Instruction Manual

Model 2582-282

Backup Switch, 1 for 8

December 2011,   Rev. 0

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INSTRUCTION MANUAL

MODEL 2582-282 Switch

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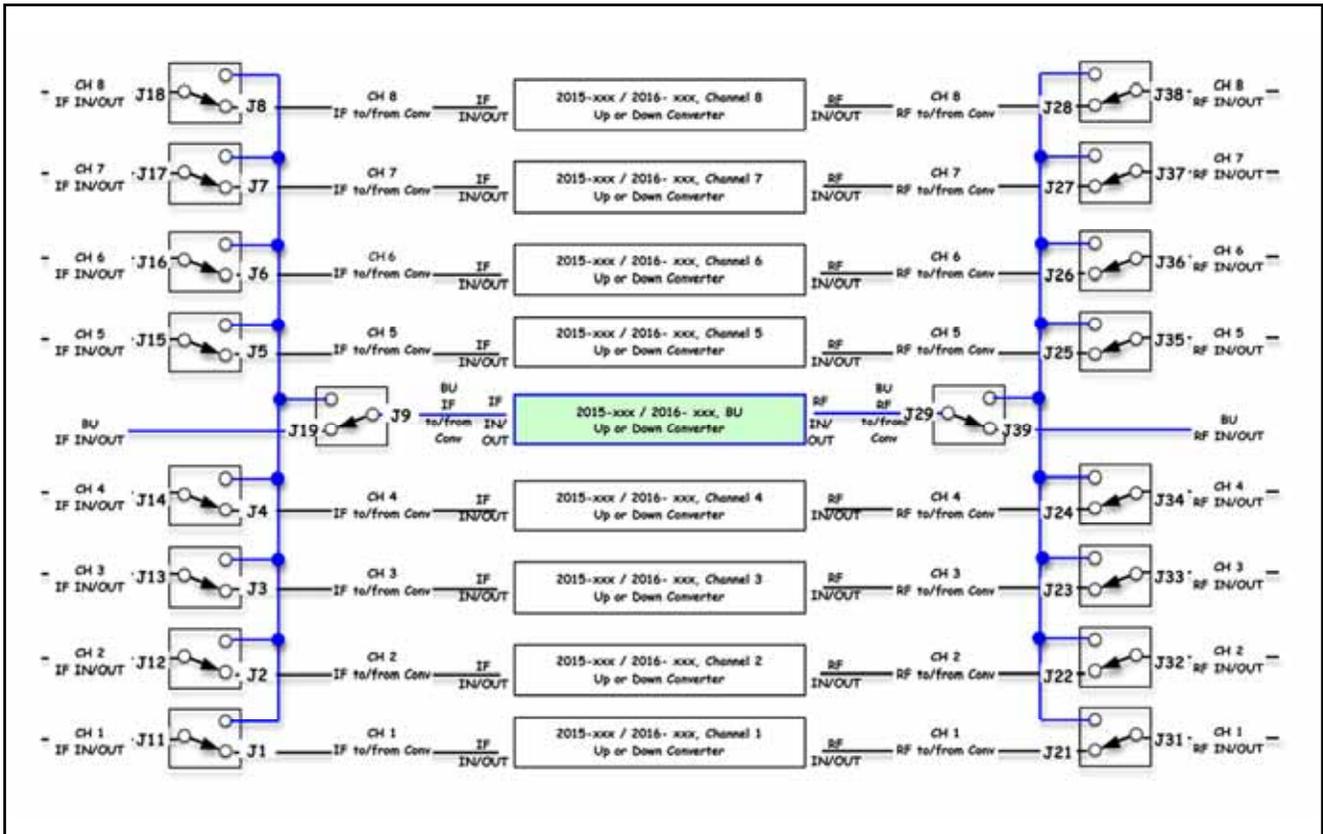
MODEL 2582-282 Switch, 1 for 8

1.0 General

1.1 Equipment Description

The 2582-282 1 for 8 Switch with Backup Controller provides Auto or Manual backup protection for up to 8 converters by relay switching IF and RF signals from one backup unit to any of 8 on-line units. The controller in the 2582-282 monitors alarms and settings of the on-line units and sets the backup unit to the parameters of the unit being backed up prior to backing it up. The 2582-282 works with standard Cross Up or Downconverters by polling their monitor and control ports on a periodic basis. A defective unit's inputs and outputs are switched from the failed unit to the backup when a failure occurs either automatically or manually. "On-line", "Off-line" and "not used" modes can be programmed for each converter. Alarms are contact closures to ground. Status of the 2582-282 is reported via a serial data stream (Ethernet, Optional) and a contact closure to ground on alarm.

All user settings of the switch are stored in nonvolatile ROM and on power up the 2582-282 polls all units. Manual Select is controlled by the multi-function switches on the front panel. LEDs indicate alarm and switch conditions. The unit is powered by two 100-240 ±10% VAC redundant power supplies, and housed in a 2RU chassis.

