

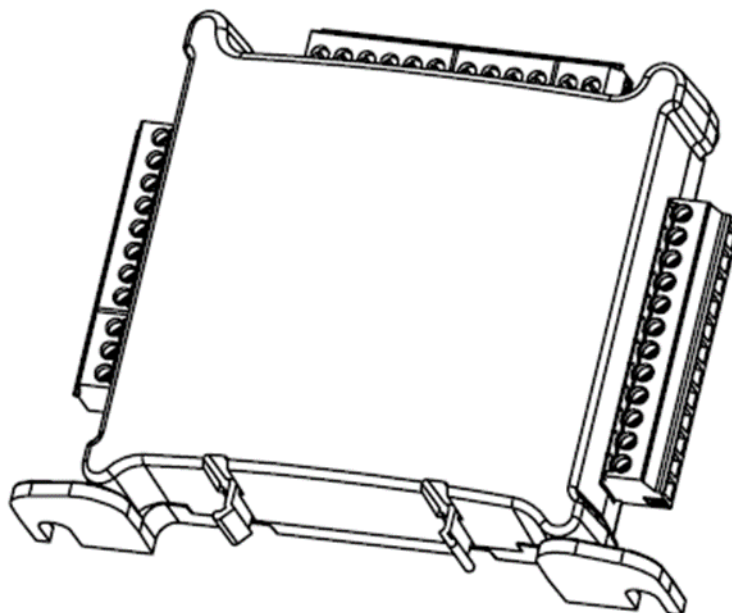
DINGS' MOTION USA™

....Precision Motion Specialists

ServoTrack™

**ST484 Dynamic Closed Loop
Drive and Programmable
Motion Controller**

HARDWARE MANUAL



ServoTrack Hardware Manual Change Log		
Date	Revision	Changes
3/15/2016	0	Initial Specs
12/22/2016	1.0	Updated and Added Specs
2/24/2018	1.1	Updated and Added Specs

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Manual Revision Rev 1.1 ,February 2018
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TABLE OF CONTENTS

Part 1: General Usage	Pages 5-7
Part 2: Specifications	Pages 8-15
Part 3: Wiring and Power Supply Guidelines	Page 16
Part 4: Warranty and RMA Information	Pages 17-18

APPLICATION ENGINEERING SUPPORT:

(408)-612-4970

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

PART 1: GENERAL USAGE

1. ServoTrack™ Introduction

The ST484 is a **DYNAMIC CLOSED LOOP** Motion Control System when utilizing the input signals from an encoder on the motor. (See recommended encoder resolutions)

The ST484 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.

Standard ST484 features include:

- 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).
- **SNAPTRACK™ SIMPLE BLOCK PROGRAMMING**
- Secondary encoder input for Electronic gearing or Camming capability (provided by following a rotary or linear axis at an electronically controlled ratio).
- Communication via RS485 Half Duplex utilizing one communication port; addressing and hardware support up to 62 self-addressed units communicating over a single line; 9600 Baud rate.
- HMI Interface via Modbus RTU
- Distributed Motion for multi-axis control (Multi-Drop with Master and Slaves)
- 35 mm Din rail OR Panel mount
- Multi-Function diagnostic LED
- Secure screw terminal connectors

1.1 SnapTrack Software

The ST484 is programmed via the USB connection.
A standard PC to micro USB cable is required. (included)

The SnapTrack Programming software should be downloaded from our website.

NOTE: Software Designed for Microsoft Windows ONLY !

