Model SC15

Serial Controller

INSTRUCTION MANUAL

March 5, 2001

CONTENTS

FIGURES

Serial Controller, Cable Interfaces

SC15 controls and monitors the signal conditioning chassis SC15 - SC17

Features

SC15 Serial Controller:

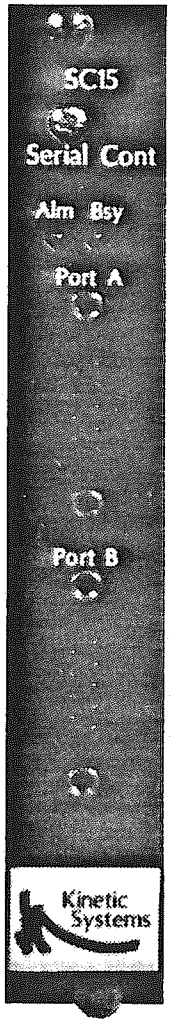
- **RS-232 interface for control and monitoring modules in the V710 active termination panel**
- **Pass-through capability for multiple V710 chassis**
- **Logical address supports up to 256 SC15 controllers**
- **Supports serial data rates from 50 baud to 38,400 baud**
- **Includes a straightforward set of nine ASCII commands**
- **SC15-AB11 includes a calibrator and reference for the SC21 bridge signal conditioner**

SC16 Cable Interface:

- **Includes two 50-contact high-density connectors**
- **Pinout matches V200 channel input paths**

SC17 Cable Interface:

- **Includes one 68-contact high-density connector**
- **Pinout matches V213 Channel input paths**



SC15 shown full size

General Description *(Product specifications and descriptions subject to change without notice.)*

The **SC15** is a serial controller for the V710. It is packaged in a 3U (5.25") high, 220 mm (8.7") deep, module. It controls and monitors the signal conditioning plug-in cards in the V710 termination panel chassis. A standard RS-232 serial port is connected to the Port A connector on the SC15. If a system contains multiple V710 panels, Port B on the first SC15 is connected to Port A on the second SC15. This is repeated for all remaining SC15s. Each SC15 can be set to one of 256 logical addresses and serial data rates from 50 to 38,400 baud. The address and the baud rate are set by switches on each SC15. The command set includes nine ASCII commands. These commands include a global reset and eight additional commands that are addressed to individual signal conditioning modules. The signal conditioning modules can be set to provide ASCII asynchronous event notification messages (such as a SC20 indicating that an excitation alarm is present, for example). Port A and Port B utilize DE9P connectors.

The **SC16** is a connector adapter that contains two 50S high-density connectors, for use with the V200 200,000 sample/s Sigma-delta ADC. The pinout on these connectors matches that on the V200. The **SC17** is a connector adapter that contains one 68S high-density connectors, for use with the V213 32-channel ADC. The pinout on this connector matches that on the V213. The SC16 or the SC17 card is affixed on the rear of the V710, depending upon the host ADC to be used with the signal conditioning modules.

Ordering Information

Model SC15-AA11	Serial Controller
Model SC15-AB11	Serial Controller with Calibrator and Internal Reference
Model SC16-AA11	Connector Adapter, Two 50S High Density Connectors (SC20/V200)
Model SC17-AA11	Connector Adapter, One 68S High Density Connector (SC20/V213)
Model SC17-AA21	Connector Adapter, One 68S High Density Connector with Calibration Connector (SC21/V213)

Related Products

Model 5930-Z1A	Connector - DE9S - 9 Contact, Sockets (1 or 2 per SC15)
Model 5911-Z1A	Connector - 2-contact plug-type LEMO (for the SC17-AA21)

990420

General Description

The SC15 is a Serial Controller for the V710-ZA11 Signal Conditioner chassis. This SC15 is responsible for managing communications between a host serial interface and the V710 chassis. The SC15 receives commands from a host serial interface. These commands are used to setup and monitor various features of the Signal Conditioning cards installed in the V710 backplane.

The SC15 contains two front-panel-mounted connectors. Both of these connectors are 9-pin socket connections. The Port A serial connector is used to receive commands and send replies to a host serial interface. The Port B connection is used to transfer data to/from additional SC15s. Each SC15 is configured with a Logical Address, which uniquely identifies the SC15 on the serial chain. The 8-bit Logical Address of the SC15 allows up to 256 SC15s to be controlled by one host serial interface. When a SC15 receives a command string on Port A, it checks the Logical Address contained in the command to determine if it is the target for the transaction. If the Logical Address of the message matches the address in the command, the SC15 executes the command. If no Logical Address match occurs, the command string is retransmitted onto Port B.

