EK-612

INSTALLATION AND MAINTENANCE MANUAL

SYSTEM PRACTICE 01400 IMG

EK-612

Electronic Key Telephone System

Issue 1-1 December 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:

TIE/communications, Inc. 5 Research Drive Shelton, CT 06484

Attention: Manager, Technical Publications

The information in this manual is subject to change. While every effort has been made to eliminate errors, the company disclaims liability for difficulties arising from interpretation of the information contained herein.

EK-612

REVISION CONTROL								
REVISION	DATE	CHANGE						
1-0	10 OCT 84	This manual supersedes part number 00290, Issue 1-1.						
1-1	24 DEC 84	Page 9-8 P/N 60098 description was 66M1-50 Connecting Block now reads Snap-Tap Connector.						
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EK-612 ELECTRONIC KEY TELEPHONE SYSTEM INTRODUCTION

This INSTALLATION AND MAINTENANCE MANUAL is divided into nine sections as follows:

Section 1, SYSTEM DESCRIPTION, introduces the reader to the system. Section 1 contains general descriptive information about the system components, and details the telephone company, site and FCC requirements. It also includes a specification table.

Section 2, FEATURES, provides a detailed description of each feature available in the system. Additional data on key callouts and flash and signaling patterns are also included.

Section 3, HARDWARE CONFIGURATION, allows the reader to develop the Order Sheet. The Order Sheet is used to record the equipment (hardware) requirements of the installation site.

Section 4, SOFTWARE CONFIGURATION, consists of the instructions necessary to configure the system programmable options. The data base developed in this section is entered on the Program Record Forms. The codes on the Program Record Forms are entered into system memory during programming.

Section 5, INSTALLATION OF STANDARD EQUIPMENT, includes the information required to install the system.

Section 6, INSTALLATION OF OPTIONAL EQUIPMENT, contains description and installation data on each piece of optional equipment that can be used with the system.

Section 7, PROGRAM ENTRY INSTRUCTIONS, tells the reader how to enter the data base recorded on the Program Record Forms into system memory.

Section 8, THEORY OF OPERATION, offers a description of the system operation including block diagrams and signal pathways.

Section 9, MAINTENANCE, is the final section of the manual and provides maintenance instructions for the system. The Recommended Parts List is included in this section.

Appendix A, GLOSSARY OF ABBREVIATIONS, contains an explanation of the most frequently used terms in the manual.

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EK-612 ELECTRONIC KEY TELEPHONE SYSTEM SECTION 1, SYSTEM DESCRIPTION

1. INTRODUCTION

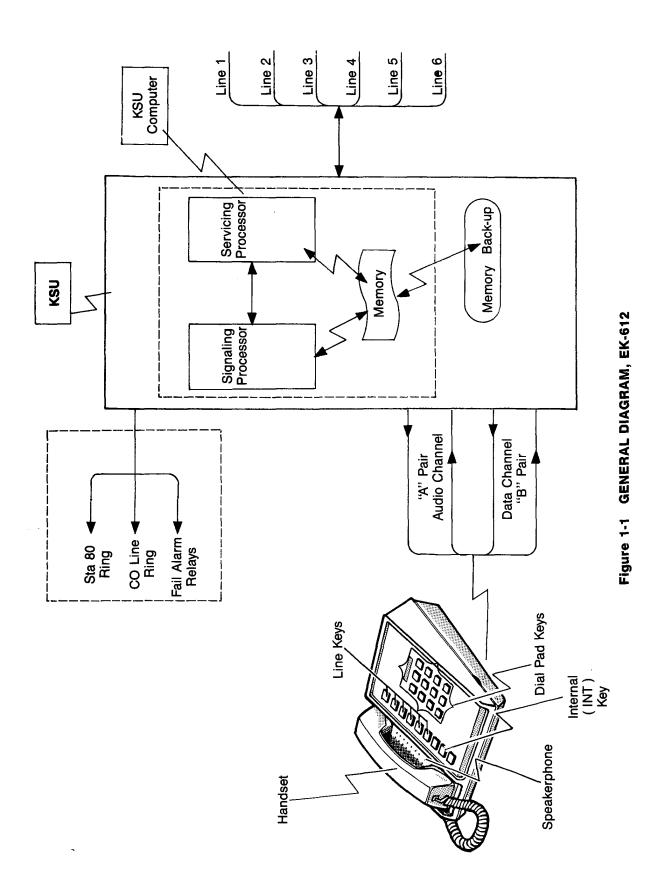
- 1.01 The EK-612 Electronic Key Telephone System is a microprocessor based, digitally controlled system designed to replace older electromechanical 1A2 telephone systems. The system operates as a stand-alone system or behind a Private Branch Exchange (PBX).
- **1.02** The system has a maximum of six Central Office (CO) or PBX lines, twelve stations and two Intercom (ICM) paths.
- 1.03 The system can accommodate both Dial Pulse (DP) and Dual Tone Multifrequency (DTMF) lines in any combination. Each dialed digit on a DP line is represented by a series of pulses. Some CO's only accept DP signaling. Each digit dialed on a DTMF line is represented by a unique set of tones. DTMF signaling is required by some Central Offices and PBXs and for special services such as MCI and Sprint. Lines may be individually programmed for either DP or DTMF signaling depending upon the type of signaling required for a particular line.
- **1.04** Conversations on all lines are private; however, the Conference feature can be used to add another party to a call.
- **1.05** Technical specifications pertaining to the EK-612 are presented in Table 1-1.

2. SYSTEM OPERATION

2.01 The system uses microprocessor technology and a unique shared-port signaling scheme to provide efficient call processing. Figures 1-1 and 1-2 provide a general overview of an EK-612 telephone system as will be described below.

The EK-612 telephone system can be reduced to 3 major sub-units:

- (a) The Telephone Lines (CO Lines)
- (b) The Key Service Unit (KSU)
- (c) The Telephones
- 2.02 The Key Service Unit, or KSU as it is more commonly known, is a self-contained system with no user serviceable parts. It has an internal computer composed of 2 microprocessors along with system memory and user-available memory. The system memory is pre-programmed while the user-available memory is programmed by the installer and/or the user.
- 2.03 The system allows the user to program several features which are a welcomed convenience to most people. For instance, if a user calls a particular number on a regular basis, rather than dialing the number each time, it may be stored in memory. Now, only a 1 or 2 digit code need be dialed to initiate the call.



1-2

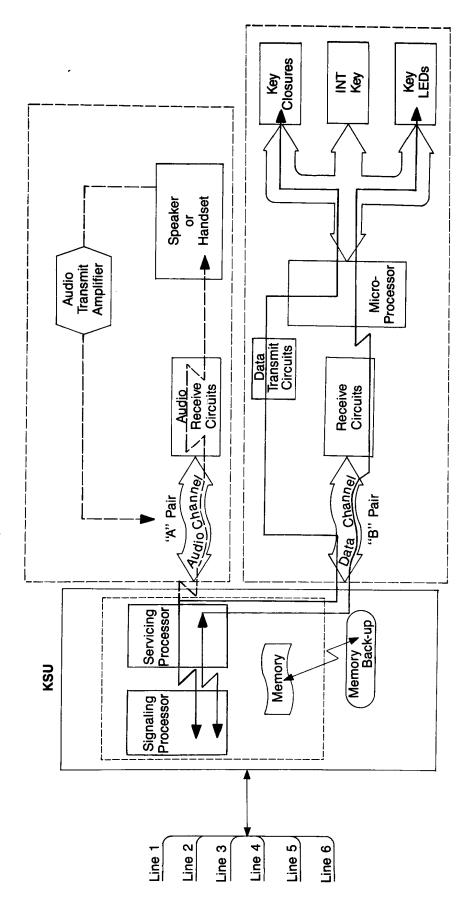


Figure 1-2 BLOCK DIAGRAM, EK-612

- 2.04 The EK-612 is equipped with a non-volatile memory. Should a power failure occur, the user programmed features will not be destroyed. For example, if a telephone number is stored and a power failure occurs, the stored data will be preserved for approximately one month. When the normal power is restored, the stored data, in this case the number, will again be available for use.
- 2.05 The KSU acts as an intermediary between the telephone lines and the telephones. Its computer constantly monitors the status of both the telephone lines (CO) and the telephones. When an incoming or outgoing call is detected, the KSU will operate whichever circuits are necessary in order to complete the call.

RECEIVING A CALL

- 2.06 The Signaling Microprocessor, which is part of the KSU computer, monitors all incoming line circuits. Each line circuit contains a Ring Detection Network which senses an incoming call. When the call is detected by the Signaling Microprocessor, it informs the master processor called the Servicing Microprocessor. The Servicing Processor, in turn, instructs the Signaling Processor to illuminate the appropriate line key on the telephone, Figure 1-2.
- 2.07 When the handset is lifted or the speaker is engaged and the illuminated line key is pressed, the telephone's computer signals the KSU, Figure 1-2. The KSU computer operates the proper relays allowing audio amplification and speaker or handset use, Figure 1-2. The parties may now converse.

NOTE: The EK-612 offers the Handsfree feature. Handsfree, which is operational on telephones with a speakerphone, allows a user to place, receive or speak on all calls without lifting the handset. Handsfree Answerback allows a user to answer an internal call without lifting the handset.

PLACING AN OUTSIDE CALL

- 2.08 When the handset is lifted (or the handsfree mode is used) and a line key is pressed, the telephone's computer signals the computer on the KSU. The KSU computer next issues a command which illuminates the pressed line key and establishes a dial tone, Figure 1-2. Dialing may now be initiated.
- **2.09** When the Dial Pad keys are pressed, the corresponding telephone number is stored in the telephone's computer. When dialing is complete, the call is issued from the telephone computer.
- **2.10** Two types of dialing are available:
- (a) Dual Tone Multifrequency (DTMF)
- (b) Dial Pulse (DP)

DTMF (Tone Dialing) will bypass the KSU and go directly to the telephone lines. DP (Rotary Dialing) will be processed by the KSU before being sent out onto the telephone lines.

PLACING AN INSIDE (INTERCOM) CALL

- 2.11 When placing an Intercom call, the handset is lifted, the Internal key (INT) is pressed and the number is dialed. The telephone computer detects the pressed INT key and signals the KSU. The KSU now instructs the telephone circuitry to illuminate the INT key and establish a dial tone.
- 2.12 The number dialed is conveyed to the KSU via the Data-Transmit Circuits. The appropriate relays are operated establishing a direct line to the station (telephone extension) dialed.

3. COMPONENT DESCRIPTION

KEY SERVICE UNIT WITH INTEGRAL POWER SUPPLY

3.01 The EK-612 system uses a compact, efficient and economical Key Service Unit (KSU). The KSU is a self-contained wall-mounted unit with a built-in power supply. The electronic circuitry for the system is contained on a single Printed Circuit Board (PCB) within the KSU.

TELEPHONES

- **3.02** Four different Multibutton Key Telephones can be used with the EK-612 system: ULTRAKEY, MERITOR 1E, ECON-O-KEY and DELPHI 6 (Figure 1-3). The status of all lines (i.e., idle, busy, ringing) appears on each telephone.
- 3.03 The EK-612 telephones have a speaker for tone signaling, Voice Call Announcing and Handsfree Answerback. In addition, telephones may be purchased with a built-in speakerphone. The speakerphone allows a user to listen and converse on a call without lifting the handset. For telephones without the optional speakerphone the Monitor feature is provided. Monitor allows a user to listen to an outside call with the handset on-hook. The user must lift the handset to converse.
- **3.04** A volume control on each telephone is used to adjust ring tone and voice levels. Visual and audible signals provide various tone and flash patterns to distinguish internal and external calls (Table 1-2).

4. FCC AND TELCO REQUIREMENTS

4.01 Rules and regulations for the operation and installation of telephone equipment have been established by the Federal Communications Commission (FCC).

SITE REQUIREMENTS

4.02 The EK-612 KSU should be installed in a clean, dry, secure location. This location should comply with Bell Functional Product Class Criteria, September 1978, in Publication PUB 48002, 3.4.3.2., paragraph C-Indoors with Environmental Control. The room must have adequate ventilation, a temperature range of 32 $^{\circ}$ to 104 $^{\circ}$ F (0 $^{\circ}$ to 40 $^{\circ}$ C) and a 5% to 95% non-condensing relative humidity. The installation site should not be near a source of static electricity, excessive vibration or in an area likely to flood (basement level).

NOTIFICATION TO TELCO

- **4.03** As owner of this telephone system, you must give the following information to the operating telephone company before connecting or disconnecting it:
- 1. Sufficient notice of your intention to use privately owned telephone equipment.
- 2. The particular lines to be used (telephone numbers xxx-xxxx through xxx-xxxx.
- 3. Model: EK-612

FCC Reg. Number: BJ286G-11827-KF-E

Ringer Equivalence: 0.4B

INCIDENCE OF HARM

4.04 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 before 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.

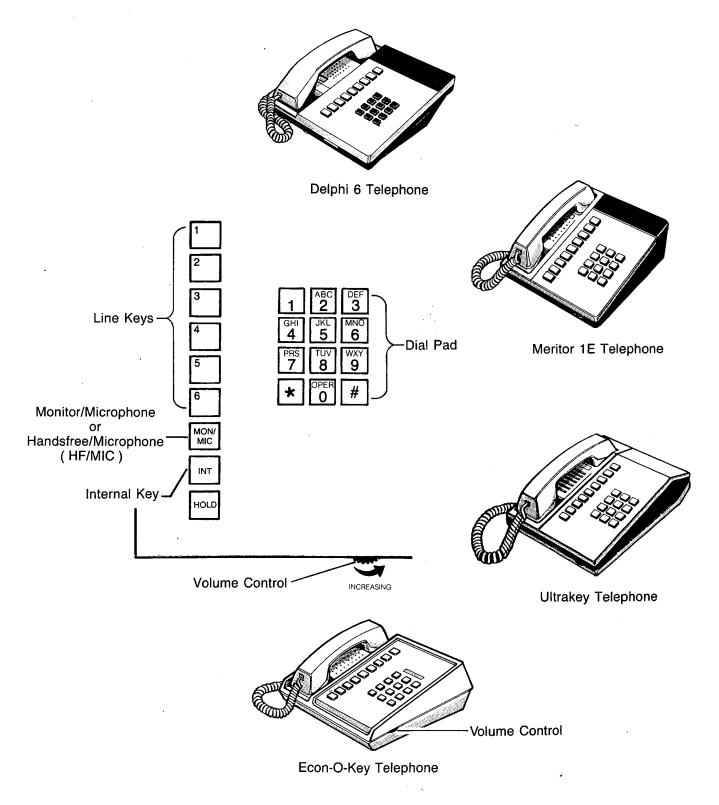


Figure 1-3 KEY DESIGNATIONS, EK-612

Table 1-1 EK-612 SPECIFICATIONS

System Capacity:

CO Lines

6 12

Stations

Intercom Links

2

Cable Requirements:

Station cable, 2-pair twisted, 24 AWG maximum cable length, 2000 feet (610m)

Power Requirements:

KSU & Power Supply:

Input: DEDICATED 117 V AC, (120 V AC nominal); 0.5 AMPS,

60 Hz, single phase.

Power Dissipation:

KSU & Power Supply:

120 V AC input and 40 watts nominal with fully loaded system.

Dimensions and Weights:

KSU:

14" W x 18" H x 2.5" D 13 lbs.

35.6cm x

45.7cm x 6.4cm

5.9 kg.

Switching Principle:

Solid state space division analog switching matrix with stored program control.

Environmental Operating Conditions:

Temperature: 0° to 40° C (32° to 104° F) Humidity: 5% to 95% relative, noncondensing.

