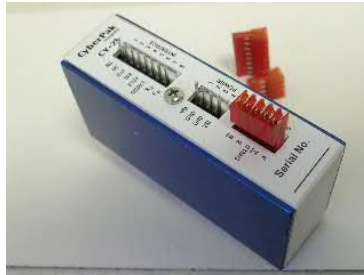


CY-20 and CY-21 Microstepping Motor Driver User's Guide

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Modification History

Date	Version	Author	Change
5/10/01	1.0	AMB	Original Version
5/24/01	1.1	AMB	Added connector information
8/16/01	1.2	AMB	Modified for low power feature
1/20/02	1.3	AMB	CY-20 (renamed from CY-21-LP)
4/05/07	1.4	GWS	Updates

1 Introduction

The CY-20 and CY-21 micro-stepping motor drive modules have an opto-coupled signal interface and bipolar chopper drive current regulation. The interface supports opto-coupled step, direction, and motor enable. TTL signals (as little as 1.6 ma) or 24-volt industrial controllers can drive this interface. This interface is a source style interface. That is to say that the step, direction and enable signals must source current to these signals and be connected to the common signal return path.

If an open collector type interface is used, it is necessary to use a pull up resistor. See our document “[Common Issues in the Application of Step Motor Drivers](#)” and also the “Typical PLC Open Collector Driven Interface” figure in the Motor Driver Interfaces section of this document.

1.1 CY-21 Specifications

The CY-21 has 16 microsteps per full step, which is 3,200 steps/rev with a standard 1.8° motor.

This bipolar chopper drive technique offers high performance at up to 42 Volt, 1.5-amp class for 2- and 4-phase step motors.

Drive signal specifications:

Max pulse rate	200 KHz
Minimum pulse width	2 microseconds
Direction setup time	200 microseconds
Enable delay	200 microseconds

1.1.1 Low Power Mode

The CY-21 goes into low power mode if a step pulse has not been received for about 1 second. Low power mode draws approximately 50% of the power that the CY-21 uses while it is stepping. When the CY-21 is at its low power level and detects a step pulse, it will immediately return to normal power level.

1.2 CY-20 Specifications

The CY-20 is identical to the CY-21 (given in the section above), except that it is optimized for very low current motors. The CY-20 has a maximum peak current of 290 ma. This product

would have its own resistor vs. current table. This product is useful for some very tiny low current motors.

The CY-20 has a separate current-limiting resistor table, given later in this manual along with the CY-21's resistor table.

2 Connector Interface Definition

2.1 P1 – Interface Connector

Signal Interface and Current Setting Pins

(On P1 a no connection and a driven low level are the same signal state)

pin #	Function	notes
1	Auxiliary 1	Reserved for future use
2	Auxiliary 2	Reserved for future use
3	/Enable Motor Power	0=Power Enabled, 1=Power Disabled
4	Direction	0=CW, 1=CCW (see note below)**
5	Step Clock	Steps on Rising Edge
6	Signal Return	Common Signal Ground
7	R _A ***	One End of Current Specifying Resistor
8	R _B ***	Other End of Current Specifying Resistor

**Direction is a relative concept. You need to decide if you want clockwise / counter-clockwise to refer to looking at the motor from the front or the back, and then always define direction from that side. Furthermore, if you reverse just one of the two coils of the motor connection, the definition of the direction will be reversed. In other words reverse P3 connections 1 & 2 or 4 & 5 (but not both) in order to have the directions reversed. It is recommended that you define direction in terms of your application and then adjust the motor leads as required so that your definition is met. This will pay off in the clarity of the software and documentation that you will deal with for your machine.

*** See the resistor value table in the section “Setting the Peak Current for your Motor.”

2.2 P2 – Power Connector

Note that the power connector uses paralleled pins for current sharing, which normally isn't required at 1 amp and below or if the socket pins you are using are rated for the motor current. Still, with the IDC-type cabled connectors it is easy to press the wire in and loop it to the next pin and press in again.

pin #	Function	notes
1	Power Supply Return (Gnd)	
2	Power Supply +Vm	12 – 42 Volts DC*
3	Power Supply +Vm	12 – 42 Volts DC*
4	Power Supply Return (Gnd)	

* Make sure you do not exceed the 42 volts, since it is a maximum. Some unregulated supplies can have outputs, which vary with the line voltage and also are higher at no load. The supply should be measured at no load and also should provide a safety reserve margin of 15%, which suggests a maximum voltage of about 36 volts. If your power supply is regulated, you could run closer to the maximum voltage.