FRONT PANEL
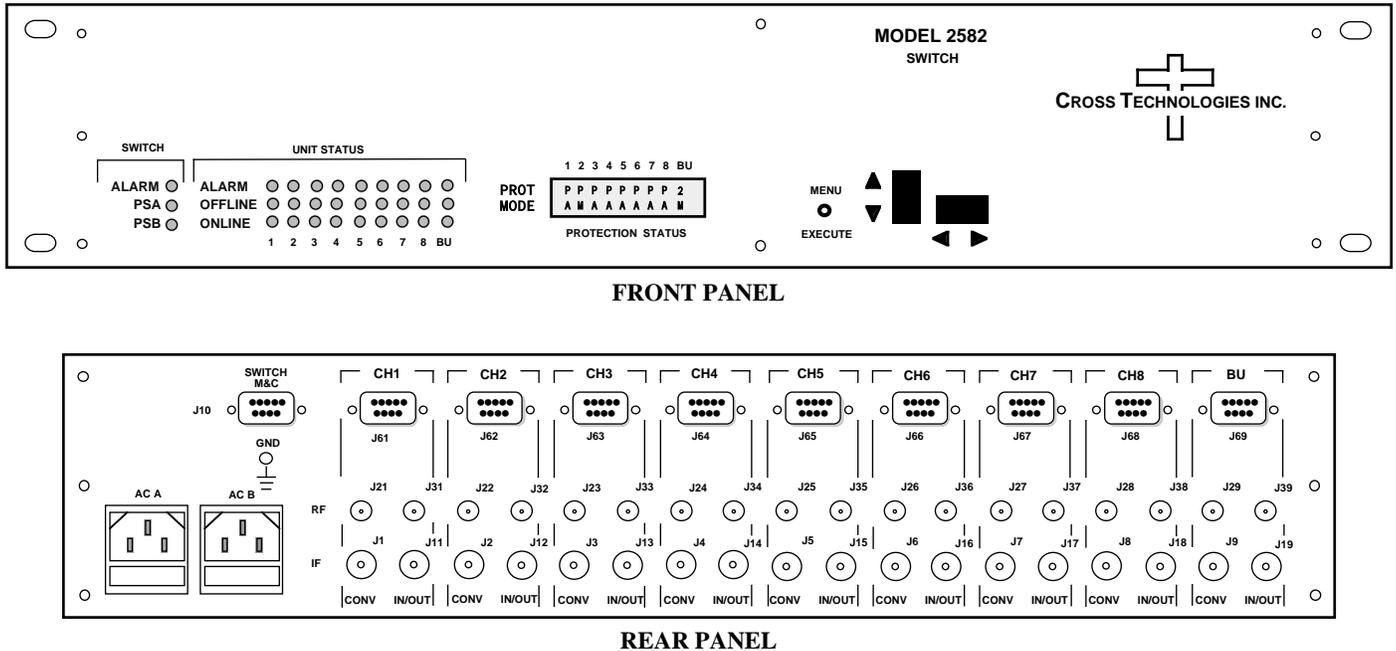
REAR PANEL

FIGURE 1.1   Model 2582-282 Front and Rear Panels

FIGURE 1.2 Model 2582-282 Switch Block Diagram

1.2 Technical Characteristics
TABLE 1.0   2582-282 Switch Specifications*

IF/L-Band Switch Characteristics

Impedance/Return Loss	50 Ω / > 12 dB Return Loss
Type	Relay
Isolation	> 55 dB, DC to 1.5 GHz
	> 50 dB, to 2.2 GHz;
Switch time	≤ 100 milliseconds
Insertion Loss	≤ 1.5 dB, to 1.5 GHz;
	≤ 2.0 dB, to 2.2 GHz
Configuration	1 for 8, no termination

RF/L-Band Switch Characteristics

Impedance/Return Loss	50 Ω / > 12 dB Return Loss
Type	Relay
Isolation	> 55 dB, DC to 1.5 GHz
	> 50 dB, to 2.2 GHz;
Switch time	≤ 100 milliseconds
Insertion Loss	≤ 1.5 dB, to 1.5 GHz;
	≤ 2.0 dB, to 2.2 GHz
Configuration	1 for 8, no termination

Controls, Indicators

Manual Selection	Push-button switches
Remote Selection	RS 232C (Optional RS 422/485
	Option Q; Ethernet Option W8)
Power	Green LEDs
Alarms	Red LEDs
Online	Green LEDs
Offline	Yellow LEDs

Other

RF Connectors	SMA (female)
IF/L-Band Connectors	BNC (female)
Alarm/Remote Conn's	DB9 (female)
Size	19 inch, 2RU Standard Chassis X 16.0" D
Power	100-240 ±10% VAC, Redundant Power Supplies

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*+10˚C to +40˚C; Specifications subject to change without notice

1.3 Monitor and Control Interface

A) Remote serial interface

Protocol: RS-232C/422/485, 9600 baud rate, no parity, 8 data bits, 1 start bit, and 1 stop bit.

Connectors: Rear panel, DB-9 female

SWITCH Pinouts (RS-232C/422/485)	
Pin	Function
1	Rx-
2	Rx+ (RS-232C)
3	Tx+ (RS-232C)
4	Tx-
5	GND
6	Alarm Relay: Common
7	Alarm Relay: Normally Open
8	Not Used
9	Alarm Relay: Normally Closed

CH1,CH2,CH3,CH4,CH5,CH6,CH7,CH8, BU Pinouts	
Pin	Function
1	Tx-
2	Tx+ (RS-232C)
3	Rx+ (RS-232C)
4	Rx-
5	GND
6	Alarm Relay: Common
7	Alarm Relay: Normally Open
8	Not Used
9	Alarm Relay: Normally Closed

B) Status Requests   Table 1.1 lists the status requests for the 2582-282 and briefly describes them.