(Reference Bell Functional Product Class Criteria of

September 1978 publication PUB 48002)

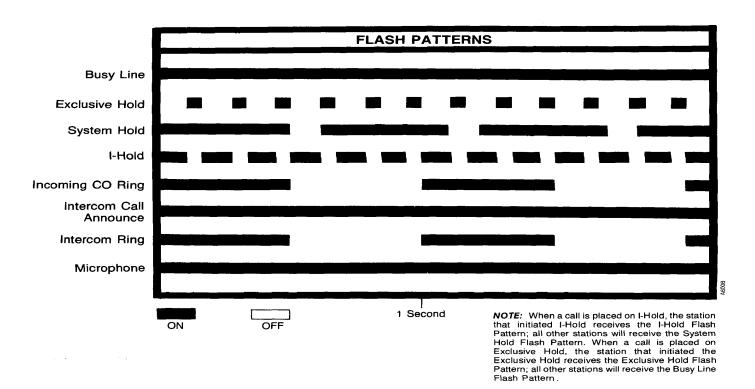
Battery:

Power Failure backup of memory for approximately 1 month.

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Table 1-2 FLASH & TONE PATTERNS



Intercom Audible CO Audible Ring Intercom Call Announce (Splashtone) 2 sec. 4 sec. 6 sec.

RADIO FREQUENCY INTERFERENCE

4.05 This equipment generates, and can radiate radio frequency energy that may cause interference to radio communications if not installed and used in accordance with the instruction manual. The EK-612 has been tested and approved for compliance with the limits for Class A computing devices pursuant to J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference. Operation of this equipment in a residential area may cause interference. The user will be required to take whatever measures may be required to correct the interference, at his own expense.

HEARING AID COMPATIBILITY

- **4.06** Rules prohibit the use of non-hearing aid-compatible telephones in the following locations:
- (a) Any public or semipublic location where coin-operated or credit card telephones may be found.

- (b) Elevators, highways, and tunnels (automobile, subway, railroad, or pedestrian) where a person with impaired hearing might be isolated in an emergency.
- (c) Places where telephones are specifically installed to alert emergency authorities such as fire, police, or medical assistance personnel.
- (d) 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.
- (e) Workstations for hearing impaired personnel.
- (f) Hotel, motel, apartment lobbies; in stores where telephones are used by patrons to order merchandise; in public transportation terminals where telephones are used to call taxis, or to reserve lodging or rental automobiles.
- (g) Hotel and motel rooms. At least ten percent of the rooms must contain hearing aid-compatible telephones; or contain jacks for plug-in hearing aid-compatible telephones which will be provided to hearing impaired customers upon request.

NOTE: These telephones are NON hearing aid-compatible.

EK-612 ELECTRONIC KEY TELEPHONE SYSTEM SECTION 2, FEATURES

1. FEATURES

1.01 The following are descriptions of each feature employed in the system.

CALL WAITING

External Call Waiting

1.02 The External Call Waiting feature allows a station user, busy on an outside call, to receive a signal (double beep) indicating that another outside call is waiting to be answered. The Call Waiting signal can be disabled for specific stations through programming.

Internal Call Waiting

1.03 The Internal Call Waiting feature allows a station user, busy on an outside call, to receive a signal (double beep) indicating that an internal station is calling on the intercom.

Programming:

Call Waiting

Related Features:

Intercom Transfer

CONFERENCE

1.04 The Conference feature permits additional internal and external parties to be added to established conversations. Conversations can be established between two outside parties and one inside party, or between one outside party and two inside parties. However, when an outside call is added to another outside call, the audio quality of the conference call may be degraded.

Programming: none

Related Features:

Intercom Placing a Call

EXTERNAL PAGING

1.05 External Paging allows announcements to be broadcast over customer supplied amplifiers and loudspeakers. External Paging requires the dedication of one unused CO position. The ability to broadcast announcements may be denied (through programming) to specific stations.

Programming:

Line Group CO Line Access

Related Features: none

FLASH

- 1.06 Flash is a programmable opening on a line for purposes of signaling. When using a CO line, Flash allows a user to obtain a new dial tone without losing the line. When utilizing a PBX, flash allows a user to transfer a call, access custom calling features, and obtain a dial tone without releasing the line when completing a call.
- 1.07 The use of Flash or the termination of the call will cause the outpulse line to revert to DP signaling. To dial using DTMF signaling after using Flash, wait at least 6 seconds before dialing further.

Programming:

Flash Enable Flash Timer

Related Features:

Placing a Call Speed Dialing Transfer

HANDSFREE CAPABILITY

1.08 Handsfree Answerback allows a user to answer a voice announced internal call without lifting the handset. In addition to Handsfree Answerback, telephones purchased with an optional speakerphone provide full Handsfree operation. Full Handsfree operation allows a user to place, receive and converse on both internal and external calls without lifting the handset.

Programming: none

Related Features:

Intercom Placing a Call

HOLD

1.09 The Hold feature is used to place a call in a temporary waiting condition. There are two types of Hold: I-Hold and Exclusive Hold. A call on I-Hold can be

picked up at any station that has access to the line, whereas a call placed on Exclusive Hold can only be picked up at the station where the call was placed on Hold.

Programming: none

Related Features:

Hold Recall

HOLD RECALL

1.10 If a call on Hold is forgotten, the system will automatically resignal the station from which the call was placed on Hold, after a pre-programmed period of time. If the call remains unanswered (after the same programmed duration) Hold Recall will ring at all stations programmed to ring on that line.

Programming:

Hold Recall CO Line Ring

Related Features:

Hold Transfer

INTERCOM

1.11 Intercom enables a station user to call another user within the system. Intercom calls can be placed to allow Intercom signaling or voice-announced reply. When a user places a voice-announced Intercom call, the called party can reply Handsfree. When Intercom signaling is used, the called station rings, requiring the called party to use the handset to reply.

Programming: none

Related Features:

Call Waiting Handsfree Capability

LAST NUMBER REDIAL .

1.12 Last Number Redial automatically stores the last outside telephone number that was manually dialed. The number is stored whether the call was answered, not answered or busy. Last Number Redial is available to all stations capable of placing outside calls.

Programming:

CO Line Access

Related Features:

Placing a Call

LINE ACCESS

1.13 Any line, or group of lines, can be programmed to allow access by any station or group of stations. Also, lines can be programmed to ring only at specified stations.

Programming:

CO Line Access
CO Line Ring

Related Features:

Private Line

MONITOR

1.14 Monitor allows the user to dial and listen to a call with the handset on-hook. The user can hear through the telephone speaker when the party answers the call, but must lift the handset to reply.

Programming: none

Related Features:

Placing a Call

NIGHT ANSWER

1.15 Night Answer allows selected stations to receive calls on all lines when the attendant station is unattended. The stations that are to receive Night Answer are assigned during programming.

NOTE: If station 70 is unplugged the system enters the Night Answering mode.

Programming:

Night Answer

Related Features:

Placing a Call

PLACING A CALL

1.16 Any station that is not restricted (by CO Line Access) during programming can be used to place an outgoing call. Dialing a CO line access code (for any line behind a PBX) may be required before dialing an outside telephone number.

Programming:

Restrict Override Toll Restriction CO Line Access

Related Features:

Conference
Flash
Handsfree Capability
Last Number Redial
Monitor
Night Answer
Private Line
Speed Dialing
Toll Restriction

POWER FAILURE TRANSFER

1.17 In the event of a power failure, this feature enables a user to place outside calls via a single line telephone.

Programming: none

Related Features: none

PRIVATE LINE

1.18 A Private Line is a line programmed for access to a specific station.

Programming:

CO Line Access CO Line Ring

Related Features:

Line Access Placing a Call

SPEED DIALING

telephone numbers. There are two types of Speed Dialing: System and Station. System Speed Dialing allows the user to store up to 10 numbers in the system memory. These numbers are programmed from station 70. A station user must have access to a line in order to access a Speed Dialing number. A toll call stored in a System Speed Dialing bin cannot be accessed by toll restricted stations. Station Speed Dialing enables up to six numbers to be stored at a particular station. These numbers are unique to the station that stores them. Speed Dialing numbers are protected for approximately one month in the event of a power failure by the battery back-up.

Programming:

Pause Time CO Line Access

Related Features:

Placing a Call Toll Restriction

TOLL RESTRICTION

1.20 The Toll Restriction feature prohibits selected stations from placing toll calls. Toll Restriction prohibits a station from dialing either 1, 0 or both as the first digit.

Programming:

Restrict Override Toll Restriction

Related Features:

Placing a Call

TRANSFER

1.21 Transfer is used to send a call from one station to another. The call can be transferred either Unscreened (unannounced), or Screened (announced). An unanswered transferred call will return to the station which initiated the transfer. If the transfer remains unanswered, the call will ring at all stations programmed to receive audible for that line.

Programming:

Flash Enable Flash Timer Hold Recall Call Waiting

Related Features:

Call Waiting Flash

EK-612 ELECTRONIC KEY TELEPHONE SYSTEM SECTION 3. HARDWARE CONFIGURATION

1. DESCRIPTION

1.01 The HARDWARE CONFIGURATION Section provides instructions for ordering equipment tailored to the specific needs of the installation.

2. INSTRUCTIONS FOR SELECTING EQUIPMENT

- **2.01** The EK-612 requires a minimal amount of equipment: a Key Service Unit (KSU) with built-in power supply, telephone sets, installation cabling and hardware, and telephone company/PBX lines.
- **2.02** Complete Table 3-1, Order Sheet, by filling in the following items:

ITEM 1: KEY SERVICE UNIT

(a) One KSU is required.

ITEM 2: TELEPHONE SETS

(a) Mark in the appropriate column (by model of telephone), the number of telephone sets required (1-12).

- (b) Indicate how many of these telephones will have a speakerphone for Handsfree operation.
- (c) Indicate how many telephones will be wall-mounted.

ITEM 3: ADDITIONAL INSTALLATION ITEMS

- (a) A dedicated 117 VAC outlet is required for the KSU.
- (b) A 66M1-50 connecting block is required for connecting the KSU to the stations.
- (c) A 25-pair cable with a 50 pin (type 57) female connector is required for connecting the KSU to the 66M1-50 block.
- (d) A 625A or 625F (4-wire) modular station jack is needed for each telephone set. Indicate the number required.
- (e) Indicate how many feet of station cable is required to connect the 66M1-50 block to each modular station iack.
- (f) A self-contained, 3-prong grounded powerline surge protector is recommended to protect the system power supply against AC service input transients.
- (g) Modular line cords are required for CO connections to the KSU (1 line cord for each line circuit used).

ITEM 4: TELEPHONE COMPANY LINES

(a) The system can accommodate up to six Central Office (CO) or Private Branch Exchange (PBX) lines. Indicate the number of lines needed.

ITEM 5: OPTIONAL EQUIPMENT

- Customer provided external paging equipment must (a) use an audio matching transformer.
- Customer provided external loud bells require a power (b)
- Customer provided Power Failure Alarm equipment (c)
- requires a power supply. A 12V relay having a 50m amp or less coil requirement is also necessary.
- A 500/2500-type telephone used for power failure must match the service for the line used, i.e., DTMF or DP.
- A Snap-Tap connector can be used in place of a connecting block to simplify installation of the stations to the KSU.

Table 3-1 ORDERING SHEET, EK-612

DESCRIPTION						
ITEM 1: KEY SERVICE UNIT						
ITEM 2: TELEPHONE SETS						
ULTRAKEY: SPEAKERPHONES WALLMOUNT						
MERITOR 1E: SPEAKERPHONES WALLMOUNT						
ECON-O-KEY: SPEAKERPHONES WALLMOUNT						
DELPHI-6: SPEAKERPHONES WALLMOUNT						
ITEM 3: ADDITIONAL INSTALLATION ITEMS						
DEDICATED 3-PRONG OUTLET (117 VAC)	ONE					
66MI-50 BLOCK						
25-PAIR CABLE WITH A 50-PIN (TYPE 57) FEMALE CONNECTOR						
625A OR 625F (4-WIRE) MODULAR STATION JACKS						
SȚATION CABLE						
3-PRONG POWERLINE SURGE PROTECTOR						
4 CONDUCTOR MODULAR-ENDED LINE CORD						
ITEM 4: TELEPHONE COMPANY LINES						
ITEM 5: OPTIONAL EQUIPMENT						
EXTERNAL PAGING EQUIPMENT						
EXTERNAL LOUD BELLS						
POWER FAILURE ALARM EQUIPMENT						
500 / 2500-TYPE TELEPHONE FOR POWER FAILURE						
SNAP-TAP CONNECTOR						

EK-612 ELECTRONIC KEY TELEPHONE SYSTEM SECTION 4, SOFTWARE CONFIGURATION

1. DESCRIPTION

1.01 The SOFTWARE CONFIGURATION Section presents a summary of the programmable options for system operation. A Program Record Form (PRF) is included at the end of this section for recording data which is entered into system memory during program entry.

2. INSTRUCTIONS FOR COMPLETING THE PRF

2.01 The instructions in the following paragraphs will allow the system software to be configured to best suit the needs of the customer.

2.02 The following paragraphs describe options which may be programmed. The initialization value (the pre-programmed software) is shown for each option.

3. TIMERS

FLASH ENABLE

3.01 Flash allows a user to transfer a call, access custom calling features, and obtain a dial tone without releasing the line after completing a telephone call. Flash is available when the CO or PBX requires an Open Loop Flash (see Flash Timer to program length of Flash). The CO or PBX must be compatible with Open Loop Flash for the Flash feature to be effective.

Instructions:

Enter a 1 in Table 4-1 if Open Loop Flashing is not required.

Initialized:

The system is initialized to provide Open Loop Flashing (0).

Related Feature:

Flash

Transfer

Related Programming:

Flash Timer

PAUSE TIME

3.02 A Pause Time is programmed to allow the system to wait for a dial tone before dialing out a Speed Dialing number. In cases where two sets of numbers must be dialed, as with MCI or SPRINT, a Pause Time is programmed to allow the system to wait for a dial tone before dialing the first set and a second dial tone before dialing the second set. The duration of the pause is determined by the requirements of the CO.

Instructions:

Select the time required, from the column marked SECONDS, and enter in Table 4-1 the corresponding 8-digit binary code from the column marked ENTRY.

SECONDS	ENTRY	SECONDS	ENTRY
0.5	0000 0110	10.5	1000 0011
1.0	0000 1101	11.0	1000 1010
1.5	0001 0011	11.5	1001 0000
2.0	0001 1001	12.0	1001 0110
2.5	0001 1111	12.5	1000 1110
3.0	0010 0110	13.0	1010 0011
3.5	0010 1100	13.5	1010 1001
4.0	0011 0010	14.0	1010 1111
4.5	0011 1000	14.5	1011 0101
5.0	0011 1111	15.0	1011 1100
5.5	0100 0101	15.5	1100 0010
6.0	0100 1011	16.0	1100 1000
6.5	0101 0001	16.5	1100 1110
7.0	0101 1000	17.0	1101 0101
7.5	0101 1110	17.5	1101 1011
8.0	0110 0100	18.0	1110 0001
8.5	0110 1010	18.5	1110 0111
9.0	0111 0001	19.0	1110 1110
9.5	0111 0111	19.5	1111 0100
10.0	0111 1101	20.0	1111 1010

Initialized:

The system is initialized with a pause of 2.0 seconds (0001 1001)

Related Feature:

Speed Dial

Related Programming: none

MAKE/BREAK RATIO

3.03 The Make/Break Ratio determines the ratio and speed of the Pulses Per Second (PPS) output of the system for dial pulsing. This entry is determined by the requirements of the CO for Dial Pulse (DP) lines.

