

Signalling Protocol Specification

This document explains the hardware and software protocols used in communication between a standard computer serial port (COM port) and the SYSPROC system processor interface. The contents of this document and the signalling commands defined herein are copyright © 2004 by Brian Kelly and are not to be reproduced or incorporated into other documents or devices without permission.

History:

Preliminary release: 23rd March 2004.

Updates:

7th April 2004 , minor text corrections and warnings put in bold type.

Electrical Specification.

The signalling protocol used in the link between SYSPROC and host system follows the RS232/V.24 electrical recommendations.

Minimally, the communication interface consists of three wires linking the SYSPROC and host ports together. The wires are named: Ground, RXD and TXD. Optionally, an additional two wires named CTS and RTS may be used to coordinate the data flow (“handshaking”) between ports.

Ground is the zero voltage reference line. It should be electrically earthed at the host end of the link only. At the SYSPROC interface, the Ground pin is electrically isolated from the system supply and can withstand a constant 1kV potential difference from true ground.

TXD is the signal generated in SYSPROC, which conveys information to the host. It is connected to the data input (RXD) pin on the host systems serial port. It can withstand 30V potential with respect to the SYSPROC grounds pin in either polarity and indefinite short-circuit to SYSPROC ground.

RXD is the signal received from the host into the SYSPROC. It is connected to the host data output pin (TXD) on the host’s serial port. It can withstand 30V potential with respect to the SYSPROC grounds pin in either polarity and indefinite short-circuit to the SYSPROC ground.

CTS is the signal from the host system. It is not used by the SYSPROC but is read and reported in the system status byte. It can withstand 30V potential with respect to the SYSPROC grounds pin in either polarity and indefinite short-circuit to the SYSPROC ground

RTS is a signal from the SYSPROC to the host. Control of the RTS signal can be enabled and disabled by commands sent from the host. It can withstand 30V potential with respect to the SYSPROC grounds pin in either polarity and indefinite short-circuit to the SYSPROC ground

Signalling Specification

The data flow between SYSPROC and host systems consists of a single flow of serial bits on each of the RXD and TXD wires. The bit rate is 57,600 bauds with each byte of data made up of eight signalling bits, one start bit and one stop bit (8N1). This format is compatible with almost all computer serial communication systems.

All commands and responses are one byte (8-bits) long.

There is no pre-amble or post-amble and no header or terminator.

All commands except “select port / EE address” are transitory. The port number or EE memory address set by the “select port / EE address” stays in effect until changed by another command of the same type. This makes it possible to write or read the same port or address many times without having to specify its address each time.

Command and Responses Reference

Commands are signals from the host to the SYSPROC that change a condition inside the SYSPROC, in one of the attached peripherals or request the SYSPROC to return information about itself or an attached peripheral.

A Response is a signal from the SYSPROC to the host that announces its status or identifies the source of information being returned in its embedded data bits.

All commands and responses are eight bits long.

Command structure:

The most significant three bits of the command byte are used to identify the command type; the remaining bits hold either data bits or address bits. As the system data bus is only 4-bits wide, data is only carried in the least significant four bits. The system internal address bus, which selects which peripheral device is being accessed, is five bits wide so it uses the least significant five bits.

Command format:

7	6	5	4	3	2	1	0
Command	Command	Command	Addr/data	Addr/data	Addr/data	Addr/data	Addr/data

Response structure:

The most significant three bits of a response byte are used to identify the source of the responses data bits or to carry the five least significant bits of the last command sent to the SYSPROC if echo or loop-back were enabled.

Response format:

7	6	5	4	3	2	1	0
Source	Source	Source	Data	Data	Data	Data	Data

Commands are not the only cause of response bytes. They can also be produced by the system announcing it is ready for operation after being reset, by a valid MF tone pair being received or by a sync detection change if “automatic sync detection” is enabled.

Command and Responses Reference

Read port command:

7	6	5	4	3	2	1	0
0	0	0	X	X	X	X	X

The command bits are 000. The remaining bits are “don’t care”, they play no part in the command but will be echoed back untouched if echo mode is enabled.

