Universal Switching Corporation

OPERATING AND PROGRAMMING MANUAL

10942B Version 2.0

Coaxial Four-Channel IF 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 or 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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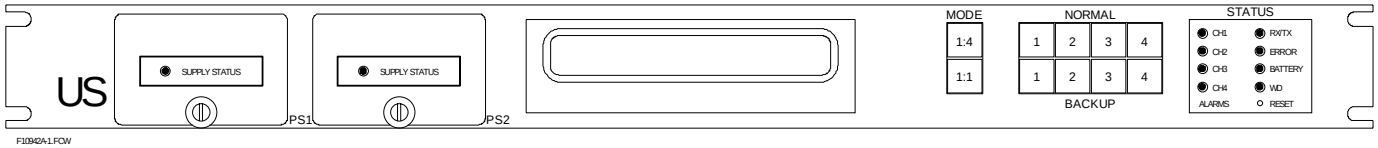
1. Introduction to the System 10942B

The system 10942B is a highly integrated coaxial switching system specially configured for routing IF signals in a four-channel backup arrangement. Under remote program or front panel control, the user may connect a backup source in place of the four standard signal inputs.

The 10942B is designed for high performance analog signal switching and incorporates ultra-high reliability relay-based switching elements. The wide bandwidth (DC-500MHz) makes the 10942B a very versatile switch for connecting numerous backup signals to digital or analog feeds, all under remote or local control.



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It is design 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:

- Wide analog bandwidth
- Hot-Swap power supplies
- Ultra high reliability relay switching elements
- 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
- Standard serial interfaces
- International AC power input (90-264VAC), DC versions available
- Compact and rugged enclosure design
- Flash field programmable

1.1. Versions

The System 10942B is available in different versions depending upon the user's need. The unit is ordered pre-configured with one type of serial port, but can be easily changed to a different type by moving serial configuration jumpers under the cover. The predecessor (10942A) did not have this flexibility.

Also, the unit can be ordered to operate from either AC (90-264VAC) or from DC voltages, plus it is available in either 75 ohm (standard) or 50 ohm versions. These cannot be changed in the field.

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 of partial or complete disassembly beyond normal maintenance or expansion procedures.

The system is a factory pre-configured system that can not be modified or expanded by simply populating it with additional modules when empty slots are available in the rack-mounted mainframe. The modification or expansion of the system requires a firmware upgrade to address and control the additional hardware installed.

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 a particular power supply that is not interchangeable with other models. Always replace the power supply 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. These voltages 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

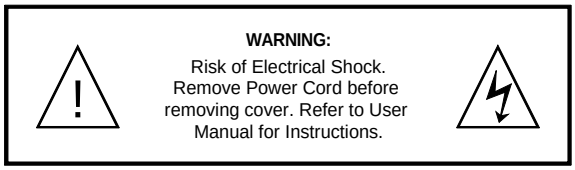
The components inside the switching system are extremely sensitive to electrostatic discharge (ESD). Electrostatic discharge can cause irreparable damage to the internal components of the switching system. The technician handling the component must know about static electricity and how to protect the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

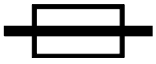
2.2. Safety Warnings and Markings

The switching system has been designed and tested to meet strict safety requirements. Two European union (EU) approved power cords that meet the Conformité Européen (CE) requirements are included with the system. If the switching system is utilizing a system's integrator, the integrator may be responsible for the correct AC power cord specific for the destination country.

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.



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
	Explaination 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 Model 10942B includes a factory assigned serial number that is unique to each piece of equipment. Since the 10942B is available in three standard configurations, there is also a label on the bottom of the unit indicating the version of the 10942B. The three different 10942B varieties are identical with exception of the serial control ports located on the rear of the unit.

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 to not 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 and if 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 10942B operates in a normal laboratory, production, or a more rugged industrial environment without any additional considerations. Protection should be provided against temperature extremes (shock) which can cause condensation.

2.5.1. Storage and Shipping

The System 10942B 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 10942B may be used in any environment with the following limitations:

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

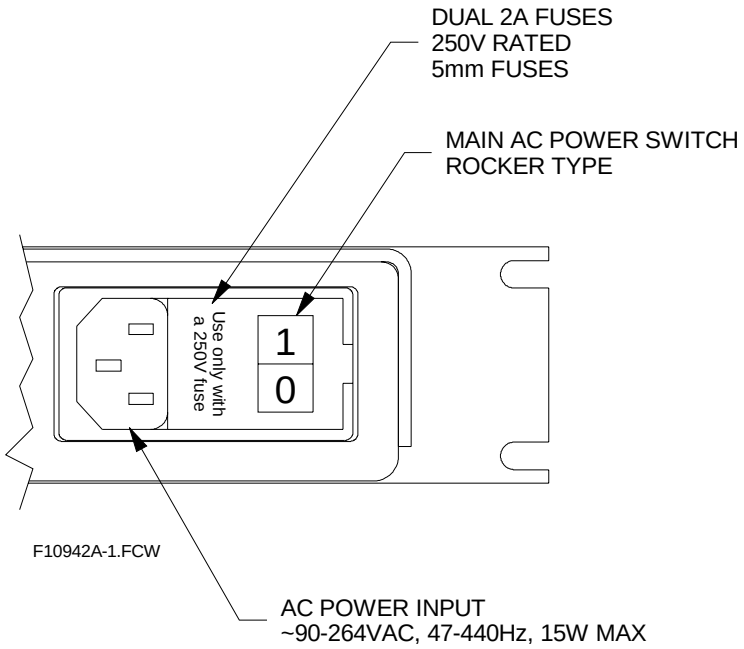
2.5.3. Installation Site Parameters

The area that the System 10942B is to be installed should be as clean as possible. A dusty environment should be avoided. It is suggested that the system be installed in an environmentally controlled area equipped with an air filtration system.

The system has been designed to be installed in a standard 19" equipment rack. The system is 1RU high (1.72"). 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 10942B (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 a standard NEMA 15A male plug is included with the system. For high reliability, front panel installed redundant hot-swap power supplies are utilized.