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

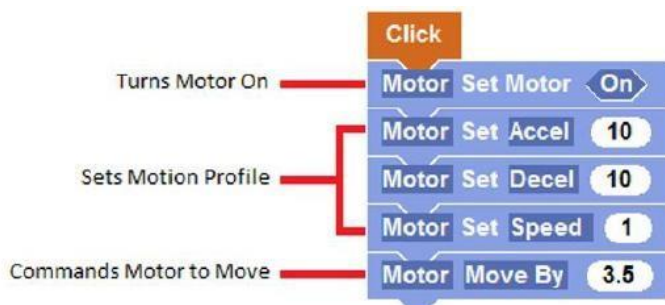
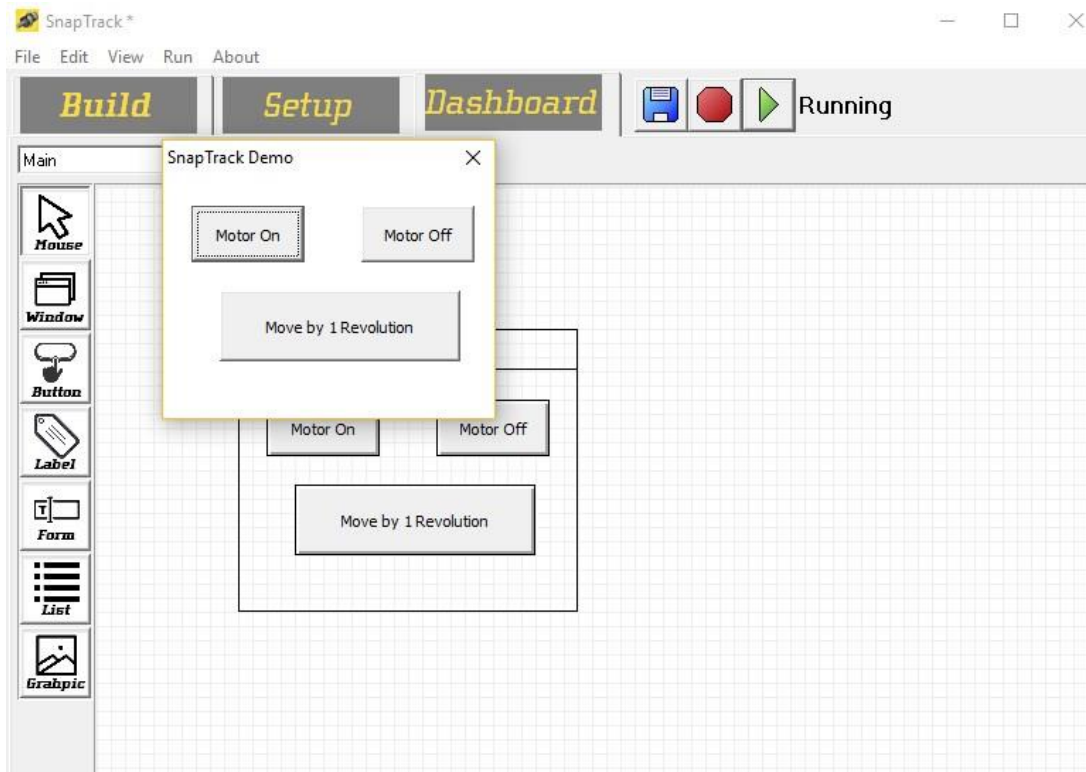


Figure 1. Push Button Block Program, Click and Set Motor

COMPUTER PROGRAMMING INTERFACE



1.2 Safety

CAUTION: DO NOT “HOT PLUG” THE MOTOR 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 ST484 before turning off AC Power at the Power Supply.

1.3 Interfacing DC Power

ST484 Maximum Voltage Input = 48VDC

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 ST484.

Shielded and Twisted Pairs are highly recommended

Recommended wire gauge = 18-20 AWG

Step Motor current settings:

Be sure to check the current rating of your step motor and set the ST484 accordingly.
Failure to do so could result in damage to your motor.

1.4 Motor Selection

The ST484 incorporates a Bipolar Driver that can operate with a Bipolar or Unipolar motor. (i.e. 4 and 8 lead motors and 6 lead center tapped motors)
See motor manufacturer documentation for wire colors associated with motor phase connections.

A lower winding inductance allows for a higher step rate and thus speed. Optimal performance for a specified torque can be attained by using a motor with lowest winding inductance along with the highest possible driver input voltage.

Motor Cabling Recommendations:

18-20 AWG at lengths of 25 Ft or less

1.5 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 are 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)

