

SYSTEM PRACTICE 00194

# **EK-616**

## **Description and Installation Manual**

Issue 1-1      May 1, 1984

***This manual should be read in its entirety before attempting to install or program the system.***

This manual has been developed by TIE/communications, Inc. It is intended for the use of its customers and service personnel.

Any comments or suggestions for improving this manual would be appreciated. Forward your remarks to:

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Attention: Manager, Technical Publications

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| <b>REVISION CONTROL</b> |           |   |
|-------------------------|-----------|---|
| REVISION                | DATE      | CHANGE  |
| 0-1                     | 08 APR 83 | First Draft.  |
| 0-2                     | 19 APR 83 | Second Draft. Engineering changes to all sections.  |
| 0-3                     | 13 JUN 83 | Third Draft. Engineering changes to all sections.   |
| 0-4                     | 12 AUG 83 | Engineering changes, never printed.   |
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| 0-6                     | 19 AUG 83 | Corrected manual to match a working production unit.  |
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| 1-0                     | 30 MAR 84 | <p><b>Section 1:</b> Specifications Table ( Table 1-1 ) revised. Drawing of Standard Key Telephone enhanced. Added FCC regulation for non-hearing aid-compatible telephones.</p> <p><b>Section 2:</b> Key callouts revised per engineering input. Feature descriptions enhanced, and all tables alphabetized. Table 2-3 added.</p> <p><b>Section 3:</b> Permitted Code OCW added. All tables moved to the end of the section. System and Station OCWs modified for consistency with Section 4. Table 3-1 was reformatted, and text was modified accordingly. Ordering information expanded.</p> <p><b>Section 4:</b> Program keys included with program description and each coinciding table.</p> <p><b>Section 5:</b> Engineering input was incorporated into the section. Additional information regarding radio frequency interference was revised at the end of the section.</p> <p><b>Section 6:</b> Programming description revised.</p> <p><b>Section 7:</b> Section 7 written for this manual. All information regarding Theory of Operation for the EK-616 Electronic Key Telephone System has been added.</p> <p><b>Section 8:</b> Section 8 written for this manual. All information regarding maintenance of the EK-616 Electronic Key Telephone System was added.</p> <p><b>Section 9:</b> Reformatted. Each optional device appears on a separate sheet.</p> |

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## REVISION CONTROL

| REVISION | DATE     | CHANGE   |
|----------|----------|--|
| 1-1      | 1 MAY 84 | <p><b>Section 1:</b> Figures 1-2 and 1-3 have been corrected and both shown on the same angle.</p> <p><b>Section 2:</b> Key callouts have been corrected.</p> <p><b>Section 3:</b> Information on Toll Restriction has been revised.</p> <p><b>Section 4:</b> Program references ( to Section 3 ) have been added to all programming prompts.</p> <p><b>Section 5:</b> New information on Radio Frequency Susceptibility has been added.</p> <p><b>Section 9:</b> New information regarding Wall Mounting Telephones, Speakerphone, Door Chime Box, External Music Connections, Alarm Connections and External Page Zone Connections has been added.</p> |

# EK-616

## ELECTRONIC KEY TELEPHONE SYSTEM

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# EK-616

## ELECTRONIC KEY TELEPHONE SYSTEM

### SECTION 1, GENERAL DESCRIPTION

1

## 1. INTRODUCTION

**1.01** The GENERAL DESCRIPTION Section provides basic information pertaining to the EK-616 Electronic Key Telephone System ( EKTS ). It describes the various components of the system, available telephones, system specifications, site requirements and Federal Communications Commission/telephone company requirements.

**1.02** Figure 1-2 and 1-3 have been revised per engineering.

## 2. SYSTEM DESCRIPTION

**2.01** The EK-616 EKTS uses a Z80 microprocessor with Erasable Programmable Read Only Memory ( EPROM ) and Complementary Metal Oxide Semiconductor ( CMOS ) Random Access Memory ( RAM ) for the main operating program. The system is designed for small businesses that require two to six Central Office ( CO ) lines. The EK-616 system has a maximum capacity of 16 stations, six CO lines and six intercom links.

### KEY SERVICE / POWER SUPPLY UNIT

**2.02** The EK-616 Key Service Unit ( KSU ) and Power Supply ( Figure 1-1 ) are contained in one unit designed for wall mounting. The KSU portion of the unit houses replaceable Printed Circuit Boards ( PCBs ). The power supply portion supplies DC voltage to the system.

## TELEPHONES

**2.03** The system can use the EK-616 Standard Key Telephone and Executive Display Key Telephone. All telephones transmit various visual and audible signals that enable the user to distinguish among outside, inside and paging calls.

### Standard Key Telephones

**2.04** The Standard Key Telephone ( Figure 1-2 ) has six CO line keys and eight Direct Station Selection ( DSS ) keys which also provide Automatic Dialer functions. These telephones also have keys that access other feature functions.

### Executive Display Key Telephones

**2.05** The Executive Display Key Telephone ( Figure 1-3 ) provides all the features of the Standard Key Telephone, as well as several unique features including full speakerphone operation and a display indicating time, date and the dialed number. The Executive Display Key Telephone is available in two configurations to accommodate tone signaling or pulse signaling during power failure. This telephone has six CO line keys and 16 DSS keys which also provide Busy Lamp Field ( BLF ) indications and Automatic Dialer functions. An Executive Display Key Telephone is also required to program the system.

## 3. SPECIFICATIONS

**3.01** Refer to Table 1-1 for technical specifications.

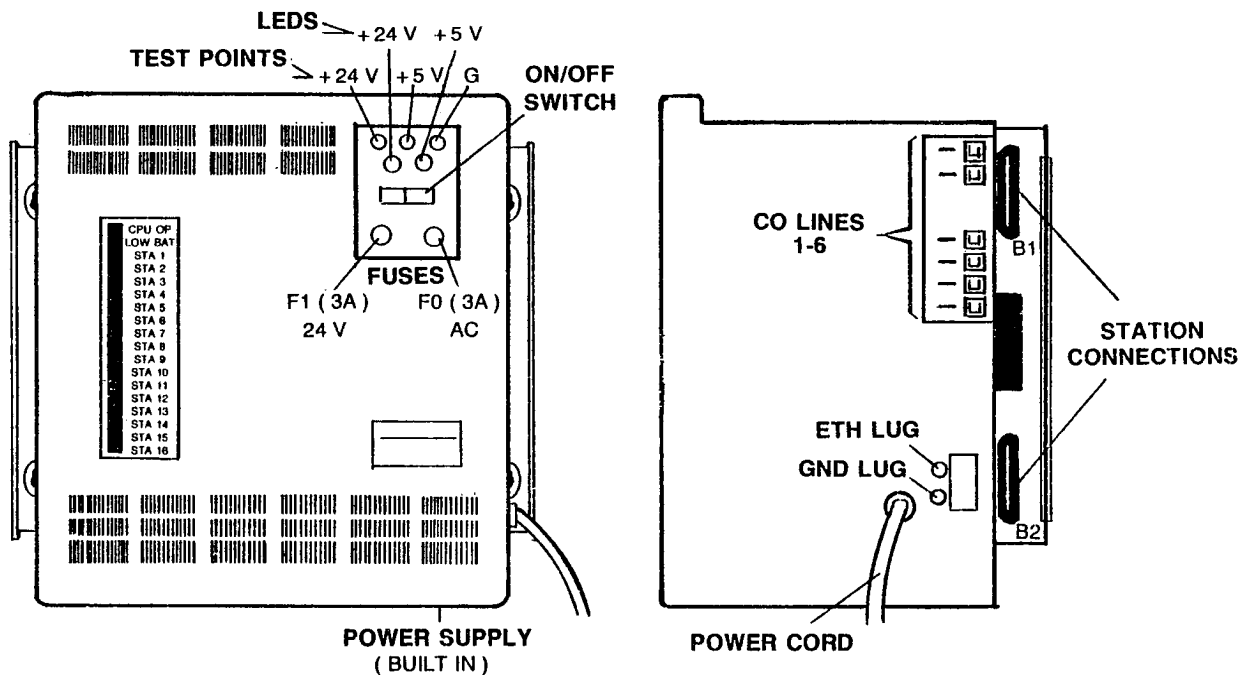


Figure 1-1 KEY SERVICE UNIT / POWER SUPPLY, EK-616

#### 4. SITE REQUIREMENTS

**4.01** The EK-616 KSU / Power Supply Unit should be installed in a clean, dry, secure location that prevents access by unauthorized personnel. This location should comply with Bell Functional Product Class Criteria of September, 1978, in publication PUB 48002, as stated in 3.4.3.2. paragraph C--Indoors W / Environmental Control. The room must have adequate ventilation and have a temperature range 0°-45° C ( 32°-113° F ) with 10%-95% non-condensing relative humidity.

**4.02** The customer must provide a dedicated three wire 117 V AC, 60 Hz circuit. The KSU / Power Supply Unit draws a maximum of 1.5 amps. The power circuit must be protected with the appropriate circuit breaker or fuse. A separate earth ground is required in addition to the third wire ground.

#### 5. FCC AND TELCO REQUIREMENTS

**5.01** Rules and regulations for the operation and installation of telephone equipment have been established by the Federal Communications Commission ( FCC ). According to Part 68 ( Connection of Terminal Equipment to the Telephone Network ) and its amendments, several actions are required before and during installation of customer-provided telephone equipment. These actions are detailed in the following paragraphs.

#### HEARING AID COMPATIBILITY

**5.02** FCC rules prohibit the use of non-hearing-aid-compatible telephones in the following locations:

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





Figure 1-2 KEY TELEPHONE, STANDARD, EK-616



Figure 1-3 KEY TELEPHONE, EXECUTIVE DISPLAY, EK-616

## NOTIFICATION TO TELCO

**5.03** The owner of the system must supply the following information prior to connecting or disconnecting the system:

1. Sufficient notice of the intention of using privately-owned equipment.
2. The particular lines to be used (telephone numbers xxx-xxxx through xxx-xxxx).
3. Model: **EK-616**  
FCC Registration Number: **C9C719-12298-KN-E**  
Ringer Equivalence: **0.6B**
4. Type of Connection: **RJ11C ( USOC )**

## CERTIFICATION OF INSTALLER

**5.04** This system must be connected to telephone company lines with FCC approved plugs and jacks. A technician must be certified to install an EK-616 EKTS. Installation classes for certification are available through TIE/communications, Inc., and its regional offices.

## INCIDENCE OF HARM

**5.05** When trouble is experienced, the customer shall disconnect the registered equipment from the telephone line to determine if the registered equipment is malfunctioning. If the registered equipment is malfunctioning, the use of such equipment shall be discontinued until the problem has been corrected.

**5.06** When practical, the telephone company must notify the customer that service may be temporarily discontinued if customer-provided equipment is causing harm to the telephone network. The telephone company must attempt to inform the customer that service is to be discontinued prior to actually terminating service. The telephone company must also provide customers with an opportunity to correct the problem and must advise customers of their right to bring complaint procedures before the FCC.

**Table 1-1 SPECIFICATIONS, EK-616 SYSTEM**

|  |   |                        |                      |
|--|---|------------------------|----------------------|
| <b>System Capacity:</b>  |   | Maximum Number         |                      |
| CO lines   |   | 6                      |                      |
| Intercom Talkpaths   |   | 6                      |                      |
| Stations ( including Executive stations )  |   | 16                     |                      |
| <hr/>  |   |                        |                      |
| <b>Cable Requirements:</b> Two pair twisted station wire. Maximum cable run up to 1500 feet ( 453m ). 1000 feet ( 305m ) using 24 AWG or 1500 feet ( 453m ) using 22 AWG wire. |   |                        |                      |
| <hr/>  |   |                        |                      |
| <b>Power Requirements:</b>   |   |                        |                      |
| KSU / Power Supply Operating Range: 117 V AC $\pm$ 10%, 60 Hz $\pm$ 1 Hz   |   |                        |                      |
| <hr/>  |   |                        |                      |
| <b>Power Dissipation:</b>  |   |                        |                      |
| KSU / Power Supply Unit -- 100 Watts; 375 BTU/hr.  |   |                        |                      |
| <hr/>  |   |                        |                      |
| <b>Dimensions and Weights:</b>   |   |                        |                      |
| KSU / Power Supply Unit:   | 14.2" H x 11.6" W x 10.8" D<br>36.0cm x 29.5cm x 27.4cm |                        | 11.0 lbs.<br>5.0 Kg. |
| Key Telephone:   | 2.8" H x 8.0" W x 8.6" D<br>7.1cm x 20.3cm x 21.8cm     |                        | 2.1 lbs.<br>0.7 Kg.  |
| Executive Telephone:   | 3.2" H x 8.0" W x 8.6" D<br>8.1cm x 20.3cm x 21.8cm     |                        | 2.2 lbs.<br>1.0 Kg.  |
| Monitor Box Station:   | 1.6" H x 4.4" W x 5.4" D<br>4.1cm x 11.2cm x 16.3cm     |                        | 0.5 lbs.<br>0.2 Kg.  |
| Door Box Station:  | 1.6" H x 4.4" W x 5.4" D<br>4.1cm x 11.2cm x 16.3cm     |                        | 0.5 lbs.<br>0.2 Kg.  |
| <hr/>  |   |                        |                      |
| <b>Environmental Operating Conditions:</b>   |   |                        |                      |
| Temperature: KSU and Telephones - 0° to 45° C ( 32° to 113° F )<br>Door Box - - 20° to 70° C ( - 4° to 158° F )  |   |                        |                      |
| Humidity: 10% - 95%  |   |                        |                      |
| <hr/>  |   |                        |                      |
| <b>BGM Specifications:</b>   |   |                        |                      |
| Input Impedance: 600 OHM<br>Input Level: Nominal 80 millivolts ( - 20 dBm )<br>Maximum Input: .1 Volt RMS  |   |                        |                      |
| <hr/>  |   |                        |                      |
| <b>MOH Specifications:</b>   |   |                        |                      |
| Input Impedance: 600 OHM<br>Input Level: Nominal 400 millivolts ( - 6 dBm )<br>Maximum Level: 1 Volt RMS   |   |                        |                      |
| <hr/>  |   |                        |                      |
| <b>Ratings of Door-Unlock Contacts:</b>  |   |                        |                      |
| 30 V AC, 75 WATTS  |   |                        |                      |
| <hr/>  |   |                        |                      |
| <b>Alarm Circuit:</b>  |   |                        |                      |
| 1K OHM @ 5 V DC  |   | Maximum input: 24 V DC |                      |
| 10K OHM @ 24 V DC  |   |                        |                      |
| <hr/>  |   |                        |                      |
| <b>External Paging Specifications:</b>   |   |                        |                      |
| Output Impedance: 600 OHM<br>Output Level: Nominal 250 millivolts ( - 10 dBm )   |   |                        |                      |



# EK-616

## ELECTRONIC KEY TELEPHONE SYSTEM

### SECTION 2, FEATURES

2

#### 1. INTRODUCTION

**1.01** The FEATURES Section defines the features and describes the station equipment of the EK-616 Electronic Key Telephone System ( EKTS ). The appropriate user's guides provide instructions for the use of each telephone.

**1.02** Key callouts have been revised. Feature descriptions enhanced per engineering input.

#### 2. STATION EQUIPMENT

**2.01** The following equipment is used with the EK-616 EKTS: the EK-616 Standard Key Telephone, the EK-616 Executive Display Key Telephone, Monitor Box and the Door Chime Box. The Monitor and Door Chime Box are described in Section 9, OPTIONAL EQUIPMENT.

#### STANDARD KEY TELEPHONES

**2.02** The EK-616 Standard Key Telephone ( Figure 2-1 ) contains a built-in microphone and speaker to allow handsfree reply on Intercom ( ICM ) calls. In addition to the dial pad, the telephones have keys that access CO lines, special function keys, and eight Direct Station Selection ( DSS ) keys which also provide the Automatic Dialer. Most keys are equipped with a Light Emitting Diode ( LED ) to indicate the status of the call or feature. Visual and audible signals provide various tone and flash patterns that distinguish outside, ICM and paging calls ( Table 2-1 and 2-2 ). The volume level for audible signals and voice announcements can be adjusted with the slide volume control on the face plate of the telephone.

#### EXECUTIVE DISPLAY KEY TELEPHONES

**2.03** The EK-616 Executive Display Key Telephone ( Figure 2-2 ) provides all the features of the Standard Key Telephones and several unique features including power failure operation and a display indicating call and feature status. There are 16 DSS keys which also provide Busy Lamp Field ( BLF ) indications and Automatic Dialer Functions. The Executive Display Key Telephone is used to program the system.

**2.04** A cross reference of feature keys is provided in Table 2-3.

#### 3. FEATURES

**3.01** The following paragraphs define the features in an EK-616 system.

#### TYPES OF FEATURES

**3.02** Each feature is one of three types: permanent, programmable or optional. Permanent features are intrinsic to the system hardware and cannot be altered by system programming. Programmable features are entered or changed when programming the system. Optional features require the installation of optional equipment.

#### ALARM

**3.03** Stations may be programmed to receive audible alarm signals from a customer provided source through the telephone speaker.

2

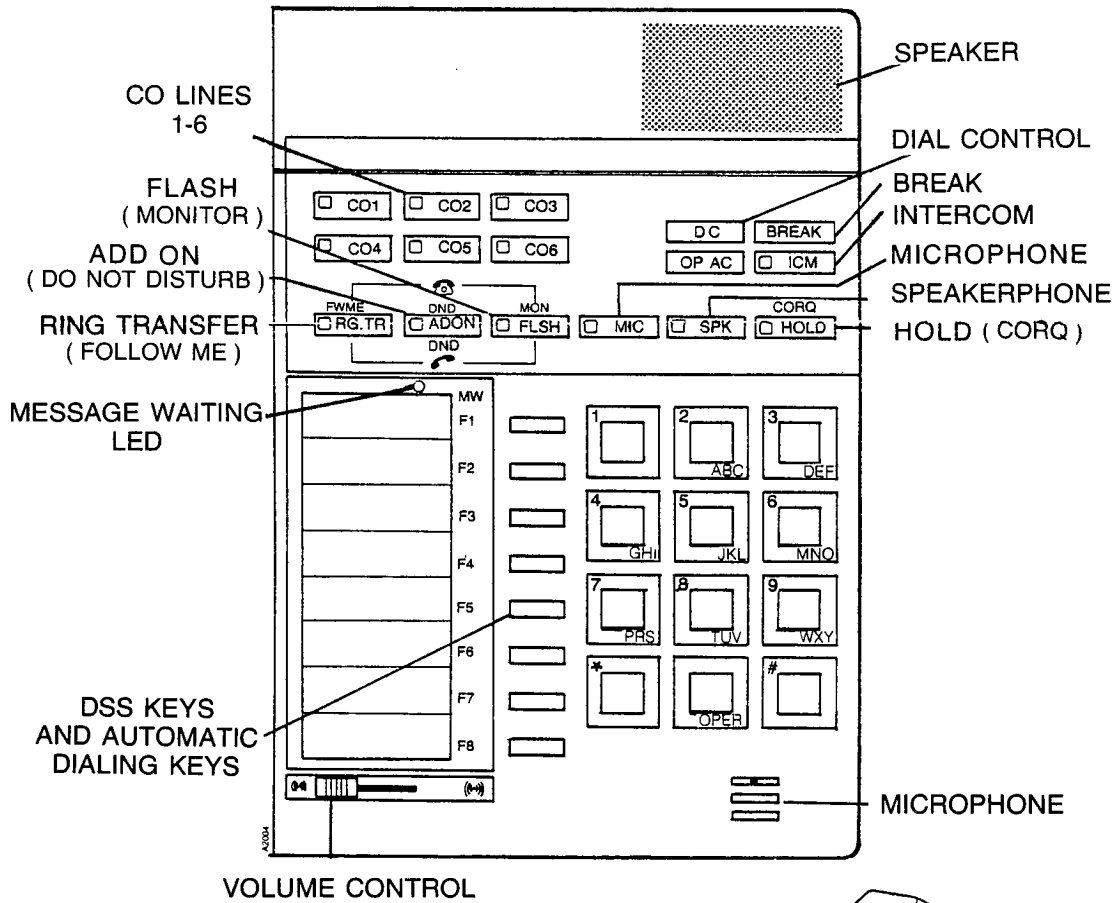
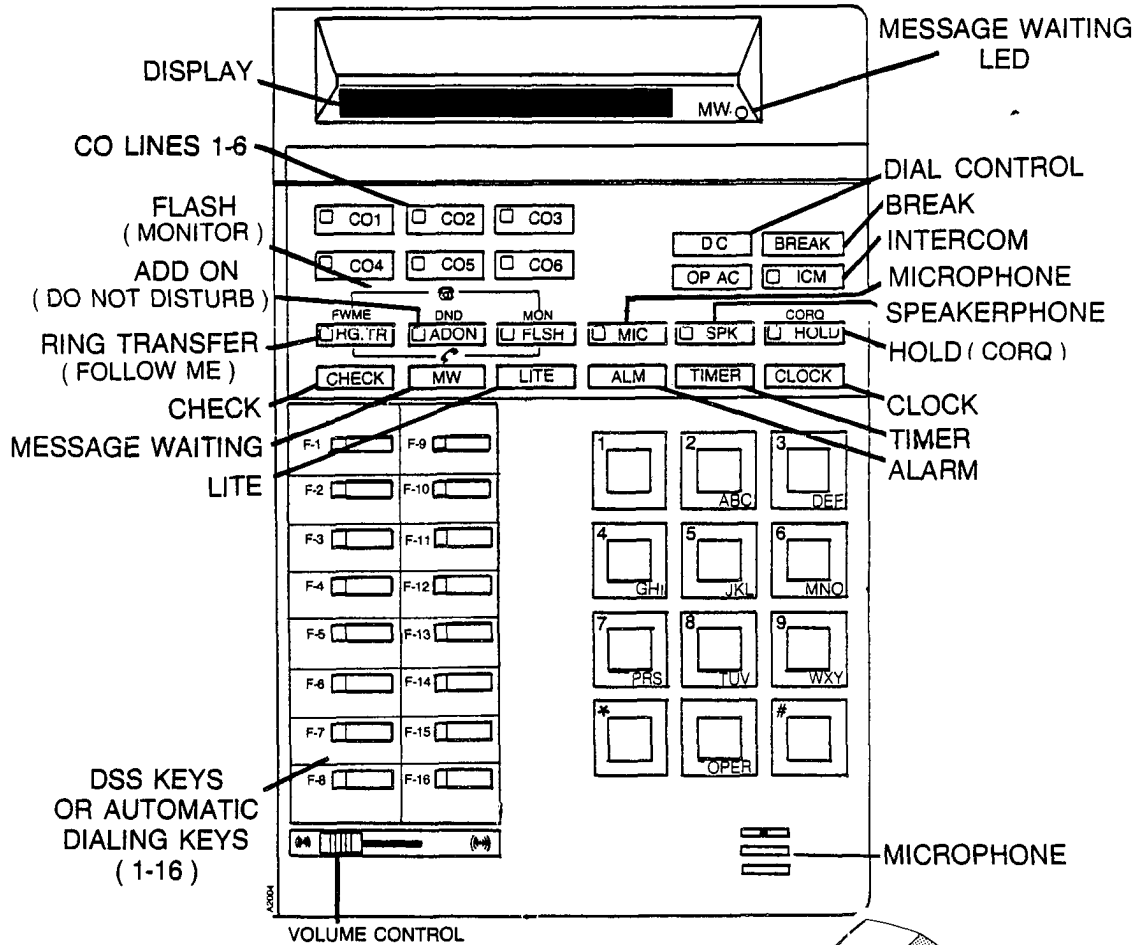


Figure 2-1 KEY TELEPHONE, EK-616, KEY DESIGNATIONS



2



Figure 2-2 EXECUTIVE DISPLAY KEY TELEPHONE, EK-616, KEY DESIGNATIONS

## ALARM CLOCK FEATURE

**3.04** The Executive Display Key Telephone has three Alarm Clock settings: Alarms 1, 2 and 3. Alarms 1 and 2 are non-repeating alarms. Alarm 3 repeats and sounds each day at the same time. The alarm tone will sound for approximately four minutes unless terminated.

## ALTERNATE POINT ANSWER

**3.05** Alternate Point Answer allows Intercom calls to be answered at any station in the same internal zone. If two Intercom calls are made simultaneously, the call to the station with the lowest station number has priority.

## AUTOMATIC DIALER

**3.06** Automatic Dialer is a programmable feature that permits automatic dialing of stored telephone numbers. Each station stores the numbers by using the DSS keys as bin storage location. Each bin accommodates one number that contains up to 20 digits. Automatic Dialer numbers can be chained, i.e. more than one Automatic Dialer number may be included in a dialing sequence. This allows Automatic Dialing numbers to be used with special services such as MCI, SPRINT, etc. Each Standard Key Telephone can store a maximum of 8 numbers; an Executive Display Key Telephone can store up to 16 numbers. Special dialing functions may be included in Automatic Dialer numbers.

## BACKGROUND MUSIC

**3.07** Background Music ( BGM ) can be broadcast through the telephone speaker. This music is automatically turned off when the telephone is in use. Background Music requires a separate music source that the customer must provide.

## BARGE-IN

**3.08** Barge-In is a programmable feature that enables designated stations to intrude upon conversations. There are two types of Barge-In: CO Line Barge-In and Intercom Barge-In. A tone will be heard at a station before another station barges-in. ICM calls in the Handsfree reply mode can be intruded upon only by a tone signal given to the calling party.

Stations are programmed into one of four levels for Barge-In:

### Level 0

(a) Stations without Barge-In.

### Level 1

- (a) Station users can directly intrude upon a CO line call, causing a three-way conversation.
- (b) Intercom calls in the handset to handset mode can also be directly intruded upon.

### Level 2

(a) Intercom calls in the handset to handset mode can be directly intruded upon.

### Level 3

(a) Station users can only intrude upon handset to handset ICM calls with a tone signal.

**NOTE:** The Barge-in feature will disable the Off Hook Tone Signaling feature when a station with Barge-In levels 1 - 3 calls an off hook station assigned Off Hook Tone Signaling.

## CALL MONITOR

**3.09** Call Monitor permits a user to dial a number without lifting the handset. It also allows the user, while on Hold from an outside party, to monitor the call with the handset on hook. The user can hear through the telephone speaker when the outside party returns to the call, and, unless the station has speakerphone capabilities, must lift the handset to be heard by the outside party. If a call is monitored from a station equipped with the Speakerphone feature, the microphone should be turned off.

## CALLBACK

**3.10** After placing an Intercom call to a busy station, a user can request to be called back when the station becomes free. Answering the Callback ring within 20 seconds will automatically dial the number of the station that was previously busy. The Callback ring stops if the initiating party does not answer before the called party becomes busy again. However, the Callback request is not cancelled and will ring the initiating party when the called party becomes free.

## CAMP-ON

**3.11** When an Intercom call is placed to a busy station, the Camp-On feature is used to connect the caller with the called station. When the called station becomes free it will receive an ICM signal. To use the Camp-On feature the calling station must remain off hook.

## CENTRAL OFFICE CALL, INCOMING

**3.12** Incoming calls can be answered at any telephone that is programmed to receive calls on a specific line. Telephones display a distinctive flash rate on the associated line key ( Table 2-1 ). Incoming Central Office ( CO ) calls also provide a distinctive tone signal at the station ( Table 2-2 ).

## CENTRAL OFFICE CALL, OUTGOING

**3.13** Outgoing calls can be initiated from any station that is programmed to place calls on designated CO lines. The dialing mode can be changed from rotary ( pulse ) to tone to accommodate special services that require tone signals.

## CO AUDIBLE DISABLE, STATION

**3.14** Each station can be programmed to disable ( block ) audible signals for incoming CO calls. This feature functions only while the system is in the normal day signaling mode. Other features which involve the transfer or forwarding of incoming audible signals may affect the use of this feature.

## CONFERENCE CALL

**3.15** Two types of conferencing are available: External and Internal. External Conference enables a maximum of two internal stations to be connected to an outside line and up to two outside lines can be included in a conference. Up to two External Conferences can occur simultaneously. The MLCU-6TA PCB is required for External Conference. Internal Conference permits up to five stations to be connected in one intercom conversation.

## DIAL PULSE TO DTMF CONVERSION

**3.16** Dial Pulse to DTMF conversion allows a system that requires dial pulse signaling to use services that need DTMF signaling.

## DIRECT STATION SELECTION

**3.17** Key telephones have Direct Station Selection ( DSS ) keys that provide single key Intercom access to particular stations. Each key corresponds to a particular station. The Standard Key Telephones have eight DSS / Automatic Dialer keys. The DSS key assignments for Standard Key Telephones are determined by the user. The Executive Display Key Telephones have 16 DSS / Automatic Dialer keys. Each key is equipped with an LED which indicates the status of the assigned station. DSS key assignments for the Executive Display Telephone are pre-assigned.

## DISPLAYS

**3.18** The following paragraphs explain the display features unique to the Executive Display Key Telephones.

### *Automatic Dialer Display*

**3.19** Automatic Dialer numbers can be reviewed.

### *Brightness Control*

**3.20** The brightness of the display can be controlled. There are three levels of brightness that can be changed from brighter to dimmer.

### *Call Timer Display*

**3.21** The duration of a call can be timed and displayed.

### *Intercom Display*

**3.22** The display will show the station number of the source of an ICM call. The station number will not be shown if the display is in the stopwatch mode.

### *Message Waiting Display*

**3.23** Pressing the flickering MW key displays the number of the station that placed a Message Waiting indication.

### *Number Dialed Display*

**3.24** The number dialed ( up to 11 digits ) is displayed. When more than 11 digits are dialed, only the last 11 digits dialed are displayed.

### *Speed Dial Display*

**3.25** Speed Dial Display is a feature that displays the number stored in Speed Dial.

### *Stopwatch Display*

**3.26** The Executive Display Key Telephones will serve as a stopwatch and indicate the time in seconds.

### *Time / Date Display*

**3.27** The time and date are normally shown on the display.

## DO NOT DISTURB

**3.28** Do Not Disturb ( DND ) is a programmable feature that blocks all incoming and Intercom audible signals to a station. Callers attempting to reach a station in the DND mode receive a fast busy tone.

## DOOR CHIME BOX

**3.29** The Door Chime Box is an optional Intercom unit equipped with a microphone and speaker to enable Handsfree Reply. When activated, the box sends a chime to an assigned station. The station then places an Intercom call to the Door Chime Box to establish communication. The Door Chime Box can also be used to provide the Door Unlock Control feature. This enables a station user to unlock a door after communicating with the Door Chime Box user. When a system contains more than one Door Chime Box, the Door Unlock Control can only be used at the Door Chime Box assigned the lowest station number.



## EXECUTIVE CALL FORWARD

**3.30** The Executive Call Forward feature forwards all incoming CO and Intercom calls from one station in the Executive Call Forward pair to the other station in the pair. The executive station must be programmed for Do Not Disturb ( DND ). A maximum of 15 pairs of Executive Call Forward partners can be assigned. More than one executive may be assigned to the same partner.

## FLASH

**3.31** The Flash feature provides a new dial tone without losing the CO line. Pressing the FLSH ( MON ) key for less than two seconds will provide the two second flash required by telco for establishing a new dial tone. If the FLSH ( MON ) key is pressed for more than two seconds, the Flash will last as long as the key is pressed. When a line is programmed for Private Branch Exchange ( PBX ) operation, Flash provides a signal to the PBX requesting transfer dial tone. The duration of the Flash may be programmed from 100ms - 25 sec., determined by the requirements of the PBX. If the FLSH ( MON ) key is pressed for more than the programmed duration, the Flash will last longer than the programmed duration. The system is provided with an open loop flash. However, a ground flash may be provided, by mounting a Ground Flash ( GRDU-6A ) PCB on the MLCU-6TA PCB.

## FLEXIBLE AUDIBLE

**3.32** Each station can be programmed to receive CO audible signals for each line, and audible for all CO lines when the system is in the Night Service mode.

## FLEXIBLE LINE ACCESS

**3.33** Each station can be programmed for full access to each line. Each line may be programmed to permit limited access by stations not programmed for full access. Limited access allows answering incoming calls and retrieving calls on hold.

## HOLD

**3.34** Hold is a permanent feature for placing a call in a temporary waiting condition. There are two types of Hold: **I-Hold** and **Exclusive Hold**.

### **I-Hold**

**3.35** I-Hold is a common hold. A call placed on I-Hold can be retrieved at any station that has been programmed to access the line. The appropriate line LED flutters at the telephone where the call was placed on Hold ( I-Hold ). The line LED flashes at all other telephones ( Table 2-1 ). After the programmed I-Hold Reminder time period, the system automatically resignals the station that placed the call on Hold. The duration of the signal is the programmed Recall / Reminder Signal time.

### **Exclusive Hold**

**3.36** Exclusive Hold places a call on Hold and prevents that call from being retrieved at any other station. The call can only be retrieved at the station where the call was originally placed on Hold. At that station, the appropriate line key flickers ( Exclusive Hold ); at other stations, the line key remains steadily illuminated. If the call is not retrieved within the Exclusive Hold Recall time period, the system signals the original station. If the call is still not retrieved after the programmed Recall / Reminder Signal time period, the call reverts to I-Hold and can be retrieved at any station that has been programmed to access the line.

## INTERCOM CALL FORWARD WITH FOLLOW-ME

**3.37** The Intercom Call Forward With Follow-Me feature allows a user to forward Intercom calls to another station ( pages are not forwarded ). The feature must be initiated at the user's own telephone. Intercom calls can be forwarded to other stations from the user's own telephone or from the station to which calls have been forwarded.

## LAST NUMBER REDIAL

**3.38** Last Number Redial is a permanent feature available to all stations that are not restricted from placing an outside call. This feature automatically stores the last number manually dialed from the station ( while on an outside line ) for automatic dialing at a later time. The number is stored until any other number is dialed, whether the call was answered, not answered or busy.

## LINE QUEUING

**3.39** Line Queuing is a programmable feature that enables a station to queue ( wait in line ) for an available CO line in a busy line group. Each station can queue any of the line groups, but can only queue a particular line group once. The system automatically signals the stations, in order, when a line in the line group is available. When a line in the group becomes available, the line LED flickers and the recall tone is given at the next station in the queue. If the line is not accessed within 20 seconds, the line is made available to the next station in the queue. A busy station will be bypassed. The line is offered when the station becomes idle.

## MEET-ME ANSWER PAGING

**3.40** Meet-Me Answer Paging is a programmable feature that enables a user to transmit a page to locate a specific person and then establish a private handset-to-handset conversation. Initiating a page renders the paged zone and All Call unavailable for 30 seconds or until the conversation is established.

**NOTE:** Only stations in the paged zone may respond unless the All Call page is used.

## MEET-ME CONFERENCE

**3.41** Up to five stations in the same internal page zone can join in a Conference that is initiated by a page. When Meet-Me Conference is initiated All Call and the paged zone are unavailable for 30 seconds or until five stations are in conference. A splash tone is heard when parties are joined.

**NOTE:** Only stations in the paged zone may respond, unless the All Call Page is used.

## MESSAGE WAITING

**3.42** The Message Waiting feature provides an indication at a called station that does not answer. The indication is a fluttering MW LED at the called station and a flickering MW LED at the calling station.

## MICROPHONE MUTE

**3.43** The Microphone Mute feature allows the user to turn the microphone in the key telephone on or off. When the microphone is off, the Microphone Mute feature provides privacy at a muted station during a conversation by preventing the other party from hearing what is being said at that station. If the Microphone Mute mode is selected while the telephone is idle, the user must press the MIC key to respond to incoming voice announced ICM calls. Both parties receive a double splash tone indicating that the called station is in the Microphone Mute mode. Key telephones equipped with the Speakerphone can also turn the microphone off (mute the microphone) while on an outside call to monitor the call. The LED on the MIC key is illuminated when the microphone is turned off.

## MUSIC-ON-HOLD

**3.44** Music-On-Hold (MOH) provides music to outside lines when they are placed on Hold. MOH can use an external music source or the internal music source provided by the system.

## NIGHT SERVICE

**3.45** The Night Service feature permits designated stations to receive incoming CO audible signals and alarm signals. This feature is normally used at night. There are two types of Night Service: **Night Service, Preset** and **Night Service, Selectable**.

### **Night Service, Preset**

**3.46** Night Service, Preset is activated at Station 10. Telephones to receive night signaling are designated during system programming. When placed in the Night Service mode, designated stations receive all audible signals for all incoming calls and alarm signals.

### **Night Service, Selectable**

**3.47** Night Service, Selectable permits the Station 10 user to transfer CO ringing normally received by Station 10 to other stations in the system. This feature is activated from Station 10. This feature is intended for use in place of Night Service, Preset when it is not desirable to send CO audible for private lines to other stations at night.

**NOTE:** When Night Service, Selectable is activated, Night Service, Preset is also activated.

## OFF HOOK TONE SIGNALING

**3.48** Off Hook Tone Signaling is a programmable feature that provides visual and audible signals of an ICM and incoming CO call to a user who is off hook (Tables 2-1 and 2-2). This feature is automatic when programmed.

**NOTE:** An off hook station will not receive off hook signals when called from a station programmed for Barge-In levels 1 - 3.

## PAGING

**3.49** Paging is a system programmable feature. There are three types of paging: **All Call Page** to page the entire system, **Internal Zone Page** to page selected areas, and **External Zone Page** to page through optional external paging equipment.

### **All Call Page**

**3.50** An All Call Page is broadcast over all stations and external paging zones that are programmed to receive page announcements.

### **Internal Zone Page**

**3.51** Internal Zone Page provides paging to a select group of stations. Telephones are programmed into paging zones during installation. A maximum of three internal page zones can be programmed. Paging can be by individual zone or simultaneously on all three internal zones.

### **External Zone Page**

**3.52** Optional paging equipment can be added to the system to receive pages. This equipment is referred to as external zones. A maximum of two external zones can be programmed. External paging equipment can be assigned during programming to receive CO audible. The incoming CO line call can then be answered at any key telephone which receives that line.



2

**PLACING INTERCOM CALLS**

**3.53** The Intercom ( ICM ) feature is used to call another station. The system is programmed for one of two signaling modes: Voice Announce, which allows handsfree reply over the Intercom voice switch circuit, or Intercom Ring, which requires handset ( private ) reply. When the system is programmed for Voice Announce, ringing will occur when the system capacity of voice switch circuits is reached. The talkback timer can be programmed to limit the time of an ICM call in the Handsfree Reply mode. When the call exceeds the programmed talkback time the voice switch circuit is released and the called station receives ICM tone ringing.

**NOTE:** Voice Announced calls to stations with Speakerphone capabilities will not be affected by the talkback timer.

**POWER FAILURE TRANSFER**

**3.54** Power Failure ( PF ) Transfer is a permanent feature that enables stations to answer incoming calls during a power failure. During a service interruption, Standard Key Telephones can only receive calls and require the installation of a PF bell. Executive Display Key Telephones receive CO audible and allow a user to dial a call. Stations are assigned access to CO lines during a power failure as follows:

| CO Line Number | Station Number with RMSU | Stations Numbers with RMXU-6A PCB |
|----------------|--------------------------|-----------------------------------|
| 1              | 10                       | 10 and 11                         |
| 2              | 13                       | 13 and 14                         |
| 3              | 16                       | 16 and 17                         |
| 4              |                          | 18 and 19                         |
| 5              |                          | 21 and 22                         |
| 6              |                          | 24 and 25                         |

**PRIVATE BRANCH EXCHANGE LINES**

**3.55** Each CO line may be assigned for operation behind a Private Branch Exchange ( PBX ). PBX access codes must be programmed into system memory to allow proper operation of toll restriction and Class of Service. The duration of the flash is programmable for PBX lines.

