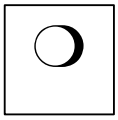
EasyServo
Digital Servo Amplifier

USER'S MANUAL

MODELS:

ESD04
ESD08
ESD10
ESD12

Safety Warnings



• The warning symbol shown at left denotes an important safety consideration. Please read this manual Carefully before performing any of the procedures contained herein. Failure to follow these instructions may result in fire, severe injury, or fatality.

• Have a qualified electrical maintenance technician install, adjust and service this equipment. Follow the National Electrical Code and all other applicable electrical and safety codes, including the provisions of the Occupational Safety and Health Act (OSHA), when installing equipment.

• The question mark symbol shown at left denotes shortcuts, reminders, or additional information which does not affect the safe operation of the drive.

• Reduce the chance of an electrical fire, shock, or explosion by proper grounding, over-current protection, thermal protection, and enclosure. Follow sound maintenance procedures.

• It is possible for a drive to run at full speed as a result of a component failure. Please ensure that a master switch has been placed in the AC line to stop the drive in an emergency.

• Circuit potentials are at 115 VAC or 230 VAC above earth ground. Avoid direct contact with the printed circuit board or with circuit elements to prevent the risk of serious injury or fatality. Use a non-metallic screwdriver for adjusting the calibration trim pots.

General Information

The **EasyServo** family of servo amplifiers is an **economical solution** to today's complex motion-control needs. The EasyServo combines a **Digital Signal Processor** (**DSP**), controller, heat sink and power supply in one standalone, **DIN-rail mountable** or panel-mounted unit. The EasyServo can be operated as a stand-alone unit or as a digital amplifier.

The EasyServo controls brushless motors with a high switching (carrier) frequency for virtually silent operation. Most servomotors used today require high precision control and a smooth, sinusoidally commutated signal. An on-board DSP provides commutation by generating the three-phase sine wave, using feedback information from an optical encoder.

The servo will accept feedback from an encoder that includes Hall sensor feedback information. It accepts commands from a variety of sources, including analog voltage, PWM and internal reference signals. The control will operate in **current (torque) mode**, **velocity mode**, or **position (step and direction) mode**. Upon initial start up, the motor is commutated using the hall sensors—for the first two or three mechanical degrees of motor rotation—to *map* the encoder; The hall-effect information is unnecessary thereafter.

The EasyServo's built-in RS-232 serial communications port and servo control program, MotionView™, make **programming** extremely **simple**. In fact, **you could be up and running in less than thirty minutes!** Each EasyServo unit is an amplifier, power supply, controller and heat sink integrated into a single standalone package. The EasyServo will only accept an encoder *with* Hall or an encoder with hall-commutation tracks encoded on the feedback device.

Specifications

ELECTRICAL CHARACTERISTICS

Drive	Maximum Continuous Current (AC in)	Continuous Phase Current (AC Amps)	Peak* Current (AC Amps)	Input Voltage (±10%, 50-60 Hz) (VAC)
ESD504	6A	4	8	90 – 240
ESD508	12A	8	14	90 – 240
ESD608	12A	8	14	90 – 240
ESD610	15A	10	20	90 – 240
ESD612-3P	19A	12	20	90 – 240

Notes:

"-3P" = 3-phase input power models

Applies to all models:

AC Output Voltage Range (Sinusoidal, Three-Phase)	0–240 VAC RMS
Minimum Output Voltage Range	0 – 340 VAC
Acceleration Time Range (Zero to Max Speed)	0 – 6000 seconds
Deceleration Time Range (Max Speed to Zero)	0 – 6000 seconds
Speed Regulation (typical)	± 0.5 RPM
Input Impedance (+REF to COM and +REF to -REF)	47 Kohms
Power Device Switching Frequency (sinusoidal commutation)	16 KHz
Encoder power supply (max)	+5 VDC @ 300 mA
Maximum encoder feedback frequency	3.0 MHz

ENVIRONMENT

Vibration

ESD500 Series	0.1 G (all frequencies)
ESD600 Series	0.5G max (20 – 50 Hz)
	0.1G max (>50 Hz)
Shock	1.0 g @10 m/sec
Ambient Operating Temperature Range	0 to 40ºC
Ambient Storage Temperature Range	-10 to 70ºC
Humidity	5 – 90% non-condensing
Altitude**	1500 m/5000 ft

***derate by 1% per 300m (1000 ft) above 1500m (5000 ft)*

DIMENSIONS AND WEIGHT

Height (inches)	6.50
Width (inches)	4.38
Depth (inches)	7.50
Weight (lbs)	8.0

OPERATING MODES

Torque

Reference	0 ± 10 VDC or 0 to 10 VDC, scalable
Accuracy	± 0.01 amp
Current-Loop Bandwidth	up to 2.5 kHz

Velocity

Reference	0 ± 10 VDC or 0 to 10 VDC
Accuracy	± 0.5 RPM
Velocity-Loop Bandwidth	up to 300 Hz
Speed Range	up to 8000:1

Position

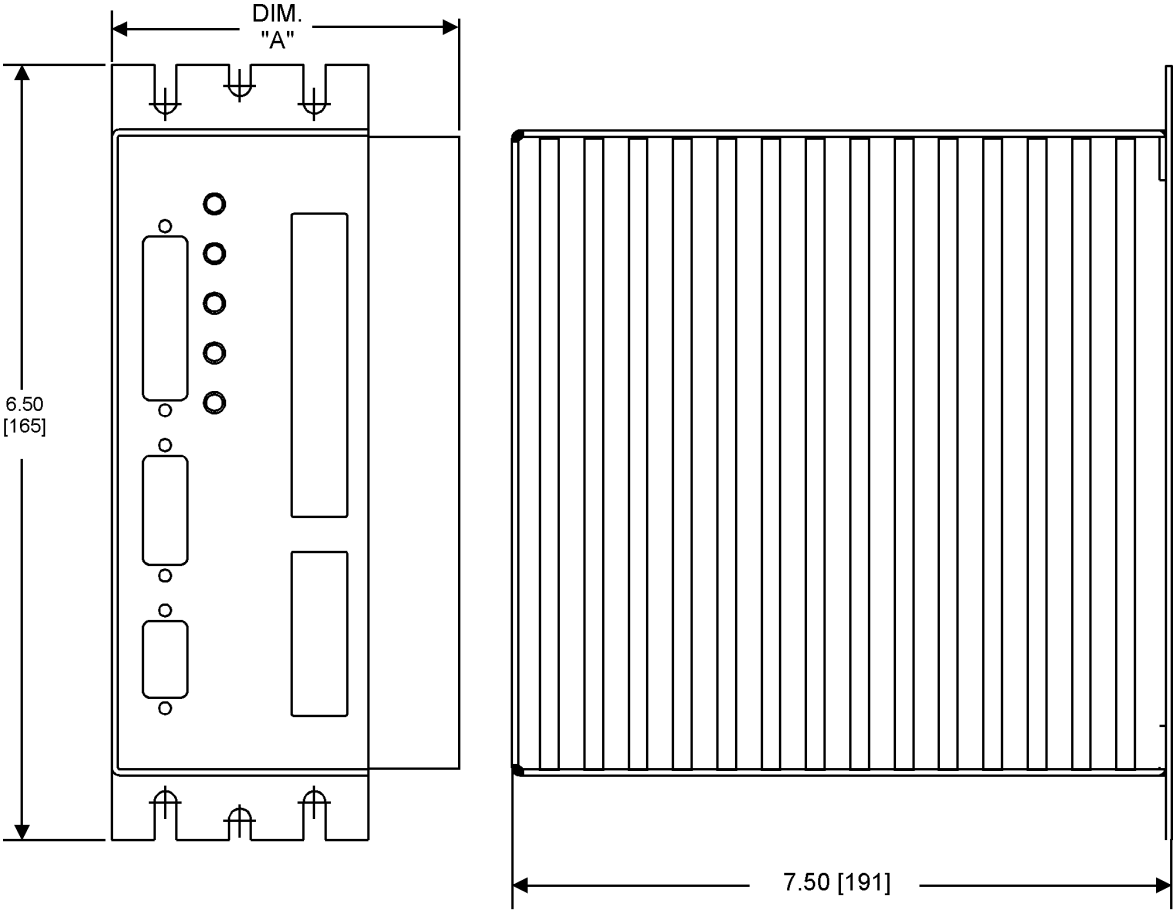
Reference	Step and direction signals or Master Encoder full quadrature signal (software selectable).
Minimum Pulse Width	250 nanoseconds
Reference Max frequency	2 MHz
Position-Loop Bandwidth	Up to200 Hz
Accuracy	±1 encoder count

