

INTRODUCTION

The **Atlas IIE KSX 128** comes with two manuals. This manual which contains a step by step explanation of the installation process, with diagrams. And the *Programming Guide* which introduces the programming process, by which the system can be programmed through the Keyphones.

The procedures and methods provided in this manual have been prepared in a step by step manner to assist the installer in planning and performing the installation task, system operation, and feature operation.

Caution:

This product must be installed by qualified personnel

Notice

The information contained in this document is believed to be correct and accurate in all respects. The information in this document is subject to change without notice. Periodic changes may be made to the information contained in this document without any obligation to notify any person of such changes. No responsibility is assumed for any errors or omissions in this document.

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Introduction

- 1.1 This document describes the **Atlas IIE KSX 128** hybrid PABX. It provides an overview of system configuration and system capabilities.
- 1.2 This document is separated into sections providing a detailed outline of the capabilities of the KSX 128.

System Overview

- 2.1 The KSX 128 is a 4-wire communications system that operates as a Keyphone system or as a multi-functional PABX.
- 2.2 The system is controlled by a 16-bit 8088 micro-processor that performs all logical operations.
- 2.3 The system uses CMOS technology space-division switching to assure non-blocking operation.
- 2.4 The Main Cabinet of the system allows for the installation of nine cards. The first card is the Central Control Card (CPU-A). The other eight cards can be any combination of interface card.
- 2.5 The system can support an Expansion Cabinet. The Expansion Cabinet allows for the installation of eight Station interface cards. All eight cards can only be Station Cards. An Expansion Cabinet is required if nine or more interface cards are to be used.
- 2.6 The system has a maximum capacity of 24 trunks. Each analog Trunk Card (COL) supports 4 analog trunk circuits. Allowing for a maximum of six Trunk Cards in the system. Trunk Cards can only be installed in the first six slots of the Main Cabinet.
- 2.7 The system has a maximum capacity of 112 stations. There are two types of station cards for Keyphone (LCU) and single-line telephone (SLT) connections respectively. Each station card supports 8 circuits.

2.8 The system is electrically compatible with most types of:

- Single-line telephones
- Proprietary Keyphone sets
- Key telephone systems
- PBX telephone systems
- Central office exchanges

Equipment Summary

- 2.9 The Main Cabinet of the KSX 128 is modular in design. The Main Cabinet houses the Power Supply Unit, the back plain bus, the Central Control Card (CPU-A), a connect for a SMDR Unit, a System Services Card (MMDF), eight slots for Trunk Cards (COL) or Station Cards (LCU or SLT), and an internal Main Distribution Frame (MMDF-I).
- 2.10 The Expansion Cabinet is also modular in design. The Expansion Cabinet houses a Power Supply Unit, the expansion back plain bus, and eight slots for Station Cards (LCU or SLT).
- 2.11 The Central Control Card (CPU-A) controls all system operations and works under the control of a 16-bit 8088 micro-processor. The system software in EPROM and stored-program database in battery-protected RAM is located on the CPU-A.
- 2.12 The Main Cabinet can be equipped with up to six Trunk Cards (COL). Each Trunk Card supports 4 trunk interface circuits for loop-start trunk applications.
- 2.13 The system can be equipped with up to fourteen Keyphone Cards (LCU). Each Keyphone Card supports 8 Keyphone interface circuits for proprietary Keyphone connections.
- 2.14 The system can be equipped with up to thirteen Single-line Telephone Cards (SLT). Each SLT Card supports 8 industry-standard single-line telephone interface circuits. The SLT Cards can not be used in the first Station Card slot.

2.15 Optional equipment that can be supported by the system include:

- Connecting terminals and control circuitry for a backup battery package.
- Connecting terminals and power relay control for an external music source.
- Connecting terminals and power relay control for external paging amplifier.
- Connecting terminals and relay control for a loud bell ringer.

Central Office Requirements

2.16 Rules and regulations for the operation and installation of telephone equipment have been established. As the owner you must give the following information to the operating telephone company before connection and disconnection of system:

- Notice of your intention to use privately-owned telephone equipment.
- Lines to be used by the system (tel. numbers xxx - xxx)
- Model No. Atlas IIE KSX 128
FCC Registration No. DOETAI-61985-KF-E
DOE632-15594-MF-E
Ringer Equivalency 0.4B
- The type of connection RJ-21X

Incidence of Harm

2.17 When practical, the telephone company must inform the customer that service may be temporarily discontinued if the equipment he is using should cause harm to the telephone network. The telephone company must attempt to inform the customer that service is to be discontinued prior to actually terminating service. The telephone company must also provide customers with an opportunity to correct the problem and must advise customers of their right to bring complaint procedures.

Cable (Station Loop) Length:

Keyphone	Diameter = 0.4 mm	(26 gauge)
	max effective length = 140 m	(460 feet)
	Diameter = 0.5 mm	(24 gauge)
	max effective length = 230 m	(750 feet)
	Diameter = 0.65 mm	(22 gauge)
	max effective length = 350 m	(1150 feet)
Single-line Telephone	800 ohms at diameter of 0.65 mm	(22 gauge)
	max effective length = 1600 m	(5250 feet)

Communication Links:

CMOS cross point switching
Electret transmitter
Dynamic receiver

Circuitry Control:

8 MHz 16-bit 8088 micro-processor and custom designed 8051 micro-computer with multi-processing technology.

Number Dialing Requirements:

1) Pulse Dial

A) speed:	10 pps or 20 pps (programmable)
B) ratio:	$60 \pm 3\%$ or $67 \pm 3\%$ (programmable)
C) pause:	1200 ms

2) DTMF

A) Frequency range:	
High Group:	1209 Hz, 1336 Hz, 1477 Hz
Low Group:	697 Hz, 770 Hz, 852 Hz, 941 Hz
B) Frequency uncertainty:	1.5% and less
C) Tone Level:	
Low Level:	-10 dBm \pm 2 dBm
High Level:	-8 dBm \pm 2 dBm
D) Duration:	70 ms (Programmable)
E) Digit Period:	70 ms (Programmable)
F) Memory Dial:	
two types:	Last Number Redial & Speed Dial
System speed dial:	90 numbers (10-99)
Station speed dial:	9 numbers (01-09)
max digits per number:	16 (Except for 10-29 which have 32 digits each)

Power Failure:

An optional backup battery can be installed for power outage prevention. Length of time usable depends on battery capacity. During most communication situations a 24 Volt battery can be used for one hour. Battery charger is built in.

Recommended: 24 Volt Battery Pack with 40 amp Circuit Breaker

Equipment Description

Main Cabinet (KSU) Refer to Figure 1.

- 4.1 The KSU is housed in a convection-cooled, metal enclosure with a removal front cover. The cabinet dimensions are 387 mm wide, 527 mm high, and 280 mm deep (15.25 inches wide, 20.75 inches high, and 11 inches deep).
- 4.2 The KSU contains the Power Supply Unit, the backplane bus, the Central Control Card (CPU-A), a connection for a SMDR Unit, a System Services Card (MMDF), eight slots for Trunk Cards (COL) or Station Cards (LCU or SLT), and an internal Main Distribution Frame (MMDF-I).
- 4.3 The KSU can be either free standing or mounted on a vertical surface. Four wall-mounting points are located on the back of the Main Cabinet to connect to a wall-mounting plate used to attach the cabinet to a vertical surface.
- 4.4 All connections to the system are made on the inside of the cabinet, except when using Station Cards with amphenol connectors to connect to external connecting blocks.
- 4.5 The Main Cabinet has the necessary power and control connections to connect to a Expansion Cabinet.

Expansion Cabinet

- 4.6 The Expansion Cabinet is a convection-cooled, metal enclosure with a removal front cover. The cabinet dimensions are 387 mm wide, 527 mm high, and 280 mm deep (15.25 inches wide, 20.75 inches high, and 11 inches deep). When the Expansion Cabinet is mounted beside the Main Cabinet with a 100 mm (4 inch) gap the system is 880 mm wide (34.5 inches wide).
- 4.7 The Expansion Cabinet contains a Power Supply Unit, the expansion backplane bus, and eight slots for Station Cards (LCU or SLT).
- 4.8 The complete system can be either free standing or wall mounted on a vertical surface. Four wall-mounting points are located on the back of the Main Cabinet to connect to a wall-mounting plate used to attach the cabinet to a vertical surface.

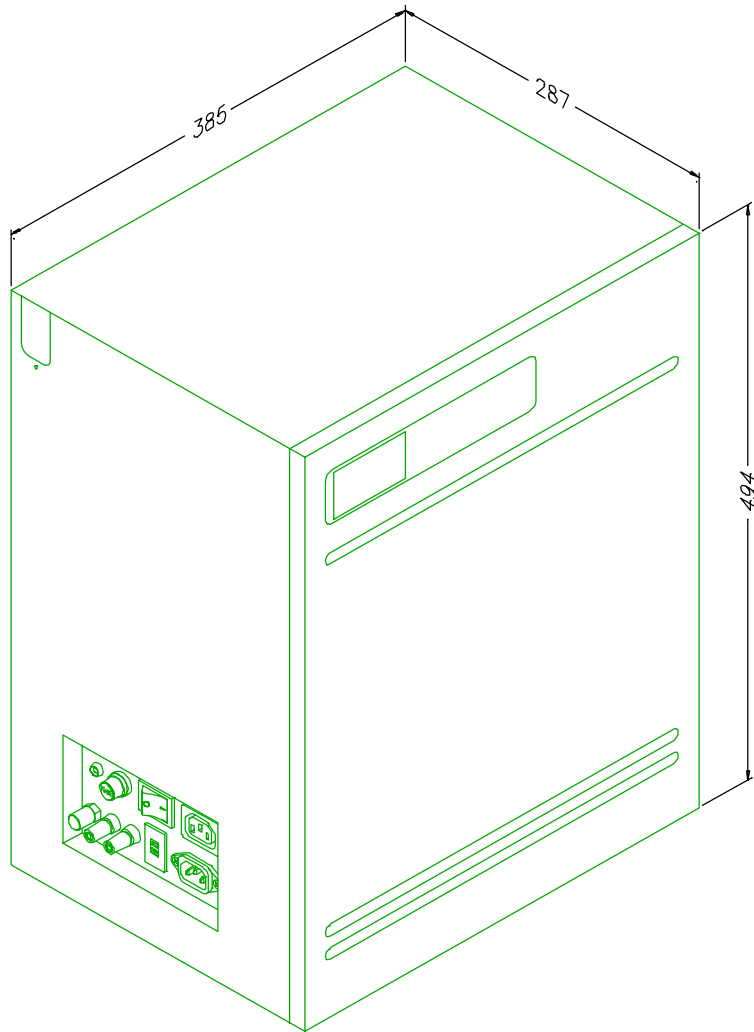


Figure 1: Main Cabinet

Central Control Card (CPU-A) Refer to Figure 2.

