DX-1S DIGITAL PABX
Installation Manual

Version 6 - Draft 01

Revised

on

18 August, 1999

CONNECTION ELECTRONICS LTD.

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1.INTRODUCTION

This manual provides general installation procedures for DX-1S Digital PABX System. It is suggested that the technical persons should read these information thoroughly before beginning the installation. Also refer to Programming Manual for information about customizing the system for a particular site.

The Installation Manual is divided into the following sections :

- Introduction
- Installation Site Requirements
- Cabling
- Hardware Overview
- Hardware Installation
- Basic Hardware Test
- Upgrade System Software
- DX-1SU

2.INSTALLATION SITE REQUIREMENTS

The DX-1S Digital PABX System should be installed in any location which fulfill the following requirements.

2.1ENVIRONMENT REQUIREMENTS

The temperature and humidity of the operating environment should be within the following range :

	Operation Conditions	Storage Conditions
Temperature	0°C to 50°C	0°C to 50°C
Relative Humidity	0% to 90% noncondensing	20% to 95% noncondensing

Table 2-1 ENVIRONMENT REQUIREMENTS

2.2SPACE REQUIREMENTS

The minimum space between the surrounding surface and left panel, right panel and top panel of DX-1S System Cabinet should be greater than 100mm. The minimum space between the rear wall and the back panel should be greater than 250mm. The clearance is for ventilation and cables installation. It should leave at least 900mm space in front of the System Cabinet for the technician to install and replace the cards. It is advised to install the System Cabinet 300mm above the floor to avoid possible flooding. The Battery Backup Power Supply SPS-4820 and CAD600A have similar space requirement.

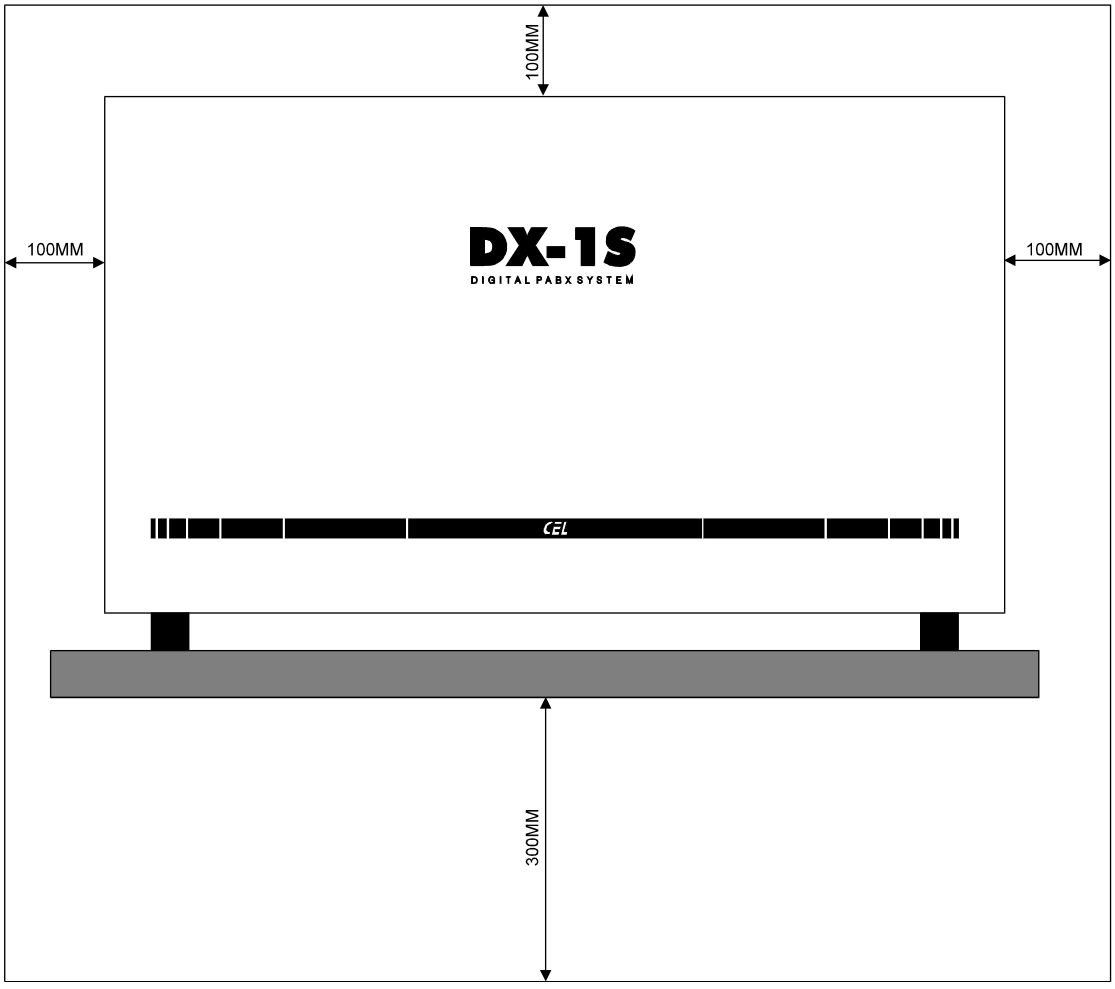


Figure 2-2.1 TOP AND SIDE PANEL CLEARANCE REQUIREMENT

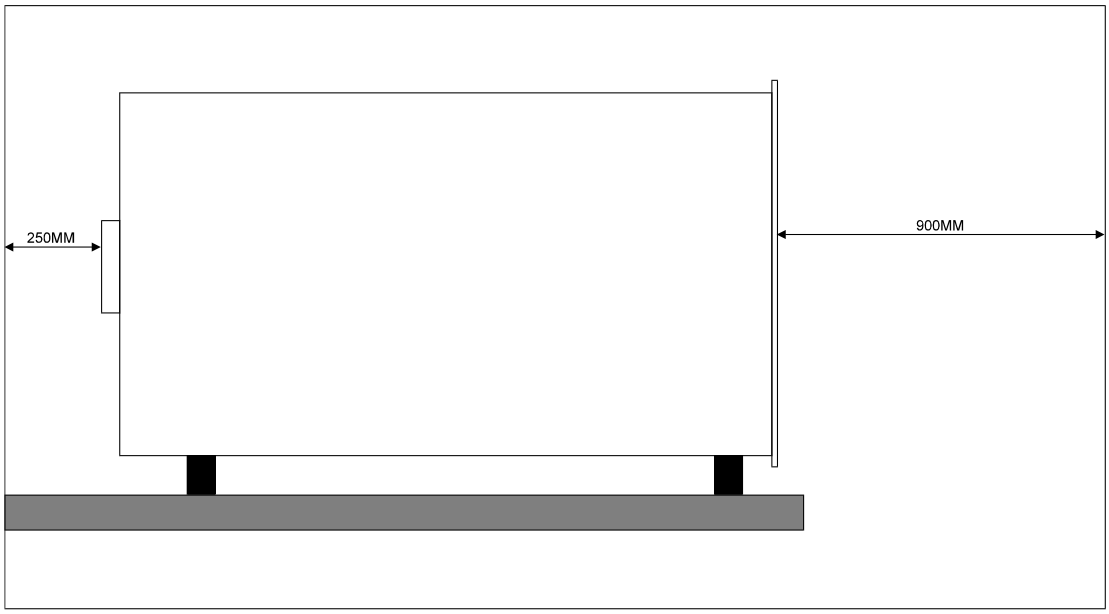


Figure 2-2.2 FRONT AND REAR PANEL CLEARANCE REQUIREMENT

2.3LOCATION REQUIREMENTS

There are some guide lines for location selection :

- Dry, clean and good ventilated.
- Easy accessible
- Not extreme heat or cold
- No direct sunlight
- No corrosive fumes or exhaust from machinery
- Not near a sprinkler system, sweating pipes, steam pipes or steam vents
- Not near a photocopier machine, blueprint equipment
- Not in passageways
- AC power available

2.4AC POWER REQUIREMENTS FOR AC/DC POWER SUPPLY

The AC/DC Power Supply requires a single phase 220V 50Hz AC main power. The AC power should meet the following requirements :

- The power socket is dedicated for system use and should not share with other equipment.
- The power socket should be able to draw 8A current capacity.
- The power socket must be a 3-wire type with ground wire connected to the ground of the electrical system.
- The power cord, power socket and plug should meet the electrical safety standard and requirement.
- It is advised to install an AC Surge Protector between power supply and AC power.
- The AC power regulation should meet the requirement of the AC/DC Power Supply. For SPS-4820 Power Supply, the AC power should be within AC 220V ±15 %, 50~60 Hz.
- For the region where the AC power is very unstable and fluctuate, it is advised to install the AC Regulator for the system.

2.5GROUNDING REQUIREMENTS

The System need a low resistance grounding system to bypass surge current. If the system ground is not well connected or the resistance is too high, the system will be damaged by external surge voltage, such as lightning, power line surge etc.. The grounding system should include a System Ground Terminal to concentrate all the hardware ground and connect to an approved building ground (such as cold water pipe etc.) directly using a #6 AWG insulated green wire. The total resistance must not be over 5 ohms.

2.6REQUIREMENTS OF AC POWER FOR MFC-1S CONSOLE

The MFC-1S Console requires a single phase 220V 50Hz AC main power. The AC power should meet the following requirements :

- The power socket is dedicated for system use and should not share with other equipment.
- The power socket should be able to draw 2A current capacity.
- The power socket must be a 3-wire type with ground wire connected to the ground of the electrical system.
- The power cord, power socket and plug should meet the electrical safety standard and requirement.
- It is advised to install an AC Surge Protector between the console and the AC power.
- The AC power regulation should be within AC 220V ±15 %, 50~60 Hz.
- For the region where the AC power is very unstable and fluctuate, it is advised to install the AC Regulator for the Console.

3.CABLING

3.1GENERAL PRECAUTIONS

- Use Module Distribution Frame (MDF) to concentrate all incoming and outgoing cables.
- Must install Gas Arrestor or Surge Protector for all the trunk lines to protect the system from surge damage.
- Must install Gas Arrestor or Surge Protector for extension lines which are installed outside the building.
- Must install Gas Arrestor or Surge Protector in all extension lines when the system is installed in the region where lightning happen very often.
- Verify there is no short circuit between the cables and ground. The short circuit may cause the system to damage or wrong operation.
- Verify there is no short circuit between cables after installation. The short circuit may cause the system to damage or wrong operation.
- The ground cables of MDF and Module System Cabinet must be well connected to low resistance approval building ground, otherwise the protective function of surge protection device will degrade or malfunction.
- Telephone cables run alongside or cross electricity power cables, the minimum separations shown below should be followed :
  a) 460mm from the high voltage (exceeding 650V measured to earth) cables.
  b) 102mm from the medium voltage (between 200V and 650V measured to earth) cables.
  c) 51mm from the low voltage (under 200V measured to earth) cables.

3.2MAXIMUM LENGTH OF EXTENSION CABLE & DOOR PHONE CABLE

The loop resistance for the extension lines including the telephone resistance should not be over 1200 ohms. The following table indicate a typical condition :

Maximum allow loop resistance	Telephone resistance	Conductor diameter	Cable loop resistance per km	Maximum cable length
1200 ohms	400 ohms	0.63mm	136 ohm/km	5.9km

Table 3-1 MAXIMUM LENGTH OF EXTENSION CABLE

3.3MAXIMUM LENGTH OF CONSOLE CABLE

The loop resistance for the console cable should not be over 40 ohms. The following table indicates a typical condition :

Maximum allow loop resistance	Conductor diameter	Cable loop resistance per km	Maximum cable length
40 ohm	0.63mm	136 ohm/km	294 meter

Table 3-2 MAXIMUM LENGTH OF CONSOLE CABLE

4.HARDWARE OVERVIEW

4.1SYSTEM HARDWARE ASSEMBLY CODE

Stock Code	Description	Marking
500-09004-1	DX-1S Module Mother Board	MMB
500-09005-1	DX-1S Module Control Card	MCC
500-09006-1	DX-1S Power Supply Card	PSC
500-09012-1	DX-1S TRK/EXT Card (4 Trk + 12 Ext)	T/E
500-09013-1	DX-1S EXT Card (16 Ext)	EXT
500-09015-1	DX-1S Module Accessories	
500-09020-1	DX-1S Cabinet	
500-09021-1	DX-1S DISA Voice Card	DVC
500-09025-1	MFC-1S Console	
500-09026-1	MFC-1S PC Interface Card	
500-09027-1	DX-1S Power Failure Transfer Module	PFT
500-09045-1	DX-1S Caller ID Card	CIC

Table 4-1 SYSTEM HARDWARE ASSEMBLY CODE

4.2HARDWARE CONFIGURATION

Every system with 240 lines installed should include the following hardware :

Item	No. of Module
DX-1S Module Mother Board	1
DX-1S Module Control Card	1
DX-1S Power Supply Card	1
DX-1S Module Accessories	1
DX-1S Cabinet	1
TRK/EXT Card + EXT Card	15
MFC-1S Console	1

Table 4-2 HARDWARE CONFIGURATION

4.3DX-1S MODULE MOTHER BOARD

4.3.1HARDWARE ASSEMBLY

DX-1S Module Mother Board includes the following hardware :

Assembly Included	Qty
DX-1S Module Mother Board	1

Table 4-3 DX-1S MODULE MOTHER BOARD ASSEMBLY

4.3.2DESCRIPTION

Module Mother Board is installed in the Cabinet. There are 17 slots connectors in the soldering side of the printed circuit board. The first slot is for Module Control Card and the last slot (17th slot) is for Power Supply Card. The remaining 15 slots (2nd to 16th) are universal to accommodate TRK/EXT Card and EXT Card. There are about 35 pieces of connectors for connection with line connectors, power input and console and external music input etc..

4.3.3DIP SWITCH SETTING

There is a 4-position Dip Switch in the Module Mother Board for system features setting.

Position	Function	ON	OFF	Factory Setting
1	Programming Mode Password	System default	User define	OFF
2	Hardware System Initialization	Initiate Programming Data	Normal	OFF
3	Expanded Mode	Slave	Master	OFF
4	Expanded Mode	Slave	Master	OFF

Table 4-4 MODULE MOTHER BOARD DIP SWITCH SETTING

4.4DX-1S MODULE ACCESSORIES

4.4.1DESCRIPTION

The Module Accessories include the connectors, card guides and accessories installed in the cabinet.

4.5DX-1S CABINET

4.5.1HARDWARE ASSEMBLY

DX-1S Cabinet includes the following hardware :

Assembly Included	Qty
DX-1S Cabinet	1
Hex Key	1

Table 4-5 DX-1S CABINET ASSEMBLY

4.5.2DESCRIPTION

The Cabinet includes a 19 inches (483mm) width metal cabinet. All the cards and boards should install inside the cabinet. The physical dimension is as following :

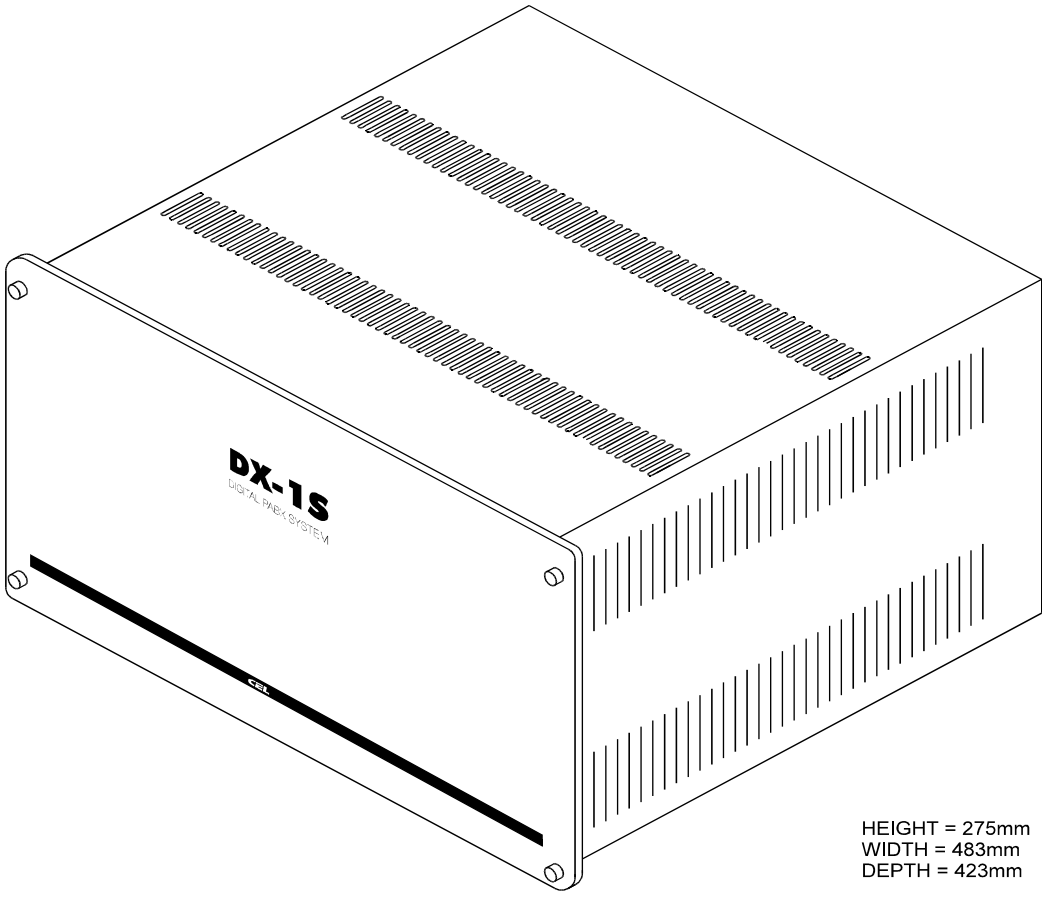


Figure 4-4.1 DX-1S CABINET PHYSICAL DIMENSION

4.5.3POWER SWITCH AND FUSE

A power switch and fuse are located at the rear panel of the cabinet and next to the power input connector. They are the power control of the module. In case of two or more module share one AC / DC power supply, the switch can turn on / off individual module.

The fuse rating is 5A slow blown type.

4.6DX-1S MODULE SYSTEM CABINET

4.6.1HARDWARE ASSEMBLY

DX-1S Module System Cabinet includes the following hardware :

Assembly Included	Qty
DX-1S Module Mother Board	1
DX-1S Module Accessories	1
DX-1S Cabinet	1
Hex Key	1

Table 4-6 DX-1S MODULE SYSTEM CABINET ASSEMBLY

4.6.2DESCRIPTION

The Module Mother Board, Module Accessories and Cabinet is assembled together to form a Module System Cabinet. The Module System Cabinet is ready for the cards to plug in and for the external cables to connect.

4.6.3CARD POSITION IN MODULE SYSTEM CABINET

There are 17 slots in the Module System Cabinet for the Power Supply Card, Module Control Card, Peripheral Cards installation as following :

Slot	Card Type	Marking	Qty
1	Module Control Card	MCC	1
2 - 16	Peripheral Cards	L01 - L15	15
17	Power Supply Card	PSC	1

Table 4-7 MODULE SYSTEM CABINET CARD SLOTS

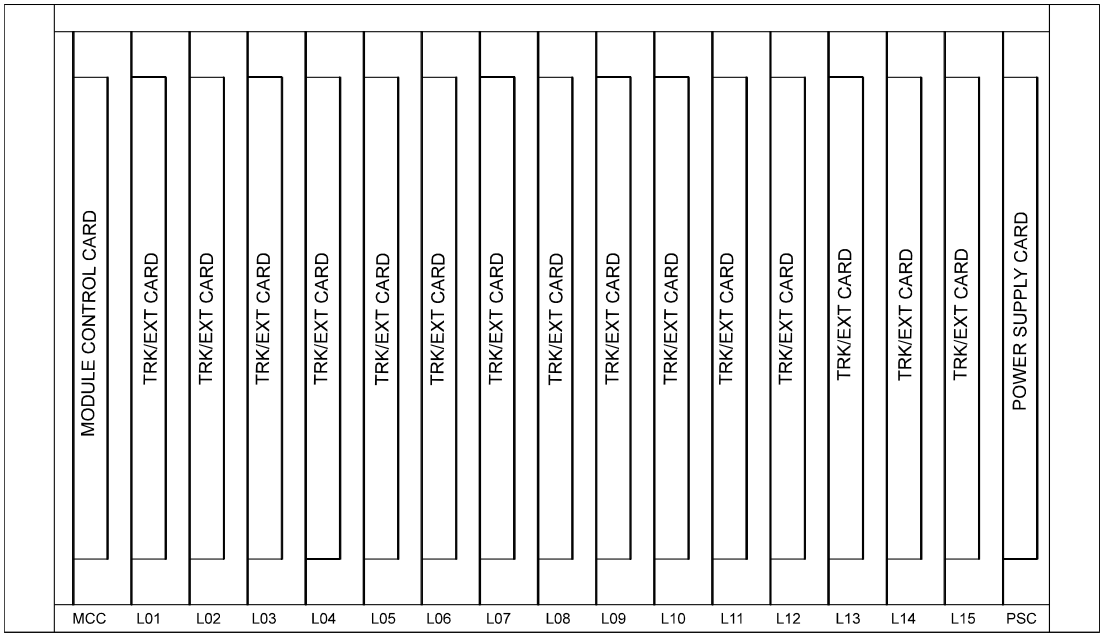


Figure 4-4.2 DX-1S MODULE SYSTEM CABINET FRONT VIEW

4.7DX-1S MODULE CONTROL CARD (MCC)

4.7.1HARDWARE ASSEMBLY

DX-1S Module Control Card includes the following hardware :

Assembly Included	Qty
DX-1S Module Control Card	1

Table 4-8 DX-1S MODULE CONTROL CARD ASSEMBLY

4.7.2DESCRIPTION

The Module Control Card is labeled as **MCC** in the card ejectors and is installed in the first slot of Module System Cabinet. This card includes the Central Processor (CPU), memory, system clock, digital switching crosspoint, DTMF receivers, tone generator and system control circuit. It performs all call processing and controls the peripherals for the entire system.