CONNECTIONS

Serial	*Standard* 9-pin D-shell
Encoder Feedback	*Standard* 15-pin D-shell
I/O	15-pin removable terminal block or 25-pin D-shell
Controller	*Standard* 25-pin D-shell
Power	8-pin removable terminal block

Windows® Software: MotionView™ (Windows 95, 98, NT)

Dimensions



DIMENSION "A"

MODEL	DIMENSION
ESD604	3.38 [86]
ESD608	4.38 [111]

ALL DIMENSIONS IN INCHES [MILLIMETERS]

Installation

Warning!

• The EasyServo must be mounted vertically for safe operation at the maximum current rating.

• Printed circuit board components are sensitive to electrostatic fields. Avoid contact with the printed circuit board directly. Hold the EasyServo by the case only.

• Protect the control from dirt, filings, airborne particles, moisture, and accidental contact. Provide sufficient room for access to the terminal block.

• Mount the control away from other heat sources. Operate within the specified ambient operating temperature range. Additional cooling with an external fan may be recommended in certain applications.

• Avoid excessive vibration to prevent intermittent connections.

• Do not disconnect any of the motor leads from the EasyServo unless power is removed or the control is disabled. Opening any one motor lead may cause failure.

• The DIN-rail mounting tab is designed to bear only the weight of the EasyServo and heat sink. Make sure enough slack exists in the wire routing to ensure that the cables do not tug or pull downward against the DIN-rail mounting tab.

MOUNTING

Note
It may be necessary to add shock-absorbing “bumpers” to the back of the ESD500.

Mount the EasyServo vertically in the panel as shown in Figure 5.

1. Ensure that a 30 mm (1.2 inch) DIN rail is installed horizontally in the rear of the panel prior to mounting the ESD500.

2. Ensure that the upper mounting tab on the back of the SS500 is in the UP position.

3. Hook the ESD500’S lower mounting tab under the DIN rail as shown in Figure 4a. The tab fit should be snug.

4. Rotate the ESD500 upward, flush against the DIN rail, ensuring that the lower mounting tab remains engaged by the DIN rail.

5. Once the ESD500 is flush against the DIN rail, push down on the mounting tab atop the drive (Figure 4b). The mounting tab will latch onto the top of the DIN rail.

Install the bumpers as follows:

1. Peel off the adhesive cover from the clear bumper. Apply to the DIN rail tab of the EasyServo (the moveable tab on the rear of the control that clamps onto the top of the DIN rail).

2. Mount the drive as indicated above.

3. Peel off the adhesive cover from the black bumper. Lift the bottom of the control (while it is still clamped to the DIN rail) to open a slightly larger air gap between the EasyServo and the enclosure.

Apply the black bumper to the back of the EasyServo (the side facing the enclosure) approximately one inch above the bottom. Release the drive. It should come to rest on the newly applied black bumper.

WIRING

Warning!
Under no circumstances should power and logic leads be bundled together. Induced voltage can cause unpredictable behavior in any electronic device, including motor controls.

• Use 18-28 AWG wire for reference and analog signal wiring. Use 12-16 AWG wire for AC line (L1 and L2) and motor (Phase U, V and W) wiring.

SHIELDING AND GROUNDING

Speeder Motion recommends the use of single-point grounding (SPG) for panel-mounted controls. Serial grounding (a “daisy chain”) is not recommended. The SPG for all enclosures must be tied to earth ground at the same point. The system ground and equipment grounds for all panel-mounted enclosures must be individually connected to the SPG for that panel using 14 AWG (5.5 mm) or larger wire. Refer to Figure 6 for wiring guidelines.

In order to minimize EMI, the chassis must be grounded to the mounting panel (Figure 6). Use 14 AWG (1.6 mm) or larger wire to join the enclosure to earth ground. A lockwasher must be installed between the enclosure and ground terminal. To ensure maximum contact between the terminal and enclosure, remove paint in a minimum radius of 0.25 in (6 mm) around the screw hole of the enclosure.

Speeder Motion recommends the use of the special servo cables. If you specify cables other please make sure all cables are shielded and properly grounded.

It may be necessary to earth ground the shielded cable (Figure 6). Ground the shield at the EasyServo end and at the motor end.

If the EasyServo continues to pick up noise after grounding the shield, it may be necessary to add AC line filtering devices and/or an output filter (between drive and servomotor).

EMI Protection

Electromagnetic interference (EMI) is an important concern for users of digital servo control systems. EMI will cause control systems to behave in unexpected and sometimes dangerous ways. Therefore, reducing EMI is of primary concern not only for servo control manufacturers, but the user as well. Proper shielding, grounding and installation practices are critical to EMI reduction.

Enclosure

The panel in which the servo is mounted must be made of metal, and must be grounded using the SPG method outlined above.

Proper wire routing inside the panel is critical; power and logic leads must be routed in different avenues inside the panel .

If you use drives that output over 8 amps, you must ensure that the panel contains sufficient clearance above and below for the cooling fan to circulate air. Refer to Figure 3 for minimum suggested cooling air clearance.

LINE FILTERING

In addition to EMI/RFI safeguards inherent in the EasyServo design, external filtering may be required. High frequency energy can be coupled between the circuits via radiation or conduction. The AC power wiring is one of the most important paths for both types of coupling mechanisms. There are many AC line filter manufacturers whose filters can be successively integrated. Speeder Motion recommends Schaffner filters (Schaffner AC filter P/N FN350-8) based on our test results.

Line filters should be placed inside the shielded panel. Connect the filter to the incoming power lines immediately after the safety mains and before any critical control components (Figure 6). Wire the AC line filter as close as possible to the EasyServo. If you add separate fuses, add them after the AC line filter.

