SYSTEM PRACTICE 13440

TC-8/TC-12/TC-22

Description and Installation Manual

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Description and Installation Manual

Draft 0-9 May 15, 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

Printed in U.S.A.

Form 0006 April 1983

REVISION CONTROL

REVISION	DATE	CHANGE
0-4	05 AUG 83	Rewritten to conform to new format.
0-5	14 SEP 83	Rewritten to incorporate new engineering information.
0-6	19 SEP 83	Incorporates SIB TC-12 / TC-22-3, A-MPU-A, Series 6 Programming Changes.
0-7	15 MAR 84	**Section 1:** This section has been rewritten to include the TC-8 System and the TC-22 Executive Display Key Telephone. The Specifications Table (Table 1-1) has been revised. **Section 2:** Descriptions and key callouts of the TC-8 Key Telephone and TC-22 Executive Display Key Telephone have been added. Features have been alphabetized. The Visual Indications Table (Table 2-1) has been expanded into two tables, one for key telephones and one for visual indications on the DSS console (Table 2-2). **Section 3:** This section has been rewritten to incorporate the TC-8 System and the TC-22 Executive Display Key Telephone. A table has been added (Table 3-1) on line circuit usage. Tables 3-7, 3-8 and 3-9 have been added to assist customers in determining required installation equipment. **Section 4:** In accordance with new format specifications, each program description has been expanded with detailed limitations, prerequisites, instructions and examples. Program access and feature references have also been added. Table 4-2 has been added showing Station Class of Service and Dial Restrictions. **Section 5:** This section has been revised to include the TC-8 System. An A-LNU circuit designation and KSU slot position table has been added (Table 5-2). A table on optional use of line circuits (Table 5-9) has been added. **Section 6:** The section name has been changed to PROGRAM ENTRY. The TC-8 System has been incorporated. Information on programming disabling conditions and program errors has been added. Displays have been boxed. Information on exiting the programming mode has been added. **Sections 7 & 8:** Mention of these forthcoming sections has been included. **Section 9:** An Optional Equipment Section has been added. Each of the following has been written as an individual subsection with detailed installation procedures: Wall Mounting Kit, A-OPU-B PCB, External Music Connections, Alarm Connections, Speakerbox, Speakerphone, External Paging Connections and Busy Lamp Field. Installation information on power supply unit for Battery Backup with Battery and Charger Box not supplied from Engineering.
0-8	4 MAY 84	**Section 1:** Information on the TC-8 PSU has been added. Specification table has been made into one table. **Section 2:** Feature descriptions have been enhanced. **Section 3:** Information on the TC-8 PSU has been added. Hardware OCWs have been revised. **Section 4:** The Program Record Form has been reformatted. **Section 5:** Information on the TC-8 PSU has been added. Table 5-5 has been revised per engineering. **Section 6:** Information on Program 46 has been revised. **Section 9:** Information on the Wall Mounting Kit, Speakerphone, Door Chime Box, External Music Connections, Alarm Connections, and External Page Zone Connections has been revised.

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Form 0008 May 1993

REVISION CONTROL

REVISION	DATE	CHANGE
0-9	15 MAY 84	**Section 1:** All drawings of the TC-8 PSU have been corrected. Information on Radio Frequency Interference and Hearing Aid Compatibility has been added. Changes have been made on the following pages: 1-1, 1-3, 1-9, 1-10 and 1-11. **Section 2:** The drawing of the TC-22 display telephone was corrected. The definitions of Private Branch Exchange and Transfer were revised. Changes have been made on the following pages: 2-1, 2-5, 2-15 and 2-20. **Section 3:** The Hardware Ordering OCWs were revised per engineering. Changes have been made on the following pages: 3-1, 3-3, 3-4, 3-7, 3-12, 3-20, 3-21 and 3-22. **Section 4:** ACCESS definitions have been abbreviated. Changes have been made on the following pages: 4-1 through 4-39. **Section 5:** Tables 5-1 and 5-9 have been revised. Changes have been made on the following pages: 5-1 through 5-4, 5-8, 5-13, 5-14, 5-16, 5-19, 5-26, 5-27, 5-28, 5-30 and 5-33. **Section 6:** Information on Programming Disabled Conditions has been corrected. Changes have been made on the following pages: 6-1 and 6-2. **Section 9:** Information on External Page Zone Connections and Speakerphone has been revised. Changes have been made on the following pages: 9-1, 9-9, 9-13, 9-17 and 9-19.

TC-8/TC-12/TC-22
ELECTRONIC KEY TELEPHONE SYSTEM
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SECTION 1 General Description

The GENERAL DESCRIPTION Section provides basic information pertaining to the TC-8/TC-12/TC-22 family of Electronic Key Telephone Systems. It summarizes the various components of the systems, specifications, site requirements and Federal Communications Commission (FCC)/telephone company requirements.

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The FEATURES Section provides detailed information for each of the features available to the TC-8/TC-12/TC-22 system.

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The INSTALLATION Section provides detailed procedures for installing the component parts of a TC-8/TC-12/TC-22 system.

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The PROGRAM ENTRY Section describes program entry procedures for the TC-8/TC-12/TC-22 system. This section is divided into five parts: Introduction, System Initialization, Program Entry, Exiting the Programming Mode and Program Reading.

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SECTION 7 Theory of Operation

The THEORY OF OPERATION Section, to be provided, will include the system and Printed Circuit Board theory of operation for the TC-8/TC-12/TC-22 family of Electronic Key Telephone Systems.

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SECTION 8

Maintenance

The MAINTENANCE Section, to be provided, will contain detailed information to assist service personnel in isolating and repairing system troubles. It will also provide a guide for systematic testing and fault location.

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TC-8/TC-12/TC-22
ELECTRONIC KEY TELEPHONE SYSTEM
SECTION 1, GENERAL DESCRIPTION

1. INTRODUCTION

1.01 The GENERAL DESCRIPTION Section provides basic information pertaining to the TC-8/TC-12/TC-22 family of Electronic Key Telephone Systems. The TC-8, TC-12 and TC-22 systems will be referred to in this manual as TC-8/12/22 unless specific information pertains to only one or two of the systems. This section describes the various components of the systems, available station instruments, specifications, site requirements, and Federal Communications Commission/telephone company requirements.

1.02 The TC-8 power supply drawings have been corrected. Information on Hearing Aid Compatability and Radio Frequency Interference has been added.

2. SYSTEM DESCRIPTION

2.01 The TC-8/12/22 are Electronic Key Telephone Systems with distributed processing that use Z80 microprocessors as the main processor and additional processors for task-sharing between the Main Processing Unit (A-MPU) and the station Printed Circuit Boards (PCBs). The systems also use a space division matrix.

2.02 The TC-8 system has a maximum capacity of 20 stations, four Intercom (ICM) talkpaths and up to ten Central Office (CO) line circuits, when equipped with TC-8 telephones. Eight circuits are reserved for common CO line access; two may be used for Private Lines or Hotlines. When equipped with TC-12 telephones the system can have up to 12 CO line circuits, ten of which are reserved for common CO line access and two which can be used for common CO lines, Private Lines or Hotlines. Privacy is provided on all internal and external calls.

2.03 The TC-12 system has a maximum capacity of 36 stations, six ICM talkpaths and 14 line circuits. Ten circuits are reserved for common line access; two line circuits may be used for Private and/or Hotlines or common CO lines; and two circuits are only used for Private and/or Hotlines. The total number of Private lines and Hotlines cannot exceed four. Privacy is provided on all internal and external calls.

2.04 The TC-22 system has a maximum capacity of 60 stations, six ICM talkpaths and 26 line circuits. Twenty circuits are reserved for common CO line access; two line circuits may be used for either Private and/or Hotlines or common CO lines; and 4 circuits are only used for Private Lines and/or Hotlines. The total number of Private Lines and Hotlines cannot exceed six. Privacy is provided on all internal and external calls.

2.05 The systems can be programmed to accommodate Dual Tone Multifrequency (DTMF) or pulse signals on CO lines.

2.06 The following paragraphs provide a summary of the major components to be detailed in subsequent sections.

KEY SERVICE & POWER SUPPLY UNITS

2.07 Key Service Units (KSUs) (Figures 1-1a, 1-1b and 1-1c) are equipped with replaceable PCBs that control the system. The KSUs are designed for wall-mounting. The Power Supply Units (Figures 1-2a, 1-2b and 1-2c) provide DC voltage to the system and are also designed for wall-mounting.

2.08 The TC-22 system can also be equipped with an optional Battery Backup Power Supply Unit and Battery and Charger Box.

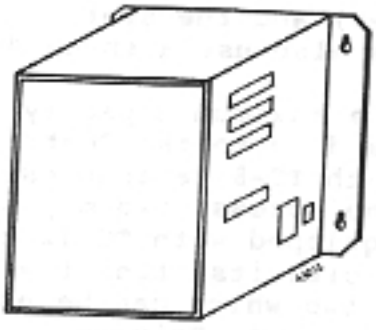

Figure 1-1a KEY SERVICE UNIT, TC-8

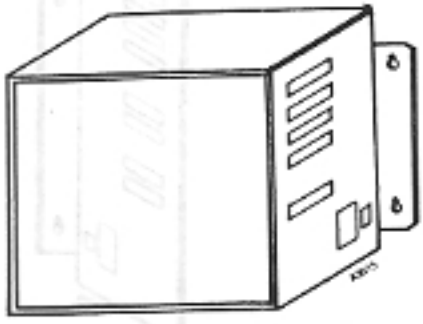

Figure 1-1b KEY SERVICE UNIT, TC-12

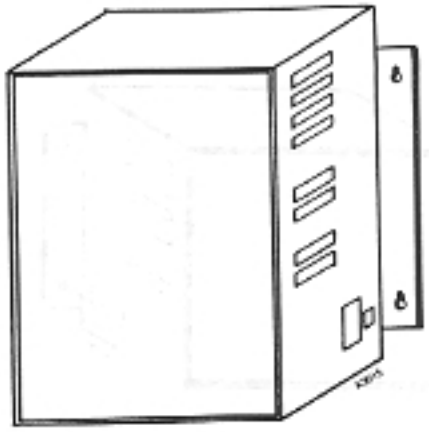

Figure 1-1c KEY SERVICE UNIT, TC-22

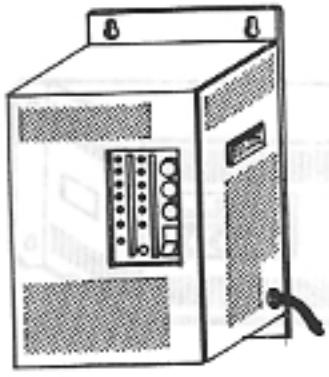

Figure 1-2a POWER SUPPLY, TC-8

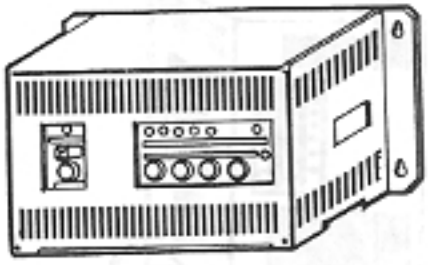

Figure 1-2b POWER SUPPLY, TC-12

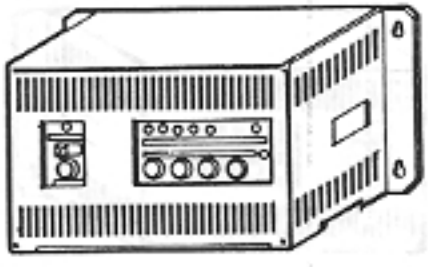

Figure 1-2c POWER SUPPLY, TC-22

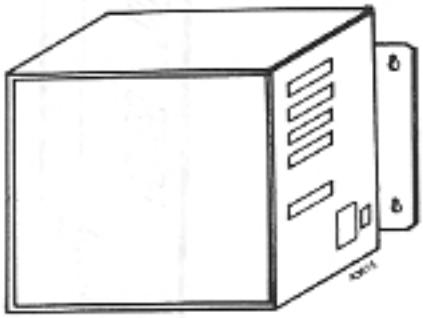

Figure 1-1b KEY SERVICE UNIT, TC-12

Figure 1-1c KEY SERVICE UNIT, TC-22

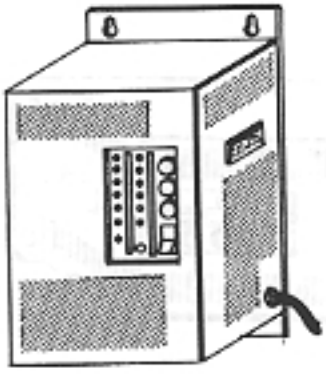

Figure 1-2a POWER SUPPLY, TC-8

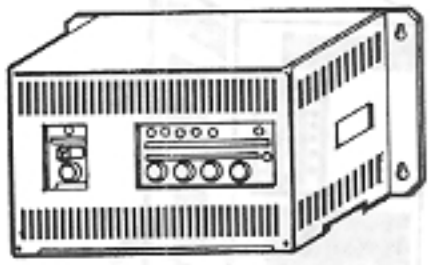

Figure 1-2b POWER SUPPLY, TC-12

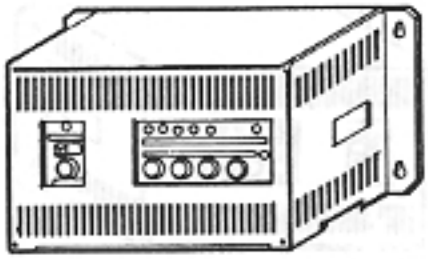

Figure 1-2c POWER SUPPLY, TC-22

TELEPHONES

2.09 The TC-8/12/22 family of Electronic Key Telephone Systems uses the following telephone instruments: TC-8 Key Telephone (Figure 1-3), TC-12 Key Telephone (Figure 1-4), TC-22 Key Telephone with and without Power Fail (PF) (Figure 1-5), TC-22 Executive Display Key Telephone (Figure 1-6), a single line telephone (Figure 1-7), TC-12 Attendant Direct Station Selection (DSS) console (Figure 1-8) and TC-22 Attendant DSS console (Figure 1-9).

2.10 Key telephones contain a loudspeaker to accommodate tone signaling and ICM voice announcements. Tone signals are provided to distinguish among outside, ICM, and paging calls. Various keys are equipped with Light Emitting Diodes (LEDs) that provide visual indication of call or feature status. A thumbwheel control is used to adjust the loudspeaker volume.

2.11 Up to five designated stations can be used during a power failure. The type of telephone installed determines whether the station can make and receive calls, or only receive calls during a local power failure.

2.12 The standard TC-8/12/22 key telephones, when designated as PF stations, can only be used to receive calls during a power failure and must be equipped with an external ringer to provide an audible signal. These telephones operate normally in a power-on condition.

TC-8 ELECTRONIC KEY TELEPHONE

2.13 The TC-8 Key Telephone (Figure 1-3) is the primary instrument used in the TC-8 system and provides rapid access to system and station features. The TC-8 Key Telephone is equipped with nine line keys to accommodate CO lines, Private Lines, Hotlines and a Flash Key depending on system programming.

Figure 1-3 KEY TELEPHONE, TC-8

TC-12 ELECTRONIC KEY TELEPHONE

2.14 The TC-12 Key Telephone (Figure 1-4) is the primary instrument used in the TC-12 system and provides rapid access to system and station features. The TC-12 is equipped with 12 line keys to accommodate CO lines, Private lines, Hotlines and a Flash key depending on system programming. This telephone can also be used with the TC-8 system; however, the number of accessible CO lines is determined by the system with which the telephone is used.

Figure 1-4 KEY TELEPHONE, TC-12

TC-22 ELECTRONIC KEY TELEPHONE

2.15 The TC-22 Key Telephone (Figure 1-5) is the primary instrument used in the TC-22 system and provides rapid access to system and station features. The TC-22 Key Telephone is equipped with 22 line keys to accommodate CO lines, Private lines, Hotlines and a Flash key depending on the requirements of a system.

2.16 The TC-22 Key Telephone with Power Failure (PF) can make and receive calls during a power failure and does not require an external ringer. A PF telephone is identifiable by a label located on the underside of the instrument. The TC-22 PF telephone is available in two configurations: the Power Failure Tone (PFT) telephone is used in DTMF systems; the Power Failure Pulse (PFP) telephone is used in pulse signaling systems.

Figure 1-5 KEY TELEPHONE, TC-22

TC-22 EXECUTIVE DISPLAY KEY TELEPHONE

2.17 The TC-22 Executive Display Key Telephone (Figure 1-6) provides all of the features of the standard TC-22 Key Telephone as well as several unique features including Speakerphone operation, Automatic Dialer functions, and a display indicating time, date, and the number dialed. This telephone can be used with the TC-8 and TC-12 systems as well; however, the number of accessible CO lines is determined by the system with which the telephone is used.

Figure 1-6 EXECUTIVE DISPLAY KEY TELEPHONES, TC-22

SINGLE LINE TELEPHONE

2.18 A standard single line telephone (Figure 1-7) can be used with the TC-8/12/22 systems as a power failure or Off-Premises Extension (OPX) instrument. When used as Off-Premises extensions, single line telephones require A-OPU PCBs in the KSU; they also require external ringing generators. (Reference Section 5 for Power Fail and Section 9 for OPX).

Figure 1-7 SINGLE LINE TELEPHONE

ATTENDANT DSS CONSOLE

2.19 The attendant position requires a DSS console, as well as a key telephone to provide direct access to all stations, to program features desired in a system, and to perform Night Service and Message Waiting functions. The DSS console keys allow rapid call transfers and provide Busy Lamp Field (BLF) indications. The console also has keys to access paging zones. The TC-12 Attendant DSS console (Figure 1-8) is used with the TC-8 and TC-12 systems. The TC-22 Attendant DSS console (Figure 1-9) is used with the TC-22 system. The system will dedicate an ICM link to each attendant position. System programming is done at the DSS console.

2.20 The TC-8/12/22 system can support up to two DSS consoles. Each DSS console requires one station position, which reduces the total number of possible stations in the system.

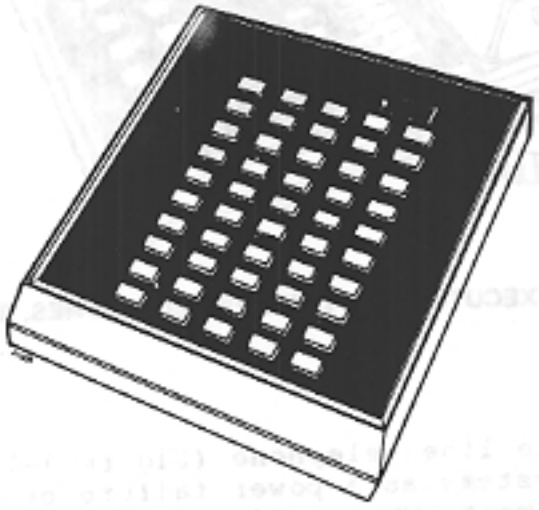

Figure 1-8 TC-12 ATTENDANT DSS CONSOLE (FOR USE WITH TC-8 AND TC-12 SYSTEMS)

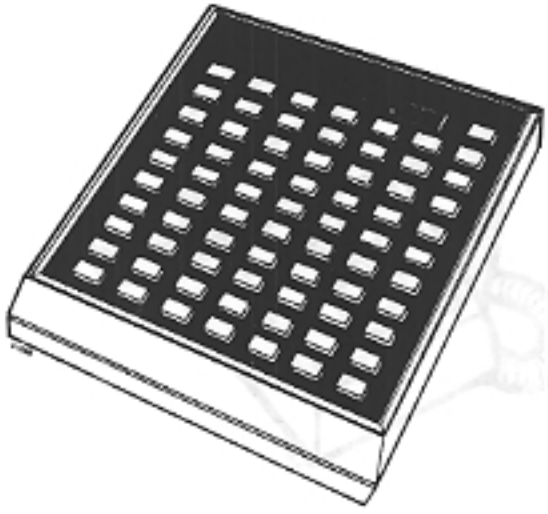

Figure 1-9 TC-22 ATTENDANT DSS CONSOLE

3. SPECIFICATIONS

3.01 Refer to Table 1-1 for technical specifications pertaining to the TC-8/12/22 Electronic Key Telephone System.

4. SITE REQUIREMENTS

4.01 The KSU should be installed in a clean, dry, secure location that prevents access by unauthorized personnel. This location, as detailed in Section 5, should comply with Bell Functional Product Class Criteria of September, 1978 in publication PUB 48002 as stated in 3.4.3.2, paragraph C -- Indoors With Environmental Control. The room must have adequate ventilation and have a temperature range of 40 to 100 degrees F (4 to 38 degrees C) with 5 to 95% noncondensing, relative humidity.

4.02 The installation site should provide ample room to mount the KSU on the wall along with the necessary connecting blocks and any ancillary equipment. The installation site should not be located in areas subject to static electricity (dry copiers), vibration (heavy machinery), or in areas likely to be flooded (basement level).

4.03 The customer must provide a dedicated three-wire 117VAC, 60Hz 15 ampere circuit. Separate earth ground is required in addition to the third-wire ground on the AC circuit. If a music source or optional external paging equipment is to be installed, it must be connected to an AC circuit other than the dedicated AC line.

5. FCC AND TELCO REQUIREMENTS

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

NOTIFICATION TO TELCO

5.02 As owner of this telephone system, you must give the following information to the operating telephone company (telco) 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: TC-8/TC-12/TC-22
FCC Registration Number:
BJ286G-68581-KF-E

Ringer Equivalence: 0.4B

Power Failure Telephone TC-22 PF
Ringer Equivalence: 1.3B

4. Type of Connection: RJ21X

CERTIFICATION OF INSTALLER

5.03 Connection of this system to telephone company lines must be made with FCC approved plugs and jacks. When the system is equipped for power failure, the installer must be certified. Classes for certification are available through TIE/communications, Inc. and its regional offices.

INCIDENCE OF HARM

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

HEARING AID COMPATIBILITY

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

(1) Any public or semipublic location where coin-operated or credit card telephones may be found.

(2) Elevators, highways, and tunnels (automobile, subway, railroad, or pedestrian) where a person with impaired hearing might be isolated in an emergency.

(3) Places where telephones are specifically installed to alert emergency authorities such as fire, police, or medical assistance personnel.

(4) Hospital rooms, residential health care facilities, convalescent homes, and prisons, specifically where telephones are used for signaling life-threatening or emergency situations if alternative signaling methods are not available.

(5) Workstations for hearing impaired personnel.

(6) Hotel, motel, apartment lobbies; in stores where 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.

(7) Hotel and motel rooms. At least ten percent of the rooms must contain telephones that are compatible with hearing aids; or contain jacks for plug-in telephones that are compatible with hearing aids, which will be provided upon request to hearing impaired customers.

6. RADIO FREQUENCY INTERFERENCE

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

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

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

"How to Identify and Remove Radio-TV Interface Problems"

Order this booklet from:

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

7. RADIO FREQUENCY SUSCEPTIBILITY

7.01 If the TC-8/12/22 System is installed in a strong radio frequency (RF) field, proper system operation may be affected. The use of the proper installation and grounding procedures outlined in this manual will help to minimize the RF susceptibility.

Table1-1 SPECIFICATIONS, TC-8/12/22

GENERAL SPECIFICATIONS

System Capacity:

	TC-8	TC-8 with TC-12 Telephones	TC-12	TC-22
Accessible CO Lines	9 *	12 *	14 *	26 *
Private CO Lines	2 **	2 **	4 **	6 **
Hotlines	2 ***	2 ***	4 ***	6 ***
Attendant DSS Console	2	2	2	2
Stations	20 †	20	36 †	60 †

* The last two lines may be converted to Private CO lines or Hotlines.

** Includes two lines converted from Common CO lines.

*** The total number of Private and/or Hotline/s cannot exceed 2 in the TC-8, 4 in the TC-12 or 6 in the TC-22 system.

† A DSS console reduces the maximum number of possible stations by one.

ELECTRICAL SPECIFICATIONS

Power Requirements:

KSU & Power Supply:
Input: 117 V AC ± 10% 60 Hz. ± 1 Hz.

Power Dissipation:

KSU & Power Supply:
TC-8 - 210 Watts, 725 BTU/hr.
TC-12 - 350 Watts, 1200 BTU/hr.
TC-22 - 550 Watts, 1900 BTU/hr.

Switching Principle:

Solid state space division matrix with stored programs and space division distribution and Z80 microprocessor.

Cable Requirements:

2-pair twisted station wire, maximum run 24 AWG 1000' or 22 AWG 1500'

Background Music/Music-On-Hold:

Input Impedance: 600 ohm
Input Level: −30 dBm
Maximum Input: 0 dBm

Limit for Alarm Circuit: 10 K ohm max.

External Paging Specifications: Output Impedance: 8 ohm
Output Level: 1.5 Watts max.

MECHANICAL SPECIFICATIONS

Dimensions and Weights:

KSU:

TC-8	TC-12	TC-22
15.5" W x 19.0" H x 11.0" D (39cm x 48cm x 28 cm) 32 lbs.	23.0" W x 19.0" H x 11.0" D (58cm x 48cm x 28cm) 61 lbs.	23.0" W x 26.0" H x 11.0" D (58cm x 66cm x 28cm) 87 lbs.

Power Supply:

TC-8	TC-12	TC-22
11.5 W x 8.0" H x 8.25" D (29cm x 20cm x 21cm) 21 lbs.	16.1" W x 11.8" H x 9.6" D (41cm x 30cm x 24cm) 55 lbs.	16.1" W x 11.8" H x 9.6" D (41cm x 30cm x 24cm) 66 lbs.

Key Telephones:
TC-8/12/22
9.9" W x 4.2" H x 9" D
(25cm x 10.7cm x 22.9cm)
4 lbs.

Executive Display Key Telephone:
9.9" W x 4.2" H x 9" D
(25cm x 10.7cm x 22.9cm)
4 lbs.

ENVIRONMENTAL SPECIFICATIONS

Environmental Operating Conditions: Temperature: 40° - 100°F (4° - 38°C)
Humidity: 5% - 95% relative, non-condensing

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TC-8/TC-12/TC-22
ELECTRONIC KEY TELEPHONE SYSTEM
SECTION 2, FEATURES

1. INTRODUCTION

1.01 The FEATURES Section provides information on the features of the TC-8/12/22 family of Electronic Key Telephone Systems.

1.02 Definitions of Private Branch Exchange and Transfer have been enhanced. Corrections were made to the TC-22 Executive Display telephone drawing.

2. STATION INSTRUMENTS

2.01 The TC-8/12/22 family of Electronic Key Telephone Systems uses the following station instruments: TC-8 Electronic Key Telephone, TC-12 Electronic Key Telephone, TC-22 Electronic Key Telephone, TC-22 Power Failure (PF) Telephone, TC-22 Executive Display Key Telephone, single line telephone, TC-12 Attendant DSS Console and TC-22 DSS Console.

Key Telephones

2.02 Key Telephones include the TC-8 Key Telephone (Figure 2-1), TC-12 Key Telephone (Figure 2-2), TC-22 Key Telephone and TC-22 Power Failure Telephone (Figure 2-3) and TC-22 Executive Display Key Telephone (Figure 2-4). In addition to the dial pad, there are keys that provide access to CO lines, system and station features, and special functions. Various keys are equipped with Light Emitting Diodes (LEDs) that provide flash patterns to distinguish among outside, Intercom (ICM) and paging calls (Tables 2-1 and 2-2). Audible signals are provided over the telephone loudspeaker (Table 2-3). Distinctive Tone Signaling is provided to distinguish between ICM and outside calls. The loudspeaker also provides ICM voice announcements. A thumbwheel volume control is provided to adjust the level of audible signals and voice announcements.

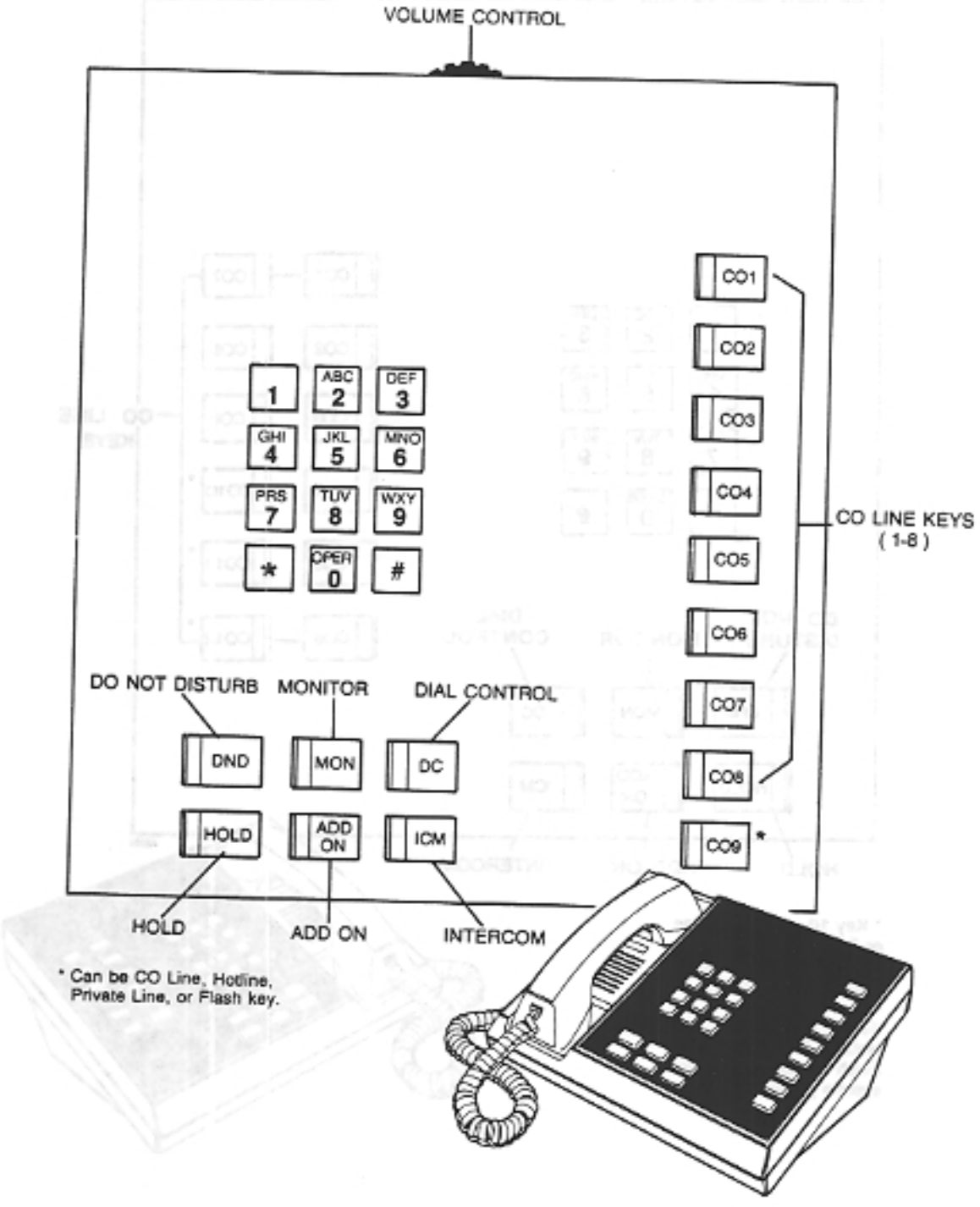
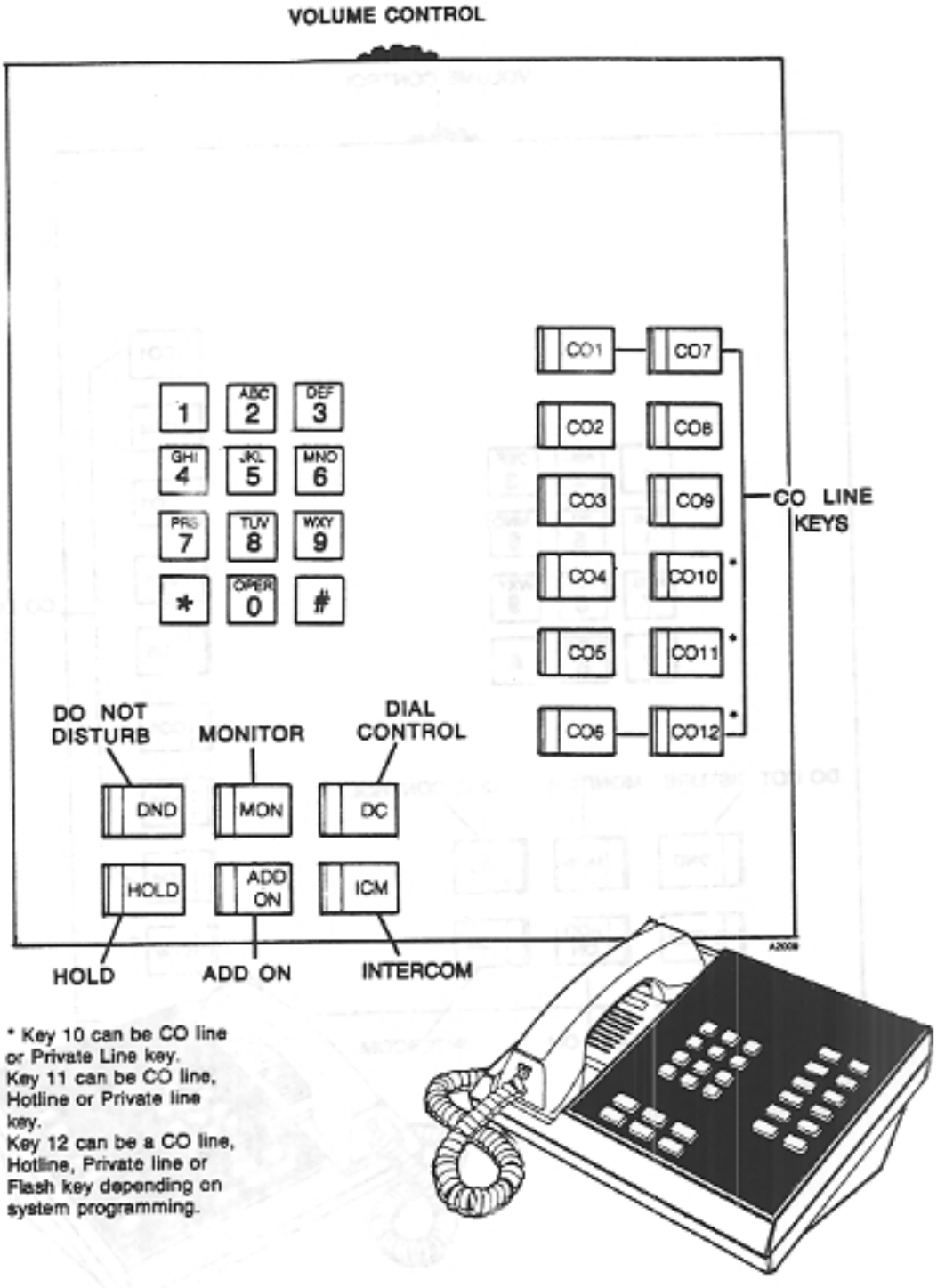
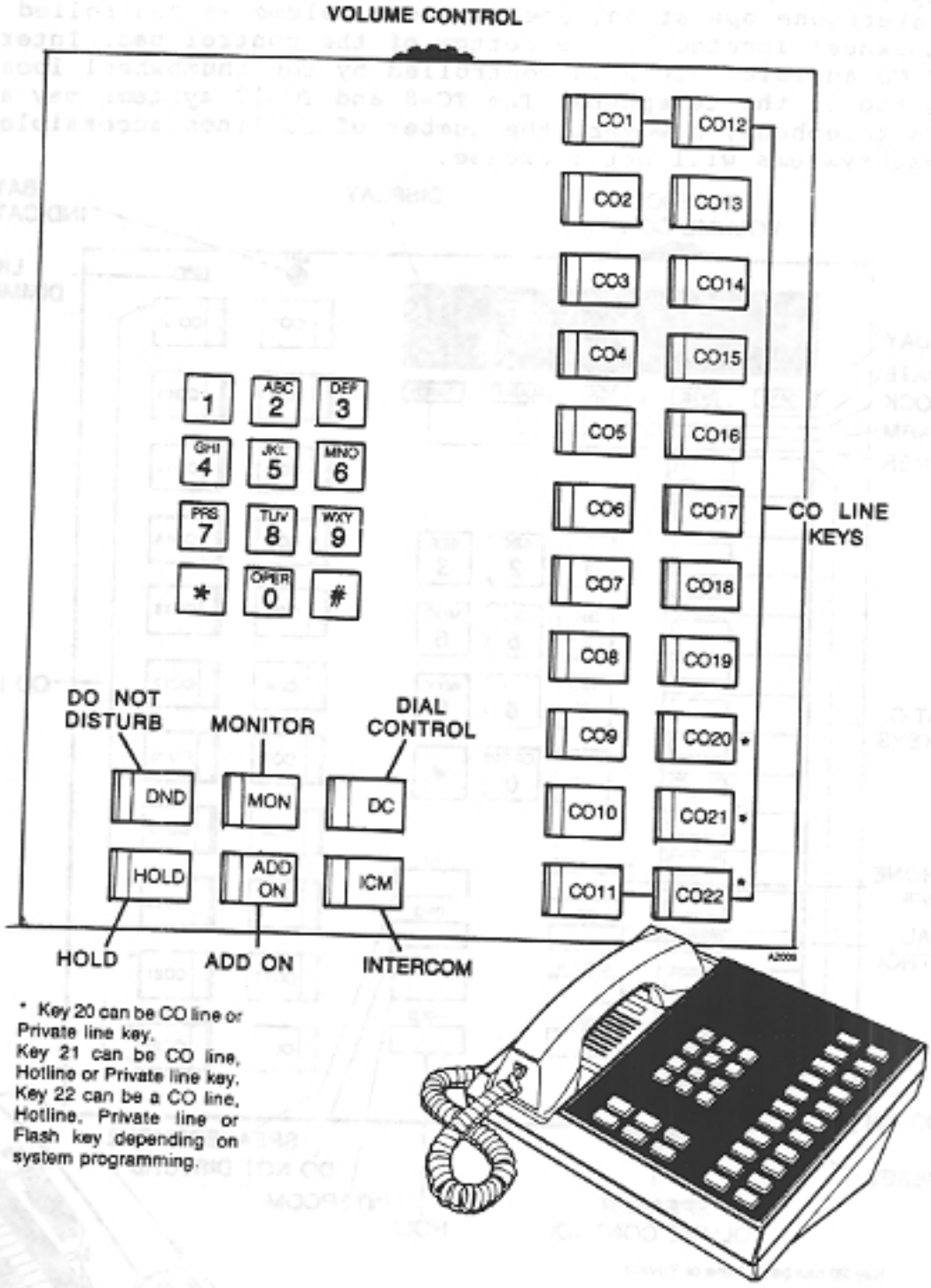


Figure 2-1 KEY DESIGNATIONS, KEY TELEPHONE, TC-8



* Key 10 can be CO line or Private Line key.
Key 11 can be CO line, Hotline or Private line key.
Key 12 can be a CO line, Hotline, Private line or Flash key depending on system programming.

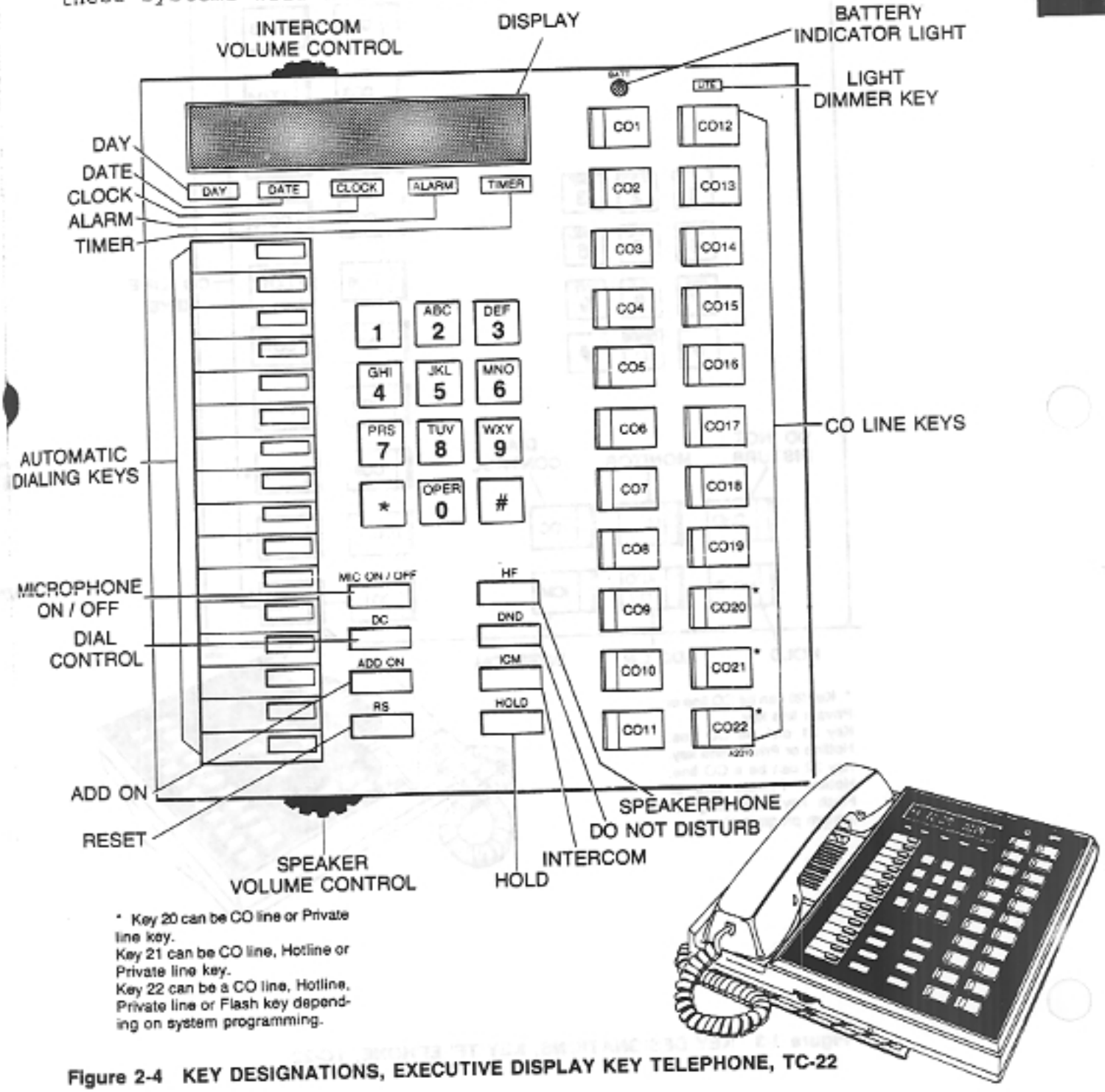
Figure 2-2 KEY DESIGNATIONS, KEY TELEPHONE, TC-12



* Key 20 can be CO line or Private line key.
Key 21 can be CO line, Hotline or Private line key.
Key 22 can be a CO line, Hotline, Private line or Flash key depending on system programming.

Figure 2-3 KEY DESIGNATIONS, KEY TELEPHONE, TC-22

2.03 The TC-22 Executive Display Key Telephone (Figure 2-4) contains 22 CO line keys and keys which access system and station features. In addition, 16 Automatic Dialer keys and a digital display are provided. This telephone is equipped for full Speakerphone operation. Speakerphone volume is controlled by the thumbwheel located at the bottom of the control pad. Intercom and CO audible volume is controlled by the thumbwheel located on the top of the telephone. The TC-8 and TC-12 systems may also use this telephone; however, the number of CO lines accessible by these systems will not increase.



* Key 20 can be CO line or Private line key.
Key 21 can be CO line, Hotline or Private line key.
Key 22 can be a CO line, Hotline, Private line or Flash key depending on system programming.

Figure 2-4 KEY DESIGNATIONS, EXECUTIVE DISPLAY KEY TELEPHONE, TC-22

POWER FAILURE TELEPHONE

2.04 The TC-22 Power Failure (PF) Telephone is similar in operation and appearance to the TC-22 Electronic Key Telephone. Unlike the standard key telephone, the PF telephone provides circuitry necessary for placing and receiving outside calls during a power failure. The PF telephone is available in two configurations: the TC-22 Power Failure Pulse (PFP) and the TC-22 Power Failure Tone (PFT) key telephone. The PFP telephone provides pulse signaling and the PFT provides DTMF signaling during a power failure. The TC-22 PF telephone may be used in the TC-8, TC-12 and TC-22 systems; however, the number of CO lines accessible by the TC-8 and TC-12 systems is not increased.

SINGLE LINE TELEPHONE

2.05 A single line telephone (Figure 2-5) can be used as an Off-Premises Extension or in case of power failure. Refer to Section 9, OPTIONAL EQUIPMENT, and Section 5, INSTALLATION, for additional description and installation information.

ATTENDANT DSS CONSOLE

2.06 The Attendant Direct Station Selection (DSS) Console contains: A Busy Lamp Field (BLF) which provides the status of each station; DSS keys for direct access to each station; and keys for internal and external paging zones, night service and Message Waiting (Figures 2-6 and 2-7). A listing of visual LED indications on the DSS console is provided in Table 2-2. The TC-12 DSS Console is used with the TC-8 and TC-12 systems. The TC-22 DSS Console is used with the TC-22 system. System programming is done at the DSS Console.

Figure 2-5 SINGLE LINE TELEPHONE

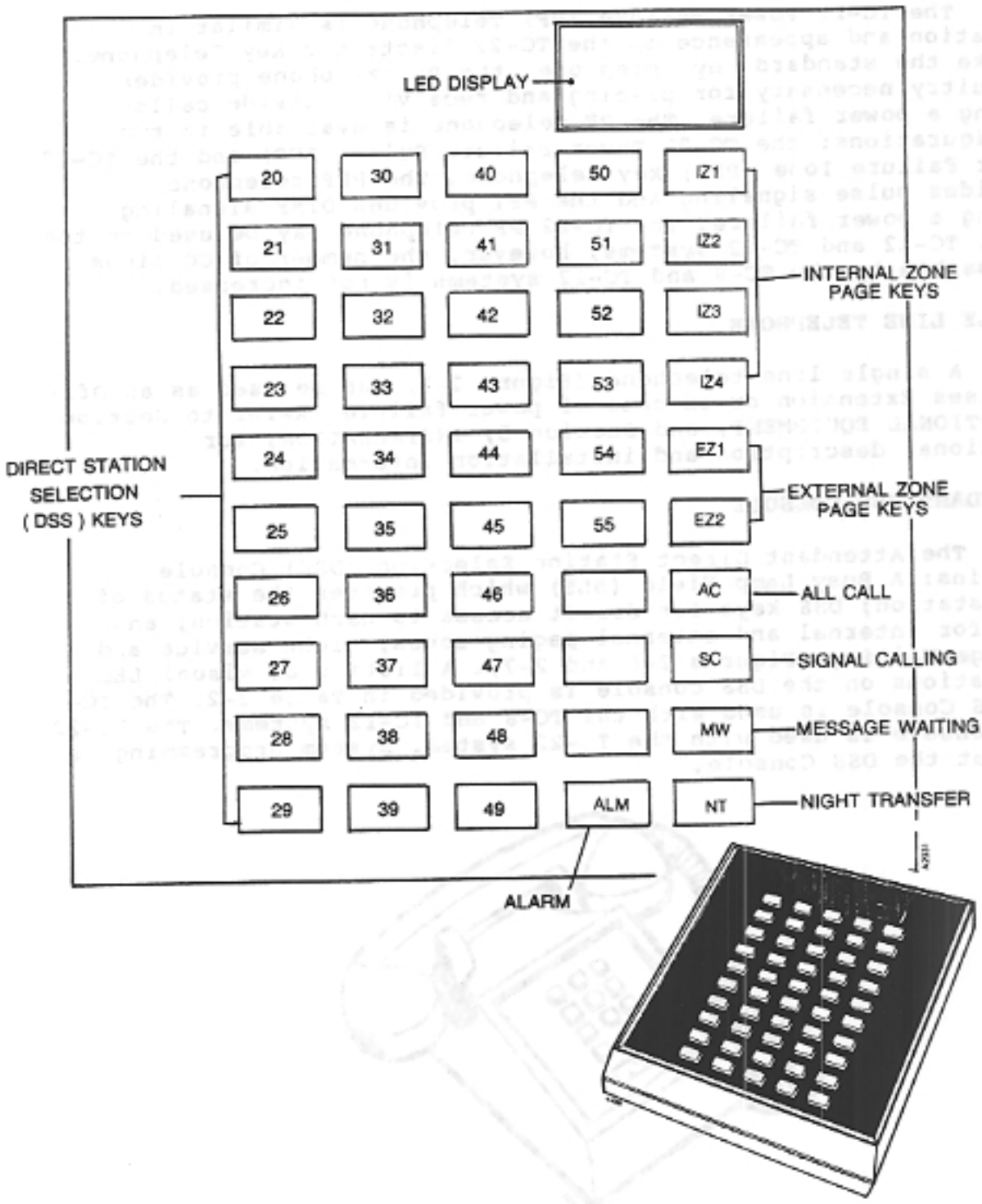


Figure 2-6 KEY DESIGNATIONS, ATTENDANT DSS CONSOLE, TC-12

2-7

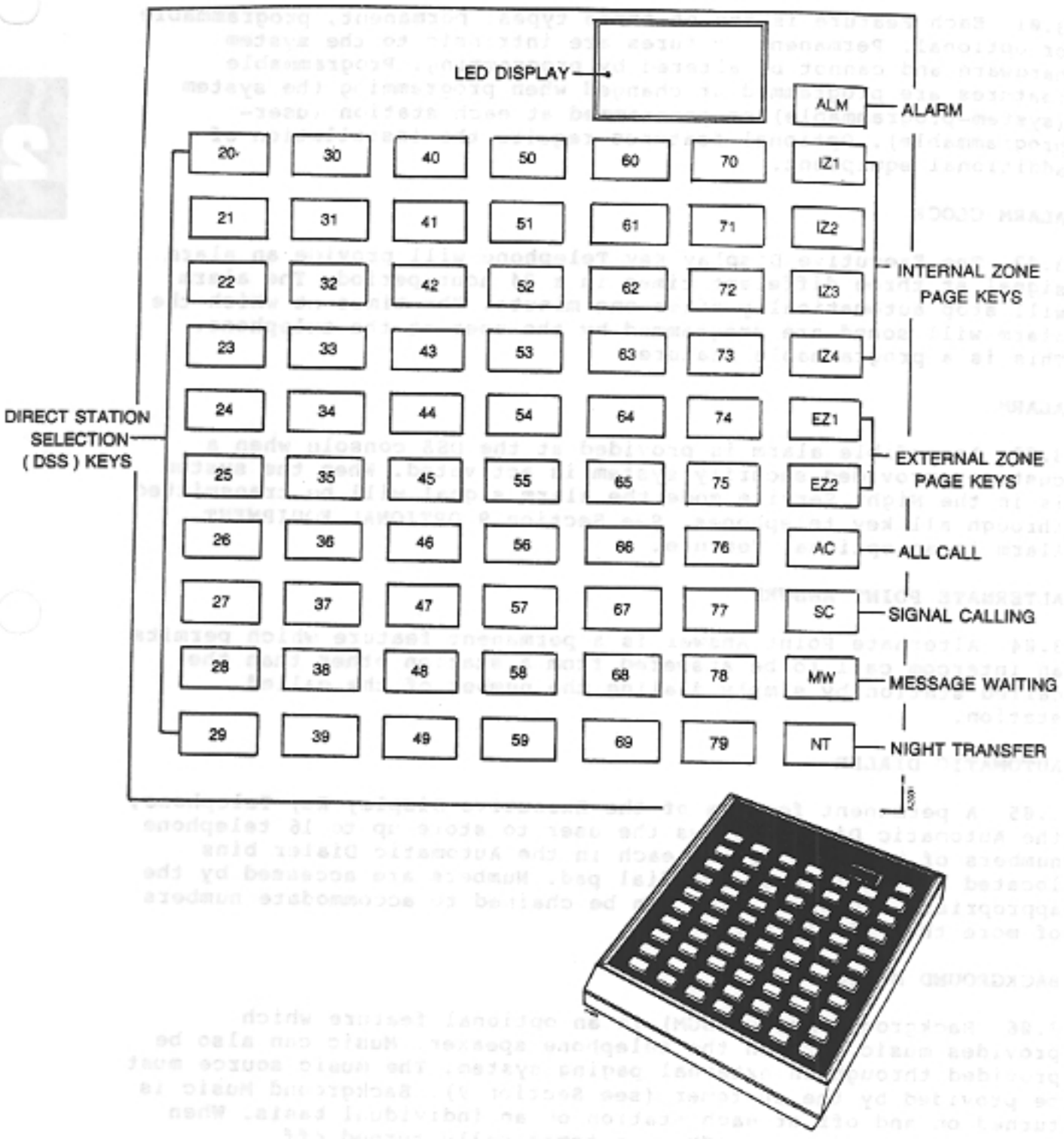


Figure 2-7 KEY DESIGNATIONS, ATTENDANT DSS CONSOLE, TC-22

3. FEATURES

3.01 Each Feature is one of three types: permanent, programmable or optional. Permanent features are intrinsic to the system hardware and cannot be altered by programming. Programmable features are programmed or changed when programming the system (system-programmable) or programmed at each station (user-programmable). Optional features require the installation of additional equipment.

ALARM CLOCK

3.02 The Executive Display Key Telephone will provide an alarm signal at three different times in a 24 hour period. The alarm will stop automatically after one minute. The times at which the alarm will sound are programmed by the user at the telephone. This is a programmable feature.

ALARM

3.03 An audible alarm is provided at the DSS console when a customer provided security system is activated. When the system is in the Night Service mode the alarm signal will be transmitted through all key telephones. See Section 9 OPTIONAL EQUIPMENT. Alarm is an optional feature.

ALTERNATE POINT ANSWER

3.04 Alternate Point Answer is a permanent feature which permits an intercom call to be answered from a station other than the called station by simply dialing the number of the called station.

AUTOMATIC DIALER

3.05 A permanent feature of the Executive Display Key Telephone, the Automatic Dialer allows the user to store up to 16 telephone numbers of up to 16 digits each in the Automatic Dialer bins located to the left of the dial pad. Numbers are accessed by the appropriate bin keys. Bins can be chained to accommodate numbers of more than 16 digits.

BACKGROUND MUSIC

3.06 Background Music (BGM) is an optional feature which provides music through the telephone speaker. Music can also be provided through an external paging system. The music source must be provided by the customer (see Section 9). Background Music is turned on and off at each station on an individual basis. When the station is in use, BGM is automatically turned off.

BATTERY BACKUP

3.07 Battery Backup is an optional feature provided by the Battery Backup unit which may be installed in the TC-22 Power Supply to provide continued system operation during a power failure. This prevents loss of internal communication on ICM links and external communication on CO lines connected before the power failure.

BUSY LAMP FIELD

3.08 Busy Lamp Field (BLF) is a permanent feature which provides various LED indications of each station's status. If the system contains a DSS console, the BLF is provided on the console with each station's DSS Key LED indicating station status. In addition to the DSS console an optional Busy Lamp Field may be used for BLF indications. For more information on the optional Busy Lamp Field, refer to Section 9. Busy Lamp Field indications are as follows:

STATUS	INDICATION
Station off hook	LED lit steadily
Station with Message Waiting	LED flashes
Station in DND mode	LED flutter
Station on Intercom call	LED winks
Station Monitor in use	LED winks

CALLBACK

3.09 Callback is a permanent feature which allows the user to leave a Callback request when an Intercom call is placed to a busy station. When the called station becomes available, the system signals the calling party who left the Callback request with an audible tone. When the originating party lifts the handset, the called station is signaled with an ICM ring tone and a visual indication on the ICM key. A Callback request will not be accepted if the called station is idle, is in the Do-Not-Disturb (DND) mode, or has already accepted a Callback request. Each station can accept only one Callback request at a time.

CENTRAL OFFICE CALL, INCOMING

3.10 A telephone call that has originated outside the telephone system can be answered at any key telephone (unless the call is on a Private Line). Incoming CO calls provide a distinctive tone signal. Key telephones also display a distinctive flash rate on the line key associated with the incoming call.

CENTRAL OFFICE CALL, OUTGOING

3.11 Outside calls may be initiated at any station not restricted by Class of Service (COS) or Toll Restriction.

CLASS OF SERVICE

3.12 A station's Class of Service determines the types of calls which may be initiated from the station. Class of Service for each station is programmed at installation. Class of Service designations include:

Ø & 1	no toll restrictions
2	can dial permitted codes and common unrestricted codes
3	can dial permitted codes, 7 digit local numbers, and common unrestricted codes
4	can dial permitted codes, 7 digit local numbers, 1 + 7 digit toll numbers and common unrestricted codes
5	can dial 7 digit local, 1 + 7 digit toll numbers and common unrestricted codes
6	can dial 7 digit local numbers and common unrestricted codes.
7	can dial common unrestricted codes
8	can dial ICM calls

CONFERENCE

3.13 Conference is a permanent feature that does not require attendant assistance. There are two types of Conferencing with an outside call: Add-On and Multi-Line.

