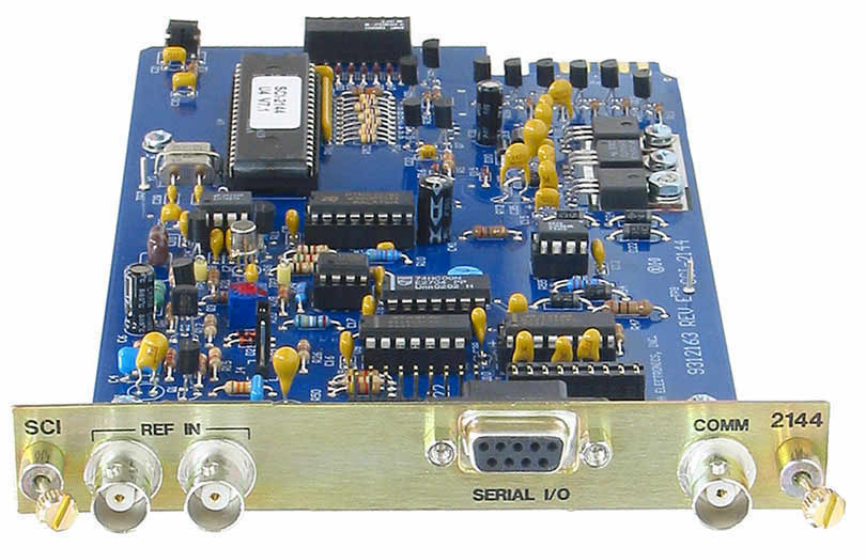
SCI-2144

SYSTEM CONTROL INTERFACE MODULE

OPERATOR'S MANUAL



SIGMA ELECTRONICS, INC.
P.O. Box 448
1027 COMMERCIAL AVENUE
EAST PETERSBURG, PA 17520
(717) 569-2681

SCI-2144

CONTENTS **PAGE**

INTRODUCTION

The SCI serial control interface card is the heart of any Sigma Series router. It functions as the controller between the user and the router crosspoints. A routing switch can be generated one of two ways:

1) remote control panels
2) serial port.

The rear of the SCI has a BNC labeled "COMM". This is the coaxial communication port that provides a control path to all remote control panels in the system. The panels are systematically polled to see if there are any transactions requested. When the poll detects an awaiting transaction it is transmitted to the SCI via the coax cable. The instruction is then executed. An update of the transaction is then transmitted to all system panels.

The second method of control is through the 9-pin sub-D connector serial port. The SCI can support either RS-232 or RS-422 communication standards. An internal jumper on either JP1 or JP2 determines which standard is selected. Communication protocol is simple and straightforward ASCII instructions. The “interrupt driven” communications link will respond immediately whenever a command is issued from an external serial device. When the command is received, it is interpreted and executed. Unless told otherwise, the SCI will issue a response of "OK" to the sending device upon completion of each transaction or send a "?" if the command was invalid.

The SCI is capable of generating a vertical interval switch. This is accomplished by applying a reference signal to one of the loop-through "REF IN" BNCs and terminating the other. This signal can be either a composite video signal or a composite sync pulse. The SCI is set at the factory to receive a blackburst or composite video level reference signal (1 Vp-p). When a composite sync pulse signal is supplied as a reference (4 Vp-p), Jumper J4 must be configured accordingly. Refer to section on Jumper Selection. The SCI will use this reference to determine when the vertical interval occurs and generate the switch during that time. The SCI-2144 can handle both NTSC and PAL reference signals. If no signal is present on the "REF IN", the SCI will execute the switch as soon as it interprets the command.

Serial port transmission parameters in the SCI-2144 are fixed at the following settings:

Character bits	8
Parity	No
Stop bit	1

The baud rate is user adjustable by configuration of the internal switch, S1. This switch is located on the front of the SCI card. It is an eight position DIP switch. The first two positions determine the baud rate for the serial port. The next three are used to define RS-232/RS-422 function and, in the event RS-422 is selected, the switch sets the logical device address. The last three switches define the matrix size of the system.

