

INTER-TEL MPK® SYSTEM
**INSTALLATION AND
MAINTENANCE PRACTICES**

340.1001

DESCRIPTION

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1.00 INTRODUCTION

1.01 General

The INTER-TEL Microprocessor Key (MPK) systems are designed to meet the needs of the small to medium key system installations where growth potential and system versatility are essential. INTER-TEL has designed two MPK systems, MPK/I and MPK/II, identical in function and features, but different in capacity to meet diverse business communications requirements. The INTER-TEL MPK/I centrally switches and controls a maximum of 4 incoming or outgoing Central Office (C.O.) lines and up to 16 keysets. The INTER-TEL MPK/II system switches and controls a maximum of 10 incoming or outgoing C.O. lines and up to 32 keysets. The features in both systems are essentially identical. Other MPK configurations of lines to stations as well as full battery back-up are also available. The MPK battery back-up systems are model MPK/IA and MPK/IIA.

While both of the INTER-TEL MPK systems are small in physical size, this has not limited the features available in the systems. By placing a microprocessor in every station set (i.e. "distributed microprocessing"), it is possible to free the central microprocessor (located within the common equipment cabinet) from such tasks as reading keyboards and controlling lamp status of all stations within the system. Once freed, the central processor can be heavily utilized to provide increased features and options.

The INTER-TEL Key Telephone Set (KTS) appears to be a typical key telephone set with typical line keys, standard telephone keypad and indicator lamps. In reality it is a computer station controlled by the central computer of an interface/switcher called a "Key Service Unit" or simply "KSU." Only the MPK KSU can control these stations; the MPK KSU cannot control standard telephones. Keysets (as well as the Direct Station Selector/Busy Lamp Field Unit, DSS/BLF) are, however, interchangeable on MPK/I and MPK/II.

The MPK system will connect any station to any loop start outside Central Office (C.O.) line, any other station or all stations (intercom all-page) when the station user presses the appropriate keys on the station or DSS/BLF. Incoming calls from the outside C.O. lines are sensed by the MPK system KSU. The KSU then begins ringing stations programmed to ring in on the particular line and finally seizes the line when the station user presses the appropriate line key. All calls in progress can be transferred by the station user to other stations or placed on hold when the station user presses the appropriate keys on the station or DSS/BLF. The KSU monitors all transferred calls and calls on hold for a programmable time period. Calls not answered within the specified time period automatically ring back to the station which placed them on hold or to the operator station.

In the MPK system, station 10 is the operator station and message center. An MPK Direct Station Selector/Busy Lamp Field (DSS/BLF) may be attached to any station, providing system-wide station access and status. Typically, one is attached to the operator/message center station; however, attachment to any or all stations is also possible. The MPK system will display C.O. line status and feature status on the station LED lamps, as well as station status on the DSS/BLF LED lamps. The MPK data base may be programmed on-site to allow line restriction, hard copy printout of call details and numerous other features for business control of internal station activity.

All power requirements can be centralized in the KSU. Only the DSS/BLF may require AC power at the station location.

The MPK system is modular in design; the system can start small and grow as demand requires. Also due to the modular design, failure in one unit may affect only that part of the system and not the entire system. Servicing of a failed station or of Printed Circuit Boards (PCB's) within the KSU can be accomplished without turning off the entire system. Only in the case of a CPU (Central Processing Unit) PCB or power supply failure must the system be turned off.

1.02 Technology

- A. Distributed Microprocessor Control Technology. The MPK system employs individual station processors reporting to a central processor in a

distributed microprocessor control technology. The audio signals are processed in a digital format by digitizing using Continuously Variable Slope Delta Modulation (CVSD). Once digitized, each conversation is assigned 1 of 16 time slot channels in a time division multiplexed time frame under the control of the central processor. The 16 time slot channels in the time frame are allocated as follows:

- 10 time slot channels for C.O. conversations
- 5 time slot channels for intercom calls
- 1 time slot channel for the music-on-hold audio source

B. Key Telephone Set Design. Key telephone sets (KTS's) have been developed from a common design and vary essentially in the amount of feature controls and C.O. lines each may access. Each keyset contains a microprocessor to process individual station data such as key activation and lamp updates. Station data is then transmitted to the central processor in the KSU via three-pair cable every time a station is polled by the KSU. Stations are configured in a star or home run configuration around the KSU central processor. Each keyset also contains an internal speaker to allow full-duplex, handsfree intercom capability and paging.

C. Call Switching and Control Functions. The system's fundamental call switching and control functions are performed in the KSU utilizing various interface PCB's to execute these functions. The KSU cardfile contains an integral bus highway on a Printed Circuit Board (PCB) equipped with plug-in connectors. A key system may be tailored into a particular configuration by inserting the appropriate number of interface and special function PCB's. PCB's currently available are: a Central Processor Unit (CPU) PCB, Station (STN) PCB, COU (Central Office Unit) PCB, and Conference (CNF) PCB.

D. Power Supply Design. Two different types of system power supplies are used for the MPK. A battery back-up version provides a switching type power supply for switched +5VDC, series pass regulated -12VDC, unregulated +30VDC, and a regulated constant voltage current limiting battery charger. A stand-alone linear power supply provides series pass regulated +5VDC and -12VDC, and unregulated +30VDC. The system power supply provides power to the KSU cardfile and all station sets. A limited

number (see Sec. 1.05, Hardware Description) of optional DSS/BLF units which are typically powered from individual wall plug-in transformers may also be powered from the system power supply.

E. RS-232C Compatibility. An RS-232C interface on the CPU PCB allows an external RS-232C-compatible communications device to access diagnostic, maintenance and call detail recording routines in the MPK software.

1.03 Installation

The MPK system requires sufficient physical space to accommodate each station and the KSU. All system components may be readily handled by the person installing the system, without disruption of business at the installation site. System installation is facilitated by the use of standard telephone industry three-pair cabling. All MPK systems require a dedicated AC power circuit. INTER-TEL offers installation training courses on a scheduled basis.

On-site programming is performed by trained personnel via a station set. Station programming is done through each individual station port and system programming through the operator station only. Additional station options may also be set via DIP switches in each station. The data base is stored in KSU RAM memory and is battery-protected. With the battery fully charged, the data will be retained for approximately 25 days during power outages or during transportation of the CPU PCB.

1.04 Servicing

Service time is minimized due to modular system design. All lamps are Light Emitting Diodes (LED) and as such require minimal servicing. Every attempt has been made to utilize standard telephone industry components in the MPK system, resulting in a system composed of components readily available from telephone and electronic supply houses.

Software maintenance has been simplified by the inclusion of maintenance and test routines as an integral part of the system's software. These routines may be accessed on-premise by an online external communications device via the RS-232C interface.

CAUTION: *The maintenance and test routines mentioned above are for trained personnel use only. Indiscriminate use of these routines may result in interruption of service.*

1.05 Hardware Description

The MPK systems consist of the following hardware: the Key Service Unit (KSU) and associated PCB's, the system power supply, the multi-line keysets, the optional Direct Station Selector/Busy Lamp Field (DSS/BLF), the optional Station Message Detail Recorder (SMDR), the optional batteries and the connectors.

A. Key Service Unit (KSU) and Associated PCB's. The KSU consists of the 8-slot MPK/I cardfile and the 8-slot backplane, or the 16-slot MPK/II cardfile and the 16-slot backplane. The KSU serves to interconnect the Central Processing Unit (CPU) PCB, the Station (STN) PCB's, the Central Office Unit (COU) PCB and the Conference (CNF) PCB. The MPK/I and MPK/II KSU's are wall-mountable; the MPK/IA and MPK/IIA KSU's are mountable in a floor cabinet.

1. Central Processing Unit (CPU) PCB (See Figure 1-1)

- One per system.
- Plugs into the MPK/I or MPK/II KSU cardfile slot marked "CPU" with components facing left.
- Provides the central processor up to 24K bytes of ROM storage, 2K bytes of RAM storage, an RS-232C I/O port, system clocks, and a music-on-hold channel. The PCB is shipped with a melody IC for music-on-hold. An optional external source music-on-hold module is available. (See Figure 1-2.)
- Provides central software control for the KSU by functioning under the control of a generic program stored in its ROM memory section.
- LED lamps on the front edge of the PCB indicate power-up status (top), clock status (second and third from top), system watchdog timer status (bottom).
- The DIP switches on the front edge of the PCB are used to provide program access, resetting, initialization, and testing of the system.
- The 25-pin subminiature "D" connector on the front edge of the PCB provides an RS-232C interface to the system, which is used to allow testing and maintenance of the MPK system and to provide an SMDR output.
- The BATT-OPEN jumper on the PCB is used to protect the battery during initial shipment (shipped out of circuit —OPEN

position). The jumper must be in the BATT position and the battery fully charged if the PCB is to be removed and the data base left intact. A fully charged battery will retain the data base for 25 days.

2. Station (STN) PCB's (See Figure 1-3)

- MPK/I: 1 to 4 STN PCB's per system.
- MPK/II: 1 to 8 STN PCB's per system.
- Each STN PCB provides the interface between the KSU and 1 to 4 stations. The interface provides data interface between the stations and the CPU PCB located in the KSU, a four-wire voice path into the audio exchange of the KSU, and a two-wire power path between the stations and system power supply. The data and voice path are multiplexed on the same wires. One DSS/BLF may be powered via the STN PCB.
- Plugs into the MPK/I KSU cardfile slot marked "STN 1-4" with components facing left.
- Plugs into the MPK/II KSU cardfile slot marked "STN 1-8" with components facing left.
- LED lamps on the front edge of the PCB indicate power-up status (top), and status of each station (bottom four).
- Each of the four circuits on a PCB is assigned a circuit number by the physical location of the PCB in the KSU and the circuit location on the PCB. The PCB plugged into slot 1 contains stations 10 to 13 top to bottom respectively, as indicated by the PCB LED lamps. Slot 2 contains stations 14 to 17 top to bottom respectively, etc. Stations may not be reassigned in the data base.
- Six-wire modular jacks, located on the front of the PCB to interface with the Key Telephone Sets (KTS's).
- Fuses: The STN PCB is fused from the KTS's to protect the KSU from foreign voltages/currents. The fuses are standard, easily replaceable and available from electronic supply outlets.

3. Central Office Unit (COU) PCB (See Figure 1-4)

- MPK/I: from 1 to 2 COU PCB's per system.
- MPK/II: from 1 to 5 COU PCB's per system.
- Each COU PCB provides interface between the KSU and 1 or 2 loop start Central Office (C.O.) lines.

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- Provides computer interface to loop start C.O. lines to detect ring-in and loop holding current, to provide loop seizures, and to send network control signaling in either DTMF or dial pulse.
- DTMF or dial pulse can be selected by inserting or removing integrated circuits on plug-in sockets. However, INTER-TEL sells the COU PCB as either a DTMF or dial pulse PCB.
- Plugs into the MPK/I KSU cardfile slot marked "COU 1-2" with components facing left.
- Plugs into the MPK/II KSU cardfile slot marked "COU 1-5" with components facing left.
- LED lamps on the front edge of the PCB indicate power-up status (top), and usage of the COU lines (bottom two).
- Each of the two circuits on a PCB is assigned a line number by the PCB location in the KSU and the circuit location on the PCB. The PCB inserted into COU slot 1, contains lines 1 to 2, top to bottom respectively, as indicated by the PCB LED lamps. Slot 2 contains lines 3 to 4, top to bottom respectively, etc. Line numbers may not be reassigned in the data base.
- Six-wire modular jack (only the middle four pins are used) on the front of the PCB to access the COU lines. This allows easy disconnection of problem local C.O. network lines from the MPK system or of a problem MPK line from the local C.O. network as required by FCC regulations.

4. Optional Conference (CNF) PCB (See Figure 1-5)

- MPK/I and MPK/II: one per system.
- Provides the necessary circuitry for the conference feature. One inside and two outside parties, or two inside and one outside parties can be conferenced. The option is activated when the PCB is plugged in.
- A maximum of two conferences can be in progress simultaneously.
- Plugs into the MPK/I or MPK/II KSU cardfile slot marked "CNF" with components facing left.
- LED lamps on the front edge of the PCB indicate power-up status (top), and usage status (bottom six, two sets of three).

- B. System Power Supply. The power supplies for MPK/I and MPK/II are separate units from the main cabinet and are not capable of supporting system battery back-up. The MPK/IA and MPK/IIA battery back-up systems have the system power supply mounted in a floor cabinet which also contains the MPK/I or MPK/II KSU.

MPK/I and MPK/II

- Wall mountings are an integral part of the design of the units.
- MPK/I supplies outputs of +5VDC at 6.0 amp, +30VDC at 1.8 amp and -12VDC at 0.3 amp to the KSU, stations, and a limited amount of DSS/BLF's.
- MPK/II supplies outputs of +5VDC at 11.0 amp, +30VDC at 4.0 amp and -12VDC at 0.3 amp to the KSU, stations, and a limited amount of DSS/BLF's.
- Plugs into standard dedicated 115VAC, 15 amp service.
- Fuses: All distributed power is protected with fuses accessible from the front of the power supply. All fuses are standard, easily replaceable and available from most electronic supply outlets.

MPK/IA and MPK/IIA

- MPK/IA and MPK/IIA power supplies are mounted in the main cabinet.
- MPK/IA and MPK/IIA output +5VDC at 20 amp maximum, -12VDC at 0.5 amp maximum, nominal +30VDC at 8 amp maximum.
- Supplies power to the KSU, all stations, and a limited number of DSS/BLF units.
- Provides constant voltage current limiting (at 1.5 amp), enabling the charging circuitry to maintain standby batteries fully charged.
- Switches in the system battery back-up without any loss of service to the system.
- Shipped with keyed DC power cable to interconnect to the cardfile.

CAUTION: *The system power supply should not be shipped or moved any great distance when mounted in the cabinet.*

- Fuses: All distributed power is protected with fuses accessible from the front of the power supply. All fuses are standard, easily replaceable and available from most electronic supply outlets.

C. Multi-Line Keysets. For MPK/I the maximum number of keysets is 16; for MPK/II the maximum number of keysets is 32. Any of the various keysets can be used on either system in any combination. All are interfaced by the STN PCB. The keysets are as follows:

1. Model 1032T Keypad (See Figures 1-6 and 1-7)

- Ten C.O. line keys each with an LED to show the status of a line.
- A special key (SPCL) used as an all-page key.
- Four special feature keys each with an LED to show status of feature.
- A standard telephone keypad.
- A handset for private conversations with standard telephone coiled dual four-pin modular handset cord.
- An internal speaker for handsfree conversations.
- A voice volume control dial for handsfree speaker volume control.
- A reversible baseplate for desk or wall mount.
- By removing the faceplate and keyboard, access is gained to a set of programmable DIP switches for setting or omitting some of the optional station features. Access to the ring tone volume control is gained, as well as access to the station +5VDC power voltage setting. The +5VDC setting may require removal of the top housing, making it difficult for a user to change this setting which is preset at the factory before shipment.
- All the necessary cables to connect to a standard six-pin modular telephone jack.
- A set of labels to mark the line and special feature keys and the station numbers. Enough blanks have been provided to allow these to be custom-made by the user if so desired.

2. Model 416T Keypad (See Figures 1-7 and 1-8)

- Four C.O. line keys each with an LED to show status of the line. Note: If the 416T is used on an MPK/II system, out-of-range lines cannot be accessed on this station. Its main use is on MPK/I.
- Four special feature keys each with an LED to show status of a feature.

- A standard telephone keypad.
- A handset for private conversations with standard telephone coiled dual four-pin modular handset cord.
- An internal speaker for handsfree conversations.
- A voice volume control dial for handsfree speaker volume control.
- A reversible baseplate for desk or wall mount.
- By removing the faceplate and keyboard, access is gained to a set of programmable DIP switches used to set or omit some of the optional station features. Access to the ring tone volume control is gained, as well as access to the station +5VDC power voltage setting. The +5VDC setting may require removal of the top housing, making it difficult for a user to change this setting which is preset at the factory before shipment.
- All the necessary cables to connect to a standard six-pin modular telephone jack.
- A set of labels to mark the line and special feature keys and the station numbers. Enough blanks have been provided to allow these to be custom-made by the user if so desired.

D. Direct Station Selector/Busy Lamp Field (DSS/BLF) Unit (Optional). If the DSS/BLF's are powered from the plug-in wall transformer, every station in the system can have a DSS/BLF. This would be a maximum of 16 DSS/BLF's for MPK/I and 32 DSS/BLF's for MPK/II. If powered from the system, a recommended maximum of one DSS/BLF per station (STN) PCB and two per system is recommended. This is, of course, dependent on the number of stations and equipment being run by the system power supply and the current carrying capability of the STN PCB and KSU backplane.

1. Model 3532D DSS/BLF (See Figures 1-9 and 1-10)

- One per station.
- 32 station keys to allow single button access to stations 10 to 41, where 10 is the upper left corner key and 41 is the second key from the left on the bottom row.
- 32 station lamps to display the status of the associated station key (i.e. busy, in do-not-disturb or available).

- Three special feature keys (NOT USED AT PRESENT).
These are the last right-most three keys on the bottom row.
- By removing the faceplate and the keyboard, access is gained to the +5VDC power voltage setting. This voltage is set at the factory prior to shipment.
- AC plug-in wall transformer and cable to power DSS/BLF. Not required if modified to be powered from the system.
- A reversible baseplate for desk or wall mount.
- All the necessary cables to connect to a standard six-pin modular telephone jack.
- A set of labels to mark the special feature key and the station numbers. Enough blanks have been provided to allow these to be custom-made by the user if so desired.

2. Model 3030D DSS/BLF (See Figures 1-11 and 1-12)

- One per key station.
- 30 station keys to allow single button access to stations 10 to 39, where 10 is the upper left and 39 is the lower right.
- 30 station lamps to display the status of the associated station key (i.e. busy, in do-not-disturb or available).
- By removing the faceplate and keyboard, access is gained to the +5VDC power voltage setting. The voltage is set at the factory at time of shipment.
- AC plug-in wall transformer and cable to power DSS/BLF. Not required if modified to be powered from the system.
- A reversible baseplate for desk or wall mount.
- All the necessary cables to connect to a standard six-pin modular telephone jack.
- A set of labels to mark the special feature key and the station numbers. Enough blanks have been provided to allow these to be custom-made by the user if so desired.

E. Station Message Detail Recording (SMDR) Unit. The SMDR unit can be any 300 baud rate RS-232C interface compatible recording device. This could be a printer or tape recorder or even a disk drive. INTER-TEL sells a 300 baud rate printer for this unit and a data cassette recorder is also available. Processing of the data re-

corded on the cassette is not performed by INTER-TEL at the present time. However, many software houses can accommodate the formatting of the data to the customer's specific requirements at a nominal cost.

- One SMDR unit per system.
- The INTER-TEL SMDR printer uses standard 3-7/8 inch adding machine roll paper available through INTER-TEL or office supply outlets. The printer utilizes standard 115VAC, 15 amp power service. Actual power dissipation may vary depending on the unit presently being marketed. All necessary connection cables are shipped with the INTER-TEL SMDR printer.
- Data is sent to the SMDR unit in a standard ASCII right-justified columnar format.

F. Batteries. The battery on the CPU PCB for data base protection is the NI-CAD rechargeable type and is not replaceable but will give years of service. When powered from the MPK/IA or MPK/IIA power supplies, batteries for the system back-up will give continuous, uninterrupted power to the entire system during periods of brownout or total loss of AC power. Power is not normally provided for the DSS/BLF's and their associated keysets. Refer to Para. D.

- +24VDC batteries (typically two +12VDC with the same amp/hour rating are required for the system backup of the MPK/IA and MPK/IIA system.
- Batteries are not sold by INTER-TEL; standard off-the-shelf batteries are available from most electrical supply outlets.

CAUTION: Batteries should be placed in a well-ventilated room and not mounted in the KSU main cabinet due to outgassing and the corrosive nature of the batteries.

- The MPK system power supply will trickle charge both the CPU and full system batteries to keep them at full power. Initially, fully charging the system may take 24 to 48 hours.

H. Connectors

- All telephone wall receptacles are standard six-pin modular jacks.
- STN and COU PCB connections are by six-pin modular plug.

- Connection to the RS-232C interface on the CPU PCB requires a 25-pin subminiature "D" male plug. Connection of an audio source to a music-on-hold module requires an 1/8" sub-miniature phono plug.
- All necessary plugs and connectors are telephone industry standard and are available from telephone/electronic parts supply distributors.
- Interface to operating company C.O. lines utilizes standard quick-connect blocks as the demarcation strip. Recommended blocks are available from:

SIEMON COMPANY
91 DEPOT STREET
WATERTOWN, CONNECTICUT 06795
AREA CODE 203/274-2523, TELEX 96-2480
BULLETIN NO. 5.

These blocks are specifically made for INTER-TEL products.

1.06 Specifications

A. Capacities, Maximum (MPK/I and MPK/IA)

- 16 stations
- 4 C.O. lines
- 5 intercom channels
- 4 C.O. channels
- 1 music-on-hold channel
- 2 conference calls
- 1 RS-232C interface
- 16 DSS/BLF units
- 25-day onboard battery protection of the system data base
- System power failure battery back-up protection — MPK/IA only

B. Capacities, Maximum (MPK/II and MPK/IIA)

- 32 stations
- 10 C.O. lines
- 5 intercom channels
- 10 C.O. channels
- 1 music-on-hold channel
- 2 conference calls
- 1 RS-232C interface
- 32 DSS/BLF units
- 25-day onboard battery protection of system data base
- System power failure battery back-up protection — MPK/IIA only

C. Physical Dimensions (Approximate)

1. KSU

MPK/I

Height — 10 in.
Width — 10.5 in.
Depth — 10 in.

MPK/II

Height — 10 in.
Width — 20 in.
Depth — 10 in.

MPK/IA

Height — 25.5 in.
Width — 27 in.
Depth — 18 in.
AC power cord — 6 ft.

MPK/IIA

Height — 25.5 in.
Width — 27 in.
Depth — 18 in.
AC power cord — 6 ft.

2. Keyset Stations (Models 416T or 1032T)

Height — 4.5 in.
Width — 8 in.
Depth — 9 in.
Handset cord — 6 ft. coiled
Line Cord — 6 ft. straight

3. SMDR Printer

Height — 6.5 in.
Width — 10.5 in.
Depth — 13 in.
AC power cord — 6 ft.
Interface cable — 3 ft.

4. DSS/BLF 3532D

Height — 3.5 in.
Width — 8 in.
Depth — 10 in.
AC power cord — 6 ft.
DSS/BLF to station cable — 2 ft. straight

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5. DSS/BLF 3030D
 Height — 3.5 in.
 Width — 10 in.
 Depth — 9 in.
 AC power cord — 6 ft.
 DSS/BLF to station cable — 2 ft. straight

6. Power Supply
 MPK/I
 Height — 6 in.
 Width — 10.25 in.
 Depth — 5.75 in.
 AC power cord — 6 ft.
 DC power cable — 2 ft.

- MPK/II
 Height — 5 in.
 Width — 10 in.
 Depth — 7.25 in.
 AC power cord — 11 ft.
 DC power cable — 2 ft.

MPK/IA power supply housed in KSU cabinet

MPK/IIA power supply housed in KSU cabinet

D. Technology

- Continuously Variable Slope Delta Modulation (CVSD)
- TDM clock frequency: 3.579 MHz
- Time slot channels: 16 (280 nsec each)
- Microprocessor: Motorola MC 6801
- Operating frequency: 1 MHz

E. Electrical Characteristics

1. Loop Limits (using 24 AWG wire)

MPK/I — MPK/II (340.06 and 340.07 power supplies)

1032T 45 ohm or 877 ft.

1032T with one 3532 DSS/BLF
 15 ohm or 283 ft.

1032T with one 3030D DSS/BLF
 13 ohm or 257 ft.

416T 48 ohm or 939 ft.

MPK/IA — MPK/IIA (680.06 power supply)

1032T 45 ohm or 877 ft.

1032T with one 3532D DSS/BLF
 15 ohm or 283 ft.

1032T with one 3030D DSS/BLF
 13 ohm or 257 ft.

416T 48 ohm or 939 ft.

NOTE: When 24 AWG wire is not used or longer station loops are required, +14VDC potential must be maintained across the station and DSS/BLF power input. Excessive and/or high resistance connections will lower the loop limits. Using larger gauge wire (lower AWG number) or multiple 24 AWG wire will reduce the loop resistance and therefore extend the loop limits. DSS/BLF units powered by individual wall plug-in transformers do not significantly affect prescribed loop limits.

2. System Power Requirement
 (All current is for maximum system)

MPK/I
 105 to 130VAC, 50/60 Hz, 1.35 amp operating current, 2.0 amp maximum start-up current.

MPK/II
 105 to 130VAC, 50/60 Hz, 2.2 amp operating current, 4.0 amp maximum start-up current.

MPK/IA
 105 to 130VAC, 50/60 Hz, 1.30 amp operating current, 8.0 amp maximum start-up current.

MPK/IIA
 105 to 130VAC, 50/60 Hz, 2.15 amp operating current, 8.0 amp maximum start-up current.

DSS/BLF

Class 2 wall plug-in transformer, 16 watt
120VAC primary, 16VAC 0.70 amp second-
ary.

3. Central Office Line Protection

Tip to Ring: 800V transient

To ground: 1500VAC RMS

4. Central Office Characteristics

MPK FCC Registration: BE287V-68377—KF-E

Ringng Voltage: 45VAC minimum

Ringer Equivalence: 0.9A REN

Central Office PCB has no effect on longi-
tudinal balance.

0 dB loss from telephone network to C.O. line.

5. Environmental Requirements

Ambient Operating Temperature:

Recommended ambient temperature not to
exceed 29° C / 90° F for an extended period
of time.

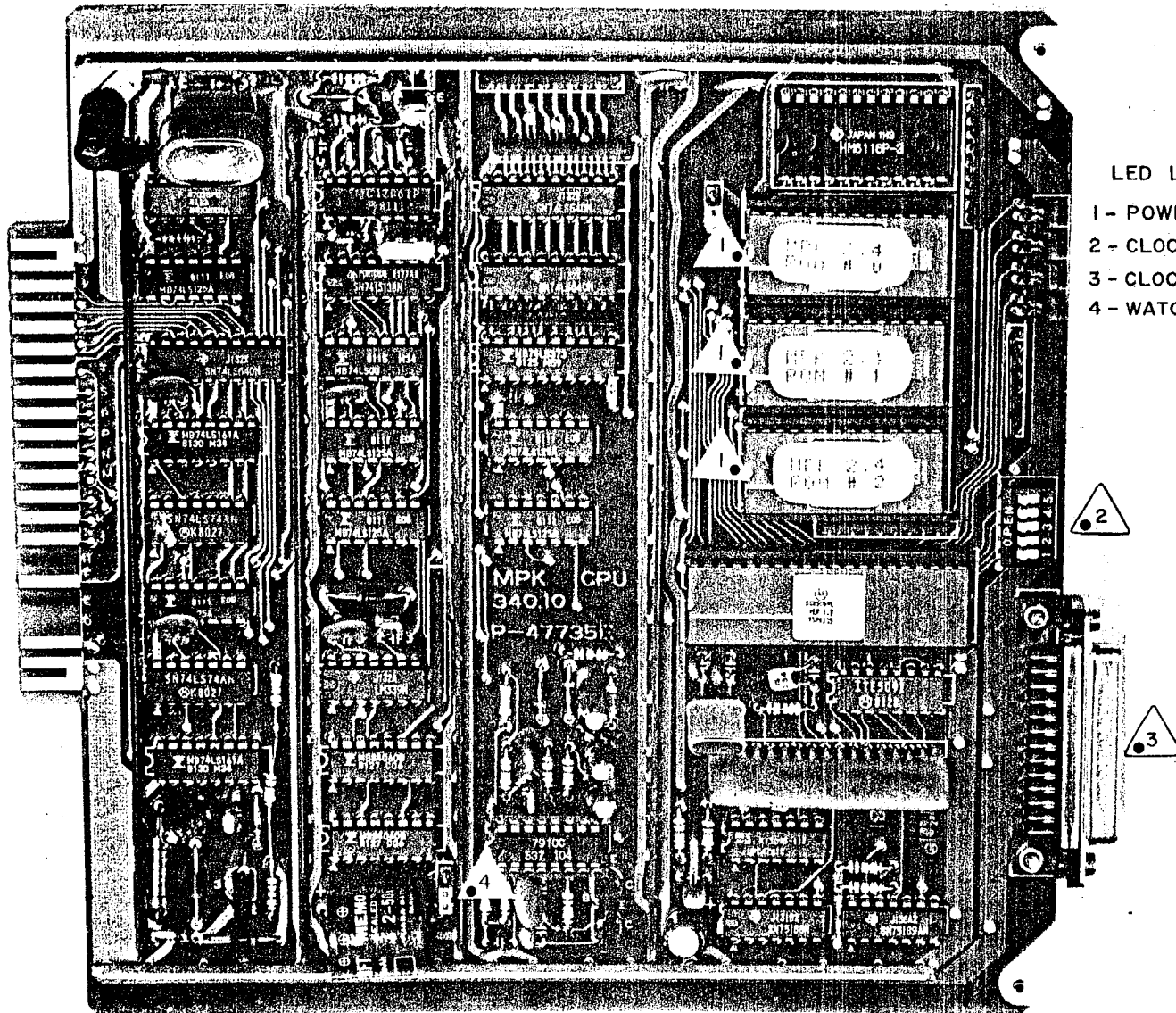
Storage Temperature:

-55° to 50° C

67° to 122° F

Humidity:

No condensation; 95% maximum relative



LED LAMPS
1 - POWER-UP
2 - CLOCK STATUS
3 - CLOCK STATUS
4 - WATCHDOG
TIMER

- 1 GENERIC ROM MEMORY
- 2 DIP SWITCHES
1 PROGRAM
2 REST
3 INIT
4 TEST
5 UNUSED
- 3 RS-232 AMPHENOL CONNECTOR
- 4 BATTERY JUMPER