**RELEASE OF ABANDONED CALL ON HOLD**

**3.56** Release of Abandoned Call on Hold returns a line to an idle condition if an outside party waiting on hold hangs up. This occurs if an open loop disconnect is given from the telco office. The system can be programmed to recognize a disconnect signal from 20 milliseconds to 2 seconds.

**ROOM MONITOR**

**3.57** The Room Monitor feature enables a station user to monitor sounds in a room where a key telephone or Monitor Box is located. Both stations must be in the Monitor mode. The monitored station LED flutters. The monitoring station LED flickers ( Table 2-1 ). Refer to Section 9, OPTIONAL EQUIPMENT for Monitor Box operation.

**SAVE**

**3.58** The Save feature stores the last manually dialed outside number for automatic dialing at a later time. The number will be erased when a new number is saved.

**SPEAKERPHONE**

**3.59** The Speakerphone allows full handsfree communication on ICM or CO line calls. The Speakerphone is standard with the Executive Display Key Telephones; the Standard Key Telephones require the installation of an optional PCB ( see Section 9 ).

**SPECIAL DIALING FUNCTIONS**

**3.60** Special Dialing Functions, including a programmable pause, flash, stop or change of dialing mode, may be included in an Automatic Dialer or Speed Dial number. Any Special Dial Function counts as a digit in the stored number.

**SPECIAL LINE ACCESS**

**3.61** During system programming, selected lines may be assigned as Private Lines. These lines may be programmed to completely deny access by other stations. Limited line access may also be programmed to allow other stations to pick lines up ( if on Hold ) or answer them ( if an incoming call ).

**SPEED DIAL**

**3.62** Speed Dial allows up to 60 telephone numbers, with up to 20 digits each to be stored in system memory, in addition to those stored in the Automatic Dialer. They are programmed into the system at station 10. The numbers are accessed by a two digit code and are available to every station that is not restricted by programming. Speed Dial numbers can be chained, i.e. more than one Speed Dial number can be included in a dialing sequence. This accommodates special services such as MCI, SPRINT, etc. In addition, Special Dialing Functions may be included in a Speed Dial number.

**THREE-MINUTE WARNING TONE**

**3.63** The system can be programmed to automatically provide the calling station with a signal every three minutes during an outgoing call.

**TOLL RESTRICTION**

**3.64** Toll Restriction is a system programmable feature that prohibits selected stations from placing unauthorized long distance ( toll ) calls. Stations can be restricted to internal and local calls, depending on the Class of Service for that station.

**TRANSFER**

**3.65** Transfer is a permanent feature used to send an outside call from one station to another. Calls are transferred using either Voice Announcements or the Ring Inward mode. A call on a common CO line can be transferred using the dial Intercom or the DSS keys. The station from which the transfer originated will receive a reminder tone for the appropriate CO line if the called station does not answer after the programmed Ring Inward or I-Hold Reminder time, based on the Transfer mode used.



**Table 2-1 VISUAL INDICATIONS ON KEY TELEPHONES, EK-616**

| FUNCTION   | LED           | INDICATION      |
|--|---------------|-----------------|
| <b>CO LINE</b>   |               |                 |
| Busy   | CO            | Steady          |
| Exclusive Hold ( Initiating Stations )                         | CO            | 120 IPM Flicker |
| Exclusive Hold ( All Other Stations )                          | CO            | Steady          |
| I-Hold ( Initiating Stations )                                 | CO            | 300 IPM Flutter |
| I-Hold ( All Other Stations )                                  | CO            | 120 IPM Wink    |
| Incoming Call  | CO            | 60 IPM Flash    |
| <b>INTERCOM</b>  |               |                 |
| Incoming Intercom Call   | ICM           | 300 IPM Flutter |
| Intercom Line Busy   | ICM           | Steady          |
| <b>MISCELLANEOUS</b>   |               |                 |
| Do Not Disturb   | ADON ( DND )  | Steady          |
| Executive Call Forward   | ADON ( DND )  | 60 IPM          |
| Intercom Call Forward with Follow-Me<br>( Initiating Station ) | RGTR ( FWME ) | 120 IPM Flicker |
| Intercom Call Forward with Follow-Me<br>( Receiving Station )  | RGTR ( FWME ) | 300 IPM Flutter |
| Line Queue Accepted  | HOLD ( CORQ ) | 120 IPM Flicker |
| Line Queue Requested   | HOLD ( CORQ ) | Steady          |
| Message Waiting called station                                 | MW            | 300 IPM Flutter |
| Message Waiting calling station                                | MW            | 120 IPM Flicker |
| Microphone Off   | MIC           | Steady          |
| Monitored Station  | FLSH ( MON )  | 300 IPM Flutter |
| Monitoring Station   | FLSH ( MON )  | 120 IPM Flicker |
| Night Service, Selectable                                      | RGTR ( FWME ) | Steady          |
| Speakerphone Enabled   | SPK           | Steady          |

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**Table 2-2 AUDIBLE SIGNALS ON KEY TELEPHONES, EK-616**

| TYPE OF AUDIBLE                       | FREQUENCY AND DURATION                                       |
|---------------------------------------|--|
| Alarm Clock                           | 1170 Hz, 0.1Sec. ON / 0.1Sec. OFF                            |
| CO Line Automatic Recall and Queue    | 580 Hz AM, 0.5Sec. ON / 0.5Sec. OFF                          |
| CO Line Incoming Call                 | 580 Hz AM, 1Sec. ON / 3Sec. OFF                              |
| Door Box Chime - 1                    | FAST CHIME, 0.25Sec. ON / 0.5Sec. OFF                        |
| Door Box Chime - 2                    | SLOW CHIME, 0.5Sec. ON / 1.0Sec. OFF                         |
| Emergency - Sensor in Operation       | 580 Hz, 0.1Sec. ON / 0.1Sec. OFF                             |
| Follow-Me Denied                      | 440 Hz, 5 SPLASH   |
| Intercom Call ( Busy Tone )           | 440 Hz, 0.5Sec. ON / 0.5Sec. OFF                             |
| Intercom Call ( Do Not Disturb Tone ) | 440 Hz, 0.1Sec. ON / 0.1Sec. OFF<br>0.1Sec. ON / 0.7Sec. OFF |
| Intercom Ring Tone                    | 630 Hz / 530 / 16 Hz FM, 1.0Sec. ON / 1.0Sec. OFF            |
| Intercom Voice-Announce Splash Tone   |  |
| With Handsfree Reply                  | 440 Hz, 1 SPLASH   |
| With ICM MIC MUTE                     | 440 Hz, 2 SPLASH   |
| Intrusion Tone                        | 440 Hz, 2 SPLASH, 0.1Sec. ON / 0.1Sec. OFF / 0.1Sec. ON      |
| Line Queue Accepted                   | 440 Hz, 1 SPLASH   |
| Line Queue Denied                     | 440 Hz, 5 SPLASH   |
| Voice Paging Splash Tone              | 440 Hz, 2 SPLASH   |

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**Table 2-3 KEY CALLOUT CROSS REFERENCE, EK-616**

| FUNCTION               | 616 STANDARD  | 616 EXECUTIVE DISPLAY |
|------------------------|---------------|-----------------------|
| Alarm                  | BREAK         | ALM                   |
| Alternate Point Answer | DC            | BREAK                 |
| Automatic Dialer       | DC            | DC                    |
| Barge-In               | BREAK         | BREAK                 |
| Callback               | *             | *                     |
| Call Monitor           | SPK           | SPK                   |
| Camp-On                | *             | *                     |
| Conference             | ADON ( DND )  | ADON ( DND )          |
| Date and Time          |               | CLOCK                 |
| Do Not Disturb         | ADON ( DND )  | ADON ( DND )          |
| Flash                  | FLSH ( MON )  | FLSH ( MON )          |
| Hold                   | HOLD ( CORQ ) | HOLD ( CORQ )         |
| Intercom               | ICM           | ICM                   |
| Intercom Call Forward  |               |                       |
| With Follow-Me         | RGTR ( FWME ) | RGTR ( FWME )         |
| Last Number Redial     | DC            | DC                    |
| Message Waiting        | *             | *                     |
| Microphone Mute        | MIC           | MIC                   |
| Night Service          | RGTR ( FWME ) | RGTR ( FWME )         |
| Room Monitor           | FLSH ( MON )  | FLSH ( MON )          |
| Save                   | DC            | DC                    |
| Speakerphone           | SPK           | SPK                   |
| Speed Dial             | DC            | DC                    |
| Stopwatch              |               | TIMER                 |
| Timer                  |               | TIMER                 |

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# EK-616

## ELECTRONIC KEY TELEPHONE SYSTEM

### SECTION 3, SYSTEM CONFIGURATION

#### 1. INTRODUCTION

**1.01** The SYSTEM CONFIGURATION Section provides information to help meet the particular equipment needs of the customer. The Option Configuration Worksheets ( OCWs ) are used to gather specific system and station data for ordering equipment and completing the Program Record Forms ( PRFs ) in Section 4.

**1.02** Key callouts have been revised. Feature descriptions enhanced per engineering input.

#### 2. DESCRIPTION OF COMPONENTS

**2.01** The following paragraphs describe the component parts of an EK-616 system: the Key Service Unit ( KSU ) / Power Supply, and Printed Circuit Boards ( PCBs ).

##### KEY SERVICE UNIT / POWER SUPPLY

**2.02** The KSU / Power Supply, contained in the same unit, houses the PCBs and provides connector plugs to join two 25-pair cables to the 66M1-50 Connecting Blocks. These blocks are used to cross-connect stations, power failure extension bells, alarm sensors, music source and amplifier for external loud speakers. Six modular jacks are provided for Central Office ( CO ) connections. The KSU is equipped with a Relay Matrix Shorting PCB ( RMSU-A ).

**2.03** The KSU cabinet for the EK-616 system can accommodate up to 16 stations, six CO lines and six Intercom ( ICM ) links.

#### PRINTED CIRCUIT BOARDS

##### *Main Common Control PCB*

**2.04** The Main Common Control ( MCCU-6TA ) PCB contains an 8-bit microprocessor for system control and two 4-bit microprocessors that control CO line signaling and data transmission between the main Central Processing Unit ( CPU ) and stations. In addition, the MCCU-6TA PCB contains circuitry for matrix control, internal tone generators, alarm connections, Background Music, Music-On-Hold and system memory.

##### *CO Line / Key Station Interface PCB*

**2.05** The CO Line Key Station Interface ( 3X8U-TA ) PCB provides circuitry to connect three common CO lines, and eight key stations, matrix switches for three CO lines and four ICM links, and a voice switch circuit for Handsfree reply on ICM calls.

##### *Matrix Expansion PCB*

**2.06** A Matrix Expansion ( RMXU-6A ) PCB is required in addition to another CO line / key station interface when the system has more than three CO lines, requires ICM links 5 and 6, and / or if two stations are required for each line during Power Failure Transfer ( PF ) operation.

##### *Matrix Shorting PCB*

**2.07** A Matrix Shorting ( RMSU-A ) PCB is used in place of the Matrix Expansion PCB when only three CO lines, four ICMs and one PF station for each line are used in the system. This PCB is shipped in the KSU.

##### *Line Circuit Protection PCB*

**2.08** A Line Circuit Protection ( LPTU-6A ) PCB is required to provide lightning and surge protection for the tip and ring of each CO line.

### **Multi-line Conference PCB**

**2.09** A Multi-line Conference ( MLCU-6A ) PCB must be installed for external conference. It maintains the audio level when several stations are in conference.

### **Speakerphone PCB**

**2.10** The Speakerphone ( SPDU-6A ) is standard in the Executive Display Key Telephone and optional in the Standard Key Telephone. This PCB provides the key telephone with full speakerphone capabilities, and replaces the Call Monitor ( FTDU-6A ) PCB equipped in the Standard Key Telephone.

### **Ground Flash PCB**

**2.11** The optional Ground Flash ( GRDU-6A ) PCB is mounted on the MLCU-6A and is used in systems requiring PBX Ground Flash.

### **Flash - Item 5**

**3.07** When the FLSH ( MON ) key is pressed, an open loop or ground Flash signal is sent by the line circuit. Indicate type of flash required ( OPEN LOOP/GROUND ) for each line.

### **Queue Groups - Item 6**

**3.08** Similar lines ( i.e. Common CO, WATS, FX etc. ) can be organized into groups ( up to six ). These groups allow a station user to queue ( wait in line ) for an available outside line in a busy line queue group. Indicate how many queue groups are desired and which lines should be arranged into each group.

### **Special Line Access - Item 7**

**3.09** An individual station user or limited number of station users may have exclusive use of a certain line. Limited access to these lines may be desired for all station users. Determine which lines, programmed for private use by a limited number of station users, should permit limited access to all other station users.

### **External Page Zones - Item 8**

**3.10** An external page zone requires the installation of ancillary equipment. For each external page zone output, indicate if External Page is required ( YES / NO ). For each line indicate if the External Page equipment is to receive CO audible signals ( YES / NO ).

### **Release of Abandoned Call On Hold - Item 9**

**3.11** Release of Abandoned Call On Hold returns a line to an idle condition if the party on Hold hangs up. For each line, indicate if Release of Abandoned Call on Hold is required ( YES / NO ).

### **Alarm - Item 10**

**3.12** Alarm signals activated by customer provided equipment can be transmitted to telephones in the system. For each alarm circuit, indicate if such equipment will be installed ( YES / NO ) and whether the equipment purchased transmits an open or closed circuit alarm indication ( OPEN / CLOSED ).

### **Meet-Me-Answer Paging and Meet-Me-Conference - Item 11**

**3.13** Meet-Me-Answer Paging enables a user to transmit a page to locate a specific person and then establish a private handset-to-handset conversation.

**3.14** Meet-Me-Conference enables up to five stations in the same Internal Page Zone to join in a conference that is initiated by a page. Indicate if the Meet-Me-Answer Paging and Meet-Me-Conference features are desired ( YES / NO ).

### **Signal Calling or Voice Announce - Item 12**

**3.15** The system can be programmed to allow one of two methods of Intercom signaling: either the called station will ring ( Signal Calling ), requiring the party to reply using the handset or the called party will receive voice announcements and can reply handsfree ( Voice Announce ). If the system is programmed to allow the Handsfree Reply, the caller can also cause the called station to ring. If the system is programmed for Intercom ringing, Handsfree Reply is not available. Indicate the type of ICM signaling desired ( SIGNAL CALLING / VOICE ANNOUNCE ).

## **3. COLLECTION OF DATA**

**3.01** Three OCWs are provided in this section to help define a customer's needs. There is a System OCW ( Table 3-1 ), the Permitted Codes OCW ( Table 3-2 ) and Station OCW ( Table 3-3 ). When completed, these worksheets will provide sufficient information to order the required hardware and to complete the Program Record Form in Section 4 of this manual.

## **SYSTEM OPTIONS**

**3.02** The following paragraphs provide instructions for completing the System OCW ( Table 3-1 ).

### **Outside Lines - Item 1**

**3.03** The EK-616 system can accommodate six outside lines. Outside lines include common, Wide Area Telephone Service ( WATS ), Foreign Exchange ( FX ), Private and other specialized services. Indicate how many outside lines are needed ( 1-6 ).

### **Stations - Item 2**

**3.04** Up to 16 stations can be installed. Stations include: Standard Key Telephones, Executive Display Key Telephones, Door Chime Boxes and Monitor Boxes. After completing Table 3-3, indicate the total number of stations required.

### **CO Line Signaling - Item 3**

**3.05** The system can send either tone or pulse signaling on each CO line. Indicate the type of telephone service ( TONE/PULSE ) required for each line.

### **PBX Lines - Item 4**

**3.06** When a system is installed behind a Private Branch Exchange ( PBX ) trunk access codes may be required for a station user to access an outside line. Indicate which lines ( 1-6 ) will be installed behind a PBX.

### **Three Minute Warning Tone - Item 13**

**3.16** The system can transmit a signal to the telephone loudspeaker every three minutes during an outside line conversation. Indicate if the Three Minute Warning Tone feature is desired ( YES / NO ).

### **Power Failure Bell - Item 14**

**3.17** In the event of a power failure, an external bell rings following the incoming signal. An external bell is only required for Standard Key Telephones. Indicate the number of Power Failure External Bells required for each line.

### **Background Music - Item 15**

**3.18** Background Music ( BGM ) requires an optional external music source and can be broadcast over the speakers in the key telephones. Indicate if BGM is required ( YES / NO ).

### **Music-On-Hold - Item 16**

**3.19** Music-On-Hold ( MOH ) can use an optional external music source or internal synthesized music. Indicate if MOH is required ( YES / NO ) and specify the music source ( EXTERNAL / INTERNAL ).

### **I-Hold Reminder - Item 17**

**3.20** When a call is placed on I-Hold and is not retrieved after a programmed period of time, the system automatically signals the station at which the call was placed on I-Hold. This programmed period of time is the I-Hold Reminder Time. Indicate the length of time, in seconds, a call may remain on I-Hold before receiving the reminder signal ( maximum: 250 seconds ).

### **Exclusive Hold Recall - Item 18**

**3.21** If a call placed on Exclusive Hold is not retrieved within a programmed period of time, the system signals the original station. This programmed period of time is the Exclusive Hold Recall Time. Indicate the length of time, in seconds, a call may remain on Exclusive Hold before receiving the recall signal ( maximum: 250 Sec. ).

### **Recall / Reminder Signal - Item 19**

**3.22** If a call placed on I-Hold or Exclusive Hold is not retrieved after the programmed time period, the station at which the call was placed on hold will receive an audible signal. The duration of this signal is the Recall / Reminder Signal time. Indicate the required length of time in seconds ( maximum: 250 Sec. ).

### **Ring Inward Time - Item 20**

**3.23** The Ring Inward Timer determines the length of transfer audible at the receiving station before the call reverts to the station which initiated the transfer. Indicate the required length of time in seconds ( maximum: 250 Sec. ).

### **Talkback Time - Item 21**

**3.24** The Intercom voice switch used for Handsfree Reply is released when an Intercom call continues longer than a programmed period of time. This period of time is the programmed Talkback Time. Indicate the required length of time in seconds ( maximum: 250 Sec. ). Enter "0" for uninterrupted talkback.

### **Flashing Timer - Item 22**

**3.25** When a line is programmed for PBX operation, a signal is sent to the PBX requesting a transfer dial tone whenever the Flash feature is used. Indicate the desired Flash Time ( 100ms. - 25 seconds ).

### **Pause Behind a PBX - Item 23**

**3.26** A programmed pause may be inserted between a PBX Access Code and a telephone number in a Speed Dial or Automatic Dialer number. Indicate the desired duration for a pause ( 100ms. - 25 seconds ).

### **Toll Restriction**

**3.27** The system can be programmed to prohibit selected stations from placing unauthorized long distance ( toll ) calls.

**3.28** Restricted stations may be programmed to access Permitted Codes. A Permitted Code allows a station to make a call to an area code which is normally inaccessible to telephones within the system, or a 1 + 800 ( WATS ) number. Decide how many Permitted Codes ( up to 16 twenty digit codes ) your system is to have and what the codes will be. Enter these codes on the portion of Table 3-2 labeled PERMITTED CODES.

**3.29** If the system is installed behind a PBX, PBX Access Codes must be assigned to PBX lines to allow stations to access outside lines. Although the PBX Access Code is usually designated as '9', other codes may be used. Up to four PBX Access Codes, of up to two digits each, may be used. Enter the desired codes on the portion of Table 3-2 labeled PBX ACCESS CODES.

**3.30** Restricted stations may be programmed to access Common Unrestricted Codes. Up to 8 Common Unrestricted Codes, of up to four digits each, may be entered into the system to allow all stations to access emergency assistance ( 911 ), directory assistance ( 1411 ) etc. Determine what the applicable codes are, and enter the desired codes on the portion of Table 3-2 labeled COMMON UNRESTRICTED CODES.

## **STATION OPTIONS**

**3.31** The Station OCW ( Table 3-3 ) is used to assign the features and type of station instrument to each station. Stations are listed by station number, in ascending order, in the left-most column of the table. The following paragraphs provide instructions for completing the Station OCW.

### **Name of Station User - Column 1**

**3.32** Enter the name of the station user next to the corresponding station number.

### **Type of Station Instrument - Column 2**

**3.33** Indicate the type of station instrument and if it is to be wall mounted ( W ). Station instruments include Standard Key Telephones, Executive Display Key Telephones, Door Chime Boxes and Monitor Boxes.



**Line Access - Column 3**

**3.34** Check those lines which should be accessed by a particular station.

**CO Audible - Column 4**

**3.35** Check those lines which should ring at a particular station.

**NOTE:** Make sure that stations have full or limited access to the selected lines.

**CO Audible Disable, Station - Column 5**

**3.36** Incoming CO ringing is blocked when the RGTR ( FWME ) key is pressed while the handset is off hook and the telephone is idle.

**Night Service, Preset - Column 6**

**3.37** Check those stations designated for Night Service, Preset.

**NOTE:** Be sure that stations have full or limited access to all lines.

**Do Not Disturb - Column 7**

**3.38** If programmed, stations can block all incoming CO and ICM calls. Check stations that should have this feature.

**Executive Call Forward - Column 8**

**3.39** Fifteen pairs of stations ( executive, executive partner ) can be set up so that calls to one of the stations in a pair will automatically be forwarded to the other station in the same pair. If the station is an executive station and is to have this feature, enter the number of the other station in the pair. More than one executive can be programmed to one partner. Executive must be programmed for DND.

**Off Hook Tone Signaling - Column 9**

**3.40** Off Hook Tone Signaling can be provided for incoming CO or ICM calls when the station is off hook on another call. Check stations that should have this feature.

**Barge-In - Column 10**

**3.41** If programmed, stations can intrude upon conversations in progress. Indicate the Barge-In level required for each station ( 0-3 ).

**Level 0**

(a) Stations without Barge-In

**Level 1**

- (a) Station users can directly intrude upon a CO line call, causing a three-way conversation.
- (b) Intercom calls in the handset to handset mode can also be directly intruded upon.

**Level 2**

(a) Intercom calls in the handset to handset mode can be directly intruded upon.

**Level 3**

(a) Station users can only intrude upon handset to handset ICM calls with a tone signal.

**Door Chime Station - Column 11**

**3.42** Stations can receive door chime tones. Check stations that should have this feature.

**Internal Page Zone - Column 12**

**3.43** Indicate the internal paging zone for each station ( 81, 82, or 83 ).

**Alarm - Column 13**

**3.44** Check stations that should receive alarm signals.

**Toll Restriction ( Class Of Service ) - Column 14**

**3.45** Dialing restrictions can be placed on a particular station. Indicate the Class of Service required for each station.

- 0 = No dial restrictions
- 1 = No dial restrictions
- 2 = Can dial permitted codes or common unrestricted codes.
- 3 = Can dial permitted codes, local 7-digit numbers and common unrestricted codes.
- 4 = Can dial permitted codes, local 7-digit numbers, "1" + 7-digit toll numbers and common unrestricted codes.
- 5 = Can dial local 7-digit numbers, "1" + 7-digit toll numbers and common unrestricted codes.
- 6 = Can dial local 7-digit numbers and common unrestricted codes.
- 7 = Can dial common unrestricted codes.
- 8 = Can dial ICM calls.

## 4. ORDER REQUIREMENTS

**4.01** Use the following guide to determine overall equipment requirements for installation ( Figure 3-1 ). Complete Table 3-4 using the OCWs ( Tables 3-1, 3-2, and 3-3 ).

(a) For each CO line installed in a system the telephone company installs an RJ11C modular jack not more than 25 feet from the KSU. To connect each RJ11C modular jack to the KSU a 4-wire modular line cord is used.

Determine how many 4-wire modular line cords are needed for connecting the RJ11C modular jacks to the KSU. ( Refer to Table 3-1, item 1, for the number of lines to be installed in the system. ) These must be ordered separately.

(b) 66M1-50 connecting blocks are used for station and miscellaneous connections.

One connecting block ( B1 ) is used to cross-connect:

- 1. Stations with ICM numbers 10-17 ( refer to Table 3-1, item 2 for the number of stations to be installed in the system ).
- 2. Power Failure External Bells for lines 1-3 ( refer to Table 3-1, item 14 ).
- 3. One alarm sensor ( refer to Table 3-1, item 10 ).
- 4. One paging amplifier ( refer to Table 3-1, item 8 ).
- 5. BGM source ( refer to Table 3-1, item 15 ).
- 6. MOH external source ( refer to Table 3-1, item 16 ).
- 7. Door facility control contact.

3

A second connecting block ( B2 ) is used to cross-connect:

1. Stations with ICM numbers 18-25.
2. Power failure bells for lines 4-6.
3. A second alarm sensor.
4. A second paging amplifier.
5. Energy Control System ( ECS ).

Determine if one or two 66M1-50 connecting blocks are needed.

(c) 25 pair cable with a 50 pin female connector on one end joins the KSU to the 66M1-50 blocks. The female connector is inserted into a 50 pin male plug on the KSU; the other end of the cable is wired to the 66M1-50 block.

(d) A 625A4 or 625F4 modular station jack is used to connect each:

1. Standard Key Telephone ( refer to Table 3-4 ).
2. Executive Display Key Telephone ( refer to Table 3-4 ).
3. Monitor Box ( refer to Table 3-4 ).

Determine how many 625A4 or 625F4 modular station jacks are needed.

(e) An AC line surge protector is recommended to protect the PSU, and a 14 AWG insulated copper wire is required to ground the KSU.

(f) Two pair twisted station cable is used to connect the 66M1-50 blocks to:

1. Each modular station jack.
2. Power failure bells.
3. Alarm sensors.
4. Door Chime Boxes ( Table 3-4 ).
5. Paging amplifiers.
6. BGM.
7. MOH external source.
8. ECS.

The standard telephony color code for two pair twisted inside wire is as follows:

|         |         |
|---------|---------|
| Pair #1 | WHT-BLU |
|         | BLU-WHT |
| Pair #2 | WHT-ORN |
|         | ORN-WHT |

**NOTE:** Color code may vary depending on wire manufacturer.

Determine how much station cable is needed.

(g) Mounting hardware depends on the installation site, standard practices and national or local codes.

(h) Determine the location of the dedicated AC line. Be sure that this line will be available at the time of system installation.

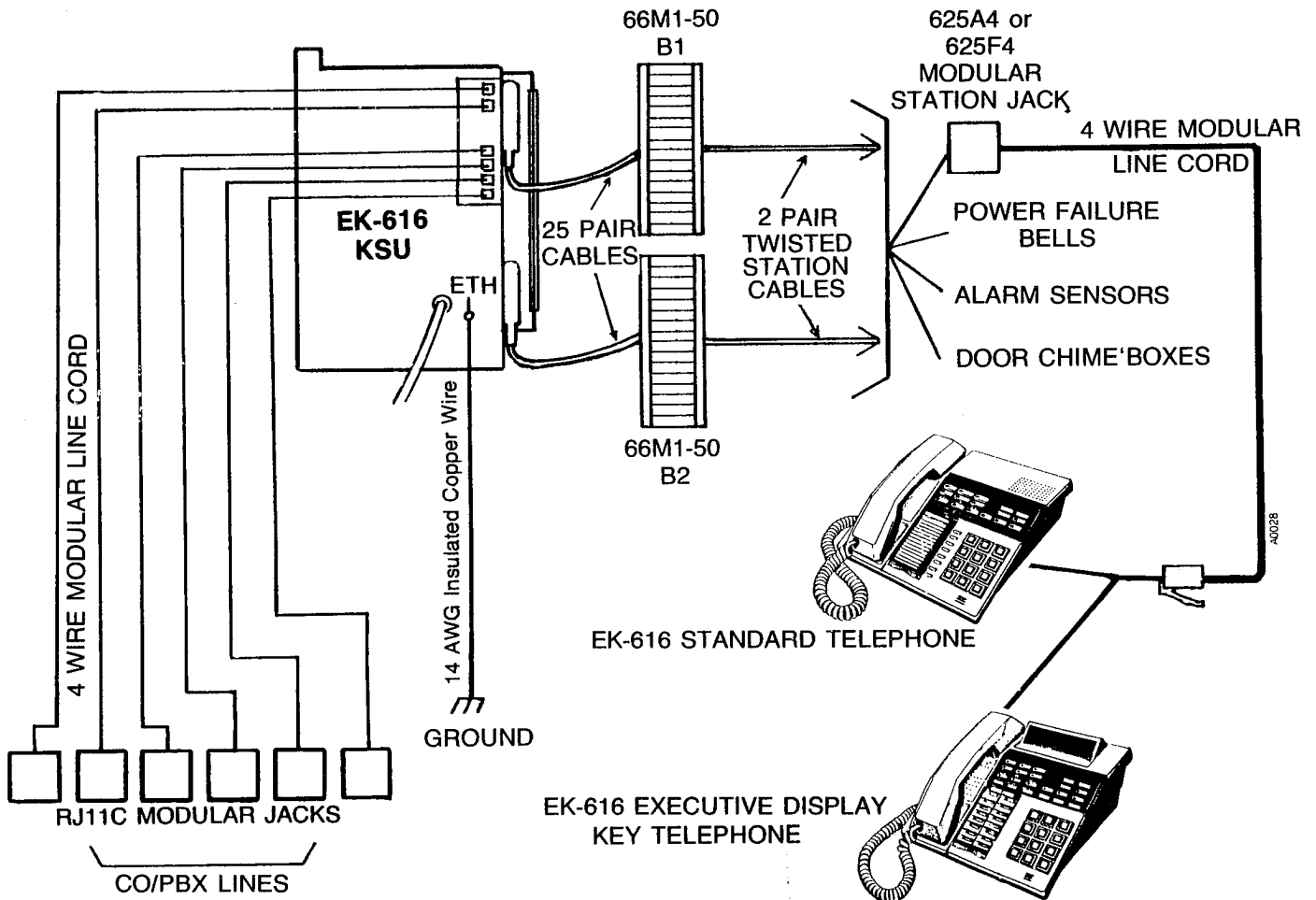


Figure 3-1 STATION EQUIPMENT, EK-616

Table 3-1 SYSTEM OPTION CONFIGURATION WORKSHEET, EK-616

| 1.    | Outside Lines ( max. 6 )                        | _____  |       |   |   |   |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| 2.    | Stations ( max. 16 )                            | _____  |       |   |   |   |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 3.    | CO Line Signaling                               | <table border="1"> <thead> <tr> <th colspan="6">LINES</th> </tr> <tr> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> </tr> </thead> <tbody> <tr><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table> | LINES |   |   |   |  |  | 1 | 2 | 3 | 4 | 5 | 6 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| LINES |   |  |       |   |   |   |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1     | 2   |  | 3     | 4 | 5 | 6 |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| 4.    | PBX Lines                                       |  |       |   |   |   |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5.    | Flash   |  |       |   |   |   |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6.    | Queue Groups                                    |  |       |   |   |   |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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|       | Group #4  |  |       |   |   |   |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|       | Group #5  |  |       |   |   |   |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|       | Group #6  |  |       |   |   |   |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7.    | Special Line Access                             |  |       |   |   |   |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 8.    | External Page Zones   Output #1                 |  |       |   |   |   |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|       | Output #2                                       |  |       |   |   |   |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 9.    | Release of Abandoned Call on Hold               |  |       |   |   |   |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 10.   | Alarm   | 1. _____   |       |   |   |   |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|       |   | 2. _____   |       |   |   |   |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 11.   | Meet-Me-Answer Paging and<br>Meet-Me-Conference | _____  |       |   |   |   |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 12.   | Signal Calling or Voice Announce                | _____  |       |   |   |   |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 13.   | Three Minute Warning Tone                       | _____  |       |   |   |   |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 14.   | Power Failure Bells                             | <table border="1"><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>  |       |   |   |   |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|       |   |  |       |   |   |   |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 15.   | Background Music                                | _____  |       |   |   |   |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 16.   | Music-On-Hold                                   | _____  |       |   |   |   |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 17.   | I-Hold Reminder Time                            | _____  |       |   |   |   |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 18.   | Exclusive Hold Recall Time                      | _____  |       |   |   |   |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 19.   | Recall Reminder Signal                          | _____  |       |   |   |   |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 20.   | Ring Inward Time                                | _____  |       |   |   |   |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 21.   | Talkback Time                                   | _____  |       |   |   |   |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 22.   | Flashing Timer                                  | _____  |       |   |   |   |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 23.   | Pause Behind a PBX                              | _____  |       |   |   |   |  |  |   |   |   |   |   |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

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Table 3-2 PERMITTED CODES OCW, EK-616

| Permitted Codes           |        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
|---------------------------|--------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|
|                           | DIGITS |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
|                           | 1      | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 1                         |        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 2                         |        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 3                         |        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 4                         |        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 5                         |        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 6                         |        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 7                         |        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 8                         |        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 9                         |        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 10                        |        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 11                        |        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 12                        |        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 13                        |        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 14                        |        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 15                        |        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 16                        |        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| PBX Access Codes          |        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 1                         |        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 2                         |        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 3                         |        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 4                         |        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| Common Unrestricted Codes |        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 1                         |        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 2                         |        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 3                         |        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 4                         |        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 5                         |        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 6                         |        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 7                         |        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 8                         |        |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |

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Table 3-3 STATION OPTION CONFIGURATION WORKSHEET, EK-616

| Stations   | Name of Station User | Type of Sta. Instrument | Line Access<br>1 2 3 4 5 6 | CO Audible<br>1 2 3 4 5 6 | CO Aud Disable<br>5 | Night Service<br>6 | Do Not Disturb<br>7 | Exec Call Forward<br>8 | Off Hook Signaling<br>9 | Barge-In (0-3)<br>10 | Door Chime<br>11 | Int Page Zone<br>81 82 83<br>12 | Alarm<br>13 | COS (0-8)<br>14 |
|------------|----------------------|-------------------------|----------------------------|---------------------------|---------------------|--------------------|---------------------|------------------------|-------------------------|----------------------|------------------|---------------------------------|-------------|-----------------|
| Station 10 | 1                    | 2                       | 3                          | 4                         | 5                   | 6                  | 7                   | 8                      | 9                       | 10                   | 11               | 12                              | 13          | 14              |
| Station 11 |                      |                         |                            |                           |                     |                    |                     |                        |                         |                      |                  |                                 |             |                 |
| Station 12 |                      |                         |                            |                           |                     |                    |                     |                        |                         |                      |                  |                                 |             |                 |
| Station 13 |                      |                         |                            |                           |                     |                    |                     |                        |                         |                      |                  |                                 |             |                 |
| Station 14 |                      |                         |                            |                           |                     |                    |                     |                        |                         |                      |                  |                                 |             |                 |
| Station 15 |                      |                         |                            |                           |                     |                    |                     |                        |                         |                      |                  |                                 |             |                 |
| Station 16 |                      |                         |                            |                           |                     |                    |                     |                        |                         |                      |                  |                                 |             |                 |
| Station 17 |                      |                         |                            |                           |                     |                    |                     |                        |                         |                      |                  |                                 |             |                 |
| Station 18 |                      |                         |                            |                           |                     |                    |                     |                        |                         |                      |                  |                                 |             |                 |
| Station 19 |                      |                         |                            |                           |                     |                    |                     |                        |                         |                      |                  |                                 |             |                 |
| Station 20 |                      |                         |                            |                           |                     |                    |                     |                        |                         |                      |                  |                                 |             |                 |
| Station 21 |                      |                         |                            |                           |                     |                    |                     |                        |                         |                      |                  |                                 |             |                 |
| Station 22 |                      |                         |                            |                           |                     |                    |                     |                        |                         |                      |                  |                                 |             |                 |
| Station 23 |                      |                         |                            |                           |                     |                    |                     |                        |                         |                      |                  |                                 |             |                 |
| Station 24 |                      |                         |                            |                           |                     |                    |                     |                        |                         |                      |                  |                                 |             |                 |
| Station 25 |                      |                         |                            |                           |                     |                    |                     |                        |                         |                      |                  |                                 |             |                 |

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Table 3-4 SYSTEM HARDWARE CONFIGURATION WORKSHEET, EK-616

| ITEM                          | PART NUMBER | DESCRIPTION  | COMMENTS   | NUMBER TO ORDER |
|-------------------------------|-------------|--|--|-----------------|
| <b>CABINETS</b>               |             |  |  |                 |
| EK-616 KSU                    | 61600       | Key Service Unit / Power Supply with Relay Matrix Shorting ( RMSU ) PCB                    | 1  | 1               |
| <b>PRINTED CIRCUIT BOARDS</b> |             |  |  |                 |
| MCCU-6TA                      | 61610       | Main Common Control  | 1  | 1               |
| RBTU-A                        | 61670       | RAM Battery Unit   | 1  | 1               |
| 3X8U-TA                       | 61620       | CO Line / Key Station Interface<br>3 CO lines / 8 Stations, one ICM HF reply circuit       | 1-2  | —               |
| RMXU-6A                       | 61625       | Matrix Expansion<br>CO lines 4-6, ICM links 5 & 6 and 2nd PF station per line ( optional ) | 1  | —               |
| LPTU-6A                       | 61605       | Line Circuit Protection with Fuses   | 1  | 1               |
| MLCU-6TA                      | 61630       | Multi-Line Conference  | 1  | 1               |
| SPDU-6A                       | 61640       | Speakerphone ( optional )  | as required  | —               |
| GRDU-6A                       | 61635       | Ground Flash ( optional )  | 1  | —               |
| <b>STATION EQUIPMENT</b>      |             |  |  |                 |
| EK-616                        | 61650       | Standard Key Telephone   | maximum  | —               |
| EK-616 PFT                    | 61655       | Executive Display Key with Speakerphone and Power Fail ( Tone )                            | 16   | —               |
| EK-616 PFP                    | 61656       | Executive Display Key Telephone with Speakerphone and Power Fail ( Pulse )                 | one Executive Display Key Telephone required for programming | —               |
| <b>OPTIONAL EQUIPMENT</b>     |             |  |  |                 |
|                               | 61665       | Monitor Box  | as required  | —               |
|                               | 61660       | Door Chime Box   | as required  | —               |
|                               | 61653       | Wall Mounting Kit ( STANDARD )   | as required  | —               |
|                               | 61654       | Wall Mounting Kit ( EXEC TEL )   | as required  | —               |

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# EK-616

## ELECTRONIC KEY TELEPHONE SYSTEM

### SECTION 4, PROGRAM RECORD FORM PREPARATION

#### 1. INTRODUCTION

**1.01** The PROGRAM RECORD FORM PREPARATION Section provides directions for entering data onto the Program Record Forms ( PRFs ) at the end of this section. The PRFs ( Tables 4-1, 4-2, 4-3 and 4-4 ) must be completed and retained as a job record.

**1.02** Program references ( to Section 3 ) have been added to programming information.

#### 2. DIRECTIONS

**2.01** The following paragraphs provide directions for determining entry codes to complete the PRFs and should be used with the completed Option Configuration Worksheets ( Section 3 ).

#### STATION PROGRAMMING

##### **Program 1, Line Access ( Key F-4 )**

**2.02** Stations can be allowed or denied full access to specific lines.

On Table 4-1 check the CO line numbers that each station should be able to access. ( See Table 3-3, item 3 ).

Initialized: All stations can access lines 1-6.

##### **Program 2, Co Audible ( Key F-5 )**

**2.03** Lines can be programmed to ring at specific stations.

Check the CO line numbers that should ring for each station on Table 4-1. ( See Table 3-3, item 4 ).

Initialized: Lines 1-6 ring at all stations.

