TEL PLUS℠

616

ELECTRONIC KEY TELEPHONE SYSTEM

GENERAL DESCRIPTION
INSTALLATION AND
SERVICE MANUAL

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1.00 INTRODUCTION

1.01 PURPOSE

This manual provides the information necessary to configure, install, operate and maintain the TEL PLUS 616 Electronic Key Telephone System.

1.02 REGULATORY INFORMATION (FCC)

The Federal Communications Commission (FCC) has established rules which allow the direct connection of the TEL PLUS 616 Electronic Key Telephone System to the telephone network. Certain actions must be undertaken or understood BEFORE the connection of customer provided equipment is completed.

A) TELCO NOTIFICATION

Before connecting the TEL PLUS 616 Electronic Key Telephone System to the telephone network, the local telephone company must be given advance notice of intention to use privately-owned telephone equipment and provided with the following information:

1. The telephone numbers to be connected to the system.

2. The FCC Registration Number which is located on the Key Service Unit. **DLP 82V-12491-KF-T**

3. The Ringer Equivalence Number which is also located on the Key Service Unit. **0.7A**

4. The USOC jack required: **RJ21X**

B) INCIDENCE OF HARM

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

C) CHANGES IN SERVICE

The telephone company may make changes in its communications facilities or procedures. If these should affect the use of the TEL PLUS 616 or its compatibility with the network, the telephone company must give written notice to the user to allow uninterrupted service.

D) MAINTENANCE LIMITATIONS

Maintenance on the TEL PLUS 616 Electronic Key Telephone System is to be performed only by TELECOM PLUS or its authorized agent. The user may not make any changes and/or repairs except as specifically noted in this manual. If unauthorized repairs or alterations are performed, any remaining warranty may be voided.

E) NOTICE OF COMPLIANCE

The TEL PLUS 616 Electronic Key Telephone complies with rules regarding radiation and radio frequency emission by Class A computing devices. In accordance with FCC standard 15 (Sub-part J) the following information must be supplied to the end user:

"WARNING:

This equipment generates and uses R.F. energy, and if not installed and used in accordance with the Instruction Manual, may cause interference to Radio Communications.

It has been tested and found to comply with the limits for a Class A computing device, pursuant to Sub-part J of Part 15 of the FCC Rules, which are designed to provide reasonable protection against such interference, when operated in a commercial environment.

Operation of this equipment in a residential area is likely to cause interference, in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference."

F) HEARING AID COMPATIBILITY

The TEL PLUS 616 Key Telephone is Hearing Aid Compatible, as defined in Section 68.316 of Part 68 FCC Rules.
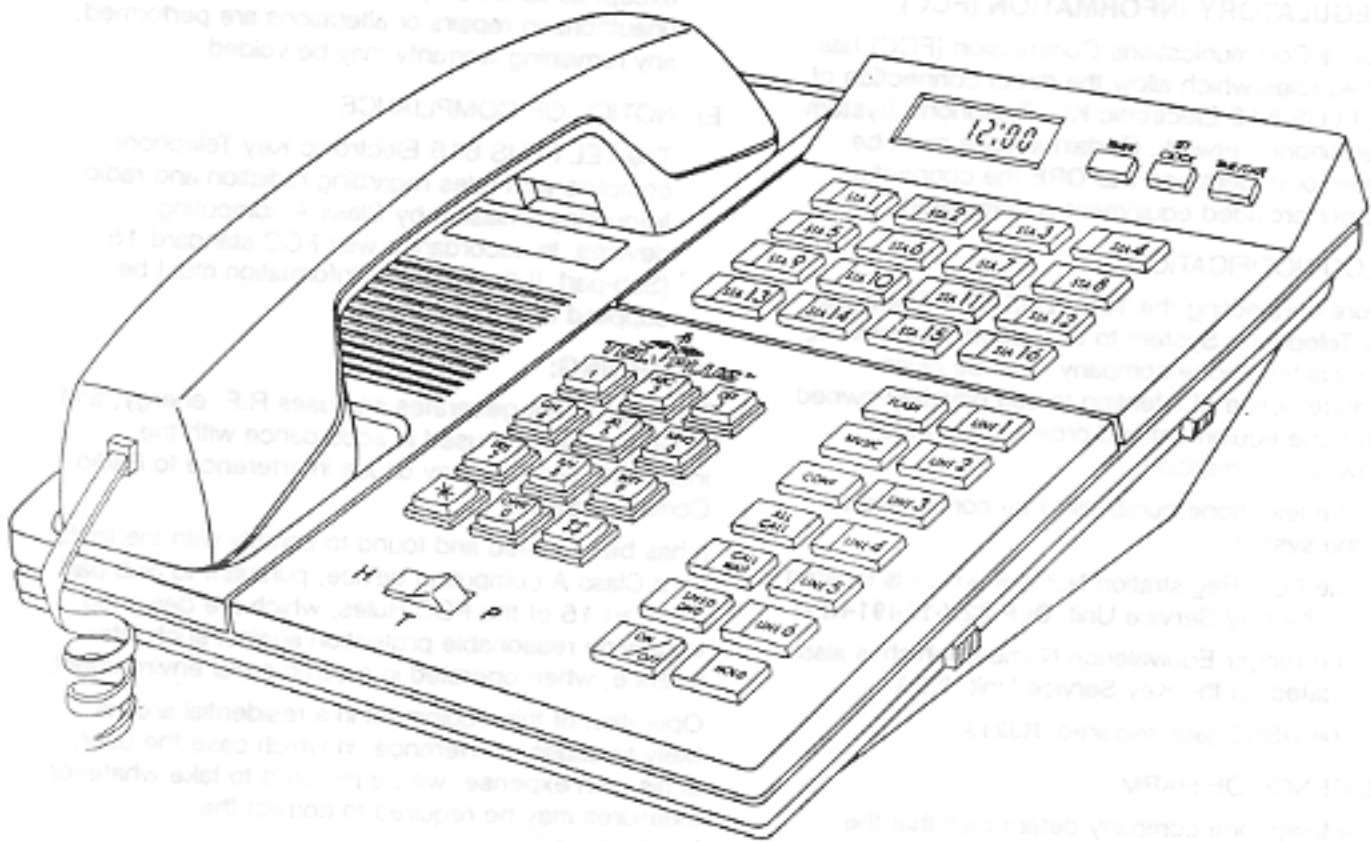
TEL PLUS 616 KEY TELEPHONE
FIGURE 1.1

2.00 GENERAL DESCRIPTION

2.01 TECHNOLOGY

The TEL PLUS 616 is a Key Telephone System that uses proven microprocessor technology to distribute communications and features. All common control circuitry is condensed onto one modular printed circuit board (PCB). This board contains the host Central Processing Unit (CPU), system memory and operating programs. From this unit, data is continually transmitted to the TEL PLUS 616 Electronic Key Telephones over four-conductor "skinny" wire cabling.

Each key telephone contains microprocessor circuitry that monitors button activity and controls lamp (LED) indications. A built-in speaker permits voice or tone calling to the station over the system intercom. Every telephone has a Busy Lamp Field (BLF) to monitor station activity in the system.

The key telephone sets are equipped with eight (8) function buttons, six (6) CO Line buttons and sixteen (16) Direct Station Selection (DSS) buttons that are used for fast INTERCOM CALLING. A three-position rocker switch is provided for easy selection of INTERCOM signaling modes, along with two separate volume controls. Included on each key telephone is a Liquid Crystal Display. The display includes time, date and elapsed time.

For emergency applications, a stand-alone battery assembly may be connected to the battery charging output terminals located inside the KSU.

The system offers automatic cut-thru of central office lines to predesignated key telephones. These instruments can make and receive calls during commercial AC power outages or following a CPU failure.

2.02 ALPHABETICAL LISTING OF FEATURES

ALARM SIGNALING

The system can recognize either an open or closed loop from an external relay and transmit an alarm signal to all available (non-busy) key telephone stations. The alarm is cancelled by operation of a reset switch and correction of the alarm condition.

ALL CALL VOICE PAGING

By lifting the handset off-hook (or utilizing the "ON/OFF" button when the SPU is provided), and pressing the "ALL CALL" feature button, a voice announcement, preceded by a short warning tone, can be made over the integrated speaker in all key telephones not busy or in the DND mode. The announcement is terminated by releasing pressure from the button. The intercom mode selection switch does not effect the ability to receive a page.

AUTOMATIC HOLD

Depressing the DSS, "ALL CALL" or "CONF" key while on an outside line will automatically place the CO Line on hold. This allows quick internal consultation and call transfer.

AUTOMATIC HOLD RECALL

Any line placed on hold by a station will recall that station if not retrieved from hold within a programmable period of time. The hold period can be set at 30 seconds, 60 seconds, 90 seconds or disabled entirely. The holding line receives a special recall flash at all keysets in the system, so that in the event the party is not at their desk, someone else can pick-up the call.

BACKGROUND MUSIC

An optional music source can be connected to the system that allows all keysets to have music over their internal speakers. The music can be selectively turned on and off at each key telephone, by utilizing the "MUSIC" button. The volume level can be controlled by rotating the speaker volume dial on the right side of the keyset. The music is eliminated upon going off-hook, and returns when the call is completed. No interface card is required for this feature.

BATTERY BACK-UP (MEMORY)

A long life lithium battery is provided on the Miscellaneous Service Unit (MSU) to retain the system database in the event of a power outage or the system being turned off. This eliminates the need for reprogramming essential information.

BATTERY BACK-UP (SYSTEM)

Optional maintenance free batteries and cabling can be connected directly to the existing TEL PLUS 616 Power Supply to provide full system operation in the event of commercial power outage. Calls in progress will continue, unaffected by the system switching over to external battery operation. The size of batteries provided determines the back-up time, as shown in Section 4.12. The power supply automatically recharges the batteries when commercial power is restored.

BUSY LAMP FIELD

Each key telephone is equipped with an LED indicator under each Direct Station Selection (DSS) button to denote the status of all other keysets in the system.

CALL ANNOUNCING

Key Telephone users can select, through a rocker switch on the key telephone the mode that allows th r calls to be announced. With the switch in the P r .e, call announcements are presented. If the key telephone is in the H mode, call announcements are presented and handsfree talkback is allowed.

CALL TRANSFER

To transfer a call to another station, the desired party's DSS button is pressed. When the intercom call is answered, the outside line can be announced. Since the CO Line is automatically placed on hold, this could be used to confer about the call. After confering, return to the holding CO Line. When the TEL PLUS 616 is used behind a PABX, the PABX Transfer Unit (PTU) can be equipped in the system to offer an adjustable flash for transfer and other feature operations.

CALL WAITING (CAMP-ON)

A station may alert a busy party that an outside line is on hold for them by use of the Call Waiting feature. To Camp-On a call, press the DSS key of the desired busy station, and then press the "CALL WAIT" key. The outside line is automatically placed on hold. The busy station will receive an off-hook ring, an "I-Hold" indication on the LED of the waiting line, and a flashing "HOLD" button if the camp-on initiator is still off-hook. The busy party can press the "HOLD" bu .n, automatically placing their first outside line on

hold to confer with the camp-on initiator, or in the event the initiator has left the call (no flashing "HOLD"), the party can press the waiting trunk button, automatically placing their first outside line on "HOLD". A station may camp-on another busy station without having the CO Line connection, if necessary. A CO Line camped-on a station will recall the camp-on initiator, if not picked up, after the programmable period of time expires. Only the attendant station can camp-on to a station in the DND mode with a visual indication only.

The station designated as "Executive" cannot be camped-on.

CONFERENCE (EXTERNAL)

A) Multi-Line

One (1) internal station can engage in a conference with two (2) external parties. Two (2) individual simultaneous conferences can take place. An external party can be excluded from the conference by pressing the CO Line button of the party wished to remain. The Multi-Line Conference Unit (MLU) is standard in each system.

B) Add-On Conference

Two (2) internal stations can engage in conference with one external party. There is no limit on the number of simultaneous add-on conferences, as this conference does not tie up an intercom path.

CONFERENCE (INTERNAL)

Three (3) internal parties can be in conference on one (1) intercom path. Two (2) individual simultaneous conferences can be achieved, each of three (3) parties, if necessary. The third party in the conference can be deleted, and another party added simply, by the originator pressing the new parties DSS button. If the originator drops out of the conference, the conference will be terminated.

DIRECT LINE ACCESS

Key telephones have direct access to all six (6) central office lines or PABX extensions.

DIRECT STATION SELECTION (DSS)

Sixteen (16) buttons are dedicated at each telephone for immediate signaling and connection to other stations.

DSS/CO LINE KEY PRESELECT

A DSS or CO Line key can be pressed before going off-hook or pressing the "ON/OFF" button, if so desired. This preselection must be followed by an off-hook within five (5) seconds.

DO NOT DISTURB (DND)

Eliminates incoming CO Line ringing, incoming intercom calls, and All Call page announcements coming through on a keyset when the DND button is pressed. An LED in the DND button provides quick verification of DND activation. The attendant station can override DND and transfer a waiting CO Line to that station via camp-on. A station in DND appears as busy on the BLF indications at other keysets.

EMERGENCY TRANSFER

In the event of commercial power or central processor failure, the system will automatically place the first stations to CO Lines on a one-to-one basis, according to the number of trunks equipped. These emergency stations are predesignated by their position on the MDF. An optional Electronic Buzzer Unit (82TPS001), must be equipped in each emergency transfer set in order to receive incoming CO ring.

EXECUTIVE/SECRETARY TRANSFER

One (1) pair of key telephones can be designated to have the ability of executive/secretary transfer. Whenever the "executive" phone is in DND or busy, transferred CO Lines and intercom calls will be directed to the "secretary" station.

EXTERNAL PAGING

A DSS button can be assigned as a page key, which could activate optional external page equipment. The optional Intercom Box and Station Interface (PSU) card (22TPS004) must be equipped to provide voice output and contacts for external page equipment.

FLEXIBLE NIGHT TRANSFER

The attendant console can selectively assign any one station in the system as a night service station. This is accomplished simply by placing the attendant console into DND and pressing the DSS key of that station. Day CO ringing stations will continue to ring in the normal manner when the system is in night mode.

HANDSFREE ANSWERBACK

A station user can reply handsfree to incoming intercom calls.

HEADSET CAPABILITY

The TEL PLUS 616 can accept a standard headset of modular type for connection to each keyset where desired.

HOLD

Any CO Line may be placed on hold by pressing the dedicated red "HOLD" button, a feature button or DSS key.

I-HOLD INDICATION

Calls placed on hold at a station are easily differentiated from other parties' held lines by a special LED flash rate.

INTERCOM

Two (2) intercom paths are available in the system for internal signaling and speech.

INTERCOM BOX

Up to eight (8) intercom boxes can be substituted on a two-for-two basis with key telephones to provide intercom announcements and handsfree talkback. The intercom box cannot originate calls. The box is assigned a DSS key, and when called, can respond handsfree to the box. The unit can be used in conjunction with a door buzzer for entranceways in the usual manner. The Intercom Box (16TPS001) requires the Intercom Box and Station Interface Unit (23TPS002) to operate. This card can support up to two (2) key telephones and two (2) Intercom Boxes, or two (2) key telephones, one (1) Intercom Box, and external page equipment or Loud Bell.

INTERCOM CALL PICK-UP

A station can retrieve an intercom call by pressing the "MUSIC" button, then the DSS button of the station being called.

INCOMING INTERCOM MODE SELECTION

The key telephone user can select the method of receiving intercom calls at that station. The mode can be easily changed by the individual station user. A rocker switch located on the telephone is used to select the mode. The choices are:

1) Tone Ringer (T)

    A standard tone ring notifies the party of an incoming call. The party answers by going off-hook.

2) Page (P)

    The station user receives a short tone burst and a voice announcement over their integrated keyset speaker, while the microphone is deactivated, providing privacy. The called party must go off-hook to pick up the call, or switch the selector to handsfree.

3) Handsfree (H)

    The station user, upon hearing a short tone burst and voice announcement over the integrated speaker, can reply handsfree.

