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Hardware Factsheet Number 1

This bulletin announces the publication of Hardware Factsheet number 1. This factsheet is the first in a series which will explain the technical details of all the hardware products sold by TIS Software Ltd.

Factsheet number 1 covers the "TCL Intelligent I/O family" which includes the TIS Hyperport, TCL Hyper/MX, TCL PCC/i and TCL Superport sub-systems.

A copy of Hardware Factsheet 1 (HF0001) is enclosed (below)

CONTENTS

1. INTRODUCTION TO THE TCL INTELLIGENT I/O FAMILY

The TCL intelligent i/o card family consists of four members:-

TIS Hyperport

TCL Hyper/MX

TCL PCC/i

TCL Superport-186

The generic term Hyperport card is used to refer to any of the four types of card. This term is not to be confused with TIS Hyperport card, which refers to just one type of card.

Up to four Hyperport cards can be installed in a single computer, with any combination of TIS Hyperport, TCL Hyper/MX, TCL PCC/i and TCL Superport-186 cards. Each Hyperport card uses an area of shared RAM which may be memory-mapped at any address provided that it does not conflict with other devices in the computer (e.g. LAN cards or EGA/VGA colour screen adapters). The shared RAM is 4Kb in size for TIS Hyperport cards and 8Kb for the others. Hyperport cards in a multiple Hyperport configuration CANNOT share memory addresses or interrupt levels. Each card must be set to a unique memory-address and interrupt level. This restriction applies to both MCA-bus cards and ISA-bus cards.

The following software drivers are supplied, in library +.J5, with System Manager (BOS):-

+J5CB60	Hyperport family console device driver
+J5CE60	Hyperport family printer device driver
+J5NHYP	Hyperport family nucleus component
+J5NASP	TCL asynchronous protocol module (required for PCC/i and Superport cards)
+J5NMXP	TCL synchronous protocol module (required for Hyper/MX cards)

The following software drivers are supplied, in library +.JW, with System Manager (DOS, Windows and Novell):-

+JWCB60	Hyperport family console device driver
+JWCE60	Hyperport family printer device driver
+JWNHYP	Hyperport family nucleus component
+JWNASP	TCL asynchronous protocol module (required for PCC/i and Superport cards)
+JWNMXP	TCL synchronous protocol module (required for Hyper/MX cards)

At the time of writing, the variant number of the above software device drivers is V4.1. Although earlier variants of the device drivers function with the TIS Hyperport, TCL Hyper/MX and TCL PCC/i cards, the V4.1 device drivers are required in order to use the TCL Superport card.

2. TIS HYPERPORT

2.1 Introduction to the TIS Hyperport

The TIS Hyperport sub-system is an intelligent multi-channel communications sub-system which transforms an IBM AT or PS/2 compatible into a true multi-user computer. The sub-system consists of two major elements:

- A co-processor card, which contains a 10MHz 80186 processor and either 512Kb or 1Mb of dual ported RAM, is fitted into the host computer and provides the common interface for the serial ports. At bootstrap time a copy of the System Manager console executive is loaded into the on-board RAM which enables Global Cobol ACCEPT and DISPLAY statements to be executed with minimum overhead on the host processor. This intelligent, high-level interface avoids overloading the host processor and minimises performance decline as user numbers increase. The remainder of the RAM (approximately 440Kb on a 512Kb card) is used as a screen image buffer pool. A single screen image typically requires between 4Kb and 8Kb of storage. The co-processor card is available in both MCA and ISA-bus versions.

- The terminator enclosure is a stand-alone mains powered unit which supports 8, 16 or 24 ports using Zilog Z8530 UARTS. The first 8 ports are controlled by a terminator mother-board. A maximum of two daughter boards, each carrying a further 8 ports can be added to the terminator enclosure. Each port has an LED indicator so that transmission and reception is visible to the user. The terminator box is connected to the

co-processor card via a 2 metre, 62-way parallel cable. Each port of the Hyperport sub-system is presented as an RJ-11 telephone style socket. The electrical interface is RS-232C and supports hardware handshaking for busy-line printers via the CTS line. The terminator box must be powered up and the cable attached before the computer is bootstrapped. Never turn the terminator box off whilst the computer is in use. Doing so will hang the computer! Simply turning the box back on again will not restore the computer to a working state.

2.2 Related Documentation

The following TIS Software documentation which should accompany the hardware must be read in conjunction with these notes:

BOS 2000 HYPERPORT User Manual
HP/1.0/0289

2.3 Hardware Configuration

The pin connections of the RJ-11 ports on the TIS Hyperport terminator box are as follows:-

Frame Ground	Pin 1
Signal Ground	Pin 2
Computer transmits data via	Pin 3
Computer receives data via	Pin 4
Busy-line (CTS)	Pin 5
Not connected	Pin 6

2.3.1 ISA-bus TIS Hyperport Card

To observe the switch settings, view the PCB from the component side with the 62-way socket to your right so that the ISA-bus connector is at the bottom right.

The memory address of the 4Kb window on a ISA-bus TIS Hyperport card is selected by the rightmost bank of 8 toggle switches on the card (labelled SW2). Switches SW2-1 to SW2-8 correspond to address lines A12-A19, respectively. A bit is set by being switched to the OFF (up) position. Using address #C0000 as an example: First, truncate the last three digits, to leave #C0 (which is the value entered into the configuration file - see below). Translate this result into binary:

#C0 is equivalent to 11000000 binary

Use the binary result with the convention that off=1, on=0 and SW2-8 is the most significant bit:

SW2	1	2	3	4	5	6	7	8
OFF					X	X		
ON	X	X	X	X	X	X		

Note that the factory default memory address is #D6000:-

SW2	1	2	3	4	5	6	7	8
OFF		X	X		X		X	X
ON	X			X		X		

The amount of memory and the operating mode of an ISA-bus TIS Hyperport card are selected by the leftmost bank of 8 toggle switches on the right hand side of the card (labelled SW1). The amount of memory on the TIS Hyperport card can be determined by inspecting the controller card and counting the number of memory chips present. Cards with 512Kb of RAM have 4 memory chips (IC19, IC20, IC23, IC24). Cards with 1Mb of RAM have 8 memory chips (IC18, IC19, IC20, IC21, IC22, IC23, IC24, IC25).

For TIS Hyperport cards shipped with 512Kb of RAM the switches MUST be set as follows:-

```
SW1   1  2  3  4  5  6  7  8
OFF   X           X     X
ON       X  X  X  X     X
```

For TIS Hyperport cards shipped with 1Mb of RAM the switches MUST be set as follows:-

```
SW1   1  2  3  4  5  6  7  8
OFF   X           X  X  X
ON       X  X  X  X
```

The interrupt level of an ISA-bus TIS Hyperport card is selected by the use of the horizontal arrangement of 9 pairs of pins along the bottom of the card marked LINKS, next to the expansion bus connector. Each pair of pins is clearly marked with the following interrupt levels: 3, 4, 5, 7, 9, 10, 11, 12, 15. The desired interrupt level is selected by placing a single jumper across the appropriately numbered pair of pins (i.e. all jumpers except for the one for the required level should be removed from this set of links). Note that interrupt level 10 is generally available on most computers. For example:-

```
      *  *  *  *  *  *  *  *  *
LINKS          |
      *  *  *  *  *  *  *  *  *
      15 12 11  10  9  7  5  4  3   IRQ
```

2.3.2 MCA-bus TIS Hyperport Card

There are no switches or jumpers on the MCA-bus version of the TIS Hyperport card. Instead, the board configuration is stored in PS/2 Programmable Option Select (POS) registers which form part of the PS/2's battery-backed memory. The information is contained in a file called the Adapter Definition File (ADF) which is supplied to you on the HYPERPORT option diskette which forms part of the MCA Hyperport package. You must transfer the ADF to the PS/2 Reference Diskette and then select the appropriate configuration data under control of the Setup Program on the Reference Diskette. The board may be configured to use interrupt levels 3, 10, 11 or 15.

The System Manager TIS Hyperport controller dynamically determines the number of cards, the memory address and the interrupt-level of the MCA bus card(s). However, the software controller does NOT determine the "card type" nor the "ports per node". These parameters MUST be established using Global Configurator (see below).

In a multiple card configuration, cards are numbered in the same order as the expansion slots they are plugged in to. For example, in a 2 card configuration, with one card in slot-3 and the other in slot-5, the card in slot-3 will be card-0 and the card in slot-5 will be card-1.

2.4 Software Configuration

Consoles and serial printers may be freely mixed on TIS Hyperport cards. In the Console controller section of Global Configurator, use the controller HYPER to configure a serial console on a TIS Hyperport card. In the Printer controller section of Global Configurator, use the controller HYPER to configure a serial printer on a TIS Hyperport card. When using Global Configurator to add consoles and printers attached to a TIS Hyperport card, the following information is needed to specify a port:-

The Hyperport card number (between 0 and 3) to which the box

containing the port is connected;

The channel number (between 1 and 24) of the port. The channel number is printed on the box to the right of the RJ-11 connector, just above the LED. A special channel number of 0 will cause the lowest unused channel to be used.

The following information is needed to specify the line characteristics for a serial console:-

Console baud rate (see appendix A);

Console attribute byte (see appendix B);

The following information is needed to specify the line characteristics for a serial printer:-

Printer baud rate (see appendix A);

Printer attribute byte (see appendix C).

