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830x/835x SERIES VME 64x -DIGITAL I/O TRANSITION CARDS.

USERS MANUAL

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1. Introduction.

The 830x/5x series is a range of VME64 extensions transition cards designed to interface the 8001 Digital I/O VME64x card to plant signals. Physically, the cards are 80mm deep (or 160mm deep, in the case of the 835x versions), with inject/eject handles, ESD discharge tracks and EMI spring strips. Electrically, the cards pick up 5-volt power from the VME64x backplane, which is fused on the card, and connect to a total of 75 TTL-level signals, which interface the 830x series transition card to the 8001. 64 of the lines are plant input/output signals; 8 are input/output 'strobe' signals and three are transition card 'type' signals which the 8001 uses to identify the 830x series cards. The transition cards all have four 50-way high-density mini-delta or SCSI-II socket connectors for plant signals. Each connector carries 16 plant I/O signals, usually in signal pairs, along with one input and one output 'strobe' signal and normally an isolated 'wetting' power supply for I/O signal energising. One card type is an exception to this restriction and that is the 8304 or 8354, the straight-through transition card, which simply connects all 50 signals to each of the rear SCSI II connectors and is normally used with the 8002 Industry Pack Carrier board.

853x Types

In the descriptions in the following pages, the reference 8301, 8302 etc should be taken to include the 160mm version of the same card, that is 8351, 8352 etc since they are electrically identical.

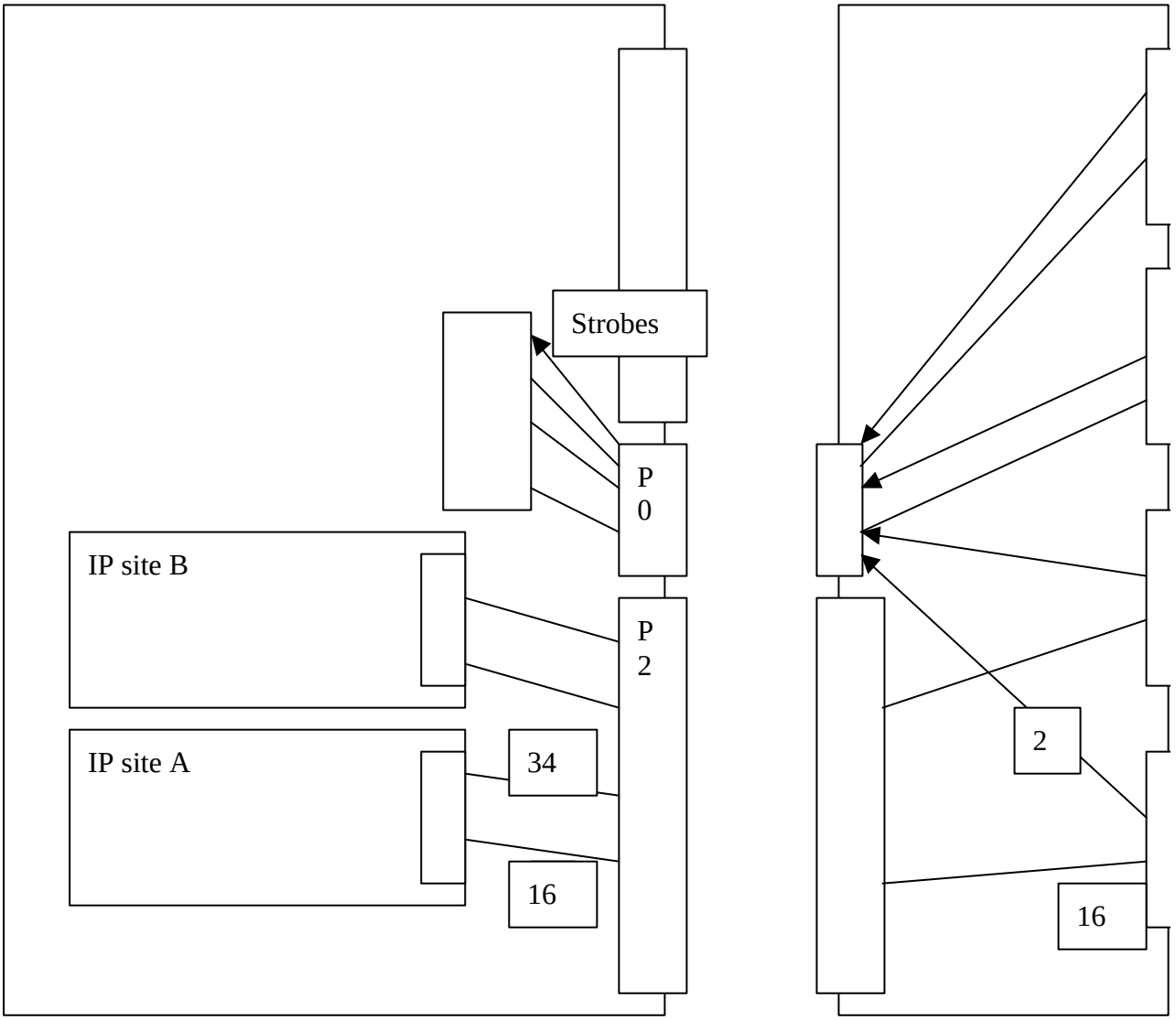
2. 8001 Interface.

