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Universal Switching Corporation

OPERATING AND PROGRAMMING MANUAL

Model 11201

Special 8x8 Digital Data Switch Array

Rev A

State-of-the-Art Switching Solutions

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1. Introduction to the System 11201

The System 11201 is a highly integrated single level 8x8 non-blocking ECL data switching system from Universal Switching Corporation (**US**). The system is configured at the factory utilizing standard parts and modules, plus a specially configured switching module with Triaxial signal connectors.

The 11201 is designed for high performance digital switching and incorporates an ultra-high reliability solid state ECL digital switching core.

User friendly interfaces, remotely as well as locally, provides for trouble-free configuration and operation of the switch. It is considered the next generation in compact and lightweight intelligent switch technology.

Some of the key features are:

- Wide digital bandwidth
- Modular plug-in design
- Ultra high reliability solid-state ECL switching core
- Transformer coupled I/O ports
- Custom I/O terminations
- Embedded intelligent controllers
- Illuminated key pad and display
- Powerful control command set
- Store and recall 200 full switching configurations
- Standard RS-232C and RS-422A serial interface
- Field serviceable

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2. System Setup

This section contains information on how to configure the 11201 system in preparation for operation.

It is important to carefully follow the instructions in this section to assure safe and trouble-free operation. The information provided will maximize the performance and expected lifetime of the System 11201.

2.1. Unpacking

The system is shipped in standard commercial packaging. Follow the **UNPACKING INSTRUCTIONS** located on the side of the box. Please pay attention when opening the shipping container so as 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 5 days of receipt.

2.2. Environmental

You may operate the System 11201 in a normal laboratory environment, production environment, or a more rugged industrial environment without any additional considerations. Protection should be provided against temperature extremes (shock) which can cause condensation.

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2.2.1. Storage and Shipping

The System 11201 may be stored or shipped in environments with the following limitations:

- Temperature: -20 degrees C to +75 degrees C
- Humidity: 0 to 90% (non-condensing)
- Altitude: 50,000 feet

2.2.2. Operating Environment

The System 11201 may be used in any environment with the following limitations:

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

2.2.3. Installation Site Parameters

The area which the System 11201 is to be installed should be as clean as possible. A dusty environment would cause an increase in system maintenance. It is recommended that the system be installed in an environmentally controlled area equipped with an air filtration system.

The system was designed to be installed in a standard 19" equipment rack. The system is 2RU high (3.47"). All I/O and control signal connections to the system are at the rear, and therefore would come from inside the rack enclosure. It is suggested that the unit be secured in the rack assembly by chassis slides in addition to the front panel flanges. This provides easy access for maintenance and excellent mechanical stability.

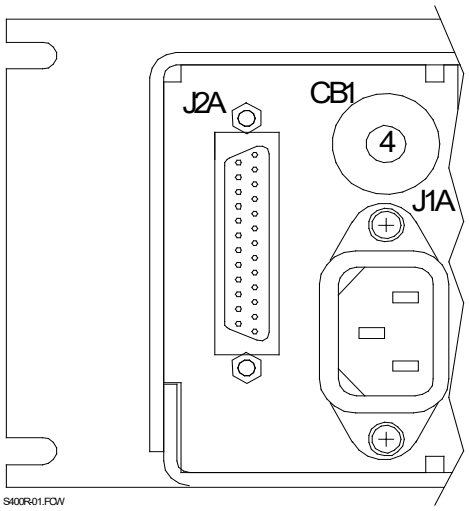
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2.2.4. Power Requirements

The System 11201 requires a power source of 90 to 264VAC single phase, 47 to 440Hz, 130 Watts maximum power. A 6 foot long power cord with a standard NEMA 15A male plug is with the system.

2.2.5. Connecting AC Power

The System 11201 is Safety Class 1 type equipment (equipment with an exposed metal chassis that is connected to earth via the power supply cord).



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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.

> ***NOTE: Since cable retractors are not included, care should be applied when sliding the drawer back into a rack enclosure. A power cord or signal cable could be damaged if proper care is not given.***

2.3. 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 identifying the current owner (including address and phone number) model and serial number of the System, 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: Please call the factory for an RMA number prior to returning the unit. No unit will be accepted without an RMA number. Many problems may be solved over the phone, or by replacement modules.***

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2.4. Connecting the Serial Interface

The System 11201 is equipped with one serial port that provides both RS-232C and RS-422A type interfacing. The serial port is factory configured for 9600 Baud, 8 Data bits, 2 Stop bits, No Parity, and Xon/Xoff flow control. Changes to these settings are explained in the following sections.

2.4.1. Serial Port Pin Assignment

The serial port has both RS-232C and RS-422A capability. The selection of either type is controlled by pin 14 as shown in the table below. Please make sure that only the signal wires used (RS232 or RS422) are present in your cable, or damage could occur.
An asterisk (*) in the designation column indicates an RS-422A signal.

Pin Number	Function	Designation
1	Protective Ground	PGND
2	Transmit Data	TX
3	Receive Data	RD
4	Ready To Send	RTS
5	Clear To Send	CTS
6	Not Used	
7	Signal Ground	SGND
8	Not Used	
9	Send Data A (RS-422A)	*SDA
10	Send Data B (RS-422A)	*SDB
11	Not Used	
12	Not Used	
13	Not Used	
14	RS-422A Select (low active)	tie to pin 7 for 422
15	Not Used	
16	Not Used	
17	Receive Data A (RS-422A)	*RDA
18	Receive Data B (RS-422A)	*RDB
19	Not Used	
20	Data Terminal Ready	DTR
21	Ready To Send A (RS-422A)	*RTSA
22	Ready To Send B (RS-422A)	*RTSB
23	Clear To Send A (RS-422A)	*CTSA
24	Clear To Send B (RS-422A)	*CTSB
25	Not Used	

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2.4.2. Setting the Serial Port (RS-232C / RS-422A)

When the 11201 leaves the factory, **it is pre-configured for 9600 baud, 8 bits per character, no parity, 2 stop bits, software handshaking (Xon-Xoff)** . These settings may be altered in the field by means of the front panel controls, or by changing the DIP switch on the interface card (not recommended since the DIP switch is inconvenient to reach).

2.4.2.1. Changing the Serial settings from the front panel

After delivery from the factory, front panel modification of serial port settings is enabled. This is controlled by the setting of the DIP switch on the serial card - position 8.

> ***NOTE: Do not change the DIP switch(8) from the OFF position, since this effectively disables the ability to alter the interface settings from the front panel, unless this is desired.***

To change the serial interface parameters from the front panel, the following sequence must be observed (any remote control activity is automatically void and the interface will be reset once the alterations are done).

- Press the MNU (menu) key on the control pad to move to the "Interface Menu", the IF1 through IF4 parameters are shown.
- Use the arrow keys (up/down) to move the cursor to the interface (IF1-IF4) that you desire to modify, and press ENTER.
- Use the (left/right) arrow keys to select a parameter to be modified, then use the (up/down) arrows to alter the value.
- When all parameters are properly defined, press "STO" to record the changes and reset the interface, or press "CNL" to cancel the changes and restore the previous settings.

When all desired modifications are complete and have been stored, press "CNL" to return to the main screen and resume operation, or press "MNU" again to display the next setup menu.

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2.4.2.2. Changing the Serial Port settings from the DIP switch

> ***NOTE: This method is NOT recommended!***

An eight position DIP switch is located on the plug-in serial interface card located under the cover of the system. This DIP switch may be altered to enable/disable front panel control of the serial card setup, or to directly define the interface card parameters, as defined by the tables below.

Baud	Position 3	Position 2	Position 1
300	OFF	OFF	OFF
600	OFF	OFF	ON
1200	OFF	ON	OFF
2400	OFF	ON	ON
4800	ON	OFF	OFF
9600	ON	OFF	ON
19.2K	ON	ON	OFF
38.4K	ON	ON	ON

Parity	Position 6	Position 5
None	OFF	OFF
Even	OFF	ON
Odd	ON	OFF
X	ON	ON

- **Handshaking - Position 4:** OFF = Hardware (RTS/CTS)
On = Software (Xon/Xoff)
- **Stop Bits - Position 7:** OFF = 1 stop bit
ON = 2 stop bits
- **Control Settings - Position 8**: OFF = Front Panel
ON = DIP Switch

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The DIP switch may be accessed by removing the cover to the unit. The DIP switch is located near the right rear side on the actual interface card. This should be done only while the AC power is off.

> ***NOTE: It is strongly recommended that the front panel controls be used to change the serial port settings.***

2.4.3. Self Test

The System's built-in intelligent controllers perform a self-test immediately when powering. It's self diagnostics are designed to run operational tests on the following system components:

- RAM
- ROM
- Vacuum Fluorescent Display
- Quantity of Plug-in Cards
- Size and Type of Plug-in Cards
- LED's on the Front Panel
- Beeper
- Power Supply Level (main +5 volt only)
- Internal CPU Functions

Upon powering the System 11201 each of the above parameters will be verified consecutively. The self-test diagnostics may be started again from the remote interface(s).