ADVANCE REPLACEMENT
CALL LOG
1702C10

Figure 1-1. MPK CPU PCB

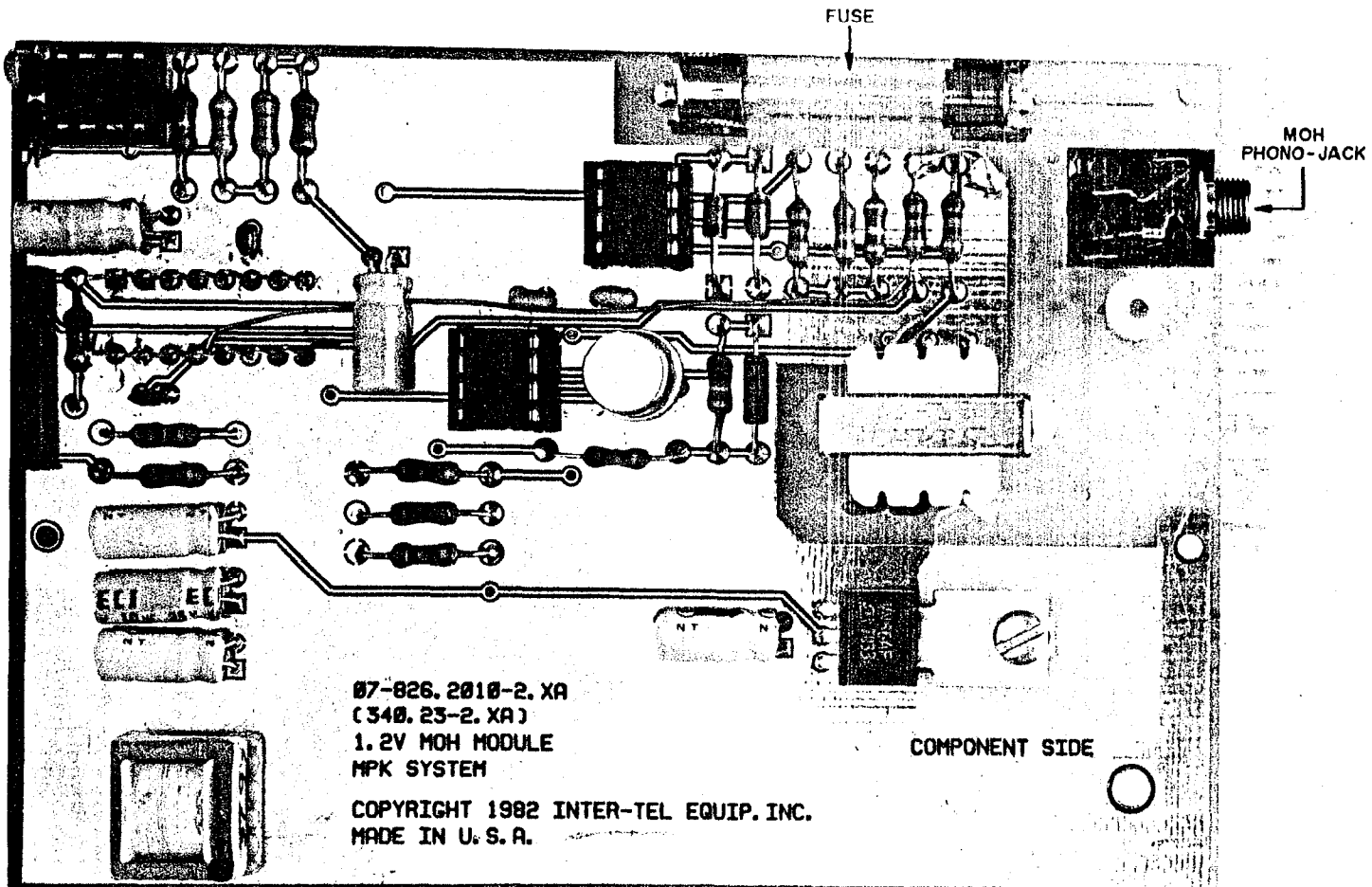


Figure 1-2. MPK Optional Music-On-Hold Module PCB

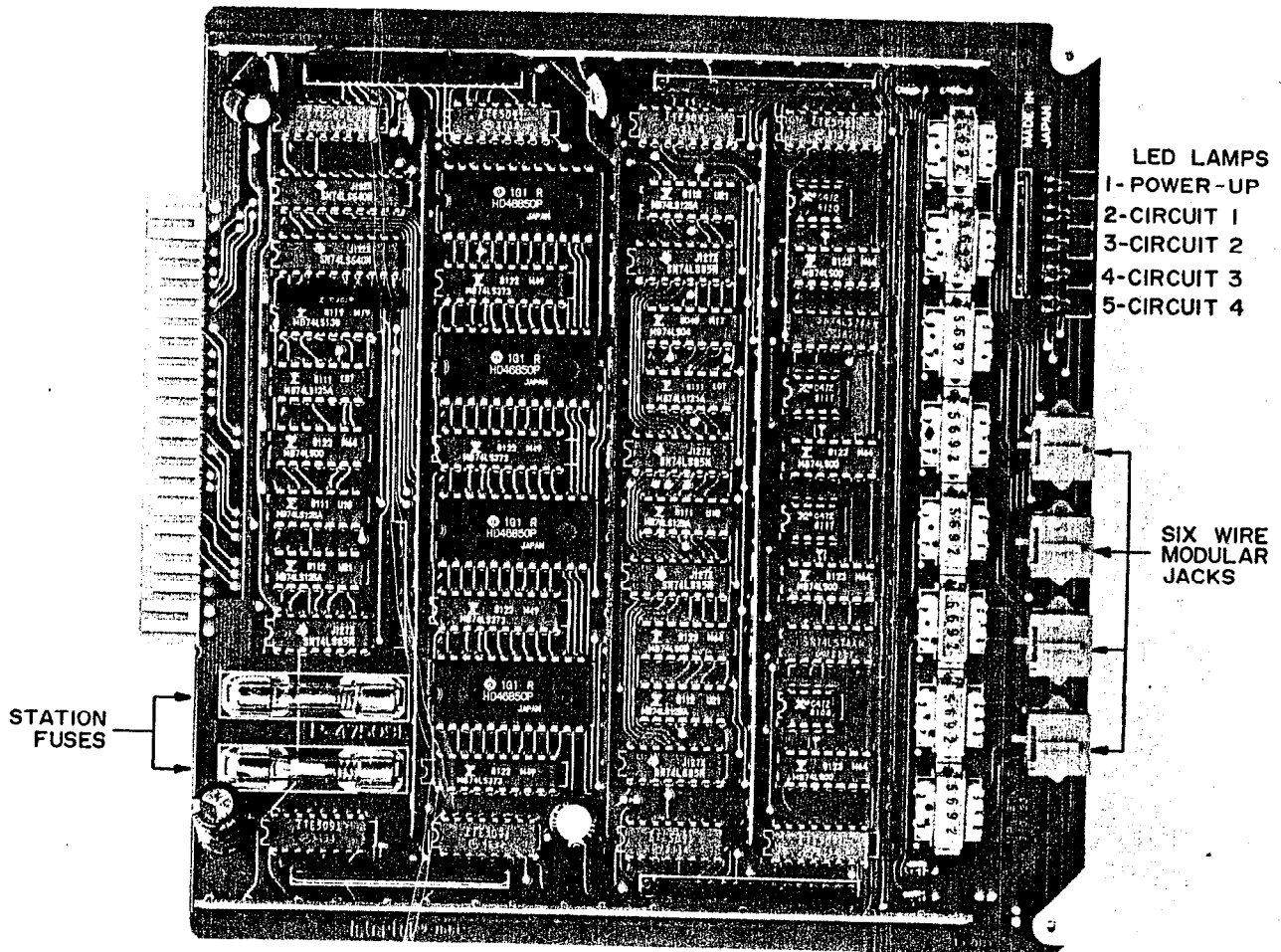


Figure 1-3. MPK STN PCB

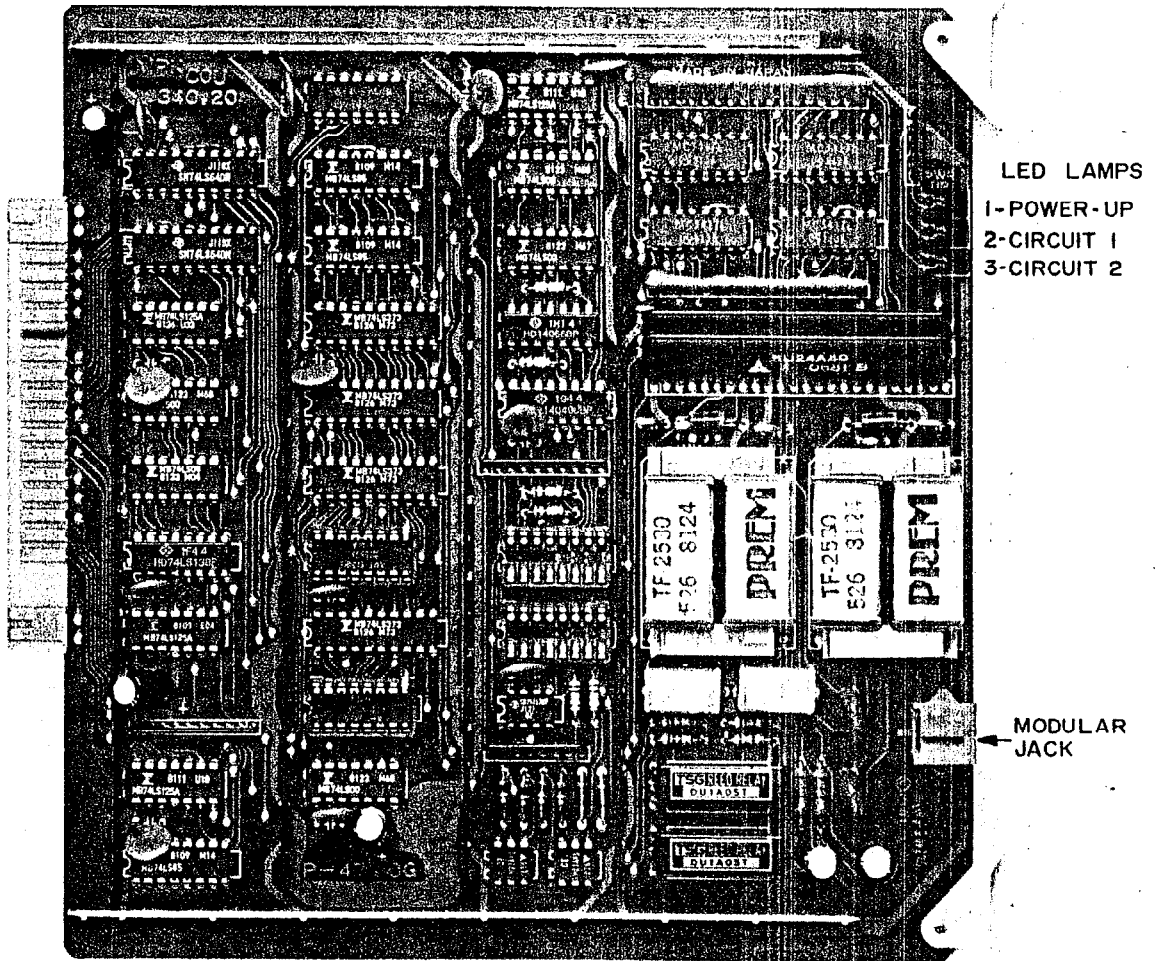


Figure 1-4. MPK COU PCB

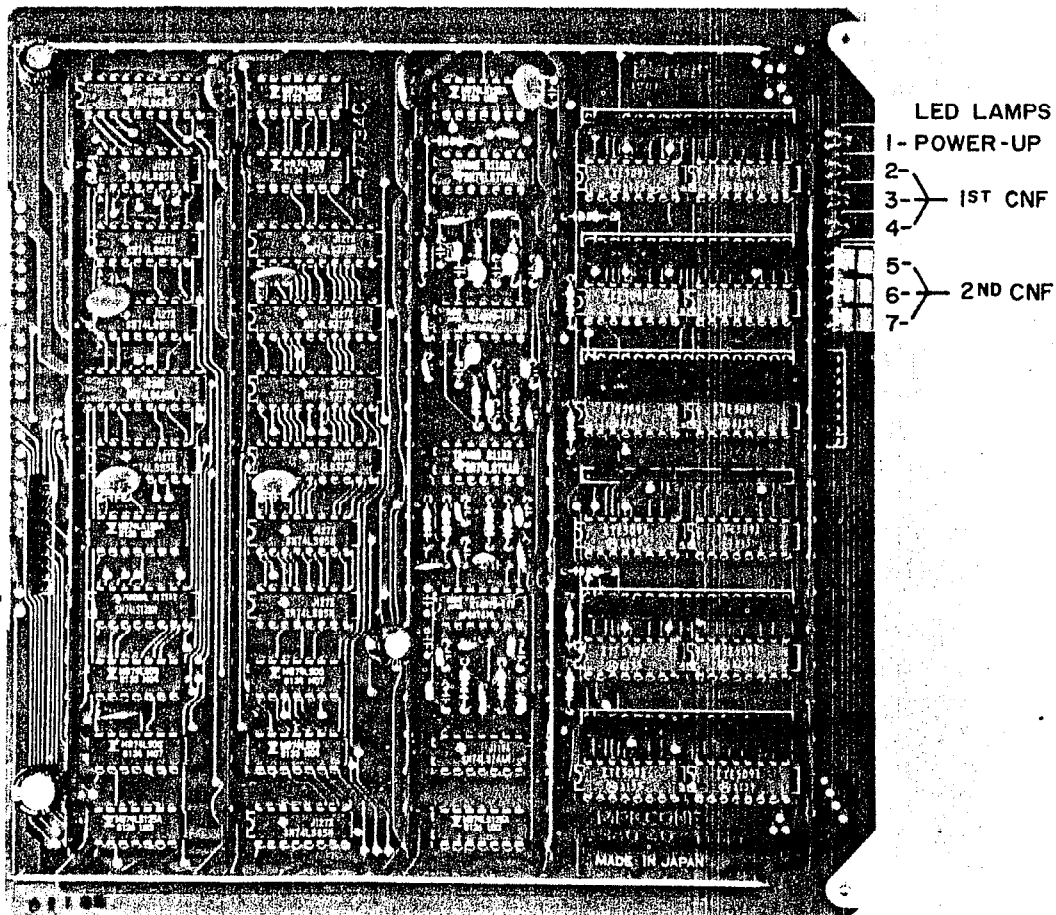
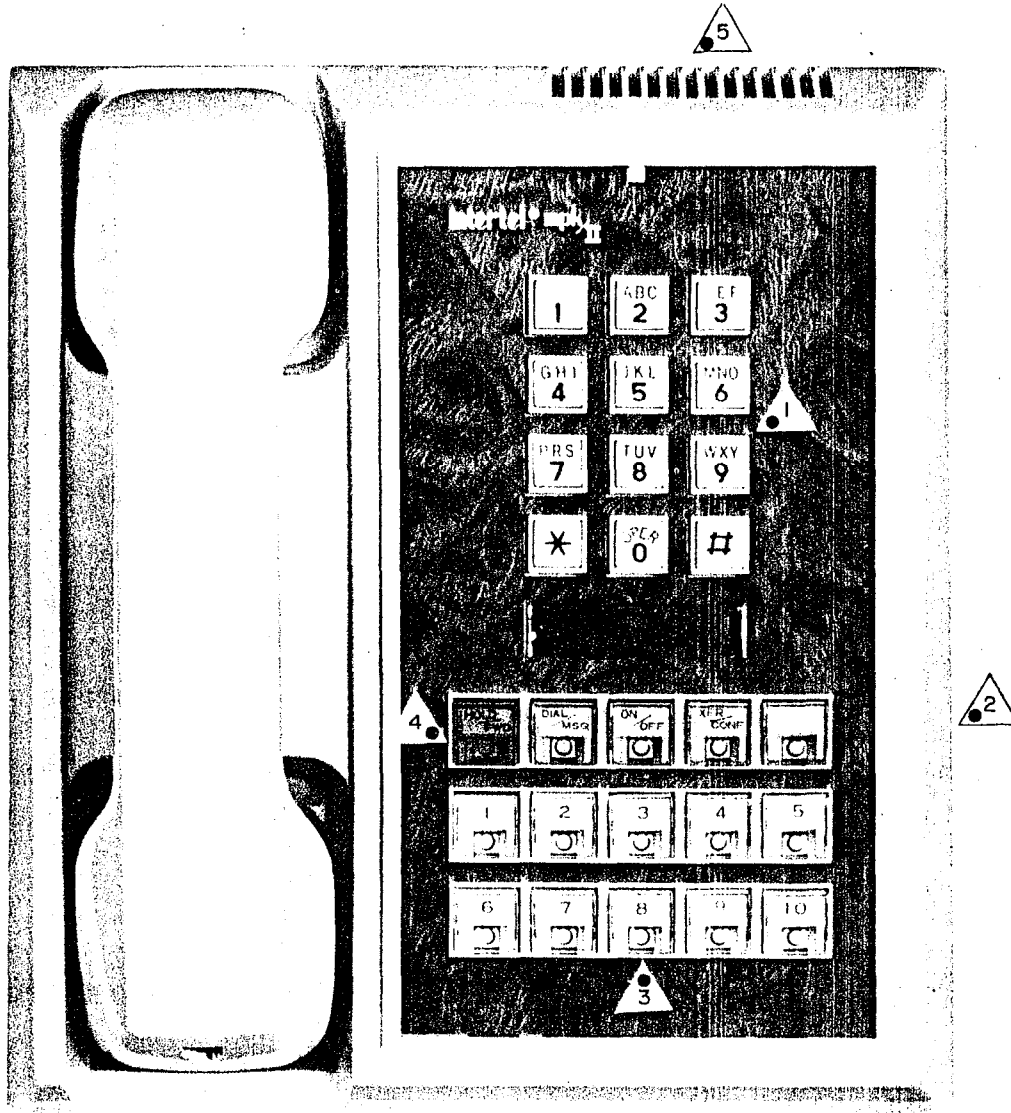


Figure 1-5. MPK CNF PCB








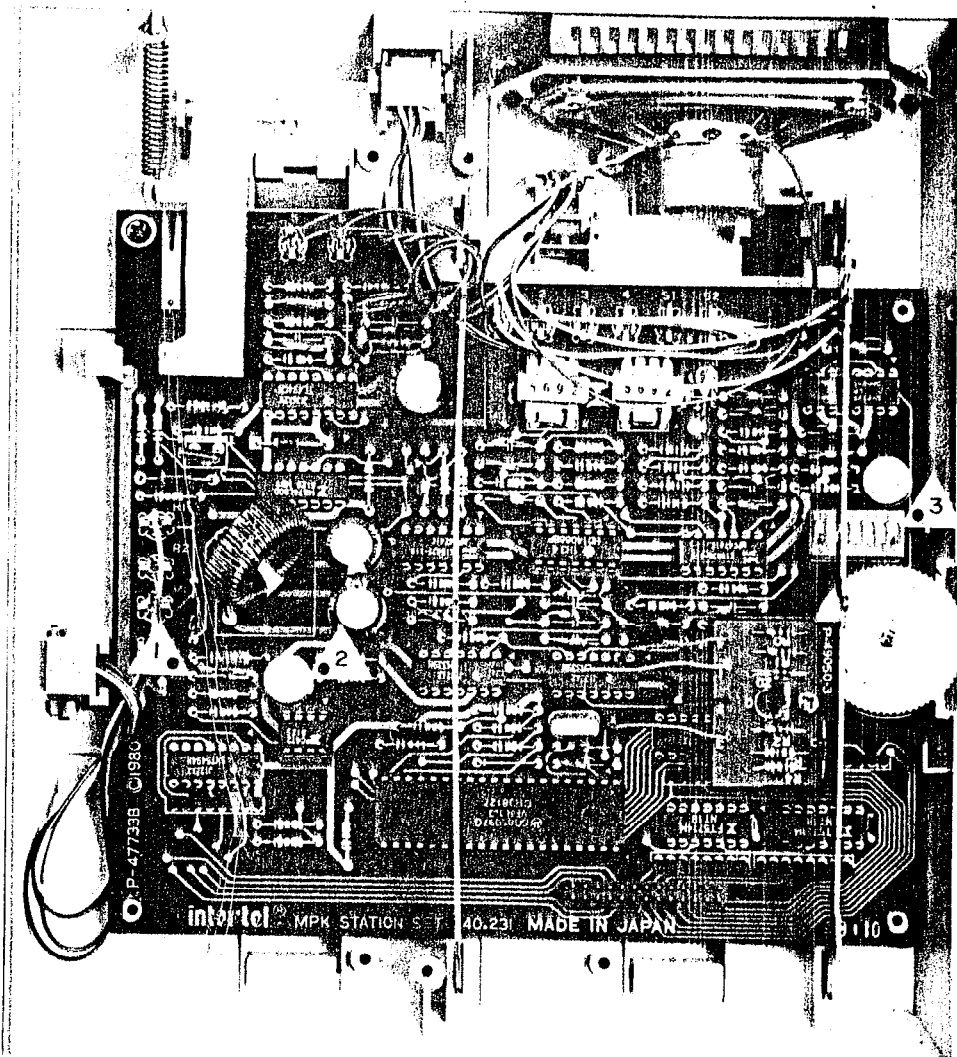
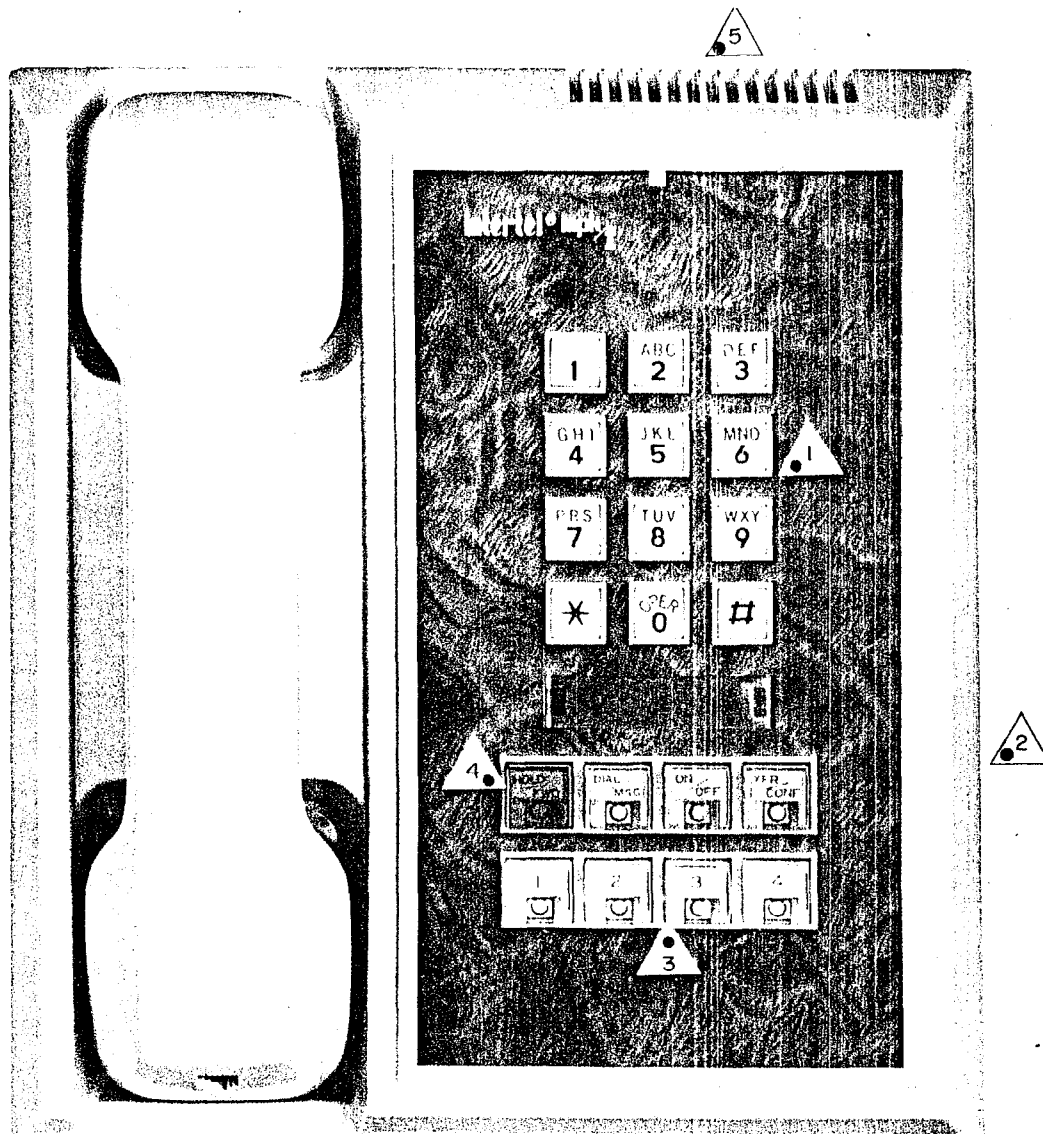
-  1 PUSH BUTTON KEYPAD
-  2 VOICE VOLUME CONTROL
-  3 10 C.O. LINE KEYS
-  4 SPECIAL FUNCTION KEYS
-  5 INTERNAL SPEAKER

Figure 1-6. MPK/II 1032T Keypad



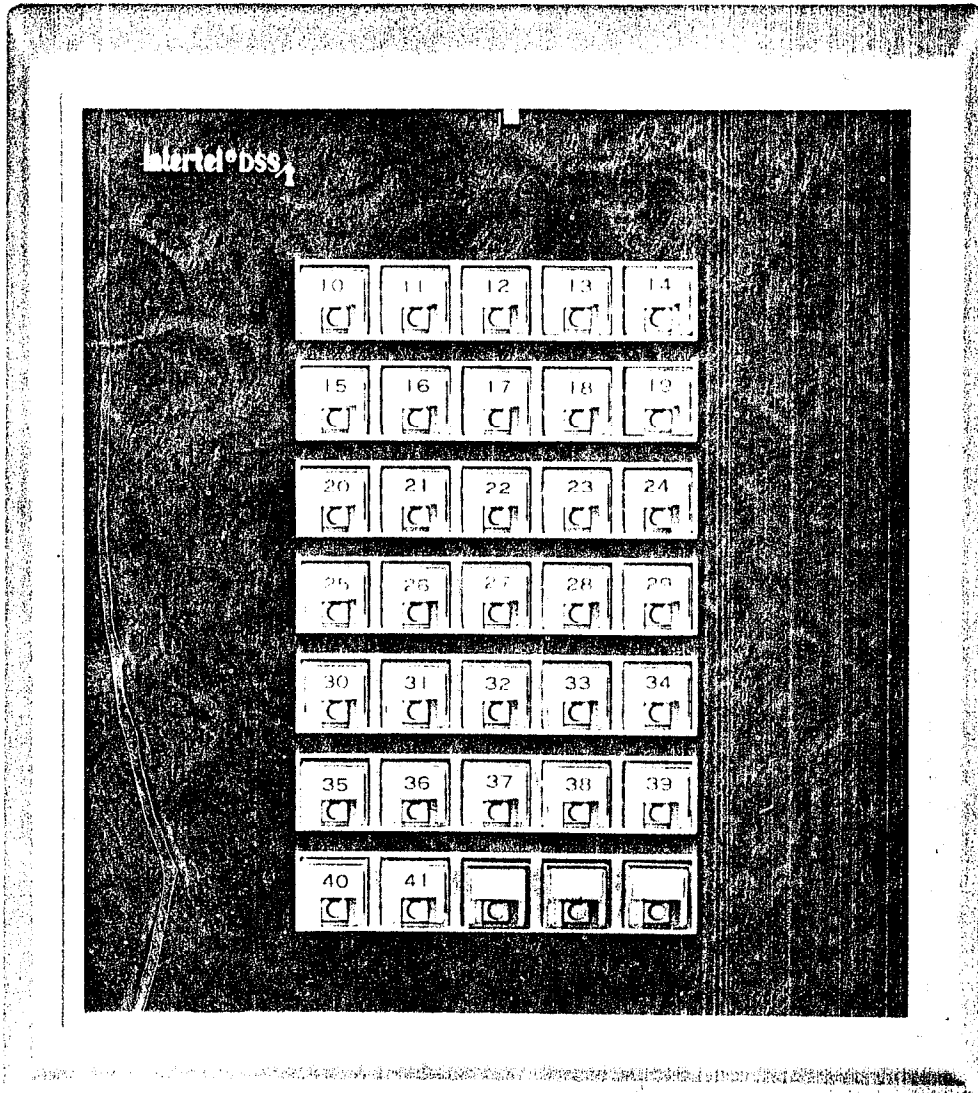
- 1 5.0V T.P. (VR2)
- 2 5.0V ADJUST (R67)
- 3 DIP SWITCHES

Figure 1-7. 416T/1032T Keyset Control PCB



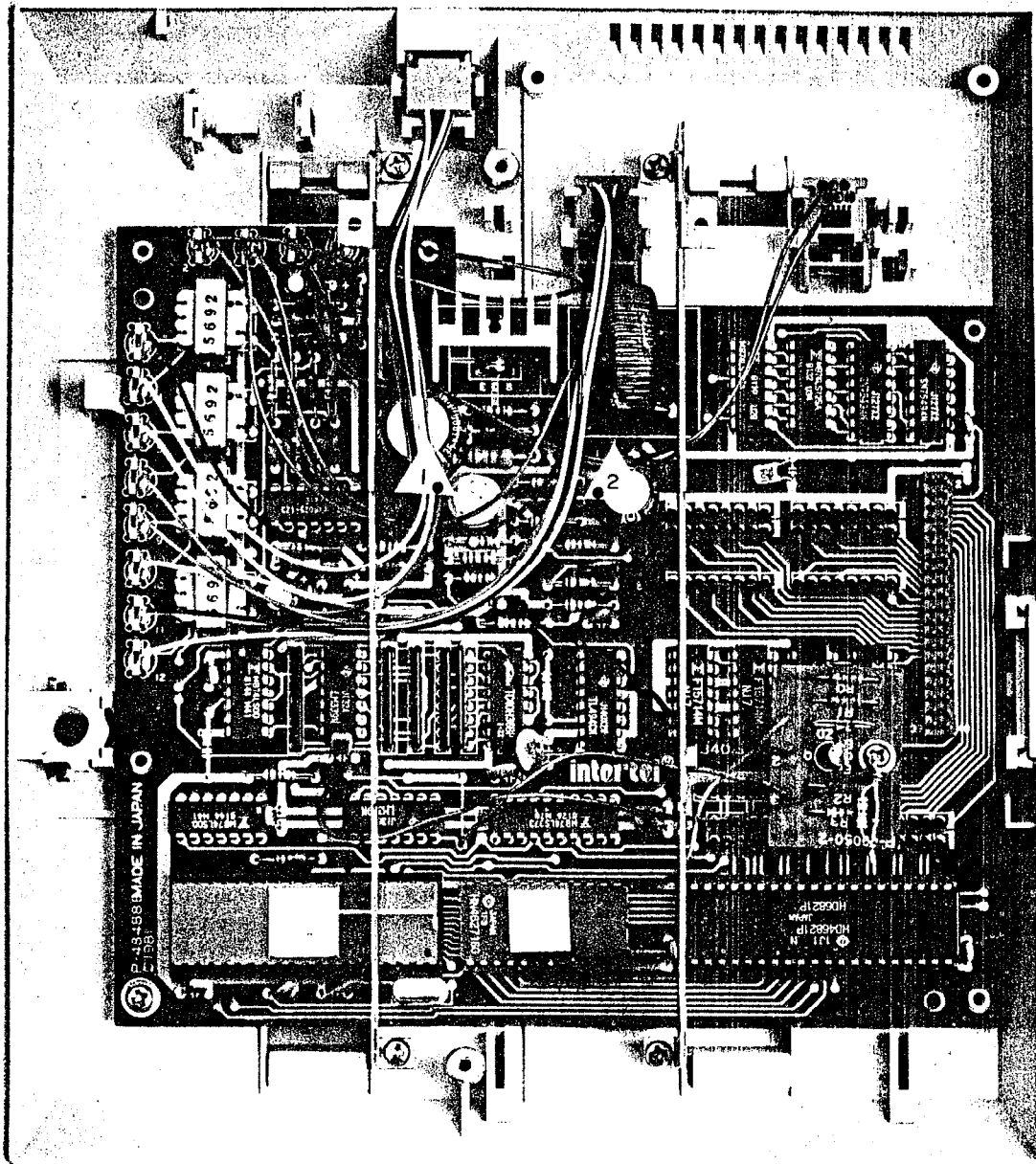
- 1 PUSH BUTTON KEYPAD
- 2 VOICE VOLUME CONTROL
- 3 4 C.O. LINE KEYS
- 4 4 SPECIAL FEATURE KEYS
- 5 INTERNAL SPEAKER