2.3 P3 – Motor Connector

pin #	Function	Notes
1	/B	Motor Coil 2
2	B	Motor Coil 2 (other end)
3	Shield Ground	Connect to motor case*
4	/A	Motor Coil 1
5	A	Motor Coil 1 (other end)

* You can reduce EMI by use a shield. The user needs to determine if a shield is required for a given application. Many systems do not use a shield.

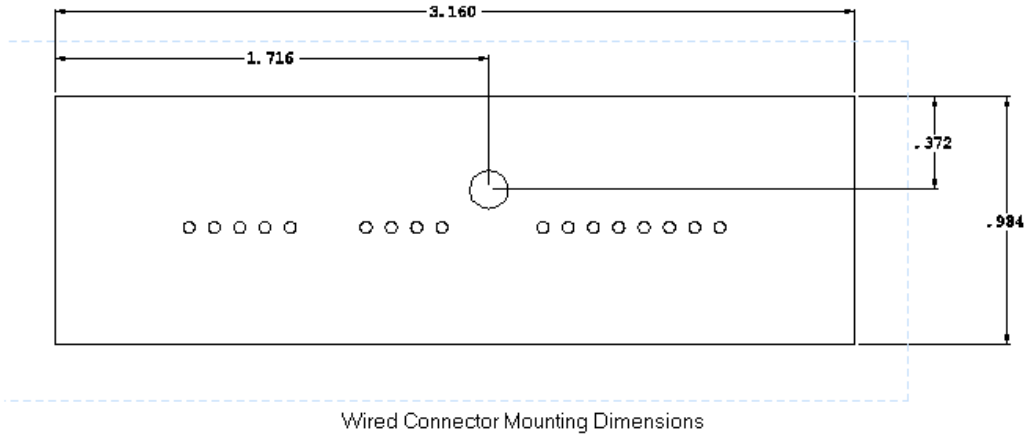
3 Mounting Methods

There are two mounting/use approaches that a customer can use

- PCB mount with the connectors facing the PCB
- Connectors facing up and using a wire cable connector style

3.1 Wired Connectors

If you are using wired cabling to interface to the power supply, (step and direction) indexer interface, and the motor, the Motor Driver will be mounted “Pins Up” and the single 4-40 screw will provide mechanical mounting to your panel. If this module is mounted to a metal panel you will benefit from additional heat-sinking capability.



The figure above shows the CY-20 / CY-21 dimensions when you are using it with pins up as a cabled-in module.

3.1.1 IDC Connectors

When using cable mount, you will typically use IDC connectors. The 22 gauge IDC connectors are normally provided with the CY-20 or CY-21. If you have special wire sizes, you may need to change the connectors. These IDC connectors come in various gauges.

CY-20/-21 Connector	Connector pin count	Wire Gauge	DigiKey Part Number	AMP Part Number
Power	4	28	A19052-ND	640443-4
Motor	5	28	A19052-ND	640443-5
Interface	8	28	A19052-ND	640443-8
Power	4	26	A19032-ND	640442-4
Motor	5	26	A19053-ND	640442-5
Interface	8	26	A19036-ND	640442-8
Power	4	24	A1902-ND	640441-4
Motor	5	24	A19021-ND	640441-5
Interface	8	24	A1904-ND	640441-8
Power	4	22	A1907-ND	640440-4
Motor	5	22	A19011-ND	640440-5
Interface	8	22	A1909-ND	640440-8

Additionally, a special tool is required to insert the wires into the IDC connectors. This tool is a T-Handle Tool available from DigiKey. Its part number is A9982-ND.

