data (16Kbps) channels (2B+D). When a BRIB is programmed into the *Triad 1/2* system, the system interprets all B channels as trunks. Thus, one BRIB which contains four 2B+D circuits provides eight line appearances to the *Triad 1/2* system. A maximum of five BRIBs can be installed into the system (40 B channels).

The BRIB uses the U interface of the BRI standard. Connection to the network is made via RJ45 connectors on the front edge of the board. No NT1 device is required to connect to the central office. The BRIB card uses eight time slots when installed.

When ordering BRI lines from the telephone company, specify Capability P as the ordering code. National ISDN 1 (NI-1) is supported. No other standards are supported.

Vodavi has successfully integrated its BRI ISDN with the Lucent 5 ESS Central Office. Vodavi ISDN should work with all Central Office switches, but this has not been verified. Therefore, some delays in service may be experienced.

Installation

1. Insert the BRIB card(s) into the desired BKSU card slot(s).

   (Slots 1 and 2 on *Triad 1* and slots 1-5 on *Triad 2*)

   - If installing a single BRIB, set switch 4 on SW2 to the ON position.
   - If multiple BRIB cards are being installed, set switch 4 on SW2 to the ON position on the first card and switch 4 on SW2 on all other cards to the OFF position. Switch 4 on SW2 determines if the board is the Master Clock source for any digital trunk cards in the system. Only one Master Source must be enabled in the system.
   - If installing a BRIB in a system that also has T1 or PRIB boards, use either the T1 or PRIB card as the Master Clock and set all BRIB SW2 switch 4s to OFF.

2. Refer to ISDN and T1 Clocking (later in this section) for clarification on clocking and cabling when combining BRIB, PRIB, and T1 cards in one KSU.

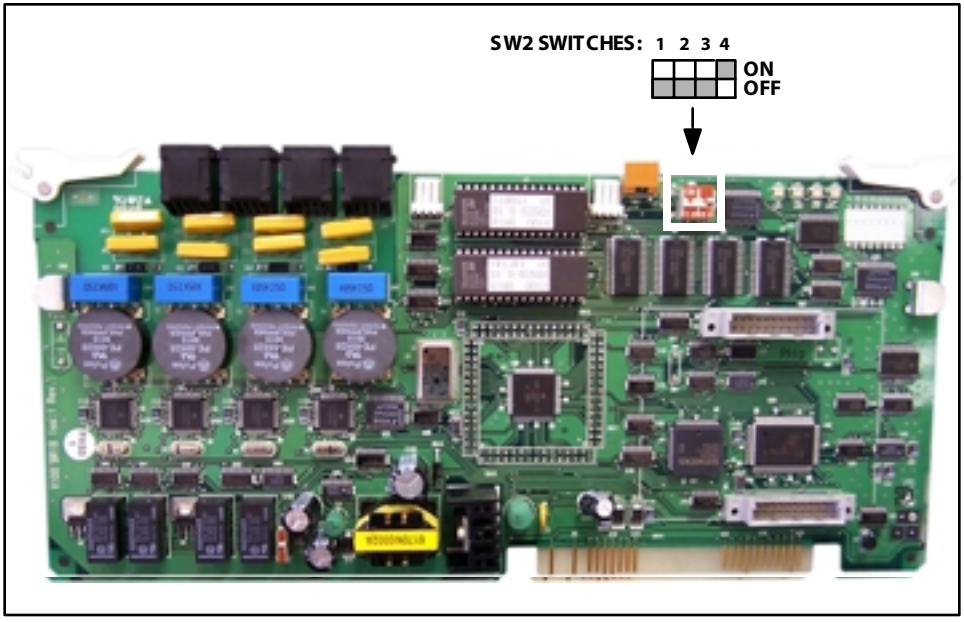


Figure 2-21: BRIB (Basis Rate Interface Board)

Electronic Key Telephone Service

Electronic key telephone service (EKTS) is a feature that can be provided on BRI ISDN to simulate standard analog DID lines. This allows several different numbers to be shared by a single BRI circuit.

Due to the decline in telephony tariffs, there is an increasing demand for BRI ISDN features. A BRI circuit allows two simultaneous calls to be handled, due to its technical specification. BRI circuits have two B-Channels at 64 kilobytes per second and one D-Channel at 16 kilobytes per second. The Bearer (B) Channels are designed for PCM (voice) and the Data (D) Channel is designed to carry information specific to each incoming and/or outgoing call.

The EKTS feature allows a single ISDN Service Profile Identifier (SPID) or B-Channel to support multiple directory numbers. A SPID is a number that telephone company switching equipment uses to track configuration information for each terminal adapter connected to an ISDN telephone line. The telephone company should provide SPIDs at the same time that the ISDN directory numbers are assigned. A directory number is another term for a telephone number.

If an application requires EKTS, be aware that BRI ISDN handles a busy number differently than a DID circuit. When the called number is busy, BRI will issue a busy signal, but a DID circuit will ring another line in the circuit. The busy signal is provided by the telephone company, therefore the call is not presented to the Vodavi telephone switch and it is not forwarded to voice mail. For example, a caller dials 480-443-6000 and is connected to the extension. While the first caller is still connected, a second caller dials the same number. The second caller will receive a busy signal that is provided by the telephone company.

In a normal BRI application, two numbers are assigned to each BRI circuit, which consists of 2 channels. There can be a maximum of 4 circuits equipped to handle 8 channels per BRIB. This is a direct number-to-channel relationship without hunting capability. Most circuit providers offer an optional "hunting" feature capability on BRI circuits. This optional feature allows numbers to hunt for idle channels on the BRIB up to a maximum of 8 channels per BRIB, assuming four BRI circuits were installed. In EKTS applications, you can have a maximum of 64 DID numbers hunt to one BRIB. Hunting cannot be accomplished between BRIBs, nor will the hunting feature allow calls to be routed to a busy DID number.

Conditions

BRI EKTS support is available in Vodavi telephone systems with software version 3.0G and higher.

Like DID, EKTS can be programmed to route calls using up to 7 digits. By default, only the last three digits are analyzed for routing.

EKTS does not require a line appearance on a specific telephone because the BRI terminates directly into the KSU.

Vodavi supports Basic EKTS. The EKTS caching option is not supported by Vodavi. Caching is normally used when an ISDN telephone instrument is used on the customer premise.

ISDN and T1 Clocking

When combining BRIB, PRIB, and T1 cards in one KSU, specific settings and cabling are important for proper clocking. The Phase Lock Loop Unit (PLLU) synchronizes the clocking from the Central Office to the clocking of the KSU. Popping, crackling, dropped calls, and one-way transmission are usually attributed to the clocking not being synchronized correctly.

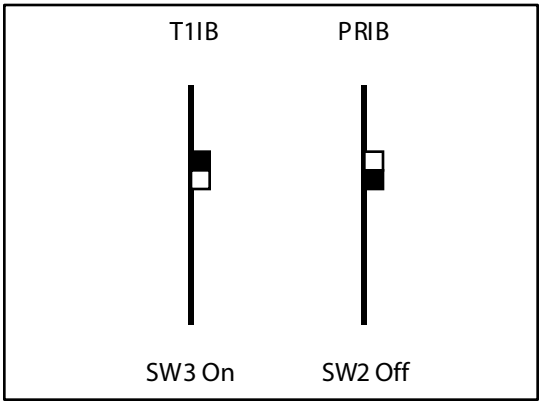
Examples - Settings and Cabling

The following examples clarify the clocking and cabling for these cards:

When the switch is in the "up" position, it should be considered "ON". When the switch is in the "down" position, it should be considered "OFF".

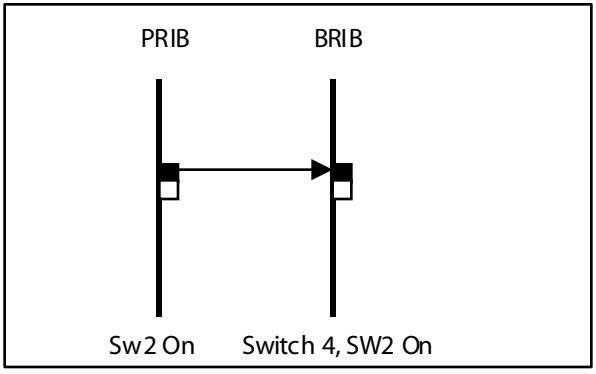
The cable connection follows the same logic - "up" is clock outside (ON) and "down" is clock inside (OFF). ON means that clocking is coming from outside the KSU and OFF means that clocking is coming from inside the KSU.

(1) T1IB and (1)PRIB



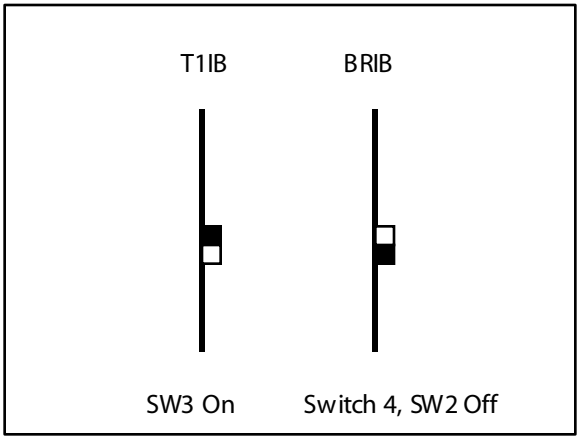
If both cards in a phone switch are connected to a telephone company clock (not point-to-point T1), put the T1 clock switch in the enable position (UP) to allow it to receive clocking from the telephone company directly, and do not install the clock cable. Set the PRIB clock switch in the disable position (OFF), which allows the PRIB to synchronize its timing off of the backplane (from the T1 clocking). If the T1 is a point-to-point T1, set the PRIB in the enable position (ON), the T1 in the disable position (OFF), and do not install the clock cable.

(1) PRIB and (1) BRIB



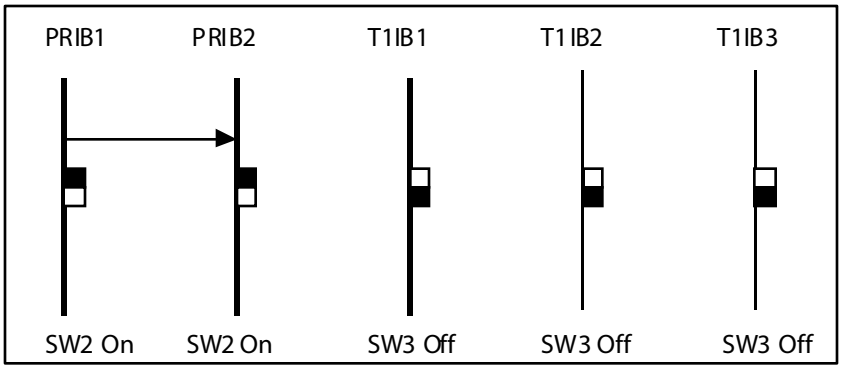
Install with the cable and set both PRIB and BRIB switches to the enable position (ON).

(1) T1IB and (1) BRIB



If both cards in a phone switch are connected to a telephone company clock (not point-to-point T1), put the T1 clock switch in the enable position (ON) to allow it to receive clocking from the telephone company directly. Do not install the clock cable. Set the BRIB clock switch in the disable position (OFF), which allows the BRIB to synchronize its timing off of the backplane (from the T1 clocking). If the T1 is a point-to-point T1, set the BRIB to the enable position (ON), the T1 in the disable position (OFF), and do not install the clock table.

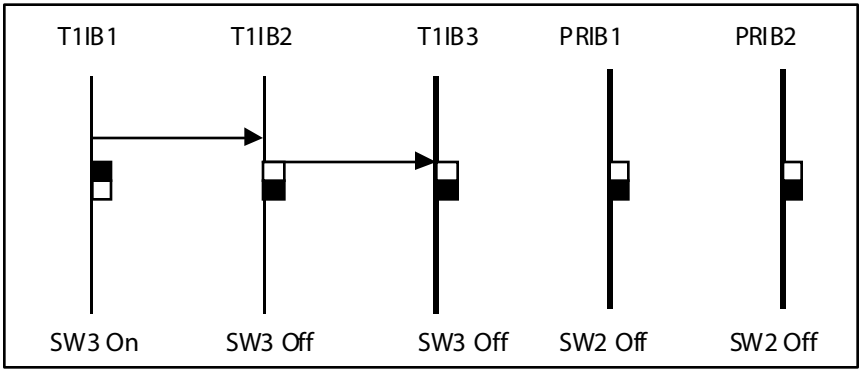
(2) PRIBs and (3) T1IBs



The clock cable should be connected to the OUT position on the connector on the PRIB1. The clock cable should be connected to the IN position on PRIB2. SW2 of the PRIB1 and PRIB2 should be placed in the

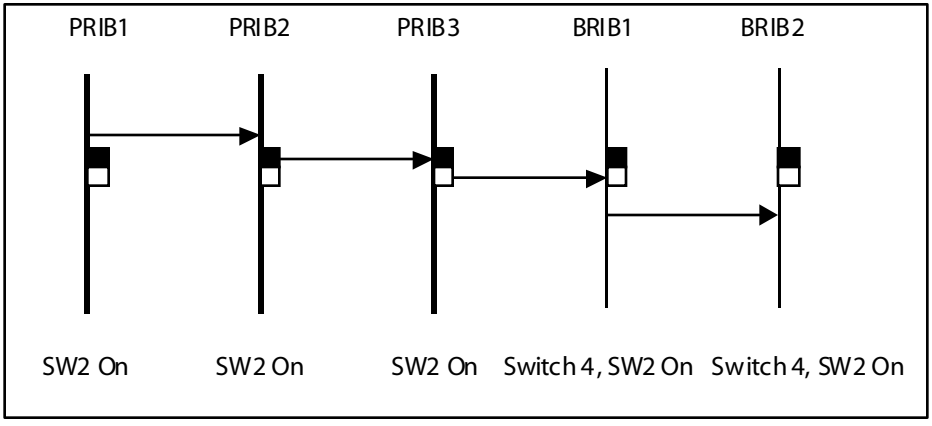
ON position. The three T1IBs are not connected with the clock control cable and SW3 on these boards should be in the OFF position.

(3) T1IBs and (2) PRIBs



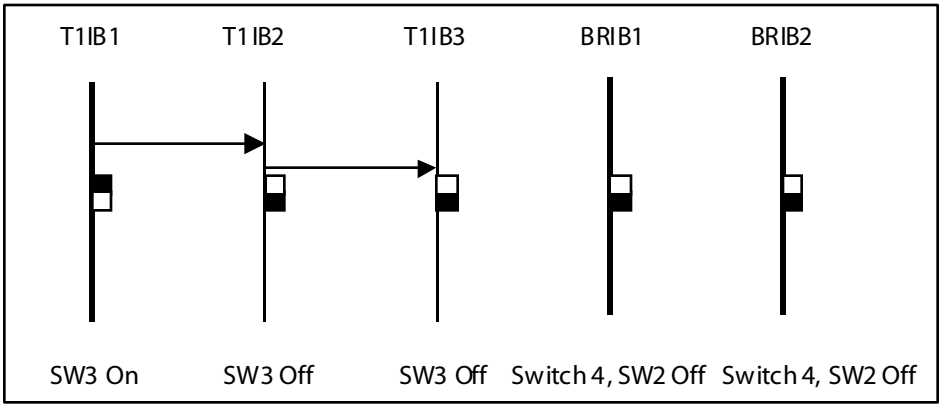
The clock cable should be connected to the OUT position on the cable connector on the T1IB and connected to the IN position on the connector on the T1IB2. The clock cable should be connected to the OUT position on T1IB2 and connected to the IN position on the T1IB3. SW3 of T1IB1 should be placed in the ON position, with SW3 on T1IB2 and T1IB3 being OFF. The two PRIBs are not connected with clock control cables, and SW2 on the PRIBs should be in the OFF position.

(3) PRIBs and (2) BRIBs



The clock cable should be connected from the OUT position of the PRIB1 to the IN connectors of all the cards and all clock switches should be in the ON position.

(3) T1IBs and (2) BRIBs



The clock OUT cable from T1IB1 should be connected to the clock IN cable of the T1IB2 and the clock OUT cable from T1IB2 should be connected to the clock IN cable of T1IB3. SW3 of T1IB1 should be in the ON position, and SW3 of T1IB2 and T1IB3 should be in the OFF position. The two BRIBs are not connected with clock control cables and SW2 of the BRIB cards are placed in the OFF position.

Station Connections

The system can be equipped with any combination of the four station boards; DTIB12, DTIB24, ETIB and SLIB6. The station interface boards can be installed in any card slot in the BKSU and EKSU, except for MPB slot of the BKSU. As a default, the software allocates slots 1 through 5 of the BKSU and 9 through 10 of the EKSU for station interface boards. It is recommended that slots beginning from SLOT #1 be used for station interface boards. Also, since the first port of the DTIB is the database access port (the only port which enables Admin programming), it is strongly recommended that a DTIB be installed in the SLOT #1 and a Digital Keyset w/LCD be connected to the first port.

Electronic Telephone Interface Board (ETIB)

The ETIB board provides the interface to twelve (12) electronic telephones or DSS/DTS terminals. The card has one LED indicator for off-hook/in use status. The ETIB card extractors are color coded green.

There is one 50-pin female amphenol connectors labeled Conn 2 located on the front of the card. This allows the system to be cabled to the main distribution frame (MDF). 25-pair telephone cabling must be prepared with mating connectors to extend the interface circuits to the MDF. The cables should be routed through the cable clamps at the bottom of the KSU to the MDF. These cables are then terminated on industry standard 66M1-50 type punchdown connector blocks. It is recommended that 66M1-50 split blocks with bridging clips be used to simplify troubleshooting and to quickly isolate faults.

Only DTIB type stations can be used for Database programming.

Table 2-11: ETIB Wiring

Pair	PIN #	Color	Description	
1	26 1	WH/BL BL/WH	VT-1 VR-1	CKT1
2	27 2	WH/OR OR/WH	DT-1 DR-1	
3	28 3	WH/GN GN/WH	VT-2 VR-2	CKT2
4	29 4	WH/BN BN/WH	DT-2 DR-2	
5	30 5	WH/SL SL/WH	VT-3 VR-3	CKT3
6	31 6	RD/BL BL/RD	DT-3 DR-3	
7	32 7	RD/OR OR/RD	VT-4 VR-4	CKT4
8	33 8	RD/GN GN/RD	DT-4 DR-4	
9	34 9	RD/BN BN/RD	VT-5 VR-5	CKT5
10	35 10	RD/SL SL/RD	DT-5 DR-5	
11	36 11	BK/BL BL/BK	VT-6 VR-6	CKT6
12	37 12	BK/OR OR/BK	DT-6 DR-6	

Pair	PIN #	Color	Description	
13	38 13	BK/GN GN/BK	VT-7 VR-7	CKT7
14	39 14	BK/BN BN/BK	DT-7 DR-7	
15	40 15	BK/SL SL/BK	VT-8 VR-8	CKT8
16	41 16	YL/BL BL/YL	DT-8 DR-8	
17	42 17	YL/OR OR/YL	VT-9 VR-9	CKT9
18	43 18	YL/GN GN/YL	DT-9 DR-9	
19	44 19	YL/BN BN/YL	VT-10 VR-10	CKT10
20	45 20	YL/SL SL/YL	DT-10 DR-10	
21	46 21	VI/BL BL/VI	VT-11 VR-11	CKT11
22	47 22	VI/OR OR/VI	DT-11 DR-11	
23	48 23	VI/GN GN/VI	VT-12 VR-12	CKT12
24	49 24	VI/BN BN/VI	DT-12 DR-12	
25	50 25	VI/SL SL/VI		

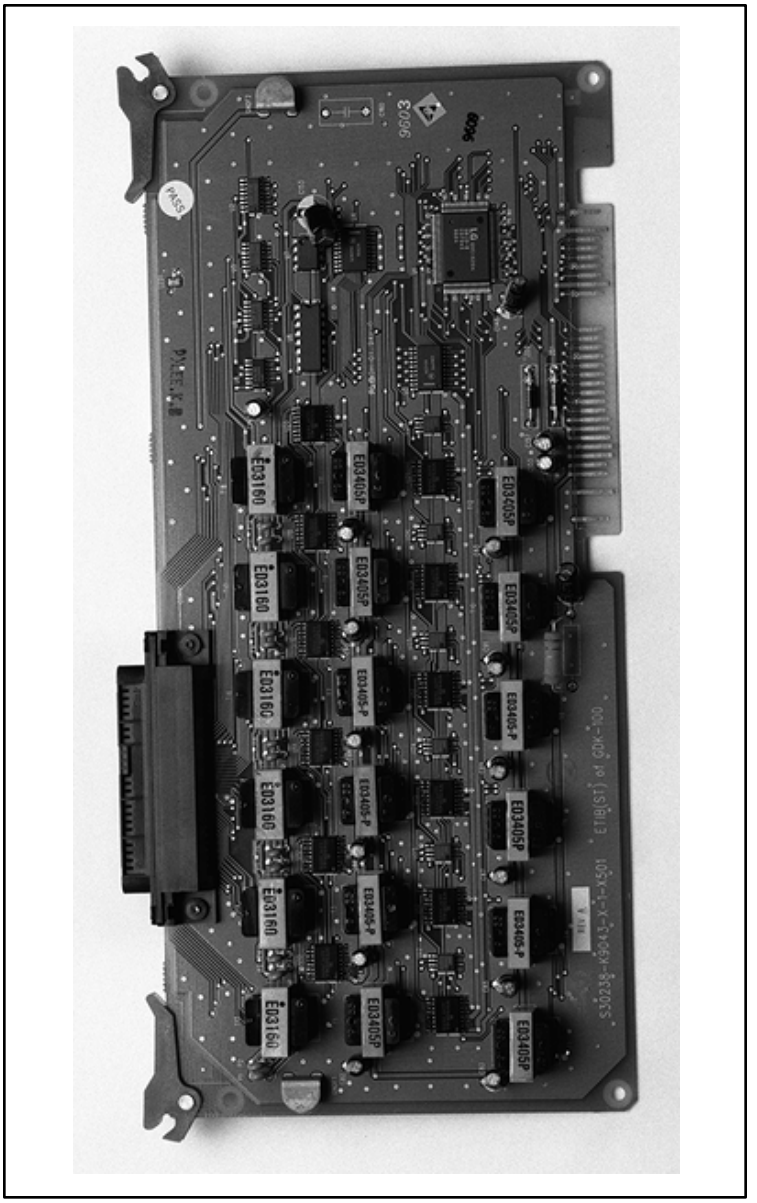


Figure 2-22: Electronic Telephone Interface Board (ETIB)

Single Line Interface Board (SLIB)

This board provides the interface to six (6) 2500 type telephones. The SLIB signals interface with mechanical 90V ringers and lights 90V message waiting lamps on 2500 sets as desired.

Only one SLT station is allowed per digital extension number. It is not possible to bridge digital station ports so that an extension number may appear in more than one location.

The station connections are via three (3) Modular (RJ14 type) connectors located on the front edge of the card. The board can support a DTRU board and a MSG12 board in a daughter board type arrangement.

The DTRU unit has two (2) DTMF receivers on it and can be installed on the SLIB board. The DTRU mounts on the SLIB board as a daughter board type arrangement.

Table 2-12: SLIB Wiring

SLIB Connector		3M Connection	6M Connection
Connector	**Pin #**		
M3	3	Tip 6	Tip 6
	2	Ring 6	Ring 6
	4	Tip 5	Tip 5
	1	Ring 5	Ring 5
M2	3	Tip 4	Tip 4
	2	Ring 4	Ring 4
	4	Tip 3	Tip 3
	1	Ring 3	Ring 3
M1	3	Tip 2	Tip 2
	2	Ring 2	Ring 2
	4	Tip 1	Tip 1
	1	Ring 1	Ring 1

Installing the DTRU Module

1. Unpack the DTRU Module from its antistatic conductive bag in the packing box.
2. Locate the CON1 and CON2 connectors on the DTRU module.
3. Locate the CONN1 and CONN2 connectors on the SLIB (outlined).
4. Position the DTRU module so that the CON2 and CON1 connectors match up with the CONN1 and CONN2 connectors on the SLIB respectively.
5. Push the DTRU module onto these connectors making sure it is seated properly.

   Refer to *Figure 2-23*. *This completes the installation procedure for the DTRU Module.*

Installing the MSGU Board

The Message Wait Lamp Relay Control (MSGU) provides Message Wait Lamp Relay Control for message lamp single line telephones. The MSGU board mounts on the SLIB board as a daughter board type arrangement.

1. Unpack the MSGU Module from its antistatic conductive bag in the packing box.
2. Locate the CONN1 and CONN2 connectors on the MSGU module.
3. Locate the CONN3, and CONN4 connectors on the SLIB (outlined).
4. Position the MSGU module so that the CONN1 and CONN2 connectors match up with the CONN3 and CONN4 connectors on the SLIB respectively.
5. Push the MSGU module onto these connectors making sure it is seated properly.

   Refer to *Figure 2-23*. *This completes the installation procedure for the MSGU Module.*

Adjusting Modem Settings

When using modems connected to SLT ports on the *Triad 1/2/3*, the gain settings on the SLT port when using T1 as access to the CO should be set to 0 dB (maximizes modem speed).

CO to SLT Call via a T1 TIE Trunk:

1. Access the specific trunk type above.
2. Hookflash and dial 638 8 on the keypad.
3. Hang up.

CO to SLT Call via a T1 Trunk:

1. Access the specific trunk type above.
2. Hookflash and dial 638 6 on the keypad.
3. Hang up.

SLT to SLT Call:

1. Place an intercom call from 1 SLT to another.
2. Hookflash and dial 638 5 on the keypad.
3. Hang up.

No adjustment is needed if access to the CO is accomplished by standard loop/ground start trunk circuits. These trunk types are set to 0 dB by default.

In all cases the maximum modem speed is not as much as if the modem were connected directly to the CO line. The system degrades the connection to the next lower baud rate that the modem supports. Example: If the modem can achieve 28800 on a direct CO line, the maximum speed on an SLT port would be 26400.

Testing proves that a baud rate of 33600 can be achieved with SLT-T1 lines. Typical connection speeds with SLT-T1 are 22700-33600. Typical connection speeds with SLT-Loop/Ground Start are 17400-23800.

All results were obtained using a 56K U.S. Robotics Sportster modem.

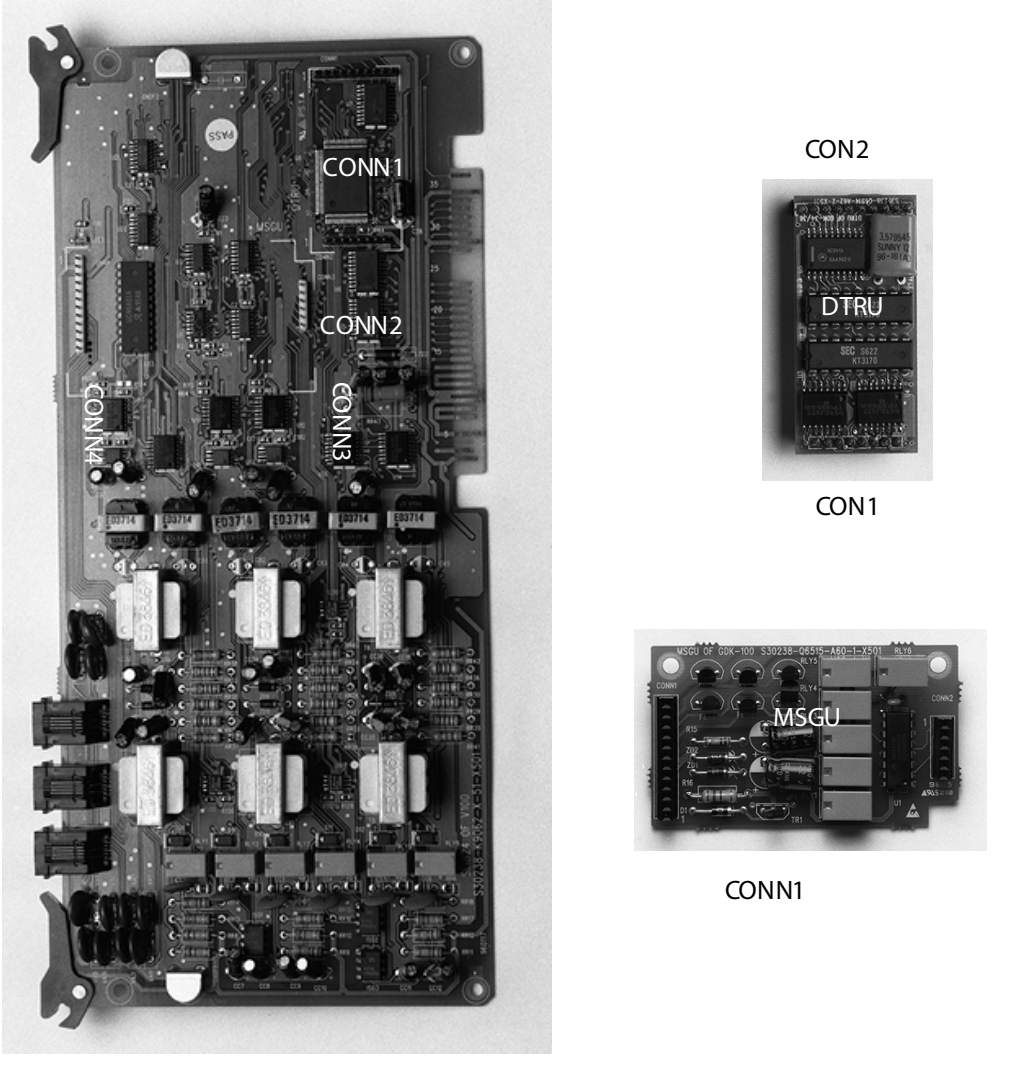


Figure 2-23: SLIB w/MSGU and DTRU Module Installation

Digital Telephone Interface Board (DTIB)

The DTIB board provides the interface to twelve (12) digital telephones. It is offered in two (2) versions, a 12-circuit and a 24-circuit. The card has one LED to indicate off-hook/in use status. The DTIB card extractors are color coded green.

Only one station is allowed per digital extension number. It is not possible to bridge digital station ports so that an extension number may appear in more than one location.

Cables

There is one 50-pin female amphenol connectors labeled Conn 2 located on the front of the card. This allows the system to be cabled to the main distribution frame (MDF).

- 25-pair telephone cabling must be prepared with mating connectors to extend the interface circuits to the MDF.
- Cables should be routed through the cable clamps at the bottom of the KSU to the MDF. These cables are then terminated on industry standard 66M1-50 type punchdown connector blocks.
- It is recommended that 66M1-50 split blocks with bridging clips be used to simplify troubleshooting and to quickly isolate faults.

Table 2-13: DTIB Wiring

Pair	PIN #	Color	Description	
1	26 1	WH/BL BL/WH	DATA-R 1 DATA-T 1	DTIB12 Station Ports
2	27 2	WH/OR OR/WH	DATA-R 2 DATA-T 2	
3	28 3	WH/GN GN/WH	DATA-R 3 DATA-T 3	
4	29 4	WH/BN BN/WH	DATA-R 4 DATA-T 4	
5	30 5	WH/SL SL/WH	DATA-R 5 DATA-T 5	
6	31 6	RD/BL BL/RD	DATA-R 6 DATA-T 6	
7	32 7	RD/OR OR/RD	DATA-R 7 DATA-T 7	
8	33 8	RD/GN GN/RD	DATA-R 8 DATA-T 8	
9	34 9	RD/BN BN/RD	DATA-R 9 DATA-T 9	
10	35 10	RD/SL SL/RD	DATA-R 10 DATA-T 10	
11	36 11	BK/BL BL/BK	DATA-R 11 DATA-T 11	
12	37 12	BK/OR OR/BK	DATA-R 12 DATA-T 12	

Pair	PIN #	Color	Description	
13	38 13	BK/GN GN/BK	DATA-R 13 DATA-T 13	DTIB24 Station Ports
14	39 14	BK/BN BN/BK	DATA-R 14 DATA-T 14	
15	40 15	BK/SL SL/BK	DATA-R 15 DATA-T 15	
16	41 16	YL/BL BL/YL	DATA-R 16 DATA-T 16	
17	42 17	YL/OR OR/YL	DATA-R 17 DATA-T 17	
18	43 18	YL/GN GN/YL	DATA-R 18 DATA-T 18	
19	44 19	YL/BN BN/YL	DATA-R 19 DATA-T 19	
20	45 20	YL/SL SL/YL	DATA-R 20 DATA-T 20	
21	46 21	VI/BL BL/VI	DATA-R 21 DATA-T 21	
22	47 22	VI/OR OR/VI	DATA-R 22 DATA-T 22	
23	48 23	VI/GN GN/VI	DATA-R 23 DATA-T 23	
24	49 24	VI/BN BN/VI	DATA-R 24 DATA-T 24	
25	50 25	VI/SL SL/VI		

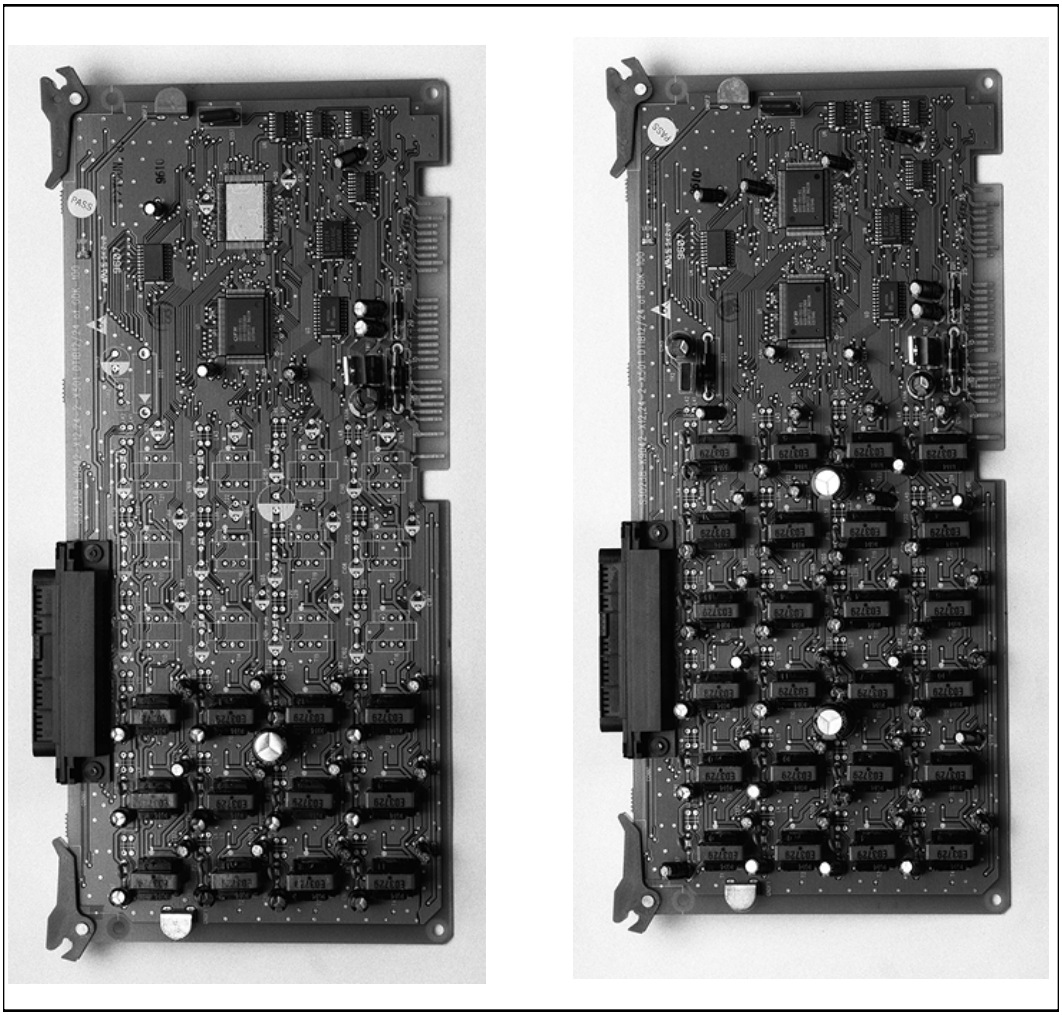


Figure 2-24: Digital Telephone Interface Board (DTIB) Installation

System Wiring

Battery Back-Up Wiring Installation

The system can be equipped to provide operation from external batteries if local AC power fails. The Back-Up batteries are connected to the strip connector on the front of the PSU as shown:

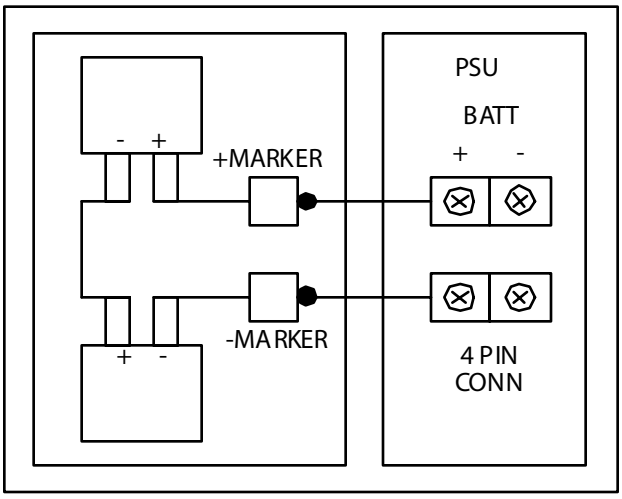


Figure 2-25: Battery Back-Up Wiring

The external batteries must provide 24 Volts DC. This is generally accomplished by connecting two 12 volt batteries in a series arrangement. Operation on batteries is controlled by the PSU. This PSU provides charging current to the batteries during normal AC power operation at a maximum of about 1 amp.

