

LINN

LINN PRODUCTS LIMITED, FLOORS ROAD, WATERFOOT, GLASGOW G76 0EP, SCOTLAND
TELEPHONE +44 141 307 7777 FACSIMILE +44 141 644 4262

RS232 control of the Linn AV5103 System Controller

Introduction:

The new System controller software, implemented in release R4B12, allows the user to select the most frequently required System controller functions remotely.

General philosophy :

A command may have a set of parameters providing additional data to enable command execution. Command response is in two parts. The initial response to the command is an indication that the command has been received and is valid. This occurs within 10 milliseconds. The final response indicates what happened when the System controller acted on the command. The final response time varies from 10 milliseconds to 3 seconds depending on the command. There is no final response if the initial response indicates that the command was not valid. In some cases where the feature could not be provided, as in a request to select rear speaker balance when no rear speakers exist, the response indicates what is currently selected. If the correct identifiers are specified, the host command and response will be echoed. Sample commands are described in the document to indicate typical command usage.

Command identifiers :

Where more than one product is connected on the communications link, identifiers are used as a means of addressing the products. These identifiers, which may be up to 8 characters, are enclosed in delimiter pairs and are known as the; #source#, &group& and @destination@ identifiers. The source identifier is used to identify the host, the destination should uniquely identify the product and the group identifier can be used to address a group of products.

Each command may be prefixed by these identifiers in order to correctly select a product. It is important to ensure that the identifiers, if specified, are in the sequence shown above. Both delimiters must be included as omission of one of the pair is likely to result in the command being ignored.

When identifiers are specified in a command, the System controller responds using its identifier as the source identifier. If a group identifier is specified on a command then the System controller obeys commands sent to a group to which it belongs but only sends a response if the command also has a destination identity, which matches that of the System controller.

When no identifiers are used, the System controller examines the input and if it recognises a command the System controller processes the command normally. In the case where no identifiers are specified and the input can not be recognised by the System controller, it assumes that the input is for another product on the line and ignores the input.

Command Format :

#SRC_ID#&GROUP_ID& @DEST_ID@ \$MESSAGE\$NL

Message Syntax :

\$<CMD>(□)<P> \$

where

\$ = start/end of command

CMD = command string

□ = optional space

P = parameter string

NL = the line termination characters - carriage return, line feed

After the command a response of the following form occurs.

Response Syntax :

#SRC_ID#&GROUP_ID& @DEST_ID@<RESPONSE>NL

Followed by a Primary response which can be :

!NL command has been accepted for processing

! ?NL command was not recognised

the command response !? does not have a second stage response.

Command processing:

Commands should be issued after the System Controller set up is complete. As mentioned earlier, a two part approach has been taken to the processing of commands. At stage one the command is inspected to ensure that the command structure is valid.

The primary response is given as ! (!? if the command structure was in error) followed by a carriage return, line feed.

During stage two the System controller processes the command and returns a final response. For a simple command this consists of an echo of the command followed by carriage return, line feed. In a command with parameters, the final response would indicate the current settings for these parameters. Thus if an audio input command AINP had requested Digital source 2, then the final response would indicate which source is currently selected. If digital source 2 had been a valid source then the final response would indicate that source 2 had been selected. If digital source 2 did not exist, then the currently selected source would be returned. For the direct record command (DREC), if the source cannot be connected a message is returned indicating that the source was not connected.

Command - response options:

The following table indicates the results of some common identifier/command configurations:

Use of the source identifier simply adds a destination identifier to the response.

| command format | | | response | Result | Command execution? |
|----------------|----------------------|---------|-------------------------|----------------------|--------------------|
| group identity | destination identity | command | initial response | final response | |
| none | none | unknown | none | None | no |
| none | none | invalid | !? | None | no |
| none | none | valid | ! | Issued | completed |
| none | unknown | valid | none | None | no |
| none | valid | valid | !(prefixed by identity) | issued with identity | completed |

| | | | | | |
|---------|-------|-------|---------------------------|------------------------|-----------|
| unknown | none | valid | none | None | no |
| valid | none | valid | none | None | completed |
| valid | valid | valid | !(prefixed by identities) | issued with identities | completed |

Use of the query parameter:

You can use the query or ? parameter to interrogate the System controller. When specified as a parameter after the command the System controller returns the current status of this command. An exception to this approach occurs for record path set-up, where more information is required. In this case the ROUT command is used to establish the state of a record output connection.