Instructions:

Select the ratio required, from the column marked MAKE/BREAK RATIO, and enter in Table 4-1 the corresponding 8-digit binary code from the column marked ENTRY.

MAKE/BREAK RATIO	ENTRY
60/40 at 10 PPS	1100 1000
68/32 at 10 PPS	1101 0110
60/40 at 20 PPS	0110 0100

Initialized:

The system is initialized with a Make/Break ratio of 60/40 at 10 PPS (1100 1000).

Related Feature: none

Related Programming:

Line Type

FLASH TIMER

3.04 The Flash Timer controls the duration of an Open Loop Flash on a CO line. This entry is determined by the CO or PBX.

Instructions:

Select the time required, from the column marked TIME, and enter in Table 4-1 the corresponding 8-digit binary code from the column marked ENTRY.

TIME	ENTRY
250ms	0000 0011
335ms	0000 0100
418ms	0000 0101
502ms	0000 0110
585ms	0000 0111
670ms	0000 1000
753ms	0000 1001
836ms	0000 1010
920ms	0000 1011
1.00sec	0000 1100
1.25sec	0000 1111
1.50sec	0001 0010
1.75sec	0001 0101
2.00sec	0001 1000
2.50sec	0001 1110
3.00sec	0010 0100

Initialized:

The Flash Timer is initialized at 753ms (0000 1001)

Related Feature:

Flash

Transfer

Related Programming:

Flash Enable

HOLD RECALL

3.05 The Hold Recall Timer determines the interval between the time a call is placed on Hold, and the time it re-rings at the extension that placed the call on Hold. The Hold Recall Timer also determines the length of time a transferred call will remain unanswered before re-signaling the transferring station.

Instructions:

Select the time required, from the column marked RECALL TIME, and enter in Table 4-1 the corresponding 8-digit binary code from the column marked ENTRY.

RECALL TIME	ENTRY
30 sec	0000 0110
1 min	0000 1100
1.5 min	0001 0010
2 min	0001 1000
2.5 min	0001 1110
3 min	0010 0100
3.5 min	0010 1010
4 min	0011 0000
4.5 min	0011 0110
5 min	0011 1100
5.5 min	0100 0010
No recall	1111 1111

Initialized:

Initialization does not return the Hold Recall Timer to a default value. The previous entry will remain in storage even after a power down.

Related Feature:

Hold

Hold Recall

Transfer

Related Programming: none

4. LINE PROGRAMMING

RESTRICT OVERRIDE

4.01 Each line can be programmed to restrict toll calling.
Toll restriction, although desired on lines such as
Direct Distance Dial (DDD) lines, may not be desired on
lines such as WATS.

Instructions:

Enter into Table 4-1, in the column labeled Restrict Override, 1, for each line that can be used by toll restricted stations.

Initialized:

Restrict Override is not provided on any line circuit.

Feature Reference:

Placing a Call Toll Restriction

Related Programming:

Toll Restriction

LINE GROUP

4.02 Four line group entries are available; (00) is reserved for unused line circuits and paging connections; (01, 10, 11) allow grouping of similar lines for different types of service (e.g., DDD, WATS, etc.). When accessing Speed Dialing or Last Number Redial, calls intended to leave on a particular group will select the first available line within that group and only within that group (e.g., a call intended to leave on a WATS line will not leave on any other line).

Paging and unequipped lines should be assigned to group 00 to prevent incorrect line seizure. All other lines may be assigned to any group and in random order. All lines may be assigned to the same group.

Instructions:

Enter into Table 4-1, in the column marked Group No., the group number assigned to each line.

Initialized:

All lines are in group 01.

Feature Reference:

External Paging

Related Programming: none

LINE TYPE

4.03 Line Type identifies what type of lines are being used in the system: DP or DTMF. In addition, this entry identifies whether the lines are installed behind a PBX.

Instructions:

Select the Line Type required, from the column marked LINE TYPE, and enter in Table 4-1 the corresponding 2-digit code from the column marked ENTRY.

LINE TYPE	ENTRY
DP CO line	00
DP PBX line	01
DTMF CO line	10
DTMF PBX line	11

Initialized:

The system is initialized with either DP or DTMF lines.

Feature Reference: none

Related Programming:

Make/Break Ratio

5. STATION PROGRAMMING

TOLL RESTRICTION

5.01 A station user can be denied the ability to dial 0 or 1 as the first digit. If the lines are programmed as PBX lines, the restriction applies to the second digit.

Instructions:

Select the level of Restriction required, from the column marked RESTRICTION, and enter in Table 4-1 the corresponding 2-digit code from the column marked ENTRY.

RESTRICTION	ENTRY
None	00
Cannot dial 0 as 1st digit	01
Cannot dial 1 as 1st digit	10
Cannot dial 0 or 1 as 1st digit	11

Initialized:

Upon system initialization no station has toll restriction (00).

Feature Reference:

Placing a Call Speed Dialing Toll Restriction

Related Programming:

Restrict Override Line Type

NOTE: Toll restricted stations will be able to dial 1 + 800, 1 + 911 and 1 + 411, plus the 7 digits which follow.

CO LINE ACCESS

5.02 To place a call a station user must have access to the line. This entry determines the lines which each station may access.

Instructions:

Enter on Table 4-1, under the column labeled CO Line Access, a 1 for each line for which the station should have access, and a 0 for lines the station is denied access.

Initialized:

When the system is initialized, all stations have access to all lines (111111).

Feature Reference:

External Paging Last Number Redial Placing a Call Private Line Speed Dialing

Related Programming: none

CALL WAITING

5.03 Call Waiting allows a station user, busy on a call, to receive a signal indicating that an outside line call is waiting to be answered. Two bursts of tone will be heard as the call comes in.

Instructions:

Enter in Table 4-1, under the column labeled CW, 0 for stations that should not be signaled and 1 for stations that should receive the Call Waiting on incoming CO lines.

Initialized:

When the system is initialized, Call Waiting is restricted for all stations.

Feature Reference:

Call Waiting

Related Programming: none

NIGHT ANSWER

5.04 Stations with assigned Night Mode Signaling can place and receive calls on all lines.

Instructions:

Enter in Table 4-1, under the column labeled ANA, a 1 if the station is assigned Night Answer, a 0 if not.

Initialized:

When the system is initialized, all stations will be signaled by incoming calls (with ringing and flashing LEDs).

Feature Reference:

Night Answer

Related Programming: none

CO LINE RING

5.05 This entry determines which lines will ring at what stations.

Instructions:

Enter in Table 4-1, under the column labeled CO Line Ring Enable, a 1 for each line that is to ring at the given station. Enter a 0 for each line if no ring is desired at the given station.

Initialized:

When the system is initialized, all stations will receive audible on all lines (111111).

Feature Reference:

Hold Recall Private Line

Related Programming: none

Table 4-1 PROGRAM RECORD FORM, EK-612

SYSTEM CONFIGURATION															
FIELD No.	FUNCT	ION							Ei	NTRY					
00	Flash														
01	Pause 1	Гime						-				_			
02	Make / Break Ratio							_				_			
03	Flash T	imer						_				_			
04	Hold Re	ecall						-			-	_			
CO LINE CONFIGURATION															
84 85 86 87 88 89	CO: CO: CO: CO:	2 3 4 5	(0 0	0 - 0 - 0 - 0 -	strict Ove	rride	Group	No.	Line	Type				
			\	STA	TION	I CC	NFI	GURA	TION						
Station Number	Toll Restriction	CO 6			Acces		CO 1	CW †	CO Line Ring Enable					CO 1	
70															
71															
72															
73	1 0		1_	1_		1		0	0						
74															
75															
76															
77				_											
78									\ ;						
79															
80									,						
81															
L	<u> </u>							<u> </u>	<u> </u>						

t CW is Call Waiting ‡ ANA is Assigned Night Answer

T5019 September 1984

5

EK-612

ELECTRONIC KEY TELEPHONE SYSTEM SECTION 5, INSTALLATION OF STANDARD EQUIPMENT

1. INTRODUCTION

- 1.01 Section 5, INSTALLATION OF STANDARD EQUIPMENT provides procedures for installing the components of the system. These procedures include Site Parameters, Equipment Requirements, Key Service Unit (KSU) and Connecting Block Installation, Station Cabling and Connecting Telco Lines.
- 2. INSTALLATION SITE PARAMETERS

WARNING: UNDER NO CIRCUMSTANCES SHOULD AN EK-612 TELEPHONE BE HOOKED-UP AS AN OFF-PREMISES EXTENSION. NOR SHOULD AN OUT-OF-BUILDING EXTENSION BE HOOKED-UP TO AN EK-612 SYSTEM, IN ORDER TO AVOID POSSIBLE DAMAGE DUE TO A VOLTAGE OVERLOAD (e.g., LIGHTNING).

- **2.01** The area for mounting the KSU should be clean, dry, temperature controlled and accessible only to authorized personnel. Site selection must include:
- (a) A dedicated 120 (nominal) VAC, 60 Hz, single phase, 3-wire power outlet that is within 7 feet (2.1m) of the KSU.
- (b) The telco lines, terminated in RJ11C connectors, within 25 feet (7.6m) of the KSU.
- (c) The maximum station cable run not exceeding 2000 feet.
- (d) A well ventilated site with a temperature range of 32° to 104° F (0° to 40° C) and 5% to 95% relative, noncondensing humidity.

EQUIPMENT REQUIREMENTS

- **2.02** Unpack the telephone equipment and compare the equipment received to the Order Sheet (Table 3-1). Check for any physical damage. Have the necessary hardware and cables available (Table 3-1).
- **2.03** Verify that the following are complete prior to installing the system:
- (a) Building plan marked with station locations.
- (b) Program Record Form (Table 4-1).
- (c) The operating telco has been notified of the information outlined in Section 1 of this manual.

KSU AND CONNECTING BLOCK INSTALLATION

- 2.04 The KSU is a sealed wall-mounted cabinet that has no user serviceable parts. All voltage potentials required by the system are provided by the power supply which is located inside the KSU. A power indicator Light Emitting Diode (LED) indicates when power is being supplied to the KSU and if the fuse is functional. A single Slo-Blo fuse, located on the bottom of the KSU (Figure 5-1), is provided to protect against overloading.
- **2.05** To install the KSU perform the following steps using Figure 5-1 as a reference.
- (a) Locate the area to mount the KSU and Connecting Block within 7 feet of the dedicated outlet and within 25 feet of the RJ11C modular jacks from the telco.

- (b) Hold up the KSU on the mounting surface[†] and mark the four points that correspond to the key hole mounting slots on the back panel of the KSU.
- (c) Secure the KSU to the mounting surface using suitable fasteners. The method used to secure the KSU depends on the type of mounting surface.
- (d) Attach the 66M1-50 connecting block to the left of the KSU. †
- (e) Punch down the free conductors from the 25-pair cable at the connecting block according to Table 5-1.
- (f) Plug the female connector on the 25-pair cable into the male plug on the KSU.
- (g) Install per manufacturer's instructions, a self-contained, 3-prong grounded powerline surge protector at the dedicated AC receptacle. Do not use a 3-wire to 2-wire adapter.
- (h) The breaker switch at the service entrance panel should be either equipped with a lock-clip to prevent accidental shut-down or labeled "Do Not Touch".

[†]The KSU must be installed on a customer-provided exterior grade plywood backboard when the mounting site is on concrete, masonry, damp or drywall surfaces.

[†]For installations using the Snap-Tap modular adaptor reference Section 6: INSTALLATION OF OPTIONAL EQUIPMENT.

NOTE: Do not mount the KSU using drywall anchors or press-in hollow wall anchors on drywall.

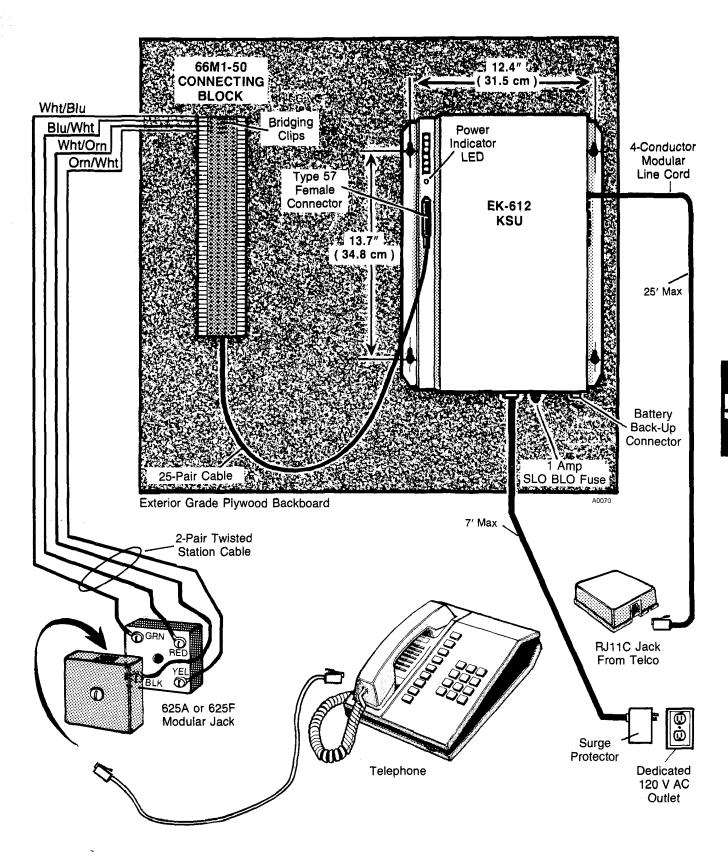


Figure 5-1 INSTALLATION LAYOUT

, Table 5-1 STATION BLOCK CONNECTIONS, EK-612

25 Pair Cable		Connecting Block		Station Cable	Line Cord	
Conn Pin	Color Code		Block Term.	Function	2 Pr. Twisted Cable To <u>62</u> 5-A	Telephone
26 1	WHT-BLU BLU-WHT	07 N	1 2	T R	WHT-BLU BLU-WHT	GRN RED
27	WHT-ORN	STATION	3	DA	WHT-ORN	BLK
2	ORN-WHT	ST	4	DB	ORN-WHT	YEL
28	WHT-GRN	7	5	T	WHT-BLU	GRN
3 29	GRN-WHT WHT-BRN	Ŷ	6 7	R DA	BLU-WHT WHT-ORN	RED
4	BRN-WHT	STATION	8	DB	ORN-WHT	BLK YEL
30	WHT-SLT	72	9	T	WHT-BLU	GRN
5	SLT-WHT		10	R	BLU-WHT	RED
31	RED-BLU	STATION	11	DA	WHT-ORN	BLK
6	BLU-RED		12	DB DB	ORN-WHT	YEL
32	RED-ORN	N 73	13	T	WHT-BLU	GRN
7 33	ORN-RED RED-GRN	TION	14 15	R DA	BLU-WHT WHT-ORN	RED BLK
8	GRN-RED	STATI	16	DB	ORN-WHT	YEL
34	RED-BRN	74	17	Т	WHT-BLU	GRN
9	BRN-RED	8	18	R	BLU-WHT	RED
35	RED-SLT	STATION	19	DA	WHT-ORN	BLK
10	SLT-RED		20	DB	ORN-WHT	YEL
36 11	BLK-BLU BLU-BLK	N 75	21 22	T R	WHT-BLU BLU-WHT	GRN RED
37	BLK-ORN	STATION	23	DA	WHT-ORN	BLK
12	ORN-BLK	STA	24	DB	ORN-WHT	YEL
38	BLK-GRN	92	25	T	WHT-BLU	GRN
13	GRN-BLK	8	26	R	BLU-WHT	RED
39	BLK-BRN	STAT	27	DA	WHTORN	BLK
14	BRN-BLK	\vdash	28	DB	ORN-WHT	YEL
40 15	BLK-SLT SLT-BLK	NOI 7	29 30	T R	WHT-BLU BLU-WHT	GRN RED
41	YEL-BLU	잂	31	DA	WHTORN	BLK
16	BLU-YEL	STATI	32	DB	ORN-WHT	YEL
42	YEL-ORN	78	33	Т	WHT-BLU	GRN
17	ORN-YEL	 No	34	R	BLU-WHT	RED
43	YEL-GRN	STATION	35 36	DA DB	WHT-ORN	BLK
18	GRN-YEL VELBBN	\vdash	36	T DR	ORN-WHT	YEL
44 19	YËL-BRN BRN-YEL	STATION 79	37 38	l R	WHT-BLU BLU-WHT	GRN RED
45	YEL-SLT	밁	39	DA	WHT-ORN	BLK
20	SLTYEL	ST	40	DB	ORN-WHT	YEL
46	VIO-BLU	8	41	Т	WHT-BLU	GRN
21	BLU-VIO	No	42	R	BLU-WHT	RED
47	VIO-ORN ORN-VIO	STATION	43 44	DA DB	WHT-ORN ORN-WHT	BLK YEL
48	VIO-GRN	81	45	T	WHT-BLU	GRN
23	GRN-VIO	NO NO	46	R	BLU-WHT	RED
49	VIO-BRN	STATIC	47	DA	WHTORN	BLK
24	BRN-VIO	ST	48	DB	ORN-WHT	YEL
50	VIO-SLT	8	49	T (PF)	WHT-BLU	GRN
25	SLT-VIO	O	50	R (PF)	BLU-WHT	RED

PF = Power Failure connections for CO line 1.