During battery operation, the PSUs discontinue battery operation if the AC power is reapplied or the battery voltage is too low to maintain proper system operation. If a low-battery cut-off occurs and a new battery is installed, it is necessary to reset the Battery Back-Up circuit in the PSU manually by momentarily depressing the white colored BATT. RESTART switch located on the faceplate of the PSU.

The length of time the system operates on the batteries is dependent on several elements including: battery charge state, condition of the batteries, capacity of the batteries, and the size of the system (number of station ports).

The following chart gives the approximate back-up time for several system sizes and different battery capacities in ampere-hours.

Table 2-14: System Back-Up Duration

Battery Capacity	36 Ports	60 Ports
20AH	4 Hour	1.75 Hour
40AH	8 Hour	3.5 Hour

MPB and SIU RS232C Port Wiring

The MPB has one standard RS232C port and the SIU has two standard RS232C ports. The RS232C ports are connected by 9-pin D connectors as shown in *Figure 2-26*. Note the configuration is 8 bits, no parity and 1 stop bit.

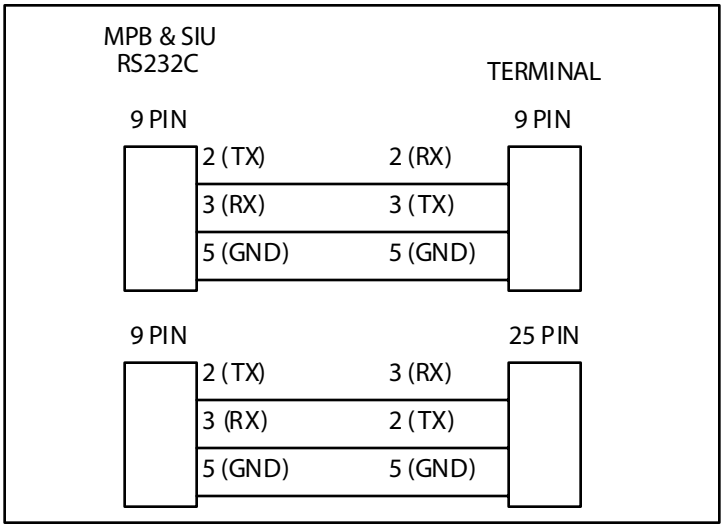


Figure 2-26: RS232 9-Pin Connector Wiring

MISU Wiring

The MISB has connections for 2 music sources, 2 External page zones and 4 relay contact controls. The MISB connections are made by the 25 pair connector. The wiring connections for the 25-pair cable are identified in *Table 2-2*.

Station Wiring

Station interface boards (DTIB, ETIB, SLIB) includes a 25 pair connector for station wiring to the ports on the board. The following provides details on the interconnection of each type of station interface board and the station jack.

Digital Keyset and Terminal Wiring

Wiring from the DTIB to station jack requires one pair of wire. Digitized voice, signaling, and power are sent over this pair.

Figure 2-27 gives details on connections of station jacks to the system and *Table 2-13* gives the configuration of the 25-pair station connector arrangement and punchdown type block.

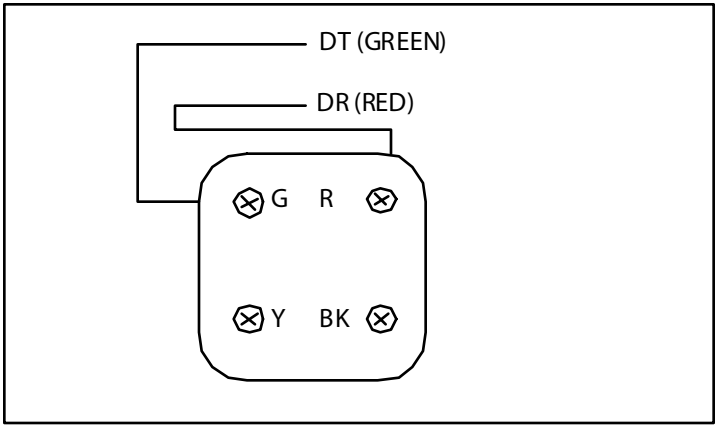


Figure 2-27: Digital Station Jack Wiring

Only the first pair (Red, Green on jack) should be connected back to the KSU. No other pairs should be connected back to the KSU.

Electronic Keyset and Terminal Wiring

Wiring from the ETIB to station jack requires two pairs of wire. The first pair provides the audio or voice path, the second is for signaling or data path. The DATA pair is polarity sensitive, reversal does not harm the keyset or system, but the port does not function properly when reversed. Power is delivered by applying DC voltage to the center tap of the coupling transformers of each of the 2 pairs.

Figure 2-22 gives details on connections of station jacks to the system and *Table 2-11* gives the configuration of the 25-pair station connector arrangement and punchdown type block.

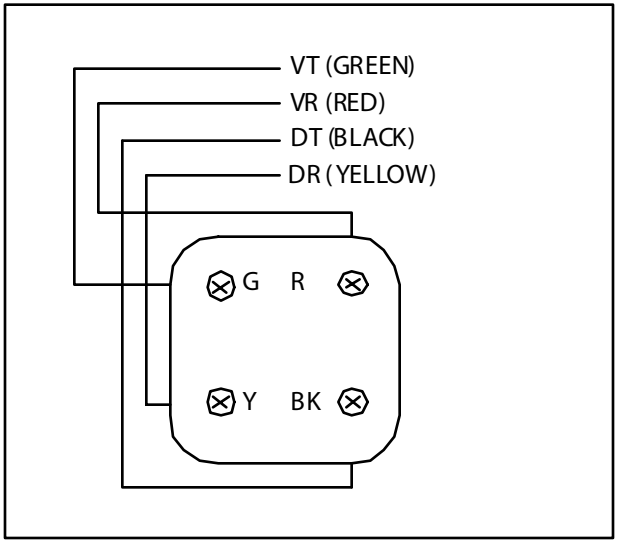


Figure 2-28: Electronic Station Wiring

Single Line Telephone Wiring

The SLIB is wired to SLT devices with a single pair of wire which provides battery feed, voice and signaling to and from the SLT. Typical wiring to the SLT jack is shown in *Figure 2-29* and *Table 2-12* gives the configuration of the station connector arrangement when connected to a punchdown type block.

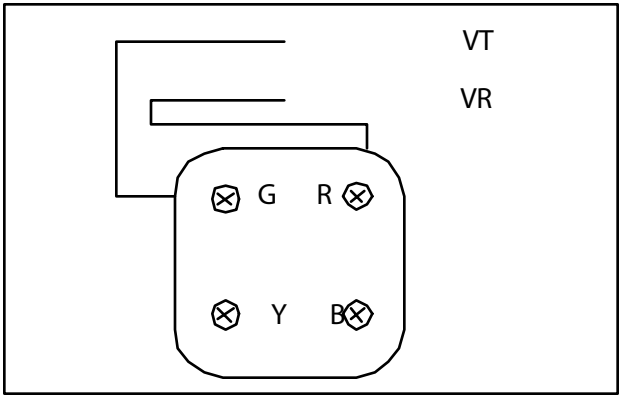


Figure 2-29: Single Line Telephone Wiring

Power Failure Transfer Wiring

The PFTU is wired from the 25-pair connector to the MDF, cross connected to the CO Line inputs from the telephone company, to the CO Line inputs of the system, and to Power Failure SLTs. The basic connections are shown in *Figure 2-30* and the connector configuration is given in *Table 2-12*. Note that the SLT may also be connected to a SLIB as shown in the figure.

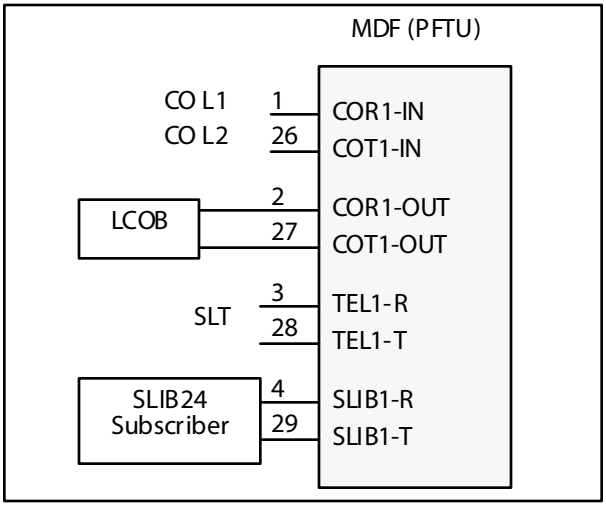


Figure 2-30: PFTU Wiring

Wall Mounting the Electronic Telephone

All connections to the Electronic Key Telephone are fully modular. To wall mount the Electronic Key Telephone, it is necessary to have one Wall Mount Kit and one standard-type jack assembly designed for normal wall hanging applications.

1. Unplug the line cord from the phone. This line cord is not be required and should be retained as a maintenance replacement item.
2. Lift the plastic number retainer upward and expose the screw underneath. Remove the screw and the handset tab. Replace it with the handset tab from the Wall Mount Kit.
3. Be careful to position the tab so that the protrusion faces the hookswitch. This allows the handset to remain secure when the telephone is on the wall. Replace the screw and snap the number retainer into place.
4. Substitute the short modular cord from the Wall Mount Assembly into the modular connector vacated by the line cord.
5. Align the wall mount baseplate with holes on the bottom of the telephone. Snap in place.
6. Now match the two key hole slots on the baseplate with the lugs on the 630-A type jack. Align the modular connector and slide telephone into place. Refer to *Figure 2-33*.

Wall Mounting the Digital Telephone

To wall mount the Digital Key Telephone, it is necessary to use the Wall Mount bracket and one standard-type jack assembly designed for normal wall hanging applications. Refer to *Figure 2-33* and *Figure 2-34*.

1. Remove the handset from the cradle and locate the plastic retainer in the bottom of the hook-switch well area. Push the plastic retainer slowly upward until it is free. Locate the tab on the plastic retainer and make sure the tab is toward you, then place it back into its holder. Slide the plastic retainer all the way down into its channel. Part of the retainer remains above its holder to hold the handset secure for the wall mount configuration.
2. Turn the telephone over and unplug the line cord. If the line cord is not plugged into the wall jack assembly, re-route the line cord thru the access channel on the top of the telephone. If the line cord is plugged into the wall jack assembly, run the line cord through the hole provided and plug into the connector on the back of the telephone.
3. Line up the hooks on the top and bottom of the wall mount bracket so they can engage with the slots cut into the bottom of the telephone base. Insert the bottom hooks first. Slide the mounting bracket slowly downwards until the top tabs slide into the top slots and snap in place.
4. Match the two key hole slots on the base plate with the lugs on the 630-A type jack. Align the modular connector and slide the telephone into place.
5. Place the handset onto the retainer. The telephone is now ready for use. Refer to *Figure 2-34* for location of mounting information.

Headset Installation

The *Triad 1/2/3* Electronic/Digital Key Telephones have been designed to operate with industry standard electret mic compatible modular headset adapters and operator headsets.

To modify an Electronic/Digital Key Telephone to support an external headset:

1. Plug the headset adapter cord into the vacant handset jack on the Key Telephone base.
2. Plug the telephone handset cord into the headset adapter box where indicated by the headset manufacturer's instructions.

The Headset Operation must be enabled (refer to *Station Programming)*. The station then has the capability to enable/disable headset mode by dialing a code. When Headset mode is active at the station, the ON/OFF button controls the on-hook or off-hook status. Also, features such as On-Hook Dialing and Handsfree Speakerphone operation become inoperable.

Caller ID Interface Unit Installation

The Caller Identification Interface Unit receives the data from the telephone company and sends the data, in ASCII RS-232C format to a printer, telephone, computer or DTE (Data Terminal Equipment) device.

Selecting the Cable

1. Select the correct RS-232 cable (P/N 9081-00) for the *Triad 1/2* MPB and SIU.
2. Connect one end of the cable on the desired KSU I/O port (1, 3, or 4).
3. Connect the other end to the OUT port on the Caller ID unit.

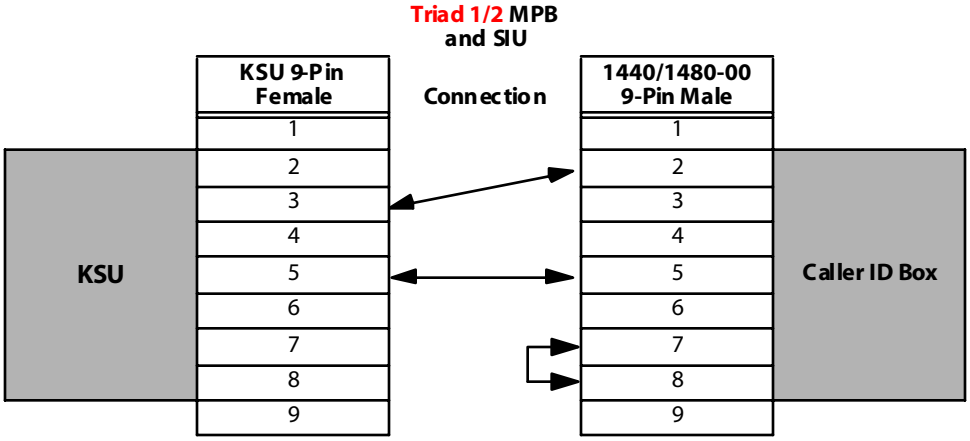
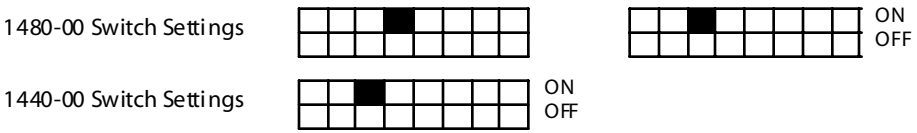
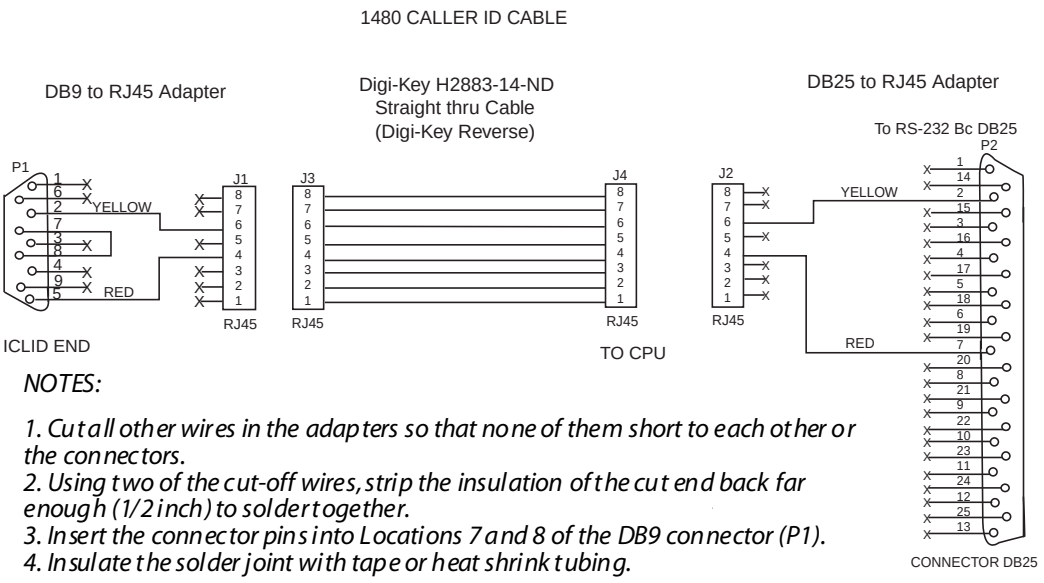


Figure 2-31: Caller ID Cable Connections



ICLID Cable Pin-Out Diagram
RJ45/DB9/RS232



NOTES:

1. Cut all other wires in the adapters so that none of them short to each other or the connectors.
2. Using two of the cut-off wires, strip the insulation of the cut end back far enough (1/2 inch) to solder together.
3. Insert the connector pins into Locations 7 and 8 of the DB9 connector (P1).
4. Insulate the solder joint with tape or heat shrink tubing.

Programming the KSU

I/O Ports

1. Verify the programming for the I/O ports, press ✳✳**3226, Flash 15**.
2. Select the desired I/O port, Button 1, 3, 4 (MPB, SIU1, SIU2).
3. Dial [5] on the dial pad and press HOLD.

CO Lines

1. Verify the programming for the CO Lines, press ✳✳**3226, Flash 40**.
2. Enter CO line Range for the Caller ID Unit and press HOLD.
3. Press Button 21 (Page C).
4. Press Button 2, Ring Delay Timer.
5. Enter 04 (minimum). Press HOLD.
6. Reset the system and the CTI box.

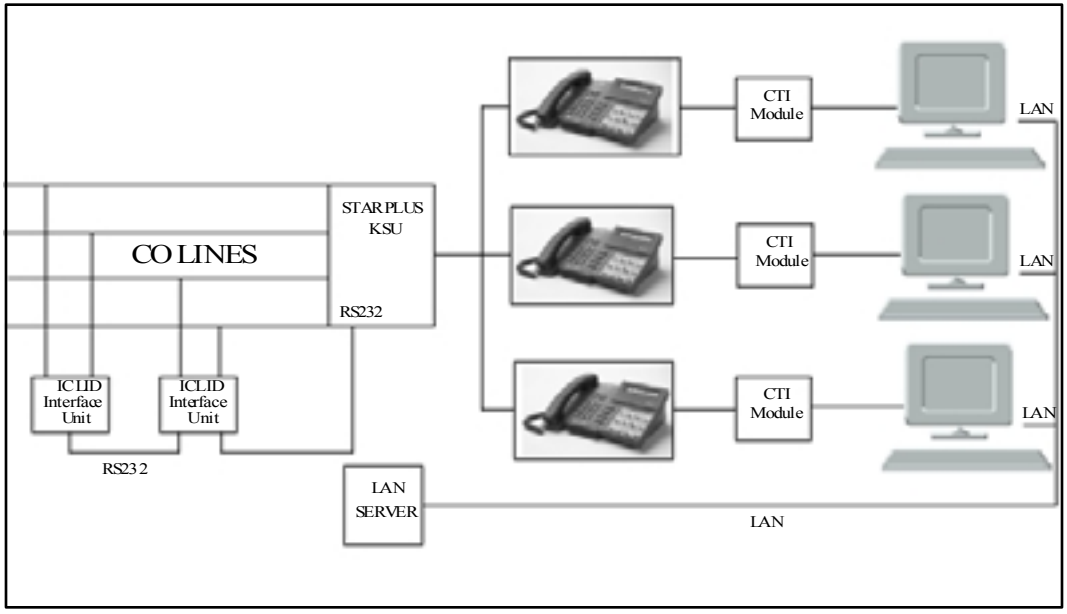


Figure 2-32: CTI System Configuration

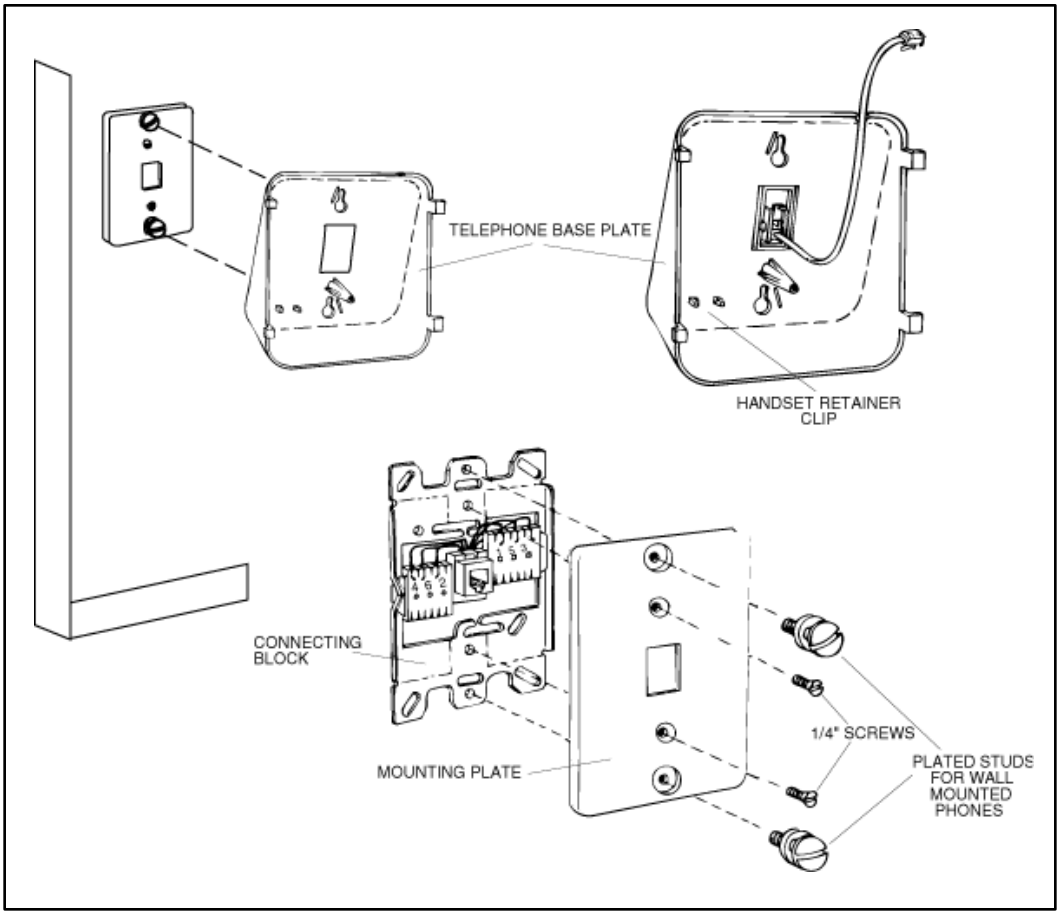


Figure 2-33: Electronic Key Telephone Wall Mounting

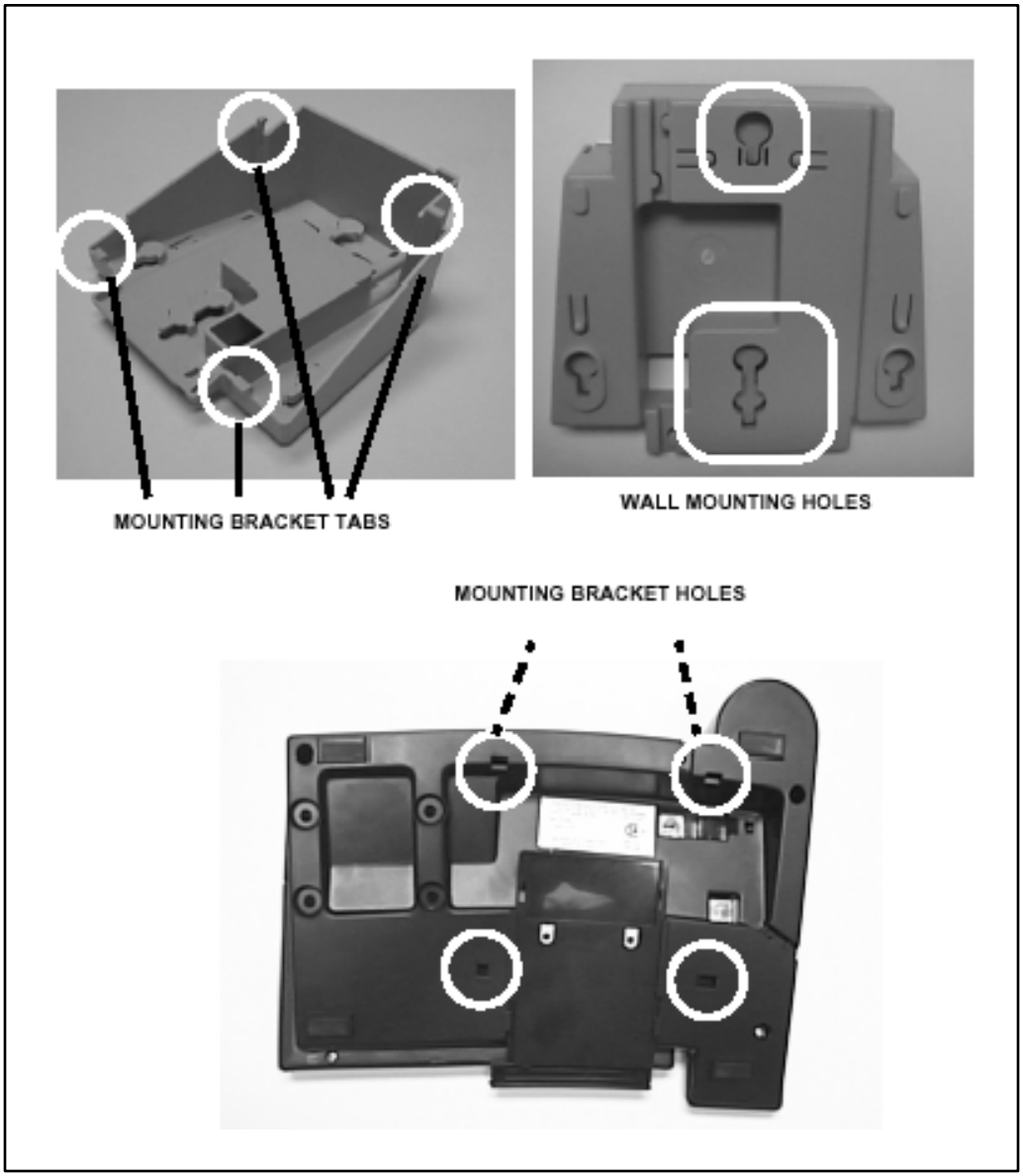


Figure 2-34: Digital Key Telephone Wall Mounting

The SMDR feature provides detailed records of all outgoing and/or incoming, long distance only or all calls. The SMDR Qualification Timer determines the length of time that is needed to determine a valid SMDR call for reporting purposes. By default, this timer is set to 30 seconds and is variable from 00 to 60 seconds in 1 sec. increments. This feature is enabled or disabled in system programming. By default, SMDR is not enabled and is set to record long distance calls only. A printout format of 80 characters maximum or 30 character maximum may be selected in system programming. The standard format is 80 characters on a single line. A 30 character format generates 3 lines per message. If the SMDR feature is enabled, the system starts collecting information about the call as soon as it starts and terminates when the call ends. If the call was longer then 30 seconds, the following information is printed:

30 character format selected:

```
          1         2         3
123456789012345678901234567890
AAAA BBB HH:MM:SS HH:MM MM/DD/YY(CR)(LF)
HCCCCCCCCCCCCCCCCCCCCCCCCCCCC<R>GGGGGGGGGGGG
STA  CO  TOTAL  START  DATE
1116 008 00:02:00 14:13 08/28/00(CR)(LF)
012345678901234567890123(CR)(LF)
123456789012(CR)(LF)
```

80 character format selected:

```
          1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
AAAA BBB HH:MM:SS HH:MM MM/DD/YY HCCCCCCCCCCCCCCCCCCCCCCCCCCCC GGGGGGGGGGGG(CR)(LF)
STA  CO TOTAL   START  DATE  DIALED            ACCOUNT CODE<_><_>COST
1116 008 00:02:00 14:13 08/28/00 O12345678901234567890123 123456789012(CR)(LF)
```

80 character format with Call Cost Display feature enabled:

```
          1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
AAAA BBB HH:MM:SS HH:MM MM/DD/YY HCCCCCCCCCCCCCCCCCCCCCCCCCCCC GGGGGGGGGGGG(CR)(LF)
STA  CO TOTAL   START  DATE  DIALED            ACCOUNT CODE<~><~>COST
1116 008 00:02:00 14:13 08/28/00 O12345678901234567890123 123456789012<_>000.00(CR)(LF)
```

80 character format for DISA Calls:

```
          1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
AAAA  BBB HH:MM:SS HH:MM MM/DD/YY HCCCCCCCCCCCCCCCCCCCCCCCCCCCC GGGGGGGGGGGG (CR)(LF)
STA CO TOTAL   START  DATE  DIALED            ACCOUNT CODE<~><~>COST
1116 001 00:02:00 14:13 08/28/00 I              123456789012<_>000.00(CR)(LF)
001    004 00:04:54  14:15 08/28/00 I012345678901234567890123456          -continued on next page-
```

Figure 2-35: SMDR Printout

```
ICLID 30 character format selected:
          1         2         3
1234567890123456789012345678 90
STA  CO  TOTAL  START  DATE
1000 001 00:00:19 09:32 08/28/00(CR)(LF)
O  480-443-6000(CR)(LF)
123456789012     **(CR)(LF)
ICLID 80 character format selected:
          1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
STA  CO  TOTAL  START  DATE  DIALED          ACCOUNT CODE<_><_>COST
1000 001 00:00:36 04:37 08/28/00 1-480-443-6000                **(CR)(LF)
 **VODAVI          (CR)(LF)
  01 00:00:00 04:38 08/28/00 U1-480-443-6000                **
 **VODAVI          (CR)(LF)
```

- AAAA = Station originator or Trunk on DISA and Off-Net (CO Line) calls.
- BBB = Outside line number
- HH:MM:SS = Duration of call in Hours, Minutes and Seconds
- HH:MM = Time of day (start time) in Hours and Minutes
- MM/DD/YY = Date of Call
- H = Indicates call type:
  - "I" = Incoming*
  - "O" = Outgoing
  - "T" = Transferred*
  - "U" = Unanswered calls for ICLID SMDR call records
- CC...CC = Number dialed
- GG...GG = Last Account code entered (optional)
- (CR) = Carriage return
- (LF) = Line Feed

Figure 2-32: SMDR Printout

3 Triad 3 System Installation

This chapter contains the basic system installation and wiring instructions for the *Triad 3* System, as well as how to install the optional cards and units.

Introduction

As with any sophisticated communications device, installation of the *STARPLUS Triad 3* System, requires the care and forethought of a competent technician. To assure easy servicing and reliable operation, several factors must be considered when planning the system installation. The installation proceeds in these major steps:

- Site Preparation
- KSU and Power Supply (PS) Installation
- PCB Installation
- System Wiring
- Keyset & Terminal Installation
- Basic Installation Check-Out
- System Programming and Verification

Installing the *STARPLUS Triad 3* System is quick and efficient if these installation instructions are followed.

Site Preparation

General Site Considerations

The first step is to locate an acceptable site for the common equipment (KSUs, boards, etc.). When locating a mounting site for the KSUs, the following points must be considered.

- The KSUs are designed for wall mounting and should not be mounted directly to a masonry or plasterboard wall. It is recommended that a 1/2 inch plywood back board be firmly mounted to the wall, and the KSU and MDF be mounted to the back board. Each BKSU/EKSU1 must have its own 110 Volt AC circuit and circuit breaker.

- The location must have access to a dedicated 110 Volt AC (±10%), 60 Hz, single-phase circuit with a circuit breaker or fuse rated at 15 amps. A 3-wire (parallel blade grounded outlet should be within approximately 6 feet of the lower left rear of the BKSU mounting.
- The location must have access to a good earth ground, such as a metallic cold water pipe with no non-metallic joints. The ground source should be located as close as possible to the system.
- The system should be located in an area which is well ventilated with a recommended temperature range of 68°-78° F and a relative humidity range of 5-60% (non condensing).
- The system should be located within 25 feet of the telephone company's termination point. Also, the location should be within the prescribed station loop lengths for all keysets and terminals. If existing cabling is to be used, the location of existing cabling and conduits should be considered.
- Protection from flooding, flammable materials, excessive dust and vibration.
- Proximity of radio transmitting equipment, arc-welding devices, copying machines and other electrical equipment that are capable of generating electrical interferences. Operation of this equipment in a residential area is likely to cause interference in which case the user, at their own expense, is required to take whatever measures may be required to correct the interference.

Back-Board Installation

A wooden back-board is recommended for all installations and must be installed when the location has masonry or plasterboard walls. A 1/2 inch plywood material is sufficient for most installations. The back-board should be mounted at a convenient height, about 3 feet above the floor and bolted in a number of places to distribute the weight of the system.