❍ **The ground connection from the filter must be wired to solid earth ground, not machine ground. This is very important!**

If the end-user is using a CE-approved motor, the AC filter combined with the recommended EasyServo motor and encoder cables, is all that is necessary to meet the EMC directives listed herein. The end user must use the comparable filter (see table above), to comply with CE specifications. The OEM may choose to provide alternative filtering that encompasses the EasyServo and other electronics within the same panel. The OEM has this liberty because CE is a machinery directive.

HEAT SINKING

EasyServos contain sufficient heat sinking in their basic configuration. There is no need for additional heat sinking. However, drives that output more than 8 amps incorporate a heat sink cooling fan; you must ensure that there is sufficient clearance for the cooling fan to circulate air (Figure 3). As a minimum, you must allow an air gap of 1 inch above and below the drive.

LINE FUSING

External line fuses must be installed on all EasyServos. Connect the external line fuse in series with the AC line voltage input. Table 3 lists the recommended line fuse sizes. Use fast acting fuses rated for 250 VAC or higher, and approximately 200% of the maximum phase current.

Table 2. Recommended Line Fuse Sizes.

Model Number	AC Line Fuse Size (AC Amps)
ESD504,604	15
ESD508,608	25

EASYSERVO CONNECTIONS

The standard servo control contains five connectors: two quick-connect terminal blocks and three subminiature type “D” connectors. These connectors provide power, communications and external feedback to the motor, servo control and host controller (Figure 8). Prefabricated cable assemblies may be purchased from Speeder motion to facilitate wiring the control, motor and host computer. Contact us for assistance.

Encoder feedback
An encoder needs to have power supplied to it. Both front-end controllers and the EasyServo each have a +5 VDC supply voltage that may be used to power the encoder. The EasyServo contains patent-pending automated switching circuitry which will power the encoder from a front-end controller if it is present (through the ENC+ pin). If no supply voltage is present at the ENC+ pin, our servo will switch its internal power (+5 VDC supply) to the encoder.

Warning!
Use only +5 VDC encoders. Do not connect any other type of encoder to the EasyServo reference voltage terminals. When front-end position controller is used, it is critical that the +5 VDC supply on the front-end controller NOT be connected to the +5 VDC supply on the EasyServo.

NOTE: We recommend an encoder resolution of 2000 PPR or higher for optimum performance.

EXTERNAL CONNECTORS

TB501 (Power, Motor and Fuse Connections)

NOTE: All conductors must be enclosed in one shield and jacket around them. The shield on the amplifier end must be terminated at TB501 pin 8 (chassis ground); the other end should be properly terminated at the motor shield. To satisfy CE requirements, we recommend that you purchase EasyServo cables for both the motor and AC line. Contact us for assistance.

TB501 is an 8-pin quick-connect terminal block used for motor, power and fuse connections. Refer to Table 3 for connector pin assignments. Where referenced in the table below, refer to Connector Wiring Notes for more information.

Wire size

If the current draw is less than 8 amps: Use 16 AWG (1.0 mm) or 14 AWG (1.6 mm) wire
If the current draw is greater than 8 amps but less than 12 amps: Use 14 AWG (1.6 mm) wire or 12 AWG (2.6 mm).
If the current draw is greater than 12 amps: Use 12 AWG (2.6 mm).

Table 3. TB501 Pin Assignments (Single phase models)

Terminal Block Pin #	*Name*	*Function*
1	W (T)	Motor Power Out
2	V (S)	Motor Power Out
3	U (R)	Motor Power Out
4	DUMP+	Dump resistor out
5	DUMP-	Dump resistor out
6	GND	Chassis ground
7	L1	AC Power In
8	L2	AC Power In

TB502 (Analog/Digital I/O Terminal Block)

TB502 is a 15-pin quick-connect terminal block used for analog and digital I/O functions in standalone mode. Refer to Table 4 for connector pin assignments.

Table 4. TB502 Pin Assignments

Terminal Block Pin #	*Name*	*Function*
1	-Vcc	-Vcc (5mA)
2	REF-	Negative reference input (differential)
3	REF+	Positive reference input (differential)
4	+Vcc	-Vcc (5mA)
5	AGND	Analog ground (Attach shield from signal source here)
6	MA+/Step+	Step+ (or master encoder channel A+) input[4]
7	MA-/Step-	Step- (or master encoder channel A-) input[4]
8	MB+/Dir+	DIR+ (or master encoder channel B+) input
9	MB-/Dir-	DIR- (or master encoder channel B-) input
10	Analog Output	Programmable analog output
11	AUX INPUT	Programmable digital input
12	EN	Enable Input[4]
13	OUT_RDY	Ready output O.C.
14	OUT_AUX	Programmable Output O.C.
15	GND	Logic common

TB504 (Motor Feedback Input from Motor)

TB504 is a 15-pin DB connector that contains connections for Hall effect sensors and encoder feedback. Refer to Table 5 for connector pin assignments. Encoder inputs on TB504 have 26LS32 or compatible differential receivers for increased noise immunity. Inputs have all necessary filtering and line balancing components so no external noise suppression networks are needed.

All conductors must be enclosed in one shield and jacket around them. We recommend that each and every pair (for example, EA+ and EA-) be twisted. In order to satisfy CE requirements, We recommend using OEM cable. Contact us for assistance.

The servo buffers encoder feedback through TB504 to TB506. Encoder channel A on TB506, for example, is buffered channel A pin of TB504 inside the our servo. The Hall sensors from the motor must be wired to the 15-pin connector.

Table 5. TB504 Pin Assignments

"D"-Sub Pin #	*Name*	*Function*[1]
1	EA+	Encoder Channel A
2	EA-	Encoder Channel A Not[2]
3	EB+	Encoder Channel B
4	EB-	Encoder Channel B Not
5	EZ+	Encoder Channel Z
6	EZ-	Encoder Channel Z Not
7	GND	Drive Common/Encoder Ground
8	SHLD	Shield
9	PWR	Encoder supply (+5VDC)
10	HA-	Hall Sensor A-
11	HA+	Hall Sensor A+
12	HB+	Hall Sensor B
13	HC+	Hall Sensor C
14	HB-	Hall Sensor B-
15	HC-	Hall Sensor C-

TB505 (Serial Communications Port input to Servo)

TB505 is a 9-pin DB connector that is used to communicate with a host computer.
All levels must be RS-232C compliant.

Table 6. TB505 Pin Assignments

"D"-Sub Pin #	*Name*	*Function*
1	Reserved	
2	TX	RS232 TX
3	RX	RS232 RX
4	Reserved	
5	GND	Common
6	Reserved	
7	Reserved	
8	Reserved	
9	Reserved	

Warning!
If you purchase serial cables from a third party, you must use pass-through cable, not Null-Modem (not crossover).

Warning!
Do not make any connection to Reserved pins !

TB506 (Controller Interface)

TB506 is a 25-pin DB connector for interfacing to front-end controllers. We strongly recommend you use OEM cables to aid in satisfying CE requirements. Contact us for assistance.