The SC15 does not implement hardware handshaking or XON/XOFF protocol. FIFO buffering on the Serial Port Controller allows for buffering of command/reply strings. Baud rates of 50, 110, 134.5, 200, 300, 600, 1050, 1200, 2400, 4800, 7200, 9600 and 38.4K are supported. The serial port is configured for 8 bits per character and no parity.

The SC15 is capable of generating an asynchronous command string back to the host serial adapter whenever a Signal Conditioner module needs attention. This message contains the Logical Address of the SC15 generating the message along with two 8-bit fields reflecting the signal conditioner within the chassis requesting service.

An option of the SC15 is available that has an internal programmable calibrator. The output of this calibrator is bussed via the backplane on the V710 Active Termination Panel to each Signal Conditioner module slot. This provides a means of performing end-to-end channel calibration in software by configuring the input multiplexer on the Signal Conditioner module to receive the calibration reference voltage from the SC15.

Front Panel

The following diagram shows the front panel layout of the SC15.

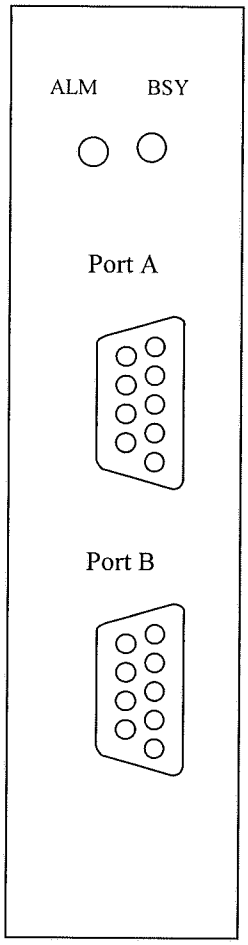


Figure 1 - SC15 Front Panel Layout

The BUSY (BSY) LED is illuminated when the SC15 receives a serial command that causes the SC15 to execute an operation within the chassis.

The ALM (ALARM) LED is illuminated when a Signal Conditioning module is requesting service. The LED remains lit until the alarm condition is cleared.

The PORT A connector is a 9 position 'D' pin connector which connects the SC15 to the host serial interface.

The PORT B connector is a 9 position 'D' pin connector that is used to connect multiple SC15s to a single host serial interface. The PORT B connector of the first SC15 is connected to the PORT A connector of the second SC15. The PORT B connector of the second SC15 is connected to the PORT A connector of the third SC15, and so on until the last SC15 has been connected.

Switch and Strap Configurations

The SC15 contains various straps and switches that allow the SC15 to be configured to the users' operating requirements. The SC15 contains a strap selection bank for Port A and one for Port B. These strap selections allow the serial port connector pinout to be configured. There are two switches located on the SC15, one for setting the Logical Address of the SC15 and the other for selecting the serial baud rate.

Serial Connector Straps

The SC15 contains strap selections to configure which connector pins are used for transmission and reception of serial data. The SC15 is factory configured to transmit RS232 data on pin 3 and receive RS232 data on pin 2. The strap selections allow this pin configuration to be changed. The following diagram shows the two sets of straps and their location on the board.