- 4.9 The CPU-A is the main controller card of the system. It performs all logical operations, call processing, and uses control signals to control the other cards in accordance with system demands.
- 4.10 The CPU-A uses a 8 MHz 16-bit 8088 micro-processor and has a memory capacity of 128 Kb of ROM, and 256 Kb of RAM. The system uses a 24 MHz oscillator.
- 4.11 The system control software is in two 64 Kb EPROMs, which can be upgraded, and the stored-program database is in battery-protected RAM.
- 4.12 The following are located on the CPU-A (refer to Figure 2):
- A) Memory protection battery
 - B) Memory battery protection and disconnect switch
 - C) Micro-processor scan indicator and memory protection indicator
 - D) System selection (128 / 256) set to 128

Trunk Attenuation

Note: The four 8-element DIP switches on the back plain are used for attenuation on Intercom paths. This lowers the volume for Intercom Calls. When Trunk Cards are installed the corresponding switch must be set to OFF. The last two switches (7 & 8) on SW4 must also remain OFF as they are used for Paging and Background Music.

SW1 Elements 1 - 4	Trunk Card 1
SW1 Elements 5 - 8	Trunk Card 2
SW2 Elements 1 - 4	Trunk Card 3
SW2 Elements 5 - 8	Trunk Card 4
SW3 Elements 1 - 4	Trunk Card 5
SW3 Elements 5 - 8	Trunk Card 6

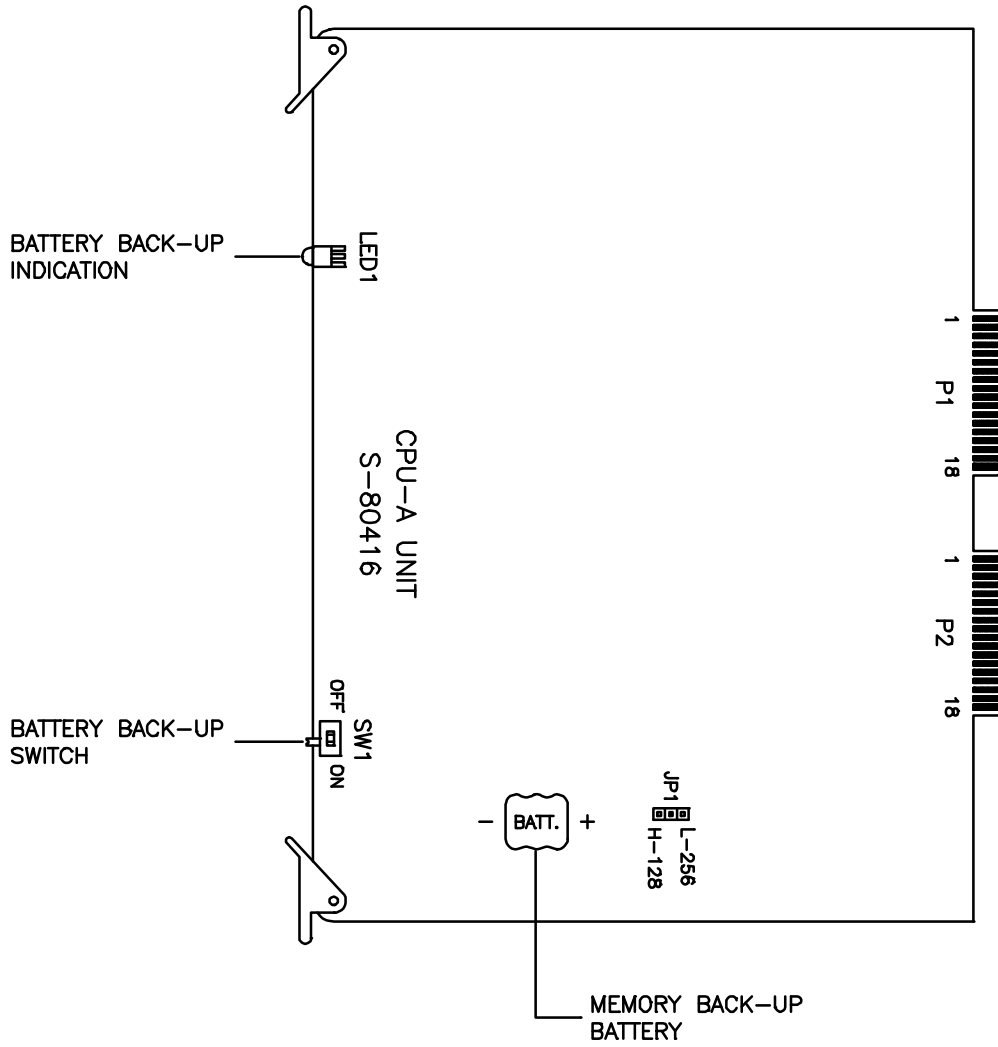


Figure 2: Central Control Card (CPU-A)

System Services Card (MMDF) Refer to Figure 3.

- 4.13 The KSX 128 has a System Services Card (MMDF). The MMDF provides the common service features for the system. The MMDF is located on the top of the Main Cabinet. It provides the circuitry and connections for the optional equipment.
- 4.14 The MMDF has a jumper (JP1) for selecting the internal music IC or an external music source connection for Background Music and Music on Hold for trunks.
- 4.15 The MMDF provides two Dry Contact relays which are used for External Paging Amplifier Power Control and Loud Bell / Music Source Power Control.
- 4.16 There is one dedicated External Page built into the system. The MMDF provides this External Page Zone which is known as Page Zone 8.
- 4.17 The following optional equipment connections are located on the MMDF Card (refer to Figure 3):
- External Music Source
 - External Paging Interface
 - External Paging Amplifier Power Control
 - Loud Bell / Music Source Power Control

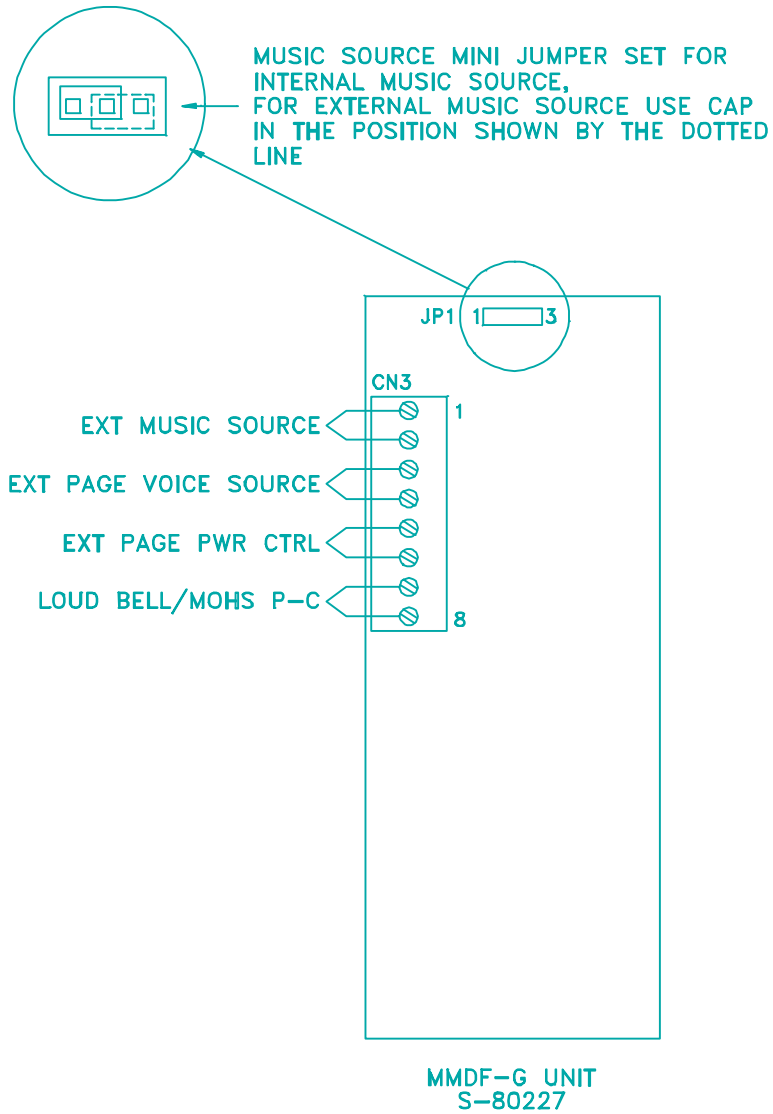


Figure 3: System Services Card (MMDF)

Power Supply Unit

4.18 The Power Supply Unit is housed in the Main Cabinet. The Power Supply Unit is a switchable unit. The power distribution circuit must be a dedicated, single phase, 3-wire type of either 110 Volt AC (60 Hz) or 220 Volt AC (50 Hz).

WARNING: Ensure the 115/230 Volt AC selection switch is set to the correct voltage otherwise incorrect voltage selection may lead to permanent damage of the equipment.

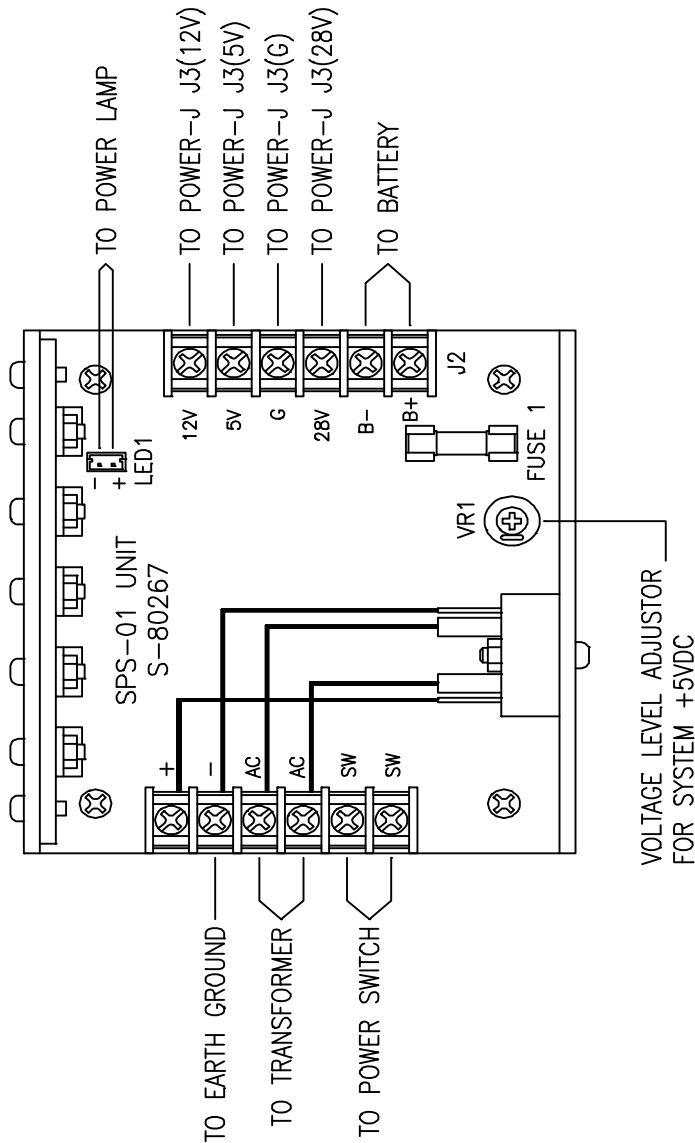


Figure 4: Power Switching Unit (SPS-01)

