PREMIER™ 616
ELECTRONIC KEY SYSTEM

GENERAL DESCRIPTION, INSTALLATION AND MAINTENANCE MANUAL

ATTENTION

OBSERVE PRECAUTIONS
FOR HANDLING

**ELECTROSTATIC
SENSITIVE
DEVICES**

FCC Registration Number is: DLP82V-12491-KF-T
Ringer Equivalent is: 0.7A

NC-616 ELECTRONIC KEY TELEPHONE SYSTEM

TABLE OF CONTENTS

100 INTRODUCTION

100.1 PURPOSE

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

100.2 REGULATORY INFORMATION (FCC)

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

A) TELCO NOTIFICATION

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

1. The telephone numbers to be connected to the system.
2. The FCC Registration Number which is located on the Key Service Unit.
3. The Ringer Equivalence Number which is also located on the Key Service Unit.
4. The USOC jack required: RJ21X

B) INCIDENCE OF HARM

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

C) CHANGES IN SERVICE

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

D) MAINTENANCE LIMITATIONS

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

E) NOTICE OF COMPLIANCE

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

"WARNING:

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

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

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

200 GENERAL DESCRIPTION

200.1 TECHNOLOGY

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

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

The key telephone sets are equipped with eight (8) function buttons, six (6) C.O. line buttons and sixteen (16) Direct Station Selection (DSS) buttons are used for fast INTERCOM CALLING. A three-position slide switch is provided for easy selection of INTERCOM signaling modes, along with two separate volume controls.

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

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

200.2 CAPACITY

The NC-616 Electronic Key System has a maximum capacity of six (6) central office lines, sixteen (16) electronic key telephones and two (2) INTERCOM paths. Up to eight (8) INTERCOM BOXES may be substituted for key telephones on a two-for-two basis. The basic system provides two (2) C.O. line interfaces, eight (8) key telephone appearances and INTERCOM CALL ANNOUNCING circuitry. Additional lines, stations and features are provided by plugging in modular printed circuit boards. These cards have uniquely color-coded ejector tabs that correspond to colored card guides located in the KSU. The KSU card connectors are mounted on a rigid backplane. No wire wrapping or special wiring is needed. All options are performed by operating the dip switches and slide switches located on the printed circuit boards. The switches, volume controls and fuse assemblies are located at the KSU entrance. This permits visual inspection or adjustment without card removal.

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

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

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

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

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

The Matrix Expansion Unit (MEU) is used when the 5th and 6th C.O. lines are interfaced.

Those key stations requiring handsfree operation on external C.O. line may now be enhanced with Speakerphone Units (SPU) inside each set.

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

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

200.3 SYSTEM COMPONENTS
NC-616 BASIC SYSTEM (431516)

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

NC-616 ELECTRONIC KEY TELEPHONE (475112)

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

NC-616 CENTRAL OFFICE UNIT (COU) (435886)

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

NC-616 - STATION INTERFACE UNIT (SIU) (435887)

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

NC-616 PHONE BOX AND STATION INTERFACE UNIT (PSU) (435888)

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

NC-616 MATRIX EXPANSION UNIT (MEU) (435889)

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

NC-616 INTERCOM BOX (450547)

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

NC-616 PABX TRANSFER UNIT (PTU) (435891)

Provides open loop or ground flashing on all C.O./PBX lines. Flashing can be adjusted for 600 msec or 2 second duration to accommodate either PABX Flash or Recall function. One card per system. When not equipped, the Flash Key is inoperative. (Brown Ejector Tabs)

NC-616 MISCELLANEOUS UNIT (MSU) (435898)

Adds STATION SPEED CALLING, LAST NUMBER REDIAL and flexible TOLL RESTRICTION to the NC-616 Key System. Each station user can selectively program (10) speed numbers of (24) digits in length. (Red Ejector Tabs)

NC-616 MULTI-LINE CONFERENCE UNIT (MLU) (435894)

PCB allows conferencing of any (2) outside C.O. lines with any one key station. (Black Ejector Tabs)

NC-616 DUMMY BOARDS (Replacement Kit of 2 lg / 3 sm) (435895)

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

NC-616 SPEAKERPHONE KIT (450545)

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

NC-616 WALL MOUNT KIT (480479)

This color matching base plate assembly easily converts standard NC-616 desk top instruments into wall mount models. One kit required per wall mounted instrument.

NC-616 REPLACEMENT KSU (431517)

Includes cover, card connectors and backplane motherboard.

NC-616 POWER SUPPLY (433131)

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

NC-616 CENTRALIZED CONTROL UNIT (CCU) (435892)

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

NC-616 HANDSFREE TALKBACK UNIT (HTU) (435893)

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

200.4 SYSTEM SPECIFICATIONS

SIGNALING SPECIFICATIONS

VISUAL INDICATORS

NAME	CONDITION	LOCATION
Busy C.O. Line	Steady Lamp	C.O. Line Button
Incoming C.O. Line	30 IPM Flashing	C.O. Line Button
I-HOLD	30 IPM Double Flash	C.O. Line Button
System HOLD	60 IPM Wink	C.O. Line Button
Line Recall	120 IPM Flashing	C.O. Line Button
Incoming Intercom	30 IPM Flashing	HOLD Button
Intercoms Busy	Steady Lamp	HOLD Button
Message Waiting	15 IPM Flashing	CALL WAIT Button
DND On	Steady Lamp	DND Button
Speakerphone ON	Steady Lamp	ON/OFF Button
BLF Extension Busy	Steady Lamp	DSS Button
DSS Transfer	30 IPM Double Flash	C.O. Line Button

AUDIBLE SIGNALS

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

* REFERS TO INTERCOM SIGNALING MODE SWITCH ON KEY TELEPHONE STATION

200.4 SYSTEM SPECIFICATIONS - (Cont.)

SYSTEMS DIMENSIONS AND WEIGHTS

BASIC SYSTEM	
Height	480 mm (19in.)
Width	380 mm (15in.)
Depth	230 mm (9in.)
Weight Approximate	34.3 lbs.
KEY TELEPHONE STATION	
Height	74 mm (3in.)
Width	204 mm (8in.)
Depth	224 mm (9in.)
Weight Approximate	2.9 lbs.
SPEAKER BOX	
Height	41 mm (1¾in.)
Width	140 mm (5½in.)
Depth	108 mm (4¼in.)
Weight Approximate	1 lbs.
POWER SUPPLY MODULE	
Height	104 mm (4¼in.)
Width	183 mm (7¼in.)
Depth	198 mm (7¾in.)
Weight Approximate	9 lbs.

ELECTRICAL

AC input to P/S	117 VAC 50/60 Hz
Power Consumption	125 WATTS
Output Voltage	24 VDC, 2.5A
Battery Charge Power	28 VDC, 0.6A MAX CHARGE
Maximum Station Cable Lengths	800 ft. of 26 AWG Cable 1200 ft. of 24 AWG Cable 2000 ft. of 22 AWG Cable
Fuses	
AC Input	1.2A, 250V
DC Output	3A, 250V
SIU/PSU Card	0.4A, 125V
Music Source (Input)	600 Ohms @0 dBM MAX.

ENVIRONMENTAL

Temperature	32-122° F (0-50° C)
Humidity	0-90% (Non-Condensing)

300 FEATURE DESCRIPTIONS

300.1 ALPHABETICAL LISTING OF FEATURES

ALARM SIGNALING

External alarm signals may be received by the KSU and transmitted to all key telephone stations in the system.

ALL CALL PAGING

Any station user may make voice announcements to all key telephones and speaker boxes simultaneously.

AUTOMATIC HOLD RECALL

A call placed on HOLD by a station will RECALL the station after a programmed time period.

BACKGROUND MUSIC

An external music source may be connected to the system for background music. Internal station users selectively receive background music over the key telephone speakers.

BATTERY BACK-UP

System battery back-up provides full system operation in the event of a power failure.

BUSY LAMP FIELD (BLF)

Each key telephone is equipped with integrated BLF indicators to provide station user status information.

CALL ANNOUNCING

Waiting C.O. line parties can be "announced" to key telephone users over integrated telephone speakers. Called station users may respond to INTERCOM calls without lifting the handset.

CALL WAITING (CAMP-ON)

Used to notify a busy station that an outside C.O. line is on HOLD and waiting. The busy station (off-hook or on speakerphone) is notified of the CALL WAITING by short rings and a distinctive flash of the associated C.O. line button

CONFERENCE

1) Internal Conference: Permits trhee-way internal CONFERENCE on INTERCOM. Two (2) simultaneous internal conferences maximum.
2) Multi-Line Conference: used when one internal station engages in a CONFERENCE with two external (C.O. line) parties. Two (2) simultaneous multi-line conferences maximum. Requires the MLU card.
3) Add-On Conference: Allows two internal stations and one external (C.O. line) party to carry on a three-way conversation.

   No limit on the number of simultaneous add-on conferences.

DIRECT LINE ACCESS

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

DIRECT STATION SELECTION (DSS)

Sixteen buttons are dedicated at each station for immediate signaling to other stations over the system INTERCOM.

DSS AND LINE KEY PRESELECT

A station user can select and press a DSS or line key before going off-hook or depressing the ON/OFF button.

DO NOT DISTURB (DND)

Eliminates incoming C.O. line ringing, INTERCOM calls, and ALL CALL PAGE announcements at the station(s) in DND mode.

EMERGENCY TRANSFER

Central office lines are automatically connected to predesignated stations (Line 1 to Station 1, Line 2 to Station 2, ect.) in the event of a power failure.

EXECUTIVE/SECRETARY TRANSFER

If a designated EXECUTIVE telephone is busy or in the DND mode, incoming intercom calls will automatically signal the designated "SECRETARY" telephone.

EXTERNAL PAGING

An EXTERNAL PAGING system (amplifier) can be accessed by the NC-616.

FLASH KEY

Allows station user to initiate a flash for PABX transfer or line recall.

FLEXIBLE NIGHT TRANSFER

The attendant can selectively transfer common C.O. audible ringing to another station in the system. NIGHT TRANSFER is used when the attendant station is unattended.

HOLD

Any C.O. line may be placed on HOLD by pressing HOLD button or DSS button.

INCOMING CALL SIGNALING

Ring signaling can be assigned on a per-station basis. Those stations designated as ringing stations will receive a muted signal when in the OFF-HOOK condition.

INTERCOM CALL PICK-UP

The station user may retrieve INTERCOM calls made to unattended stations.

INTERCOM SIGNALING MODE

Three INTERCOM SIGNALING MODES are user selectable at each key telephone:

1) (T) Tone Ringing Mode

   The called party hears a pleasant tone over the internal speaker of the telephone.

2) (P) Paging Mode

   The called party hears a chime tone followed by a one-way voice page.

3) (H) Handsfree Talkback Mode

   The called party hears a chime tone followed by a voice announcement. A conversation can take place without lifting the handset or depressing the ON/OFF button.

LAST NUMBER REDIAL

Permits user to REDIAL busy and unanswered numbers conveniently.

