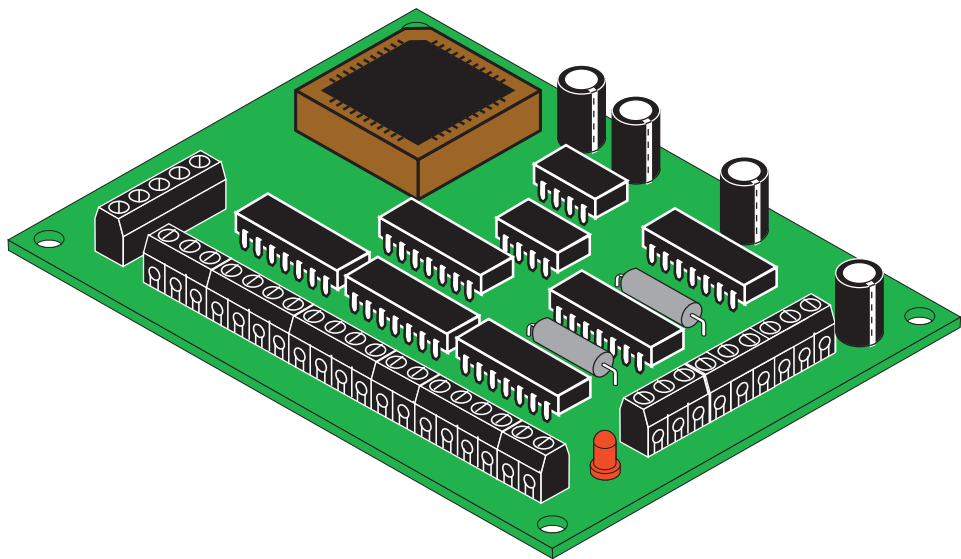


Hardware Manual

1240i-485

**Intelligent Step Motor Driver
with Multi-drop RS-485 Interface**



 **Applied
Motion
Products**
motors • drives • controls

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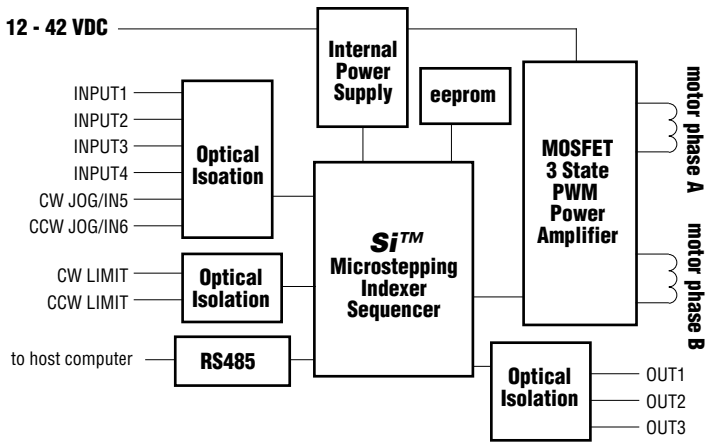
Introduction

Thank you for selecting an Applied Motion Products motor control. We hope our dedication to performance, quality and economy will make your motion control project successful. If there's anything we can do to improve our products or help you use them better, please call or fax. We'd like to hear from you. Our phone number is (800) 525-1609 or you can reach us by fax at (831) 761-6544.

Features

- Precise pulse width modulation switching amplifier providing up to 1.2 amps per phase and microstepping to 50,800 steps per revolution.
- Accepts 12 - 42 VDC power supply.
- Powerful, flexible, easy to use indexer.
- Connects to host computer by RS-485 multi-drop interface, allowing up to 32 drives to be commanded in real time from one port.
- Microsoft Windows™-based software for easy setup
- Eight inputs for interacting with the user and other equipment.
- Three outputs for coordinating external equipment.
- External trigger I/O is optically isolated, 5-24V, sinking or sourcing signals.
- 3.0 x 4.0 x 0.5 inch overall dimensions.
- CE Compliant