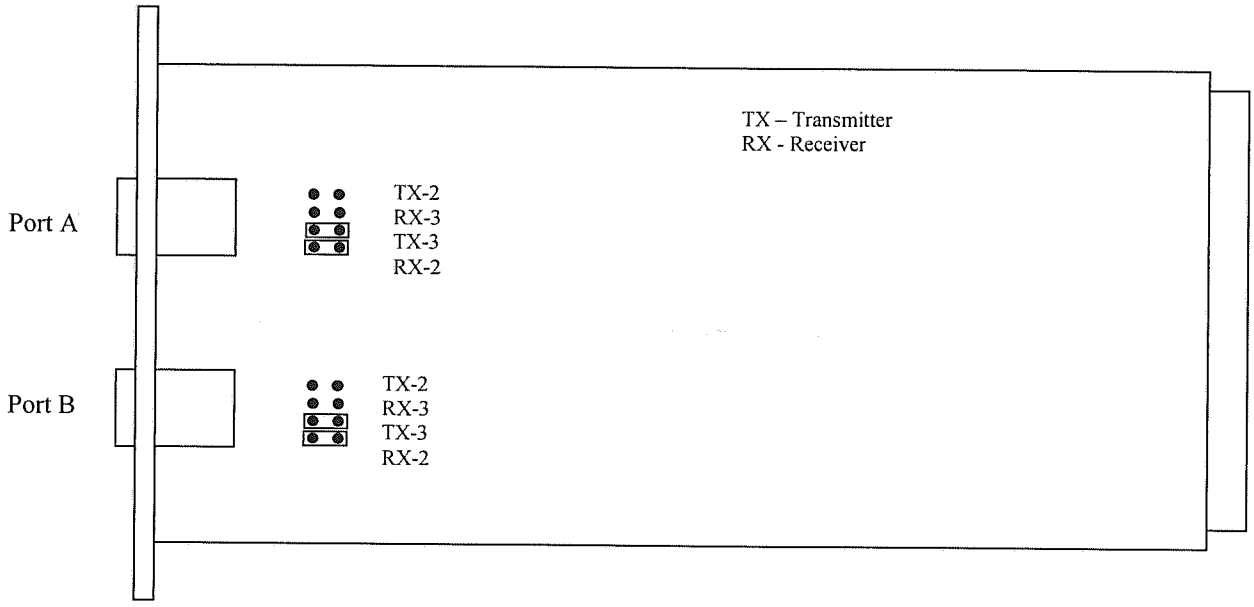


Figure 2 - SC15 TX & RX Strap Locations

When making a selection for the straps, make sure that only one strap is installed for a particular pin number.

To configure the SC15 for Transmit Data on pin 3 and for Receive Data on pin 2, place one strap in the **TX-3** position and the other strap in the **RX-2** position. To configure the SC15 for Transmit Data on pin 2 and for Receive Data on pin 3, place one strap in the **TX-2** position and the other strap in the **RX-3** position.

Logical Address Switch

Multiple SC15 controllers may be controlled by one host serial port. The SC15 that connects to the host serial port is through Port A. This port receives commands from the host computer and processes the commands. The commands received from the host serial port contain a logical address field that represents the Logical Address of the SC15 at which the command is directed. The first SC15 receives the command and compares the logical address field with its switch setting. If the two addresses match, the addressed SC15 interprets the command and performs the operation. If the addresses do not match, the SC15 passes the command to downstream SC15s for processing.

The 8-bit Logical Address switch allows for up to 256 SC15s to be driven by one host serial port. The Logical Address is set by an 8 position DIP switch located on the SC15. This switch is labeled on the card as SW2. The following diagram shows the location of the DIP switch on the board.

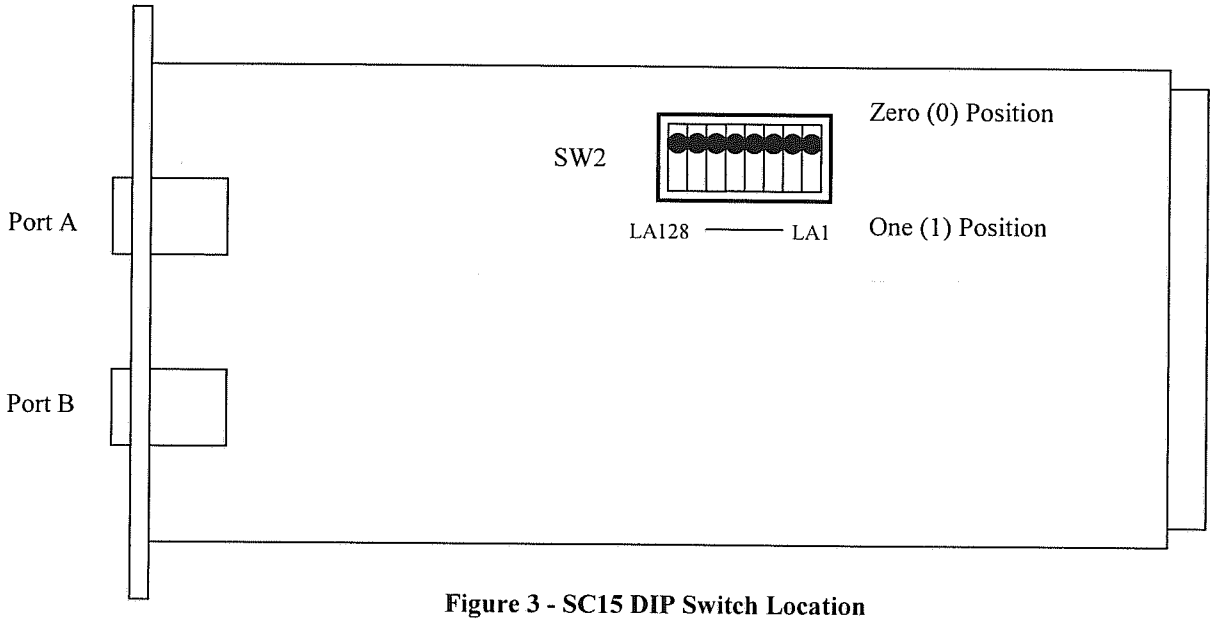


Figure 3 - SC15 DIP Switch Location

The switch bit positions are increasing in magnitude starting from the right and moving to the left. The rightmost switch is for LA1 and the leftmost switch is for LA128. The solid dot on the switch indicates which side of the switch is depressed. In the preceding diagram the switch is configured for Logical Address 0 (zero). All the top sections of the switch are depressed. To select a one for the Logical Address at a particular bit position, depress the bottom side of the switch towards the 'One Position' indication. To select a zero for the Logical Address at a particular bit position, depress the top of the switch towards the 'Zero Position' indication. The following diagrams show several examples of other Logical Address selections.