Figure 1-8. MPK/I 416T Keypad



32 DIRECT STATION SELECT KEYS
AND STATUS LAMPS

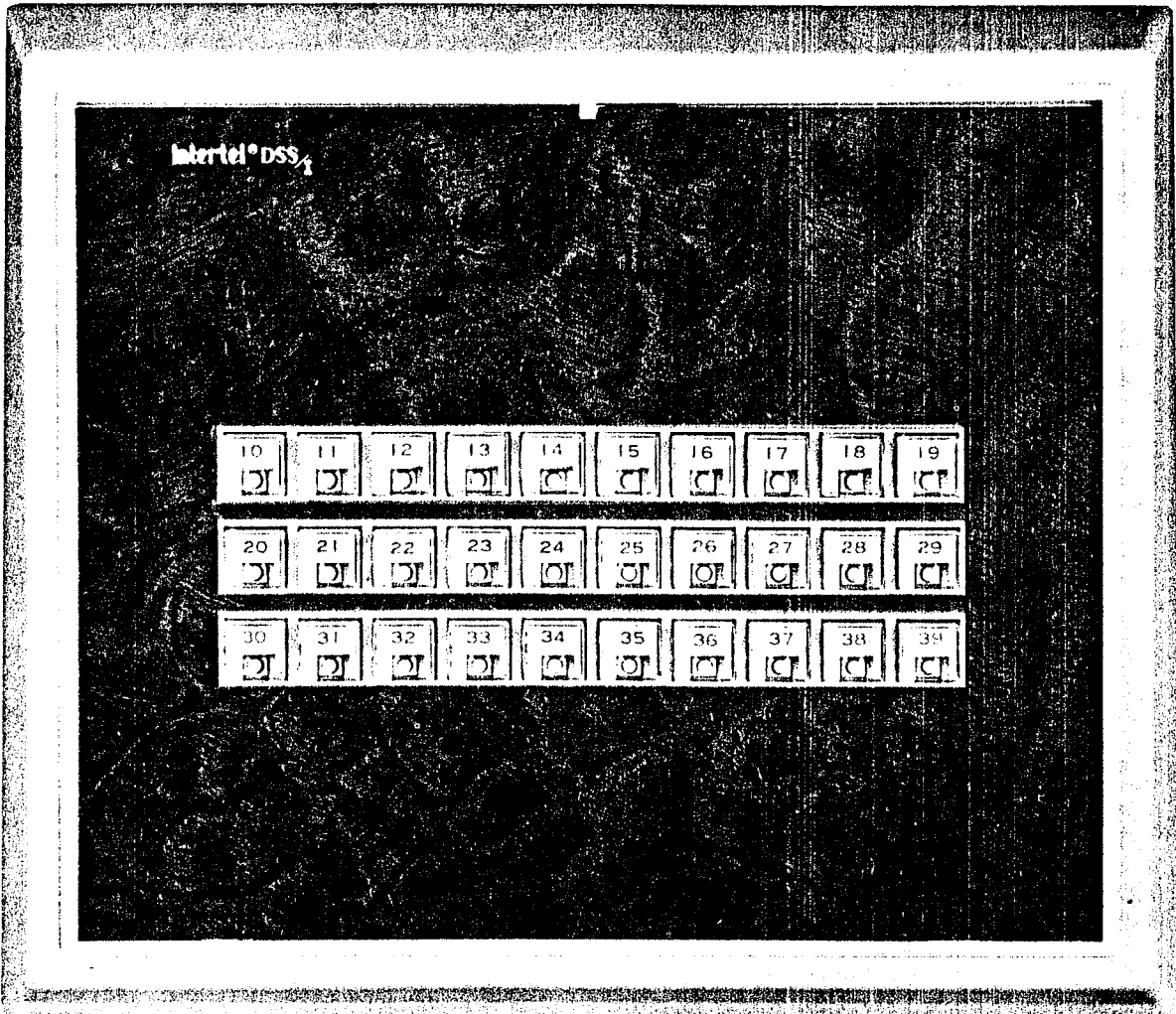
Figure 1-9. 3532D DSS/BLF



1 5.0V ADJUST (R5)

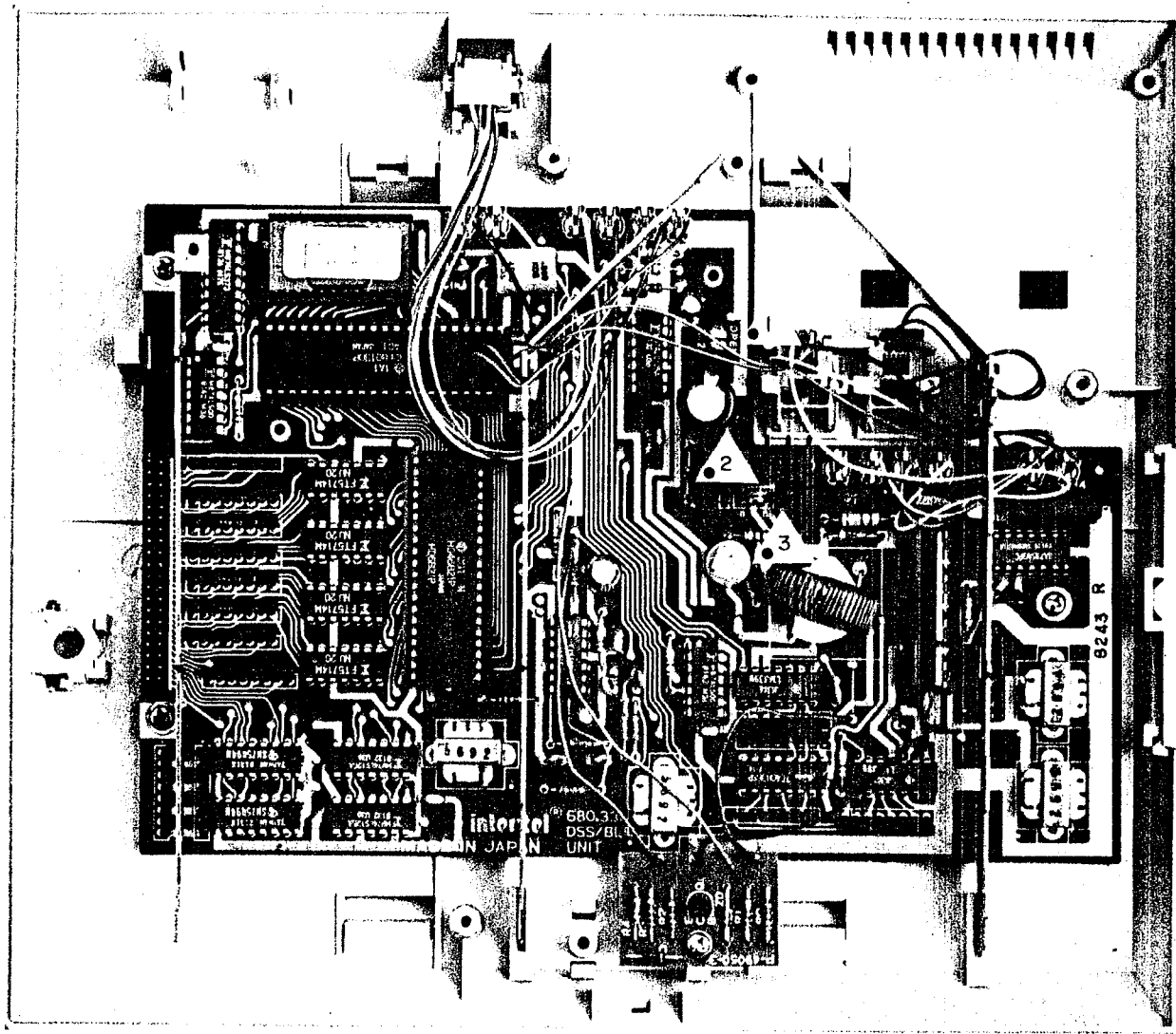
2 5.0V T.P. (CR4)

Figure 1-10. 3532D DSS/BLF Control PCB



30 DIRECT STATION SELECT KEYS
AND STATUS LAMPS

Figure 1-11. 3030D DSS/BLF






-  1 DIP SWITCHES
-  2 5.0V T.P. (CR4)
-  3 5.0V ADJUST (R5)

Figure 1-12. 6460D/3030D DSS/BLF Control PCB

INTER-TEL® MPK® SYSTEM
INSTALLATION AND
MAINTENANCE PRACTICES

340:1001

PRACTICES DOCUMENTATION KEY
MICROPROCESSOR KEY SYSTEM (MPK)

INFORMATION: This practice documentation key explains the MICROPROCESSOR KEY SYSTEM (MPK) Product Line documentation system and represents the latest status of the sections. All sections and changes listed here are in effect. Always refer to the latest issue of the key.

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2.	Features	340-100-200	Issue 3, April 1983
3.	Installation	340-100-300	Issue 3, April 1983
4.	Programming Guide	340-100-400	Issue 3, April 1983
5.	Online Monitor (ONMN)	340-100-401	Issue 3, April 1983
6.	Troubleshooting	340-100-600	Issue 3, April 1983
7.	Station Message Detail Recording (SMDR)	340-100-601	Issue 3, April 1983
8.	Replacement Parts	340-100-700	Issue 3, April 1983

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FCC REGULATIONS

All Distributors must complete the following before connecting the INTER-TEL® MPK telephone system to the switched telephone network. FCC regulations require that the following information be provided to the end user in writing.

- (1) Notify the telephone company of the line numbers to which the direct connection is to be made and provide them with the system model number 340.00 INTER-TEL® MPK telephone system which is to be installed. Be sure to include the registration number and ringer equivalence number which is listed for the equipment. The FCC registration number for the INTER-TEL® MPK telephone system model number 340.00 is BE287V-68377-KF-E. The ringer equivalence number is 0.9A. The customer is responsible for giving notice to the telephone company upon final disconnection of the equipment.
- (2) Give notice to the telephone company of the means for connecting the equipment to the telephone network, specifically, the universal service ordering code (USOC) number of the jack installed by the telephone company. The jack that shall be installed is type RJ21X or RJ14W.
- (3) When trouble is experienced, the customer shall disconnect the equipment from the telephone line to determine if it is malfunctioning, and if so, the equipment shall not be used until the malfunction has been corrected. Return all malfunctioning equipment to the manufacturer.
- (4) Do not connect the equipment to party lines unless equipment is provided with a Telco coupler. Equipment shall not be used on coin telephone lines.
- (5) The telephone company may make changes in its communications facilities. If such changes can be reasonably expected to render any customer's terminal equipment incompatible with the telephone company's facilities, or require modification, the customer shall be given adequate notice in writing to allow the customer an opportunity to maintain uninterrupted service.
- (6) Provide the customer with a copy of the service manual.
- (7) All wiring between the Key Service Unit and Central Office Lines must be less than 25 feet in length. Any ancillary devices added to the system must be FCC-approved and all station wiring to the KSU must be in accordance with the 3rd Report and Order requirements.
- (8) The customer shall not make any in-warranty or out-of-warranty repairs. These repairs must be done by INTER-TEL® or the installing dealer.

WARNING: *This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. As temporarily permitted by regulation it has not been tested for compliance with the limits for Class A computing devices pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.*

WARRANTY

INTER-TEL EQUIPMENT, 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 EQUIPMENT'S warranty does not apply to products that have been damaged due to and/or subjected to improper handling by shipping companies, negligence, accidents, improper use, or alterations not authorized by INTER-TEL EQUIPMENT, INCORPORATED.

This warranty is in lieu of and excludes all other warranties, expressed or implied and in no event shall INTER-TEL EQUIPMENT, 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.

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1.00 INTRODUCTION

This section contains the purposes, definitions and operating instructions associated with all operational features of the INTER-TEL Microprocessor Key (MPK) system. Where practical, general telephone terminology is used to describe the precise operation of the system. More condensed feature operating instructions can be found in the *MPK User Guide* also available from INTER-TEL under separate cover.

Some features are fixed by the version number of the software; others are hardware switch-selectable or software programmable by installation personnel. All features may be divided into the following categories:

- A. Internal Communications. These features are associated with station-to-station communications within the same MPK system. Refer to Section 2.00.
- B. External Communications. These features are associated with calls that are connected to C.O. lines. Refer to Section 3.00.
- C. Moving Calls and Locating Personnel. These features are associated with transferring calls within the system and locating personnel. Refer to Section 4.00.
- D. DSS/BLF Station Special Features. These features are associated with the optional Direct Station Selector and Busy Lamp Field (DSS/BLF). Refer to Section 5.00.
- E. On-Site Programming. These features include the programming modes of operation and types of service available to the MPK system. Refer to Section 6.00.
- F. Programmable Station Hardware Features. These features include those programmable by hardware switches inside the keyset. Refer to Section 7.00.
- G. Diagnostics and System Self-Testing. These features include those associated with diagnostics and testing of the MPK system. Refer to Section 8.00.

- H. System RS-232C Outputs. These features include those associated with the RS-232C port outputs. Refer to Section 9.00.

2.00 INTERNAL COMMUNICATIONS

This section defines the features associated with station-to-station communications, including:

- Automatic Intercom Availability
- Private Multi-Path Intercom Calls
- Two-Digit Dialing or Single Key DSS/BLF
- Intercom Alert Tone
- Full-Duplex Handsfree Intercom Calls
- Microphone ON/OFF Indication
- Private Intercom Calls
- Automatic Intercom Callback
- Automatic Handset/Handsfree Control
- Called Party Forced Release
- Intercom Camp-On
- Call Waiting Signal
- Call Forwarding
- Consultation Hold
- Intercom Transfer
- Do-Not-Disturb

2.01 Automatic Intercom Availability

Ready availability of an intercom channel provides for rapid and efficient access to pushbutton dialing and the many other possible system features.

On the MPK system, automatic intercom availability means that the intercom is automatically available for dialing any time you take the handset off-hook and hear an intercom dial tone through the handset; or, press the ON/OFF key, and hear an intercom dial tone through the internal speaker. (Intercom dial tone may be differentiated from outside dial tone by its higher frequency.)

Environmental acoustics, as well as proximity of the system, may produce less than satisfactory hands-free full-duplex intercom calling.

2.02 Private Multi-Path Intercom Calls

The private multipath intercom calls feature guarantees that your voice path cannot be broken into by any other caller. Instead, the MPK system allows the introduction of special tones into the voice path to signal that a call is camped-on or waiting on hold to communicate with you.

The MPK system supports up to five private intercom calls simultaneously. After you access the intercom and complete dialing, the system automatically selects an intercom path and completes the private call. If there are already five calls active, any caller trying to place an intercom call receives a busy signal (short single tones) after trying to access a station, regardless of whether the station is active or inactive. Also with five intercom calls active, any outside call ringing into the operator cannot be transferred to another station since the transfer requires an intercom path.

2.03 Two-Digit Dialing or Single Key DSS/BLF

Two-digit or single key dialing boosts rapid access to communication paths. By simply dialing a two-digit number (10-41) on a keyset, or by pressing a single key on the optional DSS/BLF, you may place an intercom call to any keyset station in the MPK system.

2.04 Intercom Alert Tone

An intercom alert tone provides a reliable means of alerting you to an incoming call. By taking advantage of this feature you can eliminate the possibility of any invasion of privacy which might occur if your intercom is turned on without your knowledge.

The MPK incoming intercom alert tone is an audible double beep which occurs at a station receiving an incoming intercom call. After the incoming intercom alert tone, the caller may request the desired party by name.

2.05 Full-Duplex Handsfree Intercom Calls

Full-duplex handsfree intercom calls allow the called party to communicate freely without the handset and without the need for either party to wait to talk until the other has stopped talking ("voice switching").

To acknowledge a full-duplex intercom call handsfree, simply answer "Yes" in a normal voice after hearing the intercom alert tone and the voice announcement of the caller. You may converse in a normal voice.

If you have difficulty hearing the voice of the other party, adjust the voice volume control on the right side of the keyset.

2.06 Microphone ON/OFF Indication

A microphone ON indication confirms the precise transmission of your voice over the microphone in the handsfree mode. It functions with the incoming intercom alert tone (see Section 2.04) to further safeguard the privacy of your conversation against unwanted listeners.

The MPK microphone ON/OFF indication consists of a lamp under the ON/OFF key which lights whenever the amplification level of the handset microphone is elevated to operate in the handsfree mode. This occurs when receiving an intercom call on any keyset, unless station option 4 (ring intercom first — see Section 340-100-400) is programmed. It will also occur when placing an intercom or outside call from a station set that has switch 5 closed (full-duplex speakerphone) inside the keyset. When switch 5 is closed, pressing the ON/OFF key is the same as lifting the handset and all station communication may be conducted handsfree. To terminate calls in this mode, press the ON/OFF key a second time. This will act the same as hanging up the receiver.

NOTE: On stations which have been adapted for full-duplex speakerphone operation (DIP switch 5 closed), an external speaker must be connected to eliminate feedback.

2.07 Private Intercom Calls

The private intercom calls feature ensures that the receiving party answers your call manually, and that there is no voice announcement.

To place a private intercom call, simply press the pound (#) key after dialing the extension number and waiting for a double beep. This causes the called party's phone to ring with short continuous double beeps, a signal that the caller wishes to speak privately. To answer, the called party must lift the handset or press the ON/OFF key. (Note: if the called party elects to press the ON/OFF key, privacy is, of course, eliminated on the receiving end.)

You may also receive privately all intercom calls arriving at your station by programming station option 4 (ring intercom first) into your keyset. In this case, you must always answer by lifting the handset or pressing the ON/OFF key, regardless of whether the calling party desires a private call. See Section 340-100-400.

2.08 Automatic Intercom Callback

Intercom call queuing assures you of access to a busy station as soon as that station becomes available. This feature differs from intercom camp-on (see Section 2.11) in that waiting off-hook is not necessary.

After reaching a busy party and hearing a busy signal, you may queue onto that extension by pressing the pound (#) key, listening for intercom dial tone and hanging up. You will then receive continuous short double beeps from the station when the called party becomes available. Pick up the handset and you will be automatically connected. If the callback is not answered within 15 seconds, the callback is canceled.

The maximum number of callbacks allowed is five per system (intercom or C.O. line) and one per station.

NOTE: If executive priority call waiting (switch 6) is enabled, callbacks will not be allowed from that station.

2.09 Automatic Handset/Handsfree Control

Automatic handset/handsfree control maximizes system versatility during an incoming intercom call by allowing you to switch easily between handset and handsfree operation.

To switch from handset to handsfree control during an outgoing intercom call, press the ON/OFF key and hang up. To switch from handsfree to handset control, simply lift the handset. This can only be done on stations that have been adapted for full-duplex speakerphone operation (DIP switch 5 closed).

NOTE: On stations which have been adapted for full-duplex speakerphone operation, (DIP switch 5 closed), an external speaker must be connected to eliminate feed back.

To switch between handset and handsfree control during an incoming intercom call, simply hang up or pick up the handset. The ON/OFF key will light to advise you when you are in the handsfree mode.

2.10 Called Party Forced Release

Called party forced release helps you to switch quickly from an intercom call received by your station to a C.O. line.

After a handsfree conversation, release the called party by pressing any unused line key.

2.11 Intercom Camp-On

When calling an intercom party that is busy, you may use the camp-on feature to ensure that you communicate with the party as soon as the station becomes free.

To camp on, simply wait until the busy signal (short single beeps) ceases after calling the busy extension. You will receive music-on-hold (if system is equipped for MOH) until the called party answers.

NOTE: A continuous busy signal indicates that a previous camp-on is in effect.

2.12 Call Waiting Signal

The call waiting signal ensures that important attempts to communicate with you will not go unnoticed.

The MPK call waiting signal is a fast-flashing HOLD/FWD key and one double tone heard through the handset or speaker. This indicates that there is another call "camped-on" or waiting to be answered. Note that the calling party will not hear or see any signals except music-on-hold.

Station DIP switch 3 must be enabled to hear the call waiting signal on the handset.

2.13 Call Forwarding

The call forwarding feature frees you from forced attendance at a particular station by allowing you to forward all your calls to another keyset.

To forward all your calls, simply go off-hook, press the HOLD/FWD key, dial the extension number where you wish to receive the calls, and hang up. The HOLD/FWD key will flash at a medium rate (once per sec, 60 IPM), indicating that all calls have been forwarded to another station.

Only the station receiving the forwarded calls can reach the station which initiated the call forwarding.

To release a phone from the call forward mode, go off-hook, press the HOLD/FWD key and hang up. The HOLD/FWD lamp will go out; queues and ring-in lines will not forward; and a call on hold will not forward on recall.

2.14 Consultation Hold

Consultation hold grants ready access to all the consultation resources available to your system during an intercom call, without need to disconnect and redial.

To place an intercom call on hold in order to "consult" with another station, press the HOLD/FWD key and then dial (within 4 seconds) the desired intercom number, or (for an outside call) a line number and the number of the outside party that you wish to consult. The HOLD/FWD lamp will flash. When the party you are consulting hangs up, you will be connected to the call on hold. Replacing the handset will connect you handsfree to the waiting party.

NOTE: Consultation on hold can only be used with both stations off-hook.

2.15 Intercom Transfer

The intercom transfer feature allows any intercom call to be transferred to ring at any other station in your MPK system, even if the station is busy.

To transfer an intercom call, answer the call (pick up your handset), press the XFR/CONF key, dial the desired extension number on the dial pad, voice announce the call, if desired, and then hang up.

2.16 Do-Not-Disturb

A station in the do-not-disturb mode will not receive any paging announcements or incoming calls except lines which are programmed to ring in. The outgoing features, however, will still be operational.

By going off-hook, pressing the HOLD/FWD key followed by the asterisk (*) key and hanging up, you can place your phone in the do-not-disturb mode. The HOLD/FWD key on your station set will flash at a medium rate (once per second, 60 IPM). As a signal to the operator, the DSS key for your station (if the system is equipped with an optional DSS/BLF) will flash at a slow rate (once every two seconds, 30 IPM) and an attempted call will produce a modified busy signal. Switch 7 inside the keyset must be closed for the do-not-disturb feature to function.

A station will ring in the night mode (for incoming C.O. calls, but not for intercom calls) when the station is in the do-not-disturb mode if switch 4 (night station) inside the phone has been closed.

Placing the operator's station in the do-not-disturb mode places the system in night ring mode. See Section 3.22.

To release do-not-disturb, lift the handset and press the HOLD/FWD key.

3.00 EXTERNAL COMMUNICATIONS

This section defines the features associated with calls that are connected to C.O. lines. Features discussed include:

- Line Status Indicators
- Outgoing Call Multi-Line Key Selection
- C.O. Line Queuing
- Privacy on C.O. Lines
- Pushbutton Dialing
- Last Number Redial
- Speed Dialing of Frequently Dialed Numbers
- Outside Dial Tone Restore
- Line Key Skipping
- Automatic Handset/Handsfree Control
- On-Hook Monitoring/Dialing
- Music-On-Hold
- Automatic C.O. Line Release (System Programmable)
- Hold Recall Time
- Operator's Recall Time
- Intercom Call Waiting Signal
- Call Splitting
- Call Hold
- Conference Calls (Two Inside Parties, One Outside Party)
- Conference Calls (Two Outside Parties, One Inside Party)
- Distinctive Central Office Ring Indications
- Night Ring Mode

3.01 Line Status Indicators

Line status indicators communicate quickly and precisely the status of each C.O. line in the system, thereby eliminating the need for guesswork or time-consuming trial-and-error methods.

The status of lines 1-4 or 1-10 are indicated by the light-emitting diode (LED) located within each line key. The various flashing rates of the LED's indicate the status of each line (where "IPM" is Interruptions Per Minute):

Double flash - Indicates a line you have answered.

Slow flash - Indicates an incoming call is on (every 2 secs, that line. 30 IPM)

Medium flash - Indicates the line is on hold on (every sec, your phone. 60 IPM)

Fast flash - Indicates that a line placed on hold (twice a sec, or transferred is recalling back to the station, or that a call has been transferred to the station. 120 IPM)

Steady light - Indicates that the outside line is in use by another station.

Slowest flash - Indicates that a conference is in (every 4 secs, progress. 15 IPM)

3.02 Outgoing Call Multi-Line Key Selection

Multi-line key selection reduces waiting time for initiating important outside communications. The MPK system allows you to choose one of four or ten line keys (depending on your keyset) to place an outside call.

3.03 C.O. Line Queuing

Use of the C.O. line queuing feature ensures your access to a busy line as soon as it becomes available.

Queue onto a line by lifting the handset, pressing the busy line key (you will hear a busy signal), pressing the pound (#) key and hanging up. The station set will produce long bursts of tone and the line key will flash at a slow rate (once every 2 seconds, 30 IPM) when the line becomes available. To place your call, lift the handset, press the line key flashing at the slow rate and dial the desired number.

There may be one line queue per station or five per system at the same time. In the rare instance where a ring-in occurs during the 1.2 second disconnect of the C.O. line you are queuing, you may receive a momentary ring-in on your station before it is disconnected, and you are re-entered in the queue. If you are able to seize the line within the 1.2 second disconnect of the C.O. line, you may be connected.

3.04 Privacy on C.O. Lines

Privacy on C.O. lines safeguards your conversations from unwanted access by other parties.

To ensure privacy, any C.O. line which is in use may not be accessed by any other station unless the conferencing feature (see Sections 3.19 and 3.20) is utilized.

3.05 Pushbutton Dialing

Pushbutton dialing, faster and more convenient than conventional rotary system dialing, has become a standard of most modern key systems. This feature is standard on all MPK keysets. The pushbutton dialing on this system can be serviced by non-DTMF Central Offices.

3.06 Last Number Redial

Last number redial saves dialing time when you reach a busy outside number and wish to redial automatically. You may also use last number redial if you have not hung up but have been disconnected and wish to re-establish the connection.

To use the last number redial feature after dialing a busy number or being disconnected, simply press the DIAL/MSG key without hanging up. This causes the system to automatically drop and reaccess the C.O. line, and to redial the number.

To redial the last number dialed after hanging up, lift the handset, and select an outside line key, press the DIAL/MSG key and the asterisk (*) key. The system will automatically redial the last number dialed. Note that this feature will not work if the last number dialed manually was longer than 10 digits or dialed via the speed dial feature (see Section 3.07).

3.07 Speed Dialing of Frequently Dialed Numbers

To save you dialing time, each multi-line station may store up to 10 frequently-dialed numbers (each up to 10 digits in length) which may then be dialed automatically by pressing the DIAL/MSG key and a single digit on the dial pad.

Numbers are stored by pressing the DIAL/MSG key and any single digit 0-9 on the dial pad for the memory location followed by the frequently-used number that you wish to store. Repeat for all numbers that you wish to store, choosing a new memory location for each number. Then press the ON/OFF key.

Stored numbers are erased by disconnecting the line cord to the station set or by entry of a new number in a specific memory location. Onboard battery back-up cannot prevent loss of these numbers if power to the

station is lost. System battery back-up can prevent the numbers from being lost during AC power outages.

To dial a stored number, simply lift the handset, select an available line key, press the DIAL/MSG key and the memory code. Forgetting to press an available line key before pressing the DIAL/MSG key and the memory code, will erase the stored number.

3.08 Outside Dial Tone Restore

Outside dial tone restore prevents others from accessing a line which you wish to keep in order to place another call.

After making an outside call, simply press the line key a second time instead of hanging up. The system will automatically restore the outside dial tone.

3.09 Line Key Skipping

Line key skipping saves you from having to hang up and wait for dial tone each time you finish a call and want to start another.

While on an outside line, you may select another line by pressing a second outside line key. This will automatically release the first line and access the second line.

3.10 Automatic Handset/Handsfree Control

Optional handset/handsfree control provides added system versatility for external communications as well as for internal communications (see also Section 2.08).

DIP switch 5 inside the keyset station should be closed for this feature to function properly. To switch from handset to handsfree control during an outgoing call, simply press the ON/OFF key and hang up. To switch from handsfree to handset control, lift the handset. The ON/OFF key will light to advise you when you are in the handsfree mode.

NOTE: On stations which have been adapted for full-duplex speakerphone operation (DIP switch 5 closed), an external speaker must be connected to eliminate feedback.

3.11 On-Hook Monitoring/Dialing

With the on-hook monitoring feature, stations not equipped with optional external speakers may be used to monitor handsfree an outside line such as

time, weather, recorded messages and waiting on hold.

To monitor on-hook, simply press the ON/OFF key and a line key, then dial the outside number.

When this feature is in use, the handset microphone is not activated. For this reason, you may not speak to an outside party although the phone speaker is connected to amplify the receiving part of the call.

3.12 Music-On-Hold

Music-on-hold not only reassures potential customers that they are still connected, but also serves to make the wait as pleasant as possible.

Any MPK station or outside line placed on hold will receive music-on-hold. The CPU board is shipped with a standard melody integrated circuit chip with the song "Holidilia." An external music source adapter is also available.

3.13 Automatic C.O. Line Release (System Programmable)

Automatic C.O. line release allows you to help dictate the conditions under which the system will retain or release a C.O. line.

The MPK automatic C.O. line release feature ensures that only 100 millisecond interruptions on a C.O. line that is on hold will automatically release that line. This can be optionally set at 1.2 seconds by entering system option 6 (1.2 second held call loop release) into the system.

3.14 Hold Recall Time

The capability to program a hold recall time not only ensures that calls placed on hold will not go unanswered, but also ensures that the hold recall time for returning an unanswered call on hold to the sender is the most appropriate for your particular office environment.

Because of the programmable hold recall time feature, a C.O. call that has been placed on hold on a station will ring back to that station after a programmable hold recall time period has expired. This time is initially set to 60 seconds but may be reprogrammed from 1 to 255 seconds. See also Section 3.15.

3.15 Operator's Recall Time

The operator's recall time functions with the hold recall time to ensure doubly that no call goes unanswered.

Because of this feature, a C.O. call that has been placed on hold will automatically ring back to the operator after ringing back to the station, if no action at the station was taken within the second programmable hold recall time parameter.

If the system is in night mode, a call does not return to the operator but remains at the station for 10 minutes.

