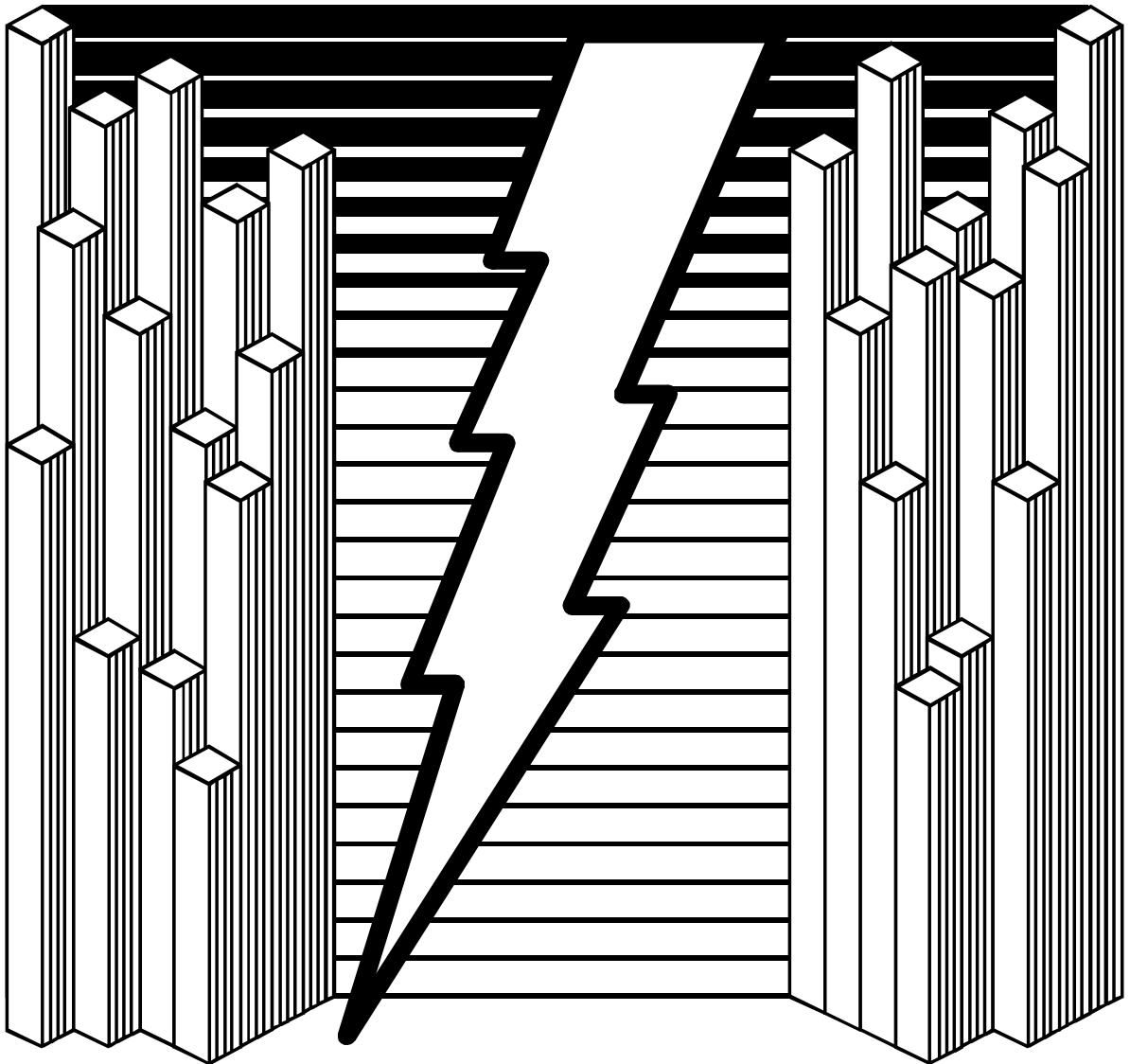


HARDWARE MANUAL



Opto DIO48

6.5 EDITION February 1999

Guarantee.

FULL 36 MONTHS GUARANTEE.

We guarantee your interface card for a full 36 months from purchase, parts and labour, provided it has been used in the specified manner. In the unlikely event of failure return your interface to your Dealer, with proof of purchase, who will determine whether to repair or replace this product with an equivalent unit.

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--

ACKNOWLEDGEMENTS.

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Opto Dio48

This product conforms to the following standards:

CE Standard: EN55022:1987 (Class B)

IEC 801-2: 1991 Level 2

IEC 801-3: 1984 Level 2

IEC 801-4: 1998 Level 2

Thank You for Buying the Optically Isolated Input Output Interface!

"

OPTO DIO48 provides 24 high voltage, high current outputs lines and 24 input lines all with +/-2500 Volts optical isolation.

The optically isolated outputs are high voltage, high current outputs lines, with +/-2500 Volts optical isolation. Fast TTL buffers, Opto isolators and drivers allow a maximum throughput of 150kHz. The cards may be fitted with source drivers or with sink drivers. The on chip current limiting resistors and output transient suppression diodes have been augmented by on board higher duty suppression diodes and pull down resistors so ensuring long term use in an industrial environment.

Cards with these outputs require an external, user supplied, power input to supply the Opto isolators and the I/O drivers. On board regulation allows the use of unregulated supplies in the range 17.5-35 Volts. A minimum of 8VA current capability per 8-line source output package is needed. DIO48 requires 25VA power supply.

The optically isolated inputs are current limited and reverse polarity protected and provide +/-2500 Volts optical isolation. Fast TTL buffers Opto isolators and drivers allow a maximum throughput of 150kHz.

Most of the Opto card range has an on board Watchdog Timer that can be used as a fail safe way to ensure the users program is running correctly and the PC has not crashed. (The Opto DIO cards are the ideal for high output current control applications such as driving relays, solenoids, stepper motors, LED's or lamps requiring separate logic and load grounds.

A separate manual "The Interfacing Guide" with a disk full of worked examples in BASIC, PASCAL, C, Assembler and FORTRAN ensure that you are up and running with the card straight away!

Your card is designed and manufactured in England, and

our policy is one of complete support to our dealers and direct to our users. It is designed 'in house' and is completely understood by our staff. Its great strength is the support we give it. Our intention is to supply the hardware, software and any technical information you may need to allow you to exercise complete control the card and I/O devices. After searching the manuals, do not hesitate to contact us on our HOTLINE number on Intro Page 2, if you need help.

We trust that if you adhere to the following procedures you will enjoy many years of useful service from your interface.

OPTO DIO48 MANUAL.

OUTLINE CONTENTS.

Chapter 1 Outputs, Inputs, Watchdog & Power.

Chapter 2. Opto DIO48 Configuration.

Chapter 3. Installation Guide.

Cumulative Index.

THE LAYOUT OF THIS MANUAL.

Chapter 1, Outputs, Inputs, Watchdog & Power, describes the features common to many of the Opto I/O cards. The topics covered are the external user supplied power supply, the output driver types, the input circuit and the watchdog timer.

Chapter 2, Opto DIO48 Configuration, shows you how to configure the Opto DIO48 card ready for installation into an expansion slot of your computer, detailing the address DIP switches, card jumpers, i/o memory map and connector pin-outs.

Chapter 3, Installation in the PC, shows how the card can be installed into an unused PC expansion slot.

The Index covers the complete contents of the manual.

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Chapter 1

OPTO OUTPUTS, INPUTS, WATCHDOG, and POWER.

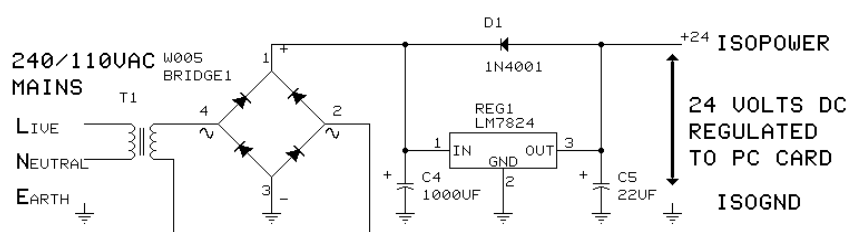
Introduction.

This chapter describes the features common to many of the Opto I/O cards. The topics covered are the external user supplied power supply, the output drivers types, the input circuit and the watch dog timer.

Power Supply.