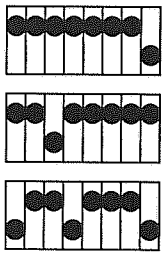


Figure 4 - SC15 Logical Address

Serial Port Communication Parameter Switch

A 6-position switch is located on the SC15 for configuring the serial port baud rate. Of the six positions on the DIP switch, only four of them are used. The remaining two switch positions are reserved for future expansion. The following chart shows the various baud rate settings and the binary patterns that select the rates.

BR3	BR2	BR1	BR0	Baud Rate
0	0	0	0	50
0	0	0	1	110
0	0	1	0	134.5
0	0	1	1	200
0	1	0	0	300
0	1	0	1	600
0	1	1	0	1200
0	1	1	1	1050
1	0	0	0	2400
1	0	0	1	4800
1	0	1	0	7200
1	0	1	1	9600
1	1	0	0	38400
1	1	0	1	Reserved
1	1	1	0	Reserved
1	1	1	1	Reserved

The serial transmitter and serial receiver operate at the same baud rate as selected by the switches. The following diagram shows the location of the Serial Port Communication Parameter switch.

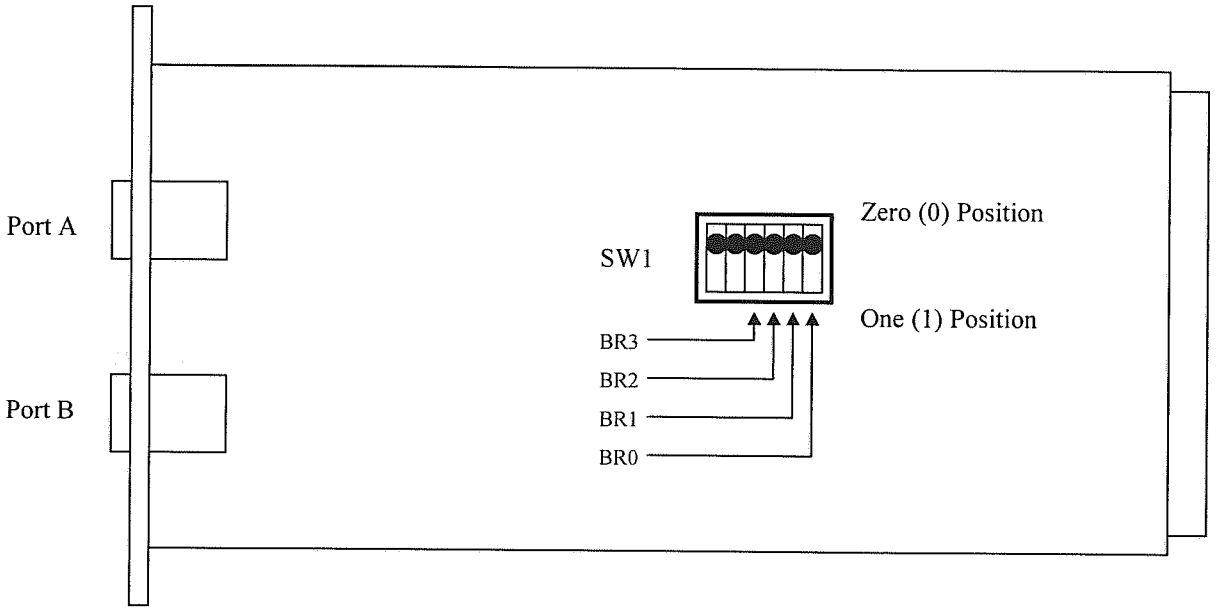
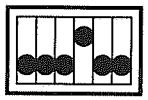
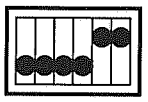


Figure 5 - SC15 Serial Port Communication Parameter Switch Location

The following are example settings yielding the indicated serial baud rates.



Baud Rate = 9600



Baud Rate = 38400

Figure 6 - SC15 Serial Baud Rate Settings

The SC15 does not implement hardware handshaking or XON/XOFF protocol. FIFO buffering on the Serial Port Controller allows for buffering of command/reply strings. Baud rates of 50, 110, 134.5, 200, 300, 600, 1050, 1200, 2400, 4800, 7200, 9600 and 38.4K are supported. The serial port is configured for 8 bits per character and no parity.