LAST NUMBER REDIAL

The system automatically remembers the last number a keyset dialed. To dial this number again, the user must go off-hook, press the "SPEED DIAL" button, and the pound (#) key on the dial pad. This method will dial the last number, even if that number was a number in speed dial. This feature requires the Miscellaneous Unit (MSU) be equipped.

LIQUID CRYSTAL DISPLAY (LCD)

The display on each keyset will provide the time and date for easy desk reference. This information will stay in the field while the station is off-hook. During a CO call, the elapsed time of the call can be manually displayed. The time and date can be easily set by the telephone user.

LONG HANDSET CORD

A twelve (12) foot handset cord is standardly provided with each keyset to allow the station user some freedom of movement around the office area.

LOUD BELL CONTROL

An external loud bell can be connected to the optional Intercom Box and Station Interface Unit (PSU) for loud ringing of particular CO Lines where required.

MESSAGE WAITING

The attendant station can serve as a message center. The attendant telephone can set a message waiting LED indication on any person's key telephone. To retrieve a message, the user presses the DSS button for the attendant station, and the attendant provides him with the information. The message indication is cancelled automatically after calling the attendant.

MUSIC ON HOLD

An optional music source can be connected directly to the system to provide all held calls with music.

OFF-HOOK RINGING

An off-hook keyset will receive muted ringing tone over the integrated speaker, informing the user of an incoming call.

ON-HOOK DIALING/CALL MONITOR

The key telephone user can dial a number without lifting the handset from the cradle, and monitor the call while the called party's phone is ringing or on hold, over the integrated speaker.

PABX FLASH

A FLASH button is provided or the key telephone for generating a 600 msec open loop flash over PBX extension lines. The optional PABX Transfer Unit (PTU) is required to provide this feature.

PRIVACY

All conversations on internal and external calls are protected from intrusion by other stations in the system.

RINGING ASSIGNMENTS

Incoming CO ringing signaling can be assigned on a per-station basis according to user requirements. A station can ring on one line only, all lines or no lines at all.

SPEAKERPHONE

An optional integrated circuit board (SPU-16TPS002) can be added internally to a keyset to provide it with full handsfree speakerphone capability.

STATION SPEED DIAL

Each station has eight (8) user programmable private speed dial numbers of up to twenty-two (22) digits in length. These numbers may contain pauses (#), with each two-second pause lessening the number length by one (1) digit. The numbers are accessed by going off-hook, pressing an idle CO Line button, pressing the "SPEED DIAL" button, and dialing the respective one (1) digit access code (1-8). The Miscellaneous Unit (MSU-22TPS002) is required for this feature.

SYSTEM SPEED DIAL

A total of ten (10) numbers can be assigned as common system speed dial numbers. The numbers can be up to twenty-two (22) digits in length, with pauses taking up digit space. The numbers are accessed by going off-hook, pressing an idle CO Line button, pressing the "SPEED DIAL" button, and dialing the two (2) digit access code (90-99). Numbers in speed dial bins cannot override toll restriction, if activated by a restricted station. The Miscellaneous Unit (MSU) is required for this feature. The system speed number are programmed from the attendant telephone.

TOLL RESTRICTION

The system assigns toll restriction through the use of Class of Service assignments to each telephone. There are four (4) classes of service assignable for providing flexible restrictions. A ten number exception table is available for Class of Service 2 and 3. The exception tables are programmable to allow exceptions to normal toll restriction.

VOLUME CONTROLS

Each keyset user can adjust both speaker and ring volume independently by using the two (2) volume slides located on the right side of the keyset.

WALL TELEPHONE

Any key set can be adapted for wall mounting. The wall mount kit (16TPS003) must be provided for wall mounting.

Feature	Availability	Additional Internal Equipment Required	External Equipment Required
Alarm Signaling	S	N	Y
All Call Voice Paging	S	N	N
Automatic Hold Recall	S	N	N
Background Music	S	N	Y
Battery Back-Up (Memory)	S	N	N
Battery Back-Up (System)	S	N	Y
Busy Lamp Field (BLF)	S	N	N
Call Announcing	S	N	N
Call Transfer	S	N	N
Call Waiting (Camp-On)	S	N	N
Conference External	S	N	N
Conference Internal	S	N	N
Direct Line Access	S	N	N
Direct Station Selection (DSS)	S	N	N
DSS & CO Line Preselect	S	N	N
Do Not Disturb (DND)	S	N	N
Emergency Transfer	S	EBU	N
Executive/Secretary Transfer	S	N	N
External Paging	O	PSU	Y
Flash Key	O	PTU	N
Flexible Night Transfer	S	N	N
Hold	S	N	N
Incoming Intercom Mode Selection	S	N	N
Intercom Box	O	PSU	Y
Intercom Call Pick-Up	S	N	N
Intercom Signaling Mode	S	N	N
Last Number Redial	O	MSU	N
Liquid Crystal Display	S	N	N
Long Handset Cord	S	N	N
Loud Bell Control	O	PSU	Y
Message Waiting	S	N	N
Music On Hold	S	N	Y
Off-Hook Ringing	S	N	Y
On-Hook Dialing	S	N	N
PABX Flash	O	PTU	N
Privacy	S	N	N
Speakerphone Operation	O	SPU	N
Station Speed Dialing	O	MSU	N
System Speed Dialing	O	MSU	N
Toll Restriction	O	MSU	N
Volume Controls	S	N	N
Wall Telephone	O	WMK	N

S = Standard Y = Yes
N = None O = Optional

FEATURE LISTING
FIGURE 2.1

SPECIFICATIONS

CAPACITY

The TEL PLUS 616 Electronic Key System has a maximum capacity of six (6) central office lines, sixteen (16) electronic key telephones and two (2) INTERCOM paths. Up to eight (8) INTERCOM BOXES may be substituted for key telephones on a two-for-two basis. The basic system provides two (2) CO line interfaces, eight (8) key telephone appearances and INTERCOM CALL ANNOUNCING circuitry.

Additional lines, stations, and features are provided by plugging in modular printed circuit boards. These cards have unique color-coded ejector tabs that correspond to colored card guides located in the KSU. The KSU card connectors are mounted on a rigid PCB backplane. No wire wrapping or special wiring is needed. All options are performed by operating the dip switches and slide switches located on the printed circuit boards (See Figure 3.1). The switches, volume controls and fuse assemblies are located at the KSU entrance. This permits visual inspection or adjustment without card removal.

Central office or PBX extension lines are interfaced with two-circuit CO Line Units (COU). Key telephones are connected to the system via four-circuit Station Interface Units (SIU). INTERCOM BOXES are served by substituting the Phone Box and Station Interface Unit (PSU) for the SIU card. The PSU card supports two INTERCOM BOXES and two telephones.

The Handsfree Talkback Unit (HTU) equips the system for handsfree talk back operation on INTERCOM.

The Multi-line Conference Unit (MLU) provides conferencing between any two CO lines and any one key station.

Economical Dummy Boards (DB-1 and DB-2) are used to connect speech paths in systems that are not fully equipped. DB-1 is provided when the MEU and MSU cards are not equipped. DB-2 is provided when the PTU and COU cards are not required.

By adding expansion cards, the system capacity is brought to maximum and many additional features are provided.

The Matrix Expansion Unit (MEU) is required when the 5th and 6th CO lines are interfaced.

Those key stations requiring the optional handsfree operation on external CO lines may be enhanced with Speakerphone Units (SPU) inside each set.

The optional PABX Transfer Unit (PTU) enables ground or open loop flashing at all key telephones.

An optional Miscellaneous Unit (MSU) provides flexible TOLL RESTRICTION, STATION SPEED DIALING, SYSTEM SPEED DIALING and LAST NUMBER REDIAL features.

3.02 SYSTEM COMPONENTS

PC-616 BASIC SYSTEM (20TPS001)

The wall mounted KSU includes an integrated modular power supply with detachable power cord, all card connectors for future expansion and built-in power line interference protection. The following cards are also included in the basic system: (1) CCU, (1) COU, (2) SIU, (1) HTU, (1) MLU and (5) DB cards. Installation Manual and spare fuses are shipped with each system.

PC-616 ELECTRONIC KEY TELEPHONE (10TPS001)

The instrument has eight (8) function buttons, six (6) CO/PBX line buttons and sixteen (16) Direct Station Selection (DSS) buttons. The set features integrated BUSY LAMP FIELD (BLF), a Liquid Crystal Display, switch-select intercom signaling, (2) volume controls, and full modularity. A 12 ft. handset cord and a 7 ft. mounting cord are included. Maximum sixteen (16) key telephones per system. A User Guide is shipped with each instrument.

PC-616 CENTRAL OFFICE UNIT [COU] (24TPS001)

Interfaces two (2) CO/PBX lines. Maximum three (3) COU cards per system. (White Ejector Tabs)

PC-616 STATION INTERFACE UNIT [SIU] (23TPS003)

Interfaces four (4) electronic key telephones per card. Maximum four (4) SIU cards per system. (Green Ejector Tabs)

PC-616 PHONE BOX AND STATION INTERFACE YBUT [PSU] (23TPS002)

Interfaces two (2) Electronic Key Telephones and two (2) Intercom Boxes per card. The PSU card may be installed in any SIU/PSU slot. (Green Ejector Tabs)

PC-616 MATRIX EXPANSION UNIT [MEU] (20TPS002)

Required only when adding CO lines 5 and 6. Interfaces the third COU card with the system matrix. (Blue Ejector Tabs)

PC-616 INTERCOM BOX (16TPS001)

Allows handsfree conversation from locations that do not require telephone dialing privileges. Maximum eight (8) INTERCOM BOXES per system. INTERCOM BOXES are substituted for key telephones on a two-or-two basis. Requires one PSU card for every two Intercom Boxes.

C-616 PABX TRANSFER UNIT [PTU] (22TPS004)

ov. , open loop or ground flashing on all CO/PBX es. System flashing can be adjusted for 600 msec 2 second duration to accommodate either PABX sh or Recall function. One card per system. When l equipped, the Flash Key is inoperative. own Ejector Tabs)

-616 MISCELLANEOUS UNIT [MSU] (22TPS002)

ds STATION/SYSTEM SPEED DIALING, LAST MBER REDIAL and flexible TOLL RESTRICTION to TEL PLUS 616 Key System. (Red Ejector Tabs)

616 MULTI-LINE CONFERENCE UNIT [MLU] PS003)

l allows conferencing of any (2) outside CO lines any one key station. (Black Ejector Tabs)

PC-616 DUMMY BOARDS [Replacement Kit of 2 lg/3 sm] (23TPS004)

Connector cards maintain speech paths thru system matrix when system is not equipped at full capacity.

PC-616 SPEAKERPHONE KIT (16TPS002)

This modular circuit upgrades the standard TEL PLUS 616 Key Telephone to full HANDSFREE SPEAKER-PHONE capability. One kit is installed in each telephone that is converted to full handsfree operation.

PC-616 WALL MOUNT KIT (16TPS003)

This color matching baseplate assembly easily converts standard TEL PLUS 616 desk top instruments into wall mount models. One kit required per wall mounted instrument.

PC-616 POWER SUPPLY (21TPS001)

Replacement power supply includes detachable AC supply cord, integrated power-line interference protection and modular KSU connector.

PC-616 CENTRALIZED CONTROL UNIT [CCU] (23TPS001)

PCB contains the system CPU, dynamic memory and associated common control circuits. (Yellow Ejector Tabs)

PC-616 HANDSFREE TALKBACK UNIT [HTU] (22TPS001)

PCB contains circuitry for handsfree talkback over both intercom links. (Orange Ejector Tabs)

PC-616 ELECTRONIC BUZZER UNIT KIT [EBU] (82TPS001)

This modular circuit provides audible ringing for the TEL PLUS 616 Key Telephone during a Power Failure Transfer (commercial power failure).

PRINTED CIRCUIT BOARDS

POWER SUPPLY

LINE
1.25A/250V

LOAD
2.5A/250V

ON

OFF

PRINTED
CIRCUIT
BOARDS

TB1

TB2

CONNECTING BLOCK

KSU CONFIGURATION
FIGURE 3.1

TABLE 3-1
CIRCUIT CARD CONFIGURATION
OF TEL PLUS 616 KSU

C.O. LINE   STATION

COU 24TPS001	POWER SUPPLY 21TPS001	SIU 23TPS003	1, 2, 3, 4
COU 24TPS001	CCU 23TPS001	SIU 23TPS003	5, 6, 7, 8
COU 24TPS001 (Note 1)	HTU 22TPS001	SIU 23TPS003	PSU 23TPS002 (Note 2)	9, 10, 11 (IBX 1), 12 (IBX 2)
MEU 20TPS002	MLU 22TPS003	SIU 23TPS003	PSU 23TPS002 (Note 2)	13, 14, 15 (IBX 3), 16 (IBX 4)
PTU 22TPS004	MSU 22TPS002		

FLASH

Note 1: When C.O. Lines 5 & 6 are added, the MEU must be added also.

Note 2: Unused Intercom Box positions (IBX) may be used for external paging zone access or Loud Bell Control.

TOLL RESTRICTION

SPEED DIAL (SYSTEM/STATION)

LAST NUMBER REDIAL

INCLUDED IN BASIC SYSTEM 20TPS001

ADDED OPTIONALLY

3.03 SYSTEM SPECIFICATIONS

SIGNALING SPECIFICATIONS

VISUAL INDICATORS

NAME	CONDITION	LOCATION
Busy CO Line	Steady Lamp	CO Line Button
Incoming CO Line	30 IPM Flashing	CO Line Button
I-HOLD	30 IPM Double Flash	CO Line Button
System HOLD	60 IPM Wink	CO Line Button
Line Recall	120 IPM Flashing	CO Line Button
Incoming Intercom	20 IPM Flashing	HOLD Button
Intercom Busy	Steady Lamp	HOLD Button
Message Waiting	15 IPM Flashing	CALL WAIT Button
DND On	Steady Lamp	DND Button
Speakerphone ON	Steady Lamp	ON/OFF Button
BLF Extension Busy	Steady Lamp	DSS Button
DSS Transfer	20 IPM Double Flash	CO Line Button
Time	Current Time	LCD
Date	Current Date	LCD
Elapsed Time	CO Call Timing	LCD

AUDIBLE SIGNALS

NAME	TONE	DURATION
Incoming CO Line	512/640 Hz Warble	1 sec on/3 sec off
Intercom Caller (T)*	420 Hz Tone	0.5 sec on/1.5 sec off
Intercom Called (T)*	(P)* (H)* Chime 500/420 Hz	Once
	512/640 Hz Warble	0.5 sec on/1.5 sec off
Call Waiting Caller	(P)* (H)* Chime 500/420 Hz	Once
Called	420 Hz Tone	0.5 sec on/1.5 sec off
A/C Warning	Muted 512/640 Hz Warble	0.5 sec on/1.5 sec off
Emergency Alarm	420 Hz Tone	1.0 sec burst (once)
Busy	420 Hz Tone	4 Hz
Vacant Station	420 Hz Tone	1 Hz
DND	420 Hz Tone	1 Hz
	420 Hz Tone	3 repetitions 0.25 sec on/0.25 sec off/pause-repeat

* DEPENDS UPON POSITION OF INTERCOM SIGNALING MODE SWITCH ON KEY TELEPHONE.

3.03 SYSTEM SPECIFICATIONS (Cont.)

DIMENSIONS AND WEIGHTS

BASIC SYSTEM

Height
Width 354   mm ($15^{13}/_{16}$ in.)
Depth 560   mm ($22^{1}/_{16}$ in.)
Weight Approximate .... 225.4 mm ($8^{7}/_8$ in.)
34.3 lbs.

KEY TELEPHONE STATION

Height
Width 87   mm ($3^{1}/_2$ in.)
Depth .... 204 mm (8 in.)
Weight Approximate .... 231 mm ($9^{1}/_8$ in.)
2.9 lbs.

INTERCOM BOX

Height
Width 41   mm ($1^{3}/_4$ in.)
Depth .... 140 mm ($5^{1}/_2$ in.)
Weight Approximate .... 108 mm ($4^{1}/_4$ in.)
1 lbs.