4.7.3INDICATION

There are one Green LED and one Red LED in the front edge of the card to indicate the card status as following :

Green LED	Red LED	Status
Flash (0.2s On, 2.8s Off)	Off	System is in initialization process
Flash (0.5s On, 0.5s Off)	Off	System running in Basic Mode
Flash (1.0s On, 1.0s Off)	Off	System running in Expanded Mode
On	On	CPU do not operate
Flash	Flash (0.5s On, 0.2s Off)	The system has found error in Programming Data and reset the data to default value.
Flash	Flash (0.2s On, 0.2s Off, 0.2s On, 0.5s Off)	The system has found the Flash PROM is failed.

Table 4-9 LED INDICATION IN MODULE CONTROL CARD

4.7.4SYSTEM SOFTWARE UPGRADE

The system may need to upgrade the system software to include the latest features. In order to upgrade the system software, U2, U37 and U79 integrated circuits in Module Control Card may need to be rewritten the content with new data or replaced with new version chips (Reference to Upgrade System Software section for details).

4.8DX-1S POWER SUPPLY CARD (PSC)

4.8.1HARDWARE ASSEMBLY

DX-1S Power Supply Card includes the following hardware :

Assembly Included	Qty
DX-1S Power Supply Card	1

Table 4-10 DX-1S POWER SUPPLY CARD ASSEMBLY

4.8.2DESCRIPTION

The Module Power Supply Card is installed in the last slot (17th slot) of Module System Cabinet and is labeled as **PSC** in the card ejectors. This card inputs DC -48V from the external AC/DC Power Supply and generates DC +5V, -5V and AC 75V 25Hz Ringing Voltage for the system.

4.8.3FUSE SETTING

There are three fuses for over current protection :

Fuse	Value	Function
F1	1.5A Quick Acting Fuse	Ring Module Input Protection
F2	2A Quick Acting Fuse	±5V Power Module Input Protection
F3	0.5A Quick Acting Fuse	Ring Module Output Protection

Table 4-11 POWER SUPPLY CARD FUSES VALUE

4.8.4INDICATION

PSC has 3 LEDs in the front edge of the card. They indicate the +5V, -5V and Ringing voltage output condition. If the LED turn on, it indicates the output from the card is normal.

4.9DX-1S TRK/EXT CARD - 4 TRK + 12 EXT (T/E)

4.9.1HARDWARE ASSEMBLY

DX-1S TRK/EXT Card includes the following hardware :

Assembly Included	Qty
DX-1S TRK/EXT Card	1

Table 4-12 DX-1S TRK/EXT CARD ASSEMBLY

4.9.2DESCRIPTION

TRK/EXT Card is one of the peripheral cards and is labeled as **T/E** in the card ejectors. It can be installed in second to sixteenth line card slots. Each card has 4 trunk interfaces and 12 telephone interfaces. The trunk and extension lines are connected to the card through the Line Connectors of Module System Cabinet.

4.9.3INDICATION

There are 16 Green LEDs in the front edge of the card to indicate the status of each trunk and extension. As the card is installed in Module System Cabinet, counting from up to down, the first four LEDs are Trunk LED and indicate the status of first four trunks. The following LEDs are Extension LED and indicate the hook status of the extensions. The first LED indicates the status of the first trunk and the second one indicates the second trunk and so on. The fifth LED indicates the hook status of the first extension in this card and the status of the following extensions are represented by the following LED.

The indication of Trunk LED is related to the polarity of trunk line. The polarity reversal and clear-back signal also affect the LED indication. The Trunk LED indicates the trunk status as following :

Trunk Status	LED Indication (Tip is positive and Ring is negative in idle condition)	LED Indication (Tip is negative and Ring is positive in idle condition)
On-Hook	On	On
Ringing	Flash in ring frequency	Flash in ring frequency
Off-Hook	Off	On
Polarity Reversed	From Off change to On	From On change to Off
Clear-Back	From On change to Off	From Off change to On

Table 4-13 INDICATION OF TRUNK LED IN TRK/EXT CARD

When the Extension LED turn on, it indicates the telephone connected to this extension is off-hook. The LED turn off indicates the extension is ringing or in on-hook status.

LED	Extension Status
On	Off-Hook
Off	On-Hook
Off	Ringing

Table 4-14 INDICATION OF EXTENSION LED IN TRK/EXT CARD

4.10DX-1S EXT CARD - 16 EXT (EXT)

4.10.1HARDWARE ASSEMBLY

DX-1S EXT Card includes the following hardware :

Assembly Included	Qty
DX-1S EXT Card	1

Table 4-15 DX-1S EXT CARD ASSEMBLY

4.10.2DESCRIPTION

EXT Card is one of the peripheral cards and is labeled as **EXT** in the card ejectors. It can be installed in any line card slots (2nd ~ 16th slots). Each card has 16 telephone interfaces. The extension lines are connected to the card through the Line Connectors of Module System Cabinet.

4.10.3INDICATION

There are 16 Green LEDs in the front edge of the card to indicate the hook status of each extension. As the card is installed in Module System Cabinet, counting from up to down, the first LED indicates the first extension hook status and the second one indicates the second extension and so on.

The LED turn on indicates the telephone connected to this extension is in off-hook status. The LED turn off indicates the extension is ringing or in on-hook status.

LED	Extension Status
On	Off-Hook
Off	On-Hook
Off	Ringing

Table 4-16 LED INDICATION IN EXT CARD

4.11DX-1S CALLER ID CARD (CIC)

4.11.1HARDWARE ASSEMBLY

DX-1S Caller ID Card includes the following hardware :

Assembly Included	Qty
DX-1S Caller ID Card	1

Table 4-17 DX-1S CALLER ID CARD ASSEMBLY

4.11.2DESCRIPTION

Caller ID Card is one of the peripheral cards and is labeled as **CIC** in the card ejectors. It can be installed in any line card slots (2nd ~ 16th slots). Caller ID card provides Caller ID display of intercom call and also incoming trunk call. Each card has 8 CIC channels and each CIC channel include a FSK and DTMF Caller ID receiver and a FSK Caller ID transmitter.

The CIC channels are required to connect to trunk lines (in parallel) in order to provide Caller ID display of incoming trunk call. CIC channels are output at the Line Connectors of Module System Cabinet.

4.11.3INDICATION

There are 8 Green LEDs in the front edge of the card to indicate the status of each CIC channel. As the card is installed in Module System Cabinet, counting from top to bottom, the first LED indicates the first CIC channel status and the second one indicates the second CIC channel and so on.

The LED turn on indicates the CIC channel is ready. The LED turn off for about two second indicates the CIC channel is sending out Caller ID information. Blinking LED indicates CIC channel is receiving FSK Caller ID information at trunk port. If the LED is always off, it indicates the CIC channel has problem.

LED	CIC Channel Status
On	Ready
2s Off	Sending Caller ID information
Blinking	Receiving FSK Caller ID information
Always off	Has problem

Table 4-18 LED INDICATION IN CALLER ID CARD

4.12SPS-4820 BATTERY BACKUP POWER SUPPLY

4.12.1HARDWARE ASSEMBLY

For SPS-4820 Battery Backup Power Supply includes the following hardware :

Assembly Included	Qty
SPS-4820 Power Supply	1
Power Cord with Built-in Surge Protection Module	1

Table 4-19 SPS-4820 BATTERY BACKUP POWER SUPPLY ASSEMBLY

4.12.2DESCRIPTION

SPS-4820 Battery Backup Power Supply is a separate device. It should be installed near Module System Cabinet. The Power Supply inputs 220 AC power, generates DC -48V for the System and charges up the backup batteries. Once the AC power is failed, the Power Supply will switch to the backup batteries automatically and draw the current to the System without interruption until the AC power is recovered.

4.12.3OPERATION

There are a voltmeter and ammeter in the front panel to indicate the output voltage and current.

The push button labeled as “POWER” in the front panel is the power switch of the Power Supply. It is tackle operation - push the button will turn on the power and push again will turn off. The AC Power LED will turn on when the power supply is in operation.

If the AC Power is in failure, the Power Supply will switch to the backup batteries automatically and draw the current to the System without interruption until the AC power is recovered. The internal buzzer will output alarm signal every 20 seconds to indicate the batteries are in operation if the batteries have connected.

The push button labeled as “EQU” is to enable the Equalization Charge Mode. The EQU LED indicates if the Equalization Charge mode is activated.

The I/P ALARM and O/P ALARM LED indicates if the protection function is activated.

The output voltage can be adjusted by the trimmer labeled as “O/P ADJ” in the front panel to meet different batteries requirement.

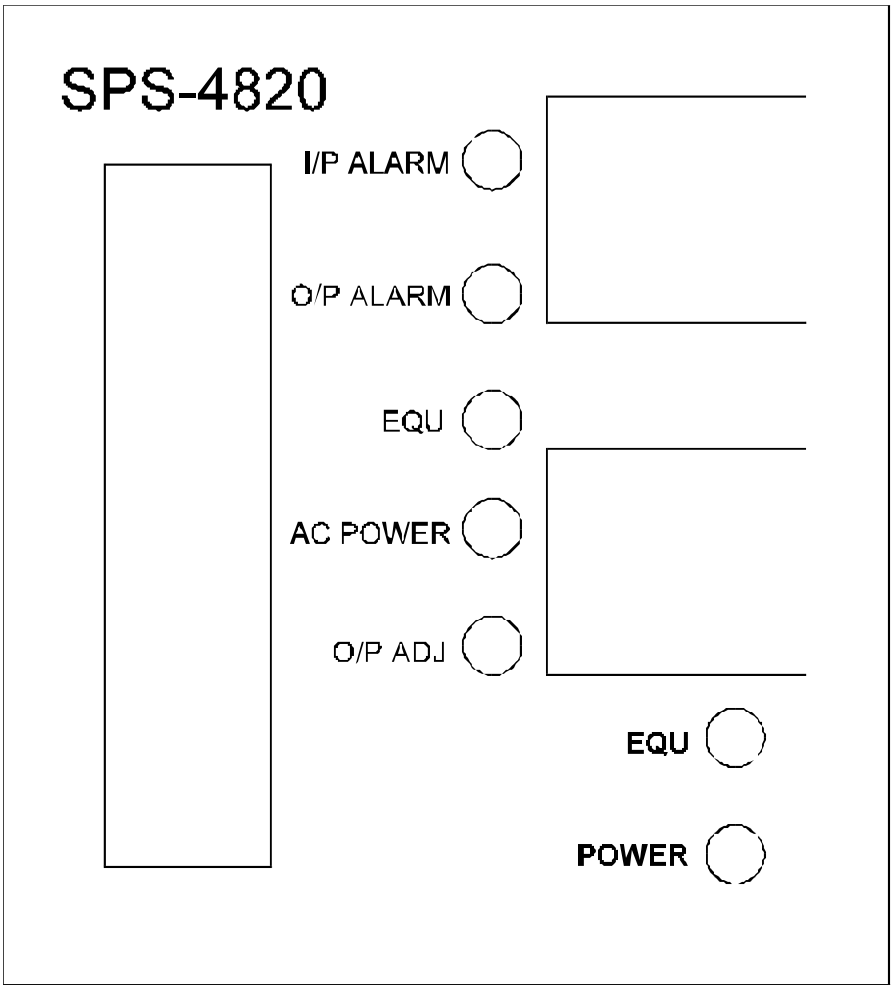


Figure 4-4.3 SPS-4820 POWER SUPPLY FRONT PANEL

4.12.4INPUT VOLTAGE PROTECTION

If the AC input voltage is lower than 170V or higher than 255V when switching on, the Power Supply will shut down the output, the I/P Alarm Red LED will light up and the internal buzzer will output alarm signal to indicate the alarm condition. The Power Supply will restart when the AC input voltage come to normal range.

When the Power Supply is ON, the Power Supply will still monitor if the AC input voltage is lower than 165V or higher than 285V. When the input voltage is out of the range, the Power Supply will shut down the output, the I/P Alarm Red LED will light up and the internal buzzer will output alarm signal to indicate the alarm condition. As the input voltage falls into the acceptable range, the Power Supply will recover to normal condition.

4.12.5OUTPUT OVER-VOLTAGE PROTECTION

The power supply includes output over-voltage protection. If the output voltage is higher than 59 voltage, the Power Supply will shut down the output, the O/P Alarm Red LED will light up and the internal buzzer will output alarm signal to indicate the alarm condition. The Power Supply can be reset to normal condition by switching off and then switching on the system again.

4.12.6BATTERY OVER-DISCHARGE PROTECTION

The Power Supply also includes output low-voltage protection to protect the backup batteries from over discharge. Once the AC power is failed, the Power Supply will switch to the backup batteries automatically and will draw the current to the System without interruption until the AC power is recovered. The protection circuit will monitor the output voltage. If the output voltage is under 42V, the protection circuit will shut down the output to avoid damaging the batteries. The O/P Alarm Red LED will light up and the internal buzzer will output alarm signal to indicate the alarm condition. If the AC power recovers and the power supply will charge up the batteries. The power supply will not output voltage to the system until the batteries has charged up to 46V.

4.12.7EQUALIZATION CHARGE MODE

Since the backup batteries is always in standby condition but seldom discharge, the batteries will become inactive and the capacity gradually decrease. The Equalization Charge activates the chemical and electrochemical of the batteries and recover the capacity. The Equalization Charge is to increase the charging voltage by 2.5V (56V charging voltage) to charge up the batteries. It is advised to refresh the batteries by using Equalization Charge once a year. SPS-4820 Power Supply includes the Equalization Charge mode. Push the EQU button in the front panel and the power supply will activate the Equalization Charge mode and the EQU LED turn on. The power supply will terminate this mode and switch to normal condition after 8 hour. It can also terminate the Equalization Charge Mode manually by pushing the EQU button.

4.12.8INPUT AND OUTPUT

There is a AC inlet for connection with 220V AC power. The 4 Way Output Terminal Block is for battery and -48V output connection.

4.12.9POWER CORD WITH BUILT-IN SURGE PROTECTOR

There is a Power Cord with Built-in Surge Protector for the Power Supply. The cord connects the Power Supply to AC power socket, filters out the high voltage surge in AC power line and protects the Power Supply from damage.

4.12.10SPECIFICATION

Parameter	Minimum Value	Typical Value	Maximum Value
AC Input Voltage	170V AC	220V AC	285V AC
AC Input Frequency	47Hz		63Hz
Max. Input Current		8A	
Input Undervoltage Protection Threshold		170V AC	
Input Overvoltage Protection Threshold		265V AC	
Output Voltage	53V DC	53.3V DC	54V DC
Adjustable Output Voltage Range	50V DC		56V DC
Max. Output Current		20A	
Load Regulation			1%
Line Regulation			0.5%
Overcurrent Protection Threshold	20.5A		22A
Output Noise (0~20MHz)		80mV p-p	150mV p-p
Output Ripple (weighed)		0.5mV rms	2mV rms
Efficiency		85%	
Battery Undervoltage Protection Threshold	41.5V DC	42V DC	42.5V DC
Output Overvoltage Protection Threshold	58V DC	59V DC	60V DC
Weight		5.4KG	

Table 4-20 SPS-4820 POWER SUPPLY SPECIFICATION

The user can use a similar power supply which has compatible specification to replace SPS-4820.

4.12.11BATTERY CAPACITY

The backup time duration is depended on battery capacity. The battery capacity via backup time is shown as following table. The Backup time in the table is an approximation only, since different traffic of the system will give different result.

Battery Capacity	Backup time (120 ports)	Backup time (240 ports)
10AH	6 hours	4.5 hours
20AH	12 hours	9 hours
40AH	25 hours	18 hours
80AH	50 hours	36 hours

Table 4-21 BACKUP TIME AGAINST BATTERY CAPACITY

4.13CAD600A BATTERY BACKUP POWER SUPPLY

4.13.1HARDWARE ASSEMBLY

For CAD600A Battery Backup Power Supply includes the following hardware :

Assembly Included	Qty
CAD600A Power Supply	1
Power Cord	1

Table 4-22 CAD600A BATTERY BACKUP POWER SUPPLY ASSEMBLY

4.13.2DESCRIPTION

CAD600A Battery Backup Power Supply is a separate device. It should be installed near Module System Cabinet. The Power Supply inputs 220 AC power, generates DC -48V for the System and charges up the backup batteries. Once the AC power is failed, the Power Supply will switch to the backup batteries automatically and draw the current to the System without interruption until the AC power is recovered.

4.13.3OPERATION

There has a 3 digits LED display in the front panel to indicate the output voltage and current. The push button labeled VOLTAGE / CURRENT under the LED display is used to toggle the display between voltage and current.

The switch labeled as “POWER” in the front panel is the power on/off switch. The AC I/P LED will turn on when AC power input is presence.

If the AC Power is in failure, the Power Supply will switch to the backup batteries automatically and draw the current to the System without interruption until the AC power is recovered

The push button labeled as “FLOAT CHARGER / BOOST” is to select Float charge or Boost charge Mode.

The 4 LEDs located in the middle of front panel is for power supply operation condition and alarm indication.

- “NORMAL” : Green LED indicator is on to indicate normal output operation in the presence of AC input or the battery is discharging without the presence of AC input
- “HIGH VOLTS ALARM”: Red LED indicator flashes to indicate output voltage higher than 58V. The red LED flashes more rapidly as the loading increases

  Yellow LED indicator is on to indicate AC input higher than 270V and the power supply has shutdown.
- “LOW VOLTS ALARM”: Red indicator is on to indicate output voltage or battery voltage lower than 43V.
- “OFF BATERY”: Red LED indicator is on to indicate battery has discharged to lower than 42V. To protect the battery from over-discharge, the protection relay is open to cut off the battery discharge.

The output voltage can be adjusted by the trimmer labeled as “VOLT ADJUST” in the front panel to meet different batteries requirement.

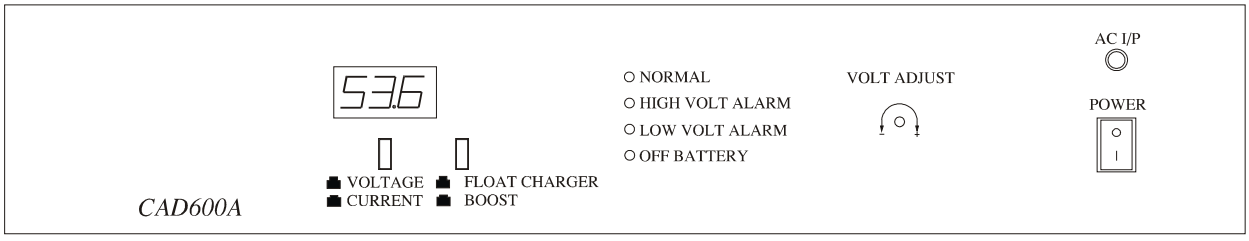


Figure 4-4.4 CAD600A POWER SUPPLY FRONT PANEL

4.13.4INPUT VOLTAGE PROTECTION

If the AC input voltage is higher than 270V when switching on, the Power Supply will shut down the output, the “HIGH VOLTS ALARM” will change to yellow. The Power Supply will restart when the AC input voltage return to normal range.

4.13.5OUTPUT OVER-VOLTAGE PROTECTION

The power supply includes output over-voltage protection. If the output voltage is higher than 58 voltage, the output will stay in the "Hiccup" mode. The "HIGH VOLTS ALARM" red LED flashes more rapidly as the loading increases. The output will recover once it is lower than 58V.

4.13.6BATTERY OVER-DISCHARGE PROTECTION

The Power Supply also includes output low-voltage protection to protect the backup batteries from over discharge. Once the AC power is failed, the Power Supply will switch to the backup batteries automatically and will draw the current to the System without interruption until the AC power is recovered. The protection circuit will monitor the output voltage. If the output voltage is under 42V, the protection circuit will cut off the battery to avoid damaging the batteries. The "OFF BATTERY" Red LED will light up. If the AC power recovers and the power supply will charge up the batteries.

4.13.7BOOST CHARGE MODE

Since the backup batteries is always in standby condition but seldom discharge, the batteries will become inactive and the capacity gradually decrease. The Boost Charge activates the chemical and electrochemical of the batteries and recover the capacity. The Boost Charge is to increase the charging voltage by 2.5V (56V charging voltage) to charge up the batteries. It is advised to refresh the batteries by using Boost Charge once a year. CAD600A Power Supply includes the Boost Charge mode. Push the "FLOAT CHARGER / BOOST" button in the front panel and the power supply will activate the Boost Charge mode. It can terminate the Boost Charge Mode by pushing the button again. The Boost Charge process should last about 8 hours.

4.13.8INPUT AND OUTPUT

There is a AC inlet for connection with 220V AC power. The two 2-Way Output are for battery and -48V output connection.

4.13.9SPECIFICATION

Parameter	Minimum Value	Typical Value	Maximum Value
AC Input Voltage	160V AC	220V AC	270V AC
AC Input Frequency	47Hz		440Hz
Max. Input Current		5A	
Input Overvoltage Protection Threshold		270V AC	
Output Voltage	53V DC	53.5V DC	54V DC
Adjustable Output Voltage Range	43V DC		57V DC
Max. Output Current		10.5A	
Load Regulation		0.4%	1%
Line Regulation		0.1%	1%
Overcurrent Protection Threshold	11A		13A
Output Noise (0~20MHz)		< 100mV p-p	
Efficiency		85%	
Battery Undervoltage Protection Threshold	41V DC	42V DC	43V DC
Output Overvoltage Protection Threshold	58V DC	59V DC	60V DC
Weight		6.5KG	

Table 4-23 CAD600A POWER SUPPLY SPECIFICATION

The user can use a similar power supply which has compatible specification to replace CAD600A.

4.13.10BATTERY CAPACITY

The backup time duration is depended on battery capacity. The battery capacity via backup time is shown as following table. The Backup time in the table is an approximation only, since different traffic of the system will give different result.