Details of each TIS Hyperport card must be entered in the nucleus section of the configuration file. Reply "Y" to the Hyperport card required? prompt, and enter the number of Hyperport cards to the Number of Hyperport cards prompt. For each card, enter the top byte of the card address to the Card-n address lines (A12-A19) prompt (e.g. C0 for a card at address C0000), and the interrupt number to the Card-n interrupt level prompt. The Card-n type MUST be set to 0 for a TIS Hyperport card. The Ports per node MUST be set to 0 for the TIS Hyperport card. For example, to set a single TIS Hyperport card at address #C0000 and interrupt level 11:-

```
Hyperport card required?          (Y):Y
Load PCC/i Module                (ASP)
Load HyperMX Module               (MXP)
Load Hyperport debugger          (HY*)
Load Hyperport module            (HYP)
Number of Hyperport cards         (  1):1
Card-0 addr. lines A12-A19        (#C0):C0
Card-0 interrupt level          (  10):11
Card-0 Type (0=Hyperport,
1=HyperMX, 2=PCC/i or Super)      (  0):0
Ports per node (READ DOC'N!)      (  0):0
```

Regardless of the reply to the Number of Hyperport cards prompt Global Configurator will always prompt for 4 cards (i.e. card-0, card-1, card-2 and card-3). The various parameters for all non-existent cards (e.g card-1, card-2 and card-3 on a single card configuration) should be set to 0.

2.5 Troubleshooting

If the Hyperport sub-system fails during the bootstrap process (as evidenced by Hyperport screens reported by $STATUS as "NOT CONNECTED" or details of Hyperport printers missing from the information displayed by $U), a diagnostic mode may be enabled. In this diagnostic mode, error messages which indicate a problem with the Hyperport setup or hardware will appear on the master console (i.e. the console associated with the System Manager user 1) during the bootstrap process. These messages will only appear if the configuration file is renamed so that its last character is "D" (e.g. rename ++5700XJ to ++5700XD).

The following message indicates that the card has not been installed or the SW2 switch bank has been set to a different address from that in the configuration file. If the four-digit code (hhhh) is not FFFF, this message indicates that the address of the TIS Hyperport card clashes with another card installed in the computer:-

AT Hyperport not installed hhhh

The following message indicates that the wrong interrupt jumper has been selected:-

No Hyperport interrupt

The following message indicates that either the terminator box is not attached; or it is not powered-up; or the 62-way co-processor-to-terminator cable is not secured:-

Wrong Hyperport ID byte xx

If a TIS Hyperport card has been entered as a TCL Hyper/MX card using Global Configurator the following message may be displayed:-

Error from Hyperport 0003

If a TIS Hyperport card has been entered as a PCC/i card, the following may be displayed:-

Error from Hyperport 0006

All the above messages are suffixed by the following extra information:-

Card n Address aaaa Interrupt ii Window wKb

This additional message contains the pertinent configuration data for the failing Hyperport card. If the values displayed for the address and interrupt are all zeroes, then the configuration file has been created using an old version of the Action File which is incompatible with the version of the Hyperport driver you are using.

In addition to the diagnostic error messages described above, the following message may be displayed if the MCA TIS Hyperport card has not been added to the PS/2 "setup" information:-

MCA Hyperport failed

The following Initiation Warnings may result on the Hyperport console controller +J5CB60 (+JWCB60), or the printer controller +J5CE60 (+JWCE60):-

An Error "D" will result if the Hyperport card to which a port is attached failed to initialise. Other causes are an out of range port number or by entering a given port for more than one console or printer with Global Configurator.

An error "I" will result if an attempt is made to use a screen or printer with the wrong type of card, such as a "HYPER" screen with a TCL Hyper/MX card.

3. TCL HYPER/MX

3.1 Introduction to the TCL Hyper/MX

The TCL Hyper/MX (aka TCL PCC/MX) sub-system is an intelligent multi-channel communications sub-system which transforms an IBM AT or PS/2 compatible into a true multi-user computer. The sub-system consists of two major elements:

ù A co-processor card, which contains a 16MHz 80186 processor and either 512Kb or 1Mb of dual ported RAM, is fitted into the host computer and provides the common interface for the serial

ports. At bootstrap time a copy of the System Manager console executive is loaded into the on-board RAM which enables Global Cobol ACCEPT and DISPLAY statements to be executed with minimum overhead on the host processor. This intelligent, high-level interface avoids overloading the host processor and minimises performance decline as user numbers increase. The remainder of the RAM (approximately 400Kb on a 512Kb card) is used as a screen image buffer pool. A single screen image typically requires between 4Kb and 8Kb of storage. The TCL HyperMX co-processor adapter card is available in both ISA-bus (PCC/2S) and MCA-bus (PCC/SYNC) versions.

ù The TCL hyper/MX card can be attached to up to 4 MX Remote Node Controllers. The card connects to the MX Remote Node Controllers via two independent synchronous/asynchronous lines. Each MX Remote Node Controller supports 8 asynchronous serial ports and one parallel i/o port (i.e. parallel printer port). In standard operation, each line is set up for high speed synchronous RS485 Multidrop operation. Two MX Remote Node Controllers can be attached to each line allowing a total of four MX Remote Node Controllers to be attached to a single adapter card. Alternatively, one or both lines can be set up for low speed RS232 operation (asynchronous or synchronous). Only one MX Remote Node Controller can be attached to an RS232 line. Operating a line in RS232 mode allows the HyperMX adapter card and MX Remote Node Controller to be connected via a modem link. Because the two lines are independent, it is possible to set one line for RS485 operation to attach to one or two "local" MX Remote Node Controllers, and the other line for RS232 operation for attaching to a "remote" MX Remote Node Controller via a modem link. The RS422 point-to-point configuration described in the TCL manual is NOT currently supported by the System Manager drivers.

As described in the TCL documentation the external distribution cable for the ISA-bus PCC/2S card (part number 9503) is NOT interchangeable with the external distribution cable for the MCA-bus PCC/SYNC card (part number 9503/MCA).

3.2 Related Documentation

The following TCL documentation which should accompany the hardware must be read in conjunction with these notes:

Hardware Installation Manual

for the PCC/MX System

Programmable Distributed
Communication Controllers

Version 4.0a August 1993

CD000127.001

IMPORTANT NOTE: The TCL documentation claims that "no host PC interrupts are used by the device driver". While this statement is true for the Unix device drivers supplied by TCL, it does not apply to the System Manager device drivers. When reading the TCL documentation please disregard all references to interrupts.

The RS422 point-to-point configuration described in the TCL manual is NOT currently supported by the System Manager drivers.

3.3 Hardware Configuration

The pin connections of the 9-pin D-type male connectors for the serial

ports on the MX Remote Node Controller are as follows:-

DCD (unused) Pin 1
Computer receives data via Pin 2
Computer transmits data via Pin 3
DTR (unused) Pin 4
Signal Ground Pin 5
DSR (unused) Pin 6
RTS (unused) Pin 7
Busy-line (CTS) Pin 8
RI (unused) Pin 9

The pin connections of the 25-pin D-type female connector for the parallel port on the MX Remote Node Controller are described in Appendix 4 of the TCL documentation. Note that this port has the same pin connections as a standard IBM PC parallel printer port.

Details of the switch settings on the MX Remote Node Controllers, and how to attach the MX Remote Node Controllers to the Hyper/MX card are contained in the TCL Hardware Reference Manual supplied with the hardware. The versions of the PROM's in the MX Remote Node Controllers MUST be 1.4x or later.

3.3.1 ISA-bus TCL Hyper/MX Card

To observe the switch settings, view the PCB from the component side with the 62-way socket to your right so that the ISA-bus connector is at the bottom right.

The memory address of the 8Kb window on a ISA-bus TCL Hyper/MX card is selected by the rightmost bank of 8 toggle switches on the card (labelled SW2). Switches SW2-1 to SW2-8 correspond to address lines A12-A19, respectively. A bit is set by being switched to the OFF (up) position. Using address #C0000 as an example: First, truncate the last three digits, to leave #C0 (which is the value entered into the configuration file - see below). Translate this result into binary:

#C0 is equivalent to 11000000 binary

Use the binary result with the convention that off=1, on=0 and SW2-8 is the most significant bit:

SW2	1	2	3	4	5	6	7	8
OFF					X	X		
ON	X	X	X	X	X	X		

Note that the factory default memory address is #D6000:-

SW2	1	2	3	4	5	6	7	8
OFF		X	X		X		X	X
ON	X			X		X		

A full list of possible address locations is described in appendix B of the TCL documentation.

The amount of memory and the operating mode of an ISA-bus TCL Hyper/MX card are selected by the leftmost bank of 8 toggle switches on the right hand side of the card (labelled SW1). The amount of memory on the TCL Hyper/MX card can be determined by inspecting the controller card and counting the number of memory chips present. Cards with 512Kb of RAM have 4 memory chips (IC34, IC35, IC38, IC39). Cards with 1Mb of RAM have 8 memory chips (IC33, IC34, IC35, IC36, IC37, IC38, IC39, IC40).