LOUD BELL CONTROL

External signal devices may be connected to the NC-616 for indication of incoming C.O. line ringing.

MESSAGE WAITING

The attendant station can act as a message center for unattended stations.

MUSIC ON HOLD

Music from a customer provided music source can be connected directly to the KSU to provide music to calls placed on hold or being transferred.

ON HOOK DIALING

With ON-HOOK Dialing, the station user may dial a number without lifting the handset. If holding for another party, this feature permits easy monitoring until conversation begins.

PRIVACY

AUTOMATIC PRIVACY is provided on all internal and external calls.

SPEAKERPHONE OPERATION

Any key telephone may be easily upgraded to a HANDSFREE SPEAKERPHONE by adding an internal SPU module to the instrument.

STATION SPEED DIALING

Each Key Telephone user may assign ten (10) commonly dialed telephone numbers for SPEED DIALING use.

TOLL RESTRICTION

Telephone abuses and long distance charges can be controlled with the station TOLL RESTRICTION feature.

VOLUME CONTROLS

Each key telephone is equipped with separate controls for tone and voice volume adjustments.

400 INSTALLATION

400.1 SITE PLANNING

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

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

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

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

D) Location of the majority of the local stations.

E) A well ventilated area having a temperature range of 32 to 122 degrees Fahrenheit (0° to 50°C), and a humidity range of 0 to 90% (non-condensing).

F) Accessibility of KSU for servicing and lighting.

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

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

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

400.2 UNPACKING

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

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

400.3 PCB HANDLING

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

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

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

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

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

400.4 SYSTEM GROUNDING

To insure that the system will operate properly, a good earth ground must be used. A metallic COLD water pipe will usually provide a reliable ground path. Carefully check that the pipe does not contain insulated joints that could isolate the ground. In the absence of a COLD water pipe, a ground rod or other source must be used. A 14 AWG or larger copper wire should be used between the ground source and the KSU.

The wire should be kept as short as possible, and can be connected to the ground lug provided at the bottom right of the KSU (Refer to Figure **1** - KSU layout.)

400.5 KSU INSTALLATION

A) The KSU is designed for wall mounting only. The KSU should NOT be mounted directly on a masonry surface.

If the KSU is to be mounted on a masonry surface, a wooden backboard of sufficient size should be attached to the wall and the KSU mounted on the backboard.

B) Mount the KSU on the backboard using four fasteners. (The fasteners should be selected carefully so as to be capable of supporting a fully loaded KSU). (Refer to Figure **2** for mounting hole locations and KSU dimensions).

C) Install the key system ground using an insulated 14 AWG or larger copper wire. Attach one end to the grounding lug inside the KSU cabinet and fasten the other end to a good earth ground (Refer to Figure **1** - KSU layout).

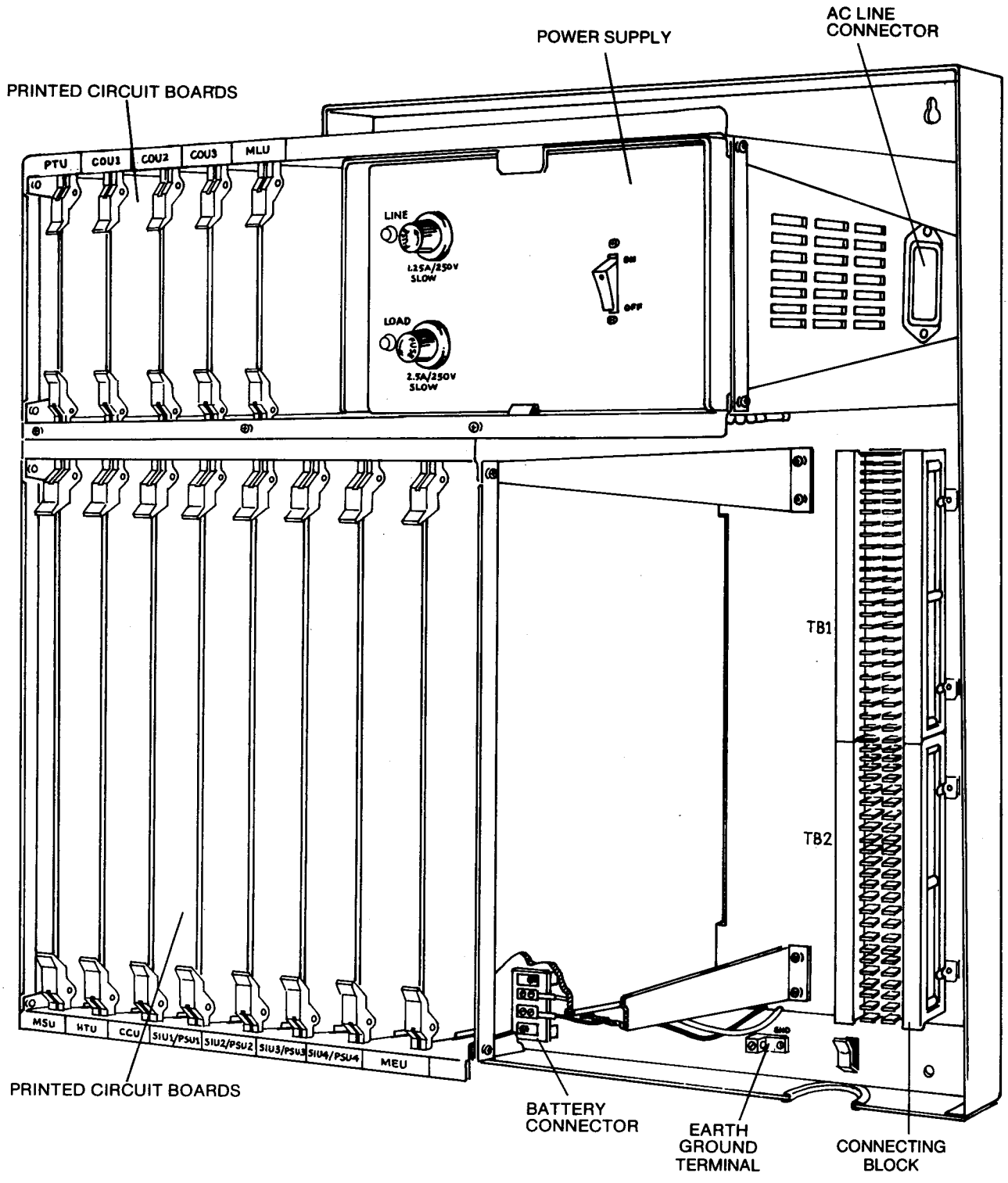


FIGURE 1. KSU LAYOUT, FULLY PROTECTED SYSTEM

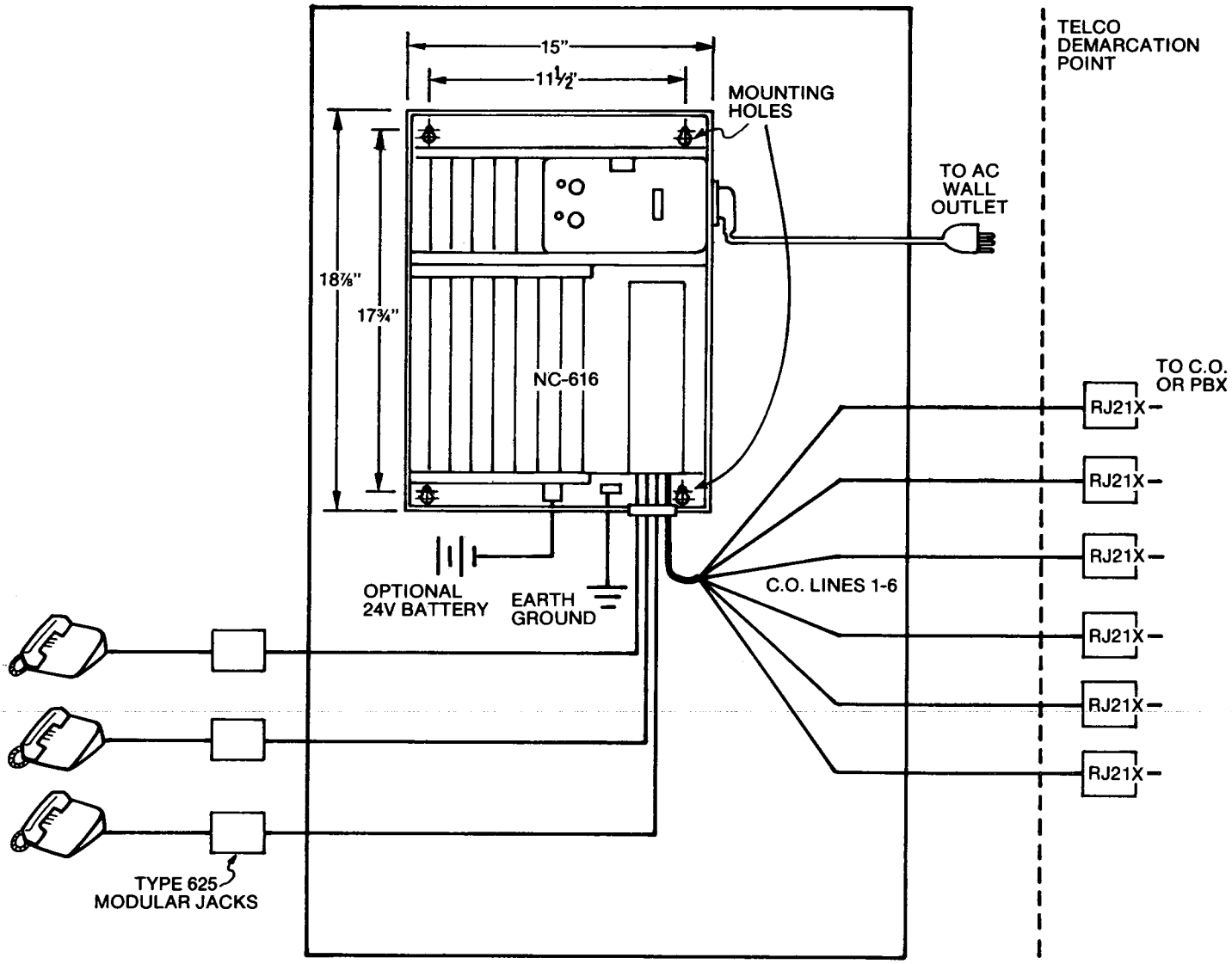


FIGURE 2. TYPICAL INSTALLATION

D) Install the NC-616 Power Module into the upper right hand corner of the KSU. (Refer to Figure **1** - KSU layout). Make sure that the power switch is in the "OFF" position. Align the module with the tray on the KSU and insure that the connector on the module is completely inserted into the KSU.

E) Plug the power cord into the connector on the side of the power supply and route the cord to AC power.