##### **Program 3, Co Audible Disable, Station ( Key F-6 )**

**2.04** Stations can block incoming CO line signaling when RGTR ( FWME ) key is pressed while the handset is off hook.

Enter "0" to disable or "1" to enable this feature for each station on Table 4-1. ( See Table 3-3, item 5 ).

Initialized: All stations disabled.

##### **Program 4, Night Service, Preset ( Key RGTR [ FWME ] )**

**2.05** When Station 10 activates the Night Service mode, designated stations receive all audible signals for incoming calls.

Enter "1" for night signaling or "0" for no night signaling for each station on Table 4-1. ( Refer to Table 3-3, item 6 ).

Initialized: All stations receive night signaling.

##### **Program 5, Do Not Disturb ( Key ADON [ DND ] )**

**2.06** Do Not Disturb ( DND ) blocks all incoming audible signals for CO and Intercom ( ICM ) calls to a station.

Enter "1" to enable DND or "0" to disable for each station on Table 4-1. ( See Table 3-3, item 7 ).

Initialized: Disabled.

**Program 6, Executive Call Forward ( Key F-7 )**

**2.07** Fifteen pairs of stations can be arranged so that calls to one of the stations in a pair will automatically be forwarded to the other station in the same pair. A station can be assigned as either an executive or partner. While functioning as an executive station, a station cannot also be a partner for another executive station. All executive stations may be assigned to the same partner. Each executive station must be programmed for DND.

Enter the partner's station number corresponding to the executive station in a pair on Table 4-1. ( See Table 3-3, item 8 ).

Initialized: No assignments.

**Program 7, Off Hook Tone Signaling ( Key F-8 )**

**2.08** Off Hook Tone Signaling provides CO and ICM audible signals for stations when the telephone is either on hook or off hook. If not programmed for Off Hook Tone Signaling, station will only receive audible when on hook.

Enter "1" to enable or "0" to disable Off Hook Signaling for each station on Table 4-1. ( See Table 3-3, item 9 ).

Initialized: Disabled.

**Program 8, Barge-In ( Key BREAK )**

**2.09** Barge-In enables designated stations to intrude upon conversations. Stations are programmed into four levels of Barge-In.

Enter 0, 1, 2 or 3 from the levels below for each station on Table 4-1 ( See Table 3-3, item 10 ):

Level 0 - Stations without Barge-In.

Level 1 - Stations can barge-in to busy CO lines directly and can barge-in to CO or ICM lines by ICM call.

Level 2 - Stations can barge-in to ICM lines by ICM call.

Level 3 - Stations can intrude upon an ICM call by sending audible tone.

Initialized: Disabled.

**Program 9, Door Chime Station ( Key F-9 )**

**2.10** When a Door Chime Box is activated, the box sends a chime to assigned stations.

Enter "1" to receive chime and "0" to not receive chime for each station on Table 4-1. ( See Table 3-3, item 11 ).

Initialized: Station 10 will receive chime.

**Program 10, Internal Page Zones ( Stations ) ( Key F-10 )**

**2.11** Each station can be assigned to one of three Internal Page Zones in order to receive paging announcements.

Check the appropriate Internal Page Zone for each station on Table 4-1. ( See Table 3-3, item 12 ).

Initialized: Zone 81 - Stations 10-13, Zone 82 - Stations 14-17, Zone 83 - Stations 18-21.

**Program 11, Alarm ( Stations ) ( Key ALM )**

**2.12** Alarm signals can be transmitted to programmed stations.

Enter "3" to enable or "4" to disable alarm signals for each station on Table 4-1. ( See Table 3-3, item 13 ).

Initialized: Station 10 enabled.

**Program 12, Class Of Service ( Key F-14 )**

**2.13** A station's Class of Service ( COS ) determines which toll restrictions will apply. ( See Table 3-3, item 14 ).

Enter COS ( 0-8 ) for each station from chart below on table 4-1:

0 = No dial restrictions

1 = No dial restrictions

2 = Can dial permitted codes or common unrestricted codes.

3 = Can dial permitted codes, local 7-digit numbers and common unrestricted codes.

4 = Can dial permitted codes, local 7-digit numbers, "1" + 7 digit toll numbers and common unrestricted codes.

5 = Can dial local 7-digit numbers, "1" + 7 digit toll numbers and common unrestricted codes.

6 = Can dial local 7-digit numbers and common unrestricted codes.

7 = Can dial common unrestricted codes.

8 = Can dial ICM calls.

**NOTE:** COS 0 and 1 are equivalent.

Initialized: All stations COS 0.

**NOTES:**

(a) Behind a PBX, any toll restriction will be applied after the PBX access code digits have been dialed.

(b) Only COS 0 and 1 station users can dial 0 or 1 as the first or second digit. COS 3 through 6 can dial "0" or "1" as the second digit if allowed by Program 25 category 5.

**LINE PROGRAMMING**

**Program 13, Co Line Signaling ( Key F-1 )**

**2.14** Central Office ( CO ) lines can be programmed for either Dual Tone Multifrequency ( DTMF ) or Dial Pulse ( DP ) signaling.

Enter "1" for DP or "0" for DTMF for each line on Table 4-2. ( See Table 3-1, item 3 )

Initialized: All lines as DTMF.

**Program 14, PBX Lines ( Key F-2 )**

**2.15** Lines which are connected to a Private Branch Exchange ( PBX ) must be assigned as PBX lines for proper operation of the Toll Restriction and Flash programs. When PBX lines are programmed, enter PBX access codes in Program 25, Category 2 and program Flashing Timer in Program 24, if required.

Enter "1" for PBX lines or "0" for CO lines for each line on Table 4-2. ( See Table 3-1, item 4 )

Initialized: All lines as CO lines.





**Program 15, Flash ( Key FLASH [ MON ] )**

**2.16** An outside line may be programmed to provide an open loop or ground flash when the FLSH ( MON ) key is pressed. Program flash time for PBX lines in Program 24, if required.

Enter "1" for open loop flash or "0" for ground flash for each line on Table 4-2. ( See Table 3-1, item 5 )

Initialized: Open loop flash.

**Program 16, Queue Groups ( Key F-3 )**

**2.17** Up to six queue groups can be programmed in order to group similar lines ( i.e. Common CO, Wide Area Telephone Service [ WATS ], Foreign Exchange [ FX ], etc. ) together. This allows a station user to queue for a specific type of line.

Check CO line numbers to be in each queue group on Table 4-2. ( See Table 3-1, item 6 )

Initialized: Lines 1-6 in first queue group.

**Program 17, Special Line Access ( Key HOLD [ CORQ ] )**

**2.18** Lines may be programmed to allow limited access by stations that have been denied full access ( Program 1 ). Limited access includes answering incoming calls and picking up calls on Hold.

Enter "1" to allow limited access or "0" to deny limited access for each CO line on Table 4-2. ( See Table 3-1, item 7 )

Initialized: Allow access for lines 1-6.

**Program 18, External Page Zones ( Lines ) ( Key F-10 )**

**2.19** Each line can be assigned to an External Page Zone so that the page zone receives CO audible for that line.

Check lines to be in each External Page Zone on Table 4-2. ( See Table 3-1, item 8 )

Initialized: Zones 85-86, No lines assigned.

**Program 19, Release of Abandoned Call on Hold ( Key TIMER )**

**2.20** Release of Abandoned Call on Hold returns a line to an idle condition if an outside party waiting on Hold hangs up. Generally, electromechanical central offices transmit a disconnect signal greater than 80 mSecs, and in electronic offices, a signal greater than 600 mSecs..

Enter disconnect signal in multiple of 20 milliseconds for each line on Table 4-2. Example: enter 10 for 200mS.  $20\text{mS} \times 10 = 200\text{mS}$ . ( See Table 3-1, item 9 )

Initialized: Interval not set.

**SYSTEM PROGRAMMING**

**Program 20, Alarm ( Key ALM )**

**2.21** Alarm signals from a customer provided security system can be transmitted to telephones in the system. Two alarm inputs can be programmed.

Enter "1" for normally closed or "0" for normally opened contacts for each alarm input on Table 4-3. ( See Table 3-1, item 10 )

Initialized: Alarm 1-open, Alarm 2-open.

**Program 21, Meet-Me-Answer Paging and Meet-Me Conference ( Key F-11 )**

**2.22** Meet-Me-Answer Paging enables a user to transmit a page and establish a private handset-to-handset conversation. Meet-Me Conference enables up to five stations in the same Internal Page Zone to join in a conference initiated by a page.

Enter "1" to enable or "0" to disable Meet-Me-Answer Paging and Meet-Me Conference on Table 4-3. ( See Table 3-1, item 11 )

Initialized: Enabled.

**Program 22, Signal Calling Or Voice Announce ( Key F-12 )**

**2.23** There are two methods of ICM signaling. The called party can receive voice announcements to which response can be made handsfree ( Voice Announce ) or the called station will ring ( Signal Calling ), requiring the party to use the handset to reply.

Enter "1" for Signal Calling or "0" for Voice Announce on Table 4-3. ( See Table 3-1, item 12 )

Initialized: Voice Announce.

**Program 23, Three Minute Warning Tone ( Key F-13 )**

**2.24** The system can automatically provide a signal to the telephone loudspeaker every three minutes during a conversation on an outgoing line.

Enter "1" to enable or "0" to disable a warning tone every 3 minutes on Table 4-3. ( See Table 3-1, item 13 )

Initialized: Disabled.

**Program 24, Timers ( Key Timer )**

**I-Hold Reminder ( Key HOLD [ CORQ ] )**

**2.25** The system automatically resignals the station that placed the call on I-Hold.

Enter required time in seconds to a maximum of 250 seconds on Table 4-3. ( See Table 3-1, item 17 )

Initialized: 30 sec.

**Exclusive Hold Recall ( Key HOLD [ CORQ ] )**

**2.26** If a call placed on Exclusive Hold is not retrieved within the programmed time period, the system signals the original station.

Enter required time in seconds to a maximum recall time of 250 seconds on Table 4-3. ( See Table 3-1, item 18 )

Initialized: 30 sec.

**Recall / Reminder Signal ( Key ICM )**

**2.27** If a call placed on Exclusive Hold or I-Hold is not picked up after the programmed time period, the station at which the call was placed on Hold will receive an audible signal. The duration of this signal is the Recall / Reminder Signal time.

Enter required time in seconds to a maximum of 250 seconds on Table 4-3. ( See Table 3-1, item 19 )

Initialized: 20 sec.

**Ring Inward Timer ( Key RGTR [ FWME ] )**

**2.28** When a call is transferred using the Ring Inward mode, the Ring Inward Timer sets the length of transfer audible at the receiving station before the call reverts to the initiating station.

Enter required time in seconds to a maximum of 250 seconds on Table 4-3. ( See Table 3-1, item 20 )

Initialized: 30 sec.

**Talkback Timer ( Key SPK )**

**2.29** The Talkback Timer releases the Intercom voice switch used for Handsfree Reply if the call continues longer than the programmed Talkback Time.

Enter required time in seconds to a maximum of 250 seconds on Table 4-3. Entering "0" allows uninterrupted talkback. ( See Table 3-1, item 21 )

Initialized: None.

**Flashing Timer ( Key FLSH [ MON ] )**

**2.30** The required flash time for PBX compatibility is programmable.

Enter multiple of 0.1 seconds from 0.1 to a maximum of 25 seconds on Table 4-3. Example: enter 200 for 20 seconds. ( See Table 3-1, item 22 )

Initialized: .5 sec.

**Pause Behind a PBX ( Key BREAK )**

**2.31** A programmable pause may be inserted between the PBX access code and the telephone number in a Speed Dial or Automatic Dialer number.

Enter multiple of 0.1 seconds from 0.1 to a maximum of 25 seconds on Table 4-3. Example: enter 030 for 3 seconds. ( See Table 3-1, item 23 )

Initialized: 3.2 sec.

**Program 25, Toll Restriction ( Key F-15 )**

**Permitted Codes-Category 0**

**2.32** Permitted codes allow users to make calls to a division of their business in a specific exchange and area code, nearby areas having different area codes where business is normally conducted, and in-WATS ( 800 ) services.

Enter up to 16 numbers of 20 digits each on Table 4-4. ( See Table 3-2 )

**NOTE:** 'DC' may be used as a 'Don't Care' digit.

**Permitted Code Digits-Category 1**

**2.33** A maximum number of digits can be specified to limit the number of digits dialed with a permitted code ( 0-30 ).

Enter one number, 0-30 on Table 4-4.

**NOTE:** A "0" entry indicates no limit to number of digits.

**PBX Access Codes-Category 2**

**2.34** The PBX recognizes trunk access codes as a request for an outside line. Access codes are entered during programming to ensure proper operation of Toll Restriction.

Enter up to 4 numbers of up to 2 digits each on Table 4-4. ( See Table 3-2 )

**NOTE:** DC may be used as a 'Don't Care' digit for the second digit of a 2 digit access code.

**Common Unrestricted Codes-Category 3**

**2.35** Common Unrestricted Codes can be established for stations with COS 2 through 7, such as emergency assistance ( 911 ), local directory ( 411 or 1411 ) and telephone repair ( 611 ).

Enter up to 8 numbers of up to 4 digits each on Table 4-4. ( See Table 3-2 )

**Digit Absorbing-Category 4**

**2.36** In certain central offices, specific digits ( when dialed as the first digit ) are absorbed ( ignored ). Entries are determined during installation.

Enter up to 4 digits on Table 4-4.

**"0" or "1" as the 2nd Digit-Category 5**

**2.37** The "0" or "1" in second digit restriction is used to prevent long distance toll calling. In areas such as New York and Los Angeles, local central office codes may have a 0 or 1 as a second digit. In such cases, restriction is not desirable.

**NOTE:** This program only applies to COS 3 through 6.

Enter "1" to allow and "0" to deny dialing "0" or "1" as the second digit on Table 4-4.

Initialized: No Toll Restriction entries.

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### Program Clock ( Key CLOCK )

**2.38** The time and date are shown on the display.

Enter 2 digits ( 00-23 ) for the hour.  
Enter 2 digits ( 00-59 ) for the minutes past the hour.  
Enter 2 digits ( 01-12 ) for the month.  
Enter 2 digits ( 01-31 ) for the date.  
Enter 4 digits ( i.e.1983 ) for the year.  
Enter 1 digit ( 0-6 ) from the chart below for the day.  
0 = Sun, 1 = Mon, 2 = Tues, 3 = Wed, 4 = Thur, 5 = Fri, 6 = Sat.

Entries should be determined during system programming.

### TOLL RESTRICTION COMPATIBILITY WITH PBX

**2.39** While engineering efforts have been made to make the toll restriction program compatible with the majority of PBXs, it is possible that PBX signaling arrangements ( particularly the transfer function ) may not be compatible with the PBX.

**WARNING: CHECK COMPATIBILITY WITH THE PBX.**

**2.40** The EK-616 Electronic Key Telephone System can recognize trunk access codes. The toll restriction program is not started until such a code is recognized. Using Program 25, Category 2, up to 4 different 1 or 2-digit codes can be programmed as trunk access codes.

**2.41** COS 0-7 may be used to dial any PBX number, even those containing 0's and 1's, without restriction.

**2.42** COS 8 is intended for use in systems behind a PBX where the user is only permitted to dial ICM calls.

### INCOMING VS OUTGOING PBX CALLS

**2.43** The system has the ability to recognize the difference between an incoming call and an outgoing call. Only stations with COS 0 and 1 are permitted to dial on incoming calls. The system has no way of determining whether the call is from another PBX station or from an outside line. If dialing were permitted under this condition, toll restriction could be defeated.

### PBX FLASHING

**2.44** In many PBX systems an open loop or ground flash is used to transfer incoming calls. The EK-616 telephones are equipped with a FLSH ( MON ) key which is designed to function with PBX systems having transfer operation.

**CAUTION: IF THE PBX DOES NOT REQUIRE FLASH FOR TRANSFER, DO NOT PROGRAM THE SYSTEM FOR FLASH KEY OPERATION.**

**2.45** The effect of FLSH ( MON ) key operation on the toll restriction program will vary, depending on the station COS ( Program 12 ) and whether the station is involved in an outgoing or an incoming call, as follows:

- (a) Outgoing Call. Operation of the FLSH ( MON ) key transmits an open or ground pulse to the PBX line circuit for transfer and, at the same time, activates the toll restriction program.
- (b) Incoming Call. On an incoming call, dialing is blocked until the FLSH ( MON ) key is pressed, except for COS 0 and 1, where dialing can be allowed. The first operation of the FLSH ( MON ) key ( and subsequent odd numbered flashes ) will permit dialing into the PBX. The second operation of the FLSH ( MON ) key ( and subsequent even numbered flashes ) will again restrict dialing.

### DIAL AND CLASS ARRANGEMENTS FOR PBX OPERATION

**2.46** Most PBX systems today use toll restriction programs that are more comprehensive than those used in key systems ( primarily for economical reasons ). The toll restriction programs utilize the fact that the system "knows" which stations are using which lines and can operate on the restriction parameters programmed into the system. When the stations are separated from the PBX by a key system ( which is really a concentrator ), the association between station and line is no longer available to the PBX. Thus, the key system must provide more flexible restriction arrangements.

**2.47** Recommendation: The following method can be used to provide the flexibility required:

- (a) Program the PBX non-restricted lines so that line access restrictions ( Program 1 ) apply.
- (b) Assign all stations that are to be subject to PBX toll restriction to COS 0 or 1.
- (c) Assign stations permitted to make only PBX calls to COS 7 and make sure that the trunk access codes are written in Program 25 Category 2.
- (d) Assign stations permitted to make only key system calls to COS 8.
- (e) Assign stations that are to be assigned key system toll restrictions to the appropriate COS 2-6.

Table 4-1 PROGRAM RECORD FORM, STATIONS, EK-616

| Program #  | Line Access |   |   |   |   |   | CO Audible |   |   |   |   |   | CO Aud Disable |         | Night Service |         | Do Not Disturb |         | Exec. C.FWD. |         | Off Hook Signaling |         | Barge-In  |         | Door Chime |         | Int Page |         | Alarm   |          | COS      |          |  |  |  |  |
|------------|-------------|---|---|---|---|---|------------|---|---|---|---|---|----------------|---------|---------------|---------|----------------|---------|--------------|---------|--------------------|---------|-----------|---------|------------|---------|----------|---------|---------|----------|----------|----------|--|--|--|--|
|            | 1           | 2 | 3 | 4 | 5 | 6 | 1          | 2 | 3 | 4 | 5 | 6 | Key F-6        | Key F-5 | Key RGTR      | Key F-4 | Key ADON       | Key F-3 | Key F-7      | Key F-8 | Key F-8            | Key F-7 | Key BREAK | Key F-6 | Key F-9    | Key F-8 | Key F-10 | Key F-9 | Key ALM | Key F-10 | Key F-14 | Key F-12 |  |  |  |  |
| Station 10 |             |   |   |   |   |   |            |   |   |   |   |   |                |         |               |         |                |         |              |         |                    |         |           |         |            |         |          |         |         |          |          |          |  |  |  |  |
| Station 11 |             |   |   |   |   |   |            |   |   |   |   |   |                |         |               |         |                |         |              |         |                    |         |           |         |            |         |          |         |         |          |          |          |  |  |  |  |
| Station 12 |             |   |   |   |   |   |            |   |   |   |   |   |                |         |               |         |                |         |              |         |                    |         |           |         |            |         |          |         |         |          |          |          |  |  |  |  |
| Station 13 |             |   |   |   |   |   |            |   |   |   |   |   |                |         |               |         |                |         |              |         |                    |         |           |         |            |         |          |         |         |          |          |          |  |  |  |  |
| Station 14 |             |   |   |   |   |   |            |   |   |   |   |   |                |         |               |         |                |         |              |         |                    |         |           |         |            |         |          |         |         |          |          |          |  |  |  |  |
| Station 15 |             |   |   |   |   |   |            |   |   |   |   |   |                |         |               |         |                |         |              |         |                    |         |           |         |            |         |          |         |         |          |          |          |  |  |  |  |
| Station 16 |             |   |   |   |   |   |            |   |   |   |   |   |                |         |               |         |                |         |              |         |                    |         |           |         |            |         |          |         |         |          |          |          |  |  |  |  |
| Station 17 |             |   |   |   |   |   |            |   |   |   |   |   |                |         |               |         |                |         |              |         |                    |         |           |         |            |         |          |         |         |          |          |          |  |  |  |  |
| Station 18 |             |   |   |   |   |   |            |   |   |   |   |   |                |         |               |         |                |         |              |         |                    |         |           |         |            |         |          |         |         |          |          |          |  |  |  |  |
| Station 19 |             |   |   |   |   |   |            |   |   |   |   |   |                |         |               |         |                |         |              |         |                    |         |           |         |            |         |          |         |         |          |          |          |  |  |  |  |
| Station 20 |             |   |   |   |   |   |            |   |   |   |   |   |                |         |               |         |                |         |              |         |                    |         |           |         |            |         |          |         |         |          |          |          |  |  |  |  |
| Station 21 |             |   |   |   |   |   |            |   |   |   |   |   |                |         |               |         |                |         |              |         |                    |         |           |         |            |         |          |         |         |          |          |          |  |  |  |  |
| Station 22 |             |   |   |   |   |   |            |   |   |   |   |   |                |         |               |         |                |         |              |         |                    |         |           |         |            |         |          |         |         |          |          |          |  |  |  |  |
| Station 23 |             |   |   |   |   |   |            |   |   |   |   |   |                |         |               |         |                |         |              |         |                    |         |           |         |            |         |          |         |         |          |          |          |  |  |  |  |
| Station 24 |             |   |   |   |   |   |            |   |   |   |   |   |                |         |               |         |                |         |              |         |                    |         |           |         |            |         |          |         |         |          |          |          |  |  |  |  |
| Station 25 |             |   |   |   |   |   |            |   |   |   |   |   |                |         |               |         |                |         |              |         |                    |         |           |         |            |         |          |         |         |          |          |          |  |  |  |  |

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**Table 4-2 PROGRAM RECORD FORM, LINES, EK-616**

| LINES   | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| <b>Program 13</b><br>CO Line Signaling ( Key F-1 )                      |   |   |   |   |   |   |
| <b>Program 14</b><br>PBX Lines ( Key F-2 )                              |   |   |   |   |   |   |
| <b>Program 15</b><br>Flash ( Key FLSH [ MON ] )                         |   |   |   |   |   |   |
| <b>Program 16</b><br>Queue Groups ( Key F-3 )                           |   |   |   |   |   |   |
| Group #1  |   |   |   |   |   |   |
| Group #2  |   |   |   |   |   |   |
| Group #3  |   |   |   |   |   |   |
| Group #4  |   |   |   |   |   |   |
| Group #5  |   |   |   |   |   |   |
| Group #6  |   |   |   |   |   |   |
| <b>Program 17</b><br>Special Line Access ( Key HOLD [ CORQ ] )          |   |   |   |   |   |   |
| <b>Program 18</b><br>External Page Zones ( Key F-10 )                   |   |   |   |   |   |   |
| Zone #85  |   |   |   |   |   |   |
| Zone #86  |   |   |   |   |   |   |
| <b>Program 19</b><br>Release of Abandoned Call on Hold<br>( Key TIMER ) |   |   |   |   |   |   |

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**Table 4-3 PROGRAM RECORD FORM, SYSTEM, EK-616**

|   |  |
|---|--|
| <b>Program 20</b><br>Alarm #1 ( Key ALM )                                       |  |
| Alarm #2 ( Key ALM )  |  |
| <b>Program 21</b><br>Meet-Me-Answer Paging/Conference ( Key F-11 )              |  |
| <b>Program 22</b><br>Signal Calling or Voice Announce ( Key F-12 )              |  |
| <b>Program 23</b><br>Three Minute Warning Tone ( Key F-13 )                     |  |
| <b>Program 24 Timers ( Key TIMER )</b><br>I-Hold Reminder ( Key HOLD [ CORQ ] ) |  |
| Exclusive Hold Recall ( Key HOLD [ CORQ ] )                                     |  |
| Recall/Reminder Signal ( Key ICM )  |  |
| Ring Inward Timer ( RGTR [ FWME ] )   |  |
| Talkback Timer ( Key SPK )  |  |
| Flashing Timer ( Key FLSH [ MON ] )   |  |
| Pause Behind a PBX ( Key BREAK )  |  |

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Table 4-4 PROGRAM RECORD FORM, TOLL RESRICTION, EK-616  
Program 25 ( Key F-15 )

| Category 0 - Permitted Codes                |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
|---|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|
| Memory Location                             | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 01  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 02  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 03  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 04  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 05  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 06  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 07  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 08  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 09  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 10  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 11  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 12  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 13  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 14  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 15  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 16  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| Category 1 - Permitted Code Digits          |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 01  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| Category 2 - PBX Access Codes               |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 01  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 02  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 03  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 04  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| Category 3 - Common Unrestricted Codes      |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 01  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 02  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 03  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 04  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 05  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 06  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 07  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 08  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| Category 4 - Digit Absorbing                |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 01  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 02  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 03  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 04  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| Category 5 - "0" or "1" as the Second Digit |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
| 01  |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |

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# EK-616

## ELECTRONIC KEY TELEPHONE SYSTEM

### SECTION 5, INSTALLATION

#### 1. INTRODUCTION

- 1.01** The INSTALLATION Section provides detailed procedures for installing the component parts of an EK-616 Electronic Key Telephone System (EKTS). Read the entire section carefully before proceeding with the installation.
- 1.02** New information on Radio Frequency Susceptibility ( para 8.03 ) has been included.

#### 2. PREPARATION

- 2.01** Before proceeding with the installation, the installation site and telephone equipment must be verified.
- 2.02** The area for mounting the Key Service Unit ( KSU ) and Power Supply ( PSU ), which are contained in one unit ( Figure 5-1 ), and related control equipment should be clean, dry, temperature controlled and only accessible to authorized personnel. The site should be away from caustic chemicals, heavy machinery and static electricity ( copying machines ). There should be ample room to mount and maintain the equipment.
- NOTE:** Use two pair twisted station cables from the KSU to the telephone instruments. Station cable should be home run to the connecting blocks and not exceed 1000 feet for 24 AWG, or 1500 feet for 22 AWG when connecting station equipment.
- 2.03** There must be a dedicated 117 V AC circuit for the KSU Unit with a minimum capacity of 15 amps. The AC service used must be three prong and located within six feet ( 2.0m ) of the KSU location.
- 2.04** The KSU requires a proper earth ground connection, in addition to the third wire ground, within 25 feet ( 7.6m ) of the installation. Check the earth ground to ensure continuity.

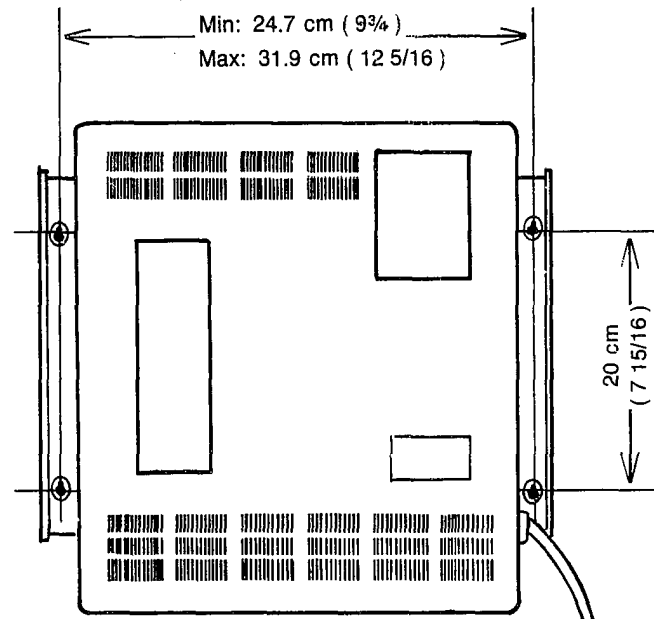
- 2.05** The operating telephone company must be notified of the proposed cut-over date and supplied with the information outlined in Section 1 of this manual. The telco lines, terminated in RJ11C connectors, must be within 25 feet ( 7.6m ) of the KSU location.
- 2.06** Read this entire section and prepare a KSU installation layout drawing ( Figure 5-2 ).

#### SITE SUMMARY CHECK

- *Location acceptable ( paragraph 2.02 ).*
- *AC line installed ( paragraph 2.03 ).*
- *Provisions for ground ( paragraph 2.04 ).*
- *Telco notified ( paragraph 2.05 ).*
- *Telco lines available ( paragraph 2.05 ).*
- *KSU installation layout ( paragraph 2.06 ).*

#### EQUIPMENT REQUIREMENTS

- 2.07** The telephone equipment should be unpacked and the equipment received compared to a list of equipment ordered to ensure that all components are on site. Check for any physical damage. Verify the number and type of stations for the installation.
- 2.08** Have the necessary hardware and cables available. This includes: exterior plywood backboard to be used as the Main Distribution Frame ( MDF ) where applicable, two 25-pair cables for KSU to block connections, two pair twisted station cables, grounding wire ( 14 AWG ), two-connecting blocks ( 66M1-50 type with bridge clips ), modular station jacks ( 625A4, 625F4 or equivalent ), power line surge protector and appropriate mounting hardware.



**Figure 5-3 KEY SERVICE UNIT / POWER SUPPLY, MOUNTING DIMENSIONS, EK-616**

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**2.09** Before starting the installation, verify that the following documents are complete and on the premises.

- Building plan with stations marked as to location and type of telephone instrument.
- Option Configuration Worksheets detailing the features for each station.
- Program Record Form with all programming information completed.

**EQUIPMENT SUMMARY CHECK**

- Equipment present ( paragraph 2.07 ).
- Hardware present ( paragraph 2.08 ).
- Necessary documents on site ( paragraph 2.09 ).

**3. EQUIPMENT INSTALLATION**

**3.01** Review the KSU installation layout prepared for the specific site. Locate the area for the plywood backboard on the wall. It should be at a convenient working height and near the dedicated AC receptacles.

**3.02** Attach the plywood backboard in the designated location with appropriate fasteners. Mark the equipment on the board using the installation layout drawing.

**3.03** A surge protector should be installed at the dedicated AC receptacle. The recommended protector is a TII Model 428 Plug-in Power Line Surge Protector or equivalent. Connect this unit according to the manufacturer's directions.

**BACKBOARD INSTALLATION CHECK**

- Review site layout ( paragraph 3.01 ).
- Mount backboard and mark equipment layout ( paragraph 3.02 ).
- Install surge protector ( paragraph 3.03 ).

**3.04** Mount the KSU as follows:

- Mark points on the backboard that correspond to the mounting brackets located on the rear of the KSU ( Figure 5-3 ).
- Drill pilot holes at these points and insert suitable fasteners. Screw in fasteners until the clearance between the fastener head and the mounting surface is 1/4 inch.
- Mount KSU on the fasteners and secure in place.
- Install surge protector and plug in the AC power cord ( Figure 5-1 ). Turn on PSU; 5 VDC and 24 VDC LEDs should illuminate. Turn off PSU.

**NOTE:** Do not install PCBs at this point.

**3.05** Mount the 66M1-50 type connecting blocks to the right of the KSU. These blocks are used to cross-connect telephone station cable. The number of blocks used depends on the number of stations and whether a Power Failure Bell, Monitor Box and / Door Box are to be included.

Assignments of the block are as follows:

- Block B1---Stations 1 through 8, Power Failure bells for lines 1-3 and miscellaneous connections.
- Block B2---Stations 9 through 16, Power Failure bells for lines 4 and miscellaneous connections.

**EQUIPMENT MOUNTING CHECK**

- Mount the KSU ( paragraph 3.04 ).
- Verify voltages ( paragraph 3.04 ).



## KSU GROUNDING

**3.06** Ground the KSU by connecting it to a known earth ground using a 14 AWG, or heavier insulated copper wire. The KSU has an ETH terminal that is used as ground for lightning protection. Systems using ground flash on CO lines also require that the ground wire be connected to the GND terminal on the KSU ( Figure 5-1 ). The grounding wire should be as short as possible ( Figure 5-2 ) and not exceed 25 feet.

**3.07** Two 50 pin male connectors ( B1 and B2 ) located on the right side of the KSU ( Figure 5-1 ) are used for station connectors, Power Failure ( PF ) Bell connections, music sources and external paging amplifiers.

**3.08** Connect the station plugs ( B1 and B2 ) from the KSU to 66M1 50 blocks. Use 25-pair cables with 50 pin female type connectors on one end. The connector mates with the plugs on the KSU ( retainer clips are provided to hold the connector in place ). Punch down the free conductors from the cables on the appropriate connecting block according to standard telephony color code ( Tables 5-1 and 5-2 ).

### GROUND CHECK

- *Ground KSU ( paragraph 3.06 ).*
- *Wire KSU to connecting blocks ( paragraph 3.07, 3.08 ).*

## 4. STATION CABLING

**4.01** Use two pair twisted station cable from the 66M1-50 block ( Tables 5-1, 5-2 ) to the telephones. All station cable should be home run to the blocks for the key telephones, Monitor Box and Door Chime Box.

**4.02** Terminate the station cable in a 625A or 625F ( 4-wire ) modular jack at the station location ( Figure 5-4 ). Modular jack assemblies should have screw-type terminals ( Figure 5-5 ), not the push-in type. Connect the AT / AR leads to the GRN / RED terminals and the BT / BR leads to the BLK / YEL terminals.

**4.03** Punch down station cable at connecting block for each station:

| Color Code | Function               | Station Block Designation |
|------------|------------------------|---------------------------|
| WHT-BLU    | Audio ( TIP )          | T#AT                      |
| BLU-WHT    | Audio ( RING )         | T#AR                      |
| WHT-ORN    | Data/Power             | T#BT                      |
|            | ( Positive side: 24V ) |                           |
| ORN-WHT    | Data/Power             | T#BR                      |
|            | ( Negative side: 24V ) |                           |

**NOTE:** The color code may vary depending on the wire used. Make sure that the AT / AR terminals on the B Block terminate at the GRN / RED terminals on the modular jack and that the BT / BR terminals of the B Block terminate at the BLK / YEL terminals on the modular jack.

## SYSTEM CABLING CHECK

- *Homerun station cable ( paragraph 4.01 ).*
- *Terminate cable in modular jack assembly ( paragraph 4.02 ).*
- *Punch down cable at connecting block ( paragraph 4.03 ).*

## 5. PRINTED CIRCUIT BOARD INSERTION

### STATIC PRECAUTIONS

**5.01** The Printed Circuit Board ( PCBs ) assemblies associated with the EK-616 EKTS are sensitive to static electricity. When installing or maintaining, use the proper precautions to guard against static damage. The following paragraphs provide instructions for handling static sensitive PCBs.

**5.02** Static sensitive PCBs are shipped in static-free conductive bags. PCBs should only be handled when they are fully protected inside the bag. Do not use the bag as a holder for the PCB when it is outside the bag ( Figure 5-6 ).

**5.03** To minimize static charges, first attach a wrist strap ( which is grounded at the KSU ) to discharge any accumulated static.

**5.04** When working with static sensitive PCBs, keep the work area free of any objects that may contain a static charge. This includes plastic, paper, loose clothing and metal objects. Never slide a PCB across the work surface. Keep foot movements to a minimum to prevent a charge build-up.