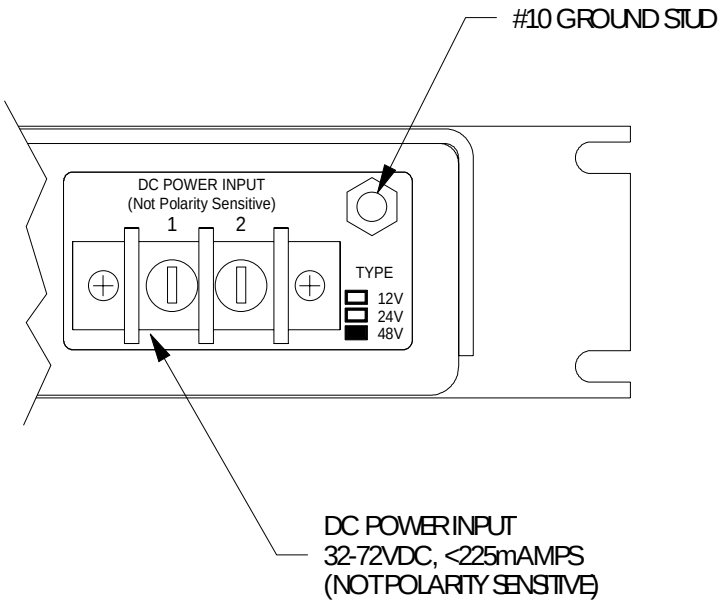
2.5.5. Connecting AC Power

The System 10942B 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 10942B is a EU approved power cord matched to meet CE requirements.

Depending on if a system integrator is utilizing this unit, the system integrator may be responsible for the correct AC power cord specific for the destination country. The power receptacle on the rear of the drawer is mated by the supplied 6-foot three-wire power cord providing the required grounding of the unit. A line filter is also included in the power section to help eliminate spikes and transients from the AC power source.

2.5.6. Power Requirements (48VDC version)

The System 10942B (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.



2.5.6.1. 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 10942B 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 system return is required, please call the factory for an RMA number prior to returning the unit. 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:

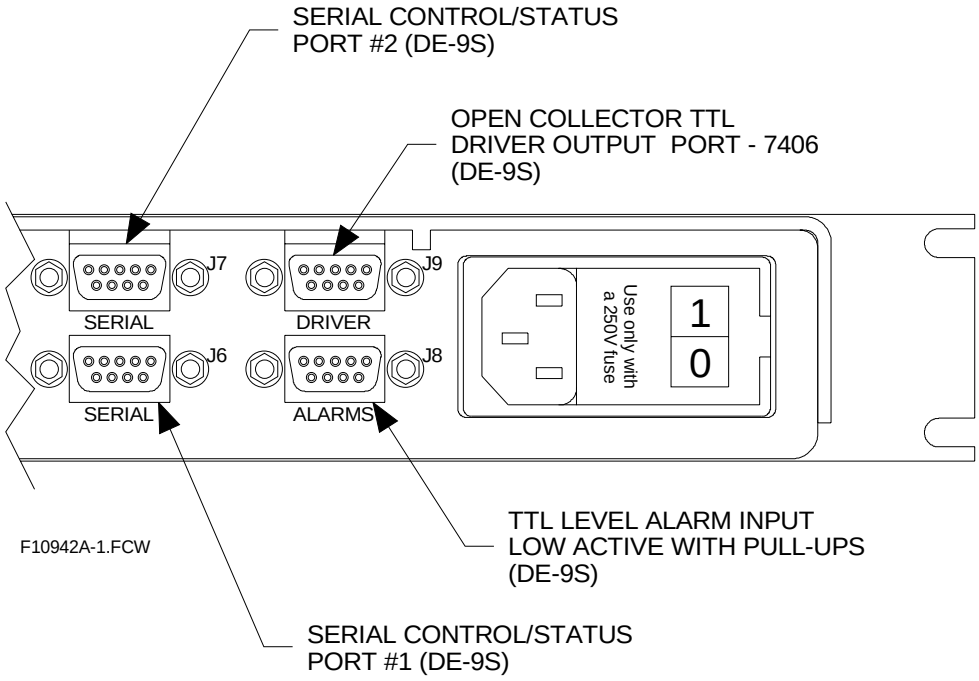
Universal Switching Corporation
7671 North San Fernando Road
Burbank, CA 91505-1073 USA

> ***NOTE: For additional information, visit our website at www.uswi.com***

2.7. Connecting the Serial Interface

The System 10942B is available with three (3) different types of dual serial control ports. The suffix of the model number defines the type of factory installed serial interface. The serial interface connectors are located on the rear of the unit and are a standard D-Type 9-position female connector. Mating connectors are not supplied with the unit (DE-9P).

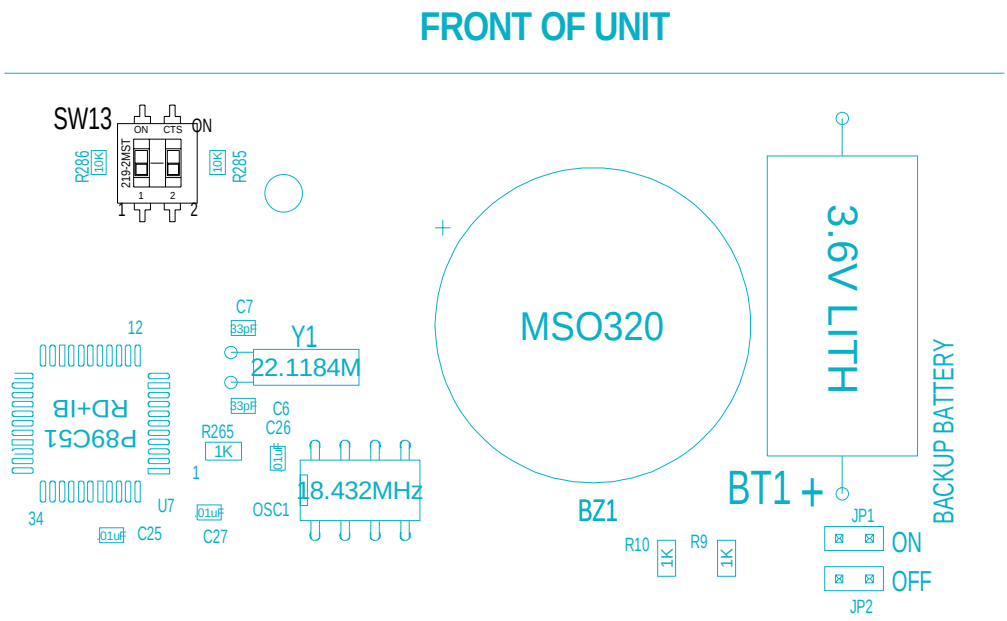
Model Number	Serial Interface Type
10942B-D232	Dual RS-232C Ports
10942B-D422	Dual RS-422A Ports
10942B-D485	Dual RS-485 Multi-Drop Ports



No matter the type of serial interface port, the port default configured at the factory for **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 ten (10). Changes to these settings are explained in the following sections.

2.7.1. Configuring the Serial Port(s) Hardware

The interface type, RS-232 / RS-422 / RS-485, is pre-configured at the factory to the type specified by the original Model number. However, if requirements change, it is possible to reconfigure one or both serial ports for a different hardware interface type. This is done by moving jumpers and dipswitches located inside the unit as described below.



