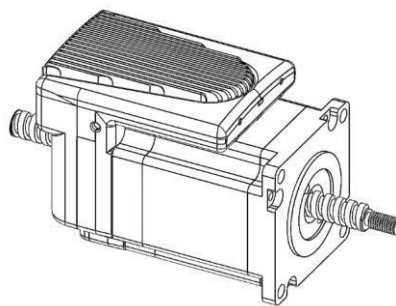


SERVOTRACK™
Vector Integrated Motion Systems
Vector™ 23 Series
HARDWARE MANUAL



| ServoTrack Vector Hardware Manual Change Log | | |
|---|-----------------|--------------------------|
| Date | Revision | Changes |
| 12-22-2016 | 0 | Initial Release |
| 6-22-2017 | 1.0 | Added Specs |
| 1-22-2018 | 1.1 | Adding More Detail Specs |
| | | |
| | | |
| | | |
| | | |

APPLICATION ENGINEERING SUPPORT:
MONDAY THROUGH FRIDAY
(8:00AM to 5:00PM Pacific Standard Time)
PH: (408) 612-4970

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APPLICATION ENGINEERING SUPPORT:

(408)-612-4970

8:00 AM TO 5:00 PM Pacific Standard Time USA

PART 1: GENERAL USAGE

1. VECTOR™ Integrated Motion Systems Introduction

The Vector 23 Integrated Systems are a **DYNAMIC CLOSED LOOP** Motion Control System with integrated driver AND Programmable controller.

The Vector 23 accepts a broad input voltage range, from +12 VDC, up to +48 VDC, delivering enhanced performance and speed. This product is constructed from industrial temperature-rated parts, -40°C to +85°C, providing long life and trouble-free service in demanding environments.

Vector Series features include:

- Rotary OR Linear Actuator Options
- Rotary Torque up to 300 oz-in
- Linear Force up to 200 lbs
- USB Programmable interface
- Six +5 -24 volt general purpose I/O lines; one 16 bit analog input; 0 to 2 MHz step clock rate; 7 microstep resolutions; up to 51,200 steps per revolution. (256 uSteps per Full Step).
- One 16 Bit Analog Input

- **SNAPTRACK™ SIMPLE BLOCK PROGRAMMING**
- Communication via RS485 utilizing one communication port.
- Distributed Motion for multi-axis control
- Multi-Function diagnostic LED
- HMI Interface Capability (via Modbus RTU)
- Secondary Encoder Input for Electronic Gearing or Camming
- Internal Encoder Pulses can be read externally, independent of the motor
- 5 VDC Output on board

1.1 SnapTrack Software

NOTE: Software Designed for Microsoft Windows ONLY!

The Vector Series is programmed via the USB connection.

A standard PC to micro USB cable is required. (included)

Please download the SnapTrack Programming software from our website at:

<http://www.kocomotionus.com/servotrack>

SNAPTRACK™ PROGRAMMING BRIEF OVERVIEW

- Simple and powerful programming
- “Block” programming
 - Eliminates traditional “coding” and syntax learning
- Creates buttons with labels with underlying programs that can be executed with a simple click
- User-friendly software

TYPICAL PROGRAMMING BLOCKS

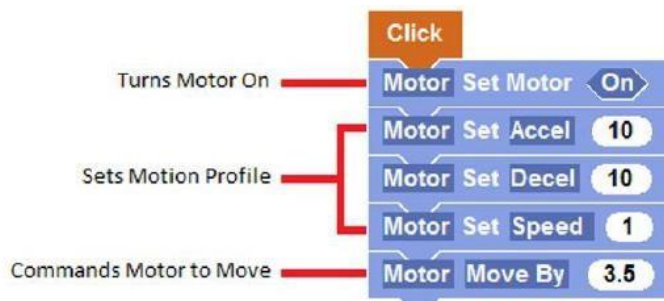
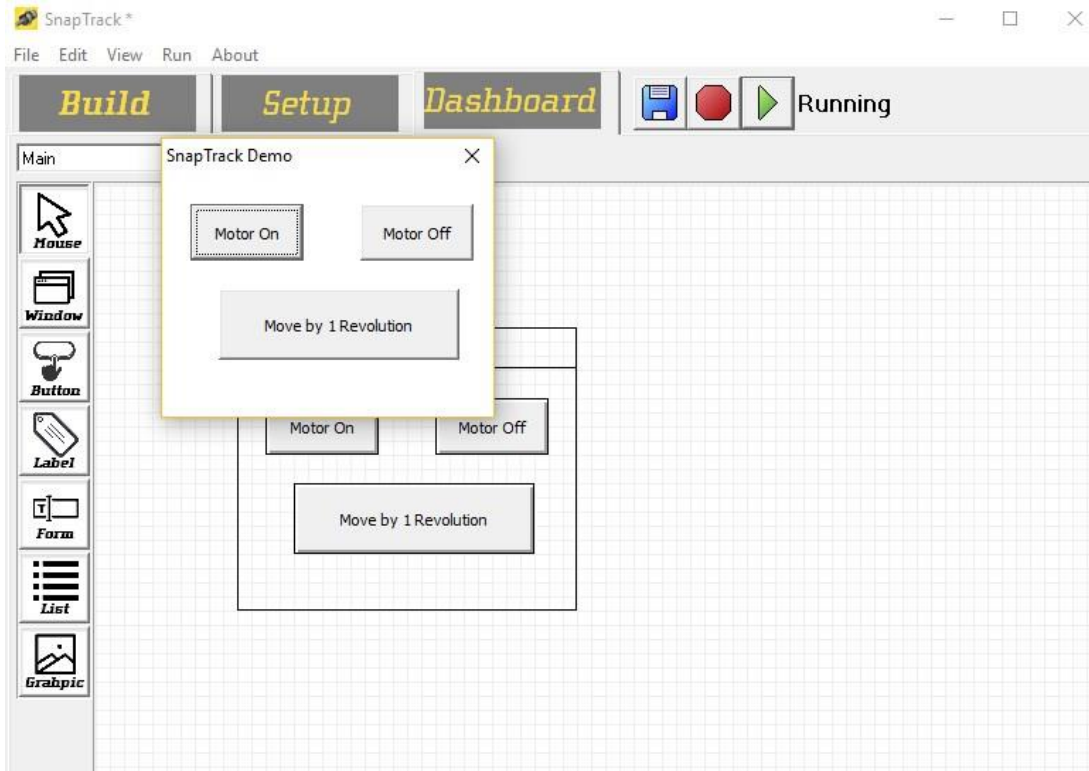