> ***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.***

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2.4.4. Error Messages

Should a failure or error condition be detected, an error message will be displayed on the front panel. An example error message would be **E0105**. For an explanation of the error messages, see section 6.

> ***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).***

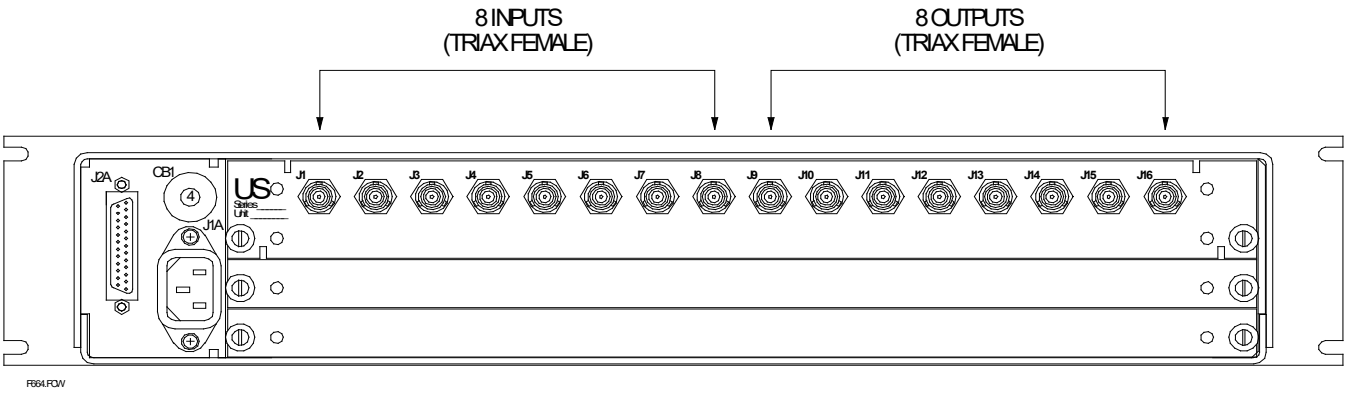
> ***NOTE: It is not recommended to remove or install plug-ins while the unit is powered or while signal cabling is connected. Doing so may cause damage to the modules and/or conflicting configuration information in the CPU's memory. Hence, new connect or disconnect commands may not be interpreted correctly.***

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3. System Configuration

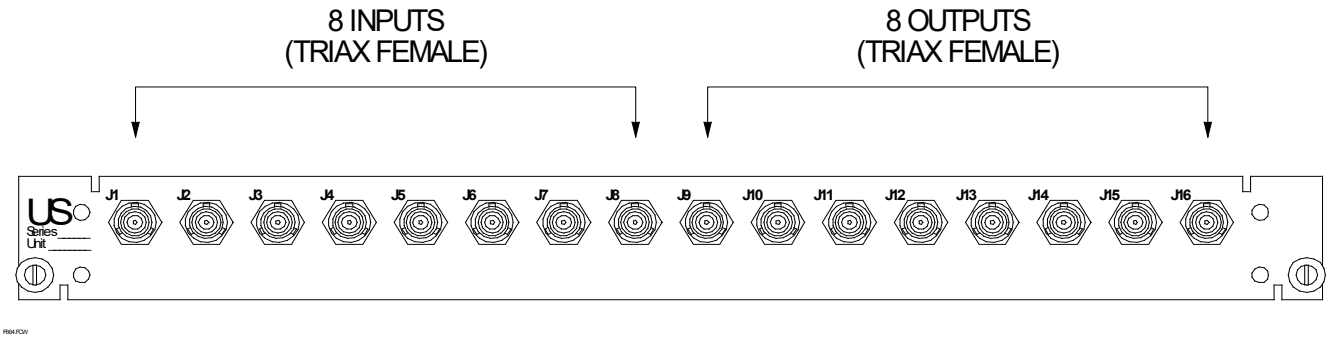
This section describes the various features of the multilevel switching matrix concept and how it is controlled by the distributed embedded microprocessors. Control is distributed to each module inside the system to form an efficient multiprocessor design. All system components are controlled by the main CPU by means of an internal serial link (**USbus**).



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3.1. Non-blocking Switching Array (matrix) Concept

The System 11201 is a single level, eight input by eight output non-blocking AC coupled digital data matrix. There is only one switching module that comprises the configuration. Having a true non-blocking switching architecture, each of the eight input ports within a module may be randomly connected to any one or all of the eight outputs with minimal data signal degradation. The switch modules plug into the rear of the unit and are secured to the chassis by captive fasteners.



The I/O ports on the switch module have custom circuits designed to meet the requirements of Cypress HOTLink products. These require special transformers between the I/O connectors and the digital ECL switching core. These are described in the following sections.

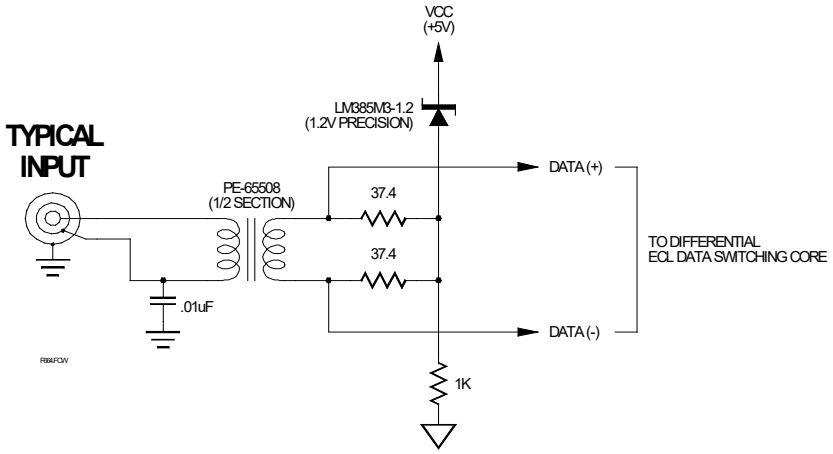
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3.1.1. Input Section of the Matrix

On the module, each of the 8 inputs have standard Trompeter BJ-77 style female TRIAX connectors, spaced .80" centers horizontally. The inputs are labeled J1 to J8 just above each of the connectors.

Each input port has a unique circuit as shown below. All circuitry and signal components are mounted on a custom designed high-performance GeTek PCB. Both the input and output connects on the module are high-performance TRIAX connectors manufactured by Trompeter Electronics.



3.1.2. Switching Core

The actual switching core of the module is an ultra-high performance 1.4Gb multi-purpose ECL/PECL crosspoint array. This switching core provides a true differential crosspoint array with broadcast capability allowing multiple outputs to be connected to a given input. Low jitter and bit errors are major features of the array.

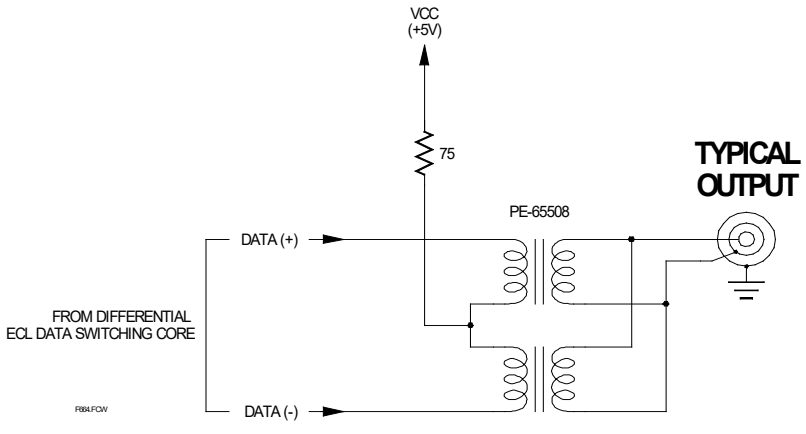
The array shares the same GeTek PC board as the custom I/O circuitry though the main control board included in the switching module delivers the control and power for the array. Carefully designed impedance matched signal traces minimize reflections on the multi-layer PCB.

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3.1.3. Output Section of the Matrix

The outputs from the switching module each have standard Trompeter BJ-77 style female TRIAX connectors, spaced .80" centers horizontally. The outputs are labeled J9 to J16 just above each of the connectors.

Each outpur port has a unique circuit as shown below. All circuitry and signal components are mounted on a custom designed high-performance GeTek PCB. Both the input and output connects on the module are high-performance TRIAX connectors manufactured by Trompeter Electronics.