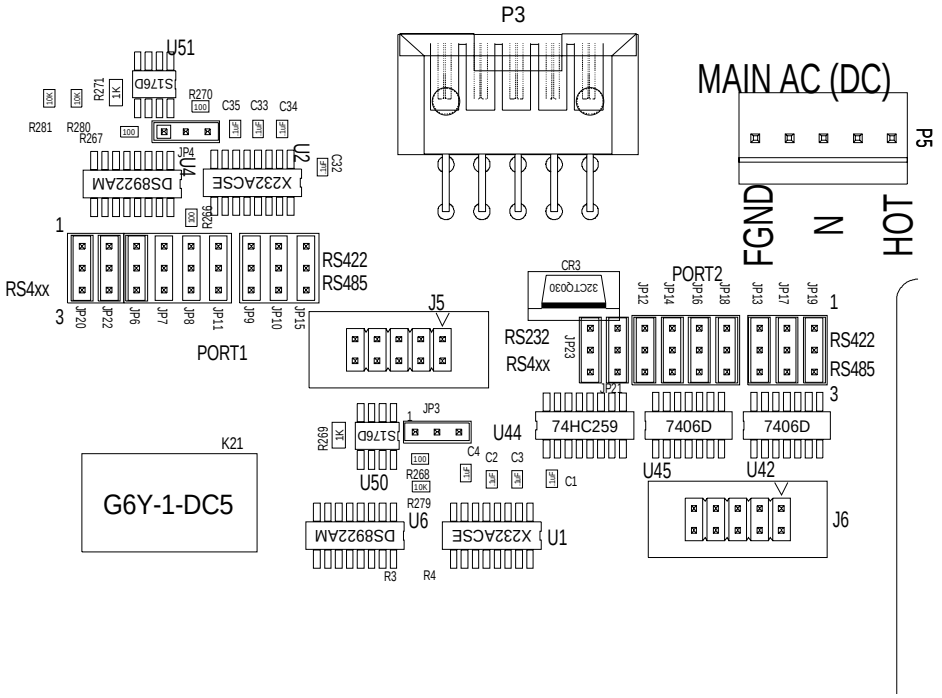
SW13 contains two (2) switches and is located near the front panel. The switch position of SW13 determines whether an "address byte" is required to precede each command.

SW13-1 controls port 1 (J6); SW13-2 controls port 2 (J7).

For RS-485, SW13 must be in the "ON" position.

For RS-232 and RS-422, SW13 must be in the "OFF" position.

PORT 1 (REAR PANEL J6 CONNECTOR)									
	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



PORT 2 (REAR PANEL J7 CONNECTOR)									
	JP23	JP21	JP12	JP14	JP16	JP18	JP13	JP17	JP19
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

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

2.7.2. 10942B-D232 (RS-232C) Serial Port Pin Assignment

The following table is the pin assignment for the RS-232C serial control ports 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	

2.7.3. 10942B-D422 (RS-422A) Serial Port Pin Assignment

The following table is the pin assignment for the RS-422A serial control ports 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 -

2.7.4. 10942B-D485 (RS-485) Serial Port Pin Assignment

The following table is the pin assignment for the RS-485 serial control ports located on the rear panel. An internal 100 ohm termination is available (but not enabled as shipped) for the RS-485 ports. JP3 and JP4 are both in the "2-3" position (OFF) from the factory. If it is desired to have the port internally terminated, the jumper should be moved to the "1-2" position instead. JP3 terminates J6, while JP4 terminates J7.

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	

2.7.5. Setting the Serial Port Baud Rate

When the 10942B leaves the factory, **the serial ports are pre-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 are two ports included with the system. They are served by the unit on a first-come, first-served basis. **The baud rates of the two ports 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:

`Ixx{CR}`

> ***NOTE: If the port is 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.

xx	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.

2.7.6. Self Test

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

- RAM
- ROM
- Vacuum Fluorescent Display
- LED's on the Front Panel
- Beeper
- Power Supply Levels
- Internal CPU Functions
- Current Relay coil status

Upon powering the System 10942B 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 user observation only. Failure of these can not be detected by the main CPU.***

2.7.7. Error Messages

Should a failure or error condition be detected, an error message will be displayed on the front panel. For an explanation of the error messages, page 55.

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

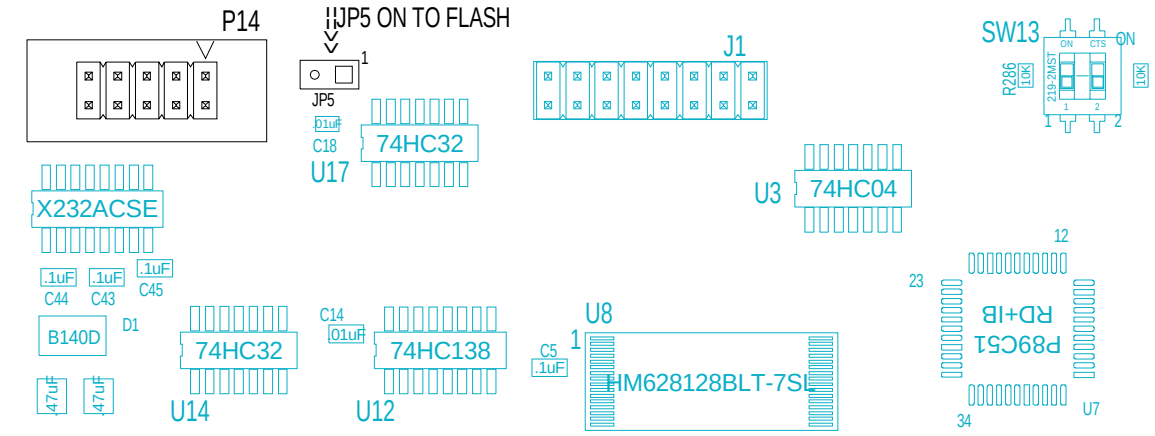
2.7.7.1. Flash Programming the 10942B

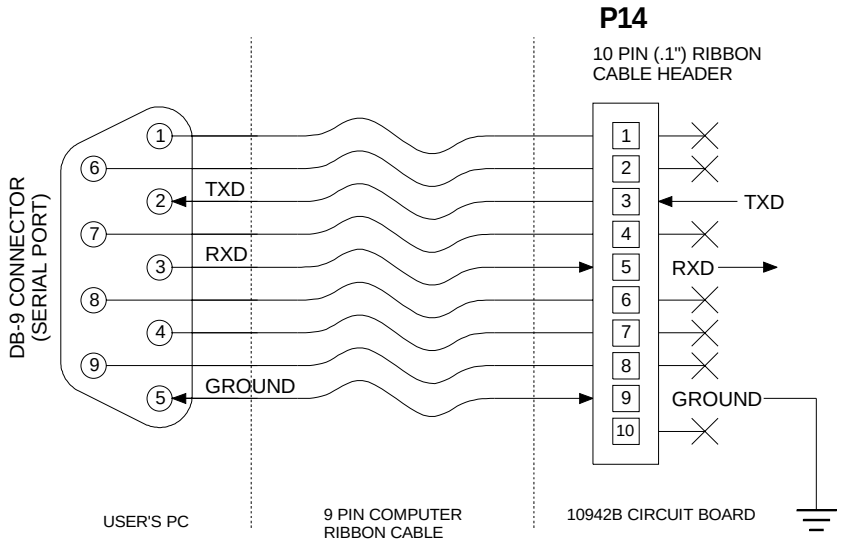
Upgraded firmware enhancements can be added to the 10942B system by downloading the new version via a standard PC's RS-232 (COM) port, through the 10942B circuit board's serial service port P14. This flash programming can be done by the factory, or by the unit's systems administrator, in the field. Please note that the service port (P14) is accessible only upon removing the cover from the unit.

