SECTION 1 GENERAL DESCRIPTION

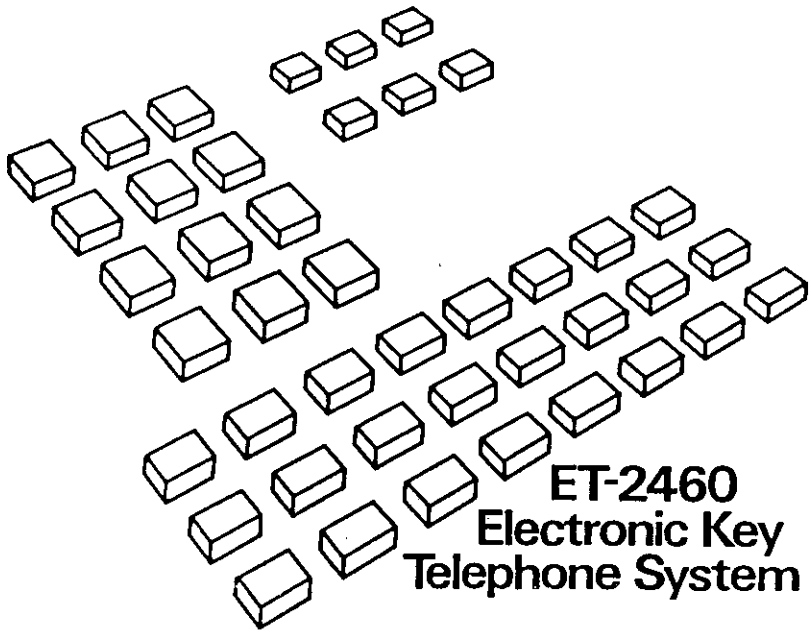
2 SECTION 2 INSTALLATION

3 SECTION 3 SERVICE

4 SECTION 4 **DRAWINGS**

5

OMEGA PHONE III



ET-2460
Electronic Key Telephone System

INSTRUCTION MANUAL

PART I GENERAL DESCRIPTION

CONTENTS

SECTION 1 SYSTEM DESCRIPTION I-1

SECTION 2 SYSTEM FEATURES I-5
- 2.1 STANDARD SYSTEM FEATURES I-5
- 2.2 E-KEY TELEPHONE FEATURES I-8
- 2.3 OPTIONAL SYSTEM FEATURES I-17
- 2.4 OPTIONAL E-KEY STATION FEATURES I-20
- 2.5 CALL PROCESSOR FEATURES I-21
- 2.6 OPX STATION FEATURES I-26

SECTION 3 SYSTEM COMPONENTS I-29
- 3.1 ELECTRONIC KEY SERVICE UNIT ... I-29
- 3.2 LINE CIRCUITS I-32
- 3.3 ADDITIONAL CIRCUIT BOARDS I-32
- 3.4 SYSTEM PROGRAMMING I-33
- 3.5 OPTIONAL FEATURE CARDS I-33
- 3.6 EXPANSION ASSEMBLY REQUIREMENTS I-34

SECTION 4 ELECTRONIC KEY TELEPHONES ... I-35
- 4.1 GENERAL FUNCTIONS I-35
- 4.2 E-KEY STATION MODELS I-35
- 4.3 STATION KEY ASSIGNMENTS I-37

SECTION 5 CALL PROCESSOR I-41
- 5.1 GENERAL DESCRIPTION I-41
- 5.2 KEY FUNCTIONS I-42

SECTION 6 SYSTEM OPERATION I-45
- 6.1 OUTSIDE (CO/PBX) LINE CALLS I-46
- 6.2 USING INTERCOM LINES I-50
- 6.3 CONFERENCE FEATURE OPERATION I-54
- 6.4 VOICE PAGE/"MEET-ME" FEATURES I-57
- 6.5 CALL PROCESSOR OPERATION I-58
- 6.6 OPX TELEPHONE OPERATION I-62

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This technical manual provides complete planning, installation, operation, and maintenance instructions for the Omega-Phone III electronic key telephone system. We recommend that craftspersons read the manual prior to the installation of the first system in order to familiarize themselves with the equipment requirements and to ensure a troublefree installation.

The technical manual is divided into four parts:

I. GENERAL INFORMATION. This part serves as the general introduction. Included in it are:

a general introduction and description of all system assemblies, standard features, and optional features.

a general guide to operation of all system standard and optional features.

II. GENERAL INSTALLATION. This part provides general planning and equipment installation information. Included are:

- o System Specification: General system specifications for the electrical, environmental, and operational aspects.
- o System Planning: A guide to determining the system assemblies and programming equipment required to meet individual system needs.
- o Key Service Unit Installation: Procedures for ET-2460 Key Service Unit.
- o Printed Circuit Board Installation: Procedures for installing and programming the printed circuit boards in the ET-2460.
- o Station Installation: Procedures for installing electronic key telephone equipment and optional station assemblies.
- o Optional System Assemblies: Procedures for installing the Call Processor and Busy Lamp Field units.
- o Verification: Procedures for operational test and verification of total system operation.

REGISTRATION NO.

ISSUE DATE

OMEGA-PHONE III

ET-2460 ELECTRONIC KEY TELEPHONE SYSTEM

TECHNICAL MANUAL REGISTRATION

TO BE FILLED OUT BY HOLDER

DATE RECEIVED: _____

ISSUED TO: Company: _____

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OMEGA PHONE III ET-2460

REVISION LIST

PAGE/LINE	ORIGINAL	TO BE REVISED
I-12/12	including Attendant ICM line and All-Call.	including All-Call.
I-12/13	The Attendant or ICM caller to the station	ICM caller to the station ....
I-12/14	in DND mode. (insertion)	in DND mode. The Attendant can call the station in DND mode if programmed.
I-21/8	Attendant Recall with Audible Indications	Attendant Recall with Audible Indications and Numeric Display
I-21/16	Call Waiting	Call Waiting with Numeric Display
I-21/25	Distination	Destination
I-22/18	in the CP-60 unit.	in the CP-60 unit, and the called station number appears in the CP-60 numeric display.
I-24/18	on the CP-60. (insertion)	on the CP-60. The called station number appears in the CP-60 numeric display.
I-59/16	(OPERATION column) Waiting; Attendant	Waiting; Called extension number appears in numeric display. Attendant .....
I-59/ 5th line from the bottom	(OPERATION column) Attendant disconnected. (insertion)	Attendant Disconnected. Call extension number appears continuously in numeric display.
I-60/ last line	(OPERATION column) Attendant disconnected. (insertion)	Attendant disconnected. Call extension number appears continuously in numeric display.
I-61/11	(OPERATION column) on CP-60. (insertion)	on CP-60. Called extension number appears in numeric display.
II-57/ last line	(TABLE 12) LAST NUMBER RE-DIAL (insertion) | YES | E	LAST NUMBER RE-DIAL | YES | E ATTENDANT CALL TO DND STATION | YES | F
II-58/ Figure 20	Note: STJ POSITION F RESERVED	(deletion)
II - 151 thru II - 153	(SECTION 7 SPEED DIAL INSTALLATION entirely added.)	

Errata continued

(2/2)

PAGE/LINE	ERROR	TO BE CORRECTED
IV-15/7	(Q'TY column) 16	8
IV-16/6	(Q'TY column) 20	24
IV-16/7	3A,3C,3D,3F 3G,3J,4A,4C 4D,4F,4G,4J | TMM323C | 12	ROM1-ROM7 | D2732 | 7
IV-16/17	C4-C17 | " ULD06F103Z | 14	C4-C8 C10-C17 | " ULD06F103Z | 13
IV-17	(Diagram changed)	

ET-2460
Electronic Key
Telephone
System

PART I
GENERAL DESCRIPTION

ET-2460
Electronic Key
Telephone
System

OMEGA PHONE III

PART I
GENERAL
DESCRIPTION

SECTION 1 SYSTEM DESCRIPTION

The Omega-Phone III Electronic Key Telephone System, illustrated in FIGURE 1, is a newly developed, fully electronic, multiple-line key telephone system featuring up to 60 extensions and up to 20 Central Office/Private Branch Exchange (CO/PBX) lines.

Micro-processor control and stored program technology provide system flexibility through a wide variety of features to suit individual user requirements. Programming is simple and easy to change.

Non-blocking space-division speech path technology and digital data transmission techniques are used. Expansion is accomplished by plug-in modules, and cable requirements are reduced to three-pair wiring between the system common control unit and each electronic key telephone.

The modular arrangement of the system common control unit enables both CO/PBX lines and stations to be individually expanded from the factory-wired configuration.

Omega-Phone III utilizes two different electronic key telephones for system economy and differentiation of features. A modular arrangement permits expansion of the smaller model to the full-capacity model. Standard single-line telephones may be used for off-premises applications.

The system offers, as an option, up to two Attendant (main answering) positions using Call Processor units. Each Call Processor operates independently on its dedicated Attendant Intercom voice circuit. Station Busy Lamp Field units are available separately in addition to the Station Busy Lamp Field provided on the Call Processor.

Capacities of Omega-Phone III are listed in TABLE 1.

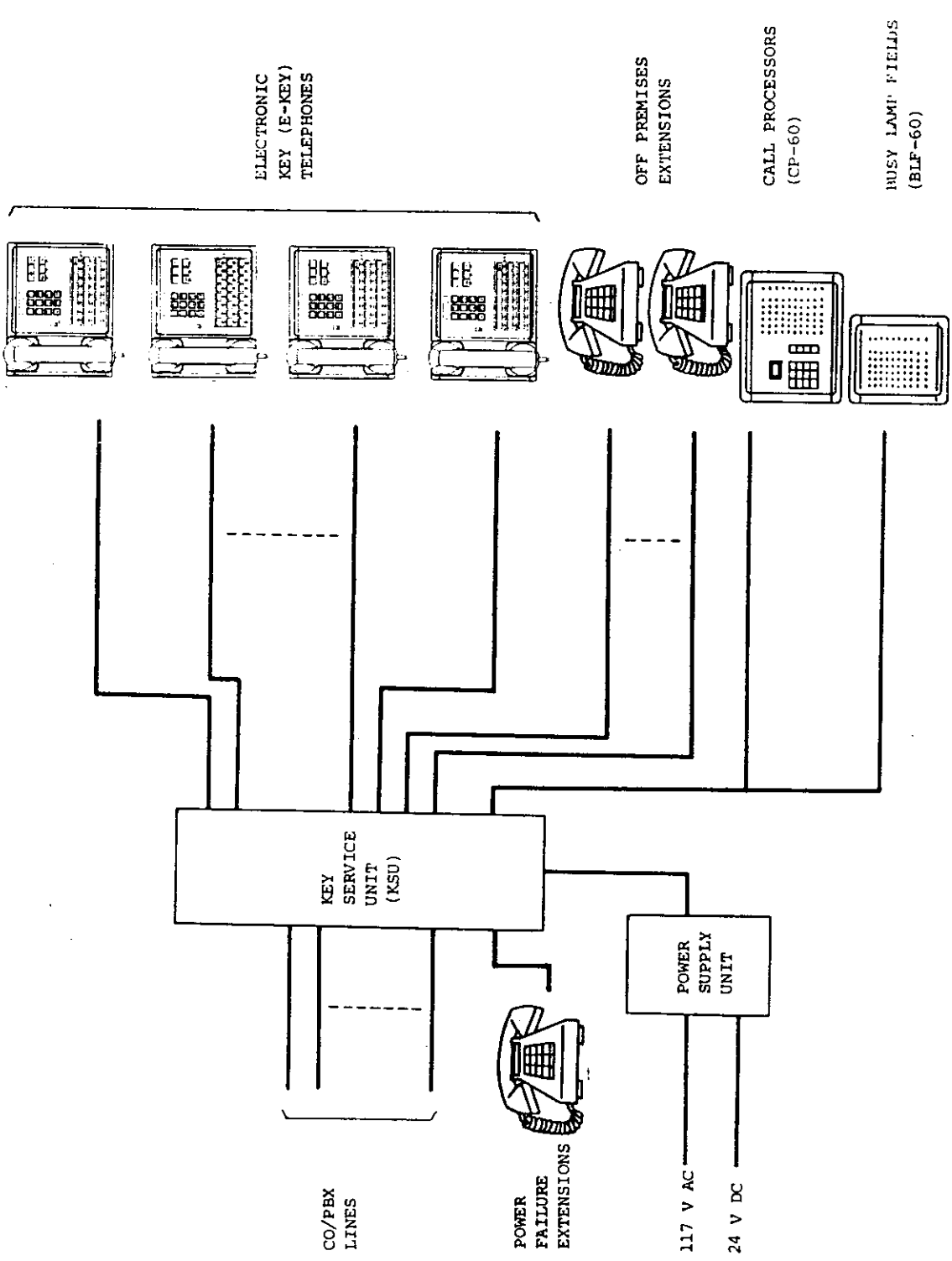


FIGURE 1 OMEGA-Phone III System

TABLE 1. OMEGA-PHONE III SYSTEM CAPACITIES

FUNCTION	STANDARD KSU	EXPANDED KSU	NOTES
CO/PBX Lines	12	20	
Electronic Key Telephone Extensions (E-KEY)	32	60	
Off-Premises Extensions (OPX)	8	8	
Intercom (ICM) Lines	(2)	(2)	1
Attendant Intercom Lines	1(2)	1(2)	2
Secretary Lines	--	--	3
Busy Lamp Field-60 (BLF-60)	4	4	4

NOTE

1. A maximum of two Intercom Lines can be used in the KSU without affecting CO/PBX Line capacity. Use of additional Intercom Lines requires reduction of CO/PBX Line capacity.
2. Two in parenthesis indicates the maximum number of Attendant Intercom Lines that can be used in the KSU. Use of the second Attendant Intercom Line requires reduction of CO/PBX Line capacity by one line.
3. Each of Secretary Line utilized reduces the CO/PBX Line capacity by one line. The number of Secretary Lines is limited only by number of line circuits available in the KSU.
4. The total number of Attendant Intercom Lines and BLF-60 is limited to five.

SECTION 2 SYSTEM FEATURES

2.1 STANDARD SYSTEM FEATURES

Standard system features of the Omega-Phone III system are listed in TABLE 2.

TABLE 2 STANDARD SYSTEM FEATURES

- DTMF and Dial Pulse CO/PBX Line Signalling
- Automatic Hold Release on CO/PBX Lines
- Music-On-Hold Interface
- Non-Blocking CO/ICM Voice Path
- Multiple Path Intercom Lines with Simultaneous Dialing
- Intercom Line Privacy/Non-Privacy Mode Selection
- Intercom Tone/Voice Signalling
- Discriminating CO/ICM Signalling
- Intercom Tone/Voice Dial Select Assignment
- PA Amplifier Interface
- Background Music Interface
- Night Ringer (PA) Interface
- Loud-Ringing Bell Interface

2.1.1 DUAL TONE MULTI-FREQUENCY (DTMF) AND DIAL PULSE CO/PBX LINE SIGNALLING

The system CO/PBX Line circuits interface with either DTMF or Dial Pulse CO/PBX Lines. CO/PBX Line signalling can be mixed to meet individual CO/PBX Line requirements by selecting equipment cards in the Key Service Unit.

2.1.2 AUTOMATIC HOLD RELEASE OF CO/PBX LINE CALLS

The system automatically disconnects a CO/PBX Line placed on "hold" if the outside CO/PBX party goes on-hook and the CO/PBX Line provides a disconnect signal.

2.1.3 MUSIC-ON-HOLD INTERFACE

A Music-on-Hold (MOH) interface to the CO/PBX Lines is provided as standard. A "phono" type audio connector is provided to connect to the music source. A high- or low-impedance music input transformer strap option is provided, as well as relay contact closures for start-stop control of the music program source.

2.1.4 NON-BLOCKING CO/ICM VOICE PATH

The system utilizes a non-blocking electronic crosspoint matrix for all station voice circuits. Non-Blocking voice paths provide total system voice circuit switching capability.

2.1.5 MULTIPLE PATH INTERCOM WITH SIMULTANEOUS DIALING

The system provides two dedicated Intercom pickup keys on the telephones. Any number of additional Intercom paths may be equipped on the system provided that line circuits are available in the Key Service Unit and telephone. Use of additional Dial ICM Lines reduces CO/PBX-Line capacity accordingly. Dialing of station-to-station calls on the Intercom paths can occur simultaneously. A time-out circuit is provided to prevent tieing up the Intercom paths upon misdialing or by inadvertent off-hook operation.

2.1.6 INTERCOM LINE PRIVACY/NON-PRIVACY MODE SELECTION

A program option allows system Dial Intercom Lines to be made "private" or "non-private", depending upon user preference.

2.1.7 INTERCOM LINE TONE VOICE SIGNALLING

For E-KEY station to E-KEY station calls, either tone signalling or voice announcing can be used to call the desired extension. The calling station on the Intercom Line dials either two or three digits to determine the type of signalling used. Only voice announcing is allowed when the called extension is busy on another call.

2.1.8 DISCRIMINATING CO/ICM CALL SIGNALLING

Different E-KEY station tone signals are used to indicate whether the incoming call to the E-KEY station is on a CO/PBX Line or Intercom Line.

2.1.9 INTERCOM TONE/VOICE SIGNALLING MODE SELECT

Dial access to voice or tone calling on E-KEY station to E-KEY station calls can be arranged for user preference. The system is factory programmed for two-digit (station number) voice (or handsfree answerback) calls with three-digits for tone calling. A program option is provided to reverse this arrangement.

2.1.10 PA AMPLIFIER INTERFACE

The system provides a high or low impedance transformer interface to a standard Public Address (PA) amplifier. A "phono" type audio connector is provided to connect to the PA amplifier as are auxiliary relay make contacts to control speaker functions. Volume controls are provided on the Key Service Unit to control voice page volume on the PA speakers, allowing guards to be placed on the PA volume controls to prevent tampering.

2.1.11 BACKGROUND MUSIC INTERFACE

Transformer coupling to a background music source for the PA system is provided. A music volume control and a "phono" type audio connector are provided. The system is so arranged that the background music on the PA system cuts off while a voice page is being made.

2.1.12 NIGHT RINGER (PA) INTERFACE

A supplemental relay make contact is provided when the system is placed in night service, permitting various changes in ringing arrangements.

2.1.13 LOUD RINGING BELL INTERFACE

Relay contacts are provided to operate external loud ringing bells for CO incoming call indication in noisy areas.

2.2 E-KEY TELEPHONE FEATURES

Standard features provided in all Omega-Phone III E-KEY telephones are listed in TABLE 3.

TABLE 3 STANDARD E-KEY STATION FEATURES

- Multiple Line Service
- Non-Locking Line Pickup Keys
- Multiple Function Keys
- LED Lamp Indicators
- Choice of 12 CO/PBX Line or 20 CO/PBX Line Capacity
- Pushbutton Dialing
- I-USE Line Indication
- I-HOLD Line Indication
- Exclusive Hold
- Non-Exclusive Hold
- Pre-Selection of Line
- On-Hook Dialing/Call Monitor
- Automatic Privacy on CO/PBX Lines
- Privacy Release With Mode Indication on CO/PBX Lines
- Executive Override of Privacy
- Flexible Pickup Line Key Assignment
- Do-Not-Disturb With Indication
- Station Busy Indication
- Answer Hold
- Selective ICM Line Call Indication
- CO/PBX Line Flash
- CO/PBX Add-On Conference
- Hold Recall to Originating Station
- Intercom Call Pickup
- Secretary Transfer/Call Forwarding
- Adaptable to Ancillary Devices
- CO/PBX Line Pickup Restriction
- Intercom Add-On Conference

TABLE 3 Cont'd

- Intercom Dial Tone Re-Order
- Automatic CO/PBX Line Add-On Conference
- Off-Hook Signalling of CO/ICM/Attendant Calls and Paging
- Soft Paging
- System All Call With "Meet-Me"
- Station Last-Number-Dialed Recall
- Night Service
- Station Directory Tray
- Desk-Wall Telephone Conversion
- Adjustable Station Volume Control
- User's Guide optional

2.2.1 MULTIPLE LINE SERVICE

The E-KEY station can handle up to 20 CO/PBX line appearances. Calls placed on "non-exclusive hold" can be answered anywhere in the system that the line appears.

2.2.2 NON-LOCKING LINE PICKUP KEYS

All line pickup keys are constructed so that the keys are non-locking and easy to operate. The use of non-locking keys enhances station reliability and performance.

2.2.3 MULTIPLE "FUNCTION" KEYS

The E-KEY station is so designed that "function keys", rather than the station dial, are utilized for control of station features. Features are thus easier to operate, affording maximum usage and enhanced system performance.

2.2.4 LED LAMP INDICATORS

All station lamp indicators are LED-type lamps, providing both high reliability and long life.

2.2.5 CHOICE OF 12-LINE OR 20-LINE STATIONS

The E-KEY stations are so designed that the station can be arranged to handle from 12 to 20 CO/PBX Line appearances. A station arranged for 12 CO/PBX Lines can be easily expanded to 20 CO/PBX Lines at any time.

2.2.6 PUSHBUTTON DIALING

Each E-KEY station utilizes an electronic pushbutton dial for network and Intercom signalling. The same dial is used for both DTMF and Dial Pulse CO/PBX Lines.

2.2.7 I-USE LINE INDICATION

When the E-KEY station user operates a CO or ICM Line pickup key, the line shows busy on all E-KEY stations in the system. At the local station, a special lamp flash indication is provided on the line lamp indicator to indicate to the user that the particular line circuit is being operated.

2.2.8 I-HOLD LINE INDICATION

When the E-KEY station places a CO/PBX Line on "hold," a special lamp flash is provided at the station to indicate to the user which line has been placed on "hold."

2.2.9 EXCLUSIVE HOLD

The E-KEY station user may place a CO/PBX Line call on "exclusive hold," allowing that user to leave the line but preventing the line from being answered by another extension. When the user places calls on "exclusive hold," an I-HOLD indication appears on the line lamp indicator at the user's station but all other stations show the line busy.

2.2.10 NON-EXCLUSIVE HOLD

The E-KEY station user may place a CO/PBX Line call on "non-exclusive hold," allowing the call to be picked up by any station in the system where the line appears. When the line is placed on "non-exclusive hold," an I-HOLD indication appears on the station line lamp indicator but all other stations show the line to be on "system (non-exclusive) hold."

2.2.11 PRE-SELECTION OF LINE

The station user can press a line pickup key before taking the handset off-hook.

2.2.12 ON-HOOK DIALING/CALL MONITOR

A function key is provided that permits a CO or ICM Line call to be dialed without taking the handset off-hook. The Speaker key is pressed before or after selecting an available CO or ICM line. Dial tone is heard through the station speaker, as is the distant party's voice upon answering. Upon taking the handset off-hook, the station speaker is disconnected from the line and two-way voice communication can begin.

2.2.13 AUTOMATIC PRIVACY ON CO/PBX LINES

Privacy on the CO/PBX Lines is a standard feature; the first extension entering a line excludes all other extensions except those programmed to override the privacy. A steady lamp indication on the line indicator of all other extensions in the system shows that the line is busy and private.

2.2.14 PRIVACY RELEASE ON CO/PBX LINES WITH MODE INDICATOR

A function key is provided through which the station that first enters a CO/PBX Line can add other extensions to the line. The station Conference (CONF) key is momentarily pressed to open the CO/PBX Line to other extensions. At the same time, the controlling station CONF indicator lamp flashes, while all other stations' line lamp indicator flashes at the "non-privacy" rate. When an extension enters the line, a momentary tone burst is heard on the line, the line lamp indicators on all other extensions return to privacy (steady) indication, and the controlling station CONF lamp indicator stops flashing. When a third extension wishes to enter the line, either station on the line can operate the "privacy release" function.

- The system functions in the same manner on the Intercom Lines if the system is arranged for privacy on Intercom.
- The "privacy release" function allows an extension that is engaged in a conference on a CO/PBX (or ICM) Line to temporarily leave the line to answer another call and return to the line without the other stations on the line having to operate the "privacy release" function.
- Any station engaged in a conference on a line can demand privacy (if the line is in the non-private mode) by pressing the station Conference (CONF) key.
- Use of the extension Conference (CONF) key is not restricted to any particular time during CO/PBX or ICM Line calls.

2.2.15 EXECUTIVE OVERRIDE OF PRIVACY

Any E-KEY station can be arranged to automatically defeat the "privacy" on a line. The "executive" extension automatically gains access to a busy line, yet demands privacy from all "non-executive" stations if a line is initially seized.

2.2.16 FLEXIBLE PICKUP KEY ASSIGNMENTS

CO/PBX Line pickup keys on the E-KEY station can be assigned to a number of functions including Tie Lines, Secretary ICM Lines, Dial Intercom Lines, and Attendant Lines.

2.2.17 DO-NOT-DISTURB WITH INDICATION

The E-KEY station features a Do-Not-Disturb (DND) switch that cuts off all incoming calls to the extension, including All-Call. ICM caller to the station receives a special warning tone to indicate that the station is in DND mode. The Attendant can call the station in DND mode if programmed.

- An extension equipped with a Secretary ICM Line receives Secretary Line calls while in the DND mode. However, the station handsfree answerback microphone is cut off in DND mode.
- A DND indicator lamp on the E-KEY station flashes when the station is in the DND mode.
- All Station Busy Lamp Fields, as well as the Attendant Call Processor(s), show the station busy when the station is in the DND mode.

2.2.18 STATION BUSY INDICATION

When an E-KEY station arranged for off-hook signalling is busy, an Intercom caller receives a momentary fast busy warning tone to indicate the called party is off-hook before Intercom (tone or voice) signalling commences.

2.2.19 SELECTIVE ICM CALL INDICATION

When a station receives a Dial ICM call, the ICM pickup key for that call flashes at a different rate so that the user can determine which line the call is waiting on. Other stations have a steady light.

2.2.20 CO/PBX LINE FLASH

The FLASH function key sends a system-timed "flash" (disconnect) signal to the CO/PBX Line to recall dial tone or to operate functions on the PBX or ESS Central Office Lines. The station user momentarily presses the FLASH key to operate the function.

2.2.21 CO-PBX LINE ADD-ON CONFERENCE

Up to three stations can talk on a CO/PBX Line at the same time. A number of means are provided to allow stations to enter the CO/PBX Line for conferencing.

2.2.22 HOLD RECALL TO ORIGINATING EXTENSION

A station receives a recall tone and visual lamp indication a certain period of time after placing a call on "hold."

- The "hold recall" function operates when either the "exclusive" or "non-exclusive hold" method is utilized.
- If "exclusive hold" is used and the recall function operates, the call reverts to "non-exclusive hold."

2.2.23 INTERCOM CALL PICKUP

A function key is provided to allow calls to be answered at extensions other that intended. The station Pickup (P-UP) key is operated before the calling line is selected.

- The "call pickup" function can be used to answer station-to-station Intercom calls at another extension.
- The "call pickup" function is also used to answer page (either station or overhead PA) "meet-me" calls at any extension in the system.

2.2.24 SECRETARY TRANSFER/CALL FORWARDING

A function key enables incoming Dial ICM and Attendant Line calls to the station to be automatically switched to a pre-determined station in the system.

- More than one station can transfer calls to the same station.
- A number of different transfers can be arranged in the system.
- A call routed to a second extension is transferred, in turn, to a third extension if the TRANSFER key is operated at the second extension.

2.2.25 ADAPTABLE TO ANCILLARY DEVICES

The station voice circuits resemble a standard telephone network. A number of ancillary devices can be attached to the station, including headsets and handsfree telephone adapters. Any ancillary device utilizing network signalling must be a DTMF-type device, however.

2.2.26 CO-PBX LINE PICKUP RESTRICTION

A number of pickup keys on the station can be arranged to prevent pickup of a CO/PBX Line. The line can be utilized by the restricted extension if the extension is added on to the line by any unrestricted extension.

2.2.27 INTERCOM ADD-ON CONFERENCE

Up to three stations can talk on an ICM Line at the same time. A number of means are provided to allow stations to enter the ICM Line for conferencing.

2.2.28 ANSWER HOLD

The Pickup (P-UP) function key is used to momentarily place on "hold" a CO/PBX Line call and answer an incoming Dial ICM or Attendant Line call. Holding the Pickup key depressed allows the station to talk to the incoming call; releasing it allows the station to switch back to the original call.

2.2.29 AUTOMATIC CO/PBX LINE ADD-ON CONFERENCE

A function key allows the station user to add another extension to a CO/PBX line call after calling the extension on an ICM line. After placing the CO/PBX call on "exclusive" or "non-exclusive" hold, the station user calls the desired party on an ICM Line. Upon establishing contact with the party, the station user presses first the ADD function key and then the CO/PBX Line pickup key. Both stations are then connected to the CO/PBX Line automatically.

2.2.30 OFF-HOOK SIGNALLING OF CO, ICM, ATTENDANT, AND PAGING

Provision is made on to receive CO, ICM, Attendant, and Page calls while talking on a CO or ICM call. Individual station program options are provided for the various types of calls.

- CO audible signals are controlled by a strap option.
- CO/ICM calls while off-hook are controlled by an individual strap option.

- All Attendant ICM Line calls can defeat the station busy and block any other call in progress.
- All-Call (Page) always defeats the station hookswitch.

2.2.31 SOFT PAGING

When an extension is programmed to receive an incoming call indication while off-hook, the volume of the station page or tone signal is reduced while the extension is off-hook.

2.2.32 INTERCOM DIAL TONE RE-ORDER

A station function key allows the station user to recall Intercom dial tone after completion of an Intercom call, to initiate a new call or to add another extension to the Intercom call. The station FLASH key is pressed to operate this feature.

- Upon completion of an ICM Line call or upon called party busy/no answer, the FLASH key is pressed. Intercom dial tone is returned to the calling station and a new Intercom call can be made.
- During a conversation on an ICM Line, a third extension can be added to the call by either extension operating the FLASH key. Intercom dial tone is then returned to the calling extension to allow dialing the third extension. While dialing or tone/voice calling the third extension is taking place, the second extension is "held" on the line. When the third extension answers (goes off-hook), the three-way conference is connected. If the third extension does not answer, the FLASH key is again pressed to reconnect the second extension.

2.2.33 SYSTEM ALL-CALL WITH "MEET-ME"

The Page function key is provided for the station to voice-page the system. The PAGE key is pressed to voice page all stations programmed to receive the All-Call and/or voice page over the external PA system. If the Page circuit is in operation, an LED indicator lamp associated with the Page function key shows busy. A timer function controls the maximum duration of the voice page. The PAGE key can be used for a number of operational functions, including:

- General Announcement: Taking the handset off-hook and pressing the PAGE key operates the All-Call function.

- Paging While on a CO/PBX Line: While a conversation is being conducted on a CO Line, the PAGE key can be operated. The CO Line automatically goes on "hold" while the PAGE key is pressed. When the PAGE key is released, the station is automatically reconnected to the CO Line.
- Paging an Extension on an ICM Lines: After the handset is taken off-hook on an ICM Line, the PAGE key is pressed and the voice page message recited over the All-Call system. When the PAGE key is operated, the ICM Line reverts to "non-private" status so that the call can be answered by any station in the system using the "call pickup" function.
- Paging During Intercom Call, Extension No Answer: When an extension does not answer an Intercom call, the PAGE key can be pressed immediately, disconnecting the original call and making the ICM Line "non-private." The called party then can answer the call anywhere in the system, utilizing the"call pickup" function.
- Paging During Intercom Call, Extension Busy: When an extension is called on the Intercom and the extension returns a busy signal to the calling party, the calling party can utilize the PAGE key to operate the All-Call function to call the busy extension.
- Paging to Add an Extension to a Line: When two stations are talking on an ICM Line, a third extension can be added to the line by either extension operating the Page function.

2.2.34 STATION LAST-NUMBER-DIALED RECALL

After dialing a CO/PBX Line call, the same CO/PBX Line number can be redialed by operating the # (pound) key on the station dial pad. CO/PBX Line numbers of up to 16 digits can be recalled.

2.2.35 NIGHT SERVICE

Any E-KEY station can be programmed to ring on the CO/PBX Line(s) arranged for Night Service. E-KEY stations serving as Attendant positions control operation of the Night Service by the Transfer switch provided on the station.

2.2.36 STATION DIRECTORY TRAY

Each station is provided with a Station Directory. A slide-out directory tray, located on the base of the unit, is utilized to store a listing of local extension and telephone exchange numbers.

2.2.37 DESK-WALL TELEPHONE CONVERSION

Each E-KEY station can be adapted for wall-mounting by adding a wall-mount assembly to the telephone handset cradle. A bracket is provided for attaching the telephone to the wall. No modification of the internal telephone assembly is required.

2.2.38 ADJUSTABLE STATION VOLUME CONTROL

An individual station volume control is provided on the front of the telephone. The volume control adjusts all station tone and voice announcement levels.

2.3 OPTIONAL SYSTEM FEATURES

Optional features of the Omega-Phone III System are listed in TABLE 4.

TABLE 4 OPTIONAL SYSTEM FEATURES

- Flexible CO/PBX Line Signalling Assignment
- Flexible Internal Zone Page Assignment
- PA Zone-Page Interface (3 Zones)
- Secretary ICM Line
- Automatic Ringdown Tie Lines
- Trunk-To-Trunk Conference
- Electronic Station Busy Lamp Field
- Speed Dialing
- Power Failure Transfer (CO/PBX Line)
- Power Failure Transfer (System)
- Individual Station Dial Restriction
- Individual Station Toll Restriction
- Flexible Timer Assignment

2.3.1 FLEXIBLE CO/PBX LINE SIGNALLING ASSIGNMENT

Individual CO/PBX Lines or groups of CO/PBX Lines can be arranged to ring at up to 12 individual extensions in the system.

2.3.2 FLEXIBLE INTERNAL ZONE PAGE ASSIGNMENT

The system provides for up to four zones of internal extensions in the system. The number of extensions that can be assigned to a zone is not limited. Any E-KEY station in the zone that is called can answer the call by operating the "call pickup" feature.

2.3.3 PA ZONE PAGE WITH "MEET-ME"

The PA Zone Page Adapter provides up to three zones of public address system voice paging. Background music can operate over the zone PA speakers while paging is not being used. Provision is made to page all three zones simultaneously.

2.3.4 SECRETARY ICM LINE

A private line connection can be arranged between two extensions in the system. Using this feature, the caller goes off-hook on an assigned station pickup key and voice announces to the second extension. The called extension can then reply to the calling extension handsfree (optional) or by handset. The Secretary ICM Line is the only function that defeats the Secretary Transfer and Do-Not-Disturb functions at the called extension. In addition, the Secretary ICM Line may be used as an Executive Intercom path, providing the calling extension with a dial access to any other extension in the system apart from the system Dial Intercom paths.

2.3.5 AUTOMATIC RINGDOWN TIE-LINES

Provision is made for the system to operate an Automatic Ringdown Tie-Line to distant Key Telephone System or single-line extension(s). Each Tie-Line circuit utilizes a CO/PBX pickup key on the E-KEY station.

2.3.6 TRUNK-TO-TRUNK CONFERENCING

A feature is provided where two CO/PBX Lines can engage in a conference without a local extension. The local station, after setting up the conference, can leave the call; disconnection is automatic when the distant conference parties go on-hook (subject to local CO/PBX operation).

2.3.7 ELECTRONIC BUSY LAMP FIELD

The system features optional stand-alone Station Busy Lamp Fields (BLF-60). Up to four BLF-60 units can be used in the system. Each unit provides LED lamp indicators for up to 60 extensions. Differential lamp indications are utilized on the unit to indicate various modes of station status.

2.3.8 SPEED DIALING

A central speed dialing system can be added to the Omega-Phone III. A 100-number system with up to 16 digits can be utilized on CO/PBX Line calls. Any E-KEY station can access any number in the speed dialing memory. Provision is made for system power failure so that no loss of memory will occur.

2.3.9 POWER FAILURE TRANSFER (CO)

A group of five CO/PBX Lines can be transferred to single-line telephones during commercial power failure.

2.3.10 POWER FAILURE TRANSFER (SYSTEM)

During commercial power failure, the entire system can operate with an optional back-up battery arrangement.

2.3.11 INDIVIDUAL STATION TOLL RESTRICTION

Toll Restriction is offered on an individual line and station basis. Toll Restriction denies all long-distance and out-of-exchange calls, yet allows all service-type (411, 611, 911) calls as well as WATTS (800) calls.

2.3.12 OUTGOING CO/PBX DIAL RESTRICTION

CO/PBX lines at individual extensions can be arranged for Dial Restriction. The extension can answer calls on the restricted lines but cannot dial outside calls.

2.3.13 FLEXIBLE SYSTEM TIMER ASSIGNMENT

The operational time associated with various system functions can be programmed for the individual system user's preference.

2.4 OPTIONAL E-KEY STATION FEATURES

Optional E-KEY Station features are listed in TABLE 5.

TABLE 5 OPTIONAL E-KEY STATION FEATURES

- Handsfree Answerback on ICM/Attendant Line Calls
- Loudspeaker Telephone Unit
- Station Memory Dialer
- CO/PBX Multi-Trunk Conference
- Station Handsfree Microphone Cutoff
- Station User's Guide

2.4.1 HANDSFREE ANSWERING ON ICM/ATTENDANT CALLS

An optional Handsfree Answer module can be added to any E-KEY station in the system to enable answering of Intercom and Attendant calls without using the handset.

2.4.2 LOUDSPEAKER TELEPHONE UNIT

An optional E-KEY station Loudspeaker Telephone applique is utilized for full handsfree operation on CO/PBX and ICM Line calls.

2.4.3 STATION MEMORY DIALER

An optional station applique unit that provides access to a 35-number memory is available. Features such as "called number display", "single number access", "recall", and "call timer" are provided.

2.4.4 CO/MULTI-TRUNK CONFERENCE

Conferencing between two CO/PBX Lines and one extension is provided when the system is equipped with the optional Trunk Conference Unit(s). Each Trunk Conference Unit provides two trunk conference circuits that can operate simultaneously. The Trunk Conference Unit provides voice circuits for any arrangement of CO/PBX Lines that are equipped on the system.

2.4.5 STATION HANDSFREE MICROPHONE CUTOFF

A function switch is provided on the E-KEY telephone so that the station handsfree microphone (when equipped) can be cut off yet still allow indication of an incoming CO/PBX or ICM Line call.

2.4.6 STATION USER'S GUIDE

A user pamphlet explains operation of the features of the ET-2460 Electronic Key Telephone System.

2.5 CALL PROCESSOR FEATURES

Call Processor (CP-60) features are listed in TABLE 6.

TABLE 6 CALL PROCESSOR (CP-60) FEATURES

- Sender Key Operation with Numeric Display
- 60-Station Busy Lamp Field
- Dual Position Operation
- Automatic CO/PBX Line Hold
- Attendant Recall With Audible Indications and Numeric Display
- Attendant Intercom Line With Privacy
- Handsfree Answerback to Attendant Line Calls
- Step Call
- Attendant Override
- Call Priority
- Attendant Call Release
- Automatic CO/PBX Line Transfer
- Call Waiting with Numeric Display
- Message Waiting
- "O" Number Assignment
- Identified Extension Calls
- Through Dialing
- Call-In-Progress Indication
- Page Access With "Meet-Me"
- Zone Page (PA) Access With "Meet-Me"
- Group Call Access With "Meet-Me"
- Call Forwarding Extension Number Destination Display

The Call Processor (CP-60) is an optional system feature that provides for convenient answering and distribution of CO/PBX Line calls in the system. Standard features of the Call Processor include:

2.5.1 SENDER KEY OPERATION

The Attendant calls extensions in the system utilizing "sender keys." An LED numeric display indicates the station number dialed.

2.5.2 SIXTY-STATION BUSY LAMP FIELD

A 60-station Busy Lamp Field is built into the CP-60. The lamp field affects the number of individual station busy lamp fields that can be utilized in the system.

2.5.3 DUAL POSITION OPERATION

The system can utilize two CP-60 Attendant positions. Both CP-60 units can operate simultaneously for the answering and distribution of CO/PBX Line calls.

2.5.4 AUTOMATIC CO/PBX LINE HOLD

When a CO/PBX Line call is answered, operating the CP-60 "key sender" or Page key automatically places the call on "system hold" and I-HOLD indication is given on the CO/PBX pickup key.

2.5.5 ATTENDANT RECALL WITH AUDIBLE INDICATION

The Attendant telephone, when equipped with the CP-60, is provided an additional recall function. When CO/PBX calls are placed on "call waiting" by operation of the CP-60, a recall time-out period is provided that is different from that used for "Hold Recall." In addition, a distinct audible warning tone indicating "recall" is provided in the CP-60 unit, and the called station number appears in the CP-60 numeric display.

2.5.6 ATTENDANT ICM PATH WITH PRIVACY

The CP-60 provides a dedicated voice path for the Attendant position. The voice path enables the Attendant to voice announce or talk with the system extension(s) privately.

- When a CO/PBX Line call is placed on "hold" and an extension in the system is called, the Attendant ICM Line lamp flashes at the called extension and glows steadily at all other E-KEY stations.
- The called station can talk to the Attendant by pressing the Attendant ICM pickup key at the extension. The called extension Attendant Line lamp then glows steadily and a private conversation can take place.
- When two Attendant positions are equipped in the same system, each has its own voice path appearance on the E-KEY station.
- The Attendant path cannot be used by extensions in the system to initiate calls to the Attendant positions.

The "call pickup" function can be used to answer Attendant calls at an E-KEY station not directly called.

2.5.7 HANDSFREE ANSWERBACK TO ATTENDANT CALLS

If the E-KEY station called is equipped with the optional Handsfree Answerback module, the called extension can answer handsfree to the Attendant call or operate the Attendant key to talk to the Attendant by handset.

2.5.8 STEP CALL

When the Attendant calls an extension and encounters a station busy or do-not-answer, the Attendant can call another station in the same number grouping by dialing the last digit of the desired extension.

2.5.9 ATTENDANT OVERRIDE

If the Attendant encounters a station busy signal after calling an E-KEY station, the Attendant must operate the Override key on the CP-60 to talk to the called extension.

- If the called station is engaged in a CO/PBX or ICM Line call, the Attendant voice will be heard through the called E-KEY station speaker.
- If the called station is busy on a handsfree Intercom call, the Attendant can override the Intercom call. The Intercom caller receives Attendant intrusion tone indication while the Attendant talks to the called extension. When the Attendant releases the call, the Intercom caller connection is re-established.
- The CP-60 Override function key does not defeat the E-KEY extension Do-Not-Disturb mode.

2.5.10 CALL PRIORITY

The system is arranged for the CP-60 to control all access to system features so that if an extension and the Attendant operate the same function, the CP-60 blocks the extension access until the call is completed.

2.5.11 ATTENDANT CALL RELEASE

A Release function key is provided on the CP-60 so that the Attendant can reconnect to the CO/PBX Line automatically after calling an extension or can cancel any CP-60 call.

2.5.12 AUTOMATIC CO/PBX LINE TRANSFER

After answering a CO/PBX Line and calling an extension using the Call Processor, the Attendant can automatically connect the CO/PBX Line to the called extension on the Attendant Line by operating the Connect function key on the CP-60. At the called extension, the pickup key of the CO/PBX Line flashes at the I-USE rate to indicate which CO/PBX Line is connected.

2.5.13 CALL WAITING

After answering a CO/PBX Line and calling an extension using the Call Processor, the Attendant can leave an indication as to the CO/PBX Line on which the outside party is waiting.

- The Attendant has the option of using the "call waiting" feature for extending a call (the Attendant dials the intended station on the CP-60 and operates the "call waiting" function). At the called extension, the line lamp of the particular CO/PBX Line flashes at the "incoming" rate and a ringing tone is heard. The station user then answers the CO/PBX Line by identifying which CO/PBX Line lamp is flashing.
- Upon encountering a station busy condition, the Attendant can operate the "call waiting" function on the CP-60. The called station number appears in the CP-60 numeric display. The lamp indicator of the line that is waiting flashes at the "incoming" rate and a warning tone is heard at the called station. The called station thus knows on which line the call is waiting.
- The CP-60 Busy Lamp Field display station indicator flashes at a special rate to indicate when a previous call is waiting. The Attendant can then decide whether to extend a second call to the same extension.

2.5.14 MESSAGE WAITING

The Attendant, upon encountering a busy or called-party no-answer condition when using the Call Processor, can leave a "Message Waiting" indication at the called extension. When the "Message Waiting" function key on the CP-60 is operated, the Attendant ICM lamp on the station flashes at the "message waiting" rate to indicate that a call-back to the Attendant is requested.

2.5.15 "0" NUMBER ASSIGNMENT

The Attendant position is dial accessed by the extensions in the system by dialing "0." In the case of two Attendant positions, "01" and "02" are utilized.

2.5.16 IDENTIFIED EXTENSION CALLS

When an extension in the system calls the Attendant, the extension number of the calling station appears on the Call Processor numeric display.

2.5.17 CALL-IN-PROGRESS INDICATION

Various Station Busy Lamp Field (BLF) lamp indications are used to indicate station status:

- A steady BLF station lamp indicates that the station is busy, i.e. talking on a CO/PBX or ICM Line, or in the Do-Not-Disturb mode.
- The dialed number on the CP-60 numeric display flashes when the CP-60 calls a station receiving a CO/PBX, ICM, or Attendant call.
- A different lamp indicator flash rate is used to indicate that a CO/PBX Line call is waiting.

2.5.18 PAGE ACCESS WITH "MEET-ME"

The Attendant can access the system All-Call by operating the PAGE key on the Call Processor.

- When the PAGE key is pressed, the CO/PBX Line call that was answered is automatically placed on "Hold." The Attendant Line lamps on all extensions flash at the "non-privacy" rate.
- Any extension in the system can answer the Attendant Page by pressing the Attendant Line pickup key and operating the "call pickup" function. The answering extension number is indicated on the Call Processor numeric display.
- Once the call has been answered by the extension, the Attendant can utilize the "automatic" CO/PBX Line transfer to connect the extension to the outside line.

2.5.19 ZONE PAGE (PA) ACCESS WITH "MEET-ME"

The Attendant can voice page individual (or all) zones of a PA system by operating the Call Processor. As with the All Call, the Attendant utilizes the Attendant Line as a "Meet-Me" line and can connect an outside call directly to the answering extension by using the "automatic call transfer" feature. A busy lamp indicator is provided for the individual Zone Page (PA) access levels to warn the Attendant that the Zone Page is engaged with a Dial Intercom or second Attendant Line call.

2.5.20 ZONE PAGE (EXTENSION) ACCESS WITH "MEET-ME"

The Attendant can voice page the individual zones of extensions or all extensions (no PA) by operating the Call Processor. The Attendant utilizes the Attendant Line for "Meet-Me" as well as for outside line call transfer.

2.5.21 CALL FORWARD EXTENSION NUMBER DESTINATION DISPLAY

When the Attendant utilizes the Call Processor to call an extension that is in the "call transfer" mode, the extension number of the station that receives the transferred call appears on the Call Processor numeric display.

2.6 OPX STATION FEATURES

Off-Premises station features are listed in TABLE 7.

TABLE 7 SINGLE-LINE STATION FEATURES

- DTMF and Dial Pulse Signalling
- Intercom Dial Access Capability
- Long Loop Capability
- Four-Level CO/PBX Line Group Access
- Privacy on CO/PBX Line Calls
- CO/PBX Line Hold and Transfer
- CO/PBX Line Add-On
- Outgoing Call Restriction on CO/PBX Lines
- Toll Restriction
- Flexible Night Service Assignment
- Camp-on of Attendant Processed Calls
- Hold Recall
- Attendant "Meet-Me"

Standard and optional features of the Omega-Phone III system when using single-line telephones include:

2.6.1 DTMF OR DIAL PULSE (DP) SIGNALLING

Either rotary or DTMF dial telephones can be used as stations in the system.

Use of DTMF dial telephones requires an optional DTMF Receiver in the Key Service Unit.

2.6.2 FULL INTERCOM DIAL ACCESS CAPABILITY

Each single-line station has Dial Intercom access to all functions in the system.

2.6.3 OFF-PREMISE OR ON-PREMISE CAPABILITY

The single-line extension can be used as either an on- or off-premise extension. Provision is made for either short loop (1000-ohm) or long loop (2000-ohm) operation.

2.6.4 FOUR-LEVEL CO/PBX GROUP ACCESS

The individual single line extension can be programmed to have dial access to four levels of CO/PBX line groups. When a specific level access code is dialed, the extension is connected to the next available CO/PBX Line in the group. The single-line extension can then dial out on the CO/PBX Line directly.

2.6.5 LINE PRIVACY ON CO/PBX LINE CALLS

When an OPX is connected to a CO/PBX Line, the line becomes private to the single-line extension.

2.6.6 CO/PBX LINE HOLD AND TRANSFER

During conversation on a CO/PBX Line, the single-line extension user can place the CO/PBX line call on "hold" so that the call can be transferred. When the extension hook switch is flashed, OPX dial tone is heard and a call can be made to another extension (including OPX) in the system. When the call is answered at the second extension, the three parties are connected.

2.6.7 OUTGOING CALL RESTRICTION ON CO/PBX LINES

An individual extension or group of single-line extensions can be arranged to deny dial access to CO/PBX Lines. However, a CO/PBX Line call may be transferred to the extension by the Attendant or an Electronic Key Telephone.

2.6.8 TOLL RESTRICTION

Toll Restriction is available on single-line extensions utilizing Dial Pulse (DP) type signalling. Single-Line telephones utilizing DTMF dials cannot be "toll restricted" unless special measures are taken.

2.6.9 FLEXIBLE NIGHT SERVICE ASSIGNMENT

The single-line telephones can be assigned to the Night Service Group so that when a call comes in on a Night Service line, the extension will ring. Taking the handset off-hook automatically connects the extension to the Night Service line.

SECTION 3 SYSTEM COMPONENTS

3.1 ELECTRONIC KEY SERVICE UNIT

The ET-2460 Key Service Unit (KSU), illustrated in FIGURE 2, forms the nucleus of the Omega-Phone III Electronic Key Telephone System. The ET-2460 KSU consists of a single cabinet assembly that can either be wall-or floor-mounted. All circuit modules plug into a prewired backplate. The system power supplies are mounted externally to the KSU; a factory-wired connecting cable is used to connect the power sources to the KSU.

The ET-2460 KSU houses two equipment shelves for plug-in printed circuit cards. The Main Equipment Shelf and the backplane motherboard (MBD) supplied with each KSU, provide capacity for the standard configurations listed in TABLE 1. The Expansion Equipment Shelf and its backplane expansion motherboard (EMB) allow expansion to the full system capacity listed in TABLE 1.

A maximum of 12 CO/PBX Lines can appear on the Main Equipment Shelf, with two Intercom Lines and one Call Processor. Any additional ICM Lines (Secretary or Dial) or a second Call Processor reduces the number of CO/PBX Lines accordingly.

The KSU Expansion Equipment Shelf is required when either the number of extensions or the number of CO/PBX Line appearances exceeds the Main Equipment Shelf capability. The EMB utilizes plug-in connectors for attachment to the MBD, and pre-wired ribbon connectors for connection to the system extensions. The EMB assembly expands the KSU to a maximum of 20 CO/PBX Lines with two Intercom Lines and one Call Processor. Use of any additional ICM Lines (Secretary or Dial) or a second Call Processor reduces the number of CO/PBX Lines accordingly. When the EMB is added to the basic E-KSU cabinet, the number of CO/PBX Lines and extensions can be increased individually. If the system extension capacity is increased beyond 32 extensions, and/or the number of trunk circuit cards installed is increased beyond 16, an additional system power supply is required.

The ET-2460 KSU interfaces to the network through ribbon-type connectors. An individual CO/PBX line disconnect and re-arrangement terminal block is provided on the motherboard.

FIGURE 3 is an overall block diagram of the Omega-Phone III system.

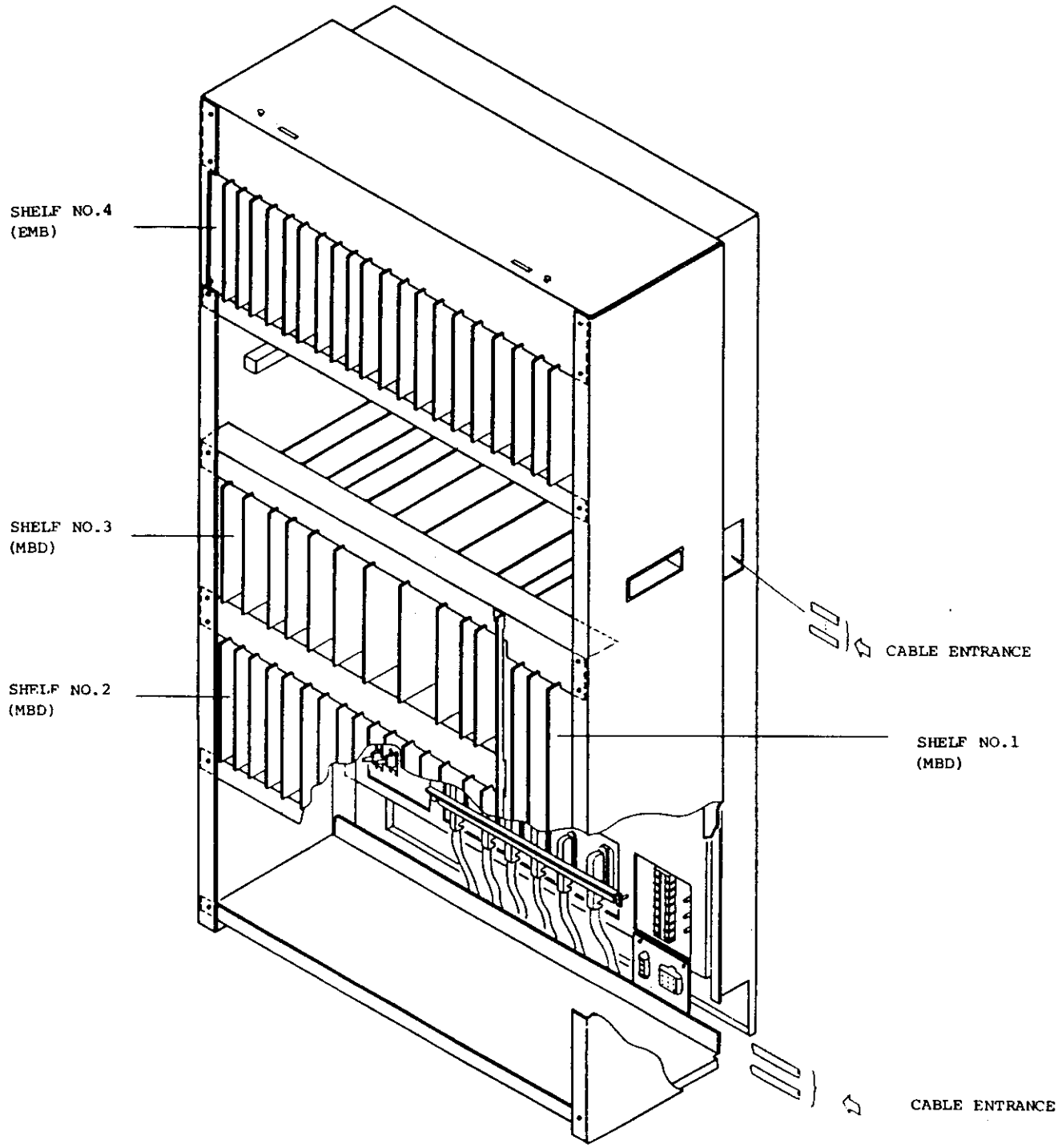


FIGURE 2 ET-2460 Key Service Unit

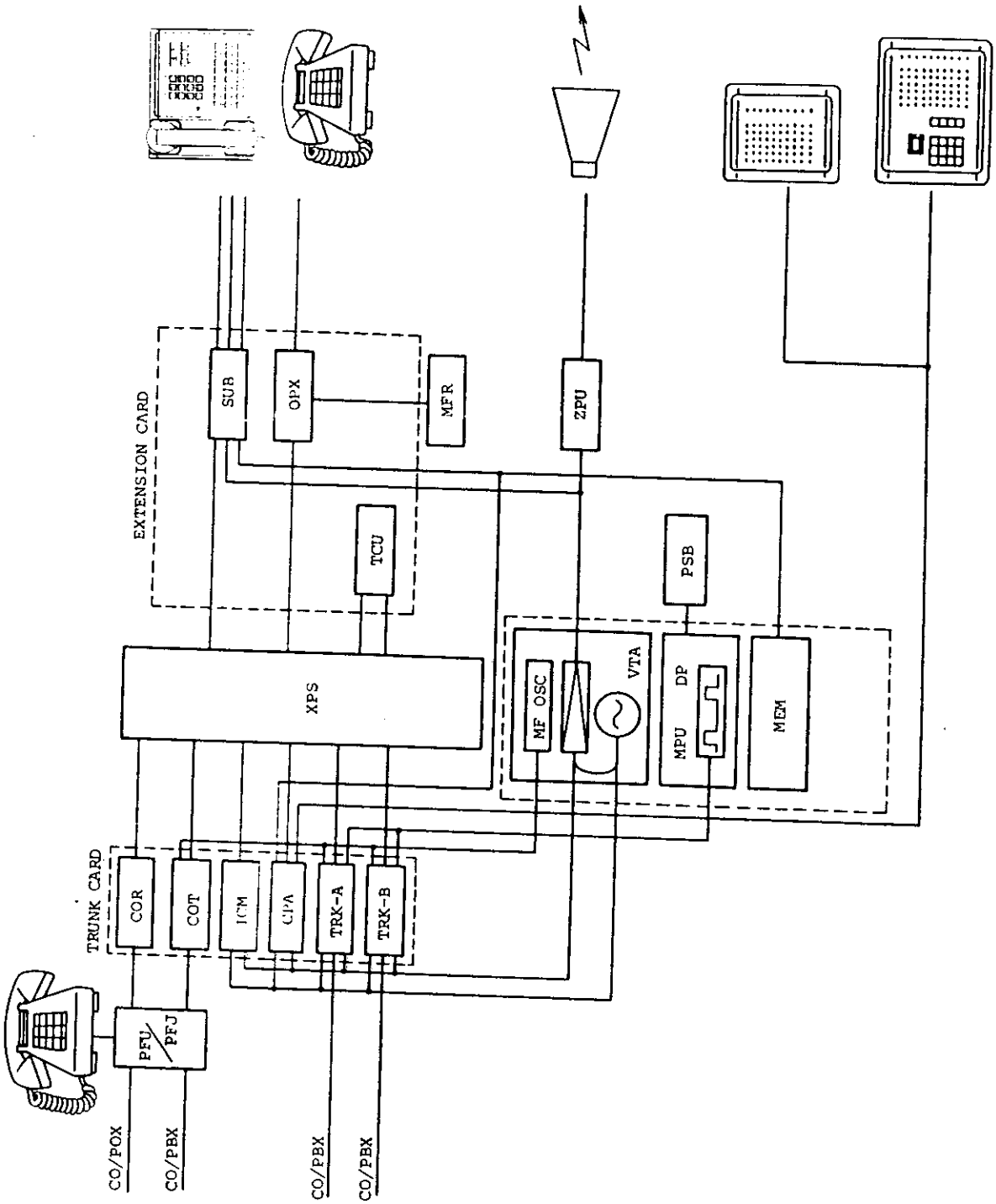


FIGURE 3 ET-2460 KTS Block Diagram

3.2 LINE CIRCUITS

The system utilizes a minimum number of line circuit cards to achieve line assignment flexibility and minimum stocking requirements. Each line circuit card provides two voice circuit interfaces (A and B) to the system solid-state crosspoint voice switching mechanism. TABLE 8 lists the CO/PBX Line, ICM Line, and optional-feature circuit cards that the system utilizes.

TABLE 8 KSU LINE INTERFACE PRINTED-CIRCUIT BOARDS

MODEL	CIRCUIT A	CIRCUIT B
COR	CO/PBX Line (DP)	CO/PBX Line (DP)
COT	CO/PBX Line (DTMF)	CO/PBX Line (DTMF)
ICM	Intercom Line	Intercom Line
CPA	Attendant Line	All-Call Page
TRK-A	CO/PBX Line (DTMF/DP) Automatic Ringdown	CO/PBX Line (DTMF/DP) Automatic Ringdown
TRK-B	CO/PBX Line (DTMF/DP) Automatic Ringdown Intercom Line Secretary/Executive Line	Intercom Line Attendant Line All-Call Page Secretary/Executive Line

3.3 ADDITIONAL CIRCUIT BOARDS

The ET-2460 E-KSU utilizes a number of common printed circuit cards in the Main Equipment Shelf. The common equipment circuit cards include:

- MPU: Contains the main processor and related system control components.
- MEM: Contains the Read-Only-Memory (ROM) and Random-Access-Memory (RAM) for control of system functions.
- VTA: Contains the internal tone sources and interface circuits for PA and background music.

Four crosspoint circuit cards (XPS) are required for VOICE circuit switching in the STD KSU. Each crosspoint card provides a switching capability for up to 16 extensions to access up to eight line circuits.

The electronic key telephone sets are interfaced to the crosspoint mechanism by the Subscriber circuit card (SUB). Each SUB card provides circuits

for up to four extensions. Program options are provided for standard system features such as Night Service assignment, Hold-Recall, Executive Override, Do-Not-Disturb, Secretary Transfer, and Hookswitch busy control for various system functions.

If single-line telephones are required, both the Off-Premises Extension (OPX) circuit cards and OPX Interface circuit card (MFR) are used. Each OPX circuit card provides four single-line telephone interfaces and includes provision for connection of the OPX Talk and Signal batteries. If DTMF single-line telephones are used, a DTMF Receiver (MDEC) card must be added to the system MFR circuit card. A maximum of two OPX circuit cards can be connected on the MBD.

3.4 SYSTEM PROGRAMMING

System programming for optional features is accomplished on the Program Set circuit cards (PSB). The Main Equipment Shelf is wired for two PSB program circuit boards.

Program Circuit Board PSB-1 provides the following program options:

- Toll call restriction
- Flexible CO/PBX line ring assignment
- Flexible single-line telephone CO/PBX line level assignment

Program Circuit Board PSB-2 provides the following program options:

- Flexible internal zone page assignment
- Outgoing CO/PBX call dial restriction
- Single-Line telephone night service assignment
- Flexible time-out period for all time-related functions.

3.5 OPTIONAL FEATURE CARDS

In addition to the Program Boards, the standard KSU (MBD) is wired for the following optional circuit cards:

- ZPU: Zone PA Adapter Unit, which provides up to three zones of Public Address voice page plus all-zone page.
- PFU: Power Failure Transfer Unit, which provides up to five CO/PBX lines to be transferred to single-line extensions during commercial power failure.

. TCU: Trunk Conference Unit, which provides two voice circuits for use as multi-trunk conference and trunk-to-trunk conference bridges. Additional TCU circuit cards can be added if usage of the feature warrants.

3.6 EXPANSION ASSEMBLY REQUIREMENTS

The Expansion Equipment Shelf provides all pre-wired circuit card slots for full capacity operation. The EMB accepts two additional program cards (PSB - 3 and 4) for program system features for the extensions and CO/PBX line appearances on the expansion shelf. Eight additional XPS crosspoint circuit cards are required for full-capacity operation.

SECTION 4 ELECTRONIC KEY TELEPHONES

4.1 GENERAL FUNCTIONS

Omega-Phone III uses electronic key telephones to reduce system installation requirements and provide innovative Key Telephone System station features.

E-KEY stations use an individual station microprocessor with built-in memory (ROM/RAM) for control of station functions. The system control circuits are digitized, utilizing a serial binary data train. The station processor includes a test program for verification of station control and lamp functions.

Analog voice circuits are used. The E-KEY instrument uses a standard telephone voice network and contains components to allow the use of standard telephone ancillary devices such as headsets, hard-of-hearing handsets, etc.

The station processor controls two voice paths: one for the handset voice circuit, and the second for Intercom calling functions. Both functions can occur simultaneously at the station.

All station dialing is pushbutton, being accomplished by digital data flow from the station to the common equipment dial sender. DTMF and DP (dial pulse) CO/PBX Lines can be mixed in the same system. Any station ancillary device utilizing network signalling must utilize a DTMF dial, however.

A number of optional station equipment assemblies are offered. Included are a full handsfree station adapter, station busy lamp field, and individual station memory dialer units that are similar in design to the station appearance.

4.2 E-KEY STATION MODELS

Omega-Phone III features two E-KEY station models: Model ET-2460 and Model ET-1632.

The ET-2460 Electronic Key Telephone, illustrated in FIGURE 4, features up to 23 line keys, allowing up to 20 CO/PBX Lines with two ICM and one

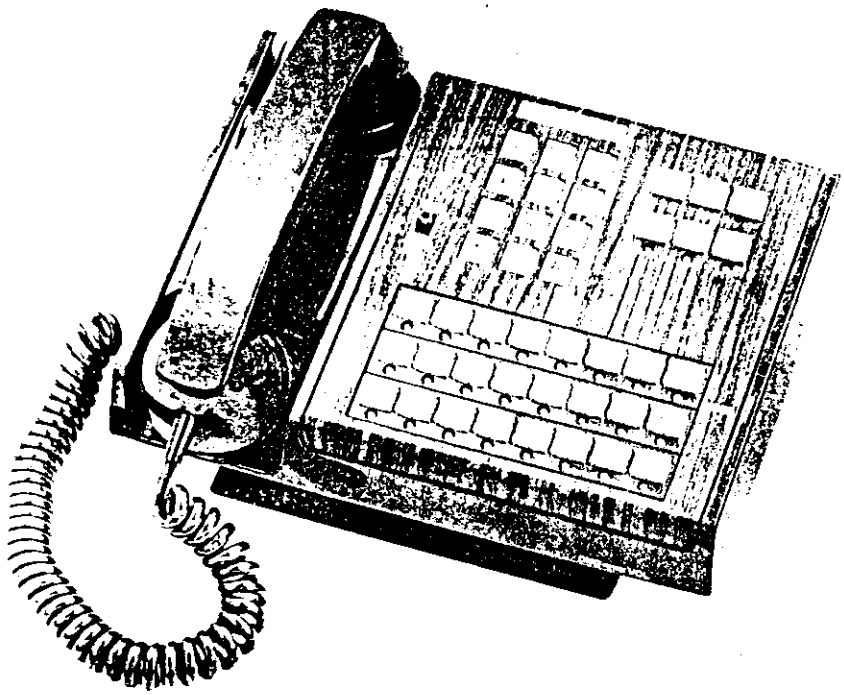


FIGURE 4 ET-2460 ELECTRONIC KEY TELEPHONE

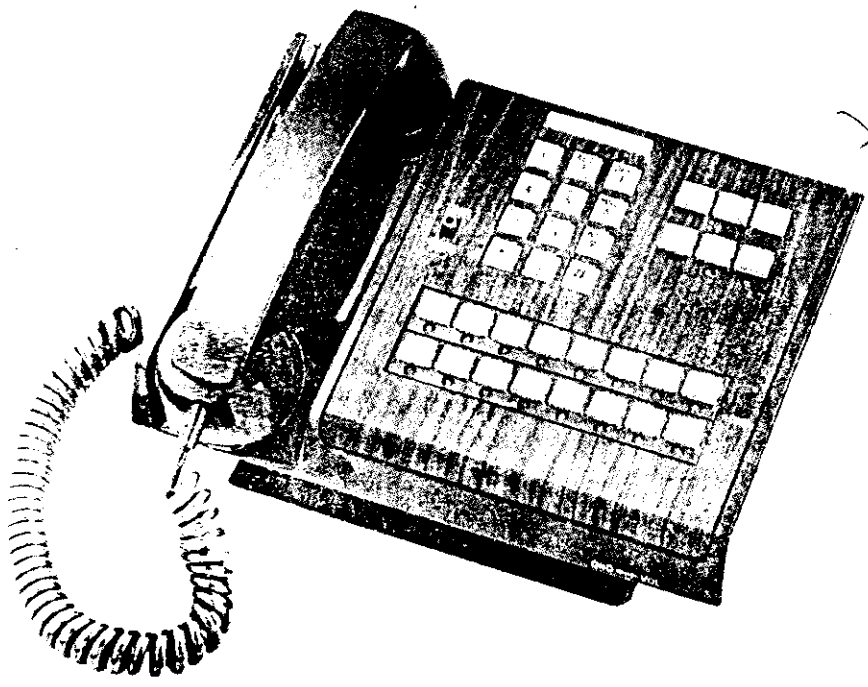


FIGURE 5 ET-1632 ELECTRONIC KEY TELEPHONE

Attendant Line. The number of Intercom appearances at the extension can be expanded and the number of Attendant Lines can be increased to two by reducing CO/PBX Line capacity.

The ET-1632 Electronic Key Telephone, illustrated in FIGURE 5, features up to 15 line keys, allowing up to 12 CO/PBX Lines with two ICM and one Attendant Line. The station ICM-Line capacity can be expanded and two Attendant Lines can be used by reducing the CO/PBX Line capacity.

The Electronic Key Telephones feature a modular design approach. Both models have the same standard base assembly (ET-SPU), which houses the station processor and associated electronic components. Both key telephones can operate in the same system. Additional CO/PBX Lines and optional line functions that appear on the second key bank of ET-2460 station will not appear on the ET-1632 station. An ET-1632 telephone can be upgraded to an ET-2460 at any time by merely changing the key assembly.

4.3 STATION KEY ASSIGNMENTS

Omega-Phone III telephones use non-locking line pickup and function keys, as well as locking switches, to control system features. The following functions are offered on both the ET-1632 and ET-2460 telephones (see FIGURE 6):

a. Line pickup keys are designated by function, including:

PU-S (Pickup) keys	These keys can operate as pickup keys for all CO/PBX Lines, Tie Lines, and Secretary Line services, as well as for additional Dial Intercom Lines.
PU-A (Pickup) key	This key can only operate as the pickup key for the first Attendant Line, a Secretary Line or a Dial Intercom Line.
PU-SA (Pickup) key	This key can operate as a standard (PU-S) pickup key, but also is convertible for the second Attendant Line.
PU-SR (Pickup) keys	These keys can operate as standard (PU-S) pickup keys and are convertible to private line pickup keys.
ICM (Pickup) keys	These keys can only operate as Dial Intercom Line or Secretary Line pickups.

b. Function keys include:

HOLD	This function key is provided to place CO/PBX Lines on system (non-exclusive) "Hold".

PICKUP KEY TABLE

PICKUP KEY NO.	FUNCTION
1-5	PU-S
6	PU-SA
7	PU-A
9-12	PU-SR
13-14	PU-S
15-16	ICM
17-20	PU-SR
21-24	PU-S

NOTE:

PICKUP KEY NO. 17-24 DO NOT APPEAR ON MODEL ET-1632 ELECTRONIC KEY TELEPHONE.

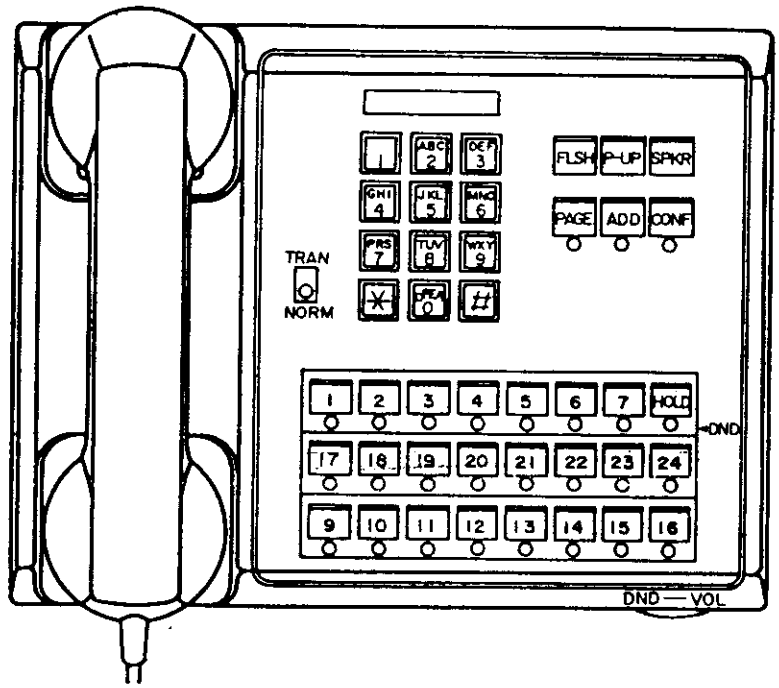


FIGURE 6 Electronic Key Telephone Pickup Key Assignments

PAGE — This function key is used to operate the system All-Call feature. An associated LED lamp indicator warns when the Paging circuit is busy.

CONF (Conference) — This function key is used to release privacy on CO/PBX and ICM Lines. An associated LED lamp indicator warns the station user when the line is "non-private".

ADD (Add-On) — This function key is used to add CO/PBX Lines or extensions to an existing conversation. An associated LED indicator lamp indicates when the "Conference" circuits are available.

P-UP (Pickup) — This function key is used for "call pickup" when on a CO/PBX or ICM Line. When the user is on a CO/PBX Line, the P-UP key is held down to answer an incoming ICM or Attendant Line call. Releasing the key returns the station to the original CO/PBX Line. The P-UP key is also used to answer another station's Intercom call

and for "meet-me" features on the ICM or Attendant Line.

FLSH (Flash) — This function key is used to operate a CO/PBX Line flash and to control ICM Line "hold and transfer" features.

SPKR (Speaker) — This key controls operation of the station on-hook dialing and call monitor function.

c. Locking-type keys used on the station include:

TRAN/NORM — This switch is used to transfer calls to another station in the system. On extensions arranged as the Attendant, this switch controls Night Service operation.

DND/VOL — This switch is used to control the station speaker volume as well as Do-Not-Disturb function. An LED indicator lamp is provided to indicate when the station is in the Do-Not-Disturb mode. On stations equipped for Hand-free Answerback, this switch operaters the Microphone cutoff feature.

SECTION 5 CALL PROCESSOR

5.1 GENERAL DESCRIPTION

Omega-Phone III uses processor-controlled electronics to provide an innovative and efficient method for distribution of CO/PBX Line calls to extensions. The CP-60 Call Processor, illustrated in FIGURE 7, is an optional system control unit that is used at the Attendant (main line answering) station:

The CP-60 Call Processor, similar in style to the key telephone station, features a station keysender and LED digital display for calling up to 60 individual stations or accessing system dial control functions. The CP-60 unit may be wall or desk mounted.

Two CP-60 Call Processors may be installed in the system. Each Call Processor can operate independently, simultaneously answering and distributing calls to system extensions.

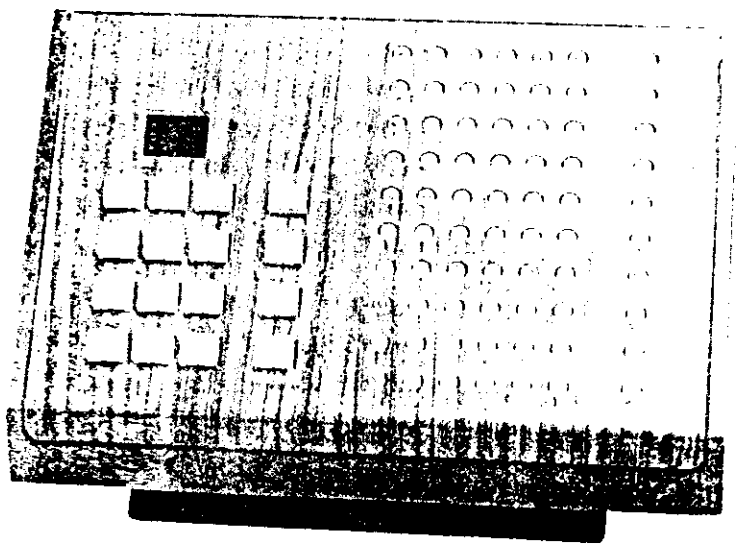


FIGURE 7 CP-60 Call Processor

The CP-60 provides the Attendant with additional system features to answer and distribute calls in the system. Additional function (feature) keys are provided to the Attendant to distribute calls. The use of dedicated voice path(s) free Dial ICM Lines for station-to-station calls.

Visual displays are provided to assist the Attendant in selecting the best means to handle the CO/PBX Line call. A sixty (60) station Busy Lamp Field and lamp indicators for dial access functions are provided.

Included with the Call Processor is a separate warning tone source that functions as the audible indicator when the "Attendant Recall" function operates.

5.2 KEY FUNCTIONS

The CP-60 Processor utilizes a number of non-locking dial and function keys to provide features.

a. Sender Key operations include:

STATION DIAL ACCESS	The Attendant uses the keysender to dial access individual E-KEY or single-line extensions.
ZONE PAGE (Internal)	The Attendant accesses the Internal Zone Page feature by using the keysender. BLF indication is provided to show when the zone page circuit is busy. Provision is also made to page all extensions without any PA announcement.
ZONE PAGE (PA) ACCESS	The Attendant uses the keysender to access the Zone Page (PA) feature. BLF indication is provided to show when the zone page circuit is busy. Provision is made to page all PA zones simultaneously.

b. Function keys provided on the Call Processor include:

MSG (Message) WAIT	The Attendant uses this key to operate the "message waiting" indication at the called extension.
OVERRIDE	The Attendant uses this key to "override" a busy extension.
CALL WAIT	The Attendant uses this key to leave an incoming call indication at the called extension.

CONNECT	The Attendant uses this key to automatically transfer the waiting CO/PBX Line call to the internal extension.
REL (Release)	The Attendant uses this function key to automatically reconnect to the waiting CO/PBX Line call or to cancel sender operation.
PAGE	The Attendant uses this key to automatically place a CO/PBX Line call on "non-exclusive hold"and to operate the system All-Call feature.

SECTION 6 SYSTEM OPERATION

This section describes user operation of all standard and optional Omega-Phone III features. Included are step-by-step descriptions of operations at E-KEY stations, CP-60 Call Processor, and OPX telephones.

The installer should become familiar with all details in this section in order to verify feature/function operation of Omega-Phone III equipment provided on an individual system. Reference to the Station Planning/ Program Sheets (see Part II) is required to verify which features are equipped on the individual system.

For better understanding each operation, refer to FIGURES 8 and 9 at the end of the section.

6.1 OUTSIDE (CO/PBX) LINE CALLS

6.1.1 DIALING AN OUTSIDE LINE CALL

INSTRUCTION	OPERATION	EXPLANATION
1. Select free outside line.		Free line is indicated by lamp being off.
2. Press line key (Momentary pressing and release is enough for all keys).	Line lamp flashes at "I-USE" (fast flashing) rate.	"I-USE" rate indicates which line is connected.
3. Take handset off-hook.	Line lamp is "STEADY" at all other extensions; dial tone heard in handset.	"STEADY" lamp indicates line is busy and private.
NOTE: Steps 2 and 3 may be reversed.		
4. Dial the desired number.	Tone in handset each time a digit of the number is dialed. Ringing tone or busy tone will be heard through handset.	Tones normally associated with outside telephone line services.
5. At end of call, place handset on-hook.	"I-USE" indication at extension ceases; all other extensions show line not busy.	Line is open to use for all extensions in the system.

6.1.2 DIALING ANOTHER CALL ON SAME OUTSIDE LINE

INSTRUCTION	OPERATION	EXPLANATION
1. Upon completion of first call, press FLSH (FLASH) "feature key."	Line indicator shows "I-USE"; outside line dial tone in handset.	Outside line automatically reset for new call.
2. Dial desired number.	Same as previously described in 1.1, step 4.	

6.1.3 AUTOMATIC RE-DIALING

INSTRUCTION	OPERATION	EXPLANATION
1. Select free line and follow steps 1, 2, and 3 of 1.1.	Same as 1.1.	Same as selection of a line for outside line call.
2. Press # (Pound) key on dial pad.	Indication in handset that number is being dialed.	Telephone automatically dials last outside line number previously dialed.

6.1.4 ANSWERING AN OUTSIDE LINE CALL

INSTRUCTION	OPERATION	EXPLANATION
1. Hear INCOMING call ring.	INCOMING call rings extensions arranged for incoming indication only.	INCOMING call indication: Modulated Tone 1 second on, 3 seconds off.
2. Look at line lamps for "INCOMING" lamp flash indication.	"INCOMING" flash is 1 second on, 1 second off.	Lamp flashes at all extensions.
3. Press outside line key.	Line lamp shows "I-USE" indication.	
4. Take handset off-hook.	Call is answered; line lamp shows busy at all other extensions and the user's line lamp shows "I-USE" indication.	Local telephone is connected to outside party.

6.1.5 PLACING AN OUTSIDE LINE CALL ON "HOLD"

INSTRUCTION	OPERATION	EXPLANATION
1. Press HOLD (H) key.	Line lamp flashes at "I-HOLD" rate; other extensions flash at "SYSTEM HOLD" rate.	I-HOLD rate: Long on, short off (flashing). SYSTEM HOLD rate: Long on, short off.
2. To return, press outside line pickup key.	"I-USE" indication at telephone of user; "STEADY" indication other extensions.	Outside line is re-connected.

6.1.6 PLACING OUTSIDE LINE ON "EXCLUSIVE HOLD"

INSTRUCTION	OPERATION	EXPLANATION
1. Press outside line key instead of pressing HOLD (H) key.	"I-HOLD" indication at user's telephone; "STEADY" indication other extensions.	Line on "HOLD" only at user's telephone. Only user can take line off "HOLD."
2. To return to line, press line key again.	"I-USE" indication at user's telephone; "STEADY" other extensions.	Telephone is re-connected to line.

6.1.7 ANSWERING HOLD RECALL

INSTRUCTION	OPERATION	EXPLANATION
1. Leave call on "HOLD" or "EXCLUSIVE HOLD" until time-out period expires.	Press HOLD or outside line key.	Time-out period starts when call is placed on hold.
2. Hear station INCOMING call ring.	Modulated tone 1 second on, 3 seconds off at user telephone.	Tone at user's telephone only.
3. View line lamps for "INCOMING" call flash.	"INCOMING" call lamp flash on recalled outside line.	"INCOMING" call indication: 1 second on modulated; 1 second off.
4. Press outside line key; take handset off-hook.	"I-USE" indication; tone ceases; conversation can resume.	Outside party re-connected.

6.1.8 ON-HOOK DIALING/CALL MONITOR

INSTRUCTION	OPERATION	EXPLANATION
1. Select free outside line.		Free line is indicated by lamp being off.
2. Press line key.	Line lamp flashes "I-USE".	"I-USE" indicates which line user is connected to.
3. Press SPKR (Speaker) "feature key."	Dial tone heard in speaker; line shows busy all other extensions.	Outside line is connected to station speaker. Distant party's voice through speaker upon answering.
NOTE: Steps 2 and 3 may be reversed.		
3. Dial call.	Dial tone ceases; digit verification tone heard in speaker.	Dial call in normal manner; Ringing or Busy Tone will be heard in Station Speaker as well as distant party's voice upon answering.
4. To disconnect speaker, take handset off-hook.	Speaker disconnected, normal two-way conversation can resume.	
5. To release outside line, if handset not used, press SPKR key.	Line lamp goes out.	Line is disconnected.
6. To return to Call Monitor mode during handset-to-handset conversation, press SPKR Key once and place handset on-hook.		User may change the mode at any time. This is useful in order to monitor the line while the outside party has the call on hold.

6.1.9 ANSWERING INTERCOM CALL WHILE ON OUTSIDE LINE - ANSWER HOLD

INSTRUCTION	OPERATION	EXPLANATION
1. Hear Intercom voice indication at telephone.	Caller's voice sounds through telephone set speaker.	Incoming intercom call indication while handset is off-hook can be allowed by programming this feature during system installation.
2. Inform outside party of new call; hold P-UP (pickup) "feature key" depressed.	Telephone connected to incoming call party; conversation can take place.	Outside party placed on "HOLD" while P-UP key is depressed.
3. To return to outside party, release P-UP "feature key."	Telephone re-connected to outside party.	User can switch back and forth between Intercom call and outside line call.

6.1.10 USING SYSTEM SPEED-DIALING FEATURE

INSTRUCTION	OPERATION	EXPLANATION
1. Press free outside line key.	"I-USE" line indication.	* (Asterisk) key accesses speed-dial feature if this option has been installed.
2. Either take handset off-hook, or press SPKR (Speaker) "feature key."	Dial tone in handset; line busy to all other stations.	
3. Press * (Asterisk) key on dial.		
4. Dial two digits of speed dial number.	Outside line number is automatically dialed.	Each telephone number in speed-dial list is assigned a two-digit code.

6.1.11 TIE-LINE CALL OPERATION

INSTRUCTION	OPERATION	EXPLANATION
1. Press line key for free tie-line.	Line lamp flashes "I-USE."	Tie-Line circuits are dedicated line keys assigned on telephone; free line is indicated by lamp being off.
2. Take handset off-hook.	Line lamp indicator "STEADY" at all other stations.	Tie-Line circuit is now busy and distant location is being automatically signalled.
3. Distant party answers.		Conversation can begin; call operates as a standard outside line call.

INSTRUCTION	OPERATION	EXPLANATION
4. At end of call, place handset on-hook.	"I-USE" indication at extension ceases; all other extensions show line not busy.	Line is open to use by other extensions in the system.

6.2 USING INTERCOM LINES

6.2.1 DIALING AN INTERCOM CALL

INSTRUCTION	OPERATION	EXPLANATION
1. Select free Intercom Line; press line key.	"I-USE" line indication.	Free line is indicated by lamp being off.
2. Take handset off-hook.	"STEADY" lamp indication at other stations; dial tone in handset.	
NOTE: Steps 1 and 2 may be reversed.		
3. Dial two-digit extension number (Voice calling).	Tone burst for digit verification.	All extensions except Operator have two-digit extension numbers.
a. Called party busy; place handset on-hook.	Continuous busy tone in handset.	Call must be dialed at a later time.
b. Called party not busy; Voice Page called party.	Tone burst handset, caller's voice at called extension.	Called party warned of incoming Intercom call.
c. Called party busy with off-hook signalling option; Voice page called party.	Short busy tone indication in handset; tone burst and caller's voice at called extension.	Telephones can be arranged to receive calls while off-hook.
4. To ring the called extension, press # (Pound) key.	Intercom tone ringing at called extension, ringback tone at calling telephone.	Intercom Tone Ringing: Tone 1 second on, 3 seconds off.
5. To return to voice calling, press # key again; voice page called party.	Caller's voice at called extension.	
6. To re-dial another extension, press FLSH (FLASH) "feature key."	Intercom dial tone in handset.	Dial call described in step 3.

6.2.2 ANSWERING INTERCOM CALLS

INSTRUCTION	OPERATION	EXPLANATION
1. Hear calling party voice or tone ringing in telephone speaker.	Voice or tone calling selected by calling party.	
2. Determine which Intercom (ICM) line call is on.	Intercom line lamp flashes at "STATION INCOMING" rate.	"STATION INCOMING" lamp flash: Modulated 1 second on, 1 second off.
3. Press Intercom line key.	"I-USE" line indication.	Intercom line key must always be pressed when answering call.
4. Take handset off-hook.	Voice or tone stops, conversation can begin.	
NOTE: Steps 3 and 4 can be reversed.		
5. At end of call, both extensions go on-hook.	Line lamp off.	Line becomes available.

6.2.3 ANSWERING INTERCOM CALLS WHILE ON INTERCOM LINE

INSTRUCTION	OPERATION	EXPLANATION
1. If a new Intercom call occurs while you are on an Intercom line, inform first Intercom party and press Intercom line key for incoming call.	Incoming call indication of second Intercom call; second call is answered when line key is pressed.	The called party can switch from Intercom line to Intercom line.
2. To return to original call, press first Intercom line key.	Second Intercom caller waiting until first is completed.	

6.2.4 ANSWERING ANOTHER EXTENSION'S INTERCOM CALL/CALL PICKUP

INSTRUCTION	OPERATION	EXPLANATION
1. Take handset off-hook.	None	
2. Press P-UP (Pickup) "feature key."	None	
3. Press Intercom Line key for incoming call.	"I-USE" lamp indication.	Intercom call is connected to telephone where line key is pressed.

6.2.5 ANSWERING INTERCOM CALLS HANDSFREE

INSTRUCTION	OPERATION	EXPLANATION
1. Station not busy; handset on-hook.	None	
2. Incoming Intercom call occurs.	Tone burst heard in station speaker; Intercom line lamp flashes at "INCOMING" rate.	
3. Caller's voice heard in telephone speaker.	Voice Calling.	Caller controls Voice Call access.
4. Reply to caller without use of handset.	Speak toward telephone.	Microphone is provided (optionally) on front of telephone.
5. To talk privately with caller, take handset off-hook; press Intercom line key.	Intercom line lamp glows "STEADY."	Telephone connected to Intercom line.

6.2.6 DIALING INTERCOM CALLS ON-HOOK

Same operation as described in 1.8, On-Hook Dialing/Call Monitor.

6.2.7 USING THE SECRETARY INTERCOM LINE

INSTRUCTION	OPERATION	EXPLANATION
1. At calling telephone, press Secretary Intercom (ICM) key.	"I-USE" indication on line lamp.	Secretary intercom line (if this option is installed) has a dedicated line key. Only programmed users have access to the line.
2. Take handset off-hook.	Tone Burst indication at called extension; Tone Burst indication at calling telephone.	
3. Voice Page.	Caller's voice heard in called station speaker; called party replies Handsfree or through handset.	If called extension is equipped for handsfree reply, no handset is required.
a. Called extension busy on outside or intercom line.	Momentary fast busy tone heard in caller's handset. Caller voice heard in called extension speaker.	Warning tone given to caller to indicate called telephone busy.

INSTRUCTION	OPERATION	EXPLANATION
b. Called Station busy, receiving a call on an Intercom or Attendant line.	Busy tone heard in caller's handset.	Called party cannot be contacted.
4. To add another extension, either extension user presses FLSH (FLASH) key and dials extension code.	Dial tone heard in telephone handset; dial third extension intercom code; three stations connected upon answering.	

6.2.8 USING THE DO-NOT-DISTURB FEATURE

INSTRUCTION	OPERATION	EXPLANATION
1. Turn DND/VOL control at base of telephone to full off (clockwise) position.	DND lamp flashes.	DND (feature programmed at installation) operation utilizes lamp under HOLD key for indication.
2. To return to normal operation, turn DND/VOL control counterclockwise.	DND lamp off.	Station can receive all calls.

6.2.9 TRANSFERRING CALLS TO PRE-DETERMINED EXTENSIONS

INSTRUCTION	OPERATION	EXPLANATION
1. Move TRAN/NORM switch to TRAN position.	TRAN/NORM locks in TRAN position; all calls automatically transferred.	Transferring to another extension is predetermined by programming at installation time. At all times when transfer is not desired, switch should be in NORM position.

6.3 CONFERENCE FEATURE OPERATION

6.3.1 ALLOWING ADDITIONAL EXTENSIONS ON OUTSIDE LINE

INSTRUCTION	OEPRATION	EXPLANATION
1. While on outside line, press CONF (CONFERENCE) "feature key."	At all extensions, line lamps indicate NON-PRIVATE flash; CONF lamp flashes at user's telephone.	Line is open to all extensions in system. NON-PRIVATE flash is the same as SYSTEM HOLD flash.
2. Second extension enters line.	CONF lamp goes out; tone burst on line when second extension enters; line lamp shows STEADY at all extensions.	Outside line again private to two extensions.
3. To allow a third extension to enter the line, extension user presses CONF "feature key."	CONF lamp flashes at both extensions; all other extensions indicate NON-PRIVACY.	Line is open for third extension.
4. Third extension enters line.	CONF lamp goes out; line lamp shows STEADY at all extensions except those on line.	Outside line private to three stations.
5. To cancel PRIVACY-RELEASE (remove third extension from conference), press CONF key again.	CONF lamp goes out (if third extension had not yet joined conference).	Outside line private to two stations.
6. To momentarily leave conference, press CONF key; answer second call.	CONF lamp on at extension(s) in conference; all other extensions indicate NON-PRIVACY.	Line is left open (non-private) in order to return to conference.
7. To return to conference, press line key.	CONF lamp goes out; line indicates privacy.	Station has re-entered call.