Figure 1. Push Button Block Program, Click and Set Motor

COMPUTER PROGRAMMING INTERFACE



1.3 Interfacing DC Power

MAXIMUM Voltage Input = 48VDC !!

CAUTION: DO NOT “HOT PLUG” THE DRIVER/CONTROLLER WHEN POWER IS APPLIED AS THIS CAN CAUSE DAMAGE TO THE ELECTRONICS!

NOTE: “Hot Plugging” means disconnecting or connecting the DC Power, Logic, or USB Communications from the System before turning off AC Power at the Power Supply.

AC power supply

The two types of power supplies commonly used are regulated and unregulated.

(Both can also be either switching or linear)

There are advantages and disadvantages depending on your application.

Please contact our Application Engineering Team for further guidance if needed.

Cabling Recommendations:

Do not exceed 50 feet of length from the Power Supply to the **VECTOR™ Series**

Shielded and Twisted Pairs are highly recommended

Recommended wire gauge = 18-20 AWG

1.4 Interfacing USB communications

USB Cable with a micro USB at one end.
Download SnapTrack programming software

1.6 Interfacing I/O

The general purpose I/O is tolerant to +24VDC.
The follow listed I/O points are TTL level (low logic), 5VDC:

1. Remote encoder input
2. Optional Step and Direction Inputs

The functions of the I/O MUST be configured in the SnapTrack programming software.
For detailed directions, please reference the SnapTrack programming manual.

I/O States

| | |
|----------------------|-------------|
| Active high and low? | |
| 0. to 0.8 VDC | Active Low |
| 2 to 5VDC | Active High |

NOTE:

General Purpose Inputs Sinking Inputs
General Purpose Outputs are Sinking and Sourcing Outputs

Analog Input (16 Bit)

Options:

Voltage (0-20VDC Scalable)
Scalable to (i.e, 0-5VDC, 0-10VDC, etc.)
Current (0.1-20mA)

The analog input allows for the ability to receive a variable input from temperature, pressure, and other forms of sensors and then control an event based on that input. [With DYNAMIC closed loop control of the Vector, it can also be applied to variable torque control OR linear force control with a linear actuator.](#)

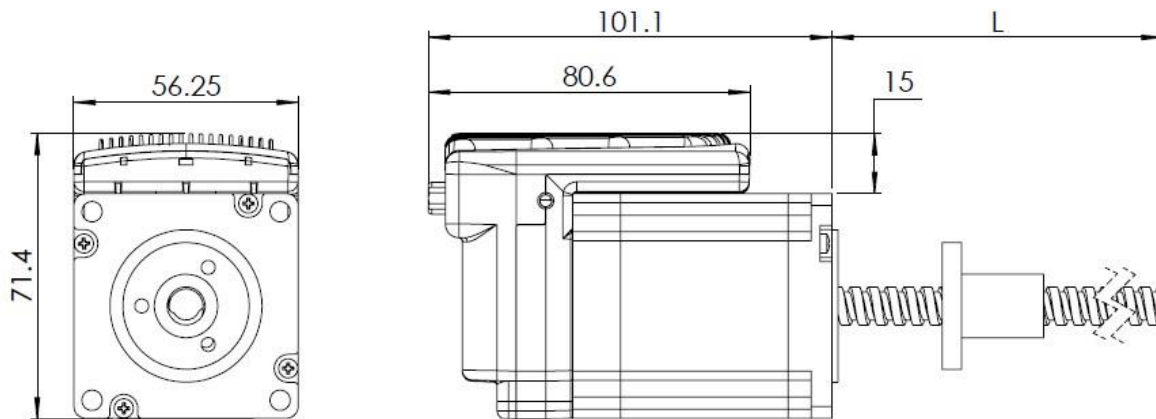
NOTE: Analog input can be programmed / scaled to correspond to motor position; e.g. (10V = 0-25 motor revs)