The proper connector is a standard 9-pin computer ribbon cable, which connects between the 10942B, and your 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 in-field programming procedure is as follows:

- Carefully remove the black back 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 cable
- Replace the cover on the unit

FRONT OF UNIT





NOTE: Only the 3, 5, and 9 pins of P14 are connected to the 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 10942B is a 1RU high unit designed to receive up to four (4) individual coaxial signals and directly pass them through without degradation or modification to four (4) individual outputs. These 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.

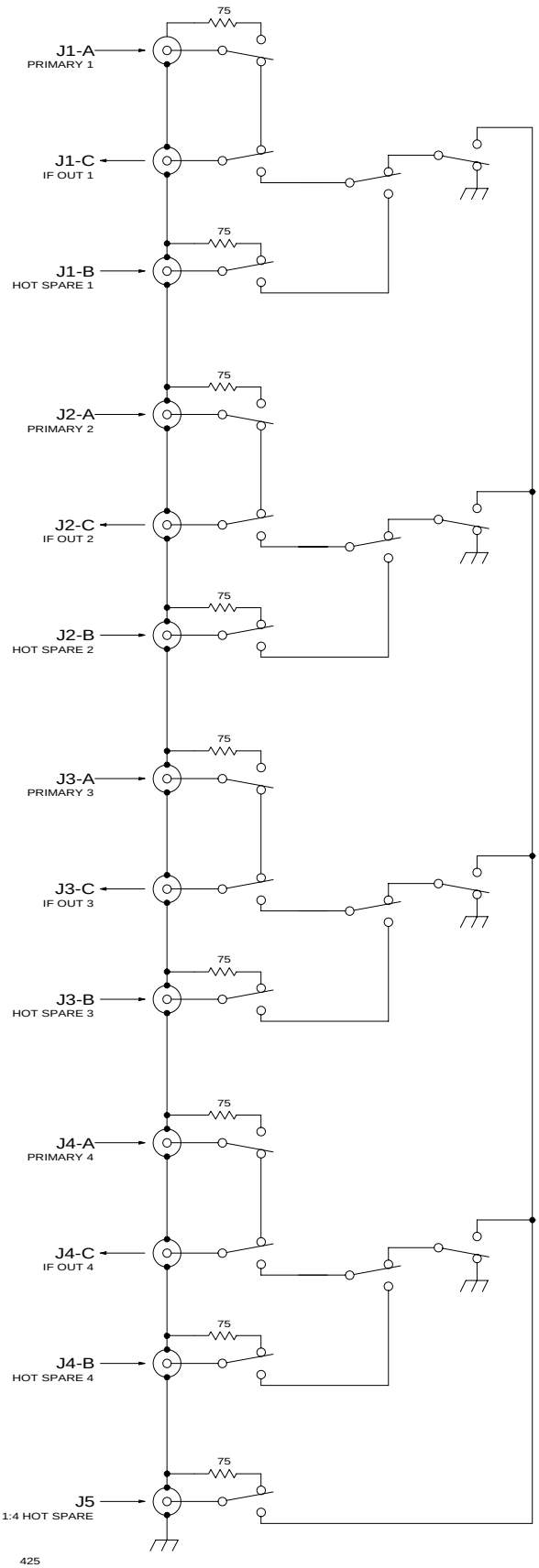
The outputs of each of these four (4) "sections" are designated on the rear panel with the letter "C" and are identified as J1-C, J2-C, J3-C and J4-C. If the unit looses power, all primary "A" inputs will fall back to the associated output port. For example, J1-A will be connected to J1-C, J2-A to J2-C and so on.

For each of the four sections, a backup port exists (B). They are identified as J1-B, J2-B, J3-B and J4-B. Under program or front panel control, the user may command the backup port to be connected to the associated output port (Jx-C).

At the same time, the associated primary port will be disconnected and terminated into 75 ohms. Likewise, when the backup port is not connected, it is terminated into 75 ohms. When the associated backup (B) input is selected to be connected, it is referred to as being in the 1:1 backup mode. In other words, there is one backup input for every output.

One additional signal input connector is provided on the rear panel identified as J5. This is referred to as the "1:4" backup input. While the unit is in the 1:4 mode, this single connector provides the backup signal for an 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.

Units with firmware version 2.01 (or higher), also has a third command mode added; 2:2 mode or "H2". In this mode, commands to ports 1 and 2 will actuate ports 1 and 3, or 2 and 4, respectively in a ganged fashion.


75
J1-A
PRIMARY 1
J1-C
IF OUT 1
75
J1-B
HOT SPARE 1
75
J2-A
PRIMARY 2
J2-C
IF OUT 2
75
J2-B
HOT SPARE 2
75
J3-A
PRIMARY 3
J3-C
IF OUT 3
75
J3-B
HOT SPARE 3
75
J4-A
PRIMARY 4
J4-C
IF OUT 4
75
J4-B
HOT SPARE 4
75
J5
1:4 HOT SPARE
425

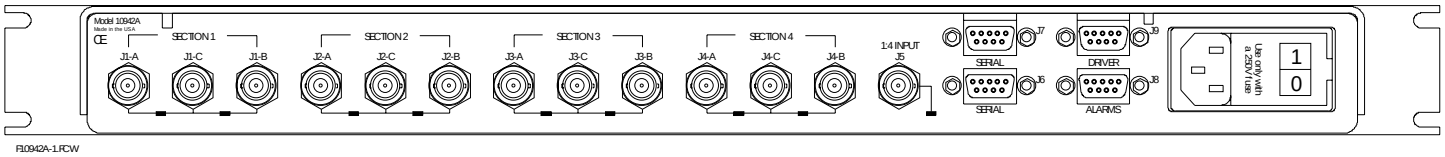
3.1. Primary Input Ports (Jx-A)

The primary input ports are female BNC 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 75 ohms. When the primary input port is connected to the output port, the green LED between the two (2) connectors will be illuminated.

3.2. Output Ports (Jx-C)

The output port (C) on each of the four (4) sections on the 10942B 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 BNC connectors and are located in the center of each section on the rear panel.