Add-On Conference

3.14 A station user on an outside call can add up to two more internal stations to the conversation. If the outside call is on a Private Line only one other internal station may be added.

Multi-Line Conference

3.15 A station on an outside call may add another external party to the conversation.

DIRECT STATION SELECTION

3.16 The attendant console has Direct Station Selection (DSS) keys that provide the attendant with one button Intercom access to each station in the system. All keys are equipped with an LED for Busy Lamp Field indications.

DIRECT STATION SELECTION CONSOLE DISPLAY

3.17 The DSS console is equipped with a digital display which is used to indicate calls that may require attendant processing. The display rotates, in sequential order, indicating unanswered calls transferred by the attendant and lines on Hold.

DIRECT STATION SELECTION OVERRIDE

3.18 The DSS attendant can override any Intercom call in progress. The party receives a DSS override tone. The DSS attendant may also be programmed to override stations in the Monitor or DND mode. When programmed, this feature is automatic for the attendant.

DISPLAYS

3.19 The following paragraphs describe the display features unique to the Executive Display Key Telephone. There are three levels of brightness for the display which are controlled by the LITE key on the telephone.

Date and Time Display

3.20 The date and time display is the display normally shown. Date includes day of the week, month and day of the month. Time includes time of day and an A.M. or P.M. indication. The battery in the telephone provides power for the clock so that time will not be lost in the event of a power failure.

Alarm Clock Display

3.21 When the telephone's alarm clock alarm sounds, the corresponding alarm number (AL1, AL2, AL3) flashes on the display.

Call Timer Display

3.22 The clock on the display can time and display the duration of a telephone call.

Stopwatch Display

3.23 The clock on the display can serve as a stopwatch and indicate time in seconds.

DO NOT DISTURB

3.24 A station user can block incoming CO, Hotline and Intercom calls by using the Do Not Disturb (DND) feature. Intercom callers attempting to reach a station in the DND mode will receive a reorder tone. The DND mode does not block an attendant programmed for DSS Override. Stations are allowed or disallowed this feature during system programming.

EXECUTIVE CALL FORWARD

3.25 Executive Call Forward is a programmable feature which sends Private Line calls, Intercom calls and calls transferred by the attendant to a designated partner station when the executive partner is in the DND mode. Executive Call Forward partners are established during system programming. Hotline calls are not forwarded.

FLASH

3.26 The Flash feature provides a new dial tone without losing the CO line. If the system is used behind a PBX, the Flash feature operates for transfer of calls and operator recall. Flash provides an open loop signal or ground flash of 550 msec. on the line. This is a programmable feature.

FLEXIBLE RINGING

3.27 Three CO audible signaling modes may be programmed into the system.

(1) A maximum of ten stations may be assigned for common audible for all CO lines (except Private Lines).

(2) Up to four signaling groups may be programmed with up to ten stations assigned to each group. A station may be assigned to one group.

(3) Up to 20 stations may be assigned to receive CO audible and alarm signaling while the system is in the Night Service mode.

HANDSFREE ANSWERBACK

3.28 Handsfree Answerback is a permanent feature that allows station users to respond to a voice announced Intercom call without lifting the handset.

HOLD

3.29 Hold is a permanent feature which places a call in a temporary waiting condition. There are three types of Hold: Automatic Hold, Exclusive Hold and I-Hold. A line is placed on I-Hold and Exclusive Hold by using the HOLD key. The attendant may place calls on Hold without using the HOLD key through the Automatic Hold feature.

Automatic Hold

3.30 Automatic Hold is a permanent feature of the attendant station. Central Office calls are automatically placed on Hold when the attendant places an Intercom call by pressing the appropriate DSS console key.

Exclusive Hold

3.31 Exclusive Hold places a call on hold and denies access by any other station. The LED indication for a call placed on Exclusive Hold is a flickering LED at the appropriate line key on the station which placed the call on Exclusive Hold. At other stations the line key will be steadily illuminated.

Exclusive Hold Recall/Transfer

3.32 Exclusive Hold Recall/Transfer is a programmable feature which sets the duration for which a call may be left on Exclusive Hold before the station which placed the call on Exclusive Hold receives an audible signal. The signal sounds at intervals for 20 seconds after which the unretrieved call is transferred to the attendant.

I-Hold

3.33 I-Hold is a common hold. A call placed on I-Hold may be retrieved at any station programmed to access the line. The LED at the appropriate line key flutters at the station which placed the call on I-Hold and winks at other stations in the system.

HOTLINE

3.34 Hotlines may be programmed to allow single button access from one station to another. Only two stations may have access to a specific Hotline. The TC-8 system may have a total of two Hotlines and Private Lines. The total number of Hotlines and Private Lines in the TC-12 system may not exceed four. In the TC-22 system a total of six Hotlines and Private Lines are allowed. Each requires one line position. Depending on the CO line position of Hotlines and Private Lines in the TC-12 system, an additional Matrix Expansion (A-MXU-B) PCB may be required. A TC-22 system with Hotlines and/or Private Lines requires one or two Matrix Expansion (A-MXU-A) PCBs.

INTERCOM

3.35 The Intercom is used to call another station in the system. When an Intercom call is placed the LED on the ICM key of the calling station is steadily illuminated. The called station will have a winking ICM key. There are two modes of intercom signaling. Calls may be voice announced, allowing the called party to respond Handsfree, or signaled by a tone, requiring the called party to lift the handset. The system provides multiple simultaneous Handsfree Intercom paths for increased internal communication. The TC-8 system has four Handsfree Intercom paths; the TC-12 and TC-22 systems also have four paths (expandable to six).

LAST NUMBER REDIAL

3.36 Last Number Redial is a permanent feature which automatically stores the last manually dialed outside telephone number for automatic dialing at a later time. The number is stored until another number is manually dialed. The number is stored whether the call was answered, not answered or busy.

MEET-ME ANSWER PAGE

3.37 Meet-Me Answer Page is a programmable feature that enables a user to locate a specific person and establish a private handset to handset conversation. The paged party may respond from any telephone in the paged zone. The paged zone and All Call paging are unavailable for 30 seconds or until the page is answered when Meet-Me Answer Page is initiated.

MESSAGE WAITING

3.38 Message Waiting is a permanent feature which allows the attendant to leave a Message Waiting indication (flashing Hold key) at a station. The appropriate station key at the DSS console flashes to allow the attendant to keep track of which stations have a message waiting.

MICROPHONE MUTE

3.39 Microphone Mute is a permanent feature which provides privacy at a station in the Handsfree Answerback mode during an intercom conversation. While engaged, Microphone Mute prevents the calling party from hearing what is being said at the called station. Microphone Mute can be activated or deactivated while the station is idle or while engaged on an intercom call. When a station is in the Microphone Mute mode, the DND key LED flashes.

MONITOR

3.40 Monitor is a permanent feature which permits the user to dial a number without lifting the handset. This feature is only available on telephones not equipped with the Speakerphone feature. The Monitor also allows the user, while on hold from an outside party, to monitor the call with the handset on hook. The user can hear through the telephone speaker when the outside party returns to the call, but must lift the handset to talk to the outside party. When using the Monitor feature, the station's MON key LED is illuminated. The LED of the station key LED on the DSS console winks to indicate the Monitor status.

MUSIC-ON-HOLD

3.41 Music-On-Hold is a permanent feature which provides internal synthesized music to lines on hold. Optionally, music from the BGM external music source may be used in place of the internal synthesized music (see Section 9).

NIGHT SERVICE

3.42 Night Service is a programmable feature which allows alternate stations to receive incoming CO audible and alarm signaling when the system is in the Night Service mode. Night Service is activated at the DSS console. Stations are designated to receive CO audible and alarm signaling in the night mode during system programming. A maximum of 20 stations may be assigned.

OFF HOOK TONE SIGNALING

3.43 If programmed for Off Hook Tone Signaling, an off hook station will receive visual and audible indications of an incoming call.

OFF-PREMISES EXTENSION

3.44 Off-Premises Extension (OPX) is an optional feature allowing single line telephones, installed off-premises, to be used with the system.

PAGING

3.45 Paging is a programmable feature that allows a station user to initiate a page. There are three types of paging: All Call, Internal Zone, and External Zone. The attendant can use either the DSS console or the telephone to initiate pages.

All Call Paging

3.46 All Call Paging is broadcast over all stations and external speakers in the system.

External Zone Paging

3.47 External Zone Paging provides paging to customer provided speakers. A system may have up to two external page zones. External zone paging requires an optional, External Page Interface (A-EPU-A) PCB.

Internal Zone Paging

3.48 Internal Zone Paging provides paging to a select group of stations. Stations are assigned to one of four (81-84) internal page zones during system programming.

Non-Paging Stations

3.49 Stations not assigned to an internal page zone will not receive paging announcements (except All Call Paging).

POWER FAILURE TRANSFER

3.50 Power Failure Transfer is an optional feature which allows up to five stations to make and/or receive calls during a power failure. The type of telephone installed determines whether the telephone can be used to make or receive calls or both. In order to use this feature the system must be equipped with an optional A-PFU-A PCB which provides five power failure transfer circuits.

PRIVACY

3.51 Privacy is a permanent feature that automatically prevents an uninvited party from entering an established outside or Intercom call.

- **PRIVATE BRANCH EXCHANGE (PBX) OPERATION**

3.52 Each CO line may be assigned for operation behind a Private Branch Exchange (PBX). Access codes must be dialed for PBX lines. This is a programmable feature.

- **NOTE:** If PBX lines are to be assigned, access codes must be programmed into the system. When programmed for PBX operation the system provides a three second pause after dialing the PBX access code.

- **PRIVATE BRANCH EXCHANGE INWARD RING**

3.53 Private Branch Exchange Inward Ring is a permanent feature that permits the attendant to release a call and have it ring at a desired station. The call can only be answered at the signaled station. If the call is not answered within 20 seconds, it returns to the attendant.

- **PRIVATE LINE**

3.54 Private Line is a programmable feature that reserves a CO line for use by a specific station. Any key telephone can have one Private Line. The TC-8 system can have a total of two Private Lines and Hotlines. The TC-12 system can have a total of four Private Lines and Hotlines. The TC-22 system can have a total of six Private Lines and Hotlines. Depending on the CO line position of Private Lines and Hotlines in the TC-12 system, an additional Matrix Expansion (A-MXU-B) PCB may be required. A TC-22 system with Private Lines and/or Hotlines requires one or two Matrix Expansion (A-MXU-A) PCBs. Private lines are assigned during system programming.

- **QUEUING**

3.55 Queuing is a programmable feature that enables a station to queue (wait in line) for an outside line when all lines in a queue group are busy. The system automatically signals the stations, in the order they joined the queue, when a line in the queue group becomes available. If the line is not accessed within 20 seconds, the line is made available to the next station in the queue. If a station is busy when a line is offered, the line is offered to the next station in the queue. When the bypassed station and the line become idle, the line is offered again. Queuing can be used to restrict outside calls to specific lines (i.e. WATS, FX, etc.).

- **NOTE:** The attendant station has priority on a queue. A line is offered to the attendant station first.

3.56 An Intercom dial tone indicates that a station is queued, Intercom busy tone indicates that the queue is full. Each queue group has eight positions, two of which are dedicated to the DSS attendant(s).

RELEASE OF ABANDONED CALL ON HOLD

3.57 Release of Abandoned Call on Hold is a permanent feature which returns a line to an idle condition if an outside party waiting on hold hangs up. This occurs if a momentary open loop disconnect of 90 msec. or more is given from the telco office.

RESTRICTED QUEUE GROUPS

3.58 Stations may be restricted from dialing on specified CO lines by programming these lines into queue groups which then are programmed as restricted queue groups. Up to three queue groups can be programmed as restricted.

SPEAKERBOX

3.59 The Speakerbox is an optional unit which provides two-way Handsfree communication on Intercom calls. A Speakerbox requires a station position. Refer to Section 9 for additional description and installation information.

SPEAKERPHONE

3.60 The Speakerphone is an optional feature which provides two-way Handsfree communication on CO line and Intercom calls. Installation of a Speakerphone unit is required for this feature. Refer to Section 9 for additional description and installation information.

NOTE: Executive Display Key Telephones are equipped with a Speakerphone and do not require the optional unit.

STATION MESSAGE DETAIL RECORDING

3.61 The Station Message Detail Recording (SMDR) feature requires an optional printer, used with the TC-8/12/22 systems, for recording all call data. If an SMDR is to be installed, an A-SMDR-A PCB is required.

STATION SPEED DIALING

3.62 Station Speed Dialing is an optional feature that permits automatic dialing of stored telephone numbers. Each station can store a maximum of 16 numbers with up to 16 digits each. Speed Dial numbers may be chained so that more than one Speed Dial number may be included in a dialing sequence. This allows Speed Dialing to be used with special services such as MCI, SPRINT, etc. Station Speed Dialing requires an optional memory (A-NMU-A/B/D) PCB (see Section 5 for installation information).

TOLL RESTRICTION

3.63 Toll Restriction is a programmable feature that prohibits selected stations from placing unauthorized toll calls. Stations can be restricted to internal and local calls, depending on their Class of Service. Toll Restriction is also applied through the designation of Restricted Queue Groups.

'Ø' & '1' Toll Restriction

3.64 'Ø' & '1' Toll Restriction is a programmable feature that allows or disallows calls when the second digit dialed is a 'Ø' or a '1'. Some central office codes may have a 'Ø' or '1' as the second digit making this restriction undesirable.

TRANSFER

3.65 Transfer is a permanent feature used to send an outside call from one station to another. If a transferred call is not answered within a programmed recall time period, the call can be returned to the station which initiated the transfer, or to the attendant. The DSS console display indicates the line and station number involved in the transfer.

Table 2-1 VISUAL INDICATIONS ON KEY TELEPHONES, TC-8/12/22

STATUS	LED INDICATION
CO LINE	**CO LINE KEY**
Add-On Conference	LED flickers at a 120 IPM at the station initiating the conference.
Busy Line	LED steadily illuminated at all stations.
Call recalled to attendant	LED flutters at 300 IPM at attendant station.
Call transferred by DSS	LED flickers at 120 IPM at attendant station.
Exclusive Hold	LED flickers at 120 IPM at the station which placed the call on Exclusive Hold. LED steadily illuminated at all other stations.
I-Hold	LED flutters at 300 IPM at the station which placed the call on I-Hold. LED winks at 120 IPM at all other stations.
Incoming call	LED flashes at 60 IPM at all stations.
INTERCOM	**INTERCOM (ICM) KEY**
All intercom lines busy	LED steadily illuminated at all stations.
Callback	LED flashes at 60 IPM at called station when calling station lifts handset in response to Callback signal.
Incoming intercom call (Microphone OFF)	LED flutters at 60 IPM at called station.
Incoming intercom call (Microphone ON)	LED flutters at 300 IPM at called station.
OTHER	
Do Not Disturb enabled	LED steadily illuminated at DND key.
Hotline, incoming call	LED winks at 120 IPM at Hotline key at called station.
Message Waiting	LED flashes at 60 IPM at HOLD key.
Microphone Mute activated	LED flashes at 60 IPM at DND key.
Monitor in use	LED steadily illuminated at MON key.

Table 2-2 VISUAL INDICATIONS ON DSS CONSOLE, TC-8/12/22

STATUS	LED INDICATION
Alarm activated	LED flutters at 300 IPM at Alarm (ALM) key.
Hotline, incoming call	LED winks at 120 IPM at appropriate station key.
Intercom, incoming call	LED winks at 120 IPM at appropriate station key.
Low Battery (on Memory PCB)	LED flashes at 60 IPM at Alarm (ALM) key.
Page zone busy	LED steadily illuminated at appropriate page zone key.
Station in DND mode	LED flutters at 300 IPM at appropriate station key.
Station Message Waiting	LED flashes at 60 IPM at appropriate station key.
Station Monitor in use	LED winks at 120 IPM at appropriate station key.
Station off hook	LED steadily illuminated at appropriate station key.
Station on intercom call	LED winks at 120 IPM at appropriate station key.

DSS1-A

Table 2-3 AUDIBLE INDICATIONS, TC-8/12/22

TYPE OF AUDIBLE	FREQUENCY AND DURATION
Alarm Tone	800 Hz, 300 IPM.
Call recalled to attendant	530/660/16 Hz, FM, 1 sec on/3 sec off.
Callback Signal	800 Hz, 2 splash heard at station which left Callback request when called station becomes available.
CO Incoming Audible Signal	530/660/16 Hz, FM, 1 sec on/3 sec off.
Dial Tone	425 Hz, steady.
DSS Override Preemption Tone	425/16 Hz, AM, 60 IPM. Heard by preempted party.
Fast Busy Tone	425 Hz, 120 IPM. Heard by party calling a station in the DND mode.
Hotline Call Tone	425 Hz, 5 short splash. Heard by both parties.
ICM Ring Signal and Ring Back Tone	425 Hz, 1 sec on/3 sec off.
Incoming intercom call (Microphone OFF) Splash Tone	800 Hz, 2 splash.
Incoming intercom call (Microphone ON) Splash Tone	800 Hz, 1 splash.
Paging Tone	425/16 Hz, 1 splash. Heard by the paging party and the zone being paged on initiation of a page.
Slow Busy Tone	425 Hz, 60 IPM. Heard by party calling a station busy on an ICM call, off hook, or in the Monitor mode. Heard by party accessing a busy page zone.

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TC-8/TC-12/TC-22
ELECTRONIC KEY TELEPHONE SYSTEM
SECTION 3, SYSTEM CONFIGURATION

3

1. INTRODUCTION

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

1.02 Definition of Memory clarified. The Hardware Ordering Worksheets have been updated per engineering.

2. DESCRIPTION OF COMPONENTS

2.01 The following paragraphs describe the component parts of the TC-8/12/22 family of Electronic Key Telephone systems: the Key Service Units (KSUs), Power Supply Units (PSUs) and Printed Circuit Boards (PCBs).

KEY SERVICE UNITS

2.02 The KSU is required to house the PCBs and is connected to CO lines and station blocks.

2.03 The KSU cabinet for the TC-8 system can accommodate up to 20 stations, 10 line circuits and four Intercom talkpaths. When the TC-8 system is used with TC-12 telephones, up to 12 line circuits can be accommodated. The total number of Private Lines and Hotlines cannot exceed two. Line circuit usage is shown in Table 3-1.

2.04 The KSU cabinet for the TC-12 system can accommodate up to 36 stations, 14 line circuits and 6 Intercom talkpaths. The total number of Private Lines and Hotlines cannot exceed four.

2.05 The KSU cabinet for the TC-22 system can accommodate up to 60 stations, 26 line circuits and six Intercom talkpaths. The total number of Private Lines and Hotlines cannot exceed six.

Table 3-1 LINE CIRCUIT USAGE, TC-8/12/22

CO LINE POSITION	TC-8		TC-8 SYSTEM WITH TC-12 TELEPHONE		TC-12		TC-22	
	COMMON	PL/HL	COMMON	PL/HL	COMMON	PL/HL	COMMON	PL/HL
1	X		X		X		X	
2	X		X		X		X	
3	X		X		X		X	
4	X		X		X		X	
5	X		X		X		X	
6	X		X		X		X	
7	X		X		X		X	
8	X		X		X		X	
9			X		X		X	
10			X		X		X	
11		X	X	X	X	X	X	
12	X	X	X	X	X	X	X	
13						X	X	
14						X	X	
15							X	
16							X	
17							X	
18							X	
19							X	
20							X	
21							X	
22							X	X
23							X	X
24								X
25								X
26								X

POWER SUPPLY

2.06 The TC-8, TC-12 and TC-22 systems require different PSUs (Figure 1-2a, 1-2b and 1-2c, Section 1). The controls and indicators on the units are, however, similar. The ON/OFF power supply switch is located on the front panel of the PSU. The Power Failure Reset Switch (RS) is used to extinguish the Power Failure Indicator LED. The Power Failure Indicator LED illuminates when a power failure with a 40 mS to 1 sec. duration has occurred. The TC-22 PSU can also be equipped with an optional Battery Backup unit and Battery and Charger Box.

PRINTED CIRCUIT BOARDS

2.07 The following Printed Circuit Boards (PCBs) are required for system operation:

Main Processor

2.08 The Main Processor (A-MPU-A) PCB is the control center for the system. The A-MPU PCB contains a Z80 microprocessor, system clocks, programs (ROM) and program updating and timing circuits.

Data Transmission

2.09 The Data Transmission (A-DMU-A) PCB contains two microcomputers for converting serial to parallel data or parallel to serial data between the stations and the Main Processor.

Intercom Link

2.10 The Intercom Link (A-ILU-A) PCB contains voice switching circuits for four Handsfree talkpaths.

Memory

2.11 The Memory (A-NMU-A/B/C/D) PCB contains system RAM memory and a battery and fuse (on a separate board), to protect memory during power failure. There are four versions of the PCB: one with no Speed Dialing (A-NMU-C), one with Speed Dialing for stations 20 to 39 (A-NMU-D) intended for use with TC-8 systems, one with Speed Dialing for stations 20 to 55 (A-NMU-B) intended for use with TC-12 systems, and one with Speed Dialing for stations 20 to 79 (A-NMU-A) intended for use with TC-22 systems.

Tone & Signaling

2.12 The Tone and Signaling (A-SSU-A/B/C) PCB contains Background Music (BGM) and Music-On-Hold (MOH) amplifiers, two potentiometers for adjusting BGM and MOH, supervisory tone oscillators for internal system use, an alarm oscillator, and a switch matrix for transmitting tones. There are three versions of this PCB: one for systems requiring DTMF signaling on CO lines (A-SSU-A), one for dial pulse signaling (A-SSU-B) on CO lines 1-16 and one for dial pulse signaling (A-SSU-C) on CO lines 17 to 26 for use with TC-22 systems.

CO Line

2.13 The CO line (A-LNU-A/B) PCB provides circuitry for common CO lines, Private Lines or Hotlines and ring detection in the system. There are two versions of this PCB, one containing four circuits (A-LNU-A); the other two circuits (A-LNU-B).

Key Station Interface

2.14 The Key Station Interface (A-SLU-A/B) PCB contains interface circuits and a switch matrix to connect to key stations. There are two versions of this PCB, one a four station interface (A-SLU-A) and the other a two station interface (A-SLU-B).

OPTIONAL PCBs

2.15 The following PCBs are not required for system operation and are optional equipment.

Intercom Expansion

2.16 The Intercom Expansion (A-IXU-A/B) PCB comes in two versions: A-IXU-A for the TC-22 system and A-IXU-B for the TC-12 system. Both increase the number of voice switch Intercom talkpaths to six. A Matrix Expansion PCB is required when an Intercom Expansion PCB is installed.

Matrix Expansion

2.17 The Matrix Expansion (A-MXU-A/B) PCB is required when an Intercom Expansion PCB has been installed. This PCB expands the matrix to access additional lines and Intercom links. There are two versions of this PCB: the A-MXU-B is required for TC-12 systems in which Private Lines or Hotlines are assigned to positions 13 and 14; the A-MXU-A is required for TC-22 systems in which more than 12 CO lines, Private Lines or Hotlines are installed. Two A-MXU-A PCBs may be installed in the TC-22 system. The first, installed in slot A-MXU-A one, is for two Intercom paths (see paragraph 2.16) and CO lines 13-18. The second, installed in slot A-MXU-A two, is for CO lines 19-26.

External Page Interface

2.18 The External Page Interface (A-EPU-A) PCB contains two 1.5-watt amplifiers for two external paging zones and provides auxiliary control relays for external amplifiers.

Power Failure Transfer

2.19 The Power Failure Transfer (A-PFU-A) PCB provides five power failure transfer circuits for five stations.

Off-Premises Extension (OPX)

2.20 The OPX (A-OPU-A) PCB enables up to four single line telephones with pulse signaling to be installed off-premises. The OPX (A-OPU-B) PCB enables up to four single line telephones with Dual Tone Multifrequency (DTMF) or pulse signaling to be installed away from the KSU location. For each DTMF OPX an MFRB-A PCB must be installed on the A-OPU-B PCB. Refer to Section 9 for additional description and installation information.

Flash Ground Unit

2.21 The Flash Ground Unit (A-AGU-A) PCB provides a ground to each Ring conductor of the PBX lines for call transfer and attendant recall in systems requiring ground flash rather than open loop flash.

SMDR PCB

2.22 The Station Message Detail Recording (SMDR) (A-SMDR-A) PCB is required when an SMDR printer is installed in the system. Refer to Section 9 for additional description and installation information.

3. COLLECTION OF DATA

3.01 Two Option Configuration Worksheets (OCWs) are provided in this section to help define a customer's needs. There is a System OCW (Table 3-2) and a Station OCW (Table 3-3). The customer, assisted by a customer representative, should complete the OCWs. When completed, these worksheets will provide sufficient information to order the required hardware and to complete the Program Record Form in Section 4 of this manual.

SYSTEM OPTIONS

3.02 The following paragraphs provide instructions for completing the System OCW (Table 3-2).

Outside Lines - Item 1

3.03 Outside lines may include CO/PBX, Wide Area Telephone Service (WATS), Foreign Exchange (FX) or other specialized services. The maximum number of outside lines available in each system is shown in Table 3-1. Only nine lines in the TC-8, 12 lines in the TC-12 and 22 lines in the TC-22 can be used as common lines. Indicate the total number of common outside lines required. Remaining lines can be used as explained in paragraph 3.04.

Private Lines/Hotlines - Item 2

3.04 The total number of Private Lines and Hotlines is up to two for the TC-8 system, up to four for the TC-12 system and up to six for the TC-22 system. An A-MXU-B PCB is also needed in a TC-12 system when Private Lines and Hotlines are installed at positions 13 and 14. A TC-22 system with Private Lines and/or Hotlines requires one or two A-MXU-A PCBs. Indicate the total number of Private Lines and Hotlines required.

Tone/Pulse Signals - Item 3

3.05 The system can transmit tone or pulse signaling. An A-SSU-A PCB is required for tone signaling. Use an A-SSU-B for pulse signaling on lines 1-16 and an A-SSU-C for pulse signaling on CO lines 17-26. Indicate the type of signaling required (TONE/PULSE).

PBX Lines - Item 4

3.06 Individual lines in the system may be connected to a Private Branch Exchange (PBX). Indicate which lines will be connected to a PBX by placing an 'X' next to the lines for the appropriate system.

Station Positions - Item 5

3.07 The TC-8 allows up to 20 stations; the TC-12 allows up to 36 stations; the TC-22 allows up to 60 stations. Each A-SLU-A PCB interfaces four stations, and each A-SLU-B interfaces two stations. Each station position may be equipped with a key telephone or a speakerbox. The attendant requires two positions to accommodate a DSS console and key telephone. After completing Table 3-3, Station OCW, enter the total number of station positions required.

Off-Premises Extensions (OPX) - Item 6

3.08 Single line telephones can be installed off-premises as Off-Premises Extensions (OPX). After completing Table 3-3, Station OCW, enter the total number of single line telephones required.

External Paging - Item 7

3.09 The system may be equipped with ancillary external paging equipment. External Paging requires an A-EPU-A PCB. Indicate if external paging is required (YES/NO) and if yes, if Background Music (BGM) and/or CO audible is required.

Background Music/Music-On-Hold - Item 8

3.10 The system can be equipped with an ancillary Background Music (BGM) source to provide music over the loudspeakers of idle telephones and external paging equipment. Music can also be provided to CO lines placed on hold. Music-On-Hold (MOH) can be supplied by the internal synthesized music source or by the BGM source. Indicate on line a if BGM is desired (YES/NO). On line b indicate if MOH is desired (YES/NO) and, if yes, the MOH source (Internal/BGM).

Alarm - Item 9

3.11 The system can be connected to ancillary equipment to transmit alarm signals to the telephone loudspeakers. Indicate if the alarm system is an open or closed.

Queue Groups - Item 10

3.12 Lines can be organized into groups so that a station user can queue (wait in line) for an available outside line in a busy line queue group. Specific queue groups can be restricted to prohibit stations from dialing lines assigned to those queue groups. This provides another means of toll restriction.

3.13 Next to each CO line listed under Item 10a, indicate the number of the queue group to which the line is to be assigned. (0 = unused queue group; 01 - 04 = common queue groups; 05 = queue group for Private Lines and Hotlines.) Indicate next to Item 10b, Restricted Queue Groups, the queue groups which are to be restricted (up to 3).

3-7

Permitted Codes/Common Unrestricted Codes - Item 11

3.14 Toll restriction may not be desired in all instances (ie., emergency numbers, information, etc.). Permitted codes and Common Unrestricted codes enable normally restricted stations to dial numbers that are determined by these codes. Indicate next to item 11a, up to eight permitted codes of up to eight digits each. Indicate next to item 11b, Permitted Code Digits, the number of digits for a permitted code. Indicate next to item 11c, Common Unrestricted Codes, up to four codes of up to four digits each.

PBX Access Codes - Item 12

3.15 The PBX recognizes trunk access codes as a request for an outside line. These codes must be dialed to access an outside line and to ensure proper operation of toll restriction. Indicate up to four PBX Access Codes (up to two digits each).

Absorb Digits - Item 13

3.16 Some Central Offices across the country absorb certain dialed digits, since they do not recognize the normally dialed seven-digit number. The system must be programmed to drop (absorb) any digits that the Central Office will not accept. The system will read all digits after the absorbed digits for purposes of toll restriction. Indicate the absorbed digits (up to four digits).

Power Failure Transfer - Item 14

3.17 One A-PFU-A PCB provides Power Failure Transfer operation for up to five stations. A TC-22 Power Failure telephone can be installed to make and receive calls during a power failure. A single line telephone can be used during a power failure, requiring an external ringer to provide ringing. Standard key telephones can receive incoming calls during a power failure if equipped with an external ringer. An optional Battery Backup power unit is also available for uninterrupted full system operation during a commercial AC power outage. Indicate if Power Failure Transfer is required (YES/NO).

Line Ring Groups - Item 15

3.18 Consecutively numbered common (non-private) lines can be organized into a maximum of four line ring groups. For each of up to four line ring groups indicate the lowest line number in the ring group under the Lowest Line column and the highest line number under the Highest Line column.

SMDR - Item 16

3.19 Indicate if SMDR is to be installed in the system (YES/NO).

NOTE: DTMF OPX is not presently available with SMDR.

Features - Item 17

3.20 Indicate the appropriate information next to each feature in Item 17. The system can be programmed for a number of features.

STATION OPTIONS

3.21 The Station OCW (Table 3-3) is used to assign the features and type of station instrument to each station. The following paragraphs provide instructions for completing the Station OCW.

Station Number - Column 1

3.22 Station numbers are assigned by the initialization program.

Name of Station User - Column 2

3.23 Enter the name of the station user next to the corresponding station number.

Station Instrument - Column 3

3.24 Enter the type of station instrument that will be used at each station: key telephone, BLF, speakerbox, speakerphone, or single line telephone. Single line telephones must be grouped together as sequentially numbered station positions.

NOTE: Each A-OPU-A/B PCB, required for OPX, provides four stations which must not overlap stations on the A-SLU-A/B PCB.

Wall Mounting - Column 4

3.25 Check this column if the telephone is to be wall mounted. Key telephones require a special wall mounting kit. The single line telephone is available in a configuration designed for wall mounting.

Ring Groups and Common Audible - Column 5

3.26 Enter the line ring group number containing the lines that will ring at each station during the day. Up to ten stations can be in each line ring group. Enter CA for stations to receive common audible (audible from all common [non-private] lines). Up to ten stations can be common audible stations.

Do Not Disturb and Executive Call Forward - Column 6

3.27 Check those stations that will have the Do Not Disturb (DND) feature. Only key telephones should be programmed for DND. OPX telephones cannot be programmed for DND. If Executive Call Forward is required, list the station number of the partner station.

Restricted Stations - Column 7

3.28 Check those stations that will be denied dialing on lines in restricted queue groups.

Class of Service - Column 8

3.29 Indicate the Class of Service (COS) for each station.

Private Line - Column 9

3.30 For stations with a Private Line, indicate the Private Line telephone number.

Hotline - Column 10

3.31 Enter the station number of the Hotline partner.

Paging - Column 11

3.32 Enter the paging zone number (1-4) for each station. All stations in a paging zone must be consecutively numbered with the lower numbered stations in the lower numbered paging zones.

Night Service - Column 12

3.33 Check those stations that will receive CO audible signals when the system is in the Night Service mode. Up to 20 stations can be programmed for Night Service.

4. ORDER REQUIREMENTS

4.01 Use the following guide to determine overall equipment requirements for installation. Complete Table 3-4 for the TC-8 system, Table 3-5 for the TC-12 system, Table 3-6 for the TC-22 system using the OCWs (Tables 3-2 and 3-3).

CABINETS

4.02 One Key Service Unit and one Power Supply Unit are required for each system. This portion of the table has been completed with the required information.

COMMON CONTROL PCB

4.03 One Main Processor (A-MPU-A) PCB, one Data Transmission (A-DMU-A) PCB, and one Intercom Link (A-ILU-A) PCB are required for system operation. This portion of the table has been completed with the required information.

SELECTABLE CONTROL PCB

Memory

4.04 Each system requires either a standard Memory (A-NMU-C) PCB or the appropriate Speed Dial Memory PCB: for TC-8 systems the Memory PCB for Speed Dial is the A-NMU-D, for TC-12 systems, the A-NMU-B and for TC-22 systems, the A-NMU-A. Indicate the required PCB by placing a '1' on the appropriate line.

Tone and Signaling

4.05 One of two Tone and Signaling PCBs (A-SSU-A/B) must be installed in each system. Depending on signaling requirements and the size of the system, the TC-22 system also requires one or two A-SSU-C PCBs. Refer to Table 3-2, Item 3, for required signaling and, on the appropriate table indicate the required PCB by filling in the proper line.

STANDARD INTERFACE PCB

CO Line

4.06 The number of A-LNU-A (containing four line circuits) and A-LNU-B (containing two line circuits) PCBs required for a system depends upon the number of line circuits to be used. Refer to Table 3-2, Item 1, for the total number of CO lines and Item 2 for the total number of Private Lines and Hotlines and fill in, on the appropriate table (3-4, 3-5, 3-6), the number of PCBs required to accommodate these lines.

Key Station Interface

4.07 The number of A-SLU-A (four station interface) and A-SLU-B (two station interface) PCBs required for a system depends on the number of station positions in the system. Refer to Table 3-2, Item 5, for the total number of station positions and fill in, on the appropriate table (3-4, 3-5, 3-6) the number of A-SLU-A/B PCBs required to accommodate these station positions. Please note maximum allowances on tables.

OPTIONAL INTERFACE PCB

Intercom Expansion

4.08 The TC-12 system allows an increase of the number of voice switch Intercom talkpaths to six when an A-IXU-B PCB is installed. If an increase is required put a '1' on the appropriate line on Table 3-5. The TC-22 system allows the same increase when an A-IXU-A PCB is installed. If required put a '1' on the appropriate line on Table 3-6.

NOTE: If an A-IXU-A/B is to be installed, as Matrix Expansion (A-MXU-A/B) PCB must also be installed.

Matrix Expansion

4.09 There are two steps for determining if a Matrix Expansion (A-MXU-A/B) PCB is required. First, if an Intercom Expansion (A-IXU-A/B PCB is to be installed the appropriate Matrix Expansion PCB (A-MXU-B for TC-12 systems, A-MXU-A for TC-22 systems) must be installed. If this is the case, place a '1' on the appropriate line. The A-MXU-B is also required in a TC-12 system if line positions 13 and 14 are to be used for Private Lines or Hotlines.

4.10 The TC-22 system can have up to two A-MXU-A PCBs. The first, in addition to intercom expansion, accommodates CO lines 13-18. The second accommodates CO lines 19-26. The PCB's function will be determined by its location in the KSU. Indicate the number of A-MXU-A PCBs required.

External Page Interface

4.11 If the system is to be equipped with ancillary external paging equipment (refer to Table 3-2, Item 7) an A-EPU-A PCB is required. Place a '1' on the appropriate line, if required.

Power Failure Transfer

4.12 Refer to Table 3-2, Item 14, to determine if Power Failure Transfer is required for the system. If so, an A-PFU-A PCB is required and a '1' must be entered on the appropriate line.

Off-Premises Extension (OPX)

4.13 If the system is to be equipped for OPX operation, the A-OPU-A/B PCB(s) is required. The number of PCBs is determined by the number of required line circuits (each PCB will accommodate 4 circuits). The A-OPU-A PCB is used when all off-premises stations have pulse signaling; the A-OPU-B PCB is used for DTMF or pulse. For each DTMF OPX accommodated by the A-OPU-B PCB, an MFRB-A PCB must be installed on the A-OPU-B PCB. For example, if it has been determined that a system is to have four off-premises stations, three of which are DTMF and one with pulse signaling, an A-OPU-B PCB must be installed. Since each PCB accommodates four circuits only one A-OPU-B is required. The total number of DTMF off-premise stations accommodated on the A-OPU-B PCB is three, therefore three MFRB-A PCBs must be installed on the A-OPU-B PCB. Determine the number of each OPX PCB required and fill in the appropriate lines.

NOTE: Each A-OPU-A and A-OPU-B PCB replaces one station interface (A-SLU-A/B) PCB.

Flash Ground Unit

4.14 If the system is to be installed behind a PBX (which requires grounded flash), an A-AGU-A PCB is required. Place a '1' on the appropriate line if this PCB is required.

SMDR

4.15 If the system is to be equipped for SMDR, an A-SMDR-A PCB is required. If an A-SMDR-A is to be installed, SMDR jack and cable assembly must also be ordered. Place a '1' on both lines if an A-SMDR-A is required.

STATION INSTRUMENTS

4.16 Appropriate station instruments are included on each table. Enter the required number of each station instrument on the lines provided.

NOTE: The total number of station instruments should not exceed the number of station positions indicated on Table 3-2, Item 5. If optional equipment requiring a station position (i. e., speakerbox) is to be installed, the number here should be less than the total number of station positions.

FEATURE AND OPTIONAL EQUIPMENT

4.17 Determine the required number of Busy Lamp Field units, External Speakerphones, Speakerboxes, Ringing Generator Boxes and Wall Mounting Kits and fill in the appropriate lines.

4.18 If a Battery Backup PSU and Battery and Charger Box are to be installed enter a '1' on the appropriate lines.

Installation Equipment

4.19 Tables 3-7 (TC-8 system), 3-8 (TC-12 system) and 3-9 (TC-22 system) are provided to assist the customer in determining cable and connecting block requirements for system installation. Equipment listed in these tables must be ordered separately by the customer. It is the customer's responsibility to ensure that this equipment is available at the installation site. Complete the appropriate table as described below.

25 Pair Cable to Connect RJ21X Connector to KSU

4.20 The telephone company installs an RJ21X connector, not more than 25 feet from the KSU. The RJ21X is connected to the A1 connector on the KSU with 25 pair cable. One 25 pair cable is required for each RJ21X connector. The TC-8 and TC-12 systems will require one RJ21X connector. Since the RJ21X connector accommodates 25 CO lines, a second RJ21X connector will be required for a TC-22 system with 26 CO lines. The second RJ21X connector is connected with a 25 pair cable to the A2 connector on the TC-22 KSU. This entry has been completed on the TC-8 and TC-12 tables. For a TC-22 system enter the required number of 25 pair cables (1 or 2) based on the number of CO lines in Table 3-2, Item 1.

Connecting Blocks

4.21 Connecting blocks (66M1-50 or equivalent) are required for station, BGM, alarm, loudspeaker, and Power Failure connections. Determine the total number of connecting blocks required using the following charts and enter this number on the appropriate table.

TC-8 system:

- One connecting block (B1) is used to cross connect station Intercom numbers 20-31.
- One connecting block (B2) is used to cross connect station Intercom numbers 32-39 and is used to cross connect an external paging source, BGM source and alarm source. Refer to Table 3-2, Item 5, for the total number of station positions required. Refer to Table 3-2, Items 7, 8 and 9, respectively, to determine if external sources will be installed.
- Two connecting blocks (A1 and C1) are used for cross-connections for Power Failure Transfer. They are required if the system is to have Power Failure Transfer operation (refer to Table 3-2, Item 14). Any installation required for Power Failure Transfer must be performed by a certified installer.

TC-12 system:
- One connecting block (B1) is used to cross connect station Intercom numbers 20-31.
- One connecting block (B2) is used to cross connect station Intercom numbers 32-43.
- One connecting block (B3) is used to cross connect station Intercom numbers 44-55. Refer to Table 3-2, Item 5 for the total number of station positions required to determine the number of B blocks needed.
- One connecting block (D1) is used to cross connect an external paging source, BGM source and alarm source. Refer to Table 3-2, Items 7, 8 and 9, respectively, to determine if these external sources will be installed.
- Two connecting blocks (A1 and C1) are used for cross connections for Power Failure Transfer. They are required if the system is to have this feature (refer to Table 3-2, Item 14).

TC-22 system:
- One connecting block (B1) is used to cross connect station Intercom numbers 20-31.
- One connecting block (B2) is used to cross connect station Intercom numbers 32-43.
- One connecting block (B3) is used to cross connect station Intercom numbers 44-55.
- One connecting block (B4) is used to cross connect station Intercom numbers 56-67.
- One connecting block (B5) is used to cross connect station Intercom numbers 68-79. Refer to Table 3-2, Item 5, to determine the number of station positions in the system.
- One connecting block (D1) is used to cross connect an external paging source, BGM source and alarm source. Refer to Table 3-2, Items 7, 8 and 9, respectively.
- Two connecting blocks (A1 and C1) are used for cross connections for Power Failure Transfer.
- One other connecting block (A2) is required to cross connect CO line 26 for Power Failure Transfer, if the system is to have a CO line 26. Refer to Table 3-2, Item 14, to determine if the system will have Power Failure Transfer, and to Table 3-2, Item 1, to determine if there are 26 CO lines.

25 Pair Cable to Connect Connecting Blocks to KSU

4.22 Each connecting block requires one 25 pair cable, terminating with a female connector on one end, to connect it to the KSU. Enter the number of cables required. The number of cables must be equal to the number of connecting blocks to be installed.

Two Pair Twisted Cable to Connect Stations to the KSU.

4.23 Two pair twisted station cable is used to connect the KSU and station B blocks to the modular jacks at the telephones. The standard telephony color code for twisted pair inside wire is as follows (the color code may vary depending on the manufacturer):

Pair #1	WHT/BLU
	BLU/WHT
Pair #2	WHT/ORN
	ORN/WHT

Determine how much station cable is needed.

AC Line Surge Protector

4.24 An AC line surge protector is recommended to protect the power supply and 14 AWG, or larger, insulated copper wire is required to ground the KSU.

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

Table 3-2 SYSTEM OPTION CONFIGURATION WORKSHEET, TC-8/TC-12/TC-22 (Page 1 of 2)

1. Common outside lines
2. Private Lines / Hotlines
3. Tone / Pulse Signaling
4. PBX lines

Line	TC-8	TC-12	TC-22
01			
02			
03			
04			
05			
06			
07			
08			
09			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			

5. Number of station positions
6. Single line telephones for OPX
7. External Paging (BGM and CO Audible)
8.
   a) Background Music
   b) Music-On-Hold
9. Alarm (Open or Closed Circuit Detection)
10.
   a) Queue Groups (00-05) *

Line	TC-8	TC-12	TC-22
01			
02			
03			
04			
05			
06			
07			
08			
09			
10			
11			
12			
13		05	
14		05	
15			
16			

* 0– unused queue group

01-04–common queue groups

05– queue group for Private lines and Hotlines

3

Table 3-2 SYSTEM OPTION CONFIGURATION WORKSHEET, TC-8/TC-12/TC-22, (Page 2 of 2)

	17	
	18	
	19	
	20	
	21	
	22	
	23	05
	24	05
	25	05
	26	05
b) Restricted Queue Groups (up to 3)		
11.		
a) Permitted Codes (up to 8 codes of up to 8 digits each)		1 2 3 4 5 6 7 8
b) Permitted Code Digits		
c) Common Unrestricted Codes (up to 4 codes of up to 4 digits each)		1 2 3 4
12. PBX Access Codes (up to 2 digitis)		1 2 3 4
13. Absorb Digits (up to 4 digits)		
14. Power Failure Transfer		
15. Line Ring Groups		Lowest line / Highest line
	01	01
	02	
	03	
	04	
16. SMDR		
17. Features		
a) Off-Hook signaling		
b) DSS Override		
c) Recall Timing (no recall-128 secs.)		
d) Flash Key (Open Loop or Ground)		
e) Meet Me Page		
f) '0' or '1' as Second Digit		

TC-12/TC-22

TC-22

Table 3-3 STATION OPTION CONFIGURATION WORKSHEET, TC-8/TC-12/TC-22

1	2	3	4	5	6	7	8	9	10	11	12
STA.	NAME	TYPE OF STATION INSTRUMENT	WALL MTG.	RING GROUP C. AUD.	DND EXEC. C.FWD	DIAL REST'D	COS	PRIVATE LINE	HOTLINE	PAGING	NIGHT SERV.
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
31											
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TC-8/TC-12/TC-22

TC-12/TC-22

TC-22

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Table 3-4 SYSTEM HARDWARE CONFIGURATION WORKSHEET, TC-8

ITEM	PART NUMBER	DESCRIPTION	COMMENTS	NUMBER TO ORDER
		CABINETS		
TC-8 KSU	13018	TC-8 Key Service Unit & Cable	1 required per system	1
TC-8 PSU	13036	TC-8 Power Supply Unit	1 required per system	1
		COMMON CONTROL PCB		
A-MPU-A	13265	Main Processor	1 required per system	1
A-DMU-A	13270	Data Transmission	1 required per system	1
A-ILU-A	13281	Intercom Link (4 circuits per PCB)	1 required per system	1
		SELECTABLE CONTROL PCB		
A-NMU-C	13070	Memory (Standard)	one or the other	
A-NMU-D	13095	Memory (Speed Dial)	required per system	
A-SSU-A	13055	Tone & Signaling (DTMF)	one or the other	
A-SSU-B	13061	Tone & Signaling (DP)	required per system	
		STANDARD INTERFACE PCB		
A-LNU-A	13105	CO Line (4 circuits per PCB)		
A-LNU-B	13115	CO Line (2 circuits, 3 & 4 per PCB)	as required (4 max.)	
A-SLU-A	13125	Key Station Interface (4 circuits per PCB		
A-SLU-B	13135	Key Station Interface (2 circuits, 1 & 2 per PCB)	as required (9 max.)	
		OPTIONAL INTERFACE PCB		
A-EPU-A	13181	External Page Interface	as required (1 max.)	
A-PFU-A	13190	Power Failure Transfer (5 circuits per PCB)	as required (1 max.)	
A-OPU-A	13175	Off-Premises Extension (pulse) (4 circuits per PCB) replaces an A-SLU PCB	as required (3 max.)	
A-OPU-B	13176	Off-Premises Extension (DTMF or pulse) (4 circuits per PCB) replaces an A-SLU PCB	as required (4 max.)	
MFRB-A	12192	Off-Premises Extension (DTMF)	as required	
A-AGU-A	13200	Flash Ground Unit	as required (1 max.)	
A-SMDR-A	13187	Station Message Detail Recording	as required (1 max.)	
A-SMDR	13188	Jack and Cable Assembly	as required (1 max.)	
		STATION INSTRUMENTS		
TC-8	13237	TC-8 Telephone	as required	
TC-12	13220	TC-12 Telephone	as required	
TC-12 DSS	13240	TC-12 DSS Console (requires station		
TC-22 PFT	13231	TC-22 Power Failure Telephone (DTMF)	as required (2 max.)	
TC-22 PFP	13232	TC-22 Power Failure (DP)	as required	
TC-22 EDKT	13215	TC-22 Display Telephone	as required	
			as required	
		FEATURE AND OPTIONAL EQUIPMENT		
BLF	13277	Busy Lamp Field	as required (2 max.)	
TC-402 SPU	13260	External Speakerphone	as required	
TC-8/12/22 Speaker Box	13367	Speakerbox (requires station position)		
RG Box	12185	Ringing Generator	as required	
Wall Mtg. Kit	13310	Wall Mounting Kit	as required (1 max.)	
TC-22	13035	Battery Backup Power Supply Unit	as required	
TC-22	13040	Battery and Charger Box	as required (1 max.)	
			as required (1 max.)	

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Table 3-5 SYSTEM HARDWARE CONFIGURATION WORKSHEET, TC-12

ITEM	PART NUMBER	DESCRIPTION	COMMENTS	NUMBER TO ORDER
		CABINETS		
TC-12 KSU	13000	TC-12 Key Service Unit & Cable	1 required per system	1
TC-12 PSU	13020	TC-12 Power Supply Unit	1 required per system	1
		COMMON CONTROL PCB		
A-MPU-A	13265	Main Processor	1 required per system	1
A-DMU-A	13270	Data Transmission	1 required per system	1
A-ILU-A	13281	Intercom Link (4 circuits per PCB)	1 required per system	1
		SELECTABLE CONTROL PCB		
A-NMU-C	13070	Memory (Standard)	one or the other required per system	____
A-NMU-B	13080	Memory (Speed Dial)		____
A-SSU-A	13055	Tone & Signaling (DTMF)	one or the other required per system	____
A-SSU-B	13061	Tone & Signaling (DP)		____
		STANDARD INTERFACE PCB		
A-LNU-A	13105	CO Line (4 circuits per PCB)	as required (4 max.)	____
A-LNU-B	13115	CO Line (2 circuits, 3 & 4 per PCB)		____
A-SLU-A	13125	Key Station Interface (4 circuits per PCB)		____
A-SLU-B	13135	Key Station Interface (2 circuits, 1 & 2 per PCB)	as required (9 max.)	____
		OPTIONAL INTERFACE PCB		
A-IXU-B	13155	Intercom Expansion - ICM 5 & 6 - (requires an A-MXU-B PCB)	as required (1 max.)	____
A-MXU-B	13140	Matrix Expansion	as required (1 max.)	____
A-EPU-A	13181	External Page Interface	as required (1 max.)	____
A-PFU-A	13190	Power Failure Transfer (5 circuits per PCB)	as required (1 max.)	____
A-OPU-A	13175	Off-Premises Extension (pulse) (4 circuits per PCB) replaces an A-SLU PCB	as required (3 max.)	____
A-OPU-B	13176	Off-Premises Extension (DTMF or pulse) (4 circuits per PCB) replaces an A-SLU PCB	as required (8 max.)	____
MFRB-A	12192	Off-Premises Extension (DTMF)	as required	____
A-AGU-A	13200	Flash Ground Unit	as required (1 max.)	____
A-SMDR-A	13187	Station Message Detail Recording	as required (1 max.)	____
A-SMDR	13188	Jack and Cable Assembly	as required (1 max.)	____
		STATION INSTRUMENTS		
TC-12	13220	TC-12 Telephone	as required	____
TC-12 DSS	13240	TC-12 DSS Console (requires station position)	as required (2 max.)	____
TC-22 PFT	13231	TC-22 Power Failure Telephone (DTMF)	as required	____
TC-22 PFP	13232	TC-22 Power Failure (DP)	as required	____
TC-22 EDKT	13215	TC-22 Display Telephone	as required	____
		FEATURE AND OPTIONAL EQUIPMENT		
BLF	13277	Busy Lamp Field	as required (2 max.)	____
TC-402 SPU	13260	External Speakerphone	as required	____
TC-8/12/22 Speaker Box	13367	Speakerbox (requires station position)	as required	____
RG Box	12185	Ringing Generator	as required (1 max.)	____
Wall Mtg. Kit	13310	Wall Mounting Kit	as required	____
TC-22	13035	Battery Backup Power Supply Unit	as required (1 max.)	____
TC-22	13040	Battery and Charger Box	as required (1 max.)	____

Table 3-6 SYSTEM HARDWARE CONFIGURATION WORKSHEET, TC-22

ITEM	PART NUMBER	DESCRIPTION	COMMENTS	NUMBER TO ORDER
		CABINETS		
TC-22 KSU	13010	TC-22 Key Service Unit & Cable	1 required per system	1
TC-22 PSU	13030	TC-22 Power Supply Unit	1 required per system	1
		COMMON CONTROL PCB		
A-MPU-A	13265	Main Processor	1 required per system	1
A-DMU-A	13270	Data Transmission	1 required per system	1
A-ILU-A	13281	Intercom Link (4 circuits per PCB)	1 required per system	1
		SELECTABLE CONTROL PCB		
A-NMU-C	13070	Memory (Standard)	one or the other required per system	____
A-NMU-A	13090	Memory (Speed Dial)		____
A-SSU-A	13055	Tone & Signaling (DTMF)		____
A-SSU-B	13061	Tone & Signaling (DP) (DP for CO Lines 1-16)	one or the other required per system	____
A-SSU-C	13065	Tone & Signaling (DP for CO Lines 17-26)	required for pulse signaling on lines 17-26	____
		STANDARD INTERFACE PCB		
A-LNU-A	13105	CO Line (4 circuits per PCB)		____
A-LNU-B	13115	CO Line (2 circuits per PCB)	as required (7 max.)	____
A-SLU-A	13125	Key Station Interface (4 circuits per PCB)		____
A-SLU-B	13135	Key Station Interface (2 circuits per PCB)	as required (15 max.)	____
		OPTIONAL INTERFACE PCB		
'XU-A	13171	Intercom Expansion - ICM 5 & 6 - (requires an A-MXU-A PCB)	as required (1 max.)	____
A-MXU-A	13160	Matrix Expansion (1st A-MXU-A for ICM expansion and CO lines 13-18; 2nd is for CO lines 19-26)	as required (2 max.)	____
A-EPU-A	13181	External Page Interface	as required (2 max.)	____
A-PFU-A	13190	Power Failure Transfer	as required (1 max.)	____
A-OPU-A	13175	Off-Premises Extension (pulse) (4 circuits per PCB), replaces an A-SLU PCB	as required (1 max.)	____
A-OPU-B	13176	Off-Premises Extensions (DTMF or Pulse) (4 circuits per PCB) replaces an A-SLU PCB	as required (3 max.)	____
MFRB-A	12192	Off-Premises (DTMF)	as required (4 max.)	____
A-AGU-A	13200	Flash Ground Unit	as required	____
A-SMDR-A	13187	Station Message Detail Recording	as required (1 max.)	____
A-SMDR	13188	Jack and Cable Assembly	as required (1 max.)	____
		STATION INSTRUMENTS		
TC-22	13230	TC-22 Telephone	as required	____
TC-22 DSS	13250	TC-22 DSS Console (requires station position)	as required (2 max.)	____
TC-22 PFT	13231	TC-22 Power Failure Telephone (DTMF)	as required	____
TC-22 PFO	13232	TC-22 Power Failure (DP)	as required	____
TC-22 EDKT	13215	TC-22 Display Telephone	as required	____
		FEATURE AND OPTIONAL EQUIPMENT		
BLF	13277	Busy Lamp Field	as required (2 max.)	____
TC-402 SPU	13260	External Speakerphone	as required	____
TC-8/12/22	13367	Speakerbox (requires station position)		____
'aker Box			as required	____
Box	12185	Ringing Generator	as required (1 max)	____
Wall Mtg. Kit	13310	Wall Mounting Kit	as required	____
TC-22	13035	Battery Backup Power Supply Unit	as required (1 max.)	____
TC-22	13040	Battery and Charger Box	as required (1 max.)	____

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Table 3-7 INSTALLATION EQUIPMENT, TC-8

DESCRIPTION	COMMENTS	NUMBER TO ORDER
25 pair cable to connect telco RJ21X to KSU	1 required	1
Connecting blocks	as required	_____
25 pair cable to connect connecting blocks to KSU	as required	_____
2 pair twisted cable as station cable	as required	_____
AC line surge protector	1 required	1

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Table 3-8 INSTALLATION EQUIPMENT, TC-12

DESCRIPTION	COMMENTS	NUMBER TO ORDER
25 pair cable to connect telco RJ21X to KSU	1 required	1
Connecting blocks	as required	_____
25 pair cable to connect connecting blocks to KSU	as required	_____
2 pair twisted cable as station cable	as required	_____
AC line surge protector	1 required	1

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Table 3-9 INSTALLATION EQUIPMENT, TC-22

DESCRIPTION	COMMENTS	NUMBER TO ORDER
25 pair cable to connect telco RJ21X to KSU	as required (2 max.)	_____
Connecting blocks	as required	_____
25 pair cable to connect connecting blocks to KSU	as required	_____
2 pair twisted cable as station cable	as required	_____
AC line surge protector	1 required	1

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TC-8/TC-12/TC-22
ELECTRONIC KEY TELEPHONE SYSTEM
SECTION 4, PROGRAM RECORD FORM PREPARATION

4

1. INTRODUCTION

1.01 The PROGRAM RECORD FORM PREPARATION Section provides directions for entering data onto the Program Record Form (PRF), Table 4-1, at the end of this section. The PRF must be completed and retained as a job record. When programming changes are made, the PRF should be updated.