TABLE 1.1 2582-282 Status Requests		
Command	Syntax *	Description
Command Status	{aaS1}	Returns {aaS1bcdefghijklmnopqrstuvwxyzABC} where:
		• b = BACK-UP Status
		0 = Normal, no channel backed up
		1 - 8 = number of the channel currently backed up
		• c = CH1 Status -- 0=PROTECTED, 1=UNPROTECTED, 2=UNUSED
		• d = CH1 Mode -- 0=AUTO, 1=MANUAL, 2=REMOTE
		• e = CH2 Status -- 0=PROTECTED, 1=UNPROTECTED, 2=UNUSED
		• f = CH2 Mode -- 0=AUTO, 1=MANUAL, 2=REMOTE
		• g = CH3 Status -- 0=PROTECTED, 1=UNPROTECTED, 2=UNUSED
		• h = CH3 Mode -- 0=AUTO, 1=MANUAL, 2=REMOTE
		• i = CH4 Status -- 0=PROTECTED, 1=UNPROTECTED, 2=UNUSED
		• j = CH4 Mode -- 0=AUTO, 1=MANUAL, 2=REMOTE
		• k = CH5 Status -- 0=AUTO, 1=MANUAL, 2=REMOTE, 2=unused
		• l = CH5 Mode -- 0=AUTO, 1=MANUAL, 2=REMOTE
		• m = CH6 Status -- 0=PROTECTED, 1=UNPROTECTED, 2=UNUSED
		• n = CH6 Mode -- 0=AUTO, 1=MANUAL, 2=REMOTE
		• o = CH7 Status -- 0=PROTECTED, 1=UNPROTECTED, 2=UNUSED
		• p = CH7 Mode -- 0=AUTO, 1=MANUAL, 2=REMOTE
		• q = CH8 Status -- 0=PROTECTED, 1=UNPROTECTED, 2=UNUSED
		• r = CH8 Mode -- 0=AUTO, 1=MANUAL, 2=REMOTE
		• s = CH1 Alarm -- 0 = normal, 1= alarm
		• t = CH2 Alarm -- 0 = normal, 1 = alarm
		• u = CH3 Alarm -- 0 = normal, 1 = alarm
		• v = CH4 Alarm -- 0 = normal, 1 = alarm
		• w = CH5 Alarm -- 0 = normal, 1 = alarm
		• x = CH6 Alarm -- 0 = normal, 1 = alarm
		• y = CH7 Alarm -- 0 = normal, 1 = alarm
		• z = CH8 Alarm -- 0 = normal, 1 = alarm
		• A = BACK-UP Alarm -- 0 = normal, 1 = alarm
		• B = Power Supply A Alarm -- 0 = normal, 1 = alarm
		• C = Power Supply B Alarm -- 0 = normal, 1 = alarm
Min. Auto Switching Status	{aaSM}	Returns {aaSMb} where:
		• b = Minimum Auto Switching mode status
		0 = Normal, Min. Auto Switching OFF
		1 = Min. Auto Switching ON
Hold Status	{aaSH}	Returns {aaSHbc} where:
		• b = Number of the channel currently backed up
		(0 if no channel is being backed up)
		• C = Hold state -- 0 = not on hold; 1 = on hold

* PLEASE NOTE: The Address (aa) should only be used when RS-485 is selected.

C) Commands Table 1.2 lists the commands for the 2582-282 and briefly describes them. After a command is sent the 2582-282 sends a return ">" indicating the command has been received and executed. If the command has an error (e.g., invalid value), the '>' character will not be returned.

General Command Format - The general command format is {aaCND...}, where:

> { = start byte
> aa = address of unit (only used if in RS-485 mode)
> C = 1 character, either C (command) or S (status)
> N = 1-digit command or status number, 1 through 9
> D = 1 character or more of data (depends on command)
> } = stop byte
> * PLEASE NOTE: The Address (aa) should only be used when RS-485 is selected.

Table 1.2 2582-282 Commands		
Command	Syntax*	Description
Set CH1 Status and Mode	{aaC1xy}	where:
		• x = 0; CH1 Protected
		• x = 1; CH1 Unprotected
		• x = 2; CH1 Unused
		• y = 0; set CH1 to AUTO mode
		• y = 1; switch BACK-UP to CH1
Set CH2 Status and Mode	{aaC2xy}	where:
		• x = 0; CH2 Protected
		• x = 1; CH2 Unprotected
		• x = 2; CH2 Unused
		• y = 0; set CH2 to AUTO mode
		• y = 1; switch BACK-UP to CH2
Set CH3 Status and Mode	{aaC3xy}	where:
		• x = 0; CH3 Protected
		• x = 1; CH3 Unprotected
		• x = 2; CH3 Unused
		• y = 0; set CH3 to AUTO mode
		• y = 1; switch BACK-UP to CH3
Set CH4 Status and Mode	{aaC4xy}	where:
		• x = 0; CH4 Protected
		• x = 1; CH4 Unprotected
		• x = 2; CH4 Unused
		• y = 0; set CH4 to AUTO mode
		• y = 1; switch BACK-UP to CH4

Command	Syntax*	Description
Table 1.2 2582-282 Commands (continued from page 8)		
Set CH5 Status and Mode	{aaC5xy}	where:
		• x = 0; CH5 Protected
		• x = 1; CH5 Unprotected
		• x = 2; CH5 Unused
		• y = 0; set CH5 to AUTO mode
		• y = 1; switch BACK-UP to CH5
Set CH6 Status and Mode	{aaC6xy}	where:
		• x = 0; CH6 Protected
		• x = 1; CH6 Unprotected
		• x = 2; CH6 Unused
		• y = 0; set CH6 to AUTO mode
		• y = 1; switch BACK-UP to CH6
Set CH7 Status and Mode	{aaC7xy}	where:
		• x = 0; CH7 Protected
		• x = 1; CH7 Unprotected
		• x = 2; CH7 Unused
		• y = 0; set CH7 to AUTO mode
		• y = 1; switch BACK-UP to CH7
Set CH8 Status and Mode	{aaC8xy}	where:
		• x = 0; CH8 Protected
		• x = 1; CH8 Unprotected
		• x = 2; CH8 Unused
		• y = 0; set CH8 to AUTO mode
		• y = 1; switch BACK-UP to CH8
Set Min. Auto Switching Mode	{aaCMx}	where:
		• x = 0; Minimum Auto Switching DISABLED
		• x = 1; Minimum Auto Switching ENABLED
Restore Switch Position	{aaCHx}	where:
		• x = 0; Remove the 'hold' after the switch position
		changed in Minimum Auto Switching mode

All external units (backup and channels 1 thru 8) can be controlled remotely via the 2582 switch. Converters to be controlled must be in remote mode. Simply enter a prefix of *0,*1,*2,*3,*4,*5,*6,*7,*8 for units where *0 is the backup, 1, 2, 3, 4, 5, 6, 7, 8, respectively, before entering the corresponding unit's status request or command. For example, to send a status command of S1 to converter #1 you would enter {aa*1S1}, where the address, **aa**, would only be necessary if the 2582 were in RS-485 mode. Any returned status will also be prefixed with a *0,*1,*2,*3,*4,*5,*6,*7,*8.