Battery Capacity	Backup time (120 ports)	Backup time (240 ports)
10AH	6 hours	4.5 hours
20AH	12 hours	9 hours
40AH	25 hours	18 hours
80AH	50 hours	36 hours

Table 4-24 BACKUP TIME AGAINST BATTERY CAPACITY

4.14MFC-1S PC INTERFACE CARD WITH CONSOLE SOFTWARE

4.14.1HARDWARE ASSEMBLY

MFC-1S PC Interface Card includes the following hardware :

Assembly Include	Qty
MFC-1S PC Interface Card Installed	1
4-Core Cable with RJ-11 Modular Jack	1
MFC-1S System Software Disk	1
MFC-1S Reset Disk	1

Table 4-25 MFC-1S PC INTERFACE CARD ASSEMBLY

4.14.2CONFIGURING MFC-1S PC INTERFACE CARD

You can install the console in the following order

- Setup Hardware Interrupt Level (JP1, the jumper block to set interrupt level).
- The default hardware interrupt level (IRQ) is 7; PIN1, PIN 2 and PIN 6 are shorted.

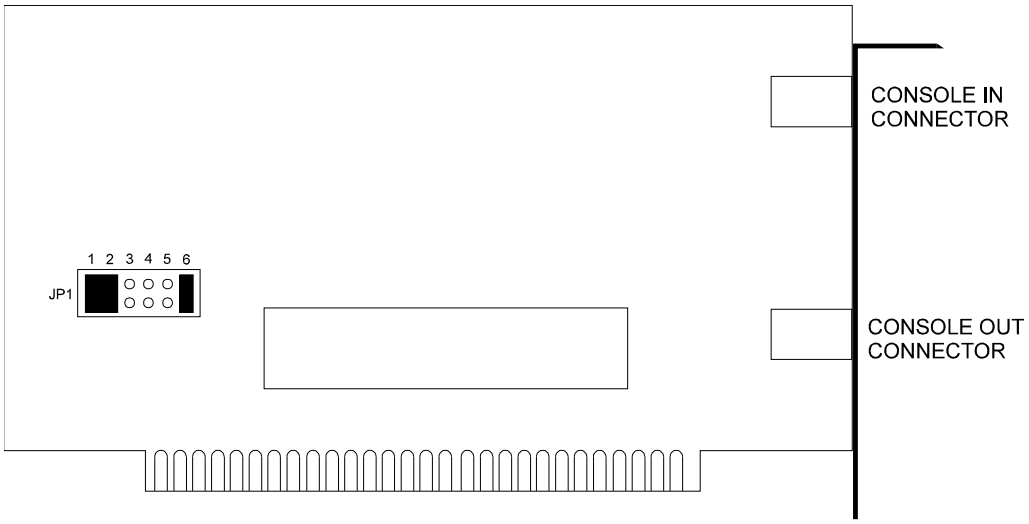


Figure 4-4.5 MFC-1S PC INTERFACE CARD

4.14.3DESCRIPTION

The MFC-1S PC Interface Card is an optical isolated serial port card. It installed in a standard PC station to form a MFC-1S Console. The console system will transmit or receive the system data through the PC Interface Card to communicate with DX-1S System. Since the communication ports in the card are optical isolated, they prevent the surge which induces in the console bus to damage the system.

The MFC-1S System Software Package includes a console software diskette and a reset diskette. The Console Software to operate the Console. The Reset Disk is used to reset the Console Setup Mode Password to default value in case the user had programmed his/her own password but lost it.

4.14.4CONNECTORS IN MFC-1S

There are two MJ-64 Module Socket connectors on the card for connection with DX-1S System and another console. The Console-in connector is for connection with DX-1S System or the prior console. The Console-out connector is to connect the next console.

4.15MFC-1S CONSOLE

4.15.1HARDWARE ASSEMBLY

MFC-1S PC Console is a dedicated operator console for DX-1S System. The Console includes the following hardware :

MFC-1S Console include	Qty
PC Computer Station with MFC-1S PC Interface Card Installed	1
9" VGA Monochrome Monitor	1
Numeric Keyboard	1
4-Core Cable with RJ-11 Modular Jack	1
Power Cord	1
MFC-1S System Software Disk	1
MFC-1S Reset Disk	1

Table 4-26 MFC-1S CONSOLE ASSEMBLY

Instead of buying the whole console system, the user can order a MFC-1S PC Interface Card and Console Software Package to install in a standard PC station to form a MFC-1S Console.

There are two versions of MFC-1S which have the same function but with different type of connectors for different ports.

4.15.2DESCRIPTION

MFC-1S is a multi-function operator console which provides the following functions :

- Display Function : System Status
  Busy Lamp Field
  Clock Display
  Extension Status Inquiry
  Incoming Call Identification
- Operator Call Processing
- Access System Programming
- Access System Maintenance
- Access System Diagnostic
- Extension Feature Setting
- SMDR Data Printout
- Programming Data Printout

4.16DX-1S DISA VOICE CARD

4.16.1HARDWARE ASSEMBLY

DX-1S DISA Voice Card includes the following hardware :

Assembly Include	Qty
DX-1S DISA Voice Card	1

Table 4-27 DX-1S DISA VOICE CARD ASSEMBLY

4.16.2DESCRIPTION

The DISA Voice Card is installed in Module Control Card. Each Module Control Card can install up to three DISA Voice Cards.

Each card has two channels. Each channel includes a fax signal detector, a voice chip for voice messages storage, DTMF detector and tone detector. Every channel can record four messages with total length of 90 seconds.

The DISA Voice Card provides the following features :

- DISA with Voice Message
- Trunk No Answer Voice Announcement
- Voice Message Recording

4.17DX-1S POWER FAILURE TRANSFER MODULE

4.17.1HARDWARE ASSEMBLY

DX-1S Power Failure Transfer Module includes the following hardware :

Assembly Include	Qty
DX-1S Power Failure Transfer Card	1
DX-1S Power Failure Transfer Module Panel	1

Table 4-28 DX-1S POWER FAILURE TRANSFER MODULE ASSEMBLY

4.17.2DESCRIPTION

The Power Failure Transfer Module is installed in the Lower Rear Panel of Module System Cabinet. The module includes 12 sets of switch and connect 12 sets of extension telephones to the extension ports in normal condition to perform extension function. If the power failure condition is happened or the module is switched to OFF condition manually, the module will disconnect the circuit between the telephones & extension ports and will connect the telephones directly to the trunk lines. This feature allows the telephones directly connect to the trunk lines during the system is temporary down for maintenance purpose or in power failure condition, so that some telephones will be able to make outgoing calls or receive incoming calls.

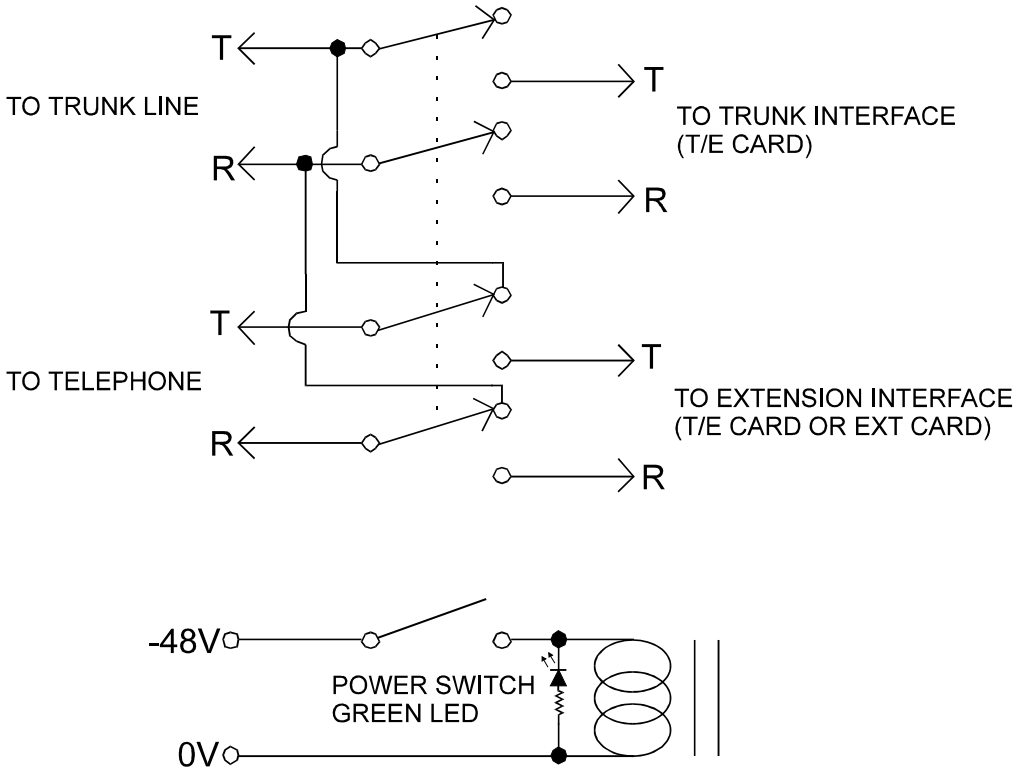


Figure 4-4.6 DX-1S POWER FAILURE TRANSFER MODULE CIRCUIT DIAGRAM

5.HARDWARE INSTALLATION

5.1BASIC PRECAUTIONS FOR INSTALLATION

- Before installing or replacing the cards, the ground connection of Module System Cabinet must be well connected.
- When installing or replacing the cards to Module System Cabinet, ensure the power has switched off.
- Do not touch the board components or connectors without static-discharge precautions.
- Wear antistatic wrist strap when handling the cards.
- Handle the cards by the edges and avoid contact the components and connectors.
- The cards should be placed in anti-static package when not in use.
- Retain the packing material until the installation completed.

5.2PREPARE BASIC INSTALLATION

- Identify all trunk lines, extension lines, door phone lines and other equipment to be connected to the system.
- Confirm the system configuration and determine the quantities and types of the cards to be installed.
- Prepare the wiring diagram and connection table for the cables in MDF.
- Select the location for system installation (Reference to Installation Site Requirements Section).
- Install the shelf or rack for placing Module System Cabinet, Power Supply, MDF and backup batteries.
- Install System Ground Terminal to concentrate all hardware ground.
- Use #14 AWG cables to connect different hardware separately to System Ground Terminal.
- Connect an approved building ground (cold water pipe etc.) directly using a #6 AWG insulated green wire to the system location but do not connect to System Ground Terminal before the verification of ground connection.
- The MDF protection ground should be connected to System Ground Terminal directly using a #10 AWG insulated green wire.
- All conductive assemblies, such as doors, shelves, racks and similar assemblies should connect to System Ground Terminal.
- Install a 10A circuit breaker for system power ON/OFF control and over-current protection.
- Install AC power socket for the system.
- Install the trunk lines to MDF.
- Install the extension lines of telephones and door phone to MDF.
- Install the equipment to provide external music source and connect the output to MDF.
- Install the Paging Amplifier System to provide paging function and connect the input to MDF.
- Connect the door lock control lines to MDF.
- Install the 32-core cables with 36 way centronic plug connectors from MDF to Module System Cabinet for Line Connectors connection.
- Install the 4-core cable with 9 way D-type female connector from MDF to Module System Cabinet for Console Connector connection.
- Install the 6-core cable with 9 way D-type male connector from MDF to Module System Cabinet for Music/Page/Relay Connector connection.

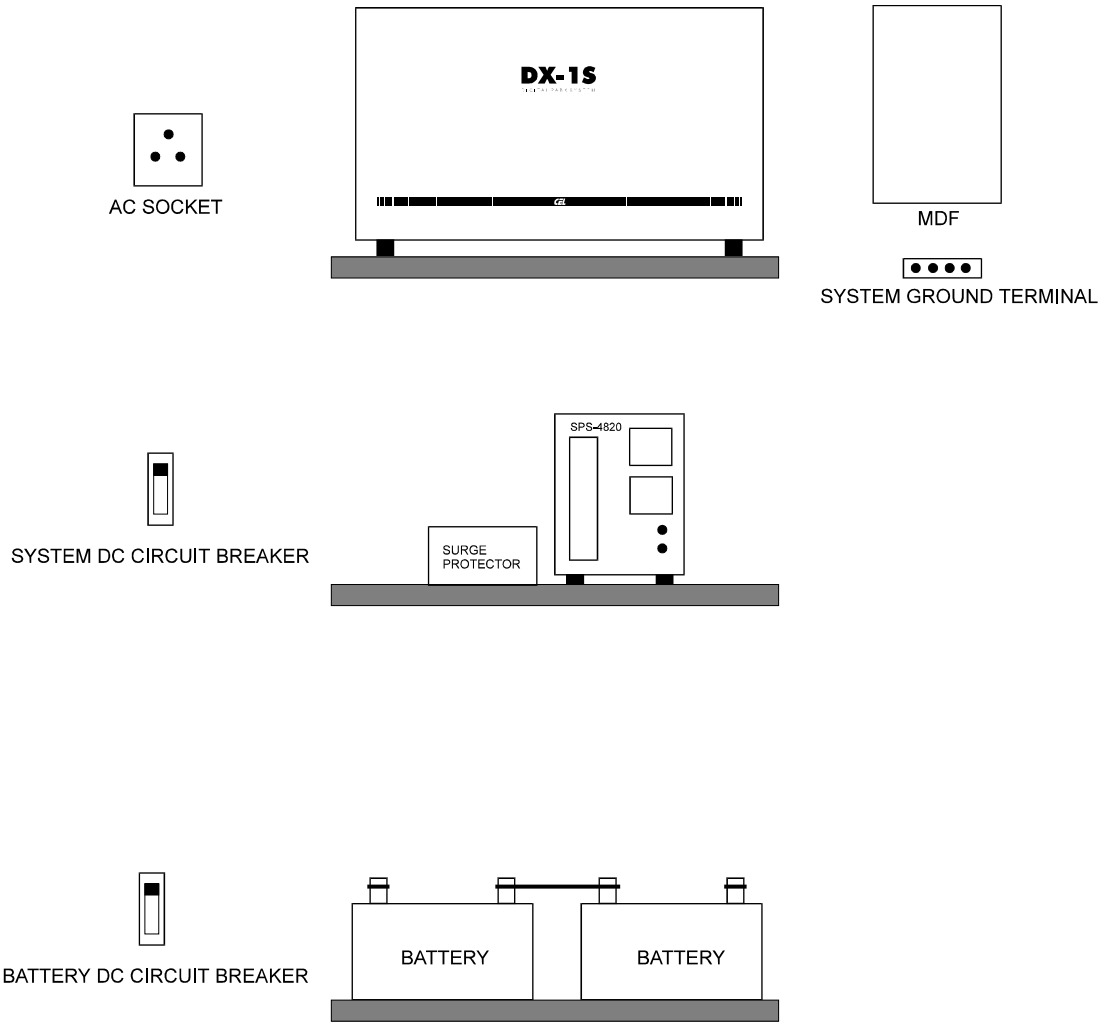


Figure 5-5.1 HARDWARE PLACEMENT SUGGESTION (WITH SPS-4820 POWER SUPPLY)

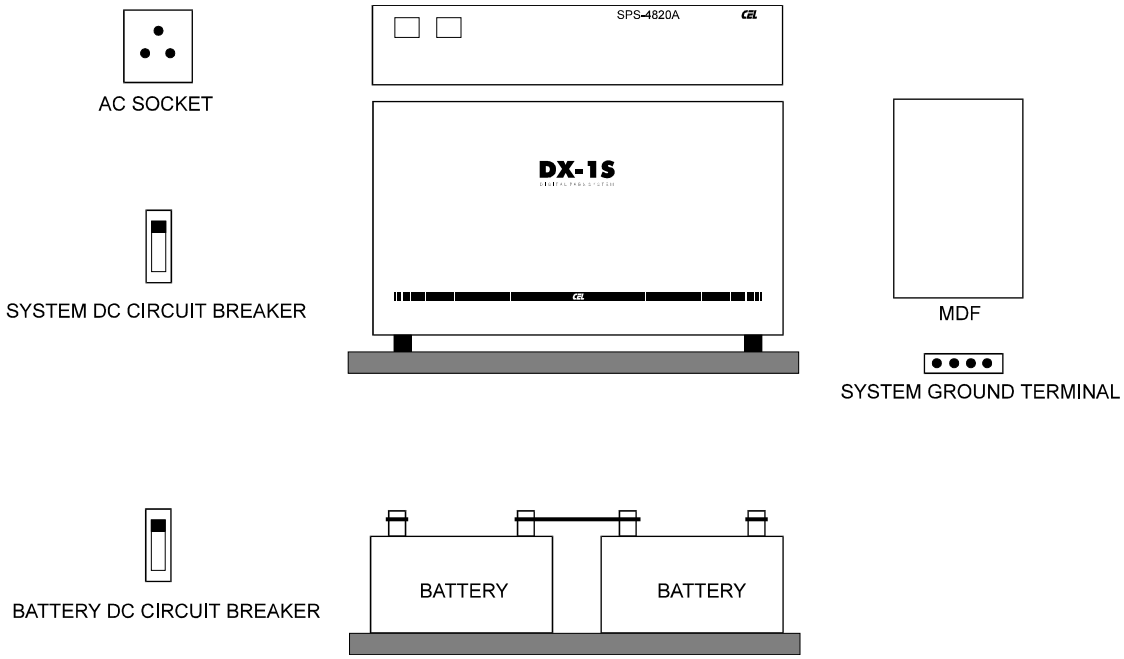


Figure 5-5.2 HARDWARE PLACEMENT SUGGESTION (WITH SPS-4820A POWER SUPPLY)

5.3SYSTEM GROUND TERMINAL

The System Ground Terminal can be a brass rod with several cable mounting screw or a large current terminal block with all pin short together. The System Ground Terminal must be very low resistance and able to withstand large current. The function of System Ground Terminal is to concentrate all ground cables from different hardware and connect to the approval building ground through a #6 AWG wire.

5.4BACKUP BATTERIES INSTALLATION

- Place the Backup Batteries to the assigned location.
- Never short the battery terminal.
- Install a 25A circuit breaker in the Negative Terminal of backup batteries for ON/OFF control and over-current protection.
- Reference to Figure 5-2 for battery connection.

5.5MODULE SYSTEM CABINET INSPECTION

- Unpack the Module System Cabinet.
- Visually inspect the cabinet if there is any damage during transportation.
- Remove the front panel.
- Check if all the card guides are in the mounting position.
- Check all the connectors in the Rear Panel are in good condition.

5.6MOTHER BOARD DIP SWITCH SETTING

- Remove the Upper and Lower Rear Panels from Module System Cabinet.
- Check if all the cables of Line Card Connector in the rear panel are well connected to the socket connectors in the Module Mother Board.
- Set all the four positions of Dip Switch SW1 to OFF position.
- Install the Upper and Lower Rear Panels to the Cabinet.

5.7SPS-4820 POWER SUPPLY INSPECTION

- Unpack the SPS-4820 Power Supply.
- Visually inspect the Power Supply is free from damage during transportation.

5.8CONNECTION BETWEEN SYSTEM CABINET AND SPS-4820 POWER SUPPLY

- Place Module System Cabinet and Power Supply to the assigned position.
- Connect Pin 4 - SGND (Surge Ground) of the Power Input Terminal in Module System Cabinet to the System Ground Terminal with minimum #14 AWG insulated green wires.
- Connect Pin 1 - GND (Battery Ground) of the Power Input Terminal in Module System Cabinet to the System Ground Terminal with minimum #14 AWG insulated green wires.
- Connect the Pin 1 - GND of the Power Input Terminal of Module System Cabinet to Pin 4 - GND of the Power Output Terminal of SPS-4820 Power Supply with minimum #14 AWG insulated black wires.
- Connect the Pin 2 - -48V of the Power Input Terminal of Module System Cabinet to the System DC Circuit Breaker with minimum #14 AWG insulated orange wires.
- Connect the Pin 3 - -48V of the Power Output Terminal of SPS-4820 Power Supply to the System DC Circuit Breaker with minimum #14 AWG insulated yellow wires.
- Connect the Pin 2 - BATT+ of the Power Output Terminal of SPS-4820 Power Supply to the Positive Terminal of backup batteries with minimum #14 AWG insulated gray wires.
- Connect the Pin 1 - BATT- of the Power Output Terminal of SPS-4820 Power Supply to the Battery DC Circuit Breaker with minimum #14 AWG insulated red wires.
- Connect the Negative Terminal of backup batteries to the Battery DC Circuit Breaker with minimum #14 AWG insulated red wires.
- Check all the connections are well connected and low resistance.
- The length of the cables between Module System Cabinet, Power Supply and backup batteries should not be over 2 meters. The over length cables will cause unstable to the system.
- Verify Ground Connection (Reference to Verify Ground Connection).
- Connect the Power Cord with Built-in Surge Protector from SPS-4820 Power Supply to the AC Power Socket.
- Do not power up the Power Supply.
- The System Power DC Circuit Breaker is in OFF position.
- The Battery DC Circuit Breaker is in OFF position.