This command requests that data from the last selected port address is returned. The port address is placed on the address bus and a read operation is performed. Data from the selected peripheral is read from the data bus and returned to the host as a “Data from port” response byte. The peripheral is then deselected.

Data from port response:

7	6	5	4	3	2	1	0
0	0	0	0	Data bit 3	Data bit 2	Data bit 1	Data bit 0

The response bits are 000. Bit 4 is always zero as all ports are 4-bits wide. This response can only be produced from a “Read port” command. Data from the last selected peripheral is returned in bits 3 through 0.

Read EE memory command:

7	6	5	4	3	2	1	0
0	0	1	X	X	X	X	X

The command bits are 001. The remaining bits are “don’t care”, they play no part in the command but will be echoed back untouched if echo mode is enabled.

This command requests that data is read from the SYSPROC EE (Electrically Erasable) memory at the last selected EE address. Data from the selected address is read from the SYSPROC internal bus, the most significant four bits are discarded and the least significant four bits are then returned to the host as a “Data from EE memory” response byte. Note that internally, the memory is 64 bytes long and 8 bits wide but only the lowest 32 bytes and lowest 4 bits can actually be accessed because of the size of the address and data busses. The data in EE memory can be used to initialise the peripheral ports when the SYSPROC is reset if the mode byte is so configured.

Data from EE memory response:

7	6	5	4	3	2	1	0
0	0	1	0	Data bit 3	Data bit 2	Data bit 1	Data bit 0

The response bits are 001. Bit 4 is always zero, the least significant four bits contain data read from the selected EE memory address. . This response can only be produced from a “Read EE memory” command. Data from the last selected peripheral is returned in bits 3 through 0.

Command and Responses Reference

Write Port Command:

7	6	5	4	3	2	1	0
0	1	0	0	Data bit 3	Data bit 2	Data bit 1	Data bit 0

The command bits are 010. Bit 4 is ignored by the command but will be echoed along with the data bits if echo mode is enabled. The data held in the least significant bits is written to the port at the last selected port address. The port address is placed on the address bus, the data bits in the command are then placed on the data bus and the system “write enable” line is activated for about 6µS. This is long enough for a port polling the write enable line to recognise it has activated and retrieve the data from the bus. The port is then deselected. Unless echo mode is enabled, this command will not produce any response byte.

Write to EE memory command:

7	6	5	4	3	2	1	0
0	1	1	0	Data bit 3	Data bit 2	Data bit 1	Data bit 0

The command bits are 011. Bit 4 is ignored by the command but will be echoed along with the data bits if echo mode is enabled. The data held in the least significant bits is written to the EE memory at the address last selected. Data storage operations in EE memory take about 10mS to complete. Attempting a second write operation before the previous one has finished will result in the second operation being ignored. The “read mode byte” command allows the state of the write cycle and its error bits to be read by the host system. Only further EE write operations are subject to the 10mS pause, as soon as the write cycle has started the SYSPROC will respond to further commands. Note that there is a short period at the start of a write operation when commands may not be recognised. An unrecognised command will not invoke an echo response.

Select Port / EE address command:

7	6	5	4	3	2	1	0
1	0	0	Address	Address	Address	Address	Address

The command bits are 100. All the other bits hold the address of the port or EE memory to be used in the next read or write operation. No distinction is made between ports and EE addresses; the commands for reading or writing decide how the address is used. If echo mode is enabled, all the address bits are echoed back to the host system. It is not necessary to set the address before each read or write command if the same address is to be used. The last address set by this command is retained in the SYSPROC until this command is used again to change it or the SYSPROC is reset.

Command and Responses Reference

Read status command:

7	6	5	4	3	2	1	0
1	0	1	X	X	X	X	X

The command bits are 101. The remaining bits are “don’t care”, they play no part in the command but will be echoed back untouched if echo mode is enabled

The contents of the SYSPROC status byte are read and sent to the host in a “status” response. See the status bit definitions for more details on the function of each bit.