2.0 Installation

2.1 Mechanical

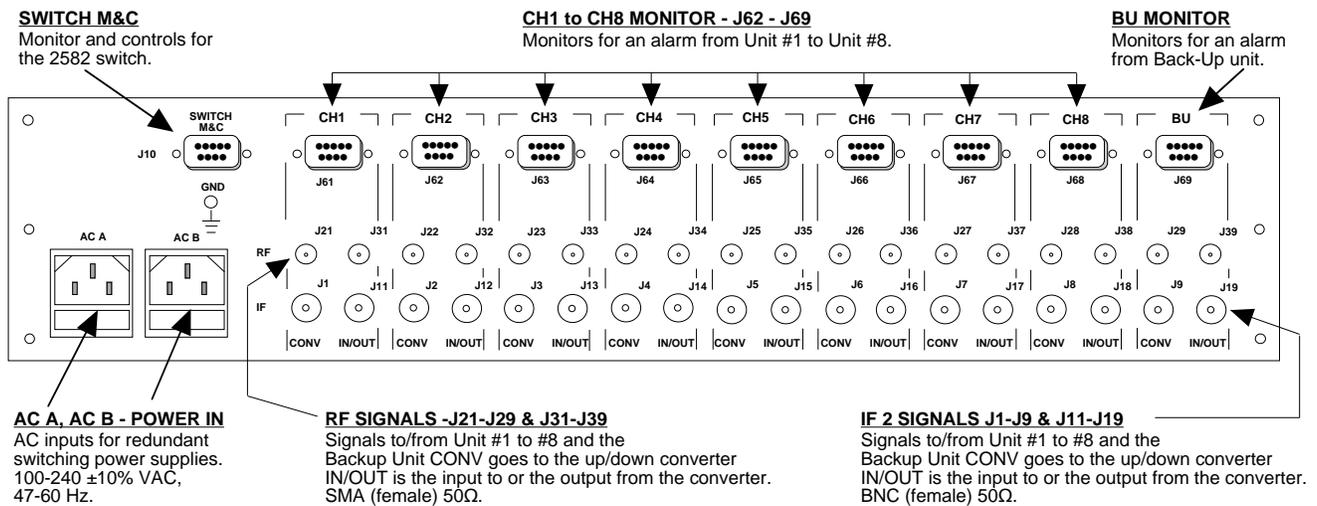The 2582-282 consists of one IF or L-Band Switching PCB, one Controller PCB, and one interface PCB housed in a 2 RU (3 1/2 inch high) by 16 inch deep chassis. Two redundant switching, ± 12, +24, +5 VDC power supplies provide power for the assembly. The 2582-282 can be secured to a rack using the 4 holes on the front panel. Figure 2.0 shows how the 2582-282 is assembled.
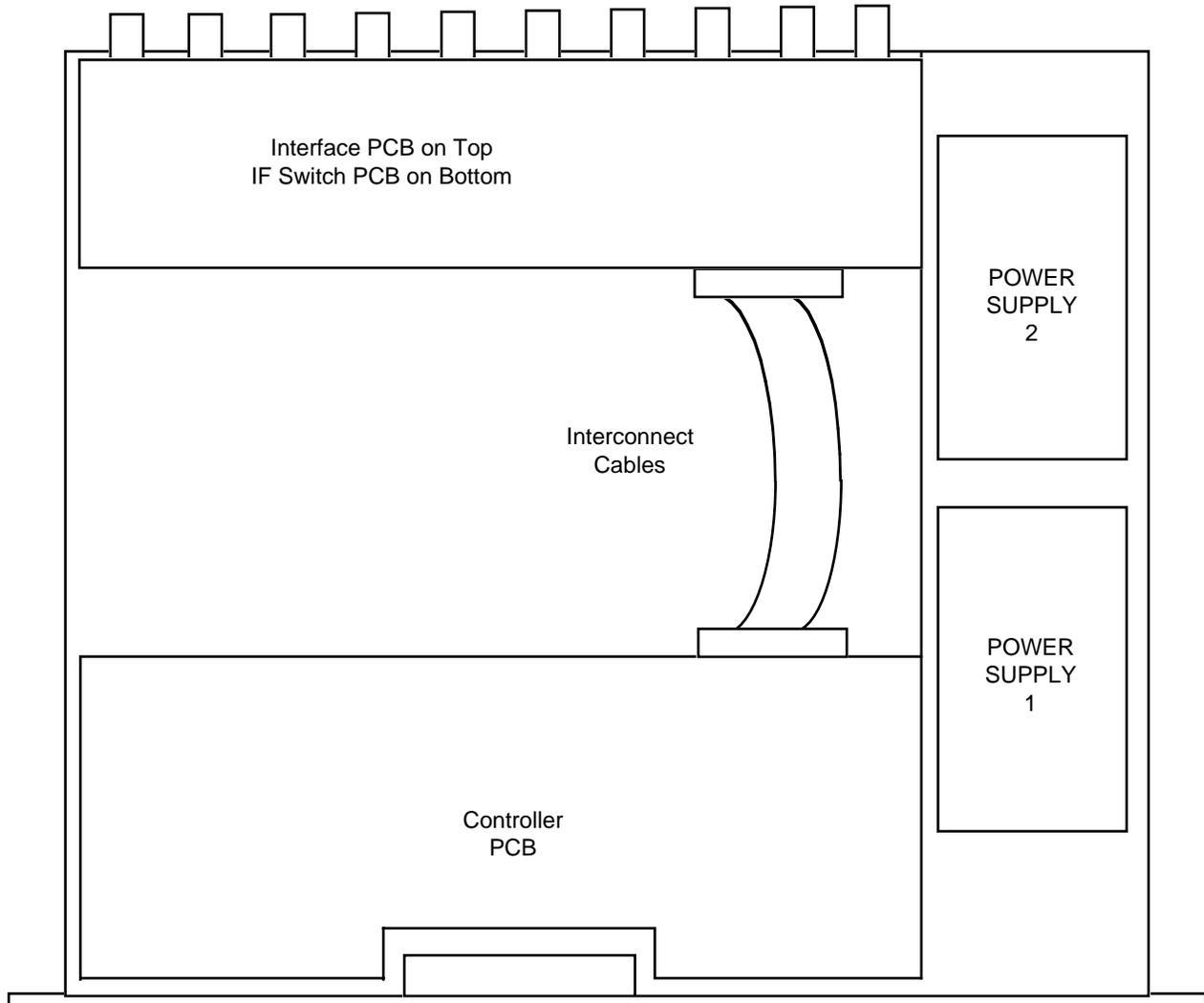
FIGURE 2.0   2582-282 Mechanical Assembly

2.2 Rear Panel Input/Output Signals

Figure 2.1 shows the input and output connectors on the rear panel.