A surge protector should be installed at the dedicated AC receptacle. The recommended protector is a TII Model 428 plug-in power line SURGE protector. Connect the unit according to the manufacturer's instructions. **DO NOT PLUG IN CORD AT THIS TIME.**

CAUTION

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

400.6 CABLING

A) Connection between the KSU and each telephone requires telephone standard quad or 2-pair (4- wire) twisted cable.

B) Cabling should be routed to avoid fluorescent light fixtures, electric motors and generators, welding equipment and radio transmitters.

Additionally, care should be taken to avoid hot locations such as steam pipes and furnaces, and areas where wiring is subject to abrasion.

C) Bring all cabling through the hole in the base of the KSU and terminate on Blocks TB 1 and TB 2. Refer to Figure **3** for specific connections inside the KSU. Terminate the key telephones on standard modular connecting blocks as shown in Figure **4.** It is recommended that type 625 modular jack assemblies (Figure 5) or equivalent be utilized for surface or flush mounting; use 630 modular jack assemblies (Figure 6) or equivalent for wall mounting applications.

CAUTION

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

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

400.7 WALL MOUNTING THE NC-616 TELEPHONE

All connections to the key telephones are fully modular.

To wall mount the telephone, it will be necessary to have one NC-616 wall mount kit and one 630—A type modular wall mount jack assembly equipped with two mounting lugs.

A) Remove the mounting cord from the telephone. This cord will no longer be needed.

B) Substitute the short modular cord on the wall mount baseplate for the mounting cord removed in A) above.

C) Rotate the plastic number retainer upwards to expose the screw underneath. Remove the screw and slide the cover plate under the number retainer towards the hookswitch.

D) Replace the cover plate with the handset retainer tab that is mounted in the wall mount base plate, and secure with the screw from C) above.

E) Rotate the plastic number retainer downwards and snap into place.

F) Align the mounting tab on the outer edges of the wall mount base with the holes on the key telephone base. Snap **shut and fasten with screw.**

G) The telephone can now be mounted to the wall by mating the two keyhole slots on the baseplate with the lugs on the modular cover assembly. Check to make sure that the modular connector on the baseplate has a firm connection with the connection on the wall jack. (Figure **6**)

400.8 CO/PBX LINE CONNECTIONS

Terminate the CO/PBX lines at the block in the KSU labeled TB **2.** Be careful to observe proper sequence of each C.O. line and polarity of C.O. Tip and C.O. Ring. Refer to Figure **4** for typical CO/PBX to KSU line connections.

400.9 EXTERNAL MUSIC SOURCE

MUSIC-ON-HOLD, as well as BACKGROUND MUSIC through telephone set speakers, can be connected via a customer provided tuner, tape deck, etc. MUSIC-ON-HOLD volume is adjusted at the music source. BACKGROUND MUSIC (BGM) levels