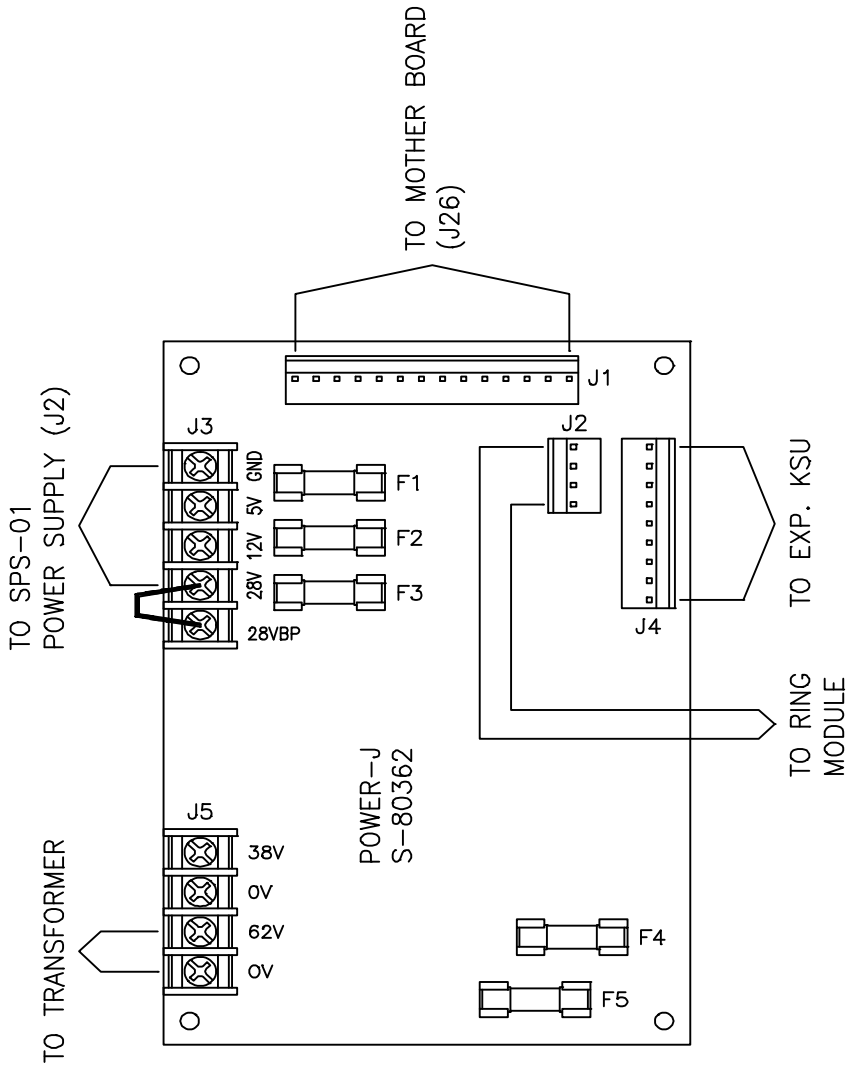


Figure 5: Power Supply Unit (POWER-J)

4.19 The fuse protection for system circuit protection is as following.

SPS-01	FUSE Power module input phased line	250 Volt / 2.0 Amp
	Fuse 1 Battery input	125 Volt / 10 Amp
POWER-J		
	F1 5 Volt DC power distribution	3.0 Amp
	F2 12 Volt DC power distribution	1.5 Amp
	F3 28 Volt DC keyphone power distribution	3.0 Amp
	F4 28 Volt DC single-line telephone power distribution	1.5 Amp
	F5 90 Volt SLT Ring Generator	1.0 Amp

WARNING: Correct fuse replacement is essential for proper system circuit protection.

Trunk Card (COL) Refer to Figure 6.

- 4.20 The KSX 128 can be equipped with up to six analog Trunk Cards (COL) in the Main Cabinet, giving a maximum capacity of 24 trunks. Each Trunk Card supports 4 analog trunk interface circuits for loop-start trunk applications. Each trunk requires a 1-pair connection.
- 4.21 Each Trunk Card contains the circuitry for ring detection, DTMF and pulse dialing, and music-on-hold distribution.
- 4.22 Each trunk interface circuit includes a two-way dual amplifier. If amplification is required on the trunk, move the jumper J1 to the 'amp' position.
- 4.23 Trunk line connections are accessible inside the top of the Main Cabinet through a amphenol type connector.
- 4.24 There are a number of programmable trunk functions.
- *Trunk Types:* Trunks can be connected to Central Office or PABX lines (Mode 11). When connected to a PABX, the access code is ignored for toll restriction.

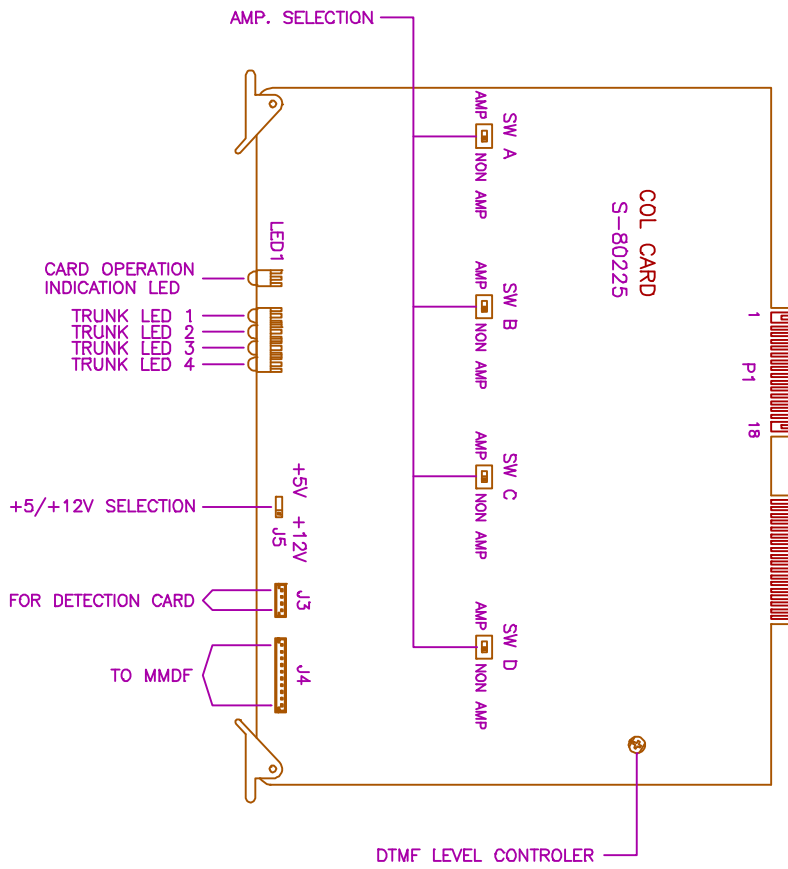


Figure 6: Trunk Card (COL)

- *Trunk Signaling:* Trunk dialing output can be DTMF or pulse (Mode 11). For pulse dialing, the pulse-per-second rate (Mode 13) and make/break ratio (Mode 14) can be set. For DTMF dialing, the tone duration is adjustable (Mode 17).
- *Flash Duration:* The timed-line disconnect sent to the distant office can be set (Mode 15) for proper recognition.
- *Trunk Ringing at Loud Bell:* Each trunk can be assigned to ring at the loud bell (Mode 11) for both day service and night service.
- *Trunk Access as Private Line:* Each trunk can be designated as a private line (Mode 21) and assigned with access allowed only by selected stations (Mode 22). Individual trunk ringing (Mode 39, 40, 41, 42), call pickup (mode 24), and common ring night service (Mode 23) are available features.
- *Trunk Hunt Groups:* Trunks can be assigned to hunt groups (1 - 8) for outgoing call access (Mode 25). Trunks are accessed in terminal or distributed mode (Mode 28). A trunk hunt group can be accessed using a dial code (Mode 27) or automatically selected at station off-hook.
- *Automatic Route Selection:* Trunk hunt groups can be assigned to Automatic Route Selection (ARS) call routing tables (Mode *4) to be accessed when the least expensive call route is selected.
- *Trunk Ringing at Station Hunt Group:* Each trunk can be set to ring a station hunt group during day service (Mode 39) and night service (Mode 40).
- *Trunk Ringing at Flexible Ring Stations:* Each trunk can be assigned to immediately ring at up to sixteen flexible ring stations during day service (Mode 41) and night service (Mode 42). Ringing can be simultaneous or ring one station at a time in a step pattern (Mode 43).
- *Trunk Ring at Common Ring Stations:* Up to twenty-four common ring stations can be assigned to ring during day service (Mode 47) and night service (Mode 48) after a programmable delay time (Mode 46).
- *Trunk Call Duration:* Trunk calls can be limited to a maximum duration before they are automatically terminated (Mode 63).

Keyphone Card (LCU)

- 4.25 The system can be equipped with up to fourteen Keyphone Cards (LCU). Each Keyphone Card supports 8 Keyphone interface circuits for proprietary Keyphone connections. Each port requires a 2-pair connection.
- 4.26 Each Keyphone Card contains the circuitry to transmit and receive digital control signals using a proprietary data protocol, and current limiting circuits to protect against an accidental short during Keyphone installation.
- 4.27 The Keyphone Card can connect to several different types of Keyphone sets, a DSS Unit, or Auto Attendant.
- 4.28 Keyphone line connections are accessible inside the top of the Main Cabinet or through an amphenol connection (optional).

Keyphone

- 4.29 Keyphones used with the system are proprietary to the **Atlas IIE** range of systems. They are micro-processor controlled and have a high degree of functionality.
- 4.30 All Keyphones have softkeys equipped with dual-color LEDs (red & green) which can be programmed for a range of features. There are also set function keys which have a range of common uses.
- 4.31 All Keyphones are equipped with a speaker and microphone for handsfree operation and Executive Keyphones have full speakerphone capability. However handsfree operation may be limited in environments with a high noise level.
- 4.32 A Keyphone allows full program access to the system and there are a number of programmable station functions.
 - *Operator Console:* A Keyphone can be designated as the system operator console (Mode 31). The operator console has parameters for incoming call ringing (Mode 44), hold recall (Mode 07), system hold recall delay (Mode 34), and system hold recall release (Mode 35).

