

EuroSystem Hardware Reference Guide for:

24bit I/O Expansion Board

Issue 1.2

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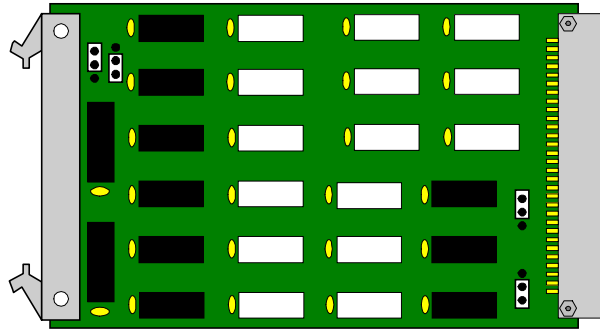
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The I/O expansion board provides 24 inputs and 24 outputs, optically isolated, and connects to the EuroSystem controller expansion bus. The I/O is brought out onto a 96 way connector, the pinout of which is shown in the following section. The I/O is accessed through MINT using the XIO keyword. Details of the keyword can be found in the MINT Programming Guide.

2.

96-way DIN Connector Pinout

c	b	a
in0(0)a o 1	in0(0)c o 1	in1(0)a o 1
in1(0)c o 2	in2(0)a o 2	in2(0)c o 2
in3(0)a o 3	in3(0)c o 3	in4(0)a o 3
in4(0)c o 4	in5(0)a o 4	in5(0)c o 4
in6(0)a o 5	in6(0)c o 5	in7(0)a o 5
in7(0)c o 6	in0(1)a o 6	in0(1)c o 6
in1(1)a o 7	in1(1)c o 7	in2(1)a o 7
in2(1)c o 8	in3(1)a o 8	in3(1)c o 8
in4(1)a o 9	in4(1)c o 9	in5(1)a o 9
in5(1)c o 10	in6(1)a o 10	in6(1)c o 10
in7(1)a o 11	in7(1)c o 11	in0(2)a o 11
in0(2)c o 12	in1(2)a o 12	in1(2)c o 12
in2(2)a o 13	in2(2)c o 13	in3(2)a o 13
in3(2)c o 14	in4(2)a o 14	in4(2)c o 14
in5(2)a o 15	in5(2)c o 15	in6(2)a o 15
in6(2)c o 16	in7(2)a o 16	in7(2)c o 16
pwr_0 o 17	pwr_1 o 17	pwr_2 o 17
pwr_0 o 18	pwr_1 o 18	pwr_2 o 18
pwr_0 o 19	pwr_1 o 19	pwr_2 o 19
out0(0) o 20	out0(1) o 20	out0(2) o 20
out1(0) o 21	out1(1) o 21	out1(2) o 21
gnd_0 o 22	gnd_1 o 22	gnd_2 o 22
out2(0) o 23	out2(1) o 23	out2(2) o 23
out3(0) o 24	out3(1) o 24	out3(2) o 24
gnd_0 o 25	gnd_1 o 25	gnd_2 o 25
out4(0) o 26	out4(1) o 26	out4(2) o 26
out5(0) o 27	out5(1) o 27	out5(2) o 27
gnd_0 o 28	gnd_1 o 28	gnd_2 o 28
out6(0) o 29	out6(1) o 29	out6(2) o 29
out7(0) o 30	out7(1) o 30	out7(2) o 30
gnd_0 o 31	gnd_1 o 31	gnd_2 o 31
com_0 o 32	com_1 o 32	com_2 o 32

96-way connector pin-out

The pinout details are as follows:

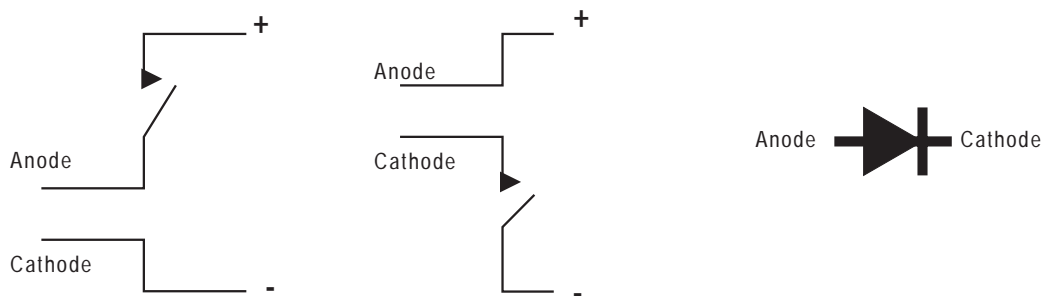
2.1.1

Inputs

All inputs are prefixed with *in* and are split into 3 banks of 8 bits. Inputs are referenced as:

`in<bit>[<bank>]<a/c>`

where <bank> is one of the 3, 8 bit banks. <bit> is bits 0 to 7 for the 8 bit bank, and 'a' is the anode connection and 'c' the cathode connection.