Space should be available on the right side of the back-board for the MDF cabling and for optional equipment such as a music source. It is recommended the location of each major item be roughly sketched on the back-board as an installation layout.

Verify On-Site Equipment

Once the equipment installation site has been identified and a dedicated AC outlet, earth ground, and lighting and ventilation are available, verify that all equipment required is on-site and has not been damaged during shipment. Unpack the KSUs and the PSUs and assure there is no shipping damage.

A mounting template is packed with each KSU, and this template is required later in the installation. Check that the type and quantity of boards receive is correct and optional equipment and a Power Line Surge Protector are on-site.

The individual boards SHOULD NOT be unpacked at this time. If any equipment is damaged or missing, notify the appropriate personnel to correct the situation.

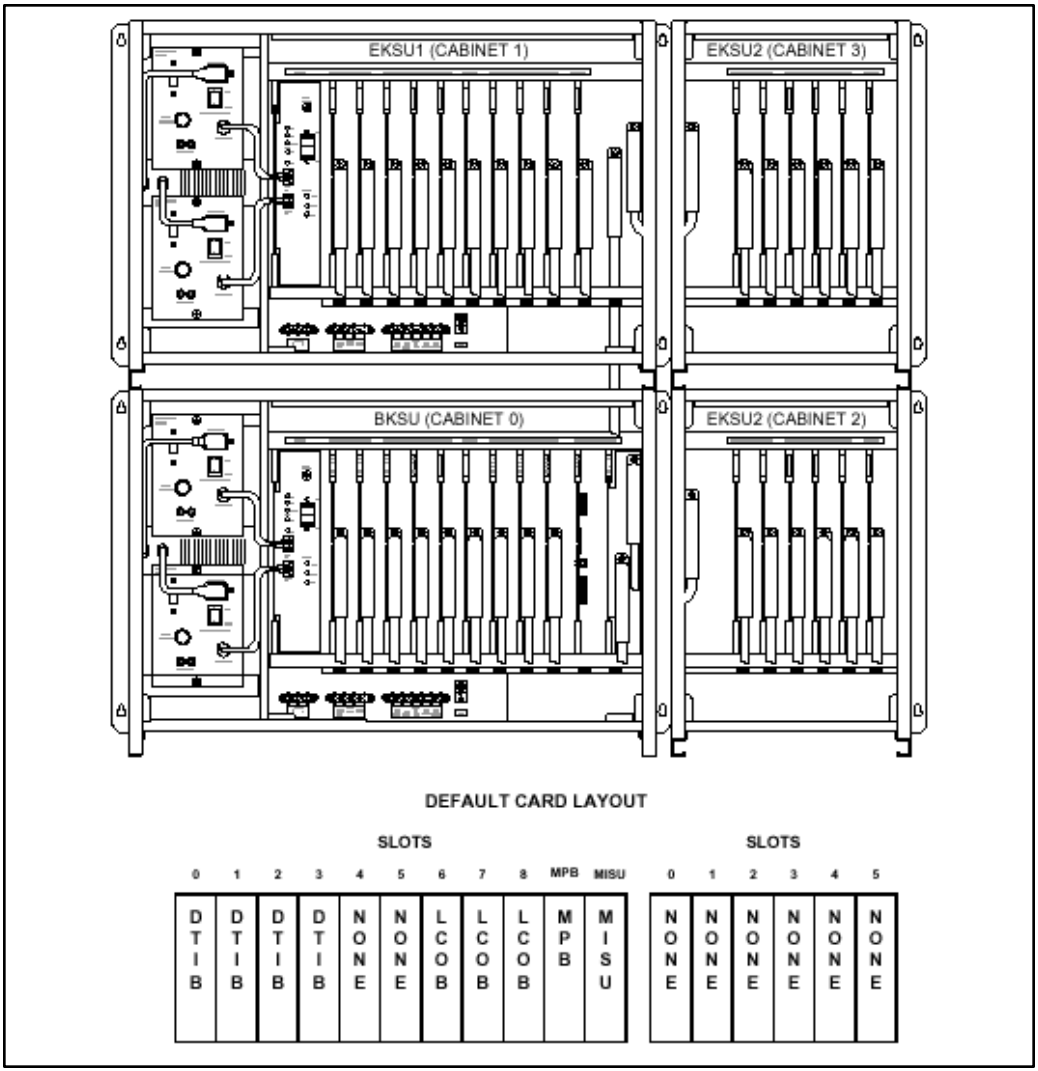


Figure 3-1: Basic Cabinet (BKSU) w/Expansion KSU (EKSU1/EKSU2)

In certain configurations, it is possible to not have all card slots utilized due to power capacities. Use the Configurator Program to calculate the correct configuration.

KSU & Power Supply (PSU) Installation

The system consists of a maximum of two cabinets that can be stacked together. The first cabinet, or Basic KSU (BKSU), houses the common equipment boards and peripheral equipment boards. The Expansion cabinet (EKSU2) mounts to the right of the BKSU.

The card slots in Expansion cabinet houses only peripheral boards. Any arrangement of CO Lines, Stations, etc. is permitted. The system size is limited to the ports available and can be configured in accordance with customer requirements. The cabinets are wall mountable.

Mounting the Basic KSU

Using the KSU mounting template provided with the BKSU, mark the location of the four screws to mount the BKSU. Again, the KSU must NOT be mounted on a masonry or dry-wall surface, in this case a wooden back-board is required. Refer to *Figure 3-2* for the distance between mounting holes.

The BSKU is mounted with four #10 or larger, 1 ½ inch or longer screws.

1. Drill pilot holes in the four locations marked.
2. Insert the screws and tighten leaving about ½ inch exposed.
3. Mount the Basic KSU on the screws and tighten the screws securely.
4. Remove the front cover by turning the two front cover screws ½ turn counter clockwise.
5. Tilt and lift the cover to remove.

   (All packing material should be removed from the inside of the KSU.)

All cabling for boards exit the BKSU from an opening on the right side of the KSU. Care should be taken to ensure enough length is provided to also pass thru the EKSU as ALL cables must exit the opening in the EKSU when installed.

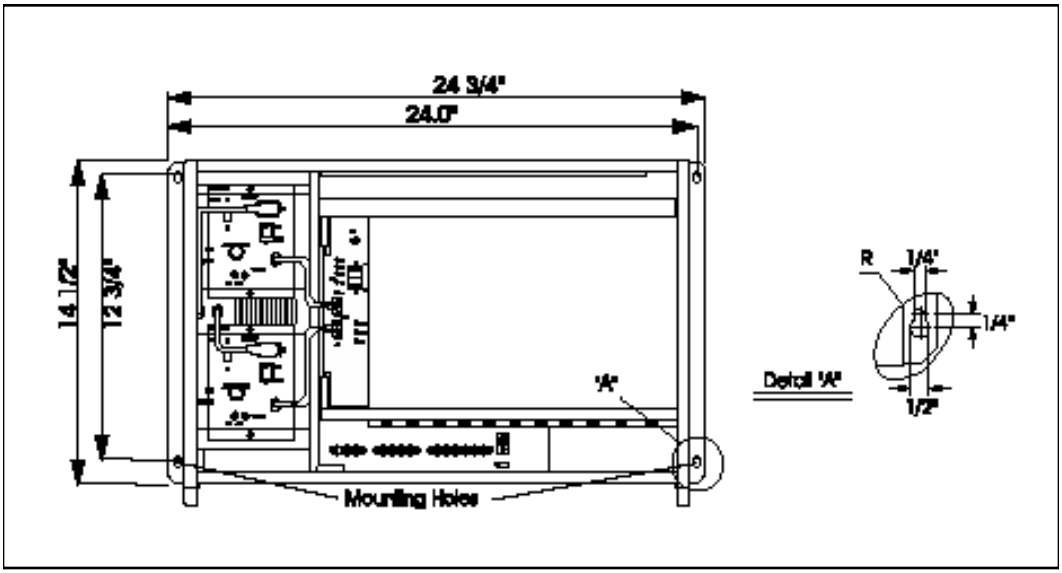


Figure 3-2: BKSU Mounting Holes

Mounting the Expansion Cabinet (EKSU1)

If required, an Expansion KSU1 (left top cabinet) is mounted directly on the top of the Basic KSU.

Before mounting the Expansion KSU on the screws:

1. Remove the KSU Interconnect Cable Cover Plate on the top at the rear right of the Basic KSU.
2. Remove the two screws holding each plate and lift the plate from the BKSU. Refer to *Figure 3-2*.

The EKSU1 is mounted in a manner similar to the BKSU.

1. Place the EKSU1 on the BKSU and mark the location of the four mounting screws.
2. Drill pilot holes in the four locations marked, insert and tighten the screws leaving about ½ inch exposed.
3. Mount the Expansion KSU1 on the screws and tighten the screws securely.
4. Mount the 4 side brackets between the Basic and Expansion KSUs.

5. Remove the front cover by turning the two front cover screws ½ turn counter clockwise.
6. Tilt and lift the cover to remove.

The KSUs require intercommunications which are provided by the KSU Data Cable shipped with each EKSU.

1. Connect the cable to the back plane of both KSUs by a 25-pair connector.
2. Install the cable through the Basic KSU where the Cable Cover Plate was removed into the Expansion KSU.
3. Insert the 25-pair connector at each end of the cable in the connector on the back plane of each KSU.

Mounting the Expansion Cabinet (EKSU2)

The Expansion KSU2 is mounted directly on the right of the BKSU.

1. Before mounting the Expansion KSU2 on the screws, remove the KSU Interconnect Cable Cover Plate on the right side at the rear right of the BKSU.
2. Remove the two screws holding each plate and lift the plate from the BKSU. (Refer to *Figure 3-2*.)
3. Mark the location of the four mounting screws.
4. Drill pilot holes in the four locations marked, insert and tighten the screws leaving about ½ inch exposed.
5. Mount the Expansion KSU on the screws and tighten the screws securely.

   The KSUs require intercommunications which are provided by the KSU Data and Power Cables shipped with each EKSU2. The KSU cable is connected to the back plane of both KSUs by a 25-pair connector and 20 wires power cable.

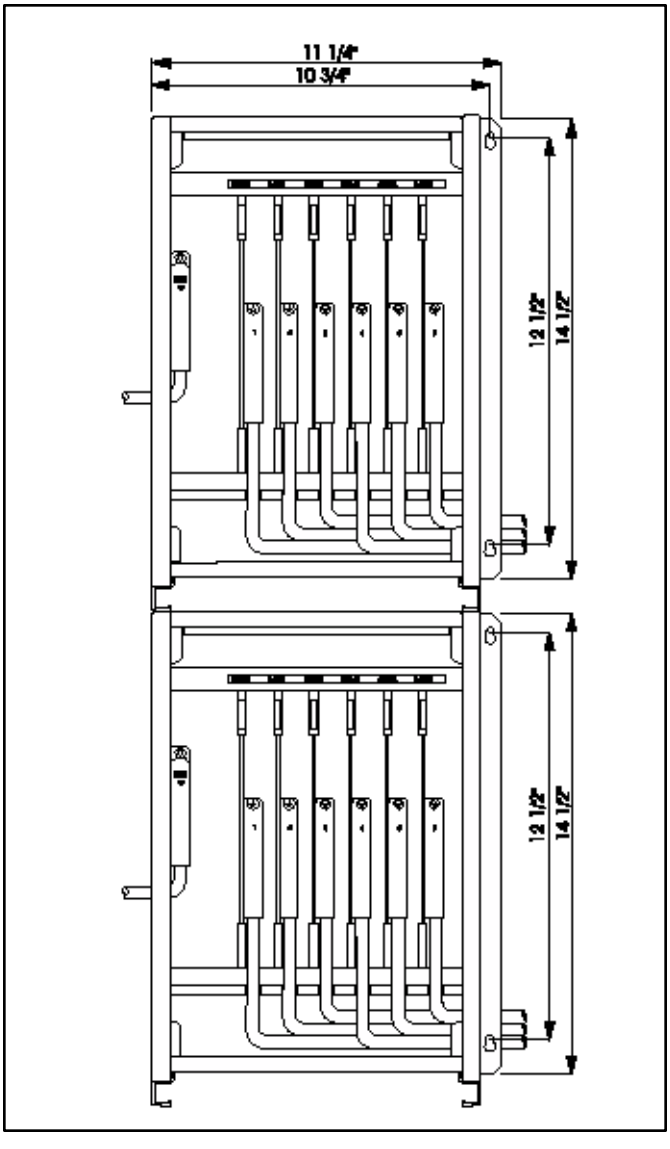


Figure 3-3: Expansion Cabinet (EKSU2) Installation

Ring Generator Installation (RGU)

This unit is needed in the BKSU, whenever SLT devices are installed on the system. This unit supplies the ring voltage and message wait voltage for the operation of SLTs on the system.

The system provides the capability to have an optional ring generator (RGU) for signaling 2500 type telephones and providing message waiting on 2500 type telephones.

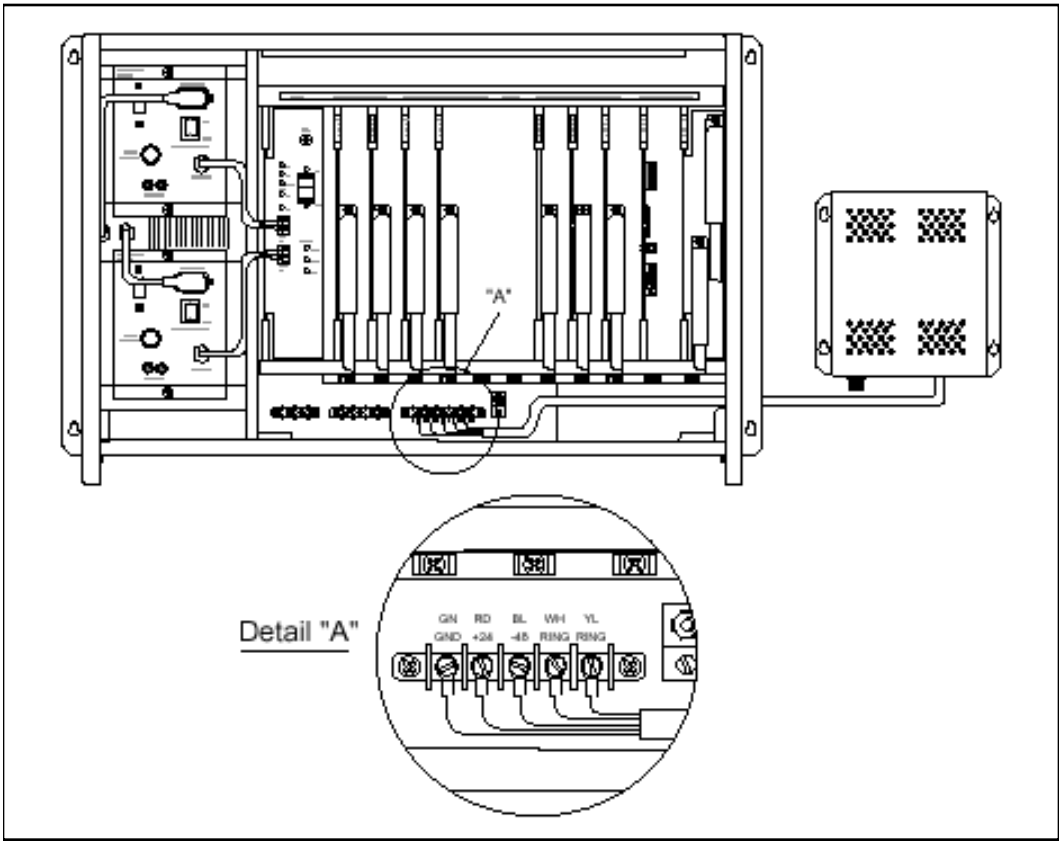


Figure 3-4: Ring Generator Installation

KSU Grounding

To ensure proper system operation and for safety purposes, a good earth ground is required.

A metallic COLD water pipe usually provides a reliable ground path. Carefully check that the pipe does not contain insulated joints that could isolate the ground path. In the absence of the COLD water pipe, a ground rod or other source may be used.

A #14 Insulated AWG or larger copper wire should be used between the ground source and the KSU. The wire should be kept as short as possible, it is recommended that the wire be no longer than about 25 feet.

Grounding Instructions

1. Remove about 1½ inches of insulation from both ends.
2. Attach one end of the wire to the Ground Lug in the middle of the Basic KSU by inserting the wire under the lug screw and tighten the screw securely. Refer to *Figure 3-5*. Attach the other end of the wire as appropriate to the ground source.
3. Take a DC resistance reading and an AC Volt reading between the chassis ground point (cold water pipe) and AC ground (third wire AC ground). The limit is 5V AC and 5 Ohms DC resistance. If a higher reading is obtained, choose a different chassis ground point and repeat this step until a suitable ground point is found.

Grounding to an electrical conduit is NOT considered a good ground!

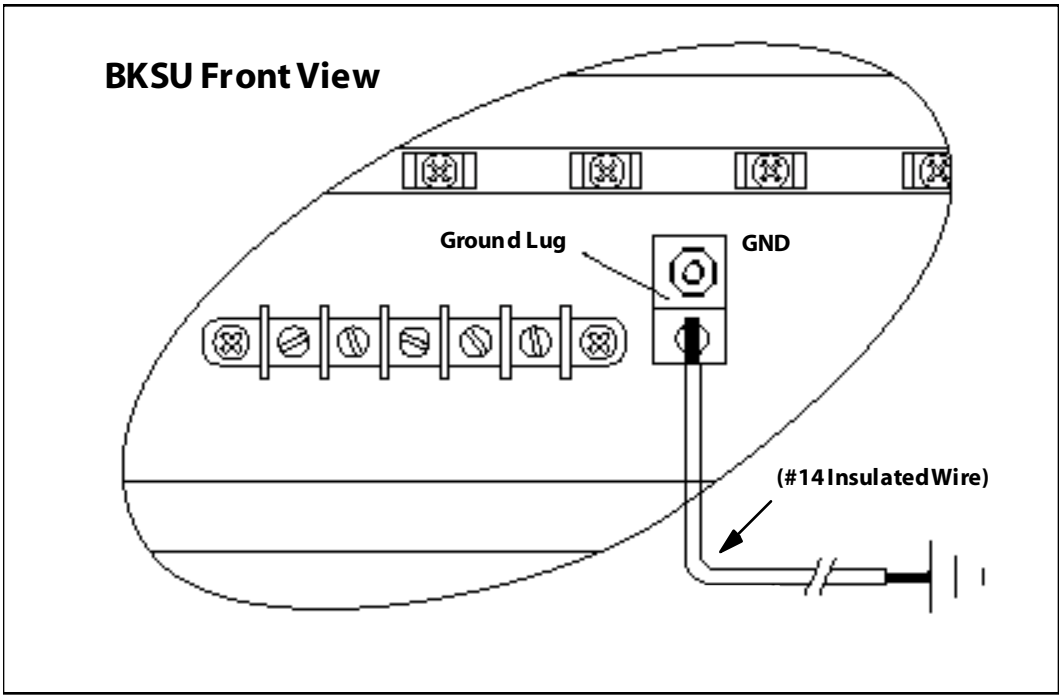


Figure 3-5: KSU Grounding

Power Supply Unit Installation

AC/DC (PS-10A or PS-15A)

There are two power supply units, one with a 10A (output) rating, the other with a 15A (output) rating. The power supply connects to the DC/DC Converter Unit (DCCU) located in the BKSU cabinet.

The BKSU/EKSU1 cabinets are powered with a separate power supplies. These power supplies should be able to support its associated cabinet in a heavily loaded configuration of station instruments.

The BKSU/EKSU1 cabinets can each house two (2) power supplies. The power supplies convert AC to 24V DC.

The PSU can operate from either 115 or 230 volts AC based on the setting of the VTG Selector Switch on the lower front of the PSU. If local AC is 110 volts, move the switch to the right to display 115V. If local AC is 230 volts, move the switch to the left to display 230V.

Although, the *Triad 3* System PSUs are equipped with power-line transient protection, an external Power Line Surge Protector should be installed at the AC outlet to give additional protection, especially during violent thunderstorm activity.

Refer to *Power Line Surge Protection*.

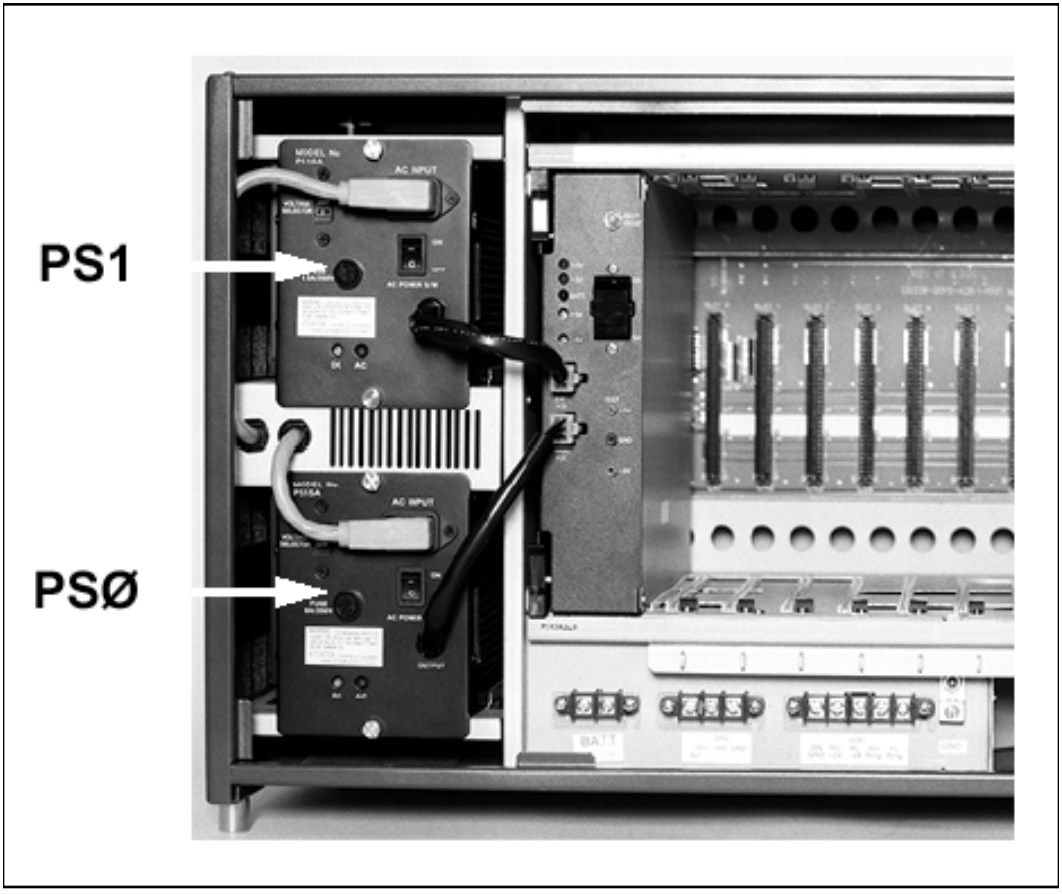


Figure 3-6: AC/DC Power Installation

DC/DC (with BCU & 48VU)

The BKSU/EKSU1 cabinets have a separate DC/DC Power supply. This power supply should be able to support its associated cabinets in a heavily loaded configuration of station instruments. The power supply connects from the AC/DC located in the BKSU.

-48V Supply Unit (48VU) - The DC/DC have an optional -48V supply unit (48VU) to the system to support certain trunks and SLT station. The system can supply -48V DC up to 1.5A amp per KSU. If 1.5A amp is exceeded in a KSU, an external -48v source must be used. Connections are made on the front panel of each KSU.

Installing Optional Battery Charging Unit (BCU)

The DC/DC Converter (DCCU) has an optional Battery Unit to provide charging of external batteries and the circuitry to support switchover to battery operation with no loss of system operation. Connections are made on the front panel of each KSU. The batteries are charged at a rating of 1 amp./per cabinet.

1. Remove the four screws on the DCCU and remove the cover. Unpack the Battery Charging Unit. There should also be a cable and four screws in the package. Locate the four screw locations on the DCCU where the BCU card is installed. Refer to *Figure 3-7*.
2. Place the BCU board so that the Molex connector is below the connector labeled TO BCU on the DCCU motherboard. Screw the BCU into place. Refer to *Figure 3-8*.
3. Attach one end of the BCU cable to the connector on the BCU board and the other end to the connector labeled TO BCU.
4. Replace the cover and screws back onto the DCCU. Insert DCCU into the BKSU.

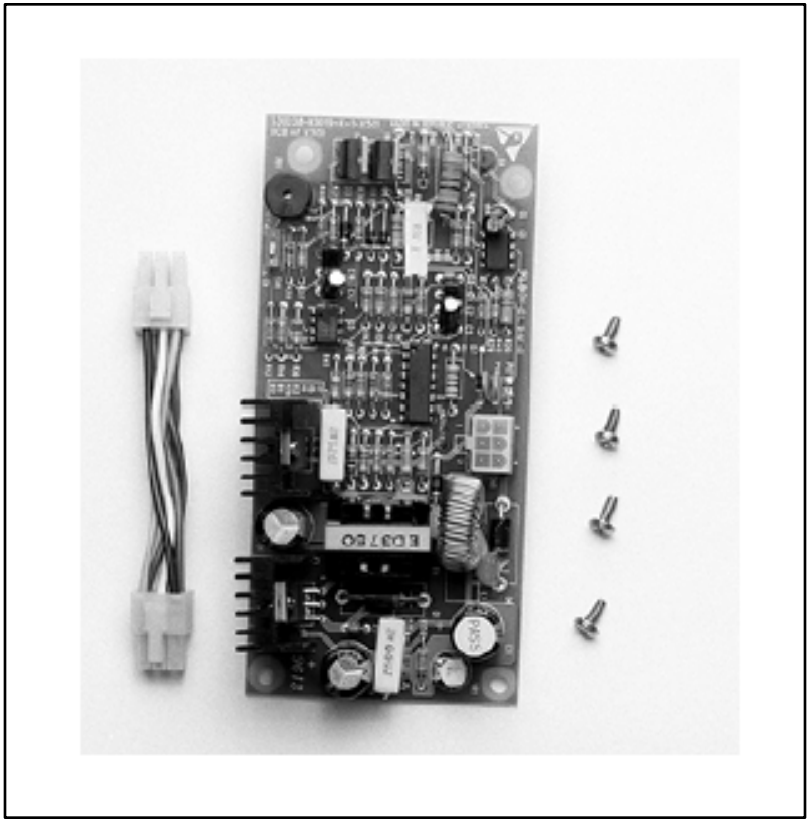


Figure 3-7: Optional Battery Charging Unit (BCU)

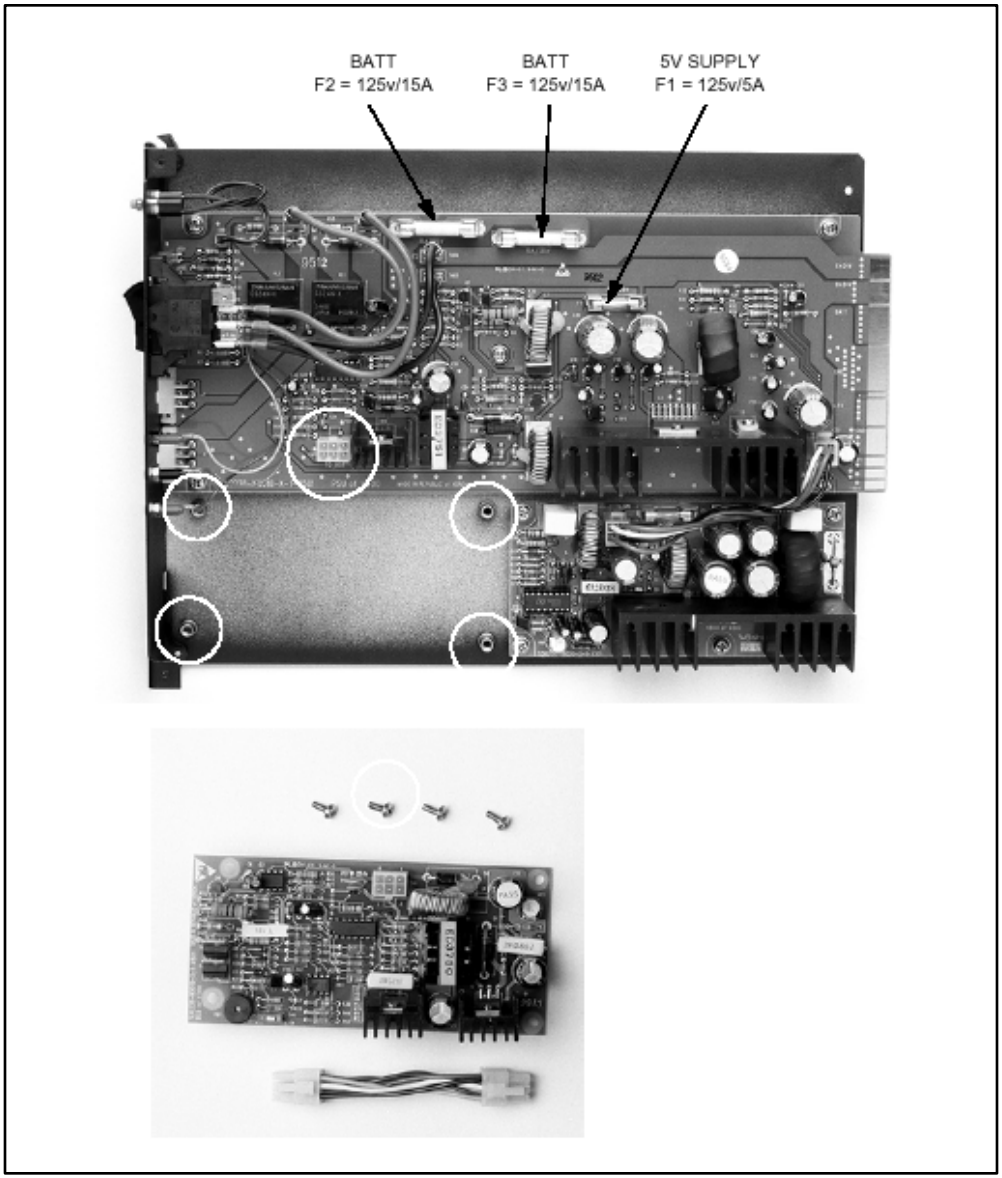


Figure 3-8: DCCU and Optional BCU Installation

Table 3-1: Power Consumption per Card

Card	Power Required
10A Power Supply provides 240 watts 15A Power Supply provides 360 watts	
Digital Telephone Interface Bd (DTIB)	38 watts*
Digital Telephone Interface Exp. Board (DTIBE	38 watts*
Electronic Telephone Interface Brd (ETIB)	42 watts*
Single Line Interface Board (SLIB)	14 watts*
Loop Start CO Trunk Board (LCOB)	7 watts
Ground Start CO Trunk Board (GCOB)	10 watts
Direct Inward Dialing Board (DIDB)	36 watts
DTMF-4A	1.5 watts
DTMF-4B	0.5 watts
T-1 Interface Board (T1IB)	4.5 watts
Primary Rate Interface Board (PRIB)	4.5 watts
Message Unit (MSGU)	6 watts
Battery Charging Unit (BCU)	36 watts
Miscellaneous Interface Unit (MISU)	3 watts
Main Processor Board (MPB)	4.5 watts
* Any Station card plugged into slots 6, 7, and 8 on the BKSU, or Slot 5 on the EKSU draws power from PS2. All DTIBEs draw power from PS2.	

Refer to *Figure 3-1* for a list of all card types.