- *Second Operator Console:* A second station can optionally be designated as a backup system operator console (Mode 32). The second operator console has parameters for incoming call ringing (Mode 45), and second operator console delay (Mode 33).
- *Station Numbers:* Each station can be assigned an unique station number for intercom calling and identification (Mode 70). Each station number can be one, two, three, or four digits.
- *Station Hunt Groups:* Stations can be assigned to hunt groups (1 - 7) for trunk ringing and idle station access (Mode 67). Stations are accessed in terminal or distributed mode (Mode 68). A station hunt group can be accessed using a dial code. The operator console destination can also be set to a station hunt group (Mode 69).
- *Softkey Programming:* Each Keyphone has a different softkey plan which can be programmed for direct trunk selection, trunk hunt group access, direct station selection, and one-touch speed dial (Mode 73).
- *Automatic Outside Line:* Stations can be assigned to automatically access an idle trunk (Mode 03) from an assigned trunk hunt group (Mode 74) when going off-hook.
- *Intercom Calling:* A Keyphone can be assigned to automatically turn the speaker on for a voice announce call. The microphone can also be assigned to automatically turn on for immediate response.
- *Call Pickup:* A station has three options when answering a call ringing on another station in the system. There is a general system pickup, a station group pickup, and a direct station pickup.
- *Locking a Station:* Stations can be set by the use to restrict usage. When locked a station can only make intercom calls and answer incoming calls which ring on the station.
- *DSS Unit:* A Keyphone can be accompanied by one or two DSS units which occupy the following Keyphone ports. The softkeys on the DSS unit can be programmed for direct trunk selection, direct station selection, or one-touch speed dial (Mode 73).

Single-line Telephone Card (SLT)

- 4.33 The system can be equipped with up to thirteen Single-line Telephone Cards (SLT). Each SLT Card supports 8 industry-standard single-line telephone (2500 type) interface circuits. SLT Cards can **NOT** be used as the first Station Card. Each port requires a 1-pair connection.
- 4.34 Each SLT Card contains the circuitry for two DTMF receivers allowing two single-line telephone ports to receive dial tone simultaneously. While pulse dialing is supported on all ports.
- 4.35 Single-line telephone line connections are accessible inside the top of the Main Cabinet or through an amphenol connection (optional).
- 4.36 There are a number of programmable station functions available for single-line telephone ports.
- *House Phone:* A station can be designated as a house phone (Mode 03) which automatically calls the operator console when going off-hook.
 - *Door Phone:* A station can be designated as a door phone (Mode 03) which rings all station assigned to ring for the door phone (Mode 03) when going off-hook.
 - *Voice Mail Port:* A station can be designated as a voice mail port (Mode 03) to work with a connected voice mail system.
 - *Paging Port:* A single-line telephone port can be designated as a zone paging port (Mode 89) to used in addition to the built-in paging port.

SMDR Unit Refer to Figure 16.

- 4.37 The SMDR Unit is an optional proprietary unit for providing Station Message Detail Records. The SMDR Unit connects to the left side of the Main Cabinet.
- 4.38 The SMDR Unit allows the user to analyze the systems telephone activity. The information is provided through either a parallel or serial port connection to a printer or computer. This information includes station number, trunk, telephone number dialed, account code, day and month, start time, duration and ring time.
- 4.39 The output of the SMDR is programmed by an 8 element DIP switch located on the SMDR Unit and by system programming.

Hardware Options

- 5.1 The KSX 128 has a variety of different hardware options for additional equipment which can be attached to the system to provide greater functionality.

Backup Battery

- 5.2 The system Power Supply Unit supports a backup battery package rated at 24 volts, 2.0 amperes/hour. A trickle-charge circuit maintains the battery at 95% efficiency, applies system cutover to battery when mains power is removed, and provides system shutdown when battery power falls below a specified level.
- 5.3 The battery leads connect at terminals located on the left side of the Main Cabinet beside the ON / OFF switch. Length of time system operation is maintained under battery power depends on battery capacity. Normal life expectancy for a 24 volt battery is 1 hour.

External Music Source

- 5.4 The system can support a customer-supplied music source. The optional external source is connected to the System Services Card (MMDF). The impedance of the music source must be less than 32 ohms with a power level of approximately 100 mW.
- 5.5 When an external music source is connected to the system, set to external using the music select jumper (JP1) located on the MMDF Card.

Note: In some cases there may be broadcast restrictions associated with the use of the external music source. Check with the music's original distributor and/or the radio station for copyright and broadcast restrictions concerning background music and music-on-hold.

Paging Amplifier

- 5.6 The system can support a customer-supplied paging amplifier for paging zone 8. The optional page amplifier is connected to the System Services Card (MMDF).
- 5.7 The page output is for zone 8. The output for zones 1 - 7 must be connected through station ports assigned by system programming (Mode 89).

External Paging Amplifier Power Control

- 5.8 When the system is equipped with an external paging amplifier for page zone 8, it is possible to use a power control relay to turn the paging amplifier off when not in use. The optional paging amplifier power control is connected to the System Services Card (MMDF). The power control relay is rated at a maximum of 3 amperes.
- 5.9 In the default state, the relay is open. When a paging call is made to page zone 8, the relay closes, enabling the power circuit to the external paging amplifier. When the paging call is terminated, the relay opens, disconnecting the power circuit.

Loud Bell / Music Source Power Control

- 5.10 The system has a power control relay which support two options. The function of the power control relay is set by element 2 of the system DIP switch located on the DSPU Card. The optional power control is connected to the System Services Card (MMDF). In the default state, the relay is open.
- 5.11 When element 2 is set ON, it is used as a power control relay for a loud bell which rings for incoming calls. When an incoming call is ringing the system, the relay closes, enabling the power circuit to the loud bell. When the incoming call is answered or the ringing stops, the relay opens, disconnecting the power circuit. Each trunk can be set to ring the loud bell in system programming (Mode 18).
- 5.12 When element 2 is set OFF, it is used as a power control relay for the external music source. When background music or music-on-hold is used, the relay closes, enabling the power circuit to the external music source. When the music is not required, the relay opens, disconnecting the power circuit.

Auto Attendant

- 5.13 The system can be equipped with a auto attendant unit to respond to incoming calls and direct them to a station from a hunt group, an individual station, or the operator console. The auto attendant occupies a Keyphone port and requires a 2-pair connection.

Facsimile / Answering Machine

- 5.14 Facsimile and answering machines can be connected to single-line telephone ports and arranged for automatic answer of incoming calls.
- 5.15 Incoming calls can be assigned to ring them for day and/or night service. They can be assigned to ring for specific trunks using flexible ring (Mode 41 and 42), or for all trunks using common ring (Mode 47 and 48). If there are multiply facsimile or answering machines, assign specific lines to ring at specific machines or select a machine from a station hunt group (Mode 67) and set it to ring (Mode 39 and 40).
- 5.16 Outgoing calls can be set to one line exclusively, or simply any available line. Automatic outside line (Mode 03) can be used to automatically access an idle trunk from an assigned trunk hunt group (Mode 74) when the machine goes off-hook.

Modem

- 5.17 Single-line telephone ports can support the use of a PC modem. This enables both internal and external data communications.
- 5.18 The normal maximum speed for modem transmission is 9600 baud depending on the quality of the Central Office connection.

Installation Procedure

- 6.1 The installation procedure of the KSX 128 is very important. Incorrect installation will not only cause the system to not function correctly, but also lead to permanent damage of the equipment. Installation must be done by experienced personnel trained to install the system.

Precautions

- 6.2 There are a number of precautions which should be observed to safeguard the installer, the system equipment, and the users of the equipment. Please observe all these precautions at all times when handling the equipment.

Handling Static-Sensitive Devices

WARNING: *The system equipment contains static-sensitive components. Handling of printed circuit boards and wiring requires knowledge of proper handling techniques, and the use of safeguard equipment necessary for protecting static-sensitive devices.*

- 6.3 Static electricity can easily accumulate a high-voltage charge in the human body. Precautions must be taken to prevent this charge from damaging static-sensitive devices.
- Touch the cabinet (or similarly-grounded item) to dissipate any stored charge immediately before removing, inserting, or otherwise handling a system card or static-sensitive device.
 - Hold the system card by the edge and avoid touching component pins or edge connectors.
 - Cover work surfaces with conductive material connected to earth ground. A ground clip connected to a static-protective shipping bag provides an adequately protective work surface.
 - Use flexible ground straps to continuously discharge static electricity.
 - Store system cards in static-protective shipping bags.

Installing Station Wiring

DANGER: TO REDUCE THE RISK OF ELECTRICAL SHOCK AND PERSONAL INJURY, USE CARE WHEN INSTALLING STATION WIRING.

6.4 Observe the following precautions when installing station wiring:

- Never install telephone wiring during a lightning storm.
- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
- Never touch un-insulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines.

Connecting Power Cords Refer to Figure 7.

WARNING: *Do not attach power supply cords to building surfaces.*

6.5 The basic system is supplied with a detachable power supply cord. The cord should be dressed for appearance and safety, but never attached to the building surface.

Complying with EMI Filter Requirements

Caution: *This equipment has been tested and found to comply with requirements, designed to provide reasonable protection against radio frequency energy when operated in a commercial environment.*

6.6 The front panel cover for the cabinet is designed to meet EMI filter requirements when installed and secured to the cabinet using retaining screws. Prior to operation, the front panel cover must be installed and secured in place using the retaining screws.

Site Planning

6.7 In selecting a suitable system installation site, requirements for facilities availability, primary power, grounding, and equipment accessibility are important considerations. The following are important considerations for site preparation and installation planning.

Power Requirements

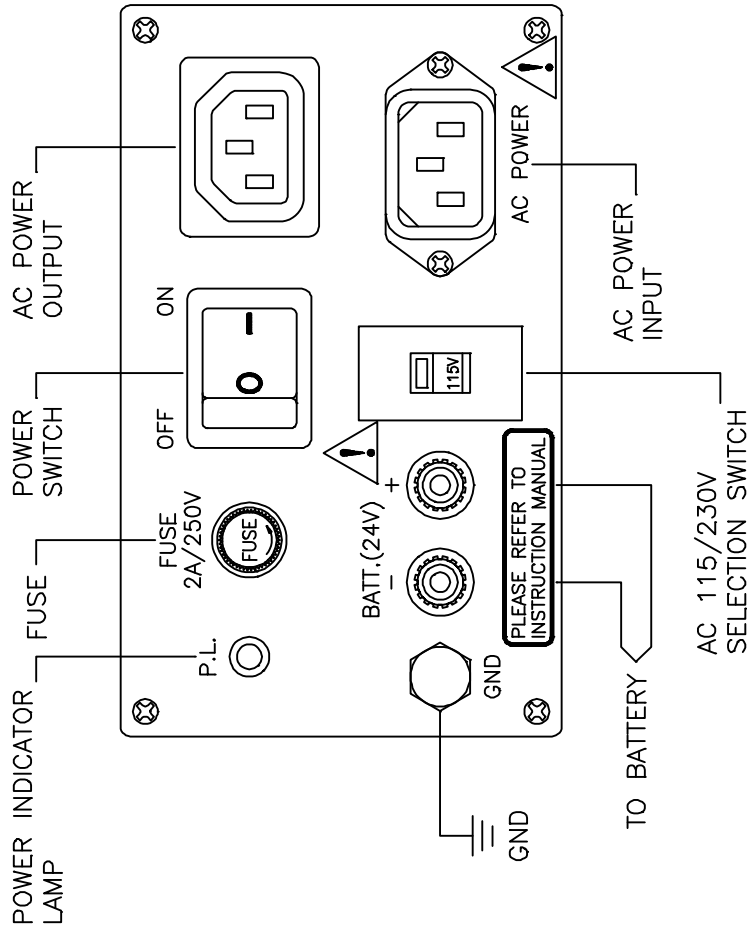


Figure 7: Power and Earth Ground Cabling

6.8 Main power for the system must be available through standard AC receptacles located within 1.8 m (6 feet) of the lower left of the cabinet. Separate AC outlets for the music source or paging amplifier if installed.