2. Specifications

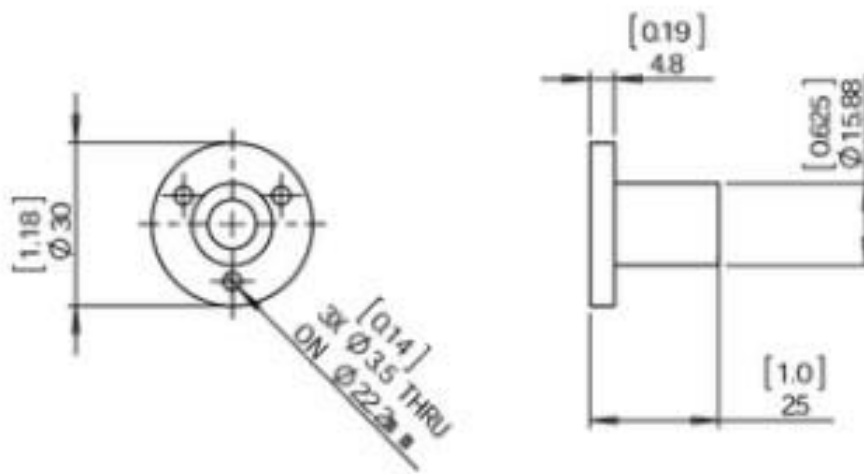
2.1 Mechanical Specifications

CAD MODELS AVAILABLE

Vector™ 23 External Version

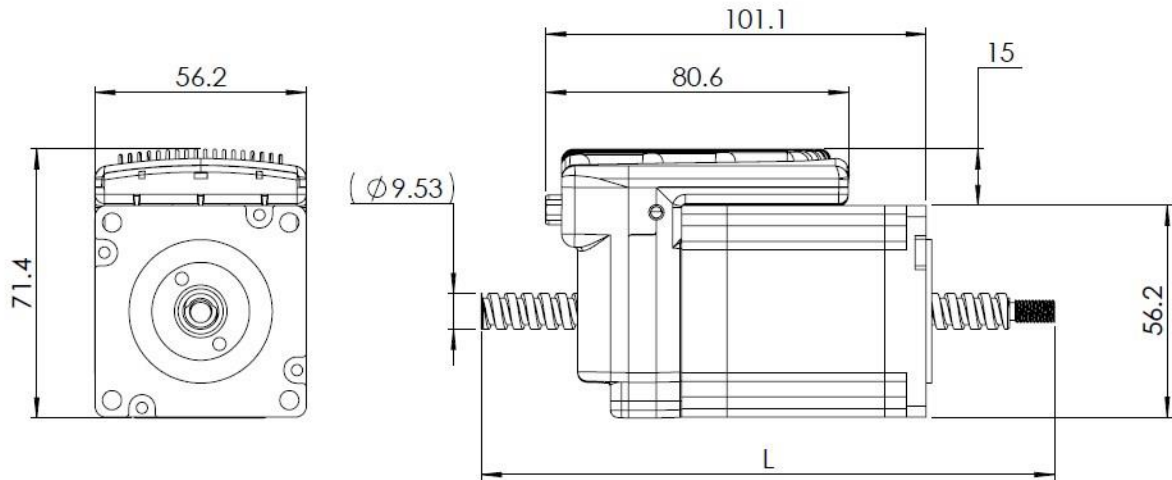


*L dimension will depend on stroke specification.



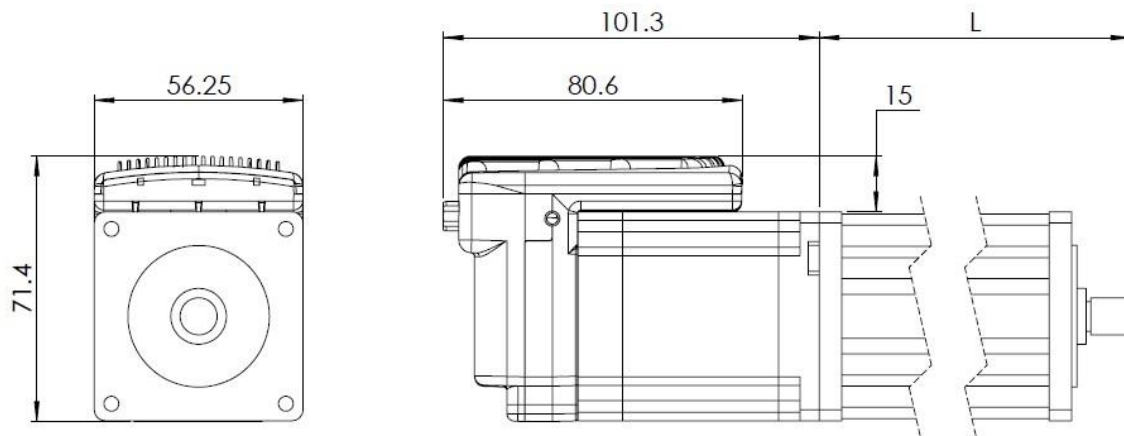
FREE WHEELING NUT DIMENSIONS

Vector™ 23 Non-Captive Version



*L dimension will depend on specification.