3.1.4. Triaxial Connectors

The switching module contains Triaxial connectors manufactured by Trompeter Electronics, a leader in high performance connectors. The Triaxial connector design delivers a coaxial connection with two independent shields. The same connector is also used in Twinaxial applications with the antiquated polarized Twinax BNC has been replace by this newer connector.

> ***NOTE: It is not recommended to remove or install plug-ins while the unit is powered or while signal cabling is connected.***

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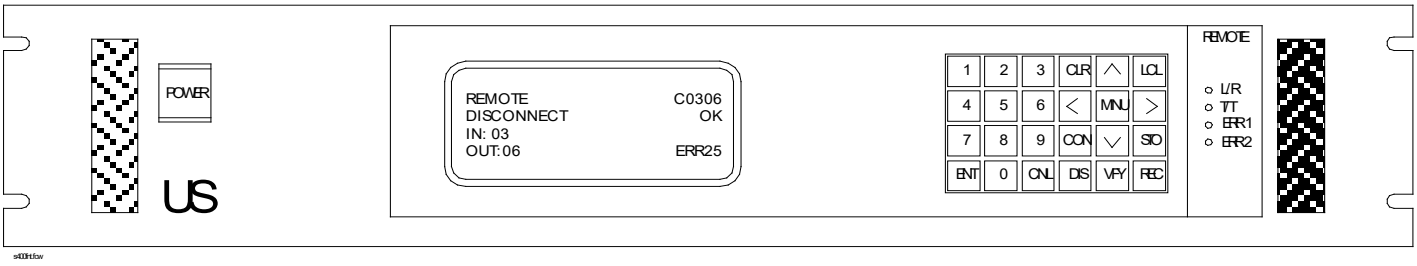
4. Front Panel Overview

This section describes the features of the System 11201 front panel control keypad and vacuum-fluorescent display. 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 have "intelligent" back-lighting, meaning that they are lit only when they are active (representing a valid choice or command).

The functions of the 24 position key pad may be divided into the following categories:

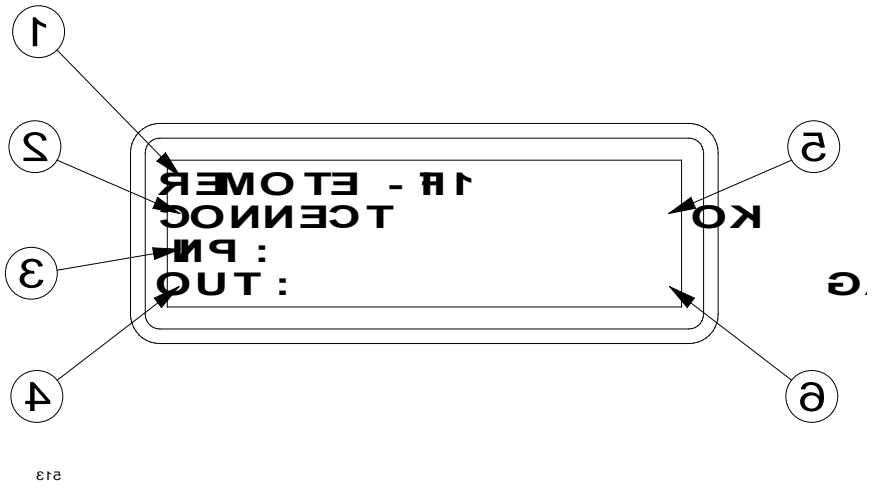
- Operators: Connect, Disconnect, Verify, or Clear All
- Control: Store, Recall, Cancel or Local/Remote
- Input: Numerical Keys, 0 through 9
- Misc.: Enter, Menu, and Arrow Keys



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4.1. Display Features

The front panel display is a high contrast vacuum fluorescent display for rugged environments and long life. During normal operation (after self-test is complete), the display is divided into six



functional areas. These are outlined in the diagram below.

- 1) Active Remote Control Port (IF1 to IF4)
- 2) Function, or operator
- 3) Input number
- 4) Output number
- 5) Operation confirmed /Error message
- 6) Control type, or replaced by module entry field

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4.2. Control Pad Entries

The front panel manual control pad is 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. You may control the System 11201 locally from the manual control pad or by means of the serial control port (remote RS-232C or RS-422A).

4.2.1. LCL (local) Key

The **LCL** key will return control to the front panel manual control pad if the controls have been locked out locally or remotely (by a security code). When pressing the "LCL" key, the user will be prompted to enter the security code if the unit is locked. After entering the code, the CPU will unlock the controls. The local key pad can also be locked to prevent unintended switch manipulation by pressing the "LCL" key and then entering a 4-digit security code. See the lockout section on page 1 for more details.

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4.2.2. Connect Function

The connect (**CON**) key is used to connect an input to an output. It is used with the numerical keys to enter an input/output combination. The example below connects input 05 to output 02.

The following sequence should be observed:

- Press connect: **CON**
- Enter an input number (two digits): **0 5**
- Next, enter an output number (two more digits): **0 2**

> ***NOTE: If the Ganged control option is set to "Off", two additional digits will have to be entered to specify switch module.***

- Both the input and output entries may be edited by using the arrow keys (up, down, left, or right) to select to the entry needing change. Once to the proper location, key in the desired number. To execute the command press the **ENT** key, or you may press the cancel **CNL** key to abort the command at any time.

After pressing the enter key, the System verifies that the input, output and module number (if applicable) represents a valid entry. If not, the System will alert you by displaying an error code and sounding the beeper. Other possible errors include attempting to connect an output to an already connected input or a switch malfunction.

The System now connects the input and output combination you specified and confirms the closure by verifying with each of the matrix levels (RGB) that the command was received and confirmed. An OK is displayed if no errors were detected.

If an error occurred while making the connection, the beeper will come on momentarily and an error message, E01xx, will be displayed in place of the "OK".

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4.2.3. Disconnect Function

The disconnect (**DIS**) key is used to disconnect (open) an input/output combination previously connected. To operate, follow this sequence:

- Press disconnect (**DIS**)
- Enter the input number followed by the output number (and possibly a module number).
- Both input and output entries may be edited by using the arrow keys (up, down, left, or right) to select the entry to be edited. To execute the command press the **ENT** key, or you may press the cancel (**CNL**) key to abort the command at any time.

After pressing the enter key, the System verifies that the input/output combination was a valid entry.

The System then disconnects the input/output combination you specified and confirms it by verifying with each of the enabled matrix levels that the command was received and confirmed. An OK is displayed.

> ***NOTE: It is not considered an error to reconnect an already connected input/output combination or to disconnect an already disconnected output.***

4.2.4. Verify Function

The verify (**VFY**) key may be used to verify the connection of a path through the matrix array without changing it's status.

To use the verify function, enter the input and output combination and press the enter key. If the combination is connected, the unit will display OK in the status field. If the combination is not connected, the unit will display "VERIFY-DIS OK" indicating that the pair is not connected. If the output is connected to another input, an error code will be returned. Since the System is a non-blocking matrix, one input may be connected to multiple outputs, if so desired.

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4.2.5. Store and Recall Switching Configurations

The System can store and recall up to 199 different configurations from the CPU's battery backed. This is very useful when changing between configurations rapidly. When a configuration is stored, the entire switching array configuration is saved into the storage memory location.

> ***NOTE: Any stored configurations will be lost if the main CPU's lithium battery jumper is removed, or if the battery life has been exceeded.***

Storing a switching configuration is accomplished by the following keystroke sequence:

- Press the store (**STO**) key
- Enter the storage memory location (001 to 199) using the numerical keys. The arrow keys may be used to edit the number prior to the next step.
- Press the enter (**ENT**) key to store the configuration.

> ***NOTE: When a configuration is stored in a location, it automatically overwrites any previously stored configuration in that memory location.***

The operation will be confirmed with an OK in the status field of the display. The storage location 000 is reserved by the System to store the current configuration should power be lost to the unit. Upon powering the unit, the System will re-configure to the last matrix setting if the Auto-restore feature is enabled in the setup menu.

To recall a configuration, press the recall (**REC**) key and enter the memory location to be recalled (001 to 199). Press the **ENT** key to execute.

> ***NOTE: When a configuration is recalled, the unit first clears the entire matrix array, then restores the desired configuration (break before make).***

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4.2.6. Clear Function

To clear the entire matrix configuration, the clear (**CLR**) key may be used. This will disconnect all previously connected input/output connections through the matrix array. To clear the matrix, press the **CLR** key once, then press the ENTER key to confirm.