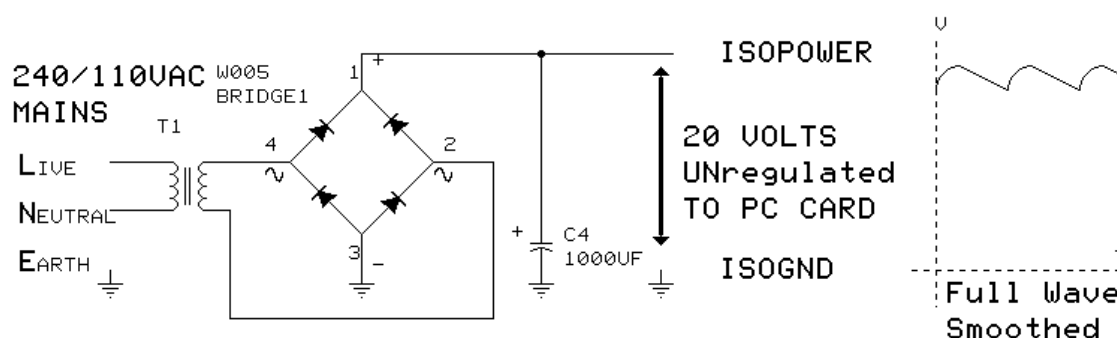
Those cards that have Opto isolated outputs require an external power input to drive the isolators and the output driver chips. The external power input is a nominal 24 volts input.

Figure 1-1. Regulated Power Supply.



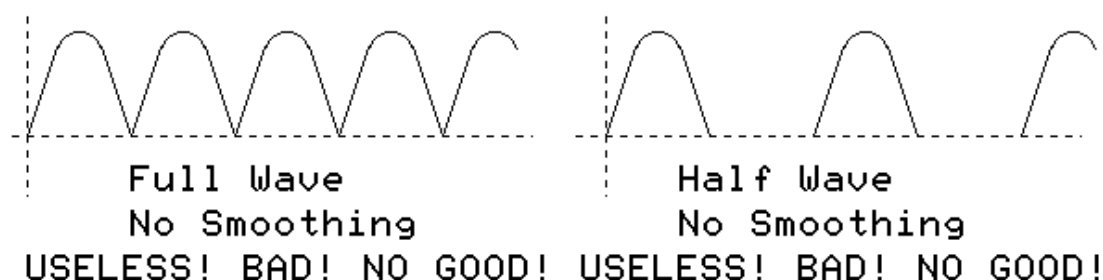
Either a commercially available DC power supply or a home made one may be used. The supply can be regulated or unregulated. The Opto cards have on board regulation and reverse connection protection. Suitable regulated and unregulated supply circuits are given below. The power supplies range of 17.5 to 30 Volts maximum must be capable of supplying a minimum of 2 Amps at 25 Volts. i.e. 50 VA rating. (OUT48 4 Amp @ 25 Volts = 100VA). If an unregulated power supply is used ensure that it is rectified and has sufficient smoothing to keep it above the absolute minimum of 17 volts.

Figure 1-2. Unregulated Power Supply.



Unsuitable power supplies are those that provide only half wave rectification and those that are unsmoothed. Both these types fall below the minimum +17 Volts necessary to allow the on board regulation to work.

Figure 1-3. Useless Power Supply.



Output Driver Types.

The Opto DIO48 can be configured to use one of two types of high voltage drive chips. These types are known as sink drivers and source drivers. The sink driver chips are of type ULN2804 and the source driver chips are of type UDN 2984 chips.

The part number used to order the card determines which type of chip is fitted on the Opto card. The cards are supplied with the SOURCE drivers UDN2984 fitted as standard, unless the user specified SINK at the time of ordering. The card can be easily

changed between sink and source specification by exchanging certain chips and setting a pair of jumpers.

The difference between these two types of driver, their output current capabilities, their power on reset condition and optional inverting configuration is explained below.

Sink and Source Explained.

The output ports of the card are optically isolated from the rest of the PC so that wiring defects or accidental connections to high voltage or high current devices do not damage the PC. In addition the outputs are via high voltage, high current driver chips. The lines of these driver chips are connected by the user to a load. As the users programs sets the output port lines high and low the output driver chips attempt to pull the loads to a high and low voltage.

When current flows out of the driver output terminal and into the load, the device is said to "source" current. This is a source driver. Conversely current flows from a load into a "sink" driver.

Source drivers can pull outputs both up and down. When the PC is powered off whilst the external power is ON the port lines are ON.

Sink drivers can only pull an output down to ground, they cannot pull an output up. When the PC is powered off whilst the external power is ON the port lines are ON.

With sink drivers the outputs only go high when the external circuit pulls them high. eg via a resistor attached to a positive voltage source.

Sink drivers can provide both source and sink functions. Sink drivers cannot provide source driver functions. However, they can cope with significantly higher current loads.

Figure 1-4. Driver Chip Select.FACTORY SETUDN2984 Source Drivers
SelectedULN2804 Sink Drivers
Selected**UDN2984 ULN2804 Driver Selection.**

The card can be configured to use one of two types of high voltage drive chips ULN2804 or UDN 2984 chips.

The two jumper pins at the top right of the card are used to make this selection.

These chips can only be changed by returning your unit to the manufacturer.

Source Driver Output Connection - UDN2984 Drivers.

The UDN2984 chips are high voltage, high current SOURCE drivers, output voltage range 35 to 80 Volts, these could be directly replaced by UDN2981 drivers for output voltages in the range 5 to 50 Volts. Whilst the 2984/81 drivers have built in output transient suppression diodes, extra diodes are provided on board the Opto DIO cards for extra protection.

The source driver output schematic is shown in Figure 1-5. Typical output connections are shown in Figure 1-6. Both pull down and pull up connection schemes work.

Figure 1-5. Source Driver Output Port Schematic.

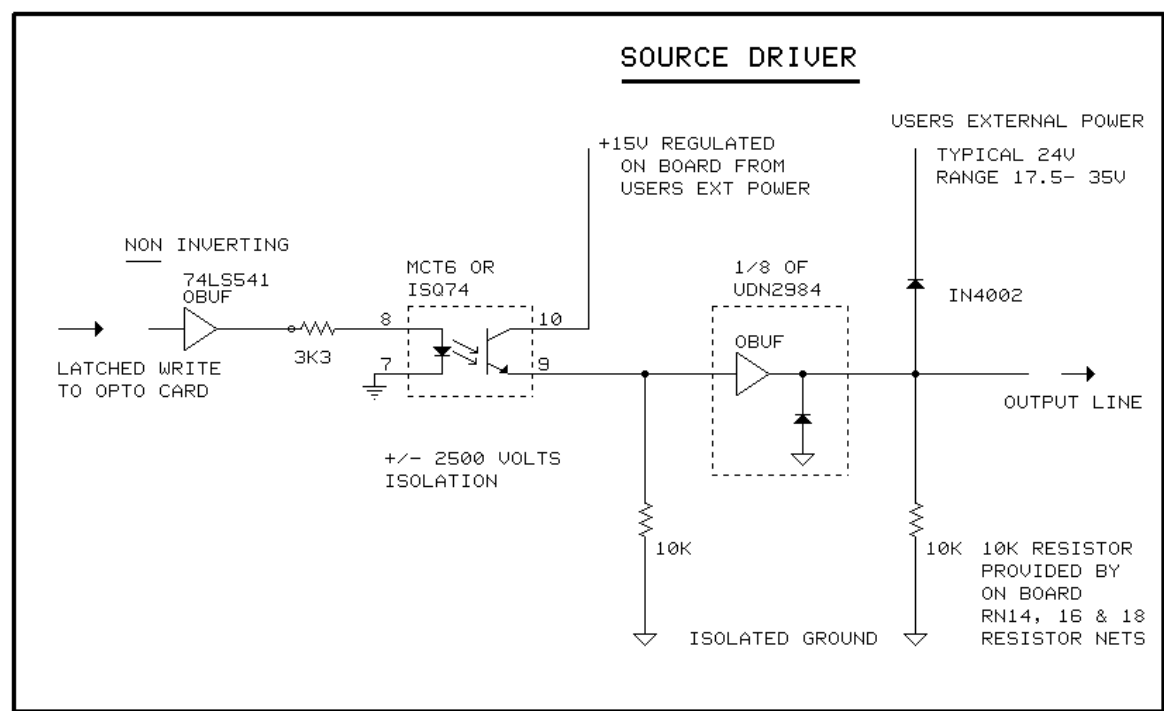
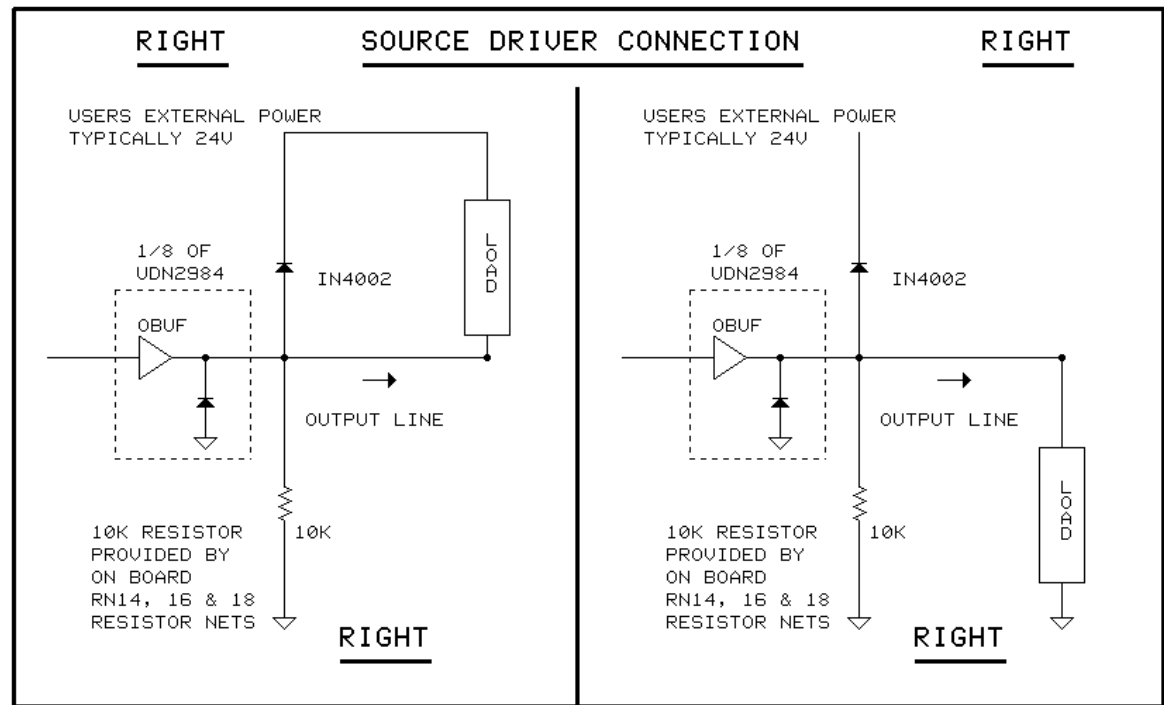