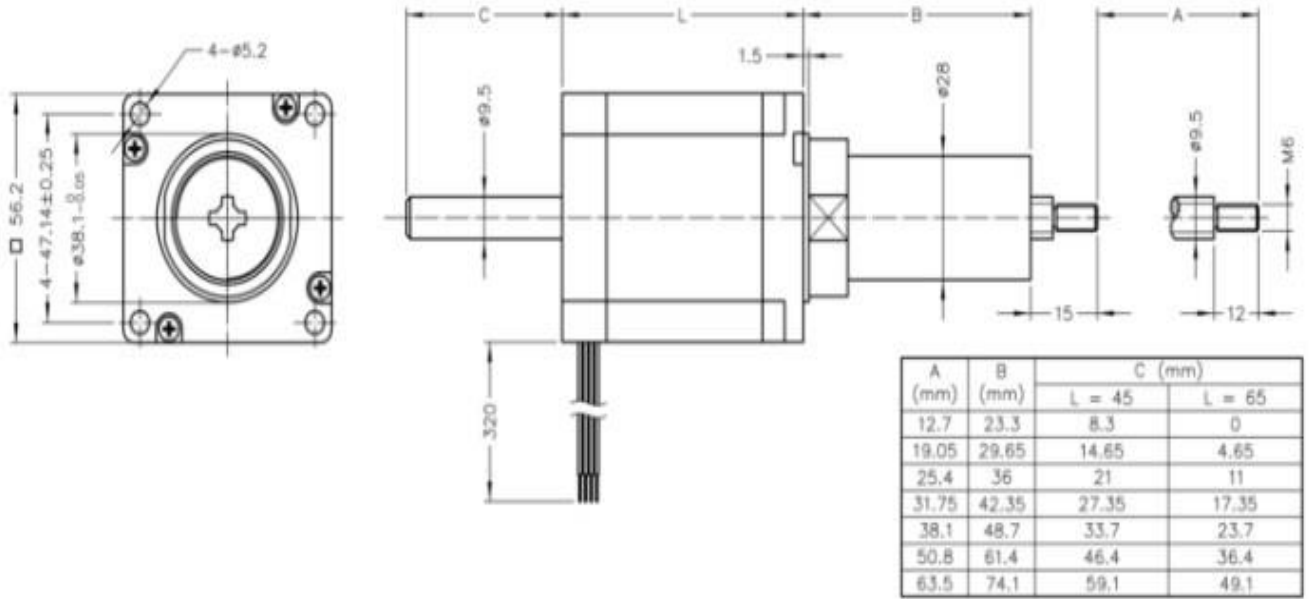
Vector™ 23 Electric Cylinder Version



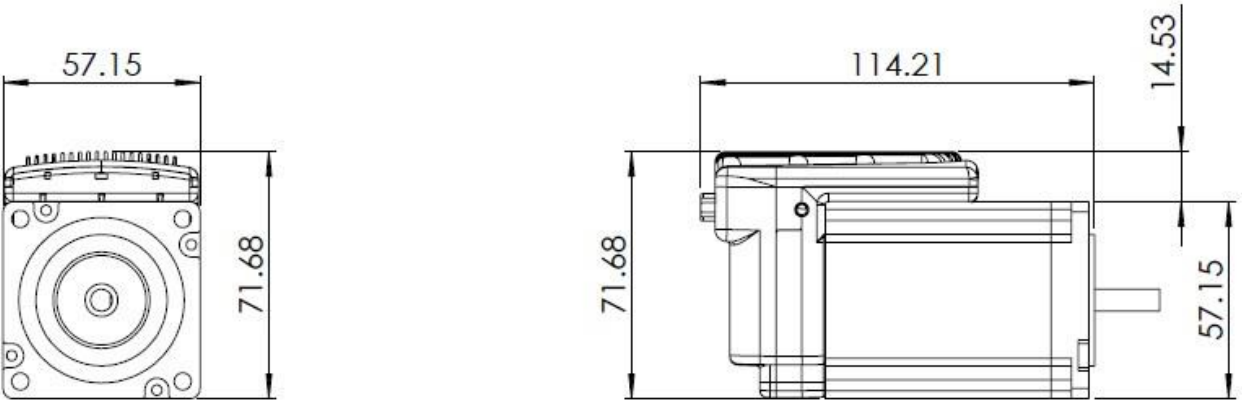
*L dimension will depend on specification.

| Stroke B inch (mm) | Dimension A (mm) | Dimension L (mm) | |
|-----------------------|---------------------|-----------------------------------|-----------------------------------|
| 0.5 [12.7] | 45.7 | Single stack motor 47 mm | Double stack motor 66 mm |
| 0.75 [19.05] | 52.05 | | |
| 1.0 [25.4] | 58.4 | | |
| 1.25 [31.8] | 64.8 | | |
| 1.5 [38.1] | 71.1 | | |
| 2.0 [50.8] | 83.8 | | |
| 2.5 [63.5] | 96.5 | | |

Vector™ 23 Kaptive Version



VECTOR 23 Rotary Versions



NOTE: We have two additional motor lengths available.

2.2 General Specifications

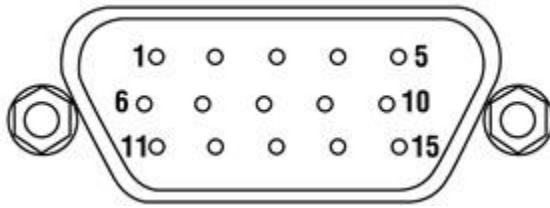
2.2.1 Electrical Specifications

| | Condition | Min | Type | Max |
|-----------------------------|-------------|--------------|------|-------------|
| Input Voltage Range | -- | +12.5 | -- | +48 |
| Power Supply Current | -- | -- | -- | 6.0 |
| Output Current | RMS | -- | -- | 4.0* |
| | Peak | -- | -- | 5.7 |

**Actual current depends upon voltage and load*

DB15 (DE-15) PINOUT FUNCTIONS:

TOP



FROM REAR OF VECTOR 23 (FEMALE PINS)

| <u>Pin #</u> | <u>Function</u> |
|--------------|--|
| 1 | General Purpose Output #1 + |
| 2 | General Purpose Output # 2 + |
| 3 | +5VDC Out |
| 4 | Rx |
| 5 | General Purpose Input #1 (OR Secondary Encoder Input, Single Ended) |
| 6 | General Purpose Output #1 - |
| 7 | General Purpose Output #2 - 8 General Purpose Output #3 + |
| 9 | N/A |
| 10 | Tx |
| 11 | General Purpose Input #2 (Or Secondary Encoder Input, Single Ended) |
| 12 | General Purpose Output #3 - |
| 13 | General Purpose Input #2 |
| 14 | GND |
| 15 | Analog Input |

NOTE 1: USING PINS 5 AND 11 FOR A SECONDARY ENCODER INPUT WILL REDUCE THE NUMBER OF INPUTS DOWN TO ONE.