6.3.2 AUTOMATIC ADD-ON CONFERENCE OUTSIDE LINE

INSTRUCTION	OPERATION	EXPLANATION
1. To add a second extension, place line on HOLD or EXCLUSIVE HOLD.	"I-HOLD" indication on outside line.	EXCLUSIVE HOLD prevents any other extension from accessing outside line while second extension is being called.
2. Press free Intercom line key.	"I-USE" lamp indication; dial tone.	
3. Dial extension on Intercom.	Intercom operation as described in 2.1.	

INSTRUCTION	OPERATION	EXPLANATION
4. Called extension answers, presses intercom key.	Originating and called parties can talk on Intercom line.	Original party can determine if called party wishes to enter outside line call.
5. Press ADD "feature key."	ADD lamp flashes.	ADD lamp flashes when conference can be started.
NOTE: ADD lamp will not flash unless called extension answers a call by pressing Intercom key.		
6. Press outside line key; conversation can continue.	Both extensions show "I-USE" on outside line; ADD lamp off.	Both extensions on outside line.

6.3.3 MULTI-TRUNK/TRUNK-TO-TRUNK CONFERENCE

INSTRUCTION	OPERATION	EXPLANATION
1. Place line on HOLD or EXCLUSIVE HOLD.	"I-HOLD" indication at telephone.	
2. Press second outside line key.	"I-USE" indication on second outside line.	This type of conference is possible only if this option is installed in system.
3. Press ADD "feature key."	ADD lamp flashes.	ADD lamp flashes only if conference circuit is available.
4. Press first outside line key; conference can begin.	ADD lamp flashes; outside lines flash at "I-USE" rate.	Both lines connected to telephone; lines are private.
5. To leave conference, press ADD "feature key" again.	Both lines flash at NON-PRIVATE rate. ADD lamp off.	Both outside lines stay connected.
6. To re-enter the lines, press the outside line key.	ADD lamp flashes and "I-USE" indication starts again.	
7. To disconnect, go on-hook.	Line lamps go off.	Both lines are disconnected.

6.3.4 DIAL INTERCOM LINE CONFERENCE

INSTRUCTION	OPERATION	EXPLANATION
1. Press FLSH (FLASH) "feature key."	Dial tone in handset; second extension is disconnected temporarily.	Third extension can be dialed.

INSTRUCTION	OPERATION	EXPLANATION
2. Dial third extension.	Voice or tone signalling at third extension; STATION INCOMING lamp flash at called extension.	Standard system operation.
a. Called extension answers; conversation begins.	Three parties are connected.	Voice conversation can resume between parties; any party can leave conversation.
b. Called extension does not answer; press FLSH (FLASH) "feature key."	Second party re-connected.	Two-party conversation resumes.

6.3.5 INTERCOM LINE ADD-ON

INSTRUCTION	OPERATION	EXPLANATION
1. Press CONF (Conference) "feature key."	Line NON-PRIVATE; CONF lamp flashes.	Line is open to all stations.
2. Third party presses INTERCOM key.	CONF lamp off; three extensions connected.	

6.3.6 EXECUTIVE OVERRIDE OPERATION

INSTRUCTION	OPERATION	EXPLANATION
1. Determine which line is to be entered.	Line lamp indicates "Privacy" (STEADY).	Lines are private unless released by controlling extension.
2. Press line key; conversation can begin.	"I-USE" indication; Executive telephone connected to line.	Executive extension automatically enters line (if this feature is programmed at installation).

6.4 VOICE PAGE/"MEET-ME" FEATURES

6.4.1 PAGING WHILE ON AN OUTSIDE LINE CALL

INSTRUCTION	OPERATION	EXPLANATION
1. See whether PAGE circuit is busy.	PAGE lamp steady when busy.	Only one extension can page at a time.
2. Hold PAGE "feature key" depressed; voice page.	"I-HOLD" on line key; PAGE lamp flashes; voice page extensions and/or PA system.	Outside party placed on HOLD during Page.
3. Release PAGE "feature key" and resume conversation.	Telephone is reconnected to outside line; "I-USE" indication.	Telephone returns to outside line.

Note: Telephone CONF "feature key" can now be pressed to allow another station to enter line.

6.4.2 ALL CALL PAGING/MEET-ME" ON INTERCOM LINE

INSTRUCTION	OPERATION	EXPLANATION
1. Caller selects Intercom line.	"I-USE" indication; dial tone in handset.	
2. Hold PAGE key depressed.	PAGE Lamp flashes.	Intercom dial tone disconnected.
3. Call other party to Intercom line.	Voice Page other extensions and/or PA system, identifying Intercom line to be used.	Call party to specific Intercom line.
4. Release PAGE key.	Intercom Line no dial tone; PAGE lamp off.	
5. Called party pressed P-UP "feature key."	None.	Utilize call pickup feature.
6. Called party presses Intercom line key.	Called extension connected to calling extension; conversation can begin.	Conversation is private.
7. To add third extension, repeat "Page" operation.		Third extension answers call in same manner.

6.4.3 DIAL ACCESS PAGE/"MEET-ME"

INSTRUCTION	OPERATION	EXPLANATION
1. Select free Intercom line.	"I-USE" indication, dial tone in handset.	
2. Dial Group or PA zone code.	Warning tone if busy.	Extension and Zones of PA are dedicated dial codes if this option is installed.
3. Voice page party to Intercom line.	Voice page over PA system or extensions in group.	Call party to specific Intercom line.
4. Called party presses P-UP "feature key."	None.	
5. Called party presses Intercom line key.	Called extension connected to calling telephone.	Conversation is private.

6.5 CALL PROCESSOR OPERATION

The CP-60 Call Processor is an optional Attendant console used to provide supplemental feature to distribute incoming CO/PBX line calls to extensions in the system. All feature/function operation utilizing the Call Processor are Standard Call Processor Features.

6.5.1 TRANSFERRING OUTSIDE CALLS TO EXTENSIONS (EXTENSION NOT-BUSY)

INSTRUCTION	OPERATION	EXPLANATION
1. Answer outside line call.	"I-USE" indication on line key.	
2. View CP-60 lamp field to determine if internal extension is busy.	Extension not-busy; no busy lamp. Extension busy; lamp steady or flashing.	If busy, call-back may be required.
3. Dial extension number on CP-60 "keysender."	Called extension number appears on numeric display; "I-HOLD" indication on outside line; Tone burst warning at called extension; INCOMING CALL lamp flash on called extension ATTND key.	INCOMING ICM call lamp flash indication on Attendant Intercom key at called extension.
4. Voice page the extension.	Attendant's voice heard at called extension.	Called extension can make handsfree reply to Attendant if extension has optional microphone.

INSTRUCTION	OPERATION	EXPLANATION
5. Called extension answers (press Attendant Intercom key); Handset off-hook.	Voice calling ceases; Attendant talks to extension; called party talks to Attendant through handset.	Attendant is informed of called party's intention regarding outside call.
a. Attendant presses CONNECT "feature key." or	Called extension: "I-USE" indication on outside line; Attendant disconnected.	Outside line call automatically transferred to called extension.
b. Attendant presses CALL WAIT "feature key." or	Called Extension: INCOMING STATION call indication on outside line key and INCOMING ringing tone CP-60 lamp field indicates Call Waiting; called extension number appears in numeric display. Attendant disconnected.	Called party identifies outside line by INCOMING STATION Call lamp indication.
c. Attendant presses REL (RELEASE) "feature key."	"I-USE" indication on outside line; Attendant re-connected to outside line party.	Attendant can call new extension or request call-back.

6.5.2 TRANSFERRING OUTSIDE CALL TO EXTENSION (EXTENSION BUSY)

INSTRUCTION	OPERATION	EXPLANATION
1. Answer outside line call.	"I-USE" indication at Attendant telephone.	
2. View CP-60 lamp field to determine if internal extension is busy.	Extension Busy: lamp flashing or steady. Extension Not-Busy: No lamp indication.	
3. Dial extension number on CP-60 "keysender."	Called extension number appears on numeric display; "I-HOLD" indicated on outside line; Busy tone on Attendant handset.	Attendant blocked because extension is busy.

Note: If called extension is receiving an Intercom call (Voice Page or Handsfree Reply), numeric display flashes.

a. Press CALL WAIT "feature key" on CP-60. or	INCOMING call indication at called extension; Attendant's lamp field indicates Call Waiting; Attendant disconnected. Called extension number appears continuously in numeric display.	Called party hears momentary INCOMING CALL tone and determines which outside line has call waiting.

INSTRUCTION	OPERATION	EXPLANATION
b. Press MSG WAIT "feature key" on CP-60 or	Attendant Intercom line flashes at MESSAGE rate at called extension;	Message Waiting indication left at called station; Call-back to Attendant will cancel Message Waiting lamp.
c. Press OVERRIDE "feature key" on CP-60.	Tone burst at called extension; Attendant voice pages extension; INCOMING CALL indication on Attendant Intercom line.	Attendant overrides busy extension.
Called extension answers Attendant on Attendant Intercom line.	Attendant and called party talk on Attendant Intercom Line.	Attendant determines status of call.

6.5.3 TRANSFERRING OUTSIDE CALLS TO EXTENSIONS BY VOICE PAGING (MEET-ME)

INSTRUCTION	OPERATION	EXPLANATION
1. Answer outside line call.	"I-USE" indication at Attendant's telephone.	
2. Either Hold PAGE "feature key" on CP-60 depressed and	"I-HOLD" indication on outside line; PAGE key lamp flashes.	
a. Voice page party to Attendant Intercom Line.	Attendant voice pages all stations and/or PA system.	Identify Attendant Intercom line if two Call Processors are included in system.
b. Release PAGE key, await response.	Attendant Intercom line is non-private. PAGE lamp is off.	Called party uses P-UP "feature key" and then line key to answer Attendant call.
or Dial voice page zone on "keysender." Voice page party to Attendant Intercom line.	Dial 80 grouping for either extension or PA Zone.	Identify Attendant Intercom line if two Call Processors are included in system.
3. Either Called party answers on Attendant Intercom line.	Voice page circuit disconnected; Attendant connected to extension; extension number in display.	Called party uses P-UP "feature key" and then line key to answer Attendant call.
or Press CONNECT "feature key" on CP-60.	"I-USE" indication on outside line; Attendant disconnected.	Answering extension connected to outside line.
or Press CALL WAIT "feature key" on CP-60.	Called extension indicates call waiting on outside line; CP-60 lamp field indicates call waiting; Attendant disconnected. Called extension number appears continuously in numeric display.	Answering extension can determine which outside line is waiting.

6.5.4 ATTENDANT RECALL OPERATION

INSTRUCTION	OPERATION	EXPLANATION
1. After placing call on Call Waiting by operation of Call Processor, time-out period for holding call expires.	Time-out starts when call is first placed on Call Waiting.	
2. Audible alert occurs on CP-60.	Electronic buzzer sounds on CP-60. Called extension number appears in numeric display.	
3. View outside line lamp indicator for INCOMING STATION call indication.	INCOMING STATION call indication appears on outside line key operating in recall mode.	INCOMING STATION call indication: modulated 1 second on, 1 second off.
4. Press outside line key	"I-USE" indication; recall stops.	

6.5.5 STEP CALL OPERATION

INSTRUCTION	OPERATION	EXPLANATION
1. Dial extension on "keysender."	Extension number appears in numeric display.	
2. If no answer or busy, dial second digit of extension in same group.	Any extension in same tens group can be called.	Any number in same group can be dialed.

6.5.6 CALL IN-PROGRESS INDICATION

INSTRUCTION	OPERATION	EXPLANATION
1. Dial extension on "keysender."	Extension number flashes on CP-60 numeric display.	Called extension is in process of being called by another extension.
2. Either press REL (Release) "feature key"	Attendant released from Attendant Intercom Line.	Attendant automatically reconnected to outside line.
or Press OVERRIDE "feature key."	Tone burst warning both Attendant and extension; Attendant voice pages called extension.	Attendant blocks Intercom caller to same station; Intercom caller given temporary "busy tone" indication.

INSTRUCTION	OPERATION	EXPLANATION
3. Press CALL WAIT "feature key" on CP-60	INCOMING CALL indication at called extension; CP-60 lamp field indicates Call Waiting; Attendant disconnected; Called extension re-connected to original extension.	Call Waiting left at extension completes original call.

6.6 OPX TELEPHONE OPERATION

The Off-Premises Extension (OPX) telephones used with OMEGA-PHONE III operate differently than the standard electronic key telephones. All features and functions are controlled by the local telephone dial. The telephone hook-switch must be used for initiating "call transfer." When OPX extensions are DTMF dial type, they are connected to an "allotter" that provides an OPX dial tone in such a way that only one OPX telephone at a time can dial Intercom calls. Once the Intercom Dial Access Code is dialed, the OPX allotter circuit disconnects and is available for other OPX extensions.

OPX Telephones are limited in the access to Intercom functions. Among the functions not available to OPX telephones are:

a. Dial Tone Re-Order:

Dial Tone Re-Order is only available to OPX telephones when the OPX extension transfers outside CO/PBX calls to an extension in the system. When talking to a system extension, Dial Tone Re-Order is not available.

b. Voice Signalling:

OPX extensions can only utilize Tone Signalling when calling an electronic key telephone extension. The system prevents dial access to Voice Calling (as well as Handsfree reply) by the OPX Telephone.

6.6.1 CALLING AN INTERCOM EXTENSION

INSTRUCTION	OPERATION	EXPLANATION
1. Take handset off-hook; listen for dial tone.		Dial tone in handset indicates a call can be dialed.
2. Dial two-digit Intercom code.	Two-digit dial code.	No Voice Calling Access is available to OPX.

INSTRUCTION	OPERATION	EXPLANATION
3. Listen for Busy tone or Ringing tone.		Called extension is either busy or free.
4. Ringing Tone stops.	Extension answers.	Call connected.
5. When Busy tone heard, go on-hook.		Call must be tried again.

6.6.2 TRANSFERRING AN OUTSIDE CALL TO ANOTHER EXTENSION

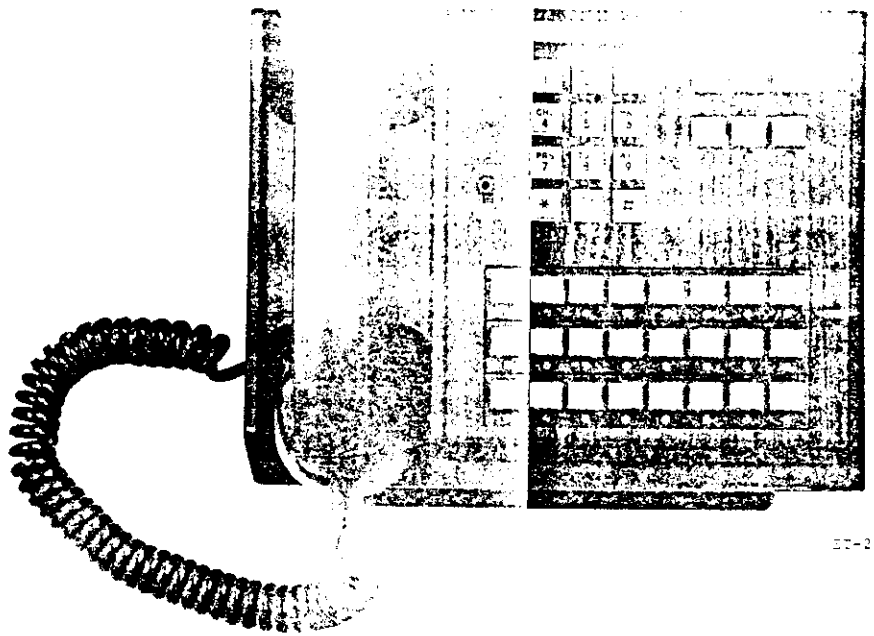
INSTRUCTION	OPERATION	EXPLANATION
1. Inform distant party to hold line; flash hookswitch once.	Press hookswitch momentarily.	Temporarily place call on "HOLD"
2. Dial tone heard in handset; dial Intercom extension number.	Two-digit dial code.	
3. Extension answers, OPX is connected to both outside line and called extension.	Ringing heard at called extension; extension answers.	Three-party conferences.
4. Extension busy, OPX flashes hookswitch.	OPX connected to CO/PBX line.	Establishing original connection.

6.6.3 DIALING A CO/PBX LINE CALL

INSTRUCTION	OPERATION	EXPLANATION
1. Take handset-off-hook; listen for OPX Dial tone.		Dial tone in handset indicates a call can be dialed.
2. Dial two-digit outside line level access code.	Level Codes 90 through 93.	
3. Listen for CO/PBX line Dial tone.	CO/PBX line Dial tone connected to OPX.	CO/PBX line Dial tone indicates call can be dialed on outside line. Dial call in usual manner. This feature is optionally programmed.

6.6.4 ANSWERING AN ATTENDANT MEET-ME CALL

INSTRUCTION	OPERATION	EXPLANATION
1. Hear Attendant Meet-Me Voice Page, and identify which Attendant is calling.	Attendant calls OPX and identifies Attendant Intercom line.	Attendant Voice Pages over PA System, identifies which Attendant is calling.
2. Take handset off-hook, listen for Dial tone.		
3. Dial 98 for Attendant No. 1 (EXT. 20) or 99 for Attendant No. 2 (EXT. 21).		Each Attendant has a separate Meet-Me access code.
4. OPX is connected to Attendant.	Voice conversation begins.	



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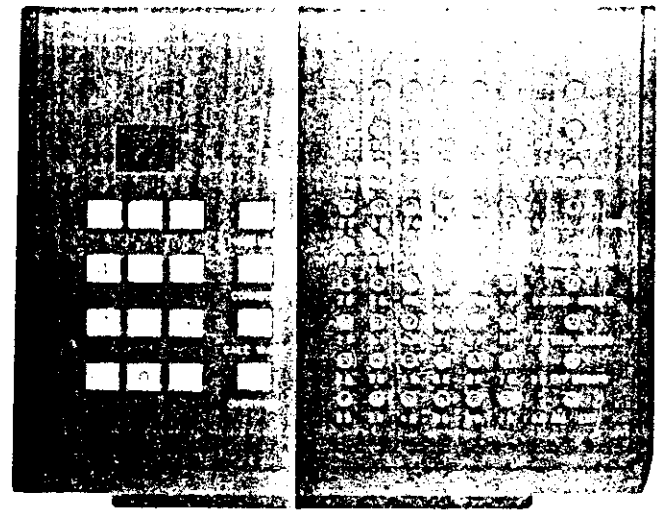
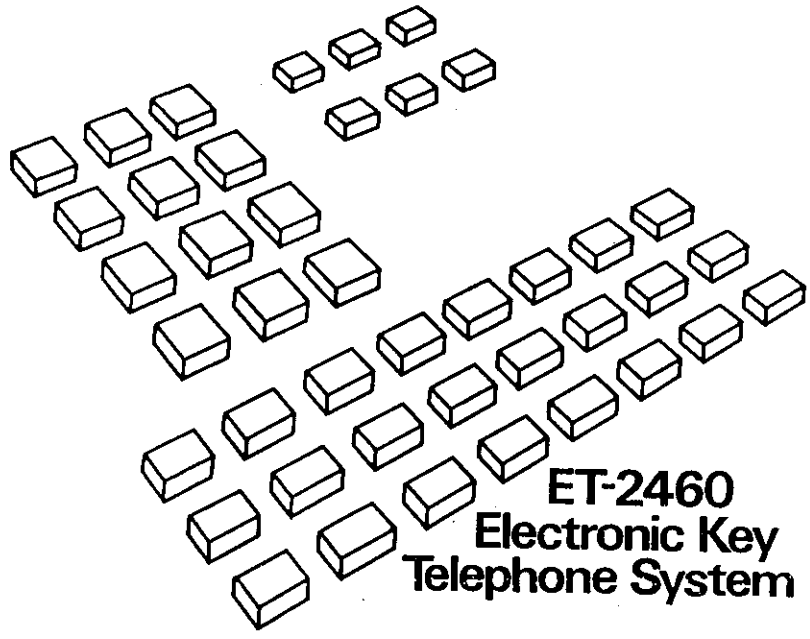


OMEGA PHONE III



ET-2460 Electronic Key Telephone System

INSTRUCTION MANUAL

PART II INSTALLATION MANUAL

CONTENTS

SECTION 1 INTRODUCTION AND SPECIFICATIONS II-1
1.1 SYSTEM CAPACITY II-1
1.2 CABLING REQUIREMENTS II-2
1.3 AUXILIARY CIRCUITS II-5
1.4 POWER SUPPLY SPECIFICATIONS II-5
1.5 DIAL ACCESS CODES II-5
1.6 SYSTEM VISUAL AND AUDIBLE INDICATIONS II-6
1.7 PROGRAMMING II-7
1.8 PHYSICAL CHARACTERISTICS II-9
1.9 TRANSMISSION PARAMETERS II-10
SECTION 2 SYSTEM PLANNING II-11
2.1 GENERAL SYSTEM PLANNING SHEET II-11
2.2 OTHER PLANNING CONSIDERATIONS II-16
2.3 EQUIPMENT REQUIREMENTS II-16
SECTION 3 KSU INSTALLATION II-37
3.1 UNPACKING AND HANDLING II-37
3.2 EXPANSION ASSEMBLY (EMB) INSTALLATION II-39
3.3 KSU LOCATION II-42
3.4 POWER SUPPLY INSTALLATION II-44
3.5 MAIN DISTRIBUTION FRAME II-45
3.6 KSU FEATURE SETTINGS II-57
3.7 KSU INSTALLER OPTIONS II-58
SECTION 4 PRINTED CIRCUIT CARD INSTALLATION II-67
4.1 GENERAL CONSIDERATIONS II-67
4.2 CO/PBX LINE INSTALLATION II-68
4.3 ICM/CROSSPOINT CIRCUIT INSTALLATION II-83
4.4 STATION CIRCUITS INSTALLATION . II-84
4.5 POWER FAILURE TRANSFER II-92
4.6 PROGRAM BOARD INSTALLATION .. II-93
4.7 INSTALLATION OF ZONE-PAGE (PA) ADAPTER II-110
SECTION 5 STATION INSTALLATION II-113
5.1 GENERAL DESCRIPTION II-113
5.2 CABLING II-118
5.3 INTERCOM DIAL CODE ASSIGNMENT II-120
5.4 STATION FEATURE ASSIGNMENT .. II-123
5.5 OPTIONAL STATION FEATURES ... II-126
SECTION 6 CP-60/BLF-60 INSTALLATION ... II-141
6.1 CP-60 CALL PROCESSOR INSTALLATION II-141
6.2 BLF-60 INSTALLATION II-146
SECTION 7 SPEED DIAL INSTALLATION II-149

ET-2460
Electronic Key
Telephone
System

PART II
INSTALLATION MANUAL

ET-2460 Electronic Key Telephone System

OMEGA PHONE III

PART II INSTALLATION MANUAL

SECTION 1 INTRODUCTION AND SPECIFICATIONS

This part of the Omega-Phone III technical manual provides information and procedures for system planning and installation.

1.1 SYSTEM CAPACITY

The Omega-Phone III electronic key (E-KEY) telephone system features two basic common equipment configurations and two models of electronic key telephones. The standard ET-2460 Key Service Unit (KSU) consists of a Motherboard Assembly (MBD) that is wired for the basic equipment capacity listed in TABLE 1. The Expanded Motherboard Assembly (EMB) is added to the standard KSU to enable the expanded equipment capacity listed in TABLE 1.

TABLE 1

OMEGA-PHONE III CAPACITY

FUNCTION	STANDARD KSU	EXPANDED KSU	NOTE
CO/PBX Lines	12	20	
Dial Intercom Lines	(2)	(2)	1
Attendant ICM Lines	1(2)	1(2)	2
Secretary ICM Lines	12	20	3
Ringdown TIE Lines	12	20	3
Electronic Key Telephone Extensions	32	60	
Off-Premises Extensions (OPX)	4(8)	4(8)	4
Trunk Conference	1	1(2)	5
Busy Lamp Field (BLF-60)	4	4	6

(LINE CIRCUITS: CO/PBX Lines, Dial Intercom Lines, Attendant ICM Lines, Secretary ICM Lines, Ringdown TIE Lines; STATION CIRCUITS: Electronic Key Telephone Extensions, Off-Premises Extensions (OPX), Trunk Conference, Busy Lamp Field (BLF-60))

NOTE

1. Number in parenthesis indicates the maximum number of Dial Intercom Lines that can be equipped on the KSU without affecting CO/PBX Line capacity. Each additional Dial Intercom Line added to the KSU reduces CO/PBX Line capacity by one line.

2. Number in parenthesis indicates maximum number of Attendant ICM Lines (Call Processors) in the system. Use of two Attendant ICM Lines reduces CO/PBX Line capacity by one.

3. The number of Secretary Lines or Ringdown Lines equipped on KSU is limited to the number of line circuits available on the KSU after equipping the system for all other line circuits.

4. The number of OPX extensions equipped on the KSU is limited to eight. Each OPX printed-circuit card provides four OPX extensions and reduces the maximum number of E-KEY extensions by four.

5. The trunk conference feature reduces the E-KEY extension capacity by four in the standard KSU configuration. In a fully expanded KSU, one trunk conference circuit does not affect KSU E-KEY capacity; use of a second trunk conference circuit, however, reduces E-KEY capacity by four.

6. The total number of Attendant Intercom Lines and BLF-60 is five.

Two models of electronic key telephone stations are offered: Model ET-1632 and Model ET-2460. Both models offer the same features and differ only in line circuit capacity. The ET-1632 capacity is limited to the standard KSU capacity and line circuit configurations. All line circuits appearing on the standard KSU must appear on the ET-1632 E-KEY telephone. The ET-2460 capacity includes all line circuits of the standard KSU plus the additional line circuits of expanded KSU.

1.2 CABLING REQUIREMENTS

1.2.1 LOOP RESISTANCES

Cable loop limits are listed in TABLE 2.

TABLE 2 SYSTEM CABLE LOOP LIMITS

FUNCTION	CABLE LOOP LIMIT
CO/PBX Line	1500 ohms (CO)
E-KEY Station	40 ohms (700 ft. No. 24 AWG wire)
CP-60 Console	40 ohms (700 ft. No. 24 AWG wire)
BLF-60	40 ohms (700 ft. No. 24 AWG wire)
OPX Station	1000 ohms at 24 VDC Talk Battery 2000 ohms at 48 VDC Talk Battery
Ringdown Line	Same as OPX

1.2.2 STATION CABLE REQUIREMENTS

Station Cable Requirements are illustrated in FIGURE 1. In addition to the station cabling shown, the following cables are required to connect the KSU to the main distribution frame (MDF):

a. ET-2460 KSU to CO/PBX line interface: A 25-pair, male-female, Amphenol-ended cable is used to connect the KSU to the CO/PBX line interface (i.e., RJ-21X).

b. ET-2460 KSU to E-KEY extensions: 25-pair, male, Amphenol-ended cables are required to connect the E-KEY station circuits on the KSU to the MDF.

c. ET-2460 KSU to CP-60 Call Processor: A 6-pair, Amphenol-ended cable assembly that is supplied with each KSU is utilized to connect the CP-60 circuit to the MDF. Both CP-60 units utilize the same KSU-MDF cable. The BLF-60 Busy Lamp Field Units used the same KSU-MDF cable as the CP-60.

d. ET-2460 KSU to OPX extensions: A 25-pair, male, Amphenol-ended cable is required to connect the OPX station circuits to the MDF.

e. ET-2460 KSU to power failure extensions: A 6-pair, Amphenol-ended cable supplied with the power failure unit (PFU) is utilized to connect the line circuits to the power failure telephones.

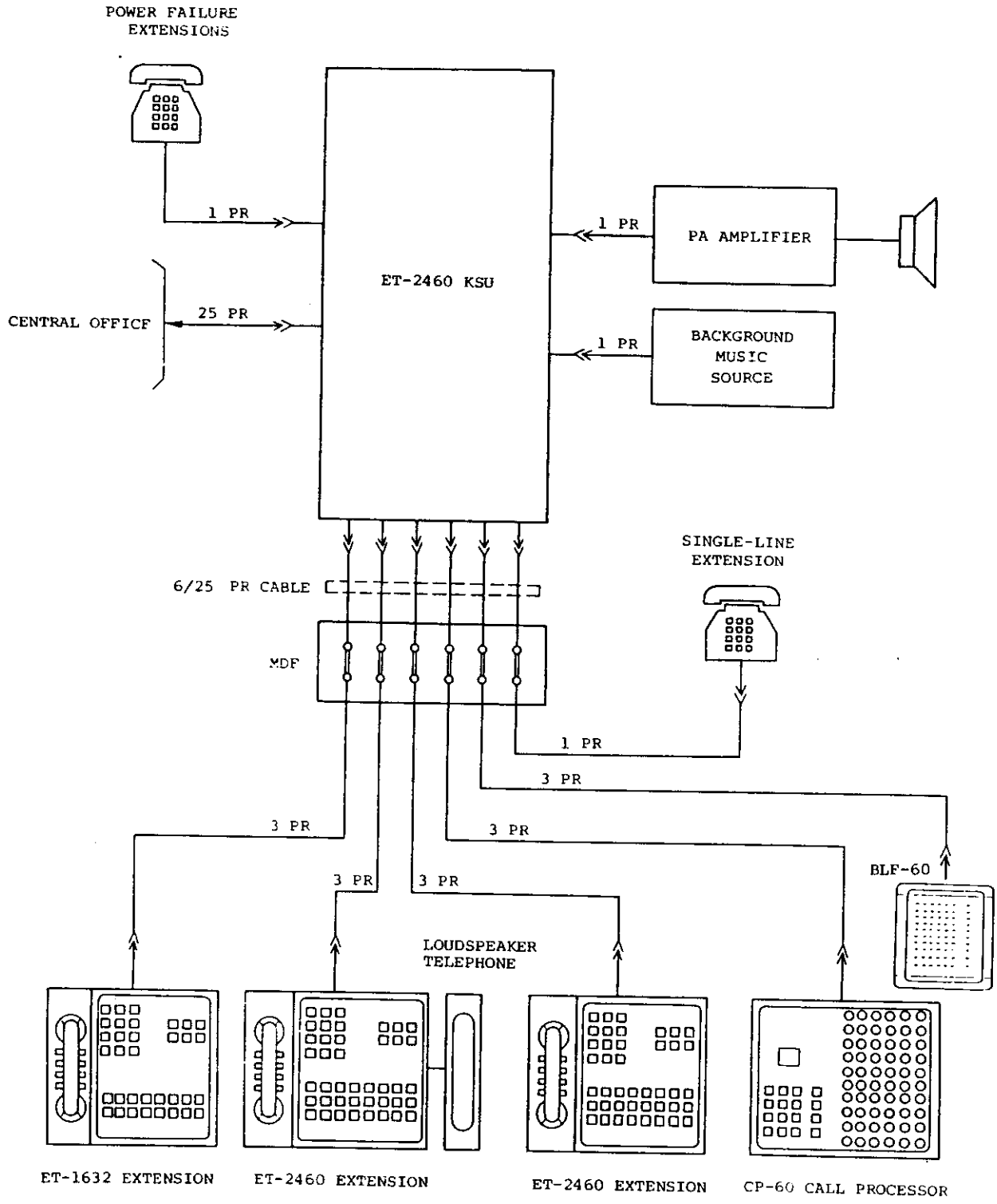


FIGURE 1 Omega-Phone III Cabling Requirements

1.3 AUXILIARY CIRCUITS

The following input sensitivity is required for connection to the PA amplifier and music sources:

a. PA Amplifier Input Sensitivity.

PA amplifier input impedance:	10 kΩ - 350 mV (-10 dBv) 600Ω - 100 mV (-20 dBv)

b. Background Music Input Sensitivity.

BGM input impedance in KSU:	10 kΩ - 100 mV (-20 dBv) not exceed 500 mV (-6 dBv) 600Ω - 25 mV (-32 dBv) not exceed 100 mV (-20 dBv)

c. Music-on-Hold Input Sensitivity.

MOH input impedance in KSU:	10 kΩ - 100 mV (-20 dBv) not exceed 500 mV (-6 dBv) 600Ω - 25 mV (-32 dBv) not exceed 100 mV (-20 dBv)

1.4 POWER SUPPLY SPECIFICATIONS

The following power sources are necessary for Omega-Phone III:

a. AC Power: 117 VAC ± 10%, at 57 Hz - 63 Hz, single phase.

b. Maximum AC current: 5 amps (up to 32 key telephones, up to 16 trunks).
7 amps (up to 60 key telephones, up to 24 trunks).

c. Backup DC Power: 24 VDC ± 3 V at 20 amps.

1.5 DIAL ACCESS CODES

The dial access code numbering plan for the Omega-Phone III is as follows:

0	Access to attendant when one CP-60 is installed.
01	Access to attendant No. 1 when two CP-60s are installed.
02	Access to attendant No. 2 when two CP-60s are installed.
20	Extension number for CP-60 No. 1, or ordinary extension number.
21	Extension number for CP-60 No. 2, or ordinary extension number.
22-43	Extension number.
44-51	Extension number/OPX number.
52-79	Extension number
80	All-Call (All-Zone paging and All-Extension call)
81-83	Zone paging.

84	All-Zone paging
85-88	Extension group call
89	All-Extension call
90-93	OPX access to CO Line group
98	OPX "Meet-Me" paging by attendant through CP-60 No. 1
99	OPX "Meet-Me" paging by attendant through CP-60 No. 2
*	Reserved for speed dialing plan
#	Last number dialing and voice/tone switching of Intercom calls.

1.6 SYSTEM VISUAL AND AUDIBLE INDICATIONS

Visual and audible indicators for E-KEY stations and CP-60 Call Processors are summarized in TABLES 3 and 4.

TABLE 3 SYSTEM VISUAL INDICATIONS

FUNCTION	VISUAL INDICATION
I-USE	Modulated steady
SYSTEM HOLD	800 m seconds on/200 m seconds off
I-HOLD	1.2 seconds on/modulated 800 m seconds
INCOMING CO CALL	1 second on/3 seconds off
INCOMING ICM CALL	Modulated 1 second on/1 second off
RECALL; CALL WAITING	Modulated 1 second on/3 seconds off
MESSAGE WAITING	1.2 seconds on/modulated 800 m seconds
DO-NOT-DISTURB (DND)	1 second on/modulated 1 second off

TABLE 4 SYSTEM AUDIBLE INDICATIONS

FUNCTION	TONE INDICATION	REPETITION RATE
INCOMING CO CALL	400 Hz/25 Hz modulated	1 second on/3 seconds off
INCOMING ICM CALL	400 Hz	1 second on/3 seconds off
RECALL (HOLD)	400 Hz/25 Hz modulated	1 second on/3 second off
CALL WAITING	400 Hz/25 Hz modulated	1 second on/3 seconds off
TONE BURST	400 Hz	1 second
DIAL TONE	400 Hz	Continuous
BUSY TONE (ICM)	400 Hz	0.5 second on/0.5 second off
RINGBACK TONE (ICM)	400 Hz/25 Hz modulated	1 second on/3 seconds off
WARNING TONE	400 Hz	0.2 second on/0.2 second off
WARNING TONE BURST	400 Hz	0.2 second on/0.2 second off/ 2 seconds

1.7 PROGRAMMING

Omega-Phone III requires programming at the time of installation for implementing various system and station features. Two methods of programming are used: bit switch and dip switch.

1.7.1 BIT SWITCH

A bit switch program option uses one program bit of information. An strapping jack is used to set the program bit on various KSU printed-circuit cards. FIGURE 2 illustrates a typical bit switch and strapping jack. System printed-circuit cards that use bit switch programming include:

a. MPU, VTA

b. COT, COR, TRK-A, TRK-B

c. SUB, OPX

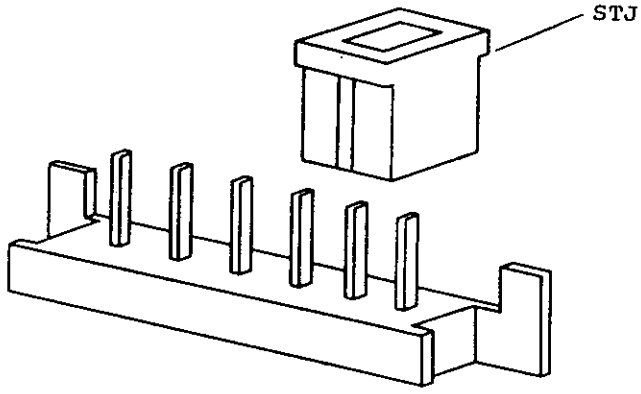
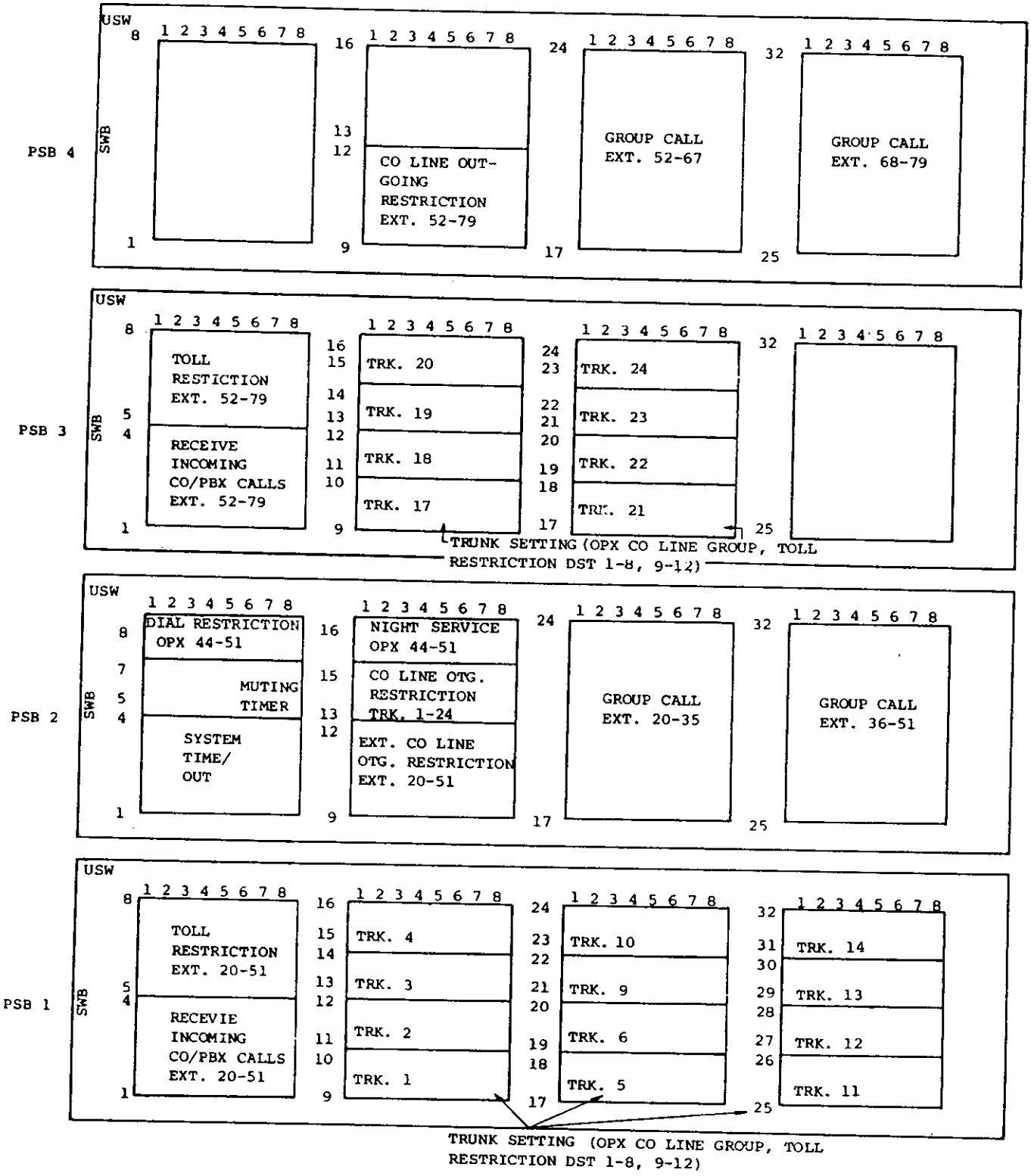


FIGURE 2 Bit Switch and Strapping Jack

1.7.2 DIP SWITCH

Dip switch programming of service features is accomplished on the PSB program boards. PSBs are used for programming optional features. (Section 2 Installation Planning, details the requirements of the PSB circuit card for the various optional features.) FIGURE 4 illustrates a typical dip switch. Switches are normally constructed to program up to eight bits of information. An individual bit is programmed with an ON or OFF decision by operating the particular switch. Dip Switches used on the PSB program boards are arranged in groupings of unit switch levels for programming the various features. FIGURE 3 illustrates the program map on PSBs 1 through 4 program boards.



SWB: SWITCH BLOCK
USW: UNIT SWITCH

FIGURE 3 Program Switch Map

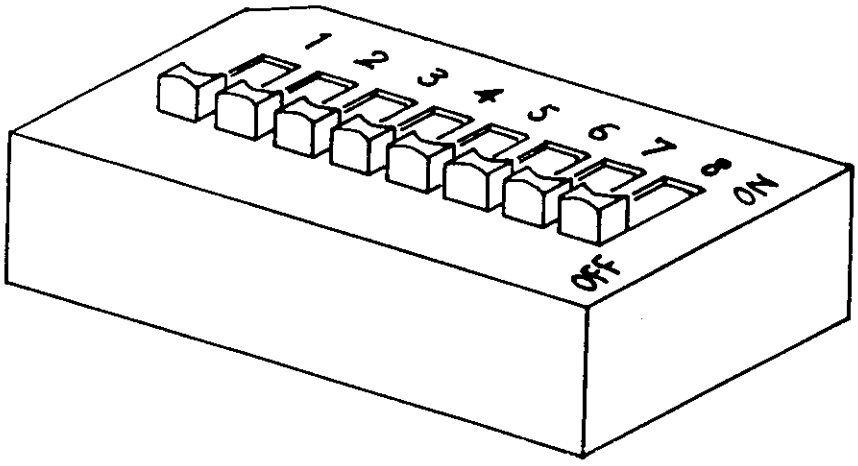


FIGURE 4 Dip Switch

1.8 PHYSICAL CHARACTERISTICS

1.8.1 DIMENSIONS

Dimensions of the KSU, Key Telephone, CP-60, BLF-60, and Power Supply are as follows:

KSU : Approximately 39.4 inches (H) x 21.6 inches (W) x 9.8 inches (D)

Key Telephone: Approximately 4.3 inches (H) x 9.9 inches (W) x 7.8 inches (D)

CP-60: Approximately 3.3 inches (H) x 9.9 inches (W) x 7.8 inches (D)

BLF-60: Approximately 3.3 inches (H) x 5.5 inches (W) x 7.8 inches (D)

Power Supply (PWS-A): Approximately 19.7 inches (H) x 13.8 inches (W) x 9.8 inches (D)

Power Supply (PWS-B): Approximately 15.8 inches (H) x 13.8 inches (W) x 9.8 inches (D)

1.8.2 WEIGHT

The net weights of the KSU, Key Telephone, CP-60, BLF-60, and Power Supply are as follows:

KSU	Approximately 66 pounds
Key Telephone	Approximately 3.1 pounds
CP-60	Approximately 2.4 pounds
BLF-60	Approximately 1.3 pounds
Power Supply (PWS-A)	Approximately 53 pounds
Power Supply (PWS-B)	Approximately 44 pounds

1.8.3 ENVIRONMENTAL REQUIREMENTS

All units are designed to operate in an environment of 0°C to 40°C (32°F to 104°F) 10 to 85% relative humidity (non-condensing).

1.9 TRANSMISSION PARAMETERS

Omega-Phone III transmission parameters are as follows:

Impedance		
Extension:	< 600Ω	
Trunk:	< 600Ω	
Insertion loss		
Extension to trunk:	<1.2 dB	
OPX to trunk:	<2.2 dB	
Frequency response (at 200 Hz to 4 kHz)		
Extension to trunk:	-0.7 to 0 dB	} + and - are over and under losses relative to at 1 kHz
OPX to trunk:	-0.2 to +0.1 dB	
Closstalk attenuation		
at 1.5 kHz:	> 75 dB	
Longitudinal balance		
at 200 kHz:	> 87 dB	
at 1 kHz:	> 73 dB	
at 4 kHz:	> 61 dB	

SECTION 2 SYSTEM PLANNING

This section describes the preparations that should be accomplished prior to equipping and programming the Omega-Phone III for system installation. The individual planning and preparation fact sheets illustrated should be duplicated and left on the equipment site. Any changes in the system configuration should be detailed on the planning/configuration sheets.

2.1 GENERAL SYSTEM PLANNING SHEET

FIGURE 5 is a general planning sheet used to determine the total quantity and type of equipment required for line circuits and extensions in an individual system. This planning sheet details the total number of station and line circuits in order to determine whether the standard ET-2460 KSU or the expanded ET-2460 KSU is required for the individual system configuration.

2.1.1 LINE CIRCUIT REQUIREMENTS

Section I of the System Planning Sheet details the system line circuit requirements. The total number of various types of line circuits required for the system should be listed. The maximum number of each type of line circuit is indicated.

CO/PBX Lines are identified as to the type of signalling used (Dial Pulse (DP) or DTMF). Special service lines, such as incoming WATS, are included in the DP or DTMF classification (depending upon the type service for the standard CO/PBX Lines), but Ringdown Tie Lines are listed separately. The total maximum number of DP Lines, DTMF Lines, and Ringdown Tie Lines cannot exceed 20.

The balance of the line circuits listed detail the system Intercom Line requirements. The total number of standard Dial Intercom Lines, Attendant (CP-60) Lines, and Secretary or Executive Lines are listed. The number of Attendant (CP-60) Lines is limited to two but the total number of Dial Intercom and Secretary or Executive Lines is limited only by the available number of line circuits not utilized in the KSU. One line circuit is

dedicated for All-Call even though All-Call may not be required on the system.

The total number of line circuits, as illustrated in FIGURE 5, cannot exceed 24.

2.1.2 STATION CIRCUIT REQUIREMENTS

Section II of the System Planning Sheet details the individual extension requirements to determine the number of station circuits. The total number of E-KEY telephones should be listed, identifying the ET-1632 and ET-2460 telephones separately. Bear in mind that the maximum number of stations is 60. Refer to the total number of line circuits listed in Section I to determine whether ET-1632 or ET-2460 telephones can be used.

NOTE

If the total number of line circuits exceeds 16, model ET-2460 must be used as the basic extension. The ET-1632 can be used to access one group of 16 dedicated lines appearing on the standard ET-2460 KSU (MBD) while the balance of the lines appear only on the ET-2460 telephones.

When the total number of line circuits is less than 16 (including All-Call), only the ET-1632 is required.

2.1.3 KSU REQUIREMENTS

Section III of the System Planning Sheet details whether the standard or expanded KSU is required, based upon the total number of line and station circuits.

If either line or station circuits exceed the listed amount for the standard KSU, the expansion assembly (EMB) is required. On the expanded KSU, provision is made for one Trunk Conference Unit (TCU), so 64 is the maximum number of station circuits when one TCU is equipped.

2.1.4 OPTIONAL ASSEMBLY REQUIREMENTS

Section IV of the General System Planning Sheets details the optional system feature assemblies. Assemblies should be checked off and quantities of each item should be listed.

SYSTEM PLANNING SHEET

I. Total Number of System Lines (Line Circuits)

A. CO/PBX Lines

1. Dial Pulse (DP) Lines ....( )
2. DTMF Lines .....( )
3. Ringdown Tie Lines .....( )

Total number of Lines cannot exceed 20.

B. Attendant Lines .....( ) Total number cannot exceed 2.

C. Dial ICM Lines .....( )

D. Dedicated Lines

1. Secretary ICM .....( )
2. Executive ICM .....( )

E. System All-Call .....(1) Required number is 1.

NOTE:

Add the total number of line circuits in items A, B, C, and D, and add one for System All Call even though it may not be equipped. The maximum number of line circuits is 24.

Total _____Line Circuits.

II. Total Number of System Extensions (Station Circuits).

A. E-KEY Telephones

1. ET-1632 Telephones .....( ) Total Number of E-KEY Telephones cannot exceed 60.
2. ET-2460 Telephones .....( )

B. OPX Telephones

1. DTMF and DP Telephones ...( ) Total number of OPX Telephones cannot exceed 8. Enter either 0, 4, or 8 telephones as being equipped.

NOTE:

OPX station circuits must be equipped in multiples of four or eight. Eight OPX circuits is the maximum.

C. Trunk Conference Unit (X4)_____ Each Trunk Conference Unit utilizes four station circuits.

FIGURE 5 Sample General System Planning Sheet

NOTE:

Add A, B, and C. If Trunk Conference (C) is equipped, the total number of station circuits cannot exceed 64. If no Trunk Conference (C) is equipped, the total number of station circuits cannot exceed 60.

Total_____Station Circuits

D. If OPX telephones are equipped, an MFR OPX Interface card must be equipped: MFR Yes_____ No_____

III. ET-2460 KSU Requirements:

	System	Standard KSU	Expanded KSU
A. Total Number of Line Circuits	_____	16	24
B. Total Number of Station Circuits	_____	32	64 (60)

Enter total number of circuits from I/II (above) and compare with Standard and Expanded KSU capacity. If total number of line and station circuits exceeds Standard KSU capacity, the KSU expansion units (EMB) must be equipped.

C. EMB Required Yes____ No____ Order PWS-B Power Supply if Yes checked

D. Determine Requirements for System Crosspoints. Total XPS_____

IV. Optional System Assemblies

A. CP-60 Call Processor	Yes____ No____	Two maximum
B. Zone-Page Adpater	Yes____ No____	One maximum
C. MDEC	Yes____ No____	One required for DTMF OPX telephones.
D. Power Failure Transfer (PFU)	Yes____ No____	One maximum
E. BLF-60 Lamp Field	Yes____ No____	Five maximum
F. Speed Dialing (SPD)	Yes____ No____	One maximum

V. System Program Features

A1. Individual CO Ringing	Yes____ No____	FEATURE PACKAGE 1 PSB-1 and PSB-3 (if EMB equipped) required.
A2. Toll Restriction	Yes____ No____	
A3. OPX CO Group Level	Yes____ No____	
B1. Internal Group Call	Yes____ No____	FEATURE PACKAGE 2 PSB-2 and PSB-4 (if EMB equipped) required.
B2. CO/PBX Outgoing Restriction	Yes____ No____	
B3. OPX Night Service	Yes____ No____	

FIGURE 5 (Continued)

B4.	Flexible Time-Out Adjustment	Yes____	No____	FEATURE PACKAGE 2 PSB-2 and PSB-4 (if EMB equipped) required
B5.	OPX Outgoing Restriction	Yes____	No____	
C1.	Non-Private ICM	Yes____	No____	MPU FEATURE SETTING
C2.	Voice Call Two Digit Dial Access	Yes____	No____	
C3.	Last Number Re-Dial	Yes____	No____	

NOTES:

FIGURE 5 (Continued)

2.1.5 PROGRAM FEATURE REQUIREMENTS

Section V of the General System Planning Sheet lists the programming options. Features to be incorporated in the system should be checked off. Feature Packages 1 and 2 require use of Program Board printed-circuit cards but MPU programming capability is provided as standard.

2.2 OTHER PLANNING CONSIDERATIONS

Prior to installation of the system, preparations should be made to ensure a smooth installation process.

The layout of the system should be inspected. A survey of the site should be made to determine the best location for the KSU, MDF, IDF's, and system cables, as well as to discover any possible hazards or obstructions that could be encountered in the installation. A layout drawing of the site should be marked to indicate the locations of the KSU, terminal boxes, cable runs, and stations.

An equipment listing should be prepared to ensure an adequate number of system assemblies for the particular installation. Details on preparing an equipment listing are given in this installation manual.

Extension Program Sheets and Trunk Program Sheets (as subsequently described) should be prepared in order to expedite programming of all station and system features.

2.3 EQUIPMENT REQUIREMENTS

2.3.1 EQUIPMENT LISTING

From the General System Planning Sheet, an equipment listing detailing the individual type and quantity of system subassemblies can be obtained. TABLE 5 lists the type and designation of the printed-circuit cards in the KSU. KSU equipment required should be itemized for each category of system components appearing on the General System Planning Sheet. FIGURE 6 illustrates the KSU printed circuit card slot assignments.

2.3.2 LINE CIRCUITS

The General System Planning Sheet details the total number and type of lines to appear on the system. Omega-Phone III uses a minimum number of line circuit printed circuit cards to achieve line assignment flexibility and minimum stocking requirements. Each line circuit card provides two voice circuit (A and B) interfaces to the CO/PBX Lines and

TABLE 5 KSU COMPONENT REQUIREMENTS

TYPE	PCB		QUANTITY	NOTES
COMMON CARDS	MPU	Processor	1 per system	Supplied with KSU
	MEM	Memory	1 per system	Supplied with KSU
	VTA	Analog control	1 per system	Supplied with KSU
	PFJ	Power failure bypass	1 per system	Supplied with KSU
LINE CIRCUITS	COR	CO/PBX Line	1 per 2 CO/PBX Lines	DP Lines
	COT	CO/PBX Line	1 per 2 CO/PBX Lines	DTMF Lines
	ICM	ICM Line	1 per 2 ICM Lines	Dial Intercom Lines
	CPA	All-Call/Attendant	1 per system	Used for CP-60 No. 1
	TRK-A	CO/PBX Line	1 per 2 CO/PBX Lines	DP/DTMF Line or TIE Line } See
	TRK-B	Set/Attendant Line	1 per 2 Lines	Used for CP-60 No. 2/SEC Lines(s) } TABLE 6
LINE/STATION	XPS	Crosspoint	1 per 8 CO/16 extensions	8 CO/16 extensions Capacity
STATION CIRCUIT	SUB	E-KEY extension	1 per 4 extensions	E-KEY station interface.
	OPX	OPX extension	1 per 4 extensions	2 OPX cards maximum
	MFR	OPX Interface	1 per system	Required when OPX equipped
	TCU	Trunk Conference	1 per 2 circuits	Second card optional
OPTIONAL	MDEC	DTMF receiver	1 per system	Required only for DTMF OPX telephone
	ZPU	Zone page PA	1 per system	Optional PA adapter
	PFU	Power failure	1 per system	5 CO/PBX transfer
	SPD	Speed dial	1 per system	100 Number capacity
EXPANSION	EMB	KSU expansion	1 per system	Full capacity operation
POWER SUPPLY	PWS-A		1 per system	Main supply
	PWS-B		1 per system	Supplemental supply
PROGRAM	PSB	Program board	1 per 32 extensions	4 cards maximum

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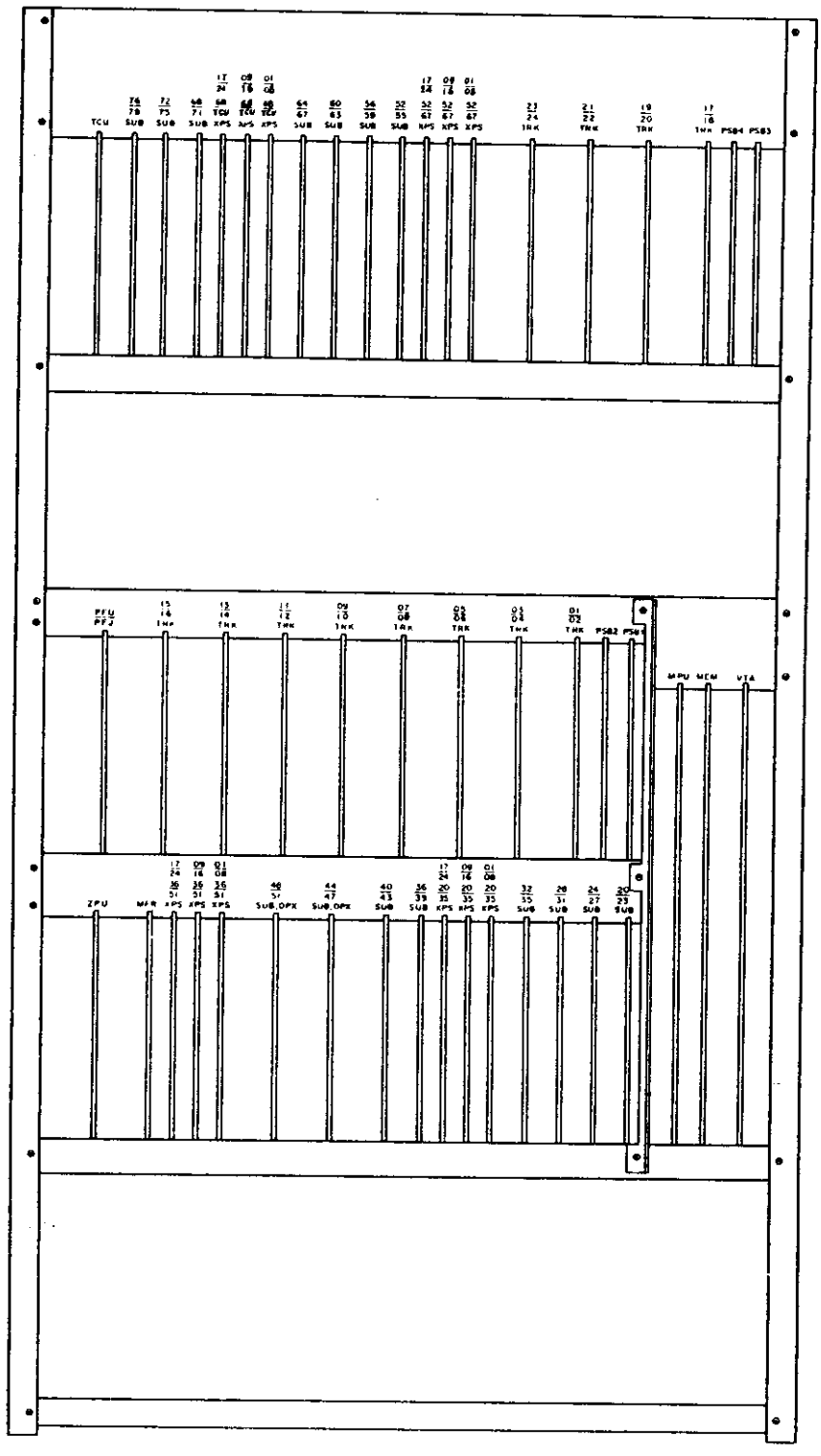


FIGURE 6 KSU Printed-Circuit Card Slot Assignments

cross-point switching mechanism. TABLE 6 lists the individual line circuit printed circuit cards and the functions of each card. The installer must assure that the proper line circuit is selected and inserted into each trunk circuit slot on the KSU for the specific feature or function that is required. TABLE 7 lists the KSU trunk circuit numbers and types of line circuit available.

Line circuits are listed at the trunk circuit number on the KSU. All odd numbered trunk circuits correspond to Circuit A on the line circuit card. All even numbered trunk circuits correspond to Circuit B on the line circuit card.

FIGURE 7 illustrates the E-KEY telephone and identifies the station pick-up keys corresponding to trunk circuit numbers. Referring to TABLE 6, the particular line circuit printed-circuit card can be selected so that the installer can ensure connection of the desired line function on the designated pickup key on the station.

TABLE 6 LINE CIRCUIT PRINTED-CIRCUIT CARD FUNCTIONS

MODEL NO.	CIRCUIT A	CIRCUIT B
COR	CO/PBX Line DP	CO/PBX Line DP
COT	CO/PBX Line DTMF	CO/PBX DTMF
TRK-A	CO/PBX Line DP CO/PBX Line DTMF Auto Ringdown	CO/PBX DP CO/PBX DTMF Auto Ringdown
TRK-B	CO/PBX Line DP CO/PBX Line DTMF Auto Ringdown Dial Intercom Secretary/Executive Line	Dial Intercom Attendant Line All-Call Page Secretary/Executive Line
ICM	Dial Intercom	Dial Intercom
CPA	Attendant Line	All-Call Page

In selecting the particular function for each pickup key on the E-KEY station, the following considerations should be addressed:

a. Trunk circuit slot number 07-08 is reserved specifically for the CPA or TRK-B type of line circuit. TRK 07, if equipped with an Attendant ICM Line, would utilize a CPA type line circuit with TRK 08 equipped for All-Call page. If no Call Processor is equipped on the system, a TRK-B type line circuit would be used for TRK 07-08, with TRK 07 wired for Dial Intercom or Secretary/Executive Line function and TRK 08 would be arranged for All-Call page.

TABLE 7 KSU TRUNK CIRCUIT NUMBER FUNCTION ASSIGNMENT

TRK NO.	LOCATION	PCB	FUNCTION NO. CODE	NOTES
TRK 01	MBD	COT, COR, ICM	A: 1,2,3,4,5	General purpose
02		TRK-A, TRK-B	B: 1,2,3,4,5	General purpose
TRK 03	MBD	COT, COR, ICM	A: 1,2,3,4,5	General purpose
04		TRK-A, TRK-B	B: 1,2,3,4,5	General purpose
TRK 05	MBD	COT, COR, ICM	A: 1,2,3,4,5	General purpose
06		TRK-A, TRK-B	B: 1,2,3,4,5,6	CP-60 #2
TRK 07	MBD	CPA, TRK-B	A: 4,5,6	CP-60 #1
08			B: 7	All-Call Only
TRK 09	MBD	COT, COR, ICM	A: 1,2,3,4,5	Dial restriction, general*
10		TRK-A, TRK-B	B: 1,2,3,4,5	Dial restriction, general*
TRK 11	MBD	COT, COR, ICM	A: 1,2,3,4,5	Dial restriction, general*
12		TRK-A, TRK-B	B: 1,2,3,4,5	Dial restriction, general*
TRK 13	MBD	COT, COR, ICM	A: 1,2,3,4,5	General purpose
14		TRK-A, TRK-B	B: 1,2,3,4,5	General purpose
TRK 15	MBD	ICM, TRK-B	A: 4,5	ICM functions only
16			B: 4,5	ICM functions only
TRK 17	EMB	COT, COR, ICM	A: 1,2,3,4,5	Dial restriction, general**
18		TRK-A, TRK-B	B: 1,2,3,4,5	Dial restriction, general**
TRK 19	EMB	COT, COR, ICM	A: 1,2,3,4,5	Dial restriction, general**
20		TRK-A, TRK-B	B: 1,2,3,4,5	Dial restrictions, general**
TRK 21	EMB	COT, COR, ICM	A: 1,2,3,4,5	General purpose***
22		TRK-A, TRK-B	B: 1,2,3,4,5	General purpose***
TRK 23	EMB	COT, COR, ICM	A: 1,2,3,4,5	General purpose***
24	-	TRK-A, TRK-B	B: 1,2,3,4,5	General purpose***

* Options ET-1632/2460

** Options ET-2460

*** ET-2460

FUNCTION NO. CODE

1. CO/PBX DP
2. CO/PBX DTMF
3. Ringdown
4. Dial Intercom
5. Secretary or Executive line
6. Attendant line
7. All-Call

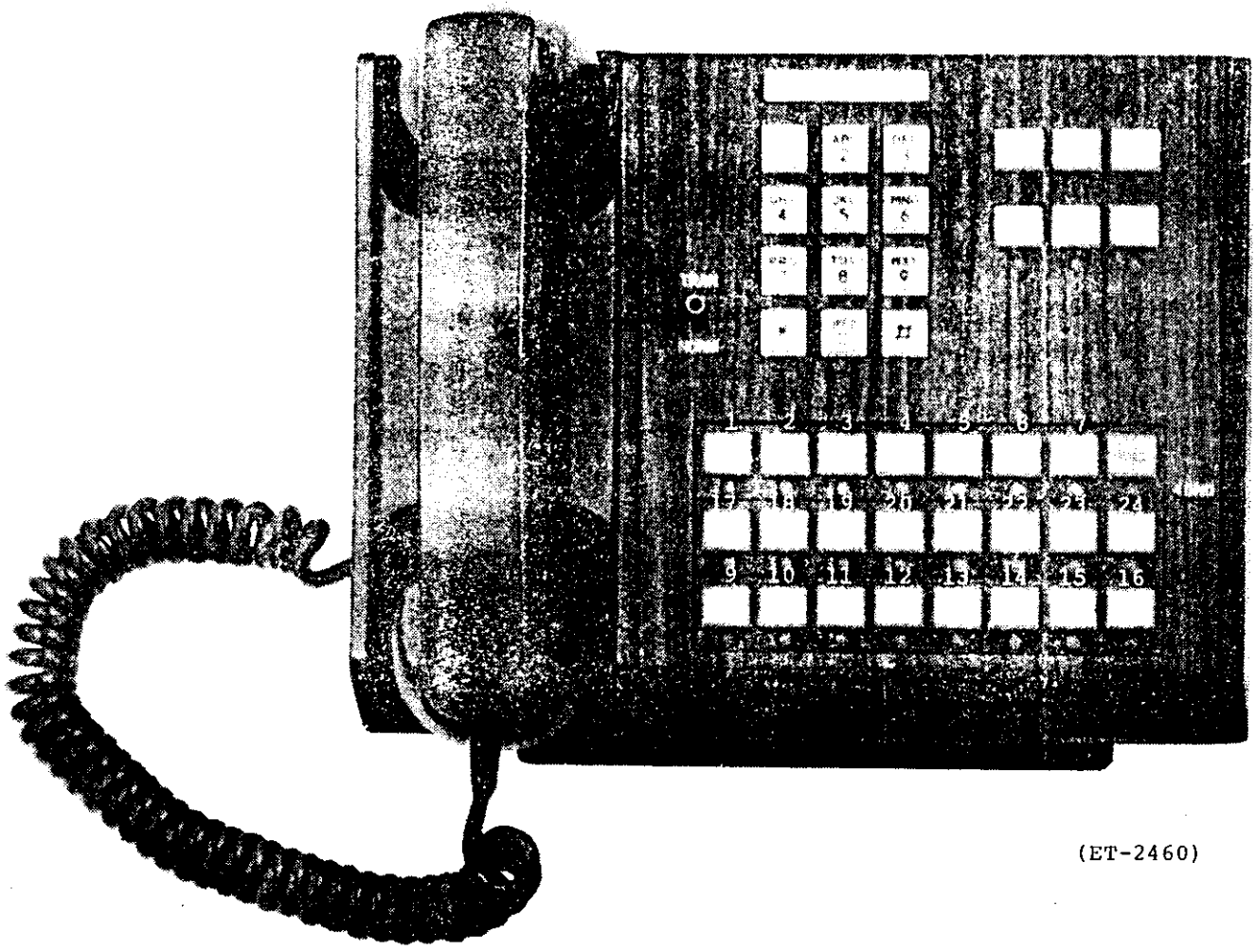


FIGURE 7 ET-1632 and ET-2460 Pickup Key Assignments

NOTES: 1. ET-1632 TELEPHONES DO NOT PROVIDE PICKUP KEYS NO. 17 THROUGH 24.

2. NO PICKUP KEY NO. 8 IS ASSIGNED BECAUSE SYSTEM ALL-CALL (PAGE function key) IS ASSOCIATED WITH TRK 8.

NOTE

TRK 08 is reserved for All-Call page; no other function can be assigned to TRK 08.

b. If a second CP-60 Call Processor is equipped, a TRK-B line Circuit card must be utilized for TRK No. 05-06. Circuit B on the TRK-B card is installer arranged for Attendant Line operation and Circuit A is arranged for either CO/PBX or ICM Line function.

c. Trunks are assigned from the lower order to the highest order. When equipping the KSU, assign the TRK circuits in order of appearance so that the number of Crosspoint cards (XPS) may be minimized and so that use of the EMB assembly is required only when the number of line circuits exceeds 16 (including All-Call).

d. The TRK-A line circuit card should be used in mixed DP/DTMF CO/PBX line applications. The TRK-A line circuit card can be installer-strapped for sending either DP or DTMF signals for CO/PBX lines on either Circuit A or B.

e. Equipping any TRK circuit for Automatic Ringdown requires a supplemental Talk and Signal Battery. Either a 24-or 48-volt Talk and 20-30 Hz Signal Battery will be required depending upon the loop length and type of signalling required.

NOTE

When equipping the system for Automatic Ringdown, consideration must be given to OPX telephones because the Talk and Signal Batteries used for Auto Ringdown will be common to the OPX supplemental battery requirements.

f. TRK No. 15-16 is reserved for Intercom functions only. Either the ICM line circuits card providing Dial Intercom, or the TRK-B line circuit card wired for Secretary/Executive Line or Dial Intercom, can be used in this position.

g. TRK No. 17-18 through 23-24 (on the EMB assembly) do not appear as pickup keys on the ET-1632 telephone.

h. TRK No. 09-10, TRK No. 11-12, TRK No. 17-18, and TRK No. 19-20 are arranged for "pickup restriction" programming at E-KEY extensions. Line circuits assigned to these positions should reflect any "pickup restriction" feature to be designated at individual E-KEY extensions.

Once the type of line circuit has been determined for each trunk number appearing in the KSU, the Trunk Installation Planning Sheet illustrated in FIGURE 8 should be completed to provide details for installation and programming of all system line circuits. Copies of the Trunk Planning Sheet are provided in the Appendix of this manual in order for planning sheets to be detailed and duplicated. A copy of the TRUNK PLANNING SHEET should remain on the installation site to allow service personnel to refer to the existing configurations. As shown in FIGURE 8, the type of line circuit and TRK No. location (as well as corresponding station pickup key) is detailed in the Line Type column. Particular features assigned to the line circuit that are installer programmed on the line circuit card are as follows:

a. Night Transfer ..... Determine whether the CO/PBX line or Ringdown Line will be assigned to ring during Night Service.

b. Trunk-Trunk ..... Trunk-to-Trunk conference requires that the serving CO/PBX line provides a disconnect signal to ensure disconnect of the conference circuit. The installer must program the card for "forced disconnect" if the serving CO/PBX Line provides such an operation.

c. Executive-User ..... When equipped for a Secretary or Executive Line, the system extension number of the Executive Station must be programmed on the TRK-B printed circuit card.

d. Secretary-User ..... When equipped for a Secretary Line, the system extension number of the Secretary station must be programmed on the TRK-B printed-circuit card.

e. DP-DTMF ..... Some line circuits provide either DP or DTMF type signalling. The card must be programmed for the type of signalling required.

f. Auto-Ringdown ..... Some line circuits provide Auto Ringdown as a program option.

In addition to feature/function programming on the line circuit, the line circuit may be assigned specific features on the system Program Boards (PSB). These features include:

OMEGA III
ELECTRONIC
KEY SYSTEM
WORKSHEET

CUSTOMER NAME — ESTIMATED IN-SERVICE DATE

CUSTOMER ADDRESS

DATE PREPARED

TRUNK ASSIGNMENT SHEET

NOTES:

		CENTRAL OFFICE LINES 1632/2460																2460 ONLY							
TELEPHONE NUMBER OR BUTTON FUNCTION																									
TYPE OF CARD - TWO CIRCUITS PER CARD																ICM	ICM								
BUTTON NUMBER		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
TYPE OF LINE ASSOCIATED WITH BUTTON	CENTRAL OFFICE/PABX TONE																								
	CENTRAL OFFICE/PABX ROTARY																								
	AUTOMATIC RINGDOWN/TIE LINE																								
	DIAL INTERCOM																								
	ATTENDANT INTERCOM																								
	EXECUTIVE INTERCOM																								
	SECRETARY HOT LINE INTERCOM																								
	OTHER (SPECIFY)																								
FEATURES	NIGHT TRANSFER																								
	TRUNK TO TRUNK CONFERENCE																								
	EXECUTIVE USER NUMBER																								
	SECRETARY USER NUMBER																								
	TOLL RESTRICT - SOME TELEPHONES																								
	INDIVIDUAL C.O. RINGING																								
	DIAL RESTRICT - SOME TELEPHONES																								
	OPX ACCESS NUMBER																								
	LOUD BELL																								

SUBTOTAL OF TRK CARDS
COT _____
COR _____
TRK-A _____
TRK-B _____
ICM _____
CPA _____

NUMBER KEYS ON ET 1632

1	2	3	4	5	6	7	H
9	10	11	12	13	14	15	16

NUMBER KEYS ON ET 2460

1	2	3	4	5	6	7	H
17	18	19	20	21	22	23	24
9	10	11	12	13	14	15	16

FIGURE 8 Trunk Installation Planning Sheet

a. Toll Restriction ..... Determine whether the CO/PBX Line circuit will be designated as Toll Restricted at assigned extensions.

b. Individual CO Ringing. Determine whether the CO/PBX or Ringdown Line circuit will be programmed to ring at a specific extension. Assign the line to the corresponding group for ringing.

c. Dial Restriction ..... Determine whether the CO/PBX Line circuit will be designated as Dial Restricted (incoming) at assigned extensions.

d. OPX Line Group ..... Assign the CO/PBX Line to one of four specific dial access levels for OPX outside Line dialing. Assignment of no CO/PBX Lines to a dial access group will restrict OPX telephones to incoming CO/PBX calls only.

In addition to the programming considerations, the CO/PBX or Ringdown Line can be assigned to operate a loud-ringing bell during Day or Night service period. In addition, a notation should be made whether the line is associated with an Individual CO ringing group.

2.3.3 STATION CIRCUITS

The general System Planning Sheet details the total number and type of stations to appear in the system. Omega-Phone III utilizes two types of station instruments: E-KEY telephones and OPX telephones. Each type of station interfaces to the KSU through a dedicated station circuit. Four stations are provided on each station circuit printed-circuit card.

E-KEY stations interface with the KSU by using the SUB printed-circuit card. Each SUB card interfaces up to four E-KEY stations. The SUB card requires programming of individual station features, as well as a "secretary transfer" feature common to all four extensions on the same SUB circuit card.

SUB card extension assignment determines the system dial codes for the particular extensions, as shown in FIGURE 6. SUB cards should be equipped on the KSU starting from the lowest number in order to minimize the number of Crosspoint (XPS) cards and to limit use of the EMB assembly to applications exceeding 32 station circuits.

The total number of SUB circuit cards required is determined by taking the total number of E-KEY stations and dividing by four, rounding off to the next highest number.

NOTE

Certain SUB card station circuit slots on the KSU are reserved for special functions. Extensions 20 and 21 are reserved for use as CP-60 Call Processor positions and as CO/PBX line common bell ringing positions when no individual CO ringing program board is installed. SUB card station circuits No. 44 through 47 and 48 through 51 are reserved for use either for E-KEY stations or OPX stations.

The Omega-Phone III may be equipped with a maximum of eight OPX telephones. OPX telephones may be rotary dial or DTMF dial models. Specified card slots and extension numbers are assigned for OPX telephones. OPX telephones connect to the KSU through the OPX printed circuit card. Each OPX card interfaces up to four extensions. One or two OPX cards can be equipped on the KSU. Unused extension numbers on the OPX card cannot be used for E-KEY telephones. Whenever OPX cards are added to the KSU, an MFR OPX interface must be ordered. When DTMF type OPX telephones are used, the MDEC DTMF receiver printed circuit card must be installed in the system. The MDEC plugs into the MFR OPX interface.

NOTE

In planning for OPX extensions, consideration should be given to"toll restriction"because DTMF type OPX telephones will require station dials incorporating special "toll restrictor"functions. Rotary dial OPX telephones can be "toll restricted" as the KSU will encompass all rotary-dial OPX instruments.

NOTE

Use of OPX telephones requires a supplemental Talk and Signal Battery. The Talk and Signal Battery required is determined by the loop length and type of signalling required. Either a 24- or 48-volt Talk Battery or 20/30 Hz Signal Battery can be used. In addition to providing power to the OPX circuits, the Talk and Signal Battery also serves the Automatic Ringdown trunk circuits if the system is so equipped.

When the system is equipped for Multi-Trunk or Trunk-to-Trunk conference, a TCU trunk conference printed-circuit card must be provided. A TCU card provides two conference circuits that are shared by all CO/PBX Lines in

service. Four station circuits are required for one TCU card. The TCU circuit card provides a conference bridge with no amplification. End-to-End voice characteristics are determined by the serving CO/PBX Line characteristics. A second TCU card can be installed in the KSU if usage of the conference features warrants. Use of the second TCU card reduces the system extension capacity by four extensions.

The Extension Planning Sheet, illustrated in FIGURE 9, details the individual extension equipment and features. Each Extension Planning Sheet details two SUB (or OPX) station circuits totalling eight stations. Copies of the planning sheet are provided in the Appendix of this manual to allow planning sheets to be detailed and duplicated. Copies should remain on the equipment site to allow service personnel to refer to the existing program. The type of telephone (1632/2460 E-KEY or OPX station) is listed in the"Telephone Model"column. The seven SUB printed-circuit card features determining the station class of service setting are specified, as follows:

a. Executive Override(Enable) — Determines whether the E-KEY extension automatically defeats the CO/PBX Line Privacy.

b. Do-Not-Disturb (Enable) — Determines whether the station will be allowed the Do-Not-Disturb (DND) option.

c. Hold Recall (Disable) — Determines whether the individual station "hold recall" feature will be enabled.

d. Night Transfer (Enable) — Determines whether the individual E-KEY station will be assigned to the Night Service Group.

e. All-Call (Disable) — Determines whether the individual E-KEY station will receive system All-Call voice page.

f. Busy Voice Call (Disable) — Determines whether the individual E-KEY station will receive an incoming call indication when already busy on a CO/PBX or ICM line call.

g. Secretary Transfer(Enable) — Determines the station number that is assigned to receive the transferred intercom calls from all four stations appearing on the same SUB card.

Certain individual station features and functions require programming on the system program boards (PSB). These include:

1. Extension No. _____ To _____

2. Option features			SUB. NO. EXTENSION NO. 1	EXTENSION NO. 2	EXTENSION NO. 3	EXTENSION NO. 4	SUB. NO. EXTENSION NO. 1	EXTENSION NO. 2	EXTENSION NO. 3	EXTENSION NO. 4
	TELEPHONE MODEL									
SUB PROGRAM NOTE 1)	1. EXECUTIVE OVERRIDE (1)									
	2. DO-NOT-DISTURB (1)									
	3. HOLD RECALL (1)									
	4. NIGHT TRANSFER (1)									
	5. ALL-CALL (1)									
	6. BUSY VOICE CALL (1)									
	7. SECRETARIAL TRANSFER (6)									
PSB PROGRAM	1. TOLL RESTRICTION									
	2. INDIVIDUAL CO RINGING									
	3. GROUP CALL									
	4. CO OUTGOING RESTRICTION									
	OPX 5. NIGHT RINGING									
	OPX 6. CO DIAL RESTRICTION									
KEY TELEPHONE — KEY SPU TELEPHONE PICKUP RESTRICTIONS	ET 1632/2460 LINE KEY	9 ( )								
		10 ( )								
		11 ( )								
		12 ( )								
	ET 2460 ONLY LINE KEY	17 ( )								
		18 ( )								
		19 ( )								
		20 ( )								
KEY TELEPHONE — ADDITIONAL EQUIPMENT	1. WALL MOUNT									
	2. HANDSFREE TALKBACK									
	3. HANDSFREE ADAPTER									
	4. OTHER									

3. Subtotal of required components

1. ET-1632 _____. 4. PSB CARD _____. 7. MFR/MDEC _____. 10. WALL MOUNTS _____.
2. ET-2460 _____. 5. OPX CARD _____. 8. HF TALKBACK _____. 11. OTHER ( ) _____.
3. SUB CARD _____. 6. TCU CARD _____. 9. HF ADAPTER _____. 12. STJ _____.

NOTE 1. Number in parenthesis indicates quantity of program jacks (STJ) required per E-key station; secretarial transfer requires up to six STJ per sub ca

a. Toll Restriction	Determines whether the station will be "toll restricted" on CO/PBX Line(s), as designated on the Trunk Planning Sheet.
b. Individual Assignment CO Ring	Up to 12 extensions can ring on assigned CO/PBX Lines. List the line(s) assigned to the individual extension.
c. Group Call	The E-KEY extension can be assigned to one of four internal dial access groups. List the group number to which the individual extension is assigned.
d. CO Dial Restriction	The E-KEY extension can be assigned to be limited to incoming calls (dial restricted) on CO/PBX Lines (see Trunk Planning Sheet).
e. CO Night Transfer (OPX)	Applicable to OPX telephones only. OPX Night Service assignment requires use of the system program boards (PSB). List whether the station will be assigned to Night Service.
f. CO Dial Restriction (OPX)	Individual OPX extensions can be designated "dial restricted" (incoming only) for all CO/PBX Line calls. List which OPX extensions will be dial restricted.

Certain line pickup keys on E-KEY stations have"pickup restriction"capability. Designate which stations are to be restricted on the specified pickup keys. List all station optional assemblies provided on the individual station. Total the number of individual station assemblies/components required.

NOTE

When a TCU card is assigned to the referenced SUB card slot, only a notation that a TCU is equipped is required for the SUB slot on the Extension Planning Sheet.

2.3.4 CROSSPOINT CIRCUITS

After determining the number of line circuits and station circuits required on a particular system, the number of crosspoint (XPS) cards must be determined. FIGURE 10 illustrates the relationship between station or line circuits and the number of crosspoint (XPS) cards required.

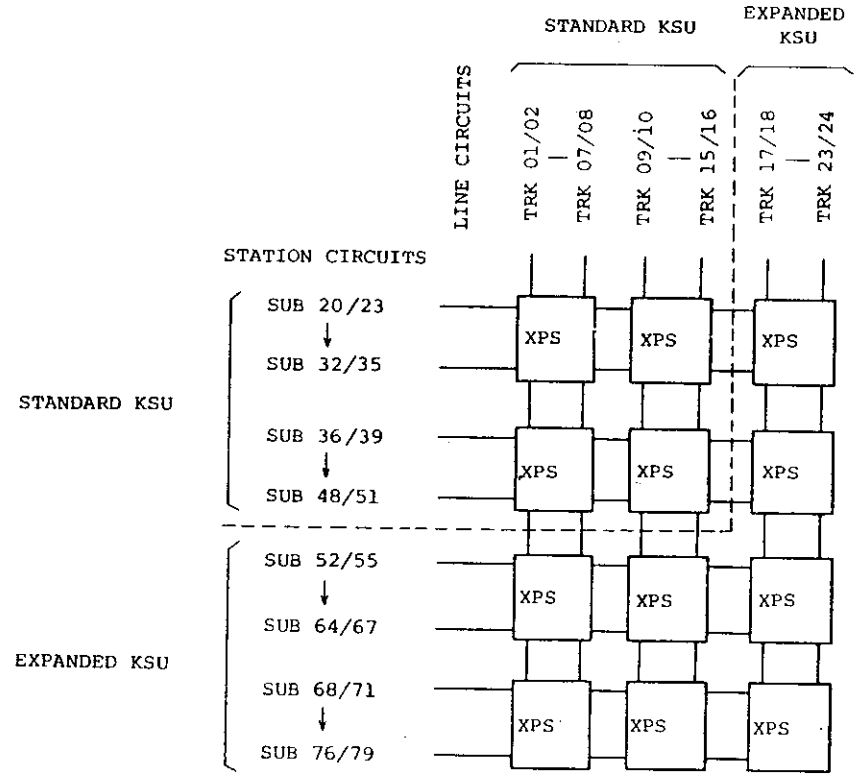


FIGURE 10 Crosspoint (XPS) Requirements

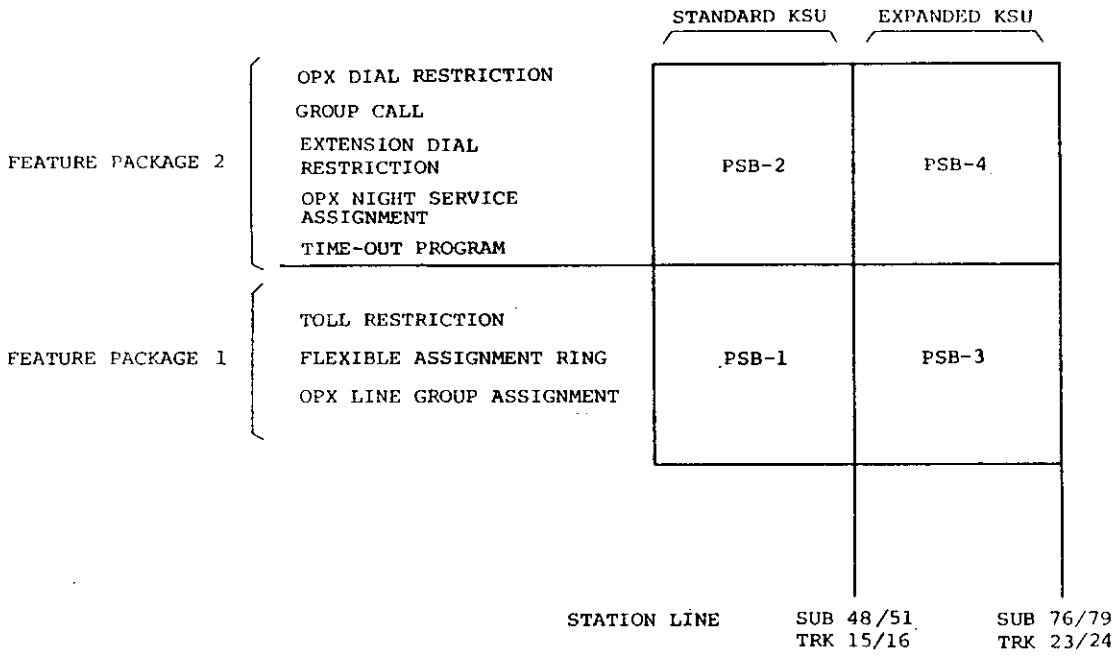
To determine total number of crosspoint cards, refer to the row showing the number of station circuits to be installed and match with the column indicating the maximum number of line circuits equipped. Four XPS cards are required for a complete Standard KSU, and 12 are required for a complete Expanded KSU. Be sure to include any TCU and OPX printed-circuit card in the number of station circuits in determining the XPS card requirements.

If a group of SUB (station) circuits includes only ET-1632 telephones, no Crosspoint card is required for the station circuits to access the Expansion (EMB) line circuits (Trunks No. 17/18 through 23/24).

2.3.5 PROGRAM CIRCUITS

After determining the trunk and station circuit features, the number of system program boards (PSB) can be determined. Up to four PSB cards can be installed in the system. The number of PSB's required is determined by the Feature Package assigned to a particular group of stations in the

system. FIGURE 11 illustrates the relationship between the Feature Package and system line and station circuits.



NOTES:
1. OPX Night Service Assignment feature does not require PSB-4 to be installed.
2. Time-Out program setting does not require PSB-4 to be installed.
3. OPX Dial Restriction feature does not require PSB-4 to be installed.

FIGURE 11 Program Board Requirements

To determine whether the PSB is required, review the Extension Planning Sheet and determine whether any feature listed for the particular feature package is required. Then determine the lines or station associated with the feature to determine whether one or two Program Boards are required.

NOTE

If a particular station feature does not include the line(s) dedicated to a certain PSB card for the feature, no PSB card is required for that particular feature. For example, if all "toll restricted" lines and stations are assigned to circuits associated with PSB-1, no PSB-2 program board is required. Certain features of Feature Package No. 2 do not require the PSB-4 program board. The OPX Dial Restriction, Night Service assignment, and the Time-Out programming do not require a PSB-4 program board because all programming is accomplished on the PSB-2 program board.

2.3.6 PROGRAM ASSIGNMENTS

To prepare for the programming of system and station features, an Extension/Line Feature Assignment Sheet, as illustrated in FIGURE 12a, should be prepared. This allows the installer to program the system program boards without having to review all Extension and Trunk Planning Sheets.

FIGURE 12a lists PSB feature programming for all extensions in SUB slots (including OPX) 20 through 51. Four entries, in accordance with the code illustrated in the figure, should be used to list the station and line for each feature.

In addition to the four entries illustrated in FIGURE 12a one additional entry is required for OPX CO/PBX Line group assignment. The group number (1 through 4) is specified for each CO/PBX Line.

FIGURE 12b lists PSB feature programming for all extensions in SUB slots 52 through 79.

2.3.7 SYSTEM TIME-OUT

The Omega-Phone III KTS provides different timer intervals for various system time-related functions. TABLE 8 lists the timer intervals for all system functions. The PSB-2 program board allows change of the system basic timer periods (illustrated in TABLE 8 as Setting No. 1). The time function for each feature should be chosen before placing the program board (PSB-2) into service.

2.3.8 PROGRAM STRAPPING PINS

Strapping pin jacks (STJ) are used for programming various features on the CO/PBX trunk cards and station "class of service" (feature) settings on the E-KEY station circuit (SUB) card. The STJ's are provided in quantities of 100. The standard KSU comes with 100 STJ's for assigning basic features. Additional program jacks are required when E-KEY station "class of service" settings are used. Refer to the Extension Planning Sheet to determine the total number of STJs for each SUB circuit card.

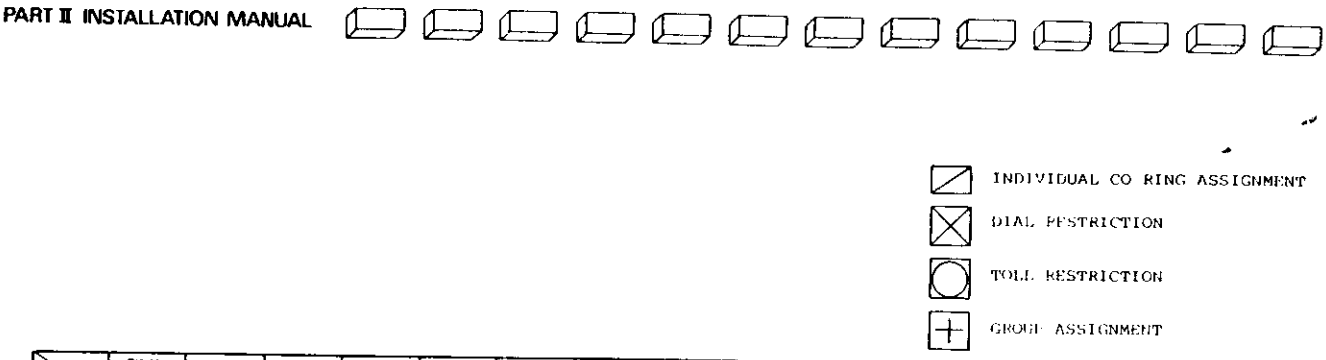


FIGURE 12a Extension/Line Feature Assignment (Ext.20-51)

INDIVIDUAL CO RING ASSIGNMENT

DIAL RESTRICTION

TOLL RESTRICTION

GROUP ASSIGNMENT

		TRK		TRK		TRK		TRK		TRK		TRK		TRK		TRK		TRK		TRK		ICM GROUP				NOTE
		01	02	03	04	05	06	09	10	11	12	13	14	17	18	19	20	21	22	23	24	01	02	03	04	
SUB	52																									
	53																									
	54																									
	55																									
SUB	56																									
	57																									
	58																									
	59																									
SUB	60																									
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	71																									
SUB	72																									
	73																									
	74																									
	75																									
SUB	76																									
	77																									
	78																									
	79																									
SUB																										

FIGURE 12b Extension/Line Feature Assignment (Ext.52-79)

TABLE 8 SYSTEM TIME SETTINGS

FUNCTION SETTING	NO.	INTER-DIGIT TIMING	WARNING TONE DURATION	ADD KEY VALID TIME	HOLD RECALL	ATTND RECALL	VOICE PAGE VALID	KEY PRE-SELECT
WITHOUT PSB-2	o	10 seconds	20 seconds	10 seconds	180 seconds	60 seconds	15 seconds	10 seconds
	1	5	5	5	20	10	5	5
	2	10	10	10	40	20	10	10
	3	15	15	15	60	30	15	15
	4	20	20	20	80	40	20	20
	5	25	25	25	100	50	25	25
	6	30	30	30	120	60	30	30
	7	35	35	35	140	70	35	35
	8	40	40	40	160	80	40	40
	9	45	45	45	180	90	45	45
	10	50	50	50	200	100	50	50
	11	55	55	55	220	110	55	55
	12	60	60	60	240	120	60	60
	13	65	65	65	255	130	65	65
	14	70	70	70	255	140	70	70
	15	75	75	75	255	150	75	75

NOTE: Switch setting 0 shows system timing of each function if PSB-2 is not installed.