TB1

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

TB2

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

FIGURE 3. KSU CONNECTING BLOCK LAYOUT

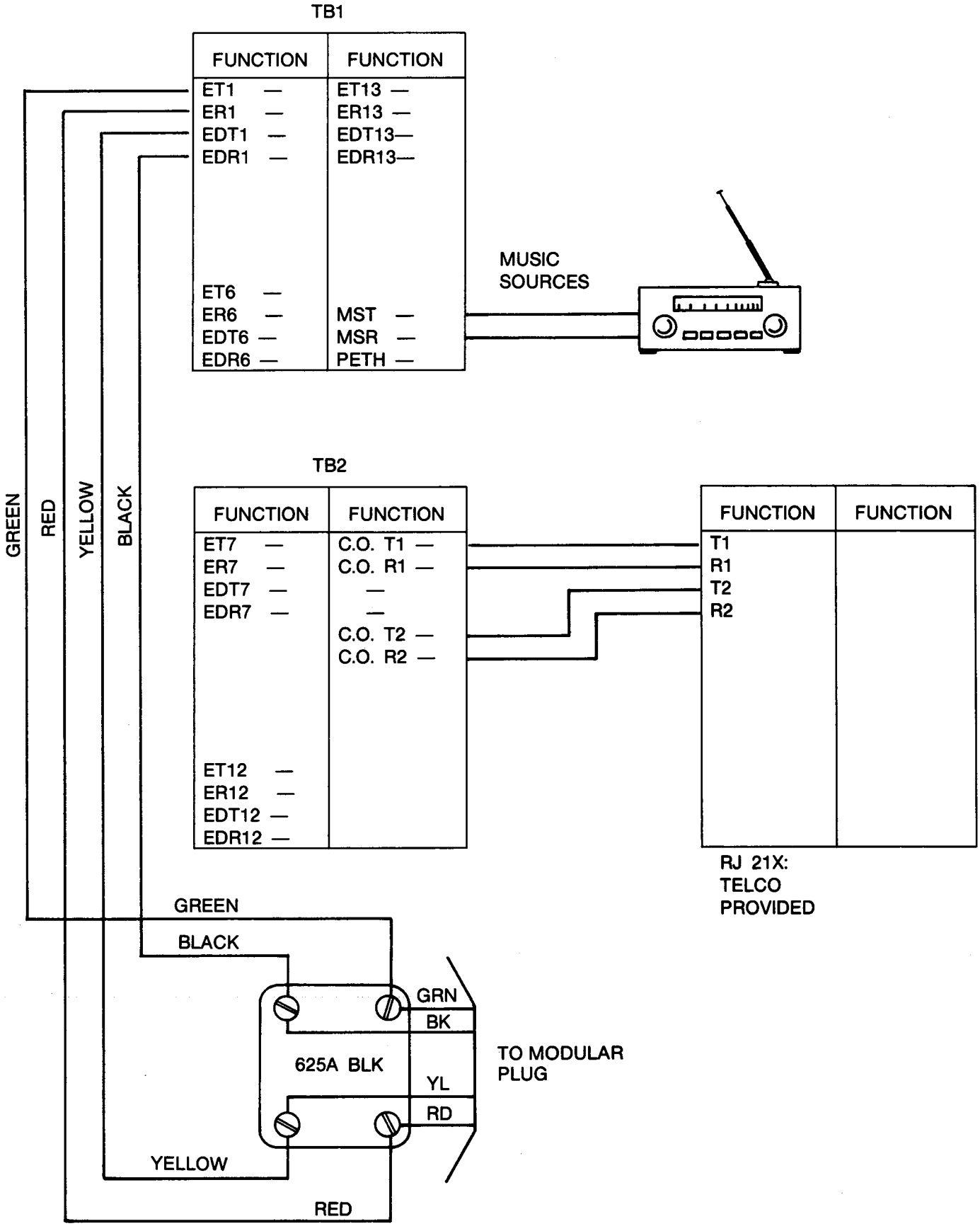


FIGURE 4. TYPICAL STATION AND CO/PBX LINE CONNECTIONS

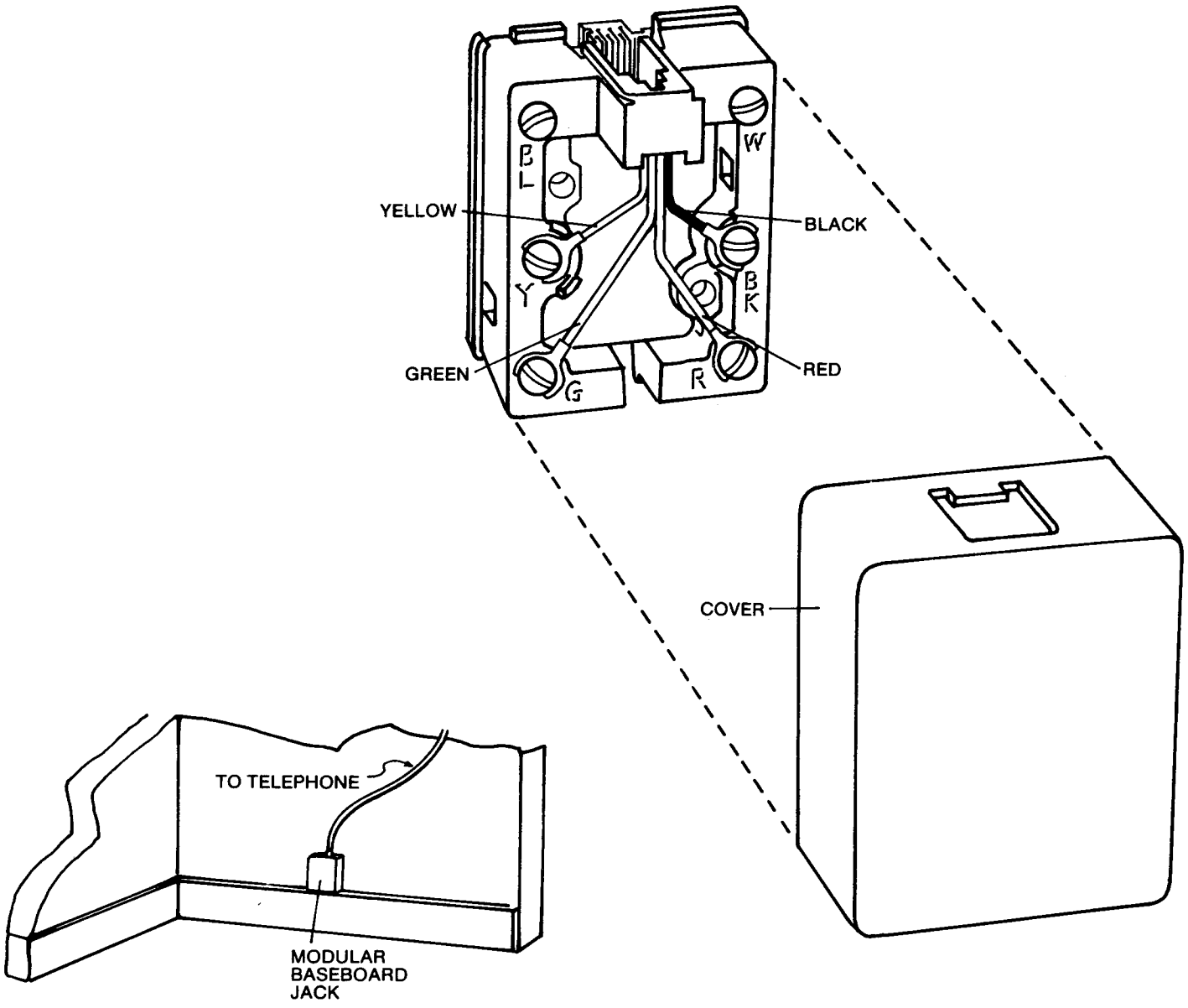


FIGURE 5. TYPE 625 BASEBOARD JACK

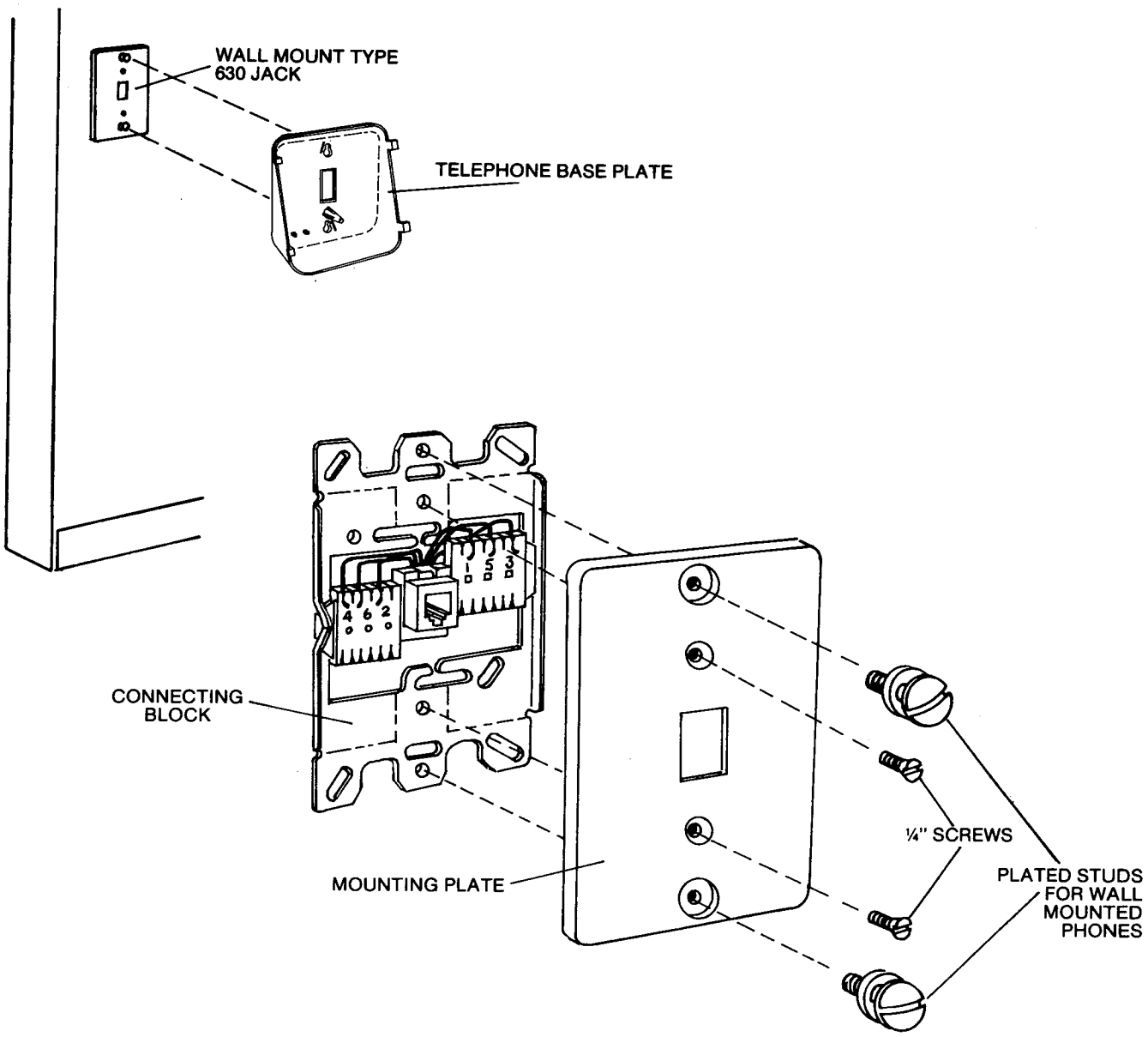


FIGURE 6. TYPE 630 WALL MOUNT JACK

are adjustable at the KSU and at each key telephone set. Input impedance to the KSU is 600 Ohms at 0 dBM. Refer to Figure 3 and 4 for termination points. To properly adjust system music levels;

1. While receiving an All-Call Page test announcement, adjust the speaker volume to an acceptable level at one key telephone. There are two (2) volume control wheels located on the right side of the instrument. The wheel located closest to the user will decrease the volume of the voice page when turned toward the station user.
2. Adjust the volume at the external music source for a comfortable level at the test instrument.
3. The MUSIC-ON-HOLD level can be increased or decreased by adjusting the volume control (VL4) located on the CCU card in the KSU (Figure 10).

400.10 ALARM INSTALLATION

The NC-616 System may be used to transmit an alarm signal to each station (except intercom boxes) in the system. When activated by an external alarm system, a repeated warbling tone is transmitted to the station speakers. Leads from the external alarm are connected to the NC-616 at TB1 terminals ALMT and ALMR (Figure 3). A customer provided reset button must be installed across the ALMR and AR terminals (Figure 7) . In the event of an alarm condition, the system must be reset by first clearing the alarm condition on the external system and then depressing the reset button for three (3) seconds (see section 500.4 for programming Alarm States). The system is also designed to create a contact closure across terminals EAT and EAR (Figure 3). In the event of CCU failure or commercial power failure, customer provided alarms may be connected across these terminals.

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

400.11 BATTERY BACK-UP

The NC-616 Key System power supply provides the charging and regulation circuitry necessary to accommodate battery back-up for the system in the event of commercial power failure. The gel-type batteries must provide 24 VDC and are connected to the Key Service Unit (See Figure 1). Table 1 provides examples of recommended battery sizes for 2, 4 and 8 hour back-up at various system configurations.

400.12 EXTERNAL PAGING

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

The PSU card contains four circuits. The first two (2) circuits are dedicated to key telephone use only and circuits three (3) and four (4) are used for EXTERNAL PAGING, LOUD BELL CONTROL, or INTERCOM BOX operation (See Section 500.7 for programming). The EXTERNAL PAGE is activated by depressing and holding down the appropriate telephone DSS button and speaking into the handset. Release the button when the page is completed. When specialty circuits have been programmed for EXTERNAL PAGING the corresponding terminals on the terminal blocks are used for paging transmit to an external amplifier and for paging control relay closure. For example, if a PSU card were inserted into the SIU4/ PSU4/ position in the KSU intercom numbers 15 and 16 become available for EXTERNAL PAGING zones after proper programming. To convert intercom number 16 to EXTERNAL PAGING, program the circuit according to Section 500.7, the transmit pair to the amplifier will be EDT16 and EDR16. The relay closure will be across ET16 and ER16. On any EXTERNAL PAGING application EDTand EDR will become the transmit pair. ET and ER will become the relay control pair (See Figure 12).

Table 1.
Gel-Type Battery
Amp. Hour Requirements

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

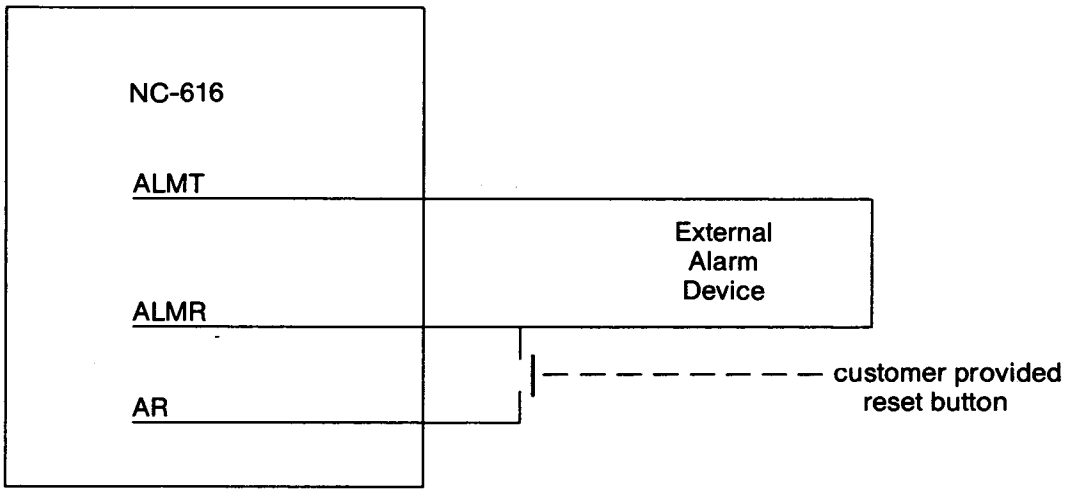


FIGURE 7. ALARM INSTALLATION

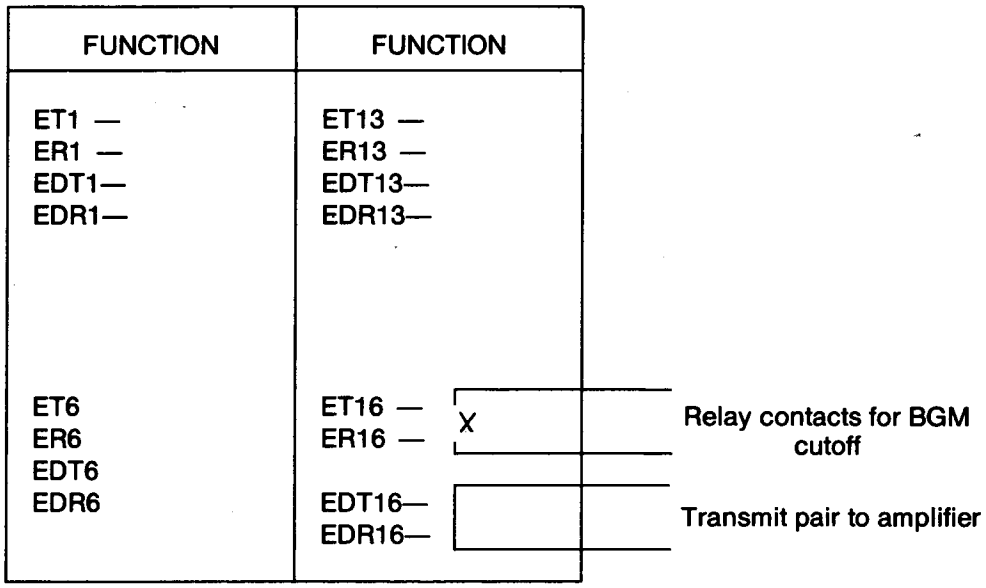


FIGURE 8. TYPICAL EXTERNAL ZONE PAGING INSTALLATION

500 PROGRAMMING

500.1 PROGRAMMING OVERVIEW

This section is a general programming guide to features that are activated for the individual customer. These steps should be accomplished prior to system start-up, but may be performed at any time with minimal system interruption. Switch settings marked with an asterisk (*) indicate factory preset condition.

500.2 PROGRAMMING C.O. LINE RING ASSIGNMENTS

Each telephone in the system may be programmed to ring on all lines, ring on no lines, or to ring on a single line only. The C.O. line ring-in assignments are performed on the SIU card with the 4 position DIP switches labelled STA1 - STA4. As an example, the switch labelled STA1 will program Station numbers 1, 5, 9 or 13 depending on which SIU slot the card is plugged into. Table 2 illustrates switch settings for the ringing options a telephone may be assigned.