Located next to the eight position DIP switch is a reset button, switch S2. Pressing this button at anytime will cause the SCI to reset itself, clear all previously stored data, and default all levels of all outputs to input 1.

SCI 2144 - RS232 PROTOCOL

Commands can be issued from any device capable of transmitting standard ASCII letters and numbers. The SCI is not case sensitive, and therefore does not care whether you use capital letters or lower case letters.

The input/output configuration of the switcher can be obtained by sending the following ASCII sequence:

? {CARRIAGE RETURN}

The response will be:

Available outputs are: 1-16
Available inputs are: 1-16

The matrix size is selected by S1, 6, 7 and 8 (see chart on Matrix Size Selection). Sigma Electronics will properly configure these switches when the SCI is part of a system.

The ASCII protocol for making a "follow" mode switch is:

IxxOxx {CARRIAGE RETURN}

The **'I'** represents INPUT and the **'O'** OUTPUT. The **'xx'** represents the one or two digit number of the respective INPUT and OUTPUT. The leading zero is optional. Valid INPUT numbers for the SCI are **01-16**. Valid OUTPUT numbers are **01-16**. To generate the TAKE, press the RETURN/ENTER key on the keyboard. When the SCI receives the request and executes the change, it will respond with an ASCII message **'OK'** (unless disabled - see "N/Y" command explanation).

The ASCII protocol for making a BREAKAWAY is:

AxxOxx {CARRIAGE RETURN}

The **'A'** could actually be **A**, **B**, **C** or **D**. These four letters represent the four input levels 1-4 respectively. So an **"A"** would correspond to **Level 1** and a **"D"** would represent **Level 4**. Again, the **'O'** is the OUTPUT. In this case only the requested input Level will change.

The ASCII protocol for making a SPLIT is:

BxxCxxOxx OR CxxDxxAxxOxx {CARRIAGE RETURN}

In this example, the inputs for multiple levels are assigned different numbers, but all will go to the same OUTPUT. Again, it is not necessary to supply the leading zero in assigning numbers. **B07C03O04** or **B7C3O4** will both work.

Order and number of levels does not matter. Any combination of levels in any order is valid. For example, **D09B12A2C4O3** is a valid sequence. Only the output MUST come last.

The STATUS of any OUTPUT can be obtained by entering the following protocol sequence:

Sxx {CARRIAGE RETURN}

The **'S'** represents STATUS and the **'xx'** represents the one or two digit ASCII number of the OUTPUT. As before, the leading zero is optional. Press the RETURN/ENTER key to generate execution. The SCI will respond with the following ASCII message:

OUTPUT xx LEVEL 1 xx LEVEL 2 xx LEVEL 3 xx LEVEL 4 xx

This will all print on one line on the video screen. The **'xx'** indicates the two digit ASCII number for both the LEVELs and the OUTPUT. In a STATUS request, the SCI will generate a leading zero for all numbers less than ten.

A GLOBAL STATUS can also be generated. This will give the STATUS for all the active OUTPUTS. By default, those OUTPUTS not yet addressed will be indicated as having INPUT 01 selected. The protocol sequence for a GLOBAL STATUS is:

SA {CARRIAGE RETURN}

The **'S'** represents STATUS and the **'A'** represents "all" outputs. As always, press the RETURN/ENTER key to execute the command. The SCI will respond with the following:

L1 L2 L3 L4 OUT
xx xx xx xx xx
.
.
xx xx xx xx xx

There will be 4 columns like this across the screen, and current INPUT STATUS for all levels of each OUTPUT will be listed. The number of outputs displayed will be 16 since the SCI is capable of a 16x16 system.

Anytime an invalid or incomplete message is sent to the SCI, it will respond with an ASCII **'?'** (unless disabled, see "N/Y" command). This will occur for each group of invalid characters it receives. The RETURN/ENTER key is the delimiter between commands. Therefore, invalid characters will not cause a **'?'** response until the RETURN/ENTER key has been sent.