Data from read status response:

7	6	5	4	3	2	1	0
0	1	1	WRERR	WR	TO	CTS	MF

The response bits are 011. The bits in the data part of the response represent:

WRERR	Set if an error occurred during the process of writing to EE memory.
WR	Set if a write to EE memory operation is in progress. (Typically lasts 10mS)
TO	Indicates a write to EE memory failed due to a time-out.
CTS	Reflects the state of the CTS line on the computer interface socket.
MF	Indicates that an MF sequence has started but not yet finished or timed out.

Data loopback command:

7	6	5	4	3	2	1	0
1	1	0	Data	Data	Data	Data	Data

The command bits are 110. This command is primarily for use as a diagnostic aid, it does not change any port or address selections or change any internal configuration. On receiving a data loopback command, the data bits are repackaged in a “loopback” response byte and sent back to the host system.

Data loopback response:

7	6	5	4	3	2	1	0
1	1	0	Data	Data	Data	Data	Data

The data bits are the same as those sent in the ‘data loopback command’.

Notes:

If loopback is enabled by default by using the configuration command F1, there may be two response bytes. The first will always be generated as a response from the request for information, the second will always be the original command re-packaged in a loopback response.

Requesting loopback as a command when it is also enabled by default will only result in one response.

Command and Responses Reference

Set configuration command:

7	6	5	4	3	2	1	0
1	1	1	X	Data	Data	Data	Data

The command bits are 111. Bit 4 is ignored by the command but will be echoed along with the data bits if echo mode is enabled. This is command is used to set various configuration options and optionally to store or clear some of the settings.

The command and data bits decode to:

- 111X0000 (F0) Disable loopback mode for all commands.
- 111X0001 (F1) Enable loopback mode for all commands.
- 111X0010 (F2) Turn RTS line OFF at the computer interface.
- 111X0011 (F3) Turn RTS line ON at the computer interface.
- 111X0100 (F4) Do not initialise ports at power up.
- 111X0101 (F5) Initialise ports from the table in EE memory at power-up.
- 111X0110 (F6) Turn automatic sync detector reporting OFF.
- 111X0111 (F7) Turn automatic sync detector reporting ON.
- 111X1000 (F8) not used.
- 111X1001 (F9) not used.
- 111X1010 (FA) not used.
- 111X1011 (FB) not used.
- 111X1100 (FC) Read the mode byte – returned as response 000 with mode bits in D3, 2, 1 and 0.
- 111X1101 (FD) Store the mode byte – saves the settings above in EE memory.
- 111X1110 (FE) Clear the EE memory – sets all EE memory locations to zero.
- 111X1111 (FF) Forced reset. Causes the SYSPROC to restart from cold.

The bracketed figures are the hexadecimal equivalent of the binary bits in the command.

The mode bits are:

3	2	1	0
Auto sync enable	EE initialise enable	RTS line enable	Data loopback enable

The mode byte is stored in EE memory but is not directly accessible by using the 'Write to EE memory' command since it is stored outside the address range possible with the five bits of the command 'Select port / EE address'. Use one or more 'Set configuration' commands to make changes to the mode byte. The mode is retained through a reset and while powered-down. Changes made to the configuration are effective immediately.

Summary of available commands and responses

The bracketed figures on the right are the hexadecimal equivalents of the binary bits on the left.

Commands **TO** the sysproc

000xxxxx	Request to read from the currently selected port	(00)
001xxxxx	Request to read from the currently selected EE address	(20)
010xdddd	Write data dddd to the currently selected port	(4d)
011xdddd	Write data dddd to the currently selected EE address	(6d)
100aaaaaa	Select port or EE address at aaaaa	(8a/9a)
101xxxxx	Read the system status word	(A0)
110xdddd	Return data dddd in a loopback response message	(Cd)
1110xxxx	Not defined except 11101010 causes reset	(EA)
11110000	Enable loopback for all subsequent commands	(F0)
11110001	Disable loopback for all subsequent commands	(F1)
11110010	Turn UART RTS line on	(F2)
11110011	Turn UART RTS line off	(F3)
11110100	Don't initialise ports when reset	(F4)
11110101	Initialise ports from table in EE memory when reset	(F5)
11110110	Turn automatic sync change report off	(F6)
11110111	Turn automatic sync change report on	(F7)
11111000	not used	
11111001	not used	
11111010	not used	
11111011	not used	
11111100	not used	
11111100	Request the mode byte	(FC)
11111101	Store the mode byte in the EE table	(FD)
11111110	Clear the EE memory table	(FE)
11111111	Cause a reset.	(FF)