For TCL Hyper/MX cards shipped with 512Kb of RAM the switches MUST be set as follows:-

```
SW1   1  2 3  4  5 6  7 8
OFF   X          X    X
ON      X X  X  X    X
```

For TCL Hyper/MX cards shipped with 1Mb of RAM the switches MUST be set as follows:-

```
SW1   1  2 3  4  5 6  7 8
OFF   X          X  X X
ON      X X  X  X
```

The interrupt level of an ISA-bus TCL Hyper/MX card is selected by the use of the horizontal arrangement of 9 pairs of pins along the bottom of the card marked LK7, next to the expansion bus connector. Each pair of pins is clearly marked with the following interrupt levels: 3, 4, 5, 7, 9, 10, 11, 12, 15. The desired interrupt level is selected by placing a single jumper across the appropriately numbered pair of pins (i.e. all jumpers except for the one for the required level should be removed from this set of links). Note that interrupt level 10 is generally available on most computers. For example:-

```
*  *  *  *  *  *  *  *  * LK7
      |
*  *  *  *  *  *  *  *  *
15  12 11  10 9  7  5  4  3
           IRQ
```

3.3.2 MCA-bus TCL Hyper/MX Card

There are no switches or jumpers on the MCA-bus version of the TCL Hyper/MX card. Instead, the board configuration is stored in PS/2 Programmable Option Select (POS) registers which form part of the PS/2's battery-backed memory. The information is contained in a file called the Adapter Definition File (ADF) which is supplied to you on the HYPERPORT option diskette which forms part of the MCA Hyper/MX package. You must transfer the ADF to the PS/2 Reference Diskette and then select the appropriate configuration data under control of the Setup Program on the Reference Diskette. The board may be configured to use interrupt levels 3, 10, 11 or 15.

The System Manager TCL Hyper/MX controller dynamically determines the number of cards, the memory address and the interrupt-level of the MCA bus card(s). However, the software controller does NOT determine the "card type" nor the "ports per node". These parameters MUST be established using Global Configurator (see below).

In a multiple card configuration, cards are numbered in the same order as the expansion slots they are plugged in to. For example, in a 2 card configuration, with one card in slot-3 and the other in slot-5, the card in slot-3 will be card-0 and the card in slot-5 will be card-1.

3.4 Software Configuration

Because of the large number of configurations possible with the TCL Hyper/MX i/o sub-system software configuration is performed in two stages. Firstly, consoles and printers are defined in the configuration file using the default connection between the Hyper/MX adapter card and the MX Remote Node Controller(s). If the default connection (i.e. 2 1Mbps RS485 lines with a total of 4 nodes) is required then no further software configuration is necessary. If any changes to the default connection are required then the =.NNNN customisation program must be used to modify the default settings. The version of the =.NNNN customisation program must be V4.1, or later.

3.4.1 Software Configuration using Global Configurator

Consoles and serial printers may be freely mixed on TCL Hyper/MX cards. In the Console controller section of Global Configurator, use the controller HYPERMX or TCLSYNC to configure a serial console on a TCL Hyper/MX card. Note the TCLSYNC option, which is only supported if the nucleus variant is V4.1, or later, results in faster system throughput. In the Printer controller section of Global Configurator, use the controller HYPERMX to configure a serial printer on a TCL Hyper/MX card and HYPERMXP to configure a parallel printer. When using Global Configurator to add serial consoles and printers attached to a TCL Hyper/MX card, the following information is needed to specify a port:-

The Hyperport card number (between 0 and 3) to which the box containing the port is connected;

The node address (between 1 and 4) of the MX Remote Node Controller containing the serial port. The node address of each MX Remote Node Controller is displayed on the status LED;

The channel number (between 1 and 8) of the serial port. The port numbers are printed beside the ports on each MX Remote Node Controller.

When using Global Configurator to add parallel printers attached to a TCL Hyper/MX card, the following information is needed to specify a port:-

The Hyperport card number (between 0 and 3) to which the box containing the port is connected;

The node address (between 1 and 4) of the MX Remote Node Controller containing the parallel port. The node address of each MX Remote Node Controller is displayed on the status LED.

The following information is needed to specify the line characteristics for a serial console:-

Console baud rate (see appendix A);

Console attribute byte (see appendix B).

The following information is needed to specify the line characteristics for a serial printer:-

Printer baud rate (see appendix A);

Printer attribute byte (see appendix C);

Details of each TCL Hyper/MX card must be entered in the nucleus section of the configuration file. Reply "Y" to the Hyperport card required? prompt, and enter the number of Hyperport cards to the Number of Hyperport cards prompt. For each card, enter the top byte of the card address to the Card-n address lines (A12-A19) prompt (e.g. C0 for a card at address C0000), and the interrupt number to the Card-n interrupt level prompt. The Card-n type MUST be set to 1 for a TCL Hyper/MX card. The Ports per node MUST be set to 0 for a TCL Hyper/MX card. For example, to set a single TCL Hyper/MX card at address #C0000 and interrupt level 11:-

```
Hyperport card required?          (Y):Y
Load PCC/i Module                (ASP)
Load HyperMX Module               (MXP)
Load Hyperport debugger          (HY*)
Load Hyperport module            (HYP)
Number of Hyperport cards  (    1):1
Card-0 addr. lines A12-A19 (#C0):C0
Card-0 interrupt level           (   10):11
```

```
Card-0 Type (0=Hyperport,
1=HyperMX, 2=PCC/i or Super)       (  0):1
Ports per node (READ DOC'N!)       (  0):0
```

Regardless of the reply to the Number of Hyperport cards prompt Global Configurator will always prompt for 4 cards (i.e. card-0, card-1, card-2 and card-3). The various parameters for all non-existent cards (e.g. card-1, card-2 and card-3 on a single card configuration) should be set to 0.

Both lines on a TCL Hyper/MX card are set up for standard operation (i.e. 1Mbps RS485 Multidrop mode). If you require one or both lines to run at a slower speed in RS485 mode, or if you require to run one or both lines in either asynchronous or synchronous RS232 mode, you must use the customisation program =.NNNN. Refer to the next section for more details.

3.4.2 Software Configuration using the =.NNNN Customisation Program

The following table describes all the theoretically possible connection options that are available with a single TCL Hyper/MX card:-

Line-2 \ Line-1	RS485	RS485*2	RS422	RS422*2	RS232S	RS232S*2	RS232A	RS232*A
N/C	(a)	(z)	No	n/a	(g)	n/a	(g)	n/a
RS485	(b)	(c)	No	n/a	(z)	n/a	(z)	n/a
RS485*2	(z)	(d)	No	n/a	(z)	n/a	(z)	n/a
RS422	No	No	No	n/a	No	n/a	No	n/a
RS422*2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
RS232S	(e)	(f)	No	n/a	(h)	n/a	(h)	n/a
RS232S*2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
RS232A	(e)	(f)	No	n/a	(h)	n/a	(h)	n/a
RS232A*	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

This table should be studied in conjunction with the TCL documentation (especially Figure-8, Example Line configurations for the PCC/2S ISA card). The following abbreviations are used:-

RS485 Single MX Remote Node Controller connected via RS485 multi-drop

RS485*2 Two MX Remote Node Controllers connected via RS485 multi-drop

RS422 Single MX Remote Node Controller connected via RS422 point-to-point

RS442*2 Two MX Remote Node Controllers connected via RS422 point-to-point (strictly illegal)

RS232S Single MX Remote Node Controller connected via synchronous RS232 point-to-point

RS232S*2 Two MX Remote Node Controllers connected via synchronous RS232 point-to-point (strictly illegal)

RS232A Single MX Remote Node Controller connected via asynchronous RS232 point-to-point

RS232A*2 Two MX Remote Node Controllers connected via asynchronous RS232 point-to-point (strictly illegal)

Entries labelled "n/a" are strictly forbidden by the TCL

hardware/firmware. For example, it is not possible to connect 2 MX Remote Node Controllers at the remote end of a single RS232 line.

Entries labelled "No" are not supported by the System Manager software drivers (i.e. the current version of the software does not support the RS422 point-to-point interface).

Entries labelled "(z)" are not recommended and are topologically equivalent to one of the supported configurations (see below).

The TCL Hyper/MX card contains two independent lines for connection to MX Remote Node Controllers. In standard operation each line is set to run in synchronous RS485 Multidrop mode, at a speed of 1Mbps. Up to two MX Remote Node Controllers can be attached to each line. The line speed can be reduced if the MX Remote Node Controllers are to be situated at large distances from the computer (refer to the TCL documentation).

Alternatively, one or both lines can be set up for low speed asynchronous or synchronous RS232 mode. Only one MX Remote Node Controller can be attached to each RS232 line. This mode of operation allows the card to be connected to one or two MX remote Node Controllers via modems.

As the two lines are independent, one line could be set for RS485 operation for connection to one or two local MX Remote Node Controllers, and the other line for RS232 operation for connection to a remote MX Remote Node Controller via a modem link.

Note that jumpers need to be changed on the card if one or both of the lines are to be used for synchronous RS232 mode. No jumpers need to be changed if one or both lines are used for asynchronous RS232 mode.