3.16 Intercom Call Waiting Signal

An intercom call waiting signal alerts you to a waiting intercom call without jeopardizing the privacy of your C.O. call.

The intercom call waiting signal feature causes a station on an intercom call or a C.O. call to receive one double beep over its handset (not audible to the outside party). The HOLD/FWD key will flash at a fast rate (twice per second) when an intercom call is incoming to the station (camped-on). As soon as the outside call is terminated, the intercom call will be connected automatically or the station may split (see Section 3.17) between the two calls.

DIP switch 3 inside the keyset must be closed to hear the intercom incoming call waiting signal on the handset. For those station users not desiring off-hook ringing, the visual signal (flashing HOLD/FWD) will still appear.

3.17 Call Splitting

Call splitting allows you to switch easily between an ongoing outside call and a camped-on intercom call.

To use this feature during an outside call, simply press the HOLD/FWD key. This puts the outside call on hold and connects the intercom call to the station. To return to the outside call, press the line key flashing at the medium rate (once a second, 60 IPM). This returns the intercom call to a camped-on condition and reconnects the outside call that was placed on hold.

If a busy line key is pushed accidentally, a busy tone will be heard. The original line key lamp will be extinguished but the call may not drop unless the outside party hangs up. Pressing the line key

immediately will reconnect you to the party and light the lamp on the line key.

3.18 Call Hold

With the call hold feature, a station may be used in any other available manner during a C.O. call.

Place a C.O. call on hold by pressing the HOLD/FWD key. The line key of the held call will flash at a medium rate (once a second, 60 IPM) on all keysets and you will hear intercom dial tone. A call on hold will flash at a medium rate and can be picked up at any station.

3.19 Conference Calls (Two Inside Parties, One Outside Party)

Using the versatile MPK conference call feature, two inside parties and one outside party can share a conversation on the same line.

To set up a conference call between two inside parties and one outside party while you are on an outside call, ask the outside party to hold. Then press the XFR/CONF key and dial the extension number of the inside party to be conferenced. After you instruct the inside party to lift the handset, press the XFR/CONF key. Your XFR/CONF lamp will be lit steady and the XFR/CONF lamp of the second party will be flashing. To end the conference call, press the asterisk (*) key and replace the handset. All parties will be disconnected.

If the second party does not go off-hook before the XFR/CONF key is pressed a second time, you will be dropped back to dial tone and redialing the extension will be necessary to re-establish the conference.

If the second party is busy, you must press the line key to re-enter the line.

If you put the conference on hold (by pressing the HOLD/FWD key), you may re-enter the conference by pressing the XFR/CONF key.

Only one conference at a time can be set up from a station.

If necessary you may split to another incoming intercom call by pressing the HOLD/FWD key. You may then re-enter the conference by pressing the XFR/CONF key, hookflashing and pressing the XFR/CONF key again.

NOTE: If the outside party chooses to hang up while you are still split to the intercom call, the conference will be dropped.

To eliminate only yourself from the conference call, hang up. The outside party will still be connected to the remaining inside phone.

To drop the second inside party only, place the outside party on hold by pressing the HOLD/FWD key.

If the second inside party in a conference goes on-hook, presses the HOLD/FWD or certain other keys twice, the second inside party cannot re-enter the conference and the outside party will be connected to the other inside party.

3.20 Conference Calls (Two Outside Parties, One Inside Party)

The conference call feature can also be used to set up a conference between two outside parties and one inside party (see also Section 3.19).

To arrange a conference call between two outside parties and one inside party, select an available line key and dial the first outside party. Ask the party to hold, press the HOLD/FWD key, call the second outside party to be conferenced and press the HOLD/FWD key again. With both outside parties holding, press the XFR/CONF key. This will bring all parties together in a conference. To end the conference, press the asterisk (*) key and replace the handset. All parties will be disconnected.

To split to an incoming intercom call waiting, just hang up. You will be automatically connected to the incoming intercom call. To split to another incoming C.O. call, hookflash and press the slow (once every two seconds, 30 IPM) flashing line key.

To eliminate only yourself from the conference call, simply hang up. (Note: because of the loop start function, it may be necessary to press the asterisk [*] key as well to drop the conference.) The other two parties will still be connected until either party hangs up. To re-enter, pick up the handset and press the XFR/CONF key.

Only one conference at a time can be set up from a station. If you choose to place the other parties on hold, you can re-establish the conference by pressing the XFR/CONF key. This will conference the calls on hold on the two lowest number line keys.

If either outside party hangs up during conferencing, dial tone will be heard by both remaining parties. To eliminate the dial tone, place the remaining outside party on hold and press the medium (once a second, 60 IPM) flashing line key to resume conversation.

3.21 Distinctive Central Office Ring Indications

An incoming C.O. call beeps distinctively for two seconds every three seconds when the station is on-hook. If the station is off-hook (and switch 3 is closed) the call will beep once every 15 seconds through the handset. However, only the inside party will hear the beeping tone.

3.22 Night Ring Mode

The night ring mode feature modifies operation of the system to reflect night time office activity. Instead of ringing only the operator, incoming C.O. calls ring all the station sets specifically programmed to be night stations. Outgoing features of the system remain the same.

The system may be placed in night ring mode simply by placing the operator's station in the do-not-disturb mode (going off-hook, pressing the HOLD/FWD key followed by the asterisk [*] key and hanging up). To designate a keyset as a night station, enable DIP switch 4 inside the station.

4.00 MOVING CALLS AND LOCATING PERSONNEL

This section defines the features associated with transferring calls within the system and locating personnel. The features discussed include:

- Call Transfer
- Call Transfer to Hold
- Transfer Recall Time (System Programmable)
- Reverse Transfer
- Transfer Cancel (Call Screening)
- Transfer Search
- Zone Paging 1-4 and All-Page
- Message Waiting Indication
- Message Center
- Executive Priority Call Waiting
- External Paging Speakers
- Account Codes
- Multiple Speed Dialing
- Station Transfer Security

4.01 Call Transfer

The call transfer feature allows any C.O. call to be transferred to any other station in your MPK system, even if the station is busy.

To transfer a call, answer the call (press the slow flashing line key), press the XFR/CONF key (the line key will flash at a medium rate), dial the desired extension number on the dial pad, voice announce the call, if desired, and then hang up. (See also Section 4.03.)

4.02 Call Transfer to Hold

The call transfer to hold feature allows any C.O. call to be transferred to hold at any other station in your MPK system.

To transfer a call to hold, answer the incoming call (press the slow flashing line key), press the XFR/CONF key (the line key will flash at a medium rate), dial the desired extension on the keypad, and press the HOLD/FWD key. The call will then appear on hold at the dialed extension and you will be returned to the intercom dial tone.

4.03 Transfer Recall Time (System Programmable)

A transfer recall time, like the hold recall time discussed in Section 3.14, helps ensure that no call goes unattended. A transferred call that has not been answered within a programmable transfer recall time limit will automatically recall to the station that initiated the transfer. It will then ring on that station for a single hold recall time. If still not answered, it will recall to the operator's station.

4.04 Reverse Transfer

Reverse transfer allows you the freedom to move from station to station without risking the loss of your calls.

With the reverse transfer feature, you can answer from any keyset any C.O. call that is ringing or was transferred to hold at another station, unless the station is in the do-not-disturb mode. (Of course, if the call is on hold or ringing in, it is flashing at all stations and can be accessed by pressing the flashing line key.)

To reverse transfer a call, lift the handset at any station, dial the extension where the call is ringing or

was transferred to hold and press the XFR/CONF key. The call will then appear on hold (medium flashing line key, 60 IPM) at your station. To establish the connection, press the line key flashing at the medium rate.

Reverse transfer is allowed for calls which are ringing at the operator's station. Lines on hold at the operator's station may not be reverse transferred.

4.05 Transfer Cancel (Call Screening)

The transfer cancel feature may be used to return transferred calls to your station (call screening) if the party to which the call is transferred is not there or refuses the call.

If the party requested refuses the transferred call (before going on-hook to complete the transfer) or is unavailable, press the medium flashing line key (once a second, 60 IPM) instead of the hookswitch. This action will cancel the transfer and reconnect the outside party to your phone. See also Section 4.06.

4.06 Transfer Search

The transfer search feature allows a station to search through a series of extensions to locate a party before transferring a call.

After answering the outside call, press XFR/CONF and dial the first extension. Announce the call and hang up or (to continue the search), press XFR/CONF and dial another extension. Repeat as desired until you have found the party, then hang up.

4.07 Zone Paging 1-4 and All-Page

Any MPK station may also be used as a versatile public address device. Paging announcements may be made to all or specific pre-determined groups of key stations.

To make a paging announcement, lift the handset and press the asterisk (*) key followed by any single digit between 1 and 5 on the dial pad. The digit pressed will select the group of stations to receive the announcement. On the 1032T Model only, you may press the SPCL key for an all-zone page instead of pressing asterisk (*) and 5 on the keypad.

Digits Pressed	Keysets Accessed
* 1	10-19
* 2	20-29
* 3	30-39
* 4	40-41
* 5	All Keysets
SPCL (On Model 1032T Only)	All Keysets

After you hear the double beep, you have 10 seconds to make the announcement.

Refer to Section 340-100-400 for programming instructions for removing a keyset from paging.

4.08 Message Waiting Indication

The message waiting indication feature can be used to leave and receive messages at the operator's station.

When the DIAL/MSG lamp on a station flashes at a fast flash rate (twice a second, 120 IPM) it indicates that there is a message waiting at the message center (operator's station). To activate this signal at another station, lift the handset, dial the extension and press the DIAL/MSG key. This will activate the message waiting lamp on the dialed extension and automatically transfer you to the message center (operator) where you may leave a message.

To release the message waiting indication, lift the handset and dial the message center. The message lamp will stop flashing as soon as the handset is lifted. After receiving the message, hang up.

4.09 Message Center

A message center provides a convenient and reliable central location where messages may be given or received.

The message center may receive messages for stations which are unattended or busy when a calling extension presses the DIAL/MSG key (see Section 4.08, Message Waiting Indication). The unattended or busy station will then receive a visual message waiting signal (DIAL/MSG key flashes twice a second, 120 IPM).

4.10 Executive Priority Call Waiting

Executive priority allows you to signal, without

invading the privacy of a busy station, that you wish to talk.

To use executive priority call waiting, DIP switch 6 inside the station must be closed. After dialing the busy extension, press the pound (#) key as many times as you wish to signal the station. The station will receive a double beep for each time you press the key (but no more than once every 4 seconds). The station HOLD/FWD will also flash at a fast rate (twice per second, 120 IPM). As soon as the busy station is free, you will be automatically connected.

Executive priority cannot be used to signal a station that has a call camped-on, that has DIP switch 3 open or that is in the do-not-disturb mode.

Stations with executive priority enabled cannot use the intercom callback feature.

4.11 External Paging Speakers

This feature can be used in existing paging areas where MPK telephones are not easily heard or placed.

The MPK system may be connected to an external paging system which is not part of the system. This paging system uses an extension number as a paging area and therefore can be separated from normal paging zones 1-5. Customer-supplied paging systems, speakers and engineering are required for external paging.

To use external paging, call the desired extension number. No audible tone (double beep) will be heard. Make your page (no time limit exists on external paging). Hang up when the page is completed.

When placing an all page, the external paging amplifier will also be activated. Initiating an external page will not initiate an all page.

4.12 Account Codes

This programmable feature is intended for those users requiring tracking or billing on a day-to-day basis.

The MPK system will output an account code in the remaining available character space of the dialed number field of a Station Message Detail Recording (SMDR — See Section 340-100-601). The total dialed number field is 24 characters long.

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To use the account code on an outside call, enter an asterisk (*) after dialing; this is to distinguish the account code from the telephone number. Then enter the account code and perform any normal MPK function. When the call is terminated, the called telephone number and account code will be printed.

The account code is output to the telephone network. Therefore, if the account code is dialed first or during a Special Service Call (SPRINT, MCI) the call may fail to be processed. For a SPRINT or MCI call that requires more than 24 digits, the account code will not be printed.

NOTE: Only a call lasting at least 30 seconds will be printed if system option 1 or 2 is enabled.

4.13 Multiple Speed Dialing

The speed dialing section of the MPK multi-line keyset may be used to dial multiple numbers in series. This feature should be used for Specialized Common Carrier type calls.

To make a Specialized Common Carrier Call, often a sequence of three or more numbers are needed to make one call: the Specialized Common Carrier number, an account code and the long distance number to be dialed. Therefore, three speed dial storage locations must be used to make one call. However, when the DIAL/MSG key, which normally redials the most recently dialed number, is pressed a second time, the present line is dropped and re-accessed. This problem is solved by enabling the system 12-second redial option (option 5). This will allow the multiple stored number locations to be sent before the line is re-accessed. The station DIP switch option 1 must be opened if the Specialized Common Carrier does not accept a leading 1.

To use the multiple speed dialing feature, select a line key. Press the DIAL/MSG key and the first stored number location. Repeat for the remaining stored number locations.

NOTES: 1) Calls of approximately 10 seconds duration will not be recorded on the SMDR when system option 5 is on.

2) Twelve seconds must elapse after multiple speed dialing before last number redial may be used.

INTER-TEL PRACTICES

4.14 Station Transfer Security

With this feature, calls may be transferred to unequipped extensions which are used as security parking codes. The reverse transfer pickup feature may then be used to recover the calls, or recall times will transfer the call to the originator or to the operator.

5.00 DSS/BLF STATION SPECIAL FEATURES

This section defines the special features that you may select in addition to those basic to call processing. Features discussed are listed below. They include those of the Direct Station Selector and Busy Lamp Field (DSS/BLF), an optional device especially developed for convenient and efficient processing of calls.

Key Functions of the DSS/BLF
Visual Indications of the DSS/BLF
Intercom Calling with the DSS/BLF
Call Transfer with the DSS/BLF
Call Transfer to a Busy Station with the DSS/BLF
Reverse Transfer with the DSS/BLF
Call Screening with the DSS/BLF
Activating the Message Waiting Indication with the DSS/BLF

5.01 Key Functions of the DSS/BLF

Two DSS/BLF models are available for use with the MPK system: the 3532D, and the 3030D.

- A. The 3532D DSS/BLF. This model has 32 station keys and 3 special function keys. The DSS/BLF assigns the station keys to keyset extensions 10 through 41, beginning with the upper left hand key and progressing downward left to right. The remaining three keys are special function keys and are presently unassigned.
- B. THE 3030D DSS/BLF. This model has 30 station keys. The DSS/BLF assigns the station keys to keyset extensions 10 through 39, beginning with the upper left hand key and progressing downward left to right. There are no special function keys on the 3030D DSS/BLF.

5.02 Visual Indications of the DSS/BLF

The DSS/BLF provides information about the status of the system with a single glance at the key lamp display. Since all keysets in the system have an

assigned key on the DSS/BLF, steady or flashing states of the individual lamps beneath the keys indicate a wide variety of useful information.

A steady lamp on the DSS/BLF indicates that the station is in use. A lamp on the DSS/BLF flashing at a slow rate (once every two seconds, 30 IPM) indicates that the station is in the do-not-disturb mode. A station lamp flashing at a fast rate, (twice a second, 120 IPM) indicates that there is a line recalling from that station. The fast-flashing line key on the associated keyset indicates which line is recalling from the station. This will occur when the recall times have expired.

5.03 Intercom Dialing with the DSS/BLF

To further reduce access time, all stations may be accessed by pressing a single key on the DSS/BLF.

To place an intercom call from a DSS/BLF, lift the handset of the associated keyset and press the key on the DSS/BLF of the desired extension number. The system will automatically dial the extension and the called party will hear the incoming intercom alert tone.

To place a private intercom call, press the pound (#) key on the associated keyset after pressing the desired extension on the DSS/BLF and hearing a double beep. The called party will then hear a continuous double beep and can either pick up the handset or press the ON/OFF key before answering.

NOTE: If the called party elects to press the ON/OFF key, privacy is, of course, eliminated.

5.04 Call Transfer with the DSS/BLF

An outside call may be transferred to another station using a DSS/BLF, by pressing the key of that extension on the DSS/BLF requested by the outside party and hanging up. The user transferring the call may voice announce the call before hanging up, if so desired.

5.05 Call Transfer to a Busy Station with the DSS/BLF

Any call can be transferred to a busy station using the DSS/BLF. While on an outside call, press the key of the DSS/BLF that is associated with the desired extension. After you hear the busy signal, complete the transfer by hanging up. This will automatically transfer the call to the busy station. If DIP switch

option 3 is closed, the busy station will hear a single tone every 15 seconds as notification that a call is waiting.

5.06 Reverse Transfer with the DSS/BLF

To reverse transfer with the DSS/BLF, pick up the handset and press the extension key from which you wish to retrieve the call. Wait for a double beep and then press the XFR/CONF key. Finally, press the medium flashing line key and ask to take a message before hanging up.

5.07 Call Screening with the DSS/BLF

To screen calls with the DSS/BLF, press the DSS/BLF key of the desired extension. If the called party does not answer or refuses the call, do not hang up. Instead, press the medium flashing line key and ask to take a message before hanging up.

5.08 Activating the Message Waiting Indication with the DSS/BLF

To activate the message waiting indication, pick up the handset, press the extension where you wish to leave the message and wait for the tone. Then press the DIAL/MSG key and hang up.

6.00 ON-SITE PROGRAMMING

The featured modes of operation available to the MPK system include: TEST mode, PROGRAM mode, INITIALIZE mode and RESET mode. These modes are selected via the miniature switch assembly located on the CPU board. (See Section 340-100-400, Programming.)

The MPK system also features two types of programming parameters: system and station. System parameters provide for programming of options which affect the system as a whole. Station parameters provide for programming of options which affect individual stations only.

6.01 Special Modes of Operation

- A. PROGRAM Mode. This program function places the MPK system in its programming mode. In this mode of operation, the station and system parameters may be entered using the station keys.
- B. INITIALIZE Mode. Initializing the MPK system establishes the basic status of certain system

features. The initialized status of these features are:

1. All keysets can gain access to all outside lines.
2. The operator's extension is 10.
3. The message center is extension 10.
4. Only the operator's extension will ring audibly for incoming calls.
5. There will be no station options on any keysets.
6. The transfer recall time is 60 seconds.
7. The hold recall time is 60 seconds.
8. No numbers have been designated as absorbed digits.
9. No numbers have been designated as WATS lines.
10. No system options have been assigned.

C. **RESET Mode.** The RESET mode is used to reset the hardware and software. This will clear the system of all calls in process. The RESET mode has no effect on any system or station programming.

D. **TEST Mode.** The TEST mode checks the Read Only Memory (ROM) and the Random Access Memory (RAM) located on the CPU board. This test gives the installer a visual indication of the status of memory and the progress of the test through the LED's on the CPU board.

NOTE: When the TEST mode is entered, all user defined programming is erased.

6.02 Types of Programming Parameters

A. **System Programming Parameters** (See also Section 340-200-400). There are five system parameters which can be programmed to adapt the MPK system to your particular office environment:

<u>Code</u>	<u>Explanation</u>
#4	Transfer Recall Time (Programmable 1-255 Seconds) — Sets the recall time limit for a transferred call. After this time limit the call will be returned to the transferring station and will ring at the station for the HOLD RECALL TIME. The call will then transfer to the operator and a recall flash will appear if the system is DSS/BLF-equipped. After arriving at the operator, it will ring for 10 minutes. If the call is still not answered, it will be considered an abandoned call and dropped.
#5	Hold Recall Time (Programmable 1-255 Seconds) — Sets the time that a call placed on hold will remain at that station silent. It will then ring at that station for a second hold recall time and transfer to the operator's extension where it will ring for 10 minutes. If the call is still not answered, it will be considered an abandoned call and dropped.
#6	Absorbed Digits — Any digit that the central office will absorb can be programmed into the MPK system. This will prevent a toll-restricted station from placing a toll-restricted call directly or through the operator.
#7	WATS Line Identification — Enables telephones that are toll-restricted to make toll calls on any line specified as a WATS line.
#8	System Options:
	1 - SMDR - Seven digits or more, thirty second duration. Prints on the SMDR printer any dialed number of 7 digits or more after an outside call has been more than 30 seconds in duration.
	2 - SMDR - Eight digits or more, 30 second duration. Prints on the SMDR printer any dialed number of 8 digits or more after an outside call has been more than 30 seconds in duration.
	3 - Enable Error Messages - Allows system diagnostic error printout. Assists in locating defective extensions.

- 4 - Conference Card Compatibility - Not normally used.
- 5 - 12 Second Redial - Inhibits the last number redial key from reselecting a line until 12 seconds have elapsed with no dialing. This is necessary to allow chained speed-dialed calls.
- 6 - Held Call Loop Release (1.2 Seconds) - For use with systems served by ESS (Electronic Switching System) Central Offices.
- 7 - 600 Millisecond Hookflash - For use behind a PABX system.

- 5 - Unused.
- 6 - Toll Restrict - Disconnects the station if the digits 0 or 1 are the first numbers dialed, unless an 800 number is dialed. The station also disconnects if any number of more than eight digits is dialed. After disconnection, the station hears a busy tone.
- 7 - Unused.

B. Station Programming Parameters. Station options are entered through the keypad and line keys of the station to be programmed.

NOTE: A station can be disconnected without loss of its programming options; stored numbers, however, will be lost.

Stations options include:

Code	Explanation
#1	Lines Restricted - Restricts the station from outgoing access to specified C.O. lines.
#2	Ring-In From Lines - Allows the C.O. lines specified to ring in audibly at the station.
#3	Station Options:
1	Unused.
2	Remove From Paging - Removes the station from its fixed paging zone and from all-paging.
3	Unused.
4	Ring Intercom First - Inhibits the station from automatically entering the hands-free intercom mode. An incoming intercom call will ring repeatedly until it is manually acknowledged by either picking up the handset or pressing the ON/OFF key to activate the handsfree circuit.

7.00 PROGRAMMABLE STATION HARDWARE FEATURES

A station can also be programmed by switches located inside the station. These switches activate functions for an individual station only.

7.01 Digit 1 Dial (Switch 1)

When switch 1 is closed, the digit 1 precedes any 10-digit speed dial number stored in the station.

7.02 Speed Transfer (Switch 2)

When closed, this switch allows you to transfer calls by dialing only the extension number, eliminating the need to press the XFR/CONF key.

NOTE: This eliminates the possibility of dialing calls except for speed dialing.

7.03 Off-Hook Ring (Switch 3)

When closed, this switch allows call waiting tones to be heard when the station is in the off-hook mode. The signaling tones are background beeps heard every 15 seconds over a C.O. call.

7.04 Night Station (Switch 4)

If this switch is closed, the station rings audibly when the system is in night mode. A call may be received on a station in the night mode even if it isn't ringing.

7.05 Full-Duplex (Switch 5)

When closed, this switch allows the connection of an external speaker for handsfree conversations on C.O. calls.

7.06 Executive Priority Call Waiting (Switch 6)

When this switch is closed, the station has the ability to signal a station that is busy every time the pound (#) key is pressed (but no more than approximately once every four seconds). Note that activating this feature disables the intercom callback feature.

Stations with a call camped-on, with switch 3 open or in the do-not-disturb mode cannot be signaled.

7.07 Do-Not-Disturb (Switch 7)

When closed, this switch enables you to put your station in the do-not-disturb mode by pressing the HOLD/FWD and the asterisk (*) keys. Placing the operator's extension in do-not-disturb places the system in night ring mode.

8.00 DIAGNOSTICS AND SYSTEM SELF-TESTING (OPTIONAL)

Any RS-232C-compatible terminal can be used to take advantage of the diagnostic and self-testing features of the MPK system.

8.01 TEST Program

This routine will test the Read Only Memory (ROM) and the Random Access Memory (RAM) of the MPK system.

8.02 Online Monitor

This program may be used to access and change the MPK system memory. For this reason, it should be used by qualified personnel only (See Section 340-100-401, Online Monitor.)

8.03 Display Program (DISP)

This routine displays in ASCII characters the activity of the MPK system or an individual station on the terminal or printer. Using this feature, station dialing and command entries may be monitored. To display the DSS commands, the terminal must be set to display normally nonprintable ASCII control characters. (Not all terminals have this capability, see Section 340-100-401, Online Monitor.)

8.04 Enable Error Messages

This diagnostic routine will identify a malfunctioning station. (See Section 340-100-601, SMDR.)

8.05 REST Program

This program restarts the MPK system. All calls in progress and the non-data base Random Access Memory (RAM) entries in the MPK system are cleared by this function.

9.00 SYSTEM RS-232C OUTPUTS

9.01 Station Message Detail Recording (SMDR)

The SMDR printout provides the following information:

Outgoing Calls	Incoming Calls
Station	Station
Number dialed	Account code (optional)
Account code (optional)	Elapsed Time
Elapsed time	C.O. line
C.O. line	

An SMDR message may be up to 40 characters in length. Information is transmitted to the device connected to the RS-232C port on the CPU PCB. SMDR printout of incoming calls is inhibited if system option 1 or 2 is enabled.

9.2 Error Messages

The MPK system displays an error message when improper information is received from any keyset. Refer to Section 340-100-401.

INSTALLATION

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General	3-1	General	3-6
Unpacking	3-1	Installation of Battery Back-Up	3-7
KSU Location	3-1	1.00 INTRODUCTION	
Power Supply Installation	3-2	1.01 General	
System Electrical Test	3-2	This section describes the prodedures required to ensure correct installation of the MPK system. Detailed instructions provide for: cabling, PCB's, wiring, keysets, Direct Station Selector/Busy Lamp Field (DSS/BLF), CPU initialization, Station Message Detail Recording (SMDR) and paging connections.	
2.00 CABLING INSTRUCTIONS	3-2	1.02 Unpacking	
General Requirements	3-2	After unpacking the MPK system, check the packing slip against the equipment received. If equipment is missing, contact INTER-TEL Order Processing.	
Starting the Cabling	3-2	Check all Printed Circuit Boards (PCB's) upon unpacking. All PCB's are fully loaded except the COU PCB. Integrated circuits U20A and U20B will be missing if the COU PCB is equipped for Dual-Tone Multi-Frequency (DTMF) dialing. (Refer to Figure 3-1.)	
Installation Method A	3-2	NOTE: <i>The printed circuit board (PCB) assemblies contain static sensitive components. Keep all PCB's in their protective plastic bags until they are installed in the Key Service Unit (KSU). Handle all PCB's not in the protective bags by the PCB edges only.</i>	
Installation Method B	3-2	1.03 KSU Location	
Central Office (C.O.) Lines	3-2	The objective of determining proper equipment location is to minimize cable run length, and to provide the proper environmental conditions for the KSU. Install the KSU at a site most suitable to meeting the following conditions:	
3.00 PRINTED CIRCUIT BOARD INSTAL- LATION	3-3	A. Availability to 105-125V 60HZ 15 amp single phase power.	
Central Processor Unit (CPU) PCB	3-3	B. Location within 25 ft. of the Central Office (C.O.) line terminations.	
Central Office Unit (COU) PLB	3-3	C. The ambient temperature does not exceed 32° F to 100° F. (80° maximum room temperature.)	
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- D. The KSU is not located near any strong magnetic fields, such as heavy motors or large copy machines.
- E. AC power from a dedicated circuit breaker.
- F. Placement of the KSU more than 4 in. from all walls.

1.04 Power Supply Installation

It is recommended that the power supply be mounted approximately 4 in. above the KSU. (Refer to Figure 3-2.) Connect the power cable between the power supply and the KSU.

NOTE: Do not force the connectors; they are keyed for proper insertion to prevent incorrect connection.

1.05 System Electrical Test

- 1. Check the value of the following fuses in the power supply:

FUSE	VOLTAGE	MPK/I	MPK/II
F1	115VAC	2 Amp	4 Amp
F2	+36VDC	3 Amp	5 Amp

- 2. Plug the AC line cord into a source of 105-125 VAC power.

NOTE: Ensure that the electrical outlet is on a separate dedicated circuit breaker.

- 3. At this point in the test procedure no PCB's should be installed in the KSU.
- 4. Apply power to the system by placing the ON/OFF switch in the ON position.
- 5. With a Digital Voltmeter (DVM) measure the following voltages on the inside of the backplane of the KSU. (Refer to Figure 3-3 for test locations.)

+30V ± 5.0V TP1 to TP2
-12V ± 1.0V TP3 to TP4
+5V ± 0.25V TP5 to TP4

NOTE: If the measured voltages are not within specified tolerances, do not proceed. Severe damage will occur if a PCB is inserted with improper voltages present. Contact INTER-TEL Field Service for assistance.

- 6. If system voltages are within tolerances, remove AC power by moving the ON/OFF switch to the OFF position.

2.00 CABLING INSTRUCTIONS

2.01 General Requirements

Two methods used for installing MPK stations are described below. Select the method best suited for your requirements.

2.02 Starting the Cabling

Standard floor plans should be developed to aid in proper station wiring. A cable identification plan must be utilized.

Using telephone industry standard three-pair cable, place a run to each location shown on the floor plans. Both ends of every cable must have identical markings to prevent cable interchange.

NOTE: Avoid cable runs parallel to light fixtures or to AC lines not in conduit.

Terminate the station end of the cable on standard modular connecting blocks, either surface-mounting or flush-mounting. (Refer to Figure 3-4 or 3-5.)

2.03 Installation Method A

Installation method A requires a special crimping tool (part no. MCT-6S) and specially designed modular connectors for use with standard solid copper 24 gauge wire (part no. 624). The crimping tool and solid modular connectors are manufactured by Futureonics Inc. and are available through most suppliers. (Refer to Figure 3-6 for typical layout.)

2.04 Installation Method B

Installation method B requires a special 66 type connecting block with 16 six-pin modular jacks (part no. S66M450-MPK). This block is manufactured by Siemon Co. and is available through most suppliers. (Refer to Figure 3-7 for typical layout.)

2.05 Central Office (C.O.) Lines

To install the C.O. lines run a two-pair standard cable (one for each two C.O. Lines) from the telephone company terminal to a modular connecting block at the KSU. Using a double-ended modular cable (standard 6 ft. four-conductor modular-to-modular base cord is recommended), connect the C.O. lines to the KSU. (Refer to Figure 3-8.)

3.00 PRINTED CIRCUIT BOARD INSTALLATION

3.01 Central Processor Unit (CPU) PCB

To install the CPU PCB (340.10) proceed as follows:

1. Inspect the CPU PCB for loose integrated circuits or shorted component leads.
2. Check the rear (solder side) of the PCB to ensure there is no shipping foam or tape attached to the card.
3. Activate onboard battery by moving the miniature shorting clip so as to short the two pins closest to the card edge. (Refer to Figure 3-9.)
4. Verify that the CPU function DIP switches (DS) are in the proper positions. (Refer to Figures 3-9 and 3-10.)
5. Install the CPU PCB with the components facing left in the slot marked "CPU" in the KSU.
6. Apply power to system.
7. Observe the flash rates of the light-emitting diodes (LED's). The flash rates of the LED's will indicate the proper operation of the CPU PCB. The flash rates should be as follows:

LED DS-1 flashes about 5 times a second.