Figure 1-6. Source Driver Output Connections.



Source Driver Output Logical Levels.

On the source cards, a logical one written to the output register drives the output high and a logical zero written to the output port drives the output low. Thus in this normal mode of operation, the voltage level of the output line follows the logical level in the output register.

There is an option of changing the polarity of the output, so that a logical one is written to the output register drives the output low and a logical zero written to the output drives the output high. See **Figure 1-7**. Thus in this inverse mode of operation the voltage level of the output line does the opposite of the logic level in the output register.

This option is set using DIP switch 7.

Figure 1-7. Logically Inverting the Source Output.

DRIVER	SWITCH 7	PORT DATA	PORT LINES	OPERATION
SOURCE	DOWN	0 = low	OFF= low	NORMAL
SOURCE	DOWN	1 = high	ON = high	NORMAL
SOURCE	UP	0 = low	ON = high	INVERSE
SOURCE	UP	1 = high	OFF= low	INVERSE

Sink Driver Output Connection - ULN2804 Drivers.

The ULN2804 chips are high voltage, high current NPN DARLINGTON open collector drivers, output voltage range to 50 Volts. Use ULN2824 chips for output up to 95 Volts. When changing from 2984 to 2804 drivers note that the 2804 are INVERTING drivers.

Figure 1-8. Sink Driver Output Port Schematic.

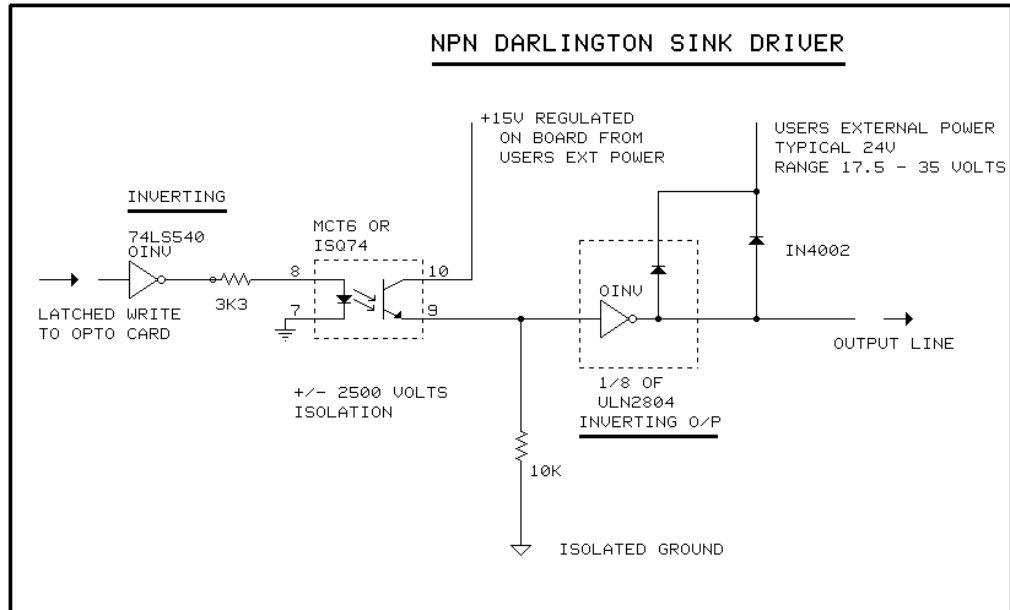
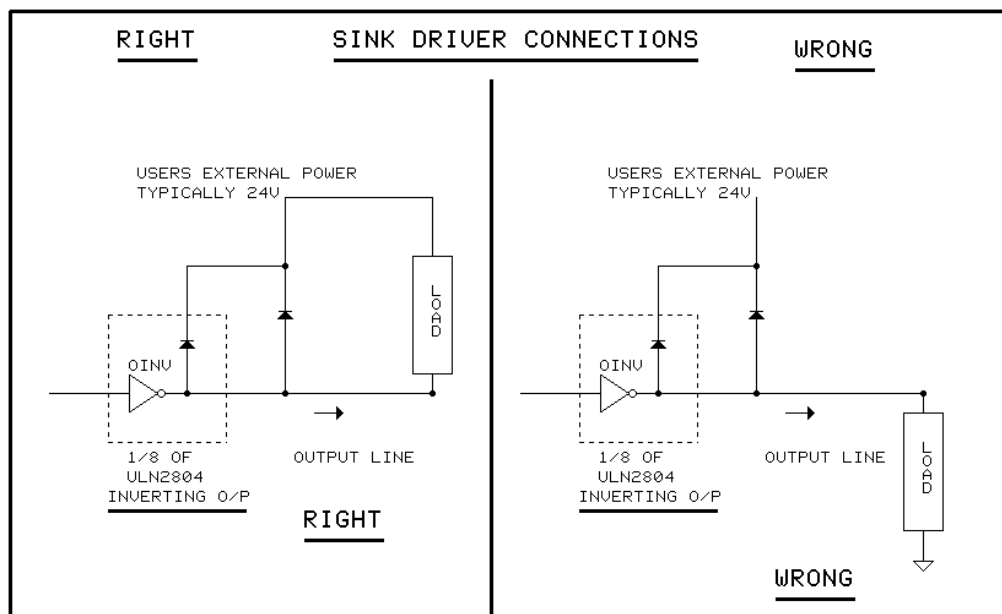


Figure 1-9. Sink Driver Output Connections.



The sink driver output schematic is shown in Figure 1-8. Typical output connections are shown in Figure 1-9. **Note only the pull down scheme works with sink drivers. The sink drivers can only pull down the output lines.**

Sink Driver Output Logical Levels.

On the sink cards, a logical one written to the output register drives the output high and a logical zero written to the output port drives the output low. Thus in this normal mode of operation, the voltage level of the output line follows the logical level in the output register.

There is an option of changing the polarity of the output, so that a logical one is written to the output register drives the output low and a logical zero written to the output drives the output high. See **Figure 1-10**. Thus in this inverse mode of operation the voltage level of the output line does the opposite of the logic level in the output register.

This option is set using DIP switch 7.

Figure 1-10. Logically Inverting The Sink Output.

