2456 32 X 128

INSTALLATION AND FIELD MAINTENANCE MANUAL

Issue 2, March 1985

NOTICE

This 2456/32X128 Installation and Field Maintenance Manual is released by INTER-TEL, Incorporated as a guide for service personnel. It provides the information necessary to properly install, program, operate, and maintain the 2456/32X128 systems.

The contents of this manual reflect current Inter-Tel standards and software version (827.2081-3), which are subject to revision or change without notice. Software packages released after the publication of this manual will be documented in addendums. Refer to earlier issues of this manual for information on earlier versions of software.

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PUBLIC NOTICE

A HEARING-AID COMPATIBLE HANDSET IS AVAILABLE AS AN ACCESSORY OPTION. PLEASE CONTACT YOUR LOCAL FACTORY REPRESENTATIVE FOR MORE INFORMATION.

FCC RULES PROHIBIT THE USE OF THIS TELEPHONE IN THE FOLLOWING LOCATIONS UNLESS IT HAS A HEARING-AID COMPATIBLE HANDSET

- Any public or semi-public location where coin-operated or credit card telephones may be found.
- (2) Elevators, highways, and tunnels (automobile, subway, railroad or pedestrian) where a person with impaired hearing might be isolated in an emergency.
- (3) Places where telephones are specifically installed to alert emergency authorities such as fire, police, or medical assistance personnel.
- (4) Hospital rooms, residential health care facilities, convalescent homes, and prisons. Specifically, where telephones are used for signalling life-threatening or emergency situations if alternative signalling methods are not available.
- (5) Workstations for hearing-impaired personnel.
- (6) In hotel, motel, and apartment lobbies; in stores where telephones are used by patrons to order merchandise; in public transportation terminals where telephones are used to call taxis, reserve lodging, or rent automobiles.
- (7) In hotel and motel rooms. At least ten percent of the rooms must contain hearing-aid compatible telephones, or they must contain jacks for plug-in hearing-aid compatible telephones which will be provided to hearing impaired customers upon request.

FCC REGULATIONS

IMPORTANT:

- Customers connecting this equipment to the telephone network shall, before such connection is made, give notice to the telephone company of the particular line(s) to which such connection is to be made, and shall provide the telephone company with the following information:
 - Complies with Part 68, FCC Rules
 - FCC Registration Number: BE287V-14484-KF-E (2456 System) BE287V-69771-MF-E (32X128 System)
 - Ringer Equivalence Number, 0.9A
 - Type of jack to be ordered from the telephone company, RJ21X

The telephone company should also be given notice upon final disconnection of this equipment from the particular line(s).

It is also the responsibility of the customer to provide the telephone company with registration numbers of any other devices which are configured for connection to the telephone network.

- It is prohibited to make connections to party lines.
- 3. Under certain circumstances the telephone company may temporarily discontinue service and make changes in facilities and services which may affect the operation of this equipment; however, the customer shall be given adequate notice in writing to allow the customer an opportunity to maintain uninterrupted service.
- Users should not make adjustments, repairs or attempt to service this equipment. In the event that a problem originates, contact the local authorized factory service representative.

In the event of trouble with the telephone line(s), this equipment must be disconnected from the telephone line(s). If trouble ceases, the equipment must be repaired by an authorized factory service representative. If the trouble continues to occur with the equipment disconnected, the telephone company should be notified that they have a problem. If this is the case, repairs or adjustments made by the telephone company will be made at their expense.

WARNING:

This equipment generates and uses radio frequency energy and may cause interference to radio and television reception. It has not been tested to show compliance with new PCC Rules (47 CFR Part 15) designed to limit interference to radio and TV reception. Operation of this equipment in a residential area is likely to cause unacceptable interference to radio communication requiring the operator to take whatever steps are necessary to correct the interference. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna
- Relocate the KSU with respect to the receiver
- Check that the KSU and receiver are not on the same circuit; the KSU must be powered from an isolated, dedicated AC outlet.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful:

"How to Identify and Resolve Radio-TV Interference Problems"

This booklet (Stock No. 004-000-00398-5) is available for approximately \$5.00 from the U.S. Government Printing Office, Washington, D.C. 20402

If RFI problems persist, contact Inter-Tel Customer Support Department.

WARRANTY

INTER-TEL, Incorporated warrants its products (except for fuses and lamps) to be free of defects in materials and/or workmanship. This warranty shall extend for a period of one (1) year from the date the product was originally shipped. All shipping costs incurred in connection with warranty work will be paid by the buyer/customer. INTER-TEL's warranty does not apply to products that have been damaged due to and/or subject to improper handling by shipping companies, negligence, accidents, improper use, or alterations not authorized by INTER-TEL, Incorporated.

This warranty is in lieu of and excludes all other warranties, expressed or implied, and in no event shall INTER-TEL, Incorporated be liable for any anticipated profits, incidental or consequential damages, loss of time, or other losses incurred by the buyer/customer in connection with the purchase, operation or use of the product.

OVERVIEW

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INTRODUCTION

- 1.01 The Inter-Tel 2456 and 32X128 systems are unique electronic key telephone systems designed to meet the needs of growing businesses. Modular design makes the system easy to install and service, and the programmable features provide over 100 userfriendly services to meet each customer's needs. Highlights of the system's design include:
 - · Advanced microprocessor technology.
 - Flexible programming to customize many system and station features.
 - Capacity in the 2456 system for 24 Central Office (C.O.) Lines, 56 stations, 8 private intercom channels, and 56 Direct Station Selector/Busy Lamp Field (DSS) Units.
 - Capacity in the 32X128 system for 32 C.O. lines, 128 stations, 8 private intercom channels, and 160 DSS's.
 - Modular, easily replaceable hardware with add-on capability for optional features.

HARDWARE SUMMARY

2.01 The SYSTEM SPECIFICATIONS section of this manual describes the hardware, including the Key Service Unit (KSU), multi-line keysets, Single-Line Electronic (SLE) sets, industry-standard pushbutton (DTMF) 2500 sets, Direct Station Selector/Busy Lamp Field (DSS) Units, system back-up batteries, and other optional equipment.

3. FEATURES SUMMARY

3.01 A list of features appears below. Those marked with an asterisk (*) are programmable options. For detailed descriptions and operating instructions, refer to the FEATURES section of this manual.

SYSTEM FEATURES

- * Station Message Detail Recording (SMDR)
- Flexible Attendant Arrangements (Alternate Point Answering)
- Flexible Night Ringing Arrangement
 - · System Battery Back-up
 - Data Base Battery Back-up
 - Dual-Tone Multi-Frequency (DTMF) or Dial Pulse Signalling
 - Music-On-Hold
 - Call Privacy
- Toll Restriction
- Variable Time-Out Capabilities
- Tenant Service
- Outgoing-Only Rotary Line Group Access
- Alternate Keyset Usage

KEYSET PEATURES

Keyset General Peatures

- 6 Feature Keys
- 24 C.O. Line Keys
- · LED Indications
- · Audible Tone Indications
- Off-Hook Ringing
 - · Immediate Ringing
 - Volume Control
 - · Call Number Buffering
 - ON/OFF Speaker
- Direct Ring-in Line Flexibility
- * C.O. Line Restriction
- Intercom Security Tone

Intercom Features

- Flexible Intercom Numbering
 - Voice Announcing
 - · Handsfree Answering
 - Station-to-Station Calling
 - · Intercom Camp-On, Call Waiting, and Call Splitting
- Executive Call Waiting
 - Busy Station Callback (Queuing)
 - · Consultation Hold
 - Intercom Transfer
- Speed Transfer
- Ring Intercom Always
- Ring Intercom First

Outside Call (C.O.) Features

- Placing and Receiving Outside Calls
- · Direct Line Key Selection
- Busy Line Callback (Queuing)
- * Outside Dial Tone Restore
 - · Line Key Skipping
 - Off-Hook Dialing
 - · Dialing SCC Numbers
 - · Speed Dialing
 - Last Number Redial
 - Calls on Hold
 - · Transferring Outside Calls
 - Off-Premise Transfer
 - Reverse Transfer/Call Pick-up
- Attendant, Hold, and Transfer Recall Times
 - · Conference Calls with Two Inside Parties/One Outside
 - Conference Calls with One Inside Party/Two Outside
 - Call Waiting
 - On-Hook Monitoring/On-Hook Dialing
 - Direct Inward System Access (DISA)
 - Private Line Assignments

Special Station Features

- Call Forwarding
- Preset Call Forwarding
- Do-Not-Disturb
 - · Message Waiting and Message Center
 - Background Music to Stations
- Paging -- All Call, Internal Zone, External Zone, Talkback Speakers
- C.O. Line Monitoring

SINGLE LINE ELECTRONIC (SLE) SET FEATURES

SLE Set General Features

- One Feature Key
- Audible Tone Indications
- Ring Volume Control
- Paging Features

Intercom Features

- Flexible Intercom Numbering
- Station-to-Station Calling
- Intercom Camp-on, Call Waiting, and Call Splitting
- Busy Station Callback (Queuing)

Outside Call (C.O.) Features

- Placing and Receiving Outside Calls
- Calls on Hold
- Outside Call Waiting/Call Splitting
- Call Transfer and Reverse Transfer
- Conference Calls with Two Inside Parties/One Outside
- Busy Line Callback (Queuing)

2500 SET FEATURES

- Audible Signal Indications
- Flexible Intercom Numbering
- Station-to-Station Calling
- Busy Station Callback (Queuing)
- Placing and Receiving Outside Calls
- Busy Line Callback (Queuing)
- Paging Features

ATTENDANT PEATURES (DSS)

- 4 Feature Keys
- Busy Lamp Field for Visual Indications
- Intercom Features
- Call Transfer and Reverse Transfer
- Call Transfer to Hold (Parking)
- Message Waiting Indication
- Night Ring Mode

Features with Capacities	2456 System	32X128 System
Paging		
Internal Zone Page	6 3	6 3
External Zone Page	3	3
Speed Dialing		
Numbers Per Station	10	10
Digits Per Entry	10	10
Night Ring-In Lines	24	24
Simultaneous Three-party		
Conference Calls	4	4 .
C.O. Line and Station Queuing	25	25
Call Waiting		
I.C. Calls Waiting Per Station	1	1
I.C. Calls Initiated Per Station	1	1
C.O. Calls Waiting Per Station	24	32
Toll Restriction		2.0
Allowed Area Codes	20	20
Allowed Long Distance Numbers	2	2
Forbidden C.O. Codes	20	20

4. INSTALLATION AND MAINTENANCE SUMMARY

- 4.01 The INSTALLATION section gives complete instructions on planning and installing the system. The PROGRAMMING section describes how to customize the system's features. Maintenance procedures are covered in the TROUBLESHOOTING and DIAGNOSTIC PROGRAMMING sections. The REPLACEMENT PARTS section lists parts available from Inter-Tel.
- 4.02 The modular design of the system, combined with self-diagnostics, facilitates rapid repair with minimal down-time. In the event of a failure, the defective module should be replaced by the service personnel from their inventory of spare parts.
- 4.03 Strict quality assurance standards for manufacturing and through field testing provide the system with the high degree of reliability demanded by today's high-technology market.

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SYSTEM SPECIFICATIONS

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1. INTRODUCTION

- 1.01 This section describes the system hardware:
 - Station Instruments
 - Direct Station Selector/Busy Lamp Field (DSS) Unit
 - Key Service Unit (KSU)
 - · Cabling and the Main Distribution Frame (MDF)
 - SMDR and Programming Terminal Requirements
 - · System Battery Back-up
 - · Other Optional Equipment
- 1.02 The 2456 system has capacity for 24 Central Office (C.O.) lines, 56 stations, and 56 Direct Station Selector/Busy Lamp Field (DSS) Units. The 32X128 system has capacity for 32 C.O. lines, 128 stations, and 160 DSS's.
- 1.03 Photographs of the keysets, DSS's, and KSU's are located at the end of this section. For installation methods, refer to the INSTALLATION section.

2. STATION INSTRUMENTS

- 2.01 Three types of instruments are available for use on the system: 2480 multi-line keysets, Single-Line Electronic (SLE) sets, and industry-standard pushbutton (DTMF) 2500 sets. Inter-Tel 616 and 1232 keysets also may be used with this system.
- 2.02 The 2480 keysets have a pushbutton keypad, 24 C.O. line keys, six special feature keys, an internal speaker and microphone, and voice volume and ring volume controls. Full-duplex, handsfree answer-back conversation is a standard keyset feature on intercom calls. Keysets have a switch-enabled internal microphone for full-duplex, handsfree operation on outside calls with the optional Speakerphone Kit (part no. 828.1033) and Desk Speaker (part no. 828.1027) added. Refer to pages 2-13 and 2-14 for photographs of the keysets. The FEATURES section provides additional descriptions.
- 2.03 The SLE sets have a pushbutton keypad, a special feature key, and a tone volume control. The advantages of using these sets are discussed in FEATURES.
- 2.04 Industry-standard 2500 sets also can be used on the system. The advantages of using these sets are discussed in FEATURES. When directly connected to the system, a DC ringer must be installed in the set. A PBX-2L low pitch DC ringer is available from most electronic supply companies. In addition, a 2500 set that is physically separate from the system can be made a part of the system. This uses the set's AC ringer and requires the addition of a High Voltage Ringing Adapter (HVRA) and some other customer-supplied hardware. For more information, refer to page 3-20, OFF-PREMISE STATION (OPS) INSTALLATION.
- 2.05 The instrument dimensions and the maximum number of stations and instruments are given below:

2480 Ke	eyset Dimension	SLE Din	ensions
Height Width	3.5 in.	Height	3.5 in.
Depth	7.5 in. 9 in.	Width Depth	7.75 in. 9 in.
Weight	2.5 lbs.	Weight	2 lbs.

	2456 System	32X128 System
Stations	56	128
Station Instruments		
2480 Keysets	56*	80*
SLE Sets	24 *	48*
2500 Sets	24*	48*

^{*}Refer to paragraph 2.06 for combinations of instruments for each system.

2.06 The following table illustrates various ways of combining the three types of station instruments on a given system. Because station printed circuit boards support from one up to eight stations each, the configurations are given in multiples of eight. This table does not represent all of the configurations possible, and is provided as a guide only.

2456 System						32X128 System				
	K	eyset		2500's	1		K	eysets	SLE'S	2500's
	(1)	56	0	0			(1)	80	48	0
	(2)	48	- 8	0			(2)	80	40	8
	(3)	40	16	0			(3)	80	32	16
	(4)	32	24	0			(4)	80	24	24
	(5)	48	0	8			(5)	80	16	32
	(6)	40	0	16			(6)	80	8	40
	(7)	32	Ö	24			(7)	80	0	48
	(8)	40	8	8						
	(9)	32	8	16						
	(10)	32	16	8						

3. DIRECT STATION SELECTOR/BUSY LAMP FIELD (DSS) UNIT

3.01 A Direct Station Selector/Busy Lamp Field is an optional device which, when attached to a multi-line keyset, allows a user to access any station by pressing the corresponding DSS key. The lamps under the DSS keys comprise the busy lamp field, which indicates the condition of each station (idle, busy, in Do-Not-Disturb, transferred call recalling attendant) by different flash rates. Tandem DSS's are required if more than 60 instruments are connected to the system.

3.02 DSS units may be powered from an AC outlet or from the Key Service Unit (KSU) power supply. When AC powered, two DSS's may be connected to every multi-line keyset in the system with an AC transformer (part no. 806.1009) added. When AC power is inaccessible, up to four DSS's may be powered by the KSU (two Station A printed circuit boards can support two DSS's each). KSU and AC powered DSS's may be mixed on the same system. Refer to pages 2-15 and 2-16 for photographs.

3.03 The DSS dimensions and the maximum number of DSS's are given below:

	2456 System	32X128 System	DSS Dimensions
DSS Units per Station DSS Units per System	2	2	Height 3.5 in. Width 7.5 in.
Powered by KSU	4	4	Depth 9 in.
AC powered	56	160	Weight 1.88 lbs.

4. KEY SERVICE UNIT (KSU)

A. KSU DESCRIPTION

- 4.01 The KSU houses the printed circuit boards (PCB's), the cardfile assembly, and the system power supply. It performs all control and switching activities for the system, detects incoming calls, processes data-controlled features, and controls the interaction between stations, C.O. lines, and intercom channels. Refer to pages 2-17 and 2-18 for photographs.
- 4.02 The system is a microprocessor-controlled, time division multiplexed system. Memory includes 32K bytes ROM and 6K bytes RAM on the Central Processing Unit (CPU) PCB. An eight-bit microprocessor located in each multi-line keyset is in constant data communication with the microprocessor on the CPU PCB. Speech channels are divided as follows:

Speech Channels	2456 System	32X128 System
C.O. Lines	24	24
Outgoing-Only C.O. Lines		8
Intercom	8	8
Music-On-Hold	1	1

4.03 The KSU cabinet measures 25.5 inches high X 27 inches wide X 19 inches deep. The 2456 cardfile has 16 PCB slots and the 32X128 cardfile has 27 PCB slots.

B. SYSTEM POWER SUPPLY

- 4.04 The power supply (680.06 for the 2456 and 680.08A for the 32X128) provides power to the KSU, all stations, and up to four DSS units. It requires an isolated, dedicated 105-125VAC, 15A, 57-63Hz, single-phase commercial power source.
- 4.05 The power supply is equipped to charge batteries that will provide back-up power to the system during a power outage or "brown-out" condition. The batteries are optional and are provided by the customer. Refer to page 2-9, SYSTEM BATTERY BACK-UP, for more information.
- 4.06 Maximum power outputs vary between power supplies.

680.06 Power Supply	680.08A Power Supply
+5VDC, 20A (Logic) -12VDC, 0.5A (RS232C) +28VDC, 8A (Keyset) +28VDC battery float voltage, 2A	+5VDC, 40A (Logic) -12VDC, 1A (RS232C) +29VDC, 12A (Keyset) +34.5VDC battery float voltage, 2A

C. ENVIRONMENTAL REQUIREMENTS

Requirements	In Operation	In Storage		
Temperature	32° to 80° F	4° to 185° F		
Humidity (Non-Condensing)	20% to 85%	0% to 85%		
Altitude	Up to 10,000 ft.	Up to 40,000 ft.		

D. CENTRAL OFFICE (C.O.) LINE CHARACTERISTICS

Characteristics:

Loss from TELCO network to C.O. lines	0dB
Ringer Equivalence	0.9A
Ringing Voltage	40VAC RMS minimum

Protection:

360V transient Tip-to-Ring

NOTE: Also refer to page 2-6, Central Office Unit PCB.

E. PRINTED CIRCUIT BOARDS (PCB'S)

4.07 The various printed circuit boards are described below. Photographs of all PCB's appear in the INSTALLATION section.

Central Processing Unit (CPU) PCB

- 4.08 The CPU PCB contains the main controlling microprocessor and its associated control, logic, and memory circuits. It provides the central processor with up to 32K bytes of ROM storage, 6K bytes of RAM storage, an RS232C port, system clocks, Music-On-Hold circuitry, and a battery for data base protection.
- 4.09 The CPU PCB provides central software control for the KSU. It functions under the control of a generic program, stored in the ROM, which is activated when the system is initialized.
- 4.10 The 25-pin subminiature "D" female connector on the front of the CPU PCB is the RS232C interface. It is the connection point for the programming terminal or the Station Message Detail Recording (SMDR) output device. Refer to page 2-9, SMDR AND PRO-GRAMMING TERMINAL REQUIREMENTS, for more information.

- 4.11 The 1/8-inch mini-phone connector on the front edge of the PCB is the input connection for an external music source. Music-on-Hold circuit provides an AGC circuit that automatically holds the volume to a predetermined level that is slightly lower than the normal voice volume, as required by FCC regulations. Optimal input level is IVRMS.
- 4.12 The BATT-OPEN jumper on the PCB is shipped in the OPEN (out of circuit) position to protect the battery. It should be moved to the BATT position during installation to protect the programmed information that is stored in the customer's data base. If the battery is fully charged, the data base will be protected for a maximum of 25 days. Allow two days for the battery to charge when installing the system.
- 4.13 The 300-9600 jumper on the PCB is used to select the baud rate for the RS232C interface.
- 4.14 The ROM-RAM jumper protects the programmed data base. the jumper is in the ROM position, the data base cannot be changed; programming can only be performed with the jumper in the RAM position. Environmental noise effects on the system can be greatly reduced with the jumper in the ROM position.

Central Office Unit (COU) PCB

- 4.15 Each COU PCB has circuitry for four C.O. lines. The 2456 system has capacity for up to 24 two-way lines, or six COU PCB's. The 32X128 system has capacity for 32 lines (eight PCB's), with 24 two-way lines and eight outgoing-only lines in a rotary group. Each COU PCB is configured for DTMF signalling, but some or all of the lines can be converted to dial-pulse signalling using the Rotary Conversion Kit (part no. 828.1032).
- NOTES: (1) On the 2456 system, when System Option 9 is enabled, line 24 is an outgoing-only line for single-line stations and multi-line keysets. Single-line users access line 24 by dialing 9; keyset users press line key 24. When System Option 9 is disabled, line 24 becomes a two-way line for multi-line keysets and single-line stations cannot access outside lines.
 - (2) On the 32X128 system, if System Option 9 is enabled and there is a rotary group of lines, keysets and single-line stations have access to up to nine outgoing-only lines. If System Option 9 is disabled, only single-line stations can access the rotary group of up to eight lines, and line 24 becomes a two-way line for multi-line keysets.
 - (3) When single-line sets are to be used for outgoing C.O. calls, the outgoing-only rotary group of lines (line 24 for 2456 and lines 24-32 for 32X128) must be DTMF lines.

4.16 Each of the four circuits on a COU PCB is assigned a circuit number by the PCB's physical location in the KSU and the location of the circuit on the PCB. The PCB inserted into COU slot 1 is assigned lines 1 to 4 (circuits 1.1 to 1.4), top to bottom. The slot 2 PCB is assigned lines 5 to 8 (circuits 2.1 to 2.4), and so on. The line number to circuit number assignment may not be changed, but the line assignments to line keys on keysets can be revised by the Tenant Service feature. Refer to the FEATURES section for more information on Tenant Service.

Station (STN) PCB'S

- 4.17 Each station PCB has circuitry for up to eight of one type of station instrument. Therefore, instruments must be mixed in multiples of eight on any given system.
- 4.18 Each of the eight circuits on a station PCB is assigned a circuit number by the PCB's physical location in the KSU and the location of the circuit on the PCB. They are assigned intercom numbers by the Initialization (INIT) program and can be changed by the Number Change (NUM) program. Refer to SYSTEM PROGRAMMING.
- 4.19 STN-A PCB's: are required for keysets. As described on page 2-3, two STN-A PCB's may support up to two DSS's each, for a maximum of four STN-A powered DSS's per system. There are two 2A. 125VAC slow-blow fuses on the STN-A PCB to protect the KSU from foreign voltages/currents from the stations connected to the PCB. The fuses may be obtained from electronic supply outlets.
- 4.20 STN-B PCB's: are required for industry-standard pushbutton (DTMF) 2500 sets.
- 4.21 STN-C PCB's: are required for Single-Line Electronic (SLE) sets.

Modem (MOD I and MOD II) PCB'S

- 4.22 The MOD I PCB: provides a 110- or 300-baud modem interface to the CPU PCB for remote system access, and two DTMF decoding circuits for single-line stations. It also provides an interface for Direct Inward System Access (DISA) DTMF signalling. This PCB does not require connection to the MDF.
- 4.23 The DTMF decoding circuits convert the DTMF signals generated by single-line stations to the digital code used by the system. They are in use only for the time it takes to process the number dialed and are not in use for the duration of the call. If a large number of SLE users are dialing at the same time, some users may not get intercom dial tone when going offhook, which indicates that the decoders are processing other calls. The user will get dial tone (within seconds) when a decoder is available.

- 4.24 The MOD II PCB: contains the same circuitry as the MOD I PCB and additional circuitry for:
 - A. Up to three external paging zones, for use in areas such as warehouses, loading docks, or other large areas.
 - B. Up to five talkback speakers (8-100 ohm). Power output for talkback speakers is 500mW.
 - C. One night transfer contact that is activated when the attendant places the system in Night Ring mode. The SPDT relay moves from the "break" to the "make" position and may be used to control lights, alarm systems, or other electronic devices. By enabling System Option 13, the relay is always activated.
 - D. One external night ring relay (SPST) that activates external signalling devices when a call rings in while the system is in Night Ring mode. The relay moves to the "make" position on an incoming C.O. call. The contact follows the normal ringing cycle. With System Option 13 enabled, it is activated day or night.
- 4.25 The MOD II PCB generates a 450Hz night ring tone that is present on the Out 1 and Out 2 pins. This tone can be sent out to the external speakers via the external night ring relay or night transfer contacts. The tone signals incoming calls when the system is in Night Ring mode, or when System Option 13 is enabled. The tone follows a ringing cycle of three seconds on and four seconds off. PCB's with artwork numbered P51026 have an adjustment to vary the night ring tone volume.

Conference (CNF) PCB

4.26 The CNF PCB provides the circuitry for up to four three-way conferences (one inside and two outside parties, and two outside parties and one inside party) and for the DISA feature.

CABLING AND THE MAIN DISTRIBUTION FRAME (MDF)

- 5.01 Connections between incoming C.O. lines, keysets, SLE sets, 2500 sets, and the PCB's in the KSU are made on the MDF. The MDF is made up of industry-standard 66Ml-50-type punch-down terminal blocks.
- 5.02 Three-pair cable serves all types of stations except the 2500 sets, which require one-pair cable. The cables for all keysets, SLE sets, and 2500 sets are terminated on station blocks at the MDF and on six- or four-conductor modular jack assemblies at the stations. Standard 25-pair cable is then used to connect station blocks on the MDF with their corresponding PCB's. Female 25-pair amphenol connectors on the cables plug into the male connectors on the PCB's.

- 5.03 Of the three optional PCB's (MOD I, MOD II, and CNF), only the MOD II PCB requires connection to the MDF. It connects using standard 25-pair cable. A female connector on the cable from the MDF terminal block plugs into the male connector on the PCB. The wiring for the optional external equipment attaches to the other side of the terminal block.
- 5.04 The C.O. lines, as required by FCC regulations, are terminated on telephone company RJ21X blocks. Cross-connect cable is used to connect the RJ21X blocks to the terminal blocks on the MDF. The C.O. lines are then connected to the COU PCB's by standard 25-pair cable. Female 25-pair amphenol connectors on the cable plug into the male connectors on the COU PCB's.
- 5.05 All terminal blocks, cables, connectors, and four- or sixconductor modular jack assemblies are telephone industry standard, and are available from electronic supply outlets.

SMDR AND PROGRAMMING TERMINAL REQUIREMENTS

- 6.01 The following requirements must be met for the SMDR output device or a programming terminal to be connected to the system.
 - A. Both devices must be RS232C compatible and have a male 25-pin subminiature "D" connector.
 - B. Both devices must be formatted for serial ASCII with no parity, and must have full-duplex communications capability.
 - C. Both devices must communicate at 300 or 9600 baud. The terminal, if used for remote programming, must also communicate at 110 or 300 baud. Remote programming requires that the terminal be equipped with a Bell System 103A type modem or equivalent.

7. SYSTEM BATTERY BACK-UP

- 7.01 Customer-provided batteries may be connected to the system to prevent loss of service in the event of a power failure. Inter-Tel recommends Globe Battery's lead calcium grid Type B battery line, based on cost, compatibility with power supply chargers, back-up time, number of batteries required, and availability.
- 7.02 Batteries may be placed in a battery compartment (part no. 823.1075). The compartment measures 12 inches high X 19 inches wide X 9 inches deep. To protect wires coming out of the compartment, use either 1/2-inch electro-mechanical tubing or a HEYCO-type strain relief connector.

- NOTE: Batteries connected in series form a "string." If desired, connect two strings in parallel to double the AH rating, which results in longer discharge rates; the voltage level remains the same.
- 7.03 The 2456 system (680.06 power supply) requires:
 - A. Two Globe #GC12230 batteries (12 volts, 23.0 AH 0 20 hr. rate) connected in series to provide 1 to 3 hours of back-up time. The batteries fit inside one battery compartment.
- Or, B. Two Globe #GC12800 batteries (12 volts, 80.0 AH @ 20 hr. rate) connected in series to provide 5 to 10 hours of back-up time. The batteries fit inside two battery compartments and weigh about 50 pounds each.
- The 32X128 system (680.08A power supply) requires: 7.04
 - A. Five Globe #GC6200 batteries (6 volts, 20.0 AH @ 20 hr. rate) connected in series to provide 1/2 to 1-1/2 hours of back-up time. The batteries fit inside one battery compartment.
- Or, B. Three Globe #GC10800 batteries (10 volts, 80.0 AH @ 20 hr. rate) connected in series to provide 2-1/2 to 7 hours of back-up time. Batteries fit inside three battery compartments and weigh about 50 pounds each.
- 7.05 Batteries must be fully charged when they are installed. Charge batteries individually using a constant-voltage currentlimited charger with less than three percent ripple. The charge voltage must be to 2.3 volts per cell. Be careful not to damage the batteries by overcharging them. New Globe batteries require 25 days of float voltage or 25-30 discharge cycles to attain full capacity. Initial capacity is 80 percent of rated capacity.
- 7.06 All batteries should be of the same age and AH rating. Globe dates batteries by stamping them with a date code. For example: 410-B, where 4=last digit of year, 10=month, and B=type of electrolyte.
- 7.07 If a battery in a string needs to be replaced, the age of the string will determine if a fresh battery can be added. If the string is two to three years old, adding a fresh battery will reduce the life of the entire string. This is because a fresh battery will be overcharged, while the older batteries are undercharged.

- 7.08 These batteries give off explosive and corrosive gas. To reduce the effects of this gas, place the batteries in a well-ventilated room and coat the terminals with an anti-corrosive agent. Do not store batteries; they will self-discharge, and their capacity decreases with age. If you must store batteries, recharge them every six months. Recharge time may vary depending on the current limit of the charger and the battery charge.
- 7.09 If you find it necessary to consider another manufacturer's battery, or require longer system battery back-up time, contact Inter-Tel's Customer Support Department.

OTHER OPTIONAL EQUIPMENT

- 8.01 The following optional equipment is available from Inter-Tel:
 - A. Speakerphone Kit (part no. 828.1033): The module connects to multi-line keysets along with the Desk Speaker (part no. 828.1027) for full-duplex handsfree operation on outside calls.
 - B. PLT-2 Headset Adapter (part no. 828,1031): Connects to multi-line keysets to allow the use of industry-standard carbon-microphone headsets.
 - C. Hearing-Aid Compatible Receiver (part no. 828.1046): Replaces the standard receiver unit for compatibility with inductive pick-up hearing aids. There is no volume adjustment.
 - D. High Voltage Ringing Adapter (part no. 680.73): Allows Off-Premise Stations (2500 sets) to be connected to the system.
 - E. Loud Ringing Adapter (part no. 828.1004): Connects to a multi-line keyset to allow the use of an external ringing device.
- 8.02 Inter-Tel recommends the Walker Amplified Handset (part. no. W6-K-6K) and Handset Amplifier (part no. W10) for hard-of-hearing users who require adjustable volume control. The amplified handset is compatible with all Inter-Tel multi-line keysets; special wiring into the keyset is required. The handset amplifier is compatible with all Inter-Tel sets.

-02

- 8.03 The following customer-provided equipment also may be added to the system. Each item is discussed in another section of the manual.
 - A. External Paging Speakers and Amplifiers Refer to pages 2-8 and 3-17.
 - B. External Ringing Devices Refer to pages 2-8 and 3-17.
- C. External Music Source (radio, tape recorder, etc.) Refer to pages 2-6 and 3-17.

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D. Talkback Speakers - Refer to pages 2-8 and 3-17.

FIGURE 2-1. 2480 PHOENIX KEYSET





PUSHBUTTON KEYPAD



24 C.O. LINE KEYS



6 FEATURE KEYS



VOICE VOLUME CONTROL



RING VOLUME CONTROL



INTERNAL SPEAKER

FIGURE 2-2. 2480 HITEC KEYSET





PUSHBUTTON KEYPAD



24 C.O. LINE KEYS





VOICE VOLUME CONTROL

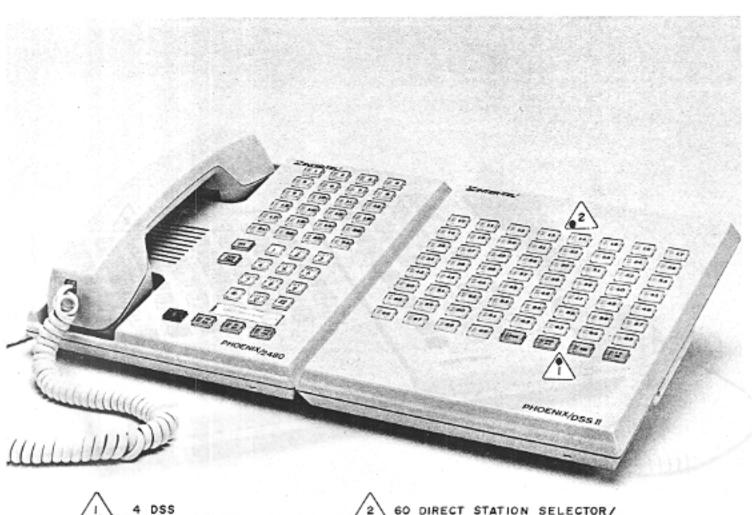


RING VOLUME CONTROL



INTERNAL SPEAKER

FIGURE 2-3. PHOENIX DSS II



FEATURE KEYS

60 DIRECT STATION SELECTOR BUSY LAMP FIELD KEYS

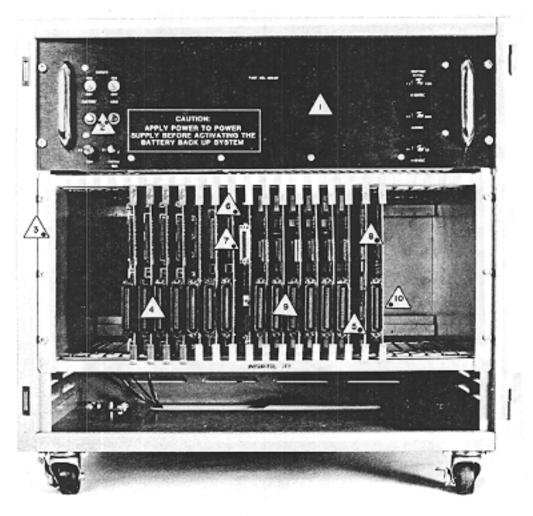
FIGURE 2-4. HITEC DSS II



FEATURE KEYS

60 DIRECT STATION SELECTOR/ BUSY LAMP FIELD KEYS

FIGURE 2-5. 2456 KEY SERVICE UNIT (KSU)





POWER SUPPLY



POWER SUPPLY



CARDFILE



CONNECTORS



SLOT FOR CNF BOARD



MUSIC-ON-HOLD PHONE JACK



RS232C CONNECTOR



SLOT FOR MOD I OR MOD I PCB

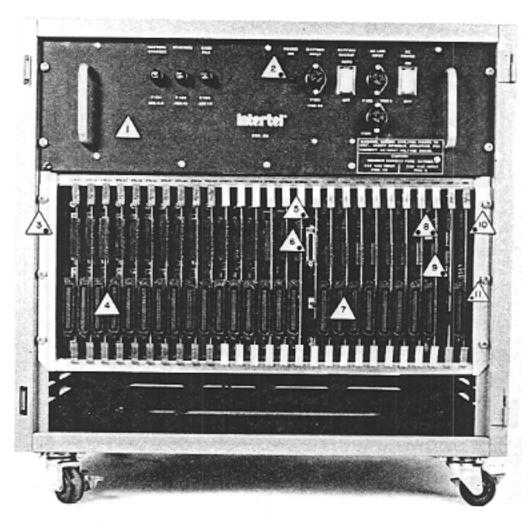


CO. LINE



CONNECTOR FOR MISCELLANEOUS CIRCUITS

FIGURE 2-6. 32X128 KEY SERVICE UNIT (KSU)



POWER SUPPLY





CARDFILE.



STATION CONNECTORS



PHONE JACK MUSIC ON HOLD



R\$232C CONNECTOR



CO. LINE CONNECTORS



SLOTS FOR OUTGOING ONLY ROTARY LINES



SLOT FOR CNF PCB



SLOT FOR MOD I OR MOD II PCB AND MISCELLANEOUS CIRCUITS



CONNECTOR FOR MISCELLANEOUS CIRCUITS

INSTALLATION

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INTRODUCTION

1.01 This section describes the recommended procedures for installing the system hardware. Refer to SYSTEM SPECIFICATIONS for most hardware descriptions.

SITE PLANNING

- 2.01 Before installing the equipment and the Main Distribution Frame (MDF), select a centralized location for the KSU that will minimize cable run lengths from each station and provide the proper environmental conditions.
 - A. Access to an isolated, dedicated 105-125VAC, 15A, 57-63Hz, single-phase commercial power source (200-260VAC, 7A, 47-63Hz, for European specifications).

NOTE: This <u>must</u> be an isolated, dedicated AC input for proper operation. Run the power, neutral, and ground wires directly from the breaker box to the KSU outlet.

- B. Select the KSU location to minimize cable run length. Refer to page 3-15, STATION LOOP RESISTANCE TEST, for loop resistance limits.
 - C. Place the equipment in a climate-controlled room. The KSU internal temperature must be maintained at 32° F to 90° F, and the room temperature must not exceed 80° F.
- D. Do not permit the equipment to be subjected to direct sunlight, high humidity, heat radiation, dust, or strong magnetic fields (such as heavy motors or large copy machines).
- E. Provide ample air space around the KSU; the power supply is convection cooled. Place the KSU at least four inches from any wall and NEVER set anything on top of it.
 - F. Allow room for optional equipment (the Station Message Detail Recording (SMDR) output device, back-up batteries, and amplifiers).
- G. Allow proper wall space for the Main Distribution Frame (MDF), including room for 19 terminal blocks, any HVRA units, and any other peripheral equipment. Refer to page 3-6.

TOOLS AND SUPPLIES REQUIRED

- A. A digital voltmeter with an accuracy of ±0.5% or better is required to set critical voltage levels in the station instruments, check the power supply, and ensure correct wiring of the modular jack assemblies.
- B. Cable (25-pair recommended) for making special termination cables to connect the COU, STN, and MOD II PCB's and the HVRA to the MDF.
- C. 25-pair female amphenol connectors and a connecting machine to interface cables to the PCB's.
- D. Standard 66M1-50-type terminal blocks and bridging clips.
- E. Three-pair (six-conductor) cable to be run from the MDF to the keyset and SLE stations. The 2500 sets require one-pair (two-conductor) cable.
- F. Six-conductor modular jack assemblies to connect the instruments at each station to the KSU. For 2500 sets, you will need four-conductor modular jack assemblies.
- G. Standard telephone hand tools.
- H. Grounding terminal and 10AWG wire for grounding the KSU.

4. STATION CABLING

- 4.01 Floor plans should be developed to aid in proper station wiring in a star configuration from the KSU. Prepare a cable identification plan using circuits numbers. Both ends of every cable should be labeled with the circuit number. For a list of circuit numbers and intercom numbers (for a newly initialized system), refer to Figure 4-3 on page 4-31 (2456) or Figure 4-4 on page 4-32 (32X128).
- 4.02 Circuit numbers are assigned as follows. The 2456 system may have up to seven station (STN) printed circuit boards (PCB's); the 32X128 may have up to 16. Each PCB supports eight instruments. The first digit of the circuit number identifies a PCB slot. The second digit identifies one of the eight circuits on the PCB. For example, circuit number 4.7 identifies the seventh circuit on the fourth STN PCB in the KSU.

A. RUNNING CABLE

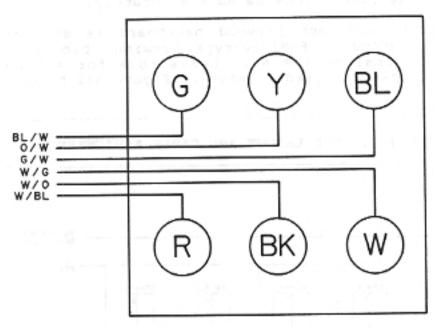
4.03 Run three-pair cable to each keyset or SLE station location shown on the floor plan. Run one-pair cable to each 2500 set station location. Label both ends of every cable with the circuit number. Follow these guidelines:

- A. Avoid running cable parallel to fluorescent light fixtures or AC lines not in conduit. If it is unavoidable, run the station cable at right angles to the obstacles.
 - B. Do not run station cables inside electrical conduit already occupied by AC power cable.
 - C. Do not run station cables near equipment with electric motors or past strong magnetic fields, such as large copy machines or arc welding equipment.
 - D. Do not place station cables where they will be stepped on or rolled over by office furniture.
- E. Hot pre-wires are NOT permitted. They act like an antenna and may transmit data errors to the KSU, causing erratic system performance.
 - F. Refer to page 3-15, STATION LOOP RESISTANCE TEST, for cable length limits.

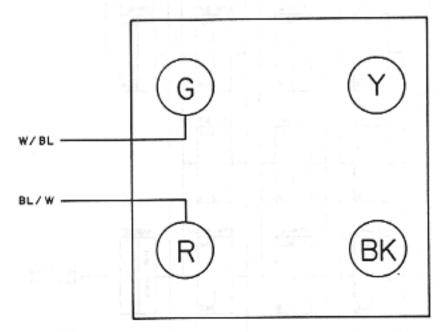
B. MODULAR JACK ASSEMBLIES

4.04 Terminate the station ends of the three-pair cables on six-conductor modular jack assemblies. Terminate the station ends of the one-pair cable on four-conductor modular jack assemblies. Do not mount them on the wall at this time. Refer to Figure 3-1 for wiring diagrams.

FIGURE 3-1. MODULAR JACK ASSEMBLY WIRING DIAGRAMS



KEYSET / SLE



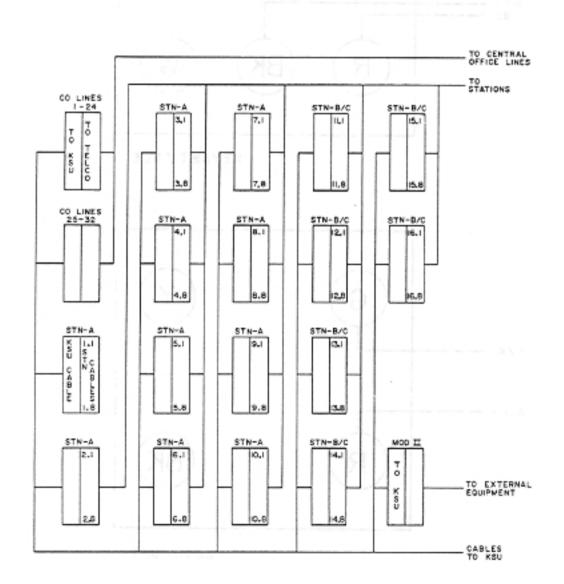
2500 SET

5. ASSEMBLING THE MAIN DISTRIBUTION FRAME (MDF) BACKBOARD

5.01 The MDF is the point at which the KSU, the stations, and the C.O. lines are connected to one another. It is extremely important that the connections be made accurately.