LED DS-2 flashes about 2 or 3 times a second.

LED DS-3 almost constantly on.

LED DS-4 off.

8. If LED DS-4 is illuminated, the system has had a watchdog timer interrupt. Momentarily close function switch 2 (RESET) then return it to the open position. This will reset the CPU and place it in the proper operating mode.

NOTE: If the above operation does not extinguish LED DS-4, replace the CPU PCB or contact INTER-TEL Field Service.

3.02 Central Office Unit (COU) PCB

A. To install the COU PCB (340.20), proceed as follows:

1. Inspect the COU PCB for any shorted leads or loose integrated circuits.

2. Determine if the local central office is equipped for DTMF dialing. If it is, the following integrated circuits will be deleted: U20A and U20B. (Refer to Figure 3-1 for component location).

3. Install the COU PCB with the component side facing left and in the first available COU slot to the right of the CPU PCB. (Refer to Figure 3-1 for PCB location).

4. Repeat this procedure for every COU PCB in the system.

5. Each COU PCB contains two interface circuits.

B. To connect the central office lines to the COU PCB modular jack assembly, proceed as follows:

1. Route a two-pair feeder cable from the central office distribution block to the modular connecting block mounted on the KSU backboard for every two C.O. lines. (Refer to Figure 3-8.)

2. Using a four-conductor modular-to-modular cable, connect the COU PCB to the modular connecting block.

3. Each COU PCB will service two lines.

3.03 Station (STN) PCB

A. To install the STN PCB (340.30), proceed as follows:

1. Inspect the STN PCB for shorted leads or loose integrated circuits.

2. Install the STN PCB with the component side facing left and in the first available slot to the left of the card file labeled "STN." (Refer to Figure 3-2 for the PCB location.)

3. Repeat for every additional STN PCB in the system.

NOTE: Each STN PCB contains four circuits.

4. Station numbering is 10 thru 25 on MPK/I and 10 thru 41 on MPK/II. The top modular jack on the first STN PCB is station 10, the second from the top is 11, and so on.

B. To connect the STN PCB to INTER-TEL MPK keysets proceed as follows:

C. Method A

1. Method A requires the use of specialized six-conductor modular plugs connected directly to the MPK station PCB. (Refer to Figures 3-4 and 3-6.)
2. Connect the modularized station cable directly into the associated PCB.
3. Repeat steps 1 and 2 for all stations.

D. Method B

1. Method B requires the use of a special 66 type (S66M450-MPK) connecting block. (Refer to Figure 3-7.)
2. Connect the modular-to-modular six-conductor cable from the modular station jack to the associated STN modular jack.
3. Repeat step 2 for all stations.

3.04 Conference (CNF) PCB

A. To install the CNF PCB (340.40) proceed as follows:

1. Inspect the CNF PCB for any shorted component leads or loose integrated circuits.
2. Install the CNF PCB in the slot marked "CNF." (Refer to Figure 3-2.)

NOTE: The CNF PCB contains two conference circuits.

4.00 STATION WIRING TEST

4.01 General

Before installing any telephone instruments, make a complete system wiring test as follows:

1. With a digital voltmeter measure across the RED and GREEN wires in the modular connecting block at the station end. The voltage should be $+30\text{VDC} \pm 5\text{V}$ (RED being positive). If the voltage is not present, trace all associated wiring back to the KSU.

2. Measure the voltage across the YELLOW and BLACK and the BLUE and WHITE wires. There should be NO voltage present. If a voltage is present, trace all associated wiring back to the KSU.

3. Measure the resistance from the YELLOW wire to the BLACK wire. Also measure the resistance from the BLUE wire to the WHITE wire. If the resistance measures higher than 80 ohms, trace all associated wiring back to the KSU.

4. Repeat steps 1, 2, and 3 for all station wires.

5.00 KEYSSET INSTALLATION

5.01 General

The purpose of this section is to provide sufficient information to program and install the 416T MPK/I and the 1032T MPK/II keysets.

5.02 Keyset Options

Before any electrical connection is made between the KSU and the keyset, the option switches located within the keyset must be selected. To gain access to the option switches, proceed as follows:

1. Remove the woodgrained faceplate by pushing the spring-loaded tab at the top of the faceplate backwards, and lifting the top of the faceplate.
2. Remove the top cover of the telephone instrument which is held in place by two Phillips head screws.
3. Carefully bend the two locking tabs which protrude through the top of the keyboard and LED assembly; lift the board up; and slide forward.

NOTE: The board has an attached ribbon cable. Care should be taken not to break or dislodge this cable.

4. Lift the board out of the keyset assembly.
5. Locate the DIP switch assembly. (Refer to Figure 3-13.)
6. Refer to Figure 3-11 for switch selectable keyset options.

NOTE: Unplugging and then re-plugging in the keyset is necessary to activate changes in the DIP switch options.

5.03 Instrument Installation

Installation of the 416T or the 1032T keysets consists of inserting the three-pair modular mounting cord into the modular jack assembly.

5.04 Voltage Regulator Setting

1. With the keyset still disassembled (refer to Figure 3-13), place a digital voltmeter across diode VR2. Adjust potentiometer R67 until a reading of $+5.0 \pm .01$ VDC is obtained.
2. Reassemble the instrument.

5.05 Speakerphone Installation

To convert a keyset for full-duplex speakerphone operation proceed as follows:

1. Disconnect the instrument mounting cord.
2. Remove the wall mount adapter (baseplate) from the bottom of the keyset.
3. Remove the modular shorting plug from the modular jack in the base of the keyset.
4. Insert the external speaker modular plug into this jack.
5. Remove the woodgrained faceplate by pushing the spring-loaded tab at the top of the faceplate backwards, and lifting the top of the faceplate.
6. Carefully bend the two locking tabs which protrude through the top of the keyboard and LED assembly; lift the board; and slide forward.
7. Lift the board out of the keyset assembly.
8. Locate the DIP switch assembly. (Refer to Figure 3-13.)
9. Enable the full-duplex speakerphone DIP switch. (Refer to Figure 3-11.)
10. Reassemble the keyset.
11. Reconnect the keyset mounting cord.

6.00 DIRECT STATION SELECTOR/BUSY LAMP FIELD (DSS/BLF)

6.01 Installation

To install the DSS/BLF (model 3030D or 3532D) proceed as follows:

1. Remove the wall mount adapter (baseplate) from the DSS/BLF.
2. Connect one end of the 24-inch 3-pair cable to the receptacle labeled "TO STA," and a 6-foot power cable to the receptacle labeled "TO POW." (Refer to Figure 3-14.)
3. Install the 3-pair cable and the power cable as shown in Figure 3-14.
4. Remove the modular connector located on the rear of the keyset and connect it to the connector labeled "From KSU" on the DSS/BLF.
5. Connect the 24-inch 3-pair cable to the keyset.
6. Attach the spade lugs on the DSS/BLF power cable to the screw connectors marked "LOAD" on the step-down transformer supplied with the DSS/BLF.
7. Connect the step-down transformer to a 117 VAC 60 HZ outlet.

6.02 Installation with Optional System Battery Back-Up or Without an AC Outlet.

For a system with optional system battery back-up, or for a system without access to an AC outlet, perform the following:

1. From the base of the DSS/BLF, remove the transformer and the transformer power cable. (See Figure 3-15 or 3-16.)
2. From inside the DSS/BLF, remove the two-wire power connector from the housing labeled "TO POW."
3. Complete the removal of the power connector by removing the red wire and the green wire from connectors 13 and 14.
4. Run jumpers from connector 1 to connector 13 and from connector 2 to connector 14.

6.03 Voltage Regulator Setting

1. Disassemble the DSS/BLF
2. Measure the voltage across CR4 with a DVM. (Refer to Figures 3-15 and 3-16). Adjust potentiometer R5 for a level of $5.0 \text{ VDC} \pm 0.01 \text{ V}$.
3. Reassemble the DSS/BLF

7.00 CPU INITIALIZATION ROUTINE

To initially program the MPK System, perform the following procedure. (Refer to Figure 3-9 and Figure 3-10.)

1. Place all CPU PCB switches in the OPEN position.
2. Place function switch 4 (TEST) in the CLOSED position momentarily, and return it to the OPEN position.

NOTE: If the CPU fails the test (i.e., the 4 LED's on the CPU fail to light within 30 seconds after the test sequence begins, this indicates a defective CPU card. Contact INTER-TEL Field Service for assistance.

3. Turn the MPK Power Supply OFF then ON.
4. Momentarily place function switch 3 (INIT) in the CLOSED position, then return it to the OPEN position. This completes the MPK initialization sequence.

8.00 OPTIONAL STATION MESSAGE DETAIL RECORDING (SMDR)

8.01 Installation

Plug the standard INTER-TEL printer cord with the RS-232 connector directly into the receptacle on the front of the CPU PCB. (Refer to Figure 3-9 and Figure 3-17.)

9.00 PAGING CONNECTIONS

9.01 Internal Paging

The internal paging zones and the all page feature have been incorporated into the MPK system. (Refer to Figure 3-12 for internal paging zone assignments.)

- A. Any station may page any zone.

- B. Any station may perform an all page.

9.02 External Paging

External paging is provided via the use of a station circuit. To install external paging proceed as follows:

1. Run a jumper cable between a modular six-conductor connecting block and the circuit connector on the STN PCB.
2. Short the receive pair on the modular connecting block and connect it to the +36 VDC screw terminal. (Refer to Figure 3-18.)
3. Using a 500 ohm to 8 ohm audio transformer, connect the 500 ohm side to the transmit pair on the connecting block.
4. Connect the 8 ohm side of the transformer to the amplifier input.
5. To access external paging, dial the station number used as the amplifier input.

10.00 OPTIONAL MUSIC-ON HOLD (MOH) MODULE

10.01 Installation

To install the optional MOH module, proceed as follows:

1. Remove the synthesized music IC from socket U31. (Refer to Figure 3-9.)
2. Remove the two screws and nuts which mount the RS-232 connector to the CPU PCB.
3. Carefully insert the 16-pin connector of the MOH module into socket U31.
4. Insert the two mounting screws through the back (solder side) of the CPU PCB and into the MOH PCB.

11.00 OPTIONAL BATTERY BACK-UP

11.01 General

The MPK system may be provided with battery back-up. Battery back-up supplies power automatically to the KSU if the main AC voltage drops below the KSU power supply regulator limit. Batteries used should be of the gell-cell type.

11.02 Installation of Battery Back-Up

To install battery back-up, proceed as follows:

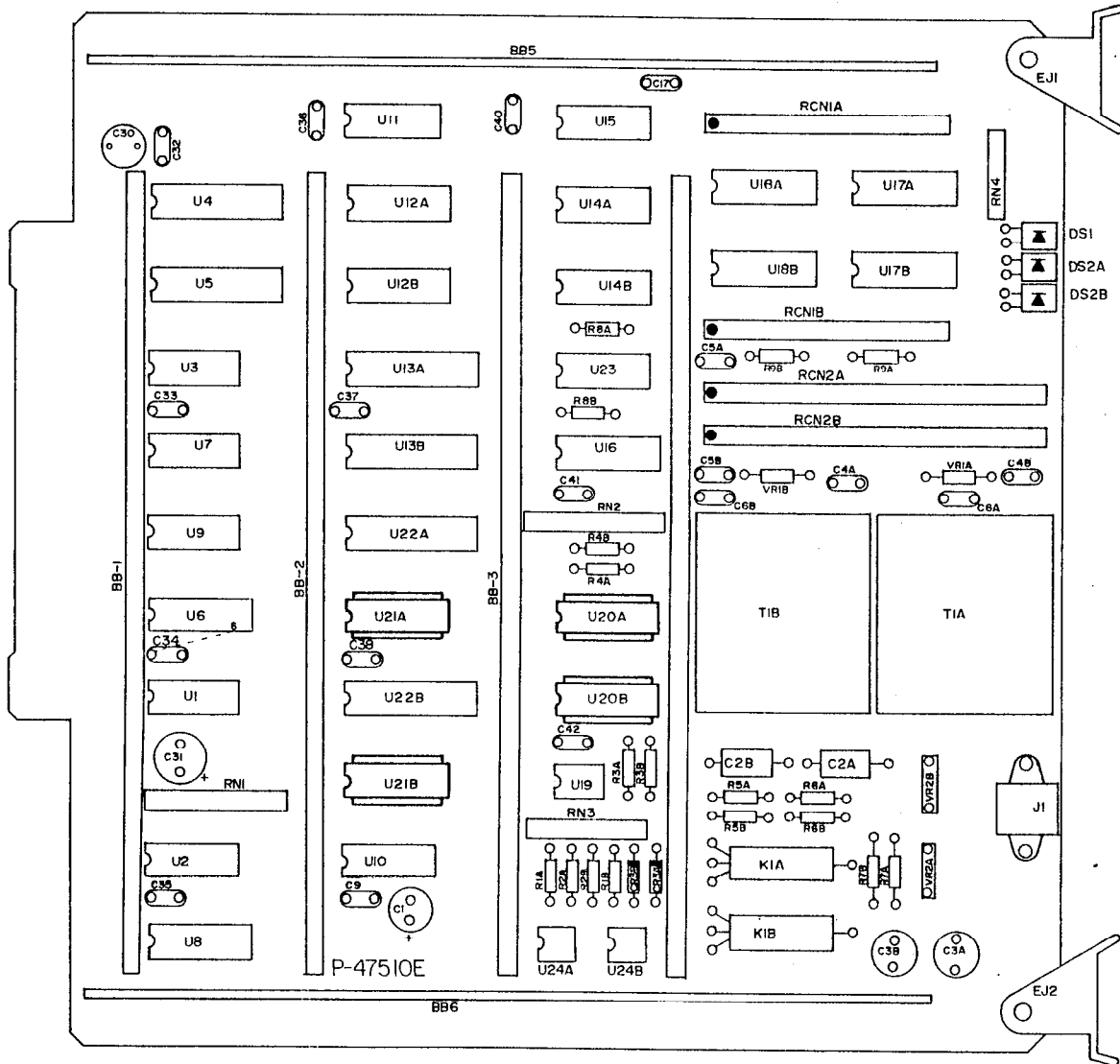
CAUTION: Make sure that the 680.06 power supply is on before connecting battery back-up. Do not place batteries inside the KSU cabinet or a sealed container. Adequate ventilation must be maintained because batteries give off gas.

1. Make sure that the (+) and (-) battery wires are connected to the power supply.
2. Turn on the AC power to the KSU.
3. Measure and adjust the float voltage to $+27\text{VDC} \pm 0.1$.

NOTE: The float voltage should be measured at the polarized connector located on the battery. Adjust this voltage with a DVM which has an accuracy of 0.01VDC.

Figure 3-19 is provided to determine the battery ampere/hour rating to be used per system configuration.

4. Make sure the battery switch is off.
5. Connect the polarized connector to the 24VDC battery pack.
6. Make sure that the battery light is on.
7. Turn the battery supply switch on.
8. Wait approximately 2 hours for the battery pack to partially charge.
9. Turn off the AC power to the KSU.
10. Make sure that the battery light is on and that the system is operating.
11. Turn on the AC power.