DRIVER	SWITCH 7	PORT DATA	PORT LINES	OPERATION
SINK	UP	0 = low	OFF= low	NORMAL
SINK	UP	1 = high	ON = high	NORMAL
SINK	DOWN	0 = low	ON = high	INVERSE
SINK	DOWN	1 = high	OFF= low	INVERSE

Power Off And Reset Output Levels.

Due to the difference in the nature of internal circuitry of the sink and source driver chips there are systematic differences in the power off and reset voltage levels of the output lines when using these two driver types.

Typically the source drivers keep the output lines at zero when the PC is switched off, whilst the sink drivers allow the outputs to float to a high voltage level determined by the external circuit.

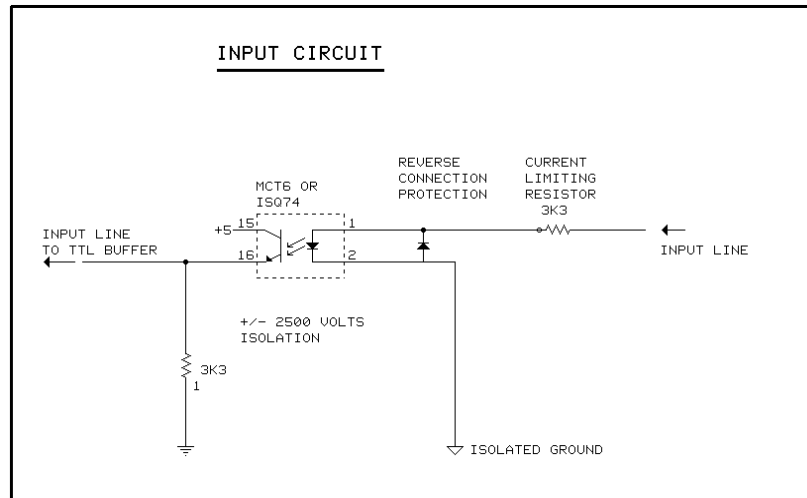
Figure 1-11. Sink Versus Source Outputs.

Driver	PC State	Ext Pwr	switch	Port Setting	Port Lines
Source	Power OFF	On	Either	N/A	OFF
Source	Power Reset	On	Either	Reset=Low	OFF
Source	On	On	DOWN	0=Low	
Source	On	On	DOWN	1=High	ON
Source	On	On	UP	0=Low	ON
Source	On	On	UP	1=High	OFF
Sink	Power Off	On	Either	N/A	ON
Sink	Power Reset	On	Either	Reset=Low	OFF
Sink	On	On	UP	0=Low	OFF
Sink	On	On	UP	1=High	ON
Sink	On	On	DOWN	0=Low	ON
Sink	On	On	DOWN	1=High	OFF

Safety First.

If the power off and power reset state of the output lines is critical to the safe operation of your circuit, examine Figure 1-11 and check the actual operation of the card when the external circuit is connected. Perform this check both with and without the external isolated power supply applied.

Do not make any assumptions about the effects of changes made to the external circuit if the power off and reset conditions are critical to the safe operation of your system.

Figure 1-12. Input Port Schematic.**Input Port Schematic.**

The input port schematic is given in Figure 1-12. The input port lines are reverse connection protected and current limited. Input voltages of 0.0 - 2.38 Volts read as input logic low, 0. Input voltages of 2.4 - 24.00 Volts read as input logic high, 1.

The inputs are current limited by a 3k3 Ohm resistor and are reverse connection protected by diodes.

The Watch Dog.

The watchdog is a failsafe method of ensuring that the user's program is still running correctly. On power up, the watchdog is disabled. If the user's program enables the watchdog, an interrupt or reset signal is generated on timeout. Reading the watchdog register refreshes the timer, postponing timeout for 50 milliseconds. When the watch dog times out an timer expired output signal is set. On those cards that provide opto isolated outputs the watchdog timer expired output, in place of Port A line bit 0, is available on the 50 way edge connector.

Note many PC reset lines are outputs only and so the Opto cards watchdog pulse will not cause a PC reset on timeout.

The watchdog is enabled by writes to the watchdog register. See Figure 1-13.

Figure 1-13. Watch Dog Enable Register.

Watch dog Enable Register Default Address' are 030b & 030f hex. This is a read/write register							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Write - Don't Care. Read - Always Zero.				Gate Port C2 Bit3 to IRQ	Gate Port C2 Bit0 to IRQ	Gate Jumper Bus to IRQ	Gate Jumper Bus to Reset
Read of this register refreshes the watchdog timer. Read this at least once every 50 milli-seconds to prevent timeout							

Watch Dog Enable Register.

The watchdog enable register is an 8 bit read write register. Writing the bits enables, gates, various signals onto the PC expansion bus IRQ or RESET line, thus allowing an interrupt or reset to be generated in the PC. On power up all the bits are cleared to zero, i.e. No signals are gated through to the PC bus. The bitmap of the watchdog register is given below.

Bits 7-4 are always read back as zero, writing them high or low has no effect. For compatibility with future versions of this card bits 7-4 should always be written as 0.

Bit 0 when =1 the watchdog BUS jumper signal is gated to PC bus RESET line. This line causes a power on reset of the PC when driven high.

NOTE this line is an output only on many PC's and so cannot be used to reset the PC.

Bit 1

When =1 the watch dog BUS jumper signal is gated to the PC bus IRQ line as selected by the IRQ jumper block.

Bit 2

When =1 the Port C2 bit 0 input signal is gated from the Opto isolator to the IRQ selected by the IRQ jumper block. Low to high transitions generates a PC interrupt.

Bit 3

When =1 the Port C2 bit 3 input signal is gated from the Opto isolator to the IRQ line selected by the IRQ jumper block. Low to high transition generates the PC interrupt.

The IRQ handler should check, by reading the watchdog register, which interrupt is enabled and service the appropriate function, e.g. watchdog timeout or transition of the Port C lines.

Watch Dog Time Out.

The watchdog times out after 50 milliseconds. The time out is prevented by a read of the watchdog register, this refreshes the 50 millisecond timeout. Writes to the register do not refresh the timeout. It is necessary to continuously perform a read of the watch dog register at least 20 times a second. The watch dog timer may be refreshed more frequently than this, in fact, as often as the user sees fit. From the end of the last refresh a 50millisecond period may elapse before the watchdog times out. On time out, depending on how the watch dog options, PA10 output select jumpers and watch dog register enable bits are set, either output lines are set or software interrupts or PC reset are caused.

Generally, the watchdog is used as a fail-safe method of ensuring that the users software is running correctly and that the PC has not crashed.

Chapter 2

CONFIGURATION.

Introduction.

Read Chapter 1 first. This chapter explains how to configure the Opto DIO48 card ready to install in a PC. Detailed instructions are given how to set the address select, the IRQ jumper block and the output driver select jumper block. The settings of the watch dog timer output are also explained.

The two-thirds size Opto DIO48 card will fit into both long and short slots, in either 8 bit slots or the longer 16 bit slots.

Configuring The Opto DIO48 Card.