Thus the supported configurations are:-

(a) Line-1: Single MX Remote Node Controller via RS485
Line-2: Not connected

(b) Line-1: Single MX Remote Node Controller via RS485
Line-2: Single MX Remote Node Controller via RS485

(c) Line-1: Two MX Remote Node Controllers via RS485
Line-2: Single MX Remote Node Controller via RS485

(d) Line-1: Two MX Remote Node Controllers via RS485
Line-2: Two MX Remote Node Controllers via RS485

(e) Line-1: Single MX Remote Node Controller via RS485
Line-2: Single MX Remote Node Controller via RS232

(f) Line-1: Two MX Remote Node Controllers via RS485
Line-2: Single MX Remote Node Controller via RS232

(g) Line-1: Single MX Remote Node Controller via RS232
Line-2: Not connected

(h) Line-1: Single MX Remote Node Controller via RS232
Line-2: Single MX Remote Node Controller via RS232

To set up a line for RS485 operation at a speed other than 1Mbps, or for RS232 operation, you must run the customisation program =.NNNN (where NNNN is the configuration number (e.g. 5700) as displayed by $S). Select option 6 from the =.NNNN main menu to enter the Hyper/MX customisation option. The following menu will be displayed:-

Hyper/MX Customisation

```
Customise number of cards.....1
Card-0 customisation.....2
Card-1 customisation.....3
Card-2 customisation.....4
Card-3 customisation.....5
Exit.....<CR>

Please select a function :
```

Select option-1 to customise the number of Hyperport cards. Select options 2, 3, 4 or 5 to customise the parameters for a particular card. For example:

```
Address lines A12-A19 (C0)
Interrupt level (10):
Allowed card types are:-
 0 = Hyperport
 1 = HyperMX
 2 = PCC/i
Specify card type ( 1):
Poll period [msecs] ( 0):
Number of connected nodes ( 0):
Ports per node ( 0):
Number of lines ( 0):
Allowed line types are:-
 0 = RS485 multi-drop driver
 2 = RS422 kilostream 64Kbps
 4 = RS232 point-to-point V32 sync
 6 = RS232 point-to-point async
Line-0 type ( 0):
Line-0 speed [bps/100] (  0):
Allowed line types are:-
 0 = RS485 multi-drop driver
 2 = RS422 kilostream 64Kbps
 4 = RS232 point-to-point V32 sync
 6 = RS232 point-to-point async
Line-1 type ( 0):
Line-1 speed [bps/100] (  0):
```

The Address lines, Interrupt level and Card type prompts allow the values specified using Global Configurator (see section 3.4.1) to be customised.

The Poll period should be set to 0 if both lines are running in RS485 mode. If one or both lines are running in RS232 mode, set the poll period to 99. Once the RS232 link is working, reducing the poll period may improve performance. For asynchronous RS232, the poll period should not be reduced below 80. For synchronous RS232, the poll period should not be reduced below 50.

The Number of connected nodes should be set to 1, 2, 3 or 4, depending on the number of MX Remote Node Controllers connected to the card.

The Number of ports per node should be set to 0.

The Number of lines should be set to 1 or 2, depending on whether you are using just the P1 line, or both the P1 and P2 lines from the card.

The Line type should be set to 0 for RS485 operation, 4 for synchronous RS232 operation or 6 for asynchronous RS232 operation. RS422 operation is not supported.

The Line speed should be set to 0 for 1Mbps RS485 operation. For 500kbps or 250 kbps RS485 operation, set the line speed to 5000 or 2500 respectively. For asynchronous RS232 operation, set the line speed to 384 or 192, depending on whether the serial link will run at 38400 or

19200 baud. For synchronous RS232 operation, set the line speed to 144.

If you wish to run one line in RS485 mode, and the other in RS232 mode, configure line 0 as the RS485 line.

Remember to set the switches on the MX Remote Node Controllers to correspond to the line settings on the card. Refer to the TCL Hardware Installation Manual for details of switch settings, and connections between the HyperMX card and MX Remote Node Controllers.

3.5 Troubleshooting

If the Hyperport sub-system fails during the bootstrap process (as evidenced by Hyperport screens reported by $STATUS as "NOT CONNECTED" or details of Hyperport printers missing from the information displayed by $U), a diagnostic mode may be enabled. In this diagnostic mode, error messages which indicate a problem with the Hyperport setup or hardware will appear on the master console (i.e. the console associated with the System Manager user 1) during the bootstrap process. These messages will only appear if the configuration file is renamed so that its last character is "D" (e.g. rename ++5700XJ to ++5700XD).

The following message indicates that the card has not been installed or the SW2 switch bank has been set to a different address from that in the configuration file. If the four-digit code (hhhh) is not FFFF, this message indicates that the address of the TCL Hyper/MX card clashes with another card installed in the computer:-

> AT Hyperport not installed hhhh

The following message indicates that the wrong interrupt jumper has been selected, or that the TCL Hyper/MX card has been entered as a TIS Hyperport card using Global Configurator:-

> No Hyperport interrupt

All the above messages are suffixed by the following extra information:-

> Card n Address aaaa Interrupt ii Window wKb MX

This additional message contains the pertinent configuration data for the failing Hyperport card. If the values displayed for the address and interrupt are all zeroes, then the configuration file has been created using an old version of the Action File which is incompatible with the version of the Hyperport driver you are using.

In addition to the diagnostic error messages described above, the following message may be displayed if the MCA TCL Hyper/MX card has not been added to the PS/2 "setup" information:-

> MCA Hyperport failed

The following initiation warnings may result on the Hyperport console controller +J5CB60 (+JWCB60), or the printer controller +J5CE60 (+JWCE60):-

> An Error "D" will result if the Hyperport card to which a port is attached failed to initialise. Other causes are an out of range port number, or an out of range node address, or by entering a given port for more than one console or printer with Global Configurator.
>
> An error "I" will result if an attempt is made to use a screen or printer with the wrong type of card, such as a "HYPERMX" screen with a TIS Hyperport card.

The following steps should be followed when installing a TCL Hyper/MX

sub-system for RS485 multi-drop operation. Please refer to the TCL documentation for further details:-

1. Install the ISA-bus TCL Hyper/MX adapter card, setting the two sets of switches and the interrupt jumpers as documented in section 3.3.1. For an MCA-bus TCL Hyper/MX adapter card, install as documented in section 3.3.2. Check the LK8, LK9, LK12, LK13, LK15, LK16, LK17 and LK18 links are installed corrected (refer to figure 6 in the TCL documentation).

2. Attach the "Y" external distribution cable (see section 4.3 of the TCL documentation). The 62-way, D-type male connector should be plugged into the TCL Hyper/MX. The two free ends each have 15-way, D-type connectors attached and are labelled "P1" and "P2".

3. To connect a single MX Remote Node Controller (i.e. node-1) set the switches on the box as follows:-

	Switch settings								
	1	2	3	4	5	6	7	8	9
Node-1	U	D	D	D	U	D	D	D	U

Using one of the longer 15-way D-type to 15-way D-type cables, connect the 15-way D-type connector marked "P1" on the "Y" external distribution cable to one of the 15-way D-type "LINE" connectors on node-1.

4. To connect two MX Remote Node Controllers (i.e. node-1 and node-2) set the switches on the boxes as follows:-

	Switch settings								
	1	2	3	4	5	6	7	8	9
Node-1	U	D	D	D	U	D	D	D	U
Node-2	D	U	D	D	U	D	D	D	U

Using one of the longer 15-way D-type to 15-way D-type cables, connect the 15-way D-type connector marked "P1" on the "Y" external distribution cable to one of the 15-way D-type "LINE" connectors on node-1. Using a second 15-way D-type to 15-way D-type cable, connect the 15-way D-type connector marked "P2" on the "Y" external distribution cable to one of the 15-way D-type "LINE" connectors on node-2.

5. To connect three MX Remote Node Controllers set the switches on the boxes as follows:-

	Switch settings								
	1	2	3	4	5	6	7	8	9
Node-1	U	D	D	D	U	D	D	D	D
Node-2	D	U	D	D	U	D	D	D	U
Node-3	U	U	D	D	U	D	D	D	U

Using one of the longer 15-way D-type to 15-way D-type cables, connect the 5-way D-type connector marked "P1" on the "Y" external distribution cable to one of the 15-way D-type "LINE" connectors on node-1. Using a second 15-way D-type to 15-way D-type cable, connect the 15-way D-type connector marked

"P2" on the "Y" external distribution cable to one of the 15-way D-type "LINE" connectors on node-2. Using a third 15-way D-type to 15-way D-type cable, connect the free 15-way D-type "LINE" connector on node-1 to one of the 15-way D-type "LINE" connectors on node-3.

6. To connect four MX Remote Node Controllers set the switches on the boxes as follows:-

	Switch settings								
	1	2	3	4	5	6	7	8	9
Node-1	U	D	D	D	U	D	D	D	D
Node-2	D	U	D	D	U	D	D	D	D
Node-3	U	U	D	D	U	D	D	D	U
Node-4	D	D	U	D	U	D	D	D	U

Using one of the longer 15-way D-type to 15-way D-type cables, connect the 15-way D-type connector marked "P1" on the "Y" external distribution cable to one of the 15-way D-type "LINE" connectors on node-1. Using a second 15-way D-type to 15-way D-type cable, connect the 15-way D-type connector marked "P2" on the "Y" external distribution cable to one of the 15-way D-type "LINE" connectors on node-2. Using a third 15-way D-type to 15-way D-type cable, connect the free 15-way D-type "LINE" connector on node-1 to one of the 15-way D-type "LINE" connectors on node-3. Using a fourth 15-way D-type to 15-way D-type cable, connect the free 15-way D-type "LINE" connector on node-2 to one of the 15-way D-type "LINE" connectors on node-4.