Power Output Terminal	Description
Pin 1	Battery +
Pin 2	Battery -
Pin 3	-48V output
Pin 4	Ground

Table 5-1 SPS-4820 POWER OUTPUT TERMINAL

Power Input Terminal	Description
Pin 1	Battery Ground
Pin 2	-48V input
Pin 3	Surge Ground
Pin 4	Surge Ground

Table 5-2 MODULE SYSTEM CABINET POWER INPUT TERMINAL

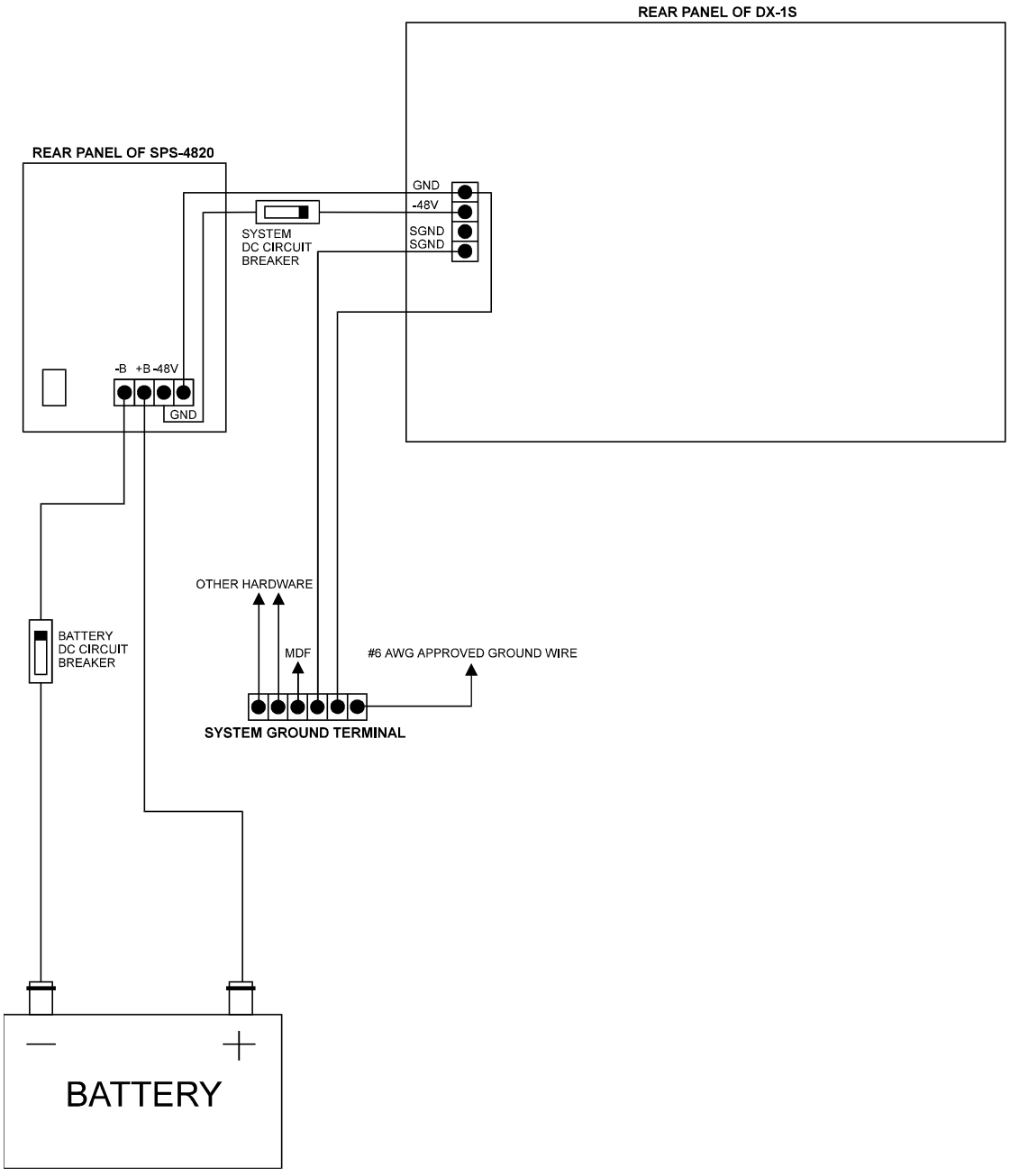


Figure 5-5.3 MODULE SYSTEM CABINET & POWER SUPPLY CONNECTION DIAGRAM

5.9VERIFY GROUND CONNECTION

- Use a digital multi-meter to measure the AC voltage between the ground pin of the AC power socket (the Ground of Electrical System) and the #6 AWG approved ground wire. The voltage should not be over 1V. If the voltage is over 1 voltage, locate another approval ground.
- Measure the resistance between the ground pin of the AC power socket (the Ground of Electrical System) and the #6 AWG approved ground wire that the resistance should not over 5 ohms. If the resistance is over 5 ohms, take action to reduce the resistance to less than 5 ohms.
- Connect the #6 AWG approved round wire to the System Ground Terminal.

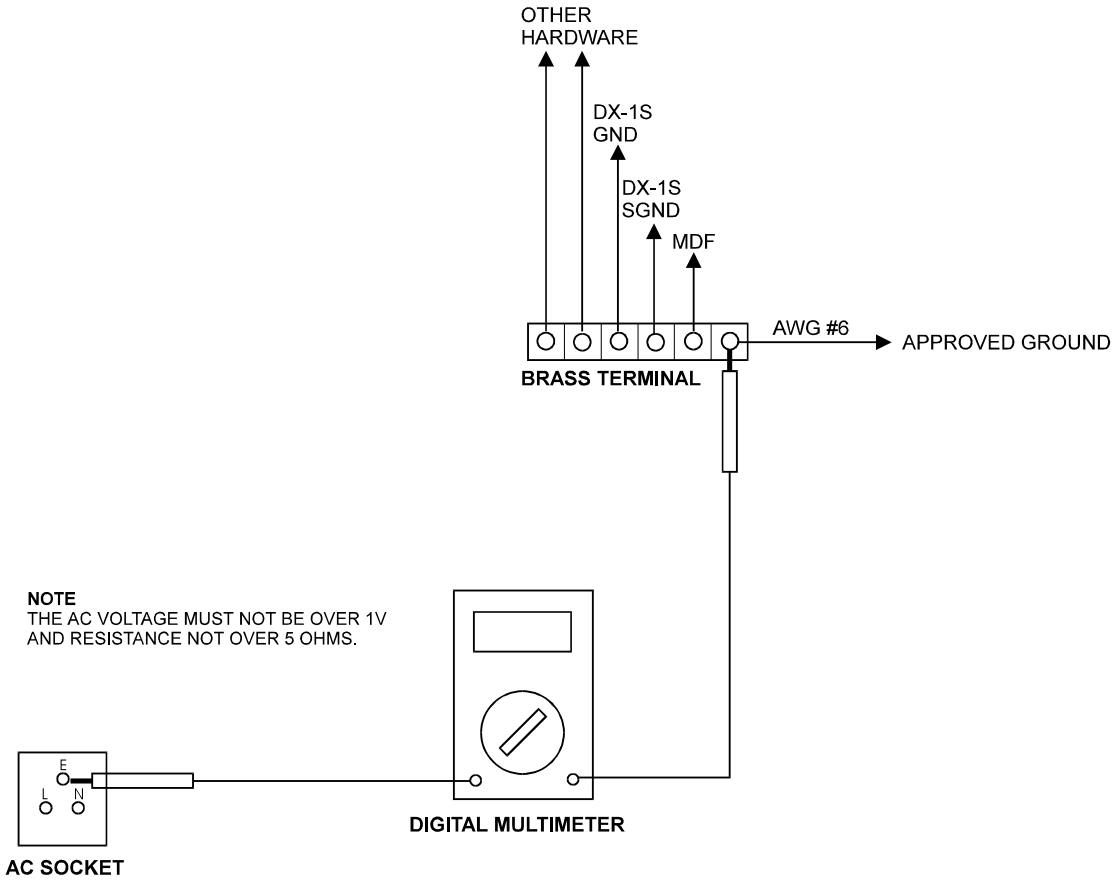


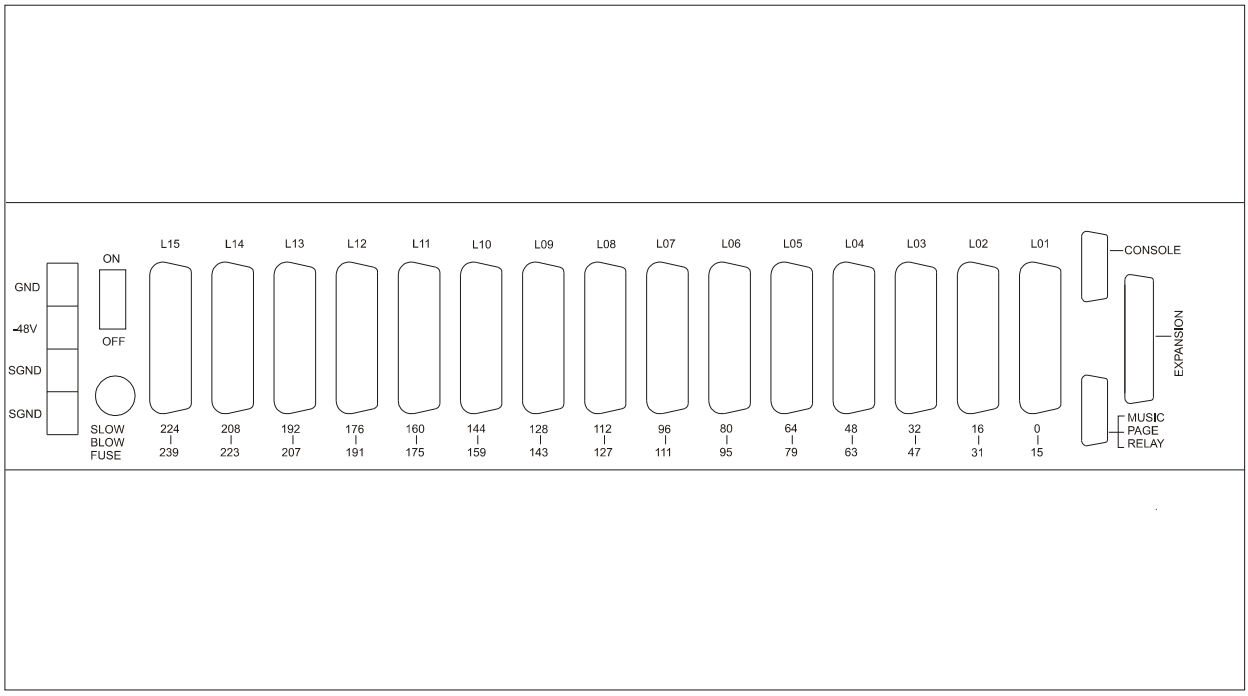
Figure 5-5.4 VERIFY GROUND CONNECTION DIAGRAM

5.10CONNECTORS IN REAR PANEL OF MODULE SYSTEM CABINET

The connectors in the rear panel are for the external cables connection as following :

Connector	Type	Function
Power Input Terminal	4 Way Terminal Block	For -48V Power Supply & Surge Ground connection
Console Connector	9 Way D-Type (DB-9) Male Connector	For MFC-1S Console connection
Music/Page/ Relay Connector	9 Way D-Type (DB-9) Female Connector	For External Music Input, Page Output & Relay Contact connection
Expansion Connector	25 Way D-Type (DB-25) Female Connector	Reserve for Future Expansion
Line Connector L01	36 Way Centronic Socket Connector	For 1st Peripheral Card output connection
Line Connector L02	36 Way Centronic Socket Connector	For 2nd Peripheral Card output connection
Line Connector L03	36 Way Centronic Socket Connector	For 3rd Peripheral Card output connection
Line Connector L04	36 Way Centronic Socket Connector	For 4th Peripheral Card output connection
Line Connector L05	36 Way Centronic Socket Connector	For 5th Peripheral Card output connection
Line Connector L06	36 Way Centronic Socket Connector	For 6th Peripheral Card output connection
Line Connector L07	36 Way Centronic Socket Connector	For 7th Peripheral Card output connection
Line Connector L08	36 Way Centronic Socket Connector	For 8th Peripheral Card output connection
Line Connector L09	36 Way Centronic Socket Connector	For 9th Peripheral Card output connection
Line Connector L10	36 Way Centronic Socket Connector	For 10th Peripheral Card output connection
Line Connector L11	36 Way Centronic Socket Connector	For 11th Peripheral Card output connection
Line Connector L12	36 Way Centronic Socket Connector	For 12th Peripheral Card output connection
Line Connector L13	36 Way Centronic Socket Connector	For 13th Peripheral Card output connection
Line Connector L14	36 Way Centronic Socket Connector	For 14th Peripheral Card output connection
Line Connector L15	36 Way Centronic Socket Connector	For 15th Peripheral Card output connection

Table 5-3 MODULE SYSTEM CABINET REAR PANEL CONNECTORS



DX1S REAR VIEW

Figure 5-5.5 DX-1S MODULE SYSTEM CABINET REAR PANEL VIEW

5.11CONNECT CONSOLE CABLE FOR MODULE SYSTEM CABINET

- Connect the 4-core cable from Console Connectors of Module System Cabinets to MDF.

Console Connector (DB-9 Male)	Description
Pin 3	CTX+
Pin 4	CTX-
Pin 2	CRX+
Pin 6	CRX-

Table 5-4 CONSOLE CONNECTOR PIN ASSIGNMENT

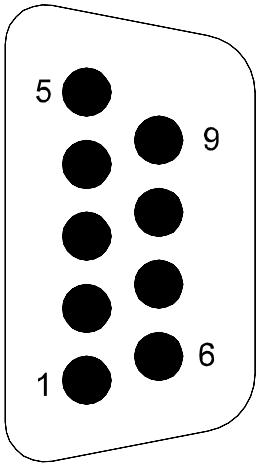


Figure 5-5.6 CONSOLE CONNECTOR DIAGRAM

5.12CONNECT MUSIC/PAGE/RELAY CABLE FOR MODULE SYSTEM CABINET

- Connect the 6-core cable from Music/Page/Relay Connectors of Module System Cabinets to MDF.

M/P/R Connector (DB-9 Female)	Description
Pin 1	Music Input
Pin 6	Music Input
Pin 2	Paging Output
Pin 7	Paging Output
Pin 4	Contact 1
Pin 9	Contact 2

Table 5-5 M/P/R CONNECTOR PIN ASSIGNMENT

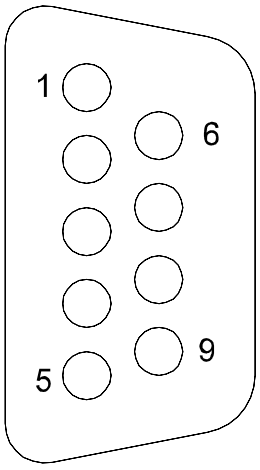


Figure 5-5.7 MUSIC/PAGE/RELAY CONNECTOR DIAGRAM

5.13CONNECT LINE CONNECTOR CABLES FOR MODULE SYSTEM CABINET

- Connect the 32-core cables from Line Connectors L01-L15 of Module System Cabinet to MDF.

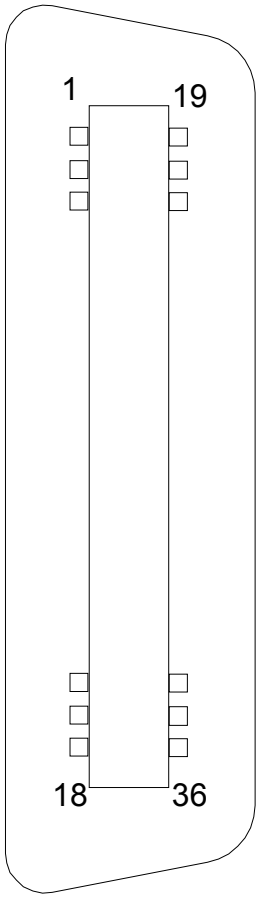


Figure 5-5.8 LINE CONNECTOR DIAGRAM

5.13.1LINE CONNECTOR L01

Pin	TRK/EXT Card is installed	EXT Card is installed
1	Trunk 1 Tip	Extension 0 Tip
19	Trunk 1 Ring	Extension 0 Ring
2	Trunk 2 Tip	Extension 1 Tip
20	Trunk 2 Ring	Extension 1 Ring
3	Trunk 3 Tip	Extension 2 Tip
21	Trunk 3 Ring	Extension 2 Ring
4	Trunk 4 Tip	Extension 3 Tip
22	Trunk 4 Ring	Extension 3 Ring
5	Extension 4 Tip	Extension 4 Tip
23	Extension 4 Ring	Extension 4 Ring
6	Extension 5 Tip	Extension 5 Tip
24	Extension 5 Ring	Extension 5 Ring
7	Extension 6 Tip	Extension 6 Tip
25	Extension 6 Ring	Extension 6 Ring
8	Extension 7 Tip	Extension 7 Tip
26	Extension 7 Ring	Extension 7 Ring
9	Extension 8 Tip	Extension 8 Tip
27	Extension 8 Ring	Extension 8 Ring
10	Extension 9 Tip	Extension 9 Tip
28	Extension 9 Ring	Extension 9 Ring
11	Extension 10 Tip	Extension 10 Tip
29	Extension 10 Ring	Extension 10 Ring
12	Extension 11 Tip	Extension 11 Tip
30	Extension 11 Ring	Extension 11 Ring
13	Extension 12 Tip	Extension 12 Tip
31	Extension 12 Ring	Extension 12 Ring
14	Extension 13 Tip	Extension 13 Tip
32	Extension 13 Ring	Extension 13 Ring
15	Extension 14 Tip	Extension 14 Tip
33	Extension 14 Ring	Extension 14 Ring
16	Extension 15 Tip	Extension 15 Tip
34	Extension 15 Ring	Extension 15 Ring
17	Not Used	Not Used
35	Not Used	Not Used
18	Not Used	Not Used
36	Not Used	Not Used

Table 5-6 LINE CONNECTOR L01 PIN ASSIGNMENT

5.13.2LINE CONNECTOR L02

Pin	TRK/EXT Card is installed	EXT Card is installed
1	Trunk 5 Tip	Extension 16 Tip
19	Trunk 5 Ring	Extension 16 Ring
2	Trunk 6 Tip	Extension 17 Tip
20	Trunk 6 Ring	Extension 17 Ring
3	Trunk 7 Tip	Extension 18 Tip
21	Trunk 7 Ring	Extension 18 Ring
4	Trunk 8 Tip	Extension 19 Tip
22	Trunk 8 Ring	Extension 19 Ring
5	Extension 20 Tip	Extension 20 Tip
23	Extension 20 Ring	Extension 20 Ring
6	Extension 21 Tip	Extension 21 Tip
24	Extension 21 Ring	Extension 21 Ring
7	Extension 22 Tip	Extension 22 Tip
25	Extension 22 Ring	Extension 22 Ring
8	Extension 23 Tip	Extension 23 Tip
26	Extension 23 Ring	Extension 23 Ring
9	Extension 24 Tip	Extension 24 Tip
27	Extension 24 Ring	Extension 24 Ring
10	Extension 25 Tip	Extension 25 Tip
28	Extension 25 Ring	Extension 25 Ring
11	Extension 26 Tip	Extension 26 Tip
29	Extension 26 Ring	Extension 26 Ring
12	Extension 27 Tip	Extension 27 Tip
30	Extension 27 Ring	Extension 27 Ring
13	Extension 28 Tip	Extension 28 Tip
31	Extension 28 Ring	Extension 28 Ring
14	Extension 29 Tip	Extension 29 Tip
32	Extension 29 Ring	Extension 29 Ring
15	Extension 30 Tip	Extension 30 Tip
33	Extension 30 Ring	Extension 30 Ring
16	Extension 31 Tip	Extension 31 Tip
34	Extension 31 Ring	Extension 31 Ring
17	Not Used	Not Used
35	Not Used	Not Used
18	Not Used	Not Used
36	Not Used	Not Used

Table 5-7 LINE CONNECTOR L02 PIN ASSIGNMENT

5.13.3LINE CONNECTOR L03

Pin	TRK/EXT Card is installed	EXT Card is installed
1	Trunk 9 Tip	Extension 32 Tip
19	Trunk 9 Ring	Extension 32 Ring
2	Trunk 10 Tip	Extension 33 Tip
20	Trunk 10 Ring	Extension 33 Ring
3	Trunk 11 Tip	Extension 34 Tip
21	Trunk 11 Ring	Extension 34 Ring
4	Trunk 12 Tip	Extension 35 Tip
22	Trunk 12 Ring	Extension 35 Ring
5	Extension 36 Tip	Extension 36 Tip
23	Extension 36 Ring	Extension 36 Ring
6	Extension 37 Tip	Extension 37 Tip
24	Extension 37 Ring	Extension 37 Ring
7	Extension 38 Tip	Extension 38 Tip
25	Extension 38 Ring	Extension 38 Ring
8	Extension 39 Tip	Extension 39 Tip
26	Extension 39 Ring	Extension 39 Ring
9	Extension 40 Tip	Extension 40 Tip
27	Extension 40 Ring	Extension 40 Ring
10	Extension 41 Tip	Extension 41 Tip
28	Extension 41 Ring	Extension 41 Ring
11	Extension 42 Tip	Extension 42 Tip
29	Extension 42 Ring	Extension 42 Ring
12	Extension 43 Tip	Extension 43 Tip
30	Extension 43 Ring	Extension 43 Ring
13	Extension 44 Tip	Extension 44 Tip
31	Extension 44 Ring	Extension 44 Ring
14	Extension 45 Tip	Extension 45 Tip
32	Extension 45 Ring	Extension 45 Ring
15	Extension 46 Tip	Extension 46 Tip
33	Extension 46 Ring	Extension 46 Ring
16	Extension 47 Tip	Extension 47 Tip
34	Extension 47 Ring	Extension 47 Ring
17	Not Used	Not Used
35	Not Used	Not Used
18	Not Used	Not Used
36	Not Used	Not Used