1.02 For each program, the ACCESS definition has been abbreviated. Limitations for Program 43 have been abbreviated.

2. DIRECTIONS

2.01 The following pages provide instructions for entering data onto the PRF and should be used with the completed Option Configuration Worksheets from Section 3. Information is also provided on program definition, access, prerequisites, limitations and feature interaction, where applicable. This information is included in this section to provide a clear understanding of each program so that PRF completion may be accurate.

CAUTION: DO NOT ATTEMPT TO PROGRAM THE SYSTEM FROM THIS SECTION. SECTION 6, PROGRAM ENTRY, CONTAINS THE REQUIRED INFORMATION FOR PROPER DATA ENTRY.

PROGRAM 20, GROUP RINGING

ACCESS:

2.02 DSS console key 20.

DESCRIPTION:

2.03 CO lines can be organized into a maximum of four line groups for CO audible signaling. (See Sect. 3, Table 3-2, item 15.)

INSTRUCTIONS:

2.04 On the PRF (Table 4-1) enter '0' in the D box if separate ring groups are not required; enter '1' if separate ring groups are required. If a "1" is entered, at least one code must be entered in Program 21.

PROGRAMS 21-23, LINE RING GROUPS

ACCESS:

2.05 DSS console key 21 for line ring group 1 / DSS console key 22 for line ring group 2 / DSS console key 23 for line ring group 3. Line ring group 4 is not manually programmed because by default it contains all remaining common lines not assigned in line ring groups 1-3.

DESCRIPTION:

2.06 Each CO line may be assigned to one of up to four line ring groups. Each line ring group can contain any number of common (non-private) CO lines, up to the maximum number in the system. CO lines within a line ring group must be consecutively numbered.

LIMITATIONS:

2.07 A CO line can be assigned to only one line ring group. Private lines cannot be assigned.

PREREQUISITE:

2.08 Program 20 must indicate that separate line ring groups are required ('1' in the D box).

INSTRUCTIONS:

2.09 In the C/D boxes enter the highest CO line number for each line ring group. Refer to the System OCW (Table 3-2, Item 15) for the high line number of each line ring group. Enter single digits as a '0' in the C box and the desired digit in the D box.

NOTE: CO lines must be consecutively numbered with line group 1 containing the lowest numbered lines in the system, line group 2 containing the next lowest, and so forth.

EXAMPLE:

2.10 It is assumed in the following example that it has already been determined in Program 20 that separate line ring groups are desired, and the system has 12 common CO lines to be assigned. The customer desires to have CO lines 1-6 in one group, 7 and 8 in another, 9 in another, and 10-12 in another. Since the lowest numbered lines must be assigned to line group 1 the first group of lines, 1-6, will be assigned in Program 21 to line group 1. The customer enters the highest line number of the group (using two digits), '06' in this example, in the C/D boxes of Program 21. Lines 7 and 8 are assigned in Program 22 as the second line ring group by entering '08' in the C/D boxes. Line 9 will be assigned to the next line ring group, group 3 in Program 23. When there is only one line in a line ring group, that line is entered in the C/D boxes. Therefore, '09' is entered for Program 23. By default, lines 10-12 are assigned to line ring group 4 without any manual entry.

PROGRAMS 24-27, RING GROUP STATIONS

ACCESS:

2.11 DSS console key 24 for ring group 1 stations / DSS console key 25 for ring group 2 stations / DSS console key 26 for ring group 3 stations / DSS console key 27 for ring group 4 stations. One of the following displays will be shown, corresponding with the ring group accessed.

DISPLAY:

01	02	03	04

DESCRIPTIONS:

2.12 Each ring group may have up to ten stations assigned to receive CO audible for all common lines in that group.

LIMITATIONS:

2.13 Each station may be assigned to only one ring group. Stations assigned to a ring group cannot also be assigned to the Common Audible group (Program 28).

PREREQUISITES:

2.14 Ring groups to which stations are being assigned must be established and entered in Programs 21-23. A station cannot be assigned to a ring group to which no lines have been assigned.

INSTRUCTIONS:

2.15 In the C/D boxes enter the station numbers to be assigned to each ring group. Refer to the Station OCW (Table 3-3, Column 5) for assignments.

NOTE: If fewer than 10 stations are in a group, enter '00' as the last station.

EXAMPLE:

2.16 A TC-12 system has 30 stations assigned as follows in the Station OCW (ring groups used here are those used in the example for Programs 21-23):

Ring Group 1: stations 25,26,30,31,32,38,39,40,43,44
Ring Group 2: 21,23,24,27,28,29,35,41
Ring Group 3: 22,33,36,37,42,46,47
Ring Group 4: 45

Stations have been assigned in this manner because in this example it is assumed that it is desirable for indicated stations to receive CO audible on the common lines assigned to the indicated ring group. On the PRF, starting with ring group 1, Program 24, stations will be entered in the C/D boxes. Entries for subsequent ring groups are made in the same manner. Since ring groups 2,3 and 4 have fewer than ten stations, a '00' must be entered in the C/D boxes after the last entry. So, in Program 27 for ring group 4, '45' is entered in the first C/D boxes, and '00' in the second.

FEATURE REFERENCE:

2.17 Flexible Ringing

PROGRAM 28, COMMON AUDIBLE STATIONS

ACCESS:

2.18 DSS console key 28.

DESCRIPTION:

2.19 Up to ten stations can be assigned as Common Audible stations to receive CO audible from all CO lines that are not Private lines. Common Audible stations cannot be assigned to any other line ring group (Programs 24-27) or to the Night Service group (Program NT).

LIMITATIONS:

2.20 No more than ten stations may be assigned.

PREREQUISITE:

2.21 Stations to be assigned must not have been assigned in Programs 24-27.

INSTRUCTIONS:

2.22 Refer to the Station OCW (Table 3-3, Column 5). If column five contains a 'CA' entry, this station is to be assigned for Common Audible. In the C/D boxes enter the numbers of the stations to receive Common Audible. If fewer than 10 stations are entered, enter '00' as the last station.

NOTE: The initialization program assigns the primary attendant's telephone as the first station and the secondary attendant's telephone as the second station in the Common Audible group. These assignments can be changed if desired.

EXAMPLE:

2.23 A customer has determined that it is required for stations 20,34,48 and 49 to receive CO audible on all common CO lines. This has already been indicated on the Station OCW and these stations have not been assigned to a ring group in Programs 24-27. Therefore, these stations can be entered on the PRF in the C/D boxes for Program 28. Since fewer than ten stations are being entered, a '00' must be entered as the last number.

FEATURE REFERENCE:

2.24 Flexible Ringing

PROGRAM 29, OFF HOOK SIGNALING AND DSS OVERRIDE

ACCESS:

2.25 DSS console Key 29.

DESCRIPTION:

2.26 Off Hook Signaling provides CO and ICM audible signals for stations when the telephone is either on hook or off hook. If the system is not programmed for Off Hook Signaling, stations will receive CO and ICM audible signals only when on hook. DSS Override allows the attendant to override any ICM call in progress and override the DND and Monitor modes. When programmed, this feature is automatic.

LIMITATIONS:

2.27 Even when a system is programmed for Off Hook Signaling, a station will only receive CO audible for lines in the ring group to which the station has been assigned.

INSTRUCTIONS:

2.28 Refer to the System OCW (Table 3-2, Items 17a and 17b) to determine if these features are to be programmed and on this basis, enter the appropriate code in the D box for Program 29 on the PRF.

Code	Function
Ø	Neither Off Hook Signaling nor DSS Override
1	Off Hook Signaling only
2	DSS Override only
3	Both Off Hook Signaling and DSS Override

EXAMPLE:

2.29 The System OCW indicates that Off Hook Signaling is not required but DSS Override is required. A '2' would be entered in the D box.

FEATURE REFERENCE:

2.3Ø Off Hook Tone Signaling, DSS Override

PROGRAM 3Ø, DTMF OPX

ACCESS:

2.31 DSS console key 3Ø.

DESCRIPTION:

2.32 Each single line telephone installed as an off-premise station can have either Dual Tone Multifrequency (DTMF) or Dial Pulse Signaling.

PREREQUISITES:

2.33 Off-premises stations must be single line telephones. If all off-premises stations have Dial Pulse Signaling one A-OPU-A PCB must be installed in the KSU for every four OPX telephones. If any of the stations has DTMF, an A-OPU-B PCB is required (also accommodating four telephones). For every DTMF OPX, an MFRB-A PCB must be installed on the A-OPU-B PCB.

INSTRUCTIONS:

2.34 Refer to the Station OCW (Table 3-3, Column 3) to determine the station numbers of single line telephones. Station numbers will be consecutively numbered. In the D boxes corresponding with these station numbers in Program 3Ø on the PRF, enter a 'Ø' if the single line telephone OPX is to have dial pulse; enter a '1' if it will have DTMF.

NOTE: Only make entries next to station numbers corresponding with off-premises stations.

EXAMPLE:

2.35 If a customer requires three OPXs (stations 37,38,39) and has decided that stations 37 and 38 should have DTMF and station 39 should have Dial Pulse Signaling, a '1' would be entered in the D boxes for stations 37 and 38 and a 'Ø' in the D box for station 39. This information also serves to check if the correct number of A-OPU and MFRB PCBs has been entered on the System Hardware Configuration Worksheet (Tables 3-4, 3-5, 3-6).

FEATURE REFERENCE:

2.36 Off-Premises Extension

PROGRAM 31, DO NOT DISTURB

ACCESS:

2.37 DSS console key 31.

DESCRIPTION:

2.38 Each station may be programmed for the DND feature, which will allow the station user to block all incoming CO and ICM audible signals. A station which is to be programmed as the executive partner in an Executive Call Forward pair must be programmed for DND.

LIMITATIONS:

2.39 The attendant can override the DND feature if the system has been programmed for DSS Override in Program 29.

INSTRUCTIONS:

2.40 Refer to the Station OCW (Table 3-3, Column 6) for those stations requiring this feature. On the PRF in the D boxes of Program 31, enter a '0' for stations not requiring DND; enter a '1' for stations requiring DND.

EXAMPLE:

2.41 If it has been determined that station 19 is to have DND, a '1' must be placed in the D box for station 19.

FEATURE REFERENCE:

2.42 DND, Executive Call Forward, DSS Override

PROGRAM 32, RECALL TIMING

ACCESS:

2.43 DSS console key 32.

DESCRIPTION:

2.44 An audible signal can be provided as a recall for calls on Exclusive Hold. Only the station at which the call was placed on Exclusive Hold will receive the signal. The amount of time that a call may be left on Exclusive Hold before a recall signal is given is programmable in 16 second intervals and up to a maximum of 128 seconds. The system may be programmed for no recall signal.

INSTRUCTIONS:

2.45 Refer to the System OCW (Table 3-2, Item 17c) to determine the desired amount of time a call may be left on Exclusive Hold before a recall signal is given. On the PRF enter the appropriate code in the D box of Program 32.

Code	Function
Ø	no recall time
1	16 seconds
2	32 seconds
3	48 seconds
4	64 seconds
5	8Ø seconds
6	96 seconds
7	112 seconds
8	128 seconds

EXAMPLE:

2.46 If it is desirable to have a recall time of 48 seconds, the corresponding code, '3' must be entered in the D box.

FEATURE REFERENCE:

2.47 Hold

PROGRAM 33, CO LINE SIGNALING

ACCESS:

2.48 DSS console key 33.

DESCRIPTION:

2.49 CO lines can be programmed for either DTMF or Dial Pulse Signaling.

PREREQUISITE:

2.50 The proper Tone and Signaling (A-SSU-A/B/C) PCB must be installed in the KSU.

INSTRUCTIONS:

2.51 Refer to the System OCW (Table 3-2, Item 3) to determine whether DTMF or Dial Pulse Signaling is required. On the PRF enter a '0' in the D box of Program 33 for DTMF; enter a '1' for Dial Pulse Signaling.

EXAMPLE:

2.52 A TC-12 system is to have DTMF signaling on CO lines. Therefore a '0' must be entered in the D box. This also indicates that an A-SSU-A PCB is required, because the A-SSU-A is the proper Tone and Signaling PCB for DTMF signaling on a TC-12 system.

FEATURE REFERENCE:

2.53 CO Call, Incoming

PROGRAM 34, PBX OPERATION

ACCESS:

2.54 DSS console key 34.

DESCRIPTION:

2.55 Lines can be assigned for PBX operation. Lines which are to be connected to a PBX must be assigned as PBX lines for proper operation of toll restriction and the Flash Key.

INSTRUCTIONS:

2.56 Refer to the System OCW (Table 3-2, Item 4) to determine which lines are to be assigned for PBX operation. On the PRF enter a '0' in the D box for each line to have normal CO line operation; enter a '1' for each line to be assigned for PBX operation.

NOTE: When PBX lines are programmed, PBX access codes must be entered in Program 44.

EXAMPLE:

2.57 If a TC-8 system is to have CO lines 1-8 with only CO line 8 assigned for PBX operation, a '0' must be entered in the D boxes of CO lines 1-7, and a '1' must be entered in the D box of CO line 8. Because there is a line programmed for PBX operation, access codes must also be programmed.

PROGRAM 35, FLASH KEY

ACCESS:

2.58 DSS console key 35.

DESCRIPTION:

2.59 The Flash key produces a 550 msec. open loop or ground flash on the CO/PBX line.

PREREQUISITE:

2.60 It must be determined if an open loop or ground flash is required. An A-AGU-A PCB must be installed for ground flash operation.

INSTRUCTIONS:

2.61 Refer to the System OCW (Table 3-2, Item 17d) to determine whether an open loop or ground flash is required. Enter the appropriate code on the PRF in the D box for Program 35.

Code	Function
0	no flash operation
1	ground transfer
2	open loop flashing

FEATURE REFERENCE:

2.62 Flash

PROGRAM 36, MEET-ME-ANSWER PAGING

ACCESS:

2.63 DSS console key 36.

DESCRIPTION:

2.64 The system may be programmed for Meet-Me-Answer Paging to allow a handset to handset conversation, initiated by a page, to be established.

LIMITATIONS:

2.65 The paged zone and All Call are unavailable for 3Ø seconds or until conversation is established.

INSTRUCTIONS:

2.66 Refer to the System OCW (Table 3-2, Item 17e) to determine if Meet-Me-Answer Paging is required. On the PRF enter a 'Ø' in the D box if not required; enter a '1' if required.

EXAMPLE:

2.67 It has been determined that Meet-Me-Answer Paging is desired for the system. A '1' must be entered in the D box for Program 36.

FEATURE REFERENCE:

2.68 Meet-Me-Answer Paging, Paging

PROGRAM 37, RESTRICTED QUEUE GROUPS

ACCESS:

2.69 DSS console key 37.

DESCRIPTION:

2.7Ø Up to three queue groups can be programmed as restricted.

LIMITATIONS:

2.71 Queue groups Ø and 5 cannot be assigned as restricted.

PREREQUISITES:

2.72 Lines will be assigned to queue groups in Program 4Ø. Stations will be assigned as dial restricted in Program 38. Dial restricted stations will not be allowed to dial on a line in a restricted queue group.

INSTRUCTIONS:

2.73 Refer to the System OCW (Table 3-2, Item 1Øb) to determine which queue groups are to be restricted. On the PRF enter the queue group number(s) (1-4) to be restricted in the D boxes for this program.

EXAMPLE:

2.74 A system is to have WATS and FX lines. It is not desirable to allow access to these lines by all stations. Therefore, these lines are assigned to a specific queue group (for the purposes of this example, queue group 2 [assignment to be made in Program 4Ø]). This queue group must then be designated as a restricted queue group by entering a '2' in the D box for Program 37. All stations programmed as dial restricted (Program 38) will be denied access to the WATS and FX lines.

NOTE: Program 37 is used only to program selected queue groups as restricted. Line assignment to queue groups and station dialing restrictions must be programmed in the appropriate programs. Refer to Figure 4-1 and Table 4-2 for an overview of queue group restriction application.

FEATURE REFERENCE:

2.75 Queuing, Toll Restriction, Central Office Call, Outgoing

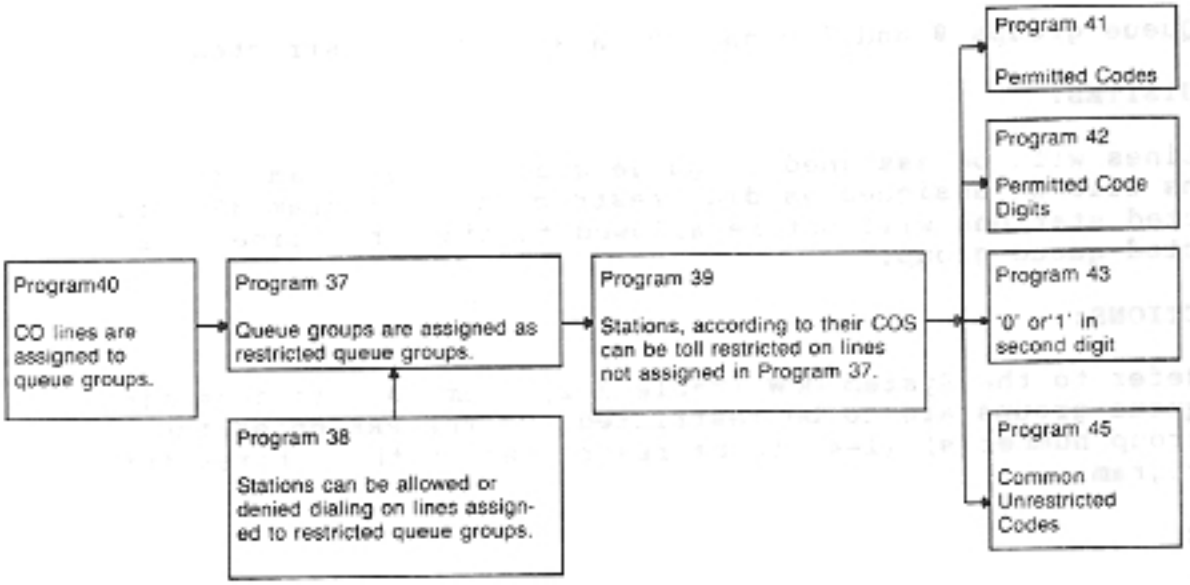


Figure 4-1 QUEUE GROUP RESTRICTIONS

Table 4-2 STATION CLASS OF SERVICE AND DIAL RESTRICTIONS

PROGRAM #38 Station Dial Restrictions	PROGRAM #39 Station COS	PERMITTED DIALING IN QUEUE GROUPS (Not in Program 37)	DENIED DIALING IN QUEUE GROUPS (Denied in Program 37)
00	00	No restriction.	No restriction.
00	01	No restriction.	No restriction.
00	02	Permitted codes & Unrestricted Codes.	No restriction.
00	03	Permitted codes, Unrestricted codes & Local 7-digit codes.	No restriction.
00	04	Permitted codes, Unrestricted codes, Local 7-digit codes & 1+7-digit codes.	No restriction.
00	05	Unrestricted codes, Local 7-digit codes & 1+7-digit codes.	No restriction.
00	06	Local 7-digit codes & Unrestricted codes.	No restriction.
00	07	Unrestricted codes.	No restriction.
**	08	Denied dialing.	Denied dialing.
01	00	No restriction.	No restriction.
01	01	No restriction.	Denied dialing.
01	02	Permitted codes & Unrestricted codes.	Denied dialing.
01	03	Permitted codes, Unrestricted codes & Local 7-digit codes.	Denied dialing.
01	04	Permitted codes, Unrestricted codes, Local 7-digit codes & 1+7-digit codes.	Denied dialing.
01	05	Unrestricted codes, Local 7-digit codes & 1+7-digit codes.	Denied dialing.
01	06	Local 7-digit codes & Unrestricted codes.	Denied dialing.
01	07	Unrestricted codes.	Denied dialing.

** Don't care

PROGRAM 38, STATION DIAL RESTRICTIONS

ACCESS:

2.76 DSS console key 38.

DESCRIPTION:

2.77 Stations are either allowed or denied dialing on lines in restricted queue groups.

PREREQUISITE:

2.78 Restricted queue groups must be identified (Program 37). Lines will be assigned to queue groups in Program 40.

INSTRUCTIONS:

2.79 Refer to the Station OCW (Table 3-3, Column 7) to determine if a station is to be dial restricted. On the PRF for each station in the system enter a 'Ø' in the D box if the station is not to be dial restricted; enter a '1' in the D box if the station is to be dial restricted.

EXAMPLE:

2.8Ø Based on the example used for Program 37, it has been determined that stations 28, 32, and 39 are not to be allowed access to WATS and FX lines. Since the queue group into which all WATS and FX lines will be assigned (queue group 2) has been programmed as a restricted queue group in Program 37, these stations may be denied access to these lines by placing a '1' in the D boxes corresponding with stations 28, 32, and 39.

NOTE: If another queue group besides queue group 2 had also been restricted in Program 37, these stations would also be restricted from dialing on the lines assigned to that queue group.

FEATURE REFERENCE:

2.81 Queuing, Toll Restriction, Central Office Call, Outgoing

PROGRAM 39, STATION CLASS OF SERVICE

ACCESS:

2.82 DSS console key 39.

DESCRIPTION:

2.83 A station's COS determines dialing restrictions applied on CO lines. These restrictions are in addition to any restrictions assigned through denied dialing on lines in restricted queue groups. Class of Service 0-7 will not affect use of Private Lines. Class of Service 8 prevents use of any CO line, including Private Lines.

INSTRUCTIONS:

2.84 Refer to the Station OCW (Table 3-3, Column 8) to determine the required COS for each station. On the PRF, for each station in the system, enter the required COS code in the D box.

Code	Function
0&1	no toll restrictions
2	can dial permitted codes (to be assigned in Program 41) and common unrestricted codes (to be assigned in Program 45)
3	can dial permitted codes, 7 digit local numbers, and common unrestricted codes
4	can dial permitted codes, 7 digit local numbers, 1 + 7 digit toll numbers and common unrestricted codes
5	can dial 7 digit local, 1 + 7 digit toll numbers and common unrestricted codes
6	can dial 7 digit local numbers and common unrestricted codes
7	can dial common unrestricted codes
8	can dial ICM calls

NOTES:

(a) Behind a PBX, toll restriction will be applied after the PBX access code has been dialed (access codes will be programmed in Program 44).

(b) COS 2-8 cannot dial '0' or '1' as the first or second digit, except as permitted codes. Program 43 can be used to override the second digit restriction.

EXAMPLE:

2.85 It has been determined that station 29 is only to be allowed access to Intercom calls. In the D box for station 29 an '8' must be entered.

FEATURE REFERENCE:

2.86 Class of Service, Toll Restriction, Central Office Call, Outgoing

PROGRAM 40, QUEUE GROUPS

ACCESS:

2.87 DSS console key 40.

DESCRIPTION:

2.88 Up to six queue groups can be programmed in order to group similar lines (i.e. FX, WATS, Common CO, etc.) together. This allows a station user to queue for a specific type of line.

INSTRUCTIONS:

2.89 Refer to the System OCW (Table 3-2, Item 10a) to determine queue group assignments. On the PRF, for each station, place the appropriate code in the D box.

Code	Function
0	No queuing or Off-Premises Extension (OPX) access will be allowed for any line assigned to this group. This code should be entered for unused lines. These lines cannot be extended to an OPX by the attendant using the SC key on the console. This group cannot be assigned in Program 37.
1	Queue group 1
2	Queue group 2
3	Queue group 3
4	Queue group 4
5	No queuing or OPX dial access will be allowed for any line assigned to this group. This code should be entered for Private Lines and Hotlines. This group cannot be assigned in Program 37.

NOTES:

(a) All lines are initialized with code '0'. All unused line positions and lines removed from service must be programmed with '0'.
(b) One queue group (usually group 1) should be used for local lines. The other groups could be used for FX lines, WATS lines etc.

EXAMPLE:

2.90 It has been determined that all FX and WATS lines are to be grouped together so that these lines may be restricted to certain stations. In keeping with previous examples, these lines are to be assigned to queue group 2. A '2' will be placed in the D box for each FX line and WATS line.

NOTE: Assignment to a queue group in this program does not automatically cause the queue group to be restricted unless the queue group was assigned as restricted in Program 37 and stations were assigned as restricted in Program 38. Refer to Figure 4-1 and Table 4-2 for an overview of queue group restriction applications.

FEATURE REFERENCE:

2.91 Queuing, Toll Restriction, Central Office Call, Outgoing

PROGRAM 41, PERMITTED CODES

ACCESS:

2.92 DSS console key 41.

DESCRIPTION:

2.93 Up to eight 8 digit codes may be entered as permitted codes to allow station users to place calls to a division of their business in a specific exchange and area code, nearby areas having different area codes (areas where business is normally conducted) and areas in WATS (800) services. A station's ability to use permitted codes has been determined by COS assignment. (Program 39)

LIMITATIONS:

2.94 Only stations with COS 0 through 4 can dial permitted codes.

INSTRUCTIONS:

2.95 Refer to the System OCW (Table 3-2, Item 11a) to determine permitted codes. In the D boxes enter the digits of up to eight permitted codes, beginning with the first D box.

NOTES:

(a) Any digits dialed after the last permitted code digit will be allowed (up to the maximum number of digits allowed by Program 42). For example, if 1-800 is entered as a permitted code, any digits dialed after 1-800 will be allowed.
(b) The DC key is used to program a digit as a "don't care" digit. For example: 1-DC-DC-DC-5-5-5 allows users to reach the Directory Assistance operator in any area code.
(c) Do not enter 0 or DC as the first digit of a permitted code, as this will allow the user to access a toll operator.
(d) Use Program 42 to enter the maximum number of digits that will be permitted.

FEATURE REFERENCE:

2.96 Class of Service, Toll Restriction, Central Office Call, Outgoing

PROGRAM 42, PERMITTED CODE DIGITS

ACCESS

2.97 DSS console key 42.

DESCRIPTION:

2.98 The number of permitted code digits may be limited from one to 15, or not limited at all.

PREREQUISITE:

2.99 At least one permitted code must be programmed in Program 41.

INSTRUCTIONS

2.100 Refer to the System OCW (Table 3-2, Item 11b) to determine the maximum number of permitted code digits. On the PRF, enter the number in the C/D boxes for Program 42. If a single digit number is to be entered (e.g. '9'), enter a zero in the C box and the digit in the D box.

4

NOTES:

(a) If '00' is entered in both the C and D boxes, any number of digits may be dialed.
(b) Do not enter DC.

EXAMPLE:

2.101 In Program 44 1-800 has been programmed as a permitted code. It is desired that up to 11 digits can be dialed after 1-800. This makes the total number of digits to be allowed 15. Therefore '15' would be entered in the C/D boxes.

FEATURE REFERENCE:

2.102 Class of Service, Toll Restriction, Central Office Call, Outgoing

PROGRAM 43, '0' OR '1' SECOND DIGIT RESTRICTION

ACCESS:

2.103 DSS console key 43.

DESCRIPTION:

2.104 The '0' or '1' Second Digit Restriction is used to allow or disallow calls when the second digit dialed is a '0' or a '1'.

LIMITATIONS:

2.105 This program will only apply to COS 3 through 6.

INSTRUCTIONS:

2.106 Refer to the System OCW (Table 3-2, Item 17f) to determine if this restriction is required. On the PRF, enter '0' in the D box if the restriction is required, enter '1' if not required.

EXAMPLE:

2.107 If it is required that the '0' or '1' Second Digit Restriction be programmed for the system the proper code, '0', must be entered in the D box.

FEATURE REFERENCE:

2.108 Class of Service, Toll Restriction, Central Office Call, Outgoing

PROGRAM 44, PBX ACCESS CODES

ACCESS:

2.109 DSS console key 44.

DESCRIPTION:

2.110 In order to obtain proper COS operation, access codes must be entered to allow users to access CO lines when the system is installed behind a PBX. If the PBX provides Night Service or call pickup using dial access codes, these codes should be programmed here as CO line access codes to prevent defeating toll restriction. Up to four access codes, of one or two digits can be entered.

LIMITATIONS:

2.111 DC can be entered as the second digit only.

PREREQUISITE:

2.112 Program 34 must indicate that at least one line is assigned for PBX operation.

INSTRUCTIONS:

2.113 Refer to the System OCW (Table 3-2, Item 12) to determine the PBX access codes. On the PRF enter the access codes in the D boxes.

EXAMPLE:

2.114 If a PBX access code for a system is to be '9', a '9' is entered in the first D box of the first block of boxes for Program 44.

FEATURE REFERENCE:

2.115 PBX, Central Office Call, Outgoing

PROGRAM 45, COMMON UNRESTRICTED CODES

ACCESS:

2.116 DSS console key 45.

DESCRIPTION:

2.117 Up to four 4 digit common unrestricted codes can be established to be accessed by stations with COS 2 through 7.

INSTRUCTIONS:

2.118 Refer to the System OCW (Table 3-2, Item 11c) for common unrestricted codes to be entered. On the PRF enter the digits of up to four codes in the D boxes beginning with the first D box. Do not enter '0' or 'DC' as the first digit as this will allow the user to access a toll operator.

EXAMPLES:

2.119 Examples of common unrestricted codes are: emergency assistance (911), local directory assistance (411 or 1411) and telephone repair (611). Therefore, for this example, '911' is entered in the D boxes of the first block of boxes for Program 45; '411' or '1411' in the D boxes of the second block of boxes, and '611' in the D boxes of the third block of boxes.

FEATURE REFERENCE:

2.120 Class of Service, Toll Restriction, Central Office Call, Outgoing

PROGRAM 46, DIGIT ABSORBING

ACCESS:

2.121 DSS console key 46.

DESCRIPTION:

2.122 In certain central offices, specific digits, when dialed as the first digit, are absorbed (ignored). (For proper toll restriction, absorbed digits should be entered in system memory.) Up to four absorb digits can be entered.

INSTRUCTIONS:

2.123 Refer to the System OCW (Table 3-2, Item 13) for the absorb digits. On the PRF enter the digits in the D boxes. Do not enter 'Ø' or '1' as an absorb digit, as this will allow the user to access a toll operator.

FEATURE REFERENCE:

2.124 Toll Restriction, Central Office Call, Outgoing

PROGRAMS 47-50, EXECUTIVE CALL FORWARD

ACCESS:

2.125 DSS console key 47 (pair 1) / 48 (pair 2) / 49 (pair 3) / 50 (pair 4).

DESCRIPTION:

2.126 Four pairs of stations can be assigned so that calls to one of the stations (the executive partner) in a pair will automatically be forwarded to the other station in the same pair.

LIMITATIONS:

2.127 The other station in the pair cannot be assigned a Private Line. A station can be assigned to only one pair.

PREREQUISITES:

2.128 The station being designated as the executive partner must be programmed for DND in Program 31.

INSTRUCTIONS:

2.129 Refer to the Station OCW (Table 3-3, Column 6) for Executive Call Forward pairs. On the PRF enter the executive partner's station number in the A/B boxes; enter the other (non-executive) partner's station number in the C/D boxes.

EXAMPLE:

2.130 It has been determined that stations 25 and 30 will be Executive Call Forward partners, with station 25 as the executive partner and 30 as the other partner. Station 25 has been programmed for DND in Program 31, therefore it can be designated as an executive partner in this program. In this example '25' will be entered in the A/B boxes, '30' will be entered in the C/D boxes.

FEATURE REFERENCE:

2.131 Executive Call Forward, DND, Central Office Call, Incoming, Intercom

PROGRAMS 51-56, PRIVATE LINE/HOTLINE ASSIGNMENTS

ACCESS:

2.132 DSS console key 51 (assignment 1) / 52 (assignment 2) / 53 (assignment 3) / 54 (assignment 4) / 55 (assignment 5) / 56 (assignment 6).

DESCRIPTION:

2.133 A station can have up to one Private Line and one Hotline assigned. The line circuits are assigned as follows:

TC-8 (Programs 51 and 52 only)
Program 51 assigns Private Line/Hotline #2 on line circuit 11,
Program 52 assigns Private Line/Hotline #1 on line circuit 12,

TC-12 (Programs 51-54 only)
Program 51 assigns Private Line/Hotline #4 on line circuit 11,
Program 52 assigns Private Line/Hotline #3 on line circuit 12,
Program 53 assigns Private Line/Hotline #2 on line circuit 13,
Program 54 assigns Private Line/Hotline #1 on line circuit 14.

TC-22
Program 51 assigns Private Line/Hotline #6 on line circuit 21,
Program 52 assigns Private Line/Hotline #5 on line circuit 22,
Program 53 assigns Private Line/Hotline #4 on line circuit 23,
Program 54 assigns Private Line/Hotline #3 on line circuit 24,
Program 55 assigns Private Line/Hotline #2 on line circuit 25,
Program 56 assigns Private Line/Hotline #1 on line circuit 26.

LIMITATIONS:

2.134 The TC-8 system can have a total of two Private Line/Hotline assignments. The TC-12 system can have a total of four. The TC-22 system can have a total of six.

PREREQUISITES:

2.135 If a station has been assigned as the non-executive partner in an Executive Call Forward pair (Programs 47-50) it cannot be assigned a Private Line.

INSTRUCTIONS:

2.136 Refer to the System OCW (Table 3-2, Item 2) to determine the total number of Private Line/Hotline assignments

Private Lines:

2.137 Refer to the Station OCW (Table 3-3, Column 9) to determine which stations are to be assigned a Private Line. On the PRF enter '00' in the A/B boxes; enter the number of the station to have a Private Line in the C/D boxes.

Hotlines:

2.138 Refer to the Station OCW (Table 3-3, Column 10) to determine Hotline pairs. On the PRF enter the number of the first station in the pair in the A/B boxes; enter the number of the other station in the same pair in the C/D boxes

NOTE: Do not assign more Private Lines and Hotlines than the maximum allowed for the system.

EXAMPLE:

2.139 A TC-8 system is to have one Private Line for station 24 and one Hotline pair, stations 26 and 32. In the A/B boxes for Program 51 '00' is entered; '24' is entered in the C/D boxes. The Hotline assignment is designated by putting a '26' in the A/B boxes for program 52 and '32' in the C/D boxes.

FEATURE REFERENCE:

2.140 Private Line, Hotline

PROGRAM ALM, ALARM

ACCESS:

2.141 DSS console key ALM.

DESCRIPTION:

2.142 Alarm signals from a customer provided security system will be transmitted to the attendant or, while the system is in the Night Service (NT) mode, to other stations.

INSTRUCTIONS:

2.143 Refer to the System OCW (Table 3-2, Item 9) to determine if this feature is required and whether open or closed circuit detection is to be used. On the PRF, enter a '0' in the D box for no alarm detection or if alarm detection is for a "closed" circuit indication (normally open contacts); enter '1' for an "open" circuit (normally closed contacts).

FEATURE REFERENCE:

2.144 Alarm, Repeating

PROGRAMS EZ1-EZ2, EXTERNAL PAGE ZONES

ACCESS:

2.145 DSS console key EZ1 (zone 1) or EZ2 (zone 2).

DESCRIPTION:

2.146 The system can be equipped with two external paging zones and can be programmed to supply Background Music and CO Audible signaling to these zones.

PREREQUISITES:

2.147 Customer provided external paging equipment must be installed.

INSTRUCTIONS:

2.148 Refer to the System OCW (Table 3-2, Item 7) to determine the BGM and CO audible assignments. For each zone, if BGM is not required, enter 'Ø' in the B box; enter '1' if it is required. CO audible transmitted through external equipment may be for:

Code	Function
Ø	no CO audible in the zone
1	CO audible for lines in Ring Group 1
2	CO audible for lines in Ring Group 2
3	CO audible for lines in Ring Group 3
4	CO audible for lines in Ring Group 4
5	CO audible for common CO lines
6	CO audible when Night Service feature is activated

For each zone, enter the appropriate code in the D box.

EXAMPLE:

2.149 A system is to have two external page zones. Both zones require BGM. Zone 1 requires CO audible for common CO lines. Zone 2 requires CO audible for lines in Ring Group 1 only. On the PRF for Program EZ1, a '1' must be entered in the B box; a '5' must be entered in the D box. For Program EZ2, a '1' must be entered in the B box and D box.

FEATURE REFERENCE:

2.150 BGM, Night Service

PROGRAM IZ1-IZ4, INTERNAL PAGE ZONES

ACCESS:

2.151 DSS console key IZ1 (zone 1) / IZ2 (zone 2) / IZ3 (zone 3) / IZ4 (zone 4).

DESCRIPTION:

2.152 Each station can be assigned to one of four internal paging zones in order to receive internal zone paging announcements. Stations in an internal paging zone must be consecutively numbered. The lowest numbered stations to be assigned must be assigned to the first internal page zone.

INSTRUCTIONS:

2.153 Refer to the Station OCW (Table 3-3, Column 11) for internal page zone assignments. On the PRF, for each internal page zone (IZ1 through IZ4) to be programmed, enter the lowest numbered station in the A/B boxes; enter the highest numbered station in the C/D boxes. Remember that stations within an internal page zone must be consecutively numbered and that lower numbered stations are assigned to the first internal page zone. If only one station is assigned, enter that station number in both the A/B and C/D boxes.

EXAMPLE:

2.154 It has been determined that the following internal page zone assignments will be made:

IZ1 - stations 20,21,22,23,24,25
IZ2 - station 26
IZ3 - stations 27,28,29,30

Notice that within each zone stations are numbered consecutively. In addition, the lowest numbered stations being assigned are in the lowest numbered page zone to which assignments are being made. The next lowest station is in the next lowest page zone and so forth. Entries for IZ1 then will be '20' in the A/B boxes and '25' in C/D boxes. Entries for IZ2 will be '26' in the A/B boxes and, since there is only one station in this zone, '26' will also be entered in the C/D boxes. Entries for IZ3 will be '27' in the A/B boxes and '30' in the C/D boxes. Nothing will be entered for IZ4 since there are no stations assigned.

FEATURE REFERENCE:

2.155 Paging

PROGRAM NT, NIGHT SERVICE

ACCESS:

2.156 DSS console key NT.

DESCRIPTION:

2.157 Stations can be assigned to receive common CO audible signaling while the system is in the Night Service mode.

LIMITATIONS:

2.158 A station assigned to the NT group cannot be assigned to the Common Audible group. A maximum of 20 stations can be assigned to the NT group.

PREREQUISITE:

2.159 Ensure that stations to be assigned have not been assigned for Common Audible in Program 28.

INSTRUCTIONS:

2.160 Refer to the Station OCW (Table 3-3, Column 12) to determine which stations are to be assigned. On the PRF enter the station numbers (up to 20) in the C/D boxes. If fewer than 20 stations are assigned, enter '00' as the last entry.

EXAMPLE:

2.161 It has been determined that stations 29, 32, 37, 42 and 50 are to be assigned to the NT group. Assuming that these stations have not already been assigned in Program 28, they may be entered in the C/D boxes. Because there are fewer than 20 stations to be assigned, a '00' will be entered in the C/D boxes below the last station number, '50'.

FEATURE REFERENCE:

2.162 Night Service, Flexible Ringing

3. TOLL RESTRICTION COMPATIBILITY WITH PBX

3.Ø1 Engineering efforts have been made to make the toll restriction program compatible with the majority of PBXs. Before installing this feature in systems behind a PBX, make sure that PBX signaling arrangements (particularly the transfer function) and the toll restriction arrangements of this system are compatible with the PBX.

WARNING: CHECK COMPATIBILITY WITH THE PBX.

3.Ø2 Electronic key telephone systems are able to recognize trunk access codes. The toll restriction program is not started until such a code is recognized. Using Program 44, up to 4 different 1 or 2 digit codes can be programmed as trunk access codes.

3.Ø3 Stations assigned to Classes of Service Ø through 7 are permitted to dial any PBX number, even those containing Ø's and 1's, without encountering restriction.

3.Ø4 Class of Service 8 is intended for use in systems behind a PBX where the user is not permitted to dial on PBX lines, but may dial all Intercom calls.

INCOMING VS OUTGOING PBX CALLS

3.Ø5 The system has the ability to recognize the difference between an incoming call and an outgoing call. Only stations with COS Ø are permitted to dial when dial tone returns after an incoming call. Stations with COS 1 are permitted dialing on lines not in restricted queue groups (Program 37). The system has no way of determining whether the call is from another PBX station or from an outside line. If dialing were permitted under this condition, toll restriction could be defeated.

PBX FLASHING

3.Ø6 In many PBX systems, the flash key is used for transferring incoming calls. The TC-8/TC-12/TC-22 systems are designed to function with PBX systems having transfer operation.

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

3.07 The effect of Flash operation on the toll restriction program will vary, depending on the station COS (Program 39) and whether the station is involved in an outgoing or an incoming call, as follows:

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

DIAL AND CLASS ARRANGEMENTS FOR PBX OPERATION

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

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

(a) Program the PBX non-restricted lines so that outgoing station restriction (Program 38) applies (i.e. assign these lines in Program 37, and program outgoing station restrictions as required).
(b) Assign all stations that are to be subject to PBX toll restriction to Class of Service 0 or 1.
(c) Assign stations permitted to make only PBX calls to Class of Service 7 and make sure that the trunk access codes are written in Program 44.
(d) Assign stations permitted to make only key system calls to Class of Service 8.
(e) Assign stations that are to be assigned key system toll restrictions to the appropriate Class of Service: 2 through 6.

Table 4-1 PROGRAM RECORD FORM, TC-8/TC-12/TC-22 (Page 1 of 5)

PROGRAM 20
Group Ringing

A	B	C	D
0	0	0	☐

PROGRAM 21
Line Ring Group 1

A	B	C	D
0	0	☐	☐

PROGRAM 22
Line Ring Group 2

A	B	C	D
0	0	☐	☐

PROGRAM 23
Line Ring Group 3

A	B	C	D
0	0	☐	☐

PROGRAM 24
Ring Group 1 Stations

A	B	C	D
0	1	☐	☐
0	2	☐	☐
0	3	☐	☐
0	4	☐	☐
0	5	☐	☐
0	6	☐	☐
0	7	☐	☐
0	8	☐	☐
0	9	☐	☐
1	0	☐	☐

PROGRAM 25
Ring Group 2 Stations

A	B	C	D
0	1	☐	☐
0	2	☐	☐
0	3	☐	☐
0	4	☐	☐
0	5	☐	☐
0	6	☐	☐
0	7	☐	☐
0	8	☐	☐
0	9	☐	☐
1	0	☐	☐

PROGRAM 26
Ring Group 3 Stations

A	B	C	D
0	1	☐	☐
0	2	☐	☐
0	3	☐	☐
0	4	☐	☐
0	5	☐	☐
0	6	☐	☐
0	7	☐	☐
0	8	☐	☐
0	9	☐	☐
1	0	☐	☐

PROGRAM 27
Ring Group 4 Stations

A	B	C	D
0	1	☐	☐
0	2	☐	☐
0	3	☐	☐
0	4	☐	☐
0	5	☐	☐
0	6	☐	☐
0	7	☐	☐
0	8	☐	☐
0	9	☐	☐
1	0	☐	☐

PROGRAM 28
Common Audible Stations

A	B	C	D
0	1	☐	☐
0	2	☐	☐
0	3	☐	☐
0	4	☐	☐
0	5	☐	☐
0	6	☐	☐
0	7	☐	☐
0	8	☐	☐
0	9	☐	☐
1	0	☐	☐

PROGRAM 29
Off Hook Signaling and DSS Override

A	B	C	D
0	0	0	☐

PROGRAM 30
DTMF Off-Premises Extensions

A	B	C	D
2	0	0	☐
2	1	0	☐
2	2	0	☐
2	3	0	☐
2	4	0	☐
2	5	0	☐
2	6	0	☐
2	7	0	☐
2	8	0	☐
2	9	0	☐
3	0	0	☐
3	1	0	☐
3	2	0	☐
3	3	0	☐
3	4	0	☐
3	5	0	☐
3	6	0	☐
3	7	0	☐
3	8	0	☐
3	9	0	☐
4	0	0	☐
4	1	0	☐
4	2	0	☐
4	3	0	☐
4	4	0	☐
4	5	0	☐
4	6	0	☐
4	7	0	☐
4	8	0	☐
4	9	0	☐

A	B	C	D
5	0	0	☐
5	1	0	☐
5	2	0	☐
5	3	0	☐
5	4	0	☐
5	5	0	☐
5	6	0	☐
5	7	0	☐
5	8	0	☐
5	9	0	☐
6	0	0	☐
6	1	0	☐
6	2	0	☐
6	3	0	☐
6	4	0	☐
6	5	0	☐
6	6	0	☐
6	7	0	☐
6	8	0	☐
6	9	0	☐
7	0	0	☐
7	1	0	☐
7	2	0	☐
7	3	0	☐
7	4	0	☐
7	5	0	☐
7	6	0	☐
7	7	0	☐
7	8	0	☐
7	9	0	☐

4

b = blank

Table 4-1 PROGRAM RECORD FORM, TC-8/TC-12/TC-22 (Page 2 of 5)

PROGRAM 31
Do Not Disturb

A	B	C	D
2	0	0	☐
2	1	0	☐
2	2	0	☐
2	3	0	☐
2	4	0	☐
2	5	0	☐
2	6	0	☐
2	7	0	☐
2	8	0	☐
2	9	0	☐
3	0	0	☐
3	1	0	☐
3	2	0	☐
3	3	0	☐
3	4	0	☐
3	5	0	☐
3	6	0	☐
3	7	0	☐
3	8	0	☐
3	9	0	☐
4	0	0	☐
4	1	0	☐
4	2	0	☐
4	3	0	☐
4	4	0	☐
4	5	0	☐
4	6	0	☐
4	7	0	☐
4	8	0	☐
4	9	0	☐

A	B	C	D
5	0	0	☐
5	1	0	☐
5	2	0	☐
5	3	0	☐
5	4	0	☐
5	5	0	☐
5	6	0	☐
5	7	0	☐
5	8	0	☐
5	9	0	☐
6	0	0	☐
6	1	0	☐
6	2	0	☐
6	3	0	☐
6	4	0	☐
6	5	0	☐
6	6	0	☐
6	7	0	☐
6	8	0	☐
6	9	0	☐
7	0	0	☐
7	1	0	☐
7	2	0	☐
7	3	0	☐
7	4	0	☐
7	5	0	☐
7	6	0	☐
7	7	0	☐
7	8	0	☐
7	9	0	☐

PROGRAM 32
Recall Timing

A	B	C	D
0	0	0	☐

PROGRAM 33
CO Line Signaling

A	B	C	D
0	0	0	☐

PROGRAM 34
PBX Operation

A	B	C	D
0	1	☐	☐
0	2	☐	☐
0	3	☐	☐
0	4	☐	☐
0	5	☐	☐
0	6	☐	☐
0	7	☐	☐
0	8	☐	☐
0	9	☐	☐
1	0	☐	☐
1	1	☐	☐
1	2	☐	☐
1	3	☐	☐
1	4	☐	☐
1	5	☐	☐
1	6	☐	☐
1	7	☐	☐
1	8	☐	☐
1	9	☐	☐
2	0	☐	☐
2	1	☐	☐
2	2	☐	☐
2	3	☐	☐
2	4	☐	☐
2	5	☐	☐
2	6	☐	☐

PROGRAM 35
Flash Key

A	B	C	D
0	0	0	☐

PROGRAM 36
Meet-Me Answer Paging

A	B	C	D
0	0	0	☐

PROGRAM 37
Restricted
Queue Groups

A	B	C	D
0	1	0	☐
0	2	0	☐
0	3	0	☐

Table 4-1 PROGRAM RECORD FORM, TC-8/TC-12/TC-22 (Page 3 of 5)

PROGRAM 38
Station Dial Restrictions

A	B	C	D
2	0	0	☐
2	1	0	☐
2	2	0	☐
2	3	0	☐
2	4	0	☐
2	5	0	☐
2	6	0	☐
2	7	0	☐
2	8	0	☐
2	9	0	☐
3	0	0	☐
3	1	0	☐
3	2	0	☐
3	3	0	☐
3	4	0	☐
3	5	0	☐
3	6	0	☐
3	7	0	☐
3	8	0	☐
3	9	0	☐
4	0	0	☐
4	1	0	☐
4	2	0	☐
4	3	0	☐
4	4	0	☐
4	5	0	☐
4	6	0	☐
4	7	0	☐
4	8	0	☐
4	9	0	☐

A	B	C	D
5	0	0	☐
5	1	0	☐
5	2	0	☐
5	3	0	☐
5	4	0	☐
5	5	0	☐
5	6	0	☐
5	7	0	☐
5	8	0	☐
5	9	0	☐
6	0	0	☐
6	1	0	☐
6	2	0	☐
6	3	0	☐
6	4	0	☐
6	5	0	☐
6	6	0	☐
6	7	0	☐
6	8	0	☐
6	9	0	☐
7	0	0	☐
7	1	0	☐
7	2	0	☐
7	3	0	☐
7	4	0	☐
7	5	0	☐
7	6	0	☐
7	7	0	☐
7	8	0	☐
7	9	0	☐

PROGRAM 39
Station Class of Service

A	B	C	D
2	0	0	☐
2	1	0	☐
2	2	0	☐
2	3	0	☐
2	4	0	☐
2	5	0	☐
2	6	0	☐
2	7	0	☐
2	8	0	☐
2	9	0	☐
3	0	0	☐
3	1	0	☐
3	2	0	☐
3	3	0	☐
3	4	0	☐
3	5	0	☐
3	6	0	☐
3	7	0	☐
3	8	0	☐
3	9	0	☐
4	0	0	☐
4	1	0	☐
4	2	0	☐
4	3	0	☐
4	4	0	☐
4	5	0	☐
4	6	0	☐
4	7	0	☐
4	8	0	☐
4	9	0	☐

A	B	C	D
5	0	0	☐
5	1	0	☐
5	2	0	☐
5	3	0	☐
5	4	0	☐
5	5	0	☐
5	6	0	☐
5	7	0	☐
5	8	0	☐
5	9	0	☐
6	0	0	☐
6	1	0	☐
6	2	0	☐
6	3	0	☐
6	4	0	☐
6	5	0	☐
6	6	0	☐
6	7	0	☐
6	8	0	☐
6	9	0	☐
7	0	0	☐
7	1	0	☐
7	2	0	☐
7	3	0	☐
7	4	0	☐
7	5	0	☐
7	6	0	☐
7	7	0	☐
7	8	0	☐
7	9	0	☐

PROGRAM 40
Queue Groups

A	B	C	D
0	1	0	☐
0	2	0	☐
0	3	0	☐
0	4	0	☐
0	5	0	☐
0	6	0	☐
0	7	0	☐
0	8	0	☐
0	9	0	☐
1	0	0	☐
1	1	0	☐
1	2	0	☐
1	3	0	☐
1	4	0	☐
1	5	0	☐
1	6	0	☐
1	7	0	☐
1	8	0	☐
1	9	0	☐
2	0	0	☐
2	1	0	☐
2	2	0	☐
2	3	0	☐
2	4	0	☐
2	5	0	☐
2	6	0	☐

4

Table 4-1 PROGRAM RECORD FORM, TC-8/TC-12/TC-22 (Page 4 of 5)

PROGRAM 41
Permitted Codes

	A	B	C	D
1	0	1	b	
	0	2	b	
	0	3	b	
	0	4	b	
	0	5	b	
	0	6	b	
	0	7	b	
	0	8	b	
2	0	1	b	
	0	2	b	
	0	3	b	
	0	4	b	
	0	5	b	
	0	6	b	
	0	7	b	
	0	8	b	
3	0	1	b	
	0	2	b	
	0	3	b	
	0	4	b	
	0	5	b	
	0	6	b	
	0	7	b	
	0	8	b	

PROGRAM 41
(cont'd)

	A	B	C	D
4	0	1	b	
	0	2	b	
	0	3	b	
	0	4	b	
	0	5	b	
	0	6	b	
	0	7	b	
	0	8	b	
5	0	1	b	
	0	2	b	
	0	3	b	
	0	4	b	
	0	5	b	
	0	6	b	
	0	7	b	
	0	8	b	
6	0	1	b	
	0	2	b	
	0	3	b	
	0	4	b	
	0	5	b	
	0	6	b	
	0	7	b	
	0	8	b	

	A	B	C	D
7	0	1	b	
	0	2	b	
	0	3	b	
	0	4	b	
	0	5	b	
	0	6	b	
	0	7	b	
	0	8	b	
8	0	1	b	
	0	2	b	
	0	3	b	
	0	4	b	
	0	5	b	
	0	6	b	
	0	7	b	
	0	8	b	

PROGRAM 42
Permitted Code Digits

	A	B	C	D
	0	0		

PROGRAM 43
"0" or "1" in 2nd Digit Permitted

	A	B	C	D
	0	0	0	

PROGRAM 44
PBX Access Codes

	A	B	C	D
1	0	1	b	
	0	2	b	
2	0	1	b	
	0	2	b	
3	0	1	b	
	0	2	b	
4	0	1	b	
	0	2	b	

PROGRAM 45
Common Unrestricted Codes

	A	B	C	D
1	0	1	b	
	0	2	b	
	0	3	b	
	0	4	b	
2	0	1	b	
	0	2	b	
	0	3	b	
	0	4	b	
3	0	1	b	
	0	2	b	
	0	3	b	
	0	4	b	
4	0	1	b	
	0	2	b	
	0	3	b	
	0	4	b	

Table 4-1 PROGRAM RECORD FORM, TC-8/TC-12/TC-22 (Page 5 of 5)

PROGRAM 46
Digit Absorbing

A	B	C	D
0	1	b	☐
0	2	b	☐
0	3	b	☐
0	4	b	☐

PROGRAM 47
Executive Call Forward

A	B	C	D
☐	☐	☐	☐

PROGRAM 48
Executive Call Forward

A	B	C	D
☐	☐	☐	☐

PROGRAM 49
Executive Call Forward

A	B	C	D
☐	☐	☐	☐

PROGRAM 50
Executive Call Forward

A	B	C	D
☐	☐	☐	☐

PROGRAM 51
Private Line/Hotline Assignments

A	B	C	D
☐	☐	☐	☐

PROGRAM 52
Private Line/Hotline Assignments

A	B	C	D
☐	☐	☐	☐

PROGRAM 53
Private Line/Hotline Assignments

A	B	C	D
☐	☐	☐	☐

PROGRAM 54
Private Line/Hotline Assignments

A	B	C	D
☐	☐	☐	☐

PROGRAM 55
Private Line/Hotline Assignments

A	B	C	D
☐	☐	☐	☐

PROGRAM 56
Private Line/Hotline Assignments

A	B	C	D
☐	☐	☐	☐

PROGRAM ALM
Alarm

A	B	C	D
0	0	0	☐

PROGRAMS EZ1-EZ2
External Page Zones

	A	B	C	D
EZ1	0	☐	0	☐
EZ2	0	☐	0	☐

PROGRAMS IZ1-IZ4
Internal Page Zones

	A	B	C	D
IZ1	☐	☐	☐	☐
IZ2	☐	☐	☐	☐
IZ3	☐	☐	☐	☐
IZ4	☐	☐	☐	☐

PROGRAM NT
Night Service

A	B	C	D
0	1	☐	☐
0	2	☐	☐
0	3	☐	☐
0	4	☐	☐
0	5	☐	☐
0	6	☐	☐
0	7	☐	☐
0	8	☐	☐
0	9	☐	☐
1	0	☐	☐
1	1	☐	☐
1	2	☐	☐
1	3	☐	☐
1	4	☐	☐
1	5	☐	☐
1	6	☐	☐
1	7	☐	☐
1	8	☐	☐
1	9	☐	☐
2	0	☐	☐

TC-8/TC-12/TC-22
ELECTRONIC KEY TELEPHONE SYSTEM
SECTION 5, INSTALLATION

1. INTRODUCTION

1.01 The INSTALLATION Section provides detailed procedures for installing TC-8/TC-12/TC-22 systems. It is intended that this equipment be installed by a competent installer who need not be certified, unless Power Failure connections are required. Read and understand this entire section before proceeding with the actual installation.

1.02 The TC-8 power supply drawing and all grounding drawings have been corrected. Information on A-NMU-A/B/C/D and the A-LNU-A/B PCBs has been revised. Tables 5-1 and 5-9 have been corrected.

5

2. PREPARATION

2.01 Factors in the following paragraphs must be considered before proceeding with the installation.

SITE REQUIREMENTS

2.02 The area for mounting the KSU and Power Supply should be clean, dry, temperature controlled and only accessible to authorized personnel. The site should be away from caustic chemicals, vibrations (heavy machinery) and static electricity (copying machines). The location should have ample room to mount and maintain the equipment (Figure 5-1a, b, c).

2.03 The Power Supply requires a dedicated 117VAC 15 AMP circuit. The AC service outlet used must be three prong and located within six feet of the power supply location. The AC service must provide a "third wire ground".