7. When the MX Remote Node Controller(s) are switched on, the segment display should flash a sequence of letters and numbers and eventually (after about 15 secs) flash between the designated node number (i.e. "1","2","3" or "4") and a "-". If the sequence does not stabilize to the simple number/hyphen combination, the MX Remote Node Controller is probably faulty. If the number is not that expected carefully check the DIP switch settings on the MX Remote Node Controller.

Note that the switches are only read by the firmware at power-on, thus if the switches are altered while the MX Remote Node Connector is powered up, no change will take place until the units are reset by turning the power off and on.

8. Use Global Configurator to add the required consoles (HYPERMX or TCLSYNC) and printers (HYPERMX or HYPERMXP) to the configuration file as described in section 3.4.1. Remember to add the Hyperport nucleus components in the NUCLEUS SECTION of the configuration file (see section 3.4.1).

9. When the reconfigured software is loaded, the flashing segment display should change to a stable display of the node number. If the segment display does not stabilise by the time the "PLEASE CONFIRM DATE/TIME" message appears check that node-4 (if present) is connected to node-2; node-3 (if present) is connected to node-1; node-2 (if present) is connected to line "P2" of the "Y" external distribution cable; node-1 is connected to line "P1" of the "Y" external distribution cable.

10. To change a line from RS485 multidrop operation to RS232 asynchronous operation, the following modifications are required:-

ISA-bus Hyper/MX card: No changes

MCA-bus Hyper/MX card: No changes

MX Remote Node Controller: No changes

Configuration: See section 3.4.2

11. To change a line from RS485 multidrop operation to RS232 synchronous operation, the following modifications are required:-

ISA-bus Hyper/MX card: For line P1:-
LK9: Change from AB to BC
LK16: A linked
B No link
C No link
For line P2:-
LK8: Change from AB to BC
LK15: A linked
B No link
C No link

MCA-bus Hyper/MX card: Modifications to the MCA-bus require re-soldering. This practise is NOT recommended. Please refer to the Hardware Dept. for more details.

MX Remote Node Controller: No changes

Configuration: See section 3.4.2

Connecting TCL Hyper/MX cards to MX Remote Node Controllers via modems is complex. It is strongly suggested to connect the card directly to the MX Remote Node Controller in asynchronous RS232 mode, to ensure the connection works before the modems are introduced. Connect the RS232 cable from the card to a breakout box. Connect the other side of the breakout box to the modem port on the MX Remote Node Controller. Set the connections on the breakout box to correspond to the following diagram:

```
Card      Device Server

2 (TX)  -------------------------3
3 (RX)  -------------------------2
7 (GND) -------------------------7
5 (CTS) ------|
6 (DSR) ------|
8 (DCD) ------|
20 (DTR) ------|
```

Lines 5, 6, 8 and 20 are wired together on the card side. Note that lines 2 and 3 are swapped over.

The TCL Hardware Installation Manual provides advice on using modems.

In general, you should always disable data compression on the modems. If you have problems getting the link to work, you should try disabling error correction as well.

The following example profiles are for the Interdial M5032/42b modem. The modem link is established by pressing the dial button on the modem connected to the TCL Hyper/MX card, after the computer has bootstrapped.

It is assumed that the TCL Hyper/MX card line and the MX Remote Node Controller have been configured for asynchronous RS232 operation at 38400 baud.

The profile for the modem connected to the TCL Hyper/MX card

should be as follows:-

```
AT&F        load factory default
ATX0        no extended codes
AT&K2       CTS flow control
AT&Q0       Async mode, no error control
ATF7        9600/9600 bps TCM
AT&I7       maximum connect code for above
ATS31=2     38400 baud speed lock
ATS2=128    disable escape
ATE0        echo off
AT&W0       write user profile 0
AT&Y0       default to user profile 0
ATZ0        load user profile 0
```

Note that the above does not include the number to dial. For the modem connected to the MX Remote Node Controller, the profile is almost identical. Insert the following command before the ATE0 command in the above:-

```
ATS0=1          auto answer mode
```

4. TCL PCC/I FAMILY

4.1 Introduction to the TCL PCC/i Family

The TCL PCC/i sub-system is an intelligent multi-channel communications sub-system which transforms an IBM AT or PS/2 compatible into a true multi-user computer. The sub-system consists of two major elements:-

- A co-processor card, which contains a 16MHz 80186 processor and 512Kb of dual ported RAM, is fitted into the host computer and provides the common interface for the serial ports. The co-processor card also contains the Zilog Z8530 UARTS. At bootstrap time a copy of the System Manager console executive is loaded into the on-board RAM which enables Global Cobol ACCEPT and DISPLAY statements to be executed with minimum overhead on the host processor. This intelligent, high-level interface avoids overloading the host processor and minimises performance decline as user numbers increase. The remainder of the RAM (approximately 400Kb) is used as a screen image buffer pool. A single screen image typically requires between 4Kb and 8Kb of storage. The co-processor card is available in both MCA and ISA-bus versions.

- A distribution cable connected to a 4-way fan-out arrangement (PCC/4i), an 8-way distribution box (PCC/8i) or a 16-way distribution box (PCC/16i). Each port of the PCC/i sub-system is presented as a 9-pin D-type male connector. The electrical interface is RS-232C and supports hardware handshaking for busy-line printers via the CTS line.

There are three types of TCL PCC/i card. The PCC/4i connects to a "fan-out" distribution cable containing 4 asynchronous ports, the PCC/8i connects to a distribution cable connected to a box containing 8 asynchronous ports, and the PCC/16i connects to a distribution cable connected to a box containing 16 asynchronous ports. NOTE THAT THE TCL PCC/4A CARD IS NOT SUPPORTED BY SYSTEM MANAGER.

Important note: The PCC/i cards and cables are NOT interchangeable. The PCC/16i cable/terminator box cannot be used with a TCL PCC/8i or PCC/4i card, and vice versa.

4.2 Related Documentation

The following TCL documentation which should accompany the hardware must

be read in conjunction with these notes:

Hardware installation manual

for the PCC/i range of intelligent
programmable communication
controllers.

Version 3.0a October 1992
1005.WP

IMPORTANT NOTE: The TCL documentation claims that "no interrupts are used by the device driver". While this statement is true for the Unix device drivers supplied by TCL, it does not apply to the System Manager device drivers. When reading the TCL documentation please disregard all references to interrupts.

4.3 Hardware Configuration

The pin connections of the 9-pin D-type male connectors on the TCL PCC/i distribution box are as follows:-

DCD (unused)	Pin 1 (ports 1 to 8 only)
Computer receives data via	Pin 2
Computer transmits data via	Pin 3
DTR (unused)	Pin 4 (ports 1 to 8 only)
Signal Ground	Pin 5
DSR (unused)	Pin 6 (ports 1 to 8 only)
RTS (unused)	Pin 7 (ports 1 to 8 only)
Busy-line (CTS)P	Pin 8
Not connected	Pin 9

4.3.1 ISA-bus TCL PCC/i Card

To observe the switch settings, view the PCB from the component side with the 62-way socket to your right so that the ISA-bus connector is at the bottom right.

The memory address of the 8Kb window on a ISA-bus TCL PCC/i card is selected by the bank of 8 toggle switches on the card (labelled SW2). Switches SW2-1 to SW2-8 correspond to address lines A12-A19, respectively. A bit is set by being switched to the OFF (down) position. Using address #C0000 as an example: First, truncate the last three digits, to leave #C0 (which is the value entered into the configuration file - see below). Translate this result into binary:

#C0 is equivalent to 11000000 binary

Use the binary result with the convention that off=1, on=0 and SW2-8 is the most significant bit:

SW1	1	2	3	4	5	6	7	8
ON	X	X	X	X	X	X		
OFF							X	X

Note that the factory default memory address is #D6000:-

SW2	1	2	3	4	5	6	7	8
ON	X			X		X		
OFF		X	X		X		X	X

The full range of possible address locations is described in appendix B of the TCL documentation.

Because the TCL PCC/i card is always fitted with 512Kb of RAM there is no equivalent to the SW1 switch bank that is present on the TIS

Hyperport and TCL Hyper MX cards.