5.02 A 4X8-foot, 3/4-inch plywood backboard is sufficient to mount up to 19 standard 66M1-50-type terminal blocks (maximum size) and peripheral equipment. Leave room for expansion if fewer than 19 blocks are used. Refer to Figure 3-2 below.

FIGURE 3-2. MDF LAYOUT AND CABLE ASSIGNMENTS

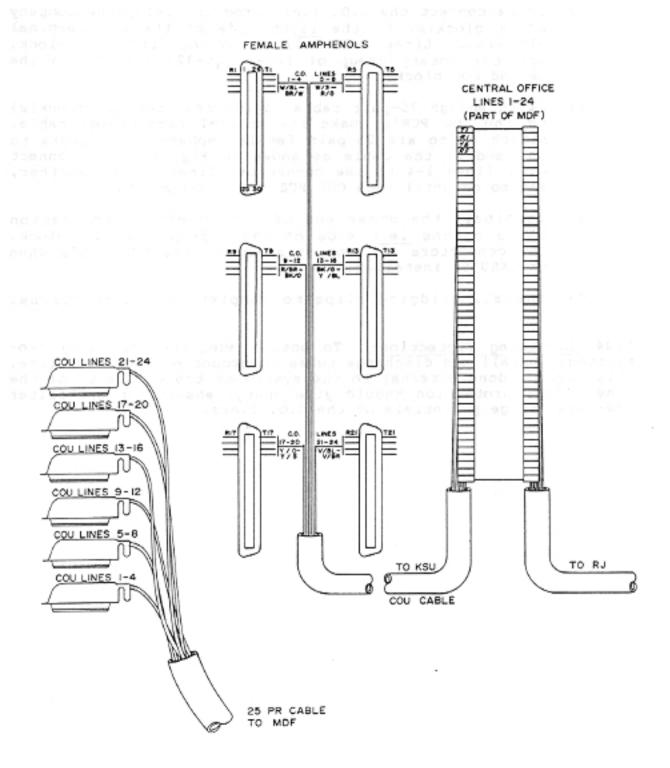


A. CONNECTING C.O. LINES AND COU PCB CABLES TO THE MDF

5.03 Connect the C.O. lines and COU cables as follows. Refer to Figure 3-3 on page 3-8.

- (1) Cross-connect the C.O. lines from the telephone company RJ21X block(s) to the <u>right</u> side of the COU terminal block(s). Lines 1-24 will be on the first COU block, and the rotary group of lines (25-32) will be on the second COU block.
- (2) Using enough 25-pair cable to run from the COU block(s) to the COU PCB's, make the special termination cable. Attach up to six 25-pair female amphenol connectors to one end of the cable as shown in Figure 3-3. Connect C.O. lines 1-4 to one connector, lines 5-8 to another, and so on until each COU PCB has a connector.
- (3) Terminate the other end of each special termination cable on the <u>left</u> side of the appropriate COU block. The connectors will be attached to the COU PCB's when the KSU is installed.
- (4) Install bridging clips to complete the connections.
- 5.04 <u>Lightning Protection</u>: To ensure adequate lightning protection, install gas discharge tubes to ground on each C.O. line. This must be done external to the system on the C.O. side of the line. This protection should give energy absorption and filter low-level surge potentials on the C.O. lines.

FIGURE 3-3. C.O. LINE TERMINATION



B. CONNECTING STATION CABLES TO THE MDF

5.05 After the cables are run, connect them to the MDF as follows:

- Ensure both ends of the cable are labeled with the circuit number.
- (2) Terminate each station cable on the <u>right</u> side of the designated STN block. Refer to Figures 3-4 through 3-7 on pages 3-10 through 3-13 for station cable terminations.
- (3) Using enough 25-pair cable to run from each STN block to each STN PCB in KSU, make the termination cables. Attach a 25-pair female amphenol connector to one end of each cable.
- (4) Terminate the other end of each cable on the <u>left</u> side of the corresponding STN block.
- (5) DO NOT use bridging clips until you have performed the station loop resistance test. The connectors will be attached to the STN PCB's when the KSU is installed.
- 5.06 To eliminate random data problems, unused station circuits (circuits without instruments connected) must be terminated on the MDF as shown in Figure 3-8 on page 3-14. Termination must be made on the Left side of the block, and bridging clips must not be used. Be sure to remove all paging zones from these circuits during programming (SERV STA).

FIGURE 3-4. STN-A AND KEYSET CABLE TERMINATIONS

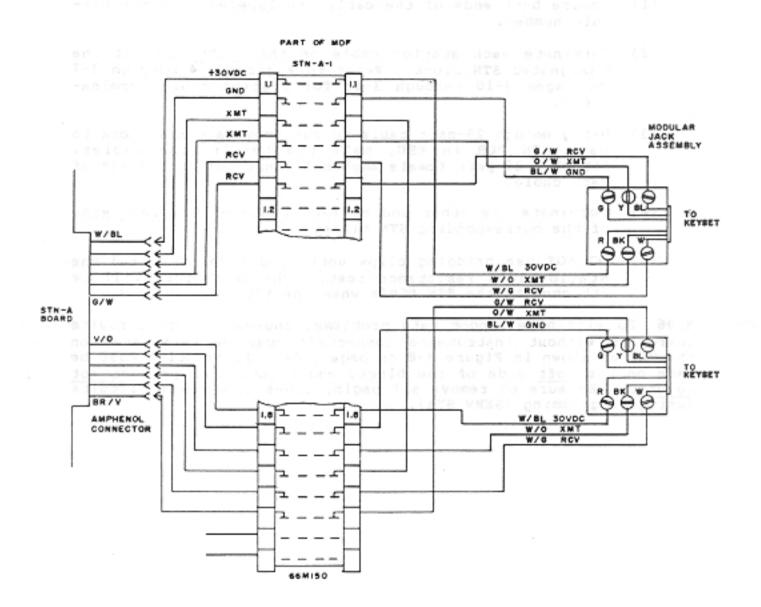


FIGURE 3-5. STN-C AND SLE STATION CABLE TERMINATIONS

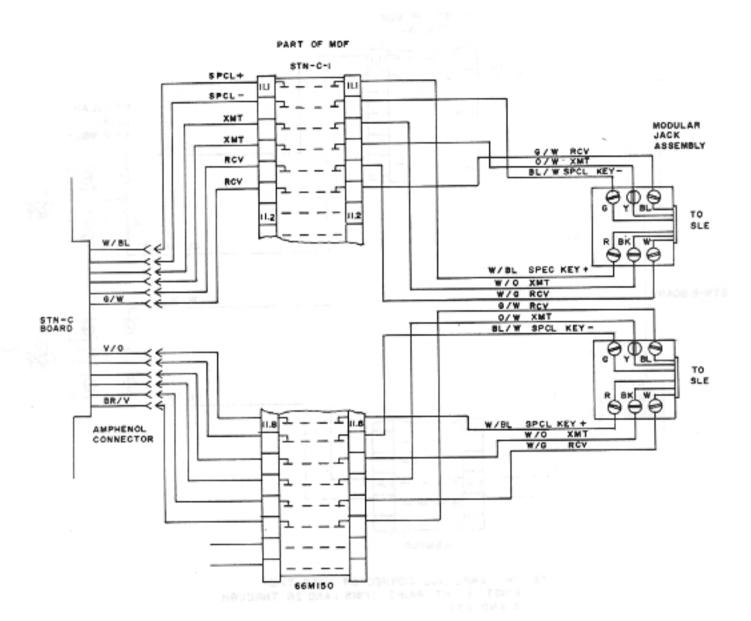
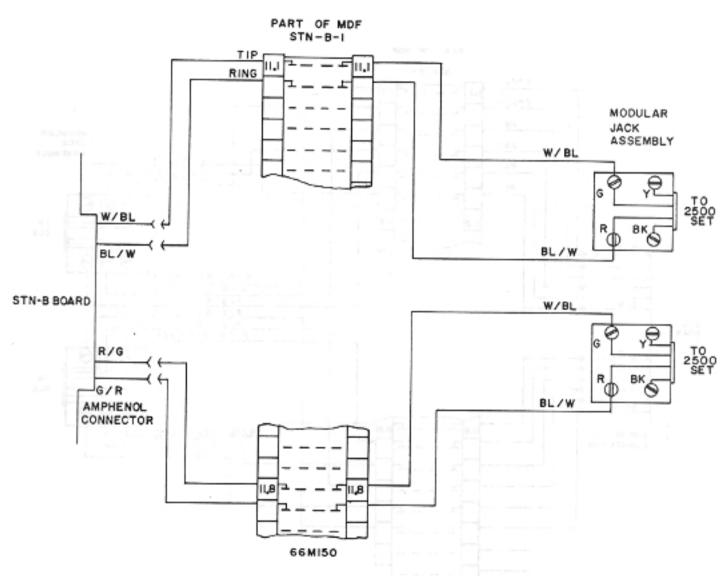


FIGURE 3-6. STN-B AND 2500 STATION CABLE TERMINATIONS

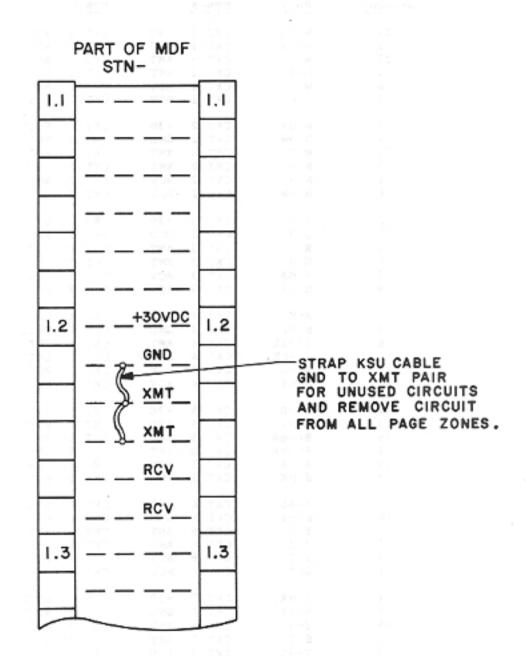


NOTE: THE AMPHENOL CONNECTOR USES THE FIRST EIGHT PAIRS (PINS I AND 26 THROUGH 8 AND 33)

FIGURE 3-7. STATION CABLE TERMINATIONS ON THE STN BLOCK

	Cable						
Amphenol	Pair	STN-A	<u>.</u>	STN-C		STN-	-В
26	W-BL	CKT 1		CKT 1	SPCL	CKT	1 TIP
1	BL-W	CKT 1		CKT 1	SPCL	CKT	1 RING
27	W-0	CKT 1		CKT 1	XMT	CKT	2 TIP
2	O-M	CKT 1		· CKT 1	XMT	CKT	2 RING
28	W-G	CKT 1		CKT 1	RCV	CKT	3 TIP
3	G-W	CKT 1	RCV	CKT 1	RCV	CKT	3 RING
29	W-BR	CKT 2		CKT 2	SPCL	CKT	4 TIP
4	BR-W	CKT 2		CKT 2	SPCL	CKT	4 RING
30	w-s	CKT 2		CKT 2	XMT	CKT	5 TIP
5	S-W	CKT 2		CKT 2	XMT	CKT	5 RING
31	R-BL	CKT 2		CKT 2	RCV	CKT	6 TIP
6	BL-R	CKT 2	RCV	CKT 2	RCV	CKT	6 RING
32	R-O	СКТ 3	+30	CKT 3	SPCL	CKT	7 TIP
7	O-R	CKT 3	GND	CKT 3	SPCL	CKT	7 RING
33	R-G	CKT 3	XMT	CKT 3	XMT	CKT	8 TIP
8	G-R	CKT 3	TMX	CKT 3	XMT	CKT	8 RING
34	R-BR	CKT 3	RCV	CKT 3	RCV		
9	BR-R	CKT 3	RCV	CKT 3	RCV		
35	R-S	CKT 4	+30	CKT 4	SPCL	NOT	USED
10	S-R	CKT 4	GND	CKT 4	SPCL		1
3.6	BK-BL	CKT 4		CKT 4	XMT		1
	BL-BK	CKT 4		CKT 4	XMT		1
37	BK-O	CKT 4		CKT 4	RCV		1
12	O-BK	CKT 4		CKT 4	RCV		1
	NO DE	CKI .4	NC V	CKI	110 4		
38	BK-G	CKT 5	+30	CKT 5	SPCL		1
13	G-BK	CKT 5	GND	CKT 5	SPCL		1
39	BK-BR	CKT 5	XMT	CKT 5	XMT		1
14	BR-BK	CKT 5	XMT	CKT 5	XMT		1
40	BK-S	CKT 5		CKT 5	RCV		1
15	S-BK	CKT 5	RCV	CKT 5	RCV		
41	Y-BL	CKT 6	+30	CKT 6	SPCL		
16	BL-Y	CKT 6	GND	CKT 6	SPCL		1
42	Y-O	CKT 6		CKT 6	XMT		
17	0-Y	CKT 6		CKT 6	XMT		
43	Y-G	CKT 6		CKT 6	RCV		1
18	G-Y	CKT 6		CKT 6	RCV		1
4.4	Y-BR	CKT 7	+30	CKT 7	SPCL		
19	BR-Y	CKT 7		CKT 7	SPCL		1
4.5	Y-S	CKT 7		CKT 7	XMT		
20	S-Y	CKT 7		CKT 7	XMT		
46	V-BL	CKT 7		CKT 7	RCV		1
21	BL-V	CKT 7		CKT 7	RCV		1
	DL-V	CAI /	NC V	CKI	NC V		
47	V-0	CKT 8		CKT 8	SPCL		
22	0-V	CKT 8		CKT 8	SPCL		1
48	V-G	CKT 8	TMX	CKT 8	XMT		1
23	G=V	CKT 8		CKT 8	XMT		Į.
4.9	V-BR		. RCV	CKT 8	RCV		1
24	BR-V	CKT 8	RCV	CKT 8	RCV .		1
50	v-s	NOT U	SED	NOT US	SED		į.
25	s-v	NOT U		NOT US			₹

FIGURE 3-8. TERMINATION OF UNUSED CIRCUITS



C. STATION LOOP RESISTANCE TEST

5.07 Perform the loop resistance test for each station individually. If the KSU is installed, turn off the power.

- Ensure that bridging clips have not been installed and the keyset is not connected.
- (2) Place a short across the RED and GREEN wires on the modular jack assembly.
- (3) On the MDF, measure the resistance across the WHITE/BLUE and BLUE/WHITE wires.
- (4) The readings must be within the following limits:

NOTE: Ohm values are the loop resistance measurements; feet values are the maximum one-way measurements from the KSU.

32X128 (680.08A power supply)

2480 keyset	68 ohms or 1313 ft.
2480 keyset with one DSS 2480 keyset with two DSS's	
1232 keyset	78 ohms or 1520 ft.
616 keyset	84 ohms or 1628 ft.
Single-Line Electronic (SLE) Set	300 ohms or 5800 ft.
2500 Set	800 ohms or 15,600 ft.
MOD II Talkback Speakers	50 ohms or 975 ft.
	Continued

2456 (680.06 power supply)

2480 keyset 39 ohms or 750 ft. 2480 keyset with one DSS 9 ohms or 171 ft. 2480 with two DSS's 3 ohms or 49 ft.

1232 keyset 45 ohms or 877 ft.

616 keyset 48 ohms or 935 ft.

Single-Line Electronic (SLE) 300 ohms or 5800 ft.

2500 Set 800 ohms or 15,600 ft.

MOD II Talkback Speakers 50 ohms or 975 ft.

NOTE: When other than 24 AWG wire is used or when longer lengths are required, +18VDC must be maintained at the station and DSS inputs. Excessive and/or high resistance connections reduce the loop limits. Using larger gauge (smaller AWG number) or multiple 24 AWG wires for the power pair (WHITE/BLUE - BLUE/WHITE) increases these loop limits.

- (5) Remove the short after the test is complete.
- (6) Repeat this test for the other pairs.
- (7) Repeat this test for each station instrument.
- (8) Install bridging clips to complete the cable connections.

5.08 When using multiple power pairs to extend the DSS loop limit:

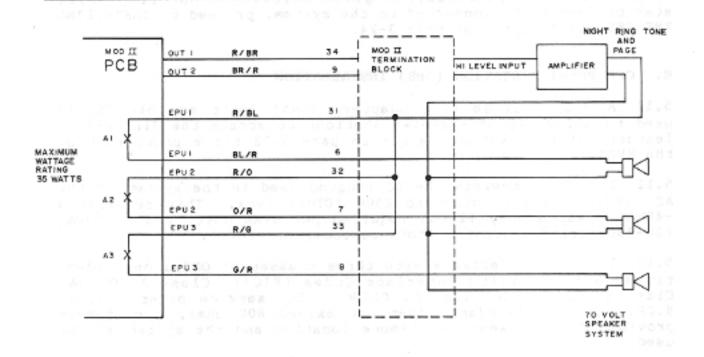
- Turn off the system power.
- (2) Short the power pair at the MDF and measure the loop resistance from the keyset modular jack assembly. Be sure to remove the short before turning on system power.

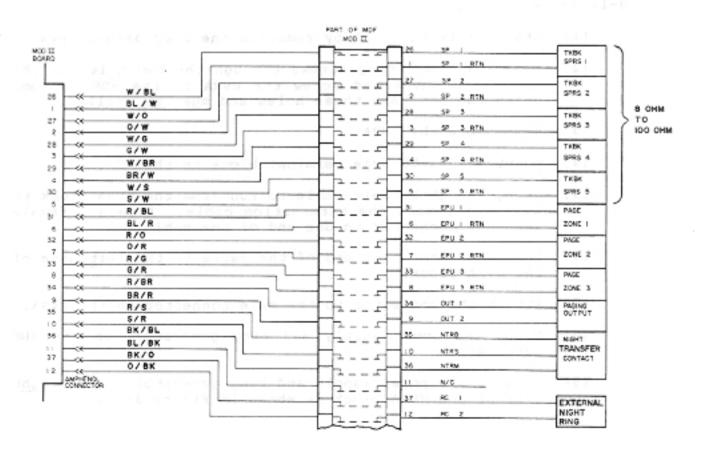
D. CONNECTING THE MODEM II (MOD II) PCB CABLES TO THE MDF

- 5.09 The MOD II PCB must be connected to the MDF in order to access talkback speakers, external paging, the external night ring relay, and night transfer contacts. Refer to Figure 3-9 on page 3-19.
 - Using enough 25-pair cable to run from the MOD II block to the MOD II PCB, make a termination cable. Attach a 25-pair female amphenol connector to one end of the cable.
 - (2) Terminate the other end of the cable on the <u>left</u> side of the terminal block. The connector will be attached to the MOD II PCB when the KSU is installed.
 - (3) Connect the optional equipment to the MOD II block as follows:
 - a. Talkback Speakers: Terminate the talkback speakers to the right side of the terminal block as shown in Figure 3-9.
 - b. External Paging Zones: Terminate the external paging zones to the <u>right</u> side of the terminal block as shown in the upper half of Figure 3-9.
 - c. Night Transfer Contact Devices: Terminate the equipment (alarms, electronic devices, etc.) on pins 35 and 10 (swing and break) or pins 10 and 36 (make and break) on the <u>right</u> side of the terminal block.
 - d. External Night Ring Devices: Terminate the external night ringing device on pins 37 and 12 on the right side of the terminal block.
 - (4) Install bridging clips to complete the connections.
- 5.10 A 450Hz night ring tone is generated by the PCB and is present on the Out 1 and Out 2 pins. As an alternative to connecting an external ringing device, this tone can be sent out of the external paging speakers via the night transfer contacts or external night ring relay. The tone will signal incoming calls when the system is in Night Ring mode or when System Option 13 is enabled. The tone follows a ringing cycle of three seconds on and four seconds off. To access the night ring tone:
 - A. Run jumper wires from pin 37 to pin 31, and from pin 12 to pin 6. This puts the night ring tone over all three paging zones via the night ring relay. (The zones remain separate for normal paging.)

- OR, B. If the night ring relay is to be used for another purpose, run the jumper wires from the night transfer contacts (pin 35 to pin 31, and pin 10 to pin 6).
- NOTE: MOD II PCB's with artwork numbered P51026 have a night ring tone volume control. Refer to page 3-55 for a photograph of the PCB. To increase the loudness, turn potentiometer VR2 clockwise; to decrease the loudness, turn it counterclockwise.

FIGURE 3-9. MODEM II (MOD II) PCB TERMINATION





Page 3-19

NOTE: If an off-premise station is to be connected to the system, follow the instructions given below. If no off-premise stations are to be connected to the system, proceed to INSTALLING THE KEY SERVICE UNIT on page 3-24.

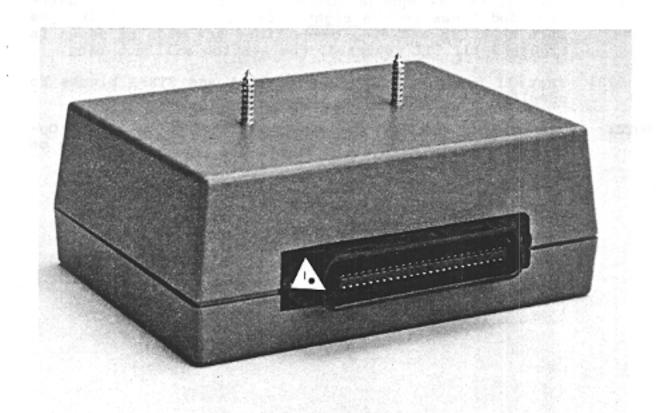
E. OFF-PREMISE STATION (OPS) INSTALLATION

- 5.11 A High Voltage Ring Adapter (HVRA) (part no. 680.73) is used to allow two off-premise stations to access the Single-line features of the system. Refer to page 3-22 for a photograph of the HVRA.
- 5.12 The HVRA converts the DC ringing used in the system to the AC ringing used in standard 2500 (DTMF) sets. This requires a -48VDC power supply (280mA required per HVRA unit) and a 110VAC (20-30Hz) ring generator (both customer provided).
- 5.13 The HVRA interfaces with three classes of OPX lines, identified with Facility Interface Codes (FIC): Class A, OL13A; Class B, OL13B; or Class C, OL13C. The service order code is 9.0F. If the impedance does not exceed 800 ohms, a customer-provided line between the remote location and the system may be used.
- 5.14 Install the HVRA on the MDF as follows. Refer to Figure 3-11 on page 3-23.
 - (1) Disassemble the HVRA by removing the four base screws.
 - (2) Insert two mounting screws through the two holes in the top of the HVRA and screw the HVRA to the MDF. (Some units may not have these holes and must be drilled.)
 - Reassemble the HVRA.
 - (4) Mount a 66M1-50-type terminal block on the MDF.
 - (5) Using enough 25-pair cable to run from the HVRA block to HVRA unit, make the termination cable. Attach a female amphenol connector to one end of the cable.
 - (6) Terminate the other end of the cable to the <u>left</u> side of the HVRA block.
 - (7) Attach the connector to the male connector on the HVRA.
 - (8) Mount the power supply and ring generators on the MDF backboard.
 - (9) Connect the power supply and ring generator on the <u>right</u> side of the HVRA block as shown in Figure 3-11.

- (10) Attach a length of 10AWG wire to the -48VDC Return (+ side terminal) on the power supply. Connect the other end to the earth ground.
- (11) Attach cross-connect cable from the <u>right</u> side of the HVRA block to the <u>right</u> side of the STN-B block. Be sure that Tip and Ring connections are made as shown in Figure 3-ll. Reversing tip and ring on the STN block will cause the HVRA to ring the off-premise station continually.
- (12) Connect the telephone company OPX line(s) or customerprovided lines to the <u>right</u> side of the HVRA block. Be sure that tip and ring connections are made as shown in Figure 3-11. If reversed, the station will not ring.
- (13) Install bridging clips on the HVRA and STN-B blocks to complete the connections.

NOTE: Off-premise stations must be programmed with Station Option 1 (OPX Ring Intercom Always) to prevent feedback on intercom calls to keysets.

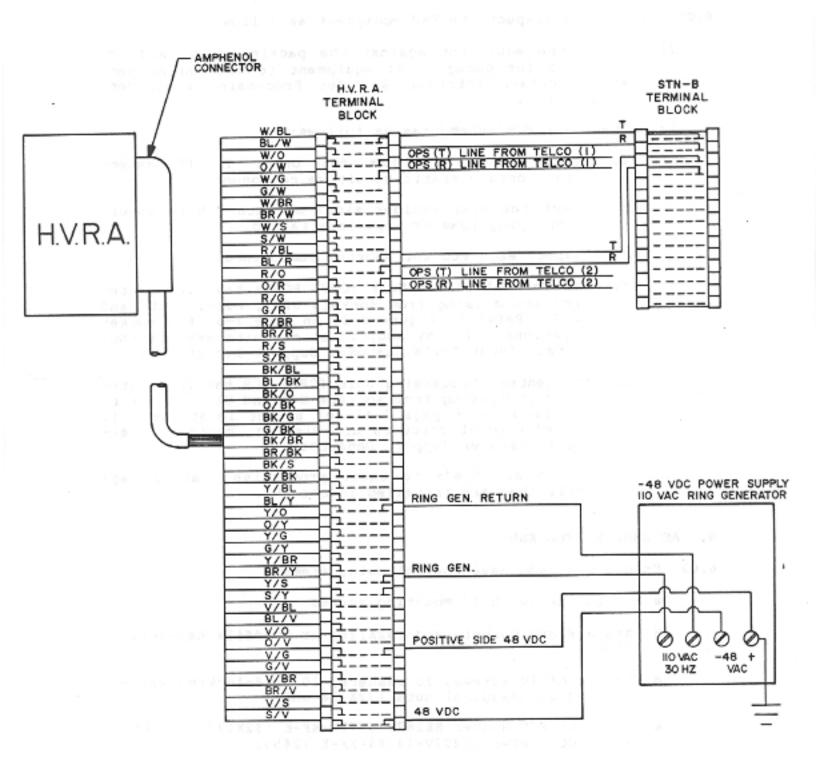
FIGURE 3-10. HVRA UNIT





AMPHENOL CONNECTOR

FIGURE 3-11. HVRA CONNECTION TO THE MDF



INSTALLING THE KEY SERVICE UNIT (KSU)

A. UNPACKING THE EQUIPMENT

- 6.01 Unpack and inspect the KSU equipment as follows:
 - Check the equipment against the packing slip, and inspect it for damage. If equipment is missing or damaged, contact Inter-Tel's Order Processing Department immediately.
 - (2) Check all PCB assemblies as follows:
 - a. Handle all PCB's by the edges only. The PCB assemblies contain static-sensitive components.
 - b. Check the rear (solder side) of each PCB to ensure no shipping foam or tape is attached.
 - c. Inspect each PCB for shorted components.
 - d. The Central Office Unit (COU) PCB's have integrated circuits missing from sockets U21A, U21B, U21C, and U21D. Refer to Figure 3-23 on page 3-50 for socket locations. If any additional circuits are missing, contact Inter-Tel's Customer Support Department.
 - e. The Central Processing Unit (CPU) PCB has integrated circuits missing from sockets U42 and U43. Refer to Figure 3-19 on page 3-42 for socket locations. If any additional circuits are missing, contact Inter-Tel's Customer Support Department.
 - f. Return all PCB's to their protective plastic bags until they are installed in the KSU.

B. ASSEMBLING THE KSU

- 6.02 Ensure that you have the following items:
 - KSU Cabinet with 10 mounting screws
 - Cardcage and Motherboard (32X128) or Cardfile Assembly (2456)
 - Package of 10 screws, 10 washers, 10 self-locking washers, and 20 hexagonal nuts (32X128 only)
 - FCC Label FCC Number BE287V-69771-MF-E (32X128) or FCC Label FCC Number BE287V-14484-KF-E (2456)

- 6.03 For the 2456 system: Refer to page 2-17 for a photograph of the assembled KSU. Install the cardfile assembly into the KSU cabinet as follows:
 - (1) Lay the cabinet on its back. Remove the three bottom cardfile mounting screws from each side of the KSU cabinet.
 - (2) Position the cardfile in the lower section of the cabinet, lining up the mounting screw slots with the three holes on each side.
 - (3) Reinstall the mounting screws.
 - (4) Place the FCC label with FCC Number BE287V-14484-KF-E on the outside of the back door in the upper left corner. If there is an FCC label already present on the cabinet, place the new label over it.

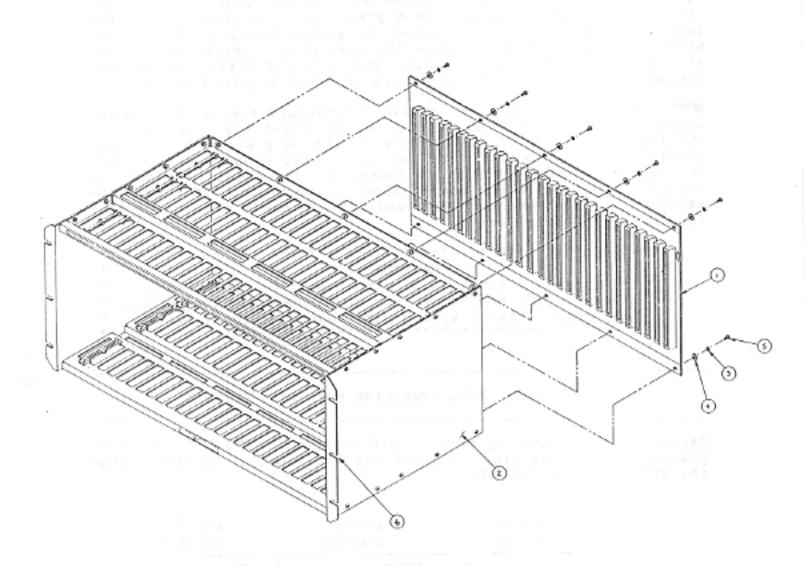
6.04 For the 32X128 system:

- Refer to Figure 3-12 on page 3-27. Assemble the cardfile as follows:
 - Place the cardcage on a flat surface with the mounting screw slots down.
 - Place the motherboard on the back of the cardcage so that the edge with the power supply connection terminal posts is above the red (STN) card slots. The posts must face out.
 - c. Place a self-locking washer, then a regular washer on each of the ten small screws.
 - Insert the screws through the holes on the motherboard and screw them into the cardcage.
 - Put a hexagonal nut on each power supply connection terminal post and tighten securely. (CAUTION: over-tightening the nuts could break the posts.) The other ten nuts will be used for connecting the DC power cable assembly.

- (2) Install the cardfile assembly into the KSU cabinet. Refer to page 2-18 for a photograph of the assembled KSU.
 - a. Lay the cabinet on its back. Remove the three bottom cardfile mounting screws from each side of the KSU cabinet.
 - b. Position the cardfile (with the slot labeling facing up) in the lower section of the cabinet, lining up the mounting screw slots with the three holes on each side.
 - c. Reinstall the mounting screws.
- (3) Place the FCC label with FCC Number BE287v-69771-MF-E on the <u>outside</u> of the <u>back door</u> in the <u>upper left corner</u>. If there is an FCC label already present on the cabinet, place the new label over it.

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FIGURE 3-12. ASSEMBLING THE 32X128 CARDFILE



1 - Motherboard

4 - Regular washer

2 - Cardcage 5 - Screw

3 - Self-locking washer 6 - Mounting screw slot

C. 2456 CARDFILE STRAPPING OPTIONS

6.05 The 2456 cardfile has seven station PCB slots. It is initially strapped for seven STN-A PCB's, but the strapping of the last three slots may be changed to accept STN-B (2500 set) or STN-C (SLE set) PCB's. Change the strapping (located on the inside of the motherboard) before adding any PCB's; standard and optional strapping arrangements are shown in Figure 3-13 below.

NOTE: STN-A PCB's must be installed consecutively, with no empty slots left between them. After every STN-A PCB has been installed, the STN-B or STN-C PCB's should be placed in the first available STN-B/C slots. If the last three slots are available and only two STN-B/C PCB's are installed, they must be placed in adjacent slots, with the vacant slot to the right. There will be vacant slots between the STN-A and STN-B/C cards when fewer than four STN-A PCB's are used.

FIGURE 3-13. 2456 STRAPPING FOR STN-B/C PCB'S

Cardfiles have shorting pins or DIP switches. The DIP switch ON position is to the right (toward the white dot). DO NOT change the DIP switch in COU slot 6.

	STN-A5 STN-BCI		STN-		STN-A7 STN-BC3		
	SHORTING	DIP SWITCH	SHORTING PIN	DIP SWITCH	SHORTING PIN	DIP SWITCH	
STATION A IN THIS CARD SLOT	0 0 0	ON OFF ON ON	000	ON OFF ON OFF	0 0 0	ON OFF OFF ON	
	(CIRCUITS	5,1-5,8)	(CIRCUITS	6.1-6.8)	(CIRCUITS	7.1-7.8)	
	SHORTING PIN	DIP SWITCH	SHORTING PIN	DIP SWITCH	SHORTING PIN	DIP SWITCH	
STATION B OR C IN THIS CARD SLOT	000	OFF ON OFF ON	0 0 0	OFF ON OFF OFF		OFF OFF ON ON	
	(CIRCUITS	(8,11-1,11	(CIRCUITS	12,1-12,8)	(CIRCUITS	13.1-13.8)	

D. INSTALLING THE POWER SUPPLY

6.06 For the 680.08A power supply: Attach the power cable assembly to the power supply before installing it in the cabinet. The power cable assembly consists of the 10-connector DC power cable assembly, the AC power cord, and the battery cable. The DC power cable wires are held by a nylon connector that mates with the power supply terminals. Refer to Figure 3-14 on page 3-32.

- Remove the covers from the three terminal housings.
 Save all screws.
- (2) Attach the DC power cable connector to the power supply as shown in Figure 3-14. Tighten down the screws on the terminal strip.
- (3) Install the housing cover attached to the DC power cable. Discard the original cover.
- (4) Connect the AC power cord to the power supply as follows:
 - a. Strike out the conduit knock-out on the AC power terminal housing.
 - Remove the nut from the AC power cord strain relief assembly.
 - c. Route the AC power cord through the knock-out, and replace the strain relief nut.
 - d. Connect the hot wire (Brown or Blue/Red/Black) to the plus/minus (+) terminal, the neutral wire (Blue or White) to the neutral (NEUT) terminal, and the ground wire (Green/Yellow or Yellow/Green or Green) to the ground (GRND) terminal.
 - Reinstall the housing cover.

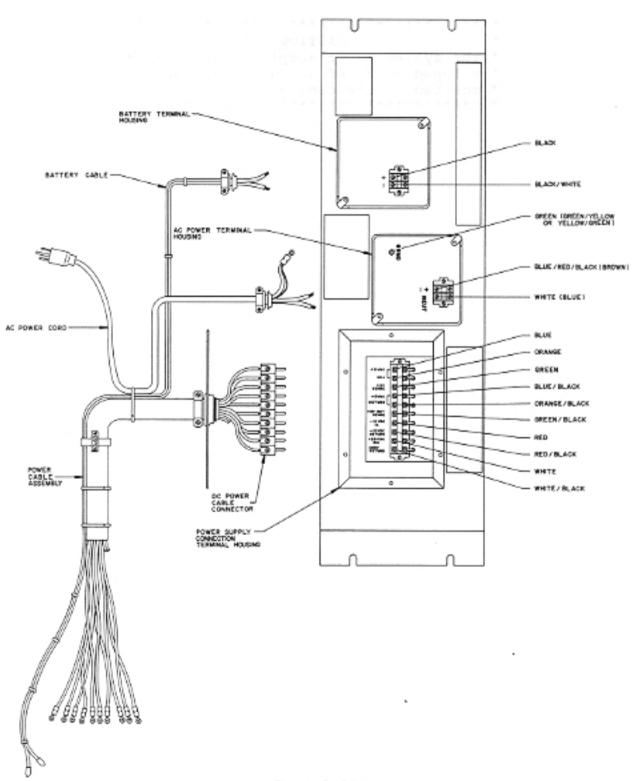
- (5) Connect the battery cable to the power supply as follows:
 - a. Strike out the conduit knock-out on the battery terminal housing.
 - b. Remove the nut from the battery cable strain relief assembly.
 - c. Route the battery cable through the knock-out, and replace the strain relief nut.
 - d. Connect the Black wire to the positive (+) terminal and the Black/White wire to the negative (-) terminal.
 - e. Reinstall the housing cover.
 - f. Ensure that the battery leads at the other end of the cable are insulated.
- (6) Install the power supply in the KSU cabinet as follows:
 - a. Remove the four power supply mounting screws shipped with the KSU cabinet.
 - b. Lay the cabinet on its back.
 - c. Position the power supply in the cabinet above the cardfile, and reinstall the mounting screws. Refer to Figure 2-6 on page 2-18 for a photograph of the assembled KSU.
- (7) Connect the unattached end of the DC power cable assembly to the cardfile backplane as specified below and shown in Figure 3-15 on page 3-33.

Assembly Wire	***************************************
Blue (+5V)	1 (top)
Orange (+5V)	2
Green (+5V Sense)	3
White/Black (+30V Return)	4
Red (-12V)	5
White (+30V)	6
Blue/Black (+5V Return)	7
Green/Black (+5 Sense Return)	8
Orange/Black (+5 Return)	9
Red/Black (-12V Return)	10 (bottom)
Black (+Battery)	To battery pack
Black/White (-Battery)	To battery pack

- (8) Route the AC power cord and battery through the cutout in the bottom or side of the cabinet.
- (9) Perform the electrical test as specified on page 3-37.

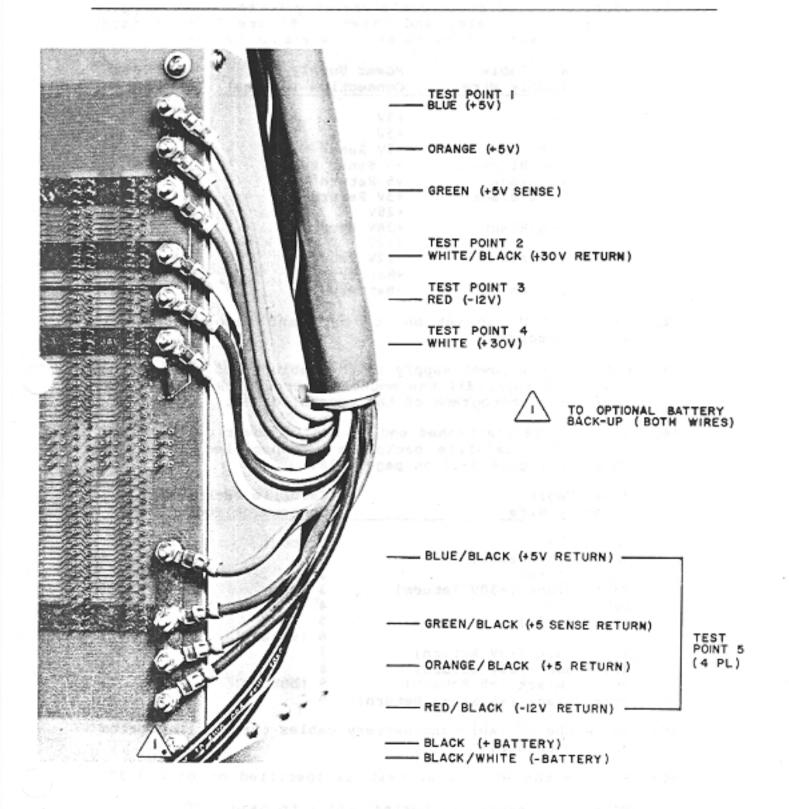
NOTE: To install batteries, refer to page 3-70.

FIGURE 3-14. CONNECTING POWER CABLE ASSEMBLY TO 680.08A POWER SUPPLY



Page 3-32

FIGURE 3-15. CONNECTING POWER CABLE ASSEMBLY TO 32X128 CARDFILE
BACKPLANE AND VOLTAGE TEST POINT LOCATIONS



6.07 For the 680.06 power supply:

(1) Connect the DC power cable assembly to the power supply as specified below and shown in Figure 3-16 on page 3-35. AC and battery back-up power must be off.

Power Cable Assembly Wire	Power Supply Connection Terminal
Blue	+5V
Orange	+5V
Green Ve-	+5V Sense
Green/Black	+5 Sense Return
Blue/Black	+5 Return
Orange/Black	+5V Return
White	+28V
White/Black	+28V Return
Red 1	-1 2V
Red/Black	-12V Return
Black	+Battery
Black/White	-Battery

- (2) Lay the KSU cabinet on its back and remove the four mounting screws.
- (3) Position the power supply in the cabinet above the cardfile, and reinstall the mounting screws. Refer to page 2-17 for a photograph of the assembled KSU.
- (4) Connect the unattached end of the DC power cable assembly to the cardfile backplane as specified below and shown in Figure 3-17 on page 3-36.

Power Cable Assembly Wire	Cardfile Backplane Connection Post			
Blue (+5V)	l (top)			
Green (+5V Sense)	1			
Orange (+5V)	2			
White/Black (+30V Return)	3			
Red (-12V)	4			
White (+30V)	5			
	6 (vacant)			
Blue/Black (+5V Return)	7			
Red/Black (-12V Return)	8			
Orange/Black (+5 Return)	9 (bottom)			
Green/Black (+5 Sense Return)	9			

- (5) Route the AC cable and battery cables through the bottom or side cutout.
- (6) Perform the electrical test as specified on page 3-37.

NOTE: To install batteries, refer to page 3-70.