Sample commands:

The following examples are given to illustrate command usage:

| Command/Response | Comments |
|--|--|
| \$MUTE Y\$! !\$MUTE Y\$ | Mute the controller |
| \$OSG N\$! !\$OSG N\$ | Switch off the On Screen Graphics |
| \$AINP ANA2\$! !\$AINP ANA 2\$ | Select analogue audio input number 2 |
| \$GID ?\$! !\$GID GROUP1\$ | Check group mode settings |
| \$GID R7\$! !\$GID GROUP1,R7\$ | Set a group identity to R7 |
| \$ID ?\$! !\$ID AV5103\$ | Determine current destination identity |
| \$ID AV\$! !\$ID AV\$ | Set the destination identity to AV |
| #HOST#&R7&@AV@\$MUTE N\$! !#AV#&R7&@HOST@\$MUTE N\$ | The controller issues the command response |
| #HOST#&R7&\$SEL VOL\$ \$VAL 40\$! !VAL 40\$ | Select volume for groupR7. reply will be omitted Set the volume |

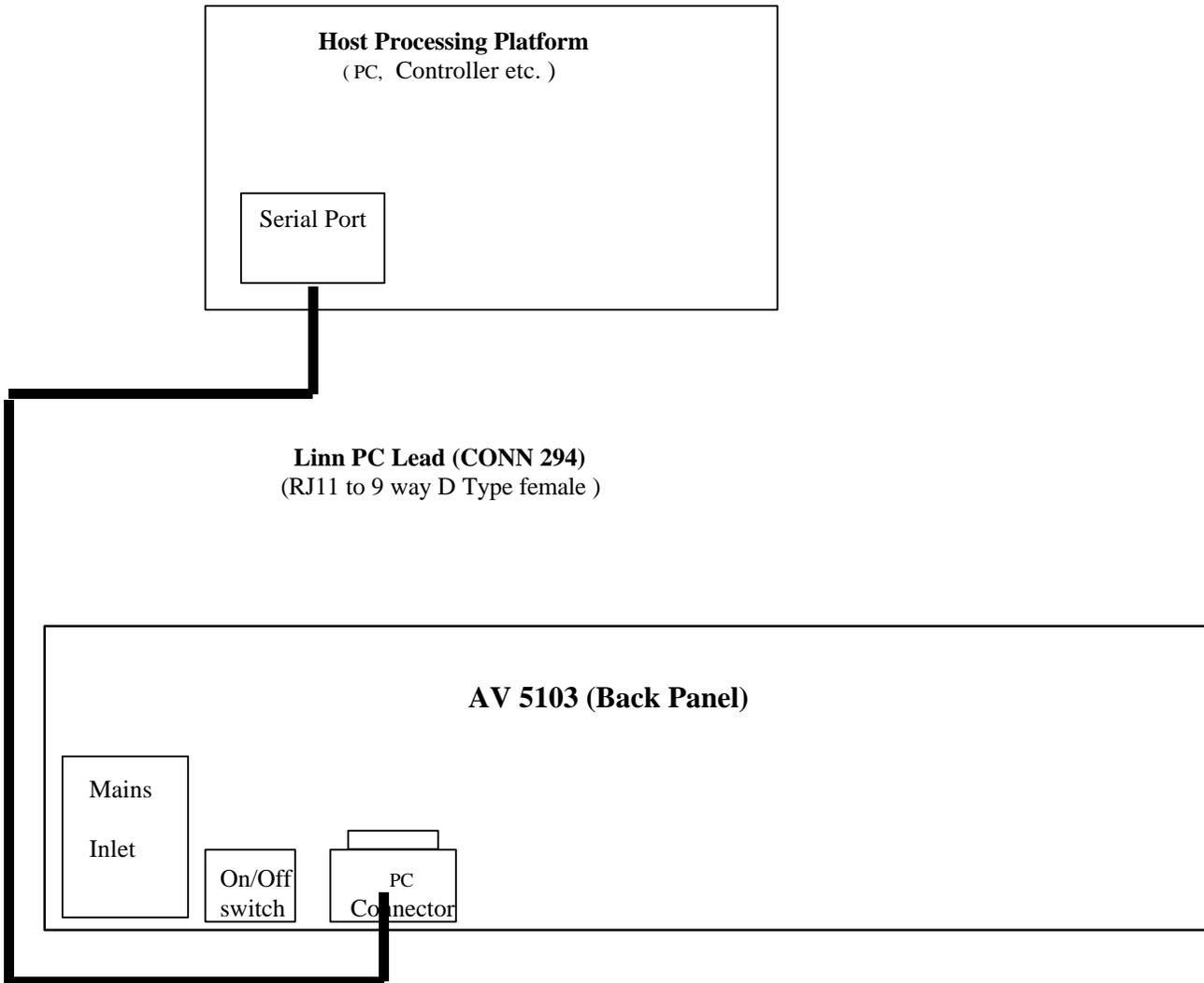
Transmission details:

The serial interface is maintained at an initial speed of 9600 bits per second, which is set as the factory default. Character transmission is set for 7 bits, even parity with 1 stop bit. Framing or parity errors will cause the system controller to respond with a NAK character and ignore the rest of the command. Each command can be terminated with carriage return, line feed. The line feed is recognised as the command terminator. Responses are terminated with carriage return, line feed. If the command length exceeds 46 characters, the System controller will respond with a NAK character

and clear the input buffer. Likewise multiple command input, where several commands are transmitted without waiting for a response from the System controller, will result in a NAK response and a cleared input buffer.

Host to Controller connection:

The following schematic indicates the cabling requirements to implement the serial connection between the host processor and the AV5103.



Initial set up:

A power-on feature has been added so that the initial configuration can be checked. Pressing the front panel plus button (+) while switching the power on displays a message on the front panel and switches

the RS232 power up message feature off or on. The factory default setting for this feature is off. When this feature is switched on, the following message is transmitted from the AV5103 to the host each time that the power is switched on:

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This feature and the use of the ECHO command can be used to test communications between the AV5103 and the host. A host terminal emulation program such as Hyper Terminal, provided with Windows '95, will make the task of establishing communications easier.

AV5103 Commands :

\$MUTE p\$: Set or return the current mute status

| Command | Final Response | Description |
|------------|-------------------------------|-----------------------------|
| \$MUTE□N\$ | !\$ MUTE□N \$ | Un-Mute product. |
| \$MUTE□Y\$ | !\$ MUTE□Y \$ | Mute product. |
| \$MUTE□?\$ | !\$MUTE□N\$ or !\$MUTE□Y\$ | Return current mute status. |

\$OSG p\$: Set or return the On Screen Graphic mode

| Command | Final Response | Description |
|-----------|-----------------------------|---------------------------------|
| \$OSG□N\$ | !\$OSG□N \$ | switch the screen graphics off. |
| \$OSG□Y\$ | !\$OSG□Y \$ | switch the screen graphics on. |
| \$OSG□?\$ | !\$OSG□N\$ or !\$OSG□Y\$ | Return current screen status. |

\$STBY p\$: Select standby mode

| Command | Final Response | Description |
|------------|-------------------------------|--------------------------------|
| \$STBY□N\$ | !\$ STBY□N \$ | Clear standby mode. |
| \$STBY□Y\$ | !\$ STBY□Y \$ | Select standby mode. |
| \$STBY□?\$ | !\$STBY□N\$ or !\$STBY□Y\$ | Return current standby status. |

When standby mode is selected other commands are rejected until standby mode is cleared.