**5.05** Wear the wrist strap while inserting or removing PCBs. Store and transport PCBs in static-free conductive bags.

**CAUTION: NEVER INSTALL OR REMOVE PCBs WITH THE POWER ON.**

### STATIC CHECK

- *Read static precautions ( paragraphs 5.01-5.05 ).*



**Table 5-1 B1 BLOCK STATION CABLE CONNECTIONS, EK-616**

| 25 Pair Cable        |            | Block B1    |          | Cable          |
|----------------------|------------|-------------|----------|----------------|
| Conn Pin             | Color Code | Block Term. | Function | 2 Pair Twisted |
| 26<br>1<br>27<br>2   | WHT-BLU    | STATION 10  | 1 T1AT   | WHT-BLU        |
|                      | BLU-WHT    |             | 2 T1AR   | BLU-WHT        |
|                      | WHT-ORN    |             | 3 T1BT   | WHT-ORN        |
|                      | ORN-WHT    |             | 4 T1BR   | ORN-WHT        |
| 28<br>3<br>29<br>4   | WHT-GRN    | STATION 11  | 5 T2AT   | WHT-BLU        |
|                      | GRN-WHT    |             | 6 T2AR   | BLU-WHT        |
|                      | WHT-BRN    |             | 7 T2BT   | WHT-ORN        |
|                      | BRN-WHT    |             | 8 T2BR   | ORN-WHT        |
| 30<br>5<br>31<br>6   | WHT-SLT    | STATION 12  | 9 T3AT   | WHT-BLU        |
|                      | SLT-WHT    |             | 10 T3AR  | BLU-WHT        |
|                      | RED-BLU    |             | 11 T3BT  | WHT-ORN        |
|                      | BLU-RED    |             | 12 T3BR  | ORN-WHT        |
| 32<br>7<br>33<br>8   | RED-ORN    | STATION 13  | 13 T4AT  | WHT-BLU        |
|                      | ORN-RED    |             | 14 T4AR  | BLU-WHT        |
|                      | RED-GRN    |             | 15 T4BT  | WHT-ORN        |
|                      | GRN-RED    |             | 16 T4BR  | ORN-WHT        |
| 34<br>9<br>35<br>10  | RED-BRN    | STATION 14  | 17 T5AT  | WHT-BLU        |
|                      | BRN-RED    |             | 18 T5AR  | BLU-WHT        |
|                      | RED-SLT    |             | 19 T5BT  | WHT-ORN        |
|                      | SLT-RED    |             | 20 T5BR  | ORN-WHT        |
| 36<br>11<br>37<br>12 | BLK-BLU    | STATION 15  | 21 T6AT  | WHT-BLU        |
|                      | BLU-BLK    |             | 22 T6AR  | BLU-WHT        |
|                      | BLK-ORN    |             | 23 T6BT  | WHT-ORN        |
|                      | ORN-BLK    |             | 24 T6BR  | ORN-WHT        |
| 38<br>13<br>39<br>14 | BLK-GRN    | STATION 16  | 25 T7AT  | WHT-BLU        |
|                      | GRN-BLK    |             | 26 T7AR  | BLU-WHT        |
|                      | BLK-BRN    |             | 27 T7BT  | WHT-ORN        |
|                      | BRN-BLK    |             | 28 T7BR  | ORN-WHT        |
| 40<br>15<br>41<br>16 | BLK-SLT    | STATION 17  | 29 T8AT  | WHT-BLU        |
|                      | SLT-BLK    |             | 30 T8AR  | BLU-WHT        |
|                      | YEL-BLU    |             | 31 T8BT  | WHT-ORN        |
|                      | BLU-YEL    |             | 32 T8BR  | ORN-WHT        |
| 42<br>17             | YEL-ORN    | PF1         | 33 BEL1T | POWER          |
|                      | ORN-YEL    |             | 34 BEL1R |                |
| 43<br>18             | YEL-GRN    | PF2         | 35 BEL2T | FAILURE        |
|                      | GRN-YEL    |             | 36 BEL2R |                |
| 44<br>19             | YEL-BRN    | PF3         | 37 BEL3T | BELLS          |
|                      | BRN-YEL    |             | 38 BEL3R |                |
| 45<br>20             | YEL-SLT    | AL1         | 39 ALMG1 | ALARM          |
|                      | SLT-YEL    |             | 40 ALMS1 |                |
| 46<br>21             | VIO-BLU    | PG1         | 41 ESPT1 | TO EXTERNAL    |
|                      | BLU-VIO    |             | 42 ESPR1 |                |
| 47<br>22             | VIO-ORN    | BGM         | 43 BGM1  | BGM            |
|                      | ORN-VIO    |             | 44 BGM2  |                |
| 48<br>23             | VIO-GRN    | MOH         | 45 MHS1  | EXTERNAL       |
|                      | GRN-VIO    |             | 46 MHS2  |                |
| 49<br>24<br>50       | VIO-BRN    | DOOR        | 47 DULS  | DOOR FACILITY  |
|                      | BRN-VIO    |             | 48 DULM  |                |
|                      | VIO-SLT    |             | 49 DULB  |                |
| 50                   | SLT-VIO    |             | 50       |                |

**Table 5-2 B2 BLOCK STATION CABLE CONNECTIONS, EK-616**

| 25 Pair Cable        |            | Block B2    |          | Cable          |
|----------------------|------------|-------------|----------|----------------|
| Conn Pin             | Color Code | Block Term. | Function | 2 Pair Twisted |
| 26<br>1<br>27<br>2   | WHT-BLU    | STATION 18  | 1 T9AT   | WHT-BLU        |
|                      | BLU-WHT    |             | 2 T9AR   | BLU-WHT        |
|                      | WHT-ORN    |             | 3 T9BT   | WHT-ORN        |
|                      | ORN-WHT    |             | 4 T9BR   | ORN-WHT        |
| 28<br>3<br>29<br>4   | WHT-GRN    | STATION 19  | 5 T10AT  | WHT-BLU        |
|                      | GRN-WHT    |             | 6 T10AR  | BLU-WHT        |
|                      | WHT-BRN    |             | 7 T10BT  | WHT-ORN        |
|                      | BRN-WHT    |             | 8 T10BR  | ORN-WHT        |
| 30<br>5<br>31<br>6   | WHT-SLT    | STATION 20  | 9 T11AT  | WHT-BLU        |
|                      | SLT-WHT    |             | 10 T11AR | BLU-WHT        |
|                      | RED-BLU    |             | 11 T11BT | WHT-ORN        |
|                      | BLU-RED    |             | 12 T11BR | ORN-WHT        |
| 32<br>7<br>33<br>8   | RED-ORN    | STATION 21  | 13 T12AT | WHT-BLU        |
|                      | ORN-RED    |             | 14 T12AR | BLU-WHT        |
|                      | RED-GRN    |             | 15 T12BT | WHT-ORN        |
|                      | GRN-RED    |             | 16 T12BR | ORN-WHT        |
| 34<br>9<br>35<br>10  | RED-BRN    | STATION 22  | 17 T13AT | WHT-BLU        |
|                      | BRN-RED    |             | 18 T13AR | BLU-WHT        |
|                      | RED-SLT    |             | 19 T13BT | WHT-ORN        |
|                      | SLT-RED    |             | 20 T13BR | ORN-WHT        |
| 36<br>11<br>37<br>12 | BLK-BLU    | STATION 23  | 21 T14AT | WHT-BLU        |
|                      | BLU-BLK    |             | 22 T14AR | BLU-WHT        |
|                      | BLK-ORN    |             | 23 T14BT | WHT-ORN        |
|                      | ORN-BLK    |             | 24 T14BR | ORN-WHT        |
| 38<br>13<br>39<br>14 | BLK-GRN    | STATION 24  | 25 T15AT | WHT-BLU        |
|                      | GRN-BLK    |             | 26 T15AR | BLU-WHT        |
|                      | BLK-BRN    |             | 27 T15BT | WHT-ORN        |
|                      | BRN-BLK    |             | 28 T15BR | ORN-WHT        |
| 40<br>15<br>41<br>16 | BLK-SLT    | STATION 25  | 29 T16AT | WHT-BLU        |
|                      | SLT-BLK    |             | 30 T16AR | BLU-WHT        |
|                      | YEL-BLU    |             | 31 T16BT | WHT-ORN        |
|                      | BLU-YEL    |             | 32 T16BR | ORN-WHT        |
| 42<br>17             | YEL-ORN    | PF4         | 33 BEL4T | POWER          |
|                      | ORN-YEL    |             | 34 BEL4R |                |
| 43<br>18             | YEL-GRN    | PF5         | 35 BEL5T | FAILURE        |
|                      | GRN-YEL    |             | 36 BEL5R |                |
| 44<br>19             | YEL-BRN    | PF6         | 37 BEL6T | BELLS          |
|                      | BRN-YEL    |             | 38 BEL6R |                |
| 45<br>20             | YEL-SLT    | AL2         | 39 ALMG2 | ALARM          |
|                      | SLT-YEL    |             | 40 ALMS2 |                |
| 46<br>21             | VIO-BLU    | PG2         | 41 ESPT2 | TO EXTERNAL    |
|                      | BLU-VIO    |             | 42 ESPR2 |                |
| 47<br>22             | VIO-ORN    | ENG         | 43 ENGC1 | ENERGY         |
|                      | ORN-VIO    |             | 44 ENGC2 |                |
| 48<br>23             | VIO-GRN    | POWER       | 45 +5    |                |
|                      | GRN-VIO    |             | 46 LGD   |                |
| 49<br>24<br>50       | VIO-BRN    |             | 47       |                |
|                      | BRN-VIO    |             | 48       |                |
|                      | VIO-SLT    |             | 49       |                |
| 50                   | SLT-VIO    |             | 50       |                |

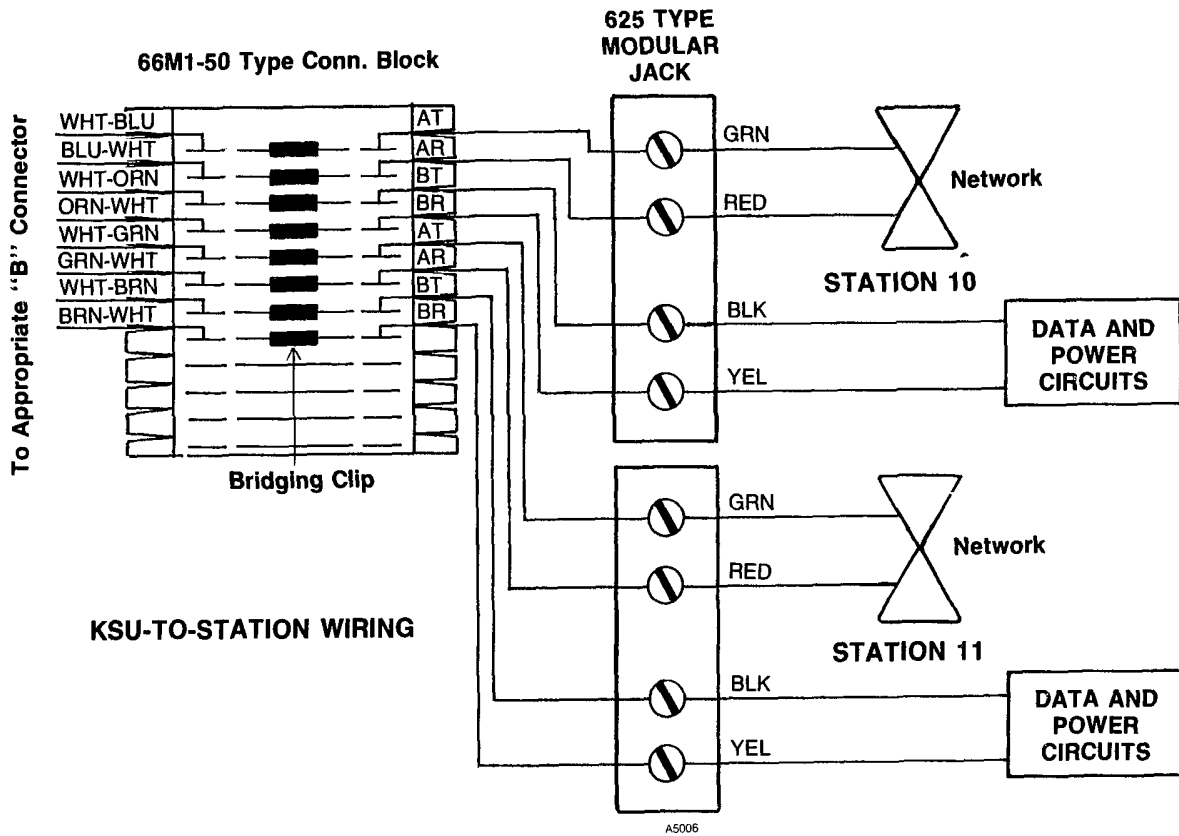


Figure 5-4 TYPICAL KSU TO STATION WIRING, EK-616

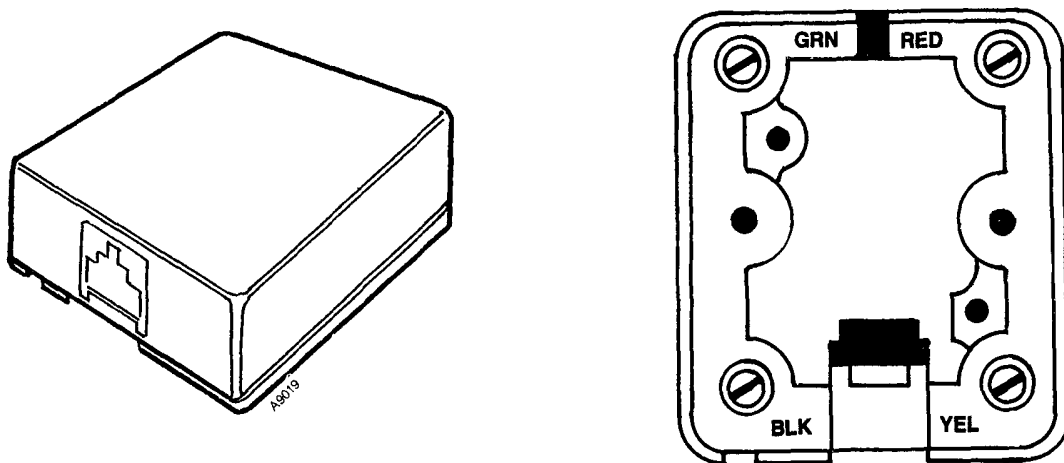
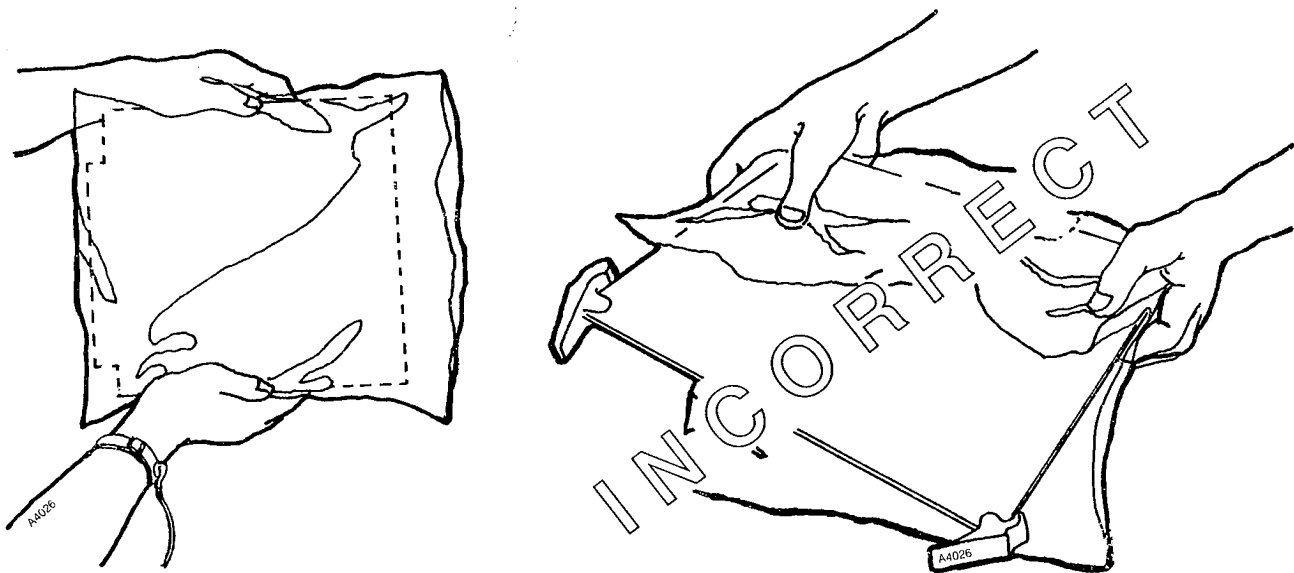


Figure 5-5 MODULAR JACK ASSEMBLY



NOTE: Do not use bag as holder.

Figure 5-6 HANDLING PCBs, EK-616

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## PCB LOCATION

**5.06** PCBs are keyed to fit only their proper slot ( Figure 5-7 ). When inserting PCBs, the connector edge slides in the slot with the component side facing the technician's left.

**5.07** PCBs should be installed with the thumb of each hand on the PCB extractors while the fingers rest on the KSU frame. ( Figure 5-8 ). Do not use the heel of the hand, or any tool, to hammer a PCB into the KSU.

### MCCU-6TA PCB

**5.08** The Main Common Control Unit ( MCCU-6TA ) PCB contains four option switches, guides for a battery PCB, a potentiometer and various LEDs ( Figure 5-9 ). It also contains a music IC chip to provide MOH. If a different music source is desired, then a customer provided music source must be installed and the MOH dip switch on the PCB must be in the H position.

The MOH switch is set as follows:

- Set to position *L* for internal MOH.
- Set to position *H* for external source.

**5.09** The PCB has two switches used for dial pulse: PPS and MR. The number of pulses per second ( PPS ) determines the setting of the PPS switch. The make / break ratio is set with the MR switch.

The PPS switch is set as follows:

- Set to side labeled *H* for 10 PPS ( most commonly used ).
- Set to position *L* for 20 PPS.

The MR Switch is set as follows:

- Set to position *L* for a 39% ratio ( most commonly used ).
- Set to position *H* for a 33% ratio.

**5.10** The WR switch located on the MCCU-6TA PCB, is used during system initialization. The system must be initialized to clear all previous system data ( Section 6 ). After initialization, as outlined in Section 6, the WR switch should be placed in the L position.

### RBTU-A

**5.11** The MCCU-6TA PCB is equipped with guides designed for the installation of a battery PCB designated RBTU-A ( Figure 5-9 ). The RBTU-A PCB contains a lithium non-rechargeable battery that protects the programmed memory during a power failure. The fuse on the RBTU-A PCB can be replaced while the system is operational and without removing the MCCU-6TA.

To Install the RBTU-A PCB:

- Insert the RBTU-A PCB in the guides, which help align the pins for insertion into the MCCU-6TA mounted connector.
- Push in the RBTU-A PCB until the pins are fully engaged in the connector.
- Press the push-to-lock fastener ( Figure 5-9 ). This action secures RBTU-A to the MCCU-6TA.

**CAUTION: DO NOT PLACE THE R-BTU-A PCB OR AN MCCU-6TA WITH AN R-BTU-A PCB ON A CONDUCTIVE SURFACE OR IN A CONDUCTIVE STATIC-SHIELDING BAG.**

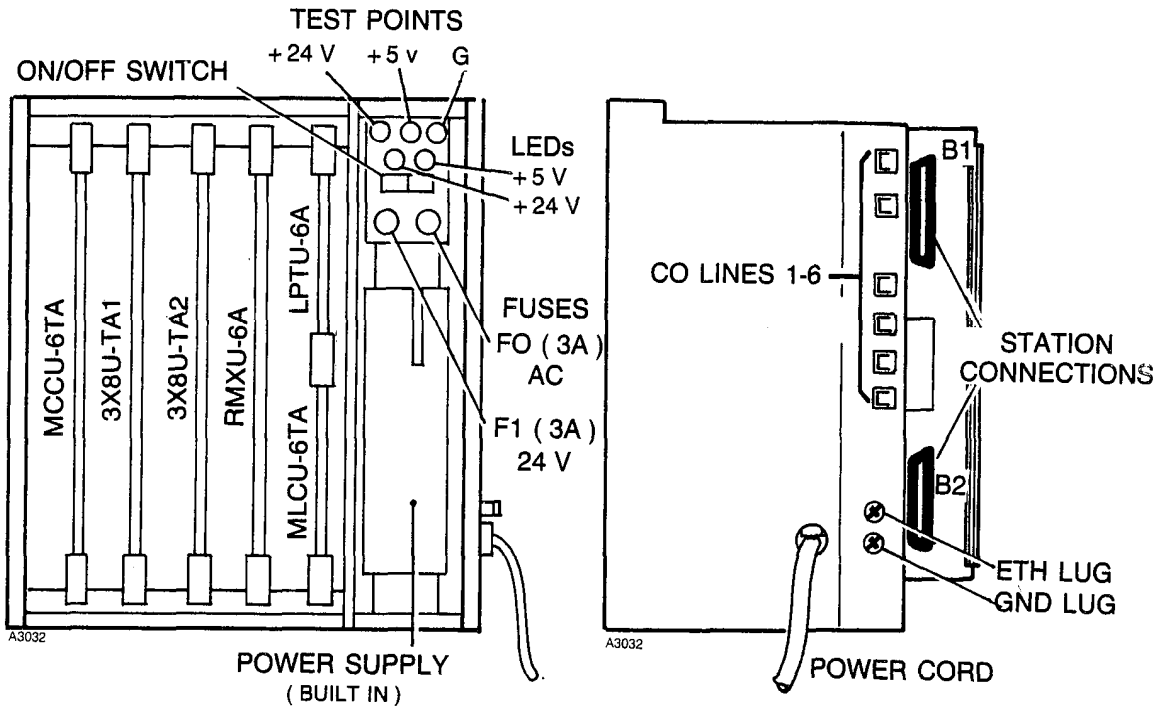


Figure 5-7 KEY SERVICE UNIT/POWER SUPPLY, EK-616, PCB ARRANGEMENT

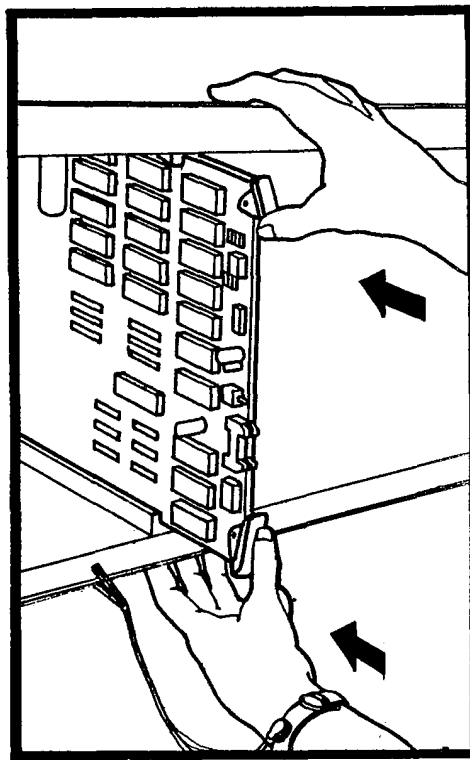


Figure 5-8 PCBS INSERTION INTO KSU

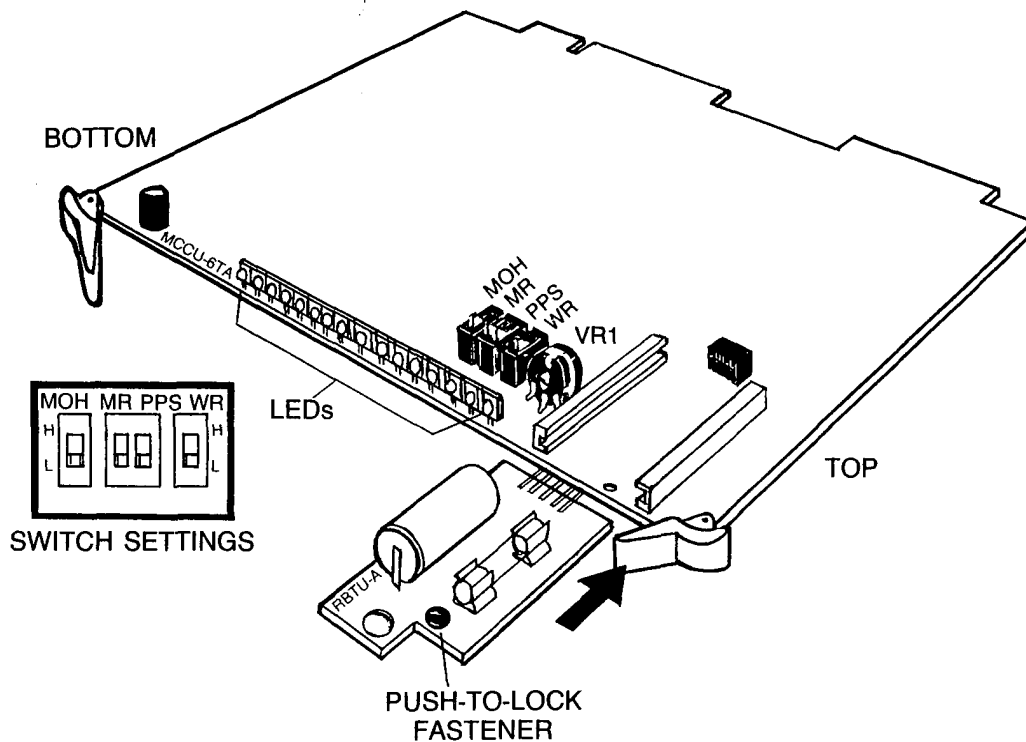


Figure 5-9 MCCU-6TA PCB, EK-616

#### LEDs

5.12 LED 1 flashes to indicate that the processor clock is running in the MCCU-6TA PCB. LED 2 illuminates and AL3 flashes at each Executive Display telephone when the battery on the RBTU-A PCB is dead. The appropriate LED, STA 1-STA 16, slowly flashes to indicate that transmission is complete between the central processor and the stations. The appropriate LED flashes fast to indicate that a station is off hook. The LED extinguishes when no station is connected.

**CAUTION: WHEN THE BATTERY ON THE RBTU-A PCB IS DEAD, REPLACE THE PCB.**

#### Potentiometer VR 1

5.13 Potentiometer VR 1 adjusts the volume level of the Music-On-Hold (MOH) music source.

- Turn VR 1 clockwise to increase the volume level of MOH.

#### MLCU-6TA

5.14 The MLCU-6TA (Figure 5-10) is used for multi-line conferencing. An optional Ground Flash (GRDU-6A) PCB is mounted on the MLCU-6TA PCB and is used in systems requiring ground transfer on PBX lines. The GRDU-6A has two male connectors that are inserted into the female connectors on the MLCU-6TA.

- Turn the GRDU-6A PCB over with the component side facing down.
- Line up the connector on the GRDU-6A PCB to match the connectors on the MLCU-6TA.

5.15 One GRDU-6A connector has pins 20 and 11 labeled on the PCB. The other connector has pins 1 and 10 labeled on the PCB. These are inserted into the corresponding connector position on the MLCU-6TA PCB.

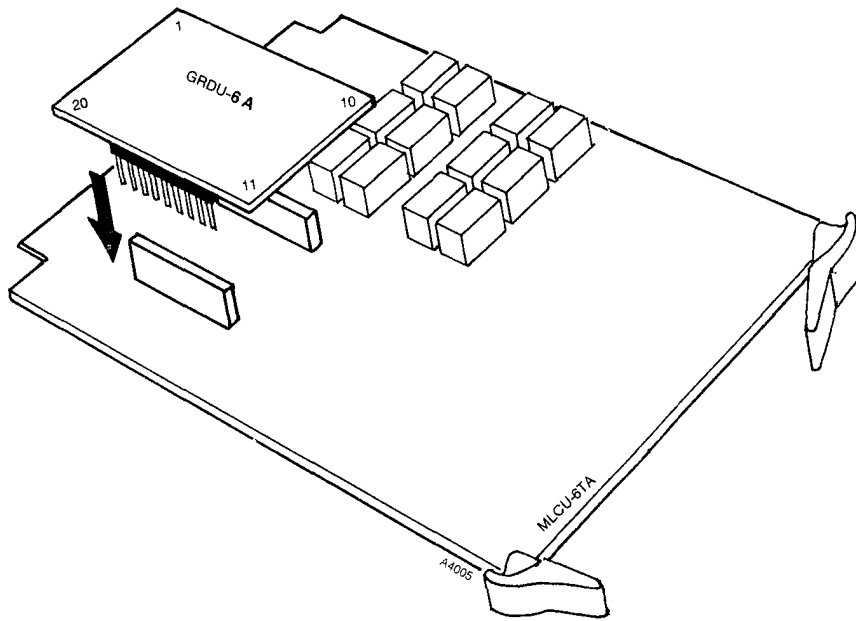


Figure 5-10 MLCU-6TA AND GRDU-6A PCBs, EK-616

5.16 The 3X8U-TA, RMXU-6A and LPTU-6A PCBs have no straps or switch settings ( Figure 5-11 ). The 3X8U-TA has an LED that is steady when a line is busy and is off when all lines are idle.

5.17 When the RMXU-6A PCB is required, remove the RMSU-A PCB from the KSU before inserting the RMXU-6A PCB.

5.18 Insert PCBs in the proper KSU / PSU slot ( Figure 5-7 ).

**KSU PCB CHECK**

- Set the appropriate switches on MCCU-6TA PCB ( para. 5.08 ).
- Install GRDU-6A PCB, if appropriate ( para. 5.14 and 5.15 ).
- Insert PCBs in appropriate slot in KSU ( para. 5.18 ).

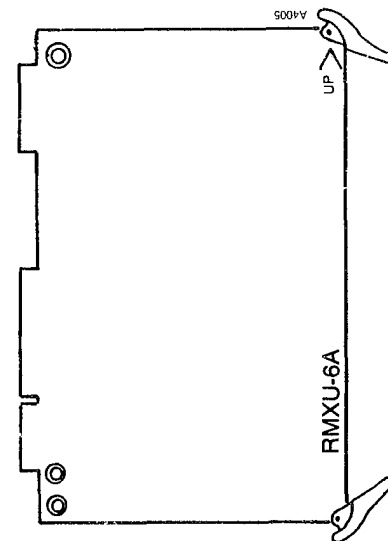
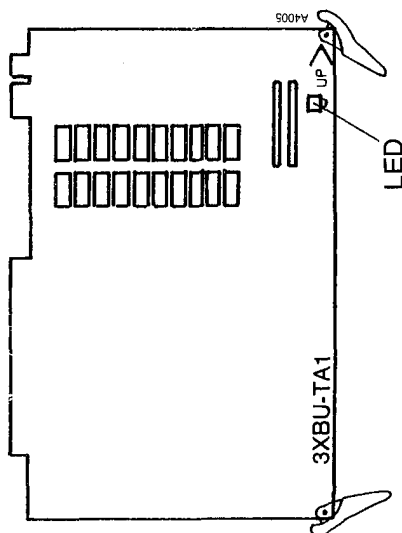
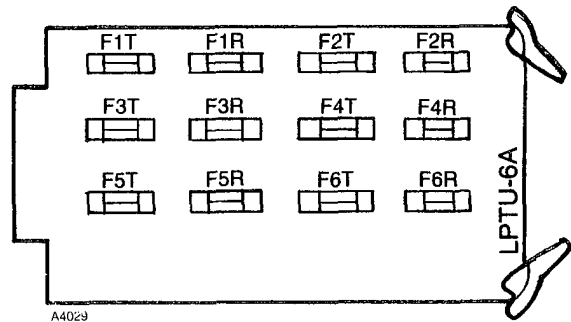


Figure 5-11 PCBs WITHOUT STRAP AND SWITCH OPTIONS, EK-616

## 6. STATION INSTALLATION

**6.01** Before installing station equipment, measure the voltage at the modular jack. Turn power switch of the Power Supply to the on position and measure the voltages as follows:

- AT to AR 24V DC ( - 10% + 5% )
- BT to BR 24V DC ( - 10% + 5% )

**NOTE:** AT is positive with respect to AR.  
BT is positive with respect to BR.

**6.02** To install the telephone, plug it into the modular jack. All telephones are equipped with modular plugs ( Figure 5-12 ). Refer to Section 9 OPTIONAL EQUIPMENT for installation of an SPDU-6A PCB in a Standard Key Telephone.

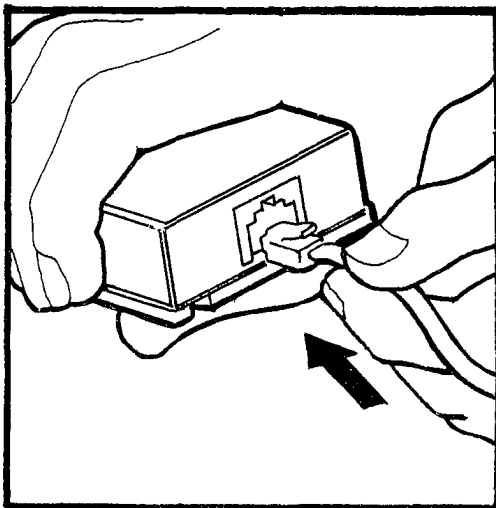


Figure 5-12 PLUGGING IN THE LINE CORD

## 7. INSTALLATION OF OPTIONAL EQUIPMENT

**7.01** Refer to Section 9 OPTIONAL EQUIPMENT for procedures for installing Door Chime Box, Monitor Box, external music sources, external paging amplifiers, power failure external bells, Energy Control System, and Alarm.

## 8. RADIO FREQUENCY INTERFERENCE

**8.01** If the system is not installed and used according to the manufacturer's instructions, this equipment may interfere with radio and television reception. It has been type-tested and found to comply with the limits for a Class A computing device, according to specifications in FCC Rules covering protection against such interference in a commercial installation. However, there is no guarantee that interference will not occur in a particular installation. Interference to radio or television reception caused by this equipment can be determined by turning the equipment off and on. If an interference problem exists, the problem may be solved in one or more of the following ways:

- (a) Re-orient the receiving antenna.
- (b) Relocate the receiver with respect to the equipment.
- (c) Plug the equipment and receiver into different outlets so that both are on different branch circuits.

**8.02** If necessary, consult your dealer for additional assistance. The following booklet, prepared by the FCC, may be helpful:

**"How to Identify and Remove Radio-TV Interference Problems"**

Order this booklet from:

U.S. Government Printing Office  
Washington, D.C. 20402  
( Stock No. 004-000-00345-4 )

### **Radio Frequency Susceptibility**

**8.03** If the EK-616 System is installed in a strong Radio Frequency ( RF ) field, it may interfere with the proper operation of the system. The use of proper installation and grounding procedures outlined in this manual will help minimize RF susceptibility.

## 9. CONNECTING TELCO LINES

**9.01** Each RJ11C connector from telco provides service for one CO line. The RJ11C connectors are connected to the EK-616 system with modular line cords. Up to six lines ( 6 RJ11C connectors ) from telco can be connected to the system. Each RJ11C is connected with a modular line cord to a modular connector on the KSU ( Figure 5-2 ).



# EK-616

## ELECTRONIC KEY TELEPHONE SYSTEM

### SECTION 6, PROGRAMMING

#### 1. INTRODUCTION

**1.01** The PROGRAMMING Section describes the programming, system initialization and program reading procedures for the EK-616 system. All data needed for programming should have been entered on the Program Record Forms ( PRFs ) completed in Section 4.

**NOTE:** The programming mode must be entered since programming date and time is required.

**1.02** No new information has been included in this section.

**1.03** Two elements used in Initialization and Programming are labeled WR. The WR switch is located on the MCCU-6TA PCB in the KSU, and the WR button is located under the designation strip of the Executive Display Key Telephone. Throughout this section, these elements will be designated WR switch ( MCCU-6TA PCB ) and WR button ( Executive Display Key Telephone ), Figures 6-1 and 6-2 respectively.

#### 2. SYSTEM INITIALIZATION

**2.01** The system must be initialized after installation. The Initialization process loads the factory-installed program into the system memory. If a change is to be made to a program during system or station programming, the system *does not* need to be initialized again.

**CAUTION: INITIALIZATION IS REQUIRED TO ESTABLISH A STABLE INITIAL STATE FOR THE SYSTEM MEMORY. IF YOU INTEND TO MAKE PROGRAMMING CHANGES, DO NOT INITIALIZE THE SYSTEM AGAIN, SINCE ALL PREVIOUSLY PROGRAMMED OPTION CODES WILL BE ERASED AND REPLACED WITH INITIALIZATION VALUES.**

**2.02** Following is the procedure to initialize the system.

To initialize the system:

- *The WR switch (MCCU-6TA PCB--Figure 6-1) must be set to H.*
- *Turn ON power supply, wait approximately 10 seconds.*
- *Set the WR switch ( MCCU-6TA PCB ) to L. ( This will activate the system memory battery backup and allow system programming. )*

#### 3. PROGRAMMING

**3.01** There are three major components of the programming process. These must be completed not only when one is first programming the system, but each time programming changes are to be entered:

- *Entering the programming mode.*
- *Entering data.*
- *Exiting the programming mode.*

#### ENTERING THE PROGRAMMING MODE.

**3.02** To program options, the system must be in the programming mode. Programming is done at Station 10 using an Executive Display Key Telephone.

To place the system in the programming mode:

- *The WR switch ( MCCU-6TA PCB ) must be in the L position ( see Figure 6-1, inset ).*
- *On the Executive Display Key Telephone, remove the designation strip and cover on the DSS / Automatic Dialer keys to expose the button labeled WR.*
- *Press the WR button ( Executive Display Key Telephone ) using an object such as a pen point or paper clip.*

6

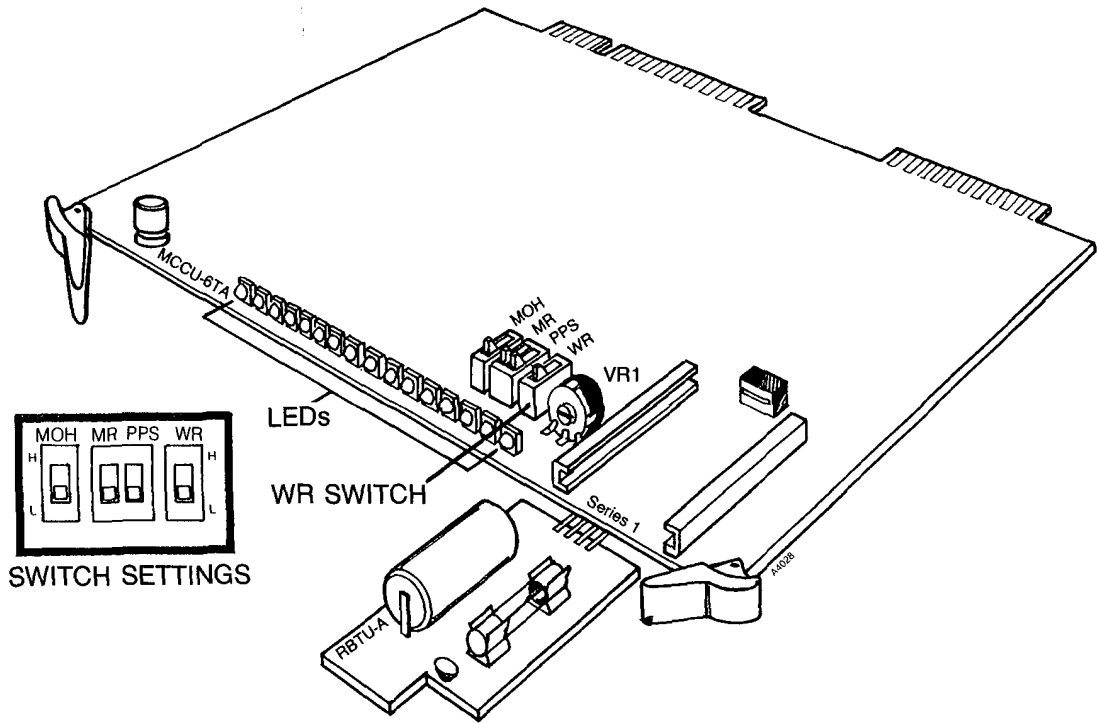


Figure 6-1 WR SWITCH LOCATION ON MCCU-6TA PCB, EK-616

6

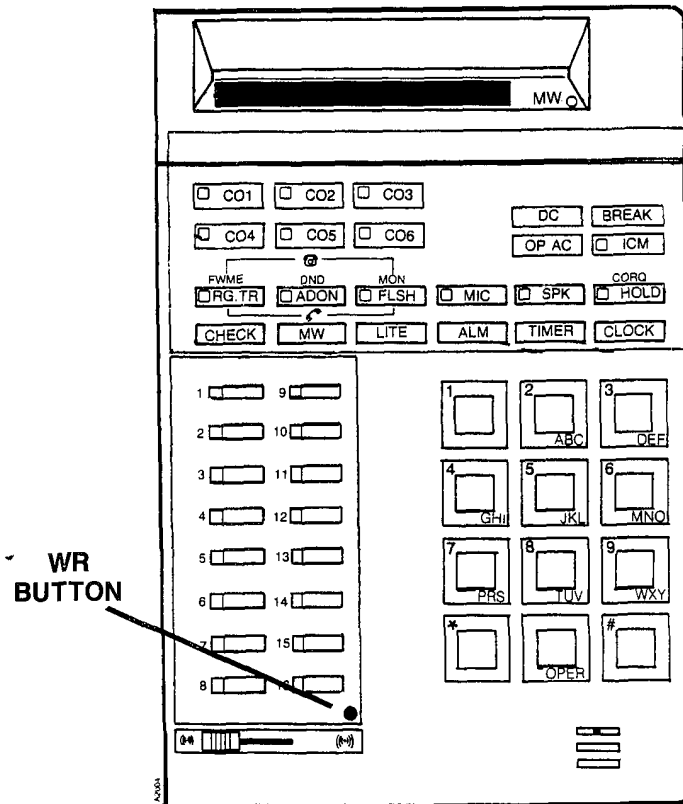


Figure 6-2 PROGRAMMING BUTTON ( WR ), EXECUTIVE DISPLAY KEY TELEPHONE, EK-616

### ENTERING THE DATA

**3.03** The appropriate steps for entering data are described for each program, beginning with paragraph 3.05. If the system has previously been programmed and data is to be entered to change a specific program, go directly to the program to be changed. Changing a program does not require the system to be initialized again. Entered data is stored in a buffer memory. In order to transfer the data to system memory the procedure detailed under **EXITING THE PROGRAMMING MODE** ( paragraph 3.04 ) **MUST** be followed.

**CAUTION: IF THE DATA ENTRY PHASE MUST BE INTERRUPTED BEFORE COMPLETION, IT IS ADVISABLE TO EXIT THE PROGRAMMING MODE TO ENSURE THAT ENTERED DATA IS NOT LOST.**

**NOTE:** When modifications are made to a program, record all changes on the Option Configuration Worksheets ( Section 3 ) and on the PRFs ( Section 4 ) so that all information will be up to date.

### EXITING THE PROGRAMMING MODE

**3.04** To transfer entered data into system memory and exit the programming mode:

- Press CHECK key.
- Display shows "C".
- Press F-16 key, "P" is shown on the right side of the display. †
- Press WR button ( Executive Display Key Telephone ) on the telephone using an object such as a pen point or paper clip.

**NOTE:** The programming mode **MUST** be exited in this manner. Failure to do so will result in the loss of all entered data.

† The system recognizes certain programming errors and will display the appropriate error indication in place of the "P". Error indications are explained below:

- 1 - PBX Access Codes are not entered even though PBX lines are set.
  - 2 - The minimum Pause Timer is set to zero even though PBX lines are set.
  - 3 - Error in data entered for Call Forwarding pair.
  - 4 - DND data is not set to the Executive Station for Call Forwarding.
  - 5 - Data for Recall Timer was set to zero.
  - 6 - Data for Ring Inward Timer was set to zero.
- C - WR switch ( MCCU-6TA PCB ) is in the wrong position.