Table 2
CO RING ASSIGNMENT

SWITCH CONTACT 1	2	3	4	RINGING C.O. LINES
0	0	0	X	ALL
1	0	0	X	1
0	1	0	X	2
1	1	0	X	3
0	0	1	X	4
1	0	1	X	5
0	1	1	X	6
1	1	1	X	* NONE

0= OFF 1= ON X= NOT USED

500.3 ASSIGNMENT OF ATTENDANT STATION

One telephone in each NC-616 System may be assigned at the attendant station. The attendant station can activate MESSAGE WAITING lamps, CAMP-ON CALLS to stations in DND status, and can activate NIGHT TRANSFER of incoming calls. The attendant station will always receive C.O. line ring on all lines regardless of ring assignment switch settings. The attendant station is assigned on the CCU card by programming the four (4) position DIP switch labelled ATD. The switch body is labelled such that DIP switch #1 is at the top, and DIP switch #4 is at the bottom. The individual DIP switches are off if they are operated to the left. Table 3 illustrates programming the ATD switch (See Figure 10 for switch locations).

Table 3
Assignment of Attendant Station

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

OFF=0 ON=1

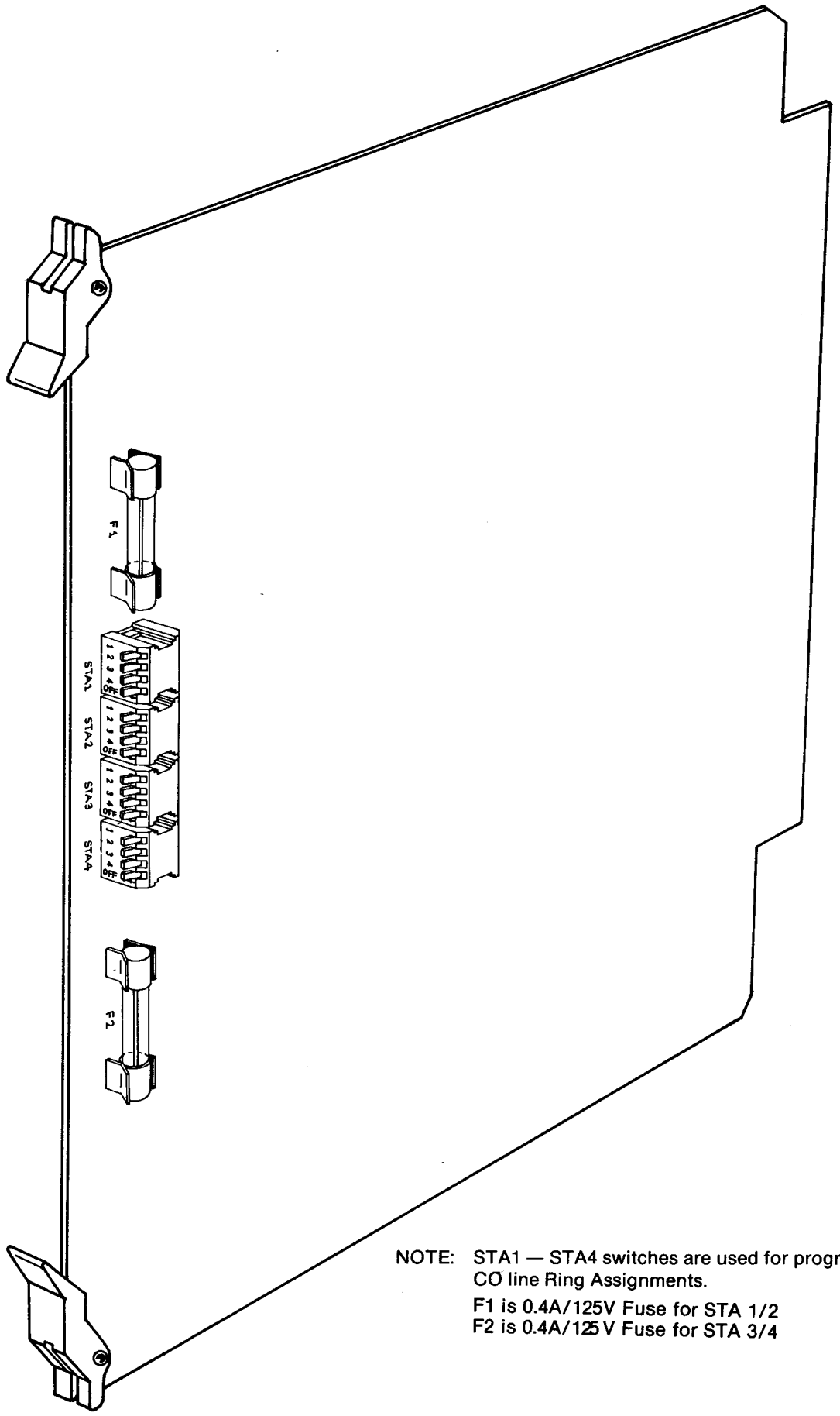
500.4 PROGRAMMING RECALL TIME

The system is designed to signal a station which has placed a call on HOLD and left it on HOLD for a predetermined amount of time. This Hold/Transfer RECALL time may be set at 30, 60 or 90 seconds or disabled entirely. The system is factory set for 60 seconds. Automatic Recall Time (ART) programming is performed at the CCU card on the four (4) position DIP switch body labelled ART. Table 4 illustrates DIP switch setting for programming AUTOMATIC RECALL times (See Figure 10 for switch locations).

Table 4
Programming Automatic Recall Time

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

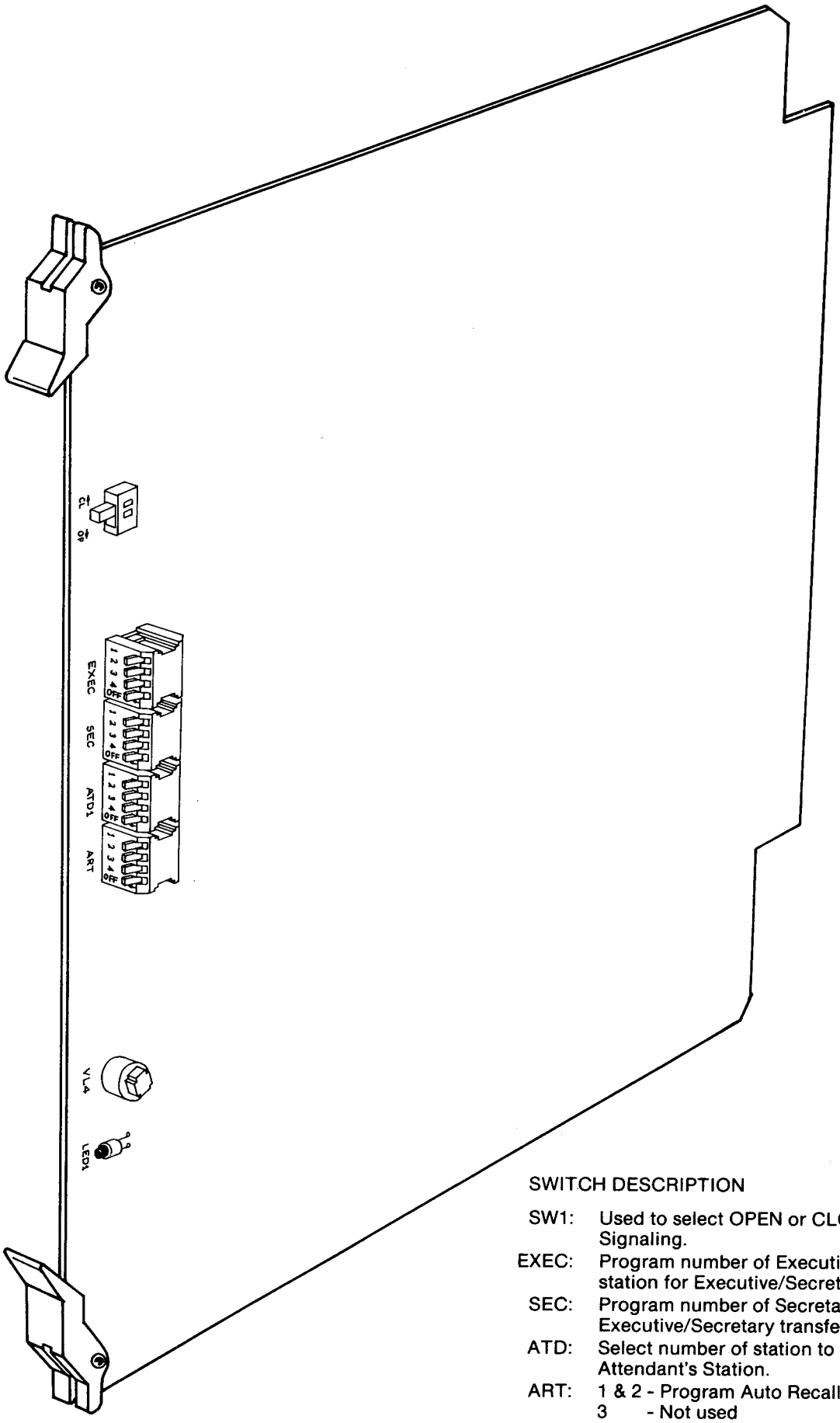
OFF=0 ON=1



NOTE: STA1 — STA4 switches are used for programming CO line Ring Assignments.

F1 is 0.4A/125V Fuse for STA 1/2
F2 is 0.4A/125V Fuse for STA 3/4

FIGURE 9. SIU STATION CARD PROGRAMMING OPTION SWITCHES



SWITCH DESCRIPTION

SW1:	Used to select OPEN or CLOSURE Alarm Signaling.
EXEC:	Program number of Executive station for Executive/Secretary transfer.
SEC:	Program number of Secretary station for Executive/Secretary transfer.
ATD:	Select number of station to be assigned as Attendant's Station.
ART:	1 & 2 - Program Auto Recall Time 3 - Not used 4 - Sets Flash Timing of 0.6 or 2 secs.

FIGURE 10. CCU CARD PROGRAMMING OPTION SWITCHES

500.5 PROGRAMMING FLASH TIME

FLASH Time may be programmed at either 0.6 seconds for PABX TRANSFER or 2.0 seconds for LINE RECALL. After programming FLASH Time each individual C.O. line must be also programmed for open loop or Ground Flash. If Ground Flash is selected, a ground input must be connected to the PETH connector terminal on TB1. FLASH Time is selected on the CCU card using the 4 position DIP switch body labelled ART (Figure 10). DIP switch #4 is used to select the desired timing. To select 0.6 seconds (600 ms) FLASH Time the DIP switch is operated to the OFF position, and if 2.0 seconds are required the switch is set to the ON position. To set the type of flash, slide switches on the PTU card must be set for each C.O. line. The slide switches are labelled TRUNK1 - TRUNK6 corresponding to C.O. lines 1-6. If a slide switch is operated DOWN (towards the bottom) of the card with the card plugged in the KSU, the card will provide Ground Flash. If the switch is operated to the UP postition the card will provide open loop FLASH. See Figure 11 for switch locations on the PTU card.