Block Diagram

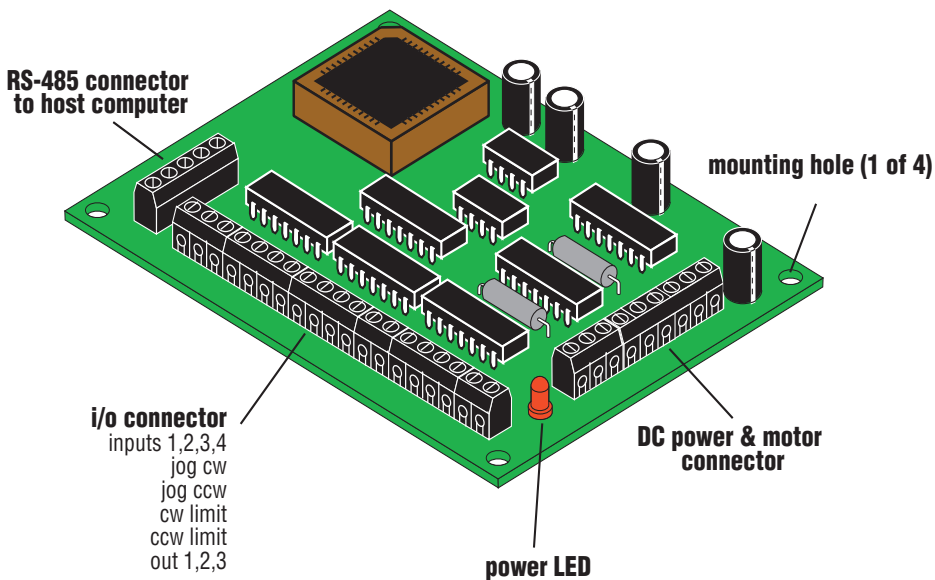


Getting Started

To use your 1240i-485 motor control, you will need the following :

- a power supply (see page 7 for help choosing one).
- a compatible step motor (see page 17 for recommended motors).
- a small flat blade screwdriver for tightening the connectors - an Applied Motion Products screwdriver suitable for this purpose is included with your drive.
- a personal computer running Windows 3.1, 95, 98 or NT with an RS-485 serial port or adapter (486 or better with 8 MB ram recommended)
- *SCL Setup Utility* software that came with your 1240i
- *SCL Software Manual* - on the CD that came with your 1240i

The sketch below shows where to find the important connection and adjustment points. Please examine it now.



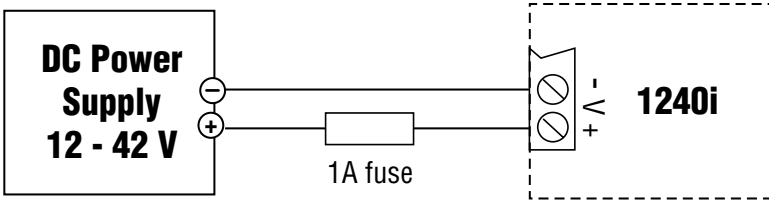
Always use the blue & white Applied Motion screwdriver with the connectors. Larger screwdrivers may remove the plastic dimples that prevent the screws from falling out.

Connecting the Power Supply

If you need information about choosing a power supply, please read *Choosing a Power Supply* on the next page.

If your power supply does not have a fuse on the output or some kind of short circuit current limiting feature, you need to put a 1 amp fast acting fuse between the drive and the power supply. Install the fuse on the + power supply lead.

Connect the motor power supply as shown below. Use no smaller than 18 gauge wire. Be careful not to reverse the wires. Reverse connection may destroy your driver, void your warranty and generally wreck your day.



Choosing a Power Supply

Please follow the recommendations below for choosing a power supply:

Voltage

Chopper drives like the 1240i work by switching the voltage to the motor terminals on and off while monitoring current to achieve a precise level of phase current. To do this efficiently and silently, you'll want to have a power supply with *a voltage rating at least five times that of the motor*. Depending on how fast you want to run the motor, you may need even more voltage than that. If you choose an unregulated power supply, do not exceed 28 volts. This is because unregulated supplies are rated at full load current. At lesser loads, like when the motor's not moving, the actual voltage can be up to 1.4 times the rated voltage. For smooth, quiet operation, a lower voltage is better.