POWER SUPPLY MODULE

Height
Width .... 104 mm($4^{1}/_4$ in.)
Depth .... 183 mm($7^{1}/_4$ in.)
Weight Approximate .... 198 mm($7^{3}/_4$ in.)
9 lbs.

ELECTRICAL

AC input to P/S
Power Consumption .... 117 VAC 50/60 Hz
Output Voltage .... 125 WATTS
24 VDC, 2.5 A

Battery Charge Power .... 28 VDC, 0.6 A (Maximum)

Maximum Station Cable Lengths
800 ft. of 26 AWG Cable
1200 ft. of 24 AWG Cable
2000 ft. of 22 AWG Cable

Fuses
AC Input
DC Output .... 1.25 A, 250 V
SIU/PSU Card .... 2.5 A, 250 V
Music Source (Input) .... 0.4 A, 250 V SLO BLOW
600 Ohms @0 dBm

ENVIRONMENTAL

Temperature
Recommended .... 32-122°F (0-50°C)
Humidity .... 70°-78°F
5-90% (Non-Condensing)

4.00 INSTALLATION

4.01 SITE PLANNING

The TEL PLUS 616 Electronic Key Telephone System, like most electronic office equipment, should not be subjected to harsh environmental conditions. To assure easy servicing and reliable operation, several factors must be considered when planning the system installation. Always consider the following BEFORE installing the KSU and wiring:

A) The KSU is designed for wall-mounting only.

B) The internal power supply operates on 117 VAC, 60 Hz, single-phase electricity. A 3-wire (parallel blade with ground) receptacle must be provided on a dedicated, separately fused 15 AMP circuit.

C) Location(s) of telephone conduits or cable runs.

D) The KSU should be within 25 feet of the telephone company (TELCO) RJ21X.
The KSU should be centrally located and assurances should be made to stay within prescribed cable lengths.
    800 ft.   26 AWG   Cable
    1200 ft. 24 AWG   Cable
    2000 ft. 22 AWG   Cable
It is recommended that 24 AWG 3 pr. twisted cable (TEC #73NEW036) be used for all TEL PLUS installations.

E) A well ventilated area having a recommended temperature range of 70 to 78 degrees Fahrenheit, and a humidity range of 5 to 90% non-condensing).

F) Accessibility of KSU for servicing and lighting.

G) Protection from flooding, flammable materials, excessive dust and vibration.

H) Proximity of radio transmitting equipment, arc-welding devices, copying machines and other electrical equipment that are capable of generating electrical interferences.

I) Access to a good earth ground such as a metallic COLD water pipe. Inspect the pipe for non-metallic joints.

4.02 UNPACKING

A) Remove the Key Service Unit from the shipping carton and place it on a level working surface with the cover facing up. Loosen the thumb screws at the bottom of the cabinet and remove the cover. Remove all packing material from the inside cover and inspect for shipping damage. Make sure that the printed circuit boards are seated firmly into the card connectors.

B) The power supply should be unpacked and inspected for damage. An AC power cord is packed in the same container.

4.03 PCB HANDLING

The Printed Circuit Board (PCB) assemblies contain static sensitive components that will require a few simple handling precautions to avoid damage:

A) Keep all PCB's in their protective plastic bags until they are installed in the Key Service Unit. All PCB's not in the protective bags should be handled by the card edges only.

B) When inserting a card into the Key Service Unit, take care to insure that the system power is turned off, the card edges are aligned with KSU card guides and that the component side of the card faces to the right. Note that the card ejectors are color coded to match the designations on the KSU.

C) Always use a grounded wrist strap when handling PCB's. This will minimize the possibility of static damage.

D) Never lay an unprotected card on a carpeted surface.

4.04 SYSTEM GROUNDING

To insure that the system will operate properly, a good earth ground must be used. A metallic COLD water pipe will usually provide a reliable ground path. Carefully check that the pipe does not contain insulated joints that could isolate the ground. In the absence of a COLD water pipe, a ground rod or other source must be used. A 8 AWG (TEC #79APW006) copper wire should be used between the ground source and the KSU.

The wire should be kept as short as possible, and can be connected to the ground lug provided at the bottom right of the KSU (Refer to Figure 4.2 – KSU layout.)

4.05 KSU INSTALLATION

A) The KSU is designed for wall mounting only. The KSU should NOT be mounted directly on a masonry surface.
If the KSU is to be mounted on a masonry surface, a wooden backboard of sufficient size should be attached to the wall and the KSU mounted on the backboard.

B) Mount the KSU on the backboard using four fasteners. (The fasteners should be selected carefully so as to be capable of supporting a fully loaded KSU). (Refer to Figure **4.1** for mounting hole locations and KSU dimensions).

C) Install the key system ground using an insulated 8 AWG copper wire. Attach one end to the grounding lug inside the KSU cabinet and fasten the other end to a good earth ground (Refer to Figure **4.2** – KSU layout).

Install the TEL PLUS 616 Power Module into the upper right hand corner of the KSU. (Refer to Figure **4.2** KSU layout). Make sure that the power switch is in the "OFF" position. Align the module with the tray on the KSU and insure that the connector on the module is completely inserted into the KSU.

E) Plug the power cord into the connector on the side of the power supply and route the cord to AC power.
A surge protector should be installed at the dedicated AC receptacle. The recommended protector is TEC #52Tii003 plug-in power line SURGE protector. Connect the unit according to the manufacturer's instructions.
DO NOT PLUG IN CORD AT THIS TIME.

CAUTION

To protect the user from possible electrical shock, a 3-wire to 2-wire isolation adapter should not be used. The 3rd wire (green) AC connection should not be treated as a reliable earth ground for the system and should not be substituted for the COLD water pipe ground.

4.06 CABLING

A) Connection between the KSU and each telephone requires telephone standard quad or 2-pair (4-wire) twisted cable. TEL PLUS recommends the use of 3 pair twisted cable (TEC #73NEW036) for all key system installations.

B) Cabling should be routed to avoid fluorescent light fixtures, electric motors and generators, welding equipment and radio transmitters. Additionally, care should be taken to avoid hot locations such as steam pipes and furnaces, and areas where wiring is subject to abrasion.

C) Bring all cabling through the hole in the base of the KSU and terminate on Blocks TB1 and TB2. Refer to Figure 4.5 for specific connections inside the KSU. Terminate the key telephones on standard modular connecting blocks as shown in Figure **4.3** & **4.4**. It is recommended that TEC #76SUT011 modular jack assemblies (Figure **4.4**) or equivalent be utilized for surface mounting; use TEC #76SUT009 modular jack assemblies (Figure **4.3**) or equivalent for wall mounting applications.

CAUTION

It is not recommended that power be applied to the system during the cable termination process.

D) Verify that the wires are properly cross-connected. Observe the telephone standard wiring color codes whenever possible.

4.07 WALL MOUNT KIT INSTALLATION

connections to the Key Telephones are fully-modular. To wall mount the Key Telephone, it is necessary to have one (1) PC-616 Wall Mount Kit and one (1) standard TEC #76SUT009 type jack assembly, designed for normal wall hanging applications.

A) Unplug the line cord from the Key Telephone. This line cord will not be required and should be retained as a future maintenance replacement item.

B) Substitute the short modular cord from the PC-616 Wall Mount assembly into the modular connector vacated by the line cord.

C) Lift the plastic number retainer upwards and expose the screw underneath. Remove the screw and reverse the handset tab so that the protrusion faces the hookswitch. This will allow the handset to remain secure when the telephone is on the wall. Replace the screw and snap the number retainer into place.

D) Align the wall mount base-plate with holes on the bottom of the Key Telephone. Snap in place and fasten with screw.

E) Now mate the two (2) key hole slots on the base-plate with the lugs on the 630-A type jack. Align modular connector and press telephone into place. (Refer to Figure 4.11)

4.08 CO/PBX LINE CONNECTIONS

Terminate the CO/PBX lines at the block in the KSU labeled TB 2. Be careful to observe proper sequence of each CO line and polarity of CO Tip and CO Ring. Refer to Figure 4.6 for typical CO/PBX to KSU line connections.

4.09 EXTERNAL MUSIC SOURCE

MUSIC-ON-HOLD, as well as BACKGROUND MUSIC through telephone set speakers, can be connected via a customer provided tuner, tape deck, etc. MUSIC-ON-HOLD volume is adjusted at the music source. BACKGROUND MUSIC (BGM) levels are adjustable at the KSU and at each key telephone set. Input impedance to the KSU is 600 Ohms at 0 dBm. Refer to Figure 4.5 & 4.6 for termination points.

To properly adjust system music levels;

1. While receiving an All-Call Page test announcement, adjust the speaker volume to an acceptable level at one key telephone. There are two (2) slide volume controls located on the right side of the instrument. The slide located closest to the user will decrease the volume of the voice page when pulled toward the station user.

2. Adjust the volume at the external music source for a comfortable level at the test instrument.

3. The MUSIC-ON-HOLD level can be increased or decreased by adjusting the volume control (VL4) located on the CCU card in the KSU (Figure 5.2).

4.10 ALARM INSTALLATION

The TEL PLUS 616 System may be used to transmit an alarm signal to each station (except intercom boxes) in the system. When activated by an external alarm system, a repeated warbling tone is transmitted to the station speakers. Leads from the external alarm are connected to the TEL PLUS 616 at TB1 terminals ALMT and ALMR (Figure 4.6). A customer provided reset button must be installed across the ALMR and AR terminals (Figure 4.8). In the event of an alarm condition, the system must be reset by first clearing the alarm condition on the external system and then depressing the reset button for three (3) seconds (See section 5.08 for programming Alarm States).

4.11 MAJOR ALARM

The system is also designed to create a contact closure across terminals MAL and MAR (Figure 4.6). In the event of CCU failure or commercial power failure, customer provided alarms may be connected across these terminals.

The emergency CCU or power failure alarm will automatically cease when the alarm causing condition is cleared. No programming is necessary for this feature.

4.12 BATTERY BACK-UP

The TEL PLUS 616 Key System power supply provides the charging and regulation circuitry necessary to accommodate battery back-up for the system in the event of commercial power failure. The gel-type batteries must provide 24 VDC and are

connected to the Key Service Unit (See Figure 4.2). Table 4-1 provides examples of recommended battery sizes for 2, 4 and 8 hour back-up at various system configurations.

TABLE 4-1
BATTERY AMP. HOUR REQUIREMENTS

System Configuration	BACK-UP TIME		
	2 hrs.	4 hrs.	8 hrs.
2 × 4	4 AH	8 AH	16 AH
2 × 8	5 AH	10 AH	20 AH
4 × 12	6 AH	12 AH	24 AH
6 × 16	7 AH	13 AH	26 AH

4.13 INTERCOM BOX INSTALLATION

The TEL PLUS 616 Intercom Box is designed to receive only intercom calls, with handsfree talkback operation. The unit should be located in weather-protected areas where paging or monitoring is required.

The Intercom Box consists of a top housing and bottom mounting plate. The top housing has a speaker, microphone, wire terminals and electronic circuitry. The housings are separated by inserting a thin, flat-edged tool at the bottom rim of the assembly. By pressing inwards on the recessed retaining tab, the assembly will open.

The connection of the Intercom Box(es) to the KSU is by standard 2-pair telephone cable. The cable is punched down on the associated ET/ER and EDT/EDR terminals on the TB1 or TB2 block (depending on the card slot position occupied by the Phone Box and Station Interface Unit). The PSU card may be plugged into any or all of the SIU/PSU card slots in the KSU. Each PSU card provides two (2) key telephone interfaces (Circuits 1 and 2) and two (2) Intercom/Paging/Loud Bell Control Interfaces (Circuits 3 and 4). The Intercom Box circuits are current-limited and are not fused.

The bottom plate of the Intercom Box assembly is fastened to the wall by mounting with customer-supplied No. 8 or larger pan head screws. The cable is routed through the cable-entry holes provided on the bottom plate and is connected to the screw terminal strip on the upper housing. Four (4) screw terminals are identified by wire color on the silk-screened printed circuit board to correspond with the wiring sequence at the punchdown connector in the KSU. (See Figure 4.7)

The slack wiring should be pulled back through the bottom mounting plate and the top housing snapped shut. The unit is ready for testing, after verification of the PSU switch settings. (See Section 5.07 – Programming the PSU card.)

4.14 EXTERNAL PAGING

EXTERNAL PAGING zones require the use of the PSU card and may be connected to the TEL PLUS 616 System by exchanging an intercom box/specialty circuit for each paging zone required.

The PSU card contains four circuits. The first two (2) circuits are dedicated to key telephone use only and circuits three (3) and four (4) are used for EXTERNAL PAGING, LOUD BELL CONTROL, or INTERCOM BOX operation (See Section 5.07 for programming). The EXTERNAL PAGE is activated by depressing the appropriate telephone DSS button and speaking into the handset. For ALL CALL PAGING, press and hold the ALL CALL button.

When specialty circuits have been programmed for EXTERNAL PAGING the corresponding terminals on the terminal blocks are used for paging transmit to an external amplifier and for paging control relay closure. For example, if a PSU card were inserted into the SIU4/ PSU4 position in the KSU intercom numbers 15 and 16 become available for EXTERNAL PAGING zones after proper programming. To convert intercom number 16 to EXTERNAL PAGING, program the circuit according to Section 5.07, the transmit pair to the amplifier will be EDT 16 and EDR16. The relay closure will be across ET16 and ER16. On any EXTERNAL PAGING application EDT and EDR will become the transmit pair. ET and ER will become the relay control pair (See Figure 4.7). The PSU card may be installed in any or all of the SIU/PSU card slots.

4.15 LOUD BELL CONTROL

The PSU card provides relay contact closure for activation of external signaling equipment, during incoming CO line ringing. The Loud Bell Control is selected by programming the DIP switches on the PSU card, in accordance with the settings detailed in Table 5-6.

Either or both of the Intercom/Paging circuits may be programmed to operate as Loud Bell Control circuits. Insert the PSU card into a vacant SIU/PSU card slot. Locate the ET/ER terminals on the TB1 or TB2 connecting block, as determined by the card slot position that the PSU card now occupies. The last two (2) key telephone interface circuits for each SIU card position are exchanged for Intercom/Paging/Loud Bell Control outputs when the PSU card is installed.

Two (2) wires are connected to the associated ET/ER terminals for "make" contact operation. Figure 4.7 illustrates the wiring position for Loud Bell Control, using the second Intercom Box circuit of a PSU card plugged into the fourth SIU/PSU card slot. A customer-provided ringing generator or other power source is required to complete the external ringing arrangement.

All incoming CO lines will activate the Loud Bell Control, causing the LBC contacts to sequence in a 1 Second ON/3 Seconds OFF rate until all lines have been answered by key telephone users. The LBC contacts are current-rated at 0.5 Amps/24 vdc.

4.16 KTS DISASSEMBLY/ASSEMBLY INSTRUCTIONS

DISASSEMBLY

The following steps are recommended when the key telephone must be dis-assembled for specific applications.

A) Slide the TONE and VOICE volume controls to their minimum volume positions, toward the front of the key telephone until no more travel exists.

B) Unplug the modular line cord and handset cord.

C) Turn the instrument upside down. Locate two (2) base plate retaining screws located at both sides of the number directory tray holder. Remove tooth screws by turning them counter-clockwise and set aside the screws.

D) Return the instrument to its normal upright position. Grasp the upper and lower housing parts at the front corner edges of the instrument.

E) The upper housing is now removed by lifting from the front-using the top portion of the instrument as a hinge (Refer to Figure 4.9).

F) By bringing the hinged housing portion forward, the two halves will separate at the rear hinge joints.

G) Carefully rest the upper housing face down on a clean static-free surface. All field serviceable areas of the top and buttom housings are conveniently exposed for inspection.

ASSEMBLY

To re-assemble the KTS, the following steps should be followed.

A) Ensure that all connectors and cables are secure before lifting the upper housing into position over the upright base plate.