DTMF U21 - 2559 OR 5086
 U20 - VACANT

ROTARY U21 - 5098
 U20 - 4049

Figure 3-1. COU PCB

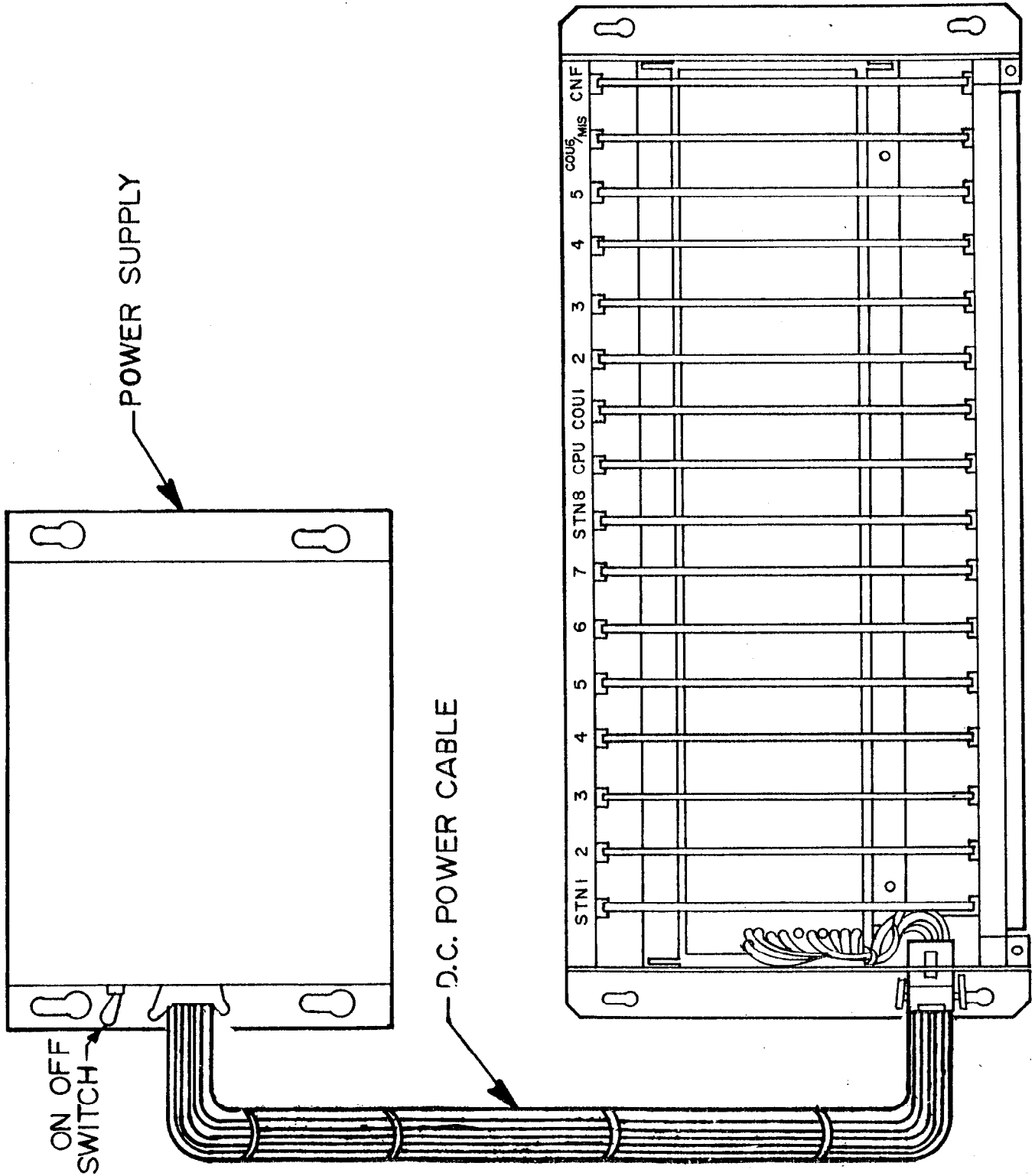


Figure 3-2. MPK/II KSU Power Supply

MPK KSU
BACKPLANE
FRONT

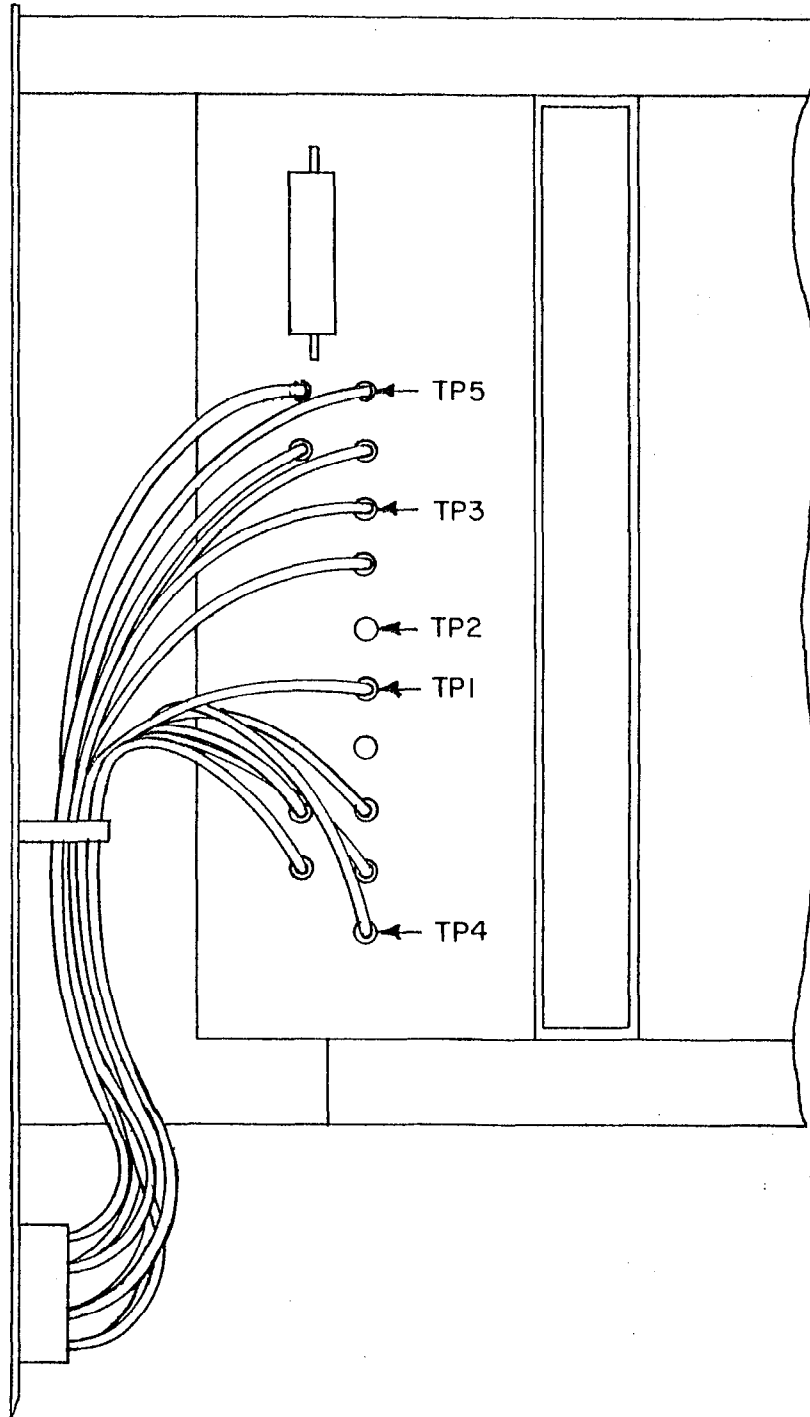


Figure 3-3. KSU Voltage Test Points

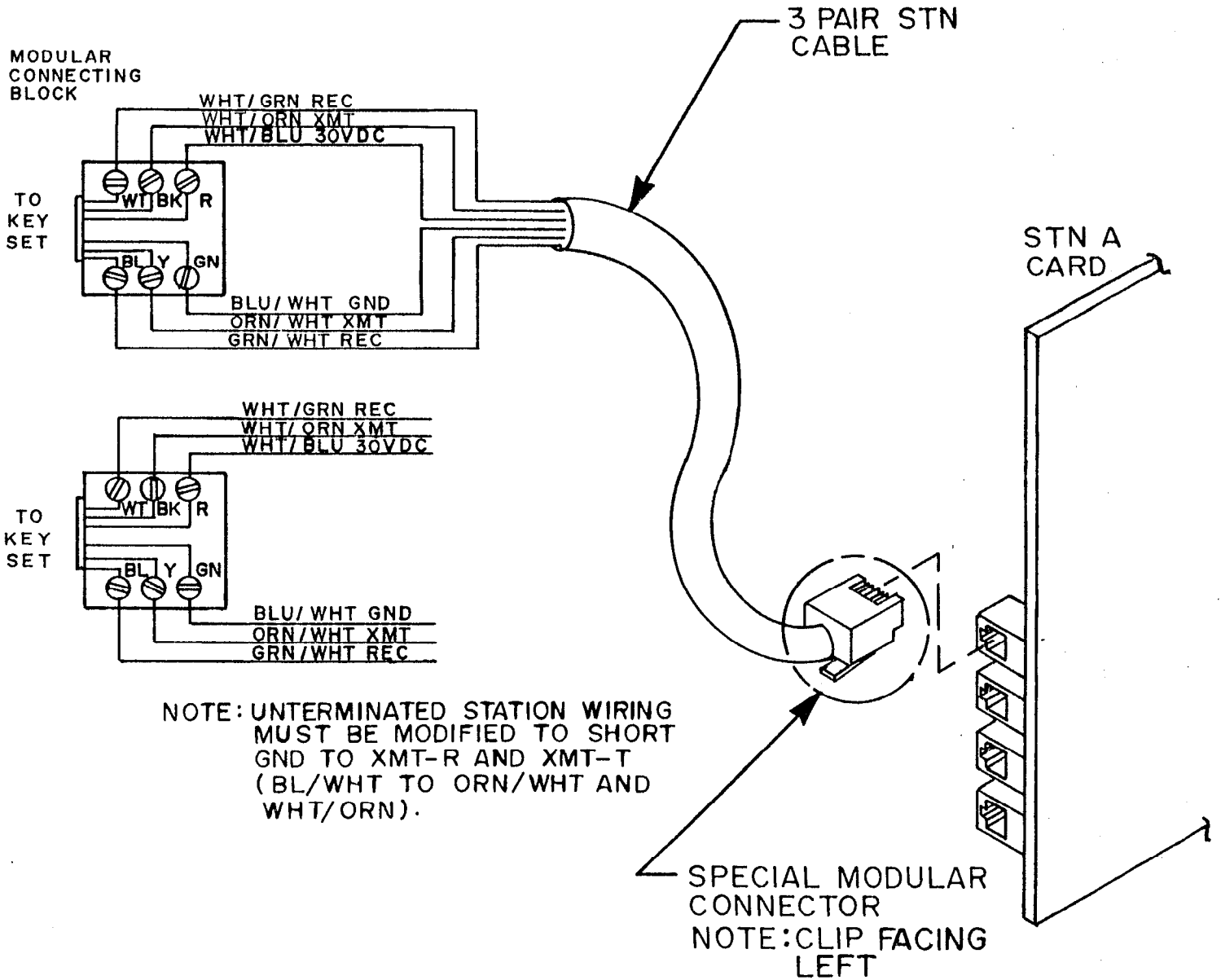


Figure 3-4. Method A Station Cable Termination

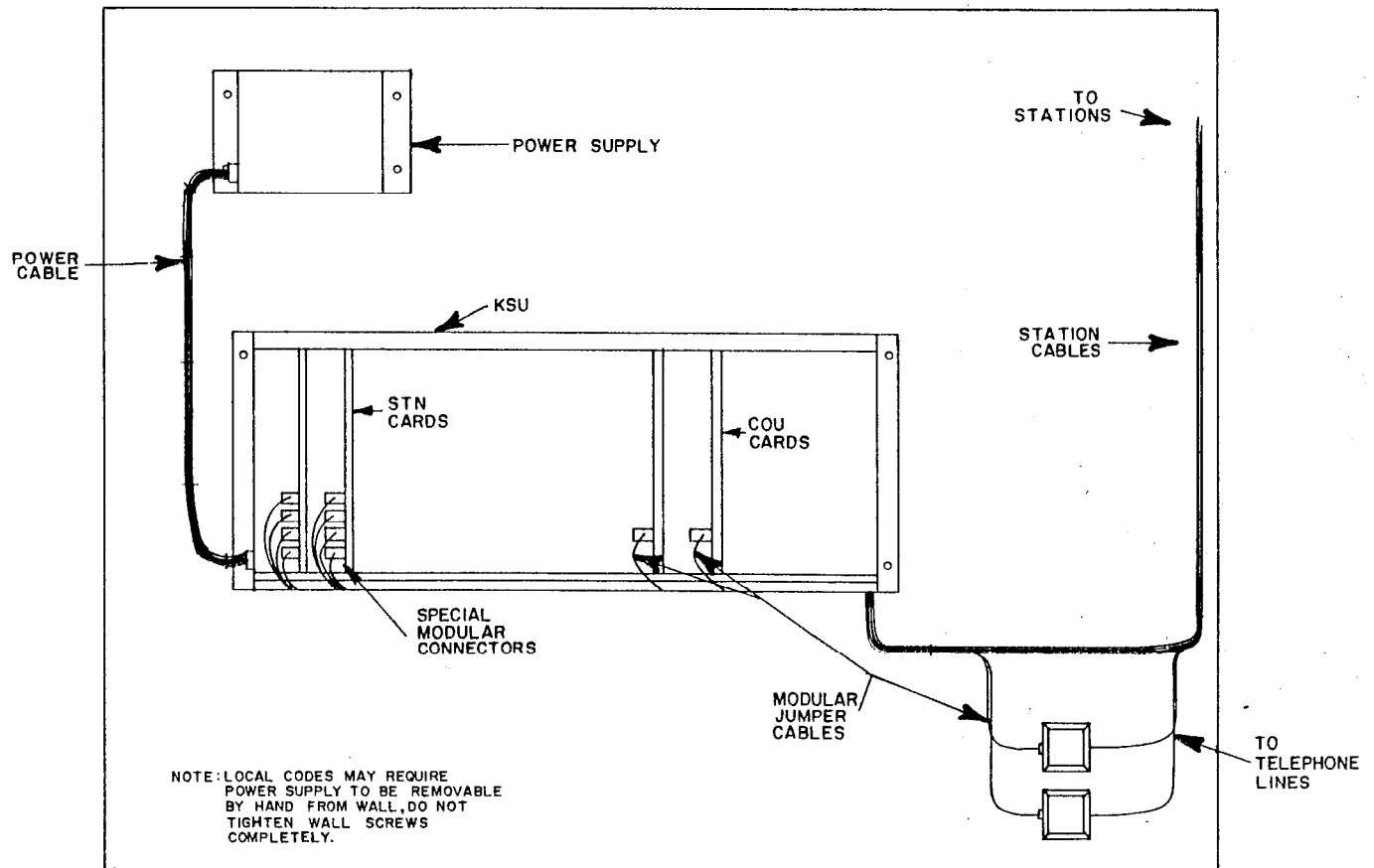


Figure 3-6. Method A Backplane Layout

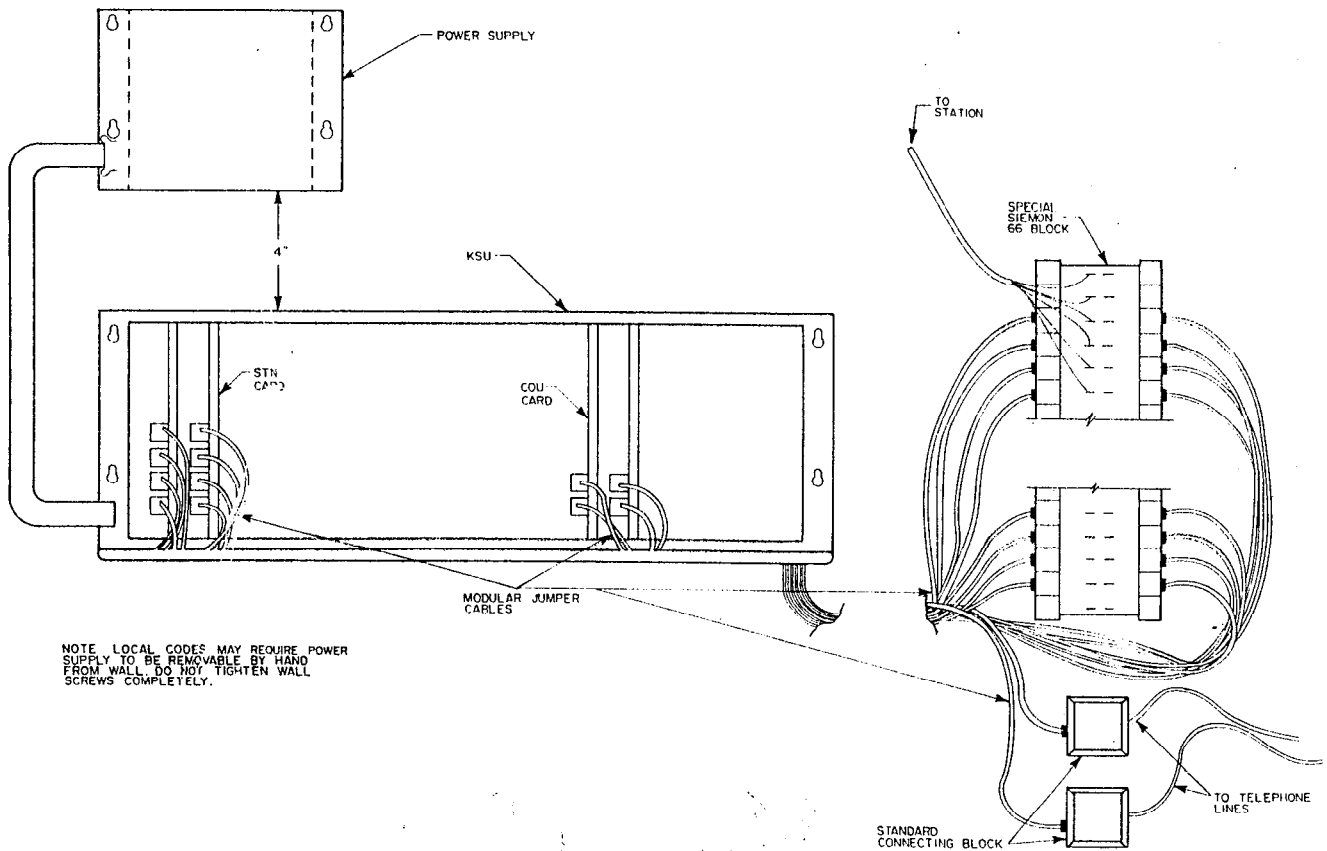


Figure 3-7. Method B Backplane Layout

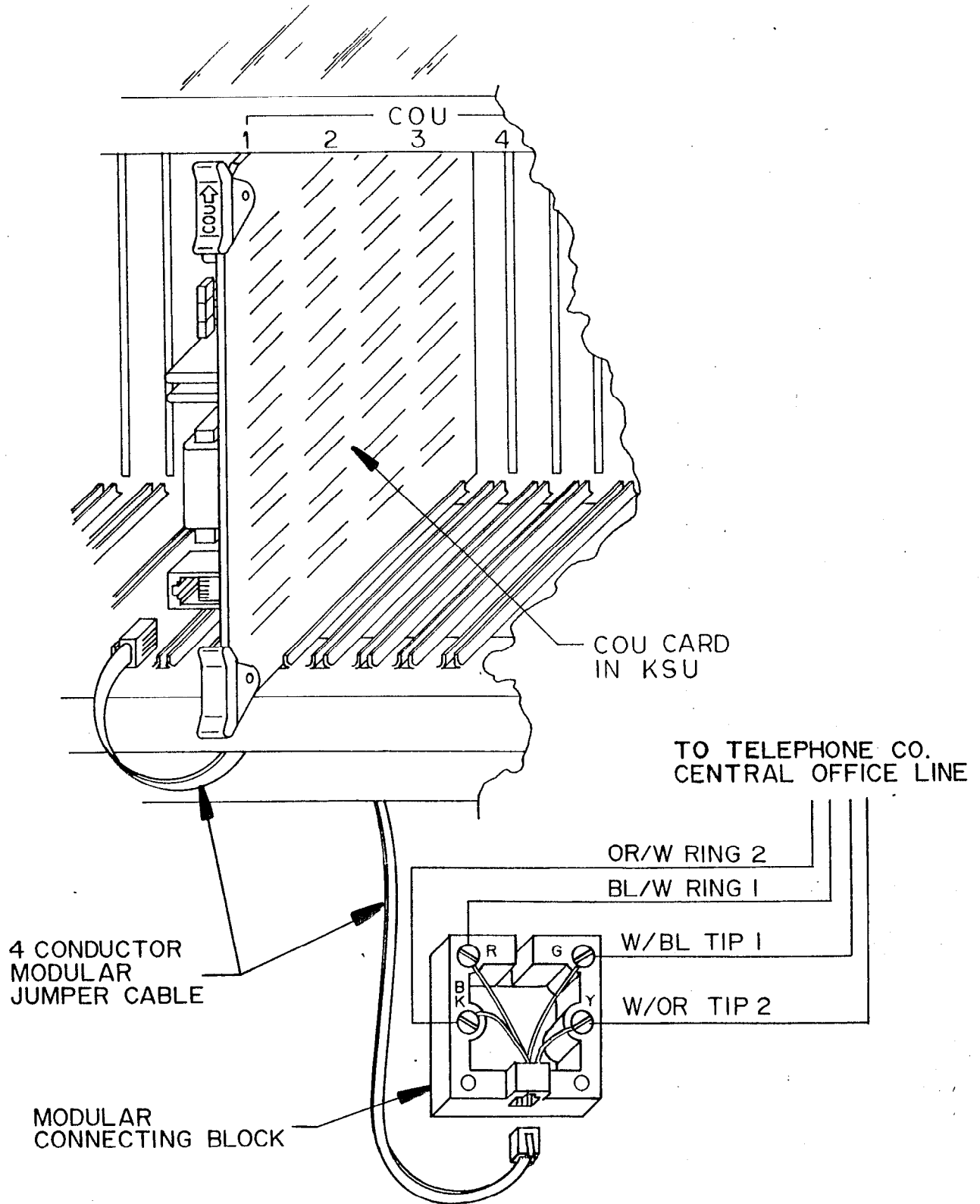


Figure 3-8. COU Connection To C.O. Lines

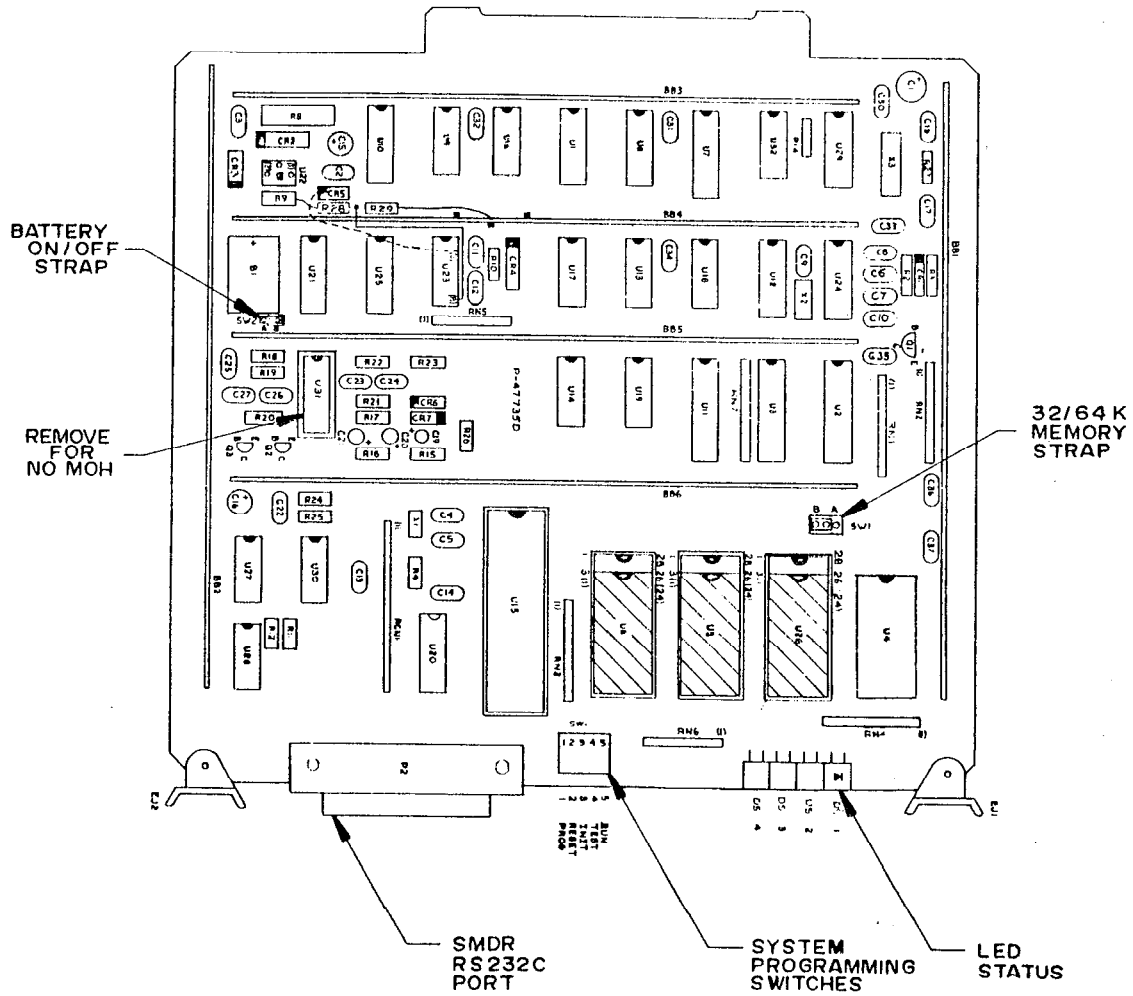


Figure 3-9. CPU PCB

Switch	Function	Initial Position
1	PROGRAM	Open
2	RESET	Open
3	INIT	Open
4	TEST	Open
5	RUN (Unused)	Open

Figure 3-10. CPU PCB Switch Positions

Switch Position	Option
4 → 1	Digit 1 Dial
2	Speed Transfer
3	Off-Hook Ring
4	Night Station
3 — 5	Full-Duplex Speakerphone
2 — 6	Executive Priority
1 → 7	Do-Not-Disturb

Figure 3-11. Keypad Switch-Selectable Options

NOTE: "ON" is closed or active;
"OFF" is open or inactive
Options 1, 3 and 7 are set "ON" at the factory.

Paging Zone	Activation Method	Extension Affected	
		MPK/II	MPK/I
Zone 1	* 1	10-19	10-19
Zone 2	* 2	20-25	20-25
Zone 3 (MPK/II Only)	* 3	30-39	Not Used
Zone 4 (MPK/II Only)	* 4	40-41	Not Used
All Page	* 5	All	All
	SPCL (MPK/II)	All	

Figure 3-12. Internal Paging Zones

KEYSET VOLTAGE ADJUSTMENT

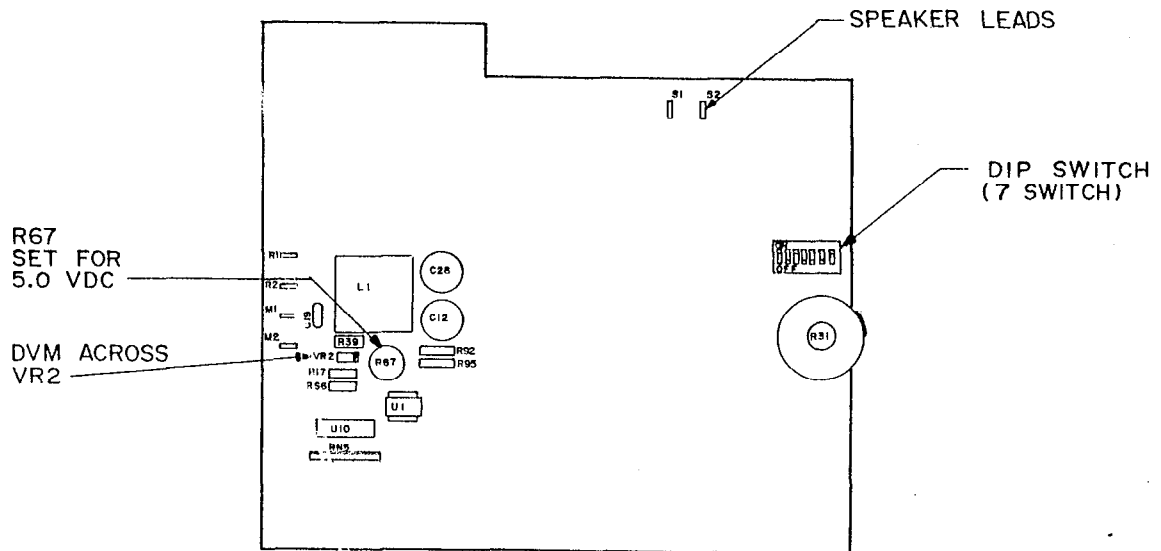


Figure 3-13. Keyset Voltage Adjustment

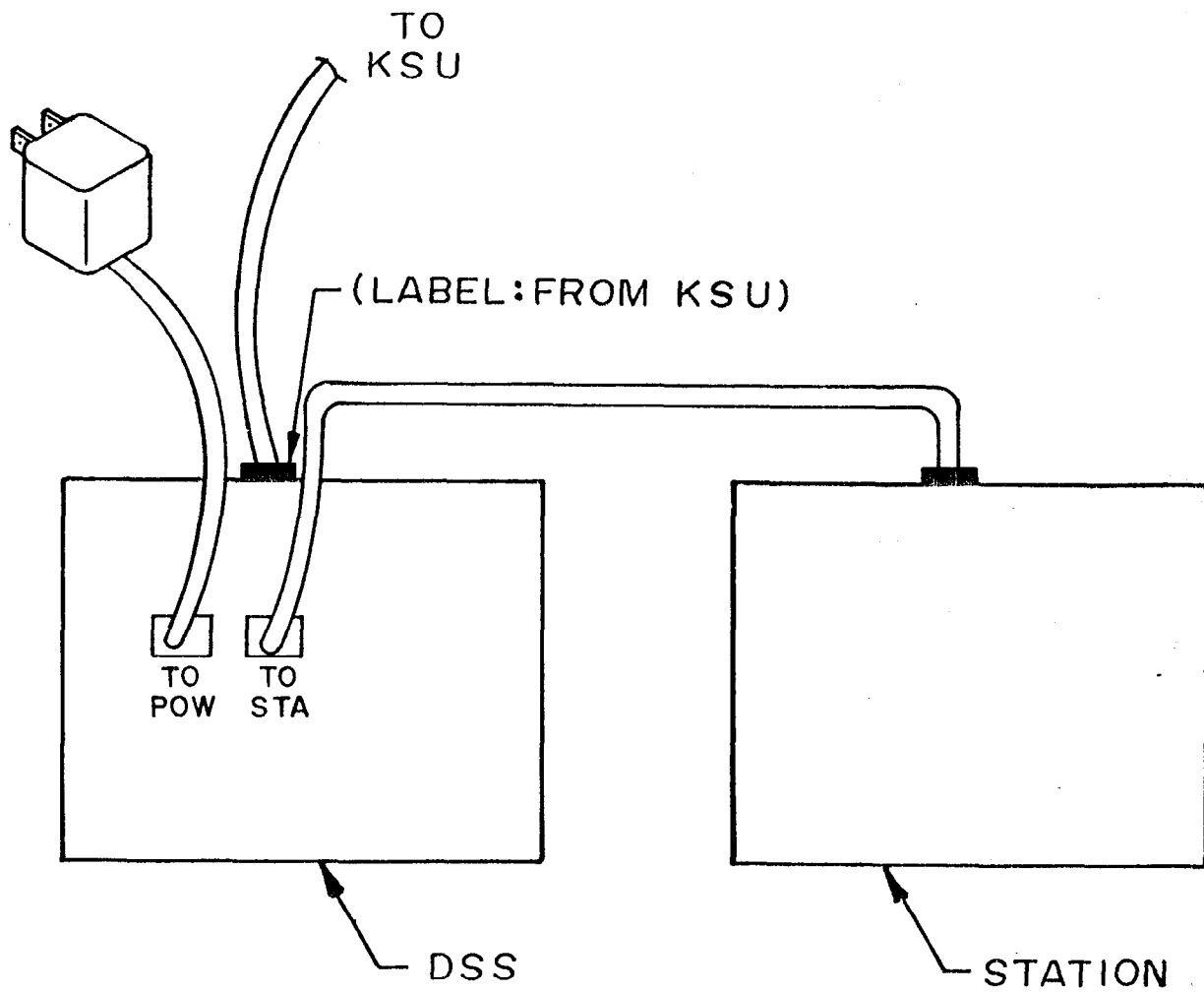
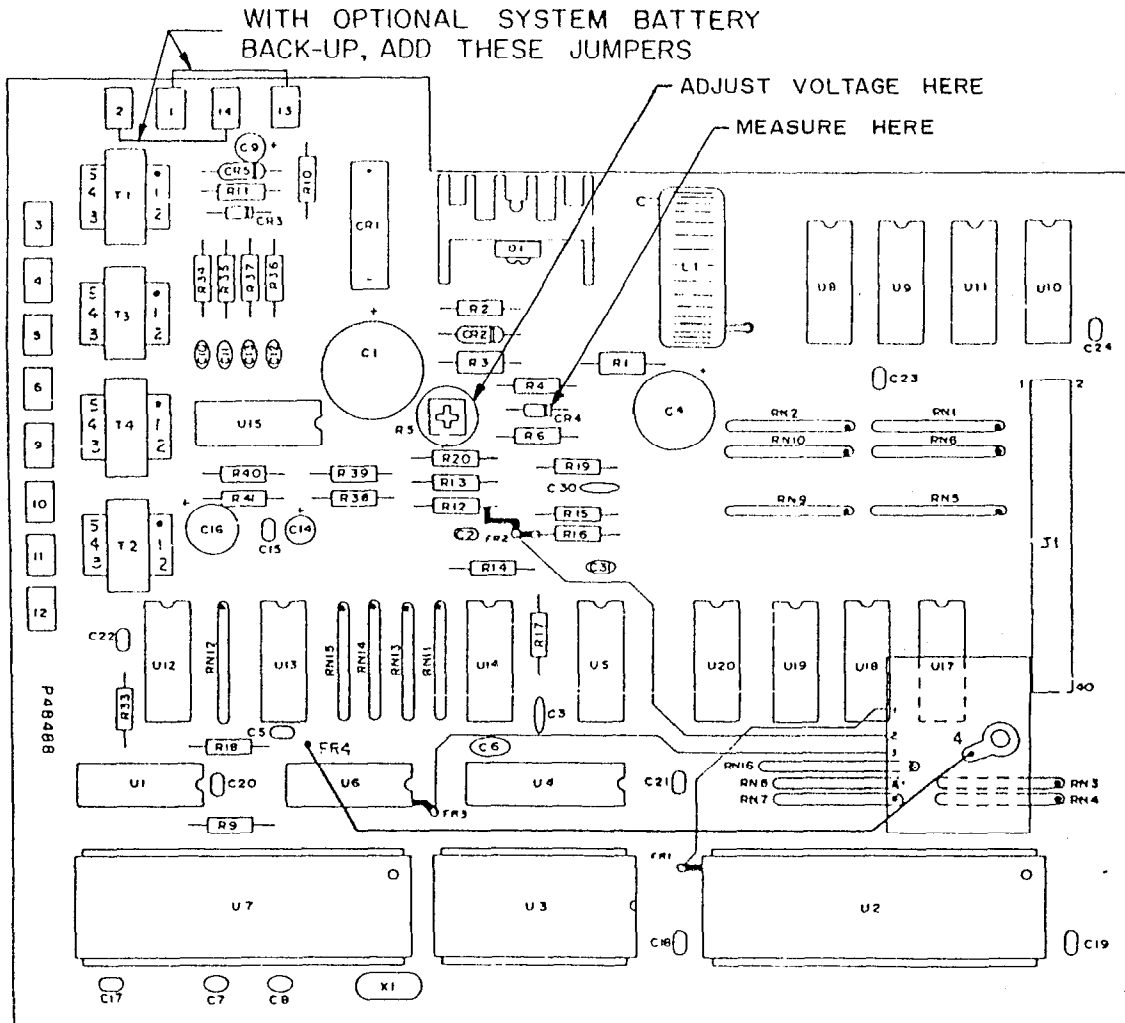


Figure 3-14. DSS/BLF Connections



**Figure 3-15. 3030D DSS/BLF (With Fast Reset) Voltage Adjustment
 and Optional Battery Back-Up**

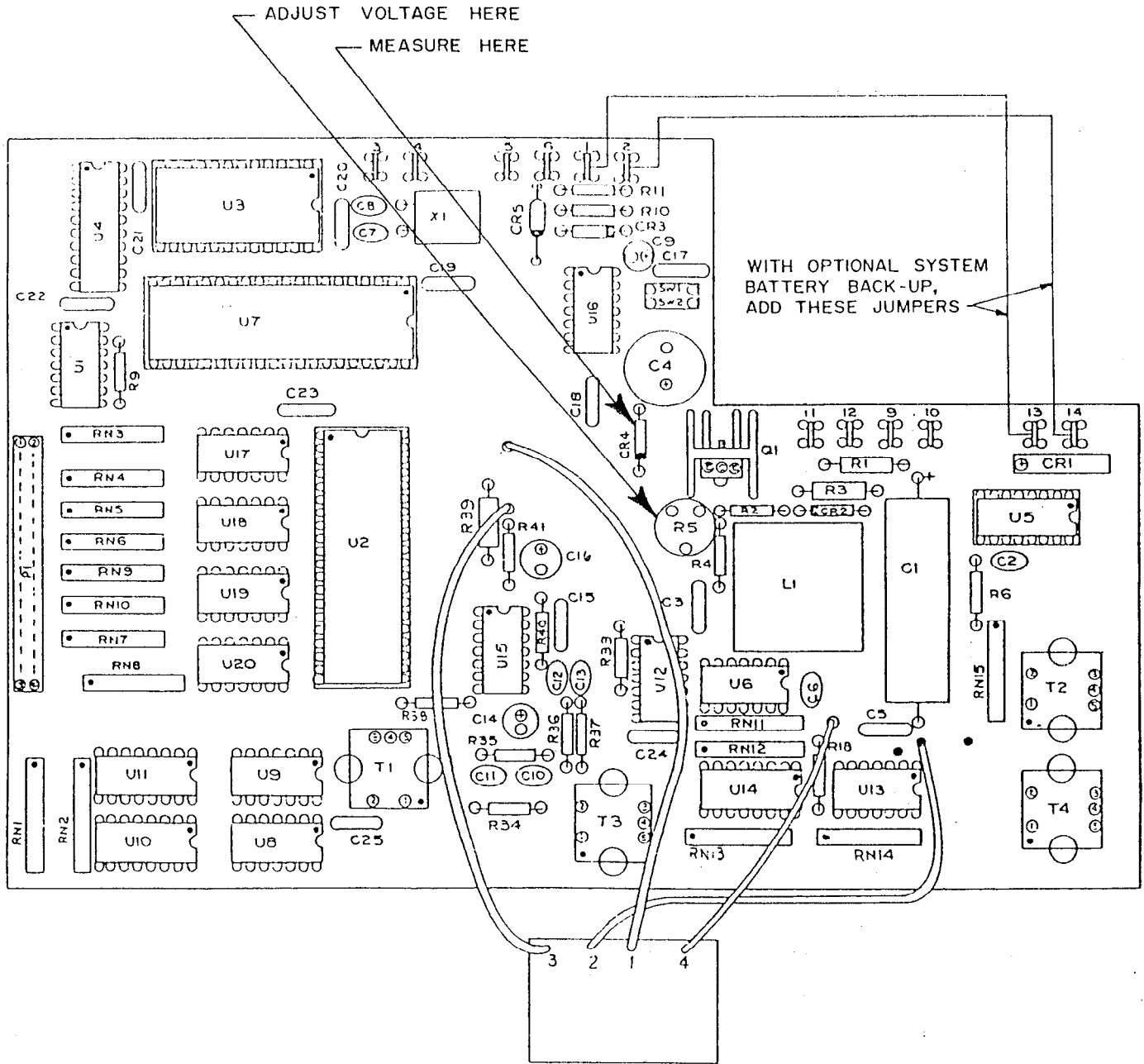
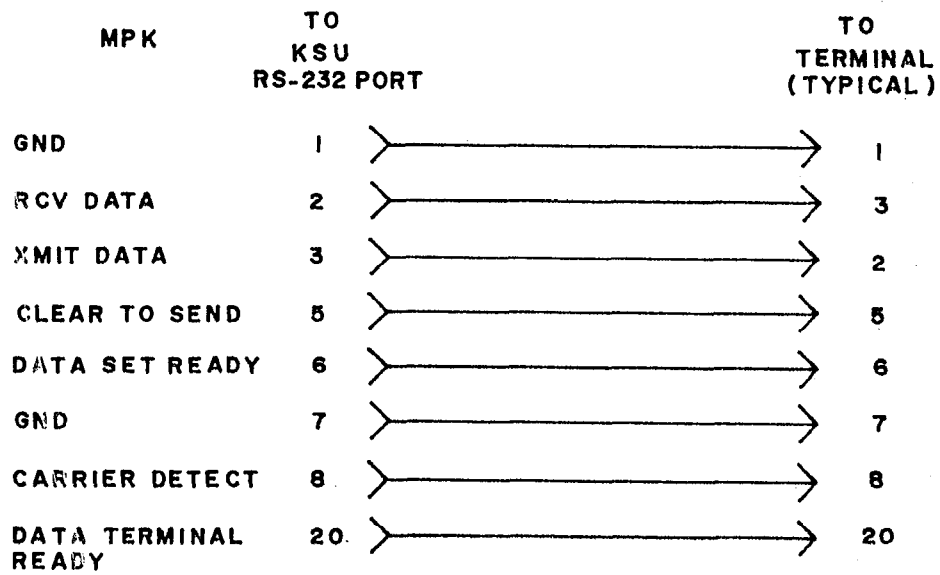


Figure 3-16. 3532D DSS/BLF (With Fast Reset) Adjustment and Optional Battery Back-Up



CONNECTOR TYPE
 AMPHENOL P/N 17-20250-1
 OR EQUIVALENT

Figure 3-17. RS-232 Cable Connection

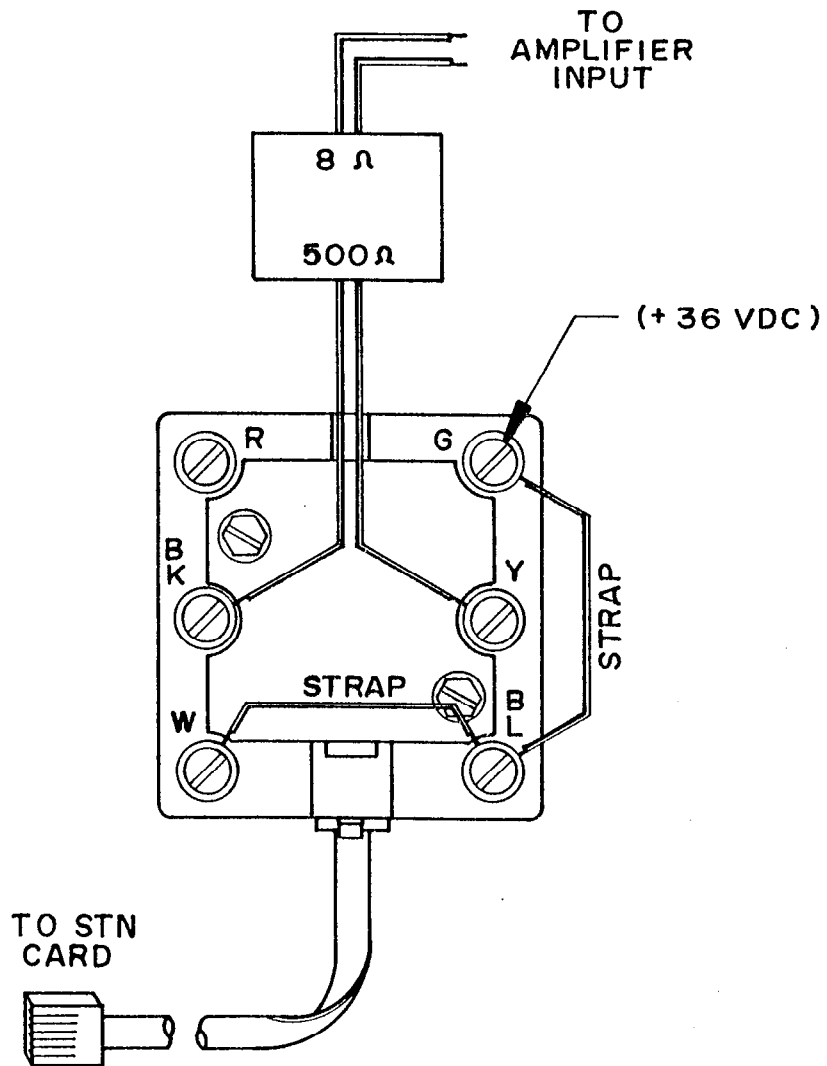


Figure 3-18. External Page Connection

Calculation of Battery Current

PCB	QTY	Current/PCB	Total PCB Current
CPU	1	0.57	0.57
CNF	1	0.13	0.13
COU	2	0.10	0.20
STN	4	0.64	2.56

Total Current to be drawn from battery = 3.46 amps

Required Battery Back-Up Capacity

(amp/hours)

Back-Up Time (Hrs)

	1	2	3	4	5	6	7	8	9	10
1	2	3.5	4	5.5	6	8.5	9.5	10	10.5	11
2	4	7	8	10.5	12	17	19	20	21	22
3	6	10	12	16	18	25	28	30	31.5	33
4	8	14	16	21	24	34	37	40	42	44
5	10	17	20	27	30	42	46	50	52	54
6	12	20	24	32	36	50	55	60	63	66
7	14	24	28	37	42	59	64	70	73	76

**System
Current
(amps)**

Figure 3-19. Back-Up Battery Amp/Hour Calculation

PROGRAMMING

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4.00 DIAGNOSTICS (OPTIONAL)	4-5
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1.00 INTRODUCTION

1.01 General

This section describes how to program the MPK system to perform features and functions unique to the individual customer. This programming procedure must be performed on initial set up or after power has been off for more than 25 days. Normally, the automatically recharged battery will protect the programmed information for approximately 25 days. The system can be reprogrammed without affecting operation. Any programming changes made while a call is in progress will not become active until after the call is completed. Some maintenance programming can affect system operation. Therefore, a certain degree of caution must be exercised when programming. Figure 4-1 lists all MPK options which are described in this practice.