Current

The maximum supply current you could ever need is the sum of the two phase currents. However, you will generally need a lot less than that, depending on the motor type, voltage, speed, and load conditions. That's because the 1240i uses switching amplifiers, converting a high voltage and low current into lower voltage and higher current. The more the power supply voltage exceeds the motor voltage, the less current you'll need from the power supply. A motor running from a 24 volt supply can be expected to draw only half the supply current that it would with a 12 volt supply. We recommend the following selection procedure:

- 1) If you plan to use only a few drives, get a power supply with at least twice the rated phase current of the motor.
- 2) If you are designing for mass production and must minimize cost, get one power supply with more than twice the rated current of the motor. Install the motor in the application and monitor the current coming out of the power supply and into the drive at various motor loads. This will tell you how much current you really need so you can design in a lower cost power supply. If you plan to use a regulated power supply you may encounter a problem with current fold back. When you first power up your drive, the full current of both motor phases will be drawn for a few milliseconds while the stator field is being established. After that the amplifiers start chopping and much less current is drawn from the power supply. If your power supply thinks this initial surge is a short circuit it may "fold back" to a lower voltage. Because of that, unregulated power supplies are better. They are also less expensive.

Connecting the Motor



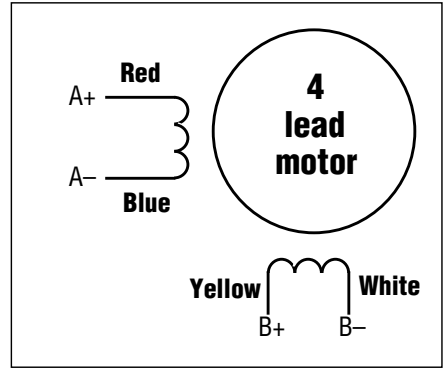
Never connect or disconnect the motor to the driver when the power is on.

Insulate unused motor leads separately, and then secure.

Never connect motor leads to ground or to a power supply.

You must now decide how to connect your motor to the drive.

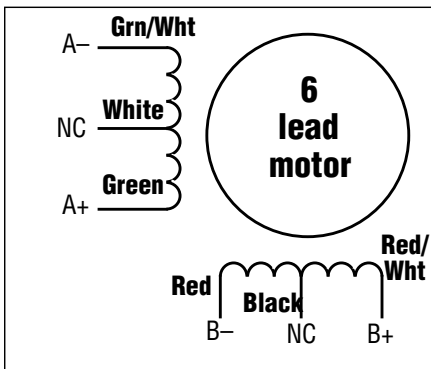
Four lead motors can only be connected one way. Please follow the sketch at the right.



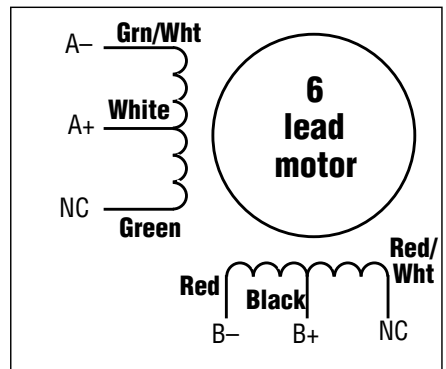
4 Leads

Six lead motors can be connected in series or center tap. In series mode, motors produce more torque at low speeds, but cannot run as fast as in the center tap configuration. In series operation, the motor should be operated at 30% less than the rated current to prevent overheating. Wiring diagrams for both connection methods are shown below.

Note: NC means not connected to anything.

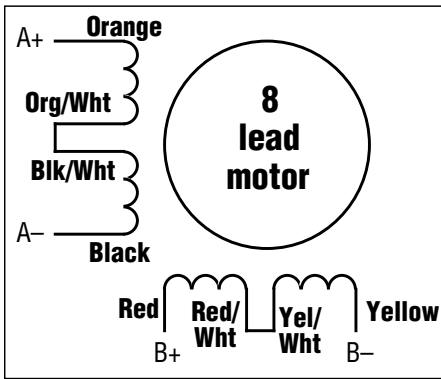


6 Leads Series Connected

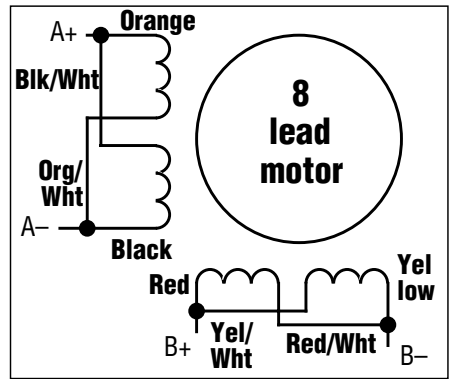


6 Leads Center Tap Connected

Eight lead motors can also be connected in two ways: series and parallel. As with six lead motors, series operation gives you more torque at low speeds and less torque at high speeds. In series operation, the motor should be operated at 30% less than the rated current to prevent overheating. The wiring diagrams for eight lead motors are shown below.