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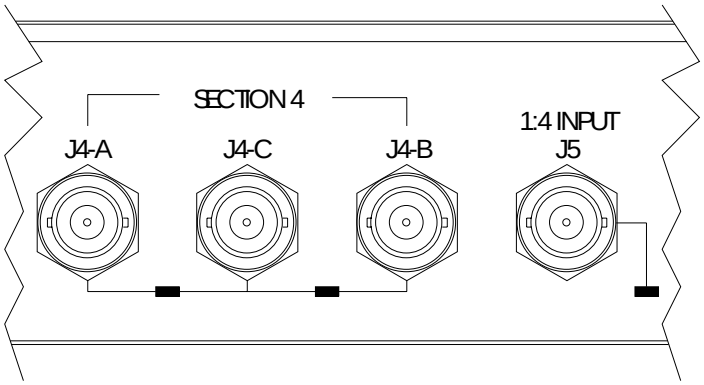
3.3. Backup Inputs (Jx-B)

Each of the four (4) outputs has an associated backup input port designated with the -C 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 75 ohms. When the backup port is selected to connect to the output, the red LED between the two (2) connectors will be illuminated.

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. It is a female BNC connector located to the far right as viewed from the rear. It is normally terminated into 75 ohms. While in the 1:4 mode and a backup is needed, this port will be connected to the desired output. When the J5 port is being utilized, the red LED adjacent to the connector is illuminated and the output port LED's blink providing a visual connection status.

3.4.1. Priority for 1:4 Backup Input



F10942A-1.FCW

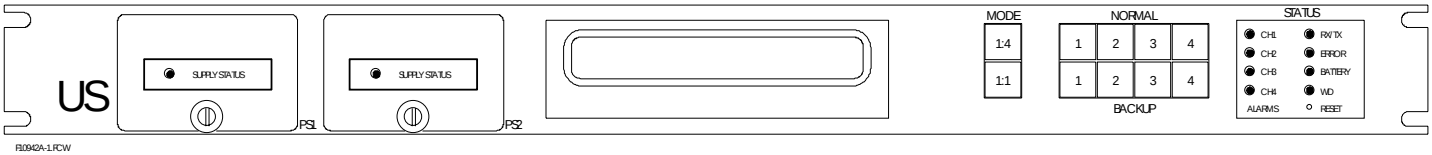
A priority scheme is included in the unit's firmware to provide a method to prioritize which output would receive the J5 input signal should more than one output require a backup signal.

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 supplied RS-422A interface. Priority loading is not available from the front panel. Default priority scheme is J1-J2-J3-J4 (highest priority first).

4. Front Panel Overview

This section describes the features of the System 10942B front panel control keypad and vacuum-fluorescent display, plus each of the individual status LED indicators. The explanation of each feature also provides a basis for their application and usage.

The System's control panel has been designed for ease of use and functionality. All control keys are back-illuminated with either a green or yellow LED.



F10942A-1.PCW

4.1. Display Features

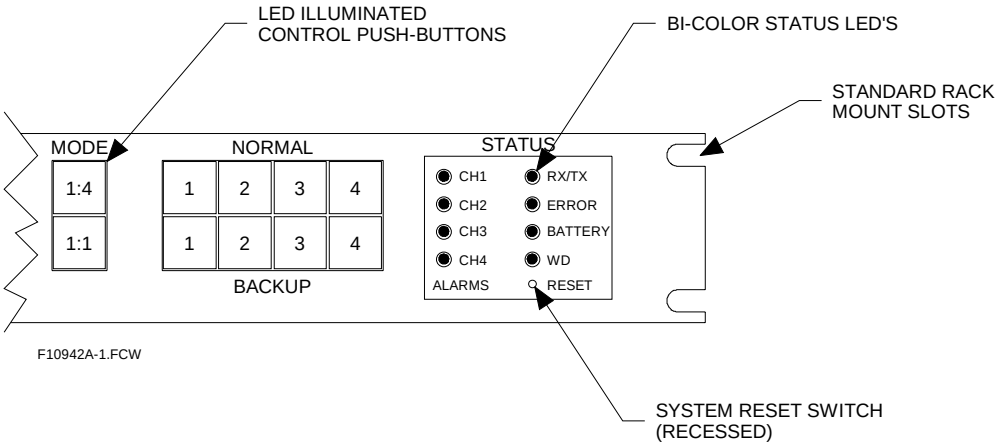
The front panel display is a high contrast vacuum fluorescent display for rugged environments and long life. During normal operation, it displays various functions being processed and also displays error messages should an error occur.

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 illuminate green when selected. The lower row is utilized to select the backup mode (yellow keys). When a backup is selected, the key will illuminate yellow, and the associated "normal" key will be 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 with 1:1 and 1:4 labeled on them select between the three (3) command modes. They are mutually exclusive. Only one mode can be selected at any one time. See page 25. Pushing a mode key, or sending a mode changing command ("Hx") also causes the switch to clear any current backup connections. Note that pushing the "1:1" key toggles mode 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 it will flash.

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

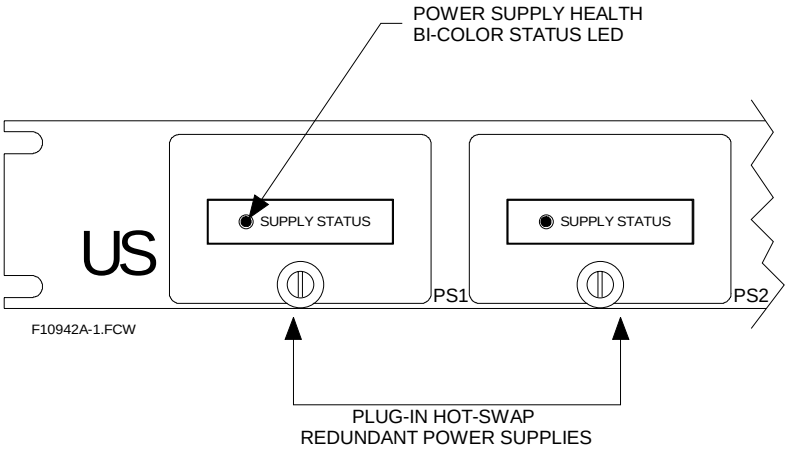
- **CH1 to CH4:** These LED's will always be green unless an alarm condition is sensed. When an alarm signal level has been detected on the alarm input connector (J7) located on the rear panel, the associated indicator will illuminate red as long as the alarm condition exists.
- **RX/TX:** This indicator 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 an RS-422A command error, relay failure or some other similar error condition is sensed, the unit illuminate this LED with the red color. Under normal conditions, the LED is off. An internal beeper will sound for .5 second in conjunction with an error condition (if enabled). The red color will be present until the error condition is removed.
- **BATTERY:** The 10942B 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 10942B is equipped with a small 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 (this will not affect 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 hole. It is about .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 10942B 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 fastener will allow you to pull 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 will be 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 10942B

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 of your controller to match the settings of the system.***

5.1. Special Notes for the RS-485 Version

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 ports, 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 10942B 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 10942B Control Protocol

The 10942B 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.