Responses **FROM** the sysproc

0000dddd	Data dddd has been read from the currently selected port	(0d)
0010dddd	Data dddd has been read from the currently selected EE address	(2d)
0100dddd	Data dddd is decoded from an incoming MF tone	(4d)
011xxxxx	Data dddd is status bits (response from status request)	(6d)
100xxxxx	Data dddd is bits 3 to 0 of the sync detector (1=video present, 0=none)	(8d)
101xxxxx	Data dddd is bits 7 to 4 of the sync detector (1=video present, 0=none)	(Ad)
110bbbbbb	Value bbbbb is the 5 least significant bits of the last command (loopback)	(Cd/Dd)
1110xxxx	Not defined except 11100101 reports a reset has occurred	(F5)

Examples:

To select video channel 3, input 5, the commands would be (in hex): **83 45**

83 selects port address 03 which is VMUX0, channel 3, 45 writes data 05 to the port.

To send data 08 to the WX satellite control port, the commands would be (in hex): **91 48**

91 selects port address 11 which is the WX satellite control port, 48 writes data 08 to the port.

To read the sync detector port, the commands would be (in hex): **94 00**

94 selects port address 14 which is the sync detector port, 00 sends a read port command.

Response 0000dddd would be returned where 'dddd' is the detectors port contents.

Port Assignments

Port 00	VMUX0	channel 0	Computer (via isolator) source (input 0 to 7)
Port 01	VMUX0	channel 1	Monitor video source
Port 02	VMUX0	channel 2	Transmitter video source
Port 03	VMUX0	channel 3	Sync detector source
Port 04	VMUX1	channel 0	For expansion – VMUX1 is not fitted
Port 05	VMUX1	channel 1	
Port 06	VMUX1	channel 2	
Port 07	VMUX1	channel 3	
Port 08	AMUX0		Monitor audio source (input 0 to 7)
Port 09	AMUX1		Transmitter audio source (input 0 to 7)
Port 0A	UARTCS		UART select, data is sent serially via SPI interface
Port 0B	8870CS		MF tone decoder select (input)
Port 0C	OSGSEL		On Screen Graphics message select
Port 0D	TCGSEL		On board TCG page select
Port 0E	IDSEL		Morse message select
Port 0F	USRBSEL		User control interface B select
Port 10	VCRSEL		VCR, IR generator select
Port 11	METSEL		Meteosat control interface select
Port 12	ANTSEL		Antenna control interface select
Port 13	USRASEL		User control interface A select
Port 14	SYNCDET		Sync detector port select(input)
Port 15 – Port 1F			spare

Information on specific ports.

Note: All the ports can be selected, written to and read but doing so in some cases makes no sense and can disrupt the operation of the system. No harm will result from using meaningless commands but a system reset (by powering down) may be necessary to regain control. In particular, it is inadvisable to write anything to port 0B (UARTSEL) as doing so may change the communications parameters and break the link to the host system. This port is automatically configured again when the SYSPROC board is powered up or reset.

Ports 00 to 03 VMUX0, primary video router

The video router is an eight input to four output video switch. Each of the four outputs can be connected to any one of the inputs and duplicate connections are allowed. For example input one could be routed to all outputs simultaneously. It is not possible to set a condition where any inputs are shorted together.

The four outputs each has its own function and its own port address. They are:

Port 00 – channel 0 drives the isolator board which then feeds video to an external computer.

Port 01 – channel 1 drives the monitor output to feed a local monitoring screen.

Port 02 – channel 2 drives the transmitter output socket for feeding to the transmitter.

Port 03 – channel 3 drives the sync detector circuits.

The eight inputs are:

00 – video from the on-board test card generator.

01 – video from the isolator board, fed from the computer interface.

02 – video from the main receiver input socket

03 – video from the EXT1 socket, normally the weather satellite input.