8 Leads Series Connected



8 Leads Parallel Connected

Connecting to the Host Computer

- The 1240i-485 includes a multi-drop RS-485 communication interface that must be connected to the RS-485 port of a host computer. Up to 32 drives can be connected to one host and individually commanded in real time. Each drive is “addressed” by a special character, unique to each drive, included at the beginning of each command. To assign an address character to each drive in your system, you’ll first need to connect each drive individually to the host. A Windows PC and the *SCL Setup Utility* is the easiest way to do this.

The RS-485 standard allows both 2 wire and 4 wire configurations. The 1240i supports the four wire type. Consider yourself lucky, as four wire RS-485 does not require the host to disable its transmitter after each command is sent, and with four wires you can send commands and receive data back at the same time.

If you plan to use a Windows PC as your host, then you’ll need to purchase an RS-232 to RS-485 adaptor. We’ve had excellent results with the model 117701 adaptor, sold by Jameco (800-831-4242). If your RS232 port is like most, it has only 9 pins, so you’ll need a “9 pin to 25 pin serial cable”. That’s also available from Jameco: model 31721.

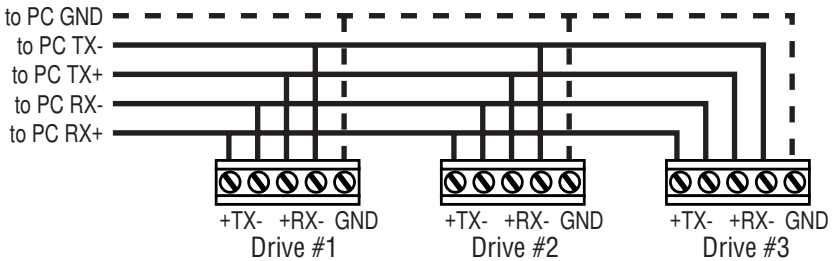
Configure the Jameco adapter as follows:

- Set the switches for “DCE” and “TxON,RxON”
- Connect adapter pin 1 to drive terminal RX+
- Connect adapter pin 2 to drive terminal RX-
- Connect adapter pin 3 to drive terminal TX-
- Connect adapter pin 4 to drive terminal TX+

Another source of RS-485 adapters is B&B Electronics (815-433-5100 or www.bb-elec.com). If your PC does not have an RS-232 serial port, B&B can supply you with a USB to RS-485 converter.

If you plan to use more than one drive in your system, then connect the drives to each other as follows:

- RX+ to RX+
- RX- to RX-
- TX+ to TX+
- TX- to TX-
- GND to GND



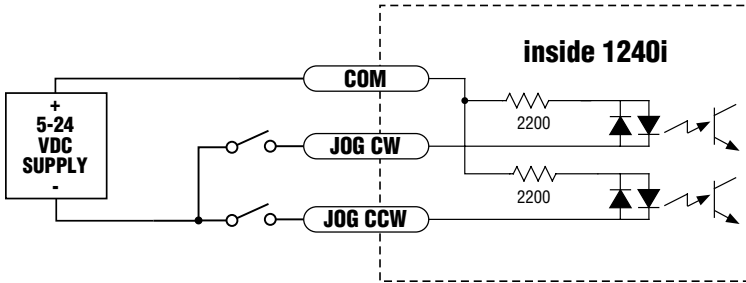
We recommend Category 5 wire, commonly used for ethernet networks. Maximum distance from the host to any drive is 4000 feet. Because our drives transmit data at a modest 9600 bits per second, no termination resistors are required.

The 1240i-485 will not work with the *Si Programmer™* software. You need a standard 1240i for that. The only software on the *Si™* CD that works with this drive is the *SCL Setup Utility*.

Jogging

Two of the 1240i input terminals are provided for jogging the motor. The inputs are labeled “JOG CW” and “JOG CCW”. Activating one of the inputs commands the drive to move the motor at a pre-designated speed until the contact is opened. A relay or mechanical switch can be used to activate the jog inputs. 5-24 volt circuitry can be used. The schematic diagram of the input circuit is shown below.