All times indicated are listed in seconds.

SECTION 3 KSU INSTALLATION

This section describes the procedures required for installing and equipping the ET-2460 KSU. Information is provided to enable the installer to properly mount and equip the KSU for various system configurations. In addition, instructions are provided for interfacing the KSU to various external circuits.

3.1 UNPACKING AND HANDLING

3.1.1 GENERAL

The ET-2460 KSU consists of a one-piece metal cabinet that houses all the system printed-circuit card assemblies. The design of the system is modular; the system is equipped for a basic configuration and expanded for operation through the use of plug-in circuit cards. FIGURE 13 illustrates the basic ET-2460 KSU cabinet assembly.

Unpack the KSU as follows:

a. Remove the ET-2460 KSU from the shipping carton by opening the top flaps, discarding the protective panels, grasping the two pull handles provided on the side of the KSU cabinet, and pulling the KSU out. Inspect the KSU for external damage to the equipment cabinet.

b. Remove the front cover of the KSU by loosening the four screws on the front of the KSU cabinet and sliding off the front cover.

3.1.2 INSPECTION

After removing the front panel, inspect the KSU motherboard for physical damage. Ensure that:

a. No cracks are present on the motherboard.

b. All connectors on the motherboard are intact, no short circuits or cracks are evident.

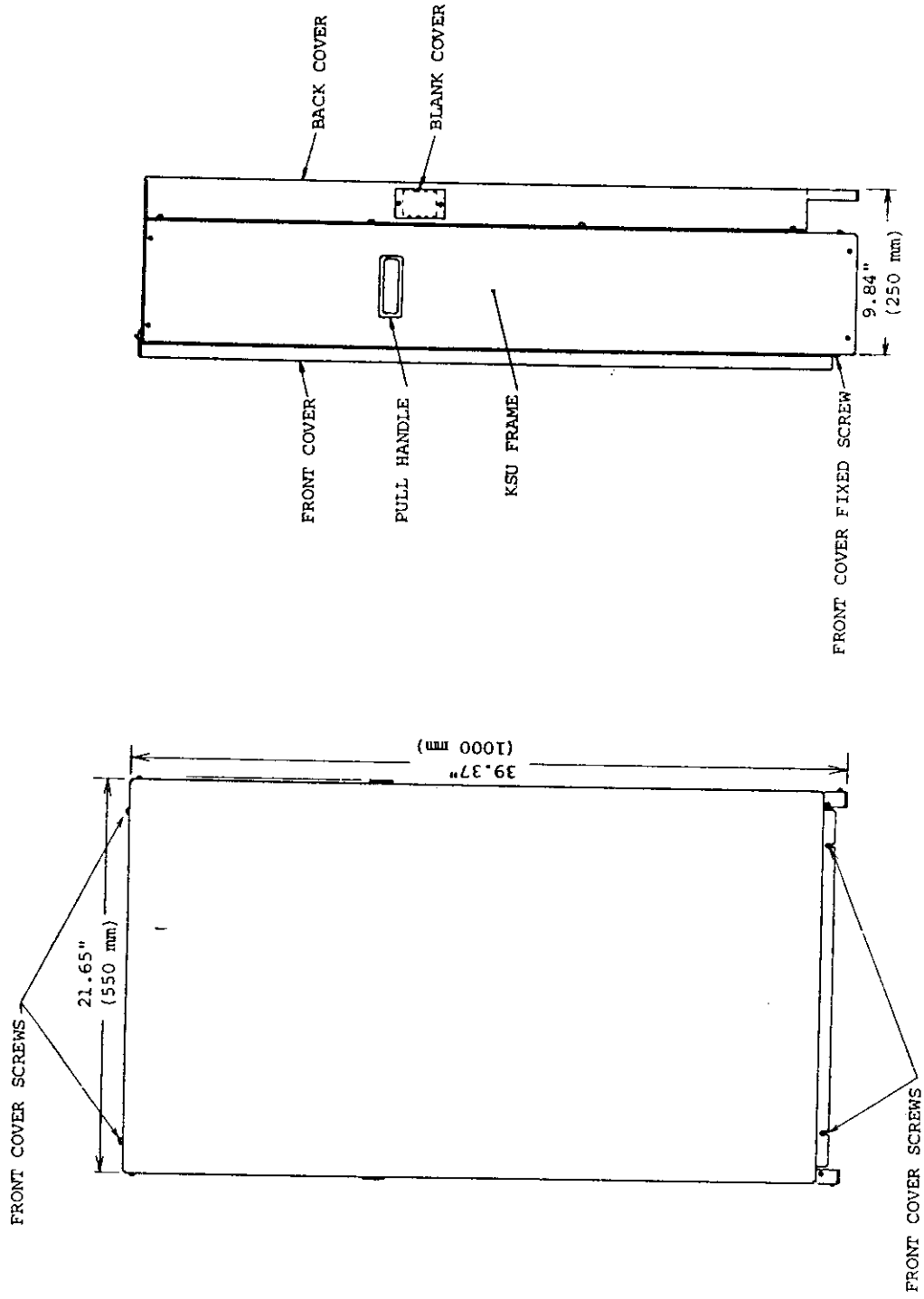


FIGURE 13 ET-2460 Key Service Unit

c. All screws holding the KSU intact are tight; no misalignment of the KSU printed-circuit mounting assemblies is present.

3.1.3 COMPONENTS

The ET-2460 KSU comes equipped with four common equipment cards. The MPU, MEM, and VTA common cards are supplied separately in their own carton whereas the PFJ common card is mounted. The common cards should not be inserted into the KSU until all KSU preparations (see below) have been performed and provision has been made for grounding.

3.2 EXPANSION ASSEMBLY (EMB) INSTALLATION

3.2.1 STANDARD KSU CAPACITY

The standard ET-2460 KSU comes factory-wired for the standard capacity listed in TABLE 1. Refer to TABLE 1 to determine if capacity of the standard KSU must be increased by addition of EMB expansion assembly.

3.2.2 INSTALLATION OF EMB

The EMB Expansion Assembly must be installed in the KSU prior to mounting the KSU or insertion of any printed-circuit cards. After determining that the EMB is required, prepare the KSU for expansion by removing both the front and back covers of the KSU cabinet. Proceed as follows:

a. Refer to FIGURE 14, Component Parts of Expanded Motherboard (EMB) Assembly. Unpack EMB Assembly and verify that each item is included and no physical damage is evident.

b. Refer to FIGURE 15, Mounting and Routing of EMB in KSU, for mounting the EMB Assembly in the standard KSU.

   (1) Attach EMB printed-circuit card to upper KSU frame using the six FP3x6S screws included in EMB Assembly.

   (2) Use one SM1-3x6 screw to secure center of EMB to KSU metal bracket.

c. Refer to FIGURE 15, Mounting and Routing of EMB Assembly in KSU, for connections between the standard KSU Motherboard (MDB) Assembly and terminals of the EMB Assembly.

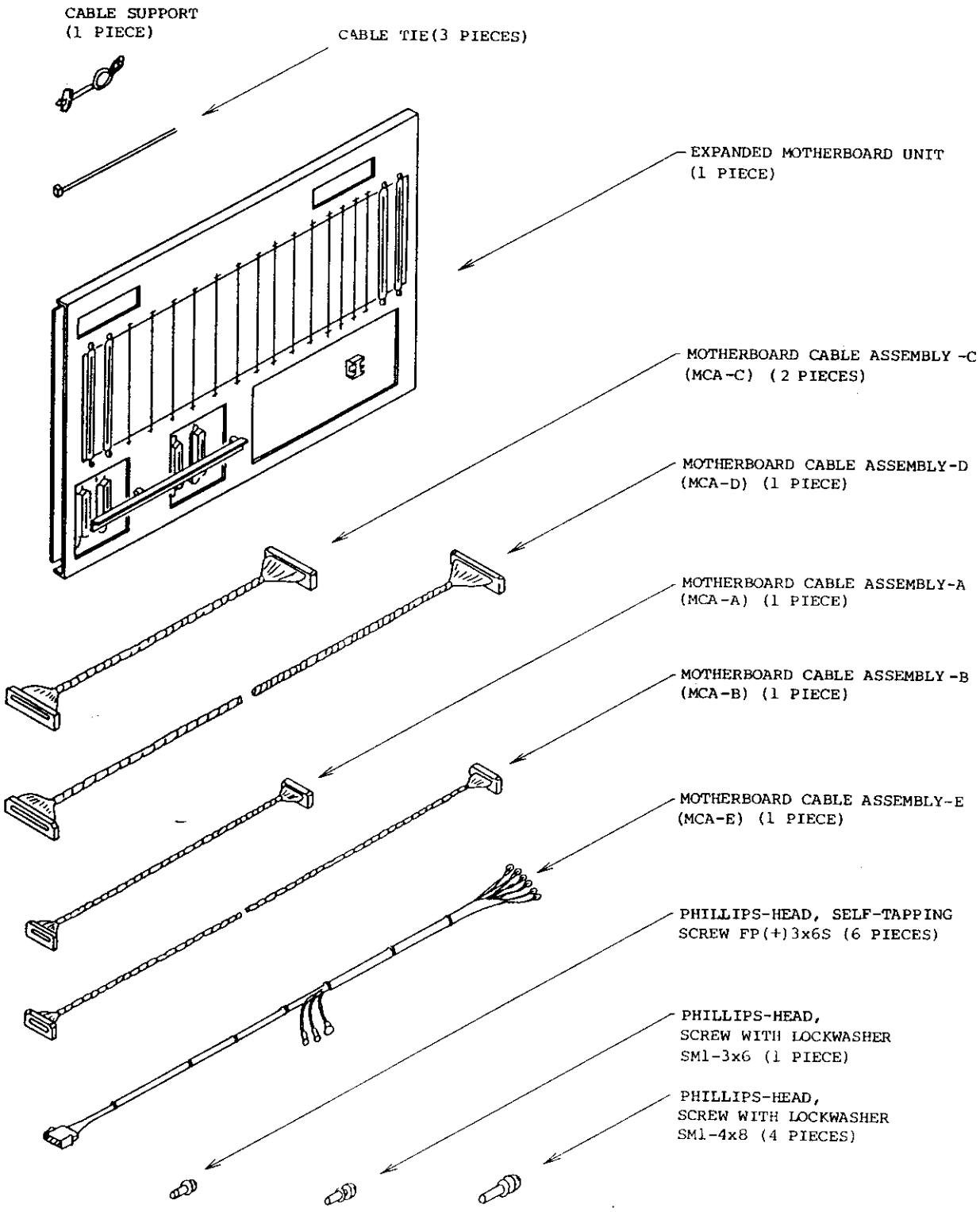
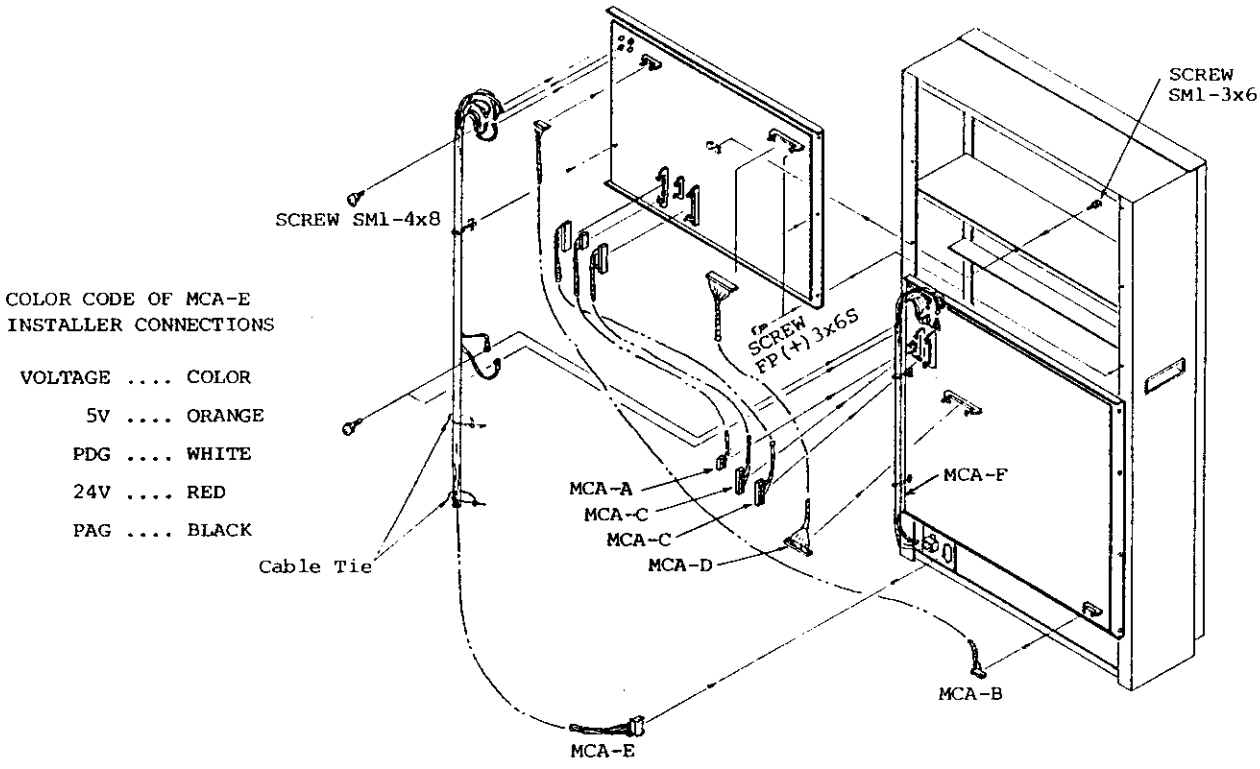


FIGURE 14 Component Parts of Expanded Motherboard Assembly(EMB)



CABLE CONNECTIONS BETWEEN MBD AND EMB

MBD CONN. NO.	TYPE OF CABLE	EMB CONN. NO.
CONN. 1	MCA-C	CONN. 1
2	MCA-C	2
3	MCA-A	3
4	MCA-D	4
5	MCA-B	5

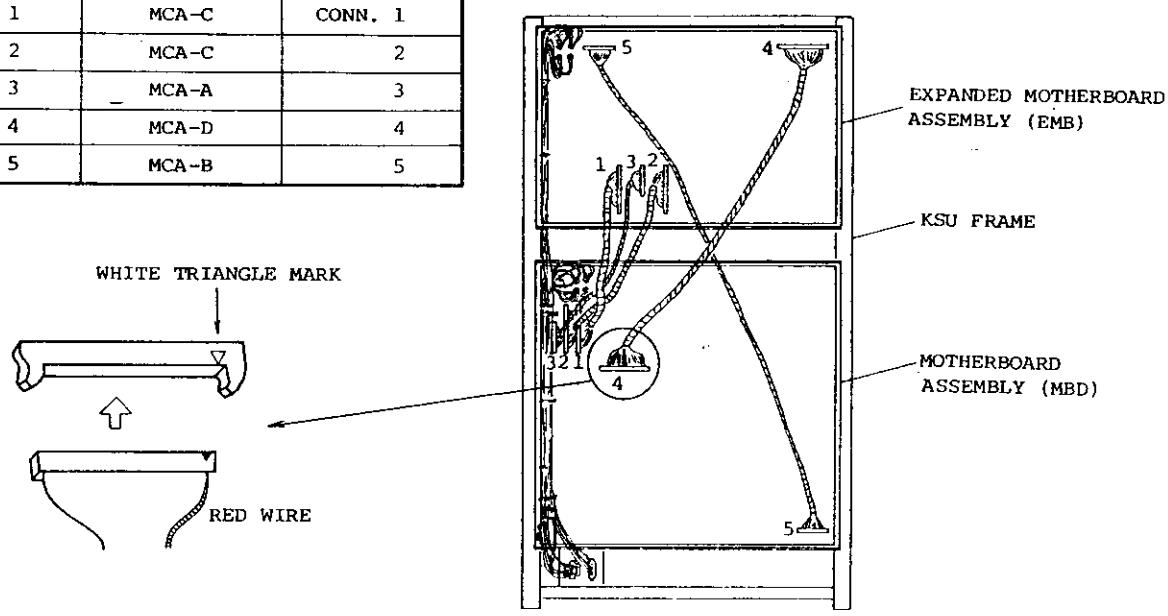


FIGURE 15 Mounting and Routing of Expanded Motherboard Assembly in Key Service Unit

(1) Connect cable assemblies MCA-A, MCA-B, MCA-C (2), and MCA-D to connectors on MBD and EMB Assemblies.

(2) Route MCA-E cable assembly as shown in FIGURE 15. Secure MCA-E connector on base of MBD as shown. Utilize Cable Ties provided to secure MCA-E cable to existing wiring harness, being careful not to disturb existing connection.

(3) Referring to FIGURE 15, establish connections of MCA-E power functions in accordance with the color code. Two locations require terminations by the installer:

(a) The four SM1-4x8 screws provided on EMB Assembly to establish connections on top of EMB as illustrated in FIGURE 15.

(b) Establish three connections on MBD Assembly in accordance with color code for 5V (orange), PDG (white), and PAG (black) functions.

CAUTION

When establishing connections for MCA-E power functions, ensure that no short circuit occurs between terminations.

(4) Check all connections to ensure that connections are established in accordance with FIGURE 15.

(5) Remove two blank covers on top of KSU equipment cable to provide for cable entrance facilities for EMB Assembly.

3.3 KSU LOCATION

The ET-2460 KSU should be placed in a location that is dry and exhibits a relatively stable temperature subject to the environmental limitations given in paragraph 1.8.3. The area should be accessible to service personnel and relatively free of dust and vibration.

The area should contain a suitable number of electrical outlets of commercial power for all system components. A dedicated (separately fused) main power line source is recommended to ensure equipment operation even in the event of other equipment power failure.

Ample space should be allotted for the installation of the system components, MDF, and external equipment such as music sources and PA amplifiers. A minimum of 3-inch spacing should be maintained between the KSU and power supply or MDF components.

The KSU can either be floor- or wall-mounted. Wall mounting is recommended, although floor mounting can be used if the KSU is mounted on a stand that elevates the KSU for servicing and protects it from possible damage by water, cleaning equipment,etc. FIGURE 16 illustrates the wall-mounting requirements for the KSU. The KSU back panel can be used for locating the wall-mounting screws. The KSU should be wall mounted on a suitable backboard with hardware strong enough to secure the cabinet.

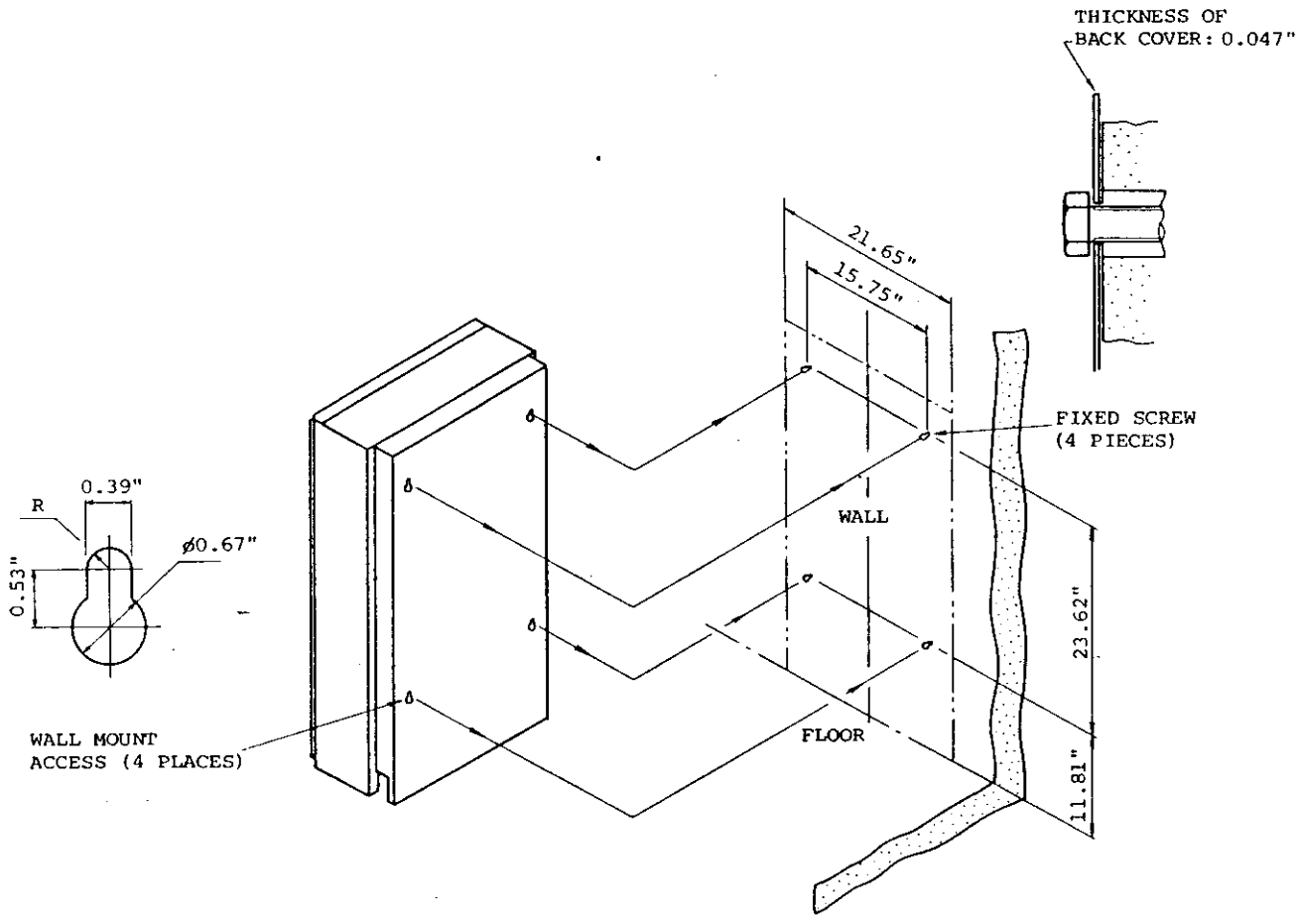


FIGURE 16 Wall Mounting of Key Service Unit

3.4 POWER SUPPLY INSTALLATION

3.4.1 REQUIREMENTS

The ET-2460 KSU requires the PWS-A Power Supply when the standard KSU capacity is used. When the EMB is added to the KSU and used for additional E-KEY stations, the PWS-B Power Supply is also required. Use of the EMB for additional line circuit appearances does not require use of the PWS-B Power Supply if the number of stations is less than 32.

3.4.2 INSTALLATION

The PWS-A Power Supply (and PWS-B Power Supply) should be installed on the right hand side of the KSU equipment cabinet, no closer than 3 inches from the side of the cabinet. Each power supply comes equipped with a connector cable assembly that is plugged into the receptacle on the power supply.

CAUTION

Before any connection is established between the KSU and Power Supplies, ensure that both the power supply ON-OFF switches are turned to the OFF position and that the AC main cord(s) are unplugged.

Route the 9-pin connector cable of the PWS-A Power Supply through the cable entrance on the lower right of the KSU. Insert the connector into the receptacle on the base of the standard motherboard (the connector is keyed to prevent improper insertion).

Route the 4-pin connector cable of the PWS-B Power Supply (if equipped) through the cable entrance on the lower right of the KSU. Insert the connector into the receptacle on the base of the standard motherboard (the connector is keyed to prevent improper insertion).

3.4.3 GROUNDING

PWS-A and PWS-B (if equipped) must be earth grounded to ensure safety and operation. A ground post is provided on the power supply cabinets and should be connected to a cold water pipe or ground rod. A heavy copper conductor, No. 14 AWG or better, should be used to establish connections to the earth ground point.

Although the power supplies utilize a three prong plug that can connect to electrical ground, use of the external ground strap is recommended.

No earth ground should be derived from associated telephone company equipment or terminations, but use of the same earth ground point is acceptable.

3.5 MAIN DISTRIBUTION FRAME

3.5.1 REQUIREMENTS

The ET-2460 KSU utilizes ribbon-type connectors to establish connections with the MDF and CO/PBX Line functions. FIGURE 17 illustrates a typical MDF terminal block layout and function assignment.

A 25-pair, male/female, Amphenol-ended cable is used to connect the KSU to the telephone company RJ21X interface. A CO/PBX Line Trunk cross-connection field is located internal to the KSU for individual line assignment and disconnection.

E-KEY Station and OPX Station Circuits appearing on the MBD and EMB assemblies are connected to terminal blocks on the MDF through 25-pair, male-ended, Amphenol cables. Up to eight station circuits are assigned on each cable.

CP-60 Call Processor/BLF-60 units and Power Failure transfer extensions use 6-pair, male-ended, Amphenol cables. Both cable assemblies are provided with the equipment; one cable assembly for the CP-60/BLF-60 is supplied with each KSU, and the cable assembly used for the Power Failure extensions is supplied with the PFU Assembly.

FIGURE 18 illustrates the connector locations and terminal arrangements on the MBD and EMB assemblies. A connector clamp, consisting of a bar with a locking screw on each end, can be adjusted for various connector cover heights. All KSU-MDF cables should use the cable entrance on the left side of the KSU cabinet. FIGURE 19 illustrates typical wiring between the MDF Terminal Block, key telephones, and the CP-60/BLF-60.

3.5.2 Terminal Block Pin Assignments. MDF Terminal Block Pin Number assignments for KSU-MDF cables are illustrated in the following tables. Terminal blocks utilized on the MDF should be installer-marked with the terminal designations. TABLE 9 illustrates the MBD-KSU connector Cables A,B,C,D, and D1 (OPX) conductor and terminal block pin number designations. TABLE 10 illustrates KSU connector cable PFT and CP-60/BLF conductor and terminal block pin number designations. TABLE 11 illustrates the EMB-KSU connector Cables E,F,G, and H and terminal block pin number designations.

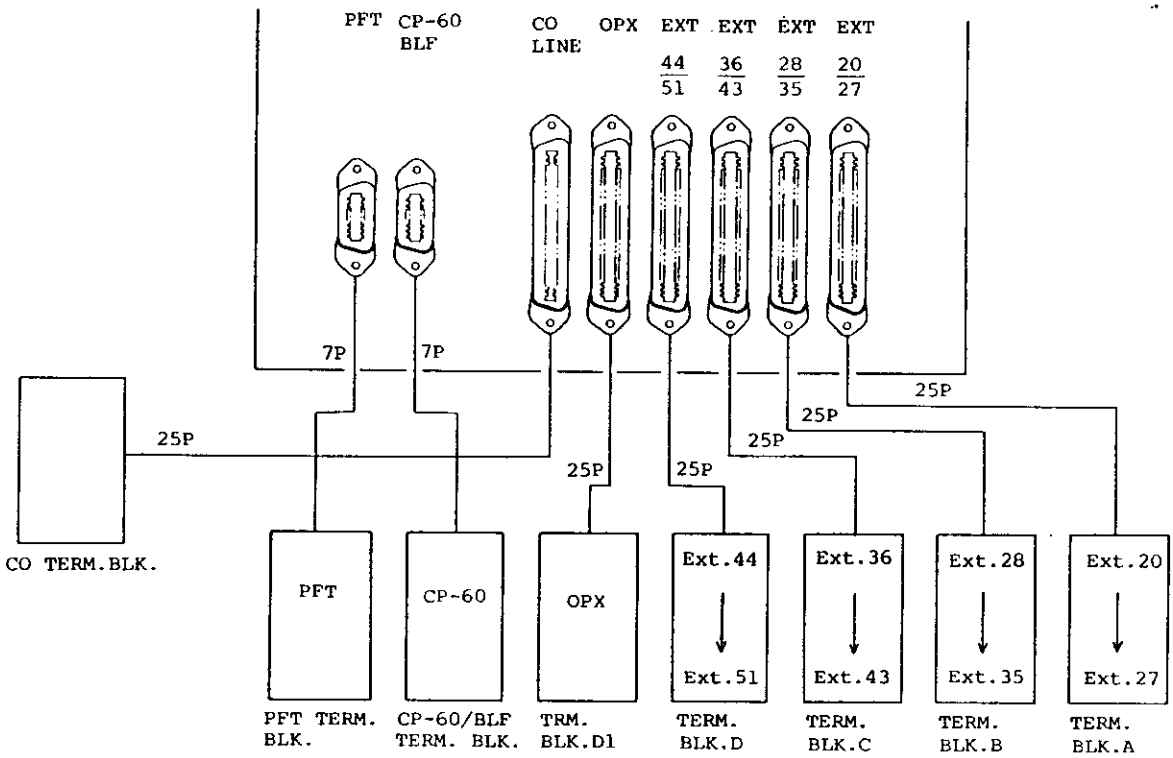


FIGURE 17a MDF Cable and Terminal Block Requirements

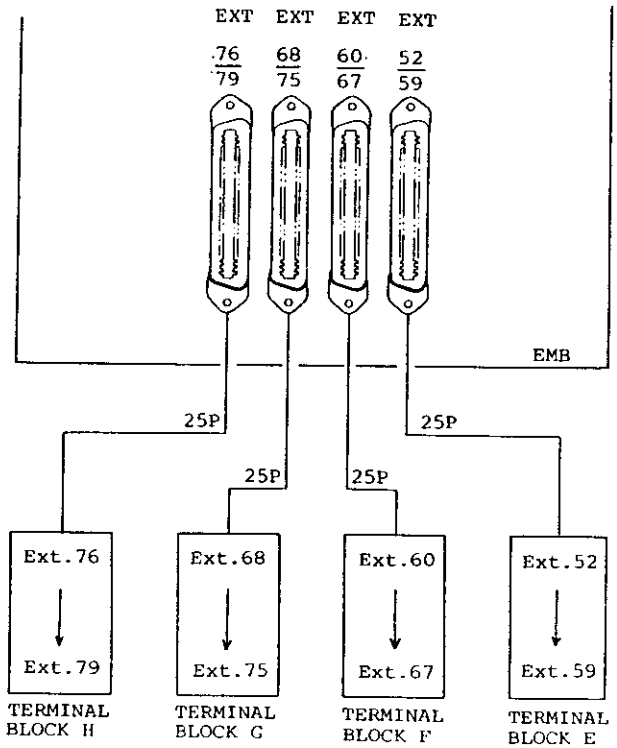


FIGURE 17b MDF Cable and Terminal Block Requirements (EMB)

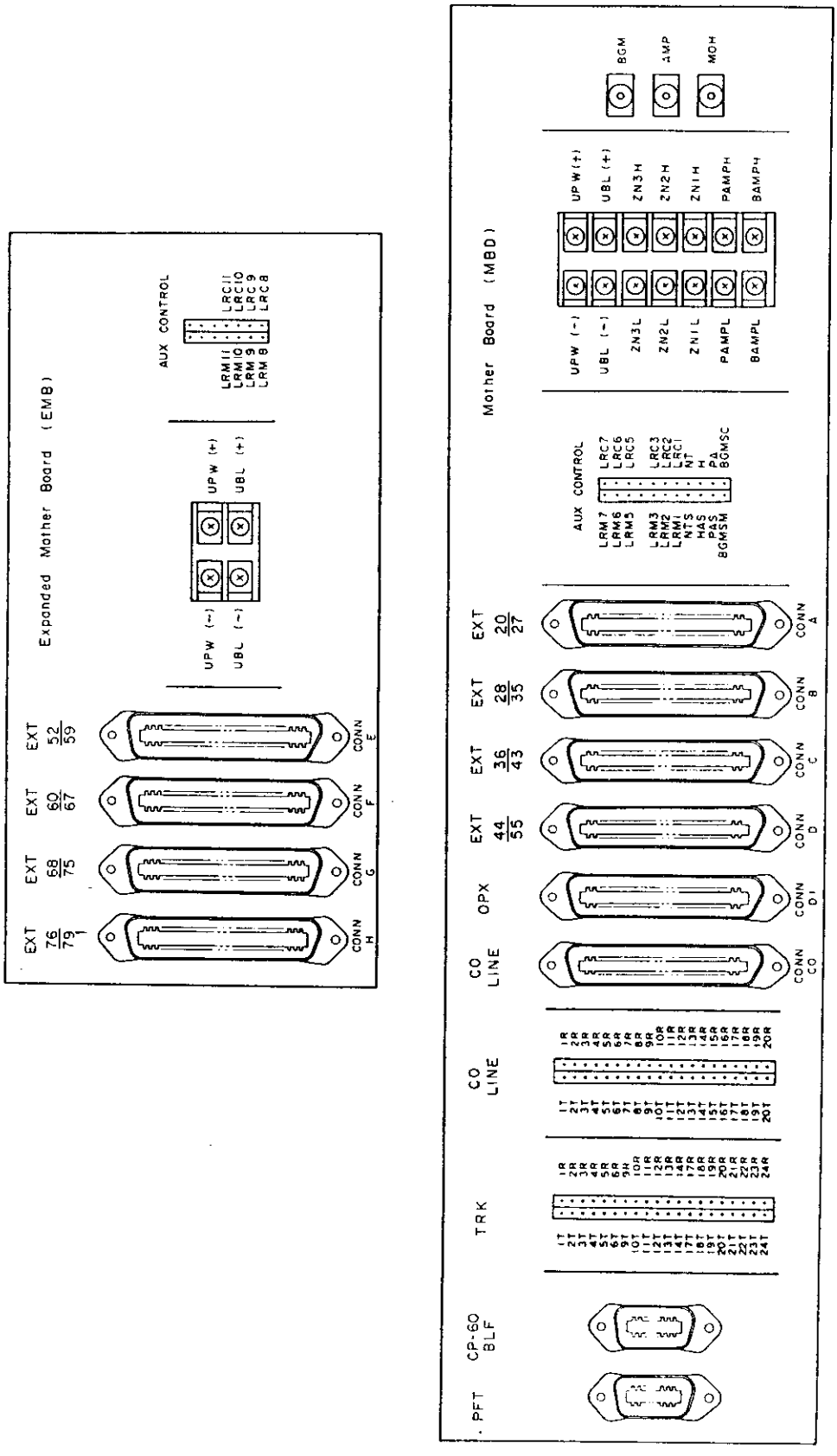


FIGURE 18 KSU Connector Layout (continued)

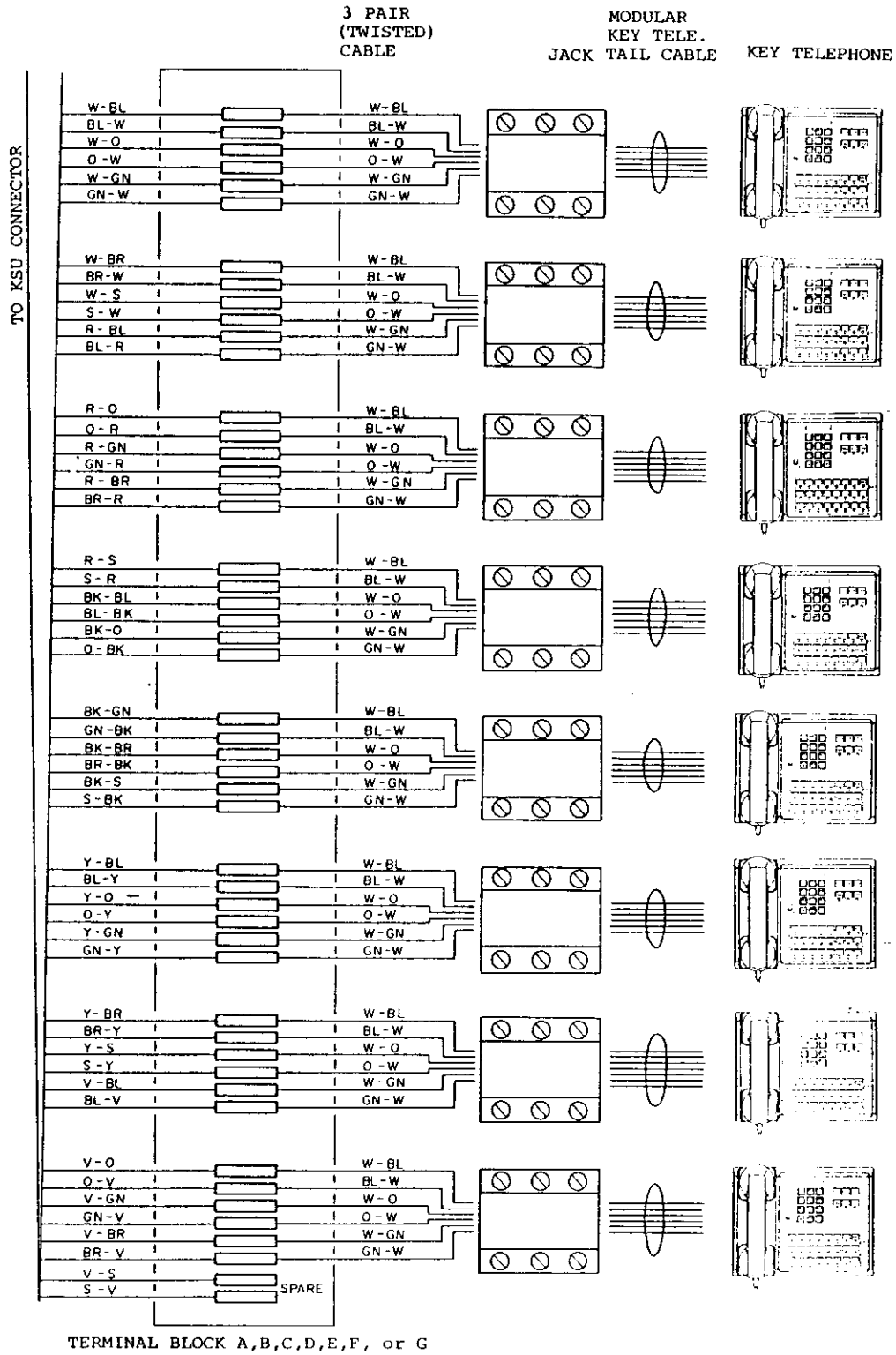


FIGURE 19 Typical MDF-KSU-Extension

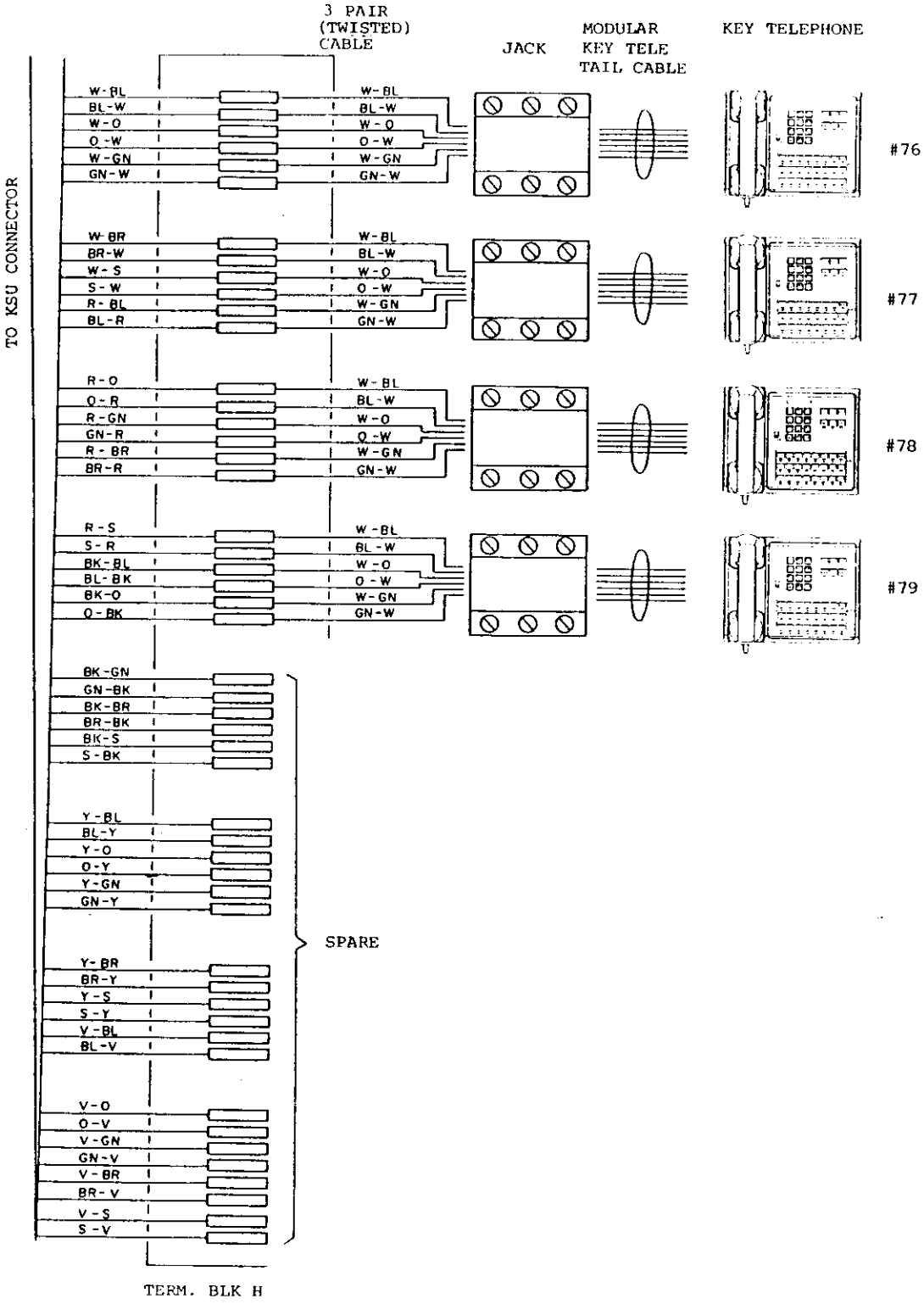
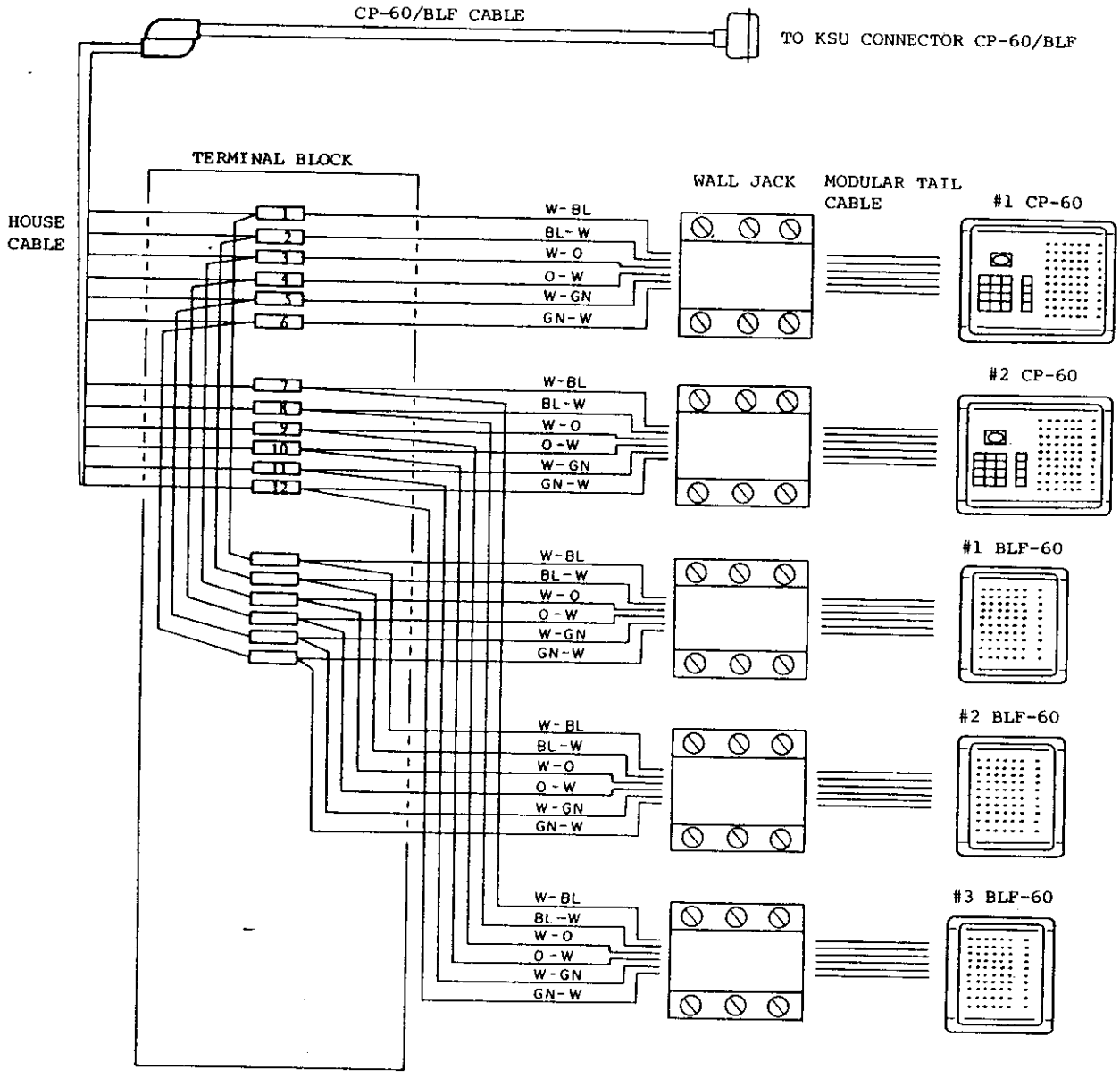


FIGURE 19 continued



CP-60 Terminal Block Pin Assignment

TERMINAL BLOCK CLIP NO.	FUNCTION	HOUSE CABLE COLOR	CP-60/BLF CABLE COLOR
1	#1 Battery	WH-BL	BL-RD1
2	#1 Battery	BL-WH	BL-BK1
3	#1 Channel A	WH-OR	OR-RD1
4	#1 GND	OR-WH	OR-BK1
5	#1 GND	WH-GR	GR-RD1
6	#1 Channel B	GR-WH	GR-BK1
7	#2 Battery	WH-BL	PK-RD1
8	#2 Battery	BL-WH	PK-BK1
9	#2 Channel A	WH-OR	SL-RD1
10	#2 GND	OR-WH	SL-BK1
11	#2 GND	WH-GR	BD-RD2
12	#2 Channel B	GR-WH	BL-BK2

TABLE 9 MBD-KSU CONNECTOR CABLES

CONN-A BLOCK

FUNCTION	LEAD DESIGN.	CONN. PIN NO.	KSU CABLE COLOR	CLIP NO.	NOTE
Ext. 20	BYPASS 2	26	WHT-BLU	1	
	BYPASS 1	1	BLU-WHT	2	
	TIP	27	WHT-ORN	3	
	RING	2	ORN-WHT	4	
	GROUND	28	WHT-GRN	5	
	DATA	3	GRN-WHT	6	
Ext. 21	BYPASS 2	29	WHT-BRN	7	
	BYPASS 1	4	BRN-WHT	8	
	TIP	30	WHT-SLT	9	
	RING	5	SLT-WHT	10	
	GROUND	31	RED-BLU	11	
	DATA	6	BLU-RED	12	
Ext. 22	BYPASS 2	32	RED-ORN	13	
	BYPASS 1	7	ORN-RED	14	
	TIP	33	RED-GRN	15	
	RING	8	GRN-RED	16	
	GROUND	34	RED-BRN	17	
	DATA	9	BRN-RED	18	
Ext. 23	BYPASS 2	35	RED-SLT	19	
	BYPASS 1	10	SLT-RED	20	
	TIP	36	BLK-BLU	21	
	RING	11	BLU-BLK	22	
	GROUND	37	BLK-ORN	23	
	DATA	12	ORN-BLK	24	
Ext. 24	BYPASS 2	38	BLK-GRN	25	
	BYPASS 1	13	GRN-BLK	26	
	TIP	39	BLK-BRN	27	
	RING	14	BRN-BLK	28	
	GROUND	40	BLK-SLT	29	
	DATA	15	SLT-BLK	30	
Ext. 25	BYPASS 2	41	YEL-BLU	31	
	BYPASS 1	16	BLU-YEL	32	
	TIP	42	YEL-ORN	33	
	RING	17	ORN-YEL	34	
	GROUND	43	YEL-GRN	35	
	DATA	18	GRN-YEL	36	
Ext. 26	BYPASS 2	44	YEL-BRN	37	
	BYPASS 1	19	BRN-YEL	38	
	TIP	45	YEL-SLT	39	
	RING	20	SLT-YEL	40	
	GROUND	46	VIO-BLU	41	
	DATA	21	BLU-VIO	42	
Ext. 27	BYPASS 2	47	VIO-ORN	43	
	BYPASS 1	22	ORN-VIO	44	
	TIP	48	VIO-GRN	45	
	RING	23	GRN-VIO	46	
	GROUND	49	VIO-BRN	47	
	DATA	24	BRN-VIO	48	
SPARE	Δ	50	VIO-SLT	49	
	Δ	25	SLT-VIO	50	

CONN-B BLOCK

FUNCTION	LEAD DESIGN.	CONN. PIN NO.	KSU CABLE COLOR	CLIP NO.	NOTE
Ext. 28	BYPASS 2	26	WHT-BLU	1	
	BYPASS 1	1	BLU-WHT	2	
	TIP	27	WHT-ORN	4	
	RING	2	ORN-WHT	4	
	GROUND	28	WHT-GRN	5	
	DATA	3	GRN-WHT	6	
Ext. 29	BYPASS 2	29	WHT-BRN	7	
	BYPASS 1	4	BRN-WHT	8	
	TIP	30	WHT-SLT	9	
	RING	5	SLT-WHT	10	
	GROUND	31	RED-BLU	11	
	DATA	6	BLU-RED	12	
Ext. 30	BYPASS 2	32	RED-ORN	13	
	BYPASS 1	7	ORN-RED	14	
	TIP	33	RED-GRN	15	
	RING	8	GRN-RED	16	
	GROUND	34	RED-BRN	17	
	DATA	9	BRN-RED	18	
Ext. 31	BYPASS 2	35	RED-SLT	19	
	BYPASS 1	10	SLT-RED	20	
	TIP	36	BLK-BLU	21	
	RING	11	BLU-BLK	22	
	GROUND	37	BLK-ORN	23	
	DATA	12	ORN-BLK	24	
Ext. 32	BYPASS 2	38	BLK-GRN	25	
	BYPASS 1	13	GRN-BLK	26	
	TIP	39	BLK-BRN	27	
	RING	14	BRN-BLK	28	
	GROUND	40	BLK-SLT	29	
	DATA	15	SLT-BLK	30	
Ext. 33	BYPASS 2	41	YEL-BLU	31	
	BYPASS 1	16	BLU-YEL	32	
	TIP	42	YEL-ORN	33	
	RING	17	ORN-YEL	34	
	GROUND	43	YEL-GRN	35	
	DATA	18	GRN-YEL	36	
Ext. 34	BYPASS 2	44	YEL-BRN	37	
	BYPASS 1	19	BRN-YEL	38	
	TIP	45	YEL-SLT	39	
	RING	20	SLT-YEL	40	
	GROUND	46	VIO-BLU	41	
	DATA	21	BLU-VIO	42	
Ext. 35	BYPASS 2	47	VIO-ORN	43	
	BYPASS 1	22	ORN-VIO	44	
	TIP	48	VIO-GRN	45	
	RING	23	GRN-VIO	46	
	GROUND	49	VIO-BRN	47	
	DATA	24	BRN-VIO	48	
SPARE	Δ	50	VIO-SLT	49	
	Δ	25	SLT-VIO	50	

TABLE 9 (continued)

CONN-C BLOCK

FUNCTION	LEAD DESIGN.	CONN. PIN NO.	KSU CABLE COLOR	CLIP NO.	NOTE
Ext. 36	BYPASS 2	26	WHT-BLU	1	
	BYPASS 1	1	BLU-WHT	2	
	TIP	27	WHT-ORN	3	
	RING	2	ORN-WHT	4	
	GROUND	28	WHT-GRN	5	
	DATA	3	GRN-WHT	6	
Ext. 37	BYPASS 2	29	WHT-BRN	7	
	BYPASS 1	4	BRN-WHT	8	
	TIP	30	WHT-SLT	9	
	RING	5	SLT-WHT	10	
	GROUND	31	RED-BLU	11	
	DATA	6	BLU-RED	12	
Ext. 38	BYPASS 2	32	RED-ORN	13	
	BYPASS 1	7	ORN-RED	14	
	TIP	33	RED-GRN	15	
	RING	8	GRN-RED	16	
	GROUND	34	RED-BRN	17	
	DATA	9	BRN-RED	18	
Ext. 39	BYPASS 2	35	RED-SLT	19	
	BYPASS 1	10	SLT-RED	20	
	TIP	36	BLK-BLU	21	
	RING	11	BLU-BLK	22	
	GROUND	37	BLK-ORN	23	
	DATA	12	ORN-BLK	24	
Ext. 40	BYPASS 2	38	BLK-GRN	25	
	BYPASS 1	13	GRN-BLK	26	
	TIP	39	BLK-BRN	27	
	RING	14	BRN-BLK	28	
	GROUND	40	BLK-SLT	29	
	DATA	15	SLT-BLK	30	
Ext. 41	BYPASS 2	41	YEL-BLU	31	
	BYPASS 1	16	BLU-YEL	32	
	TIP	42	YEL-ORN	33	
	RING	17	ORN-YEL	34	
	GROUND	43	YEL-GRN	35	
	DATA	18	GRN-YEL	36	
Ext. 42	BYPASS 2	44	YEL-BRN	37	
	BYPASS 1	19	BRN-YEL	38	
	TIP	45	YEL-SLT	39	
	RING	20	SLT-YEL	40	
	GROUND	46	VIO-BLU	41	
	DATA	21	BLU-VIO	42	
Ext. 43	BYPASS 2	47	VIO-ORN	43	
	BYPASS 1	22	ORN-VIO	44	
	TIP	48	VIO-GRN	45	
	RING	23	GRN-VIO	46	
	GROUND	49	VIO-BRN	47	
	DATA	24	BRN-VIO	48	
SPARE	Δ	50	VIO-SLT	49	
	Δ	25	SLT-VIO	50	

CONN-D BLOCK

FUNCTION	LEAD DESIGN.	CONN. PIN NO.	KSU CABLE COLOR	CLIP NO.	NOTE
Ext. 44	BYPASS 2	26	WHT-BLU	1	
	BYPASS 1	1	BLU-WHT	2	
	TIP	27	WHT-ORN	3	
	RING	2	ORN-WHT	4	
	GROUND	28	WHT-GRN	5	
	DATA	3	GRN-WHT	6	
Ext. 45	BYPASS 2	29	WHT-BRN	7	
	BYPASS 1	4	BRN-WHT	8	
	TIP	30	WHT-SLT	9	
	RING	5	SLT-WHT	10	
	GROUND	31	RED-BLU	11	
	DATA	6	BLU-RED	12	
Ext. 46	BYPASS 2	32	RED-ORN	13	
	BYPASS 1	7	ORN-RED	14	
	TIP	33	RED-GRN	15	
	RING	8	GRN-RED	16	
	GROUND	34	RED-BRN	17	
	DATA	9	BRN-RED	18	
Ext. 47	BYPASS 2	35	RED-SLT	19	
	BYPASS 1	10	SLT-RED	20	
	TIP	36	BLK-BLU	21	
	RING	11	BLU-BLK	22	
	GROUND	37	BLK-ORN	23	
	DATA	12	ORN-BLK	24	
Ext. 48	BYPASS 2	38	BLK-GRN	25	
	BYPASS 1	13	GRN-BLK	26	
	TIP	39	BLK-BRN	27	
	RING	14	BRN-BLK	28	
	GROUND	40	BLK-SLT	29	
	DATA	15	SLT-BLK	30	
Ext. 49	BYPASS 2	41	YEL-BLU	31	
	BYPASS 1	16	BLU-YEL	32	
	TIP	42	YEL-ORN	33	
	RING	17	ORN-YEL	34	
	GROUND	43	YEL-GRN	35	
	DATA	18	GRN-YEL	36	
Ext. 50	BYPASS 2	44	YEL-BRN	37	
	BYPASS 1	19	BRN-YEL	38	
	TIP	45	YEL-SLT	39	
	RING	20	SLT-YEL	40	
	GROUND	46	VIO-BLU	41	
	DATA	21	BLU-VIO	42	
Ext. 51	BYPASS 2	47	VIO-ORN	43	
	BYPASS 1	22	ORN-VIO	44	
	TIP	48	VIO-GRN	45	
	RING	23	GRN-VIO	46	
	GROUND	49	VIO-BRN	47	
	DATA	24	BRN-VIO	48	
SPARE	Δ	50	VIO-SLT	49	
	Δ	25	SLT-VIO	50	

TABLE 9 (continued)

CONN. D1 (OPX) BLOCK

FUNCTION	LEAD DESIGN.	CONN. PIN NO.	KSU CABLE COLOR	CLIP NO.	NOTE
OPX 1	1T	26	WHT-BLU	1	
(Ext.44)	1R	1	BLU-WHT	2	
OPX 2	2T	27	WHT-ORN	3	
(Ext.45)	2R	2	ORN-WHT	4	
OPX 3	3T	28	WHT-GRN	5	
(Ext.46)	3R	3	GRN-WHT	6	
OPX 4	4T	29	WHT-BRN	7	
(Ext.47)	4R	4	BRN-WHT	8	
OPX 5	5T	30	WHT-SLT	9	
(Ext.48)	5R	5	SLT-WHT	10	
OPX 6	6T	31	RED-BLU	11	
(Ext.49)	6R	6	BLU-RED	12	
OPX 7	7T	32	RED-ORN	13	
(Ext.50)	7R	7	ORN-RED	14	
OPX 8	8T	33	RED-GRN	15	
(Ext.51)	8R	8	GRN-RED	16	
		34	RED-BRN	17	
		9	BRN-RED	18	
		35	RED-SLT	19	
		10	SLT-RED	20	
		36	BLK-BLU	21	
		11	BLU-BLK	22	
		37	BLK-ORN	23	
		12	ORN-BLK	24	
		38	BLK-GRN	25	
		13	GRN-BLK	26	
		39	BLK-BRN	27	
		14	BRN-BLK	28	
		40	BLK-SLT	29	
		15	SLT-BLK	30	
SPARE		41	YEL-BLU	31	
		16	BLU-YEL	32	
		42	YEL-ORN	33	
		17	ORN-YEL	34	
		43	YEL-GRN	35	
		18	GRN-YEL	36	
		44	YEL-BRN	37	
		19	BRN-YEL	38	
		45	YEL-SLT	39	
		20	SLT-YEL	40	
		46	VIO-BLU	41	
		21	BLU-VIO	42	
		47	VIO-ORN	43	
		22	ORN-VIO	44	
		48	VIO-GRN	45	
		23	GRN-VIO	46	
		49	VIO-BRN	47	
		24	BRN-VIO	48	
		50	VIO-SLT	49	
		25	SLT-VIO	50	

TABLE 10 KSU CONNECTOR CABLE, PFT AND CP-60 BLF

CP-60/BLF CONN BLOCK

FUNCTION	LEAD DESIGN.	CONN. PIN NO.	KSU CABLE COLOR	CLIP NO.	NOTE
CP-60 #1	+24	26	WHT-BLU	1	
	+24	1	BLU-WHT	2	
	A	27	WHT-ORN	3	
	AG	2	ORN-WHT	4	
	AG	28	WHT-GRN	5	
	B	3	GRN-WHT	6	
CO-60 #2	+24	29	WHT-BRN	7	
	+24	4	BRN-WHT	8	
	A	30	WHT-SLT	9	
	AG	5	SLT-WHT	10	
	AG	31	RED-BLU	11	
	B	6	BLU-RED	12	
SPARE	Δ	32	RED-ORN	13	
	Δ	7	ORN-RED	14	
	Δ	33	RED-GRN	15	
	Δ	8	GRN-RED	16	
	Δ	34	RED-BRN	17	
	Δ	9	BRN-RED	18	
	Δ	35	RED-SLT	19	
	Δ	10	SLT-RED	20	
	Δ	36	BLK-BLU	21	
	Δ	11	BLU-BLK	22	
	Δ	37	BLK-ORN	23	
	Δ	12	ORN-BLK	24	
	Δ	38	BLK-GRN	25	
	Δ	13	GRN-BLK	26	
	Δ	39	BLK-BRN	27	
	Δ	14	BRN-BLK	28	
	Δ	40	BLK-SLT	29	
	Δ	15	SLT-BLK	30	
	Δ	41	YEL-BLU	31	
	Δ	16	BLU-YEL	32	
	Δ	42	YEL-ORN	33	
	Δ	17	ORN-YEL	34	
	Δ	43	YEL-GRN	35	
	Δ	18	GRN-YEL	36	
	Δ	44	YEL-BRN	37	
	Δ	19	BRN-YEL	38	
	Δ	45	YEL-SLT	39	
	Δ	20	SLT-YEL	40	
	Δ	46	VIO-BLU	41	
	Δ	21	BLU-VIO	42	
	Δ	47	VIO-ORN	43	
	Δ	22	ORN-VIO	44	
	Δ	48	VIO-GRN	45	
	Δ	23	GRN-VIO	46	
	Δ	49	VIO-BRN	47	
	Δ	24	BRN-VIO	48	
	Δ	50	VIO-SLT	49	
	Δ	25	SLT-VIO	50	

PFT CONN. BLOCK

FUNCTION	LEAD DISIGN.	CONN. PIN NO.	KSU CABLE COLOR	CLIP NO.	NOTE
PFT 1	1T	26	WHT-BLU	1	
	1R	1	BLU-WHT	2	
PFT 2	2T	27	WHT-ORN	3	
	2R	2	ORN-WHT	4	
PFT 3	3T	28	WHT-GRN	5	
	3R	3	GRN-WHT	6	
PFT 4	4T	29	WHT-BRN	7	
	4R	4	BRN-WHT	8	
PFT 5	5T	30	WHT-SLT	9	
	5R	5	SLT-WHT	10	
SPARE	Δ	31	RED-BLU	11	
	Δ	6	BLU-RED	12	
	Δ	32	RED-ORN	13	
	Δ	7	ORN-RED	14	
	Δ	33	RED-GRN	15	
	Δ	8	GRN-RED	16	
	Δ	34	RED-BRN	17	
	Δ	9	BRN-RED	18	
	Δ	35	RED-SLT	19	
	Δ	10	SLT-RED	20	
	Δ	36	BLK-BLU	21	
	Δ	11	BLU-BLK	22	
	Δ	37	BLK-ORN	23	
	Δ	12	ORN-BLK	24	
	Δ	38	BLK-GRN	25	
	Δ	13	GRN-BLK	26	
	Δ	39	BLK-BRN	27	
	Δ	14	BRN-BLK	28	
	Δ	40	BLK-SLT	29	
	Δ	15	SLT-BLK	30	
	Δ	41	YEL-BLU	31	
	Δ	16	BLU-YEL	32	
	Δ	42	YEL-ORN	33	
	Δ	17	ORN-YEL	34	
	Δ	43	YEL-GRN	35	
	Δ	18	GRN-YEL	36	
	Δ	44	YEL-BRN	37	
	Δ	19	BRN-YEL	38	
	Δ	45	YEL-SLT	39	
	Δ	20	SLT-YEL	40	
	Δ	46	VIO-BLU	41	
	Δ	21	BLU-VIO	42	
	Δ	47	VIO-ORN	43	
	Δ	22	ORN-VIO	44	
	Δ	48	VIO-GRN	45	
	Δ	23	GRN-VIO	46	
	Δ	49	VIO-BRN	47	
	Δ	24	BRN-VIO	48	
	Δ	50	VIO-SLT	49	
	Δ	25	SLT-VIO	50	

TABLE 11 EMB-KSU CONNECTOR CABLES

CONN-E BLOCK

FUNCTION	LEAD DESIGN.	CONN. PIN NO.	KSU CABLE COLOR	CLIP NO.	NOTE
Ext. 52	BYPASS 2	26	WHT-BLU	1	
	BYPASS 1	1	BLU-WHT	2	
	TIP	27	WHT-ORN	3	
	RING	2	ORN-WHT	4	
	GROUND	28	WHT-GRN	5	
	DATA	3	GRN-WHT	6	
Ext. 53	BYPASS 2	29	WHT-BRN	7	
	BYPASS 1	4	BRN-WHT	8	
	TIP	30	WHT-SLT	9	
	RING	5	SLT-WHT	10	
	GROUND	31	RED-BLU	11	
	DATA	6	BLU-RED	12	
Ext. 54	BYPASS 2	32	RED-ORN	13	
	BYPASS 1	7	ORN-RED	14	
	TIP	33	RED-GRN	15	
	RING	8	GRN-RED	16	
	GROUND	34	RED-BRN	17	
	DATA	9	BRN-RED	18	
Ext. 55	BYPASS 2	35	RED-SLT	19	
	BYPASS 1	10	SLT-RED	20	
	TIP	36	BLK-BLU	21	
	RING	11	BLU-BLK	22	
	GROUND	37	BLK-ORN	23	
	DATA	12	ORN-BLK	24	
Ext. 56	BYPASS 2	38	BLK-GRN	25	
	BYPASS 1	13	GRN-BLK	26	
	TIP	39	BLK-BRN	27	
	RING	14	BRN-BLK	28	
	GROUND	40	BLK-SLT	29	
	DATA	15	SLT-BLK	30	
Ext. 57	BYPASS 2	41	YEL-BLU	31	
	BYPASS 1	16	BLU-YEL	32	
	TIP	42	YEL-ORN	33	
	RING	17	ORN-YEL	34	
	GROUND	43	YEL-GRN	35	
	DATA	18	GRN-YEL	36	
Ext. 58	BYPASS 2	44	YEL-BRN	37	
	BYPASS 1	19	BRN-YEL	38	
	TIP	45	YEL-SLT	39	
	RING	20	SLT-YEL	40	
	GROUND	46	VIO-BLU	41	
	DATA	21	BLU-VIO	42	
Ext. 59	BYPASS 2	47	VIO-ORN	43	
	BYPASS 1	22	ORN-VIO	44	
	TIP	48	VIO-GRN	45	
	RING	23	GRN-VIO	46	
	GROUND	49	VIO-BRN	47	
	DATA	24	BRN-VIO	48	
SPARE	Δ	50	VIO-SLT	49	
	Δ	25	SLT-VIO	50	

CONN-F BLOCK

FUNCTION	LEAD DESIGN.	CONN. PIN NO.	KSU CABLE COLOR	CLIP NO.	NOTE
Ext. 60	BYPASS 2	26	WHT-BLU	1	
	BYPASS 1	1	BLU-WHT	2	
	TIP	27	WHT-ORN	3	
	RING	2	ORN-WHT	4	
	GROUND	28	WHT-GRN	5	
	DATA	3	GRN-WHT	6	
Ext. 61	BYPASS 2	29	WHT-BRN	7	
	BYPASS 1	4	BRN-WHT	8	
	TIP	30	WHT-SLT	9	
	RING	5	SLT-WHT	10	
	GROUND	31	RED-BLU	11	
	DATA	6	BLU-RED	12	
Ext. 62	BYPASS 2	32	RED-ORN	13	
	BYPASS 1	7	ORN-RED	14	
	TIP	33	RED-GRN	15	
	RING	8	GRN-RED	16	
	GROUND	34	RED-BRN	17	
	DATA	9	BRN-RED	18	
Ext. 63	BYPASS 2	35	RED-SLT	19	
	BYPASS 1	10	SLT-RED	20	
	TIP	36	BLK-BLU	21	
	RING	11	BLU-BLK	22	
	GROUND	37	BLK-ORN	23	
	DATA	12	ORN-BLK	24	
Ext. 64	BYPASS 2	38	BLK-GRN	25	
	BYPASS 1	13	GRN-BLK	26	
	TIP	39	BLK-BRN	27	
	RING	14	BRN-BLK	28	
	GROUND	40	BLK-SLT	29	
	DATA	15	SLT-BLK	30	
Ext. 65	BYPASS 2	41	YEL-BLU	31	
	BYPASS 1	16	BLU-YEL	32	
	TIP	42	YEL-ORN	33	
	RING	17	ORN-YEL	34	
	GROUND	43	YEL-GRN	35	
	DATA	18	GRN-YEL	36	
Ext. 66	BYPASS 2	44	YEL-BRN	37	
	BYPASS 1	19	BRN-YEL	38	
	TIP	45	YEL-SLT	39	
	RING	20	SLT-YEL	40	
	GROUND	46	VIO-BLU	41	
	DATA	21	BLU-VIO	42	
Ext. 67	BYPASS 2	47	VIO-ORN	43	
	BYPASS 1	22	ORN-VIO	44	
	TIP	48	VIO-GRN	45	
	RING	23	GRN-VIO	46	
	GROUND	49	VIO-BRN	47	
	DATA	24	BRN-VIO	48	
SPARE	Δ	50	VIO-SLT	49	
	Δ	25	SLT-VIO	50	

TABLE 11 (continued)

CONN-G BLOCK

FUNCTION	LEAD DESIGN.	CONN. PIN NO.	KSU CABLE COLOR	CLIP NO.	NOTE
Ext. 68	BYPASS 2	26	WHT-BLU	1	
	BYPASS 1	1	BLU-WHT	2	
	TIP	27	WHT-ORN	3	
	RING	2	ORN-WHT	4	
	GROUND	28	WHT-GRN	5	
	DATA	3	GRN-WHT	6	
Ext. 69	BYPASS 2	29	WHT-BRN	7	
	BYPASS 1	4	BRN-WHT	8	
	TIP	30	WHT-SLT	9	
	RING	5	SLT-WHT	10	
	GROUND	31	RED-BLU	11	
	DATA	6	BLU-RED	12	
Ext. 70	BYPASS 2	32	RED-ORN	13	
	BYPASS 1	7	ORN-RED	14	
	TIP	33	RED-GRN	15	
	RING	8	GRN-RED	16	
	GROUND	34	RED-BRN	17	
	DATA	9	BRN-RED	18	
Ext. 71	BYPASS 2	35	RED-SLT	19	
	BYPASS 1	10	SLT-RED	20	
	TIP	36	BLK-BLU	21	
	RING	11	BLU-BLK	22	
	GROUND	37	BLK-ORN	23	
	DATA	12	ORN-BLK	24	
Ext. 72	BYPASS 2	38	BLK-GRN	25	
	BYPASS 1	13	GRN-BLK	26	
	TIP	39	BLK-BRN	27	
	RING	14	BRN-BLK	28	
	GROUND	40	BLK-SLT	29	
	DATA	15	SLT-BLK	30	
Ext. 73	BYPASS 2	41	YEL-BLU	31	
	BYPASS 1	16	BLU-YEL	32	
	TIP	42	YEL-ORN	33	
	RING	17	ORN-YEL	34	
	GROUND	43	YEL-GRN	35	
	DATA	18	GRN-YEL	36	
Ext. 74	BYPASS 2	44	YEL-BRN	37	
	BYPASS 1	19	BRN-YEL	38	
	TIP	45	YEL-SLT	39	
	RING	20	SLT-YEL	40	
	GROUND	46	VIO-BLU	41	
	DATA	21	BLU-VIO	42	
Ext. 75	BYPASS 2	47	VIO-ORN	43	
	BYPASS 1	22	ORN-VIO	44	
	TIP	48	VIO-GRN	45	
	RING	23	GRN-VIO	46	
	GROUND	49	VIO-BRN	47	
	DATA	24	BRN-VIO	48	
SPARE	Δ	50	VIO-SLT	49	
	Δ	25	SLT-VIO	50	

CONN-H BLOCK

FUNCTION	LEAD DESIGN.	CONN. PIN NO.	KSU CABLE COLOR	CLIP NO.	NOTE
Ext. 76	BYPASS 2	26	WHT-BLU	1	
	BYPASS 1	1	BLU-WHT	2	
	TIP	27	WHT-ORN	3	
	RING	2	ORN-WHT	4	
	GROUND	28	WHT-GRN	5	
	DATA	3	GRN-WHT	6	
Ext. 77	BYPASS 2	29	WHT-BRN	7	
	BYPASS 1	4	BRN-WHT	8	
	TIP	30	WHT-SLT	9	
	RING	5	SLT-WHT	10	
	GROUND	31	RED-BLU	11	
	DATA	6	BLU-RED	12	
Ext. 78	BYPASS 2	32	RED-ORN	13	
	BYPASS 1	7	ORN-RED	14	
	TIP	33	RED-GRN	15	
	RING	8	GRN-RED	16	
	GROUND	34	RED-BRN	17	
	DATA	9	BRN-RED	18	
Ext. 79	BYPASS 2	35	RED-SLT	19	
	BYPASS 1	10	SLT-RED	20	
	TIP	36	BLK-BLU	21	
	RING	11	BLU-BLK	22	
	GROUND	37	BLK-ORN	23	
	DATA	12	ORN-BLK	24	
SPARE	Δ	38	BLK-GRN	25	
	Δ	13	GRN-BLK	26	
	Δ	39	BLK-BRN	27	
	Δ	14	BRN-BLK	28	
	Δ	40	BLK-SLT	29	
	Δ	15	SLT-BLK	30	
	Δ	41	YEL-BLU	31	
	Δ	16	BLU-YEL	32	
	Δ	42	YEL-ORN	33	
	Δ	17	ORN-YEL	34	
	Δ	43	YEL-GRN	35	
	Δ	18	GRN-YEL	36	
	Δ	44	YEL-BRN	37	
	Δ	19	BRN-YEL	38	
	Δ	45	YEL-SLT	39	
	Δ	20	SLT-YEL	40	
	Δ	46	VIO-BLU	41	
	Δ	21	BLU-VIO	42	
	Δ	47	VIO-ORN	43	
	Δ	22	ORN-VIO	44	
	Δ	48	VIO-GRN	45	
	Δ	23	GRN-VIO	46	
	Δ	49	VIO-BRN	47	
	Δ	24	BRN-VIO	48	
	Δ	50	VIO-SLT	49	
	Δ	25	SLT-VIO	50	

3.6 KSU FEATURE SETTINGS

3.6.1 FEATURE DESCRIPTION

The MPU printed-circuit card requires installer programming of various system features before insertion of the card into the KSU. Feature programming is accomplished by strapping jack (STJ) settings. Operational features that require programming are:

a. Intercom Line Privacy/Non-Privacy. Determines whether the system features private or non-private conversations on the intercom lines.

b. Toll Restriction. Determines whether the system features CO/PBX Line toll restriction.

c. Voice/Tone ICM Dial Access. Determines the dial access level to voice or tone signalling when making calls on the Dial Intercom Lines.

d. Speed-Dialing. Determines whether the system will operate the optional Speed-Dialing call mechanism.

e. Last Number Re-dial. Determines whether the system will feature last number re-dial of CO/PBX Line calls.

3.6.2 FEATURE SETTING

To determine the feature settings on the MPU printed circuit card, refer to the strapping jack requirements listed in TABLE 12. Refer to FIGURE 20 for strapping jack locations and pin assignments on the MPU printed-circuit card. A total of 100 strapping jacks are supplied with each KSU.

TABLE 12 MPU CARD STRAPPING JACK ASSIGNMENT

FEATURE ASSIGNMENT	STJ REQUIRED	JACK LOCATION
INTERCOM LINE PRIVACY	NO	A
TOLL RESTRICTION	YES	B
VOICE 2-DIGIT ACCESS	NO	C
SPEED-DIALING	YES	D
LAST NUMBER RE-DIAL	YES	E
ATTENDANT CALL TO DND STATION	YES	F

CAUTION

Once MPU programming has been accomplished and the KSU has been earth grounded, the common equipment printed-circuit cards can be inserted into the KSU cabinet. It is good practice to physically touch the metal frame of the KSU cabinet prior to handling or inserting the circuit cards into the KSU, to discharge any body electrostatic potential.

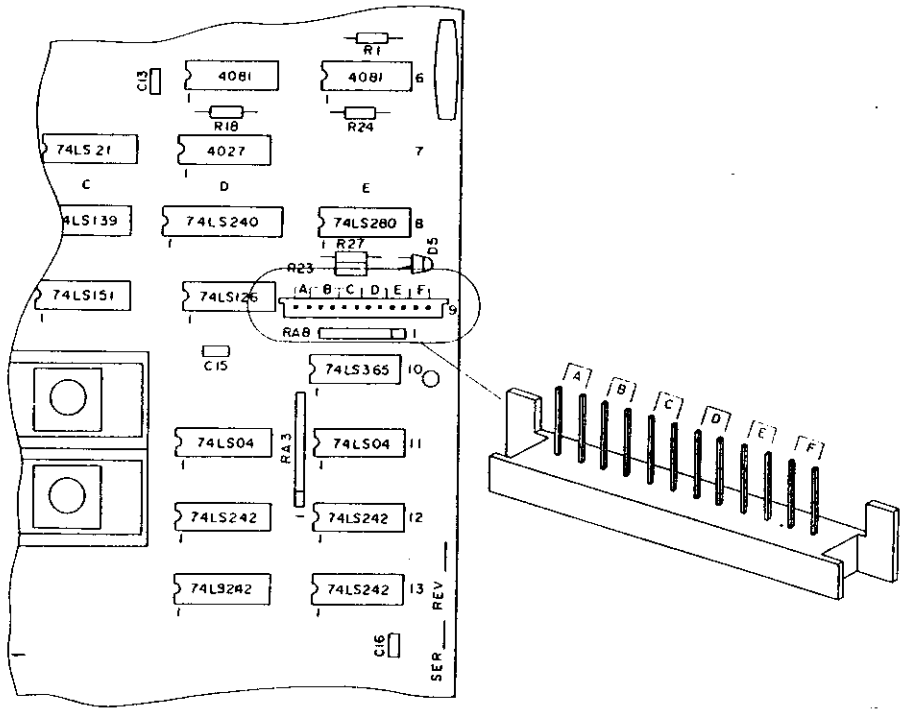


FIGURE 20 MPU Strapping Jack Pin Assignments

3.7 KSU INSTALLER OPTIONS

3.7.1 VOLUME CONTROL ADJUSTMENT

The VTA printed-circuit card provides master volume controls for various system functions. All volume controls are located on the front edge of the card and can be adjusted while the card is in service. TABLE 13 lists the volume control functions and designations.

TABLE 13 VTA PRINTED-CIRCUIT CARD VOLUME CONTROLS

FUNCTION	DESIGNATION	DESCRIPTION
BGM CONTROL	BGM	Master volume control for background music input to local PA System.
MOH CONTROL	MOH	Master volume control for music-on-hold level on CO/PBX lines.
PA VOICE	PAG	Master volume control for voice level on PA amplifier.
PA RINGER	NRG	Master volume control for night service tone ringing on PA amplifier.
BUSY OVERRIDE #1	1VC	Master volume control for adjusting level of caller's voice on voice bypass line #1.
BUSY OVERRIDE #2	2VC	Master volume control for adjusting level of caller's voice on voice bypass line #2.
CP-60 #1 VOICE	1CP	Master volume control for CP-60 No. 1 voice page level.
CP-60 #2 VOICE	2CP	Master volume control for CP-60 No. 2 voice page level.
ALL CALL	ALL	Master volume control for system All-Call voice page level.

3.7.2 PA/BGM INTERFACE

The Omega-Phone III system provides, as standard equipment, interfaces to an external background music/public address system. Provision is also made to connect CO/PBX audible ringing to the PA system when the system is placed in the Night Service mode. Separate transformer-coupled inputs are provided for a background music source (such as a tuner or tape deck) and a standard PA amplifier. The system, itself, supplies no power amplification; an external power amplifier, its rating determined by the speaker load, must be used to drive any external speaker(s).

NOTE

When equipping a system for background music and voice paging over a PA, a separate music source should be used utilized rather than a combination tuner/PA amplifier unit. The system provides automatic disconnect of the music while a voice page is in progress.

Connections to the external PA amplifier and background music source are established by standard "phono" type connectors. As shown in FIGURE 18, the installer connects the PA amplifier input to the AMP connector on the MBD assembly. The music source is connected to the BGM connector on the MBD assembly.

High- (10K) and low- (600Ω) impedance strap options are provided on the VTA printed-circuit card. Shorting bar strap options are used to set the input impedance on the VTA circuit card to match the external source. If the PA amplifier PHONO or AUX input is used, the AMP input should be set to 10K. If a LINE input is used on the PA amplifier, the 600-ohm impedance should be used. If the background music source is a tuner or tape deck, the BGM input should be set to the 10K input. If a LINE input is used, the 600-ohm impedance setting on the VTA should be used.

An auxiliary set of relay contacts is provided for speaker or voice muting control during the voice page interval. A set of "make" contacts is provided on terminals PA and PAS on the MBD AUX CONTROL terminal strip.

The installer adjusts the PA voice page level and background music level on the PA system by the volume controls provided on the VTA circuit card. Guards can be used on the PA amplifier volume controls because all levels can be controlled by the volume controls provided on the VTA.

The PAG volume control sets the PA system voice page level. The BGM control sets the background music level on the PA system. If no background is utilized on the PA system, the BGM volume control should be turned off.

The NRG volume control sets the level for the Night Service ringing tone on the PA system. This feature only operates when the system is placed in the Night Service mode. If no ringing is desired over the PA system, turn the NRG_to the off position.

3.7.3 MUSIC-ON-HOLD

Omega-Phone III provides, as standard equipment, an interface to an external music source to provide music while a CO/PBX Line is on "HOLD". A transformer coupled input is provided for a standard tuner or tape player. The same music source can be used for background music over a PA system.

NOTE

When equipping a system for Music-on-Hold and a PA system, a separate music source should be utilized rather than a combination tuner/amplifier.

Connection to the music source is established using standard "phone" type audio connectors. As indicated in FIGURE 18, the installer connects the music source to the MOH connector on the MBD assembly.

High- (10K) and low- (600Ω) impedance strap options are provided on the VTA printed-circuit card. Shorting bar contacts are used to set the impedance on the MOH input transformer to match the impedance of the music source. If the same music source is utilized as the background music input to the local PA system and the music-on-hold source, both the BGM and MOH input transformers should be set to high (10K) impedance. The low impedance option provides 600-ohm impedance.

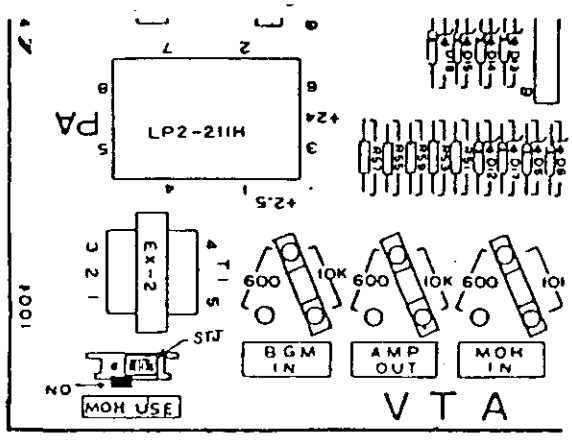
An auxiliary set of relay contacts is provided for start-stop control when a tape player is utilized as the music source for music-on-hold. A set of "make" contacts is provided at terminals HA-HAS on the MBD AUX CONTROL terminal strip. This set of contacts should be used to operate the low-voltage on-off control of the tape player. Do not utilize this set of contacts to control 110-volt AC power to the tape player.

The MOH volume control on the VTA printed-circuit card sets the level of music on the CO/OBX Lines. Care should be taken to ensure that the music source output level is relatively constant in order to avoid different levels on the CO/PBX Lines.

A program strap is provided on the VTA circuit card to allow MOH operation. When equipping music-on-hold in the system, set the STJ program strap as illustrated in FIGURE 20-1 to allow MOH operation.

NOTE

- If no music-on-hold is provided, ensure that the STJ illustrated in FIGURE 20a is set to the OFF position.



3.7.9 SPEED DIAL INSTALLATION

The Omega III ET-2460 Key Telephone System offers System Speed Dial as an optional feature. The "Speed Dial" feature provides non-volatile storage of up to 100 telephone numbers with a maximum of 16 digits each. "Speed Dial" access is three digits, the first digit being the * (asterisk) digit followed by a two-digit code for the individual speed dial listing. "Access pause" times can be included in the speed dial listing to allow a delay between digits in order for the serving central office (or PBX) line equipment to set up for the call. All ET-2460 KTS equipment shipped prior to the availability of Speed Dialing can be equipped with this feature without any equipment modification.

The ET-2460 KTS Speed Dial feature consists of an EPROM I.C. that is programmed with the system speed dial listings as well as system interface information. Until field programming terminals are available, all programming will be accomplished at Iwatsu America.

This requires that the complete "speed dial" listing be forwarded to Iwatsu America for programming an original I.C. When changes are requested, a new listing is sent to Iwatsu America and a replacement I.C. is forwarded to the company and the original I.C. returned to Iwatsu America.

It is important that the "speed dial" listing contains all the information required and no errors so as to avoid delays in implementing the feature.

FIGURE 20-2 illustrates a sample "speed dial" listing. The information provided includes:

(1) Customer Name, Address, and Telephone Number.

(2) Telephone Number listing including Name of Listing and Order of Listing.

(3) Company requesting the Speed Dial.

(4) Access Pause Time (if required).

(1) Ordering Company: Name/Address/Telephone No. of Company ordering SPD.

(2) Customer: Name/Address/Telephone No. of Company using SPD.

(3) SPD. Serial No. Identification Number of SPD if modification of previously issued SPD is requested.

(4) Access Pause Required? Yes___No___Pause Time___(1-9)

Access Code No.	Name	Telephone No.
00	ABC Inc.	1 2 0 1 9 3 5 8 5 8 0 _ _ _ _ _
01	DEF Inc.	1 2 0 1 9 3 5 8 5 8 1 _ _ _ _ _
99	XYZ Inc.	9 P 1 2 0 1 9 3 5 8 5 8 0 _ _ _

16 digits

(1) When "Access Pause" is required, use "P" designation.

(2) Ensure that a maximum of only 16 digits (including access pauses) are assigned to one access code.

FIGURE 20-2 Sample Speed Dial Listings

List, in the order requested, the names and telephone number to be placed in the Speed Dial access code. The order that you list the individual numbers can be arranged alphabetically by name, by function, by area, or by any other grouping that is desired. If an additional number is to be added to a grouping at a later date, skip an access code (or codes) so that the entire listing does not have to be changed.

A total of 100 different numbers can be utilized, starting with "Access Code" and ending with 99. A maximum of 16 digits can be assigned to each access code. An "access pause" counts as a digit.

Include, in the listing, all the digits that must be dialed to call the distant party. Typical variations include the digit "1," which in most areas of the country, is dialed before an "area code" is dialed. Also, if a specific code must be dialed to access the outside line (such as behind a PBX), include those in the telephone listing.

Some listings (typically those which are accessed when calling from behind a PBX) may require an "access pause" time delay. Indicate in the telephone number listing when an "access pause time" is required by placing the letter "P" between digits. More than one "access pause time" can be placed in the same listing. However, each "access pause time" uses up one digit of the 16 digits that can be assigned to each listing. In addition, the actual time duration of the "access pause" should be determined by manually dialing the number and counting the required seconds (with some leeway) for setting up the call. Indicate the "access pause time" duration required for the respective speed dial unit. Access pause times can be set for from 1 to 9 seconds on one-second increments. Specify the exact time required for the listing.

The Speed Dial "access pause time" must be such that the time is compatible with all "access pause times" required for any number on the entire "speed dial" list. If a long time interval is required for some numbers and a short time for other numbers, utilizing a short pause time with repetitive pauses using up digits is acceptible to achieve a long pause. Remember, use of any "access pause time" reduces the digit capacity of each listing by one digit for each pause.

The speed dial listing is subject to the following additional limitations:

(1) No "*" or "#" number can be programmed for any listing or system that cannot accept DTMF type signals.

(2) Extended digit dialing beyond 16 digits (including "access pause" times) cannot be achieved. For applications requiring more than 16 digits, a station "memory dialer" must be used.

Upon receipt of the "Speed Dial" I.C. from Iwatsu America, note the designation number of the SPD chip.

In handling the chip, avoid contact with the I.C. pinouts. Do not place the I.C. on any ungrounded surface. Do not, under any circumstances, remove the shield over the center window of the I.C. as the memory contents may be erased.

A five-digit number is used to identify the chip. The first three digits are the serial number of the device; the second two digits reflect the revision number.

To install the SPD, follow the instructions listed below:

(1) Turn off the system power supply and remove the system MPU and MEM circuit card.

(2) Refer to ET-2460 Tech. Manual Section 3; Part II; Figure 20, Page 58 for location of the STJ strapping jack location on the MPU. Connect an STJ strapping jack on jack location D when equipping the SPD. Insert the MPU into the KSU.

(3) Referring to FIGURE 20-3, locate the EPROM socket on the MEM circuit card that accepts the SPD chip. Note the alignment of the I.C. in the socket.

Under no circumstance should the SPD chip be inserted into the I.C. socket in the wrong manner as possible damage to the I.C. could result.

(4) Place the SPD chip into the I.C. socket by first aligning the pins of the I.C. in the socket and then applying downward pressure. Ensure that all the I.C. pins are set in the proper manner in the socket.

(5) Insert the MEM card into the KSU and turn on the system power supply.

(6) Access the system speed dial and check system operation.

(7) In case of trouble, repeat installation steps to ensure proper installation. If problem persists, consult Iwatsu America Engineering Dept.

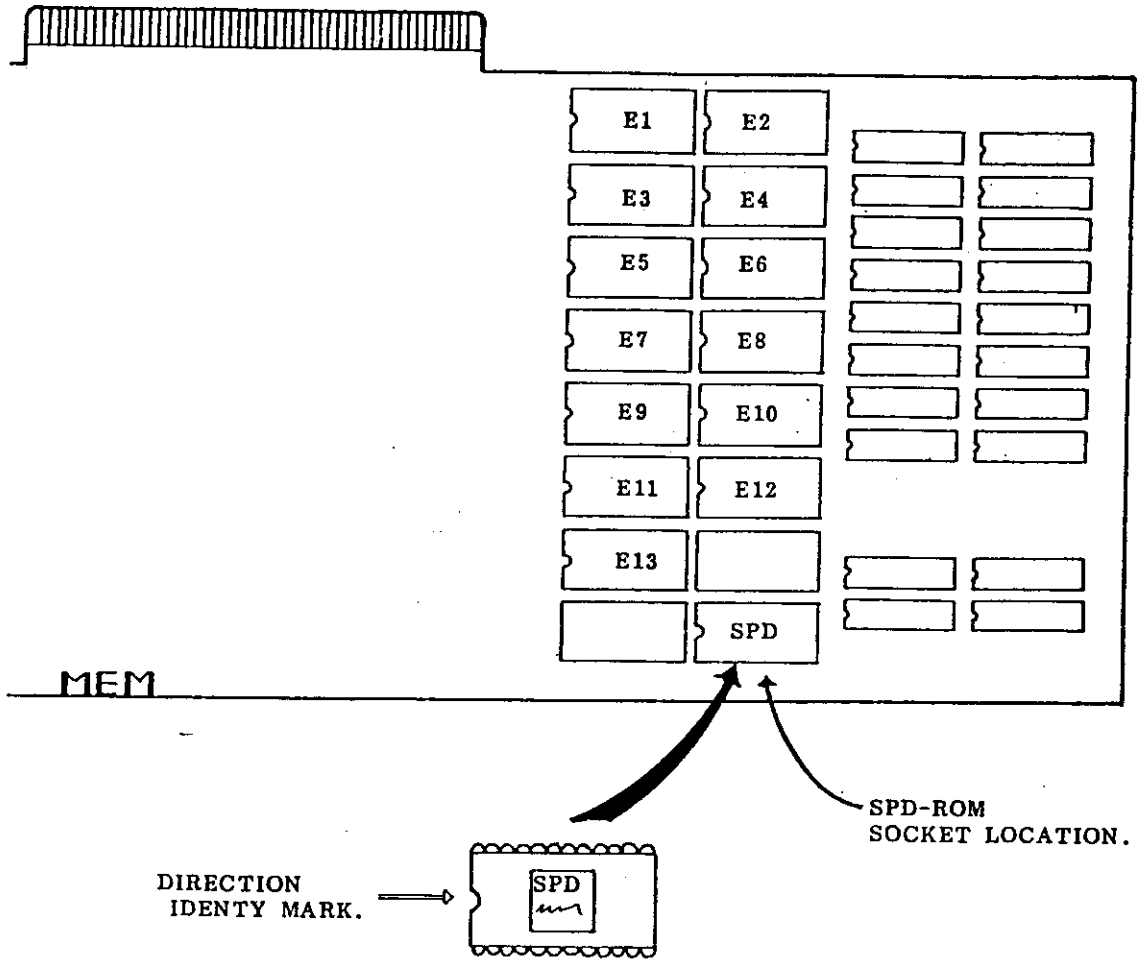


FIGURE 20-3 SPD Installation on MEM Card

SECTION 4 PRINTED CIRCUIT CARD

This section describes installation procedures for equipping the ET-2460 KSU with printed-circuit cards. The function settings and programming of all cards installed in the KSU are described.