As mentioned above, there are a total of 75 actual TTL signals passing between the 8001 and the transition card. There are in fact 200 connection points on the VME64x backplane assigned to I/O signals, in accordance with the Greenspring convention for connecting the I/O ports of Industry Packs (IPs) to their rear-panel connectors.

Since the 8001 is allowed to carry Industry Packs in sites A and B (corresponding to the lower two connectors on the rear panel of the transition card), the 50 lines assigned to each of the I/O connectors for these IP positions are all connected to their designated points on P2 and P0 at the rear of the 8001 board. Only 16 of them are in fact used on each path to carry I/O signals to and from the backplane.

Thus two sets of 16 input/output signals are connected via the IP sites' I/O connectors and a further 32 I/O signals have their own set of bi-directional buffers on the 8001, connected to the rear transition card via P0. Again, only 16 out of each set of 50 lines are used for this, and the unused signals are either grounded, used for strobe signals or for transition card 'type' signals.

The picture below attempts to show the paths of these signals. The card ‘type’ signals also pass through P0, using spare signal paths from the D IP site allocation.



Notice how 16 actual I/O lines and 34 ‘spares’ connect each IP site and the transition card connectors and how two strobe lines from each connector are collected at P0 and brought through along with the site D signals.

The connectors down the right-hand side of the picture are the I/O connectors. The lowest one connects signals 0-15; the next one up, signals 16-31, and so on.

3. Transition Card Types.

At the time of writing, the 8300 series consists of 5 types. All perform some buffering or signal conditioning except one. This is the 8304, which is a straight-through card for any IP carrier or I/O card. It is not intended to be used with the 8001 since it has no card type lines and cannot therefore be identified by the 8001.

The 8300 series is as follows:

Card Type	Function	Code
8301	64 optically isolated inputs	000
8302	64 TTL inputs or outputs	100 *
8303	64 optically isolated outputs	101
8304	Straight-through	
8305	32 inputs and 32 outputs, all opto-isolated.	110

- (*) The 8302 is fitted with a jumper to select input or output mode. Inserting this jumper to select input mode changes the code to 000.

The code referred to in the above table shows how the transition card 'type' signals appear in the CSR CB register of the 8001 card in the order shown below:

Status (Read)
Address: Base + 08

D15	D14	D13	D12	D11	D10	D09	D08	D07	D06	D05	D04	D03	D02	D01	D00
T0	T1	T2	HYTEC IP	MEM SIZE	NU	NU	NU	NU	BADD SEL	IPCLK SEL	INTSEL 2	INTSEL 1	INTSEL 0	INTEN	Rst

4. The 8301 in more detail.

The 8301 has four sets of 16 opto-isolated inputs, each with an input strobe, an output strobe, and access to an isolated 24-volt power supply. In common with all the other transition cards, the pin convention at the rear panel is that the 'signal' is the more positive voltage and the 'return' is the lower voltage. The pin connections for connector A are shown on the next page:

8001 set-up for the 8301: In order that the input signals connected to the 8301 can be seen by the 8001, it must be placed in INPUT mode, with its scan enabled and a scan clock source active. This involves writing '00' to the 'direction' or input/output mode selection bits of the CSR IO register, bits 11 and 10.