If the clear key was pressed by accident, you may press the cancel key (**CNL**) to abort the function**. Once you have cleared the matrix, the previous configuration is lost unless you stored it in a memory location.**

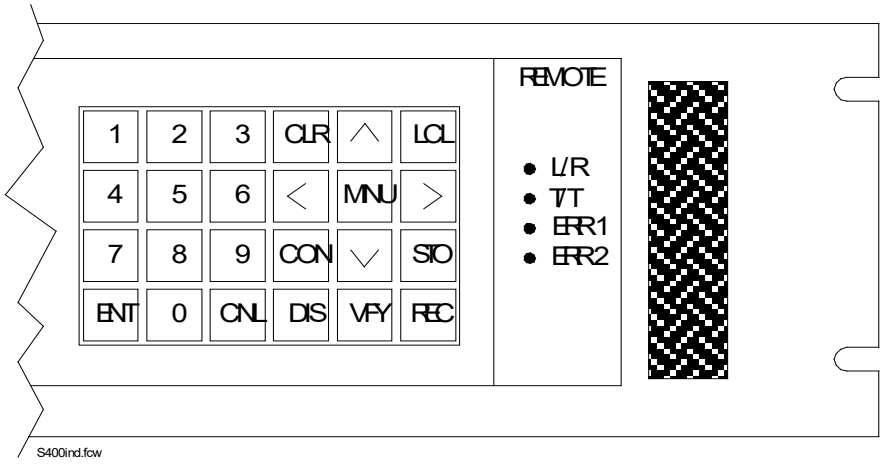
4.2.7. Cancel Key

The cancel (**CNL**) key may be used at any time to abort a menu selection or command entered from the manual control pad.

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4.3. Front Panel Indicators

The front panel has four discrete LED's located next to the vacuum fluorescent display. They provide a direct visual status of four main parameters. Two of the indicators are for communication information (L/R, T/T are green), two are warning signals (ERR, WDF are red). The green LED's provide information about the remote interface and inter-module communication (**USbus**).



4.3.1. Indicator Definition

- **L/R** (listen / receive) is lit when the System is addressed to listen during IEEE-488 control or when serial data has been sensed on pin 3 of J2A when a serial interface card is installed.
- **T/T** (talk/transmit) is lit green when the system is addressed to talk during IEEE-488 control or when data is being sent by means of the serial interface to your computer serial port using pin 2 of J2A.
- **ERR 1** is the error indicator, and will illuminate red (along with the audible tone sounding if enabled) if an error is detected.
- **ERR 2** is the main CPU's watch dog timer circuit. This will light if the circuit has detected a CPU failure or if the main 5 volt power supply is below 4.65V.

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5. Programming the 11201

This section introduces basic programming information and provides examples to get you started with your system programming.

Before you start trying to communicate with the system, be sure to configure the serial port to match the settings of your controlling computer.

The basic operations that can be programmed are as follows:

- Connect an input to an output
- Disconnect an input from an output
- Clear all input/output connections
- Verify the status of an input/output combination
- Store and recall entire configurations
- Run the self test diagnostics (RESET)
- Security functions

The serial control port is the J2A connector on the rear of the unit which is a female DB-25S connector. **All commands must be terminated with a carriage return {CR}.** A line feed **{LF}** is optional, but will be ignored by the system.

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5.1. USI Command Syntax

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

5.1.1. Addressing Range

The switching system is comprised of only a single plug-in module. An additional module could be installed in the future. The standard module plugged into the rear can be individually addressable and has a unique slot address. For the 11201 system, the slot addresses will be "02". The input section addresses range from 01 to 08, and the output range is 01 to 08.

5.1.2. Connect Command

The connect command is used to connect (close) a specified input/output connection. The string must be seven characters in length. The first two digits specify the module slot in the mainframe (always 02), the second two digits specify the input port on the module and the last two digits specify the output port. Shorter or longer messages will be ignored or cause an error message to be generated. Lower case 'C' will also generate an error message.

> ***NOTE: In GANGED mode (default), the module slot is ignored, and could be set to "00" since all modules are controlled simultaneously.***

C020301{CR}

C020503{CR}

The top example connects input 03 to output 01. The bottom example input 05 and output 03 on module 2.

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

C020101,C020202,C020303{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 100mS for a single command.

5.1.3. Disconnect Command

The disconnect command is used to disconnect (open) an input/output. The message string must be seven characters in length. Shorter or longer messages will be ignored or cause an error message to be returned. Lower case alpha will generate an error message.

D020801{CR}

D020202{CR}

The top example disconnects input 08 from output, and the bottom example disconnects input 2 from output 2 on the module in the second slot (02). The slot address (the first two digits) will be ignored in GANGED MODE.

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Multiple strings may be sent together by delimiting each with a comma. They do not have to be the same type of command. For example:

D020201,D020103,C020403{CR}

The command will not be acted upon until the **{CR}** is sensed. A string will be returned consisting of concatenated responses from each command. The responses can be the command string returned (if no errors occurred) or an error code for each command.

5.1.4. Verify Command

The verify command is used to verify the connection status of a specific input/output combination. The command is structured the same as the connect and disconnect commands, except for a capital V being used for the first character.

V020301{CR}

The example verifies the state of the input 3 to output 1 connection. If it is in the connected state, the unit will return C020301. If it is not in the disconnected state, the unit will return D020301 (if disconnected) or E0104 (if used with other input).

This command verifies the static state indicated by the module's embedded CPU. It does not verify the actual signal path by way of signal injection or other means.

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5.1.5. Clear All Command

The unit has the ability to simultaneously clear all input/output connections 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.

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

5.1.6. 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 was 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.***

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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.

5.1.7. 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. If the POWERUP MESSAGE is enabled, a string consisting of Model number and software version will be returned after the system has restarted.

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5.1.8. 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.

> ***NOTE: The operator must use caution with this command since simply powering down the System will not relinquish the front panel lockout.***

To lock the front panel control pad from remote serial control interface, send the character **"L"** followed by four user selected numbers. The same four numbers may also be keyed into the front panel control pad to regain local control. For example:

L1234{CR}

After the lockout command has been sent, the front panel display will say *"KEYPAD IS LOCKED !!"* and the System will return the code to the controller indicating that the unit is locked. Valid numbers are 0000 to 9999.

To unlock the front panel controls, the following command must be sent, or key the numerical code at the front panel key pad. Press **LCL** prior to entering the code.

UNLOK{CR}

There is no need to send the numerical code number from the remote port. The command will be returned to the user's controller upon completion.

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5.1.9. Download Configuration Data

DLOAD{CR}

To assist in quickly determining the present I/O connection of the matrix array, you may send the download command. This command reports all I/O crosspoint connections.

The unit will return 18 characters with the first two identifying the total number of outputs of the. The second two digits represent output 01 and the input it is connected to. If output 01 is connected to input 07 then the second two digits will be 07.

The following digits likewise represent status of the balance of the output ports on each module (8 outputs each equals 8 total pairs of digits), each requiring two digits. If the output is not connected any input, the digits will be "00". In the below example, output 01 is connected to input 07, and output 02 is connected to input 01.

080701000……00{CR}

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6. Error codes

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

- E0101 Specified output does not exist
- E0102 Specified input does not exist
- E0103 Unrecognized command
- E0104 Specified output is already connected to other input
- E0105 Specified input is already connected to other output
- E0106 Specified output is not connected
- E0107 Specified input is not connected
- E0108 Specified memory location is empty
- E0109 Non-numeric argument
- E0110 Power supply level below specified limit
- E0111 Power supply level above specified limit
- E0112 Random access memory checksum error
- E0113 Read only memory (EPROM) checksum error
- E0114 IEEE-488 (GPIB) controller failure
- E0115 General power failure
- E0116 Incorrect UNLOK code entered
- E0117 RS232: Break
- E0118 RS232: Framing
- E0119 RS232: Parity
- E0120 RS232: Overrun
- E0122 Middle stage module not available to route signal
- E0123 Bad key bad entry
- E0124 Verification signal too low (during Query)
- E0125 Verification signal too high (during Query)
- E0126 Empty slot addressed
- E0127 Bad coil voltage sensed during verification
- E0128 Invalid input / output combination
- E0129 No remote keypad available
- E0140 General main CPU internal communication failure
- E0141 Main CPU failed to receive module acknowledgment
- E0142 Main CPU failed to send module acknowledgment

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> ***NOTE: This is a general list of all error messages utilized for many different units manufactured by Universal Switching Corporation. Some error messages may not apply to the 11201.***

6.1. Error Codes on the Display

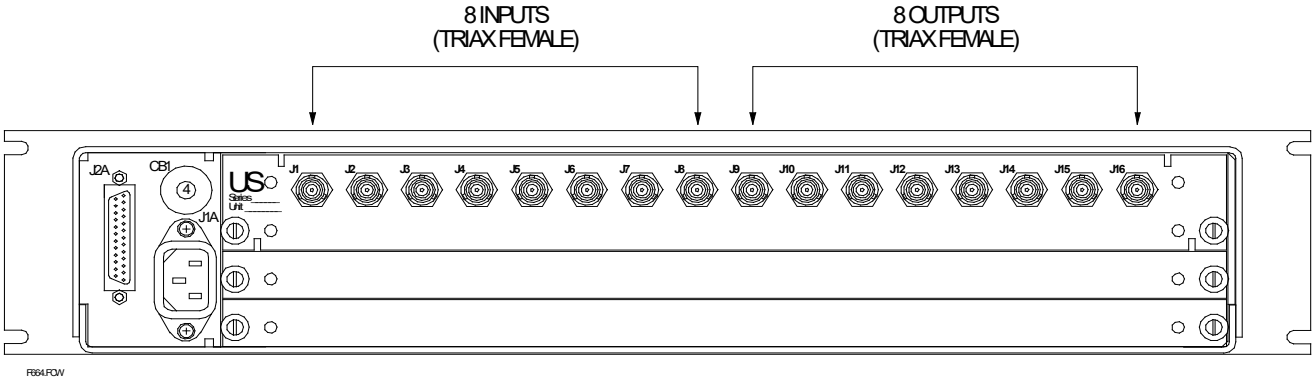
When an error occurs, the front panel error LED illuminates (red) and the beeper sounds for 1 second. The error LED stays on until a new command is executed (without error).