System planning and Programming Sheets described in SECTION 2 should be completed before attempting to equip the KSU. Strapping Jacks are required for feature/function settings on many cards. Operations described in SECTION 3, KSU Installation, should be accomplished before equipping the KSU.

4.1 GENERAL CONSIDERATIONS

4.1.1 UNPACKING/HANDLING

Because the cards that make up the ET-2460 system utilize MOS-type circuits, some constraints should be exercised while unpacking and handling individual cards as they are introduced into the system.

When unpacking and handling printed-circuit cards, it is good practice to ground all body electrostatics by physically touching the earth grounded KSU cabinet before handling the cards.

Avoid touching the solid-state components. It is good practice to hold the individual card by its edges (aside from the contact finger side).

If difficulty is encountered with a card and it proves defective, place the card in its original protective shield and carton. Do not put the card into any plastic container other than that originally supplied, as electrostatic damage may occur.

4.1.2 GROUNDING

The ET-2460 KSU must be earth grounded before any cards are inserted into designated card slots. This minimizes possible electrostatic damage to the cards. Instructions for earth grounding are detailed in SECTION 3.

a. Avoid placing cards on non-grounded surfaces. Do not place cards on plastic sheets or carpets which could result in possible electrostatic damage.

4.1.3 CARD INSERTION

Because the ET-2460 system utilizes MOS-type semiconductor devices, certain precautions must be used when equipping or replacing cards in the KSU:

a. All installer strap/programming options for setting the individual function/features must be accomplished before card is placed in service.

b. All cards must be inserted in the KSU card slots with system power turned OFF. Upon complete installation of all cards, the system power supply may be turned ON.

c. As the ET-2460 utilizes a different number of cards that are the same physical sizes, ensure that the cards are inserted into the correct slots in order to prevent possible damage to the cards.

d. Whenever a card in service needs to be removed from the KSU, the system power supply must be turned OFF prior to removal of the card. The card extractor, Model RTCB, should be used to remove all cards from the KSU.

4.2 CO/PBX LINE INSTALLATION

4.2.1 GENERAL

Omega-phone III features various of CO/PBX line services, including operation on rotary (DP), DTMF, and Automatic Ringdown Tie Lines. The type of service required determines the type of line circuit card utilized.

SECTION 2, System Planning, describes each type of line circuit available and the options and restrictions of each. The Trunk Planning Sheet, illustrated in the System Planning section, lists the individual trunk configuration, line circuit types, and feature/function options required. This information is necessary before the installer can proceed with trunk installation.

All CO/PBX Lines and Tie lines connect to the KSU through the CO CONN on the base of KSU motherboard (MBD) assembly. A female, 50-pin, Amphenol-type connector is required to connect to the CO/PBX Line circuits.

A CO/PBX Line to Trunk cross-connect field is provided on the MBD base. This field is factory-wored to connect the CO/OBX Lines to the line circuit appearances on the KSU. To disconnect an individual CO/PBX Line in case of

trouble, the bridged connection between the CO/PBX Line number and Trunk (line) circuit number can be removed.

4.2.2 FCC CONSIDERATIONS

When requesting service for CO/PBX Line services encompassed under Part 68 of the FCC Rules/Regulations regarding Direct Connection of Telephone Systems, certain information must be provided to the local telephone company. The telephone system model, FCC Registration Number, and largest ringer equivalence presented to any line in service must be provided to the local telephone company before service can be connected. Also, the FCC Registration Number and model of any ancillary equipment apart from the Omega-Phone III and its ringer equivalence (if connected on the telephone company side of the standard interface) must be included.

The Omega-Phone III system has been registered with the FCC as a "fully protected" system (i.e. the system contains all protective elements to meet FCC requirements). No "Installation Affidavit" is required to be filed with the local telephone company. The FCC Registration Number (BD687Y-67586-KF-E) must be supplied to the local telephone company at the initial request for service. This number is also found printed on the KSU equipment cabinet label.

Omega-Phone III uses the RJ-21X standard interface to connect the CO/PBX lines to the KSU. CO/PBX line appearances on the RJ-21X must be arranged, at the time of service request, in the order that they will appear on the system. The ringer equivalence of the ET-2460 system is 0.4B. This information must be given to the local telephone company when requesting service.

NOTE

If the system is equipped with power failure transfer so that up to five individual CO/PBX Lines are transferred to single-line extensions during power failure, the ringer equivalence of the single-line telephone(s) (usually 1.0B) must be given to the local telephone company for these lines.

If power failure transfer is equipped on the system, an Installation Affidavit may be required for the wiring associated with the power failure transfer telephones. Installation of these telephones must be in accordance with SECTION 68.215 of the FCC rules regarding Direct Connection, with the exception of the "authorized installation supervisor authority"

required from the manufacturer. Complete copies of these rules are available from the U. S. Government Printing Office or copies of SECTION 68.215 can be requested from Iwatsu America.

If private line services and/or services from lines not encompassed under Part 68 of the rules is required, an FCC-Registered cross-connect field must be installed between the RJ-21X connector and the CO CONN (Amphenol) on the ET-2460 KSU.

4.2.3 CO/PBX LINE ASSIGNMENT

TABLE 14 shows the CO/PBX CONN line circuit assignment and factory-wired cross-connect to the line (trunk) circuits appearing on the ET-2460 KSU. Items to be considered required when assigning lines include:

a. For convenience sake, the order of CO/PBX Line appearances on the RJ-21X standard connector should be determined in order to have each line appear on the corresponding trunks (and pickup key) on the station equipment. Refer to TABLE 14 to assign individual CO/PBX lines to line circuit (TRK) appearances in accordance with that required and detailed on the Trunk Planning Sheet.

b. If two CP-60 Call Processors are used, no CO/PBX Line can be assigned to CO CONN Circuit No. 7 because the Trunk Circuit and pickup key associated with this line will be utilized for the CP-60 Attendant Intercom path.

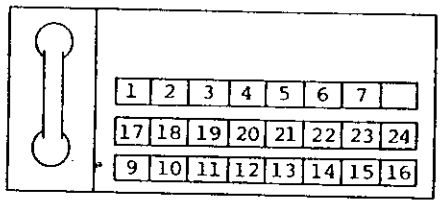
c. To change the CO CONN Line Circuit No. after initial installation, a cross-connect can be accomplished on the KSU cross-connect field by strapping the CO CONN Line No. to the desired trunk number.

d. CO/PBX Lines connected to the Omega-Phone III use "loop start" signalling. "Ground start" type lines cannot be used. Although CO/PBX Line battery reversal does not in any way affect circuit operation, line tip/ring connections should correspond to TABLE 14 to facilitate testing and power failure transfer operation.

4.2.4 AUTOMATIC RINGDOWN TIE LINE

The TRK-A and TRK-B trunk cards can be arranged for automatic ringdown operation to a distant Key Telephone System or single-line telephone. Operating the E-KEY extension line circuit assigned for the Ringdown circuit causes 20(or 30 Hz) ringing to appear on the line and operate the ring

TABLE 14 ET-2460 KSU CO CONN - TRUNK CIRCUIT ASSIGNMENT



CO/PBX CONN.

FUNCTION	TRUNK NO.	PICKUP KEY NO.	LEAD DESIG.	CONN. PIN NO.	CABLE COLOR	CLIP NO.	NOTE
CO/PBX 1	TRK01	1	1T	26	WHT-BLU	1	
			1R	1	BLU-WHT	2	
CO/PBX 2	TRK02	2	2T	27	WHT-ORN	3	
			2R	2	ORN-WHT	4	
CO/PBX 3	TRK03	3	3T	28	WHT-GRN	5	
			3R	3	GRN-WHT	6	
CO/PBX 4	TRK04	4	4T	29	WHT-BRN	7	
			4R	4	BRN-WHT	8	
CO/PBX 5	TRK05	5	5T	30	WHT-SLT	9	
			5R	5	SLT-WHT	10	
CO/PBX 6	TRK06	6	6T	31	RED-BLU	11	
			6R	6	BLU-RED	12	
CO/PBX 7	TRK09	9	7T	32	RED-ORN	13	
			7R	7	ORN-RED	14	
CO/PBX 8	TRK10	10	8T	33	RED-GRN	15	
			8R	8	GRN-RED	16	
CO/PBX 9	TRK11	11	9T	34	RED-BRN	17	
			9R	9	BRU-RED	18	
CO/PBX 10	TRK12	12	10T	35	RED-SLT	19	
			10R	10	SLT-RED	20	
CO/PBX 11	TRK13	13	11T	36	BLK-BLU	21	
			11R	11	BLU-BLK	22	
CO/PBX 12	TRK14	14	12T	37	BLK-ORN	23	
			12R	12	ORN-BLK	24	
CO/PBX 13	TRK17	17	13T	38	BLK-GRN	25	
			13R	13	GRN-BLK	26	
CO/PBX 14	TRK18	18	14T	39	BLK-BRN	27	
			14R	14	BRN-BLK	28	
CO/PBX 15	TRK19	19	15T	40	BLK-SLT	29	
			15R	15	SLT-BLK	30	
CO/PBX 16	TRK20	20	16T	41	YEL-BLU	31	
			16R	16	BLU-YEL	32	
CO/PBX 17	TRK21	21	17T	42	YEL-ORN	33	
			17R	17	ORN-YEL	34	
CO/PBX 18	TRK22	22	18T	43	YEL-GRN	35	
			18R	18	GRN-YEL	36	
CO/PBX 19	TRK23	23	19T	44	YEL-BRN	37	
			19R	19	BRU-YEL	38	
CO/PBX 20	TRK24	24	20T	45	YEL-SLT	39	
			20R	20	SLT-YEL	40	
				46	VIO-BLU	41	
				21	BLU-VIO	42	
				42	VIO-ORN	43	
				22	ORN-VIO	44	
				48	VIO-GRN	45	
				23	GRN-VIO	46	
				49	VIO-BRU	47	
				24	BRU-VIO	48	
				50	VIO-SLT	49	
				25	SLT-VIO	50	

Note 1. TRK 07 is reserved for No.1 CP-60 or any other ICM function
2. TRK 08 is reserved for All Call function
3. TRK 15 and 16 are strictly used for ICM function

detector or station ringer at the distant location. When the distant location goes off-hook, ringing stops and a voice circuit is established.

When Automatic Ringdown operation is needed, a talk and signal battery must be connected to the ET-2460 KSU. Specifications of the Talk Battery and Signal Battery for the maximum loop limits of the TRK-A/TRK-B Ringdown circuits are listed in TABLE 15. The voltage rating of the talk battery is determined by the maximum DC loop resistance of the Rigdown circuit. The type of signal battery utilized is determined by local telephone company signalling requirements. Check to determine whether a 20 or 30 Hz signal battery is required for Ringdown circuits.

TABLE 15 AUTOMATIC RINGDOWN BATTERY SPECIFICATION

TYPE	LOOP RESISTANCE	VOLTAGE
TALK BATTERY	LONG LOOP - 2000 OHMS MAX.	48 VDC ± 10%
	SHORT LOOP - 1000 OHMS MAX.	24 VDC ± 10%
SIGNAL BATTERY	LONG LOOP - 2000 OHMS MAX.	105 VAC, 20 or 30 Hz
	SHORT LOOP - 1000 OHMS MAX.	105 VAC, 20 or 30 Hz

NOTE

The talk and signal battery used for the Automatic Ringdown circuit will be the same battery used for OPX telephones equipped on the ET-2460 KSU. Check OPX line specifications before deciding whether to use a 24 or 48 Volt DC talk battery and 20 or 30 Hz signal battery.

When requiring Automatic Ringdown service, the following specifications apply:

a. Maximum DC Loop Resistance: 1000 or 2000 ohms

b. Talk Battery: Either 24 or 48 volts DC

c. Type Signalling: Distant location: 20 or 30 Hz ringing
ET-2460 location: loop start

d. Maximum Line Attenuation: -5.5 dB

Connection of the talk and signal batteries is accomplished at designated screw terminals at the base of the ET-2460 KSU mother-board (MBD) and on the expansion assembly (EMB) when equipped. Referring to FIGURE 17 (paragraph 3.5.1) connect the plus (+) side of the talk battery to screw terminals UPW (+) on the MBD (and EMB if equipped). Connect the minus (-) side of the talk battery to screw terminal UPW (-) on the MBD (and EMB if equipped).

Ensure proper polarity of connections and absence of short circuits before talk battery is turned on.

NOTE

Ensure that the plus (+) side of the talk battery is earth grounded. Utilize the system ground or telephone ground point to ensure proper grounding.

Connect the high side of the signal (ring) battery to screw terminal UBL (-) on the MBD (and EMB if equipped). Connect the ground (BND) side of the signal (ring) battery to screw terminal UBL (+) on the MBD (and EMB if equipped). Verify proper connections and no short circuits before applying power to the signal battery.

NOTE

For proper circuit operation, the ground (GND) side of the signal battery must be earth grounded. Utilize the system ground or telephone ground point to ensure proper grounding.

Connection of the tip/ring of the tie line circuit is (until such time as "private lines" are encompassed under Part 68 of the FCC rules/regulations regarding direct connection) outside of the RJ-21X standard connector. Two alternatives are offered for connection of the private line to the trunk circuit appearance on the ET-2460 KSU:

(1) Disconnect the cross-connect between the CO CONN and trunk circuit number on the ET-2460 motherboard (MBD)(see FIGURE 18). Attach the tip/ring of the "private line" directly to the trunk circuit number by wire-wrapping the terminals to the private line. Do not assign any CO/PBX Lines to trunk appearances on the RJ-21X that are being utilized for Ringdown circuits.

(2) As an alternative, an FCC-registered cross-connect field can be utilized to introduce the private line tip/ring circuit(s) into the KSU CO CONN (connector).

NOTE

When establishing connections to the "private line" circuit, ensure that plus (+) talk and ground (GND) of the signal battery are applied to the tip (T) side of the circuit. The ring (R) side of the ringdown circuit(s) should be negative (-) with respect to the tip (T) side during the talking state.

4.2.5 COT TRUNK CARD INSTALLATION

The COT trunk card provides two CO/PBX Line circuits (A and B) for connection to outside lines arranged for DTMF-type dial address signalling. The COT printed-circuit card can be inserted into any Trunk (TRK) card slot (except TRK 07/08 and 15/16) on the ET-2460 KSU assigned for DTMF-type address signalling, or into any line circuit assigned for one-way incoming (e.g., incoming WATS-type) service. The COT card can be combined in the system with any other type trunk card arranged for Dial Pulse (DP) network address type signalling.

The installer should refer to the Trunk Planning Sheet to determine which TRK slots on the ET-2460 KSU will utilize the COT card and what features are assigned to the individual circuits on the COT. Program options are provided on the COT card for two different functions on each CO/PBX Line circuit. FIGURE 21 illustrates the COT printed circuit card and location of the programming options for circuits A and B. Circuit A reflects the odd-numbered trunk appearance and circuit B the even-numberd trunk appearance that the card is assigned to.

To assign the COT trunk for Night Service, install a strapping jack on the program jack pin 01 (circuit A) and/or 11 (circuit B). To allow either "calling party forced disconnect" or "trunk-to-trunk" conference with automatic disconnection, install a strapping jack on program jack pin 02 (circuit A) and/or 12 (circuit B). Verify that the CO/PBX Line provides a disconnect signal of greater than 600 ms before assigning this program feature to COT circuits.

CAUTION

All programming and insertion of the COT card into the assigned card slot on the ET-2460 KSU should be accomplished with system power off. When servicing COT trunk cards, ensure that the programming is accomplished on the new card and system power supply is turned off prior to physical replacement.

4.2.6 COR TRUNK CARD INSTALLATION

The COR trunk card provides two CO/PBX Line circuits (A and B) for connection to outside lines arranged for Dial Pulse (DP)-type dial address signalling. The COR trunk card can be inserted into any trunk card slot on the ET-2460 KSU assigned for DP-type lines or into any circuit assigned for one-way incoming (e.g., incoming WATS-type) services. The COR trunk circuit can be mixed with any other type trunk card arranged for DTMF-type network address type signalling.

FEATURE	STJ REQ	PROGRAM JACK LOCATION CIRCUIT A	CIRCUIT B
NIGHT SERVICE	YES	01	11
CO/PBX DISCONNECT	YES	02	12

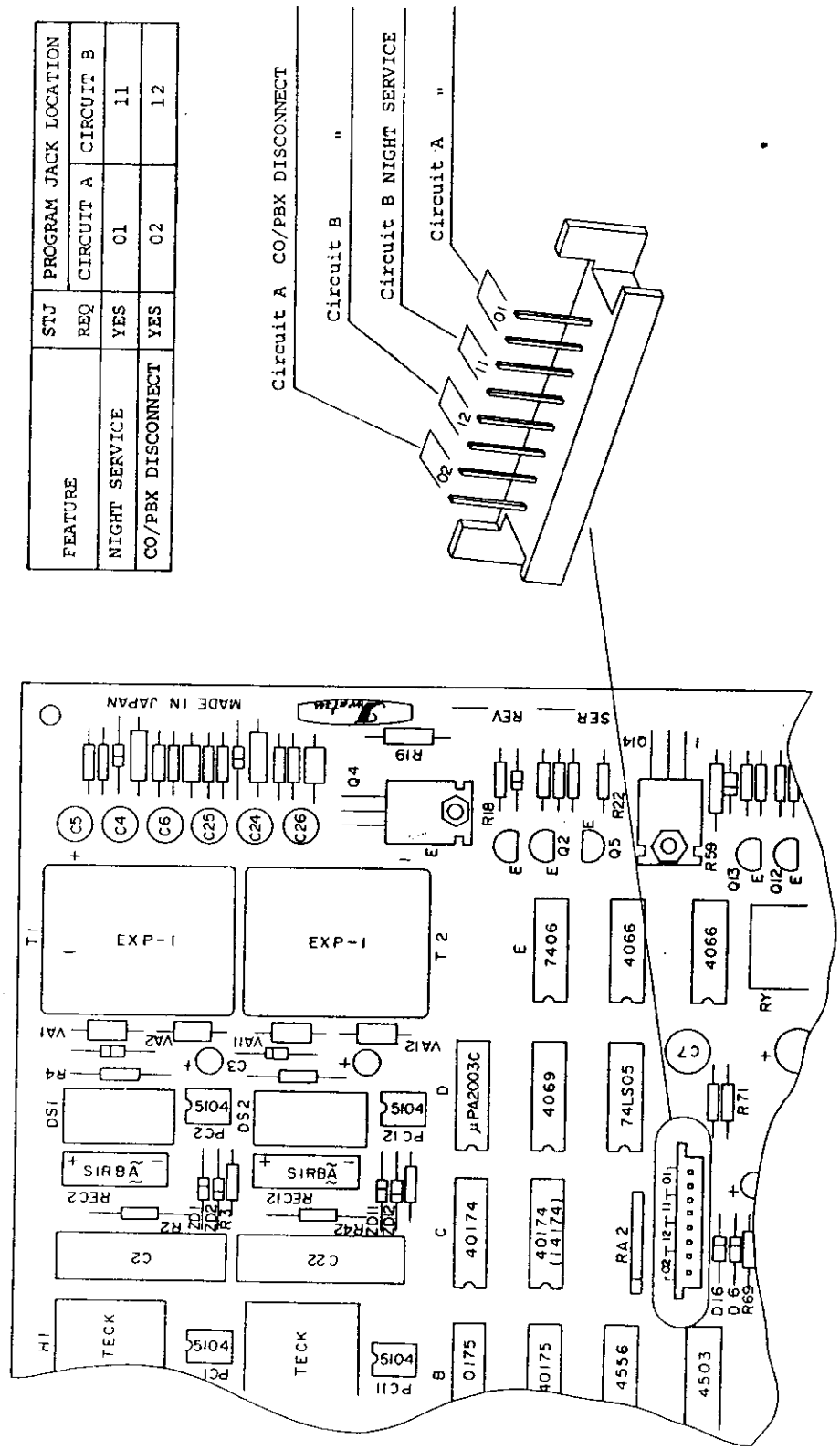


FIGURE 21 COT Trunk Card Programming

FEATURE	STJ REQ	PROGRAM JACK LOCATION	
		CIRCUIT A	CIRCUIT B
NIGHT SERVICE	YES	01	12
CO/PBX DISCONNECT	YES	02	11

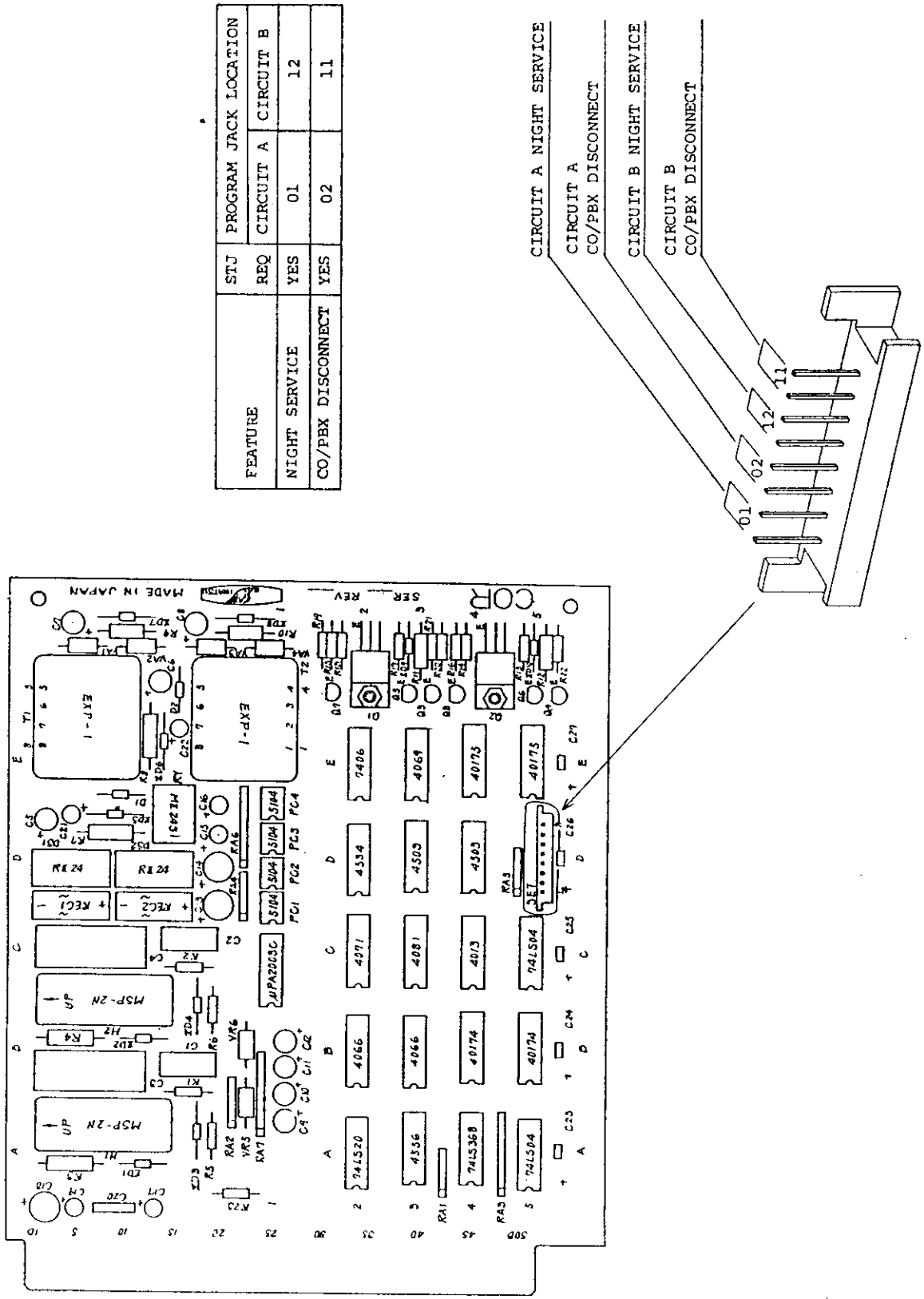


FIGURE 22 COR Trunk Card Programming

The installer should refer to the Trunk Planning Sheet to determine which TRK slots on the ET-2460 KSU will utilize the COR card and which features are assigned to the individual circuits on the COR card. Program options are provided on the COR trunk card for two different features on each CO/PBX line circuit. FIGURE 22 illustrates the COR trunk card and location of the programming options for circuits A and B. Circuit A reflects the odd-numbered trunk appearance and circuit B the even-numbered trunk appearance that the card is assigned to.

To assign the COR trunks for Night Serviec, install a strapping jack on program jack pin 01 (circuit A) and/or 11 (circuit B). To allow either "calling party forced disconnect" or "trunk-to-trunk conference" with automatic disconnection, install a strapping jack on program jack pin 02 (circuit A) and/or 12 (circuit B). Verify that the CO/PBX Line provides a disconnect signal of greater than 600 ms before assigning this program feature to the COR circuits.

CAUTION

All programming and insertion of the COR trunk card into the assigned TRK card slot on the KSU should be accomplished with system power turned off. When servicing COR trunk cards, ensure that the programming is accomplished on the new card and system power supply is turned off prior to physical replacement.

4.2.7 TRK-A TRUNK CARD INSTALLATION

The TRK-A trunk card provides two CO/PBX line circuits (A and B) for connection to outside lines arranged for DP- or DTMF-type network address signalling, or for Automatic Ringdown Tie-Line operation. Each circuit (A or B) on the TRK-A card can be independently configured to the desired type of service. The TRK-A trunk card can be mixed with any other type trunk card arranged for either DP- or DTMF-type network address signalling.

The installer should refer to the Trunk Planning Sheet to determine which TRK slots on the ET-2460 KSU will utilize the TRK-A card and what features and functions are assigned to each circuit. TRK-A trunk card settings to determine type of CO/PBX Line signalling or Automatic Ringdown Tie-Line operation are listed in TABLE 16. Trunk settings are determined by slide switches S1 and S2. Refer to TABLE 16 and FIGURE 23 for the locations of switches and programming jack pins. The TRK-A card is arranged at the factory for DTMF-type CO/PBX Line operation.

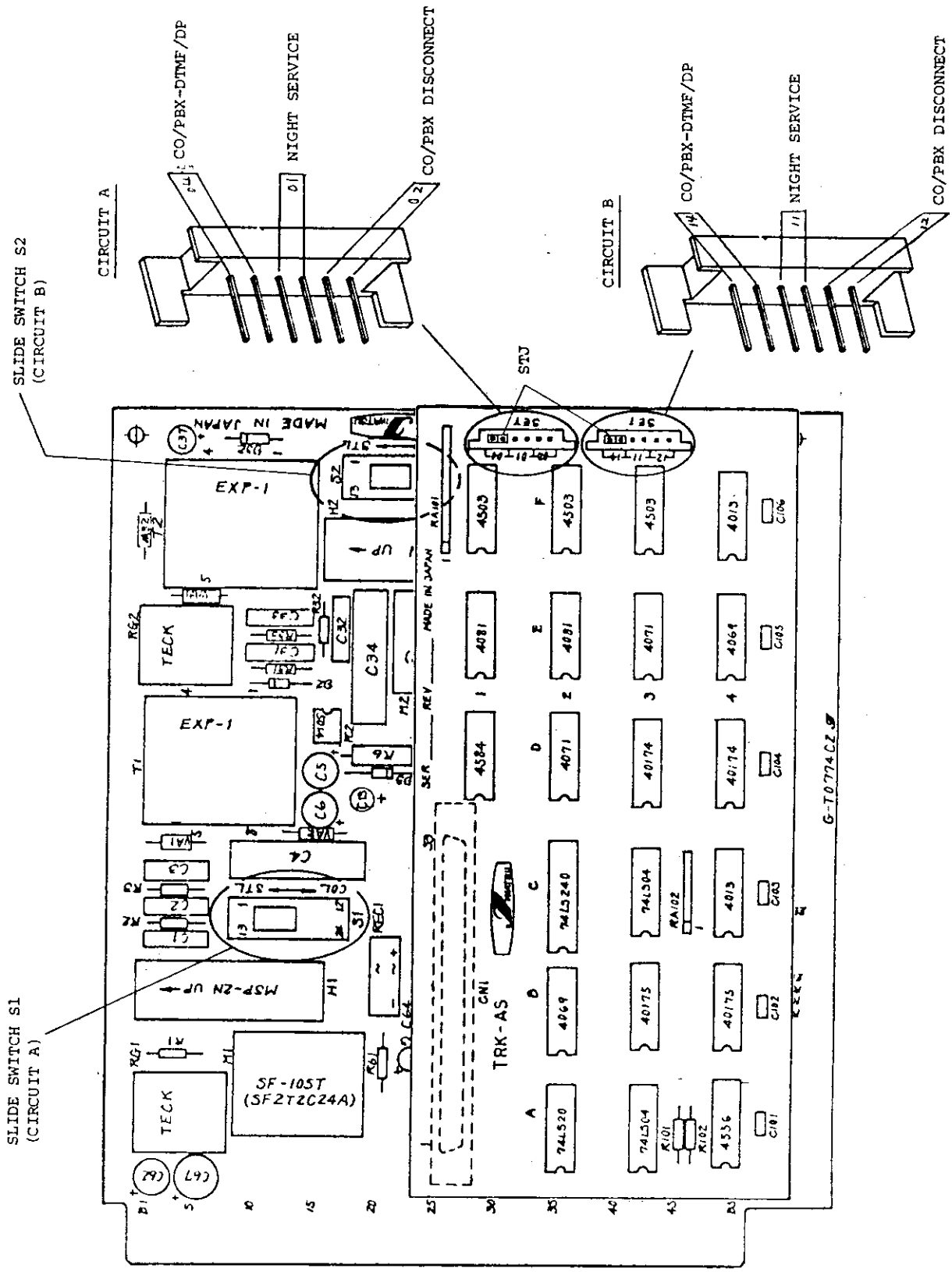


FIGURE 23 TRK-A Trunk Card Program Settings

TABLE 16 TRK-A TRUNK CARD FEATURE/FUNCTION SETTINGS

FUNCTION/ FEATURE	CIRCUIT A				CIRCUIT B			
	S1 SLIDE SW	PROGRAM JACK PIN 01	02	04	S2 SLIDE SW	PROGRAM JACK PIN 11	12	14
CO/PBX-DP	COL				COL			
CO/PBX-DTMF	COL			STJ	COL			STJ
TIE LINE	STL				STL			
NIGHT SERVICE		STJ				STJ		
CO/PBX DISCONNECT			STJ				STJ	

Slide Switch S1 determines whether circuit A of the TRK-A card operates with a CO/PBX Line or Tie-Line. Slide Switch S2 determines whether circuit B of the TRK-A card operates with a CO/PBX Line or Tie-Line. The settings of both slide switches should be verified at installation time.

A strapping jack must be removed at program jack pins 04 (circuit A) and 14 (circuit B) on the TRK-A card for DP-type network address signalling operation.

A strapping jack is required for assigning each line circuit on the TRK-A card for Night Service. Refer to TABLE 16 and the locations of program jacks on the TRK-A card (FIGURE 23) to assign the Night Service feature.

A strapping jack is required for assigning each line circuit on the TRK-A card for either "calling party forced disconnect" or "trunk-to-trunk conferencing" with automatic disconnection. Refer to TABLE 16 and location in FIGURE 23 to assign the CO/PBX disconnect function. Verify that the CO/PBX Line provides a disconnect signal of greater than 600 ms before the CO/PBX firced disconnect function is assigned to the trunks.

When arranging the TRK-A trunk card for Automatic Ringdown Tie-Line operation, a talk and signal battery must be connected to the system. Refer to 4.2.4 wiring and equipment considerations when providing Ringdown circuits.

4.2.8 TRK-B TRUNK CARD INSTALLATION

The TRK-B trunk card is a general-purpose card that provides two line circuits. TABLE 17 lists the functions available on each circuit. Circuit A provides both CO/PBX Line and Intercom functions, whereas circuit B provides only Intercom or All-Call functions. Each circuit (A or B) on the TRK-B card can be independently configured to the designed-type line functions. The TRK-B card can be mixed with any other type trunk card.

TABLE 19 SECRETARY/EXECUTIVE INTERCOM EXTENSION ASSIGNMENT

Extension Number	Setting Pin A	B	C	D	E	F
20						
21						o
22					o	
23					o	o
24				o		
25				o		o
26				o	o	
27				o	o	o
28			o			
29			o			o
30			o		o	
31			o		o	o
32			o	o		
33			o	o		o
34			o	o	o	
35			o	o	o	o
36		o				
37		o				o
38		o			o	
39		o			o	o
40		o		o		
41		o		o		o
42		o		o	o	
43		o		o	o	o
44		o	o			
45		o	o			o
46		o	o		o	
47		o	o		o	o
48		o	o	o		
49		o	o	o		o

Extension Number	Setting Pin A	B	C	D	E	F
50		o	o	o	o	
51		o	o	o	o	o
52	o					
53	o					o
54	o				o	
55	o				o	o
56	o			o		
57	o			o		o
58	o			o	o	
59	o			o	o	o
60	o		o			
61	o		o			o
62	o		o		o	
63	o		o		o	o
64	o		o	o		
65	o		o	o		o
66	o		o	o	o	
67	o		o	o	o	o
68	o	o				
69	o	o				o
70	o	o			o	
71	o	o			o	o
72	o	o		o		
73	o	o		o		o
74	o	o		o	o	
75	o	o		o	o	o
76	o	o	o			
77	o	o	o			o
78	o	o	o		o	
79	o	o	o		o	o

o INDICATES STJ SETTING

Strapping jacks SS1 and SS2 are associated with circuit A. SS1 is used to assign the Executive extension whereas SS2 is used to assign the Secretary extension if circuit A is used for Secretary or Executive Intercom service.

Strapping jacks SS3 and SS4 are associated with TRK-B card circuit B. SS3 is used to assign the Executive extension and SS4 is used to assign the Secretary extension if Circuit B is used for Secretary or Executive Intercom service.

TABLE 19 lists Secretary/Executive extension assignments on program pin settings SS1 through SS4. Strapping jacks are inserted on the program pins indicated in TABLE 19 for the extensions assigned to the Secretary or Executve Intercom line. If both program pin settings for the same circuit (SS1 and SS2 for circuit A, SS3 and SS4 for circuit B) are programmed for the same extension number, the setting enables the Executive Intercom feature whereby Intercom calls on the line circuit can only be initiated by the Executive (assigned) extension.

The TRK-B trunk card is one of only two trunk cards that can be assigned to the TRK 07/08 card slot in the ET-2460 KSU. TRK-B is used for this trunk appearance when no CP-60 Call Processors are equipped and system All-Call is required. Circuit B (TRK 08) is then programmed for All-Call, and circuit A (TRK 07) can be programmed for any ICM function. When two CP-60 Call Processors are installed in a system, the TRK-B trunk card is assigned to the TRK 05/06 slot in the KSU. Circuit B (TRK 06) is then programmed for Attendant Intercom (in accordance with TABLE 17), and circuit A (TRK 05) can be programmed for any CO/PBX Line or Intercom function.

4.3 ICM/CROSSPOINT CIRCUIT INSTALLATION

Two trunk cards provide Intercom functions only: the ICM card and the CPA card. Neither card requires any program setting or function settings.

4.3.1 ICM TRUNK CARD

The ICM trunk card provides two Dial Intercom circuits (A and B). The ICM trunk card is normally assigned to the TRK 15/16 slot in the ET-2460 since this slot is restricted to Intercom function only. The ICM card is also used to expand the system Intercom capacity beyond two lines. It can be assigned any trunk slot in the KSU except TRK 07/08, which is reserved for All-Call.

4.3.2 CPA TRUNK CARD

The CPA trunk card is assigned to TRK 07/08 when the system is equipped with both a CP-60 Call Processor and All-Call. The CPA trunk card cannot be assigned to any other slot in the ET-2460 KSU. TRK 08 on the KSU is limited strictly to the All-Call voice page circuit appearance. No programming or function settings are required on the CPA trunk card. Volume control adjustment is required on the VTA card for Attendant voice and system voice page levels.

4.3.3 CROSSPOINT (XPS) INSTALLATION

The system crosspoint (XPS) circuit cards are installed in the KSU in accordance with the Trunk circuits and Station circuits that are utilized. Each crosspoint (XPS) card provides voice paths for eight Trunks to be connected to 16 Station circuits.

Note the individual Trunk and Station circuit notations for each XPS circuit card mounting location in the KSU (refer to FIGURE 6 for illustration of the KSU). The top two numbers indicate the trunk circuits that the crosspoint card is associated with while the bottom two numbers reflect the station circuits that the crosspoints encompass.

Insert crosspoint cards in all locations that encompass the actual configuration of the system i.e. the trunk circuits and station circuits being utilized. In most cases, four crosspoint (XPS) cards are required if the STD KSU is utilized and six crosspoint (XPS) cards are required if the EXP. KSU is used with only trunks appearing in the Expansion (EMB) unit. Crosspoint (XPS) cards need be placed in XPS card slots in the EMB whenever station circuits are installed in the EMB.

4.4 STATION CIRCUITS INSTALLATION

4.4.1 GENERAL

Omega-Phone III uses three different station circuit cards: the SUB E-KEY station card, OPX station card, and TCU trunk conference unit. Functions and features of the station circuits are shown in the Extension Planning Sheet (FIGURE 9, paragraph 2.3.3). The number required of each type of station circuit should be determined in accordance instructions in paragraph 2.3 prior to actual installation.

4.4.2 SUB STATION CARD INSTALLATION

The SUB E-KEY station card provides a total of six program settings to determine individual E-KEY station class-of-service setting as well as one program setting to determine a Secretary Transfer assignment for all four stations. The SUB station circuit card is installed in the assigned SUB slot in the KSU as determined by the intercom dial code listed on the Extension Planning Sheet. Prior to physically inserting the card into the assigned card slot in the KSU, all programming features must be set.

Figure 25 illustrates the SUB station circuit card and locations of strapping jack pins for each E-KEY station. TABLE 20 lists the six class-of-service settings for each E-KEY station and corresponding pin assignmnents. From the Extension Planning Sheet(s), determine the individual class-of-service setting for each E-KEY station and insert strapping jacks to enable or disable the features in accordance with TABLE 20.

TABLE 20 SUB STATION CARD CLASS-OF-SERVICE SETTINGS LOCATION

Class	FEATURE	EXT.1 SS1	EXT.2 SS2	EXT.3 SS3	EXT.4 SS4
1	EXEC OVERRIDE ENABLE*	A	A	A	A
2	DO-NOT-DISTRUB ENABLE*	B	B	B	B
3	HOLD RECALL DISABLE**	C	C	C	C
4	NIGHT SERVICE ENABLE*	D	D	D	D
5	ALL-CALL DISABLE**	E	E	E	E
6	OFF-HOOK SIGNALLING**	F	F	F	F

* A strapping jack (STJ) is inserted in the program pin for each E-KEY station to enable the Executive Override, Do-Not-Disturb (DND), and Night Service features.

** A strapping jack is inserted in the program pin for each E-KEY station to disable Hold Recall, All-Call Voice Page, and Off-Hook Signalling.

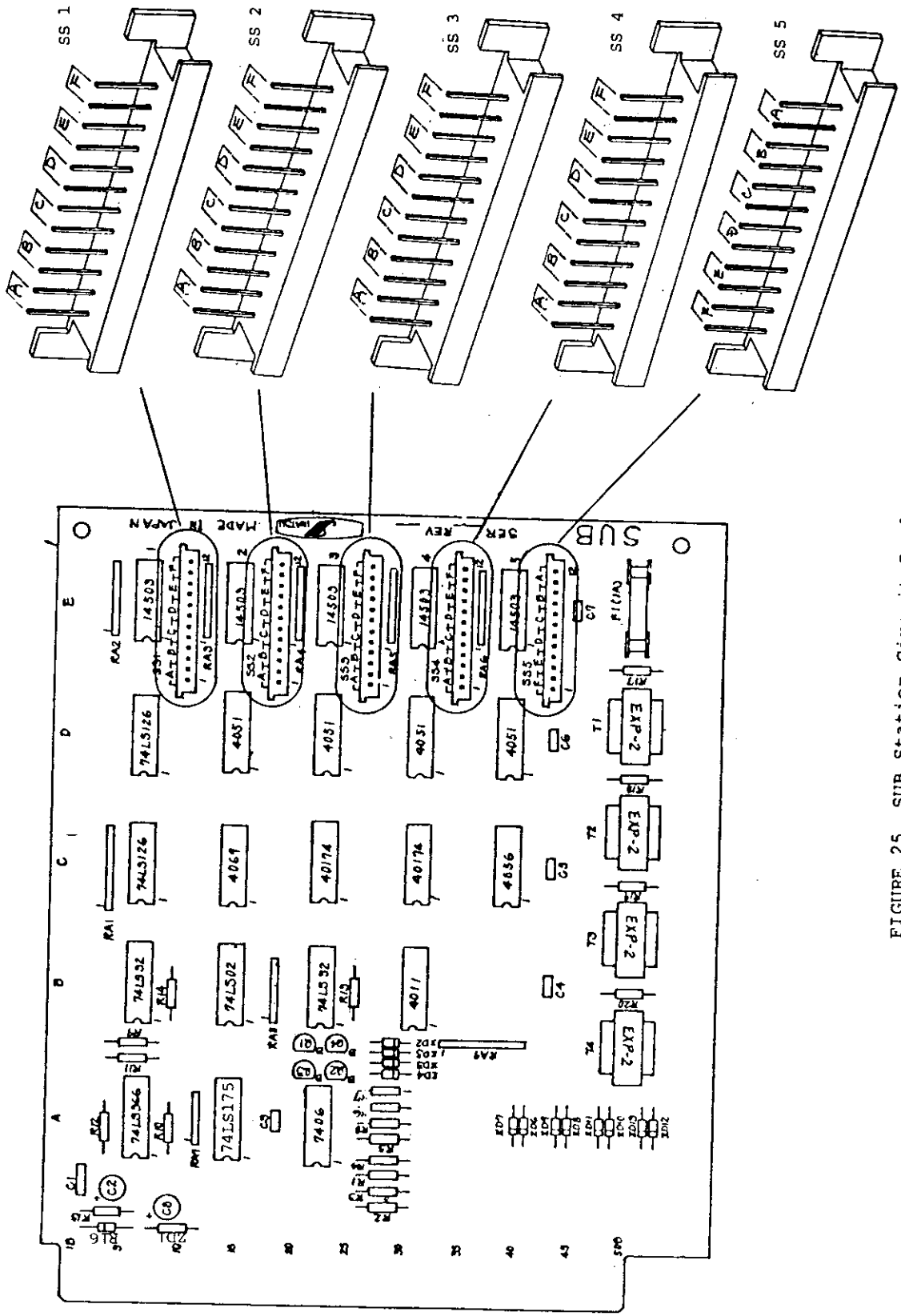


FIGURE 25 SUB Station Circuit Card Setting

TABLE 21 SUB STATION CARD SECRETARY TRANSFER ASSIGNMENTS

Extension Number	Setting Pin F E D C B A
20	
21	o
22	o
23	o o
24	o
25	o o
26	o o
27	o o o
28	o
29	o o
30	o o
31	o o o
32	o o
33	o o o
34	o o o
35	o o o o
36	o
37	o o
38	o o
39	o o o
40	o o
41	o o o
42	o o o
43	o o o o
44	o o
45	o o o
46	o o o
47	o o o o
48	o o o
49	o o o o

Extension Number	Setting Pin F E D C B A
50	o o o o
51	o o o o o
52	o
53	o o
54	o o
55	o o o
56	o o
57	o o o
58	o o o
59	o o o o
60	o o
61	o o o
62	o o o
63	o o o o
64	o o o
65	o o o o
66	o o o o
67	o o o o o
68	o o
69	o o o
70	o o o
71	o o o o
72	o o o
73	o o o o
74	o o o o
75	o o o o o
76	o o o
77	o o o o
78	o o o o
79	o o o o o

o INDICATES STJ SETTING

When the Secretary Transfer feature is assigned to an individual SUB station circuit card, all four E-KEY stations will transfer all Intercom calls (no CO/PBX ringing) to the same extension when the E-KEY station TRAN key is operated. The station designated to receive the calls on the individual SUB card can be any station in the system, including a station on the same SUB card. FIGURE 25 illustrates the SS5 program pin location on the SUB card. Strapping jacks are inserted in the SS5 pin setting in accordance with TABLE 21: A strapping jack is inserted in the pin setting indicated for the extension assigned to receive Secretary Transfer calls in accordance with the Extension Planning Sheet as detailed in paragraph 2.3.

4.4.3 OPX STATION CARD INSTALLATION

The Omega-Phone III can be equipped with two OPX station circuit cards, providing a total of eight OPX telephones. The OPX station circuit cards can be assigned only to SUB 44/47 and SUB 48/51 card slots in the ET-2460 KSU. Refer to the Extension Planning Sheet to determine which card slot is assigned to the OPX card.

Use of the OPX cards in the KSU requires that the MFR OPX interface card be installed in the KSU. The MFR card is inserted into the MFR card slot in the KSU.

Either DTMF or DP type station equipment can be used for OPX service. Different types of telephone can be used on the same OPX card. If any DTMF dial telephones are used as OPX telephones, an MDEC DTMF Receiver must be added to the MFR circuit card. The MDEC module plugs directly into the MFR card, utilizing the multi-pin connectors on the MDEC. The MDEC module connector is polarized so that it can only be inserted into the MFR card in a fixed manner. Align the contact pins on the MFR with the connector on the MDEC and apply pressure to the MDEC until it is firmly seated on the MFR.

FIGURE 26 illustrates the OPX circuit card and locations of the program pins on the card. TABLE 22 lists the strapping jack assignments that indicate which telephones connected to the card are Dial Pulse type. Insert a strapping jack for each Dial Pulse telephone.

TABLE 22 DP ASSIGNMENT ON OPX CIRCUIT CARDS

EXTENSION	DIAL CODE	PIN SETTINGS
EXT. 1	44.48	A
EXT. 2	45.49	B
EXT. 3	46.50	C
EXT. 4	47.51	D

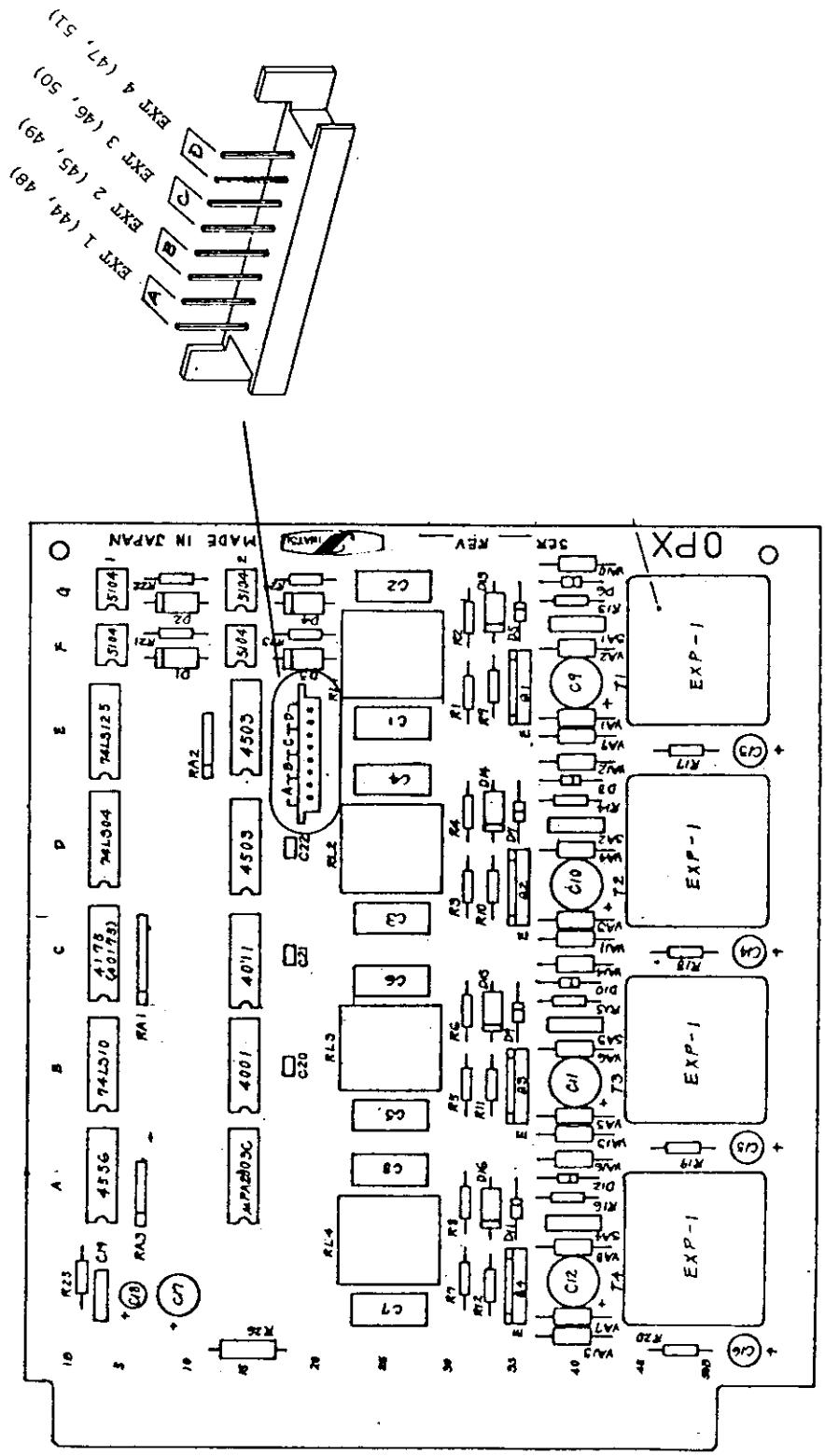


FIGURE 26 OPX Card DTMF Telephone Assignment

NOTE

Use of DTMF-type telephones eliminates the optional toll restriction feature for OPX telephones. If DTMF telephones are used and toll restriction is required, station line restriction or dial toll restriction must be added to the OPX circuits.

Use of the OPX circuit cards requires use of a supplemental talk and signal battery for the OPX lines. The type of battery used is determined by the maximum DC loop resistance of the OPX service that is available from the local telephone company and as the type of signalling (20 to 30 Hz) that is required. Maximum loop limits and talk battery requirements for the OPX telephones are:

(1) Long Loop (less than 2000 ohms): 48 VDC $\pm$ 10%
(2) Short Loop (less than 1000 ohms): 24 VDC $\pm$ 10%

The signal battery for the OPX telephones requires a 20- or 30 Hz, 105-volt power supply. Check with the local telephone company to determine whether a 20 or 30 Hz battery can be used.

NOTE

The talk and signal battery used for the OPX telephones is the same battery used for automatic ringdown circuits. The talk and signal battery requirements must be determined for both before final decision as to what type battery to use.

Connection of the Talk and Signal Battery for OPX services is accomplished at designated screw terminals at the base of the KSU mother-board (MBD). FIGURE 17 illustrates the mother-board connections. OPX battery connection requirements are:

(1) The plus (+) side of the talk battery connects to screw terminal UPW (+) on the MBD.

(2) The minus (-) side of the talk battery connects to screw terminal UPW (-) on the MBD.

(3) The high side of the signal battery connects to screw terminal UBL (-) on the MBD.

(4) The ground (GND) side of the signal battery connects to screw termianl UBL (+) on the MBD.

NOTE

Verify that both the plus (+) side of the OPX talk battery and ground (GND) side of the OPX signal battery are earth grounded to ensure proper operation of the OPX circuit on long line applications.

Connection of the OPX telephone line circuits appears on the KSU CONN D1 terminal block of the MDF. TABLE 23 lists the required connections for all OPX telephones at the MDF. A 25-pair ribbon connector (Amphenol type) cable is required to connect the OPX terminal block to the KSU.

TABLE 23 OPX KSU TERMINAL BLOCK

KSU SLOT	OPX NO.	LINE	CLIP NO.	KSU CONN PIN NO.	CONN CABLE COLOR
SUB 44-47	44	TIP	1	26	WH-BL
		RING	2	1	BL-WH
	45	TIP	3	27	WH-OR
		RING	4	2	OR-WH
	46	TIP	5	28	WH-GR
		RING	6	3	GR-WH
	47	TIP	7	29	WH-BR
		RING	8	4	BR-WH
SUB 48-51	48	TIP	9	30	WH-SL
		RING	10	5	SL-WH
	49	TIP	11	31	RD-BL
		RING	12	6	BL-RD
	50	TIP	13	32	RD-OR
		RING	14	7	OR-RD
	51	TIP	15	33	RD-GR
		RING	16	8	GR-RD

NOTE

For proper operation on long lines, ensure that the tip side of the OPX line is plus (GND) battery and the ring side is minus (-) battery. During signalling, the tip side of the OPX line must be at ground (GND) potential.

4.4.4 TRUNK CONFERENCE UNIT

The Trunk Conference Unit (TCU) is installed when multi-trunk or trunk-to-trunk conference is equipped on the system. The TCU card provides two conference circuits that can be used for conferencing any CO/PBX Lines equipped on the system. A TCU card uses one SUB station card slot, therefore using up four station circuits. Only one TCU card is normally required; if traffic usage of the TCU warrants, an additional TCU card can be added providing two additional conference circuits if a SUB station card slot and XPS circuits are available.

The TCU is normally assigned the SUB station card slot in the KSU next to the last SUB card slot in order to minimize cross-point (XPS) requirements. The TCUs, however, cannot be placed in the first four SUB card slots. The physical size of the TCU card does not allow mounting the card between two SUB station cards. When adding extensions and SUB cards to a KSU in service, the TCU card may have to be removed and assigned a different card slot.

When a TCU card is assigned to a system equipped with OPX station cards, the TCU can be mounted in card slot SUB 40/43 (if available) or must be mounted in the EMB expansion cabinet if no station (SUB) slot is available.

4.5 POWER FAILURE TRANSFER

4.5.1 GENERAL

The power failure transfer circuit card (PFU) provides power failure transfer of the first five CO/PBX Line (TRK 1-5) to dedicated single-line telephones during commercial or system battery failure conditions. The PFU circuit card is installed in the ET-2460 KSU in place of the power failure jumper (PFJ) circuit card that is provided with each KSU. The PFJ circuit card is removed from the standard ET-2460 KSU when the PFU circuit card is installed. The first five CO/PBX Line appearances are then switched to dedicated transfer circuits upon power failure conditions.

NOTE

All single-line telephones associated with the power transfer circuits must be "FCC Registered" and installed in accordance with Section 68.215 of the FCC rules/regulations regarding "unprotected" terminal equipment, with the exception of the requirement that the installer be an "authorized installation supervisor" of the manufacturer of the host registered equipment. Copies of Section 69.215 of FCC rules/regulations regarding direct connection of telephone equipment is available from Iwatsu America upon request.

4.5.2 INSTALLATION

Single-line telephones to be connected to the system during power failure are connected to the PFT terminal block on the MDF. Telephones should correspond to the type of network signalling utilized on the system (i.e. DTMF dial telephones can only be used on DTMF-type lines).

TABLE 24 lists the power failure transfer (PFT) terminal block connections at the MDF. A multi-pair tail cable with a ribbon-type connector is provided with the PFU circuit card. The tail cable, in turn, is terminated on the MDF in a terminal block in accordance with TABLE 24. Care should be taken to ensure continuity as well as DTMF operation during power failure condition, to assure operation of telephone instruments wired for power failure transfer. The 14-pin connector cable provided with the power failure transfer (PFT) unit is connected to the PFT CONNECTOR on the standard ET-2460 KSU motherboard (MBD). (See FIGURE 17.)

TABLE 24 POWER FAILURE TRANSFER MDF CONNECTIONS

SLT CABLE	JUNCTION CABLE	PIN NO.	CLIP NO.	CIRCUIT
BL-RD1	WH-BL	26	1	1T
BL-BK1	BL-WH	1	2	1R
OR-RD1	WH-OR	27	3	2T
OR-BK1	OR-WH	2	4	2R
GR-RD1	WH-GR	28	5	3T
GR-BK1	GR-WH	3	6	3R
PK-RD1	WH-BR	29	7	4T
PK-BK1	BR-WH	4	8	4R
SL-RD1	WH-SL	30	9	5T
SL-BK1	SL-WH	5	10	5R

Only one PFU circuit card may be installed in the ET-2460 KSU. Only the first five CO/PBX Line appearances on the system can be transferred to dedicated single-line telephone instruments. During power failure, lines transferred to single-line telephones can be used to answer and initiate CO/PBX Line calls. Interruption of calls will occur when power is restored.

4.6 PROGRAM BOARD INSTALLATION

4.6.1 GENERAL

The program board (PSB) is used for installation and programming of optional system features. Two feature packages are offered:

a. Feature Package I includes toll restriction, individual CO/PBX Line Incoming Call Signalling, and OPX CO/PBX Line Group Level Access.

b. Feature Package II includes group calling of extensions on Intercom Lines, CO/PBX Line Dial Restriction, OPX Night Transfer assignment, Time-Out of system functions and CO/PBX Line Restriction for OPX telephones.

4.6.2 REQUIREMENTS

The program circuit board is used for assigning both extensions and CO/PBX lines to Feature Packages I and II. Refer to the Extension Planning Sheets and Station Program Planning Sheets for determining which features are to be assigned each extension and requirements for the number of program boards in the ET-2460 KSU.

The standard ET-2460 KSU requires one program board for each Feature Package. Program board PSB1 and PSB2 card slots are provided on the standard KSU for the Feature Packages. Program board card slots PSB3 and PSB4 are provided on the expanded ET-2460 KSU for Feature Packages I and II when the KSU expansion unit is equipped. Program boards are associated with CO/PBX Lines/stations of the standard or expanded KSU. Station or CO/PBX Lines may not require PSB cards if the lines/stations are divided in such a manner that they are not a part of the lines/stations encompassing the individual program board. TABLE 25 lists the CO/PBX Lines and system extensions that are associated with each program board.

TABLE 25 PROGRAM BOARD LINE/EXTENSION ASSIGNMENT

PROGRAM BOARD	TRK NO.	SUB NO.	PACKAGE
PSB-1	1-14	EXT. 20-51	PACKAGE I
PSB-2	1-24	EXT. 20-51	PACKAGE II
PSB-3	17-24	EXT. 52-79	PACKAGE I
PSB-4	NONE	EXT. 52-79	PACKAGE II

Some features of Feature Package II do not require that PSB-4 be equipped, namely: OPX Night Service Assignment, OPX Dial Restriction and System Time-Out programming.

Program boards (PSB) utilize dip-switch program settings. Each program card slot (PSB1 through PSB4) in the KSU utilizes the same PSB circuit card; each feature, in turn, requires different settings of dip-switches appearing on the board. Each dip-switch is designated as a Program Switch (SWB).

The PSB circuit card comes equipped with 32 Program Switches. FIGURE 27 illustrates the Program Switch (SWB) number assignment for each of the 32 switches appearing on the PSB card. Each Program Switch consists of eight

Unit Switches (USW). Each Unit Switch determines the individual program setting. Unit Switches are numbered from USW-1 through USW-8. FIGURE 27 illustrates the eight Unit Switches that each Program Switch comprises. Unit Switch settings are identified as either "on or off". Program cards are provided with Unit Switches in the off position. Enabling the feature requires that the designated Unit Switch (USW) be set to the on position.

NOTE

When first installing program boards, verify that all Unit Switches are reset (i.e. in the "off" position) before any program settings are made.

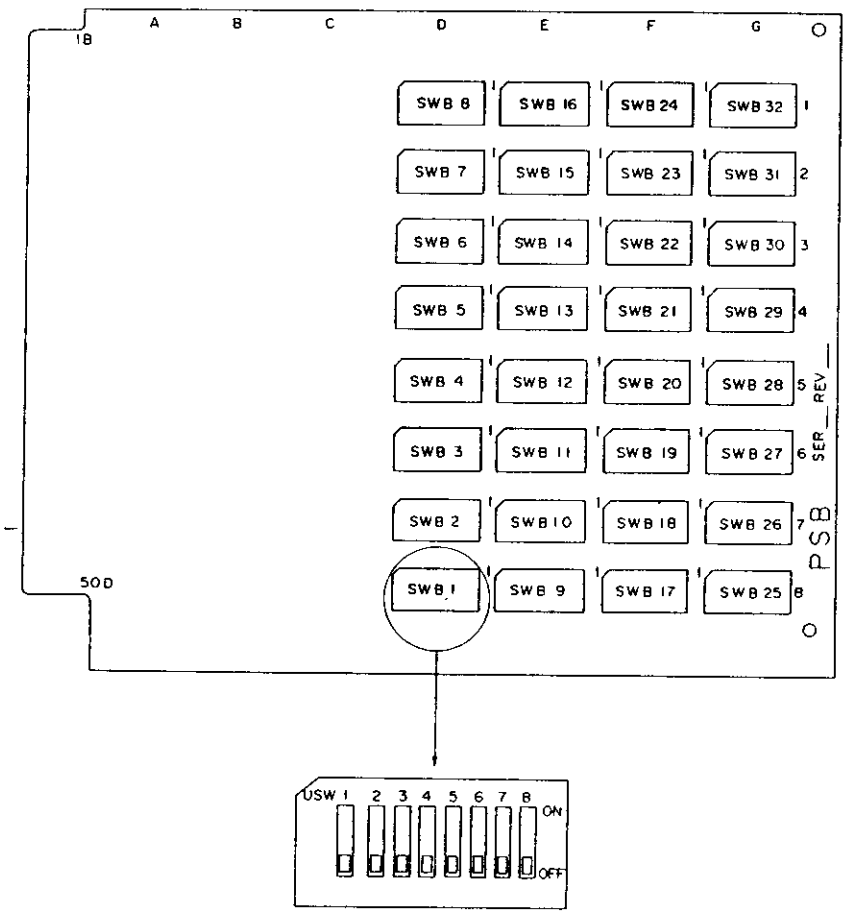


FIGURE 27 Program Board (PSB) Dip-Switch Designations

4.6.3 FEATURE PACKAGE I PROGRAMMING

Feature Package I requires equipping the KSU with PSB-1 (and PSB-3 if expansion assembly is utilized). Program board PSB-3 is required only if the lines/extensions associated with the expansion KSU assembly are included in the system program. Refer to the Extension/Line Feature Assignment program sheets to determine which extensions/lines require programming on PSB-1 and PSB-3.

4.6.3.1 TOLL RESTRICTION

Omega-Phone III provides Toll Restriction of CO/PBX Line calls for E-KEY stations and OPX (rotary dial) telephones when PSB-1 and PSB-3 program boards are equipped. Toll Restriction consists of restricting CO/PBX Line calls when the digit "0" or "1" is dialed on the first or second digit of a CO/PBX Line call. Upon restriction of the call, the CO/PBX Line is momentarily disconnected.

Toll Restriction is assigned on an individual CO/PBX line and extension basis. Refer to the Trunk Planning and Extension Planning Sheets for determining which lines and extensions are Toll Restricted. Refer to FIGURE 28 for locations of Program Switches on the PSB assigned for Toll Restriction programming.

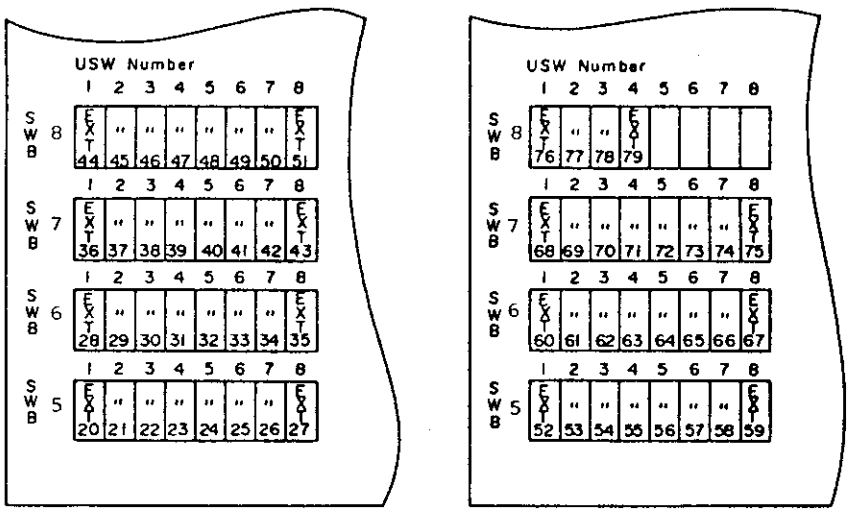
To assign system extensions for Toll Restriction, locate the Program Switches (SWB) on PSB-1 (and PSB-3 if equipped) illustrated in FIGURE 28a. Each Unit Switch for the system station is set to the position to program the station to be Toll Restricted. To assign CO/PBX Lines for Toll Restriction, locate Unit Switch 8 (USW8) of the Program Switches illustrated in FIGURE 28b (PSB-1) and (PSB-3) for the respective CO/PBX Lines. Set each Unit Switch 28c (USW8) to the position for each CO/PBX Line to be designated as Toll Restricted.

4.6.3.2 INCOMING CO/PBX SIGNALLING ASSIGNMENT

Up to 12 E-KEY telephones can be assigned to ring on designated CO/PBX Lines in the system when the PSB-1 and PSB-3 (if required) program boards are equipped. The Program Boards are also required when Extension 20 (Attendant 1) and Extension 21 (Attendant 2) cannot be assigned to ring on all incoming CO/PBX Lines in the system.

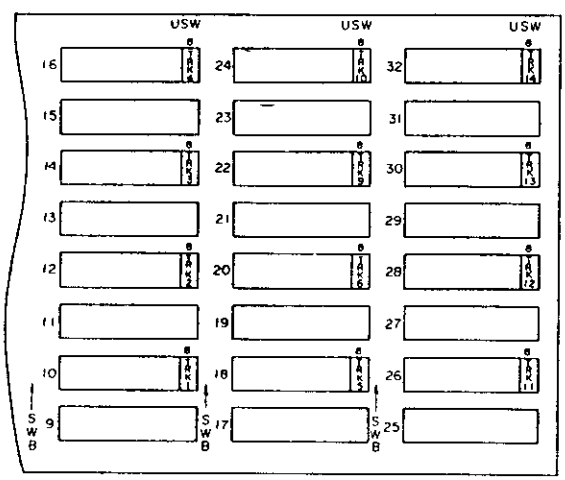
NOTE

When the system is equipped with program boards PSB-1 (and PSB-3), no programming of CO/PBX Line ringing is required if Extensions 20 and 21 will receive common bell CO/PBX line ringing. Conversely, when no PSB is equipped or no assignment is done Extensions 20 and 21 will receive common bell CO/PBX Line ringing.



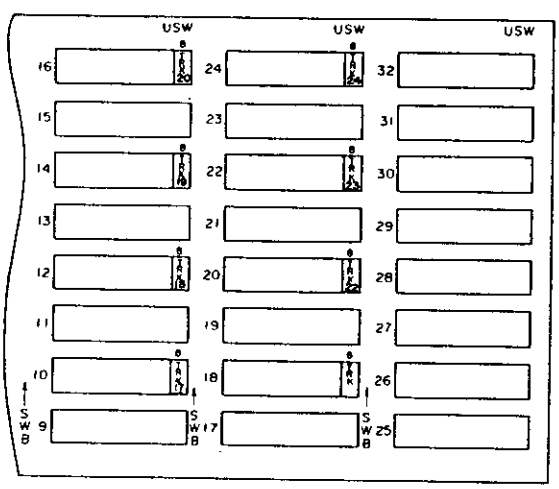
PSB-1 PSB-3

a. Extension Toll Restriction Settings



PSB-1

b. CO/PBX Line Toll Restriction



PSB-3

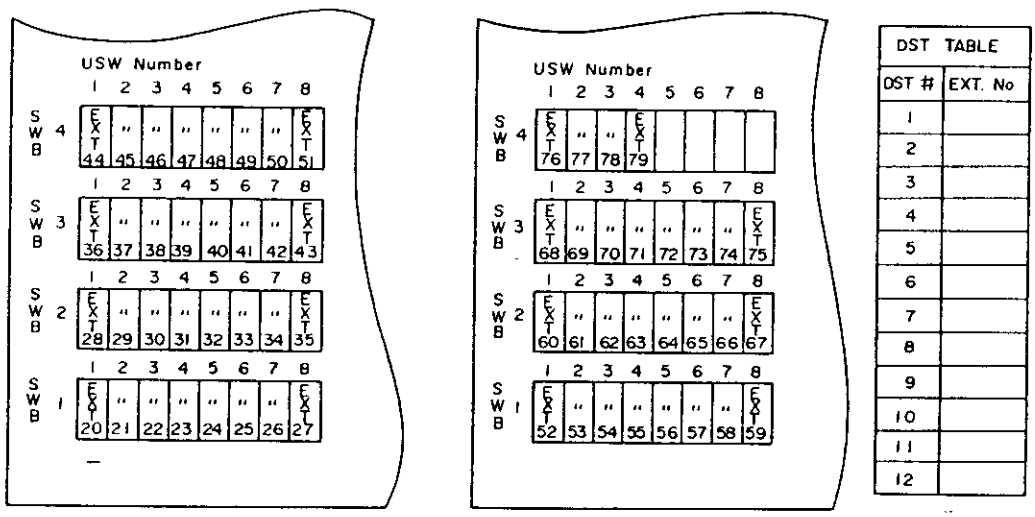
c. CO/PBX Line Toll Restriction

FIGURE 28 Toll Restriction Program Switch Map

FIGURE 29a illustrates location of the Program Switches on PSB-1 and PSB-3 for setting extensions to receive incoming CP/PBX call ringing. Up to twelve E-KEY extensions can be programmed to receive CO/PBX ringing. Set each Unit Switch for the extension to the "on" position to enable the extension to receive call indication.

List each E-KEY station number assigned to CO/PBX Line ringing in a Destination (DST) table as illustrated in FIGURE 29a starting from the lower order Intercom number. Each station is then referenced as the DST# (DST 1 through 12) when assigning the individual CO/PBX Lines.

Each E-KEY station assigned for ringing is programmed for the individual CO/PBX Line (or group) by Unit Switch settings on Program Switches illustrated in FIGURE 29b (PSB-1) and 29c (PSB-3). The Unit Switches of the two designated Program Switches for each trunk are then set (turned on) in accordance with the E-KEY station DST # (DST 1 through 12) that will receive CO/PBX Line ringing.



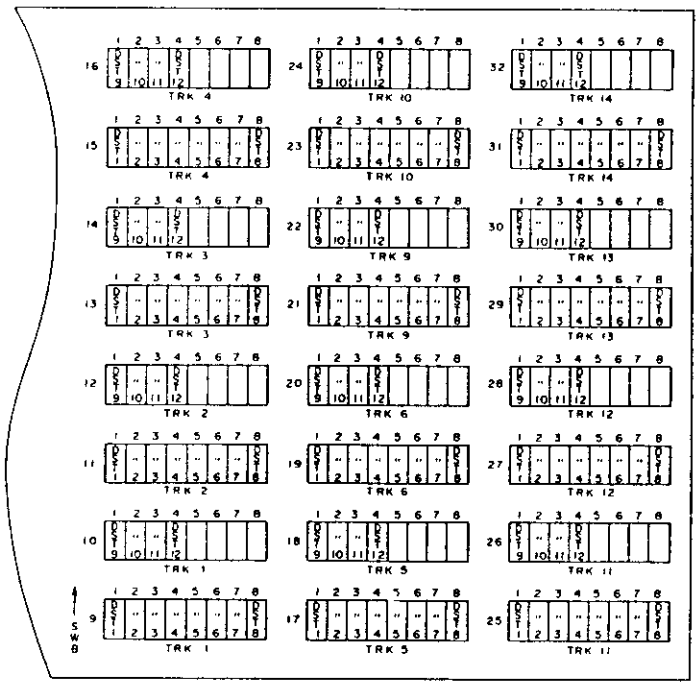
a. Individual Line Station Assignment

FIGURE 29 CO/PBX Ringing Assignments

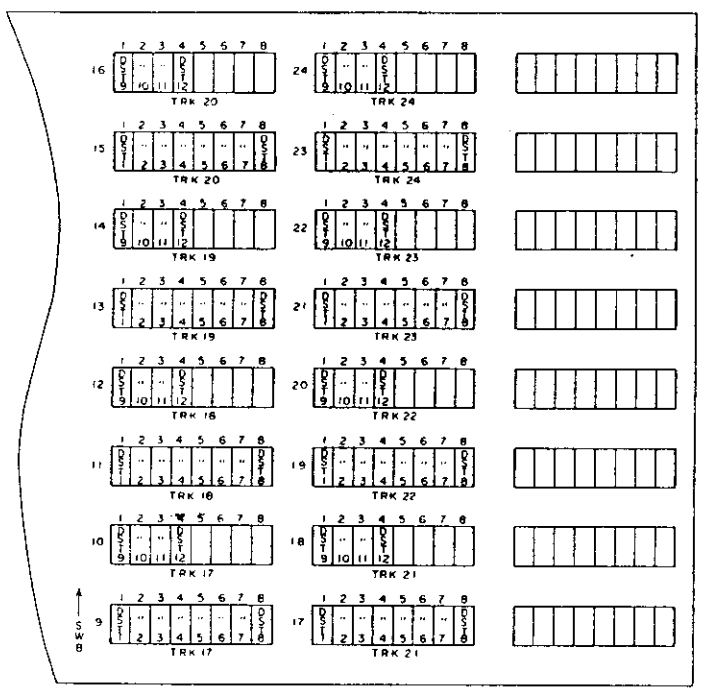
4.6.3.3 OPX CO/PBX GROUP LEVEL ASSIGNMENT

OPX telephones can dial access up to four groups of CO/PBX Lines when PSB-1 and PSB-3 (if required) are installed. Groups of CO/PBX Lines are dial accessed in accordance with the following access codes:

Group 1 ..... Dial 90
Group 2 ..... Dial 91
Group 3 ..... Dial 92
Group 4 ..... Dial 93

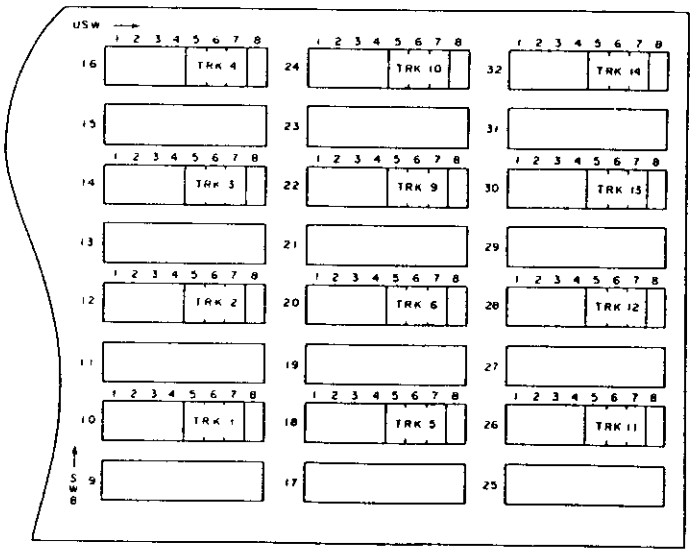


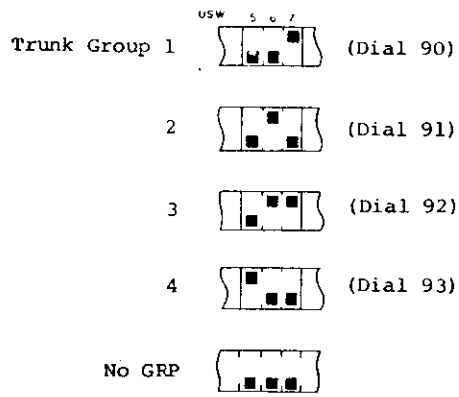
b. PSB-1 Trunk Setting for Individual CO/PBX Line Ringing



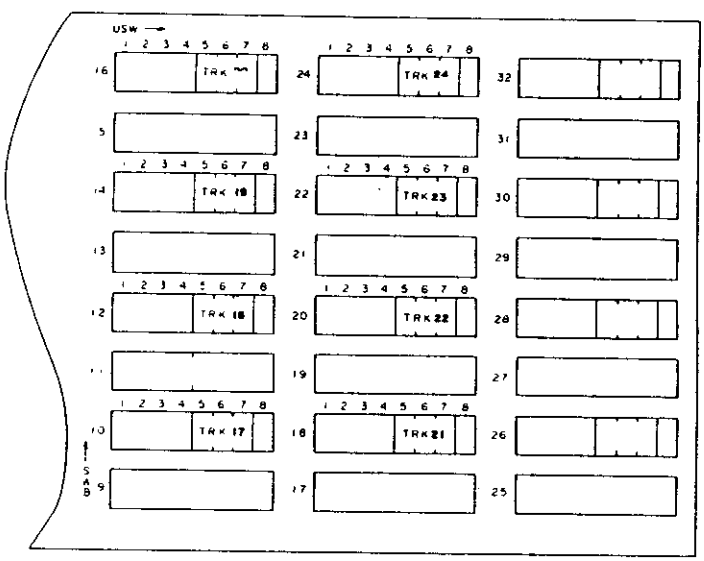
c. PSB-3 Trunk Setting for Individual CO/PBX Ringing

FIGURE 29 (Continued)





a. PSB-1



b. PSB-3

FIGURE 30 CO/PBX Line O2X Group Level Assignment

If neither PSB-1 nor PSB-3 is installed, OPX telephones have no dial access to CO/PBX Lines in the system. CO/PBX Lines can be transferred to OPX extensions through the Intercom add-on conference feature, however. To assign CO/PBX Lines to OPX Dial Access Group Levels, set the Unit Switches at the Program Switches illustrated in FIGURE 30 to the "on" position, in accordance with the Trunk Group Switching Code illustrated in FIGURE 30.

4.6.4 FEATURE PACKAGE II PROGRAMMING

Feature Package II requires equipping the ET-2460 KSU with PSB-2 (and PSB-4 if the EMB expansion assembly is equipped). Program board PSB-4 is required only for the extensions associated with the CO/PBX Line Dial Restriction feature and Intercom Group Call extension assignment. Refer to the Extension Line Feature Assignment Program sheets to determine which extensions/lines require programming on PSB-2 and PSB-4 for Feature Package II.

4.6.4.1 ICM GROUP CALLING

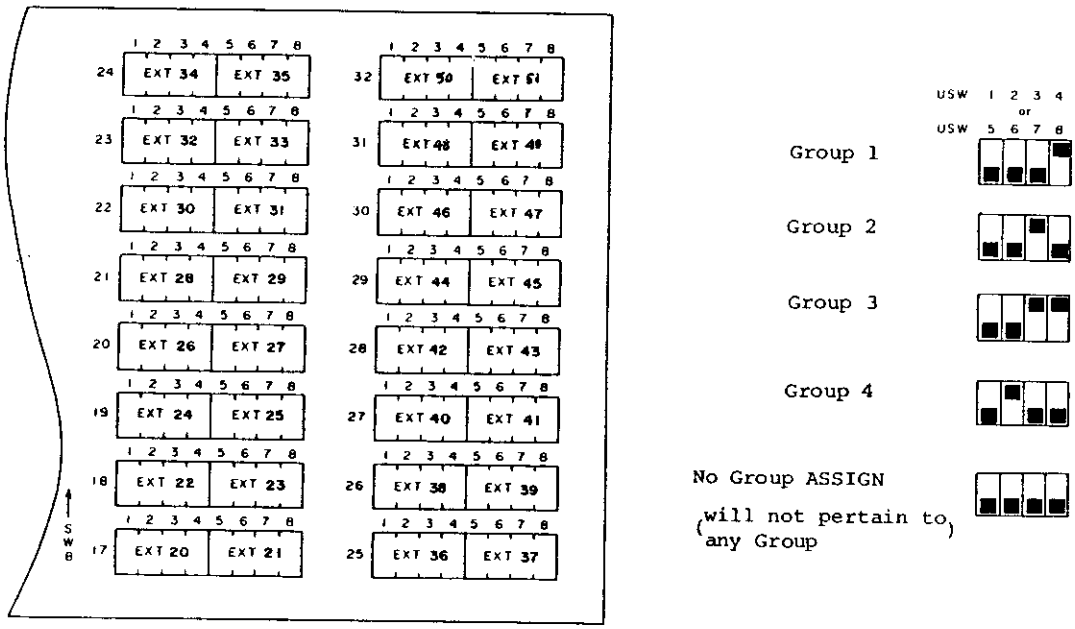
To designate Intercom stations to be dialed on a specific group-call Intercom access number requires a PSB-2 program board for extensions in the standard KSU and a PSB-4 for all extensions assigned groups in the expanded KSU. Groups of intercom extensions are dialed accessed in accordance with the following access codes:

ICM GROUP 1 ..... Dial 85
ICM GROUP 2 ..... Dial 86
ICM GROUP 3 ..... Dial 87
ICM GROUP 4 ..... Dial 88

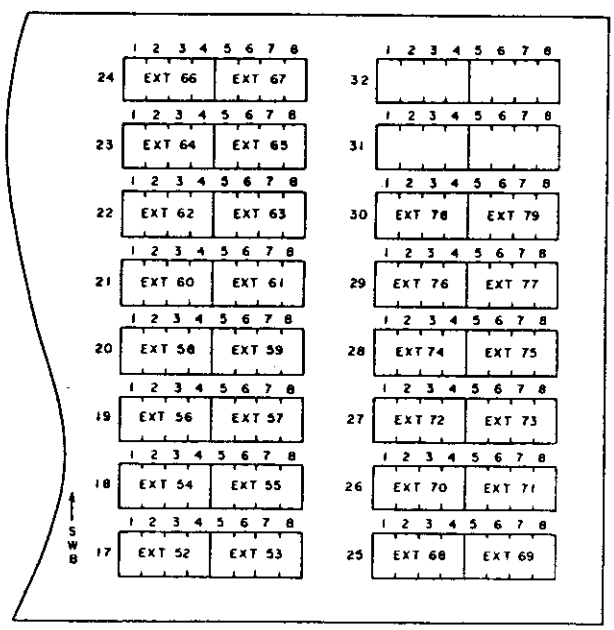
To assign an individual extension to an Intercom Group Call Number, a four bit Unit Switch must be set on either PSB-2 or PSB-4 for the extension in accordance with the code illustrated in FIGURE 31. Determine which Intercom group the extension is assigned to and set the four USW switches for the particular group setting in accordance with the Extension Group Code illustrated in FIGURE 31.

NOTE

OPX stations cannot be included in any Intercom group. Program setting for an OPX station made at PSB-2 will be disregarded.



a. PSB-2



b. PSB-4

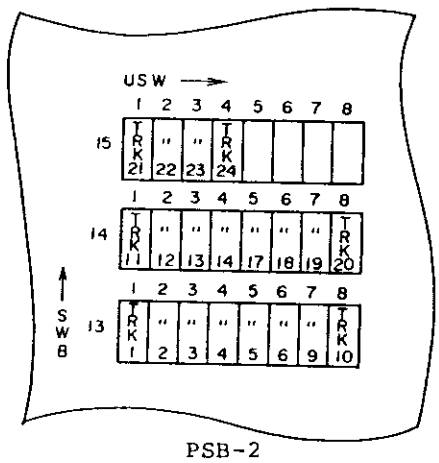
FIGURE 31 Intercom Group-Call Setting

4.6.4.2 E-KEY EXTENSION DIAL RESTRICTION

CO/PBX Line Dial Restriction requires program settings on PSB-2 and PSB-4. Any E-KEY station and CO/PBX Line can be restricted so that only incoming calls can be received on the E-KEY station line circuit appearance. Refer to the Extension Line Feature Assignment sheet for determining which CO/PBX lines and extensions are to be Dial-Restricted. To program the CO/PBX Lines to be Dial-Restricted, locate the Program Switches on PSB-2 illustrated in FIGURE 32a and set (turn on) the Unit Switch for each CO/PBX Line to be Dial-Restricted. To program the individual extension to be Dial-Restricted, locate the Program Switches on PSB-2 and PSB-4 illustrated in FIGURE 30b and set (turn on) the Unit Switch for the E-KEY extension to be Dial-Restricted.

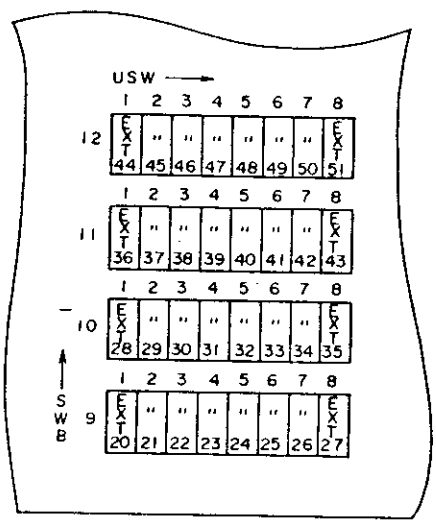
4.6.4.3 OPX NIGHT SERVICE ASSIGNMENT

The OPX telephones in the system can be assigned to the system Night Service so that all incoming CO/PBX Lines assigned to Night Service will ring at the OPX telephones. Program settings are required on PSB-2 only.

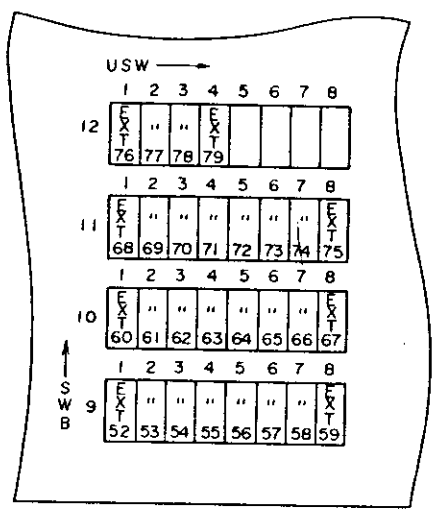


PSB-2

a. CO/PBX Line Settings



PSB-2



PSB-4

b. Extension Settings

FIGURE 32 CO/PBX Line Dial-Restriction

Eight OPX telephones can be equipped in the system. Each OPX telephone can be individually assigned to ring during Night Service. FIGURE 33 illustrates Program Switch SWB 16 on PSB-2. Each Unit Switch is assigned to one of the eight OPX stations. Setting the Unit Switch to the on position places the corresponding OPX station in the Night Service group.

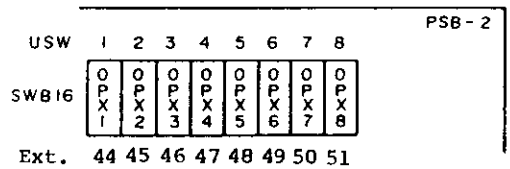


FIGURE 33 OPX Telephone Night Service Setting

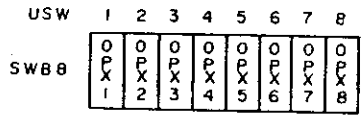
No PSB-4 program board is required for the KSU when assigning OPX Night Service features because all OPX Telephones are installed in the standard KSU cabinet at SUB 44-51 station circuits.

4.6.4.4 OPX OUTGOING DIAL RESTRICTION

Individual OPX extensions can be programmed for Outgoing Dial-Restriction access to CO/PBX Line group levels. CO/PBX Lines can be transferred and answered by OPX extensions; dial access to any of the four group levels for outgoing calls is not permitted. Eight OPX telephones can be equipped on the system. Each OPX telephone can be individually assigned for Dial Restriction on CO/PBX Lines. FIGURE 34 illustrates SWB 8 on program board PSB-2. Each Unit Switch is assigned to one of the eight OPX telephones. Setting the Unit Switch for the OPX to the on position places the OPX in the Dial-Restricted group. No PSB-4 program board is required for OPX Dial-Restriction because all OPX telephones are installed in the standard KSU cabinet at SUB 44-51 station circuits.

NOTE

Intercom dial code 44 through 51 are assigned to eight OPX stations. When OPX stations are equipped, Dial-Restriction setting for the station dial codes (described in paragraph 4.6.4) is disregarded.



(PSB-2)

Figure 34 OPX Telephone Dial-Restriction Setting

4.6.4.5 SYSTEM TIME-OUT PROGRAMMING

Operation times, for various system features and functions can be adjusted to the desired settings by Program Switches on PSB-2. Timer functions that can be adjusted by Program Switches on PSB-2 include:

(1) Interdigit Timing: Limiting the maximum time period for dialing digits of an Intercom number before forced disconnection.

(2) Warning Tone Duration: Determining the time duration for the system warning tone (fast busy) indication.

(3) Add-on Operation: Limiting the time duration after the ADD key is operated for completion of the add-on connection.

(4) Hold Recall Timing: Setting the time period for station "hold recall" operation.

(5) ATTND Recall Timing: Setting the time period for "Attendant recall" operation.

(6) Voice Page Duration: Limiting the time duration for a voice page on the PA System or All-Call System.

(7) Pre-Selection Time-Out: Limiting the time period that a station shows line access before the handset is taken off-hook.

(8) System Muting Time: Determines the time duration that the CO/PBX Line is muted during dialing (sending)

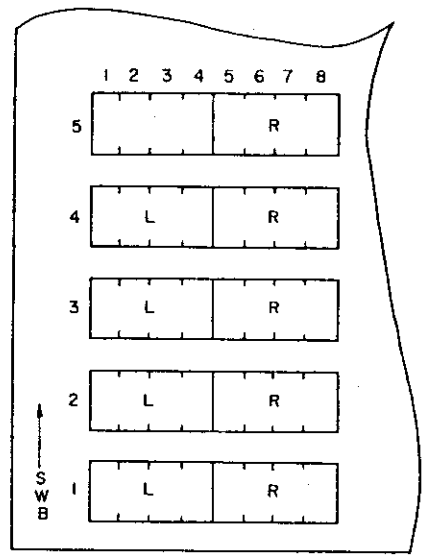
FIGURE 35 illustrates the locations of the Program Switches on PSB-2 for the time-controlled feature, and functions. Four Unit Switch settings are required for each feature or function.