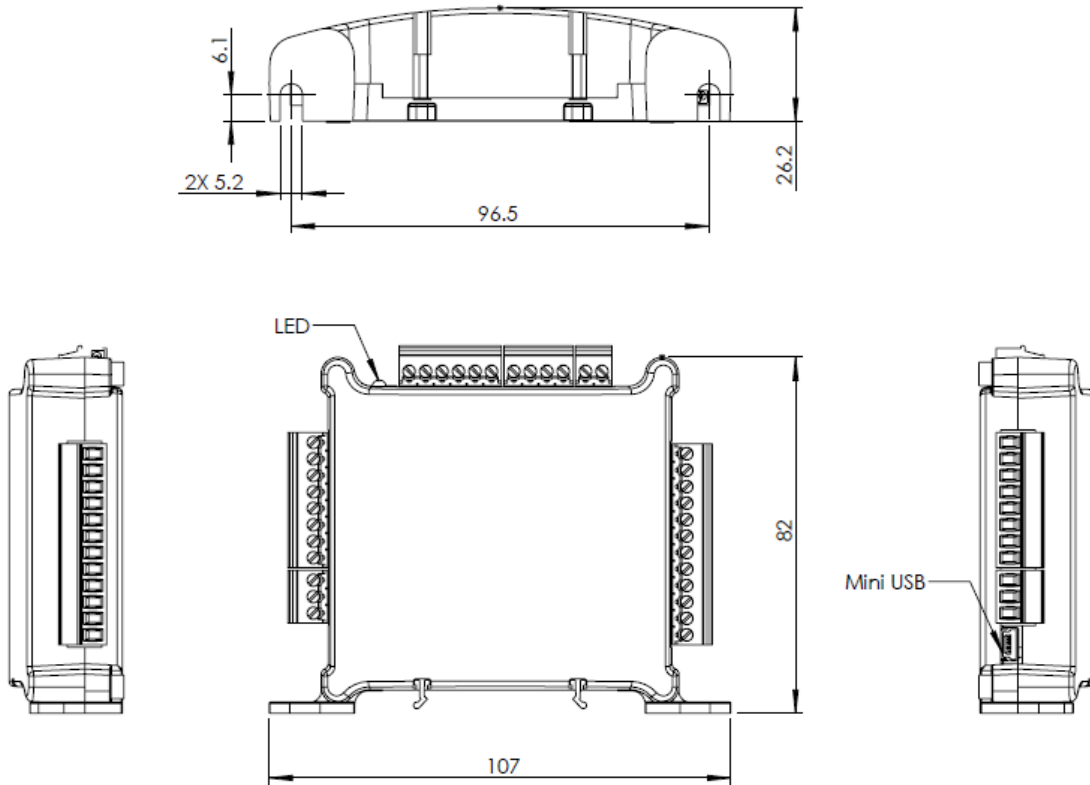
The analog input allows for the ability to receive a variable input from temperature, pressure, and other forms of sensors and then control an event based on that input.

With DYNAMIC closed loop control of the ST484 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



Mounting Options:

- *35 mm Din Rail
- *Panel Mount

NOTE: IF your application requires the motor or linear actuator to move while the ST484 is stationary, please apply sufficient strain relief to the connections to prevent operation failure.

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*

Encoder Resolutions Supported:

(Before Quadrature)

1000 and 1024 Line provides OPTIMAL Dynamic Closed Loop operation

500 Line

512 Line

400 Line

256 Line

200 Line

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.