Pin assignments for Hytec 8001 digital input module and 8301 Transition cards.

Source	Signal name	Backplane connection	Rear conn. pin	External Signal
IP.A.01	Data A.1	P2.A.6	SCSI.A.26	INPUT 0
IP.A.02	Return A.1	P2.C.6	SCSI.A.1	INPUT 0 RETURN
IP.A.03	Data A.2	P2.A.7	SCSI.A.27	INPUT 1
IP.A.04	Return A.2	P2.C.7	SCSI.A.2	INPUT 1 RETURN
IP.A.05	Data A.3	P2.A.8	SCSI.A.28	INPUT 2
IP.A.06	Return A.3	P2.C.8	SCSI.A.3	INPUT 2 RETURN
IP.A.07	Data A.4	P2.A.9	SCSI.A.29	INPUT 3
IP.A.08	Return A.4	P2.C.9	SCSI.A.4	INPUT 3 RETURN
IP.A.09	Data A.5	P2.A.10	SCSI.A.30	INPUT 4
IP.A.10	Return A.5	P2.C.10	SCSI.A.5	INPUT 4 RETURN
IP.A.11	Data A.6	P2.A.11	SCSI.A.31	INPUT 5
IP.A.12	Return A.6	P2.C.11	SCSI.A.6	INPUT 5 RETURN
IP.A.13	Data A.7	P2.A.12	SCSI.A.32	INPUT 6
IP.A.14	Return A.7	P2.C.12	SCSI.A.7	INPUT 6 RETURN
IP.A.15	Data A.8	P2.A.13	SCSI.A.33	INPUT 7
IP.A.16	Return A.8	P2.C.13	SCSI.A.8	INPUT 7 RETURN
IP.A.17	Data A.9	P2.A.14	SCSI.A.34	INPUT 8
IP.A.18	Return A.9	P2.C.14	SCSI.A.9	INPUT 8 RETURN
IP.A.19	Data A.10	P2.A.15	SCSI.A.35	INPUT 9
IP.A.20	Return A.10	P2.C.15	SCSI.A.10	INPUT 9 RETURN
IP.A.21	Data A.11	P2.A.16	SCSI.A.36	INPUT 10
IP.A.22	Return A.11	P2.C.16	SCSI.A.11	INPUT 10 RETURN
IP.A.23	Data A.12	P2.A.17	SCSI.A.37	INPUT 11
IP.A.24	Return A.12	P2.C.17	SCSI.A.12	INPUT 11 RETURN
IP.A.25	Data A.13	P2.A.18	SCSI.A.38	INPUT 12
IP.A.26	Return A.13	P2.C.18	SCSI.A.13	INPUT 12 RETURN
IP.A.27	Data A.14	P2.A.19	SCSI.A.39	INPUT 13
IP.A.28	Return A.14	P2.C.19	SCSI.A.14	INPUT 13 RETURN
IP.A.29	Data A.15	P2.A.20	SCSI.A.40	INPUT 14
IP.A.30	Return A.15	P2.C.20	SCSI.A.15	INPUT 14 RETURN
IP.A.31	Data A.16	P2.A.21	SCSI.A.41	INPUT 15
IP.A.32	Return A.16	P2.C.21	SCSI.A.16	INPUT 15 RETURN
IP.A.33	Data A.17	P2.A.22	SCSI.A.42	
IP.A.34	Return A.17	P2.C.22	SCSI.A.17	
IP.A.35	Data A.18	P2.A.23	SCSI.A.43	
IP.A.36	Return A.18	P2.C.23	SCSI.A.18	
IP.A.37	Data A.19	P2.A.24	SCSI.A.44	STROBE I/P
IP.A.38	Return A.19	P2.C.24	SCSI.A.19	STROBE I/P RETURN
IP.A.39	Data A.20	P2.A.25	SCSI.A.45	
IP.A.40	Return A.20	P2.C.25	SCSI.A.20	
IP.A.41	Data A.21	P2.A.26	SCSI.A.46	
IP.A.42	Return A.21	P2.C.26	SCSI.A.21	
IP.A.43	Data A.22	P2.A.27	SCSI.A.47	STROBE O/P
IP.A.44	Return A.22	P2.C.27	SCSI.A.22	STROBE O/P RETURN
IP.A.45	Data A.23	P2.A.28	SCSI.A.48	
IP.A.46	Return A.23	P2.C.28	SCSI.A.23	
IP.A.47	Data A.24	P2.A.29	SCSI.A.49	
IP.A.48	Return A.24	P2.C.29	SCSI.A.24	
IP.A.49	Data A.25	P2.A.30	SCSI.A.50	Isolated 0 volts
IP.A.50	Return A.25	P2.C.30	SCSI.A.25	Isolated +24 volts