Table 5-8 LINE CONNECTOR L03 PIN ASSIGNMENT

5.13.4LINE CONNECTOR L04

Pin	TRK/EXT Card is installed	EXT Card is installed
1	Trunk 13 Tip	Extension 48 Tip
19	Trunk 13 Ring	Extension 48 Ring
2	Trunk 14 Tip	Extension 49 Tip
20	Trunk 14 Ring	Extension 49 Ring
3	Trunk 15 Tip	Extension 50 Tip
21	Trunk 15 Ring	Extension 50 Ring
4	Trunk 16 Tip	Extension 51 Tip
22	Trunk 16 Ring	Extension 51 Ring
5	Extension 52 Tip	Extension 52 Tip
23	Extension 52 Ring	Extension 52 Ring
6	Extension 53 Tip	Extension 53 Tip
24	Extension 53 Ring	Extension 53 Ring
7	Extension 54 Tip	Extension 54 Tip
25	Extension 54 Ring	Extension 54 Ring
8	Extension 55 Tip	Extension 55 Tip
26	Extension 55 Ring	Extension 55 Ring
9	Extension 56 Tip	Extension 56 Tip
27	Extension 56 Ring	Extension 56 Ring
10	Extension 57 Tip	Extension 57 Tip
28	Extension 57 Ring	Extension 57 Ring
11	Extension 58 Tip	Extension 58 Tip
29	Extension 58 Ring	Extension 58 Ring
12	Extension 59 Tip	Extension 59 Tip
30	Extension 59 Ring	Extension 59 Ring
13	Extension 60 Tip	Extension 60 Tip
31	Extension 60 Ring	Extension 60 Ring
14	Extension 61 Tip	Extension 61 Tip
32	Extension 61 Ring	Extension 61 Ring
15	Extension 62 Tip	Extension 62 Tip
33	Extension 62 Ring	Extension 62 Ring
16	Extension 63 Tip	Extension 63 Tip
34	Extension 63 Ring	Extension 63 Ring
17	Not Used	Not Used
35	Not Used	Not Used
18	Not Used	Not Used
36	Not Used	Not Used

Table 5-9 LINE CONNECTOR L04 PIN ASSIGNMENT

5.13.5LINE CONNECTOR L05

Pin	TRK/EXT Card is installed	EXT Card is installed
1	Trunk 17 Tip	Extension 64 Tip
19	Trunk 17 Ring	Extension 64 Ring
2	Trunk 18 Tip	Extension 65 Tip
20	Trunk 18 Ring	Extension 65 Ring
3	Trunk 19 Tip	Extension 66 Tip
21	Trunk 19 Ring	Extension 66 Ring
4	Trunk 20 Tip	Extension 67 Tip
22	Trunk 20 Ring	Extension 67 Ring
5	Extension 68 Tip	Extension 68 Tip
23	Extension 68 Ring	Extension 68 Ring
6	Extension 69 Tip	Extension 69 Tip
24	Extension 69 Ring	Extension 69 Ring
7	Extension 70 Tip	Extension 70 Tip
25	Extension 70 Ring	Extension 70 Ring
8	Extension 71 Tip	Extension 71 Tip
26	Extension 71 Ring	Extension 71 Ring
9	Extension 72 Tip	Extension 72 Tip
27	Extension 72 Ring	Extension 72 Ring
10	Extension 73 Tip	Extension 73 Tip
28	Extension 73 Ring	Extension 73 Ring
11	Extension 74 Tip	Extension 74 Tip
29	Extension 74 Ring	Extension 74 Ring
12	Extension 75 Tip	Extension 75 Tip
30	Extension 75 Ring	Extension 75 Ring
13	Extension 76 Tip	Extension 76 Tip
31	Extension 76 Ring	Extension 76 Ring
14	Extension 77 Tip	Extension 77 Tip
32	Extension 77 Ring	Extension 77 Ring
15	Extension 78 Tip	Extension 78 Tip
33	Extension 78 Ring	Extension 78 Ring
16	Extension 79 Tip	Extension 79 Tip
34	Extension 79 Ring	Extension 79 Ring
17	Not Used	Not Used
35	Not Used	Not Used
18	Not Used	Not Used
36	Not Used	Not Used

Table 5-10 LINE CONNECTOR L05 PIN ASSIGNMENT

5.13.6LINE CONNECTOR L06

Pin	TRK/EXT Card is installed	EXT Card is installed
1	Trunk 21 Tip	Extension 80 Tip
19	Trunk 21 Ring	Extension 80 Ring
2	Trunk 22 Tip	Extension 81 Tip
20	Trunk 22 Ring	Extension 81 Ring
3	Trunk 23 Tip	Extension 82 Tip
21	Trunk 23 Ring	Extension 82 Ring
4	Trunk 24 Tip	Extension 83 Tip
22	Trunk 24 Ring	Extension 83 Ring
5	Extension 84 Tip	Extension 84 Tip
23	Extension 84 Ring	Extension 84 Ring
6	Extension 85 Tip	Extension 85 Tip
24	Extension 85 Ring	Extension 85 Ring
7	Extension 86 Tip	Extension 86 Tip
25	Extension 86 Ring	Extension 86 Ring
8	Extension 87 Tip	Extension 87 Tip
26	Extension 87 Ring	Extension 87 Ring
9	Extension 88 Tip	Extension 88 Tip
27	Extension 88 Ring	Extension 88 Ring
10	Extension 89 Tip	Extension 89 Tip
28	Extension 89 Ring	Extension 89 Ring
11	Extension 90 Tip	Extension 90 Tip
29	Extension 90 Ring	Extension 90 Ring
12	Extension 91 Tip	Extension 91 Tip
30	Extension 91 Ring	Extension 91 Ring
13	Extension 92 Tip	Extension 92 Tip
31	Extension 92 Ring	Extension 92 Ring
14	Extension 93 Tip	Extension 93 Tip
32	Extension 93 Ring	Extension 93 Ring
15	Extension 94 Tip	Extension 94 Tip
33	Extension 94 Ring	Extension 94 Ring
16	Extension 95 Tip	Extension 95 Tip
34	Extension 95 Ring	Extension 95 Ring
17	Not Used	Not Used
35	Not Used	Not Used
18	Not Used	Not Used
36	Not Used	Not Used

Table 5-11 LINE CONNECTOR L06 PIN ASSIGNMENT

5.13.7LINE CONNECTOR L07

Pin	TRK/EXT Card is installed	EXT Card is installed
1	Trunk 25 Tip	Extension 96 Tip
19	Trunk 25 Ring	Extension 96 Ring
2	Trunk 26 Tip	Extension 97 Tip
20	Trunk 26 Ring	Extension 97 Ring
3	Trunk 27 Tip	Extension 98 Tip
21	Trunk 27 Ring	Extension 98 Ring
4	Trunk 28 Tip	Extension 99 Tip
22	Trunk 28 Ring	Extension 99 Ring
5	Extension 100 Tip	Extension 100 Tip
23	Extension 100 Ring	Extension 100 Ring
6	Extension 101 Tip	Extension 101 Tip
24	Extension 101 Ring	Extension 101 Ring
7	Extension 102 Tip	Extension 102 Tip
25	Extension 102 Ring	Extension 102 Ring
8	Extension 103 Tip	Extension 103 Tip
26	Extension 103 Ring	Extension 103 Ring
9	Extension 104 Tip	Extension 104 Tip
27	Extension 104 Ring	Extension 104 Ring
10	Extension 105 Tip	Extension 105 Tip
28	Extension 105 Ring	Extension 105 Ring
11	Extension 106 Tip	Extension 106 Tip
29	Extension 106 Ring	Extension 106 Ring
12	Extension 107 Tip	Extension 107 Tip
30	Extension 107 Ring	Extension 107 Ring
13	Extension 108 Tip	Extension 108 Tip
31	Extension 108 Ring	Extension 108 Ring
14	Extension 109 Tip	Extension 109 Tip
32	Extension 109 Ring	Extension 109 Ring
15	Extension 110 Tip	Extension 110 Tip
33	Extension 110 Ring	Extension 110 Ring
16	Extension 111 Tip	Extension 111 Tip
34	Extension 111 Ring	Extension 111 Ring
17	Not Used	Not Used
35	Not Used	Not Used
18	Not Used	Not Used
36	Not Used	Not Used

Table 5-12 LINE CONNECTOR L07 PIN ASSIGNMENT

5.13.8LINE CONNECTOR L08

Pin	TRK/EXT Card is installed	EXT Card is installed
1	Trunk 29 Tip	Extension 112 Tip
19	Trunk 29 Ring	Extension 112 Ring
2	Trunk 30 Tip	Extension 113 Tip
20	Trunk 30 Ring	Extension 113 Ring
3	Trunk 31 Tip	Extension 114 Tip
21	Trunk 31 Ring	Extension 114 Ring
4	Trunk 32 Tip	Extension 115 Tip
22	Trunk 32 Ring	Extension 115 Ring
5	Extension 116 Tip	Extension 116 Tip
23	Extension 116 Ring	Extension 116 Ring
6	Extension 117 Tip	Extension 117 Tip
24	Extension 117 Ring	Extension 117 Ring
7	Extension 118 Tip	Extension 118 Tip
25	Extension 118 Ring	Extension 118 Ring
8	Extension 119 Tip	Extension 119 Tip
26	Extension 119 Ring	Extension 119 Ring
9	Extension 120 Tip	Extension 120 Tip
27	Extension 120 Ring	Extension 120 Ring
10	Extension 121 Tip	Extension 121 Tip
28	Extension 121 Ring	Extension 121 Ring
11	Extension 122 Tip	Extension 122 Tip
29	Extension 122 Ring	Extension 122 Ring
12	Extension 123 Tip	Extension 123 Tip
30	Extension 123 Ring	Extension 123 Ring
13	Extension 124 Tip	Extension 124 Tip
31	Extension 124 Ring	Extension 124 Ring
14	Extension 125 Tip	Extension 125 Tip
32	Extension 125 Ring	Extension 125 Ring
15	Extension 126 Tip	Extension 126 Tip
33	Extension 126 Ring	Extension 126 Ring
16	Extension 127 Tip	Extension 127 Tip
34	Extension 127 Ring	Extension 127 Ring
17	Not Used	Not Used
35	Not Used	Not Used
18	Not Used	Not Used
36	Not Used	Not Used

Table 5-13 LINE CONNECTOR L08 PIN ASSIGNMENT

5.13.9LINE CONNECTOR L09

Pin	TRK/EXT Card is installed	EXT Card is installed
1	Trunk 33 Tip	Extension 128 Tip
19	Trunk 33 Ring	Extension 128 Ring
2	Trunk 34 Tip	Extension 129 Tip
20	Trunk 34 Ring	Extension 129 Ring
3	Trunk 35 Tip	Extension 130 Tip
21	Trunk 35 Ring	Extension 130 Ring
4	Trunk 36 Tip	Extension 131 Tip
22	Trunk 36 Ring	Extension 131 Ring
5	Extension 132 Tip	Extension 132 Tip
23	Extension 132 Ring	Extension 132 Ring
6	Extension 133 Tip	Extension 133 Tip
24	Extension 133 Ring	Extension 133 Ring
7	Extension 134 Tip	Extension 134 Tip
25	Extension 134 Ring	Extension 134 Ring
8	Extension 135 Tip	Extension 135 Tip
26	Extension 135 Ring	Extension 135 Ring
9	Extension 136 Tip	Extension 136 Tip
27	Extension 136 Ring	Extension 136 Ring
10	Extension 137 Tip	Extension 137 Tip
28	Extension 137 Ring	Extension 137 Ring
11	Extension 138 Tip	Extension 138 Tip
29	Extension 138 Ring	Extension 138 Ring
12	Extension 139 Tip	Extension 139 Tip
30	Extension 139 Ring	Extension 139 Ring
13	Extension 140 Tip	Extension 140 Tip
31	Extension 140 Ring	Extension 140 Ring
14	Extension 141 Tip	Extension 141 Tip
32	Extension 141 Ring	Extension 141 Ring
15	Extension 142 Tip	Extension 142 Tip
33	Extension 142 Ring	Extension 142 Ring
16	Extension 143 Tip	Extension 143 Tip
34	Extension 143 Ring	Extension 143 Ring
17	Not Used	Not Used
35	Not Used	Not Used
18	Not Used	Not Used
36	Not Used	Not Used

Table 5-14 LINE CONNECTOR L09 PIN ASSIGNMENT

5.13.10LINE CONNECTOR L10

Pin	TRK/EXT Card is installed	EXT Card is installed
1	Trunk 37 Tip	Extension 144 Tip
19	Trunk 37 Ring	Extension 144 Ring
2	Trunk 38 Tip	Extension 145 Tip
20	Trunk 38 Ring	Extension 145 Ring
3	Trunk 39 Tip	Extension 146 Tip
21	Trunk 39 Ring	Extension 146 Ring
4	Trunk 40 Tip	Extension 147 Tip
22	Trunk 40 Ring	Extension 147 Ring
5	Extension 148 Tip	Extension 148 Tip
23	Extension 148 Ring	Extension 148 Ring
6	Extension 149 Tip	Extension 149 Tip
24	Extension 149 Ring	Extension 149 Ring
7	Extension 150 Tip	Extension 150 Tip
25	Extension 150 Ring	Extension 150 Ring
8	Extension 151 Tip	Extension 151 Tip
26	Extension 151 Ring	Extension 151 Ring
9	Extension 152 Tip	Extension 152 Tip
27	Extension 152 Ring	Extension 152 Ring
10	Extension 153 Tip	Extension 153 Tip
28	Extension 153 Ring	Extension 153 Ring
11	Extension 154 Tip	Extension 154 Tip
29	Extension 154 Ring	Extension 154 Ring
12	Extension 155 Tip	Extension 155 Tip
30	Extension 155 Ring	Extension 155 Ring
13	Extension 156 Tip	Extension 156 Tip
31	Extension 156 Ring	Extension 156 Ring
14	Extension 157 Tip	Extension 157 Tip
32	Extension 157 Ring	Extension 157 Ring
15	Extension 158 Tip	Extension 158 Tip
33	Extension 158 Ring	Extension 158 Ring
16	Extension 159 Tip	Extension 159 Tip
34	Extension 159 Ring	Extension 159 Ring
17	Not Used	Not Used
35	Not Used	Not Used
18	Not Used	Not Used
36	Not Used	Not Used

Table 5-15 LINE CONNECTOR L10 PIN ASSIGNMENT

5.13.11LINE CONNECTOR L11

Pin	TRK/EXT Card is installed	EXT Card is installed
1	Trunk 41 Tip	Extension 160 Tip
19	Trunk 41 Ring	Extension 160 Ring
2	Trunk 42 Tip	Extension 161 Tip
20	Trunk 42 Ring	Extension 161 Ring
3	Trunk 43 Tip	Extension 162 Tip
21	Trunk 43 Ring	Extension 162 Ring
4	Trunk 44 Tip	Extension 163 Tip
22	Trunk 44 Ring	Extension 163 Ring
5	Extension 164 Tip	Extension 164 Tip
23	Extension 164 Ring	Extension 164 Ring
6	Extension 165 Tip	Extension 165 Tip
24	Extension 165 Ring	Extension 165 Ring
7	Extension 166 Tip	Extension 166 Tip
25	Extension 166 Ring	Extension 166 Ring
8	Extension 167 Tip	Extension 167 Tip
26	Extension 167 Ring	Extension 167 Ring
9	Extension 168 Tip	Extension 168 Tip
27	Extension 168 Ring	Extension 168 Ring
10	Extension 169 Tip	Extension 169 Tip
28	Extension 169 Ring	Extension 169 Ring
11	Extension 170 Tip	Extension 170 Tip
29	Extension 170 Ring	Extension 170 Ring
12	Extension 171 Tip	Extension 171 Tip
30	Extension 171 Ring	Extension 171 Ring
13	Extension 172 Tip	Extension 172 Tip
31	Extension 172 Ring	Extension 172 Ring
14	Extension 173 Tip	Extension 173 Tip
32	Extension 173 Ring	Extension 173 Ring
15	Extension 174 Tip	Extension 174 Tip
33	Extension 174 Ring	Extension 174 Ring
16	Extension 175 Tip	Extension 175 Tip
34	Extension 175 Ring	Extension 175 Ring
17	Not Used	Not Used
35	Not Used	Not Used
18	Not Used	Not Used
36	Not Used	Not Used

Table 5-16 LINE CONNECTOR L11 PIN ASSIGNMENT

5.13.12LINE CONNECTOR L12

Pin	TRK/EXT Card is installed	EXT Card is installed
1	Trunk 45 Tip	Extension 176 Tip
19	Trunk 45 Ring	Extension 176 Ring
2	Trunk 46 Tip	Extension 177 Tip
20	Trunk 46 Ring	Extension 177 Ring
3	Trunk 47 Tip	Extension 178 Tip
21	Trunk 47 Ring	Extension 178 Ring
4	Trunk 48 Tip	Extension 179 Tip
22	Trunk 48 Ring	Extension 179 Ring
5	Extension 180 Tip	Extension 180 Tip
23	Extension 180 Ring	Extension 180 Ring
6	Extension 181 Tip	Extension 181 Tip
24	Extension 181 Ring	Extension 181 Ring
7	Extension 182 Tip	Extension 182 Tip
25	Extension 182 Ring	Extension 182 Ring
8	Extension 183 Tip	Extension 183 Tip
26	Extension 183 Ring	Extension 183 Ring
9	Extension 184 Tip	Extension 184 Tip
27	Extension 184 Ring	Extension 184 Ring
10	Extension 185 Tip	Extension 185 Tip
28	Extension 185 Ring	Extension 185 Ring
11	Extension 186 Tip	Extension 186 Tip
29	Extension 186 Ring	Extension 186 Ring
12	Extension 187 Tip	Extension 187 Tip
30	Extension 187 Ring	Extension 187 Ring
13	Extension 188 Tip	Extension 188 Tip
31	Extension 188 Ring	Extension 188 Ring
14	Extension 189 Tip	Extension 189 Tip
32	Extension 189 Ring	Extension 189 Ring
15	Extension 190 Tip	Extension 190 Tip
33	Extension 190 Ring	Extension 190 Ring
16	Extension 191 Tip	Extension 191 Tip
34	Extension 191 Ring	Extension 191 Ring
17	Not Used	Not Used
35	Not Used	Not Used
18	Not Used	Not Used
36	Not Used	Not Used

Table 5-17 LINE CONNECTOR L12 PIN ASSIGNMENT

5.13.13LINE CONNECTOR L13

Pin	TRK/EXT Card is installed	EXT Card is installed
1	Trunk 49 Tip	Extension 192 Tip
19	Trunk 49 Ring	Extension 192 Ring
2	Trunk 50 Tip	Extension 193 Tip
20	Trunk 50 Ring	Extension 193 Ring
3	Trunk 51 Tip	Extension 194 Tip
21	Trunk 51 Ring	Extension 194 Ring
4	Trunk 52 Tip	Extension 195 Tip
22	Trunk 52 Ring	Extension 195 Ring
5	Extension 196 Tip	Extension 196 Tip
23	Extension 196 Ring	Extension 196 Ring
6	Extension 197 Tip	Extension 197 Tip
24	Extension 197 Ring	Extension 197 Ring
7	Extension 198 Tip	Extension 198 Tip
25	Extension 198 Ring	Extension 198 Ring
8	Extension 199 Tip	Extension 199 Tip
26	Extension 199 Ring	Extension 199 Ring
9	Extension 200 Tip	Extension 200 Tip
27	Extension 200 Ring	Extension 200 Ring
10	Extension 201 Tip	Extension 201 Tip
28	Extension 201 Ring	Extension 201 Ring
11	Extension 202 Tip	Extension 202 Tip
29	Extension 202 Ring	Extension 202 Ring
12	Extension 203 Tip	Extension 203 Tip
30	Extension 203 Ring	Extension 203 Ring
13	Extension 204 Tip	Extension 204 Tip
31	Extension 204 Ring	Extension 204 Ring
14	Extension 205 Tip	Extension 205 Tip
32	Extension 205 Ring	Extension 205 Ring
15	Extension 206 Tip	Extension 206 Tip
33	Extension 206 Ring	Extension 206 Ring
16	Extension 207 Tip	Extension 207 Tip
34	Extension 207 Ring	Extension 207 Ring
17	Not Used	Not Used
35	Not Used	Not Used
18	Not Used	Not Used
36	Not Used	Not Used

Table 5-18 LINE CONNECTOR L13 PIN ASSIGNMENT

5.13.14LINE CONNECTOR L14

Pin	TRK/EXT Card is installed	EXT Card is installed
1	Trunk 53 Tip	Extension 208 Tip
19	Trunk 53 Ring	Extension 208 Ring
2	Trunk 54 Tip	Extension 209 Tip
20	Trunk 54 Ring	Extension 209 Ring
3	Trunk 55 Tip	Extension 210 Tip
21	Trunk 55 Ring	Extension 210 Ring
4	Trunk 56 Tip	Extension 211 Tip
22	Trunk 56 Ring	Extension 211 Ring
5	Extension 212 Tip	Extension 212 Tip
23	Extension 212 Ring	Extension 212 Ring
6	Extension 213 Tip	Extension 213 Tip
24	Extension 213 Ring	Extension 213 Ring
7	Extension 214 Tip	Extension 214 Tip
25	Extension 214 Ring	Extension 214 Ring
8	Extension 215 Tip	Extension 215 Tip
26	Extension 215 Ring	Extension 215 Ring
9	Extension 216 Tip	Extension 216 Tip
27	Extension 216 Ring	Extension 216 Ring
10	Extension 217 Tip	Extension 217 Tip
28	Extension 217 Ring	Extension 217 Ring
11	Extension 218 Tip	Extension 218 Tip
29	Extension 218 Ring	Extension 218 Ring
12	Extension 219 Tip	Extension 219 Tip
30	Extension 219 Ring	Extension 219 Ring
13	Extension 220 Tip	Extension 220 Tip
31	Extension 220 Ring	Extension 220 Ring
14	Extension 221 Tip	Extension 221 Tip
32	Extension 221 Ring	Extension 221 Ring
15	Extension 222 Tip	Extension 222 Tip
33	Extension 222 Ring	Extension 222 Ring
16	Extension 223 Tip	Extension 223 Tip
34	Extension 223 Ring	Extension 223 Ring
17	Not Used	Not Used
35	Not Used	Not Used
18	Not Used	Not Used
36	Not Used	Not Used