SWITCH M&C
Monitor and controls for
the 2582 switch.

CH1 to CH8 MONITOR - J62 - J69
Monitors for an alarm from Unit #1 to Unit #8.

BU MONITOR
Monitors for an alarm
from Back-Up unit.

AC A, AC B - POWER IN
AC inputs for redundant
switching power supplies.
100-240 ±10% VAC,
47-60 Hz.

RF SIGNALS -J21-J29 & J31-J39
Signals to/from Unit #1 to #8 and the
Backup Unit CONV goes to the up/down converter
IN/OUT is the input to or the output from the converter.
SMA (female) 50Ω.

IF 2 SIGNALS J1-J9 & J11-J19
Signals to/from Unit #1 to #8 and the
Backup Unit CONV goes to the up/down converter
IN/OUT is the input to or the output from the converter.
BNC (female) 50Ω.

FIGURE 2.1   2582-282 Rear Panel I/O's

TABLE 2.1 SWITCH Pinouts (RS-232C/422/485)	
Pin	**Function**
1	Rx-
2	Rx+ (RS-232C)
3	Tx+ (RS-232C)
4	Tx-
5	GND
6	Alarm Relay: Common
7	Alarm Relay: Normally Open
8	Not Used
9	Alarm Relay: Normally Closed

*Remote Serial Interface
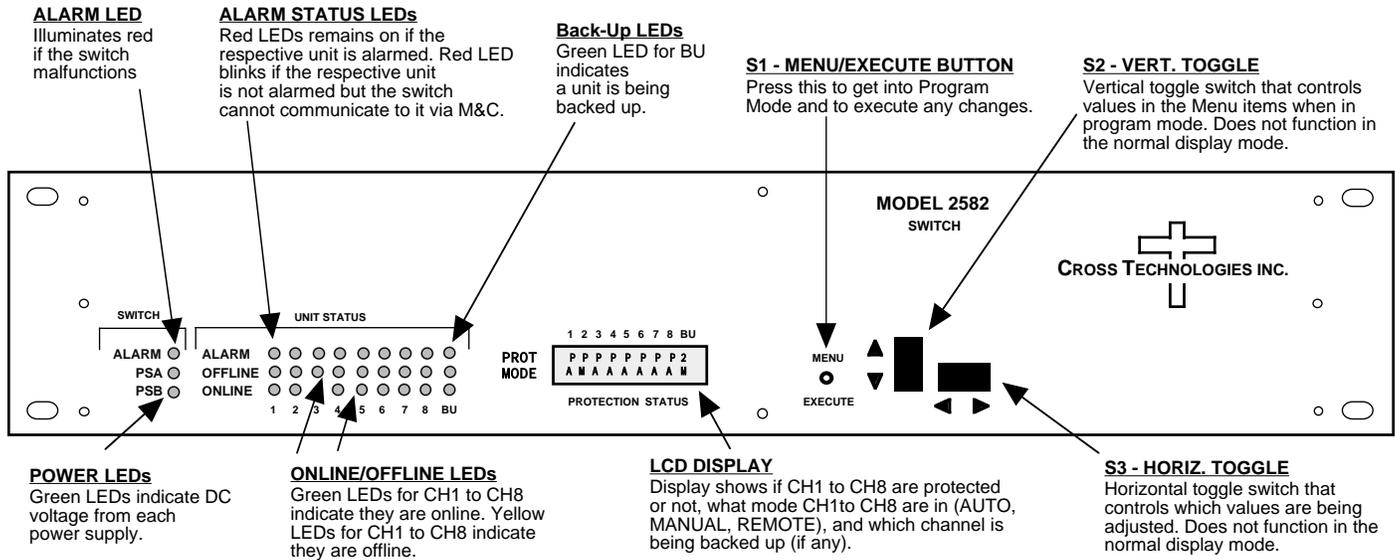Interface: DB-9 Male
Protocol: RS-232C/422/485, 9600 baud rate, no parity,
8 data bits, 1 start bit, 1 stop bit.

TABLE 2.2 CH1,CH2,CH3,CH4,BU Pinouts	
Pin	**Function**
1	Tx-
2	Tx+ (RS-232C)
3	Rx+ (RS-232C)
4	Rx-
5	GND
6	Alarm Relay: Common
7	Alarm Relay: Normally Open
8	Not Used
9	Alarm Relay: Normally Closed

2.3 Front Panel Controls and Indicators

Figure 2.2 shows the front panel controls and indicators.

ALARM LED
Illuminates red if the switch malfunctions

ALARM STATUS LEDs
Red LEDs remains on if the respective unit is alarmed. Red LED blinks if the respective unit is not alarmed but the switch cannot communicate to it via M&C.

Back-Up LEDs
Green LED for BU indicates a unit is being backed up.

S1 - MENU/EXECUTE BUTTON
Press this to get into Program Mode and to execute any changes.

S2 - VERT. TOGGLE
Vertical toggle switch that controls values in the Menu items when in program mode. Does not function in the normal display mode.

POWER LEDs
Green LEDs indicate DC voltage from each power supply.

ONLINE/OFFLINE LEDs
Green LEDs for CH1 to CH8 indicate they are online. Yellow LEDs for CH1 to CH8 indicate they are offline.

LCD DISPLAY
Display shows if CH1 to CH8 are protected or not, what mode CH1 to CH8 are in (AUTO, MANUAL, REMOTE), and which channel is being backed up (if any).