Responses generated by the SCI can be disabled by pressing a single key. The command is:

N

This will prevent all SCI responses. No carriage return is required. At any time, the responses can be resumed. The command is:

Y

Again, no carriage return is needed. Please note this process differs from the **XON/XOFF** routine. In that case, the responses are held in a buffer and then all pending messages are sent upon receiving the **XON** command. In this case, the messages are simply discarded and no record of them is kept. In this way, it is possible to tailor a program to allow only a status response but inhibit all other SCI messages.

Any time a wrong key is accidentally pressed or a command needs to be changed, the current command can be cancelled by pressing the SPACEBAR. This is always true as long as the RETURN/ENTER key has not yet been pressed. All keys pressed since the last entry of the RETURN/ENTER key will be erased. The CANCEL command is automatic and does not require the RETURN/ENTER key to be pressed. The format is:

{SPACEBAR}

The SCI will respond by sending a carriage return and linefeed to move the cursor on the screen to the beginning of the next line.

The SCI always gives priority to commands over responses. Therefore, it is possible for a perceptible delay in getting a response, especially during a SALVO. All commands are executed first before beginning any responses. This process assures the fastest handling of a change request.

There are two ways to reset the SCI via the serial port. The first is a warm reboot and is activated by sending a **CTRL-W** to the serial port. This will force the internal watchdog timer to restart the system as though a power-on had occurred. The second method is the cold reboot and this is activated by sending **CTRL-C**. This command has the same effect as pressing the reset button on the front of the SCI card. All outputs are reassigned to input 1, all previously stored data is cleared and the system will then reboot as though a power-on condition had occurred.

As of version 5 software (see the sticker attached to the CPU on the interface card for the version number, given as 'V#.#') three additional commands have been implemented. It is now possible to disable the remote control panels and give exclusive attention to the serial port for improved response time to incoming serial commands. To halt the panel scans press:

H {CARRIAGE RETURN}

The response is "**Panels Inactive**." This will cause the polling and updating of any remote panels to stop. This command is especially useful in systems where control panels are not being used. Also, this command can be used to temporarily disable the panel scan, execute time critical serial transactions, then re-enable the panel scan. To re-enable the panel scan routines press:

G {CARRIAGE RETURN}

The response is "**Panels Active**." Now the SCI is fully functional again and the panels will be updated and polled as before. Careful tailoring of programming will allow maximum efficiency in executing serial commands in those applications where execution time is especially critical.

The current panel status can be determined by pressing:

P {CARRIAGE RETURN}

This will yield the response of **Panels Active** or **Panels Inactive** depending on the current state.

SCI 2188 COMPATIBILITY

Beginning with version 7.0, the SCI-2144 supports backward compatibility with the SCI-2188's breakaway protocol. In the 2188, an **'A'** was used for audio breakaway and a **'V'** for video breakaway. To use software written for the 2188's protocol, set the audio module for level 1 and the video module for level 2. The audio module will respond to the level 1 **'A'** command while the video module will respond to the level 2 **'V'** command, which functions exactly as the **'B'** level 2 command.

SCI 2144 - RS422 CONTROL

Unlike RS232, RS422 allows for multiple devices to be connected to a computer/terminal at the same time. In order for the computer/terminal to communicate with a device in RS422, it must first tell the device to listen. This is the purpose of the logic address. The SCI has three DIP switches reserved for setting the device's logic address. Valid addresses for the SCI are 01-07 (an address of 00 indicates that RS-232 is being used).

The format for protocols is identical to that of RS232 with one exception. Any instruction (including **XON/XOFF**) must be preceded by the following:

/xx

The slash is the precursor, and the **'xx'** is the logic address of the device. This is **ALWAYS** a TWO DIGIT NUMBER.

By way of example, to generate a switch, the sequence would be as follows:

/xxIxxOxx {RETURN/ENTER}

where the first **'xx'** is the SCI's logic address (two digits), the second **'xx'** is the one or two digit INPUT number and the third **'xx'** is the one or two digit OUTPUT number.