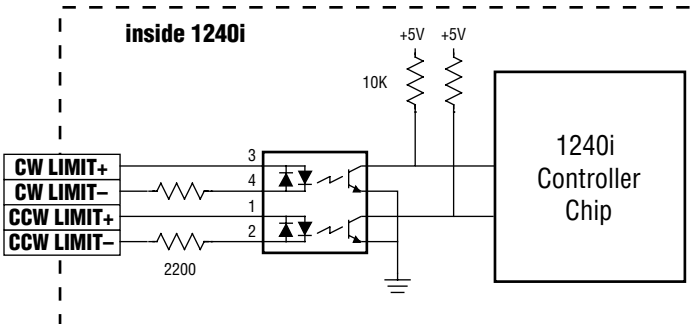
If you're using a switch or relay, wire one end to the JOG input and the other to the power supply negative (-) terminal. Then connect the COM input to the power supply positive (+) terminal.



Limit Switches

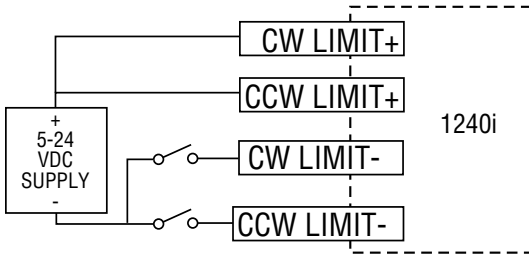
The 1240i has two limit switch inputs, LIMIT CW and LIMIT CCW. By connecting switches or sensors that are triggered by the motion of the motor or load, you can force the 1240i to operate within certain limits. This is useful if a program error could cause damage to your system by traveling too far.

The limit inputs are optically isolated. This allows you to choose a voltage for your limit circuits of 5 to 24 volts DC. This also allows you to have long wires on limit sensors that may be far from the 1240i with less risk of introducing noise to the 1240i. The schematic diagram of the limit switch input circuit is shown below.



Wiring a Mechanical Limit Switch

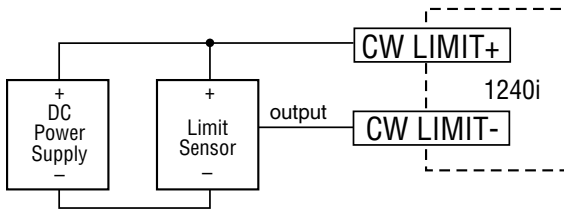
You can use normally open or normally closed limit switches. Either way, wire them as shown here. If the switch closes at the limit, select the option “closed”. If the switch is open, or high voltage, choose “open”.



Wiring a Limit Sensor

Some systems use active limit sensors that produce a voltage output rather than a switch or relay closure. These devices must be wired differently than switches.

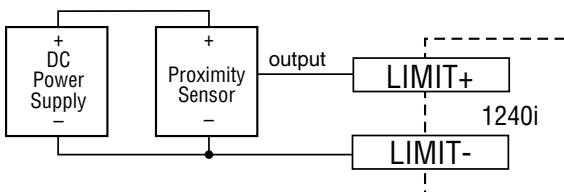
If your sensor has an open collector output or a **sinking** output, wire it like this:



Wiring for Sinking or Open Collector Output

If the sensor output goes low at the limit, select the option “closed”. If the output is open, or high voltage, choose “open”.

Other sensors have **sourcing** outputs. That means that current can flow out of the sensor output, but not into it. In that case, wire the sensor this way:

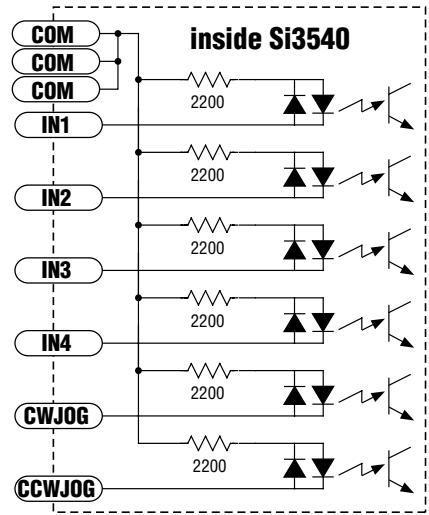


Wiring for Sourcing Output

If the sensor output goes high at the limit, choose the program option “closed”. If the output is low at the limit, select “open”.