TABLE 26 PSB-2 Time Control Features and Functions Setting

SWITCH NO.		1R	1L	2R	2L	3R	3L	4R	
FUNCTION		INTER-DIGIT TIMING	WARNING TONE DURATION	ADD KEY VALID TIME	HOLD RECALL	ATTND RECALL	VOICE PAGE VALID	KEY PRE-SELECT	MUTING TIME
SETTING	NO.								
WITHOUT PSB-2	0	10 seconds	20 seconds	10 seconds	180 seconds	60 seconds	15 seconds	10 seconds	0.1 seconds
□□□□	0	10	20	10	180	60	15	10	1.5
□□□■	1	5	5	5	20	10	5	5	0.1
□□■□	2	10	10	10	40	20	10	10	0.2
□□■■	3	15	15	15	60	30	15	15	0.3
□■□□	4	20	20	20	80	40	20	20	0.4
□■□■	5	25	25	25	100	50	25	25	0.5
□■■□	6	30	30	30	120	60	30	30	0.6
□■■■	7	35	35	35	140	70	35	35	0.7
■□□□	8	40	40	40	160	80	40	40	0.8
■□□■	9	45	45	45	180	90	45	45	0.9
■□■□	10	50	50	50	200	100	50	50	1.0
■□■■	11	55	55	55	220	110	55	55	1.1
■■□□	12	60	60	60	240	120	60	60	1.2
■■□■	13	65	65	65	255	130	65	65	1.3
■■■□	14	70	70	70	255	140	70	70	1.4
■■■■	15	75	75	75	255	150	75	75	1.5

NOTE: Switch setting 0 shows system timing of each function if PSB-2 is not installed.

1R: INTERDIGIT TIMING
1L: WARNING TONE DURATION
2R: ADD-ON OPERATION
2L: HOLD RECALL TIMING
3R: ATTEND RECALL TIMING
3L: VOICE PAGE DURATION
4R: PRE-SELECTION TIME-OUT
5R: CO/PBX MUTING TIME



PSB-2

FIGURE 35 System Time Control Settings

TABLE 26 lists the various time-controlled system functions and features, and settings for each time interval. Note that the time interval for each feature or function is different; the installer can vary the time between the limits listed in TABLE 26 by appropriate settings of the four Unit Switches. Refer to the System Time Function Feature program sheet for setting the individual features and functions. Changes can be made after initial installation to suit individual system requirements. A copy of the program sheet should be left on the equipment site for reference. Non-setting of Unit Switches on PSB-2 or no use of PSB-2 in a KSU results in system times of no Unit Switch setting for each function or feature as listed in TABLE 26. Setting of system time-controlled features and functions does not require use of PSB-4. All programming is accomplished on PSB-2.

4.6.5 DOCUMENTATION

Upon completion of all programming on the PSB1-4 circuit card, notation of the exact program setting on the individual PSB circuit card for permanent records should be made on the PSB Program Sheet. FIGURE 35-1 illustrates a master program sheet record that can be used. One sheet is utilized for each PSB circuit card equipped in the system.

Upon accomplishing the program, the installer makes notations on the respective PSB Program Sheet as to which UNS switches are operated on the

individual SWB. The 32 SWB switches illustrated on the sheet correspond to the 32 SWB's on the respective PSB.

The PSB Program Sheet is also useful in that notations can be made on assigned sheets for instruction to the installer to set the desired program.

PROGRAM SHEET FOR PSB ( )

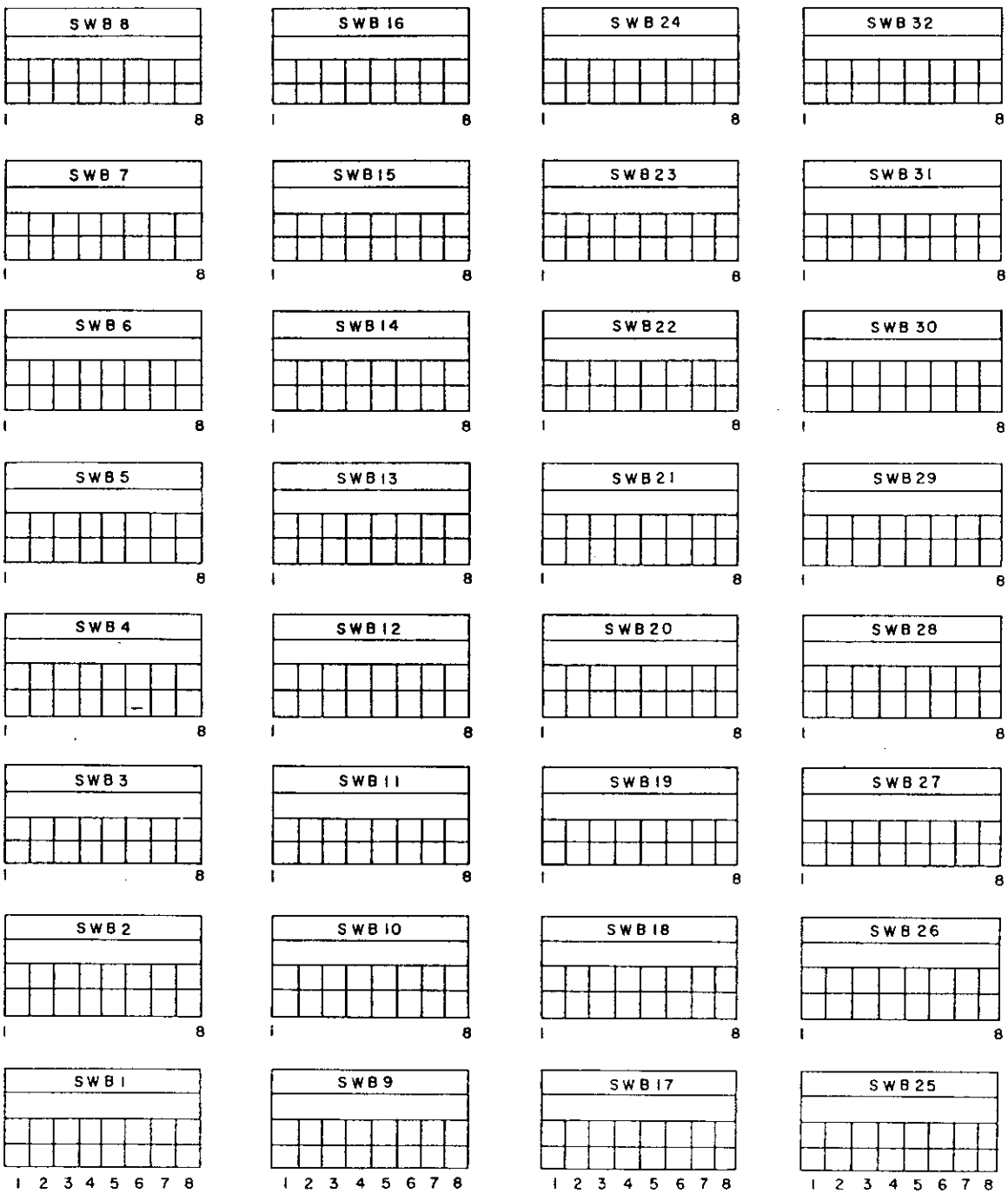


FIGURE 35-1 PSB Program Sheet

4.7 INSTALLATION OF ZONE-PAGE (PA) ADAPTER

4.7.1 GENERAL

The Zone-Page Adapter Unit (ZPU) provides three zones of public address (PA) plus access to all zones simultaneously. The ZPU circuit card contains no amplification; a standard PA amplifier must be used with the system. Provision is made for background music to be played over the zone page speaker while no voice page is being made. Two connection options are offered: one allows uninterrupted music in the PA zones not being accessed, and the other cuts off music in all zones when any zone is accessed. Accessing all zones of the PA system disconnects the background music in both arrangements. Arranging the system for uninterrupted music requires one music source and two PA amplifiers. One PA amplifier is used to drive all speaker zones for background music, while the other is used for the individual zone voice page. Both amplifier ratings should be sufficient for all three zones. Arranging the system for cutoff of background music requires one music source and only one PA amplifier. The capacity (wattage) of the amplifier should be sufficient to operate all three zones simultaneously.

4.7.2 CIRCUIT CONNECTIONS

All speaker leads for the individual zones are connected to the MBD screw terminal strip on the ET-2460 KSU. Input to the PA amplifier and background music source utilize "phono" jack-type connectors located on the MBD. Connections to the "phono" jacks vary with the optional music cutoff feature.

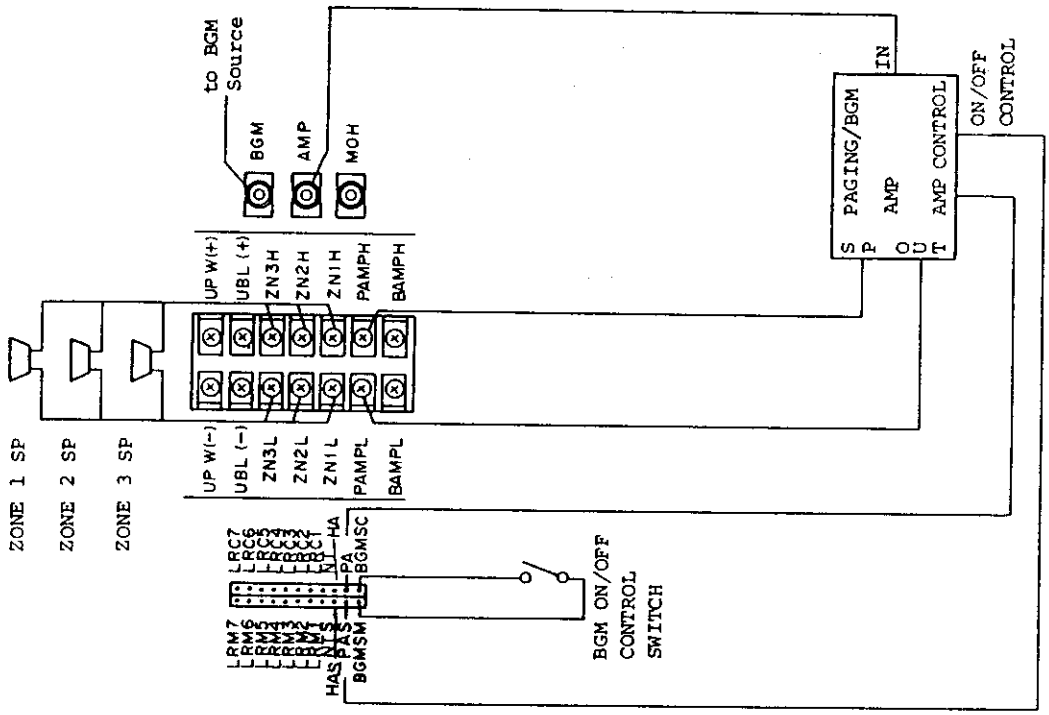
Speaker cable connections are established on the MBD screw terminal (refer to FIGURE 18). Shielded pair speaker cables are attached to screw terminals ZN1 through ZN3 high-low screw terminals on the MBD. All shields for speaker cables should be attached to earth ground. Either the 70-volt or 25-volt (constant voltage) output of the associated PA amplifier should be used when zones of speakers have different wattage requirements. Use of the constant-voltage-type output will eliminate different speaker voice levels when accessing the different zones.

FIGURE 36a illustrates connections required when two PA amplifiers and one music source (Option 1) are utilized so that uninterrupted music occurs when a voice page is made. Note connections required on the MBD terminal strip and wire-wrap connection required for music control.

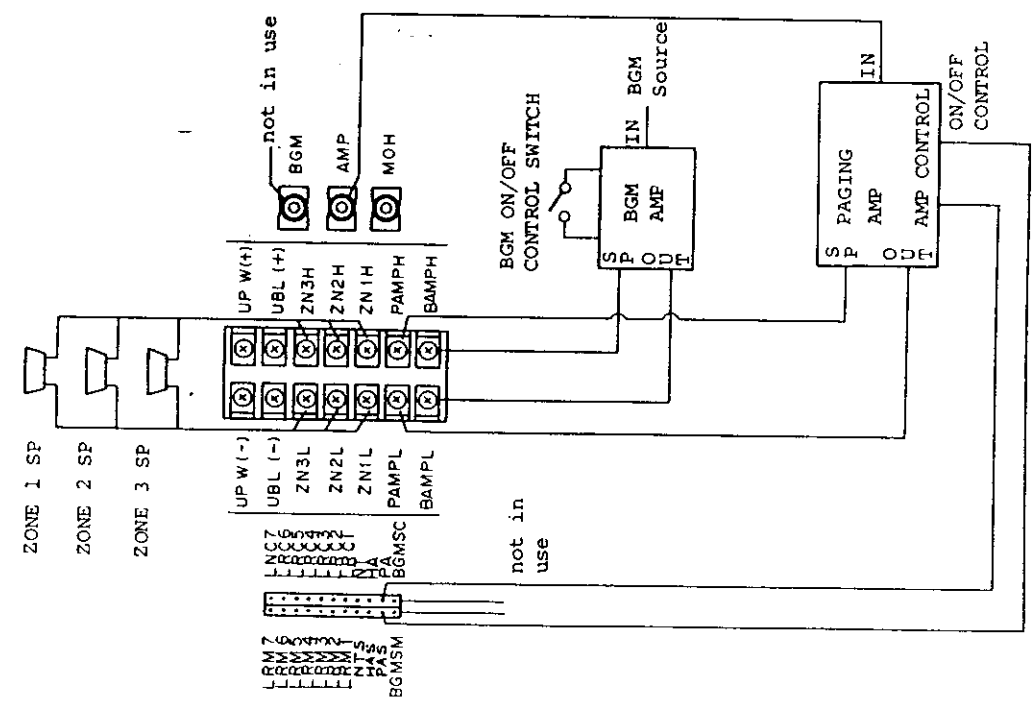
NOTE

When Option 1 is utilized for zone paging, the music source can be utilized for the music-on-hold circuit if a standard tuner or tape player is utilized. Connect the music-on-hold "phono" jack directly to the output of the tuner/tape, not to the music PA amplifier.

FIGURE 36b illustrates Option 2 connections using only one PA amplifier, when music cutoff is allowed or music is not required.



b. Option 2



a. Option 1

FIGURE 36 PA Circuit Connections

SECTION 5 STATION INSTALLATION

5.1 GENERAL DESCRIPTION

5.1.1 DESCRIPTION

Omega-Phone III features two models of electronic key telephone station equipment: the model ET-1632 and model ET-2460 key telephones. Each E-KEY telephone is equipped with a modular cord for connection to a 6-pin modular station block. Both telephone are identical except for the increased line capacity of the ET-2460. A model ET-1632 E-KEY telephone may be field upgraded to the model ET-2460 type.

5.1.2 UNPACKING

The model ET-1632 and ET-2460 E-KEY telephones are packaged as individual units complete with various components required for installation. FIGURE 37 illustrates the components parts of the ET-1632 and ET-2460 E-KEY telephones. When unpacking the station equipment, verify that all items are present including:

- A 6-pin, modular-ended Mounting Cord for house cable connection, and
- Pressure-Sensitive labels for identification of key-strips and directory tray.

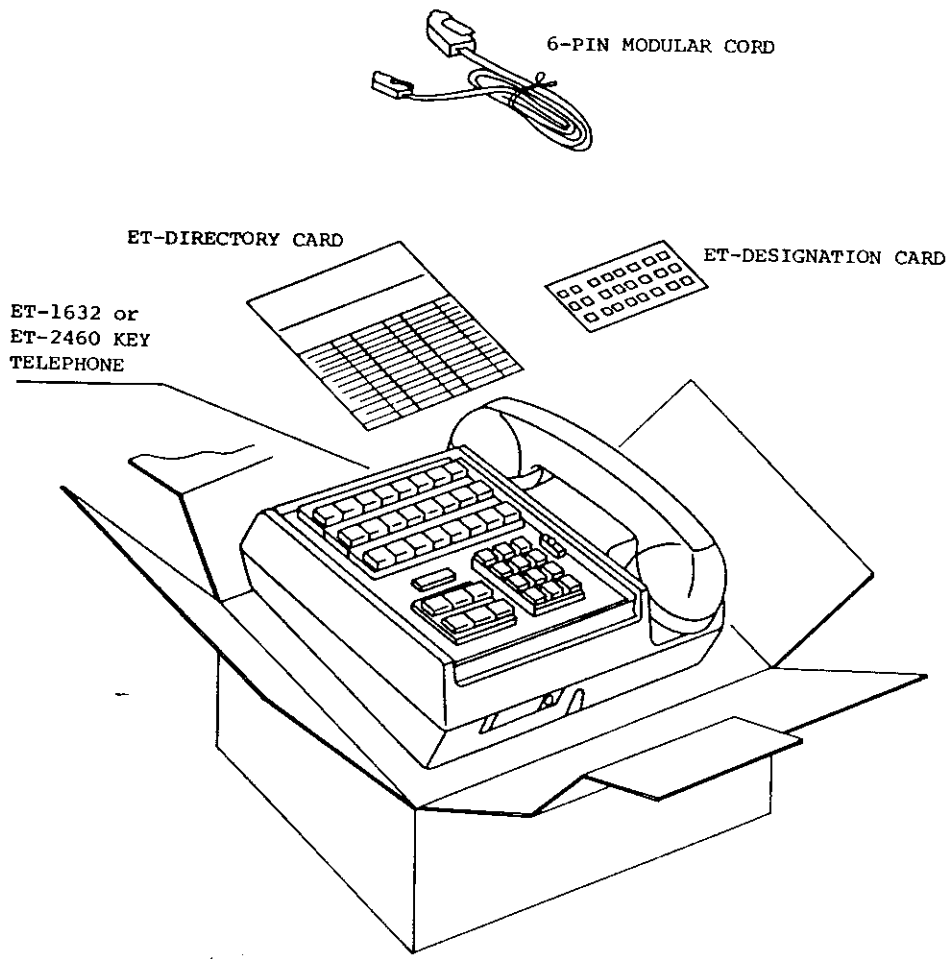


FIGURE 37 ET-1632 and ET-2460 Components

FIGURE 38 illustrates the faceplate and components.
The ET-1632 and ET-2460 E-KEY telephones require different faceplates due to the difference in line capacity. A dial Plate/Label are provided to identify the extension Intercom dial code number.

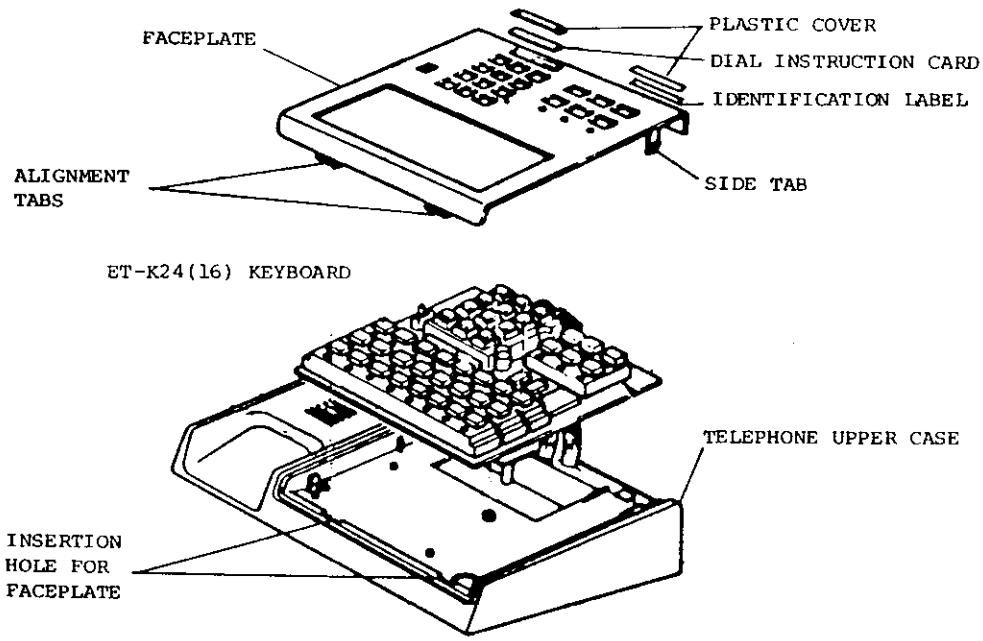


FIGURE 38 ET-1632 and ET-2460 Faceplate and Components

5.1.3 HANDLING

The E-KEY Telephones may require disassembly for installation of optional station features. Proper disassembly procedures will ensure good equipment appearance and reliability.

FIGURE 39 illustrates removal-attachment of the telephone faceplate. No tools are required for this operation.
For attachment of the faceplate to the telephone, insert the two alignment tabs on the front of the faceplate into the holes on the front of the telephone upper case. Apply pressure on the top of the faceplate until the two side tabs lock securely on the top of the upper case.
For removal of the faceplate, lift the back of the faceplate to disengage the two side tabs of the faceplate from the upper case. Swing the faceplate forward until the two front tabs are disengaged.

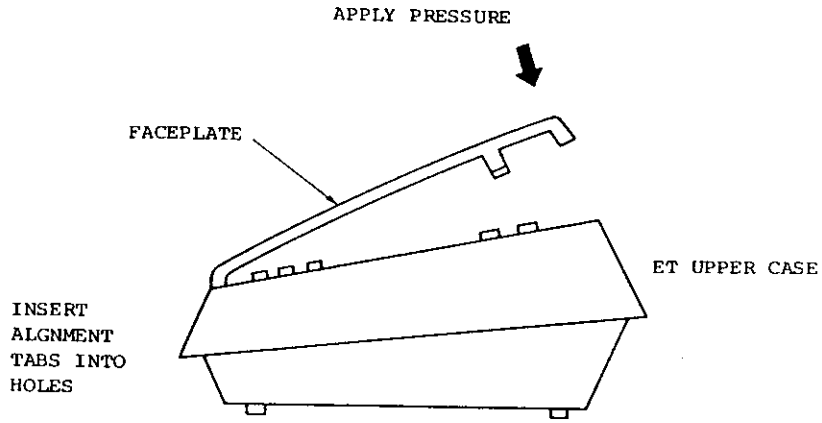


FIGURE 39 Faceplate Insertion

To open the E-KEY telephones, proceed as follows:

CAUTION

Avoid contact with electronic components on both the keyboard and SPU station circuit card assembly. It is good practice to discharge any static electricity present on one's person before handling the station circuit card components, by physically touching the grounded KSU cabinet.

(1) Unscrew the three screws on the lower case of the telephone.

(2) Separate the upper and lower case by removing the two connectors on the station circuit card that connect the station upper case (keyboard) assembly, as well as the two speaker leads.

(3) Remove the faceplate from the upper case if access to the station keyboard is required. To remove keyboard, unscrew one screw in center of keyboard and lift assembly out of upper case.

NOTE

If station keyboard access only is required, only removal of faceplate is required. No removal of lower case is required.

To reassemble the E-KEY telephones, proceed as follows:

(1) Reconnect the speaker leads and keyboard connector. Be sure that the wires do not become entangled in the hookswitch.

(2) Align the upper and lower case of the telephone; tighten the three screws on the lower case.

(3) Verify that the hookswitch plunger works freely.

To remove the line key caps, insert a pointed pin into the hole at the base of the key cap and pry up. After attaching the designation label, snap the cap back into position.

5.1.4 INSTALLATION OF KEY TELEPHONES ET-1632 and ET-2460

To modify a model ET-1632 to become a model ET-2460, a jumper bar should be installed on the ET-SPU printed-circuit card. See FIGURE 46 for jumper bar installation location. Remove ET-K16 Keyboard and replace with ET-K24 Keyboard.

5.2 CABLING

5.2.1 GENERAL

The ET-1632 and ET-2460 E-KEY telephones require six conductor cables for connection of the MDF. The telephone cable can be connected directly to the MDF by a home run or connected to a branch terminal (IDF) that utilizes a multi-conductor, twisted-pair cable run to the MDF. TABLE 27 illustrates the function and terminal assignment for the six conductor station cable.

TABLE 27 STATION WIRING FUNCTIONS

DESIGNATION	FUNCTION	PAIR ASSIGNMENT	
BP2	BYPASS2	WH-BL	PAIR
BP1	BYPASS1	BL-WH	
T	TIP	WH-OR	PAIR
R	RING	OR-WH	
GND	GROUND	WH-GR	PAIR
DATA	DATA	GR-WH	

House cable connections and assignments for both the ET-1632 and ET-2460 E-KEY telephones are identical.

5.2.2 TYPE OF CABLE

The key telephones utilize three pair twisted cable for all connections to the KSU MDF terminal blocks. Non-Shielded No. 22-24 AWG wire may be utilized. Two-pair station wiring normally associated with single-line station equipment (often referred to as J-K wiring) may not be used because this type cable does not contain enough twist.

5.2.3 MAXIMUM LENGTH

The maximum distance that the E-KEY telephone can be connected from the KSU is related to the DC ohmic resistance of the house cable, not the physical lengths of cable. Use of No. 22 or No. 24 AWG wire allows different maximum lengths allowed for station wiring. TABLE 28 illustrates the maximum distance that the cable can be run.

TABLE 28 ET-1632 and ET-2460 HOUSE CABLE REQUIREMENTS

TYPE CABLE	MAX. RES.	MAX. LENGTH
No. 22 AWG Solid	40 ohms	1150 feet
No. 24 AWG Solid	40 ohms	700 feet

Estimated lengths of cable given are based maximum loop resistance of 40 ohms between individual conductors that make up one pair.

5.2.4 CABLE TERMINATION

The 6-pin modular connector supplied with each E-KEY telephone must be terminated in a modular 6-pin station block jack. The house cable, in turn, is connected to pin terminals on the jack in accordance with the color coding and pin assignments illustrated in Table 29.

TABLE 29 E-KEY TELEPHONE STATION JACK TERMINAL ASSIGNMENT

JACK PIN NO.	WIRE COLOR	FUNCTION	HOUSE CABLE COLOR
6	WHITE	BP-2	WH-BL
5	BLACK	BP-1	BL-WH
4	RED	T	WH-OR
3	GREEN	R	OR-WH
2	YELLOW	GND	WH-GR
1	BLUE	DATA	GR-WH

CAUTION

Some manufacturers of 6-pin Modular Jacks have Pin No. 1 (blue) and Pin No. 6 (white) terminations reversed. Verify, by using an ohmmeter, that Pin 1 and Pin 6 are wired in accordance with color code. Refer to FIGURE 40 for modular jack construction.

NOTE

If blue and white conductors of modular jack do not correspond to jack pin number assignment, reverse connections of blue and white wires of jack on station terminal block.

5.2.5 HOUSE CABLE TERMINATION

The ET-1632 and ET-2460 E-KEY telephones can be connected to the KSU MDF either by individual home run cables or by multi-pair twisted cables connected at an IDF. Use of IDF cables does not eliminate the maximum KSU-EXT loop resistances given in TABLE 28.

When an E-KEY station is connected to an IDF, the three-pair conductors of the station cable are cross-connected to assigned pairs of the multi-conductor feeder cable and, in turn, are cross-connected to assigned terminals on KSU terminal blocks A through H. Bridged Stations (two or more stations that are connected in multiple) are not allowed on Omega-Phone III.

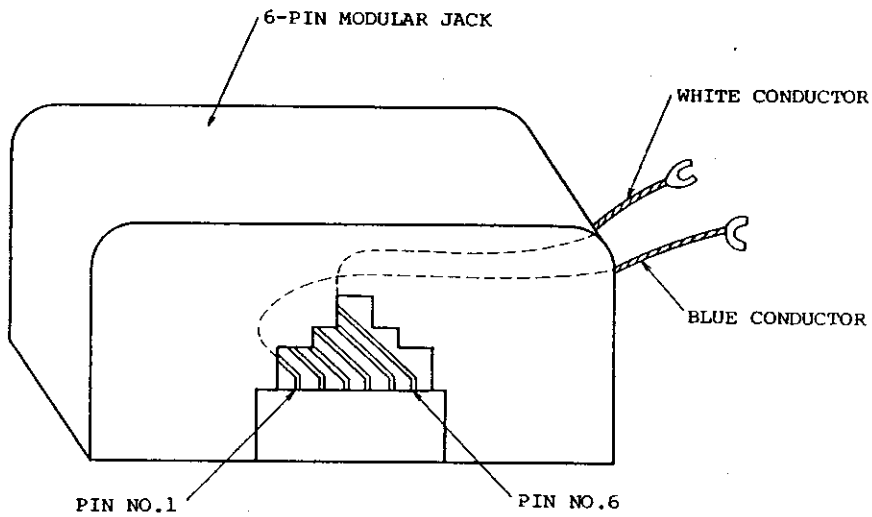


FIGURE 40 Modular Jack Construction

5.3 INTERCOM DIAL CODE ASSIGNMENT

5.3.1 GENERAL REQUIREMENTS

The E-KEY station Intercom dial code number is assigned by connection of the six station conductors to the dial code number appearing on KSU terminal blocks A through H at the MDF. FIGURE 41 illustrates the KSU MDF terminal block assignments for the Intercom dial codes.

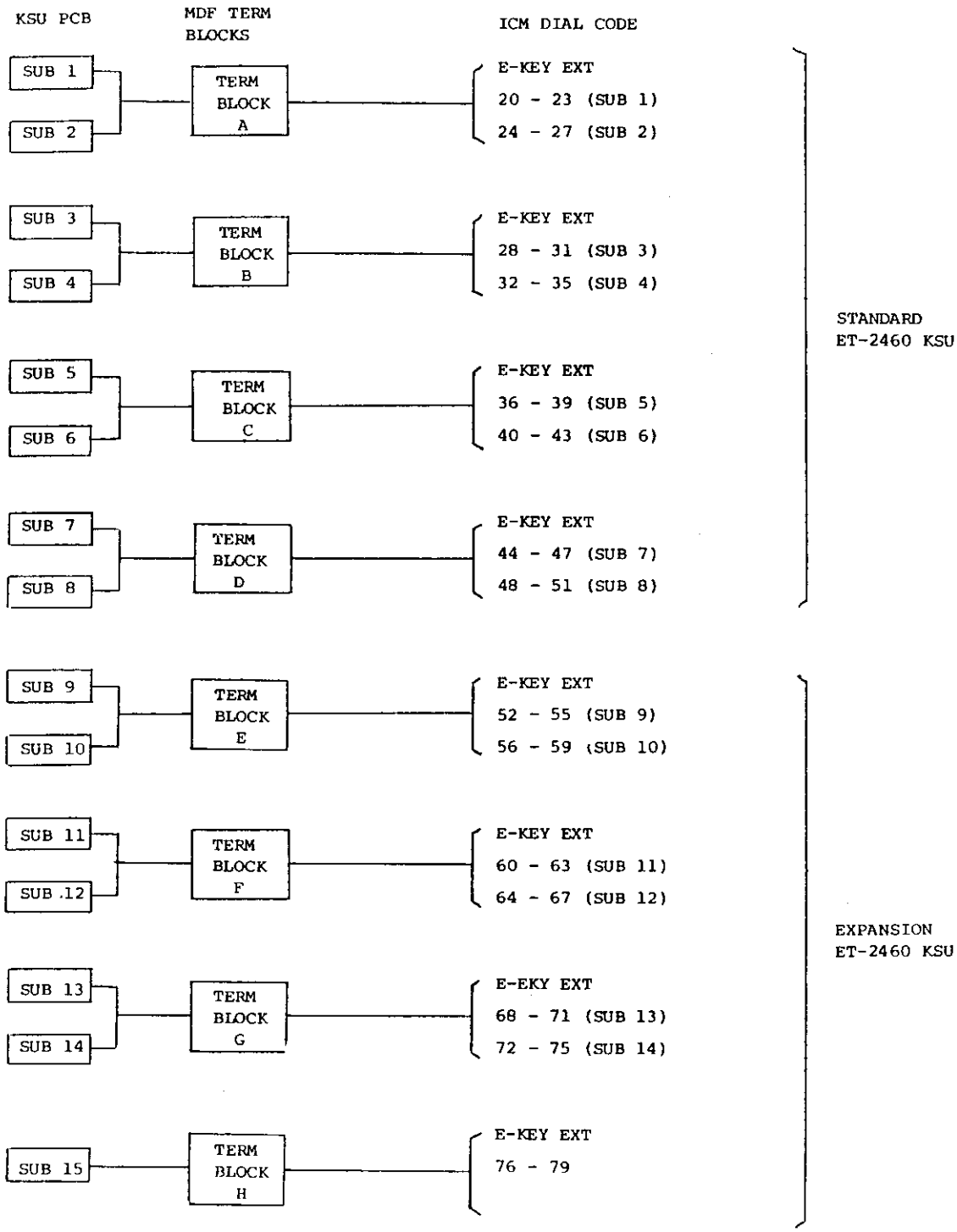


FIGURE 41 MDF Terminal Block Assignment

NOTE

Before attempting to connect E-KEY stations to the MDF and assign dial codes, the installer should accomplish all Planning Considerations outlined in SECTION 2 because dial code assignment may effect operational aspects of the station.

5.3.2 SPECIAL CONSIDERATIONS

Special considerations when assigning Intercom dial codes are:

a. When a system is not equipped with a CP-60 Call Processor and no program board option for Individual CO/PBX Audible Ringing Assignment is equipped, extensions No. 20 and 21, appearing on KSU MDF Terminal Block A, are assigned to receive CO COMMON BELL AUDIBLE.

b. When a system is equipped with the optional CP-60 Call Processor(s), extensions No. 20 and 21 appearing on KSU Terminal Block A must be used as the associated station number assignment.

c. Intercom dial code numbers assigned must correspond with SUB and XPS printed-circuit cards in the KSU. Refer to Planning Considerations and SUB/XPS card installation when assigning dial codes.

d. When the system is equipped with OPX circuit cards, estensions No. 48 through 51 (one OPX card) or extensions No. 44 through 51 (two OPX cards) appearing on KSU terminal block D cannot be used for E-KEY stations.

e. When the system is equipped with a trunk conference unit card (model TCU), the Intercom dial codes associated with the SUB card file assigned to the TCU cannot be utilized for E-KEY extensions.

f. When assigning ICM Dial Code Numbers, the installer should consider the E-KEY telephones assigned for Secretary Transfer because the E-KEY extensions appearing on the same SUB circuit card cannot transfer to different extensions.

5.4 STATION FEATURE ASSIGNMENT

5.4.1 CLASS OF SERVICE

The ET-1632 and ET-2460 provide up to six class-of-service settings that assign various feature operations at the individual E-KEY stations. Class-of-service settings are accomplished on the SUB printed-circuit cards assigned to the station as determined by the Intercom dial code setting. The six class-of-service feature settings for each E-KEY station are:

- Busy Override — Extension receives CO/ICM call indication while off-hook.
- All-Call — Extension receives or is denied station All-Call.
- Night Transfer — Extension is arranged to ring during Night Service.
- Hold Recall — Extension is allowed or not allowed Hold Recall feature.
- Do-Not-Disturb — Extension is allowed or not allowed DND feature.
- Executive Override — Extension is allowed or not allowed Executive Override.

NOTE

The class-of-service settings should be detailed on the E-KEY Station Planning Sheet and accomplished by strapping jacks upon insertion of the SUB circuit card in the ET-2460 KSU.

5.4.2 SECRETARY TRANSFER

Secretary Transfer allows Intercom and Attendant calls to be transferred to a pre-determined extension. The Secretary Transfer number is established by programming of the SUB printed-circuit card.

NOTE

The station Planning Sheet should detail the Secretary Transfer setting for each stations. All E-KEY stations appearing on the same SUB printed-circuit card will transfer to the same extension. Care should be taken in assigning station Intercom dial codes when the station is arranged for Secretary Transfer.

Secretary Transfer cannot be programmed on any station appearing at extension 20. The TRAN switch at extension 20 (operator) is dedicated for use as the Night Service control. Extension 20 can be programmed to receive transferred calls, however. Secretary Transfer can be programmed on extension 21 if Call Processor (CP-60) No. 2 is not equipped. If CP-60 No. 2 is equipped, the TRAN switch on extension 21 also operates the Night Service feature.

More than one station can transfer to the same station. All such stations should be assigned to the same SUB printed-circuit card. Serial transfers can be effected so that a station's transferred call can, in turn, be transferred to a second station. No transfers can be made to a third station however.

The Secretary Transfer feature transfers all Dial Intercom and Attendant calls to the predetermined extension. CO/PBX Individual Line Ringing is not affected by operation of the TRAN switch. Secretary Line calls automatically defeats the Secretary Transfer feature.

5.4.3 CO/PBX LINE PICKUP RESTRICTION

Both the ET-1632 and ET-2460 E-KEY telephones can be arranged for Line Pickup Restriction on dedicated CO/PBX Line keys. Calls cannot be initiated on these lines; however, calls can be transferred to extensions arranged for pickup_Restriction through use of the Automatic CO/PBX Add-on Conference feature or Call Processor Automatic Add-on Operation.

Pickup Restriction is established by opening the E-KEY telephone and cutting designated straps on the SPU station circuit board. TABLE 30 lists the straps for the various line pickup keys that can be Pickup Restricted. FIGURE 42 illustrates the location of the straps on the SPU station circuit card and line pickup key assignments on the E-KEY telephones.

CAUTION

When establishing line Pickup Restriction, remove the 6-pin modular cord from the station to prevent possible damage to the station electronics. If line pickup restriction is to be added after a station is placed in service, the PWS-A Power Supply must be

momentarily turned off after reconnecting the station to the system.

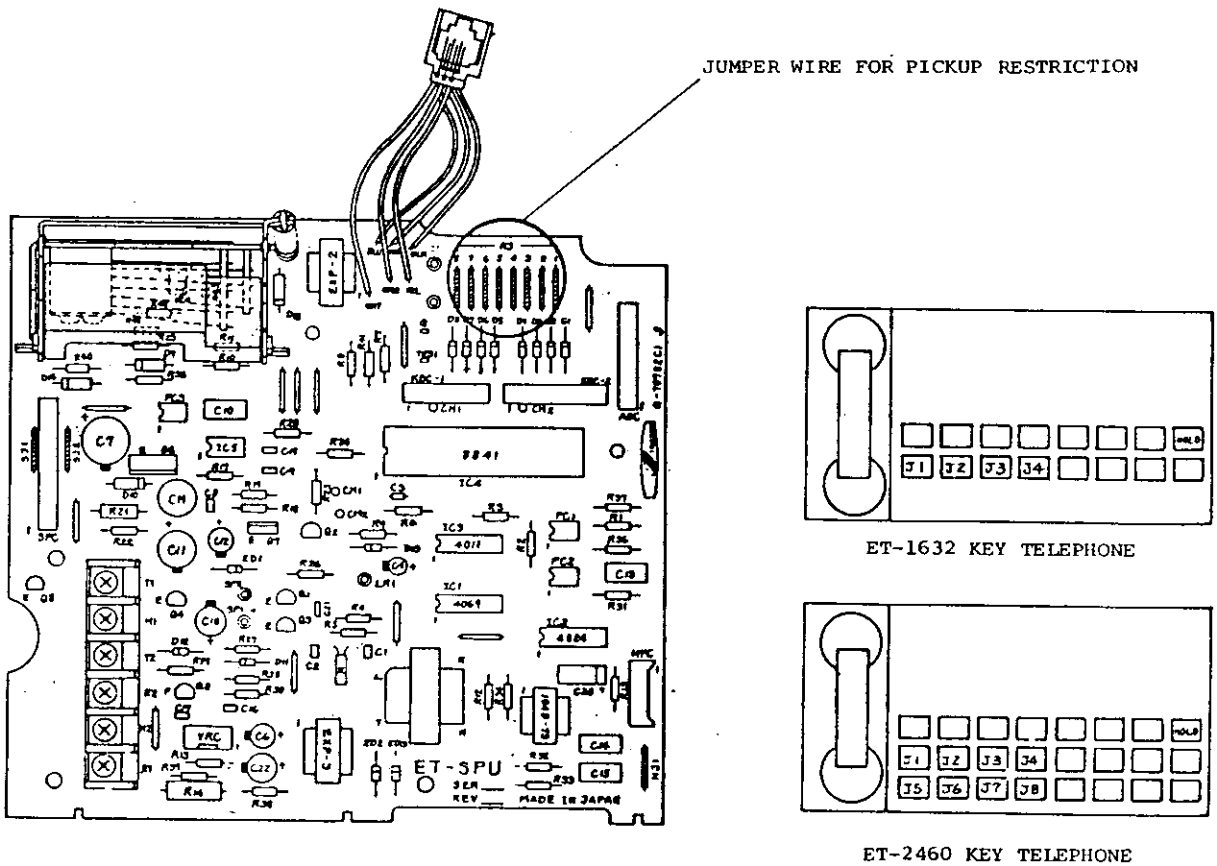


FIGURE 42 Line Pickup Restriction Strap Location

TABLE 30 LINE PICKUP RESTRICTION STRAP OPTION

STRAP NO.	LINE KEY NO.	REMARKS
RJ1	J1	ET-1632 & ET-2460
RJ2	J2	
RJ3	J3	
RJ4	J4	
RJ5	J5	ET-2460 only
RJ6	J6	
RJ7	J7	
RJ8	J8	

5.5 OPTIONAL STATION FEATURES

5.5.1 GENERAL REQUIREMENTS

The ET-1632 and ET-2460 E-KEY telephones can be arranged for a number of optional service features. Some features require additional station equipment, whereas other features require program boards in the ET-2460 KSU. TABLE 31 lists the optional features of the station and indicates equipment requirements for each feature.

NOTE

All service features listed should be detailed on the Station Feature Planning Sheets. To implement those features assigned to a program board, refer to SECTION 4.

TABLE 31 OPTIONAL E-KEY STATION FEATURES

FEATURE	LOCATION	REQUIREMENT
INDIVIDUAL CO/PBX RINGING	KSU	PSB-1; PSB-3
EXT. DIAL RESTRICTION	KSU	PSB-2; PSB-4
EXT. TOLL RESTRICTION	KSU	PSB-1; PSB-3
EXT. GROUP CALL	KSU	PSB-2; PSB-4
WALL MOUNTING	STATION	WMU
HANDSFREE ANSWERBACK	STATION	HFA
HEADSET JACK	STATION	HJB
LOUDSPEAKER TELEPHONE	STATION	SPB
MEMORY DIALER	STATION	RPD

5.5.2 INDIVIDUAL CO AUDIBLE RINGING ASSIGNMENT

When the Omega-phone III system equipped for individual extensions to receive assigned ringing on CO/PBX Lines and Tie-Lines, the KSU must be equipped with program boards PSB-1 and PSB-3 to assign extensions to designated lines. A maximum of twelve extensions can receive Individual CO Audible Ringing Assignments.

5.5.3 STATION DIAL RESTRICTION

Individual CO/PBX Lines on E-KEY stations can be arranged for Outgoing Call Dial Restriction. Program boards PSB-2 and PSB-4 must be equipped in the KSU to designate individual extensions and CO/PBX Lines for Outgoing Dial Restriction.

NOTE

CO/PBX Lines programmed for Dial Restriction will be restricted at all extensions designated for Dial Restriction. Groups of restricted CO/PBX Lines cannot be designated at different extensions.

5.5.4 STATION TOLL RESTRICTION

Individual CO/PBX Lines can be programmed for Toll Restriction at dedicated extensions. Program boards PSB-1 and PSB-3 are required. Toll-Restricted CO/PBX Lines are denied call to the Operator, as well as any outside calls that utilize zero or 1 on the first or second digit. Service calls (such as 411, 611, and 911) are allowed as are outgoing WATS (800-number) calls.

5.5.5 STATION GROUP CALLING

Omega-Phone III provides four groups of extensions for Group Calling when the PSB-2 and PSB-4 program boards are equipped. Any number of extensions can be assigned to a group. No extension can be assigned to two different groups.

5.5.6 WALL MOUNTING

The E-KEY telephones can be wall-mounted by adding WMU wall-mount adapters. FIGURE 43 illustrates the wall-mount adapter components and the provisions on the E-KEY station for wall mounting. To install the WMU wall-mount adapter:

(1) Remove the station directory and 6-pin modular drop cord from the E-KEY station.

(2) Using the wall-mount plate as a template, attach to the wall surface the screws that will hold the wall-mount plate. Utilize the keyhole slots that will allow removal of the wall-mount plate.

(3) Insert the wall-mount plate into the base of the E-KEY station housing as illustrated in FIGURE 41. Holding the mounting plate at an angle, insert the two top tabs of the plate into the holes on the E-KEY telephone base. Then insert the bottom tab into the slot on the E-KEY station base.

(4) Insert the station directory tray in the directory slide at the top of the station.

(5) Run the station drop cord in between the bottom of station and the mounting plate, and insert it into the station jack.

(6) Attach the unit to the wall using the keyholes on the mounting plate.

(7) Attach the wall-mount cup to the station by applying pressure and inserting the cup into the two holes provided on the handset cradle just above the hookswitch.

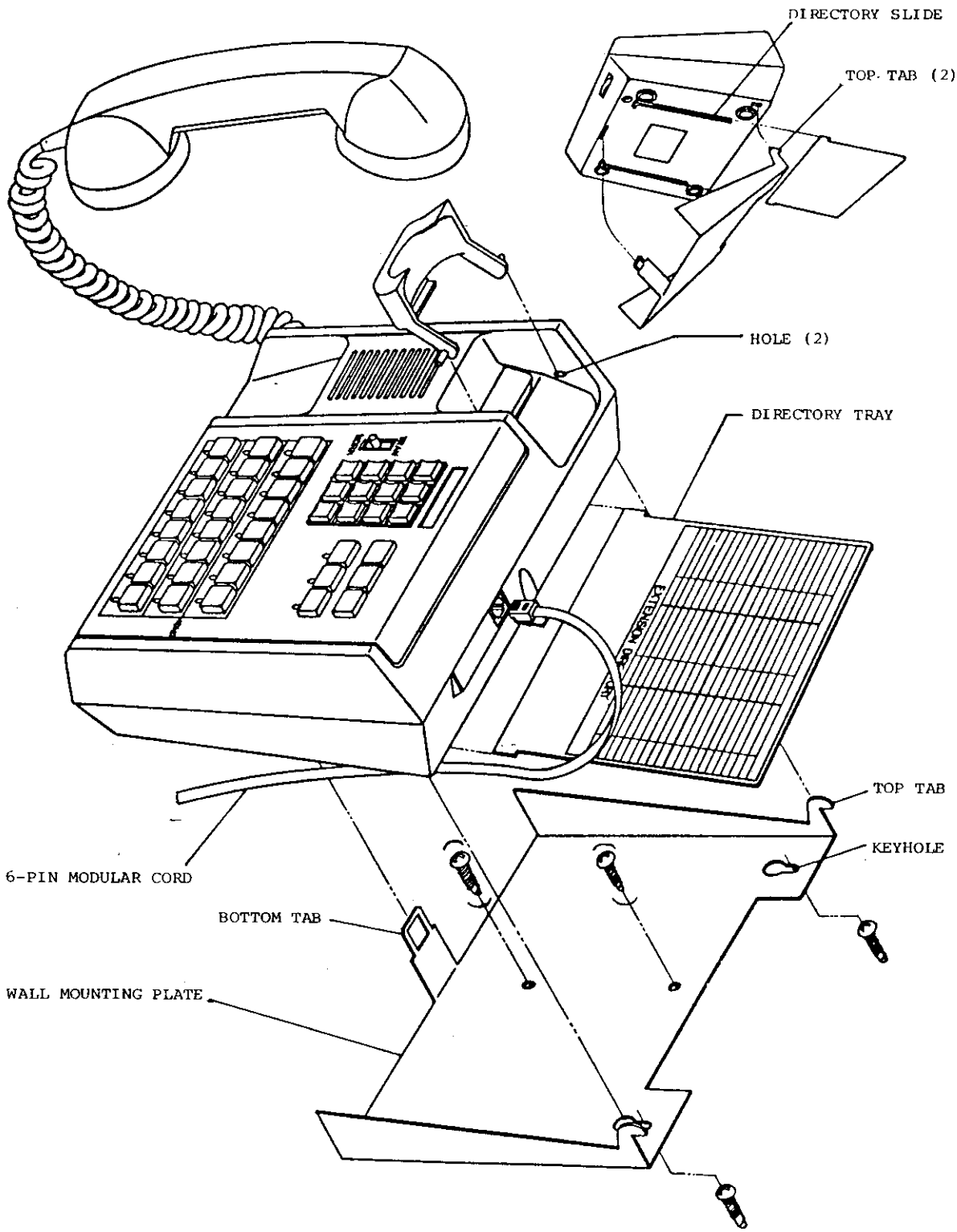


FIGURE 43 Wall-mount Installation

5.5.7 HANDSFREE ANSWERBACK ADAPTER

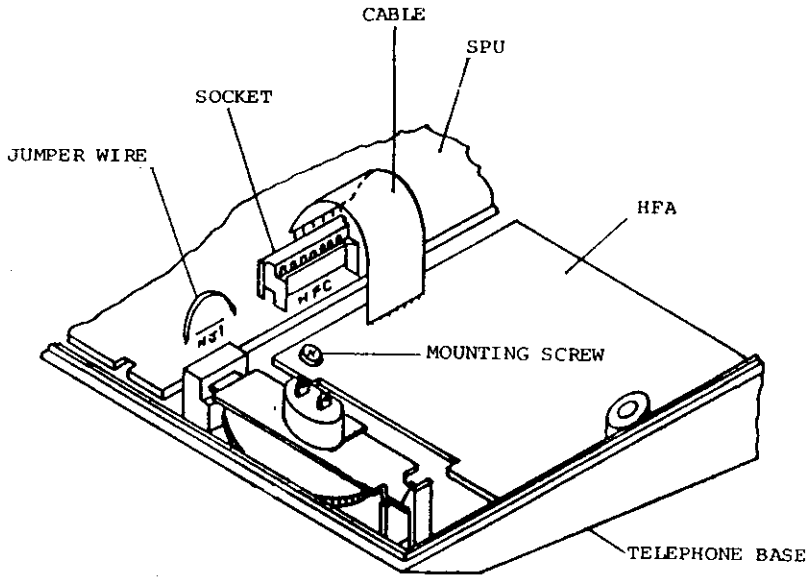
The E-KEY telephone can be equipped for handsfree reply to all Intercom, Attendant, and Secretary Line calls by addition of the optional HFA handsfree answerback assembly. To install the HFA, refer to FIGURE 44 HFA Installation, and proceed as follows:

(1) Disconnect the 6-pin modular drop cord from E-KEY station.

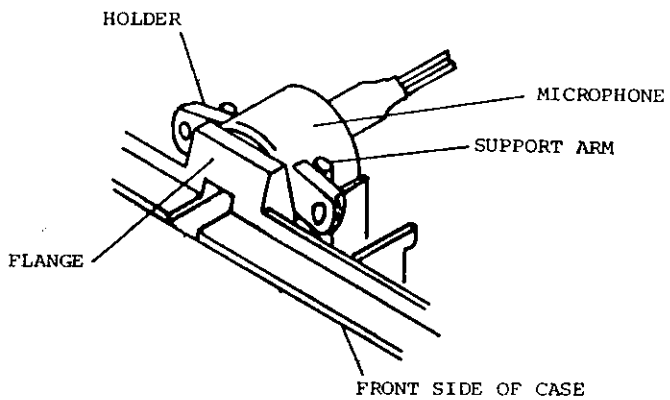
(2) Open the E-KEY by removing the three screws on the base of the station. Separate the upper and lower cases; remove the SPKR leads and keyboard connector from the station circuit card (SPU).

(3) Mount the HFA circuit card on the base of the station, as illustrated in FIGURE 44a, with the hardware provided.

(4) Mount the HFA microphone on the front of the station base. Depress the rubber microphone seal and insert it between the base aperture flange and support arm.



a. HFA Circuit Card Mounting



b. Microphone Installation

FIGURE 44 HFA Installation

(5) Plug the HFA connector into the HFC socket on the SPU circuit card.

(6) Cut the HJI jumper wire on the SPU circuit card as illustrated in FIGURE 44.

(7) Reassemble the station and connect the 6-pin modular drop cord.

No adjustments of the handsfree answerback level is required. All levels are factory-set to ensure no oscillation. Care should be taken in locating the station so that no acoustic feedback results. Avoid placing the station instrument in tight corners or any other location where speaker level feedback will result in oscillation.

The handsfree talkback circuit is full duplex; no directional voice switching is present so both parties are able to talk at the same time.

5.5.8 HEADSET JACK INSTALLATION

An operator headset may be used on the ET-1632 or ET-2460 E-KEY telephone by utilizing an HJA Headset Adapter. The HJA mates set. The "turn-key" jack is used to provide hookswitch control of station functions as well as switching the station handset off the voice network and connecting the transmitter/receiver of the headset.

The HJA utilizes the same physical mounting location as the Loudspeaker Telephone Adapter (SPB). Both the Loudspeaker Telephone Adapter (SPB) and Headset Adapter (HJA) cannot be mounted in the same telephone instrument.

FIGURE 46 illustrates the mounting of the HJA Terminal Board on the station lower case as well as the HJA Connector and Handset Terminal wiring. The HJA mounts on the station base plate held in place by one screw. To install the HJA in the station:

(1) Attach the HJA Connector to the SPC socket on the station circuit card as illustrated in FIGURE 46.

(2) Cut the SJ2 strap on the station circuit card. Strap SJ2 should only be cut as long as a jackset is physically connected to the HJA Terminal Board.

(3) Connect the six wires to the Handset Terminal as illustrated in FIGURE 45.

(4) Using a file or a drill bit, remove the cutout indication on the station base for the headset jack cable.

(5) Connect the headset jack cable to the HJA Terminal Board as illustrated in FIGURE 45. Terminations on the HJA Terminal Board are in accordance with the individual jackset function color coding. FIGURE 45 illustrates the required switching (contacts) internal to the jackset for proper operation.

CAUTION

IWATSU AMERICA neither approves or promotes use of headset arrangements on the Omega III ET-2460. Use of headsets on E-KEY telephones may result in possible electrostatic interference resulting in system operating faults. If a fault occurs when headsets are used on a system, the headsets must be removed or substituted until normal operation resumes.

5.5.9 LOUDSPEAKER TELEPHONE INSTALLATION

A loudspeaker telephone, such as the PC-4A manufactured by Precision Components or Companion II manufactured by Northern Telecom, can be added to the ET-1632 or ET-2460 E-KEY telephone. To add a loudspeaker telephone, an SPB loudkpeaker telephone adapter must be installed in the station. Operation of the loudspeaker telephone is the same as that of the handset.

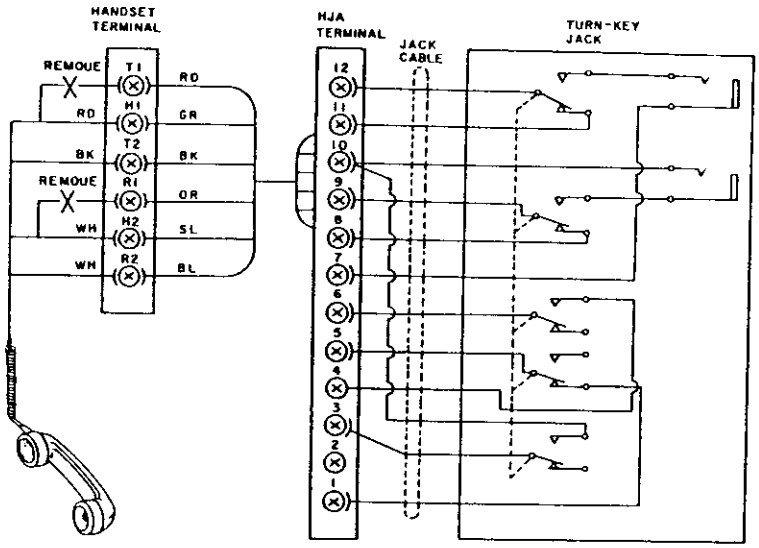


FIGURE 45 HEADSET JACK (HJB) Installation

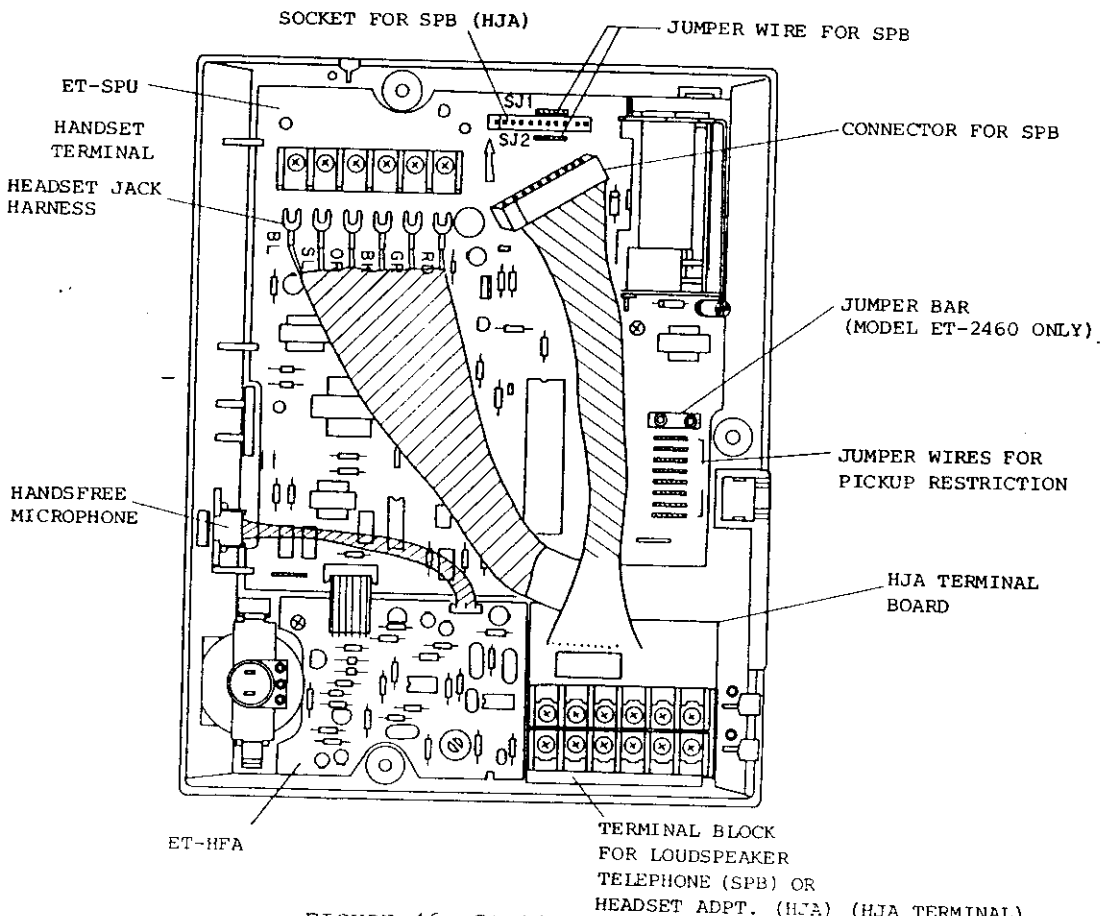


FIGURE 46 Station Component Layout

All functions such as dialing and answering CO/PBX and Intercom calls can be operated while in the loudspeaker telephone mode. Taking the handset off-hook automatically disconnects the loudspeaker telephone.

To install the loudspeaker telephone adapter, refer to FIGURE 46 for mounting the SPB terminal board in the E-KEY station. FIGURE 47 illustrates use of the Companion II unit, and FIGURE 48 illustrates the PC-4A installation. To install the SPB:

(1) Remove the 6-pin modular drop cord and open the E-KEY station by loosening the three screws on the station base.

(2) After separating the housing, remove the SPKR leads and keyboard connector from the station circuit card (SPU).

(3) Mount the SPB terminal board on the SPU as illustrated in FIGURE 46.

(4) Insert the SPB connector into the SPB socket on the SPU station circuit card.

(5) Cut the SJ1 and SJ2 jumper wires on the SPU station circuit card as illustrated in FIGURE 46.

(6) Two cutout indications are provided on the E-KEY telephone case for the speaker telephone cables. Use a drill bit or round file to remove the cutouts.

(7) When using the Companion II, wire the SPB terminal to the Companion II drop cord as illustrated in FIGURE 47.

(8) When using the PC-4A, wire the SPB terminal to the PC-4A drop cord as illustrated in FIGURE 48.

(9) Check all connections and reassemble the station; connect the 6-pin modular cord to the station jack.

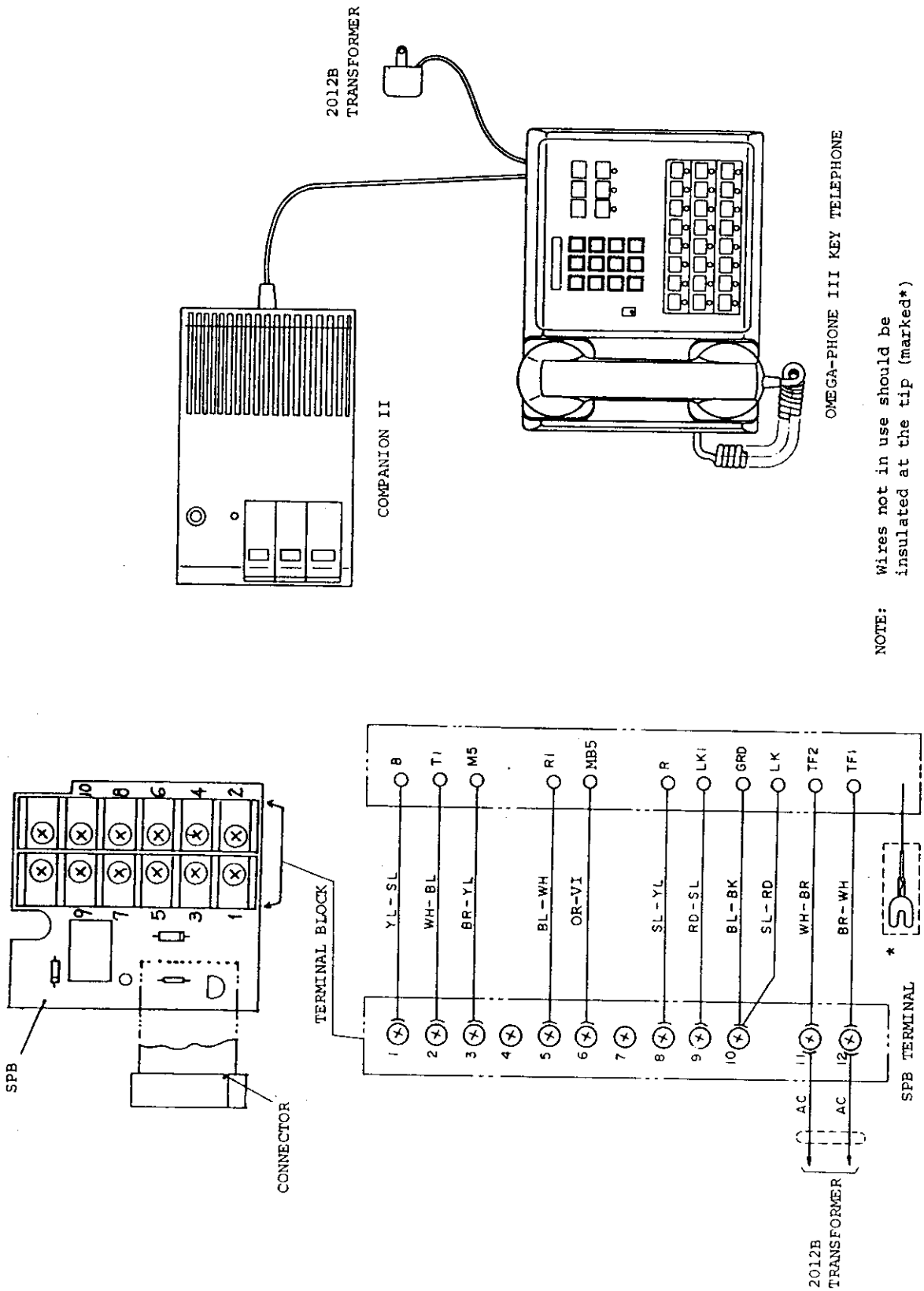
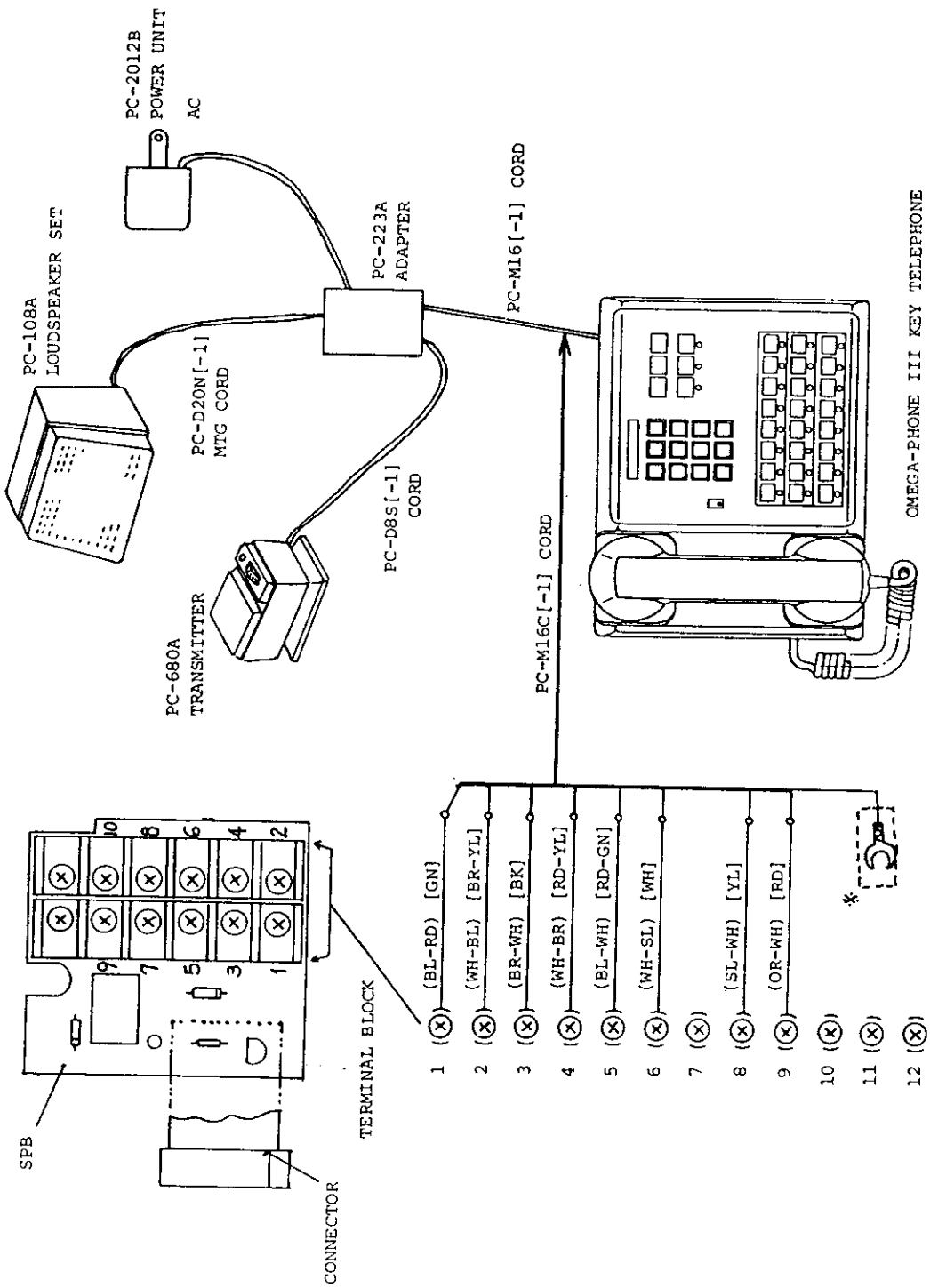


FIGURE 47 Companion II Installation



NOTES
1. Color code in ( ) is cord assembly label without -1
2. Color code in [ ] is cord " " with -1
3. Wires not in use should be insulated at the tip. (marked *)

FIGURE 48 PC-4A Installation

5.5.10 STATION RINGER ADAPTER INSTALLATION

An optional station ringer can be attached to the Omega Phone III key telephone. Mount it on the SRA board, making connections according to FIGURE 49.

The station ringer adapter card drives the bell with the telephone speaker ON signal, giving it a 1-second ON, 3-second OFF signal. The bell is driven by this contact-output signal. The contact capacity is about 0.5 A; avoid directly driving the bell with 117 V a.c. because that will cause noise.

NOTE

The following points must be observed when using a telephone set with a station ringer:

1. Do not use CALL MONITOR ability (reverse SPKR key insertion after cutting the point A* of the key).

2. Deny ALL CALL capability (Refer to Part II, Section 4.4.2, SUB STATION CARD INSTALLATION)

Cut point A.

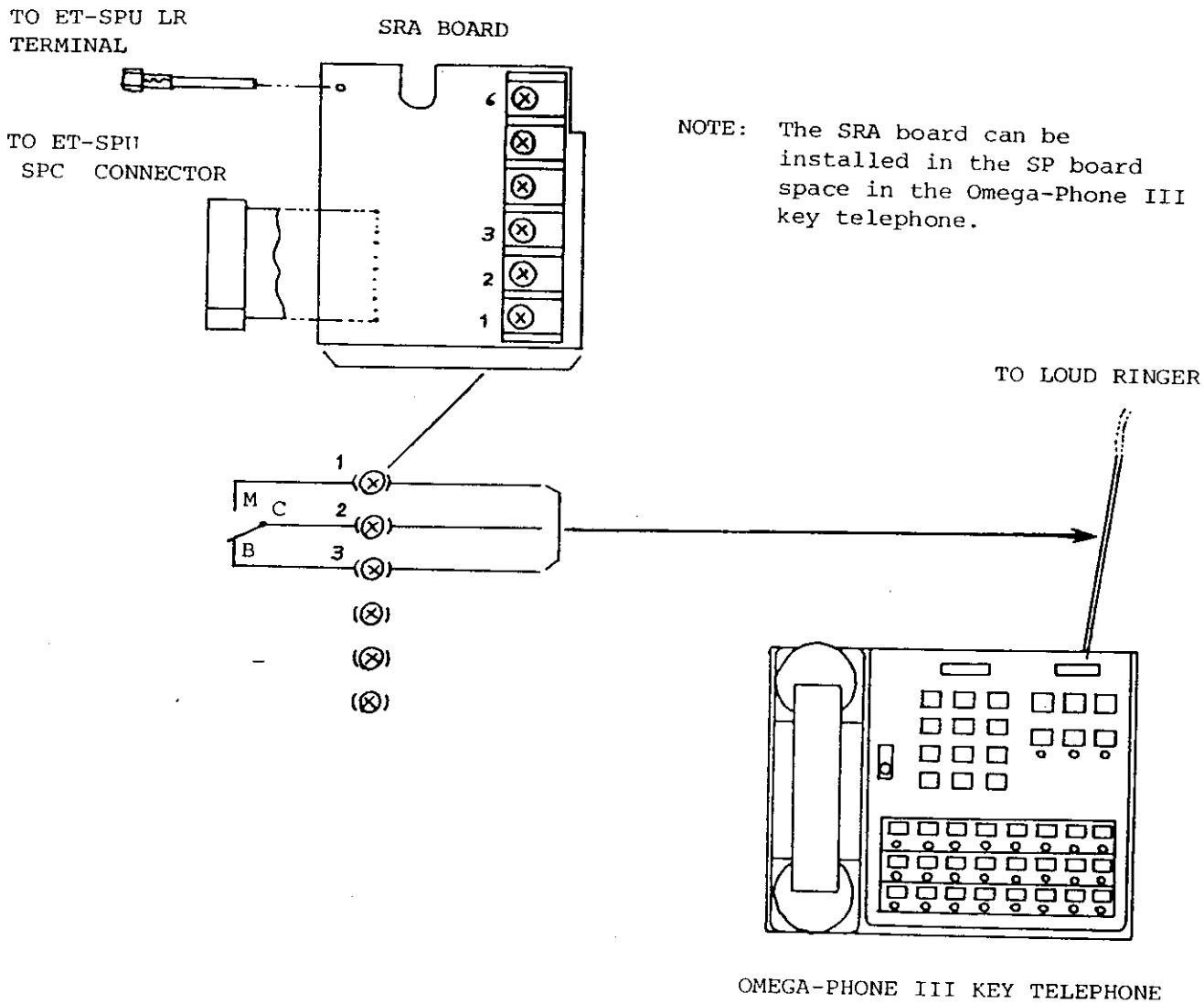


FIGURE 49 STATION Ringer Adapter Installation

SECTION 6 CP-60/BLF-60 INSTALLATION

6.1 CP-60 CALL PROCESSOR INSTALLATION

6.1.1 GENERAL

The CP-60 Call Processor console, as illustrated in FIGURE 49, is utilized at the Attendant position to provide new and advanced features to answer and distribute incoming calls to extensions in a key telephone system. Similar in design to the standard E-KEY station, the CP-60 Call Processor features pushbutton selection for station calling, multiple feature keys, and a built-in busy lamp field. An LED number display is provided to identify stations that the CP-60 position is talking to. The unit can either be wall or desk mounted. Up to two Call Processors can be installed in the system.

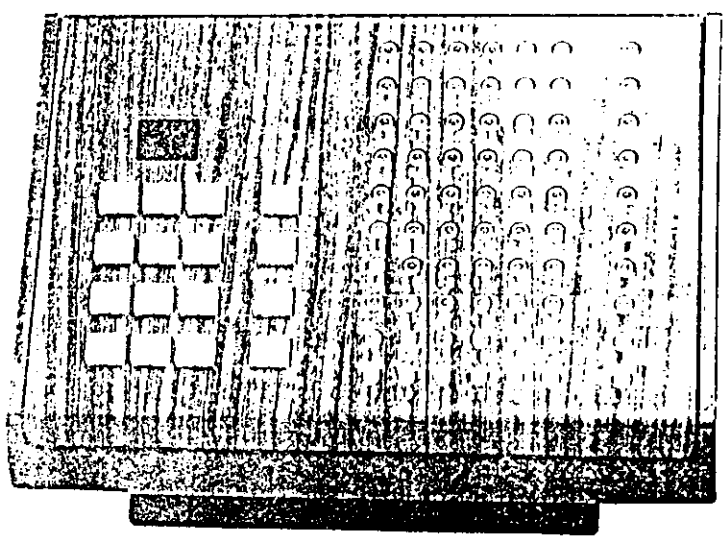


FIGURE 49 CP-60 Call Processor

6.1.2 UNPACKING/HANDLING

The CP-60 Call Processor is packaged individually in a carton. Included with the CP-60, as illustrated in FIGURE 50, are a 6-pin modular connector, and station directory card.
Upon removing the CP-60 from the shipping carton, verify that all items illustrated in FIGURE 50 are present. Inspect the CP-60 for evidence of any damage incurred during shipment.

No strap options or optional assemblies are required for the CP-60. Therefore there is no requirement to open the unit unless evidence of physical damage exists. To open the unit, remove the three screws on the base of the unit and separate the upper and lower case, noting that connections exist between the two.

6.1.3 INSTALLATION

The CP-60 Call Processor requires 3-pair cabling from the CP-60 console to the KSU MDF terminal block assigned. No installer connections are needed between the Attendant E-KEY station and CP-60 console.

TABLE 32 shows the CP-60 6 conductor lead and color-coding identification.

TABLE 32 CP-60 Call Processor Cable Designation

JACK PIN NO.	JACK WIRE COLOR	DESIG.	FUNCTION	HOUSE CABLE COLOR	
1	Blue	B	Channel B	GR-WH	Pair
2	Yellow	AG	Analog GND	WH-GR	
3	Green	AG	Analog GND	OR-WH	Pair
4	Red	A	Channel A	WH-OR	
5	Black	+24	Battery	BL-WH	Pair
6	White	+24	Battery	WH-BL	

A standard 6 pin modular jack is required to install the CP-60.

CAUTION

As indicated in Section 5, certain jacks may have pins No. 1 and 6 wire colors (white and blue) reversed. Verify that the blue wire of the jack is connected to pin No. 1 and the white wire of the jack is connected to pin No. 6, as illustrated in FIGURE 40.

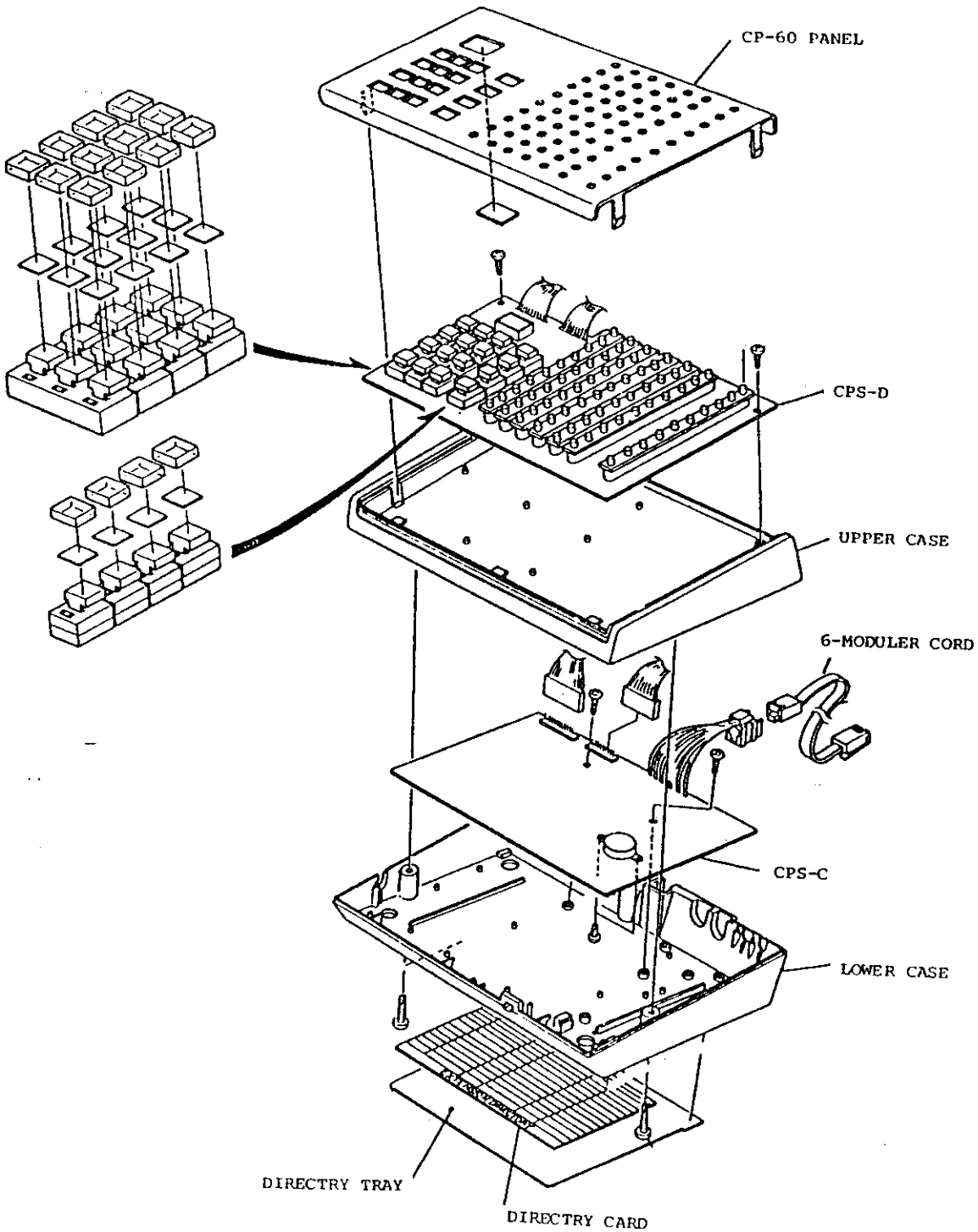


FIGURE 50 CP-60 Components

Cable limits for the CP-60 are the same as for the standard E-KEY station. A 40-ohm loop limit (measured between conductors of one pair) is required, resulting in loop lengths of 700 feet when wiring No. 24 AWG wire and 1150 feet using No. 22 AWG wire. Twisted-pair cable, similar to that is used for E-KEY station wiring, is required. Use of straight lay telephone type-4 conductor pair wiring is prohibited. The CP-60 conductors may be included in a multi-pair cable connection between an IDF and system MDF. Appropriate cross-connects are accomplished at the system IDF and MDF on cable pairs assigned the CP-60 functions.

When more than one CP-60 is equipped, each CP-60 requires dedicated three-pair cabling and connection on the CP-60 terminal block at the MDF.

The CP-60 consoles must be assigned to dedicated E-KEY extensions in the system. E-KEY extension No. 20 is reserved for CP-60 No. 1 and extension No. 21 is assigned CP-60 No. 2.

Dial codes for CP-60s No. 1 and No. 2 are "01" and "02" when two CP-60's are installed.

When one CP-60 is installed, extension No. 20 is utilized as the associated E-KEY station. Intercom dial code "zero" (Operator) is assigned automatically to the Call Processor console.

Both CP-60 consoles connect to the CP-60 terminal block on the MDF.

A 14-pin amphenol-ended cable assembly is provided with the ET-2460 KSU to connect the CP-60 terminal block to the KSU. No other installer operations are required except to cross-connect the CP-60 cable to the functions on the CP-60 terminal block on the MDF. TABLE 33 shows the CP-60 terminal block lead assignment.

TABLE 33 CP-60 Terminal Block Pin Assignment

LEAD DESIG.	FUNCTION	CP-60/BLF CABLE COLOR	CP-60/BLF CABLE PIN NO.	TERMINAL BLOCK CLIP NO.	HOUSE CABLE COLOR
+24	#1 Battery	BL-RD1	26	1	WH-BL
+24	#1 Battery	BL-BK1	1	2	BL-WH
A	#1 Channel A	OR-RD1	27	3	WH-OR
AG	#1 GND	OR-BK1	2	4	OR-WH
AG	#1 GND	GR-RD1	28	5	WH-GR
B	#1 Channel B	GR-BK1	3	6	GR-WH
+24	#2 Battery	PK-RD1	29	7	WH-BL
+24	#2 Battery	PK-BK1	4	8	BL-WH
A	#2 Channel A	SL-RD1	30	9	WH-OR
AG	#2 GND	SL-BK1	5	10	OR-WH
AG	#2 GND	BL-RD2	31	11	WH-GR
B	#2 Channel B	BL-BK2	6	12	GR-WH

6.1.4 OPERATION

When equipped with a CP-60 Call Processor, the Attendant station has "call priority" on all system operational features. While using the Call Processor to access a feature, the CP-60 temporarily disconnects an E-KEY extension (other than the second Call Processor); connection is re-established when the CP-60 releases the function.
Even though the associated Attendant E-KEY extension is equipped with a CP-60 Call Processor, the extension TRANS key (on either Call Processor position) controls night service operation and cannot be used for secretary transfer.

The CP-60 Call Processor is equipped with a PAGE function key.
Even though the associated Attendant station has a PAGE Key, the PAGE key provided on the CP-60 should be utilized for all system All-Call functions.

Provided with the CP-60 Call Processor is the Attendant recall feature. This feature differs from the Hold Recall feature in that the Attendant recall feature will operate whenever the Attendant uses the CP-60 features to place calls on "Call Wait". An audible alert tone, incorporated in the CP-60, indicates whenever Attendant recall occurs. No volume control is provided for the Attendant alert warning buzzer.
Various system operational functions are indicated by the station busy lamp field. TABLE 34 lists the various lamp indicators.

TABLE 34 BUSY LAMP FIELD INDICATIONS

INDICATION	FUNCTION
STEADY Lamp	EXT. off hook; DND: ICM VOICE CALLING
FLASHING Lamp	CALL WAITING

6.2 BLF-60 INSTALLATION

6.2.1 GENERAL

The Busy Lamp Field BLF-60, as illustrated in FIGURE 51, provides busy lamp field indication for up to 60 stations. Up to four station busy lamp field units can be installed in the system. Similar in design to the E-KEY telephone, the BLF-60 features LED lamp indicators showing the status of all stations in the system.

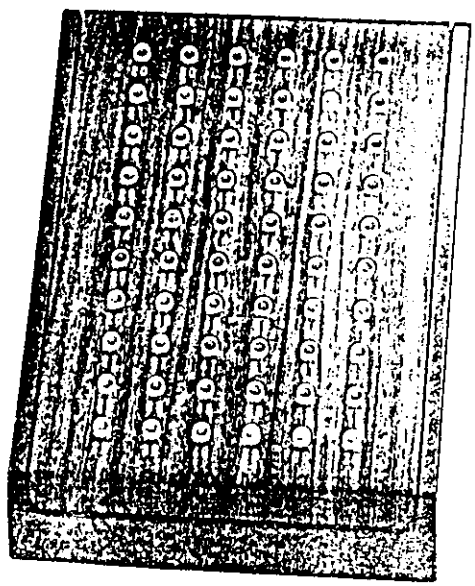


FIGURE 51 BLF-60 Station Busy Lamp Field

6.2.2 UNPACKING/HANDLING

The BLF-60 Busy Lamp Field, as illustrated in FIGURE 52, is individually packaged in a carton. Included with the BLF-60 is a 6-pin modular drop cord. Upon removing the BLF-60 from the shipping carton, inspect the unit for evidence of physical damage during shipment.
As there are no installer strap options or optional assemblies to add to the BLF-60, there is no reason to open the unit unless there is evidence of damage. To open the unit remove the two screws on the base of the unit, separating the upper and lower case.

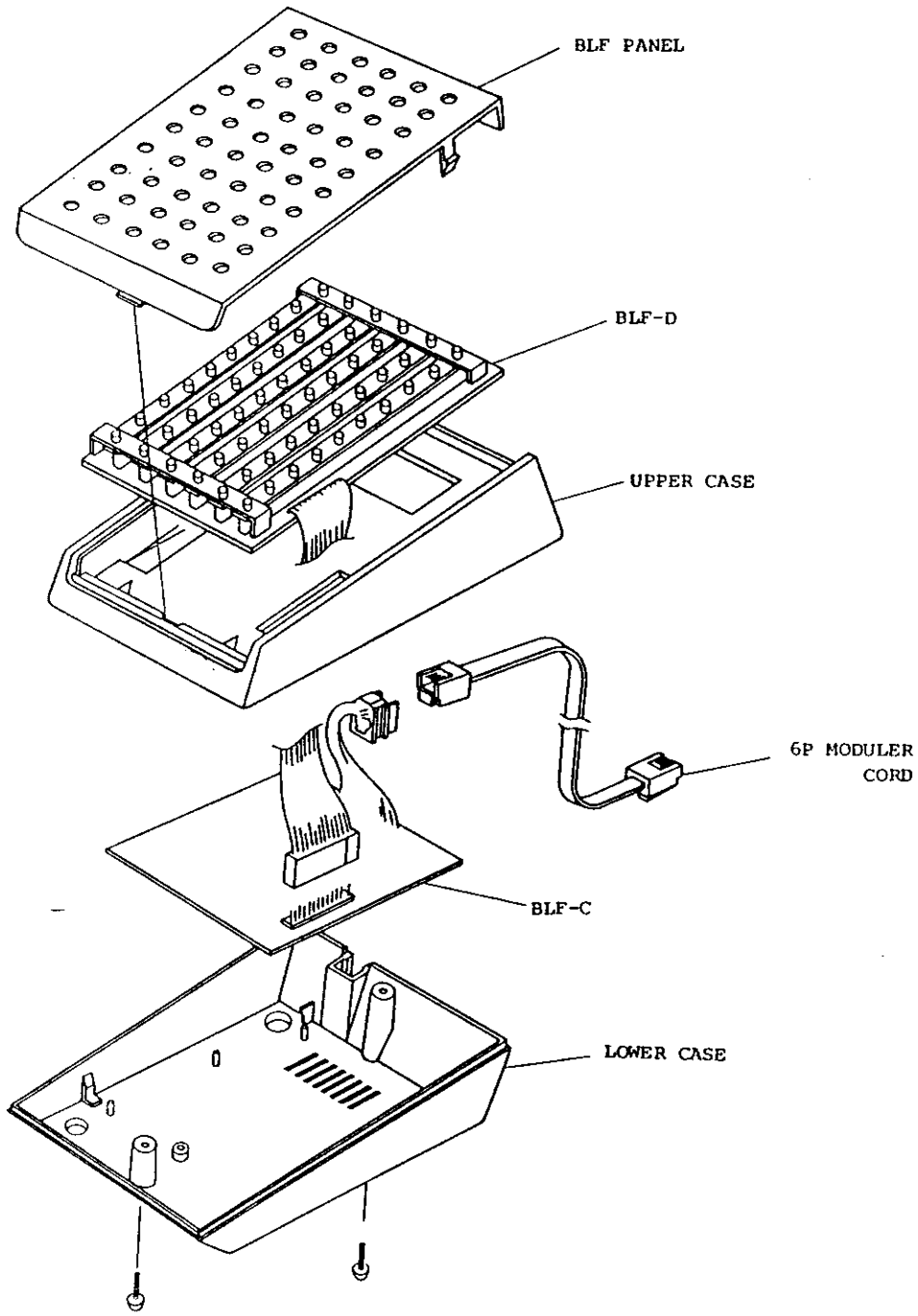


FIGURE 52 BLF-60 Components

6.2.3 INSTALLING

The BLF-60, although equipped with a three-pair modular jack, requires three-pair wiring between the unit and the MDF. The BLF-60 station cable terminals appear in multiple on the CP-60 terminal Block on the MDF. Refer to TABLE 33 for lead assignment.

TABLE 35 illustrates the BLF-60 6-conductor lead designation and color-code assignment. Note that the six conductors are identical to the CP-60 cable.

TABLE 35 BLF-60 Busy Lamp Field Cable Designation

JACK PIN NO.	JACK WIRE COLOR	TERM DESIG.	FUNCTION	HOUSE CABLE COLOR
1	Blue	B	Channel B	GR-WH } Pair
2	Yellow	AG	Analog GND	WH-GR }
3	Green	AG	Analog GND	OR-WH } Pair
4	Red	A	Channel A	WH-OR }
5	Black	+24	Battery	BL-WH } Pair
6	White	+24	Battery	WH-BL }

CAUTION

As indicated for the E-KEY station and CP-60 modular jack wiring, some manufactured modular jacks may have terminals 1 and 6 reversed. Verify that the modular jack is jack is wired so that pin No. 1 is attached to the blue wire of the jack and pin No. 6 is attached to the white wire of the jack. Refer to FIGURE 40.

Even though the BLF-60 utilizes multiple connections of the CP-60 terminals on the CP-60 terminal block, utilize separate house cables to ensure that the maximum DC loop resistance of 40 ohms is maintained. As with the E-KEY station and CP-60 Call Processor, maximum loop length utilizing No. 24 AWG wire is 700 feet and that using No. 22 AWG is 1150 feet.

Twisted-pair cable must be used for BLF-60 installation. Four conductor telephone wire normally used with single-line station instruments is not suitable for BLF-60 installation.

No connections are required between the associated E-KEY telephone and BLF-60.

6.2.4 OPERATION

The operation of the BLF-60 Busy Lamp Field unit is the same as that of the station lamps on the CP-60 Call Processor. TABLE 34 lists the various lamp indicators and system functions.

SECTION 7 SPEED DIAL INSTALLATION

The Omega III ET-2460 Key Telephone System offers System Speed Dial as an optional feature. The "Speed Dial" feature provides non-volatile storage of up to 100 telephone numbers with a maximum of 16 digits each. "Speed Dial" access is three digits, the first digit being the * (asterisk) digit followed by a two-digit code for the individual speed dial listing. "Access pause" times can be included in the speed dial listing to allow a delay between digits in order for the serving central office (or PBX) line equipment to set up for the call. All ET-2460 KTS equipment can be equipped with this feature without any equipment modification.

Included in the system speed dial arrangement is a user option whereby up to 32 digits, including pause intervals, can be accessed at one time. By operating the * (asterisk) key twice, two speed dial memory locations can be accessed serially. This allows a total of 32 digits. Use of the last number redial feature will operate the 32 digit number as well.

The ET-2460 KTS Speed Dial feature consists of an EPROM I.C. that is programmed with the system speed dial listings as well as system interface information. Until field programming terminals are available, all programming will be accomplished at Iwatsu America.