B) Inspect the positions of the two (2) volume slide levers in the base plate to insure that they will properly align with the protruding tabs of the volume controls on the station PCB.

C) Gently lower the upper housing into position at the rear portion of the bottom housing. Hinge tabs are situated along the rear edger of the top and bottom housings to secure the halves together.

D) Carefully watch for pinched wires. Rest the upper housings on the bottom housing lip, until all edges have made contact.

E) While holding the halves together, turn the complete assembly upside down the insert the two (2) base retaining screws. DO NOT TIGHTEN THE SCREWS.

F) Test the TONE/VOICE volume controls for easy movement and verify that the levers are properly mated with the slide assemblies inside the instrument.

G) If the controls operate smoothly, tighten the base retaining screws until the instrument housings are securely joined.

H) Plug in the line and handset cords.

I) Test for proper tones, levels and keyset button operation.

4.17 INSTALLATION OF SPU (SPEAKERPHONE UNIT)

A) After dis-assembly of the key telephone housings (Section 4.7), locate the ON-HOOK DIALING UNIT (OHU). The OHU is a rectangular printed circuit board (PCB) located directly above the speaker and is held in place by two screws. (Refer to Figure 4.10).

B) Loosen the two (2) PCB retaining screws at the OHU and set aside the screws and nylon washer.

C) Pinch the ribbon cable between the thumb and fore finger at the OHU connector. Seperate the ribbon cable from the connector at the OHU-leaving the ribbon cable plugged into the P-Connector on the MSTU board.
Lay the OHU aside.

D) Unpack the Speakerphone Unit (SPU) and fastening hardware from the packing carton and locate the vacant ribbon cable connector next to the transformers on the component side.

E) Turn the SPU over, component side down, with the SPU connector positioned above the MSTU ribbon cable and plug the free end of the MSTU ribbon cable into the SPU connector socket.

CAUTION
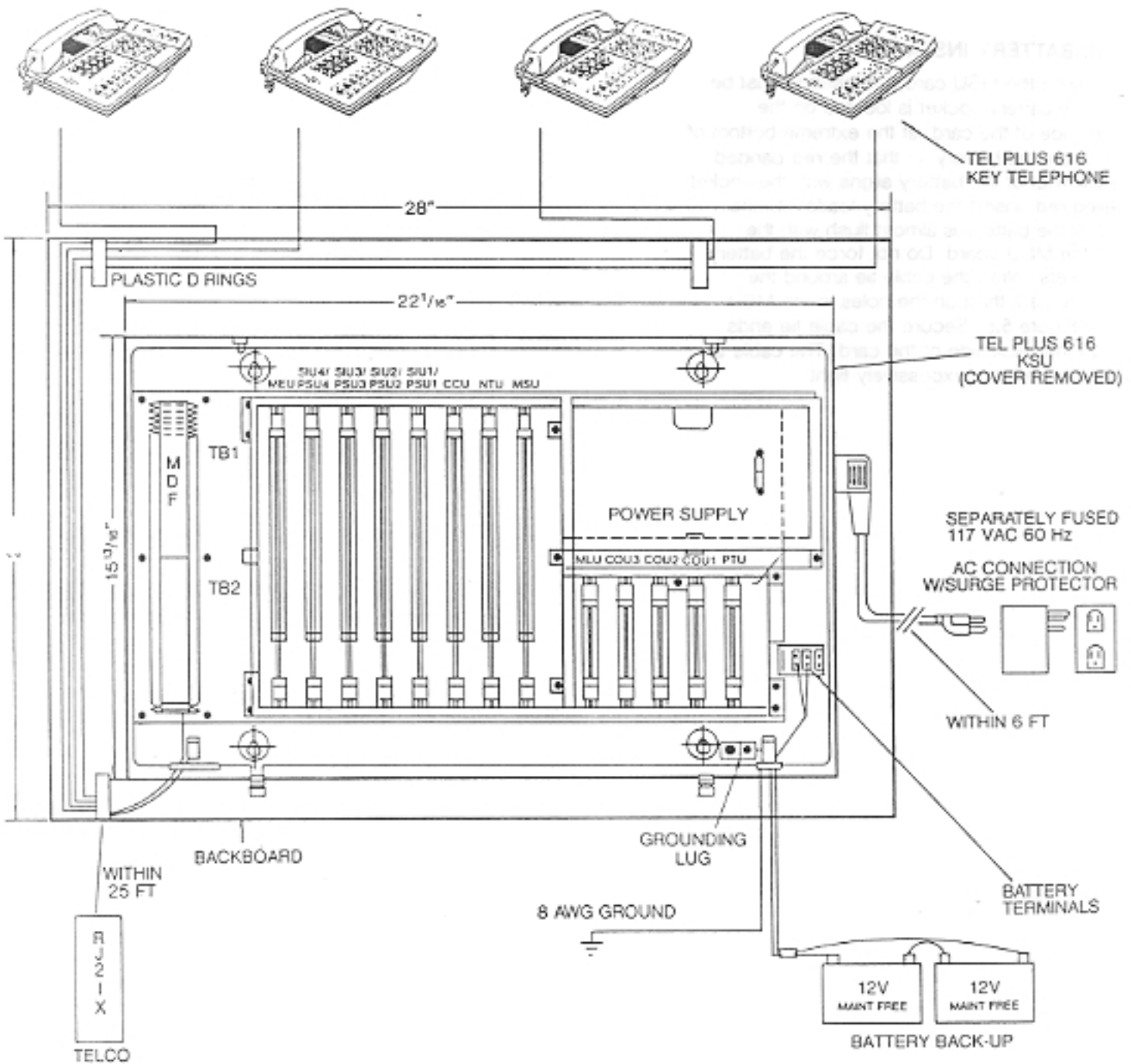
The contact edge(s) of the ribbon cable is one sided and the non-insulated contacts must align with the contact surfaces on the SPU connector.

F) Position the SPU over the three (3) PCB stand-offs and secure with the three (3) PCB retaining screws and nylon washers. (Refer to Figure 4.10). The washers are notched to ensure proper re-assembly.
DO NOT OVER-TIGHTEN THE SCREWS.

G) Inspect for pinched wires or other handling damage.

H) Re-assembly the Key Telephone (Section 4.16) and test the instrument for correct handsfree speakerphone operation.
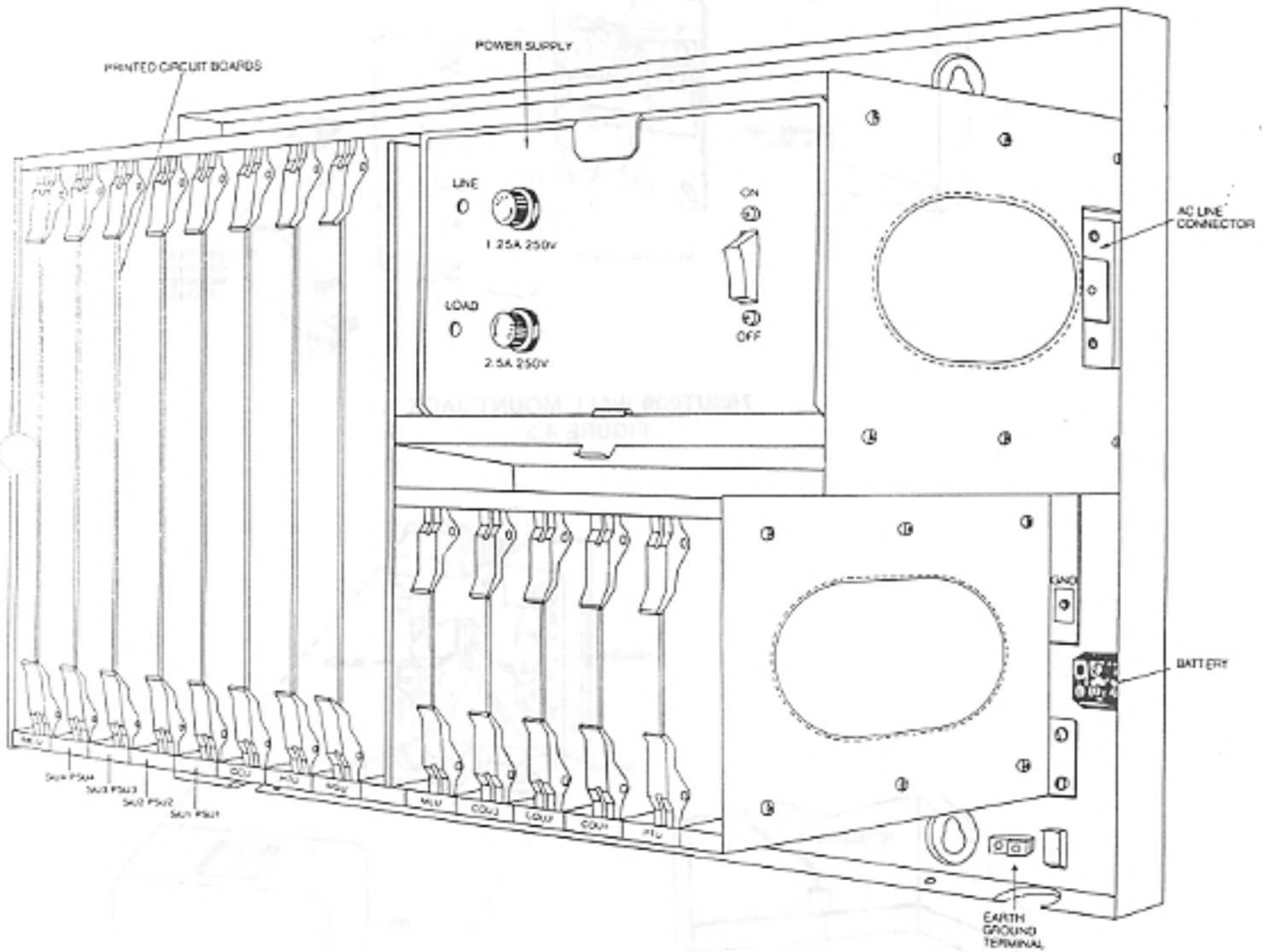
4.18 INSTALLATION OF EBU (POWER FAILURE TONE RINGER)

The Electronic Buzzer Unit (EBU) is installed in each key telephone designated as an emergency power failure station that will need to receive incoming call indications during the emergency.
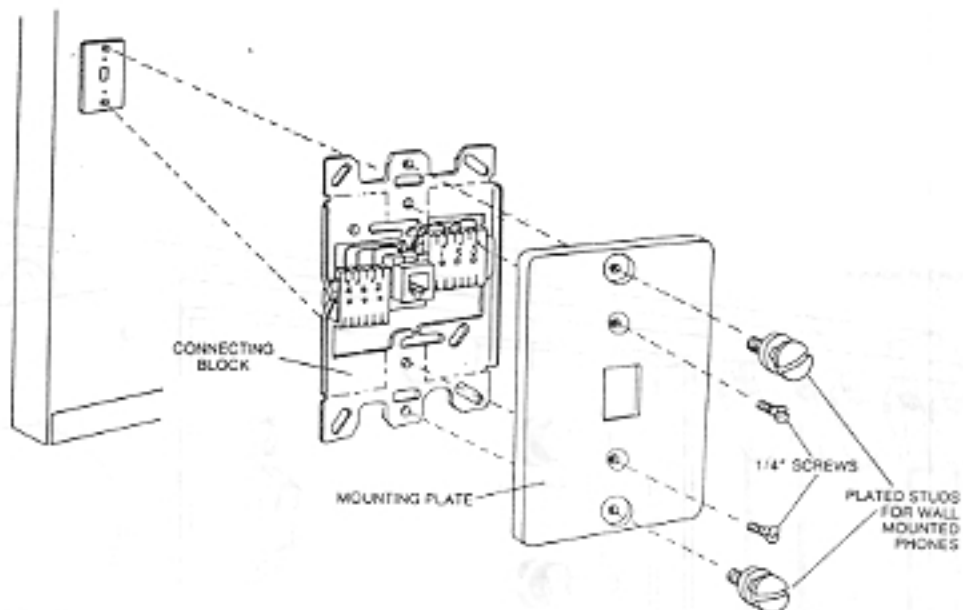
A) Unpack the EBU assembly and inspect the items. The EBU assembly consists of a small PCB with a two conductor plug-ended cord for connection to the MSTU. An adhesive mounted buzzer is provided and it includes a three conductor cable for connection to the EBU circuit. A PCB retaining screw is also included with the EBU kit.

B) Position the EBU circuit board over the stand-offs molded into the bottom housing to the left of the modular line cord plug assembly. The EBU component side should be facing up. (See Figure 4.11).

C) Secure the EBU to the base, using the provided retaining screw.

D) Remove the protective adhesive backing paper from the buzzer and affix the signal unit to the bottom housing. There are two positioning post that will align the tweeter and will protrude into the two tabs on the tweeter housing. (See Figure 4.11).

E) Plug the buzzer cable into the EBU socket. The cable has a locking-type connector and will only plug into the EBU socket in one direction.

F) Locate the "EB" connector socket on the MSTU board. (Refer to Figure 4.10). Plug the EBU two-conductor cable into the EB socket. The EB connector is keyed to insure correct polarity and is a locking type socket.

G) Re-assemble the Key Telephone (Section 4.17) and test the instrument for incoming ring indication on its pre-assigned CO line. (Note: This requires that the system power be turned off and that external batteries, if equipped, are disconnected.)

H) Affix the new ringer equivalence sticker to the FCC part 68 manufacturer's label in such a way that it covers the original ringer equivalence of o.o.

MSU BATTERY INSTALLATION

...stalling the MSU card, the battery must be
... the battery socket is located on the
...nt side of the card, at the extreme bottom of
...: Orient the battery so that the **red**-banded
...ve terminal of the battery aligns with the socket
...belled red. Insert the battery leads into the
...ts until the battery is almost flush with the
... of the MSU board. Do not force the battery
... sockets. Wrap the cable tie around the
... and route it through the holes in the MSU
...: See Figure 5.5. Secure the cable tie ends
...er on the back side of the card. The cable tie
...: be snug but not excessively tight.

