



OPERATING AND PROGRAMMING MANUAL



10943B-Type

Coaxial Four-Channel Backup System

State-of-the-Art Switching Solutions

Warranty

This **Universal Switching Corporation** product is warranted against manufacturing defects, and workmanship for a period of two years from the date of shipment from our factory. During this period, Universal Switching will, at its option, either repair or replace products which prove to be defective or out of specification per the original purchase order or contract. Damage by misuse or abnormal conditions of operation, or evidence of partial or complete disassembly beyond normal maintenance or expansion procedures voids this warranty. Since Universal Switching Corporation has no control over conditions of use for the products it manufactures, no warranty is made or implied as to the suitability for the customer's intended use, beyond such performance specifications as are made a part of the purchase order or contract.

Equipment shipped F.O.B. Universal Switching Corporation shall become the property of the Buyer upon delivery to the carrier. Equipment shipped F.O.B. Destination shall become the property of the Buyer upon delivery acceptance from the carrier. Damage during shipment, for items shipped F.O.B. Universal Switching Corporation should be handled by immediately requesting the carrier's inspection upon evidence of damage to the equipment. This warranty excludes all other warranties expressed or implied. Universal Switching Corporation shall not be liable for any special, indirect, or consequential damages.

For warranty service or repair, the Buyer shall prepay shipping charges to Universal Switching Corporation, and Universal Switching Corporation shall pay shipping charges to return the product to the Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to Universal Switching Corporation from another country.

Universal Switching Corporation warrants that its software and firmware designated by Universal Switching Corporation for use with an instrument will execute its programming instructions when properly installed on that instrument. Universal Switching Corporation does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error-free.

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TECHNICAL SUPPORT

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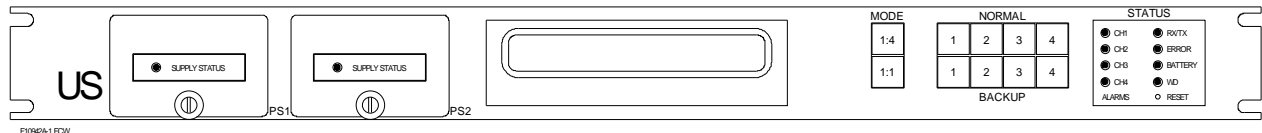
Universal Switching Corporation
7671 North San Fernando Road
Burbank, CA. 91505-1073

Email support@uswi.com

1. Introduction to the 10943B

The 10943B is a highly integrated coaxial switching system specially configured for routing signals in a four-channel backup arrangement. It is available in models with dual serial interfaces (10943B-D485), or with one serial interface and one Ethernet interface (10943B-SE10-4), in AC or DC powered configurations. Under remote program or front panel control, the user may connect a backup source in place of the four (4) standard signal inputs.

The 10943B is designed for high performance analog signal switching and incorporates high reliability relays. The up to 2400MHz bandpass makes the 10943B a very versatile switch for connecting L-band signals under remote or local control.



The 10943B is designed for high reliability and high performance utilizing the latest in component technology. Front panel accessible and hot-swap redundant power supplies are included to provide for zero down time in the event of a power supply failure.

Some of the key features are:

- >2400MHz bandpass
- Hot-Swap power supplies
- High reliability relays
- Embedded intelligent controller
- Front panel status LED's
- Vacuum fluorescent display (1x20)
- Illuminated control keys and display
- Powerful control command set
- Store and recall switching configurations
- Dual serial interfaces (10943B-D485)
- Serial and Ethernet interfaces (10943B-SE10-4)
- International AC power input (90-264VAC), DC versions available
- Compact and rugged enclosure design
- Flash field programmable

1.1. System 10943B Configurations

The 10943B-SE10-4 is configured with one Ethernet control port and one RS-232C serial control port (the serial port can be easily configured for RS-422A or RS-485 by changing an internal switch setting and jumpers under the system cover). In addition, there is one serial alarm port and one serial driver port.

The 10943B-D485 is configured with dual multi-serial control ports (the ports may be configured for RS-232, RS-422, or RS-485 by changing an internal switch setting and jumpers under the system cover). In addition, there is one serial alarm port and one serial driver port.

The unit can be ordered to operate from either AC (90-264VAC) or from DC voltages.

1.2. System Expansion

As previously expressed in the warranty notice, Universal Switching Corporation voids the warranty of this system if it has been damaged by misuse or abnormal conditions of operation, or evidence exists of partial or complete disassembly beyond normal maintenance or expansion procedures.

The series G2 product line provides enhanced control, additional features, higher performance, and greater system flexibility than ever before; however, if you need to modify or expand your system please consult our application engineers for further assistance.



CAUTION: *The system is configured with particular power supplies that are not interchangeable with other models. Always replace power supplies with the same model number. Failure to observe this CAUTION could result in damage to equipment.*

2. System Setup

This section contains safety warnings and instruction on how to configure the switching system in preparation for operation.

It is very important to read and follow carefully the instructions provided below to assure safe and trouble-free operation and also to maximize the performance and expected lifetime of the system.

2.1. Preventing Electrostatic Discharges (ESD)

Many electronic components inside the system contain microcircuits and other sensitive devices that can be damaged internally by electrostatic discharges (ESD).

Electrostatic discharges (ESD) are the most severe form of electromagnetic interference. The human body can build up static charges that range up to many thousands of volts. This voltage can discharge very rapidly into an electrically grounded body or device. Damage to the internal components of a sensitive device can cause failure with just one static discharge.

The most common causes of ESD are the human body, low humidity, improper grounding, unshielded cables, and poor connections.

2.1.1. Anti-Static Protection

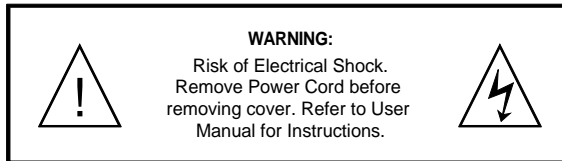
The components inside the switching system are extremely sensitive to electrostatic discharge (ESD). Electrostatic discharge can cause irreparable damage to the internal components of the switching system. The technician handling the component must know about static electricity and how to protect the components from ESD.



NOTE: Please follow normal ESD precautions and use anti-static protection to minimize or eliminate possible damage to the sensitive components included with the system.

2.2. Safety Warnings and Markings







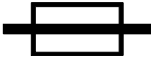

The system contains high voltage hazardous to human life and safety, and is capable of inflicting personal injury. The following warning marking is visible on the outside of the system. Note that this marking should never be removed and must remain on the system at all times.



2.2.1. Declaration of Conformity (DoC)

Declaration of Conformity (DoC) is included with the system when shipping to EU Member countries, only. The DoC also contains the serial number of the system.

The following IEC symbols are utilized as appropriate throughout the unit. This table can be used as a reference.

	Meaning of Symbols	IEC Symbol Reference
	High Voltage: Risk of Electric Shock	ISO 3864, No. 3.3.1 and 5036
	Explanation Needed: Refer to this Operations Manual	ISO 3864, No. 3.3.1
	AC Voltage	5032
	Switch ON	5007
	Switch OFF	5008
	ON/OFF (alternate action with Push-ON, Push-OFF)	5010
	ON/OFF (alternate action with Push-ON, Push-OFF)	5016
	Protective Earth Ground	5019

2.3. Serial Number Label

The system includes a factory assigned serial number that is unique to each piece of equipment. There is also a label on the bottom of the unit indicating the version of the 10943B and the MAC address.

2.4. Unpacking

The system is packed in antistatic material and shipped in multiple cartons of custom commercial packaging. Please pay attention when opening the shipping container not to inflict any cosmetic damage to the system. Check the packing list against the contents of the shipping container.



NOTE: Carefully inspect the packaging for shipping damage. Of damage is present, immediately notify Universal Switching Corporation and the carrier. Keep all shipping materials for the carrier's inspection.

If the contents are not complete, or there is any kind of mechanical damage or visible defects, you must notify the factory within five (5) days of receipt.

2.5. Environmental

The system may operate in a normal laboratory, a production, or a more rugged industrial environment without any additional considerations. However, protection against a dusty environment and temperature extremes which can cause condensation should be considered.

2.5.1. Storage and Shipping

The system may be stored or shipped in environments with the following limitations:

- Temperature: -20 degrees C to +85 degrees C
- Humidity: 0 to 90% (non-condensing)
- Altitude: 50,000 feet

2.5.2. Operating Environment

The system may be used in any environment with the following limitations:

- Temperature: 0 degrees C to +60 degrees C
- Humidity: 0 to 90% (non-condensing)

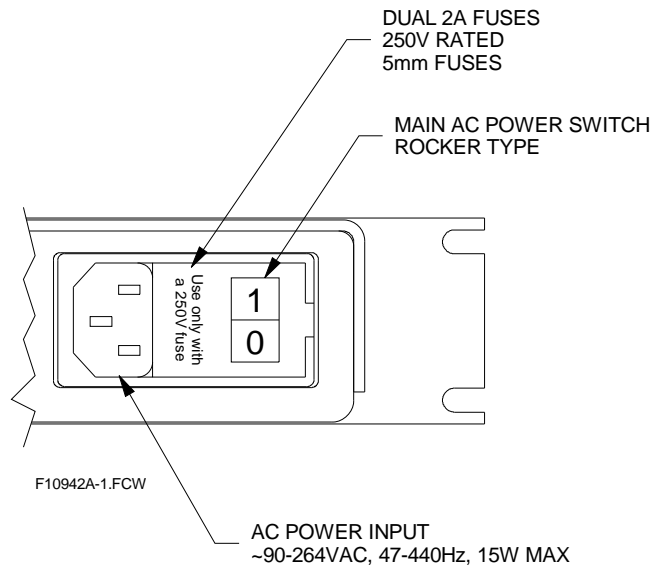
2.5.3. Installation Site Parameters

The installation site in which the system is to be installed should be as clean as possible. A dusty environment should be avoided. It is recommended that the system be installed in an environmentally controlled area equipped with an air filtration system.

The system has been designed to be mounted in a standard 19" equipment rack. The system is 1RU high (1.75"). All I/O and control signal connections to the system are at the rear, and therefore would come from inside the rack enclosure.

2.5.4. Power Requirements (AC Version)

The system (AC version) requires a power source of 90 to 264VAC single phase, 47 to 440Hz, and consumes <10 Watts of power. A 6-foot long power cord with standard NEMA 15A male plug is included with the system. For high reliability, front panel installed redundant hot-swap power supplies are utilized.



2.5.5. Connecting AC Power

The system is Safety Class 1 type equipment (equipment with an exposed metal chassis that is connected to earth via the power supply cord). Included with the 10943B is a UL approved power cord.

The switching system has been designed and tested to meet strict safety requirements. A UL approved power cord is included with the system. The system integrator is responsible for the correct AC power cord specific for the destination country.

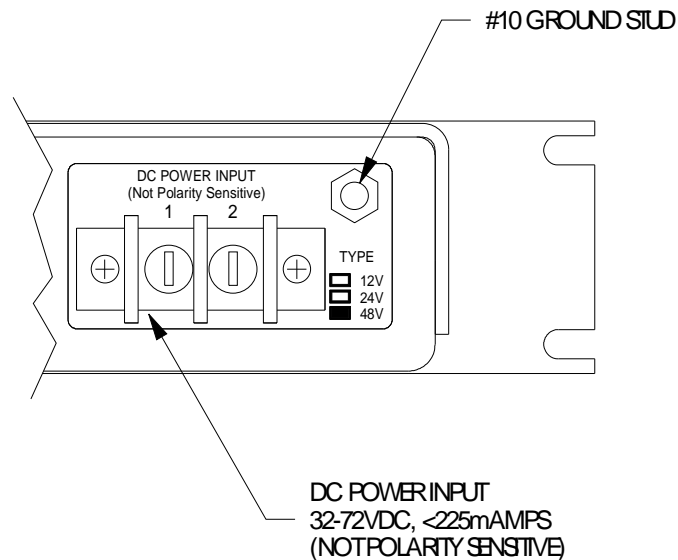
The power section on the rear of the system accepts the power cord providing the required grounding of the unit. A line filter is included in the power section to help eliminate spikes and transients from the AC power source.