\$QUIET p\$: Select quiet mode when an AC3 source is selected

| Command | Final Response | Description |
|-------------|---------------------------------|------------------------|
| \$QUIET□N\$ | !\$ QUIET□N \$ | Clear quiet mode. |
| \$QUIET□Y\$ | !\$ QUIET□Y \$ | Select quiet mode. |
| \$QUIET□?\$ | !\$QUIET□N\$ or !\$QUIET□Y\$ | Return current status. |

\$SURR p\$: Select a surround mode from those available to the source

| Command | Final Response | Description |
|--------------------|--------------------------|-------------------------------|
| \$SURR□STES\$ | !\$SURR□STEREO\$ | Select stereo mode. |
| \$SURR□STES\$ | !\$SURR□STEREOSUB\$ | Select stereo with subwoofer. |
| \$SURR□PRL\$ | !\$SURR□PRO □LOGIC\$ | Select prologic mode. |
| \$SURR□PRLP\$ | !\$SURR□PL□PHANT\$ | Select prologic phantom. |
| \$SURR□PRLS\$ | !\$SURR□PL□3STER\$ | Select prologic 3 stereo. |
| \$SURR□LIM3,SETn\$ | !\$SURR□LIMBIK□3,SETn \$ | Select limbik 3 mode. |
| \$SURR□LIM5,SETn\$ | !\$SURR□LIMBIK□5,SETn \$ | Select limbik 5 mode. |
| \$SURR□AC3\$ | !\$SURR□AS MIX\$ | Select DSP As Mix mode . |
| \$SURR□AC3P\$ | !\$SURR□PHANTOM\$ | Select DSP phantom mode. |
| \$SURR□AC3S\$ | !\$SURR□3STEREO\$ | Select DSP 3 stereo mode. |
| \$SURR□PARTY\$ | !\$SURR□PARTY□\$ | Select Party mode. |
| \$SURR□NXT\$ | One of the above | Select next mode. |
| \$SURR□?\$ | One of the above | Return current mode. |

Limbik modes are not available to an AC3 source.

\$SEL p\$: Select a new operating mode.

| Command | Final Response | Description |
|--------------|------------------|-----------------------------------|
| \$SEL□VOL\$ | !\$SEL□VOLUME\$ | Select volume mode. |
| \$SEL□REAR\$ | !\$SEL□REAR\$ | Select rear speaker balance. |
| \$SEL□CNTR\$ | !\$SEL□CENTRES\$ | Select centre speaker balance. |
| \$SEL□SUB\$ | !\$SEL□SUB\$ | Select subwoofer speaker balance. |
| \$SEL□BAL\$ | !\$SEL□BALANCE\$ | Select stereo balance mode. |
| \$SEL□NXT\$ | One of the above | Select the next mode. |
| \$SEL□?\$ | One of the above | Return current mode. |

Used by the VAL or source selection commands.

\$VAL p\$: Set a value for the currently selected operating mode

| Command | Final Response | Description |
|--------------|--------------------------------------|--|
| \$VAL□INCS\$ | !VAL□nn\$ | Increment the current value by one to nn. |
| \$VAL□DEC\$ | !VAL□nn\$ | decrement the current value to nn. |
| \$VAL□>\$ | !VAL□nn\$ (on command completion) | Repeat incrementing the value until a VAL S command. |
| \$VAL□<\$ | !VAL□nn\$ (on command completion) | Repeat decrementing the value until a VAL S command |
| \$VAL□SS\$ | !VAL□nn\$ | Stop the repeat cycle |
| \$VAL□nn\$ | !VAL□nn\$ | Set the selected mode to value nn. |
| \$VAL□+?\$ | !VAL□nn\$ | Return the maximum setting for the selected mode. |
| \$VAL□-?\$ | !VAL□nn\$ | Return the minimum setting for the selected mode. |
| \$VAL□?\$ | One of the above | Return current mode. |

If a balance mode has been selected, the value nn can be positive or negative but should be within the allowable range of the selected mode. Repeated increment/decrement has a frequency of approx. 10hz. The cycle stops when the limit is reached or a stop or other command is issued.