The anode should be connected to positive, and the cathode to negative. In a system where a switch is used to switch to ground, the anode would be connected to power, and the cathode to the switch.

2.1.2

Outputs

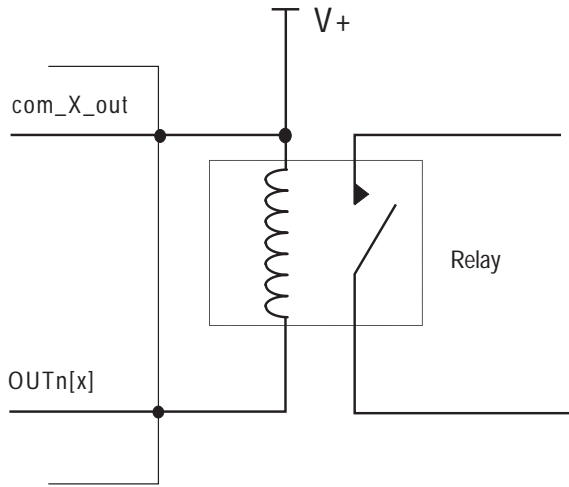
All outputs are prefixed with *out* and are split into 3 banks of 8 bits. Outputs are referenced as:

`out<bit>[<bank>]`

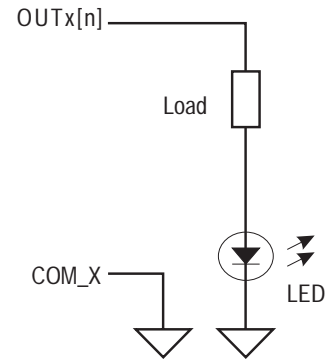
where <bank> is one of the 3, 8 bit banks and <bit> is bits 0 to 7 of that bank.

com_X is a flyback diode connection for use with inductive loads. In NPN systems this terminal may be left unconnected when using resistive loads, however in PNP systems it must always be connected to ground.

Examples of use:



Example: Switching Relays:NPN



Example: LED Output:PNP

2.1.2.1

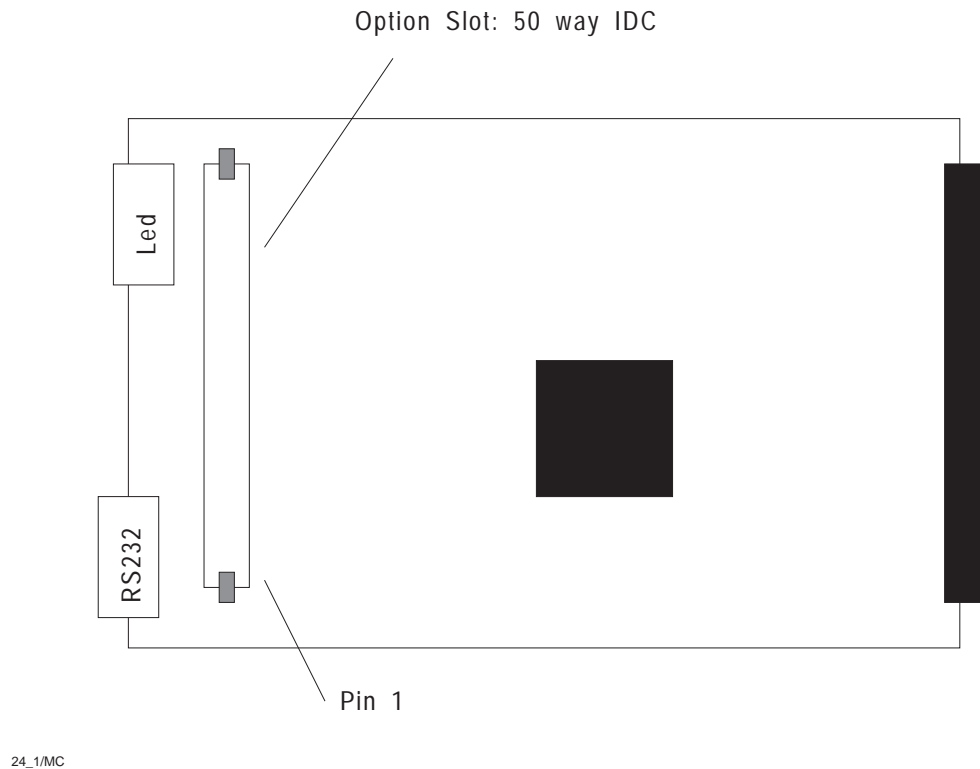
Power

Power for the outputs is taken from *pwr_X* and *gnd_X* where X is the relevant bank to be powered. *pwr_X* must always be connected to 12 to 24V, *gnd_X* is connected to 0V in NPN systems (standard) but must be connected to the same voltage as *pwr_X* in PNP systems, also *COM_X* must be connected to 0V in PNP systems.