04 – video from the EXT2 socket

05 – video from the EXT3 socket

06 – video from the EXT4 socket

07 – unused input

For example – to route video from the EXT4 socket to the transmitter, the commands (in hex) are:

82 46. 82 selects port 02 and 46 writes 06 to it.

Note that if the automatic sync detector function is enabled, port 03 is written to at approximately 0.5 second intervals to route each input in turn to the sync detector circuits.

Ports 04 to 07 VMUX1, secondary video router

This is not fitted to the system as standard but the addresses are decoded and signals are available at test pins on the MUX board.

Port 08 AMUX0 Audio router

The primary audio router is an eight input, one output switch. Only one input at a time can be routed to the output. The output is filtered, buffered and passed to the monitor output socket. Note that the channel numbers on the audio router do not correspond with those on the video router. The channel to be used is selected by the data in a 'write port' command as follows:

- 00 – Unused
- 01 – Audio from EXT4 socket
- 02 – Audio from EXT2 socket
- 03 – Unused
- 04 – Audio from EXT3 socket
- 05 – Audio from isolator board, fed from computer interface
- 06 – Audio from EXT1 socket
- 07 – Audio from main receiver input socket

Port 09 AMUX1 Audio router

The secondary audio router is an eight input, one output switch. Only one input at a time can be routed to the output. The output is filtered, buffered and passed to the transmitter output socket. Note that the channel numbers on the audio router do not correspond with those on the video router. The channel to be used is selected by the data in a 'write port' command as follows:

- 00 – Unused
- 01 – Audio from EXT4 socket
- 02 – Audio from EXT2 socket
- 03 – Unused
- 04 – Audio from EXT3 socket
- 05 – Audio from isolator board, fed from computer interface
- 06 – Audio from EXT1 socket
- 07 – Audio from main receiver input socket

Port 0A UARTCS serial port controller

IT IS NOT RECOMMENDED THAT ANY OPERATIONS ARE CARRIED OUT ON THIS PORT. WRITING INFORMATION TO THIS PORT COULD RESULT IN A MALFUNCTION REQUIRING THE SYSTEM TO BE RESET TO REGAIN CONTROL. For further information, see the SYSPROC software listings and the MAXIM MAX3100 data sheet.

Port 0B CS8870 MF tone decoder

Writing to this port will have no effect, it has no configurable registers or options. When read, the data returned will indicate which MF digit was last received. Under normal circumstances, there should be no need to read this port as any newly received data will automatically be presented in a 0100dddd response byte. If a read is performed, only the most recently received digit can be accessed, each new digit overwrites the data from the previous one. The data returned corresponds to the following MF digits:

00 – digit ‘D’
01 – digit ‘1’
02 – digit ‘2’
03 – digit ‘3’
04 – digit ‘4’
05 – digit ‘5’
06 – digit ‘6’
07 – digit ‘7’
08 – digit ‘8’
09 – digit ‘9’
0A - digit ‘0’
0B – digit ‘*’
0C – digit ‘#’
0D – digit ‘A’
0E – digit ‘B’
0F – digit ‘C’

Port 0C OSGSEL On Screen Graphics select

This device generates the text overlay used to give visual station identification and information. Its video is mixed with the signal from the VMUX before being sent to the transmitter video output socket. The overlay is not present on the monitor video output socket. Only the three least significant bits of the data written to the port are used, the fourth is ignored.

The overlays available are:

00 – no overlay, used to clear any previous overlay from the screen
01 – overlay is “GB3ZZ”
02 – overlay is “GB3ZZ” with locator, grid reference, input and output frequencies
03 – overlay is “Via 3cm link”, intended to be used when repeaters are linked together
04 - no overlay, used to clear any previous overlay from the screen
05 – overlay is “GB3XG”
06 – overlay is “GB3XG” with locator, grid reference, input and output frequencies
07 – overlay is “Via 23cm link”, intended to be used when repeaters are linked together.

Overlay captions remain inserted into the video stream until command 00 or 04 are used to turn them off.

Port 0D TCGSEL Testcard page selector

Data written to this port is passed directly to the paging inputs on the TCG (Test Card Generator) where one of 16 test card patterns is selected. The test card signal is always present but may not be routed to one of the video outputs.