Table 5-19 LINE CONNECTOR L14 PIN ASSIGNMENT

5.13.15LINE CONNECTOR L15

Pin	TRK/EXT Card is installed	EXT Card is installed
1	Trunk 57 Tip	Extension 224 Tip
19	Trunk 57 Ring	Extension 224 Ring
2	Trunk 58 Tip	Extension 225 Tip
20	Trunk 58 Ring	Extension 225 Ring
3	Trunk 59 Tip	Extension 226 Tip
21	Trunk 59 Ring	Extension 226 Ring
4	Trunk 60 Tip	Extension 227 Tip
22	Trunk 60 Ring	Extension 227 Ring
5	Extension 228 Tip	Extension 228 Tip
23	Extension 228 Ring	Extension 228 Ring
6	Extension 229 Tip	Extension 229 Tip
24	Extension 229 Ring	Extension 229 Ring
7	Extension 230 Tip	Extension 230 Tip
25	Extension 230 Ring	Extension 230 Ring
8	Extension 231 Tip	Extension 231 Tip
26	Extension 231 Ring	Extension 231 Ring
9	Extension 232 Tip	Extension 232 Tip
27	Extension 232 Ring	Extension 232 Ring
10	Extension 233 Tip	Extension 233 Tip
28	Extension 233 Ring	Extension 233 Ring
11	Extension 234 Tip	Extension 234 Tip
29	Extension 234 Ring	Extension 234 Ring
12	Extension 235 Tip	Extension 235 Tip
30	Extension 235 Ring	Extension 235 Ring
13	Extension 236 Tip	Extension 236 Tip
31	Extension 236 Ring	Extension 236 Ring
14	Extension 237 Tip	Extension 237 Tip
32	Extension 237 Ring	Extension 237 Ring
15	Extension 238 Tip	Extension 238 Tip
33	Extension 238 Ring	Extension 238 Ring
16	Extension 239 Tip	Extension 239 Tip
34	Extension 239 Ring	Extension 239 Ring
17	Not Used	Not Used
35	Not Used	Not Used
18	Not Used	Not Used
36	Not Used	Not Used

Table 5-20 LINE CONNECTOR L15 PIN ASSIGNMENT

5.14INSTALL POWER FAILURE TRANSFER MODULE

5.14.1CONNECTORS IN POWER FAILURE TRANSFER MODULE

The module includes three 36 Way Centronic Socket Connectors, one 4 Way Terminal Block and a Power Switch and Power LED on the panel :

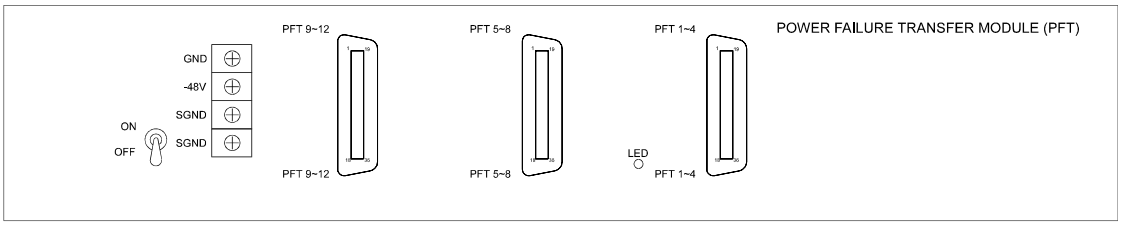


Figure 5-5.9 DX-1S POWER FAILURE TRANSFER MODULE PANEL

The connectors in the rear panel are for the external cables connection as following :

Connector	Type	Function
Power Input Terminal	4 Way Terminal Block	For -48V Power Supply & Surge Ground connection
Power Supply	Toggle Switch	For power input control
Power On LED	Green Round LED	For Power ON indication
PFT Line Connector PFT 1~4	36 Way Centronic Socket Connector	For trunk lines, extension lines and telephones connection
PFT Line Connector PFT 5~8	36 Way Centronic Socket Connector	For trunk lines, extension lines and telephones connection
PFT Line Connector PFT 9~12	36 Way Centronic Socket Connector	For trunk lines, extension lines and telephones connection

Table 5-21 POWER FAILURE TRANSFER MODULE PANEL CONNECTORS

5.14.2INSTALL POWER FAILURE TRANSFER MODULE IN MODULE SYSTEM CABINET

- Unpack the packing of the module.
- There is no jumper or Dip Switch setting in module.
- Remove the Lower Rear Panel.
- Install the Power Failure Transfer Module in the position of Lower Rear Panel.

5.14.3CONNECT POWER CABLE FOR POWER FAILURE TRANSFER MODULE

- Connect Pin 4 - SGND (Surge Ground) of Power Failure Transfer Module to Pin 3 - SGND (Surge Ground) of Module System Cabinet with minimum #26 AWG insulated green wire.
- Connect Pin 1 - GND (Battery Ground) of Power Failure Transfer Module to Pin 1 - GND (Battery Ground) of Module System Cabinet with minimum #26 AWG insulated black wire.
- Connect Pin 2 - -48V of Power Failure Transfer Module to Pin 2 - -48V of Module System Cabinet with minimum #26 AWG insulated yellow wire.
- Switch the Power Switch of Power Failure Transfer Module to ON position.

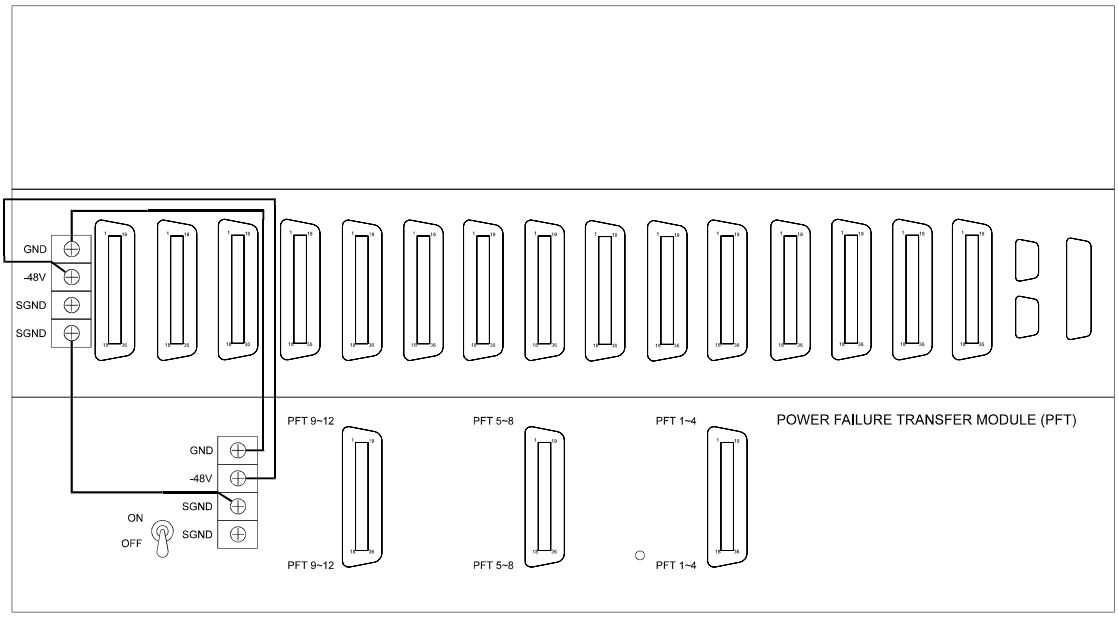


Figure 5-5.10 POWER FAILURE TRANSFER MODULE INSTALLATION

5.14.4CONNECT PFT LINE CONNECTOR CABLES FOR POWER FAILURE TRANSFER MODULE

- Connect the 32-core cables from PFT 1~4 Connector of Power Failure Transfer Module to MDF.
- Connect the 32-core cables from PFT 5~8 Connector of Power Failure Transfer Module to MDF.
- Connect the 32-core cables from PFT 9~12 Connector of Power Failure Transfer Module to MDF.
- Connect the wires in MDF reference to PFT Line Connector Pin Assignment table.

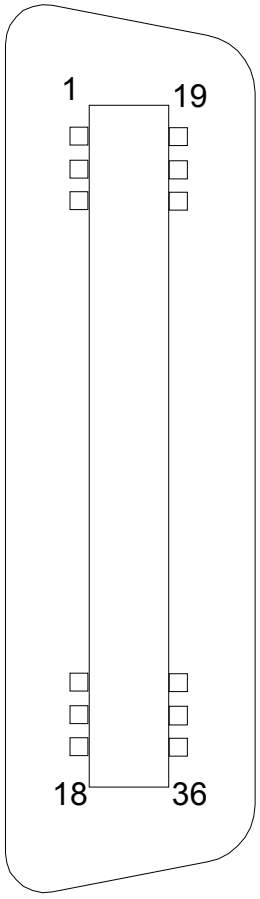


Figure 5-5.11 PFT LINE CONNECTOR DIAGRAM

5.14.5PFT LINE CONNECTOR PIN ASSIGNMENT

Pin	PFT 1~4 Pinout	PFT 5~8 Pinout	PFT 9~12 Pinout
1	1st Trunk Line Tip	5th Trunk Line Tip	9th Trunk Line Tip
19	1st Trunk Line Ring	5th Trunk Line Ring	9th Trunk Line Ring
2	1st Trunk Interface Tip	5th Trunk Interface Tip	9th Trunk Interface Tip
20	1st Trunk Interface Ring	5th Trunk Interface Ring	9th Trunk Interface Ring
3	1st Telephone Tip	5th Telephone Tip	9th Telephone Tip
21	1st Telephone Ring	5th Telephone Ring	9th Telephone Ring
4	1st Extension Tip	5th Extension Tip	9th Extension Tip
22	1st Extension Ring	5th Extension Ring	9th Extension Ring
5	2nd Trunk Line Tip	6th Trunk Line Tip	10th Trunk Line Tip
23	2nd Trunk Line Ring	6th Trunk Line Ring	10th Trunk Line Ring
6	2nd Trunk Interface Tip	6th Trunk Interface Tip	10th Trunk Interface Tip
24	2nd Trunk Interface Ring	6th Trunk Interface Ring	10th Trunk Interface Ring
7	2nd Telephone Tip	6th Telephone Tip	10th Telephone Tip
25	2nd Telephone Ring	6th Telephone Ring	10th Telephone Ring
8	2nd Extension Tip	6th Extension Tip	10th Extension Tip
26	2nd Extension Ring	6th Extension Ring	10th Extension Ring
9	3rd Trunk Line Tip	7th Trunk Line Tip	11th Trunk Line Tip
27	3rd Trunk Line Ring	7th Trunk Line Ring	11th Trunk Line Ring
10	3rd Trunk Interface Tip	7th Trunk Interface Tip	11th Trunk Interface Tip
28	3rd Trunk Interface Ring	7th Trunk Interface Ring	11th Trunk Interface Ring
11	3rd Telephone Tip	7th Telephone Tip	11th Telephone Tip
29	3rd Telephone Ring	7th Telephone Ring	11th Telephone Ring
12	3rd Extension Tip	7th Extension Tip	11th Extension Tip
30	3rd Extension Ring	7th Extension Ring	11th Extension Ring
13	4th Trunk Line Tip	8th Trunk Line Tip	12th Trunk Line Tip
31	4th Trunk Line Ring	8th Trunk Line Ring	12th Trunk Line Ring
14	4th Trunk Interface Tip	8th Trunk Interface Tip	12th Trunk Interface Tip
32	4th Trunk Interface Ring	8th Trunk Interface Ring	12th Trunk Interface Ring
15	4th Telephone Tip	8th Telephone Tip	12th Telephone Tip
33	4th Telephone Ring	8th Telephone Ring	12th Telephone Ring
16	4th Extension Tip	8th Extension Tip	12th Extension Tip
34	4th Extension Ring	8th Extension Ring	12th Extension Ring
17	Not Used	Not Used	Not Used
35	Not Used	Not Used	Not Used
18	Not Used	Not Used	Not Used
36	Not Used	Not Used	Not Used

Table 5-22 PFT LINE CONNECTOR PIN ASSIGNMENT

5.15INSTALL POWER SUPPLY CARD

- Unpack the packing of the card.
- Check the fuse condition and value. F1 is a 1.5A quick acting fuse. F2 is a 2A quick acting fuse and F3 is a 0.5A quick acting fuse.
- Check the fuses if they are well installed in the fuse sockets.
- Install the Power Supply Card to the 17th slot of the Module System Cabinet which is label as PSC.
- Check if the card is plugged into the slot connector firmly.

5.16INSTALL MODULE CONTROL CARD

- Unpack the packing of the card.
- There is no jumper or Dip Switch setting in Module Control Card.
- Install the Module Control Card to the first slot of the Module System Cabinet which is label as MCC.
- Check if the card is plugged into the slot connector firmly.

5.17INSTALL DISA VOICE CARD

- Unpack the packing of the card.
- There is no jumper or Dip Switch setting in DISA Voice Card.
- Install the first DISA Voice Card to Module Control Card by connecting the CN3 -18 Way Socket Connectors on DISA Voice Card to the CN3 - 18 Pin Header on Module Control Card as the following diagram. The first DISA Voice Card is installed in the center position of Module Control Card.
- install the two screws to firmly mount DISA Voice Card on Module Control Cards.
- Install the second DISA Voice Card (if available) to Module Control Card by connecting the CN3 - 18 Way Socket Connectors on DISA Voice Card to the CN4 - 18 Pin Header on Module Control Card.
- install the two screws to firmly mount the second DISA Voice Card on Module Control Cards.
- Install the third DISA Voice Card (if available) to Module Control Card by connecting the CN3 -18 Way Socket Connector on DISA Voice Card to the CN5 - 18 Pin Header on Module Control Card.
- Install the two screws to firmly mount the third DISA Voice Card on Module Control Cards.
- Check if the 18 Way Socket Connectors are connected with the 18 Pin Headers firmly.

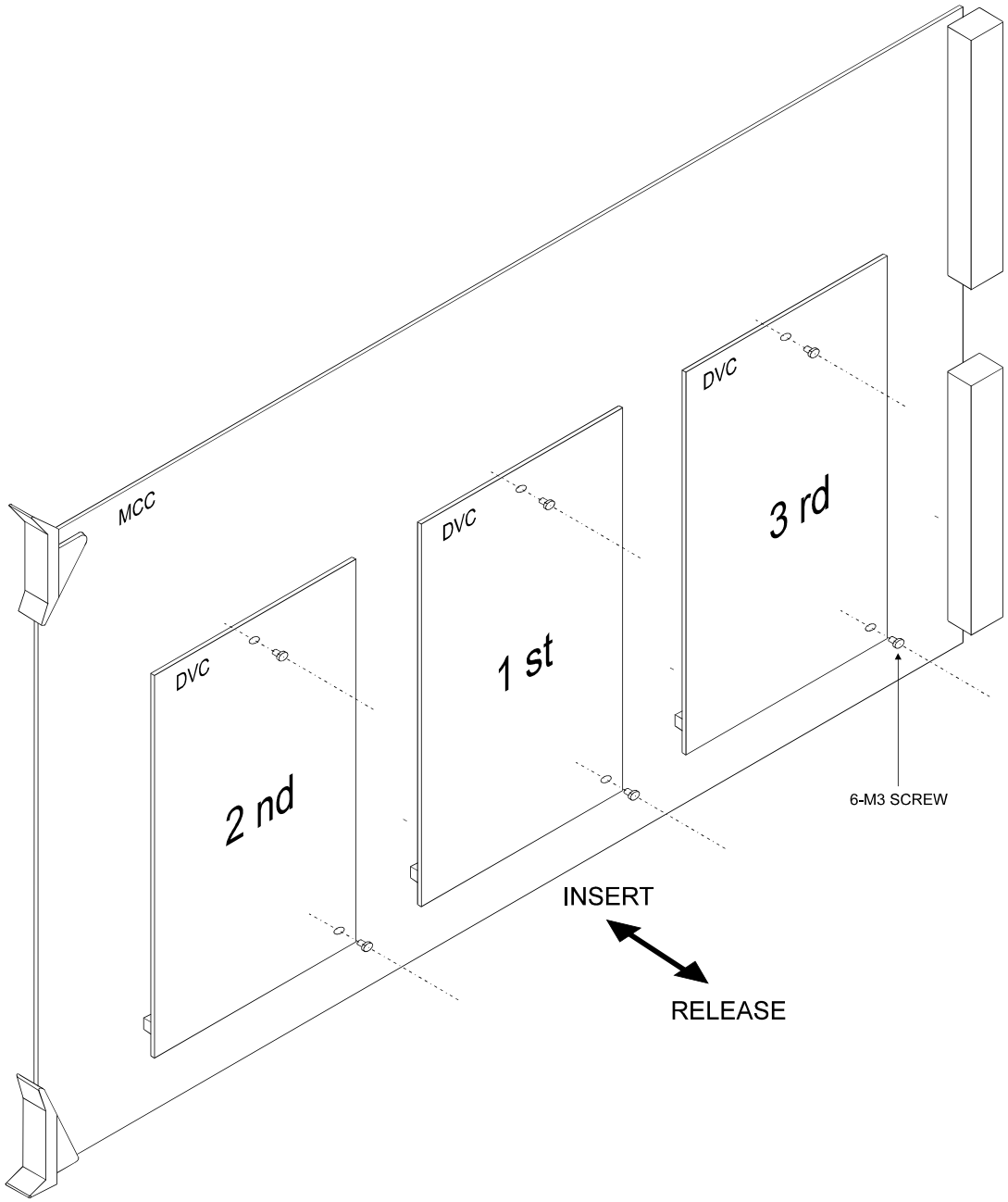


Figure 5-5.12 DISA VOICE CARD INSTALLATION

5.18INSTALL TRK/EXT CARD AND EXT CARD

- Unpack the packing of the cards.
- There is no jumper or Dip Switch setting in TRK/EXT Card and EXT Card.
- Install the first TRK/EXT Card to the 2nd slot of the Module System Cabinet which is label as L01.
- Install all the TRK/EXT Cards to the following slots of the Module System Cabinet.
- After all TRK/EXT Cards are installed, install the first EXT Card to the slot which is next to the last TRK/EXT Card.
- Install all the EXT Cards to the following slots after the first EXT Card.
- Check if the cards are plugged into the slot connectors firmly.

5.19INSTALL CALLER ID CARD

- Unpack the packing of the cards.
- There is no jumper or DIP Switch setting in Caller ID Card.
- Install the Caller ID Card into any free slot from 2 ~ 16 of the Module System Cabinet which are labeled as L01 ~ L15.
- Check if the cards are plugged into the slot connectors firmly.
- Connect CIC channel (output at the Line Connectors of Module System Cabinet) to C.O. line. The CIC channel should connect to C.O. line in parallel with Trunk port (usually connect at MDF).

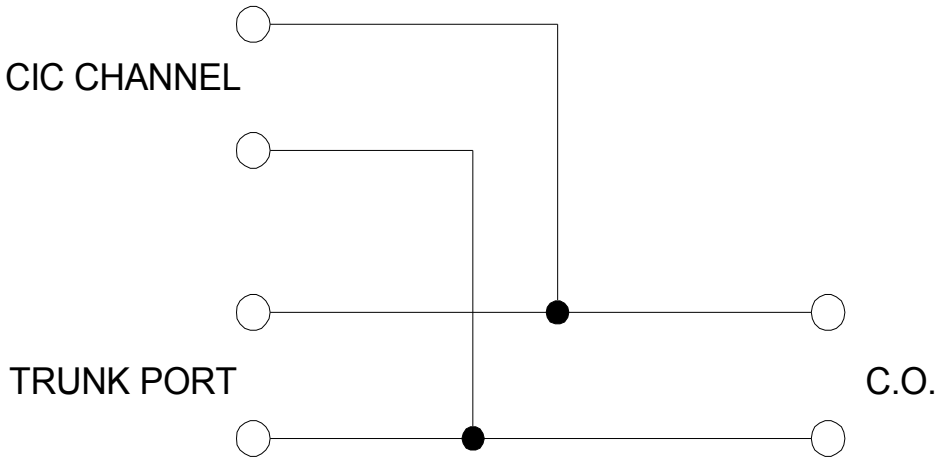


Figure 5-5.13 CIC CHANNEL CONNECT TO C.O. LINE IN PARALLEL WITH TRUNK PORT

Pin	EXT Card is installed
1	CIC channel 1 Tip
19	CIC channel 1 Ring
2	Not Used
20	Not Used
3	CIC channel 2 Tip
21	CIC channel 2 Ring
4	Not Used
22	Not Used
5	CIC channel 3 Tip
23	CIC channel 3 Ring
6	Not Used
24	Not Used
7	CIC channel 4 Tip
25	CIC channel 4 Ring
8	Not Used
26	Not Used
9	CIC channel 5 Tip
27	CIC channel 5 Ring
10	Not Used
28	Not Used
11	CIC channel 6 Tip
29	CIC channel 6 Ring
12	Not Used
30	Not Used
13	CIC channel 7 Tip
31	CIC channel 7 Ring
14	Not Used
32	Not Used
15	CIC channel 8 Tip
33	CIC channel 8 Ring
16	Not Used
34	Not Used
17	Not Used
35	Not Used
18	Not Used
36	Not Used

Table 5-23 LINE CONNECTOR PIN ASSIGNMENT OF CALLER ID CARD

5.20INSTALL MFC-1S PC INTERFACE CARD

5.20.1INSTALL THE MFC-1S PC INTERFACE CARD IN PC STATION

- Unpack the packing of the card.
- Inspect all the items are free from damage.
- Check correct number of items received.
- Prepare a PC station which should meet the following requirements :

Hardware	Requirements
PC Computer Station	PC/AT Compatible
Processor	386SX 20MHz or higher
Expansion Slot for PC Interface Card Installation	one XT/AT Slot available
Com Port and Interrupt for PC Interface Card	Com 4 (2E8) and IRQ 7
RAM	1M Byte RAM
Real Time Clock	Built-in with battery backup
Disk Driver	3.5” Floppy Disk Driver
Serial Port (for printer)	RS-232C set as COM 1 (3F8) and operate with IRQ 4
Parallel Port (for printer)	Standard Parallel Port set as LPT1
Monitor	Hercules monochrome, VGA monochrome or color monitor
Keyboard	w/ Numeric or Standard Keyboard

Table 5-24 PC STATION REQUIREMENTS FOR MFC-1S CONSOLE

- Install the MFC-1S PC Interface Card in the XT/AT Slot in the PC station.
- Reference to MFC-1S Console for the following installation procedures.