### STATION PROGRAMMING

#### Program 1, Line Access

**3.05** To program Line Access press F-4 key and proceed as follows:

Display:

- Enter station number.

Display:

- Press LINE key(s) station can access as indicated on Table 4-1.

Display:

- Dial \*.
- Repeat procedure, beginning with entering station number, for the next station and all subsequent stations until all stations have been programmed.
- Dial # to exit.

Initialized: All stations can access lines 1-6.

#### Program 2, CO Audible

**3.06** To program CO Audible press F-5 key and proceed as follows:

Display:

- Enter station number.

Display:

- Press LINE key(s) to ring at station as indicated on Table 4-1.

Display:

- Dial \*.
- Repeat procedure, starting with next station number, until all stations have been programmed.
- Dial # to exit.

Initialized: Lines 1-6 ring at all stations.

#### Program 3, Co Audible Disable, Station

**3.07** To program CO Audible Disable, Station press F-6 key and proceed as follows:

Display:

- Enter station number.

Display:

- Dial \*.
- Enter code for that station as indicated on Table 4-1.

Display:

- Dial \*.
- Repeat procedure, starting with next station number, until all stations have been programmed.
- Dial # to exit.

Initialized: All stations disabled.



**Program 4, Night Service, Preset**

**3.08** To program Night Service, Preset press RGTR ( FWME ) key and proceed as follows:

Display:

- Enter station number.

Display:

- Dial \*.
- Enter code as indicated on Table 4-1.

Display:

- Dial \*.
- Repeat procedure, starting with next station number, until all stations have been programmed.
- Dial # to exit.

Initialized: All stations receive night signaling.

**Program 5, Do Not Disturb**

**3.09** To program Do Not Disturb press ADON ( DND ) key and proceed as follows:

Display:

- Enter station number.

Display:

- Dial \*.
- Enter code for that station as indicated on Table 4-1.

Display:

- Dial \*.
- Repeat procedure, starting with next station number, until all stations have been programmed.
- Dial # to exit.

Initialized: Disabled

**Program 6, Executive Call Forward**

**3.10** To program Executive Call Forward press F-7 key and proceed as follows:

Display:

- Enter executive's station number as indicated on Table 4-1. ( If no partner enter "00". )

Display:

- Dial \*.
- Enter partner's station number as indicated on Table 4-1.

Display:

- Dial \*.
- Repeat procedure, starting with next executive's station number, until all pairs have been programmed.
- Dial # to exit.

Initialized: No assignments.

**Program 7, Off Hook Tone Signaling**

**3.11** To program Off Hook Tone Signaling press F-8 key and proceed as follows:

Display:

- Enter station number.

Display:

- Dial \*.
- Enter code for that station as indicated on Table 4-1.

Display:

- Dial \*.
- Repeat procedure, starting with next station number, until all stations have been programmed.
- Dial # to exit.

Initialized: Disabled.

**Program 8, Barge-In**

**3.12** To program Barge-In proceed as follows:

- Press BREAK key.

Display:

- Enter code as indicated on Table 4-1 for station being programmed.

Display:

- Dial \*.
- Enter station number.

Display:

- Dial \*.

Display:

- Repeat procedure starting with next station number until all stations for that code have been entered.
- Dial #.
- Repeat procedure to program next code from Table 4-1.

Initialized: Disabled.

**Program 9, Door Chime Station**

**3.13** To program a station to receive Door Chime audible press F-9 key and proceed as follows:

Display:

- Enter station number.

Display:

- Dial \*
- Enter code as indicated on Table 4-1.

Display:

- Dial \*
- Repeat procedure, starting with next station number, until all stations have been programmed.
- Dial # to exit.

Initialized: Station 10 will receive chime.

**Program 10, Internal Page Zones ( Stations )**

**3.14** To program Internal Page Zones proceed as follows:

- Press F-10 key.

Display:

- Enter Zone selection 81, 82 or 83 as indicated on Table 4-1.

Display:

- Dial \*
- Enter each station number for that zone with an \* after each.

Display:

- Dial #
- Repeat procedure to program next zone, until all zones have been programmed.

Initialized: Zone 81, stations 10-13; Zone 82, stations 14-17; Zone 83, stations 18-21.

To cancel data entered for Internal Page Zones:

- Press F-10 key.

Display:

- Dial 81, 82 or 83, internal zones

Display:

- Press F-10 key.
- Enter station number to be canceled with an \* after each.

Display:

- Dial #.

**Program 11, Alarm ( Stations )**

**3.15** To enable Alarm for each station press ALM key and proceed as follows:

Display:

- Dial 3.

Display:

- Dial \*
- Enter each station number as indicated on Table 4-1 to have this feature with an \* after each.

Display:

- Dial # to exit.

Initialized: Station 10 enabled.

To disable Alarm for each station press ALM key and proceed as follows:

Display:

- Dial 4.

Display:

- Dial \*
- Enter each station number with an \* after each.

Display:

- Dial # to exit.

**Program 12, Class of Service**

**3.16** To program Class Of Service ( COS ) proceed as follows:

- Press F-14 key.

Display:

- Enter COS from Table 4-1.

Display:

- Dial \*
- Enter each station number for that COS as indicated on Table 4-1 with an \* after each.

Display:

- Dial #.
- Repeat procedure to program next COS code, until all codes have been programmed.

Initialized: All stations COS 0.

## LINE PROGRAMMING

### Program 13, Co Line Signaling

**3.17** To program CO Line Signaling press F-1 key and proceed as follows:

Display:

- Press LINE key.

Display:

- Enter code for that line as indicated on Table 4-2.

Display:

- Dial \*
- Repeat procedure, starting with next LINE key, until all lines have been programmed.
- Dial # to exit.

Initialized: All lines as DTMF.

### Program 14, PBX Lines

**3.18** To program PBX Lines press F-2 key and proceed as follows:

**NOTE:** PBX Access Codes ( Program 25, Category 2 ) must be programmed when assigning lines as PBX lines.

Display:

- Press LINE key.

Display:

- Enter code for that line as indicated on Table 4-2.

Display:

- Dial \*
- Repeat procedure, starting with next LINE key, until all lines have been programmed.
- Dial # to exit.

Initialized: All lines as CO lines.

### Program 15, Flash

**3.19** To program Flash press FLSH ( MON ) key and proceed as follows:

Display:

- Press LINE key.

Display:

- Enter code for that line as indicated on Table 4-2.

Display:

- Dial \*
- Repeat procedure, starting with next LINE key, until all lines have been programmed.
- Dial # to exit.

Initialized: Open Loop Flash

### Program 16, Queue Groups

**3.20** To program Queue Groups press F-3 key and proceed as follows:

Display:

- Enter queue group number.

Display:

- Press LINE key(s) to be in Queue Group as indicated on Table 4-2.

Display:

- Dial \*
- Repeat procedure, starting with next queue group number, until all groups have been programmed.
- Dial # to exit.

Initialized: Lines 1-6 in first queue group.

### Program 17, Special Line Access

**3.21** To program Special Line Access press HOLD ( CORQ ) key and proceed as follows:

Display:

- Press LINE key.

Display:

- Enter code for that line as indicated on Table 4-2.

Display:

- Dial \*
- Repeat procedure, starting with next LINE key, until all lines have been programmed.
- Dial # to exit.

Initialized: All stations access lines 1-6.

### Program 18, External Page Zones ( Lines )

**3.22** To program External Page Zones press F-10 key and proceed as follows:

Display:

- Enter Zone selection 85 or 86 from Table 4-2.

Display:

6

- Press LINE key(s) to be in that zone as indicated on Table 4-2.

Display:

- Dial \*.
- Repeat procedure starting with next zone.
- Dial # to exit.

Initialized: Zones 85-86, no lines assigned.

### Program 19, Release of Abandoned Call on Hold

**3.23** To program Release of Abandoned Call on Hold press TIMER key and proceed as follows:

Display:

- Press LINE key.

Display:

- Enter code for line as indicated on Table 4-2.

Display:

- Dial \*.
- Repeat procedure, starting with next LINE key, for remaining lines.
- Dial # to exit.

Initialized: Interval not set.

## SYSTEM PROGRAMMING

### Program 20, Alarm

**3.24** To program Alarm:

- Press ALM key.

Display:

- Enter 1 for first alarm input.

Display:

- Dial \*.
- Enter code for first alarm input as indicated on Table 4-3.

Display:

- Dial \*.
- Enter 2 for second alarm input.

Display:

- Dial \*.
- Enter code for second alarm input as indicated on Table 4-3.

Display:

- Dial \*.
- Dial # to exit.

Initialized: Alarm 1-2, open.

### Program 21, Meet-Me Answer Paging and Meet-Me Conference

**3.25** To program Meet-Me Answer Paging and Meet-Me Conference:

- Press F-11 key.

Display:

- Enter code as indicated on Table 4-3.

Display:

- Dial \*.
- Dial # to exit.

Initialized: Enabled.

### Program 22, Signal Calling or Voice Announce

**3.26** To program Signal Calling or Voice Announce:

- Press F-12 key.

Display:

- Enter code as indicated on Table 4-3.

Display:

- Dial \*.
- Dial # to exit.

Initialized: Voice Announce.

### Program 23, Three Minute Warning Tone

**3.27** To program Three Minute Warning Tone:

- Press F-13 key.

Display:

- Enter code as indicated on Table 4-3.

Display:

- Dial \*.
- Dial # to exit.

Initialized: Disabled.

**Program 24, Timers**

**I-Hold Reminder**

**3.28** To program I-Hold Reminder:  
• Press **TIMER** key.

Display:

• Press **HOLD ( CORQ )** key.

Display:

• Enter code as indicated on Table 4-3.

Display:

• Dial \*.  
• Dial # to exit.

Initialized: 30 seconds.

**Exclusive Hold Recall**

**3.29** To program Exclusive Hold Recall:  
• Press **TIMER** key.

Display:

• Press **HOLD ( CORQ )** key twice.

Display:

• Enter code as indicated on Table 4-3.

Display:

• Dial \*.  
• Dial # to exit.

Initialized: 30 seconds.

**Recall / Reminder Signal**

**3.30** To program Recall / Reminder Signal:  
• Press **TIMER** key.

Display:

• Press **ICM** key.

Display:

• Enter code as indicated on Table 4-3.

Display:

• Dial \*.  
• Dial # to exit.

Initialized: 20 seconds.

**Ring Inward Timer**

**3.31** To program Ring Inward Timer:  
• Press **TIMER** key.

Display:

• Press **RGTR ( FWME )** key.

Display:

• Enter code as indicated on Table 4-3.

Display:

• Dial \*.  
• Dial # to exit.

Initialized: 30 seconds.

**Talkback Timer**

**3.32** To program Talkback Timer:  
• Press **TIMER** key.

Display:

• Press **SPK** key.

Display:

• Enter code as indicated on Table 4-3.

Display:

• Dial \*.  
• Dial # to exit.

Initialized: None.

**Flashing Timer**

**3.33** To program Flashing Timer ( PBX Lines only ):  
• Press **TIMER** key.

Display:

• Press **FLSH ( MON )** key.

Display:

• Enter code as indicated on Table 4-3.

Display:

• Dial \*.  
• Dial # to exit.

Initialized: .5 seconds.

6



**Pause Behind a PBX**

**3.34** To program Pause Behind A PBX:

- Press **TIMER** key.

Display:

- Press **BREAK** key.

Display:

- Enter code as indicated on Table 4-3.

Display:

- Dial **\***.
- Dial # to exit.

Initialized: 3.2 seconds.

**Program 25, Toll Restriction**

**3.35** To program Toll Restriction proceed as follows:

- Press **F-15** key.

Display:

- Enter category code from Table 4-4.

Display:

- Dial **\***.
- Enter memory location from Table 4-4.

Display:

- Dial **\***.
- Enter data as indicated on Table 4-4.
- Dial **\***.
- Repeat procedure starting with next memory location until all data have been entered for category being programmed.
- Dial #.
- Repeat procedure to program next category.

Initialized: No toll restriction entries.

**Program Clock**

**3.36** To set Clock:

- Press **CLOCK** key.

Display:

- Press # for **PM**, **\*** for **AM**.

Display:

- Enter hours ( 00-12 ). The hour will appear as a two digit number.

Display:

- Enter minutes ( 00-59 ). Minutes will appear as the last two digits on the right side of the display window.

Display:

- Dial **\***.
- Dial #.

**Date**

**3.37** To set Date:

- Press **CLOCK** key twice.

Display:

- Enter month ( 01-12 ).

Display:

- Enter date ( 01-31 ).

Display:

- Dial **\***.
- Dial #.

**Year**

**3.38** To set Year:

- Press **CLOCK** key three times.

Display:

- Enter year ( 4 digits ).

Display:

- Dial **\***.
- Dial #.

**Day**

**3.39** To set Day:

- Press **CLOCK** key four times.

Display:

- Enter 0=Sun, 1=Mon, 2=Tues, 3=Wed, 4=Thur, 5=Fri, 6=Sat.

Display:

- Dial **\***.
- Dial #.

## PROGRAMMING COMPLETION

**3.40** After all data has been entered one of two steps may be taken:

- *Data may be checked at this time, or,*
- *Data may be stored and the programming mode exited.*

**3.41** If data is to be checked at this time proceed in accordance with the PROGRAM READING steps beginning in paragraph 4.01. When the programming check is completed, exit the programming mode in accordance with paragraph 3.04.

**3.42** If a programming check is not to be done at this time, exit the programming mode in accordance with paragraph 3.04. Data will be stored in system memory for checking at a later time.

## 4. PROGRAM READING

**4.01** All data programmed into the system can be checked using the following procedure:

### STATION PROGRAMMING CHECK

#### Program 1, Line Access

**4.02** To check codes entered for Line Access:

- *Press CHECK key.*
- *Press F-4 key.*
- *Enter each station number with an \* after each. Lines assigned are displayed.*
- *Dial # to exit.*

#### Program 2, CO Audible

**4.03** To check codes entered for CO Audible:

- *Press CHECK key.*
- *Press F-5.*
- *Enter each station number with an \* after each. Lines assigned are displayed.*
- *Dial # to exit.*

#### Program 3, CO Audible Disable, Station

**4.04** To check codes entered for CO Audible Disable, Station:

- *Press CHECK key.*
- *Press F-6 key.*
- *Enter first station number and \* for next station.*
- *Dial # to exit.*

#### Program 4, Night Service, Preset

**4.05** To check codes entered for Night Service, Preset:

- *Press CHECK key.*
- *Press RGTR ( FWME ) key.*
- *Enter first station number and \* for next station.*
- *Dial # to exit.*

#### Program 5, Do Not Disturb

**4.06** To check codes entered for Do Not Disturb:

- *Press CHECK key.*
- *Press ADON ( DND ) key.*
- *Enter first station number and \* for next station.*
- *Dial # to exit.*

#### Program 6, Executive Call Forward

**4.07** To check codes entered for Executive Call Forward:

- *Press CHECK key.*
- *Press F-7 key.*
- *Enter first executive station number and \* for next pair.*
- *Dial # to exit.*

#### Program 7, Off Hook Tone Signaling

**4.08** To check codes entered for Off Hook Tone Signaling:

- *Press CHECK key.*
- *Press F-8 key.*
- *Enter first station number and \* for next station.*
- *Dial # to exit.*

#### Program 8, Barge-In

**4.09** To check codes entered for Barge-In:

- *Press CHECK key.*
- *Press BREAK key.*
- *Dial 1, 2 or 3 to check station numbers in each level.*
- *Dial \* repeatedly to display each station in level.*
- *Dial #.*
- *Repeat procedure to check next level.*

#### Program 9, Door Chime Station

**4.10** To check codes entered for Door Chime Station:

- *Press CHECK key.*
- *Press F-9 key.*
- *Enter first station number and \* for next station.*
- *Dial # to exit.*

#### Program 10, Internal Page Zones ( Stations )

**4.11** To check codes entered for Internal Page Zones:

- *Press CHECK key.*
- *Press F-10 key.*
- *Dial 81, 82 or 83 to check stations in each zone.*
- *Dial \* repeatedly to display all stations in zone.*
- *Dial #.*
- *Repeat procedure to check next zone.*

#### Program 11, Alarm ( Stations )

**4.12** To check codes entered for Alarm:

- *Press CHECK key.*
- *Press ALM key.*
- *Dial 3.*
- *Dial \* repeatedly to display each station.*
- *Dial # to exit.*

### Program 12, Class of Service

- 4.13** To check codes entered for Class Of Service:
- Press CHECK key.
  - Press F-14 key.
  - Enter first COS number.
  - Dial \* repeatedly to display each station in that COS.
  - Dial #.
  - Repeat procedure to check next COS number.

## LINE PROGRAMMING CHECK

### Program 13, Co Line Signaling

- 4.14** To check codes entered for CO Line Signaling:
- Press CHECK key.
  - Press F-1 key.
  - Press each LINE key.
  - Dial # to exit.

### Program 14, PBX Lines

- 4.15** To check codes entered for PBX lines:
- Press CHECK key.
  - Press F-2 key.
  - Press each LINE key.
  - Dial # to exit.

### Program 15, Flash

- 4.16** To check codes entered for Flash:
- Press CHECK key.
  - Press FLSH ( MON ) key.
  - Press each LINE key.
  - Dial # to exit.

### Program 16, Queue Groups

- 4.17** To check codes entered for Queue Groups:
- Press CHECK key.
  - Press F-3 key.
  - Enter each queue group number with an \* after each.
  - Dial # to exit.

### Program 17, Special Line Access

- 4.18** To check codes entered for Special Line Access:
- Press CHECK key.
  - Press HOLD ( CORQ ) key.
  - Press each LINE key.
  - Dial # to exit.

### Program 18, External Page Zones ( Lines )

- 4.19** To check codes entered for External Page Zones:
- Press CHECK key.
  - Press F-10 key.
  - Dial 85 or 86 to check lines in each zone.
  - Dial #.
  - Repeat procedure to check next zone.

### Program 19, Release of Abandoned Call on Hold

- 4.20** To check codes entered for Release of Abandoned Call on Hold:
- Press CHECK key.
  - Press TIMER key.
  - Press first LINE key.
  - Dial #.
  - Repeat procedure to check next line key.

## SYSTEM PROGRAMMING CHECK

### Program 20, Alarm

- 4.21** To check codes entered for Alarm:
- Press CHECK key.
  - Press ALM key.
  - Dial 1 for first Alarm input.
  - Dial \*.
  - Dial 2 for second Alarm input.
  - Dial \*.
  - Dial # to exit.

### Program 21, Meet-Me Answer Paging and Meet-Me Conference

- 4.22** To check codes entered for Meet-Me Answer Paging and Meet-Me Conference:
- Press CHECK key.
  - Press F-11 key.
  - Dial # to exit.

### Program 22, Signal Calling Or Voice Announce

- 4.23** To check codes entered for Signal Calling or Voice Announce:
- Press CHECK key.
  - Press F-12 key.
  - Dial # to exit.

### Program 23, Three Minute Warning Tone

- 4.24** To check codes entered for Three Minute Warning Tone:
- Press CHECK key.
  - Press F-13 key.
  - Dial # to exit.

### Program 24, Timers

#### I-Hold Reminder

- 4.25** To check codes entered for I-Hold Reminder:
- Press CHECK key.
  - Press TIMER key.
  - Press HOLD ( CORQ ) key.
  - Dial \*.
  - Dial # to exit.

### **Exclusive Hold Recall**

**4.26** To check codes entered for Exclusive Hold Recall:

- Press *CHECK* key.
- Press *TIMER* key.
- Press *HOLD ( CORQ )* key twice.
- Dial \*
- Dial # to exit.

### **Recall / Reminder Signal**

**4.27** To check codes entered for Recall / Reminder Signal:

- Press *CHECK* key.
- Press *TIMER* key.
- Press *ICM* key.
- Dial # to exit.

### **Ring Inward Timer**

**4.28** To check codes entered for Ring Inward Timer:

- Press *CHECK* key.
- Press *TIMER* key.
- Press *RGTR ( FWME )* key.
- Dial # to exit.

### **Talkback Timer**

**4.29** To check codes entered for Talkback Timer:

- Press *CHECK* key.
- Press *TIMER* key.
- Press *SPK* key.
- Dial # to exit.

### **Flashing Timer**

**4.30** To check codes entered for Flashing Timer:

- Press *CHECK* key.
- Press *TIMER* key.
- Press *FLSH ( MON )* key.
- Dial # to exit.

### **Pause Behind a PBX**

**4.31** To check codes entered for Pause Behind a PBX:

- Press *CHECK* key.
- Press *TIMER* key.
- Press *BREAK* key.
- Dial # to exit.

### **Program 25, Toll Restriction**

**4.32** To check codes entered for Toll Restriction:

- Press *CHECK* key.
- Press *F-15* key.
- Enter category ( 0-5 ).
- Dial \*.
- Enter first memory location.
- Dial \* to display entry.
- Dial \*.
- Repeat procedure starting with next memory location.
- Dial #.
- Repeat procedure to check next category.

**NOTE:** The programming mode must be exited in accordance with paragraph 3.04.

## EK-616

# ELECTRONIC KEY TELEPHONE SYSTEM

## SECTION 7, TESTS AND FAULT LOCATION

### 1. INTRODUCTION

**1.01** The THEORY OF OPERATION Section provides the system and Printed Circuit Board ( PCB ) theory of operation for the EK-616 Electronic Key Telephone System. The information presented in this section can be used in conjunction with the maintenance data provided in Section 8 ( MAINTENANCE ) to localize system faults to the plug-replaceable unit. An analysis of signal flow, based on the three basic modes of system operation ( i.e. receive an outside call, place an outside call and Intercom ) is included at the end of this section ( Part 8 ).

**1.02** No new information has been included in this section.

### 2. SYSTEM OPERATION

**2.01** The EK-616 system ( Figure 7-1 ) uses microprocessor technology to process outside calls, manage internal system traffic, and provide the hardware control required to execute the system features and programmable options. The KSU ( Key Service Unit ) is the system architectural base and interfaces the telephone stations, power supply and external devices to the plug-in circuit boards.

**2.02** Five principle circuit board types are plugged into the KSU. These are:

- (a) **MCCU-6TA ( Main Common Control )**, ( Figure 7-2 ) which provides microprocessors for data management; generators for system tones; page amplifiers; and devices for alarm detection, Music-On-Hold and Background Music, and Energy Control System control interface.
- (b) **3X8U-TA ( CO Line / Key Station Interface )**, ( Figure 7-3 ) which contains three line circuits, eight station circuits, one intercom voice switching ( talkback ) circuit and analog switching components for the lines, stations, and four ICM paths ( links ).
- (c) **RMXU-6A ( Matrix Expansion )**, ( Figure 7-4 ) consisting of CO line relay matrix expansion and crosspoint matrix expansion elements for a heavily loaded ( greater than three line by four ICM link ) system. The RMSU Shorting PCB shorts the relay matrix area on systems where the RMXU-6A is not required.
- (d) **MLCU-6TA ( Multi-Line Conference )**, ( Figure 7-5 ) which provides circuitry for multi-line and multi-station conferencing. The MLCU-6TA also provides mounting for the optional GRDU-6A ground flash enable PCB.
- (e) A fifth circuit board, the **LPTU-6A** ( Figure 7-6 ), is plugged into the KSU for CO line fuse and surge protection.

**SUMMARY OF SYSTEM ARCHITECTURE  
( FULLY LOADED )**

**2.03** The six CO lines, fuse protected by the LPTU-6A Line Protection Unit, are connected through the KSU backplane artwork to the MLCU-6TA conference PCB. Compensation networks for conference are selectively enabled or disabled, under program control, and the CO lines are routed, through the RMXU-6A PCB, to the respective 3X8U-TA line / station PCBs.

**2.04** The two 3X8U-TA line / station PCBs and the RMXU-6A expansion matrix PCB are interconnected in the backplane circuitry to create a 6 line × 16 station × 6 link analog matrix. This matrix, as are all other KSU PCB functions, is controlled by the MCCU-6TA processor. All station audio is switched in the matrix; CO lines are switched in the relay sub-matrix and the ICM links are switched in the electronic crosspoint sub-matrix. The matrix also has provisions for speakerphone network, system audible and music, and dial switching.

**2.05** The MCCU-6TA Main Common Control Unit makes all the processing decisions for the KSU components. The on-board circuits for paging, music, alarm detection and the Energy Control System are routed through the backplane to station (B) block positions, facilitating external connections. The tones produced on the MCCU-6TA are connected, via backplane circuitry, to the 6 line × 16 station × 6 link matrix for integration into the system.

**2.06** The power supply in the KSU provides DC operating voltages for the PCBs from the 117 V AC input source.

**2.07** Telephone to KSU communication is over two pair twisted station wire, terminated at the station (B) blocks. The "A" pair is reserved for audio: handset, speakerphone, audibles and music. The "B" pair uses serial data transmission superimposed on DC voltage to allow the microprocessor in the telephone to communicate with the MCCU-6TA processors in the KSU. Although most of the processing decisions are made in the KSU, a limited amount are made locally ( in the station equipment ).

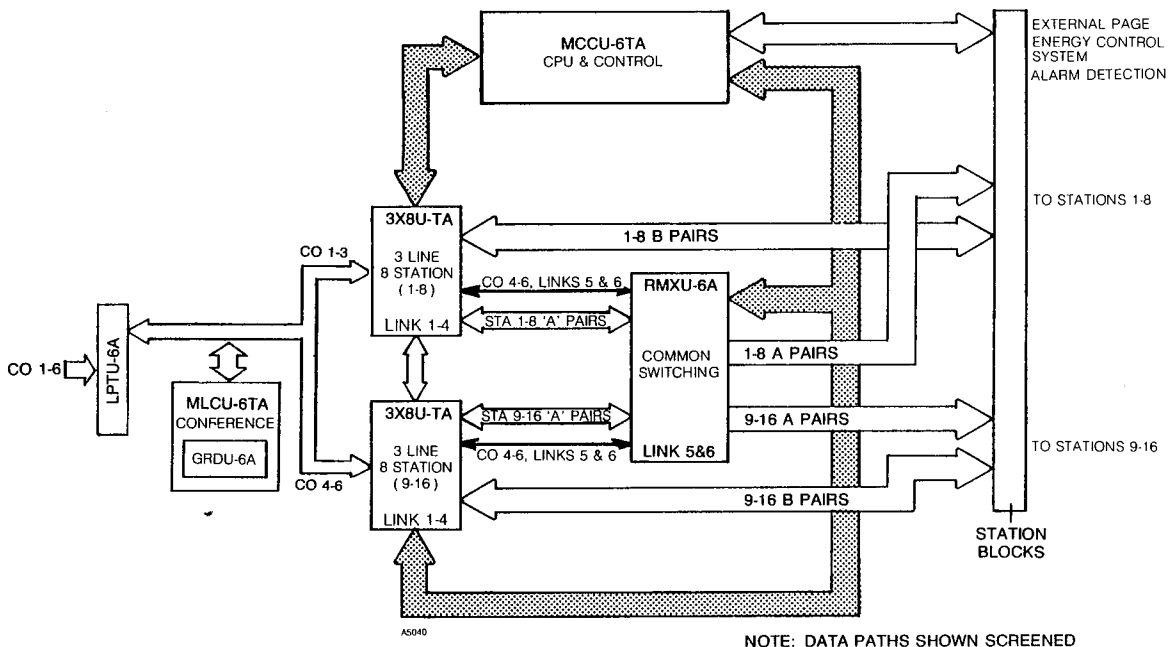


Figure 7-1 SYSTEM BLOCK DIAGRAM, EK-616

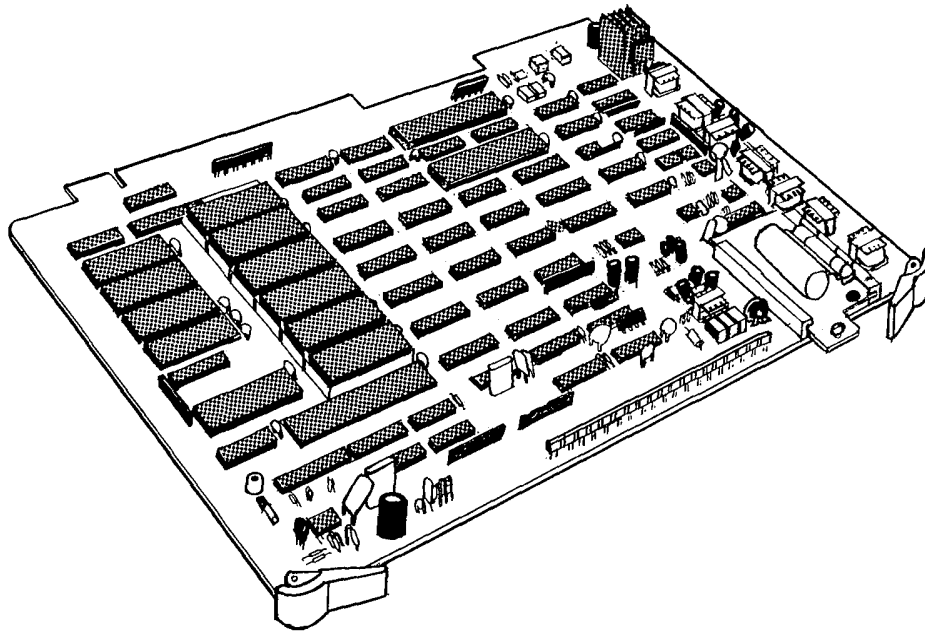


Figure 7-2 MCCU-6TA, EK-616

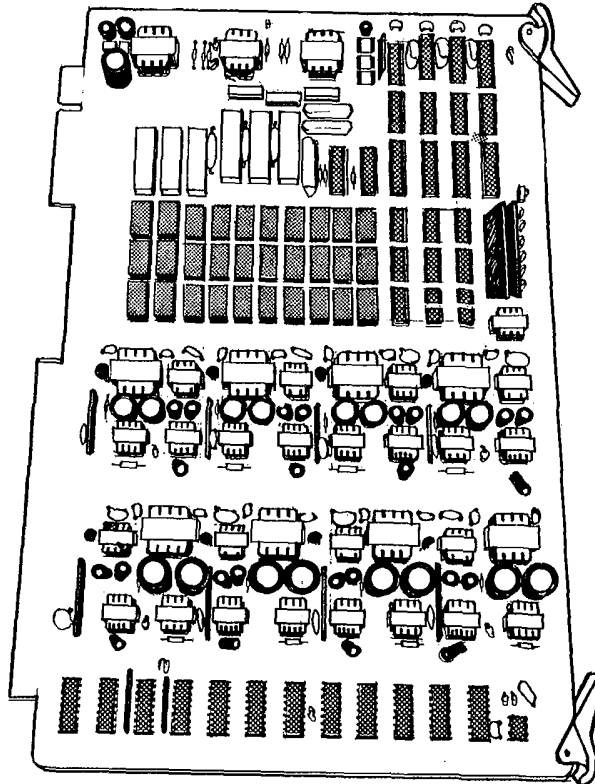


Figure 7-3 3X8U-TA PCB, EK-616

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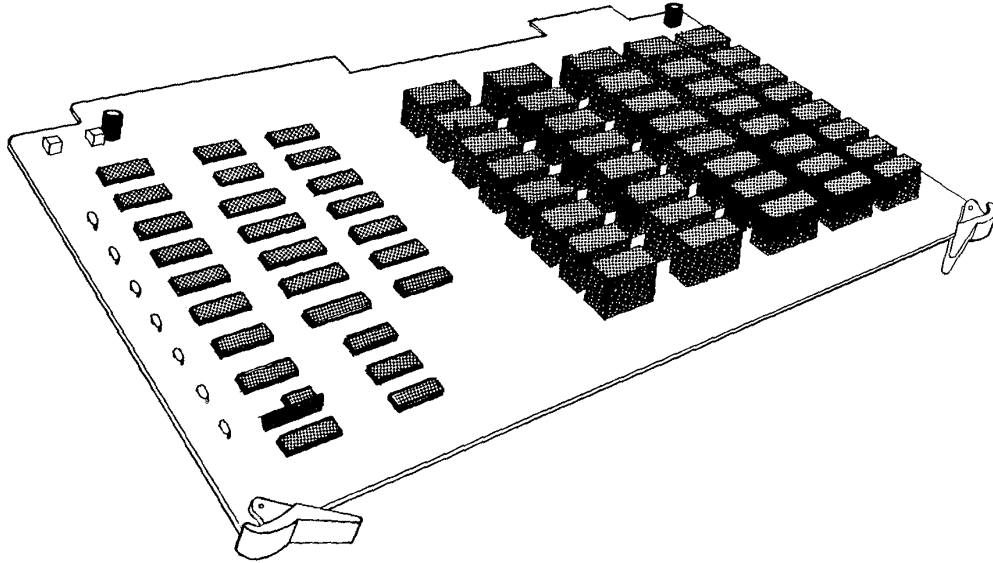


Figure 7-4 RMXU-6A PCB, EK-616

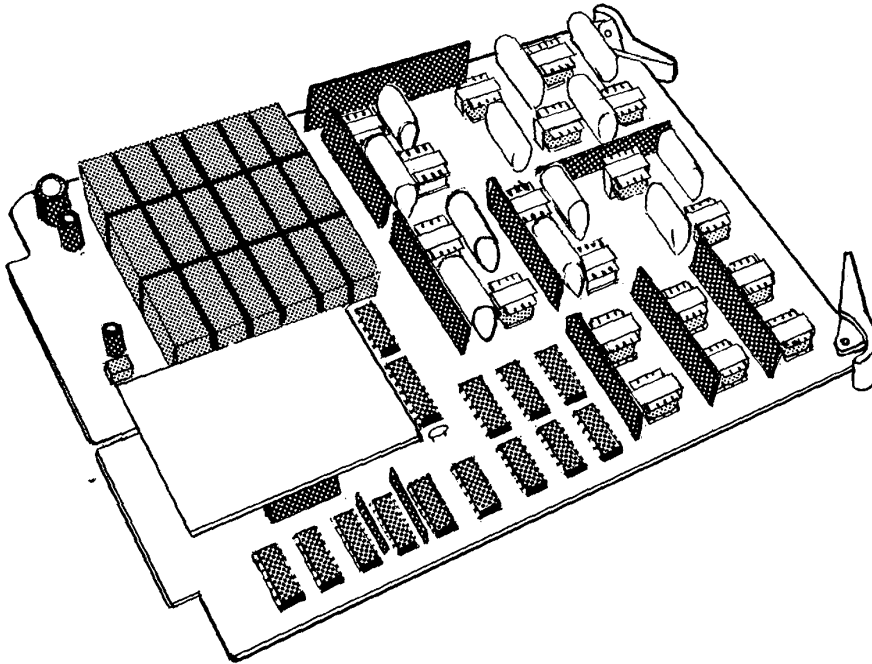


Figure 7-5 MLCU-6TA PCB, EK-616

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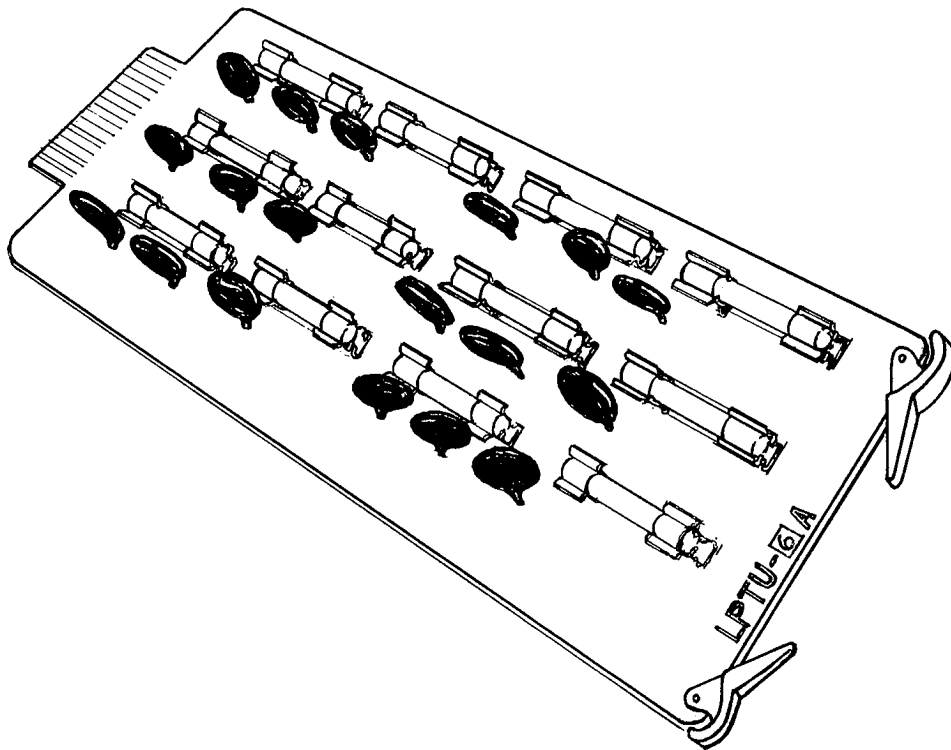


Figure 7-6 LPTU-6A PCB, EK-616

### 3. MCCU-6TA MAIN COMMON CONTROL PCB

**3.01** The MCCU-6TA (Figure 7-7) allows Z80 eight bit microprocessor control over the EK-616 system. The on-board Z80 main CPU is supported by two subordinate microprocessors, operating CMOS RAM, Read Only Memory (ROM) for system firmware, and logic circuitry for signal gating and distribution. Analog circuitry generates system tones and synthesized music, provides amplification for paging, and provides external alarm detection.

**3.02** The Z80 microprocessor integrated circuit (IC chip) controls the logic on the MCCU-6TA over a sixteen line address bus and an eight bit data bus. All of the digital circuits on the MCCU-6TA, as well as on the other PCBs in the KSU, are positioned along these two busses. All system logic is controlled by the Z80, through the KSU backplane.

**3.03** The condition of the address bus is established by the Z80 processor. The Z80 then uses the data bus to send control data to other system components, or fetch stored information from the addressed locations. All system events are effectively under digital control. System firmware is resident on the ROMs while the volatile operating software resides in 12K of on-board battery backed-up Random Access Memory (RAM). The stability of the Z80 is maintained by the crystal controlled oscillator that provides system clock to the processor. Power-up reset circuitry assures that the main CPU will be correctly initialized after installation or following a long term power interruption.

**3.04** The Z80 CTC (counter / timer circuit) provides interrupt timing pulses to the Z80 processor and four base frequencies to the tone generators. The tones are output to other components in the system that require audibles. Dual Tone Multifrequency (DTMF) tones are produced in the DTMF generator in response to input codes from the data bus. A music synthesizer is used for Music-On-Hold when a separate music source is not installed.

**3.05** Two subordinate microprocessors are used: the Dial Sub CPU and the DTR Sub CPU. The Dial Sub CPU controls the dialing on CO lines and is the source of pulses when outpulse dialing is required. Dial status data words stored in the  $4 \times 4$  Data File Chips are polled by the Dial Sub CPU when required. The DTR Sub CPU processes the serial data to (SDO) and from (SDI) the telephone stations. The  $4 \times 4 \times 4$  Data File Chips allow 32 bits of input data and 32 bits of output data to be stored until polled by the Z80 or DTR Sub CPU.

**3.06** The Real Time Clock Chip provides the Z80 data bus with encoded time and date information. Time and date can be displayed at Executive Telephones.

**3.07** LED driver circuitry and sixteen LEDs are included on the MCCU-6TA to allow visual monitoring of station status. A station in use is indicated by a flashing station LED. Additional LEDs indicate if the processor clock is running and when the RAM battery back-up is not functional.