Wiring Inputs

The 1240i input circuits can be used with sourcing or sinking signals, 5 to 24 volts. This allows connection to TTL circuits, PLCs, relays and mechanical switches. Because the input circuits are isolated, they require a source of power. If you are connecting to a TTL circuit or to a PLC, you should be able to get power from the PLC or TTL power supply. If you are using relays or mechanical switches, you will need a 5-24 V power supply. This also applies if you are connecting the 1240i inputs to another Si product from Applied Motion, like the Si-1 and Si-100 indexers or the 3540i, Si3540, Si5580, 7080i and BL series drives.

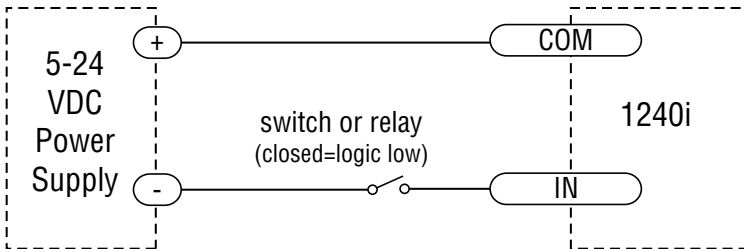


Note: If current is flowing into or out of a 1240i input, the logic state of that input is low. If no current is flowing, or the input is not connected, the logic state is high.

The diagrams on the following pages show how to connect 1240i inputs to various devices.



The maximum voltage that can be applied to an input terminal is 24 volts DC. Never apply AC voltage to an input terminal.

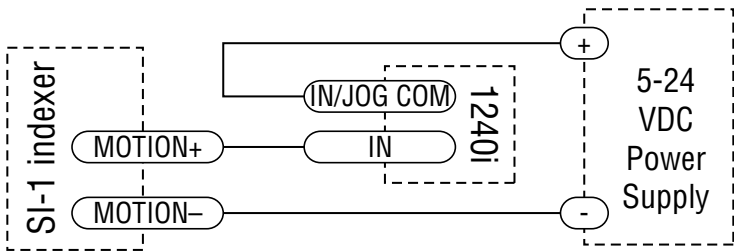


Connecting an Input to a Switch or Relay

Use normally open momentary switch to trigger 1240i using Wait Input instruction.

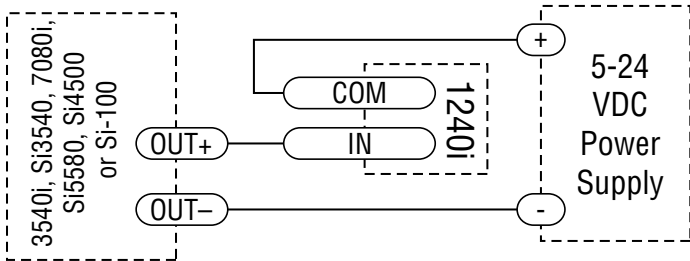
Use single throw switch if using the If Input instruction for program branching.

Use normally open momentary switch for jogging.



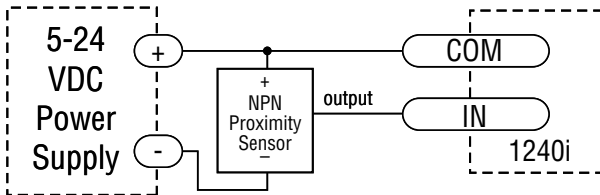
Connecting an Input to the Si-1 Motion Output

(Set Si-1 motion signal to "in position". Si-1 will trigger 1240i at end of each move).



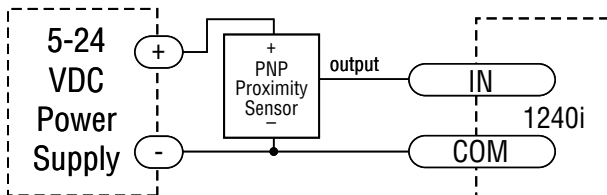
Connecting a 3540i, Si3540, Si5580, 7080i, BL7080i or BLSi7080

(When output closes, 1240i input goes low).



Connecting an NPN Type Proximity Sensor to a 1240i input

(When prox sensor activates, 1240i input goes low).



Connecting a PNP Type Proximity Sensor to a 1240i input

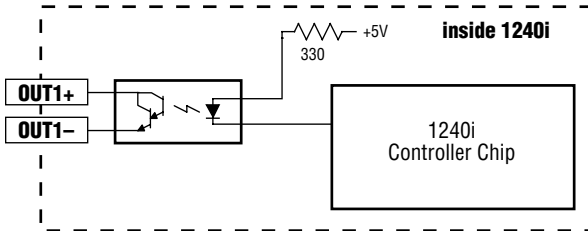
(When sensor activates, 1240i input goes low).