STATION CABLING

10.07

- **2.06** Use standard 2-pair twisted cable for connections between the connecting block and the modular station jacks. If it is necessary to use existing quad cabling from a previous telephone system, follow the procedures indicated in INSTALLATION OF OPTIONAL EQUIPMENT, Section 6.
- (a) Punch down each station cable at the connecting block according to Table 5-1.
- (b) Insert bridging clips to connect the KSU side to the station side of the connecting block.
- (c) Home run, i.e., directly connect, the station cable to the modular station jacks. A cable run cannot exceed 2000 feet.

(d) Terminate each station cable at the station location in a 625A or 625F (4-wire) modular jack, or equivalent with screw type terminals as follows:

TWISTED PAIR CABLING	JACK TERMINAL
CADLING	I EIWIIIAL
WHT-BLU	GRN
BLU-WHT	RED
WHT-ORN	BLK
ORN-WHT	YEL

(e) Use a 4-conductor line cord to connect each telephone to its modular station jack.

CONNECTING TELCO LINES

- **2.07** Each RJ11C modular jack from the telco provides service for one CO line. The RJ11C jacks are joined to the EK-612 system as follows:
- (a) Use a 4-conductor modular ended line cord to connect one RJ11C jack to one modular input jack (located on the right side of the KSU and numbered 1-6) for each CO line.

EK-612 ELECTRONIC KEY TELEPHONE SYSTEM SECTION 6, INSTALLATION OF OPTIONAL EQUIPMENT

1. INTRODUCTION

1.01 Section 6, INSTALLATION OF OPTIONAL EQUIPMENT provides detailed procedures for installing optional equipment for the system. These procedures include Quad Station Cabling, Power Failure Transfer, External Paging Amplifier, Station 80 Loud Bells, Common Audible Loud Bells, Power Failure Alarm and Snap Tap Modular Adapter.

QUAD STATION CABLING

1.02 If existing quad cabling from a previous telephone system must be used, punch down as follows:

FUNCTION	DESIGNATION
AUDIO	TIP
AUDIO	RING
DATA POWER	DATA A
DATA	DATA B
	AUDIO AUDIO DATA POWER

NOTE: In certain installations quad cable may introduce noise.

POWER FAILURE TRANSFER

- **1.03** To provide power failure transfer (Figure 6-1):
- (1) Turn the system power ON.
- (2) Punch down the station cable (WHT-BLU and BLU-WHT wires) at the block terminals 49 and 50.
- (3) Connect the WHT-BLU wire to the GRN terminal and the BLU-WHT wire to the RED terminal on the

- modular station jack to be used for the power failure telephone.
- (4) Install bridging clips.
- (5) Install a single line (500/2500 type) telephone. This telephone will automatically be connected to line 1 in the event of a power failure.

NOTE: The telephone used for power failure must match the service for the line (DTMF or DP).

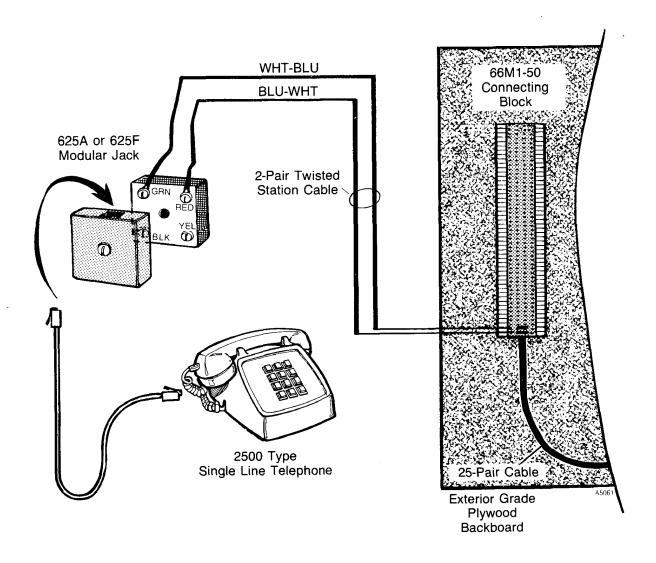


Figure 6-1 POWER FAILURE TRANSFER

EXTERNAL PAGING AMPLIFIER

- **1.04** To connect an external paging amplifier to the system (Figure 6-2):
- (a) Connect an unused line position via the KSU modular input jack to an audio matching transformer (600 ohms input to 50K ohms output).
- (b) Using an audio cable, connect the matching transformer to the paging amplifier inputs.

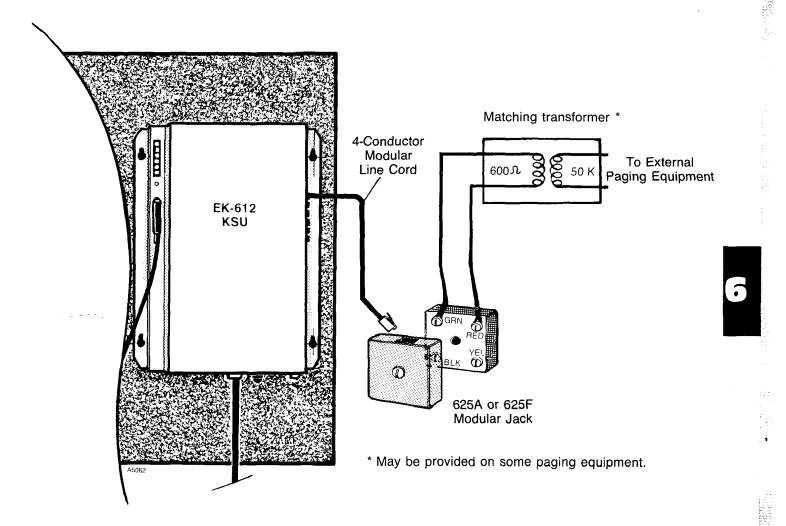


Figure 6-2 TYPICAL EXTERNAL PAGING AMPLIFIER CONNECTIONS

STATION 80 LOUD BELLS

1.05 The system provides a normally open dry relay contact (24 VDC @ 100mA) which will close whenever a call comes into station 80. This contact may be used to activate a station 80 audible loud ringer. The EK-612 supplies only a closed loop. The power for the loud ringer must be separately supplied. Note also that station 80 must be plugged in for this feature to function. Connect the loud ringer as follows (Figure 6-3):

- (a) Connect the loud ringer to screw terminals 1 and 2 located on the left side of the KSU.
- (b) Connect to a power supply.

WARNING: IF THE STATION 80 AUDIBLE BELL OR ANNUNCIATOR HAS REQUIREMENTS THAT EXCEED THE RATING OF THE CONTACTS, EX-TERNAL RELAYS MUST BE USED. DO NOT TRY TO SWITCH AC POWER USING CONTACTS 1 AND 2.

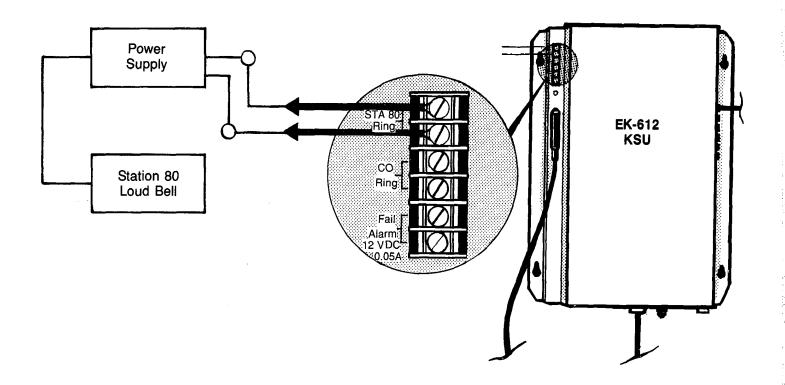


Figure 6-3 STATION 80 LOUD BELLS

COMMON AUDIBLE LOUD BELLS

1.06 The system provides a normally open dry relay contact (24 VDC @ 100mA) which will close whenever a call comes in. This contact may be used to activate a common audible loud bell. The EK-612 supplies only a closed loop. The power for the loud bell must be separately supplied. Connect the bell or annunciator as follows (Figure 6-4):

- (a) Connect the bell or annunciator to screw terminals 3 and 4 located on the left side of the KSU.
- (b) Connect to a power supply.

WARNING: IF THE COMMON AUDIBLE BELL OR ANNUNCIATOR HAS REQUIREMENTS THAT EXCEED THE RATING OF THE CONTACTS, EX-TERNAL RELAYS MUST BE USED. DO NOT TRY TO SWITCH AC POWER USING CONTACTS 3 AND 4

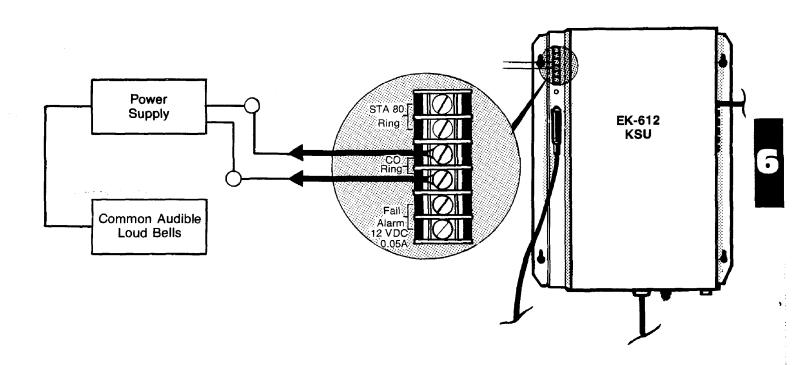


Figure 6-4 COMMON AUDIBLE LOUD BELLS

POWER FAILURE ALARM

- which can be used to provide an alarm system that indicates an AC power failure. A customer provided coil with a 12VDC rating and a 50mA or less current rating is required along with a 12VDC Battery Alarm Relay System. See Figure 6-5a.
- 1.08 During normal KSU operation, the coil is energized by the AC which creates a non-pulsing

electromagnetic field. The field holds open the alarm relay. See Figure 6-5a. Should an AC failure occur, the coil deenergizes and its electromagnetic field collapses, closing the Alarm Relay. The Alarm Battery now operates the alarm proper. See Figure 6-5b.

(a) Connect the alarm device to screw terminals 5 and 6 located on the left side of the KSU.

NOTE: Do not use the 12VDC output for any other purpose as it may affect system operation.

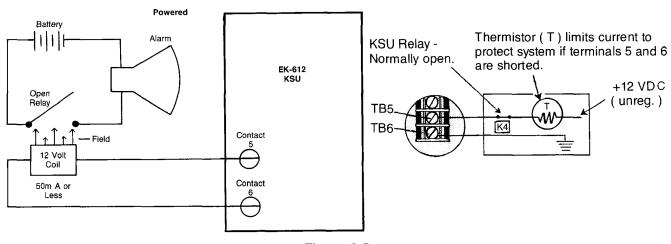


Figure 6-5a

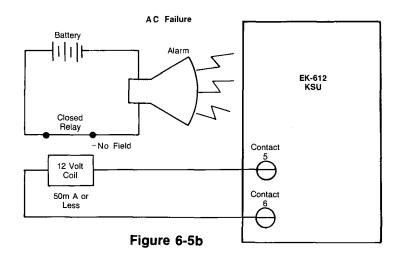


Figure 6-5 POWER FAILURE ALARM

SNAP-TAP MODULAR ADAPTOR

1.09 The Snap-Tap (P/N 60098) modular adaptor for the EK-612 KSU eliminates the need for wiring the telephones to a station block. The telephones can be directly plugged into the KSU. There are two types of connectors. The installation of each is described below. Before installing the Snap-Tap, make sure the Velcro pads are securely adhered to the KSU and the Snap-Tap.

To install the Snap-Tap:

- 1. Remove the white tape, exposing the tacky side of the Velcro (Figure 6-6a).
- 2. Insert the female connector on the Snap-Tap into the male connector on the KSU (Figure 6-6b). Press firmly to insure adhesion.

3. Snap the modular plugs into the desired stations (Figure 6-6c).

To remove the Snap-Tap:

- 1. Unplug the modular connectors of the desired stations and power failure telephones. Be sure to label the cabling for particular station positions.
- 2. Release the spring-clip on the male type 57 connector. This can be done by sliding the metal locking clip down more than ¼ inch. This clip should not be removed, since it ensures connection through the male connector to plastic-headed female connectors, including the Snap-Tap connector.
- 3. Gently pull the Snap-Tap straight off the KSU.

NOTE: PF receptacles should be used for power failure telephones only.

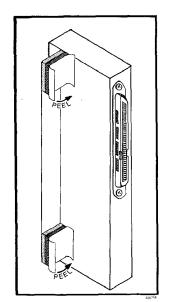


Figure 6-6a

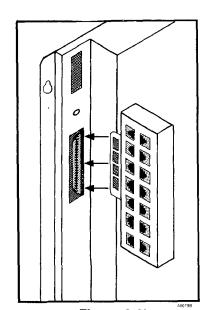


Figure 6-6b

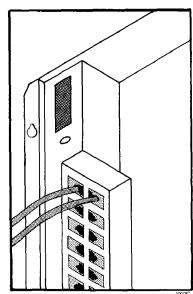


Figure 6-6c

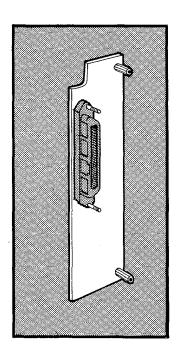
Figure 6-6 SNAP TAP MODULAR ADAPTOR

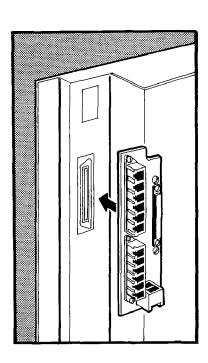
To install the Snap-Tap (Figure 6-6d):

- 1. Insert the female connector on the Snap-Tap into the male connector on the KSU. Press firmly, (Figure 6-6e).
- 2. The Snap-Tap has a screw on either side of the female connector. Fasten them to the KSU, (Figure 6-6f).
- 3. Connect the modular plugs to the appropriate stations.