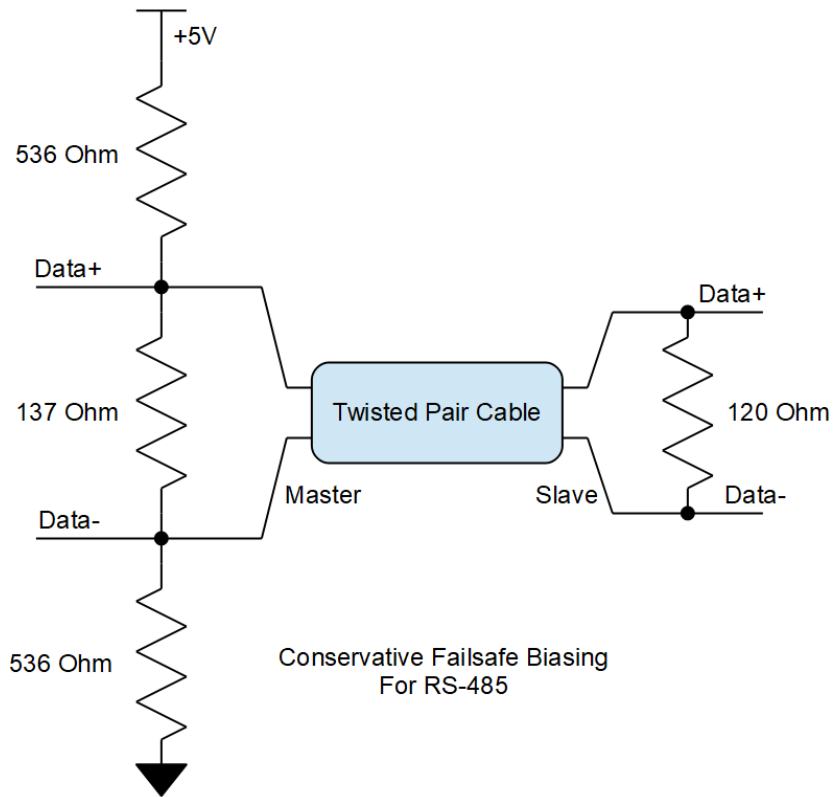
** With scaling

Clock I/O (Step & Direction I/O)	
Types	Step / direction, up / down, quadrature
Logic Threshold	+2 VDC TTL to +24VDC input

Optional Remote Encoder	
Type	User-supplied single or differential encoder
Counts per Revolution (With Quadrature)	Up to 4,096

2.2.3 Serial RS485 Half Duplex Communication Specifications

	Condition	Min	Type	Max	Unit
RS-485 (Standard)					
BAUD Rate	--	--	--	9600	bps



2.2.4 Thermal Specifications

	Condition	Min	Type	Max	Unit
Heat Sink Temperature	Non-condensing humidity	-40	--	+85	°C

2.2.5 Motion Specifications

Microstep Resolution									
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
Encoder Functions	Dynamic Closed Loop, Stall PREVENTION / Detection and Position Maintenance

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

Phone: **(408) 612-4970**

2.2.6 Connectivity Specifications / Pin Assignments – Communications:

RS-485 Communications (Half Duplex)

Pin Number	Function	Description
1	GND	Communications ground ONLY
2	RX	Receive
3	TX	Transmit

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

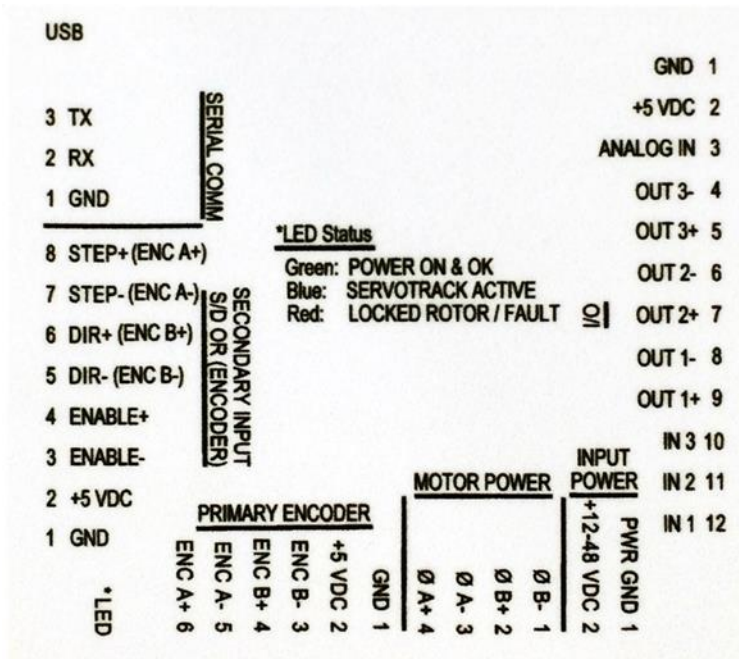
DC Input Power

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

Motor Power

Pin Number	Function	Description
1	∅ B-	Motor Phase B minus side
2	∅ B+	Motor Phase B plus side
3	∅ A-	Motor Phase A minus side
4	∅ A+	Motor Phase A plus side

Pinout REAR Label on ST484:

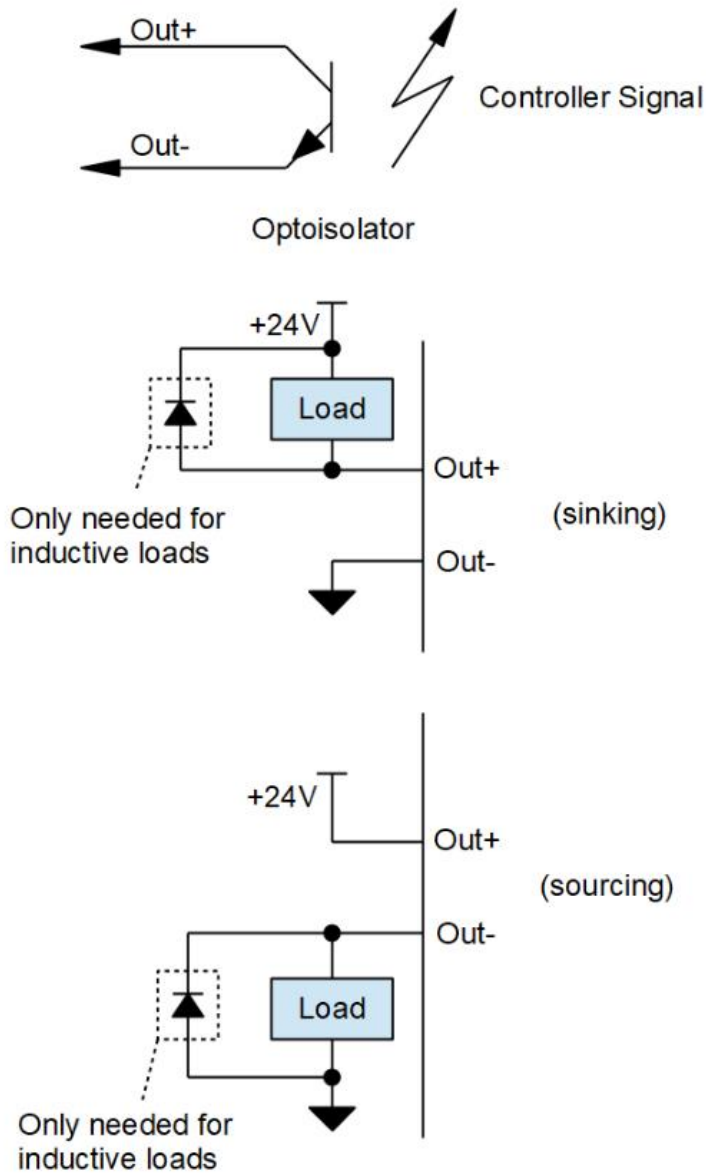


Detailed Pinout Description:

Connector Number	Pin Number	Pin Name	Description
I/O (C12)	1	GND	Internally connected to PWR GND, provided for wiring convenience
	2	+5 VDC	+5VDC output pin. Qty 1 of 3. Combined current limit of 100mA from all 3 pins
	3	ANALOG IN	Analog Input available to software, 0 to 20V, 28k ohm load
	4	OUTPUT 3-	Low voltage side of general purpose opto-isolated output 3 switch
	5	OUTPUT 3+	High voltage side of opto-isolated output 3 switch. 50 ma max current
	6	OUTPUT 2-	Low voltage side of general purpose opto-isolated output 2 switch
	7	OUTPUT 2+	High voltage side of opto-isolated output 2 switch. 50 ma max current
	8	OUTPUT 1-	Low voltage side of general purpose opto-isolated output 1 switch
	9	OUTPUT 1+	High voltage side of opto-isolated output 1 switch. 50 ma max current
	10	INPUT 3	General purpose input 3
	11	INPUT 2	General purpose input 2
	12	INPUT 1	General purpose input 1
INPUT POWER (C2)	1	PWR GND	Power Supply Return
	2	+12-48 VDC	Power Supply Voltage
MOTOR POWER (C4)	1	PHASE B-	Motor Phase B-
	2	PHASE B+	Motor Phase B+
	3	PHASE A-	Motor Phase A-
	4	PHASE A+	Motor Phase A+
PRIMARY ENCODER (C6)	1	GND	Internally connected to PWR GND, provided for wiring convenience
	2	+5 VDC	+5VDC output pin. Qty 1 of 3. Combined current limit of 100mA from all 3 pins
	3	ENC B-	Encoder B differential signal minus. If single-ended leave disconnected
	4	ENC B+	Encoder B differential signal plus or single-ended signal
	5	ENC A-	Encoder A differential signal minus. If single-ended leave disconnected
	6	ENC A+	Encoder A differential signal plus or single-ended signal
SECONDARY INPUT S/D OR ENCODER (C8)	1	GND	Internally connected to PWR GND, provided for wiring convenience
	2	+5 VDC	+5VDC output pin. Qty 1 of 3. Combined current limit of 100mA from all 3 pins
	3	ENABLE-	Low voltage side of opto-isolated drive disable input
	4	ENABLE+	High voltage side of opto-isolated drive disable input
	5	DIR- (ENC B-)	Direction/aux encoder B differential signal minus. If single-ended leave disconnected
	6	DIR+ (ENC B+)	Direction/Aux Encoder B differential signal plus or single-ended signal
	7	STEP+ (ENC A+)	Step/aux encoder A differential signal minus. If single-ended leave disconnected
	8	STEP- (ENC A-)	Step/Aux Encoder A differential signal plus or single-ended signal
SERIAL COMM (C3)	1	GND	Internally connected to PWR GND, provided for wiring convenience
	2	RX	RS232 Receive Signal
	3	TX	RS232 Transmit Signal