Wiring Outputs

Before we discuss the output conditions, we need to talk about the circuitry. All three 1240i outputs are optically isolated. That means that there is no electrical connection between the indexer-drive and the output terminals. The signal is transmitted to the output as light. What you “see” is a transistor (NPN type) that closes, or conducts current, when the output is “low”. When the output is high, the transistor is open.



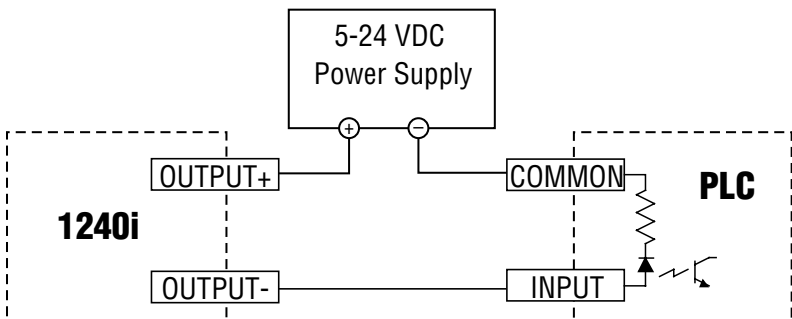
The maximum voltage between any pair of + and - output terminals is 24 volts DC. Never connect AC voltages to the 1240i output terminals. Maximum current is 100 mA per output.



Schematic Diagram of 1240i Output Circuit

Since there is no electrical connection to the 1240i, you must provide the source of current and voltage, typically from a power supply. You must also limit the current to less than 100 mA so that the output transistor is not damaged. You would normally use a resistor for this, but some loads (such as PLC inputs) limit the current automatically.

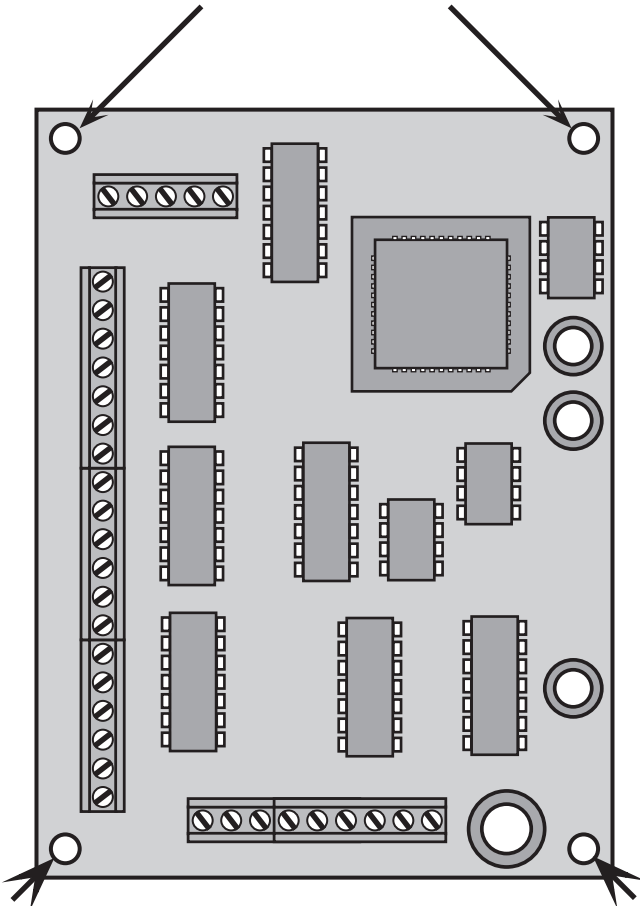
The diagram below shows how to connect an 1240i output to an optically isolated PLC input.



Mounting the Drive

The 1240i has four 0.156 inch diameter holes in the circuit board for mounting. Always use standoffs or spacers to support the 1240i: a 1240i with power connected will be damaged if you set it on a conductive surface without supports. The standoffs or spacers can be up to 0.25 inch in outer diameter. You can use #4 or #6 screws to fasten the 1240i.