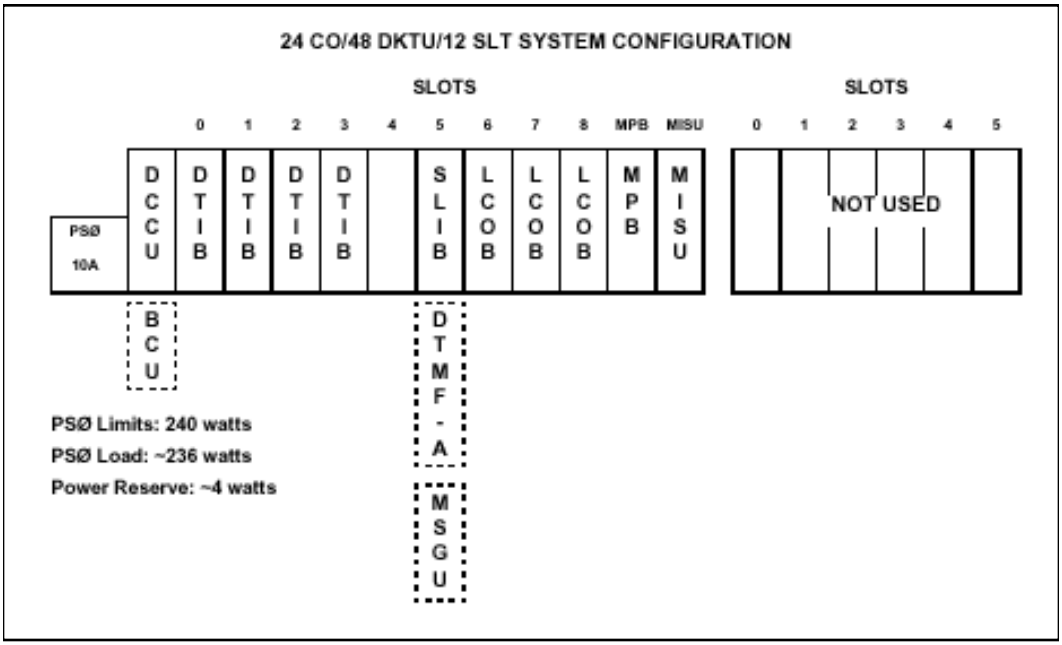


Figure 3-9: Typical System Configurations

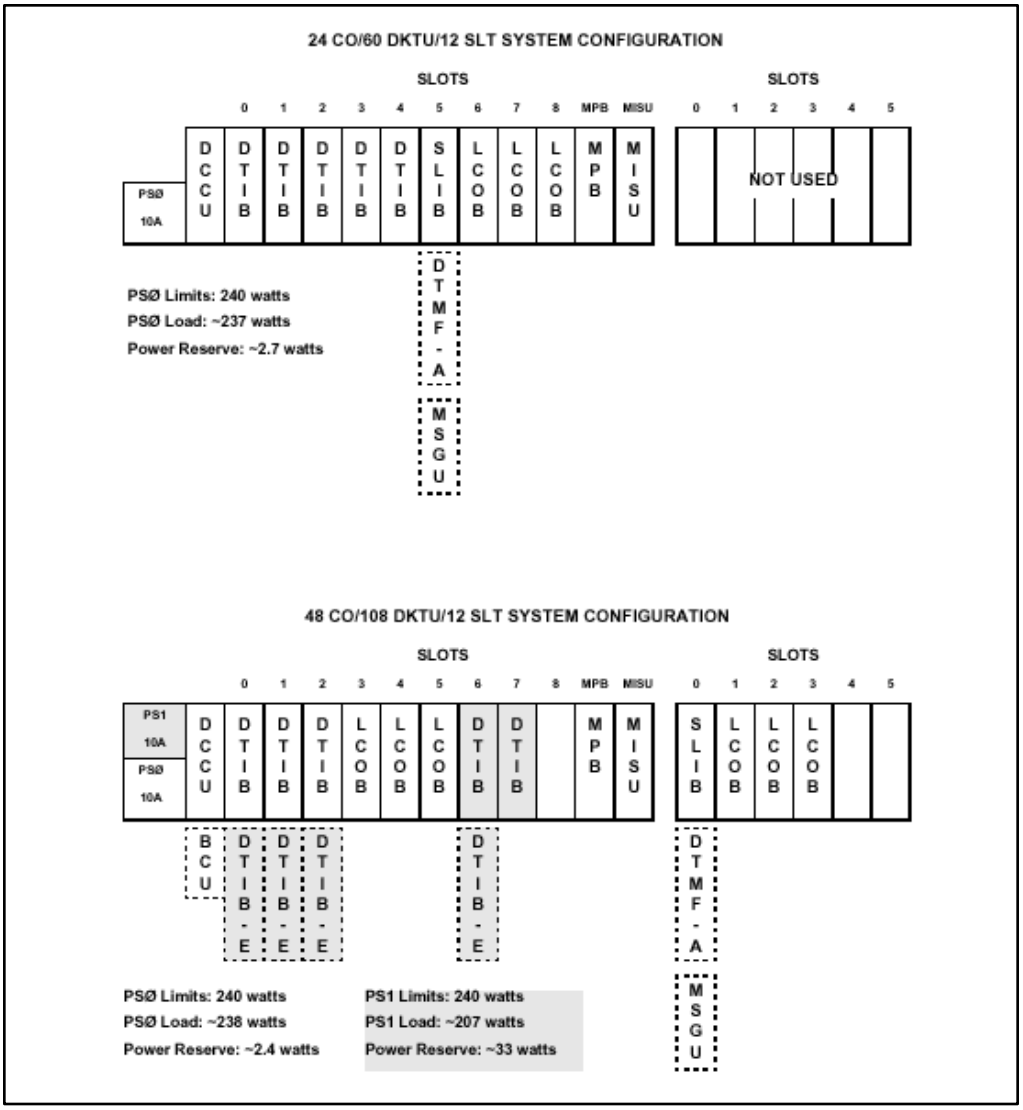


Figure 3-10: Typical System Configurations

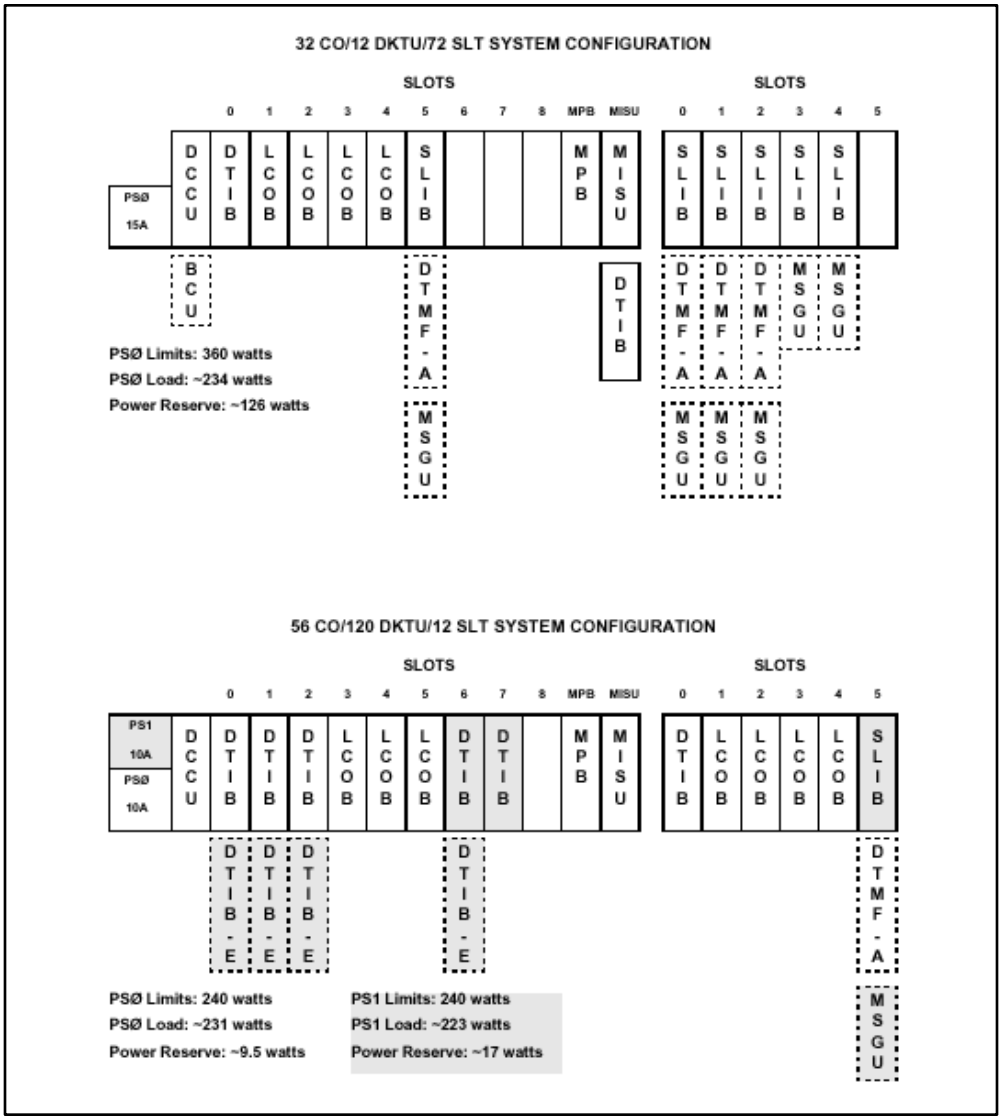


Figure 3-11: Typical System Configurations

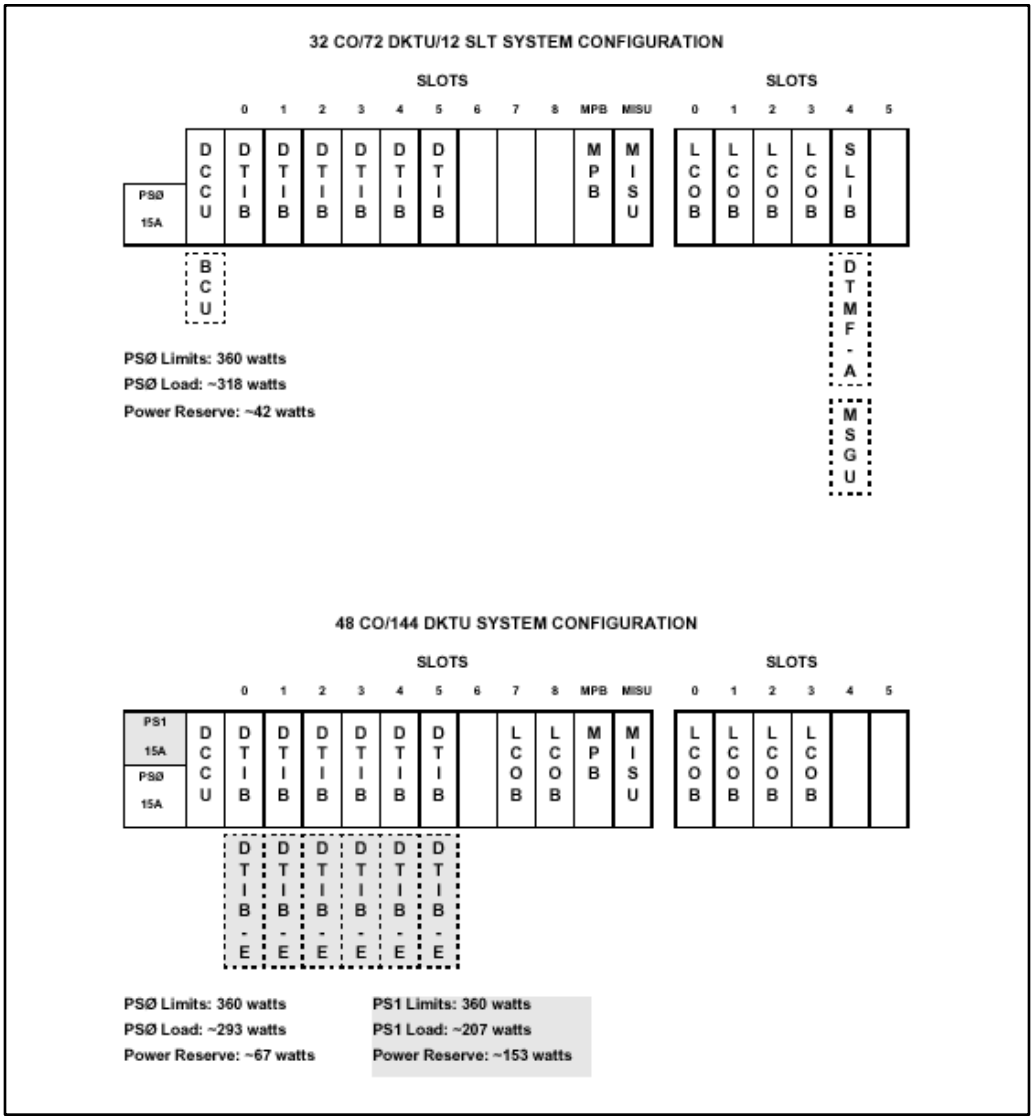


Figure 3-12: Typical System Configurations

Battery Back-up Wiring Installation

As indicated in *Figure 3-2*, the *Triad 3* System can be equipped to provide operation from external batteries if local AC power fails. The Back-Up batteries are connected to the terminal block of the BKSU/EKSU1 cabinets.

The external batteries must provide 24 volts DC. This is generally accomplished by connecting two 12 volt batteries in a series arrangement. Operation on batteries is controlled by the BCU. This BBU provides charging current to the batteries during normal AC power operation at a maximum of about 1 amp.

During battery operation, the PSUs discontinue battery operation if the AC power is reapplied or the battery voltage is too low to maintain proper system operation. If a low-battery cutoff occurs and a new battery is installed, it is necessary to reset the Battery Back-Up circuit in the PSU manually by momentarily depressing the orange colored BATT RESTART switch located on the face plate of each PSU. Note that the Battery Back-Up circuit in both PSUs of a two cabinet system must be reset.

The length of time the system operates on the batteries is dependent on several elements: battery charge state, condition of the batteries, capacity of the batteries, and the size of the system (number of station ports).

The following table gives the approximate backup time for several system sizes and different battery capacities in ampere-hours.

Table 3-2: System Back-Up Duration

Battery Capacity	36 Ports	82 Ports	132 Ports
20 amp/hr	4 Hour	1.5 Hour	1/2 Hour
40 amp/hr	8 Hour	3 Hour	1 Hour

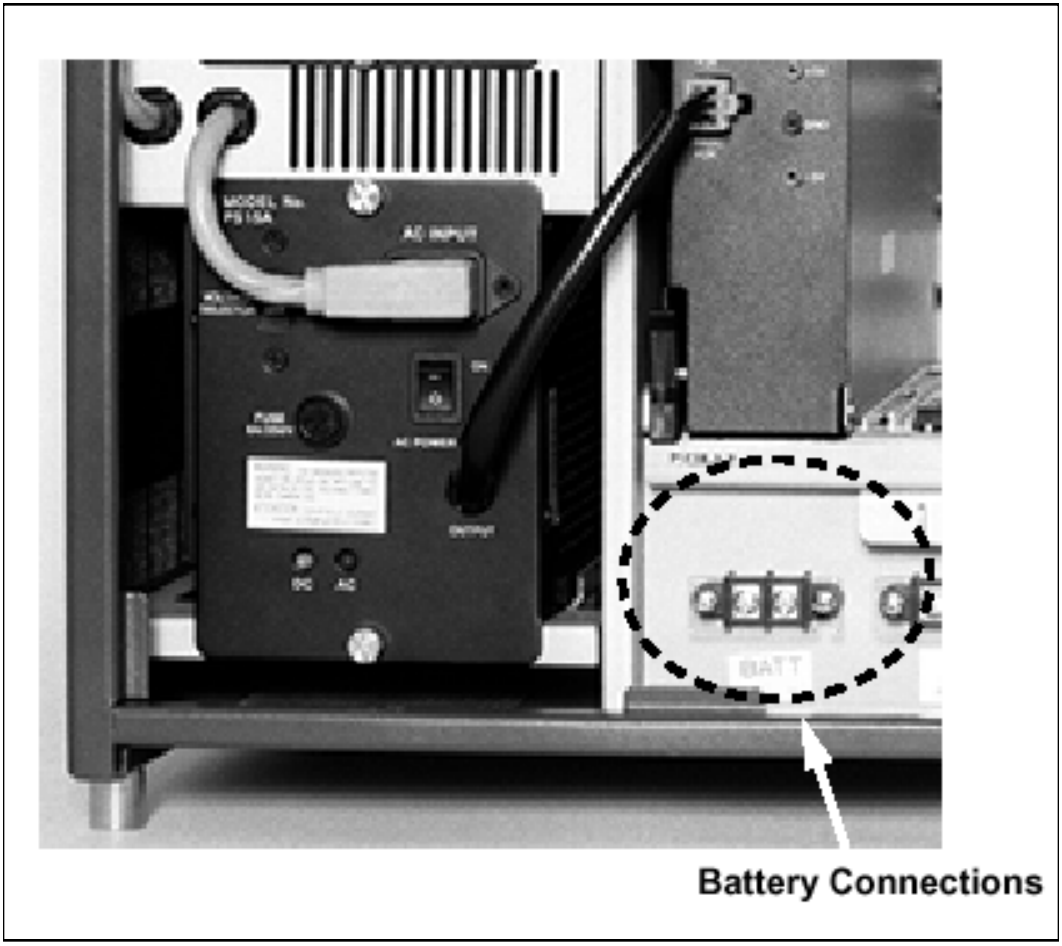


Figure 3-13: Battery Back-Up Installation

Power Line Surge Protection

The AC outlet should be equipped with an additional power line transient surge protection device. Systems using such devices are more resistant to damage from power line surges than unprotected systems. Power line surges often occur during switching operations and especially during violent thunderstorm activity.

Installation of a surge protector meeting the specifications described in the follow paragraph prevents or minimizes the damage resulting from power line surges.

The isolation transformer/surge protector shall be a 15 amp self contained unit that plugs into a standard grounded 117 VAC wall outlet. The wall outlet must be designed to accept a 3-prong plug (2 parallel blades and ground pin). The protector should be fast operating and capable of protecting transients greater than 200 volts.

It is recommended that the AC outlet be equipped with an isolation transformer/surge protection device that utilized MOV protection.

Lightning Protection

The system provides secondary protection per UL 1459 Specifications. Primary protection circuitry is the installers responsibility and should be installed per the National Electric Code (NEC).

KSU AC Power Plug

Before plugging the KSU power cord into the AC source:

1. Verify that the Power switch on the AC/DC front panel is off. (Refer to *Figure 3-6*.) Make sure the Power switches on the DC/DC are in the off position.
2. Plug the KSU power cord into the AC outlet and turn the AC/DC Power switch on. The red/green LED on the PSUs should illuminate.
3. DO NOT turn the DC/DC Power switch on at this time.

PCB Installation

PCB Handling & General Installation

The system PCBs contain digital circuitry which, while extremely reliable, can be damaged by exposure to excessive static electricity. When handling PCBs, a grounded wrist strap should be used to protect the boards from static discharges. Also, use common sense when handling PCBs.

For example, do not place a PCB in locations where heavy objects might fall on the PCB and damage components. With the exception of the MPB/PMU, all boards may be installed or removed with power applied. However, power must be turned off prior to insertion or removal of the MPB/PMU. All other boards have a NORMAL/SERVICE switch which should be put in the SERVICE position before insertion or removal with the system powered. In the NORMAL position, the boards function normally.

In the SERVICE position, the board is placed in an out-of-service mode. Ports active when the switch is placed in the SERVICE position remains active until released normally. When the port returns to idle, it is marked as out-of-service and, when all ports and circuits on the board are idle, the status LED(s) extinguishes indicating the board is idle and can be removed from the system without affecting system operation.

Inserting a PCB

1. Hold the PCB by the injector tabs and, with the components facing right, align the top and bottom edge of the PCB in the card guides.
2. Slide the card into the system and use the injectors to seat the PCB firmly into the back plane connector.

Removing a PCB

1. Reverse the procedure above. There is a ground tab located on the top and bottom of each PCB toward the front end of the card. There is also a ground tab located to the right of each card guide in each cabinet.
2. Make sure when the PCB's are inserted into the card guide and secured in their respective card slots, that the ground tab on each card mates with the ground tab on each card guide. This ensure a good ground potential to reduce RFI and EMI interference possibilities.

Main Processor Board (MPB) Installation

The MPB supervises all resources in the system and controls the Inter-System Communications (ISC) highways. Each highway is comprised of separate 4.096Mbps transmit and receive paths. Through these highways, digitized audio (PCM), and 512Kbps HDLC channels are provided to and from all other circuits and ports of the system. The MPB also controls the exchange of PCM and signaling, system synchronization, PCM system tones, PCM gain and conferencing, call processing, etc.

The MPB is comprised of a Processor, Reset and Watch-Dog circuit, Reset Detect Circuit, 2 port UART, LED indicators and Switch Controls, Real Time Clock, Battery Back Up circuit, Modem Circuit, PCM and Signaling Control ASICs, and PCM ROM and system RAM. Additionally, a system Program Module Unit (PMU), Memory Expansion Unit (MEMU) and Phased Lock Loop Unit (PLLU) are installed via connectors on the MPB.

The Basic system database, scratch-pad memory, etc. is stored in 512Kbytes of RAM. With the optional MEMU, the system's RAM can be expanded by 512Kbytes, for a total of 1 Megabyte of RAM, when expanded feature capacity is desired. Portions of the RAM are protected from power loss by the Battery Back-Up circuit.

The RAM Battery Back-up circuitry is comprised of a long life lithium battery, a voltage detector to sense the +5V DC source, and a switch to control the connection of the back-up lithium battery.

A 2-port Universal Asynchronous Receiver Transmitter (UART), provides two asynchronous RS-232C output ports. One port is connected to a DB9 connector providing access for input of information to the system database and output of data such as SMDR.

The second port drives the 2400 Baud On-Board Modem Circuit for Remote access to the system's database and maintenance files. Access to the Modem can also be provided to any CO line or Single Line port connected to the system. This connection is based on attributes in the system database.

An eight position dip switch is employed to control specific operating characteristics of the MPB.

A bank of eight LEDs indicate the operation status of the MPB. On power up or reset, the software initiates a self-test routine. During this routine, the LEDs 1-8 illuminate in sequence as each bank of 64K bytes or RAM is tested and passes. Each LED remains lit until RAM testing is complete, then the LEDs respond to MPB resource testing.

There is a single dip switch located above the PMU and below the lithium battery. This switch controls the battery backup function of the MPB. This switch should be set to the ON position.

Before installing the MPB, install the daughter boards as required. Refer to *Figure 3-14*.

Use extra care when removing RS232 cables from the Triad 1/2/3 MPB or SIU boards. Hold the MPB/MISU card in the card slot before removing the RS-232 cable. Failure to perform this action may result in the MPB/MISU card being pulled from its' slot.

Before programming the system, switch 8 should be placed in the ON position and power cycled off and on to initialize the system database to default. Once the database has been initialized, switch 8 should be placed in the OFF position to protect the database.

Table 3-3: MPB Dip Switch Functions

Function	SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8
	Not Used (Software Controlled)				Not Used		Not Used	
Flow Control				ON= XonXoff				
				OFF RTS/CTS				
Memory Diagnostics						ON=Test ROM & RAM		
						OFF= No Test		
Default Data								*

** If switch in ON position when power is off, default data is loaded.*
** If switch in OFF position when power is off, customer database is saved.*

Table 3-4: I/O Port RS232 Connections

PIN #	Description
2	Transmit Data
3	Receive Data
7	RTS (Request To Send
8	CTS (Clear To Send)
6	DSR (Data Set Ready)
5	Grd
1	CD (Carrier Detect)
4	DTR (Data Terminal Ready)

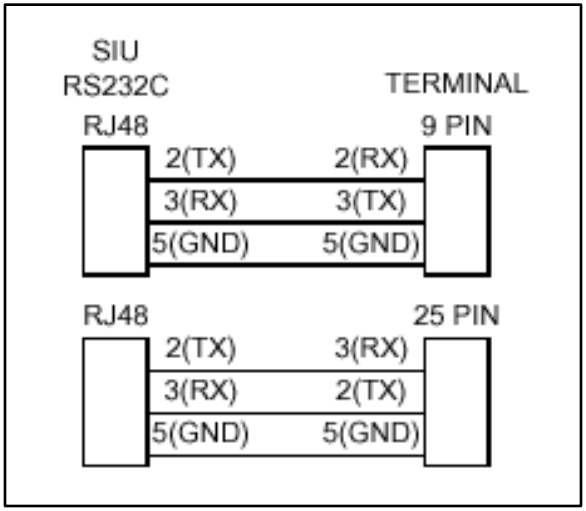
Serial Interface Unit (SIU2)

A Universal Asynchronous Receiver Transmitter (UART), provides two RS-232C interface ports. These two ports are connected to RJ48 connectors providing access for input information to the system database and output of data.

Installing the SIU2

1. Unpack the SIU2 from its antistatic conductive bag in the packing box. There should also be a plastic bag with two plastic standoffs and two metal screws.
2. Push the two standoffs into the holes on the SIU2 board.
3. Locate the CONN6 connector and the two screw holes (outlined) on the MPB.
4. Push the SIU2 board onto the CONN6 connector and be sure it is seated correctly.
5. From the back side of the MPB board, insert the two metal screws into the holes and tighten them into the bottom of each stand-off and secure.

Refer to *Figure 3-14*. This completes the installation procedure for the SIU2.



Phase Lock Loop Unit (PLLU)

This board MUST BE installed whenever a T-1 or PRIB card is installed in the system. The Phase Locked Loop Unit (PLLU) is an option board which generates a 32.768MHz clock synchronized to 1.544MHz from the T-1/PRIB interface board or internal clock. The 32.768MHz clock is provided to CGMD on MPB. It consists of a PLL circuit, PLL Monitoring circuit and clock (from T-1/PRIB interface board) monitoring circuit.

Installing the PLLU

1. Unpack the PLLU from its antistatic conductive bag in the packing box.
2. Locate CONN10 and CONN11 (outlined) on the MPB board.
3. Remove the jumper from pins 12 and 13 on CONN10. **THIS JUMPER IS VERY IMPORTANT, SO DON'T LOSE IT**.

   If the PLLU is removed from the MPB board, this jumper needs to be put back onto pins 12 and 13 of this connector or the MPB does not operate properly.
4. Position the PLLU so that CON1 and CON2 match up with CONN11 and CONN10 respectively.
5. Push the PLLU onto their respective connectors and make sure the PLLU is seated correctly.

Refer to *Figure 3-14*. This completes the installation procedure for the SIU2.

Memory Expansion Unit (MEMU)

This unit is added to the MPB board to provide an additional 512K of RAM to the system. The MPB board is required when the system capacity exceeds 48 CO Lines and 96 Stations.

Installing the MEMU

1. Unpack the MEMU from its antistatic conductive bag in the packing box.
2. On the MEMU, locate the battery switch SW1 and put the switch in the ON position.
3. Locate the CONN7 and CONN8 connectors (outlined) on the MPB. Locate the CONN1 and CONN2 connectors on the MEMU.
4. Position the MEMU so that CONN1 and CONN2 match up with CONN7 and CONN8 respectively on the MPB.
5. Push the MEMU onto their respective connectors and make sure it is seated properly.

Refer to *Figure 3-14*. This completes the installation procedure for the SIU2.

Program Module Unit (PMU)

The PMU is installed on the MPB and contains the software used by the system to control features and their function.

Installing the PMU

1. Unpack PMU from its antistatic conductive bag in the packing box.
2. Turn the PMU over so the labels are down prior to inserting the module into the plastic guide rails on the MPB.
3. Slide the PMU until the card edge of the PMU fully engages the card edge connector of the MPB. Note that the PMU should never be removed from or installed in a live system.

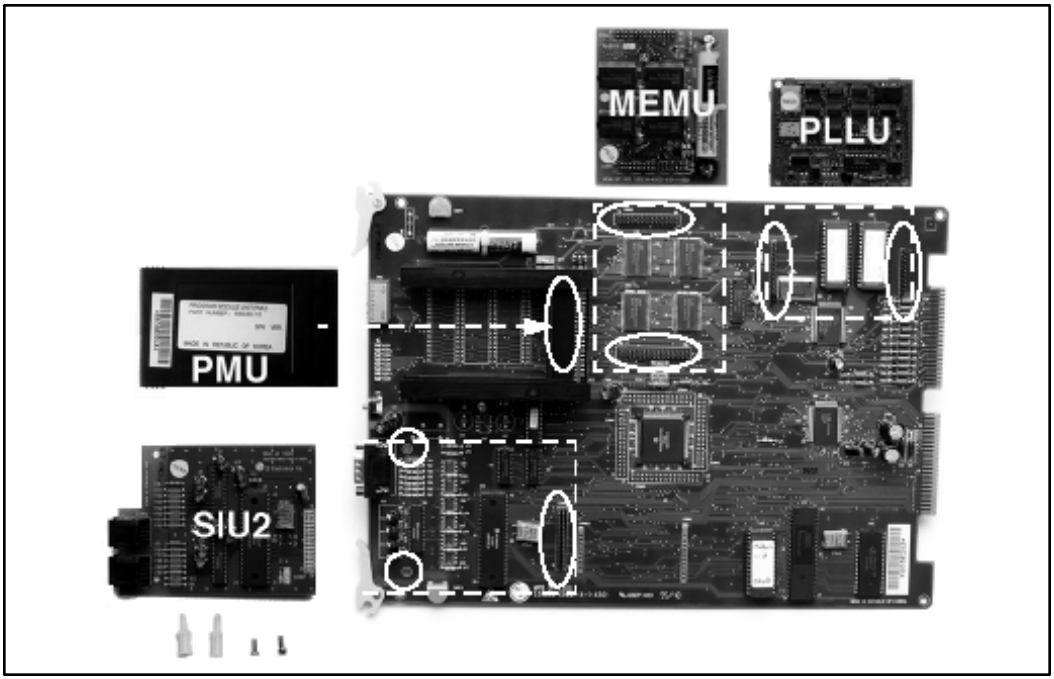


Figure 3-14: MPB Daughter Boards Installation

Miscellaneous Interface Unit (MISU) Installation

The Miscellaneous Unit (MISU) provides two external page ports, two DTMF Receiver circuits, two External Music sources, and 6 dry relay contacts.

Use extra care when removing RS-232 cables from the Triad 1/2/3 MPB or SIU boards. Hold the MPB/MISU card in the card slot before removing the RS232 cable. Failure to perform this action may result in the MPB/MISU card being pulled from its' slot.

When using CO Lines as additional music inputs, keep in mind that the music source may require a talk battery in series with either TIP or Ring.

This talk battery boosts the signal level sufficiently so that the CO Line interface can read the signal.

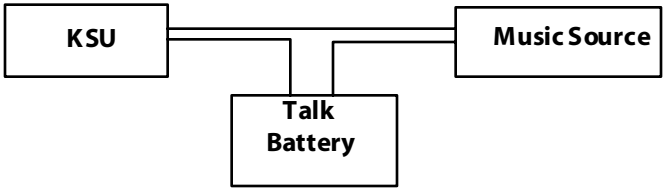


Figure 3-15: Talk Battery

The MISU consists of the following:

- Two external page ports are provided from the amphenol connector on the front edge of the MISU. These ports are connected to transformers, providing a 600 ohm impedance.
- Music inputs are provided from the amphenol connector on the front edge of the card.
- 6 independent relay contacts are provided through the amphenol connector on the front edge of the MISU. These contacts are controlled by software from entries in the system database. Control signals are sent by the MPB. The output drives the relay coils, controlling the state of the 1 amp, 24V relay contacts.
- The signals to activate the externally provided power failure transfer are provided on the MISU.
- The MISU has 2 DTMF Receivers for system use. (SLT, DISA)

Table 3-5: MISU Wiring

Pair	PIN #	Color	Description
1	26 1	WH/BL BL/WH	RELAY1T RELAY1R
2	27 2	WH/OR OR/WH	RELAY2T RELAY2R
3	28 3	WH/GN GN/WH	RELAY3T RELAY3R
4	29 4	WH/BN BN/WH	RELAY4T RELAY4R
5	30 5	WH/SL SL/WH	RELAY5T RELAY5R
6	31 6	RD/BL BL/RD	RELAY6T RELAY6R
7	32 7	RD/OR OR/RD	
8	33 8	RD/GN GN/RD	
9	34 9	RD/BN BN/RD	
10	35 10	RD/SL SL/RD	
11	36 11	BK/BL BL/BK	BGM/MOH1T BGM/MOH1R
12	37 12	BK/OR OR/BK	BGM/MOH2T BGM/MOH2R
13	38 13	BK/GN GN/BK	EXP1T EXP1R
14	39 14	BK/BN BN/BK	EXP2T EXP2R
15	40 15	BK/SL SL/BK	
16	41 16	YL/BL BL/YL	
17	42 17	YL/OR OR/YL	
18	43 18	YL/GN GN/YL	
19	44 19	YL/BN BN/YL	
20	45 20	YL/SL SL/YL	
21	46 21	VI/BL BL/VI	
22	47 22	VI/OR OR/VI	
23	48 23	VI/GN GN/VI	
24	49 24	VI/BN BN/VI	
25	50 25	VI/SL SL/VI	

Power Failure Transfer Unit (PFTU)

The PFTU optional unit is installed on the MISU board It provides the transfer of up to 6 CO lines to 6 stations. It has a switch to provide manual switchover. The controls are connected to the unit from the MISU.

The PFTU is wired from the 25-pair connector on the KSU CO line connector to the MDF, then cross connected to the CO Line inputs from the telephone company, to the CO Line inputs of the system, and to Power Failure SLTs. Note that the SLT may also be connected to a SLIB in the system as shown in *Table 3-6*.

Installing the PFTU

1. Unpack the PFTU from its antistatic conductive bag in the packing box. There should also be a plastic bag with two mounting screws along with a multicolored cable.
2. Plug one end of the multicolored cable onto the connector on the PFTU.
3. Position the PFTU so that the amphenol connector is to the left.
4. Use the two mounting screws and mount the PFTU to the MISU.
5. Locate the connector CONN1 on the MISU and plug the other end of the multicolored cable to this connector.

Refer to *Figure 3-16*. This completes the installation procedure for the PFTU.

Table 3-6: Power Failure Transfer Unit (PFTU) Wiring

Pair	PIN #	Color	Description
1	26 1	WH/BL BL/WH	CO RING 1 - IN CO TIP 1 - IN
2	27 2	WH/OR OR/WH	CO RING 1 - OUT CO TIP 1 - OUT
3	28 3	WH/GN GN/WH	SLT RING 1 SLT TIP 1
4	29 4	WH/BN BN/WH	SLIB RING 1 SLIB TIP 1
5	30 5	WH/SL SL/WH	CO RING 2 - IN CO TIP 2 - IN
6	31 6	RD/BL BL/RD	CO RING 2 - OUT CO TIP 2 - OUT
7	32 7	RD/OR OR/RD	SLT RING 2 SLT TIP 2
8	33 8	RD/GN GN/RD	SLIB RING 2 SLIB TIP 2
9	34 9	RD/BN BN/RD	CO RING 3 - IN CO TIP 3 - IN
10	35 10	RD/SL SL/RD	CO RING 3 - OUT CO TIP 3 - OUT
11	36 11	BK/BL BL/BK	SLT RING 3 SLT TIP 3
12	37 12	BK/OR OR/BK	SLIB RING 3 SLIB TIP 3
13	38 13	BK/GN GN/BK	CO RING 4 - IN CO TIP 4 - IN
14	39 14	BK/BN BN/BK	CO RING 4 - OUT CO TIP 4 - OUT
15	40 15	BK/SL SL/BK	SLT RING 4 SLT TIP 4
16	41 16	YL/BL BL/YL	SLIB RING 4 SLIB TIP 4
17	42 17	YL/OR OR/YL	CO RING 5 - IN CO TIP 5 - IN
18	43 18	YL/GN GN/YL	CO RING 5 - OUT CO TIP 5 - OUT
19	44 19	YL/BN BN/YL	SLT RING 5 SLT TIP 5
20	45 20	YL/SL SL/YL	SLIB RING 5 SLIB TIP 5
21	46 21	VI/BL BL/VI	CO RING 6 - IN CO TIP 6 - IN
22	47 22	VI/OR OR/VI	CO RING 6 - OUT CO TIP 6 - OUT
23	48 23	VI/GN GN/VI	SLT RING 6 SLT TIP 6
24	49 24	VI/BN BN/VI	SLIB RING 6 SLIB TIP 6
25	50 25	VI/SL SL/VI	

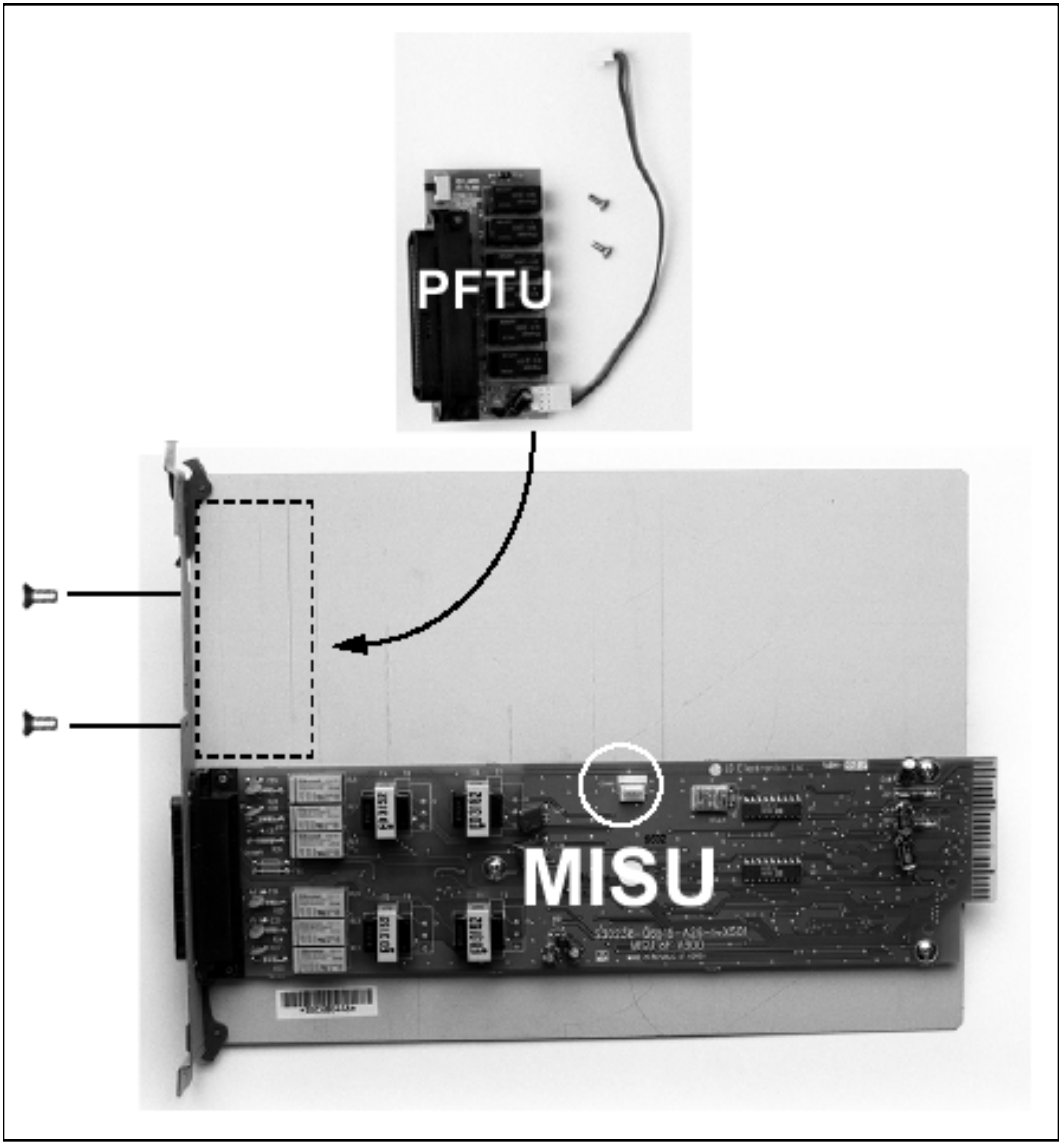


Figure 3-16: MISU & PFTU Installation

CO/PBX Connections

These boards provide the interface from system PCM ports to stations or the switching network. They are described as follows:

Loop Start CO Trunk Board (LCOB))

The LCOB board provides the interface to eight Loop Start CO, FX, or WATS trunks.