Port 0E Audio ID Generator (IDSEL)

This is the device to generate Morse characters as audible tones. It is used to identify the station. Two volume levels can be selected, low volume to make a less intrusive sound when the repeater is in use and high volume for all other times. The low volume level is set by command and is reset to high again after the following command has been processed. On reset, high volume is assumed; no message is sent. The access command causes two low beeps then one high pitched beep, the drop command does the reverse, two high pitched beeps first then a low beep.

IDSEL Commands

- 00 - Send Morse "GB3ZZ"
- 01 - Send Morse "GB3ZZ North Bristol IO81RM"
- 02 - Send Morse "GB3XG"
- 03 - Send Morse "GB3XG Dundry Hill IO81QJ"
- 04 - Send Morse "K" (dah dit dah)
- 05 - Send Morse digit 1 (dit dah dah dah dah)
- 06 - Send Morse digit 2 (dit dit dah dah dah)
- 07 - Send Morse digit 3 (dit dit dit dah dah)
- 08 - Send Morse digit 4 (dit dit dit dit dah)
- 09 - Send Morse digit 5 (dit dit dit dit dit)
- 0A - Send Morse "P" (dit dah dah dit)
- 0B - Send Morse "S" (dit dit dit)
- 0C - Send Morse "TEST"
- 0D - Send drop (access lost) tones
- 0E - Send access tones
- 0F - Select low volume level

Note that it is necessary to send command 0F prior to any other command to drop the volume level. High volume is automatically restored when the next sequence of tones is completed.

Port 10 VCRSEL Video Cassette Recorder command selector

Writing data to this port initiates a sequence of infra-red light flashes which simulate the remote control functions of the video recorder. During the 'off' periods the IR LED is not illuminated, during the 'on' periods it pulses with a 50% duty cycle at approximately 38KHz. The actual command set for the VCR is stored inside the IR controller processor and can be modified for other devices by reprogramming that processor. The IR emitter is mounted on the front panel of the controller and connections for an external LED are also available at the DIN socket on the front panel. By default the command sent are:

- 00 - "Stop"
- 01 - "Play"
- 02 - "Rewind"
- 03 - "Fast Forward"
- 04 - not used
- 05 - "Record"
- 06 - not used
- 07 - "Pause"
- 08 - not used
- 09 - "Freeze"
- 0A - initialise (power off, power on, standby, rewind)
- 0B - "Channel up"
- 0C - "Channel down"
- 0D - power ON
- 0E - power OFF

The power on and off commands provide control for mains switching to the VCR. The switching signal is present at the DIN socket on the front panel.

Port 11 METSEL, Meteosat weather satellite control port.

This port carries TTL level control signals to the weather satellite receiver. The data at the port is exactly as sent in the command programming the port. For example, writing 0101 in the data field of the 'write port' command will cause low, high,low, high voltages at the port connections.

Note: if the weather satellite is removed, this port could be used for any other purpose, subject to the limitations of the TTL drive capability. **Important!** – the port can be driven with any 4-bit data, however, if the unit is driven from the SAP (Stand Alone Processor), bit 0 may be toggled in response to the MF command for selecting the WX satellite channel. This must be borne in mind if other equipment is connected to the port and there is any possibility of the SAP being in control.

Port 12 ANTSEL, Antenna selector control port.

This port carries TTL level control signals to the antenna selector unit. The data at the port is exactly as sent in the command programming the port. For example, writing 0101 in the data field of the 'write port' command will cause low, high,low, high voltages at the port connections.

Note: the data at the port is reset to 0000 (all bits off) when the SAP (Stand Alone Processor) is in control and the sync detector sees no sync signal present at the receiver video input socket. The intention of this is to reselect an omni-directional antenna in the absence of any incoming transmission. It therefore follows that data 0000 should inform the selector hardware to select the omni-directional antenna.

Port 0F USERBSEL and Port 13 USERASEL, user relay ports.

It is possible to reconfigure the operation of these ports by reprogramming the port driver processors, the information here assumes they are in their original configurations.