**3.08** All analog crosspoint and relay matrix networks in the EK-616 system are under direct program control. Closure decisions are made by the main CPU. Data is then sent to the data bus to effect the closures.

**3.09** Relay drive (seize) data for the 3X8U-TA relay matrix and CO line ring detect interrupts are placed on the Z80 data bus. This facet of the system architecture establishes main processor control over CO line operation.

**3.10** Analog crosspoints are included on the MCCU-6TA PCB for the ICM talkback circuit, Energy Control System DTMF, system tones, and Background Music. Four amplifiers for system page zones and two opto-couplers for external alarm detection are also provided on the MCCU-6TA PCB.

### DATA FORMAT

**3.11** Serial transmission between the MCCU-6TA and the remote stations is based on 28 bit data words transmitting at 333.3K Hz. Each telephone station is polled once every 100 mSec, providing real time control of system functions. Once the CPU has selected a station for polling, a start bit is transmitted. The station responds to this query by returning an acknowledge bit followed by 28 bits of station data. The acknowledge bit is used as a sync bit to assure proper data synchronization. The data returned by the telephone consists mainly of station identification and key status information.

**3.12** After the CPU receives the 28 station data bits, it will send the first 28 bit command word, preceeded by a sync bit. Following successful transmission of its first word, the CPU sends a second (and final) data word, also preceeded by a sync bit. The command words sent to the telephone determine the function to be initiated and the LED to be illuminated. The entire data transmission scheme consumes 84 bits (with 3 leading bits).

7

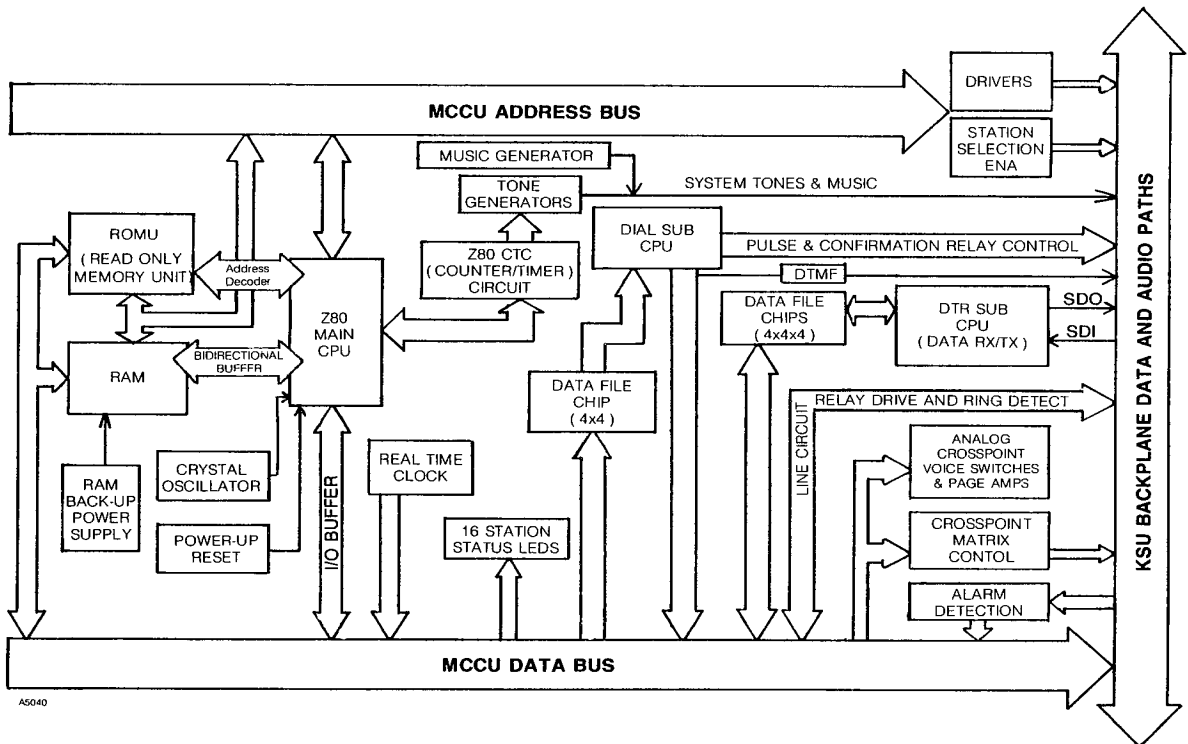
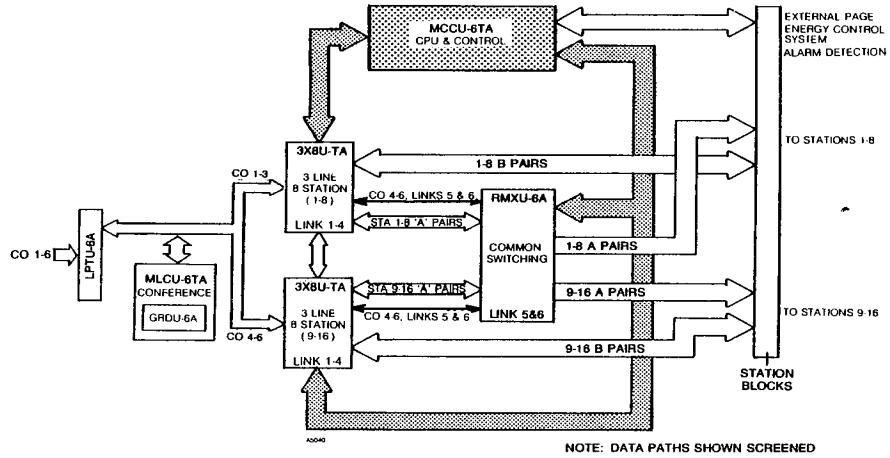


Figure 7-7 MCCU-6TA PCB, EK-616

## 4. 3X8U-TA LINE / STATION INTERFACE INTERFACE PCB

**4.01** The 3X8U-TA Line / Station Interface ( Figure 7-8 ) is comprised of circuitry to process three CO lines and eight telephone stations. All CO line and station processing is controlled by the Z80 microprocessor.

**4.02** Each CO line interface circuit contains an analog ring detection network; pulse, seize, hold and power failure relay contacts; and an attenuator circuit for dial confirmation ( i.e. reduced dial level mirrored to station ). In response to an incoming ring, the ring detect network will cause an analog pulse to be photo-coupled to pulse stretchers and conditioners. These pulse conditioning circuits provide ring detect ( line status ) data, via the KSU backplane wiring, to the Z80 CPU. The CO interface relays in effect form an analog matrix, controlled by relay matrix control circuitry, which is subordinate to the MCCU-6TA data bus. The power failure relays are operated whenever power is applied, and shunt all CO interface circuitry if power is lost ( thereby appearing on preselected station "A" pairs ).

**4.03** Eight station circuits connect the telephone stations to audio and data switching networks, the Handsfree path, and line interface relays. Station "A" pair audio is switched, under Z80 program control, in analog crosspoints. These crosspoints are for Handsfree operation ( 4 × 8 ) and ICM link ( 4 × 8 ). An additional 2 × 3 crosspoint switches Music-On-Hold and DTMF to the three CO line circuits. A 3 × 8 crosspoint network for matrixing the station "A" pairs to the tip and ring of the CO lines is created through relays. Two station circuits have power failure relays that pass the "A" pair directly to the telephone when power is lost.

**4.04** Serial data is transmitted and received over the station "B" pairs. Receive serial data from the telephone is multiplexed by an 8-in 1-out gating network to the serial data input port of the MCCU-6TA PCB. Transmit data is de-multiplexed from the MCCU-6TA serial data output port to the individual station transmit data circuits.

**4.05** The 3X8U-TA circuit board has a talkback voice switch network for Handsfree communication on Intercom calls. Analog crosspoints on the MCCU-6TA place this network in series in a station-to-station ICM link when the telephones involved do not have local speakerphone talkback circuitry. The talkback circuit is not applicable on outside calls.

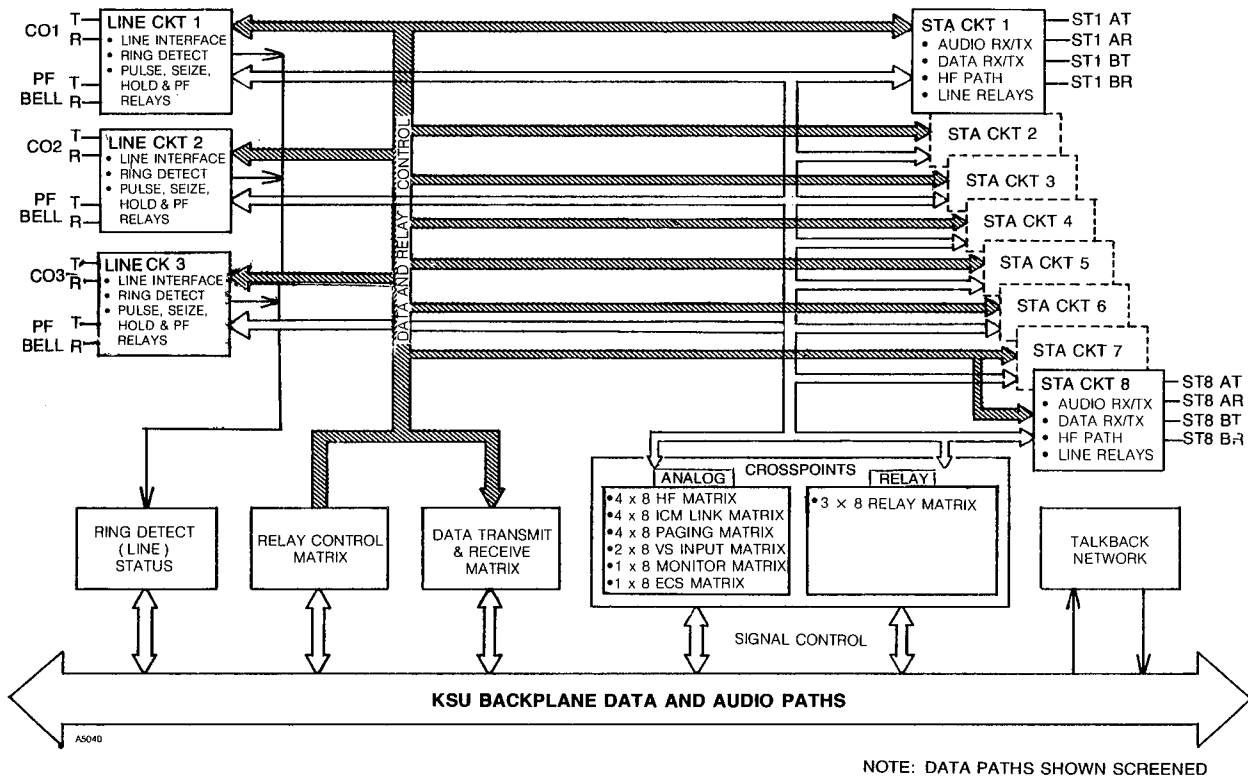
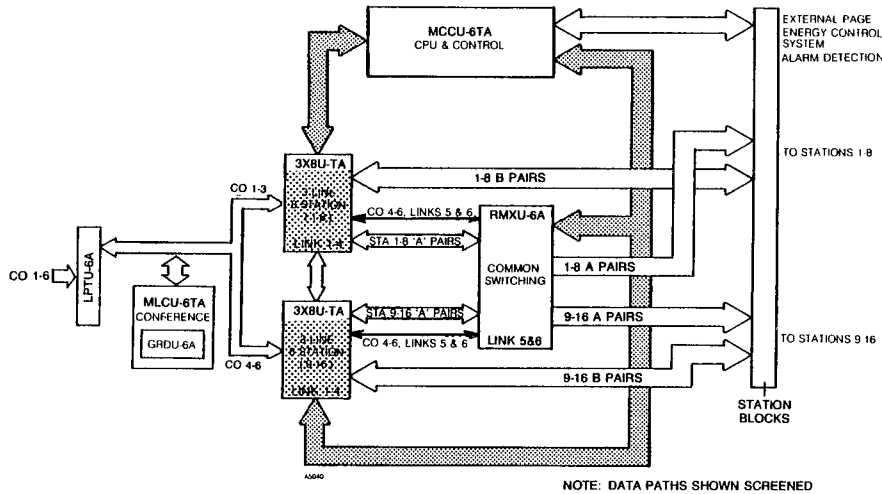


Figure 7-8 3X8U-TA BLOCK DIAGRAM, EK-616

### 5. RMXU-6A MATRIX EXPANSION PCB

**5.01** The RMXU-6A Matrix Expansion PCB (Figure 7-9) provides expansion crosspoints that link two 3X8U CO Line / Station Interface boards for systems requiring more than three CO lines, one PF station/line, and / or four ICM paths ( links ). The board is structured in two elements: a 16 x 3 station / CO line relay matrix and a 16 x 2 station / link 5 & 6 expansion crosspoint circuit. The relay matrix allows the "A" pairs from the 3X8U-TA1 PCB ( stations 1-8 ) and the 3X8U-TA2 PCB ( stations 9-16 ) to access CO lines 4-6. ( CO lines 1-3 are direct accessed to stations 1-16 in the 3X8U-TA PCB. ) The expansion crosspoint circuit allows all sixteen stations to access links 5 & 6, the talkback circuit ( switch ) and system tones. The expansion crosspoint circuit and the relay matrix are controlled by the Z80 microprocessor through the MCCU-6TA data bus and KSU backplane artwork.

**5.02** Six additional power failure relay circuits are installed on the RMXU-6A, providing a second power failure station for each CO line.

**5.03** An RMSU-A shorting PCB replaces the RMXU-6A in systems of where the RMXU-6A is not required. This board shorts stations 1-16 "A" pairs through to the KSU backplane.

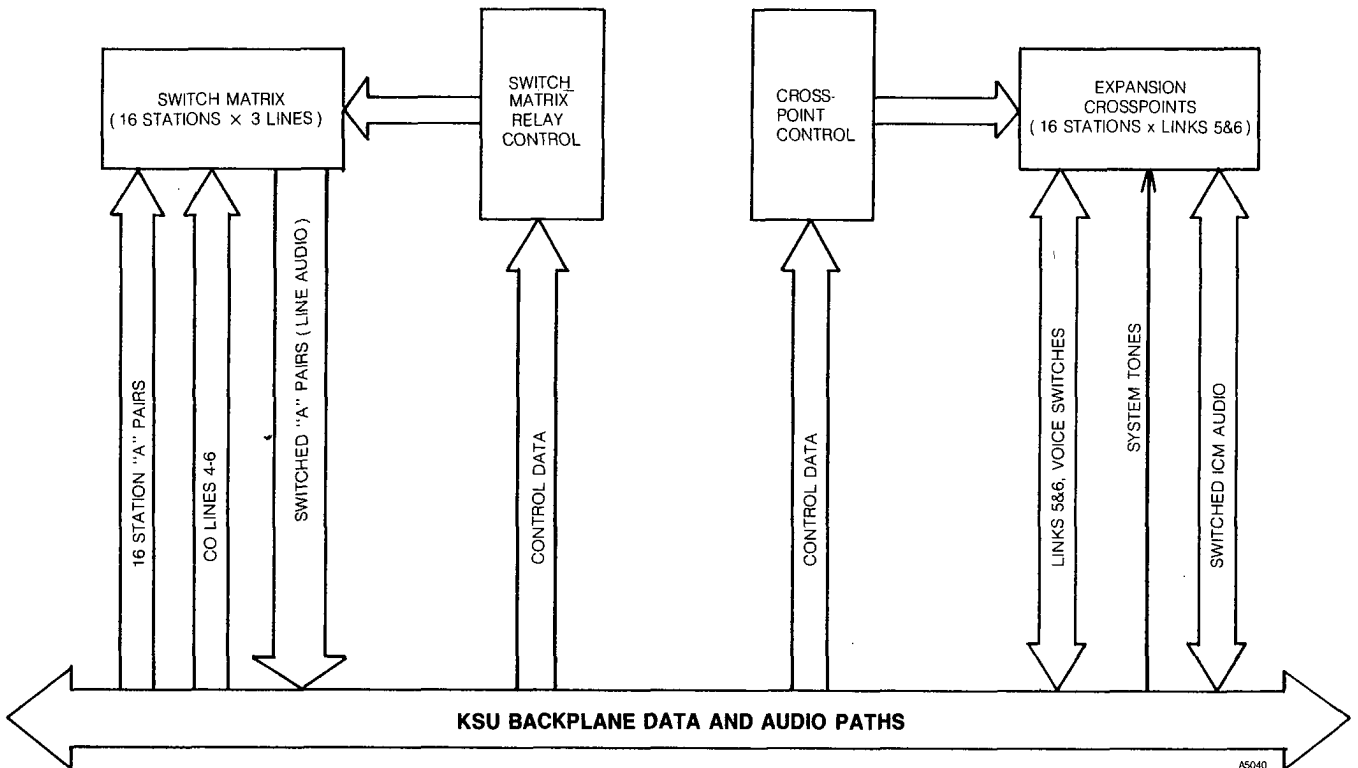
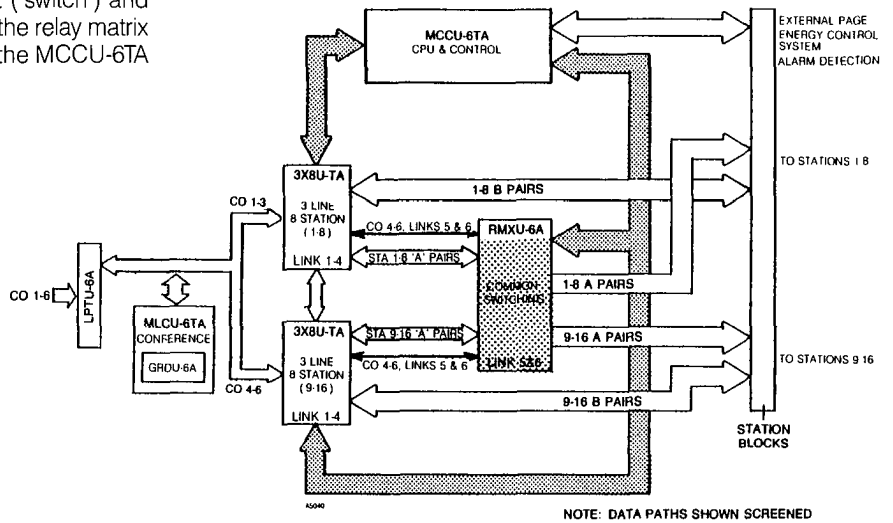


Figure 7-9 RMXU-6A BLOCK DIAGRAM, EK-616

## 6. MLCU-6TA MULTI-LINE CONFERENCE PCB

**6.01** The MLCU-6TA ( Figure 7-10 ) is installed in the EK-616 KSU to facilitate multi-line and multi-station conferencing. One negative impedance ( -Z ) loss compensating network is dedicated to each CO line and each ICM link. The line -Z circuits are switched onto the lines in conference by a line relay matrix under CPU program control. The ICM -Z networks are enabled through audio crosspoints ( analog switches ), which are also under CPU program control. The ICM -Z networks function in three modes, determined by the number of stations ( 3-5 ) joined to the link in conference.

**6.02** Provision is made on the MLCU-6TA for mounting and control of a GRDU-6A grounding PCB. This board enables flash-to-ground for lines ( predominantly PBX lines ) requiring that function.

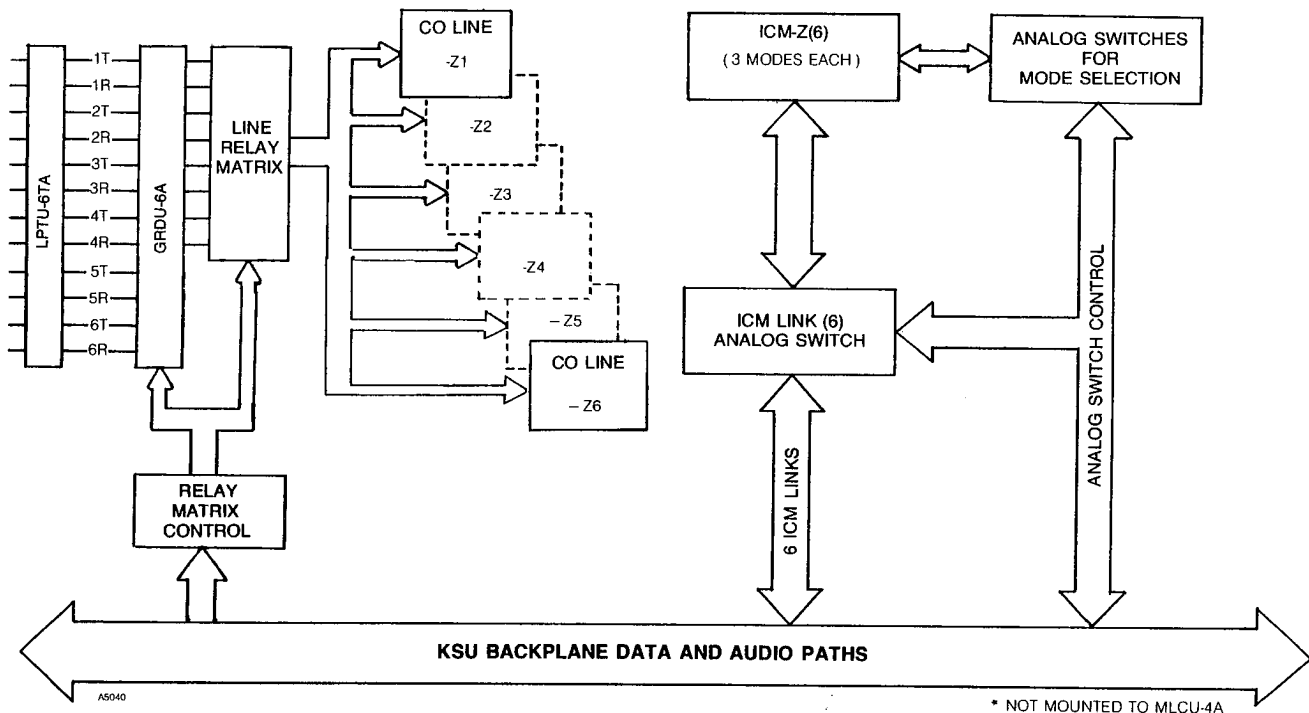
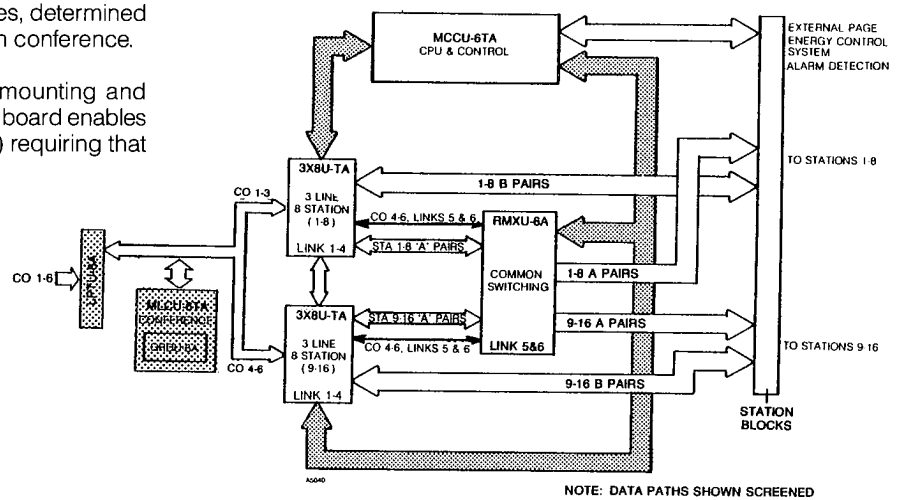


Figure 7-10 MLCU-6TA BLOCK DIAGRAM, EK-616

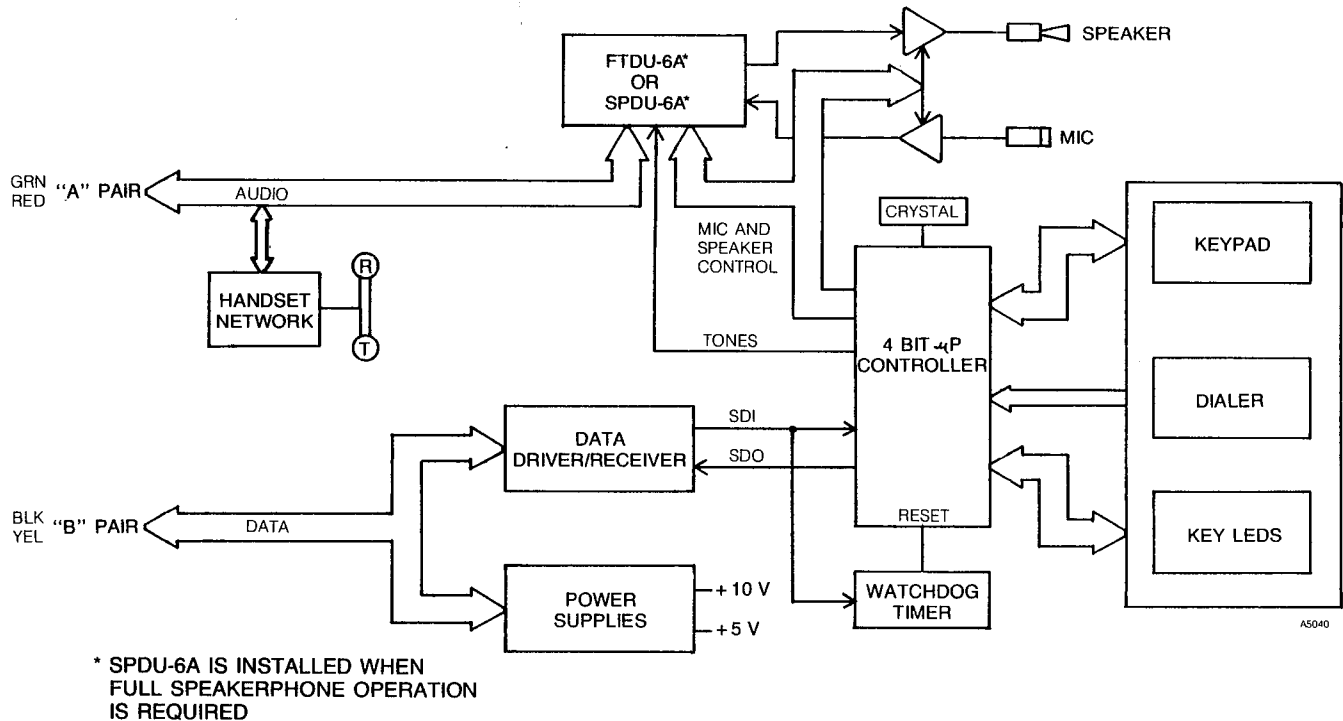


Figure 7-11 STANDARD KEY TELEPHONE BLOCK DIAGRAM, EK-616

## 7. LPTU-6A LINE PROTECTION UNIT PCB

**7.01** The LPTU-6A Line Protection Unit PCB is plugged into the EK-616 to provide "front-end" line fusing and surge protection. This PCB is required in all systems.

## 8. SYSTEM TELEPHONES

### STANDARD KEY TELEPHONE

**8.01** The Standard Key Telephone (Figure 7-11) is a multifunction, microprocessor based key telephone instrument. The telephone has a handset; a microphone and speaker for Handsfree functions; a dial pad; and special keys for CO lines and special functions. Most keys use LEDs to indicate key status.

**8.02** Communication to the circuit boards in the KSU is over four conductor station cable; one pair of wires reserved for station audio ("A" pair) and one pair of wires dedicated to station data and DC power ("B" pair). "A" pair audio is connected, through the hookswitch, to the handset network and the handset receiver and transmitter. Audio is also connected to the SPDU-6A (speakerphone) PCB or the FTDU-6A (non-speakerphone) PCB for Handsfree and audible signal processing. The telephone microprocessor controls the microphone / speaker switching and provides the FTDU / SPDU PCB with off hook tones. A volume control is mounted on the front of the telephone to allow adjustment of the speaker volume.

**8.03** The "B" pair carries the data and DC power which allows the four-bit local microprocessor to handshake with the Z80 CPU in the KSU. The telephone power supplies suppress the data from the DC component and regulate the resultant to the 5 V DC and 10 V DC levels required by the telephone circuits. The data receiver circuits strip the data from the DC "B" pair component, condition it, and present it to the serial data input port of the microprocessor. The serial data in (SDI) also provides the input to the watchdog timer, which will reset the microprocessor if data transmission is lost for longer than the allowed time. The microprocessor serial data output port (SDO) connects to the transmit data drivers. These drivers send data to the KSU, superimposed on the "B" pair DC level. System timing (paragraph 3.11) allows the telephone and KSU to differentiate between transmit and receive data.

**8.04** A "phantom" pair is established between the actual "A" and "B" station pairs. The "phantom" circuit couples the amplified microphone output to the voice switch talkback network in the 3X8U-TA PCB. This enables Handsfree reply on Intercom calls for telephones that do not have the SPDU speakerphone installed.

**8.05** The telephone key closure data (from the key pad), key LEDs and dialer are controlled by the microprocessor in the telephone. The local CPU scans the keys for closures and provides this key data to the KSU in its output serial data. The KSU returns lamp control data to the telephone microprocessor, which in turn alters the command lines into the key LED matrix to cause the appropriate lamp to illuminate. Dialer functions are translated (encoded) in the local CPU and output over the station "B" pair for CO line or station decoding.



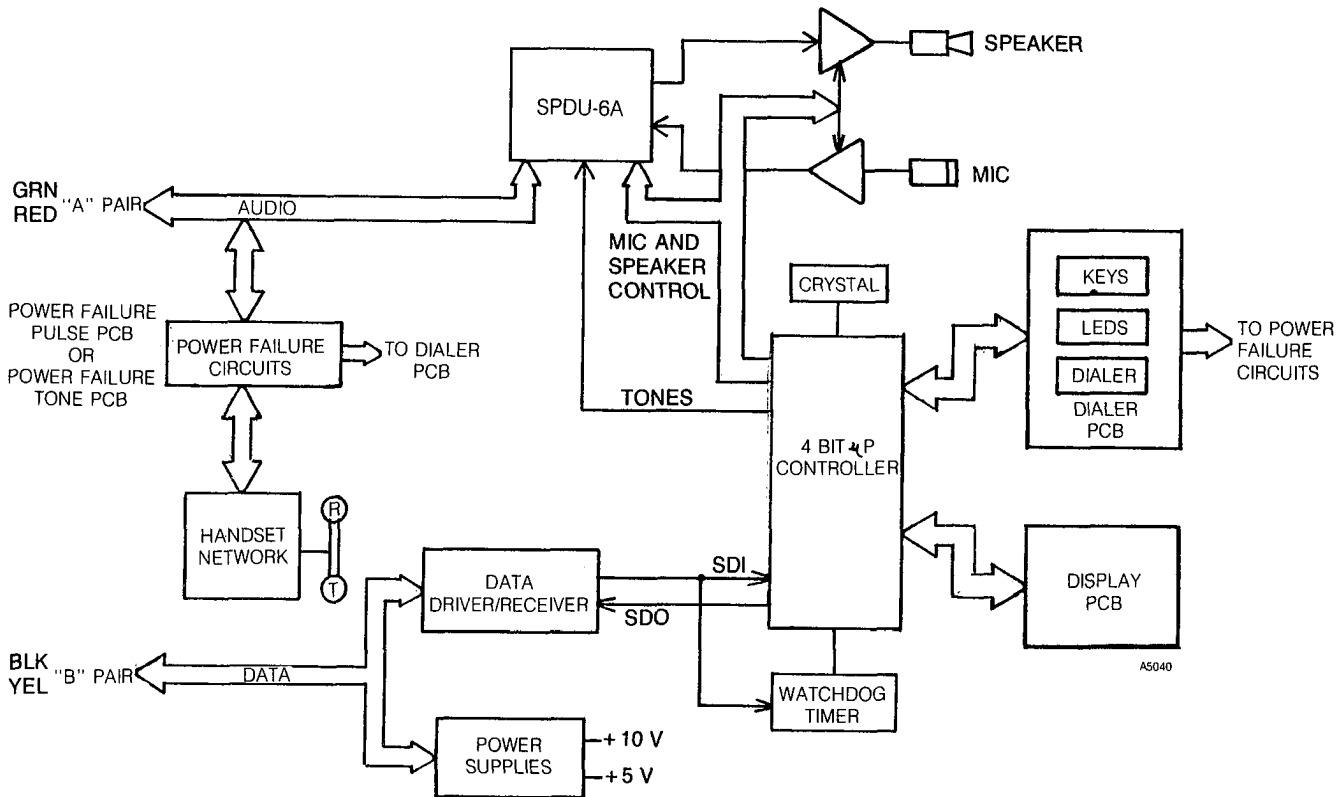


Figure 7-12 EXECUTIVE DISPLAY KEY TELEPHONE BLOCK DIAGRAM, EK-616

## EXECUTIVE DISPLAY KEY TELEPHONE

**8.06** The circuitry in the Executive Display Key Telephone (Figure 7-12) is similar to that in the Standard Key Telephone, with the addition of the Power Failure (DP or DTMF) PCB and the display components. All display telephones use the SPDU PCB to allow Handsfree communication on outside (CO) calls.

**8.07** To facilitate telephone operation during a power failure, "A" pair audio is presented to the power failure circuits (in series with the handset network). During normal system operation, power failure circuits are shunted and "A" pair connection is made directly to the handset network. When system power is lost (i.e. all "B" pair DC power and data transmission has ended) relays close in the power failure PCB. These relays effectively connect the telephone dialer and handset, via the hookswitch, to the "A" pair. Power failure relay closures in the KSU, installed in selected station ports, link the station "A" pairs to the CO lines. The telephone power failure circuits provide ring detection and CO audible for all incoming calls, and allow dialing on all outgoing calls.

**8.08** Power failure operation is possible for both tone and pulse exchanges. The Power Failure Pulse PCB is installed in the Executive Telephone when exchanges are pulse type and converts dial key closures to outpulse signals. The Power Failure Tone PCB is installed when exchanges are the tone type, and converts dial key closures to DTMF signals.

**8.09** The display window on the Executive Telephone is used to visually indicate the following:

- Time and date
- Message Waiting display
- Intercom display
- Stopwatch
- Call timer
- Number dialed
- Automatic Dialer number
- Speed Dial number
- Alarm clock
- Programming data

The display data is contained in the second command word transmitted from the KSU to the telephone. This information is processed by the telephone CPU and converted into a format suitable for driving the display processor. The display processor in turn drives the display elements.

**PLACING AN INTERCOM CALL**

**9.05** Placing a DSS Intercom call requires the telephone user to press the desired DSS key. This action will cause an Intercom data request to be transmitted to the MCCU-6TA processor ( Figure 7-15, signal 1 ). The CPU reacts by sending link request commands to the 3X8U-TA PCBs ( Figure 7-15, signal 2 ). In the example below, station 1 makes a request for Intercom to station 9. The link closure is made ( station 1 to available link to station 9, Figure 7-15, signal 3 ), the station "A" pairs are connected, ( Figure 7-15, signal 4 ), and Intercom conversation can begin.

**9.06** The dial-up Intercom works on the same principle, but requires more handshaking before conversation can begin. Pressing the ICM key requests an Intercom link, and if a link is available ICM tone is sent back to the telephone. ( Key illumination data is sent to the telephone whenever a CPU query detects a closure. ) An ICM link closure is then made in response to the dial data sent from the telephone when the user dials up the station being called.

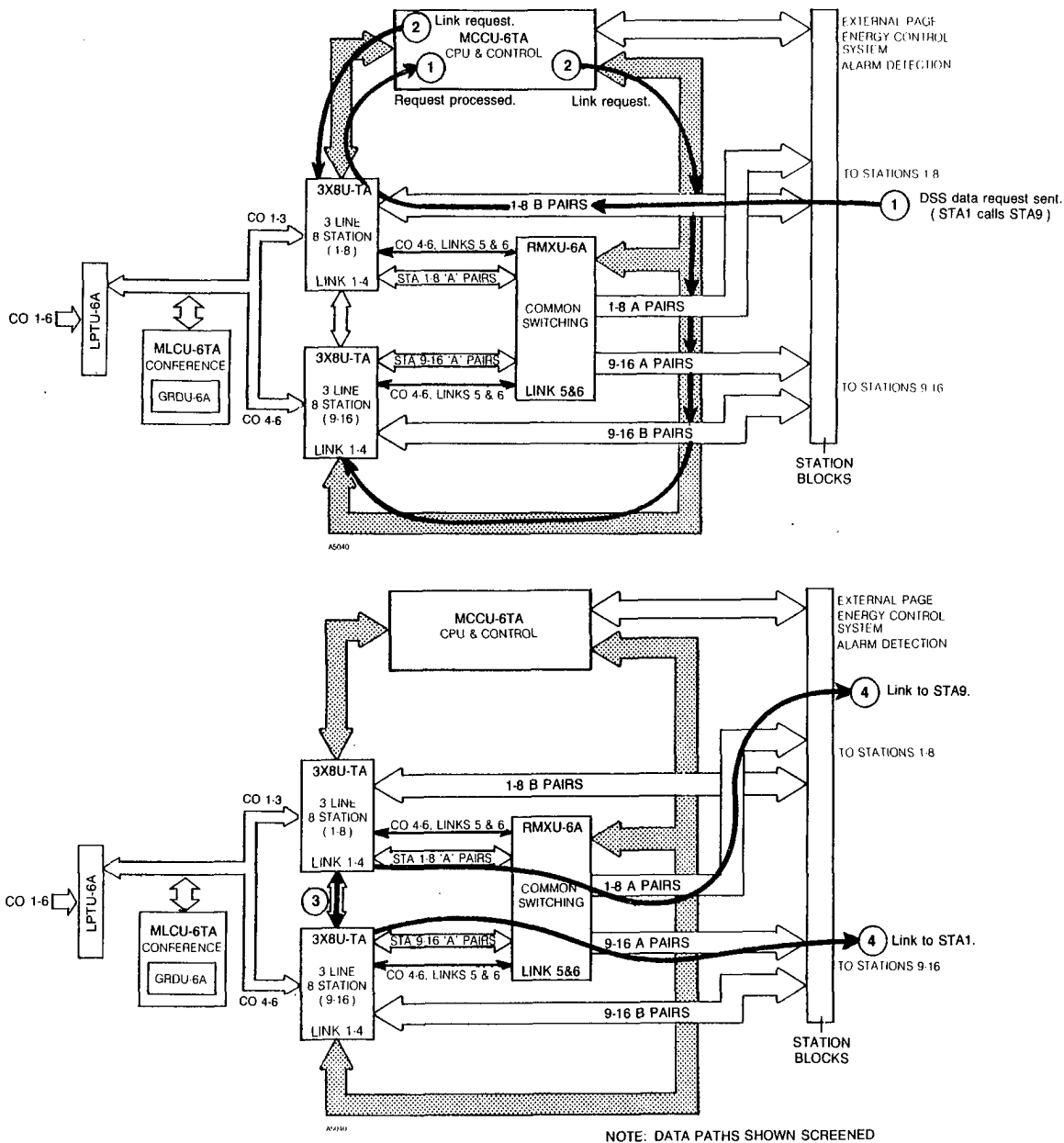


Figure 7-15 PLACING AN INTERCOM CALL, EK-616

# EK-616

## ELECTRONIC KEY TELEPHONE SYSTEM

### SECTION 8, MAINTENANCE

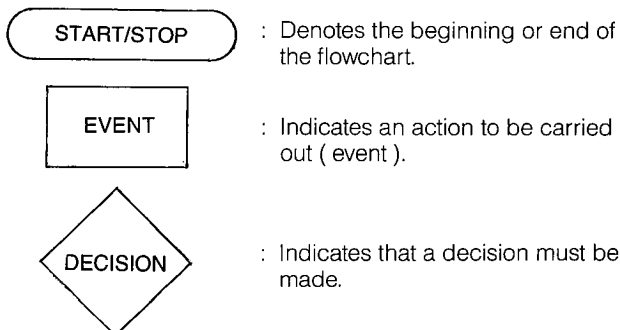
#### 1. INTRODUCTION

**1.01** The MAINTENANCE Section, intended to be used in conjunction with the EK-616 THEORY OF OPERATION (Section 7), allows service personnel to isolate and repair system troubles to the module (plug-replaceable unit) level. This section uses The System Troubleshooting Flowchart (Figure 8-1) to guide the technician in efficient and systematic testing and fault location. The flowchart is supported by the Operational Test Procedure (Table 8-1), System Voltages (Table 8-2), the Replaceable Parts List (Table 8-3), and the illustration on LEDs and Testpoints (Figure 8-2).