TYPICAL INSTALLATION
FIGURE 4.1

KSU LAYOUT
FIGURE 4.2

CONNECTING
BLOCK

MOUNTING PLATE

1/4" SCREWS

PLATED STUDS
FOR WALL
MOUNTED
PHONES

76SUT009 WALL MOUNT JACK
FIGURE 4.3

BL

W

YELLOW

BLACK

Y

BK

GREEN

RED

G

R

TO TELEPHONE

MODULAR
BASEBOARD
JACK

COVER
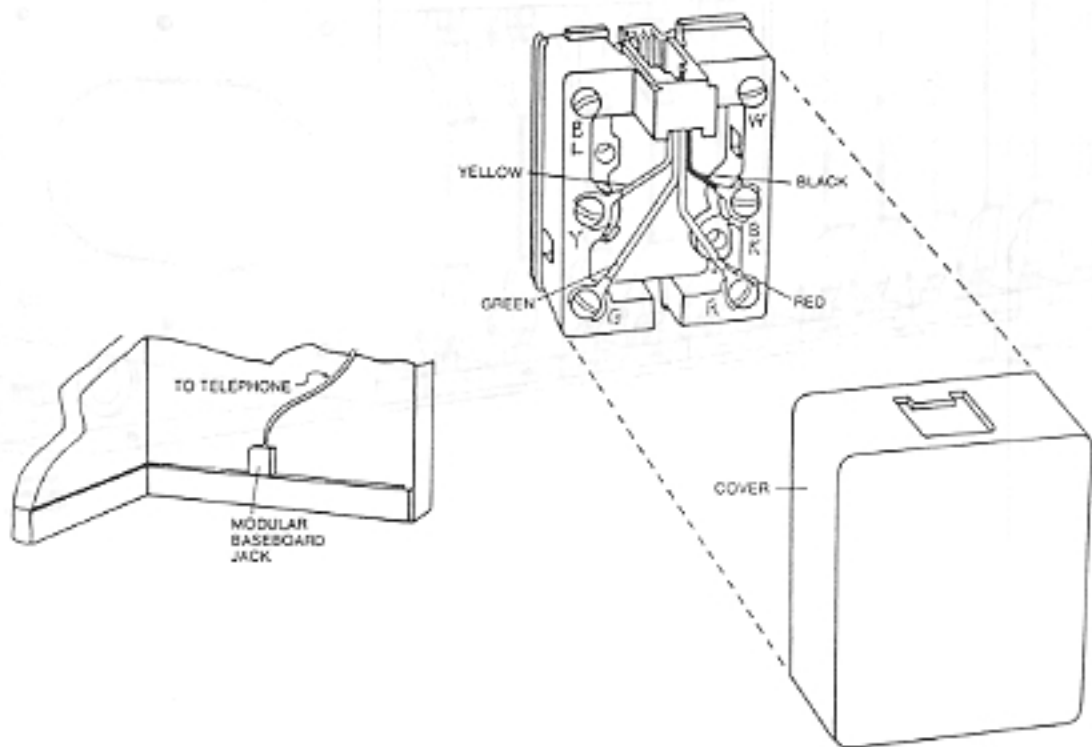
76SUT011 BASEBOARD JACK
FIGURE 4.4

TB1

FUNCTION	FUNCTION	
ET1	ET13	
ER1	ER13	
EDT1	EDT13	
EDR1	EDR13	
ET2	ET14	
ER2	ER14	
EDT2	EDT14	
EDR2	EDR14	
ET3	ET15	
ER3	ER15	
EDT3	EDT15	
EDR3	EDR15	
ET4	ET16	
ER4	ER16	
EDT4	EDT16	
EDR4	EDR16	
ET5	ALMT	— ALARM
ER5	ALMR	— ALARM RETURN
EDT5	AR	— ALARM RESET
EDR5	MAL	— MAJOR ALARM
ET6	MAR	— MAJOR ALARM RETURN
ER6	MST	— MUSIC SOURCE
EDT6	MSR	— MUSIC SOURCE RETURN
EDR6	PETH	— EARTH GROUND
—	—	— NOTE

TB2

FUNCTION	FUNCTION
ET7	CO T1
ER7	CO R1
EDT7	—
EDR7	—
ET8	CO T2
ER8	CO R2
EDT8	—
EDR8	—
ET9	CO T3
ER9	CO R3
EDT9	—
EDR9	—
ET10	CO T4
ER10	CO R4
EDT10	—
EDR10	—
ET11	CO T5
ER11	CO R5
EDT11	—
EDR11	—
ET12	CO T6
ER12	CO R6
EDT12	—
EDR12	—
—	—

Note: When extending the TB1/TB2 wire terminations to an externally mounted punchdown connector, the spare terminals at the bottom of TB1 (#25) are not used and should not be connected.

CONNECTING BLOCK LAYOUT

TB1

ET1	—	ET13	—
ER1	—	ER13	—
EDT1	—	EDT13	—
EDR1	—	EDR13	—
		ALMT	—
		ALMR	—
		AR	—
ET6	—	MAL	—
ER6	—	MAR	—
EDT6	—	MST	—
EDR6	—	MSR	—
		PETH	—

ALARM
CONNECTIONS

OPTIONAL
MUSIC
SOURCE
600 OHM @ 0 dBM.

TB2

FUNCTION		FUNCTION	
ET7	—	CO T1	—
ER7	—	CO R1	—
EDT7	—		—
EDR7	—		—
		CO T2	—
		CO R2	—
ET12	—		
ER12	—		
EDT12	—		
EDR12	—		

FUNCTION	FUNCTION
T1	
R1	
T2	
R2	

RJ21X:
TELCO
PROVIDEO

R (B/W)
YELLOW (W/O)
BLACK (O/W)

GREEN

BLACK

GRN
BK
625A BLK
YL
RD

TO MODULAR
PLUG

YELLOW

RED
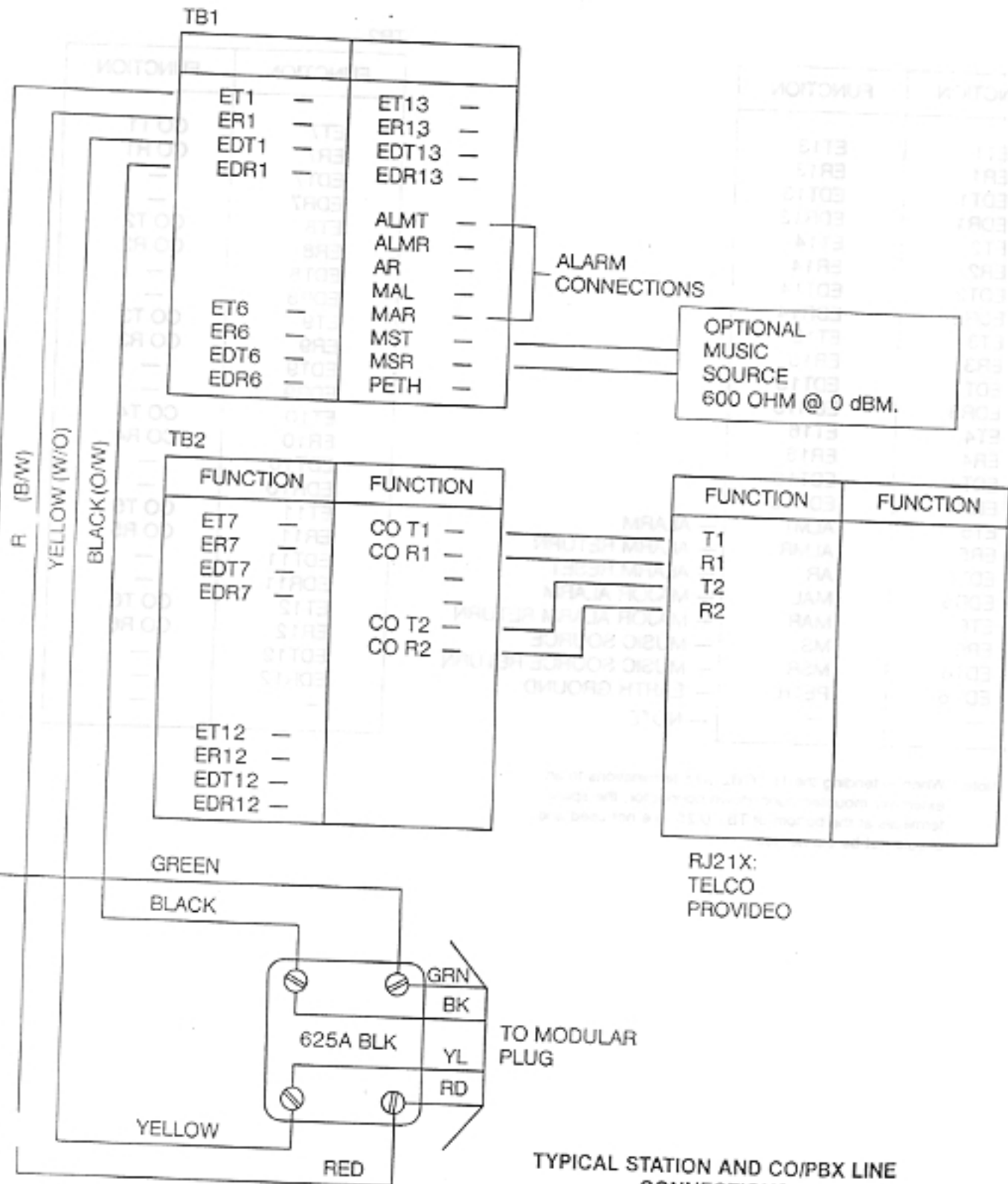
**TYPICAL STATION AND CO/PBX LINE
CONNECTIONS
FIGURE 4.6**

TYPICAL INTERCOM
BOX INSTALLATION
WITH PSU CARD IN
THE LAST SIU/PSU
CARD SLOT.

T/B CONNECTOR

ET1 —	ET13 —
ER1 —	ER13 —
EDT1 —	EDT13—
EDR1 —	EDR13—
ET6 —	ET16 — GN
ER6 —	ER16 — RD
EDT6 —	YL
EDR6 —	EDT16—
	EDR16— BK

GN Receive pair from
RD intercom box
YL Transmit pair to
BK intercom box

TYPICAL EXTERNAL
ZONE PAGING
INSTALLATION WITH
THE PSU CARD IN
THE LAST SIU/PSU
CARD SLOT.

T/B CONNECTOR

ET1 —	ET13 —
ER1 —	ER13 —
EDT1 —	EDT13—
EDR1 —	EDR13—
ET6 —	ET16 — X
ER6 —	ER16 —
EDT6 —	
EDR6 —	EDT16—
	EDR16—

Relay contact closure
for external equipment
control

Transmit pair to amplifier

TYPICAL LOUD BELL
CONTROL
INSTALLATION WITH
THE PSU CARD IN
THE LAST SIU/PSU
CARD SLOT.

T/B CONNECTOR

ET1 —	ET13 —
ER1 —	ER13 —
EDT1 —	EDT13—
EDR1 —	EDR13—
ET6 —	ET16 — X
ER6 —	ER16 —
EDT6 —	
EDR6 —	EDT16—
	EDR16—

Relay contact closure
for Loud Bell control
(customer provided
bell and ring generator)

INTERCOM BOX, EXT PAGE, LOUD BELL CONNECTIONS
FIGURE 4.7

WALL MOUNT
JACK

HANDSET RETAINER

WALL MOUNT
BRACKET

TO TELEPHONE
BASE PLATE

TELEPHONE   WALL MOUNT   WALL JACK
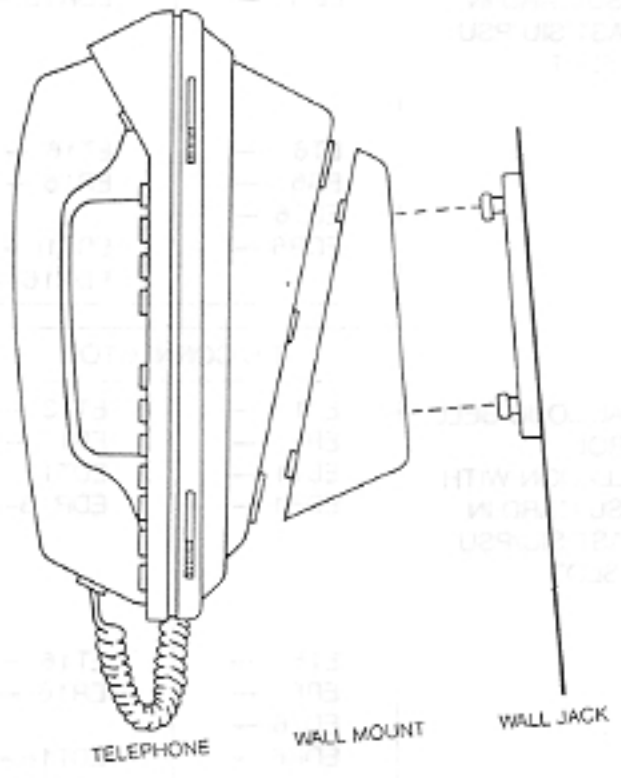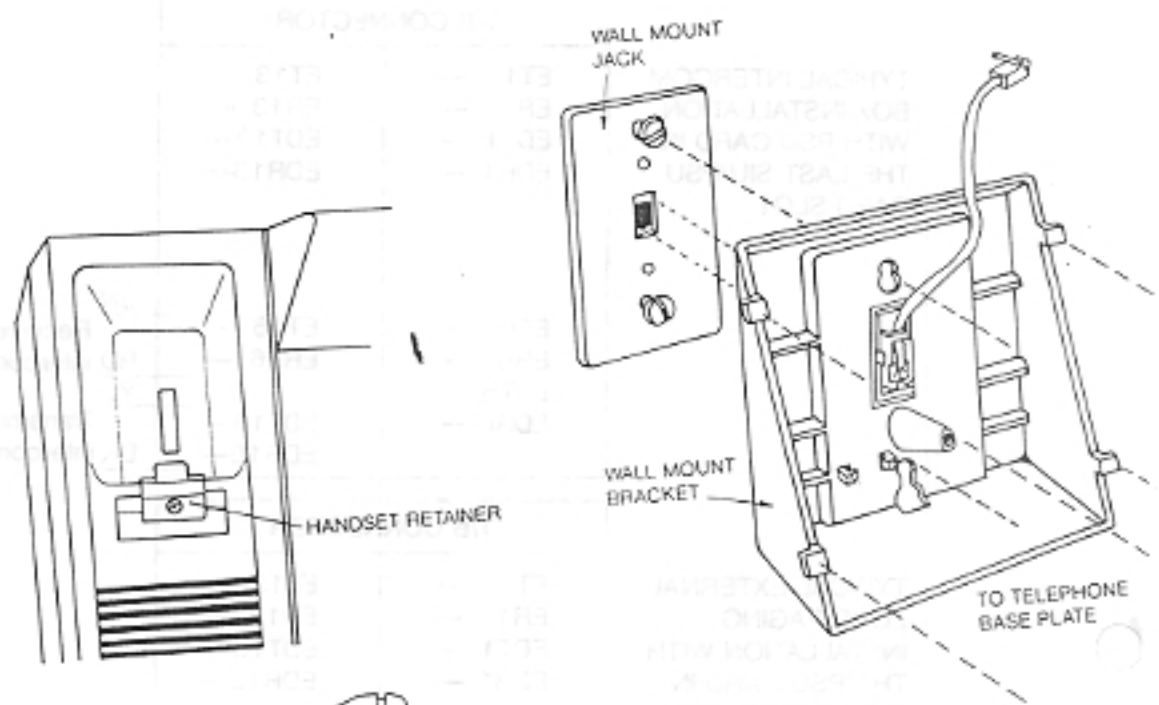
WALL MOUNTING
THE 616 KEY TELEPHONE
FIGURE 4.12

PROGRAMMING

PROGRAMMING OVERVIEW

...on is a general programming guide to
...that are activated for the individual customer.
...eps should be accomplished prior to system
...but may be performed at any time with
...a system interruption. Switch settings marked
...in asterisk (*) indicate factory preset condition.

PROGRAMMING CO LINE RING ASSIGNMENTS

...phone in the system may be programmed to
...lines, ring on no lines, or to ring on a single
... The CO line ring-in assignments are
...ed on the SIU card with the 4 position
...ches labelled STA1-STA4. As an example,
...ch labelled STA1 will program Station
...s 1, 5, 9 or 13 depending on which SIU slot
...is plugged into. Table 5-1 illustrates switch
...for the ringing options a telephone may be
...ed. (See Figure 5.1 for switch locations)

TABLE 5-1
CO Ring Assignment

SWITCH CONTACT				RINGING CO LINES
1	2	3	4	
0	0	0	X	ALL
1	0	0	X	1
0	1	0	X	2
1	1	0	X	3
0	0	1	X	4
1	0	1	X	5
0	1	1	X	6
1	1	1	X	*NONE

0 = OFF   1 = ON   X = NOT USED

5.03 ASSIGNMENT OF ATTENDANT STATION

One telephone in each TEL PLUS 616 System may
be assigned at the attendant station. The attendant
station can activate MESSAGE WAITING lamps,
CAMP-ON CALLS to stations in DND status, and can
activate NIGHT TRANSFER of incoming calls. The
attendant station will always receive CO line ring on
all lines regardless of ring assignment switch
settings. The attendant station is assigned on the

CCU card by programming the four (4) position DIP
switch labelled ATD. The switch body is labelled
such that DIP switch #1 is at the top, and DIP switch
#4 is at the bottom. The individual DIP switches are
off if they are operated to the left. Table 5-2 illustrates
programming the ATD switch (See Figure 5.2 for
switch locations).