Command error messages are shown on the front panel display if the command was issued from either the front panel or the remote interface. These may be addressing a point that doesn't exist or disconnecting a point that isn't connected. Syntax errors like "claer" instead of "clear" will not be shown on the front panel display because these are handled by the interface cards themselves.

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7. Rear Panel Signal Connectors

The system's signal connectors are located on the switching module Model VSECL-112202-200. There is only one of these modules which provide a total of 16 signal I/O. The user connects directly to each of the modules via female TRIAX connectors. The direct connection provides the best signal response and connection reliability.



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8. Service Information

This section outlines various procedures for removal and installation of the plug-in modules included within the switching system. User service to the unit is limited to very minor repairs because special equipment is required to test and repair the modules.

All modules are software controlled by the main CPU. If a module or card fails in the field, the suspected module may be swapped out with a spare, and sent to the factory for repair.

It is suggested that, for applications critical to down time, a minimum of spare modules or sub-assemblies be purchased and be kept on site. See the factory recommended spares list.

8.1. Service Tools

The highly integrated and modular design allows most of the critical modules and cards to be easily removed by the user. No special tools are required. Only the following tools are required for service:

- Phillips Head Screwdriver
- Bladed Screwdriver
- 3/32 Allen Wrench
- 5/32 Allen Wrench

All of these may normally be found in any test lab environment, or technician's toolbox. Periodic maintenance may be required depending upon the application and the use of the unit. For example, in a dirtier environment, in would be a good idea to simply remove the top cover and blowout any dust accumulated in and around the internal fans and all connectors.

8.1.1. Removing a Switch Module

The switch module may be removed by using a bladed screwdriver. Loosen both black captive fasteners on the module installed. Gently, but firmly remove the module straight back towards the rear.

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> ***NOTE: It is suggested that the AC power be disconnected from the System before removing any modules.***

When installing a module, be sure it is properly aligned with the slot's card guide. The module installs with the components and cover facing up. Slide the module in until the edge connector begins to mate inside the mainframe. Be sure to seat the card all the way by securing the two black captive fasteners with a bladed screwdriver.

8.1.2. Locating the EPROM on the CPU

The system's EPROM is installed in a socket located on the main CPU board. The EPROM is installed in U6. To access the CPU board, the top cover may be removed (remove all screws retaining the top), or the front panel may be removed. Removing the front panel is the easiest since less screws are involved and you have direct access to the CPU board. If a chip must be removed use an IC removal tool or other suitable device to prevent any damage to the IC.

> ***WARNING: The CPU card and the EPROM are static sensitive devices! Use appropriate anti-static protection when handling any parts internal to the unit.***

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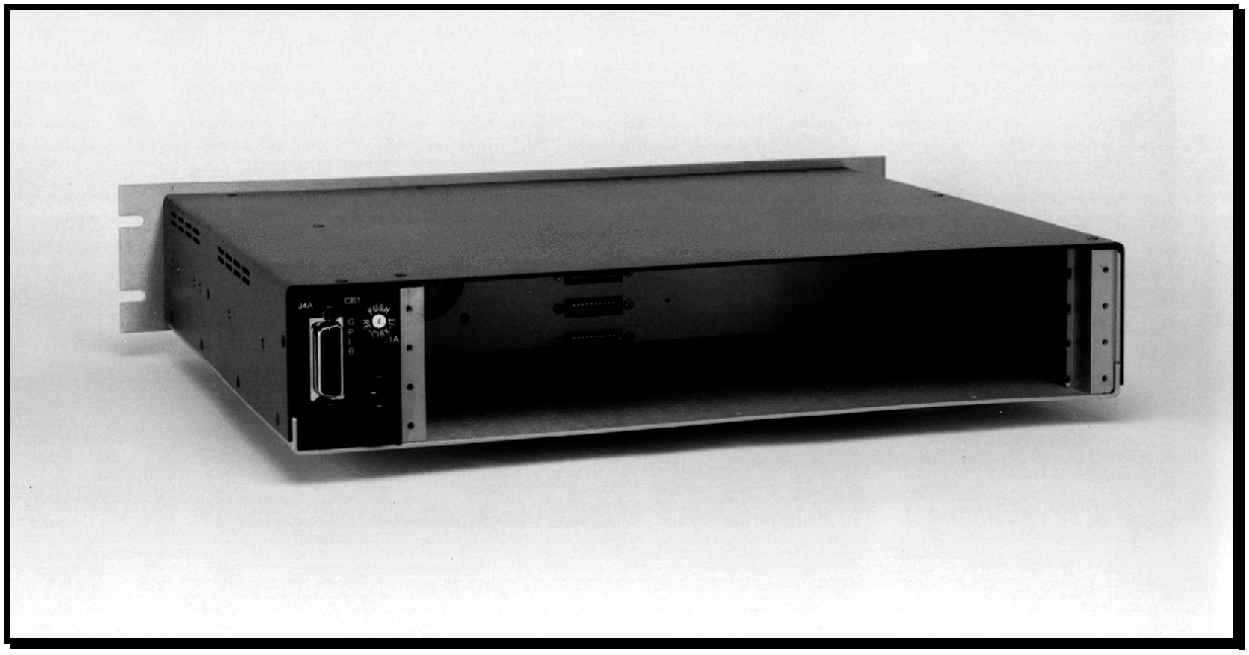
9. Model S400R-200 Mainframe Controller

The S400R-200 is a controller and mainframe assembly with DC power supplies, serial interface port, front panel controls and CPU controller. It is designed to accept up to four modules. The rugged design of the unit is enhanced by the modularity of the internal structure. All of the internal subassemblies are easily removed with common hand tools. This allows you to make simple subassembly swaps in the field for low down time.

9.1. Power section

The unit contains a total of three high quality power supplies. There is one 5 volts @ 3 amps which one is used for all control and logic. The other two supplies are configured for +5volts @ 6 amps and -5volts @ 6 amps. These are for use by modules which have to deal with analog signals which are routed through the system (modules containing solid-state switching and amplifiers). This assists in eliminating any digital control noise from the users analog or digital signals.

A temperature sensitive fan is also included for cooling modules installed and the internal power supplies. The power supplies are easily replaced by removing the screws which retain each of them (please note that these screws are 4-40 type).



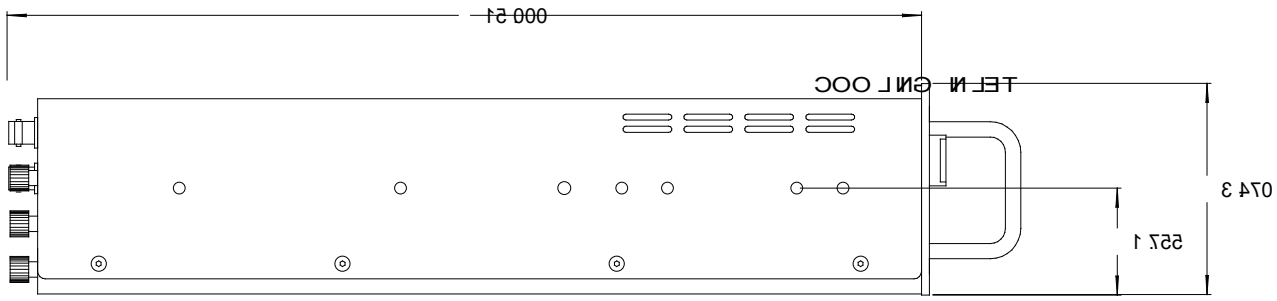
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9.2. Construction

The mainframe is constructed from a rugged aluminum frame. The frame is gold irradiate plated for resistance to corrosion elements and excellent conductivity. The exterior of the frame is painted in a texture coat epoxy paint per MIL-STD-595B color black. Finger prints 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.