FIGURE 3-16. CONNECTING POWER CABLE ASSEMBLY TO 680.06 POWER SUPPLY

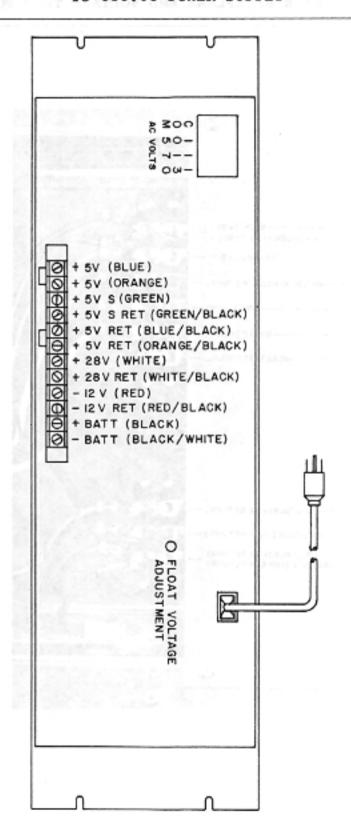
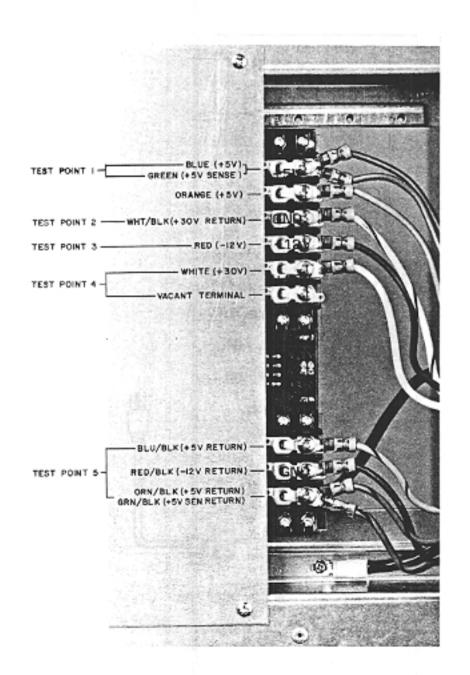


FIGURE 3-17. CONNECTING POWER CABLE ASSEMBLY TO 2456 CARD-FILE BACKPLANE AND VOLTAGE TEST POINT LOCATIONS



Power Supply Electrical Test

6.08 Before plugging in the AC power cord, perform the following electrical checks:

(1) Check the values of the fuses:

For the 680.06 power supply:

Fl -- 8A, 250VAC Slow Blow (115VAC Input)

F2 -- 10A, 125VAC (+28VDC)

F3 -- 8A, 125VAC (+5VDC)

F4 -- 2.5A, 125VAC (-12VDC)

F5 -- 20A, 250VAC Slow Blow (Battery Charger)

For the 680.08A power supply:

F101 -- MDX 4A, 250VAC

F102 -- ABC 15A, 250VAC

F103 -- ABC 15A, 250VAC

F104 -- FNQ 30A, 500VAC

F105 -- 115VAC Input FNM-5A, 250VAC

F106 -- 115VAC Input FNM-10A, 250VAC (US) 230VAC Input FNM-5A, 250VAC (Europe)

- (2) Ensure that the AC line and battery switches are off, and that there are no PCB's installed in the cardfile.
- Plug the AC power cord into a 105-125VAC, 15A, 57-63Hz source.
- (4) Turn on the AC line switch. The red indicator will light.
- (5) Using a digital voltmeter with an accuracy of +0.5%, measure the following voltages on the back of the cardfile backplane. Refer to Figure 3-15 on page 3-33 (32X128) or Figure 3-17 on page 3-36 (2456) for test point locations. If voltage measurements are not within limits, DO NOT PROCEED. Contact Inter-Tel's Customer Support Department.

Backplane Voltages

TP·1 to TP 5	+5.0 <u>+</u> 0.1VDC
TP 3 to TP 5	-12.0 <u>+</u> 2.5VDC
TP 4 to TP 2	+30 +6VDC (unregulated)

(6) If the voltages are within limits, turn off the AC power to the KSU and unplug the AC power cord.

Voltage Surge Protection

6.09 AC voltage surges may cause system malfunctions, misregistration, false logic, and damage to the electronic components. To prevent surges, Inter-Tel recommends the use of an AC line conditioner or surge protector. The chosen device must:

- Clip fast voltage transients at 300VDC nominal in 5 nanoseconds or less.
- в. Sustain the input voltage level when the AC source drops below 97VAC.
- C. Prevent extraneous signals carried into the equipment on the AC input, even though the AC outlet has an isolated, dedicated circuit.

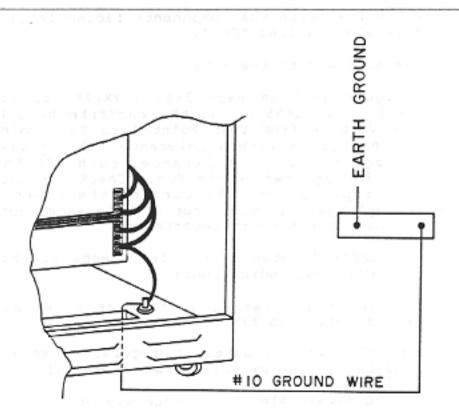
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Grounding Requirements

- 6.10 Using 10AWG wire, ground the KSU as follows:
 - Ensure that the power cord is unplugged from the AC (1) outlet and battery back-up is not on.
 - (2) Mount a grounding terminal on the MDF and connect it to:
 - The earth ground.
 - b. The ground lug on the floor of the KSU cabinet.
 - (3) Connect the KSU cabinet to the cardfile by running approximately 15 inches of wire between:
 - a. The ground lug on the floor of the cabinet.
 - b. One of the ground terminals on the back of the cardfile backplane.

If a difference of potential exists between the third NOTE: wire lead on the local electrical circuit and the earth ground, noise may develop on the system. If this occurs, call an electrician.

FIGURE 3-18. KEY SERVICE UNIT (KSU) GROUNDING



D. INSTALLING THE PRINTED CIRCUIT BOARDS (PCB's)

Central Processing Unit (CPU) PCB

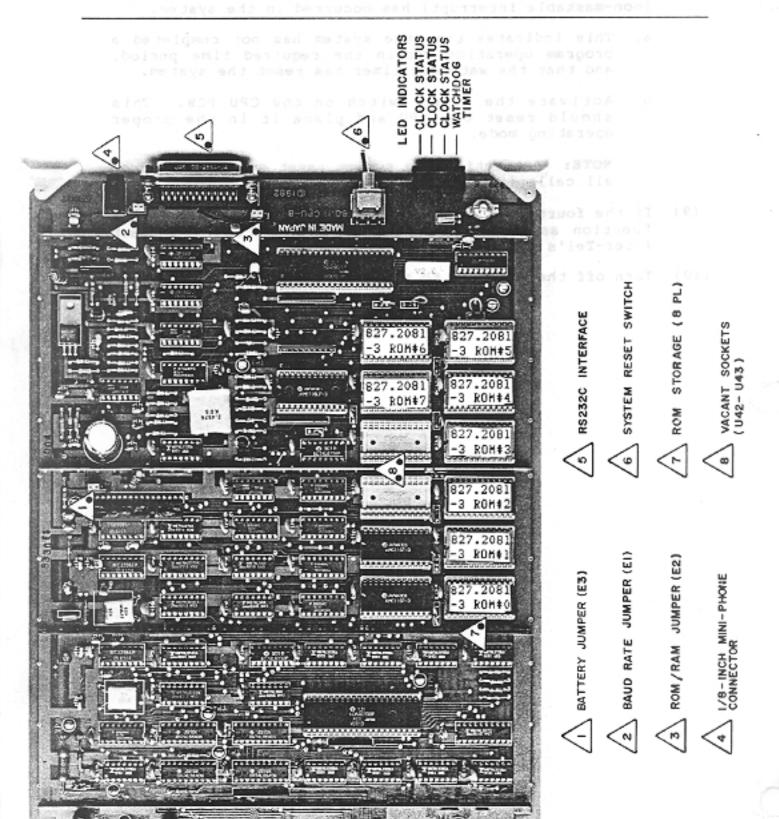
- 6.11 Refer to page 3-42 for a photograph. Install the CPU PCB as follows:
 - (1) Place the jumpers in these positions:
 - El Connect the center pin to 300 or 9600 depending on the baud rate of your programming terminal or SMDR output device.
 - E2 Connect the center pin to the RAM pin for programming, or to the ROM pin to protect the data base.
 - E3 Connect the center pin to the BATT pin.
 - (2) Check the eight ROM's for proper seating. They are located in positions U34-U41 and should be numbered in order as shown in the photo.
 - (3) Ensure that there is NO power to the KSU.
 - NOTE: Installing the CPU with the power supply on can
 - Slide the CPU PCB (with the components facing left) into the cardfile slot labeled "CPU".
 - (5) Turn on the AC power to the KSU.
 - (6) Refer to Figure 3-15 on page 3-33 (32X128) or Figure 3-17 on page 3-36 (2456). On the cardfile backplane, measure the voltage from Test Point 1 to Test Point 5, and ensure that it is within tolerance (+5.0 +0.1VDC). If the voltage is out of tolerance, turn off the AC power to the KSU and remove the PCB. Check for shorted components, replace the PCB, turn on the power, and recheck the voltage. If still out of tolerance, contact Inter-Tel's Customer Support Department.
 - Observe the LED's located on the front edge of the CPU PCB for the following indications:
 - DS1 (topmost LED) Flashes at regular intervals of approximately five times a second.
 - DS2 (2nd LED down) Flashes at regular intervals of approximately two or three times a second.
 - DS3 (3rd LED down) Almost continuously on.
 - DS4 (bottommost LED) Off.

- If LED DS4 is illuminated, a watchdog timer interrupt (non-maskable interrupt) has occurred in the system.
 - This indicates that the system has not completed a program operation within the required time period, and that the watchdog timer has reset the system.
 - Activate the reset switch on the CPU PCB. should reset the CPU and place it in the proper operating mode.

NOTE: Activating the system reset switch will drop all calls in progress.

- (9) If the fourth LED lights again or the other LED's do not function as described above, DO NOT PROCEED. Contact Inter-Tel's Customer Support Department.
- (10) Turn off the AC power to the KSU.

FIGURE 3-19. CENTRAL PROCESSING UNIT (CPU) PCB

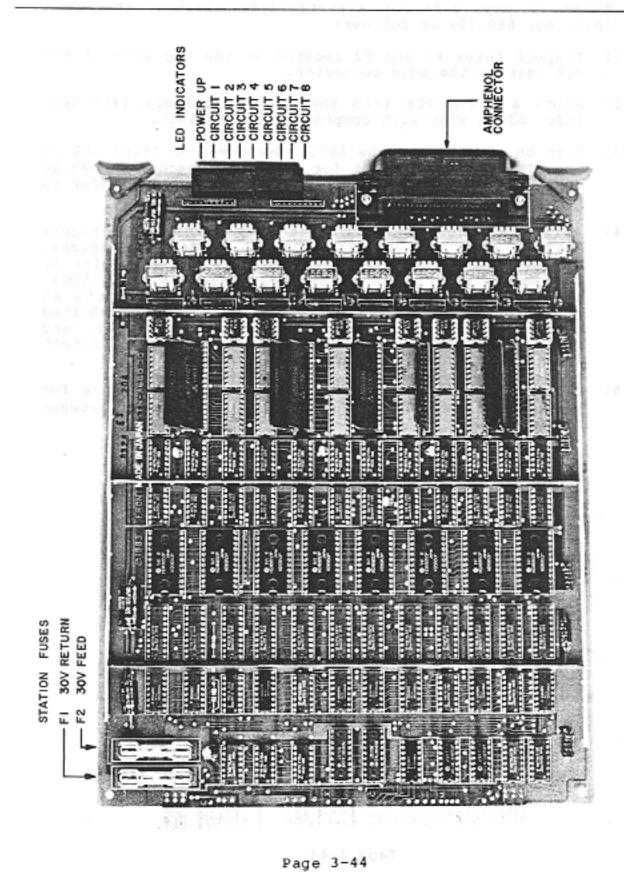


Station A (STN-A) PCB

6.12 Refer to page 3-44 for a photograph. Install the STN-A PCB's (part no. 680.30) as follows:

- Inspect fuses Fl and F2 located at the top rear of the PCB next to the edge connector.
- (2) Slide a STN-A PCB into the first available (furthest left) STN-A slot with components facing left.
- (3) Turn on AC power to the KSU. The power-up (top) LED on the STN-A PCB will light for one to two seconds, then go out. If the LED does not perform as described, refer to the TROUBLESHOOTING section.
- (4) Refer to Figure 3-15 on page 3-33 (32X128) or Figure 3-17 on page 3-36 (2456). On the cardfile backplane, measure the voltage from Test Point 1 to Test Point 5, and ensure that it is within tolerance (+5.0 ±0.1VDC). If the voltage is out of tolerance, turn off the AC power to the KSU and remove the PCB. Check for shorted components, replace the PCB, turn on the power, and recheck the voltage. If still out of tolerance, contact Inter-Tel's Customer Support Department.
- (5) Turn off power to the KSU. Repeat this procedure for each additional STN-A PCB. Do not skip slots between STN-A PCB's.

FIGURE 3-20. STATION A (STN-A) PCB



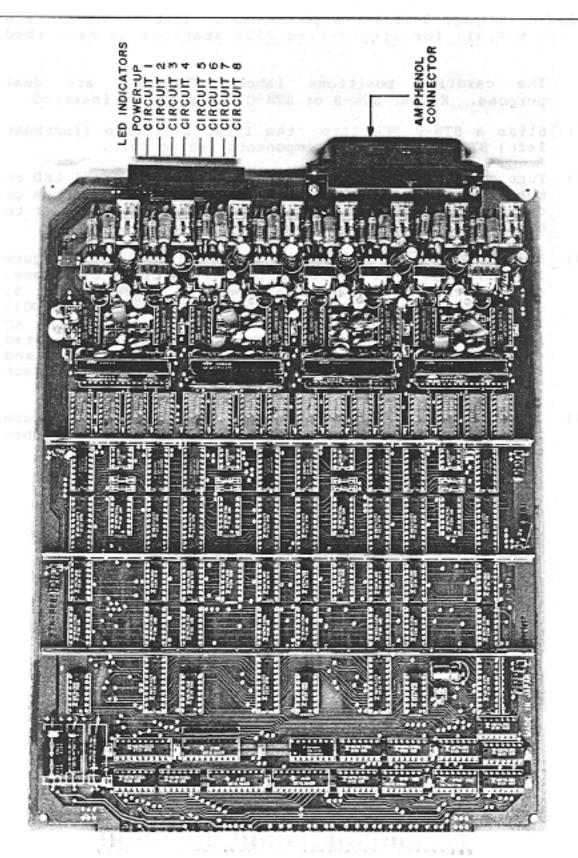
Station B (STN-B) PCB

6.13 Refer to page 3-46 for a photograph. Install STN-B PCB's (part no. 680.31) for single-line 2500 stations as described below.

NOTE: The cardfile positions labeled "STN-BC" are dual purpose. Either STN-B or STN-C PCB's may be inserted.

- Slide a STN-B PCB into the first available (furthest left) STN-BC slot with components facing left.
- (2) Turn on the power to the KSU. The power-up (top) LED on the STN-B PCB will light for one to two seconds, then go out. If the LED does not perform as described, refer to the TROUBLESHOOTING section.
- (3) Refer to Figure 3-15 on page 3-33 (32X128) or Figure 3-17 on page 3-36 (2456). On the cardfile backplane, measure the voltage from Test Point 1 to Test Point 5, and ensure that it is within tolerance (+5.0 ±0.1VDC). If the voltage is out of tolerance, turn off the AC power to the KSU and remove the PCB. Check for shorted components, replace the PCB, turn on the power, and recheck the voltage. If still out of tolerance, contact Inter-Tel's Customer Support Department.
- (4) Turn off the power to the KSU. Repeat this procedure for each additional STN-B PCB. Do not skip slots between STN-B PCB's.

FIGURE 3-21. STATION B (STN-B) PCB



Page 3-46

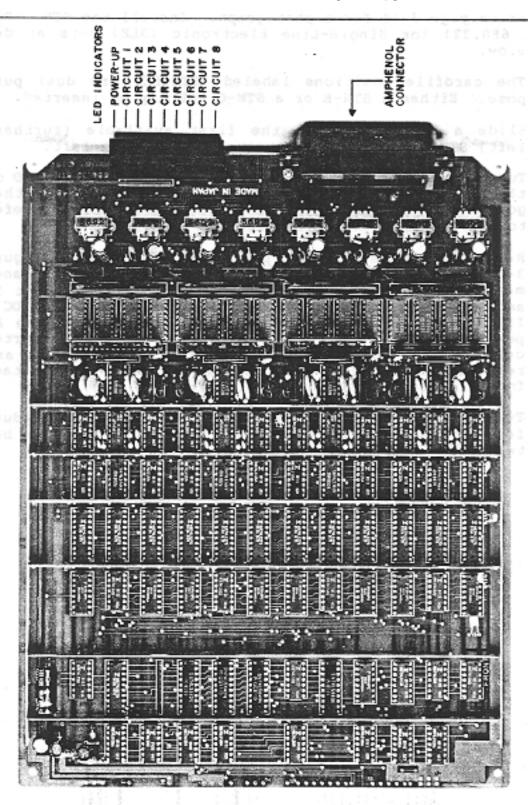
Station C (STN-C) PCB

6.14 Refer to page 3-48 for a photograph. Install the STN-C PCB (part no. 680.32) for Single-Line Electronic (SLE) sets as described below.

NOTE: The cardfile positions labeled "STN-BC" are dual purpose. Either a STN-B or a STN-C PCB may be inserted.

- Slide a STN-C PCB into the first available (furthest left) STN-BC slot with the components facing left.
- (2) Turn on the power to the KSU. The power-up (top) LED on the STN-C PCB will light for one to two seconds, then go out. If the LED does not perform as described, refer to the TROUBLESHOOTING section.
- (3) Refer to Figure 3-15 on page 3-33 (32X128) or Figure 3-17 on page 3-36 (2456). On the cardfile backplane, measure the voltage from Test Point 1 to Test Point 5, and ensure that it is within tolerance (+5.0 ±0,1VDC). If the voltage is out of tolerance, turn off the AC power to the KSU and remove the PCB. Check for shorted components, replace the PCB, turn on the power, and recheck the voltage. If still out of tolerance, contact Inter-Tel's Customer Support Department.
- (4) Turn off the power to the KSU. Repeat this procedure for each additional STN-C PCB. Do not skip slots between STN-C PCB's.

FIGURE 3-22. STATION C (STN-C) PCB



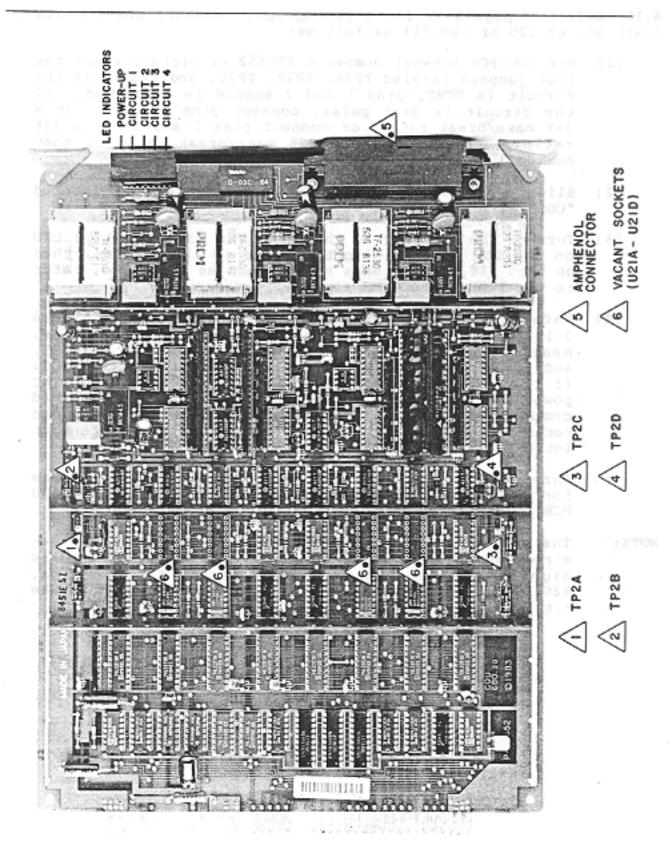
Central Office Unit (COU) PCB

6.15 Refer to page 3-50 for a photograph. Install the COU PCB (part no. 680.20 or 680.21) as follows:

- (1) For COU PCB artwork numbered P50652 or higher, check the four jumpers labeled TP2A, TP2B, TP2C, and TP2D. If the circuit is DTMF, pins 1 and 2 should be connected. If the circuit is dial pulse, connect pins 1 and 2 for a 39% make/break ratio, or connect pins 2 and 3 for a 33% ratio. (In the U.S., a 39% make/break ratio is most common.)
- (2) Slide a COU PCB into the first available slot labeled "COU" with components facing left.
- (3) Turn on the AC power to the KSU. The power-up (top) LED on the COU PCB will light for one to two seconds, then go out. If the LED does not perform as described, refer to the TROUBLESHOOTING section.
- (4) Refer to Figure 3-15 on page 3-33 (32X128) or Figure 3-17 on page 3-36 (2456). On the cardfile backplane, measure the voltage from Test Point 1 to Test Point 5, and ensure that it is within tolerance (+5.0 ±0.1VDC). If the voltage is out of tolerance, turn off the AC power to the KSU and remove the PCB. Check for shorted components, replace the PCB, turn on the power, and recheck the voltage. If still out of tolerance, contact Inter-Tel's Customer Support Department.
- (5) Turn off the power to the KSU. Repeat this procedure for each additional COU PCB in the system. The COU PCB's for the rotary group go in COU slots 7 and 8.

NOTE: The COU PCB is configured for DTMF signalling. If desired, some or all lines may be converted for dial pulse signalling using the Rotary Conversion Kit, part no. 828.1032. Installation instructions are included in the kit.

FIGURE 3-23. CENTRAL OFFICE UNIT (COU) PCB

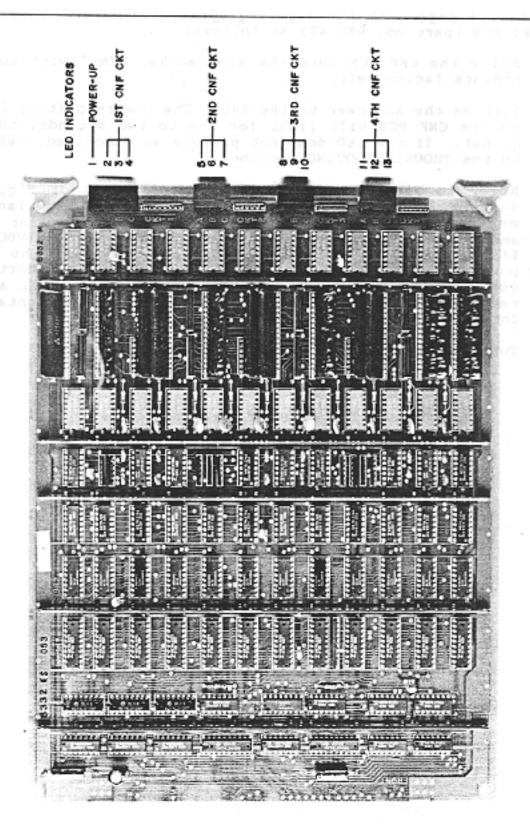


Conference (CNF) PCB

6.16 Refer to page 3-52 for a photograph. Install the Conference (CNF) PCB (part no. 680.40) as follows:

- Slide the CNF PCB into the slot marked "CNF" with components facing left.
- (2) Turn on the AC power to the KSU. The power-up (top) LED on the CNF PCB will light for one to two seconds, then go out. If the LED does not perform as described, refer to the TROUBLESHOOTING section.
- (3) Refer to Pigure 3-15 on page 3-33 (32X128) or Figure 3-17 on page 3-36 (2456). On the cardfile backplane, measure the voltage from Test Point 1 to Test Point 5, and ensure that it is within tolerance (+5.0 +0.1VDC). If the voltage is out of tolerance, turn off the AC power to the KSU and remove the PCB. Check for shorted components, replace the PCB, turn on the power, and recheck the voltage. If still out of tolerance, contact Inter-Tel's Customer Support Department.
- (4) Turn off power to the KSU.

FIGURE 3-24. CONFERENCE (CNF) PCB



Modem I (MOD I) PCB or Modem II (MOD II) PCB

- 6.17 For the MOD I PCB, set the baud rate before installing it. Refer to page 3-54 for a photograph of the PCB.
 - A. PCB's with artwork numbered P48269: Connecting pins 1 (left) and 2 allows communication at 110 baud. Connecting pins 2 and 3 allows communication at 300 baud.
 - B. PCB's with artwork numbered P48984: Connecting pins 1 (top) and 2 allows communication at 110 baud. Connecting pins 2 and 3 allows communication at 300 baud.
- 6.18 For the MOD II PCB, set the baud rate before installing it. The baud rate straps are reversed depending on the artwork number of the PCB. The pins are configured two ways (refer to page 3-55 for a photograph of the PCB):
 - A. PCB's with artwork numbered P47506: Connecting pins 1 and 2 allows communication at 110 baud. Connecting pins 2 and 3 allows communication at 300 baud.
 - B. PCB's with artwork numbered P51026: Connecting pins 1 and 2 allows communication at 300 baud. Connecting pins 2 and 3 allows communication at 110 baud.
- 6.19 Install either the MOD I or the MOD II PCB as follows:
 - (1) Slide the MOD PCB into the slot labeled "MIS" with components facing left.
 - (2) Turn on the KSU. The power-up (top) LED on the MOD PCB will light for one to two seconds, then go out. If the LED does not perform as described, refer to the TROUBLE-SHOOTING section.
 - (3) Refer to Figure 3-15 on page 3-33 (32X128) or Figure 3-17 on page 3-36 (2456). On the cardfile backplane, measure the voltage from Test Point 1 to Test Point 5, and ensure that it is within tolerance (+5.0 ±0.1VDC). If the voltage is out of tolerance, turn off the AC power to the KSU and remove the PCB. Check for shorted components, replace the PCB, turn on the power, and recheck the voltage. If still out of tolerance, contact Inter-Tel's Customer Support Department.
 - (4) Turn off the KSU.
- NOTES: (1) The MOD II PCB option must be enabled during system programming (SERV SYS). Refer to page 4-17.
 - (2) Refer to page 3-18 for instructions on adjusting the night ring tone volume on the MOD II PCB.

FIGURE 3-25. MODEM I (MOD I) PCB

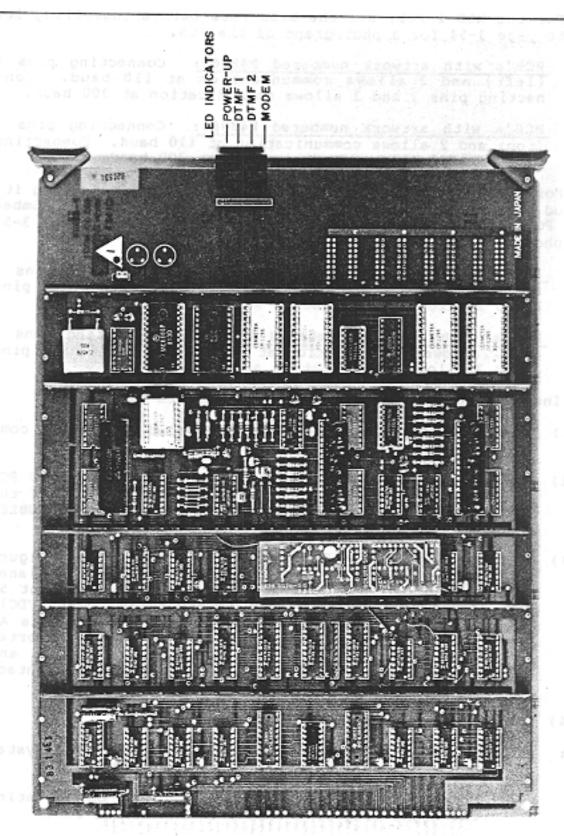
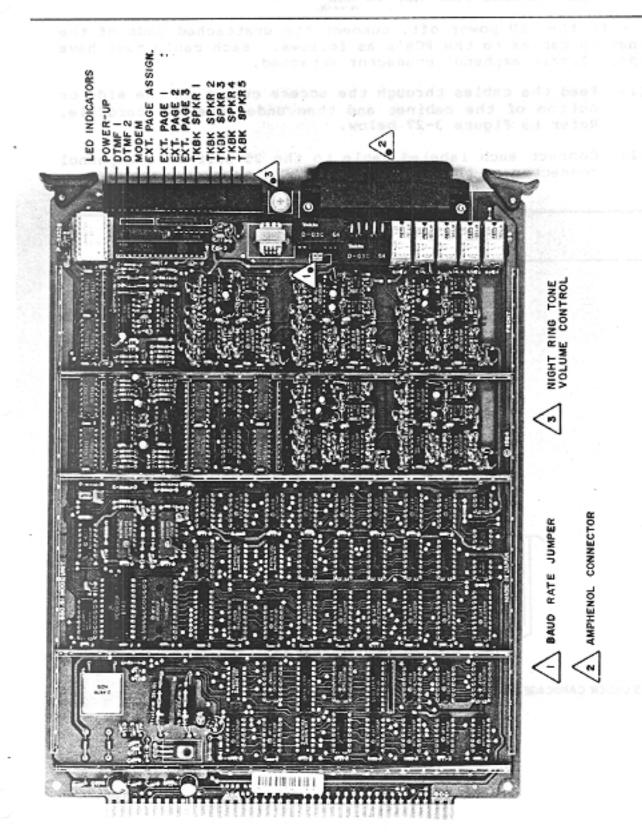




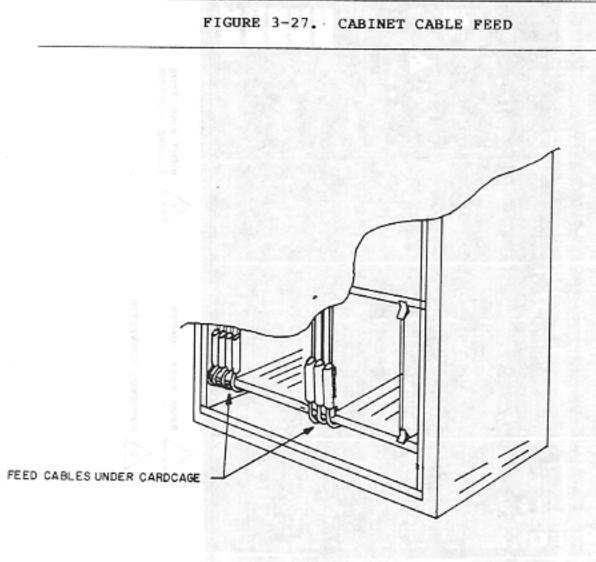
FIGURE 3-26. MODEM II (MOD II) PCB



F. CONNECTING CABLES FROM MDF TO KSU

6.20 With the KSU power off, connect the unattached ends of the termination cables to the PCB's as follows. Each cable must have a 25-pair female amphenol connector attached.

- Feed the cables through the access cutout on the side or bottom of the cabinet and then under the KSU cardfile. Refer to Figure 3-27 below.
- Connect each labeled cable to the 25-pair male amphenol (2) connector on the corresponding PCB.



Page 3-56

7. STATION INSTALLATION

7.01 This section contains information for connecting the station instruments to the cables. It includes the following:

- A. Keyset Installation
 B. DSS Installation
- B. DSS Installation
- C. Single-Line Electronic (SLE) Set Installation
- D. Single-Line 2500 Set Installation

************ CAUTION * Keysets are connected to STN-A PCB's, * * 2500 sets connect to STN-B PCB's, and the * * Single-Line Electronic sets connect to * * STN-C PCB's. Improper connection will * * cause damage to equipment. ***********

A. KEYSET INSTALLATION

7.02 Install 2480 keysets as follows:

- Unpack each keyset and check for damage. A keyset, one 7-foot three-pair line cord, one two-pair coiled handset cord, and one handset are included. If items are damaged or missing, contact Inter-Tel's Order Processing Department.
- (2) Turn on power to the KSU.
- (3) Before connecting the keyset to the KSU, measure the voltage on the RED terminal of the modular jack assembly, which must be +30VDC. Ground is on the GREEN (GND) terminal. If -30VDC is measured, check the cabling for a reversed pair.

************ CAUTION * If the power pair is reversed, installing * * a keyset will damage a fuse on the STN-A * PCB. This will affect operation of all * keysets connected to that PCB. *

- (4) Mount the modular jack assembly.
- (5) Open up the keyset by removing the three screws on the bottom. Be careful not to dislodge the ribbon cable when the covers separate. Refer to Figure 3-28 on page 3-59.

- (6) Set the internal DIP switches in the ON position for the desired options, as shown in Figure 3-29 on page 3-60. For a photo of the the control board, refer to page 3-61.
- (7) With the keyset disassembled, plug one end of the 7-foot line cord into the modular jack assembly, and the other end into the keyset jack labeled "KSU."
- (8) With a digital voltmeter, measure the voltage across diode VR2, which must be +5.0 +0.01VDC. If necessary, adjust potentiometer R15 to establish this voltage.

NOTE: While the keyset is disassembled, you may wish to install a speakerphone (kit part no. 828.1033), headset adapter (kit part no 828.1031), or loud ringing adapter (kit part no. 828.1004). Installation instructions are included in each kit.

- (9) Unplug the line cord from the keyset and reassemble the keyset.
- (10) Reconnect the line cord.

Wall-Mounting Keysets

- 7.03 To mount the keyset on a wall:
 - Remove the baseplate from the keyset by pressing down on the top of the baseplate and pulling it out. Set keyset aside.
 - (2) Hold the baseplate so that the mounting holes are at the top. Mark the location of the keyset mounting holes on the wall, then set it aside.
 - (3) Install a screw in the center of each mounting hole marking, allowing the head of the screw to protrude approximately 1/4 to 1/2 inch.
 - (4) Replace the baseplate on the keyset with the holes toward the top.
 - (5) Hang the keyset on the screws.

FIGURE 3-28. BOTTOM OF 2480 KEYSET

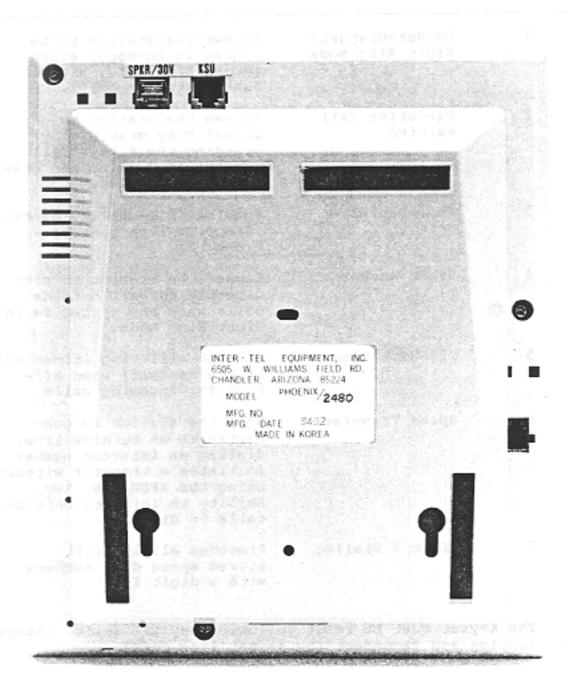
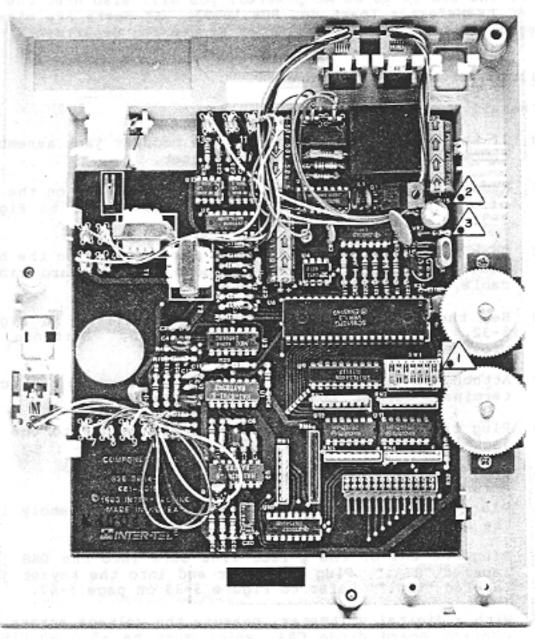


FIGURE 3-29. KEYSET DIP SWITCH OPTIONS

DIP Switch	Option	Description				
1	Do-Not-Disturb/ Night Ring Mode	Allows the station to be placed in Do-Not-Disturb (Night Ring mode, attendant's station only).				
2	Executive Call Waiting	Allows the station to signal busy stations by pressing the # key. All queuing (C.O. line and sta- tion) is disabled.				
3	Full-Duplex	Enables full-duplex, hands- free C.O. line conversa- tions.				
4	Night Answer	Causes the station to ring directly for all outside calls when the system is in Night Ring mode.				
5	Off-Hook Ring	Station will ring (tones are in the handset) when off-hook for incoming calls.				
6	Speed Transfer	When the station is con- nected to an outside line, dialing an intercom number initiates a transfer without using the XFER/CONF key. Ability to initiate outside calls is disabled.				
7	Digit 1 Dialing	Precedes all 10-digit stored speed dial numbers with a digit 1.				

The keyset must be reset following any DIP switch change (unplug and reconnect the keyset line cord). NOTE:

FIGURE 3-30. 2480 KEYSET CONTROL BOARD





DIP SWITCHES



5.0 V TEST POINT (VR 2)



5.0 V ADJUST (R 15)

B. DSS INSTALLATION

7.04 A DSS attaches to a keyset. If the system has more than 60 stations, tandem DSS's are required. Included with the DSS are a 2-foot three-pair line cord and a 7-foot AC power cord with spade lugs. If the DSS is to be AC powered, you will also need the optional AC transformer (part no. 806.1009). If parts are missing or damaged, contact Inter-Tel's Order Processing Department.

Installation of DSS with AC Power

7.05 Install the DSS as follows:

- If the keyset is plugged into the modular jack assembly, remove the line cord from the keyset.
- (2) Remove the baseplate from the DSS by pressing on the top of the baseplate and pulling it out. Refer to Figure 3-31 on page 3-65.
- (3) Open up the DSS by removing the three screws on the bottom. Be careful not to dislodge the keyboard ribbon cable when the covers separate.
- (4) Set the internal DIP switches as specified in Figure 3-32, DSS Configuration, on page 3-66. Settings are provided for single or tandem units.
- (5) Attach the spade lugs on the AC power cord to the screw terminals marked "LOAD" on the AC transformer.
- (6) Plug the modular end of the AC power cord into the DSS jack labeled "PWR."
- (7) Plug the transformer into an AC outlet.
- (8) Plug the line cord from the modular jack assembly into the DSS jack labeled "KSU."
- (9) Plug one end of the 2-foot line cord into the DSS jack labeled "STA." Plug the other end into the keyset jack labeled "KSU." Refer to Figure 3-33 on page 3-67.
- (10) With a digital voltmeter, measure the voltage across DSS control board diode CR4, which must be +5.0 ±0.01VDC. If necessary, adjust potentiometer R5 to establish this voltage. Refer to page 3-68 for a photograph of the DSS control board.

- (11) Unplug the transformer from the AC outlet. Unplug the two line cords from the DSS jacks. Reassemble the DSS.
- (12) Plug the two line cords into the DSS jacks. Plug the transformer into the AC outlet. has delegated

Installation of DSS with DC Power

NOTE: Up to four DSS's may be DC powered by the KSU (two Station A PCB's can support two DSS's each). DC and AC powered DSS's may be mixed on the same system.

7.06 For a system with optional system battery back-up, or for a DSS without access to an AC outlet, install the DSS as follows:

- If the keyset is plugged into the modular jack assembly, remove the line cord from the keyset.
- Remove the baseplate from the DSS by pressing on the top (2) of the baseplate and pulling it out. Refer to Figure 3-31 on page 3-65.
- Open up the DSS by removing the three screws on the (3) bottom. Be careful not to dislodge the keyboard ribbon cable when the covers separate.
- Set the internal DIP switches as specified in Figure (4) 3-32, DSS Configuration, on page 3-66. Settings are provided for single or tandem units.
- (5) Remove the RED wire and the GREEN wire of the "PWR" modular jack from spade lug terminals 13 and 14 on the control board. Tape and store the leads. For a photograph of the DSS control board, refer to page 3-68.
- Solder two jumper wires between the terminals as fol-(6) lows:
 - a. From terminal 1 to 13.
 - b. From terminal 2 to 14.
- Plug one end of the 2-foot line cord into the DSS jack (7) labeled "STA." Plug the other end into the keyset jack labeled "KSU." Refer to Figure 3-33 on page 3-67.
- (8) Plug the KSU line cord from the modular jack assembly into the DSS jack labeled "KSU."

- (9) With a digital voltmeter, measure the voltage across diode CR4, which must be +5.0 +0.01VDC. If necessary, adjust potentiometer R5 to set the voltage level at 5.0 +0.01VDC. Refer to page 3-68 for a photograph of the DSS control board. 30 300 0A 08
- Unplug the two line cords from the DSS jacks. Reassem-(10)ble the DSS unit. Towns DG Malw EBG to not salls small
- (11) Plug the line cords into the DSS jacks. A PCB 4 can support two PS's eachi. DC and AC powered DSS's may be mixed on the sare system.