NOTE 2: Step and Direction Inputs can accept 24V, however, exposure to absolute maximum rated conditions for extended periods of time may affect device reliability,

Note 3: Outputs have two (2) terminals each to allow for the User to supply your own voltage source and also to allow for sinking and sourcing circuits.

**NOTE: WE RECOMMEND PURCHASING THE BREAKOUT BOARD (Part # VBB-1).
DB15 PIN BREAKOUT BOARD FOR EASY RAPID PROTOTYPING !**

Part # = VBB-1

NOTE: NOT DESIGNED FOR PRODUCTION ENVIRONMENT

The optional breakout board is ideal for rapid prototyping and proof of concept designs. The breakout board may be plugged directly into the ServoTrack, or panel mounted using the included spacers.

Signals are accessed via a pluggable 15-pin Phoenix clamp-type terminal connector



A.2 Mechanical Specifications

Figure A.1: ServoTrack Breakout Board

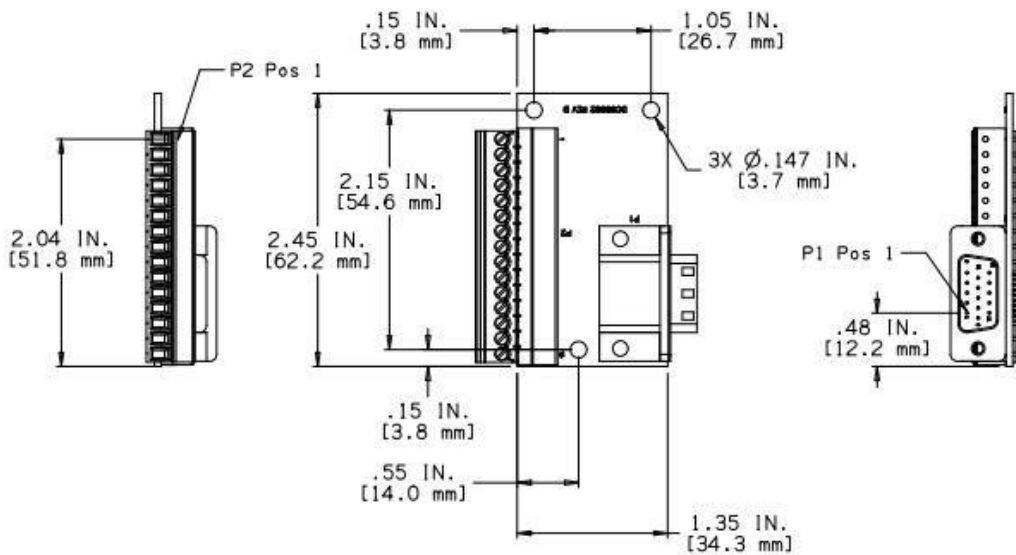


Figure A.2: Breakout Board Dimensions

2.2.2 I/O Specifications

Qty 6 I/O points configurable as sinking or sourcing inputs or sinking outputs

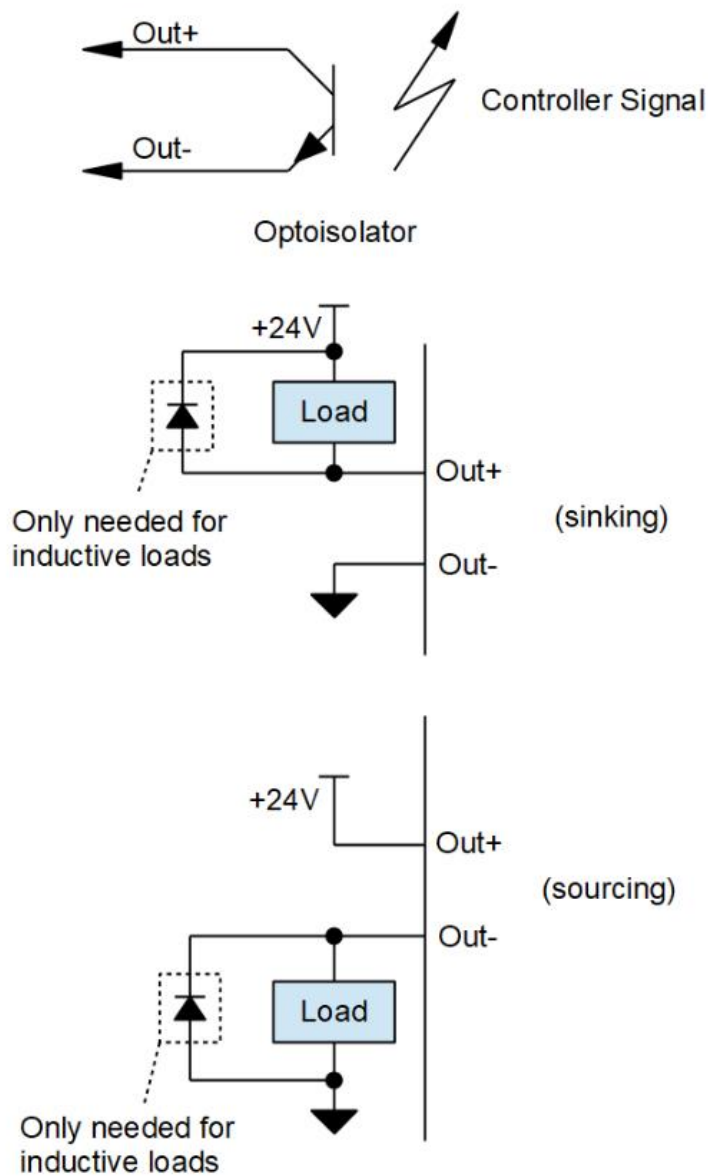
Optically Isolated Outputs

| | Condition | Min | Type | Max | Unit |
|---|--------------|-----|------|-----------------------|------|
| General Purpose I/O (Electrical) | | | | | |
| Inputs | TTL to 2VDC | 2 | -- | +24 | VDC |
| Sinking Outputs* | -- | 5 | -- | +24 | VDC |
| Output Sink Current | Per Channel | -- | -- | 50 | mA |
| Analog Input (16 Bit) | | | | | |
| Range** | Voltage Mode | -- | -- | 0-+5 VDC, 0 to 10 VDC | VDC |
| | Current Mode | -- | -- | 4 to 20mA, 0 to 20mA | mA |

* Inputs are high impedance, and are no current draw.