2.5.6. Powering ON (AC version)

A rocker switch located on the power section on the rear of the system provides for powering ON or OFF the system.

2.5.7. Power Requirements (48VDC version)

The system (DC version) requires a power source of 48 Volts DC (32-72V range), and consumes <10W of power. For high reliability, front panel installed redundant hot-swap power supplies are utilized. Other input voltage ranges are available. The 48 volt version is identified by the appropriate voltage box adjacent to the input connector. Contact the factory for additional ranges.



2.5.7.1. Connecting DC Power

DC power is supplied to the unit using the rear panel mounted screw terminals. The two terminals are marked "1" and "2", respectively, but any polarity may be used, since the DC powered system is equipped with an input rectifier. A ground terminal is also provided.

2.6. Shipment of the System

If any portion of the system is to be shipped back to the factory for service or modification, please attach a tag to the system. This tag must identify the current owner (including address and phone number) model and serial number of the unit, as well as a brief description or the required service or suspected problem.

Mark the container **FRAGILE** to help insure safe handling by the carrier. In correspondence, refer to the return item by the model number and serial number.



NOTE: Many problems may be solved over the phone. If return of the unit is necessary, contact the factory for an RMA number. No unit shall be accepted without an RMA number.

2.6.1. Return Address

When returning the unit for repair or service, please use the following address:

Universal Switching Corporation
7671 North San Fernando Road
Burbank, CA 91505 USA

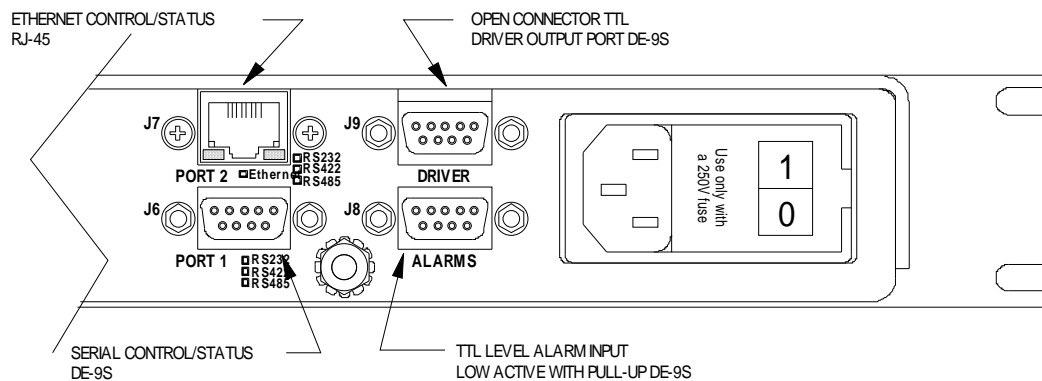


NOTE: Additional information is available at the Universal Switching Corporation website: www.uswi.com.

2.7. Connecting the Control Interface: 10943B-SE10-4

The 10943B-SE10-4 features one configurable serial control port and one Ethernet control port. The serial interface connectors are located on the rear of the unit and are standard D-Type 9-position female. The Ethernet interface is located on the back panel and is an RJ-45 connector.

Model Number	Interface Type	Connector
10943B-SE10-4	Ethernet	RJ-45 Port (J7)
	Serial (RS-232, 422, 485)	DE-9S Port (J6)

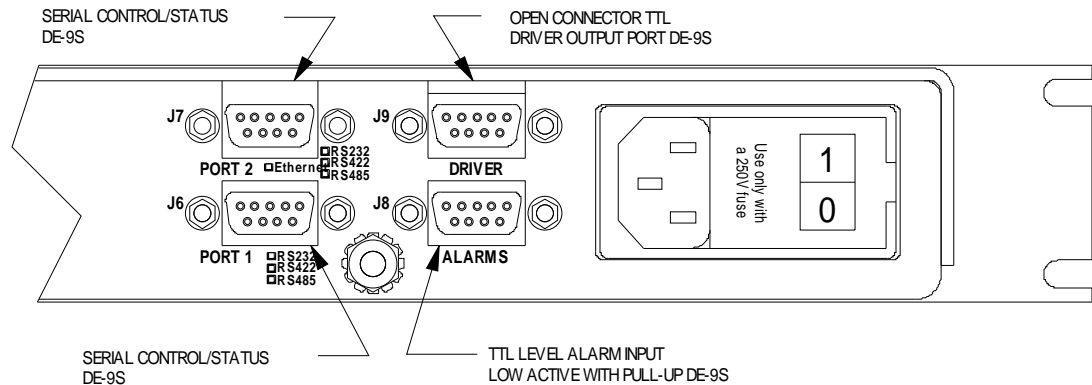


The serial interface port (J6) default configuration is **9600 baud, 8 data bits, 1 start bit, 2 stop bits, no parity, and no flow control**. In the case of the RS-485 multi-drop (addressable interface), the factory default address is 10. Changes to these settings are explained in the following sections.

2.8. Connecting the Control Interface: 10943B-D485

The 10943B-485 features dual, configurable serial control ports. The serial interface connectors are located on the rear of the unit and are standard D-Type 9-position female.

Model Number	Interface Type	Connector
10943B-485	Serial (RS-232, 422, 485)	DE-9S Port (J7)
	Serial (RS-232, 422, 485)	DE-9S Port (J6)



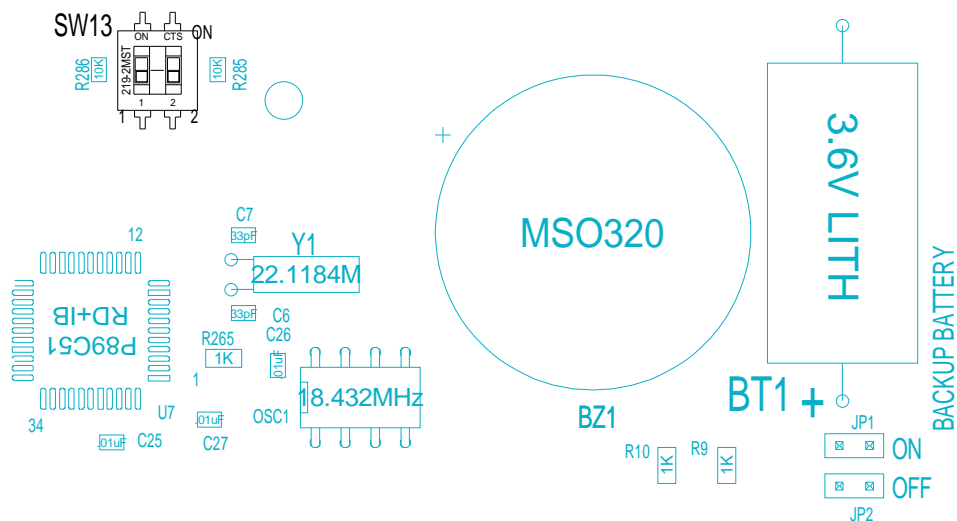
The serial interface ports (J6 and J7) default configuration is **9600 baud, 8 data bits, 1 start bit, 2 stop bits, no parity, and no flow control**. In the case of the RS-485 multi-drop (addressable interface), the factory default address is 10. Changes to these settings are explained in the following sections.

2.8.1. Configuring the Serial Port Hardware

The serial ports are configurable for RS-232, RS-422 or RS-485. This is done by changing jumpers and the SW13-1 switch position located inside the unit as described below. The system cover must be removed.

NOTE: The default factory interface for a 10943B-SE10-4 system is RS-232. The default factory interface for a 10943B-D485 is RS-485.

FRONT OF UNIT

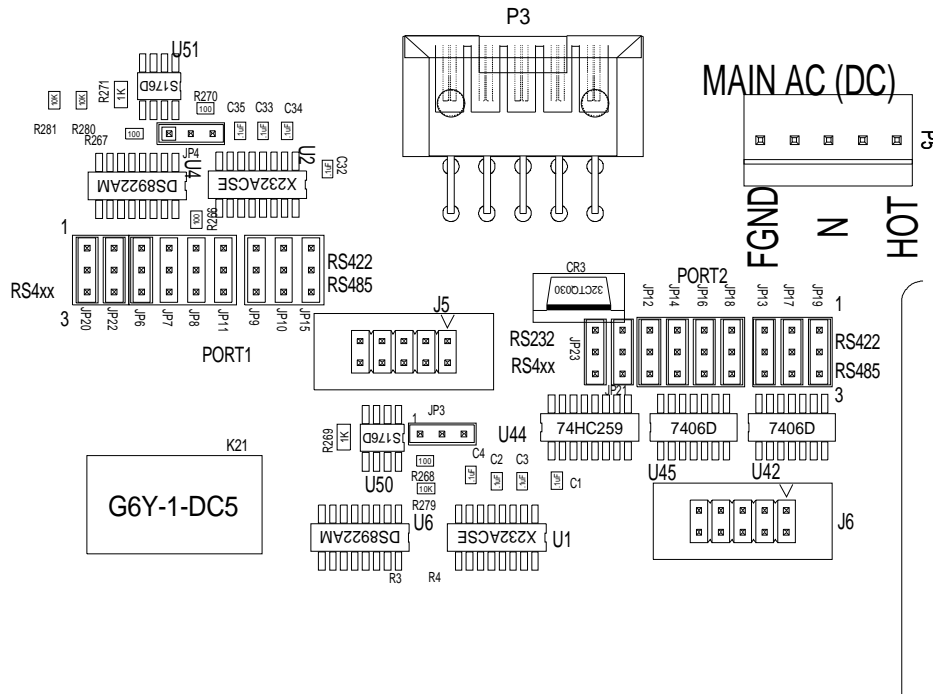


SW13, located near the front panel, determines whether or not an "address byte" is required to precede each command.

SW13-1 controls serial port J6; SW13-2 controls serial port J7 (applicable to 10943B-D485 only).

- SW13-1 and SW13-2 in the OFF position for RS-232 and RS-422
- SW13-1 and SW13-2 in the ON position for RS-485

NOTE: If the system is at the end of the RS-485 communication string, JP3 should be installed in the 1-2 position to provide termination.



REAR PANEL J6 & J7 CONNECTORS									
	JP20	JP22	JP6	JP7	JP8	JP11	JP9	JP10	JP15
RS-232	1-2	1-2	1-2	1-2	1-2	1-2	X	X	X
RS-422	2-3	2-3	2-3	2-3	2-3	2-3	1-2	1-2	1-2
RS-485	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3

- JP_n in position 1-2 means towards front panel
- JP_n in position 2-3 means towards rear panel
- JP_n in position X means that the position of this jumper doesn't matter

NOTE: Serial port J7 is applicable to 10943B-D485 only.

2.8.2. RS-232C Serial Pin Assignment

The following table is the pin assignment for using RS-232C serial control. The serial port J6 connector for 10943B-SE10-4, and the port J6 and port J7 for 10943B-D485, are located on the rear panel.