To remove the Snap-Tap:

- 1. Unplug the modular connectors of the desired stations and power failure telephones. Be sure to label the cabling for particular station positions.
- 2. Release the spring clip on the male type 57 connector. This can be done by sliding the metal locking clip down more than ¼ inch. This clip should not be removed.
- 3. Unscrew the Snap-Tap.
- 4. Gently pull the Snap-Tap straight off.





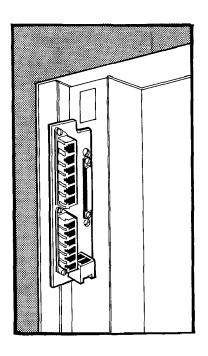


Figure 6-6d

Figure 6-6e

Figure 6-6f

7/

EK-612 ELECTRONIC KEY TELEPHONE SYSTEM SECTION 7, PROGRAM ENTRY INSTRUCTIONS

1. INITIALIZATION

- **1.01** The EK-612 is initialized with the following values:
- (a) The system is initialized as either DP or DTMF dialing.
- (b) Open Loop Flashing is provided.
- (c) The Pause Time is 2.0 seconds.
- (d) The Make/Break Ratio is 60/40 at 10 pulses per second.
- (e) The Flash Timer is 753ms.
- (f) The Hold Recall value is selected during the initialization procedure.
- (g) There is no Toll Restriction on any line.
- (h) All lines are assigned to group (01).
- (i) Call Waiting is restricted to all stations.
- (j) Night Answering is not assigned.
- (k) All stations will receive access and ringing for all CO lines.
- 1.02 If the pre-programmed system suits the needs of the customer, initialization is all that is required. Initialization sets the program and determines if signaling on all lines will be Dial Pulse (at 10 PPS with a 60/40 make/break ratio) or Dual Tone Multifrequency (DTMF). All programming (Table 4-1), including initialization is done from station 70.

DIAL PULSE INITIALIZATION

To initialize the system with Dial Pulse (DP) signaling:

- (1) Lift the handset at station 70.
- (2) Press the INT key. Listen for internal dial tone.
- (3) *Dial* # followed by 08.
- (4) Hang up.

To disable the Night Answering Mode:

- (1) Lift the handset at station 70.
- (2) Press the INT key. Listen for internal dial tone.
- (3) *Dial* # followed by 830.
- (4) Hang up.

To set the Hold Recall feature:

- (1) Lift the handset at station 70.
- (2) Press the INT key. Listen for internal dial tone.
- (3) Dial # followed by 04.
- (4) Dial the 8-digit entry from Table 4-1.
- (5) *Hang up.*

DUAL TONE MULTIFREQUENCY INITIALIZATION

To initialize the system with Dual Tone Multifrequency (DTMF) signaling:

- (1) Lift the handset at station 70.
- (2) Press the INT key. Listen for internal dial tone.
- (3) Dial # followed by 09.
- (4) Hang up.

To disable the Night Answering Mode:

- (1) Lift the handset at station 70.
- (2) Press the INT key. Listen for internal dial tone.
- (3) *Dial* # followed by 830.
- (4) Hang up.

To set the Hold Recall feature:

- (1) Lift the handset at station 70.
- (2) Press the INT key. Listen for internal dial tone.
- (3) Dial # followed by 04.
- (4) Dial the 8-digit entry from Table 4-1.
- (5) Hang up.

2. PROGRAMMING

2.01 The following paragraphs provide the procedures for programming the system to a customer's particular needs.

FLASH ENABLE

- **2.02** To program FLASH ENABLE:
- (1) At station 70, lift handset.
- (2) Press the INT key. Listen for internal dial tone.
- (3) *Dial* # followed by 00.
- (4) Dial the entry from Table 4-1.
- (5) *Hang up.*

Reference Section 4, paragraph 3.01.

PAUSE TIME

2.03 To program PAUSE TIME:

- (1) At station 70, lift handset.
- (2) Press the INT key. Listen for internal dial tone.
- (3) Dial # followed by 01.
- (4) Dial the 8-digit entry from Table 4-1.
- (5) *Hang up.*

Reference Section 4, paragraph 3.02.

MAKE/BREAK RATIO

2.04 To program MAKE/BREAK RATIO:

- (1) At station 70, lift handset.
- (2) Press the INT key. Listen for internal dial tone.
- (3) Dial # followed by 02.
- (4) Dial the 8-digit entry from Table 4-1.†
- (5) *Hang up.*

Reference Section 4, paragraph 3.03

FLASH TIMER

2.05 To program FLASH TIMER:

- (1) At station 70, lift handset.
- (2) Press the INT key. Listen for internal dial tone.
- (3) Dial # followed by 03.
- (4) Dial the 8-digit entry from Table 4-1.
- (5) Hang up.

Reference Section 4, paragraph 3.04.

[†]If more or less than 8 digits are entered, the system disregards the entry. If more than 8 digits are entered, a reorder tone is given.

HOLD RECALL

2.06 To program HOLD RECALL:

- (1) At station 70, lift handset.
- (2) Press the INT key. Listen for internal dial tone.
- (3) Dial # followed by 04.
- (4) Dial the 8-digit entry from Table 4-1.†
- (5) *Hang up.*

Reference Section 4, paragraph 3.05.

CO LINE CONFIGURATIONS

- **2.07** To program CO LINE CONFIGURATIONS:
- (1) At station 70, lift handset.
- (2) Press the INT key. Listen for internal dial tone.
- (3) Dial # then 84 for the first CO line.
- (4) Dial 85-89 for subsequent CO lines.
- (5) Dial the 8 entries from Table 4-1 for the first line.
- (6) Hang up. Repeat procedure for the remaining lines.

Reference Section 4, paragraph 4.01 through 4.03.

STATION CONFIGURATION

- **2.08** To program STATION CONFIGURATIONS:
- (1) At station 70, lift handset.
- (2) Press the INT key. Listen for internal dial tone.
- (3) Dial # then dial the station number.
- (4) Dial the 16 entries from Table 4-1 for the station.*
- (5) Hang up. Repeat procedure for the remaining stations.

Reference Section 4, paragraph 5.01 through 5.05.

[†]If more or less than 8 digits are entered, the system disregards the entry. If more than 8 digits are entered, a reorder tone is given.

[†]If more or less than 16 digits are entered, the system disregards the entry. If more than 16 digits are entered, a reorder tone is given.

NIGHT ANSWER MODE

- **2.09** To enable Night Answer:
- (1) Lift handset at station 70.
- (2) Press INT key; LED illuminates. Dial tone audible.
- (3) Dial #; LED extinguishes: no dial tone audible.
- (4) Dial 831.
- (5) Hang up.

To disable Night Answer:

- (1) Lift handset at station 70.
- (2) Press INT key; LED illuminates; dial tone audible.
- (3) Dial #; LED extinguishes; no dial tone audible.
- (4) Dial 830.
- (5) *Hang up.*

3. PROGRAM VERIFICATION AND TESTING

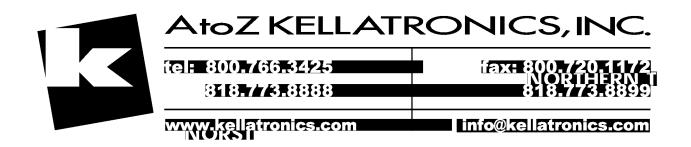
- **3.01** Testing and verification of desired features is recommended, especially when CO line ringing has been changed.
- 3.02 If station 70 has been unplugged, the system may have inadvertently entered the Night Answer mode.For an explanation of Night Answer see Section 2, paragraph 1.15.
- **3.03** Before testing any programmed features, verify that all telephones are in good repair. Merely call station to station. Next, disable Night Answer. See Paragraph 2.09 in this section.
- **3.04** Test all programmed features. If problems arise consult Section 9 of this manual.

EK-612 ELECTRONIC KEY TELEPHONE SYSTEM SECTION 8, THEORY OF OPERATION

1. SYSTEM OPERATION

1.01 The EK-612 Electronic Key Telephone System (Figure 8-1) incorporates microprocessor technology and a unique shared-port signaling scheme to provide efficient internal and external call processing, system flexibility and reliability. All system circuitry is contained in

the subsets (telephones) and the single Printed Circuit Board (PCB) in the Key Service Unit (KSU). The telco lines are connected through modular jacks mounted in the KSU. Connection to telephones and external devices is via the single 50 position connecting block or Snap-Tap Modular adaptor. The KSU contains all the components for the system power supply. The Power Supply provides all the voltages required by the system.



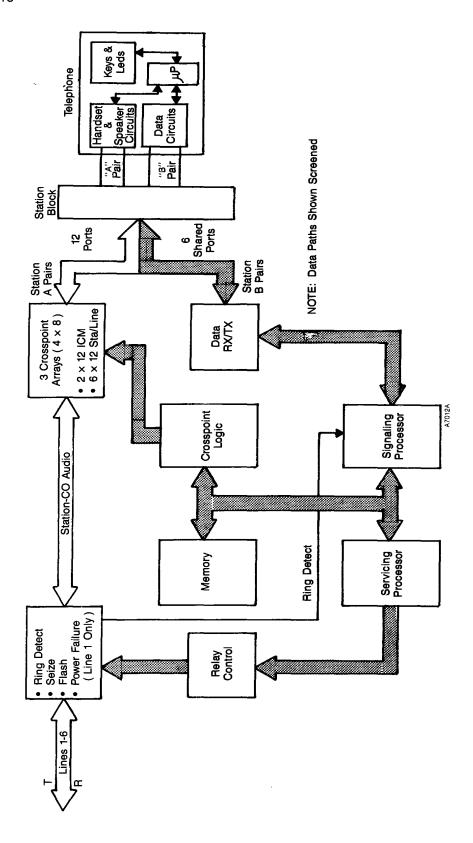


Figure 8-1 SYSTEM BLOCK DIAGRAM, EK-612

SUMMARY OF SYSTEM ARCHITECTURE

- 1.02 The KSU PCB serves as the main control element in the system. It is structured around the Servicing and Signaling Microprocessors. The microprocessors communicate (handshake) via shared input/output (I/O) and data ports. Program control is provided over the six line circuits, the crosspoint arrays, and the telephone to KSU data communication scheme. The architecture facilitates real time system response to internal actions and Central Office (CO) line transitions.
- transmission between the KSU and the telephone and also monitors the condition of the six outside lines. It determines the format, rate and timing of the serial data that is passed through the data receive/transmit (Rx/Tx) circuits. The Servicing Processor is the master processor, receiving and interpreting the telephone data from the Signaling

Processor. It also controls the analog array crosspoints and the CO line circuit relays. Both microprocessors use system memory elements.

- 1.04 Analog switching of the voice and tones, in the KSU, is handled in the Servicing Processor by the three $4{\times}8$ crosspoint arrays. These arrays are interconnected to provide a $6{\times}12$ station line matrix and a $2{\times}12$ station Intercom (ICM) link matrix. Six discrete line circuits provide a voice (analog) path, ring detect, seize and flash for each of the six incoming lines.
- 1.05 Twisted-pair station cable, composed of 4 wires where 2 wires are twisted around each other forming 2 pairs, is used to connect the telephones to the KSU. Station A pair carries the audio (analog) component; station B pair carries the data (digital) component. One audio port is dedicated to each station. A pair of stations is assigned to each data port, distinguished from each other by system timing and data polarity. DC power for each telephone is superimposed on the B pair; DC power return is provided by the A pair.

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2. PRINTED CIRCUIT BOARD FUNCTIONS

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2.01 The logic in the system (Figure 8-2) is controlled by two 8-bit microprocessors on the KSU PCB. The Signaling Processor is responsible for maintaining serial data communication with the telephone and monitoring the condition of the six line circuits (via the Ring Detect). It provides the data receive/transmit (Rx/Tx) circuits with serial outputs for each telephone. The serial data out (SDO) for the even numbered stations is inverted. Station data is then demultiplexed onto the six data ports. Each port has two sets of data; separated by timing, and opposite in polarity. This scheme permits two telephones to be hooked up to the same port without interference. Serial data in (SDI) from the stations is multiplexed and presented to the Signaling Processor. The data is decoded in the Signaling Processor and presented to the Servicing Processor.

2.02 The Servicing Processor is the master microprocessor for the system. It receives the decoded station and line status data from the Signaling Processor, interprets it, and executes the system control functions. It controls the relays in the line circuits, generates dial pulsing (if required) and provides control data to the Crosspoint Control Logic (analog switching). The Servicing Processor also controls Station 80 Ring, CO Line Ring and Power/Processor Failure auxiliary relays. Handshaking is through the processor I/O ports and data ports. The Address Latch latches the processor data outputs enabling the processor to interface with slower system logic and memory components. The Servicing Processor operates with the system software resident in the 8K Erasable Programmable

Read Only Memory (EPROM). Both processors share the 2K Random Access Memory (RAM).

2.03 The Reset Logic monitors the condition of the processors and resets both if either one should fail. The RAM Battery Back-Up Power Supply ensures that system programming will not be lost if the AC service should fail. The battery back-up supply is tied into the Reset Logic to insure that system RAM will be protected if processor failure occurs.

DATA FORMAT

the control data between the KSU PCB and the telephones. The KSU signals each station once every 80mS. Each signaling time is 5mS, consisting of a ten bit transmit word (from KSU to telephone) followed by an eight bit receive word (from telephone to KSU). Each bit cell is 250uS; 125uS of data and 125uS null. The stations are paired in the communication scheme so that paired stations receive two interrupts, one signaling valid data and the other signaling invalid data (from the mate station). This establishes the 40mS time base for the subset.

2.05 There are four discrete transmit words: the set control, the Light Emitting Diode (LED) control, the tone generation, and a spare. Ten transmit words are required to completely update the telephone; so a complete update occurs once every 800mS. However, the receive word (from telephone to KSU) always contains any change-of-state information that may have occurred since the last transmission. This provides for an 80mS response time for any key depressions.

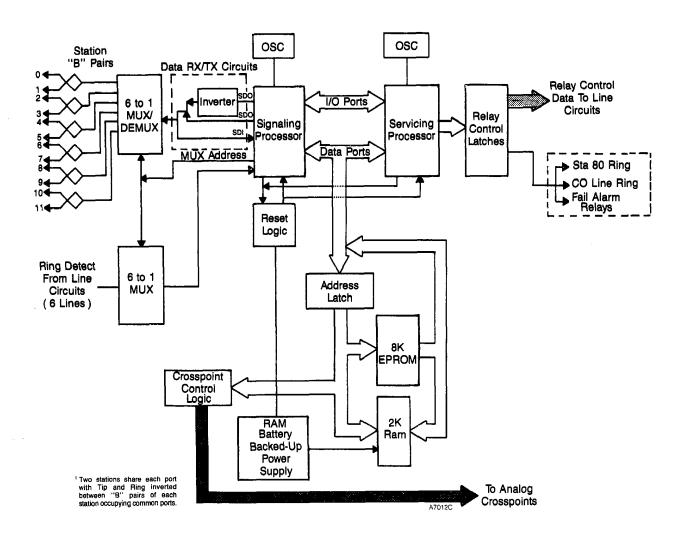


Figure 8-2 CONTROL CIRCUITS BLOCK DIAGRAM, EK-612

LINE AND STATION CIRCUITS

- 2.06 The Line and Station Circuits (Figure 8-3) are controlled by the Servicing Processor and provide for analog switching between the six CO lines and the twelve stations. Each line is connected to a line circuit, permitting ring detection, seize, flash or dial pulsing, and hold. Line circuit 1 has provisions for power failure transfer.
- 2.07 Each of the six line circuits contains an Opto-Isolator Ring-Detection Network. The output of this network is continually scanned by the Signaling

Microprocessor for the processing of incoming calls. Relays in the line circuits provide a DC path for a seized line, a relay for Open Loop Flash and Dial Pulsing, and a relay and network for Hold. The line circuit audio is AC coupled to the CO side of the analog crosspoint arrays.