- Each trunk circuit contains a hybrid, 2-wire interface circuit and control circuitry.
- The operation for Pulse Dialing or DTMF signaling can be done on a per circuit basis.
- Each circuit has an LED indicator that gives trunk status.
- Each trunk circuit can be disabled as well as the card.
- A Normal/Service switch located near the top of the card allows the card to be inserted or removed from the system while under power.
- The CO lines are connected via a 50-pin male amphenol connector located on the front edge of the card.
- The card can accept a DTMF-B unit in a daughter board type arrangement.
- The card ejector tabs are color coded white.

Installing the DTMF-B Module

1. Unpack the DTMF-B Module from its anti-static conductive bag in the packing box.
2. Locate the K1 and K2 connectors on the DTMF-B module.
3. Locate the K2 and K3 connectors on the LCOB (outlined).
4. Position the DTMF-B module so that the K2 and K1 connectors match up with the K3 and K2 connectors on the LCOB respectively.
5. Push the DTMF-B module onto these connectors making sure it is seated properly.

Refer to *Figure 3-19*. This completes the installation procedure for the DTMF-B.

Table 3-7: LCOB Wiring

Pair	PIN #	Color	Description	
1	26 1	WH/BL BL/WH	RING TIP	CO 1
2	27 2	WH/OR OR/WH	RING TIP	CO 2
3	28 3	WH/GN GN/WH	RING TIP	CO 3
4	29 4	WH/BN BN/WH	RING TIP	CO 4
5	30 5	WH/SL SL/WH	RING TIP	CO 5
6	31 6	RD/BL BL/RD	RING TIP	CO 6
7	32 7	RD/OR OR/RD	RING TIP	CO 7
8	33 8	RD/GN GN/RD	RING TIP	CO 8
9	34 9	RD/BN BN/RD		
10	35 10	RD/SL SL/RD		
11	36 11	BK/BL BL/BK		
12	37 12	BK/OR OR/BK		
13	38 13	BK/GN GN/BK		

Pair	PIN #	Color	Description	
14	39 14	BK/BN BN/BK		
15	40 15	BK/SL SL/BK		
16	41 16	YL/BL BL/YL		
17	42 17	YL/OR OR/YL		
18	43 18	YL/GN GN/YL		
19	44 19	YL/BN BN/YL		
20	45 20	YL/SL SL/YL		
21	46 21	VI/BL BL/VI		
22	47 22	VI/OR OR/VI		
23	48 23	VI/GN GN/VI		
24	49 24	VI/BN BN/VI		
25	50 25	VI/SL SL/VI		

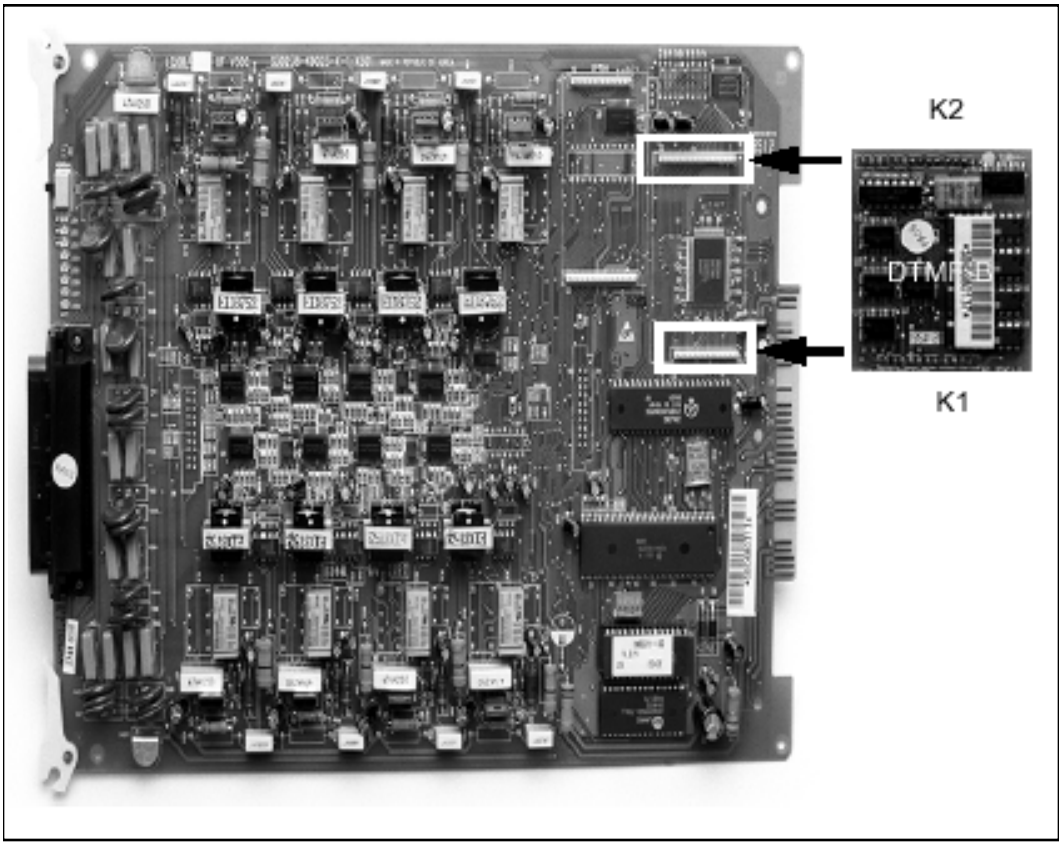


Figure 3-17: LCOB w/DTMF-B Installation

Ground Start CO Trunk Board (GCOB)

The GCOB board provides the interface to eight Ground Start CO, FX, or WATS trunks.

- Each trunk circuit contains a hybrid, 2-wire interface circuit and control circuitry.
- The operation for Pulse Dialing or DTMF signaling can be done on a per circuit basis.
- Each circuit has an LED indicator that gives trunk status.
- Each trunk circuit can be disabled as well as the card.
- A Normal/Service switch located toward the top of the card allows the card to be inserted or removed from the system while under power.
- The CO lines are connected via a 50-pin male amphenol connector located on the front edge of the card.
- The card can accept a DTMF-B unit in a daughter board type arrangement.
- The card ejector tabs are color coded white.

Installing the DTMF-B Module

1. Unpack the DTMF-B Module from its anti-static conductive bag in the packing box.
2. Locate the K1 and K2 connectors on the DTMF-B module.
3. Locate the K2 and K3 connectors on the GCOB (outlined).
4. Position the DTMF-B module so that the K2 and K1 connectors match up with the K3 and K2 connectors on the GCOB respectively.
5. Push the DTMF-B module onto these connectors making sure it is seated properly.

   Refer to *Figure 3-18*. This completes the installation procedure for the DTMF-B.

Table 3-8: GCOB Wiring

Pair	PIN #	Color	Description	
1	26 1	WH/BL BL/WH	RING TIP	CO 1
2	27 2	WH/OR OR/WH	RING TIP	CO 2
3	28 3	WH/GN GN/WH	RING TIP	CO 3
4	29 4	WH/BN BN/WH	RING TIP	CO 4
5	30 5	WH/SL SL/WH	RING TIP	CO 5
6	31 6	RD/BL BL/RD	RING TIP	CO 6
7	32 7	RD/OR OR/RD	RING TIP	CO 7
8	33 8	RD/GN GN/RD	RING TIP	CO 8
9	34 9	RD/BN BN/RD		
10	35 10	RD/SL SL/RD		
11	36 11	BK/BL BL/BK		
12	37 12	BK/OR OR/BK		
13	38 13	BK/GN GN/BK		

Pair	PIN #	Color	Description	
14	39 14	BK/BN BN/BK		
15	40 15	BK/SL SL/BK		
16	41 16	YL/BL BL/YL		
17	42 17	YL/OR OR/YL		
18	43 18	YL/GN GN/YL		
19	44 19	YL/BN BN/YL		
20	45 20	YL/SL SL/YL		
21	46 21	VI/BL BL/VI		
22	47 22	VI/OR OR/VI		
23	48 23	VI/GN GN/VI		
24	49 24	VI/BN BN/VI		
25	50 25	VI/SL SL/VI		

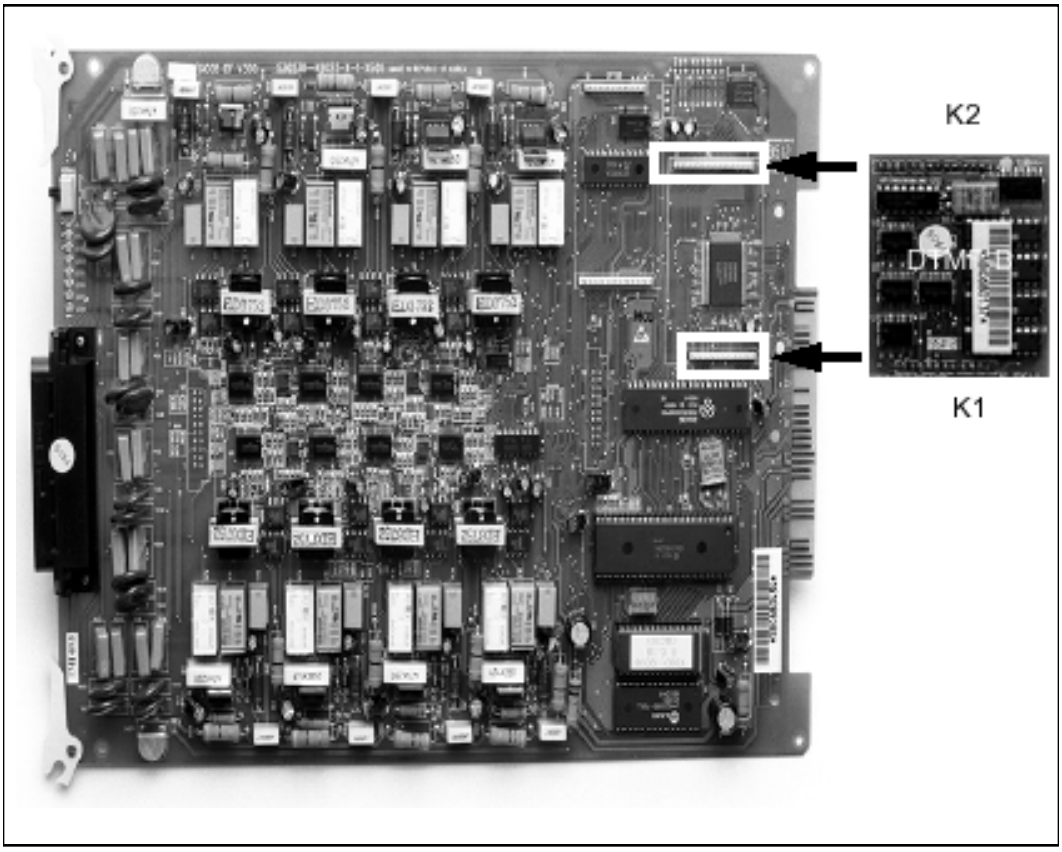


Figure 3-18: GCOB w/DTMF-B Installation

DID Trunk Board (DIDB)

The DIDB board provides the interface to eight (8) Direct Inward Dialing (DID) trunks.

- Each of the trunk circuits contain a hybrid, 2- wire interface circuit and control circuitry.
- The operation for dial-repeating address or DTMF signaling can be immediate, wink, or delay-start supervision.
- Each circuit has an LED indicator that gives trunk status. Each circuit can be disabled as well as the card.
- The CO Lines are connected via a 50-pin male amphenol connector located on the card front edge.
- A Normal/Service switch located toward the top of the card allows the card to be inserted or removed from the system while under power.
- The card can accept a DTMF4-B unit as a daughter board type arrangement. This unit has 4 DTMF Receivers installed on it. This board can be installed on the LCOB, GCOB, and DIDB boards. This board mounts as a daughter board type arrangement.

Installing the DTMF-B Module

1. Unpack the DTMF-B Module from its anti-static conductive bag in the packing box.
2. Locate the K1 and K2 connectors on the DTMF-B module.
3. Locate the K2 and K3 connectors on the DIDB (outlined).
4. Position the DTMF-B module so that the K2 and K1 connectors match up with the K3 and K2 connectors on the DIDB respectively.
5. Push the DTMF-B module onto these connectors making sure it is seated properly.

Refer to *Figure 3-19*. This completes the installation procedure for the DTMF-B.

Table 3-9: DIDB Wiring

Pair	PIN #	Color	Description	
1	26 1	WH/BL BL/WH	RING TIP	CO 1
2	27 2	WH/OR OR/WH	RING TIP	CO 2
3	28 3	WH/GN GN/WH	RING TIP	CO 3
4	29 4	WH/BN BN/WH	RING TIP	CO 4
5	30 5	WH/SL SL/WH	RING TIP	CO 5
6	31 6	RD/BL BL/RD	RING TIP	CO 6
7	32 7	RD/OR OR/RD	RING TIP	CO 7
8	33 8	RD/GN GN/RD	RING TIP	CO 8
9	34 9	RD/BN BN/RD		
10	35 10	RD/SL SL/RD		
11	36 11	BK/BL BL/BK		
12	37 12	BK/OR OR/BK		
13	38 13	BK/GN GN/BK		

Pair	PIN #	Color	Description	
14	39 14	BK/BN BN/BK		
15	40 15	BK/SL SL/BK		
16	41 16	YL/BL BL/YL		
17	42 17	YL/OR OR/YL		
18	43 18	YL/GN GN/YL		
19	44 19	YL/BN BN/YL		
20	45 20	YL/SL SL/YL		
21	46 21	VI/BL BL/VI		
22	47 22	VI/OR OR/VI		
23	48 23	VI/GN GN/VI		
24	49 24	VI/BN BN/VI		
25	50 25	VI/SL SL/VI		

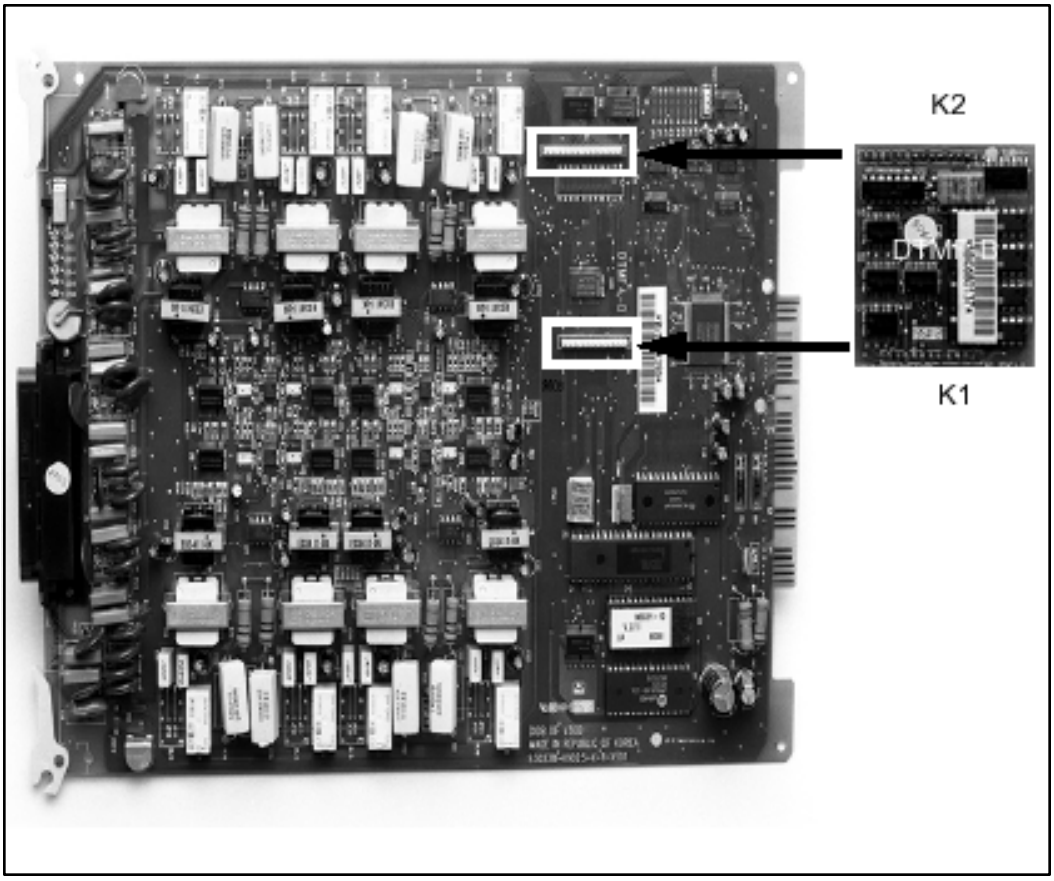


Figure 3-19: DIDB w/DTMF-B Installation

T-1 Interface Board (T1IB)

The T1IB board allows the network connection to a T-1 (1.544Mbps, 24 Voice Channel) digital interface.

The T1IB contains T-1 interface circuit, control circuitry, and synchronous clock control circuits. DTMF tone detection units can be installed optionally on the T1IB. The T1IB has 8 LEDs on the front edge of the PCB which indicates errors of T-1 line, in-use status, and synchronous clock enable status.

The PLLU must be installed on the MPB for the T-1 card to operate properly.

Software 2.1G or newer is needed when using any T-1 card that contains 1.0G Firmware. Without the newer software, the T-1 card will not work.

Table 3-10: T-1 Board LEDs

LED		Function
1	IN USE	At least one of the 24 circuits is in use.
2	RED	T1IB is in RED alarm due to any alarm.
3	H/W TEST	Normal call processing is not available.
4	BLUE	T1IB has detected RX_BLUE alarm.
5	YELLOW	T1IB has detected RX_YELLOW alarm.
6	OOF	T1IB is Out of Frame synchronization
7	RCL	T1IB receives Carrier Loss (un-plugged from the cable)
8	CLOCK	Clock Enable/Disable T-1 Ordering Information

The T1IB contains 3 switches and 2 connectors. The Normal/Service switch is used during maintenance to place the card in an Out-Of-Service (OOS) mode. The clock selection switch is used for control synchronous clock. The Line Build-Out switch is controlled by distance between the *Triad 3* System and a CSU and the Switch #4 is used for loopback control.

The system can be equipped with four (4) T-1 Interface Boards and the T1IB can be installed in card slots 0-8 in the Basic KSU. The Phase Locked Loop Unit (PLLU) must be installed on the MPB when the T1IB is installed. The DTMF4-A board which contains 4 DTMF receivers can be optionally installed on the T1IB.

The clock control cable should be connected by daisy-chain method like *Figure 3-20*: T-1 Clock Connect Cable Installation when more than one T1IB boards are installed. When the clock control cable of the T1IB is connected by daisy-chain method, the clock selection switch of the first T1IB must be placed in the Enable position and the other board should be placed in the Disable position. The Line Build-Out switch must be selected by distance between the *Triad 3* System and a CSU and the switch selection as indicated below. If the CSU is located near the KSU, all LBO switches should be ON.

The SW1 switch #4 of the Line Build-Out switch is used for LoopBack control. Its switch is used only for hardware test and must be placed in the ON position for normal operation.

Table 3-11: T-1 Ordering Information

T-1 Ordering Information	
Ringer Equivalent Number	6.0P
Facility Line Interface	04DU9-B
Jack Type	RJ48C

Table 3-12: T-1 Switch Positions

Distance	Switch #			
	1	2	3	4
0 to 133 feet	on	on	on	on
133 to 266 feet	off	on	on	on
266 to 399 feet	on	off	on	on
399 to 533 feet	off	off	on	on
533 to 655 feet	on	on	off	on

If the T1IB is to be installed in a live system, the Normal/Service switch should be placed in the Service position. After installing the board, the Normal/Service switch must be placed in the Normal position.

- This board supports standard D4 framing format with robbed bit signaling. The Extended Super Frame (ESF-B8ZS) format is also supported.
- The board can support TIE, Loop and Ground start signaling emulation per channel.
- The board requires an external CSU unit.
- The T-1 board can accept two (2) DTMF-A units in a daughter board type arrangement. This unit has 4 DTMF Receivers installed on it. This board can be installed on the SLIB, and T1IB boards.
- The board has a 15-pin D Sub connector for connection to a CSU unit.
- The card ejector tabs are color coded white.

Functionality Description

Automatic Number Identification (ANI) information from the carrier is treated exactly the same as an inbound ICLID (Caller ID) number. Calls can be routed, placed in the unanswered call table, sent out to the CTI Module port on a keyset, and run through the number to name translation table. The *Triad 3* System provides call progress tones in the same manner as ICLID.

Dialed Number Identification Service (DNIS) information from the carrier is treated using DID line rules. DNIS calls are routed based on the DID routing table.

ANI/DNIS is a combined format, where the system waits for the ANI/DNIS information from the carrier. When it is received, the system routes the call using ICLID processing.

- If this information is not found in the ICLID Route Tables, the DNIS information is compared to the DID table for a match. The call is then routed based on the DID tables.
- If a match is not found on either the ANI or DNIS number, the call is routed based on normal CO line operation (CO Ringing Assignments).

The following table summarizes the operation of the system.

Table 3-13: Call Routing Criteria

ANI	DNIS	Operation
N	N	Calls routed based on normal CO operation (CO Ring Assignments).
N	Y	Calls routed based on DID tables with DID operation.
Y	N	Calls routed based on ICLID routing and ICLID operation
Y*	Y	Calls routed on ICLID first, if no route is found, the DNIS digits are compared to the DID table. If no route is found in the DID table the call is routed based on CO line Ringing Assignments.
** If both ANI and DNIS calls are routed -- the following table summarizes what is displayed at the phone.*		

The T-1 card accepts ANI/DNIS information in a DTMF format only. Some carriers do not provide ANI or ANI/DNIS in a DTMF format. Consult your local carrier for available options.

Table 3-14: Call Routing Display Format

Route Found	Type of Display	Format
ICLID	ICLID	ANI number placed in the 14-character number field, the DNIS number followed by the name programmed in ICLID translation table placed in the 24-character name field.
DID	ICLID	ANI number placed in 14-character number field. DNIS number followed by programmed name from the DID tables in 24-character name field.
NONE	ICLID	ANI number placed in 14-character number field and the DNIS number is placed in the 24-character name field.

T-1 Ordering Information: When ordering a T-1 circuit from a carrier, request either D4 framing and Alternate Mark Inversion (AMI) Line coding using the superframe (SF) or the Extended Superframe (ESF-B8ZS) format. The following are additional ordering information specifications:

If ordering... Circuit Information	**ANI/DNIS DID/TIE** 2 wire	**Loop Start/ Ground Start Signaling*** 2 wire
Supervisory Signaling	TIE	Loop or Ground
Address Signaling	DTMF	DTMF
Start Dial Indicator	Wink Start	Dial Tone

** ANI/DNIS not available on Loop/Ground start signaling. If Loop Start signaling protocol is ordered, The Central Office does not provide Disconnect Supervision. However if TIE signaling protocol is ordered, disconnect supervision is provided. The switching equipment processes DNIS numbers received from the T-1 circuit depending on the trunk simulation.*

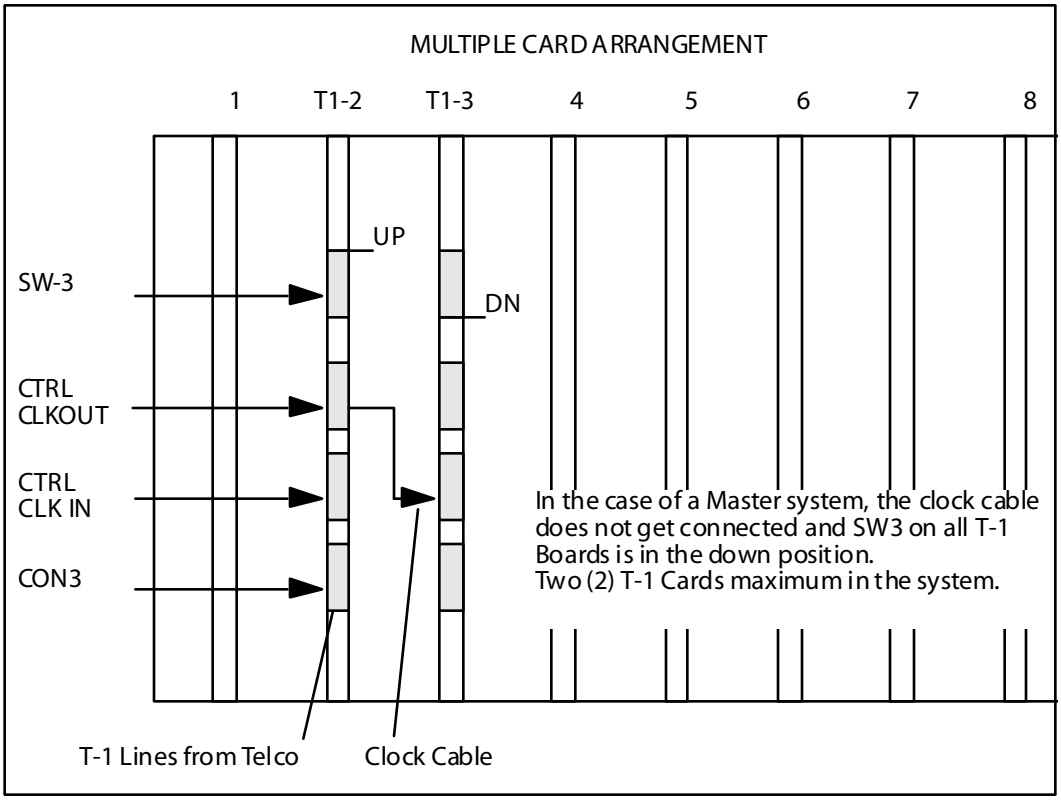


Figure 3-20: T-1 Clock Connect Cable Installation (Multiple Cards)

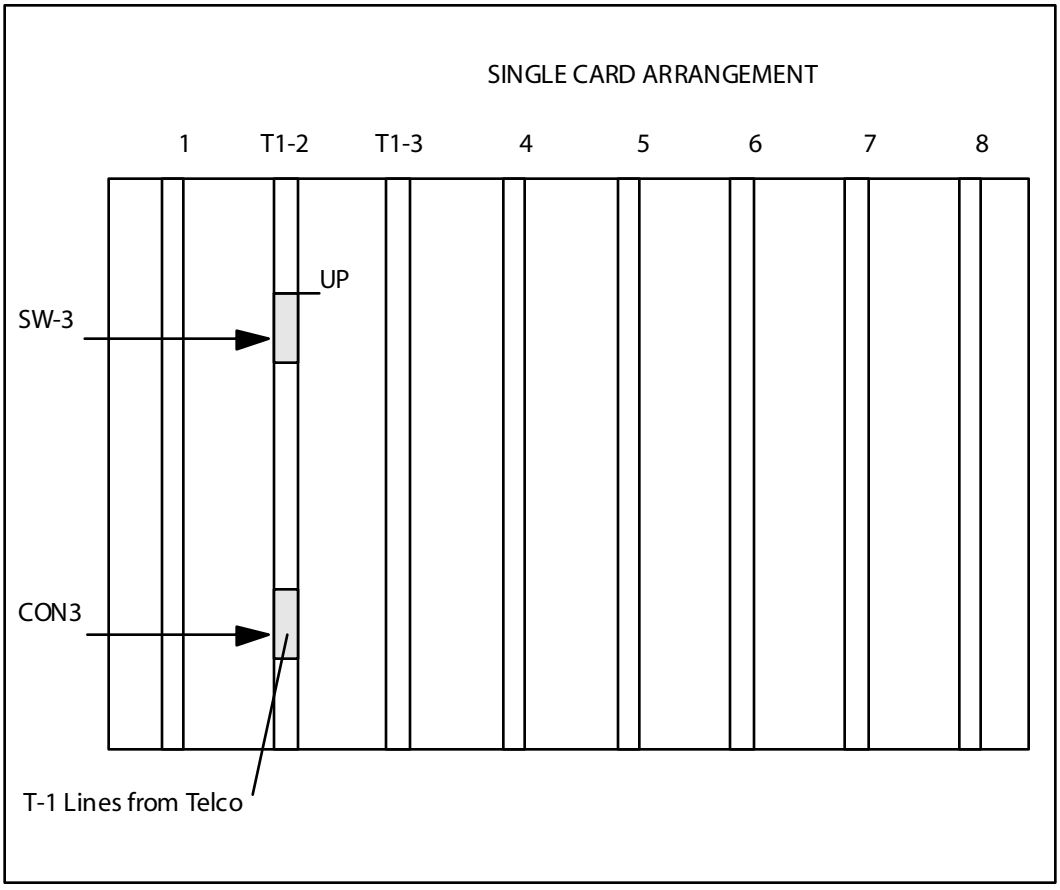


Figure 3-21: T-1 Clock Connect Cable Installation (Single Card)

Installing the DTMF-A Modules

1. Unpack the DTMF-A Modules from their antistatic conductive bags in the packing boxes.
2. Locate the CONN5 and CONN6 connectors on the DTMF-A modules.
3. Locate the CON4, CON5, CON8 and CON9 connectors on the T1IB (outlined).
4. Position one of the DTMF-A modules so that the CONN5 and CONN6 connectors match up with the CON8 and CON9 connectors on the T1IB respectively.
5. Push the DTMF-A module onto these connectors making sure it is seated properly.
6. Position the second DTMF-A module so that the CONN5 and CONN6 connectors match up with the CON4 and CON5 connectors on the T1IB respectively.
7. Push the DTMF-A module onto these connectors making sure it is seated properly.

Refer to *Figure 3-22*. This completes the installation procedure for the DTMF-A Modules.

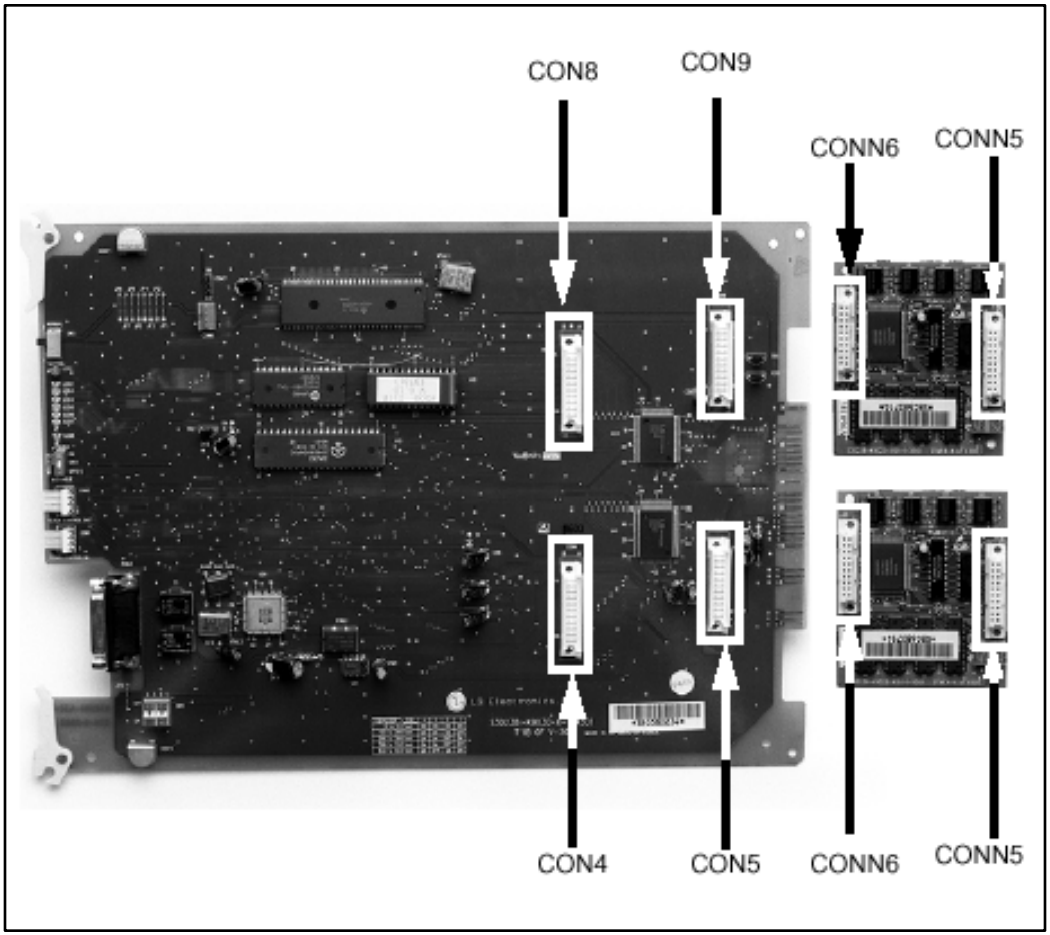


Figure 3-22: T1IB w/DTMF-A Module Installation

Primary Rate Interface Board (PRIB)

The PRIB board allows the network connection to a Primary Rate ISDN interface. It provides one Primary Rate Interface circuit. Each circuit is comprised of 23 bearer channels and one data channel (23B+D). The system interprets all B channels as trunks/line appearances. A maximum of six PRIBs can be installed into the system. The PRIB uses 24 time slots.