500.6 PROGRAMMING EXECUTIVE/SECRETARY TRANSFER

A pair of key telephones in the system may be programmed for EXECUTIVE screening. Any time the telephone designated EXECUTIVE is busy or in the DND mode, incoming INTERCOM and transferred CO calls will automatically signal the designated SECRETARY telephone. Only one pair of phones may be programmed for this feature. Programming is performed on the CCU card by DIP switch selection. The Secretary phone is assigned by operating the DIP switches on the switch body labeled SEC in accordance with Table 5. The executive phone is assigned by programming the DIP switches on the switch body labelled EXEC as shown in Table 6 (See Figure 10 for switch locations).

Table 5
Programming the Secretary Phone

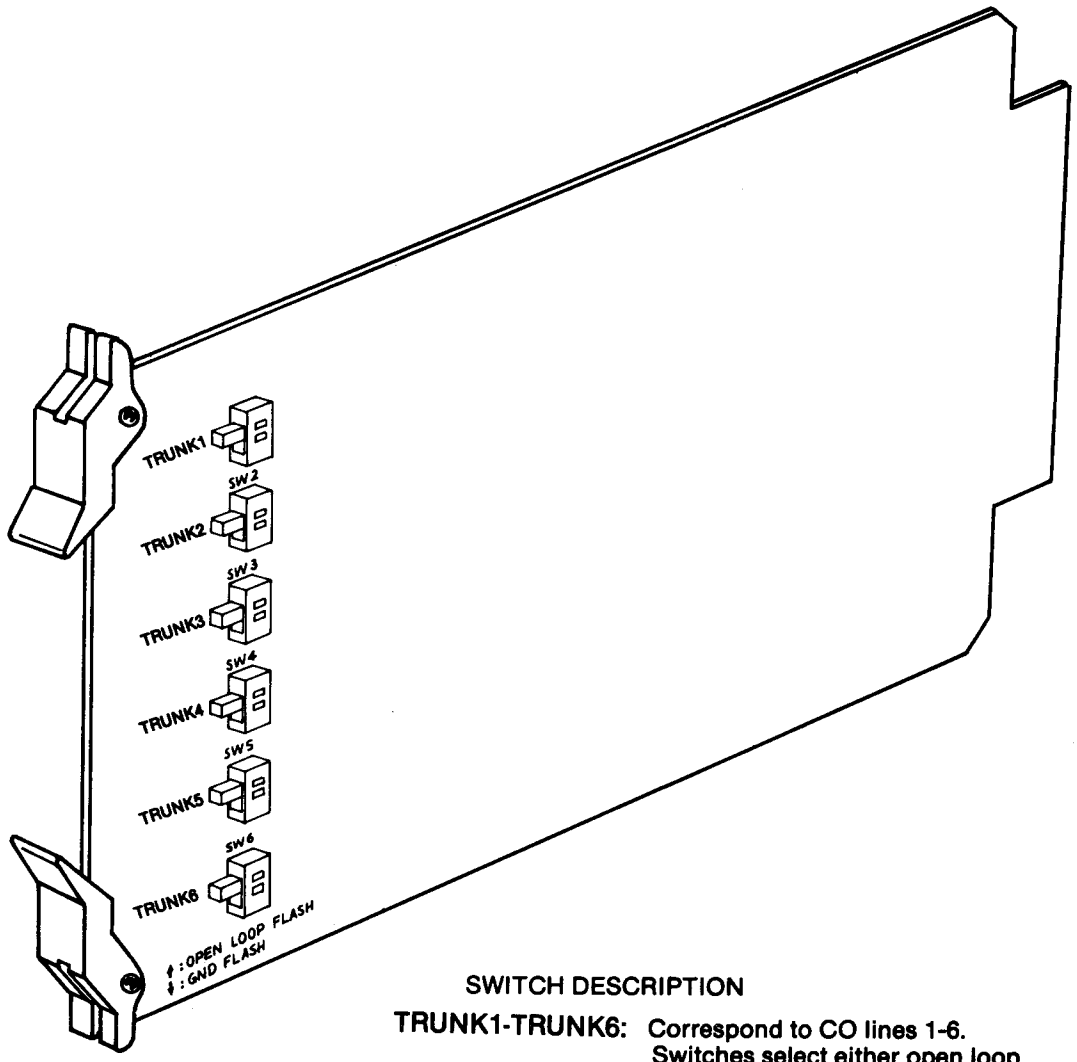
SEC Switch Settings				Number of Station Assigned As SEC
1	2	3	4	
0	0	0	0	1*
1	0	0	0	2
0	1	0	0	3
1	1	0	0	4
0	0	1	0	5
1	0	1	0	6
0	1	1	0	7
1	1	1	0	8
0	0	0	1	9
1	0	0	1	10
0	1	0	1	11
1	1	0	1	12
0	0	1	1	13
1	0	1	1	14
0	1	1	1	15
1	1	1	1	16

OFF=0 ON=1

Table 6
Programming the Executive Phone

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

OFF=0 ON=1



SWITCH DESCRIPTION

TRUNK1-TRUNK6: Correspond to CO lines 1-6.
Switches select either open loop or ground flash.
Flash timing is set at the CCU Card.

FIGURE 11. PTU CARD PROGRAMMING OPTION SWITCHES

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

The Phone Box Station Interface Unit (PSU) is designed to meet the needs of users who require INTERCOM only locations, External Paging, and/or Loud Bell control. The card is designed such that the first two circuits on the card are dedicated to key telephone operation only and are programmed for ringing as described in Section 500.2. Circuits three (3) and four (4) are specialty circuits. Programming steps for specialty Intercom Box, External Paging, and Loud Bell operations are performed on the 4 position switch body labelled Select and two slide switches labelled Box 1 and Box 2 (Figure 12).

a) To program interrupted ringing for Loud Bell operation on the first specialty circuit, the slide on Box 1 is operated to the UP position and DIP switches 1 & 3 are operated to the ON position. Loud Bell operation on the 2nd specialty circuit is programmed by operating slide switch Box 2 to the UP position and DIP switches 2 & 4 are in the ON position (Table 7).

b) Paging Control may be programmed on either or both specialty circuits. To program specialty circuit 1 the Box 1 slide is operated to the UP position and DIP switches 1 & 3 are in the OFF position. To program circuit 2, the Box 2 slide switch is operated to the UP position and DIP switches 2 & 4 are in the OFF position (Table 7).

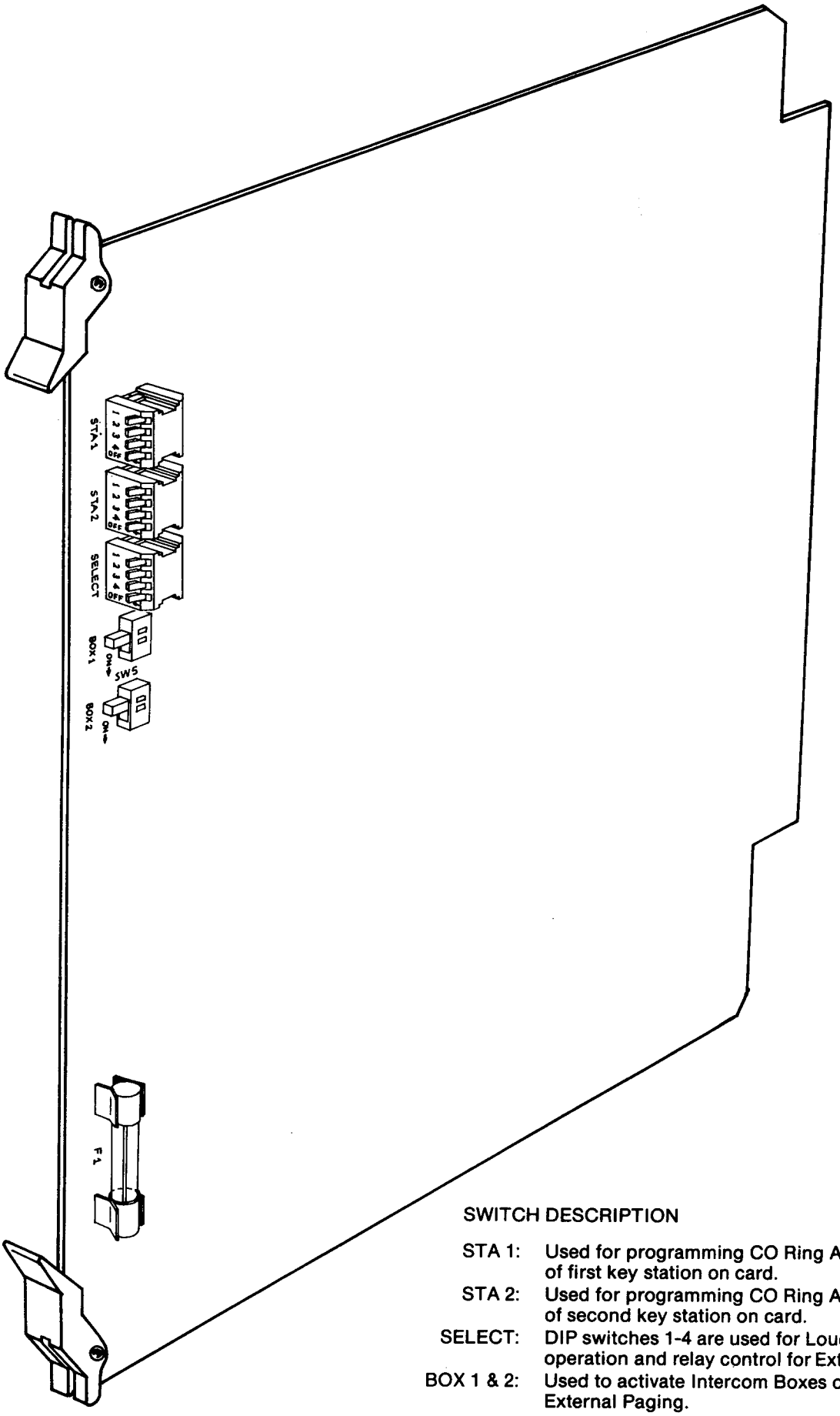
c) Intercom box operation is programmed by operating the slide switch for Box 1 or Box 2 to the DOWN position. With the slide switch set for intercom box operation, the corresponding DIP switches (1 & 3 for Box 1 and 2 & 4 for Box 2) must be in the OFF position.

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

Table 7
Programming Specialty
Circuits on the PSU CARD

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

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



SWITCH DESCRIPTION

STA 1:	Used for programming CO Ring Assignment of first key station on card.
STA 2:	Used for programming CO Ring Assignment of second key station on card.
SELECT:	DIP switches 1-4 are used for Loud Bell operation and relay control for External Paging.
BOX 1 & 2:	Used to activate Intercom Boxes or External Paging.