NOTE: All Outputs are Opto-isolated to prevent damage from over voltage.

OUTPUT SCHEMATICS

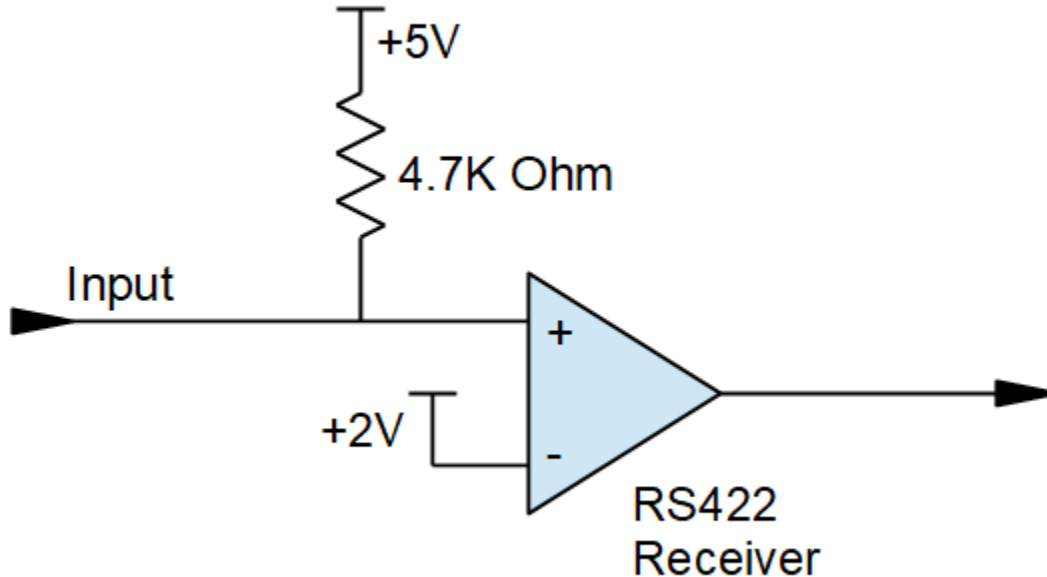


Attached is the image for the outputs. The top image is the electrical equivalent circuit for the outputs. The middle figure is how to drive a load by sinking, effectively acting as a switch closure to ground. The bottom figure shows how to source power into a load (acting like a switch closure to +24V).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

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 are designed into the ST484 for this purpose.

*** 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:

- 1) Input 2 (Pin 11) (Pertains to the motor), and
- 2) Input 1 (Pin 12) (Pertains to the encoder)

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

Auxiliary Encoder Input OR Step and Direction Input

Connector Group C8 can be configured as a quadrature and used to connect another encoder for Electronic Gearing, Conveyor Tracking, or Camming. This enables controlled motion to have an established relationship with external motion. This Group can also be as a Step and Direction input IF wanting to utilize closed loop with a third party controller.

Interfacing an HMI:

The ST484 is capable of interfacing to a User HMI. The HMI must be capable of Serial Modbus RTU in order to connect with RS485 Seral Port pins.

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

3. Wiring and Power Supply Guidelines

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.

3.1 Recommended Wiring / Cabling Specifications:

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

3.2 Interfacing DC Power:

CAUTION **OVER VOLTAGE:**

ST484 **MAXIMUM** DC voltage is +48 VDC.

Allow 6.0 A maximum power supply output current in the system per ST484. Actual power supply current will depend upon voltage and load.

Failure to follow these instructions can result in equipment damage.

3.2.1 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)

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 NEGLECT, 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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- **Obtaining Warranty Service:**
 - **NOTE: OPENING THE SERVOTRACK 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 # _____

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