2.04 An earth ground must be provided within 25 feet (7.6m) of the installation. The third wire of the AC line cord is not an acceptable earth ground. In most installations, a cold water pipe that is metallic throughout (including all joints and sections) will provide a good earth ground.

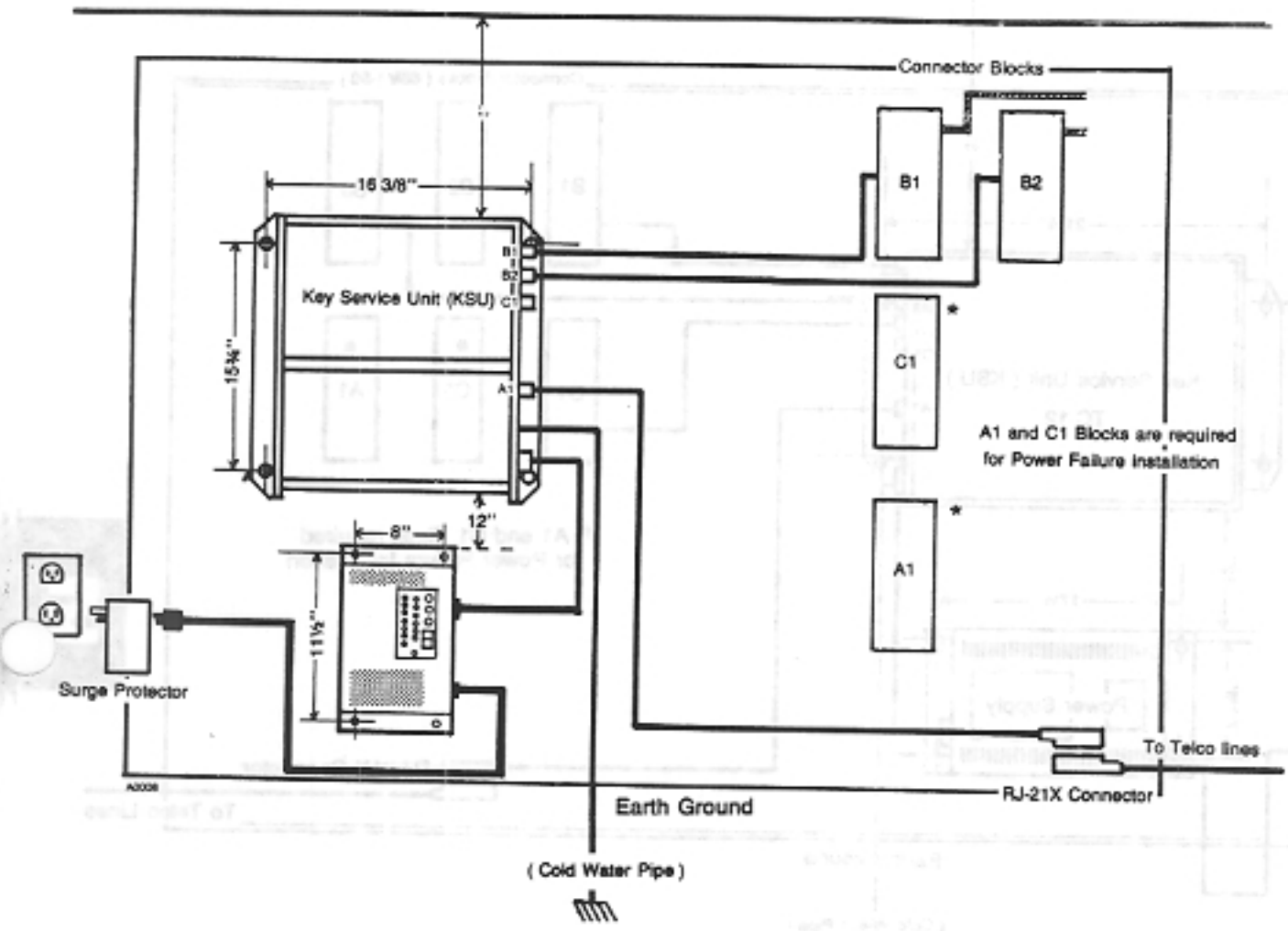


Figure 5-1a INSTALLATION LAYOUT FOR TC-8 SYSTEM

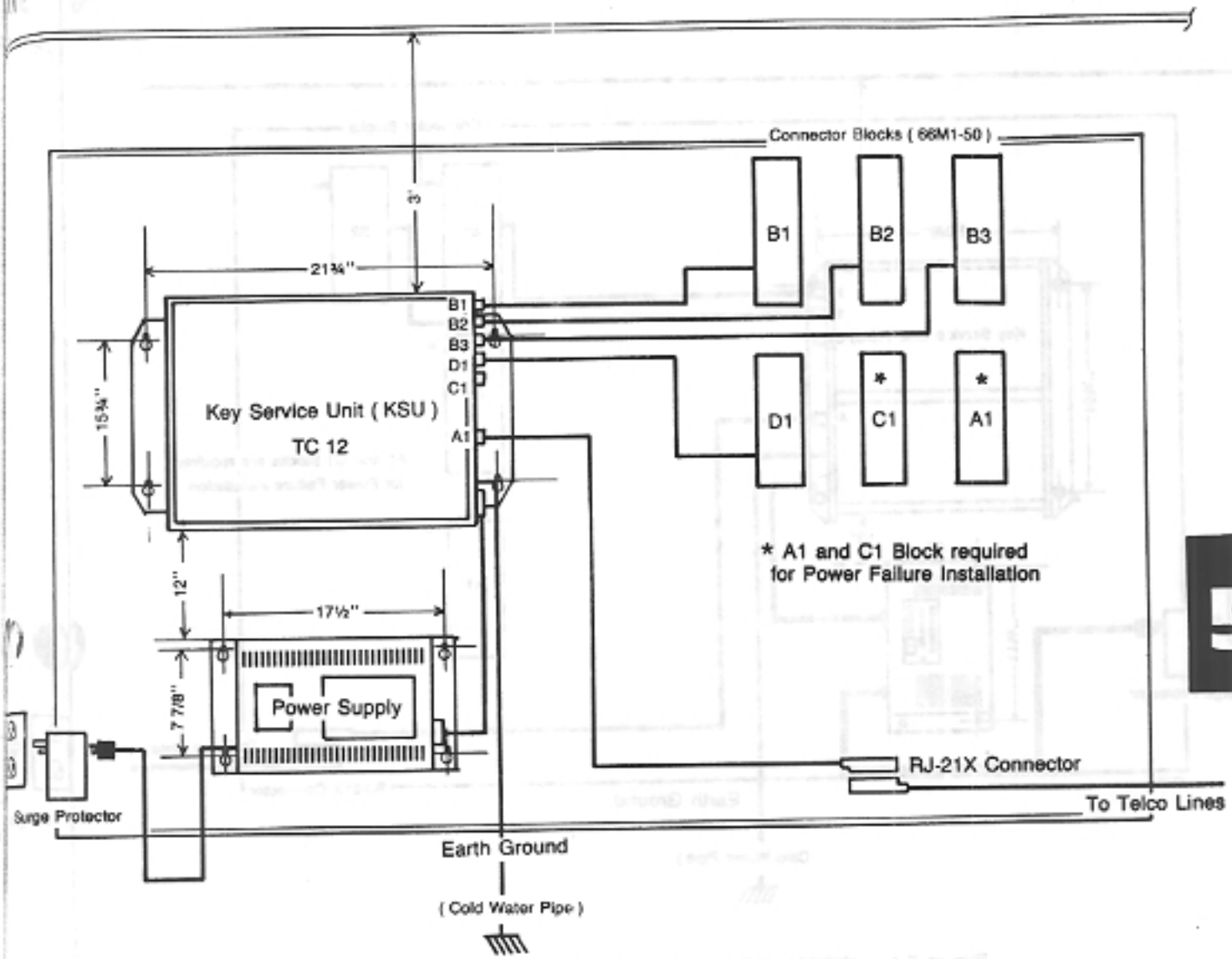


Figure 5-1b INSTALLATION LAYOUT FOR TC-12 SYSTEM

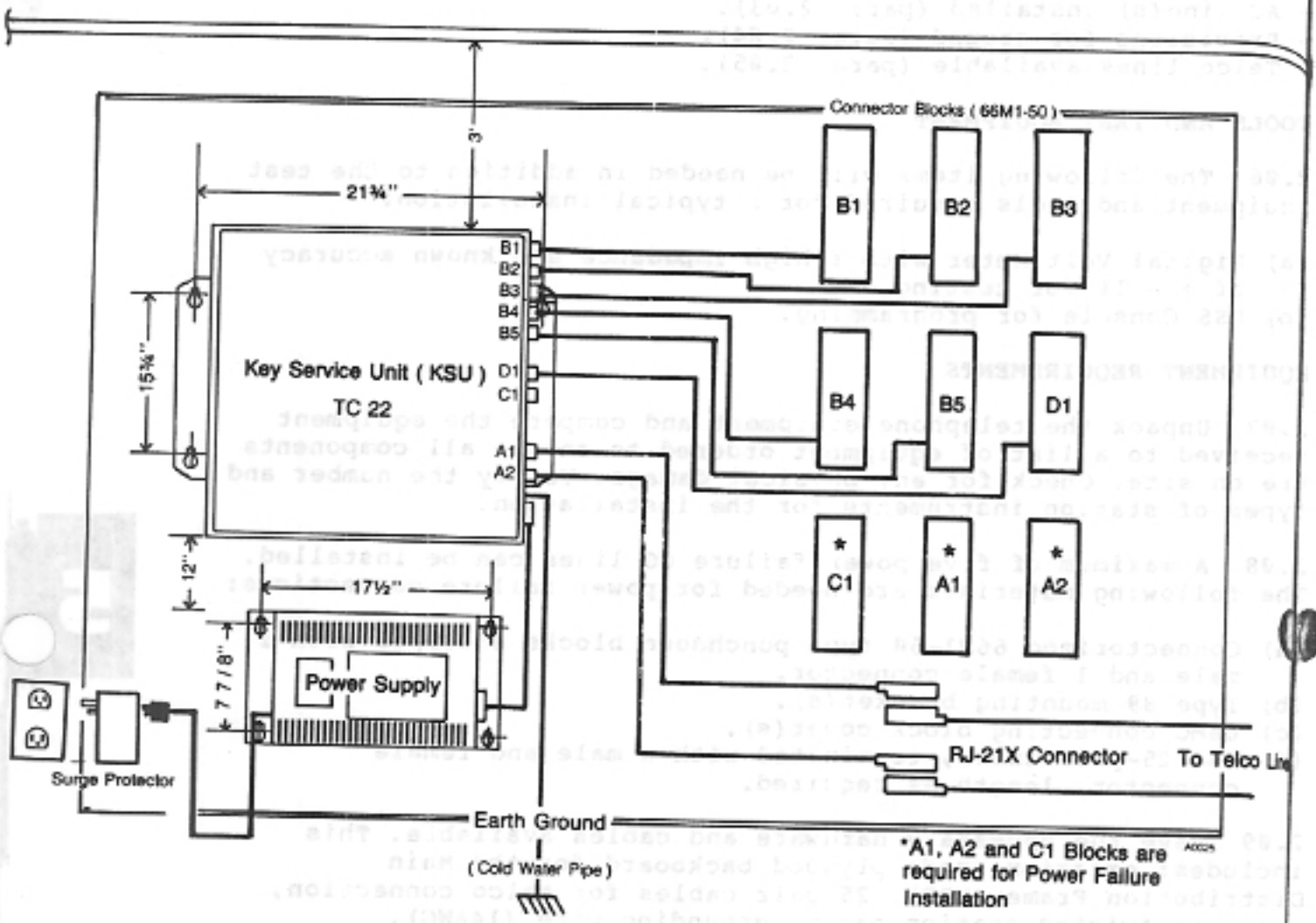


Figure 5-1c INSTALLATION LAYOUT FOR TC-22 SYSTEM

SITE SUMMARY CHECK

- Location acceptable (para. 2.02).
- KSU installation layout (para. 2.02).
- AC line(s) installed (para. 2.03).
- Provisions for ground (para. 2.04).
- Telco lines available (para. 2.05).

TOOLS AND TEST EQUIPMENT

2.06 The following items will be needed in addition to the test equipment and tools required for a typical installation:

(a) Digital Volt Meter with a high impedance and known accuracy of +/- 1% for testing.
(b) DSS Console for programming.

EQUIPMENT REQUIREMENTS

2.07 Unpack the telephone equipment and compare the equipment received to a list of equipment ordered to ensure all components are on site. Check for any physical damage. Verify the number and types of station instruments for the installation.

2.08 A maximum of five power failure CO lines can be installed. The following materials are needed for power failure connections:

(a) Connectorized 66M1-50 type punchdown blocks equipped with 1 male and 1 female connector.
(b) Type 89 mounting bracket(s).
(c) 66MC connecting block cover(s).
(d) One 25-pair cable, terminated with a male and female connector, length as required.

2.09 Have the necessary hardware and cables available. This includes: exterior grade plywood backboard for the Main Distribution Frame (MDF), 25-pair cables for telco connection, two pair twisted station cable, grounding wire (14AWG), connecting blocks (66M1-50 type) with bridging clips, modular station jacks (625A4, 625F4, or equivalent), power line surge protector, and appropriate mounting hardware.

2.10 Verify that the following documents are complete and on the premises before starting the installation:

(a) Building plan showing location and type of telephone instrument.
(b) Option Configuration Worksheets (Tables 3-2 and 3-3).
(c) Program Record Form (Table 4-1).

EQUIPMENT SUMMARY CHECK

- Equipment present (para. 2.06-2.08).
- Hardware present (para. 2.09).
- Necessary documents on site (para. 2.10).

3. INSTALLATION

3.01 Installation procedures are divided into four parts: KSU and Power Supply Installation, PCB Insertion, Station Cabling and System Connections, and Station Installation.

> WARNING: ALTERATIONS OR MODIFICATIONS OF THIS EQUIPMENT EXPRESSLY SHOWN IN THIS INSTALLATION MANUAL ARE PROHIBITED. IF EQUIPMENT MALFUNCTION IS SUSPECTED, DISCONNECT THE SYSTEM FROM THE TELEPHONE COMPANY LINES BY UNPLUGGING THE TELCO RJ21X CONNECTOR.

4. KSU AND POWER SUPPLY INSTALLATION

MAIN DISTRIBUTION FRAME MOUNTING

4.01 The Main Distribution Frame (MDF) is the plywood backboard that is used for mounting the system equipment. Attach the plywood to the designated location with appropriate fasteners. Mark the equipment layout on the MDF backboard using the installation layout (Figures 5-1a, b, c).

4.02 A power line surge protector should be installed at the dedicated AC receptacle to minimize the effects from high static voltage, low level transients, and ripple effects. The protector should be self-contained 3-prong grounded receptacle with 15A capacity, or equivalent. Connect this unit according to the manufacturer's instructions.

KSU MOUNTING

4.03 To mount the KSU:

- Mark four points on the MDF backboard that correspond to the dimensions between the mounting hole centers (Figures 5-1a, b, c and 5-2).
- Drill pilot holes at these points and insert suitable fasteners having a 1/4 inch shank diameter. Screw in fasteners until the clearance between the fastener head and the mounting surface is 1/4 inch.
- Mount KSU on the four fasteners.
- Tighten each fastener until the KSU is securely attached to the MDF.

KSU GROUNDING

4.04 Ground the KSU by connecting one end of a 14AWG, or heavier, insulated copper wire to the grounding lug on the KSU. Connect the other end of the wire to a grounding clamp and cold water pipe or other known earth ground (Figure 5-1a, b, c). The ground wire should be as short as possible.

NOTE: Do not install PCBs at this point.

POWER SUPPLY MOUNTING

4.05 The Power Supply should be mounted at least 12 inches below the KSU and within 6 feet of the AC outlet, according to the following procedure. The length of cable determines the distance the Power Supply is mounted from the KSU. To mount the Power Supply:

- Mark four points on the backboard that correspond to the dimensions between the mounting hole centers (Figures 5-1a, b, c, and 5-3a, 5-3b, and 5-3c).
- Drill pilot holes at these points and insert suitable fasteners with a 1/4 inch shank diameter. Screw in fasteners until the clearance between the fastener head and the mounting surface is 1/4 inch.
- Mount Power Supply on the four fasteners.
- Tighten each fastener until the Power Supply is securely attached to the mounting surface.

4.06 Connect the Power Supply to the KSU using the supplied cable. The Power Supply cable connectors are located on the right side of the KSU and the Power Supply.

- Turn on the Power Supply and verify that the voltage indicators are illuminated. If the RS LED is illuminated, then press the RS button. The RS LED should extinguish. Turn off Power Supply.

KSU AND POWER SUPPLY INSTALLATION CHECK

- Mount backboard and mark equipment layout (para. 4.01).
- Install surge protector (para. 4.02).
- Mount KSU (para. 4.03).
- Ground KSU (para. 4.04).
- Mount Power Supply (para. 4.05).
- Connect Power Supply power cable to KSU (para. 4.06).

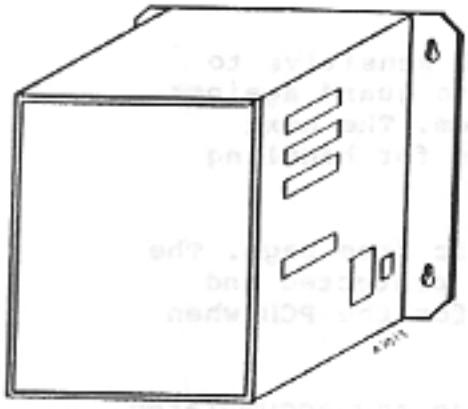


Figure 5-2a KEY SERVICE UNIT, TC-8

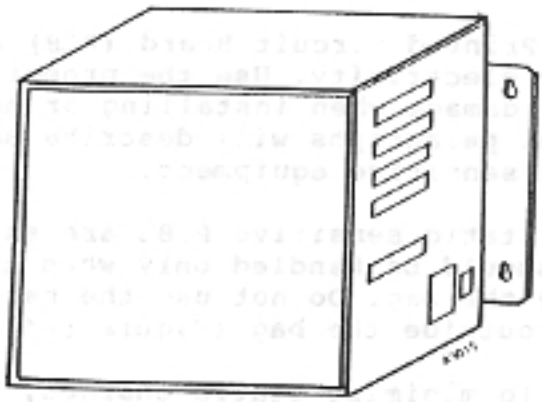


Figure 5-2b KEY SERVICE UNIT, TC-12

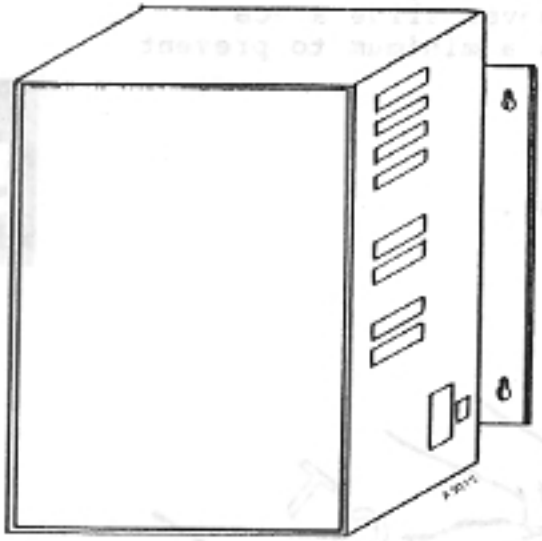


Figure 5-2c KEY SERVICE UNIT, TC-22

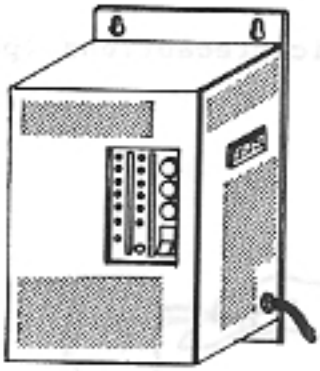


Figure 5-3a POWER SUPPLY, TC-8

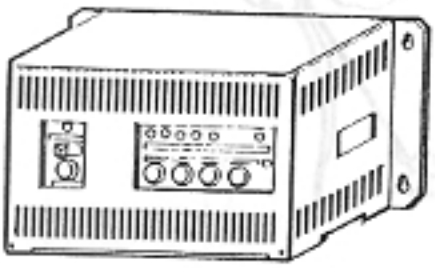


Figure 5-3b POWER SUPPLY, TC-12

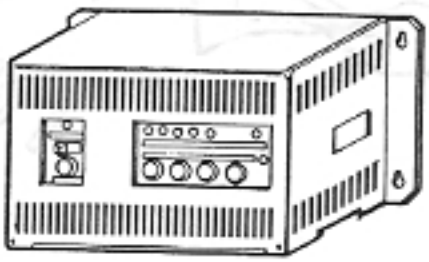


Figure 5-3c POWER SUPPLY, TC-22

5. PCB INSERTION

STATIC PRECAUTIONS

5.01 Printed Circuit Board (PCB) assemblies are sensitive to static electricity. Use the proper precautions to guard against static damage when installing or maintaining them. The next several paragraphs will describe safe techniques for handling static sensitive equipment.

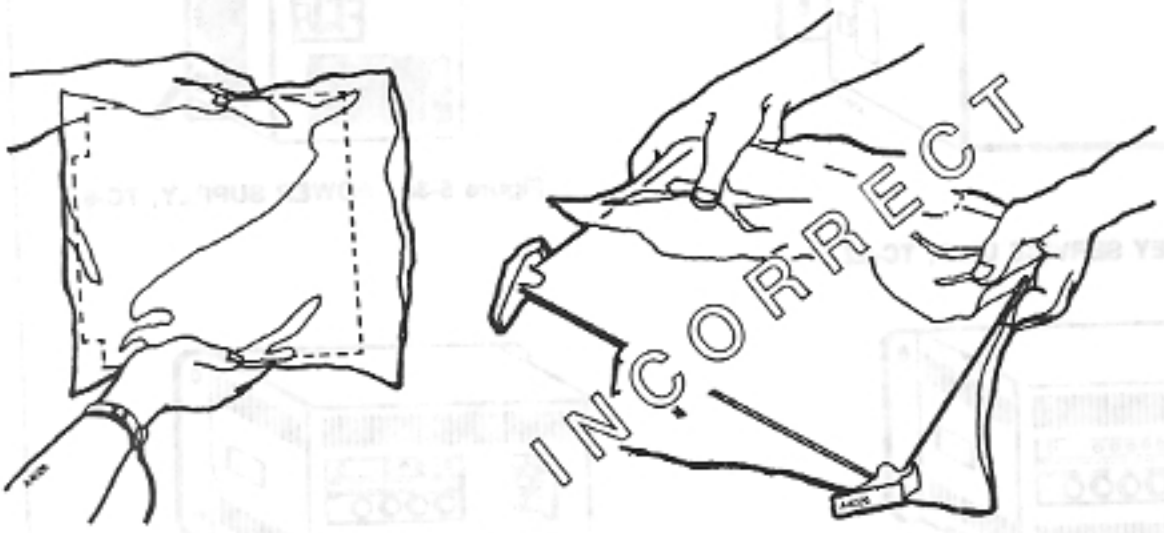
5.02 Static sensitive PCBs are shipped in static free bags. The PCBs should be handled only when they are fully protected and inside the bag. Do not use the bag as a holder for the PCB when it is outside the bag (Figure 5-4).

5.03 To minimize static charges, first discharge any accumulated body static by touching a grounded object and then attach a wrist groundstrap.

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

STATIC CHECK

- Read static precautions (para. 5.01 - 5.04).



NOTE: Do not use bag as holder.

Figure 5-4 HANDLING PCBS

PCB LOCATION

5.05 Each PCB is keyed so that it fits a specific slot in the KSU (Figure 5-5a, b, c). To insert a PCB, place the connector edge into the slot first, keeping the component side of the PCB facing the installer's left (Figure 5-6).

5.06 A PCB should be installed with the thumb of each hand on the PCB extractors and the fingers on the KSU frame (Figure 5-6). Push the PCB until firmly seated. Do not use the heel of your hand or any tool to hammer a PCB into a slot.

5.07 It is recommended that the system be turned OFF to remove PCBs. However, if necessary, the following procedures should be followed when installing or removing PCBs in working TC-8/TC-12/TC-22 systems.

(a) PCBs with RED pulls:

- Snap on grounded wrist strap.
- Turn off power supply.
- Install or remove PCB, according to paragraph 5.06.
- Turn ON Power Supply.

(b) PCBs with WHITE pulls:

- Snap on grounded wrist strap.
- Install or remove PCB, according to paragraph 5.06.
- Press Cross-point (XPT) Clear button, located below the LED on the A-NMU board, for approximately three seconds. This sets the cross-points on the newly installed PCB.

Strap, Switch Options and LED Indications

Refer to Table 5-1 for a brief description of the PCBs covered in this installation section. Other PCBs and optional equipment are covered in Section 9.

A-MPU-A PCB

5.08 The Main Processing (A-MPU-A) PCB has four connectors: PR1, PR2, PR3 and PR4. These connectors should be strapped from 1 to 2 (Figure 5-7). The PCB also contains two LEDs. LED 1 flashes when data is being transferred between the MPU and the DMU; LED 2 flashes when the processor clock is running in the microprocessor.

NOTE: LED 1 will remain in an on or off steady condition when in the programming mode.

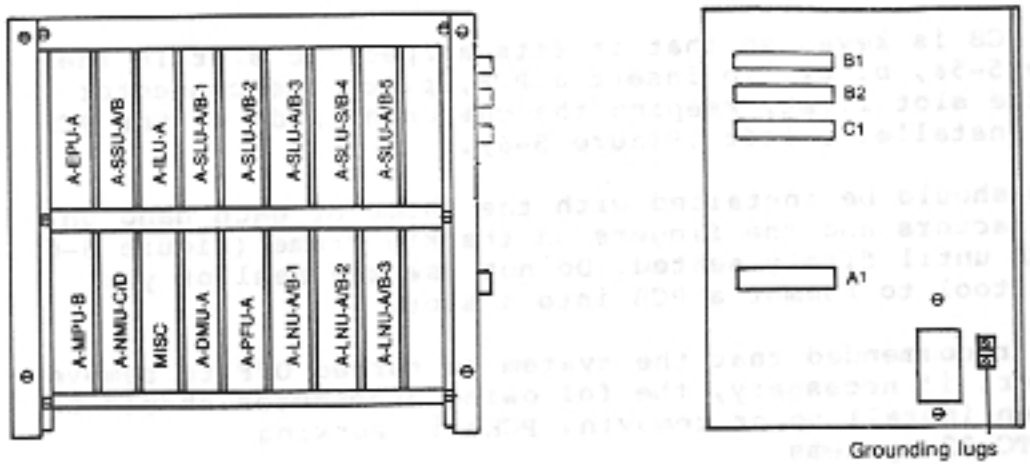


Figure 5-5a KSU, TC-8, PCB ARRANGEMENT

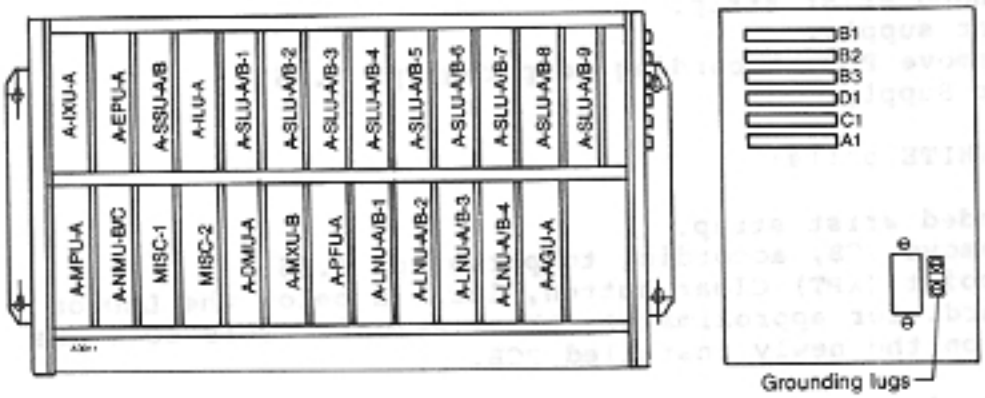


Figure 5-5b KSU, TC-12, PCB ARRANGEMENT

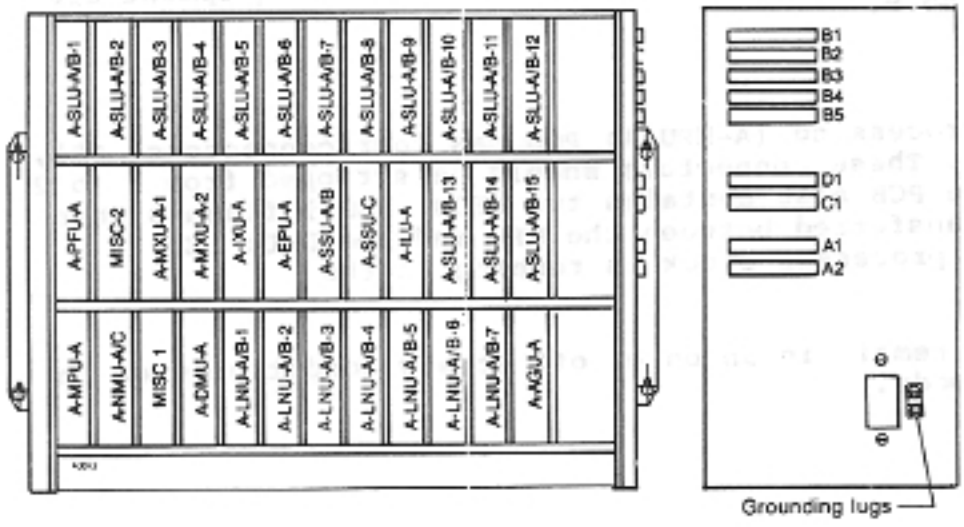


Figure 5-5c KSU, TC-22, PCB ARRANGEMENT

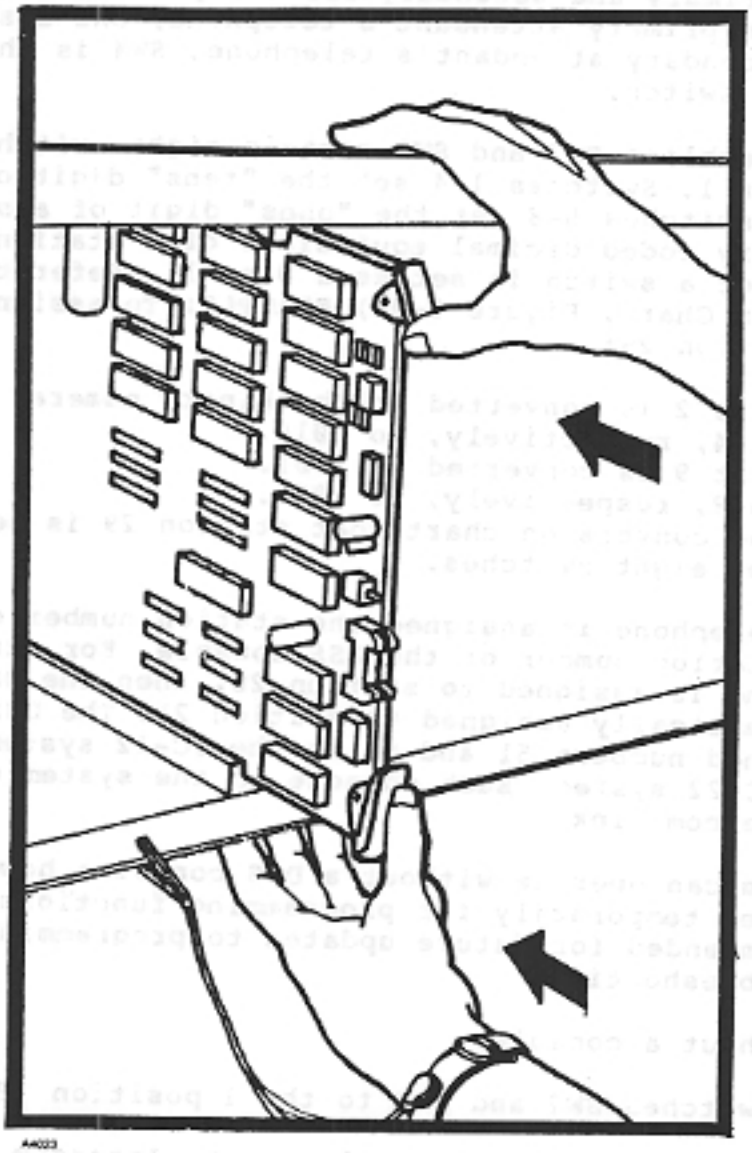


Figure 5-6 PCB INSERTION INTO KSU

A-NMU-A/B/C/D PCB

5.09 The Memory (A-NMU-A/B/C/D) PCB contains four switch assemblies: SW1, SW2, SW3 and SW4. It also has a battery and fuse assembly, designated as BTB-A (Figure 5-8). SW1 is used in the power-on initialization program. SW2 and SW3 assign the station numbers to the primary and secondary DSS telephones. SW3 assigns the number of the primary attendant's telephone; SW2 assigns the number of the secondary attendant's telephone. SW4 is the Crosspoint Clear switch.

5.10 Switch assemblies SW2 and SW3 contain eight switches that are set as a 0 or 1. Switches 1-4 set the "tens" digit of a station number; switches 5-8 set the "ones" digit of a station number. The binary coded decimal equivalent of a station number determines whether a switch is set as a 0 or 1. (Refer to the Binary Conversion Chart, Figure 5-9.) EXAMPLE: To assign a DSS telephone as station 29:

- The "tens" digit 2 is converted to the binary numeral 0010.
- Set switches 1-4, respectively, to 0010.
- The "ones" digit 9 is converted to 1001.
- Set switches 5-8, respectively, to 1001.
- Verify with the conversion chart that station 29 is set as 00101001 on the eight switches.

NOTE: The DSS telephone is assigned the station number directly preceding the station number of the DSS console. For example, if the DSS telephone is assigned to station 20, then the DSS console is automatically assigned to station 21. The DSS station cannot be assigned numbers 51 and 55 in the TC-12 system and 51 and 79 in the TC-22 system. Each console in the system will have a dedicated Intercom link.

5.11 The system can operate without a DSS console; however, one must be installed temporarily for programming functions. A DSS console is recommended for future updates to programming and to facilitate troubleshooting.

For systems without a console:

- Set all dip switches SW2 and SW3 to the 1 position (Figure 5-9).
- Turn Power Supply on and off to release the Intercom links dedicated to the attendant.

For a system with one console (Figure 5-9):

- Set switch SW2 to the 1 position.
- Set switch SW3 to indicate the desired station number of the attendant's telephone.

Table 5-1 PCBs, TC-8/TC-12/TC-22

ABBREVIATION	DESCRIPTION	SYSTEM REQUIREMENTS
	STRAPPING REQUIRED	
A-MPU-A	Main Processing Unit for control of CO lines, Intercom links, X-Pt Matrix, lamps and dialing. Strapping. Data transfer and processor clock LED.	1 required
A-SSU-A	Generates and sends tones for BGM, MOH, and internal use. For DTMF signaling. Strapping.	1 required when system requires DTMF signaling.
A-SSU-B	As above (A-SSU-A) for dial pulse signaling on CO lines 1-16. Strapping.	1 required when system requires dial pulse signaling
A-SSU-C	As above (A-SSU-A) for dial pulse signaling on CO lines 17-26 in the TC-22. Strapping.	1 required for dial pulse signaling for lines 17-26. TC-22 only.
A-LNU-A	Provides CO lines (Common, Private and Hot Lines) and ring detection. For four lines. Strapping.	TC-8 - up to 3; TC-12 - up to 4; TC-22 - up to 7.
A-LNU-B	As above (A-LNU-A) for two lines. Strapping. Line status LEDs.	Substitution of A-LNU-A if only 2 lines required.
	NO STRAPPING	
A-NMU-A	C-MOS for RAM system data and speed dial data for 60 stations (20-79). Battery Backup has switches to assign DSS stations and to initialize system. No strapping.	1 required when Speed Dial is required.
A-NMU-B	C-MOS as above (A-NMU-A) with RAM for Speed Dial for 36 stations (20-55). No strapping. Switch options.	1 required when Speed Dial is required.
A-NMU-C	C-MOS as above (A-NMU-A), without Speed Dial data. No strapping. Switch options.	1 required when Speed Dial is not required.
A-NMU-D	C-MOS as above (A-NMU-A) with RAM for Speed Dial for 20 stations (20-39). No strapping. Switch options.	1 required when Speed Dial is required.
A-ILU-A	For intercom handsfree reply for four stations. No strapping.	1 required.
A-DMU-A	Two microcomputers to convert serial to parallel and vice versa. No strapping.	1 required.
A-SLU-A	Contains interface circuits and matrix to connect to key telephone stations. For four station interfaces. No strapping. Station status LED.	TC-22 - up to 15; TC-12 - up to 9; TC-8 - up to 5.
A-SLU-B	As above (A-SLU-A) for two station interfaces. No strapping.	Substitution of A-SLU-A if only 2 lines required.
	OPTIONAL	
A-EPU-A	External Paging Unit provides 2 amplifiers.	1
A-PFU-A	Power Failure Transfer Unit provides 5 lines to be used as PF lines.	1
A-MXU-A	Expansion Unit, provided with 60 stations x 6 links. TC-22 only.	1 (if more than 12 lines are equipped and/or 6 Intercom lines are required). TC-22 only.
A-MXU-B	Expansion Unit, provided with 36 stations x 4 lines. TC-12 only.	1 (if more than 12 lines are equipped or 6 Intercom lines are required). TC-12 only.
A-IXU-A	Expansion Unit, provided with 60 stations x 2 Intercom links and 2 Handsfree Talkback circuits. TC-22 only.	1 (If 6 Intercom lines are required.) TC-22 only.
A-IXU-B	Expansion Unit, provided with 36 ports x 2 Intercom links and 2 Handsfree Talkback circuits. TC-12 only.	1 (If 6 Intercom lines are required.) TC-12 only.
A-AGU-A	Grounding Unit used in systems requiring Ground Flash. TC-12/TC-22 only.	1. TC-12/TC-22 only.

T20rl

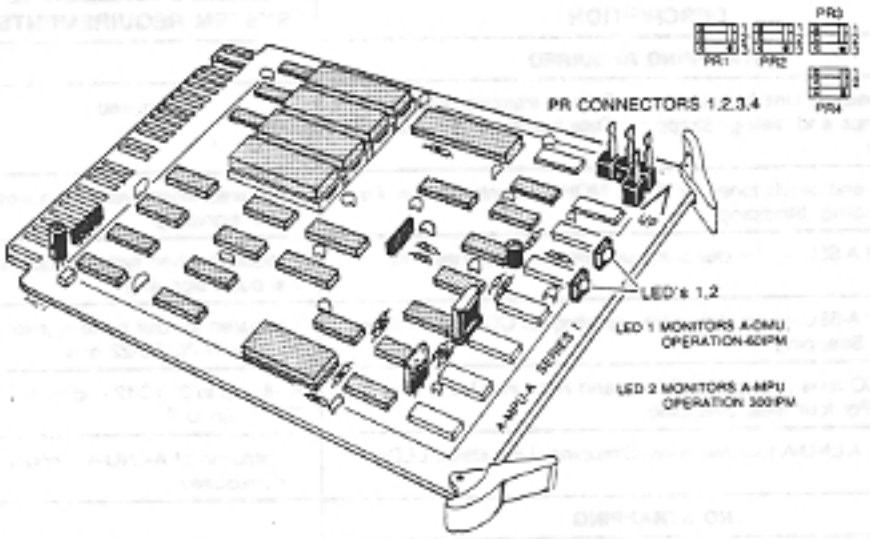


Figure 5-7 PCB, A-MPU-A

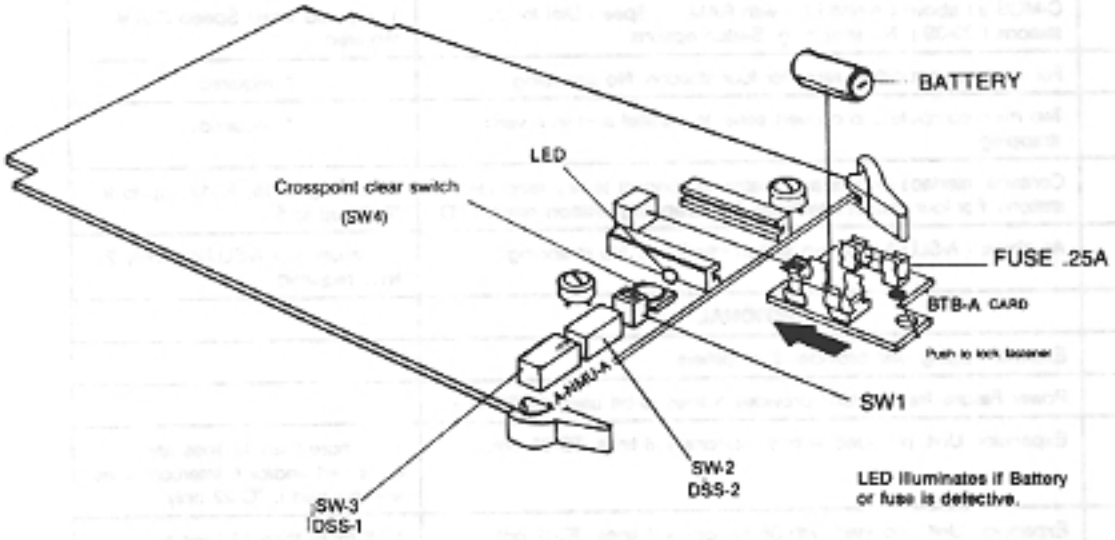
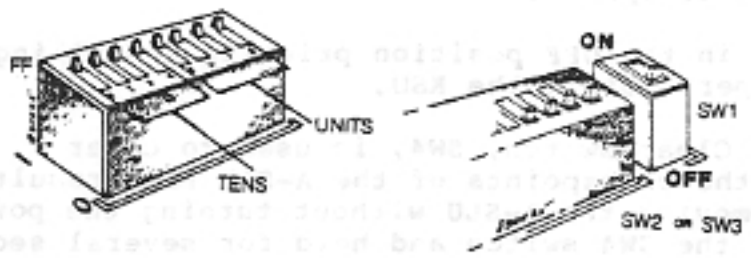


Figure 5-8 PCB, A-NMU-A/B/C/D



DSS TELEPHONE STATION NUMBER	DIP SWITCH NUMBERS 1 2 3 4 5 6 7 8	DSS TELEPHONE STATION NUMBER	DIP SWITCH NUMBERS 1 2 3 4 5 6 7 8
20	0 0 1 0 0 0 0 0	50	0 1 0 1 0 0 0 0
21	0 0 1 0 0 0 0 1	51	cannot assign
22	0 0 1 0 0 0 1 0	52	0 1 0 1 0 0 1 0
23	0 0 1 0 0 0 1 1	53	0 1 0 1 0 0 1 1
24	0 0 1 0 0 1 0 0	54	0 1 0 1 0 1 0 0
25	0 0 1 0 0 1 0 1	55	cannot assign (TC-12)
26	0 0 1 0 0 1 1 0	56	0 1 0 1 0 1 1 0
27	0 0 1 0 0 1 1 1	57	0 1 0 1 0 1 1 1
28	0 0 1 0 1 0 0 0	58	0 1 0 1 1 0 0 0
29	0 0 1 0 1 0 0 1	59	0 1 0 1 1 0 0 1
30	0 0 1 1 0 0 0 0	60	0 1 1 0 0 0 0 0
31	0 0 1 1 0 0 0 1	61	0 1 1 0 0 0 0 1
32	0 0 1 1 0 0 1 0	62	0 1 1 0 0 0 1 0
33	0 0 1 1 0 0 1 1	63	0 1 1 0 0 0 1 1
34	0 0 1 1 0 1 0 0	64	0 1 1 0 0 1 0 0
35	0 0 1 1 0 1 0 1	65	0 1 1 0 0 1 0 1
36	0 0 1 1 0 1 1 0	66	0 1 1 0 0 1 1 0
37	0 0 1 1 0 1 1 1	67	0 1 1 0 0 1 1 1
38	0 0 1 1 1 0 0 0	68	0 1 1 0 1 0 0 0
39	0 0 1 1 1 0 0 1	69	0 1 1 0 1 0 0 1
40	0 1 0 0 0 0 0 0	70	0 1 1 1 0 0 0 0
41	0 1 0 0 0 0 0 1	71	0 1 1 1 0 0 0 1
42	0 1 0 0 0 0 1 0	72	0 1 1 1 0 0 1 0
43	0 1 0 0 0 0 1 1	73	0 1 1 1 0 0 1 1
44	0 1 0 0 0 1 0 0	74	0 1 1 1 0 1 0 0
45	0 1 0 0 0 1 0 1	75	0 1 1 1 0 1 0 1
46	0 1 0 0 0 1 1 0	76	0 1 1 1 0 1 1 0
47	0 1 0 0 0 1 1 1	77	0 1 1 1 0 1 1 1
48	0 1 0 0 1 0 0 0	78	0 1 1 1 1 0 0 0
49	0 1 0 0 1 0 0 1	79	cannot assign (TC-22)

CONVERSION CHART

Decimal Characters to Binary Bits

Figure 5-9 SWITCHES, A-NMU PCB

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For a system with a primary and secondary console:

- Set switch SW2 to indicate the desired station number of the secondary attendant's telephone.
- Set switch SW3 to indicate the desired station number of the primary attendant's telephone.

NOTE: Set switch SW1 in the OFF position prior to installing the A-NMU PCB in the proper slot in the KSU.

5.12 The Crosspoint Clear switch, SW4, is used to clear erroneous data from the crosspoints of the A-SLU PCB, resulting from inserting or removing the A-SLU without turning the power off. To clear data, press the SW4 switch and hold for several seconds.

5.13 The A-NMU-A/B/C/D is also equipped with a battery assembly, designated as BTB-A PCB. The BTB-A PCB contains a lithium non-rechargeable battery, BR-3, 3V; connecting pins; battery clip; fuse clip and a push-to-lock fastener. The battery and/or fuse can be replaced without loss of system memory if the battery assembly is removed WITHOUT removing the A-NMU-A/B/C/D PCB while system is fully operational. The battery protects system memory during a power failure. The fuse protects the battery if a short circuit occurs on the memory board.

CAUTION: IF THE BATTERY ASSEMBLY IS REMOVED WHILE THE A-NMU-A/B/C/D IS OUT, SYSTEM MEMORY WILL BE LOST.

NOTE: The LED on the A-NMU-A/B/C/D PCB will illuminate and the ALM LED on the DDS console flashes under the following conditions:

(a) The battery output drops to less than 2.5 volts.
(b) The fuse blows on the BTB-A PCB.
(c) The battery or the BTB-A PCB is removed.

CAUTION: STORE THE BATTERY IN ITS PLASTIC BAG. THIS TYPE OF BATTERY MAY EXPLODE OR LEAK WHEN RECHARGED, HEATED, DISASSEMBLED, SHORT-CIRCUITED OR DISPOSED OF IN A FIRE. DISCARD THE BAG WHEN THE BATTERY IS READY TO BE INSTALLED.

Install the BTB-A PCB as follows (Figure 5-8):

- Install the battery, observing polarity, in the battery clips on the BTB-A PCB.
- Insert the BTB-A PCB into the guides on the A-NMU PCB.
- Push the BTB-A PCB until the pins are fully engaged in the connector on the A-NMU PCB.
- Press the push-to-lock fastener to secure the BTB-A board to A-NMU PCB.

NOTE: Battery is factory installed on some BTB-A PCBS.

DANGER: DO NOT PLACE THE BTB-A PCB WITH BATTERY ON A CONDUCTIVE SURFACE OR IN A CONDUCTIVE-TYPE STATIC SHIELDING BAG. THIS COULD DESTROY FUSE OR BURST BATTERY.

A-SSU-A/B/C PCBs

5.14 The Tone and Signaling PCB (A-SSU) has three configurations: the A-SSU-A, A-SSU-B and the A-SSU-C. The A-SSU-A is used in systems requiring DTMP signaling; the A-SSU-B is used in systems requiring dial pulse signaling. The A-SSU-C is installed when a system has more than 16 CO lines using dial pulsing or when an A-LNU-A/B is installed in position 6 or 7 for a Private Line (dial pulse).

5.15 The A-SSU-A and the A-SSU-B have an HT connector that is strapped for MOH as follows (Figure 5-10):

- Positions 1 and 2 are strapped for internal synthesized music.
- Insert the strapping pin into positions 2 and 3 when the Background Music (BGM) source is used for Music-On-Hold (MOH).
- Omit strapping pin for no MOH.

5.16 The A-SSU-B and A-SSU-C PCBs also have a PPS and an MR connector for dial pulsing. The PPS Connector is strapped according to the desired pulses per second (PPS) output on the CO lines; the strapping on the MR connector determines the make/break ratio of the dial pulses. They are strapped as follows:

PPS Connector:

- Positions 1 and 2 are strapped to provide 20 PPS.
- Insert the strapping pin into positions 2 and 3 to provide 10 PPS.

MR Connector:

- Positions 1 and 2 are strapped to provide a 39%/61% make/break ratio.
- Insert the strapping pin into positions 2 and 3 to provide a 33%/67% make/break ratio.

NOTE: The 39%/61% is generally used. However, various COs and several external signaling circuits may require the 33%/67% ratio.

A-LNU-A/B PCBs

5.17 The CO Line (A-LNU) PCB has two configurations: A-LNU-A and A-LNU-B. The A-LNU-A (Figure 5-11) provides four CO lines, the A-LNU-B two CO lines.* A-LNU-A or B can be installed in any A-LNU position (Table 5-2). Each A-LNU-A PCB has four LEDs and four HR connectors. The A-LNU-A has two DB connectors (Figure 5-11). The A-LNU-B has two LEDs, two HR connectors and one DB connector. The TC-8 can hold 3 A-LNU PCBs; the TC-12 can hold four; the TC-22 can hold seven.

* The A-LNU-B always utilizes only the last 2 circuits in the card slot.

5.18 The HR connectors set the sensitivity of the Release of Abandoned Call on Hold feature if disconnect supervision is supplied by telco. Strap positions 1 and 2 for 90 mS (Electromechanical CO). Strap positions 2 and 3 for 600 MS (Electronic CO).

5.19 DB1 and DB2 connectors determine the signaling mode of the LNU PCB. The key should be in position 12 for dial pulse and position 13 for DTMF signaling.

5

Table 5-2 A-LNU CIRCUIT DESIGNATION IN THE KSU

KSU SLOT	A-LNU-A SERVES LINE CIRCUITS	A-LNU-B SERVES LINE CIRCUITS
	TC-8/TC-12/TC-22	TC-8/TC-12/TC-22
A-LNU-A/B-1	1 - 4	3 and 4
A-LNU-A/B-2	5 - 8	7 and 8
A-LNU-A/B-3	9 - 12	11 and 12
	TC-22	TC-12/TC-22
A-LNU-A/B-4	13 and 14†	13 and 14
	TC-22	TC-22
A-LNU-A/B-5	15 - 18	17 and 18
A-LNU-A/B-6	19 - 22	21 and 22
A-LNU-A/B-7	23 - 26	25 and 26

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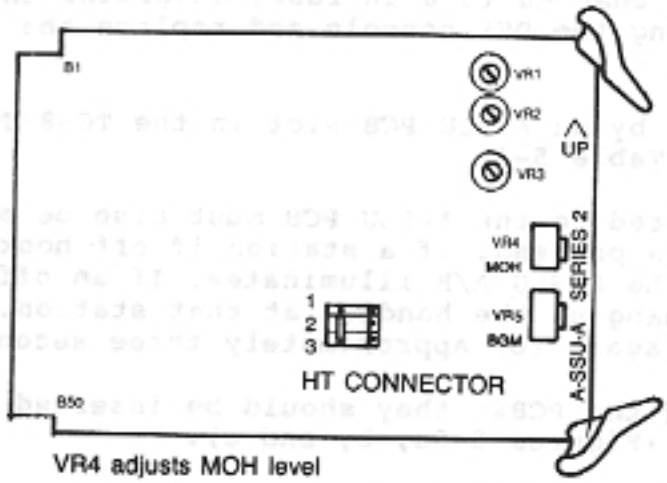
† Since only two line circuits are served by the PCB in the A-LNU-A/B-4 slot, it is recommended that an A-LNU-B PCB be installed rather than an A-LNU-A PCB for TC-22 systems. In TC-12 systems an A-LNU-B PCB must be installed for line circuits 13 and 14 because, where used, these two line circuits are for Private Lines and Hotlines only.



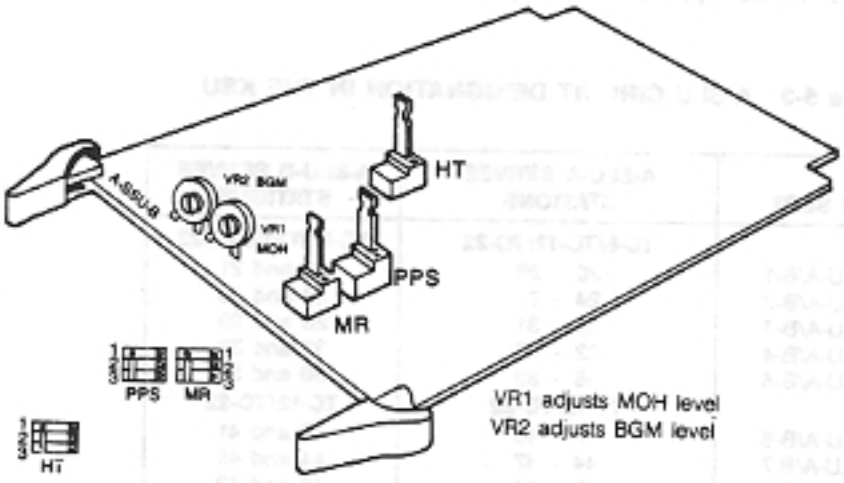


Figure 5-10 PCB, ASSU-A/B/C

A-SLU-A/B PCBS

5.20 The Station Interface (A-SLU) PCB (Figure 5-12) has two configurations: the A-SLU-A and the A-SLU-B. The A-SLU PCBs are equipped with .5A fuses for each station served. The PCBs have no strapping options; however, fuses for the station circuit serving a DSS console must be changed to a 1A fuse. Determine the station circuit serving the DSS console and replace the appropriate fuse.

5.21 Stations served by an A-SLU PCB slot in the TC-8/TC-12/TC-22 system are listed in Table 5-3.

NOTE: Stations connected to the A-SLU PCB must also be on hook when the XPT button is pressed. If a station if off hook, the LED for that station on the A-SLU-A/B illuminates. If an off hook indication appears, hang up the handset at that station. Press the XPT Clear button again for approximately three seconds.

5.22 After strapping the PCBs, they should be inserted into the appropriate KSU slot (Figures 5-5a, b, and c).

PCBS WITHOUT STRAP AND SWITCH OPTIONS

5.23 The A-ILU-A, A-EPU-A, A-PFU-A, A-DMU-A, A-AGU-A, A-IXU-A and A-MXU-A PCBS have no strap or switch options (Figure 5-13) and should be inserted into the appropriate slot in the KSU (Figures 5-5a, b and c).

PCB CHECK

- Strap and insert PCBs (5.06-5.23).