5.21INSTALL MFC-1S CONSOLE

5.21.1CONNECTORS IN MFC-1S

There is a power switch in the front panel of PC Computer Station.

The rear panel of PC Computer Station includes the connectors for monitor, keyboard, printer and DX-1S System connection.

Console-In Connector is for connection with DX-1S System or prior MFC-1S Console. Console-Out Connector is for next MFC-1S Console connection.

Printer 1 and Com 1 Connectors output the data to for SMDR printing. Printer 1 Connectors is for connection with parallel port printer and Com 1 Connector is for serial port printer connection.

There are two version of MFC-1S which have the same function but with different type of connectors for different ports.

The connectors type in Version A and Version B are as following :

Connector	Version A	Version B	Function
AC Inlet	3 Pin AC Power Male Socket	3 Pin AC Power Male Socket	For 220V AC Power connection
AC Outlet	3 Pin AC Power Female Socket	3 Pin AC Power Female Socket	For monitor AC Power connection
Keyboard Connector	5 Pin Din Socket	5 Pin Din Socket	For keyboard connection
Monitor Connector	15 Way D-Type (DB-15) Female Connector	15 Way D-Type (DB-15) Female Connector	For VGA monitor connection
Console-In Connector	MJ-64 Module Socket	MJ-64 Module Socket	For DX-1S or prior MFC-1S Console connection
Console-Out Connector	MJ-64 Module Socket	MJ-64 Module Socket	For next MFC-1S Console connection
Printer 1 Connector	25 Way D-Type (DB-25) Female Connector	25 Way D-Type (DB-25) Female Connector	For parallel port printer connection
Com 1 Connector	9 Way D-Type (DB-9) Male Connector	9 Way D-Type (DB-9) Male Connector	For serial port printer connection
Com 2 Connector	25 Way D-Type (DB-25) Male Connector	9 Way D-Type (DB-9) Male Connector	Reserve for future use

Table 5-25 MFC-1S CONSOLE CONNECTORS

The rear panel diagrams of Version A and Version B are as following :

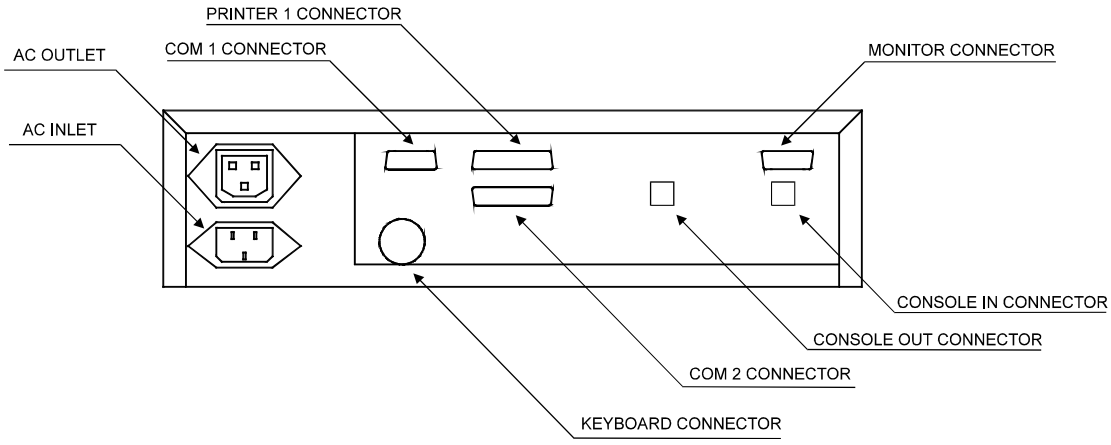


Figure 5-5.14 REAR PANEL OF MFC-1S CONSOLE (VERSION A)

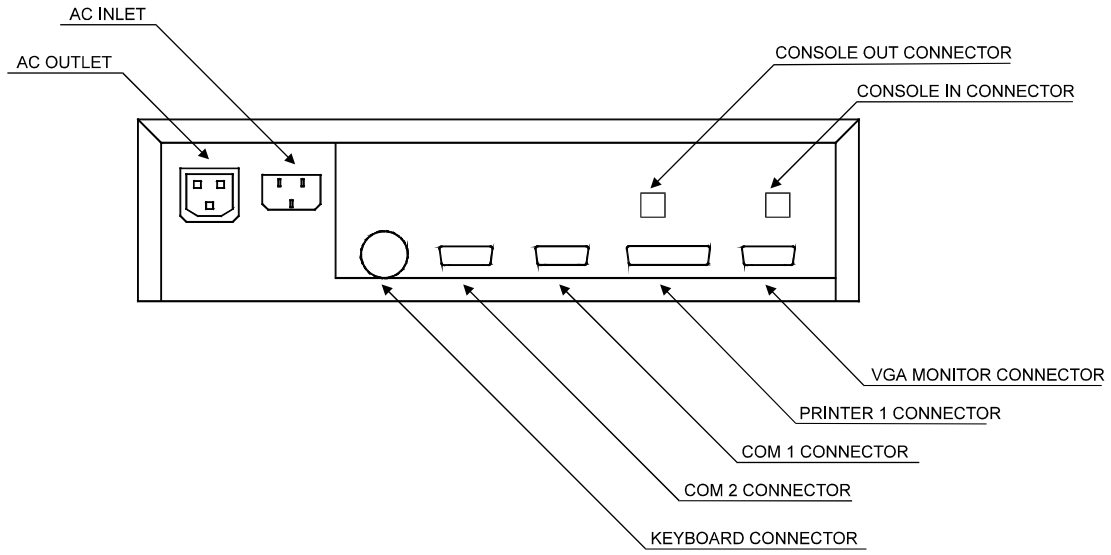


Figure 5-5.15 REAR PANEL OF MFC-1S CONSOLE (VERSION B)

5.21.2INSTALL THE FIRST MFC-1S CONSOLE

- Unpack the packing of the console.
- Inspect all the items are free from damage.
- Check correct number of items received :

PC Computer Station	* 1
9" VGA Monochrome Monitor	* 1
Numeric Keyboard	* 1
4-Core Cable with RJ-11 Modular Jack	* 1
Power Cord	* 1
MFC-1S System Software Disk	* 1
MFC-1S Reset Disk	* 1

- Open the cover of PC Computer Station cabinet and check if all the cards is well installed in the mother board.
- Restore the cover to the cabinet.
- There are two version of MFC-1S which have the same function but with different type of connectors for different ports. Please verify the MFC-1S Console is Version A or Version B.
- Connect the monitor power cord to the AC Outlet of PC Computer Station.
- Connect the monitor signal cable to the Monitor Connector of PC Computer Station.
- Connect the power cord to the AC power socket. The power socket must be a 3-wire type with ground wire connected to the ground of the electrical system.
- Connect the 4-core cable from MDF to Connection Box near the Console location.
- Connect the 4-core Cable with RJ-11 Module Jack from Connection Box to the Console-In Connector in the rear panel of the PC Computer Station.
- Install a DTMF telephone or headset telephone beside the Console as the console telephone.

Console Connector in Module System Cabinet		Console-In Connector in first MFC-1S
Pin 3 (CTX+)	Connect with 4-core cable	Pin 4 (CRXIN+)
Pin 4 (CTX-)		Pin 5 (CRXIN-)
Pin 2 (CRX+)		Pin 2 (CTXOUT+)
Pin 6 (CRX-)		Pin 3 (CTXOUT-)

Table 5-26 MODULE SYSTEM CABINET TO 1ST MFC-1S CONSOLE CONNECTION

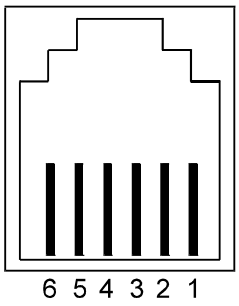


Figure 5-5.16 CONSOLE-IN AND CONSOLE-OUT (MJ-66) CONNECTOR DIAGRAM

5.21.3INSTALL THE SECOND TO SIXTEENTH MFC-1S CONSOLES

- Unpack the packing of the console.
- Inspect all the items are free from damage.
- Check correct number of items received.
- Open the cover of PC Computer System cabinet and check if all the cards is well installed in the mother board. The cards may slip out from the connectors in the mother board during transportation.
- Restore the cover to the cabinet.
- Connect the monitor power cord to the AC Outlet of PC Computer Station.
- Connect the monitor signal cable to the Monitor Connector of PC Computer Station.
- The power socket must be a 3-wire type with ground wire connected to the ground of the electrical system.
- Connect the power cord to the AC power socket. The power socket must be a 3-wire type with ground wire connected to the ground of the electrical system.
- Connect the 4-core cable from Console-Out Socket of the first Console to the Console-In Socket of the second PC Computer Station.
- Connect the 4-core cable from the Console-Out Socket of the second Console to the Console-In Socket of the third PC Computer Station.
- Connect all the following consoles with the same method.
- Install the DTMF telephones or headset telephones beside the Consoles as the console telephones.

Console-Out Connector in Prior MFC-1S Console		Console-In Connector in Next MFC-1S Console
Pin 2 (CTXIN+)	Connect with 4-core cable	Pin 2 (CTXOUT+)
Pin 3 (CTXIN-)		Pin 3 (CTXOUT-)
Pin 4 (CRXOUT-)		Pin 4 (CRXIN+)
Pin 5 (CRXOUT+)		Pin 5 (CRXIN-)

Table 5-27 MFC-1S CONSOLE TO CONSOLE CONNECTION

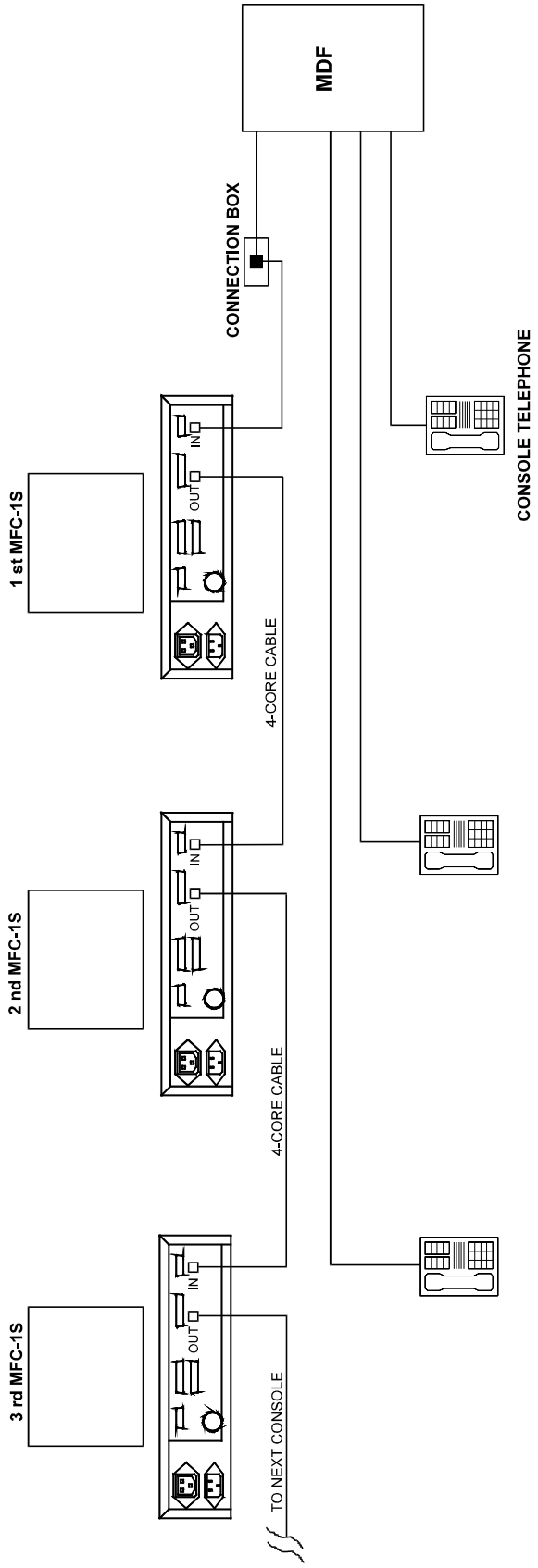


Figure 5-5.17 MFC-1S CONSOLES CONNECTION DIAGRAM

5.21.4VERIFY THE CONSOLE CABLE LOOP RESISTANCE

- The total loop resistance of console cable from Module System Cabinet to the last Console should be less than 40 ohm.
- All consoles must be power down.
- Prepare a Console Loop Testing Plug (Reference to Console Loop Testing Plug section).
- Install the Console Loop Testing Plug to the Console-Out Socket of the last Console.
- Disconnect the console cable from Module System Cabinet Console Connector.
- Use a digital multi-meter to measure the resistance between Pin 2 & 3 of the connector of console cable. The resistance should not be over 40 ohms.
- Measure the resistance between Pin 4 & 6 in the connector of console cable. The resistance should not be over 40 ohms.
- If the resistance is over 40 ohms, take action to reduce the resistance : relocate the consoles location in order to shorten the length of the cable or use a larger diameter conductor cable to be console cable.
- After the test, connect the console cable to Console Connector of Module System Cabinet.
- Remove the Console Loop Testing Plug in the last Console.

5.21.5CONSOLE LOOP TESTING PLUG

- The Console Loop Testing Plug is used to test the loop resistance of the console cable. It is a 6 Pin RJ-11 Module Plug. Pin 2 and 4 are shorted. Pin 3 and 5 are also shorted. This connector is not included in MFC-1S Console hardware.

Console Loop Testing Plug	Connection
Pin 2	short circuit to Pin 4
Pin 3	short circuit to Pin 5
Pin 4	short circuit to Pin 2
Pin 5	short circuit to Pin 3

Table 5-28 CONSOLE LOOP TESTING PLUG PIN ASSIGNMENT

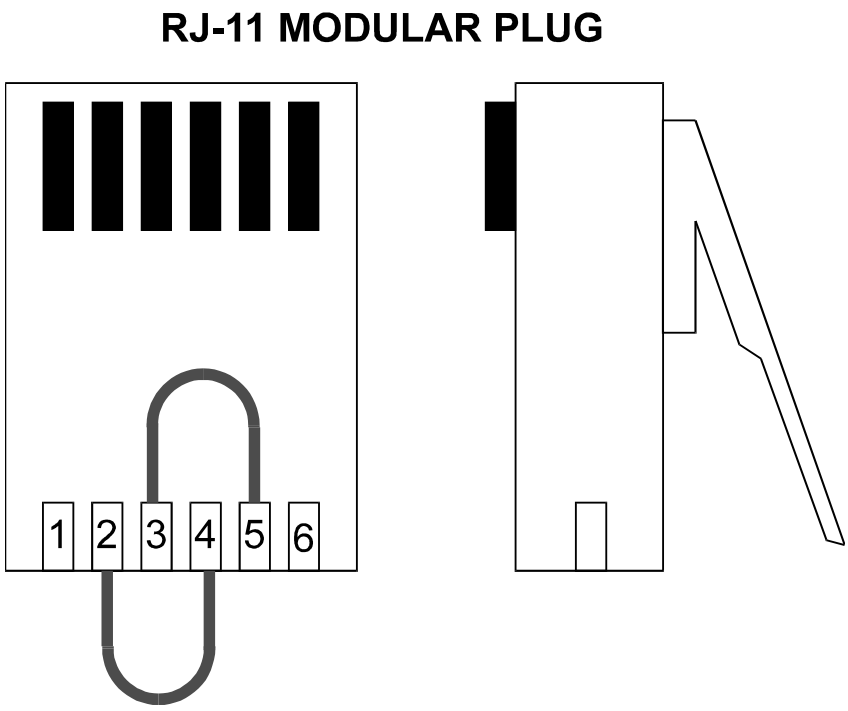


Figure 5-5.18 CONSOLE LOOP TESTING PLUG DIAGRAM

5.22PRINTER CONNECTION

A parallel printer and a serial printer should be connected to the console if the console need to perform SMDR, programming data or diagnostic result print out.

For parallel printer, the printer should be PC Compatible parallel printer and connected to Printer 1 Connector. The cable for printer and console connection is the standard parallel printer cable for PC Compatible computer.

For serial printer, the printer should be connected to Com 1 Connector and configured to meet the serial port (RS-232C) transmission specification as following :

Serial Printer Port Specification
Serial interface type RS232C
Operating speed 1200 baud
8 data bit
1 stop bit
No parity
Hardware (DTR) Handshaking
Software Handshaking XON/XOFF

Table 5-29 SERIAL PRINTER PORT SPECIFICATION

Com 1 Connector in Version A (DB-25 Male)	Com 1 Connector in Version B (DB-9 Male)	Description
Pin 2	Pin 2	Transmitted Data (TXD)
Pin 3	Pin 3	Received Data (RXD)
Pin 6	Pin 6	Data Set Ready (DSR)
Pin 7	Pin 5	Signal Ground
Pin 20	Pin 4	Data Terminal Ready (DTR)

Table 5-30 COM 1 CONNECTOR PIN ASSIGNMENT

5.23EXTERNAL MUSIC SOURCE IMPEDANCE REQUIREMENT

- The output specification of the external music source should match the input impedance of External Music Port.
- The input impedance of the External Music Port is 600 ohm and transformer isolated.
- No DC current should input to External Music Port.

5.24PAGING SYSTEM OUTPUT IMPEDANCE REQUIREMENT

- The input specification of the paging amplifier system should match the output impedance of Page Port.
- The output impedance of the Page Port is 600 ohm and transformer isolated.
- No DC current should input to Page Port.

5.25DOOR LOCK CONNECTION REQUIREMENT

The maximum switching current and voltage for Door Lock Control should not be over the contact rating as following :

Relay Contact Rating	Specification
Relay Contact	Normally Open
Relay Time	1 second
Maximum Switching Power	60W, 62.5VA
Maximum Switching Voltage	220V DC, 250V AC
Maximum Switching Current	2A
Maximum Carrying Current	3A

Table 5-31 DOOR LOCK RELAY CONTACT

For door lock purpose, the relay releases the door lock by closing contact. Since the electric door lock is essentially a solenoid controlled door-strike, there may be some noise and surge generate during the relay open and close which will cause damage to the PABX system circuit. It is advised to add a diode or varistor in parallel with the door lock to absorb the surge or noise generated as the following diagram :

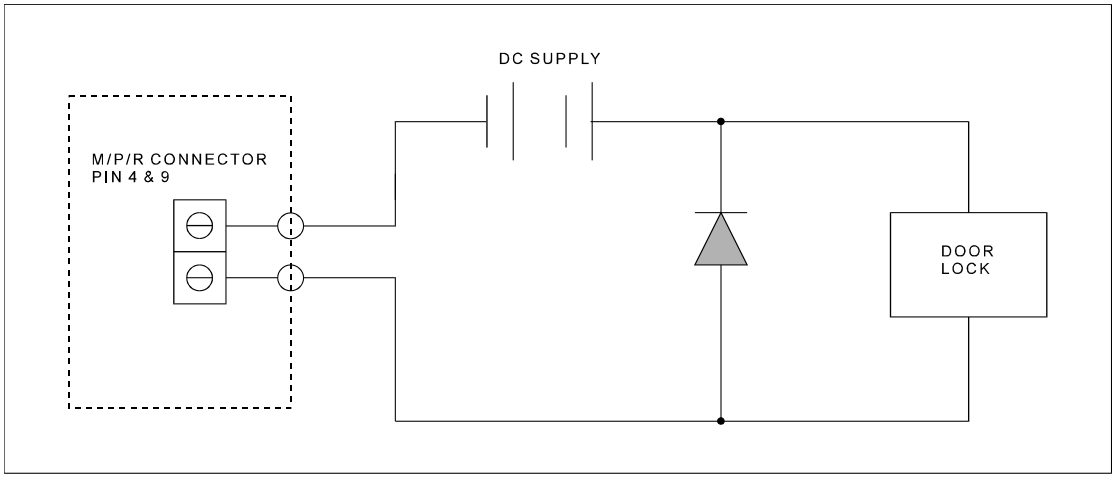


Figure 5-5.19 DC DOOR LOCK CONNECTION

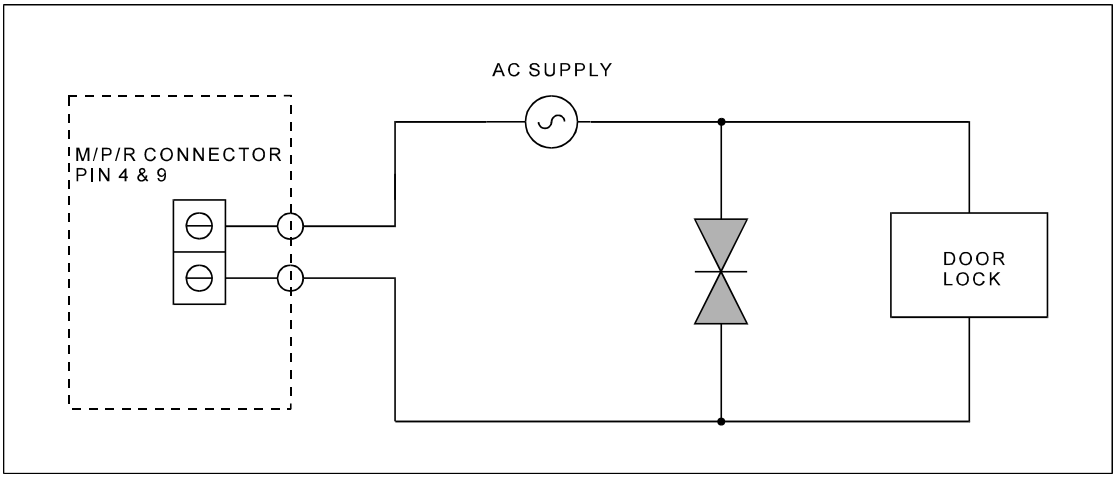


Figure 5-5.20 AC DOOR LOCK CONNECTION

6.BASIC HARDWARE TEST

6.1CHECKING

- The Power Supply SPS-4820 is switched OFF.
- The Battery Output Circuit Breaker is switched OFF.
- The Power Output Circuit Breaker is switched OFF.
- All MFC-1S Console is switched OFF.
- Check the cables between Module System Cabinet and SPS-4820 Power Supply are connected correctly. Wrong connection of these cables will damage the System and Power Supply.
- Check the cables between SPS-4820 Power Supply and backup batteries are connected correctly. Wrong connection of these cables will damage the Power Supply and batteries.
- Check all ground cables are well connected.
- Check the AC power cord are well installed in AC power socket.
- Check all cable connectors are completely plugged into the connectors in Module System Cabinet.
- Check all cable connectors are completely plugged into the connectors in Power Failure Transfer Module.
- Check the console cable between MDF and MFC-1S Console is well connected.
- Check the console cables between MFC-1S Consoles are well connected.
- Check if the DISA Voice Cards are installed in Module Control Card firmly.
- Check all cards are plugged into the slot connectors firmly.