2.08 The analog crosspoints establish a solid state matrix between the lines and the stations and also provide two internal ICM paths (links). These matrices are 6×12 for lines and 2×12 internal. Since all address (closure) data is sent by the Servicing Processor, real-time switching for internal and CO calls is possible.

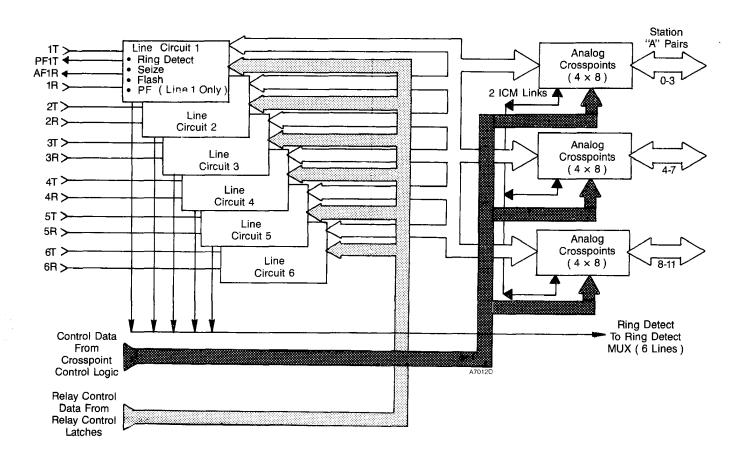


Figure 8-3 LINE AND STATION BLOCK DIAGRAM, EK-612

3. TELEPHONES

- 3.01 The EK-612 subset (telephone) (Figure 8-4) is a microprocessor based telephone. The subset uses the signaling scheme established by the KSU PCB to allow incoming, outgoing, and internal calls and special functions. Communication with the KSU is over four wires, with two wires dedicated to audio (A pair) and two wires dedicated to digital communications (B pair). Subset operating voltages are derived from the DC level superimposed on the B pair. Circuit ground is superimposed on the station A pair.
- 3.02 Control data interrupts from the KSU are received every 40mS, with valid subset data received every 80mS. The Data-Receive Circuits detect the interrupts and the valid data, and provide the information to the microprocessor controller. The controller, using the 40mS interrupts as its time base, decodes and stores the data to provide for set control, key LED control, and tone generation control. The microprocessor scans the keyboard for switch closures, monitors the optical hookswitch, and formats a response word. The response word is acted on by the data transmit circuits and sent out over the B pair to the KSU.
- 3.03 All flash and tone patterns are produced locally in the subset. The tone generator controls data, once decoded, is used to provide inputs to the DTMF generator. This generator produces, at its output, all audible signals and Dual Tone Multifrequency (DTMF) tone clusters. The analog frequency base for the DTMF generator is provided by the crystal oscillator, which also serves as the master oscillator for the microprocessor controller. The microprocessor on the subset generates the visual signal timing.
- **3.04** A watchdog timer is used to monitor the condition of the microprocessor. The watchdog is constantly refreshed by an output from the processor, and generates a reset interrupt to the processor if the refresh is interrupted.

- 3.05 All audio communication is done over the A pair. Audio from the KSU (Rx) is input into the audio Rx (receive) switch. This switch is under processor control and controls the input (i.e., receive audio, sidetone or muted DTMF) fed into the audio Rx (receive) amplifier. If the audio is received via the handset, the output of the receive-amplifier is fed directly to the processor-enabled handset receiver. If the audio is output over the speaker, the microprocessor turns the speaker switch on, causing the audio information to be amplified by the speaker amp and presented to the speaker. The handset receiver is turned off.
- 3.06 Audio from the telephone to the KSU (Tx) originates from the handset transmitter which operates in one of two modes: normal Handset or Speakerphone. In the normal Handset mode the transmitter is enabled; voice information is amplified in the Audio Tx Preamp and then sent to the Variable Attenuator. The Variable Attenuator works in conjunction with the microprocessor to control the gain of the Audio Tx Amplifier. In the normal Handset mode the gain is set to be compatible with the handset transmitter. One channel of the attenuator is used to introduce tone signals and DTMF tone clusters into the audio network. Amplifier output is connected to the station A pair, for transmission to the KSU, and sampled by the sidetone network, for handset sidetone mirroring.
- 3.07 In the Speakerphone mode, output from the handset transmitter (in the cradle) is preamplified and sent through the high gain mode of the Variable Attenuator. High gain is required since the cradled handset is relatively insensitive to input. The handset receiver is shut down, and the speaker is enabled.
- 3.08 DC voltages for powering the subset circuitry are derived from the DC offset of the A and B pairs. The A pair is referenced to ground; the B pair is tied to +24 VDC. These levels are used to establish the subset +5 VDC power supply. The A and B pairs are AC coupled to the audio and data circuits to remove the DC component from the signal paths.

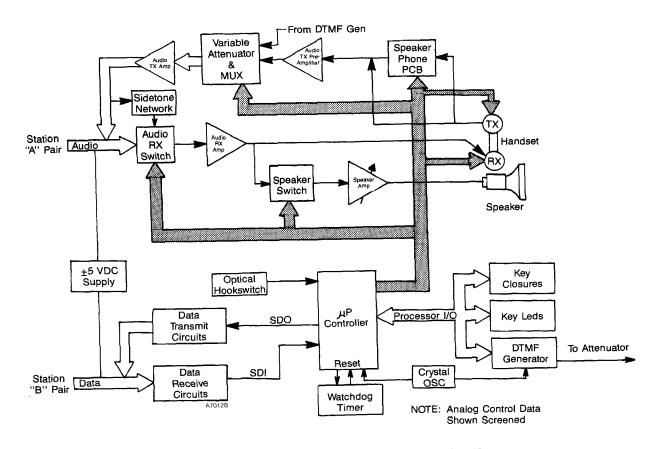


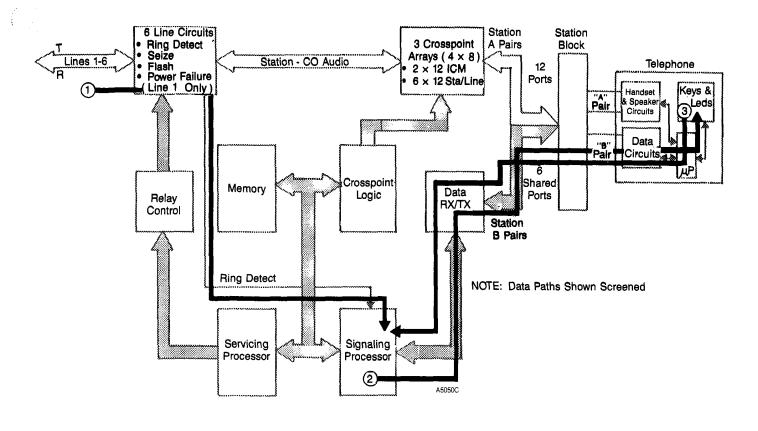
Figure 8-4 SUBSET BLOCK DIAGRAM, EK-612

4. ANALYSIS OF SIGNAL FLOW

RECEIVING AN OUTSIDE CALL

4.01 An incoming CO ring causes current flow in the appropriate line circuit Ring Detect Network. This current is sufficient to cause a ring detect interrupt to be sent to the Signaling Processor (Figure 8-5, Signal 1). This information is interpreted by the Servicing Processor, which instructs its companion microprocessor to send LED control data to the subsets indicating that the line is ringing in (Figure 8-5, Signal 2). The subsets decode this data and use their internal processors to flash the line key associated with the incoming call. The subset microprocessors also gate on CO audible, if enabled through programming.

4.02 If a station user desires to access (seize) the incoming call, the handset is lifted (or Handsfree initiated) and the line key is pressed. The key closure is detected by the subset microprocessor, which sends the closure data to the KSU PCB on the very next data transmission (Figure 8-5, Signal 3). The closure data is received by the Signaling Processor and decoded by the Servicing Processor, which generates relay and crosspoint control instructions (Figure 8-5, Signal 4). The line circuit seize relay closes, connecting the line audio through the station CO audio path to the crosspoint array. The station/line crosspoint is closed and the line audio is connected, via the A pair, to the telephone. The KSU PCB then transmits a word to the telephone enabling the audio path in the subset and establishing conversation between the telephone and the line (Figure 8-5, Signal 5).



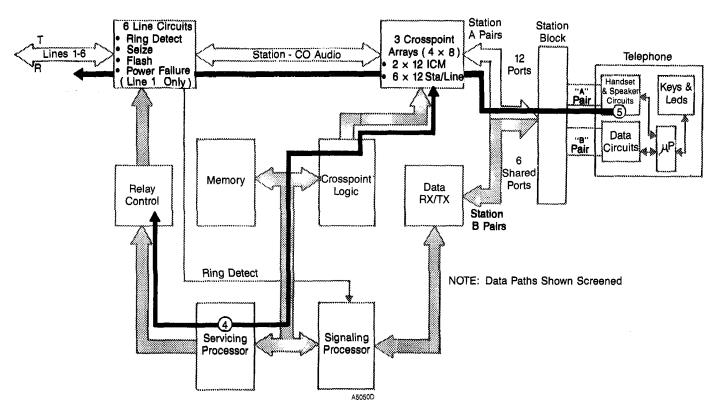


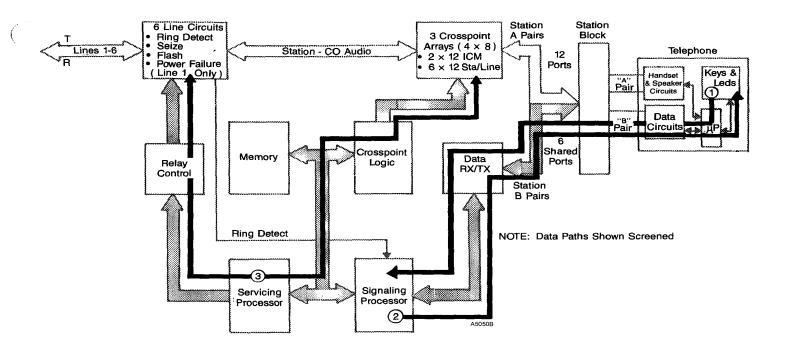
Figure 8-5 RECEIVING AN OUTSIDE CALL, EK-612

PLACING AN OUTSIDE CALL

4.03 To place an outside call, the user must lift the handset (or use the Handsfree mode) and press an idle line key. The subset microprocessor, which continually scans the hookswitch and the keys, formats the key closure into its next transmit data word. When a valid interrupt and data from the KSU are received, the subset transmit word is sent to the data receive network in the KSU (Figure 8-6, Signal 1). The Signaling Processor accepts the data and reformats it for presentation to the Servicing Processor. The Servicing Processor then executes two tasks. First, it instructs the Signaling Processor to communicate with the subset microprocessor which in turn, illuminates the line key LED and establishes the audio path, either handset or speakerphone (Figure 8-6, Signal 2). Second, it commands

(via the Relay Control logic) the appropriate line circuit to seize, and the appropriate line/station crosspoint to close (via the crosspoint control logic, Figure 8-6, Signal 3). An audio path is established between the seized line and the telephone, through the crosspoint array and station A pair, (Figure 8-6, Signal 4).

4.04 Dialing can now begin. The dial pad keys are pressed and the subset microprocessor scans the keys and temporarily stores the result. If tone dialing is enabled, DTMF tone clusters are then produced in the subset and sent to the line through the station A pairs (Figure 8-6, Signal 5). If pulse dialing is enabled, dial pad data is sent to the KSU and used by the KSU PCB microprocessor to pulse the dial control relay in the line circuit (Figure 8-6, Signal 6). Muted dial data is audible as sidetone in the subset.



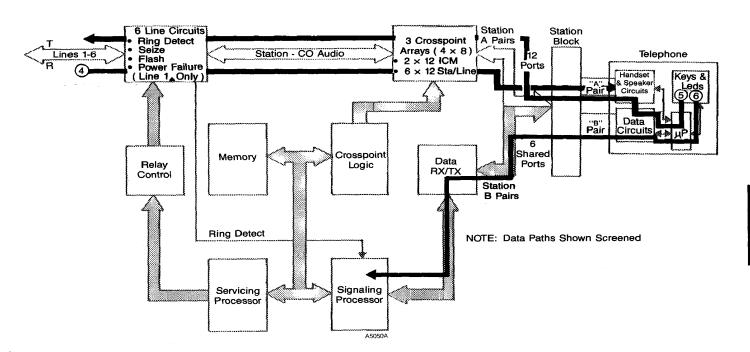


Figure 8-6 PLACING AN OUTSIDE CALL, EK-612

Part No. 01400 IMG-18

PLACING AN INTERCOM CALL

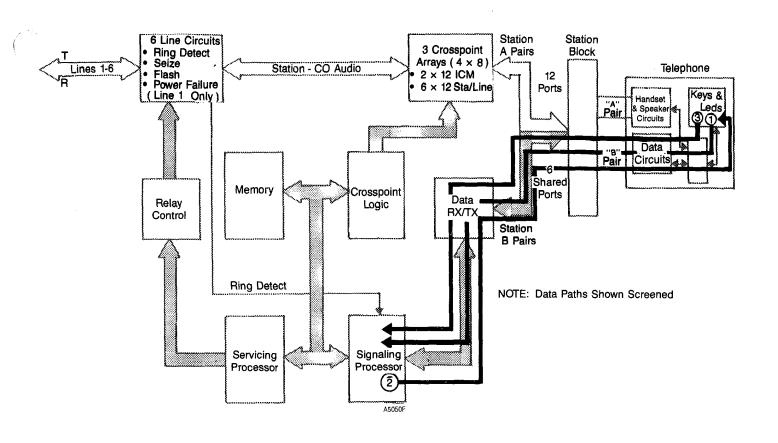
4.05 Intercom calls can be placed by lifting the handset, pressing the INT key and dialing the number of the station to be accessed. The microprocessor in the telephone sends the handset key closure data and hookswitch status to the KSU during its next transmit time (Figure 8-7, Signal 1). The data are received by the data receive circuits and the Signaling Processor, and is acted on by the Servicing Processor. Data is returned to the telephone instructing it to illuminate the INT key and enable ICM dial tone to the audio circuit (Figure 8-7, Signal 2). Dial pad data, mirrored at the telephone as DTMF digits, is then transmitted to the KSU

and processed by the KSU microprocessors (Figure 8-7, Signal 3).

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4.06 The Servicing Processor in the KSU decodes the dial data and closes the crosspoint between the two stations (Figure 8-7, Signal 4). It transmits data to the called station to announce the call and transmits data to the calling station to establish an audio path (Figure 8-7, Signal 5). If the called station has the Handsfree reply option, its speakerphone is automatically enabled and intercom conversation is established. If the called extension does not have the Handsfree reply option, conversation is established only after the handset is lifted. This necessitates additional handshaking between the KSU and the called station (Figure 8-7, Signal 6).