2.2

Connection to EuroSystem

The I/O expansion card is connected to EuroSystem through the option bus slot on the controller using a 50 way IDC connector. See the diagram below for the location of the option slot on EuroSystem.



Caution:
You must ensure that the connection to the option slot is correct. Failure to do so may damage the controller. Note that pin 1 of the 50 way connector is marked by an arrow/triangle.

2.3

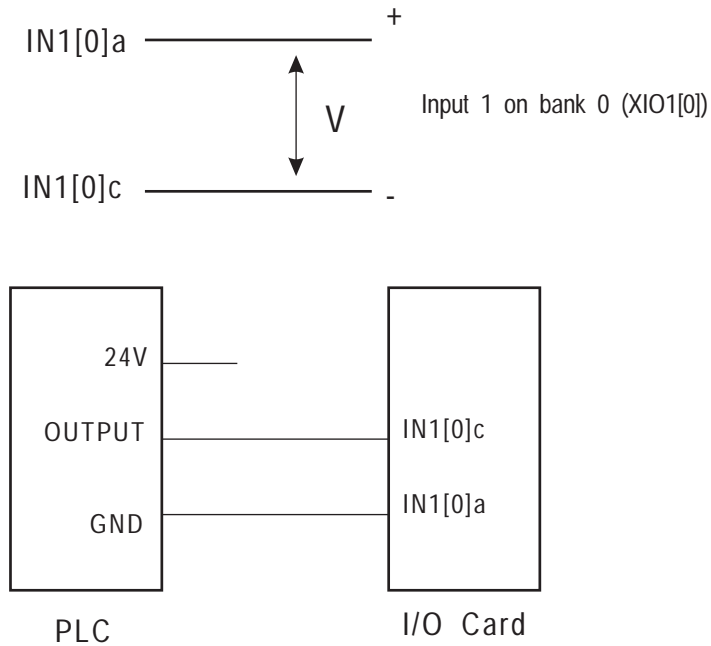
Specification

2.3.1

Digital Inputs

Input voltage range:	12 to 24V
Maximum input voltage:	28V
Logical 0	Voltage applied across input
Logical 1	Unconnected

The digital inputs must have a voltage applied across the anode and cathode connection. For example:



2.3.2

Digital Outputs

2.3.2.1

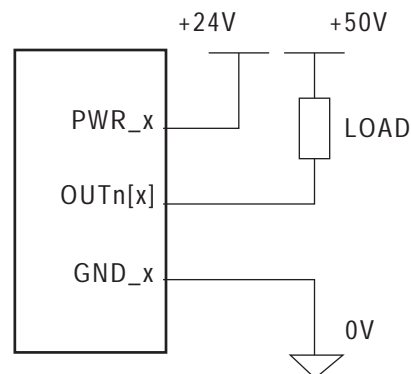
NPN Outputs

Output voltage range:	12 to 24V and ground
Output driver:	ULN2803 darlington drivers
Current sink:	400mA per channel

In NPN systems the 24 outputs are driven by 3 ULN2803 darlington drivers. Each output can sink up to 400mA. However due to power dissipation, each device can only sink a total of 800mA continuously.

The output circuits will work with voltages up to 30V. However the outputs themselves can withstand 50V.

For example:



2.3.2.2

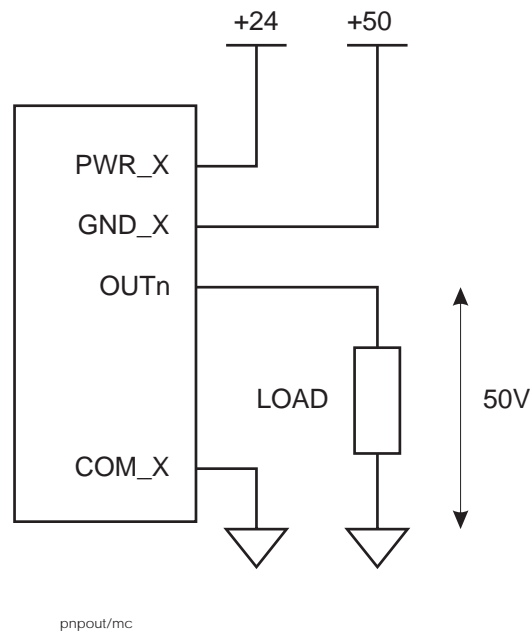
PNP Outputs

Output voltage range:	12 to 24V and ground
Output driver:	UDN2982 source drivers
Current drain:	400mA per channel

The 24 outputs are driven by 3 UDN2982 source drivers. Each output can source up to 350mA. However due to power dissipation, each device can only sink a total of 700mA continuously.