- 6.9 The power distribution circuit must be a dedicated, single phase, 3-wire type, protected by a dedicated 15 Amp circuit breaker for 110 Volt AC (60 Hz) or 10 Amp circuit breaker for 220 Volt AC (50 Hz). The third-wire grounding conductor of the power distribution circuits must be connected to the single-point grounding bus in the power distribution panel. The circuit must be free of any type of switching device between the circuit breaker and the AC receptacle, and it must not be shared with any other equipment.

Grounding Requirements

WARNING: *To avoid equipment damage, do not attempt to connect or operate the equipment before a proper ground has been installed.*

- 6.10 An approved earth ground must be located within 7.5 m (25 feet) of the Main Cabinet. It is important that all grounding connections comply with the system grounding scheme. Improper grounding techniques can impair operation, causing maintenance problems.
- 6.11 The ground wire used for chassis ground must be #12 AWG, or larger, standard copper wire. Ground wire used for single-point ground must conform to local building codes. There is a ground lug located on the lower left of the cabinet along with the power switch, and AC power cable. (Refer to Figure 7)

Environmental Requirements

Caution: *The equipment is susceptible to RFI (Radio Frequency Interference). Use of the system in strong RF fields may cause operational difficulties. Avoid installation near radio and television transmitting equipment, or in buildings adjacent to broadcast antennas.*

- 6.12 The selected location for the equipment and MDF should be clean (no dust), dry, static-free (grounded or not carpeted), away from direct sunlight, well ventilated, temperature within the range of 0-40°C (32-100°F), 10% - 90% relative, noncondensing humidity, and accessible only to authorized personnel.

6.13 The following locations are to avoided as installation sites:

- In an extremely dusty atmosphere.
- Areas with extremes of temperature or humidity.
- Near heat-producing or steam-producing equipment.
- Near a passageway or aisle used for moving machinery or vehicles.
- Away from utility or building maintenance areas.
- Near a reproduction or copying machine, microwave ovens, electric welding equipment, or near strong magnetic or RF fields.

Equipment Location

6.14 The equipment area should be large enough to house the equipment backboard. The backboard will contain the cabinet and MDF. There must be sufficient space for routing cables, servicing the equipment, and possible future expansion.

WARNING: *The area should not be carpeted or have curtains or other material that may generate static electricity. See **Environmental Requirements** in this section.*

6.15 The Main Cabinet is designed for either free standing or wall mounting. When wall mounted the cabinet should be mounted on a backboard. A backboard of 1.0 m by 1.2 m (40 x 48 inches) is the minimum size recommended for a full capacity system.

6.16 Use the wall-mounting plate as a template for positioning the wall-mounting screws used to attach the cabinet to the backboard.

6.17 Optional equipment should be located near the cabinet. The optional equipment requires space for installing, so allow ample space when positioning the Main Cabinet. Consider the heat generated by the equipment when calculating cooling requirements.

Unpacking and Inspecting

- 6.18 The system is packaged for shipment with all equipment installed in the cabinet. The system package also contains a power supply cord and a copy of the system documentation.
- 6.19 All equipment is packaged in corrugated cardboard containers. All equipment options are packaged separately in individual cartons. Each telephone is packaged separately in an individual carton. However, an outer slip or larger container may be used to group quantities of telephones.
- 6.20 Check all items received against the packing slip. Examine cartons for visual signs of damage. If cartons appear to be damaged, make a note of such damage on the packing slip and on the carrier way bill, if available.
- 6.21 Open the carton containing the Main Cabinet (KSU). Remove the packaging material from the carton. Remove the cabinet and stand it up on a level work surface. Check the exterior of the cabinet. Make a note of any damages.
- 6.22 Observing electronic equipment handling precautions, remove each piece of equipment from its shipping container. As each item is unpacked, place it on a level work surface. Remove packaging material and inspect the equipment for physical damage. Make a note of any damages.
- 6.23 Report all damages noted to your supplier or distributor.

Main Cabinet (KSU) Installation**See Expansion Cabinet Installation for installing a system with an Expansion Cabinet.**

- 6.24 Mount the Main Cabinet so that all cables and power cords are neatly arranged. Do not mount the cabinet directly on masonry, concrete, or other wall surfaces subject to moisture or condensation. Use a plywood backup board.

Note: The recommended screw size for attaching the cabinet wall mounting brackets on a 20 mm plywood backboard is 6 mm x 19 mm (#10 x 3/4 inches) pan-head screws.

- 6.25 Immediately connect the Main Cabinet to an approved earth ground facility, using a #12 AWG or larger stranded copper wire of sufficient length. A ground post is located on the lower left of the Main Cabinet to ensure the system is properly grounded.

6.26 Four wall-mounting points are located on the back of the Main Cabinet for hanging the system. The power switch and power cable should be on the lower left of the cabinet. Once the mounting plate is attached to the wall or prepared backboard, simply hang the unit on the wall.

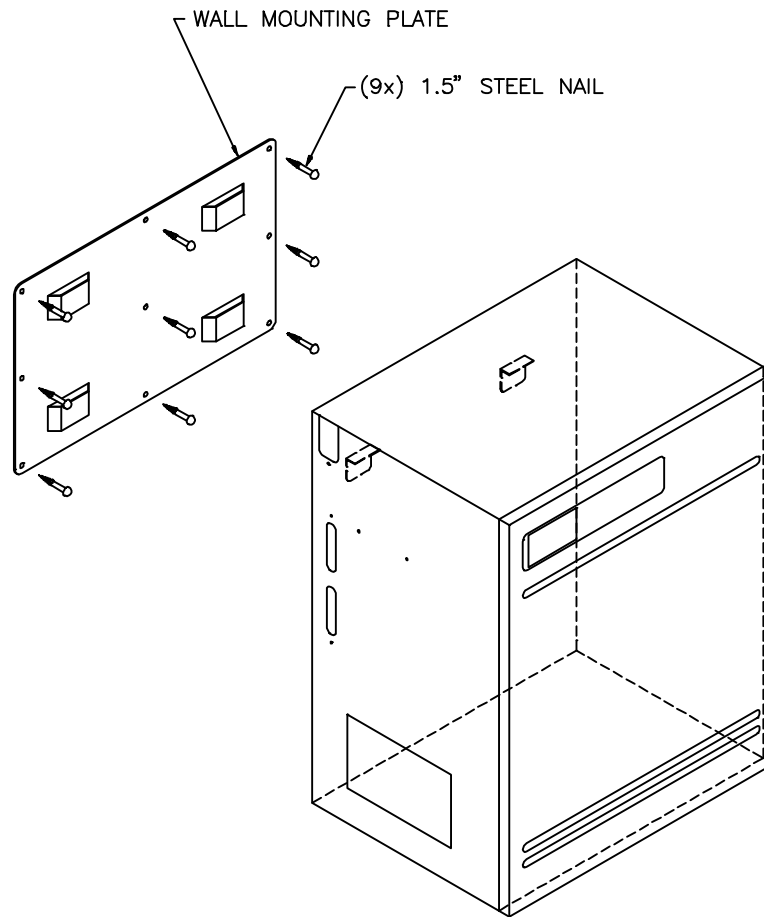


Figure 8: Wall Mounting the Main Cabinet

Expansion Cabinet Installation

Note: Ensure the ON / OFF switch on both the Main and Expansion Cabinets is **OFF** before connecting any cables.

6.27 When using an Expansion Cabinet, allow enough space to mount the Expansion Cabinet to the right of the Main Cabinet before going any further. A gap 100 to 200 mm (4 to 8 inches) is required between the two cabinets. Remember to allow space to neatly arrange all cables and power cords.

6.28 Immediately connect the Main and Expansion Cabinets to an approved earth ground facility, using a #12 AWG or larger stranded copper wire of sufficient length. A ground post is located on the lower left of the Main Cabinet to ensure the system is properly grounded. (Refer to Figure 7)

6.29 Connect the upper grey flat cable on the left side of the Expansion Cabinet to the connection in the upper slot on the right side of the Main Cabinet. The red stripe should be on the upper edge.

6.30 Connect the lower grey flat cable on the left side of the Expansion Cabinet to the connection in the lower slot on the right side of the Main Cabinet. The red stripe should be on the upper edge.

6.31 Connect the multi-coloured 9-conductor power cable from J4 on the POWER-J Unit in the Expansion Cabinet to J4 on the POWER-J Unit in the Main Cabinet. (Refer to Figure 5)

6.32 Connect the black mains power supply cable from the Expansion Cabinet to the AC Power Outlet socket on the lower left side of the Main Cabinet. (Refer to Figure 7)

Note: Both grey flat cables, the multi-coloured 9-conductor power cable, and the black power cable must be connected correctly to make the system function.

6.33 To mount the system on the wall see the *Main Cabinet Installation* section.

Installation of Cards

6.34 The Main Cabinet (KSU) can hold eight interface cards. The basic capacity is 4 trunks and 8 stations (1 Trunk Card and 1 Keyphone Card), growing up to a maximum of 24 trunks and 16 stations (max trunk cards), or 8 trunks and 48 stations (typical).

WARNING: *Before installing or removing cards, make sure the power is switched **OFF** !*

CPU 1 2 3 4 5 6 7 8

Power Supply Unit

Figure 9: System Configuration

Trunk Card Installation

- 6.35 The KSX 128 can be equipped with up to six analog Trunk Cards (COL), giving a maximum capacity of 24 trunks. Each Trunk Card supports 4 analog trunk interface circuits for loop-start trunk applications.
- 6.36 The Trunk Cards have to be installed first. They have to be installed in slots 1 - 6, in the Main Cabinet, with the first Trunk Card in slot 1. No empty slots or station cards can be installed in between.
- 6.37 For each installed Trunk Card, the attenuation must be removed from the corresponding voice paths to allow maximum volume. The DIP switches to control attenuation are located on the back-plane. (Refer to Figure 1)
- 6.38 Trunk line connections are accessible inside the top of the Main Cabinet through a amphenol type connector (J7) located on the MMDF-I Unit. 10-wire cables are used to connect the MMDF-I Unit to the Trunk Cards. (Refer to Figure 10)

Station Card Installation

- 6.39 The KSX 128 can be equipped with up to fourteen Station Cards (LCU or SLT). Each Station Card supports 8 circuits (station ports).
- 6.40 The Station Cards are installed after all the Trunk Cards are installed. The first Station Card installed after the Trunk Cards must be a Keyphone Card (LCU). Otherwise the Station Cards can be arranged as desired. Leaving empty slots between Station Cards is no problem.
- 6.41 When using an Expansion Cabinet divide the Station Cards between both cabinets so that the total number of cards in each is even.