This requires that the complete "speed dial" listing be forwarded to Iwatsu America for programming an original I.C. When changes are requested, a new listing is sent to Iwatsu America and a replacement I.C. is forwarded to the company and the original I.C. returned to Iwatsu America.

It is important that the "speed dial" listing contains all the information required and no errors, so as to avoid delays in implementing the feature.

FIGURE 53 illustrates a sample "speed dial" listing. The information provided includes:

(1) Customer Name, Address, and Telephone Number.
(2) Telephone Number listing including Name of Listing and Order of Listing.
(3) Company requesting the Speed Dial.
(4) Access Pause Time (if required).

(1)	Ordering Company:	Name/Address/Telephone No. of Company ordering SPD.
(2)	Customer:	Name/Address/Telephone No. of Company using SPD.
(3)	SPD. Serial No.	Identification Number of SPD if modification of previously issued SPD is requested.
(4)	Access Pause Required?	Yes____No____Pause Time____(1-9)

Access Code No.	Name	Telephone No.
00	ABC Inc.	1 2 0 1 9 3 5 8 5 8 0 _ _ _ _ _
01	DEF Inc.	1 2 0 1 9 3 5 8 5 8 1 _ _ _ _ _
99	XYZ Inc.	9 P 1 2 0 1 9 3 5 8 5 8 0 _ _

16 digits

(1) When "Access Pause" is required, use "P" designation.

(2) Ensure that a maximum of only 16 digits (including access pauses) are assigned to one access code.

FIGURE 53 Sample Speed Dial Listings

List, in the order requested, the names and telephone numbers to be placed in the Speed Dial access code. The order that you list the individual numbers can be arranged alphabetically by name, by function, by area, or by any other grouping that is desired. If an additional number is to be added to a grouping at a later date, skip an access code (or codes) so that the entire listing does not have to be changed.

A total of 100 different numbers can be utilized, starting with "Access Code" and ending with 99. A maximum of 16 digits can be assigned to each access code. An "access pause" counts as a digit.

Include, in the listing, all digits that must be dialed to call the distant party. Typical variations include the digit "1," which in most areas of the country, is dialed before an "area code" is dialed. Also, if a specific code must be dialed to

Upon receipt of the "Speed Dial" I.C. from Iwatsu America, note the designation number of the SPD chip.

In handling the chip, avoid contact with the I.C. pins. Do not place the I.C. on any ungrounded surface. Do not, under any circumstances, remove the shield over the center window of the I.C. as the memory contents may be erased.

A five-digit number is used to identify the chip. The first three digits are the serial number of the device; the second two digits reflect the revision number.

To install the SPD, follow the instructions listed below:

(1) Turn off the system power supply and remove the system MPU, MEM circuit cards.

(2) Refer to ET-2460 Technical Manual Section 3; Part II; TABLE 12, for location of the STJ strapping jack location on the MPU. Connect an STJ strapping jack on jack location D when equipping the SPD.

(3) Referring to FIGURE 54, locate the EPROM socket on the MEM circuit card that accepts the SPD chip. Note the alignment of the I.C. in the socket.

Under no circumstance should be SPD chip be inserted into the I.C. socket in the wrong manner as damage to the I.C. could result.

(4) Place the SPD chip into the I.C. socket by first aligning the pins of the I.C. in the socket and then applying downward pressure. Ensure that all the I.C. pins are set in the socket in the proper manner.

(5) Insert the MPU and MEM cards into the KSU and turn on the system power supply.

(6) Access the system speed dial and check system operation.

(7) In case of trouble, repeat installation steps to ensure proper installation. If problem persists, consult Iwatsu America Engineering Department.

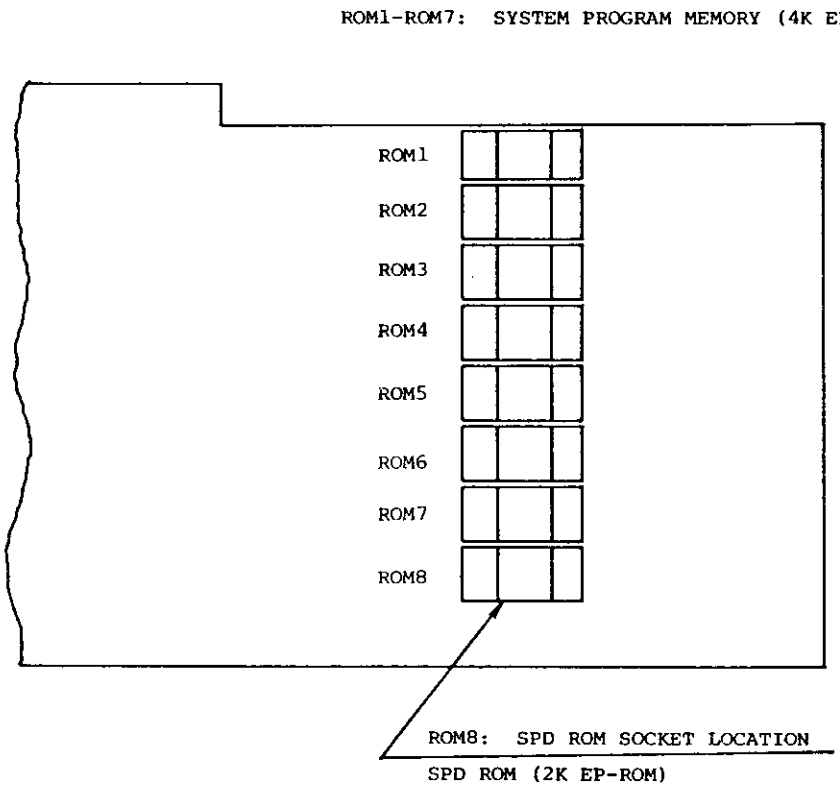


FIGURE 54 Installation on MEM Card

ET-2460 Electronic Key Telephone System

OMEGA PHONE III

PART III SERVICE MANUAL

SECTION 1 INTRODUCTION

This part of the Omega-Phone III technical manual provides system circuit descriptions and troubleshooting procedures.

The Omega-Phone III system is a microprocessor-controlled system, so both software and hardware control the various circuits of the system. Because the software implementation and associated hardware circuit operation are beyond the normal maintenance requirements, system circuit descriptions are limited to providing an understanding of system operational flow through the various components. This allows troubleshooting by replacement of printed-circuit cards, rather than by actual repair of individual devices.

The KSU contains many interfaces to outside circuits, so details are provided to enable determination of whether these circuits are operating properly.

The E-KEY station contains many options (including attachment of ancillary devices) for functions including Loudspeaker Telephones, Dialers, etc. Details are therefore given on the various circuits that constitute the E-KEY telephones.

Because the complexity of the system electronics goes beyond the normal limit of familiarization of maintenance/installation personnel, the circuit diagrams illustrate only those circuits that maintenance/installation personnel can access and monitor in order to determine possible problems.

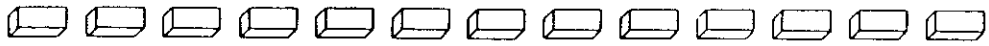
1.1 GENERAL PRECAUTIONS

The system utilizes MOS-type solid-state components, so care must be exercised during troubleshooting to avoid damage to the equipment.

Shutdown of the system power supply is required to avoid damage to circuit components during removal and insertion of KSU printed-circuit cards.

Circuit card removal tools are available that allow the cards to be removed from the KSU without structural damage to the cards.

Proper grounding of the equipment is essential to minimize the possible damage to the system MOS components during handling. Physically touch the



KSU before handling circuit cards in order to minimize the possibility of damage from body static electricity.

Avoid touching components on the cards. It is good practice to handle all cards by the edges, avoiding the card edge connector contacts.
Avoid placing cards on top of rugs, plastic containers or sheaths, or any ungrounded surface that could cause static charge damage. If a component is to be repaired or replaced on the card, be sure that an "earth grounded" soldering iron is utilized for soldering components.

1.2 MAINTENANCE SERVICE PACKAGE

A Maintenance Service Package is offered by Iwatsu America. This package includes all system components needed for correction of any system major trouble by replacement of a card or reconfiguring the card in the service package to replace an existing card.

SECTION 2 KSU CIRCUIT DESCRIPTIONS

FIGURE 1, System Flow Diagram, illustrates the ET-2460 KSU components and interfaces to the various assemblies or stations that make up the ET-2460 KTS. The circuits in this diagram are described below.

2.1 COMMON CONTROL UNIT CARDS

The ET-2460 KSU utilizes three common control cards: (1) Main Processor Unit (MPU), (2) Memory Unit (MEM), and (3) Tone/Voice Control Unit (VTA).

2.1.1 MPU CARD

The MPU card, in conjunction with the MEM card, controls the entire system. It consists of an 8085A 8-bit microprocessor; interrupt processing circuit; address, data, and control bus circuits; and system clock.

Four levels of interrupts are provided to control the processor in case of loop (program runaway) errors. Provision is made for a system reset without turning off the system power supply.

2.1.2 MEM CARD

The MEM card contains the system read-only memory (ROM) and random-access memory (RAM). The card provides 26 kilobytes of ROM, 10 kilobytes of RAM, and control circuits. The DMA control circuit on the MEM card transfers data between the extensions and the KSU; the 128 bits of data transferred to or from each station (64 bits from the KSU to the telephone and 64 bits from the telephone to the KSU) are stored in the MEM card RAM.

The MEM card also stores all installer program settings on the various KSU assemblies. When the system power supply is turned on (or the system MPU card is initialized), the system processor scans all program settings on the OPX, SUB, TRK, and PSB circuit cards and transfers all bit assignments to assigned locations in the RAM on the MEM circuit card. Once a system is initialized, no changes in program setting occur unless the system power supply or reset is operated.

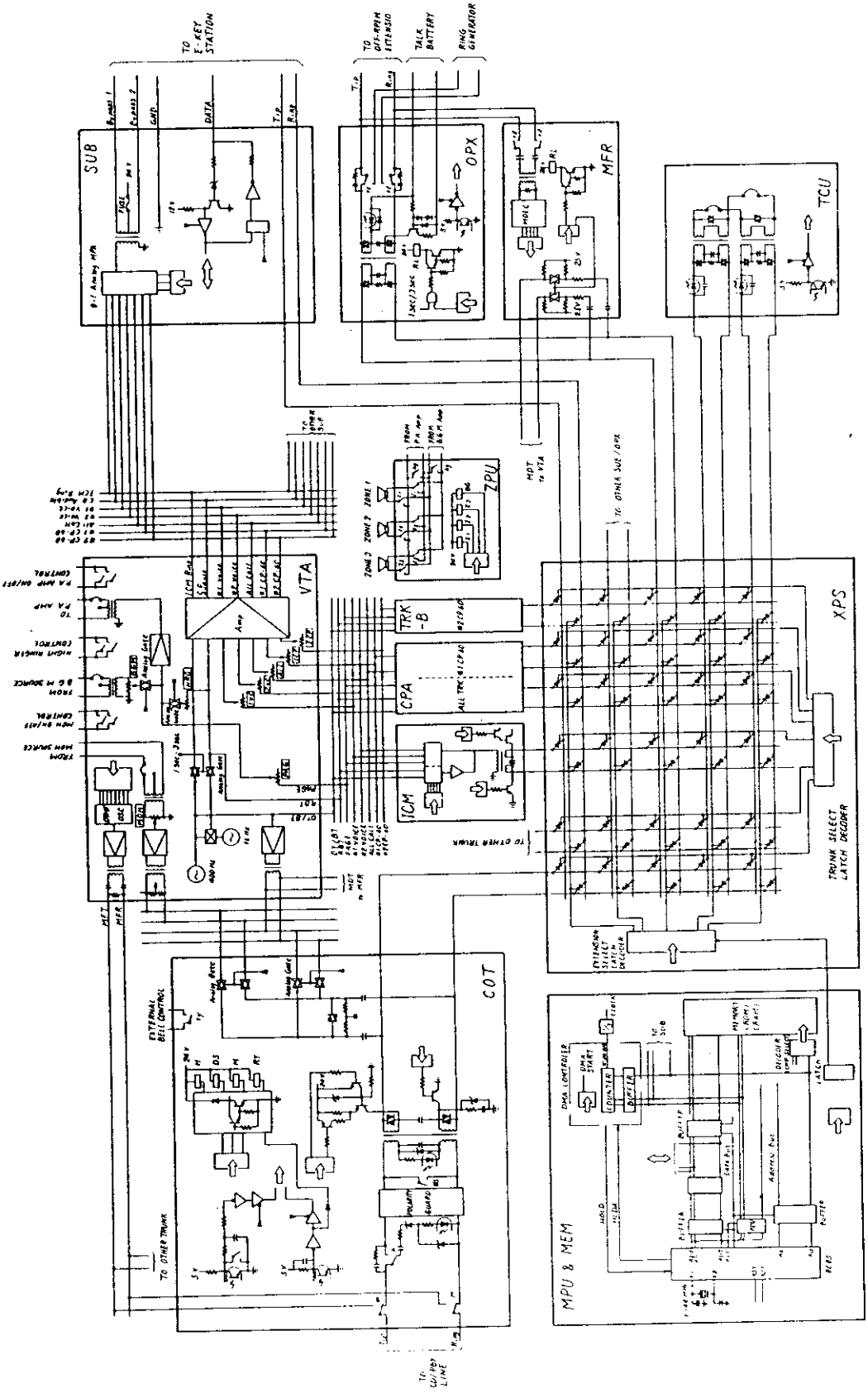


Figure 1 System Block Diagram

2.1.3 VTA CARD

The VTA circuit card provides the DTMF tone generator, voice paging amplifier and control circuit, music-on-hold (MOH) circuit, and all other system tone signal generating and control circuits.

All DTMF tones are generated under control of the central processor and are switched to a TRK circuit in accordance with station requests on a time-shared basis. Terminals for checking the output of the DTMF tones are provided on the VTA. No provision is made for field adjustment of the DTMF level or frequencies.

The MOH circuit consists of a preamplifier using either a 600-ohm or 10-kilohm input impedance-matching transformer connection to the music source. Shorting bar strap options are provided on the VTA card for impedance matching, as is a volume control to adjust the level for individual requirements. Analog gates, under the control of the central processor, are used to connect the MOH source to the TRK circuit; varisters are used to limit the MOH level to prevent overdriving the telephone lines. A set of relay "make" contacts on the VTA are provided for stop/start control of the music source if a tape player is used.

Analog gates, under control of the central processor, control the public address and background music (PA/BGM) inputs on the VTA card. Transformer-coupled circuits utilizing either 600 ohms or 10 kilohms impedance connect the system to a local PA amplifier. A set of "make" contacts operates each time the PAGE (All Call) circuit is operated. Coupled with the PA connection are provisions for the CO/PBX Line Audible circuit to be connected to the local PA system when night service is activated. A volume control is provided to set the level of the night service ring tone, as is an auxiliary set of "make" relay contacts to control external night service functions.

The VTA card generates a 400-Hz line intrusion tone that operates momentarily when a second (or third) extension enters any CO/PBX or ICM Line through a privacy release operation. The 400-Hz tone is also used as the tone source for supplementary dial tone, busy, and warning tone for OPX extensions.

CO/PBX Line ringing (400-Hz modulated by 16-Hz tone) and ICM ringing tone (400-Hz) are generated on the VTA circuit card and switched to the station circuits under control of the central processor. The CO/PBX ringing tone is also used as ringback tone, and the 400-Hz tone source is used also for dial tone, warning tone and busy tone for the various Intercom and paging circuits.

The VTA circuit card interfaces all ICM card voice paths to provide a path for the Intercom caller's voice when the called party is on-hook.

Two Busy Bypass voice circuits are provided; when a busy station condition is detected by the processor, the Intercom caller's voice is switched through the ICM card to the VTA card, amplified, and switched to the called station SUB card. Two volume controls are provided to adjust the level of the caller's voice on the station bypass circuit. Only two bypass circuits are provided. When both circuits are busy, busy tone is returned to the Intercom caller even though the called extension is arranged for off-hook signalling. No provision is made for off-hook signalling on Intercom calls using an ICM ringing tone; only voice calling can be used.

Two voice circuit interfaces are provided on the VTA card for the CP-60 Call Processors that can be equipped on the system. When the CP-60 encounters a busy station, a voice connection is established through the VTA card, amplified, and switched to the bypass circuit of the called extension SUB card. Two bypass circuits, one for each CP-60, are always available for use by the Call Processors; therefore, no blocking of CP-60's calls is allowed.

The system All Call circuit output on the CPA (or TRK-B) card interfaces the VTA circuit card, is amplified, and then is switched to the SUB station circuit cards under control of the central processor. A master volume control is provided on the VTA card.

2.2 TRUNK CIRCUIT CARDS

The ET-2460 utilizes a total of six trunk circuit cards: (1) COT (DTMF) trunk; (2) COR (Dial Pulse) trunk; (3) TRK-A (DTMF, DP, Tie Line) trunk; (4) CPA (All Call, CP-60) trunk; (5) ICM (Dial Intercom) trunk; and TRK-B (CO/ICM) trunk.

2.2.1 COT CARD

The COT trunk card is utilized for DTMF network address signalling as well as for one-way incoming outside line services. The card provides two identical circuits consisting of a CO/PBX Line interface (which includes a ring detector, holding bridge, and DTMF signal source connection), station talk supply circuit, tone interface circuit, relay control circuit, and local card control circuits.

The CO/PBX Line interface includes a coupler for detection of CO/PBX Line ringing. When an incoming ring is detected, the central processor acknowledges the incoming ringing and connects the CO audible ringing tone from the VTA card to the assigned destination. An external ringer control relay (RY) operates synchronously with the incoming ringing repetition rate.

When the call is answered at an extension, the COT card provides loop current through the system crosspoint array set up by the central processor to connect the TRK to the answering extension voice circuit. The talk battery output then appears on the extension tip/ring pair enabling the extension user to talk to the outside party.

When the call is answered at the extension, relay H on the extension circuit operates and provides a "holding bridge" across the CO/PBX Line. The holding bridge is maintained whenever the line is connected to a system extension or when the line is placed on hold. A coupler monitors the outside line, looking for a disconnect signal from the CO in order to operate the "calling party forced disconnect function" when the line is on hold and the program setting for disconnect has been made.

When a call is dialed, DTMF signals, generated on the VTA card under control of the central processor, are connected to the TRK circuit through the M relay for the duration of the DTMF signalling period. DTMF signals are time-shared among all CO/PBX Lines. During the time that the DTMF signals are operated, relay DS shunts the line input transformer to prevent DTMF tones and relay switching noises from being heard by the calling extension.

Analog gates under control of the central processor are utilized to connect the MOH input and warning tone to the trunk circuit.

2.2.2 COR CARD

The COR-type trunk card operates in the same manner as the COT card except that Dial Pulse (DP) network address signalling is utilized instead of DTMF-type signalling. The COR card may also be used for one-way incoming applications, if required.

As with the COT trunk card, relay H of the line circuit operates and establishes a "holding bridge" across the CO-PBX Line. When a call is being dialed by the station user, relay H, under control of the central processor, operates in accordance with the dialed digits. As with the COT-type trunk, relay DS shunts the line input transformer to prevent dial pulse noises from being heard by the dialing extension.

One notable difference between the COT-type trunk and the COR-type trunk is that different outside lines that utilize dial pulse are active at the same time, whereas DTMF signalling occurs on only one line at a time. However, because the time period required for DTMF signals (150 milliseconds) is so short, no noticeable time delay effect is felt by the station users who are dialing calls.

As with the COT-type card, a coupler monitors the outside line and looks for a disconnect signal if the call is placed on hold. In order for the

disconnect to operate, the program setting for "forced disconnect" must be set by the installer on the trunk card line circuit.

2.2.3 TRK-A CARD

The TRK-A trunk card provides two trunk circuits that can be arranged for DTMF- or DP-type signalling as well as Tie Line operation.

The TRK-A CO/PBX Line interface circuit operates in the same manner as the COT and COR circuits, so no description of the circuit is necessary.

When this card is arranged for Tie Line operation, the local talk and signal batteries are connected to the TRK circuit. The central processor starts interrupted ringing on the line at a one second ON, three seconds OFF rate and awaits closure of the line circuit loop by the distant extension. When answering occurs at the distant extension, ringing stops and the station voice path is connected to the outside line.

2.2.4 ICM CARD

The ICM trunk card provides two Dial Intercom Lines. The card consists of the talk current supply, tone/voice interface circuits to the VTA card, and a common control circuit.

The talk current supply provides a talk battery to the calling and called extensions. When an E-KEY station user selects an Intercom Line, the central processor connects the station to the ICM trunk selected. The talk battery, supplied by the ICM trunk, enables the calling extension to voice call the desired party and also maintains the crosspoint connection (on the XPS card) between the calling extension and ICM trunk.

When the calling extension calls the desired extension, the caller's voice is connected to the tip/ring pair of the called station through the cross-point connection on the XPS, under control of the central processor, if the called party is not busy (off-hook). If the called party is busy, the caller's voice is connected through the ICM card to the bypass circuit interface on the VTA card and, in turn, connected to the called extension SUB card through one of the two bypass voice circuits.

Only two bypass circuits are provided on the VTA circuit card. All Intercom Lines in the system (other than Attendant Intercom) use the same two circuits on a first-come-first-connected basis. When both circuits are busy, no call can be made on any Intercom Line (except Attendant Intercom) to a busy station.

Station busy, ringback tone, and warning tone are connected to the tip/ring pair of the extension through an interface on the ICM card to the function sources on the VTA.

2.2.5 CPA CARD

The CPA trunk card provides two trunk circuits: (1) No. 1 CP-60 Attendant Intercom Line and (2) the system All Call trunk. Both trunk circuits consist of a talk current supply circuit, tone/voice interface circuit, and local control circuits.

The Attendant Intercom Line circuit operates in the same manner as an ICM Line circuit. The CP-60 trunk circuit card provides a talk battery through the crosspoint array on the XPS card to the CP-60 associated E-KEY telephone tip/ring pair after detection of data from the CP-60 interface circuits. The Attendant's voice is connected to the called extension station speaker by connection of the called extension tip/ring pair to the Attendant Intercom crosspoint.

When a busy extension is called, the CP-60 voice signal is connected to the bypass pair of the called extension through interfaces on the CPA to the

is the same as the Intercom circuit operation except that program settings limit operation of features to the extensions programmed as the executive and secretary stations.

2.3 STATION CIRCUIT CARDS

The ET-2460 KTS utilizes three types of station circuit cards: (1) SUB E-KEY station interface, (2) OPX telephone card, and (3) TCU trunk conference card.

2.3.1 SUB CARD

The SUB station circuit card provides four E-KEY station interfaces to the system voice crosspoint and control circuits. The card consists of an extension two-way data transmission interface circuit, bypass pair control/interface circuit, speech path interface circuit, and station class-of-service setting circuits.

The data exchanged between the KSU and E-KEY extension are interfaced to the individual station Data pair by the SUB circuit card. Data at 2,048 Hz and at a 12-volt-peak level is transmitted and detected by the SUB data interface circuits.

The bypass pair of the individual E-KEY extension is interfaced to the KSU voice/tone circuits through the SUB circuit card. The seven bypass functions are switched to the E-KEY extension through an analog gate on the SUB card under control of the central processor. The bypass signals are superimposed on the +24 volt DC battery feed. The DND, All Call Denial, and Hook Signalling Denial class-of-service settings affect operation of some bypass circuit functions.

A battery feed fuse is provided on each SUB card for limiting the +24 volt battery currents. One fuse protects the four E-KEY extensions that are associated with the same card. Class-of-service (COS) settings are provided on the SUB card for the six COS settings, as are Secretary Transfer settings. When the system is initialized, the central processor transfers all COS settings to RAM memory. Any change in COS settings requires that the system power supply be turned off or the system reset operated.

When extensions are added to an existing SUB card in service, the system power supply must be turned off or the system reset operated to enable the processor to include the added station in the RAM memory.

2.3.2 OPX CARD

The OPX circuit card is utilized with the MFR circuit card to provide OPX telephone interfaces to the system. One card provides four OPX telephone

circuits, each circuit consisting of a speech path, ringing signal control circuit, off-hook detector circuit, and dial address signal detection /control circuit.

The speech path provided by the OPX card utilizes the supplemental talk battery. The battery used is 24 or 48 VDC, depending upon the loop length of the associated telephone(s). A coupler detects the loop closure of the OPX telephone and starts processor control of the OPX call. When the handset is lifted off the hook, the OPX dial tone is provided by connection of the VTA card 400-Hz signal source through analog gates on the MFR card. If the OPX telephone has been programmed as a DTMF-type, the MDEC DTMF receiver is connected to the OPX voice pair for detection of DTMF tones.

When two digits are dialed at the OPX extension, the central processor connects the OPX extension to the desired type of TRK circuit (CO/PBX or Intercom). When the two digits for connection to an Intercom Line or another OPX extension are dialed, the central processor establishes an Intercom voice circuit connection between the two extensions, the ICM trunk circuit supplies local battery on the crosspoint pair, and the OPX line transformer provides a loop closure to maintain the crosspoint connection.

If the called E-KEY or OPX telephone is busy, the central processor connects a busy tone to the calling OPX telephone by interrupting the analog gates on the MFR card. No ICM trunk circuit connection is established. No voice signalling can be used to call an E-KEY extension. At completion of extension number dialing, the MFR card disconnects and all control functions are operated through the ICM trunk circuit selected by the central processor. When DTMF telephones are used, the MDEC DTMF receiver is used to detect and decode the OPX telephone DTMF signals. When an Intercom dial code or a CO access code is dialed, the MDEC releases and is available for another call.

When the CO/PBX Line circuits are accessed through the OPX, the OPX telephone can dial call directly on the CO/PBX Line If rotary-dial type telephones are used, OPX dial pulses are detected by the central processor and dialed on the CO/PBX Line as DTMF or DP in accordance with the type of signalling utilized in the trunk circuit. If DTMF-type telephones are used, establishment of the voice connection through the crosspoint (XPS) array allows the OPX extension to dial CO/PBX calls by DTMF tones generated at the OPX extension. Program settings are provided on the OPX card for setting the type of OPX extension signalling (DTMF or DP) used.

On outgoing calls to the OPX, an Intercom path is extablished by the calling party and a ringing battery is sent to the called OPX extension at a 15-IPM rate. When the OPX extension handset is lifted off the hook, the OPX is connected to the calling station Intercom Line.

2.3.3 TCU Card

The TCU card provides two conference circuits for multi-trunk or trunk-trunk conferences. The card consists of two sets of transformer holding bridges that connect the two CO/PBX Line crosspoint circuits that will be conferenced. A 600-ohm/600-ohm conference bridge is formed across the two crosspoint circuits. Provision is made for future implementation of a two-way voice amplifier to compensate for voice losses occurred during long loop operation. A trouble detection circuit is provided to re-establish the conference loop in case of an inadvertent disconnection.

2.4 CROSSPOINT CIRCUIT CARDS

The crosspoint (XPS) circuit consists of a balanced tip and ring crosspoint array, each having 8 circuits on the trunk side and 16 circuits on the station side; a control circuit that selects the crosspoint address and turns on the respective thyristor switches; and an internal power supply circuit. One thyristor switch connects the tip side of the trunk circuit on the extension circuit while another thyristor switch connects the ring side of the trunk circuit. Two different latch and decoder circuits are provided to operate the row and column select of the thyristor to be operated.

Current to maintain the crosspoint thyristor operated for the trunk/station circuit is supplied by the TRK card.

2.5 PROGRAM BOARDS

The program board (PSB) circuit cards provide system program settings for system features. The central processor, upon system initialization, scans all program boards and transfers program settings to RAM memory. Whenever the program features of the PSB are changed, the system must be initialized by momentarily turning off the system power supply or operating the system reset. Once the system has been initialized and program settings on the PSB card have been transferred to RAM memory on the MEM card, the PSB card remains dormant.

2.6 OTHER CIRCUIT CARDS

Three additional circuit cards are utilized in the ET-2460. The power failure jumper (PFJ) and power failure transfer unit (PFU) are used for a CO/PBX Line power failure transfer circuit and the zone page unit (ZPU) is utilized for zones of overhead paging.

3.4 STATION VOICE CIRCUIT

The station telephone (voice) network is supplied loop current (60 mA) by the trunk circuit constant-current source. Once a station connection is established to a trunk (line) circuit by the central processor, a 24 volt talk battery is supplied through the system crosspoint mechanism by the trunk circuit.

3.5 STATION DIAL CIRCUIT

All station dial functions are controlled by the station microcomputer. Dial (digit) keys are decoded and the key signals are processed by the station microcomputer and transmitted to the KSU. A local signal source generates a 1-kHz, 48-millisecond tone burst that is connected to the station speaker amplifier or network to indicate that the dial key has been pressed. A lockout control is provided that prevents two keys from being depressed at the same time and causing a dialing error.

3.6 STATION INTERFACE CIRCUIT

The E-KEY telephone (voice) network resembles a standard telephone station network allowing connection of ancillary devices on the tip/ring. Terminals are provided for connection devices on the voice path to allow on-hook operation of the device.

3.7 STATION HANDSFREE REPLY UNIT

The E-KEY telephone can be equipped with a handsfree reply unit for both-way conversations on Intercom calls when the station is not busy. The HFA handsfree unit is mounted in each telephone to be equipped for handsfree operation. Talkback levels are automatically set by an amplifier in the HFA unit. No adjustments are provided except a hybrid balance control to prevent feedback.

3.8 STATION KEYBOARD TEST PROGRAM

A program is provided in the E-KEY station microcomputer to test all keyboard functions and lamp indicators while the ET-2460 KTS is in operation. The station test is useful to test the dial digits and determine whether there is a faulty line pickup or function key. No tools other than a Phillips-head screwdriver and a clip lead are required to implement the test. The procedure is described below.

3.8.5 STATION SETTING CHECK

a. Press SPKR key on telephone. LED indicators on the eight (2460 key telephone telephone) or four (1632 key telephone) rows of keys will light on all keys not arranged for pickup restriction. Line lamp(s) on key(s) arranged for pickup restriction will not light.

b. Operate Do-not-Disturb (DND) switch on base of telephone. The LED lamp on line key no. 4 will light.

3.8.6 DIAL CHECK

a. With handset off-hook, press dial key starting from key number 1 and following order listed in Table 1. When number 1 is pressed, the first four LED lamps on the top line key bank will light and the fifth through eighth keys will light in accordance with TABLE 1.

NOTE: LED lamps on the fifth through eighth pickup keys will light if an X appears in the lamp column.

TABLE 1 STATION DIAL KEY CHECK LIST

PRESS KEY NO.	LAMP INDICATION L5	L6	L7	L8
1	x	-	-	-
2	-	x	-	-
3	x	x	-	-
4	-	-	x	-
5	x	-	x	-
6	-	x	x	-
7	x	x	x	-
8	-	-	-	x
9	x	-	-	x
0	-	x	-	x
*	x	x	-	x

b. While dial key is pressed, verification tone can be heard in handset.

c. Press # key on dial to cancel dial check mode.

3.8.7 STATION RECONNECTION AFTER TEST

a. Disconnect station drop cord from modular station block.

b. Remove short across Terminals TES1 and Ground (GND) on station circuit card.

c. Reassemble station, making sure that station speaker leads and keyboard connector are securely in place on station circuit card.

d. Reconnect station drop cord to modular station block.

e. Check all operations of station on working system.

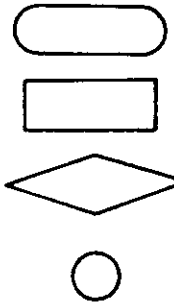
SECTION 5 SYSTEM FLOW CHARTS

System flow charts are provided to enable the service technician to troubleshoot problems in the system. Troubleshooting is limited to inspection of system wiring connections and replacement of defective system components. The tables used for investigating problems in the 2460 KTS are as follows:

Table A	System Troubleshooting Flow Diagram
Table B	System Power Supply Checkout
Table C	KSU Common Card Replacement
Table D	E-KEY Extension Problems
Table E	CP-60 Check
Table F	BLF-60 Lamp Field Problems
Table G	OPX Telephone Problems
Table H	CO/PBX Line Problems
Table I	Ringdown Tie Line Problems
Table J	Dial Intercom Line Problems
Table K	Secretary/Executive Intercom Line Problems
Table L	All-Call Problems
Table M	Trunk Conference Problems
Table N	PA/Background Music and MOH Problems
Table O	Power Failure Transfer Problems
Table P	Feature Programming Problems

a. Refer to TABLE A to determine the specific flow chart for the individual system problem. Although some problems may overlap, a determination must be made whether the problem is system-related or related to individual extensions in the system.

b. The following symbols are used in the flow charts to indicate order of flow.



Start of flow; reference to specific table.

Work operation to be performed.

Question (Yes or No) whether or not operation is valid; follow decision path.

Branch (return) to location indicated.

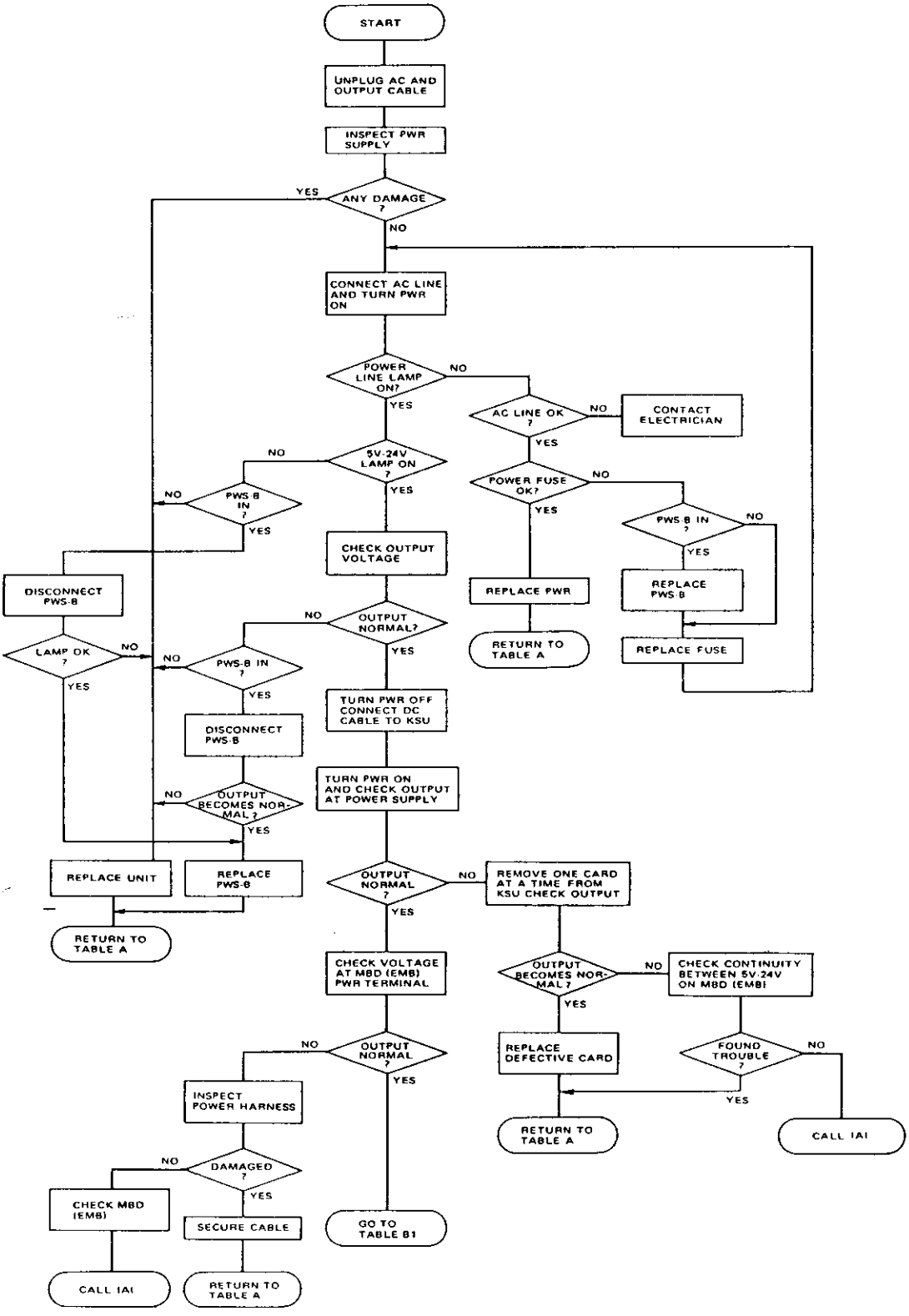
c. System power supply voltage specifications on-board voltage regulation in the system are as follows (when referring to Table B, this data is utilized to determine locations of power supply voltages on the individual KSU components):

TABLE 2 SYSTEM POWER SUPPLY VOLTAGES

LOCATION	VOLTAGE	TEST POINT	TOLERANCE
PWS-A	AC Input +24 V +5 V	AC Line Power Supply Terminal	117 V ±10% Vac 23.5 - 25.0 Vdc 5.0 - 5.3 Vdc
PWS-B	+24 V	Power Supply Terminal	23.5 - 25.0 Vdc
VTA	+5 V	[+5] Test Point (+) DG Test Point (-)	4.8 - 5.25 Vdc
	+12V	[+12] Test Point (+) AG Test Point (-)	11.0 - 13.6 Vdc
	+6 V	[+6 VTA] Test Point (+) DG Test Point (-)	5.5 - 6.8 Vdc
	+2.5 V	[+2.5 VTA] Test Point (+) DG Test Point (-)	2.3 - 2.7 Vdc
	+24 V	[+24] Test Point (+) AG Test Point (-)	23.5 - 25.0 Vdc
	A6 V	[+6 TRK] Test Point (+) AG Test Point (-)	5.5 - 6.8 Vdc
	A2.5 V	[+2.5 TRK] Test Point (+) DG Test Point (-)	2.3 - 2.7 Vdc

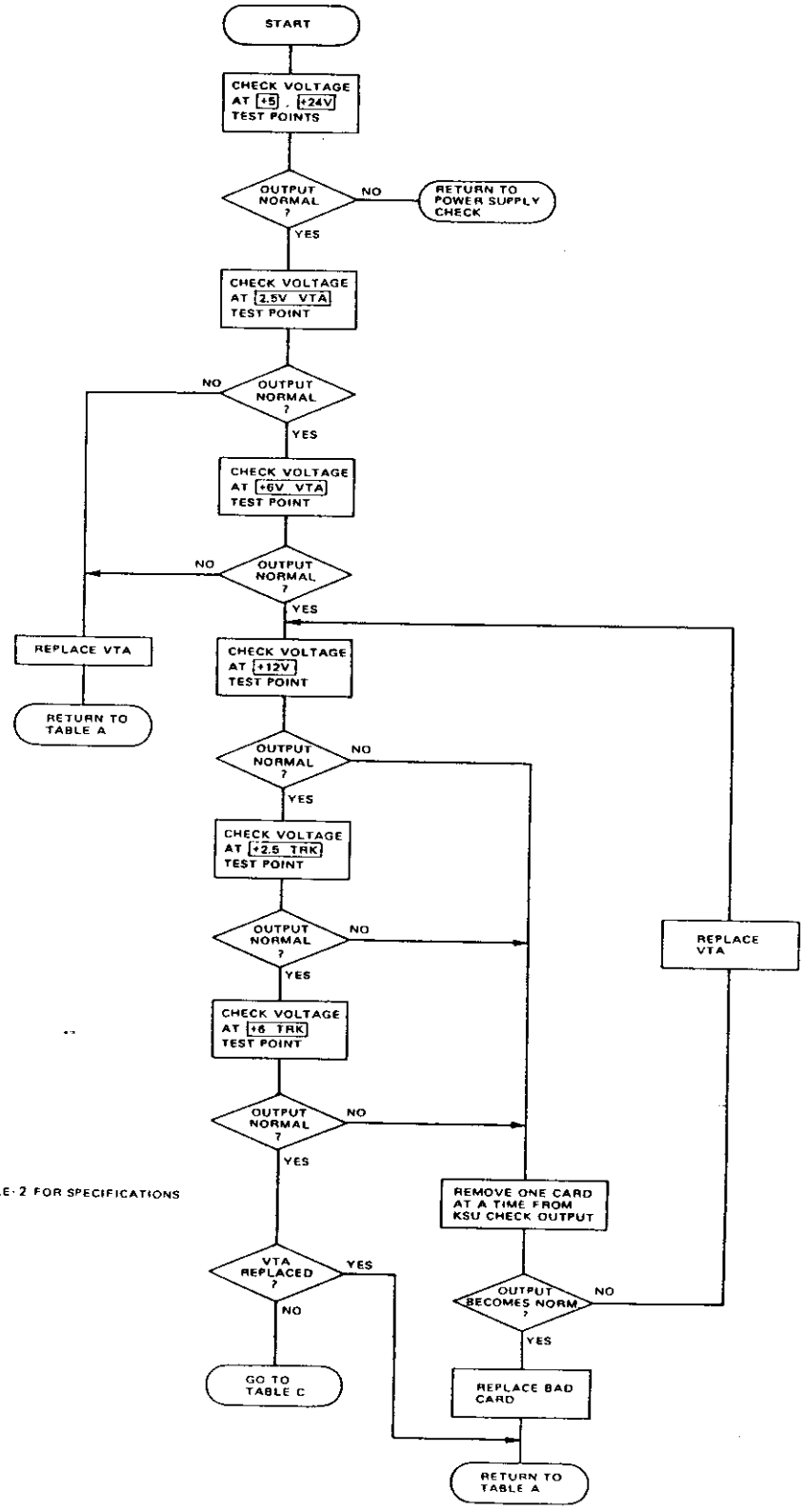
d. Table 3 is used to determine locations involved in extension problems.

TABLE B: POWER SUPPLY CHECK



NOTE REFER TO TABLE 2 FOR SPECIFICATIONS ON PAGE III-24.

TABLE B1: VTA VOLTAGE CHECK



NOTE REFER TO TABLE-2 FOR SPECIFICATIONS ON PAGE III-24.

TABLE C: COMMON CONTROL CARD CHECK

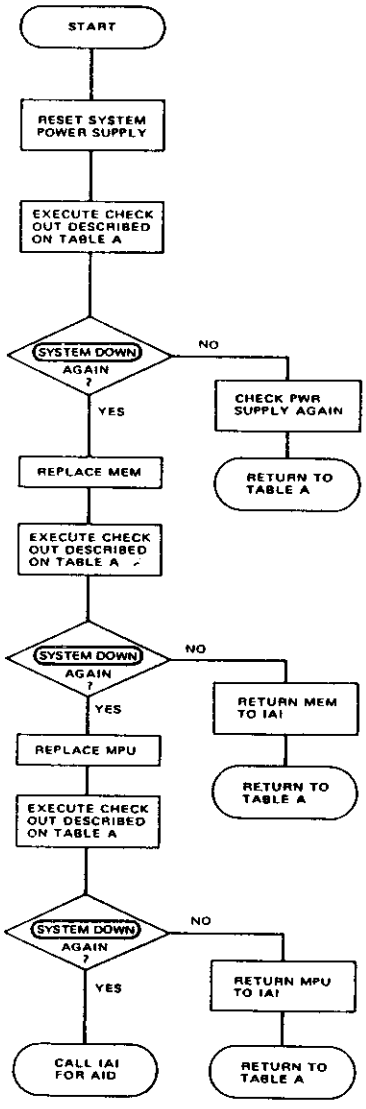
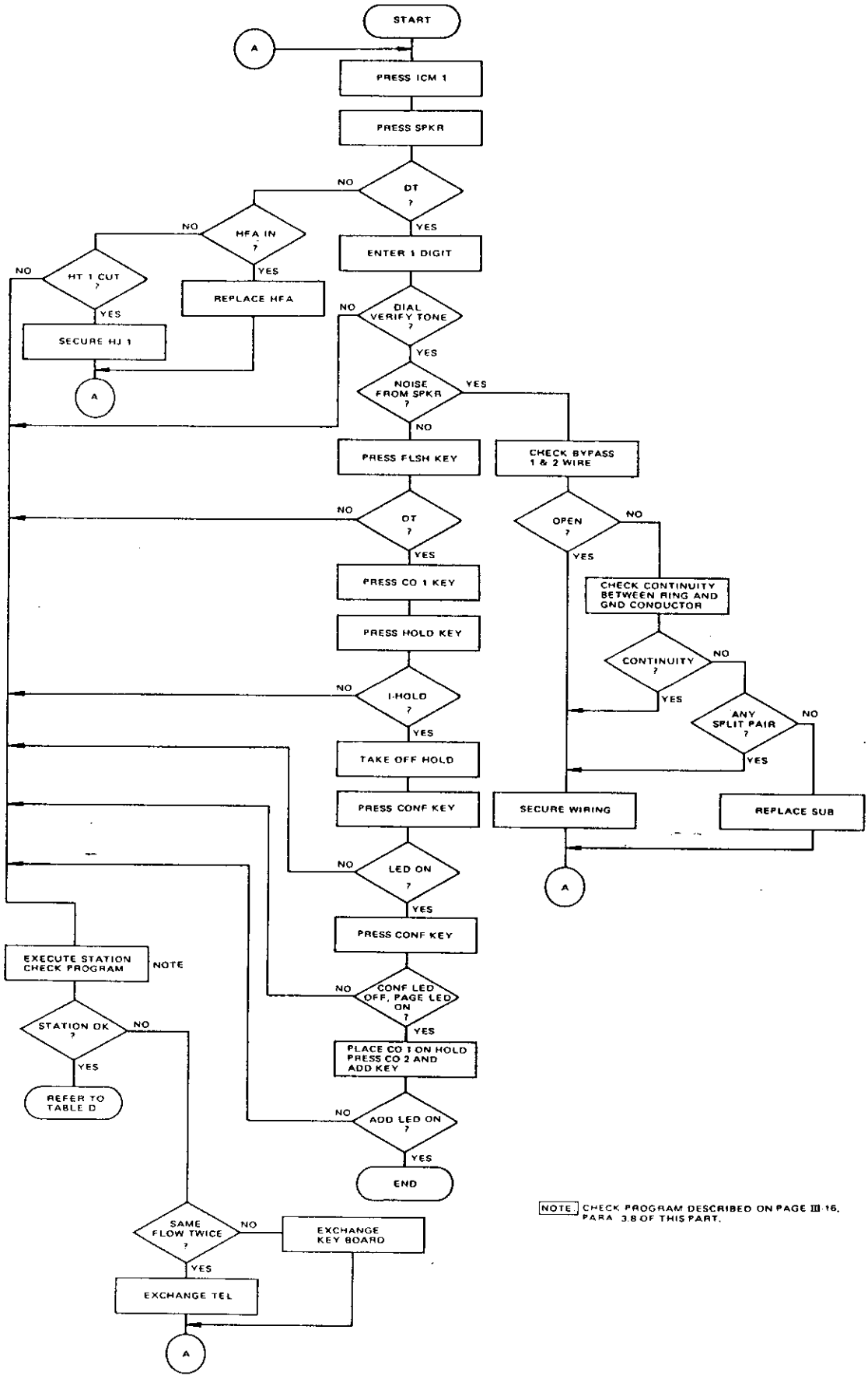


TABLE D2: FUNCTIONAL TROUBLE CHECK



NOTE CHECK PROGRAM DESCRIBED ON PAGE III-16, PARA 3.8 OF THIS PART.

TABLE D3: EXTENSION FEATURE TROUBLE

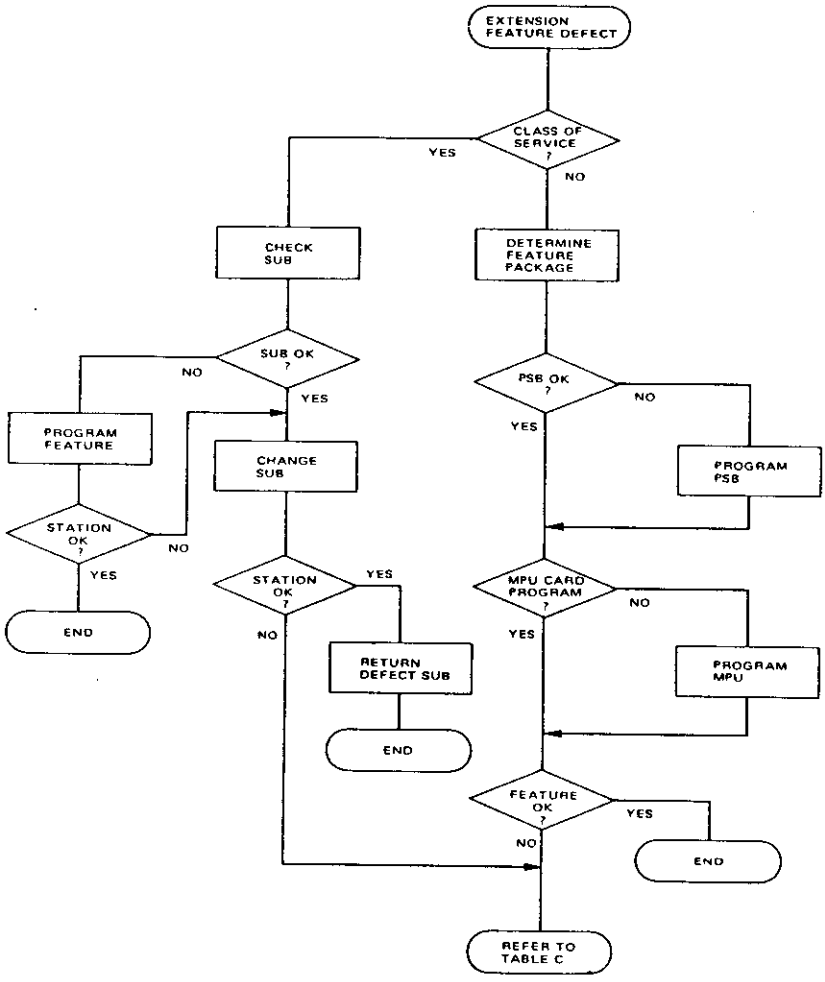


TABLE D4: E-KEY STATION SIGNALLING DEFECT

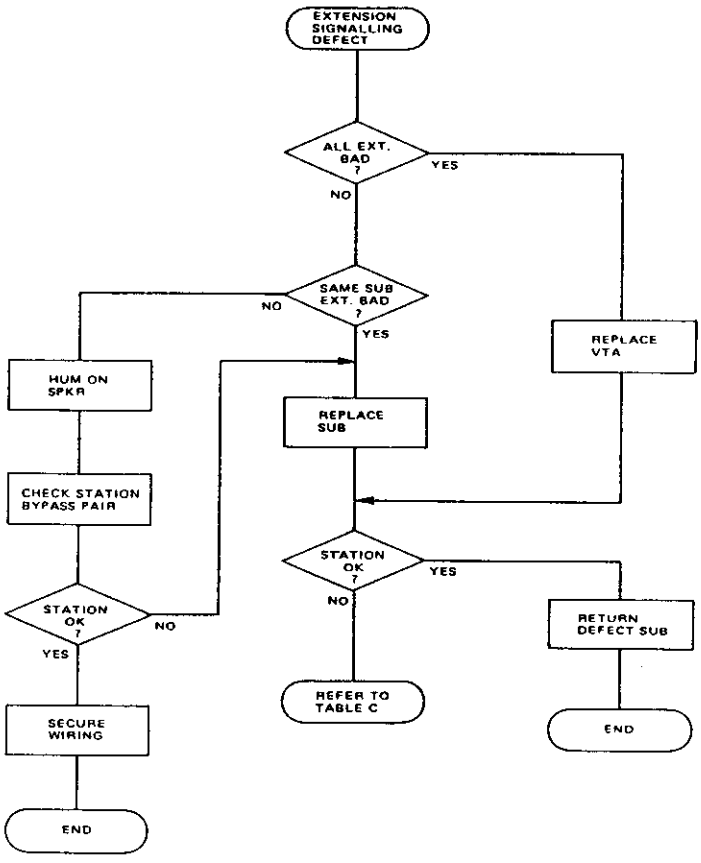


TABLE E: CP-60 CHECK

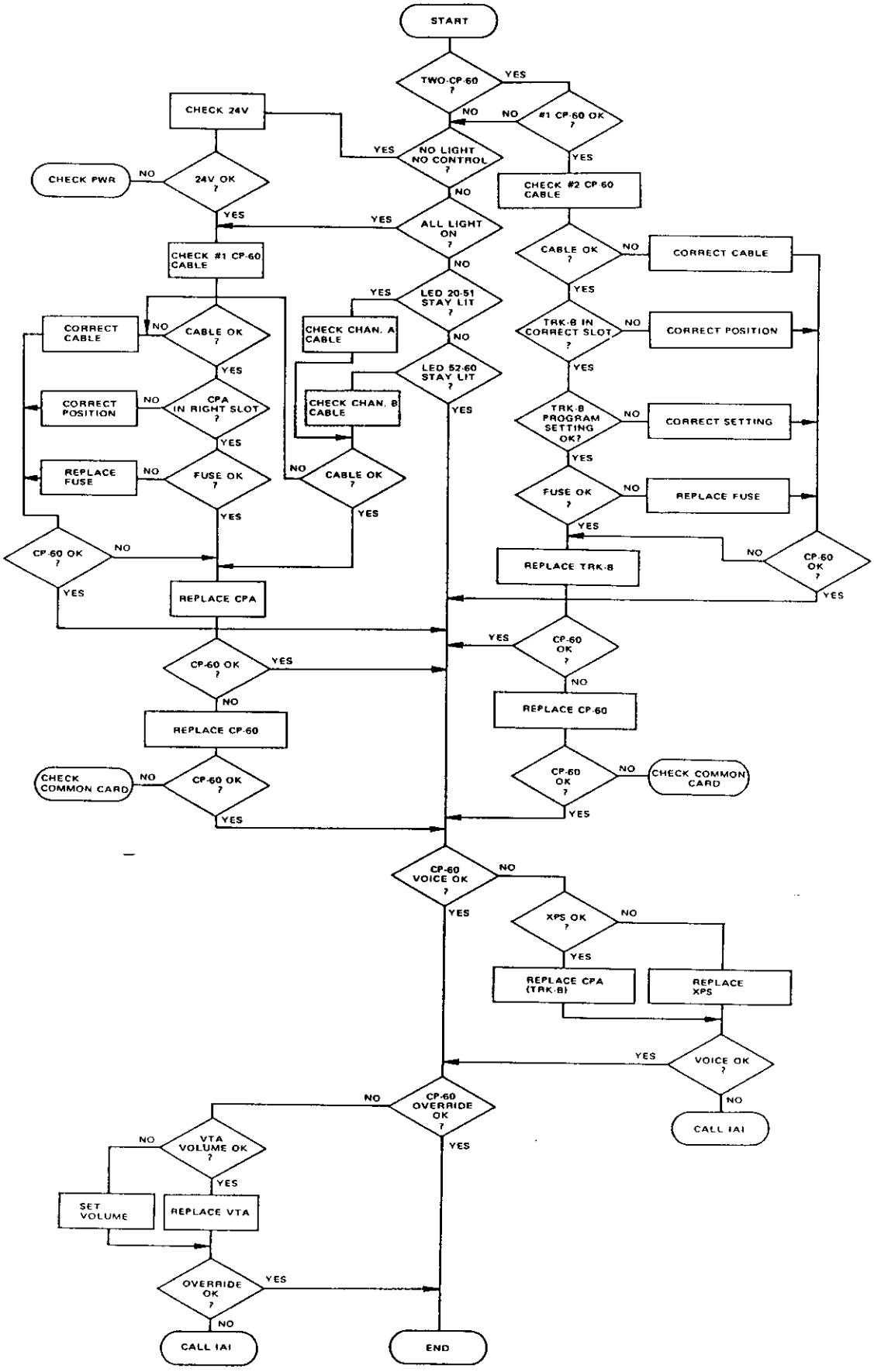
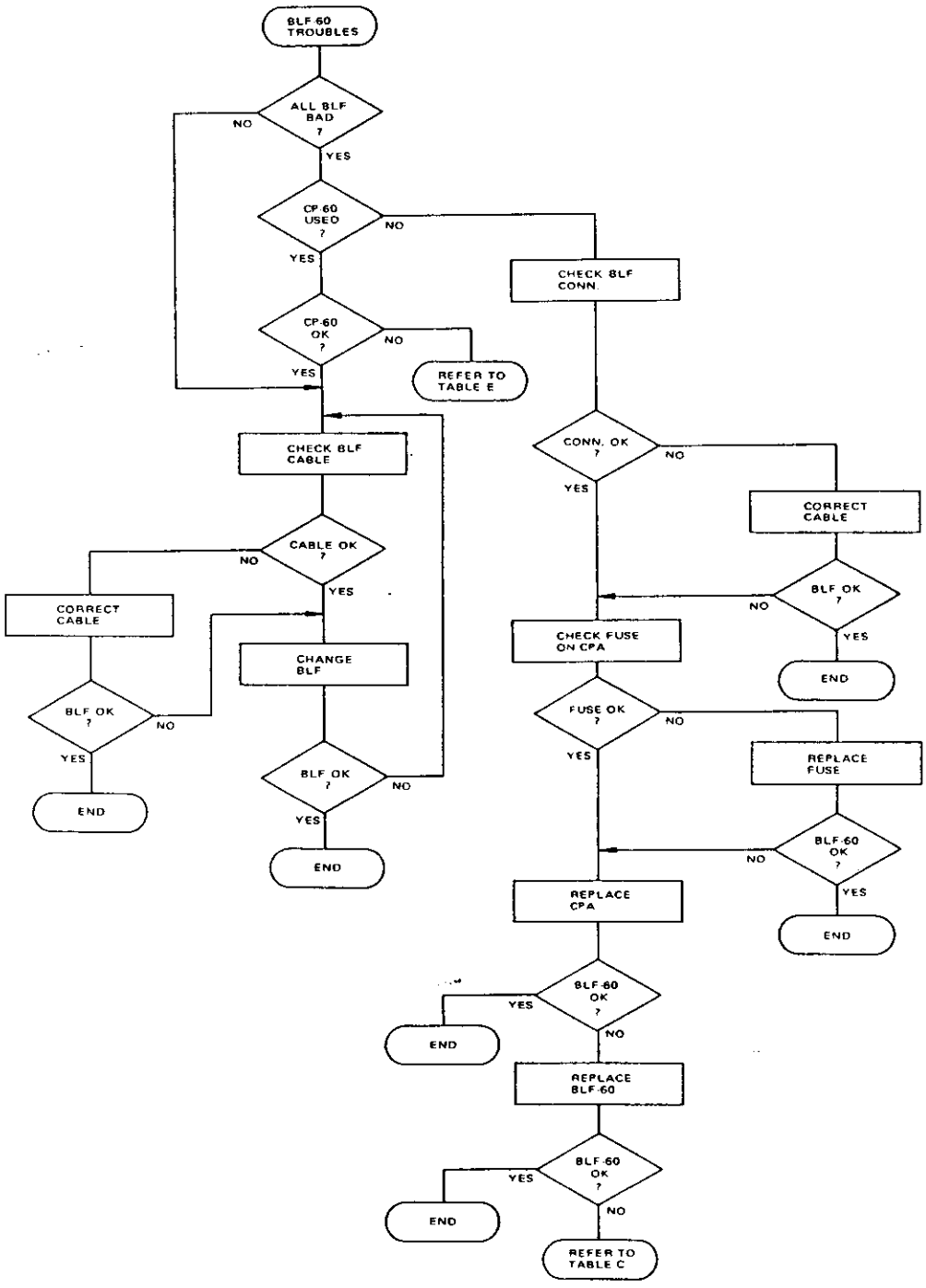


TABLE F: BLF-60 TROUBLESHOOTING



NOTE IF BLF-60 UNITS ARE CONNECTED TO CP 60 #2 TERMINATIONS ON THE MDF (BLF #4 6), REFER TO TRK-B CARD LOCATED IN TRK SLOT 05/06.

TABLE G: OPX TOUBLESHOOTING

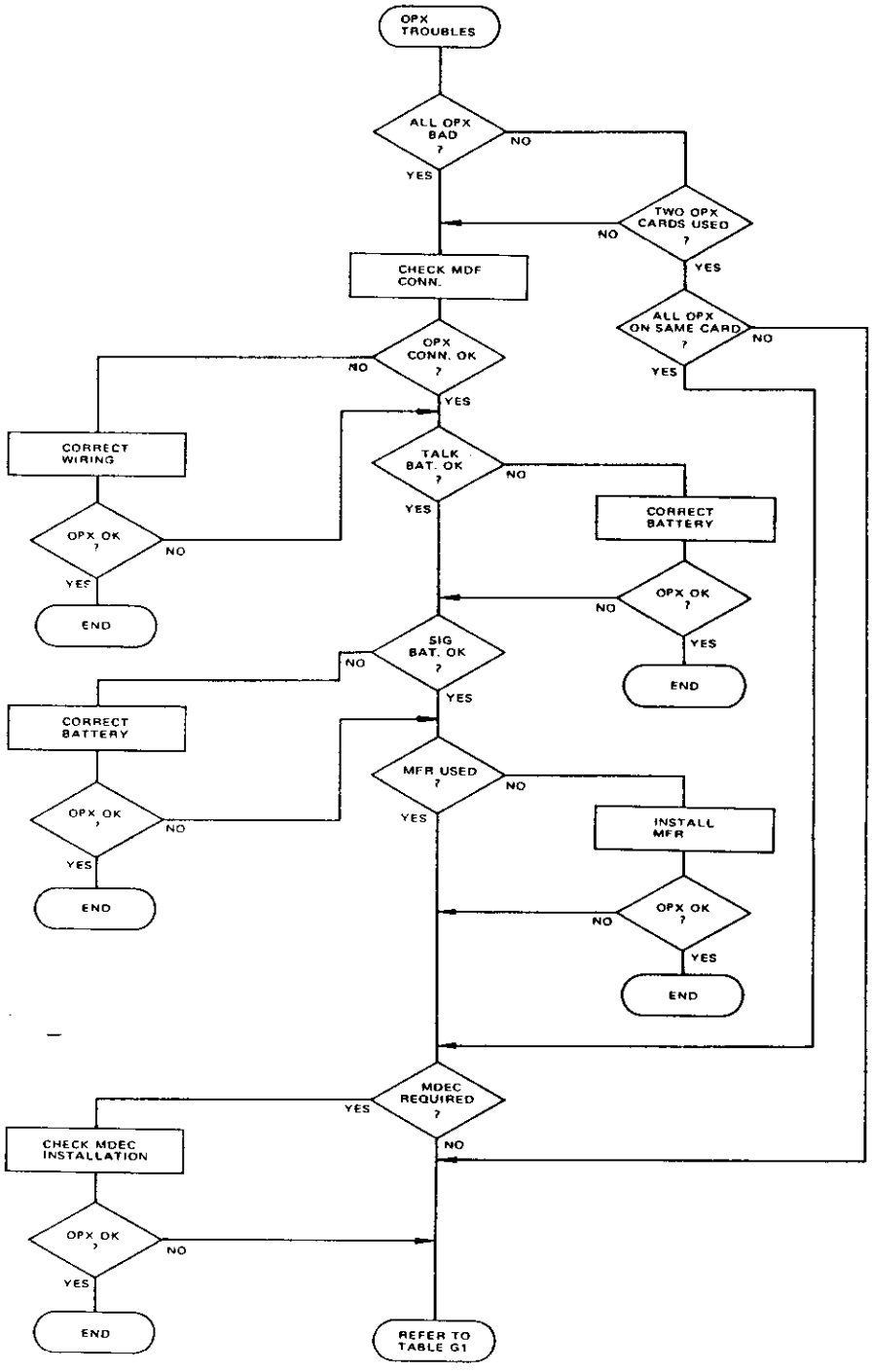


TABLE G1: OPX TROUBLESHOOTING

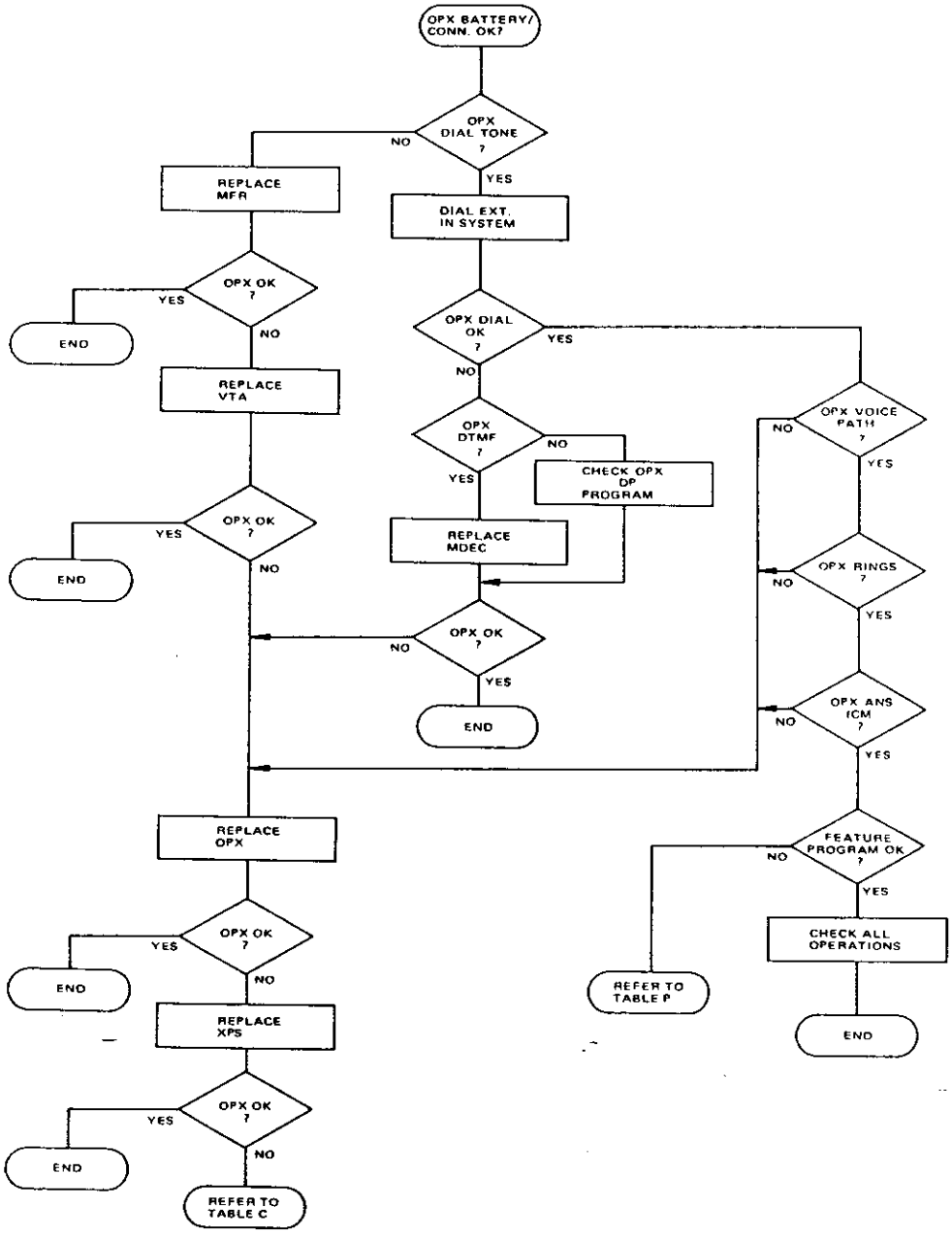


TABLE H: CO/PBX LINE

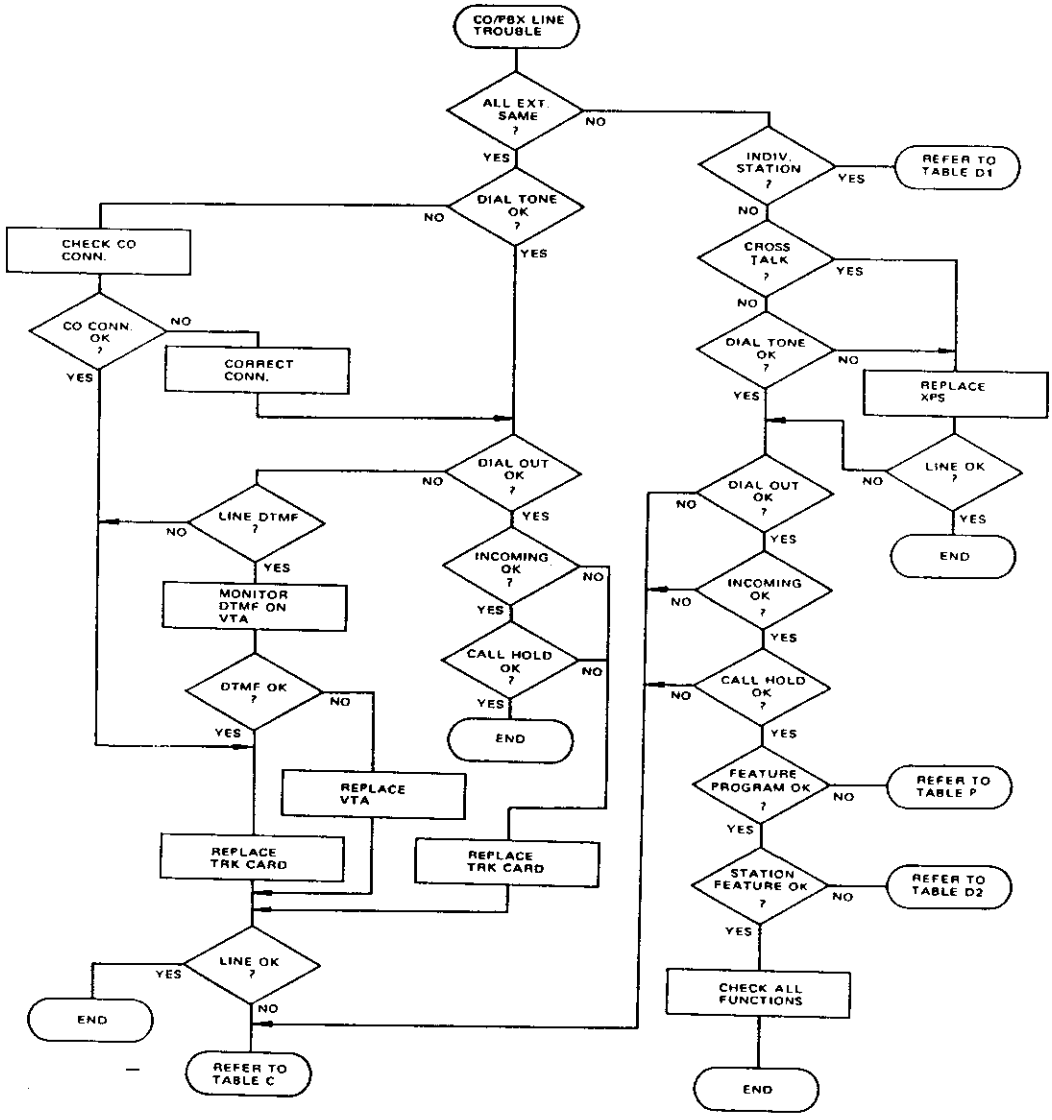


TABLE K: SEC/EXEC ICM LINE TROUBLESHOOTING

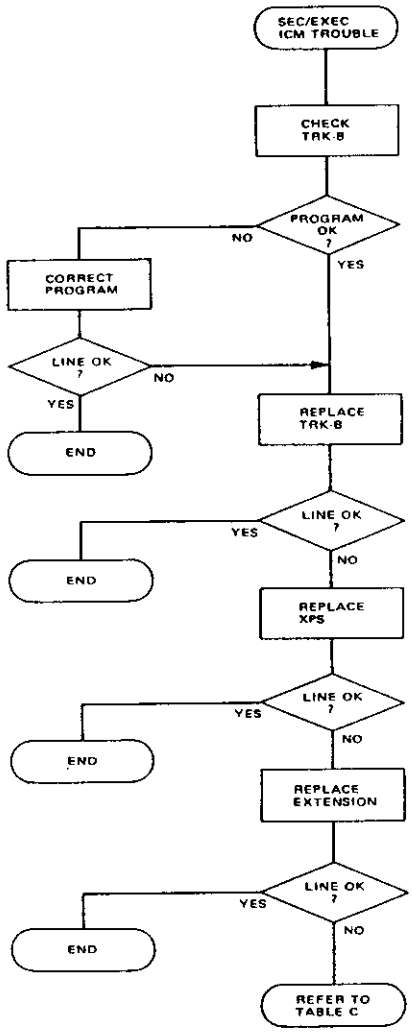


TABLE L: ALL CALL TROUBLESHOOTING

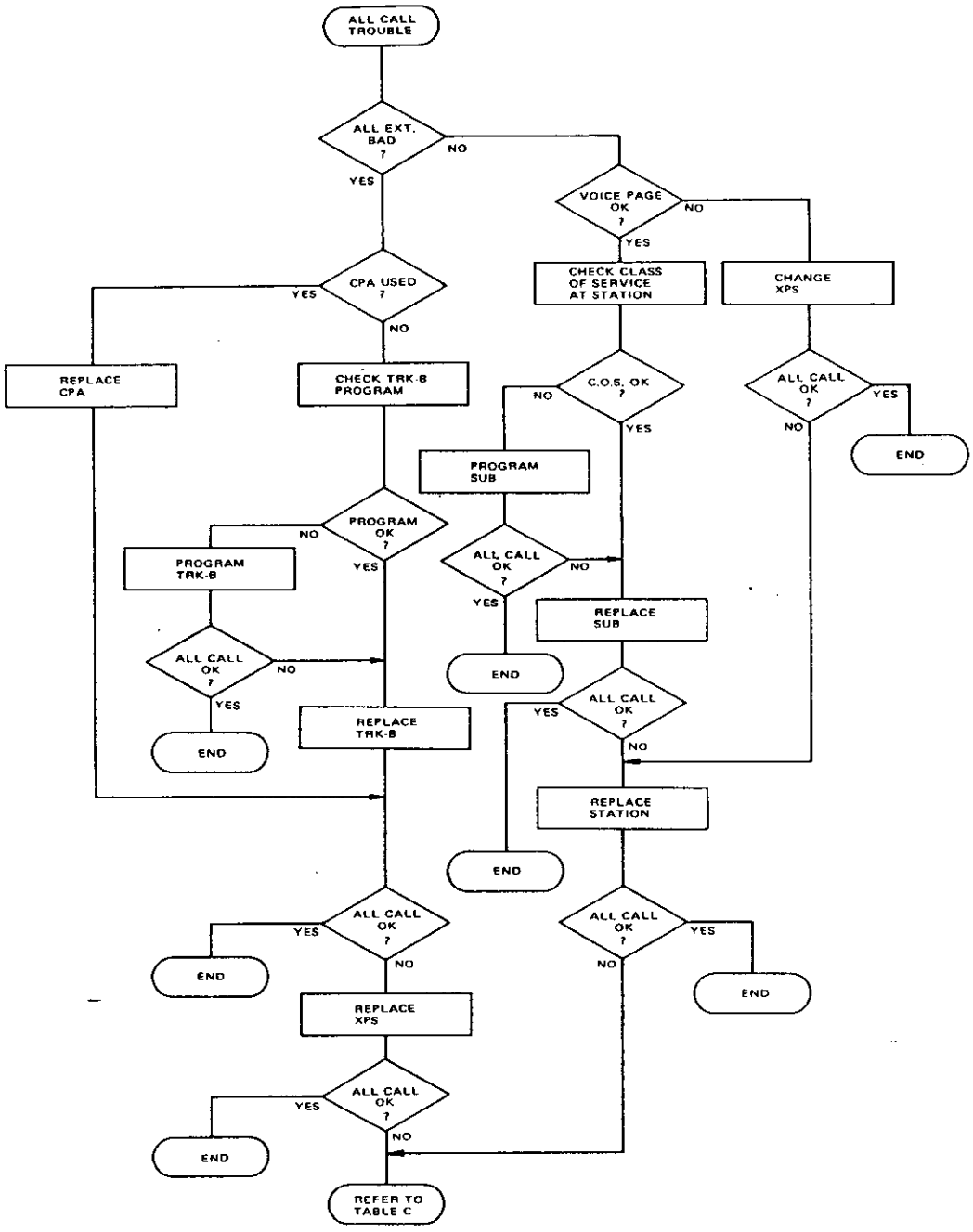


TABLE M: TRUNK CONFERENCE TROUBLESHOOTING

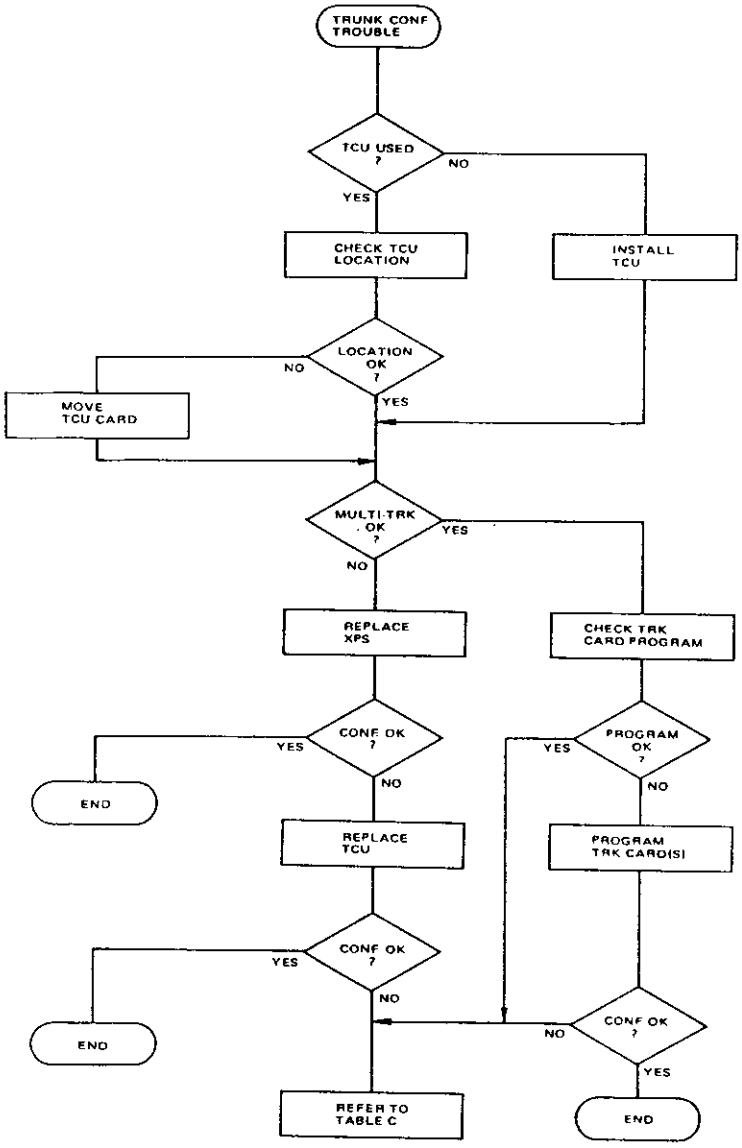


TABLE N: VTA TROUBLESHOOTING

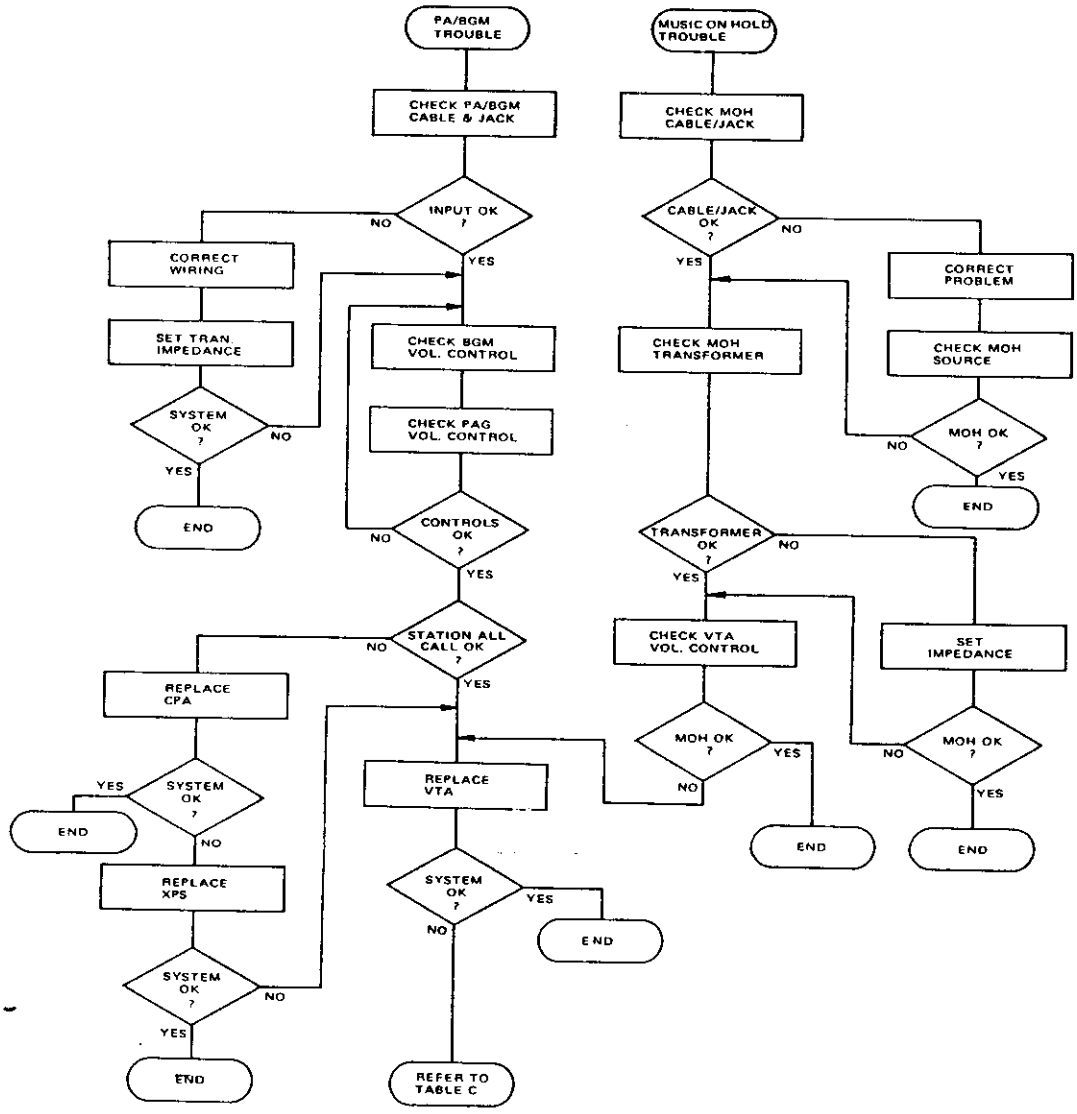


TABLE O: PWR FAILURE TRANSFER TROUBLESHOOTING

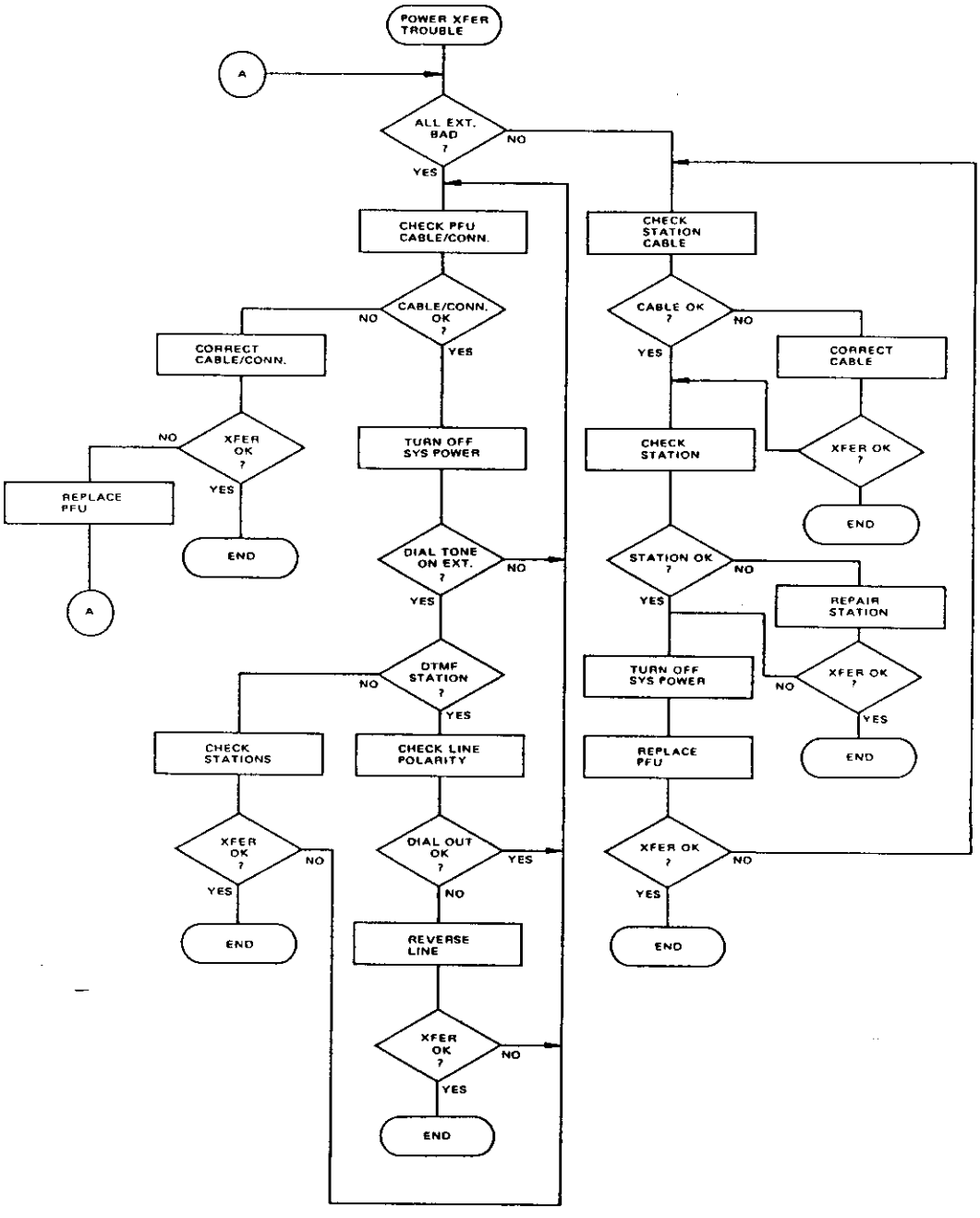
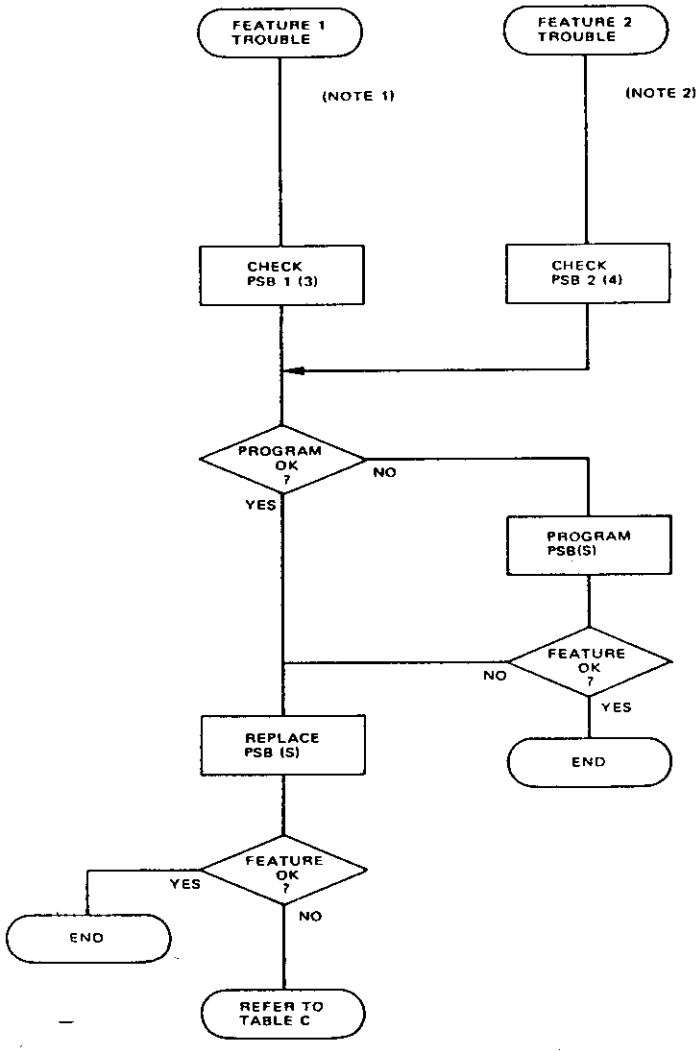


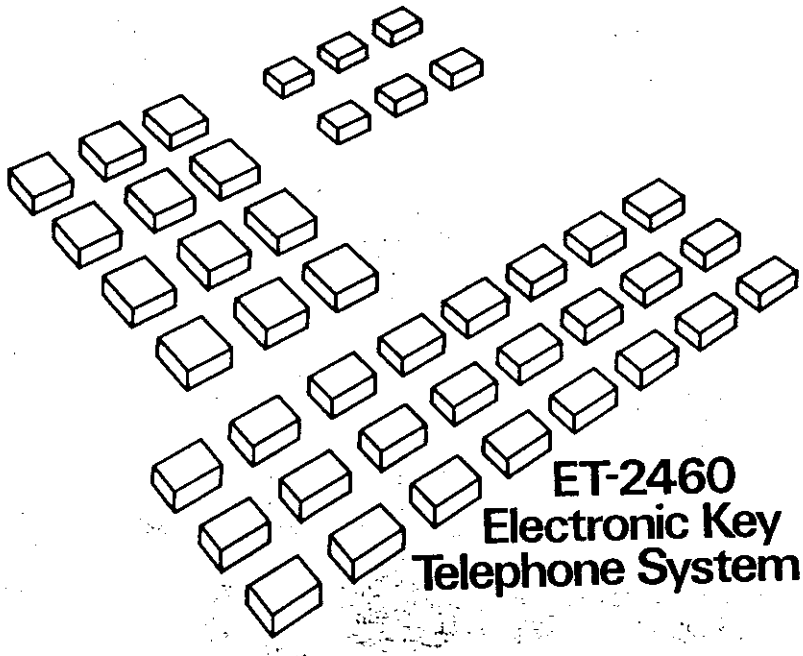
TABLE P: PROGRAM BOARD TROUBLESHOOTING



NOTE 1. FEATURE PACKAGE 1
(1) CO Incoming Assignment
(2) Toll Restriction
(3) OPX CO Grp Access. Assign.

NOTE 2. FEATURE PACKAGE 2
(1) CO Dial Restriction
(2) ICM Ext Group Call Assign.
(3) OPX Dial Restriction
(4) OPX Night Service
(5) System Timer Prog.