6.2POWER ON TEST

- Turn on the SPS-4820 Power Supply but not the Battery Output Circuit Breaker and Power Output Circuit Breaker. You will see the voltmeter in the front panel show that the output voltage is about 53V after 30 seconds. But there should no output current.
- Switch Power Output Circuit Breaker to ON position, the reading of ammeter should be lower than 1A and indicate that the System is drawing current from SP-4820 Power Supply.
- If the System is OK, the Green LED in Power Supply Card will turn on and the Green LED in Module Control Card will flash.
- Switch Battery Output Circuit Breaker to ON position. The output current may increase up to 20A and the output voltage may drop down a few voltages. It is normal and indicate that the Power Supply is now charging the batteries if the batteries are not fully charged before. The output current may drop down after sometimes if the charging process finished.
- Perform MFC-1S Console Power On Test.
- Perform Power Failure Transfer Module Test.
- Perform Extension Functional Test for each extensions.
- Perform Trunk Line Functional Test for each trunk.
- Perform External Music Port Functional Test.
- Perform Paging Port Functional Test.
- Perform Door Phone Functional Test.
- Perform Door Lock Functional Test.

6.3MFC-1S CONSOLE POWER ON TEST

- Insert the MFC-1S Software Disk to the floppy disk driver of PC Computer Station.
- Turn on the PC Computer Station and Monitor of MFC-1S Console.
- The screen should show “Loading MFC-1S Software” message when the console is loading the program.
- The monitor should display the screen of Attendant Console Mode.
- The System Status Bar is rotating. If there are TRK/EXT Cards and EXT Cards installed in Module System Cabinet, the trunk and extension numbers should display on the Attendant Console screen.
- If the System Status Bar do not rotate, the console or the system is not yet in normal operation or the cable between the console and system is not connected.
- Start MFC-1S Console Setup Programming. (Reference to MFC-1S Console Operation Manual for details.)
- Start DX-1S System Programming. (Reference to Programming Manual for details.)

6.4POWER FAILURE TRANSFER MODULE TEST

- Switch the Power Switch in Power Failure Transfer Module Panel to ON position.
- Power On Green LED should light up.
- Check in MDF that the trunk lines and trunk interfaces which connected to Power Failure Transfer Module should be connected to each other.
- Check in MDF that the telephone lines and extension interfaces which connected to Power Failure Transfer Module should be connected to each other.
- Switch the Power Switch in Power Failure Transfer Module Panel to OFF position.
- The telephone lines are now disconnected with extension interfaces and connected to trunk lines.
- The trunk lines are disconnected with trunk interfaces.
- If everything OK, switch the Power Switch in Power Failure Transfer Module Panel to ON position. The Power Switch should remain in ON position for normal operation.

6.5EXTENSION FUNCTIONAL TEST

- Pick up the handset of an extension telephone.
- Dial to the operator console.
- Talk to the operator in order to test the voice circuit.
- Ask the operator to dial to the extension.
- The extension telephone should ring.
- Pick up the handset and talk to operator.
- If everything OK, the extension is in normal condition.
- Test all the extensions by repeating the testing procedure in each extension telephone.

6.6TRUNK LINE FUNCTIONAL TEST

- Pick up the handset of a console telephone.
- Dial the specified trunk access code to get a trunk line, you should hear the dialing tone from the trunk line.
- Make an outgoing call and talk to the people.
- Ask the outside people to dial to the trunk line.
- The assigned trunk answering extension telephone should ring.
- Pick up the call and talk to the people.
- If everything OK, the trunk is in normal condition.
- Repeat the testing procedure to test all the trunks.

6.7CALLER ID CARD FUNCTION TEST

Caller ID Card Detection

- When DX-1S start, it will display the cards inserted in L01 ~ L15 on the MFC-1S display. Check if Caller ID Card is correctly detected.
  Caller ID Card should have the display: "CIC XX XX XX XX XX XX XX XX". Where XX is the version number of each CIC channel. E.g. 03.

Caller ID Transmission Test

- Pick up the handset of an extension telephone.
- Dial to another extension with a Caller ID telephone connected.
- One of the LED on CIC card will turn off which indicate this channel is sending out Caller ID information.
- Check the Caller ID display on the Caller ID telephone – it should show the extension number of calling extension.
- Since system will use the CIC channel one by one, repeat the transmission test 7 times will test all the CIC channels.

Caller ID Receiving Test

- Make sure the trunk lines from C.O. are connected to CIC and the have Caller ID function.
- Ask the outside people to dial to the trunk line.
- The assigned trunk answering extension telephone should ring and has Caller ID display.
- If everything OK, the CIC channel is in normal condition.
- Repeat the testing procedure to test all CIC channels.

6.8EXTERNAL MUSIC PORT FUNCTIONAL TEST

- Program to enable the External Music feature.
- Input music to the External Music Input Port.
- Make an intercom call.
- Push the Flash key and one of the extensions will be held and hear music.
- Adjust the volume of the music source to a suitable level.

6.9PAGING PORT FUNCTIONAL TEST

- Program to enable the Paging feature.
- Key in Paging Access Code in an extension telephone.
- The beep tone is heard and then the telephone is connected to Paging Amplifier System.
- Speak some words and your voice will be heard through the Paging Amplifier System.

6.10DOOR PHONE FUNCTIONAL TEST

- Test Door Phone if available.
- Program to enable the Door Phone feature.
- Push the button of the Door Phone, the assigned answering extension telephone will ring.
- Pick up the handset and talk to Door phone.

6.11DOOR LOCK FUNCTIONAL TEST

- Program to enable the Door Lock feature
- Use a digital multimeter to measure the resistance between the two wires of the Relay Contact Port.
- Key in Door Lock Access Code in an extension telephone.
- The relay contact will become short circuit for one second and then recover to open circuit.

7.UPGRADE SYSTEM SOFTWARE

7.1DESCRIPTION

The system software will change from time to time to increase the features or improve the performance of the system. In order to upgrade the system software for existing systems, U2, U37 and U79 integrated circuits in Module Control Card may need to be rewritten the content with new data or replaced with new version chips.

Which integrated circuit need to be rewritten or replaced will depend on which part of the software has been changed. Consult the manufacturer for details.

Important Note : The programming data may be lost after upgrading the software, it is advised to backup the programming data in hardcopy before changing the software.

7.2BACKUP PROGRAMMING DATA

The programming data may be lost when the system software is upgraded to a higher version. It is very important to keep a **hardcopy** of the programming data before upgrading the software. The system should be re-programmed after changing system software.

7.3INTEGRATED CIRCUITS FOR UPGRADE

The following integrated circuits may need to replaced or be rewritten with new data for system software upgrade purpose :

Integrated circuit	Package	Description	Upgrade method
U2	32 Pin Dip Package	Contain System Software	Rewrite the content with new data
U37	40 Pin Dip Package	Contain System Software	Replace with new version chip
U79	28 Pin Dip Package	Contain Tone Signal Information	Rewrite the content with new data

Table 7-1 INTEGRATED CIRCUIT FOR UPGRADE

These integrated circuits should have labels stuck on the components. The label indicates the version of software contain in the chip.

The position of the integrated circuits in Module Control Card are shown in the following diagram :

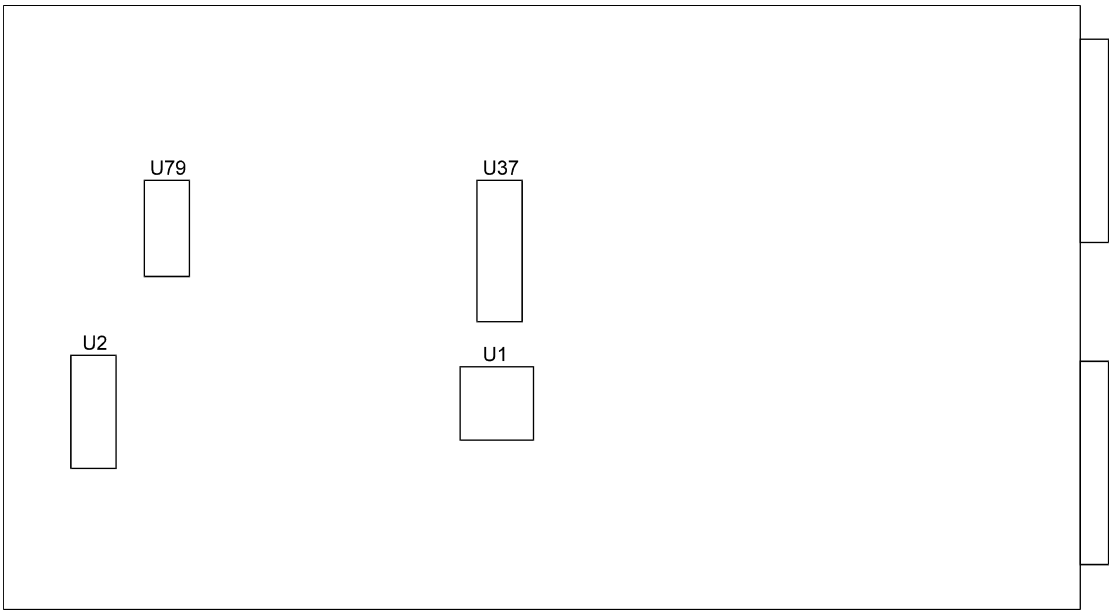


Figure 7-7.1 MODULE CONTROL CARD LAYOUT

7.4BASIC PRECAUTIONS FOR UPGRADE

- When installing or replacing the Module Control Card to Module System Cabinet, ensure the power has switched off.
- Do not touch the board components or connectors without static-discharge precautions.
- Wear anti-static wrist strap when handling the cards.
- Handle the cards by the edges and avoid to contact the components and connectors.
- The cards should be placed in anti-static package when not in use.
- Use IC Extract Tools to take out the integrated circuit from printed circuit board.
- A Programmer which is able to program FLASH PROM and EPROM is required.
- A EPROM Eraser is required.

7.5REWRITE I.C. U2 FOR SOFTWARE UPGRADE

- Take out the integrated circuit U2 from Module Mother Board.
- Remove the label on the integrated circuit.
- Prepare the new version data file and download to the Programmer which is able to program FLASH PROM.
- Rewrite the content of the integrated circuit with new data by the Programmer.
- Stick a new label on the integrated circuit to indicate the version.
- Insert U2 in the original IC socket of Module Mother Board.

7.6REPLACE I.C. U37 FOR SOFTWARE UPGRADE

- Since U37 cannot be re-programmed, it need to be replaced with new version chip for upgrade purpose.
- Take out the integrated circuit from IC socket in Module Mother Board.
- Insert a new version chip into the IC socket.

7.7REWRITE I.C. U79 FOR SOFTWARE UPGRADE

- Take out the integrated circuit U79 from Module Mother Board.
- Remove the label on the integrated circuit.
- Erase the content in the integrated circuit with a EPROM Eraser.
- Prepare the new version data file and download to a Programmer which is able to program EPROM.
- Rewrite the content of the integrated circuit with new data by the Programmer.
- Stick a new label on the integrated circuit to indicate the version.
- Insert U79 in the original IC socket of Module Mother Board.

7.8POWER ON TEST

- Install the Module Control Card in Module System Cabinet.
- Switch on the power.
- The system should run with the new software.
- It may need to initiate the programming data by Software System Initialization or Hardware System Initialization and re-program the system data again.

8.DX-1SU

8.1DESCRIPTION

DX-1SU is a small version of DX-1S, which has maximum capacity of 160 ports. The DX-1SU had integrated the AC / DC power supply inside the system cabinet, no SPS-4820 or other AC / DC power supply is required.

The DX-1SU is aimed to provide a cost-effective solution for a system requires less then 160 ports. Since DX-1SU uses the same software of DX-1S, it includes most of the features of DX-1S.

The main difference between DX-1S and DX-1SU are system cabinet and power supply.

8.2DX-1SU MODULE SYSTEM CABINET

DX-1SU cabinet has the same dimension of the DX-1S cabinet, but the right area inside the cabinet is reserved for the DX-1SU power supply.

DX-1SU has a smaller Module Mother board, which can accommodate 10 peripheral card at most. So that it has a maximum capacity of 160 ports per system.

8.3DX-1SU POWER SUPPLY

The DX-1SU Power Supply is a battery backup AC/DC power supply and it should installed in the dedicated space inside the DX-1SU cabinet. The DX-1SU Power Supply has the function of both AC / DC power supply and PSC as in DX-1S. The Power Supply inputs 220 AC power, generates DC +5V, -5V, -48V and Ringing voltage for the System and charges up the backup batteries. Once the AC power is failed, the Power Supply will switch to the backup batteries automatically and draw the current to the System without interruption until the AC power is recovered.

8.3.1BUILT-IN INPUT SURGE PROTECTOR

The Power Supply has a Built-in Surge Protector for the AC power input. The surge protector will filters out the high voltage surge in AC power line and protects the Power Supply from damage.

8.3.2OUTPUT OVER-VOLTAGE PROTECTION

The power supply includes output over-voltage protection. If the 48V output voltage is higher than 60 voltage, the power supply will shut down automatically. It requires manual reset the power supply by turn off the system, wait about 1 minutes and then turn it on again.

If a backup battery is connected to the Power Supply, the Power Supply will switch to the backup batteries automatically when the power supply shut down.

8.3.3BATTERY OVER-DISCHARGE PROTECTION

The Power Supply also includes output low-voltage protection to protect the backup batteries from over discharge. Once the AC power is failed, the Power Supply will switch to the backup batteries automatically and will draw the current to the System without interruption until the AC power is recovered. The protection circuit will monitor the output voltage. If the output voltage is under 42V, the protection circuit will cut off the battery to avoid damaging the batteries. The “L.V.” red LED will light up. If the AC power recovers and the power supply will charge up the batteries.

8.3.4AUTO-RANGING VOLTAGE

The Power Supply has the Auto-Ranging Voltage capability for input AC voltage. It will accept input voltage of 85 ~ 132V / 170 ~ 264V.

8.3.5LED INDICATION

The DX-1SU Power Supply has 5 LEDs in the front panel. The first four green LEDs indicate the +5V, -5V, -48V and Ringing voltage output condition. If the LED turn on, it indicates the output from the Power Supply is normal.

The fifth red LED is “L.V.” – Low Voltage cut off indication. When it turn on, it indicate the battery output is under 42V and the batteries are cut off to avoid damaging the batteries.

8.3.6COOLING FAN

The DX-1SU Power Supply has a cooling fan inside for cooling purpose. The cooling fan will turn on when the Power Supply temperature is high enough (require cooling). When the Power Supply is cooling down, the fan will turn off automatically.

8.3.7SPECIFICATION

Parameter	Minimum Value	Typical Value	Maximum Value
AC Input Voltage (110V)	85V AC	110V AC	132V AC
AC Input Voltage (220V)	170V AC	220V AC	264V AC
AC Input Frequency	47Hz		440Hz
Input Overvoltage Protection Threshold		264V AC	
Output Voltage (+5V)	5.1	53.3V DC	5.3
Output Voltage (-5V)	5.1	5.2	5.3
Output Voltage using AC Input (-48V)	51.5	53.5V DC	55.5
Output Voltage Using Battery Backup (-48V)	42	48	53
Output Voltage (Ringing)	70	75V AC	80
Max. Output Current (-48V)		4.2A	
Battery Undervoltage Protection Threshold	41.5V DC	42V DC	42.5V DC
Output Overvoltage Protection Threshold		60V DC	
Weight			

8.4INSTALLATION

The installation of DX-1SU should follow the precaution and requirement as in DX-1S installation.

Since DX-1SU has a newly design power supply and cabinet, the following section will discuss the connection of DX-1SU with backup battery and power.

8.4.1CONNECTION OF DX-1SU CABINET, BATTERY AND POWER

- Place DX-1SU System Cabinet to the assigned position.
- Connect Pin 4 - SGND (Surge Ground) of the Power Output Terminal in DX-1SU System Cabinet to the System Ground Terminal with minimum #14 AWG insulated green wires.
- Connect Pin 1 - Battery + of the Power Output Terminal in DX-1SU System Cabinet to the Positive Terminal of backup batteries with minimum #14 AWG insulated gray wires.
- Connect Pin 2 - Battery - of the Power Output Terminal in DX-1SU System Cabinet to the Negative Terminal of backup batteries with minimum #14 AWG insulated red wires.
- Check all the connections are well connected and low resistance.
- The length of the cables between Module System Cabinet, Power Supply and backup batteries should not be over 2 meters. The over length cables will cause unstable to the system.
- Verify Ground Connection (Reference to Verify Ground Connection).
- Connect the Power Cord from AC INPUT socket at DX-1SU System Cabinet to the AC Power Socket.

Power Input Terminal	Description
Pin 1	Battery +
Pin 2	Battery -
Pin 3	Surge Ground
Pin 4	Surge Ground

Table 8-2 DX-1SU SYSTEM CABINET POWER OUTPUT TERMINAL

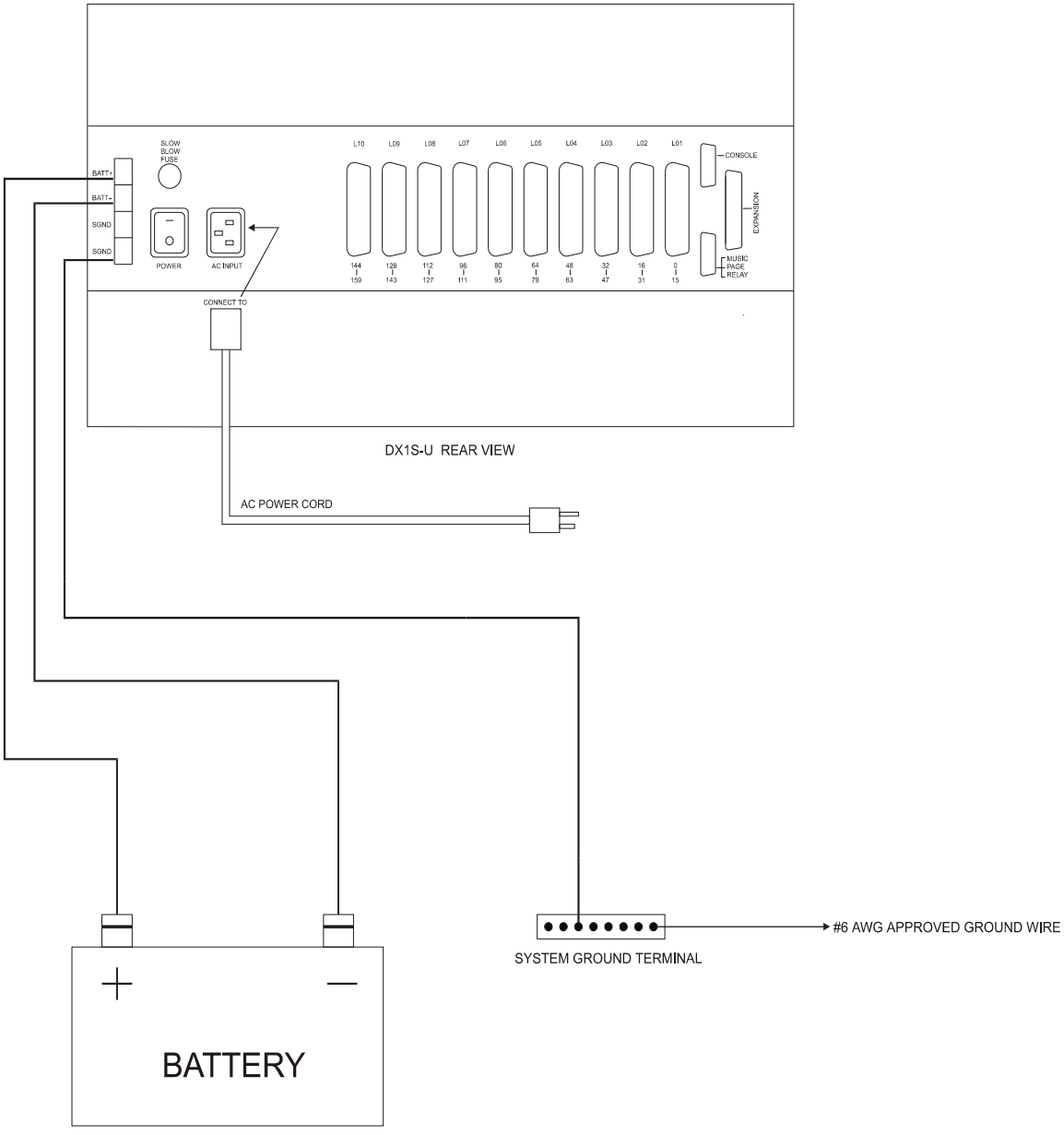


Figure 8-8.1 DX-1SU SYSTEM CABINET, POWER & BATTERY CONNECTION DIAGRAM