Table 7. TB506 Pin Assignments

"D"-Sub Pin #	*Name*	*Function*[1, 4]
1	EA+	Encoder Channel A
2	EA-	Encoder Channel A Not[2]
3	EB+	Encoder Channel B
4	EB-	Encoder Channel B Not
5	EZ+	Encoder Channel Z
6	EZ-	Encoder Channel Z Not
7	GND	Drive Common
8	SHLD	Shield
9	ENC+	Positive Terminal of Encoder Power (+)[3]
10	N/C	Spare
11	MA+/Step+	Master Encoder A+ / Step input+[5]
12	MA-/Step-	Master Encoder A- / Step input-[5]
13	MB+/Dir+	Master Encoder B+ / Direction input +
14	MB-/Dir-	Master Encoder B- / Direction input -
15	READY-C (OC)	Output Ready OC. Collector
16	READY-E	Output Ready OC. Emitter
17	ENABLE+	Enable Input +[4]
18	ENABLE-	Enable Input -[4]
19	AUX-C (OC)	Programmable output OC. Collector
20	AUX-E (OC)	Programmable output OC Emitter
21	EXTPOWER	+5 V (20ma max)
22	GND	Drive Common
23	REF+	Positive (+) of Analog Reference Signal Input
24	REF -	Negative (-) of Analog Reference Signal Input
25	Analog Ground	Reference Signal Ground/Analog Shield

CONNECTORS AND WIRING NOTES

Note 1
Each of the encoder output pins on TB506 is buffered pass-trough. The encoder channel A pin on TB504, for example, is buffered and routed to the encoder channel A pin on TB506 inside the our servo. If you require encoder information, wire your controller to TB506. The encoder and Hall sensor feedback from the motor must be wired to the 15-pin Type D receptacle (connector) through the feedback cable.

Note 2

The complement of A is sometimes written as not A**.** The B, C and Z encoder channels are annotated in a similar fashion.

Note 3

Warning!
Do not connect the +5 VDC supply on the front-end controller to the +5 VDC supply on the our servo. This will result in damage to the EasyServo.

The encoder needs to have power supplied to it. A front-end controller, as well as the our servo, has a +5 VDC supply voltage that may be used to power the encoder. Our servo contains patent-pending automated switching circuitry which will power the encoder from a front-end controller if it is present (through the ENC+ pin). If no supply voltage is present at the ENC+ pin, our servo will switch its internal power (+5 VDC supply) to the encoder.

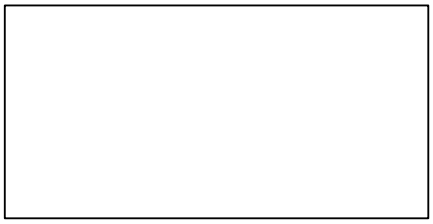
Note 4
The enable (EN) pin, TB502 pin 9 or TB506 pin 17/18, must be wired to one of the output terminals on the front-end controller, i.e., if the controller is present, it must supervise the enable function on the our servo. The EasyServo will accept open-collector outputs for use as a switch, TTL or CMOS outputs (5V) programmed for active low operation.

Note 5
An external pulse train signal (for “step”) supplied by an external device, such as a PLC or stepper indexer, can control the speed and position of the servomotor. The speed of the motor is controlled by the frequency of the step signal, while the number of pulses that are supplied to the EasyServo determines the position of the servomotor. “DIR” input controls direction of the motion.

I/O DETAILS

1. Step and direction/ master encoder inputs: TB506-11, 12,13,14 TB502-6, 7,8,9

You can connect a master encoder with quadrature outputs or a step and direction pair of signals to control position in step/direction operating mode. These inputs are optically isolated from rest of drive circuits and from each other. (See figure below.) Both inputs can operate from any voltage source in range 5 to 24 VDC



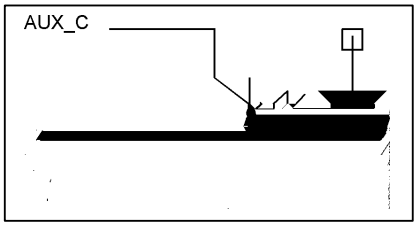
Master encoder/step and direction input circuit.

You can connect a single ended or differential signal to the inputs. You also can connect sink or source outputs to these inputs. See application note in “Section A” of this manual for the connection guidelines. The function of these inputs “Master Encoder” or “Step and direction” is software selectable. Use MotionView set up program to choose desirable function.

2. Digital outputs

There are two digital outputs “READY” and “OUT AUX” available in different output configurations.

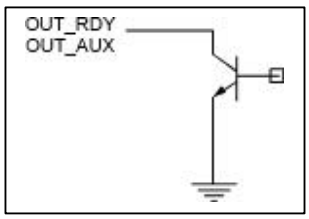
<u>On TB506</u>
“READY”(TB506-15,16) “AUX-C and AUX-E” (TB506-19, 20).
Outputs are fully isolated from the rest of the drive circuits (“dry contact”). See figure below for its electrical diagram.



On TB502

"OUT_RDY" (TB502-13), "OUT_AUX" (TB502-14).

Functions the same as "READY" and "AUX" but have open-collector sink outputs referenced to drive logic common. See figure below for the electrical diagram.



Both versions of outputs (On TB506 and TB502) have the same logic.

"READY" output Activated when the drive is ready and enabled. It is reset to an inactive state when the drive is disabled, not operational or any fault is detected.

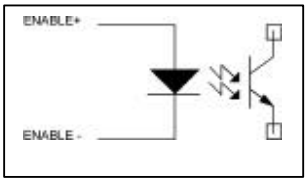
"AUX" output Programmable output. Activated when any one of the selected conditions are true. The conditions are software selectable. Use MotionView to select the condition assigned to this programmable output. Only one condition at a time can be selected for output. Possible choices are:

- Zero speed
- In speed window
- Current limit
- Run Time Fault

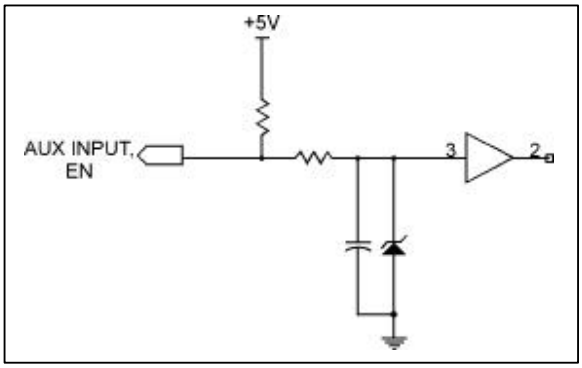
3. Digital inputs

"ENABLE+ & ENABLE-" (TB506-17, 18).

Optically isolated input. Compatible with 5 -24V voltage source or open-collector sink output. For connection guidelines, refer to the application note in "Section A". See figure below for electrical diagram.



AUX INPUT (TB502-11), "EN" (TB502-12)
"EN" Functions same as "ENABLE+ ENABLE-"
This is a single-ended input, compatible with 5V TTL, open-collector sink output, and switch or relay contacts. The input is referenced to drive logic common. These inputs are active low, i.e., connecting it to drive logic common or supplying logic "0" referenced to drive logic common activates this input. For connection guidelines see application note in "Section A". See figure below for electrical diagram.