F1: 0.4A/125V Fuse for both key telephones

FIGURE 12. PSU CARD PROGRAMMING OPTION SWITCHES

500.8 PROGRAMMING ALARM SIGNALS

The NC-616 KSU may be used to transmit an alarm signal to every key telephone in the system. The alarm signal is activated by either an open or a closed circuit on the External Alarm Leads. To program the KSU to scan for either an open or closure, SW1 (Figure 10) located on the CCU board must be set. Placing the switch in the DOWN position will cause the CCU card to recognize a closure on the external alarm leads as normal and an OPEN as an alarm condition. Operating the switch to the UP position the system will recognize an open as a normal condition and a CLOSURE as an alarm state (See Table 8).

Table 8
Programming Alarm States

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

500.9 PROGRAMMING TOLL RESTRICTION

Telephone abuses and long distance charges can be controlled and effectively administered with TOLL RESTRICTION and Class of Service (COS). The optional Miscellaneous Unit (MSU) card (Figure 13) is required to be installed in its dedicated KSU position. Only one COS can be assigned to each key station and every station must have a COS assigned. Default programming is COS 1 for all stations.

Four (4) Classes-Of-Service (COS) are available:

COS-1 UNRESTRICTED:

a. All calls permitted.

COS-2 SEMI-RESTRICTED:

a. Allows local calls. These calls do not have a 0 or 1 in the first or second digit; calls are seven (7) digits in length.

b. Allows exception codes. These toll free service codes are passed after monitoring the beginning four (4) digits dialed.

c. Allows billed toll calls within the customer's Home Area Code. Most Home Area Code dialing requires eight (8) digits beginning with a 1 as the first digit and no 0/1 in the second and third digits.

d. Denies operator-assisted (0+) calls.

e. Denies billed long distance codes outside the Home Area Code.

f. Denies billed service codes 411 and 1+411.

COS-3 RESTRICTED:

a. Allows local calls. These calls do not have a 0 or 1 in the first or second digit; calls are seven (7) digits in length.

b. Allows exception codes. These toll free service codes are passed after monitoring the beginning four (4) digits dialed.

c. Denies billed toll calls within the customer's Home Area Code. Most Home Area Code dialing requires eight (8) digits, beginning with a 1 as the first digit and no 0/1 in the second and third digits.

d. Denies operator-assisted (0+) calls.

e. Denies billed long distance codes outside the Home Area Code.

f. Denies billed service codes 411 and 1+411.

COS-4 HOUSE PHONE:

No dialing permitted. Only inside (DSS) calling is permitted.

To program each key station with a COS (See Table 9).

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

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

STEP 3 At key station 1, press an idle C.O. line button and go off-hook.

STEP 4 Press the DND/SPEED button.

STEP 5 Press the pound (#) key once.

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

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

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

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

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

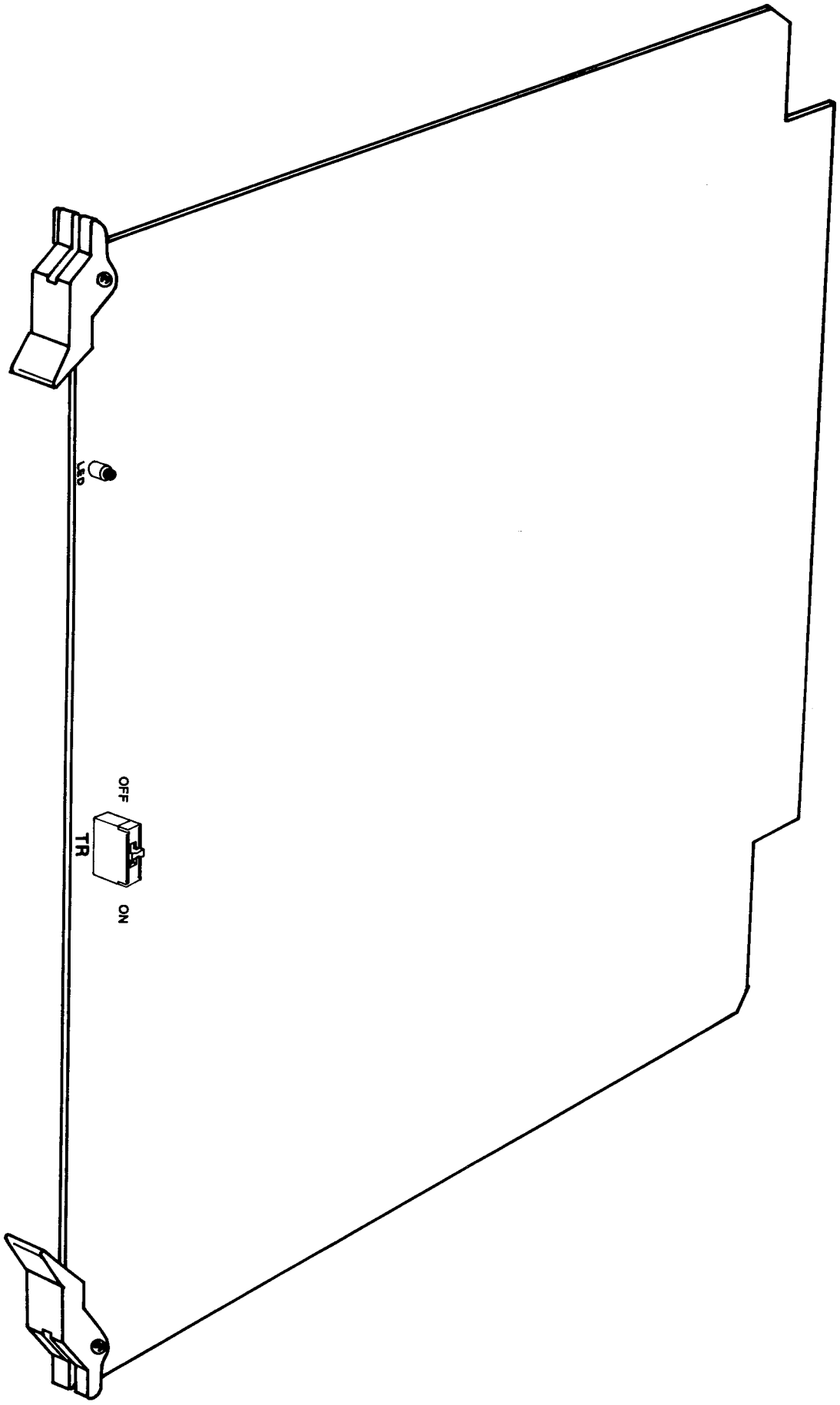


FIGURE 13. MSU CARD PROGRAMMING SWITCH

Table 9

CLASS OF SERVICE TABLES

CLASS	ALLOWS	DENIES
COS 1	ALL CALLS	——
COS 2	Local Calls NNX-XXXX	All 0+ Calls
	Free Service Codes 800+, 1+800+ [1-3] 11 and [5-9] 11	Charged Service Codes 411, 1 + 411
	Calls Inside Home Area Code [1-9][2-9][0-9] + 1 + [1-9][2-9][0-9] + Local Calls NNX-XXXX	Calls Outside Home Area Code All 0+ Calls
COS 3	Free Service Codes 800+, 1 + 800+ [1-3] 11 and [5-9] 11 1 + [1-3] 11 and 1 + [5-9] 11	Charged Service Codes 411, 1 + 411
	——	Calls Inside or Outside Home Area Code
COS 4	House Phone	All Calls

Notes 1. Default program is COS 1 (Unrestricted) for all stations.

2. N = digits 2-9, X = digits 0-9.

3. House phone may receive incoming calls and, with set up by a COS 1-3 station, can complete outgoing C.O. line calls.

600. FUNCTIONAL TEST PROCEDURES

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

600.1 PRELIMINARY CHECKLIST

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

a) Station cables for proper connections and polarity.

b) Central office line connections.

c) Earth ground connections.

d) AC power cable.

e) Music source connections (if provided).

f) Alarm connections (if provided).

g) All programming switch settings.

h) That all necessary PCB's are installed in the KSU. Consult Table 10 for a fault analysis guideline based on PCB's that are removed from the system.

Table 10
FAULT ANALYSIS/PC BOARD REMOVAL
of the NC-616 System

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

600.2 FUNCTION TEST PROCEDURES

600.2.1 KEY STATION TESTING

OPERATIONAL TEST	RESULT	PROCEDURE
1. Connect the modular cord to the instrument.	1. Tone is heard for a short time from the speaker of the instrument. All LED's are momentarily illuminated. 2. No tone, no reaction.	1. Normal 2.1 Check the cabling connection of the instrument, especially the polarity of the wires. 2.2 Check the connections of modular cord into the instrument. 2.3 Check the associated fuse on the SIU/PSU card. 2.4 Change the instrument.
2. Depress the ON/OFF button on the instrument.	1. ON/OFF lamp lights. 2. Associated station DSS key lights. 3. No reaction.	1. Normal 2. Normal 3.1 Check the connections of key board connector "K" in instrument.
3. Background music 3.1 With the instrument in an idle state, depress the MUSIC button.	1. Background music is heard. 2. No reaction.	1. Normal 2.1 Check that instrument is in on-hook state. 2.2 Check the Music Source connection at the KSU. 2.3 Increase the volume of music source. 2.4 Increase the voice volume of the instrument. 2.5 Check the cabling connection of the instrument. 2.6 Check the connections of the Modular Cord and connector "L" of the instrument. 2.7 Change the instrument. 2.8 Change the SIU/PSU. 2.9 Change the CCU.
3.2 Adjust the voice volume knob (closest to the user) of the instrument.	1. Volume is increased or decreased, as desired. 2. No reaction.	1. Normal 2. Check the volume connector (VL2) (closest to line keys) in the instrument.
3.3 Press the MUSIC button again.	1. MUSIC is turned off	1. Normal
4. Do Not Disturb 4.1 Depress the DND button. NOTE: Telephone must be on-hook.	1. DND lamp is lit steadily. 2. No reaction.	1. Normal 2.1 Check the connections of key board connector "K" in the instrument. 2.2 Change the instrument.