S3 - HORIZ. TOGGLE
Horizontal toggle switch that controls which values are being adjusted. Does not function in the normal display mode.
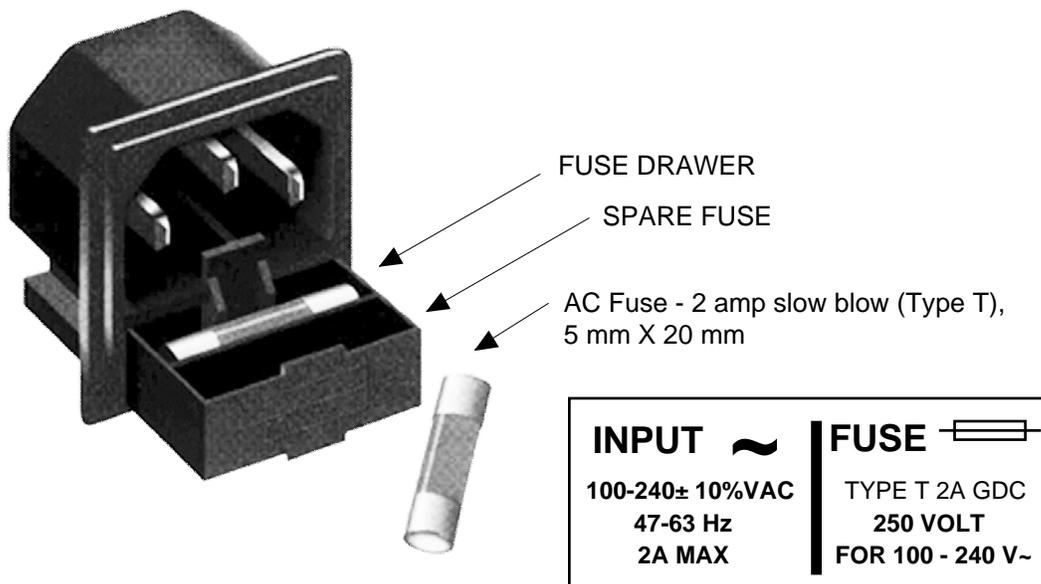
FIGURE 2.2   2582-282 Front Panel Controls and Indicators

2.4 Installation / Operation

2.4.1 Installing and Operating the 2582-282, Switch Section.

1. Connect Converters (CH1, CH2, CH3, CH4, CH5, CH6, CH7, CH8, BU) to respective channels on the 2582 (Figure 2.1).
2. Connect Alarm/Control cables from Converters to respective monitors on the 2582 (Figure 2.1).
3. Connect two 100-240 ± 10% VAC, 47 - 63 Hz power cords to AC A and AC B on the back panel (Figure 2.1).
4. Set which unit(s) you wish to protect and the mode for each unit (See Section 2.5 Menu Settings).
5. Be sure PSA & PSB (green, DC Power) are on and the red alarm LED is off (Figure 2.2).
6. <u>AC Fuses</u> **-** The fuses are 5 mm X 20 mm, 2 amp slow blow (Type T) and are inserted in the far slot in the drawer below the AC inputs as shown in Figure 2.3. There is a spare fuse in the near slot. If a fuse continues to open, the corresponding power supply is most likely defective.

FUSE DRAWER

SPARE FUSE

AC Fuse - 2 amp slow blow (Type T), 5 mm X 20 mm

INPUT $\sim$	FUSE
100-240± 10%VAC	TYPE T 2A GDC
47-63 Hz	**250 VOLT**
2A MAX	**FOR 100 - 240 V~**

FIGURE 2.3   Fuse Location and Spare Fuse

2.5 Menu Settings

2.5.1 Functions - This section describes operation of the front panel controls. There are three operator switches, the LCD display and alarm indicator LEDs. All functions for the equipment are controlled by these components. The functions are (see Figure 2.4):

> **Power Up**
> **Normal Display**

> **Menu 1**   Set CH1 Protected/Unprotected/Unused and
>   Set CH1 Mode (MANUAL overrides REMOTE which overrides AUTO)
> **Menu 2**   Set CH2 Protected/Unprotected/Unused and
>   Set CH2 Mode (MANUAL overrides REMOTE which overrides AUTO)
> **Menu 3**   Set CH3 Protected/Unprotected/Unused and
>   Set CH3 Mode (MANUAL overrides REMOTE which overrides AUTO)
> **Menu 4**   Set CH4 Protected/Unprotected/Unused and
>   Set CH4 Mode (MANUAL overrides REMOTE which overrides AUTO)
> **Menu 5**   Set CH5 Protected/Unprotected/Unused and
>   Set CH5 Mode (MANUAL overrides REMOTE which overrides AUTO)
> **Menu 6**   Set CH6 Protected/Unprotected/Unused and
>   Set CH6 Mode (MANUAL overrides REMOTE which overrides AUTO)
> **Menu 7**   Set CH7 Protected/Unprotected/Unused and
>   Set CH7 Mode (MANUAL overrides REMOTE which overrides AUTO)
> **Menu 8**   Set CH8 Protected/Unprotected/Unused and
>   Set CH8 Mode (MANUAL overrides REMOTE which overrides AUTO)
> **Menu 9**   Set Remote interface
> **Menu 10**   Set RS-485 address
> **Menu 11**   Set Minimum Auto Switching Mode ON and OFF
> **Menu 12**   Restore Switch Position in Minimum Auto Switching mode

> **Save Menu** When "R" is selected or when get to the end

Alarm indications appear on the LEDs (see figure 2.2).

All program changes must start with the operation of the Menu/Execute switch and must also end with the operation of the Menu/Execute switch verified by the "Save Settings?" Menu. If this sequence is not followed, none of the changes will take effect.

2.5.2. Power On Settings

NOTE: The last status of a unit is retained even when power is removed. When power is restored, the unit will return to it's previous settings.