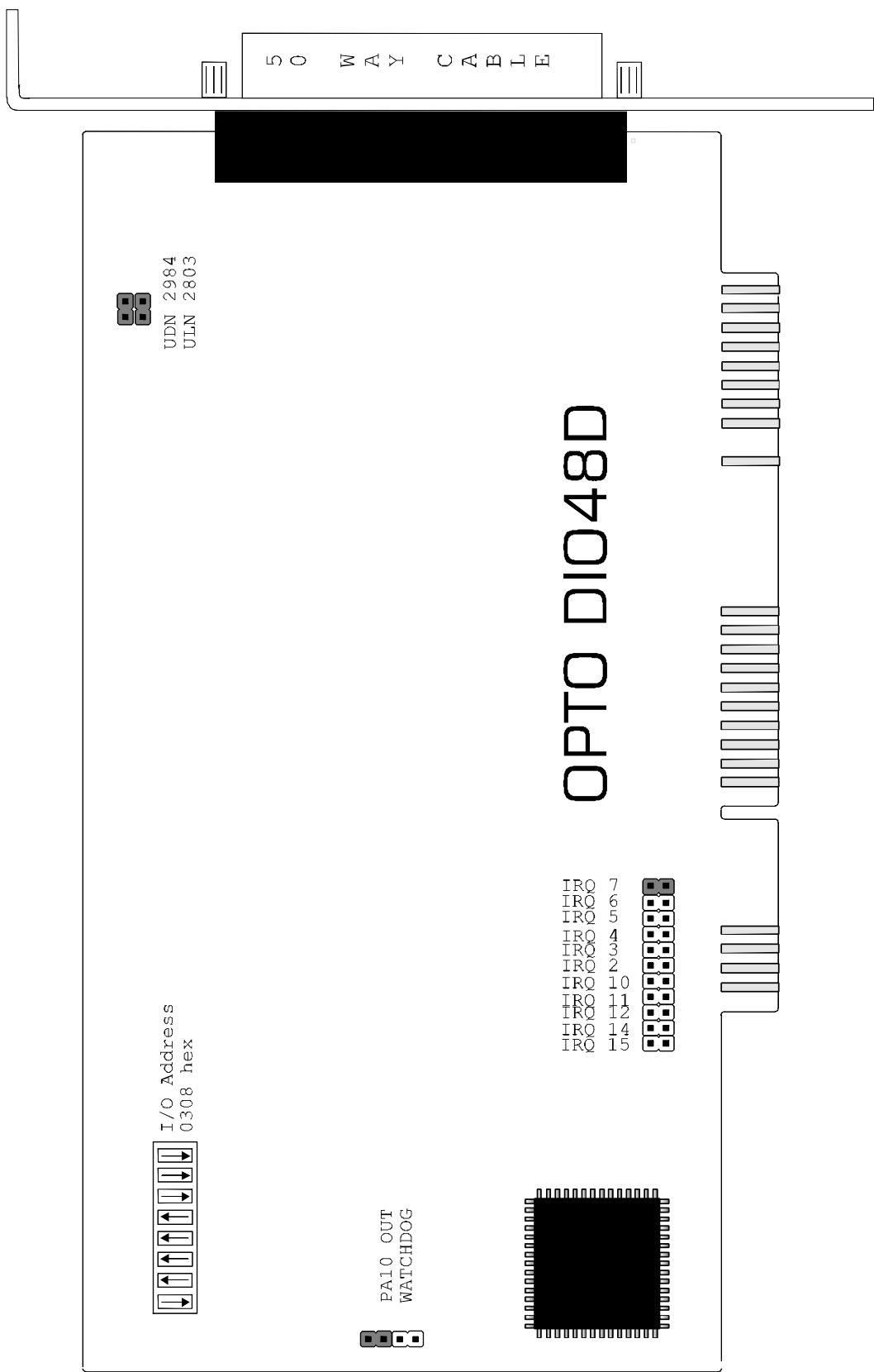
In the state it leaves our factory, Opto DIO48 card is ready to plug straight into a PC computer. **So, unless you have GOOD REASON, you do not need to alter its default setting.**

However, due to the large variety of add-on cards that may be present in the PC, your Opto DIO48 card may need adjusting to suit your setup.

The layout of the Opto DIO48 card is given in Figure 2-1. The default settings are I/O address 0308Hex, IRQ 7 selected but not enabled, WATCHDOG VIA PA10 disabled - the PA10 line is output. The source cards have the UDN2984 chips installed and the sink cards have ULN2804 chips installed.

The Opto DIO48 requires an external power input to power the output drivers and the isolated side of the Opto couplers. On card power regulation allows the use of external un-regulated power source, input range 17.5 - 35 Volts. The power supply input is reverse polarity protected.

Figure 2-1. Opto DIO48 Card Layout.



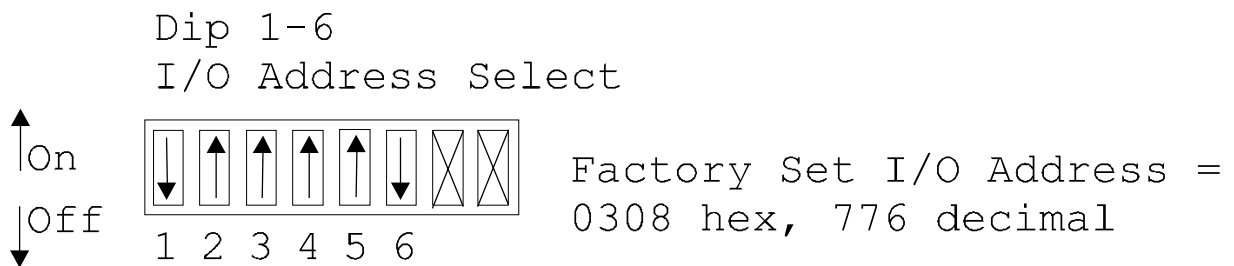
Setting the Opto DIO48 I/O Address.

By referring to the Opto DIO48 card locate the 6 way DIP switch at the middle left hand corner of the card.

The factory set address, 0308H, is set as shown in Figure 2-2. DIP switches control the base address selected, switches 1-6 correspond to the A3-A8 address lines. The Opto DIO48 card can reside at one of 64 base addresses on an 8-byte boundary within the range 0200H-03F8H.

The software controlling the card must know its I/O address.

Figure 2-2. Opto DIO48 Factory Set DIP Switches.



Note: Switches 7 & 8 whose function is not appropriate in setting the in/out address are described later in the section **Driver Chip Select**

The I/O addresses that are likely to be good are in Figure 2-3, addresses to avoid are given in Figure 2-4. Only if the particular card is present need the relevant address be avoided.

Using More Than One Opto DIO48 Board.

Several Opto DIO cards can be installed at the same time, allowing each card to control its own set of I/O lines.

The golden rule is - Ensure that each card is set to a different I/O address and the ranges do not overlap!

Figure 2-3. I/O Addresses To Avoid.

I/O ADDRESS	NORMAL USE.
0201H - 0201H	Game Control Adapter
0278H - 027FH	*** Second Printer Port Adapter
02E1H	*** PC ELITE IEEE Card.
02F8H - 02FFH	*** COM2 Serial Port
0300H - 030FH	*** PC IEEE Card
0300H - 0303H	*** PC DIO24 Card
0308H - 030BH	*** PC OPTO OUT24 Card
0308H - 030FH	OPTO OUT48, DIO16, DIO48 & DIO48 Cards
030CH - 030FH	*** PC OPTO IN24 Card
0310H - 031FH	*** PC Timer-DIO Card
0340H - 0360H	*** PC DIO192 Card
0378H - 037FH	*** Printer Port Adapter
03F0H - 03F7H	Floppy Disk Drive Drive.
03F8H - 03FFH	*** COM1 Serial Port.

*** These cards available from your Dealer.

Figure 2-4. Likely I/O Address.

I/O ADDRESS	NORMAL USE.
0204H-0277H	Unused.
0280H-02BFH	Unused.
02C8H-02DFH	Unused.
02E4H-02F7H	Unused.
0300H-031FH	Unused.
0330H-035FH	Unused.
0380H-03AFH	Unused Usually.
03E0H-03EFH	Unused.

Figure 2-5. Opto DIO48 Base Addresses.

Off	Off	Off	Off	Off	Off	↓↓↓↓↓↓	03F8h	1016d
On	Off	Off	Off	Off	Off	↑↓↓↓↓	03F0h	1008d
Off	On	Off	Off	Off	Off	↓↑↓↓↓	03E8h	1000d
On	On	Off	Off	Off	Off	↑↑↓↓↓	03E0h	992d

Off	Off	On	Off	Off	Off	↓↓↑↓↓	03D8h	984d
On	Off	On	Off	Off	Off	↑↓↑↓↓	03D0h	976d
Off	On	On	Off	Off	Off	↓↑↑↓↓	03C8h	968d
On	On	On	Off	Off	Off	↑↑↑↓↓	03C0h	960d

Off	Off	Off	On	Off	Off	↓↓↓↑↓	03B8h	952d
On	Off	Off	On	Off	Off	↑↓↓↑↓	03B0h	944d
Off	On	Off	On	Off	Off	↓↑↓↑↓	03A8h	936d
On	On	Off	On	Off	Off	↑↑↓↑↓	03A0h	928d

Off	Off	On	On	Off	Off	↓↓↑↑↓	0398h	920d
On	Off	On	On	Off	Off	↑↑↑↑↓	0390h	912d
Off	On	On	On	Off	Off	↓↑↑↑↓	0388h	904d
On	On	On	On	Off	Off	↑↑↑↑↓	0380h	896d

Off	Off	Off	Off	On	Off	↑↓↓↑↓	0378h	888d
On	Off	Off	Off	On	Off	↓↓↓↑↓	0370h	880d
Off	On	Off	Off	On	Off	↑↑↓↑↓	0368h	872d
On	On	Off	Off	On	Off	↓↓↓↑↓	0360h	864d

Off	Off	On	Off	On	Off	↑↓↑↑↓	0358h	856d
On	Off	On	Off	On	Off	↓↑↑↑↓	0350h	848d
Off	On	On	Off	On	Off	↑↑↑↑↓	0348h	840d
On	On	On	Off	On	Off	↓↓↓↑↑	0340h	832d