9.2.1. 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 2 rack units high (3.47"). It is highly suggested that the unit be mounted using chassis slides, and not via the front panel flanges alone.



9.2.1.1. Chassis slides

It is suggested that the unit not be mounted by the front panel flanges by themselves, but by some chassis slides mounted to the side of the unit. Both pivoting and straight slide types may be mounted. These are available through the factory. Threaded mounting holes for both types are provided.

Chassis-Trak ®

Non-pivoting type:	C-300-S-140
Pivot type:	C-300-D-140-TH

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The type of slide used is up to the *Systems Engineer* in charge of the installation, and the desired result. The pivot type of slide detents in three locations, straight, +90° and -90°.

9.2.2. Cooling

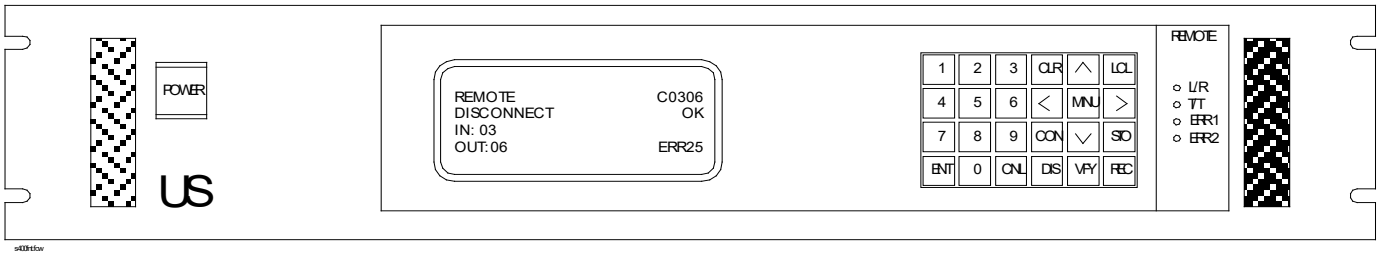
The S400R-200 contains a temperature regulated cooling fan internal to the unit which distributes air from inlet slots located on the sides of the unit, and exhausts the air out the rear between the installed modules. No filter is included at the factory. If the unit is used in an excessively dirty environment, consult the factory for assistance.

The fan is considered a "smart" fan because it senses the temperature and change the rotation speed of the blades accordingly. Normally the fan rotates at half speed to keep the acoustic noise of the system low. At temperatures over 37° C, the fans will increase speed until they are at full speed at 40° C and over.

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9.3. Front Panel Controls

This section describes the features of the front panel control keypad and vacuum-fluorescent display. The explanation of each feature also provides a basis for their application and usage.



9.3.1. Intelligent Keypad

The control panel has been designed for ease of use and functionality. All control keys are back-lit with a green LED for easy reading in direct sunlight, or in a completely dark room. To ease the operation of the unit even further, only the valid keys are lit (key which have no bearing on the current operation or are not a current choice will not be illuminated). This keypad is referred to as "intelligently back-lit" keypad. The functions of the 24 position control pad may be divided into the following categories:

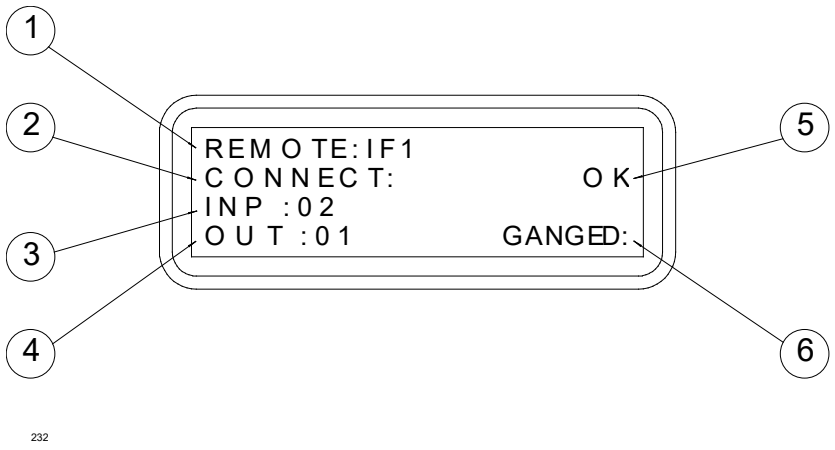
- Operators: Connect, Disconnect, Verify, or Clear All
- Control: Store, Recall, Cancel or Local/Remote
- Input: Numerical Keys, 0 through 9
- Misc.: Enter, Menu, and Arrow Keys

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9.3.2. Display Features

The front panel display is a high contrast vacuum fluorescent display for rugged environments and long life. During normal operation (after self-test is complete), the display is divided into functional areas. These are outlined in the diagram below.

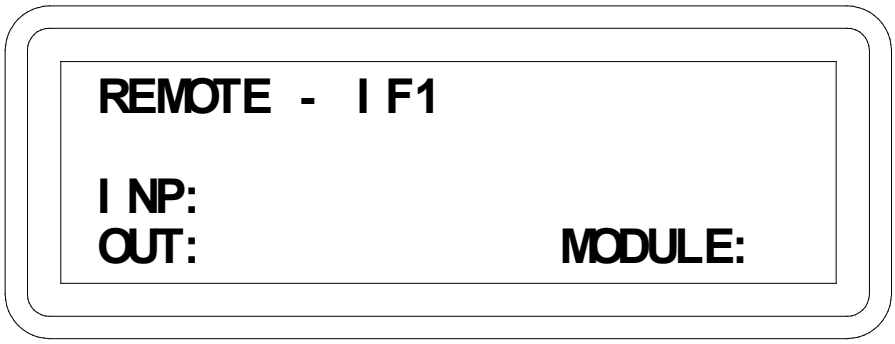


- 1) Active remote input
- 2) Function, or operator
- 3) Input number
- 4) Output number
- 5) Operation confirmed
- 6) Ganged mode indicator (or module input field)

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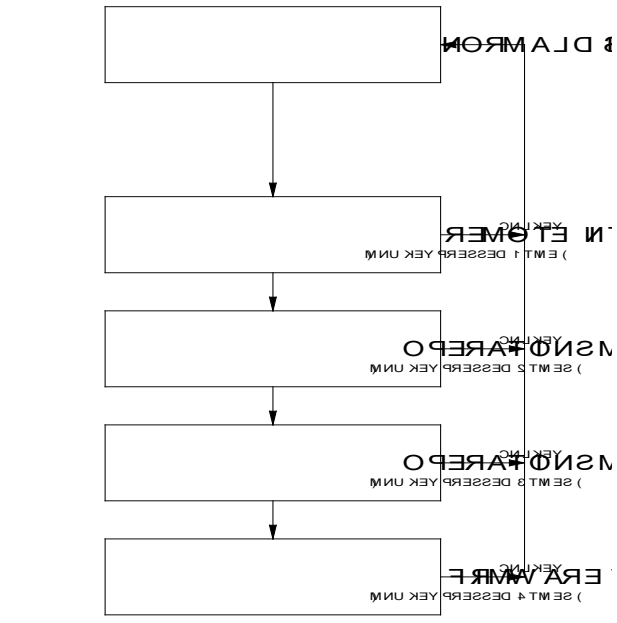
9.4. Display Menu System

The system may be configured to perform various tasks by setting up the unit via menu driven selections. By pressing the MNU key on the front panel control keypad, the user will cycle through four different menu screens. The "normal display" is the screen shown after the unit has finished the power up tests and is idle waiting for commands (shown below).



302: Normal Screen

The order of the display menus are shown in the block diagram below. Pressing the MNU key on the control keypad provides access.

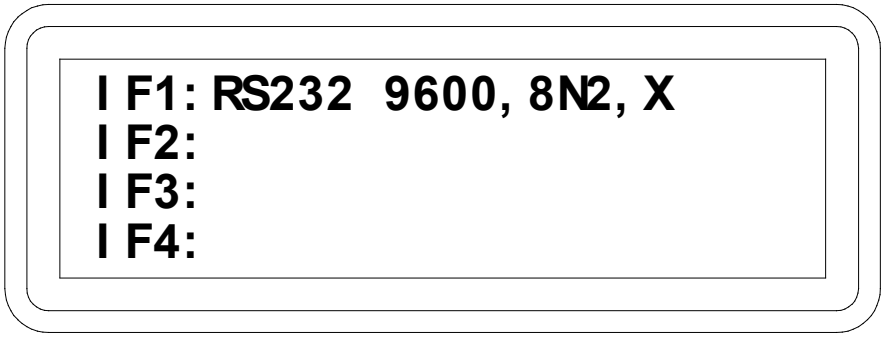


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9.4.1. Remote Interface Screen

By pressing the MNU key once, the interface configuration menu appears on the display. The unit will display the parameters for any installed remote interface cards. The 11201 is factory equipped with a single serial interface port (RS-232C and RS-422A). The serial interface card data is displayed on the IF-1 line. Any additional interfaces installed in the field will also be displayed in this menu.