Serial Controller Commands

The SC15 Serial Controller can respond to eight commands (ten commands for the SC15-AB11 option with internal calibrator). These commands are used to setup various functions within a signal conditioner card and monitor its status. There are also several utility commands to reset each chassis and return firmware revision levels. The following sections describe each command in detail. Please note that each command and reply sequence is terminated with a carriage return and line feed, as denoted by <CRLF>. Any command that does not require data to be returned is followed by a reply message from the SC15. This reply message for these commands is $OK<CRLF>. If a command sequence is sent to the SC15 and it is not capable of executing the command, a reply of $ILL<CRLF> is returned. Please refer to the individual command descriptions for further information.

Global Reset Command

The Global Reset Command is a 4-character string that informs all SC15s in the serial chain to perform a reset inside each chassis. Since this command is global, no Logical Address is required and no reply is expected. The following is the format of the Global Reset Command.

$Z<CRLF>

Addressed Reset Command

The Addressed Reset command is a 6-character string that instructs the addressed SC15 module to perform a reset inside the chassis. Since this is an addressed command, a reply sequence is received from the addressed SC15. The following is the format of the Addressed Reset Command.

$Xxx<CRLF>

xx represents two hexadecimal digits specifying the Logical Address of the SC15

If the command is successful, a reply sequence is generated by the addressed SC15. The reply has the following format.

$OK<CRLF>

For example, to execute an Addressed Reset command to Logical Address 200 (C8 hex), the following character string is sent to the SC15:

$XC8<CRLF>

The addressed SC15 responds to the command with the sequence:

$OK<CRLF>

Query Revision Level Command

The SC15 includes the Query Revision Level command to verify the revision level of the firmware on the SC15. This 6-character command can be helpful in diagnosing problems related to firmware upgrades. The format of the command is as follows:

$Vxx<CRLF>

xx represents two hexadecimal digits specifying the Logical Address of the SC15

After the SC15 processes this command, it returns a string that reflects the firmware revision level of the PROM on the SC15. The reply has the following format:

$Vdd<CRLF>

dd represents two hexadecimal digits indicating the firmware revision level

Write Command

The Write command is used to send a byte of data to an addressable 8-bit register located on a signal-conditioning card. Each execution of this command moves 8 data bits. The data is represented as two hexadecimal digits in the command string. The following is the format of the Write command:

$Wxxyyzzdd<CRLF>

xx represents two hexadecimal digits specifying the Logical Address of the SC15.
yy represents two hexadecimal digits specifying the slot number to be accessed.
zz represents two hexadecimal digits specifying the address within the slot to be accessed.
dd represents two hexadecimal digits specifying the data to be written to the address.

The Slot Number specifies which slot in the addressed chassis is to be accessed. This number can range from 1 through 16 to address individual modules. A Slot Number specification of 17 is a pseudo slot address, which enables the Broadcast Write operation. When this slot number is specified, the write operation is executed to all signal conditioner modules in the chassis. This can be very efficient when setting up multiple signal conditioner cards with the same data. Note that this broadcast operation only works with the Write command.

After the SC15 processes and executes the Write command, the following reply string is generated:

$OK<CRLF>

For example, to execute a Write command to Logical Address 129 (81 hex), Slot 2, Address 6 and write data of 172 (AC hex), the following command string is sent.

$W810206AC<CRLF>

The reply received from this command is as follows:
$OK<CRLF>

Read Command

The Read command is a 10 character command that is used to retrieve a byte of data from an addressable 8-bit register located on a signal conditioning card. Each execution of this command moves 8 data bits. The data returned is represented by two hexadecimal digits. The following is the format of the Read command:

$Rxxyyzz<CRLF>

xx represents two hexadecimal digits specifying the Logical Address of the SC15.
yy represents two hexadecimal digits specifying the slot number to be accessed.
zz represents two hexadecimal digits specifying the address within the slot to be accessed.

The Slot Number specifies which slot in the addressed chassis is to be accessed. This number can range from 1 through 16 to address individual modules.

After the SC15 processes and executes the Read command, the following reply string is generated:

$Ddd<CRLF>

dd represents two hexadecimal digits reflecting the data read from the addressed register

For example, the Command sequence to read a register at Logical Address 1, Slot 2, and address 8 that contains data of 85 (55 hex) is as follows:

$R010208<CRLF>

The reply received from this command is:

$D55<CRLF>

Read LAM Register Command

Some signal conditioner modules can indicate a request for service by generating a LAM (Look-At-Me). The assertion of a LAM signal can generate an asynchronous character string to be sent back to the host serial port. This sequence is enabled by executing an Enable Asynchronous LAM Notification command and disabled by a Disable Asynchronous LAM Notification command. The individual slot locations for each LAM are enabled/disabled using the Write LAM Mask command.