The SCI supports the **XON/XOFF** protocol. This is a method, through software, of halting and resuming transmission of data. The **XOFF** is activated by holding the Control key and pressing **'S' (CTRL-S)**. This will halt data transmission. **XON** is activated by holding the Control key and pressing **'Q' (CTRL-Q)**. This will resume transmission. Incoming commands are still executed during an **XOFF**. It is the responses generated by the SCI that are not sent. They are held in a message buffer until an **XON** is received. At that time all pending responses are sent out the serial port in the same sequence in which they were received.

Like the CANCEL command, **XON** and **XOFF** are automatic and do not require the RETURN/ENTER key to be pressed.

SALVOS

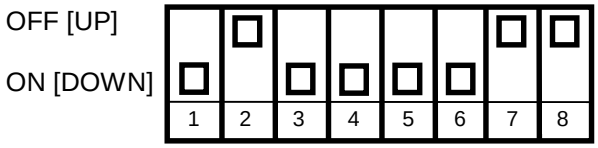
It is possible to create a SALVO and transmit multiple commands very quickly. This is accomplished by first sending the **SALVO HOLD {CTRL-T}** command. Once this is done, the transmit buffer can be loaded by typing in all the commands that make up the salvo, being certain to separate each with the RETURN/ENTER key. At the appropriate moment, the SALVO can be executed by issuing the **SALVO RELEASE {CTRL-R}** command. The buffer size is 255 characters. If it is exceeded, the buffer input would wrap around and begin rewriting data that was entered at the beginning.

The SCI always gives priority to commands over responses. It is possible for there to be a perceptible delay, especially between releasing the SALVO sequence **{CTRL-R}** and receiving responses. All commands are executed first before beginning any responses. This process assures the fastest handling of a change request.

SCI INTERFACE SELECTOR SWITCH [S1]

BAUD RATE SELECT [S1,1-S1,2]

S1,1	S1,2	BAUD RATE
ON	ON	4800
OFF	ON	9600
ON	OFF	19200
OFF	OFF	38400



S1 CONFIGURATION

232/422 LOGIC ADDRESS SELECT [S1,3-S1,5]

S1,3	S1,4	S1,5	Logic Address
ON	ON	ON	RS-232*
OFF	ON	ON	01
ON	OFF	ON	02
OFF	OFF	ON	03
ON	ON	OFF	04
OFF	ON	OFF	05
ON	OFF	OFF	06
OFF	OFF	OFF	07

* Use address 00 for RS-232. All other settings are for RS-422 operation.

MATRIX SIZE SELECTION [S1,6-S1,8]

S1,6	S1,7	S1,8	Matrix Size
ON	ON	ON	4 Inputs x 4 Outputs
OFF	ON	ON	8 Inputs x 4 Outputs
ON	OFF	ON	16 Inputs x 4 Outputs
OFF	OFF	ON	8 Inputs x 8 Outputs
ON	ON	OFF	8 Inputs x 16 Outputs
OFF	ON	OFF	16 Inputs x 8 Outputs
ON	OFF	OFF	16 Inputs x 16 Outputs
OFF	OFF	OFF	*** Reserved ***

* Reserved setting will function as a 16 x 16 matrix system.

SCI RESET BUTTON - SWITCH [S2]

Switch S2, momentary pushbutton, is located on the front of the SCI-2144. The purpose of S2 is to reset the SCI. It will cause all stored data to be cleared, and defaults all Levels of all Outputs to Input 1.

SCI-2144 JUMPER SELECTION

SERIAL PORT COMMUNICATION FORMAT

RS-232 SELECTION JP2, 9 position jumpers with header attached, factory default.

RS-422 SELECTION JP1, 9 position jumper, move header to this position for RS-422.

REFERENCE INPUT LEVEL SELECTION

COMPOSITE VIDEO SIGNAL J4: Jumper positions 2 and 3 for 1VP-P reference signal.

COMPOSITE SYNC. PULSE J4: Jumper positions 1 and 2 for 2VP-P to 4VP-P signals.