TABLE 5-2
ASSIGNMENT OF ATTENDANT STATION

ATD Switch Settings				Number of Station Assigned As ATD
1	2	3	4	
0	0	0	0	1*
1	0	0	0	2
0	1	0	0	3
1	1	0	0	4
0	0	1	0	5
1	0	1	0	6
0	1	1	0	7
1	1	1	0	8
0	0	0	1	9
1	0	0	1	10
0	1	0	1	11
1	1	0	1	12
0	0	1	1	13
1	0	1	1	14
0	1	1	1	15
1	1	1	1	16

OFF = 0   ON = 1

5.04 PROGRAMMING RECALL TIME

The system is designed to signal a station which has
placed a call on HOLD and left it on HOLD for a
predetermined amount of time. This Hold/Transfer
RECALL time may be set at 30, 60 or 90 seconds or
disabled entirely. The system is factory set for 60
seconds. Automatic Recall Time (ART) programming is
performed at the CCU card on the four (4) position
DIP switch body labelled ART. Table 5-3 illustrates
DIP switch setting for programming AUTOMATIC
RECALL times (See Figure 5-2 for switch locations).

TABLE 5-3
PROGRAMMING AUTOMATIC RECALL TIME

ART SWITCH		TIME
SW (1)	SW (2)	(Seconds)
0	0	30
1	0	60*
0	1	90
1	1	Disable

OFF = 0   ON = 1

5.05 PROGRAMMING FLASH TIME

FLASH Time may be programmed at either 0.6 seconds for PABX TRANSFER or 2.0 seconds for LINE RECALL. After programming FLASH Time each individual CO line must be also programmed for open loop or Ground Flash. If Ground Flash is selected, a ground input must be connected to the PETH connector terminal on TB1. FLASH Time is selected on the CCU card using the 4 position DIP switch body labelled ART (Figre 5.2). DIP switch #4 is used to select the desired timing. To select 0.6 seconds (600 ms) FLASH Time the DIP switch is operated to the OFF position, and if 2.0 seconds are required the switch is set to the ON position.

To set the type of flash, slide switches on the PTU card must be set for each CO line. The slide switches are labelled TRUNK1-TRUNK6 corresponding to CO lines 1-6. If a slide switch is operated DOWN (towards the bottom) of the card with the card plugged in the KSU, the card will provide Ground Flash. If the switch is operated to the UP position the card will provide open loop FLASH. See Figure 5.3 for switch locations on the PTU card.

5.06 PROGRAMMING EXECUTIVE/SECRETARY TRANSFER

A pair of key telephones in the system may be programmed for EXECUTIVE screening. Any time the telephone designated EXECUTIVE is busy or in the DND mode, incoming INTERCOM and transfer screened CO calls will automatically signal the designated SECRETARY telephone. Only one pair of phones may be programmed for this feature. Programming is performed on the CCU card by DIP switch selection.

TABLE 5-4
PROGRAMMING THE SECRETARY PHONE

SEC Switch Settings				Number of Station Assigned As SEC
1	2	3	4	
0	0	0	0	1*
1	0	0	0	2
0	1	0	0	3
1	1	0	0	4
0	0	1	0	5
1	0	1	0	6
0	1	1	0	7
1	1	1	0	8
0	0	0	1	9
1	0	0	1	10
0	1	0	1	11
1	1	0	1	13
1	0	1	1	14
0	1	1	1	/
1	1	1	1	16

OFF = 0   ON = 1

TABLE 5-5
PROGRAMMING THE EXECUTIVE PHONE

EXEC Switch Settings				Number of Station Assigned As EXEC
1	2	3	4	
0	0	0	0	1*
1	0	0	0	2
0	1	0	0	3
1	1	0	0	4
0	0	1	0	5
1	0	1	0	6
0	1	1	0	7
1	1	1	0	8
0	0	0	1	9
1	0	0	1	10
0	1	0	1	11
1	1	0	1	12
0	0	1	1	13
1	0	1	1	14
0	1	1	1	
1	1	1	1	16

OFF = 0   ON = 1

NOTE: Care should be taken during programming of the above steps to insure that DIP switch settings are correct.

Secretary phone is assigned by operating the switches on the switch body labeled SEC in accordance with Table 5-4. The executive phone is assigned by programming the DIP switches on the switch body labelled EXEC as shown in Table 5-5 (see Figure 5.2 for switch locations).

5.07 PROGRAMMING THE PSU CARD FOR INTERCOM BOX OPERATION, EXTERNAL PAGING CONTROL, AND LOUD BELL CONTROL

The Intercom Box Station Interface Unit (PSU) is designed to meet the needs of users who require INTERCOM only locations, External Paging, and/or Loud Bell control. The card is designed such that the first two circuits on the card are dedicated to key telephone operation only and are programmed for paging as described in Section 5.02. Circuits three (3) and four (4) are specialty circuits. Programming steps for specialty Intercom Box, External Paging, and Loud Bell operations are performed on the 4 position switch body labelled Select and two slide switches labelled Box 1 and Box 2 (Figure 5.4).

A) To program interrupted ringing for Loud Bell operation on the first specialty circuit, the slide on Box 1 is operated to the UP position and DIP switches 1 & 3 are operated to the ON position. Loud Bell operation on the 2nd specialty circuit is programmed by operating slide switch Box 2 to the UP position and DIP switches 2 & 4 are in the ON position (Table 5-6).

B) Paging Control may be programmed on either or both specialty circuits. To program specialty circuit 1 the Box 1 slide is operated to the UP

circuit is programmed by operating DIP switches 2 Box 2 to the UP position and DIP switches 2 & 4 are in the ON position (Table 5-6).

B) Paging Control may be programmed on either or both specialty circuits. To program specialty circuit 1 the Box 1 slide is operated to the UP position and DIP switches 1 & 3 are in the OFF position. To program circuit 2, the Box 2 slide switch is operated to the UP position and DIP switches 2 & 4 are in the OFF position (Table 5-6).

TABLE 5-6
PROGRAMMING SPECIALTY CIRCUITS ON THE PSU CARD

Specialty Circuit 1 Functions	BOX1 Slide Switch (Card Plugged into KSU)	SELECT DIP Switch Nos. 1 & 3 Settings
Loud Bell Control	UP	ON
External Paging Control	UP	OFF
Intercom Box	*DOWN	OFF

Specialty Circuit 2 Functions	BOX2 Slide Switch (Card Plugged into KSU)	SELECT DIP Switch Nos. 2 & 4 Settings
Loud Bell Control	UP	ON
External Paging Control	UP	OFF
Loud Bell Control		OFF
External Paging Control	UP	
Intercom Box	*DOWN	

5.08 PROGRAMMING ALARM SIGNALS

The TEL PLUS 616 KSU may be used to transmit an alarm signal to every key telephone in the system. The alarm signal is activated by either an open or a closed circuit on the External Alarm Leads. To program the KSU to scan for either an open or closure, SWI (Figure 5.2) located on the CCU board must be set. Placing the switch in the DOWN position will cause the CCU card to recognize a closure on the external alarm leads as normal and an OPEN as an alarm condition. Operating the switch to the UP position the system will recognize an open as a normal condition and a CLOSURE as an alarm state (See Table 5-7).

TABLE 5-7
PROGRAMMING ALARM STATES

SW1 SETTING	ALARM CONDITION
* UP (CL)	CLOSURE
DOWN (OP)	OPEN

5.09 PROGRAMMING TOLL RESTRICTION

Telephone abuses and long distance charges can be controlled and effectively administered through Class of Service (COS) assignments to each station. The optional Miscellaneous Unit (MSU) card (Figure 5.5) is required to provide COS and toll restriction. Only one Class of Service can be assigned to each key station and every key telephone must have a COS assignment.

The four (4) Classes of Service available are:

COS 1 – Unrestricted. No restrictions applied, unlimited dialing.

COS 2 – Semi Toll Restricted. Allows seven digit local calling, allows Home Area Code toll calls (1 + 7 digits), allows codes entered into Exception Table A. Denies 0 on first digit and any call exceeding 7 digits (8 digits if 1 is first digit dialed).

COS 3 – Toll Restricted. Allows seven digit local calling, allows codes entered into Exception Table B. Denies 0/1 on first digit and any call exceeding 7 digits.

COS 4 – Fully Restricted (Housephone). No dialing permitted. Only inside (DSS) calling is permitted.

To assign a Class of Service to a key station, the following steps must be utilized:

STEP 1 Verify that Key Station #1 is idle (on-hook).

STEP 2 With the system power on, operate the DIP switch "TR" located on the MSU card to the "ON" position (LED on MSU card lights).

STEP 3 At Key Station #1, press an idle CO Line button and go off-hook.

STEP 4 Press the DND/SPEED button.

STEP 5 Press the pound (#) key once.

STEP 6 Dial a two-digit station number (01-16).

STEP 7 Enter (dial) the COS digit (1-4) to assign the appropriate class-of-service to the station designated in STEP 6.

STEP 8 To assign another station, repeat STEPS 5-7.

STEP 9 To exit COS programming mode, depress # key and go on-hook at Station #1.

STEP 10 Return the "TR" switch to the "OFF" position (LED on MSU card goes out). See Note 1.

The Exception Tables A & B are organized into two sets that allow specific restrictions to be bypassed. Exception Table A is assigned to COS 2 and Exception Table B is assigned to COS 3. The tables may contain up to 10 entries. Each entry can consist of four (4) digits or less. Where less than four (4) digits are entered in a bin, a # (pound) should be entered to signal the system where to stop searching.

If an Exception Table is empty (nothing programmed), the basic rules of the associated class-of-service applies.

Note 1: the "TR" switch must be returned to the OFF position to allow proper programming of the System Speed Bins (90-99).

TABLE 5-8
TOLL RESTRICTION

COS	Allowed	Denied
COS 1	All Calls	None
COS 2	A. Seven digit local dialing B. Home Area Code (1 + 7 digits) C. Service Codes beginning with 1 (1911, 1411, etc.) D. Entries found in Exception Table A	A. 0 dialed as first digit B. Calls over 7 digits (over 8 if 1 is dialed as first digit)
COS 3	A. Seven digit local dialing. B. Entries found in Exception Table B.	A. 0 dialed as first digit B. Calls over 7 digits C. Service codes beginning with a 1
COS 4	None	All Dialed Calls

Exception Table A (Rule 1)

Code	Field (Up to four digits)			
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				

Exception Table B (Rule 2)

Code	Field (Up to four digits)			
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				

Rule 1. Entries in Table A have priority and will override the basic dial restriction rules associated with Class of Service 2, whenever the leading digits (up to four digits maximum) are found in Table A.

Rule 2. Entries in Table B have priority and will override the basic dial restriction rules associated with Class of Service 3, whenever the leading digits (up to four digits maximum) are found in Table B.

Rule 3. An asterisk (*) entry is invalid and will cause invalidation of the program sequence. The MSU-P card translates the (*) as a speed dial programming prompt.

Rule 4. Each Exception Table (A/B) number bin is validated and its digit length determined, upon recognition of the trailing pound (#) sign.

To program Exception Table A (allowing exceptions to the basic COS 2 rules):

STEP 1   Operate the "TR" switch to "ON".

STEP 2   At Key Station #1, go off-hook and press an idle CO Line button.

STEP 3   Press SPEED button.

STEP 4   Dial the (#) pound character.

STEP 5   Dial the desired unique bin address for the ten (10) reserved bins of Exception. Table A (dial 20-29).

STEP 6   Enter the allowed code (up to four digits maximum).

STEP 7   Dial the (#) pound character.

STEP 8   Repeat STEPS 5-7 for other allowed codes, as required.

STEP 9   Go on-hook.

STEP 10   Return "TR" switch to "OFF", at the MSU card.

To program Exception Table B (allowing exceptions to the basic COS 3 rules):

STEP 1   Operate the "TR" switch to "ON".

STEP 2   At Key Station #1, go off-hook and press an idle CO Line button.

STEP 3   Press SPEED button.

STEP 4   Dial the (#) pound character.

STEP 5   Dial the desired unique bin address for the ten (10) reserved bins of Exception. Table B (dial 30-39).

STEP 6   Enter the allowed code (up to four digits maximum).

STEP 7   Dial the (#) pound character.

STEP 8   Repeat STEPS 5-7 for other allowed codes, as required.

STEP 9   Go on-hook.

STEP 10   Return "TR" switch to "OFF", at the MSU card.

5.10 PROGRAMMING SYSTEM SPEED DIAL NUMBERS

The TEL PLUS 616 System may be programmed to provide station user with up to ten (10) system speed dial numbers of twenty-two (22) digits each, including pauses. Pauses are entered by pressing the (#) key and have a duration of 2 seconds each. Numbers in speed dial bins cannot override toll restriction, if activated by a restricted station. The system speed dial bins are always programmed at Key Station 1 regardless of programmed attendant station selection. The system must be equipped with a Miscellaneous Unit (MSU) to provide this feature.

To Program a System Speed Dial:

1. At Key Station #1, (Station #1 does not have to be the attendant) go off-hook and press an idle CO Line button.

2. Press the SPEED button.

3. Dial "*" (Asterisk).

4. Dial the two-digit System Speed Bin address (90-99).

5. Enter the desired number [up to twenty-two (22) digits, including pauses].

6. Dial "*".

7. To program other System Speed Bins, repeat steps 4-6.
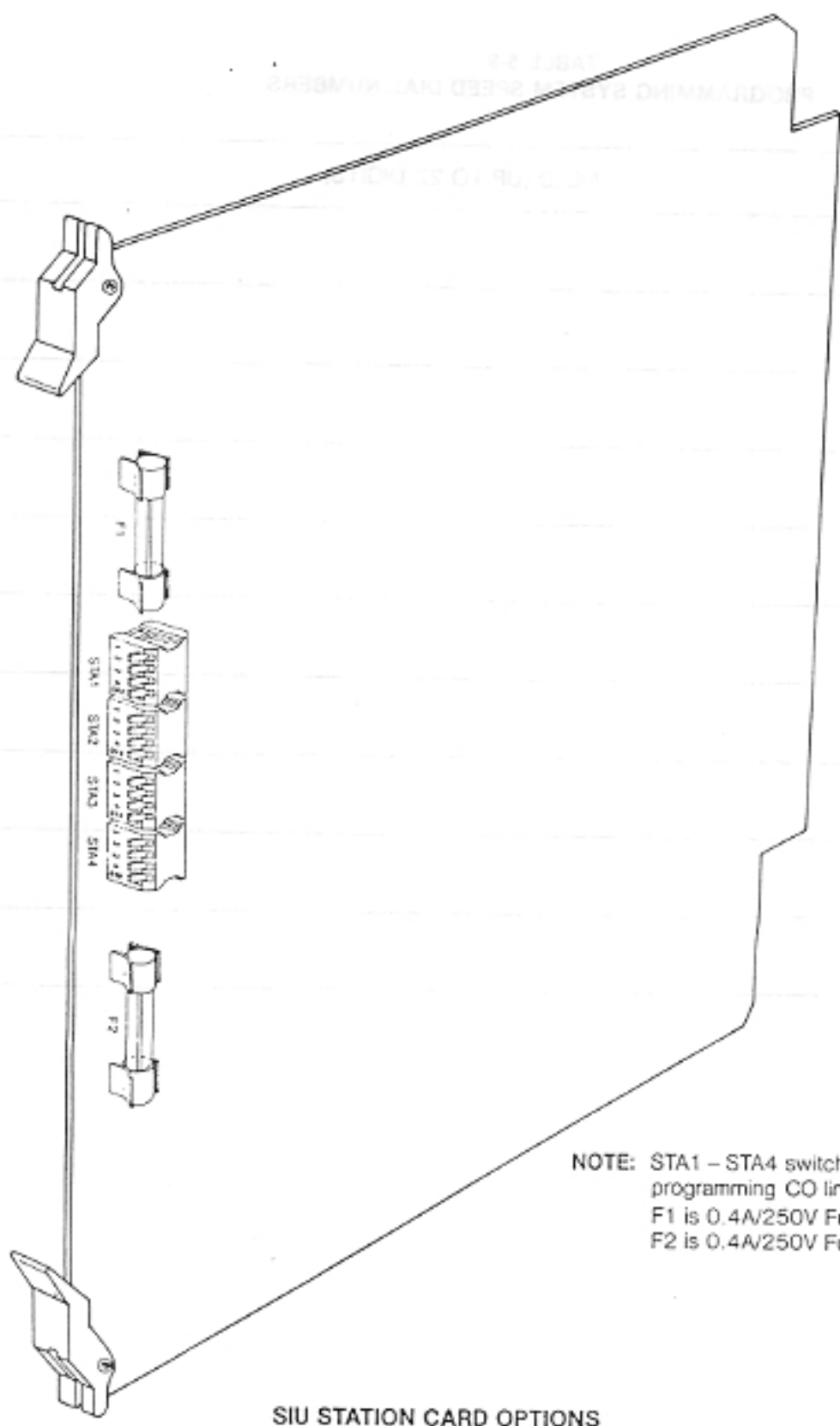
8. Go on-hook at Key Station #1.