Alternatively, the 10942B 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 10942B control features and protocol be used, not the System 11001 protocol.

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

5.2.2. Special 11001 Control Protocol

Provided as a growth path for smaller systems, the 10942B 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 10942B is a component element of a larger system.

The 10942B 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 10942B 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 10942B units is needed, then the 10942B protocol should be used. The 10942B protocol has many additional features that the System 11001 does not provide. See the individual section to help make your choice.

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

5.3. Normal 10942B 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-485 address
- **Onnn:** Outputs to the TTL driver port binary equivalent of "nnn"

5.3.1. Command Details

The dual serial control ports are located on the rear panel of the system labeled J6 and J7. Both are a standard DE-9S female 9-position D-Type connector. They can be mated with any industry standard DE-9P (male plug).

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 will be connected to J2-C. If the unit is in the 1:4 mode, the J5 backup input will be 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.

Please note that when a backup input is connected, the primary input port (Jx-A) is disconnected and terminated into 75 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 will be connected as desired and the previously connected port will be disconnected.

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

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

5.3.1.2. The Ni Command

- *Syntax:* `Ni`

The **Ni** command will disconnect 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}** will disconnect 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 it the backup port is not currently connected.***

When the command has been received and properly executed and verified by the embedded CPU, the unit will echo the same command back to the user via the serial control port followed by a **{CR}.** If an error occurred, the appropriate error code will be returned instead of the command. The front panel LED illuminated keys will 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 will return **B3{CR}** if the port is in the backup mode (J3-B to J3-C), or **N3{CR}** if the section in in the normal state (J3-A to J3-C). If an error occurred, the appropriate error code will be returned instead of the verification status.

5.3.1.4. Priority Command

- *Syntax:* `Pnnnn`

The 10942B 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 affect. 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 capitol "**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 **P2314{CR}** is sent to the unit. This will assign section 2 the highest priority and section 4 the lowest priority with section 3 and 1 being second and third priority respectively. Sending the command with a different set of variables will automatically overwrite the previous priority settings. This priority is kept in a non-volatile memory location and will not be 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 and properly executed and verified by the embedded CPU, the unit will echo the same command back to the user via the serial control port followed by a **{CR}**. If an error occurred, the appropriate error code will be returned instead of the command.

5.3.1.5. STORE Command

- *Syntax:* `Snn`

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

When the command has been received and properly executed and verified by the embedded CPU, the unit will echo the same command back to the user via the serial control port followed by a **{CR}**. If an error occurred, the appropriate error code will be returned instead of the command. Sending the command to a previously assigned memory location will overwrite 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. Depending upon the unit's application, this could simplify control. 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 (2) digits. For example, the command **R06{CR}** will recall the switching configuration stored in memory location 06.

When the command has been received and properly executed and verified by the embedded CPU, the unit will echo the same command back to the user via the serial control port followed by a **{CR}**. If an error occurred, the appropriate error code will be 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 will be disconnected and the primary inputs (Jx-A) will be reestablished. The command is **CLR{CR}** and will be echoed back to the user's controller when it is properly executed. If an error occurred, the appropriate error message will be returned instead.

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

- *Syntax:* `Hn`

The 10942B 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 is available for all 4 outputs (J5). The 2:2 mode works like the 1:1 mode, except that channel 1 and 3 are switched together while channel 2 and 4 are also switched together.

The string **H1{CR}** will set the unit in 1:1 mode, while **H2{CR}** will enable 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 and properly executed and verified by the embedded CPU, the unit will echo the same command back to the user via the serial control port followed by a **{CR}**. If an error occurred, the appropriate error code will be returned instead of the command. The front panel LED illuminated keys will 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 string **DL{CR}** will return a status string. The unit will return a string six characters long plus the **{CR}**. The first two (2) characters indicate the current control mode and will be either "**H1**", "**H2**", or "**H4**".

The next character will represent the status of section #1 and will be 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 string indicating that the unit is in the 1:1 mode and that both section 2 and 4 are in the backup condition would be the following: **H1NBNB{CR}**

5.3.1.10. RESET Command

- *Syntax:* `RST`

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

If the AUTO-RECALL setting is OFF, the unit will be returned to the "normal" mode where all primary input ports are connected to the associated output port, and all backup ports are terminated into 75 ohms.

5.3.1.11. Firmware Version Request Command

- *Syntax:* `VER`

The user may request the firmware version of the unit by sending the string **VER{CR}**. The unit will respond 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 string **LCK{CR}** will lock the front panel control keys. They will still represent the current status of the switching configuration but the user will not be able to control the unit from these keys. Turning the unit off will not relinquish the front panel locking since this is stored in memory. To unlock the front panel controls, the string **UNL{CR}** will immediately unlock them.

When ether command has been received and properly executed and verified by the embedded CPU, the unit will echo the same command back to the user via the serial control port followed by a **{CR}**. If an error occurred, the appropriate error code will be 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 string **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 will not send the error message, but an alert message indicating that an error has occurred and should be serviced by the users controller. The actual error(-s) can be fetched 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 string **SOF{CR}** will disable 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 10942B has variable baud rates the user can select from. When it leaves the factory, **the serial port is pre-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:

Ixx{CR}

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

xx	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.

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.

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

The command will be echoed back to the user's controller when it is properly executed including a **{CR}**. If an error occurred, the appropriate error message will be 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 string **RON{CR}** must be sent. This enables the AutoRecall mode (factory default setting).

The command will be echoed back to the user's controller when it is properly executed including a **{CR}**. If an error occurred, the appropriate error message will be 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 string **ROF{CR}** must be sent. This disables the AutoRecall mode (factory default setting is RON).

The command will be echoed back to the user's controller when it is properly executed including a **{CR}**. If an error occurred, the appropriate error message will be 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
- **REnnn:** 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 dual serial control ports are located on the rear panel of the system labeled J6 and J7. Both are a standard DE-9S female 9-position D-Type connector. They can be mated with any industry standard DE-9P (male plug).

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.

5.4.1.1. 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 for the 10942B.

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 will not be acted upon until the **{CR}** is sensed.

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

The serial port will return 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 10942B 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 executed without errors, the same command string will be returned indicating to the controller that the command has processed properly. If an error occurred, an error message will be returned. (for concatenated strings, a response will be returned for each command string, delimited by a comma).

The serial port will return 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 will not be acted upon until the **{CR}** is sensed. The system will return 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.