When power is first applied, the LCD display goes through six steps:

1. All alarm, offline & online LEDs are turned on. If any one does not come on, there is a hardware fault that should be fixed.
2. The LCD goes black to show all segments are functioning.
3. The model number and software version will be displayed.

```
          1   2   3   4   5   6   7   8   BU
        ┌─────────────────────────────────────┐
PROT    │  2582-282                           │
        │                                     │
MODE    │  Rev. 5.00                          │
        └─────────────────────────────────────┘
              PROTECTION STATUS
```

4. Green LEDs are lit in succession, 1 thru 8 and backup. This is the initial scan for all channel settings.
5. All alarm, offline & online LEDs are set by the control program to reflect the current states of the attached units.
6. The present protection state and mode of each channel/unit are shown.

```
          1   2   3   4   5   6   7   8   BU
        ┌─────────────────────────────────────┐
PROT    │  P   P   P   P   P   P   P   P   2  │
        │                                     │
MODE    │  A   A   A   A   A   A   A   A   M  │
        └─────────────────────────────────────┘
              PROTECTION STATUS
```

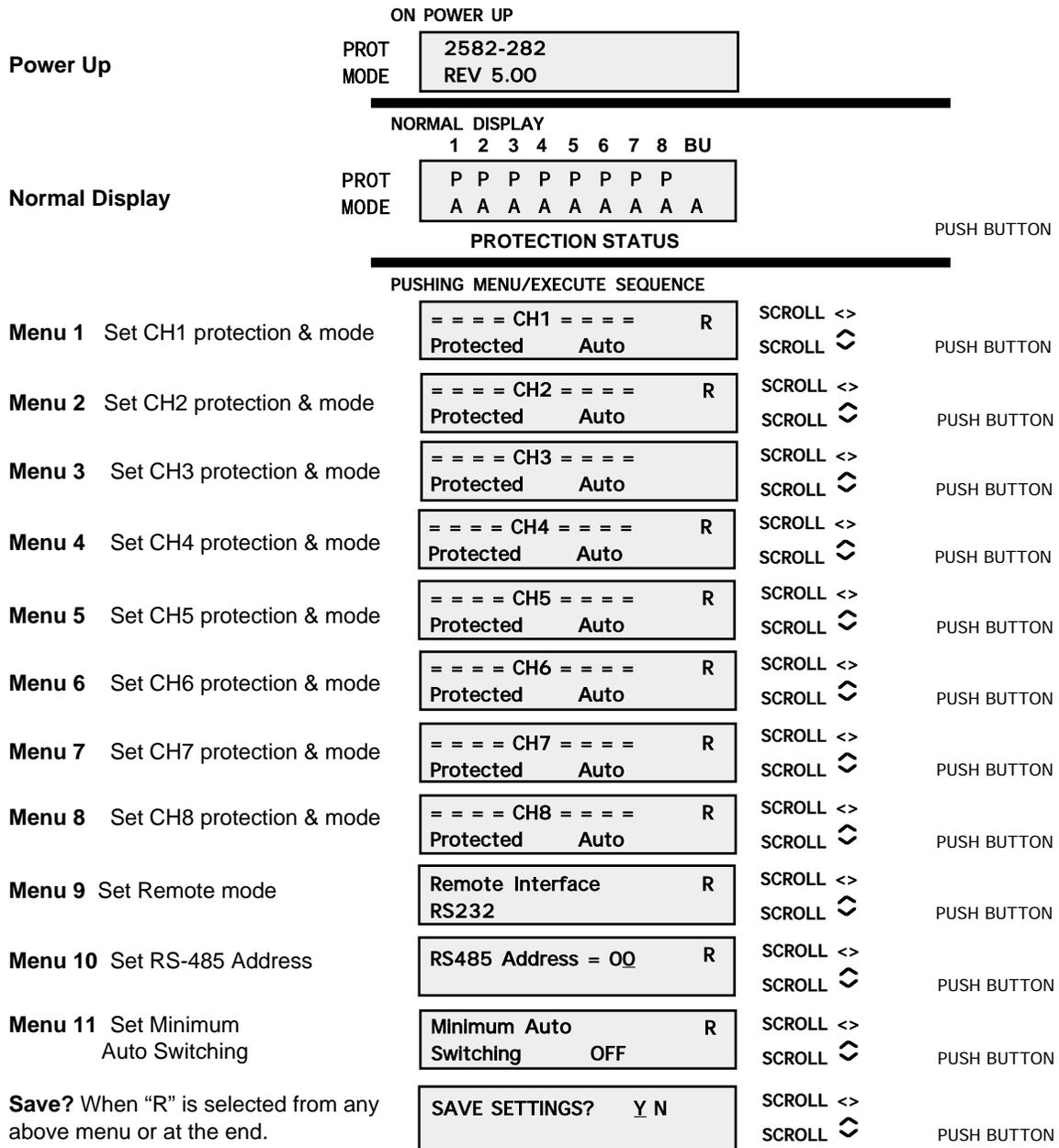The unit is now operational and ready for any changes the operator may desire.

2.5.3 Control Switches

1. <u>Menu/Execute</u> - Any change to the programming of the unit must be initiated by pressing the Menu/Execute switch and completed by pressing the Menu/Execute switch.
2. <u>Horizontal Switch</u> - This switch is mounted so its movement is horizontal and moves the cursor left or right.
3. <u>Vertical Switch</u> - This switch is mounted so its movement is vertical, and changes settings in each menu.

2.5.4 Alarm Indications

An alarm condition will occur if the corresponding unit's local oscillator phase lock loop (PLL) comes out of lock (when connected properly).