The PRIB contains an ISDN interface circuit, control circuitry, and synchronous clock control circuits. DTMF tone detection units can be installed optionally on the PRIB. The PRIB accepts two DTMF-A boards. The PRIB has 8 LEDs on the front edge of the PCB which indicates errors of ISDN line, in-use status, and synchronous clock enable status.

The PLLU must be installed on the MPB for the PRIB card to operate properly.

Vodavi has successfully integrated its PRI ISDN with the Lucent 5 ESS, Siemens, Stromburg Carlson, and the DMS100 Central Offices. Vodavi ISDN should work with all Central Office switches, but this has not been verified. Therefore, some delays in service may be experienced.

Table 3-15: PRIB Board LEDs

LED		Function	
1 (Green)	OFF ON	Line Idle Line busy (use)	Line Status
2 (Red)	OFF ON	Normal RX Carrier Loss	PRI Line Error Status
3 (Red)	OFF ON	Normal Out of Frame	
4 (Red)	OFF ON	Normal Yellow Alarm	
5 (Red)	OFF ON	Normal AIS or Blue Alarm	
6 (Red)	OFF ON	Normal Loop	
7 (Red)	OFF ON	Normal Multi-Frame Establish Alarm	
8 (Red)	OFF ON	Clock Disable Clock Enable	Clock Status

The PRIB contains 2 switches and 3 connectors. The Normal/Service switch is used during maintenance to place the card in an Out-Of-Service (OOS) mode. The clock selection switch is used for control synchronous clock.

The system can be equipped with six (6) PRI Interface Boards and the PRIB can be installed in any card slot in the Basic KSU. The Phase Locked Loop Unit (PLLU) must be installed on the MPB when the PRIB is installed. The DTMF4-A board which contains 4 DTMF receivers can be optionally installed on the PRIB.

Table 3-16: PRI Ordering Information

PRI Ordering Information	
Ringer Equivalent Number	6.0P
Facility Line Interface	04DU9-B
Jack Type	RJ45

When ordering a PRI circuit from a carrier, request the NI-2 standard.

If the PRIB is to be installed in a live system, the Normal/Service switch should be placed in the Service position. After installing the board, the Normal/Service switch must be placed in the Normal position for proper operation.

- This board supports Extended Super Frame (ESF) format and B8ZS line coding.
- The board can support TIE, Loop and Ground start signaling emulation per channel.
- The board requires an external CSU unit.
- The PRIB board can accept two (2) DTMF-A units in a daughter board type arrangement. This unit has 4 DTMF Receivers installed on it. This board can be installed on the SLIB, and T1IB boards.
- The board has a 15-pin D Sub connector for connection to a CSU unit.
- The card ejector tabs are color coded white.

Installation

1. Insert the PRIB card(s) into the desired BKSU card slot(s). Up to six PRIB cards can be installed in a system. Each PRIB provides 23 CO Lines to the system.
2. If installing a single PRIB, set SW2 to the ON position.

   If multiple PRIBs are being installed, set SW2 to the ON position on the first card and SW2 on all other cards to the OFF position.

   The PRIB comes with a clock cable. This cable is used when multiple PRIB and/or digital trunk cards are to be installed in the system. The clock cable is supplied with each PRIB.
3. Connect the DB15 cable from the PRIB to the CSU.
4. Connect the network cable from the CSU to the network.
5. Refer to *ISDN and T1 Clocking* for clarification on clocking and cabling when combining BRIB, PRIB, and T1 cards in one KSU.

Figure 3-23: PRIB (Primary Rate Interface Board)

The PRIB is offered as a stand-alone card or as a kit which includes the PRIB, CSU, and cables.

Functionality Description

Automatic Number Identification (ANI) information from the carrier is treated exactly the same as an inbound ICLID (Caller ID) number. Calls can be routed, placed in the unanswered call table, sent out to the CTI Module port on a keyset, and run through the number to name translation table. The *Triad 3* System provides call progress tones in the same manner as ICLID.

Dialed Number Identification Service (DNIS) information from the carrier is treated using DID line rules. DNIS calls are routed based on the DID routing table.

ANI/DNIS is a combined format, where the system waits for the ANI/DNIS information from the carrier. When it is received, the system routes the call using ICLID processing.

- If this information is not found in the ICLID Route Tables, the DNIS information is compared to the DID table for a match. The call is then routed based on the DID tables.
- If a match is not found on either the ANI or DNIS number, the call is routed based on normal CO line operation (CO Ringing Assignments).

The following table summarizes the operation of the system.

Table 3-17: Call Routing Criteria

ANI	DNIS	Operation
N	N	Calls routed based on normal CO operation (CO Ring Assignments.
N	Y	Calls routed based on DID tables with DID operation.
Y	N	Calls routed based on ICLID routing and ICLID operation.
Y*	Y	Calls routed on ICLID first, if no route is found, the DNIS digits are compared to the DID table. If no route is found in the DID table the call is routed based on CO line Ringing Assignments.

**If both ANI and DNIS calls are routed -- the following table summarizes what is displayed at the phone.*

Table 3-18: Call Routing Display Format

Route Found	Type of Display	Format
ICLID	ICLID	ANI number placed in the 14-character number field, the DNIS number followed by the name programmed in ICLID translation table placed in the 24-character name field.
DID	ICLID	ANI number placed in 14-character number field. DNIS number followed by programmed name from the DID tables in 24-character name field.
NONE	ICLID	ANI number placed in 14-character number field and the DNIS number is placed in the 24-character name field.

Installing the DTMF-A Modules

1. Unpack the DTMF-A Modules from their antistatic conductive bags in the packing boxes.
2. Locate the CONN5 and CONN6 connectors on the DTMF-A modules.
3. Locate the CON4, CON5, CON8 and CON9 connectors on the PRIB (outlined).
4. Position one of the DTMF-A modules so that the CONN5 and CONN6 connectors match up with the CON8 and CON9 connectors on the PRIB respectively.
5. Push the DTMF-A module onto these connectors making sure it is seated properly.
6. Position the second DTMF-A module so that the CONN5 and CONN6 connectors match up with the CON4 and CON5 connectors on the PRIB respectively.
7. Push the DTMF-A module onto these connectors making sure it is seated properly.

Refer to *Figure 3-24*. This completes the installation procedure for the DTMF-A Modules.

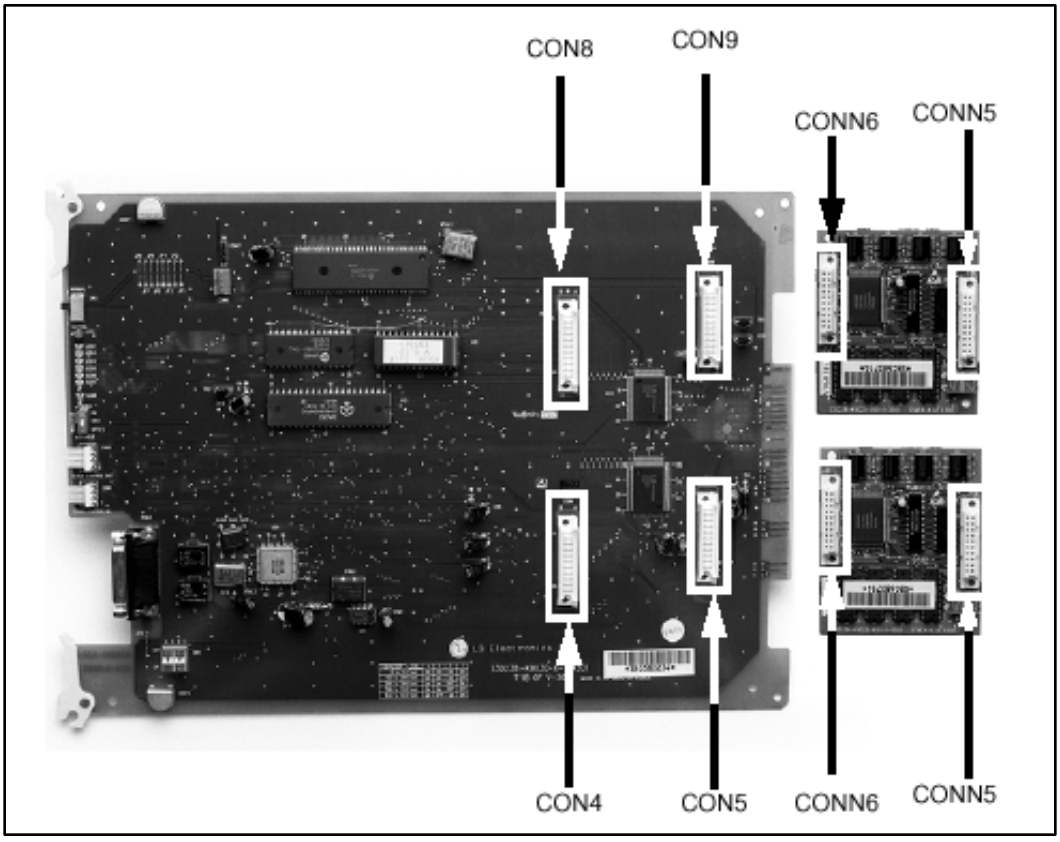


Figure 3-24: PRIB w/DTMF-A Module Installation

Basic Rate Interface Board (BRIB)

This interface provides four Basic Rate Interface circuits. Each circuit is comprised of two bearer (64Kbps each) and one data (16Kbps) channels (2B+D). When a BRIB is programmed into the *Triad 3* system, the system interprets all B channels as trunks. Thus, one BRIB which contains four 2B+D circuits provides eight line appearances to the *Triad 3* system. A maximum of eight BRIBs can be installed into the system (64 B channels).

The BRIB uses the U interface of the BRI standard. Connection to the network is made via RJ45 connectors on the front edge of the board. No NT1 device is required to connect to the central office. The BRIB card uses eight time slots when installed.

When ordering BRI lines from the telephone company, specify Capability P as the ordering code. National ISDN 1 (NI-1) is supported. No other standards are supported.

Vodavi has successfully integrated its BRI ISDN with the Lucent 5 ESS Central Office. Vodavi ISDN should work with all Central Office switches, but this has not been verified. Therefore, some delays in service may be experienced.

Installation

1. Insert the BRIB and/or BRIB-E card(s) into the desired BKSU card slot(s).
   - If installing a single BRIB, set switch 4 on SW2 to the ON position.
   - If multiple BRIB cards are being installed, set switch 4 on SW2 to the ON position on the first card and switch 4 on SW2 on all other cards to the OFF position. Switch 4 on SW2 determines if the board is the Master Clock source for any digital trunk cards in the system. Only one Master Source must be enabled in the system.
   - If installing a BRIB in a system that also has T1 or PRIB boards, use either the T1 or PRIB card as the Master Clock and set all BRIB SW2 switch 4s to OFF.
2. Refer to ISDN and T1 Clocking (later in this section) for clarification on clocking and cabling when combining BRIB, PRIB, and T1 cards in one KSU.

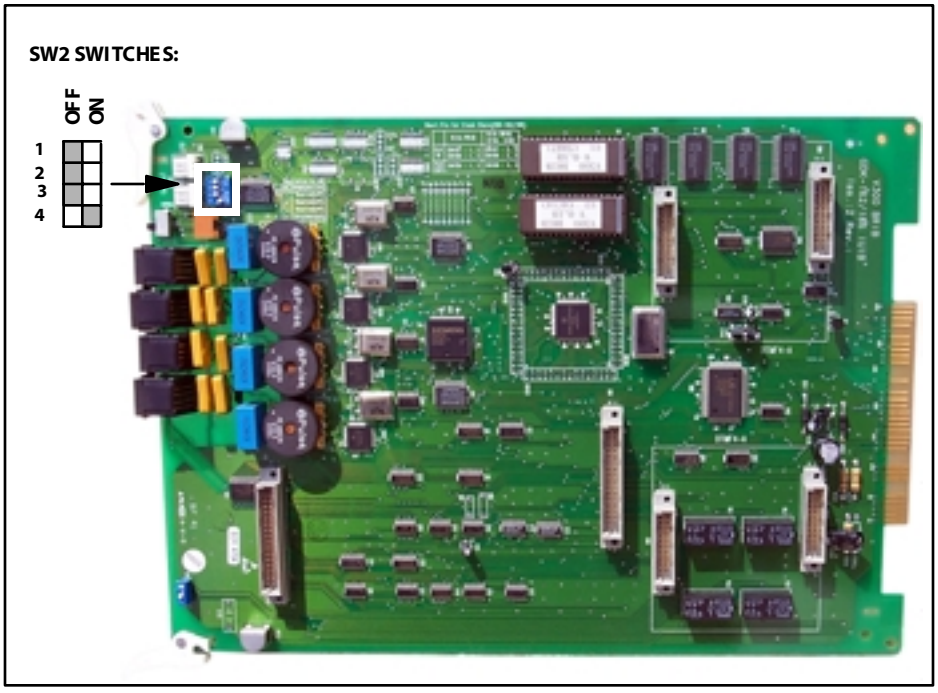


Figure 3-25: BRIB (Basis Rate Interface Board)

Electronic Key Telephone Service

Electronic key telephone service (EKTS) is a feature that can be provided on BRI ISDN to simulate standard analog DID lines. This allows several different numbers to be shared by a single BRI circuit.

Due to the decline in telephony tariffs, there is an increasing demand for BRI ISDN features. A BRI circuit allows two simultaneous calls to be handled, due to its technical specification. BRI circuits have two B-Channels at 64 kilobytes per second and one D-Channel at 16 kilobytes per second. The Bearer (B) Channels are designed for PCM (voice) and the Data (D) Channel is designed to carry information specific to each incoming and/or outgoing call.

The EKTS feature allows a single ISDN Service Profile Identifier (SPID) or B-Channel to support multiple directory numbers. A SPID is a number that telephone company switching equipment uses to track configuration information for each terminal adapter connected to an ISDN telephone line. The telephone company should provide SPIDs at the same time that the ISDN directory numbers are assigned. A directory number is another term for a telephone number.

If an application requires EKTS, be aware that BRI ISDN handles a busy number differently than a DID circuit. When the called number is busy, BRI will issue a busy signal, but a DID circuit will ring another line in the circuit. The busy signal is provided by the telephone company, therefore the call is not presented to the Vodavi telephone switch and it is not forwarded to voice mail. For example, a caller dials 480-443-6000 and is connected to the extension. While the first caller is still connected, a second caller dials the same number. The second caller will receive a busy signal that is provided by the telephone company.

In a normal BRI application, two numbers are assigned to each BRI circuit, which consists of 2 channels. There can be a maximum of 4 circuits equipped to handle 8 channels per BRIB. This is a direct number-to-channel relationship without hunting capability. Most circuit providers offer an optional "hunting" feature capability on BRI circuits. This optional feature allows numbers to hunt for idle channels on the BRIB up to a maximum of 8 channels per BRIB, assuming four BRI circuits were installed. In EKTS applications, you can have a maximum of 64 DID numbers hunt to one BRIB. Hunting cannot be accomplished between BRIBs, nor will the hunting feature allow calls to be routed to a busy DID number.

Conditions

BRI EKTS support is available in Vodavi telephone systems with software version 3.0G and higher.

Like DID, EKTS can be programmed to route calls using up to 7 digits. By default, only the last three digits are analyzed for routing.

EKTS does not require a line appearance on a specific telephone because the BRI terminates directly into the KSU.

Vodavi supports Basic EKTS. The EKTS caching option is not supported by Vodavi. Caching is normally used when an ISDN telephone instrument is used on the customer premise.

Basic Rate Interface Expansion Board (BRIB-E)

This card installs as a daughter-board on the BRIB and provides an additional four Basic Rate Interface circuits. One BRIB and BRIB-E assembly provides 16 line appearances to the *Triad 3* system. A maximum of four BRIB/BRIB-E assemblies can be installed into the system.

The BRIB-E uses the U interface of the BRI standard. Connection to the network is made via RJ45 connectors on the front edge of the board. The BRIB-E card uses eight time slots when installed.

ISDN and T1 Clocking

When combining BRIB, PRIB, and T1 cards in one KSU, specific settings and cabling are important for proper clocking. The Phase Lock Loop Unit (PLLU) synchronizes the clocking from the Central Office to the clocking of the KSU. Popping, crackling, dropped calls, and one-way transmission are usually attributed to the clocking not being synchronized correctly.

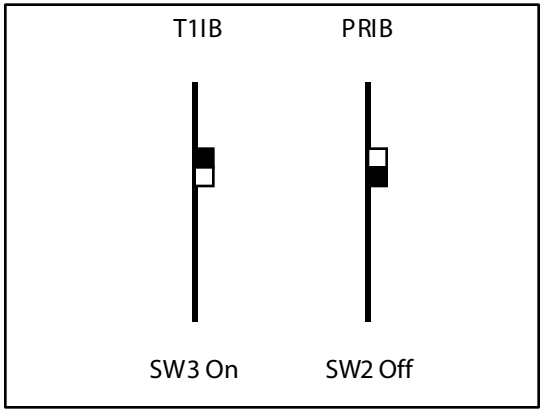
Examples - Settings and Cabling

The following examples clarify the clocking and cabling for these cards:

When the switch is in the "up" position, it should be considered "ON". When the switch is in the "down" position, it should be considered "OFF".

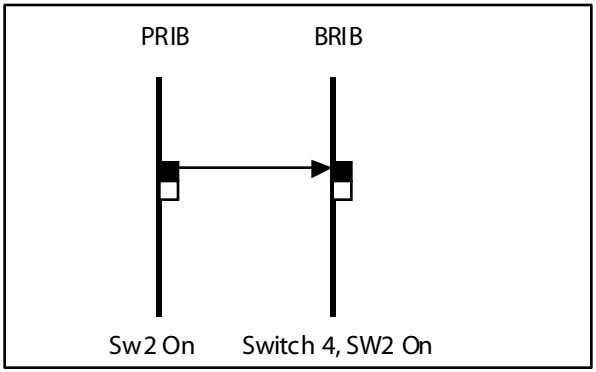
The cable connection follows the same logic - "up" is clock outside (ON) and "down" is clock inside (OFF). ON means that clocking is coming from outside the KSU and OFF means that clocking is coming from inside the KSU.

(1) T1IB and (1)PRIB



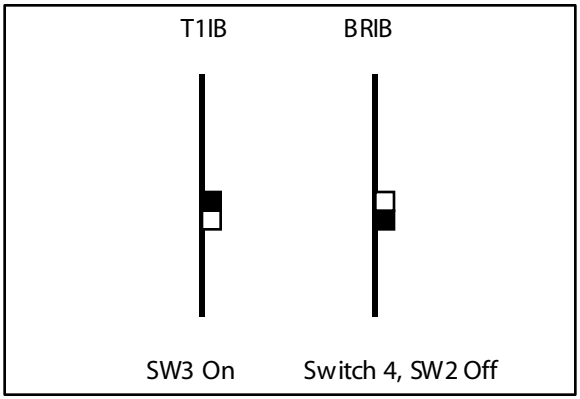
If both cards in a phone switch are connected to a telephone company clock (not point-to-point T1), put the T1 clock switch in the enable position (UP) to allow it to receive clocking from the telephone company directly, and do not install the clock cable. Set the PRIB clock switch in the disable position (OFF), which allows the PRIB to synchronize its timing off of the backplane (from the T1 clocking). If the T1 is a point-to-point T1, set the PRIB in the enable position (ON), the T1 in the disable position (OFF), and do not install the clock cable.

(1) PRIB and (1) BRIB



Install with the cable and set both PRIB and BRIB switches to the enable position (ON).

(1) T1IB and (1) BRIB

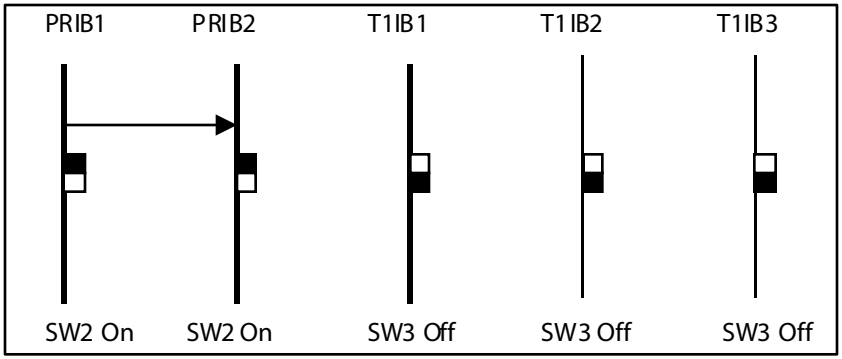


If both cards in a phone switch are connected to a telephone company clock (not point-to-point T1), put the T1 clock switch in the enable position (ON) to allow it to receive clocking from the telephone company directly. Do not install the clock cable.

Set the BRIB clock switch in the disable position (OFF), which allows the BRIB to synchronize its timing off of the backplane (from the T1 clocking).

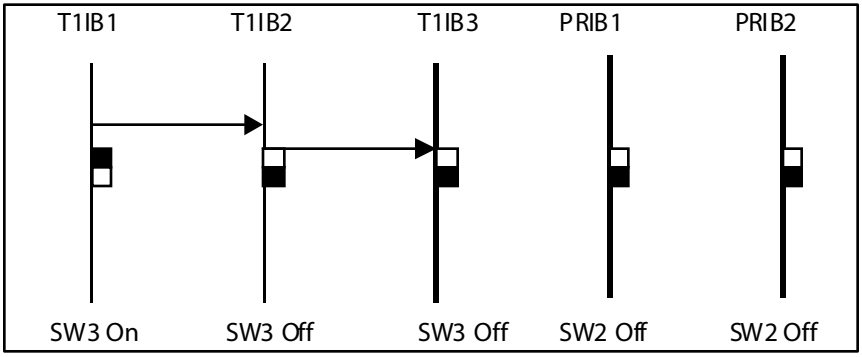
If the T1 is a point-to-point T1, set the BRIB to the enable position (ON), the T1 in the disable position (OFF), and do not install the clock table.

(2) PRIBs and (3) T1IBs



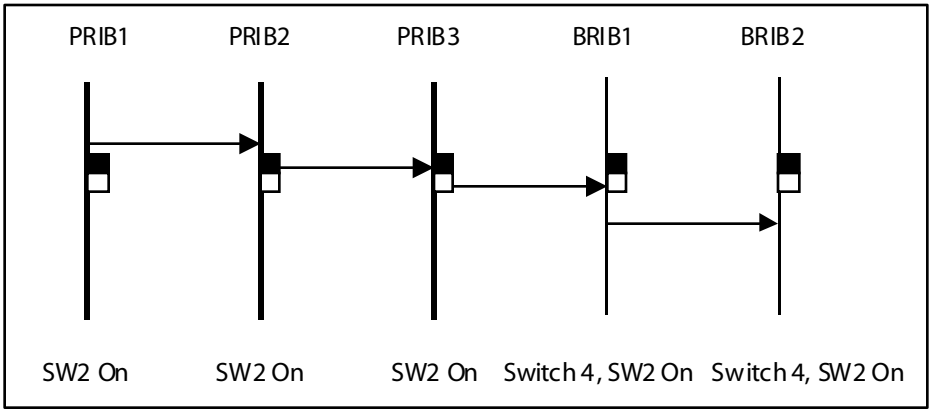
The clock cable should be connected to the OUT position on the connector on the PRIB1. The clock cable should be connected to the IN position on PRIB2. SW2 of the PRIB1 and PRIB2 should be placed in the ON position. The three T1IBs are not connected with the clock control cable and SW3 on these boards should be in the OFF position.

(3) T1IBs and (2) PRIBs



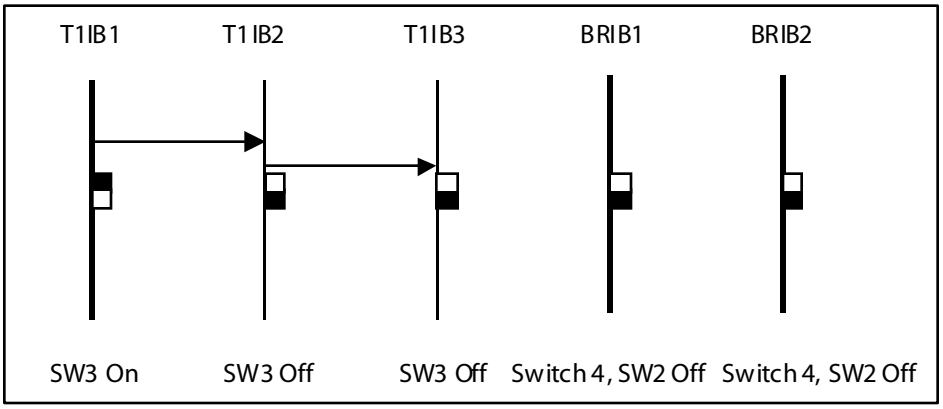
The clock cable should be connected to the OUT position on the cable connector on the T1IB and connected to the IN position on the connector on the T1IB2. The clock cable should be connected to the OUT position on T1IB2 and connected to the IN position on the T1IB3. SW3 of T1IB1 should be placed in the ON position, with SW3 on T1IB2 and T1IB3 being OFF. The two PRIBs are not connected with clock control cables, and SW2 on the PRIBs should be in the OFF position.

(3) PRIBS and (2) BRIBs



The clock cable should be connected from the OUT position of the PRIB1 to the IN connectors of all the cards and all clock switches should be in the ON position.

(3) T1IBs and (2) BRIBs



The clock OUT cable from T1IB1 should be connected to the clock IN cable of the T1IB2 and the clock OUT cable from T1IB2 should be connected to the clock IN cable of T1IB3. SW3 of T1IB1 should be in the ON position, and SW3 of T1IB2 and T1IB3 should be in the OFF position. The two BRIBs are not connected with clock control cables and SW2 of the BRIB cards are placed in the OFF position.

Station Connections

The peripheral boards provide the interface from system PCM ports to station.

Electronic Telephone Interface Board (ETIB)

This board provides the interface to twelve (12) electronic telephones or DSS/DTS terminals. The card has one LED indicator for off-hook/in use status. The ETIB can be installed or removed under system power. The card extractors are color coded green.

There is one 50-pin female amphenol connectors labeled Conn 2 located on the front of the card. This allows the system to be cabled to the main distribution frame (MDF). 25-pair telephone cabling must be prepared with mating connectors to extend the inter-face circuits to the MDF. The cables should be routed through the cable clamps at the bottom of the KSU to the MDF. These cables are then terminated on industry standard 66M1-50 type punchdown connector blocks. It is recommended that 66M1-50 split blocks with bridging clips be used to simplify troubleshooting and to quickly isolate faults.

Basic Key Telephones are not supported at this time.

Only DTIB type stations can be used for Database programming.

Table 3-19: ETIB Wiring

Pair	PIN #	Color	Description	
1	26 1	WH/BL BL/WH	RING TIP	CKT1
2	27 2	WH/OR OR/WH	DATA-R DATA-T	
3	28 3	WH/GN GN/WH	RING TIP	CKT2
4	29 4	WH/BN BN/WH	DATA-R DATA-T	
5	30 5	WH/SL SL/WH	RING TIP	CKT3
6	31 6	RD/BL BL/RD	DATA-R DATA-T	
7	32 7	RD/OR OR/RD	RING TIP	CKT4
8	33 8	RD/GN GN/RD	DATA-R DATA-T	
9	34 9	RD/BN BN/RD	RING TIP	CKT5
10	35 10	RD/SL SL/RD	DATA-R DATA-T	
11	36 11	BK/BL BL/BK	RING TIP	CKT6
12	37 12	BK/OR OR/BK	DATA-R DATA-T	
13	38 13	BK/GN GN/BK	RING TIP	CKT7
14	39 14	BK/BN BN/BK	DATA-R DATA-T	

Pair	PIN #	Color	Description	
15	40 15	BK/SL SL/BK	RING TIP	CKT8
16	41 16	YL/BL BL/YL	DATA-R DATA-T	
17	42 17	YL/OR OR/YL	RING TIP	CKT9
18	43 18	YL/GN GN/YL	DATA-R DATA-T	
19	44 19	YL/BN BN/YL	RING TIP	CKT10
20	45 20	YL/SL SL/YL	DATA-R DATA-T	
21	46 21	VI/BL BL/VI	RING TIP	CKT11
22	47 22	VI/OR OR/VI	DATA-R DATA-T	
23	48 23	VI/GN GN/VI	RING TIP	CKT12
24	49 24	VI/BN BN/VI	DATA-R DATA-T	
25	50 25	VI/SL SL/VI		

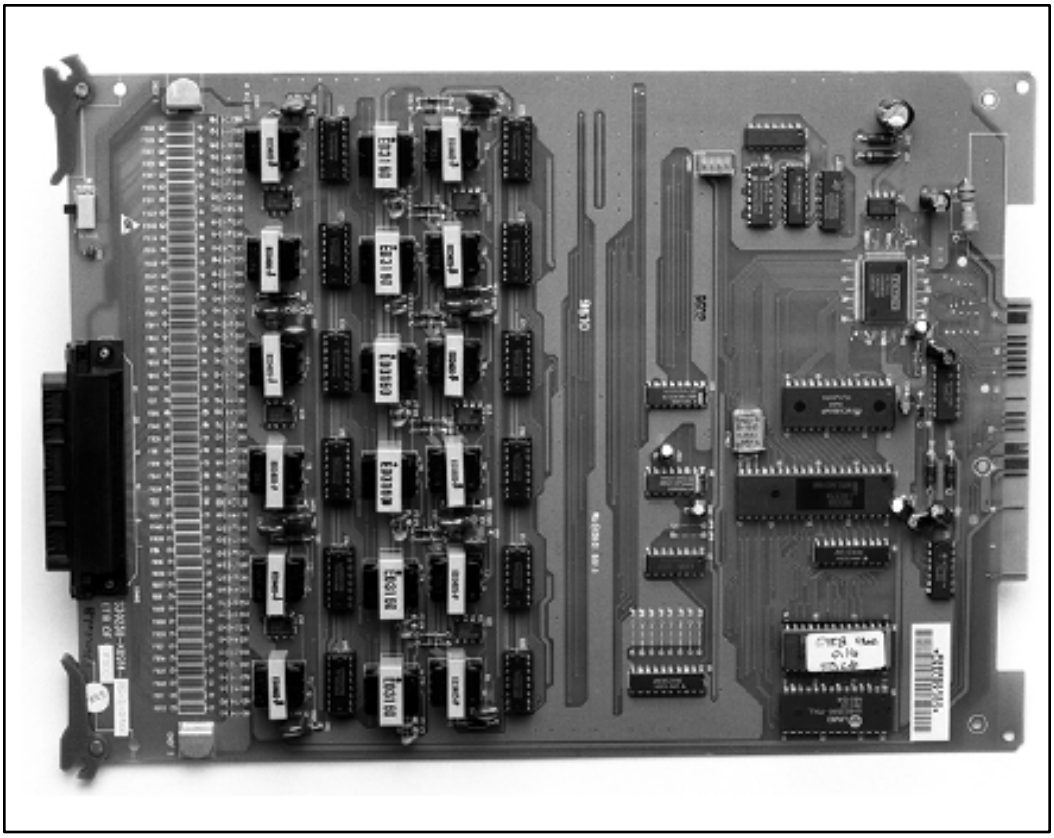


Figure 3-26: Electronic Telephone Interface Board (ETIB)

Single Line Interface Board (SLIB)

This board provides the interface to twelve (12) 2500-type telephones. The SLIB signals interface with mechanical 90V ringers and lights 90V message waiting lamps on 2500 sets as desired. The SLIB board has one LED indicator for status. A Normal/Service switch located toward the top of the card allows the card to be inserted or removed from the system while under power and also can be used to disable all station circuits on the card.

The station connections are via one (1) 50-pin female (amphenol type) connector located on the front edge of the card.

The board can support a MSG12 board and a DTMF4-A board in a daughter board type arrangement.

The Message Wait Lamp Relay Control (MSG12) provides Message Wait Lamp Relay Control for message lamp single line telephones. The MSG12 board mounts on the SLIB board as a daughter board type arrangement.

Installing the MSG12 Board

1. Unpack the MSG12 Module from its anti-static conductive bag in the packing box.
2. Locate the CONN5 and CONN6 connectors on the MSG12 module.
3. Locate the CONN3, and CONN4 connectors on the SLIB (outlined).
4. Position the MSG12 module so that the CONN3 and CONN4 connectors match up with the CONN3 and CONN4 connectors on the SLIB respectively.
5. Push the MSG12 module onto these connectors making sure it is seated properly.

   Refer to *Figure 3-27*. This completes the installation procedure for the MSG12 Module.

Adjusting Modem Settings

When using modems connected to single line telephone ports on the *Triad 1/2/3*, the gain settings on the SLT port when using T1 as access to the CO should be set to 0 dB (maximizes the modem speed).

CO to SLT Call via a T1 TIE Trunk:

1. Access the specific trunk type above.
2. Hookflash and dial 638 8 on the keypad.
3. Hang up.

CO to SLT Call via a T1 Trunk:

1. Access the specific trunk type above.
2. Hookflash and dial 638 6 on the keypad.
3. Hang up.

SLT to SLT Call:

1. Place an intercom call from 1 SLT to another.
2. Hookflash and dial 638 5 on the keypad.
3. Hang up.

No adjustment is needed if access to the CO is accomplished by standard loop/ground start trunk circuits. These trunk types are set to 0 dB by default.

In all cases the maximum modem speed is not as much as if the modem were connected directly to the CO line. The system degrades the connection to the next lower baud rate that the modem supports.

Example: If the modem can achieve 28800 on a direct CO line, the maximum speed on an SLT port would be 26400.

Testing proves that a baud rate of 33600 can be achieved with SLT-T1 lines. Typical connection speeds with SLT-T1 are 22700-33600. Typical connection speeds with SLT-Loop/Ground Start are 17400-23800.

All results were obtained using a 56K U.S. Robotics Sportster modem.