OMEGA PHONE III



ET-2460
Electronic Key Telephone System

INSTRUCTION MANUAL

PART Ⅳ DRAWINGS

ET-2460
Electronic Key
Telephone
System

PART IV
DRAWINGS

ET-2460
Electronic Key
Telephone
System

OMEGA PHONE III

PART IV
DRAWINGS

SECTION 1 DRAWINGS AND PARTS LISTS

1.1 ET-2460 KEY SERVICE UNIT (ET-2460 KSU) AND INDIVIDUAL COMPONENTS FOR KEY SERVICE UNIT

(1) ET-2460 Key Service Unit (ET-2460 KSU) IV-1
(2) Expanded Mother Board (EMB) IV-5
(3) Main Processor Unit (MPU) IV-9
(4) Memory Unit (MEM) IV-15
(5) Voice and Tone Adaptor (VTA) IV-19
(6) Cross Point Switch Unit-1 (XPS-1) IV-27
(7) Power Failure Jumper (PFJ) IV-31
(8) Power Failure Unit (PFU) IV-35
(9) Central Office Line Unit – DTMF (COT) IV-39
(10) Central Office Line Unit – Rotary (COR) IV-45
(11) Intercom Unit (ICM) IV-51
(12) Call Processor and All Call Trunk (CPA) IV-57
(13) Trunk-A (TRK-A) IV-63
(14) Trunk-B (TRK-B) IV-75
(15) Subscriber Unit (SUB) IV-89
(16) Trunk Conference Unit (TCU) IV-93
(17) Off Premises Extension Unit (OPX) IV-97
(18) Multi-Frequency Receiver Unit (MFR) IV-103
(19) Program Switch Board (PSB) IV-107
(20) Zone Paging Unit (ZPU) IV-111
(21) Strapping Jack (STJ) IV-115
(22) Removing Tool for Circuit Board (RTCB) IV-119
(23) Circuit Board Extender – Large (CBE-L) IV-123
(24) Circuit Board Extender – Small (CBE-S) IV-127
(25) Extension Cable Assembly for SLT (ECA-A) IV-131
(26) Extension Cable Assembly for CP-60 (ECA-B) IV-135
(27) Mother Board Cable Assembly-A (MCA-A) IV-139
(28) Mother Board Cable Assembly-B (MCA-B) IV-143
(29) Mother Board Cable Assembly-C (MCA-C) IV-147
(30) Mother Board Cable Assembly-D (MCA-D) IV-151
(31) Mother Board Cable Assembly-E (MCA-E) IV-155
(32) Mother Board Cable Assembly-F (MCA-F) IV-159

1.2 KEY-TELEPHONE AND INDIVIDUAL COMPONENTS FOR KEY TELEPHONE

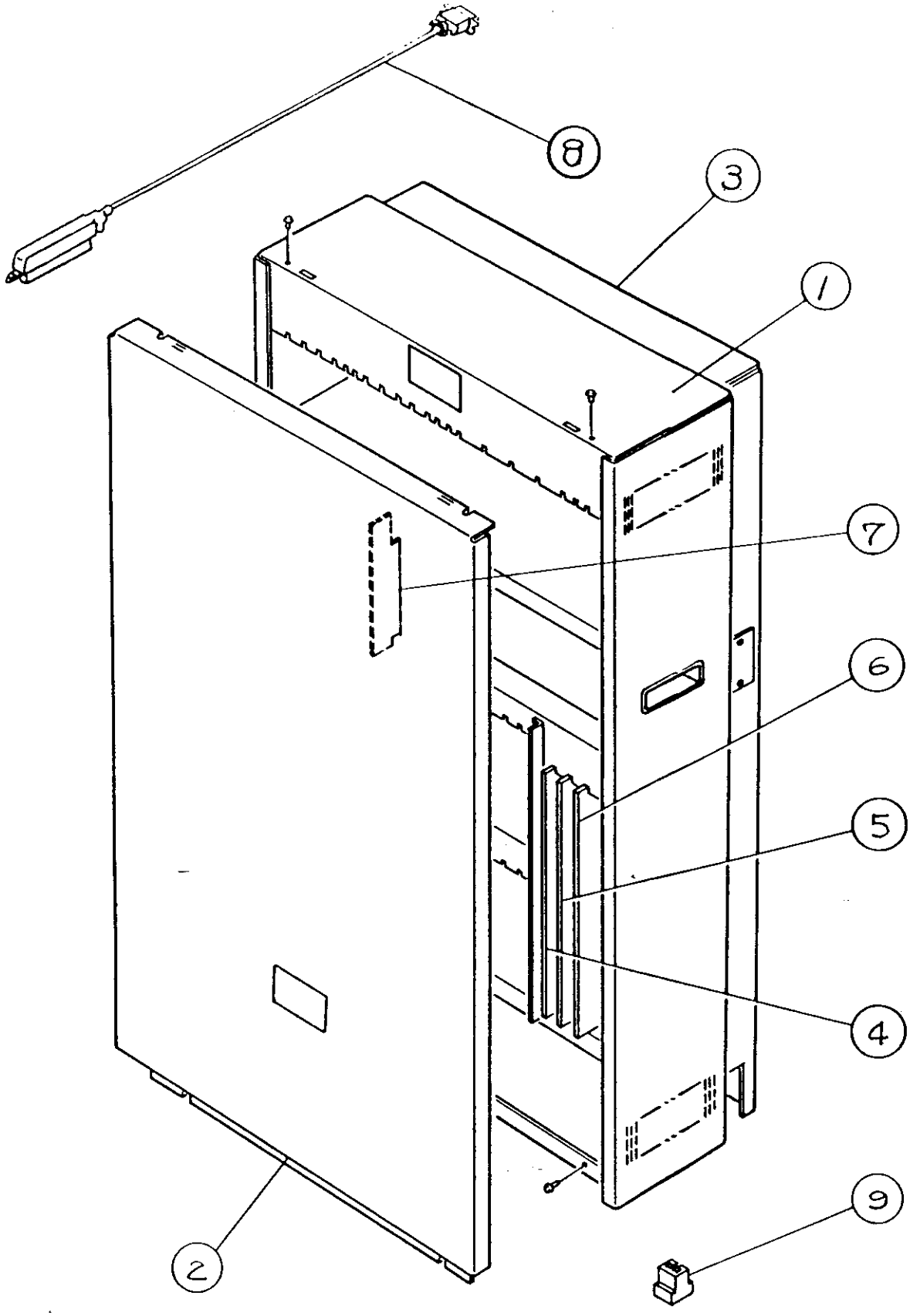
(1) ET-2460 Key Telephone (ET-2460) ... IV-163
(2) ET-1632 Key Telephone (ET-1632) ... IV-167
(3) Station Processor Unit (ET-SPU) IV-171
(4) Electronic Key Telephone Keyboard 24 (ET-K24) IV-177
(5) Electronic Key Telephone Keyboard 16 (ET-K16) IV-181
(6) Wall Mount Unit (ET-WMU) IV-185
(7) Handsfree Answer Back Unit (ET-HFA) IV-189
(8) Handsfree Answer Back Unit-1 (ET-HFA-1) IV-193
(9) Speakerphone Adaptor Board (ET-SPB) IV-197
(10) Headset Jack Bracket (ET-HJB) IV-201
(11) Headset Jack Adaptor Unit (ET-HJA) .. IV-205

1.3 INDIVIDUAL SYSTEM COMPONENTS

(1) Call Processor-60 (CP-60) IV-209
(2) Call Processor-Control Unit (CPS-C) ... IV-213
(3) Call Processor-Display Unit (CPS-D) ... IV-219
(4) Busy Lamp Field Unit 60 Lamps (ET-BLF-60) IV-223
(5) Busy Lamp Field-Control Unit (ET-BLF-C) IV-227
(6) Busy Lamp Field-Display Unit (ET-BLF-D) IV-231

PARTS LIST

ORDERING CODE	1000		UNIT NAME	ET-2460 KEY SERVICE UNIT	
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION	Q'TY	NOTE
		ET-2460KSU	ET-2460 KEY SERVICE UNIT	(1)	
	1		KSU FRAME ASSEMBLY	1	
	2		KSU FRONT COVER	1	
	3		KSU BACK COVER	1	
1010	4	MPU	MAIN PROCESSOR UNIT	1	COMMON CARDS
1011	5	MEM	MEMORY UNIT	1	
1012	6	VTA	VOICE AND TONE ADAPTOR	1	
1020	7	PFJ	POWER FAILURE JUMPER	1	
1065	8	ECA-B	EXTENSION CABLE ASSEMBLY FOR CP-60	1	
1060	9	STJ	STRAPPING JACK	100	


8
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1
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6
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4
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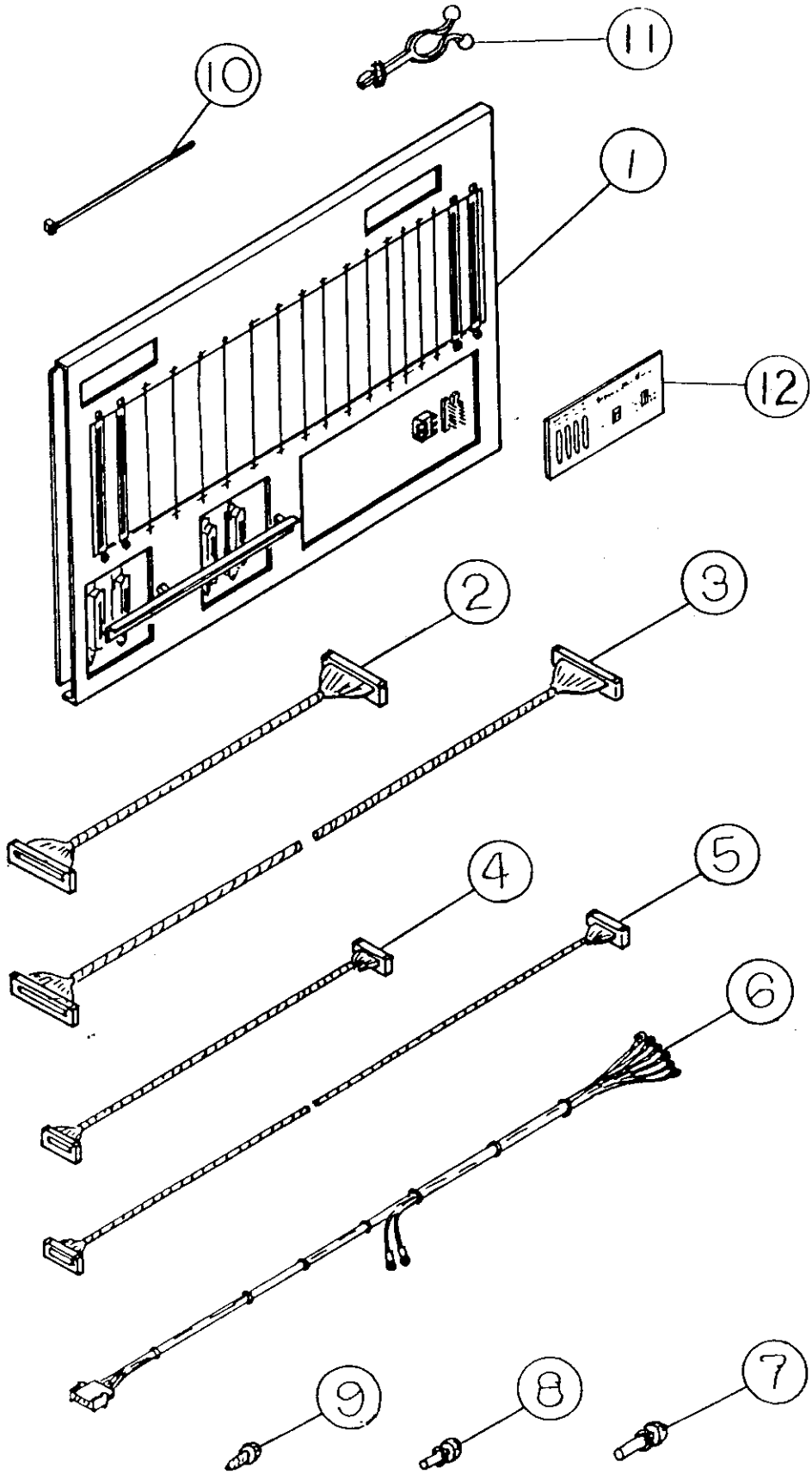
2

PARTS LIST

ORDERING CODE	1002		UNIT NAME	EXPANDED MOTHER BOARD (EMB)	
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION	Q'TY	NOTE
		EMB	EXPANDED MOTHER BOARD	(1)	
	1		EMB FLAME ASSEMBLY	1	
1066	2	MCA-C	MOTHER BOARD CABLE ASSEMBLY-A	2	50-CONDUCTOR SHORT CABLE
1067	3	MCA-D	MOTHER BOARD CABLE ASSEMBLY-B	1	50-CONDUCTOR LONG CABLE
1068	4	MCA-A	MOTHER BOARD CABLE ASSEMBLY-C	1	26-CONDUCTOR SHORT CABLE
1069	5	MCA-B	MOTHER BOARD CABLE ASSEMBLY-D	1	26-CONDUCTOR LONG CABLE
1070	6	MCA-E	MOTHER BOARD CABLE ASSEMBLY-E	1	POWER HARNESS
	7		SCREW SM1-4x8	4	
	8		" FP(+)3x6S	6	PHILLIPS-HEAD SELF-TAPPING
	9		" SM1-3x6	1	
	10		TY-RAP	3	
	11		CABLE SUPPORT	1	
	12		EMB LABEL	1	


11
10
1
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7

PARTS LIST

ORDERING CODE	1010		UNIT NAME	MAIN PROCESSOR UNIT (MPU)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		MPU	MAIN PROCESSOR UNIT		(1)	
	1		MPU PCB		1	
	2		IC SOCKET - 24P		2	
	3		IC SOCKET - 18P		3	
	4		IC SOCKET - 40P		1	
	5		FLAT CABLE CONNECTOR -50P		1	
	6	SS1	BIT SWITCH - 6B		1	
	7	RSW L-1NH P-1NH	BIT SWITCH - 1B		3	
		15A	INTEGRATED CIRCUIT	P-8085A	1	
		12D,12E 13D,13E	"	SN74LS242N	4	
		15D	"	SN74LS373N	1	
		10E, 14C,14D	"	SN74LS365N	3	
		2A,9A,11D 11E,14A	"	SN74LS04N	5	
		1B,8A,8B 6A	"	SN74LS00N SN74LS08N	3 1	
		7A,7B 17D	"	SN74LS32N	3	
		3A,4B	"	SN74LS390N	2	
		3B	"	SN74LS290N	1	
		4A	"	CD4040BE	1	
		2B	"	SN74LS393N	1	
		1A	"	SN74LS20N	1	
		4D,4E	"	CD4013BE	2	

PARTS LIST

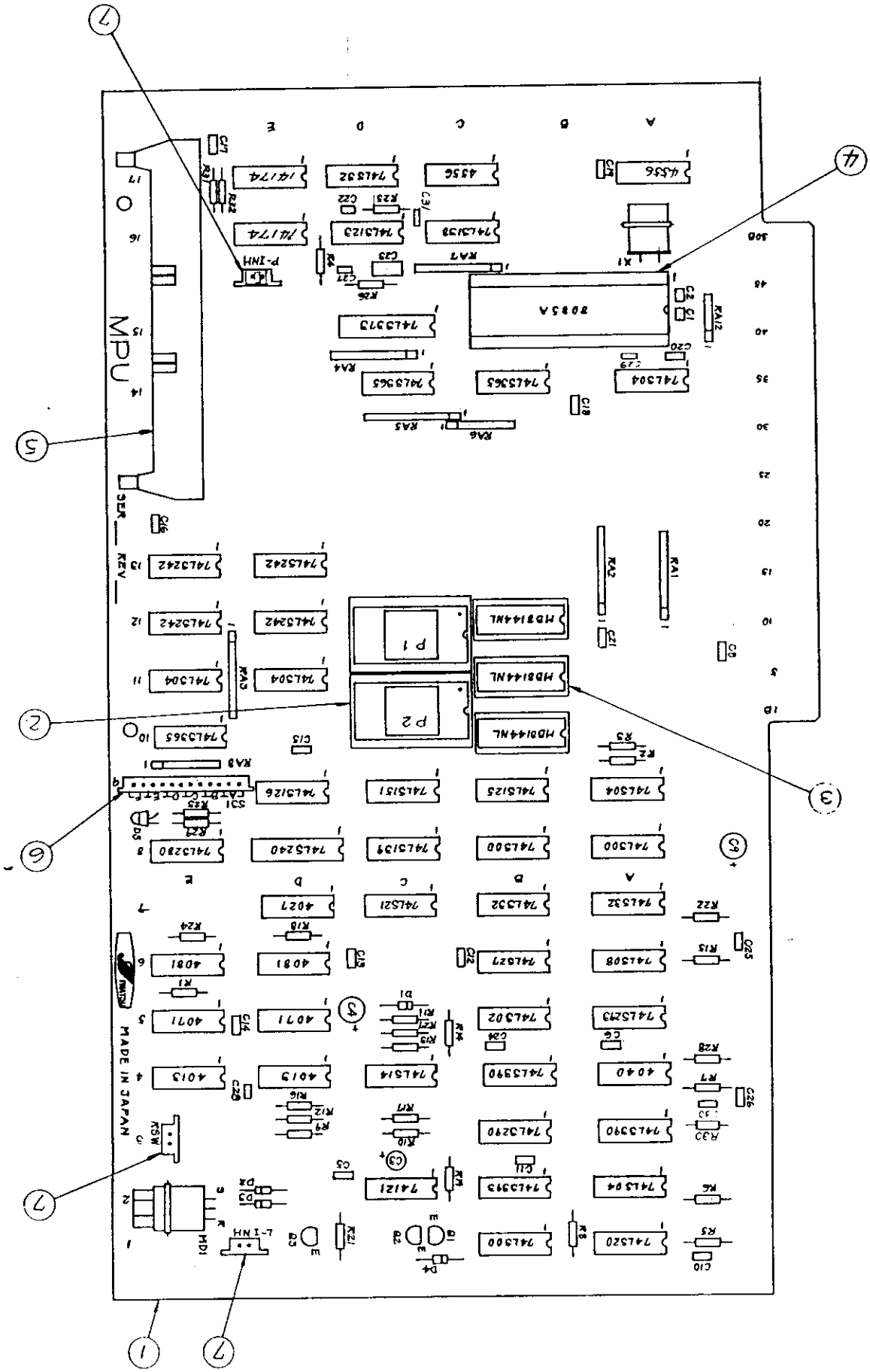
ORDERING CODE	1010		UNIT NAME	MAIN PROCESSOR UNIT (MPU)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		2C	INTEGRATED CIRCUIT	SN74121N	1	
		6D,6E	"	CD4081BE	2	
		5D,5E	"	CD4071BE	2	
		4C	"	SN74LS14N	1	
		5B	"	SN74LS02N	1	
		16D	"	SN74LS123N	1	
		5A	"	SN74LS293N	1	
		9D	"	SN74LS126N	1	
		6B	"	SN74LS27N	1	
		16C	"	SN74LS138N	1	
		17C	"	CD4556BE	1	
		11C,12C	"	TMM323C	2	
		9C	"	SN74LS151N	1	
		8C,17A	"	SN74LS139N	1	
		10B 11B,12B	"	MB8144NL	3	
		7C	"	SN74LS21N	1	
		8D	"	SN74LS240N	1	
		8E	"	SN74LS280N	1	
		9B	"	SN74LS125N	1	
		16E,17E	"	MC14174BCP	2	
		7D	"	CD4027BE	1	

PARTS LIST

ORDERING CODE	1010		UNIT NAME	MAIN PROCESSOR UNIT (MPU)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		Q1	TRANSISTOR	2SC945K	1	
		Q2,Q3	"	2SC1247AFV	2	
		D1-D4	DIODE	1S2076A	4	
		D5	LED	SLP-24B	1	
		R15	RESISTOR	PSS 1/4 2.7KΩJ	1	1/4W ±5%
		R1-9,R12-14 R16,R18,R22 -24,31,32	"	PSS 1/4 10KΩJ	19	"
		R10	"	PSS 1/4 18KΩJ	1	
		R11,R17	"	PSS 1/4 4.7KΩJ	2	"
		R19	"	PSS 1/4 820KΩJ	1	"
		R21,R30	"	PSS 1/4 1KΩJ	2	"
		R27,R28	"	PSS 1/4 220KΩJ	2	1/4W ±5%
		R25	"	EF 1/4 6.8KΩF	1	1/4W ±1%
		R26	"	EF 1/4 220KΩF	1	1/4W ±1%
		R29	"	PSS 1/4 270 ΩJ	1	1/4W ±5%
		C1,C2	CAPACITOR	USD04SL220K	2	22pF 50WV
		C3	"	CE04W1C100	1	10μF 16WV
		C4,C9	"	CE14W1A470	2	47μF 10WV
		C8	"	SC45F1H104Z	2	0.1μF 50WV
		C6,C24-25 C27,C28	"	UFD05B102K	6	1000pF 50WV
		C5 C10-21	"	ULD06F103Z	14	0.01μF 50WV

PARTS LIST

ORDERING CODE	1010		UNIT NAME	MAIN PROCESSOR UNIT (MPU)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		C22	CAPACITOR	UFD04B101K	1	100pF 50WV
		C26	"	USD04B221K	1	220pF 50WV
		C23	"	MM-3 2G334K	1	0.33μF400WV
		X1	CRYSTAL	TQC-209A-8C	1	6.144MHz
		MD1	MAG-SIGN	30ND-06	1	
		RA12	RESISTOR ARRAY	4-220KΩK	1	
		RA1-5 RA7	"	8- 10KΩK	6	
		RA6 RA8	"	6- 10KΩK	2	



MAIN PROCESSOR UNIT (MPU)

PARTS LIST

ORDERING CODE	1011		UNIT NAME	MEMORY UNIT (MEM)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		MEM	MEMORY UNIT		(1)	
	1		MEM PCB		1	
	2		IC SOCKET - 24P		8	
	3	ROM/WIRE	BIT SWITCH - 1B		1	
		9K,9M,10K 10M,12K,12M	INTEGRATED CIRCUIT	SN74LS107N	6	
		13M	"	SN74LS121N	1	
		9G	"	SN74LS393N	1	
		7E,7G,8C 8E,8G	"	SN74LS125N	5	
		7K,7M 9C,9E	"	SN74LS126N	4	
		10G	"	SN74LS293N	1	
		13G	"	SN74LS74AN	1	
		8K,8M,11G 11G,12C,13C 14C	"	SN74LS04N	7	
		13E,14E	"	SN74LS138N	2	
		11M,12G	"	SN74LS08N	2	
		12E	"	SN74LS00N	1	
		10E	"	SN74LS32N	1	
		10C	"	SN7408N	1	
		5F,5J	"	HD74LS154P	2	
		5M	"	SN74LS20N	1	
		5A,5B	"	SN74LS242N	2	
		13K	"	SN74107N	1	

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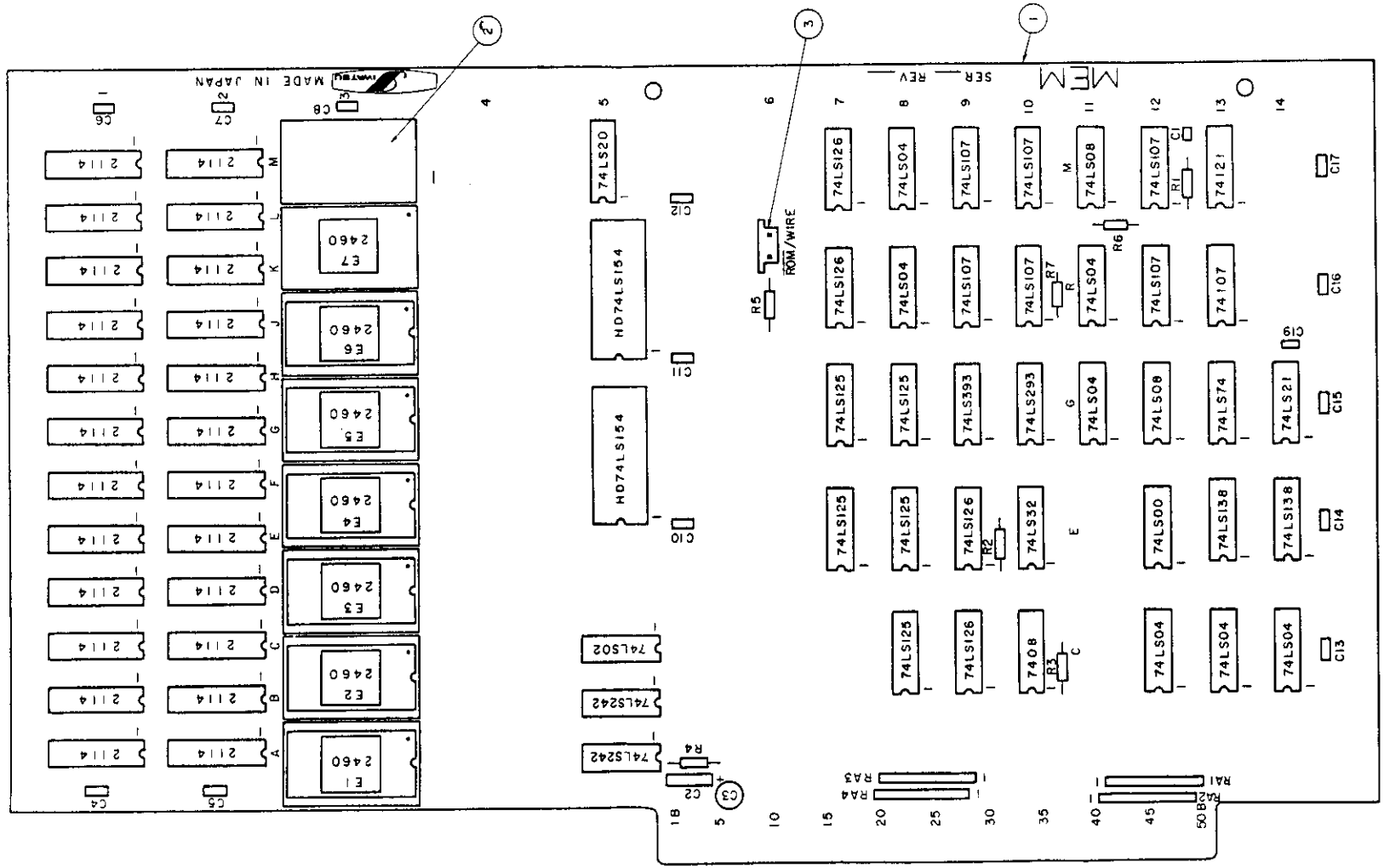
MEM
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ROM/WIRE
74LS20
HD74LS154
HD74LS154
74LS02
74LS242
74LS242
74LS126
74LS04
74LS107
74LS107
74LS08
74LS107
74121
74LS125
74LS125
74LS393
74LS293
74LS04
74LS08
74LS74
74LS21
74LS125
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74LS126
74LS32
74LS00
74LS138
74LS138
74LS125
74LS126
7408
74LS04
74LS04
74LS04
2114
2460

PARTS LIST

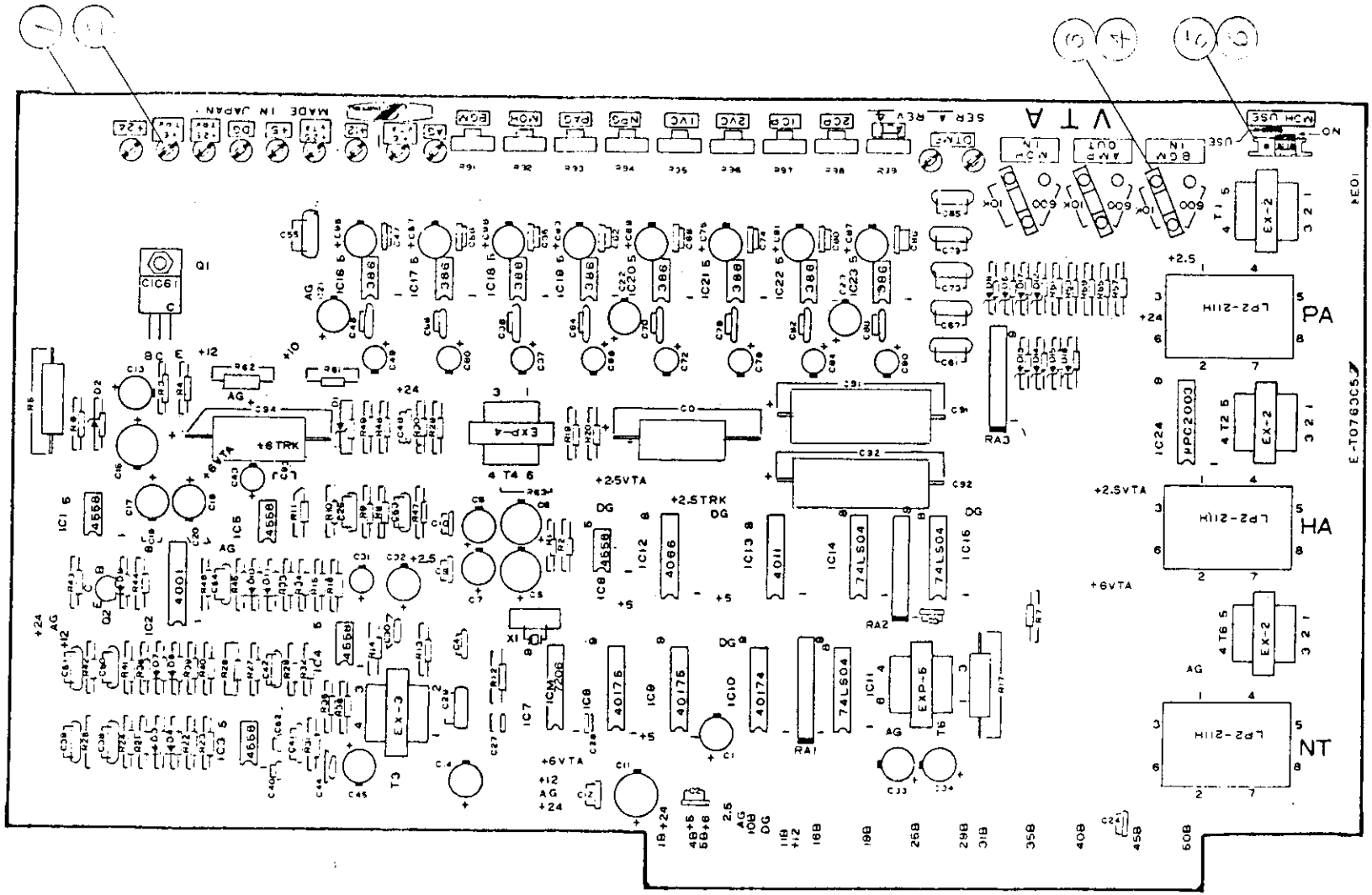
ORDERING CODE	1012		UNIT NAME	VOICE AND TONE ADAPTOR (VTA)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		VTA	VOICE AND TONE ADAPTOR		(1)	
	1		VTA PCB		1	
	2		TERMINAL-SOLDERING TYPE		11	
	3		TERMINAL-PUSH.ON TYPE		9	
	4		JUMPER BAR		3	
	5	MOH.USE	BIT SWITCH-2B		1	
	6	USE OR NO	STAPPING JACK		1	
		IC11 IC14,IC15	INTEGRATED CIRCUIT	SN74LS04N	3	
		IC10	"	MC14174BCP	1	
		IC8,IC9	"	TC40175BP	2	
		IC13	"	CD4011BE	1	
		IC12	"	CD4066BE	1	
		IC2	"	CD4001BE	1	
		IC7	"	ICM7206JPE	1	
		IC16-IC25	"	NJM386D	8	
		IC1 IC3-IC6	"	NJM4558D	5	
		IC24	"	μPA2003C	1	
		Q1	TRANSISTOR	2SC1061C	1	
		Q2	"	2SC1815-Y	1	

PARTS LIST

ORDERING CODE	1012		UNIT NAME	VOICE AND TONE ADAPTOR (VTA)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		C30	CAPACITOR	MF-3, 1H103K	1	0.01μF 50V
		C2,C3,C4 C9,C10,C12, C19,C20,C24	"	ULD06F103Z	9	0.01μF 50V
		C35,C44,C47 C56,C62,C68 C74,C80,C86	"	ULD06F103Z	9	0.01μF 50V
		C40,C52	"	UFD04B221K	2	220pF 50V
		C5,C6	"	CE04W0J221	2	220μF 6.3V
		C1,C7,C8 C17,C18	"	CE04W1A101	5	100μF 10V
		C15	"	CE04W1A221	1	220μF 10V
		C31,C37,C49 C60,C66,C72 C78,C84,C90	"	CE04W1C330	9	33μF 16V
		C13,C14	"	CE04W1C470	2	47μF 16V
		C11	"	M-CE04W1V101	1	100μF 35V
		C43	"	CE04W1H4R7	1	4.7μF 50V
		C32,C33,C34 C45	"	CE04W1H100	4	10μF 50V
		C94	"	SM-CE02W1A222	1	2200μF 10V
		C0	"	SM-CE02W0J222	1	2200μF 6.3V
		C91,C92	"	SM-CE02W0J472	2	4700μF 6.3V
		C36,C48,C58 C64,C70,C76 C82,C88	"	SC45F1H104Z	8	0.1μF 50V
		C21,C22,C23 C57,C63,C69 C75,C81,C87	"	M-CE04W1C101	9	100μF 16V
		C95,C96	"	M-CE04W1C101	2	100μF 16V
		C93	"	UFD08B472K	1	0.0047μF 50V
		Q1	SCREW	KP(+)3x8S	1	ACCESSORIES FOR Q1
		Q1	SPACER	YZ033S	1	"
		Q1	SPRING WASHER	SW-3S	1	"

PARTS LIST

ORDERING CODE	1012		UNIT NAME	VOICE AND TONE ADAPTOR (VTA)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		Q1	NUT	N-3S	1	ACCESSORIES FOR Q1


VTA
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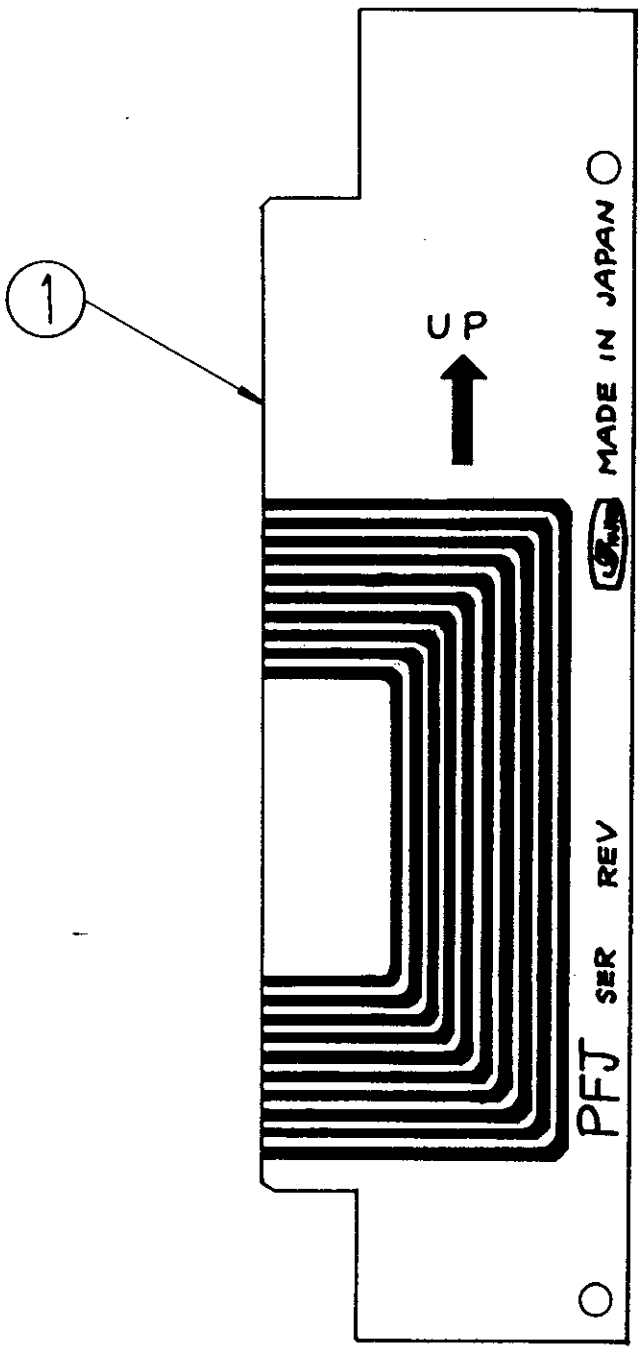
PARTS LIST

ORDERING CODE	1013		UNIT NAME	CROSS POINT SWITCH UNIT-1 (XPS-1)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		XPS-1	CROSS POINT SWITCH UNIT-1		(1)	
	1		XPS-1 PCB		1	
		2F	INTEGRATED CIRCUIT	CD4555BE	1	
		3F	"	CD4011BE	1	
		6F	"	CD4515BE	1	
		1F,4F	"	SN7406N	2	
		7F,9F	"	SN74LS05N	2	
		IC1	"	TA78L008AP	1	
		2B∿9B,2C∿9C 2D∿9D,2E∿9E	"	μPA1001C	32	
		Q1∿Q8	TRANSISTOR	2SA1015Y	8	
		D1∿D8	DIODE	1S2076A	8	
		RA1,RA2	RESISTOR ARRAY	8-820ΩK	2	
		RA3,RA4	"	8-10KΩK	2	
		RA5	"	10-220KΩK	1	
		RA6	"	8S-180ΩK	1	
		RA7	"	8S-1.5KΩK	1	

PARTS LIST

ORDERING CODE	1020		UNIT NAME	POWER FAILURE JUMPER (PFJ)	
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION	Q'TY	NOTE
		PFJ	POWER FAILURE JUMPER	(1)	
	1		PFJ PCB	1	



POWER FAILURE JUMPER (PFJ)

PARTS LIST

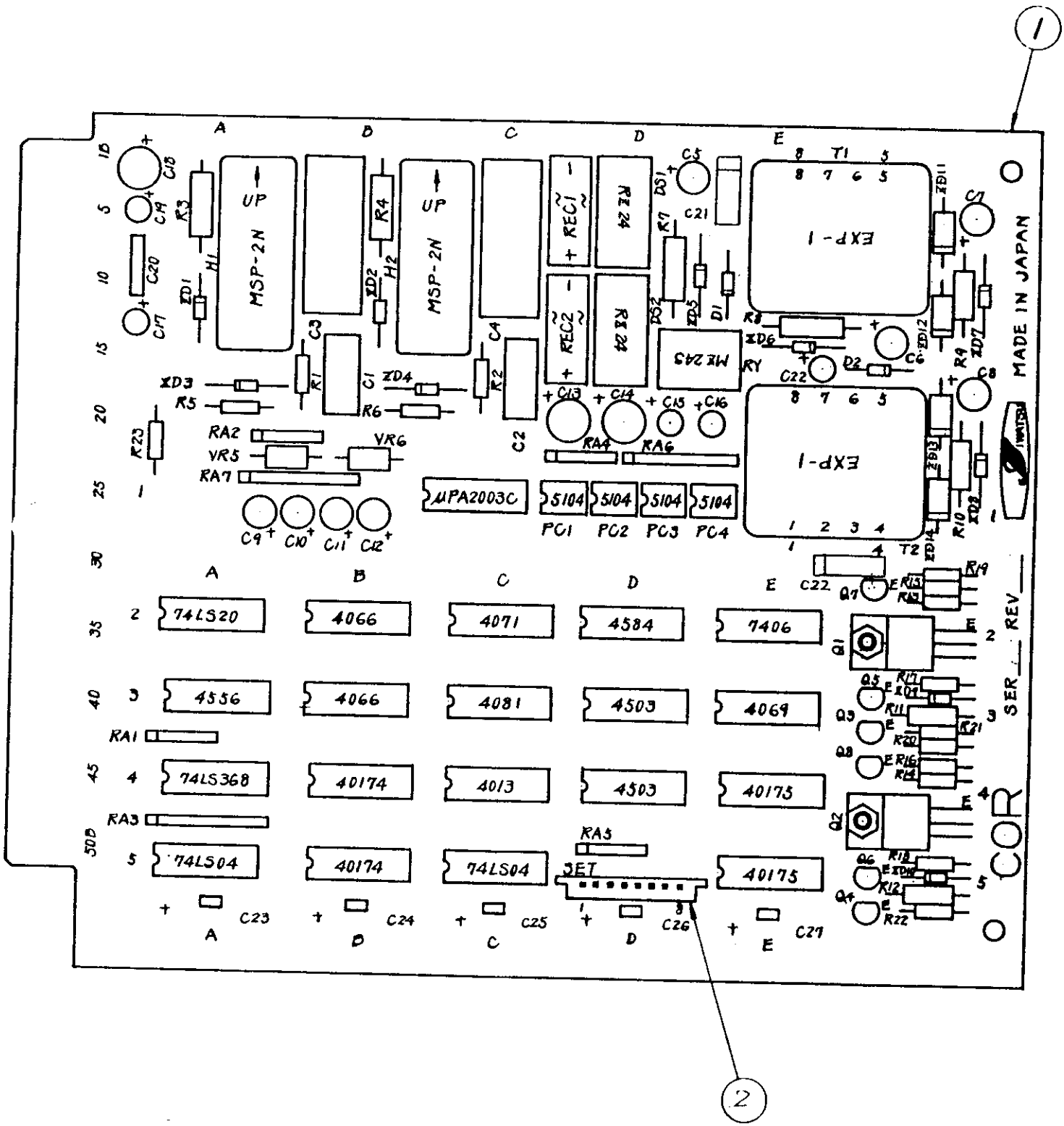
ORDERING CODE	1021		UNIT NAME	POWER FAILURE UNIT (PFU)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		PFU	POWER FAILURE UNIT		(1)	
	1		PFU PCB		1	
1064	2	ECA-A	EXTENSION CABLE ASSY S/T		1	
		IC1	INTEGRATED CIRCUIT	SN74LS02N	1	
		IC2	"	SN74LS74AN	1	
		IC3	"	SN75450BN	1	
		D1,D2	DIODE	SM-1-02	2	
		PF1,PF2	RELAY	M-108	2	
		C1	CAPACITOR	CE04W1V100	1	10μF 35WV
		C2	"	SC45F1H104Z	1	0.1μF 50WV
		C3	"	CE04W1C100	1	10μF 16WV
		C4	"	UFD05B102K	1	0.001μF 50WV

PARTS LIST

ORDERING CODE	1030		UNIT NAME	CENTRAL OFFICE LINE UNIT-DTMF (COT)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		D1,D6 D11,D16	DIODE	1S2076A	4	
		ZD1,ZD11	ZENER DIODE	RD39FB	2	39V
		ZD2∿ZD4 ZD12∿ZD14	"	RD5.1FB	6	5.1V
		ZD5,ZD15	"	RD2.4EB	2	2.4V
		ZD6,ZD7 ZD16,ZD17	"	RD2.7EB	4	2.7V
		VA3,VA13	VARISTOR	VR-60B	2	
		REC2,REC12	BRIDGED RECTIFIER	SIRBA40Z	2	
		PC1,PC2 PC11,PC12	OPTO ISOLATOR	NJL5104D	4	
		H1,H2	RELAY	TECK-TT24	2	
		DS1,DS2	"	RZ-24	2	
		RY	"	MZ-24S	1	
		M1,M2	"	SF-105T	2	
		T1,T2	TRANSFORMER	EXP-1	2	600Ω:600Ω
		RA1,RA2	RESISTOR ARRAY	6-10KΩK	2	
		R1,R10 R41,R50	RESISTOR	PSS 1/4 68ΩJ	4	1/4W, ±5%
		R2,R42	"	RSF1B6.2KΩJ	2	1W, ±5%
		R7,R7,R29∿ R31,R47,R49,	"	PSS 1/4 10KΩJ	12	1/4W, ±5%
		R69∿R71, R85,R86	"	PSS 1/4 10KΩJ	12	1/4W, ±5%

PARTS LIST

ORDERING CODE	1031		UNIT NAME	CENTRAL OFFICE LINE UNIT-ROTARY (COR)	
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION	Q'TY	NOTE
		COR	CENTRAL OFFICE LINE UNIT-ROTARY	(1)	
	1		COR PCB	1	
	2	SET	BIT SWITCH-4B	1	
		3E	INTEGRATED CIRCUIT MSM4069RS	1	
		4E,5E	" IC40175BP	2	
		2B,3B	" CD4066BE	2	
		4B,5B	" MC14174BCP	2	
		4C	" CD4013BE	1	
		3C	" CD4081BE	1	
		2C	" CD4071BE	1	
		2D	" MC14584BCP	1	
		3D,4D	" MC14503BCP	2	
		3A	" CD4556BE	1	
		2E	" SN7406N	1	
		5A,5C	" SN74LS04	2	
		2A	" SN74LS20	1	
		4A	" SN74LS368	1	
		1C	" μPA2003C	1	
		Q1,Q2	TRANSISTOR 2SA671	2	
		Q3,Q4	" 2SC1959-Y	2	



CENTRAL OFFICE LINE UNIT-ROTARY (COR)

PARTS LIST

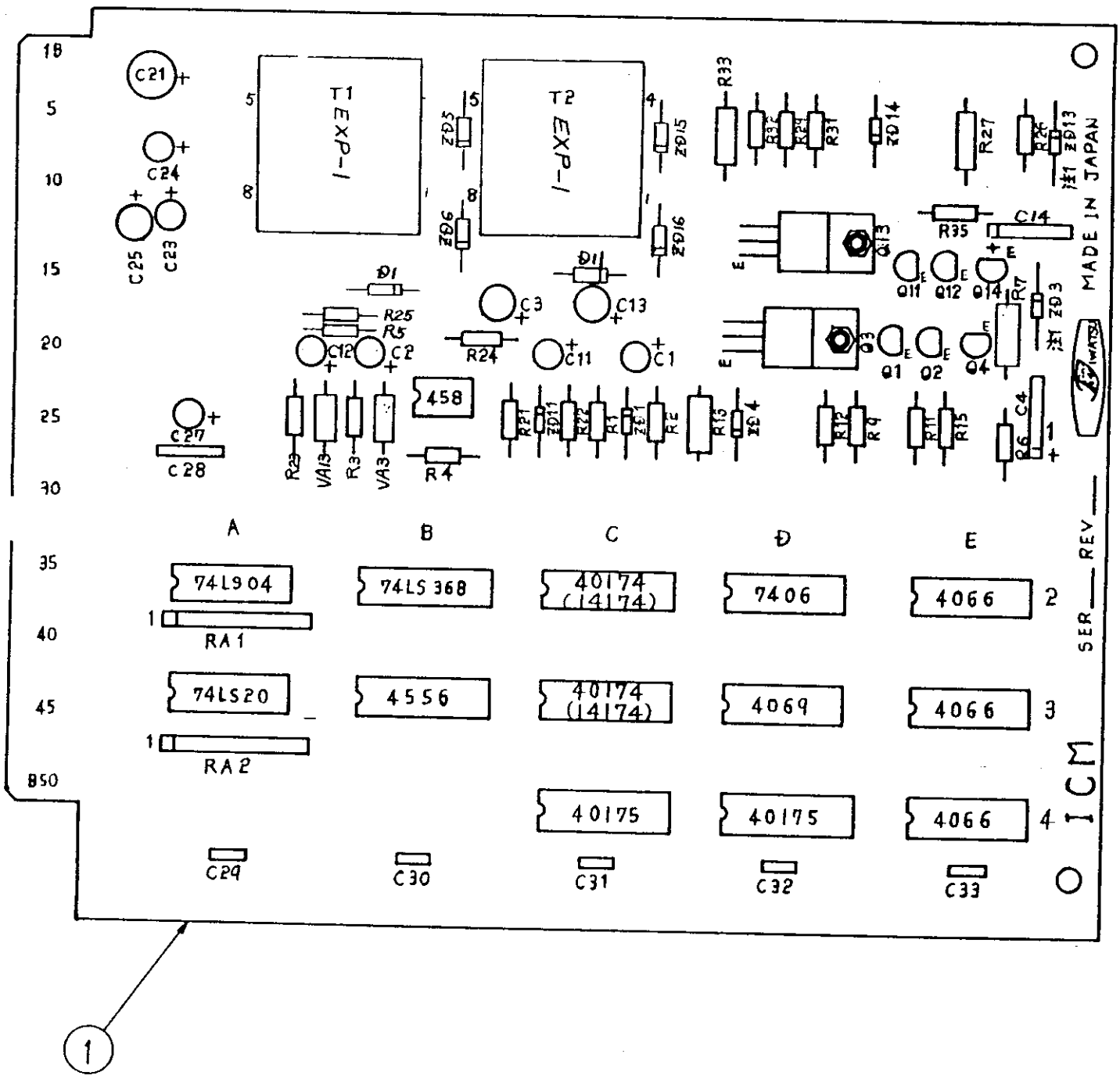
ORDERING CODE	1032		UNIT NAME	INTERCOM LINE UNIT (ICM)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		ICM	INTERCOM UNIT		(1)	
	1		ICM PCB		1	
		3D	INTEGRATED CIRCUIT	MSM4069RS	1	
		3B	"	CD4556BE	1	
		2E,3E,4E	"	CD4066BE	3	
		2C,3C	"	MC14174BCP	2	
		4C,4D	"	TC40175BP	2	
		2A	"	SN74LS04N	1	
		2D	"	SN7406N	1	
		2B	"	SN74LS368N	1	
		3A	"	SN74LS20N	1	
		1B	"	HA17458PS	1	
		Q1,Q2 Q11,Q12	TRANSISTOR	2SA1015Y	4	
		Q3,Q13	"	2SA671	2	
		Q4,Q14	"	2SC1959-Y	2	
		D1,D11	DIODE	IS2076A	2	
		ZD1,ZD11	ZENER DIODE	RD4.7EB	2	4.7V
		ZD3,ZD13	"	RD5.1FB	2	5.1V
		ZD4,ZD14	"	RD2.4EB	2	2.4V

PARTS LIST

ORDERING CODE	1032		UNIT NAME	INTERCOM LINE UNIT (ICM)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		ZD5,ZD6 ZD15,ZD16	ZENER DIODE	RD2.7EB	4	2.7V
		VA3,VA13	VARISTOR	VR-60B	2	
		T1,T2	TRANSFORMER	EXP-1	2	600Ω: 600Ω
		RA1	RESISTOR ARRAY	8-10KΩK	1	
		RA2	"	8-220KΩK	1	
		R2,R22	RESISTOR	PSS 1/4 10KΩJ	2	1/4W, ±5%
		R4,R24	"	PSS 1/4 560ΩJ	2	1/4W, ±5%
		R5,R25	"	PSS 1/4 3.3KΩJ	2	1/4W, ±5%
		R6,R26	"	PSS 1/4 680ΩJ	2	1/4W, ±5%
		R9,R29	"	PSS 1/4 39ΩJ	2	1/4W, ±5%
	–	R3,R23	"	PSS 1/4 33KΩJ	2	1/4W, ±5%
		R11,R15 R31,R35	"	PSS 1/4 5.6KΩJ	4	1/4W, ±5%
		R12,R32	"	PSS 1/4 27ΩJ	2	1/4W, ±5%
		R1,R21	"	PSS 1/4 100KΩJ	2	1/4W, ±5%
		R7,R13 R27,R33	"	PSS 1/2 2.2KΩJ	4	1/2W, ±5%
		C1,C2 C11,C12	CAPACITOR	CE04W1V4R7	4	4.7μF, 35WV
		C3,C13	"	CE04W1V100	2	10μF, 35WV
		C21	"	CE04W1V220	1	22μF, 35WV
		C23,C24,C27	"	CE04W1A220	3	22μF, 10WV

PARTS LIST

ORDERING CODE	1032		UNIT NAME	INTERCOM LINE UNIT (ICM)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		C25	CAPACITOR	CE04W1C220	1	22μF, 16WV
		C28	"	SC45F1H104Z	1	0.1μF, 50WV
		C29~C33	"	ULD06F103Z	5	0.01μF,50WV
		C4,C14	"	CA92C1R000R56	2	1μF, 16WV


T1
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C27
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R12
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RA2
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C29
C30
C31
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C33
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4
1

PARTS LIST

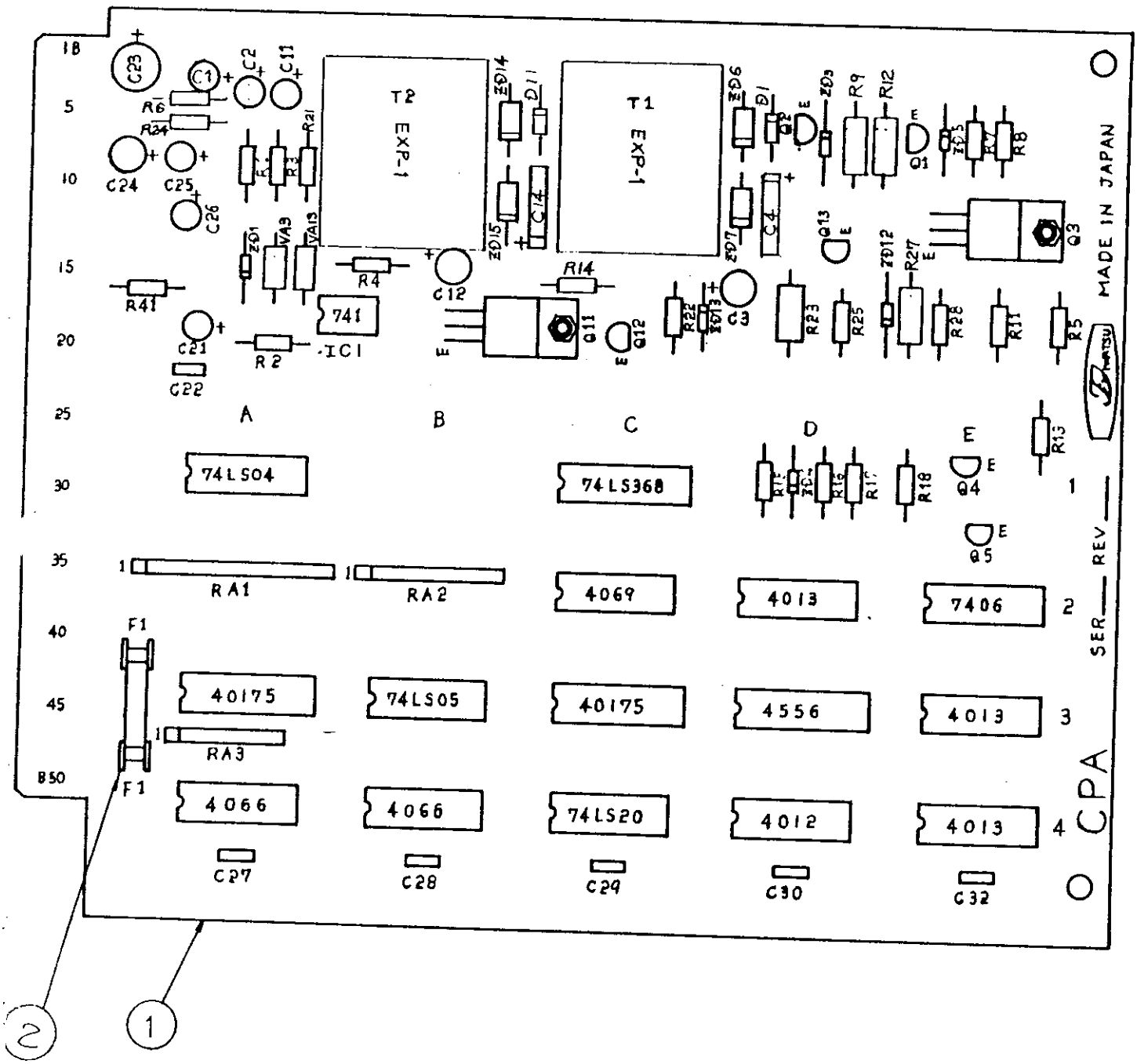
ORDERING CODE	1033		UNIT NAME	CALL PROCESSOR AND ALL CALL TRUNK (CPA)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		CPA	CALL PROCESSOR AND ALL CALL TRUNK		(1)	
	1		CPA PCB		1	
	2		FUSE HOLDER S-N5053		2	
	3		FUSE	FA-1	1	1A
		4D	INTEGRATED CIRCUIT	CD4012BE	1	
		3D	"	CD4556BE	1	
		2D,3E,4E	"	MSM4013RS	3	
		3A,3C	"	TC40175BP	2	
		4A,4B	"	CD4066BE	2	
		2E	"	SN7406N	1	
		2C	"	MSM4069RS	1	
		1A	"	SN74LS04N	1	
		3B	"	SN74LS05N	1	
		1C	"	SN74LS368N	1	
		4C	"	SN74LS20N	1	
		IC1	"	HA17741PS	1	
		Q1,Q2,Q12	TRANSISTOR	2SA1015Y	3	
		Q3,Q11	"	2SA671	2	
		Q5	"	2SC1815Y	1	
		Q4,Q13	"	2SC1959-Y	2	

PARTS LIST

ORDERING CODE	1033		UNIT NAME	CALL PROCESSOR AND ALL CALL TRUNK (CPA)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		D1,D11	DIODE	1S2076A	2	
		ZD1	ZENER DIODE	RD4.7EB	1	4.7V
		ZD3,ZD12	"	RD5.1FB	2	5.1V
		ZD4	"	RD4.3EB	1	4.3V
		ZD5,ZD13	"	RD2.4EB	2	2.4V
		ZD6,ZD7 ZD14,ZD15	"	RD2.7EB	4	2.7V
		VA3,VA13	VARISTOR	VR-60B	2	
		T1,T2	TRANSFORMER	EXP-1	2	600Ω: 600Ω
		RA1	RESISTOR ARRAY	12-10KΩK	1	
		RA2	"	8-220KΩK	1	
		RA3	"	6-220KΩK	1	
		R2,R41	RESISTOR	PSS 1/4 10KΩJ	2	1/4W, ±5%
		R4,R14	"	PSS 1/4 560ΩJ	2	1/4W, ±5%
		R16	"	PSS 1/4 4.7KΩJ	1	1/4W, ±5%
		R15,R17,R18	"	PSS 1/4 1KΩJ	3	1/4W, ±5%
		R5,R11,R25	"	PSS 1/4 5.6KΩJ	3	1/4W, ±5%
		R6,R24	"	PSS 1/4 3.3KΩJ	2	1/4W, ±5%
		R3,R21	"	PSS 1/4 33KΩJ	2	1/4W, ±5%
		R8,R22	"	PSS 1/4 27ΩJ	2	1/4W, ±5%
		R9,R12 R23,R27	"	PSS 1/2 2.2KΩJ	4	1/2W, ±5%

PARTS LIST

ORDERING CODE	1033		UNIT NAME	CALL PROCESSOR AND ALL CALL TRUNK (CPA)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		R13,R28	RESISTOR	PSS 1/4 680ΩJ	2	1/4W, ±5%
		R7	"	PSS 1/4 39ΩJ	1	1/4W, ±5%
		R1	"	PSS 1/4 100KΩJ	1	1/4W, ±5%
		C1,C2,C11	CAPACITOR	CE04W1V4R7	3	4.7μF, 35WV
		C3,C12	"	CE04W1V100	2	10μF, 35WV
		C21,C25,C26	"	CE04W1A220	3	22μF, 10WV
		C23	"	CE04W1V220	1	22μF, 35WV
		C24	"	CE04W1C220	1	22μF, 16WV
		C22	"	SC45F1H104Z	1	0.1μF, 50WV
		C27~C30 C32	"	ULD06F103Z	5	0.01μF,50WV
		C4,C14	"	CA92C1R000R56	2	1 F, 16WV



CALL PROCESSOR AND ALL CALL TRUNK (CPA)

PARTS LIST

ORDERING CODE	1034		UNIT NAME	TRUNK-A (TRK-A)	
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION	Q'TY	NOTE
		TRK-A	TRUNK-A	(1)	
	1	TRK-AP	TRK-A PRIMARY UNIT	1	
	2	TRK-AS	TRK-A SECONDARY UNIT	1	
	3		LOCKING SUPPORT	1	

PARTS LIST

ORDERING CODE	1034		UNIT NAME	TRUNK-A (TRK-A)'		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		TRK-AP	TRK-A PRIMARY UNIT		(1)	
	1.1		TRK-AP PRIMARY PCB		1	
	1.2	CN1	CONNECTOR	PCN5-53PT-1.27DSA	1	53P
	1.3	S1,S2	SWITCH	SSA08200	2	
		IC1,IC2	INTEGRATED CIRCUIT	CD4066BE	2	
		IC3	"	SN7406N	1	
		IC4,IC5	"	µPA2003C	2	
		Q1,Q31	TRANSISTOR	2SD718-0	2	
		Q2,Q4 Q32,Q34	"	2SA1015Y	4	
		Q3,Q33	"	2SA671	2	
		Q5,Q35	"	2SC1959-Y	2	
		D1,D31	DIODE	SM-1A-02	2	
		D2,D32	"	1S2076A	2	
		ZD1,ZD31	ZENER DIODE	RD39FB	2	39V
		ZD2,ZD3, ZD6,ZD32 ZD33,ZD36	"	RD5.1FB	6	5.1V
		ZD4,ZD34	"	RD2.0EB	2	2.0V
		ZD7,ZD8 ZD37,ZD38	"	RD2.7EB	4	2.7V
		ZD5,ZD35	"	RD2.4EB	2	
		REC1,REC31	BRIDGED RECTIFIER	SIRBA40Z	2	

PARTS LIST

ORDERING CODE	1034		UNIT NAME	TRUNK-A (TRK-A)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		SD1,SD31	VARISTOR	ENB850D-10A	2	
		VA3,VA33	"	VR-60B	2	
		PC1∿PC3 PC31∿PC33	OPTO ISOLATOR	NJL5104D	6	
		RG1,RG2	RELAY	TECK-TT24	2	
		DS1,DS2	"	RZ24	2	
		M1,M2	"	SF-105T	2	
		H1,H2	"	MSP-2N	2	
		RY	"	MZ-24S	1	
		T1,T2	TRANSFORMER	EXP-1	2	600Ω: 600Ω
		RA1	RESISTOR ARRAY	8-220KΩK	1	
		RA2,RA3	"	6-10KΩK	2	
		R6,R36	RESISTOR	RSF1B 100ΩJ	2	1W, ±5%
		R1∿R3,R22 R31∿R33,R52	"	PSS 1/4 68ΩJ	8	1/4W, ±5%
		R4,R34	"	RSF1B6.2KΩJ	2	1W, ±5%
		R5,R35	"	PSS 1/4 1KΩJ	2	1/4W, ±5%
		R7,R37	"	PSS 1/4 22KΩJ	2	1/4W, ±5%
		R11,R41	"	PSS 1/4 27ΩJ	2	1/4W, ±5%
		R18∿R21 R48∿R51,R61	"	PSS 1/4 10KΩJ	9	1/4W, ±5%

PARTS LIST

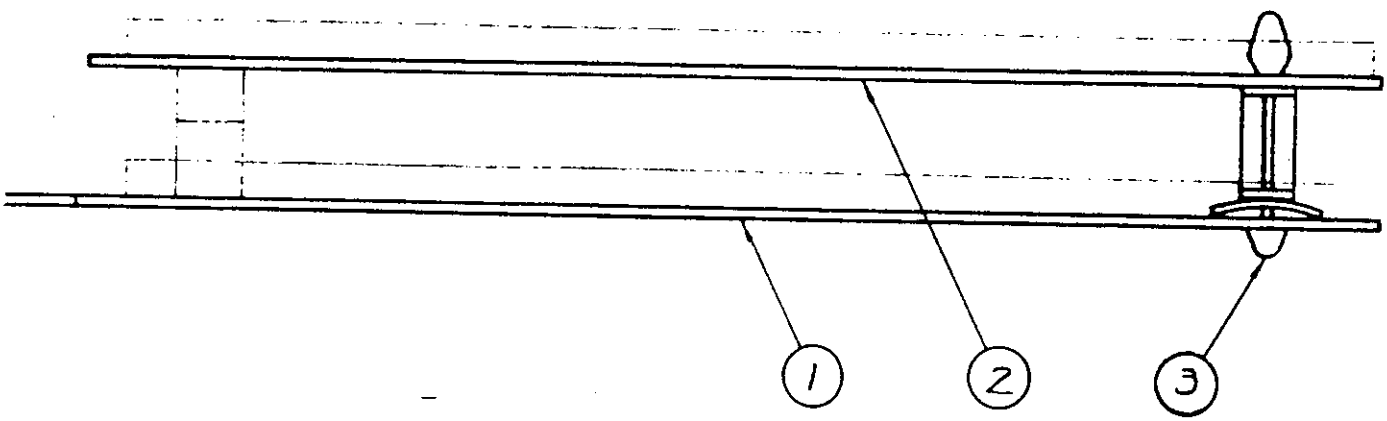
ORDERING CODE	1034		UNIT NAME	TRUNK-A (TRK-A)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		R9,R15 R39,R45	RESISTOR	PSS 1/4 5.6KΩJ	4	1/4W, ±5%
		R8,R10 R38,R40	"	PSS 1/4 39ΩJ	4	1/4W, ±5%
		R14,R44	"	PSS 1/4 680ΩJ	2	1/4W, ±5%
		R16,R17 R46,R47	"	PSS 1/4 330ΩJ	4	1/4W, ±5%
		R12,R13 R42,R43	"	PSS 1/2 2.2KΩJ	4	1/4W, ±5%
		C1~C3 C31~C33	CAPACITOR	MM-32G104K	6	0.1μF,400WV
		C4,C34	"	MM-32E205K	2	2μF, 250WV
		C5,C6,C35 C36,C62	"	CE04W1V220	5	22μF, 35WV
		C7~C9 C37~C39	"	CE04W1V100	6	10μF, 35WV
		C10,C40	"	CE04W1A101	2	100μF, 10WV
		C11,C12 C41,C42	"	CE04W1V4R7	4	4.7μF, 35WV
		C13,C43	"	CA92C1R000R56	2	1μF, 16WV
	—	C14,C44	"	MM-32E104K	2	0.1μF,250WV
		C61,C63	"	CE04W1A220	2	22μF, 10WV
		C67	"	CE04W2A100	1	10μF,100WV
		C64	"	SC45F1H104Z	1	0.1μF, 50WV
		C65,C66	"	ULD06F103Z	2	0.01μF,50WV

PARTS LIST

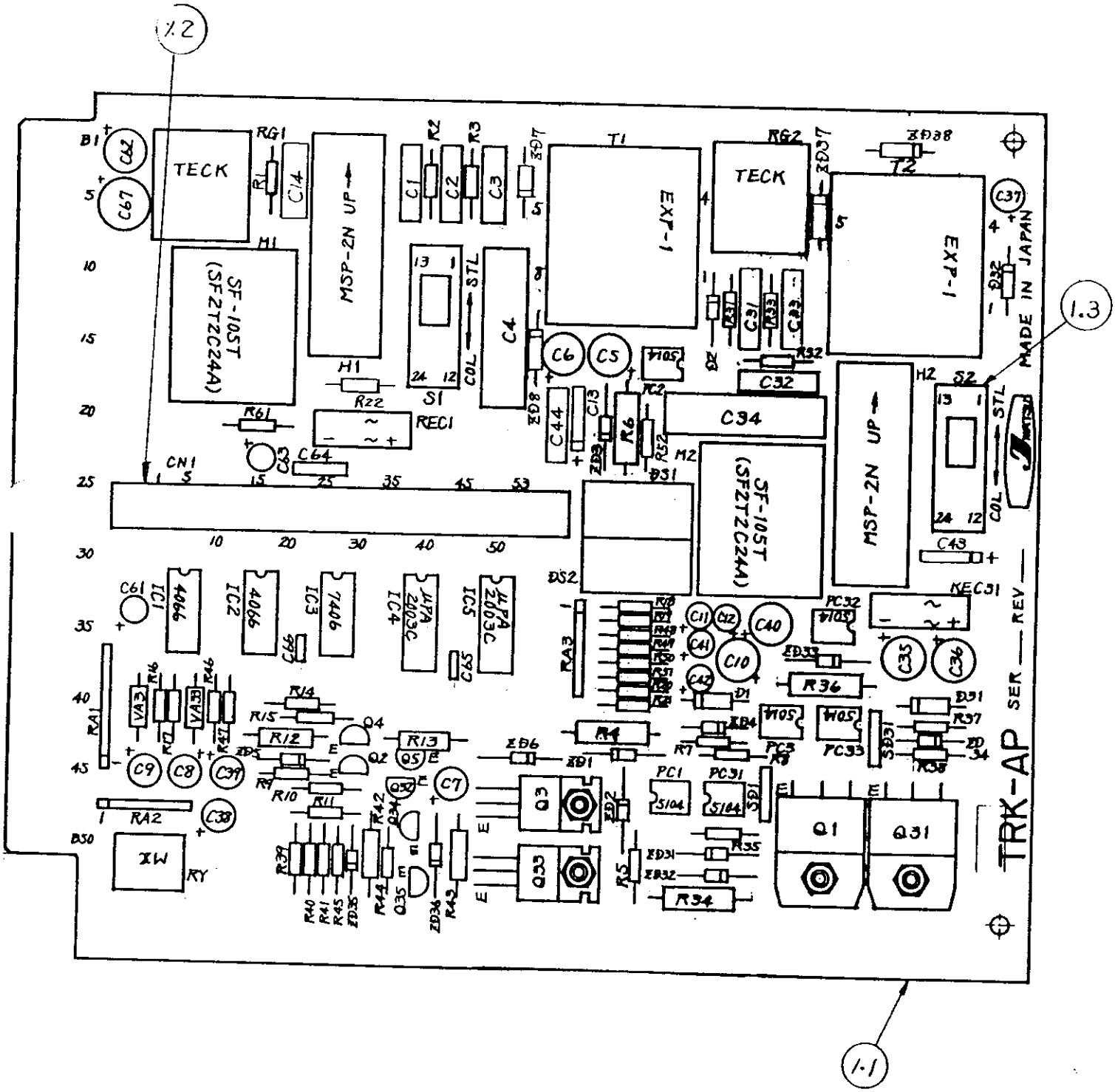
ORDERING CODE	1034		UNIT NAME	TRUNK-A (TRK-A)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		TRK-AS	TRK-A SECONDARY UNIT		(1)	
	2.1		TRK-AS SECONDARY PCB		1	
	2.2		CONNECTOR	PCN5-53ST-1.27DS	1	53P
	2.3		BIT SWITCH-3B		2	
	2.4		STRAPPING JACK		2	
	3A,3C		INTEGRATED CIRCUIT	SN74LS04N	2	
	2A		"	SN74LS20N	1	
	2C		"	SN74LS240N	1	
	2B,4E		"	MSM4069RS	2	
	4A		"	CD4556BE	1	
	1F,2F 3F		"	MC14503BCP	3	
	3D,4D		"	MC14174BCP	2	
	3B,4B		"	TC40175BP	2	
	1E,2E		"	CD4081BE	2	
	2D,3E		"	CD4071BE	2	
	4C,4F		"	CD4013BE	2	
	1D		"	MC14584BCP	1	
		RA101	RESISTOR ARRAY	10-10KΩK	1	
		RA102	"	6-10KΩK	1	

PARTS LIST

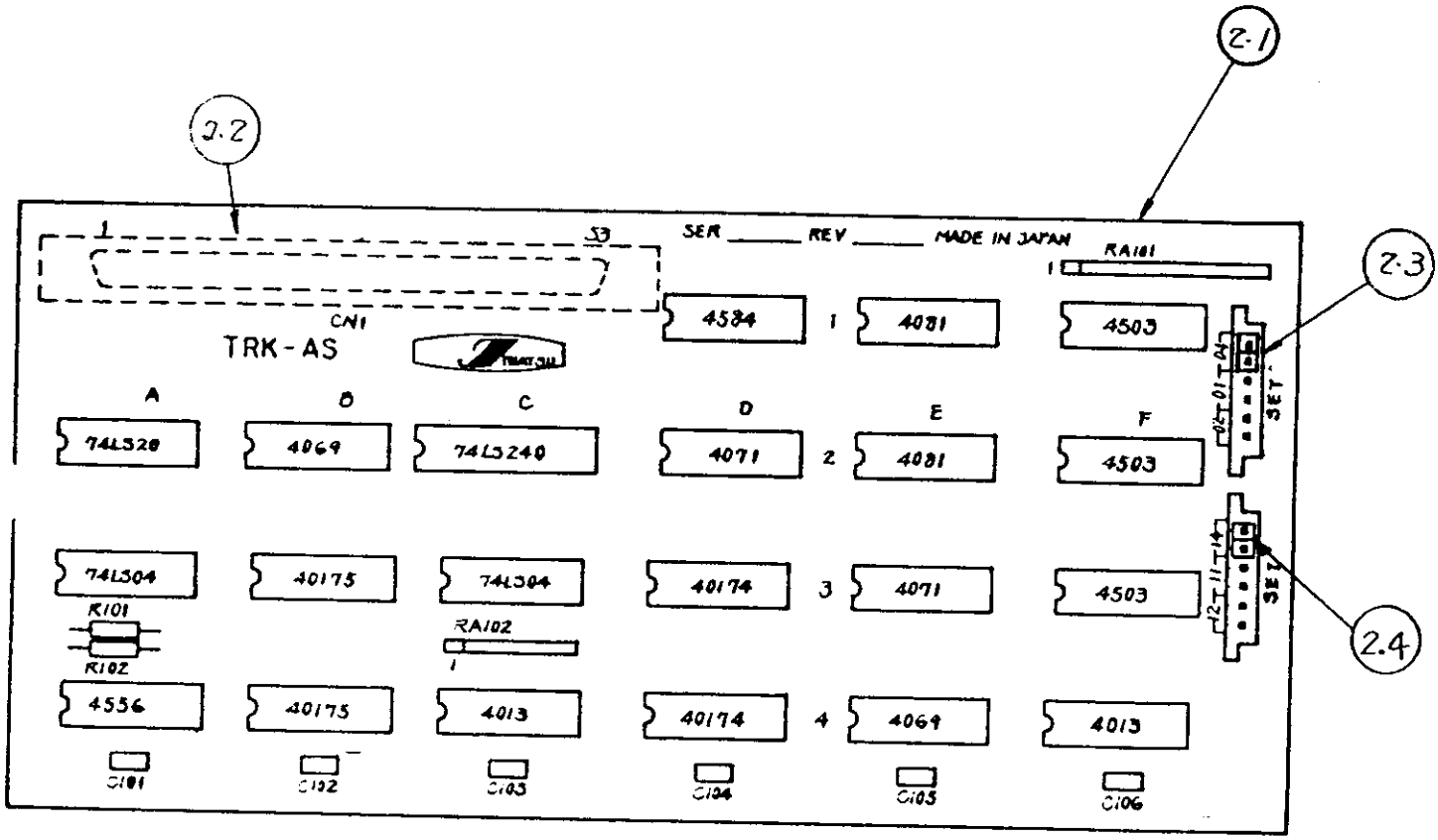
ORDERING CODE	1034		UNIT NAME	TRUNK-A (TRK-A)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		R101,R102	RESISTOR	PSS 1/4 10KΩJ	2	1/4W, ±5%
		C101~C106	CAPACITOR	ULD06F103Z	6	0.01μF,50WV



TRUNK-A (TRK-A) 1/3



TRUNK-A (TRK-A) 2/3



TRUNK-A (TRK-A) 3/3

PARTS LIST

ORDERING CODE	1035		UNIT NAME	TRUNK-B (TRK-B)	
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION	Q'TY	NOTE
		TRK-B	TRUNK-B	(1)	
	1	TRK-BP	TRK-B PRIMARY UNIT	1	
	2	TRK-BS	TRK-B SECONDARY UNIT	1	
	3		LOCKING SUPPORT	1	

PARTS LIST

ORDERING CODE	1035		UNIT NAME	TRK-B UNIT (TRK-B)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		TRK-BP	TRK-B PRIMARY UNIT		(1)	
	1.1		TRK-BP PRIMARY PCB		1	
	1.2	CN1	CONNECTOR	PCN5-53PT-1.27DSA	1	
	1.3		FUSE HOLDER	S-N5053	2	
	1.4		FUSE	FA-1	1	1A
	1.5	C/S,C/I	SWITCH	SSA08200	2	
		4C	INTEGRATED CIRCUIT	SN7406N	1	
		3A	"	CD4081BE	1	
		3B	"	CD4071BE	1	
		4B	"	MSM4069RS	1	
		4A,1B 1C,2C	"	CD4066BE	4	
		2B	"	MSM4013RS	1	
		4D	"	MC14093BCP	1	
		1A,2A	"	MC14174BCP	2	
		3C	"	μPA2003C	1	
		IC1	"	HA17458PS	1	
		Q3,Q5 Q42,Q43	TRANSISTOR	2SA1015Y	4	
		Q45	"	2SC1815Y	1	
		Q4,Q44	"	2SA671	2	
		Q1	"	2SD718-0	1	

PARTS LIST

ORDERING CODE	1035		UNIT NAME	TRK-B UNIT (TRK-B)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		Q2,Q41	TRANSISTOR	2SC1959-Y	2	
		D1	DIODE	SM-1A-02	1	
		D2,D42	"	1S2076A	2	
		ZD1	ZENER DIODE	RD39FB	1	39V
		ZD2,ZD3 ZD7,ZD43	"	RD5.1FB	4	5.1V
		ZD4	"	RD2.0EB	1	2.0V
		ZD6,ZD41	"	RD4.7EB	2	4.7V
		ZD45	"	RD4.3EB	1	4.3V
		ZD8,ZD44	"	RD2.4EB	2	2.4V
		ZD9,ZD10 ZD46,ZD47	"	RD2.7EB	4	2.7V
		VA3,VA4, VA43	VARISTOR	VR-60B	3	
		SD1	"	ENB850D-10A	1	
		REC	BRIDGED DIODE	SIRBA40Z	1	
		PC1~PC3	OPTO ISOLATOR	NJL5104D	3	
		RG	RELAY	TECK-TT24	1	
		DS	"	RZ24	1	
		M	"	SF-105T	1	
		RY	"	MZ24S	1	
		H	"	MSP-2N	1	

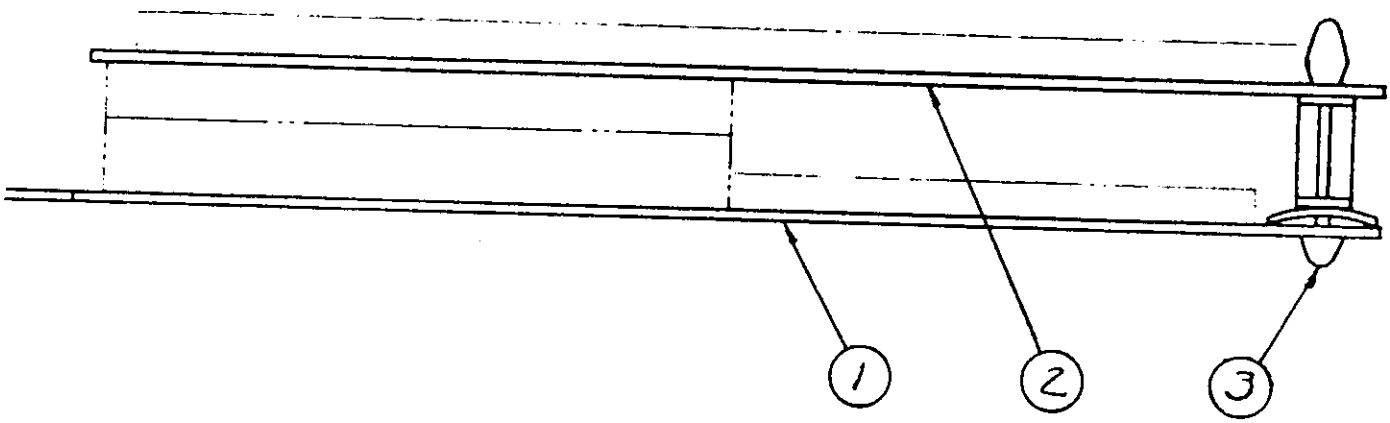
PARTS LIST

4/7

ORDERING CODE	1035		UNIT NAME	TRK-B UNIT (TRK-B)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		T1,T2	TRANSFORMER EXP-1		2	600Ω: 600Ω
		RA1	RESISTOR ARRAY	6-33KΩK	1	
		RA2	"	12-220KΩK	1	
		R1∿R3 R34	RESISTOR	PSS 1/4 68ΩJ	4	1/4W, ±5%
		R4	"	RSF1B 6.2KΩK	1	1/4W, ±5%
		R5,R35,R52	"	PSS 1/4 1 KΩK	3	1/4W, ±5%
		R6	"	RSF1B100ΩJ	1	1/4W, ±5%
		R7	"	PSS 1/4 22KΩJ	1	1/4W, ±5%
		R14,R45	"	PSS 1/4 27ΩJ	2	1/4W, ±5%
		R53	"	PSS 1/4 4.7KΩJ	1	1/4W, ±5%
		R9,R24∿R30 R41,R61	"	PSS 1/4 10KΩJ	10	1/4W, ±5%
	-	R18,R19,R47 R48,R50,R51	"	PSS 1/4 5.6KΩJ	6	1/4W, ±5%
		R33,R54	"	PSS 1/4 3.3KΩJ	2	1/4W, ±5%
		R8,R13,R44	"	PSS 1/4 39ΩJ	3	1/4@, ±5%
		R12,R49	"	PSS 1/4 680ΩJ	2	1/4W, ±5%
		R16,R17	"	PSS 1/4 330ΩJ	2	1/4W, ±5%
		R11,R15 R43,R46	"	PSS 1/2 2.2KΩJ	4	1/4W, ±5%
		R10,R42	"	PSS 1/4 560ΩJ	2	1/4W, ±5%
		R31,R32,R60	"	PSS 1/4 220KΩJ	3	1/4W, ±5%

PARTS LIST

ORDERING CODE	1035		UNIT NAME	TRK-B UNIT (TRK-B)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		C1~C3	CAPACITOR	MM-32G104K	3	0.1μF,400WV
		C4	"	MM-32E205K	1	2μF, 250WV
		C17	"	MM-32E104K	1	0.1μF,250WV
		C7	"	CE04W2A100	1	10μF, 100WV
		C8,C9,C13 C14,C41,C42	"	CE04W1V4R7	6	4.7μF,35WV
		C61,C65,C66	"	CE04W1A220	3	22μF, 10WV
		C5,C6,C63	"	CE04W1V220	3	22μF, 35WV
		C64	"	CE04W1C220	1	22μF, 16WV
		C15	"	CE04W1A101	1	100μF, 10WV
		C10~C12 C43	"	CE04W1V100	4	10μF, 35WV
		C62	"	SC45F1H104Z	1	0.1μF, 50WV
		C16,C44	"	CA92C1R000R56	2	1μF, 16WV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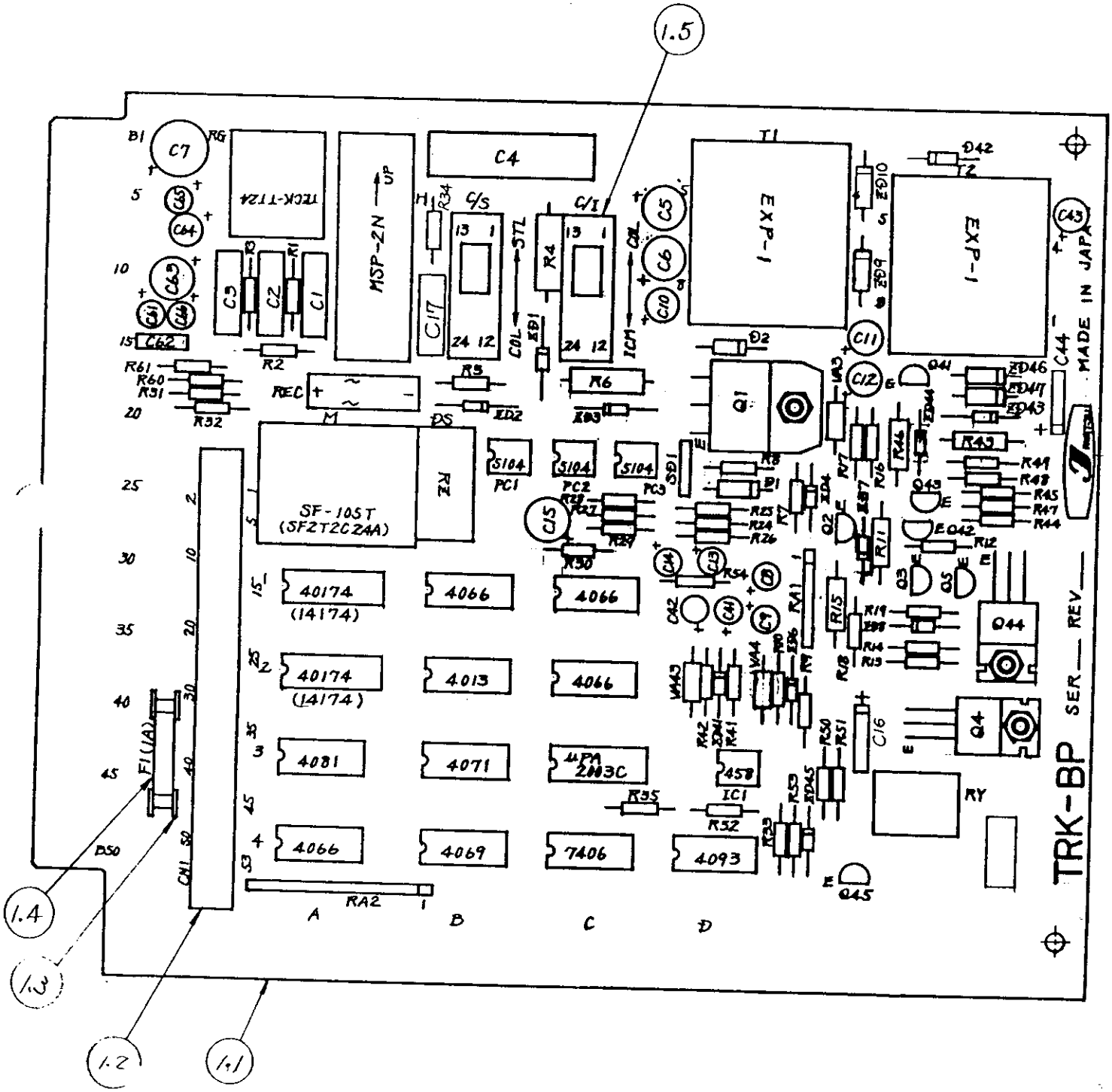
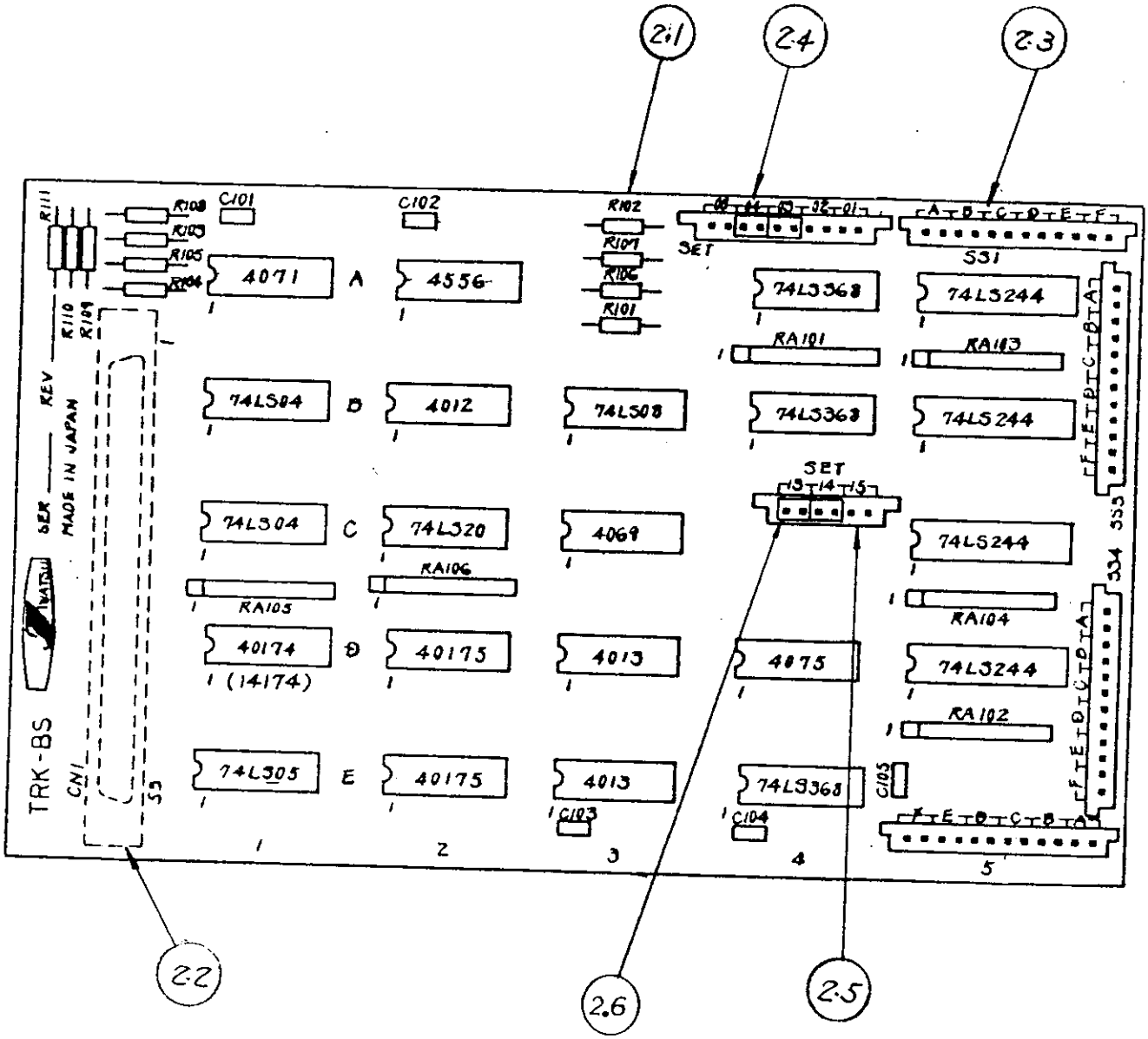