If the asynchronous LAM notification is not used, one can also execute polling type commands to check for the occurrence of a LAM. The Read LAM Register command returns two bytes of data representing the status of each signal conditioners' LAM signal. There is one LAM signal for each slot. Each bit in the two bytes of data returned corresponds to a particular slot number in the chassis. The following is the format for the Read LAM Register command:

$Lxx<CRLF>

xx represents two hexadecimal digits specifying the Logical Address of the SC15.

The reply sequence from the SC15 has the following format:

$LHddLLdd<CRLF>

The first dd sequence returned is the data from the upper 8 slots in the chassis and the second dd sequence is for the lower 8 slots. The LH designation indicated LAM High and the LL designation indicates LAM Low.

For example, assume a reply message from the Read LAM Register has the following pattern:

$LH02LL05<CRLF>

This reply indicates that the signal conditioners in slots 1, 3 and 10 have LAMs pending.

Enable Asynchronous LAM Notification Command

The Enable Asynchronous LAM Notification command is a 6 character addressed command that is used that is used to enable the SC15 to generate an asynchronous event string to the host serial port. Once a LAM is enabled, it remains enabled until a Asynchronous LAM Notification message is sent by the SC15 or a Disable Asynchronous LAM Notification command is received. Please note that each slot must have its LAM individually enabled/disabled using the Write LAM Mask command. After the message is sent, further messages are disabled until the enable

command is again executed. The format of the Enable Asynchronous LAM Notification command is as follows:

$Exx<CRLF>

xx represents two hexadecimal digits specifying the Logical Address of the SC15.

The reply sequence for this command has the following format:

$OK<CRLF>

$Exxdddd<CRLF>

Disable Asynchronous LAM Notification Command

The Disable Asynchronous LAM Notification command is addressed to an SC15 and is used to prevent an SC15 from generating an Asynchronous LAM Notification message. The format of this command is as follows:

$Dxx<CRLF>

xx represents two hexadecimal digits specifying the Logical Address of the SC15.

The reply sequence from this command is as follows:

$OK<CRLF>

Write LAM Mask Command

The Write LAM Mask command is a 10 byte character string used to enable/disable a slot from participating in an Asynchronous LAM Notification. Each slot in the chassis has its own individual LAM signal that can be driven to the SC15 controller. Each slot that is to be enabled must be masked 'on' in order to generate an Asynchronous LAM Notification.

A 16-bit pattern is used to represent the mask to be applied by the SC15. The least significant bit represents slot location 1 and the most significant bit represents slot 16. Any bit location set to a one enables the LAM to generate a LAM notification and any bit location set to a zero disables the slot.

The following shows the format for the Write LAM Mask command:

$Mxxdddd<CRLF>

xx represents two hexadecimal digits specifying the Logical Address of the SC15.

dddd represents four hexadecimal digits specifying the LAM Mask pattern.

The reply sequence from the SC15 has the following format:

$OK<CRLF>

For example, to enable LAMs from slots 1, 2, 3, 7, 10, 13 and 16 at Logical Address 2, the following command sequence should be executed.

$M029247<CRLF>

After the LAM Mask is enabled, the Asynchronous LAM Notification message must be enabled. Please refer to the Enable Asynchronous LAM Notification Command for additional information.

Asynchronous LAM Notification Message

The Asynchronous LAM Notification message is an asynchronous character string generated by an SC15. This command is issued when a LAM occurs in a chassis. The event that actually triggers the LAM depends on the type of signal conditioning module. Please refer to the hardware manual for each signal conditioner for additional information.

The LAM Notification message must be enabled before the SC15 can notify the host serial port. The message is enabled with the Enable Asynchronous LAM Notification command and disabled by the Disable Asynchronous LAM Notification command. Each slot that is to participate in LAM generation must also be enabled using the Write LAM Mask command.

When an SC15 generates the asynchronous message, a field in the message indicates the Logical Address from which the message originated and the LAM High and LAM Low registers for the chassis. The message has the following format.

!LAxxLLddLHdd<CRLF>

xx represents the Logical Address from where the message originated.

The first dd sequence returned is the data from the lower 8 slots in the chassis and the second dd sequence is for the upper 8 slots. The LH designation indicated LAM High and the LL designation indicates LAM Low.

After an Asynchronous LAM Notification (ALN) message is sent to the host serial port, the SC15 generating the message is preventing from sending additional messages until the ALN messages are re-enabled.