Off	Off	Off	On	On	Off	↑↓↑↑↑	0338h	824d
On	Off	Off	On	On	Off	↓↑↑↑↑	0330h	816d
Off	On	Off	On	On	Off	↑↑↑↑↑	0328h	808d
On	On	Off	On	On	Off	↓↓↑↑↑	0320h	800d

Off	Off	On	On	On	Off	↑↑↑↑↑	0318h	792d
On	Off	On	On	On	Off	↓↑↑↑↑	0310h	784d
Off	On	On	On	On	Off	↑↑↑↑↑	0308h	776

Opto DIO48

Configuration

On	On	On	On	On	Off	↓↓↓↓↓↑	0300h	768d
Off	Off	Off	Off	Off	On	↑↓↓↓↓↑	02F8h	760d
On	Off	Off	Off	Off	On	↓↑↓↓↓↑	02F0h	752d
Off	On	Off	Off	Off	On	↑↑↓↓↓↑	02E8h	744d
On	On	Off	Off	Off	On	↓↓↑↓↓↑	02E0h	736d

Off	Off	On	Off	Off	On	↑↑↑↓↓↑	02D8h	728d
On	Off	On	Off	Off	On	↓↑↑↓↓↑	02D0h	720d
Off	On	On	Off	Off	On	↑↑↑↓↓↑	02C8h	712d
On	On	On	Off	Off	On	↑↑↑↓↓↑	02C0h	704d

Off	Off	Off	On	Off	On	↓↓↓↑↓↑	02B8h	696d
On	Off	Off	On	Off	On	↑↓↑↓↑↑	02B0h	688d
Off	On	Off	On	Off	On	↓↑↓↑↑↑	02A8h	680d
On	On	Off	On	Off	On	↑↑↓↑↑↑	02A0h	672d

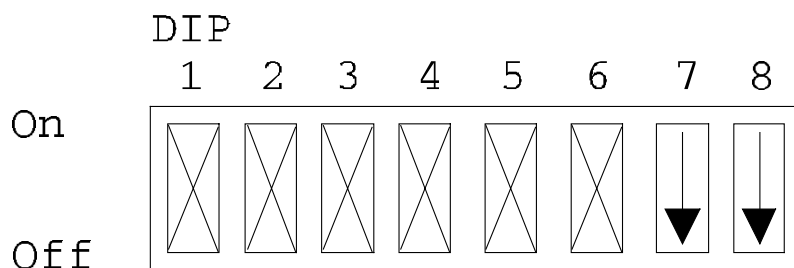
Off	Off	On	On	Off	On	↓↓↑↑↓↑	0298h	664d
On	Off	On	On	Off	On	↑↓↑↑↓↑	0290h	656d
Off	On	On	On	Off	On	↓↑↑↑↓↑	0288h	648d
On	On	On	On	Off	On	↑↑↑↑↓↑	0280h	640d

Off	Off	Off	Off	On	On	↓↓↓↑↑↑	0278h	632d
On	Off	Off	Off	On	On	↑↓↑↑↑↑	0270h	624d
Off	On	Off	Off	On	On	↓↑↑↑↑↑	0268h	616d
On	On	Off	Off	On	On	↑↑↑↑↑↑	0260h	608d

Off	Off	On	Off	On	On	↓↓↑↑↑↑	0258h	600d
On	Off	On	Off	On	On	↑↓↑↑↑↑	0250h	592d
Off	On	On	Off	On	On	↓↑↑↑↑↑	0248h	584d
On	On	On	Off	On	On	↑↑↑↑↑↑	0240h	576d

Off	Off	Off	On	On	On	↓↓↓↑↑↑	0238h	568d
On	Off	Off	On	On	On	↑↓↑↑↑↑	0230h	560d
Off	On	Off	On	On	On	↓↑↑↑↑↑	0228h	552d
On	On	Off	On	On	On	↑↑↑↑↑↑	0220h	544d

Off	Off	On	On	On	On	↓↓↑↑↑↑	0218h	536d
On	Off	On	On	On	On	↑↓↑↑↑↑	0210h	528d
Off	On	On	On	On	On	↓↑↑↑↑↑	0208h	520d
On	On	On	On	On	On	↑↑↑↑↑↑	0200h	512d

Figure 2-6. Driver Chip Select.***Switch 7-Source/Sink Mode***

Switch 7 Down - Source Mode (UDN2984)

Switch 7 Up - Sink Mode (ULN2084)

Switch 8-Watchdog Mode

Switch 8 Down - Watchdog Goodlo out

Switch 8 Up - Watchdog Goodhi out

UDN2984 ULN2804 Driver Selection.

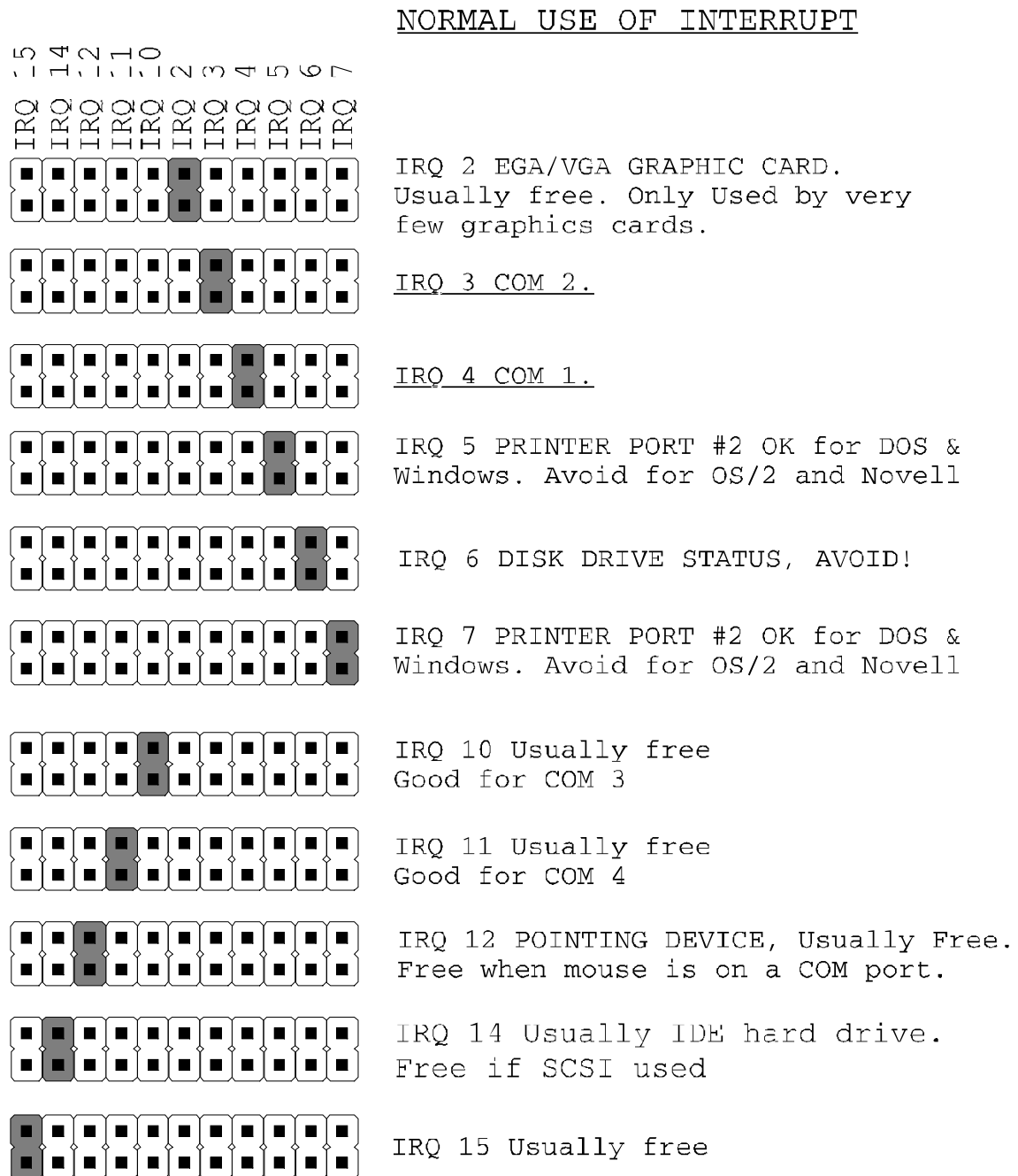
The card can be configured to use one of two types of high voltage drive chips ULN2804 or UDN 2984 chips. Chapter 1 explains the difference and function of these two driver types.