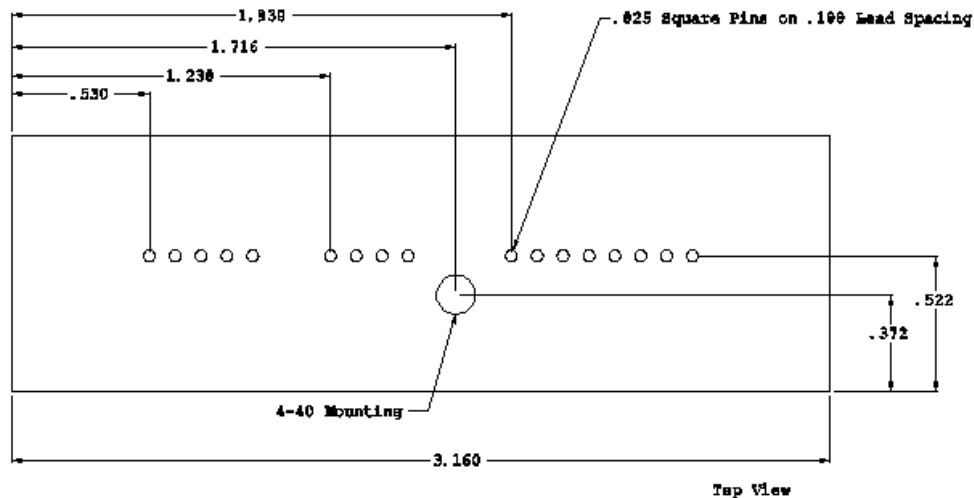
3.1.2 Crimp-style Connectors

An alternative cabling solution is to use crimp-style connectors. The following part numbers allow you to connect the CY-20 or CY-21 in this manner.

CY-20/-21 Connector	Connector pin count	Wire Gauge	DigiKey Part Number	AMP Part Number
Power	4	22 - 26	A19492-ND	770602-4
Motor	5	22 - 26	A19493-ND	770602-5
Interface	8	22 - 26	A19496-ND	770602-8
Crimp Contact	N/A	N/A	A19520-ND	770666-1

3.2 PCB Mount

If you are using the CY-20 or CY-21 as a component on a circuit board see the following diagram. This shows the mounting dimensions when the pins are pointing downward and are to be placed into a PCB.



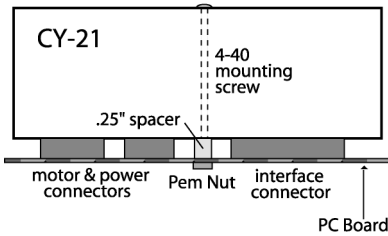
PCB Mounting Dimensions

The figure above is a view of the PCB footprint of a circuit board laid out to accept the CY-20 or CY-21 to be plugged into the board. Please note that the pin spacing is .1 inch for all three connectors, and that they are spaced so at a multiple of .1 inch with respect to each other to ease setup for mounting on a PC board.

There are two methods you can use for mounting the CY-20 or CY-21 on a circuit board.

3.2.1 Top Entry Connector Mount

CY-21 Top Entry Connector PCB Mount
(side view)

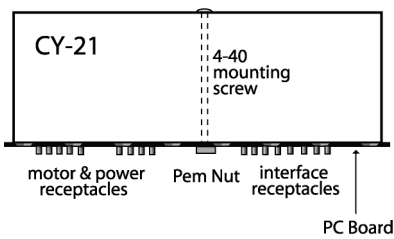


- Use PCB-mount top-entry connectors on the circuit board. Details of mounting hardware required follow:

Item	Distributor	Part Number	Comments
5 position connector	DigiKey	WM3203-ND	
4 position connector	DigiKey	WM3202-ND	
8 position connector	DigiKey	WM3206-ND	
4-40 Screw			Minimum Screw Length = 2.071
#4 Spacer			Spacer height = 0.25 inches
Pem Nut	McMaster-Carr	95185A110	Requires .204 hole on PCB

3.2.2 Flush Mount

CY-21 Flush Mount on PCB
(side view)

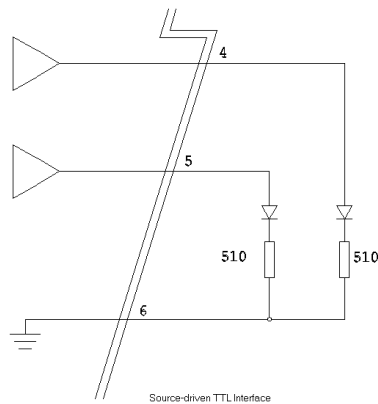


- Use PCB receptacles in 1/16 holes for each pin on the CY-20/-21. Details of the mounting hardware required follow.