305: Remote Interface Menu

9.4.1.1. Serial Port Settings

With the interface configuration menu on the display, the factory default serial port settings will be displayed. The factory default settings (which may be restored if RAM battery is removed for 10 seconds) are 9600 baud, 8 data bits/char, no parity, 2 stop bit and software (Xon/Xoff) handshaking.

To edit these parameters, move the blinking cursor to the interface needing changes on the display, press the ENT key once. This enables the edit mode. Using the arrow keys to move the cursor, select the parameter that you wish to change. The up and down arrows will display the different selections available for each parameter.

When all parameters have been configured press the STO (store) key to store the configuration in the unit's memory and send the updated parameters to the interface card. The interface configuration menu will reappear. If you are finished configuring the interface settings, either press the CNL key to return the unit to the normal operating mode, or press the MNU key to enter the Operations 1 menu.

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9.4.1.2. GPIB Interface Settings (not included)

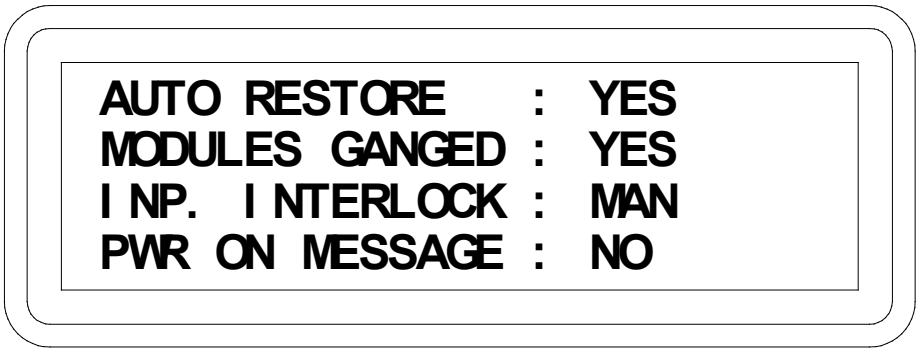
With the interface configuration menu on the display, the factory default GPIB port settings will be displayed. The factory default settings (which may be restored if RAM battery is removed for 10 seconds) are GPIB address 10 and SRQ enabled.

To edit these parameters, move the blinking cursor to the GPIB interface port to be modified then press the ENT key once. This will enable the edit mode. Using the arrow keys to move the cursor, select the parameter that you wish to change. The up and down arrows will "scroll through" the different selections available to the user for each value. When the desired parameter is displayed, move the cursor to the next parameter to be changed.

When all parameters have been configured to meet all requirements, press the STO (store) key to store the configuration in the unit's memory. The interface configuration menu will reappear. If you are finished configuring the interface settings, either press the CNL key to return the unit to the normal operating display, or press the MNU key to enter the Operations 1 menu.

9.4.2. Operations Menu 1

By pressing the MNU key twice (from the normal screen) the Operation Menu 1 will appear on the display. From this menu the items described in the following paragraphs may be changed.



306: Operations Menu 1

9.4.2.1. AutoRestore

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The AutoRestore parameter may be enabled (YES) or disabled (NO). When enabled, the unit will automatically restore the last configuration from before the unit was turned off (or power was lost to the unit). When disabled, all crosspoints are automatically cleared on power up. The factory default is to have the unit power up with AutoRestore enabled so that the unit is returned to the last known state.

To configure the unit to the AutoRestore mode, press the ENT key to enter the edit mode while in the Operation Menu 1, then use the up or down arrow to select AUTORESTORE: YES, then press the STO key to memorize this. To have the unit power in the "all clear" mode, press the ENT key once, then use the up/down arrow keys to select AUTORESTORE: NO, then press the STO key to memorize. Press the CNL key prior to the STO key to void the change, or press the CNL key after pressing the STO key to return to the normal display.

9.4.2.2. Ganged Module Control

Some systems have multiple (identical) modules installed . It may be desired to have the modules controlled in a ganged fashion to facilitate multiple levels of switching to occur with a single command. An example of this type of switching would be to have three modules switch together for RGB video applications.

If the modules are gang controlled, the user only needs to provide the input and output number (or relay and port numbers) from the front panel or via the remote control interface, and all installed modules will switch together. From the remote control port, the "slot" address will be ignored.

If the unit is not in "ganged mode", the unit will require an additional keypad entry for slot number at the front panel controls, and will be sensitive to the slot address received from the remote interface. The factory default for model 11201 is to have the unit in GANGED MODULE: YES.

To change the factory default setting, press the MNU key twice to display Operation Menu 2, then move the cursor to the GANGED MODULE line on the display. Press the ENT key to change to the edit mode. Use the up/down keys to select the desired mode (YES or NO), then press the STO key to memorize the state. Press the CNL key prior to the STO key to void the change, or press the CNL key after pressing the STO key to return to the normal display.

If the ganged mode is selected, the word" GANGED" appears in the lower right corner of the display. If the unit is not in the

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"GANGED" mode, the module number will be displayed in the lower right corner of the display.

9.4.2.3. Input Interlocking

Two different types of control are available. The Input Interlocking feature enables the user to connect a new input to an output without first disconnecting the previous input connection. With the interlocking feature in AUTO mode, the unit will automatically disconnect any input connected to the specified output port (or relay port) before making the new input connection. This saves control overhead time by eliminating an entire command (disconnect) to make a new input connection to an output. The "manual" mode forces the user to send a disconnect command for the existing crosspoint connection (port connection) prior to connecting the new input port.

To enable the Input Interlocking feature (factory default is manual interlocking), from the normal display, press the MNU key twice, move the cursor to the INP. INTERLOCK line on the display. Press the ENT key to change to the edit mode. Use the up/down keys to select the desired mode (AUTO or MAN), then press the STO key to memorize the state. Press the CNL key prior to the STO key to cancel the change, or press the CNL key after pressing the STO key to return to the normal display.

9.4.2.4. Power On Message

The unit may be set to automatically send a message via the remote interface after powering up and passing all of the self tests. This is normally used when the user is controlling the unit from a serial interface port. The factory default is to have no message sent after power up.

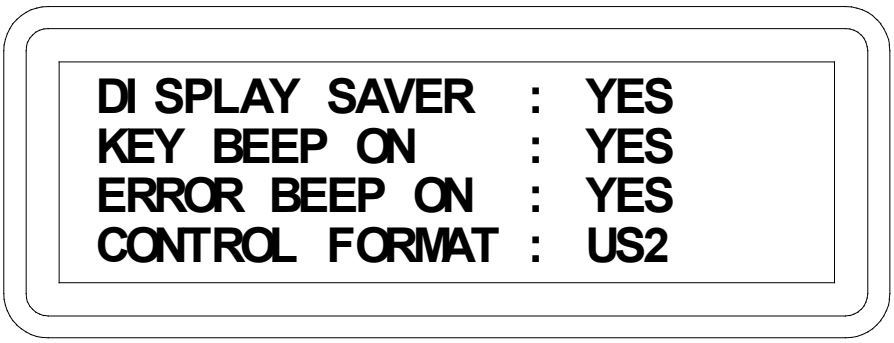
To change this setting, from the normal display, press the MNU key twice. The Operations Menu 1 will appear. Using the up/down arrow keys, move the cursor to the Power Up Message line and press the ENT key. The unit will enter the edit mode. Using the up/down arrow keys again, select the power up message protocol desired (YES or NO), then press the STO key to memorize. Press the CNL key prior to the STO key to cancel the change, or press the CNL key after pressing the STO key to return to the normal.

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When POWER ON MESSAGE: YES is selected, the unit will send the system model number and firmware version number after completing the self tests. An example is: MODEL S600A/11201, VER 4.01. Many systems contain semi-custom firmware tailored to the system configuration, so the message may be slightly different from the one shown.

9.4.3. Operations Menu 2

By pressing the MNU key three times (from the normal screen) the Operation Menu 2 will appear on the display. From this menu the items described in the following paragraphs may be changed.



307: Operations Menu 2

9.4.3.1. Display Saver

The unit incorporates a high contrast vacuum fluorescent display (VFD). To prolong the life and contrast of the display over many years, the display can be set to dim automatically when no entries have been made at the front panel controls for five minutes or more. The display will instantly go to full brightness if a key on the front panel control keypad is pressed. The factory default is to have the display saver enabled (YES).

To disable the display saver (display at full brightness), from the normal menu, press the MNU key three times, move the cursor the DISPLAY SAVER line on the display. Press the ENT key to change to the edit mode. Use the up/down keys to select the desired mode (YES or NO), then press the STO key to memorize the state. Press the CNL key prior to the STO key to cancel the change, or press the CNL key after pressing the STO key to return to the normal display.