\$AINP p\$: Select a new audio source

| Command | Final Response | Description |
|----------------|------------------|--------------------------------------|
| \$AINP□NONES\$ | !\$AINP□NONES\$ | Disconnect the current audio source. |
| \$AINP□ANAnn\$ | !\$AINP□ANA□nn\$ | Select analogue audio input 1-10. |
| \$AINP□DIGn\$ | !\$AINP□DIG□n\$ | Select digital audio input 1-5. |
| \$AINP□?\$ | One of the above | Return currently selected source. |

\$VINP p\$: Select a new audio source

| Command | Final Response | Description |
|----------------|------------------|--------------------------------------|
| \$VINP□NONE\$ | !\$VINP□NONE\$ | Disconnect the current video source. |
| \$VINP□COMPn\$ | !\$VINP□COMP□n\$ | Select composite video input 1-8. |
| \$VINP□SVHSn\$ | !\$VINP□SVHS□n\$ | Select SVHS input 1 or 2. |
| \$VINP□?\$ | One of the above | Return currently selected source. |

\$DINP p\$: Select a direct audio or video source.

When an audio source is selected the current video source is disconnected and vice versa.

| Command | Final Response | Description |
|----------------|------------------|--------------------------------------|
| \$DINP□NONE\$ | !\$VINP□NONE\$ | Disconnect the current video source. |
| \$DINP□ANAnn\$ | !\$DINP□ANA□nn\$ | Select analogue audio input 1-10. |
| \$DINP□DIGn\$ | !\$DINP□DIG□n\$ | Select digital audio input 1-5. |
| \$DINP□COMPn\$ | !\$DINP□COMP□n\$ | Select composite video input 1-8. |
| \$DINP□SVHSn\$ | !\$DINP□SVHS□n\$ | Select SVHS input 1 or 2. |
| \$DINP□?\$ | One of the above | Return currently selected source. |

Selection of the audio part of an AV pair results in the error message:- “invalid request”

\$MRAINP p\$: Select a multi room audio source

| Command | Final Response | Description |
|------------------|--------------------|--------------------------------------|
| \$MRAINP□NONE\$ | !\$MRAINP□NONE\$ | Disconnect the current audio source. |
| \$MRAINP□ANAnn\$ | !\$MRAINP□ANA□nn\$ | Select analogue audio input 1-10. |
| \$MRAINP□DIGn\$ | !\$MRAINP□DIG□n\$ | Select digital audio input 1-5. |
| \$MRAINP□?\$ | One of the above | Return currently selected source. |

\$MRVINP p\$: Select a multi room video source

| Command | Final Response | Description |
|------------------|--------------------|--------------------------------------|
| \$MRVINP□NONE\$ | !\$MRVINP□NONE\$ | Disconnect the current video source. |
| \$MRVINP□COMPn\$ | !\$MRVINP□COMP□n\$ | Select composite video input 1-8. |
| \$MRVINP□SVHSn\$ | !\$MRVINP□SVHS□n\$ | Select SVHS input 1 or 2. |
| \$MRVINP□?\$ | One of the above | Return currently selected source. |

\$MRDINP p\$: Select a multiroom direct source.