FIGURE 3-31. BOTTOM OF DSS II

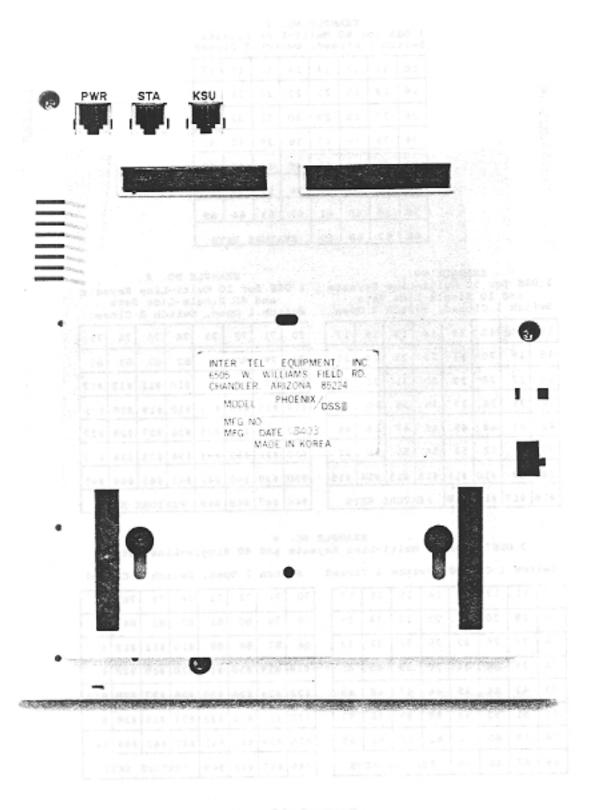


FIGURE 3-32. DSS CONFIGURATION

EXAMPLE NO. 1 1 DSS for 60 Multi-Line Keysets Switch 1 Closed, Switch 2 Closed

10	11	12	13	14	15	16	17
18	19	20	21	22	23	24	25)
26	27	28	29	30	31	32	33
34	35	36	37	38	39	40	41
42	43	44	45	46	4.7	48	49
50	51	52	53	54	55	56	57
58	59	60	61	62	63	64	65
66	67	68	69	FEATURE KEYS			

EXAMPLE NO. 2 1 DSS for 50 Multi-Line Keysets and 10 Single-Line Sets Switch 1 Closed, Switch 2 Open

_	open								
10	11	12	13	14	15	16	17		
18	19	20	21	22	23	24	25		
26	27	28	29	30	31	32	33		
34	35	36	37	38	39	40	41		
42	43	44	45	46	47	48	49		
50	51	52	53	54	55	56	57		
58	59	#10	#11	#12	#13	#14	#15		
#16	#17	# 18	#19	FEATURE KEYS					

EXAMPLE NO. 3 1 DSS for 20 Multi-Line Keysets and 40 Single-Line Sets Switch 1 Open, Switch 2 Closed

	Switch i Open, Switch 2 Closed							
70	71	72	73	74	75	76	77	
78	79	80	81	82	83	84	85	
86	87	88	89	#10	#11	#12	#13	
#14	#15	#16	#17	#18	#19	#20	#21	
#22	#23	#24	# 25	#26	#27	#28	#29	
#30	#31	#32	#33	#34	‡ 35	#36	#37	
#38	‡ 39	#40	#41	#41	‡ 43	#44	#45	
#46	#47	#48	#49	FEATURE KEYS				

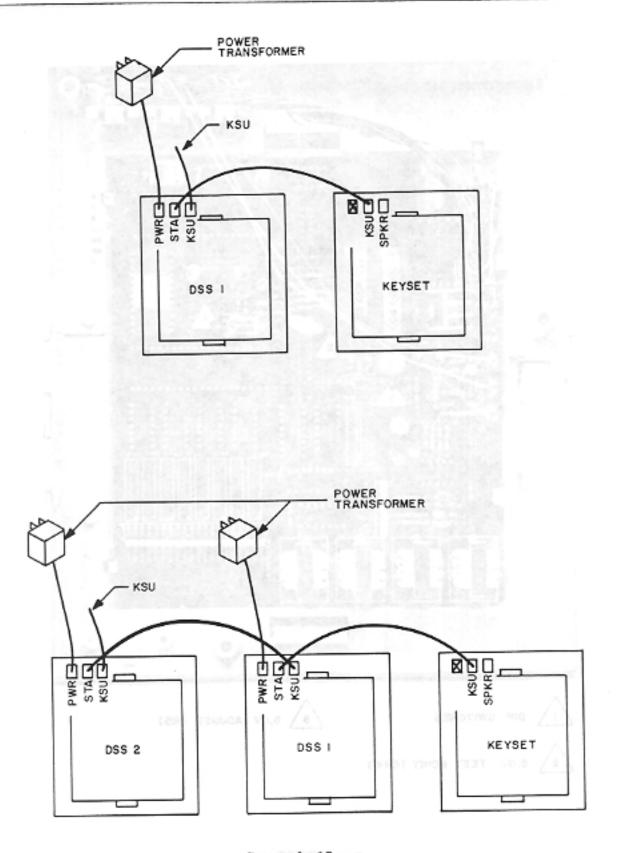
EXAMPLE NO. 4 2 DSS's for 80 Multi-Line Keysets and 40 Single-Line Sets

Switch 1 Closed, Switch 2 Closed Switch 1 Open, Switch 2 Closed

10	11	12	13	14	15	16	17	
18	19	20	21	22	23	24	25	
26	27	28	29	30	31	32	33	
34	35	36	37	38	39	40	41	
42	43	44	45	46	47	48	49	
50	51	52	53	54	55	56	57	
58	59	60	61	62	63	64,	65	
66	67	68	69	FEATURE KEYS				

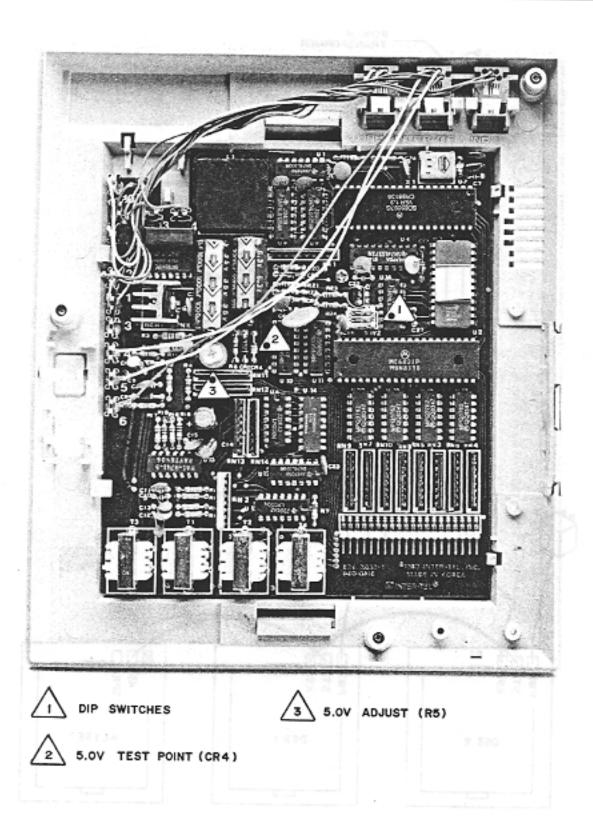
_							
70	71	72	73	74	75	76	77
78	79	80	81	82	83	84	85
86	87	88	89	#10	#11	#12	#13
#14	#15	#16	#17	#18	#19	#20	#21
#22	*23	#24	#25	#26	#27	#28	#29
#30	#31	#32	#33	#34	#35	#36	#37
#38	#39	#40	#41	#42	#43	#44	#45
146	# 47	‡ 48	#49	FEATURE KEYS			

PIGURE 3-33. DSS TO KEYSET CONNECTIONS



Page 3-67

FIGURE 3-34. DSS II CONTROL BOARD



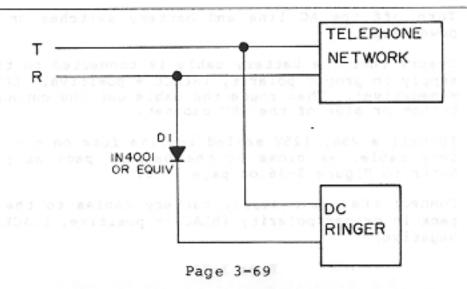
C. SINGLE-LINE ELECTRONIC (SLE) SET INSTALLATION

7.07 Install the SLE sets by plugging one end of the 7-foot line cord into the modular jack assembly, and the other end into the SLE jack on the back of the set.

D. SINGLE-LINE 2500 SET INSTALLATION

- (1) Disassemble the 2500 set and disconnect the AC ringer.
- (2) Install a 24-volt DC ringer in the 2500 set by connecting one lead to the telephone Tip circuit. Connect the other lead to the telephone Ring circuit, using a lN400l diode as shown in Figure 3-35 below. (A suitable ringer is a PBX-2L low pitch DC ringer available from most electronic supply companies. Refer to page 2-2 for more information.)
- (3) Reassemble the 2500 set.
- (4) Install the 2500 set by plugging one end of the line cord into the modular jack assembly, and the other end into the jack on the 2500 set.

FIGURE 3-35. DC RINGER CONNECTION TO 2500 SETS



8. SYSTEM BATTERY BACK-UP INSTALLATION

8.01 Refer to SYSTEM SPECIFICATIONS for additional information. Install the optional battery back-up system as follows:

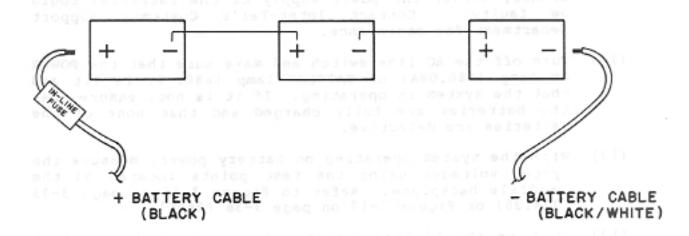
- (1) The batteries may be placed in a ventilated battery compartment (part no. 823.1075). (Check your local codes.) To prepare each battery compartment:
 - a. Remove the three screws that hold the cover in place. Save the screws.
- b. As required by local code, either strike out the knock-out on the side of the compartment and attach a 1/2-inch electro-mechanical tubing (EMT) connector, or use a 10AWG HEYCO-type strain relief connector on each of the two small openings when inserting the battery wires.
 - c. Using 10AWG wire, connect the compartment ground lug to the earth ground.
- d. Place the batteries in the compartments.
- (2) Using 10AWG wire, connect the batteries selected from the specifications in series. The batteries must be fully charged and of the same amp-hour (AH) rating and age. (The AH rating of the string is the same as the AH rating of any single battery in the string.) The connecting wires must be the same length to ensure proper float voltage. Refer to Figure 3-36 on page 3-72 for a wiring diagram.
 - (3) If desired, you can connect two strings in parallel to double the AH rating and lengthen the discharge rate. The voltage level remains the same. Connect the positive side and negative side of the parallel batteries to common termination points. Refer to Figure 3-36.
 - (4) Turn off the AC line and battery switches on the KSU power supply.
 - (5) Ensure that the battery cable is connected to the power supply in proper polarity (BLACK = positive, BLACK/WHITE = negative). Then route the cable out the cutout in the bottom or side of the KSU cabinet.
 - (6) Install a 25A, 125V sealed in-line fuse on the (+) battery cable, as close to the battery pack as possible. Refer to Figure 3-36 on page 3-72.
 - (7) Connect the power supply battery cables to the battery pack in proper polarity (BLACK = positive, BLACK/WHITE = negative).

- (8) Turn on the power supply AC line switch and make sure that the POWER ON lamp is lit.
- (9) Turn on the battery switch.
- (10) Measure the float voltage on the power supply battery cable connections, which must be 33-35VDC (680.08A) or 26-28VDC (680.06). If the float voltage is out of tolerance, either the power supply or the batteries could be faulty. Contact Inter-Tel's Customer Support Department for assistance.
- (11) Turn off the AC line switch and make sure that the POWER ON lamp (680.08A) or BATTERY lamp (680.06) is lit and that the system is operating. If it is not, ensure that the batteries are fully charged and that none of the batteries are defective.
- (12) With the system operating on battery power, measure the system voltages using the test points located on the cardfile backplane. Refer to Figure 3-15 on page 3-33 (32X128) or Figure 3-17 on page 3-36 (2456).
- (13) Turn on the AC line switch. Leave the battery switch on.

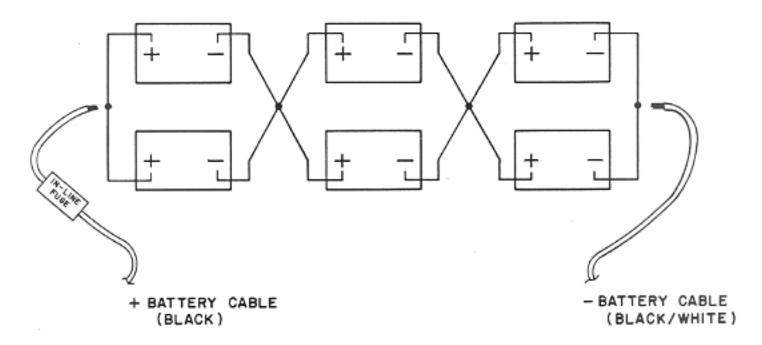


FIGURE 3-36. CONNECTING THE BATTERY PACK

SERIES CONNECTION:



SERIES PARALLEL CONNECTION:



INSTALLING THE SMDR OUTPUT DEVICE

- 9.01 The output device for the Station Message Detail Recording (SMDR) feature must have these characteristics:
 - A. It must be RS232C compatible.
 - B. It must be formatted for serial ASCII with no parity.
 - C. It must be capable of reception at either 300 or 9600 baud.
 - D. The RS232C interface must be equipped with a male 25-pin subminiature "D" connector. Consult the owners guide for the device to verify that the individual pin functions are identical to those of the PCB. If necessary, rewire the connector on the device to match the requirements for the CPU. Pin functions for the 25-pin interface are shown below.

Name	Function	Pin
-Protective Ground	Ground (tied to Pin 7)	1
Receive Data (RXD)	Data to CPU	2
_Transmit Data (TXD)	Data from CPU	3 /
-Clear to Send (CTS)	Signal from CPU	5 -
Data Set Ready (DSR)	Always true	6
-Signal Ground	Ground	7_
Data Carrier Detect (DCD)	Always true	8
Data Terminal Ready (DTR)	Signal to CPU	20

- 9.02 To connect the output device to the CPU PCB:
 - (1) Turn on the AC power to both the device and the system before connecting the terminal cable to the CPU PCB. This will prevent any electrical surges from being transmitted by the interface.
 - (2) Carefully connect the RS232C interface cable from the device to the RS232C port on the CPU PCB. Refer to the photograph in Figure 3-19 on page 3-42.
- 9.03 For more information about the SMDR feature, refer to SYS-TEM PROGRAMMING and FEATURES.

10. INSTALLING THE EXTERNAL MUSIC-ON-HOLD SOURCE

10.01 There is a female connector on the CPU PCB for an external music source. It will accept a 1/8-inch mini-phone plug which can be purchased at any electronic parts store.

10.02 To install the customer-provided external music source, attach the mini-phone plug wire to the music source, at either the earphone jack or directly to the speaker output wires, and plug it into the connector on the CPU PCB. (Refer to the photograph on page 3-42.) The optimal input level is lVRMS.

Transmi Data (TXD) Data from CPU S Clear to Send (CTS) Signal from CPU S Data Set Ready (DSR) Always true Signal cround

Data Terminal Ready (DTR: Signel to CFO 2Q-

Turn on the AC power to both the device and the tystem before connecting the terminal cable to the CRC PCB.

This will prevent any electrical surges from being

(2) Ca etully connect the Rollson interface capie that the device to the RS233C port on the CPU PCB. Refer to the photograph in Engure 3-19 on page 3-42.

9.03 For nore information about the SMDR feature, return to SYS-TEM PROCRAMMING and PEATORES.

SYSTEM PROGRAMMING

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INTRODUCTION

1.01 This section describes the initializing and programming procedures for the system. For proper system operation, the system must be initialized when it is installed or after power has been off for more than 25 days. Programming enables service personnel to customize the system to meet each user's requirements.

* PROGRAMMING MUST ONLY BE PERFORMED *

BY TRAINED SERVICE PERSONNEL *

1.02 After initial installation, changes may be made at any time without affecting service. Any changes made while a call is in progress do not take effect until after the call is completed.

PROGRAMMING METHODS

A. PROGRAMMING THE DATA BASE

- 2.01 The programmer needs an input/output device, such as a CRT terminal or printer terminal, with a keyboard. The terminal is used for on-site and remote programming. It must have these characteristics:
 - (1) RS232C compatible.
 - (2) Formatted for serial ASCII with no parity.
 - (3) Full-duplex transmission at either 300 or 9600 baud for on-site programming and 110 or 300 baud for remote programming.
- (4) For on-site programming, the RS232C interface on the programming terminal must be equipped with a male 25-pin subminiature "D" connector. Consult the programming terminal owner's guide to verify that the individual pin functions are identical. If necessary, rewire the RS232C connector on the programming terminal to match the CPU PCB outlet. Refer to INSTALLATION for RS232C pin connections.
 - (5) For remote programming, the terminal must be equipped with a Bell System 103A-type modem or equivalent.

B. KEYSET PROGRAMMING

2.02 Some options are enabled by setting DIP switches in the OPEN or CLOSED position in the keysets and DSS. For information on the correct setting for these switches, refer to INSTALLATION.

C. PROGRAMMING SHEETS

2.03 To assist in the installation and programming of a system, two programming sheets are provided. All system and station options may be planned prior to installation, making programming easier, quicker, and more accurate. Refer to Figure 4-1, System Programming Sheet, on page 4-29, and Figure 4-2, Station Programming Sheet, on page 4-30.

- 4.06 DEL or RUBOUT Key: You may correct entry errors by using the DEL or RUBOUT key before (CR) to backspace and type over characters.
- 4.07 CONTROL-D Keys: Holding down the Control (CTRL) key and then pressing D at the same time allows you to redisplay the current line before the carriage return is pressed. If the input line has had several characters typed over, the line may be unreadable. The CTRL-D keys can be used to show a "clean" copy of the line.
- 4.08 CONTROL-X Keys: Holding down the Control (CTRL) key and then pressing X at the same time allows you to cancel the input line entered before a carriage return. Any characters entered on the current input line will be deleted, and the equal sign (=) prompt will be displayed.
- 4.09 Error Message: If data is entered incorrectly, the terminal will print the error message "WHAT?" and will redisplay the line in question followed by the equal sign (=) prompt.
- 4.10 QUIT Command: Entering QUIT<CR> will end the programming sequence and sign off.
- 4.11 Miscellaneous Programming Information: The information listed below will aid in the operation of the terminal used to program the system.
 - (1) Use uppercase letters only.
 - (2) Use one of the following methods when entering numbers:
 - The hyphen (-) may be used to list consecutive numbers. For example, list the lines restricted as 1-8 instead of 1,2,3,4,5,6,7,8.
 - b. The comma (,) must be used to list a series of nonconsecutive numbers. For example, list the lines restricted as 3,5,7,10.
 - A combination of commas and hyphens may be used. For example, 1-8,13,18,20-24.
 - (3) To erase data in a particular line and move to the next line, press the space bar, then <CR>.
 - If a line does not need to be changed, press <CR>. This will advance the system to the next line without altering any data.
 - (5) The symbols X.Y, XX.Y and XX are used throughout these procedures to indicate numerical variables.

- (6) For accurate results, respond to all questions displayed by the system.
- (7) To terminate any SERV subroutine, press the BREAK key. The terminal will respond with the sign-on message equal sign (=) prompt. You may then choose another major procurrent in before the carriage return is pressed. marpine input if ne has hid several characters typed over the line may be unreadable. The CTRL-D keys can be used to show a "clean" copy

5. SYSTEM PROGRAMMING

A. OUTLINE TO PROGRAM NEW SYSTEMS (1) Sign on to the system.

- Run the software test (TEST).
- Initialize the system (INIT).

 Set the date and time (TIME). (3)
 - (4)
 - If desired, list the programs available (SERV).
- (6) If desired, list the system and station options available (SERV OPT).
 - Enter the System Features (SERV SYS). All entries (7) appear in Figure 4-1 on page 4-29.
 - (8) Change (SERV NUM) and verify (SERV VER) the intercom number assignments if desired.
- (9) Equip C.O. lines (SERV EQU).
 - Enter the Station Features (SERV STA). All entries (10)appear in Figure 4-2, Station Programming Sheet, on page 4-30.
 - (11)End your programming session (QUIT).

It a line does not need to be changed, Frag CER This

SYSTEM PROGRAMS

Major	SISIEM PROGRAMO
Programs /	SERV Subroutines
Trograms	THE STATE OF THE PROPERTY OF T
TEST	SYStem and the second force of the body of the second second
y langos:	OPERATOR EXT = 10
a 1 1879 1197	MESSAGE CENTER EXT= 10
INIT	SYSTEM OPTIONS= 9
arc v - mortiwing	 Print MDR 7-Digits and more 30 sec.
	Print MDR 8-Digits and more 30 sec.
TIME	 Enable error messages
)	4. Disable I-Hold
/	5. 12 sec. Re-dial timing
SERV <	Held call loop release = 1.2 sec.
	7. 600 msec hookswitch flash
)	Table 8. Tic-Tone
DISP	Line key 24 rotary selection
	10. SL SMDR print/toll monitor
	 Programmed night service
REST	 Intercom security tone
(=) np 's	13. Extended external bell
	14. C.O. line reseize disable
ONMN	15. Disable C.O. account code
	16. 1664 system
	17. Allow 411 and 1411
	18. Allow 1-555-1212 and 1-XXX-555-1212
	19. MOD-II card installed
DUMP/LOAD	TRANSPER RECAIL TIMES 60 SECONDS
	HOLD RECALL TIME= 60 SECONDS
	WATS LINE ID=
Lamidnes	DISA LINE ID (DAY)=
t, Enter	DISA LINE ID (NIGHT)=
	ABSORBED DIGIT ID=
	ATTOMOR TONG RECONNER 4-
	ALLOWED LONG DISTANCE #= ALLOWED AREA CODES= 800
	FORBIDDEN OFFICE CODES=
	STATION
	LINES RESTRICTED= RING IN FROM LINES=
	RING IN FROM LINES=
	OPTIONS=
	 OPX ring intercom always
1	 Line monitoring
	4. Ring intercom first
	6. Toll restrict
ROS edd i	7. Forward on busy
bas lies	8. C.O. ring forward
the space	PAGING ZONES= 1 PRESET FWD. EXTENSION=
	PRESET FWD. EXTENSION=
	TENANT NUMBER= 1
contact	BOTPPCC
1	OPTION
	NUMber
1	CIRcuit
Į	VERI fy
	D 4 7

B. SOFTWARE SELF-TEST (TEST)

5.01 The Software Self-test tests the Random Access Memory (RAM) and the Read-Only Memory (ROM) on the CPU PCB. This program should be run under two conditions: (1) when first installing the CPU PCB to make sure that the software is operating properly, or (2) as a check to make sure the currently-installed CPU PCB is functioning properly. This program will halt the CPU; no new calls or features can be activated. Calls are dropped when you turn off the power supply to reset the system.

> ************ CAUTION * TEST will scramble the data base and must * * be followed by INIT. Always run TEST *
> * after changing the ROMS on the CPU PCB. * ************

- To start TEST, after the sign-on message equal sign (=) prompt, enter TEST(CR).
- (2) The terminal will respond with:

SYSTEM WILL HALT ON THIS COMMAND, ARE YOU SURE (Y/N)?

- (3) Answer yes or no.
 - a. To end the TEST program, enter N<CR>. The terminal will respond with the equal sign (=) prompt. Enter the name of the next major program to run.
- OR, b. To perform the test, enter Y<CR>.
- (4) The terminal will respond with:

ROM & RAM CHECK *ROM CHECK* *RAM CHECK* \$1000-\$1FFF...PASS \$5000-\$57FF...PASS TURN POWER-SUPPLY SW OFF, THEN ON!!

- a. If the ROM/RAM jumper on the CPU PCB is in the ROM position, the RAM check (\$5000-\$57FF) will fail and an error message will be displayed. Press the space bar to halt the error printout.
- b. If the response is not as shown above, contact Inter-Tel Customer Support.

- (5) Turn the power supply off for 10 seconds and then on again. This resets parts of memory.
- (6) Press the space bar. The sign-on message will be displayed, and you may begin programming after initializing the system.

C. INITIALIZE (INIT)

- 5.02 This program presets the system in a standard software configuration. All previously programmed data is erased and the initialization sets the following software features:
 - Attendant's (operator) station number is 10.
 - Message center is station 10.
 - System Option 9 (line key 24 rotary selection) is enabled.
 - The only allowed area code is 800.
 - The Transfer Recall time is 60 seconds.
 - The Hold Recall time is 60 seconds.
 - Lines 1-24 are set to ring in at the attendant's station.
 - All lines are equipped.
 - All keysets may gain access to all outside lines.
 - All keysets are in paging zone l.
 - All keysets are in tenant group 1.
 - Station Option 6 (Toll Restrict) and Option 4 (Ring Intercom First) are enabled for single-line instruments.
 - All intercom numbers are assigned sequentially beginning with intercom number 10 on circuit 1.1. Refer to Figures 4-3 and 4-4 on pages 4-31 and 4-32 for initialized intercom number assignments.

Enter the two-digit number (01-12) and other.

- 5.03 To initialize the system:
- After the sign-on message equal sign (=) prompt, enter INIT<CR>.
 - (2) The terminal will respond with:

OPT RAM INITIALIZING INITIALIZATION COMPLETE

(3) Enter the name of the next major program to run.

D. TIME AND DATE (TIME)

- 5.04 This program displays and changes the date and time on the SMDR printout. The clock starts when the minutes are entered.
 - To change the date or time, after the sign-on message equal sign (=) prompt, enter TIME<CR>.
 - (2) The terminal will respond with:

THE DATE AND TIME IS NOW:

(The current date and time)

CORRECT?

- (3) Answer yes or no.
 - a. If correct, enter Y<CR>. The terminal will respond with the equal sign (=) prompt. Enter the name of next major program to run.
- OR, b. To change either the date or time, enter N<CR>.
 - (4) The terminal will respond with:

ENTER NEW DATE AND TIME

DAY OF WEEK =

- (5) Enter the two-letter abbreviation (SU,MO,TU,WE,TH,FR,SA) and <CR>.
- (6) The terminal will respond with:

MONTH =

(7) Enter the two-digit number (01-12) and (CR).

- (8) The terminal will respond with: DAY OF MONTH =
- (9) Enter the two-digit number (01-31) and <CR>.
 - (10) The terminal will respond with: YEAR =
 - Enter the last two digits of the year and <CR>. (11)
 - (12) The terminal will respond with: HOUR =
 - (13) Enter two digits (00-23, midnight is 00) and <CR>.
 - The terminal will respond with: (14) MINUTE = TOTAL AND AND MOTING BAT
 - (15) Enter two digits (00-59) and <CR>.
 - The terminal will respond with: (16) SECONDS ARE PRESET TO ZERO!!
 - (17) Enter the name of the next major program to run.

E. SERVICE (SERV)

5.05 The Service (SERV) program is used to enable all of the system features. These options may be system-wide or they may affect individual stations. The SERV program has seven subroutines, as shown below.

- (1) To enter the major SERV program, after the sign-on message equal sign (=) prompt, enter SERV<CR>.
- The terminal will respond with a list of subroutines:

FIELD PROGRAMMING ACCESS OPT-OPTION CODE LISTING

STA-STATION FEATURES NUM-NUMBER CHANGE (INTERCOM) SYS-SYSTEM FEATURES CIR-CIRCUIT # / IC # LISTING
EQU-EQUIPPED LINES VER-VERIFY CIRCUIT ASSIGNMENTS

ENTER PROGRAMMING AREA DESIRED=

(3) Enter a three-character subroutine code and <CR>.

NOTE: These subroutines may be accessed by entering the batch command: SERV, space, and the subroutine code. For example, SERV STA<CR> accesses the Station Features subroutine.

Option Code Listing (OPT)

5.06 This subroutine lists the available system and station options. Each option is identified by a number used in the SYS and STA subroutines.

- (1) While in the SERV program, enter OPT<CR>.
- (2) The terminal will respond with:

STATION OPTION CODE LISTING 1-OPX RING INTERCOM ALWAYS 2-LINE MONITORING 6-TOLL RESTRICT 3-1032 STATION 7-FORWARD ON BUSY 4-RING INTERCOM FIRST 8-C.O. RING PORWARD

SYSTEM OPTION CODE LISTING

1-PRINT MDR 7-DIGITS AND MORE 30SEC.

2-PRINT MDR 8-DIGITS AND MORE 30SEC.

3-ENABLE ERROR MESSAGES

4-DISABLE I-HOLD

5-12SEC. RE-DIAL TIMING

6-HELD CALL LOOP RELEASE=1.2 SEC.

7-600 MSEC HOOKSWITCH FLASH

8-TIC-TONE

9-LINE KEY 24 ROTARY SELECTION 10-SL SMDR PRINT/TOLL MONITOR 11-PROGRAMMED NIGHT SERVICE

12-INTERCOM SECURITY TONE

13-EXTENDED EXTERNAL BELL

14-C.O. LINE RESEIZE DISABLE

15-DISABLE C.O.ACCOUNT CODE

16-1664 SYSTEM

17-ALLOW 411 AND 1411

18-ALLOW 1-555-1212 AND 1-XXX-555-1212

19-MOD-II CARD INSTALLED

ENTER PROGRAMMING AREA DESIRED=

(3) Enter the name of the next SERV subroutine to run.

System Features (SYS)

5.07 The System Features (SYS) subroutine sets up, changes, or deletes system-wide features. These options affect all stations that are connected to the system.

- (1) While in the SERV program, enter SYS (CR).
 - (2) The terminal will respond with the features that were preset during initialization or the information entered last. If the system was initialized, the list will look like this:

SYSTEM STATUS
OPERATOR EXT = 10
MESSAGE CENTER EXT = 10
SYSTEM OPTIONS = 9
TRANSFER RECALL TIME = 60 SECONDS
HOLD RECALL TIME = 60 SECONDS
WATS LINE ID =
DISA LINE ID (DAY) =
DISA LINE ID (NIGHT) =
ABSORBED DIGIT ID =
ALLOWED LONG DISTANCE #=
ALLOWED AREA CODES = 800
FORBIDDEN OFFICE CODES =
CORRECT?

- (3) Answer yes or no:
- a. If correct, enter Y<CR>. The terminal will respond with:

ENTER PROGRAMMING AREA DESIRED=

and you may enter the name of the next SERV sub-routine to run.

OR, b. If incorrect, enter N<CR>. The terminal will respond with:

ENTER REVISED SYSTEM FEATURES
SYSTEM STATUS
OPERATOR EXT=

- (4) The terminal will display each line of the program individually, beginning with OPERATOR EXT (see Step 5 below).
 - a. If the entry printed in the list is correct, enter <CR> to skip that line and access the next program line.
- b. If the entry is incorrect, enter the new information as described below and <CR>.
 - c. If you need to erase an entry, press the space bar once and <CR>.

(5) OPERATOR EXT=

Enter the two-digit attendant's intercom number and <CR>. It is preset to 10 during initialization but can be changed from 10-89. There may be only one attendant's intercom number, and this is the only station that can set the system in Night Ring mode, is accessed by dialing 0 on intercom calls, and is the final recall station.

(6) MESSAGE CENTER EXT=

Enter the two-digit intercom number (can be the attendant's) and <CR>. It is preset to 10 during initialization but can be changed from 10-89. There may be only one message center, and this is the station that is automatically dialed when the caller presses the MSG/DIAL key. The called station must dial the Message Center to retrieve the message.

(7) SYSTEM OPTIONS=

Enter the option number(s), separated by commas, and <CR>. Option 9 is the only option preset during initialization. The system options are:

- a. Option 1 Print MDR 7-Digits and More 30 Sec.: The SMDR will print calls when 7 digits or more are dialed and the call is 30 seconds or longer in duration.
- b. Option 2 Print MDR 8-Digits and More 30 Sec.: The SMDR will print calls when 8 or more digits are dialed and the call is 30 seconds or longer in duration.

NOTE: If options 1 or 2 are not selected, all incoming and outgoing calls will be recorded on the SMDR printout.

- Option 3 Enable Error Messages: A system diagnostic printout on the SMDR identifies defective stations and user errors. This option works with options 1 and 2. The SMDR error message format is explained in DIAGNOSTIC PROGRAMMING.
 - Option 4 Disable I-Hold: Causes all calls ringing in or on hold to flash on all keysets and enables every station to answer every incoming line.
- e. Option 5 12 Sec. Re-dial Timing: The last number redial feature is delayed for 12 seconds. This allows speed-dialed numbers to be chained by dialing the subsequent numbers within the 12-second delay.
- f. Option 6 Held Call Loop Release = 1.2 Sec.: The normal 0.1 second interrupt time is increased to 1.2 seconds. This is the length of time allowed before calls on hold will disconnect. This option is required when the system is serviced by an Electronic Switching System (ESS) Central Office.
- g. Option 7 600 msec Hookswitch Flash: A 600 msec flash (normally 1.2 sec.) is generated on a line by pressing the line key in use. This option is intended for system use behind a PABX to access PBX features. If this option is not enabled, pressing the line key will cause the call in progress to be disconnected, and will reseize outside dial tone. Option 7 overrides System Option 14.
 - h. Option 8 Tic-Tone: As an alternative to Music-On-Hold, a Tic-Tone signal generated by the CPU PCB may be heard by outside callers when placed on hold.
- i. Option 9 Line Key 24 Rotary Selection: When enabled on the 32X128 system, this option allows keyset users access to the rotary group of lines by pressing line key 24. (Single-line users access the rotary group by dialing 9.) When disabled, only single-line sets have access to the rotary group and line 24 becomes a two-way line for keysets. When enabled on the 2456 system, this option allows single-line users to access line 24 by dialing 9. When disabled, line 24 becomes a two-way line for keysets and single-line sets cannot access outside lines. Do not use System Option 16 with this option.

j. Option 10 - SL SMDR Print/Toll Monitor: This option serves two purposes. It includes calls placed by single-line sets in the SMDR printout and provides expanded toll restriction for single-line sets through the DTMF decoder on the MOD PCB.

NOTE: Station Option 6 must be enabled on the single-line circuits for Toll Monitor.

- k. Option 11 Programmed Night Service: Only C.O. lines programmed to ring in on the attendant's station will be placed in the Night Ring mode. Private lines that are programmed to ring in directly are not affected by the Night Ring mode.
- 1. Option 12 Intercom Security Tone: When a keyset user responds to an intercom call handsfree (on-hook), a beep tone is sent out the keyset speaker every 30 seconds as a reminder that the microphone is active.
- m. Option 13 Extended External Bell: If enabled, the MOD II PCB closes the Night Transfer contacts. The External Night Ring relay is enabled for all incom-ing calls. Normally, these relays are activated only when the system is placed in the Night Ring mode.
- n. Option 14 C.O. Line Reseize Disable: Prevents the user from terminating an outside call and reaccessing the same C.O. line by pressing the line key . again. System Option 7 overrides this option.
- o. Option 15 Disable C.O. Account Code: This option allows the asterisk (*) to be sent over C.O. lines as a tone (useful for telebanking, etc.). Normally, the asterisk and the following six digits entered on the keypad are muted, and are printed in the SMDR account code field.
- p. Option 16 1664 System: This option offers software compatability with Inter-Tel's 1664 system.

NOTE: Do not use this option with System Option 9 or Station Option 3.

q. Option 17 - Allow 411 and 1411: This option allows toll-restricted stations to dial local information (411 and 1411).

- r. Option 18 Allow 1-555-1212 and 1-XXX-555-1212: This option allows toll-restricted stations to dial long distance information (1-555-1212 or 1-XXX-555-1212).
- s. Option 19 MOD-II Card Installed: If enabled, this option allows the KSU to use the expanded features of the MOD II PCB. It must be disabled for the MOD I PCB

(8) TRANSFER RECALL TIME=

Enter the time in seconds (1-255) and <CR>. This sets the time delay before an unanswered transferred call will recall the transferring station and the attendant, or will forward to the preset forward station. This feature is preset to 60 seconds during initialization. Entering zero will result in a default time of 60 seconds, and you may not enter a number greater than 255.

(9) HOLD RECALL TIME=

Enter the hold recall time in seconds (1-255) and <CR>. This is the time limit that: (1) calls can be placed on hold before recalling at the station, and (2) recalled calls (from hold or transfer) will ring at the station before returning to the attendant. This feature is preset to 60 seconds during initialization. Entering zero will result in a default time of 60 seconds, and you may not enter a number greater than 255.

NOTE: As a result of the transfer recall time and hold recall time, a call may be placed on hold for a maximum of 8-1/2 minutes before returning to the attendant. If the attendant does not answer the recall, it will be dropped after 10 minutes as a result of the abandoned recall timer expiring.

(10) WATS LINE ID=

Enter the C.O. line number(s) and <CR>. These are the lines which toll-restricted stations may access to dial long distance numbers without being disconnected. These lines are not necessarily WATS lines, but may be local C.O. lines, FX lines, and PBX lines. No lines are preset during initialization.

(11) DISA LINE ID (DAY)=

Enter the C.O. line number(s) to be programmed for DISA and <CR>. A DISA line gives outside callers the ability to directly dial intercom numbers and to access outgoing C.O. lines. The outside phone must be a pushbutton (DTMF) phone. A maximum of 24 DISA Line ID's are allowed for lines 1-24. No lines are preset during initialization.

(12) DISA LINE ID (NIGHT)=

Enter the C.O. line number(s) and <CR>. This is the same as the DISA line ID (day) except that it operates only when the system is in the Night Ring mode.

(13) ABSORBED DIGIT ID=

Enter the digit (2-9) and <CR>. The system tollrestriction table will ignore this digit if it is the
first one dialed. By absorbing the digit, a long
distance call from toll-restricted stations cannot be
processed. There may be only one absorbed digit
programmed for the system. No digits are preset during
initialization.

(14) ALLOWED LONG DISTANCE #=

Enter up to two 10-digit telephone numbers and <CR>.
These are numbers that toll-restricted stations are permitted to call. Each number must include 10 characters and the two telephone numbers must be separated by a comma when entered. Entering an X as part of a number allows any digit 0 to 9 in that location. For example, XXX5551212 allows directory assistance for any area code. No numbers are preset during initialization.

(15) ALLOWED AREA CODES=

Enter the area codes which toll-restricted stations may call and <CR>. There may be a maximum of 20 three-digit codes entered, separated by commas. Entering an X as part of a number allows any digit 0 to 9 in that location. For example, 31X allows all area codes from 310 to 319. Area code 800 is preset during initialization.

(16) FORBIDDEN OFFICE CODES=

Enter the local telephone exchanges (office codes) that toll-restricted stations may not call and <CR>. There may be a maximum of 20 three-digit codes entered, separated by commas. Entering an X as part of a number allows any digit 0 to 9 in that location. For example, 93X forbids office codes from 930 to 939. No codes are preset during initialization.

When you have finished entering the System Features, the (17) terminal will print:

CORRECT?

- (18) Answer yes or no:
 - If any entry is incorrect, enter N<CR>. The terminal will automatically cycle back through the SYS subroutine. Refer to Step 3 on page 4-13.
- OR, b. If correct, enter Y<CR>. The terminal will respond with:

ENTER PROGRAMMING AREA DESIRED

and you may enter the name of the next SERV subbas sedmon groutine to run, wen end of eloya wa

Station Features (STA)

5.08 The Station Features subroutine is used to set up, change, or delete the features of individual stations. The procedure for keysets is described below; single-line stations are covered on page 4-24.

5.09 Procedure for keysets:

- While in the SERV program, enter STA<CR>.
- (2) The terminal will respond with:

STATION STATUS ENTER CIRCUIT #

(3) Enter the circuit number (1.1-10.8) of the station you wish to check and <CR>. If you do not know the circuit number, use the CIR subroutine, or Figures 4-3 and 4-4 on pages 4-31 and 4-32 to locate it. Figures 4-3 and 4-4 apply to initialized systems only.

(4) The terminal will respond with the features that had been preset for the station when the system was initialized, or the information that was last entered. The printout will look like this:

STATION STATUS ENTER CIRCUIT # X.Y CKT # X.Y IC # XX LINES RESTRICTED= RING IN FROM LINES= OPTIONS= PAGING ZONES= 1 PRESET FWD. EXTENSION= TENANT NUMBER= 1 CORRECT?

> NOTE: The system attendant's circuit number 1.1 will also be preset with Ring-In From Lines 1-24.

- a. If the station entries are correct, enter Y<CR>. The terminal will respond:

- 1. If you enter Y<CR>, the terminal will automatically cycle to the next higher circuit number and print the message shown in Step 4 above.
 - If you enter N<CR>, the terminal will respond with:

ENTER PROGRAMMING AREA DESIRED=

and you may enter the name of the next SERV subroutine to run.

If the station entries are not correct, enter N<CR>. The terminal will respond with:

ENTER REVISED STATION FEATURES LINES RESTRICTED=

- (6) The terminal will display each line individually.
 - a. If the entry printed in the list above was correct, press <CR> to access the next line.
 - b. If the entry should be erased, press the space bar once and <CR>.
 - c. If the entry is incorrect, enter the new information as instructed below.

(7) LINES RESTRICTED=

Enter the C.O. line numbers (1-24) that are restricted and <CR>. Outgoing calls may not be placed on these restricted lines from this station. However, incoming and transferred calls may be received on these lines. No lines are preset during initialization.

NOTE: To create a private line: except for the designated station, restrict all other stations (including the attendant) from using the line. Then assign direct ring-in on that line for the designated station. Enable system Option 11.

(8) RING IN FROM LINES=

Enter the C.O. line numbers (1-24) that will ring in directly to the station and <CR>. Upon initialization, only the attendant's station is assigned ring-in for all lines.

(9) STATION OPTIONS=

Enter the option number(s) desired. 2480 keysets may use all options, but only options 1, 4, and 6 apply to single-line sets. Station Option 4 will always be enabled for single-line sets.

- a. Option 1 OPX Ring Intercom Always: An intercom call from this station forces the called station to ring. The called party may respond by lifting the handset or pressing the ON/OFF key. This option must be used by off-premise stations (OPS's) to eliminate feedback.
- b. Option 2 Line Monitoring: Enables the station to monitor C.O. calls in progress. While monitoring, the station's transmitter is muted. The station cannot monitor lines from which it is restricted.
- c. Option 3 1032 Station: When a 1032 keyset is used with the system, lines 11-32 may be transferred to it and picked up using the SPCL key. This is possible even though the 1032 station may only make outgoing calls on lines 1-10 and 32X128 system rotary lines 24-32.
- d. Option 4 Ring Intercom First: All incoming intercom calls to this station will ring until answered. The called party may answer by picking up the handset or pressing the ON/OFF key. If not set, all intercom calls will be connected handsfree.

- e. Option 5 Not used.
- f. Option 6 Toll Restrict: Inhibits a station from making any long distance calls unless it meets an exception in the master toll-restriction table incorporated in system programming. Toll restriction is not checked when using C.O. lines identified as WATS lines.
- Q. Option 7 Forward on Busy: If a station is busy, an incoming intercom call or transferred C.O. call will automatically be forwarded to the preset station assigned below. This negates the camp-on and queuing features to the busy station. This option is chainable from station to station. A direct ring-in line will not forward when busy.
- h. Option 8 C.O. Ring Forward: A call on a direct ring-in line not answered within 15 seconds, or a transferred call not answered within the transfer recall time, will be forwarded to the preset forward station assigned below. If the transferred call is not answered after the hold recall time, the call will return to the attendant. Direct ring-in calls will continue to ring at the preset forward extension until answered. This option has one-step forwarding; it is not chainable.

NOTE: When System Options 7 and 8 are used together, direct ring-in lines will forward when busy.

(10) PAGING ZONES=

Enter the internal paging zones (1-6) that will include this station and <CR>. Each station may be assigned to any combination of paging zones or may not be included in any paging zone. Each station is preset with paging zone 1 (All-Page) during initialization.