Write Calibrator Command

The write calibrator command is used to program the output of a precision active attenuator (calibrator) that has as an input a 10 volt reference voltage. The output of this calibrator is bussed via the backplane of the V710 Active Termination panel to each Signal Conditioner slot. The calibrator allows any voltage from ±2 millivolts to ±10 volts in a 1,2,5 sequence to be applied to a Signal Conditioner module channel input. This provides a means of doing end-to-end channel calibration for various gain settings on a Signal Conditioner module. **See table 1 on the following page for a list of commands for each of the calibration voltage settings**. The format for the Write Calibrator command is as follows:

$Cxxdddd<CRLF>

xx represents two hexadecimal digits specifying the Logical Address of the SC15.
dddd represents four hexadecimal digits specifying the calibrator output voltage.

The reply sequence from the SC15 has the following format:

$OK<CRLF>

Read Calibrator Command

The read calibrator command retrieves the 16-bit data pattern specifying the calibrator output voltage setting. The format for this command is as follows:

$Gxx<CRLF>

xx represents two hexadecimal digits specifying the Logical Address of the SC15.

The reply from this sequence returns the following:

$Ddddd<CRLF>

dddd represents four hexadecimal digits specifying the calibrator output voltage setting.

Table 1 – Calibration Voltage Settings

Calibration Voltage	Write Calibrator Command
+10.0 Volts	$Cxx0091
+5.0 Volts	$Cxx00A1
+2.0 Volts	$Cxx00C1
+1.0 Volts	$Cxx0092
+0.5 Volts	$Cxx00A2
+0.2 Volts	$Cxx00C2
+0.1 Volts	$Cxx0094
+0.05 Volts	$Cxx00A4
+0.02 Volts	$Cxx00C4
+0.01 Volts	$Cxx0098
+0.005 Volts	$Cxx00A8
+0.002 Volts	$Cxx00C8
0 Volts (Ground)	$Cxx0280
-0.002 Volts	$Cxx0148
-0.005 Volts	$Cxx0128
-0.01 Volts	$Cxx0118
-0.02 Volts	$Cxx0144
-0.05 Volts	$Cxx0124
-0.1 Volts	$Cxx0114
-0.2 Volts	$Cxx0142
-0.5 Volts	$Cxx0122
-1.0 Volts	$Cxx0112
-2.0 Volts	$Cxx0141
-5.0 Volts	$Cxx0121
-10.0 Volts	$Cxx0111

Appendix A

Command Summary

SC15 Command	Command Sequence	Reply Sequence
Global Reset	$Z<CRLF>	No Reply
Addressed Reset	$Xxx<CRLF>	$OK<CRLF>
Query Revision Level	$Vxx<CRLF>	$Vdd<CRLF>
Write Command	$Wxxyyzzdd<CRLF>	$OK<CRLF>
Read Command	$Rxxyyzz<CRLF>	$Ddd<CRLF>
Read LAM Register	$Lxx<CRLF>	$LHddLLdd<CRLF>
Enable Asynchronous LAM Notification	$Exx<CRLF>	$OK<CRLF>
Disable Asynchronous LAM Notification	$Dxx<CRLF>	$OK<CRLF>
Write LAM Mask	$Mxxdddd<CRLF>	$OK<CRLF>
Write Calibrator Command	$Cxxdddd<CRLF>	$OK<CRLF>
Read Calibrator Command	$Gxx<CRLF>	$Ddddd<CRLF>