**1.02** No new information has been included in this section.

#### 2. INSTRUCTIONS

**2.01** The System Troubleshooting Flowchart (Figure 8-1) logically sequences through system evaluation. Isolated steps in the flowchart should never be used out of context, since any step assumes that proper results were obtained on all previous tests. The following symbols are used:



: Instructs the technician to go (branch) to the indicated area of the flowchart (i.e. B to B, C to C etc.).



: Indicates the order in which events and decisions are executed.

**CAUTION: THE PRINTED CIRCUIT BOARDS USED IN THE EK-616 SYSTEM CONTAIN STATIC SENSITIVE CMOS COMPONENTS. AN ANTI-STATIC GROUND WRIST STRAP, TERMINATED AT EARTH GROUND, MUST BE WORN IF PCBs ARE TO BE HANDLED. PCBs MUST BE STORED IN THEIR VELOSTAT BAGS WHEN NOT PLUGGED INTO THE KSU. REMOVE RBTU-A FROM MCCU-6TA BEFORE STORING PCB IN VELOSTAT BAG.**

**2.02** The Operational Test Procedure (Table 8-1), referenced in the flowcharts, provides a checklist for evaluating the system features. The features are divided into four groups: Internal, External, Executive Telephone, and Optional. The table presents the features in the order they should be checked. The AVAILABLE column indicates the telephones that access the feature; the VERIFIED column is used to provide a checklist for feature status, based on the operation presented in the appropriate user's guide. If a feature does not operate correctly, the symptom is entered in the SYMPTOM column. The PROBABLE CAUSE column lists components that can cause failure. The components are presented in the order of the probability of failure.

**NOTE:** Since all EK-616 features are accessed by the telephone, the telephone could cause any feature to fail. Before replacing a PCB, verify proper operation of the telephone at a known good station location.

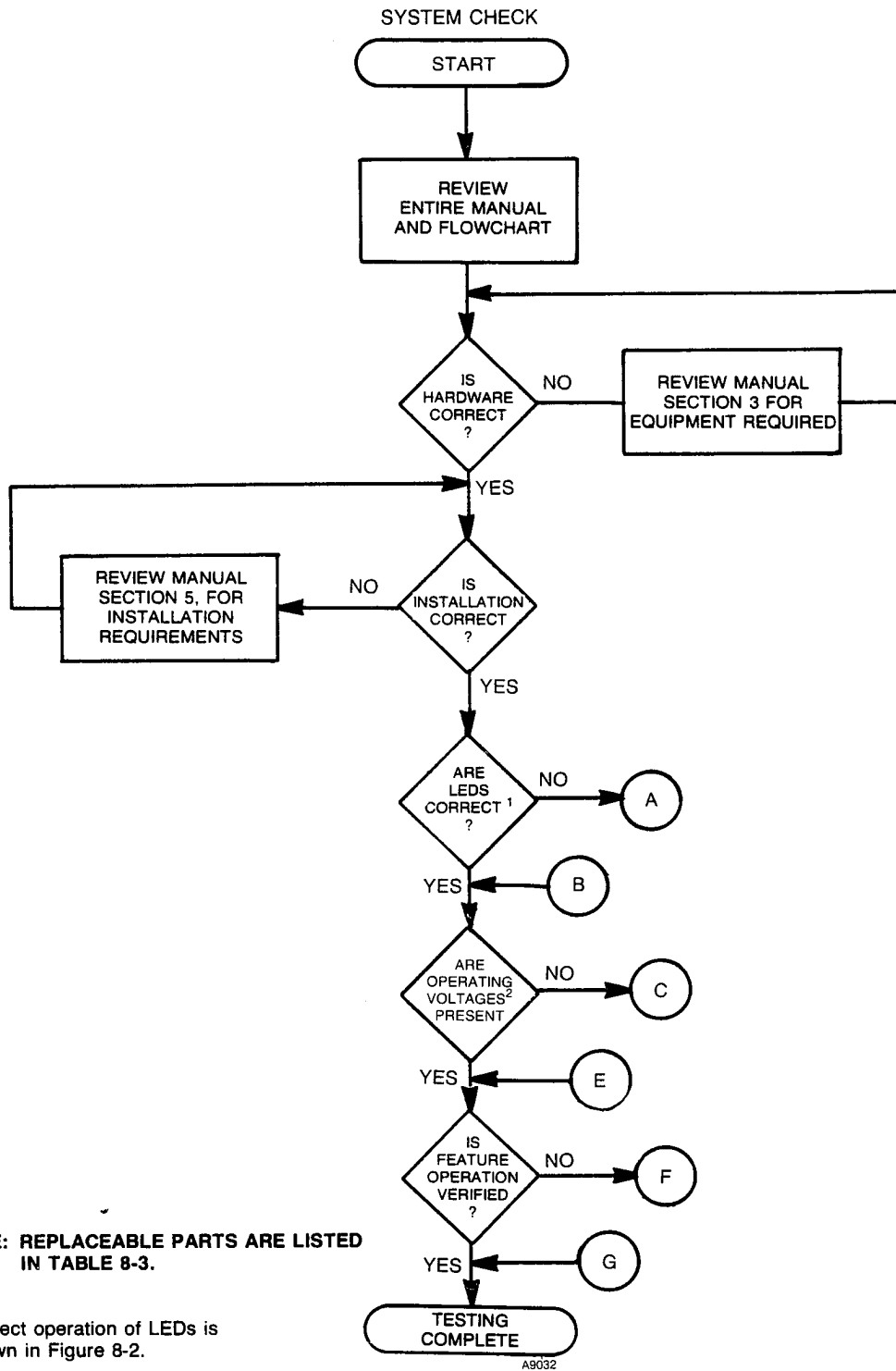


Figure 8-1 SYSTEM TROUBLESHOOTING FLOWCHART, EK-616 ( Page 1 of 5 )

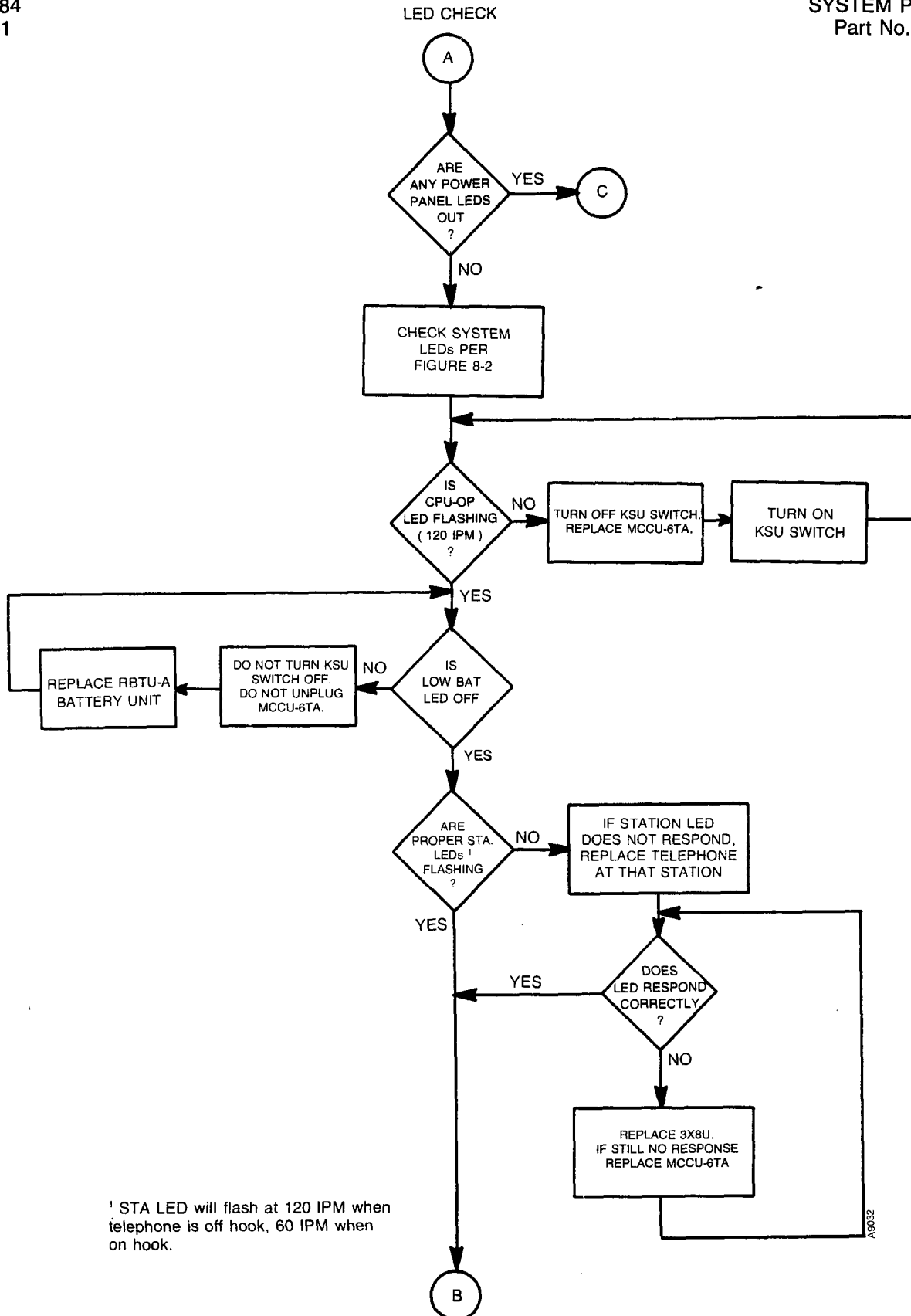


Figure 8-1 SYSTEM TROUBLESHOOTING FLOWCHART, EK-616 ( Page 2 of 5 )

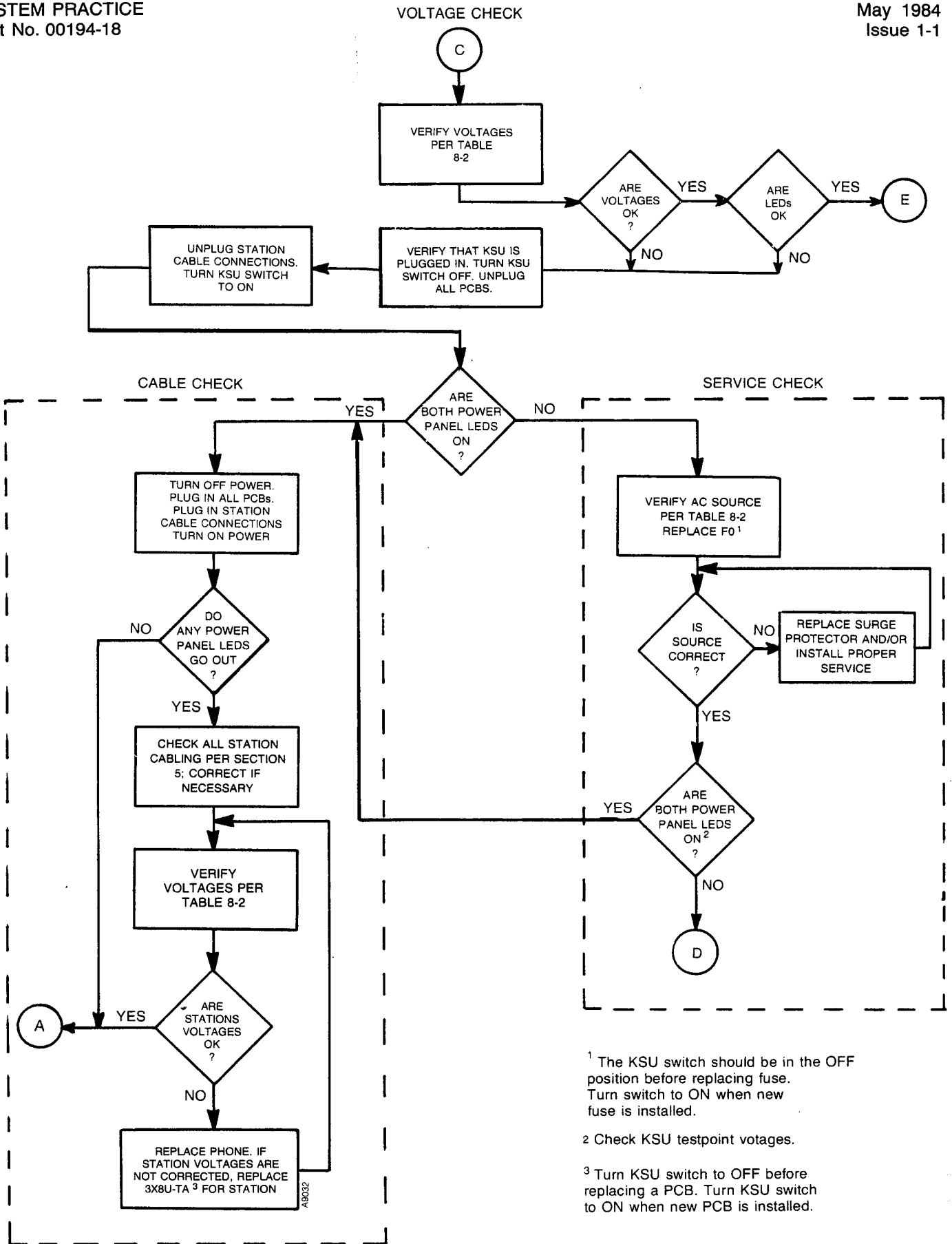


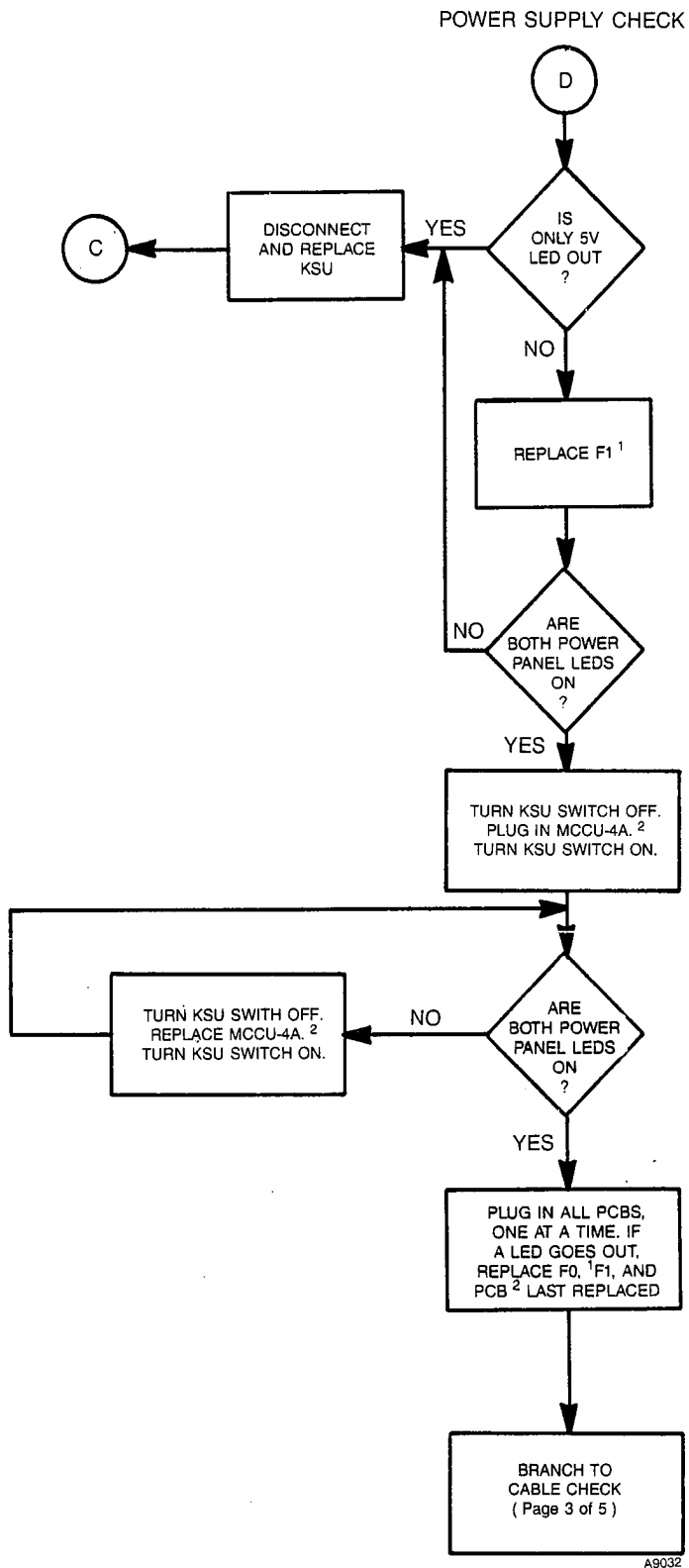
Figure 8-1 SYSTEM TROUBLESHOOTING FLOWCHART, EK-616 ( Page 3 of 5 )

<sup>1</sup> The KSU switch should be in the OFF position before replacing a fuse. Turn switch to ON when new fuse is installed.

<sup>2</sup> Check KSU testpoint votages.

<sup>3</sup> Turn KSU switch to OFF before replacing a PCB. Turn KSU switch to ON when new PCB is installed.

8



<sup>1</sup> The KSU switch should be in the OFF position before replacing fuse. Turn switch to ON when new fuse is installed.

<sup>2</sup> Turn KSU switch to OFF before replacing a PCB. Turn KSU switch to ON when new PCB is installed.



Figure 8-1 SYSTEM TROUBLESHOOTING FLOWCHART, EK-616 ( Page 4 of 5 )

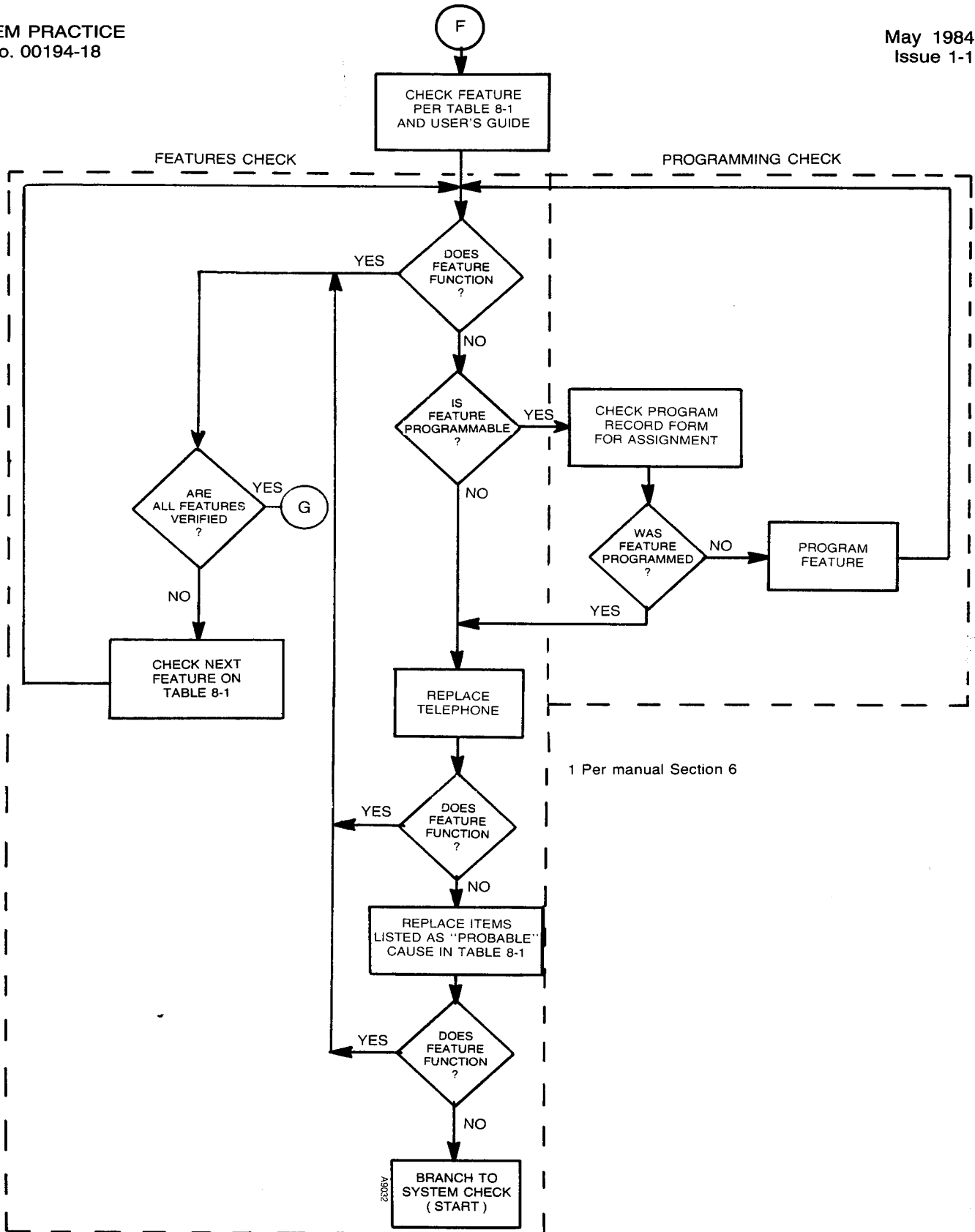


Figure 8-1 SYSTEM TROUBLESHOOTING FLOWCHART, EK-616 ( Page 5 of 5 )

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**2.03** Operating voltages can be checked using Table 8-2. This table, called out in the System Troubleshooting Flowchart, permits technical personnel to measure KSU and station voltages. The voltages are identified, the acceptable range stated, and the test condition defined. The testpoint location for each voltage is explained.

**DANGER: DIRECT CONTACT WITH POWER SUPPLY INPUT AND OUTPUT VOLTAGES MAY BE LETHAL. ONLY QUALIFIED PERSONNEL SHOULD ATTEMPT TO TAKE THE VOLTAGE READING OUTLINED IN TABLE 8-2.**

**2.04** A replaceable parts list is provided as Table 8-3. Unless otherwise indicated, the items listed are available from:

**TIE/communications, Inc.**

Items not available from TIE/communications may be purchased from local telephone equipment supply houses.

**2.05** The LEDs and testpoints for the EK-616 KSU are shown in Figure 8-2. The LEDs on the MCCU-6TA are visible through the KSU Status Panel Window. The LED on the 3X8U-TA PCB is only visible when the KSU cover is removed. The testpoints are designed so that standard meter leads can be plugged into them, without danger of shorting together. The KSU fuses, mounted in screw type receptacles, can be quickly and safely replaced ( with the power switch off ).

### **3. TOOLS AND TEST EQUIPMENT**

**3.01** The following tools and test equipment items are recommended:

- Standard punch down tool
- Digital voltmeter ( high input impedance, at least  $\pm 1\%$  accuracy )
- Continuity checker
- Anti-static wrist strap
- Spare bridging clips
- Needle nose pliers
- Small diagonal pliers
- Medium size Philips-head screwdriver
- Butt set ( for checking CO lines )

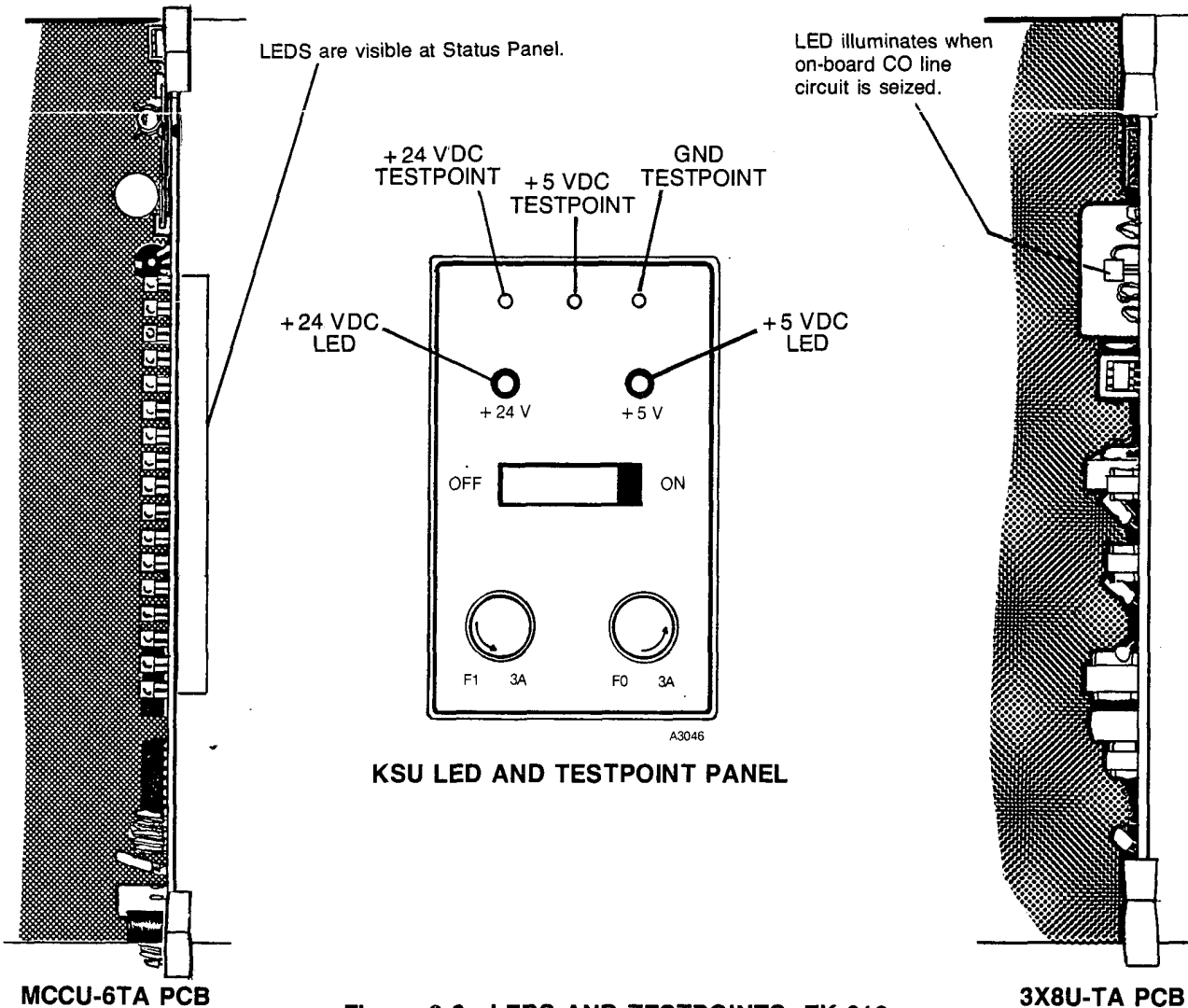
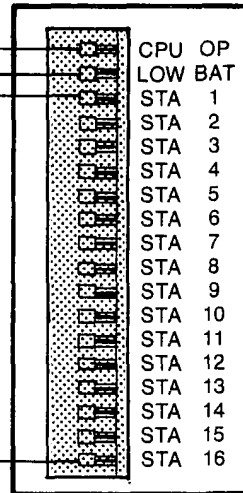
**KSU STATUS PANEL**

Indicates processor clock is running.

Illuminates when RBTU-A battery is discharged or fuse is open.

Stations LEDs flash slowly (60 IPM) when station is idle; Station LEDs flash fast (120 IPM) when station is off hook.

**NOTE:** Station LEDs are off when the station is not connected.



**Figure 8-2 LEDs AND TESTPOINTS, EK-616**

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Table 8-1 OPERATIONAL TEST PROCEDURE, EK-616 ( page 1 of 2 )

| FEATURE                            | AVAILABLE <sup>1</sup> | VERIFIED <sup>2</sup> |    | SYMPTOM | PROBABLE CAUSE <sup>3</sup> |
|------------------------------------|------------------------|-----------------------|----|---------|-----------------------------|
|                                    |                        | YES                   | NO |         |                             |
| INTERNAL                           |                        |                       |    |         |                             |
| PLACING INTERCOM CALL              | E, S                   |                       |    |         | 3X8U, MCCU, RMXU            |
| DIRECT STATION SELECTION           | E, S                   |                       |    |         | 3X8U, MCCU, RMXU            |
| PAGING                             | E, S                   |                       |    |         | MCCU, 3X8U                  |
| CALLBACK                           | E, S                   |                       |    |         | MCCU, 3X8U                  |
| CAMP-ON                            | E, S                   |                       |    |         | MCCU, 3X8U                  |
| INTERCOM CALL FORWARD              | E, S                   |                       |    |         | MCCU, 3X8U                  |
| MEET-ME CONFERENCE                 | E, S                   |                       |    |         | MCCU, 3X8U, RMXU            |
| MEET-ME-ANSWER PAGING              | E, S                   |                       |    |         | MCCU, 3X8U                  |
| SPEAKERPHONE                       | E, S (OPTIONAL)        |                       |    |         | SPDU-6A, 3X8U, MCCU         |
| VOLUME CONTROL                     | E, S                   |                       |    |         | TELEPHONE ONLY              |
| OFF HOOK TONE SIGNALING            | E, S                   |                       |    |         | MCCU                        |
| BACKGROUND MUSIC                   | E, S                   |                       |    |         | MCCU, 3X8U                  |
| BARGE-IN                           | E, S                   |                       |    |         | MCCU, 3X8U                  |
| ALTERNATE POINT ANSWER             | E, S                   |                       |    |         | MCCU                        |
| DO NOT DISTURB                     | E, S                   |                       |    |         | MCCU                        |
| MICROPHONE MUTE                    | E, S                   |                       |    |         | MCCU, 3X8U                  |
| MESSAGE WAITING                    | E, S                   |                       |    |         | MCCU, 3X8U                  |
| EXECUTIVE CALL FORWARD             | E, S                   |                       |    |         | MCCU, 3X8U                  |
| ROOM MONITOR                       | E, S                   |                       |    |         | MCCU, 3X8U                  |
| NIGHT SERVICE, SELECTABLE          | E, S                   |                       |    |         | MCCU                        |
| NIGHT SERVICE, PRESET              | E, S                   |                       |    |         | MCCU                        |
| EXTERNAL                           |                        |                       |    |         |                             |
| PLACING A CALL ( PBX and/or CO )   | E, S                   |                       |    |         | LPTU ( fuses ), 3X8U, RMXU  |
| ANSWERING A CALL ( PBX and/or CO ) | E, S                   |                       |    |         | 3X8U, RMXU                  |
| HOLD                               | E, S                   |                       |    |         | 3X8U, MCCU                  |
| FLASH, OPEN LOOP                   | E, S                   |                       |    |         | 3X8U, MCCU                  |
| FLASH, GROUND                      | E, S                   |                       |    |         | GRDU, MLCU                  |
| RELEASE OF ABANDONED CALL          | E, S                   |                       |    |         | MCCU, 3X8U                  |
| MUSIC-ON-HOLD                      | E, S                   |                       |    |         | 3X8U, MCCU                  |
| AUTOMATIC DIALER                   | E, S                   |                       |    |         | MCCU                        |

14032C

<sup>1</sup> E = Executive Display Key Telephone  
S = Standard Key Telephone

<sup>2</sup> Verify according to user's guide.

<sup>3</sup> For a maintenance record, circle the item actually at fault.



Table 8-1 OPERATIONAL TEST PROCEDURE, EK-616 ( page 2 of 2 )

| FEATURE                   | AVAILABLE <sup>1</sup> | VERIFIED <sup>2</sup> |    | SYMPTOM | PROBABLE CAUSE <sup>3</sup> |
|---------------------------|------------------------|-----------------------|----|---------|-----------------------------|
|                           |                        | YES                   | NO |         |                             |
| EXTERNAL (cont'd)         |                        |                       |    |         |                             |
| CALL MONITOR              | E, S                   |                       |    |         | 3X8U, MCCU                  |
| CONFERENCE CALL           | E, S                   |                       |    |         | MLCU, MCCU                  |
| DIAL PULSE TO DTMF CONV.  | E, S                   |                       |    |         | MCCU                        |
| FLEXIBLE AUDIBLE          | E, S                   |                       |    |         | MCCU, 3X8U                  |
| FLEXIBLE LINE ACCESS      | E, S                   |                       |    |         | MCCU, 3X8U, RMXU            |
| LAST NUMBER REDIAL        | E, S                   |                       |    |         | MCCU                        |
| LINE QUEUING              | E, S                   |                       |    |         | MCCU                        |
| SAVE                      | E, S                   |                       |    |         | MCCU, 3X8U                  |
| SPECIAL LINE ACCESS       | E, S                   |                       |    |         | MCCU                        |
| SPEED DIAL                | E, S                   |                       |    |         | MCCU                        |
| THREE MINUTE WARNING TONE | E, S                   |                       |    |         | MCCU                        |
| TOLL RESTRICTION          | E, S                   |                       |    |         | MCCU                        |
| TRANSFER                  | E, S                   |                       |    |         | MCCU, 3X8U                  |
| POWER FAILURE TRANSFER    | E, S                   |                       |    |         | 3X8U, RMXU, TELEPHONE       |
| EXECUTIVE TELEPHONE       |                        |                       |    |         |                             |
| ALARM CLOCK FEATURE       | E                      |                       |    |         | MCCU                        |
| DISPLAYS                  | E                      |                       |    |         | MCCU                        |
| OPTIONAL                  |                        |                       |    |         |                             |
| ALARM                     | E, S                   |                       |    |         | MCCU                        |
| DOOR CHIME BOX            | OPTIONAL EQUIPMENT     |                       |    |         | 3X8U, MCCU                  |
| MONITOR BOX               | OPTIONAL EQUIPMENT     |                       |    |         | 3X8U                        |
| EXTERNAL PAGE             | OPTIONAL EQUIPMENT     |                       |    |         | MCCU                        |
|                           |                        |                       |    |         |                             |
|                           |                        |                       |    |         |                             |
|                           |                        |                       |    |         |                             |
|                           |                        |                       |    |         |                             |
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|                           |                        |                       |    |         |                             |
|                           |                        |                       |    |         |                             |
|                           |                        |                       |    |         |                             |
|                           |                        |                       |    |         |                             |

<sup>1</sup> E = Executive Display Key Telephone  
S = Standard Key Telephone

<sup>2</sup> Verify according to user's guide.

<sup>3</sup> For a maintenance record, circle the item actually at fault.

Table 8-2 SYSTEM VOLTAGES, EK-616

**DANGER: DIRECT CONTACT WITH POWER SUPPLY INPUT AND OUTPUT VOLTAGES MAY BE HARMFUL OR LETHAL. ONLY QUALIFIED PERSONNEL SHOULD ATTEMPT TO TAKE THE VOLTAGE READINGS OUTLINED IN THE CHART BELOW.**

| DESCRIPTION          | READING <sup>1</sup>                     | TEST CONDITION   | TEST POINT LOCATION  |
|----------------------|--|--|--|
| AC Input             | 106 to 128 VAC                           | No load ( i.e., no PCBs installed ) and load ( i.e., all PCBs installed ). | Measure service outlet or use power line monitor.  |
| PSU<br>+24 VDC       | +22.8 to +25.2 VDC                       | No load and load.  | Measure between PSU ground test point and +24 VDC test points on KSU power panel.                    |
| PSU<br>+5 VDC        | +4.75 to +5.25 VDC                       | No load and load.  | Measure between PSU ground test point and +5 V test point on KSU power panel.                        |
| Station<br>A Pair DC | +21.6 to +25.2 VDC<br>+21.6 to +25.2 VDC | No telephones connected.<br>Telephone connected, idle.                     | Measure between AT and AR on station blocks <sup>2</sup> and GRN and RED terminals on modular jacks. |
| Station<br>B Pair DC | +21.6 to +25.2 VDC<br>+21.6 to +25.2 VDC | No telephones connected.<br>Telephone connected, idle.                     | Measure between BT and BR on station blocks <sup>2</sup> and BLK and YEL terminals on modular jacks. |
| RAM Battery          | +2.5 to +3.1 VDC                         | Test with RBTU removed from system.  | Measure across battery terminals and fuse.   |

<sup>1</sup> Readings should be made with a digital voltmeter with a known accuracy of at least  $\pm 1\%$ .

<sup>2</sup> Verify proper polarity: AT positive with respect to AR; BT positive with respect to BR.