The interrupt level of an ISA-bus TCL PCC/i card is selected by the use of the horizontal arrangement of 9 pairs of pins along the bottom of the card marked LK10, next to the expansion bus connector. AN INTERRUPT LEVEL MUST BE CONFIGURED FOR SYSTEM MANAGER EVEN THOUGH THE CARD IS NOT SUPPLIED WITH A SUITABLE LINK. Each pair of pins is clearly marked with the following interrupt levels: 3, 4, 5, 7, 9, 10, 11, 12, 15. The desired interrupt level is selected by placing a single jumper across the appropriately numbered pair of pins (i.e. all jumpers except for the one for the required level should be removed from this set of links). Note that interrupt level 10 is generally available on most computers. For example:-

```
   *  *  *  *  *  *  *  *  *
LK10 IRQ            |
   *  *  *  *  *  *  *  *  *
   3  4  5  7  9  10 11 2  15
```

4.3.2 MCA-bus TCL PCC/i Card

There are no switches or jumpers on the MCA-bus version of the TCL PCC/i card. Instead, the board configuration is stored in PS/2 Programmable Option Select (POS) registers which form part of the PS/2's battery-backed memory. The information is contained in a file called the Adapter Definition File (ADF) which is supplied to you on the option diskette which forms part of the MCA PCC/i package. You must transfer the ADF to the PS/2 Reference Diskette and then select the appropriate configuration data under control of the Setup Program on the Reference Diskette. The board may be configured to use interrupt levels 3, 10, 11 or 15.

The System Manager TCL PCC/i controller dynamically determines the number of cards, the memory address and the interrupt-level of the MCA bus card(s). However, the software controller does NOT determine the "card type" nor the "ports per node". These parameters MUST be established using Global Configurator (see below).

In a multiple card configuration, cards are numbered in the same order as the expansion slots they are plugged in to. For example, in a 2 card configuration, with one card in slot-3 and the other in slot-5, the card in slot-3 will be card-0 and the card in slot-5 will be card-1.

4.4 Software Configuration

Consoles and serial printers may be freely mixed on PCC/i cards. In the Console controller section of Global Configurator, use the controller PCC/I or TCLASYNC to configure a serial console on a PCC/i card. Note the TCLASYNC option, which is only supported if the nucleus variant is V4.1, or later, results in faster system throughput. In the Printer controller section of Global Configurator, use the controller PCC/I to configure a serial printer on a TCL PCC/i card. When using Global Configurator to add consoles and printers attached to a TCL PCC/i card, the following information is needed to specify a port:-

The PCC/i card number (between 0 and 3) to which the box containing the port is connected;

The channel number of the port. The channel number must be between 1 and 4 for a PCC/4i card, between 1 and 8 for a PCC/8i card or between 1 and 16 for a PCC/16i card. On the PCC/4i, the channel number is labelled on each connector of the 4-way "fan-out" cable. On the PCC/8i, the channel number is labelled next to each connector on the 8-way distribution box. On the PCC/16i, the channel number is labelled next to each connector on the 16-way distribution box. A special channel number of 0

will cause the lowest unused channel to be used.

The following information is needed to specify the line characteristics for a serial console:-

Console baud rate (see appendix A);

Console attribute byte (see appendix B).

The following information is needed to specify the line characteristics for a serial printer:-

Printer baud rate (see appendix A);

Printer attribute byte (see appendix C).

Details of each PCC/i card must be entered in the nucleus section of the configuration file. Reply "Y" to the Hyperport card required? prompt, and enter the number of Hyperport cards to the Number of Hyperport cards prompt. For each card, enter the top byte of the card address to the Card-n address lines (A12-A19) prompt (e.g. C0 for a card at address C0000), and the interrupt number to the Card-n interrupt level prompt. The Card-n type MUST be set to 2 for a TCL PCC/i card. The Ports per node MUST be set to the number of ports connected to the card (i.e. 4 for a PCC/4i card, 8 for a PCC/8i card or 16 for a PCC/16i card). For example, to set a single PCC/8i card at address #C0000 and interrupt level 11:-

```
Hyperport card required?          (Y):Y
 Load PCC/i Module               (ASP)
 Load HyperMX Module               (MXP)
 Load Hyperport debugger          (HY*)
 Load Hyperport module           (HYP)
 Number of Hyperport cards        (  1):1
 Card-0 addr. lines A12-A19       (#C0):C0
 Card-0 interrupt level          ( 10):11
 Card-0 Type (0=Hyperport,
  1=HyperMX, 2=PCC/i or Super)    (  0):2
 Ports per node (READ DOC'N!)     (  0):8
```

Regardless of the reply to the Number of Hyperport cards prompt Global Configurator will always prompt for 4 cards (i.e. card-0, card-1, card-2 and card-3). The various parameters for all non-existent cards (e.g. card-1, card-2 and card-3 on a single card configuration) should be set to 0.

4.5 Troubleshooting

If the Hyperport sub-system fails during the bootstrap process (as evidenced by Hyperport screens reported by $STATUS as "NOT CONNECTED" or details of Hyperport printers missing from the information displayed by $U), a diagnostic mode may be enabled. In this diagnostic mode, error messages which indicate a problem with the Hyperport setup or hardware will appear on the master console (i.e. the console associated with the System Manager user 1) during the bootstrap process. These messages will only appear if the configuration file is renamed so that its last character is "D" (e.g. rename ++5700XJ to ++5700XD).

The following message indicates that the card has not been installed or the SW2 switch bank has been set to a different address from that in the configuration file. If the four-digit code (hhhh) is not FFFF, this message indicates that the address of the TCL PC/i card clashes with another card installed in the computer:-

AT Hyperport not installed hhhh

The following message indicates that the wrong interrupt jumper has been

selected or the TCL PCC/i card has been entered as a TIS Hyperport card using Global Configurator:-

No Hyperport interrupt

If the number of ports per node entered is greater than the actual number of ports connected to the card, the following message may be displayed:-

Error from Hyperport 0003

All the above messages are suffixed by the following extra information:-

Card n Address aaaa Interrupt ii Window wKb MX

This additional message contains the pertinent configuration data for the failing Hyperport card. If the values displayed for the address and interrupt are all zeros, then the configuration file has been created using an old version of the Action File which is incompatible with the version of the Hyperport driver you are using.

In addition to the diagnostic error messages described above, the following message may be displayed if the MCA TCL PCC/i card has not been added to the PS/2 "setup" information:-

MCA Hyperport failed

The following Initiation Warnings may result on the Hyperport console controller +J5CB60 (+JWCB60), or the printer controller +J5CE60 (+JWCE60):-

An Error "D" will result if the Hyperport card to which a port is attached failed to initialise. Other causes are an out of range port number or by entering a given port for more than one console or printer with Global Configurator.

An error "I" will result if an attempt is made to use a screen or printer with the wrong type of card, such as a "PCC/I" screen with a TCL Hyper/MX card.

5. TCL SUPERPORT

5.1 Introduction to the TCL Superport

The TCL Superport sub-system is an intelligent multi-channel communications sub-system which transforms an IBM AT or PS/2 compatible into a true multi-user computer. The sub-system consists of two major elements:-

- A co-processor card, which contains a 20MHz 80186 processor and 1Mb of dual ported RAM, is fitted into the host computer and provides the common interface for the serial ports. At bootstrap time a copy of the System Manager console executive is loaded into the on-board RAM which enables Global Cobol ACCEPT and DISPLAY statements to be executed with minimum overhead on the host processor. This intelligent, high-level interface avoids overloading the host processor and minimises performance decline as user numbers increase. The remainder of the RAM (approximately 920Kb) is used as a screen image buffer pool. A single screen image typically requires between 4Kb and 8Kb of storage. The co-processor card is available in both MCA and ISA-bus versions either of which is suitable, unmodified, for any of the terminators.

- The terminator is a stand-alone mains powered unit of modular design. An 8-port base unit incorporates the power-supply and

support circuitry to interface to the Superport host adapter card through a high-performance 68-way cable. Up to 7 further expansion layers (8 serial ports per layer) may be fitted onto the Superport base to allow a configuration of up to 64 serial ports. The Superport layers are fitted with 9-pin D-type male connectors. As standard, the RS-232 lines are surge protected on all serial i/o lines and support hardware handshaking for busy-line printers via the CTS line. The terminator box must be powered up and the cable attached before the computer is bootstrapped. Never turn the terminator box off whilst the computer is in use. Doing so will hang the computer! Simply turning the box back on again will not restore the computer to a working state.

Only the TCL Superport-186 controller card, which features a 20MHz AMD 80c186 processor, is supported by System Manager. The related TCL Superport-RISC controller card, which features an IDT 3051 RISC processor is NOT supported.

Note also that Superport-186 cards with less than 1Mb of RAM are not supported.

5.2 Related Documentation

The following TCL documentation which should accompany the hardware must be read in conjunction with these notes:

Hardware installation Manual
for the
Superport range
of
Programmable Communications Controllers

26th April 1993

CD000090.002

IMPORTANT NOTE: The TCL documentation claims that "no interrupts are used by the device driver". While this statement is true for the Unix device drivers supplied by TCL, it does not apply to the System Manager device drivers. When reading the TCL documentation please disregard all references to interrupts.

5.3 Hardware Configuration

The pin connections of the 9-pin D-type male connectors on the TCL Superport distribution box are as follows:-

DCD (unused)	Pin 1
Computer receives data via	Pin 2
Computer transmits data via	Pin 3
DTR (unused)	Pin 4
Signal Ground	Pin 5
DSR (unused)	Pin 6
RTS (unused)	Pin 7
Busy-line (CTS)	Pin 8
RI (unused)	Pin 9

5.3.1 ISA-bus TCL Superport Card

To observe the switch settings, view the PCB from the component side with the 68-way socket to your right so that the ISA-bus connector is at the bottom right.