Pin Number	Function	Designation
1	Not Used	
2	Transmit Data	TXD
3	Receive Data	RXD
4	Not Used	
5	Signal Ground	GND
6	Not Used	
7	Clear To Send	CTS
8	Ready To Send	RTS
9	Not Used	

2.8.3. RS-422A Serial Pin Assignment

The following table is the pin assignment when using RS-422A serial control. The serial port J6 connector for 10943B-SE10-4, and the port J6 and port J7 for 10943B-D485, are located on the rear panel.

Pin Number	Function	Designation
1	Transmit Data (-)	TXD -
2	Transmit Data (+)	TXD +
3	Receive Data (+)	RXD +
4	Receive Data (-)	RXD -
5	Signal Ground	GND
6	Clear To Send (-)	CTS -
7	Clear To Send (+)	CTS +
8	Ready To Send (+)	RTS +
9	Ready To Send (-)	RTS -

2.8.4. RS-485 Serial Pin Assignment

The following table is the pin assignment when using RS-485 serial control. The serial port J6 connector for 10943B-SE10-4, and the port J6 and port J7 for 10943B-D485, are located on the rear panel. An internal 100 ohm termination is enabled as shipped for RS-485. JP3 is set to the "2-3" position (OFF). If it is desired to have the port internally terminated, the jumper should be moved to the "1-2" position instead.

Pin Number	Function	Designation
1	TR Data (-)	485 -
2	TR Data (+)	485 +
3	Not Used	
4	Not Used	
5	Signal Ground	GND
6	Not Used	
7	Not Used	
8	Not Used	
9	Not Used	

2.8.5. Setting the Serial Port Baud Rate

When the 10943B leaves the factory, **the serial port is configured for 9600 baud, 8 bits per character, 1 start bit, no parity, 2 stop bits, no handshaking.** Only the baud rate may be changed. All other parameters are fixed. The baud rate is changed by means of a remote control command; no DIP switches are available. There is one serial port included with the system. **The baud rate of the port can be set to different settings.**



NOTE: All commands are standard ASCII and must be terminated by a CR (carriage return). Any LF (line feed) termination is ignored by the system.

To change the baud rate of the serial port, the following command is available:

I x x { C R }



NOTE: If configured for RS-485, a preceding "address byte" must be added at the beginning of the command.

The three character command is an "I" followed by the desired baud rate abbreviation as seen in the table below.

Ixx	Baud Rate
03	300
12	1200
24	2400
96	9600 (default)
19	19.2k
38	38.4k
56	56.7k
15	115.2k

After receipt of the "I" command (including a {CR}), the unit will return the same command using the original baud rate. The unit will then change to the new baud rate, and all successive commands will be interpreted using the new baud rate.

2.8.6. Ethernet Port J7 (10943B-SE10-4)

The 10943B-SE10-4 system features an Ethernet port (LAN interface). The Ethernet port (J7) uses a gateway module that converts TCP/IP (packet switched data) to serial data for communication with the 10943B system. Conversely, the 10943B-SE10-4 converts serial data (at 230kbps) to packet switched data under TCP/IP for communication on LANs.

The Ethernet port is a 10/100Mbps auto sensing LAN interface. The user may utilize Telnet or any other software that supports Telnet (for example, Hyperterminal) for communication and control.

2.8.7. Configuring the Ethernet Port J7 (10943B-SE10-4)

The Ethernet interface is pre-configured and tested at the factory. However, if necessary, it is possible to reconfigure the Ethernet interface by using the EG-SR-7150MJ utility. Go to www.uswi.com and click on *Support*, and then click on the bullet point for *Software, Firmware, Drivers and Configuration Tools*. The EG-SR-7150MJ utility is downloadable from the website when you click on the icon.

2.8.7.1. Setup (for 10943B-SE10-4)

The following steps guide the user through setup of the Ethernet port.

- Verify the system is connected to network or PC
- Logon to the Universal Switching Corporation website at www.uswi.com
- Download the EG-SJ-7150MJ file
- Extract the EG-SJ-7150MJ file
- Open the EG-SJ-7150MJ.exe file and follow the steps on the screen to install the utility and create a shortcut icon
- Double-click on the utility icon

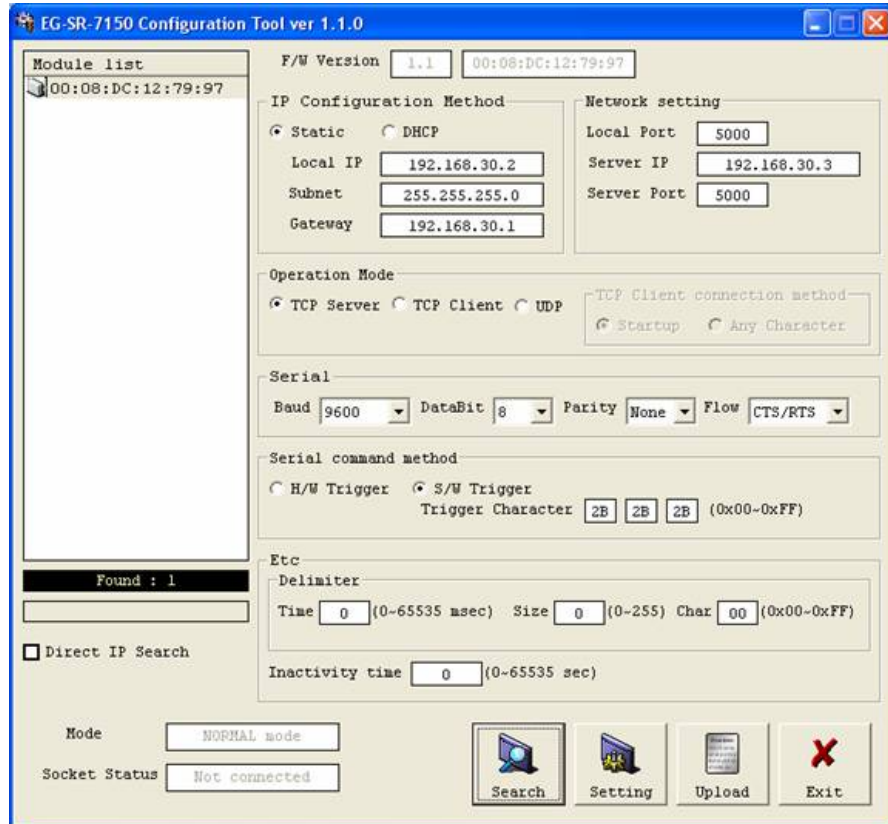
2.8.7.2. EG-SR-7150MJ Configuration Tool Screen (for 10943B-SE10-4)


A blank screen appears to allow configuring the system.

- Click on the Search button. The utility finds the gateway module.
- Select the correct MAC address from the Module list. (See the MAC address label on the system.) The configuration values of the selected module are displayed.
- Per user requirements, modify the IP Configuration Method area fields, and the Network Setting area fields. No other fields need to be modified.



NOTE: The baud rate may be changed but must match the system baud rate. (See 2.7.5.)



 **NOTE:** In the TCP Server or Client mode, once the connection has been established, data is transparently transmitted in both directions (from Server to Client or from Client to Server).

- Click on the Setting button to save the configuration
- Click on the Exit button and exit the screen

2.8.7.3. Telnet Control and Commands (for 10943B-SE10-4)

Telnet may be used for establishing communication with the system. Follow the steps below.

- Open a Telnet VT100 compatible terminal session
- Enter the following: Telnet <IP address> <port> (where IP address and port matches the values used in the configuration step)
- A connection is established
- Enter commands as described in Section 5
- Exit the Telnet session

2.8.8. Ethernet Port Pin Assignment (10943B-SE10-4)

The following table is the pin assignment for the Ethernet control port (J7 connector) located on the rear panel.

Pin Number	Function	Designation
1	Transmit Data	TX+
2	Transmit Data	TX-
3	Receive Data	RX+
4	Not Used	
5	Not Used	
6	Receive Data	RX-
7	Not Used	
8	Not Used	

2.8.9. Ethernet Factory Default Settings (10943B-SE10-4)

When the 10943B-SE10-4 leaves the factory, the Ethernet port is tested and hardware pre-configured per the following table.

IP Configuration Method	Static
Local IP address	192.168.30.2
Subnet mask	255.255.255.0
Gateway address	192.168.11.1
Local port number	5000
Server IP address	192.168.11.3
Server port number	5000

2.8.10. Self Test

The system's embedded controller performs a self-test immediately after power is applied. The self-test diagnostics are designed to run operational tests on the following system components:

- RAM
- ROM
- Vacuum Fluorescent Display (VFD)
- LED's on the front panel
- Beeper
- Power supply levels
- Internal CPU functions
- Current relay coil status

Upon powering ON the system, each of the above parameters will be verified consecutively. The self-test diagnostics may be started again from the remote interface.



NOTE: The self-test for the LED's, beeper, and front panel display are by observation. Failure cannot be detected by the main CPU.

2.8.11. Error Messages

Should a failure or error condition be detected, an error message is displayed on the front panel. For an explanation of the error codes, see Section 6.



NOTE: The System's main CPU continually monitors various functions while powered. Should errors be detected, the CPU illuminates the front panel "ERR" LED and make an audible tone on the beeper (if enabled).

2.8.11.1. Flash Programming

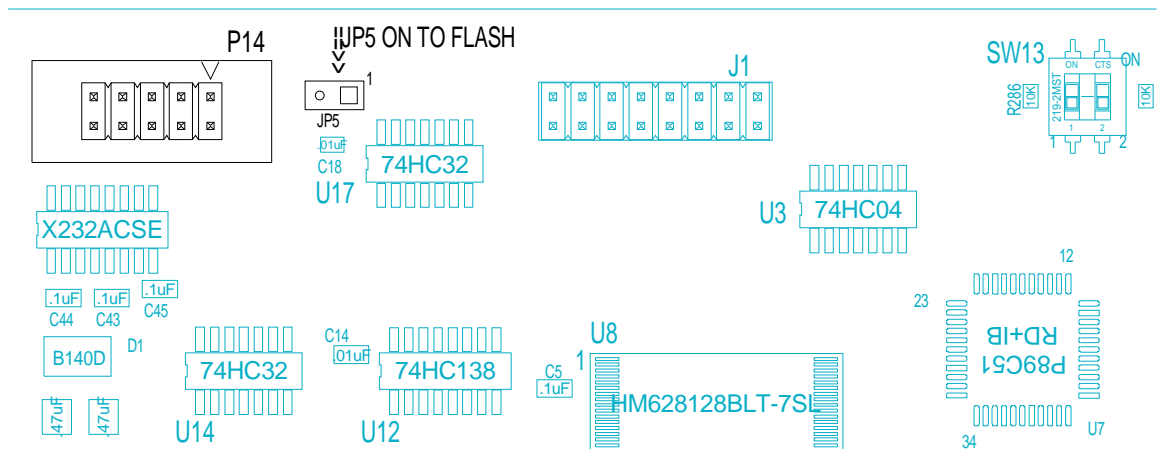
Firmware upgrades to the system are made available by downloading, via a standard PC's RS-232 (COM) port, to the circuit board (P10942B) serial service port P14. Firmware upgrades can be done by the factory or in the field.