Input/output signal levels

The 8301's input circuit is designed to accept any voltage from 3 to 24 volts at a current of around 5 milliamps. When any input signal (including the strobe input) is at 3 volts or more with respect to

its return signal, the corresponding opto-coupler will be energised and its output will be low, presenting a logic ‘0’ to the 8001 input scanning circuit.

The strobe output circuit consists of the collector and emitter of an opto-coupler. The collector is connected to the ‘signal’ side and the emitter to the ‘return’ side. When the output strobe signal is active, the transistor will conduct, passing up to 5 milliamps at a collector-emitter voltage of up to 0.5 volts. In the off state, the collector-emitter voltage may be up to 24 volts.

All inputs and outputs are fully protected against reverse and over-voltage. Over-voltage occurs at +27 volts and the reverse voltage limit is –0.7 volts.

The isolated 24-volt power supply, which is common to all four input connectors and can supply a maximum of 40 milliamps total, is intended for energising voltage-free contacts for connection to the isolated (passive) optically-coupled inputs.

5. The 8302 in more detail.

The 8302 has four sets of 16 buffered TTL input/output signals, each with an input strobe and an output strobe. In common with all the other transition cards, the pin convention at the rear panel is that the ‘signal’ is the more positive voltage and the ‘return’ is the lower voltage.

Each input/output signal at the rear-panel connector has a 1Kohm pull-up resistor for use with volt-free contact or open-collector input sources. In output mode, the buffered signals can drive up to 24 milliamps in the low state at an output voltage of 0.44 volts maximum and up to 24 milliamps in the high state at an output voltage of 3.80 volts minimum. It is therefore quite possible to directly connect an 8302 in output mode to an 8301 in input mode.

The selection of input or output mode is performed by a jumper, JP1. When the jumper is IN, the I/O signals are INPUTs and the card type reads ‘000’; when the jumper is OUT, the signals are OUTPUTS and the card type reads ‘100’. JP1 also controls the direction of the strobe signals, subject to JP2 and JP3, see below. The latest revision of the 8001 card Xilinx program, version V301, allows the 8001 to control the data direction of the 8302 card. When this is used, jumper JP1 is left OUT and the card ID is always read as ‘100’. Control of the IN/OUT selection on the 8302 is now controlled by the direction bits 10 and 11 in the CSR IO register automatically.

8001 set-up for the 8302: When the 8302 is in INPUT mode, in order that the input signals connected to the 8302 can be seen by the 8001, it must be placed in INPUT mode, with its scan enabled and a scan clock source active. This involves writing ‘00’ to the ‘direction’ or input/output mode selection bits of the CSR IO register, bits 11 and 10.