Source Driver Output Connection -UDN2984 Drivers.

The UDN2984 chips are high voltage, high current SOURCE drivers, output voltage range 35 to 80 Volts, these could be directly replaced by UDN2981 drivers for output voltages in the range 5 to 50 Volts. Whilst the 2984/81 drivers have built in output transient suppression diodes, extra diodes are provided on the Opto DIO cards for extra protection.

Sink Driver Output Connection - ULN2804 Drivers.

The ULN2804 chips are high voltage, high current NPN DARLINGTON drivers, output voltage range to 50 Volts, these could be directly replaced by ULN2824 chips, by the manufacturer for output voltages up to 95 Volts. The 2804 have open collector outputs.

Figure 2-7. The IRQ Jumper Block.**Interrupt Selection.**

The Opto DIO48 card can produce interrupts from low to high transitions on three signal lines, Watch Dog timeout, Port C2 input bit 0 and Port C2 input bit 3.

Opto DIO48

Configuration

The IRQ must be ENABLED in software AND the IRQ jumper must both be set before any IRQ requests are generated. Thus IRQs can be enabled under program control to suit the changing needs of the application. The position of the jumper MUST match the IRQ level set in the software.

The IRQ enable bits in the watch dog register selects which Opto DIO48 signal generates the interrupt, the IRQ jumper block selects which PC interrupt line is asserted, and so which software interrupt service routine is called. Write your IRQ service routine to patch the appropriate software interrupt.

Watch Dog Selection.

The Watchdog is now output via PA10 or IRQ ONLY! No other configuration options are available on this revision. The watch dog enable register is an 8 bit read write register, see Chapter 1.

Opto DIO48 Memory Map.

The Opto DIO48 has 24 dedicated output lines arranged as 3 eight bit read/write registers, 24 dedicated input lines arranged as 3 eight bit read only registers and one read/write watchdog enable/strobe register. Thus the DIO card occupies 7 consecutive i/o addresses. The output ports are output only, however the output registers are read/write, writing to them sets the level of the output lines, reading them provides a read back of the previously written value. On power up the outputs are zero.

Inputting and outputting data to the Port A, B and C registers senses and sets the values of the pins at the external connector. Writes to the watchdog register gate the Port C2 bit 0 and Bit 3 input signals are gated onto IRQ line or RESET line of the PC.

Reading the watchdog register refreshes the timer and postpones timeout for another 50milliseconds.

Figure 2-8. Opto DIO48 Memory Map.

BASE ADDRESS OFFSET	DEFAULT ADDRESS	DEFAULT ADDRESS	DIO PORT	REGISTER SELECTED			
0000 R/W	0308 h	776 d	P#0	PORT A#1 OUTPUT PORT A			
0001 R/W	0309 h	777 d	P#1	PORT B#1 OUTPUT PORT B			
0002 R/W	030A h	778 d	P#2	PORT C#1 OUTPUT PORT C			
0003 R/W	030B h	779 d	P#3	WATCH DOG ENABLE REG TO REFRESH WATCHDOG			
0004 READ	030C h	780 d	P#4	PORT A#2 OUTPUT PORT A			
0005 READ	030D h	781 d	P#5	PORT B#2 OUTPUT PORT B			
0006 READ	030E h	782 d	P#6	PORT C#2 OUTPUT PORT C			
READ / WRITE WATCH DOG ENABLE REGISTER DEFAULT ADDRESS = 030B h							
BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
WRITE DON'T CARE READ ALWAYS 0				GATE PORT C2 BIT3 TO IRQ	GATE PORT C2 BIT0 TO IRQ	GATE JUMPER BUS TO IRQ	GATE JUMPER BUS TO RESET

Opto DIO48 Output Specification.

Number Of Port Output Lines 24

External Power Voltage Range..... 17.5 -35 Volts

Ext Power Supply Reverse Polarity Connection Protected.

Maximum External Power Current

All Outputs High Shorted To All Inputs.....1000 mA @ 24V

WHEN SOURCE DRIVER UDN2984 FITTED

Output Voltage.....0 - 35 Volts

Can with stand Maximum OFF Voltage. 80 Volts

Sustained Simultaneous O/p Current all lines.....50mA @35V

Max Output Current per 8-line package.....500mA

Peak Output Current any one line.....350mA

WHEN SINK DRIVER ULN2804 FITTED

Output Voltage.....6 - 35 Volts

Sustained Simultaneous O/p Current on all lines.375mA

Max Output Current per 8-line package.....3A

Peak Output Current any one line.....500mA

Opto DIO48 Input Specification.

Number Of Port Input Lines..... 24

Input Logic level HIGH. 2.4 - 24.0 Volts

Input Logic level LOW.....0.0 - 2.38 Volts

Maximum I/p Current One In Line High.....7.25 mA @24V

Maximum I/p Current All In Lines High.....175 mA @ 24V

Absolute Maximum Input Voltage. 35 Volts

PC Power Requirements.....125 mA at 5 Volts

Optical Isolation.....+/- 2500 Volts

Length x Height Of Card.....9.75 x 4.2 inch.

All Inputs Reverse Polarity Connection Protected.

Opto DIO48 Pinouts.

The DIO48 card has a 50 pin D connector which has three rows of 17, 16, 17 pins, on a 2.75 mm pitch.

Figure 2-9. Opto DIO48 J2 Female 50D Pinout.

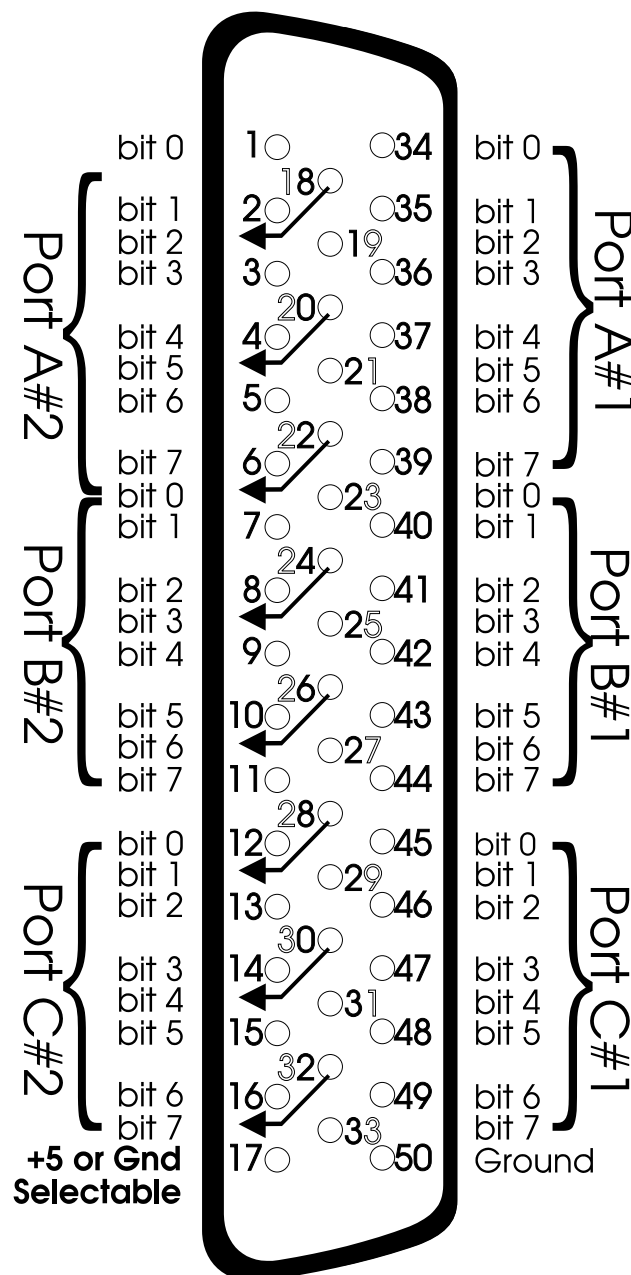


Figure 1-14 and figure 1-15 are a cross-reference of the 50 IDC connector to 50 way female D connector pinouts for those customers using previous versions of this product.