1.02 Programming Terminal

Programming of the MPK system can be performed through the five function switches that are located on the CPU board, individual station set keypads and line keys; therefore the use of a programming terminal is not necessary. However, the MPK CPU may be accessed by a programming terminal for diagnostic testing if desired. Refer to Section 4.00, Diagnostics.

2.00 ON-SITE PROGRAMMING

2.01 KSU Setup

The CPU PCB has two programming options available to it. These options are:

- A. 32/64 Memory Jumper. This jumper allows the use of either a 32K or 64K BIT ROM memory for 1 of the ROM slots available. With the jumper set in the upper position, the CPU PCB is compatible with a 32K BIT ROM in the slot, and in the lower position, a 64K BIT ROM. The jumper is set at the factory and should not be changed.
- B. Battery ON/OFF Jumper. The battery ON/OFF jumper is shipped in the OFF position. After placing the jumper in the ON position and allowing time for the battery to charge (two days for full charge), power may be removed from the CPU without loss to data. The battery will provide protection for the programmed data base for approximately 25 days with a fully charged battery.

2.02 Major Programming Areas

The MPK system contains five major programming areas, TEST, REST, PROGRAM, RUN, and INIT, which may be accessed by the programmer via the function switches located on the CPU PCB. (See Section 340-100-300, Figure 3-10.) The definitions of these programming areas are:

- A. PROGRAM. This program places the MPK system in its programming mode. This mode permits entry of station and system options. Activate PROGRAM by closing function switch 1 on the CPU PCB.
- B. REST (Restart). This program restarts the 6801 microprocessor without cycling power or affecting the data base. It is primarily a maintenance routine used to restart the system after a watchdog timer interrupt has occurred. Activate REST by momentarily closing function switch 2 on the CPU PCB. This extinguishes the watchdog timer LED (DS4) on the CPU PCB.

CAUTION: This program drops all calls in progress.

- C. INIT (Initialize). This program places the MPK system in its basic mode of operation as described below. Activate this program by closing function switch 3 on the CPU PCB.

- All keysets can gain access to all outside lines.
- The operator's station (ext. 10) will be the only keyset that will ring in audibly for incoming calls. All others will just flash.
- Message center is station 10.
- There will be no options on any telephones.
- The transfer recall time is 60 seconds.
- The hold recall time is 60 seconds.
- No number has been designated as an absorbed digit.
- No lines have been designated as WATS lines.
- No system options have been assigned.
- Paging zones are set as follows:

MPK/II	MPK/I
Paging Zones	Paging Zones
* 1 Stations 10-19	* 1 Stations 10-19
* 2 Stations 20-29	* 2 Stations 20-25
* 3 Stations 30-39	* 3 Not used
* 4 Stations 40-41	* 4 Not used
* 5 All areas 10-41	* 5 All areas 10-25

D. TEST. The purpose of the TEST program is to test for proper functioning of the CPU ROM and RAM. The TEST program can be activated by function switch 4 on the CPU PCB. To run TEST, momentarily close function switch 4, then return it to the OPEN position. The 6801 microprocessor will automatically check both ROM and RAM memories located on the CPU PCB. LED's on the front of the CPU PCB will indicate the test status. The topmost LED will indicate that the test is in progress. The second LED will light if the ROM memory passes. The third LED will light when the RAM section of memory passes. The fourth LED will light when both memories have been tested and passed. The LED that does not light indicates which section of memory has failed.

CAUTION: After TEST is run, the power must be turned off momentarily to reset memory.

NOTES 1) If response to the TEST program is not as stated above, contact INTER-TEL's Field Service for assistance.

2) Always run INIT after TEST.

CAUTION: When the TEST program is entered, all user-defined programming is erased.

E. RUN. This switch is unused.

2.03 Initial MPK Programming

To initially program a new installation of an MPK system, perform the following:

NOTE: All CPU switches must be open.

1. Momentarily close function switch 4 (TEST) on the CPU PCB, then return it to the open position. If the CPU PCB fails the test according to the guidelines of Section 2.02 D of this practice, contact INTER-TEL Field Service for assistance.
2. Turn the MPK power supply (labeled "LINE") off. Wait 10 seconds, then turn it back on.
3. Momentarily close function switch 3 (INIT), then return it to the open position.

This completes the MPK initialization sequence. The MPK system is now ready for the programming of system and station options.

2.04 System Programming

This section contains all the information necessary to program the MPK's system operational parameters listed in Figures 4-2 and 4-3. System planning sheets should be used to plan the system's final configuration prior to actual programming. (Refer to Figures 4-4 and 4-5.) These sheets are configured in the actual programming sequence, and their use will eliminate any confusion or possible errors at the time of programming.

All system programming is done at the operator's station (Ext. 10, Circuit 1.1) through the use of the keypad and line keys. Whenever a digit or symbol is pressed, a single tone is heard. The MPK system has a built-in error signal that will continuously beep to notify the programmer that incorrect or invalid information was entered into the keyset. The error signal will be activated only when an operational error is made. An "operational error" is defined as a user error in programming of the keyset. For example, if a tone pad key is accidentally pressed during the entry of line restriction data, the error

signal will be activated. To cancel the error signal, press the # key followed by any system parameter number. Doing this will cancel the erroneous entry and allow entry of correct information.

- ✶ A. System Programming Sequence. To begin the system programming sequence, place the CPU in the program mode by setting function switch

✶ 1 (PROGRAM) on the CPU PCB in the closed position.

The operator's station is now ready to accept changes in system parameters entered through the tone keypad and line keys. Refer to Figure 4-2 for programming entries.

PLP 2

— Performed on the Operator's Station —

KEYPAD ENTRY	ACCESSED PARAMETER	TONE PAD OR LINE KEY ENTRY TO CHANGE ACCESSED PARAMETER
Press # and 4	Transfer Recall Time	Press the desired transfer recall time in seconds (1 to 255 sec) on the tone pad.
Press # and 5	Hold Recall Time	Press the desired hold recall time in seconds (1 to 255 sec) on the tone pad.
Press # and 6	Absorbed Digit Identification	Press the desired absorbed digit on the tone pad.
Press # and 7	WATS Line Identification	Press the desired line keys for the C.O. lines to be used as WATS lines (1 or more keys).
Press # and 8	System Options	Press the desired system option numbers on the keypad (digits 1 to 7). See the system option listing in Figure 4-3.

FIGURE 4-2. System Programming Entries

<u>Option Numbers</u>	<u>Function</u>
(1)	SMDR 7 digits or more, 30 second duration.
(2)	SMDR 8 digits or more, 30 second duration.
(3)	Enable error messages.
(4)	Conference card compatibility.
(5)	12-second redial timing.
(6)	Loop release 1.2 seconds.
(7)	600 ms hookflash.

Figure 4-3. System Options

When the desired parameters have been changed, lift and replace the handset. This terminates the programming sequence. If no other change in programming is desired, take the CPU out of the programming mode by placing function switch 1 of the CPU PCB in the open position.

2.05 Station Programming

This section contains all information necessary to program the MPK's individual station parameters. Station programming is done through each individual station's keypad and line keys. The operator's station (Ext. 10, Circuit 1.1) is used not only to enter system options but also to enter its own station options.

When an individual station is programmed, a single tone is heard whenever a character is pressed on the keyset's keypad. A continuous beeping indicates that the error signal has been activated. This indicates that incorrect or invalid information has been entered on the keypad. To cancel the error signal tone, press the # key followed by the station parameter number in which the error occurred. This cancels the erroneous entry and allows entry of correct information. (Refer to Section 2.04, System Programming, for further information on error messages.)

A. Station Programming Sequence. To begin the station programming sequence, place the CPU in the program mode by closing switch 1 (PROGRAM) on the CPU PCB. Individual station sets are now ready to accept changes in their station parameters entered through the keypad and line keys. Refer to Figure 4-6 for programming entries.

<u>KEYPAD ENTRY</u>	<u>ACCESSED PARAMETER</u>	<u>STONE PAD OR LINE KEY ENTRY TO CHANGE ACCESSED PARAMETER</u>
Press # and 1	Lines Restricted	Press the line keys which are to be restricted from that individual station for outgoing calls.
Press # and 2	Ring in From Lines	Press the line keys which are to ring in audibly from outside on that individual station.
Press # and 3	Station Options	Press the desired station option number on the keypad. (digits 2, 4, and 6). See Figure 4-7.

Figure 4-6. Station Programming Entries

<u>Option Numbers</u>	<u>Function</u>
(2)	Remove from paging.
(4)	Ring intercom first.
(6)	Toll restrict.

Figure 4-7. Station Options

After you change the desired parameters on the first station, lift and replace the handset of that station. This terminates the programming sequence for that station. Repeat the programming sequence for all stations that are to be changed, making sure to terminate the sequence at every station.

The station parameters can also be entered at the KSU by plugging a single station set into the desired station jacks. After you program all the desired stations, return function switch 1 of the CPU PCB to the open position.

3.00 KEYSSET PROGRAMMING SWITCHES

In addition to programmable options, each station has switch-selectable options which are programmed for each keyset through internal switches. (See Section 340-100-300, Figure 3-12.) These switches are numbered and the option available through each is listed in Figure 4-8. See also Figure 4-9 for an explanation of each of these options.

- (1) Digit 1 dial
- (2) Speed Transfer
- (3) Off-hook ring
- (4) Night Station
- (5) Full-duplex speakerphone
- (6) Executive Priority
- (7) Do-not-disturb.

ON=Closed or active
OFF=Open or Inactive

Figure 4-8. Switch-Selectable Options

After setting the desired switch-selectable options, unplug the phone for 3 sec and then reconnect. This resets the microprocessor inside the phone so that it recognizes the new options.

4.00 DIAGNOSTICS (OPTIONAL)

This section describes use of the programming terminal as a diagnostic aid for the purpose of monitoring and debugging the MPK system. The

terminal should be an input and output device, such as a keyboard and CRT terminal, or a keyboard and printer terminal. The input and output devices are connected to the terminal and must be RS-232C compatible. The receptacle on the CPU PCB is a standard 25-pin female "D" connector. The keys on the terminal keyboard will produce the standard ASCII code required to access the MPK system. The terminal must be set on line and in the full-duplex mode with the baud rate set to 300.

4.01 Operating Terminal

The following areas are of special note if a terminal is to access the diagnostic and programming features of the MPK system:

- 1. SIGN-ON MESSAGE — Refer to Section 4.01A.
 - 2. EQUAL SIGN (=) — Refer to Section 4.01B.
 - 3. COMMAND LINE AND CARRIAGE RETURN (CR) — Refer to Section 4.01C.
 - 4. TIME-OUT MESSAGE — Refer to Section 4.01D.
 - 5. DEL OR RUBOUT KEY — Refer to Section 4.01E.
 - 6. CTRL-D KEY — Refer to Section 4.01F.
 - 7. CTRL-X KEY — Refer to Section 4.01G.
 - 8. ERROR MESSAGE — Refer to Section 4.01H.
 - 9. UPPER CASE LETTERS — Refer to Section 4.01I.
 - 10. QUIT — Refer to Section 4.01J
- A. SIGN-ON MESSAGE. To access the MPK programming functions, press the space bar or any other terminal key.

You will see the following prompt when the system first enters the programming mode:

MPK X.Y. COPYRIGHT 1983 INTER-TEL INC.
ENTER: INIT, ONMN, TEST, REST OR DISP.

NOTE: The "X.Y." indicates the version and revision of the software running the system. The first digit, "X," indicates the version level, while the second digit, "Y," specifies the revision cycle.

- B. EQUAL SIGN (=). The equal sign (=) prompt at the extreme left column of the programming terminal indicates that the major programming areas of the system may be accessed. These areas are explained in Section 4.02.
- C. COMMAND LINE AND CARRIAGE RETURN (CR). The MPK system uses the command line format for the system data entry. A command entered in this format is not executed until the carriage return is pressed. This format allows the programmer to check the command just entered for errors before execution.

NOTE: In the following text, the symbol (CR) represents the carriage return key or the enter key.

- D. TIME-OUT MESSAGE. The INTER-TEL MPK system contains a built-in timer which is activated during any of the programming modes. This timer is reset each time information is entered on the programming terminal. *If no information is entered in 4 min, 15 sec period, the MPK system will disengage from the programming terminal.* Any time this happens, the programmer must re-display the sign-on message by pressing the space bar to continue programming. If a time-out occurs, any programming done up to that point will be executed.

- E. DEL OR RUBOUT. The DEL or RUBOUT key serves as a backspace key during data entry. If the programmer detects an error in the current input line (before a carriage return is pressed) the DEL or RUBOUT key will cause the preceding character to be removed from the input line.

- F. CONTROL-D KEYS. The CONTROL-D function is a combination of two keys that are pressed simultaneously: the CONTROL (CTRL) key and the D key. This combination allows the programmer to re-display the current line (before a terminating carriage return is pressed). If the input line has had several characters deleted (see DEL or RUBOUT Section 4.01E), the line may be unreadable. The CTRL-D keys can be used to show a "clean" copy of the line for the programmer's inspection. The fresh line will be shown on the line following the current input line. Programming input is not terminated with the CTRL-D key. Any remaining input must still be supplied, as well as the terminating carriage return.

- G. CONTROL-X KEYS. The CONTROL-X function is also a combination of two keys being pressed simultaneously: the CONTROL key and the X key. This combination is used to cancel the input line that was just entered by the programmer before a carriage return is pressed. Any characters entered on the current input line will be deleted, and the input command must be resumed from the beginning of the line.

- H. ERROR MESSAGE. An error message generated by the INTER-TEL MPK will indicate that the format used to enter data into the MPK system is incorrect. The error message will be indicated by the word "WHAT" followed by a question mark (?). An example of the error message is given below:

WHAT?

When the error message is displayed, the MPK system will automatically redisplay the prompt and line in which the error was made..

- I. UPPERCASE LETTERS. All programming must be done in upper case letters.
- J. QUIT. To exit the programming mode, type QUIT.

NOTE: If SMDR messages (up to 10) have been stored, they will be printed when the programming mode is exited.

4.02 Diagnostic Features

The MPK system contains five diagnostic features which can be accessed by use of a terminal and keyboard. These features are as follows:

- A. TEST. To run the test feature using a terminal, enter the work TEST and press the carriage return (CR) after receiving the sign-on message and the equal sign (=). The terminal should then respond with:

```
X ROM & RAM CHECK X
XROM CHECK X
XRAM CHECK X
$8000 -$87FF . . . Pass
TURN POWER-SUPPLY SW OFF, THEN ON !!
```

CAUTION: After running TEST the power must be turned off momentarily to reset memory.

NOTES: 1) If response to the TEST feature is not as stated above, contact INTER-TEL's Field Service.

2) When TEST feature is entered, all user-defined programming will be erased.

B. INIT (Initialize). The initialize feature is activated by typing INIT (CR) on the terminal. This will cause the 6801 microprocessor to place the MPK system in its basic mode of operation. The basic mode of operations is as follows:

- All keysets can gain access to all outside lines.
- The operator's station (Ext. 10) will be the only station which rings audibly for incoming calls. All others will just flash.
- The message center is station 10.
- There will be no options on any keysets.
- The transfer recall time is 60 seconds.
- The hold recall time is 60 seconds.
- No number has been designated as an absorbed digit.
- No lines have been designated as WATS lines.
- No system options have been assigned.
- Paging zones are set as follows:

MPK/II	MPK/I
Paging Zones	Paging Zones
1 Stations 10 - 19	1 Stations 10 - 19
2 Stations 20 - 29	2 Stations 20 - 25
3 Stations 30 - 39	3 Not used
4 Stations 40 - 41	4 Not used
5 Stations 10 - 41	5 All areas 10-25

C. DISP (Display). This feature displays the ASCII character (see Figure 4-10) of activity of the MPK system or of an individual station on the terminal. To start the display feature, type the command DISP, then press CR. The terminal will respond with:

DISPLAY IN PROGRESS !!

The terminal will now display the activity of the entire system. To monitor the activity of a single

station, type in DISP XX, XX being the desired extension number. (Be sure to press the space bar after typing DISP.) The terminal will respond with:

DISPLAY IN PROGRESS !! XX

When you use the display feature, the input/output part of the terminal is tied up and no SMDR is possible. Also, the display feature does not time out. It is therefore necessary to terminate this feature by pressing the space bar.

D. ONMN (Online Monitor). This feature is used to monitor, change and debug the MPK system. For this reason, it should only be used by qualified personnel. (See Section 340-100-401.)

E. REST (Restart). This feature is activated by typing the word REST (CR) on the programming terminal. This action restarts the 6801 microprocessor without cycling power or affecting the data base. It is primarily a maintenance routine used to restart the system after a watchdog timer interrupt has occurred. This extinguishes the watchdog timer LED (DS4) on the CPU PCB.

STATION PROGRAM INPUT

- #1) Lines Restricted
- #2) Ring In From Line
- #3) Station Options
 - 2) Remove From Paging
 - 4) Ring Intercom First
 - 6) Toll Restriction

SYSTEM PROGRAM INPUT (OPERATOR ONLY)

- #4) First Recall Time
- #5) Second Recall Time
- #6) Absorbed Digit Identification
- #7) WATS Line Identification
- #8) System Options
 - 1) SMDR - 7 digits or more, 30 sec. duration
 - 2) SMDR - 8 digits or more, 30 sec. duration
 - 3) Enable Error Messages
 - 4) Conference Compatibility
 - 5) 12-Second Redial Timing
 - 6) Loop Release 1.4 Sec
 - 7) 600 ms Hookflash

DIP SWITCH STATION - SELECTABLE OPTIONS

- 1) Digit 1 Dial
- 2) Speed Transfer
- 3) Off-Hook Ring
- 4) Night Station
- 5) Full-Duplex Speakerphone
- 6) Executive Priority
- 7) Do-Not-Disturb Enable

On = closed or active
Off = open or inactive

PAGING ZONES

- | MPK/II | MPK/I |
|----------------------|-------------------------|
| * 1 — Stations 10-19 | * 1 — Stations 10-19 |
| * 2 — Stations 20-29 | * 2 — Stations 20-25 |
| * 3 — Stations 30-99 | * 3 — Stations not used |
| * 4 — Stations 40-41 | * 4 — Stations not used |
| * 5 — Stations 10-41 | * 5 — All areas |

CPU PCB SWITCHES

- 1) PROGRAM
- 2) RESET
- 3) INIT
- 4) TEST
- 5) RUN

Figure 4-1. MPK Option Summary

INTER-TEL MPK

Page 4-9

Station

Programming Code Extension # _____ User: _____

#1 Lines Restricted = _____

#2 Ring In From Lines = _____

#3 Options: Disable Page Zone = 2
 Ring Intercom First = 4
 Toll Restriction = 6

Instrument: MPK/I MPK/II

Keyset Options

DIP Switch		Enable/Disable
1	Digit 1 Dial	<input type="checkbox"/>
2	Speed Transfer	<input type="checkbox"/>
3	Off-Hook Ring	<input type="checkbox"/>
4	Night Station	<input type="checkbox"/>
5	Full-Duplex Speakerphone	<input type="checkbox"/>
6	Executive Priority	<input type="checkbox"/>
7	Do-Not-Disturb	<input type="checkbox"/>

Station

Programming Code Extension # _____ Use

#1 Lines Restricted = _____

#2 Ring In From Lines = _____

#3 Options: Disable Page Zone = 2
 Ring Intercom First = 4
 Toll Restriction = 6

Instrument: MPK/I

Keyset Options

DIP Switch	
1	Digit 1 Dial
2	Speed Transfer
3	Off-Hook Ring
4	Night Station
5	Full-Duplex Speakerphone
6	Executive Priority
7	Do-Not-Disturb

Figure 4-4. Programming Planning Sheet - Station Class

MPK

System Class of Service

Programming Record

At Operator's station (ext. 10):

Transfer Recall Time (#,4): _____(1-255 seconds).

Hold Recall Time (#,5): _____(1-255 seconds).

Absorbed Digit I.D. (#,6): _____(2 through 9)

WATS Line I.D. (#,7): _____

- System Options (#,8)
- 1 — SMDR — 7 digits or more, 30 sec duration.
 - 2 — SMDR — 8 digits or more, 30 sec duration.
 - 3 — Enable Error Message.
 - 4 — Conference PCB Compatibility.
 - 5 — 12-second Redial Timing.
 - 6 — 1.2-second Held Call Loop Release.
 - 7 — 600-millisecond Hookflash.

Figure 4-5. Programming Planning Sheet - System Class

MPK Switch	Position	Option	Description
1	CLOSED	Digit 1 Dialing	Precedes all 10-digit stored speed dial numbers with a 1.
2	CLOSED	Speed Transfer	When the station is connected to an outside line every 2-or-3 digit keystroke entry initiates a transfer without hitting the Transfer Key. This station will not have the ability to initiate outside calls.
3	CLOSED	Off-Hook Ring	Station will ring (tones are in the handset) when off-hook for incoming calls.
4	CLOSED	Night Station	Causes the station to ring directly for all outside calls when the system is in the night ring mode.
5	CLOSED	Full-Duplex Speakerphone	Enables the station's microphone so that an optional external speaker may be connected for a full-duplex speakerphone on outside calls.
6	CLOSED	Executive Priority Call Waiting	Allows the station to signal busy extensions by pressing the # key. Intercom callback is disabled.
7	CLOSED	Do-Not-Disturb	Allows the station to be placed in Do-Not-Disturb as defined in Section 680-100-200.
		Night Ring	For the operators station only.

NOTE: "CLOSED" means that the feature is on or active
"OPEN" means that the feature is off or inactive.

Figure 4-9. Multi-Line DIP Switch-Selectable Options

STATION COMMAND CODE DEFINITIONS

Encoded Character	Action	Encoded Character	Action
!	CALL FORWARD	I	HOLD
"	DO-NOT-DISTURB	J	RE-DIAL
#	RESET CFWD/DND	O	*
\$	STACK INTERCOM CALL	N	0
%	RECONNECT INTERCOM CALL	O	1
&	CONF. ACCESS	P	2
'	CONF. RELEASE	Q	3
(	CALL BACK	R	4
)	EXEC. PRIORITY	S	5
*	CALL TRANSFER	T	6
+	OFF-HOOK	U	7
,	ON-HOOK	V	8
-	STATION POWER-UP	W	9
.	CANCEL ENTRY	X	#
/	INTERCOM TONE RING	Y	SPEED DIAL
0	PAGE COMMAND		
1	LINE KEY 1 PRESSED		
2	LINE KEY 2 PRESSED		
3	LINE KEY 3 PRESSED		
4	LINE KEY 4 PRESSED		
5	LINE KEY 5 PRESSED		
6	LINE KEY 6 PRESSED		
7	LINE KEY 7 PRESSED		
8	LINE KEY 8 PRESSED		
9	LINE KEY 9 PRESSED		
:	LINE KEY 10 PRESSED		

DSS/BLF COMMAND CODE DEFINITIONS

Encoded Character	Action
Z	DSS/BLF SENDS THIS CODE AS A FUNCTION KEY CODE (\$00-\$4F, \$50-\$7F)
[DSS/BLF SENDS THIS CODE AS SPECIAL KEY CODE (\$38-\$3F)
8	DSS/BLF SPECIAL KEY 1

ONLINE MONITOR

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1.00 INTRODUCTION

1.01 General

The Online Monitor (ONMN) feature of the MPK system allows the display and alteration of the system memory. This feature is intended for the advanced installer or engineer, when debugging and maintaining the MPK system. It is not intended for customer usage.

CAUTION: Indiscriminate use of the Online Monitor can cause data base errors and system execution errors resulting in the need for reprogramming of the data base or a system reset. The Online Monitor cannot cause permanent system or hardware damage.

1.02 Description

With the ONMN routine, you can monitor the MPK system, as well as change its state by altering memory storage locations. These memory storage locations include the control block contents, which are described in Section 3.00. The ONMN routine displays the contents of these control blocks and allows altering of bytes with the use of ONMN commands.

2.00 COMMANDS

To use the Online Monitor, type ONMN and press the carriage return. The following is a list of commands which may now be used after the characteristic # (pound) prompt. Be sure to press the carriage return (where indicated by the symbol <CR>) after typing each command.

2.01 Memory Display M <CR>

Typing M, a hexadecimal memory address in upper case and a carriage return, displays the 16-byte area of memory starting at that memory address. The cursor remains at the end of the line, awaiting any of the following:

- <CR> —Pressing the carriage return displays the next 16-byte block of memory.
- \<CR> —Pressing a backslash and a carriage return displays the previous 16 bytes of memory.
- CTRL X —Pressing X while holding down the CTRL key redisplay the current 16 bytes of memory.
- Any Other ONMN Command —Entering any other ONMN command (such as change, Quit or Control Block Display) will perform the functions indicated in the following sections.

2.02 Change C <CR>

Typing C, a space, a hexadecimal memory address (xxxx) in upper case and a carriage return displays the contents of memory at that address. The system then waits for any of the following to be typed:

- 0 to FF <CR> —Entering a hexadecimal value from 0 to FF followed by a carriage return writes that value in memory at the specified address. The system then verifies that the new value is written in the correct location and, if true, displays the next memory location. Otherwise, the system displays the message, "WHAT?" and the value of the memory location.

- \<CR> —Entering a backslash and a carriage return displays the contents of memory at the previous address.
- ,<CR> or <CR> —Entering a comma and a carriage return or simply a carriage return, displays the contents of the next consecutive memory address.
- CTRL X —Pressing X while holding down the CTRL key redisplay the current memory address.
- .<CR> —Pressing a period and the carriage return ends the change feature.

2.03 Quit Q <CR>

Pressing Q and the carriage return exits the Online Monitor. The monitor does not time out; only the Quit command exits the monitor properly to permit, for example, removal of the display device.

Typing the entire word QUIT followed by a carriage return exits the Online Monitor and the terminal display mode so that the SMDR printout may continue.

2.04 Control Block Display x nn <CR>

Control blocks are areas in memory which contain formatted information useful for controlling certain system functions. Typing the designator letter (x) for the type of control block, any allowed number value (nn) for that type of control block (see Figure 5-1), and then pressing the carriage return, displays the control block in the following form:

```
BB AAAA DDDDDDDDDDDDDDDDDDDDDDDDDDDDD
          DDDDDDDDDDDDDDDDDDDDD
```

WHERE:

- BB is the hexadecimal number of the requested block
- AAAA is the hexadecimal RAM address of the start of the requested block
- DDD..D is the contents of the control block in hexadecimal. Two characters are displayed for each hexadecimal data byte in the block.

Designator Letter	Name	Number
B	Call Back Queue Entry	1-5
F	Conference	1-2
I	Intercom Channel	1-5
L	C.O. line	1-10
S	MPK station	10-41
T	MPK station data base options. Located in battery back-up memory.	10-41
X	System statistics	(R=reset)

Figure 5-1. Available Control Blocks

The number of control blocks available varies with the type of control block. Values requested outside of the actual range of the number available for that type of control block default to the first block of that type.

Examples:

- S or S1 or S 1 —Displays the control block for the first station
- S10 or S 10 —Displays the control block for the first station
- S41 or S 41 —Displays the last station
- S99 or S 99 —Displays the first station

After displaying the requested control block, the system waits for a memory display command, a change command, a quit command or any of the following:

- <CR> —Entering a carriage return displays the next block of the current type
- \<CR> —Entering a backslash and a carriage return displays the preceding control block of the same type
- CTRL X —Pressing X while holding down the CTRL key redisplay the current block

3.00 CONTROL BLOCK FORMATS

The following figures list the control block formats and definitions.

BYTE	LABEL	BIT 7	6,5,4	BIT 3	2,1,0
00	LSO		1		2
01	LS1		3		4
02	LS2		5		6
03	LS3		7		8
04	LS4		9		10
05	LS5		11		12
06	LS6		13		14
07	LS7		15		16
08	LS8		17		18
09	LS9		19		20
0A	LS10		21		22
0B	LS11		23		24
0C	LS12		HD		RD
0D	LS13		ON/ OFF		CF
OE	CTL0	Station Control			
OF	CTL1	Flags			
10	DBUF	STN Data			
11	SWORK	Work Area			
12	STIME	.1 Second Timer			
13	RTAH	Software			
14		Break Point			
15	LACON	Last Channel Connection			
16	CTL2	Software Control Flags			
17	FWD	Call Forward Stations			
18	OPT	STN Options DIP SW			

NOTE: MPK Stations only use LSO to LS4 lamps.

Figure 5-2. S — Station Control Block

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 — I.C. Call Holding
- 2 — Call Forward/DND

Redial/MSS Lamp Status

- 1 — Message Waiting

CONF/TRANS Lamp Status

- 1 — Monitor
- 2 — Second Station
- 7 — Origin Station

Station Option DIP Switches

- 80 — Always Set High
- 40 — Do-Not-Disturb
- 20 — Executive Priority

- 10 — Full-Duplex Speakerphone
- 08 — Night Ring
- 04 — Off-Hook Tones
- 02 — Speed Transfer

- 01 — Digit 1 Dial: Long Dist.
The memory is there for other functions, but is not accessed.

sp	-	20	-	No data (idle)	H	-	48	-	SPCL Key
!	-	21	-	Call Forward	I	-	49	-	Hold Key
"	-	22	-	Do-Not-Disturb	J	-	4A	-	Redial Key
#	-	23	-	Reset CFWD/DND	K	-	4B	-	ON/OFF Key
\$	-	24	-	Stack Intercom Call	L	-	4C	-	XFR/CONF Key
%	-	25	-	Reconnect Intercom	M	-	4D	-	T/T ★
&	-	26	-	Conf. Access	N	-	4E	-	T/T 0
'	-	27	-	Conf. Release	O	-	4F	-	T/T 1
(	-	28	-	Call Back	P	-	50	-	T/T 2
)	-	29	-	Exec. Priority Call	Q	-	51	-	T/T 3
*	-	2A	-	Call Transfer	R	-	52	-	T/T 4
+	-	2B	-	Off-Hook	S	-	53	-	T/T 5
,	-	2C	-	On-Hook	T	-	54	-	T/T 6
-	-	2D	-	Power-Up	U	-	55	-	T/T 7
.	-	2E	-	Cancel Entry	V	-	56	-	T/T 8
/	-	2F	-	Intercom Tone Ring	W	-	57	-	T/T 9
0	-	30	-	Page Command	X	-	58	-	T/T #
1	-	31	-	Line Key 1	Y	-	59	-	Repeat Dial Start
2	-	32	-	Line Key 2	Z	-	5A	-	DSS Key Flag
3	-	33	-	Line Key 3	[	-	5B	-	DSS SPCL Key Flag
4	-	34	-	Line Key 4	\	-	5C	-	Unused
5	-	35	-	Line Key 5	]	-	5D	-	Unused
6	-	36	-	Line Key 6	^	-	5E	-	Unused
7	-	37	-	Line Key 7	-	-	5F	-	Unused
8	-	38	-	Line Key 8					
9	-	39	-	Line Key 9					
:	-	3A	-	Line Key 10					

Station Control Flags
CTLO

40 - Incoming IC
 20 - In IC Ringing
 10 - In C.O. Ringing
 04 - In IC Complete
 02 - Monitor
 01 - Call Xfering
 80/08 Bits Will Not Be Transmitted to
 Any MPK Stations

Station Control Flags
CTL 1

40 - Out IC Busy
 20 - Out IC Complete
 10 - Out IC Ringing
 04 - Out C.O. Complete
 02 - Force Release
 01 - Clear to Send

Software Control Flags
CTL 2

80 - STN Is On-Hook
 40 - Offline Error Count
 20 - Offline Error Count
 10 - Offline Error Count
 08 - DSS XFR To Hold Active
 04 - DSS ID Is Next DBUF
 02 - Out IC Connected
 01 - Conference Active

Figure 5-3. Station Command Code Definitions — DBUF / DISP COMMAND / Error SMDR

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

Command Codes — COMD

- 0 - No Command
- 1 - Seize Line
- 2 - Re-Seize 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 - Unused
- F - Unused

- 10 - C.O. Callback Active
- 11 - Immediate XFR

Status — Cost

- 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
- 01 - Good Connection

Status — Cost1

- 80 - Outgoing Call
- 40 - Reverse XFR Ringing-In
- 20 - Ringing-In Refreshed
- 10 - '40' Previously Encountered
- 08 - Toll Restrict Edit Complete
- 04 - Unused
- 02 - Lamp Refresh Flag
- 01 - Ring-In Time Out (FWD)

Figure 5-4. L — C.O. Line Control Block

BYTE	LABEL	DEFINITION
00	EXTN	Requesting Station
01	PORT	Requested Resource

If the requested resource value exceeds 200 (\$C8), then it is a C.O. line.
The C.O. line number is always offset by \$C8.
Otherwise the value indicates a station ID.