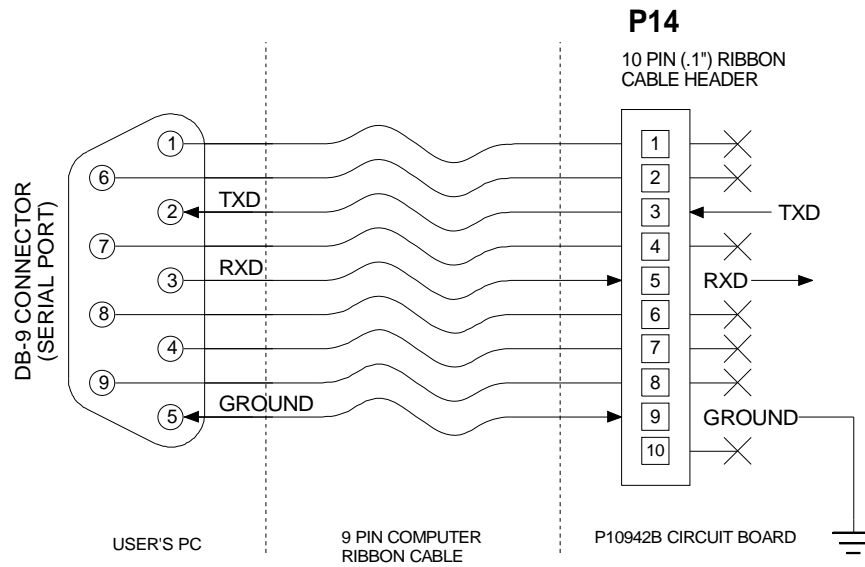
NOTE: The service port (P14) is accessible only after removing the cover from the unit.

The proper connector is a standard 9-pin computer ribbon cable, which connects between the P14 connector, and a PC computer's COM 1, 2, 3, or 4 port (or any serial control device's RS-232 port). Cables, as well as the program to flash the unit, are available from the factory. The procedure for flash programming a firmware upgrade in the field is as follows:

- Carefully remove the black cover assembly from the unit
- Connect the ribbon cable from unit interface port (P14) to the computer or serial control device's RS-232 port
- Set the JP5 jumper to the "ON" position
- Run flash program (WinISP)
- Set the JP5 jumper to the "OFF" position
- Disconnect the cable
- Replace the black cover on the unit

FRONT OF UNIT





NOTE: Only the 3, 5, and 9 pins are connected to the circuit board. No harm will come to the unit if other pin connection paths are active from the controller's end.

3. System Configuration

This section describes the various features of the switching system and the basic construction.

The 10943B is a 1RU high unit designed to receive up to four (4) coaxial signals on individual "sections" and directly route them without degradation or modification to four (4) individual outputs.

The four (4) inputs are referred to as the primary "A" inputs and are designated on the rear panel as J1-A, J2-A, J3-A and J4-A. The outputs are designated with the letter "C" and identified on the rear panel as J1-C, J2-C, J3-C and J4-C.

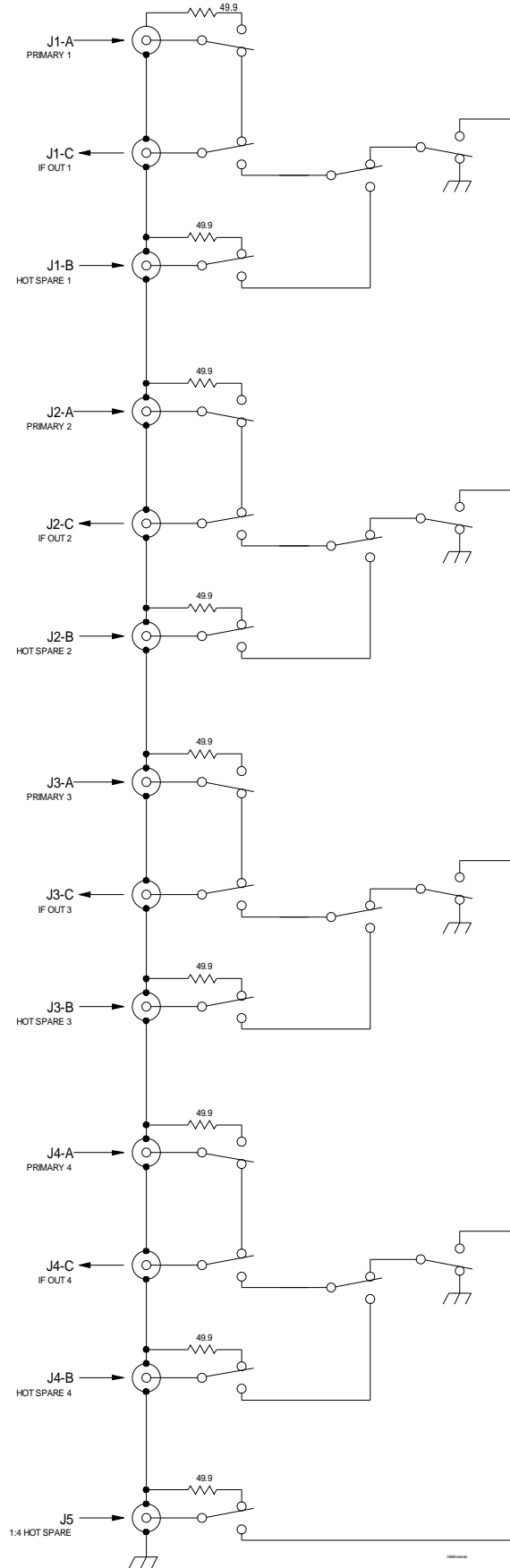
If the unit loses power, all primary "A" inputs fall back to the associated output port. For example, J1-A will be connected to J1-C, J2-A to J2-C, J3-A to J3-C, and J4-A to J4-C.

For each of the individual sections, a backup port exists and is designated with letter "B". The backup ports are identified as J1-B, J2-B, J3-B and J4-B. Under remote or front panel control, the user may command the backup port to be connected to the associated output port (Jx-C). For example, J1-B will be connected to J1-C, J2-B to J2-C, J3-B to J3-C, and J4-B to J4-C. When the associated backup (B) input is connected, it is referred to as being in the 1:1 backup mode.

When the backup port "B" is selected, the associated primary port "A" will be disconnected and terminated into 50 ohms. Likewise, when the backup port "B" is not connected, it is terminated into 50 ohms.

The unit also includes a "ganged" 2:2 command mode named "H2". In this "ganged" mode, commands to port 1 actuate ports 1 and 3, and commands to port 2 actuate ports 2 and 4.

One additional signal input connector is provided on the rear panel, identified as J5, and referred to as the "1:4" backup input. While the unit is in the 1:4 mode, the J5 connector provides the backup signal for a single output port when it is desired to connect a backup input. The primary input (Jx-A) would be disconnected and terminated, and the J5 connector would be connected to the desired output being provided the backup signal.



3.1. Primary Input Ports (Jx-A)

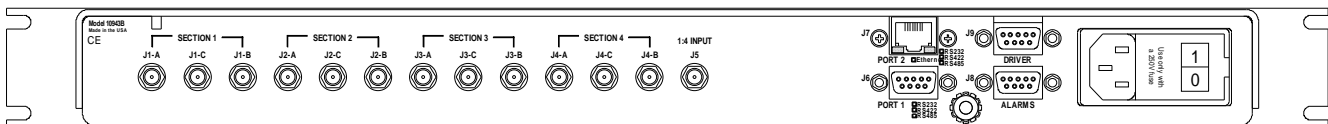
The primary input ports are female SMA connectors identified with the "A" suffix on the connector labeling. They are located to the left of each output port (as viewed from the rear). This is the normal input for each of the four (4) sections of the unit and is connected to the associated output port (Jx-C) should power be lost to the unit.

When it is disconnected from the output port, it is terminated into 50 ohms.

3.2. Output Ports (Jx-C)

The output port (C) on each of the four (4) sections on the 10943B is always connected to either the primary input port (Jx-A), the associated backup input port (Jx-B) or the 1:4 backup input port (J5). The output ports are female SMA connectors and are located in the center of each section on the rear panel.

Shown below is the 10943B-SE10-4.



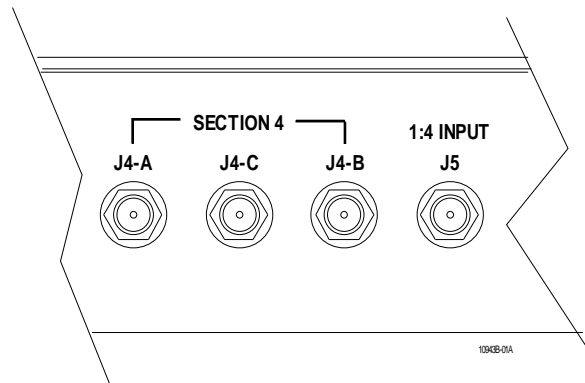
3.3. Backup Inputs (Jx-B)

Each of the four (4) outputs has an associated backup input port designated with the -B suffix. While the unit is in the 1:1 mode, this input port will be selected should a backup port be desired. When in the "normal" state or with power OFF, this port is disconnected and terminated into 50 ohms.

3.4. 1:4 Backup Input (J5)

The 1:4 backup input (J5) is only available when the unit is in the 1:4 mode. Backup input J5 is a female SMA connector located to the far right as viewed from the rear. It is normally terminated into 50 ohms. While in the 1:4 mode and a backup is needed, the J5 backup port is connected to the desired output.

3.4.1. Priority for 1:4 Backup Input



A priority scheme is included in the unit's firmware to provide a method to prioritize which output would receive the J5 input signal should more than one output require a backup signal.

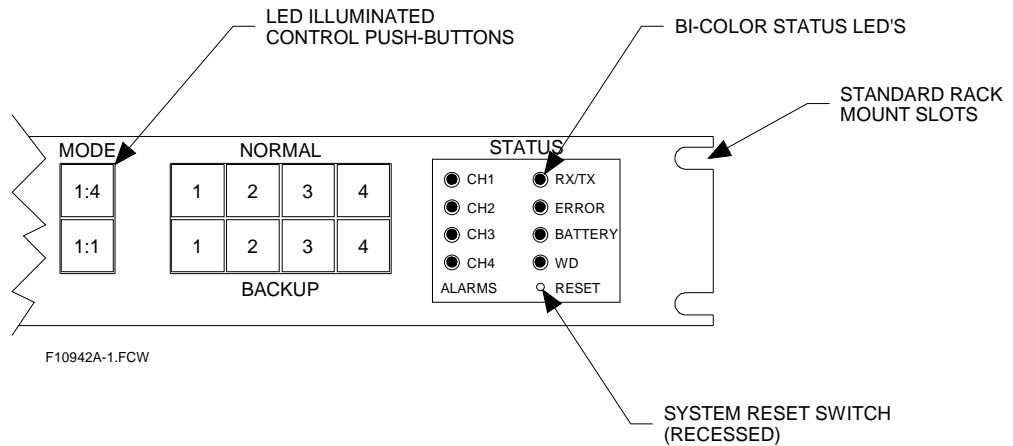
Example: J5 backup is currently connected to output J4-C and the unit is commanded to backup J1-C. If J1-C has a higher priority than J4-C, J4-C will be disconnected from the J5 connector and J1-C will be connected instead. Priorities are defined by means of sending a command to the unit via the applicable interface. Priority loading is not available from the front panel. Default priority scheme is J1-J2-J3-J4 (highest priority first).

4.2. Control Pad Entries

The front panel manual control keys are designed for switching operations in excess of 5 million entries per push-button. When a button is pressed, it provides both audible (if enabled) and tactile feedback to the operator.

4.2.1. Normal or Backup Keys

Two (2) rows of keys are available to select either a backup condition or normal condition for each of the four (4) switching sections. The upper row is the NORMAL mode selection (clear keys) and illuminates GREEN when selected. The lower row is utilized to select the BACKUP mode (YELLOW keys). When a backup is selected, the backup key illuminates YELLOW, and the associated "normal" key is turned off.



These keys provide local indication of the switch status as well as a means of local control. They reflect the status even when the switch is commanded from the serial control port or the external alarm inputs have created a selection.