Cabinet	Card	MMDF-I
slot 1	Trunk Card 1	J1
slot 2	Trunk Card 2	J2
slot 3	Trunk Card 3	J3
slot 4	Trunk Card 4	J4
slot 5	Trunk Card 5	J5
slot 6	Trunk Card 6	J6

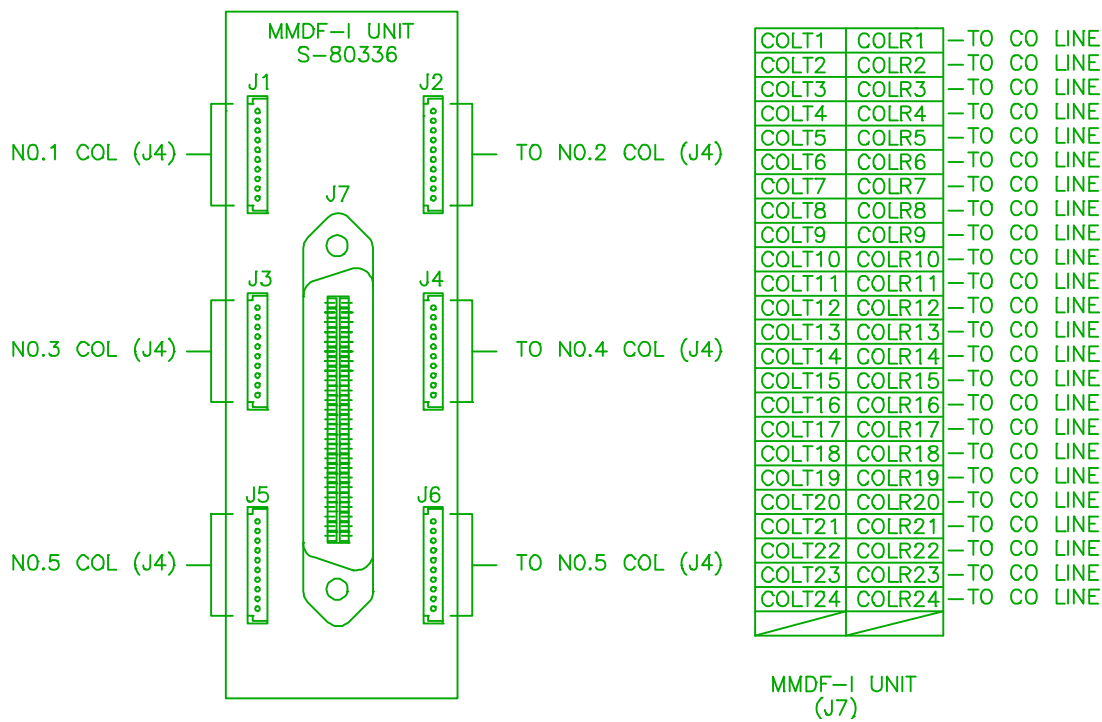
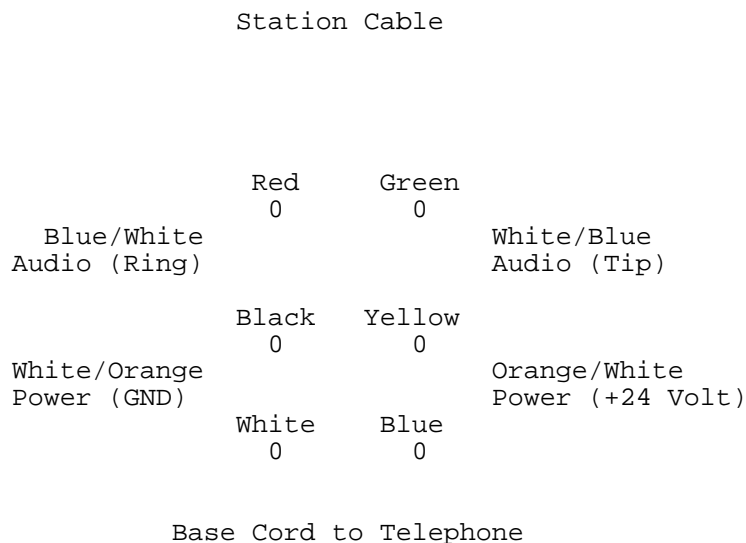


Figure 10: Trunk Connections to MMDF-I Unit

Keyphone Station Wiring

- 6.42 All stations are line run to common 66 type connecting blocks. Keyphones require 2-pair twisted-pair industry standard cable. The maximum cable length is 350 m (1150 feet) with 0.65 mm (22 gauge) wire, 230 m (750 feet) with 0.5 mm (24 gauge) wire, and 140 m (460 feet) with 0.4 mm wire (26 gauge). Single-line telephones can use a cable length of up to 1600 m (5250 feet) using 0.65 mm (22 gauge) cable.
- 6.43 Each Keyphone is supplied with a four-wire, fully modular line cord. A 625 QA jack assembly or equivalent should be mounted where each telephone will be installed. Cable pairs should not be crossed or get reversed during installation. Polarity must be maintained for correct operation of Keyphones.

**Figure 11:** Wiring to Modular Box

- 6.44 Connections from the blocks to the KSU are made using 25-pair cable with amphenol connectors. The connectors can be attached directly to the KSU on one end and the block on the other.
- 6.45 Some guidelines for running station cable:
- Avoid cable runs parallel to fluorescent light fixtures or power lines. If these obstacles are unavoidable, run the cable across them at right angles.
 - DO NOT run station cables inside electrical conduit already occupied by AC power cable. To do so is a violation of the National Electrical Code.
 - DO NOT run station cables near a reproduction or copying machine, microwave ovens, electric welding equipment, or near strong magnetic or RF fields.
 - DO NOT place station cables where they can be stepped on, or rolled over by office chairs.

Installing the Keyphones

- 6.46 Unpack and inspect each Keyphone for damage. In each Keyphone box, there should be a Keyphone, a 1.8 m (12 foot) line cord, a coiled handset cord, and a handset. Connect the coiled handset cord to the handset and to the side of the Keyphone.
- 6.47 Before connecting the Keyphone to the modular jack, check for the correct voltage (24 Volt) across the **black** and **yellow** terminals on each modular jack assembly. (Refer to Figure 11)

WARNING: If the **black** and **yellow** are reversed the Keyphone will not function.

- 6.48 Install the Keyphones by plugging the 1.8 m (12 foot) base cord into the back of the Keyphone and also into the modular wall jack assembly.

Note: If the Keyphone is equipped with an LCD display then the day, date, time, and station number will appear on the display.

Table I: Keyphone Block Connections

25-Pair Cable		Connecting Block		Line Cord 2-Pair	Modular Jack	Station Port
Pin	Color Code	Term	Funcn			
26	White-Blue	1	Tip	White-Blue	Green	Station 1
1	Blue-White	2	Ring	Blue-White	Red	
27	White-Orange	3	DA1R	White-Orange	Black	Station 1
2	Orange-White	4	DA1T	Orange-White	Yellow	
28	White-Green	5	Tip	White-Blue	Green	Station 2
3	Green-White	6	Ring	Blue-White	Red	
29	White-Brown	7	DA2R	White-Orange	Black	Station 2
4	Brown-White	8	DA2T	Orange-White	Yellow	
30	White-Slate	9	Tip	White-Blue	Green	Station 3
5	Slate-White	10	Ring	Blue-White	Red	
31	Red-Blue	11	DA3R	White-Orange	Black	Station 3
6	Blue-Red	12	DA3T	Orange-White	Yellow	
32	Red-Orange	13	Tip	White-Blue	Green	Station 4
7	Orange-Red	14	Ring	Blue-White	Red	
33	Red-Green	15	DA4R	White-Orange	Black	Station 4
8	Green-Red	16	DA4T	Orange-White	Yellow	
34	Red-Brown	17	Tip	White-Blue	Green	Station 5
9	Brown-Red	18	Ring	Blue-White	Red	
35	Red-Slate	19	DA5R	White-Orange	Black	Station 5
10	Slate-Red	20	DA5T	Orange-White	Yellow	
36	Black-Blue	21	Tip	White-Blue	Green	Station 6
11	Blue-Black	22	Ring	Blue-White	Red	
37	Black-Orange	23	DA6R	White-Orange	Black	Station 6
12	Orange-Black	24	DA6T	Orange-White	Yellow	
38	Black-Green	25	Tip	White-Blue	Green	Station 7
13	Green-Black	26	Ring	Blue-White	Red	
39	Black-Brown	27	DA7R	White-Orange	Black	Station 7
14	Brown-Black	28	DA7T	Orange-White	Yellow	
40	Black-Slate	29	Tip	White-Blue	Green	Station 8
15	Slate-Black	30	Ring	Blue-White	Red	
41	Yellow-Blue	31	DA8R	White-Orange	Black	Station 8
16	Blue-Yellow	32	DA8T	Orange-White	Yellow	

Table II: Single-line Telephone Block Connections

25-Pair Cable		Connecting Block		Station Port
Pin	Color Code	Term	Function	
26	White-Blue	1	Tip	Station 1
1	Blue-White	2	Ring	
27	White-Orange			
2	Orange-White			
28	White-Green	5	Tip	Station 2
3	Green-White	6	Ring	
29	White-Brown			
4	Brown-White			
30	White-Slate	9	Tip	Station 3
5	Slate-White	10	Ring	
31	Red-Blue			
6	Blue-Red			
32	Red-Orange	13	Tip	Station 4
7	Orange-Red	14	Ring	
33	Red-Green			
8	Green-Red			
34	Red-Brown	17	Tip	Station 5
9	Brown-Red	18	Ring	
35	Red-Slate			
10	Slate-Red			
36	Black-Blue	21	Tip	Station 6
11	Blue-Black	22	Ring	
37	Black-Orange			
12	Orange-Black			
38	Black-Green	25	Tip	Station 7
13	Green-Black	26	Ring	
39	Black-Brown			
14	Brown-Black			
40	Black-Slate	29	Tip	Station 8
15	Slate-Black	30	Ring	
41	Yellow-Blue			
16	Blue-Yellow			

To Wall Mount a Keyphone

6.49 A base stand is used to wall mount a Keyphone.

- Position the base stand on the wall where the Keyphone is to be located with the large wedge down, and mark on the wall the location of the two keyhole slots.
- Install a 6 mm x 12 mm (#8 x 0.5 inch) pan-head screw at each marked location. Partially tighten the screws leaving approximately 6 to 8 mm protruding (approx. 0.25 inch).
- Attach the base stand to the underside of the Keyphone with the large wedge down. Position the Keyphone over the two mounting screws, with the screws inserted into the large slots in the keyholes. Slide the Keyphone down until it is tight and stable. Adjust the handset hanger clip.

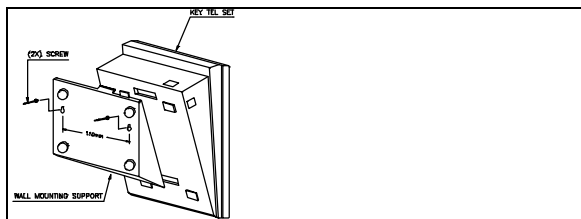


Figure 12: Mounting the Keyphone



Figure 13: Adjusting the Clip

DSS Unit Installation

6.50 The installation of a DSS Unit requires one Keyphone port. The DSS Unit is installed in the adjacent Keyphone port along from the Keyphone which the DSS Unit will work with.

e.g. Keyphone is port 11, then DSS Unit is port 12. Keyphone is port 18, then DSS Unit is port 21.