NOTE: To ensure that a System Speed Bin is empties of any useable information (and subsequently exclude access) the programmer at Key Station 1 should program the Steps 1-4 and Step 6 (*), which will erase any random data stored in that System Speed Bin.

TABLE 5-9
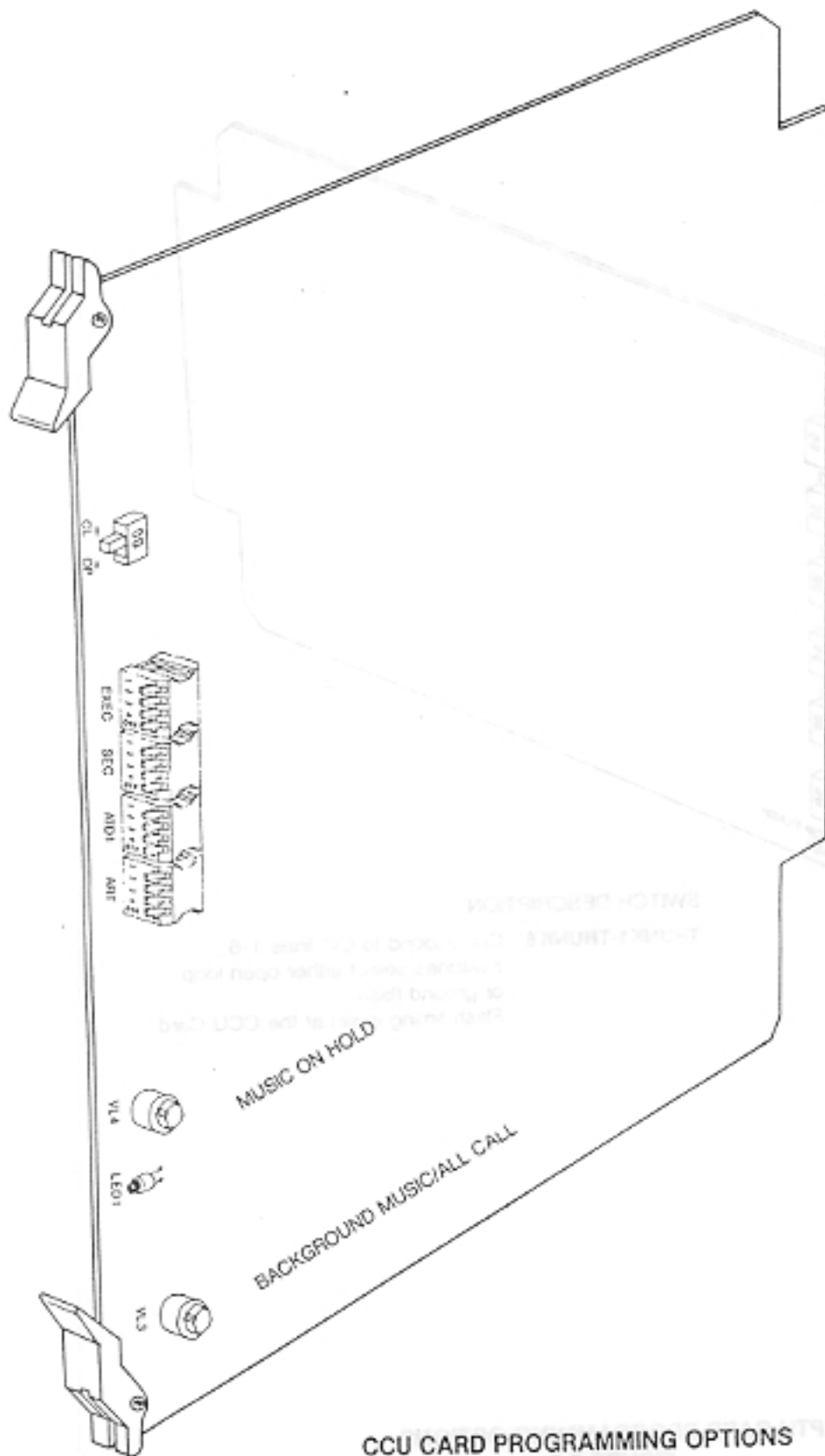## PROGRAMMING SYSTEM SPEED DIAL NUMBERS

CODE	FIELD (UP TO 22 DIGITS)
90	
91	
92	
93	
94	
95	
96	
97	
98	
99	

NOTE: STA1 – STA4 switches are used for
programming CO line Ring Assignments.
F1 is 0.4A/250V Fuse for STA 1/2
F2 is 0.4A/250V Fuse for STA 3/4

SIU STATION CARD OPTIONS
FIGURE 5.1

SWITCH DESCRIPTION

SW1: Used to select OPEN or CLOSURE Alarm Signaling.

EXEC: Program number of Executive station for Executive/Secretary transfer.

SEC: Program number of Secretary station for Executive/Secretary transfer.

ATD: Select number of station to be assigned as Attendant's Station.

ART: 1&2-Program Auto Recall Time
3 -Not used
4 -Sets Flash Timing of 0.6 or 2 secs.

MUSIC ON HOLD

BACKGROUND MUSIC/ALL CALL

CCU CARD PROGRAMMING OPTIONS
FIGURE 5.2
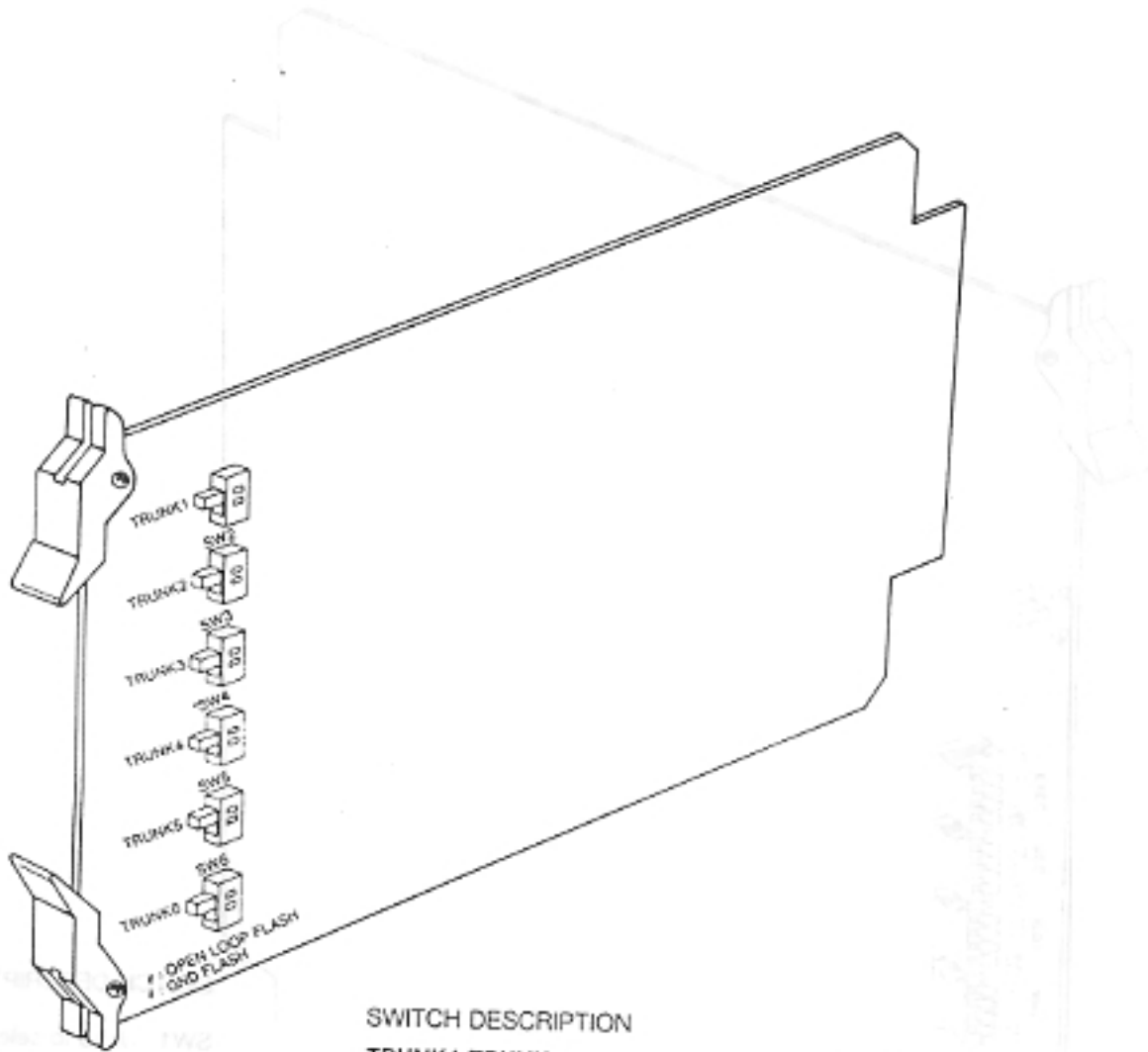
SWITCH DESCRIPTION

TRUNK1-TRUNK 6: Correspond to CO lines 1-6.
Switches select either open loop
or ground flash.
Flash timing is set at the CCU Card.

PTU CARD PROGRAMMING OPTIONS
FIGURE 5.3
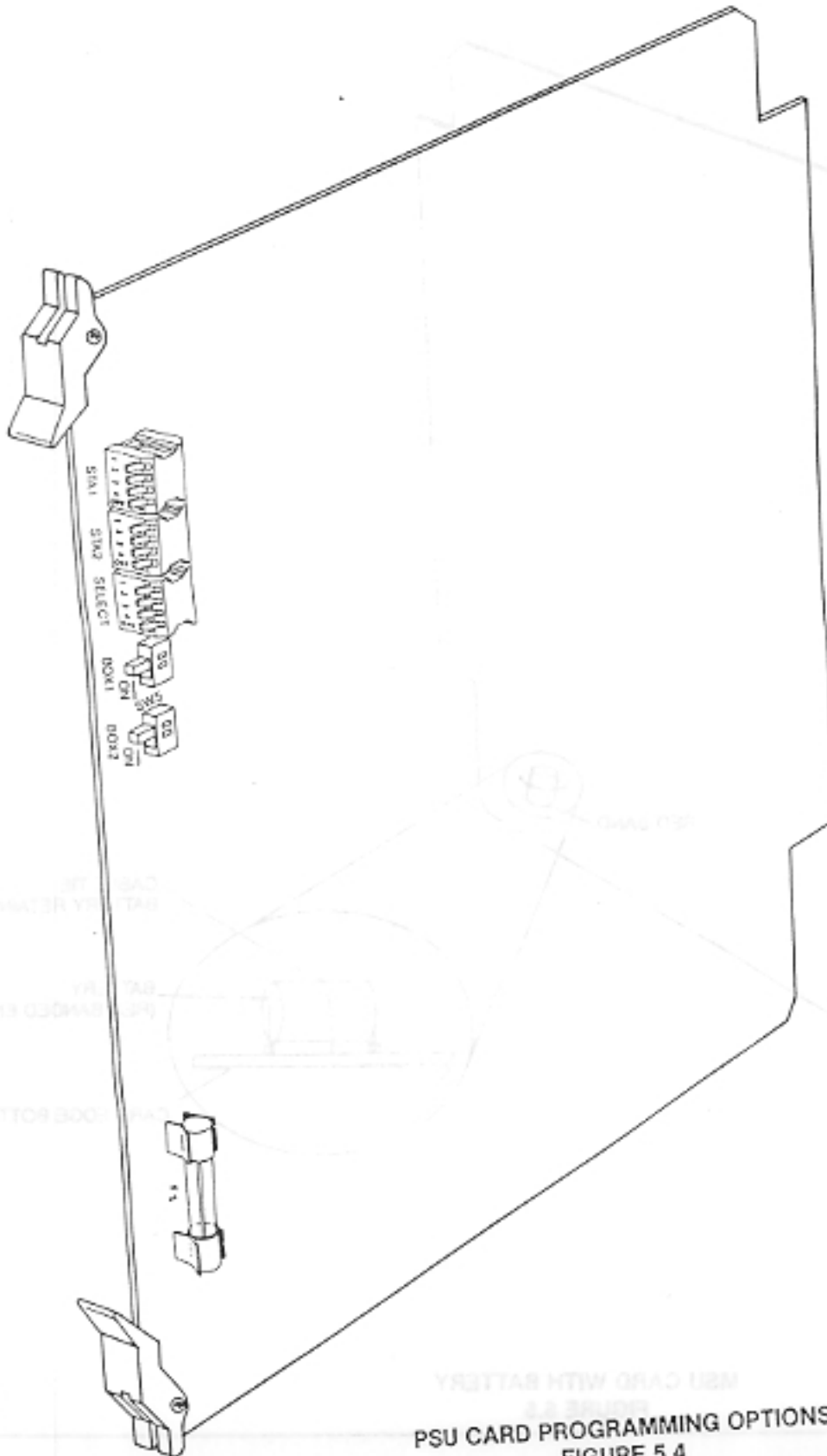
SWITCH DESCRIPTION

STA 1: Used for programming CO
Ring Assignment of first key
station on card.

STA 2: Used for programming CO
Ring Assignment of second
key station on card.

SELECT: DIP switches 1-4 are used
for Loud Bell operation and
relay control for External
Paging.