4.2.2. Mode Keys (1:1 and 1:4)

A front panel means of backup mode selection is available. Two (2) keys labeled 1:1 or 1:4 select between the three (3) command modes. Only one mode can be selected at any one time (see Section 3). Pushing the "1:1" key toggles modes between the "1:1" (H1) mode, and the "2:2" (H2) mode. The "1:1" key is illuminated steady in H1 mode, while in H2 mode the key flashes.



NOTE: Pushing a mode key, or sending a mode changing command ("Hx") causes the switch to clear any current backup connections.

4.3. Front Panel Indicators

The front panel has eight (8) discrete bicolor LED's located on the right side of the front panel. They provide a direct visual status of main parameters.

4.3.1. LED Indicator Definitions

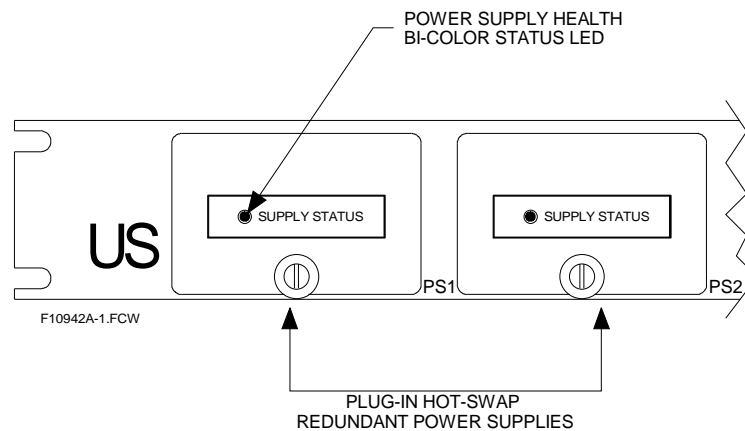
- **CH1 to CH4:** These LED's will always be GREEN unless an alarm condition is sensed. When an alarm signal level has been detected on the alarm input connector (J7) located on the rear panel, the associated indicator will illuminate RED as long as the alarm condition exists.
- **RX/TX:** This indicator is illuminated when the unit is receiving serial control data from the user on either of the serial port connectors (GREEN) or will be illuminated ORANGE when the unit is transmitting data to the user.
- **ERROR:** When a control command error, relay failure or some other similar error condition is sensed, the unit illuminates this LED with the color RED. Under normal conditions, the LED is off. An internal beeper will sound for 0.5 second in conjunction with an error condition (if enabled). The color RED will be present until the error condition is removed.
- **BATTERY:** The 10943B system includes a lithium battery to support the internal memory features of the unit. Also included is a battery monitor. Normally this LED is illuminated GREEN, but should the battery voltage level be marginal, the LED will turn RED. Should the LED turn RED, the unit will require service at the factory.
- **WD:** This LED should always be GREEN. It is directly controlled by the embedded CPU. Should a catastrophic failure occur, causing the unit to freeze (stop running the internal firmware), the LED will turn a solid RED. The unit will then automatically reset.

4.4. Reset Switch

The 10943B is equipped with a reset switch located in the lower right portion of the front panel. A small access hole is located directly below the status LED's. To reset the unit (reset does not change any downloaded parameters such as stored configurations), simply use a small object such as an opened paper clip to depress the switch located behind the access hole. It is about 0.3" behind the front panel. Be careful not to press the switch too hard! Pressing the Reset Switch has the same effect as cycling the power to the unit.

4.5. Plug-in Power Supplies

The 10943B system is designed with redundant power supplies that are replaceable from the front of the unit while the power is ON. This is referred to as "hot-swappable" power sections. Two (2) identical supplies are included, each being secured to the chassis by one captive fastener. Loosening the captive fastener allows removing the power supply from the unit.



The power supplies are monitored by the embedded CPU and include a bicolor status indicator on the supply unit itself. With the indicators illuminated green, the power supplies are operating within tolerance. Should an indicator turn red, the supply has dropped below operational limits or has failed completely and requires service. Failure of a power supply is considered an error condition and is treated as such by the CPU.

NOTE: *Plug-In Power supply types are specific to the type of power used for the system (AC or DC). These power supply module versions CANNOT be interchanged. Be careful when ordering spare power supplies to specify the correct power type.*

5. Programming the 10943B

This section introduces basic programming information and provides examples to get you started with the system programming. **Before you start trying to communicate with the system, be sure to configure the serial port or Ethernet port of your controller to match the settings of the system.**

5.1. Special Notes for Using RS-485

Commands are comprised of standard ASCII characters, terminated with a {CR} (control code 13). {LF} is optional, and will be ignored by the system.

5.1.1. How to Address the Unit

When using the RS-485 interface to control the unit, all commands must be preceded with an address byte. The address byte must match the number displayed during powering the unit. **The factory default is "10".** For example, if the display for the address shows "A=10", the address byte must have the binary value 10. Also, all RS-485 responses will have the address byte inserted first in the string returned.

5.1.2. Changing the RS-485 Device Address

The address is settable only from the serial control port, or upon special request prior to shipment of the system from the factory. The device address range is from "01" to "99". To change the device address, the following command syntax must be sent:

A14{CR}

The above example changes the device address for the port to address "14". As usual, the command must be preceded by the current device address. The factory default is "10".



NOTE: Setting to address to "00" will omit the requirement for the address byte from ALL command strings.

5.2. Control Protocols

The 10943B provides the user with two (2) different command protocols. Two (2) types have been provided for system integrators as a means of writing code that can be used on either of two (2) types of systems from Universal Switching Corporation.

5.2.1. Normal 10943B Control Protocol

The 10943B has a unique streamlined control code to access the many features of the unit. It is different from the standard **US2**, **US3** and **US4** protocols that Universal Switching Corporation uses.

Commands are comprised of standard ASCII characters, terminated with a **{CR}** (control code 13). **{LF}** is optional, and will be ignored by the system.

Alternatively, the 10943B also has the **US3** protocol embedded for use as a small 4-channel configuration of the System 11001. For newer applications, it is suggested that the normal 10943B control features and protocol be used, not the System 11001 protocol.

5.2.2. Special 11001 Control Protocol

Provided as a growth path for smaller systems, the 10943B provides the user with the option to control the unit with the System 11001 **US3** protocol. This is a simpler protocol with fewer features, but can be utilized on a larger switching system where the 10943B is a component element of a larger system.

The 10943B only has 4-channels of backup switching, while the System 11001 can be expanded from a simple 3-channel system, to a full 60 channels per unit. The command protocol for the System 11001 provides for this larger capacity while the normal 10943B protocol does not (4-channels only). It is suggested that if the user is intending to expand to the growth capacity of the System 11001, that this protocol be utilized. If no growth beyond the capacity of one or two 10943B units is needed, then the 10943B protocol should be used. The 10943B protocol has many additional features that the System 11001 does not provide.

For additional information on the System 11001, please contact the factory or consult the System 11001 Operation and Programming Manual.

5.3. Normal 10943B Command Overview

The basic operations that can be programmed are as follows:

- **Bi**: Connect a backup port to an output port (backup)
- **Ni**: Disconnect a backup port from an output port (normal)
- **Vi**: Verify the status of a backup connection
- **Snn**: Store switching configuration
- **Rnn**: Recall switching configuration
- **CLR**: Clear all backup connections
- **Pnnnn**: Set backup priorities for the 1:4 mode
- **H1, H2, or H4**: Set backup mode (1:1, 2:2 or 1:4)
- **DL**: Download switch configuration
- **RST**: Reset the system to default (clear all configuration data)
- **ER?**: Error status request
- **VER**: Request for firmware version
- **SON**: Enables unsolicited error attention message "ER!"
- **SOF**: Disables unsolicited error attention message "ER!"
- **Ixx**: Sets the baud rate of the serial communication port
- **LCK**: Locks the front panel controls
- **UNL**: Unlocks the front panel controls
- **BPx**: Controls conditions for internal beeper usage
- **RON**: Enables the system AutoRecall mode
- **ROF**: Disables the system AutoRestore mode
- **Ann**: Changes the factory default RS-232 address
- **Oann**: Outputs to the TTL driver port binary equivalent of "nnn"

5.3.1. Command Details

The serial and Ethernet control ports are located on the rear panel of the system. The serial ports (J6 & J7 on a 10943B-D485; J6 on the 10943B-SE10-4) are standard DE-9S female D-Type connectors; the Ethernet port (J7 on the 10932B-SE10-4) is a standard RJ-45 connector.

The command syntax is simple for the programmer to integrate into his application software. Commands are sent to the System using strings of standard ASCII characters. **All commands must be terminated with a carriage return {CR}**. A line feed {LF} is optional and will be ignored by the system. As an option, National Instruments LabVIEW drivers are available from the factory upon request.

5.3.1.1. The Bi Command

- *Syntax: Bi*

The **Bi** command connects a backup input port to the specified section's output. The "i" is replaced by a digit representing the Section number to be backed up. For example, **B2{CR}** commands the unit to connect a backup input to the output port of Section 2 (J2-C). If the unit is in the 1:1 mode, the J2-B input port is connected to J2-C. If the unit is in the 1:4 mode, the J5 backup input is connected to the J2-C port. In 2:2 mode (H2), only B1 and B2 are valid commands as they also switch backup channels 3 and 4 respectively. B1 and B3 are ganged together while B2 and B4 also are ganged.

Note that when a backup input is connected, the primary input port (Jx-A) is disconnected and terminated into 50 ohms. Also, if the unit is in the 1:4 mode and an output section is already connect to the J5 input port with a higher priority assignment, no switching takes place and an error message is generated. If the selected port has a higher priority, the J5 port is connected as desired and the previously connected port is disconnected.



NOTE: It is not considered an error condition to command the unit to connect the backup port if the backup port is already connected.

When the command has been received, executed and verified by the embedded CPU, the unit echoes the same command back to the user via the serial control port followed by a **{CR}**. If an error occurs, the appropriate error code is returned instead of the command. The front panel LED illuminated keys reflects any changes to the configuration.

5.3.1.2. The Ni Command

- *Syntax: Ni*

The **Ni** command disconnects a backup port from an output port and return the specified section to the “normal” connection where the primary input (Jx-A) is connected to the associated output port (Jx-C). The “i” is replaced with a digit representing the desired section number. For example, the command **N4{CR}** disconnects any backup input currently connected to the output of Section 4 (J4-C).



NOTE: It is not considered a error condition to command the unit to disconnect the backup port if the backup port is not currently connected.

When the command has been received, executed and verified by the embedded CPU, the unit echoes the same command back to the user via the serial control port followed by a **{CR}**. If an error occurs, the appropriate error code is returned instead of the command. The front panel LED illuminated keys reflect any changes to the configuration.

5.3.1.3. The Vi Command

- *Syntax: Vi*

The **Vi** command verifies the status of an output port to see if it is in the normal or backup mode. The “i” is replaced with a digit representing the desired section number to be verified. For example, sending the command “V3{CR} will verify the status of Section number 3.

The unit returns **B3{CR}** if the port is in the backup mode (J3-B to J3-C), or **N3{CR}** if the section is in the normal state (J3-A to J3-C). If an error occurs, the appropriate error code is returned instead of the verification status.

5.3.1.4. Priority Command

- *Syntax: Pnnnn*

The 10943B has the ability to be in one of two backup modes. They are referred to as 1:1 or 1:4. In the 1:1 mode, there is an individual backup port (Jx-B) associated to each output port (Jx-C). No priority is required in this mode so this command has no effect. However, when the unit is in the 1:4 mode, only one backup input (J5) is available for all 4 outputs. This is the reason for the priority command.