(11) PRESET FWD. EXTENSION=

Enter one intercom extension number and <CR>. Each station may select one intercom number as a forwarding station to receive calls when Station Options 7 and 8 are enabled.

NOTE: If you enter this station's intercom number (the station being programmed) or if you enter a station that is programmed to forward to this station, you will receive the "ILLEGAL PRESET" error message.

(12) TENANT NUMBER=

Enter the tenant group number (1-5) which will include this station and (CR). It is preset to group 1. Tenant service allows the customized distribution of C.O. lines. This controls which C.O. lines are accessed by the line keys on each keyset. It is useful for multiple users sharing a common KSU. Lines 21-24 (COU PCB 6) cannot be shifted. Keysets with fewer than 24 line keys may be used. C.O. line arrangements are shown in the following chart:

Line Keys on keyset	C.O. Li Group 1	nes accessed Group 2	Group 3		umn l in: Group 5
1-4	1-4	5-8	9-12	13-16	17-20
5-8	5-8	9-12	13-16	17-20	1-4
9-12	9-12	13-16	17-20	1-4	5-8
13-16	13-16	17-20	1-4	5-8	9-12
17-20	17-20	1-4	5-8	9-12	13-16

- (13) CORRECT?
- (14) Answer yes or no.
 - a. If an entry is incorrect, enter N<CR>. The terminal will respond with:

ENTER REVISED STATION FEATURES LINES RESTRICTED=

Refer to Step 5b on page 4-20.

If all of the station entries are correct, enter b. Y<CR>. The terminal will respond with:

CONTINUE?

- If Y<CR> is entered, the terminal will automatically cycle to the next higher circuit number in sequence.
- 2. If N<CR> is entered, the terminal will return to:

ENTER PROGRAMMING AREA DESIRED=

and you may enter the name of the next SERV subroutine to run.

- While in the SERV program, enter STA<CR>.
- (2) The terminal will respond with:

STATION STATUS ENTER CIRCUIT #

- (3) Enter the circuit number (11.1-16.8) of the station and <CR>. Refer to Figures 4-3 and 4-4 on pages 4-31 and 4-32 for circuit numbers.
 - (4) The terminal will list the preset entries, or the information last entered:

CKT # XX.Y IC # #XX OPTIONS= 4,6 CORRECT?

- (5) Answer yes or no.
 - a. If the station options are correct, enter Y<CR>. The terminal will respond with:

CONTINUE?

- If Y<CR> is entered, the terminal will automatically cycle to the next higher circuit number.
- If N<CR> is entered, the terminal will return 2. to:

ENTER PROGRAMMING AREA DESIRED=

and you may enter the name of the next SERV subroutine to run.

If any of the station options are incorrect, enter N<CR>. The terminal will respond with:

ENTER REVISED STATION FEATURES OPTIONS=

- Enter station option number(s) and <CR>.
 - a. Only Station Options 1, 4, and 6 apply to singleline sets.
 - Press the space bar and <CR> to remove the options. Option 4 can never be removed.
 - c. Press <CR> if no changes are needed.

(7) The terminal will respond with:

CORRECT?

Refer to Step 5 on page 4-24.

Equipped Lines (EQU)

5.11 This subroutine displays and specifies the outside lines available to the system. All C.O. lines connected to the system must be "equipped" in order to access them with station instruments.

- While in the SERV program, enter EQU<CR>.
- (2) The terminal will respond with:

LINES EQUIPPED: (lists line numbers currently equipped)
CORRECT?

NOTE: Any lines not in use should be unequipped.

- (3) Answer yes or no.
 - a. If not correct, enter N<CR>. The terminal will respond with:

LINES EQUIPPED:

Enter the lines equipped (1-32) and <CR>.

b. If correct, enter Y<CR>. The terminal will respond: ENTER PROGRAMMING AREA DESIRED=

and you may enter the name of the next SERV subroutine to run.

Circuit Number and Intercom Number Listing (CIR)

- 5.12 This subroutine cross-references intercom numbers to their respective circuit numbers.
 - (1) While in the SERV program, enter CIR<CR>.
 - (2) The terminal will respond with:

CIRCUIT #/IC ASSIGNMENTS LISTING ENTER DESIRED INTERCOM NUMBERS=

- (3) Enter the intercom numbers you wish to cross-reference.
 - a. Enter up to 20 numbers. Separate each number by a comma, not a hyphen. Press <CR>.
- OR, b. If you wish to list all the intercom numbers, enter ALL
<CR>.
- (4) The terminal will list the intercom number(s) and their respective circuit number(s).

NOTE: To stop the listing, press the space bar. The terminal will finish printing the STN PCB it has started.

(5) When finished printing, the terminal will respond with: ENTER PROGRAMMING AREA DESIRED=

and you may enter the name of the next SERV subroutine to run.

Number Change (Intercom) (NUM)

- 5.13 This subroutine allows you to change the intercom number of a station. Intercom numbers 10 through 89 may assigned to keysets. Single-line intercom numbers must be between #10 and #57. For initialized intercom number assignments, refer to Figures 4-3 and 4-4 on pages 4-31 and 4-32.
- 5.14 The system does not allow duplicate or unassigned intercom numbers. All intercom number assignment changes should be made in pairs. For example, if you change intercom number 10 to 20, you must also change 20 to 10, or continue with another number until none are duplicated. The Verify Circuit Assignments (VER) subroutine should be used to assist in locating duplicate or unassigned numbers.

- While in the SERV program, enter NUM<CR>.
- (2) The terminal will respond with:

INTERCOM NUMBER ASSIGNMENT CHANGE ENTER CIRCUIT # OF INTERCOM TO BE CHANGED =

- (3) Enter the circuit number of the intercom you wish to change and <CR>. If you do not know the circuit number, use the CIR subroutine or Figures 4-3 and 4-4 on pages 4-31 and 4-32, to locate it.
- (4) The terminal will respond with: CKT # X.Y OLD IC #= XX NEW IC #= (multi-line sets)
- OR, CKT # XX.Y OLD IC #= #XX NEW IC #= (single-lines)
- (5) Enter the intercom number to be assigned to this station and <CR>.
- (6) If the intercom number is already assigned elsewhere in the system, the terminal will respond with:

NOTICE....NEW IC # ALREADY ASSIGNED TO CKT #X.Y OK ?

- a. If N<CR> is entered, the terminal will repeat the questions as described above in step 4.
- b. If Y<CR> is entered, the terminal will respond with: CONTINUE?
 - If Y(CR) is entered, the program will cycle to the next higher circuit number in sequence.
 - If N<CR> is entered, the program will return to:
 ENTER PROGRAMMING AREA DESIRED=

and you may enter the name of the next SERV subroutine to run. Be sure run VER after NUM.

Verify Circuit Assignments (VER)

5.15 This subroutine checks for duplicated and unassigned intercom numbers and generates the appropriate warning messages.
The data base is not altered.

- (1) While in the SERV program, enter VER<CR>.
- (2) If there are no duplicate or unassigned numbers, the terminal will respond with:

DATABASE CONFIGURATION EDIT CONFIGURATION EDIT COMPLETED

ENTER PROGRAMMING AREA DESIRED=

and you may enter the name of the next SERV subroutine to run.

OR, (3) If there are errors, the terminal will print:

DATABASE CONFIGURATION EDIT
XX UNASSIGNED
XX DUPLICATE ASSIGNMENT
#XX UNASSIGNED
#XX DUPLICATE ASSIGNMENT
CONFIGURATION EDIT COMPLETED

ENTER PROGRAMMING AREA DESIRED=

and you may enter the name of the next SERV subroutine to run.

- a. "UNASSIGNED" designates an unassigned intercom number. "DUPLICATE ASSIGNMENT" identifies intercom numbers which are assigned to more than one circuit.
- b. Use the NUM subroutine to correct errors.

Diagnostic Programs

5.16 The diagnostic programs, DISP, REST, ONMN and DUMP/LOAD are detailed in the next section of the manual.

FIGURE 4-1. SYSTEM PROGRAMMING SHEET

	_
OPERATOR EXTENSION NUMBER (10-89)	
MESSAGE CENTER EXTENSION NUMBER (10-89)	
SYSTEM OPTIONS (check options to enable)	
1. Print MDR 7-Digits and More 30 sec. 2. Print MDR 8-Digits and More 30 sec. 3. Enable Error Messages 4. Disable I-Hold 5. 12 Sec. Re-dial Timing 6. Held Call Loop Release=1.2 sec	
3. Enable Error Messages 4. Disable I-Hold 5. 12 Sec. Re-dial Timing 6. Held Call Loop Release=1.2 sec 7. 600 msec Hookswitch Flash 8. Tic-Tone 9. Line Key 24 Rotary Selection 10. SL SMDR Print/Toll Monitor 11. Programmed Night Service 12. Intercom Security Tone 13. Extended External Bell 14. C.O. Line Reseize Disable 15. Disable C.O. Account Code 16. 1664 System 17. Allow 411 and 1411 18. Allow 1-555-1212 and 1-XXX-555-1212.	
sec. TRANSFER RECALL TIME (1-255)	
sec. HOLD CALL RECALL TIME (1-255)	
WATS LINE ID NUMBER(S) (1-24 only):	_
DISA LINE ID NUMBER(S) (1-24 only):	
DISA NIGHT ID NUMBER(S) (1-24 only):	_
ABSORBED DIGIT (2-9)	
ALLOWED LONG DISTANCE NUMBER(S):	
ALLOWED AREA CODE(S):	,
FORBIDDEN OFFICE CODE(S):	
	,

PIGURE 4-2. STATION PROGRAMMING SHEET

	OPERATOR EXTENSION RESERVED 1
CIRCUIT NUMBER	
INTERCOM NUMBER	
LINES RESTRICTED (1-24):	on knortys (creck syttoms no
RING IN FROM LINES (1-24):	1 Peint MOR "-Digits an
OPTIONS: (check options to be en	abled) # 10 13 1 10 10
1. OPX Ring Intercom Al 2. Line Monitoring 3. 1032 Station 4. Ring Intercom First 6. Toll Restrict 7. Forward on Busy 8. C.O. Ring Forward	S. 12 Sec. Re-dia: Faysw 7. 600 masc Mcck va. ch i 8. Tic-Tone V. Line Key 24 Rotaty ov 10. St. SMOR Print Tol. Mc
PAGING ZONE(S) (1-6):	Extended back to Sel
PRESET FORWARD EXTENSION: TENANT NUMBER (1-5): STATION TYPE: (check one)	To Allow 411 and 1-11.
SLE 2500 616	SEC TRANSFER RECALL FIRE 1 SEC. POLD CALL RECALL TIME 1 WATS LINE 10 NUMBER(S) (1-25 only
KEYSET DIP SWITCHES: (check if c	losed) - In (2) Myamum on Lagic Allo
Executive Call Waiting Full-Duplex Speaker Night Station	

FIGURE 4-3. 2456 INITIALIZED INTERCOM ASSIGNMENTS

NOTE: Intercom numbers are initially assigned according to the STN PCB and circuit on which they are located. For example, Circuit 4.7 is the seventh circuit on the fourth STN PCB, which is the position for intercom number 40.

CKT = IC STN- NO. PCB's	Α	CKT =	IC STN PCB's	I-A	IC STN	-B or C
1.1= 10 1.2= 11 1.3= 12 1.4= 13 1.5= 14 1.6= 15 1.7= 16		STN-A 5.1= 5.2= 5.3= 5.4= 5.5= 5.6= 5.7= 5.8=	42 43 44 45 46 47 48	OR	11.1= 11.2= 11.3= 11.4= 11.5= 11.6= 11.7= 11.8=	#10 #11 #12 #13 #14 #15 #16 #17
STN-A2 2.1= 18 2.2= 19 2.3= 20 2.4= 21 2.5= 22 2.6= 23 2.7= 24 2.8= 25		STN-8 6.1= 6.2= 6.3= 6.4= 6.5= 6.6= 6.6= 6.7= 6.8=	50 51 52 53 54 55 56 57	OR	12.1= 12.2= 12.3= 12.4= 12.5= 12.6= 12.7= 12.8=	#18 #19 #20 #21
3.1= 26 3.2= 27 3.3= 28 3.4= 29 3.5= 30 3.6= 31 3.7= 32		STN-2 7.1= 7.2= 7.3= 7.4= 7.5= 7.6= 7.7= 7.8=	58 59 60 61 62 63 64 65	OR	13.1= 13.2= 13.3= 13.4= 13.5= 13.6= 13.7= 13.8=	#26 #27 #28 #29 #30 #31
STN-A4 4.1= 34 4.2= 35 4.3= 36 4.4= 37 4.5= 38 4.6= 39 4.7= 40						

FIGURE 4-4. 32X128 INITIALIZED INTERCOM NUMBER ASSIGNMENTS

edf o:	phib	nigned accor	as yll	sidini ona	ared	sun mo	neter	13
CKT=	IC		IC	CKT=	IC		CKT=	ic
STN-	Al	STN		STN-	-BC1		STN-	BC6
	10	6.1=			= #10		16.1=	
	11	6.2=			= #11		16.2=	
	12		52		= #12		16.3=	
	1.0	6.4=					16.4=	#53
1.5=	14	6.5=	54	11.5	= #14		16.5=	#54
1.6=	15	6.6=		11.6	#15		16.6=	#55
1.7=	16	6.7=	56	11.7			16.7=	#56
1.8=	17	6.8=	57	11.8	= #17		16.8=	#57
STN-	A2	STN	-A7	STN-	-BC2			
2.1=		7.1=		10.1				
	19	7.2=		12.2				
	20	7.3=		10.0				
2.4=	21	7.4=						
	22	7.5=		12.5	#22			
2.6=	23	7.6=	63	12.6	= #23			
2.7=	24	7.7=	64	12.7:	#24			
2.8=	25	7.8=	65	12.8	= #25			
STN-	A3	STN	-A8	STN-	-BC3			
3.1=	26	8.1=			= #26			
	27	8.2=			= #27			
	28	8.3=		13.3	#28			
3.4=	29	8.4=	69	13.4	= #29			
3.5=	30	8.5=	70	13.5	= #30			
3.6=	31	8.6=	71	13.6	= #31			
3.7=	32	8.7=	72	13.7	#32			
3.8=	33	8.8=	73	13.8	= #33			
STN-	A 4	ŞTN	60 ps_	STN.	-BC 4			
4.1=			74		= #34			
4.2=			75	14 2	= #35			
4.3=	36	0 3=	76	14 3:	# #36			
4.4=		9.4=	77	14.4				
4.5=	38	9.5=	78	14.5				
4.6=	39	9.6=		14.6	= #39			
4.7=		9.7=			#40			
4.8=	41	9.8=		14.8				
STN-			-A10		-BC5			
5.1=	42		= 82		= #42			
5.2=	43		= 83		= #43			
5.3=	44		= 84		= #44			
5.4=	45		= 85		= #45			
5.5=	46		= 86		= #46			
5.6=	47		= 87		= #47			
5.7=	48		= 88		= #48			
5.8=	49	10.8	= 89	15.8	= #49			

DIAGNOSTIC PROGRAMMING

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1. INTRODUCTION

- 1.01 The Diagnostic Programming section contains detailed information and procedures for using system maintenance features including:
 - Display (DISP) for monitoring the activity of the system and its stations.
 - · Restart (REST) for resetting the programmed data base.
 - Station Message Detail Recording (SMDR) for monitoring system generated error messages.
 - On-Line Monitor (ONMN) for displaying and changing the system memory.
 - DUMP/LOAD programs for storing and recalling system programming data using an external storage device.

2. DISPLAY (DISP)

2.01 The DISP program displays the activity of the system or an individual station. The printout shows ASCII characters, which can be decoded using Figure 5-1 on the next page. This is for testing the station or the DSS.

FIGURE 5-1. STATION AND DSS COMMAND CODE DEFINITIONS

Encoded	STATION COMMAN	D CODE DEFINITION	TIONS
Character	Action	Character	Action
1-6	CALL DODGES		MOIT SUGOSTRU
: !!	CALL FORWARD	=	LINE KEY 13 PRESSED
1-3	DO-NOT-DISTURB		LINE KEY 14 PRESSED
	RESET CALL FWD/DND	?	LINE KEY 15 PRESSED
E-2	STACK INTERCOM CALL	9	LINE KEY 16 PRESSED
5	RECONNECT IC CALL	A	LINE KEY 17 PRESSED
6-2	CONF ACCESS	В	LINE KEY 18 PRESSED
	CONF RELEASE	C	LINE KEY 19 PRESSED
T-3 /	CALLBACK	D	LINE KEY 20 PRESSED
OR \	EXEC CALL WAITING	E	LINE KEY 21 PRESSED
	CALL TRANSFER	F	LINE KEY 22 PRESSED
	OFF-HOOK	G STAMROY	LINE KEY 23 PRESSED
	ON-HOOK	H	LINE KEY 24 PRESSED
11-6	STATION POWER-UP	I or \$	HOLD/FWD KEY
1	CANCEL ENTRY	J or Y	MSG/DIAL KEY
11-6	INTERCOM TONE RING	+ or ,	ON/OFF KEY
(zero)	PAGE COMMAND	AO * or & 990	
	LINE KEY PRESSED	0(zero)	XFER/CONF KEY * KEY
	LINE KEY 2 PRESSED	N N	
	LINE KEY 3 PRESSED	0	0(zero)
	LINE KEY 4 PRESSED	P	a marrius deservir
	LINE KEY 5 PRESSED	P	2
tions on f		2 20 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	3
	THE THE PERSON OF THE PERSON O	R	4
		S	105 008 001 0 01 0 16 160 1 0 68
	LINE KEY 8 PRESSED	T	6
	LINE KEY 9 PRESSED	Ü	7
	LINE KEY 10 PRESSED	T. A. Tuom Jer	(8e10) Ae de l'e
	LINE KEY 11 PRESSED	W	og te dece to be con-
	LINE KEY 12 PRESSED	X or / or)	#
		TOT TESSTY IN	SPEED DIAL

DSS COMMAND CODE DEFINITIONS Encoded Character Action

iz made the grays and chang	FUNCTION KEY CODE
	SPECIAL AND KEY CODE
8	DSS SPECIAL KEY 1
ocing and receiling s.e.	DSS SPECIAL KEY 2
: solveb aparora larrett	DSS SPECIAL KEY 3
;	DSS SPECIAL KEY 4
<	DSS SPECIAL KEY 5
=	DSS SPECIAL KEY 6
>	DSS SPECIAL KEY 7
the activity of the 'S'	DSS SPECTAL KEY 8

NOTE: SLE and 2500 stations will not display hookswitch action (+ ,). SLE stations will not display any SPCL key action.

- 2.02 If the terminal has the capability, it will beep every 40 seconds as a reminder that the input/output port is tied up with this function and no SMDR is possible.
 - (1) To monitor activity for all stations, after the sign-on message equal sign (=) prompt, enter DISP<CR>. The terminal will respond with:

DISPLAY IN PROGRESS!

OR, To monitor the activity of a single station, enter DISP (space) XX<CR> (for multi-line sets) or DISP (space) #XX<CR> (for single-line sets). XX represents the intercom number. The terminal will respond with:

DISPLAY IN PROGRESS! XX

(2) To terminate the DISP program, press the space bar. DISP will not time out. The terminal will respond with the equal sign (=) prompt and you may enter the name of the program you want to run next.

3. RESTART (REST)

3.01 This program resets system hardware and software without cycling power or affecting the data base. It is primarily a maintenance routine and is not used in general programming.

CAUTION: REST drops all calls in progress.

- (1) To start REST, after the sign-on message equal sign (=) prompt, enter REST<CR>.
- (2) The terminal will respond with:

JUMP TO NMI VECTOR!

(date) to add willide basemen somethic and made

STN NUMBER DIALED DUR TIME LN ACCOUNT

(3) Press the space bar to display the equal sign (=) prompt and to continue programming.

4. SMDR ERROR MESSAGES

4.01 The system monitors itself and prints error messages on the Station Message Detail Recording (SMDR) printout whenever a user or system error occurs. This section defines the error message format and code definitions used in the SMDR printout.

Error Message Format

4.02 The error message format of user and system error codes appearing on the the SMDR printout is shown below. System Option 3 must be set to generate all error messages. Without Option 3, only *NMI messages are generated. If one of the fields is blank, the information appearing in that field does not apply to the

STN			NUMBER DIALED	DUR	TIME	LN	ACCOUNT
STATION NUMBER	ERROR TYPE	ERROR CODE	TELEPHONE NUMBER	RING DURA- TION	TIME OF DAY	C.O. LINE	ACCOUNT NUMBER
18 21 10	CURR ONHK	15 8	2587600	x 18833	0143 0145 0145	2	123456
10	RING RING			0:08	0150 0151	21 21	

- 4.03 Station Number: This message field indicates the station where the error was detected. Station numbers 10 through 89 will appear for keyset stations, numbers #10 through #57 for singleline sets and *** for an unanswered RING message. The *NMI error code uses a different format discussed later.
- 4.04 Error Type: The error types recognized by the system are categorized as RING, ONHK, OFHK, DROP, OFLN, CURR, *NMI, DLAY, and DATA. Each is described below.
 - RING: The RING code indicates that a C.O. call rang in for the time specified in the ring duration field. If the call was answered, the station answering the call is noted in the station number field. If the call was not answered, *** is printed.
 - ONHK: The ONHK code indicates that the user entered data other than the off-hook command while the station was onhook. For example, pressing the digit 2 key while onhook will generate an ONHK P error message. For code definitions, refer to Figure 5-1 on page 5-2.

NOTE: Pressing keyset buttons while on-hook may cause the station to be locked out until reset by a hookflash.

C. OFHK: The OFHK code indicates that the user entered incorrect data while the station was off-hook and not in use. For example, an OFHK + indicates that the off-hook command was received with the station already off-hook.

D. DROP: The DROP code indicates that a station has been placed off-line because of excessive data errors. The data field indicates the connection lost if a call was in progress when the station was dropped. Drop code definitions are as follows:

Drop Code	Designates
01-0F 10-1F	Lines 1-15 Lines 16-31
20	Line 32
1	Intercom Channel 1
	Intercom Channel 2
# 0	Intercom Channel 3
\$	Intercom Channel 4
8	Intercom Channel 5
å	Intercom Channel 6
•	Intercom Channel 7
(Intercom Channel 8

- E. OFLN: The OFLN code indicates that a previously off-line (dropped) station has been reconnected to the system and is communicating with the KSU. An error message of OFLN 20 indicates that an idle station was reconnected to the system.
- F. CURR: The CURR message indicates that C.O. loop current was removed while the station was connected to a C.O. line. This is caused by the telephone company network releasing the line. The error code field shows the C.O. line that was released in hex value.
- interrupt (watchdog timer interrupt) has occurred. An NMI will interrupt normal operation, record the condition of the system, and automatically reset. The system will continue to process calls and handle existing calls. C.O. lines that are on hold, transferred, parked, and in conference will be placed on hold. C.O. lines in use and intercom calls will remain connected. *NMI error messages are normally generated when software does not reset the system timer or when a hardware error occurs, such as a power spike or improper PCB insertion. Stack data in a hardware-generated *NMI message will not contain significant diagnostic information. The *NMI error codes and system status are displayed in the following format:

NOTE: An excess of soft resets within a certain time will cause the system to perform a hard reset, which results in all calls in progress being dropped.

FIGURE 5-2.	*NMI	MESSAGE	FORMAT
-------------	------	---------	--------

*	NMI*NMI		!FFA		.C9		31	0B1	B23C1B1021		нмн
1	Е	1. 1	S	1 1		S				1.8	M I
1	R	1 1	T	1 1		Т				! (I C
!	R	1 1	A	t = 4		A				10	JN
1	0	1 1	C	1 1		C				11	5
1	R	1 1	K	1 1		K				i.	
1		1.1		1 1						i	T
1	C		P	1 1		D				i	Ī
1	()	and i	0	1 1		A				i	м
1	D	1 1	T	1 1		т				i	E
!	E	nana n	N	1 1		Ā				i	_
1	2 ten		T	1 1		-				i	0
!		9999	E	1 1						i	F
		oodij g	R	1 1						i	
!		- i i		1 1						i	D
1		1 1		1 1						i	A
1		1 1		1 1						- 1	Y

NOTE: The error message display format changes in *NMI messages to accommodate 14 bytes of stack data.

- H. DLAY: The DLAY error code is printed when the station lamp status data processing has been delayed. The message is only displayed to measure data processing performance. System Option 24 (not referenced in the SYSTEM PROGRAMMING Section) must be enabled to generate this message.
- I. DATA: This message displays any station-generated data errors outside the legal range for ONHK and OPHK error messages. System Option 24 must be enabled to display these messages.
- 4.05 Error Code: This field contains the data relating to the error. The data may be either a single ASCII character or a two-digit hex value representing the ASCII character as defined in paragraph 4.04D, Drop Code, on page 5-5.
- 4.06 Ring Duration: This field records the ring duration of incoming calls (expressed in minutes and seconds) and the duration of C.O. calls.
- 4.07 Time of Day: This field records the time of day when the message is printed, expressed in 24-hour international time.

4.08 C.O. Line: This field indicates the C.O. line being used when the error occurred. If none were in use, or it does not apply to the error type, this field is blank.

ON-LINE MONITOR (ONMN)

5.01 The On-line Monitor (ONMN) feature is used to display and alter the system memory. Because it requires a knowledge of hex and binary mathematics, it is intended only for use by an advanced installer or engineer for debugging and maintaining the system. It is not intended for customer use; careless use may cause an operating system to "crash." Also, the SMDR cannot operate while the On-Line Monitor is in use.

> ************** CAUTION Use of the On-line Monitor by untrained * * personnel can result in data base and * system execution errors. This could * require reprogramming the data base or a system reset. The On-line Monitor cannot cause permanent system or hard-* ware damage. *

5.02 The ONMN feature allows the system to be monitored and the control block contents to be changed. Refer to Section B, CON-TROL BLOCK FORMATS, for a list of the control blocks.

A. COMMANDS

- 5.03 To use the On-line Monitor:
 - When the sign-on message equal sign (=) prompt appears, enter ONMN (CR).
 - The terminal will respond with a pound (#) prompt. You may then enter one of the commands shown below and described on the following pages.
 - Control Block Display (x nn)
 - Memory Display (M)
 - · Change (C)
 - Quit (Q)

Control Block Display

- 5.04 Control blocks are memory areas that contain information for controlling system functions. To use the ONMN, you must find the memory address for the block of memory you wish to display or change. The number of control blocks available varies with the type of control block. Numbers entered that are outside the normal range for a type of control block default to the lowest number allowed. Use Figures 5-3 through 5-13 on pages 5-11 through 5-16 to decode the control blocks. To find a memory address or display a control block:
- Enter designator letter, number value, and (CR).

Designator	Letter	Name	Number
В		Callback queue entry	1-25
D		DTMF HOTTOAD	1-2
E			10-57
F		Conference	1-4
I		Intercom channel	1-8
L		C O line	1-32
S		Keyset station	10-89
T		Keyset station data base	10-89
		options. Located in battery	
U		Single-line station data base	10-57
X		System statistics	

Examples:

- S, Sl, S l, Sl0, or S 10 -- Displays the control block for the first circuit S89 or S 89 -- Displays the last circuit S99 or S 99 -- Displays the first circuit S#10 -- Displays the same as ElO
- (2) The terminal will display the control block in the following format:

 - is the hex equivalent of the requested station
 - AAAA is the starting address of that RAM block
 - is the contents of the control block. Two DD..DD characters are displayed for each data byte in the block

- (3) Enter one of the following commands:
 - a. <CR> -- Entering a carriage return displays the next control block of the same type.
 - \<CR> -- Entering a backslash and a carriage return displays the preceding control block of the same type.
- c. CTRL X -- Pressing X while holding down the CTRL key redisplays the current block.
- d. Enter another ONMN Command and <CR> to change functions.

Memory Display (M)

- 5.05 To display a 16 byte area of memory:
 - (1) Enter M (space) XXXX <CR>. (XXXX is the desired address in hex.)

Find the four-character memory address using Control Block Display.

- (2) The cursor remains at the end of the line. Enter one of the following:
 - a. <CR> -- Entering a carriage return displays the next block of memory.
 - b. \CR> -- Entering a backslash and a carriage return displays the previous block of memory.
 - c. CTRL X -- Pressing X while holding down the CTRL key redisplays the current block of memory.
 - d. Enter another ONMN Command and <CR> to change functions.

Change (C)

NOTE: The following program changes the system memory and should be performed by trained personnel only. So this STAR SATE (A)

- 5.06 To make changes in the memory area:
 - (1) Enter C (space) XXXX <CR>. (XXXX is the desired address and again hex.) Id toggnes and rell serupth provolted

Find the four-character memory address using Control Block Display.

- (2) The terminal will display the data for that address. The cursor remains at the end of the line. Enter one of the following:
 - a. 0 to FF<CR> -- Entering a hexadecimal value from 0 to FF followed by a carriage return enters the value in the memory. If the new value is in the correct location, the next memory block will appear. The message "WHAT?" followed by the memory address may appear if the ROM/RAM jumper is in the ROM position or you entered an address which is not in RAM.
 - b. \<CR> -- Entering a backslash and a carriage return displays the contents of the memory in the preceding block.
 - c. <CR> -- Entering a carriage return displays the contents of the next memory block.
- d. CTRL X -- Pressing X while holding down the CTRL key redisplays the current memory block.
 - e. . <CR> -- Entering a period and the carriage return ends the Change function.
 - Enter another ONMN Command and (CR) to change functions.

Quit (Q)

5.07 To exit the On-line Monitor:

- (1) Enter Q<CR>. bas because MMMM gastions as Ja3 . .
- (2) The terminal will respond with the equal sign (=) prompt.
- (3) Enter QUIT<CR> to exit the system programming mode.
- (4) The SMDR printout will continue: a leadard yet learned and

B. CONTROL BLOCK FORMATS

5.08 The following figures list the control block formats and definitions.

FIGURE 5-3. STATION CONTROL BLOCK (S)

BYTE	LABEL	BIT 7	6,5,4	BIT 3	2,1,0
00	LSO	(C.v.	of March	2.5	2
01	LS1	CC V4	3	20.6	4
02	LS2	ES. Vi	5	BMUSIC	6
03	LS3	Monitor	7.1	8.6	8
04	LS4	1/9	9	0.1	10
05	LS5	70.2	f.s11bc/	A.A.	12
06	LS6	179 XI	13	4.8	14
07	LS7	vell 3M	15	40.0	16
08	LS8		17	(a)	18
09	LS9		19	4.6	20
0A	LS10		21	44	22
0B	LS11		23	5.0	24
0C	LS12		HD	SI	RD
0D	LS13		ON/ OFF	52	CF
0E	CTL0	Station	Control	12	
0F	CTL1	Flags	T TV	3.5	
10	DBUF	STN Da	ta	7 06 7	
11	SWORK	Work Ar	ea	2.7	
12	STIME	.1 Secor	nd Timer	1 15	
13	RTAH	Software	9	5.5	
14	1.80	Break Po	oint	1 A2	
15	LACON	Last Cha	annel Con	nected	
16	CTL2	Software	Control	Flags	
17	FWD	Call For	ward Stati	ons	
18	OPT	STN Op	tions DIP	SW	

Line Lamp Status

LSO-LS11:

- 0 Off
- 1 Recall
- 2 Hold
- 3 Ring In
- 4 Unused
 - 5 Line Seized on Station
- 6 Conference
 - 7 Line In use

HOLD/FWD (HD) Lamp Status

- 1 Intercom Call Forwarding
 - 2 Call Forward/ Do-Not-Disturb

Redial/MSG (RD) Lamp Status

l - Message Waiting

ON/OFF Lamp Status

7 - Receiving Handsfree Intercom call

XFER/CONF (CF) Lamp Status

- 1 Executive Monitor
- 2 Second Party Conference
- 7 Conference Originator

Station Option DIP Switches

- 80 Always Set High
- 40 Do-Not-Disturb (1)
- 20 Executive Call Waiting (2)
 - 10 Duplex Speakerphone(3)
- 08 Night Ring Station (4)
 - 04 Off-Hook Tones (5)
 - 02 Speed Transfer (6)
 - 01 Digit 1 Dial (7)

FIGURE 5-4. STATION COMMAND CODE DEFINITIONS-DBUF/DISP COMMAND/ERROR SMDR

191	738 76 CMMJ 98 1J			
	No data (idle)	40	Line Key 16	
	Call Forward	41		
22	Do-Not-Disturb	42		
23	Reset Call Fwd/Do-Not-Dist	43		
24				
25				
26				
27				
28		48		
29	Executive Call Waiting	49		
2A	Call Transfer			
2B				
2C				
2D				
2E				
2F				
30				
31	Line Kev 1			
32				
33				
34	and the same and t			
35				
38	Line Kev 8			
	Line Kev 9			
3B				
			2	
1	200000000000000000000000000000000000000			
			ALL OF WILLIAM CO.	
	24 25 26 27 28 29 2A 2B 2C 2D 2E 2F 30 31 32 33 34 35 36 37 38	21 Call Forward 22 Do-Not-Disturb 23 Reset Call Fwd/Do-Not-Dist 24 Stack Intercom Call 25 Reconnect Intercom 26 Conference Access 27 Conference Release 28 Call Back 29 Executive Call Waiting 2A Call Transfer 2B Off-Hook 2C On-Hook 2D Power-Up 2E Cancel Entry 2F Intercom Tone Ring 30 Page Command 31 Line Key 1 32 Line Key 2 33 Line Key 3 34 Line Key 4 35 Line Key 5 36 Line Key 6 37 Line Key 7 38 Line Key 8 39 Line Key 9 3A Line Key 9 3A Line Key 10 3B Line Key 11 3C Line Key 12 3D Line Key 12 3D Line Key 13 3E Line Key 14	21 Call Forward 41 22 Do-Not-Disturb 42 23 Reset Call Fwd/Do-Not-Dist 43 24 Stack Intercom Call 44 25 Reconnect Intercom 45 26 Conference Access 46 27 Conference Release 47 28 Call Back 48 29 Executive Call Waiting 49 2A Call Transfer 4A 2B Off-Hook 4B 2C On-Hook 4C 2D Power-Up 4D 2E Cancel Entry 4E 2F Intercom Tone Ring 4F 30 Page Command 50 31 Line Key 1 51 32 Line Key 2 52 33 Line Key 3 53 34 Line Key 4 54 35 Line Key 5 55 36 Line Key 6 56 37 Line Key 7 57 38 Line Key 8 58 39 Line Key 9 59 3A Line Key 10 5A 3B Line Key 11 5B 3C Line Key 12 5C 3D Line Key 13 5D 3E Line Key 14 5E	21 Call Forward

	tion Control Flags	CTL	tion Control FLags	Sof	tware Control Flags , 2
40	Incoming Intercom		Out Intercom Busy	80	STN is On-Hook
20	In Intercom Ringing	20	Out IC Complete	40	Offline Error Count
			Out Intercom Ringing	20	Offline Error Count
04	In IC Complete	04	Out C.O. Complete	10	Offline Error Count
02	Monitor	02	Force Release	8 0	DSS XFER/HOLD Active
01	Call Transferring	01	Clear to Send	04	DSS ID is Next DBUF
	th falo I field			02	Out IC Connected
					Conference Active

FIGURE 5-5. C.O. LINE CONTROL BLOCK (L)

BYTE	LABEL	DEFINITION
00	COMD	Command (Right)
01	COST	Status (Below)
02	COST1	Status (Below)
03	STN	Station ID
04	OLD	Transfer Origin
05	TIME	Call Duration
	(2)	1 Sec Timer
07	TIME1	Recall Time
	(2)	Remaining — 1 Sec Timer
09	TIME2	5 Millisecond
		Tone Control
0A	TIME3	5 Millisecond
		Loop Current
0B	DIAL	Dialed Digit
0C	DIAL1	Dial MOTTATE SWILL
	(12)	Buffer
18	POINT	Dial Buffer Index
19	RCTR	Ring Counter
1A	ACT1	Account
	(3)	Buffer
1D	BKP	Program Return
	(2)	Address

COMD - Command Codes

0	-	No Command
1	-	Seize Line
2	-	Reseize Line

3 - Release Line

4 - Disable Mute

5 - Dial Number

6 - Redial Buffer

7 - Hold Line

8 - Transfer Line

9 - Park

A - Conference

B - Unused

C - Unused

D'- Unused

E - Modem

F - DISA

10- C.O. Callback Active

11- Immediate Transfer

12- 1032 Station Ring Transfer to L24

COST - Status

80 - MOH Connection Made

40 - Std Connection Made

20 - Loop Current Timer

10 - Ring-In Timer Set

08 - Call Complete

04 - Ring Acknowledge

02 - Ringing-in

COST1 - Statusl

80 - Outgoing Call

40 - Reverse Transfer Ringing-in

20 - Ringing-in Refreshed

10 - '40' Previously Encountered

08 - Toll Restrict Edit Complete

04 - Unused

02 - Lamp Refresher Flag

01 - Good Connection 01 - Ring-in Time Out (FWD)

FIGURE 5-6. CALLBACK QUEUE ENTRY (B)

BYTE	LABEL	DEFINITION
00	EXTN	Requesting Station
01	PORT	Requested Resource

If the requested value exceeds SC8 it is a C.O. Line. The C.O. Line number is always offset by \$C8. Otherwise the value indicates a station ID.

PIGURE 5-7. DTMF (SINGLE-LINE DTMF DETECTOR) (D)

BYTE	LABEL	DEFINITION
00	DFSTAT	Time Slot ID
01	DFTONE	Tone Control Byte
03	DFTIME	Timer
04	DFBUF1	Dialed Digits
05	DFBUF2	(These Digits Have
06	DFBUF3	Not Been Processed)

Tone Control Byte

- 80 Generate Tone 40 - Collect Digits
 - 20 Unused .
 - 10 Unused
- 08 Unused
 - 04 Intercom Ringing Out
- 02 Busy Tone
 - 01 Dial Tone

PIGURE 5-8. SINGLE-LINE STATION (E)

BYTE	LABEL	DEFINITION
00	SSTNS	Status
01	BKPT	Software Break
02		Point
03	LACONS	Last Connection

SSTNS - Status

- 80 Incoming Intercom Waiting
- 40 Incoming C.O. Waiting
- 20 Unused
- 10 C.O. Call On Hold
- 08 Unused
- 04 Unused
- 02 SPCL Key Pushed
- 01 Station is Off-Hook

FIGURE 5-9. CONFERENCE CONTROL BLOCK (F)

BYTE	LABEL	DEFINITION
00	CFST	Status
01	CEX	Controlling STN
02	CP1	CHNL.1 (C.O. Line)
03	CP2	CHNL.2 (C.O. or STN)

CFST - Status

- 80 2-Station Mode
 - 40 Originator is in Conference
 - 20 CP2 is Known Gone
 - 01 Block is Active

NOTE: C.O. Line values are offset by SC8.

FIGURE 5-10. INTERCOM CHANNEL BLOCK (I)

BYTE	LABEL	DEFINITION
00	CHMD	Command
01	CHST	Status
02	IN.	Calling Party
03	OUT	Called Party
04	BKCH	Software Break
05		Point
06	TIMEX	.1 Msec. Timer

CHST - Status

80 - Out is Busy

40 - In Camped On - MOH

20 - Out Just Reversed Intercom

10 - Out is Off-Hook

08 - Out Has Intercom Ring

04 - Camp-On is Causing Background Incoming C.O. Ring

02 - Connection Granted

01 - Out is in Do-Not-Disturb

The IN field set to zero indicates an available channel. NOTE:

Channel Command Codes

		- OPEN (may be assigned) - Connect to Station	08 - Double Tone Ring Called 09 - Page
		- Reconnect	0A - Conference
	03	- Drop	0b - Unused
	04	- Transfer	OC - Unused
L bourst I	0.5	- Ring Called Party	OD - Drop Single-line Station
	06	- Stack On Called Party	OE - DSS Tone Command
	07	- Stack On Called Party	OF - Unused

FIGURE 5-11. 2480 STATION DATA BASE (T)

BYTE	LABEL	DEFINITION
00	L1.8	This is a 3-byte field with
01	L9.16	the leftmost bit indicating
02	L17.24	line 1 and the rightmost bit indi-
		cating line 24. This is the line
		restriction table.
03	R1.8	This is a 3-byte field with
04	R9.16	the leftmost bit indicating
05	R17.24	line 1 and the rightmost bit indi-
		cating line 24. This is the
		station ring-in table.
06	OPTION	Station Options
07	ZONES	Paging Zones
08	NUMB	Station ID
09	PRSTFW	Preset Forward
0A	LOFST	Tenant Number — 1

Options

80	-	1:OPS ID
40	-	2:C.O. Line Monitor
20	-	3:1032 Station Type
10	-	4: Ring Intercom First
08	-	5:Unused
04	-	6:Toll-Restricted

02 - 7:Preset Forward -- Busy 01 - 8:Preset Forward -- No Answer

FIGURE 5-12. SINGLE-LINE DATA BASE OPTIONS (U)

BYTE LABEL DEFINITION 00 OPTNS Station Options NUMBS 01 Station ID

S/L Station Options

80 - 1:OPS ID

10 - 4: Ring Intercom First

04 - 6:Toll-Restricted

FIGURE 5-13. SYSTEM STATISTICS AREA (X)

BYTE	LABEL	DEFINITION
00	SXTSTN	Maximum Station Loop Duration
02	SXTLNE	Maximum Line Loop Duration
04	SXLMIN	Minimum Line Loops Between Station Loops
05	SXLMAX	Maximum Line Loops Between Station Loops
06	SFTCTR	Soft Resets Available (Maximum: Ten)
07	SFTOTL	Soft Reset Count Since Last Power-Up Or 'REST'

All times are in milliseconds (msec).

> The available soft reset count (SFTCTR) is reset to \$0A (ten) approximately every 3 hours. I. count of soft reset occurrences is initialized to zero on powerup and when the REST program is used.

Typing either CTRL X or <CR> after typing the X command will repeat the statistics display.

Typing X R<CR> will cause the statistics values to be re-initialized.

6. DUMP/LOAD and animal of the company of the compa

- 6.01 On-line dumps and off-line loads of the system data base are performed using the DUMP/LOAD feature. The DUMP command allows you to store system parameters and options in an external storage device. The system data base can be reloaded quickly from the memory storage device by using the LOAD command.
- 6.02 The recommended storage device to be used with this system is the Texas Instruments Silent 700 terminal (763/765) equipped with on-line bubble memory. The following instructions are for using the Silent 700 to dump and reload the system data base.
- 6.03 You will be using the following Silent 700 commands:
 - STATUS
 - CREATE
 - CHANGE
 - ERASE
 - a set . RECORDIA of 007 the FIR and eauth filly brammed airl
 - PLAYBACK was no voastaly and made dulyed elil moul
- 6.04 In the following procedures, <CR> refers to the SKIP key on the Silent 700 terminal.