Appendix B

Switch and Strap Locations

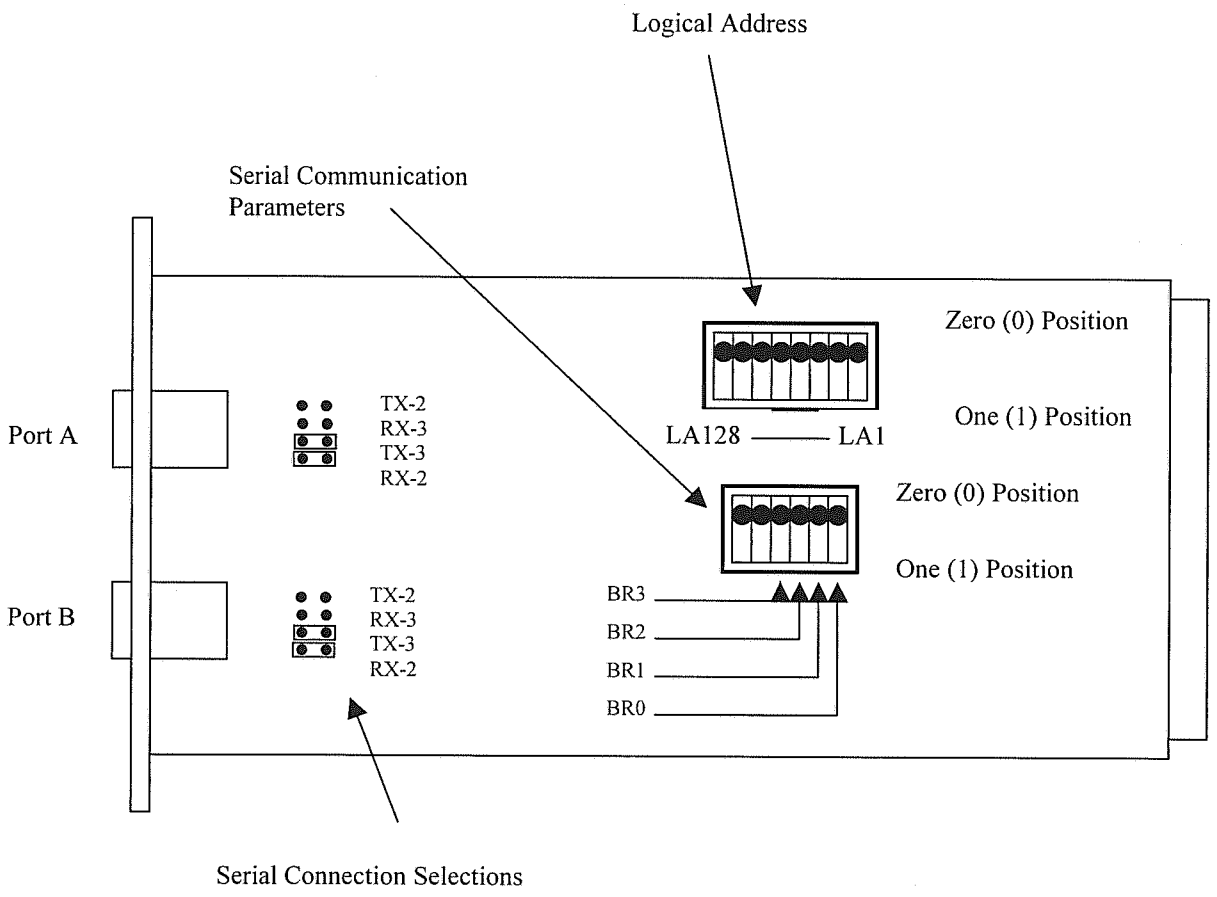


Figure 7 - SC15 Switch and Strap Locations

Appendix C

Serial Connector Pinout

The following shows the pinout of the front panel connectors.

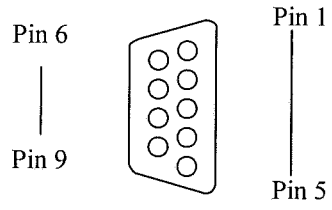


Figure 8 - SC15 Front Panel Connector Pinout

Pin Number	Signal Connection
1	Not Used
2	Receive Data (Default)
3	Transmit Data (Default)
4	Not Used
5	Ground
6	Not Used
7	Not Used
8	Not Used
9	Not Used

WARRANTY

KineticSystems Company, LLC warrants its standard hardware products to be free of defects in workmanship and materials for a period of one year from the date of shipment to the original end user. Software products manufactured by KineticSystems are warranted to conform to the Software Product Description (SPD) applicable at the time of purchase for a period of ninety days from the date of shipment to the original end user. Products purchased for resale by KineticSystems carry the original equipment manufacturer's warranty.

KineticSystems will, at its option, either repair or replace products that prove to be defective in materials or workmanship during the warranty period.

Transportation charges for shipping products to KineticSystems shall be prepaid by the purchaser, while charges for returning the repaired warranty product to the purchaser, if located in the United States, shall be paid by KineticSystems. Return shipment will be made by UPS, where available, unless the purchaser requests a premium method of shipment at their expense. The selected carrier shall not be construed to be the agent of KineticSystems, nor will KineticSystems assume any liability in connection with the services provided by the carrier.

The product warranty may vary outside the United States and does not include shipping, customs clearance, or any other charges. Consult your local authorized representative or reseller for more information regarding specific warranty coverage and shipping details.

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1. Contact KineticSystems and discuss the problem with a Technical Service Engineer.
2. Obtain a Return Authorization (RA) Number.
3. Initiate a purchase order for the estimated repair charge if the product is out of warranty.
4. Include a description of the problem and your technical contact person with the product.
5. Ship the product prepaid with the RA Number marked on the outside of the package to:

KineticSystems Company, LLC
Repair Service Center
900 North State Street
Lockport, IL 60441

Telephone: (815) 838-0005
Facsimile: (815) 838-4424
Email: tech-serv@kscorp.com