Both USER ports are identical in operation. They are intended to be used to directly or indirectly control other equipment present at the repeater site. The ports are wired with one common connection and eight normally-open relay contact connections. Sending appropriate commands to the ports will operate one of the relays, linking or unlinking the common connection to one of the other control lines. All the relays are controlled independently and there are no connections between relays on port 0F and port 13. Additionally, all lines, including the common connections are isolated from system ground. If power is lost, the relays will de-energise and all connections will be broken. When power is re-applied, and if the initialise from EE memory function is enabled and the EE memory locations are so programmed, any one relay on each port can be made to energise automatically.

The data field of the 'write to port' is as follows:

7	6	5	4	3	2	1	0
0	1	0	0	C	R	R	R

Where: C = 0 means turn relay RRR ON
C = 1 means turn relay RRR OFF

RRR decodes as:

- 000 = common to contact 1
- 001 = common to contact 2
- 010 = common to contact 3
- 011 = common to contact 4
- 100 = common to contact 5
- 101 = common to contact 6
- 110 = common to contact 7
- 111 = common to contact 8

See the port connection diagrams for contact to socket pin mapping.

Port 14 – SYNCDET, sync detector port.

This port is four bits wide and all bits are accessible for driving on the MUX board, however the on-board sync detector circuits only drive bits 0 and 1, the least significant bits. Reading this port will return the state of all four bits, allowing additional sync detection circuitry to be attached and interrogated if required. Note that the ‘automatic sync detection’ function does not distinguish between the bits, it will report a change in sync state whenever the value changes to or from zero to any other value. When ‘auto sync detection’ is enabled, each of the video input sources is selected and fed to the on-board detector in sequence. The step time from one source to the next is approximately 0.5 seconds so the time to respond to a change in presence of video will in worst case be about 4 seconds. If the automatic detection is turned off, it becomes the duty of the SAP or external computer to poll the port to check the state of the video inputs. To do this, channel 3 of VMUX0 must first be selected and have the input number written to it, then the sync detector must be selected and the port read.

For example to check for video on input 4, commands are 83 44 94 00

83 – selects VMUX channel 3, 44 writes ‘4’ to the channel selector, routing its video to the sync detector, 94 selects the sync detector port and 00 requests the sync bits from it. Response 0000dddd returns the state of the four sync bits in ‘dddd’.

Notes:

The on-board video presence detector is connected to bit 0, the least significant bit. The bit will be zero if there is no input at the selected video channel and set to one if more than approx 0.5V of signal or noise is present. Bit 1 conveys the lock state of a PLL and filter. It is set to one if recognisable video is present and the dominant sync frequency is 15625Hz +/- 700Hz, otherwise it is set to zero.

Writing to port 03 while the auto-sync detector reporting is enabled may cause unpredictable results. New data written to port 03 may cause a change to the video channel being connected to the sync detector and make the SYSPROCs copy of the current video state differ from the real state at the video inputs. For this reason, it is not recommended that the automatic sync detect reporting is enabled if the port is to be written to.

Port 15 through to Port 1E.

These are not present on any card in the control box. However, they are decoded and selection signals are made available on pins of the PLD on the SYSPROC card. If the unit is expanded, it is possible to utilise these signals to add more ports to the unit.

Port 1F

This port is not present in the unit but it is used as a way of deselecting all other ports. In other words, port 1F is active if no other ports are and inactive if any other port is selected. It is not recommended that this port is used at all for selecting peripheral devices. The signal can be used however, as an indication that the SYSPROC internal bus is free of traffic should the need for such a signal arise.

EE Memory addresses.

The EE memory is a non-volatile storage area inside the SYSPROC. Data is stored even when the unit is powered down and should stay intact for at least 40 years (manufacturers data).

The addresses correspond directly to the port numbers and the data saved at each address is automatically written to the same numbered port when the unit is powered on and the 'initialise from EE' function is enabled. For example if data 05 is written to address 02 and the initialise from EE function is turned on, after a reset or power-up, the TX video output (port 02) will be routed from input channel 5.

If the initialise from EE function is not used, all the EE memory addresses can be used as general purpose storage locations.

Note that the mode byte is also stored in EE memory but at an address outside the range that can be user programmed. It is therefore only changeable and readable through the special commands designated for doing so.