Refer to the *Programming Guide* - (Mode 73) Softkey Plan Programming.

Off-hook Voice Announce (OHVA)

6.51 Off-hook Voice Announce with Answer Back allows for calls to be announced while the user is on-line. The OHVA module takes an additional port on the station card and two extra wires in the base cord. There may be a maximum of 4 OHVA Keyphones per Keyphone Card (LCU).

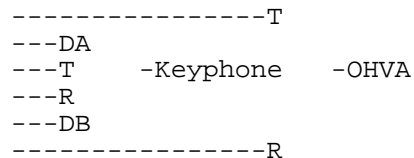
6.52 The Off-hook Voice Announce feature utilizes the tip and ring from an unused station port. It can be wired directly to the base cord jack of any OHVA equipped Keyphone.

Note: The idle station to be used must be at the opposite end of the station group.
(e.g. If Port 11 is to have OHVA, use the tip and ring from Port 18. If Port 12 is to have OHVA, use the tip and ring from Port 17, ...)

Keyphone Card (LCU)

<u>Keyphone</u>	<u>OHVA T&R</u>
Port 1	Port 8
Port 2	Port 7
Port 3	Port 6
Port 4	Port 5

Keyphone Jack Wiring



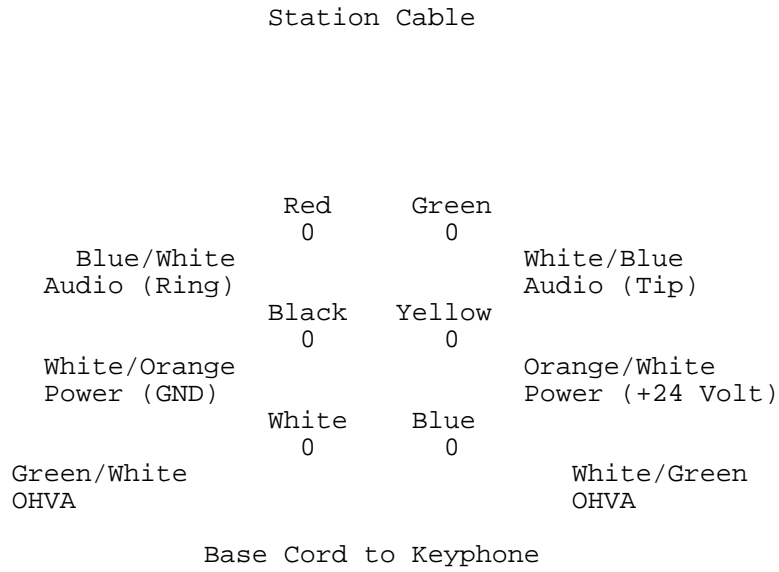


Figure 14: Off-hook Voice Announce Connection

Optional Equipment Connections

- 7.1 Connections for most optional equipment are made on the equipment terminal block located at the top inside the cabinet.

External Music Source

- 7.2 The system can use either an internal or external music source. The music source is selected by using the JP1 music select jumper located on the MMDF Card. (Refer to Figure 3)
- 7.3 Connect the music source output leads to the equipment terminal block. If required, connect the external music source controller leads to the equipment terminal block.

Note: DIP switch Element 2 controls the use of a set of dry relay contacts for music source power control (set to OFF) or loud bell ringer controller (set to ON).

Note: The impedance of the external music source must be less than 32 ohms with a power level of approximately 100 mW.

Paging Amplifier

- 7.4 Connect the paging amplifier input leads to the System Services Card (MMDF). This provides paging output for paging zone 8. The paging output for paging zones 1 - 7 must be connected through station ports assigned by system programming (Mode 89).
- 7.5 Amplifier control is provided only when paging zone 8 is activated. To control the amplifier for paging zone 8, connect the power control leads to the equipment terminal block. In the default state, the relay is open. The relay closes when a paging call is made to page zone 8. The power control relay is rated at a maximum of 3 amperes.

Loud Bell Ringer

- 7.6 Connect the loud bell ringer controller leads to the System Services Card (MMDF). In the default state, the relay is open. (Refer to Figure 3)

Note: DIP switch Element 2 controls the use of a set of dry relay contacts for music source power control (set to OFF) or loud bell ringer controller (set to ON).

Battery Backup

- 7.9 Install the battery package. Position it with the terminals within 2 feet of the lower left corner of the cabinet. Keep the battery dry and clean so avoid damp wet areas or areas where the battery may be easily damaged. **DO NOT connect the cable leads at this time.** (Refer to Figure 7)

Note: Use a 24 Volt Battery Pack with 40 Amp Circuit Breaker.

DANGER !!!: To reduce the risk of fire or injury to persons, read and follow these instructions:

- Do not dispose of the battery in a fire. The cell may explode. Check with local codes for possible special disposal instructions.
- Do not open the battery. Released electrolyte is corrosive and may cause damage to the eyes or skin. It may be toxic if swallowed.
- Exercise care in handling the battery in order not to short the battery with conducting materials such as rings, bracelets and keys. The battery may overheat and cause burns.
- Charge the battery provided with or identified for use with this product only in accordance with the instructions and limitations specified in this manual.
- Observe proper polarity orientation between the battery and the battery connecting terminals on the Main Cabinet.

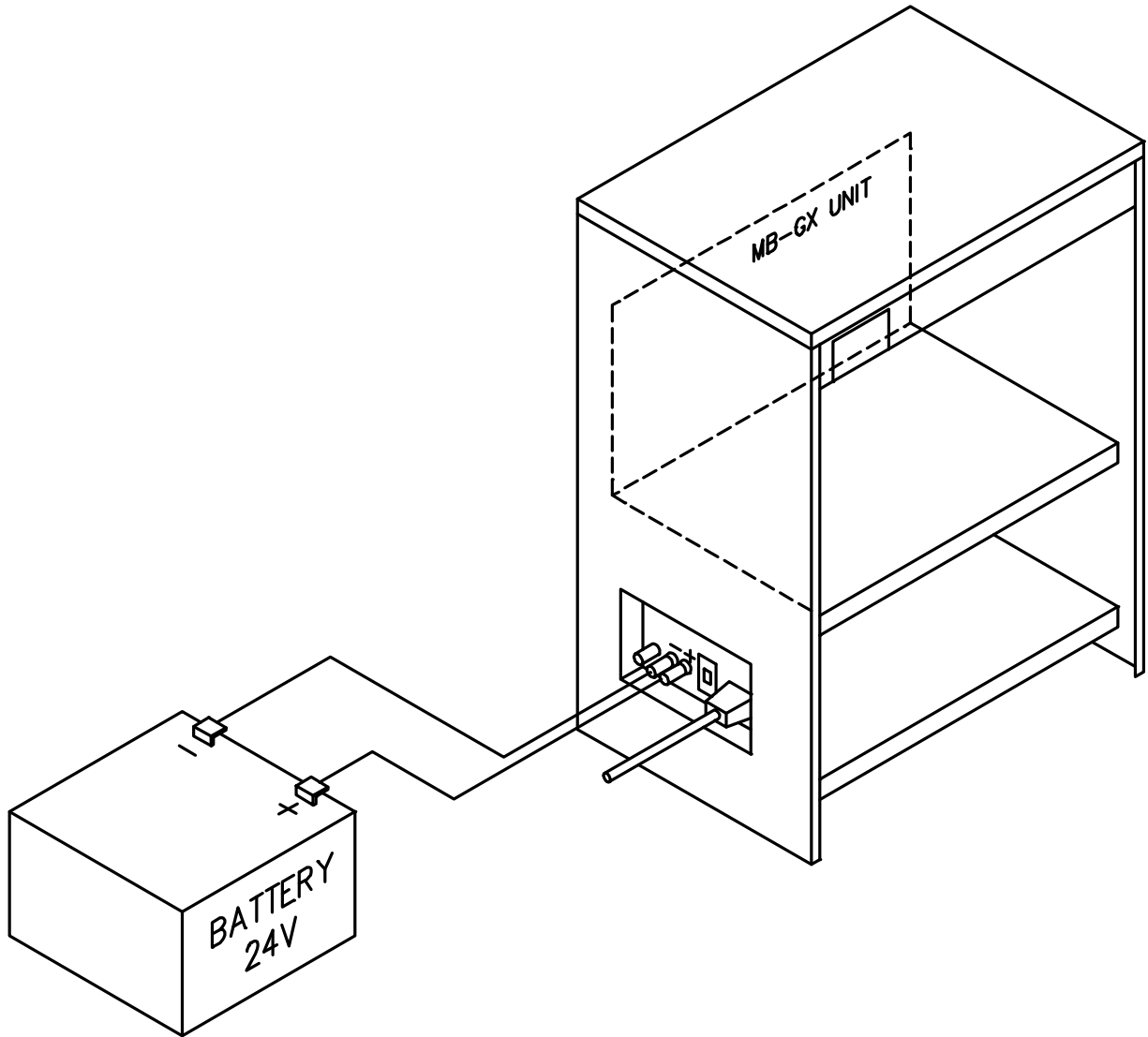


Figure 15: Battery Installation

SMDR Operation

- 8.1 The SMDR unit is an optional proprietary unit for providing Station Message Detail Records. It allows the user to analyze the systems telephone activity. The information is provided through either a parallel or serial port connection to a printer or computer. This information includes station number, trunk, telephone number dialed, account code, day and month, start time, duration and ring time. **A ribbon cable is furnished to connect the SMDR to the left side of the Main KSU.**
- 8.2 The SMDR also provides connections for the use of Line Reversal Detector (LRD) cards or Pulse Metering cards for accurate call duration and call costing respectively.

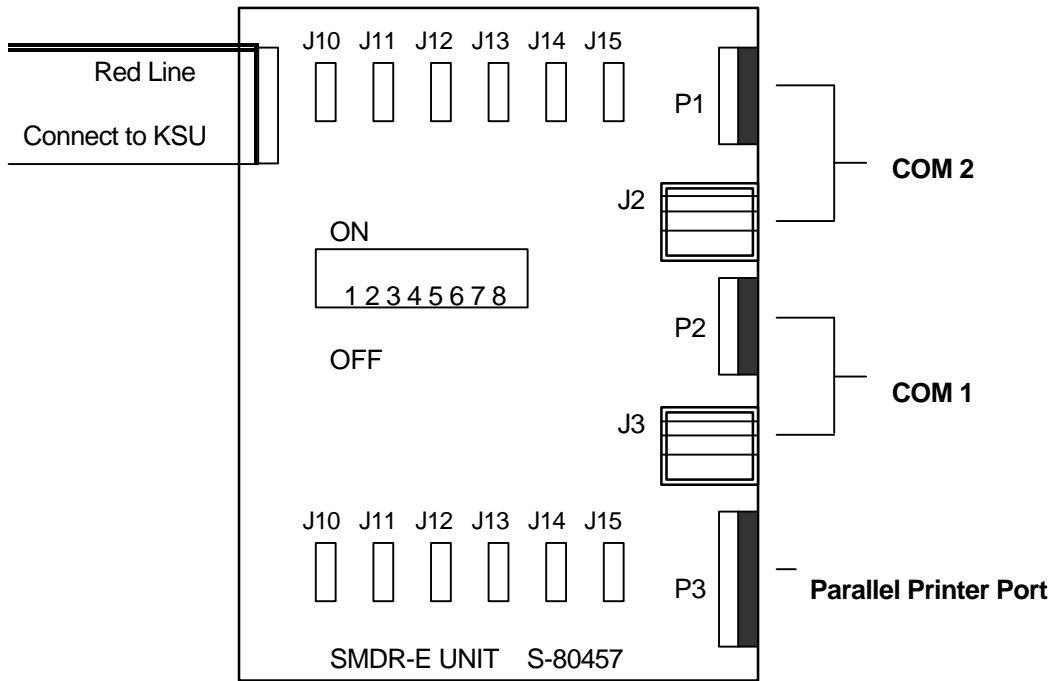


Figure 16: SMDR-E Unit

- J1** 34-pin flat cable connector to KSU
- P1/2** DB-9 connector (female) for industry standard RS-232C serial port to computer
- J2/3** 6-pin modular jack (alternate RS-232C serial port connection instead of P1/2)
- P3** DB-25 connector (female) for industry standard parallel printer connection
- J10-J15** Connectors for Detector cards for Trunks 1 - 24.