6.09 Assivating the Terminal Port: To set up the the Silent 700 to be used with the system, activate its external RS232C port:

A. INITIALIZING THE SILENT 700

- 6.05 The Silent 700 terminal must be initialized before you can use the DUMP/LOAD commands. This section describes initialization of the terminal.
- 6.06 Creating a Memory File: First, create a bubble-memory file. This file can be given any name you desire. For this demonstration, we will name the file DMPLOD. To create a file:
 - (1) Press the CMD key to enter Command mode.
 - (2) Enter CREATE DMPLOD L 60 80<CR>.

This will create a line-type memory file named DMPLOD. The file will consist of 60 records of 80 characters each. These 60 records will be sufficient to completely dump the system data base.

- 6.07 Defining the RECORD File: To define the new file as a RECORD file so that data may be recorded in it:
- (1) Press the CMD key to enter Command mode.
- (2) Enter CHANGE RECORD TO DMPLOD<CR>.

The terminal is now initialized to record data in the DMPLOD file when the RECORD ON keys (FCTN and 2) are pressed at the same time on the keyboard. I sake and all

- 6.08 Defining the PLAYBACK File: To define the new file as the PLAYBACK file so that data can be played back from it:
 - (1) Press the CMD key to enter Command mode.
 - (2) Enter CHANGE PLAYBACK TO DMPLOD<CR>.

This command will cause the Silent 700 to play back data from file DMPLOD when the PLAYBACK ON keys (FCTN and 1) are pressed at the same time on the keyboard. 6.04 In the following procedures, KCR: refers to the SKI

- 6.09 Activating the Terminal Port: To set up the the Silent 700 to be used with the system, activate its external RS232C port:
 - (1) Press the CMD key to enter Command mode.
- -s (2) Enter CHANGE PORT TO EIA<CR>. abasence GAGI\SUG and asset
- 6.10 Setting the Baud Rate: The recommended transmission rate is 300 baud for off-line loads. This minimizes data errors and should eliminate any problems with Checksum Errors during the load. To change the baud rate on the Silent 700:
 - Press the CMD key to enter Command mode.
 - (2) Enter CHANGE SPEED TO 300<CR>.
- NOTE: In order to use 300 baud communications between the Silent 700 terminal and the system CPU PCB RS232C port, the baud rate jumper on the CPU PCB must be in the 300 baud position.

- 6.11 Enabling the External Device Control: The system software utilizes the Silent 700 external device control feature to turn off PLAYBACK automatically when the data base load stops. To enable the external device control:
 - (1) Press the CMD key to enter Command mode.
 - (2) Enter CHANGE EDC TO ON CREATER BELL-900 HA DELEGORANG ...
- (3) Press the CMD key to enter Command mode.
- (4) Enter CHANGE DC1.3 TO ON<CR>.

B. PERFORMING A DUMP

- 6.12 The DUMP command records the system data base in the bubble memory of the Silent 700. To record data using a system DUMP:
 - Plug the terminal into the CPU PCB RS232C port and press <CR>. The terminal will print:

INTER-TEL, INC. SOFTWARE PART NUMBER 827.2081-3
COPYRIGHT 1980 (1984)
ENTER: SERV, TIME, DISP, TEST, INIT, REST OR ONMN

- (2) To prepare the terminal for recording:
 - Press the CMD key to enter Command mode.
 - b. Enter ERASE DMPLOD<CR>. STANDARD SAUS NOW SEA
 - c. Rewind the RECORD function by pressing the FCTN key and the 6 key at the same time.
- d. Enable the RECORD function by pressing the FCTN key and the 2 key at the same time. The REC lamp will light on the Silent 700 terminal.
- e. Enter DUMP<CR>.
- (3) The software will begin dumping data from the CPU PCB RAM to the Silent 700 terminal. When the dump is complete, it will print the equal sign (=) prompt. Turn off the RECORD function by pressing the FCTN key and the 4 key at the same time.

(4) The data base DUMP is now complete and the data has been stored in the Silent 700 bubble memory. This data will remain in the memory even after the terminal has been turned off. The data can be reloaded into the system from the terminal at any time using the LOAD command.

C. PERFORMING AN OFF-LINE LOAD WORKER OF DOOR WORKER OF THE CO.

- 6.13 The LOAD command initiates an off-line load of the system data base. To guarantee that the load proceeds correctly, system operations halt. When loading is completed, the system is automatically restarted with the new data base. To perform an offline load:
 - (1) Plug the Silent 700 terminal into the CPU PCB RS232C port and press <CR>. The terminal will print:

INTER-TEL, INC. SOFTWARE PART NUMBER 827.2081-3 COPYRIGHT 1980 (1984) ENTER: SERV, TIME, DISP, TEST, INIT, REST OR ONMN

- (2) Rewind the PLAYBACK function by pressing the FCTN key and the 5 key at the same time.
- (3) Enter LOAD<CR>.
- (4) The terminal will print:

SYSTEM WILL HALT ON THIS COMMAND, ARE YOU SURE (Y/N)?

- (5) Answer Yes or No:
 - a. If you enter N<CR>, the system assumes that a load will not be performed and returns to Command mode. The sign-on message equal sign (=) prompt will return.
- b. If you enter Y<CR>, the system processing will halt and the CPU PCB will be ready for final instructions (step 6 below). The only way to restore service is to complete the LOAD sequence or reset the hardware.
- (6) To continue the load sequence, initiate the PLAYBACK function by pressing the FCTN key and the 1 key at the same time.
 - (7) The Silent 700 terminal will begin to load recorded data in the CPU RAM.

- (8) When the terminal is finished loading, the software will automatically turn off PLAYBACK if the EDC and DC 1.3 options have been properly enabled (refer to paragraph 6.11). If they have not been enabled, turn off PLAYBACK manually by pressing the FCTN and 3 keys at the same time.
- (9) The software automatically resets the system and it goes back to SMDR with a new header.
- (10) The system is now on-line with a new system data base.
- 6.14 Checksum Error Handling: A checksum error may be detected during the load sequence. If this happens:
 - (1) The LOAD program will disable the PLAYBACK mode and print:

CHECKSUM ERROR DETECTED RESTART LOAD (Y/N)?

- (2) Answer Yes or No:
 - a. If you enter Y<CR>, the software will restart the load sequence. Return to paragraph 6.13 and repeat the load procedures.
 - b. If you enter N<CR>, the software will reset the system and cancel the LOAD sequence. Initialize the system using the INIT command to ensure valid data in the data base.

- (8) the terminal is inclined indicated to the following the matter of the terminal terminal in the following the terminal terminal training to the terminal terminal
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TROUBLESHOOTING

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	DEFECTIVE UNIT RETURN POLICY	6-1
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1. INTRODUCTION

1.01 This section describes the troubleshooting procedures to follow in the event of a system malfunction. System repair is limited to replacement of modules, (e.g., printed circuit board, power supply, keyset, etc.). Repair beyond module replacement is not covered in this manual.

DEFECTIVE UNIT RETURN POLICY

2.01 Return Authorization Tags: To return a unit, obtain a Material Return Authorization (MRA) tag from the Inter-Tel MRA Department and attach it to the defective unit. The following guidelines will help you properly fill out the tag.

NOTE: Inter-Tel does not accept the return of defective units without MRA tags.

- (1) Obtain a repair authorization number from your Inter-Tel order processing clerk.
- (2) Identify the unit by the equipment name, part number, and serial number.
 - (3) Describe the defect and, if applicable, the circuit number related to the defect.
 - (4) Document the estimated service time prior to failure.
 - (5) Attach the upper portion of the tag to the defective equipment. Retain the bottom portion for your files.
 - (6) Write the MRA number on the outside of the box before shipping.

3. TROUBLESHOOTING PROCEDURE

A. PRELIMINARY TROUBLESHOOTING CHECKLIST

3.01 Use this troubleshooting checklist before you start the system troubleshooting procedures. It may save you time and possibly eliminate the need for detailed troubleshooting.

- (1) Is the problem caused by user errors? You can monitor the system or individual stations using the DISP program described in DIAGNOSTIC PROGRAMMING. Or, use the features according to the instructions in the FEATURES section of this manual.
- (2) Has the equipment been disconnected or disabled? Refer to the INSTALLATION and SYSTEM PROGRAMMING sections for more information.
- (3) If the problem involves an optional feature, has the option been enabled? Use the SERV program described in SYSTEM PROGRAMMING to check the system and station features. Check station DIP switches if the feature is switch-enabled (refer to page 3-60).
 - (4) Are printed circuit boards and equipment cables securely seated and connected? Refer to INSTALLATION for details.
- (5) Check all LED's for proper indication. Refer to Section B, LIGHT-EMITTING DIODE INDICATIONS, on the next page.
- (6) Is the problem caused by optional external equipment (e.g., auto-dialer, headset, loud ringing adapter, etc.), connected to the system?
- (7) Each keyset contains a microprocessor that is essential to its functions. Ensure that the supply voltage to the microprocessor is set at +5.0 +0.01VDC. For voltage adjustment procedures, refer to page 3-58.
- (8) If the problem persists after completing the checklist, proceed to Section C, SYSTEM TROUBLESHOOTING PROCEDURES, starting on page 6-7.

B. LIGHT-EMITTING DIODE (LED) INDICATIONS

3.02 Light-Emitting Diodes (LED's), on the front edge of each PCB, indicate specific functions. Figure 6-1, Light-Emitting Diode Indications, on the next page, and Figure 6-2, LED Locations, on page 6-6, indicate the normal condition of each LED. To correct LED problems:

- A. If the Power Reset LED does not light up, or will not go out after two seconds, when the PCB is reset or powered up:
 - Remove the faulty PCB.
 - (2) Wait 10 seconds and re-insert the PCB.
 - (3) If the power reset LED still does not function correctly, replace the PCB.
- B. If the NMI (watchdog timer) bottom LED on the CPU PCB is lit, use the reset switch on the CPU PCB or the REST program to reset the system. Refer to SYSTEM PROGRAMMING for REST procedures.

NOTE: Use of the reset switch will disconnect any calls in progress. If the NMI LED lights up frequently, contact Inter-Tel Customer Support for assistance.

C. If the first three LED's on the CPU PCB are not flashing at the proper rates:

NOTE: The top LED flashes approximately 5 times a second, the second LED flashes 2 or 3 times a second, the third is almost constantly on, and the bottom is not lit unless a non-maskable interrupt (NMI) has occurred.

- Check the +5VDC on the KSU power supply. Replace the power supply if faulty.
 - (2) Turn the system power off and remove the CPU PCB.
 - (3) Inspect the CPU PCB components, integrated circuits, and ROMS as described on page 3-40.
 - (4) Replace the CPU PCB and turn the system power on. If the problem persists, contact Inter-Tel Customer Support for assistance.

FIGURE 6-1. LIGHT-EMITTING DIODE INDICATIONS

РСВ		LED LOCATION*	DESCRIPTION STATE OF THE PROPERTY OF THE PROPE
STN-A		A	Power Reset LED (normally off)
STN-B STN-C	bered		Lights when the PCB has not been acknowledged and reset by the CPU.
		B-I	Circuit LED's (off when not in use)
		PCB.	Indicates that the station associated with that circuit is using processor time.
CPU		A-C	Data LED's
			Indicates that the CPU is functioning. Rate of flash indicates the amount of activity.
		D	NMI LED (normally off)
			Indicates that a non-maskable interrupt has occurred.
cou	shing	Aron ene 8	Power Reset LED (normally off)
			Lights when the PCB has not been acknowledged and reset by the CPU.
		B-E	Circuit LED's
			Indicates that the C.O. line associated with that circuit is accessed.
CNF	PCB.	Nove Che	Power Reset LED (normally off)
			Lights when the PCB has not been acknowledged and reset by the CPU.
		B-D	Conference Circuit 1 LED's (normally off)
		E-G	Conference Circuit 2 LED's (normally off)
		H-J K-M	Conference Circuit 3 LED's (normally off) Conference Circuit 4 LED's (normally off)
			Indicates that the conference circuit is activated.

^{*} Refer to Figure 6-2 on page 6-6 for the locations of the LED's.

FIGURE 6-1. LIGHT-EMITTING DIODE INDICATIONS (CONT'D)

РСВ		LED LOCATION*	DESCRIPTION
MODEM	I	A	Power Reset LED (normally off)
			Lights when the PCB has not been acknowledged and reset by the CPU.
		B C	DTMF Decoder LED 1 (normally off) DTMF Decoder LED 2 (normally off)
			Will light when a single-line station is dialing or when DISA is accessed.
		D	Modem LED (normally off)
			Will light when modem is in use.
MODEM	II	A	Power Reset LED (normally off)
			Lights when the PCB has not been acknowledged and reset by the CPU.
		B C	DTMF Decoder LED 1 (normally off) DTMF Decoder LED 2 (normally off)
			Will light when a single-line station is dialing or when DISA is accessed.
		D	Modem LED (normally off)
			Will light when modem is used.
		E	External Paging Unit LED (normally off)
			Will light when any external paging zone is activated.
		F G	External Paging Unit #1 LED (normally off) External Paging Unit #2 LED (normally off)
		Н	External Paging Unit #3 LED (normally off)
			Lights when external paging zone is activated
-		I -M	LED's for External Talkback Speakers 1-5 (normally off)
			Will light when a talkback speaker is used.

^{*} Refer to Figure 6-2 on page 6-6 for the locations of the LED's.

Page 6-5

FIGURE 6-2. LED LOCATIONS

STN-A, ST STN-C P	TN-8 &	PCB		CNF PCB	MODI PCB	MOD II PCB
4800000000	off; off; line stat ccessed,		00000	00000	0000	A B C C C C C C C C C C C C C C C C C C
	.eeu ni	modem is	Light: viren	# 000 3		2 K L
(worns:	A B C C	0000		* 8		

C. SYSTEM TROUBLESHOOTING PROCEDURES

- 3.03 The troubleshooting procedures for correcting equipment failures have been divided into four categories:
 - Feature Failure
 - Internal Communications
 - External Communications
 - System Malfunctions

Feature Failure

- 3.04 If the problem involves system features:
 - Use the feature following the instructions in the FEA-TURES section to determine if the problem is due to user errors.
 - (2) If the feature does not work properly, remove the keypad portion of the keyset. Examine the contacts under the feature button for dirt or dust and clean if necessary.
 - (3) If the feature still does not operate properly, proceed to Figure 6-3, Feature Failure Troubleshooting Chart, on page 6-8.

Internal Communications

3.05 If the problem involves only internal calls, refer to Figure 6-4, Internal Communications Troubleshooting Chart, on page 6-11.

External Communications

3.06 If the problem involves only external calls, refer to Figure 6-5, External Communications Troubleshooting Chart, on page 6-12.

System Malfunctions

- 3.07 If the problem appears throughout the system, refer to Figure 6-6, System Malfunctions Troubleshooting Chart, on page 6-14.
- 3.08 The troubleshooting charts list symptoms, possible causes, and corrective actions. Look for the problem reported and perform the corrective actions in the order given.

FIGURE 6-3. FEATURE FAILURE TROUBLESHOOTING CHART

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Cannot place a call on Hold	User error	Refer to page 8-20 and 8-29.
	5.0V regulator out of tolerance	Adjust keyset 5.0VDC setting as described on page 3-58.
	Defective keyset	Replace the keyset.
Cannot put the station on Call	User error	Refer to page 8-37.
Forwarding	Defective keyset	Replace the keyset.
	Defective CPU PCB	Refer to page 3-40, then con- tact Inter-Tel Customer Support for assistance.
Cannot put the	User error	Refer to page 8-38.
station in Do-Not-Disturb	Option not enabled	Place keyset DIP switch 1 in the ON position.
	Defective keyset	Replace the keyset.
	Defective CPU PCB	Refer to page 3-40, then con- tact Inter-Tel Customer Support for assistance.
Last Number	User error	Refer to page 8-28. The redial
HOL WOLK		feature cannot be used for redialing numbers stored in the keyset memory after disconnect.
	System Option 5 enabled	Use last number redial after disconnect for manually dialed numbers. Refer to page 8-28.
reter to Fig- on page 6-14.	Defective keyset	Replace the keyset.

and corrective actions. Look for the problem reported and per-

FIGURE 6-3. FEATURE FAILURE TROUBLESHOOTING CHART (CONT'D)

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION	
Speed-dial number memory	User error	Refer to page 8-26.	
lost or not working	Speed-dial attempted without accessing a C.O. line	Reprogram the memory storage location. Use the speed-dial feature only after pressing a line key.	
	Power to keyset was turned off	Ensure that the keyset has power and reprogram the numbers.	
	Defective keyset	Replace the keyset.	
Cannot activate another keyset's	User error	Refer to page 8-39.	
message waiting	Defective keyset	Replace the keyset.	
key	Defective CPU PCB	Refer to page 3-40, then con- tact Inter-Tel Customer Support for assistance.	
Full-duplex speakerphone	Option not enabled	Place keyset DIP switch 3 in the ON position.	
not working		Using an ohmmeter, check the cable for a broken wire. If cable is good, and speakerphone still does not work, replace speakerphone.	
	Defective Speaker- phone Module	Replace speakerphone module.	
	Defective keyset	Replace the keyset.	

FIGURE 6-3. FEATURE FAILURE TROUBLESHOOTING CHART (CONT'D)

CVMDmou	CONTROL ACTO	PROBABLE CAUSE	
SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION	
Cannot transfer outside calls	User error	Refer to page 8-29.	
to other keysets	Called station is in Do-Not-Disturb	Any station in Do-Not-Disturb cannot receive transfer calls.	
	Defective keyset	Replace the keyset.	
	Defective CPU PCB	Refer to page 3-40, then con- tact Inter-Tel Customer Support for assistance.	
Cannot initiate a conference	User error	Refer to page 8-33.	
	System is not equipped for conference	The system must have optional Conference (CNF) PCB.	
-noo n00	Defective keyset	Replace the keyset.	
	Defective CNP PCB	Replace CNF PCB.	
	Defective CPU PCB	Refer to page 3-40, then con- tact Inter-Tel Customer Support for assistance.	
Cannot initiate a page	User error	Refer to page 8-40.	
and sparkerphone work, replace	no paging zones	Ensure that stations are pro- grammed for paging through the SERV STA program (page 4-19).	
	Defective keyset	Replace the keyset.	
	Defective CPU PCB	Refer to page 3-40, then con- tact Inter-Tel Customer Support	
		for assistance.	
Paging times out in less	User error	Refer to page 8-40.	
than 12 seconds	STN-A PCB has unterminated extensions	Terminate the unused extensions as described on page 3-9.	
	Defective keyset	Replace the keyset.	
	Defective CPU PCB	Refer to page 3-40, then con- tact Inter-Tel Customer Support for assistance.	

FIGURE 6-4. INTERNAL COMMUNICATIONS TROUBLESHOOTING CHART

NOTE: These symptoms are isolated to one keyset only. For identical problems involving more than one keyset, refer to Figure 6-6, System Malfunctions Troubleshooting Chart.

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
No intercom dial tone	Defective cabling	Check cable connections.
al net	Defective keyset	Replace the keyset.
	program procedure	Determine which STN PCB corresponds to the affected station and replace it.
	Replace the keysa	estex animoran
Cannot place intercom calls	Defective keyset	Replace the keyset.
	Defective STN PCB	Determine which STN PCB corresponds to the affected
g rocedure. swrtch:6 in	Standard operation Place keyest DIF	station and replace it.
Data noise in keyset	Defective cabling or connections	Check for loose or open connections, or crossed wires.
	Defective keyset	Replace the keyset.
	Defective STN PCB	Determine which STN PCB corresponds to the affected station and replace it.
Keyset not working	Defective or misadjusted keyset	Check the internal 5.0VDC setting and adjust if necessary (refer to page 3-58.) Replace keyset if still not working.
	Defective cabling	Check for loose or open con- nections in corresponding cabling.
	Defective STN PCB	Refer to page 3-43, then re- place the corresponding STN PCB.
Other station conversations can be heard	Defective STN PCB	Replace the corresponding STN PCB.
on the line	Defective CPU PCB	Refer to page 3-40, then con- tact Inter-Tel Customer Support for assistance.

FIGURE 6-5. EXTERNAL COMMUNICATIONS TROUBLESHOOTING CHART

	culan deputations of	
SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Cannot obtain C.O. dial tone	C.O. line(s) restricted	Check the station option option programming for that keyset
		(refer to page 4-19).
. 308	Improper programming	Ensure that the line is equipped. Refer to SYSTEM
	B Determine which corresponds to	PROGRAMMING for SERV EQU program procedures (page 4-25).
. 31 0061	Defective keyset	Replace the keyset.
Cannot place an outside call, C.O. dial tone	Keyset is toll-restricted	Check the station option programming for that keyset.
present (intercom works)	Speed transfer enabled	Standard operating procedure. Place keyset DIP switch 6 in OFF position if speed transfer
		is not desired.
	Defective keyset	Replace the keyset.
	Defective CPU PCB	Refer to page 3-40, then con-
		tact Inter-Tel Customer Support for assistance.
	gen bas nothers	

FIGURE 6-5. EXTERNAL COMMUNICATIONS TROUBLESHOOTING CHART CONT'D

Outside calls
being dropped
during conver-
sation or upon
answering C.O.
call

Line key is pressed by user after initial connection is established Standard operating procedure. Pressing a line key after the connection has been made will automatically drop the call in progress and reseize that C.O. line. The C.O. Line Reseize Disable feature may be used to alleviate this problem. Refer to page 4-16.

Loop current interrupt from Central Office

The Central Office must supply constant loop current. Enable system option 6 (1.2 second held call loop release) as described on page 4-15. (This will only help call on hold.)

Insufficient loop current supplied by Central Office

Central Office must supply 20mA loop current minimum.

Defective keyset

Replace the keyset.

Defective COU PCB .

Replace the COU PCB.

FIGURE 6-6. SYSTEM MALFUNCTIONS TROUBLESHOOTING CHART

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
No keysets in the system will operate.	Main Power +30VDC fuse open	Examine the fuse and replace it if necessary.
No LED indication when a line key is pressed.		CAUTION: Do not exceed maximum rating of fuse (refer to page 3-37).
	between power supply and KSU cardfile	Turn off the system. Use an ohmmeter to check the cable connector and replace or repair the faulty cable.
	Defective STN PCB	Remove all STN PCB's from the KSU. Check the voltage on the cardfile backplane as described on page 3-43. If in tolerance, replace the STN PCB's one at a time, measuring the voltage
		each time, until the defective PCB is isolated.
	Defective Power Supply	Using a voltmeter, check the voltage on the cardfile back-plane. If the voltage is not 30 ±6VDC, replace the power supply. Refer to page 3-37.
A group of 8 keysets will not operate. No LED	Defective fuse on the STN PCB	Remove the STN PCB from the KSU and replace the fuse.
indication when a line key is	Defective STN PCB	Replace the STN PCB.
pressed. All 8 sets are located on one STN PCB.	Defective or mis- wired amphenol connector on STN PCB	Remove the cable from the STN PCB. Using a ohmmeter, verify the pinout of the cable. Refer to page 3-13.
	Defective receptacle on KSU backplane	Replace the KSU cardfile. Contact Inter-Tel Customer Support for assistance.
	Defective CPU PCB	Refer to page 3-40, then con- tact Inter-Tel Customer Support for assistance.

FIGURE 6-6. SYSTEM MALFUNCTIONS TROUBLESHOOTING CHART (CONT'D)

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
C.O. line Defective C.O. inoperative line from Central throughout system Office		Disconnect the C.O. line from COU PCB. Use a test set to verify the C.O. connection.
	programming	Ensure that the line is equipped. Refer to page 4-25 PROGRAMMING for SERV EQU program procedures.
	Defeative COU DOD	Replace the COU PCB.
	Defective CPU PCB	Refer to page 3-40, then contact Inter-Tel Customer Support for assistance.
Terminal will not communicate with CPU PCB	Baud rates of the terminal and CPU PCB are not the same	Match the baud rates of the terminal and the CPU. Set for either 300 or 9600 baud (refer to page 3-40 and 4-3).
3-40 then con-		Repair or replace connecting cable. Refer to page 3-73 for proper pinout of RS232C connector.
	-12VDC fuse defective	Check the -12VDC fuse and replace it if necessary.
Defective power supply		Check the -12VDC with a voltmeter on the terminals of the power supply. Also check the cable between the power
		supply and the KSU cardfile (refer to pages 3-29 to 3-37).
RS232C interfa on CPU PCB is faulty		Examine RS232C interface for faulty solder connections or broken pins. Contact Inter-Tel Customer Support for assistance.

6-6. SYSTEM MALFUNCTIONS TROUBLESHOOTING CHART (CONT'D)

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
	AC line is not dedicated	Have dedicated, isolated AC line installed from the main power panel with a third wire ground. Ensure telephone power is on its own circuit breaker.
	lines (no keyset connected at the end of the cable)	Locate any unused circuits on the main distribution frame. Terminate the O-W pair to the BL-W wire of each unused cir- cuit (refer to page 3-9).
	+5VDC low	Replace faulty power supply. Contact Inter-Tel Customer Support for assistance.
rates of the he ceu. Cet for he decome to the ceter ad 4-3). Ace connecting to page to page to page to the ceter address to the	field (e.g., high voltage power transformers or	Relocate the KSU to an isolated room a minimum of 20 feet away from any equipment that pro- duces a magnetic field.
	Defective CPU PCB	Refer to page 3-40, then con- tact Inter-Tel Customer Support for assistance.
No Music-On-Hold or background music (external music source is	External music source turned off or inoperative	Check the external music source for proper operation.
connected)		Replace or repair the cable. Check that the proper connector was used. Refer to page 3-74.
	Defective CPU PCB	Refer to page 3-40, then con- tact Inter-Tel Customer Support for assistance.

D. HOW TO GET HELP SESSON MATERS SERVING LIN CARLESS SECOND

Customer Support .93703 to MRUT39 sasso bas CTEO21 issin3 (1)

- 3.09 If the problem persists, contact Inter-Tel Customer Support for assistance. They can be reached between 8:00 AM and 5:00 PM Mountain Standard Time at 602-961-9000 or 1-800-523-8180.
- 3.10 For Emergencies Only: After office hours and on weekends, call 602-961-0277 and leave your message with the operator. A Customer Support Product Specialist will return your call within an hour. Please remember that this is an emergency number. Sales questions, equipment orders, etc., can only be processed during business hours. The seas If the state of the

ISIS

- 3.11 Inter-Tel Systems Information Service (ISIS) is available to distributors 24 hours a day. By following the instructions given below, you can access the latest news, Tech Tips, and sales information. You may access ISIS for up to 30 minutes per call. ISIS will disconnect automatically after 30 minutes.
- 3.12 To call ISIS, you will need to know your ISIS distributor code, which is identical to your Inter-Tel account number, and the ISIS access number (150377). You also need to have a computer terminal with a CRT or printer, and a modem with these characteristics: de para unamedua A 193743 30 980739
 - A. Bell 103 or 212 standard modem compatibility.
 - 0 to 300 baud rate. THOUSE SET TO SHO TOSLINE SEASLE в.
 - C. Full-duplex communication ability (parity is not checked) or sea graits seg god mabel git hos

3.13 Accessing ISTS: Paris Accessing ISTS:

- (1) Dial 602-961-1825. The state of the stat
- (2) When you hear the modem tone, activate your modem according to the manufacturer's instructions.
- (3) Press the ENTER or RETURN key repeatedly until the terminal responds.
- (4) When you are connected to ISIS, your terminal will print: USERNAME.
- (5) Enter: ISIS and press RETURN or ENTER.

- (6) Your terminal will print: ENTER ACCESS CODE, THE OF MON ...
- (7) Enter: 150377 and press RETURN or ENTER. Jacque 18001803
- (8) Your terminal will print: ENTER DISTRIBUTOR CODE.
- (9) Enter: your distributor code (Inter-Tel account number as it appears on your monthly invoice) and RETURN or 3.10 For Emergencies Only: After office hours and . MSTMS conds.
- (10) Your terminal will print: WELCOME TO ISIS and will tell you when various files were updated last. (If the files have not been updated since you called last, you may not want to continue.) It will then prints: and seem land polared

PLEASE CHOOSE ONE OF THE FOLLOWING:

- A) Latest News (new or updated equipment and procedures)
- B) Technical Service (training schedules and Tech Tips)

3.12 to call ISIS, you will need to know you

- C) Marketing (Marketing Memos/Applications Guidelines)
- selss D) Sales (training schedules) seeps as you soled sevi;
- E) Help (instructions on how to use ISIS)
 - F) Leave a Message with vilabilatedus ibennobalbility 2121
 - G) Exit ISIS (disconnects you from ISIS)

bos , Field letter? (A-G): and move of isolanebl al access number (150377). You also need

(11) Enter the field letter (A-F) of the file you want to read and RETURN or ENTER. A sub-menu will then print. For example, if you choose B (Technical Services), your terminal will print:

PLEASE SELECT ONE OF THE FOLLOWING: 1 008 01 01 01

- 1) Latest News | files noises inummos xeigub-file |
- Tech Tip Index for SPK (lists SPK Tech Tips available)
- Tech Tip Index for MPK (lists MPK Tech Tips avail-3) able)
- Tech Tip Index (lists Tech Tips available)
- Print SPK Tech Tip (prints selected SPK Tech Tips)
- 6) Print MPK Tech Tip (prints selected MPK Tech Tips)
- Print Tech Tip (prints selected Tech Tips)
- Training Information (monthly schedule)
- 9) Return to Main Menu (to select another area)

Field number? (1-9):

- (12) Enter the field number (1-9) and RETURN or ENTER. You will now be able to read the information you selected.
- (13) If you want to leave a file while it is printing, hold down the CONTROL key and press the Y key to return to the main menu.
- (14) You may halt the file by holding down the CONTROL key and pressing S. To continue, hold down the CONTROL key and press the Q key.
- (15) If you respond incorrectly to any prompt, ISIS will ask if you need help. If you respond by entering YES, ISIS will provide you with instructions to help you continue. Or, you may select the Help field from the main menu.
- (16) When you are finished, select EXIT ISIS from the main menu and terminate your call according to your modem's instructions. Make sure that you are disconnected; if you do not disconnect from ISIS, your telephone company will charge you for the length of time you were connected to ISIS.

NOTE: If you have any problems, please exit ISIS and report the problem to Customer Support between 8:00 and 5:00 (MST).

- 127 car r the field meaner (1-4) and (ET198 or CRIEF You wil now be able to lasd the information you suled ed.
- (13) If or want to leave a fire while it is printing, hold dow the the CONTROL key and press the Y-key to return to the near.
- () () way half the file by helding sown the CONTROL key and utersting S. To contine, held down the CONTROL key and greet the O key.
- (15) if you respond incorrectly to any prompt, ISIS will sak
 if you need help. If you respond by ontening YES, ISIS
 will provide you with instructions to help you continue.
 Or, you may select the Help first from the main mem.
- (16) when you are finished, select fXIT 'SIS from the main meri and terminate your call according to your midem's introction. Make sure that you are disconnected; if you do not ifscone, from ISIS, your relephone company will charge you for the length if time you were cornected to SIS.
- MOTES If you have ony problems, please exitetils and report the peoples to functioner support netwern A:00 and 5:00 (HST).

REPLACEMENT PARTS

CONTENTS	PAGE
1. INTRODUCTION	
3. REPLACEMENT PARTS LIST	
4. RECOMMENDED SPARE PARTS	
	085 11 13g
1. INTRODUCTION	
1.01 This section provides the replacement parts for the 2456 and	information necessary to order
2 ADDROVING PROGRAMA	

- ORDERING PROCEDURE
- 2.01 When ordering equipment for the 2456 and 32X128 systems, provide the following information to your order processing clerk:
 - Company name
 - Purchase order number
 - Required date of shipment
 - Part number(s) of equipment ordered
 - Quantity required
- REPLACEMENT PARTS LIST
- 3.01 Figure 7-1 on the next page lists the parts available for replacement on the 2456 and 32X128 systems.
- RECOMMENDED SPARE PARTS
- 4.01 Spare parts must be kept on hand to ensure the best possible customer service. Figure 7-2 on page 7-5 lists the spare parts and quantities necessary to maintain and service ten 2456 or 32X128 systems.

FIGURE 7-1. REPLACEMENT PARTS

Part Descrip	otion	HITEC Number	PHOENIX Number
Instru	nents		
- Keyset	- 24 line key	682,3000	681.3000
	- 12 line key	344.3000	343.3000
	- 6 line key		341.3000
DSS II	2	684.3100	683.3100
Housing	10		
noustrie	12		
DSS II	Top	810.5127	810,5122
DSS Bot	_	810.5128	810.5124
	set Baseplate	810.5129	810.5125
	Bottom	810.5133	810,5134
	Top - 24 line key	810.5131	810.5132
Keyset	Top - 12 line key	810.5137	810.5139
Keyset	Top - 6 line key	810.5136	810.5138
Instru	ment Components		
Handeot	Assembly	817.3024	817,3025
Hookswi		010 5135	810.5135
	eiver for Handset	817.3005	817.3005
	Cable	813.1045	813.1042
	ord (mod to mod)	813,1044	813.1049
	wer Cable (mod/spade)	813.1052	813.1050
	at Cable (mod to mod)	813.1051	813.1053
	Control Board	681.3010	681.3010
	Control Board	681.3011	681.3011
Contro	Board w/Voice & Tone	681.3012	681.3012
	Control Board	683.3110	683.3110
Keyset	Keyboard - 24 line ke	y 682.3020	681.3020
Keyset	Keyboard - 12 line ke	y 344.3020	343.3020
Keyset	Keyboard - 6 line key	342.3020	341.3020
DSS Key	yboard - DSS II	684.3120	683.3120
Button	Caps Kit - 24 line ke	y 812.1022	812.1022
Button	Caps Kit - 12 line ke	y 812.1024	812.1024
	Caps Kit - 6 line key		812.1023
	Caps Kit - DSS II	812.1020	812.1020

FIGURE 7-1. REPLACEMENT PARTS (CONT'D)

These parts have the same number for HITEC and PHOENIX models:

Part Description	Part Number
KSU	
32X128 KSU Assembly Kit Cardfile Assembly Cardcage Motherboard	681.1000 681.1010 823.1012 683.1000 683.1010 823.1027 680.021 823.1012 828.1053
oduleckie 828::033	Spenkerphone Noted to Note Noted Ranging A
CPU-B COU (DTMF) COU Rotary Conversion Kit	680.11 680.20
Power Supply	
2456 32X128	680.06 680.08A
Power Cable Assembly	
680.06 680.08A	813.1032 813.1034

FIGURE 7-1. REPLACEMENT PARTS (CONT'D)

These parts have the same number for HITEC and PHOENIX models:

Part Description	Part Number
User Documentation	
Installation and Field	
Maintenance Manual	681.8002
2480 Hear Guide	681.8003
616 User Guide	341.8010
1232 User Guide	343.8010
DSS II User Guide	681.8006
Miscellaneous Equipment	
	020 1022
Speakerphone Module Kit	828.1033
Loud Ringing Adapter	828.1004
PLT-2 Headset Adapter	828.1031
Desk Speaker	828.1027
HAC Handset Receiver	828.1046
HVRA	680.73
DSS Power Transformer	806.1009

FIGURE 7-2. RECOMMENDED SPARE PARTS

Part Number	Description	Quantity
680.11 680.20 828.1032 680.30 680.31 680.32 680.40 680.50 680.51	CPU-B PCB COU PCB - DTMF COU Rotary Conversion Kit STN-A PCB STN-B PCB STN-C PCB CNF PCB MOD I PCB MOD II PCB Power Supply 2456 Power Supply 32X128 2456 KSU	Quantity 1 2 1 2 2 2 2 1 1 1 1 1 1
682.3000 344.3000 342.3000 684.3100 681.3000 343.3000	HITEC Keyset - 24 line key HITEC Keyset - 12 line key HITEC Keyset - 6 line key HITEC DSS II	4 4 4 1 4 4 4

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PEATURES

CONTENTS	AGE
INTRODUCTION TO FEATURES 8	
SYSTEM PEATURES 8	-3
KEYSET FEATURES 8	
SINGLE-LINE ELECTRONIC (SLE) SET FEATURES 8	
2500 SET FEATURES 8	-52
ATTENDANT FEATURES 8	-57

INTRODUCTION TO FEATURES

In addition to their stylish appearance and easy installation and programming, the 2456 and 32X128 systems have over 100 userfriendly features. These have been divided into the following categories:

System Features:

- Station Message Detail Recording (SMDR)
- Flexible Attendant Arrangements (Alternate Point Answering)
- Flexible Night Ringing Arrangement
- System Battery Back-up
- Data Base Battery Back-up
- Dual-Tone Multi-Frequency (DTMF) or Dial Pulse Signalling
- Music-On-Hold
- Call Privacy
- Toll Restriction
- Variable Time-Out Capabilities
- Tenant Service
- Outgoing-Only Rotary Line Group Access
- · Alternate Keyset Usage

Keyset Features: Features available for each keyset station are grouped as follows:

- Keyset General Features
- Intercom Features
- Outside Call Features
- SDAS Special Station Features

Single-Line Electronic (SLE) Set Features: Features available for Single-line Electronic (SLE) sets are grouped as follows:

- SLE Set General Features
 - Intercom Features
- Outside Call Features
 - Paging Features

2500 Set Peatures: Features available for the 2500 single-line sets are grouped as follows:

- 2500 Set General Features
- Intercom Features
- Outside Call Features
- Paging Features

Attendant Features: Features that apply to the system attendant(s) and stations using the Direct Station Selector/Busy Lamp Field (DSS) units are grouped as follows:

- Key Functions
- Visual Indications
- Intercom Features
- Call Transfer and Reverse Transfer
- Message Waiting Indication
 Night Ring Mode

SYSTEM FEATURES

1. INTRODUCTION

- 1.01 System features include the following:
 - Station Message Detail Recording (SMDR)
 - Flexible Attendant Arrangements (Alternate Point Answering)
 - Flexible Night Ringing Arrangement

 - Data Base Battery Back-up
 Dual-Tone Walter • Dual-Tone Multi-Frequency (DTMF) or Dial Pulse Signalling

 - Music-On-Hold
 Call Privacy
 Toll Restriction
 - Variable Time-Out Capabilities
 - Tenant Service
 - Outgoing-Only Rotary Line Group Access
 Alternate Keyset Heads
 - Alternate Keyset Usage

2. STATION MESSAGE DETAIL RECORDING (SMDR)

- 2.01 Station Message Detail Recording (SMDR) provides a detailed record of long distance and local calls.
- 2.02 Data may be recorded on a customer-provided printer or alternate device (such as magnetic tape or floppy disk). This device is connected to the RS232C port on the Central Processing Unit (CPU) printed circuit board (PCB). Refer to SYSTEM SPECIFI-CATIONS for more information.
- 2.03 SMDR options are programmed using the System Features (SERV SYS) program. The options are:
 - · All local and long distance calls, including incoming and outgoing calls (no options programmed).
 - Local and long distance calls at least 30 seconds in duration (System Option 1 enabled).
 - Only long distance calls at least 30 seconds in duration (System Option 2 enabled).
 - Error messages (System Option 3 enabled). Refer to the DIAGNOSTIC PROGRAMMING section of this manual for details.
- 2.04 The following paragraphs describe the call data items that appear on the SMDR output report. A sample SMDR report is shown in Figure 8-1 on page 8-4.

FIGURE 8-1. SMDR PRINTOUT

STN	NUMBER	DIALED	DUR	TIME	LN	ACCOUNT	
10		xxxxxx	1	0043	1	XXXXXX	
10		XXXXXX					

- 2.05 Station Number (STN): This field identifies the originator of the outgoing call by recording the station intercom number. If the call is transferred, the station that terminates the call is listed as the originator.
- 2.06 Number Dialed: This field records the telephone number dialed by the station user, showing the last 24 digits dialed. This field will be blank for incoming calls.
- 2.07 Duration of Call (DUR): This field indicates the duration of the call in minutes. The timer starts when the user finishes dialing and ends when the Central Office (C.O.) line in use is released. Calls are recorded in one-minute units, for up to 255 minutes. If more than 255 minutes have elapsed, three asterisks (***) will be printed.
- 2.08 Time of Day (TIME): This field records the time of day when the call is terminated. Hours and minutes are recorded in 24-hour international time.
- 2.09 C.O. Line Number (LN): This field identifies the C.O. line used to place or receive the call.
- 2.10 Account Code (ACCOUNT): If a station user enters an account code while on an outside call, it will appear in this field on the SMDR printout. This feature helps to identify the called party. For example, if a business assigns account numbers to clients, calls to them may be identified by the account code. This makes it easy to locate the data and charge the client for the call. An account code may include up to six digits, and is entered during the call by pressing the asterisk (*) key and entering the account code. Refer to paragraph 4.05 on page 8-23 for further instructions on entering an account code.
- 2.11 Day Header: A page header is generated daily when the real-time clock cycles from 2359 to 0000. The header includes the date (month, day, year, day of week) and column headings for the SMDR printout.

FLEXIBLE ATTENDANT ARRANGEMENTS (ALTERNATE POINT ANSWERING)

- 3.01 The system may be configured for one-attendant, multipleattendant, or no-attendant operation.
- 3.02 Each attendant has full-feature capability for processing incoming calls. However, in the case of multiple attendants, there is only one system-identified attendant. Only this station will be able to place the system in the Night Ring mode, respond to "0" as an intercom number, and receive recalls from within the system. The attendant's intercom number is assigned in the System Features (SERV SYS) program.
- 3.03 One-Attendant Operation: With this feature, incoming C.O. lines are programmed to ring in at the attendant's station. This does not include any direct ring-in (private) lines. C.O. line ring-in is assigned in the Station Features (SERV STA) program.
- 3.04 Multiple-Attendant Operation: Incoming C.O. lines are programmed to ring in at two or more keyset stations, but only one of the keysets will be the system-identified attendant.
- 3.05 No-Attendant Operation: With this feature, incoming and outgoing calls may be handled without the use of an attendant. This is accomplished in one of two ways. One way is to program C.O. lines to ring in at any station using the SERV STA program. Another method is to permanently place the system in Night Ring mode, allowing every station to answer incoming calls.

4. FLEXIBLE NIGHT RINGING ARRANGEMENT

- 4.01 The Night Ring mode provides flexible system operation after hours. It is enabled by placing the system attendant's station in the Do-Not-Disturb mode. Incoming calls flash on all keysets, and keysets may be programmed to audibly ring. Do-Not-Disturb is a switch-enabled option.
- 4.02 Station users can answer any incoming C.O. call while the system is in Night Ring mode, even if the keyset is not programmed to audibly ring. Incoming calls cause the appropriate line key to flash at the slow rate (30 IPM) on all keysets. When System Option 11 is enabled, only the lines ringing in on the attendant's extension will be placed in the Night Ring mode.
- 4.03 System features not requiring an attendant may be used while the Night Ring mode is enabled. For example, calls may be put on hold or transferred to another station, but attendant recall will not be available. In addition, there is a night transfer contact on the Modem II (MOD II) PCB which may be used to activate electrical devices.