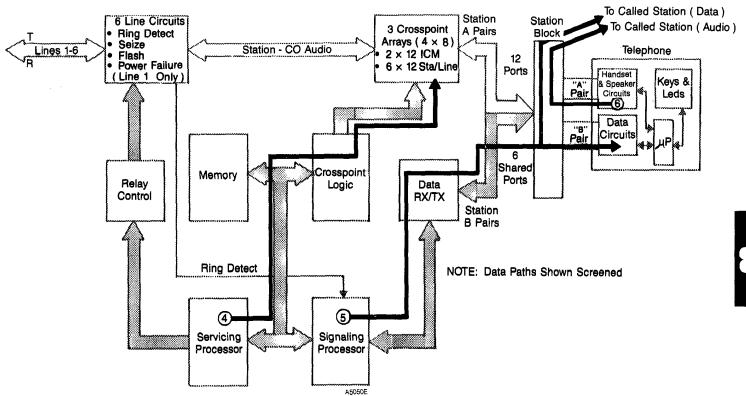


Figure 8-7 PLACING AN INTERCOM CALL, EK-612

EK-612 ELECTRONIC KEY TELEPHONE SYSTEM SECTION 9, MAINTENANCE

1. INTRODUCTION

2.

2.01

in conjunction with EK-612 THEORY OF OPERATION (Section 8), allows service personnel to isolate and repair system troubles. This section uses the System Troubleshooting Flowchart (Figure 9-1) to guide the technician in efficient and systematic testing and fault location. The flowchart is supported by the Operational Test Procedure (Table 9-1), System Voltages (Table 9-2), the Replaceable Parts List (Table 9-3), and the illustration on Light Emitting Diodes (LEDs) and Testpoints (Figure 9-2).

2.02 Steps in the flowchart should never be used out of sequence since each step assumes that proper results were obtained on all previous tests. The following symbols are used:

START / STOP

: Denotes the beginning or end of the flowchart.

EVENT

: Indicates an action to be carried out (event).



: Indicates that a decision must be made.

(A)

: 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.

provides service personnel with a logical framework for system checking and fault isolation. The flowchart is subdivided into three parts: the System Check (page 1 of 3), the Cable and Service Check (page 2 of 3), and the Features and Programming Check (page 3 of 3). The System Check provides the outline for a correct installation, as well as a sequence for fault isolation and repair. The Cable and Service

TROUBLESHOOTING FLOWCHARTS

The System Troubleshooting Flowchart (Figure 9-1)

Checks are used to verify the AC source and station wiring. The Features and Programming Checks permit features and programming to be evaluated on a station-by-station basis.

WARNING: THE KEY SERVICE UNIT (KSU) CONTAINS NO USER-SERVICEABLE PARTS INSIDE. DO NOT ATTEMPT TO REMOVE THE KSU COVER. IF THE KSU PROVES TO BE DEFECTIVE, CONSULT YOUR SUPPLIER FOR ASSISTANCE.

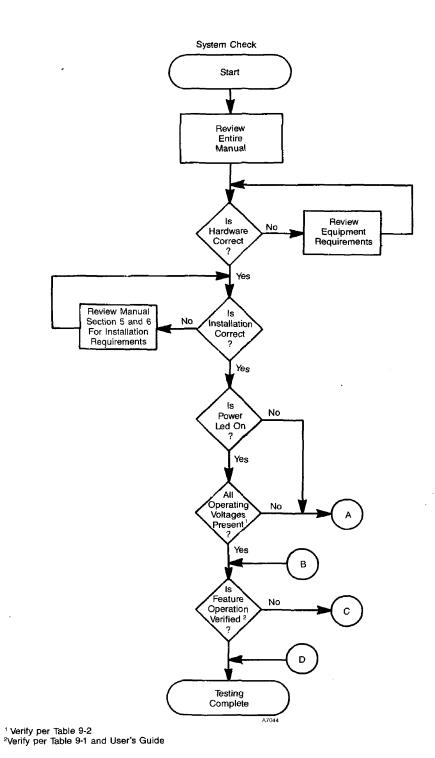


Figure 9-1 SYSTEM TROUBLESHOOTING, EK-612 (Page 1 of 3)

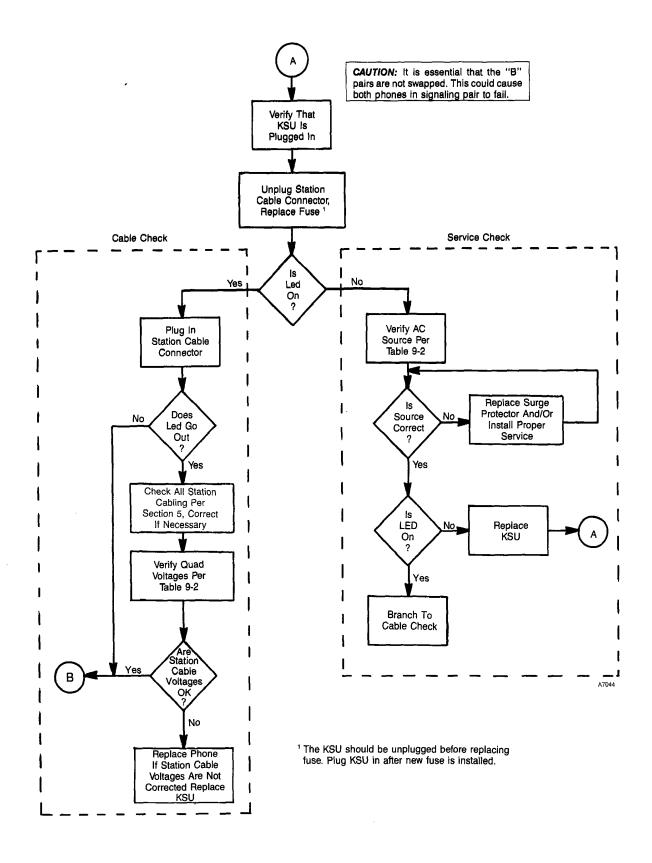


Figure 9-1 SYSTEM TROUBLESHOOTING, EK-612 (Page 2 of 3)

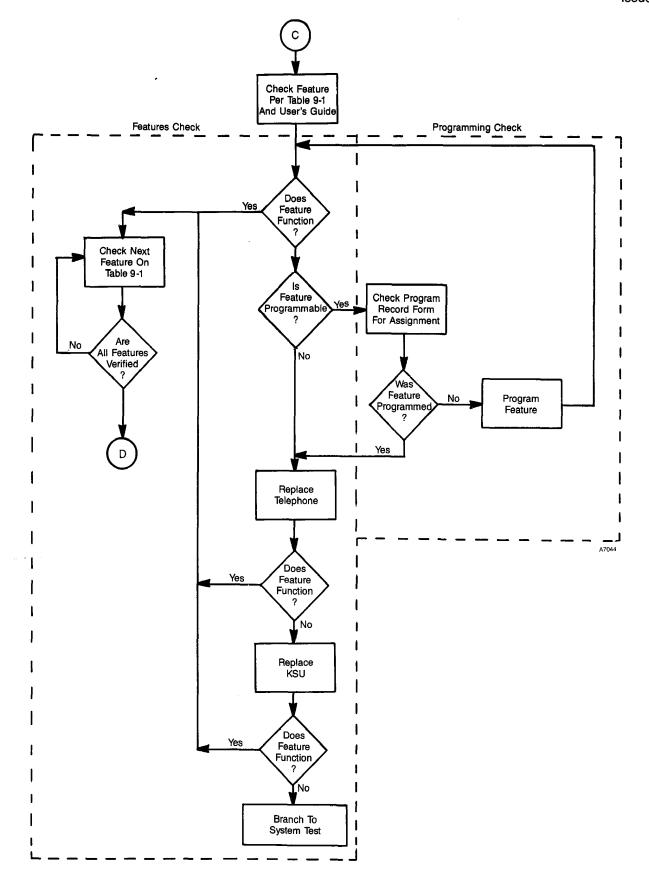


Figure 9-1 SYSTEM TROUBLESHOOTING, EK-612 (Page 3 of 3)

3. OPERATIONAL TEST PROCEDURE

3.01 The Operational Test Procedure (Table 9-1), provides a checklist for evaluating the system features. The features are divided into two groups: Internal and External. The table presents the features in the order which they should be checked. The AVAILABLE column indicates the telephones that access the feature; the VERIFIED column is used as 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 Operational Test Procedure should be retained as a job record.

NOTE: Since all EK-612 features are accessed by the telephone, the telephone can cause any feature to fail. Before replacing the KSU, verify proper operation of the telephone at a known good station location.

4. OPERATING VOLTAGE CHECK

4.01 Operating voltages can be checked using Table 9-2. In this table, the voltages are identified, the acceptable range stated, and the test condition defined. The testpoint location for each voltage is given.

CAUTION: IT IS ESSENTIAL THAT PROPER B PAIR (DATA PAIR) WIRING BE MAINTAINED. SWAPPING OF B PAIR WIRES CAN CAUSE ONE OR BOTH TELEPHONES IN A SIGNALING PAIR TO FAIL.

Signaling Pairs are assigned as follows:

STATIONS	SIGNALING PAIR
70 & 71	1
72 & 73	2
74 & 75	3
76 & 77	4
78 & 79	5
80 & 81	6

4.02 The LEDs and testpoints for the EK-612 are shown in Figure 9-1. There is only one LED on the KSU; this LED indicates that the KSU power supply circuits are operating. System voltages are checked at the A.C. input, the station block or the telephone modular jack. The KSU fuse, mounted in a receptacle, can be quickly and safely replaced (with the power switch off).

5. REPLACEABLE PARTS LIST

5.01 A Replaceable Parts list is provided as Table 9-3. Unless otherwise indicated, the items listed are available from:

TIE/communications, Inc. 5 Research Drive Shelton, CT. 06484 (203) 926-2000

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

6. TOOLS AND TEST EQUIPMENT

6.01 The following tools and test equipment items are recommended:

Standard punchdown tool
Digital high impedance voltmeter
Continuity checker
Spare bridging clips
Needle nose pliers
Small diagonal pliers
Medium size flat blade screwdriver
Butt set (for checking Central Office [CO] lines)
Wire cutters
Wire strippers

,Table 9-1 OPERATIONAL TEST PROCEDURE, EK-612

		VERIFIED ²		
FEATURE	AVAILABLE ¹	YES	NO	SYMPTOM
INTERNAL				
INTERCOM	ALL			
HANDSFREE REPLY	ALL			
VOLUME CONTROL	ALL			
PRIVATE REPLY	ALL			
CALL WAITING, INTERNAL	ALL			
EXTERNAL				
PLACING A CALL	ALL			
FLASH	ALL			
ANSWERING A CALL	ALL			
TERMINATING A CALL	ALL			
HANDSFREE DIALING	If Installed			
MONITOR	ALL			
I-HOLD	ALL		<u></u>	
EXCLUSIVE HOLD	ALL		<u> </u>	
HOLD RECALL	ALL			
TRANSFER	ALL			
ADD ON CONFERENCE	ALL			
LINE CONFERENCE	ALL			
LAST NUMBER REDIAL	ALL			
EXTENSION SPEED DIAL	ALL			
SYSTEM SPEED DIAL	ALL			
CALL WAITING, CO	ALL		L	
PRIVATE LINE	If Installed			
TOLL RESTRICTION	If Programmed			
NIGHT RING PICK-UP	If Programmed			

¹ALL indicates feature is available on all telephones.

T4032A

² Verify according to User's Guide.

Table 9-2 SYSTEM VOLTAGES, EK-612

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 ¹	TEST CONDITION	TEST POINT LOCATION
AC Input	106 to 128 VAC	KSU and all telephones installed.	Measure service outlet or use power line monitor.
Station Voltage	+22.8 to +25.2 VDC	With and without telephones installed.	Measure between T (or R) and DA (or DB), with DA (or DB) positive with respect to T (or R). ²
A Pair DC	0 VDC	With and without telephones installed.	Open modular jack (Figure 9-1) and measure between GRN and RED terminals.
B Pair DC	0 VDC	With and without telephones installed.	Open modular jack (Figure 9-1) and measure between YEL and BLK terminals.
Telephone Station Voltage	+22.8 to +25.2 VDC	With and without telephones installed.	Open modular jack (Figure 9-1) and measure between GRN (or RED) and YEL (or BLK) terminals. YEL (or BLK) must be positive with respect to GRN (or RED).

 $^{^1}$ Readings should be made with a high impedance digital voltmeter with a know accuracy of at least $\pm 1\%$.

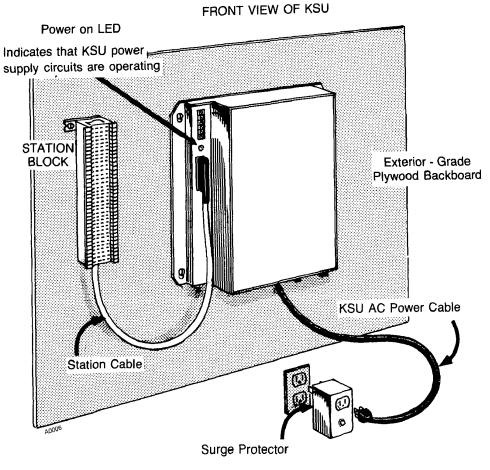
T4033A August 1984

² Correct polarity is of the utmost importance since the shared port signaling scheme uses the polarity of the data to distinguish between valid and invalid transmission.