Table 5-3 A-SLU CIRCUIT DESIGNATION IN THE KSU

KSU SLOT	A-SLU-A SERVES STATIONS	A-SLU-B SERVES STATIONS
	TC-8/TC-12/TC-22	TC-8/TC-12/TC-22
A-SLU-A/B-1	20 - 23	20 and 21
A-SLU-A/B-2	24 - 27	24 and 25
A-SLU-A/B-3	28 - 31	28 and 29
A-SLU-A/B-4	32 - 35	32 and 33
A-SLU-A/B-5	36 - 39	36 and 37
	TC-12/TC-22	TC-12/TC-22
A-SLU-A/B-6	40 - 43	40 and 41
A-SLU-A/B-7	44 - 47	44 and 45
A-SLU-A/B-8	48 - 51	48 and 49
A-SLU-A/B-9	52 - 55	52 and 53
	TC-22	TC-22
A-SLU-A/B-10	56 - 59	56 and 57
A-SLU-A/B-11	60 - 63	60 and 61
A-SLU-A/B-12	64 - 67	64 and 65
A-SLU-A/B-13	68 - 71	68 and 69
A-SLU-A/B-14	72 - 75	72 and 73
A-SLU-A/B-15	76 - 79	76 and 77

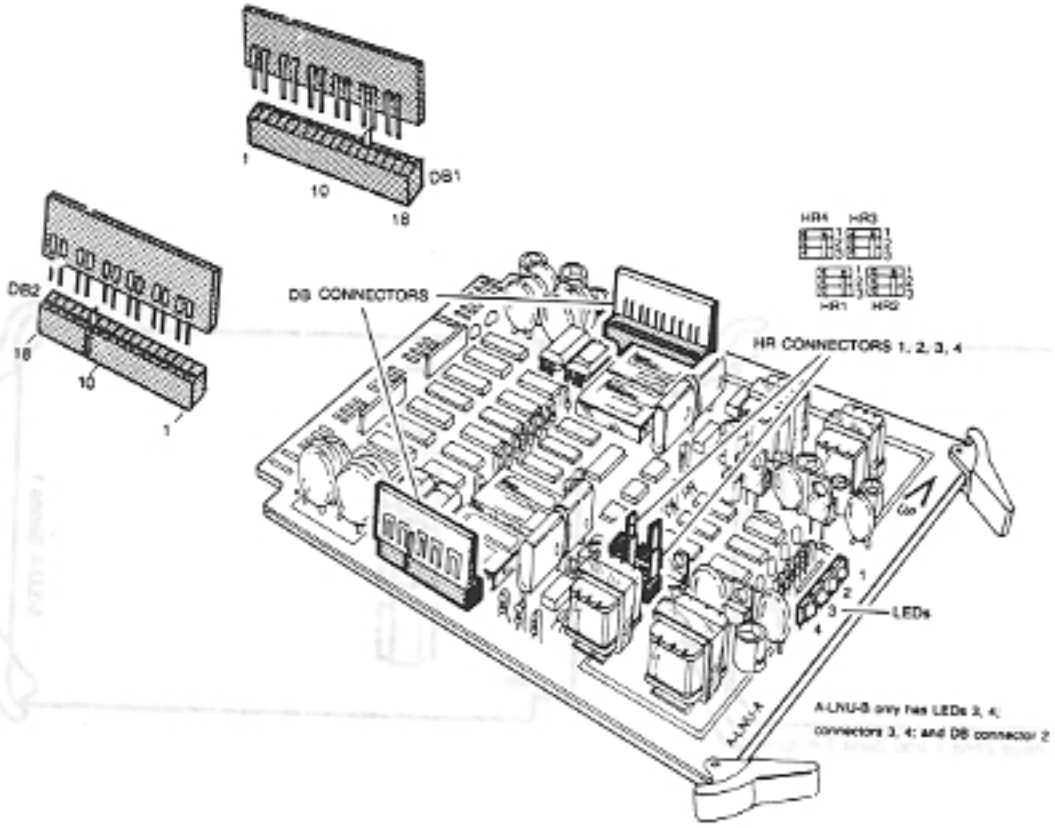


Figure 5-11 PCB, A-LNU-A

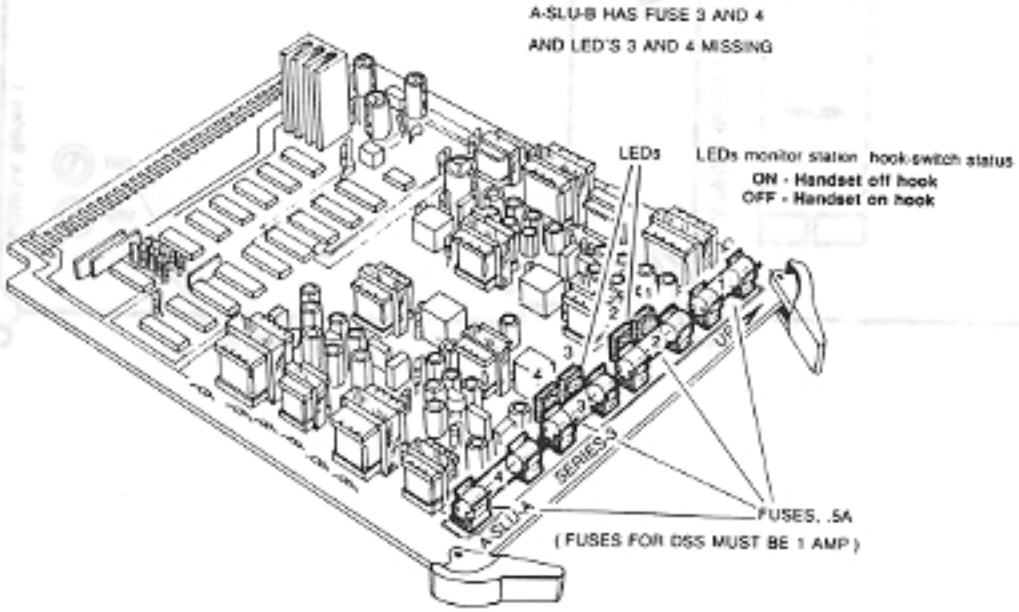


Figure 5-12 PCB, A-SLU-A/B

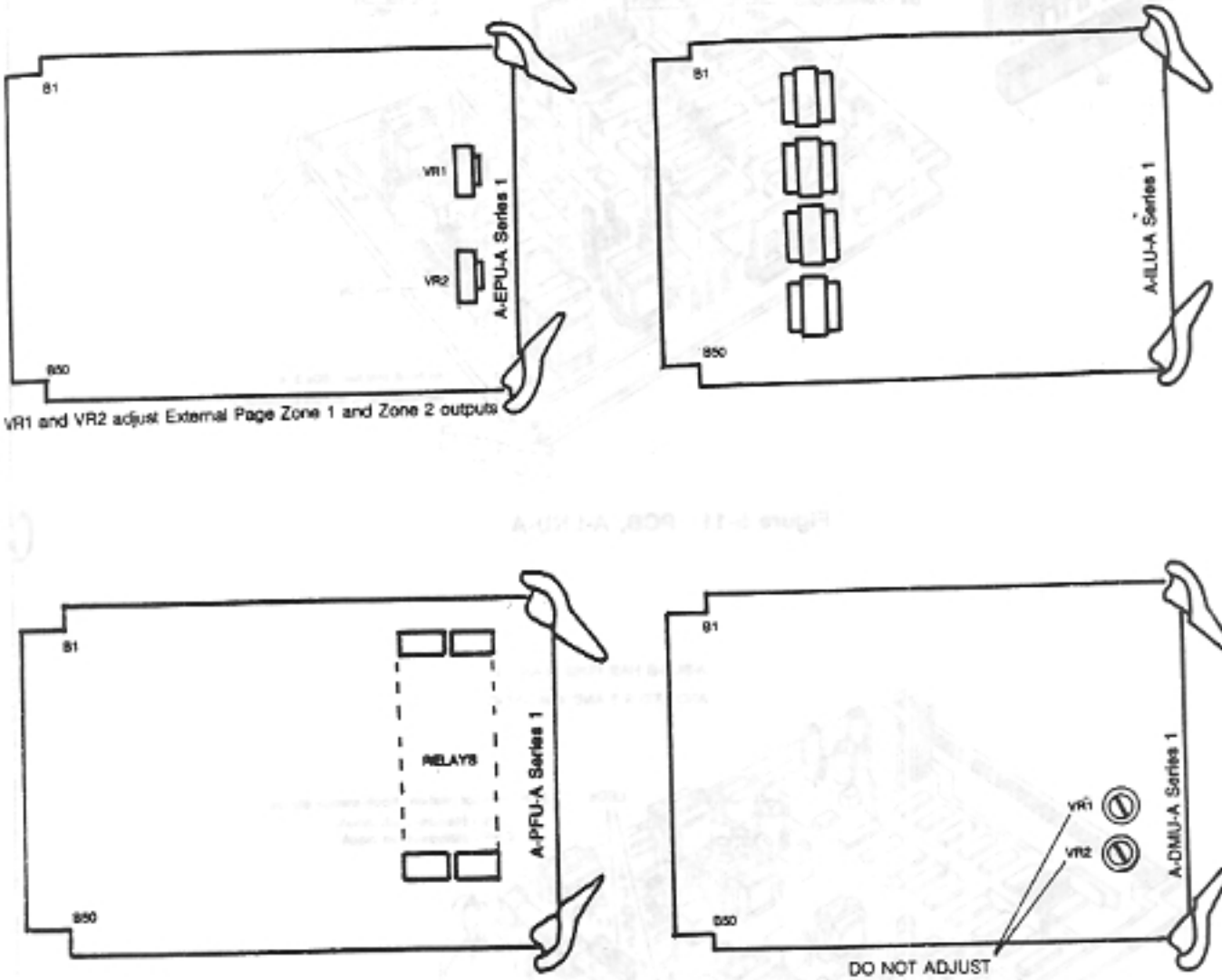


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Figure 5-13 PCBS WITHOUT STRAP AND SWITCH OPTIONS (1 of 2)

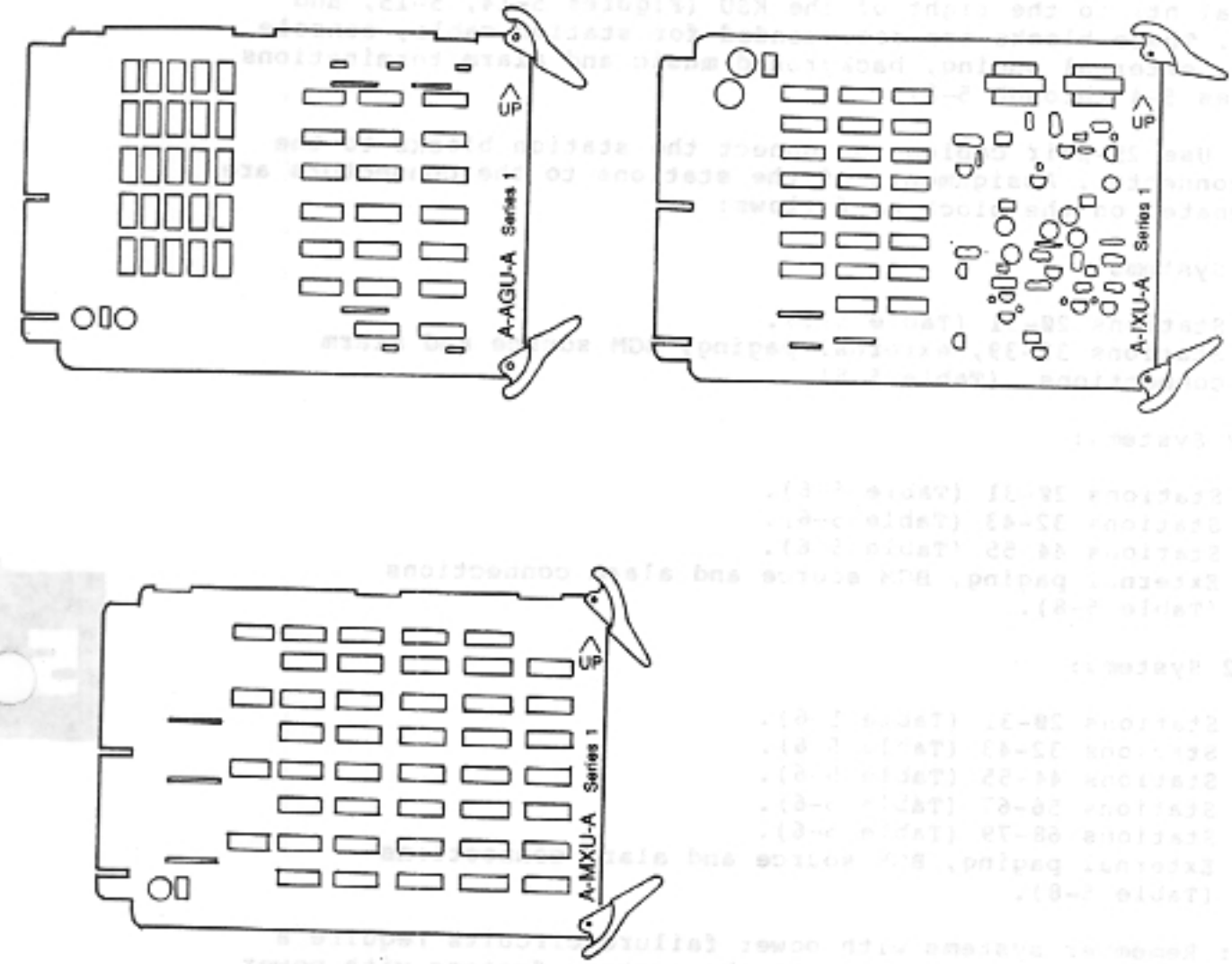


Figure 5-13 PCBS WITHOUT STRAP AND SWITCH OPTIONS (2 of 2)

6. STATION CABLING AND SYSTEM CONNECTIONS

6.01 Mount the required connecting blocks (66M1-50 or equivalent) to the right of the KSU (Figures 5-14, 5-15, and 5-16). These blocks are recommended for station cable, console cable, external paging, background music and alarm terminations (Tables 5-4 through 5-8).

6.02 Use 25-pair cables to connect the station blocks to the KSU connector. Assignments of the stations to the connectors are designated on the block as follows:

TC-8 Systems:

B1 - Stations 20-31 (Table 5-5).
B2 - Stations 32-39, external paging, BGM source and alarm connections (Table 5-5).

TC-12 Systems:

B1 - Stations 20-31 (Table 5-6).
B2 - Stations 32-43 (Table 5-6).
B3 - Stations 44-55 (Table 5-6).
D1 - External paging, BGM source and alarm connections (Table 5-8).

TC-22 Systems:

B1 - Stations 20-31 (Table 5-6).
B2 - Stations 32-43 (Table 5-6).
B3 - Stations 44-55 (Table 5-6).
B4 - Stations 56-67 (Table 5-6).
B5 - Stations 68-79 (Table 5-6).
D1 - External paging, BGM source and alarm connections (Table 5-8).

NOTE: Remember systems with power failure circuits require a certified technician to install the system. Systems with power failure circuits also require A and C blocks as follows:

TC-8 Systems:

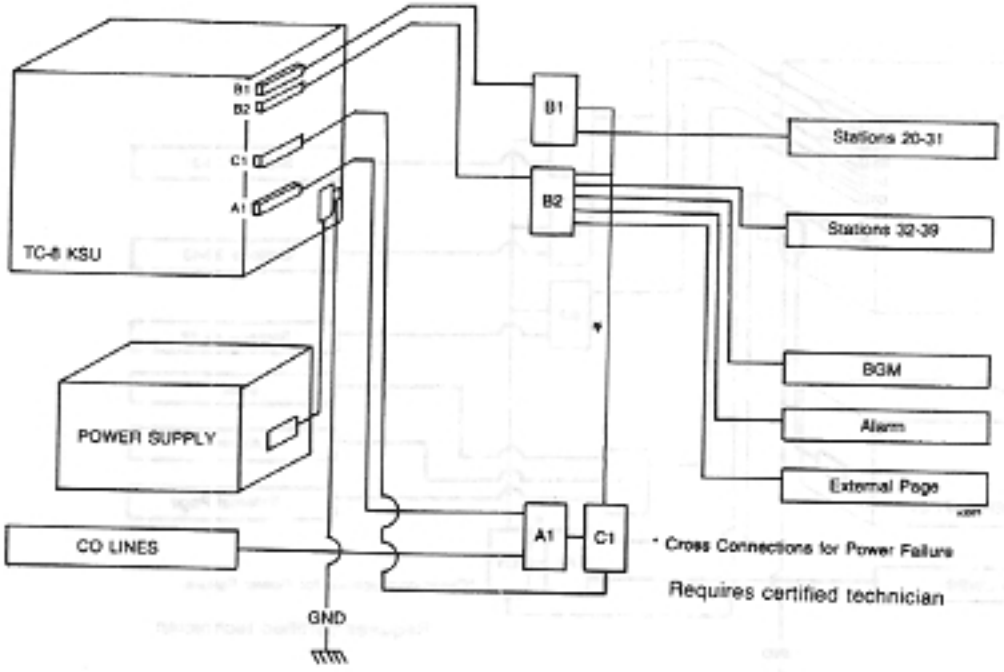
A1 - CO lines 1-12 (Table 5-4).
C1 - Power Failure: 5 stations (Table 5-7).

TC-12 Systems:

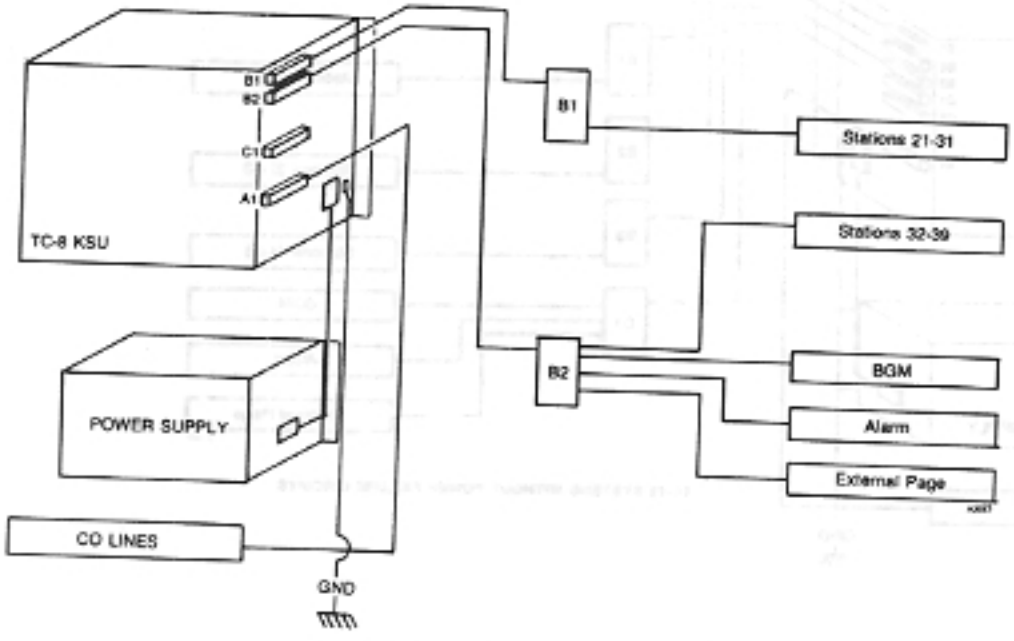
A1 - CO lines 1-14 (Table 5-4).
C1 - Power Failure: 5 stations (Table 5-7).

TC-22 Systems:

A1 - CO lines 1-25 (Table 5-4).
A2 - CO line 26 (Table 5-4).
C1 - Power Failure: 5 stations (Table 5-7).

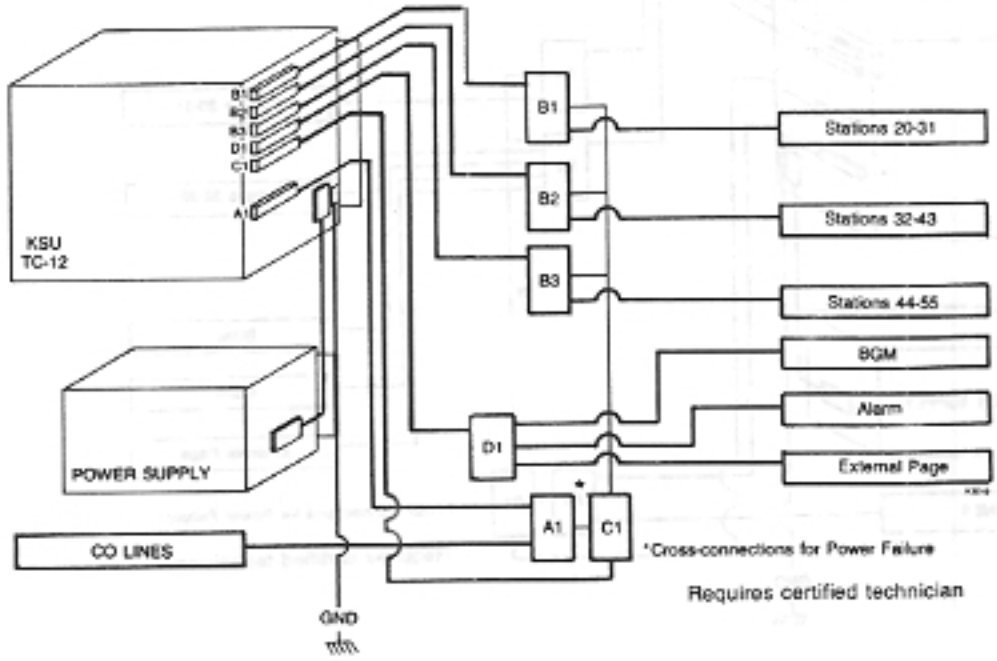


TC-8 SYSTEMS WITH POWER FAILURE CONNECTIONS

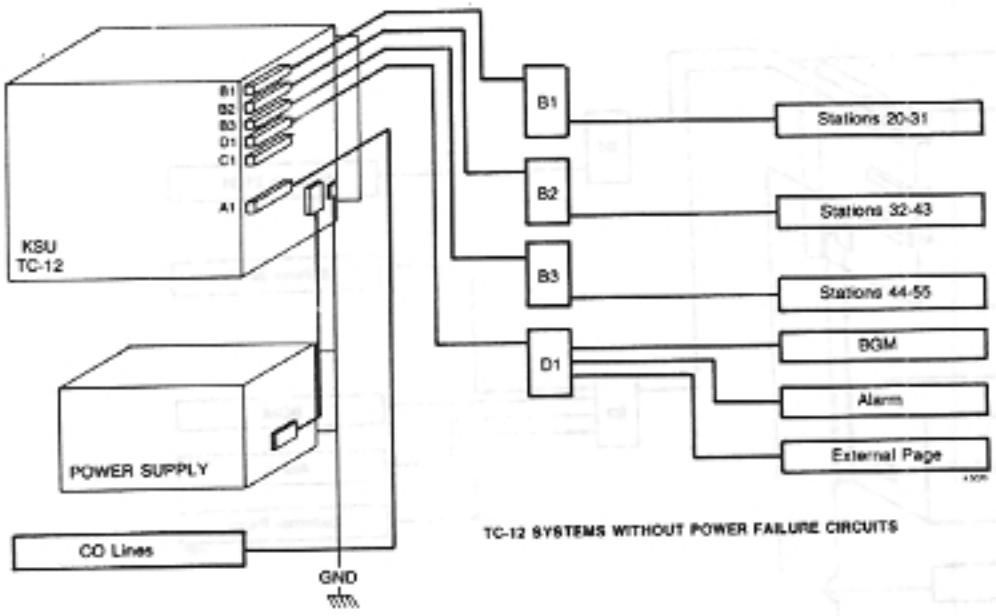


TC-8 SYSTEM WITHOUT POWER FAILURE CONNECTIONS

Figure 5-14 INSTALLATION BLOCK DIAGRAM, TC-8

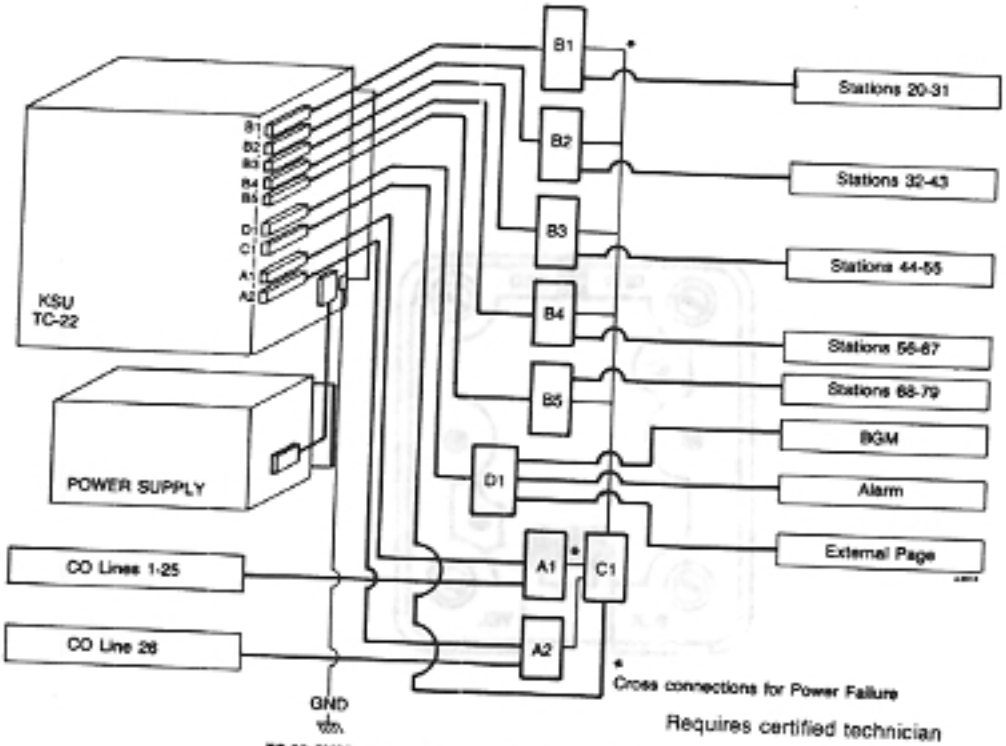


TC-12 SYSTEMS WITH POWER FAILURE CIRCUITS

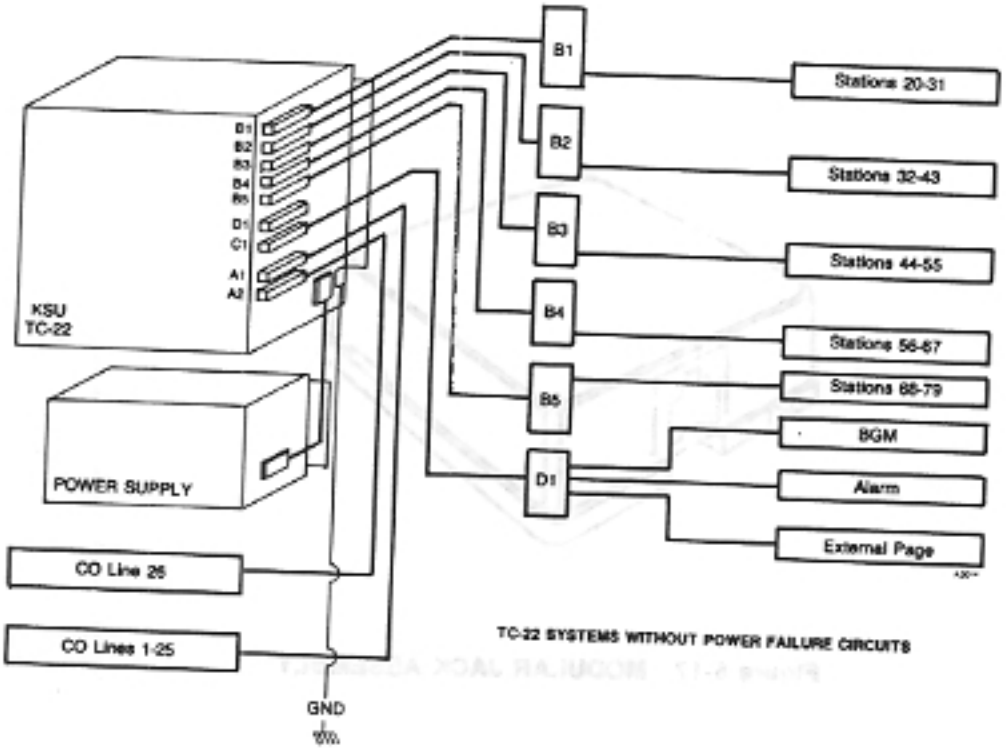


TC-12 SYSTEMS WITHOUT POWER FAILURE CIRCUITS

Figure 5-15 INSTALLATION BLOCK DIAGRAM, TC-12

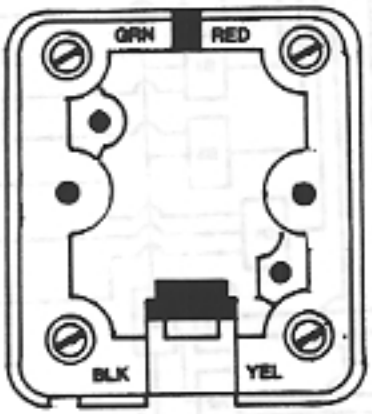


TC-22 SYSTEMS WITH POWER FAILURE CIRCUITS



TC-22 SYSTEMS WITHOUT POWER FAILURE CIRCUITS

Figure 5-16 INSTALLATION BLOCK DIAGRAM, TC-22



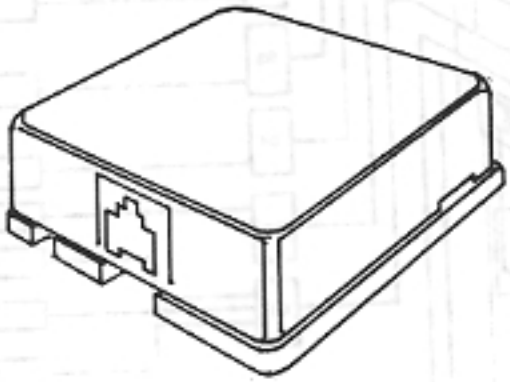


Figure 5-17 MODULAR JACK ASSEMBLY

6.03 Mount a modular jack assembly, 625 A4 or 625 F4 (Figure 5-17) at each station location. Two jacks are required for stations equipped with external power failure ringers.

EQUIPMENT MOUNTING CHECK

- Mount connecting blocks (para. 6.01).
- Mount station jacks (para. 6.03).

STATION CABLING

6.04 Use two pair twisted station cable from the KSU and station B blocks to the modular jacks at the telephones. Station cable is homerun to the connecting block and should not exceed 1000 feet for 24 AWG wire or 1500 feet for 22 AWG wire.

CAUTION: DO NOT USE RANDOM TWISTED 4-WIRE INSIDE CABLE (QUAD) BETWEEN THE STATIONS AND THE MAIN DISTRIBUTION FRAME (MDF). THIS CAN CAUSE CROSSTALK AND NOISE ON THE VOICE AND DATA PAIRS.

6.05 Determine the DSS location before terminating the station's cabling (refer to Section 3, *SYSTEM CONFIGURATION*). The DSS telephone is assigned to the station number directly preceding the station number of the DSS console. The DSS station cannot be assigned to numbers 51 and 55 in the TC-12 system and 51 and 79 in the TC-22 system. The DSS console is connected as any other station (Table 5-5 for TC-8 systems; Table 5-6 for TC-12 and TC-22).

6.06 Modular station cabling is terminated at the station B blocks (KSU) and station jacks (Figure 5-18 and Tables 5-5 and 5-6).

CAUTION: FOR PROPER OPERATION, IT IS IMPORTANT THAT PAIR-FOR-PAIR CONNECTIONS BE MAINTAINED AND POLARITY OF PAIRS BE OBSERVED AT ALL LOCATIONS WHERE TERMINATIONS OR CROSS CONNECTIONS ARE MADE.

6.07 Install bridging clips for the AT, AR, BT and BR terminals for non power failure stations.

CO LINE CONNECTIONS

Systems Without Power Failure Connections

6.08 Use 25-pair cables to plug the RJ21X into the A1 and A2 connectors on the KSU (Table 5-4).

Systems With Power Failure Circuits

NOTE: A certified technician is required for these connections.

6.09 The 25-pair RJ21X connector provided by the telephone company must be plugged into the male side of the 66M1-50 type connecting block (A block) when Power Failure circuits are required. The female side is connected to the A connector of the KSU with a connector-ended 15-pair cable.

6.10 The first 12 pairs (24 clips) on the A1 Block in the TC-8 system are used for CO lines. Remaining clips are vacant. The first 14 pairs (28 clips) on the A1 Block in the TC-12 system are used for CO lines. Remaining clips are vacant. All pairs on the A1 and the first pair on the A2 in the TC-22 system are used for CO lines. Remaining pairs are vacant (Table 5-4). Bridging clips are not installed for Power Failure lines on the Power Fail Cross Connections.

6.11 Each CO line which is to appear at a Power Failure station must be connected to an A-PFU-A circuit. The connection points are located on the C1 block (Figure 5-19).

NOTE: Not all CO lines require PF cross connection.

6.12 For a Power Failure CO line, cross connect the B clips (T and R) of the A block to the D clips (COT and COR) on the C block (Figure 5-19 and Table 5-4). Cross connect the C clips (T and R) on the A block to the D clips (L-T and L-R) on the C block.

6.13 Lines which are not connected to Power Failure circuits in systems equipped with an A-PFU-A PCB must be strapped with bridging clips on the A block (Figure 5-19).

6.14 Cross connect the D clips of the STA-T, STA-R leads on the C block to the C clips (AT, AR) on the B block. Cross connect the D clips of the ST-T and ST-R leads of the C block to the B clips (AT, AR) on the B block.

6.15 The BEL leads can be used to terminate a single line telephone for PF service or for visual and audible indicators of an incoming call during a power failure. TIE's BE-5 ringer is recommended for a visual and audible indication of an incoming call during a power failure. One BE-5 is required for every five lines.

6.16 When a standard key telephone is designated as a PF station, dial tone will be received but dialing will be ineffective. An external PF ringer can be connected to the D clip designated as BEL T and BEL R on the C block (Figure 5-19), or may be connected to the GRN/RED terminals of the modular station jack (Figure 5-18). Two modular jacks should be installed at the telephone location: one jack for the telephone and the other for the ringer. A Procter single line electronic ringer (Procter #43732) or any other FCC approved single line high voltage (40-150VAC) ringer can be used.

PRIVATE LINE AND HOTLINE CONNECTIONS

6.17 Line circuit usage in the TC-8/TC-12/TC-22 systems is outlined in Table 5-9.

NOTE: Private Lines and/or Hotlines should be put in service in reverse order (e.g. in a TC-8 system: line 12 first and 11 last; in a TC-12 system: first lines 14, 13, 12 and 11 last; in a TC-22 system: first lines 26, 25, 24, 22 and 21 last).

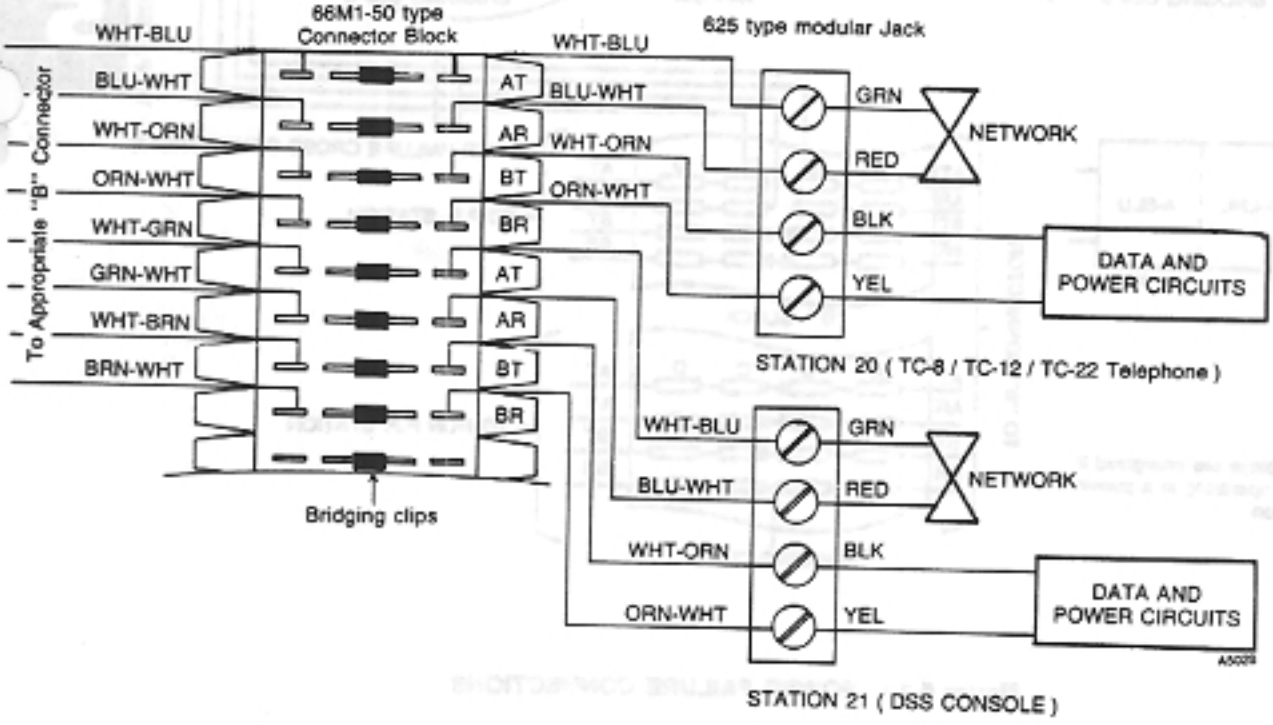


Figure 5-18 KSU TO STATION WIRING

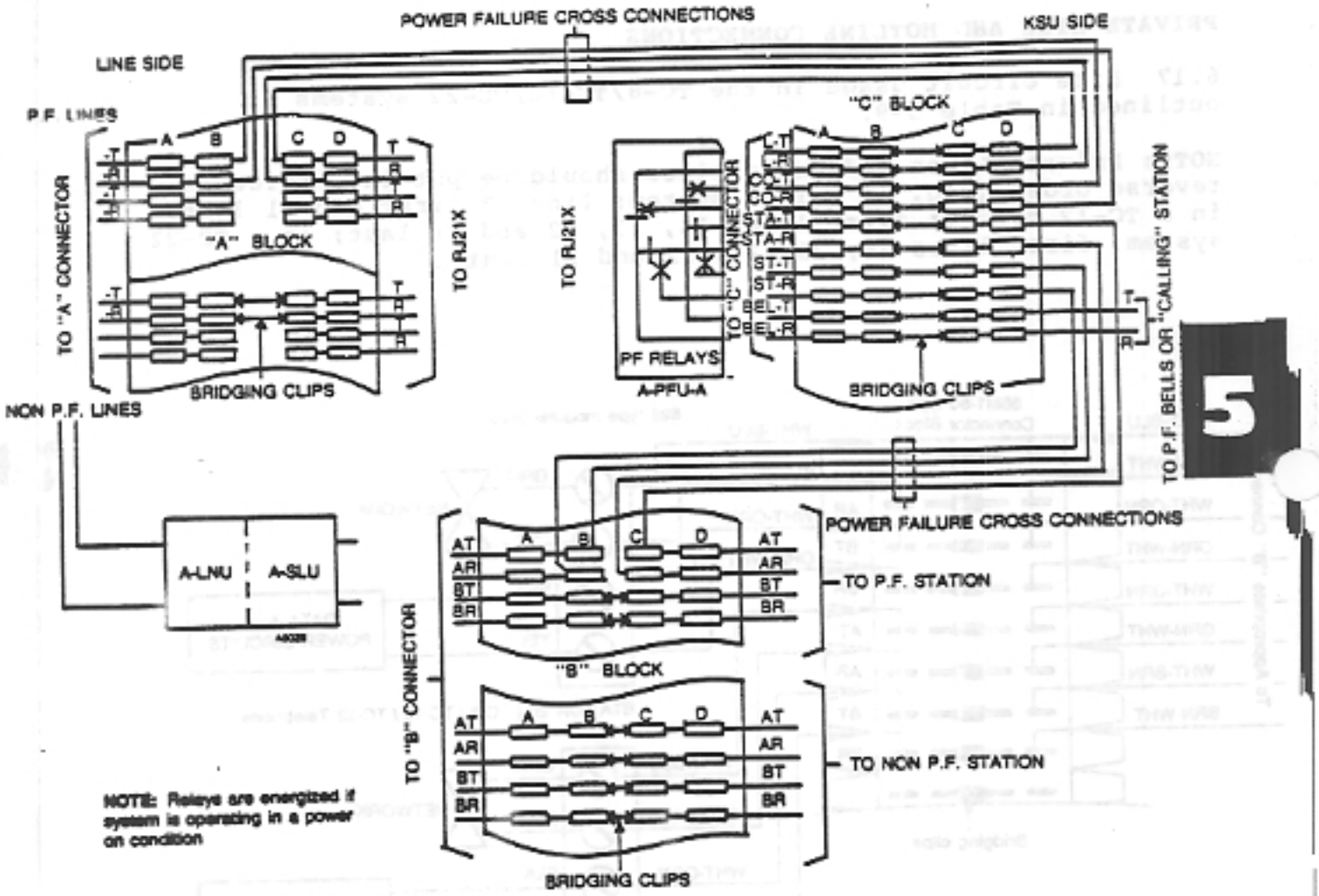


Figure 5-19 POWER FAILURE CONNECTIONS

Table 5-4 A BLOCK CO LINE CONNECTIONS, TC-8/TC-12/TC-22

25 Pair Cable		Block A1 (TC-8)			Block A1 (TC-12)			Block A1 (TC-22)			Block A2 (TC-22)		
Conn Pin	Color Code		Block Term.	Function		Block Term.	Function		Block Term.	Function		Block Term.	Function
26	WHT-BLU	CO 1	1	1T	CO 1	1	1T	CO 1	1	1T	CO 1*	1	26T
1	BLU-WHT		2	1R		2	1R		2	1R		2	26R
27	WHT-ORN	CO 2	3	2T	CO 2	3	2T	CO 2	3	2T		3	
2	ORN-WHT		4	2R		4	2R		4	2R		4	
28	WHT-GRN	CO 3	5	3T	CO 3	5	3T	CO 3	5	3T		5	
3	GRN-WHT		6	3R		6	3R		6	3R		6	
29	WHT-BRN	CO 4	7	4T	CO 4	7	4T	CO 4	7	4T		7	
4	BRN-WHT		8	4R		8	4R		8	4R		8	
30	WHT-SLT	CO 5	9	5T	CO 5	9	5T	CO 5	9	5T		9	
5	SLT-WHT		10	5R		10	5R		10	5R		10	
31	RED-BLU	CO 6	11	6T	CO 6	11	6T	CO 6	11	6T		11	
6	BLU-RED		12	6R		12	6R		12	6R		12	
32	RED-ORN	CO 7	13	7T	CO 7	13	7T	CO 7	13	7T		13	
7	ORN-RED		14	7R		14	7R		14	7R		14	
33	RED-GRN	CO 8	15	8T	CO 8	15	8T	CO 8	15	8T		15	
8	GRN-RED		16	8R		16	8R		16	8R		16	
34	RED-BRN	CO 9†	17	9T	CO 9	17	9T	CO 9	17	9T		17	
9	BRN-RED		18	9R		18	9R		18	9R		18	
35	RED-SLT	CO 10†	19	10T	CO 10	19	10T	CO 10	19	10T		19	
10	SLT-RED		20	10R		20	10R		20	10R		20	
36	BLK-BLU	CO 11**	21	11T	CO 11**	21	11T	CO 11	21	11T		21	
11	BLU-BLK		22	11R		22	11R		22	11R		22	
37	BLK-ORN	CO 12**	23	12T	CO 12**	23	12T	CO 12	23	12T		23	
12	ORN-BLK		24	12R		24	12R		24	12R		24	
38	BLK-GRN		25		CO 13**	25	13T	CO 13	25	13T		25	
13	GRN-BLK		26			26	13R		26	13R		26	
39	BLK-BRN		27		CO 14**	27	14T	CO 14	27	14T		27	
14	BRN-BLK		28			28	14R		28	14R		28	
40	BLK-SLT		29			29		CO 15	29	15T		29	
15	SLT-BLK		30			30			30	15R		30	
41	YEL-BLU		31			31		CO 16	31	16T		31	
16	BLU-YEL		32			32			32	16R		32	
42	YEL-ORN		33			33		CO 17	33	17T		33	
17	ORN-YEL		34			34			34	17R		34	
43	YEL-GRN		35			35		CO 18	35	18T		35	
18	GRN-YEL		36			36			36	18R		36	
44	YEL-BRN		37			37		CO 19	37	19T		37	
19	BRN-YEL		38			38			38	19R		38	
45	YEL-SLT		39			39		CO 20	39	20T		39	
20	SLT-YEL		40			40			40	20R		40	
46	VIO-BLU		41			41		CO 21**	41	21T		41	
21	BLU-VIO		42			42			42	21R		42	
47	VIO-ORN		43			43		CO 22**	43	22T		43	
22	ORN-VIO		44			44			44	22R		44	
48	VIO-GRN		45			45		CO 23**	45	23T		45	
23	GRN-VIO		46			46			46	23R		46	
49	VIO-BRN		47			47		CO 24**	47	24T		47	
24	BRN-VIO		48			48			48	24R		48	
50	VIO-SLT		49			49		CO 25**	49	25T		49	
25	SLT-VIO		50			50			50	25R		50	

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* Used as Common CO lines, Private Lines or Hotlines.
** Used as Private Lines or Hotlines.
† Available only when TC-12 telephones are used with TC-8 system.

Table 5-5 B BLOCK STATION CONNECTIONS, TC-8

25 Pair Cable		Block B1			Block B2			2 Pr. Cable
Conn Pin	Color Code		Block Term.	Function		Block Term.	Function	Color Code
26	WHT-BLU	STATION 20	1	AT	STATION 32	1	AT	WHT-BLU
1	BLU-WHT		2	AR		2	AR	BLU-WHT
27	WHT-ORN		3	BT		3	BT	WHT-ORN
2	ORN-WHT		4	BR		4	BR	ORN-WHT
28	WHT-GRN	STATION 21	5	AT	STATION 33	5	AT	WHT-BLU
3	GRN-WHT		6	AR		6	AR	BLU-WHT
29	WHT-BRN		7	BT		7	BT	WHT-ORN
4	BRN-WHT		8	BR		8	BR	ORN-WHT
30	WHT-SLT	STATION 22	9	AT	STATION 34	9	AT	WHT-BLU
5	SLT-WHT		10	AR		10	AR	BLU-WHT
31	RED-BLU		11	BT		11	BT	WHT-ORN
6	BLU-RED		12	BR		12	BR	ORN-WHT
32	RED-ORN	STATION 23	13	AT	STATION 35	13	AT	WHT-BLU
7	ORN-RED		14	AR		14	AR	BLU-WHT
33	RED-GRN		15	BT		15	BT	WHT-ORN
8	GRN-RED		16	BR		16	BR	ORN-WHT
34	RED-BRN	STATION 24	17	AT	STATION 36	17	AT	WHT-BLU
9	BRN-RED		18	AR		18	AR	BLU-WHT
35	RED-SLT		19	BT		19	BT	WHT-ORN
10	SLT-RED		20	BR		20	BR	ORN-WHT
36	BLK-BLU	STATION 25	21	AT	STATION 37	21	AT	WHT-BLU
11	BLU-BLK		22	AR		22	AR	BLU-WHT
37	BLK-ORN		23	BT		23	BT	WHT-ORN
12	ORN-BLK		24	BR		24	BR	ORN-WHT
38	BLK-GRN	STATION 26	25	AT	STATION 38	25	AT	WHT-BLU
13	GRN-BLK		26	AR		26	AR	BLU-WHT
39	BLK-BRN		27	BT		27	BT	WHT-ORN
14	BRN-BLK		28	BR		28	BR	ORN-WHT
40	BLK-SLT	STATION 27	29	AT	STATION 39	29	AT	WHT-BLU
15	SLT-BLK		30	AR		30	AR	BLU-WHT
41	YEL-BLU		31	BT		31	BT	WHT-ORN
16	BLU-YEL		32	BR		32	BR	ORN-WHT
42	YEL-ORN	STATION 28	33			33		
17	ORN-YEL		34			34		
43	YEL-GRN		35	BT		35	1T	BGM/MOH
18	GRN-YEL		36	BR		36	1R	BGM/MOH
44	YEL-BRN	STATION 29	37	AT		37		
19	BRN-YEL		38	AR		38		
45	YEL-SLT		39	BT		39	ALT	ALM
20	SLT-YEL		40	BR		40	ALR	ALM
46	VIO-BLU	STATION 30	41	AT		41	1T	PAGE
21	BLU-VIO		42	AR		42	1R	1
47	VIO-ORN		43	BT		43	1S1	CONT
22	ORN-VIO		44	BR		44	1S2	1
48	VIO-GRN	STATION 31	45	AT		45	2T	PAGE
23	GRN-VIO		46	AR		46	2R	2
49	VIO-BRN		47	BT		47	2S1	CONT
24	BRN-VIO		48	BR		48	2S2	2
50	VIO-SLT		49			49		
25	SLT-VIO		50			50		

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Table 5-6 B BLOCK STATION CONNECTIONS, TC-12/TC-22

25 Pair Cable		Block B1			Block B2			Block B3			Block B4			Block B5			Cable
Conn Pin	Color Code		Block Term	Function		Block Term.	Function		Block Term	Function		Block Term.	Function		Block Term	Function	2-Pair Cable
26	WHT-BLU	STATION 20	1	AT	STATION 32	1	AT	STATION 44	1	AT	STATION 56	1	AT	STATION 68	1	AT	WHT-BLU
1	BLU-WHT		2	AR		2	AR		2	AR		2	AR		2	AR	BLU-WHT
27	WHT-ORN		3	BT		3	BT		3	BT		3	BT		3	BT	WHT-ORN
2	ORN-WHT		4	BR		4	BR		4	BR		4	BR		4	BR	ORN-WHT
28	WHT-GRN	STATION 21	5	AT	STATION 33	5	AT	STATION 45	5	AT	STATION 57	5	AT	STATION 69	5	AT	WHT-BLU
3	GRN-WHT		6	AR		6	AR		6	AR		6	AR		6	AR	BLU-WHT
29	WHT-BRN		7	BT		7	BT		7	BT		7	BT		7	BT	WHT-ORN
4	BRN-WHT		8	BR		8	BR		8	BR		8	BR		8	BR	ORN-WHT
30	WHT-SLT	STATION 22	9	AT	STATION 34	9	AT	STATION 46	9	AT	STATION 58	9	AT	STATION 70	9	AT	WHT-BLU
5	SLT-WHT		10	AR		10	AR		10	AR		10	AR		10	AR	BLU-WHT
31	RED-BLU		11	BT		11	BT		11	BT		11	BT		11	BT	WHT-ORN
6	BLU-RED		12	BR		12	BR		12	BR		12	BR		12	BR	ORN-WHT
32	RED-ORN	STATION 23	13	AT	STATION 35	13	AT	STATION 47	13	AT	STATION 59	13	AT	STATION 71	13	AT	WHT-BLU
7	ORN-RED		14	AR		14	AR		14	AR		14	AR		14	AR	BLU-WHT
33	RED-GRN		15	BT		15	BT		15	BT		15	BT		15	BT	WHT-ORN
8	GRN-RED		16	BR		16	BR		16	BR		16	BR		16	BR	ORN-WHT
34	RED-BRN	STATION 24	17	AT	STATION 36	17	AT	STATION 48	17	AT	STATION 60	17	AT	STATION 72	17	AT	WHT-BLU
9	BRN-RED		18	AR		18	AR		18	AR		18	AR		18	AR	BLU-WHT
35	RED-SLT		19	BT		19	BT		19	BT		19	BT		19	BT	WHT-ORN
10	SLT-RED		20	BR		20	BR		20	BR		20	BR		20	BR	ORN-WHT
36	BLK-BLU	STATION 25	21	AT	STATION 37	21	AT	STATION 49	21	AT	STATION 61	21	AT	STATION 73	21	AT	WHT-BLU
11	BLU-BLK		22	AR		22	AR		22	AR		22	AR		22	AR	BLU-WHT
37	BLK-ORN		23	BT		23	BT		23	BT		23	BT		23	BT	WHT-ORN
12	ORN-BLK		24	BR		24	BR		24	BR		24	BR		24	BR	ORN-WHT
38	BLK-GRN	STATION 26	25	AT	STATION 38	25	AT	STATION 50	25	AT	STATION 62	25	AT	STATION 74	25	AT	WHT-BLU
13	GRN-BLK		26	AR		26	AR		26	AR		26	AR		26	AR	BLU-WHT
39	BLK-BRN		27	BT		27	BT		27	BT		27	BT		27	BT	WHT-ORN
14	BRN-BLK		28	BR		28	BR		28	BR		28	BR		28	BR	ORN-WHT
40	BLK-SLT	STATION 27	29	AT	STATION 39	29	AT	STATION 51	29	AT	STATION 63	29	AT	STATION 75	29	AT	WHT-BLU
15	SLT-BLK		30	AR		30	AR		30	AR		30	AR		30	AR	BLU-WHT
41	YEL-BLU		31	BT		31	BT		31	BT		31	BT		31	BT	WHT-ORN
16	BLU-YEL		32	BR		32	BR		32	BR		32	BR		32	BR	ORN-WHT
42	YEL-ORN	STATION 28	33	AT	STATION 40	33	AT	STATION 52	33	AT	STATION 64	33	AT	STATION 76	33	AT	WHT-BLU
17	ORN-YEL		34	AR		34	AR		34	AR		34	AR		34	AR	BLU-WHT
43	YEL-GRN		35	BT		35	BT		35	BT		35	BT		35	BT	WHT-ORN
18	GRN-YEL		36	BR		36	BR		36	BR		36	BR		36	BR	ORN-WHT
44	YEL-BRN	STATION 29	37	AT	STATION 41	37	AT	STATION 53	37	AT	STATION 65	37	AT	STATION 77	37	AT	WHT-BLU
19	BRN-YEL		38	AR		38	AR		38	AR		38	AR		38	AR	BLU-WHT
45	YEL-SLT		39	BT		39	BT		39	BT		39	BT		39	BT	WHT-ORN
20	SLT-YEL		40	BR		40	BR		40	BR		40	BR		40	BR	ORN-WHT
46	VIO-BLU	STATION 30	41	AT	STATION 42	41	AT	STATION 54	41	AT	STATION 66	41	AT	STATION 78	41	AT	WHT-BLU
21	BLU-VIO		42	AR		42	AR		42	AR		42	AR		42	AR	BLU-WHT
47	VIO-ORN		43	BT		43	BT		43	BT		43	BT		43	BT	WHT-ORN
22	ORN-VIO		44	BR		44	BR		44	BR		44	BR		44	BR	ORN-WHT
48	VIO-GRN	STATION 31	45	AT	STATION 43	45	AT	STATION 55	45	AT	STATION 67	45	AT	STATION 79	45	AT	WHT-BLU
23	GRN-VIO		46	AR		46	AR		46	AR		46	AR		46	AR	BLU-WHT
49	VIO-BRN		47	BT		47	BT		47	BT		47	BT		47	BT	WHT-ORN
24	BRN-VIO		48	BR		48	BR		48	BR		48	BR		48	BR	ORN-WHT
50	VIO-SLT		49			49			49			49			49		
25	SLT-VIO		50			50			50			50			50		

NOTE: Blocks B1, B2, and B3 are for TC-12 and TC-22 systems. Blocks B4 and B5 are for the TC-22 system only.