Figure 2-10

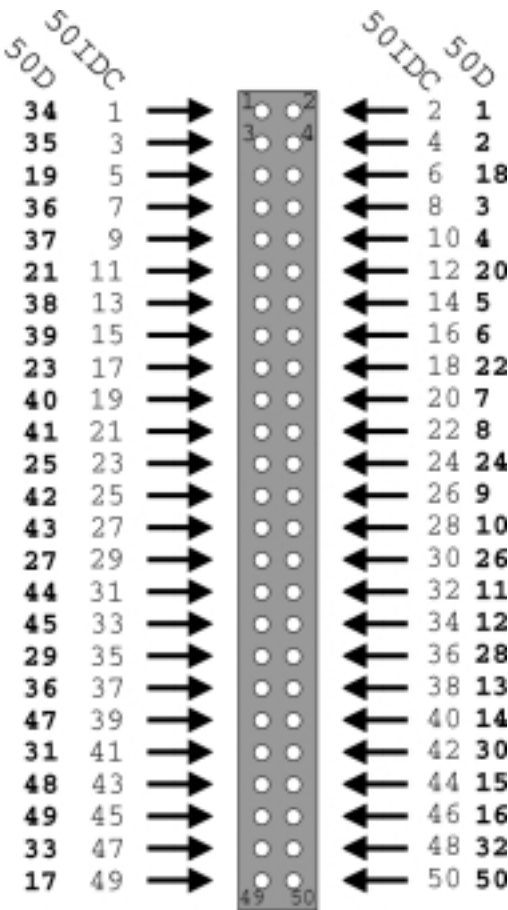
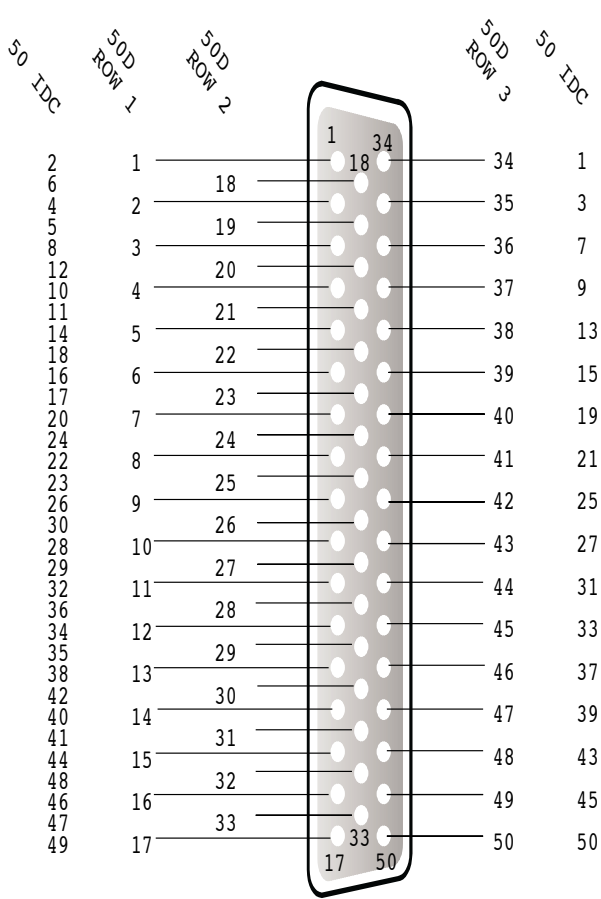


Figure 2-11



Chapter 3

INSTALLATION.

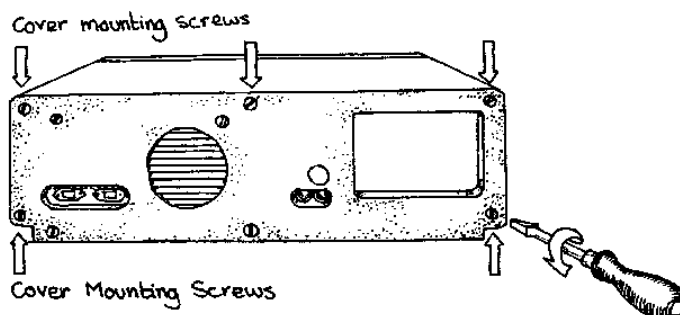
Installing The Opto DIO Board In The Computer.

NOTE: Always turn the computer OFF before installing or removing any interface board!

After having made sure that the I/O address is correctly set, now is the time to insert the Opto board into the I/O connector slots in the computer.

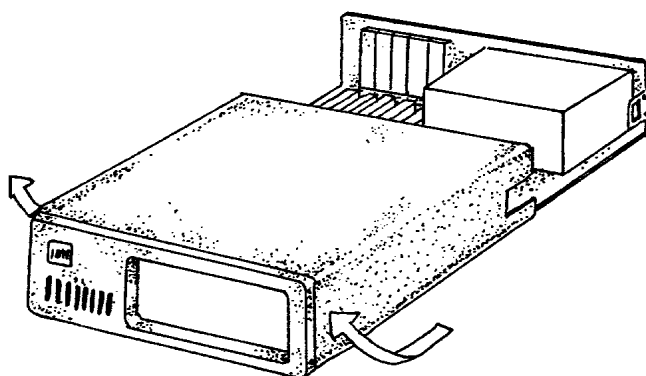
STEP 1 Before the Opto board can be installed the power to the PC MUST be switched OFF!

Figure 3-1. Remove Cover Mounting Screws.



STEP 2: Then using a screwdriver, remove the cover mounting screws on the back panel of the PC system unit.

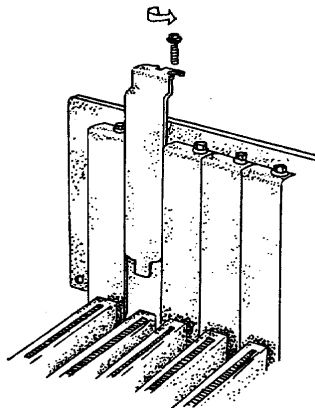
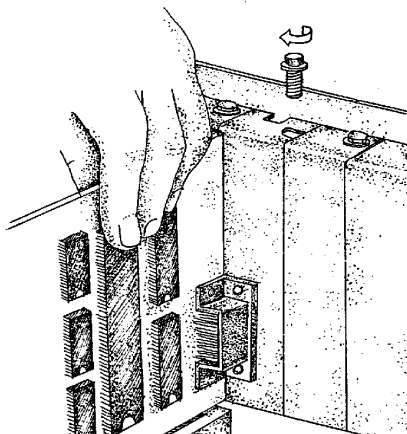
Figure 3-2. Removing The PC Cover.



STEP 3: Next, remove the PC's cover by sliding it forward and up. It usually helps to disconnect the keyboard from the PC since it tends to get in the way when the case is removed.

Figure 3-3. Removing Blanking Cover.

STEP 4 Choose an empty expansion slot. The Opto card will fit either a full length or a short slot, a 8 bit PC type slot or a 16 bit AT type slot. In general it is wise to leave the larger slots free for those boards that insist on greater room. Remove the blanking cover protecting the slot on the PC back panel. KEEP the blanking cover screw safely for later.

**Figure 3-4. Inserting The Opto Card.**

STEP 5: Now insert the Opto card in the slot. Be careful to ensure that the gold plated pcb fingers fits neatly into the I/O expansion connector. Press down firmly but evenly on the top of the Opto card.

STEP 6: The 50 way IDC connector should fit neatly through the slot's aperture to the outside world.

Use the screw kept back from the blanking cover to screw the Opto retaining bracket into the PC back panel housing.

STEP 7: Now replace the system unit's cover by carefully sliding it down and over the system unit. Replace the cover screws.

STEP 8: After attaching all the monitor and keyboard cables, power up the PC. Do not forget the mains power cable!

The PC should power on in the normal way.

Problems!

If the system fails to power up check the following.

- i.) Ensure that the Opto card is installed correctly.
- ii.) Ensure that other cards in the PC have not been upset.
- iii.) Ensure the power is connected and the PC is switched ON!
- iv.) Ensure the Opto card I/O address is set correctly. Default for the Opto DIO48 is at 0308h.

If all these have been checked and the PC still does not power up then there is probably a conflict of I/O address between the Opto board and another board in the PC. Ask your dealer to check this or contact the HELP line as given on Intro page 2.

Screw Terminal Board.

The easiest and tidiest way to connect your I/O card to your rig is via the Screw Terminal Board.

The Screw Terminal Board converts from either 50 IDC ribbon or 50D cable to screw terminals. The screw terminals can take wire up to 2.5mm, 0.1 inch diameter. The 50IDC entry is a latching connector, the 50D has screw locks to ensure hold fast connections. Power taken from the PC via the cards PWR=LNK jumper is fed through a removable fuse and LED. De-coupling capacitors are provided.

Each screw terminal, is clearly identified by IDC pin number, and Opto DIO signal name, it can also take an optional LED to show signal logic state. A handy cable grip clamps the wires to ensure a robust, tidy layout. Order one now!

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