** With scaling

OUTPUT SCHEMATICS

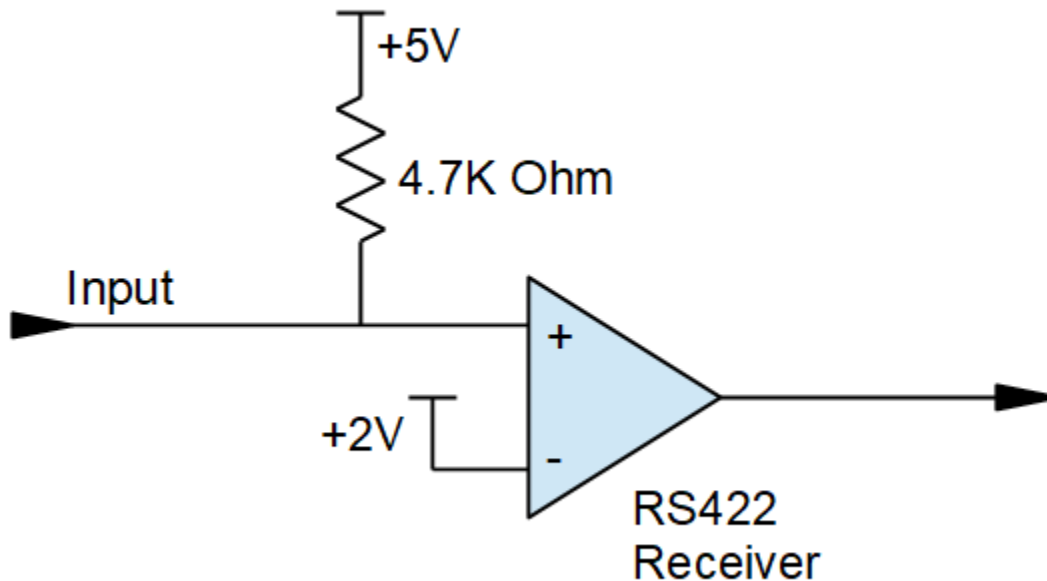


Attached is the image for the outputs. The top image is the electrical equivalent circuit for the outputs. The middle figure is how to drive a load by sinking, effectively acting as a switch closure to ground. The bottom figure shows how to source power into a load (acting like a switch closure to +24V). Explanatory test follows:

Outputs on the Vector are provided by 50 ma optoisolators. Both the positive and negative leads of the output transistor are available on the DSub connector. To achieve a sinking configuration, where the output acts like a switch closure to ground, connect the "Out-" pin for the selected output to ground. Connect the negative side of the load to Out+ and the positive side of the load to +24V. The optoisolator acts like a switch. When it turns on the Out+ will connect to Out- connecting the negative side of the load to ground. For a sourcing configuration, where the output acts like a switch closure to +24V, connect Out+ to +24V. Connect Out- to the positive side of the load. Connect the negative side of the load to ground. When Out+ connects to Out- the +24V will be presented to the positive side of the load. If an inductive load is being driven a flyback diode may be warranted to provide current an escape path and to prevent a voltage spike when the output turns off.

NOTE: This includes a flyback diode if an inductive load is being used.