Table 5-7 C BLOCK ASSIGNMENTS, TC-8/TC-12/TC-22

25 Pair Cable		Connecting Block C1		Comments
Conn Pin	Color Code	Block Term.	Function	
26	WHT-BLU	1	L1T	Cross connect to C clips on A block for 1st P.F. line.
1	BLU-WHT	2	L1R	
27	WHT-ORN	3	CO1T	Cross connect to B clips on A block for 1st P.F. line.
2	ORN-WHT	4	CO1R	
28	WHT-GRN	5	STA1T	Cross connect to C clips on B block for 1st P.F. station.
3	GRN-WHT	6	STA1R	
29	WHT-BRN	7	ST1T	Cross connect to B clips on B block for 1st P.F. station.
4	BRN-WHT	8	ST1R	
30	WHT-SLT	9	BEL1T	To 1st P.F. originating station or ringer.
5	SLT-WHT	10	BEL1R	
31	RED-BLU	11	L2T	Cross connect to C clips on A block for 2nd P.F. line.
6	BLU-RED	12	L2R	
32	RED-ORN	13	CO2T	Cross connect to B clips on A block for 2nd P.F. line.
7	ORN-RED	14	CO2R	
33	RED-GRN	15	STA2T	Cross connect to C clips on B block for 2nd P.F. station.
8	GRN-RED	16	STA2R	
34	RED-BRN	17	ST2T	Cross connect to B clips on B block for 2nd P.F. station.
9	BRN-RED	18	ST2R	
35	RED-SLT	19	BEL2T	To 2nd P.F. originating station or ringer.
10	SLT-RED	20	BEL2R	
36	BLK-BLU	21	L3T	Cross connect to C clips on A block for 3rd P.F. line.
11	BLU-BLK	22	L3R	
37	BLK-ORN	23	CO3T	Cross connect to B clips on A block for 3rd P.F. line.
12	ORN-BLK	24	CO3R	
38	BLK-GRN	25	STA3T	Cross connect to C clips on B block for 3rd P.F. station.
13	GRN-BLK	26	STA3R	
39	BLK-BRN	27	ST3T	Cross connect to B clips on B block for 3rd P.F. station.
14	BRN-BLK	28	ST3R	
40	BLK-SLT	29	BEL3T	To 3rd P.F. originating station or ringer.
15	SLT-BLK	30	BEL3R	
41	YEL-BLU	31	L4T	Cross connect to C clips on A block for 4th P.F. line.
16	BLU-YEL	32	L4R	
42	YEL-ORN	33	CO4T	Cross connect to B clips on A block for 4th P.F. line.
17	ORN-YEL	34	CO4R	
43	YEL-GRN	35	STA4T	Cross connect to C clips on B block for 4th P.F. station.
18	GRN-YEL	36	STA4R	
44	YEL-BRN	37	ST4T	Cross connect to B clips on B block for 4th P.F. station.
19	BRN-YEL	38	ST4R	
45	YEL-SLT	39	BEL4T	To 4th P.F. originating station or ringer.
20	SLT-YEL	40	BEL4R	
46	VIO-BLU	41	L5T	Cross connect to C clips on A block for 5th P.F. line.
21	BLU-VIO	42	L5R	
47	VIO-ORN	43	CO5T	Cross connect to B clips on A block for 5th P.F. line.
22	ORN-VIO	44	CO5R	
48	VIO-GRN	45	STA5T	Cross connect to C clips on B block for 5th P.F. station.
23	GRN-VIO	46	STA5R	
49	VIO-BRN	47	ST5T	Cross connect to B clips on B block for 5th P.F. station.
24	BRN-VIO	48	ST5R	
50	VIO-SLT	49	BEL5T	To 5th P.F. originating station or ringer.
25	SLT-VIO	50	BEL5R	

Table 5-8 D BLOCK ASSIGNMENTS, TC-12/TC-22

25 Pair Cable		Connecting Block D		Circuit
Conn Pin	Color Code	Block Term	Function	Function
26	WHT-BLU	1	1T	BGM/MOH
1	BLU-WHT	2	1R	
27	WHT-ORN	3		
2	ORN-WHT	4		
28	WHT-GRN	5	ALT	ALARM
3	GRN-WHT	6	ALR	
29	WHT-BRN	7	1T	PAGE No. 1
4	BRN-WHT	8	1R	
30	WHT-SLT	9	1S1	CONT. No. 1
5	SLT-WHT	10	1S2	
31	RED-BLU	11	2T	PAGE No. 2
6	BLU-RED	12	2R	
32	RED-ORN	13	2S1	CONT. No. 2
7	ORN-RED	14	2S2	
33	RED-GRN	15		
8	GRN-RED	16		
34	RED-BRN	17		
9	BRN-RED	18		
35	RED-SLT	19		
10	SLT-RED	20		
36	BLK-BLU	21		
11	BLU-BLK	22		
37	BLK-ORN	23		
12	ORN-BLK	24		
38	BLK-GRN	25		
13	GRN-BLK	26		
39	BLK-BRN	27		
14	BRN-BLK	28		
40	BLK-SLT	29		
15	SLT-BLK	30		
41	YEL-BLU	31		
16	BLU-YEL	32		
42	YEL-ORN	33		
17	ORN-YEL	34		
43	YEL-GRN	35		
18	GRN-YEL	36		
44	YEL-BRN	37		
19	BRN-YEL	38		
45	YEL-SLT	39		
20	SLT-YEL	40		
46	VIO-BLU	41		
21	BLU-VIO	42		
47	VIO-ORN	43		
22	ORN-VIO	44		
48	VIO-GRN	45		
23	GRN-VIO	46		
49	VIO-BRN	47		
24	BRN-VIO	48		
50	VIO-SLT	49		
25	SLT-VIO	50		

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Table 5-9 OPTIONAL USE OF LINE CIRCUITS, TC-8/TC-12/TC-22

CO LINE POSITION	TC-8		TC-8 SYSTEM WITH TC-12 TELEPHONE		TC-12		TC-22	
	COMMON	PL/HL	COMMON	PL/HL	COMMON	PL/HL	COMMON	PL/HL
1	X		X		X		X	
2	X		X		X		X	
3	X		X		X		X	
4	X		X		X		X	
5	X		X		X		X	
6	X		X		X		X	
7	X		X		X		X	
8	X		X		X		X	
9			X		X		X	
10			X		X		X	
11		X	X	X	X	X	X	
12	X	X	X	X	X	X	X	
13						X	X	
14						X	X	
15							X	
16							X	
17							X	
18							X	
19							X	
20							X	
21							X	X
22							X	X
23								X
24								X
25								X
26								X

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SYSTEM CABLING CHECK

- Homerun all station cable (para. 6.04).
- Terminate cable in modular jack at station location (para. 6.06).
- Complete all system connections and install bridging clips as required (para. 6.08-6.18).

7. STATION INSTALLATION

7.01 Prior to installing key telephones, verify that the wires are on the proper terminals in the modular jack assemblies.

7.02 To check wiring, measure DC voltage at each station block beginning at the first station. Connect the voltmeter as follows and turn on Power Supply:

CONNECT VOLTMETER +	CONNECT VOLTMETER −	VOLTMETER READING (TYPICAL)
GRN (AT)	RED (AR)	11-16 VDC
BLK (BT)	YEL (BR)	24-50 VDC

Check station cabling and wiring from station block against Figure 5-18, if these voltages are not obtained.

7.03 There is no need to open key telephones or power failure telephones for installation unless a TC-402 speakerphone is installed (refer to Section 9). Plug the set into its modular jack.

8. RADIO FREQUENCY INTERFERENCE

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

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

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

HOW TO IDENTIFY AND REMOVE RADIO-TV INTERFERENCE PROBLEMS

Order this booklet from:

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

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9. CONNECTING TELCO LINES

9.01 The RJ21X connector from the telco provides service for the CO lines. The RJ21X connector is joined to the TC-8/TC-12/TC-22 system by using a 25-pair cable terminated with a 25-pair connector at the other end. This cable cannot exceed 25 feet in length.

9.02 Lines 1 through 12 in a TC-8, lines 1 through 14 in a TC-12 and lines 1-25 in a TC-22 system appear on connector A1 at the KSU. These lines are connected with a 25-pair cable from A1 to the RJ21X from the telco. Line 26 in a TC-22 system appears on the A2 block and requires a second RJ21X.

TC-8/TC-12/TC-22
ELECTRONIC KEY TELEPHONE SYSTEM
SECTION 6, PROGRAM ENTRY

1. INTRODUCTION

1.01 The PROGRAM ENTRY Section describes system initialization, program entry and program reading procedures for the TC-8/TC-12/TC-22 systems. All data needed for program entry has been entered on the Program Record Form (PRF) completed in Section 4.

1.02 Information on Programming Disabled Conditions has been corrected.

2. SYSTEM INITIALIZATION

2.01 The system must be initialized prior to programming option codes. Initialization loads the factory installed program in the system memory.

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

To initialize the system:

- Turn OFF power supply.
- Set SWI switch on the A-NMU PCB to the OFF position.
- Turn ON power supply. The factory installed program has now been loaded to the system memory.
- After approximately 10 seconds, set SWI switch on the A-NMU PCB to the ON position, to protect the memory from momentary loss of power.

2.02 If the system is not properly initialized, such as not placing SWI in the OFF position, system malfunction may occur due to random data loaded in the operating program.

2.03 The factory installed program configures the system as follows:

a) DSS attendants' telephone numbers are set according to the positions of switches SW2 & SW3 on the A-NMU PCB.
b) The attendants' telephones will receive common CO audible on all common CO lines.
c) The system is programmed for DTMF CO line signaling.
d) Internal page zones:
   Zone 1- stations 20-23
   Zone 2- stations 24-27
   Zone 3- stations 28-31
   Zone 4- stations 32-35
f) The system has DSS override.

PROGRAMMING DISABLED CONDITIONS

2.04 Under certain operational conditions, changes to specific programs will not be allowed. In these cases, the DSS key LED will not illuminate when the key is pressed while the system is in the programming mode. Specifically:

a) If a CO line is in the ringing mode, Programs 20 through 28 and NT (ring groups and station assignments to ring groups) cannot be changed.
b) When any CO line is in use, Programs 33 or 35 cannot be changed.
c) When a CO line is in use, that CO line cannot be programmed to be a Private Line (Programs 51-56).
d) When Paging is in progress, Programs IZ1-IZ4 and EZ1-EZ2 (Paging programs) cannot be changed.
e) If Private Lines are in use at executive stations or the station is in the DND mode, Programs 47-50 (Executive Call Forward assignments) cannot be changed.

3. PROGRAM ENTRY

3.01 To program option codes, the system must be in the programming mode. To place the system in the programming mode:

- Remove primary DSS console faceplate to expose DATA ENTRY key (Figures 6-1 and 6-2).
- Press DATA ENTRY key. LED on MW key illuminates and the system stops processing calls.
- Place primary DSS station handset off hook.

3.02 When program entry has been completed:

- Place primary DSS station on hook.
- Press DATA ENTRY key. MW key extinguishes and the system resumes processing calls.
- Replace primary DSS console faceplate.

NOTE: If after pressing the DATA ENTRY key, the alarm sounds at the console, a conflict exists in the data entered. Return to the programming mode and review data input for the programs that correspond to the illuminated console key LEDs and correct the conflict.

3.03 If a specific program requires modification at a later date then the procedure for placing the console in the programming mode must be followed.

CAUTION: DO NOT INITIALIZE THE SYSTEM AGAIN. INITIALIZING ERASES ALL PREVIOUSLY SELECTED OPTION CODES.

3.04 Record all changes on the Option Configuration Worksheets (OCWs) and on the PRF to keep all information up to date. Beginning with paragraph 3.05, procedures for entering data into each program are described. Refer to the PRF for data.

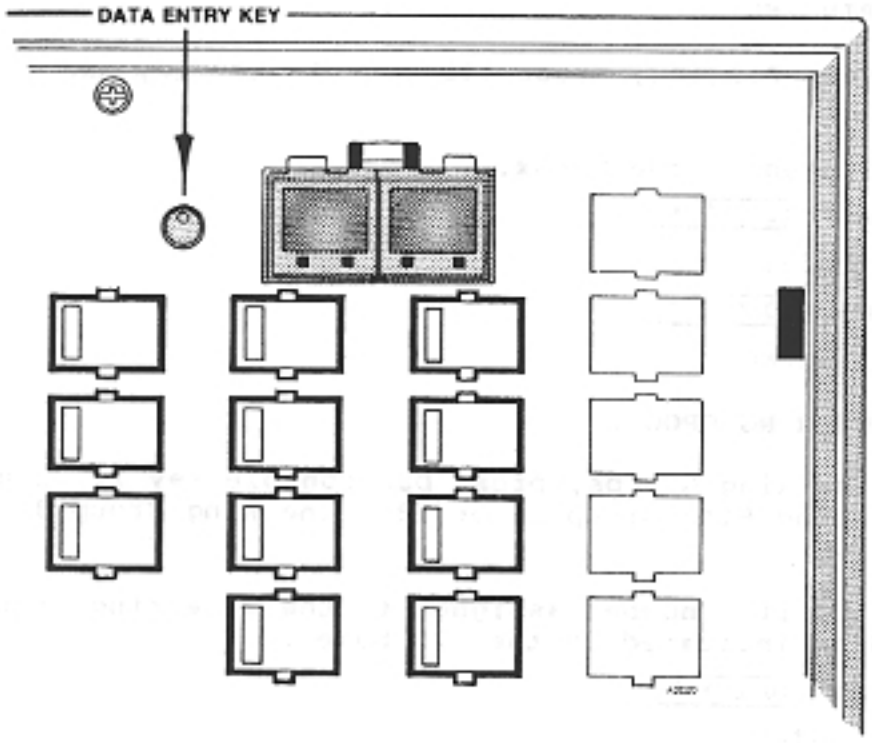

Figure 6-1 DSS CONSOLE WITHOUT FACEPLATE, TC-8/TC-12

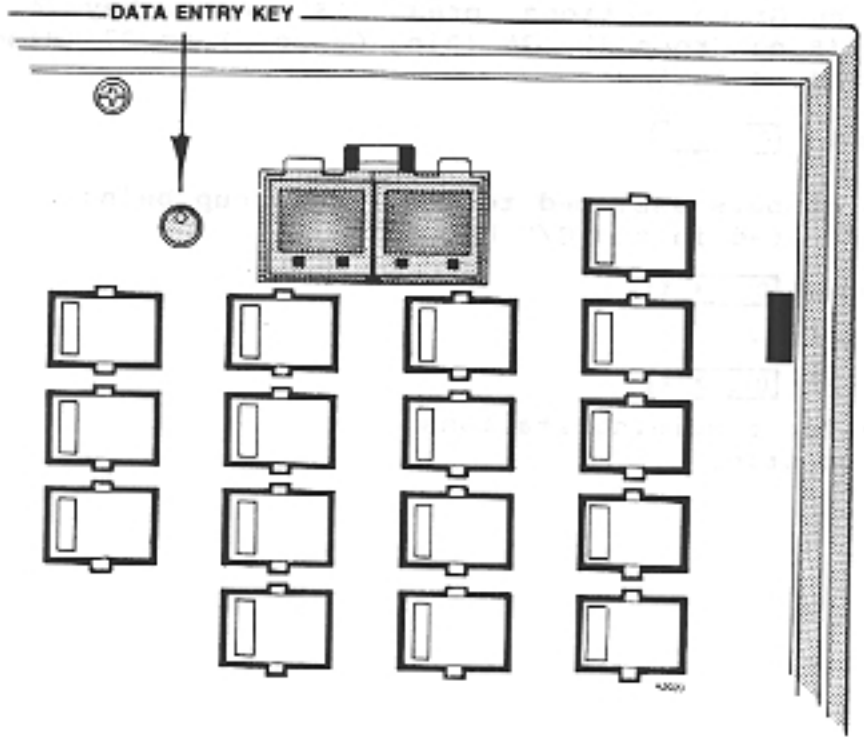

Figure 6-2 DSS CONSOLE WITHOUT FACEPLATE, TC-22

PROGRAM 20, GROUP RINGING

3.05 To program Group Ringing, press DSS console key 20, and proceed as follows:

- Dial code as indicated in the D box.

  Display: [0 0 0 X]

- Press * to enter code.

  Display: [0 0 0 0]

- Press # to exit program.

PROGRAMS 21-23, LINE RING GROUPS

3.06 To program Line Ring Groups, press DSS console key 21 (Line Ring Group 1), 22 (Line Ring Group 2) or 23 (Line Ring Group 3), and proceed as follows:

- Dial The highest CO line number assigned to the line ring group being programmed as indicated in the C/D boxes.

  Display: [0 0 X X]

- Press * to enter code.

  Display: [0 0 0 0]

- Press # to exit program.

PROGRAMS 24-27, RING GROUP STATIONS

3.07 To program Ring Group Stations, press DSS console key 24 (Ring Group 1), 25 (Ring Group 2), 26 (Ring Group 3) or 27 (Ring Group 4), and proceed as follows:

Display: [0 1 0 0]

- Dial the station numbers assigned to the ring group being programmed as indicated in the C/D boxes.

  Display: [0 1 X X]

- Press * to enter code.

  Display: [0 2 X X]

- Repeat procedure for remaining stations.
- Press # to exit program.

PROGRAM 28, COMMON AUDIBLE STATIONS

3.Ø8 To program Common Audible stations press DSS console key 28, and proceed as follows:

- Dial the first Common Audible station number indicated in the C/D box.

  Display: [0 X X X]

- Press * to enter Code.

  Display: [0 0 0 0]

- Repeat procedure for remaining stations.
- Press # to exit program.

PROGRAM 29, OFF HOOK SIGNALING AND DSS OVERRIDE

3.Ø9 To program Off Hook Signaling and DSS Override, press DSS console key 29, and proceed as follows:

- Dial code as indicated in the D box.

  Display: [0 0 0 X]

- Press * to enter code.

  Display: [0 0 0 0]

- Press # to exit program.

PROGRAM 3Ø, DTMF OPX

3.1Ø To program DTMF OPX, press DSS console key 3Ø, and proceed as follows:

- Dial station number as indicated in the A/B boxes.

  Display: [X X 0 0]

- Dial * to enter code.
- Dial code as indicated in the D box.

  Display: [X X 0 X]

- Press * to enter code.

  Display: [0 0 0 0]

- Press # to exit program.

PROGRAM 31, DO NOT DISTURB

3.11 To program Do Not Disturb, press DSS console key 31, and proceed as follows:

- Dial the first station number to be programmed for DND as indicated in the A/B boxes.

  Display: [X X 0 0]

- Press * to enter code.

  Display: [X X 0 0]

- Dial code for station being programmed as indicated in the D box.

  Display: [X X 0 X]

- Press * to enter code.

  Display: [0 0 0 0]

- Repeat procedure for next station to be programmed for DND.
- Press # to exit program.

PROGRAM 32, RECALL TIMING

3.12 To program Recall Timing, press DSS console key 32, and proceed as follows:

- Dial code as indicated in the D box.

  Display: [0 0 0 X]

- Press * to enter code.

  Display: [0 0 0 0]

- Press # to exit program.

PROGRAM 33, CO LINE SIGNALING

3.13 To program CO line Signaling, press DSS console key 33, and proceed as follows:

- Dial code as indicated in the D box.

  Display: [0 0 0 X]

- Press * to enter code.

  Display: [0 0 0 0]

- Press # to exit program.

PROGRAM 34, PBX OPERATION

3.14 To program PBX Operation, press DSS console key 34, and proceed as follows:

- Dial line number as indicated in the A/B boxes.

Display: [X X 0 0]

- Press *.
- Dial code as indicated in the D box.

Display: [X X 0 X]

- Press * to enter code.

Display: [0 0 0 0]

- Repeat for remaining lines.
- Press # to exit program.

PROGRAM 35, FLASH KEY

3.15 To program Flash Key, press DSS console key 35, and proceed as follows:

- Dial code as indicated in the D box.

Display: [0 0 0 X]

- Press * to enter code.

Display: [0 0 0 0]

- Press # to exit program.

PROGRAM 36, MEET-ME PAGE

3.16 To program Meet-Me Page, press DSS console key 36, and proceed as follows:

- Dial code as indicated in the D box.

Display: [0 0 0 X]

- Press * to enter code.

Display: [0 0 0 0]

- Press # to exit program.

PROGRAM 37, RESTRICTED QUEUE GROUPS

3.17 To program Restricted Queue Groups, press DSS console key 37, and proceed as follows:

- Dial code as indicated in the B box.

  Display: [0 X 0 0]

- Press * to enter code.

  Display: [0 X 0 0]

- Dial queue group number as indicated in the D box.

  Display: [0 X 0 X]

- Press * to enter code.

  Display: [0 0 0 0]

- Repeat procedure to program remaining entries.
- Press # to exit program.

PROGRAM 38, STATION DIAL RESTRICTIONS

3.18 To program Station Dial Restrictions, press DSS console key 38, and proceed as follows:

- Dial station number as indicated in the A/B boxes.

  Display: [X X 0 0]

- Press * to enter code.

  Display: [X X 0 0]

- Dial code as indicated in the D box.

  Display: [X X 0 X]

- Press * to enter code.

  Display: [0 0 0 0]

- Repeat procedure to program remaining stations.
- Press # to exit program.

PROGRAM 39, STATION CLASS OF SERVICE

3.19 To program Station Class of Service, press DSS console key 39, and proceed as follows:

- Dial station number as indicated in the A/B boxes.

  Display: [X X 0 0]

- Press * to enter code.

  Display: [X X 0 0]

- Dial code as indicated in the D box.

  Display: [X X 0 X]

- Press * to enter code.

  Display: [0 0 0 0]

- Repeat procedure to program remaining stations.
- Press # to exit program.

PROGRAM 40, QUEUE GROUPS

3.20 To program Queue Groups, press DSS console key 40, and proceed as follows:

- Dial line number as indicated in the A/B boxes.

  Display: [0 X 0 0]

- Press * to enter code.

  Display: [0 X 0 0]

- Dial code as indicated in the D box.

  Display: [0 X 0 X]

- Press * to enter code.

  Display: [0 0 0 0]

- Repeat procedure to program remaining lines.
- Press # to exit program.

PROGRAM 41, PERMITTED CODES

3.21 To program Permitted Codes, press DSS console key 41, and proceed as follows:

- Dial each digit of a permitted code as indicated in the D box.

  Display: [0 X b X]

- Press * to enter code.

  Display: [0 X b b]

- Repeat procedure to program remaining codes.
- Press # repeatedly until display shows "0 0 0 0" to exit program.

NOTE: When adding new codes, use the # key to bypass existing codes that are to be saved.

PROGRAM 42, PERMITTED CODE DIGITS

3.22 To program Permitted Code Digits, press DSS console key 42, and proceed as follows:

- Dial maximum number of digits for a permitted code as indicated in the C/D boxes.

  Display: [0 0 X X]

- Press * to enter code.

  Display: [0 0 0 0]

- Press # to exit program.

PROGRAM 43, '0' OR '1' IN 2nd DIGIT

3.23 To program '0' or '1' in Second Digit, press DSS console key 43, and proceed as follows:

- Dial code as indicated in the D box.

  Display: [0 0 0 X]

- Press * to enter code.

  Display: [0 0 0 0]

- Press # to exit program.

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PROGRAM 44, PBX ACCESS CODES

3.24 To program PBX Access Codes, press DSS console key 44, and proceed as follows:

- Dial each digit of an access code as indicated in the D box.

  Display: 0 X b X

- Press * to enter code.

  Display: 0 X b b

- Repeat procedure to program remaining access codes.
- Press # repeatedly until display shows "Ø Ø Ø Ø" to exit program.

NOTE: When adding new codes, use # key to bypass existing codes that are to be saved.

PROGRAM 45, COMMON UNRESTRICTED CODES

3.25 To program Common Unrestricted Codes, press DSS console key 45, and proceed as follows:

- Dial each digit of a common unrestricted code as indicated in the D box.

  Display: 0 X b X

- Press * to enter code.

  Display: 0 X b b

- Repeat procedure to program remaining codes.
- Press # repeatedly until display shows "Ø Ø Ø Ø" to exit program.

NOTE: When adding new codes, use # key to bypass existing codes that are to be saved.

PROGRAM 46, DIGIT ABSORBING

3.26 To program Digit Absorbing, press DSS console key 46, and proceed as follows:

- Dial first absorb digit as indicated in the D box.

  Display: 0 X b X

- Press * to enter code.

  Display: 0 X b b

- Repeat procedure to program remaining absorb digits.
- Press # repeatedly until display shows "0 0 0 0" to exit program.

PROGRAM 47-50, EXECUTIVE CALL FORWARD

3.27 To program Executive Call Forward, press DSS console key 47 (Pair 1), 48 (Pair 2), 49 (Pair 3) or 50 (Pair 4), and proceed as follows:

- Dial executive station number as indicated in the A/B boxes.

  Display: X X 0 0

- Press * to enter code.

  Display: X X 0 0

- Dial other station number in pair as indicated in the C/D boxes.

  Display: X X X X

- Press * to enter code.

  Display: X X X X

- Press # to exit program.
- Repeat procedure for next executive pair program.

PROGRAMS 51-56, PRIVATE LINE/HOTLINE ASSIGNMENTS

3.28 To program Private Line/Hotline Assignments, press DSS console key 51 (Assignment 1), 52 (Assignment 2), 53 (Assignment 3), 54 (Assignment 4), 55 (Assignment 5) or 56 (Assignment 6), and proceed as follows:

- Dial code as indicated in the A/B boxes ('00' for a private line must be entered).

  Display: [X X 0 0]

- Press * to enter code.

  Display: [X X 0 0]

- Dial code as indicated in the C/D boxes.

  Display: [X X X X]

- Press * to enter code.

  Display: [0 0 0 0]

- Press # to exit program.

PROGRAM ALM, ALARM

3.29 To program Alarm, press DSS console key ALM, and proceed as follows:

- Dial code as indicated in the D box.

  Display: [0 0 0 X]

- Press * to enter code.

  Display: [0 0 0 0]

- Press # to exit program.

PROGRAMS EZ1-EZ2, EXTERNAL PAGE ZONES

3.30 To program External Page Zones, press DSS console key EZ1 (Zone 1) or EZ2 (Zone 2), and proceed as follows:

- Dial code as indicated in the B box.

  Display: [0 X 0 0]

- Press * to enter code.

  Display: [0 X 0 0]

- Dial code as indicated in the D box.

  Display: [0 X 0 X]

- Press * to enter code.

  Display: [0 X 0 X]

- Press # to exit program.

PROGRAMS IZ1-IZ4, INTERNAL PAGE ZONES

3.31 To program Internal Page Zones, press DSS console key IZ1 (Zone 1), IZ2 (Zone 2), IZ3 (Zone 3) or IZ4 (Zone 4), and proceed as follows:

- Dial lowest station number assigned to zone being programmed as indicated in the A/B boxes.

  Display: [X X 0 0]

- Press * to enter code.

  Display: [X X 0 0]

- Dial highest station number assigned to zone being programmed as indicated in the C/D boxes.

  Display: [X X X X]

- Press * to enter code.

  Display: [0 0 0 0]

- Press # to exit program.

PROGRAM NT, NIGHT SERVICE

3.32 To program Night Service press DSS console key NT and proceed as follows:

Display: [X X 0 0]

- Dial station number to be programmed as indicated in the C/D boxes.

  Display: [X X X X]

- Press * to enter code.

  Display: [X X 0 0]

- Repeat procedure to program next station.
- Press # to exit program.

6

EXITING THE PROGRAMMING MODE

4.01 When all data has been entered, exit the programming mode in accordance with paragraph 3.02. If a conflict exists in the data entered the alarm at the console sounds and the appropriate DSS console key LEDs illuminate.

Recognized program errors include:

- Group Ringing assigned in Program 20 but no lines assigned to Line Ring Group 1 in Program 21.
- For Ring Group Station assignments (Programs 24-27) '00' has not been entered as the last station in ring groups with fewer than 10 stations.
- At least one line assigned for PBX operation (Program 34) but no PBX access code assignments in Program 44.
- A station assigned as the executive in an Executive Call Forward pair (Programs 47-50) has not been assigned DND (Program 31).
- A station had been assigned more than one Private Line or Hotline (Programs 51-56).

4.02 If an error does exist, return to the programming mode, and review data input for the programs that correspond to the illuminated console key LEDs and correct the conflict.

4.03 A check should be made to verify that in Program 46 the first digit has been absorbed:

- Dial the first digit of a local exchange.
- Dial 0; if the call is routed to an operator, the first digit was probably absorbed.
- Repeat procedure two or three times for verification.
- Dial the absorbed digit twice.
- Dial Operator; if the digit has been absorbed, the operator should be reached.

If a problem occurs with digit absorption, then return to Program 46 (para. 3.26) and reenter data.

5. PROGRAM READING

5.Ø1 To verify a program, first place the system in the programming mode in accordance with paragraph 3.Ø1. Then proceed:

- Press DSS console key AC. LED illuminates
- Press DSS console key of desired program. (If console key LED does not illuminate and AC key LED extinguishes, no data has been programmed.)
- Complete the steps as listed for the desired program under PROGRAM ENTRY in this section.
- Dial # once to leave the program.+
- Repeat entire procedure to read another program or press DATA ENTRY key to resume normal call processing.

+Dial # in programs 41, 44, 45, 46 to advance to the next code entry.

TC-8/TC-12/TC-22
ELECTRONIC KEY TELEPHONE SYSTEM
SECTION 7, TESTS AND FAULT LOCATION

1. INTRODUCTION

1.01 The THEORY OF OPERATION Section, to be provided, will contain the system and Printed Circuit Board (PCB) theory of operation for the TC-8/TC-12/TC-22 family of Electronic Key Telephone Systems.

1.02 This paragraph is reserved for summarizing major revisions to this section.

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TC-8/TC-12/TC-22
ELECTRONIC KEY TELEPHONE SYSTEM
SECTION 8, MAINTENANCE

1. INTRODUCTION

1.01 The MAINTENANCE Section, to be provided, is intended for use with Section 7 in isolating and repairing system problems.

1.02 This paragraph is reserved for summarizing major revisions to this section.

2. INSTRUCTIONS

2.01 To be provided.

3. TOOLS AND TEST EQUIPMENT

3.01 To be provided.

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TC-8/TC-12/TC-22
ELECTRONIC KEY TELEPHONE SYSTEM
SECTION 9, OPTIONAL EQUIPMENT

1. INTRODUCTION

1.01 The OPTIONAL EQUIPMENT Section provides information on equipment accessories and equipment required for optional features. Each subsection provides detailed description and installation information.

1.02 Information on External Page Zone Connections and Speakerphone has been revised.

2. EQUIPMENT ACCESSORIES

2.01 The following publication is included in this manual:

WALL MOUNTING KIT	Part Number 01083

3. EQUIPMENT REQUIRED FOR OPTIONAL FEATURES

3.01 The following publications are included in this manual:

EXTERNAL MUSIC SOURCE CONNECTIONS	Part Number 01078
ALARM CONNECTIONS	Part Number 01079
SPEAKERBOX	Part Number 01081
SPEAKERPHONE	Part Number 01082
EXTERNAL PAGING ZONE CONNECTIONS	Part Number 01093
BUSY LAMP FIELD	Part Number 01080
A-OPU-A OFF-PREMISES EXTENSION PCB	Part Number 01225
A-OPU-B OFF-PREMISES STATION PCB	Part Number 01018
A-SMDR-A PCB	Part Number 13189

EXTERNAL MUSIC SOURCE CONNECTIONS

DESCRIPTION

If Background Music (BGM) is required, a customer provided music source must be used. This source can be a radio, tuner, tape deck, piped-in music, etc. The customer provided source can also be used to provide Music-On-Hold (MOH).

BGM provides music through the loudspeakers in the telephones of the TC-8/TC-12/TC-22 systems. Music can also be provided through the paging system (programmable).

SPECIFICATIONS

The music source should have an adjustable output level between −30 dBm and 0 dBm and an output of 600 ohms or less.

INSTALLATION

For the TC-12 and TC-22 systems use twisted pair wire to connect the music source to terminals 1 and 2 on the D1 block for BGM / MOH (terminals 35 and 36 for BGM / MOH on the B2 block for the TC-8 system) and install bridging clips (Figures 1 and 2).

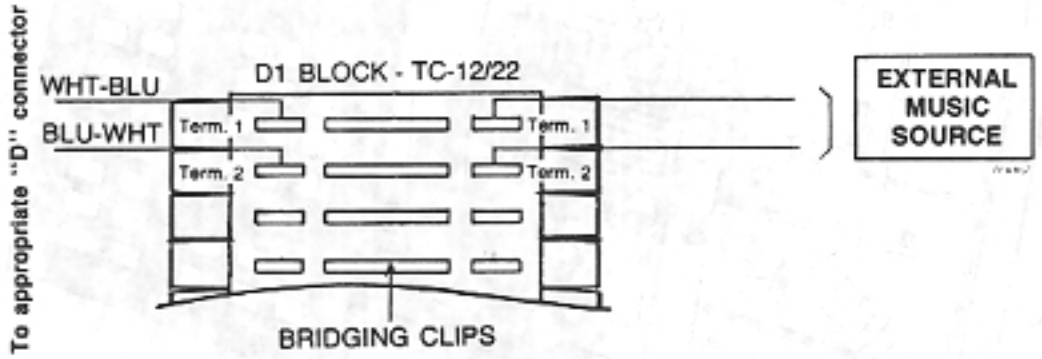

Figure 1 EXTERNAL MUSIC SOURCE CONNECTIONS, TC-12/TC-22

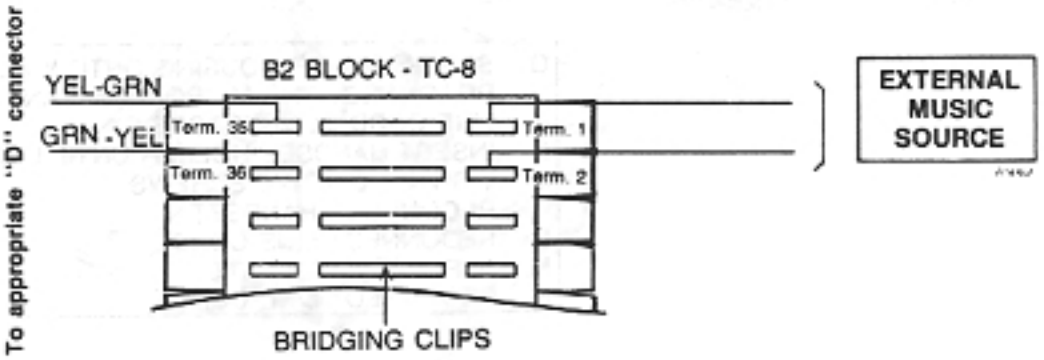

Figure 2 EXTERNAL MUSIC SOURCE CONNECTIONS, TC-8

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ALARM CONNECTIONS

DESCRIPTION

The TC-8/TC-12/TC-22 system allows alarm indications from a customer owned security system to be transmitted to the DSS consoles and, when the DSS console is in the Night mode, to all telephones in the system. Provision is made for either open or closed alarm circuit activation. Programming is done from the DSS console.

INSTALLATION

For the TC-12 and TC-22 systems connect the alarm input pair to terminals 5 and 6 on the D1 block (terminals 39 and 40 on the B2 block for the TC-8 system) and install bridging clips (Figure 1).

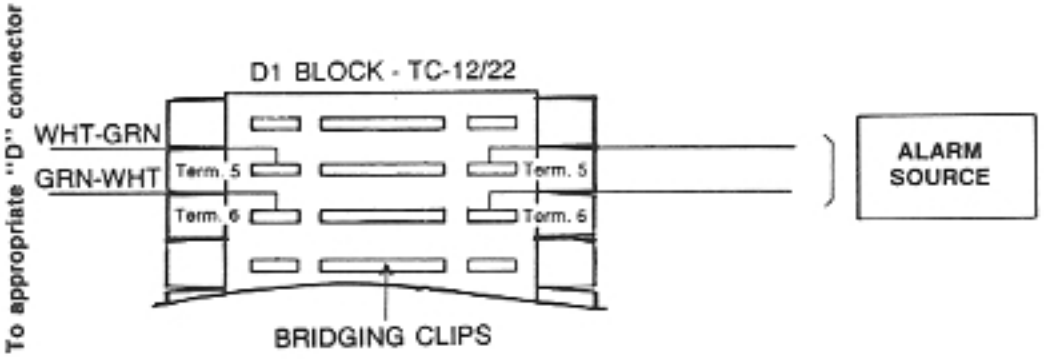

Figure 1 ALARM CONNECTIONS, TC-12/TC-22

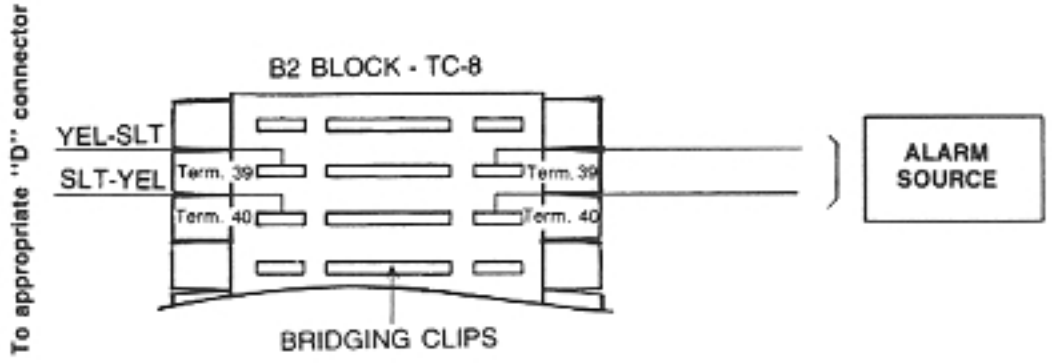

Figure 2 ALARM CONNECTIONS, TC-8

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SPEAKERBOX

DESCRIPTION

The Speakerbox (P / N 13367) (Figure 1) is a self-contained unit having a volume control, loudspeaker and the electronic circuitry required by the system enclosed in a housing which may be desk or wall mounted. Installation of a Speakerbox allows two-way Handsfree communication on Intercom calls. The Speakerbox requires a station position. Only one Speakerbox can be installed per station position.

Four (4) leads (2-pair) are required between the Speakerbox and the KSU. The leads are designated AT / AR, BT / BR.

A station number must be assigned to the Speakerbox. The Speakerbox may be called on the Intercom by dialing the corresponding station number. Voice Announcing and Handsfree Answerback are standard features of the Speakerbox.

Station users must *NOT* call the Speakerbox station using Intercom tone signals. A call in this mode *CANNOT* be answered at the Speakerbox.

The attendant must *NOT* transfer a CO line call to a Speakerbox station. The DSS console circuitry automatically places a transferred call on Hold and that call *CANNOT* be answered at the Speakerbox station.

The Speakerbox can be assigned to a paging zone.

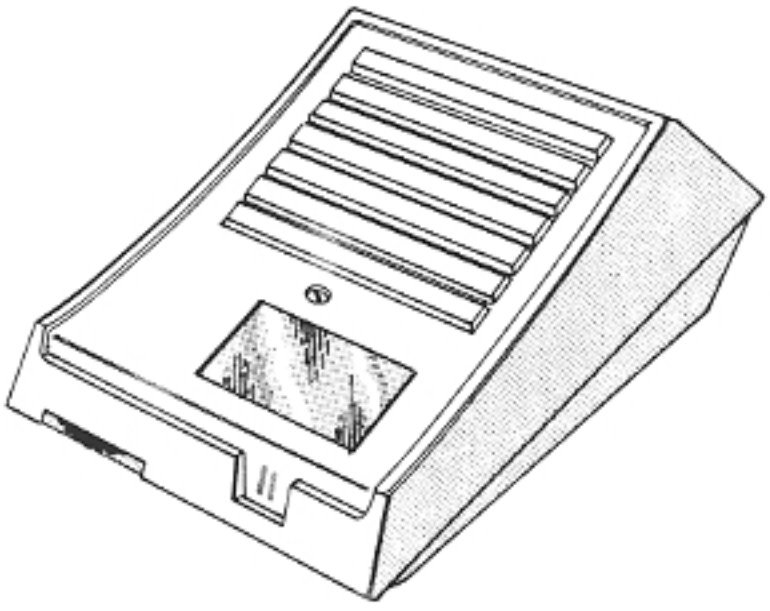

Figure 1 TCSBU SPEAKERBOX

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SPECIFICATIONS

Dimensions: 2.2" high
4.5" wide
6.4" deep

Weight: 11 ounces

INSTALLATION

The materials required for each Speakerbox installation consist of the following:

TCSBU
2-pair twisted station wire [length as required]
4-wire modular station jack (625 type or equivalent)

Mounting

The Speakerbox may be either desk or wall mounted.

To desk mount the Speakerbox: two (2) self-adhesive strips are provided for use as non-skid feet.

- *Remove backing from strips and insert strips into the grooves along the sides of the base of the Speakerbox (Figure 2).*

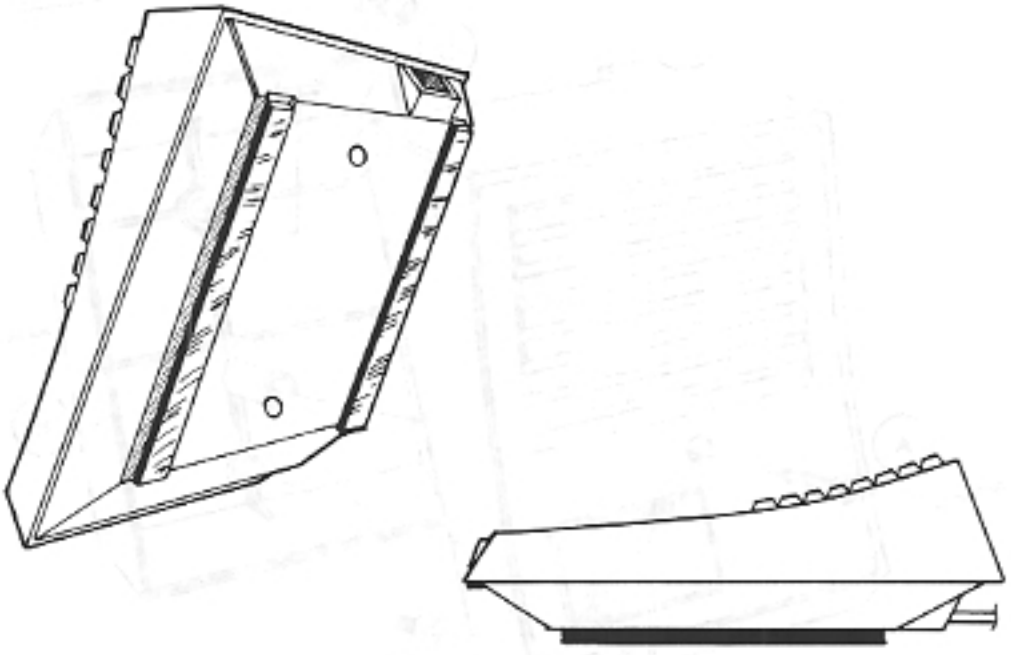


Figure 2 DESK MOUNTING THE SPEAKERBOX

To wall mount the Speakerbox:

- *Remove base of Speakerbox by loosening captive screw located in the front lower center of Speakerbox (Figure 3).*
- *Mount base of Speakerbox on the wall with two (2) screws provided. If Speakerbox is to be mounted on a masonry surface, #10 plastic anchors may be used to secure screws. Base should be mounted with two (2) square openings at the bottom (Figure 3).*

TROUBLESHOOTING

Testing

To test the Speakerbox, perform the following:

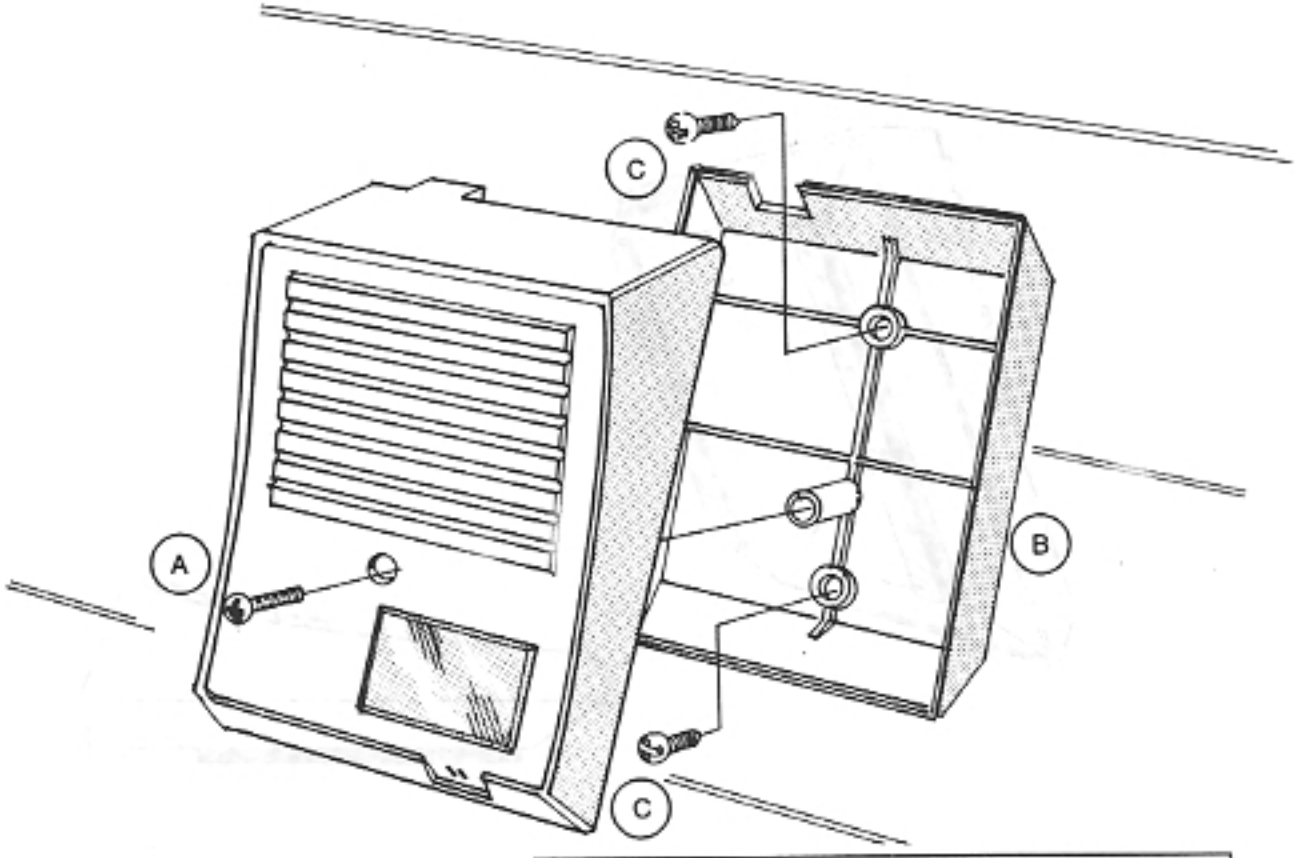
- *Call the Speakerbox from another station in system.*
  1. Call announcing should be heard from the Speakerbox.
  2. Call announcing loudness should be adjustable from the volume control at the Speakerbox.
  3. Talkback should be heard at the calling station.

If test results are not satisfactory, proceed as follows:
(The following procedure assumes that the system has been installed and tested in accordance with the instructions in the TC-8/TC-12/TC-22 Description and Installation Manual, P / N 13440).

- *Check wiring connections at B block and at the Speakerbox modular jack. Disconnect Speakerbox from station jack and measure voltage across AT / AR and BT / BR as follows:*

METER DESIGNATION		VOLTAGE READING
+	–	
AT	AR	11-16 V DC
BT	BR	24-50 V DC

- *Move Speakerbox to a different station number. If Speakerbox functions at this time, replace card which served the previous station number.*
- *If no fault can be found with box wiring, replace Speakerbox.*



TO WALL MOUNT THE SPEAKERBOX:
A. REMOVE CAPTIVE SCREW.
B. SEPARATE BASE FROM COVER.
C. MOUNT BASE TO WALL WITH TWO SCREWS.

Figure 3 REMOVING THE BASE WALL MOUNTING THE SPEAKERBOX

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TC-402 SPEAKERPHONE

DESCRIPTION

The external TC-402 Speakerphone (P / N 13260) (Figure 1) is an optional unit which provides two-way Handsfree communication on CO line and Intercom calls.

INSTALLATION

To install an external Speakerphone for use with non-Power Failure telephones:

- *Remove telephone housing.*
- *Remove strap between F1 and RR ANU terminals (Figure 2) in telephone.*
- *Remove TC-402 housing.*
- *Move switch in Speakerphone to 20 V position (Figure 3).*
- *Connect spade tipped Speakerphone leads, located at the back of unit, to ANU terminals in telephone as follows:*

SPEAKERPHONE LEAD	TO	ANU TERMINAL IN TELEPHONE
LGN		LK
SLT		RR
BRN		F1
WHT		L1
BLU		SG
ORN		RB
VIO		K1

- *Tape and store remaining leads.*

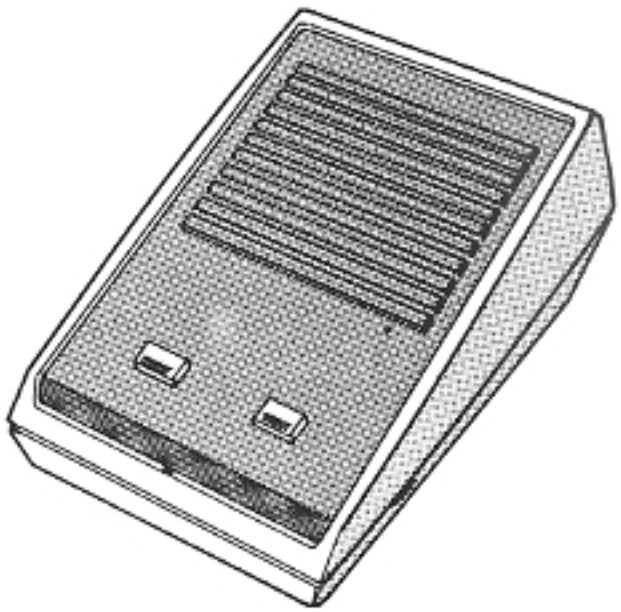

Figure 1 SPEAKERPHONE, TC-8/TC-12/TC-22

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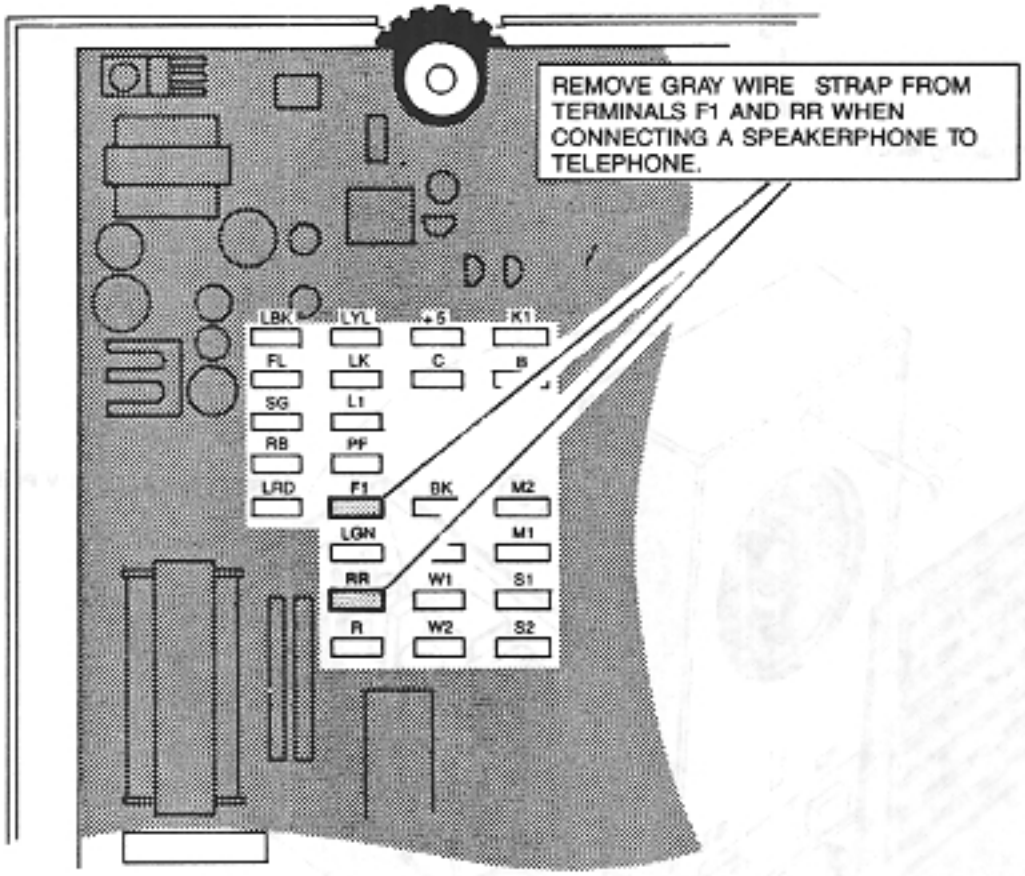

Figure 2 REMOVING STRAP

To install an external Speakerphone for use with Power Failure telephones:

- *In the telephone, remove BLU lead from F1 and connect to FL.*
- *Move switch in Speakerphone to 20 V position (Figure 3).*
- *Connect spade tipped Speakerphone leads to ANU terminals in telephone as follows:*

SPEAKERPHONE LEAD	TO	ANU TERMINAL IN TELEPHONE
LGN		LK
VIO		K1
ORN		RB
BLU		SG
BRN		F1
WHT		L1
SLT		FL

- *Tape and store remaining leads.*

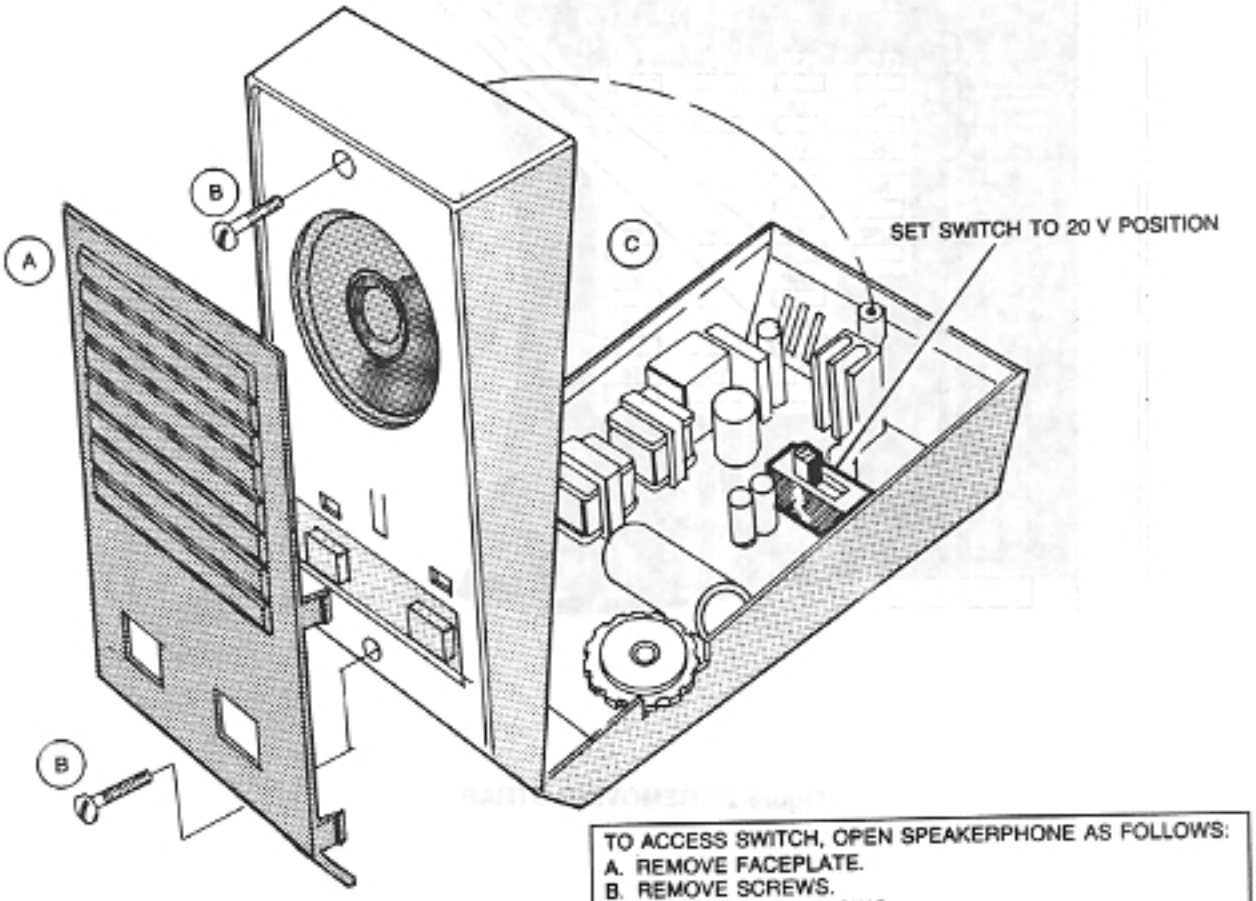

Figure 3 SETTING SWITCH

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EXTERNAL PAGING ZONE CONNECTIONS

DESCRIPTION

The TC-8/TC-12/TC-22 family provides a maximum of two external paging zones. Each zone has a maximum output power of 1.5 watts into an 8 ohm load. If more than 1.5 watts are required in a zone, customer provided amplifier(s) will be required.

If external amplifiers are not required, the external zone loudspeakers can be directly connected to terminals 7 and 8 (Zone 1) and 11 and 12 (Zone 2) on the D1 block (Figure 1). If the TC-8 system is used, loudspeakers should be connected to terminals 41 and 42 (Zone 1), and terminals 45 and 46 (Zone 2) on the B2 block (Figure 2). The maximum distance between the KSU and external speakers is 300 feet, using 22 AWG wire.

If external amplifiers are required, twisted wire may be used between the amplifiers and the station block. Connect the amplifier inputs to terminals 7 and 8 (Zone 1) and 11 and 12 (Zone 2). Install bridging clips on the D1 block.

Separate external zone paging level controls are provided on the A-EPU-A PCB. VR1 controls the level of external Zone 1; VR2 controls the level of external Zone 2.

Dry contacts are provided for auxiliary purposes when the A-EPU-A PCB is used. The contacts are rated at 1.25A for 24V DC resistive loads. These contacts are activated whenever the paging amplifiers are in use, including CO audible and BGM.

The contacts appear on the D1 block (Figure 3), terminals 9 and 10 for Zone 1 and terminals 13 and 14 for Zone 2 (terminals 43 and 44, and terminals 47 and 48 on the B2 block for the TC-8 system [Figure 4]). Install bridging clips on the D1 or B2 block.

NOTE: If external amplifiers are used, it may be necessary to include isolation transformers between the KSU outputs and the external amplifier inputs.