The command string is five (5) ASCII characters long and begins with a capital "P" followed by four (4) digits. The position of the digit represents the section number (first digit is section #1 and the last digit is section #4). The number assigned to the position in the string represents the priority assignment of that section. The lower the value of the digit represents higher the priority.

For example, if the string **P3124{CR}** is sent to the unit. This assigns section 3 the highest priority and section 4 the lowest priority with Section 1 and 2 being second and third priority respectively. Sending the command with a different set of variables automatically overwrites the previous priority settings. This priority is kept in a non-volatile memory location and is not cleared if power is lost. The factory default is 1-1, 2-2, 3-3 and 4-4.



NOTE: It is not considered an error condition to command the unit to set all backup priorities at the same level.

When the command has been received, executed and verified by the embedded CPU, the unit echoes the same command back to the user via the serial control port followed by a **{CR}**. If an error occurs, the appropriate error code is returned instead of the command.

5.3.1.5. STORE Command

- *Syntax: Snn*

A command is available to store switching configurations in a memory location for retrieval. This simplifies control depending upon the unit's application. The command includes a two-digit memory location number between 01 and 99 to store the switching configuration. The command begins with the character "S" and is followed by the two (2) digit memory location number. For example, the command **S15{CR}** stores the current switching configuration to memory location #15.

When the command has been received, executed and verified by the embedded CPU, the unit echoes the same command back to the user via the serial control port followed by a **{CR}**. If an error occurs, the appropriate error code is returned instead of the command. Sending the command to a previously assigned memory location overwrites the location with the new configuration.



NOTE: Only the switching configuration is stored with this command. All other parameters are automatically stored.

5.3.1.6. RECALL Command

- *Syntax: Rnn*

Used in conjunction with the STORE command, the RECALL command is used to clear any current configuration and recall a stored configuration from the battery backed RAM. The command recalls the configuration from a memory location assigned a two-digit number between 01 and 99. The command begins with the character “**R**” and is followed by the two-digits. For example, the command **R06{CR}** recalls the switching configuration stored in memory location 06.

When the command has been received, executed and verified by the embedded CPU, the unit echoes the command back to the user via the serial control port followed by a **{CR}**. If an error occurs, the appropriate error code is returned instead of the command.



NOTE: It is not considered an error condition to command the unit to recall the same memory configuration more than once.

5.3.1.7. Clear Command

- *Syntax: CLR*

The CLEAR command is utilized to restore all “normal” paths at the same time. If any backup connections are made, they are disconnected and the primary inputs (Jx-A) are reestablished. The command **CLR{CR}** is echoed back to the user’s controller when it is properly executed. If an error occurs, the appropriate error message is returned instead.

5.3.1.8. The 1:1, 2:2, or 1:4 Mode Command

- *Syntax: Hn*

The 10943B has the ability to be in one of three (3) backup modes. They are referred to as 1:1, 2:2, or 1:4. In the 1:1 mode, there is an individual backup port (Jx-B) associated to each output port (Jx-C). However, when the unit is in the 1:4 mode, only one backup input (J5) is available for all 4 outputs. The 2:2 mode works like the 1:1 mode, except that channels 1 and 3 and channels 2 and 4 are switched together.

The string **H1{CR}** sets the unit in 1:1 mode, while **H2{CR}** enables the 2:2 mode. To select the 1:4 backup mode **H4{CR}** must be sent.



NOTE: It is not considered an error condition to command the unit to set the current backup mode.

When the command has been received, executed and verified by the embedded CPU, the unit echoes the same command back to the user via the serial control port followed by a **{CR}**. If an error occurs, the appropriate error code is returned instead of the command. The front panel LED illuminated keys reflect the current control mode.

5.3.1.9. Download Switch Configuration Command

- *Syntax: DL*

The user may interrogate the system as to the current status of the switching configuration. The command **DL{CR}** returns a status string. The unit returns a string six (6) characters long plus the **{CR}**. The first two (2) characters indicate the current control mode and are either "H1", "H2", or "H4".

The next character represents the status of section #1 and is either an "N" indicating normal mode (Jx-A to Jx-C) or a "B" indicating a backup condition. The balance of the string represents sections 2 through 4 respectively. An example of a string indicating that the unit is in the 1:1 mode and that both sections 2 and 4 are in the backup condition is as follows: **H1NBNB{CR}**

5.3.1.10. RESET Command

- *Syntax: RST*

Sending the command **RST{CR}** initiates the unit into a self test similar to the power-up test (i.e.: a warm reboot). The unit returns the same command **RST{CR}** and resets after five (5) seconds. If the AUTO-RECALL setting is ON (factory default), the unit restores the last switching configuration prior to receipt of the reset command.

If the AUTO-RECALL setting is OFF, the unit is returned to the “normal” mode where all primary input ports are connected to the associated output port, and all backup ports are terminated into 50 ohms.

5.3.1.11. Firmware Version Request Command

- *Syntax: VER*

The user may request the firmware version of the unit by sending the command **VER{CR}**. The unit responds with the full model number followed by the firmware version number.

5.3.1.12. Front-panel Lock and Unlock Commands

- *Syntax: LCK or UNL*

Critical installations may require the user to lock the front panel control from unauthorized or inadvertent configuration changes at the front panel controls. The command **LCK{CR}** locks the front panel control keys. The front panel display represents the current status of the switching configuration but the user is not able to control the unit from the front panel. Turning the unit off does not relinquish the front panel locking since this is stored in memory. To unlock the front panel controls, the command **UNL{CR}** must be sent.

When either command has been received, executed and verified by the embedded CPU, the unit echoes the same command back to the user via the serial control port followed by a **{CR}**. If an error occurs, the appropriate error code is returned instead of the command.

5.3.1.13. Enabling unsolicited ERROR attention message

- *Syntax: SON*

A command is available to enable the unsolicited error alert if it has been disabled. The command **SON{CR}** enables the unsolicited error attention message “**ER!**”.

When errors occur, the unit can send an unsolicited error alert message (**ER!**). Messages that are automatically sent to the user without request are considered “unsolicited” messages. Some users may not be able to handle this unexpected data communication since special serial port handling is required to capture the error alert message.

If an error occurs, the unit does not send the error message, but sends an alert message indicating that an error has occurred and should be serviced by the user’s controller. The actual error(-s) can be retrieved using the **ER?{CR}** command.

5.3.1.14. Disabling unsolicited ERROR attention message

- *Syntax: SOF*

Some users may not be able to handle this unexpected data communication since special serial port handling is required to capture an unsolicited error alert message. The command **SOF{CR}** disables the unsolicited error attention message “**ER!**”.

5.3.1.15. Request ERROR Messages

- *Syntax: ER?*

To request error information from the internal error stack, the string **ER?{CR}** returns messages. The messages are formatted as **Ennn** where the “nnn” represents a three-digit code. If the message **E000{CR}** is received, no errors have occurred and the error stack is empty. *If there are error messages, the user should keep sending the “ER?” command until the “E000” is received.*

5.3.1.16. Setting the serial port BAUD Rate

- *Syntax: Ixx*

The 10943B has selectable baud rates. **The serial port is configured for 9600 baud, 8 bits per character, no parity, 2 stop bits, no handshaking.** Only the baud rate may be changed. All other parameters are fixed. The baud rate is changed under program control, not by DIP switch settings.

To change the baud rate of the serial port, the following command is available:

I x x { C R }

The three (3) character command is an "I" followed by the desired baud rate abbreviation as seen in the table below.

Ixx	Baud Rate
03	300
12	1200
24	2400
96	9600 (default)
19	19.2k
38	38.4k
56	56.7k
15	115.2k

After receipt of the "I" command (including a {CR}), the unit returns the same command using the original baud rate. The unit then changes to the new baud rate, and all successive commands are interpreted using the new baud rate.

5.3.1.17. Beeper Controls

- *Syntax: BPx*

The internal beeper may be set to operate under different conditions. The command is **BPx{CR}** where the "x" is replaced by a digit from the table below.

BPx	Function
0	Beeper Off
1	Error Condition Beep Only
2	Keypad Entry Beep Only
3	Error Condition and Keypad Entry

The command is echoed back to the user's controller when it is properly executed including a **{CR}**. If an error occurs, the appropriate error message is returned instead.

5.3.1.18. Enable AutoRecall (default)

- *Syntax: RON*

To enable the unit to recall the last switching state it was in prior to being powered down, the command **RON{CR}** must be sent. This enables the AutoRecall mode (factory default setting).

The command is echoed back to the user's controller when it is properly executed including a **{CR}**. If an error occurs, the appropriate error message is returned instead.

5.3.1.19. Disable AutoRecall

- *Syntax: ROF*

To have the unit power to a known state (all normal condition) the AutoRecall mode must be disabled. To disable the AutoRecall mode, the command **ROF{CR}** must be sent. This disables the AutoRecall mode (factory default setting is RON).

The command is echoed back to the user's controller when it is properly executed including a **{CR}**. If an error occurs, the appropriate error message is returned instead.

5.4. Special 11001 Command Overview

The basic operations that can be programmed are as follows:

- **Cpppmmm**: Connect a backup port to an output port (backup)
- **Dpppmmm**: Disconnect a backup port from an output port (normal)
- **Vpppmmm**: Verify the status of a backup connection
- **STnnn**: Store switching configuration
- **RTnnn**: Recall switching configuration
- **clear**: Clear all backup connections
- **DLOAD**: Download switch configuration
- **RESET**: Reset the system to default (clear all configuration data)
- **VER**: Request for firmware version
- **Lnnnn**: Locks the front panel controls
- **UNLOK**: Unlocks the front panel control

5.4.1. Command Details

The serial control ports of a 10943B-D485 are located on the rear panel of the system and labeled J6 and J7. They are standard DE-9S female 9-position D-Type connectors.

The serial and Ethernet control ports of a 10943B-SE10-4 are located on the rear panel of the system and labeled J6 and J7. The serial port J6 is a standard DE-9S female 9-position D-Type connector. The Ethernet port J7 is a standard RJ-45 connector.

The command syntax is simple for the programmer to integrate into his application software. Commands are sent to the System using strings of standard ASCII characters. **All commands must be terminated with a carriage return {CR}**. A line feed {LF} is optional and is ignored by the system. As an option, National Instruments LabVIEW drivers are available from the factory upon request.

5.4.1.1. Connect Command

The connect command is used to connect (close) a specified port on the associated backup port ("B" port). The string must be seven (7) characters in length. Four (4) possibilities exist.

C001001 = Connects J1 to J1B

C002001 = Connects J2 to J2B

C003001 = Connects J3 to J3B

C004001 or C001002 = Connects J4 to J4B

Multiple strings may be concatenated by delimiting each with a comma. For example:

C001001,C002001,C003001{CR}

The command is not acted upon until the **{CR}** is received.

If a command executed without errors, the same command string is returned indicating to the controller that the command has processed properly. If an error occurs, an error message is returned. (for concatenated strings, a response is returned for each command string, delimited by a comma).

The serial port returns the string(s) or error code for each command once the command is processed by the system. The delay from when the command was received and until the response is sent back is approximately 20ms for a single command.

5.4.1.2. Disconnect Command

The disconnect command is used to disconnect (open) the associated backup port ("B" port). Four (4) possibilities exist for the unit:

D001001{CR} = Connects J1 to J1A (default position)

D002001{CR} = Connects J2 to J2A (default position)

D003001{CR} = Connects J3 to J3A (default position)

D004001{CR} or D001002{CR} = Connects J4 to J4A (default)



NOTE: *It should be noted that when the backup port is disconnected, the main input port associated with the port is re-connected ("A" port).*

If a command executes without errors, the same command string is returned indicating to the controller that the command has processed properly. If an error occurs, an error message is returned. (for concatenated strings, a response is returned for each command string, delimited by a comma).