Figure 5-5. B — Callback Queue Entry

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)

Status — CFST

- 80 - 2-STN Mode
- 40 - Origin Is In CONF
- 20 - CP2 Is Known Gone
- 01 - Block Is Active

Figure 5-6. F — Conference Control Block

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

CHST — Status

- 80 - Out Is Busy
- 40 - In Camped On — MOH
- 20 - Old Just Reversed IC
- 10 - Out Is Off-Hook
- 08 - Out Has IC Ring
- 04 - Camp-On Is Causing Background Incoming C.O. Ring
- 02 - Connection Granted
- 01 - Out Is Do-Not-Disturb

NOTE: The In Field Set to Zero indicates an available channel.

Channel Command Codes

- 00 - OPEN (See Note on In)
- 01 - Connect to STN
- 02 - RECON
- 03 - DROP
- 04 - XFR
- 05 - Ring Called Party
- 06 - Stack On Called Party
- 07 - Stack On Called Party
- 08 - Double Tone Ring Called
- 09 - Page
- 0A - Conference
- 0B - Unused
- 0C - Unused
- 0D - Unused
- 0E - DSS Tone Command
- 0F - Unused

Figure 5-7. I — Intercom Channel Block

BYTE	LABEL	DEFINITION
00 01	L1.8 L9.10	Lines Restricted — This is a 2 byte field with the leftmost bit indicating line 1 and the rightmost bit indicating line 10. This is the line restriction table.
02 03	R1.8 R9.10	Lines to Ring-In — This is a 2 byte field with the leftmost bit indicating line 1 and the rightmost bit indicating line 10. This is the station ring-in table.
04	OPTION	Station Options
05	ZONES	Paging Zones
06	NUMB	Station ID

Options

80 - 1:Unused
40 - 2:REMOVE FROM PAGE

20 - 3:Unused
10 - 4:Ring-IC-First (RIF)
08 - 5:Unused
04 - 6:Toll Restricted

Figure 5-8. T — MPK Station Data Base Options

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.

The available soft reset count (SFTCTR) is reset to ten (OA) approximately every 3 hours after any hard reset and at power-up. The count of soft reset occurrences is initialized to zero on power-up and when the 'REST' command is entered.

Typing either CTRL-X or return after typing the X command will repeat the statistics display.

Typing 'X R' will cause the statistics values to be re-initialized.

Figure 5-9. X — System Statistics Area

TROUBLESHOOTING

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1.00 INTRODUCTION

1.01 General

This section describes the troubleshooting procedures that should be followed in the event of system malfunction. System troubleshooting and repair will be confined to module replacement (e.g., printed circuit board, power supply, keyset, etc.). Repair beyond module replacement is not within the scope of this manual.

2.00 DEFECTIVE UNIT RETURN POLICY

2.01 Return Authorization Tags

To return a unit, obtain a Return Authorization Tag and attach it to the defective unit. Proper documentation of the Return Authorization Tag will ensure the rapid repair and return of the equipment. Adhere to the following guidelines when filling out a Return Authorization Tag:

NOTE: INTER-TEL does not accept the return of defective units without return authorization tags.

- A. Obtain a repair authorization number from the INTER-TEL Return Authorization Department.
- B. Identify the unit by the equipment name, part number, and serial number.
- C. Describe the defect and, if applicable, the circuit number related to the defect.
- D. Document the estimated service time prior to failure.
- E. Attach the upper portion of the tag to the

defective equipment. Retain the bottom portion for your files.

3.00 TROUBLESHOOTING PROCEDURE

3.01 Preliminary Troubleshooting Checklist

Before starting the system troubleshooting procedures, complete the following checklist. This check list may save your time and possibly eliminate the need for detailed troubleshooting.

CHECKLIST:

- A. Verify that the problem is not related to user error or equipment that has been disconnected or disabled.
- B. If the defect is related to an optional feature, make sure that the option has been enabled.
- C. Check that all printed circuit boards and equipment cables are securely seated or connected.
- D. Check all LED's for proper indication. See Section 3.03, Light-Emitting Diode Indications, for proper indications.
- E. If any optional external equipment (e.g., autodialers, headsets, loud ringing adapter, etc.) is connected to the system, verify that this equipment is not responsible for the problem.
- F. Each multi-line keyset contains a micro-processor that is essential to the functions of the keyset. The supply voltage to the micro-processor is CRITICAL and must be set at the correct voltage level to ensure proper operation of the phone set. For correct voltage adjustment, refer to the installation section of this manual (340-100-300; 1.05).

If the problem is still present after completing the Preliminary Troubleshooting Checklist, proceed to Section 3.02, "Detailed System Troubleshooting Procedures."

3.02 System Troubleshooting Procedures

This portion of the troubleshooting procedures is designed to assist the technician in the event of an equipment failure. The troubleshooting procedures have been divided into four separate categories:

feature failure, internal communications, external communications, and system malfunctions.

The troubleshooting charts in this section list the symptom, the possible cause, and the corrective action for the symptom. After locating the symptom listing which corresponds to the problem being experienced within the system, perform the corrective action steps in the order indicated in the procedures. If the problem is not corrected by following the procedure, contact INTER-TEL's Field Service for assistance.

- A. **Feature Failure.** Before starting this troubleshooting procedure, refer to Section 340-100-200, Features, and perform the function which is reported to be defective. This is to ensure that the trouble is not the result of misoperation of the keyset by the user. Once proper operation is confirmed, remove the keypad portion of the keyset. Examine the contacts under the feature button for dirt or dust and clean if necessary. If proper feature operation is still not possible, proceed to the FEATURE FAILURE TROUBLESHOOTING CHART, Figure 6-1.
- B. **Internal Communications.** This portion of the troubleshooting section deals with internal calls only. Refer to Figure 6-2, INTERNAL COMMUNICATIONS TROUBLESHOOTING CHART.
- C. **External Communications.** This portion of the troubleshooting section deals with external calls only. Refer to Figure 6-3, EXTERNAL COMMUNICATIONS TROUBLESHOOTING CHART.
- D. **System Malfunctions.** This portion of the troubleshooting section is designed to isolate a malfunction which appears throughout the system. Refer to Figure 6-4, SYSTEM MALFUNCTIONS TROUBLESHOOTING CHART.

3.03 Light-Emitting Diode Indications (LED)

Each board in the INTER-TEL MPK system contains light-emitting diodes (LED's). These LED's will indicate specific functions related to that board. Figure 6-5 indicates the normal status of the LED's when the MPK is operating. If the LED's are not as stated, perform the troubleshooting procedures as described in Sections 3.02B, 3.02C, or 3.02D when the problem involves a specific circuit or circuits. If the power reset LED will not illuminate and extinguish after a reset condition or power up, remove that PCB, wait 10 seconds, and re-insert the PCB. If power interrupt indications are still incorrect, replace that PCB with a known good PCB. If the NMI LED is illuminated on the CPU, reset the system by momentarily placing SW2 of the CPU PCB in the ON position.

NOTE: Use of the reset (REST) function will disconnect any calls in progress. If the NMI LED is illuminated frequently, contact INTER-TEL's Field Service for assistance.

If the first three LED's on the CPU are not flashing at their respective rates (refer to Section 340-100-300 for proper flash rates), check the +5VDC on the KSU power supply and adjust if necessary. After checking the voltage and making any necessary adjustments, turn the system power off, wait for 10 seconds, and re-apply system power. If problem still exists, contact INTER-TEL's Field Service for assistance.

NOTE: The following symptoms are isolated to one keyset only. For identical problems involving more than one keyset, refer to para. 3.02; D SYSTEM MALFUNCTIONS.

NOTE: The following symptoms are isolated to one keyset only. For identical problems involving more than one keyset, refer to Section 3.02; D SYSTEM MALFUNCTIONS.

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Cannot place a call on hold	a. User error	a. Refer to Section 340-100-200 and verify feature operation.
	b. 5.0V regulator out of tolerance	b. Set 5.0V regulator as outlined in Section 340-100-300.
	c. Defective keyset	c. Replace keyset with a known good keyset.
	d. Defective CPU	d. Contact INTER-TEL's Field Service for assistance.
Cannot put keyset into call forwarding	a. User error	a. Refer to Section 340-100-200 and verify feature operation.
	b. Defective keyset	b. Replace keyset with a known good keyset.
	c. Defective CPU	c. Contact INTER-TEL's Field Service for assistance.
Cannot put keyset in do-not-disturb	a. User error	a. Refer to Section 340-100-200 and verify feature operation.
	b. Switch-selectable option not enabled	b. Enable the DIP switch setting as outlined in Section 340-100-300.
	c. Defective keyset	c. Replace the keyset with a known good keyset.
	d. Defective CPU	c. Contact INTER-TEL's Field Service for assistance.

Figure 6-1. Feature Failure Troubleshooting Chart

Figure 6-1. Continued

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Last number redial inoperative	a. User error	a. Refer to Section 340-100-200 and verify feature operation.
	b. Improper usage	b. The redial function cannot be used for redialing numbers stored in the keyset's memory.
	c. Defective keyset	c. Replace the keyset with a known good keyset
Redial busy number inoperative	a. User error	a. Refer to Section 340-100-200 and verify feature operation.
	b. Defective keyset	c. Replace the keyset with a known good keyset.
Keyset stored number memory lost or inoperative	a. User error	a. Refer to Section 340-100-200 and verify feature operation.
	b. A line key was not accessed prior to activating one of the stored number memory locations.	b. Reprogram the memory storage location and ensure that the line key is accessed prior to using the stored number.
	c. Power to keyset was removed.	c. Verify that the keyset has power and then reprogram the numbers.
	d. Defective keyset	d. Replace the keyset with a known good keyset.
Cannot activate another keyset's message waiting lamp	a. User error	a. Refer to Section 340-100-200 and verify feature operation.
	b. Defective keyset	b. Replace the keyset with a known good keyset. (Check the called party's keyset to ensure it is operating properly.)
	c. Defective CPU	c. Contact INTER-TEL's Field Service for assistance.
Full-duplex speakerphone inoperative	a. Defective speaker or speaker cable	a. Check the speaker cable with an ohmmeter. If the speaker is still inoperative, replace the speaker.
	b. Switch-selectable option not enabled	b. Enable DIP switch 5 inside the phone. Refer to Section 340-100-300.
	c. Defective keyset	c. Replace the keyset with a known good keyset.

Figure 6-1. *Continued*

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Cannot transfer outside calls to other keysets	a. User error	a. Refer to Section 340-100-200 and verify feature operation.
	b. Called station is in do-not-disturb	b. Standard operating procedure. Any keyset in do-not-disturb cannot receive calls from a transferring station.
	c. Defective keyset	c. Replace the keyset with a known good keyset. (Check the called party's keyset to ensure it is operating properly.)
	d. Defective CPU	d. Contact INTER-TEL's Field Service for assistance.
Cannot initiate a conference	a. User error	a. Refer to Section 340-100-200 and verify feature operation.
	b. System is not equipped for conferencing	b. The system must have optional conference board.
	c. Defective keyset	c. Replace the keyset with a known good keyset. (Check the C.O. line status to ensure that external parties are being put on a hold status which setting up the conference.)
	d. Defective conference PCB	d. Replace conference PCB with a known good PCB.
	e. Defective CPU	e. Contact INTER-TEL's Field Service for assistance.
Cannot initiate a page	a. User error	a. Refer to Section 340-100-200 and verify feature.
	b. No paging zones in the program	b. Verify that the stations are programmed for paging through the station feature program subroutine.
	c. Defective keyset	c. Replace the keyset with a known good keyset. (If keyset cannot receive a page, ensure that the keyset is in the appropriate paging zone.)

Figure 6-1. *Continued*

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Paging times out in less than 12 seconds	a. User error	a. Refer to Section 340-100-200 and verify feature operation.
	b. STN PCB has undetermined extensions	b. Terminate the unused extensions. Refer to Section 340-100-300 for instruction.
	c. Defective CPU	c. Contact INTER-TEL's Field Service for assistance.

NOTE: Speed transfer, digit 1 dial, night station ringing, do-not-disturb enable, full-duplex speakerphone, executive priority call waiting, and off-hook tones are switch-selectable features enabled for an individual phone. If proper settings have been confirmed, replace the keyset with a known good keyset.



NOTE: The following symptoms are isolated to one keyset only. For identical problems involving more than one keyset, refer to Section 3.02D System Malfunction, and Figure 6-4.

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
No intercom dial tone	a. Defective cabling	a. Verify correct cable connections.
	b. Defective keyset	b. Replace the keyset with a known good keyset.
	c. Defective station board	c. Determine which PCB corresponds to the affected station and replace.
Cannot place intercom calls	a. Defective keyset	a. Replace keyset with a known good keyset.
	b. Defective station PCB	b. Determine which PCB corresponds to the affected station and replace.
Data noise in keyset	a. Defective cabling or connections	a. Check for loose or open connections, or crossed data wires.
	b. Defective keyset	b. Replace keyset with a known good keyset.
	c. Defective station PCB	c. Replace the corresponding STN PCB with a known good PCB.
Keyset inoperative	a. Defective or misadjusted keyset	a. Check the internal 5.0VDC setting and adjust if necessary. Replace the set if still inoperative.
	b. Defective cabling	b. Check for loose or open connections in corresponding cabling.
	c. Defective station	c. Replace the corresponding STN PCB with a known good PCB.
Other station conversations can be heard on the station set	a. Defective station PCB	a. Replace the corresponding STN PCB with a known good PCB.
	b. Defective CPU PCB	b. Contact INTER-TEL's Field Service for assistance.

Figure 6-2. Internal Communications Troubleshooting Chart

NOTE: The following symptoms are isolated to one keyset only. For identical problems involving more than one keyset, refer to Section 3.02D System Malfunctions, and Figure 6-4.

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Cannot obtain C.O. dial tone (intercom function.)	a. C.O. line(s) restricted	a. Check the station option sheet and compare with the station programming for that keyset.
	b. Defective keyset	b. Replace the keyset with a known good keyset.
Cannot place an outside call. C.O. dial tone present (intercom functions)	a. Keyset is toll restricted	a. Check the station option sheet and compare with the station programming for that keyset.
	b. Speed transfer switch-selectable option is enabled in the keyset	b. Standard operating procedure. Disable DIP switch in keyset if speed transfer is not desired.
	c. Defective keyset	c. Replace the keyset with a known good keyset.
	d. Defective CPU	d. Contact INTER-TEL's Field Service for assistance.
Outside calls being dropped during conversation or upon answering C.O. call	a. Line key is pressed by user after initial connection is established	a. Standard operating procedure. Pressing a line key after the connection has been made will automatically drop the call in progress and re-access that C.O. line.
	b. Loop current interrupt from Central Office	b. Incorporate system option 6 (1.2 second held call loop release) into system programming.
	c. Insufficient loop current being supplied by the Central Office	c. Central Office must supply 20 mAmp loop current minimum.
	d. Defective keyset	d. Replace the keyset with a known good keyset.

Figure 6-3. External Communications Troubleshooting Chart

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
All keysets in the system will not operate. No LED indications when a line key is pressed	a. Main power fuse open	a. Examine the fuse and replace it if necessary. CAUTION: Do not exceed maximum rating of fuse.
	b. Open connection in cable between power supply and KSU motherboard	b. Remove power from the system. Use an ohmmeter to check the cable connector and replace or repair faulty cable.
	c. Defective station board	c. Remove all STN PCB's from the KSU. Check the voltage on the terminal block of the power supply. If voltage returns to correct indication, replace the PCB's one at a time until the defective PCB is isolated. If voltage is still incorrect, proceed with step d.
	d. Defective power supply	d. Use a voltmeter and check the voltage at terminal block of the power supply. If the voltage is not $30V \pm 6VDC$, replace the power supply.
A group of four keysets will not operate. No LED indications when a line key is pressed. All four sets are located on one station board	a. Defective fuse on station board	a. Remove the station board from the KSU and replace fuse.
	b. Defective station board	b. Replace the STN PCB with a known good STN PCB.
	c. Defective receptacle on KSU backplane	c. Replace KSU cardfile.
	d. Defective CPU	d. Contact INTER-TEL's Field Service for assistance.
C.O. line inoperative throughout system	a. Defective C.O. line from Central Office	a. Disconnect the C.O. line from the COU PCB. Use a test set to verify the C.O. connection.
	b. Defective COU PCB	b. Replace the COU PCB with a known good PCB.
	c. Defective CPU	c. Contact INTER-TEL's Field Service for assistance.

Figure 6-4. System Malfunctions Troubleshooting Chart

Figure 6-4. Continued

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
The SMDR printer will not communicate with CPU	a. Baud rates of the terminal and the CPU are not the same	a. Match the baud rates of the printer and the CPU. Set the printer for 300 baud.
	b. Miswired or defective cable	b. Repair or replace connecting cable.
	c. Defective power supply	c. Check the -12VDC with a voltmeter on the terminals of the power supply. Also check the cable between the power supply and the KSU backplane. Contact INTER-TEL's Field Service for assistance.
	d. Defective CPU	d. Contact INTER-TEL's Field Service for assistance.
Repeated occurrence of dropped calls, misdialled C.O. numbers and intercom numbers, and lost transferred calls	a. The AC line is not dedicated	a. Have a dedicated AC line installed by a qualified electrician from the main power panel with a third wire ground. Ensure telephone power is on its own circuit breaker.
	b. Equipped but un-terminated data lines (no keyset connected at the end of the cable) on the STN PCB.	b. Locate any unused circuits on the main distribution block. Then ground the STN board transmit pair of each unused circuit.
	c. +5VDC low	c. Contact INTER-TEL's Field Service for assistance
	d. KSU located near a strong magnetic field. (e.g., high voltage power transformers or copying machines)	d. Relocate the KSU to an isolated room a minimum of 20 feet away from any magnetic field-producing equipment.
	e. Defective CPU	e. Contact INTER-TEL's Field Service for assistance.

Figure 6-4. System Malfunctions Troubleshooting Chart

NOTE: See Figure 6-6 for the locations of the LED lamps.

PRINTED CIRCUIT BOARD	LAMP LOCATION	DESCRIPTION
STN	A	Power reset LED (normally OFF) 1. Indicates PCB has been acknowledged and electrically reset by the CPU. 2. Indicates that a power interrupt has occurred on that PCB.
	B through E	Circuit LED's (OFF when not in use) 1. Indicates that the station associated with that circuit is in use.
CPU	A through C	Data LED's 1. Indicates that the CPU is functioning. The rate of flash indicates the amount of activity in the system. Refer to Section 340-100-300 for proper flash rates.
	D	NMI LED (normally OFF) 1. Indicates that the watchdog timer has had an interrupt.
COU	A	Power Reset LED (normally OFF) 1. Indicates that the PCB has been acknowledged and electrically reset by the CPU. 2. Indicates that a power interrupt has occurred on that PCB.
	B and C	1. Loop current indicator. Will light when the associated C.O. line is accessed

Figure 6-5. Light Emitting Diode Indications

Figure 6-5. *Continued*

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Conference	A	Power Reset (normally OFF) <ol style="list-style-type: none"> 1. Indicates that the PCB has been acknowledged and electrically reset by the CPU. 2. Indicates that a power interrupt has occurred on that PCB.
	B through D	Conference CKT 1 (normally OFF) <ol style="list-style-type: none"> 1. Lights when circuit is activated.
	E through G	Conference CKT 2 (normally OFF) <ol style="list-style-type: none"> 1. Lights when the circuit is activated.

2.01 Printout Field Description

- A. The EXTENSION NUMBER is a three-character field. Valid characters for this field are station numbers 10-41.
- B. The DIALED NUMBERS area is a 24-character field. Valid characters for this field are 0 through 9 and the characters asterisk (*) and pound (#). Account codes are output in this field and are recorded in the sequence in which they are entered. You may distinguish the account code from the dialed number by encasing the account code in asterisks (*); however, the asterisks (as well as the account codes) are output on the C.O. line.
- C. The ELAPSED TIME in minutes is a three-character field. Valid output is 0 to 255 minutes. The elapsed time of a C.O. call is rounded off to the nearest minute.

NOTE: The elapsed time in excess of 255 minutes will be printed as asterisks (****).

- D. The TIME OF DAY is a four-character field. This field is left blank because a real time clock does not exist in MPK.
- E. The C.O. LINE NUMBER is a two-character field. Valid data includes the line numbers 1 through 10.
- F. All blanks are ASCII spaces (\$20).
- G. Each line of printout ends in a CR/LF.

NOTE: System options 1, 2, and 3 will have an impact on the error messages included in the SMDR printout. See Programming Section 340-100-400.

3.00 ERROR MESSAGE FORMAT

Figure 7-2 shows the format that is used for the SMDR printout of user and system errors. System option 3 (ENABLE ERROR MESSAGES) must be set to provide the output to the SMDR. These messages also indicate user errors; as such, they may not be system errors. This is especially true of the ONHK message as defined in Section B-4.

XXX	DDDD	FF	MM:SS	HHMM	LL
E	E	E	M S	H M	C
X	R	R	I E	O	I
T	R	R	N C	U N	O
E	O	O	U O	R U	.
N	R	R	T N	T	
S			E D	E	L
I	T	C	S S	S	I
O	Y	O	R		N
N	P	D	I	T	E
	E	E	N	T	
N			G	M	
U				E	
M			D		
B			U		
E			R		
R			A		
			T		
			I		
			O		
			N		

Figure 7-2. Error Message Format

Information contained in the SMDR message fields is defined in the following paragraphs:

A. XXX

The EXTENSION NUMBER field indicates the station on which the error was detected. Valid data in this section will be either *** or extension numbers 10 through 41.

B. DDDD

The ERROR TYPE field defines the type of message printed when an error is detected. The nine types of errors are: RING, OFLN, OFHK, ONHK, CURR, DROP, DATA, DLAY AND *NMI.

1. RING

The RING error type will indicate for how long a C.O. line rang in. The time is displayed in minutes and seconds (MM:SS). The extension number of the station answering the C.O. call is printed in the XXX message field; if the line is not answered *** is printed in the XXX field. The C.O. line number that rang in is printed in the C.O. lines (LL) column.

EXAMPLES:

10 RING 1:26 3
*** RING 0:35 7

2. OFLN

The OFLN error type will indicate that a previously offline (DROP) station has been connected to the system, powered up and is communicating with the KSU. Typical output to the SMDR is an OFLN 20 referring to a station powered up in the idle state.

EXAMPLE: 38 OFLN 20

3. OFHK

The OFHK error type indicates that erroneous data was received from a station while the station was off-hook and not in use. Typical output is an OFHK + referring to the KSU receiving an off-hook command with the station already off-hook.

EXAMPLE: 24 OFHK +

4. ONHK

The ONHK error type will indicate that data other than the off-hook command was received while the station was on-hook. For example, pressing line key 2 while on-hook would output an ONHK 2 message.

NOTE: Indiscriminate pressing of keyset buttons may cause lockout of the station.

EXAMPLE: 39 ONHK 2

5. CURR

A CURR error type will be generated if a C.O. line that is in use loses loop current by either a network drop or the outside party going on-hook. The C.O. line number which lost loop current is output in the FF error code column.

EXAMPLE: 10 CURR 08.....

6. DROP

This message is printed whenever any station is placed offline due to excessive data errors. If the data portion of this message contains a character, that character indicates the connection lost due to the change in station status. If there is no data field, then the station was not connected at the time it was dropped. In previous software this message only appeared for active stations which caused a C.O. line or an intercom connection to be lost.

EXAMPLE: 20 DROP 07.....

DROP CODE	DEFINES
01-0A	LINES 1-10
0B-0F	IC CHANNELS 1-5

Figure 7-3. Drop Code Definitions

7. DATA

This message is displayed for any online station data errors in the ranges of \$00-\$19 and \$5C to \$FE. System option 24 must be enabled to display these messages. This message includes all such errors regardless of the current station state and includes any

messages which were previously displayed as ONHK with the same data error contents.

EXAMPLE: 14 DATA 15

8. DLAY

The DLAY error is printed whenever station data has not been transferred from the input area prior to the data collection processor starting a new station polling cycle. In this case a station lamp update cycle will be inserted into the polling sequence to allow the station data processor additional time for the transfer. Nothing is lost as a result of this condition and the message is displayed for performance measurement purposes only. The data code of "L" indicates that the delay was the result of slow handling of the previous station data. The absence of a code indicates that the data has been processed but that the processing of other system functions did not allow a prompt transfer out of the input area. The blank data code condition occurs frequently and is displayed only if system option 24 is enabled.

9. *NMI

The *NMI error type indicates that a Non-Maskable Interrupt (NMI) has occurred. *NMI errors are normally generated when software does not reset the system timer or when a hardware error, such as a power spike or improper board insertion, occurs. 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 in the following manner: C.O. lines that are on hold, transfer, park, and in conference will be placed on hold; C.O. lines that are seized, being reseized, dialing or redialing will remain seized; and IC calls will remain connected. The *NMI error code and system status at the time of the *NMI are displayed in Figure 7-4.

NOTE: The stack data displayed has been altered to always reflect the 14 bytes of stack data at the high address of the stack. This means that the stack data will always reflect the system stack data contents regardless of what actions may have altered the value of the stack pointer.

```

★ NMI ★ NMI 8 7 5 A . . E 8 1 F . . F B D 7 E 2 C 4 . . . . . C D 3 2 . .
!      E ! ! S ! !           S
!      R ! ! T ! !           T
!      R ! ! A ! !           A
!      O ! ! C ! !           C
!      R ! ! K ! !           K
!      ! !   ! !
!      C ! ! P ! !           D
!      O ! ! O ! !           A
!      D ! ! I ! !           T
!      E ! ! N ! !           A
!      ! ! T ! !
!      ! ! E ! !
!      ! ! R ! !

```

Figure 7-4. *NMI Error Message Format

A. FF

This message field location contains data (IC or C.O. in use at the time of the error, etc.) related to the above error types. Except for the *NMI code, the data will be a single ASCII character or a two-digit hex value representing the ASCII character. Refer to Figure 7-3.

B. MM:SS

This message field will indicate ring duration of an incoming call. The time is expressed in minutes (MM) and seconds (SS). This field will be blank for other error types.

C. HH:MM

This message field indicates the time of day during which the printout occurred. However a real time clock does not exist on the MPK system and this field will be left blank.

D. LL

This field will indicate the C.O. line in use, if applicable, during the occurrence of the error; otherwise, this field will be left blank.

REPLACEMENT PARTS

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1.00 INTRODUCTION	8-1		
General	8-1	416T	Keypad — 4 Button
		1032T	Keypad — 10 Button
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		817.3005	Transceiver for Handset
3.00 MAXIMUM SYSTEM CONFIG- URATION	8-1	810.4003	Red Plastic Cap for Keypad
		810.4001	Clear Plastic Cap for Keypad
		810.4002	Amber Plastic Cap for Keypad
1.00 INTRODUCTION		810.5018	Faceplate for 416T Keypad
		810.5019	Faceplate for 1032T Keypad
1.01 General		340.01	Cardfile (MPK/I)
		340.02	Cardfile (MPK/II)
		340.10	CPU PCB
		340.20	Central Office Unit PCB Assembly (COU) DTMF
		340.21	Central Office Unit PCB Assembly (COU) Rotary
		340.30	Station PCB (STN)
		340.40	Conference PCB (CNF)
		340.06	Power Supply (MPK/I)
		340.07	Power Supply (MPK/II)
		3030D	DSS/BLF Unit (30-Station)
		340.331	DSS/BLF Control PCB
		340.330	DSS/BLF Key PCB
		340.2301	Key Board for 416T Keypad
		340.2302	Key Board for 1032T Keypad
		3532D	DSS/BLF Unit (32-Station)
		340.333	DSS/BLF Control PCB
		340.332	DSS/BLF Keyboard
		340.23	MOH

This section provides the necessary technical information required for ordering replacement parts for the INTER-TEL MPK system. All major units or assemblies are labeled with identification numbers and can be ordered using this information.

2.00 REPLACEMENT PARTS LIST

Figure 8-1 lists all the parts authorized for replacement in the INTER-TEL MPK system. Parts other than the ones listed are not authorized for replacement in the field. All metal or cosmetic parts associated with the INTER-TEL system may be replaced by contacting INTER-TEL's Order Processing Department.

3.00 MAXIMUM SYSTEM CONFIGURATION

The INTER-TEL MPK system may be configured for either the MPK/I or MPK/II systems. The MPK/I system will have the capability for 16 multi-line keysets and will interface with 4 two-way central office lines. The MPK/II system will have the capacity for 32 multi-line keysets and will interface with 10 two-way central office lines. Figure 8-2 represents the maximum capacity of each system. It is possible to reduce the system capacity by reducing the number of STN PCB's used in the system.

Figure 8-1. Replacement Parts List

System	P/S	CPU	STN	DTMF Or Rotary COU	CNF	Keysets	DSS/BLF*
MPK/I	1	1	4	2	1	16	16
MPK/II	1	1	8	5	1	32	32

*One DSS/BLF per station.

Figure 8-2. MPK System Maximum Configuration

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