Table 8-3 REPLACEABLE PARTS, EK-616

| ITEM            | PART NUMBER        | DESCRIPTION                                  | WHERE USED   |
|-----------------|--------------------|--|--------------|
| EK-616 KSU/PSU  | 61600 <sup>1</sup> | EK-616 KSU/Power Supply with RMSU PCB        | KSU          |
| MCCU- 6TA       | 61610 <sup>1</sup> | Main Common Control PCB                      | KSU          |
| 3X8U-TA         | 61620 <sup>1</sup> | CO Line/Key Station Interface PCB            | KSU          |
| RMXU-6A         | 61625 <sup>1</sup> | Matrix Expansion PCB                         | KSU          |
| RMSU-6A         | 61626 <sup>1</sup> | Shorting PCB                                 | KSU          |
| LPTU-6A         | 61605 <sup>1</sup> | Line Circuit Protection PCB                  | KSU          |
| MLCU-6TA        | 61630 <sup>1</sup> | Multi-Line Conference PCB                    | KSU          |
| SPDU-6A         | 61640 <sup>1</sup> | Speakerphone PCB                             | Stand. Tel.  |
| GRDU-6A         | 61635 <sup>1</sup> | Ground Flash PCB                             | MLCU-6TA     |
| RBTU-A          | 61670 <sup>1</sup> | RAM Battery Unit                             | MCCU-6TA     |
| 616 Tel.        | 61650 <sup>1</sup> | Standard Key Telephone                       | Station      |
| 616 EX ( PFT )  | 61655 <sup>1</sup> | Executive Power Failure Tone Telephone       | Station      |
| 616 EX ( PFP )  | 61656 <sup>1</sup> | Executive Power Failure Pulse Telephone      | Station      |
| —               | 61665              | Monitor Box                                  | Station      |
| —               | 61660 <sup>1</sup> | Door Chime Box                               | Station      |
| WALL KIT        | 61653 <sup>1</sup> | Wall Mount Kit ( Key Telephone )             | Station      |
| WALL KIT (EXEC) | 61654 <sup>1</sup> | Wall Mount Kit ( Executive Telephone )       | Station      |
| F0              | TBD <sup>1</sup>   | 3 AMP Fuse for AC Line                       | KSU          |
| F1              | TBD <sup>1</sup>   | 3 AMP Fuse for 24 V DC                       | KSU          |
| —               | 85113 <sup>1</sup> | Handset Coil Cord 6'                         | Station      |
| —               | 85114 <sup>1</sup> | Handset Coil Cord 9'                         | Station      |
| —               | 85115 <sup>1</sup> | Handset Coil Cord 13'                        | Station      |
| —               | 85116 <sup>1</sup> | Line Cord 7'                                 | Station / CO |
| —               | 85117 <sup>1</sup> | Line Cord 14'                                | Station / CO |
| —               | 85118 <sup>1</sup> | Line Cord 25'                                | Station / CO |
| —               | — <sup>2</sup>     | 2 Pair Twisted Station Cable                 | Station      |
| —               | — <sup>2</sup>     | 66M1-50 Connecting Blocks w/clips            | KSU          |
| —               | — <sup>2</sup>     | 25 Pair Cable w/Connector One End            | KSU          |
| —               | — <sup>2</sup>     | 625 A4 Modular Station Jack                  | Station      |
| —               | — <sup>2</sup>     | 625 F4 Modular Station Jack                  | Station      |
| —               | — <sup>2</sup>     | Plug-In Power Line Surge Protector           | KSU          |
| —               | — <sup>2</sup>     | Anti-Static Wrist Strap                      | KSU          |
| —               | TBD <sup>1</sup>   | RBTU-A Fust ( 0.25 Amp )                     | MCCU-6TA     |
| —               | TBD <sup>1</sup>   | LPTU-6A CO Line Fuses ( 2 Amp Slo-Blo        | LPTU-6A      |
| —               | 61675 <sup>1</sup> | Telephone Handset, Less Cord                 | Station      |
| —               | TBD <sup>1</sup>   | Directory Tray                               | Station      |
| —               | 61679 <sup>1</sup> | Designation Strip ( 1-8 )                    | Station      |
| —               | 61677 <sup>1</sup> | Designation Strip ( 1-16 )                   | Station      |
| —               | 61678 <sup>1</sup> | Station Lens ( F1-F8 ), Standard Telephone   | Station      |
| —               | 61676 <sup>1</sup> | Station Lens ( F1-F16 ), Executive Telephone | Station      |
| —               | TBD <sup>1</sup>   | Designation Protector                        | Station      |
| —               | TBD <sup>1</sup>   | Face Plate                                   | Station      |

<sup>1</sup> Parts available from TIE/communications, Inc., unless otherwise indicated.

<sup>2</sup> Parts available from telephone equipment supply houses.

# EK-616

## ELECTRONIC KEY TELEPHONE SYSTEM

### SECTION 9, OPTIONAL EQUIPMENT

#### 1. INTRODUCTION

**1.01** The OPTIONAL EQUIPMENT Section provides information on equipment accessories, equipment required for optional features and customer provided equipment which may be used with the EK-616 system.

**1.02** Information on Wall Mounting Telephones, Speakerphone, Door Chime Box, External Music Connections, Alarm Connections and External Page Zone Connections has been revised.

#### 2. EQUIPMENT REQUIRED FOR OPTIONAL FEATURES

**2.01** The EK-616 system can be equipped with the following optional features and accessories:

| ITEM   | DOCUMENT<br>PART # |
|--|--------------------|
| Wall Mounting Telephones for EK-616 .....                          | 01056              |
| Speakerphone ( optional on Standard Key<br>Telephones only ) ..... | 01057              |
| Door Chime Box .....   | 01058              |
| Monitor Box .....  | 01059              |
| Power Failure .....  | 01060              |
| Energy Control System .....  | 01061              |
| External Music Sources and<br>External Paging Amplifiers .....     | 01062              |
| Alarm .....  | 01063              |

Equipment required for the use of these features, and the installation of this equipment is explained in the following documentation.

## WALL MOUNTING TELEPHONES

### INSTALLATION PROCEDURE

The Standard and Executive Key Telephones can be wall mounted. The wall mounting base is attached to the back of the Executive Display Key Telephone. The handset bracket is ordered separately. The Standard Key Telephone requires an optional Wall Mounting Kit.

To wall mount the Standard Key Telephone:

- *Unplug modular line cord from the telephone.*
- *Unplug handset.*
- *Secure wall mounting bracket on wall in desired location with three screws ( Figure 1 ).*
- *Place telephone stand in bracket ( Figure 2 ).*
- *Secure the telephone into place in the bracket.*
- *Insert the handset bracket in the station housing below hookswitch ( Figure 3 ).*
- *Plug in modular line cord.*
- *Plug in handset.*

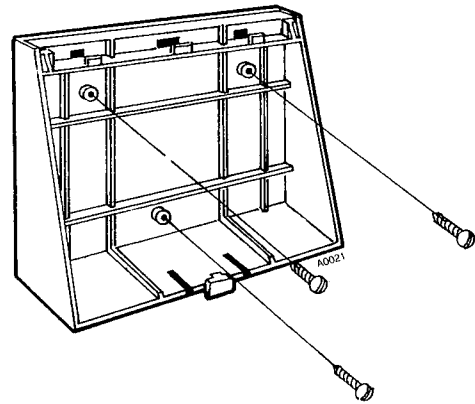


Figure 1 SECURING WALL MOUNTING BRACKET, EK-616

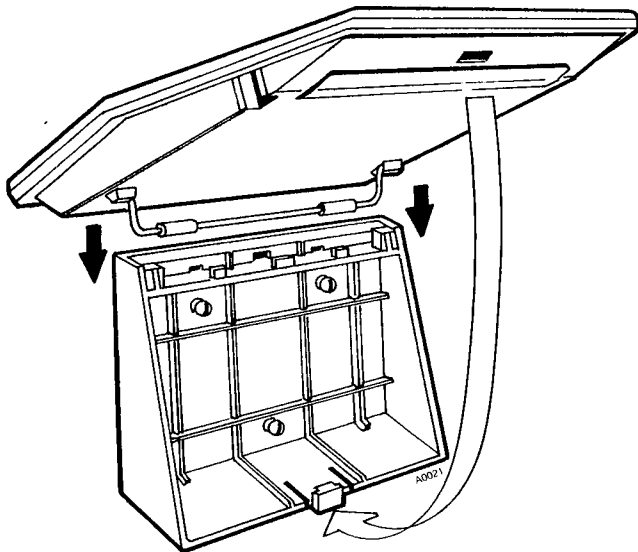


Figure 2 SECURING TELEPHONE IN BRACKET, EK-616

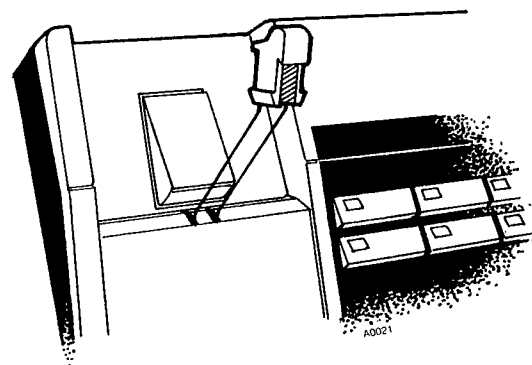


Figure 3 INSERTING HANDSET BRACKET, EK-616



To wall mount the Executive Display Key Telephone:

- Unplug modular line cord from telephone.
- Unplug handset.
- Push top of wall mounting down to remove it from telephone ( Figure 4 ).
- Unplug ribbon from SPDU-6A ( Figure 5 ).
- Turn wall mounting base so that thin portion faces up. ( This is opposite from the position when telephone is placed on a desk ).
- Secure telephone base to wall with four ( 4 ) screws ( Figure 6 ).
- Connect ribbon cord and assure ribbon cable terminals are facing connector terminals ( Figure 7 ).
- Secure telephone into mounting kit ( Figure 7 ).
- Plug in modular line cord.
- Plug in handset.
- Insert handset bracket in station housing below hookswitch ( Figure 3 ).

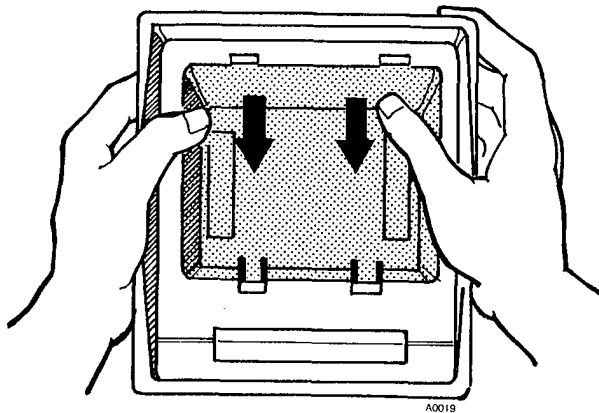


Figure 4 REMOVING WALL MOUNTING BASE FROM TELEPHONE, EK-616

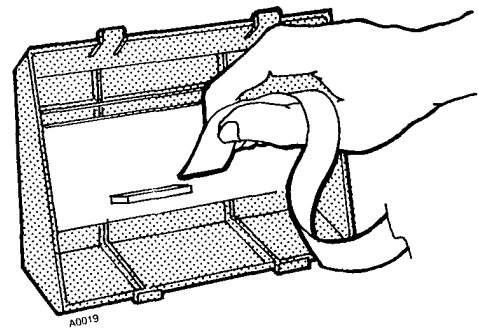


Figure 5 UNPLUGGING RIBBON CORD, EK-616

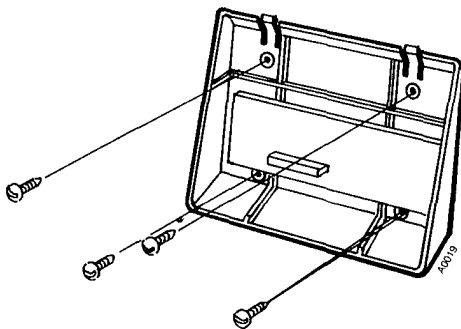


Figure 6 SECURING MOUNTING BASE TO WALL, EK-616

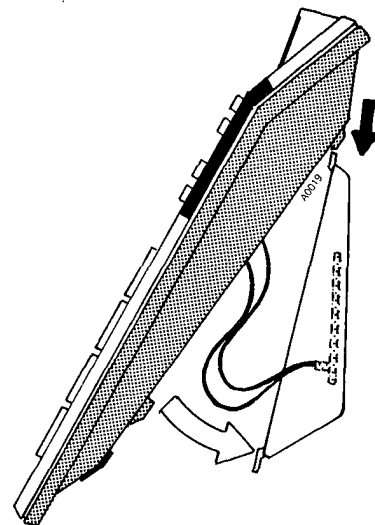


Figure 7 SECURING TELEPHONE INTO MOUNTING KIT, EK-616

## SPEAKERPHONE ( SPDU-6A ) PCB

### INSTALLATION PROCEDURE

The SPDU-6A PCB, when installed in the telephone, enables a user to communicate handsfree on outside lines. This PCB is standard in Executive Key Telephones and can be inserted into any Standard Key Telephone in order to allow use of the Speakerphone feature.

To insert an SPDU-6A PCB into a Standard Key Telephone:

- *Unplug modular line cord from telephone.*
- *Unplug handset.*
- *Remove 2 captive screws holding telephone housing together and separate housing ( Figure 1 ).*
- *Remove ribbon cables ( Figure 2 ).*
- *Remove FTDU-6A PCB ( Figure 2 ).*
- *Insert the SPDU-6A PCB ( Figure 3 ).*
- *Replace ribbon cables.*
- *Replace telephone housing.*
- *Plug in modular line cord.*
- *Plug in handset.*

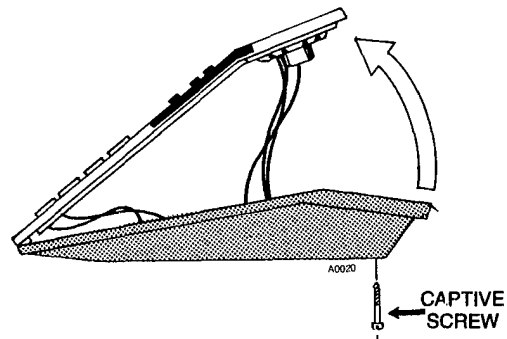


Figure 1 REMOVING HOUSING FROM STANDARD TELEPHONE, EK-616

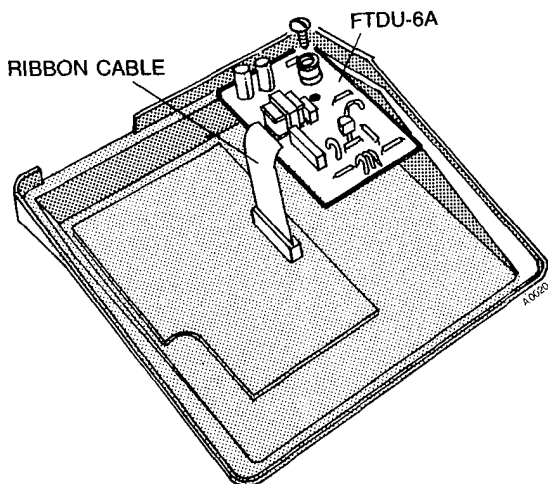


Figure 2 REMOVING FTDU-6A PCB, EK-616

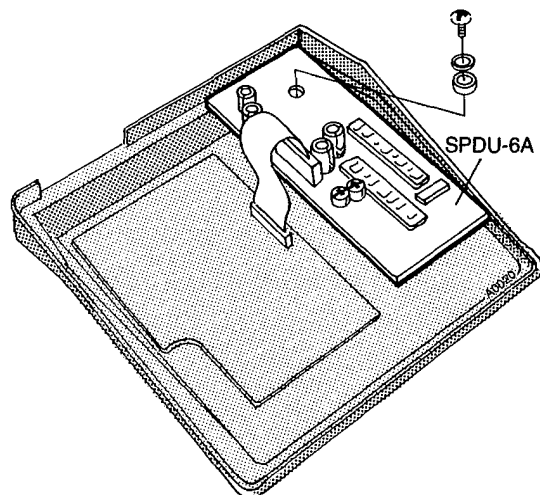


Figure 3 INSTALLING SPDU-6A PCB, EK-616

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## DOOR CHIME BOX

### INSTALLATION PROCEDURE

A Door Chime Box is an Intercom unit equipped with a microphone and speaker to enable Handsfree reply. When activated, the box sends a chime to an assigned station. The station then places an Intercom call to the Door Chime Box to establish communication. The Door Chime Box can also be used to provide the Door Unlock Control feature and must be wired accordingly. This feature enables a station user to unlock a door after communicating with the Door Chime Box user. When a system contains more than one Door Chime Box, the Door Unlock Control feature can only be used at the Door Chime Box assigned the lowest station number.

Mount the Door Chime Box in the desired location as follows:

- *Separate the base and cover of the unit by placing a screwdriver in the slots at the top and prying the base from the cover ( Figure 1 ).*
- *Mount the base on the wall in the desired location ( Figure 2 ) ( Do not over tighten mounting screws. Use only flat head screws.)*

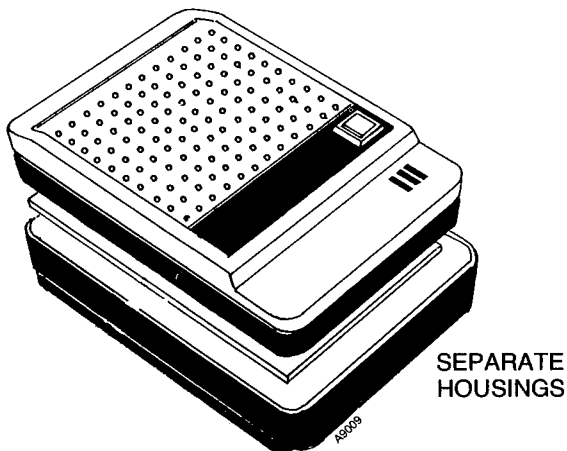


Figure 1 SEPARATING BASE AND COVER,  
DOOR CHIME BOX

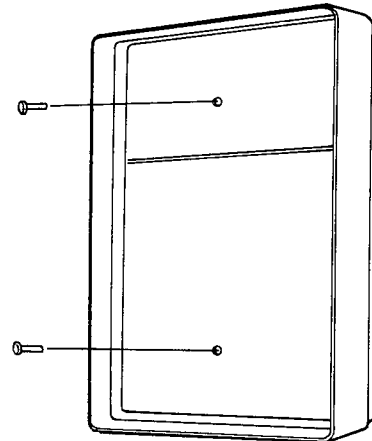


Figure 2 MOUNTING BASE ON WALL

The Door Chime Box contains screw terminals ( Figure 3 ) that should connect directly to the B1 or B2 station block. Use two pair twisted cable for all connections.

**NOTE:** The Door Chime Box requires a station position and is designated as a station on the connecting block ( Tables 5-1 and 5-2 of the EK-616 Installation Manual, 00194 ).

**CAUTION: DO NOT ASSIGN BOXES TO STATION LOCATIONS ASSIGNED FOR POWER FAILURE.**

Punch down the wires in the following manner on the Door Chime Box station block ( Figure 4 ) and then insert bridging clips:

| WIRE DESIGNATION ON B1 OR B2 BLOCK | DOOR CHIME BOX TERMINAL DESIGNATION |
|------------------------------------|-------------------------------------|
| T#AT                               | GN                                  |
| T#AR                               | RD                                  |
| T#BT                               | BK                                  |
| T#BR                               | YL                                  |

The Door Chime Box also has switch SW1 that must be set to determine the speed and duration of the chime signal. For a slow chime cycle, set bit 1 of the SW1 switch to the position with no marking. For a fast cycle, set bit 1 to the position marked ON. Set the bits as follows to assign the number of the chime signals:

| NUMBER OF CHIME SOUNDS |             | BIT 4 POSITION | BIT 3 POSITION | BIT 2 POSITION |
|------------------------|-------------|----------------|----------------|----------------|
| <b>SLOW</b>            | <b>FAST</b> |                |                |                |
| 1                      | 2           | No Marking     | No Marking     | No Marking     |
| 2                      | 3           | No Marking     | No Marking     | ON             |
| 3                      | 4           | No Marking     | ON             | No Marking     |
| 4                      | 5           | No Marking     | ON             | ON             |
| 5                      | 6           | ON             | No Marking     | No Marking     |
| 6                      | 7           | ON             | No Marking     | ON             |
| 7                      | 8           | ON             | ON             | No Marking     |
| 8                      | 1           | ON             | ON             | ON             |

- Replace the cover of the Door Chime Box.

To operate the Door Chime Box:

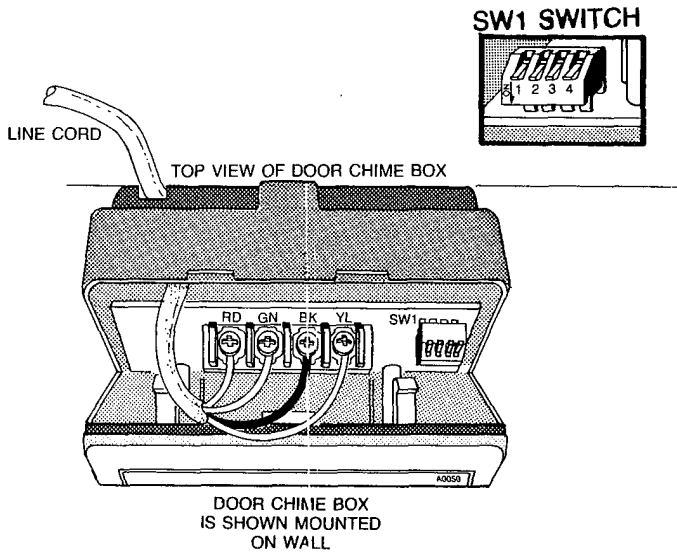
- Press Door Chime key on Door Chime Box ( Figure 5 ).

To respond to Chime at station:

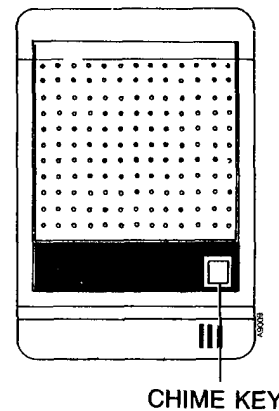
- Place Intercom call to Door Chime Box. The Door Chime Box user responds Handsfree.

To operate the Door Unlock Control feature:

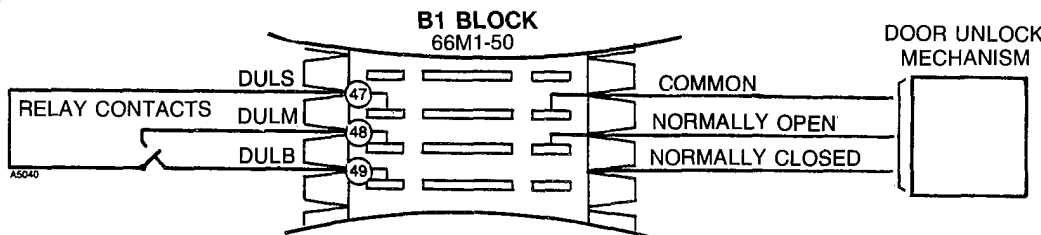
- Use the preceding procedure to establish communication between a user with a key telephone and Door Chime Box user.
- Press FLSH ( MON ) key at telephone to unlock door.



**Figure 3 SCREW TERMINALS, DOOR CHIME BOX, EK-616**



**Figure 5 DOOR CHIME BOX, EK-616**



**Figure 4 DOOR CHIME BOX CONNECTIONS**

## MONITOR BOX

### INSTALLATION PROCEDURE

The Monitor Box can be installed in a room to receive Intercom calls and pages. It also enables a user to answer Intercom calls Handsfree if voice switch path is available. Only All Call pages can be initiated from the Monitor Box. The Monitor Box can also be used to broadcast Background Music.

The Monitor Box requires a station position and is connected to the B1 or B2 station block in the same manner as all telephones in the system. Connect the modular jack assembly to the B1 or B2 block ( Tables 5-1 or 5-2 of the EK-616 Manual, 00194 ). Insert one plug from a modular line cord into the modular jack assembly. Insert the other plug into the Monitor Box.

**NOTE:** The Monitor Box requires a station position and is designated as a station on the connecting block.

**CAUTION: DO NOT ASSIGN BOXES TO STATION LOCATIONS ASSIGNED FOR POWER FAILURE.**

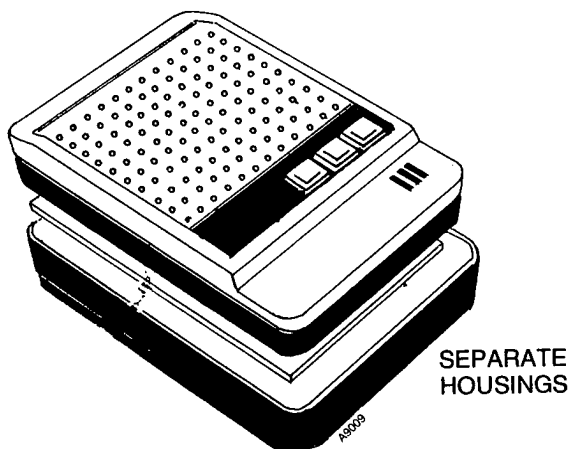


Figure 1 SEPARATING BASE AND COVER, MONITOR BOX

When wall mounting is desired, mount the Monitor Box as follows:

- Separate the base and cover of the unit by placing a screwdriver in the slots at the top and prying the base from the cover ( Figure 1 ).
- Mount the base on the wall in the desired location ( Figure 2 ). ( Do not over tighten screws. Use only flat head screws. )
- Replace the cover.

To operate the Monitor Box ( Figure 3 ):

- Press DND key to prevent receiving pages.
- Press AC key to initiate All Call page.
- Press MON key when in Monitor mode. The key will flash when Monitor Box is in the Handsfree Reply mode.

To turn Background Music on and off on the Monitor Box:

- Press DND key.
- Press AC key.
- Press DND key again.

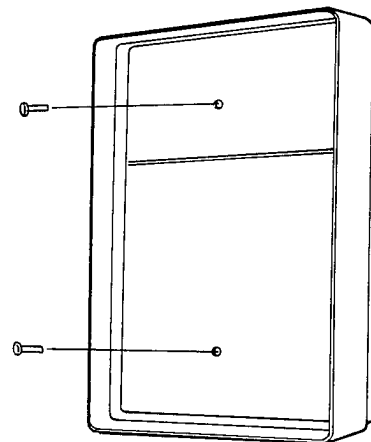


Figure 2 MOUNTING BASE ON WALL

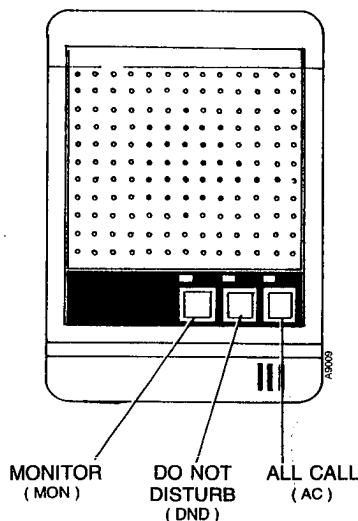


Figure 3 MONITOR BOX, EK-616

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# POWER FAILURE

## INSTALLATION PROCEDURE

Power Failure (PF) Transfer requires no cross connection in the EK-616 system. Standard Telephones enable users to answer incoming calls during a power failure and require the installation of external PF bells for ring detection. Executive Display Telephones do not require PF bells since they provide ring detection, CO audible and dialing capabilities during a Power Failure. Access to CO lines is assigned to specific stations. These assignments are as follows:

| CO LINE NUMBER | STATION NUMBER WITH THE RMSU-6A PCB | STATION NUMBERS WITH THE RMXU-6A PCB |
|----------------|-------------------------------------|--------------------------------------|
| 1              | 10                                  | 10 AND 11                            |
| 2              | 13                                  | 13 AND 14                            |
| 3              | 16                                  | 16 AND 17                            |
| 4              |                                     | 18 AND 19                            |
| 5              |                                     | 21 AND 22                            |
| 6              |                                     | 24 AND 25                            |

PF bells are connected directly to the B station block ( Figure 1 ). Punch down wires according to Tables 5-1 and 5-2 of the EK-616 Installation Manual ( 00194 ).

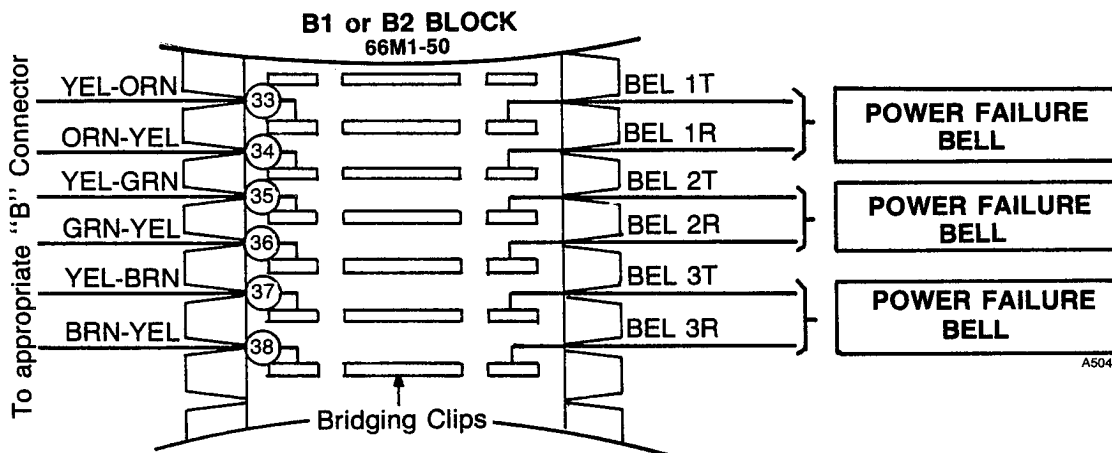


Figure 1 POWER FAILURE BELL CONNECTIONS, EK-616





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# ENERGY CONTROL SYSTEM

## INTRODUCTION

The Energy Control System (ECS) provides you with security and convenience by allowing you to remotely control your lights and appliances. The ECS can be operated remotely using any tone telephone or from within your facility where it must be connected to the key telephone system.

Each ECS can control up to eight modules, each of which can control one or more electrical devices. The ECS will allow you to activate each module individually or all modules together (except major appliance modules) with one single entry.

If an appliance requires preparation prior to use, e.g., water in the coffee pot, and has not been properly prepared, avoid activating the appliance using the ECS; appliance damage or fire could result.

## BEFORE INSTALLATION

### Notification to Telco

You must provide the following information to the operating telephone company before connecting or disconnecting the system:

1. Sufficient notice of intention to use privately owned telephone equipment.
2. The telephone number on which the equipment will be used.
3. Model: **Energy Control System**  
FCC Registration Number: **BJ286G-64-413-AN-N**  
Ringer Equivalence: **0.4B**

**NOTE:** Connection of this system to telephone company lines must be made with FCC approved plugs and jacks.

## EQUIPMENT AND INSTALLATION

### Equipment

**ECS.** The actual ECS unit measures 6¾" (17.0cm) by 4¾" (12.0cm) by 1¾" (4.5cm). It weighs about 1½ pounds (0.8 kg). It operates on standard 110 V AC, 60 Hz current (220 V AC, 50 Hz outside the U.S.A.) and uses 1.5 watts. It can control devices plugged into 110 or 220 V AC circuits. An AC cord is part of the ECS unit. CO and station telephone cords must be inserted to use the ECS.

**Control Modules.** Depending on the device to be controlled, the appropriate module must be used.

The following modules are available:

- a. Lamp (2 prong)
- b. Appliance (2 or 3 prong)
- c. Heavy Duty Appliance (220 volt at 15 amps)
- d. Wall Receptacle
- e. Wall Switch (Toggle, push-button or three-way)

**CAUTION: DO NOT USE SERIES T CONNECTORS.**

To connect to an EK-616 system:

- Set system mode switch on the bottom of ECS to 4, four wire position.
- Connect wiring according to Figures 1 and 2.
- Set three digit security code switches.
- Set ring response time.
- Set house code.

To connect the module(s):

- Plug module into wall outlet.
- Plug controlled device into module.
- Turn on controlled device.

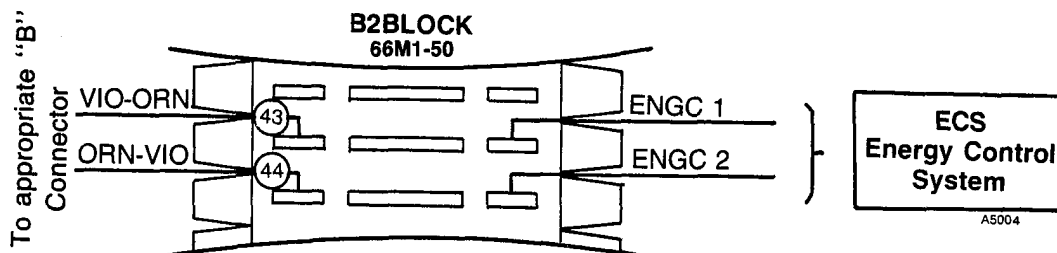
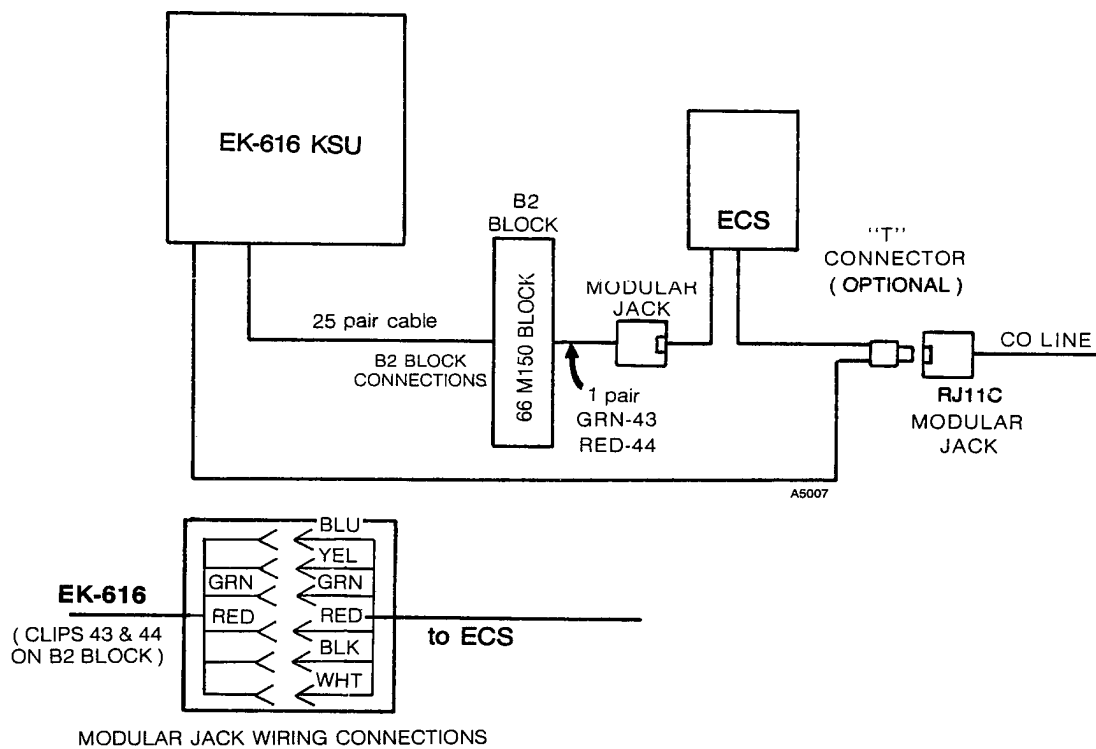


Figure 1 ENERGY CONTROL SYSTEM CONNECTIONS

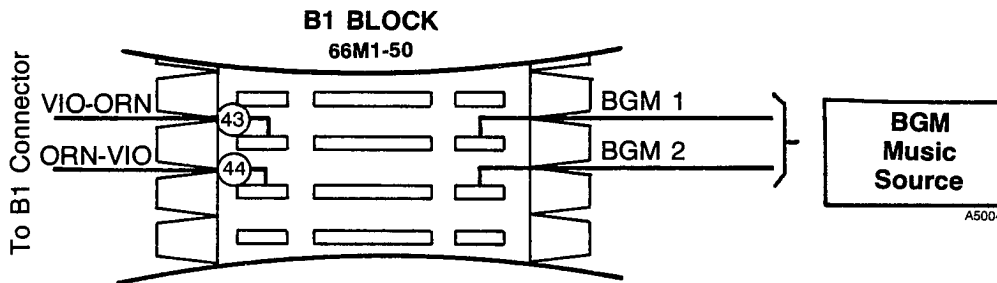


**Figure 2 WIRE CONNECTIONS FOR ENERGY CONTROL SYSTEM**

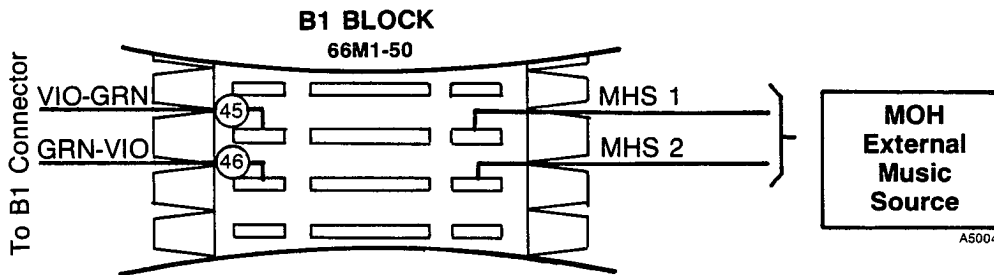
## EXTERNAL MUSIC SOURCES AND EXTERNAL PAGING AMPLIFIERS

### INSTALLATION PROCEDURE

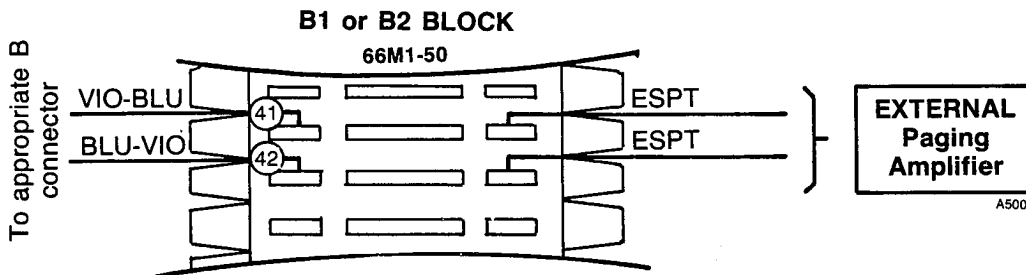
External music sources and external paging amplifiers are connected to a B block. Punch down wires according to Tables 5-1 and 5-2 of the EK-616 Manual( 00194 ). Block connections are diagramed in Figures 1, 2, and 3.



**Figure 1 BACKGROUND MUSIC SOURCE CONNECTIONS, EK-616**



**Figure 2 MUSIC-ON-HOLD EXTERNAL SOURCE CONNECTIONS, EK-616**



**Figure 3 EXTERNAL PAGE AMPLIFIER CONNECTIONS, EK-616**

## ALARM

### INSTALLATION PROCEDURE

Alarm inputs require an external 5 V DC, 20 mA source. Programming determines which stations receive alarm signals and whether the alarm detection is for a "closed" ( normally open contacts ) or an "open" ( normally closed contacts ) circuit indication.

Connections are as follows ( Figure 1 ):

- Connect the ALMG clip on the B block to the negative side of the DC source.
- Connect the positive side of the DC source to one terminal on the alarm device.
- Connect the ALMS clip on the B block to the other terminal on the alarm device.

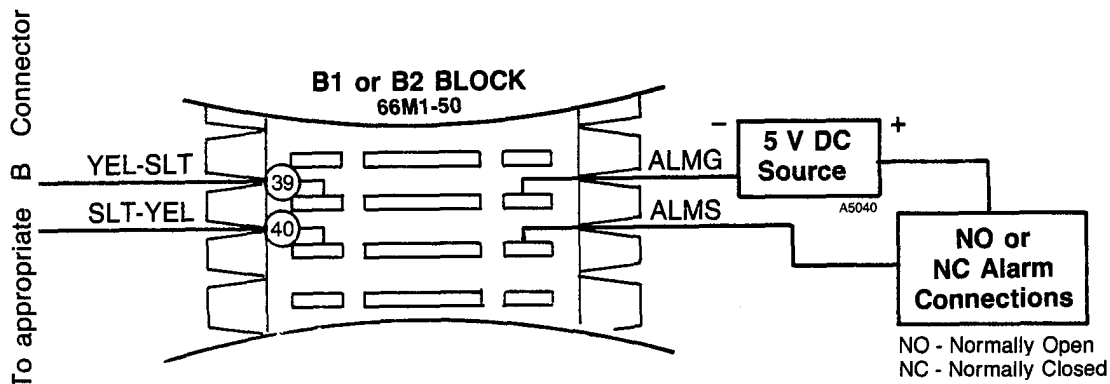


Figure 1 ALARM CONNECTIONS, EK-616



## **TECHNICAL ASSISTANCE**

When problems or questions arise during installation or servicing that cannot be resolved using this or related documents, then contact TIE Technical Service Department as follows:

For assistance between 8:30 AM and 5:00 PM, Eastern time, call:

**(203) 926-2033**

For assistance in the event of an **ABSOLUTE** emergency at other times than those listed, call:

**(203) 929-7920**