Table 3-20: SLIB Wiring

Pair	PIN #	Color	Description	
1	26 1	WH/BL BL/WH	RING TIP	CKT1
2	27 2	WH/OR OR/WH	RING TIP	CKT2
3	28 3	WH/GN GN/WH	RING TIP	CKT3
4	29 4	WH/BN BN/WH	RING TIP	CKT4
5	30 5	WH/SL SL/WH	RING TIP	CKT5
6	31 6	RD/BL BL/RD	RING TIP	CKT6
7	32 7	RD/OR OR/RD	RING TIP	CKT7
8	33 8	RD/GN GN/RD	RING TIP	CKT8
9	34 9	RD/BN BN/RD	RING TIP	CKT9
10	35 10	RD/SL SL/RD	RING TIP	CKT10
11	36 11	BK/BL BL/BK	RING TIP	CKT11
12	37 12	BK/OR OR/BK	RING TIP	CKT12
13	38 13	BK/GN GN/BK		

Pair	PIN #	Color	Description	
14	39 14	BK/BN BN/BK		
15	40 15	BK/SL SL/BK		
16	41 16	YL/BL BL/YL		
17	42 17	YL/OR OR/YL		
18	43 18	YL/GN GN/YL		
19	44 19	YL/BN BN/YL		
20	45 20	YL/SL SL/YL		
21	46 21	VI/BL BL/VI		
22	47 22	VI/OR OR/VI		
23	48 23	VI/GN GN/VI		
24	49 24	VI/BN BN/VI		
25	50 25	VI/SL SL/VI		

Installing the DTMF-A Unit

The DTMF-A unit has 4 DTMF receivers installed on it. This board can be installed on the SLIB and T1IB boards. The DTMF-A mounts on the SLIB board as a daughter board type arrangement.

1. Unpack the DTMF-A Module from its anti-static conductive bag in the packing box.
2. Locate the CONN5 and CONN6 connectors on the DTMF-A module.
3. Locate the CONN5, and CONN6 connectors on the SLIB (outlined).
4. Position the DTMF-A module so that the CONN5 and CONN6 connectors match up with the CONN5 and CONN6 connectors on the SLIB respectively.
5. Push the DTMF-A module onto these connectors making sure it is seated properly.

Refer to *Figure 3-27*. This completes the installation procedure for the DTMF-A Module.

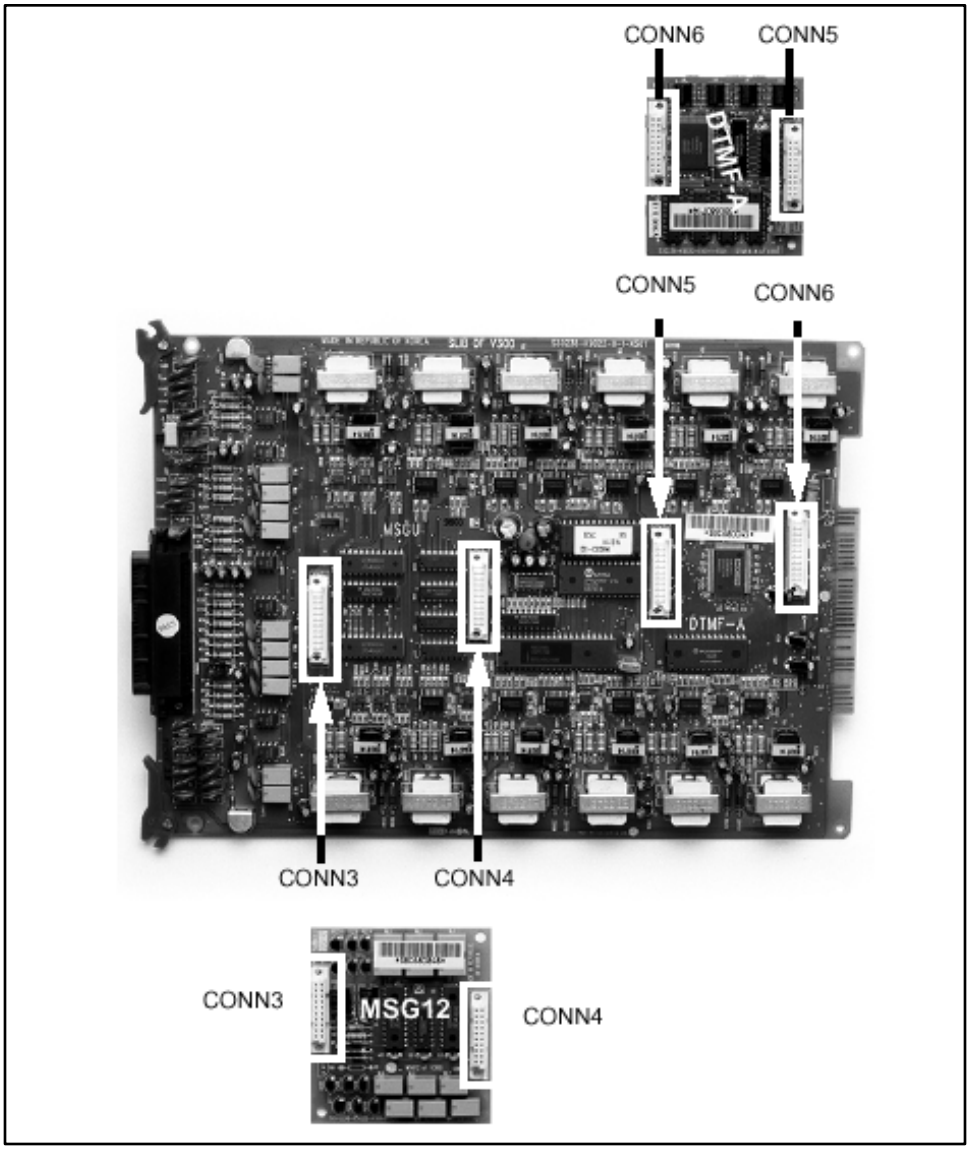


Figure 3-27: SLIB w/DTMF-A and MSG12 Installation

Digital Telephone Interface Board (DTIB)

This board provides the interface to twelve (12) digital telephones. The card has two LEDs (one for the DTIB board, the other for the DTIBE (DT24) board) to indicate off-hook/in use status. The DTIB can be installed or removed under system power. The card extractors are color coded green.

There is one 50-pin female amphenol connectors labeled CONN3 located on the front of the card. This allows the system to be cabled to the main distribution frame (MDF). 25-pair telephone cabling must be prepared with mating connectors to extend the inter-face circuits to the MDF. The cables should be routed through the cable clamps at the bottom of the KSU to the MDF. These cables are then terminated on industry standard 66M1-50 type punchdown connector blocks. It is recommended that 66M1-50 split blocks with bridging clips be used to simplify troubleshooting and to quickly isolate faults.

The Digital Telephone Interface Board Expansion (DTIBE) (DT24) utilizes the other LED on the DTIB board to indicate off-hook/in use status. This PCB is installed onto a DTIB board in a daughter board type arrangement to provide an additional twelve (12) digital phones.

A compatibility issue exists between certain DTIB and DTIB-E boards, which could result in noise on stations connected to particular Issue 2 DTIB-E boards.

The boards affected can be identified by the Issue level, which is silkscreened on the boards. VTI has released Issue 1 DTIB and Issue 1 DTIB-E boards, as well as Issue 2 DTIB and Issue 2 DTIB-E boards.

The compatibility issue may surface when an Issue 2 DTIB-E is installed on an Issue 1 DTIB. Configure DTIB/DTIB-E cards according to the table to avoid this compatibility issue.

	Issue 1 DTIB-E	**Issue 2 DTIB-E**
Issue 1 DTIB	Compatible	Not Compatible
Issue 2 DTIB	Compatible	Compatible

Installing the DTIB-E Expansion Module

1. Unpack the DTIB-E Expansion Module from its antistatic conductive bag in the packing box.
2. Locate the CONN1 and CONN2 connectors on the DTIB-E module.
3. Locate the CONN1 and CONN2 connectors on the DTIB (outlined).
4. Position the DTIB-E module so that the CONN1 and CONN2 connectors match up with the CONN1 and CONN2 connectors on the DTIB respectively.
5. Push the DTIB-E module onto these connectors making sure it is seated properly.

   Refer to *Figure 3-28*. *This completes the installation procedure for the DTIB-E Module.*

No DTIB-E cards can be installed in the upper cabinets. These are cabinets #1 and #3.

Table 3-21: DTIB Wiring

Pair	PIN #	Color	Description	
1	26 1	WH/BL BL/WH	DATA-R 1 DATA-T 1	DTIB12 Station Ports
2	27 2	WH/OR OR/WH	DATA-R 2 DATA-T 2	
3	28 3	WH/GN GN/WH	DATA-R 3 DATA-T 3	
4	29 4	WH/BN BN/WH	DATA-R 4 DATA-T 4	
5	30 5	WH/SL SL/WH	DATA-R 5 DATA-T 5	
6	31 6	RD/BL BL/RD	DATA-R 6 DATA-T 6	
7	32 7	RD/OR OR/RD	DATA-R 7 DATA-T 7	
8	33 8	RD/GN GN/RD	DATA-R 8 DATA-T 8	
9	34 9	RD/BN BN/RD	DATA-R 9 DATA-T 9	
10	35 10	RD/SL SL/RD	DATA-R 10 DATA-T 10	
11	36 11	BK/BL BL/BK	DATA-R 11 DATA-T 11	
12	37 12	BK/OR OR/BK	DATA-R 12 DATA-T 12	

Pair	PIN #	Color	Description	
13	38 13	BK/GN GN/BK	DATA-R 13 DATA-T 13	DTIB24 Station Ports
14	39 14	BK/BN BN/BK	DATA-R 14 DATA-T 14	
15	40 15	BK/SL SL/BK	DATA-R 15 DATA-T 15	
16	41 16	YL/BL BL/YL	DATA-R 16 DATA-T 16	
17	42 17	YL/OR OR/YL	DATA-R 17 DATA-T 17	
18	43 18	YL/GN GN/YL	DATA-R 18 DATA-T 18	
19	44 19	YL/BN BN/YL	DATA-R 19 DATA-T 19	
20	45 20	YL/SL SL/YL	DATA-R 20 DATA-T 20	
21	46 21	VI/BL BL/VI	DATA-R 21 DATA-T 21	
22	47 22	VI/OR OR/VI	DATA-R 22 DATA-T 22	
23	48 23	VI/GN GN/VI	DATA-R 23 DATA-T 23	
24	49 24	VI/BN BN/VI	DATA-R 24 DATA-T 24	
25	50 25	VI/SL SL/VI		

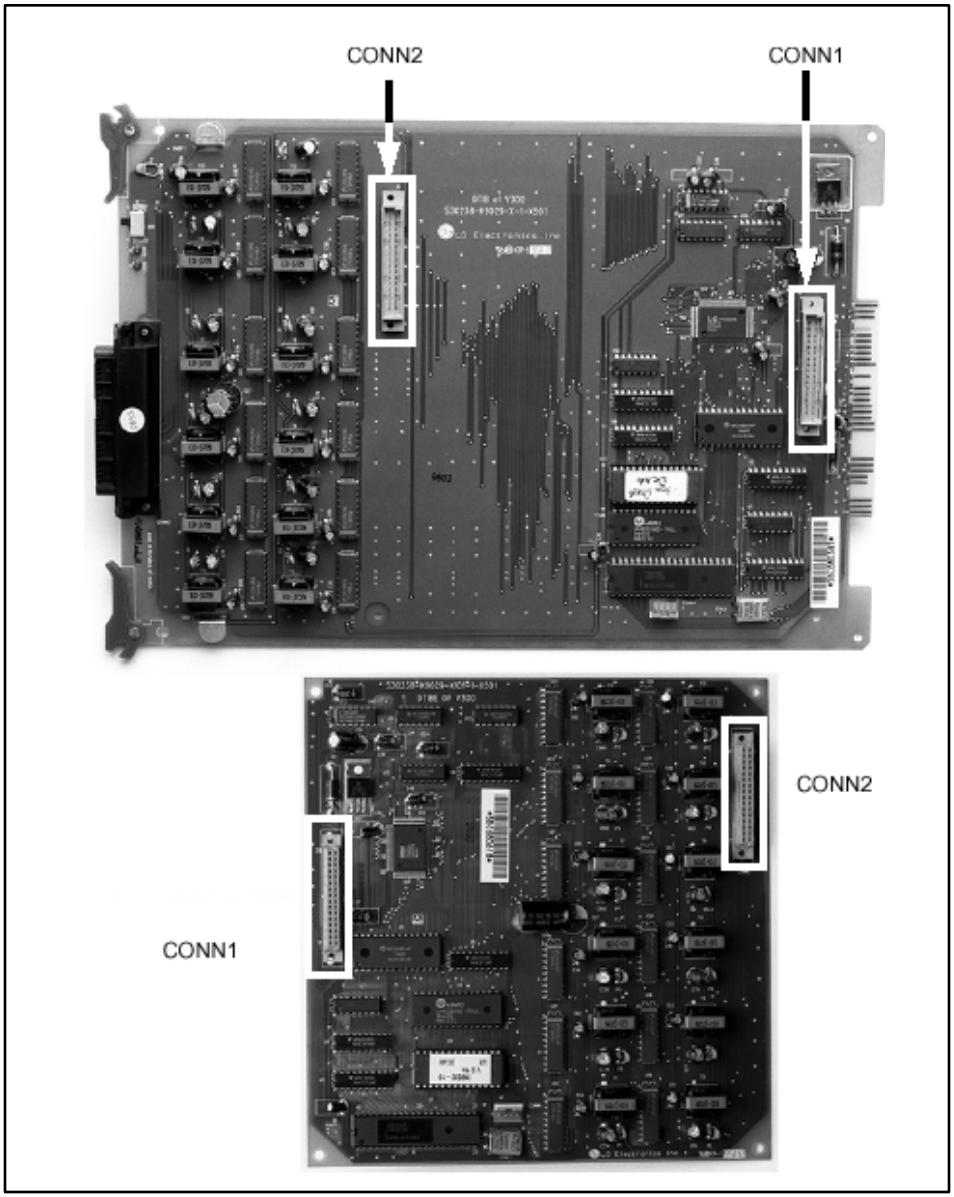


Figure 3-28: DTIB w/DTIB-E Installation

Station Wiring

Station interface boards (DTIB, ETIB, SLIB) includes a 25 pair connector for station wiring to the ports on the board. The following provides details on the interconnection of each type of station interface board and the station jack.

Digital Keyset & Terminal Wiring

Wiring from the DTIB to station jack requires one pair of wire. Digitized voice, signaling, and power are sent over this pair. *Figure 3-29* gives details on connections of station jacks to the system and *Table 3-21* gives the configuration of the 25-pair station connector arrangement and punchdown type block.

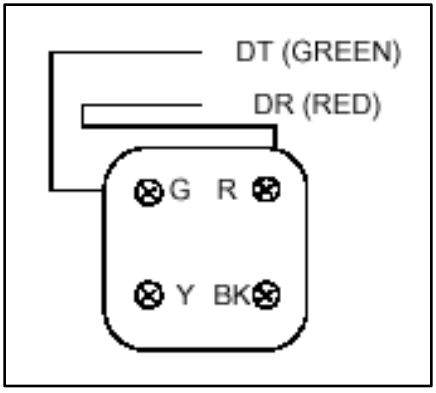


Figure 3-29: Digital Station Jack Wiring

Electronic Keyset and Terminal Wiring

Wiring from the ETIB to station jack requires two pairs of wire. The first pair provides the audio or voice path, the second is for signaling or data path. The DATA pair is polarity sensitive, reversal does not harm the keyset or system, but the port does not function properly when reversed.

Power is delivered by applying DC voltage to the center tap of the coupling transformers of each of the 2 pairs. *Figure 3-26* gives details on connections of station jacks to the system and *Table 3-19* gives the configuration of the 25-pair station connector arrangement and punchdown type block.

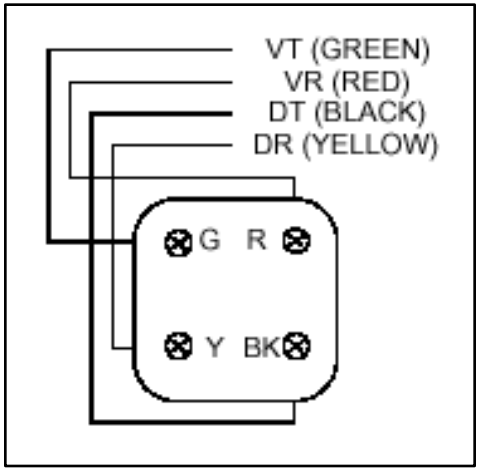


Figure 3-30: Electronic Station Jack Wiring

Only the first pair (Red, Green on jack) should be connected back to the KSU. No other pairs should be connected back to the KSU.

Single Line Telephone Wiring

The SLIB is wired to SLT devices with a single pair of wire which provides battery feed, voice and signaling to and from the SLT. Typical wiring to the SLT jack is shown in *Figure 3-31* and *Table 3-20* gives the configuration of the 25-pair station connector arrangement when connected to a punchdown type block.

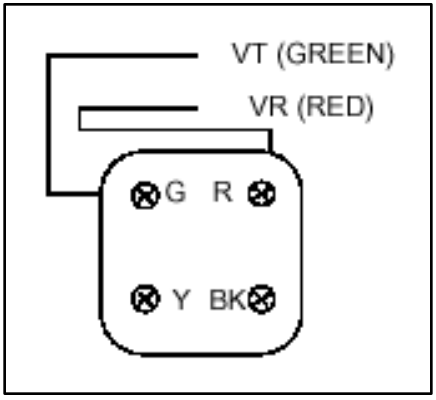


Figure 3-31: Single Line Telephone Wiring

Power Failure Transfer Wiring

The PFTU is wired from the 25-pair connector to the MDF, cross connected to the CO Line inputs from the telephone company, to the CO Line inputs of the system, and to Power Failure SLTs. The basic connections are shown in *Figure 3-32* and the 25- pair connector configuration is given in *Table 3-6*. Note that the SLT may also be connected to a system SLIB as shown.

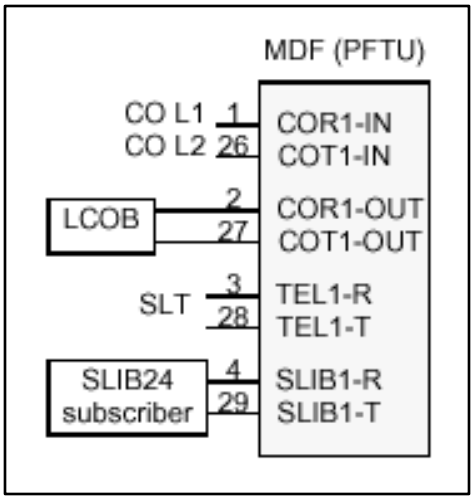


Figure 3-32: PFTU Wiring

Wall Mounting the Electronic Telephone

All connections to the Electronic Key Telephone are fully modular. To wall mount the Electronic Key Telephone, it is necessary to have one Wall Mount Kit and one standard-type jack assembly designed for normal wall hanging applications.

1. Unplug the line cord from the phone. This line cord is not be required and should be retained as a maintenance replacement item.
2. Lift the plastic number retainer upward and expose the screw underneath. Remove the screw and the handset tab. Replace it with the handset tab from the Wall Mount Kit.
3. Be careful to position the tab so that the protrusion faces the hookswitch. This allows the handset to remain secure when the telephone is on the wall. Replace the screw and snap the number retainer into place.
4. Substitute the short modular cord from the Wall Mount Assembly into the modular connector vacated by the line cord.
5. Align the wall mount baseplate with holes on the bottom of the telephone. Snap in place.
6. Now match the two key hole slots on the baseplate with the lugs on the 630-A type jack. Align the modular connector and slide telephone into place. (Refer to *Figure 3-36*.)

Wall Mounting the Digital Telephone

To wall mount the Digital Key Telephone, it is necessary to use the Wall Mount bracket and one standard-type jack assembly designed for normal wall hanging applications. Refer to *Figure 3-36* and *Figure 3-37*.

1. Remove the handset from the cradle and locate the plastic retainer in the bottom of the hook-switch well area. Push the plastic retainer slowly upward until it is free. Locate the tab on the plastic retainer and make sure the tab is toward you, then place it back into its holder. Slide the plastic retainer all the way down into its channel. Part of the retainer remains above its holder to hold the handset secure for the wall mount configuration.
2. Turn the telephone over and unplug the line cord. If the line cord is not plugged into the wall jack assembly, re-route the line cord thru the access channel on the top of the telephone. If the line cord is plugged into the wall jack assembly, run the line cord through the hole provided and plug into the connector on the back of the telephone.
3. Line up the hooks on the top and bottom of the wall mount bracket so they can engage with the slots cut into the bottom of the telephone base. Insert the bottom hooks first. Slide the mounting bracket slowly downwards until the top tabs slide into the top slots and snap in place.
4. Match the two key hole slots on the base plate with the lugs on the 630-A type jack. Align the modular connector and slide the telephone into place.
5. Place the handset onto the retainer. The telephone is now ready for use. Refer to *Figure 3-37* for location of mounting information.

Headset Installation

The Electronic/Digital Key Telephones have been designed to operate with industry standard electronic mic compatible modular headset adapters and operator headsets.

To modify an Electronic/Digital Key Telephone to support an external headset:

1. Plug the headset adapter cord into the vacant handset jack on the Key Telephone base.
2. Plug the telephone handset cord into the headset adapter box where indicated by the headset manufacturer's instructions.

The Headset Operation must be enabled (refer to *Station Programming)*. The station then has the capability to enable or disable headset mode by dialing a code. When Headset mode is active at the station, the ON/OFF button then controls the on-hook or off-hook status. Also, features such as On-Hook Dialing and Handsfree Speakerphone operation become inoperable.

Caller ID Interface Unit Installation

The Caller Identification Interface Unit receives the data from the telephone company and sends the data, in ASCII RS-232C format to a printer, telephone, computer or DTE (Data Terminal Equipment) device.

Selecting the Cable

1. Select the RS-232 cable (P/N 9081-10) for the *Triad 3* MPB or SIU.
2. Connect one end of the cable on the desired KSU I/O port (1, 3, or 4).
3. Connect the other end to the OUT port on the Caller ID unit.

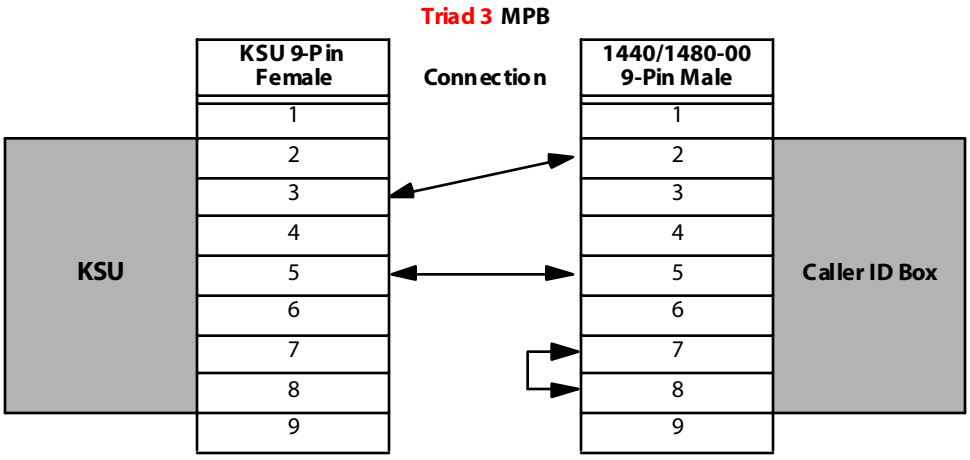


Figure 3-33: Caller ID Cable Connections

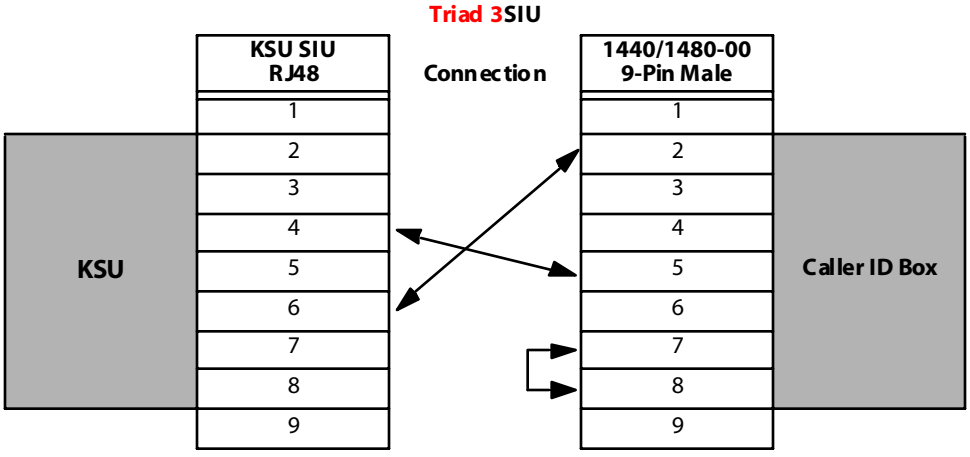
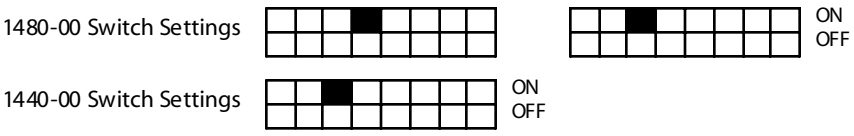


Figure 3-34: Caller ID Cable Connections - Triad 3 SIU



Programming the KSU

I/O Ports

1. To verify the programming for the I/O ports, press ****3226, Flash 15**.
2. Select the desired I/O port, Button 1, 3, 4 (MPB, SIU1, SIU2).
3. Dial [5] on the dialpad and press HOLD.

CO Lines

1. To verify the programming for the CO Lines, press ****3226, Flash 40**.
2. Enter CO line Range for the Caller ID Unit and press HOLD.
3. Press Button 21 (Page C).
4. Press Button 2, Ring Delay Timer.
5. Enter 04 (minimum). Press HOLD.
6. Reset the system and the CTI box.

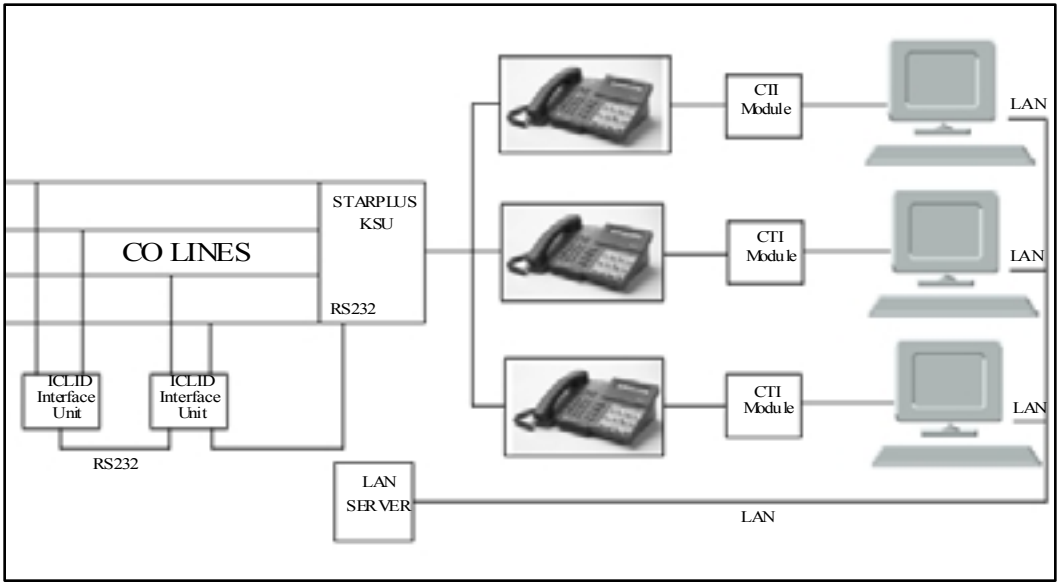


Figure 3-35: CTI System Configuration

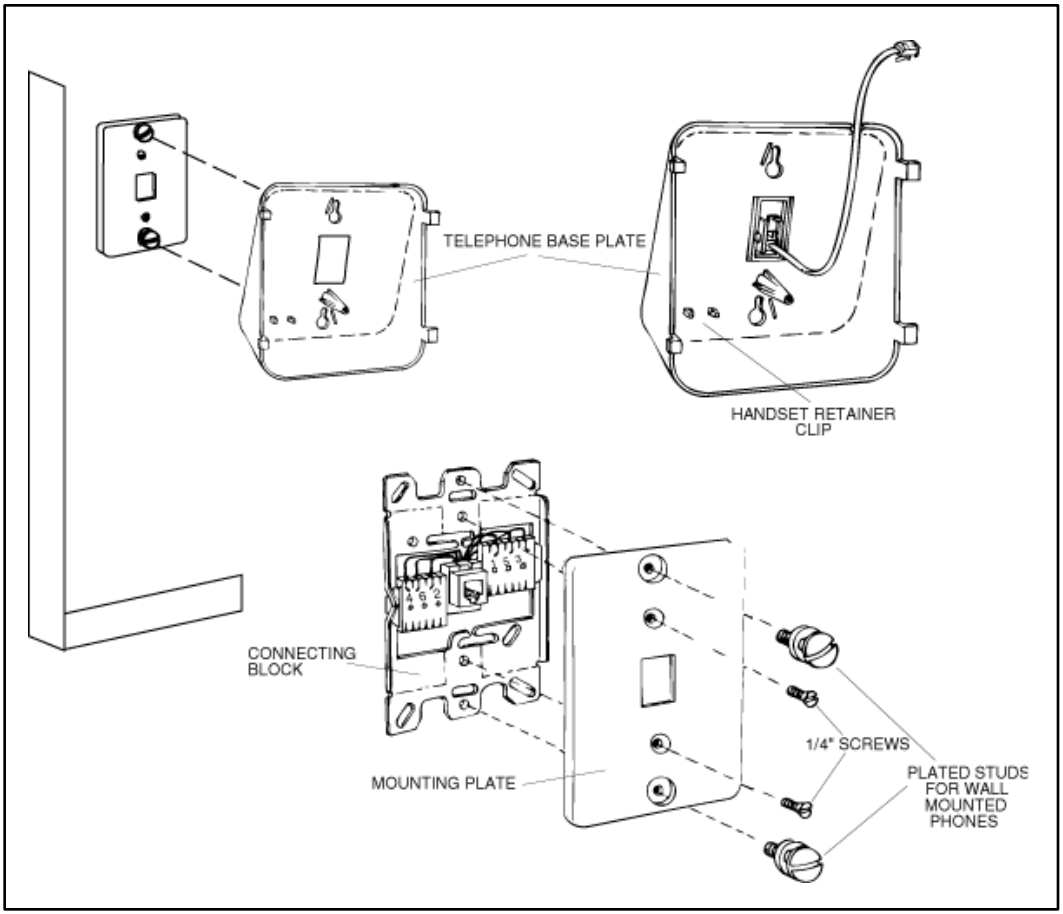


Figure 3-36: Electronic Key Telephone Wall Mounting

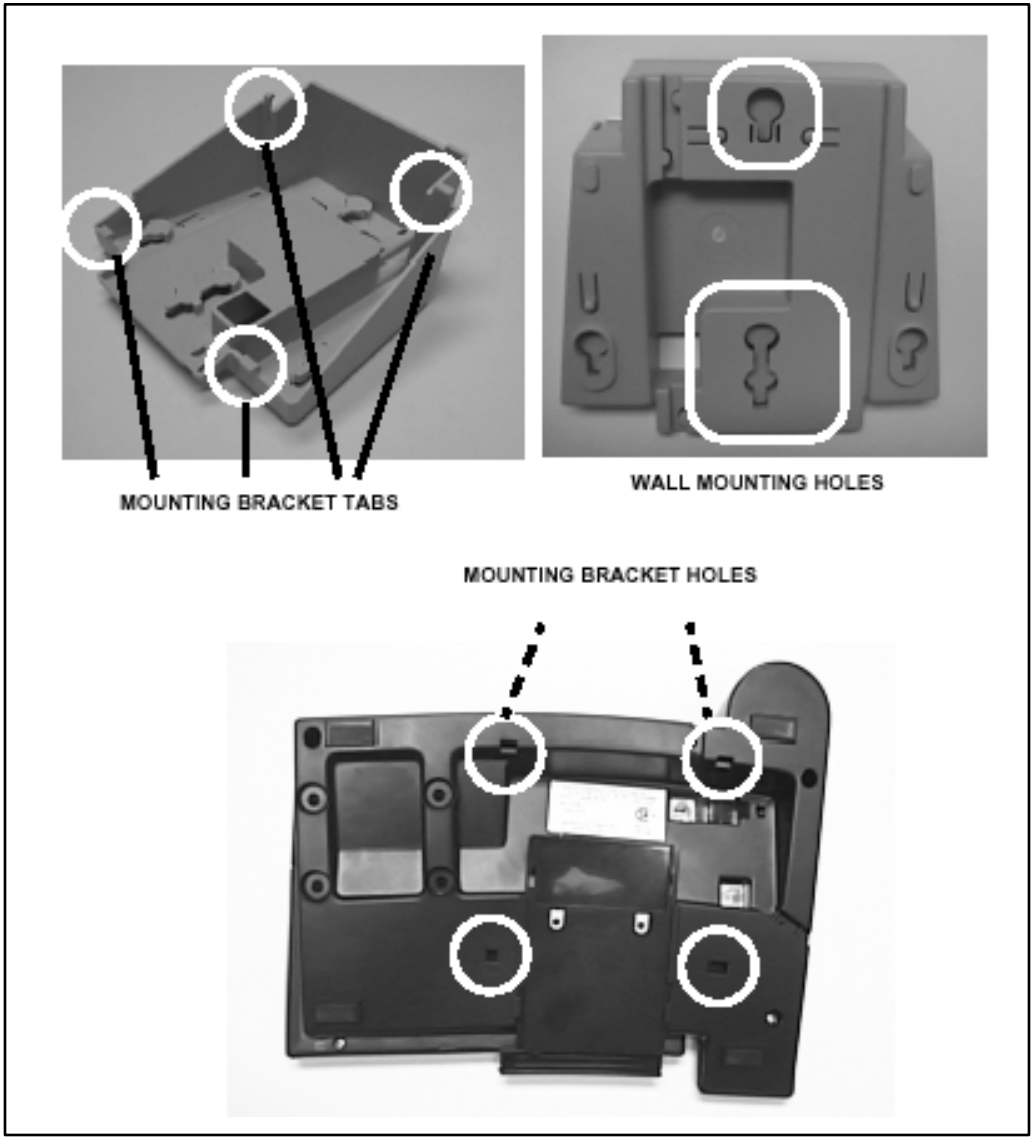


Figure 3-37: Digital Key Telephone Wall Mounting

The SMDR feature provides detailed records of all outgoing and/or incoming, long distance only or all calls. The SMDR Qualification Timer determines the length of time that is needed to determine a valid SMDR call for reporting purposes. By default, this timer is set to 30 seconds and is variable from 00 to 60 seconds in 1 sec. increments. This feature is enabled or disabled in system programming. By default, SMDR is not enabled and is set to record long distance calls only. A printout format of 80 characters maximum or 30 character maximum may be selected in system programming. The standard format is 80 characters on a single line. A 30 character format generates 3 lines per message. If the SMDR feature is enabled, the system starts collecting information about the call as soon as it starts and terminates when the call ends. If the call was longer then 30 seconds, the following information is printed:

30 character format selected:

```
          1         2         3
123456789012345678901234567890
AAAA BBB HH:MM:SS HH:MM MM/DD/YY(CR)(LF)
HCCCCCCCCCCCCCCCCCCCCCCCCCCCC<R>GGGGGGGGGGGG
STA  CO  TOTAL  START  DATE
1116 008 00:02:00 14:13 08/28/00(CR)(LF)
012345678901234567890123(CR)(LF)
123456789012(CR)(LF)
```

80 character format selected:

```
          1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
AAAA BBB HH:MM:SS HH:MM MM/DD/YY HCCCCCCCCCCCCCCCCCCCCCCCCCCCC GGGGGGGGGGGG(CR)(LF)
STA  CO TOTAL   START  DATE  DIALED              ACCOUNT CODE<_><_>COST
1116 008 00:02:00 14:13 08/28/00 O12345678901234567890123 123456789012(CR)(LF)
```

80 character format with Call Cost Display feature enabled:

```
          1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
AAAA BBB HH:MM:SS HH:MM MM/DD/YY HCCCCCCCCCCCCCCCCCCCCCCCCCCCC GGGGGGGGGGGG(CR)(LF)
STA  CO TOTAL   START  DATE  DIALED              ACCOUNT CODE<~><~>COST
1116 008 00:02:00 14:13 08/28/00 O12345678901234567890123 123456789012<_>000.00(CR)(LF)
```

80 character format for DISA Calls:

```
          1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
AAAA  BBB HH:MM:SS HH:MM MM/DD/YY HCCCCCCCCCCCCCCCCCCCCCCCCCCCC GGGGGGGGGGGG (CR)(LF)
STA CO TOTAL   START  DATE  DIALED              ACCOUNT CODE<~><~>COST
1116 001 00:02:00 14:13 08/28/00 I                123456789012<_>000.00(CR)(LF)
001    004 00:04:54  14:15 08/28/00 I012345678901234567890123456          -continued on next page-
```

Figure 3-38: SMDR Printout

```
ICLID 30 character format selected:
          1         2         3
1234567890123456789012345678 90
STA  CO  TOTAL  START  DATE
1000 001 00:00:19 09:32 08/28/00(CR)(LF)
O  480-443-6000(CR)(LF)
123456789012    **(CR)(LF)
ICLID 80 character format selected:
          1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
STA  CO  TOTAL  START  DATE  DIALED          ACCOUNT CODE<_><_>COST
1000 001 00:00:36 04:37 08/28/00 1-480-443-6000              **(CR)(LF)
 **VODAVI          (CR)(LF)
  01 00:00:00 04:38 08/28/00 U1-480-443-6000              **
 **VODAVI          (CR)(LF)
```

- AAAA = Station originator or Trunk on DISA and Off-Net (CO Line) calls.
- BBB = Outside line number
- HH:MM:SS = Duration of call in Hours, Minutes and Seconds
- HH:MM = Time of day (start time) in Hours and Minutes
- MM/DD/YY = Date of Call
- H = Indicates call type:
  - "I" = Incoming*
  - "O" = Outgoing
  - "T" = Transferred*
  - "U" = Unanswered calls for ICLID SMDR call records
- CC...CC = Number dialed
- GG...GG = Last Account code entered (optional)
- (CR) = Carriage return
- (LF) = Line Feed

Figure 3-36: SMDR Printout

4 System Check-Out

Prior to actual power up and initialization, the *Triad 1/2/3* Digital Key Telephone Systems should be checked over to avoid start up delays or improper loading. A step-by-step checklist is provided for this purpose.