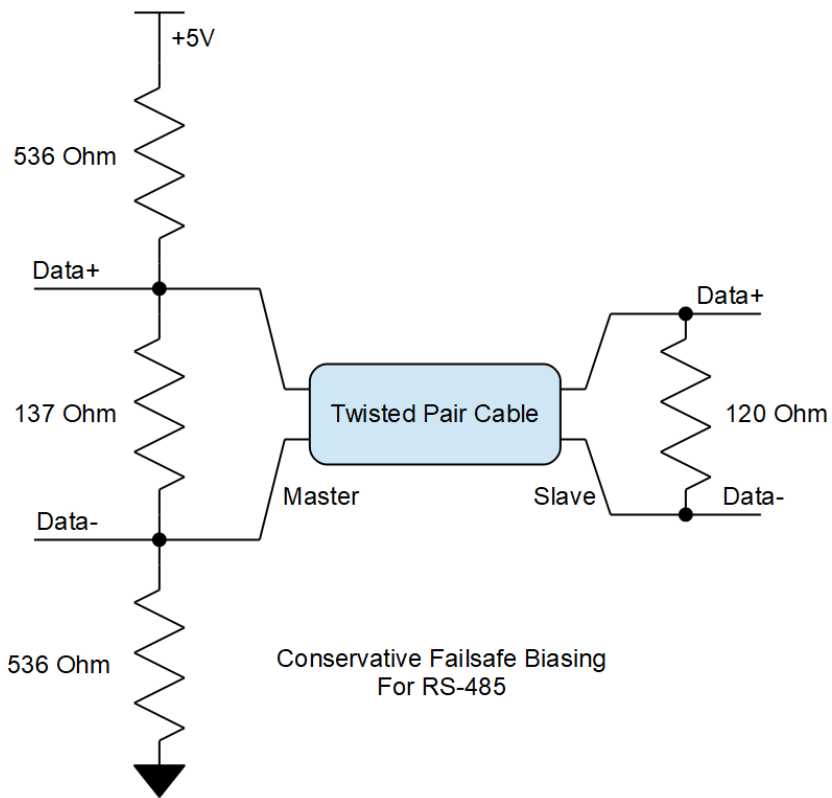
INPUT SCHEMATICS



"General Purpose Input signals go to an RS422 receiver for high speed as these signals can be used for step/dir input. An internal pull of 4.7K Ohms to an internal 5V reference is provided. The comparison reference is 2V making the signals TTL compatible. The maximum voltage specification for these RS422 receivers is 24 volts although this is not a recommended operating voltage as it is a maximum specification. To read a sinking signal (switch closure to GND) it is sufficient to just connect the signal. To read a sourcing signal (switch closure to positive voltage) it is necessary to provide an external 1K Ohm pull-down resistor to overcome the internal pullup. An additional 10K Ohm is needed if the sourcing voltage is 24 volts so as to make a voltage divider to respect the maximum voltage specification."

2.2.3 RS485 Half Duplex Serial Communication Specifications

| | Condition | Min | Type | Max | Unit |
|--------------------------|-----------|-----|------|------|------|
| <i>RS-485 (Standard)</i> | | | | | |
| BAUD Rate | -- | -- | -- | 9600 | bps |



2.2.4 Thermal Specifications

| | Condition | Min | Type | Max | Unit |
|-----------------------|------------------------|-----|------|-----|------|
| Heat Sink Temperature | Noncondensing humidity | -40 | -- | +85 | °C |

2.2.5 Motion Specifications

| <i>Microstep Resolution</i> | | | | | | |
|--|------|------|------|-------|-------|-------|
| Number of Microstep Resolutions | 7 | | | | | |
| Available Microsteps per Revolution (1.8° Motor) | | | | | | |
| 800 | 1600 | 3200 | 6400 | 12800 | 25600 | 51200 |

2.2.6 Software Specifications

| | |
|--|--|
| Program Storage Type / Size | TBD (Just try to run out of space) |
| Math, Logic, and Conditional Functions | +, -, x, ÷, <, >, =, ≤, ≥, AND, OR, XOR, NOT |
| Distributed Motion Mode Addresses | 62 |

DISTRIBUTED MOTION CONTROL:

The ServoTrack™ ST484 is capable of Distributed Motion Control (For multi-drop with Master and Slave) through ST484 Master and Slave assignments.

For more information / details, Reference our SnapTrack Programming Manual at www.kocomotionus.com/servotrack

Phone: (408) 612-4970

RS485 SERIAL COMMAND STRUCTURE AND DLL'S

Please reference this link on our website for this document:

www.kocomotionus.com/servotrack

2.2.6 Connectivity Specifications / Pin Assignments – Communications:

RS-485 Communications (Half-Duplex)

| Pin Number | Function | Description |
|------------|----------|----------------------------|
| 14 | GND | Communications ground ONLY |
| 4 | RX | Receive |
| 10 | TX | Transmit |

2.2.7 Connectivity Specifications / Pin Assignments – Power and I/O:

DC Input Power

| Pin Number | Function | Description |
|------------|--|---------------------|
| 1 | GND (Typically Black Wire Color) | Power supply return |
| 2 | PWR Input Voltage (Typically Red Wire Color) | +12.5 – 48 VDC |



 **CAUTION**  **OVER VOLTAGE:**

VECTOR SERIES **MAXIMUM** DC voltage is +48 VDC.

Allow 6.0 A maximum power supply output current in the system per Vector Unit. Actual power supply current will depend upon voltage and load.

Failure to follow these instructions can result in equipment damage.

Many machine control applications require various types of simple high-speed monitoring and control. These applications usually involve some type of motion control or high-speed interrupts for time-critical events.

*** HIGH SPEED CAPTURE INPUTS (11 and 12):**

There is a provision in the ST484 hardware for “capture” operations. Axis position is latched and retained in response to an input. There are two capture inputs:

This provision also enables recording of precise relationships between both encoders.

Note: All Outputs are Opto-isolated

NOTE: All Outputs are Opto-Isolated

Examples of uses of Capture Input here.....

Please contact our Application Engineering Team for assistance with this Option. 408-612-4970 (8AM to 5:00PM Monday-Friday PST)

3. Recommended Wiring Specifications:

| | |
|----------------|------------------------|
| Voltage Range | +12 to +48 VDC |
| Type | Unregulated linear |
| Ripple | Or switching $\pm 5\%$ |
| Output Current | 6.0 A (per ST484) |

Layout and Interface Guidelines:

Logic-level cables must be shielded to reduce the chance of EMI induced noise. This shield must be grounded to earth at the signal source. The shield's other end must be allowed to float (do NOT tie / connect to anything). This allows the shield to act as a drain.