ST156{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:

RE199{CR}

When executing the recall command, the unit first clears existing connections in the switching array, it then connects the inputs and outputs defined in the memory location. This obviously 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 will be sent back to advise the user that it has indeed received the command and is about to initiate a reset. It is suggested that the user wait for about 10 seconds after receiving the RESET back from the system for the unit to perform the self test diagnostics so that it will be ready to communicate with the user's controller again. A string consisting of Model number and software version will be 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 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 will be 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 constant and is 62 characters long.

> ***NOTE: The 10942B only has a fixed capacity of four backup sections. The response will still be 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 will be a total of 62 characters (2+(20*3)).

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 will be change 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)

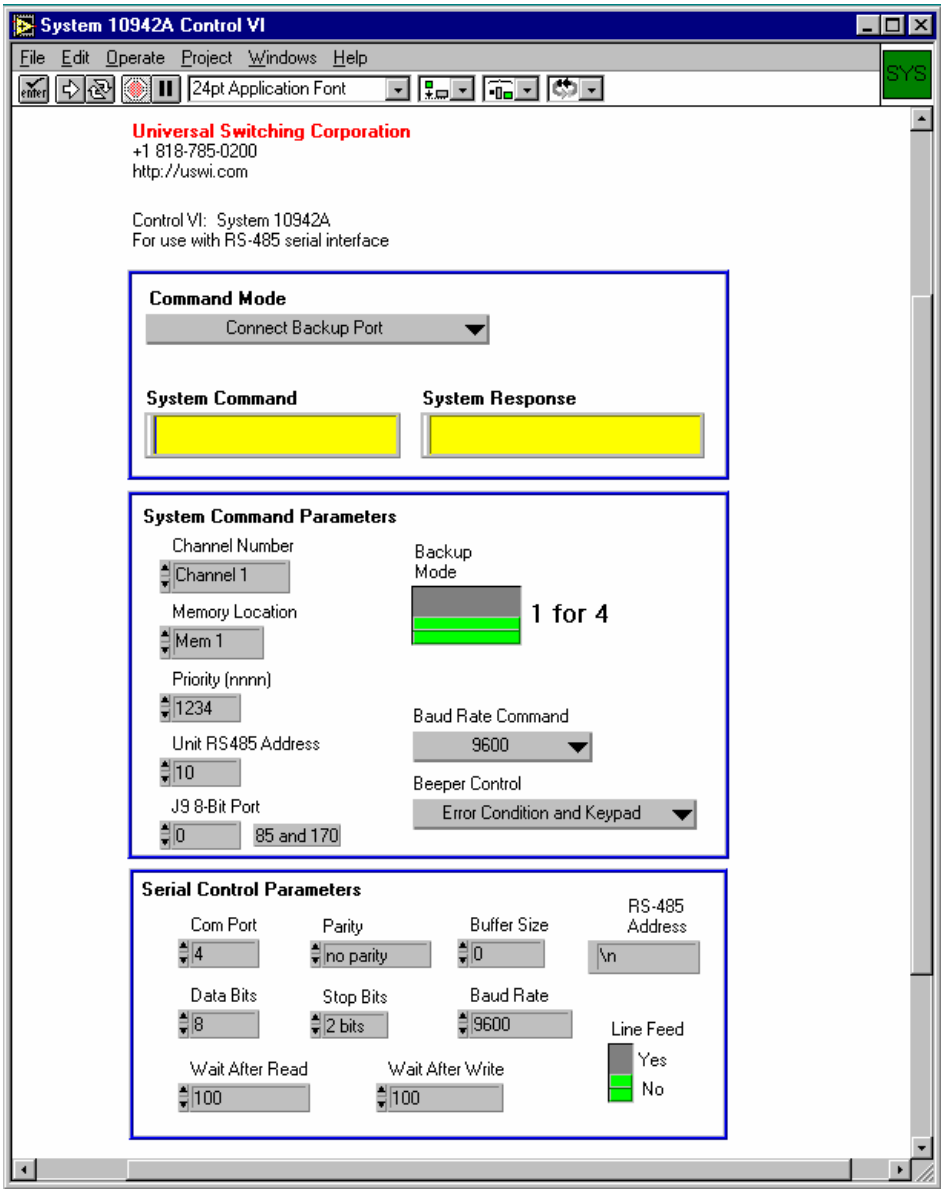
The example response above shows the following status of the system.

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.



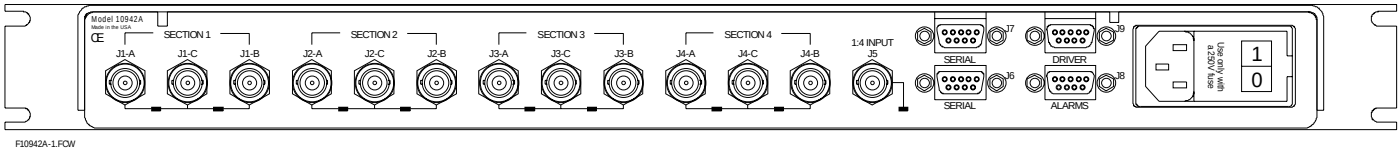
6. Error codes

If an error occurred during execution of a command, one of the error codes listed below will be 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 BNC female. Any industry standard BNC male plug may mate these connectors. They are sufficiently spaced to connect and disconnect mating cables without the use of special cabling tools.



F10942A-1.FOW

7.1. Construction

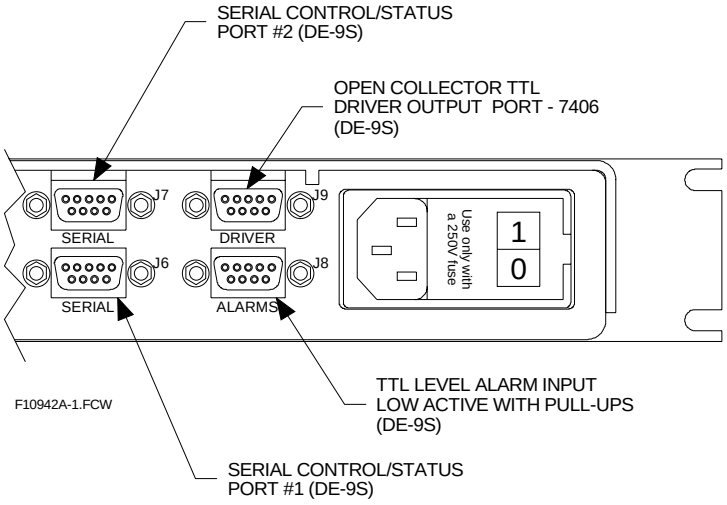
The mainframe is constructed from a rugged aluminum frame. The frame is gold irradiate plated for resistance to corrosion elements and is excellent for ground conductivity. The exterior of the frame is painted black with texture coated epoxy paint per MIL-STD-595B. Fingerprints and other markings do not easily appear on the finish because of the texture coating, plus it provides and 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 the standard RETMA slots for rackmount equipment. The unit is 1RU (rack unit) high (1.72").