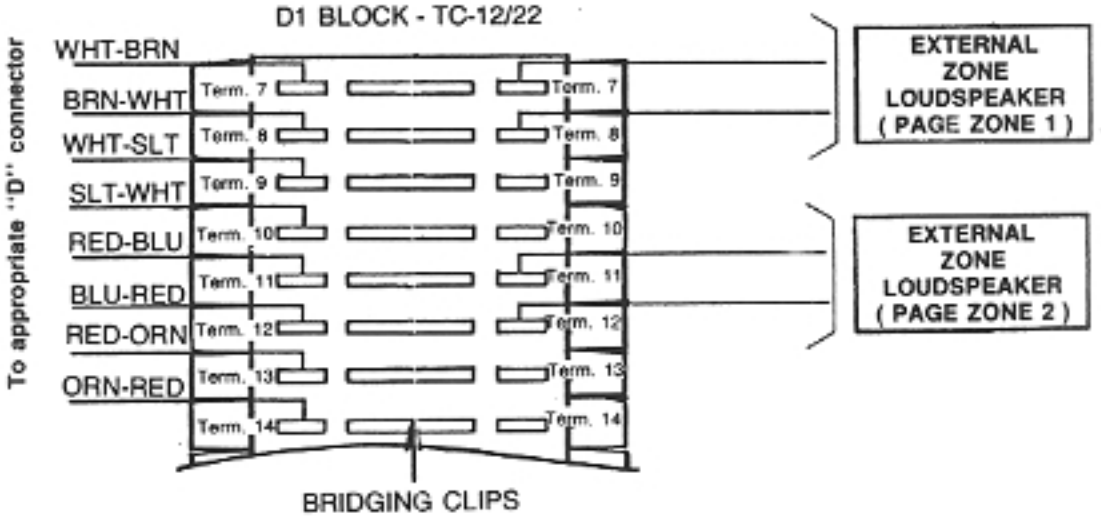

Figure 1 EXTERNAL LOUD SPEAKER CONNECTIONS WHEN EXTERNAL AMPLIFIERS NOT REQUIRED, TC-12/22

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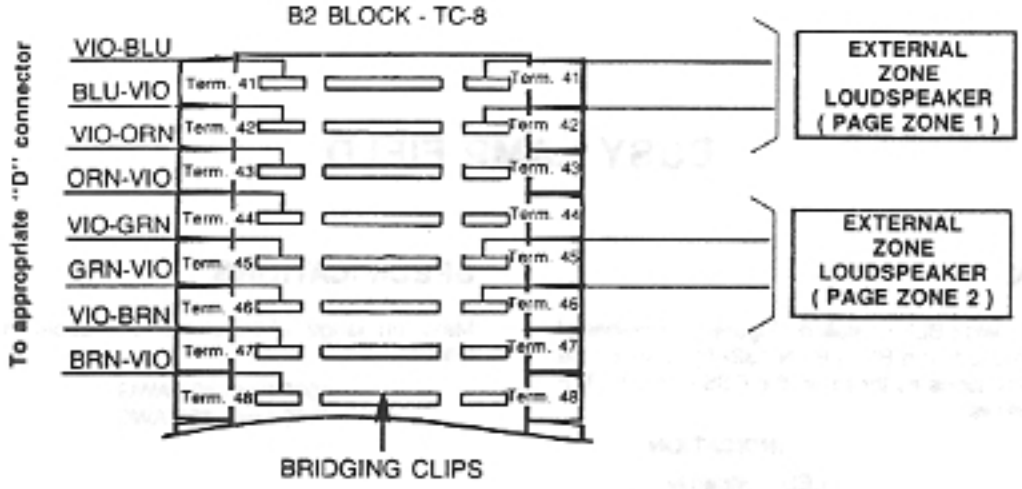

Figure 2 EXTERNAL LOUD SPEAKER CONNECTIONS WHEN EXTERNAL AMPLIFIERS NOT REQUIRED, TC-8

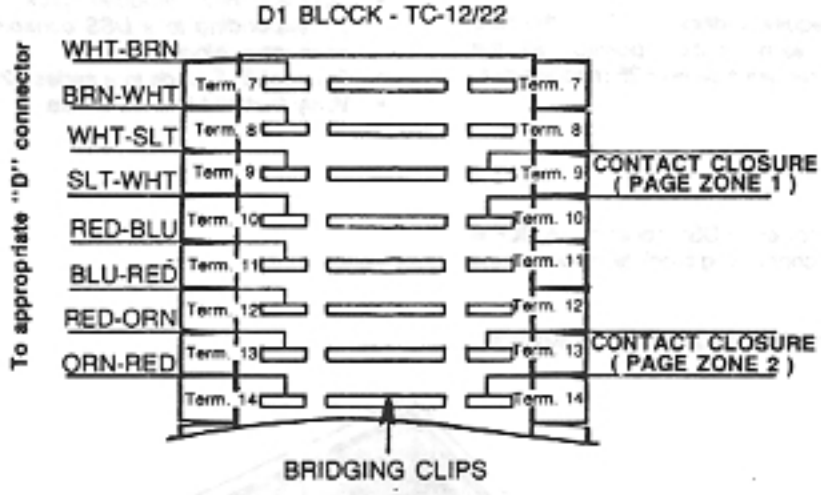

Figure 3 PAGING CONTACTS, TC-12/22

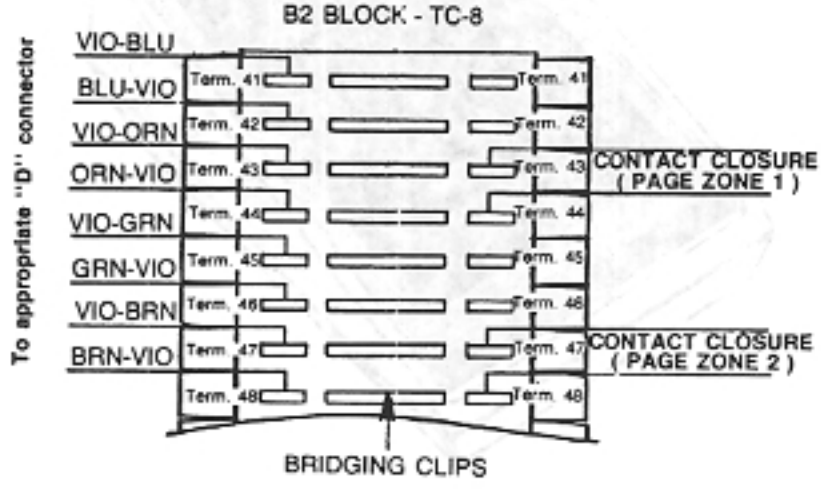

Figure 4 PAGING CONTACTS, TC-8

BUSY LAMP FIELD

DESCRIPTION

With the Busy Lamp Field (BLF) installed (Figure 1), activities of stations can be monitored. The BLF (P / N 13277) provides the same visual LED indications as those on the DSS console. BLF indications are as follows:

STATUS	INDICATION
Station Off Hook	LED lit steadily
Station w/Message Waiting	LED flashes (60 IPM).
Station in DND Mode	LED flutters (300 IPM)
Station on Intercom Call	LED winks (120 IPM)
Station Monitor in Use	LED winks (120 IPM)

Installation of a BLF does not require additional PCBs in the KSU because the BLF uses the same station position as the corresponding console. It does require a series 625 modular jack.

SYSTEM CAPACITY

One (1) BLF may be installed for each DSS console. (A BLF is connected to the same rows of connecting block terminals as the corresponding DSS console).

The BLF unit may be used with TC-8, TC-12 and TC-22 systems.

SPECIFICATIONS

Maximum length of the station loop depends on wire gauge as follows:

1000 feet - #24 AWG
1500 feet - #22 AWG

INSTALLATION

Using Figure 2 as a guide, the BLF is installed as follows.

- *Connect BLF modular jack leads to rows of clips, corresponding to a DSS console, on appropriate B block connecting block.*
- *Connect BLF leads to a series 625 modular jack.*
- *Verify that all LEDs illuminate.*

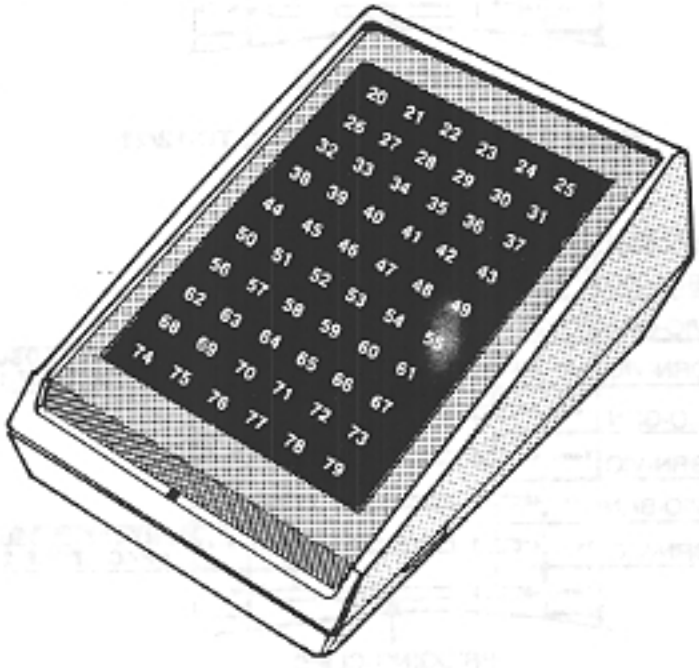

Figure 1 BUSY LAMP FIELD

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Table 1-1 SPECIFICATIONS A-OPU-A PCB

Electrical: Rotary Dial Pulse Rate: 10 or 20 Pulses Per Second ± 20%. Make / Break Ratio: 80% / 20% to 50% / 50%. Contact Bounce: 1.0 mSec. or less.
Cable Requirements: Loop Limit (max.) 500 ohms: with 22 AWG, 9300 feet (280 m); with 24 AWG, 5800 feet (178 m).

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INTERCOM

2.04 Intercom calls can be placed so that the called party can answer handsfree or so that the called station will ring, requiring the party to use the handset to reply.

LINE QUEUING

2.05 Line Queuing enables an Off-Premises Extension to queue (wait in line) for an available outside line in a busy line group. The system signals the stations, in order, when the line group is available.

PAGING

2.06 There are three types of paging: ***All Call, Internal Zone*** and ***External Zone.*** All Call Paging is broadcast to all external speakers and to appropriate stations. Internal Zone Paging provides paging to groups of stations. External Paging requires optional customer provided speakers and other equipment.

PLACING AN OUTSIDE CALL

2.07 Outside calls can be placed from any Off-Premises Extension unless the station's Class Of Service prohibits the call.

TRANSFER

2.08 Transfer sends an outside call from one station to another. The station receiving transfer can either be on or off premises.

3. INSTALLATION

3.01 The following paragraphs provide step by step instructions for installing an A-OPU-A PCB.

3.02 There are four (4) strappable option connectors on each A-OPU-A PCB designated CN1, CN2, CN3, and CN4 (Figure 3-1). When the strapping bars for these connectors are in position 1-2, the stations have dial access to the CO line queue groups. When the strapping bars are in position 2-3, the stations do **not** have dial access to the CO line queue groups.

NOTE: Check the strapping bar in each connector to see that it is in the correct position for the particular installation.

- *Insert the A-OPU-A PCB into the appropriate A-SLU-A slot in the KSU.*

3.03 To connect each single line station to the Main Distribution Frame (MDF) at the KSU location:

- *Connect the pair of wires from the station to the D clips of the AT / AR pair on the B block corresponding to the station number being installed (Figure 3-2, Table 3-1, and Table 3-2).*
- *Install bridging clips.*

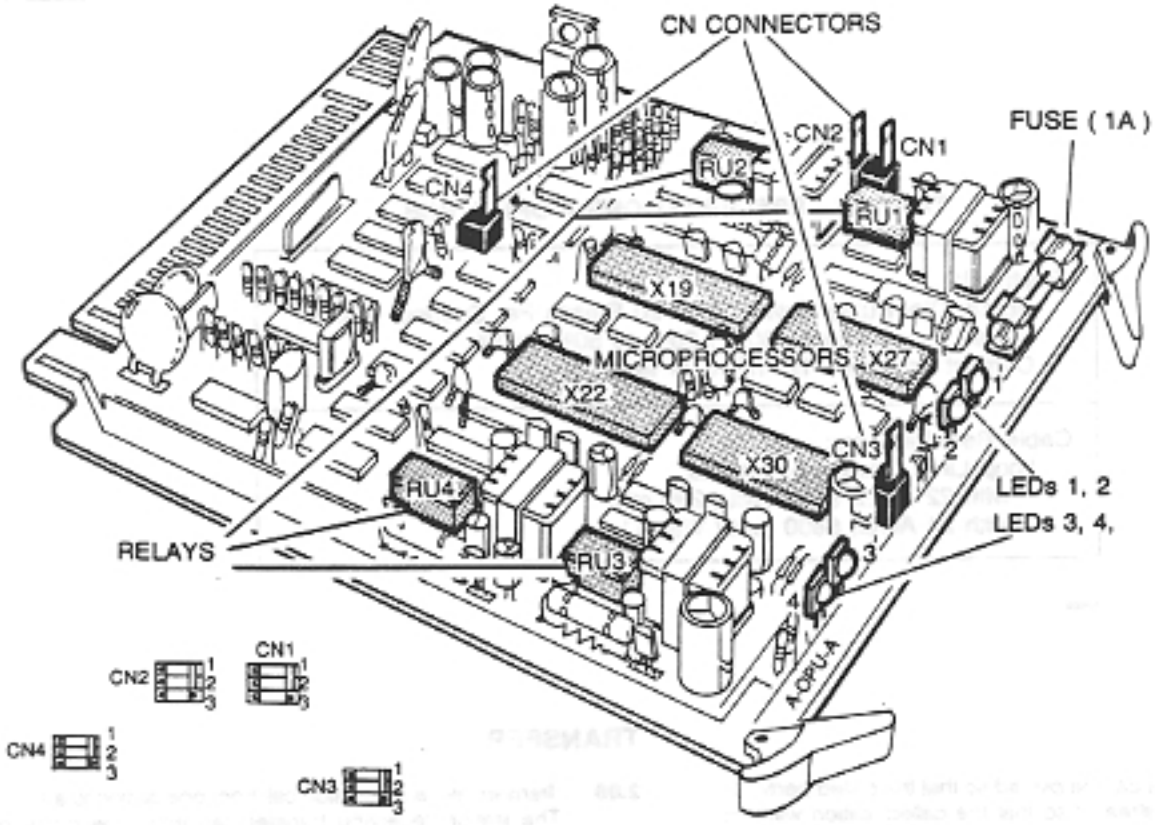

Figure 3-1 A-OPU-A STATION BLOCK CONNECTIONS

3.04 The A-OPU-A PCB requires an external ring generator such as the TIE Ring Generator (Part Number 12185). This ring generator has been designed to work using the 24 volts from the KSU. Other manufacturer's ring generators should not use the 24 volts from the KSU as their primary source of power.

NOTE: The TIE RG Box may be used to supply ringing currents for up to two A-OPU-A PCBs.

3.05 Connect the output terminals from the Ringing Generator to the D clips on the B block that represent the BT / BR pair of the first station circuit of each A-OPU-A PCB (Table 3-2). To connect one or more external Ringing Generators to the MDF:

- *Connect the output terminals from the RG to the D clips of the first circuit BT / BR pair on the B block (Figure 3-2, Table 3-1 and Table 3-2).*
- *Install bridging clips.*
- *Connect the input terminal designated + from the RG to the second circuit BT D clip (Figure 3-2, Table 3-1 and Table 3-2).*
- *Connect the input terminal designated G from the RG to the second circuit BR D clip (Figure 3-2, Table 3-1 and Table 3-2).*
- *Install bridging clips.*

NOTE: Each OPX key should be identified at the DSS console to remind attendant that call announcing is not possible at an OPX and that it is not possible to override an OPX.

4. PROGRAMMING

4.01 When programming a TC-8, TC-12, TC-22 or TC-8 DS system refer to the appropriate Description and Installation Manual.

4.02 The following options must be considered for programming:

(a) If CO line dial access is required queue groups must be established.

(b) Toll and dial or access restrictions are as indicated in the appropriate installation manual.

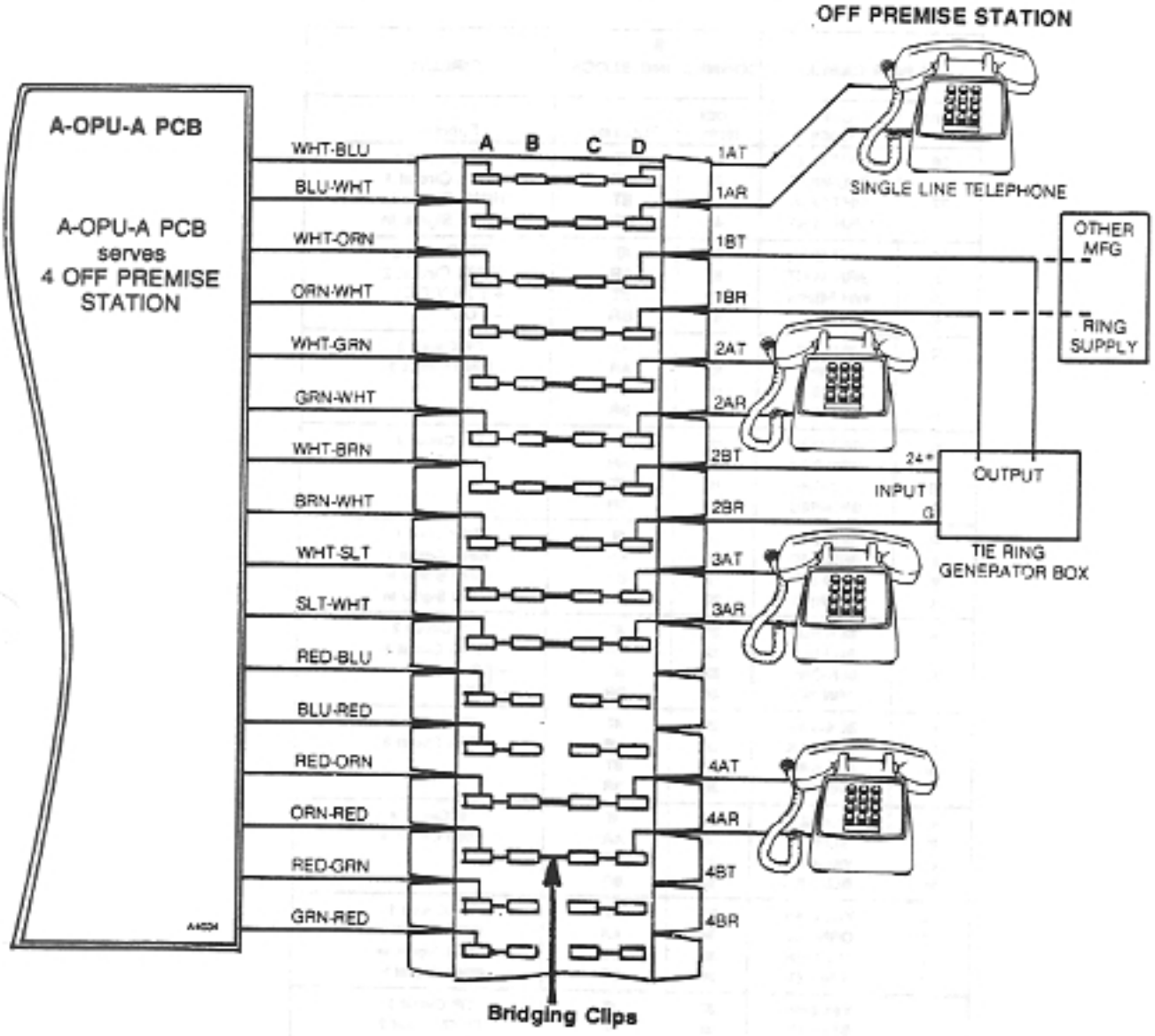

Figure 3-2 OFF-PREMISES STATION CONNECTIONS

Table 3-1 A-OPU-A STATION BLOCK CONNECTIONS

25 PAIR CABLE		"B" CONNECTING BLOCKS		CIRCUIT
Conn Pin	Color Code	Block Term.	Function	Function
26	WHT-BLU	1	AT	TIP Circuit 1
1	BLU-WHT	2	AR	RING Circuit 1
27	WHT-ORN	3	BT	RING Signal In
2	ORN-WHT	4	BR	RING Signal In
28	WHT-GRN	5	AT	TIP Circuit 2
3	GRN-WHT	6	AR	RING Circuit 2
29	WHT-BRN	7	BT	+ 24 V DC
4	BRN-WHT	8	BR	– OUT
30	WHT-SLT	9	AT	TIP Circuit 3
5	SLT-WHT	10	AR	RING Circuit 3
31	RED-BLU	11	BT	
6	BLU-RED	12	BR	
32	RED-ORN	13	AT	TIP Circuit 4
7	ORN-RED	14	AR	RING Circuit 4
33	RED-GRN	15	BT	
8	GRN-RED	16	BR	
34	RED-BRN	17	AT	TIP Circuit 1
9	BRN-RED	18	AR	RING Circuit 1
35	RED-SLT	19	BT	RING Signal In
10	SLT-RED	20	BR	RING Signal In
36	BLK-BLU	21	AT	TIP Circuit 2
11	BLU-BLK	22	AR	RING Circuit 2
37	BLK-ORN	23	BT	+ 24 V DC
12	ORN-BLK	24	BR	– OUT
38	BLK-GRN	25	AT	TIP Circuit 3
13	GRN-BLK	26	AR	RING Circuit 3
39	BLK-BRN	27	BT	
14	BRN-BLK	28	BR	
40	BLK-SLT	29	AT	TIP Circuit 4
15	SLT-BLK	30	AR	RING Circuit 4
41	YEL-BLU	31	BT	
16	BLU-YEL	32	BR	
42	YEL-ORN	33	AT	TIP Circuit 1
17	ORN-YEL	34	AR	RING Circuit 1
43	YEL-GRN	35	BT	RING Signal In
18	GRN-YEL	36	BR	RING Signal In
44	YEL-BRN	37	AT	TIP Circuit 2
19	BRN-YEL	38	AR	RING Circuit 2
45	YEL-SLT	39	BT	+ 24 V DC
20	SLT-YEL	40	BR	– OUT
46	VIO-BLU	41	AT	TIP Circuit 3
21	BLU-VIO	42	AR	RING Circuit 3
47	VIO-ORN	43	BT	
22	ORN-VIO	44	BR	
48	VIO-GRN	45	AT	TIP Circuit 4
23	GRN-VIO	46	AR	RING Circuit 4
49	VIO-BRN	47	BT	
24	BRN-VIO	48	BR	
50	VIO-SLT	49		
25	SLT-VIO	50		

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Table 3-2 "B" BLOCK STATION LOCATIONS

PCB POSITION	BLOCK	FOR STATIONS
A-SLU-A / B-1 A-SLU-A / B-2 A-SLU-A / B-3	B1	20 to 23 24 to 27 28 to 31
A-SLU-A / B-4 A-SLU-A / B-5 A-SLU-A / B-6	B2	32 to 35 36 to 39 40 to 43
A-SLU-A / B-7 A-SLU-A / B-8 A-SLU-A / B-9	B3	44 to 47 48 to 51 52 to 55
A-SLU-A / B-10 A-SLU-A / B-11 A-SLU-A / B-12	B4	56 to 59 60 to 63 64 to 67
A-SLU-A / B-13 A-SLU-A / B-14 A-SLU-A / B-15	B5	68 to 71 72 to 75 76 to 79

T3010

A-OPU-B
OFF-PREMISES STATION
PRINTED CIRCUIT BOARD

CONTENTS PAGE

1. INTRODUCTION

1.01 The A-OPU-B Printed Circuit Board (PCB) is used with a TC-8, TC-12, TC-22 or TC-8 DS Key Telephone System as an interface between the Key Service Unit (KSU) and single line telephones. It converts off-hook and dialing information to digital data for use by the Main Processing Unit (MPU). Digital data received from the MPU is converted to signals that can be processed by single line telephones. The A-OPU-B PCB can be used with either tone or rotary type telephones. Installations using single line pulse telephones as internal extensions may be able to use the A-OPU-A PCB. (Refer to the A-OPU-A PCB supplement in the TC-8 and TC-12 / TC-22 Description and Installation Manuals.)

1.02 This paragraph is reserved for summarizing major revisions to this manual.

1.03 Each A-OPU-B PCB functions as an interface for four single line stations. Only single line telephones can be used with an A-OPU-B PCB. The ringing signal provided by an external Ringing Generator to the OPS is controlled by the A-OPU-B PCB.

1.04 The maximum number of A-OPU-B PCBs that may be installed in a system is equal to the maximum number of A-SLU-A PCBs allowed, less one. At least one A-SLU-A PCB must be installed for the DSS station circuit. This circuit is required for programming.

MAXIMUM NUMBER OF A-OPU-B PCBs PER SYSTEM

SYSTEM	NUMBER OF A-OPU-B
TC-8	4
TC-8 DS	4
TC-12	8
TC-22	14

1.05 Specifications for the A-OPU-B PCB are provided in Table 1-1.

1.06 The A-OPU-B PCB carries the FCC Registration Service Code 9.0F in accordance with the Federal Communications Commission (FCC) Rules and Regulations Part 68 (Connection of Terminal Equipment to the Telephone Network), and the Facility Interface Code OL13B in accordance with Bell System Communications Technical Reference, PUB43209 (Registered Off-Premises Station Facility Interface Codes OL13A / B / C). This PCB is used in fully protected systems and is included in the system FCC Registration Number as follows:

Systems: **TC-8, TC-8 DS, TC-12, TC-22**
FCC Registration Number: **BJ286G-68581-KF-E**

2. FEATURES

2.01 The following paragraphs provide directions for using the features available to an Off-Premises Station. See Off-Premises Station User's Guide (TP01052) for operational information.

ANSWERING A CALL

2.02 Incoming calls can be answered at any Off-Premises Station. Programming determines which stations receive the signal.

Table 1-1 SPECIFICATIONS AOPU-B PCB

Electrical: Rotary Dial Pulse Rate: 10 or 20 Pulses Per Second ± 20%. Make / Break Ratio: 80% / 20% to 50% / 50%. Contact Bounce: 1.0 mSec. or less.
Cable Requirements: Loop Limit (max.) 500 ohms: with 22 AWG, 9300 feet (280 m); with 24 AWG, 5800 feet (178 m).

T3002

CONFERENCE

3 An Off-Premises Station can originate a conversation with one outside party and / or two internal parties.

INTERCOM

2.04 Intercom calls can be placed so that the called party can answer handsfree or so that the called station will ring, requiring the party to use the handset to reply.

LINE QUEUING

2.05 Line Queuing enables an Off-Premises Station to queue (wait in line) for an available outside line in a busy line group. The system signals the stations, in order, when the line group is available.

PAGING

2.06 There are three types of paging: ***All Call, Internal Zone*** and ***External Zone.*** All Call Paging is broadcast to all external speakers and to stations programmed to receive paging announcements. Internal Zone Paging provides paging to groups of stations. External Paging requires optional customer-provided speakers and other equipment.

PLACING AN OUTSIDE CALL

2.07 Outside calls can be placed from any Off-Premises Station unless the station's Class-Of-Service programmed for that station prohibits the call.

TRANSFER

2.08 Transfer sends an outside call from one station to another. The station receiving transfer can either be on or off premises.

3. INSTALLATION

3.01 The following paragraphs provide step by step instructions for installing an A-OPU-B PCB.

3.02 For Off-Premises Stations requiring Dual Tone Multi-Frequency (DTMF) signaling, before installation check the PCB series identification as follows:

Systems: **TC-8, TC-12, TC-22**
Requirement: **Series 6 A-MPU-A PCB**
System: **TC-8 DS**
Requirement: **Series 2 A-MPU-B PCB**

3.03 DTMF signaling requires that an MFRB-A PCB be plugged into each CN connector, labeled CN1-CN4, on the A-OPU-B PCB serving a DTMF station (Figure 3-1).

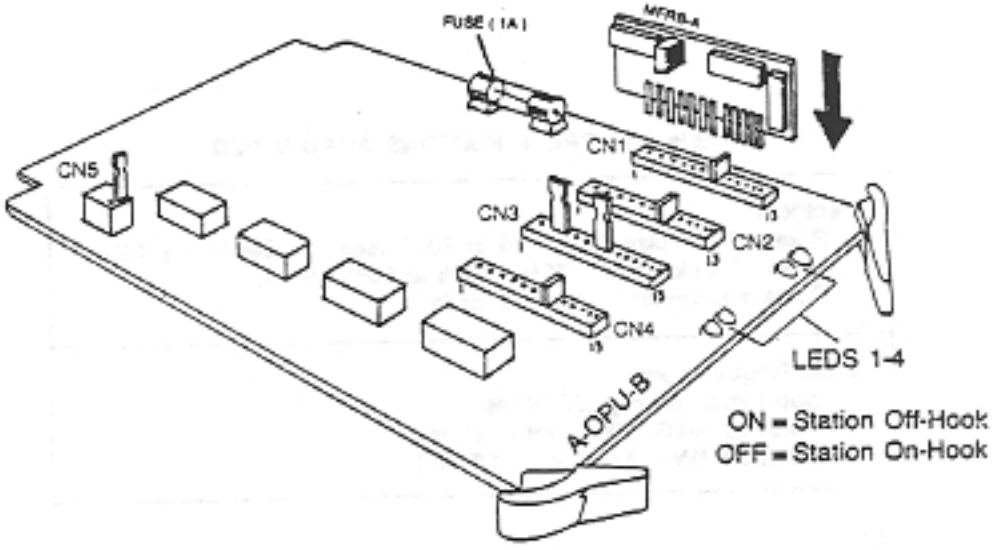


Table 3-1 A-OPU-B STATION BLOCK CONNECTIONS

3.04 Dial Pulse (DP) signaling requires that each CN connector (labeled CN1-CN4) serving a DP station be strapped 2-3 and 6-7 (Figure 3-1).

NOTE: CN5 is reserved for future enhancements and must be left strapped 1-2 (Figure 3-1).

- *Insert the A-OPU-B PCB into the appropriate A-SLU-A slot in the KSU.*

3.05 To connect each single line station to the Main Distribution Frame (MDF) at the KSU location:

- *Connect the pair of wires from the station to the D clips of the AT / AR pair on the B block corresponding to the station number being installed (Figure 3-2, Table 3-1, and Table 3-2).*
- *Install bridging clips.*

3.06 The A-OPU-B PCB requires an external ring generator such as the TIE Ring Generator (Part Number 12185). This ring generator has been designed to work using the 24 volts from the KSU. Other manufacturer's ring generators should not use the 24 volts from the KSU as their primary source of power.

NOTE: The TIE RG Box may be used to supply ringing currents for up to two A-OPU-B PCBs.

3.07 Connect the output terminals from the Ringing Generator to the D clips on the B block that represent the BT / BR pair of the first station circuit of each A-OPU-B PCB (Table 3-2). To connect one or more external Ringing Generators to the MDF:

- *Connect the output terminals from the RG to the D clips of the first circuit BT / BR pair on the B block (Figure 3-2, Table 3-1 and Table 3-2).*
- *Install bridging clips.*
- *Connect the input terminal designated + from the RG to the second circuit BT D clip (Figure 3-2, Table 3-1 and Table 3-2).*
- *Connect the input terminal designated G from the RG to the second circuit BR D clip (Figure 3-2, Table 3-1 and Table 3-2).*
- *Install bridging clips.*

3.08 When an A-OPU-B PCB is installed in a TELCO facility (such as an OL13B), an earth ground is required. To connect an earth ground:

- *Connect a wire from the third circuit BT and / or BR D clip to the KSU ground terminal (Figure 3-2).*
- *Install bridging clips.*

NOTE: Each OPS key should be identified at the DSS console to remind attendant that call announcing is not possible at an OPS and that it is not possible to override an OPS.

4. PROGRAMMING

4.01 When programming a TC-8, TC-12, TC-22 or TC-8 DS system refer to the appropriate Description and Installation Manual.

4.02 The following options must be considered for programming:

(a) If CO line dial access is required queue groups must be established.

(b) Toll and dial or access restrictions are as indicated in the appropriate installation manual.

(c) When DTMF Off-Premises Stations are required, programming is necessary. Refer to the appropriate system manual for compatibility.

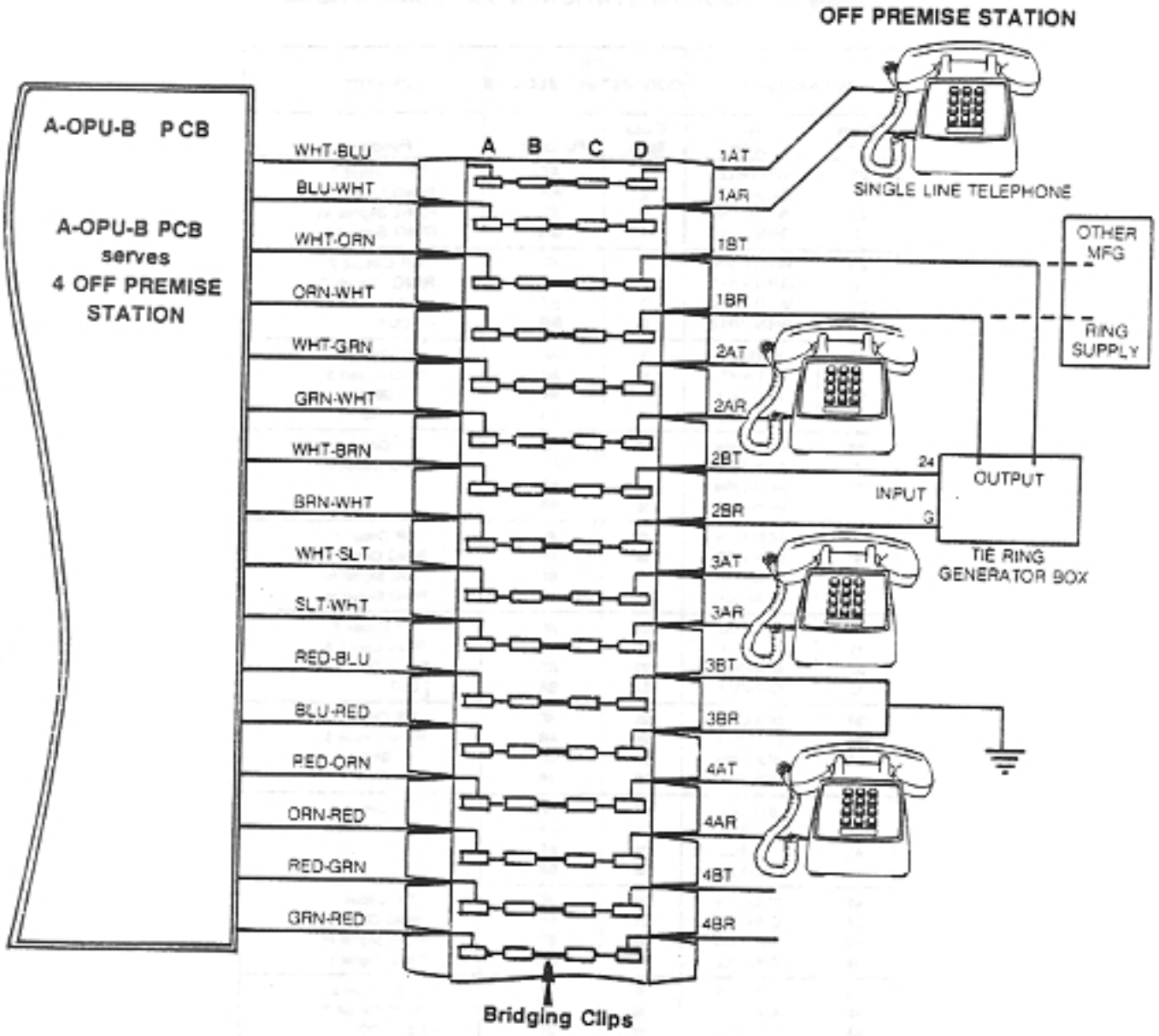


Figure 3-2 OFF-PREMISES STATION CONNECTIONS

Table 3-1 A-OPU-B STATION BLOCK CONNECTIONS

25 PAIR CABLE		"B" CONNECTING BLOCKS		CIRCUIT
Conn Pin	Color Code	Block Term.	Function	Function
26	WHT-BLU	1	AT	TIP Circuit 1
1	BLU-WHT	2	AR	RING Circuit 1
27	WHT-ORN	3	BT	RING Signal In
2	ORN-WHT	4	BR	RING Signal In
28	WHT-GRN	5	AT	TIP Circuit 2
3	GRN-WHT	6	AR	RING Circuit 2
29	WHT-BRN	7	BT	+ 24 V DC
4	BRN-WHT	8	BR	– OUT
30	WHT-SLT	9	AT	TIP Circuit 3
5	SLT-WHT	10	AR	RING Circuit 3
31	RED-BLU	11	BT	GND
6	BLU-RED	12	BR	GND
32	RED-ORN	13	AT	TIP Circuit 4
7	ORN-RED	14	AR	RING Circuit 4
33	RED-GRN	15	BT	
8	GRN-RED	16	BR	
34	RED-BRN	17	AT	TIP Circuit 1
9	BRN-RED	18	AR	RING Circuit 1
35	RED-SLT	19	BT	RING Signal In
10	SLT-RED	20	BR	RING Signal In
36	BLK-BLU	21	AT	TIP Circuit 2
11	BLU-BLK	22	AR	RING Circuit 2
37	BLK-ORN	23	BT	+ 24 V DC
12	ORN-BLK	24	BR	– OUT
38	BLK-GRN	25	AT	TIP Circuit 3
13	GRN-BLK	26	AR	RING Circuit 3
39	BLK-BRN	27	BT	GND
14	BRN-BLK	28	BR	GND
40	BLK-SLT	29	AT	TIP Circuit 4
15	SLT-BLK	30	AR	RING Circuit 4
41	YEL-BLU	31	BT	
16	BLU-YEL	32	BR	
42	YEL-ORN	33	AT	TIP Circuit 1
17	ORN-YEL	34	AR	RING Circuit 1
43	YEL-GRN	35	BT	RING Signal In
18	GRN-YEL	36	BR	RING Signal In
44	YEL-BRN	37	AT	TIP Circuit 2
19	BRN-YEL	38	AR	RING Circuit 2
45	YEL-SLT	39	BT	+ 24 V DC
20	SLT-YEL	40	BR	– OUT
46	VIO-BLU	41	AT	TIP Circuit 3
21	BLU-VIO	42	AR	RING Circuit 3
47	VIO-ORN	43	BT	GND
22	ORN-VIO	44	BR	GND
48	VIO-GRN	45	AT	TIP Circuit 4
23	GRN-VIO	46	AR	RING Circuit 4
49	VIO-BRN	47	BT	
24	BRN-VIO	48	BR	
50	VIO-SLT	49		
25	SLT-VIO	50		

TD01

Table 3-2 "B" BLOCK STATION LOCATIONS

PCB POSITION	BLOCK	FOR STATIONS
A-SLU-A / B-1	B1	20 to 23
A-SLU-A / B-2		24 to 27
A-SLU-A / B-3		28 to 31
A-SLU-A / B-4	B2	32 to 35
A-SLU-A / B-5		36 to 39
A-SLU-A / B-6		40 to 43
A-SLU-A / B-7	B3	44 to 47
A-SLU-A / B-8		48 to 51
A-SLU-A / B-9		52 to 55
A-SLU-A / B-10	B4	56 to 59
A-SLU-A / B-11		60 to 63
A-SLU-A / B-12		64 to 67
A-SLU-A / B-13	B5	68 to 71
A-SLU-A / B-14		72 to 75
A-SLU-A / B-15		76 to 79

T3010

TECHNICAL ASSISTANCE

When problems or questions arise during installation or servicing that cannot be resolved using this or related documents, then contact TIE Technical Service Department as follows:

For assistance between 8:30 AM and 5:00 PM, Eastern time, call:

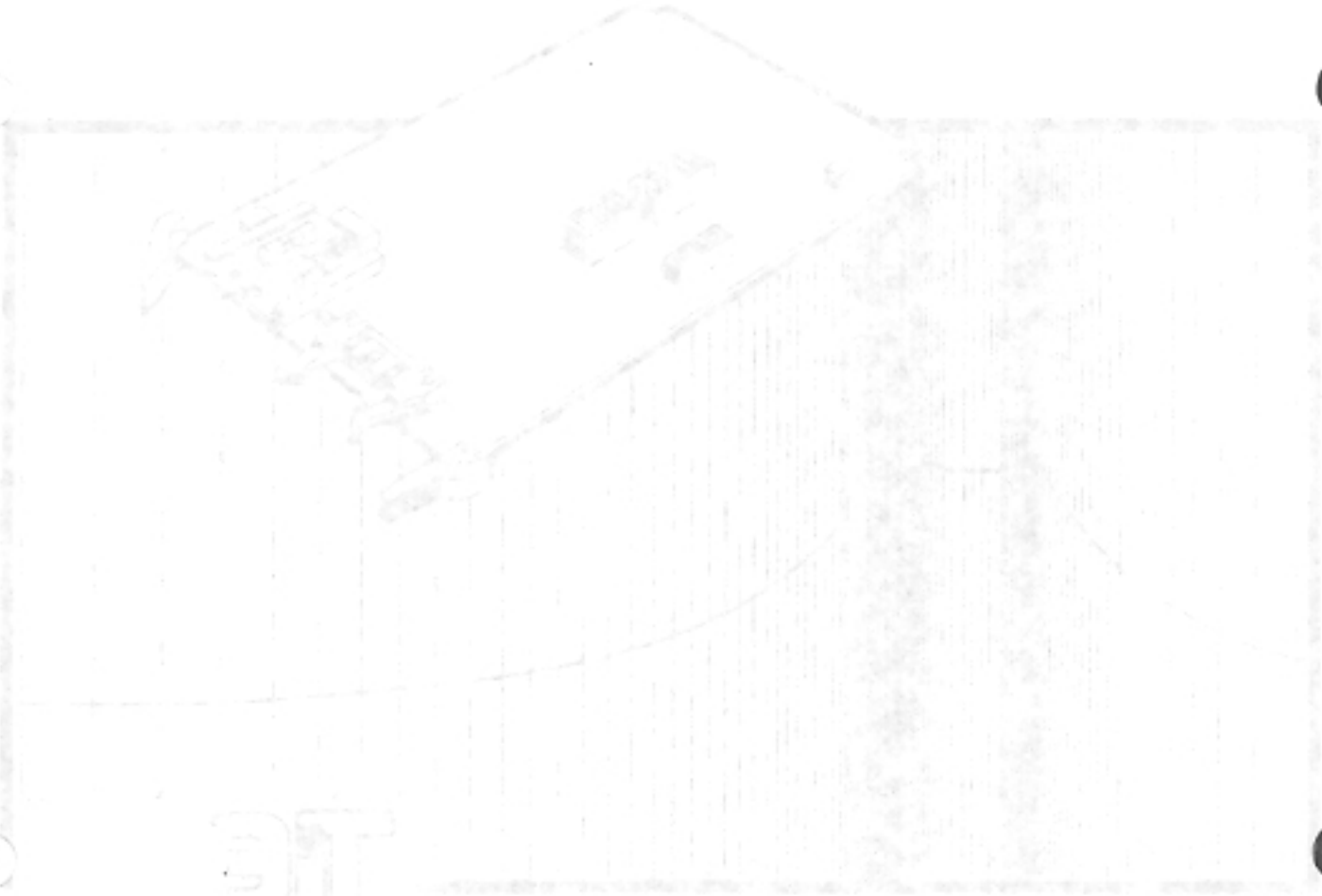
(203) 926-2033

For assistance in the event of an ***ABSOLUTE*** emergency at other times than those listed, call:

(203) 929-7920

Form 0008A May 1983

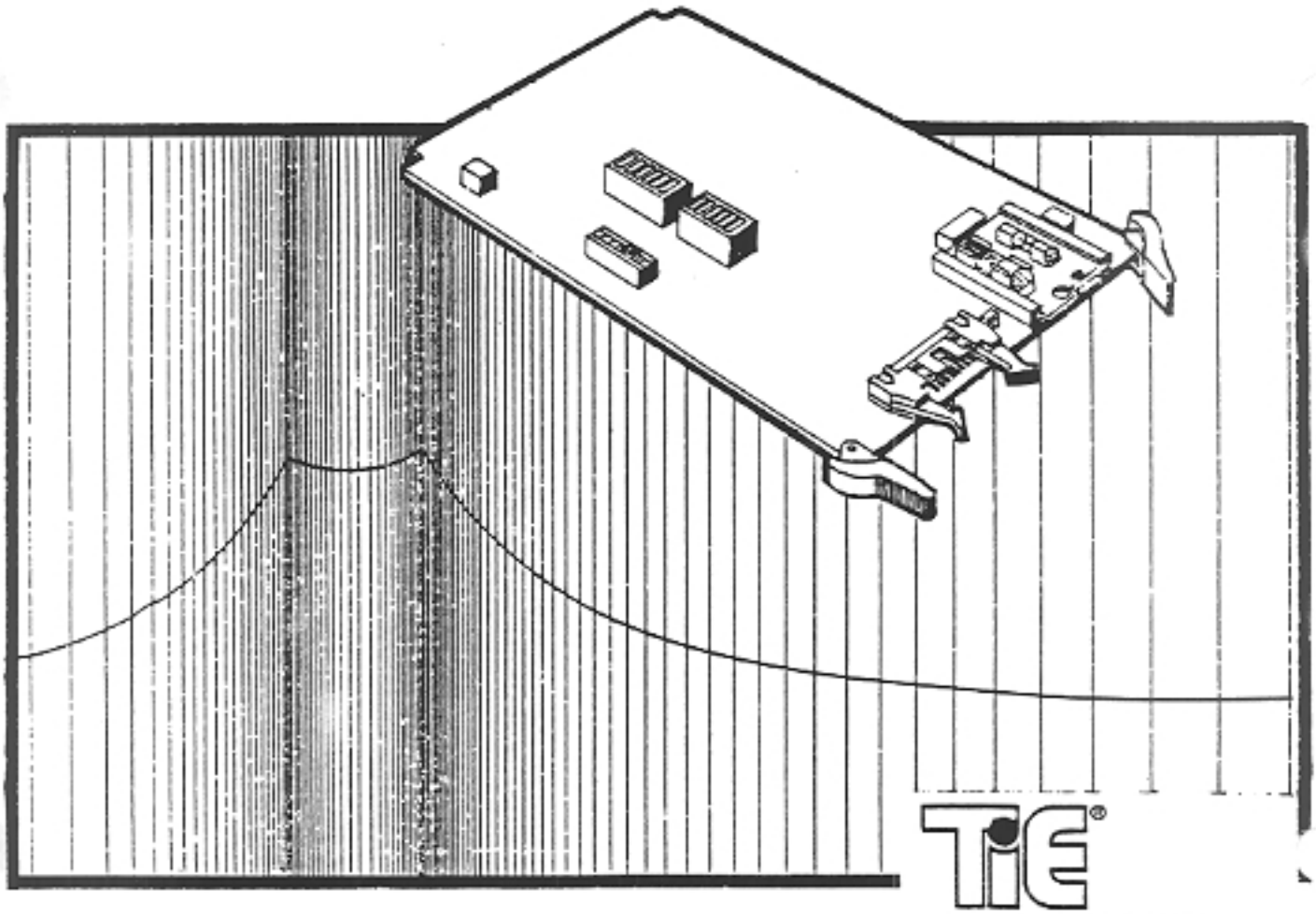
Printed in U.S.A.



A-SMDR-A

PRINTED CIRCUIT BOARD

INSTALLATION MANUAL



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(203) 929-7373 TELEX: 643104

TIE PRACTICE TP13189

A-SMDR-A PCB

Description and Installation Manual

Issue 1-1 January 26, 1983

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.

Form 0006 April 1983

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STATUS SHEET

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Page	Issue	Date	Page	Issue	Date
1-1	1-0	120ct82			
1-2	1-1	26Jan83			
1-3	1-1	26Jan83			
1-4	1-1	26Jan83			
2-1	1-0	120ct82			
2-2	1-1	26Jan83			
2-3	1-1	26Jan83			
2-4	1-0	120ct82			
2-5	1-0	120ct82			
3-1	1-0	120ct82			
4-1	1-0	120ct82			
4-2	1-0	120ct82			
4-3	1-0	120ct82			
4-4	1-0	120ct82			
4-5	1-1	26Jan83			
5-1	1-0	120ct82			
5-2	1-1	26Jan83			
5-3	1-0	120ct82			
5-4	1-1	26Jan83			
6-1	1-0	120ct82			
6-2	1-0	120ct82			
6-3	1-0	120ct82			
6-4	1-0	120ct82			
6-5	1-0	120ct82			
7-1	1-0	120ct82			
7-2	1-1	26Jan83			
7-3	1-0	120ct82			
7-4	1-0	120ct82			
7-5	1-0	120ct82			

A-SMDR-A PCB

GENERAL DESCRIPTION

CONTENTS PAGE

1. INTRODUCTION

1.01 The GENERAL DESCRIPTION section provides a basic introduction of the A-SMDR-A Printed Circuit Board (PCB). This PCB is used in conjunction with TC-12/TC-22 key telephone systems.

1.02 If this section is reissued, then the reason for the reissue will appear in this location.

RELATED SECTIONS

1.03 Related sections on the A-SMDR-A include:

SECTION 2 --- FEATURES
SECTION 3 --- SYSTEM CONFIGURATION
SECTION 4 --- PROGRAM RECORD AND PCB OPTION FORMS PREPARATION
SECTION 5 --- INSTALLATION
SECTION 6 --- PROGRAMMING
SECTION 7 --- OPERATIONAL TESTS AND FAULT LOCATION

2. PCB DESCRIPTION

2.01 The A-SMDR-A PCB provides Station Message Detail Recording data, such as class of call, date and time made, duration, and telephone number dialed, as well as account codes. This data enables a customer to more efficiently and economically manage the operation of a TC-12 or TC-22 key telephone system.

2.02 The data sent by an A-SMDR-A PCB is ASCII coded and sent to a customer supplied RS232C compatible cable and recording device. The A-SMDR-A is a data communications equipment with a Type C interface.

2.03 The A-SMDR-A PCB is supplied with a Battery Terminal Board (BTB-A), a 3-volt battery and an Installation Kit. This kit contains an interface cable and jack assembly.

3. COMPONENTS

3.01 The A-SMDR-A PCB has two DUAL-IN-LINE PACKAGE (DIP) switch assemblies, each containing 8 switches, and a single, 8-position DIP slide switch (refer to figure 1-1). Switch assembly SW1 controls various PCB options. Switch assembly SW2 has been incorporated for implementing future options, and slide switch SW3 sets the rate data is transmitted to the recording device. This PCB also contains the system operating software, the programs and memory for controlling the printing options, and the formatting of station message data to be transmitted. In addition, the A-SMDR-A contains a buffer that can store station message data for up to eight calls per CO line when the recorder is busy.

3.02 The BTB-A PCB contains connecting pins, battery clips, fuse clips, a 0.25 Ampere fuse, and a push-to-lock fastener to attach it to the A-SMDR-A PCB (refer to figure 1-1). With battery installed, the BTB-A provides battery power to the real-time clock on the A-SMDR-A during power failure. A fully charged battery can maintain the clock operation of up to one year. The battery, which is fuse-protected against accidental short circuit on the A-SMDR-A PCB or improper battery installation, can be replaced without removing the A-SMDR-A. The battery supplied is a 3-volt, non-rechargeable, lithium battery; designation BR-2/3A, 3V (TIE part No. 12364).

CAUTION: Removing the A-SMDR-A causes loss of system operation.

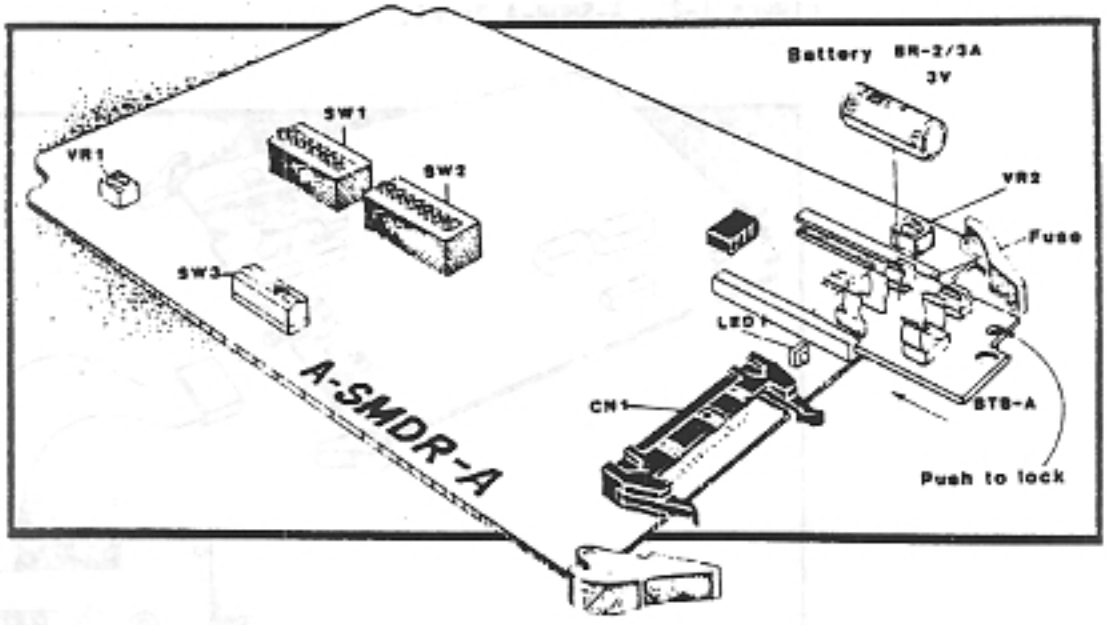


Figure 1-1 A-SMDR-A PCB.

3.03 The interface cable and jack assembly for the A-SMDR-A consists of a flat cable and a panel (refer to figure 1-2). The cable is terminated on one end with a connector which plugs into the A-SMDR-A (refer to figure 1-3). The other end terminates into a standard EIA RS232 connector mounted on the panel used to connect the printer/recorder device. The interface panel measures approximately 2 x 6 inches (5.1 x 15.2 cm). The panel includes a printer status switch, that informs the A-SMDR-A when the recorder is busy, (i.e. out of service for a paper change). An LED has been added for future use. The RS-232 connector pin out is shown in figure 1-4.

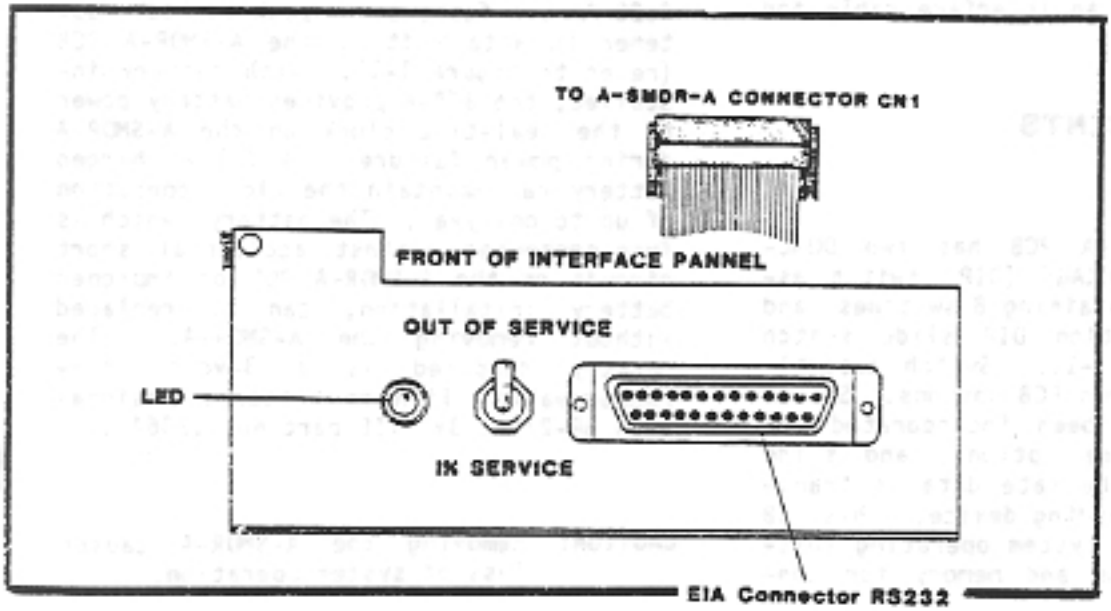


Figure 1-2 A-SMDR-A Panel.