"EN", "ENABLE+ ENABLE- " Drive enable input. Activating this input enables the drive.

"AUX INPUT" Programmable input**:** Function of this input software selectable. Use MotionView program to select function for this input. Possible choices are:

- External fault
- Stop
- Reverse

4. Analog reference input

IN+, IN- (TB506-23, 24)
Analog differential input. This input will accept +/-10V single-ended voltage on IN+ or IN- input or +/-5V differential voltage between IN+ and IN-. Both connections must be referenced to Analog Common (TB506-25 or TB502-5) of the drive. This input is used to control speed or torque of the motor in velocity or torque mode. The total reference voltage as seen by the drive is the voltage difference between IN+ and IN-. If used in single-ended mode one of the inputs must be connected to voltage source while the other one must be connected to Analog Common. If used in differential mode, the voltage source is connected across IN+ and IN- inputs and driving circuit common (if any) needs to be connected to drive Analog Common terminal.

Reference as seen by drive: Vref = (VIN+) - (VIN-)

Operation

CONFIGURE THE EASYSERVO

Regardless of the mode in which you wish to operate, you must first configure the EasyServo for your particular motor, mode of operation and additional features if used.

1. Ensure that the control is properly installed and mounted. Refer to “INSTALLATION” section early in this manual for installation instructions.
2. Perform wiring to the motor and external equipment suitable for desired operating mode and your system requirements. Refer to system configurations diagram in Section A for various system configuration examples.
3. Connect drive serial port TB505 to your PC serial port.
4. Make sure that the drive is disabled.
5. Launch MotionView software on your computer.
6. From the MotionView menu, select <Project> <Connection setup> and select “RS-232” radio button on opened connection dialog. Click <Properties> and select the serial port number to which the drive is connected. Leave the rest of the settings unchanged. Click <OK> to close dialogs.
7. From menu, click <Node> then <Connect drive>.
8. Set parameters for the drive according to the section “Drive configuration procedure” in MotionView Help file. (Select <Help> <Help Topics>; expand <Quick Start> book; and select “Drive configuration procedure”).
9. After you configure the drive, proceed to tuning procedure if operating in Velocity or Step & Direction mode. Torque Mode doesn’t require additional tuning or calibration. Refer to MotionView Help file book “Tuning” for instructions on how to tune for Velocity or Step & Direction mode.

OPERATING MODES

1. Torque mode.

In this mode motor current is proportional to the voltage at analog input.
Phase Current [A] = Vin [Volt] * Current Scale [A/Volt]
Current Scale – parameter set in MotionView software.

2. Velocity Mode.

In this mode motor shaft velocity is proportional to the voltage at analog input
MotorVelocity [RPM] = Vin[V] * Velocity Scale [RPM/V]
Velocity Scale – parameter set in MotionView software.

3. Position follower (Step & Direction or Quadrature Master Encoder)

In this mode motor shaft position is proportional to number of supplied pulses to step & directions inputs (or master encoder inputs).
Parameter “Step input type “ in MotionView determines whether Step & Direction type inputs or Master Encoder (A and B in quadrature) type is used. Parameter “Steps per revolution” sets resolution.

DIAGNOSTIC LEDS

The EasyServo has five diagnostic LEDs mounted on the front panel (Figure 15). These LEDs are designed to help you monitor system status and troubleshoot any faults.

READY (Green)
Green LED lights when drive is enabled and there is no fault. If drive gets disabled by means of the ENABLE input or because any fault occurs, this light will turn off.

Fault (Red)
Red LED lights when drive is in fault state.The LED will flash one or more according table below than pause for about 1.5 Sec then start over again until fault is reset again. Fault reset is accomplished by disabling or re-enabling drive depending on settings performed during drive set-up.

Fault code table

Fault Code	Fault	
1	Overvoltage	Drive bus voltage reached maximum level due to regen.
2	Bad Halls code	One or more motor hall sensors inoperatable or not connected.
3	Overcurrent	Drive reached absolute maximum in-rush current limit and couldn't control it.
4	Overtemperature	Heatsink temperature reached maximum (90-100 degree C)
5	External fault input activated	Digital input was programmed as external fault input and has been activated.
6	Overspeed	Motor reached velocity above its specified limit
7	Position error excess	During following in step and direction mode following error (in motor encoder counts) was more and longer time then specified
8	Bad motor data	Motor profile data invalid or no motor was selected for operation
9	Subprocessor failure	Internal failure. Drive need to be sent for repair.

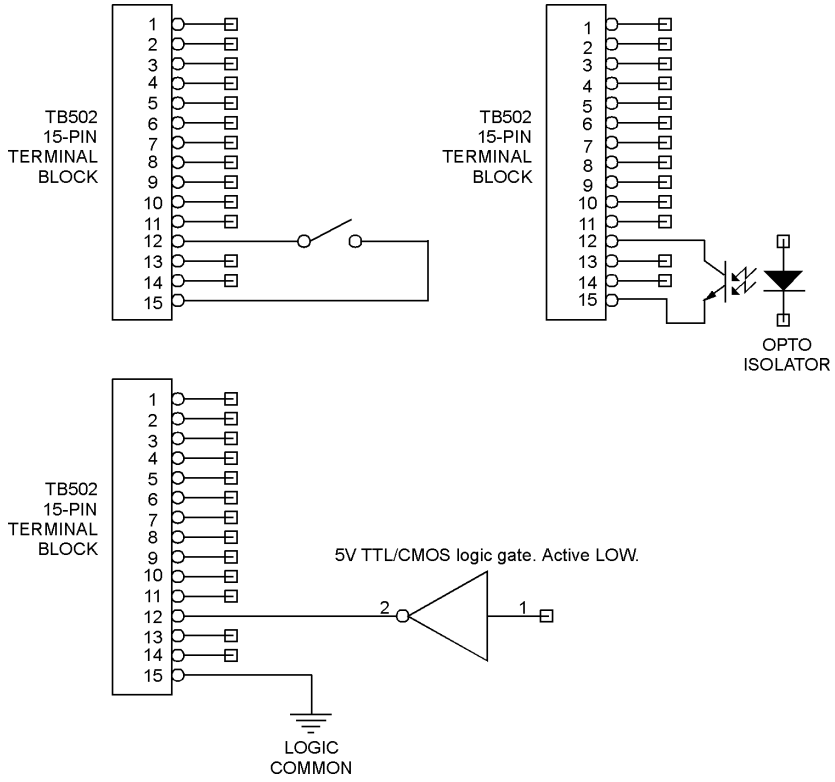
OVER-CURRENT (O/C)
Red LED lights when drive current limiting is active.

OVER-VOLTAGE (O/V) (Red)
Red LED lights when the drive bus exceeds threshold limit caused usually by motor regeneration energy flowing back into drive. If this LED lights frequently, you will need to connect a dumping resistor.