When the 8302 is in OUTPUT mode, in order that the output signals connected to the 8302 can be driven by the 8001, it must be placed in OUTPUT mode, with its scan disabled. This involves writing ‘11’ to the ‘direction’ or input/output mode selection bits of the CSR IO register, bits 11 and 10.

There are two other jumpers on the 8302 card, jumpers JP2 and JP3. These control the function of the input and output strobe signals. With JP3 fitted and JP2 absent, the I/O connector pins corresponding to the input and output strobes on this card will follow the normal convention for transition cards. With JP3 absent and JP2 fitted, the functions are reversed; input strobe becomes output strobe and so on.

The purpose of these jumpers is to ensure that in normal mode, when JP1 is fitted, the strobe signals will have the same function as those on an 8301, and when JP1 is out, they will be the same as on an 8303 output transition card. This removes the need for the strobe signals to be swapped over in a cable connecting two of these cards.

When JP2 and JP3 are fitted in the non-standard positions, the exact opposite is true. All 8302 cards should be operated with JP3 IN and JP2 OUT.

6. The 8303 in more detail.

The 8303 has four sets of 16 opto-isolated outputs, each with an input strobe, an output strobe, and access to an isolated 24-volt power supply. In common with all the other transition cards, the pin convention at the rear panel is that the 'signal' is the more positive voltage and the 'return' is the lower voltage.

8001 set-up for the 8303: In order that the output signals connected to the 8303 can be driven by the 8001, it must be placed in OUTPUT mode, with its scan disabled. This involves writing '11' to the 'direction' or input/output mode selection bits of the CSR IO register, bits 11 and 10.

Input/output signal levels

The 8303's output circuit consists of the collector and emitter of an opto-coupler. The collector is connected to the 'signal' side and the emitter to the 'return' side. When the output signal is active, the transistor will conduct, passing up to 5 milliamps at a collector-emitter voltage of up to 0.5 volts. In the off state, the collector-emitter voltage may be up to 24 volts.

The strobe input circuit is designed to accept any voltage from 3 to 24 volts at a current of around 5 milliamps. When the strobe input is at 3 volts or more with respect to its return signal, the corresponding opto-coupler will be energised and its output will be low, presenting a logic '0' to the 8001 card.

All inputs and outputs are fully protected against reverse and over-voltage. Over-voltage occurs at +27 volts and the reverse voltage limit is –0.7 volts.

The isolated 24-volt power supply, which is common to all four output connectors and can supply a maximum of 40 milliamps total, is intended for energising voltage-free contacts for connection to the isolated (passive) optically-coupled inputs.

Pin assignments for Hytec 8001 digital input module and 8303 Transition cards.