When an audio source is selected the current video source is disconnected and vice versa.

| Command | Final Response | Description |
|---------|----------------|-------------|
|---------|----------------|-------------|

| | | |
|------------------|--------------------|--------------------------------------|
| \$MRDINP□NONE\$ | !\$MRDINP□NONE\$ | Disconnect the current video source. |
| \$MRDINP□ANAnn\$ | !\$MRDINP□ANA□nn\$ | Select analogue audio input 1-10. |
| \$MRDINP□DIGn\$ | !\$MRDINP□DIG□n\$ | Select digital audio input 1-5. |
| \$MRDINP□COMPn\$ | !\$MRDINP□COMP□n\$ | Select composite video input 1-8. |
| \$MRDINP□SVHSn\$ | !\$MRDINP□SVHS□n\$ | Select SVHS input 1 or 2. |
| \$MRDINP□?\$ | One of the above | Return currently selected source. |

\$DREC in,rout\$: Set up or break a direct audio or video link to the record output connector.

| Command | Final Response | Description |
|-------------------|-------------------|--|
| \$DREC □in,rout\$ | !\$DREC□in,rout\$ | Route the audio or video input to the record output connector. |

Where in and rout can have one of the following values:

in: - ANA1 - 10, DIG1 - 5, COMP1 - 8 or SVHS1 - 2

rout: - NONE, RDIG, RANA1-3, RCOMP1-2 or RSVHS

If NONE is specified then the link for the in parameter is cleared .

On conclusion, the command is echoed with the parameters set to those which the controller has set. If the operation can not be completed satisfactorily, the parameter is replaced with a message explaining the cause of the failure.

\$ROUT p\$: Return the status of the specified record connection.

| Command | Final Response | Description |
|-----------------|----------------|--|
| \$ROUT□RANAn\$ | !\$ROUT□con\$ | Return any links for the record connector Ranan. where n 1-3. |
| \$ROUT□RDIG\$ | !\$ROUT□con\$ | Return any link for the record connector RDIG. |
| \$ROUT□RCOMPn\$ | !\$ROUT□con\$ | Return any links for the record connector RCOMPn. where n 1-2. |
| \$ROUT□RSVHS\$ | !\$ROUT□con\$ | Return any link for the record connector RSVHS. |

Where con can have one of the following values:

con: - NONE, ANA1 - 10, DIG1 - 5, COMP1 - 8, SVHS1 - 2 or UNAVAILABLE (if connector is not configured or audio part of an audio/video pair)

\$NORM\$: Normalises the currently selected source.

| Command | Final Response | Description |
|----------|----------------|---------------------------------|
| \$NORM\$ | !\$NORM\$ | normalise the product settings. |

\$RESET\$: clears the input output buffers.

| Command | Final Response | Description |
|-----------|----------------|--------------------------------|
| \$RESET\$ | !\$RESET\$ | Clear comms buffer on product. |

\$CLREC\$: clears all record paths.

| Command | Final Response | Description |
|-----------|----------------|---------------------------------|
| \$CLREC\$ | !\$CLREC\$ | Clear record paths set by DREC. |

\$ID p\$: Set the product identity

| Command | Final Response | Description |
|--------------|----------------|--------------------------------------|
| \$ID □ XXX\$ | !\$ID □ XXX\$ | Write ID to product destination. |
| \$ID □ ~\$ | !\$ID □ \$ | Remove the ID name from the product. |
| \$ID ?\$ | !\$ID □ XXX\$ | Return the current destination ID. |

Spaces are not allowed within an identity specification. The factory default identity is AV5103

\$GID : Configures a device as part of a group.

Up to five group names can be used to identify the product

| Command | Final Response | Description |
|----------------|---------------------------|--|
| \$GID □ XXX\$ | !\$GID □ XXX\$ | Write group ID to the selected product. |
| \$GID □ ~XXX\$ | !\$\$ | Remove a group name from a particular product. |
| \$GID □ ~\$ | !\$\$ | Remove all group names from the product. |
| \$GID □ ?\$ | !\$GID □ value,value,..\$ | Read group ID's from currently selected product. |

Spaces are not allowed within an identity specification.