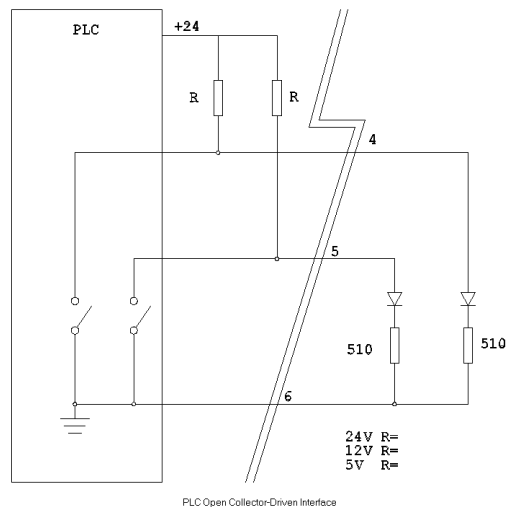
Item	Distributor	Part Number	Comments
.022/.032 diameter receptacles	DigiKey	ED5008-ND	PCB hole size required is 1/16 inch. Our pin size is .025 square.
4-40 Screw			Minimum Screw Length = 1.8325
Pem Nut	McMaster-Carr	95185A110	Requires .204 hole on PCB

4 Motor Driver Interfaces

- The following figure shows a typical Source Driven TTL Interface:



- The following figure shows a typical PLC Open Collector Driven Interface:



For 24V, R=7.5K. For 12V, R=3.3K. For 5V, R=1.0K.

5 Mode Switch

This driver can be used in microstepping mode, half step mode and full step mode. The mode is specified by setting a DIP switch inside the unit. This product is sold as a microstep driver, and it is recommended that you use the module in the microstep mode, however if you need to change to half or full step you will have to disassemble the driver. This requires removal of the two Philips screws on the bottom of the module channel. Don't loose these screws, they are special 100° angle screws. Now you can slide the metal channel off the plastic board holder. You will see the dip switch. The switches are numbered 1, 2, 3, 4. Note that one side of the switch is labeled 'ON'. Use the table below to choose the desired mode. Be gentle with this switch. It is fragile.

Mode	Switch 1	Switch 2	Switch 3	Switch 4
MicroStep Mode	N/A	N/A	OFF	N/A
Half Step Mode	N/A	N/A	ON	ON
Full Step Mode	N/A	N/A	ON	OFF

Note: N/A means that this switch position does not have any affect. Their usage is either defined elsewhere or they are reserved for future use.

6 Setting the Peak Current for your Motor

6.1 CY-21 Current-setting Resistor Values

For motors less than 1.5 Amp, you must attach a **resistor between terminal strip pin 7 and pin 8 on the Interface Connector**. This can be a ¼ watt resistor. The values shown below are standard 1% values. Often you can pick a value that is close enough out of 5% values, since the motor current may not be critical in your application. For 1.5 Amps, no resistor is required. These values are for peak, not RMS values.

Motor Amps	Use Resistor	Motor Amps	Use Resistor
1.5	No resistor	0.7	549
1.4	7.320K	0.6	464
1.3	3.160K	0.5	280
1.2	2.430K	0.4	232
1.1	1.540K	0.3	147
1	1.270K	0.2	80
0.9	887	0.1	51
0.8	649		

6.2 CY-20 Current-setting Resistor Values

This appendix provides information on the current-limiting resistors that are needed for the low CY-20 microstepping motor driver.

6.3 *Setting the Peak Current for your Motor*

For motors less than .3 Amps (300 milliamps), you must attach a **resistor between terminal strip pin 7 and pin 8 on the Interface Connector**. This can be a ¼ watt resistor. The values shown below are standard 1% values. Often you can pick a value that is close enough out of 5% values, since the motor current may not be critical in your application. For 300.milliamps, no resistor is required. These values are for peak, not RMS values.

Motor Amps	Use Resistor	Motor Amps	Use Resistor
0.300	No resistor	0.125	316
0.250	2.43K	0.100	221
0.225	1.40K	0.075	147
0.200	909	0.050	86.6
0.175	634	0.025	39.2
0.150	442		

7 Support

For technical support or service please contact us using the information following:

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