Source	Signal name	Backplane connection	Rear conn. pin	External Signal
IP.A.01	Data A.1	P2.A.6	SCSI.A.26	OUTPUT 0
IP.A.02	Return A.1	P2.C.6	SCSI.A.1	OUTPUT 0 RETURN
IP.A.03	Data A.2	P2.A.7	SCSI.A.27	OUTPUT 1
IP.A.04	Return A.2	P2.C.7	SCSI.A.2	OUTPUT 1 RETURN
IP.A.05	Data A.3	P2.A.8	SCSI.A.28	OUTPUT 2
IP.A.06	Return A.3	P2.C.8	SCSI.A.3	OUTPUT 2 RETURN
IP.A.07	Data A.4	P2.A.9	SCSI.A.29	OUTPUT 3
IP.A.08	Return A.4	P2.C.9	SCSI.A.4	OUTPUT 3 RETURN
IP.A.09	Data A.5	P2.A.10	SCSI.A.30	OUTPUT 4
IP.A.10	Return A.5	P2.C.10	SCSI.A.5	OUTPUT 4 RETURN
IP.A.11	Data A.6	P2.A.11	SCSI.A.31	OUTPUT 5
IP.A.12	Return A.6	P2.C.11	SCSI.A.6	OUTPUT 5 RETURN
IP.A.13	Data A.7	P2.A.12	SCSI.A.32	OUTPUT 6
IP.A.14	Return A.7	P2.C.12	SCSI.A.7	OUTPUT 6 RETURN
IP.A.15	Data A.8	P2.A.13	SCSI.A.33	OUTPUT 7
IP.A.16	Return A.8	P2.C.13	SCSI.A.8	OUTPUT 7 RETURN
IP.A.17	Data A.9	P2.A.14	SCSI.A.34	OUTPUT 8
IP.A.18	Return A.9	P2.C.14	SCSI.A.9	OUTPUT 8 RETURN
IP.A.19	Data A.10	P2.A.15	SCSI.A.35	OUTPUT 9
IP.A.20	Return A.10	P2.C.15	SCSI.A.10	OUTPUT 9 RETURN
IP.A.21	Data A.11	P2.A.16	SCSI.A.36	OUTPUT 10
IP.A.22	Return A.11	P2.C.16	SCSI.A.11	OUTPUT 10 RETURN
IP.A.23	Data A.12	P2.A.17	SCSI.A.37	OUTPUT 11
IP.A.24	Return A.12	P2.C.17	SCSI.A.12	OUTPUT 11 RETURN
IP.A.25	Data A.13	P2.A.18	SCSI.A.38	OUTPUT 12
IP.A.26	Return A.13	P2.C.18	SCSI.A.13	OUTPUT 12 RETURN
IP.A.27	Data A.14	P2.A.19	SCSI.A.39	OUTPUT 13
IP.A.28	Return A.14	P2.C.19	SCSI.A.14	OUTPUT 13 RETURN
IP.A.29	Data A.15	P2.A.20	SCSI.A.40	OUTPUT 14
IP.A.30	Return A.15	P2.C.20	SCSI.A.15	OUTPUT 14 RETURN
IP.A.31	Data A.16	P2.A.21	SCSI.A.41	OUTPUT 15
IP.A.32	Return A.16	P2.C.21	SCSI.A.16	OUTPUT 15 RETURN
IP.A.33	Data A.17	P2.A.22	SCSI.A.42	
IP.A.34	Return A.17	P2.C.22	SCSI.A.17	
IP.A.35	Data A.18	P2.A.23	SCSI.A.43	
IP.A.36	Return A.18	P2.C.23	SCSI.A.18	
IP.A.37	Data A.19	P2.A.24	SCSI.A.44	STROBE O/P
IP.A.38	Return A.19	P2.C.24	SCSI.A.19	STROBE O/P RETURN
IP.A.39	Data A.20	P2.A.25	SCSI.A.45	
IP.A.40	Return A.20	P2.C.25	SCSI.A.20	
IP.A.41	Data A.21	P2.A.26	SCSI.A.46	
IP.A.42	Return A.21	P2.C.26	SCSI.A.21	
IP.A.43	Data A.22	P2.A.27	SCSI.A.47	STROBE I/P
IP.A.44	Return A.22	P2.C.27	SCSI.A.22	STROBE I/P RETURN
IP.A.45	Data A.23	P2.A.28	SCSI.A.48	
IP.A.46	Return A.23	P2.C.28	SCSI.A.23	
IP.A.47	Data A.24	P2.A.29	SCSI.A.49	
IP.A.48	Return A.24	P2.C.29	SCSI.A.24	
IP.A.49	Data A.25	P2.A.30	SCSI.A.50	Isolated 0 volts
IP.A.50	Return A.25	P2.C.30	SCSI.A.25	Isolated +24 volts

Notice how the input and output strobe signals have the opposite sense to those on the 8301.

7. The 8304 in more detail.

As mentioned above, the 8304/8354 is a straight-through transition board intended to be used with the 8002 IP Carrier card. The connections from the Industry Pack connectors to the four 50-way SCSI II panel mounted sockets is as follows:

The notation ‘X’ means either A, B, C or D for each Industry Pack and Rear Connector.