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9.4.3.2. Keypad Beep

When the system is equipped with a front panel control keypad and display option, each time a front panel key is pressed, a short beep will sound. This may not be desirable for all applications and may be disabled. The factory default is to have the keypad beeper enabled (YES).

To disable the keypad beeper, from the normal display, press the MNU key three times, then using the up/down arrow keys, move the cursor to the KEY BEEP ON line on the display. Press the ENT key to change to the edit mode. Use the up/down keys to select the desired mode (YES or NO), then press the STO key to memorize the state. Press the CNL key prior to the STO key to cancel the change, or press the CNL key after pressing the STO key to return to the normal display.

9.4.3.3. Error Beep

The unit has an internal beeper to indicate when an error occurred. The factory default is to have the error beep enabled. This assists the user during firmware development and to alert the user of equipment failure. The unit also has a red front panel LED labeled ERR that will **always** go on during an error condition.

For certain applications, it may be desired to turn the error beeper off permanently. To do so, from the normal menu, press the MNU key three times, move the cursor the ERROR BEEPER ON line on the display. Press the ENT key to change to the edit mode. Use the up/down keys to select the desired mode (YES or NO), then press the STO key to memorize the state. Press the CNL key prior to the STO key to cancel the change, or press the CNL key after pressing the STO key to return to the normal display.

9.4.3.4. Control Protocol

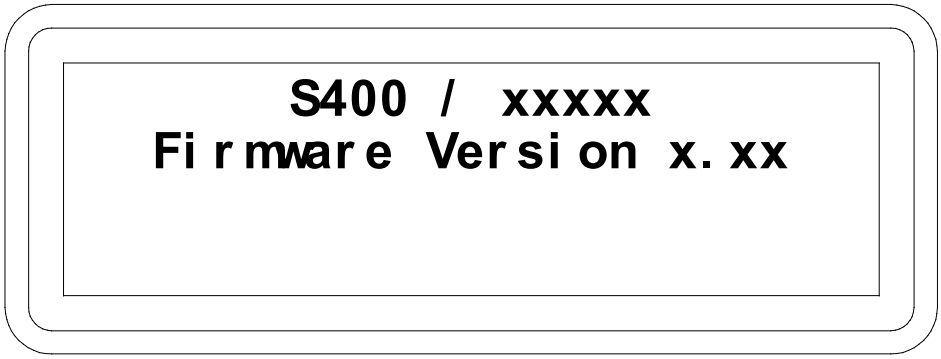
Universal Switching's firmware offers some compatibility to the control protocol of older units, and to the control codes of some other manufacturers.

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To change the control protocol from the factory default (US2), from the normal display, press the MNU key twice, then move the cursor to the PROTOCOL line on the display. Press the ENT key to change to the edit mode. Use the up/down keys to select the desired mode (US1, US2, or MSC), then press the STO key to memorize the state. Press the CNL key prior to the STO key to cancel the change, or press the CNL key after pressing the STO key to return to the normal display.

9.4.4. Firmware Version Screen

By pressing the MNU key four times (from the normal screen) the Firmware Version Screen will appear (shown below). This displays the main CPU firmware currently installed in the unit. It also displays the system model number of the unit.



308: Firmware Version Screen

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9.4.5. Control Pad Entries

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

9.4.5.1. LCL (local) Key Function

The **LCL** key will return control to the front panel manual control pad if the controls have been locked out locally or remotely (by a security code). When pressing the "LCL" key, the user will be prompted to enter the security code if the unit is locked. After entering the code, the CPU will unlock the controls.

The local key pad can also be locked to prevent unintended switch manipulation by pressing the "LCL" key and then entering a 4-digit security code. See the lockout section on page **Error! Bookmark not defined.** for more details.

9.4.5.2. CON (connect) Key

The connect (**CON**) key is used to connect an input to an output. It is used with the numerical keys to enter an input/output combination. The example below connects input 05 to output 02.

The following sequence should be observed:

- Press connect: **CON**
- Enter an input number (two digits): **0 5**
- Next, enter an output number (two more digits): **0 2**

> ***NOTE: If the Ganged control option is set to "Off", two additional digits will have to be entered to specify switch module.***

- Both the input and output entries may be edited by using the arrow keys (up, down, left, or right) to select to the entry needing change. Once to the proper location, key in the desired number. To execute the command press the **ENT** key, or you may press the cancel **CNL** key to abort the command at any time.

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After pressing the enter key, the System verifies that the input, output and module number (if applicable) represents a valid entry. If not, the System will alert you by displaying an error code and sounding the beeper. Other possible errors include attempting to connect an output to an already connected input or a switch malfunction.

The System now connects the input and output combination you specified and confirms the closure by verifying with each of the matrix levels (RGB) that the command was received and confirmed. An OK is displayed if no errors were detected.

If an error occurred while making the connection, the beeper will come on momentarily and an error message, E01xx, will be displayed in place of the "OK".

9.4.5.3. DIS (disconnect) Key

The disconnect (**DIS**) key is used to disconnect (open) an input/output combination previously connected. To operate, follow this sequence:

- Press disconnect (**DIS**)
- Enter the input number followed by the output number (and possibly a module number).
- Both input and output entries may be edited by using the arrow keys (up, down, left, or right) to select the entry to be edited. To execute the command press the **ENT** key, or you may press the cancel (**CNL**) key to abort the command at any time.

After pressing the enter key, the System verifies that the input/output combination was a valid entry.

The System then disconnects the input/output combination you specified and confirms it by verifying with each of the enabled matrix levels that the command was received and confirmed. An OK is displayed.



NOTE: It is not considered an error to reconnect an already connected input/output combination or to disconnect an already disconnected output.

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9.4.5.4. VFY (verify) Key

The verify (**VFY**) key may be used to verify the connection of a path through the matrix array without changing it's status.

To use the verify function, enter the input and output combination and press the enter key. If the combination is connected, the unit will display OK in the status field. If the combination is not connected, the error code ERR01 will be given indicating that the pair is not connected.

9.4.5.5. STO and REC (store and recall) Switching Configurations Key

The System can store and recall up to 99 different configurations from the CPU's battery backed RAM (up to 199 configurations locally or if the Standard control command format is enabled, "**USI**"). This is very useful when changing between configurations rapidly. When a configuration is stored, the entire switching array configuration is saved into the storage memory location.

> ***NOTE: Any stored configurations will be lost if the main CPU's lithium battery jumper is removed, or if the battery life has been exceeded.***

Storing a switching configuration is accomplished by the following key stroke sequence:

- Press the store (**STO**) key
- Enter the storage memory location (001 to 199) using the numerical keys. The arrow keys may be used to edit the number prior to the next step.
- Press the enter (**ENT**) key to store the configuration.

> ***NOTE: When a configuration is stored in a location, it automatically overwrites any previously stored configuration in that memory location.***

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The operation will be confirmed with an OK in the status field of the display. The storage location 000 is reserved by the System to store the current configuration should power be lost to the unit. Upon powering the unit, the System will reconfigure to the last matrix setting if the AutoRestore feature is enabled in the setup menu.

To recall a configuration, press the recall (**REC**) key and enter the memory location to be recalled (001 to 199). Press the **ENT** key to execute.

> ***NOTE: When a configuration is recalled, the unit first clears the entire matrix array, then restores the desired configuration (break before make).***

The STO key is also used to enter setup parameters into memory for the remote interface and operations menus. See section 9.4.

9.4.5.6. CLR (clear) Key

To clear the entire matrix configuration, the clear (**CLR**) key may be used. This will disconnect all previously connected input/output connections through the matrix array. To clear the matrix, press the **CLR** key once, then press the ENTER key to confirm.

If the clear key was pressed by accident, you may press the cancel key (**CNL**) to abort the function**.**

> ***NOTE: Once you have cleared the matrix, the previous configuration is lost unless you stored it in a memory location.***

9.4.5.7. CNL (cancel) Key

The cancel (**CNL**) key may be used any time to abort a menu selection on the manual control pad.

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10. System 11201 Specifications

• Configuration	Single level 8in x 8 out array
• I/O configuration	HOTLink Compatible
• Impedance	75 Ohms
• Signal connectors	TRIAX BJ-77 Female
• Switching technology	Solid-state ECL
• Signal coupling	Transformer
• AC power	90-264VAC <75 Watts 47-440Hz
• Power cord	NEMA 15A (USA), 6 foot long (detachable)
• Control Types	RS-232C and RS-422A Front panel illuminated keypad
• Control connector	DB-25S type
• Operation temp range	0 to +60C
• Storage temp range	-20C to +75C
• Physical size	19.00" W x 14.50" D x 3.72" H
• Weight	<21.5lbs

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