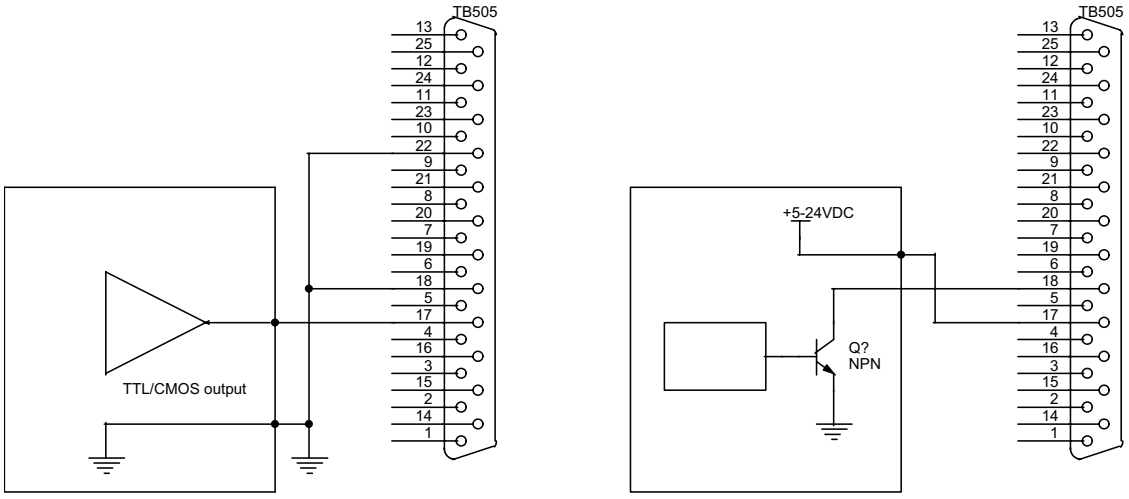
POWER (Green)
Green LED lights when power is applied to the drive.

ENABLING THE DRIVE

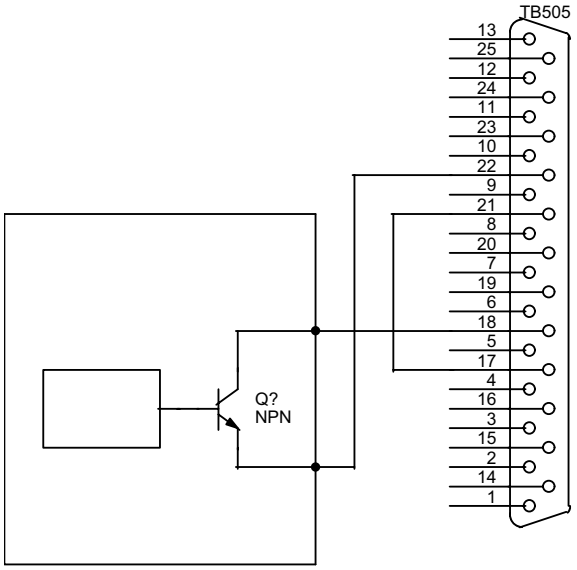
Regardless of selected operating mode, the EasyServo must be enabled before it can operate. Refer to drawings below for various enabling options.



Enabling options via TB502 connector.



Enabling options via TB506 connector.

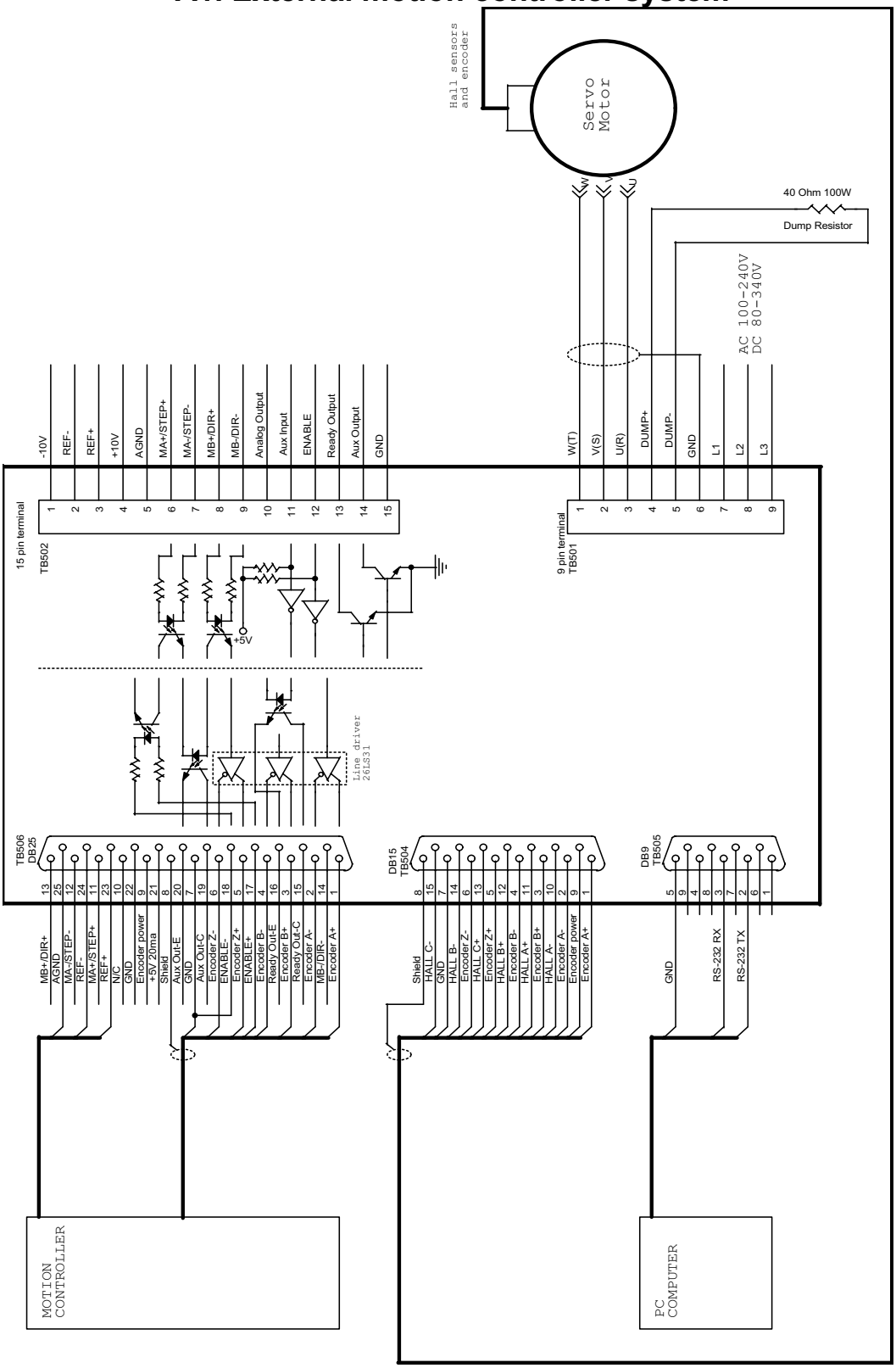


Enabling options via TB506 connector.(using drive’s internal power supply)