Source	Rear conn. pin
IP.X.01	SCSI.X.26
IP.X.02	SCSI.X.1
IP.X.03	SCSI.X.27
IP.X.04	SCSI.X.2
IP.X.05	SCSI.X.28
IP.X.06	SCSI.X.3
IP.X.07	SCSI.X.29
IP.X.08	SCSI.X.4
IP.X.09	SCSI.X.30
IP.X.10	SCSI.X.5
IP.X.11	SCSI.X.31
IP.X.12	SCSI.X.6
IP.X.13	SCSI.X.32
IP.X.14	SCSI.X.7
IP.X.15	SCSI.X.33
IP.X.16	SCSI.X.8
IP.X.17	SCSI.X.34
IP.X.18	SCSI.X.9
IP.X.19	SCSI.X.35
IP.X.20	SCSI.X.10
IP.X.21	SCSI.X.36
IP.X.22	SCSI.X.11
IP.X.23	SCSI.X.37
IP.X.24	SCSI.X.12
IP.X.25	SCSI.X.38
IP.X.26	SCSI.X.13
IP.X.27	SCSI.X.39
IP.X.28	SCSI.X.14
IP.X.29	SCSI.X.40
IP.X.30	SCSI.X.15
IP.X.31	SCSI.X.41
IP.X.32	SCSI.X.16
IP.X.33	SCSI.X.42
IP.X.34	SCSI.X.17
IP.X.35	SCSI.X.43
IP.X.36	SCSI.X.18
IP.X.37	SCSI.X.44
IP.X.38	SCSI.X.19
IP.X.39	SCSI.X.45
IP.X.40	SCSI.X.20
IP.X.41	SCSI.X.46
IP.X.42	SCSI.X.21
IP.X.43	SCSI.X.47
IP.X.44	SCSI.X.22
IP.X.45	SCSI.X.48
IP.X.46	SCSI.X.23
IP.X.47	SCSI.X.49
IP.X.48	SCSI.X.24
IP.X.49	SCSI.X.50
IP.X.50	SCSI.X.25

8. The 8305 in more detail.

The 8305 has two sets of 16 opto-isolated inputs and two sets of 16 opto-isolated outputs, each with an input strobe, an output strobe, and access to an isolated 24-volt power supply. In common with all the other transition cards, the pin convention at the rear panel is that the 'signal' is the more positive voltage and the 'return' is the lower voltage. The lower two connectors on the rear panel, corresponding to Industry Packs A and B, carry opto-isolated input signals and the top two connectors, corresponding to Industry Packs C and D, carry opto-isolated output signals.

8001 set-up for the 8305: In order that the input and output signals connected to the 8305 are handled correctly by the 8001, it must be placed in INPUT/OUTPUT mode, with the upper 32-bits set as outputs, the lower 32-bits set as inputs and with its scan enabled. This involves writing '10' to the 'direction' or input/output mode selection bits of the CSR IO register, bits 11 and 10, setting the scan enable bit and selecting a valid scan clock source.

Input/output signal levels

The 8305's input circuit is designed to accept any voltage from 3 to 24 volts at a current of around 5 milliamps. When any input signal (including the strobe input) is at 3 volts or more with respect to its return signal, the corresponding opto-coupler will be energised and its output will be low, presenting a logic '0' to the 8001 input scanning circuit.

The 8305's output circuit consists of the collector and emitter of an opto-coupler. The collector is connected to the 'signal' side and the emitter to the 'return' side. When the output signal is active, the transistor will conduct, passing up to 5 milliamps at a collector-emitter voltage of up to 0.5 volts. In the off state, the collector-emitter voltage may be up to 24 volts.

The strobe input circuit is designed to accept any voltage from 3 to 24 volts at a current of around 5 milliamps. When the strobe input is at 3 volts or more with respect to its return signal, the corresponding opto-coupler will be energised and its output will be low, presenting a logic '0' to the 8001 card.

All inputs and outputs are fully protected against reverse and over-voltage. Over-voltage occurs at +27 volts and the reverse voltage limit is –0.7 volts.

The isolated 24-volt power supply, which is common to all four input/output connectors and can supply a maximum of 40 milliamps total, is intended for energising voltage-free contacts for connection to the isolated (passive) optically-coupled inputs.