Power supply leads to the ST484 should be twisted. If more than one driver is to be connected to the same power supply, run separate power and ground leads from the power supply to each drive.

| | |
|-------------------|----------------|
| Logic Wiring | 22 AWG |
| Wire Strip Length | 0.25" (6.0 mm) |
| Power and Ground | 20 AWG |
| Motor Wiring | 20 AWG |

Recommended Power Supply Characteristics

| | |
|-----------------------|------------------------|
| Voltage Range | +12.5 to +48 VDC |
| Type | Unregulated linear |
| Ripple | Or switching $\pm 5\%$ |
| Output Current | 6.0 A (per ST484) |

Also available is our Stand Alone ServoTrack ST484, shown below:



4. Warranty:

□ **Warranty Limitations:** DINGS' Motion USA WARRANTS ITS PRODUCTS DELIVERED HEREUNDER TO CONFORM TO FINAL SPECIFICATIONS, DRAWINGS, OR OTHER DESCRIPTIONS APPROVED IN WRITING BY SELLER AND TO BE FREE FROM DEFECTS IN MATERIALS AND WORKMANSHIP. THIS WARRANTY SHALL EXTEND TO BUYER AND / OR ITS CUSTOMERS, AND WILL BE **IN EFFECT FOR A PERIOD OF TWO (2) YEARS AS OF PRODUCT SHIP DATE**. THIS WARRANTY SHALL NOT APPLY TO ANY PRODUCT THAT HAS BEEN IMPROPERLY INSTALLED, SUBJECTED TO MISUSE OR NEGLIGENCE, OR WHICH HAS BEEN REPAIRED OR ALTERED EXCEPT BY SELLER'S ACCREDITED REPRESENTATIVE, NOR TO ANY PRODUCT WHICH HAS BEEN SUBJECTED TO ACCIDENT. NO WARRANTY IS GIVEN WITH RESPECT TO ANY APPARATUS, INSTRUMENT, COMPONENT OR ACCESSORY NOT MANUFACTURED BY SELLER, OR AS TO ANY PRODUCT WHICH IS MANUFACTURED BY SELLER BUT WHICH IS INSTALLED OR OTHERWISE SUBJECTED TO USAGE WITH ANY APPARATUS, INSTRUMENT, COMPONENT OR ACCESSORY NOT MANUFACTURED BY SELLER AND NOT APPROVED IN WRITING BY SELLER AS APPROPRIATE FOR USAGE WITH SELLER'S PRODUCTS. EXCEPT AS EXPRESSLY STATED HEREINABOVE IN THIS PARAGRAPH AND NOTWITHSTANDING ANYTHING TO THE CONTRARY CONTAINED IN THESE "TERMS AND CONDITIONS" OR OTHERWISE, SELLERS PRODUCTS ARE OFFERED AND SOLD WITHOUT ANY WARRANTIES, EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS, OR OF ANY OTHER KIND WHATSOEVER PERTAINING THERETO.

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- REPAIR OF DEFECTIVE OR NON-CONFORMING PRODUCTS, OR

- REPLACEMENT OF DEFECTIVE OR NON-CONFORMING PRODUCTS, OR
 - REFUND OF THE PURCHASE PRICE PAID FOR DEFECTIVE OR NON-CONFORMING PRODUCTS
 - SELLER'S LIABILITY AS AFORESAID SHALL BE APPLICABLE ONLY AS REGARDS SUCH DEFECTIVE OR NON-CONFORMING PRODUCTS AS ARE RETURNED TO SELLER WITHIN SIX (6) MONTHS OF THE DATE OF SHIPMENT. THE REMEDIES PROVIDED HEREIN SHALL CONSTITUTE BUYER'S SOLE AND EXCLUSIVE REMEDIES FOR LOSS OR DAMAGE ARISING OUT OF, RESULTING FROM, OR CONCERNING ANY ASPECT OF THE OFFERING AND SALE BY SELLER OF ITS PRODUCTS TO BUYER; AND SELLER SHALL NOT UNDER ANY CIRCUMSTANCES (WHETHER AS A RESULT OF BREACH OF CONTRACT, BREACH OF WARRANTY, TORT OR OTHERWISE) BE LIABLE TO BUYER IN THAT REGARD FOR CONSEQUENTIAL, INCIDENTAL, SPECIAL, PUNITIVE, EXEMPLARY OR OTHER DAMAGES OF ANY KIND OR MANNER, INCLUDING, WITHOUT BEING LIMITED TO, LOSS OF PROFITS OR REVENUES, LOSS OF USE OF OR DAMAGE TO ASSOCIATED PRODUCTS OR EQUIPMENT, COSTS OF CAPITAL OR COSTS OF SUBSTITUTE PRODUCTS, FACILITIES OR SERVICES.
- This LIMITED WARRANTY shall be void if the Customer fails to comply with all of the terms set forth in this Limited Warranty. This Limited Warranty is the sole warranty offered by DINGS' Motion USA with respect to the Product. DINGS' Motion USA does not assume any other liability in connection with the sale of the Product. No representative of DINGS' Motion USA is authorized to extend this Limited Warranty or to change it in any manner whatsoever. No warranty applies to any party other than the original Customer.
 - DINGS' Motion USA and its directors, officers, employees, subsidiaries and affiliates shall not be liable for any damages arising from any loss of equipment, loss or distortion of data, loss of time, loss or destruction of software or other property, loss of production or profits, overhead costs, claims of third parties, labor or materials, penalties or liquidated damages or punitive damages, whatsoever, whether based upon breach of warranty, breach of contract, negligence, strict liability or any other legal theory, or other losses or expenses incurred by the Customer or any third party.

- **Obtaining Warranty Service:**

- **NOTE: OPENING THE SERVOTRACK VECTOR HOUSING WILL VOID THE WARRANTY !!**

- To obtain warranty service, contact DINGS' Motion USA for a Return Material Authorization (RMA). Please contact Customer Service at sales@dingsmotionusa.com, or (408) 612-4970 (Pacific Time Zone) USA.

- Customer shall prepay shipping charges for Products returned to DINGS' Motion USA for warranty service; DINGS' Motion USA shall pay for return of Products to Customer via ground transportation. Customer is responsible for all shipping charges, duties and taxes relating to Product returns to DINGS' Motion USA originating outside the United States.

ATTN: RMA # _____

DINGS' MOTION USA

335 Cochrane Circle

Morgan Hill, CA 95037 USA

PH: (408) 612-4970

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