5. POWER FAILURE CAPABILITIES

- 5.01 The system is equipped to charge batteries that will provide power to the power supply and data base during a power outage or "brown-out" condition.
- 5.02 System battery back-up: Customer-provided batteries are trickle-charged by the power supply. In the event of a "brown-out" condition or power failure, these batteries are automatically activated and the system will remain operational for a limited time. Back-up time varies depending on the type of battery selected. Without battery back-up, calls in progress during a power failure are dropped, and stored speed-dial numbers are lost. Refer to SYSTEM SPECIFICATIONS for more information.
- 5.03 Data base back-up: Power for the customer's data base memory is provided as an integral part of the CPU PCB. A battery on the PCB is trickle-charged by the system power supply. In the event of a power failure, this battery protects the memory for up to 25 days before the data base must be reprogrammed.

6. DUAL-TONE MULTI-FREQUENCY (DTMF) OR DIAL PULSE SIGNALLING

- 6.01 All instruments equipped with pushbutton keypads may have DTMF or dial pulse signalling.
- 6.02 Any combination of DTMF or dial pulse signalling may be mixed on a line-by-line basis on the Central Office Unit (COU) PCB. A digital code is generated by the instrument and decoded as either a DTMF or dial pulse signal. On the 32X128 system, lines 25-32 must be DTMF to be accessed by single-line sets.
- 6.03 Normally, the asterisk (*) key tone is not sent over an outside line so that SMDR account codes may be entered. For specialized applications (banking, computer call-ups, etc.), the asterisk (*) key may be programmed to send a DTMF signal by enabling System Option 15 (SERV SYS program).

7. MUSIC-ON-HOLD

- 7.01 The system may use an external music source for calls on hold or waiting, and as background music to stations. This feature not only makes the wait as pleasant as possible, but it assures the holding parties that they are still connected.
- 7.02 Music-On-Hold is enabled on the CPU PCB. The music source is provided by the customer. An alternate option is Tic-Tone, which may be programmed into the system by enabling System Option 8 (SERV SYS program). Refer to SYSTEM SPECIFICATIONS for more information.

CALL PRIVACY

- 8.01 The call privacy feature restricts access to a call by all other station users. This applies to intercom and outside calls.
- 8.02 When an intercom channel is selected by dialing a two-digit (for multi-line keysets) or three-digit (for single-line sets) intercom number, no other station may seize that channel.
- 8.03 When a C.O. line is selected by pressing one of the 24 line keys, no other station can seize that line. Control of the line may be transferred to another station through a conference or a call transfer.

9. TOLL RESTRICTION

- 9.01 As a means of controlling costs, the system is capable of restricting specific stations from accessing outside C.O. lines or making toll calls. These restrictions are programmed using the SERV program:
 - A. Basic Toll Restrictions
 - B. WATS Line Access
 - B. WATS Line Access
 C. Allowed Area Codes List
 - D. Forbidden Central Office Codes
 - E. Allowed Long Distance Numbers
 - F. Allow 411 and 1411
 - G. Allow 1-555-1212 and 1-XXX-555-1212

A. BASIC TOLL RESTRICTIONS

- 9.02 Stations may be restricted from placing toll calls unless assisted by an unrestricted station. This permits control of long-distance dialing.
- 9.03 A station may be programmed for toll restrictions by enabling Station Option 6 (SERV STA program). This prevents the station user from placing a call when the number dialed has a 0 or I for the first or second digit. If the user attempts such a call, a busy signal will be heard and the C.O. line will be disconnected. The system may also disconnect the line if the third digit after the leading 1 is a 0 or 1.
- 9.04 The basic toll-restrictions feature may be expanded to include additional restrictions and exceptions. Each is described below.

B. WATS LINE ACCESS

9.05 Using the SERV SYS program, the system may be programmed to allow access to an unrestricted line for placing toll calls that may otherwise be denied. This line does not need to be an actual WATS line. It may be a local C.O. line, FX line, PBX line, etc. This option is provided in case the user wants to exclude a line from toll restriction.

C. ALLOWED AREA CODES LIST

9.06 A list of allowed area codes may be programmed for toll restriction purposes using the SERV SYS program. The system will allow toll-restricted stations to place calls to these area codes only. All other long distance calls will be denied. If a call is denied, the station user will hear a busy signal. The list may include a maximum of 20 three-digit area codes.

D. FORBIDDEN CENTRAL OFFICE CODES

9.07 A list of forbidden Central Office (C.O.) codes may be programmed for toll restriction purposes using the SERV SYS program. Long distance calls made by toll-restricted stations will be denied if the C.O. code (prefix) of the number dialed matches one of the codes on the list. This feature enables the system to identify and restrict toll calls within the local area code. If the call is denied, the station user will hear a busy signal. The list may include a maximum of 20 three-digit C.O. codes.

E. ALLOWED LONG DISTANCE NUMBERS

9.08 Two 10-digit telephone numbers may be programmed as allowed long distance numbers using the SERV SYS program. These are numbers that may be dialed by toll-restricted stations.

P. ALLOW 411 AND 1411

9.09 Toll-restricted stations may dial local information (411 and 1411), if System Option 17 in the SERV SYS program is enabled.

G. ALLOW 1-555-1212 AND 1-XXX-555-1212

9.10 Toll-restricted stations may dial long distance information for any area code -- 1-555-1212 or 1-(area code)-555-1212 -- if System Option 18 in the SERV SYS program is enabled.

VARIABLE TIME-OUT CAPABILITIES

10.01 This feature provides time parameters for the system. Variable timers are either software dependent or may be changed using the SERV SYS program. Initialized and variable values are shown below:

Times 15 and 15	Initialized Value	Variable Range
Timer	value	Kange
Transfer Recall	60 sec	1-255 sec
Hold Recall	60 sec	1-255 sec
Station Camp-On (rings		
busy before camp-on)	4 sec	13.0) Tore
Call Waiting Tone (incoming C.O.)	15 sec	12X128 <u>- r</u> atem set can a
Callback Ring Duration	12 sec	
Lamp Status (Flash Sequence)	Refer to Figure 8-2, page 8-13	
Abandoned Call Timer	10 minutes	
Page Time-out (Internal and External)	12 sec	

TENANT SERVICE

- 11.01 Tenant service allows the customized distribution of C.O. lines between multiple users sharing a common KSU. Assigning a station to a tenant group controls which C.O. lines will be accessed by the line keys on that keyset. Lines 21 through 24 (COU PCB 6) cannot be shifted. The shifting is done in station programming (SERV STA).
- 11.02 Keysets with fewer than 24 line keys may be used with Tenant Service. One attendant keyset with a key for each C.O. line is required.

12. OUTGOING-ONLY ROTARY LINE GROUP ACCESS (32X128 ONLY)

12.01 On the 32X128 system, a group of up to nine outgoing-only C.O. lines (24-32) is accessible to single-line stations and multi-line keysets (System Option 9 enabled). Single-line users access the group by dialing 9; keyset users select line 24. When System Option 9 is disabled, only single-line stations can access the rotary group of up to eight lines (25-32), and line 24 becomes a two-way line for multi-line keysets. For more information, refer to Central Office Unit (COU) PCB on page 2-6.

ALTERNATE KEYSET USAGE

13.01 Inter-Tel 616 and 1232 keysets may be used on the 2456 and 32X128 systems. However, only those lines appearing on the keyset can be accessed or programmed as direct ring-in lines.

Page 8-10

KEYSET FEATURES

1. INTRODUCTION

- 1.01 Keyset features of the system include the following:
 - Keyset General Peatures
 - Intercom Features

 - Special Station Features

KEYSET GENERAL FEATURES

- 2.01 Features available to each keyset for all operations are described in this section, including the following:

 - A. Key Functions
 B. LED Indications
 - C. Audible Tone Indications
 - D. Volume Control
 - E. Call Number Buffering

 - F. ON/OFF Speaker G. Direct Ring-in Line Flexibility
 - H. C.O. Line Restriction
 - I. Intercom Security Tone

A. KEY FUNCTIONS

2.02 All 2480 keysets have a standard 12-key pushbutton keypad, 24 line keys, and six feature keys. The line keys provide direct access to C.O. lines, and the feature keys provide user-friendly operation of the system functions.

2.03 The functions of these six feature keys are defined below:

Key Name	Punction
HOLD/FWD	Places a call on hold. Forwards calls to another station. Places the station in Do-Not-Disturb mode.
XFER/CONF	Transfers an outside call to another station. Reverse transfers calls from another station. Connects a three-party conference.
ZONE PAGE	Places pages through keyset speakers in programmed zones.
QUE	Initiates an intercom callback. Requests a callback on a busy C.O. line.
MSG/DIAL	Activates another keyset's message waiting key and automatically dials the message center. Speed-dials stored numbers. Redials the last number manually dialed.
ON/OFF	Controls the internal speaker for call monitoring. Controls the optional speakerphone unit for handsfree operation. Disconnects when dialing on-hook. Indicates an incoming intercom call.

B. LED INDICATIONS

2.04 The status of the line keys and four of the feature keys is indicated by the Light-Emitting Diode (LED) in each key. The flash rates of the LED's have distinct meanings as shown in Figure 8-2 on the next page. The LED flash rates are described below in interruptions per minute (IPM).

a.	STEADY	-	No flash	ning					
b.	FAST	-	Fläshes	120	IPM (or two	times	per	second.
c.	MEDIUM	-	Flashes	60	IPM o	r one t	ime pe	er se	cond.
d.	SLOW	-	Flashes	30	IPM o	r once	every	two	seconds.
e.	DELAYED	-	Flashes	15	IPM o	r once	every	four	seconds.
f.	DOUBLE	_	Light re	epea	at edly	flash	es twic	ce an	d pauses.

PIGURE 8-2. LED INDICATIONS

doep	STEADY (0 IPM)	FAST (120 IPM)	MEDIUM (60 IPM)	SLOW (30 IPM)	DELAYED (15 IPM)	CADENCE
HOLD/FWD		IC call waiting on your keyset	Keyset has calls forwarded Keyset is in Do-Not- Disturb	onis uo s	ence l gair o co pao.	2.06
XFER/CONF	Confer- ence in- itiated by this keyset is in pro- gress	C.O. line monitor	This keyset in conference (non- initiating party)		Recalli One in	d
MSG/DIAL		Message waiting	1 (/8 :	ak osedni sd:lao	Private Station	
ON/OFF	Micro- phone on	ng process	gan de sar	antamor bu	Нерозіі	ь
	Incoming IC call	0.00	grafel6-dal	esc i el	to tadá (
LINE KEYS	Line in use by another keyset		Line on hold	Incoming or trans- ferred call Queued	Line in con- ference your keyset	You are using this line
			and are also	line available		
	7 75 76		apietr hift	C.O. call waiting on your keyset		

C. AUDIBLE TONE INDICATIONS

2.05 There are several distinct "rings" (audible tones) for each type of call.

Ring Tones

- 2.06 The ring tones are described below.
 - a. Long continuous tones () Incoming outside call Line now available from busy line callback Recalling outside call
 - b. One double tone (--) based soulder be said a Intercom call
 - c. Repeating double tones (-- --)

Private intercom call Station callback

d. Repeating combination of 4 tones and pause (----)

Station is in Do-Not-Disturb mode

- Busy signal for only 3 or 4 seconds (----), then Music-On-Hold or Tic Tone if enabled/equipped Your station is camped on to a busy station
 - f. Continuous busy signal (-----)

C.O. line is busy All intercom channels are busy Another station is camped on to the busy station you are calling You dialed an invalid intercom number Your keyset is toll restricted

Immediate Ringing

2.07 A called station rings immediately after the station circuit is tested and found to be idle, without waiting for the normal ringing cycle.

Off-Hook Ringing

- 2.08 A keyset may be switch-enabled to ring while off-hook. A signal tone is heard through the handset but is inaudible to the outside party.
 - a. A single tone every 15 seconds (-) indicates an outside call waiting.
 - b. A double tone (--) and flashing HOLD/FWD key indicate an intercom call waiting.

D. VOLUME CONTROL

2.09 A thumbwheel tone control adjusts the volume of all tones from the keyset. Another thumbwheel controls the voice volume from the internal speaker.

E. CALL NUMBER BUFFERING

2.10 Digits dialed are buffered by the CPU, preventing the user from dialing too fast for processing.

F. ON/OFF SPEAKER

2.11 The ON/OFF key controls the keyset's internal speaker and microphone. Outside calls may be placed without lifting the handset but must be conducted through the handset once the outside party answers (unless the keyset is equipped with an optional speakerphone unit).

G. DIRECT RING-IN LINE FLEXIBILITY

2.12 Direct ring-in line flexibility allows C.O. lines to ring in on specific stations, bypassing the attendant's station. If programmed for direct ring-in, an incoming call will cause the C.O. line key to flash and the keyset to ring. Assignments for ring-in are programmed using the Station Feature program (SERV STA).

H. C.O. LINE RESTRICTION

2.13 A station may be restricted (SERV STA program) from accessing C.O. lines for outgoing calls. An attempt to use a restricted line will produce a busy signal. However, calls on restricted lines may be received from and transferred to other stations.

I. INTERCOM SECURITY TONE

2.14 An intercom security tone may be programmed into the system (SERV SYS program, System Option 12). A tone will be heard every 30 seconds to indicate an active microphone on a keyset when receiving a handsfree intercom call.

INTERCOM FEATURES

- 3.01 The intercom features presented in this section are as follows:
 - A. Flexible Intercom Numbering

 - C. Handsfree Answering
 - D. Station-to-Station Calling
 - E. Intercom Camp-On, Call Waiting, and Call Splitting
 - F. Executive Call Waiting
 - G. Busy Station Callback (Queuing)
 - H. Consultation Hold
 - I. Intercom Transfer
 - J. Speed Transfer
 - K. Ring Intercom Always
 - L. Ring Intercom First

A. FLEXIBLE INTERCOM NUMBERING

3.02 All keyset stations are accessed by two-digit intercom numbers (10-89) or by a single key on the optional Direct Station Selector (DSS). (Refer to ATTENDANT FEATURES section.) Singleline stations are accessed by extension numbers #10-#57. Intercom numbers are assigned during initialization, but can be changed using the SERV NUM program. Intercom numbers #60 through #64 are reserved for the five external talkback speakers and cannot be changed. (Refer to Section 5F, PAGING FEATURES.)

B. VOICE ANNOUNCING

3.03 The internal speaker and microphone in your 2480 keyset are activated by incoming intercom calls, which allows the caller to announce the call and you to respond handsfree.

C. HANDSFREE ANSWERING

3.04 If you receive an intercom call, you may answer handsfree from anywhere in the room, or you may lift the handset for a private conversation. This feature may be disabled using Station Option 4 (SERV STA program).

D. STATION-TO-STATION CALLING

3.05 Intercom calls can be placed from one station to another. One of eight available intercom channels is selected automatically when an intercom number is dialed. If all eight intercom channels are busy, you will receive a busy signal. You may not transfer any outside calls when intercom channels are busy. If an unassigned, unequipped, or invalid intercom number is dialed, you will hear a busy signal.

3.06 To place an intercom call to a keyset station:

- (1) Lift the handset and dial the intercom number. If the called station is idle, both parties will hear one double tone and the called keyset's speaker and microphone will be activated.
 - (2) You may announce yourself.
- 3.07 To place an intercom call to a single-line station: Lift the handset and dial the intercom number. You will hear continuous double tones until answered.
- 3.08 To place an intercom call to a busy station: If you hear a busy signal when you call another station, you have the following options:
 - A. Hangoup and try later. DMITIAM TOAD . NO-THAD MODRATMI . 3
 - B. Do not hang up. You will camp on automatically. When the called station is available, you will be connected. Refer to Section 3E, INTERCOM CAMP-ON.
 - C. Request a busy station callback. This is similar to camping on except that you hang up while waiting. Refer to Section 3G, BUSY STATION CALLBACK.
 - D. If your keyset is enabled for Executive Call Waiting, you may camp on and send call waiting signals to the busy party. Refer to Section 3F, EXECUTIVE CALL WAITING.
- 3.09 To receive an intercom call: When you hear a double-tone and possibly a voice announcement, and the ON/OFF key is lit, you may respond handsfree or lift the handset for privacy.

3.10 To place a private intercom call:

- (1) Lift the handset and dial the intercom number.
- (2) If the called station is idle, both parties will hear one double tone.
 - (3) Press the pound (#) key. You will hear continuous double tones until the called party answers by lifting the handset.
- (4) If the called station is busy, the same options apply as discussed in paragraph 3.08 on page 8-17.
- 3.11 To receive a private intercom call: When you hear continuous double tones, lift the handset or press the ON/OFF key.

3.12 To end an intercom call:

- (1) The calling party may terminate an intercom call at any time by either hookflashing or hanging up.
- OR, The called party may terminate an intercom call while on-hook by pressing an available C.O. line key.

E. INTERCOM CAMP-ON, CALL WAITING, AND CALL SPLITTING

- 3.13 This feature allows you to camp on to a busy station and wait until it is available. You are automatically camped on as long as you remain off-hook and will hear Music-on-Hold, if equipped. The busy station is alerted with the call waiting signal.
- 3.14 Any station user may camp on to a busy station unless it is in Do-Not-Disturb mode (indicated by repeating four busy tones and a pause) or has a previous intercom call waiting (indicated by continuous busy tones).

3.15 To initiate intercom camp-on:

- (1) If the called station is busy and no other intercom calls are camped on, you will hear the intercom busy signal for approximately three or four seconds and then Music-On-Hold, if equipped.
 - (2) Do not hang up. The called station is alerted to the call waiting by a fast flashing HOLD/FWD key. A double tone will be heard through the handset if programmed (DIP switch 5).
 - (3) When the busy station becomes available, you will be connected automatically.

3.16 To answer a waiting intercom call while on an outside call (call-splitting):

- (1) If you are notified of a call waiting by a fast flashing HOLD/FWD key and a double tone through the handset, place the outside call on hold by pressing the HOLD/FWD key. The waiting intercom call will connect automatically.
- (2) To reconnect with the outside call on hold, press the medium flashing line key. The intercom call will be camped on as long as the calling party remains off-hook. This allows you to split back and forth between calls as desired.
- 3.17 To answer a waiting intercom call while on another intercom call: If you are notified of a waiting intercom call by one double tone, complete the current intercom call and hang up. The waiting intercom call will connect automatically.

F. EXECUTIVE CALL WAITING

- 3.18 Keysets may be switch-enabled for executive call waiting. This is a method of signalling a busy station, without disrupting the ongoing call, that the calling party is waiting to talk.
- 3.19 Stations with the executive call waiting feature lose the busy station and line callback (queue) features. If the busy station is not programmed to receive audible signals through the handset when off-hook, the waiting signal will not be heard.

3.20 To use executive call waiting:

- (1) If you hear a busy signal when calling another station, press the pound (*) key to signal the user. Do not hang up. The busy station will hear a double tone when the pound (*) key is pressed, not to exceed one every five seconds. The HOLD/FWD key on the busy station will flash at a fast rate.
- (2) As soon as the busy station is free, you will be connected automatically.

G. BUSY STATION CALLBACK (QUEUING)

3.21 Busy station callback allows a station to be called back when a busy station becomes available. This feature is similar to intercom camp-on and call waiting, except that you may hang up while waiting. This feature is disabled if Executive Call Waiting is enabled on the keyset. 3.22 The system can process up to 25 callback requests, but each station may request only one callback. If a second callback is requested, the previous request is cancelled.

3.23 To initiate a callback:

- (1) If the called station is busy, press the QUE key.
- (2) Hang up. This places you on a non-prioritized (first in, first out) callback list.

NOTE: If the call is camped on before pressing the QUE key, the call can still be set for busy station callback by pressing the QUE key and hanging up.

3.24 To answer a callback:

- When the busy station becomes available, you will be alerted by continuous double tones.
 - (2) Lift the handset.
- (3) The queued station will be called and the called party will hear one double tone.
 - (4) You may speak and the called party may respond handsfree or by lifting the handset.
- 3.25 If the calling party's station is busy when the callback is returned, the request is placed back in the queue list. The next station in the queue is then called back. If the waiting station is idle, the system will signal the station for a maximum of 12 seconds. If unanswered after this time, the callback request will be dropped from the queue list.

3.26 To cancel the callback:

- (1) Lift the handset and dial your own intercom number.
 - (2) Press the OUE kev.
- (3) Press and release the hookswitch (hookflash) and hang up.

H. CONSULTATION HOLD

3.27 Consultation hold allows you to put an intercom call on hold, call someone else, and be reconnected without having to redial the intercom number.

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3.28 To use consultation hold:

NOTE: Both stations must be off-hook.

- While connected to an intercom call, press the HOLD/FWD key. The HOLD/FWD key will flash at a fast rate.
- (2) Within four seconds, dial another intercom number or press an available line key to dial an outside call.
- (3) When you hang up, the original intercom call will reconnect automatically and you may answer on- or offhook.

I. INTERCOM TRANSFER

3.29 Intercom transfer may be used to transfer an intercom call to another station. Both parties must be off-hook.

3.30 To use intercom transfer:

- (1) While on an intercom call, press the XFER/CONF key.
- (2) Within four seconds, dial the station to receive the call.
- (3) Announce the call and hang up.
- (4) The transfer will go through when you hang up, and the two intercom parties will be connected.

J. SPEED TRANSFER

3.31 The speed transfer feature is a switch-enabled option (DIP switch 6) that allows you to transfer outside calls by dialing only the number of the intercom you wish to reach. A station with this feature loses the ability to manually dial outside numbers, but retains the ability to call out using speed dial numbers.

K. RING INTERCOM ALWAYS

3.32 If enabled on your keyset, the Ring Intercom Always feature prevents you from activating another station's speaker and microphone. (You cannot voice announce, and the called party cannot answer handsfree.) The called party must respond by lifting the handset or pressing the ON/OFF key. It is a programmable feature (SERV STA, Station Option 1).

L. RING INTERCOM FIRST

3.33 If enabled on your keyset, the Ring Intercom First feature prevents your speaker and microphone from being activated by incoming intercom calls. (The voice announce feature is disabled for the keyset.) The keyset will continue to double tone. You may respond by lifting the handset or pressing the ON/OFF key. It is a programmable feature (SERV STA, Station Option 4).

4. OUTSIDE CALL FEATURES

- 4.01 The outside call features available on the system are divided into the following categories:
 - A. Placing and Receiving Outside Calls
 - B. Alternate Methods for C.O. Line Selection
 - C. Alternate Methods of Dialing
 - D. Calls on Hold
 - E. Transferring Outside Calls
 - F. Reverse Transfer/Call Pick-up
 - G. Automatic Recall Times
 - H. Outside Call Waiting
 - I. Conference Calls
 - ed J. On-Hook Monitoring and (sub-calcabous and calcabillation
 - K. Direct Inward System Access (DISA)

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A. PLACING AND RECEIVING OUTSIDE CALLS

4.02 The basic procedures for placing outgoing calls and receiving incoming calls are described below. There also are many alternate procedures for selecting a C.O. line, dialing, and responding to different sources of calls (such as calls waiting, calls on hold, transferring calls, and conference calls).

4.03 Placing an outside call:

- Lift the handset and press an available unlit line key. The line key will double flash.
 - (2) Listen for the outside dial tone and dial the desired telephone number.
- 4.04 Receiving an outside call: When a line key is flashing at a slow rate and is accompanied by long, continuous tones, lift the handset and press the flashing line key. The call will be connected and the line key will double flash while the call is in progress.

- 4.05 To add an account code for SMDR reporting: An account code may be added during a call. This code will appear on the SMDR printout.
 - (1) Before hanging up, press the asterisk (*) key.
 - (2) Dial the assigned account code (up to six digits).

NOTE: If this option has been disabled (SERV SYS program, System Option 15), pressing the asterisk (*) and numbers will send tones over the C.O. line.

4.06 To record an incoming call on the SMDR printout: The only way to record an incoming call on the SMDR printout is by entering an account code during the call. Upon answering an incoming call, enter the six-digit account code as described above in paragraph 4.05. The call will be timed starting at that point.

B. ALTERNATE METHODS FOR C.O. LINE SELECTION

- 4.07 The following sections describe alternate methods for selecting C.O. lines. The topics discussed are as follows:
 - Direct Line Key Selection
 - Busy Line Callback (Queuing)
 - Outside Dial Tone Restore
 - Line Key Skipping

Direct Line Key Selection

4.08 This feature allows you to press an unlit line key to access a C.O. line for an outgoing call. A station user may have access to up to 32 C.O. lines, as determined by the system installed and its data base. On the 32X128 system, using the 2480 keyset, line key 24 accesses the outgoing-only rotary group of lines 24 through 32 if System Option 9 (SERV SYS program) has been enabled. This rotary group is not available on the 2456 system; line key 24 accesses one C.O. line.

Busy Line Callback (Queuing)

- 4.09 Busy line callback allows stations to be placed on a call-back list waiting for an available C.O. line. When the C.O. line becomes available, the system recalls the waiting station. This feature is disabled if Executive Call Waiting is enabled on the keyset.
- 4.10 The callback order is organized on a first in, first out basis. No station has the priority to override another station's position in the callback order.

4.11 It is possible for the system to have 25 callbacks requested at a time, including C.O. line and station callbacks. Any C.O. line available to a station may be queued, but only one callback may be requested by each station. If a second callback is requested, the previous request is cancelled.

4.12 To initiate busy line callback:

- Lift the handset and press a busy (lit) line key. You will hear a busy signal.
- (2) Press the QUE key and hang up.

4.13 To answer a callback:

- (1) When the busy line becomes available, the line key will flash at a slow rate and you will hear long, single tones.
 - (2) Lift the handset and press the flashing line key.
- (3) When you hear the outside dial tone, proceed with the call.

4.14 To cancel a callback:

- (1) Lift the handset and dial your own intercom number.
- (2) Press the QUE key.
- (3) Press and release the hookswitch (hookflash) and hang up.
- 4.15 If the waiting station is busy when the line requested is available, that station is placed back in the callback list. The next station waiting will receive a signal for the available line. If the waiting station is idle, the system signals the station for a maximum of 12 seconds. If unanswered after this time, the next person in line is signalled, and the unavailable party is removed from the callback list.

Outside Dial Tone Restore

4.16 This feature allows you to disconnect from one call and reaccess the same line for another call by pressing the line key. This feature may be disabled by System Option 14 (SERV SYS program). 4.17 To use outside dial tone restore: After making an outside call, press the same flashing line key instead of hanging up. The system will disconnect the call and reseize outside dial tone automatically.

Line Key Skipping

- 4.18 Line key skipping allows you to make an outside call without having to hang up and reaccess a C.O. line.
- 4.19 To use line key skipping: After ending an outside call, press an unlit line key. The system will automatically disconnect you from the first line and connect you to the second.

C. ALTERNATE METHODS OF DIALING

- 4.20 Additional methods available for dialing outside phone numbers include:
 - On-Hook Dialing
 - Dialing Specialized Common Carrier (SCC) Numbers Manually
 - Station Speed Dialing
 - Speed Dialing SCC Numbers
 - Last Number Redial

On-Hook Dialing

4.21 To dial on-hook:

- (1) Press the ON/OFF key.
- (2) Press an available line key and listen for the outside dial tone.
- (3) Dial the telephone number.
- When the called party answers, lift the handset to (4) respond. Or, if you have dialed a recorded message, listen without lifting the handset.
- If you reach a busy or unanswered line, disconnect by pressing the ON/OFF kev.
- NOTE: When this feature is used, your keyset's microphone is not activated and you cannot be heard by the outside party (DIP switch 3 disabled).

Manually Dialing Specialized Common Carrier (SCC) Numbers

4.22 To dial SCC numbers:

- (1) Lift the handset and press an available unlit line key.
- (2) Listen for the outside dial tone and dial the SCC local access number.
- (3) Listen for the special dial tone and dial the SCC security code.
- (4) Dial the area code and telephone number.

NOTE: For your convenience, SCC numbers may be speed dialed. Refer to paragraph 4.28 on page 8-27.

Station Speed Dialing

- 4.23 The speed-dial feature allows up to 10 frequently-called numbers to be stored in the keyset. Each number can be up to 10 digits long and is identified with a one-digit memory location code (0 through 9). These numbers can be changed or erased as desired. The leading digit 1 for direct long distance dialing can be inserted automatically before all 10-digit speed dial numbers (DIP switch 7).
- 4.24 The data base battery back-up will not prevent loss of the stored numbers if power to the station is lost. However, the system battery back-up will prevent the numbers from being erased if an AC power outage occurs. Unplugging the keyset also will erase these numbers.

4.25 To store or change frequently called numbers:

- (1) While on-hook, press the MSG/DIAL key.
- (2) Enter the memory location code (0-9) on the keypad.
- (3) Enter the phone number (up to 10 digits).
- (4) Repeat steps 1 through 3 until all numbers are entered. If the same code is used more than once, the last phone number entered with that code will be retained.
- (5) Press the ON/OFF key to complete the procedure and store the numbers.

4.26 To speed dial numbers:

- (1) Lift the handset and press an available unlit line key.
- (2) Listen for the outside dial tone and press the MSG/DIAL key.
- (3) Dial the one-digit memory location code on the keypad. The number will be dialed.

NOTE: If you do not press the C.O. line key before you press the one-digit memory location, the number stored at that location will be erased.

4.27 To erase one stored number:

- (1) Lift the handset and press the MSG/DIAL key.
- (2) Dial the one-digit memory location code to be erased and hang up.

Speed Dialing SCC Numbers

- 4.28 Memory location codes may be chained together for use with Specialized Common Carrier (SCC) services requiring more than 10 digits.
- 4.29 SCC dialing includes the SCC local access number, your account or security code, and the long distance telephone number. These three numbers are linked together in the dialing process. The telephone number can be speed dialed (if in memory) or manually dialed.
- 4.30 In order for the numbers to be linked, System Option 5 (SERV SYS program) must be enabled; this inserts a 12-second pause after the MSG/DIAL key is pressed. Without this option, pressing the key a second time would redial the first number. When this option is enabled, calls of less than 10 seconds in duration will not be recorded on the SMDR printout even if the account code is entered. In addition, 12 seconds must elapse before the last number redial feature can be used.
- 4.31 If the SCC number you are dialing does not accept a leading 1, disable DIP switch 7.

4.32 To store SCC numbers:

- (1) While on-hook, press the MSG/DIAL key.
- (2) Enter the one-digit memory location code on the keypad.
 - (3) Enter the SCC local access number.

- (4) Repeat steps 1 through 3 to store the security code in another memory location.
- (5) Press the ON/OFF key.

4.33 To speed-dial SCC numbers:

- Lift the handset, press an available unlit line key, and listen for the outside dial tone.
- (2) Press the MSG/DIAL key.
 - (3) Dial the one-number memory location code for the SCC local access number; listen for the special dial tone.
 - (4) Press the MSG/DIAL key again.
 - (5) Dial the memory location code for the SCC security code.
 - (6) Press the MSG/DIAL key again, followed by the memory location of the long distance number.
 - OR, Manually dial the telephone number if it is not stored in speed-dial memory.

Last Number Redial

4.34 This feature remembers the last phone number manually dialed on the keyset. The keyset memory for this feature is updated every time a new number is dialed. If a dialed number is busy, there is no answer, or you get disconnected, you can redial it by pressing two keys instead of redialing the entire number. If System Option 5 (12 second redial timing) is enabled, you will have to wait 12 seconds before pressing the MSG/DIAL key to redial the number.

4.35 To redial the phone number while still on the line:

- (1) When you reach an outside number which is busy or does not answer, do not hang up.
- (2) Press the MSG/DIAL key. The system will drop and reaccess the C.O. line, and the number will be redialed immediately.

4.36 To redial the last number dialed after disconnecting:

- (1) Lift the handset and press an available unlit line key.
- (2) Listen for the outside dial tone and press the MSG/DIAL key.
- (3) Press the asterisk (*) key. The number will be dialed.

D. CALLS ON HOLD

4.37 The hold feature allows you to leave an outside call without disconnecting the outside party. The station can then be used to make intercom or outside calls, while the C.O. line on hold remains connected and unavailable to all other stations.

4.38 To place a call on hold:

- (1) While on an outside call, press the HOLD/FWD key.
- (2) You will receive the intercom dial tone and the line key will flash at a medium rate. The caller will hear Music-On-Hold, if equipped.
- 4.39 To return to a call on hold: Lift the handset and press the medium flashing line key. The flash will return to a double rate.
- 4.40 To answer a call on hold from another station (also refer to reverse transfer on page 8-31):
 - Lift the handset and dial the intercom number where the call is holding.
 - (2) When you hear the double tone, press the XFER/CONF key.
 - (3) Press the medium flashing line key.
- 4.41 If you do not return to a call you have placed on hold within the programmed Hold Recall time, the call will ring at your station and the line key will flash fast. If it remains unanswered for the second Hold Recall time, it will return to the attendant. Refer to Section 4G, AUTOMATIC RECALL TIMES.

E. TRANSFERRING OUTSIDE CALLS

- 4.42 The call transfer feature allows you to transfer an outside call to any other station, including the attendant.
- 4.43 If transferred calls are not answered within the programmed Transfer Recall time, the call will return to the station which transferred it. If the call is transferred to hold per paragraph 4.44, it will recall the attendant after two hold recall times. Refer to Section 4G, AUTOMATIC RECALL TIMES.

Call Transfer

4.44 To transfer a call to another station:

- While on an outside call, press the XFER/CONF key. The line key will flash at a medium rate.
- (2) Dial the intercom number.
- (3) If the called station is idle, after the double tone, announce the call. Do one of the following:
- a. If the call is accepted, either hang up to complete the transfer (the call will ring until answered) or press the HOLD/FWD key and hang up to transfer the call to hold (it will not ring while waiting).
 - b. If the called party does not answer or refuses the call, press the medium flashing line key to return to the caller.
 - c. If the called party does not answer, first transfer the call by pressing the HOLD/FWD key and the hookswitch. Then page the party and announce that a call is holding.
- OR, (4) If the called station is busy, do one of the following:
 - Return to the caller by pressing the medium flashing line key.
 - b. Transfer the call by hanging up. The caller will camp on and the busy station will be alerted by the medium flashing line key and a call waiting signal every 15 seconds.
 - c. Transfer the call to hold by pressing the HOLD/FWD key and hanging up. The caller will camp on and the busy station will be alerted by the medium flashing line key only.

4.45 To receive a transferred call:

- When you hear a double tone and possibly a voice announcement, wait for the transferring station user to hang up.
 - (2) Lift the handset and press the slow flashing line key.

Off-Premise Transfer

4.46 This feature allows you to transfer an incoming outside call to an off-premise location which is not part of the system. For more information, refer to Section 4I, CONFERENCE CALLS.

4.47 To use off-premise transfer:

- While on an outside call, ask the party to hold, then press the HOLD/PWD key.
- (2) Select an outside line and dial the external telephone number.
- (3) When that party answers, ask him to hold, then press the HOLD/FWD key.
 - (4) Press the XFER/CONF key and hang up. The two outside parties are connected.

F. REVERSE TRANSFER/CALL PICK-UP

4.48 This feature allows the station user to pick up an outside call which is ringing or on hold at another station. Only outside calls may be reverse transferred. Calls on hold or recalling at the attendant's station cannot be reverse transferred.

4.49 To answer a call on hold or ringing at another station:

- Lift the handset and dial the intercom number of the station where the call is on hold or ringing.
 - (2) When you hear the double tone, press the XFER/CONF key.
- (3) Press the line key that is flashing at a medium rate.

G. AUTOMATIC RECALL TIMES

- 4.50 With the attendant recall feature, it is impossible for calls on hold or transferred to be forgotten. When the call goes unanswered for the programmed period of time, the station which placed the call on hold or transferred it is recalled. The two system programmable (SERV SYS program) recall time limits are Transfer Recall and Hold Recall.
- 4.51 When the system attendant transfers an outside call to an unattended station, the call returns to the attendant after the Transfer Recall time elapses.

- 4.52 Transfer Recall: When any station transfers an outside call to another station, the call must be answered within the Transfer Recall time limit. If there is no response, the call returns to the station that transferred it. The station is alerted by a fast flashing line key and continuous ringing for the Hold Recall time. If there is no response, the call returns to the attendant's station, which is alerted by a fast flashing line key and continuous ringing for up to 10 minutes before the system considers it abandoned and disconnects the line.
- 4.53 Hold Recall: After the Hold Recall time elapses, a call on hold recalls the station where it is waiting, alerting the station with continuous ringing and a fast flashing line key. If the Hold Recall time elapses again, the call returns to the attendant's station, which is alerted by continuous ringing and a fast flashing line key for up to 10 minutes before the system considers it abandoned and disconnects the line.

H. OUTSIDE CALL WAITING

- 4.54 This feature allows an outside call to be camped on to a busy station. An outside call may be transferred and camped on to a station by the attendant or from another station.
- 4.55 The number of outside calls which can be camped on to one station is only limited by the number of C.O. lines connected to the system.
- 4.56 If an outside call is waiting on your station, the line key will flash slowly and you will hear a single tone through the handset every 15 seconds (if programmed for off-hook ringing, DIP switch 5). The party you are speaking to will not hear the tone.
- 4.57 To answer an outside call waiting while on another outside call:
 - End the current call and press the slow flashing line key.
- OR, (1) Place the current call on hold by pressing the HOLD/FWD key. The outside party will hear Music-On-Hold, if equipped. The line key will flash at a medium rate.
 - (2) Press the slow flashing line key to answer the waiting call.
 - (3) To go back to the first call and put the second call on hold, press the HOLD/FWD key and then press the other medium flashing line key.
 - OR, To go back to the first call after ending the second call, press the medium flashing line key.

4.58 To answer an outside call waiting while on an intercom call:

- (1) End the intercom call and press the slow flashing line key.
- OR, (1) Place the intercom call on hold by pressing the HOLD/FWD key. If the other station is off-hook, the call will be camped on and the HOLD/FWD key will flash after three or four seconds. If the other station is on-hook, the call will be disconnected.
 - (2) Press the slow flashing line key.
 - (3) To go back to the camped on intercom call and place the outside line on hold, press the flashing HOLD/FWD key.
 - OR, The camped on intercom call will connect automatically when the outside call is ended and you hang up.

I. CONFERENCE CALLS

- 4.59 This feature permits a station user to establish a three-way conversation without operator assistance. The three parties may include one inside party and two outside parties, or two inside parties and one outside party. The conference call feature requires a Conference (CNF) PCB in the KSU.
- 4.60 A keyset user may initiate one conference at a time. The system can maintain four conference calls simultaneously.

Two Inside Parties and One Outside Party

4.61 This feature allows a keyset user to initiate a conference with another inside party and one outside party. The initiating station has control of the conference, but may pass control to the other inside station.

4.62 To place a conference call:

- While on an outside call, press the XFER/CONF key. The line key will flash at a medium rate.
- (2) Dial the intercom number of the station you wish to add to the conference and instruct them to lift the handset.
 - (3) After the inside party lifts the handset, press the XFER/CONF key. Your XFER/CONF key will light steadily, and the light on the other inside party's keyset will flash at a medium rate. The conference will be initiated and the key for the outside line will flash at a delayed rate.

- (4) You may end the conference by pressing the asterisk (*) key and hanging up.
- OR, If any of the three parties hangs up during the conference, the call becomes a regular two-party call for the remaining parties.

NOTE: The conference cannot be re-entered. To speak to the other parties, the process of establishing a conference must be repeated.

One Inside Party and Two Outside Parties

4.63 This feature allows a three-party conference between one inside station and two outside parties. The station user has control of the conference.

4.64 To place a conference call:

- (1) Place the first outside call.
- (2) When that party is on the line, press the HOLD/FWD key. The line key will flash at a medium rate.
- (3) Place the second outside call.
 - (4) When the second outside party is on the line, press the HOLD/FWD key. The line key will flash at a medium rate.
 - (5) When both outside parties are holding, press the XFER/CONF key. This will initiate the conference. The XFER/CONF key will be lit and the keys of the lines in conference will flash at a delayed rate.
 - (6) If you want to leave the conference, but not disconnect the two outside parties, hang up. The outside lines will still be in conference and you may make other calls. The XFER/CONF key will be lit.
 - (7) You may re-enter the conference by lifting the handset and pressing the XFER/CONF key. You will be connected to the two outside parties once again.
 - (8) To end the conference, press the asterisk (*) key and replace the handset. All parties will be disconnected. The line keys and XFER/CONF key will no longer be lit.

J. ON-HOOK MONITORING

- 4.65 On-hook monitoring allows stations to monitor an outside line without lifting the handset. It is usually used for monitoring time and weather announcements, recorded messages, etc. (refer to paragraph 4.21). It can also be used when you are waiting for an outside party to return to the line.
- 4.66 When this feature is in use, the station's microphone is not activated and you cannot be heard by an outside party (DIP switch 3 disabled).

4.67 To monitor a call when you have been put on hold:

- When the called party has left the phone or put you on hold, press the ON/OFF key and replace the handset.
- (2) You will be able to monitor the line until the called party returns. Lift the handset to respond.

K. DIRECT INWARD SYSTEM ACCESS (DISA)

- 4.68 Direct Inward System Access (DISA) is a programmable feature that allows you to dial into the system from an external telephone and then directly call an intercom number or access a C.O. line to place a call. The telephones used to call DISA must be DTMF (pushbutton) instruments. DISA requires that the Modem and Conference PCB's be installed.
- 4.69 When you call into the DISA system and dial an intercom number, you will be placed on hold while the system is signalling the call. If you select an outside line through the DISA feature, the system will establish a direct connection to that line. When not in use for DISA purposes, the DISA line may be used internally for outgoing calls.

4.70 To place a DISA intercom call:

- (1) Dial the DISA line access telephone number and wait for the DISA dial tone to stop.
 - (2) Dial the number of the station you want (intercom numbers 10-89 and #10-#57).
- (3) The DISA line will appear as an incoming call to the called station. You will hear Music-on-Hold, if it is equipped.

NOTE: There may be as many DISA intercom calls in process as there are DISA lines.

4.71 To access a DISA C.O. line:

- Dial the DISA line access telephone number and wait for the DISA dial tone to stop.
- (2) Press the pound (#) key twice. A server of dealer to said . 3
- (3) Dial a two-digit C.O. line number (01-24).
- (4) Listen for the outside dial tone, and place your call.
- (5) If the requested line is busy, wait for the busy tones to stop and the DISA tone will be heard again. Repeat the process.