The serial port returns the string(s) or error code for each command once the command is processed by the system. The delay from when the command was received and until the response is sent back is approximately 20ms for a single command. They do not have to be the same command.

5.4.1.3. Verify Command

The verify command is used to verify the connection status of a specific port. The command is structured the same as the Connect and Disconnect commands, except for a capital V being used for the first character.

V001001{CR}

The example verifies the position status of the input J1 to either J1A or J1B. If the command returns "D" in place of the "V", the port is in the default state (J1 to J1A). If the command returns "C" in place of the "V", the port is in the backup state (J1 to J1B).

5.4.1.4. Clear All Command

The unit has the ability to simultaneously clear all backup connections previously made with one command. This is the clear command. *It must be lower case as shown below.*

clear{CR}

The command is not be acted upon until the **{CR}** is received. The system returns the response or error code once the command is processed by the system. All ports are changed to the normal (default) "A" connection.



NOTE: Once the system has received the clear command, all connection combinations are lost and may not be recalled unless previously stored into a memory location. See the STORE and RECALL commands.

5.4.1.5. Store and Recall Switching Configurations

The user may store and recall complete switching configurations remotely to be recalled later from either the front panel or remotely. The CPU stores up to 199 different configurations in its battery backed RAM. They are assigned locations 001 to 199. Below is an example of the store command.

ST 156 {CR}

The above command saves the switch array configuration in memory location 156. If the configuration is successfully stored, the command is returned, otherwise an error code is returned.



NOTE: Storing a configuration in a memory location overwrites any previously stored configuration in that location.

To recall a previously stored memory location, the syntax is as follows:

RE 199 {CR}

When executing the recall command, the unit first clears existing connections in the switching array and then connects the inputs and outputs defined in the memory location. This saves a significant amount of time in setting up the switching array either manually or remotely when frequent repeated changes to the switch configuration are necessary. Valid locations are from 001-199.

5.4.1.6. Reset Command

The reset command initiates the power up self-diagnostics routine, identical to a "cold start". The same parameters are tested as if the unit were powered for the first-time.

RESET{CR}

The command is sent back to advise the user that it has indeed received the command and is about to initiate a reset. It is recommended that the user wait 10 seconds after receiving the RESET back from the system (the unit performs the self test diagnostics) before the unit is ready to communicate with the user's controller. A string consisting of Model number and software version is returned after the system has restarted.

5.4.1.7. Local Lockout and Unlock Command

The programmer has the ability to lock the front panel controls to prevent inadvertent or unauthorized control of the System. To lock the front panel control pad from a remote serial control interface, send the character "L" followed by four (4) user selected numbers. The same four (4) numbers may also be keyed into the front panel control pad to regain local control. For example:

L1234{CR}

Valid numbers are 0000 to 9999. To unlock the front panel controls, the following command must be sent:

UNLOK{CR}

The command is returned to the user's controller upon completion.

5.4.1.8. Download Configuration Data Command

The programmer has the ability to download the current configuration data for evaluation. This is done with a single command, and returns a string identifying all backup connections. The length of the string is 62 characters.



NOTE: The 10943 has a fixed capacity of four backup sections. The response is 62 characters for compatibility with the System 11001 and provide status for 4-sections.

The command is:

DLOAD{CR}

Once the command is received, the unit returns a string indicating all connections in the following format.

20AABABB.....000{CR}

The first two digits indicate the number of slots in the mainframe (System 11001, including non-populated slots). The string contains three (3) characters per module (one slot with three sections). Since a total of 20 modules can be installed, the string is always a total of 62 characters (2+(20*3)) in length.

After the first two (2) characters, the following digits are 20 sets of triples. Each triple represents a module in the system. Each character in the triple specifies the status of one of the three (3) ports for each module starting with port J1. The second character is for J2 and the third is for J3.

The character changes depending upon the status of the module, and the number of modules installed in the system.

A= Normal Condition (port "A")
B = Back-up Condition (port "B")
0 = Not installed (zero)

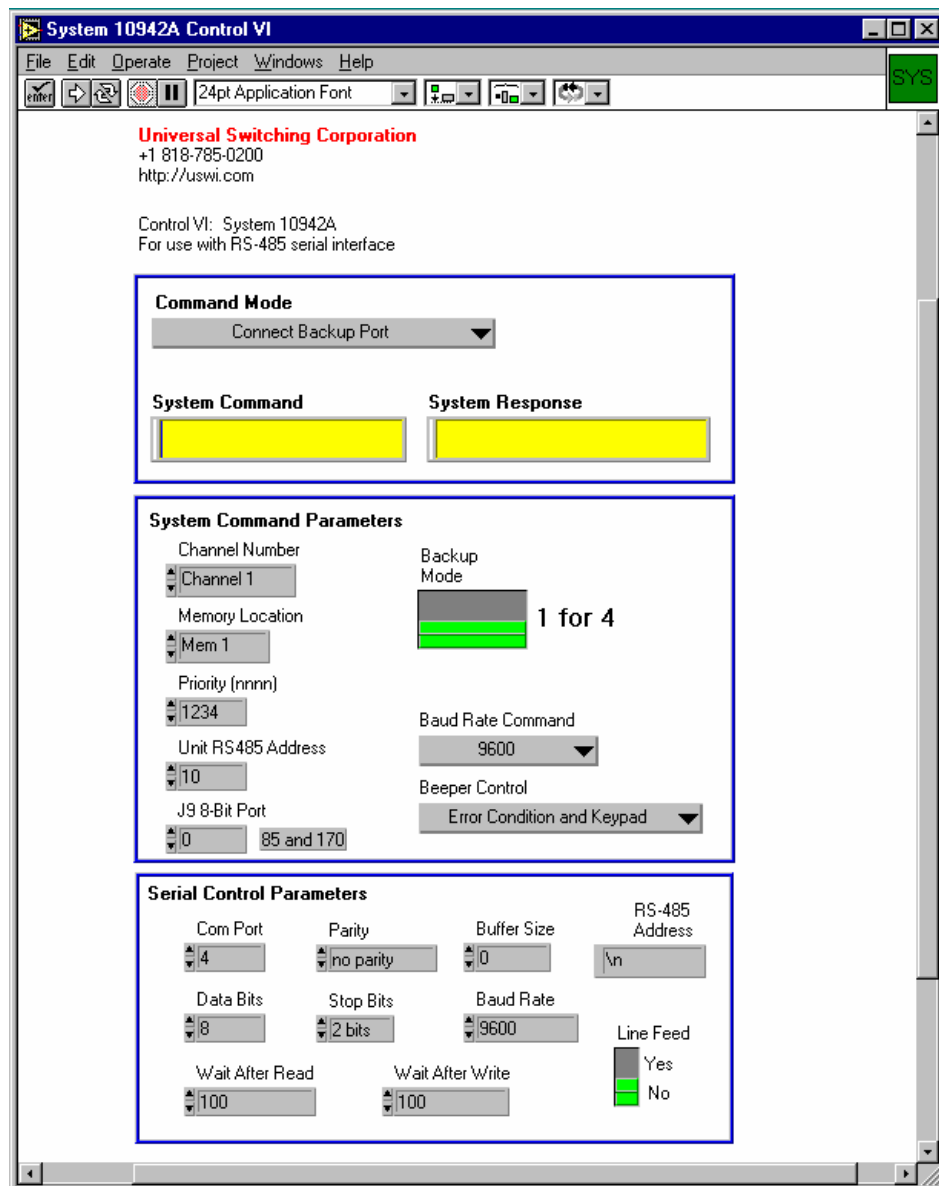
The example response above shows the following status of the system.

Module	Port	Status
001	001 (J1)	Normal (J1A)
001	002 (J2)	Normal (J2A)
001	003 (J3)	Backed-up (J3B)
002	001 (J1)	Normal (J1A)
002	002 (J2)	Backed-up (J2B)
002	003 (J3)	Backed-up (J3B)
.		
.		
.		
020	001	Not Installed
020	002	Not Installed
020	003	Not Installed

5.5. National Instruments LabVIEW Drivers

Universal Switching Corporation can provide National Instruments LabVIEW drivers upon request. The latest version is available at our WebSITE (<http://uswi.com>).

The drivers are referred to as Virtual Instruments, or more commonly as VI's. A view of the standard VI screen is shown below.



6. Error codes

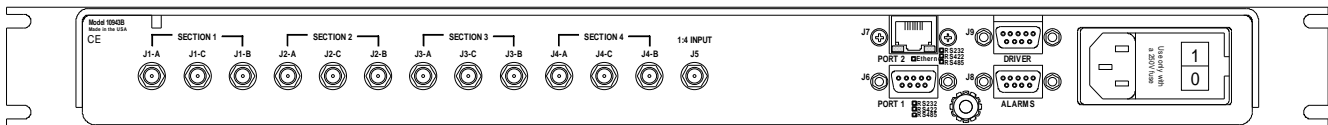
If an error occurred during execution of a command, one of the error codes listed below is returned:

- E002 Specified module port does not exist
- E003 Unrecognized command
- E004 Specified module is already in backup mode
- E005 Specified port is already in backup condition
- E007 Specified port is not connected to backup port
- E008 Specified memory location is empty
- E009 Invalid command argument received
- E012 Random access memory checksum error
- E013 Read only memory (EPROM) checksum error
- E015 General power failure
- E023 Bad key bad entry
- E027 Bad coil voltage sensed during verification
- E037 Low Priority - Active port has higher priority
- E040 Power Supply #1 (left) is LOW
- E041 Power Supply #2 (right) is LOW
- E042 Power Supply #1 (left) is not installed
- E043 Power Supply #2 (right) is not installed

7. Rear Panel Features

The system's signal connectors are located directly on the rear panel. The signal connectors are a standard SMA female. An industry standard SMA male plug mates with these connectors. They are sufficiently spaced to connect and disconnect cables without the use of special cabling tools.

Shown below is a 10943B-SE10-4.



7.1. Construction

The mainframe is constructed from a rugged aluminum frame. The frame is gold irradiate plated for resistance to corrosion elements and to provide excellent ground conductivity. The exterior of the mainframe cover is painted black with texture coated epoxy paint per MIL-STD-595B. Fingerprints and other markings do not easily appear on the finish because of the texture coating, plus it provides an additional measure of protection against possible corrosion.

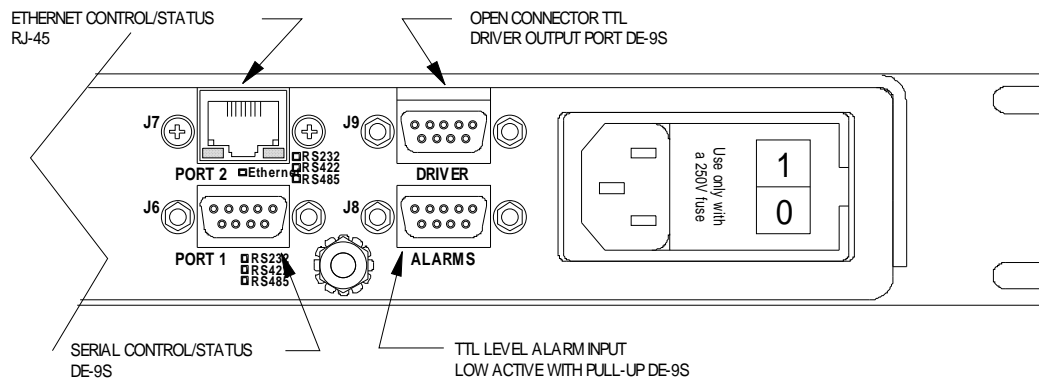
7.1.1. Mounting

The front panel is 1/8" (.125") thick, which is standard for most 19" rackmount equipment, and also contains standard RETMA slots for rackmount equipment. The unit is 1RU (rack unit) high (1.72").