TRUNK-B (TRK-B) 2/3



TRUNK-B (TRK-B) 3/3

PARTS LIST

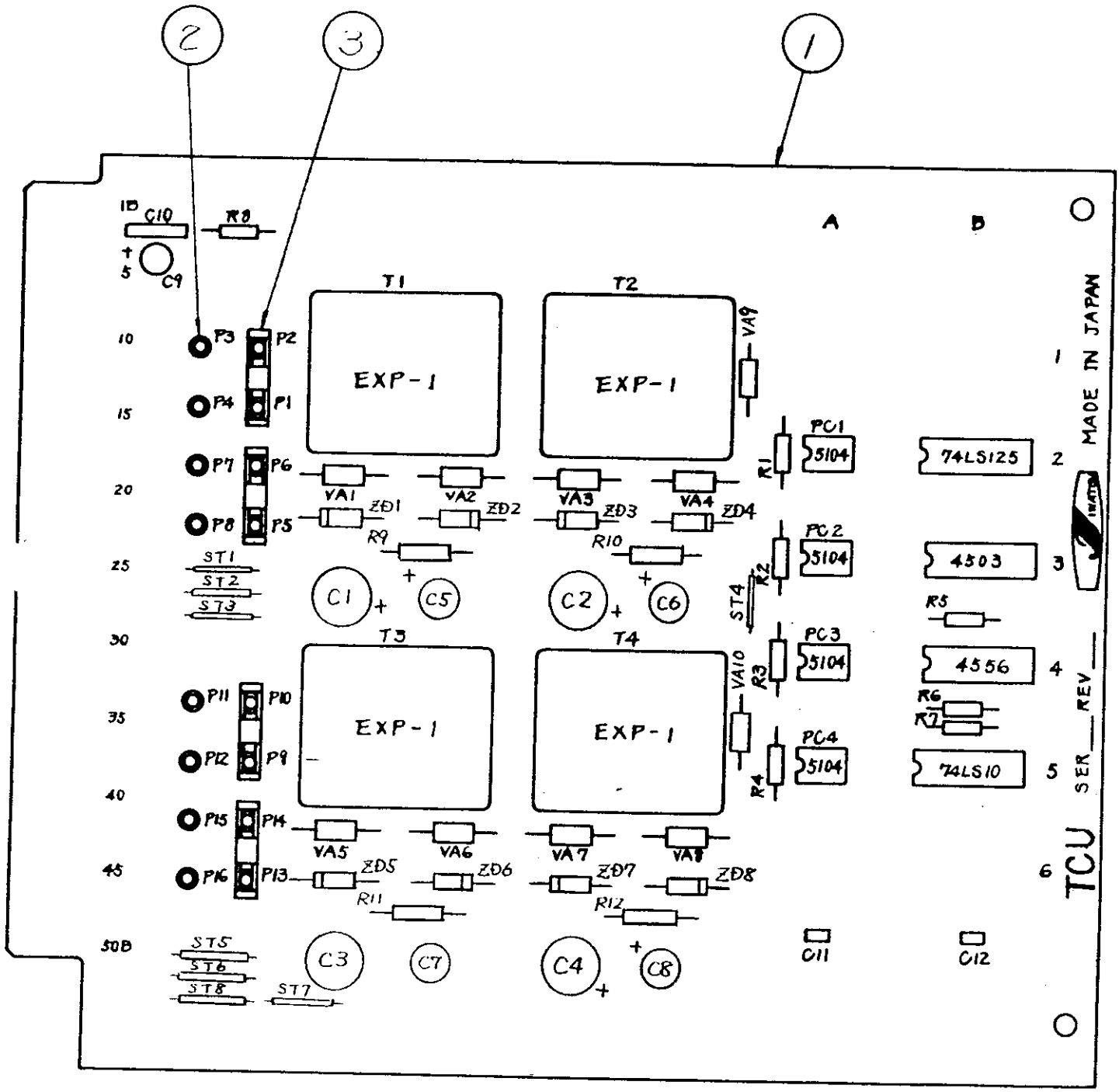
ORDERING CODE	1040		UNIT NAME	SUBSCRIBER UNIT (SUB)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		SUB	SUBSCRIBER UNIT		(1)	
	1		SUB PCB		1	
	2		BIT SWITCH-6B		5	
	3		FUSE HOLDER S-N5053		1	
		3A	INTEGRATED CIRCUIT	SN7406N	1	
		2A	"	SN74LS175N	1	
		1A	"	SN74LS366N	1	
		1B,3B	"	SN74LS32N	2	
		2B	"	SN74LS02N	1	
		1C,1D	"	SN74LS126N	2	
		4B	"	TC4011BP	1	
		2C	"	CD4069BE	1	
		5C	"	CD4556BE	1	
		2D,3D 4D,5D	"	CD4051BE	4	
		3C,4C	"	MC14174BCP	2	
		1E∿5E	"	MC14503BCP	5	
		Q1∿Q4	TRANSISTOR	2SC1815-Y	4	
		ZD1	ZENER DIODE	RD12EB	1	12V
		ZD2∿ZD5	"	RD7.5EB	4	7.5V

PARTS LIST

ORDERING CODE	1040		UNIT NAME	SUBSCRIBER UNIT (SUB)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		ZD6∿ZD13	ZENER DIODE	RD30FB	8	30V
		T1∿T4	TRANSFORMER	EXP-2	4	1-3 150Ω 4-5 2KΩ
		RA1	RESISTOR ARRAY	7-10KΩK	1	
		RA2∿RA6	"	6-10KΩK	5	
		RA7	"	4-220KΩK	1	
		RA8	"	5-220KΩK	1	
		RA9	"	7-220KΩK	1	
		R1∿R4, R13∿R15 R19∿R20	RESISTOR	PSS 1/4 10KΩJ	11	1/4W, ±5%
		R5∿R8	"	PSS 1/4 4.7KΩJ	4	1/4W, ±5%
		R9∿R12	"	PSS 1/4 1KΩJ	4	1/4W, ±5%
	—	R16	"	PSS 1/4 1.2KΩJ	1	1/4W, ±5%
		R21∿R24	"	PSS 1/4 330ΩJ	4	1/4W, ±5%
		C1	CAPACITOR	SC45F1H104Z	1	0.1μF, 50V
		C2	"	CE04W1A470	1	47μF, 10V
		C3∿C7	"	ULD06F103Z	5	0.01μF,50V
		C8	"	CE04W1V100	1	10μF, 35V
		F1	FUSE	FA-1	1	1A

PARTS LIST

ORDERING CODE	1041		UNIT NAME	TRUNK CONFERENCE UNIT (TCU)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		C1∿C4	CAPACITOR	CE04W1H470	4	47μF, 50V
		C9	"	CE04W1A220	1	22μF, 10V
		C5∿C8	"	CE04W1V100	4	10μF, 35V
		C10	"	SC45F1H104Z	1	0.1μF, 50V
		C11,C12	"	ULD06F103Z	2	0.01μF, 50V
		ST1∿ST8	BT-C JUMPERWIRE J		8	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R10
PC1
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R6
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5104
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P15
P14
P16
P13
VA5
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VA8
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ZD8
R11
R12
ST5
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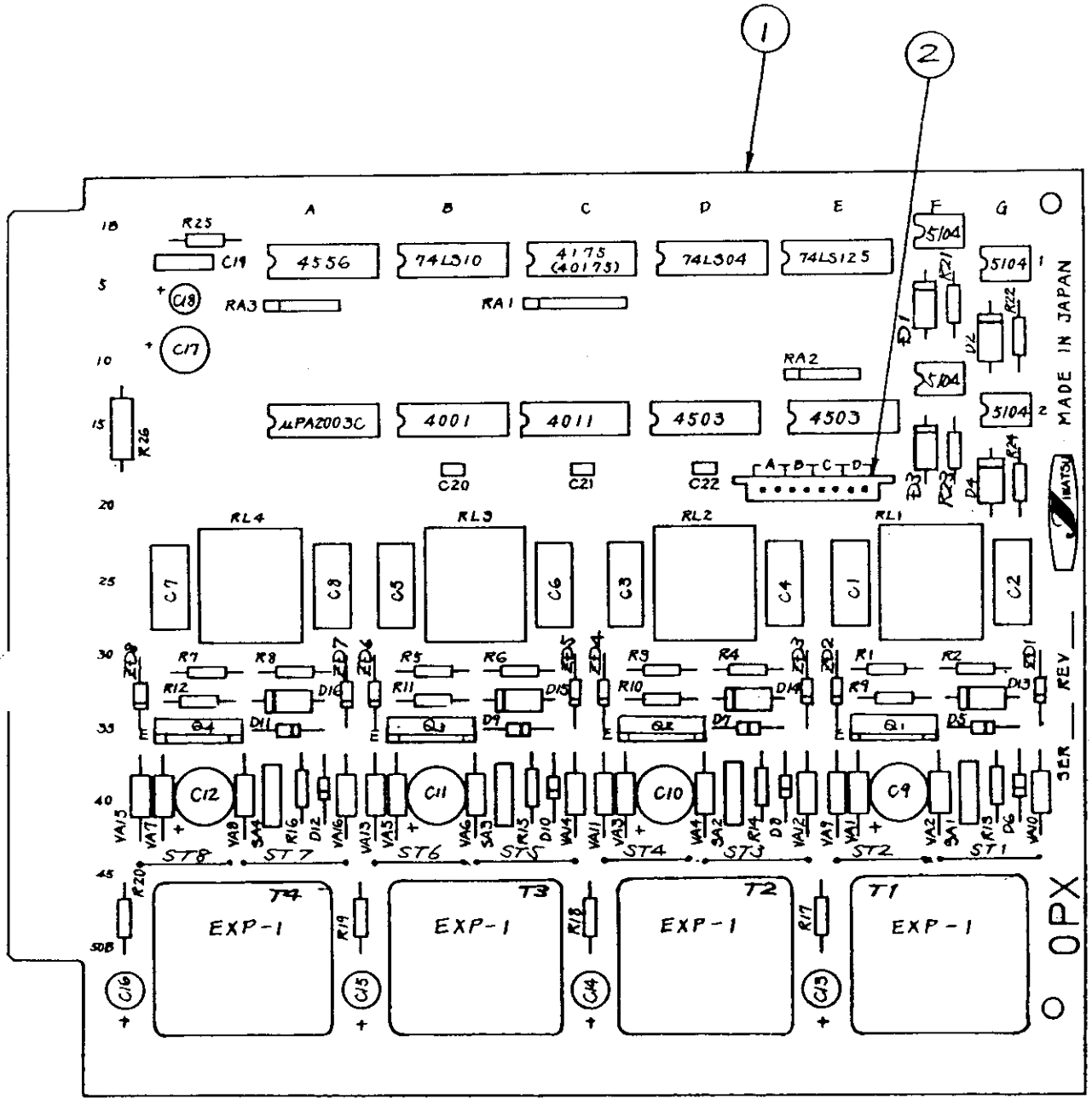
PARTS LIST

ORDERING CODE	1042		UNIT NAME	OFF PREMISES EXTENSION UNIT (OPX)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		C9~C12	CAPACITOR	CE04W2A100	4	10μF 100V
		C13~C16	"	CE04W1V100	4	10μF 35V
		C17	"	CE04W1V220	1	22μF 35V
		C18	"	CE04W1A220	1	22μF, 10V
		C19	"	SC45F1H104Z	1	0.1μF 50V
		C20~C22	"	ULD06F103Z	3	0.01μF 50V
		ST1~ST8	BT-C JUMPER WIRE		8	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MADE IN JAPAN
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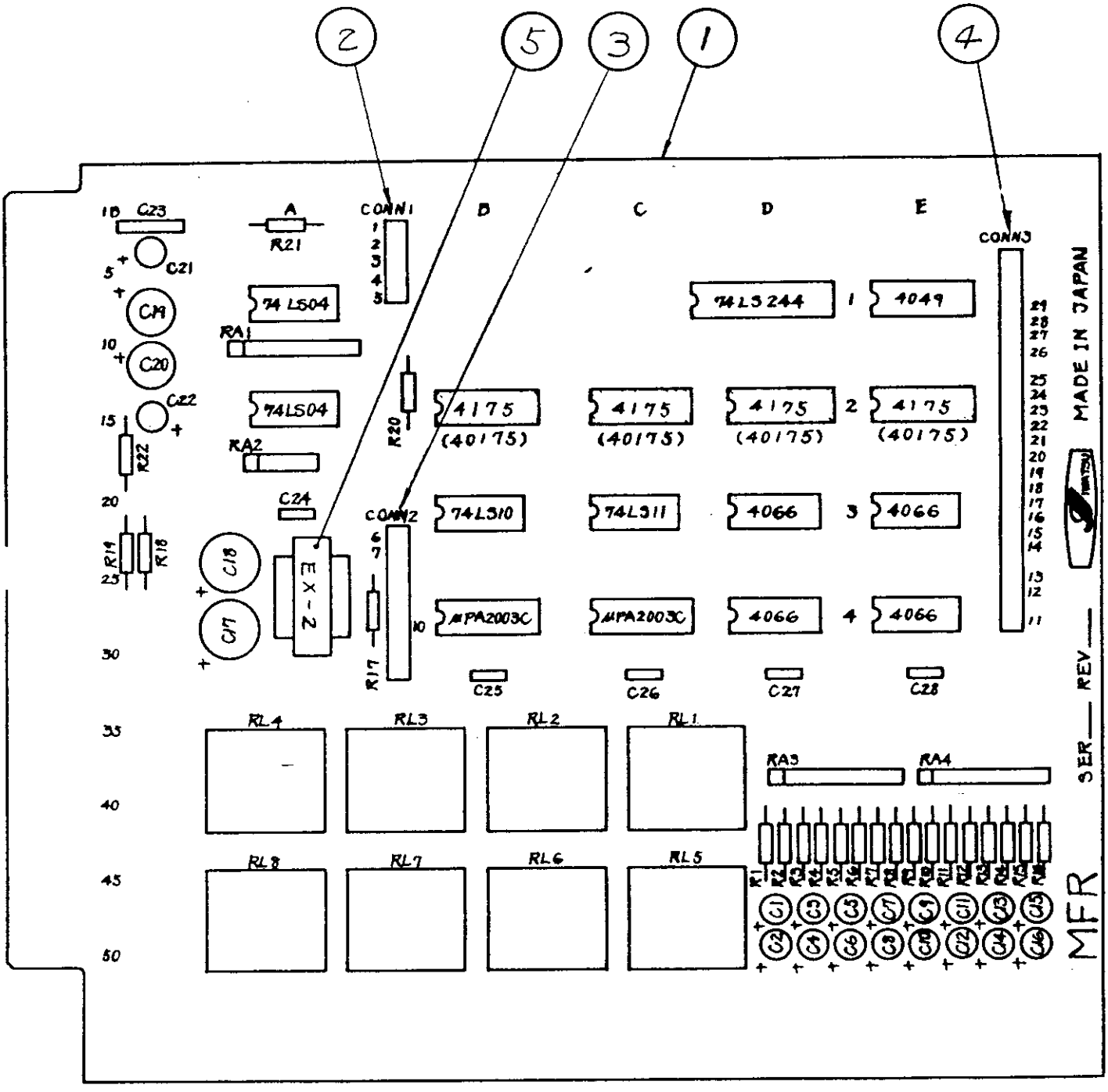
OPX

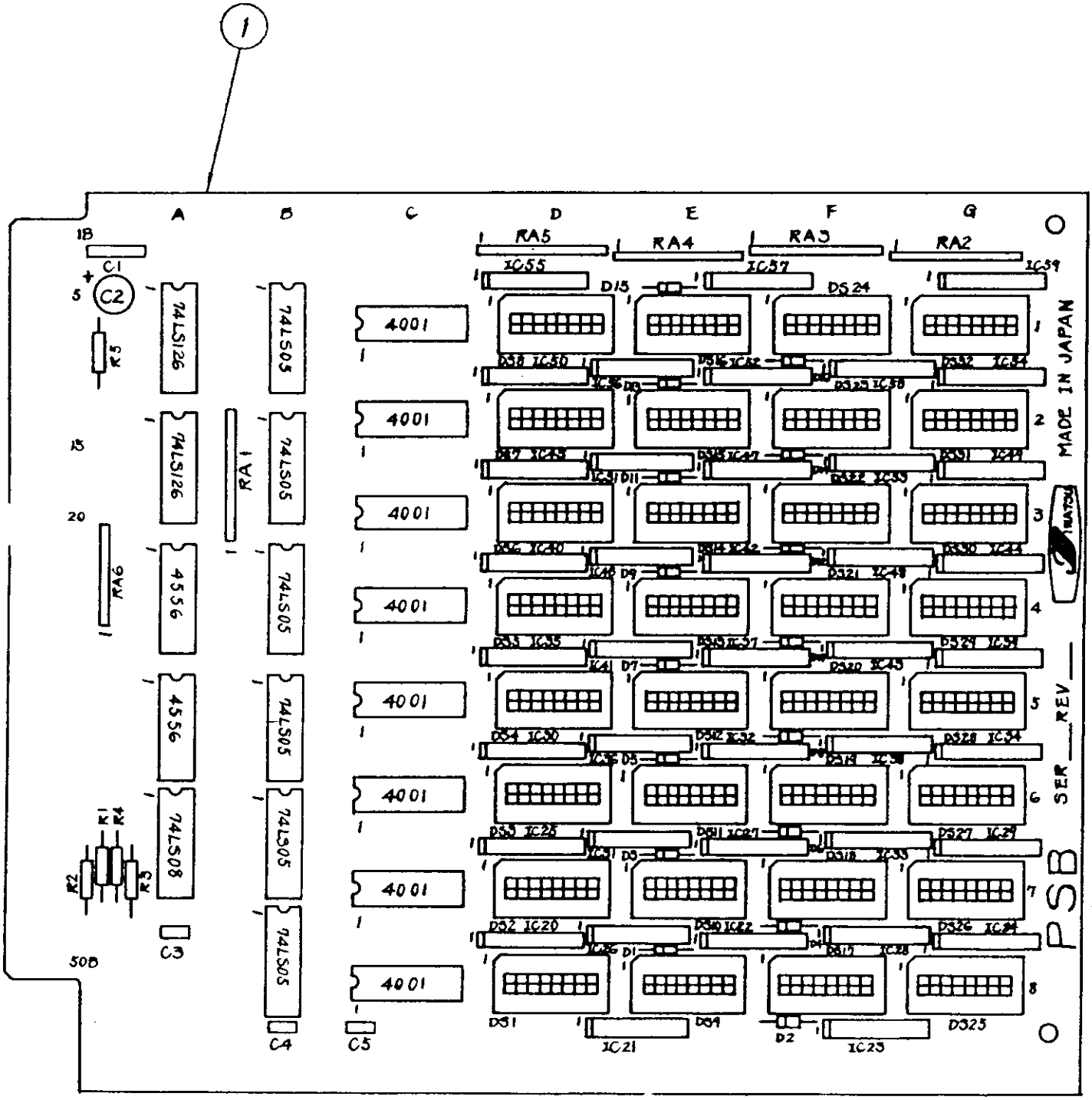
PARTS LIST

ORDERING CODE	1043		UNIT NAME	MULTI-FREQUENCY RECEIVER UNIT (MFR)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		MFR	MULTI-FREQUENCY RECEIVER UNIT		(1)	
	1		MFR PCB		1	
	2	CONN1	CONNECTOR	PS-5SD-S4TS1-1	1	
	3	CONN2	CONNECTOR	PS-10SD-S4TS1-1	1	
	4	CONN3	CONNECTOR	PS-25SD-S4TS1-1	1	
	5		TRANSFORMER	EX-2	1	1-2 600Ω 1-3 10kΩ 4-5 1kΩ
		1D	INTEGRATED CIRCUIT	SN74LS244N	1	
		3B	"	SN74LS10N	1	
		1A, 2A	"	SN74LS04N	2	
		3C	"	SN74LS11N	1	
		1E	"	CD4049BE	1	
	-	2B, 2C 2D, 2E	"	TC40175BP	4	
		3D, 3E 4D, 4D	"	CD4066BE	4	
		4B, 4C	"	μPA2003C	2	
		RL1~RL8	RELAY	TECK-TT24	8	
		RA1	RESISTOR ARRAY	8-10kΩK	1	
		RA2	"	4-10kΩK	1	
		RA3, RA4	"	8-22kΩK	2	

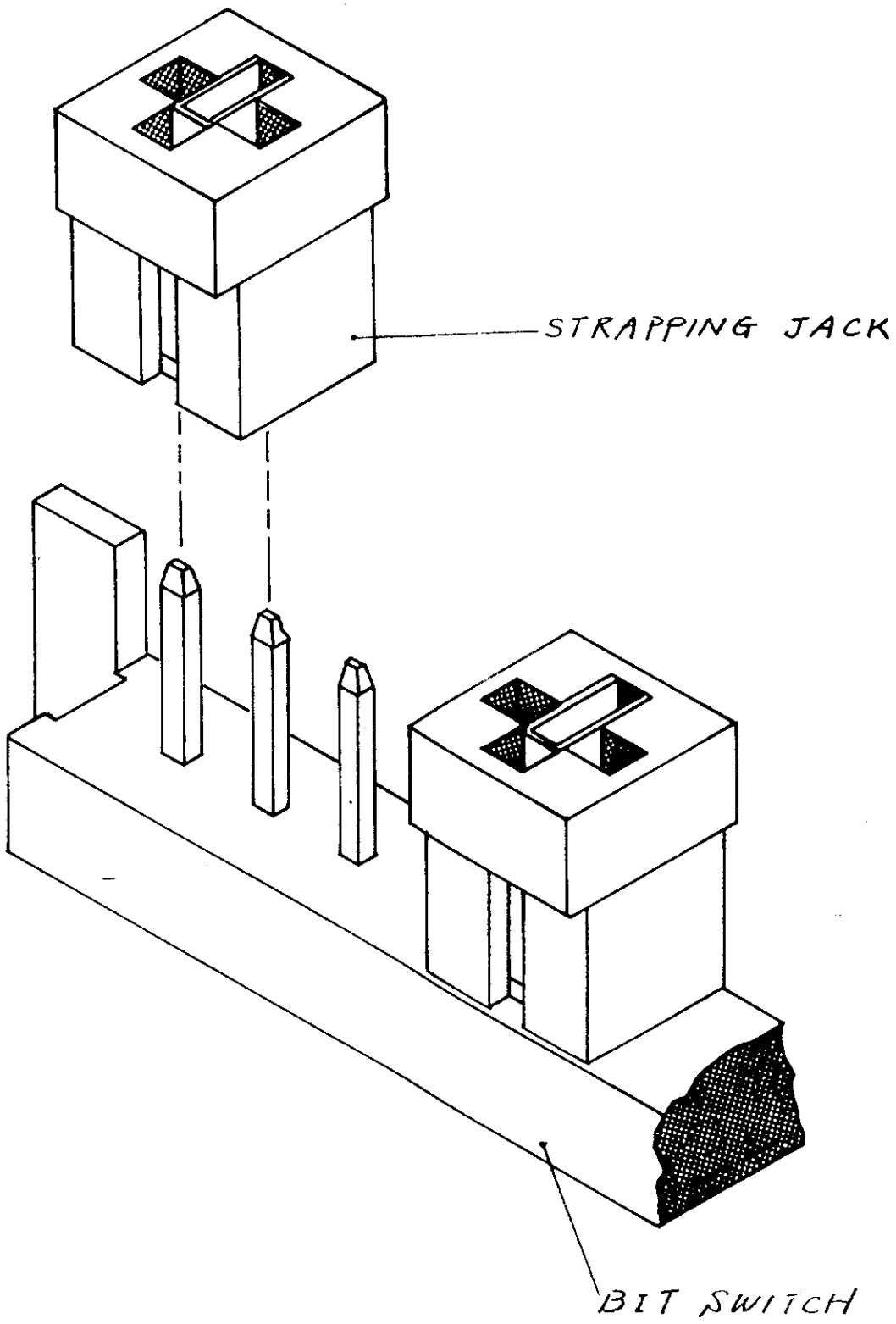
PARTS LIST

ORDERING CODE	1043		UNIT NAME	MULTI-FREQUENCY RECEIVER UNIT (MFR)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		R1~R16	RESISTOR	PSS1/4 330ΩJ	16	1/4W, ±5%
		R17	"	PSS1/4 1kΩJ	1	1/4W, ±5%
		R18, R19	"	PSS1/4 22kΩJ	2	1/4W, ±5%
		R20	"	PSS1/4 220kΩJ	1	1/4W, ±5%
		R21, R22	"	PSS1/4 10kΩJ	2	1/4W, ±5%
		C1~C16	CAPACITOR	CE04W1V4R7	16	4.7μF, 35V
		C17, C18	"	CE04W2C100	2	10μF, 160V
		C19, C20	"	CE04W1V220	2	22μF, 35V
		C21, C22	"	CE04W1A220	2	22μF, 10V
		C23	"	SC45F1H104Z	1	0.1μF, 50V
		C24~C28	"	ULD06F103Z	5	0.01μF, 50V


2
5
3
1
4
CONN1
CONN2
CONN3
A
B
C
D
E
R21
74LS04
RA1
74LS04
RA2
R20
4175
(40175)
74LS244
4049
74LS10
74LS11
4066
μPA2003C
C23
C21
C19
C20
C22
R22
C24
R14
R18
C18
C17
EX-Z
R17
C25
C26
C27
C28
RL4
RL3
RL2
RL1
RL8
RL7
RL6
RL5
RA3
RA4
MADE IN JAPAN
REV
MFR

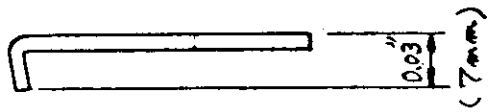


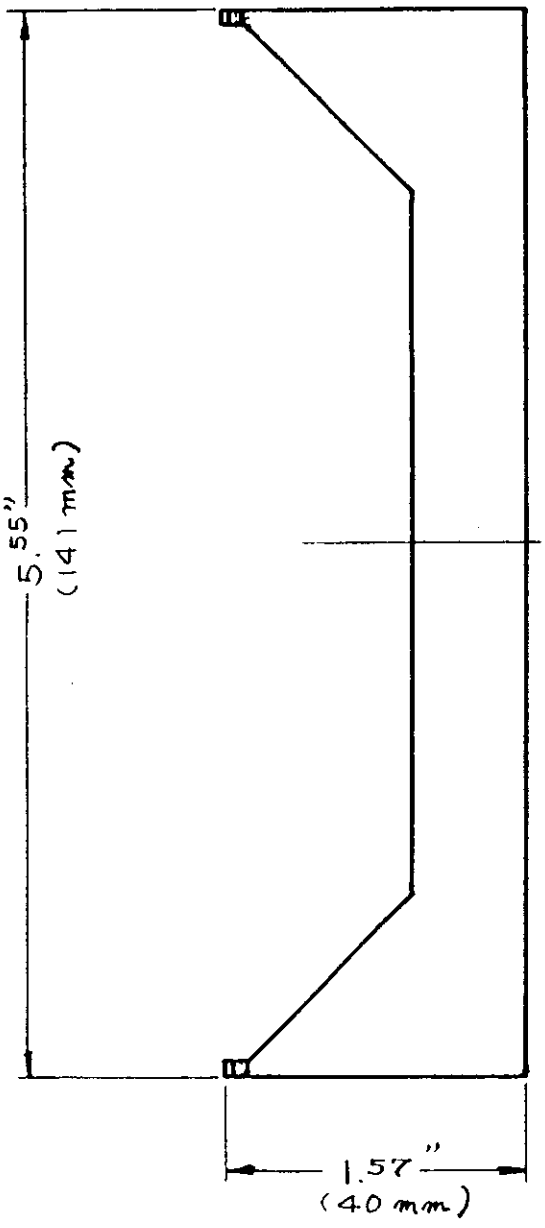
PROGRAM SWITCH BOARD (PSB)


STRAPPING JACK
BIT SWITCH

PARTS LIST

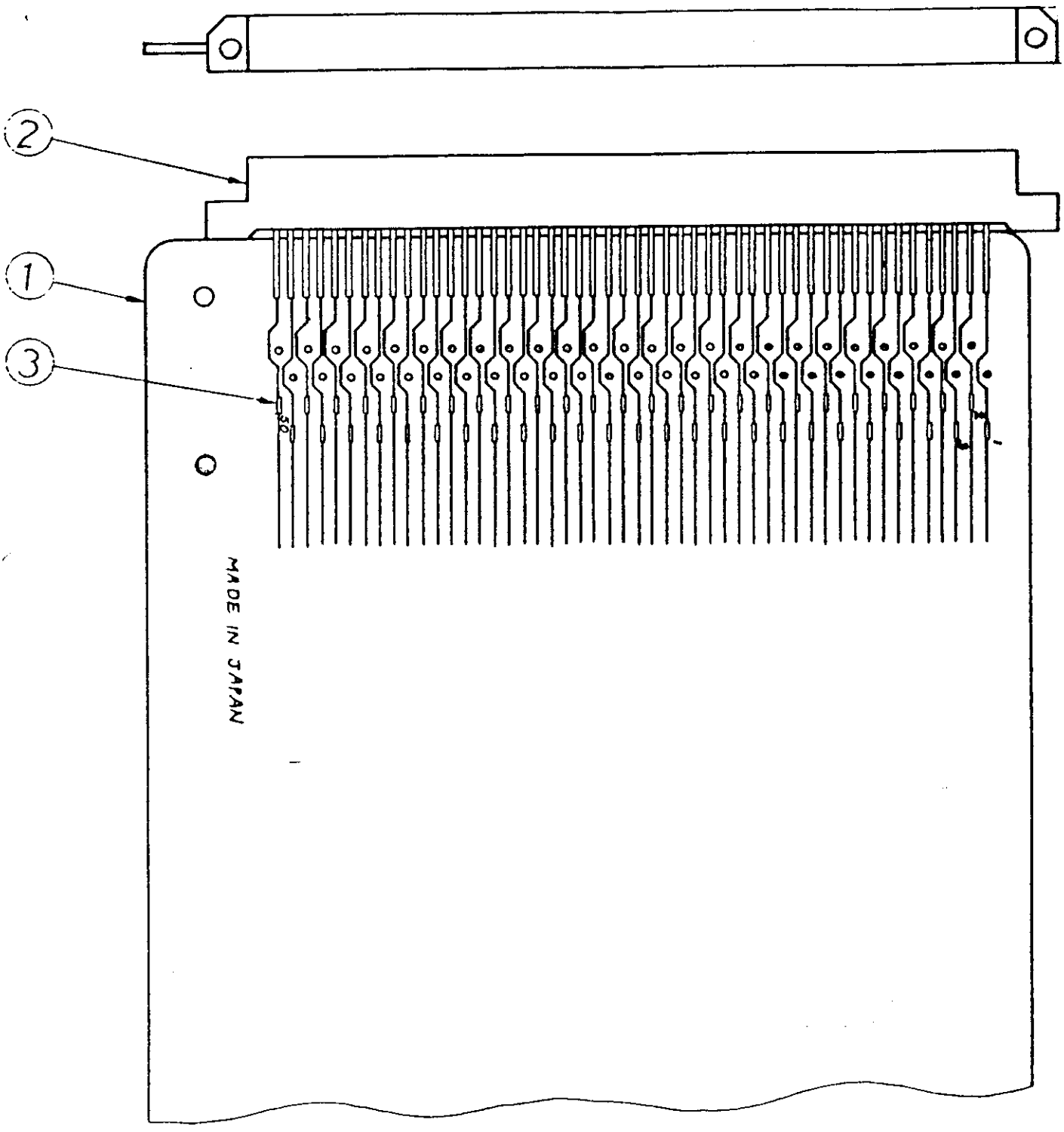
ORDERING CODE	1061		UNIT NAME	REMOVING TOOL FOR CIRCUIT BOARD (RTCB)	
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION	Q'TY	NOTE
		RTCB	REMOVING TOOL FOR CIRCUIT BOARD	(1)	


0.03"
(7mm)


5.55"
(141 mm)
1.57"
(40 mm)

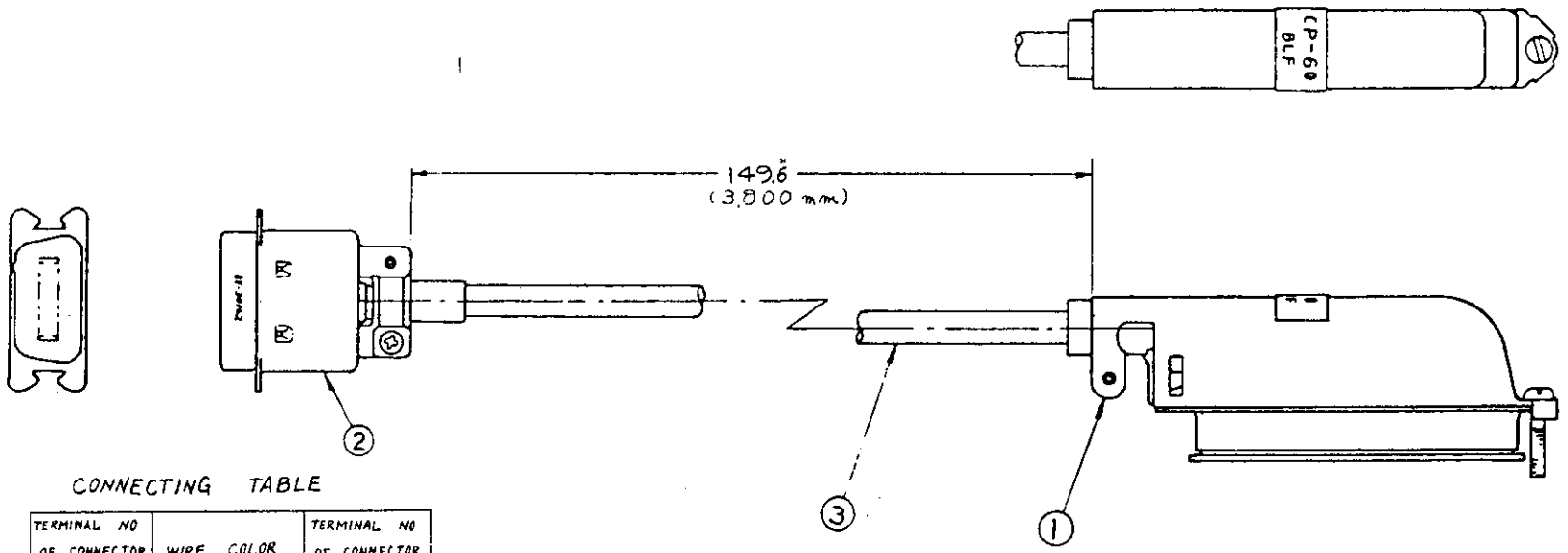
PARTS LIST

ORDERING CODE	1063		UNIT NAME	CIRCUIT BOARD EXTENDER-SMALL (CBE-S)	
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION	Q'TY	NOTE
		CBE-S	CIRCUIT BOARD EXTENDER-SMALL	(1)	
	1		CBE-S PCB	1	
	2		CONNECTOR 225D-100050C2-2311	1	
	3		TERMINAL NO.226	100	


2
1
3
50
1
MADE IN JAPAN

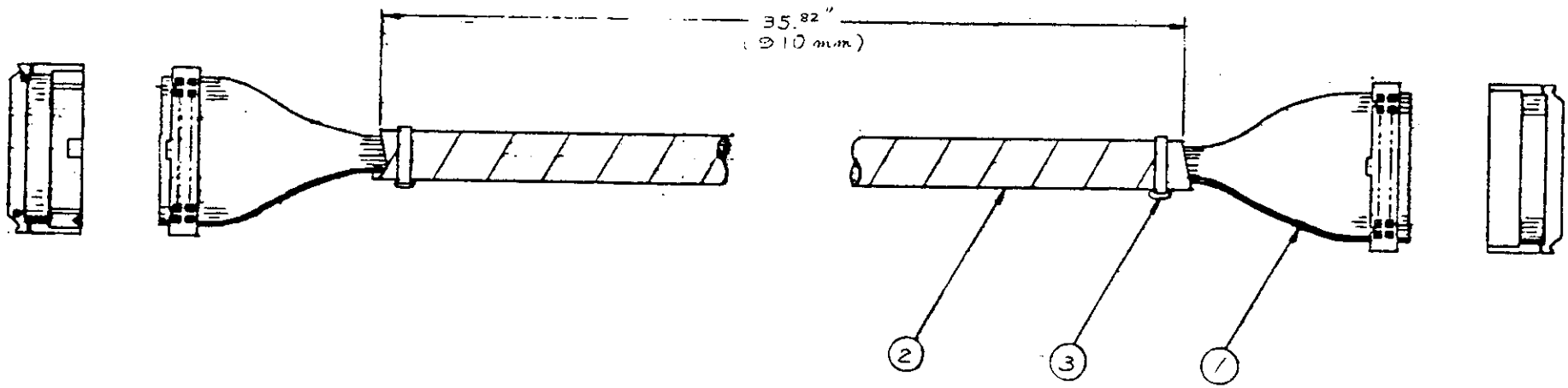
PARTS LIST

ORDERING CODE	1065		UNIT NAME	EXTENSION CABLE ASSEMBLY FOR CP-60 (ECA-B)	
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION	Q'TY	NOTE
		ECA-B	EXTENTION CABLE ASSEMBLY FOR CP-60	(1)	
	1		CONNECTOR 57-10500-7	1	
	2		CONNECTOR 57-30142	1	
	3		CABLE ECA-B	1	
	—				



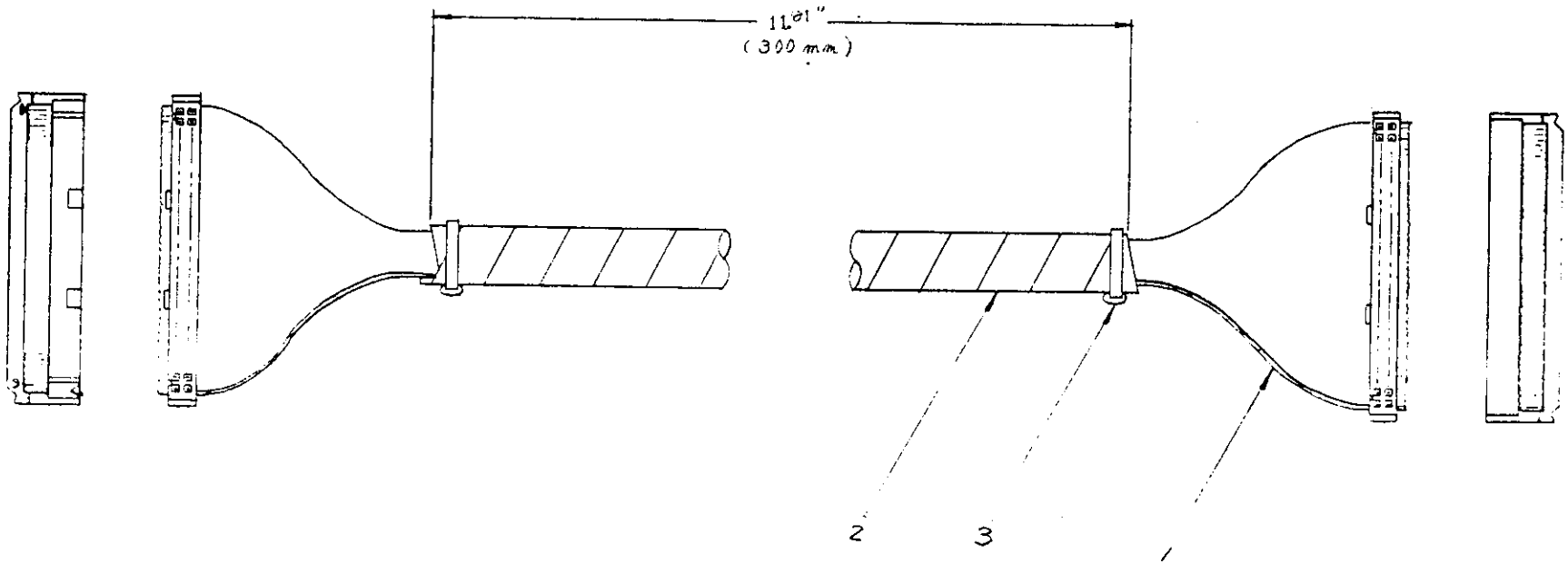
CONNECTING TABLE

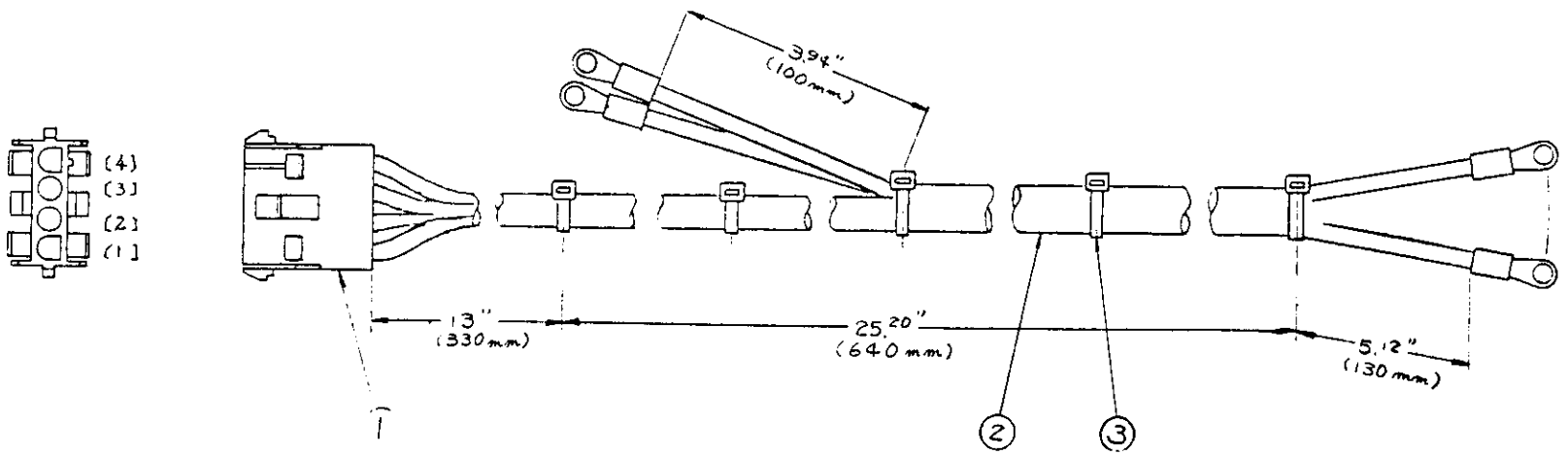
TERMINAL NO OF CONNECTOR 57-30142	WIRE COLOR	TERMINAL NO OF CONNECTOR 57-10500-7
1	GR – BK1	3
8	GR – RD1	28
2	OR – RD1	27
9	OR – BK1	2
3	BL – BK1	1
10	BL – RD1	26
4	BL – BK2	6
11	BL – RD2	31
5	SL – RD1	30
12	SL – BK1	5
6	PK – BK1	4
13	PK – RD1	29


35.82"
(910 mm)
2
3
1

PARTS LIST

ORDERING CODE	1068		UNIT NAME	MOTHER BOARD CABLE ASSEMBLY-C (MCA-C)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		MCA-C	MOTHER BOARD CABLE ASSEMBLY-C		(1)	
	1		CONNECTOR	FRC2-A50-3	2	
	2		CABLE	50 MCA-C	1	
	3		WIRING HARNESS BAND CV-70		2	


11.81"
(300 mm)
2
3
1

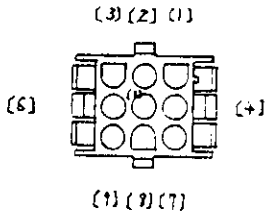


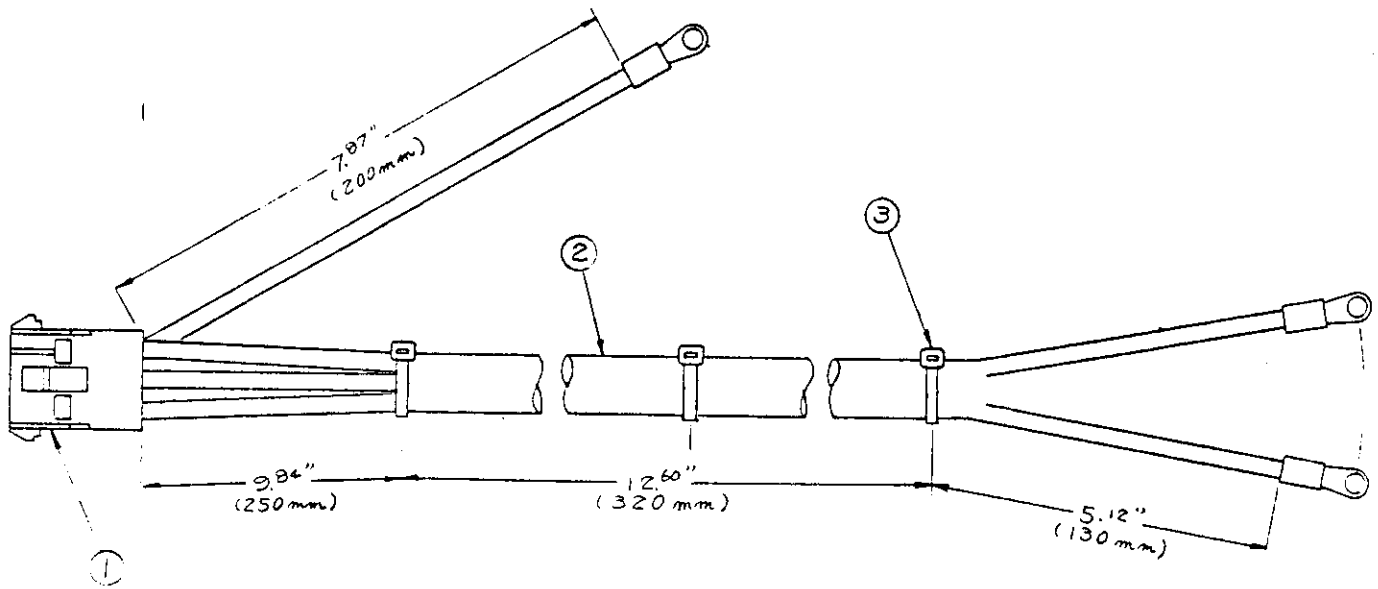
CONNECTING TABLE

TERMINAL NO. OF CONNECTOR	WIRE COLOR
1	RED
2	RED
3	BLACK
4	BLACK

PARTS LIST

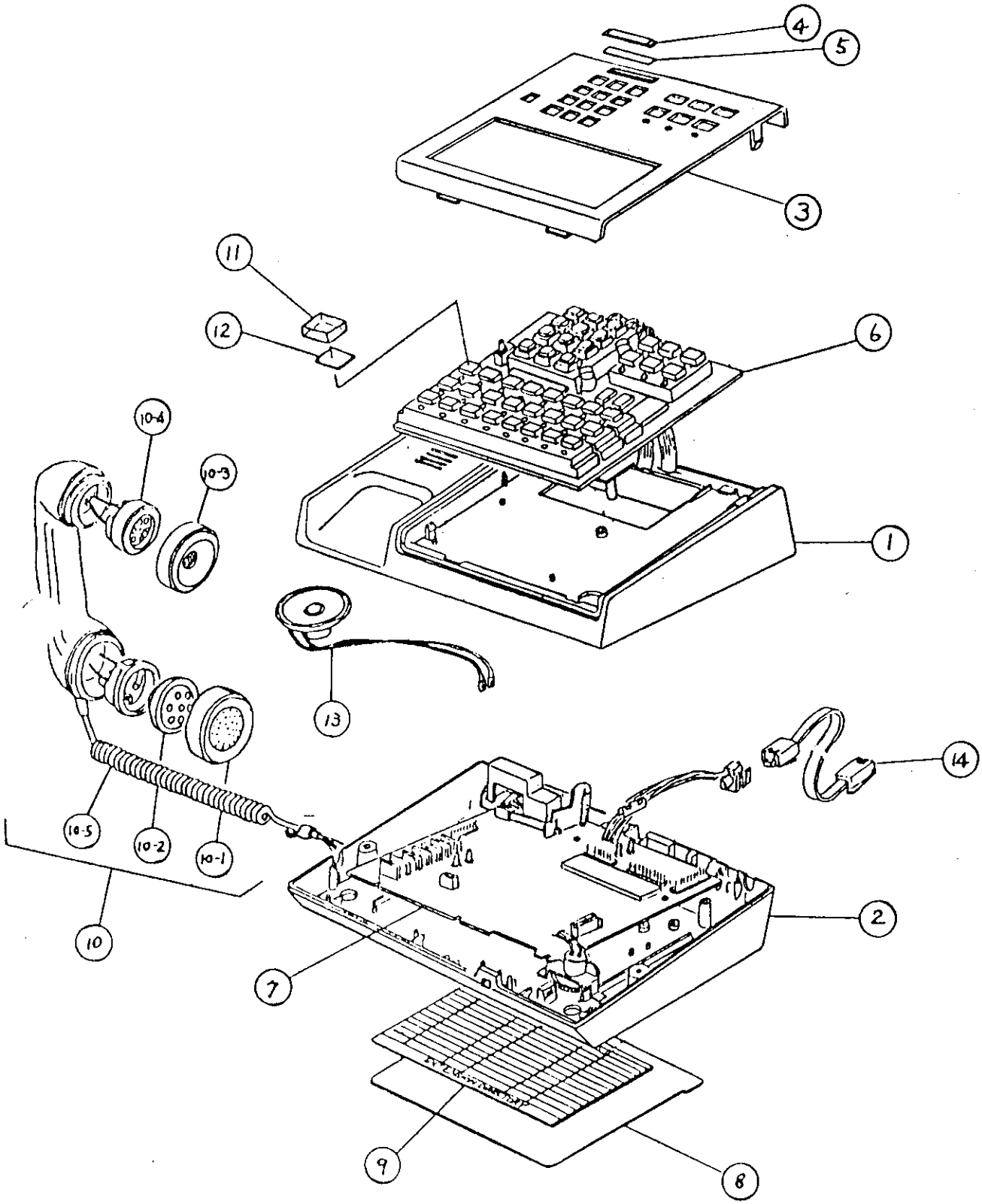
ORDERING CODE	1071		UNIT NAME	MOTHER BOARD CABLE ASSEMBLY-F (MCA-F)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		MCA-F	MOTHER BOARD CABLE ASSEMBLY-F			
	1		CONNECTOR 1-480707-0 (UL/CSA)		1	
	2		CABLE MCA-F		1	
	3		WIRING HARNESS BAND CV-70		3	





CONNECTING TABLE

TERMINAL NO. OF CONNECTOR	WIRE COLOR
1	ORANGE
2	ORANGE
3	GREEN
4	WHITE
5	WHITE
6	BLACK
7	RED
8	RED
9	BLACK

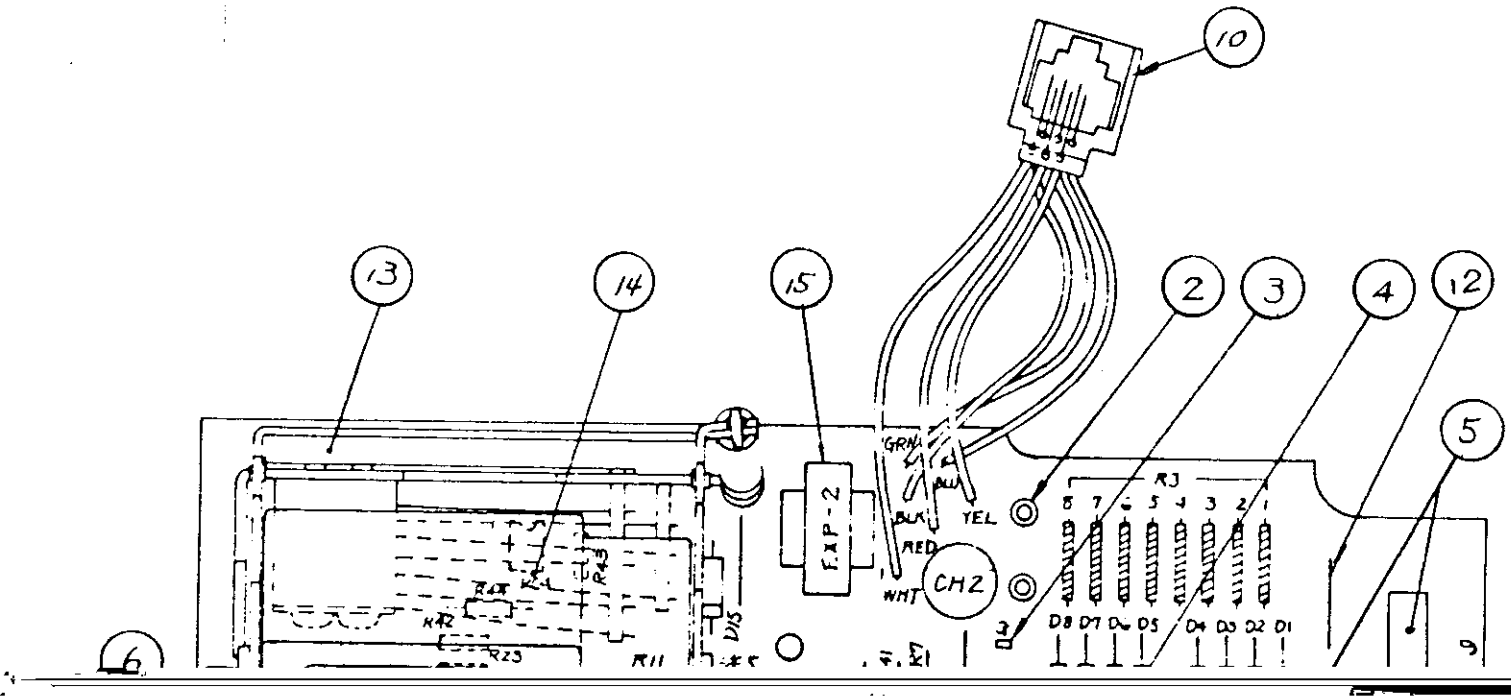

4
5
3
11
12
6
10-4
10-3
1
13
14
10-5
10-2
10-1
10
2
7
9
8

PARTS LIST

ORDERING CODE	1210		UNIT NAME	STATION PROCESSOR UNIT (ET-SPU)	
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION	Q'TY	NOTE
		ET-SPU	STATION PROCESSOR UNIT (ET-SPU)		
	1		ET-SPU PSB	1	
	2	SP1,SP2 SET1,SET2	N-60 TERMINAL	4	
	3	G,TES1	PBKT TERMINAL	2	
	4	KBC-1	CONNECTOR M33-07-30-114P	1	
	5	ADC KBC-2	CONNECTOR M33-09-30-114P	2	
	6	SPC	CONNECTOR M33-12-30-114P	1	
	7	VRC	CONNECTOR M36-04-30-114P	1	
	8	HFC	CONNECTOR FJ-06-001	1	
	9		6P TERMINAL BLOCK	1	
	10		6P MODULAR JACK	1	
	11	RJ1-RJ8 HJ1, SJ1,2	BT-C JUMPER WIRE J	11	
	12		BT-C JUMPER WIRE	11	
	13		HS-J2 HOOK SWITCH	1	
	14		ET HOOK BUTTON	1	
	15		TRANSFORMER EXP-2	1	150:2K
	16		" EXP-3	1	250:2K
	17		" 104B-T3	1	10K:1K
	18		" L-62 Induction coil	1	

PARTS LIST

ORDERING CODE	1210		UNIT NAME	STATION PROCESSOR UNIT (ET-SPU)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		R42	RESISTOR	PSS1/4 33kΩJ	1	1/4 watt
		R40	"	PSS1/4 6.8kΩJ	1	1/4 watt
		R10	"	PSS1/4 15kΩJ	1	1/4 watt
		C1,C2	CAPACITOR	USD04SL330K	2	33P
		C3	"	USD06SL151K	1	150P
		C8,C19,C21	"	MF-31H103K	3	0.01μF/50V
		C16	"	MF-31H332K	1	3300P/50V
		C9,C17	"	MF-31H222K	2	2200P/50V
		C10, C13-C15	"	MF31H104K	4	0.1μF/50V
		C4	"	CE04W1A220K	1	22μF/10V
		C7	"	CE04W1V221	1	220μF/35V
		C6	"	CE04W1E470	1	47μF/25V
	—	C11	"	CE04W1V101	1	100μF/35V
		C12	"	CE04W1C220	1	22μF/16V
		C18	"	CE04W1E330	1	33μF/25V
		C22	"	CE04W1A101	1	100μF/10V
		C20	"	CA92C1CR000-R56	1	

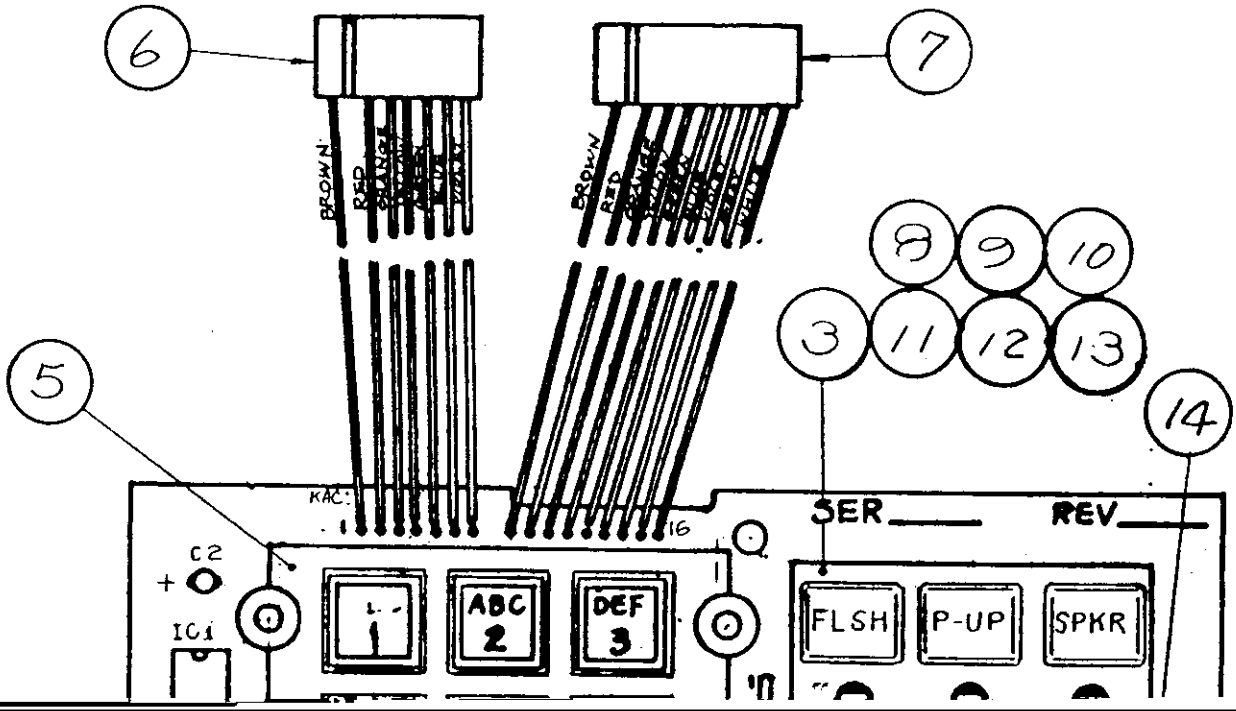

10
13
14
15
2
3
4
12
5
6
EXP-2
GRN
BLK
RED
WHT
YEL
CH2
R3
8 7 6 5 4 3 2 1
D8 D7 D6 D5 D4 D3 D2 D1
R43
R42
R23
R11
D15

PARTS LIST

ORDERING CODE	1220		UNIT NAME	ELECTRONIC KEY TELEPHONE KEY BOARD 24 (ET-K24)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		ET-K24	ELECTRONIC KEY TELEPHONE KEY BOARD 24		(1)	
	1		ET-K16/24 PCB		1	
	2		ET-LK8 SWITCH		3	
	3		ET-FK3 SWITCH		2	
	4		ET-SLIDE SWITCH		1	
	5		10-KEY DIAL		1	
	6		7P SOCKET 200L		1	
	7		9P SOCKET 220L		1	
	8		ET-FLSH CARD		1	
	9		ET-P-UP CARD		1	
	10		ET-SPKR CARD		1	
	11		ET-PAGE CARD		1	
	12		ET-ADD CARD		1	
	13		ET-CONF CARD		1	
	14		ET-HOLD CARD		1	
	15		LED	SLP-24B	27	
		IC1	INTEGRATED CIRCUIT	SN74LS145N	1	
		IC2,IC3	"	TC5020BP	2	
		IC4	"	TMS1025N2L	1	
		D1	DIODE	1S2076 (A)	1	

PARTS LIST

ORDERING CODE	1220		UNIT NAME	ELECTRONIC KEY TELEPHONE KEY BOARD 24 (ET-K24)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		R1-R3	RESISTOR ARRAY	8-1.8kΩK	3	1/8 watt
		R4	"	8-100kΩK	1	1/8 watt
		R5	"	4-1.8kΩK	1	1/8 watt
		C1	CAPACITOR	CS15E1C100M	1	10μF/16V
		C2	"	CS15E0J100M	1	10μF/6.3V

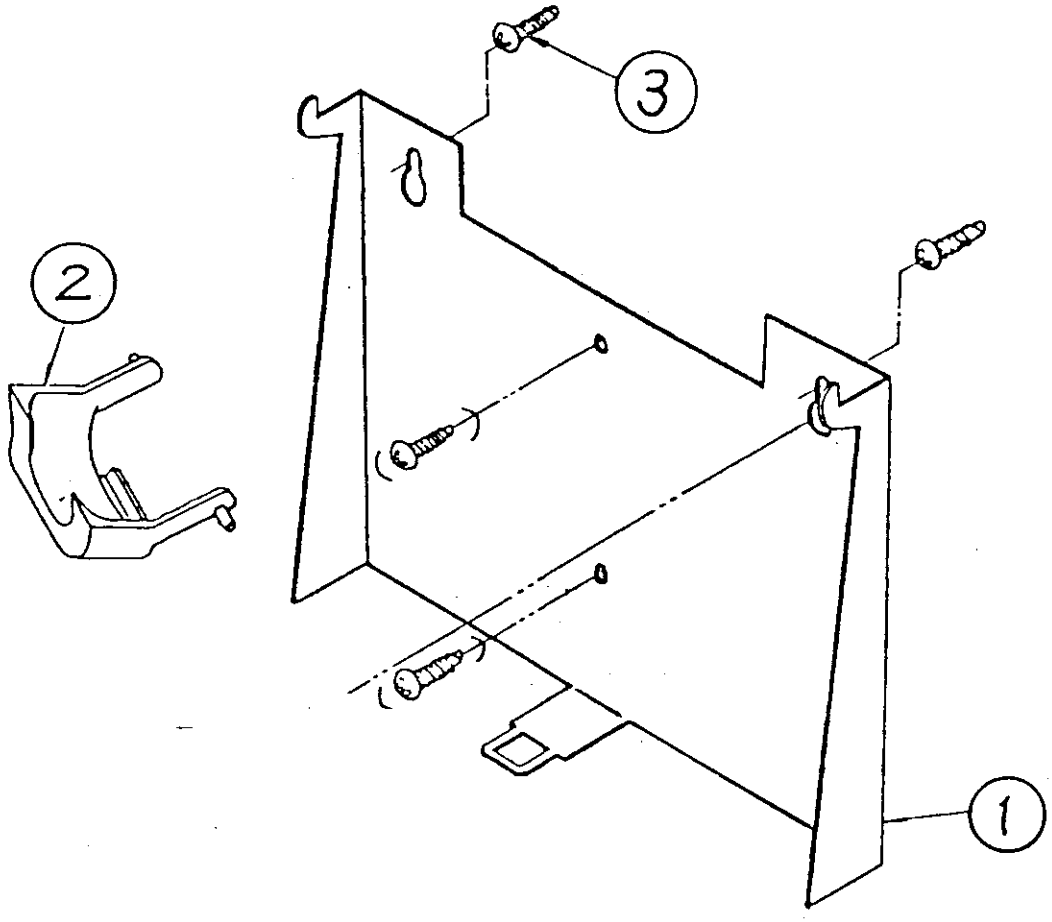

6
7
BROWN
RED
BROWN
RED
8
9
10
3
11
12
13
5
14
SER
REV
C2
IC1
ABC
2
DEF
3
FLSH
P-UP
SPKR

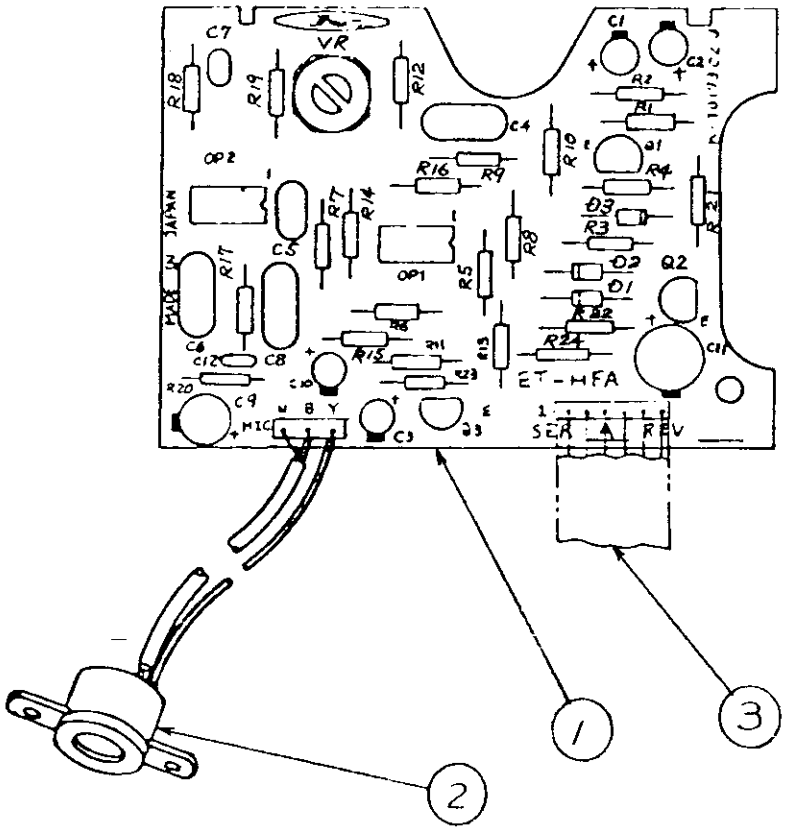
PARTS LIST

ORDERING CODE	1221		UNIT NAME	ELECTRONIC KEY TELEPHONE KEY BOARD 16 (ET-K16)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		ET-K16	ELECTRONIC KEY TELEPHONE KEY BOARD 16		(1)	
	1		ET-16/24 PCB		1	
	2		ET-LK8 SWITCH		2	
	3		ET-FK3 SWITCH		2	
	4		ET-SLIDE SWITCH		1	
	5		10 KEY DIAL		1	
	6		7P SOCKET 200L		1	
	7		9P SOCKET 200L		1	
	8		ET-FLSH CARD		1	
	9		ET-P-UP CARD		1	
	10		ET-SPKR CARD		1	
	11		ET-PAGE CARD		1	
	12		ET-ADD CARD		1	
	13		ET-CONF CARD		1	
	14		ET-HOLD CARD		1	
	15		LED	SLP-24B	19	
		IC1	INTEGRATED CIRCUIT	SN74LS145N	1	
		IC2,IC3	"	TC5020BP	2	
		IC4	"	TMS1025N2L	1	

PARTS LIST

ORDERING CODE	1221		UNIT NAME	ELECTRONIC KEY TELEPHONE KEY BOARD 16 (ET-K16)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		R1-R3	RESISTOR NETWORK	8-1.8kΩK	3	1/8 watt
		R5	"	4-1.8kΩK	1	1/8 watt
		R4	"	8-100kΩK	1	1/8 watt
		D1	DIODE	1S2076 (A)	1	
		C1	CAPACITOR	CS15E1C100M	1	10μF/16T
		C2	"	CS15E0J100M	1	10μF/6.3V
	—					


3
2
1


C7
VR
R18
R19
R12
C1
C2
R2
R1
C4
R10
Q1
R4
OP2
R16
R9
R17
R14
D3
R3
R21
C5
R8
D2
Q2
OP1
R5
D1
R17
R22
R6
R24
C6
C12
C8
R15
R11
R13
C11
R20
C10
R23
ET-HFA
C9
W B Y
MIC
C3
Q3
SER
REV
1
2
3

PARTS LIST

ORDERING CODE	1260		UNIT NAME	HANDSFREE ANSWER BACK UNIT (ET-HFA)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		ET-HFA	HANDSFREE ANSWER BACK UNIT		(1)	
	1		ET-HFA PCB		1	
	2		ET-HFA MICROPHONE		1	
	3		6P CONNECTION 40L		1	
		OP1,OP2	INTEGRATED CIRCUIT	NJM4558D	2	
		Q1	TRANSISTOR	2SA1015-Y	1	
		Q2,Q3	"	2SC1815-Y	2	
		D1-D3	DIODE	1S2076 (A)	3	
		R1,R2,R9	RESISTOR	PSS1/4 470ΩJ	3	1/4 watt
		R5	"	PSS1/4 1.2kΩJ	1	1/4 watt
		R3,R4,R6 R7,R13	"	PSS1/4 33kΩJ	5	1/4 watt
		R8,R23	"	PSS1/4 820ΩJ	2	1/4 watt
		R10	"	PSS1/4 560ΩJ	1	1/4 watt
		R24	"	PSS1/4 22ΩJ	1	1/4 watt
		R12	"	PSS1/4 1.8kΩJ	1	1/4 watt
		R14,R15	"	PSS1/4 100kΩJ	2	1/4 watt
		R16	"	PSS1/4 47kΩJ	1	1/4 watt
		R17,R19	"	PSS1/4 180kΩJ	2	1/4 watt

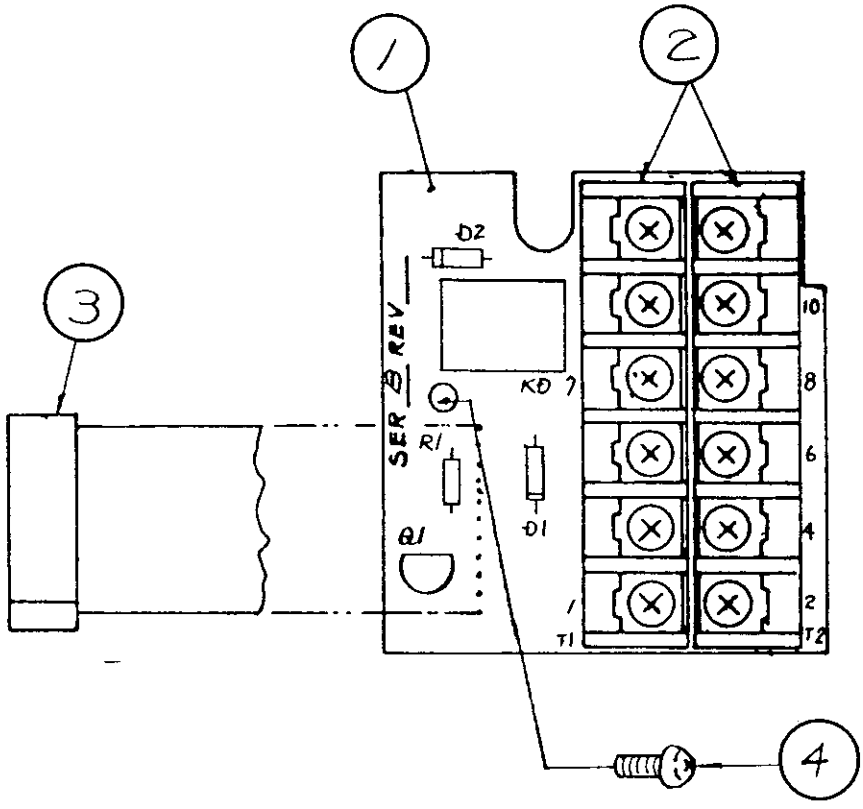
[redacted]

PARTS LIST

ORDERING CODE	1260		UNIT NAME	HANDSFREE ANSWER BACK UNIT (ET-HFA-1)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		ET-HFA-1	HANDSFREE ANSWER BACK UNIT		(1)	
	1		ET-HFA-1 PCB		1	
	2		ET-HFA MICROPHONE		1	
	3		6P CONNECTOR 40L		1	
		OP1,OP2	INTEGRATED CIRCUIT	NJM4558D	2	
		Q1	TRANSISTOR	2SA1015-Y	1	
		Q2,Q3	"	2SC1815-Y	2	
		D1-D3	DIODE	1S2076 (A)	3	
		R1,R2,R9	RESISTOR	PSS1/4 470ΩJ	3	1/4 watt
		R5,R11	"	PSS1/4 1.2kΩJ	2	1/4 watt
		R3,R4,R6 R7,R13	"	PSS1/4 33kΩJ	5	1/4 watt
		R8,R23	"	PSS1/4 820ΩJ	2	1/4 watt
		R10	"	PSS1/4 560ΩJ	1	1/4 watt
		R24	"	PSS1/4 22ΩJ	1	1/4 watt
		R12	"	PSS1/4 1.8kΩJ	1	1/4 watt
		R14,R15	"	PSS1/4 100kΩJ	2	1/4 watt
		R16	"	PSS1/4 47kΩJ	1	1/4 watt
		R17	"	PSS1/4 180kΩJ	1	1/4 watt

PARTS LIST

ORDERING CODE	1260		UNIT NAME	HANDSFREE ANSWER BACK UNIT (ET-HFA-1)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		R18	RESISTOR	PSS1/4 4.7kΩJ	1	1/4 watt
		R20	"	PSS1/4 4.3kΩJ	1	1/4 watt
		R19	"	PSS1/4 150kΩJ	1	1/4 watt
		R21	"	PSS1/4 10kΩJ	1	1/4 watt
		R22	"	PSS1/4 270ΩJ	1	1/4 watt
		C1,C2	CAPACITOR	CE04W1A470	2	47μF/10V
		C3	"	CE04W1A220	1	22μF/10V
		C11	"	CE04W1C221	1	220μF/16V
		C9	"	CE04W1C220	1	22μF/16V
		C5	"	MF-31H473K	1	0.047μF/50V
		C7	"	MF-31H222K	1	2200p/50V
		C4,C13	"	MF-31H104K	2	0.1μF/50V
		C8	"	MF-31H223K	1	0.022μF/50V
		C6,14	"	MF-31H683K	1	0.068μF/50V
		C12	"	UFD04B471K	1	470pF
		VR	VARIABLE RESISTOR	RG102B500Ω		


1
2
3
4
D2
SER B REV
KD 7
R1
D1
Q1
10
8
6
4
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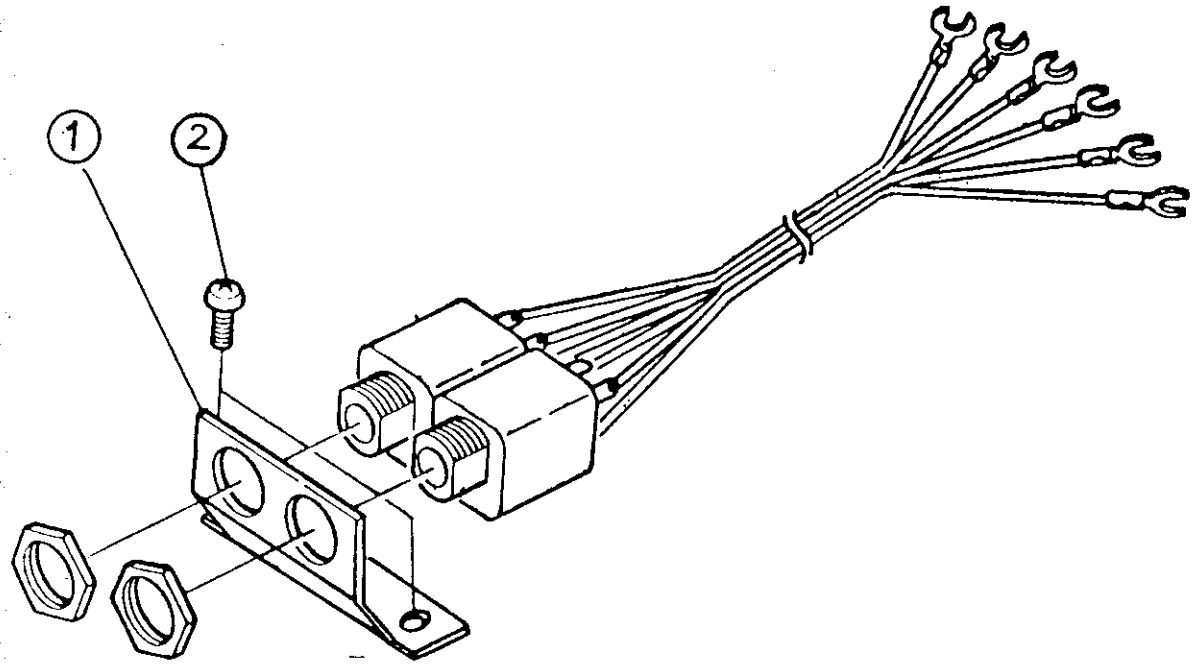
1
T1
T2

PARTS LIST

ORDERING CODE	1262		UNIT NAME	HEADSET JACK BRACKET	
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION	Q'TY	NOTE
			HEADSET JACK BRACKET	(1)	
	1		HEADSET JACK BRACKET	1	
	2		SCREW	2	



HEADSET JACK BRACKSET

PARTS LIST

ORDERING CODE	1300		UNIT NAME	CALL PROCESSOR-60 (CP-60)	
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION	Q'TY	NOTE
		CP-60	CALL PROCESSOR-60	(1)	
	1		CP-60 UPPER HOUSING (BR)	1	
1615	2		LOWER HOUSING (BR)	1	
	3		CP-60 FACE PLATE-WG	1	
1310	4	CPS-C	CALL PROCESSOR-CONTROL UNIT	1	
1320	5	CPS-D	CALL PROCESSOR-DISPLAY UNIT	1	
1603	6		EXTENSION DIRECTORY CARD	1	
1604	7		EXTENSION DIRECTORY TRAY	1	
1607	8		MODULAR CABLE-6Ft.	1	3-PAIR

PARTS LIST

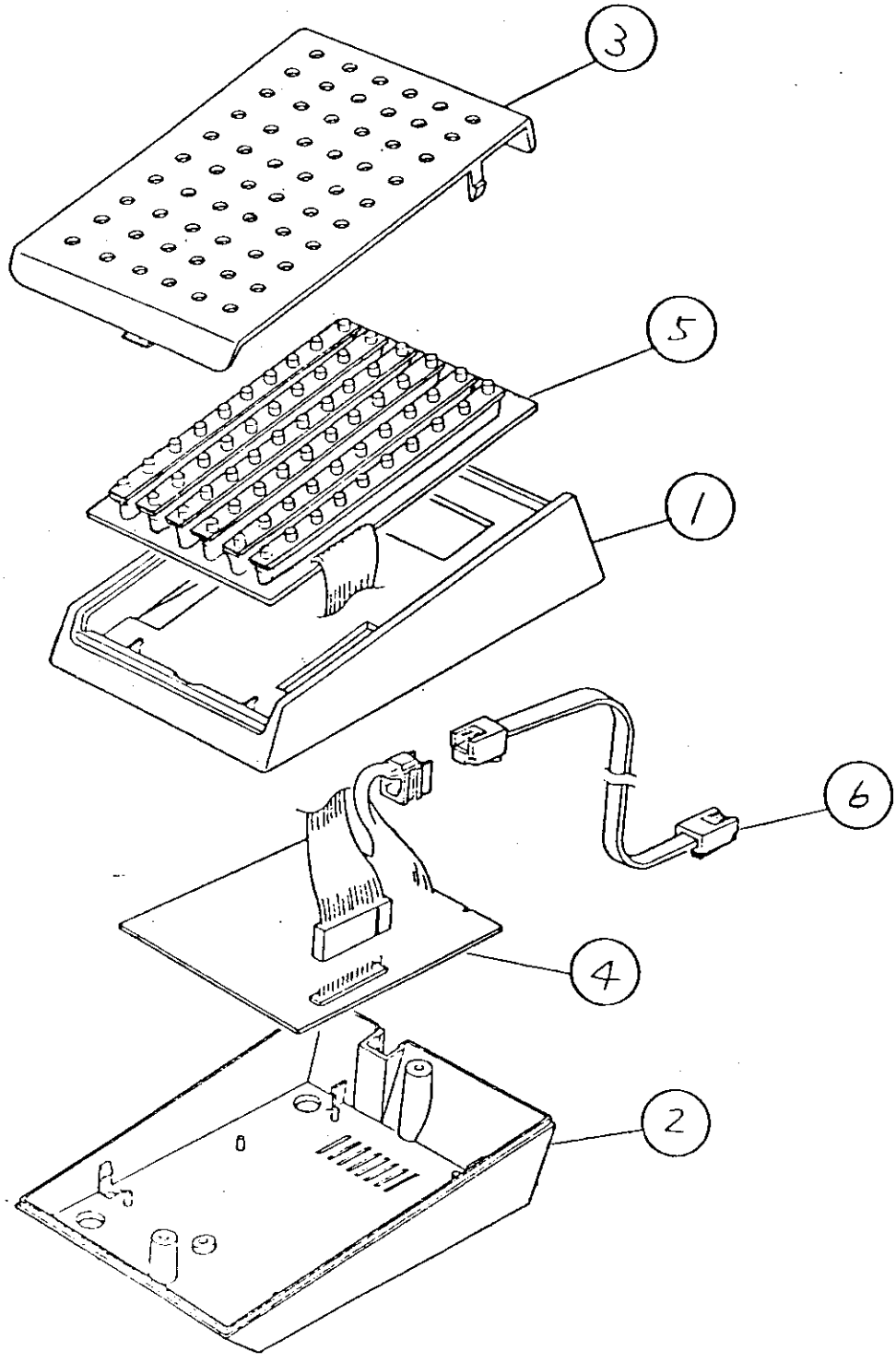
ORDERING CODE	1310		UNIT NAME	CALL PROCESSOR-CONTROL UNIT (CPS-C)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		Q1 ~ Q3	TRANSISTOR	2SC1815-Y	3	
		Q4	"	2SA671C	1	
		D1,D2	DIODE	1S2076A	2	
		D3,D4	"	SM-1A-02	2	
		R9,R14	RESISTOR	PSS 1/4 100kΩJ	2	1/4W ±5%
		R1,R2,R5	"	PSS 1/4 4.7kΩJ	3	1/4W ±5%
		R3,R4	"	PSS 1/4 22kΩJ	2	1/4W ±5%
		R6	"	PSS 1/4 220kΩJ	1	1/4W ±5%
		R7	"	PSS 1/4 2.2MΩJ	1	1/4W ±5%
		R8	"	PSS 1/4 10kΩJ	1	1/4W ±5%
		R10	"	PSS 1/4 1MΩJ	1	1/4W ±5%
		R11	"	PSS 1/4 10kΩJ	1	1/4W ±5%
		R12	"	PSS 1/4 15kΩJ	1	1/4W ±5%
		R13	"	PSS 1/4 4.3kΩJ	1	1/4W ±5%

PARTS LIST

ORDERING CODE		1310	UNIT NAME	CALL PROCESSOR-CONTROL UNIT (CPS-C)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		C1,C2	CAPACITOR	UFD05B102K	2	0.001μF 50V
		C3,C4	"	USD04SL330K	2	33pF 50V
		C5	"	CE04W1H3R3	1	3.3μF 50V
		C7,C13	"	SC45F1H104Z	2	0.1μF 50V
		C8	"	CE04W 1V470	1	47μF 35V
		C9	"	MF-3, 1H103K	1	0.01μF 50V
		C10	"	UFD04B101K	1	100pF 50V
		C11	"	MF-3, 1H104K	1	0.1μF 50V
		C12	"	CE04W1C221	1	220μF 16V
		C6	"	CE04W1C101	1	100μF 16V
		X1	CRYSTAL	P-3	1	32.768 kHz
		L1	INDUCTOR	FL9H122J	1	1.2mH ±5%
		BZ	BUZZER	PB-2713/ PB-2715	1	PIEZO-TYPE

PARTS LIST

ORDERING CODE	1320		UNIT NAME	CALL PROCESSOR-DISPLAY UNIT (CPS-D)		
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION		Q'TY	NOTE
		IC31~IC41	INTEGRATED CIRCUIT	CD4099BE	11	
		IC42,IC43	"	CD4532BE	2	
		IC44	"	CD4071BE	1	
		D20~D89	LED	SLP-24B	70	
		DS1	"	TLR321	1	
		RA2-RA8	ARRAYS	10-1.2kΩK	7	1/8W ±10%
		RA9,RA10	"	4S-1kΩK	2	1/8W ±10%
		RA11,RA12	"	3S-1kΩK	2	1/8W ±10%
		RA13,RA14	"	8-10kΩK	2	1/8W ±10%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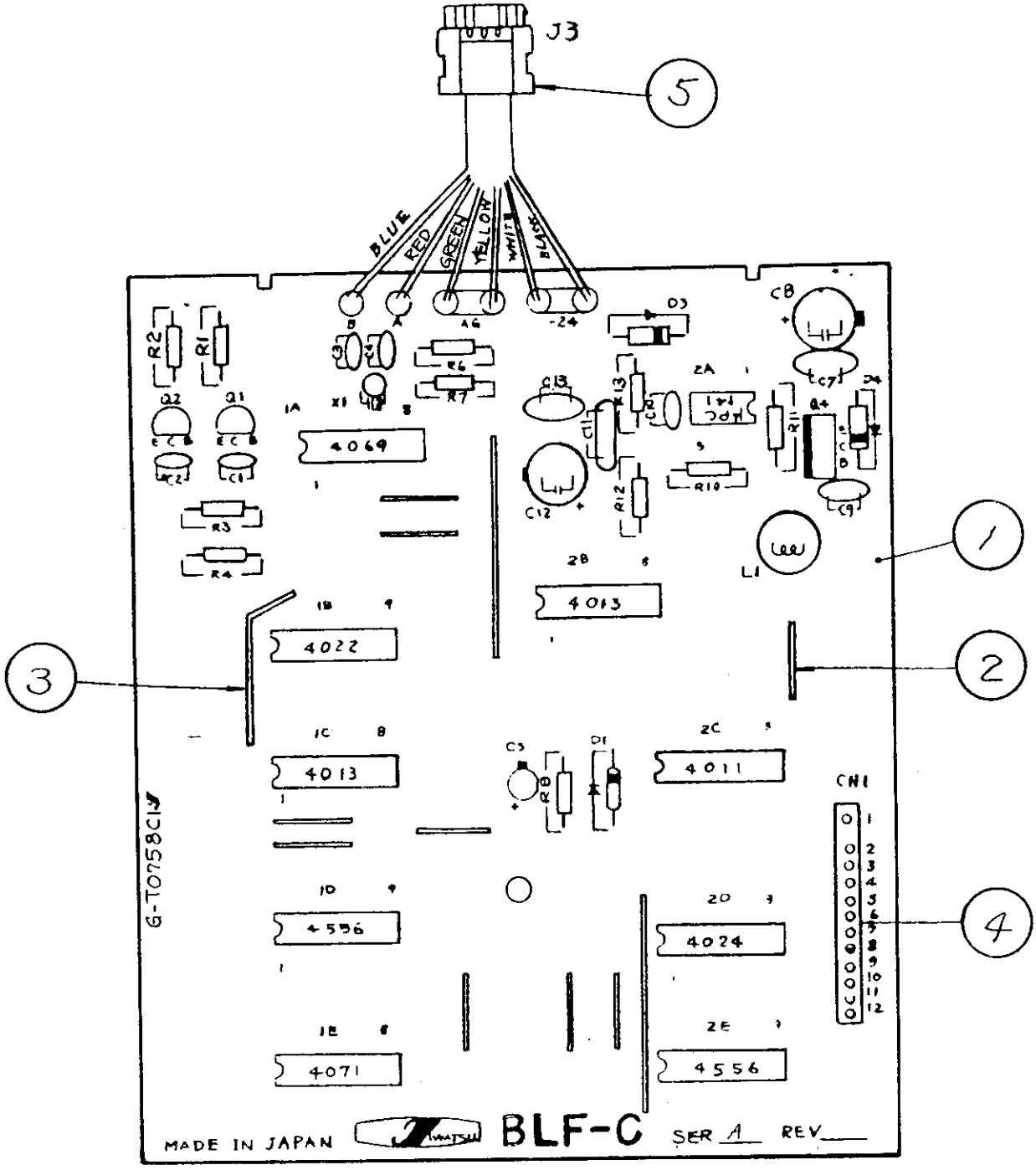
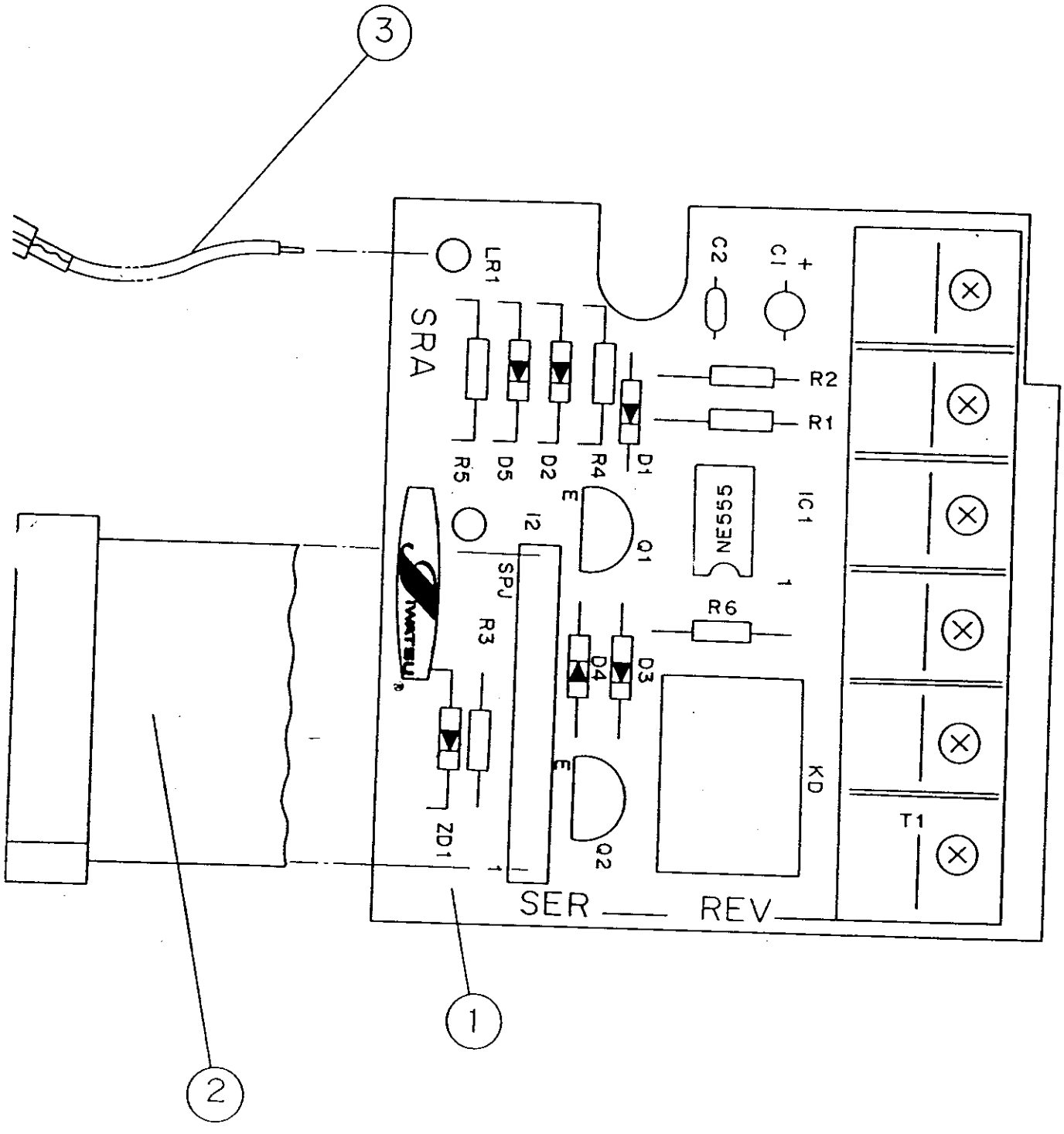

J3
5
BLUE
RED
GREEN
YELLOW
WHITE
BLACK
B
A
AG
-24
D3
C8
R2
R1
R6
R7
C13
2A
C7
Q2
Q1
1A
X1
4069
C11
R11
Q4
C2
C1
R3
R4
C12
R12
R10
C9
L1
1
2B
4013
1B
4022
3
2
1C
4013
C3
D1
R8
2C
4011
CN1
G-T0758C1
1D
4556
2D
4024
4
1E
4071
2E
4556
MADE IN JAPAN
BLF-C
SER A
REV

PARTS LIST

ORDERING CODE	1420		UNIT NAME	BUSY LAMP FIELD-DISPLAY UNIT (ET-BLF-D)	
SUB ASSY CODE	ITEM NO.	SYM NO.	DESCRIPTION	Q'TY	NOTE
		BLF-D	BUSY LAMP FIELD-DISPLAY UNIT	(1)	
	1		BLF-D PCB	1	
	2		LED SOCKET	6	
	3	J1	12-1P CONNECTOR 200	1	
	4	IC31-IC38	INTEGRATED CIRCUIT CD4099BE	8	
	5	D20-D79	LED SLP-24B	60	
	6	R20-R79	RESISTOR PSS 1/4 1.2kΩJ	60	1/4W ±5%



STATION RINGER ADAPTER (SRA)