600.2.1 KEY STATION TESTING (Cont.)

OPERATIONAL TEST	RESULT	PROCEDURE
4.2 Press the DND button again.	1. DND lamp goes out.	1. Normal
5. Tone Volume NOTE: Instrument must be in tone signaling mode.		
5.1 From another instrument place an intercom call to set under test.	1. Muted tone is heard. Adjust volume.	1. Normal
	2. Muted tone is not heard.	2.1 Check the connections of speaker connector "S" in the instrument. 2.2 Change the instrument.
5.2 Depress the ON/OFF button again.	1. The muted ringing tone is louder.	1. Normal
5.3 Adjust the tone volume.	1. Increase or decrease volume as desired.	1. Normal
	2. No reaction.	2.1 Check the tone volume connector (VL3) in the instrument. 2.2 Change the instrument.
6. Transmitting of Data Signals.		
6.1 When incorrect or no data signals are transmitted between KSU and instrument.	1. Only ON/OFF and DND LED's on BLF will light when pressed. The remaining LED's are not lit.	1.1 Check the cabling connections and the modular cord of the instrument. 1.2 Check the connection of connector "L" in the instrument. 1.3 Check the connections of key board connector "K" in the instrument. 1.4 Change the instrument. 1.5 Change the corresponding SIU/PSU in KSU.
7. Where there is difficulty in the operation of speakerphone. SPU card must be installed in the instrument and handset is in cradle.	1. Calls are not received through the built-in speaker.	1.1 Check to determine if SPU is installed in the instrument. 1.2 Check the connections of the speaker-connector(s) in the instrument. 1.3 Check the connections of the speakerphone connector. 1.4 Change the speakerphone (SPU). 1.5 Change the instrument.
	2. Speech through microphone of the instrument is not transmitted.	2.1 Check that the instrument is in the on-hook mode. 2.2 Check the microphone connections in the instrument. 2.3 Check the ribbon cable of the speakerphone connector (SP) in the instrument. 2.4 Change the SPU. 2.5 Change the instrument.

600.2.2 TEST INTERCOM FUNCTIONS

OPERATIONAL TEST	RESULT	PROCEDURE
1. Intercom Call		
1.1 Lift the handset or depress the ON/OFF button, and depress the DSS button for the desired instrument.	1. ON/OFF lamp lights. 2. DSS lamp of called party is lit. 3. Intercom lamp (HOLD button) of called party is flashing 30 IPM. 4. Busy tone is heard.	1. Normal 2. Normal 3. Normal 4.1 if called party is off-hook, in DND mode or not installed: normal. 4.2 If conditions of 4.1 above do not apply, check the cabling connections of the called instrument. 4.3 Change the called instrument. 4.4 Check the fuses of corresponding SIU/PSU. 4.5 Change the SIU/PSU. 4.6 Change the instrument.
a. In the event the called instrument is placed in the handsfree talk back (voice) mode.	5. Chime tone is heard. 6. Handsfree communication is possible at the called instrument. 7. HOLD button flashes at called Party. 8. Intercom call is not connected. 9. Intercom ringing is heard instead of chime tone. 10. Handsfree conversation at the called instrument is not possible.	5. Normal 6. Normal 7. Normal 8.1 Check to determine if all intercom links are busy. (HOLD button will have steady lamp) 8.2 Change the instrument. 9. Confirm whether the HTU is mounted and called station is in P or H mode. 10.1 Check connections of microphone and speakerphone ribbon connector (SP) in the called instrument. 10.2 Change the instrument of the called party. 10.3 Change the HTU. 10.4 Change the CCU.
1.2 If the called station answers by lifting the handset.	1. The flashing HOLD lamp of the called instrument lights steadily. 2. Ring back tone is stopped. 3. Handsfree conversation is possible.	1. Normal 2. Normal 3. Normal
1.3 Call Pick-Up		
a. Lift Handset and depress DSS button for called station.	1. Ring or chime tone is heard at the called station.	1. Normal
b. To answer at the remote staftion, lift the handset or depress the ON/OFF button.	1. HOLD button flashes.	1. Normal
c. Depress the MUSIC button.	1. No change.	1. Normal

600.2.2 TEST INTERCOM FUNCTIONS (Cont.)

OPERATIONAL TEST	RESULT	PROCEDURE
d. Depress the DSS button for called instrument.	1. Called station returns to idle state. HOLD lamp is extinguished.	1. Normal
	2. Intercom conversation between calling instrument and remote answering station is possible.	2. Normal
	3. If remote answering is not possible.	3.1 Change the remote answer instrument. 3.2 Change the SIU/PSU.
1.4 Intercom-Conference		
a. During an intercom conversation depress the CONF button.	1. Party goes on HOLD.	1. Normal
b. Depress the DSS button for another party (3rd instrument)	1. No change.	1. Normal
	2. Busy tone is heard.	2.1 The 3rd instrument is busy or not installed: normal. 2.2 Change the 3rd instrument. 2.3 Change the PSU/SIU. 2.4 Change the CCU.
	3. Ringing tone is heard.	3.1 Normal
c. Lift the handset at the 3rd instrument.	1. All three parties are connected together for conference.	1. Normal
d. Depress the DSS button for the desired 4th instrument at initiating station.	1. The 4th instrument is connected for conference and the 3rd station is disconnected.	1. Normal
1.5 Call Waiting/Message Waiting		
a. Lift the handset and depress the DSS button for the desired instrument that is busy on the CO line or intercom.	1. Busy tone is heard.	1. The called instrument is busy: normal.
b. Depress the CALL WAIT button.	1. Ring back tone is heard at the calling instrument and muted warble tone is heard over the speaker at the called instrument.	1. Normal
	2. HOLD lamp is flashing at the called instrument.	2. Normal
	3. Busy tone is heard continuously.	3.1 Check connection of the called instrument. 3.2 Change the called instrument. 3.3 Change the calling instrument. 3.4 Change the SIU/PSU card. 3.5 Change the CCU card.
1.6 Transferring intercom calls to Exec-Sec instrument. The incoming intercom call is routed to the executive station which is busy.	1. The incoming intercom call is automatically transferred to the secretary station.	1.0 Normal
	2. The incoming intercom call is not transferred.	2.1 Confirm the programming of Exec/Sec assignment on the CCU. 2.2 Change the CCU card.

600.2.2 TEST INTERCOM FUNCTIONS (Cont.)

OPERATIONAL TEST	RESULT	PROCEDURE
1.7 All Call Paging:		
a. Lift the handset and depress the ALL CALL button until the paging announcement is completed.	1. ALL CALL warning tone is heard.	1. Normal
	2. ALL CALL lamp lights up steadily.	2. Normal
	3. All idle instruments are paged.	3. Normal
	4. ALL CALL paging does not occur.	4.1 Change the instrument. 4.2 Change the SIU/PSU. 4.3 Change the CCU.
b. Release the ALL CALL button.	1. ALL CALL paging is terminated and all stations not off-hook return to idle status.	1. Normal

600.2.3 TEST CO LINE FUNCTIONS

OPERATIONAL TEST	RESULT	PROCEDURE
1. Outgoing Calls		
1.1 Lift the handset or depress the ON/OFF button and depress a CO line button.	1. The CO line lamp is lit steady.	1. Normal
	2. Dial tone is heard.	2. Normal
	3. CO lamp is not lit.	3. Confirm whether the COU has been installed.
	4. Dial tone is not heard.	4.1 Check the connections of CO line 4.2 If CO line 5 or 6 are installed, confirm whether the MEU board is installed. 4.3 Confirm the "FLASH" assignment on the PTU. 4.4 Change the COU. 4.5 Change the SIU/PIU. 4.6 Change the MEU if CO line #5 and 6 are installed. 4.7 Change the PTU. 4.8 Change the instrument.
2. Incoming Calls		
2.1 Incoming CO ringing.	1. CO ringing is heard.	1. Normal
	2. CO ringing is not heard, but CO line is ringing.	2.1 Confirm the incoming CO ring assignment on SIU or assignment on SIU or assignment of attendant and night transfer. 2.2 Check the CO line connection. 2.3 Change the COU. 2.4 Change the CCU.
	3. The CO line lamp is flashing at 30 IPM.	3. Normal
2.2 Lift the handset or depress the ON/OFF button.		
2.3 Depress the flashing CO line button.	1. CO line lamp is lit steady.	1. Normal
3. Transferring a CO line call.		
3.1 During a CO line conversation, depress the DSS button for station to which CO line is to be transferred.	1. The CO line is placed on HOLD automatically.	1. Normal
	2. The CO line lamp is flashing I-HOLD at transferring station.	2. Normal
	3. At the 2nd instrument, the CO line lamp is flashing at 60 IPM (indicating the transferred CO line is on System HOLD.	3. Normal
	4. MUSIC-ON-HOLD is transmitted to the external CO line subscriber.	4. Normal
	5. No MUSIC-ON-HOLD is transmitted to the external CO lines.	5.1 Check connections of music source. 5.2 Change the COU. 5.3 Change the CCU.

600.2.3 TEST CO LINE FUNCTIONS (Cont.)

OPERATIONAL TEST	RESULT	PROCEDURE
3.2 At the 2nd instrument, depress the flashing CO line button after answering intercom call from 1st instrument.	1. The CO line lamp is steady at all stations in the system. 2. The CO line call is not trans- transferred to the desired station.	1. Normal 2. Change the COU.
4. Add-On-Conference 4.1 During a CO line conversation, depress the CONF button at the 1st instrument and depress the DSS button for desired 2nd instrument.	1. The CO line is placed on HOLD.	1. Normal
4.2 When the two internal parties are ready for the conference with the external CO line, they both must depress the CO line button which is on HOLD.	1. The three parties are connected for conferencing. 2. At the 1st station: The CO line lamp is lit steady. 3. 2nd station: The CO line lamp is lit steady.	1. Normal 2. Normal 3. Normal
4.3 Hang up the handset at the 1st station to terminate conference call. 5. Multi-line Conference 5.1 a. Make an outgoing CO line call to subscriber (B). b. Press CONF button (CO line party (B) will automatically be put on I-HOLD at your station, system busy at other station.) c. Press another CO line button to make another outgoing CO line call to party (C). d. Press CONF button again. (CO line party (C) will be put on I-HOLD.)		
e. Simultaneously press both CO line buttons (B) and (C) to achieve a 3-way, multi-CO line conference call.	1. All three parties are connected. 2. The two CO line lamps are lit steady. 3. Only one CO line is connected for conference or the three parties are nor connected for conference.	1. Normal 2. Normal 3.1 Confirm whether the MLU has been installed. 3.2 Change the MLU. 3.3 Change the CCU.
5.2 Depress one of two CO line buttons again.	1. Conversation with the pressed CO line continues, the other CO line is disconnected from the conference.	1. Normal

600.2.3 TEST CO LINE FUNCTION (Cont.)

OPERATIONAL TEST	RESULT	PROCEDURE
6. Flash		
6.1 During the CO line conversation, depress the FLASH button.	1. CO dial tone is heard again.	1. Normal
	2. No "FLASH" function occurs.	2.1 Confirm the "FLASH" assignment on the PTU and CCU. 2.2 Change the PTU. 2.3 Change the CCU.
7. Night Transfer		
7.1 At the attendant station, depress the DND button.	1. DND lamp is lit steady.	1. Normal
7.2 Lift handset and press the DSS button of the desired instrument and inform the called station of intention to night transfer.	1. The called instrument is assigned to the night service station.	1. Normal
7.3 Repress the DND button.	1. DND lamp goes out. 2. The night service assignment is released.	1. Normal 2. Normal
8. In the event of commercial power failure.		
8.1 Turn off the power switch and remove the back-up battery, if provided.	1. Instruments #1-6 operate the same as a single telephone.	1. Normal
	2. If instruments do not operate.	2.1 Check the CO line connection. 2.2 Change the COU.

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