Preliminary Procedures

1. Make sure that the Basic Key Service Unit (BKSU) is properly grounded.
2. Verify that all PCBs are firmly plugged into the correct card slot positions or expander modules are firmly seated onto their connectors.
3. Inspect the MDF for shorted wiring and improper polarity that would affect the Digital Terminal or DSS console.
4. Make certain that the lithium battery switch on the Master Processor Board (MPB) is set to the ON position to enable Battery Backup option.
5. Make sure that the plug-ended MDF cables connected to the KSU are secure and are plugged into the correct position.

Power Up Sequence

The power up sequence involves the proper application of AC power to the System, and MPB LEDs. A successful power up is assured if the installation checklist has been followed.

1. Plug the AC power cord of the Key Service Unit into the dedicated 117 Vac outlet.
2. Turn the power switch of the KSU to ON.
3. The MPB has eight red LEDs located on the front of the card. If the power up is successful, LEDs 1, 2, 5 and 8 will be flickering.
4. Press the reset button on the MPB. The above LED indications will repeat. Initialization may be required prior to programming.
5. The system is ready for programming. If any problems have occurred, Refer to *Maintenance and Troubleshooting* chapter.

Table 4-1: Power Supply Tests

Voltage Designation	Voltage Reading	Test Point Location
117 Vac	+117 Vac, ±10%	Commercial Power Source

Note: The power supply is preset at the time of manufacturing, but should be checked at system initialization with a digital voltmeter having an accuracy of ±1%

Table 4-2: *Triad 3* DCCU Test Points

Voltage Designation	Voltage Reading	Test Point Location
+5V dc	±5%	Front Panel
-5V dc	±5%	

5 Maintenance and Troubleshooting

This chapter is provided as a guideline in isolating and resolving functional problems that may be encountered as a result of improper use or component failure of the *Triad 1/2/3* Systems. Other failures, such as no dial tone from the central office, must also be considered as an overall troubleshooting procedure.

System Programming and Verification

System operation should be verified as per the programmed customer database once all customer database programming has been completed. A hard copy of the customer database can be printed from the system and should be kept on-site and up to date for future reference.

*System must be initialized **before** customer database is programmed.*

The *Triad 1/2/3* Systems are highly featured digital switches and as such, feature activation can sometimes be mistaken for improper operation. First, verify all programmable features are enabled for the phone or function in question. Then compare the suspected improper operation with the feature operation description to determine which feature is causing conflict. Be aware that some features can **override** others and take precedence in operational priority. Then make the necessary programming changes in customer database programming to acquire the desired operation.

If feature operation is not the cause of the suspected problem, then general troubleshooting procedures should be employed. A basic guideline for determining the cause of a reported problem are as follows:

1. Verify that system programming is correct and that the suspected feature, circuit or function has been enabled in programming.
2. Check the unit on another circuit, if possible, and verify that it is functioning.
3. Check the installation cabling/wiring and connectors for cuts, shorts or loose connections.
4. Check the system interface circuit by substituting a known good circuit. Verify the Service/Normal switch on the printed circuit board is in the *NORMAL* position.

   By verifying correct operation for each segment of the installation and system, the source of the problem is isolated and can be identified and resolved.

Telephone and Terminal Troubleshooting

This section discusses general functions on a variety of key telephones and terminals available for use on the system. It is assumed that basic troubleshooting skills in the identification and resolution of basic problems are already possessed (e.g. static/noise heard on conversation, one phone only; Replace worn handset cord).

Keyset Self Test

The *Triad 1/2/3* Systems contain a test mode feature that supports the off-line testing of digital keysets and DSS units. The term off-line means that the unit under test is disconnected from the switch during the test operation. Keysets not under test continue to operate in the normal manner. Tests are provided to verify the keyset and DSS LED, LCD, and keyboard button operations.

1. Enter the test mode by taking a keyset's handset off hook.
2. Press the SPEED button and dial [7#] on the dial pad. This disconnects the keyset from the system and brings up the Test Mode Menu on the keyset's LCD.
3. Exit the test mode by putting the handset back on hook. This reconnects the keyset to the system.

Test Mode Menu – The menu allows the operator to select a test mode by pressing the mode number at the dial pad. The operator can always return to the main test menu by pressing [##].

Keyset LCD/LED Test

This test outputs a series of continuously repeated LCD string messages to LCD lines 1 and 2. The set of strings consists of the letters **A** through **X** and **a** through **x**. The next set of strings are:

```
"PICKUP TRUCK SPEED ZONE!"
"*** STANDING BACK ***"
```

The strings are alternately displayed on lines 1 and 2 of the LCD display.

Keyset Button Test

1. Press a keyset button to turn on the LED and display an LCD message identifying the button number.

```
PRESS KEYSET BUTTONS
DIGIT 1                    <--------
```

   Each time the selected button is pressed it sequences through the table of flash rates available.

Table 5-1: Flash Rates

Button	ipm	Type
01	On	Steady
02	30	Flash
03	60	Flash
04	60	Double Wink
05	240	Flash
06	240	Flutter
07	480	Flash
08	480	Flutter
09	15	Flash
10	120	Flash
11	120	Flutter
12	30	Double Flash
13	480	Double Wink
14	480	Double Flash

2. Press the dial pad keys to display an LCD message that indicates which digit was pressed.

   Depressing the H-T-P switch from one position to another displays one the following words: H_POS, T_POS, or P_POS.
3. Test LEDs independently of the Keys by pressing the flex LED button.

DSS LED/Button Test

When the DSS test is selected and a DSS test is invoked, ALL DSS units associated with the keyset are placed in the test mode.

If no DSS unit is associated with the keyset, the keyset display indicates NO DSS. The DSS LED test causes all the LEDs to light steady. All LEDs remain lit steady until a DSS flex button is depressed. Pressing a DSS button turns on the DSS button LED and displays an LCD message on the associated keyset identifying the DSS button number (01 to 48). In addition, it turns off the previously selected flex LED.

Conditions

Test mode interrupts the normal operation of a keyset or DSS.

Key Telephones/Terminals

The following actions apply to multi-line key telephones:

Table 5-2: Key Telephones/Terminals

Function	Fault Options
No Power to Keyset	Verify that keyset is connected to correct type of station card (digital or electronic.
No Handsfree Answer-back on intercom	On digital keysets, the mode of intercom answer is programmable.
	On electronic keysets, make sure the intercom mode switch is in the HF position.
CO Line/Station Button won't access CO Line/Station	Check Flexible button programming for that button.
Speakerphone doesn't work	Check station programming for speakerphone allowed.
	Verify phone is a speakerphone model.
Can not call another intercom station	Check programming for intercom access.
No Camp-On signals or Override to phone	Check station programming for Override enable
Station response to wrong intercom number	(adjacent circuit number only, e.g. 110 & 111) Data pair of wires are reversed on electronic keysets (ETIB), or DSS.
	Check programming for assigned intercom number

Single Line Telephones

The following applies to all 2500-type single line telephones connected to the system

Table 5-3: Single Line Telephones

Function	Fault Options
Phone Doesn't Dial Out	Verify correct SLT type programmed (Pulse or DTMF) in Station Identification.
	Verify MISU board is installed and operational in the system (DTMF only). Make sure DTMF Receivers are installed on the MISU (26 maximum on *Triad 3*. On the *Triad 1/2* must have DTRU boards on each SLIB, LCOB, etc.
No Ringing to Phone	Ensure a Ring Generator Unit (RGU) has been installed in cabinet servicing that phone.
	Check CO Line Ringing Assignments in programming.
Message Waiting Lamp Does Not Work	Check Station ID assignment in programming.
	Make sure a Ring Generator Unit (RGU) has been installed in cabinet (KSU) servicing that phone.

DSS/DLS Console

The following applies to DSS/DLS Consoles:

Table 5-4: DSS/DLS Console

Function	Fault Options
Buttons on DSS/DLS do not function as labeled	Check Station Identification assignment in programming for correct DSS Map assignment.
Pressing buttons on DSS does not activate keyset	DSS must be assigned to keyset in Station ID programming
No Power	Verify unit is connected to the correct type of station board (digital or electronic).

CO Line Card Functions

The system can be equipped with various types of line interface cards. Verify each card type and its location in the KSU (Line Number).

Table 5-5: CO Line Loop Start Interface Board (LCOB)

Function	Fault Options
To provide the Loop Start Line interface from the Public Telephone Network, recognize ringing, and provide Loop Start flash. *Triad 1/2* Systems = 6 Loop Start circuits *Triad 3* System = 8 Loop Start circuits	6 or 8 Loop Start CO lines on the system are not working.
	CO Line(s) are not ringing. (Check CO Line Ring Assignment in programming.
	Noise or Crosstalk on the line. (CO Line checks fine at demarcation point with system isolated)
	CO Flash not working.

Table 5-6: CO Line Ground Start Interface Board (GCOB) (*Triad 3* only)

Function	Fault Options
To provide the Ground Start Line interface from the Public Telephone Network, recognize ringing, and provide Ground Start flash. *Triad 3* System = 8 Ground Start circuits	8 Ground Start CO lines on the system are not working.
	CO Line(s) are not ringing. (Check CO Line Ring Assignment in programming.
	Noise or Crosstalk on the line. (CO Line checks fine at demarcation point with system isolated)
	CO Flash not working.

Table 5-7: Direct Inward Dial Interface Board (DIDB)

Function	Fault Options
To provide the Direct Inward Dial Line interface from the local Central Office (or a PBX) and line polarity control for answer supervision. *Triad 1/2* Systems = 4 DID circuits *Triad 3* System = 8 DID circuits	4/8 DID lines on the system are not working.
	DID Line won't provide programmed station ringing. (Also check MISU DTMF receivers and DID digits conversion programming. Check DTMF Receiver on LCOB, DIDB, GCOB, SLIB.
	Noise or Crosstalk on the line. (CO Line checks fine at demarcation point with system isolated)

Table 5-8: PRIB Switches

SW5 of Triad 3 PRIB	
Switch 1	Provides ISDN layer 1 trace info to be supplied out RS-232
Switch 2	Provides ISDN layer 2 trace info to be supplied out RS-232
Switch 3	Provides ISDN layer 3 trace info to be supplied out RS-232
Switch 4	Not currently used
NOTE: SW5 switches should normally be set to OFF. They are used by the manufacturer for debug purposes.	

System Functions

The following functions are related to system resources and the common equipment boards controlling them.

Table 5-9: Master Processor Board (MPB)

Function	Fault Options
Provides system central processing function, real time clock, digital (PCM) voice processing and gain control, feature control, customer database, system tone generation and conference functions.	Complete system failure.
	Any correctly activated feature not working properly.
	SMDR and display phone time-of-day incorrect.
	Loss of system intercom dial tone and call processing tones.
	Loss of customer database programming. (Verify status of initialization switch and database backup battery connection)
	SMDR RS232C Port inoperative.
	Modem Port (or 2nd RS-232C port) inoperative. (Verify Modem Unit, MODU, is installed and programming is correct.
	Can not program customer database. (Verify status of database access switch)

Table 5-10: Memory Expansion Module Unit (MEMU) (*Triad 3* only)

Function	Fault Options
Provides additional customer database memory for expanded system features such as expanded Speed Dial number access. Required when capacity exceeds 48 CO Lines and 96 Stations.	Unable to access or use features utilizing expanded memory.

Table 5-11: Modem Unit (MODU)

Function	Fault Options
Provides an asynchronous modem for access to the system database and fault reporting features from a remote site. Provides an RS232 port for local access.	Can not access system database programming remotely. (Also check Modem programming)
	Second RS-232C port inoperative (Check Modem Bypass programming).

Table 5-12: Program Module Unit (PMU)

Function	Fault Options
Provides the system operating software.	The system does not operate without this component.

Table 5-13: Power Supply Unit (PSU)

Function	Fault Options
Provides Direct Current power to the system in the form of -48VDC, +30VDC, +5VDC, and -5VDC. LEDs on the Power Supply Unit (PSU) in each cabinet show presence of each voltage type. Provides connections for batteries and charging current for batteries (optional).	System does not operate (Loss of +5VDC). Also check +5VDC tolerance on PSU.
	Analog phones and CO Line do not operate (Loss of -5VDC).
	DID Lines do not operate (Loss of -48VDC).
	Battery Back-up for system not working. (Also press Battery Restart switch on PSU)

Table 5-14: Miscellaneous Interface Board (MISU)

Function	Fault Options
Provides external paging, external contact control, internal (synthesized) music on hold, music on hold and background music inputs, and DTMF receiver functions (*Triad 3* Only).	One or both external paging ports do not work.
	Some or none of the 4/6 external control contacts do not operate.
	Music on hold is not heard (Also check music source and music volume control on MISU).
	Background music is not heard (Also check music source and background music volume control on MISU).
	DTMF single line telephones can not dial.
	DISA calls can't dial system resources after call connection.
	DID Lines won't ring intended station(s). Also check DID programming.
	SIU for functioning properly on *Triad 1/2* Systems

Table 5-15: DTMF Receiver Unit (DTRU, DTMF-A, DTMF-B)

Function	Fault Options
Provides DTMF Receiver functions.	DTMF Single Line telephones can not dial out.
	DISA calls can't dial system resources after call connection.
	DID Lines won't ring intended station(s). Also check DID programming.

Miscellaneous Functions

The following functions are related to other system functions:

Table 5-16: Ring Generator Unit (RGU)

Function	Fault Options
Provides ringing voltages of 24VDC and 48VDC, and message waiting lamp voltage signaling for single line telephones. Each cabinet (Basic & Expansion) supporting SLTs must have an RGU installed.	Single line Telephones do not ring when called on intercom.
	Message Waiting signal to single line telephones with a message waiting lamp does not light the lamp. (Verify correct SLT type programmed, SLT with Msg Lamp, in Station ID programming.

Table 5-17: Power Failure Transfer Unit (PFTU)

Function	Fault Options
Provides automatic cut-over of up to 6 central office lines to up to 6 single line telephones when system power or the central processor fails.	Central office lines connected through the PFTU never available to the system in normal operation. Check the NORMAL/TEST switch on the PFTU. Make sure it is in the Normal position.

Station Card Functions

The system can be equipped with various types of station interface cards. Verify each card type and its location in the KSU (Line Number).

Table 5-18: Digital Key Terminal Interface Board (DTIB)

Function	Fault Options
Provides the interface for twelve (12) Digital Terminals, DSS/DLS Consoles.	Unable to receive intercom dial tone.
	Port transmission characteristics.
	Key telephone set inoperative.
	Key telephone unable to invoke features.
	No LED indications.

Table 5-19: Single Line Interface Board (SLIB) w/MSGU

Function	Fault Options
Provides the interface for Single Line Telephones. *Triad 1/2* System = 6 SLTs *Triad 3* System = 12 SLTs	SLT can't receive dial tone.
	Poor transmission characteristics.
Also provides for SLTs with/without M/W lights.	No Message Wait lights, MSGU inoperative.

Remote Maintenance

Overview

The Remote Maintenance feature allows authorized personnel to survey system and slot configuration information. This can be done through a modem or data terminal connected via the RS-232C port on the MPB, SIU or SIU2 Module. The commands are entered from a keyboard and are limited to those listed.

Overview of Maintenance Commands

There are four basic commands available in the Remote Maintenance feature. All commands begin with a single character, followed by a space, another character and an optional digit or digits. All commands are terminated with the <r> key.

Maintenance Password

The Remote Maintenance feature, like Remote Programming, is entered via a six-character alphanumeric string. The password prompt is given by depressing the <r> key at the device connected to the SIU or SIU2 Module port. After the prompt is printed out, the password should be entered followed by the <r> key. Proper entry of the password results in the maintenance prompt. The Remote Maintenance password is: `{CONFIG}`

Exit Maintenance

The Exit command terminates the current Remote Maintenance feature session. The Exit command format is: `maint>x`

```
maint>?
command list:
 c       - clear log error trace
 d s[nn] - dump system or slot configuration data
           [nn] specifies an optional slot number parameter
           no parameter indicates that the entire system will be dumped
           examples:
                     maint>d s    (dumps entire system configuration)
                     maint>d s2   (dumps slot 2 configuration, etc.)
 d b     (dumps busy device.)
 d e     (dumps event trace.)
 d p     (dumps pp que error counts.)
 r cxxx  (reset coline)
 r kxx   (reset cab/slot)
 r sxxx  (reset station)
 d r     (dumps RCVR configuration.)
 d r01   (toggle RCVR 01 stat & dumps configuration)
 f p     (flush pp que error counts)
 t0..4   - set trace (off,soft start,cold start,soft/cold start,error
log
 x       - exit maint
 ?       - help menu
maint>x
```

Figure 5-1: Maintenance Help Menu

System Configuration

Figure 5-2: is a configuration of the *Triad 1/2/3* Systems displays what is printed when:

The installer types **d<space>s** at the `maint>` prompt.

```
maint>d s
   SLOT        BRD TYPE      SERV STAT     BRD OPTS     FW VER.
 ---------    ----------    -----------  ----------   ---------
     00           DT24          INS             0         00-0
     01           SLIB          OOS             0          -0
     02           LCOB          OOS             0          -0
```

Figure 5-2: Remote System Configuration

Where:

Column 1 lists the card slot.

Column 2 lists card type of that card slot.

Column 3 lists the firmware version of the card.

Column 4 lists card type and if that card is installed.

Column 5 lists card options.

Column 6 lists card status:

OOS status can indicate the entire card is out of service or a specific station is not installed or installed but not operational.

INS status can indicate a specific station is installed and operating correctly.

Station Configuration

Figure 5-3 illustrates a representation of what is printed out for slot one when a SLIB is installed in that slot and:

The installer types **d<space>s1** at the `maint>` prompt.

```
maint>d s1
   SLOT        BRD TYPE      SERV STAT     BRD OPTS     FW VER.
 ---------    ----------    -----------  ----------   ---------
     01           SLIB          OOS             0          -0

   STA
 FLEX-FIX      TYPE           STATUS      LCD    STATE
 --------    --------       ----------   -----  -----
  124-124   SP 24BTN           OOS         N     KEY_ID_UN
  125-125   SP 24BTN           OOS         N     KEY_ID_UN
  126-126   SP 24BTN           OOS         N     KEY_ID_UN
  127-127   SP 24BTN           OOS         N     KEY_ID_UN
  128-128   SP 24BTN           OOS         N     KEY_ID_UN
  129-129   SP 24BTN           OOS         N     KEY_ID_UN

maint>
```

Figure 5-3: Station Configuration

Column	Indicates:
1	Station Number
2	Station Type (keyset, DSS, SLT) Keyset - ID 0 = Key station DXX 1 = DSS Map 1 DXX 2 = DSS Map 2 DXX 3 = DSS Map 3 DXX 4 = DSS Map 4 DXX 5 = DSS Map 5 SLT - ID 6 = SLT SLT w/Lamp - ID 7 = SLT w/Message Waiting
3	Status: □ **OOS** status can indicate the entire card is out of service; a specific station is not installed; or installed but not operational. □ **INS** status can indicate a specific station is installed and operating correctly.
4	Whether or not the station has an LCD Display
5	State of the device

CO Line Configuration

Figure 5-4 illustrates a representation of what is printed out for slot two when a LCOB is installed in that slot and:

The installer types **d<space>s2** at the `maint>` prompt.

```
maint>d s2
   SLOT        BRD TYPE      SERV STAT     BRD OPTS     FW VER.
 ---------    ----------    -----------  ----------   ---------
     02           LCOB          OOS             0          -0

  CO            STATUS          PULSE/DTMF   CO/PBX  STATE
 ---   ----------------------   ----------   ------  -----
   1   OOS, Bothway  Enabled        DTMF       CO    WAIT_IDLE
   2   OOS, Bothway  Enabled        DTMF       CO    WAIT_IDLE
   3   OOS, Bothway  Enabled        DTMF       CO    WAIT_IDLE
   4   OOS, Bothway  Enabled        DTMF       CO    WAIT_IDLE
   5   OOS, Bothway  Enabled        DTMF       CO    WAIT_IDLE
   6   OOS, Bothway  Enabled        DTMF       CO    WAIT_IDLE


maint>x
```

Figure 5-4: CO Line Configuration

Column	Indicates:
1	CO Line Number
2	Status: □ **OOS** status can indicate the entire card is **o**ut **o**f **s**ervice. □ **INS** status can indicate a board station is **in-s**ervice and operating correctly. Incoming = Incoming CO line calls are allowed Outgoing = Outgoing CO line calls are allowed Bothway = Both incoming and outgoing CO line calls are allowed For example, Outgoing Enabled indicates the CO line is active in the system. Outgoing Disabled indicates that the Attendant has disabled the CO line for outgoing access.
3	Whether CO Line is Pulse or DTMF (programmable option)
4	Whether CO Line is a CO Line or a PBX Line (programmable option)
5	CO line State

Event Trace Buffer

The Event Trace Buffer is used to store and dump event traces (up to 30) that occur just prior to a *Triad 1/2/3* System soft or hard restart. These can then be reviewed by authorized personnel to aid in system troubleshooting. The basic format for the commands are:

Table 5-20: Event Trace Buffer Commands

Command	Function
t<space><return>	Displays the current status of the Event trace buffer.
t<space>0<return>	Turns the Trace buffer OFF.
t<space>1<return>	Turns the Trace buffer ON to record events prior to a soft system reset.
t<space>2<return>	Turns the Trace buffer ON to record events prior to a hard system restart.
t<space>3<return>	Turns the Trace buffer ON to record events prior to either a soft reset or a hard system restart.
d<space>e<return>	Dumps Trace Events stored from last system reset (soft or hard).
d<space>b<return>	Permits maintenance personnel to determine the busy status of all the busy keysets and CO Lines in the system, including the T1 lines.
r<space>sXXX<return>	Permits a specific station to be reset.
r<space>cXXX<return>	Permits a specific CO Line to be reset.

Press the Esc key to abort the Data Dump and return to the `maint>` *prompt.*

DTMF Receiver Trace

The CONFIG utility to allow technicians to take specific DTMF receivers in/out of service. This is useful for troubleshooting DTMF receiver problems to isolate a specific DTMF receiver that may be faulty.

Connect a terminal to the I/O port 1 on the MPB. At the ENTER PASSWORD prompt type CONFIG and press ENTER.

The basic format for the commands is:

d<space>r<return> - To display the status of all DTMF receivers in the system. The display shows the receiver number, cabinet location, card slot location, receiver status, and state of the receiver.

Making a Receiver Busy:

d<space>rXX<return> - Where XX is the specific receiver number to make busy.

Making a Receiver Available:

d<space>rXX<return> - Where XX is the specific receiver number to make available.

Remote System Monitor

Overview

The Remote Monitor feature provides remote access to the installed system for diagnostic purposes. These capabilities benefit Service personnel enabling them to support the end user remotely. Different levels of access, via password, allows authorized personnel to trace, monitor and upload critical information directly from the *Triad 1/2/3* Systems. This provides a more accurate means of acquiring system information that leads to a quick resolution of problems that may occur. This is all done without interfering with ongoing call processing or normal system operation, and in many cases may be performed without a site visit. The built-in 2400 baud modem is used for remote access.

Capabilities allowed and reserved for this *high-level troubleshooting* are:

- Monitor Mode
- Enable & Disable Event Trace
- Dump Trace Buffer (up-load)

Monitor Password

The Remote Monitor feature, like Remote Maintenance, is entered via a six-character alphanumeric string. The password prompt is given by pressing the <r> key at the device connected to the SIU or SIU2 Module. After the prompt is printed out, the password should be entered followed by the <r> key. Proper entry of the password results in the `mon>` prompt. The Remote Maintenance password is: `{ETRACE}`

The remote monitor feature is intended for use only under the guidance and instruction by authorized personnel from VODAVI Technical Support. Care and caution must be observed when using this feature as permanent damage to the software structure can occur.

Help Menu (?)

A convenient on screen Help Menu is provided by typing [?], then pressing the <r> key. The following displays:

```
    Digital Hybrid Key-System
Eng. Ver. 3.0I-FFFF DATE: 03/05/01  TIME: 16:14:35
ENTER PASSWORD:
mon>?
command list:
 ?         - help menu
 a board   - board-cmd slot,cmd,data1,data2
 b rate    - set baud rate
 c [c]     - dump co data
 d [a][a]  - dump memory
 e [s]     - dump prot sta data
 f         - flush minor alarm log
 g [s]     - dump local sta data
 h         - hdlc status report
 k         - key-cmd sta,cmd,data1...data17
 l         - display minor alarm log
 m add     - modify memory
 n         - display stack trace
 p         - Send Sta Event (Sta Event Data1 Data2)
 q         - Send Sta Event (Sta Event Data1 Data2) & exit monitor
 s [s]     - dump sta data
 t [d]     - set trace key
 x         - exit monitor
mon>x
```

Figure 5-5: Help Menu

Dump Memory Data

Three options allow the memory structure to be ***dumped*** for viewing. The three options are entered as follows:

c [c] – Dump CO Line memory structure

s [s] – Dump Station memory structure

d [a] [a] – Dump a memory address structure

The data obtained from these commands is in hexadecimal format and is used primarily for manufacturer- level support.

Press the Esc key to abort the Data Dump and returns to the `mon>` *prompt.*

Event Trace Mode

The t command enables and disables the *Triad 1/2/3* Systems' Trace mode. While the trace mode is enabled events for the trace desired is displayed on the monitor, printer or PC connected to the *Triad 1/2/3* Systems in an event record. To view the current status of the trace mode type **[t]**<return> at the `mon>` prompt, the following displays:

```
    Digital Hybrid Key-System
Eng. Ver. 3.0I-FFFF DATE: 03/07/01  TIME: 08:17:05
ENTER PASSWORD:
mon>t

Cmd   Messages     Y/N
---   --------     ---
 B - BOARD EVT  -> N
 C - COL States -> N
 D - Dev PP Cmd -> N
 E - Error Msg  -> N
 H - H/W States -> Y
 I - CTI PP Msg -> N
 K - LCD PP Cmd -> N
 L - LED PP Cmd -> N
 M - MSC States -> N
 P - PCM        -> N
 Q - Que Evt    -> N
 S - Stn States -> N

mon>
```

Figure 5-6: Trace Mode Status

1. To enable an Event Trace, type **t<space>** (space bar).
2. Then type of trace desired [d], where **d** is determined as follows:

   B = Board event trace (traces events associated with PCBs)

   M = Miscellaneous State event trace

   P = Pulse Coded Modulation (PCM) traces events associated with voice communications

   C = CO Line (LCOB) States (traces events associated with CO Line activity)

   S = Station (STA) States (traces events associated with Station activity)

   E = Error Messages (traces error messages)

   Q = Queue (QUE) Events (traces queuing events, e.g.: DTMF receiver, UCD, LCR, etc.)

   D = Device Command (traces commands to peripheral devices).
3. Then enter the specific board, CO line or Station number of the trace desired or type **all**, if all board's, CO line's or Station's events are desired.

   1–31 = Board KSU card slot position (CPU = 1)

   001-144 = CO Line port

   100-351 = Station location

   All = All Boards, CO lines or Stations

4. Then press <r> to enable the trace. A similar screen displays:

```
mon>t b

Cmd    Messages      Y/N
---    --------      ---
 B - BOARD EVT   -> Y
 C - COL States  -> N
 D - Dev PP Cmd  -> N
 E - Error Msg   -> N
 H - H/W States  -> Y
 I - CTI PP Msg  -> N
 K - LCD PP Cmd  -> N
 L - LED PP Cmd  -> N
 M - MSC States  -> N
 P - PCM         -> N
 Q - Que Evt     -> N
 S - Stn States  -> N

mon>
```

Figure 5-7: Enable Event Trace

5. To disable or turn off a particular trace mode, DO NOT ENTER a specific board, CO Line, or Station Number (i.e., **`t<space>s<return>`** to disable station event trace).
6. To have event traces displayed on the screen, you must first exit the MONitor mode by typing **`x`** at the `mon>` prompt. After you exit the event(s), the trace begins as shown in *Figure 5-8*.

Unless instructed by personnel at VODAVI Technical Support, do not leave the trace mode enabled for extended periods of time. The system dumps the requested event(s) trace which may use up paper or fill memory buffers on the collecting device. It is recommended that the trace events be disabled (turned off) for all event(s) traces before leaving the system site.

Modify Memory Command

The Modify Memory Command is for Engineering Use only.

Use of this command can alter or damage the Triad 1/2/3 System's operating database, which can result in system malfunction. If this occurs it is necessary to power the system down and re-initialize the database, then completely reprogram the customer programming data.

Baud Rate Command

The Baud Rate command provides a convenient means for changing the baud rate, for the RS-232C port located on the Master Processor Board (MPB), while in the Monitor mode. To change the baud rate type [B] plus the desired baud rate, then the enter key.

After changing the Baud Rate via Baud Rate command, you must change your Baud Rate on your Receiver/Terminal.

Exit the Monitor Mode

The Exit command terminates the current Remote Monitor enable/disable session. If Event(s) Trace have been or are still enabled, the event records are displayed only after exiting the MONitor mode. The Exit command format is: `mon> x`

Unless instructed by personnel at VODAVI Technical Support, do not leave the trace mode enabled for extended periods of time. The system dumps the requested event(s) trace which may use up paper or fill memory buffers on the collecting device. It is recommended that the event traces be disabled (turned off) for all event(s) before leaving the system site.

```
Sta 100: State= DIAL_TONE, Evt= Dial Pad (25), Data=7
Sta 100: State= DIALING, Evt= Dial Pad (25), Data=5
Sta 100: State= DIALING, Evt= Int Page (69), Data=8
Sta 100: State= PAGING, Evt= Dial Pad (25), Data=3
Sta 100: State= PAGING, Evt= Dial Pad (25), Data=9
Sta 100: State= PAGING, Evt= Dial Pad (25), Data=5
Sta 100: State= PAGING, Evt= Dial Pad (25), Data=8
Sta 100: State= PAGING, Evt= Dial Pad (25), Data=7
Sta 100: State= PAGING, Evt= Dial Pad (25), Data=4
Sta 100: State= PAGING, Evt= Dial Pad (25), Data=3
Sta 100: State= PAGING, Evt= Dial Pad (25), Data=9
Sta 100: State= PAGING, Evt= Dial Pad (25), Data=9
Sta 100: State= PAGING, Evt= Dial Pad (25), Data=9
Sta 100: State= PAGING, Evt= Dial Pad (25), Data=7
Sta 100: State= PAGING, Evt= Dial Pad (25), Data=11
Sta 100: State= PAGING, Evt= Dial Pad (25), Data=3
Sta 100: State= PAGING, Evt= Dial Pad (25), Data=2
Sta 100: State= PAGING, Evt= Page T/O (150), Data=0
Sta 100: State= MISC_TONE, Evt= Dial Pad (25), Data=4
Sta 100: State= MISC_TONE, Evt= Dial Pad (25), Data=9
Sta 100: State= MISC_TONE, Evt= Key Data (26), Data=32
Sta 100: State= MISC_TONE, Evt= Mon Key (145), Data=-1
Sta 100: State= MISC_TONE, Evt= On Hook (17), Data=0
```

Figure 5-8: Event Trace

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