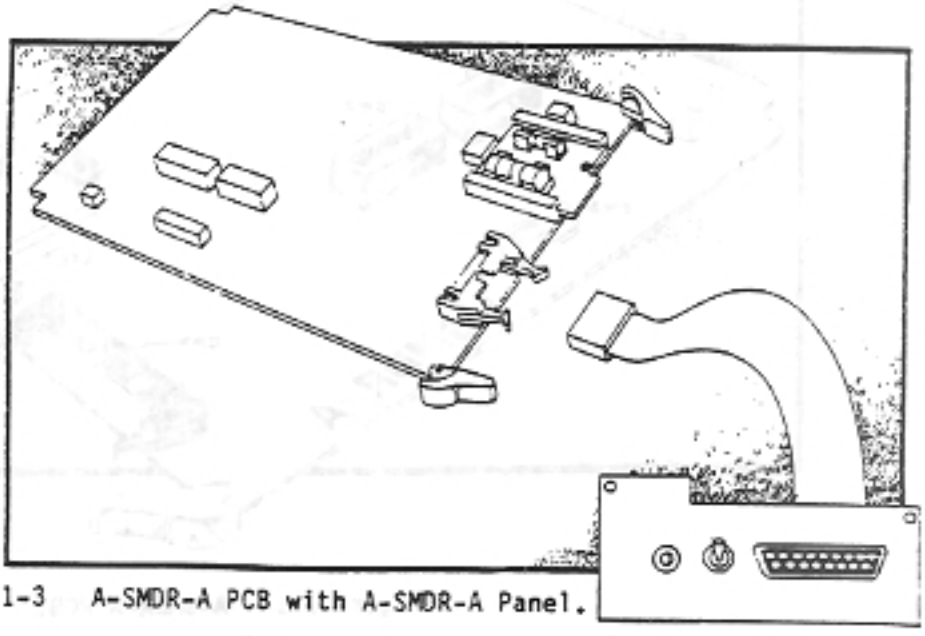
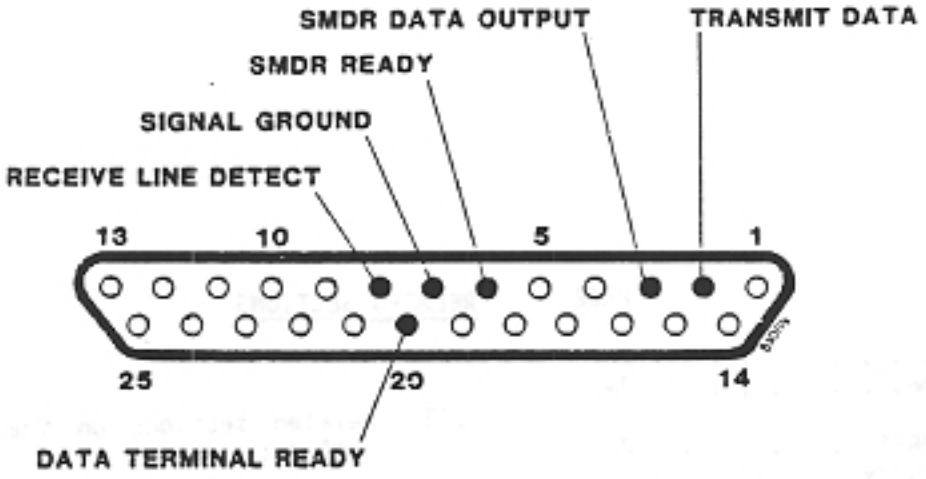


Figure 1-3 A-SMDR-A PCB with A-SMDR-A Panel.



PIN #	RS-232C DESIGNATION	FUNCTION
3	Received Data.	Data output from A-SMDR-A.
6	Data set ready.	SMDR ready signal from A-SMDR-A.
7	Signal ground.	Common ground reference.
20	Data terminal ready.	Printer/Recorder ready signal to A-SMDR-A.
8*	Received line signal detector.	Monitor for pin #2.
2*	Transmitted data.	Data input to A-SMDR-A.

* Not required.

Figure 1-4 RS232 Connector.

A-SMDR-A PCB

FEATURES

CONTENTS PAGE

1. INTRODUCTION

1.01 The section provides a description of the A-SMDR-A standard and optional features.

1.02 If this section is reissued, then the reason for reissue will appear in this location.

RELATED SECTIONS

1.03 Related sections on the A-SMDR-A include:

SECTION 1 --- GENERAL DESCRIPTION
SECTION 3 --- SYSTEM CONFIGURATION
SECTION 4 --- PROGRAM RECORD AND PCB OPTION PREPARATION FORMS
SECTION 5 --- INSTALLATION
SECTION 6 --- PROGRAMMING
SECTION 7 --- OPERATIONAL TESTS AND FAULT LOCATION

2. STANDARD FEATURES

2.01 Following are descriptions of the standard features.

ACCOUNT CODE ENTRY

2.02 An ACCOUNT CODE ENTRY is provided as a part of the station message detail. This code (up to 8 digits) is entered by the station user in the following sequence: #, code digits, #. Other parties on the line are unable to detect the account code entry.

NOTE: Off premise stations and dial restricted stations will be unable to enter account codes.

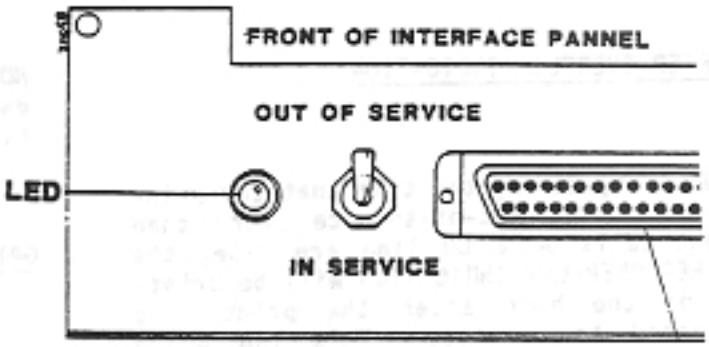
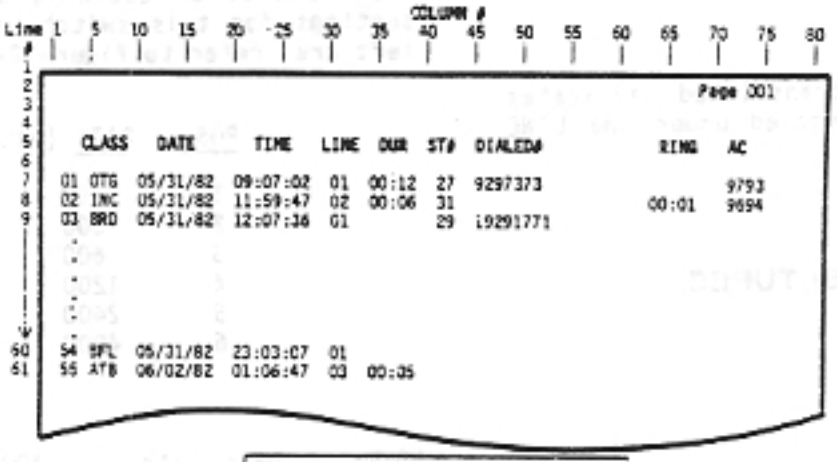


Figure 2-1 Printer Status Switch.

BUFFER MEMORY

2.03 The BUFFER MEMORY stores SMDR data for up to eight calls per CO line. This permits sufficient time to change paper on the recording device. Data will be stored in the buffer when the printer status switch is placed in the OUT OF SERVICE position indicating that the printer is out- of-service (refer to figure 2-1). When the recorder is returned to service by placing the printer status switch in the IN-SERVICE position, the A-SMDR-A automatically transmits a new heading line (refer to figure 2-2) followed by the SDMR data stored in the buffer.

2.04 When the terminal is sufficiently sophisticated, the buffer may be employed via the data terminal READY lead. However, a new heading line is not printed on return to service.



Class	Description
OTG	Outgoing Call
INC	Incoming Call
BRD	Barred (restricted) call attempted
BFL	Buffer Overflow
ATB	All trunks Busy in (Queue) Group

Figure 2-2 Sample Data Output Printout.

BUFFER OVERFLOW INDICATION

2.05 If, during the time that the printer is out-of-service, more than eight calls on a CO line are made, the BUFFER OVERFLOW INDICATION will be printed on the hour after the printer is returned to service. This indication includes the date, time, and number of calls missed.

ALL TRUNKS BUSY

2.06 An ALL TRUNKS BUSY (ATB) printout indicates that all lines in a group have been busy for more than one minute. When one or more of the lines in the Queue Group Program 40 have returned to an idle state for more than one minute, the ATB data is transmitted to the printer/recorder.

NOTE: The data transmitted indicates the Queue Group involved under the LINE field.

3. OPTION FEATURES

OPTION SWITCH SW1

3.01 OPTION SWITCH SW1 is used to select optional features. SW1 is a DIP switch assembly containing eight Single Pole, Single Throw (SPST) switches. The SPST switches are numbered SW1-1 to SW1-8. The optional features and switch controls are outlined in Table 2-1.

NOTE: Switch SW1-8 is not presently used and should be set to the off position.

OPTION SWITCH SW2

3.02 OPTION SWITCH SW2 is a DIP switch assembly that contains eight SPST switches numbered SW2-1 to SW2-8. This switch assembly is not used at this time and the position of all SPST switches on SW2 should be off.

VARIABLE BAUD RATE

3.03 Slide switch, SW3, provides a VARIABLE BAUD RATE for transmitting SMDR data to a recording device. The settings for this switch, from right to left are (refer to figure 2-3):

POS.	RATE (bits/second)
1	150
2	300
3	600
4	1200
5	2400
6	4800

NOTE: A baud rate of 2400 or less is recommended.

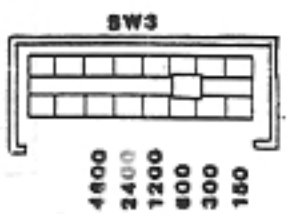


Figure 2-3 Variable Baud Rate Settings.

SWITCH NO.	OPTION "OFF"	OPTION "ON"	* "NOTES"
SW1-1 Outgoing Call Print Option	Allows transmission of SMDR data to the recording device only when the number dialed for an outgoing call exceeds 7 digits (i.e., no local calls are recorded.) *	Allows transmission of SMDR data to the recording device for all outgoing calls. *	With either setting, when the line is behind a PBX, the data will be transmitted only if the PBX CO line access code has been dialed.
SW1-2 Time Duration Print Option	Allows transmission of SMDR data to the recording device when the call duration is greater than one minute. *	Allows transmission of SMDR data to the recording device regardless of the call duration. *	Call Duration time is always indicated to the next highest minute.
SW1-3 Call Timing Start Option	Causes the timing of call durations to start immediately after dialing. *	Causes the timing of call durations to start 4.8 seconds after dialing. This prevents calls from being recorded if a busy signal is encountered and the call is immediately terminated. *	If the "Time Duration Print" option is set to OFF and the "Call Start Timing" option is set to ON, SMDR data will not be recorded for calls which are less then one minute 4.8 seconds long. Thus, outgoing calls which receive busy signals, no answer, or wrong numbers will not be recorded.
SW1-4 Account Code Entry Option	Requires an account code to be entered in order to dial an outgoing call. With this setting, unless an account code is entered, only ICM calls and internal PBX calls are permitted. Dialing on an outside line is denied. *	Does not require an account code to be dialed for outgoing calls. An account code may be entered at any time before a call is terminated.	Off-premises station users cannot dial "#". Therefore, the OFF option should not be used if OP station users must make outside calls. When an account code is not required, the key set station user can still enter an account code at any time during the call.
SW1-5 Incoming Call Print Option	SMDR data will be transmitted to the recording device for incoming calls only if an account code is entered at some time during the duration of a call. *	SMDR data will be transmitted for all incoming calls.	The account code may be entered either by the attendant or at the destination station of the call (except for off-premises destinations). The number of the last station to receive the incoming call will be recorded.
SW1-6 Restricted Call Print Option	SMDR data will be transmitted for all restricted calls attempted. *	SMDR data will not be transmitted for any restricted calls attempted. *	If the system is behind a PBX, a call will not be considered restricted (under toll restriction) unless a PBX access code is dialed.
SW1-7 Off-Hook Alert Tone Option	A beep tone will be heard on the line every three minutes when a station is off-hook on an outgoing CO line. All parties on the line can hear the beep.	No beep tone will be heard.	
SW1-8	**PUT IN OFF POSITION**	**PUT IN OFF POSITION**	**NOT USED**

Table 2-1 Selectable Switch Options.

4. OUTPUT DATA FORMAT

4.01 The output format for data sent to the recorder is a 7-bit ASCII code with no parity bit. Data is transmitted one-way with a start bit and one stop bit.

4.02 Data output is printed according to the format shown in Figure 2-2. The A-SMDR-A automatically provides the line feed operation.

4.03 The Dialed Number Field, beginning at column 45, can accommodate up to 24 digits for outgoing calls. These digits extend into the Incoming Ring Field which is not used during the time of outgoing calls. Automatic line feed operation is provided by the A-SMDR-A.

A-SMDR-A PCB

SYSTEM CONFIGURATION

CONTENTS PAGE

1. INTRODUCTION

1.01 The SYSTEM CONFIGURATION section is not applicable to the A-SMDR-A. Therefore, refer to the Installation manual for the system.

RELATED SECTIONS

1.02 Related sections on the A-SMDR-A include:

SECTION 1 --- GENERAL DESCRIPTION
SECTION 2 --- FEATURES
SECTION 4 --- PROGRAM RECORD AND PCB OPTION FORMS PREPARATION
SECTION 5 --- INSTALLATION
SECTION 6 --- PROGRAMMING
SECTION 7 --- OPERATIONAL TESTS AND FAULT LOCATION

A-SMDR-A PCB

PROGRAM RECORD AND PCB OPTION FORMS PREPARATION

CONTENTS PAGE

1. INTRODUCTION

1.01 The PROGRAM RECORD and PCB OPTION FORMS PREPARATION section provides information regarding preparation of the PCB option form and the program record form. These forms should be completed before the A-SMDR-A is installed.

1.02 If this section is reissued, then the reason for the reissue will appear in this location.

RELATED SECTIONS

1.03 Related sections on the A-SMDR-A include:

SECTION 1 --- GENERAL DESCRIPTION
SECTION 2 --- FEATURES
SECTION 3 --- SYSTEM CONFIGURATION
SECTION 5 --- INSTALLATION
SECTION 6 --- PROGRAMMING
SECTION 7 --- OPERATIONAL TESTS AND FAULT LOCATION

1.04 When the A-SMDR-A is installed in an existing system, transcribe the entry data for the remaining programs from the old Program Record Form to the form provided with this section. If it is a new installation, then complete the form provided in this section by using the instructions contained in the Installation Manual provided with the system and the instructions for Program 21 to 28 as covered in this manual.

2. A-SMDR-A PROGRAMS

2.01 The PROGRAM RECORD FORM (refer to figure 4-1) is used to record the data inputs required for system programming or reprogramming. Detailed information is provided on each changed program to allow for proper entry of codes. Some programming is changed from a basic system (i.e., an A-MPU PCB and no software

feature PCBs) to allow for the SMDR features. The following paragraphs provide detailed information for establishing Program Record Form entry codes.

PROGRAM 21 - LINE RING GROUPS

2.02 LINE RING GROUPS (Program 21) assigns separate line ring groups. This program combines programs 21, 22, and 23, found in the TC-12/TC-22 Manual.

2.03 The following conditions must be satisfied before the entry codes are determined:

(1) A private line can not be assigned to a Ring Group.

(2) Entries can not exceed the maximum number of common (non-private) lines in the system.

(3) A CO line can be assigned to only one ring group.

(4) If 1 was entered in Program 20, at least one line must be entered in Program 21.

(A) RING GROUP 1 LINES (Program 21) are the lowest numbered lines in the system. Any number of CO lines can be assigned to the first Line Ring Group, up to the maximum number of common CO lines in the system. Write the last CO line number in the CD boxes of program 21, Ring Group 1. Example: if lines 1, 2, and 3 are in Ring Group 1, then write 03 in the CD boxes.

(B) RING GROUP 2 LINES (Program 21) are the lowest numbered lines immediately following Ring Group 1 lines. Any number of lines not assigned to Ring Group 1, up to the maximum number of common lines, can be assigned to line Ring Group 2. Write the last line number in the CD boxes of Program 21, Ring Group 2. Example: if lines 4, 5, and 6 are in this group, then write 06 in the CD boxes.

(C) RING GROUP 3 LINES (Program 21) are lines immediately following Ring Group 2 lines. Any number of lines not assigned to Ring Groups 1 and 2, up to the maximum number of common lines, may be assigned to line Ring Group 3. Write the last line number in the CD boxes of Program 21, Ring Group 3. Example: if lines 7, 8, and 9 are in this group, write 09 in the CD boxes.

(D) RING GROUP 4 LINES are lines immediately following Ring Group 3 lines and by default are all remaining common lines in the system. Example: if the system is a TC-12 system with no private lines, and the last line in line Ring Group 3 was 9, line Ring Group 4 consists of lines 10 through 12 inclusive. No entry is required on the form for this group.

PROGRAM 22 - RING GROUP STATIONS

2.04 RING GROUP STATIONS (Program 22) combines old programs 24, 25, 26 and 27. Stations assigned to a ring group receive incoming audible for the lines assigned in the ring group (program 21). Example: if lines 1, 2 and 3 are in line ring group 1, and station 25 is assigned as a group 1 station, it will receive CO audible from lines 1, 2 and 3. The following conditions must be satisfied before the entry codes are determined:

(a) A station can be assigned to only one ring group.

(b) If a station is assigned to a ring group, then it cannot be assigned to the COMMON AUDIBLE GROUP. However, it can be assigned to the NIGHT TRANSFER GROUP.

(c) Station numbers assigned to any ring group must be valid numbers.

(A) GROUP 1 STATIONS (Program 22) can receive CO audible from the lines in Ring Group 1. A maximum of 10 stations can be assigned as GROUP 1 STATIONS. Write the station numbers in the CD boxes for Program 22, Ring Group 1. If less than ten stations are in the group, write 00 as the last station.

(B) GROUP 2 STATIONS (Program 22) can receive CO audible from the lines in Ring Group 2. A maximum of 10 stations can be assigned as GROUP 2 STATIONS. Write the station numbers in the CD boxes for Program 22, Ring Group 2. If less than ten stations are in the group, write 00 as the last station.

(C) GROUP 3 STATIONS (Program 22) can receive CO audible from the lines in Ring Group 3. A maximum of 10 stations can be assigned as GROUP 3 STATIONS. Write the station numbers in the CD boxes for Program 22, Ring Group 3. If less than ten stations are in the group, write 00 as the last station.

(D) GROUP 4 STATIONS (Program 22) can receive CO audible from the lines in Ring Group 4. A maximum of 10 stations can be assigned as GROUP 4 STATIONS. Write the station numbers in the CD boxes for Program 22, Ring Group 4. If less than ten stations are in the group, write 00 as the last station.

PROGRAM 23 - COMMON AUDIBLE

2.05 COMMON AUDIBLE (Program 23) is CO audible from all CO lines that are not private lines. A maximum of ten stations can be common audible stations. Common audible stations cannot be in any other ring group.

NOTE: The initialization program assigns the primary attendant's telephone as the first station and the secondary attendant's telephone as the second station in the COMMON AUDIBLE GROUP. However, this assignment can be changed.

2.06 The following conditions must be satisfied before the entry codes are determined:

(a) If a station is assigned to the COMMON AUDIBLE GROUP, it cannot be assigned to any LINE RING GROUP, or the NIGHT TRANSFER GROUP.
(b) Only valid station numbers are programmed.

Entry: Enter the station numbers in the CD boxes of Program 23 for all COMMON AUDIBLE stations. If less than ten stations are in the group, write 00 as the last station.

PROGRAMS 24 & 25

2.07 PROGRAMS 24 & 25 are not used with the A-SMDR-A.

PROGRAMS 26, 27, & 28 - DATE/TIME

2.08 DATE/TIME (Programs 26, 27 & 28) defines the month, day, year, hour, minute and second for the real time clock on the A-SMDR-A PCB. This data is dependent on the actual installation time, therefore, no codes should be entered on the form. Code entry is covered in PROGRAMMING Section 6.

(A) GROUP 1 STATIONS (Program 22) can receive CO audible from the lines in Ring Group 1. A maximum of 10 stations can be assigned as GROUP 1 STATIONS. Write the station numbers in the CD boxes for Program 22, Ring Group 1. If less than ten stations are in the group, write 00 as the last station.

(B) GROUP 2 STATIONS (Program 22) can receive CO audible from the lines in Ring Group 2. A maximum of 10 stations can be assigned as GROUP 2 STATIONS. Write the station numbers in the CD boxes for Program 22, Ring Group 2. If less than ten stations are in the group, write 00 as the last station.

(C) GROUP 3 STATIONS (Program 22) can receive CO audible from the lines in Ring Group 3. A maximum of 10 stations can be assigned as GROUP 3 STATIONS. Write the station numbers in the CD boxes for Program 22, Ring Group 3. If less than ten stations are in the group, write 00 as the last station.

(D) GROUP 4 STATIONS (Program 22) can receive CO audible from the lines in Ring Group 4. A maximum of 10 stations can be assigned as GROUP 4 STATIONS. Write the station numbers in the CD boxes for Program 22, Ring Group 4. If less than ten stations are in the group, write 00 as the last station.

PROGRAM 23 - COMMON AUDIBLE

2.05 COMMON AUDIBLE (Program 23) is CO audible from all CO lines that are not private lines. A maximum of ten stations can be common audible stations. Common audible stations cannot be in any other ring group.

NOTE: The initialization program assigns the primary attendant's telephone as the first station and the secondary attendant's telephone as the second station in the COMMON AUDIBLE GROUP. However, this assignment can be changed.

2.06 The following conditions must be satisfied before the entry codes are determined:

(a) If a station is assigned to the COMMON AUDIBLE GROUP, it cannot be assigned to any LINE RING GROUP, or the NIGHT TRANSFER GROUP.
(b) Only valid station numbers are programmed.

Entry: Enter the station numbers in the CD boxes of Program 23 for all COMMON AUDIBLE stations. If less than ten stations are in the group, write 00 as the last station.

PROGRAMS 24 & 25

2.07 PROGRAMS 24 & 25 are not used with the A-SMDR-A.

PROGRAMS 26, 27, & 28 - DATE/TIME

2.08 DATE/TIME (Programs 26, 27 & 28) defines the month, day, year, hour, minute and second for the real time clock on the A-SMDR-A PCB. This data is dependent on the actual installation time, therefore, no codes should be entered on the form. Code entry is covered in PROGRAMMING Section 6.

(A) GROUP 1 STATIONS (Program 22) can receive CO audible from the lines in Ring Group 1. A maximum of 10 stations can be assigned as GROUP 1 STATIONS. Write the station numbers in the CD boxes for Program 22, Ring Group 1. If less than ten stations are in the group, write 00 as the last station.

(B) GROUP 2 STATIONS (Program 22) can receive CO audible from the lines in Ring Group 2. A maximum of 10 stations can be assigned as GROUP 2 STATIONS. Write the station numbers in the CD boxes for Program 22, Ring Group 2. If less than ten stations are in the group, write 00 as the last station.

(C) GROUP 3 STATIONS (Program 22) can receive CO audible from the lines in Ring Group 3. A maximum of 10 stations can be assigned as GROUP 3 STATIONS. Write the station numbers in the CD boxes for Program 22, Ring Group 3. If less than ten stations are in the group, write 00 as the last station.

(D) GROUP 4 STATIONS (Program 22) can receive CO audible from the lines in Ring Group 4. A maximum of 10 stations can be assigned as GROUP 4 STATIONS. Write the station numbers in the CD boxes for Program 22, Ring Group 4. If less than ten stations are in the group, write 00 as the last station.

PROGRAM 23 - COMMON AUDIBLE

2.05 COMMON AUDIBLE (Program 23) is CO audible from all CO lines that are not private lines. A maximum of ten stations can be common audible stations. Common audible stations cannot be in any other ring group.

NOTE: The initialization program assigns the primary attendant's telephone as the first station and the secondary attendant's telephone as the second station in the COMMON AUDIBLE GROUP. However, this assignment can be changed.

2.06 The following conditions must be satisfied before the entry codes are determined:

(a) If a station is assigned to the COMMON AUDIBLE GROUP, it cannot be assigned to any LINE RING GROUP, or the NIGHT TRANSFER GROUP.
(b) Only valid station numbers are programmed.

Entry: Enter the station numbers in the CD boxes of Program 23 for all COMMON AUDIBLE stations. If less than ten stations are in the group, write 00 as the last station.

PROGRAMS 24 & 25

2.07 PROGRAMS 24 & 25 are not used with the A-SMDR-A.

PROGRAMS 26, 27, & 28 - DATE/TIME

2.08 DATE/TIME (Programs 26, 27 & 28) defines the month, day, year, hour, minute and second for the real time clock on the A-SMDR-A PCB. This data is dependent on the actual installation time, therefore, no codes should be entered on the form. Code entry is covered in PROGRAMMING Section 6.

3. PCB OPTION FORM PREPARATION

3.01 The PCB OPTION FORM (Refer to Figure 4-2) is used to indicate the positions of switches SW1 (SW1-8 should be in the OFF position) and SW2 for selecting optional features. Reference Table 2-1 to determine the settings desired for the eight positions of each switch. Place an X in either the ON or OFF position on the PCB Option Form.

NOTE: Option Switch SW2 has been incorporated for future use, therefore, all positions (SW2-1 through SW2-8) for Option Switch SW2 should be in the OFF position.

3.02 To indicate the desired Variable Baud Rate for Option Switch SW3 place an X in the preferred slide position. Reference paragraph 3.03, Section 2.

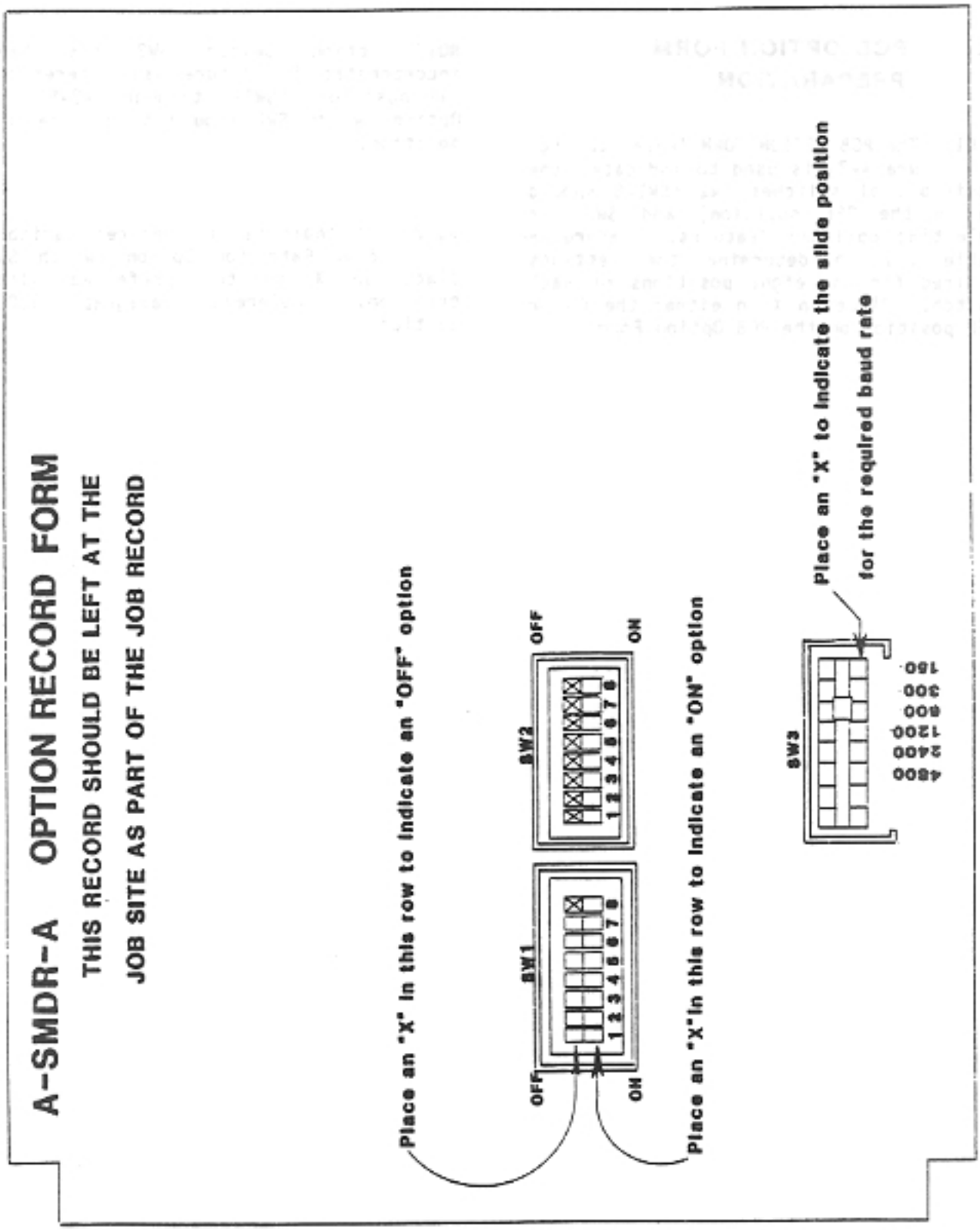


Figure 4-2 A-SMDR-A Option Record Form.

PROGRAM RECORD FORM

TC-12/TC-22 Systems with A-SMDR-A

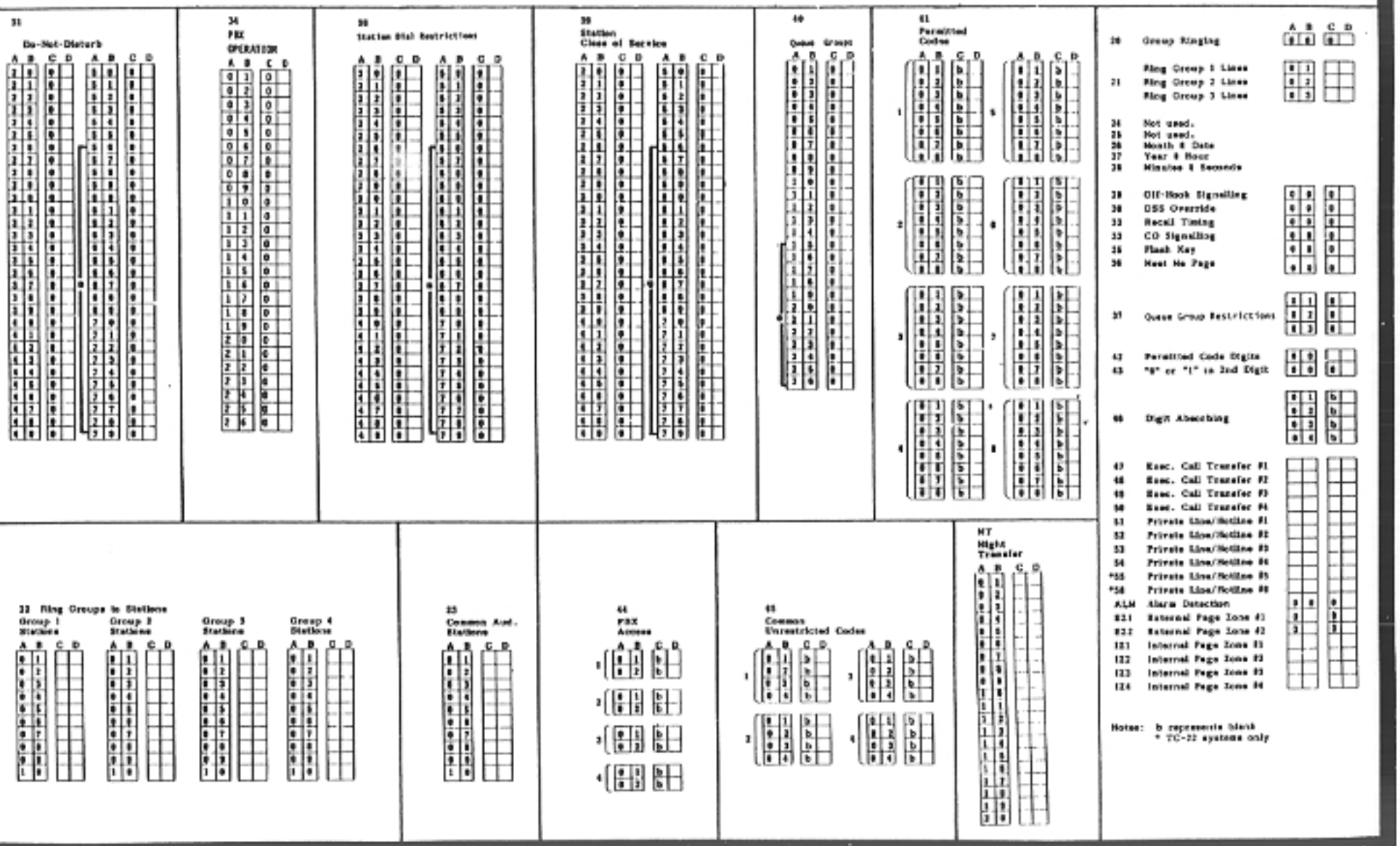


Figure 4-1 A-SMDR-A Program Record Form.

A-SMDR-A PCB
INSTALLATION

CONTENTS PAGE

1. INTRODUCTION

1.01 The INSTALLATION section provides information on installing an A-SMDR-A PCB in a TC-12/TC-22 key telephone systems.

1.02 If this section is reissued, then the reason for the reissue will appear in this location.

RELATED SECTIONS

1.03 Related sections on the A-SMDR-A include:

SECTION 1 --- GENERAL DESCRIPTION
SECTION 2 --- FEATURES
SECTION 3 --- SYSTEM CONFIGURATION
SECTION 4 --- PROGRAM RECORD AND PCB OPTION PREPARATION FORMS
SECTION 6 --- PROGRAMMING
SECTION 7 --- OPERATIONAL TESTS AND FAULT LOCATION

1.04 Before proceeding with the installation, check that the A-SMDR-A program record form and the A-SMDR-A option record form have been completed. If these forms have not been completed, refer to Section 4, PROGRAM RECORD AND PCB OPTION FORMS PREPARATION, in this manual for instructions.

1.05 The A-SMDR-A PCB has RED EDGE and RED PULLS. This indicates that the PCB contains CMOS devices that can be damaged by static discharges. Always wear a grounded wrist strap for static protection when handling the A-SMDR-A and the system power must be off when inserting or removing the A-SMDR-A.

2. INSTALLATION PROCEDURES

CAUTION: TURN OFF the power before proceeding with the installation.

2.01 Remove the A-MPU PCB and strap as shown in figure 5-1. Reinstall the A-MPU PCB.

2.02 Remove the plastic covers on the SW1 and SW3 switch groups on the A-SMDR-A PCB. Set the SPST switches as shown on the PCB OPTION FORM (refer to figure 4-2). After replacing the plastic covers, insert the A-SMDR-A PCB in the MISC-1 position of the KSU.

BTB-A AND BATTERY INSTALLATION

2.03 The battery or fuse can be replaced on the BTB-A PCB without removing the A-SMDR-A PCB. The system remains fully operational and there is no loss of the real time clock stored in the A-SMDR-A memory.

2.04 The A-SMDR-A PCB LED will be illuminated and the ALM LED on the DSS console will flash during the following fault conditions:

(a) battery output drops below 2.5 V.
(b) the fuse blows on BTB-A PCB.
(c) the battery or BTB-A PCB is removed.

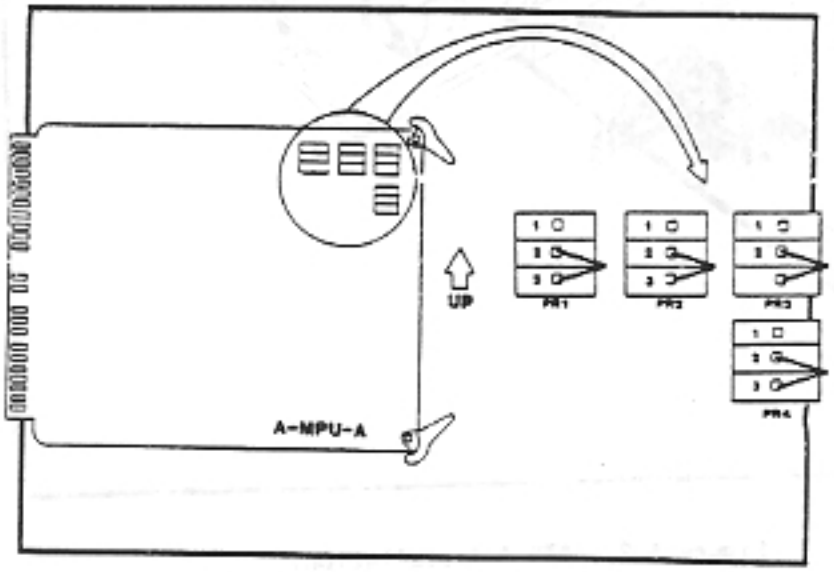


Figure 5-1 A-MPU-A Strapping.

CAUTION: To prevent accidental shorting, leave battery in plastic bag until it is to be installed on the BTB-A PCB.

2.05 Observe the polarity markings on the battery and on the BTB-A PCB. Carefully insert the battery into the clips with the proper orientation. Check the 0.25 AMP fuse to see that it is intact (refer to figure 5-2).

2.06 Insert the BTB-A PCB into the guides. The guides align the pins for insertion into the A-SMDR-A mounted connector. Push in the BTB-A PCB until the pins are fully engaged in the connector. Press the push-to-lock fastener to secure BTB-A to the A-SMDR-A.

NOTE: DO NOT place the BTB-A PCB with battery in a conductive-type static shielding bag or other conductive surface. Damage can result if the battery is recharged, short-circuited, disassembled, heated or disposed of in fire.

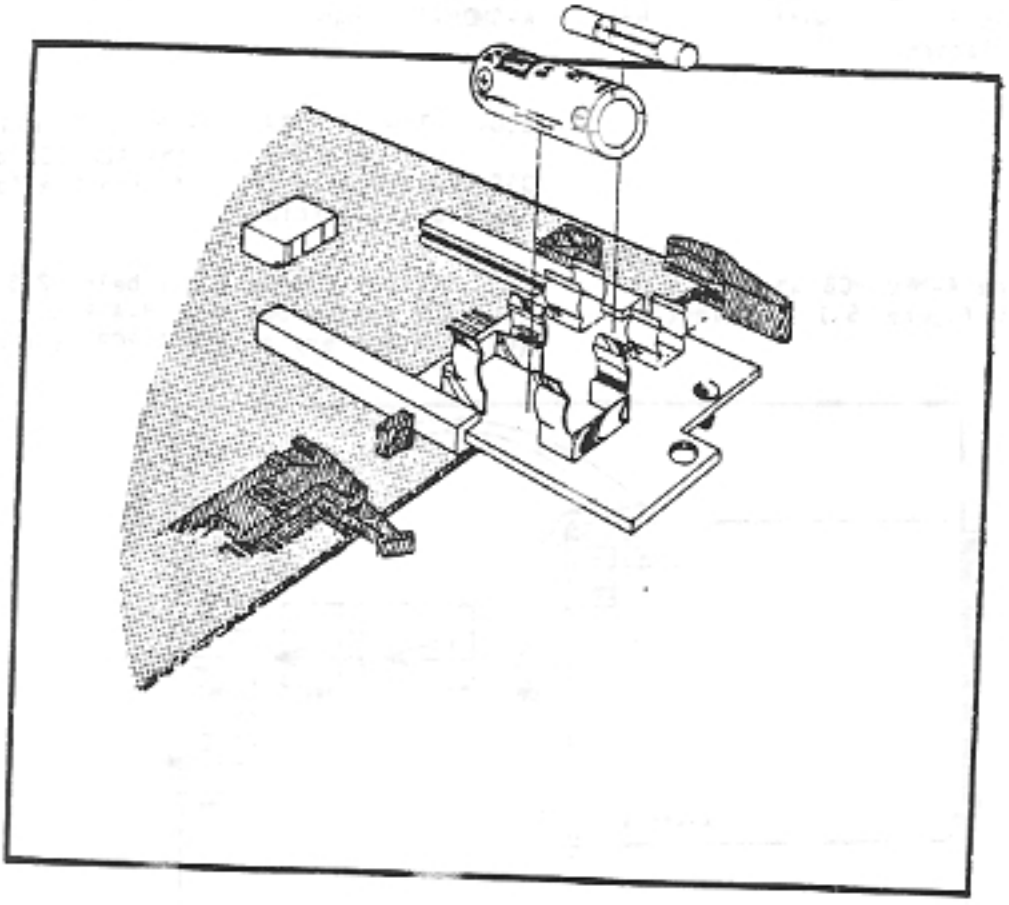


Figure 5-2 BTB-A Installation.

3. CABLE AND JACK ASSEMBLY

3.01 Mount the cable and jack assembly to the KSU and secure with the screw as shown in figure 5-3.

3.02 Plug the cable connector of the cable and jack assembly into the A-SMDR-A connector with the RED wire at the top (figure 5-3). Spread the retaining clips on the A-SMDR-A to allow entrance of the mating connector.

4. POWER UP

4.01 Put the printer status switch on the panel in the OUT OF SERVICE position and connect the RS232-C recorder input cable to the RS232-C jack on the panel.

4.02 Put SW1, on the A-NMU PCB, to the OFF position and turn ON the system power.

4.03 The LED on the A-SMDR-A should not be illuminated. If the LED is illuminated, then remove the BTB-A PCB and check the battery, battery clips and the fuse. Reinstall the BTB-A PCB after correcting the problem.

4.04 Turn on the recording device.

4.05 Place the printer status switch on the panel to IN SERVICE Position. The heading line should print (refer to Figure 2-2). If the heading line is properly printed, then proceed with Programming, Section 6. If the heading line is not correctly printed then refer to Section 7, paragraph 3, Operational Tests and Fault Location.

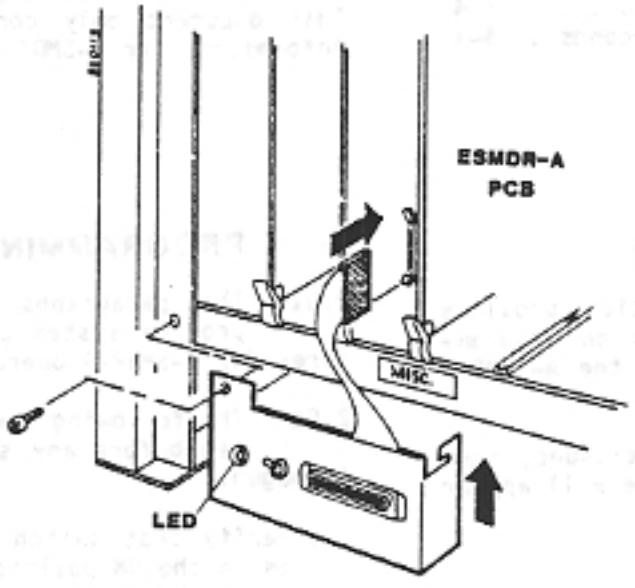


Figure 5-3 Mounting Cable and Jack Assembly to the KSU.

A-SMDR-A PCB PROGRAMMING

CONTENTS

1.04 When an A-SMDR-A PCB is installed in a system, the system must be entirely reprogrammed. Initialization instructions and basic programs are found in the TC-12/TC-22 Installation Manual. This document only contains programming information for A-SMDR-A operation.

1. INTRODUCTION

1.01 The PROGRAMMING section provides detailed instructions on programming a system equipped with the A-SMDR-A PCB.

1.02 If this section is reissued, then the reason for reissue will appear in this location.

RELATED SECTIONS

1.03 Related sections on the A-SMDR-A include:

2. PROGRAMMING PROCEDURE

2.01 The paragraphs in this section provide system programming procedures for A-SMDR-A operation.

2.02 The following steps must be executed before any system programming is begun:

- Verify that switch SW1 on the A-NMU is in the ON position.
- Remove handset on the primary attendant's station from its cradle.
- Press the DATA ENTRY key on the DSS console.

3. PROGRAMS

3.01 The following paragraphs describe the program procedures for the A-SMDR-A, and should be used with the completed Program Record Form. For all programs not covered in the following, refer to the TC-12/TC-22 System manual.

PROGRAM 21 - LINE RING GROUPS

3.02 Program 21 is used to assign CO lines to Line Ring Groups. When a CO line is in the ringing mode, assignments to RING GROUPS cannot be changed.

Programming procedure:

(a) Refer to paragraph 2.02.

(b) Press DSS console key 21.

Display = [0 0 0 0]

(c) Enter LINE RING GROUP number, begin with Line Ring Group 1.

Display = [0 y 0 0]

(y represents the ring group number.)

(d) Dial * once.

Display = [0 y 0 0]

(e) Dial number for last CO line to be assigned to this ring group.

Display = [0 y x x]

(xx represents the line number)

(f) Dial * once.

(g) Repeat procedure for Line Ring Groups 2 and 3 starting at step (c).

(h) Dial # to leave program.

(i) Press DATA ENTRY key to resume call processing, or proceed to step (b) of another program.

PROGRAM 22 - RING GROUP STATIONS

3.03 Program 22 is used to assign stations to LINE RING GROUPS. When a CO line is in the ringing mode, assignments to RING GROUPS cannot be changed.

Programming procedure:

(a) Refer to paragraph 2.02.

(b) Press DSS console key 22.

Display = [0 0 0 0]

(c) Dial RING GROUP NUMBER, beginning with Ring Group 1.

Display = [0 0 0 x]

(x represents Ring Group)

(d) Dial * once.

Display = [0 1 0 0]

(01 in boxes AB indicates 1st station in the group.)

(e) Enter 1st station in group as shown on the program record form.

Display = [0 1 x x]

(xx represents station number.)

(f) Dial * once.

Display = [0 2 0 0]

(g) Repeat procedures for each station in the group up to 10 stations. If less than 10 stations are entered, then enter 00 as the last station.

(h) Dial # once to leave program.

(i) Repeat procedures for each remaining Ring Group starting at step (b).

(j) Press DATA ENTRY key to resume call processing, or proceed to step (b) of another program.

PROGRAM 23 - COMMON AUDIBLE GROUP

3.04 Program 23 is used to assign stations to the COMMON AUDIBLE GROUP. When a CO line is in the ringing mode, assignments to RING GROUPS cannot be changed.

Programming procedure:

(a) Refer to paragrah 2.02.

(b) Press DSS console key 23.

Display = [0 1 y y]

(yy represents numbers previously entered or assigned by initialization)

Initialization assigns the primary DSS telephone station as the 1st station in the Common Audible Group.

(c) Enter the 1st station in the group as shown on the program record form, if different than the DSS, or proceed to next step.

Display = [0 1 x x]

(xx represents station numbers.)

(d) Dial * once.

Display = [0 2 y y]

(yy represents numbers previously entered or assigned by initialization)

Initialization assigns the secondary DSS telephone station as the 2nd station in the Common Audible Group.

(e) Enter the 2nd station in the group as shown on the program record form, if different than the DSS, or proceed to next step.

Display = [0 2 x x]

(xx represents station numbers)

(f) Dial * once.

Display = [0 3 0 0]

(g) Repeat steps (e) and (f) for each station in the group up to 10 stations. If less than 10 stations are entered, then enter 00 as the last station.

(h) Dial # to leave program.

(i) Press DATA ENTRY key to resume call processing, or proceed to step (b) of another program.

PROGRAMS 24 AND 25.

3.05 Programs 24 and 25 are not used.

PROGRAM 26 (MONTH AND DATE)

3.06 Program 26 is used to enter the month and date for real time clock.

Programming procedure:

(a) Refer to paragraph 2.02.

(b) Press DSS console key 26.

Display = [z z z z]

(z represents initialization code)

(c) Dial * once.

Display = [b b z z]

(b represents a blank)

(d) Enter month as 01 through 12.

Display = [x x z z]

(xx represents the month.)

(e) Dial * once.

Display = [x x b b]

(xx represents the month, b represents a blank

(f) Enter date as 01 through 31.

Display = [x x y y]

(xx represents the month, yy represents the date.)

(g) Dial * once.

Display = [0 0 0 0]

(h) Dial # to leave program.

(i) Press DATA Entry key to resume call processing, or proceed to step (b) of another program.

PROGRAM 27 - YEAR AND HOUR

3.07 Program 27 is used to enter the year and hour for the real time clock.

Programming procedure:

(a) Refer to paragraph 2.02.

(b) Press DSS console key 27.

Display = [z z z z]

(z represent initialization code)

(c) Dial * once.

Display = [b b z z]

(b represents a blank)

(d) Enter the year (last 2 digits).

Display = [x x z z]

(xx represents the year.)

(e) Dial * once.

Display = [x x b b]

(xx represents the year, b represents a blank)

(f) Enter the hour as 00 through 23.

Dislay = [x x y y]

(xx represents the year & yy represents the hour.)

(g) Dial * once.

Display = [0 0 0 0]

(h) Dial # to leave program.

(i) Press DATA ENTRY key to resume call processing, or proceed to step (b) of another program.

PROGRAM 28 - MINUTES AND SECONDS

3.08 Program 28 is used to enter the minutes and seconds of the real time clock.

Programming procedure:

(a) Refer to paragraph 2.02.

(b) Press DSS console key 28.

Display = [z z z z]

(z represents initialization code, display shows minutes and seconds. Seconds will advance.)

(c) Dial * once.

Display = [b b z z]

(b represents a blank)

(d) Enter the minutes.

Display = [x x z z]

(xx represents the minutes)

(e) Dial * once.

Display = [x x b b]

(xx represents the minutes, b represents a blank)

(f) Enter the seconds.

Display = [x x y y]

(xx represents the minutes and yy the seconds.)

(g) Dial * once.

Display = [0 0 0 0]

(h) Dial # to leave program.

(i) Press DATA ENTRY key to resume call processing, or proceed to step (b) of another program.

A-SMDR-A PCB

OPERATIONAL TESTS AND FAULT LOCATIONS

CONTENTS PAGE

1. INTRODUCTION

1.01 The OPERATIONAL TEST AND FAULT LOCATION section provides information and procedures for testing and locating faults in a TC-12/TC-22 system equipped with an A-SMDR-A PCB.

1.02 If this section is reissued, then the reason for the reissue will appear in this location.

RELATED SECTIONS

1.03 Related sections on the A-SMDR-A include:

SECTION 1 --- GENERAL DESCRIPTION
SECTION 2 --- FEATURES
SECTION 3 --- SYSTEM CONFIGURATION
SECTION 4 --- PROGRAM RECORD AND PCB OPTION PREPARATION FORMS
SECTION 5 --- INSTALLATION
SECTION 6 --- PROGRAMMING

2. OPERATIONAL TEST

2.01 The operational test in this manual has been divided into two categories: (1) A-SMDR-A/Recorder Interface tests and (2) A-SMDR-A option tests.

2.02 In order to minimize the time required to test the system, the tests should be conducted in the following order:

(1) A-SMDR-A/Recorder Interface tests.

(2) Operational tests as detailed in the TC-12/TC-22 Installation Manual.

(3) A-SMDR-A optional tests.

2.03 When the A-SMDR-A PCB is installed, telephone operation is altered for stations having Class Of Service 0 or 1. In order to make a proper record of all calls made, stations with these classes are not allowed to dial on incoming calls until operation of the flash key. On a direct CO line connection , operation of the flash key terminates the incoming call and, if appropriate, SMDR data is transmitted.

2.04 Behind a PBX, pressing the flash key and dialing PBX access codes will, if appropriate, cause SMDR data to

be transmitted and initiate an outgoing call record for the outgoing call. Operation of the flash key allows outgoing dialing. A second operation of the flash key will deny outgoing dialing. This modification may be noted during the station test category of the installation manual.

3. FAULT LOCATION

3.01 If a problem develops during operational tests of the A-SMDR-A/Recorder interface or A-SMDR-A options, refer to the following paragraphs. For additional information on system fault locations, refer to the TC-12/TC-22 Installation manual.

A-SMDR-A/RECORDER INTERFACE

3.02 If the header line is not printed, or printed incorrectly when the printer status switch is placed in the OUT OF SERVICE to IN SERVICE position, the following items should be checked:

a) System power ON.
b) Recorder power switch ON.
c) Interface cable connected.
d) RS232C cable connected.
e) RS232C cable wiring (pin 20).
f) Baud rate compatibility.
g) Proper A-MPU card strapping.
h) Instructions for printer.

3.03 If the printer does not function satisfactorily after checking the items in paragraph 3.02, then replace the A-SMDR-A PCB and installation kit.

A-SMDR-A OPTION TESTS

3.04 If proper results are not obtained when making the option tests, do the following:

1) Put on grounded wrist strap.
2) Turn OFF system power.
3) Remove the A-SMDR-A card.
4) Verify the setting of the appropriate option switch(es).
5) Return the card to the KSU.
6) Turn ON system power.

3.05 If the above steps fail to solve the problem, replace the A-SMDR-A.

Category 1 -- A-SMDR-A/RECORDER INTERFACE

TEST	VERIFICATION
At the A-SMDR-A panel, turn the PRINTER STATUS SWITCH from the OUT OF SERVICE to the IN SERVICE position.	HEADER LINE printed as shown in Figure 2-2

Category 2 - A-SMDR-A OPTION TESTS

NOTE:
The following tests assume that the A-SMDR-A interface test (category 1) was successful and that the A-SMDR-A card and printer are functioning properly.

TEST	VERIFICATION
1. Account Code Entry	
a) If option switch SW1-4 ON.	
(1) From a key telephone, lift the handset.	Station key illuminated at DSS console.
(2) Press a line key.	Dial tone available in handset. Line key is illuminated at all stations.
(3) Dial a known number.	Call completed.
(4) Hangup.	Line releases and all LEDs extinquished
b) If option switch SW1-4 OFF.	
(1) Perform steps in a) above.	Same as above except dialing not permitted.
(2) Dial #, 9, #, followed by a known number.	Dialing now permitted and call completed as above.
(3) Hangup.	Line releases and all LEDs go out.
2. Outgoing Call Print:	
a) If option switch SW1-1 ON.	
(1) From a key telephone, make a 7-digit call (add PBX access digit if required).	Call completed.
(2) After more than 1 minute, hangup.	Line releases, all LEDs go out, and SMDR data printed.
b) If option switch SW1-1 OFF.	
(1) Perform steps in 2a) above.	Same as test 2a) above, except SMDR data not printed.
(2) Make a call with more than 7 digits.	Call completed.

A-SMDR-A OPTION TESTS continued

TEST	VERIFICATION
(3) After more than 1 minute, hangup.	Same as 2a) above with data printed.
3. Call Time Duration:	
a) If option switch SW1-2 ON.	
(1) From a key telephone, make a call as required in Test 2 to obtain an SMDR print-out.	Call completed.
(3) After 30 seconds, hangup.	Data printed.
b) If option switch SW1-2 OFF.	
(1) Perform all steps in 3a) above.	Call completed and data not printed.
(2) Remake call.	Call completed.
(3) After 1 minute, hangup.	Data printed.
4. Incoming Call Print:	
a) If option switch SW1-5 ON.	
(1) From a key telephone, make a call to another line in the system.	Incoming call rings in.
(2) Answer the incoming call.	Call completed
(3) Hang-up at both telephones.	Outgoing call printed (if appropriate). Incoming call printed.
b) If option switch SW1-5 OFF.	
(1) Perform steps in 4a.	Outgoing call only printed (if appropriate).
(2) Repeat step 4a(1).	Incoming call rings in.
(3) Answer the incoming call.	Incoming and outgoing stations connected.
(4) At the answering station, dial #, 9, #, and hangup.	Outgoing call printed (if appropriate). Incoming call printed.

A-SMDR-A OPTION TESTS continued

TEST	VERIFICATION
5. Restricted Call Print:	
a) If option switch SW1-6 ON.	
(1) From a restricted telephone, make an outgoing restricted call.	Fast busy tone returned. After 5-10 seconds, station disconnected. SMDR data not printed.
b) If option switch SW1-6 OFF.	
(1) Perform steps in 5a.	Same as above, except data printed.
7. Off-Hook Alert Tone:	
a) If option switch SW1-7 ON.	
(1) From a key telephone, make an outgoing call to another line in the system.	Call rings in.
(2) Answer the incoming call.	Both stations connected.
(3) Keep both stations off-hook for more than 3 minutes. Listen to handset at the 3 minute interval.	No beep tone at the 3-minute interval.
b) If option switch SW1-7 OFF.	
(1) Perform all steps in 6a.	Same as 6a), except a beep tone is received at the 3-minute interval.

END OF A-SMDR-A OPTION TESTS

INSTALLER NOTES ON A-SMDR-A OPTION TESTING:

TECHNICAL ASSISTANCE

When problems or questions arise during installation or servicing that cannot be resolved using this or related documents, then contact TIE Technical Service Department as follows:

For assistance between 8:30 AM and 5:00 PM, Eastern time, call:

(203) 926-2033

For assistance in the event of an ***ABSOLUTE*** emergency at other times than those listed, call:

(203) 929-7920

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