NOTE: There may be two line-to-line DISA calls in process at one time if the attendant and message center have different extension numbers. If the attendant and message center have the same extension number, there may be only one line-to-line DISA call.

SPECIAL STATION FEATURES

- 5.01 This section includes the following special features:
 - A. Manual Call Forwarding
 B. Preset Call Forwarding

 - C. Do-Not-Disturb
 - D. Message Waiting and Message Center
 - E. Background Music to Stations
 - F. Paging Features
 - G. C.O. Line Monitoring

A. MANUAL CALL FORWARDING

- 5.02 This feature enables you to temporarily forward all intercom and outside calls to another station.
- 5.03 Several stations may have calls forwarded to the same station.
- 5.04 If there are any busy line or station callback requests in process, these requests will remain queued at that station. 5.05 To forward calls:

- (1) Lift the handset and press the HOLD/FWD key.
- Dial the intercom number where you want the calls to be forwarded, and hang up. The HOLD/FWD key will flash at a medium rate.

5.06 To cancel call forwarding:

- (1) Lift the handset and press the HOLD/FWD key.
- (2) Hang up. The light in the HOLD/FWD key will go out. the life and handert and proced the solutions of the

B. PRESET CALL FORWARDING

5.07 Preset call forwarding has two programmable options that automatically forward calls to a preset station. Once programmed, the preset station will be permanent unless manual call forwarding is used. Refer to Section 5A, MANUAL CALL FORWARDING.

Preset Forward - Busy

5.08 This option will automatically forward intercom calls or outside calls to the preset station when your station is busy. This feature is programmed by enabling Station Option 7 and programming the preset number (SERV STA program).

Preset Forward - No Answer

5.09 After 15 seconds, unanswered incoming calls (including direct ring-in lines) will be forwarded to the preset station. Transferred outside calls will also be forwarded after the transfer recall time has expired. This feature is programmed by enabling Station Option 8 and entering the preset number (SERV STA program).

C. DO-NOT-DISTURB

5.10 This switch-enabled feature allows you to block all calls and pages to your station, except for C.O. lines set to ring in directly at your station. Outgoing calls may be placed while your station is in Do-Not-Disturb mode. If your station has a preset forward station (Station Option 8, SERV STA program), that station will receive your incoming calls. Refer to Section 5B, PRESET CALL FORWARDING.

5.11 To place a station in Do-Not-Disturb mode:

- (1) Lift the handset and press the HOLD/FWD key.
- (2) Press the asterisk (*) key, and hang up. The HOLD/FWD key will flash at a medium rate.

5.12 To cancel Do-Not-Disturb mode:

- Lift the handset and press the HOLD/FWD key.
- (2) Hang up. The light under the HOLD/FWD key will go out.
- 5.13 If any other station user tries to access this station while it is in the Do-Not-Disturb mode, they will hear four busy tones and a pause repeatedly (---- ----).
- 5.14 Placing the attendant's station in Do-Not-Disturb mode will put the system into Night Ring mode. Refer to ATTENDANT FEA-TURES, Section 7.

D. MESSAGE WAITING AND MESSAGE CENTER

- 5.15 When a station is busy or goes answered, the caller may leave a message at the message center. The MSG/DIAL key will flash at a fast rate to inform the user that a message is waiting at the message center. Messages may be left for stations in the Do-Not-Disturb mode, and there is no restriction on the number of messages that can be left for any one station.
- 5.16 The message center intercom number is initially set at 10, but may be programmed to another station during system programming (SERV SYS).

5.17 To leave a message:

- (1) Dial the intercom number of the desired station.
- (2) If the station is busy or there is no answer, press the MSG/DIAL key.
- (3) You will hear a double tone as the message center is automatically dialed.
 - (4) When the message center answers, leave your message.
- (5) The light under the MSG/DIAL key at the called party's station will flash at a fast rate.

5.18 To pick up messages:

- If the MSG/DIAL key is flashing at a fast rate on your keyset, lift the handset. (The light under the MSG/DIAL key will go off.)
- (2) Dial the message center.

E. BACKGROUND MUSIC TO STATIONS

5.19 A user may listen to the system's Music-On-Hold (if equipped on the system) through the keyset's internal speaker. Signal tones, announcements, and pages will momentarily interrupt the background music. All calls will be received as usual.

5.20 To enable background music: 1818 1818 1818 1818 1818

- (1) While on-hook, press the pound (#) key. sucy was N (1)
- (2) Press the digit 6 key.

5.21 To cancel background music:

- (1) While on-hook, press the pound (#) key.
- (2) Press the digit 6 key.

F. PAGING FEATURES

- 5.22. The paging features of the system allow pages to stations in six internal zones. Stations may be assigned to one or more zones (SERV STA). Pages are heard through the internal speaker of each keyset.
- 5.23 Since all stations are initially programmed to be included in Zone 1, it is suggested that this zone be reserved for All-Call paging.
- 5.24 An optional feature provides paging to three external zones. External zone and area paging allows station users to page to large areas such as warehouses and loading docks. This requires customer-provided paging equipment and the MOD II PCB. All external areas may use the same audio amplifier, with the output of the audio amplifier switched to three different zones.
- 5.25 There is also an option which allows two-way conversations over five talkback speakers by dialing an access code (#60-#64). This requires standard speakers and the MOD II PCB.

5.26 To page an internal zone:

- (1) Lift the handset and press the ZONE PAGE key.
 - (2) Dial the zone code (1,2,3,4,5,6) and listen for the double tone.
 - (3) Make your announcement within 12 seconds.

5.27 To page an external zone:

- (1) Lift the handset and press the ZONE PAGE key.
 - (2) Dial the zone code (7,8,9, or 0) and listen for the double tone. Dialing 0 accesses all three external zones and the five talkback speakers.
 - (3) Make your announcement. and seeing second-so allow (1)

5.28 To use the talkback speaker page:

- Lift the handset and dial the access code (#60-#64) for the speaker you want to page.
- (2) Listen for the double tone; you may have a two-way conversation for as long as you like.

G. C.O. LINE MONITORING

5.29 C.O. line monitoring is a programmable feature that allows a station, undetected, to monitor any unrestricted line. It is enabled by Station Option 2 (SERV SYS program).

5.30 To monitor a specific C.O. line:

- (1) While on-hook, press the pound (#) key.
- (2) Press the digit 7 key; the XFER/CONF key will flash at a fast rate.
 - (3) Press the line key you wish to monitor.
 - (4) Lift the handset; you will be able to monitor the line undetected.
 - (5) Hang up to terminate the monitor.

5.31 To monitor a station on a C.O. line:

- (1) While on-hook, press the pound (#) key.
- (2) Press the digit 7 key. The arm to be suffered and 10.5
- (3) Dial the intercom number of the busy station to be monitored.
- (4) Lift the handset; you will be able to monitor the station undetected.
- (5) Hang up to terminate the monitor.

SINGLE-LINE ELECTRONIC (SLE) SET FEATURES

INTRODUCTION

- 1.01 This section describes the Single-Line Electronic (SLE) set which can be used with the system. It is an Inter-Tel product designed to be used in areas where all the features offered in a keyset are not required.
- 1.02 The number of SLE sets per system varies, depending on whether the system is a 2456 or a 32X128. A maximum of 24 of SLE sets can be installed on the 2456. The 32X128 system can support 48 SLE sets.
- 1.03 The SLE has a 12-key pushbutton keypad and one red special function (SPCL) key. The number of outside lines which can be accessed by the SLE is dependent on the system chosen and the programming of that system.
- 1.04 The topics covered in this section include:
 - SLE Set General Features
 - Intercom Features
 - Outside Call Features | Description of grant (2)
 - Paging Features

2. SLE SET GENERAL FEATURES OF SALES ASSESSED ASSESSEDAD ASSESSED ASSESSEDA

- 2.01 The features of the SLE sets include the following:
- A. Key Functions
 - B. Audible Tone Indications
 - C. Volume Control

A. KEY FUNCTIONS

2.02 The keypad is used to dial both intercom and outside numbers. The asterisk (*) and pound (#) keys are also used for special functions.

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- 2.03 The red SPCL key has a number of functions. It can be used:
 - To place an outside call on hold.
 - · To transfer outside calls to another station.
 - To initiate a conference call.

B. AUDIBLE TONE INDICATIONS

2.04 The audible signals heard on an SLE set are summarized below.

Audible Signal

Occurrence

Intercom Dial Tone

When the handset is lifted.

When the SPCL key is pressed while on an

outside call.

Outside Dial Tone

When a line is available, the handset is lifted and the digit 9 key is pressed.

Ring Tones

- 2.05 The ring tones are described below.
 - a. Long continuous tones (_____)

 Incoming outside call
 Recalling outside call
 Line now available from busy line callback
 - b. Repeating double tones (-- -- --)

Intercom call Busy station callback

c. Repeating combination of 4 tones and pause (----)

Station you are calling is in Do-Not-Disturb mode

d. One tone every 15 seconds (-)

Station has outside call waiting Outside call on hold

- e. One double tone every 15 seconds while off-hook (--)
 Station has intercom call waiting
- f. Busy signal for only 3 or 4 seconds (----)
 Your station is camped on to a busy station

Page 8-43

g. Continuous busy signal (-----)

C.O. line is busy
All intercom channels are busy
Another station is camped on to the busy station you are
calling
You dialed an invalid intercom number

C. VOLUME CONTROL

2.06 A switch on the side of the set allows you to select loud or soft ringing. This is the only adjustment that can be made to the volume.

INTERCOM FEATURES

- 3.01 The intercom features on an SLE are as follows:
 - A. Flexible Intercom Numbering
 - B. Station-to-Station Calling
 - C. Intercom Camp-On, Call Waiting, and Call Splitting
 - D. Busy Station Callback (Queuing)
 - E. Ring Intercom Always
 - F. Ring Intercom First

A. FLEXIBLE INTERCOM NUMBERING

3.02 All SLE stations are accessed by three-digit intercom numbers (#10-#57) or by a single key on the optional Direct Station Selector/Busy Lamp Field (DSS). Intercom numbers are assigned during initialization, but can be changed using the SERV NUM program.

B. STATION-TO-STATION CALLING

- NOTE: If you do not get intercom dial tone when going off-hook, wait a few seconds; you will get dial tone as soon as a DTMF decoder is available to process your call. For more information, refer to Modem PCB's in the SYSTEM SPECIFICATIONS section.
- 3.03 To place an intercom call on an SLE: Lift the handset, listen for intercom dial tone, and dial the intercom number (keysets 10-89, single-lines #10-#57).
- 3.04 To receive an intercom call on an SLE: When your intercom rings with continuous double tones, lift the handset to respond.

C. INTERCOM CAMP-ON, CALL WAITING, AND CALL SPLITTING

3.05 This feature allows you to camp on to a busy station and wait until it is available. You will be camped on as long as you remain off-hook; you will hear Music-On-Hold, if the system is equipped for it, or Tic-Tone, if System Option 8 is enabled (SERV SYS program). The busy station is alerted with the call waiting signal. Also, you can split between two calls using the SPCL key.

3.06 To initiate intercom camp-on:

- Lift the handset, listen for intercom dial tone, and dial the intercom number.
- (2) Do not hang up when you hear the busy signal. After 10 seconds, a double tone will be heard at the called station to signal a call waiting.
 - (3) You will be connected automatically when the called party ends the other call.

3.07 To split from an intercom call to an outside call waiting:

- While on an intercom call, if you are notified of an outside call waiting by the single tone, press and release the hookswitch (hookflash).
 - (2) The intercom call will be terminated and you will be connected automatically to the call waiting.

3.08 To split from an outside call to an intercom call waiting:

- While on an outside call, if you are notified of an intercom call waiting by the double tone, press the SPCL key.
 - (2) The outside call will be placed on hold and you will be connected automatically to the call waiting.
 - (3) To return to the outside call, press and release the hookswitch (hookflash).
- 3.09 To answer an intercom call waiting while on another intercom call: Complete the first intercom call and hookflash to connect with the waiting caller.

C. INTERCON CAMP-ONL CALL NOIT

D. BUSY STATION CALLBACK (QUEUING)

3.10 The busy station callback feature notifies you when a busy SLE or keyset becomes available.

3.11 To initiate busy station callback:

- Lift the handset, listen for intercom dial tone, and dial the intercom number.
- (2) When you hear the busy tone, press the pound (#) key and hang up.
- (3) Your station set will ring with continuous double tones when the station you called becomes available. If you do not answer the callback within 15 seconds, it will be cancelled.
- (4) Lift the handset and the station will be called automatically.

E. RING INTERCOM ALWAYS

3.12 If enabled on your SLE, Ring Intercom Always (Station Option 1, SERV STA program) forces outgoing intercom calls to ring at the called station rather than allowing voice announcing.

F. RING INTERCOM FIRST the sale of ylles assesses be been seen

3.13 Because SLE's do not have internal microphones and speakers, voice announcements cannot be heard. Ring Intercom First (Station Option 4, SERV STA program) is a standard feature on SLE sets and cannot be changed. It forces incoming calls to ring at the called SLE station.

4. OUTSIDE CALL FEATURES

- 4.01 The outside call features available on the SLE set include:
 - A. Placing and Receiving Outside Calls
 - B. Calls on Hold
 - C. Outside Call Waiting/Call Splitting
 - D. Call Transfer and Reverse Transfer cololew and disk goennoo
 - E. Conference Calls
 - F. Busy Line Callback (Queuing)

PLACING AND RECEIVING OUTSIDE CALLS

- 4.02 An SLE can place and receive outside calls. It can also answer calls while the system is in Night Ring mode.
- NOTES: (1) On the 2456 system, SLE's can only access outside lines if System Option 9 is enabled and line 24 is equipped. The 32X128 system must have an outgoingonly rotary group of lines.
 - (2) If you do not get intercom dial tone when going offhook, wait a few seconds; you will get dial tone as soon as a DTMF decoder is available to process your call. For more information, refer to Modem PCB's in the SYSTEMS SPECIFICATIONS section.

4.03 To place an outside call:

- (1) Lift the handset, listen for intercom dial tone, and dial 9.
 - (2) Wait for the outside dial tone and dial the telephone
- 4.04 To receive an outside call: When you hear long, continuous tones, lift the handset. The call will be connected automatically.
- NOTE: If the call was transferred to you from another station and you do not answer it within the Transfer Recall time, it will return to the transferring party. Refer to KEYSET FEATURES, Section 4G, AUTOMATIC RECALL TIMES.

4.05 To receive an outside call while the system is in Night Ring mode:

- (1) When you hear outside ring tones on designated keysets or external ring speakers, lift the handset and listen for intercom dial tone.
 - (2) Press the pound (#) key. Sign as Sarag serial and
- (3) Press the digit 8 key.
- (4) The lowest numbered C.O. line that is ringing will be connected to your station.

[4] You can witerhate between cries by pressing the SPCL

B. CALLS ON HOLD

4.06 The SLE can be used to place outside calls on hold.

4.07 To place an outside call on hold:

- (1) While on an outside call, press the SPCL key and hang up.
- (2) You will hear a single tone every 15 seconds. The outside caller will hear Music-On-Hold, if equipped.
- (3) To return to the call, lift the handset.

NOTE: If the call is on hold for the Hold Recall time, it will ring at your station for the recall time. If it was transferred to you from another station and you do not answer it within the Transfer Recall time, it will return to the transferring party. Refer to KEYSET FEATURES, Section 4G, AUTOMATIC RECALL TIMES.

C. OUTSIDE CALL WAITING/CALL SPLITTING

4.08 When you are using your SLE, single tones every 15 seconds will notify you that there is an outside call waiting. You must end the first call or put it on hold to answer the call waiting. The call splitting feature allows you to alternate between two outside calls without losing either of them. Refer to Section 3C, INTERCOM CALL SPLITTING, for information on call splitting while on an intercom call.

4.09 To answer an outside call waiting and split between the two outside calls:

- (1) While on an outside call, if you are notified of a call waiting by a single tone, hang up or hookflash. The call waiting will be connected automatically.
- OR, (1) While on an outside call, press the SPCL key to place the first party on hold.
 - (2) Press and release the hookswitch (hookflash). You will be connected automatically to the other call.
 - (3) To return to the first call, press the SPCL key and hookflash.
 - (4) You can alternate between calls by pressing the SPCL key, then hookflashing.
 - (5) Terminate either call by hookflashing or hanging up while you are connected to that call. You will be connected automatically to the remaining call.

D. CALL TRANSFER AND REVERSE TRANSFER

4.10 Outside calls may be transferred to other stations and retrieved from other stations by SLE sets. These features are known as call transfer and reverse transfer. Calls may be screened before transferring.

Call Transfer

4.11 To transfer outside calls:

- (1) While on an outside call, press the SPCL key.
- (2) Dial the station number to receive the call.
- (3) If the destination is a keyset with the voice announcing feature enabled, you may announce the call. If the destination is a single-line set or a keyset without the voice announcing feature, the receiving party must lift the handset before you can announce the call.
- (4) When you hang up the call will be transferred. Calls may be camped on even if the called station is busy.
- OR, If the inside party is unavailable or refuses the call, press the SPCL key, then press and release the hookswitch (hookflash) to reconnect to the outside party.

Reverse Transfer

4.12 This feature allows the station user to pick up an outside call which is ringing or on hold at another station. Only outside calls may be reverse transferred. This excludes direct ring-in lines. Calls on hold or recalling at the attendant's station cannot be reverse transferred.

4.13 To reverse transfer:

- Lift the handset, listen for intercom dial tone, and dial the station where the call is holding or ringing.
- (2) Press the SPCL key.
- (3) The lowest-numbered line on hold will be transferred. If no lines are on hold, the lowest numbered transferred line will be picked up.

E. CONFERENCE CALLS

4.14 To initiate a conference between one outside and two inside parties:

- (1) While you are on an outside call, ask the party to hold.
- (2) Press the SPCL key.
- (3) When you hear the intercom dial tone, dial the station of the inside party to be included.
- (4) Instruct the inside party to lift the handset.
- (5) Press the SPCL key again to initiate the conference.
- (6) If one of the two inside parties hangs up, the outside call is transferred to the remaining station as an ordinary outside call.
- (7) To end the conference, hang up.

F. BUSY LINE CALLBACK (QUEUING)

4.15 Busy line callback allows stations to be placed on a call-back list, waiting for an available C.O. line. When the C.O. line becomes available, the system recalls the waiting station. The callbacks will be returned in the order in which they were received.

4.16 To queue a busy outside line:

- Lift the handset, listen for intercom dial tone, and dial 9.
 - (2) When you hear a busy tone, press the pound (#) key and hang up.
 - (3) You will hear long single tones when an outside line becomes available. (If you do not answer the callback within 12 seconds, the system will cancel the queue.)
 - (4) Lift the handset and listen for the outside dial tone.
- (5) Dial the number.

PAGING PEATURES

5.01 The system allows pages to stations in six internal zones (paging zones 1 through 6) and up to three external zones (paging zones 7-9,0). Zone 0 (external all-page) pages across all external zones and the talkback speakers. SLE's cannot access talkback speakers individually (extensions #60-#64).

5.02 To page using an SLE:

- Lift the handset, listen for intercom dial tone, and press the asterisk (*) key.
- (2) Dial zone code (0-9) of the area you want to page.

	To Access Zone		
*1 - *6	Internal page zones.		
*7 - *9	External page zones.		
*0	All external areas, including all talkback speakers.		

(3) Make your announcement in a normal tone of voice within 12 seconds. You will not hear any tone to indicate that the page has been connected.

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2500 SET FEATURES

INTRODUCTION

1.01 Industry standard single-line 2500 sets modified with a DC ringer may be directly connected to the system. They may be used to control costs when full-feature keysets are not required. The number of outside lines that can be accessed by the 2500 sets is dependent on the system chosen and the programming of that system. Unmodified sets may be used as off-premise stations (OPS's) with some mechanical adaptations. Refer to the INSTALLATION section of this manual for details.

1.02 The following areas are discussed:

- 2500 Set General Features
- Intercom Features
 - Outside Call Features
 - Paging Features

2. 2500 SET GENERAL FEATURES PROJUCTION AND AND ADDRESS OF THE PROPERTY OF THE

A. KEY FUNCTIONS

2.01 The 2500 set has a standard pushbutton keypad. The digits 0 through 9, asterisk (*), and pound (#) keys are used to dial intercom and outside numbers. The special functions of the asterisk (*) and pound (#) keys are listed as they apply in the following sections.

B. AUDIBLE SIGNAL INDICATIONS

2.02 The audible signals heard on a 2500 set are described below.

Audible Signal

Occurrence

Intercom Dial Tone When the handset is lifted on an idle

Outside Dial Tone When a line is available, with the handset lifted and the digit 9 key pressed.

2.03 The ring signals are:

Repeating double rings (-- -- --) about the campact of the off

Intercom call ringing Busy station recalling

b. Long single rings (____)

Outside call ringing Busy line recalling

c. Continuous busy signal (----)

C.O. line is busy All intercom channels are busy Another station is camped on to the busy station you are You dialed an invalid or unequipped intercom number

3. INTERCOM FEATURES

- 3.01 The standard 2500 set can place and receive intercom calls and interact with keysets, SLE sets, and other 2500 sets. The intercom features are:
 - A. Flexible Intercom Numbering
 B. Station-to-Station Calling
 - C. Busy Station Callback (Queuing)
 - D. Ring Intercom First

A. FLEXIBLE INTERCOM NUMBERING

3.02 All 2500 stations are accessed by three-digit intercom numbers (#10-#57) or by a single key on the optional Direct Station Selector/Busy Lamp Field (DSS). Intercom numbers are assigned during initialization, but can be changed using the SERV NUM program.

STATION-TO-STATION CALLING В.

If you do not get intercom dial tone when going off-hook, NOTE: wait a few seconds; you will get dial tone as soon as a DTMF decoder is available to process your call. For more information, refer to Modem PCB's in the SYSTEM SPECIFI-CATIONS section.

3.03 To place an intercom call:

- Lift the handset, listen for intercom dial tone, and dial the station (keysets 10-89, single-lines #10-#57).
- (2) If the called party has a keyset, he can respond handsfree. A party with an SLE or a 2500 set must lift the handset to respond.
- 3.04 To receive an intercom call: When you hear continuous double rings, lift the handset to respond.

C. BUSY STATION CALLBACK (QUEUING)

3.05 The busy station callback feature is used to notify you when a busy station becomes available.

3.06 To use busy station callback:

- Lift the handset, listen for intercom dial tone, and dial the intercom number.
- (2) If you hear a busy signal, press the pound (#) key and hang up.
 - (3) When the station you called becomes available, you will hear double rings on your phone. (If you do not answer the callback within 12 seconds, the system cancels the request.)
 - (4) Lift the handset and the system will automatically, connect you to the requested station.

D. RING INTERCOM FIRST

3.07 Because 2500 sets do not have internal microphones and speakers, the Ring Intercom First feature is always enabled (Station Option 4, SERV STA program). This forces the station to ring for intercom calls.

4. OUTSIDE CALL FEATURES

- 4.01 The standard 2500 set can be used for placing and receiving outside calls. The features associated with C.O. lines are:
 - A. Placing and Receiving Outside Calls
 - B. Busy Line Callback (Queuing)

- NOTES: (1) On the 2456 system, 2500 sets can only access outside lines if System Option 9 is enabled and line 24 is equipped. The 32X128 system must have an outgoing-only rotary group of lines.
 - (2) If you do not get intercom dial tone when going offhook, wait a few seconds; you will get dial tone as soon as a DTMF decoder is available to process your call. For more information, refer to Modem PCB's in the SYSTEMS SPECIFICATIONS section.

A. PLACING AND RECEIVING OUTSIDE CALLS

4.02 To place an outside call:

- Lift the handset, listen for the intercom dial tone, and dial 9.
- (2) Listen for the outside dial tone and dial the number.
- 4.03 To receive an outside call: When you hear continuous single tones, lift the handset.
- NOTE: If the call has been transferred to you from another station and you do not answer within the programmed Transfer Recall time, the call will return to the party that transferred it. Refer to KEYSET FEATURES, Section 4G, AUTO-MATIC RECALL TIMES.
- 4.04 The 2500 set can be used to answer calls during Night Ring mode, though it cannot be programmed to ring during Night Ring mode operation.

4.05 To answer an outside call during Night Ring mode:

- When you hear a call ringing in over external ringing devices or through selected instruments, lift your handset, listen for intercom dial tone, and press the pound (#) key.
- (2) Press the digit 8 key.
- (3) The lowest numbered C.O. line ringing in will be connected to your station.

B. BUSY LINE CALLBACK (QUEUING)

4.06 The 2500 set can be used to request a callback when a busy line becomes available. All requests are answered in the order in which they were received.

4.07 To queue a busy outside line:

- (1) Lift the handset, listen for the intercom dial tone, and dial 9.
 - When you hear a busy tone, press the pound (#) key and hang up.
- When an outside line becomes available you will hear long single rings. (If the callback is not answered with 12 seconds, the system will cancel the gueue.)
 - (4) Lift the handset, listen for the outside dial tone, and dial the number.

PAGING PRATURES 5. PAGING PEATURES

5.01 The 2500 set can be used to page. It will access all the available paging zones (0-9), except individual talkback speakers (extensions #60-#64).

5.02 To page with the 2500 set:

- (1) Lift the handset and listen for intercom dial tone.
 - (2) Press the asterisk (*) key and the zone code for the area you want to page. Codes are listed below.

Press Code	To Access Zone
*1 - *6	Internal paging zones.
*7 - *9	External paging zones.
*0	All external areas.

(3) Make your announcement within 12 seconds.

ATTENDANT FEATURES

INTRODUCTION

- 1.01 This section lists the attendant features of the system. They include the functions of the Direct Station Selector/Busy Lamp Field (DSS), an optional device. A DSS attached to a keyset allows access to intercom numbers with one keystroke, and indicates the condition of every station. The features of the DSS are as follows:

 - Visual Indications
 Intercom Features
 - Call Transfer and Reverse Transfer
 - Message Waiting Indication
 - Night Ring Mode

KEY FUNCTIONS

2.01 The DSS II has four special function keys and 60 station keys. Tandem DSS's are required for a system equipped with more than 60 stations or with more than 10 single-line stations. The station keys may be assigned to keysets or single-line sets as shown below.

Key Numbers	Keyset Intercom Numbers	Single-Line Intercom Numbers
l through 60	10 through 69	120 129
l through 60	10 through 59	#10 through #19
l through 60	70 through 89	#10 through #49

DSS key numbers may not be assigned to single-line intercom numbers #50 through #57.

diff the markers and presenting ESS proceed diety.

2.02 The special key functions of the DSS are shown below.

Name of Key

Function

PARK

Places transferred calls on hold (parking).

XFER/RLS

Releases (or terminates) a transferred call

without hanging up.

C.W. IND

Generates an immediate call waiting signal to a called station, permitting call screening

before transferring.

MSG

Lights the called station's message waiting

NOTE: For your convenience, there are three methods of "hanging up." You may hang up the handset, press the XFER/RLS key, or press the hookswitch.

3. VISUAL INDICATIONS

3.01 The DSS keys indicate the status of each station. The visual indications are as shown below. They are given in interruptions per minute (IPM).

Rate of Flash	Indication	

Steady The station is in use.

Slow 30 IPM The station is in the Do-Not-Disturb

mode.

Fast

120 IPM

There is an outside call recalling the attendant from that station. The line key will also flash at a fast rate.

4. INTERCOM FEATURES

4.01 All stations, with the exception of the last eight singleline sets on the 32X128 system, can be accessed by pressing the corresponding key on the DSS.

4.02 To place an intercom call:

- (1) Lift the handset and press the DSS intercom key.
- (2) After the double tone, announce the call.

4.03 To place a private intercom call:

- (1) Lift the handset and press the desired DSS intercom key.
- (2) Listen for the double tone and press the pound (#) key on the keyset.
- (3) The called party will hear continuous double tones and can pick up the handset or press the ON/OFF key to answer.

5. CALL TRANSFER AND REVERSE TRANSFER

A. CALL TRANSFER

- 5.01 Calls may be transferred, camped on, or placed on hold (parked) at a station. They may also be screened to see if the receiving party is busy or wants to refuse the call.
- 5.02 If a call is transferred to an idle station, it will ring until answered. If it goes unanswered for the programmed Transfer Recall time, it will return to the attendant.
- 5.03 If a call is transferred to a busy station, the caller will camp on and hear Music-On-Hold, if equipped. The busy station will be alerted by a flashing line key and a call waiting signal through the handset every 15 seconds.
- 5.04 If a call is transferred to hold at an idle station, only the line key will flash; there will be no audible signal. If it goes unanswered for the Hold Recall time, the call will ring at the station for the Hold Recall time. If still unanswered, the call will return to the attendant.
- 5.05 If a call is transfered to hold at a busy station, the line key will flash, but the busy party will not receive an audible call waiting signal.

5.06 To transfer a call to an idle station:

- (1) If the station's DSS key is not lit:
 - Press the DSS key.
 - b. After the double tone, call out the party's name.

- (2) If the called party answers, announce the call.
- a. If the call is accepted, hang up or press the XFER/RLS key to transfer that call and respond to the next call ringing in.
- OR, b. If the call is refused, press the medium flashing line key to return to the caller.
- OR, (3) If there is no answer:
 - a. Press the medium flashing line key to reconnect with the caller.
 - b. Announce that there was no answer and ask if the caller wants to leave a message or hold while you try paging the called party.
 - c. If the caller wants to hold, press the called party's DSS key and press the PARK key to transfer the call.
 - d. Page the called party and announce that a call is holding for him.

5.07 To transfer a call to a busy station (the DSS key is lit):

- Ask if the caller wants to hold. If so, press the DSS key and you will hear a busy signal.
- (2) If you need to first screen the call, press the C.W. IND key to immediately send a call waiting signal to the busy station. Wait for the party to respond.
 - a. If the call is refused, press the medium flashing line key to return to the caller.
- OR, b. If the call is accepted, press the PARK key to transfer it to hold.
- 5.08 If a call returns to the attendant: If a transferred call goes unanswered for the programmed recall time, it will return to the attendant. This is indicated by a line key and a DSS key both flashing fast. Press the line key to connect to the caller.

Alter that double born, wall out thy previous

B. REVERSE TRANSFER

5.09 To reverse transfer:

- Lift the handset and dial the number of the intercom where the call is waiting or ringing in. (Dial on the keyset, do not use the DSS intercom key.)
- (2) When you hear the double tone, press the XFER/CONF key on the keyset.
- (3) Press the medium flashing line key on the keyset and you will be connected to the outside call.

MESSAGE WAITING INDICATION

6.01 To activate the message waiting indication:

- Lift the handset and press the DSS intercom key where you want to leave a message waiting indication.
- (2) Press the MSG key and hang up. The MSG/DIAL key will fast flash at the called party's keyset to indicate a message waiting.

NIGHT RING MODE

7.01 To place the system in Night Ring Mode:

- Lift the handset of the attendant's keyset and press the HOLD/FWD key.
- (2) Press the asterisk (*) key, and hang up. The HOLD/FWD key will flash at the medium rate.
- 7.02 To cancel Night Ring Mode: Lift the handset, press the HOLD/FWD key, and hang up. The light under the HOLD/FWD key will go out.

B. REVERSE TRANSFER

5.09 To reverse transfers

- (1) cift the handest and that the number of the intercomscheme the call is extring or right of the covert do not use the 185 intercombe.
- (2) When you near to rible tone, place the XER/COYD key on the Nevset.
- (3) Press the medius that regime key on the keyset and you will be connected to the outside radia.

WOLTANDERN BARTING INDICATION

6.01 To activate the message veiting indication:

- Lift the handsot and grass the LOS intercom key where you want to leave a message was try indication.
- (2) Press the MSG key and sang up. The MSG/DIAL key will fast thash at the valled party's keylet to indicate a mossage waiting.

7. MIGHT RING MODE

7.01 To place the system is Hight Bing Today

- (1) til the manual out the attendant sixty set and pressithe HOLD/FWD Ray.
- (2) Press the amierisk (1 key) and sangup. The HCLD/FWD key will firsh at the addish cate.
- 7.02 To cancel Might Air, modes lift the randest press the HOLD/FWD key will and hand og: The Louis under the HOLD/FWD key will

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CHANGES TO ISSUE 2 OF THE 2456/32X128 INSTALLATION & FIELD MAINTENANCE MANUAL Part No. 681,8002-0

This addendum updates the current issue of the Installation & Field Maintenance manual. Include this information with your manual for future reference.

2456 CARDFILE STRAPPING

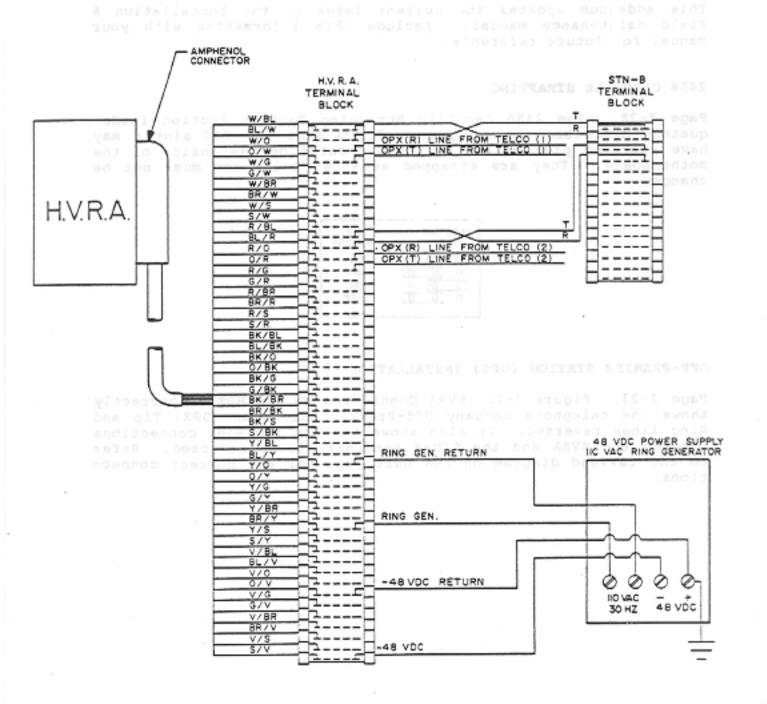
Page 3-28. The 2456 Cardfile Strapping Options section inadequately describes the strapping of COU slot 6. COU slot 6 may have shorting pins or DIP switches located on the inside of the motherboard. They are strapped as shown below and must not be changed.

SHORTING	SWITCH
0 0 0	ON
0 0 0	OFF
0 0 0	ON
0 0	OFF

OFF-PREMISE STATION (OPS) INSTALLATION

Page 3-23. Figure 3-11 (HVRA Connection to the MDF) incorrectly shows the telephone company Off-Premise Extension (OPX) Tip and Ring lines reversed. It also shows the Tip and Ring connections between the HVRA and the STN-B terminal blocks reversed. Refer to the revised diagram on the next page for the correct connections.

FIGURE 3-11. HVRA CONNECTION TO THE MDF



CHANGES TO ISSUE 2 OF THE 2456/32X128 INSTALLATION & FIELD MAINTENANCE MANUAL Part No. 681.8002-0

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NEW SYSTEM SOPTWARE

New software has been developed for the 2456/32X128 System. The first six changes involve software coding only and require no programming by the installer. The seventh is a new system option that can be enabled or disabled as desired. The new software features are described below.

- The software now allows a toll restricted station to dial an asterisk (*) as the first digit. It then checks the remaining digits for toll restriction.
- 2. If the attendant answers a call and transfers it to a station and then accesses a call on one of the lines under line key 24, the first call will be allowed to recall as soon as the recall timer expires. (In the previous software, the call did not recall until the line under line key 24 was released by disconnecting or transferring.)
- 3. Previously, when the attendant had an intercom call waiting (camped on), the DSS/BLF special feature keys did not function. This has been corrected so that camped on calls do not affect the function of the DSS/BLF feature keys.
- The timer that checks for C.O. loop interrupt was changed to prevent DISA calls from being denied connection or dropped prematurely.
- 5. To prevent the receiving station user from hearing static when the attendant transfers a call using the DSS/BLF, the call is disconnected from the attendant's station and connected to the receiving station more quickly.
- 6. When a keyset station has the "ring intercom first" feature enabled, the system will not connect the call during the ring tones. This prevents the user from hearing a burst of static when answering a call.
- 7. Because the basic toll restriction feature will disconnect a call if the first or second digit dialed is a "0" or "1", toll-restricted users in areas with overlapping area and office codes are unable to make local calls when the number contains a "0" or "1" for the second digit. System Option 20 was added that can be enabled to allow these calls.

If System Option 20 is enabled and the station is toll restricted, a four-second inter-digit timer is activated each time a digit is dialed. Calls are allowed or denied as described below. (If option 20 is not enabled, the toll restriction options operate as described in the 2456/32X128
Installation and Field Maintenance Manual.)

- If "0" is the first digit dialed, the call will be dropped immediately.
- If "1" is the first digit dialed and the three digits following the "1" do not match an entry on the Allowed Area Codes list, the call will be dropped 4 seconds after the fourth digit is dialed.
- If "0" or "1" is the second digit dialed but not the first digit dialed:
 - -- The call is dropped 4 seconds after the last digit is dialed if the number dialed is nine digits or more and the first three digits do not match an entry on the Allowed Area Codes list.
 - -- The call is dropped 4 seconds after the fourth digit is dialed if the number is eight digits or less and the first three digits match an entry on the Forbidden Office Codes list.

NOTE: Because option 20 may prevent users from dialing SCC and similar services, the seven-digit access numbers should be stored as Allowed Long Distance Numbers. Each entry must have 10 digits, so add XXX at the end of each number (2345678XXX).

NEW POWER SUPPLY

When the existing stock of 680.08A power supplies has been exhausted, 690.0100 power supplies will be shipped with all 32X128 systems. Installation instructions for the power supply are included with each unit. Current versions of the 690.0100 power supply are not equipped for battery back-up; if battery back-up is desired, Inter-Tel recommends the use of a Tripp-lite SB1000-LVC Standby Supply and Globe #GC12800 batteries (12 volts, 80.0 AH @ 20 hr. rate). One battery provides 3/4 to 1-3/4 hours of back-up time; four batteries connected in parallel provide 4 to 8 hours of back-up time.

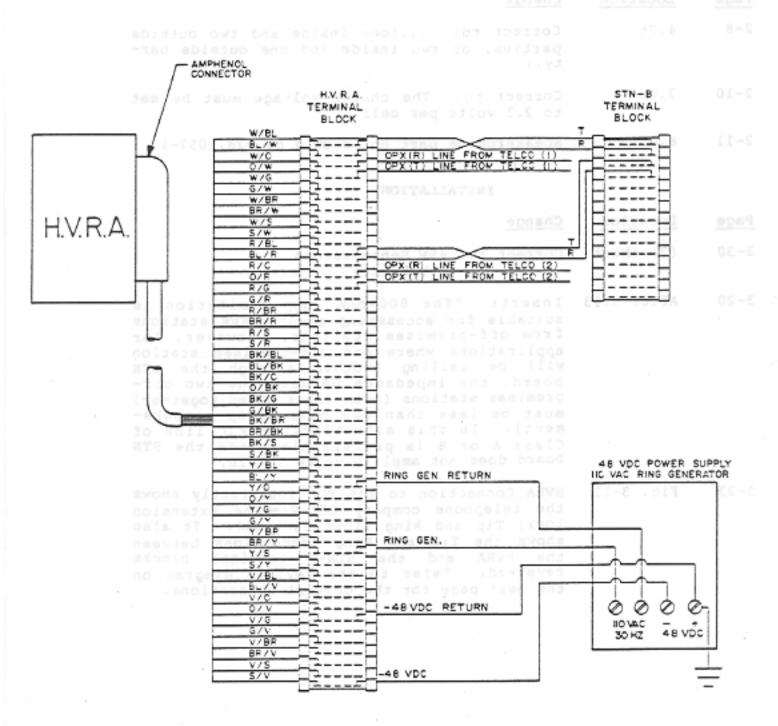
7. Because the basic toll restriction resture will disconnect a call if the first or second digit disled in a "0" or "1",

CHANGES TO THE MANUAL

SYSTEM SPECIFICATIONS

Page	Location	Change	
2-8	4.26	Correct to:(one inside and two outside parties, or two inside and one outside party.)	
2-10	7.05	Correct to: The charge voltage must be set to 2.3 volts per cell.	
2-11	8.01	Speakerphone part no. should be 828.1057-1.	
		INSTALLATION	
Page	Location	Change	
3-30	(7) chart	Correct to: +5V Sense Return +5V Return	
3-20	After 5.13	er 5.13 Insert: "The 800-ohm loop limitation is suitable for accessing on-premises stations from off-premises stations. However, for applications where one off-premises station will be calling another through the STN board, the impedance between the two off-premises stations (both lines added together) must be less than 800 ohms (loop measurement). In this situation, an FIC line of Class A or B is preferrable since the STN board does not amplify voice levels."	
3-23	Fig. 3-11	HVRA Connection to the MDF incorrectly shows the telephone company Off-Premise Extension (OPX) Tip and Ring lines reversed. It also shows the Tip and Ring connections between the HVRA and the STN-B terminal blocks reversed. Refer to the revised diagram on the next page for the correct connections.	

FIGURE 3-11. HVRA CONNECTION TO THE MDF



3-28		The 2456 Cardfile Strapping Options section inadequately describes the strapping of COU slot 6. COU slot 6 may have shorting pins or DIP switches located on the inside of the motherboard. They are strapped as shown below and must not be changed. SHORTING DIP PIN SWITCH DODOO OFF ODOOO OFF ODOOO OFF	
3-30	Fig. 3-15	The figure does not indicate whether the power supply is mounted on a wall or sitting on a shelf. As shown, it is sitting on a shelf. If it were mounted on the wall, the +5VDC and -12VDC markings would be at the top of the diagram.	
3-31	(8)	Correct to: Route the battery cable through the cutout	
3-38	6.09	Voltage surge/spike protector specifications: Check the manufacturer's specifications for the following:	
		a. Clamp voltage transients at 300V within 5 nanoseconds when exposed to waveforms as described in ANSI/IEEE Standard C62.41- 1980 (IEEE 587).	
		b. Reduce RFI/EMI noise by at least 20dB at frequencies between 5KHz and 30MHZ.	
3-70	(7)	Add to the beginning: Insert the battery cables through the holes in the battery compartment.	
3-71	(12)-(13)	Add a step (12A): Replace the cover on the battery compartment.	

The 2456 Cardille Strapping Options section
inadequately describes the strapping of COU slot 6 may have charting pins or DIP switches located on the inside of the motherboard. They are strapped as shown below and must not be changed.