SCI-2144 9 PIN 'D' RS-422 WIRING

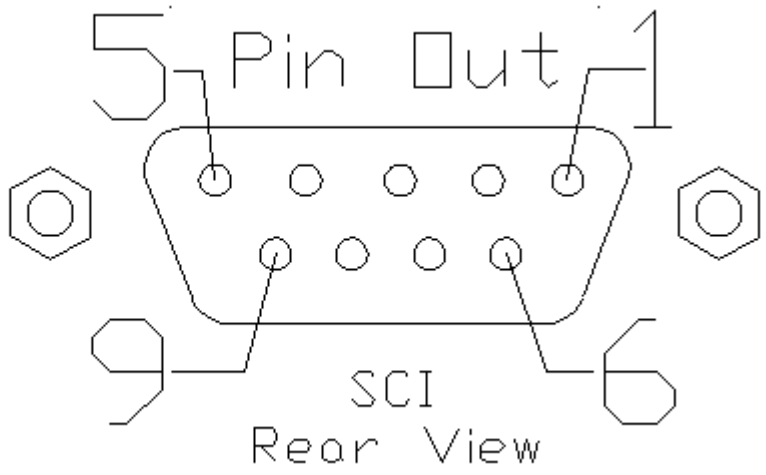
PIN #	FUNCTION*	DIRECTION
1	Ground	----
2	Transmit A	Output (Tx Data -)
3	Receive B	Input (Rx Data +)
4	Receive Common	----
5	N/C	----
6	Transmit Common	----
7	Transmit B	Output (Tx Data +)
8	Receive A	Input (Rx Data -)
9	Frame Ground	----

*(Same as standard: ANSI/SMPTE 207M/1984)

SCI-2144 9 PIN 'D' RS-232 PIN ASSIGNMENT

PIN #	FUNCTION*	DIRECTION
1	N/C	----
2	RECEIVE DATA	INPUT
3	TRANSMIT DATA	OUTPUT
4	DATA TERMINAL READY	OUTPUT----
5	SIGNAL GROUND	N/A
6	DATA SET READY	INPUT
7	READY TO SEND	OUTPUT
8	CLEAR TO SEND	INPUT
9	N/C	----

The Pin assignments noted are per the RS-232 standard. Although the standard defines the use of twenty five (25) Pins, only nine (9) are required for basic PC serial communications. Of those nine pins, only seven are required for communication to the SCI when hand shaking is active. Consult the control device manufacturer's data sheet to determine proper wiring.



RS-232C WIRING EXAMPLE

SCI-2144 Pin Assignment	SCI-2144 Signal Designation		**Control Device (DTE)**	Control Device (DCE)
Pin 1	N/C		N/C	N/C
Pin 2	Receive Data (RXD)		**TXD** **typically Pin 3**	RXD typically Pin 2
Pin 3	Transmit Data (TXD)		**RXD** **typically Pin 2**	TXD typically Pin 3
Pin 4	Data Terminal Ready (DTR)		CTS Pin 8	CTS Pin 8
Pin 5	Signal Ground		**Ground** **typically Pin 5 or 7**	Ground typically Pin 5 or 7
Pin 6	Data Set Ready (DSR)		Ready To Send	Ready To Send
Pin 7	Ready To Send (RTS)		Data Set Ready	Data Set Ready
Pin 8	Clear To Send		Data Terminal Ready	Data Terminal Ready
Pin 9	N/C		N/C	N/C

Although the RS-232C standard defines the use of 25 pins, only nine of those are needed for basic PC serial communications. Of those nine, only three are required for serial communications with the SCI-2144 (seven pins required if handshaking is used). The above wiring chart is typical for most IBM and compatible PC's as well as third party control interfaces. However, it is always best to check with the manufacturer's wiring specifications to determine exact pin assignments before beginning. This is especially true if using COMM 1, since some manufacturers use a 9 pin 'D' connector instead of a 25 pin 'D'. Regardless of the connector, the signal connections are the same. RXD and TXD are reversed depending upon whether the serial port is configured as a DTE (data terminal equipment) or a DCE (data communications equipment).

If the control equipment requires handshaking, there are four additional wire paths. See the chart above to properly configure the handshaking connections.

There is no need to jumper the handshaking pins on the SCI-2144 when handshaking is not required. Only 3 pins will be used: TXD, RXD and Signal Ground. All other pins will have no connection.