7.2. Alarm Input Connector (J8)

The 10943B provides a means of directly accessing control of the switching configuration. An ALARM input connector is available on the rear panel (J8). The connector is a D-Type female DE-9S connector that can be mated to any industry standard DE-9P male plug. The implementation for the alarm inputs is up to the user, but it provides four (4) TTL compatible lines to directly select a section to be “backed-up” depending upon the control mode (1:1 or 1:4).

Shown below is a 10943B-SE10-4.



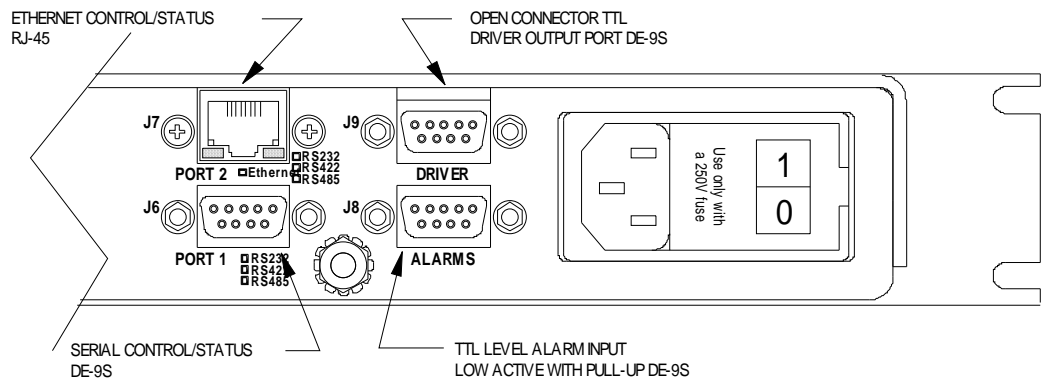
There is a control line for each section. The control lines are pulled high (10K ohm) so external pull-up resistors are not required. The lines are active low meaning that a TTL low (<0.8V) will select the associated section. The 10943B firmware keeps the section in the backup mode until instructed to change from the serial or Ethernet control port or front panel controls even if the alarm is cleared. The exception is if the unit is in the 1:4 mode and a higher priority alarm is received.

Pin	Function
1	Alarm 1
2	Alarm 2
3	Alarm 3
4	Alarm 4
5	GND
6	GND
7	GND
8	GND
9	GND

7.3. TTL Driver Output Connector (J9)

A rear panel connector J9 provides the user with a TTL compatible driver output for various external tasks. It is an 8-Bit port that the user can “write” to for controlling external relays or digital equipment. The connector is a D-Type female DE-9S connector that can be mated to any industry standard DE-9P male plug. The port is controllable only from the serial or Ethernet control ports and not the front panel controls of the unit.

Shown below is a 10943B-SE10-4.



Being sized to 8-Bits, the user can write a number from 0 (zero) to 255 to the port. Each output is an open collector driver output from an industry standard TTL technology 7406 device. Upon powering the unit, all lines are at the “open” state. When writing to the port, the associated line is driven low. A maximum of 40mA is supplied from each driver.

The level of these digital signals is referenced to chassis ground of the unit (ground). Writing a “zero” value to the port causes all eight (8) lines to be in the open collector state, while writing a value of 255 to the port will cause all lines to be driven low.

Pin	Function
1	1 (LSB)
6	2
2	4
7	8
3	16
8	32
4	64
9	128 (MSB)
5	VCC (+5V)

The port is controlled from either the remote control serial or remote control Ethernet ports located on the rear of the unit. The following syntax must be followed:

Onnn{CR}

The syntax calls for a capital "O" followed by a value "nnn" that represents the decimal value of a binary number that is to be written to the 8-Bit port. After execution of the command, the command is echoed back to the port it originated from, or an error code is returned (if an error occurred).

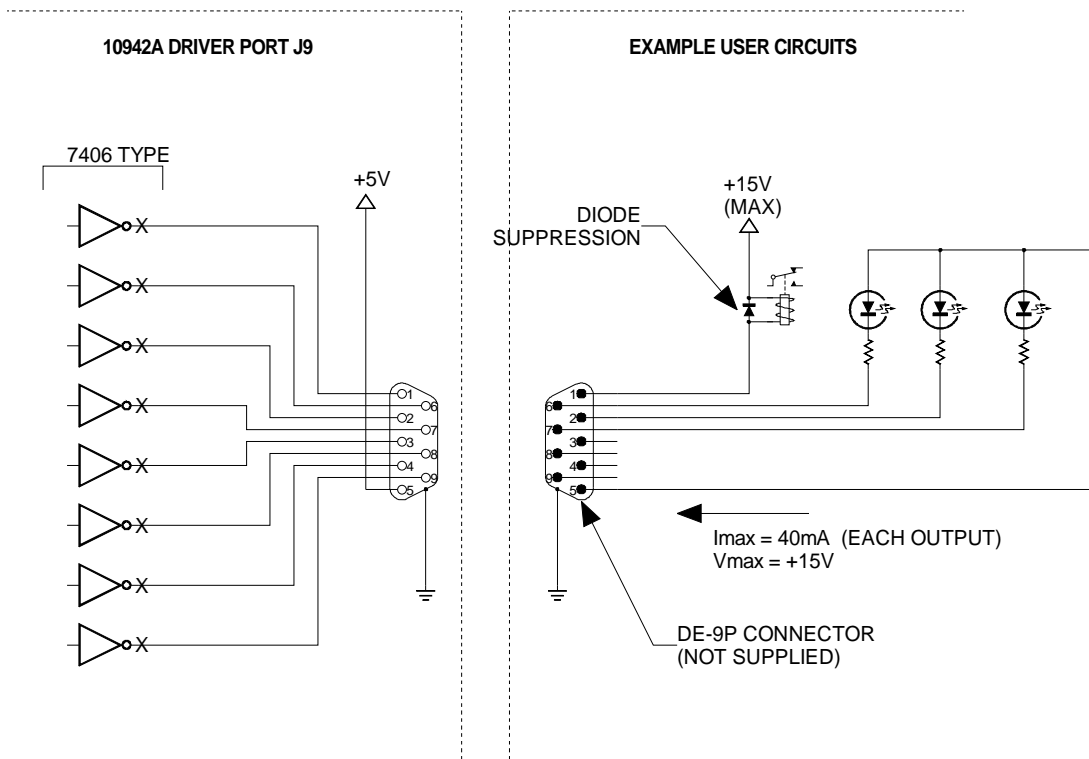


NOTE: If the TTL driver port is used to drive relays, be sure to provide diode suppression across each coil for each driver external to the unit. An inductive spike will damage the driver outputs.

7.3.1. Driver Port Capacity

The J9 driver port has the capacity to control up to eight (8) devices or digital lines that are TTL compatible. The drivers are open collector type allowing the outputs to drive devices other than TTL logic. The drivers are from the TTL family of logic and are type 7406. This type of device can handle a maximum of +15V and can sink a maximum of 40mA at each output.

Below is an example diagram.



F10942A-1.FGV

8. Spare Parts List

Following is a recommended listing of spare parts for the 10943B system.

8.1. Factory Recommended Spares List

For situation critical installations, standard system engineering practice recommends sparing of certain critical items in order to ensure low/no down times. The factory recommended spares list for this unit is as follows:

Quantity	Model or P/N	Description
1	PS10942B-001	Plug-in Power Supply Assembly (AC version)
1	PS10942B-048	Plug-in Power Supply Assembly (DC version)



NOTE: Plug-In Power supply types are specific to the type of power used for the system (AC or DC). These power supply modules are unique to the power format of the system and **CANNOT** be interchanged. Be careful when ordering spare power supply units to specify the correct power type for your system.

9. System 10943B-Type Specifications

• Configuration	Four channel A/B backup configuration
• Bandpass	Up to 2400MHz
• Transmission loss (1:1 or 2:2 mode)	<-0.25dB @ 870MHz <-0.50dB @ 1.4GHz <-0.80dB @ 2.4GHz
• Transmission loss (1:4 mode)	<-1.0dB @ 870MHz <-1.50dB @ 1.4GHz <-2.50dB @ 2.4GHz
• Crosstalk isolation (within section)	>60dB @ 900MHz >50dB @ 2.4GHz
• Crosstalk isolation (adjacent sections)	>55dB @ 900MHz >45dB @ 2.4GHz
• VSWR loss (1:1 or 2:2 mode)	<1.2:1 @ 870MHz <1.2:1 @ 1.4GHz <1.5:1 @ 2.4GHz
• VSWR loss (1:4 mode)	<1.3:1 @ 870MHz <1.4:1 @ 1.4GHz <2.1:1 @ 2.4GHz
• Impedance	50 ohms
• Signal connectors	SMA female
• Switching technology	High frequency relays
• Switching speed	<5ms
• AC power	90-264VAC <10 Watts 47-440Hz
• Power cord	NEMA 15A (USA), 6 foot long
• Control types	Serial Ethernet (10943B-SE10-4 only) Front panel illuminated keypad External "alarm" input
• Control connector	DE-9S type (serial, driver and alarm ports) RJ-45 type (Ethernet port)
• Operation temp range	0 to +60C
• Storage temp range	-20C to +85C
• Physical size	19.00" W x 9.50" D x 1.72" H
• Weight	<5lbs

10. Record of Changes

This section only applies to revised manuals. The table below indicates the revision level entered and a brief description of change(s) incorporated into the manual.

Revision	Description of Change	Date
A	Revised to include 10943B-D485. Supersedes 10932B-SE10-4.	10Oct2008
B	Revised specs.	14Jan2009

NOTES

EUROPEAN UNION DECLARATION OF CONFORMITY INFORMATION TECHNOLOGY EQUIPMENT



Coaxial Four Channel Backup System
Classified as Control and Measurement Equipment

Series – 10943B-SE10-4

Council Directive ---- 73/23/EEC Low Voltage Directive (LVD)
Council Directive ---- 89/336/EEC EMC Directive

The Product cited above (and its variations) complies with the following Safety, RF Emissions and Immunity Standard when installed and operated in accordance with the Users Instructions provided. The product, with its accompanying modules is declared to comply by virtue of Design, validated by Third Party Evaluation and Testing. EMC Testing and Evaluation were conducted by NATIONAL TECHNICAL SYSTEMS, an independent EMC Test Laboratory, located in Fullerton, CA 92631, USA. Product Safety Evaluations and Risk Assessments were conducted by ARROWHEAD STANDARD, INC., located in Dana Point, CA 92629, USA.

PRODUCT SAFETY/LOW VOLTAGE DIRECTIVE

EN61010 Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use.

RF EMISSIONS AND IMMUNITY/EMC DIRECTIVE

EN55011: 1991	Emissions Limits for Industrial, Scientific And Medical (ISM) RF Equipment	Class B Conducted and Radiated
EN61000-4-2	Electrostatic Discharge Immunity	Level 2
EN61000-4-3	Radiated Emission Immunity	Level 2
EN61000-4-4	Electric Fast Transients Burst	Level 3

We the undersigned hereby declare that the equipment specified above conforms to the noted Directives and Standards in accordance with the LVD and EMC Directives. Refer to Technical Construction File USC 99201, provided upon request.

IMPORTER

(Signature)

(Typed Name)

(Title)

(Date)

Verified to be Compliant by: Chuck Helton, V.P. Regulatory Compliance
Arrowhead Standard, Inc., 33831A El Encanto, Dana Point, CA 92629