BOX1 & 2: Used to activate Intercor
Boxes or External Paging

F1: 0.4A/250V Fuse for both key
telephones

PSU CARD PROGRAMMING OPTIONS
FIGURE 5.4

RED BAND

CABLE TIE
BATTERY RETAINER

BATTERY
(RED BANDED END)

CARD EDGE BOTTOM
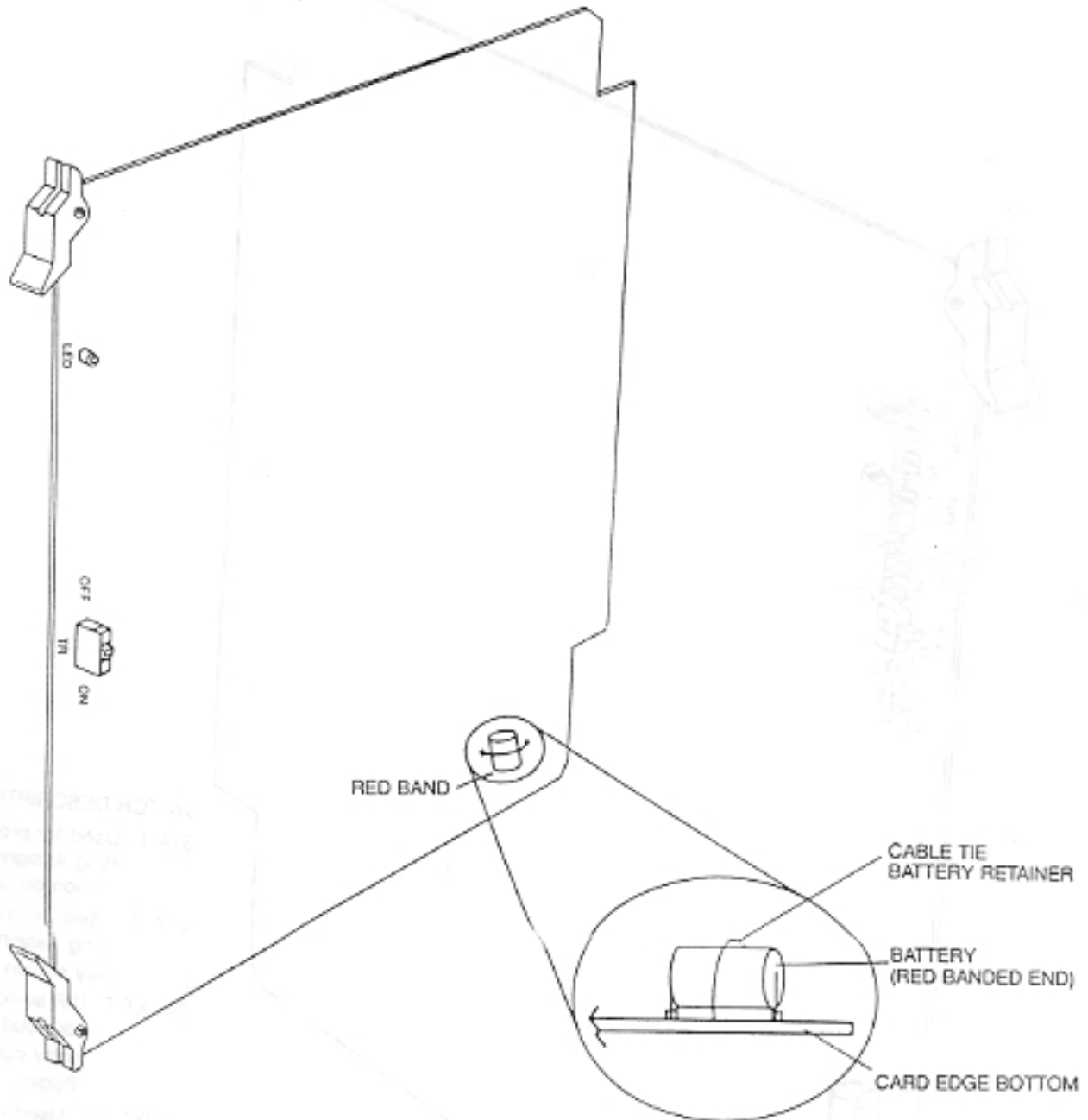
MSU CARD WITH BATTERY
FIGURE 5.5

6.00 FUNCTIONAL TEST PROCEDURES

This section describes the procedures that should be followed during system start-up. The installer will also find these tests to be helpful in the event of system malfunction and trouble shooting. System trouble shooting will be confined to replacement of printed circuit boards, key telephone sets, fuses and power supplies.

6.01 PRELIMINARY CHECKLIST

Before starting the functional test procedures it is recommended that the following checklist be completed. This is designed to save time and possibly eliminate the need for more detailed trouble shooting.

Check:
A) Station cables for proper connections and polarity.
B) Central office line connections.
C) Earth ground connections.
D) AC power cable.
E) Music source connections (if provided.)
F) Alarm connections (if provided).
G) All programming switch settings.
H) That all necessary PCB's are installed in the KSU. Consult Table 6-1 for a fault analysis guideline based on PCB's that are removed from the system.

TABLE 6-1
FAULT ANALYSIS/PC BOARD REMOVAL
OF THE TEL PLUS 616 SYSTEM

Printed Circuit Card Removed	Symptom Analysis (Card Slot Vacant) Fault(s) Found
COU 1/DB 2*	CO Line 1 & 2 Dead Stations 1 & 2 no voice x-mit or receive. Data x-mit OK.
COU 2/DB 2*	CO Line 3 & 4 Dead Stations 3 & 4 no voice x-mit or receive. Data x-mit OK.
COU 3/DB 2*	CO Line 5 & 6 Dead Station 5 & 6 no voice x-mit or receive. Data x-mit OK.
MLU	Loss of CO Line conferencing only. Station conferencing OK.
PTU/DB 2*	Loss of talk path of all CO trunks.
HTU	Loss of Hands Free talkback to all stations. Station default to ring only.
CCU	Loss of all data to stations. EMERGENCY TRANSFER TAKES EFFECT
SIU 1/PSU	Stations 1-4 Dead Stations 5-16 get busy tone when access 1-4.
SIU 2/PSU	Stations 5-8 Dead Stations 1-4 & 9-16 get busy tone when access 5-8.
SIU 3/PSU	Stations 9-12 Dead Stations 1-8 & 13-16 get busy tone when access 9-12.
SIU 4/PSU	Stations 13-16 Dead Stations 1-12 get busy tone when access 13-16.
MEU/DB 1*	No voice transmit or receive throughout system. No CO 5 & 6.
MSU/DB 1*	No CO lines. 1-6 all dead.

* A circuit card or Dummy Board (DB) must be present.

6.02.01 KEY STATION TESTING (Cont.)

OPERATIONAL TEST	RESULT	PROCEDURE
6. Transmitting of Data Signals.		
6.1 When incorrect or no data signals are transmitted between KSU and instrument.	1. Only ON/OFF and DND LED's on BLF will light when pressed. The remaining LED's are not lit.	1.1 Check cabling. 1.2 Replace key telephone. 1.3 Replace SIU/PSU card.
7. Where there is difficulty in the operation of speakerphone. spu card must be installed in the instrument and handset is in cradle.	1. Calls are not received through the built-in speaker. 2. Speech through microphone of the instrument is not tramsmitted.	1. Check to determine if SPU is installed in the instrument. 2.1 Check that the instrument is in the on-hook mode. 2.2 Check the microphone connections in the instrument. 2.3 Check the ribbon cable of the speakerphone connector (SP) in the instrument.

6.02 FUNCTION TEST PROCEDURES

6.02.01 KEY STATION TESTING

OPERATIONAL TEST	RESULT	PROCEDURE
1. Connect the modular cord to the instrument.	1. Tone is heard for a short time from the speaker of the instrument. All LED's are momentarily illuminated. 2. No tone, no reaction.	1. Normal 2. Check wiring and fuse on SIU.
2. Depress the ON/OFF button on the instrument.	1. ON/OFF lamp lights. 2. Associated station DSS key lights. 3. No reaction.	1. Normal 2. Normal 3. Check the connections of key board connector "K" in the instrument.
3. Background music 3.1 With the instrument in an idle state, depress the MUSIC button.	1. Background music is heard. 2. No reaction.	1. Normal 2.1 Check that instrument is in on-hook state. 2.2 Check the Music Source connection at the KSU.
3.2 Adjust the voice volume knob (closest to the user) of the instrument.	1. Volume is increased or decreased, as desired. 2. No reaction.	1. Normal 2. Check the volume connector (VL2) (closest to line keys) in the instrument.
3.3 Press the MUSIC button again.	1. MUSIC is turned off.	1. Normal
4. Do Not Disturb 4.1 Depress the DND button. NOTE: Telephone must be on-hook.	1. DND lamp is lit steadily. 2. No reaction.	1. Normal 2. Check the connections of key board connector "K" in the instrument.
4.2 Press the DND button again.	1. DND lamp goes out.	1. Normal
5. Tone Volume NOTE: Instrument must be in tone signaling mode. 5.1 From another instrument place an intercom call to set under test.	1. Muted tone is heard. Adjust volume. 2. Muted tone is not heard.	1. Normal 2. Check the connections of speaker connector "S" in the instrument.
5.2 Depress the ON/OFF again.	1. The muted ringing tone is louder.	1. Normal
5.3 Adjust the tone volume.	1. Increase or decrease volume as desired. 2. No reaction.	1. Normal 2. Change the instrument.

1.02.02 INTERCOM FUNCTIONS TEST

OPERATIONAL TEST	RESULT	PROCEDURE
Intercom Call		
Lift the handset or depress the ON/OFF button, and depress the DSS button for the desired instrument.	1. ON/OFF lamp lights. 2. DSS lamp of called party is lit. 3. Intercom lamp (HOLD button) of called party is flashing 30 IPM. 4. Busy tone is heard.	1. Normal 2. Normal 3. Normal 4. If called party is off-hook, in DND mode or not installed; normal.
1. In the event the called instrument is place in the handsfree talk back (voice) mode.	5. Chime tone is heard. 6. Handsfree communication is possible at the called instrument. 7. HOLD button flashes at called Party. 8. Intercom call is not connected.	5. Normal 6. Normal 7. Normal 8. Check to determine if all intercom links are busy. HOLD button will have steady lamp)
	9. Intercom ringing is heard instead of chime tone. 10. Handsfree conversation at the called instrument is not possible.	9. Confirm whether the HTU is mounted and called station is in P or H mode. 10. Check connections of microphone and speaker-phone ribbon connector (SP) in the called instrument.
1.2 If the called station answers by lifting the handset.	1. The flashing HOLD lamp of the called instrument lights steadily. 2. Ring back tone is stopped. 3. Handsfree conversation is possible.	1. Normal 2. Normal 3. Normal

6.02.02 INTERCOM FUNCTIONS TEST (Cont.)

OPERATIONAL TEST	RESULT	PROCEDURE

1.3 Call Pick-Up
  a. Lift Handset and depress DSS button for called station.
  b. To answer at the remote station, lift the handset or depress the ON/OFF button.
  c. Depress the MUSIC button.
  d. Depress the DSS button for called instrument.
	1. Ring or chime tone is heard at the called station.
	
	1. HOLD button flashes.
	
	1. No change.
	
	1. Called station returns to idle state. HOLD lamp is extinguished.
	2. Intercom conversation between calling instrument and remote answering station is possible.
	3. If remote answering is not possible.
		1. Normal
		
		1. Normal
		
		1. Normal
		
		1. Normal
		
		2. Normal
		
		3. Change the remote answer instrument.

1.4 Intercom-Conference
  a. During an intercom conversation depress the CONF button.
  b. Depress the DSS button for another party (3rd instrument)
 	
  c. Lift the handset at the 3rd instrument.
  d. Depress the DSS button for the desired 4th instrument at initiating station.
	1. Party goes on HOLD.
	
	1. No change.
	
	2. Busy tone is heard.
	
	3. Ringing tone is heard.
	1. All three parties are connected together for conference.
	1. The 4th instrument is connected for conference and the 3rd station is disconnected.
		1. Normal
		
		1. Normal
		
		2. The 3rd instrument is busy or not installed: Normal.
		3. Normal
		1. Normal
		
		1. Normal

6.02.02 INTERCOM FUNCTIONS TEST (Cont.)

OPERATIONAL TEST	RESULT	PROCEDURE
1.5 Call Waiting/Message Waiting a. Lift the handset and depress the DSS button for the desired instrument that is busy on the CO line or intercom. b. Depress the CALL WAIT button.	1. Busy tone is heard.	1. The called instrument is busy; normal.
	1. Ring back tone is heard at the calling instrument and muted warble tone is heard over the speaker at the called instrument. 2. HOLD lamp is flashing at the called instrument. 3. Busy tone is heard continuously.	1. Normal 2. Normal 3. Check connection of the called instrument.
1.6 Transferring intercom calls to Exec-Sec instrument. The incoming intercom call is routed to the executive station which is busy.	1. The incoming intercom call is automatically transferred to the secretary station. 2. The incoming intercom call is not transferred.	1. Normal 2. Confirm the programming of Exec/Sec assignment on the CCU.
1.7 All Call Paging: a. Lift the handset and depress the ALL CALL button until the paging announcement is completed. b. Release the HOLD button.	1. ALL CALL warning tone is heard. 2. HOLD lamp lights up steadily. 3. All idle instruments are paged. 4. ALL CALL paging does not occur. 1. ALL CALL paging is terminated and all stations not off-hook return to idle status.	1. Normal 2. Normal 3. Normal 4. Change the instrument. 1. Normal

6.02.03 CO LINE FUNCTIONS TEST

OPERATIONAL TEST	RESULT	PROCEDURE
1. Outgoing Calls 1.1 Lift the handset or depress the ON/OFF button and depress a CO line button.	1. The CO line lamp is lit steady. 2. Dial tone is heard. 3. CO lamp is not lit. 4. Dial tone is not heard.	1. Normal 2. Normal 3. Confirm whether the COU has been installed. 4.1 Check the connections of CO line. 4.2 If CO line 5 or 6 are installed, confirm whether the MEU board is installed.
2. Incoming Calls 2.1 Incoming CO ringing.	1. CO ringing is heard. 2. CO ringing is not heard, but CO line is ringing. 3. The CO line lamp is flashing at 30 IPM.	1. Normal 2.1 Confirm the incoming CO ring assignment on SIU or assignment on SIU or assignment of attendant and night transfer. 2.2 Check the CO line connection. 3. Normal
2.2 Lift the handset or depress the ON/OFF button. 2.3 Depress the flashing CO line button. 3. Transferring a CO line call.	1. CO line lamp is lit steady.	1. Normal
3.1 During a CO line conversation, depress the DSS button for station to which CO line is to be transferred.	1. The CO line is placed on HOLD automatically. 2. The CO line lamp is flashing I-HOLD at transferring station. 3. At the 2nd instrument, the CO line lamp is flashing at 60 IPM (indicating the transferred CO line is on System HOLD.) 4. MUSIC-ON-HOLD is transmitted to the external CO line subscriber. 5. No MUSIC-ON-HOLD is transmitted to the external CO lines.	1. Normal 2. Normal 3. Normal 4. Normal 5. Check connections of music source.

6.02.03 CO LINE FUNCTIONS TEST (Cont.)

OPERATIONAL TEST	RESULT	PROCEDURE
3.2 At the 2nd instrument, depress the flashing CO line button after answering intercom call from 1st instrument.	1. The CO line lamp is steady at all stations in the system. 2. The CO line call is not transferred to the desired station.	1. Normal 2. Change the COU.
4. Add-On-Conference		
4.1 During a CO line conversation, depress the CONF button thre 1st instrument and depress the DSS button for desired 2nd instrument.	1. The CO line is placed on HOLD.	1. Normal
4.2 When the two internal parties are ready for the conference with the external CO line, they both must depress the CO line button. which is on HOLD.	1. The three parties are connected for conferencing. 2. At the 1st station: The CO line lamp is lit steady. 3. 2nd station: The CO Line lamp is lit steady.	1. Normal 2. Normal 3. Normal
4.3 Hang up the handset at the 1st station to terminate conference call.		
5. Multi-line Conference		
5.1 a. Make an outgoing CO line call to subscriber (B). b. Press CONF button (CO line party (B) will automatically be put on I-HOLD at your station, system busy at other station.) c. Press another CO line button to make another outgoing CO line call to party (C). d. Press CONF button again. (CO Line party (C) will be put on I-HOLD.) e. Simultaneously press both CO line buttons (B) and (C) to achieve a 3-way, multi-CO line conference call.	1. All three parties are connected. 2. The two CO line lamps are lit steady. 3. Only one CO line is connected for conference or the three parties are nor connected for conference.	1. Normal 2. Normal 3. Confirm whether the MLU has been installed.

6.02.03 CO LINE FUNCTIONS TEST (Cont.)

OPERATIONAL TEST	RESULT	PROCEDURE
5.2 Depress one of two CO line buttons again.	1. Conversation with the pressed CO line continues, the other CO line is disconnected from the conference.	1. Normal
6. Flash		
6.1 During the CO line conversation, depress the FLASH button.	1. CO dial tone is heard again. 2. No "FLASH" function occurs.	1. Normal 2. Confirm the "FLASH" assignment on the PTU AND CCU.
7. Night Transfer		
7.1 At the attendant station, depress the DND button.	1. DND lamp is lit steady.	1. Normal
7.2 Life handset and press the DSS button of the desired instrument and inform the called station of intention to night transfer.	1. The called instrument is assigned to the night service station.	1. Normal
7.3 Depress the DND button.	1. DND lamp goes out. 2. The night service assignment is released.	1. Normal 2. Normal
8. In the event of commercial power failure.		
8.1 Turn off the power switch and remove the back-up battery, if provided.	1. Instruments #1-6 operate the same as a single telephone. 2. If instruments do not operate.	1. Normal 2. Check the CO line connection.