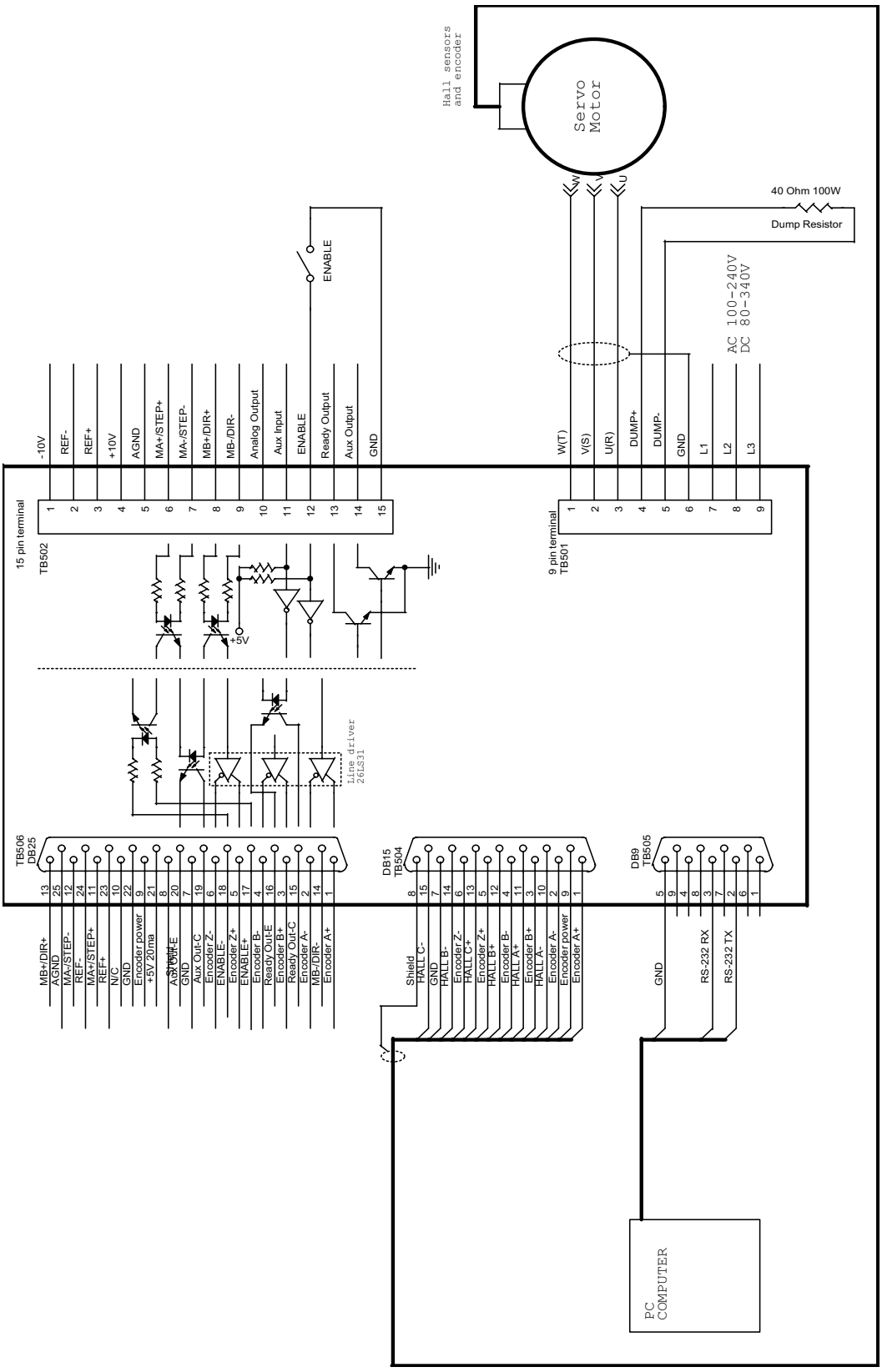
Section A

EasyServo system connection examples

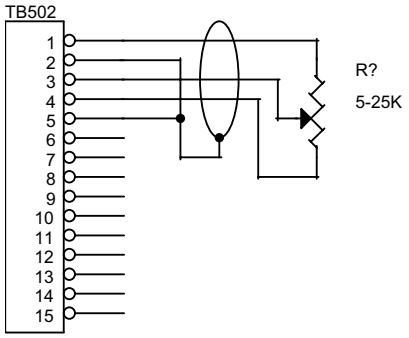
A1. External motion controller system



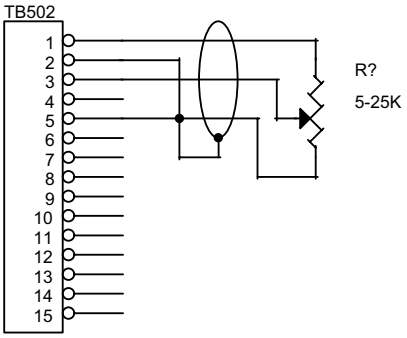
A2. Simple Torque and velocity system



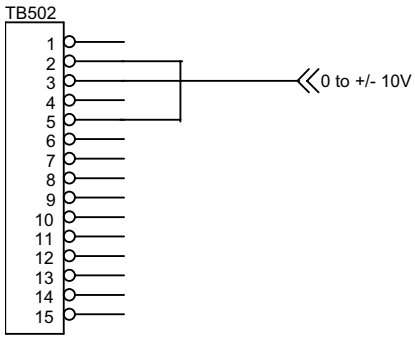
A2.2 Analog reference connection options