FIGURE 2.4   2582-282 Menu Display and Sequences

Power Up

ON POWER UP

PROT
MODE
| 2582-282 |
| REV 5.00 |

Normal Display

NORMAL DISPLAY
      1 2 3 4 5 6 7 8 BU

PROT
MODE
| P P P P P P P P |
| A A A A A A A A A |

PROTECTION STATUS   PUSH BUTTON

PUSHING MENU/EXECUTE SEQUENCE

Menu 1 Set CH1 protection & mode

| = = = = CH1 = = = =   R |
| Protected   Auto |

SCROLL <>
SCROLL ↕   PUSH BUTTON

Menu 2 Set CH2 protection & mode

| = = = = CH2 = = = =   R |
| Protected   Auto |

SCROLL <>
SCROLL ↕   PUSH BUTTON

Menu 3   Set CH3 protection & mode

| = = = = CH3 = = = = |
| Protected   Auto |

SCROLL <>
SCROLL ↕   PUSH BUTTON

Menu 4   Set CH4 protection & mode

| = = = = CH4 = = = =   R |
| Protected   Auto |

SCROLL <>
SCROLL ↕   PUSH BUTTON

Menu 5   Set CH5 protection & mode

| = = = = CH5 = = = =   R |
| Protected   Auto |

SCROLL <>
SCROLL ↕   PUSH BUTTON

Menu 6   Set CH6 protection & mode

| = = = = CH6 = = = =   R |
| Protected   Auto |

SCROLL <>
SCROLL ↕   PUSH BUTTON

Menu 7   Set CH7 protection & mode

| = = = = CH7 = = = =   R |
| Protected   Auto |

SCROLL <>
SCROLL ↕   PUSH BUTTON

Menu 8   Set CH8 protection & mode

| = = = = CH8 = = = =   R |
| Protected   Auto |

SCROLL <>
SCROLL ↕   PUSH BUTTON

Menu 9 Set Remote mode

| Remote Interface   R |
| RS232 |

SCROLL <>
SCROLL ↕   PUSH BUTTON

Menu 10 Set RS-485 Address

| RS485 Address = 00   R |

SCROLL <>
SCROLL ↕   PUSH BUTTON

Menu 11 Set Minimum
          Auto Switching

| Minimum Auto   R |
| Switching   OFF |

SCROLL <>
SCROLL ↕   PUSH BUTTON

Save? When "R" is selected from any
above menu or at the end.

| SAVE SETTINGS?   Y N |

SCROLL <>
SCROLL ↕   PUSH BUTTON

2.5.5 Minimum Auto Switching Mode

Enabling and Disabling

The Minimum Auto Switching mode is enabled and disabled via a front panel menu. The Minimum Auto Switching mode can also be enabled and disabled via the following M&C command:

> {CMx}
>
> Where x=1 to enable and x=0 to disable.

The status of the 2582-282 Minimum Auto Switching mode setting can be queried by sending the following command:

> {SM}
>
> Which returns {SMx} where x=1 if enabled and x=0 if disabled.

Operation

In the Minimum Auto Switching mode the switch will remain in a backup state after an alarm event - even if the alarm event that caused the unit to switch has been cleared. The main display will show an "H" (hold) under the BU MODE after an alarm causes the switch to change states while in the Minimum Auto Switching mode. The unit can be restored to the normal state via a front panel restore command or an M&C restore command. The front panel Restore Switch menu appears after the Minimum Auto Switching mode ON/OFF menu only if the Minimum Auto Switching mode is on. The backup can also be released from its hold state via the following M&C command:

> {CHx}
>
> Where x = 0 to restore.

NOTE: The switch will automatically restore - as soon as the alarm event that caused the unit to switch has been cleared - *IF* the Minimum Auto Switching mode is disabled either via the front panel setting or by the M&C command.

2.5.6 Switch Actions in Response to Various Conditions

General Operation Description

If one of channels 1 thru 8 is alarmed, the 2582 automatically switches the RF signals from that unit to the backup unit. I.e., the alarmed unit is now offline and the backup unit is now online operating in place of the alarmed unit. If more than one unit is alarmed, only the highest priority unit is backed up. The priority is based on the channel number where 1 is the highest priority and 8 is the lowest.

However, if a unit's settings have never been successfully obtained by the 2582 since being powered up, then the 2582 does not have settings with which to program the backup unit for that channel. Therefore, if the 2582 does not have settings for an alarmed unit, that alarmed unit cannot be backed up.

Any <u>one</u> of the following conditions will prevent an alarmed unit from being automatically backed up.

    a) The 2582 never successfully obtained settings from the unit.
    b) The unit's protection setting is not PROTECTED.
    c) The unit's mode setting is not AUTO.
    d) The backup unit is alarmed.
    e) A unit of higher priority is already being backed up.
    f) Some other unit is being forcefully backed up via MANUAL or REMOTE.
    g) Minimum auto switching is on and is holding another channel in backup until released.

Specifics

The following describes specific conditions in more detail, the response of the 2582 and any changes to the display or LEDs to indicate the stated condition.

1. Channel **i** is alarmed.
   - Highest priority unit is backed up. Channel **i** has higher priority than channel **j** if $i < j$.
   - Remaining units are online, even if alarmed.

2. Failure to obtain settings from unit **i** at power up.
   - Red LED **i** blinks.
   - Unit **i** can not be backed up since there are no settings with which to program the BU unit.

3. Failure to detect unit **i**'s communication after power up.
   - In firmware, unit **i** is declared "not connected".
   - Red LED **i** blinks.
   - No other corrective action is taken.
   - If alarmed & the highest priority channel, unit **i** will be backed up using the latest settings successfully obtained from the unit.

(continued ...)

4. Failure to successfully send settings to unit **i** when switching **i** back online from being backed up.
    *   No corrective action is taken.
    *   If preempted by a higher-priority unit needing to be backed up, unit **i** is switched online anyway.
    *   If alarmed & the highest priority channel, unit **i** will be backed up using the latest settings successfully obtained from the unit.

5. Backup unit is alarmed.
    *   No unit can be backed up.
    *   Any channel being backed up is switched back online at the time the BU unit alarms.

6. Channel **i** is set for "UNUSED".
    *   'X' appears on the display under the channel number for both Prot. & Mode.
    *   Unit is not considered for backing up.
    *   LEDs for that unit are all turned off.

3.0 Environmental Use Information

A. **Rack-Mounting** - To mount this equipment in a rack, please refer to the installation instructions located in the user manual furnished by the manufacturer of your equipment rack.

B. **Mechanical Loading** - Mounting of equipment in a rack should be such that a hazardous condition does not exist due to uneven weight distribution.

C. **Elevated Operating Ambient Temperature** - If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack may be greater than room ambient temperature. Therefore, consideration should be given to Tmra.

D. **Reduced Air Flow** - Installation of the equipment in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised. Additional space between units may be required.

E. **Circuit Overloading** - Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading of circuits could have on over current protection and supply wiring. Appropriate consideration of equipment name plate rating should be used when addressing this concern.

F. **Reliable Earthing** - Reliable earthing of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connection to the Branch (use of power strips).

G. **Top Cover** - There are no serviceable parts inside the product so, the Top Cover should not be removed. If the Top Cover is removed the ground strap and associated screw MUST BE REINSTALLED prior to Top Cover screw replacement. FAILURE TO DO this may cause INGRESS and/or EGRESS emission problems.

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