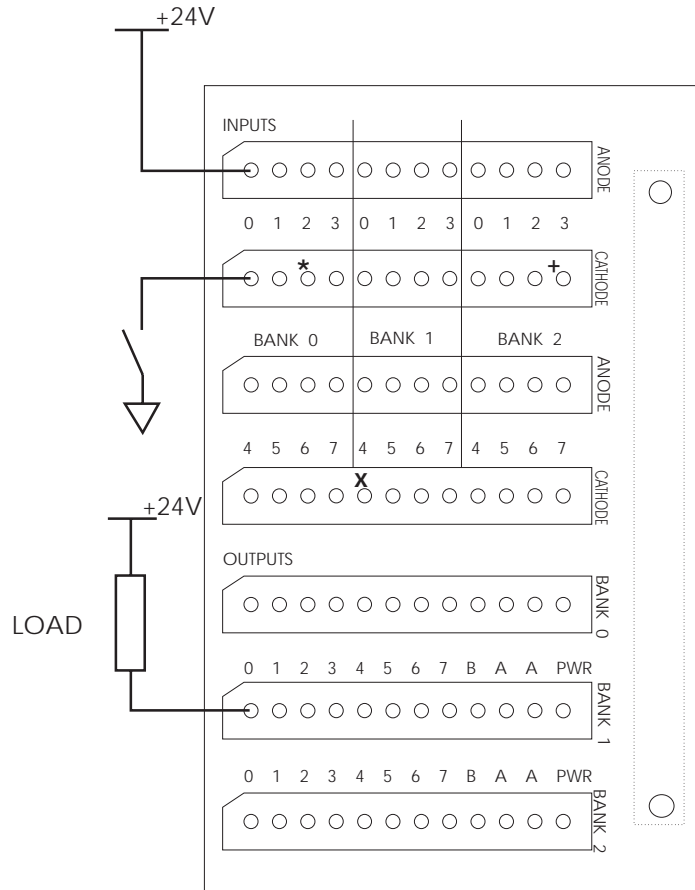
The PNP output circuits will only work with voltages up to 24V. However the outputs themselves can source up to 50V

For example:



3. Wiring to the 24 I/O board backplane.

24 I/O Backplane showing example wiring for NPN opto-I/O card



Example of how to find terminals (MINT keywords are shown in brackets)

- * Bank 0 input 2 Cathode (XIO2[0])
- + Bank 2 input 7 Anode (XIO7[2])
- x Bank 1 input 4 Cathode (XIO4[1])

3.1

Inputs

Both the Anode and Cathode are available for connection and both must be connected. For NPN input types connect the input to the cathode, and the anode to the power rail (usually +24V). For PNP input types connect the input to the anode, and the cathode to ground.

3.2

Outputs

Only one connection per output is available, this is normally NPN. The load should be connected between the power rail and the output. The terminals marked A must be connected to ground, PWR must be connected to the power rail and B is a common flyback diode connection for inductive loads.

The card can be ordered with the outputs set to PNP if this is the case the load should be connected between the output and ground. The power connections also change, A and PWR must be connected to the power rail and B must be connected to ground. This type of output has built in flyback diodes which require no external connection.

3.3

Power

The power connections are labelled slightly differently than in the previous section:

PWR	Power to the isolated circuitry (24V)
A	Main power connection (0V in NPN, 24V in PNP)
B	Secondary power connection (0V in PNP, flyback diode in NPN)

3.4

XIO Keyword

The 24 I/O is referenced using the XIO keyword (see the MINT Programming Guide for further details). The inputs and outputs are split into 3 banks of 8 to make them easier to use. For example:

```
XIO6[1] = 1 : REM Set output bit 6 on bank 1  
a = XIO0[2] : REM Read input bit 0 on bank 2  
XIO[0] = 0 : REM Set all 8 bits on bank 0 to 0
```

The 24 I/O is factory set for correct functioning of the XIO keyword , and for the output type used. If required jumpers JP1 and JP2 can be re configured to change the address of the board to any of the four possible addresses. JP1 and JP2 are read as a two digit binary number with '0' in the lower position and '1' in the upper position and JP1 is the most significant bit (default is address 3).

Each bank of outputs can be either NPN or PNP by changing the final drive chip and changing the position of JP3,4 and/or 5. For NPN configuration the relevant jumper must be in the left position and for PNP configuration it must be in the right position.