BI-DIRECTIONAL REFERENCE
CONNECTION

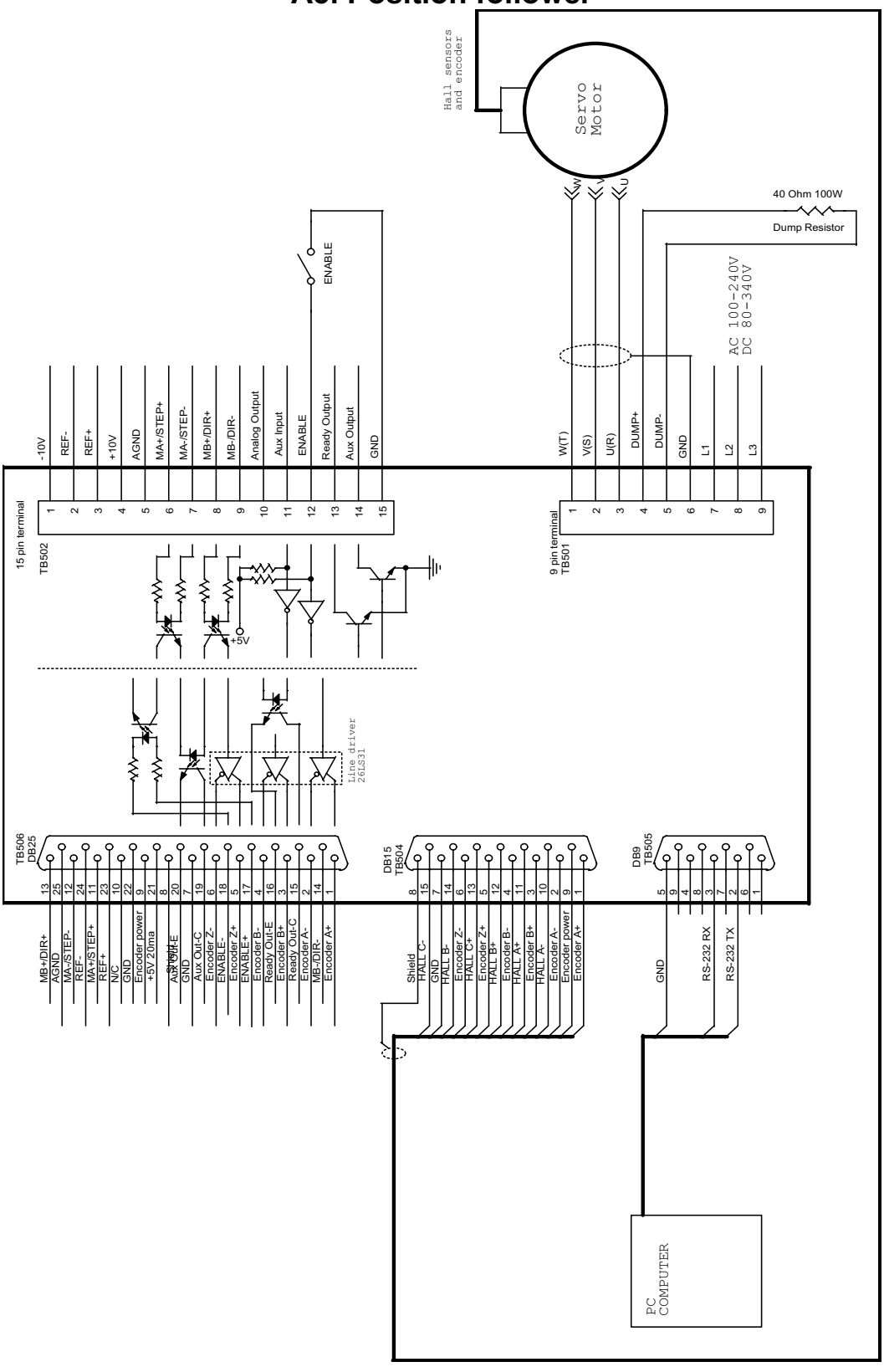


SINGLE DIRECTION
REFERENCE
CONNECTION

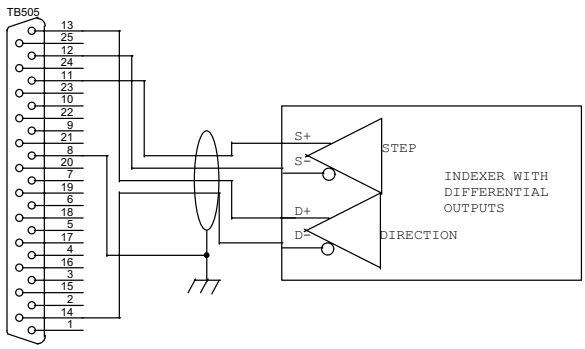


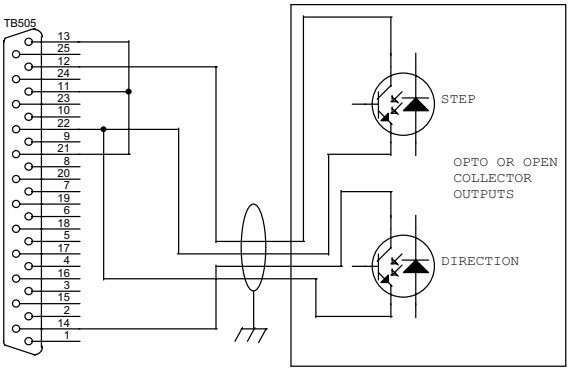
EXTERNAL VOLTAGE
REFERENCE
CONNECTION

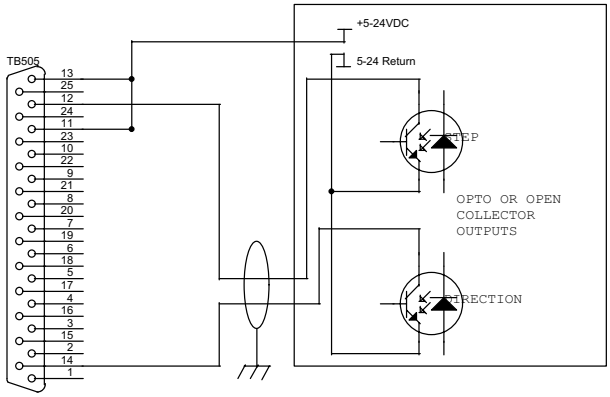
A3. Position follower



A3.3 Indexer connection options for position follower







Section B

Troubleshooting

> **Warning!**
> Dangerous voltages exist on the EasyServo when it is powered, and up to 30 seconds after power is removed and the motor stops. When possible, disconnect the AC or DC voltage input from the EasyServo while troubleshooting. Be alert. High voltages can cause serious or fatal injury.

Before troubleshooting

Perform the following steps before starting any procedure in this section:

- Disconnect AC or DC voltage input from the EasyServo. Wait 30 seconds for power to discharge.
- Check the EasyServo closely for damaged components.
- Check that no foreign material has become lodged on, or fallen into, the EasyServo.
- Verify that every connection is correct and in good condition.
- Verify that there are no short circuits or grounded connections.
- Check that the drive's rated phase current and RMS voltage are consistent with the motor ratings.

For additional assistance, contact your local EasyServo® authorized distributor.

Problem
External line fuse blows

Possible Cause

1. Line fuses are the wrong size.
2. Motor leads or incoming power leads are shorted to ground.
3. Nuisance tripping caused by EMI noise spikes caused by poor grounding and/or shielding.

Suggested Solution

1. Check that line fuses are properly sized for the motor being used.
2. Check motor cable and incoming power for shorts.
3. Check that you follow recommendation for shielding and grounding listed in section "Shielding and grounding" early in this manual.

Problem
Ready LED is on but motor does not run.

Suggested Solution
If in torque or velocity mode:

1. Reference voltage input signal is not applied.
2. Reference signal is not connected to the EasyServo input properly; connections are open.
3. In MotionView program check <Parameters> <Reference> set to <External>

4. For Velocity mode only: In Motion View check <Parameters> <Compensation><Velocity loop filter> P-gain must be set to value more then 0 in order to run. Without load motor will run with P-gain set as low as 20 but under load might not. If P-gain is set to 0 motor will not run at all.

In step and direction mode:

1. Step and direction inputs are not wired correctly.

2. In MotionView program check <Parameters> <Step input type> is set for <S/D> if you use a step-and-direction indexer output; and <Master Encoder> if you use quadrature type output from a master motor encoder or indexer.

3. Position loop P-gain set to 0. Set P-gain to 200 and D-gain to 200 initially to get motion. Tune them afterwards for best performance.

Problem

In velocity mode, the motor runs away.

Possible cause

1. Hall sensors or encoder miswired.

2. EasyServo not programmed for motor connected.

Suggested solution

1. Check hall sensor and encoder connections.

2. Check that the proper motor is selected.