The memory address of the 8Kb window on a ISA-bus TCL Superport card is selected by the bank of 8 toggle switches on the bottom right of the card (labelled SW1). Switches SW1-1 to SW1-7 correspond to address

lines A13-A19, respectively (SW1-8 must always be set in the off position). NOTE THAT THESE SWITCH SETTINGS ARE DIFFERENT FROM THE SWITCH SETTINGS ON THE TIS HYPERPORT, TCL HYPER/MX AND TCL PCC/i CARDS. A bit is set by being switched to the OFF (down) position. Using address #C0000 as an example: First,truncate the last three digits, to leave #C0 (which is the value entered into the configuration file - see below). Translate this result into binary:

#C0 is equivalent to 11000000 binary

Use the binary result with the convention that off=1, on=0 and SW1-7 is the most significant bit:-

```
SW1   1   2  3   4   5  6   7  8
ON    X   X  X   X   X
OFF                  X   X  X
```

The least significant bit is ignored and SW1-8 is always set in the "off" position.

Note that the factory default memory address is #D6000:-

```
SW1   1   2  3   4   5  6   7  8
ON          X       X
OFF   X   X      X      X   X  X
```

The full range of possible address locations is described in appendix 2 of the TCL documentation.

Because the TCL Superport card is always fitted with 1Mb of RAM there is no equivalent to the SW1 switch bank that is present on the TIS Hyperport and TCL Hyper MX cards.

The interrupt level of an ISA-bus TCL Superport card is selected by the use of the horizontal arrangement of 9 pairs of pins along the bottom of the card marked LK7, next to the expansion bus connector. AN INTERRUPT LEVEL MUST BE CONFIGURED FOR SYSTEM MANAGER EVEN THOUGH THE CARD IS NOT SUPPLIED WITH A SUITABLE LINK. Each pair of pins is clearly marked with the following interrupt levels: 3, 4, 5, 7, 9, 10, 11, 12, 15. The desired interrupt level is selected by placing a single jumper across the appropriately numbered pair of pins (i.e. all jumpers except for the one for the required level should be removed from this set of links). Note that interrupt level 10 is generally available on most computers. For example:-

```
LK7   *   *  *   *   *  *   *  *  *
IRQ               |
      *   *  *   *   *  *   *  *  *
      3   4  5   7   9  10  11 12 15
```

5.3.2 MCA-bus TCL Superport Card

There are no switches or jumpers on the MCA-bus version of the TCL Superport card. Instead, the board configuration is stored in PS/2 Programmable Option Select (POS) registers which form part of the PS/2's battery-backed memory. The information is contained in a file called the Adapter Definition File (ADF) which is supplied to you on the option diskette which forms part of the MCA Superport package. You must transfer the ADF to the PS/2 Reference Diskette and then select the appropriate configuration data under control of the Setup Program on the Reference Diskette. The board may be configured to use interrupt levels 3, 10, 11 or 15.

The System Manager TCL Superport controller dynamically determines the number of cards, the memory address and the interrupt-level of the MCA

bus card(s). However, the software controller does NOT determine the "card type" nor the "ports per node". These parameters MUST be established using Global Configurator (see below).

In a multiple card configuration, cards are numbered in the same order as the expansion slots they are plugged in to. For example, in a 2 card configuration, with one card in slot-3 and the other in slot-5, the card in slot-3 will be card-0 and the card in slot-5 will be card-1.

5.4 Software Configuration

Consoles and serial printers may be freely mixed on Superport cards. In the Console controller section of Global Configurator, use the controller PCC/I (sic) or TCLASYNC to configure a serial console on a TCL Superport card. Note the TCLASYNC option, which is only supported if the nucleus variant is V4.1, or later, results in faster system throughput. In the Printer controller section of Global Configurator, use the controller PCC/I (sic) to configure a serial printer on a TCL Superport card. When using Global Configurator to add consoles and printers attached to a TCL Superport card, the following information is needed to specify a port:-

The Superport card number (between 0 and 3) to which the box containing the port is connected;

The channel number (between 1 and 64) of the port. The channel number is determined as follows:-

Base-unit:	Channel-1 (LHS) to channel-8 (RHS)
Next unit:	Channel-9 (LHS) to channel-16 (RHS)
Next unit:	Channel-17 (LHS) to channel-24 (RHS)
Next unit:	Channel-25 (LHS) to channel-32 (RHS)
Next unit:	Channel-33 (LHS) to channel-40 (RHS)
Next unit:	Channel-41 (LHS) to channel-48 (RHS)
Next unit:	Channel-49 (LHS) to channel-56 (RHS)
Next unit:	Channel-57 (LHS) to channel-64 (RHS)

A special channel number of 0 will cause the lowest unused channel to be used.

The following information is needed to supply the line characteristics for a serial console:-

Console baud rate (see appendix A);

Console attribute byte (see appendix B).

The following information is needed to specify the line characteristics for a serial printer:-

Printer baud rate (see appendix A);

Printer attribute byte (see appendix C).

Details of each Superport card must be entered in the nucleus section of the configuration file. Reply "Y" to the Hyperport card required? prompt, and enter the number of Hyperport cards to the Number of Hyperport cards prompt. For each card, enter the top byte of the card address to the Card-n address lines (A12-A19) prompt (e.g. C0 for a card at address C0000), and the interrupt number to the Card-n interrupt level prompt. The Card-n type MUST be set to 2 for a TCL Superport card. The Ports per node MUST be set to the number of ports connected to the card (e.g. 8 for a Superport base-unit, 16 for a Superport base-unit with 1 modular layer, 64 for a Superport base-unit with 7 modular layers). For example, to set a fully populated Superport sub-system (i.e. base-unit with 7 modular layers) at address #C0000 and interrupt level 11:-

```
Hyperport card required?          (Y):Y
 Load PCC/i Module               (ASP)
 Load HyperMX Module              (MXP)
 Load Hyperport debugger          (HY*)
 Load Hyperport module            (HYP)
 Number of Hyperport cards         (  1):1
 Card-0 addr. lines A12-A19        (#C0):C0
 Card-0 interrupt level          (  10):11
 Card-0 Type (0=Hyperport,
  1=HyperMX, 2=PCC/i or Super)     (  0):2
 Ports per node (READ DOC'N!)     (  0):64
```

Regardless of the reply to the Number of Hyperport cards prompt Global Configurator will always prompt for 4 cards (i.e. card-0, card-1, card-2 and card-3). The various parameters for all non-existent cards (e.g. card-1, card-2 and card-3 on a single card configuration) should be set to 0.

5.5 Troubleshooting

If the Hyperport sub-system fails during the bootstrap process (as evidenced by Hyperport screens reported by $STATUS as "NOT CONNECTED" or details of Hyperport printers missing from the information displayed by $U), a diagnostic mode may be enabled. In this diagnostic mode, error messages which indicate a problem with the Hyperport setup or hardware will appear on the master console (i.e. the console associated with the System Manager user 1) during the bootstrap process. These messages will only appear if the configuration file is renamed so that its last character is "D" (e.g. rename ++5700XJ to ++5700XD).

The following message indicates that the card has not been installed or the SW1 switch bank has been set to a different address from that in the configuration file. If the four-digit code (hhhh) is not FFFF, this message indicates that the address of the TCL Superport card clashes with another card installed in the computer:-

```
AT Hyperport not installed hhhh
```

The following message indicates that the wrong interrupt jumper has been selected or the TCL Superport card has been entered as a TIS Hyperport card using Global Configurator:-

```
No Hyperport interrupt
```

If the number of ports per node entered is greater than the actual number of ports connected to the card, the following message may be displayed:-

```
Error from Hyperport 0003
```

All the above messages are suffixed by the following extra information:-

```
Card n Address aaaa  Interrupt ii Window wKb  MX
```

This additional message contains the pertinent configuration data for the failing Hyperport card. If the values displayed for the address and interrupt are all zeroes, then the configuration file has been created using an old version of the Action File which is incompatible with the version of the Hyperport driver you are using.

In addition to the diagnostic error messages described above, the following message may be displayed if the MCA TCL Superport card has not been added to the PS/2 "setup" information:-

```
MCA Hyperport failed
```

The following Initiation Warnings may result on the Hyperport console controller +J5CB60 (+JWCB60), or the printer controller +J5CE60 (+JWCE60):-

An Error "D" will result if the Hyperport card to which a port is attached failed to initialise. Other causes are an out of range port number or by entering a given port for more than one console or printer with Global Configurator.

An error "I" will result if an attempt is made to use a screen or printer with the wrong type of card, such as a "PCC/I" screen with a TCL Hyper/MX card.

Note that the TCL documentation claims that the TCL Superport-186 adapter card can be used in an ISA 8-bit expansion slot. This option may not work on all IBM PC compatibles and is not supported by the software drivers supplied by TIS Software.

6. MEMORY ALLOCATION ON THE TCL INTELLIGENT I/O FAMILY

As explained in earlier sections, when System Manager is bootstrapped a copy of the Console Executive is loaded into the on-board RAM which enables Global Cobol ACCEPT and DISPLAY statements to be executed with minimum overhead on the host processor. This intelligent, high-level interface avoids overloading the host processor and minimises performance decline as user numbers increase. In addition to the Console Executive, the various Hyperport device drivers are also loaded onto the co-processor card. The remainder of the RAM is used as a screen image buffer pool.