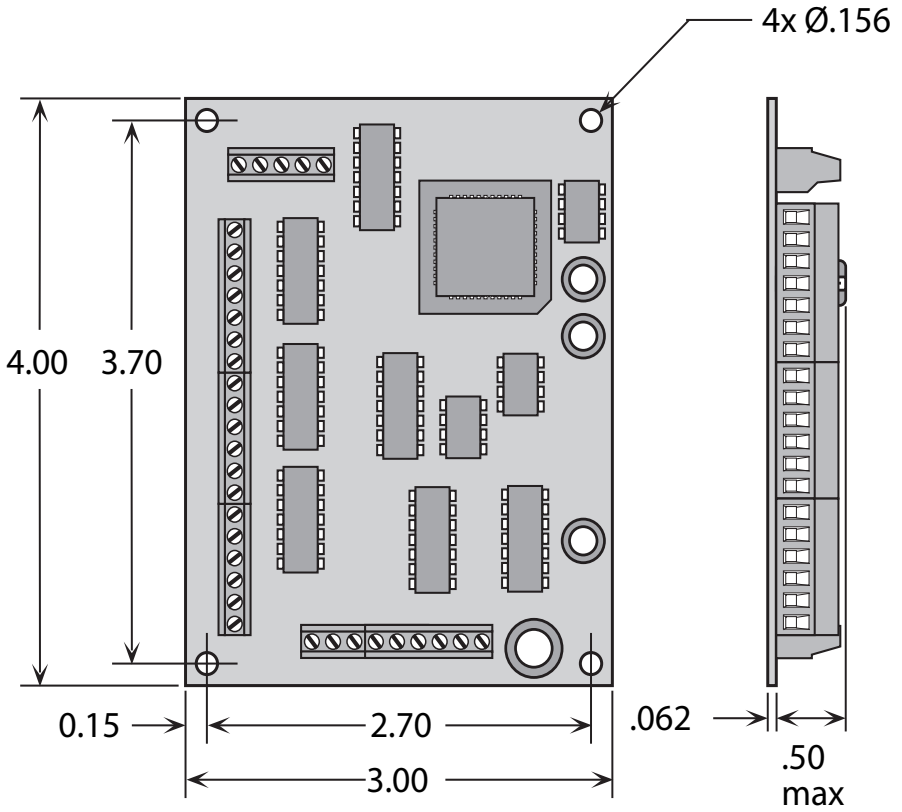
Four .156" mounting holes



Recommended Motors

Motor Number	Winding Connection	Max Torque oz-in	Current Setting Amps/phase
HT11-012	series	7	1.0
HT11-013	series	10	1.0
5014-842	series	19	1.0
HT17-068	parallel	22	1.2
HT17-072	parallel	32	1.1
HT17-076	parallel	52	1.1
HT23-393	parallel	45	1.2
HT23-396	parallel	115	1.2
HT23-399	parallel	170	1.2

Mechanical Outline



Technical Specifications

Amplifiers	Dual H-bridge, 3 state, pulse width modulated (PWM) switching at 25 kHz. 0.1 - 1.2 amps/phase output current, software selectable. 48 watts maximum output power. Automatic idle current reduction (software programmable) reduces current to motor when idle. Minimum motor inductance is 0.8 mH.
Power Supply	Accepts 12 - 42 VDC power supply. 1.2 amps typical max. load.
Inputs	5 - 24 VDC, optically isolated. 2200 ohms internal resistance. Can be configured for sinking (NPN) or sourcing (PNP) signals. Analog Input - not currently supported by Si Programmer, may be read in SCL mode using "RA or "IA" commands
Outputs	Optically isolated. 5-24 VDC, 100 mA max.
Microstepping	13 software selectable resolutions. Steps per revolution with 1.8° motor: 2000, 5000, 10000, 12800, 18000, 20000, 21600, 25000, 25400, 25600, 36000, 50000, 50800. Waveform: pure sine.
Motion Update	12800 Hz.
Physical	Constructed on 0.063 inch thick printed circuit board. Four mounting holes, 0.156 inch diameter. Overall size : 3.00 x 4.00 x 0.65 inches. 0.15 lb. 0 to 50°C ambient operating temperature. See page 20 for detailed drawing.
Connectors	European style screw terminal blocks. Power supply and motor: 6 position. Wire size: AWG 16 - 28. Signal input/output: 19 position. Wire size: AWG 16 - 28. RS-485 communications: 5 position, AWG 16-28.
Agency Approvals	CE compliant to EN55011A, EN50082-1(1997)

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