\$BAUD nn\$: Select the transmission speed

| Command | Final Response | Description |
|---------------|----------------|-------------------------------|
| \$BAUD □ nn\$ | !\$BAUD □ nn\$ | Set transmission speed to nn. |
| \$BAUD □ ?\$ | !\$BAUD □ nn\$ | return the current baud rate. |

nn can have the following values:- 1200, 2400, 4800, 9600, 19200 or 38400 bits per second.

The factory default setting is 9600 baud.

\$ECHO ascii-string\$: echo the command and string

| Command | Final Response | Description |
|-------------------|------------------------|----------------------------------|
| \$ECHO □ string\$ | !\$ECHO □ <□ STRING>\$ | Use for initial testing of link. |

\$POLL p\$; extract details of linked Linn Products connected to the host.

| Command | Final Response | Description |
|------------------|----------------------|---|
| \$POLL □ START\$ | !\$POLL □ START\$ | Marks the start of polling |
| \$POLL □ ID\$ | !\$POLL □ ID □ pid\$ | Returns product id (pid) |
| \$POLL □ SLEEP\$ | !\$POLL □ SLEEP\$ | Product responding to this will ignore all further POLL ID commands until 'POLL DONE' is received |
| \$POLL □ DONE\$ | | All products will now return to active operation |

Important

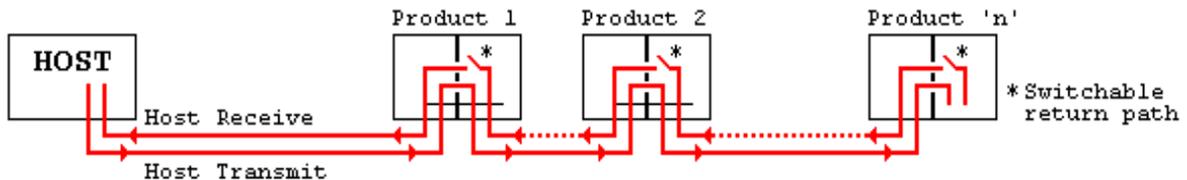
The 'POLL SLEEP' command should be used with the product identifier returned by 'POLL ID'.

If this is not done then all the products will stop responding and the polling sequence will fail.

Polling Explained

On recently developed Linn products The RS232 interface hardware, via the POLL command, allows the return path on daisy-chained RS232 controlled devices to be isolated or in-circuit. While the AV5103 does not have a switchable return path, it can be used at the end of linked products. As a result of this possible configuration, the AV5103 system will respond to poll commands which reach it through the RS232 link.

Using the Poll feature allows the host to 'auto-detect' the slave products on the RS232 link.



By taking advantage of this, it is possible to identify what is on the link using the following type of algorithm:

\$POLL START\$

- opens return path switches in all devices, so only first device in chain can respond

\$POLL ID\$

- all devices respond but only response from first device reaches host

@dest_1_id@\$POLL SLEEP\$

- where 'dest_1_id' is the result of the previous 'POLL ID'

- matching product closes its switch

- product will not respond to any command now until 'POLL DONE' command

received.

\$POLL ID\$

- second device can now respond with it's ID

@dest_2_id\$POLL SLEEP\$

- where '**dest_2_id**' is the result of the previous '**POLL ID**'
- matching product closes its switch
- product will not respond to any command now until '**POLL DONE**' command

received.

The '**POLL ID**' and '**POLL SLEEP**' commands are issued repeatedly until all products have been queried and there is no response from the last '**POLL ID**' command.

When the AV5103, which does not have a switchable return path, is included it must be the last product in the link. It responds to the POLL commands until a POLL sleep command is received at which point the system controller ignores further poll id commands.

\$POLL ID\$

- no response since all product id's read, so time-out

\$POLL DONE\$

- resync all products on link again

Hardware Note

If a product in the chain is switched off then the chain will be broken. If a product is removed then the chain must be re-established by use of a joining cable or by connecting the cable from the preceding product to the following product.

Note that on power_up all return path switches are closed.