By using the memory available on the co-processor card to hold the memory-hungry screen images it is possible to build very large multi-user System Manager configurations using Hyperport i/o sub-systems. Such multi-user configurations are generally very much larger than those possible using non-intelligent serial i/o sub-systems (e.g. Arnet Multiport, Arnet Smartport, Baydel SMUX). However, the amount of memory on the co-processor cards is finite and certain restrictions apply. This section describes the calculations necessary to estimate the number of screen partitions that can be included in a multi-user Hyperport configuration.

Some of the memory on the co-processor card is occupied by the Console Executive, Hyperport device drivers, interrupt vectors, machine-code stack and fixed window. The following table gives a guide to the amount of memory available for screen images on the various members of the Hyperport family:-

Card type	Available memory (Kb)
TIS Hyperport (512b RAM option)	442
TIS Hyperport (1Mb RAM option)	954
TCL Hyper/MX (512Kb RAM option)	408
TCL Hyper/MX (1Mb RAM option)	920
TCL PCC/i (512Kb RAM always)	408
TCL Superport-186 (1Mb RAM always)	920

When calculating the memory occupied by screen images, the following parameters in the configuration data must be considered:-

Type-ahead buffer length (t)
Display buffer length (b)
Function-key buffer size (f)
Screen image width (w)
Screen image depth (d)
Number of stored attribute bytes (a)

Number of partitions (p)
Character translation enabled (x=896 if Y; x=0 if N)

The amount of memory occupied by the screen images for a single HYPER, HYPERMX, PCC/I, TCLSYNC or TCLASYNC console is given by this equation:-

((((a + 1) * w * d) + b + t) * p) + f + x + 516

So, the amount of memory occupied by the screen images etc. for the following example HYPER console entry:-

```
CONTROLLER (HYPER):       Console on BOS/Hyperport card
TYPE AHEAD BUFFER LENGTH              ( 1000):
DISPLAY BUFFER LENGTH                 ( 1000):
FUNCTION KEY BUFFER LENGTH            ( 1000):
SCREEN IMAGE WIDTH                    ( 132):
SCREEN IMAGE DEPTH                    (  24):
NUMBER OF STORED ATTR' BYTES          (  1):
NUMBER OF PARTITIONS                  (  8):
CHARACTER TRANSLATION ENABLED         (Y):
CONSOLE EXECUTIVE FLAG BYTE           (#00):
Hyperport card number (0-3)           (  0):
Channel number (1 to 24)              (  3):
Console baud rate                     ( 38400):
Console attribute byte                (#F4):
```

is given by:-

((((1 + 1) * 132 * 24) + 1000 + 1000) * 8) + 1000 + 896 + 516

which is approximately 67Kb.

If the total size of the screen images etc. exceeds the amount of available memory on the co-processor, card partitions will be dynamically removed from the configuration (without any accompanying error messages). The only evidence of the truncated configuration will be the $STATUS report which will exclude the partitions or screens that are specified in the configuration file (i.e. the last few screens will be absent from the $STATUS report). However, under some conditions, the computer may crash during the bootstrap if the total size of the screen images etc. exceeds the amount of available memory on the co-processor card. For this reason, we strongly advise the following procedure be followed when building a large multi-user Hyperport configuration file:-

1) Add the desired Hyperport card(s) to the configuration file with a single HYPER, HYPERMX, PCC/I, TCLSYNC or TCLASYNC specified for each card. This will allow you to check that the hardware parameters in the configuration file (e.g. card-address, interrupt-vector etc.) are correct.

2) When the single screen Hyperport configuration has been bootstrapped and is functioning correctly, gradually add screens and printers until the target configuration is obtained. Note that the addition of HYPER, HYPERMX, HYPERMX or PCC/I printers has a negligible effect on memory allocation on the co-processor card.

The following zap can be applied to the V4.1 +J5NHYP module to display the co-processor memory allocation, during bootstrap, on the Hyperport console configured on channel-1:-

```
ZZZZZZ
GVWYZN
GZGWKH
```

HHRQGM
HLHRDC
QXMGSL
VMCLXL
FLGBRZ

The diagnostic information is displayed at 9600 baud, 8-data bits, 1 stop-bit and no parity.

The following information is displayed:-

IHMEM	PTR1	CNT1	PTR2	CNT2	LIMIT	CBF	NCB	NO.
hhhh hhhh	hhhh	hhhh	hhhh	hhhh	hhhh	hh	hh	hh
hhhh hhhh	hhhh	hhhh	hhhh	hhhh	hhhh	hh	hh	hh
hhhh hhhh	hhhh	hhhh	hhhh	hhhh	hhhh	hh	hh	hh
hhhh hhhh	hhhh	hhhh	hhhh	hhhh	hhhh	hh	hh	hh

etc.

All word-values, hhhh, and byte-values, hh, are displayed in hexadecimal.

The double-word values in the IHMEM column contain the value of the high-memory limit AFTER the control blocks for the particular console have been allocated.

The word values in the PTR1 column contain the values of the incremental pointer in the nucleus segment which is used for CB-block allocation.

The word values in the CNT1 column contain the values of the decrementing count in the nucleus segment which is used for CB-block allocation.

The word values in the PTR2 column contain the values of the incremental pointer in the nucleus segment which is used for UDF-block allocation.

The word values in the CNT2 column contain the values of the decrementing count in the nucleus segment which is used for UDF-block allocation.

The word values in the LIMIT column contain the start address of the +J5NHYP module.

The byte values in the CBF column should start from 00 but may change to 01 for entries at the end of the table. The values in this column show the state of the flag which indicates where the CB-blocks are being allocated.

The byte values in the NCB column indicate the number of partitions that were successfully allocated for the particular screen. If this value is less than the number of partitions specified in the configuration file then the memory allocator has dynamically removed a partition. If this value is 00 then the memory allocator has dynamically removed an entire screen.

The byte values in the NO. column count the screens configured on the Hyperport card. This count simply increments from 01 up to the number of screens in the configuration file. This number is NOT related to the Hyperport channel number which is not displayed by the diagnostic option.

APPENDIX A - CONSOLE AND PRINTER BAUD-RATES

The following baud-rates are allowed for the HYPER console controller and HYPER printer controller:-

300
600
1200
2400
4800
9600
19200
38400

If the value in the configuration file does not match any of the above values a default of 9600 is used.

The following baud-rates are allowed for the HYPERMX console controller, PCC/I console controller. TCLASYNC console controller, TCLSYNC console controller, HYPERMX printer controller and PCC/I printer controller.

50
62
75
110
134
150
200
300
600
1200
1800
2000
2400
3600
4800
7200
9600
19200
38400
57600
76800 (entered as 7680 in configuration file)
115200 (entered as 11520 in configuration file).

If the value in the configuration file does not match any of the above values a default of 9600 is used.

APPENDIX B - CONSOLE ATTRIBUTE BYTES

The console attribute byte for the HYPER console controller is defined as follows:-

Bits-1, 0	x0	No parity
	01	Odd parity
	11	Even Parity
Bits-3, 2	00	Invalid
	01	1 stop bit
	10	1.5 stop bits
	11	2 stop bits
Bits-5, 4	00	5 Tx data bits
	01	7 Tx data bits (sic)
	10	6 Tx data bits (sic)
	11	8 Tx data bits
Bits-7, 6	00	5 Rx data bits
	01	7 Rx data bits (sic)
	10	6 Rx data bits (sic)
	11	8 Rx data bits

The default value of #F4 specifies:-

8 Tx data bits
8 Rx data bits
1 stop bit
No parity

The console attribute byte for the HYPERMX console controller, PCC/I console controller, TCLASYNC console controller and TCLSYNC console controller is defined as follows:-

Bits-1, 0	x0	No parity
	01	Odd parity
	11	Even parity
Bits-3, 2	00	Invalid
	01	1 stop bit
	10	1.5 stop bits
	11	2 stop bits
Bits-5, 4	00	5 Rx & Tx data bits
	01	7 Rx & Tx data bits (sic)
	10	6 Rx & Tx data bits (sic)
	11	8 Rx & Tx data bits
Bits-7, 6	00	CTS Tx flow control
	01	XON/XOFF Tx flow control
	10	XON/XOFF Tx & Rx flow control
	11	XON/XOFF Tx flow control

The default value of #F4 specifies:-

XON/XOFF flow control
8 Rx & Tx data bits
1 stop bit
No parity

APPENDIX C - PRINTER ATTRIBUTE BYTES

The printer attribute byte for the HYPER printer controller, HYPERMX printer controller and PCC/I printer controller is defined as follows:-

Bits-1, 0	x0	No parity
	01	Odd parity
	11	Even parity
Bits-3, 2	00	Invalid
	01	1 stop bit
	10	1.5 stop bits
	11	2 stop bits
Bits-5, 4	00	5 Rx & Tx data bits
	01	7 Rx & Tx data bits (sic)
	10	6 Rx & Tx data bits (sic)
	11	8 Rx & Tx data bits
Bit-6	0	CTS Tx flow control (busy-line)
	1	XON/XOFF Tx flow control
Bit-7	0	If character sent after CR
	1	No LF, after CR character

The default value of #74 specifies:-

8 Rx & Tx data bits
1 stop bit
No parity