SMDR DIP Switch

- 8.3 The output of the SMDR unit is controlled by an 8 element DIP switch located on the SMDR unit and by system programming.

COM 1:

2. **Page Heading** - If DIP switch 2 is ON, the SMDR will do paging with a Page Header at the top of each page. If it is OFF, no paging will be done and the output will be continuous.
3. **Serial / Parallel output** - If DIP switch 3 is ON, the call records from the SMDR will be output via the Serial port. If it is OFF, then the call records will be output via the Parallel port. The call records must be set to Parallel when using PC Programming.
4. **Intercom Calls** - If DIP switch 4 is ON, the SMDR will print a record for each answered Intercom Call.
5. **Station Wake-up / Alarm Calls** - If DIP switch 5 is ON, the SMDR will print Station Wake-up / Alarm Calls.
6. **PC Programming Remote** - If DIP switch 6 is ON, then PC Programming is Remote.

COM 2:

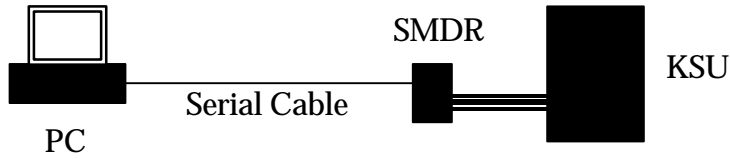
1. **Voice Mail Interface** - If DIP switch 1 is ON, the SMDR will support an SMDI Voice Mail Interface.

DIP switches 7 and 8 are currently not used.

SMDR Serial Output (RS-232C)

- 8.4 The SMDR unit provides Station Message Detail Records through either a parallel or serial port connection to a printer or computer. The serial port connection is an industry standard RS-232C serial port.

Setting: 1200 baud, 8 data bits, 1 stop bits, no parity



8.5 The serial port connection can be made either using the DB-9 Serial Connector (female) (P1/P2) or the 6-pin modular jack (J2/3).

COM1,COM2 (9 PIN)		J2,J3 (modular jack)		RS-232 ADAPTER (9 PIN)	
1	CD	1	TX	2	TX WHITE
2	TX	2	RX	3	RX BLACK
3	RX	3	RTS	5	GND BLUE
4	DSR	4	CTS	6	DTR YELLOW
5	GND	5	DTR	7	CTS GREEN
6	DTR	6	GND	8	RTS RED
7	CTS				
8	RTS				
9	RI				

SMDR to serial printer connections

RS-232 Adaptor	Serial Printer
TX	RXD
CTS	REV (Printer ready indication)
GND	GND

SMDR Format

8.7 The SMDR unit allows the user to analyze the systems telephone activity. This information includes station number, trunk, telephone number dialed, account code, day and month, start time, duration and ring time.

ST	TK	Telephone No.	TRF	Acc No.	Date	Start	Duration	Ring
100	1	29579711		113	10/12	10:10	1:10	
113	1	29579711			10/12	10:10	5:20	
143	4	*****		223344	10/12	11:26	12:16	0:15
***	6	*****			10/12	11:49		0:58
107		<station alarm>			10/12	12:15		
104		<intercom>		143	10/12	12:18		

Explanation:

- ST : Station number.
- TK : Trunk number.(20 digits)
- Telephone No. : "*****" represents an internal call.
- TRF : Transfer the call.
- Acc. No. : Account number.
- Date : Date of call (MM/DD).
- Start : Starting time of call (HH:MM).
- Duration : Length of calls (HH:MM:SS).
- Ring : Ring time for incoming call (MM:SS).

Case Explanation:

- 1) On October 12, 10:10 AM, Station 100 made an outgoing call on Trunk 1. The number dialed was 29579711. The conversation lasted 1 minute and 10 seconds and then the call was transferred to Station 113.
- 2) Station 113 continued the call on Trunk 1 for 5 minutes and 20 seconds. Total time on Trunk 1 was 6 minutes 30 seconds.
- 3) Incoming call on trunk 4 rang for 15 seconds and was answered by station 143. Account number 223344 was entered and the call lasted 12 minutes and 16 seconds.
- 4) Incoming call rang on Trunk 6 for 58 seconds but was not answered.
- 5) A station alarm rang Station 107 at 12:15 PM.
- 6) Station 104 completed an Intercom Call to Station 143 at 12:18 PM.

Connections for Detector Cards

8.8 The SMDR can be set to use Line Reversal Detector (LRD) cards or Pulse Metering cards for accurate call duration and call costing respectively. See (Mode 57) SMDR Detector Use, (Mode 58) Print Zero Pulses, and (Mode 59) SMDR Pulse Cost for setting System Programming to use Detector cards.

Note: The facility used by these Detector cards is supplied by the Central Office exchange, and is not available in every country.

- J9** Detector card for first Trunk Card (trunks 1 - 4).
- J8** Detector card for second Trunk Card (trunks 5 - 8).
- J7** Detector card for third Trunk Card (trunks 9 - 12).
- J6** Detector card for fourth Trunk Card (trunks 13 - 16).
- J5** Detector card for fifth Trunk Card (trunks 17 - 20).
- J4** Detector card for sixth Trunk Card (trunks 21 - 24).

Start-Up Procedure

9.1 The following paragraphs provide instructions for applying power to the system, performing initialisation, and verifying basic system functions. These procedures should be completed before the system is initialised and the database is changed by system programming to include the customers requirements.

Power-Up Procedure

9.2 Before applying power to the system, ensure that all Installation Configuration changes have been made and switches and straps are in proper position. Also check the interior that no loose or frayed wiring is present. All stations and trunk lines should be connected and wiring checked for circuit continuity.

9.3 To power up the system following installation:

- 1) Set the power 0/1 switch to off, '0' position. (Refer to Figure 7) The P.L. indicator lamp (red) is off.
- 2) At the AC wall receptacle and at the power receptacle on the lower left of the Main Cabinet, plug in the power supply cord.
- 3) Set the power 0/1 switch to on, '1' position. Observe the following:
 - P.L. indicator lamp (red) is on. (Refer to Figure 7)
 - Memory protection indicator on. (Refer to Figure 2)
 - Micro-processor scan indicator is flashing.
 - Trunk idle/busy status indicators are off.

Initialisation Procedure

Caution: *This procedure is intended for initial installation only. Performing the following steps will erase the database and load the default values.*

9.4 To initialise the system following installation:

- 1) Set the power 0/1 switch to off, '0' position. (Refer to Figure 7) The P.L. indicator lamp (red) is off.
- 2) Set system DIP switch element 1 to OFF.
- 3) Set the memory battery disconnect selector switch to OFF.
- 4) Set the power 0/1 switch to on, '1' position. Observe the following:
 - P.L. indicator lamp (red) is on. (Refer to Figure 7)
 - Memory protection indicator on. (Refer to Figure 2)
 - Micro-processor scan indicator is flashing.
 - Trunk idle/busy status indicators are off.
- 5) Set system DIP switch element 1 to ON.
- 6) Set the memory battery disconnect selector switch to ON (up). Memory protection indicator lamp (red) is on.

Battery Backup Connection

WARNING: *Improper battery connections will damage the power supply. Ensure that the proper polarity is maintained when connecting the battery cable leads to power supply terminal pair + BATTERY -.*

9.5 To connect the battery backup to the system following installation:

- 1) Set the power 0/1 switch to off, '0' position. (Refer to Figure 7) The P.L. indicator lamp (red) is off.

- 2) At the previously installed battery pack, connect the cables at the battery pack and connect the leads at terminals + BATTERY - on power supply unit located at the lower left of the Main Cabinet. Check the battery leads polarity at the battery and make sure the polarity is matched at the terminals (black = negative and red = positive). Route the cables through an open slot on the side of the cabinet.
- 3) Set the power 0/1 switch to on, '1' position. Observe the following:
 - P.L. indicator lamp (red) is on. (Refer to Figure 7)
 - Memory protection indicator on. (Refer to Figure 2)
 - Micro-processor scan indicator is flashing.
 - Trunk idle/busy status indicators are off.

Note: The system will automatically cut off the power supply from battery when the voltage gets too low, so that the battery can be later recharged.

System Test Procedure

- 9.6 The system test procedure is used to verify the operation of installed equipment and to provide a confidence check before programming the system. Before starting systems tests, ensure that the system is fully equipped and configured for operation as required by the customer, and that the Power-Up Procedure was accomplished successfully.

Station Equipment

- 9.7 Verify each telephone station for dial tone, voice transmission, and feature operation as follows:
- 1) Go off-hook. Dial tone should be received and the stations DSS button should be on (red).
 - 2) Dial the extension number of another station.

Keyphone calling keyphone when using voice announce.

- Dial tone should be removed when the first digit is dialed.
- The called station should receive a call announce alerting tone.

Station calling another station with normal intercom ringing.

- Dial tone should be removed when the first digit is dialed.
 - The called station should ring with ring-back tone received at the calling station.
 - Transmission should be normal when the call is answered.
- 3) Press the **RLS** key. Dial tone should be received.
 - 4) Go on-hook, all station status indicators on keyphones should be off.

Trunk Lines

- 9.8 Check trunk lines for incoming ringing, assignment appearances, and line clarity by seizing at outgoing line, and dialing back into the system, as follows:
 - 1) Go off-hook at a keyphone. Dial tone should be received and the stations DSS button should be on (red).
 - 2) Select trunk line key assigned by default. The trunk key indicator lights green, and outside dial tone is received.
 - 3) Dial the directory number of an idle trunk.
 - 4) The appropriate trunk line key on all keyphones should light red. The Console (default is port 11 - station 10 or 11) should start to ring.
 - 5) At the Console, answer the call and check for clarity.
 - 6) Put the trunk on hold and listen for the music-on-hold from the station that called in and adjust the volume using the **MUSIC VOLUME** control.

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