7.2. Alarm Input Connector (J8)

The 10942B provides a means of directly accessing control of the switching configuration. An ALARM input connector is available on the rear panel (J7). 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).

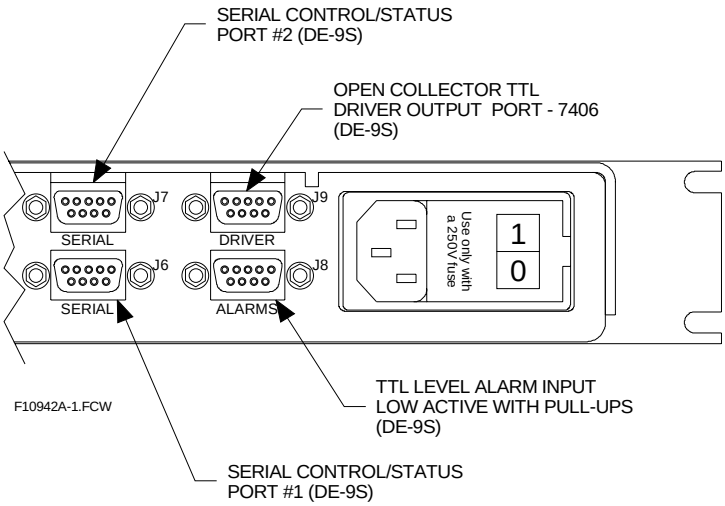


There is a control line for each section. The control lines are pulled high (10K ohm) so external pull-up resistors are not required. The lines are active low meaning that a TTL low (<.8v) will select the associated section. The 10942B firmware keeps the section in the backup mode until instructed to change from the serial 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 control port and not the front panel controls of the unit.



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 will be 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 will cause 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 of the remote control serial control ports located on the rear of the unit. The following syntax must be followed:

Onnn{CR}

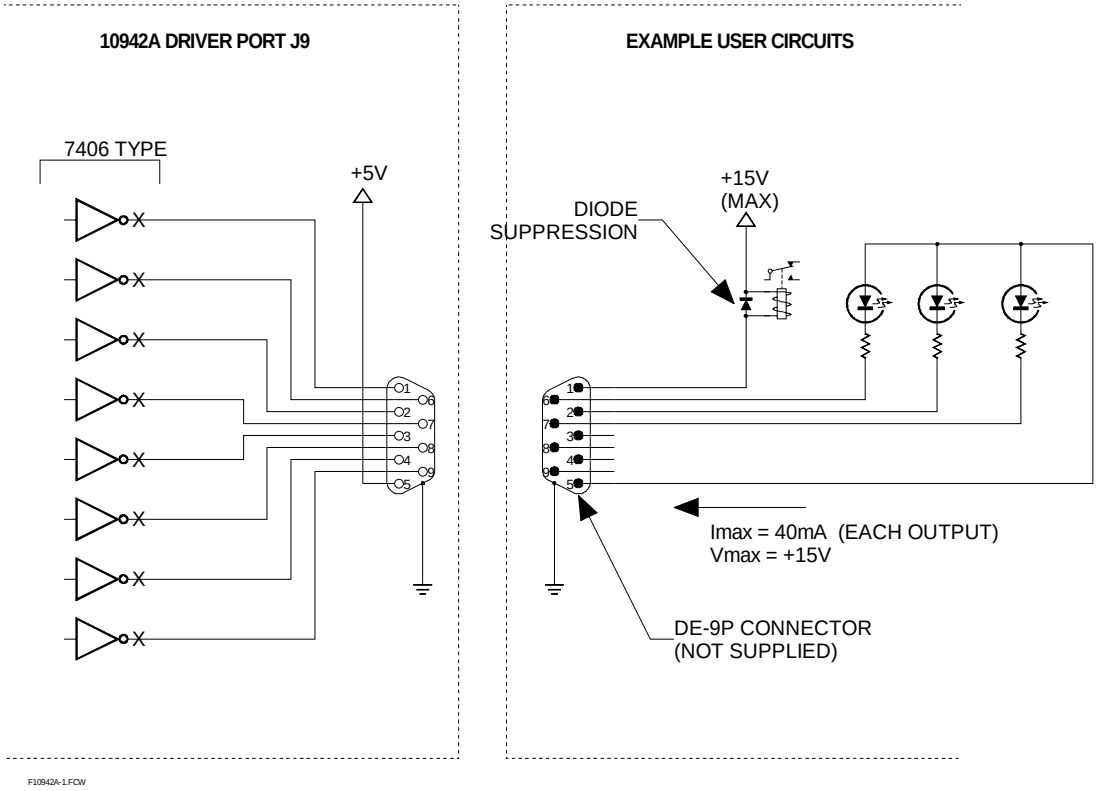
The syntax calls for a capital "O" followed by a value "nnn" that represents the decimal value of a binary number that is to be written to the 8-Bit port. After execution of the command, the command will be echoed back to the serial port it originated from, or an error code will be returned (if an error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



8. Spare Parts List

Following is a recommended listing of spare parts for the 10942B 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 list for this unit is as follows:

Quantity	Model or P/N	Description
1	PS10942B-001	Plug-in Power Supply Assembly (**AC** version)
	or	
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 10942B Specifications

• Configuration	Four channel A/B backup configuration
• Frequency range	DC-500MHz (min)
• Transmission loss (1:1 mode – JxB to JxC)	<0.1dB @ 100MHz <0.3dB @ 200MHz <0.6dB @ 300MHz <1.0dB @ 500MHz
• Crosstalk isolation	>90dB @ 100MHz >72dB @ 200MHz >68dB @ 300MHz >60dB @ 500MHz
• Impedance	75 Ohms (50 ohms optional)
• Signal connectors	75 ohm BNC Female
• Switching technology	High Reliability Relays
• AC power	90-264VAC <10 Watts 47-440Hz
• Power cord	NEMA 15A (USA), 6 foot long (detachable)
• Control Types	Serial ports (two) Front panel illuminated keypad External "alarm" input
• Control connector	DE-9S type (both serial ports and alarm inputs)
• 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
V2.0	Revised manual format and style to comply with the latest documentation standards. 2:2 mode (H2) documentation added.
V2.0 Rev. A	Updated diagram and associated tables on pg. 19. Revised manual format and contact information.
V2.0 Rev. B	Removed manual duplication prohibition. Revised Port 1 and Port 2 identification on pages 18 and 19.

NOTES

EUROPEAN UNION DECLARATION OF CONFORMITY
INFORMATION TECHNOLOGY EQUIPMENT

CE

Coaxial Four Channel IF Backup System
Classified as Control and Measurement Equipment
Series – 10942B
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