Table 9-3 REPLACEABLE PARTS, EK-612

	PART		WHERE
ITEM ´	NUMBER	DESCRIPTION	USED
EK-612 KSU	60012-Ç ¹	EK-612 KSU Single Unit, wall mounted	_
ULTRAKEY	60015	ULTRAKEY Telephone	
ULTRAKEY w/SPU	60016	ULTRAKEY Telephone with Handsfree	
MERITOR 1E	60020;	MERITOR 1E Telephone	_
MERITOR 1E w/SPU	60021	MERITOR 1E Telephone with Handsfree	_
ECON-O-KEY	60025	ECON-O-KEY Telephone	_
ECON-O-KEY w/SPU	60026	ECON-O-KEY Telephone with Handsfree	_
DELPHI-6	60030	DELPHI-6 Key Telephone	
DELPHI-6 w/SPU	60031 ¹ 86062 ¹	DELPHI-6 Key Telephone with Handsfree ULTRAKEY Wall Mounting Kit	— ULTRAKEY
_	86077	MERITOR 1E Wall Mounting Kit	MERITOR 1E
1 =	30883 ¹	ECON-O-KEY Wall Mounting Kit	ECON-O-KEY
-	41643	DELPHI-6 Wall Mounting Kit	DELPHI-6
F1	60097	1 AMP SLO-BLO Fuse for AC Line	KSU
	600981	Snap-Tap Connector	KSU
1 —	86125 ¹	ULTRAKEY & MERITOR Handset Coil Cord 6'	ULTRAKEY
_	86126 ¹	ULTRAKEY & MERITOR Handset Coil Cord 9'	and
-	86127 ¹	ULTRAKEY & MERITOR Handset Coil Cord 13'	MERITOR
<u> </u>	86128	ULTRAKEY & MERITOR Line Cord (4 cond.) 7'	ULTRAKEY
 	86129	ULTRAKEY & MERITOR Line Cord (4 cond.) 14'	and
 	86130	ULTRAKEY & MERITOR Line Cord (4 cond.) 25'	MERITOR
	66005	ULTRAKEY Tele. Hookswitch Plunger	ULTRAKEY
	60052	MERITOR Des. Sheet	MERITOR
	60053	MERITOR Clear Key Cap (8 per)	MERITOR
	60054	MERITOR Red Key Cap (1 per)	MERITOR
i	86132 ¹	MERITOR Rubber Feet	MERITOR
	60057 ¹ 86134 ¹	MERITOR Tele. Hookswitch Plunger MERITOR Tele. Hookswitch Coil Spring	MERITOR MERITOR
i	86145	MERITOR Plastic Sta. No. Shield	MERITOR
I _	30862	ECON-O-KEY Handset Coil Cord 6'	ECON-O-KEY
i _	30863	ECON-O-KEY Handset Coil Cord 9'	ECON-O-KEY
 _	30864	ECON-O-KEY Handset Coil Cord 13'	ECON-O-KEY
 —	30847 ¹	ECON-O-KEY Line Cord (4 cond.) 7'	ECON-O-KEY
l –	30848	ECON-O-KEY Line Cord (4 cond.) 14'	ECON-O-KEY
l —	30849]	ECON-O-KEY Line Cord (4 cond.) 25'	ECON-O-KEY
]	30866	ECON-O-KEY Rubber Feet (4 per set)	ECON-O-KEY
1.	30889	ECON-O-KEY Hookswitch Plunger & Spring	ECON-O-KEY
	60038	ECON-O-KEY Face Plate (W.G.)	ECON-O-KEY
	72999	ECON-O-KEY Plastic Sta. No. Insert	ECON-O-KEY
_	41685	DELPHI-6 Handset Coil Cord 6'	DELPHI-6
-	41686	DELPHI-6 Handset Coil Cord 9'	DELPHI-6
_	41687 41688	DELPHI-6 Handset Coil Cord 13' DELPHI-6 Line Cord (4 cond.) 7'	DELPHI-6 DELPHI-6
1 =	41689	DELPHI-6 Line Cord (4 cond.) 7	DELPHI-6
	41690	DELPHI-6 Line Cord (4 cond.) 14	DELPHI-6
1	6005A ¹	DELPHI-6 Directory Tray No. Card	DELPHI-6
	60059 ¹	DELPHI-6 Top Plate No. Insert Card	DELPHI-6
_	2	Two Pair Twisted Pair Station Cable	Telephone KSU
_		25-Pair Cable w/Female Connector One End	KSU
-		625 A4 Modular Station Jack	Telephone
-		625 F4 Modular Station Jack	Telephone
-		Plug-In Power Line Surge Protector	KSU
-	60051	ULTRAKEY Handset	ULTRAKEY
_	60056	MERITOR 1E Handset	MERITOR 1E
-	12369	ECON-O-KEY Handset	ECON-O-KEY
-	41671	DELPHI 6 Handset	DELPHI 6
-	60058A ¹	Directory Tray	Telephone
	01400 IMG ¹ 01400 MBU ¹	EK-612 Description & Installation Manual ULTRAKEY Multibutton User Guide	
	01400 MBU	MERITOR 1E Multibutton User Guide	
	01400 MBK	ECON-O-KEY Multibutton User Guide	
	STACO MOIN	200110 Italianianion obor dulad	

¹ Parts available from TIE/communications, Inc. ² Parts available from telephone equipment supply houses.



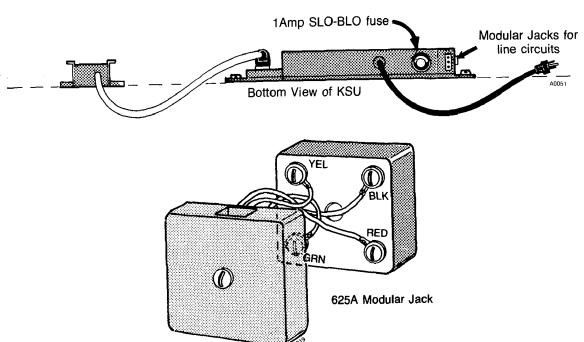


Figure 9-2 LEDS AND TEST POINTS, EK-612

SYSTEM PRACTICE Part No. 001400 IMG-19

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9-10

EK-612 ELECTRONIC KEY TELEPHONE SYSTEM OPERATIONAL SPECIFICATION

ANSWERING AN OUTSIDE CALL

To answer an outside call:

- Lift handset.
- Press flashing line key.

NOTE: If telephone is equipped with Handsfree feature, do not lift handset, press flashing Line key for Handsfree operation. HF/MIC key will illuminate.

CALL WAITING

External Call Waiting

When on an outside call, a user can receive a signal that another outside call is waiting. A second call is signaled by two beeps and a flashing Line key.

To answer a second call:

- Press HOLD key (places first call on Hold).
- Press flashing Line key.

To access first call:

• Press fluttering Line key.

Internal Call Waiting

A user can signal a station when the station user is busy with an outside call.

To signal a busy station:

- · Lift handset.
- Press INT key.
- Dial station number (70-81). Receive busy tone.
- Press INT key again. Double beep audible in receiver of called party and INT key flashes at called station. Caller hears ring.

To answer an internal call waiting:

- Press INT key. First call placed on Hold.
- Answer internal party.

To pick up call placed on Hold:

Press fluttering Line key.

CONFERENCE

Add-On Conference

Three parties (two internal stations and one outside line) can be connected for a conference call.

To add an internal party to an outside call:

- Press INT key and dial station number to be added to the conference.
- Announce conference and Line number.
- Press and hold announced Line key until internal party joins the conference. (Conference is initiated when called party's voice is heard.)

The invited internal party must:

- Lift handset.
- Press announced Line key.

Line Conference

To conference two outside lines and one internal party:

- Establish first call.
- Press HOLD key twice (Line key flutters, call is placed on Exclusive Hold).
- Establish second call.
- Press HOLD key twice (Line key flutters, second call is placed on Exclusive Hold).
- Dial # (both Line keys are illuminated and conference is established).

NOTE: To keep one of the conferenced parties, press Line key for that party. Other call will disconnect.

To place two conferenced lines on Hold:

 Press HOLD key (both conferenced key LEDs flutter, both lines placed on Exclusive Hold).

To return to two conferenced lines:

Dial #.

WARNING: WHEN USING LINE CONFERENCING, THE QUALITY OF AUDIO RECEPTION AND TRANSMISSION MAY BE DEGRADED.

EXTERNAL PAGING

External Paging requires optional equipment and permits pages to be heard in large noisy areas. Stations are programmed for access to this feature.

To page an external area:

- Lift handset.
- Press Line key dedicated to the external page.
- Make announcement.
- Hang up.

FLASH

To receive a new dial tone without releasing the line:

• Press and release Line key already accessed.

HOLD

A red HOLD key is used to place outside calls in a temporary waiting condition. There are two types of Hold: *I-Hold* and *Exclusive Hold*.

I-Hold

The I-Hold feature is a common hold whereby a call placed on I-Hold can be picked up from any station in the system. The appropriate Line key flutters at the telephone that placed the call on Hold and flashes at all other telephones.

To place a call on I-Hold:

Press HOLD key.

To return to a call placed on I-Hold:

• Press fluttering Line key.

Exclusive Hold

Exclusive Hold places a call on Hold and prevents that call from being answered from any other station in the system. A Hold indication is only provided at the station that placed the call on Exclusive Hold. All other telephones in the system show the line as busy with the Line key illuminated.

To place a call on Exclusive Hold:

Press HOLD key twice.

To return to a call placed on Exclusive Hold:

• Press fluttering Line key.

Hold Recall

A call placed on Hold will automatically re-ring at the station which placed it on Hold after a programmed period. If the call is not answered, the call is automatically placed on I-Hold and after another programmed period will ring at the attendant's station.

NOTE: Any call placed on Exclusive Hold will revert to I-Hold after the first programmed period.

•

INTERCOM CALLS

Placing Intercom Calls

The Intercom feature is used to call another station and can be initiated from any station in the system. The INT key illuminates when the telephone is in the Intercom mode.

To place a voice announced Intercom call without using the Handsfree feature:

- Lift handset.
- Press INT key. Dial tone audible. INT key illuminated.
- Dial station number (70-81).
- Press INT key and hold to speak. Splash tone heard at both stations. Release INT key to listen.

NOTE: Station 70 is normally the attendant's station and can also be accessed by dialing 0.

To place a voice announced Intercom call with Handsfree feature:

- Press INT key. Listen for dial tone. INT key illuminated.
- Dial station number (70-81). Splash tone audible at both stations.
- Make announcement.

NOTE: If a ring is heard instead of a splash tone, the station being called does not have the Handsfree feature. Lift handset, press and hold INT key to speak. Release INT key to listen.

Answering Intercom Calls

An Intercom splash tone can be answered Handsfree. A ring must be answered by lifting the handset. When an Intercom call is voice announced from another key telephone, the called station is first signaled by a splash tone, an illuminated INT key and MON/MIC (HF/MIC) key.

To answer an Intercom call Handsfree:

 Answer voice announcement through speakerphone when INT key is illuminated. The caller controls the conversation.

LAST NUMBER REDIAL

The last number manually dialed is placed in system memory and can be automatically redialed by pressing one key.

To redial the last number:

• Dial *.

NOTE: The system uses the line originally used for the call. If busy, it will use any line available within the same group. If all lines available within that group are busy, then a reorder tone is heard.

To use a particular line to redial the last number:

- Press Line key.
- Press INT key.
- Dial *.

MONITOR

Monitor allows the user to dial and listen to a call with the handset on-hook. The user can hear through the telephone speaker when the party answers the call, but must lift the handset to reply.

To monitor a call:

- Press MON/MIC key. Key illuminates.
- Hang up.

When party returns to the call:

• Lift handset.

NIGHT ANSWER

Night Answer allows assigned stations to ring on all incoming calls in the attendant's absence.

To enable Night Answer mode (from station 70 only):

- Lift handset.
- Press INT key. LED lights. Dial tone audible.
- Dial #. LED extinguishes. No audible dial tone.
- Dial 831.
- Hang up.

To disable Night Answer mode (initiated from station 70):

- Lift handset.
- Press INT key. LED lights. Dial tone audible.
- Dial #. LED extinguishes. No audible dial tone.
- Dial 830.
- Hang up.

PLACING A CALL

Outside calls can be initiated from any station that is not restricted by programming.

To place an outside call:

- Lift handset.
- Press Line key (1-6). Key is illuminated. Listen for dial tone
- Dial telephone number.

To pre-select a line, press the Line key before lifting the handset.

NOTE: A call can be placed Handsfree by pressing the Line key while the handset is on-hook if the telephone is equipped with the Handsfree feature.

SPEED DIAL

The Speed Dial feature permits automatic dialing of stored telephone numbers. There are two types of Speed Dial: **Station Speed Dial** and **System Speed Dial**. Toll Restriction programming can limit Speed Dial capabilities for a particular station.

A particular line can be assigned to a number when it is stored for Speed Dialing, or the line can be selected when placing the call. When no line is preselected, the system selects the first available line within group 1.

Telephone numbers are stored in bin locations that are accessed by dialing a specific code. Each bin stores one telephone number with up to 16 digits.

Bins can be connected (chained) together to accommodate services (MCI, Sprint) requiring numbers with more than 16 digits. If the line is programmed for dial pulse, the first bin is dialed out with pulses. Subsequent chained bins are sent with DTMF signals.

Station Speed Dial

This feature enables up to six numbers to be stored at a particular station. These numbers are unique to the station user who stored them. The keys 1 through 6 on the dial pad are used to access bin storage locations. If a number is entered into a used bin, then the previous number is erased.

To store a Station Speed Dial Number:

- Lift handset.
- (Optional) Press Line key (1-6) to be stored with Speed Dial number.
- Press INT key. Listen for dial tone.
- Dial #.
- Dial unused one-digit bin number (1-6). Listen for dial tone
- Dial number to be stored.
- Hang up.

NOTE: When you hang up a pre-selected line, that line will remain on I-Hold.

To release the line you must:

- Lift handset.
- Press Line key.
- Hang up.

NOTE: If the system is installed behind a PBX, store the appropriate access code (i.e., 9) with the Speed Dial number.

Pauses can be stored in a Speed Dial number by dialing *. Each pause counts as a digit in the number.

To store a number with more than 16 digits:

- Store 16 digits of a number in one bin.
- Hang up (stores first 16 digits or less).
- Repeat the same procedure using a second bin.

To place a Speed Dial call:

- Dial bin number (1-6). System automatically seizes stored line and dials the number.
- Lift handset when called party answers.

To place a Speed Dial number with chained bins:

- Dial first bin number (1-6). Wait until all digits dial out.
- Press INT key.
- Dial second bin number.
- Lift handset when called party answers.

To place a Speed Dial call using a particular line:

- Press desired Line (will override any previously stored line).
- Press INT key. Listen for dial tone.
- Dial bin number (1-6) where desired number is stored.
- Lift handset when called party answers.

NOTE: If the telephone has the Handsfree feature, then a Handsfree conversation is possible without lifting the handset when the called party answers.

System Speed Dial

Up to 10 frequently dialed numbers can be stored in system memory. These numbers are programmed at station 70 and are accessible to all unrestricted key telephones in the system.

Codes 90 through 99 are used to access bin locations. If a number is entered into a used bin, the previous number is erased.

To store System Speed Dial numbers (only from station 70):

- Lift handset.
- (Optional) Press Line key (1-6) to pre-select line.
- Press INT key. Listen for dial tone.
- *Dial* #.
- Dial an unused two-digit bin access code (90-99).
- Dial number to be stored. If more than 16 digits are dialed, reorder tone is heard.
- Hang up.

NOTE: Dial * to enter a pause. Each pause counts as a digit.

To place a System Speed Dial call:

- Dial bin access code (90-99) on dial pad. The system automatically seizes the stored line and dials the number.
- Lift handset when called party answers.

NOTE: If the telephone has the Handsfree feature, then Handsfree conversation is possible without lifting the handset when the called party answers.

TRANSFER

An outside call can be transferred to another station.

To transfer an outside call to another station:

- Press INT key. Call placed on Hold, dial tone audible.
- Dial station number (70-81). Caller receives double beep in handset.
- Press INT key and announce call and line number.
- Hana up.

To return to the outside call:

• Press flashing Line key.

NOTE: If the called station is busy, press INT key again, caller receives ringing, called station will receive double beep in receiver (if on an outside call only). No signal is given to a station busy on an Intercom call.

EK-612 ELECTRONIC KEY TELEPHONE SYSTEM APPENDIX A GLOSSARY OF ABBREVIATIONS

CO (Central Office): The facility containing both the switching system and the associated equipment which provides a telephone system to a specific geographical region.

DDD (Direct Distance Dialing): A service which enables a telephone user to dial a long distance telephone number without the assistance of an operator.

DTMF (Dual Tone Multifrequency): A technique where messages are sent over a telephone system network involving the alternate opening and closing of relays.

DP (Dial Pulsing): A technique where messages are sent over a telephone system network involving the alternate opening and closing of relays.

EPROM (Eraseable Programming Read-Only Memory): A solid-state device whose stored data can be read at random. The data can be erased and rewritten.

ICM (Intercom): A two way communications system allowing stations within a local system, i.e., PBX, to communicate.

KSU (Key Service Unit): The microprocessor based electronic system which controls the EK-612 telephone system. It acts as an intermediary between the telephones and the telephone lines.

LED (Light Emitting Diode): A solid-state device which illuminates when a current is passed through it.

OCC (Other Common Carriers): Specialized systems (e.g., companies that use satellites) which provide a telecommunications network.

PBX (Private Branch Exchange): A local telephone system serving a limited area (e.g., a business) which allows internal and external communication.

PCB (Printed Circuit Board): A board containing electronic circuits composed of conductive material with an insulating material acting as a matrix.

RAM (Random Access Memory): A solid-state storage device where data may be retrieved or stored in random fashion.

Rx (Receive)

SDI (Serial Data In): The transmission of sequential data on a single wire into some device.

SDO (Serial Data Out): The transmission of sequential data on a single wire from some device.

Tx (Transmit)

WATS (Wide Area Telephone Service): A telephone service which allows a customer to place unlimited long distance calls while being billed a fixed monthly amount.