

CD-LITE

QUICK START

DO NOT DISCARD

In a continuing effort to satisfy our customers, Danaher Motion Kollmorgen Speciality Electronics has provided this packet of instructions with your product. This information provides safety, warranty, and liability information. This information enables you, the customer to get this unit up and running with installation steps. Tuning information is contained in the technical manuals on this CD-ROM. The software for this product is also contained on this CD-ROM. The included CD-ROM has all the technical manuals in PDF format. For your convenience, Adobe[®]'s Acrobat Reader can also be installed from this CD-ROM. Danaher Motion Kollmorgen's technical documentation is subject to change without notice. Be sure to check the website for the latest version. Compare wiring diagrams to the latest version on the website to prevent damage to equipment.

General

SAFETY INFORMATION

Only qualified personnel are permitted to transport, assembly, commission, and maintenance this equipment. Properly qualified personnel are persons who are familiar with the transport, assembly, installation, commissioning and operation of motors, and who have the appropriate qualifications for their jobs. The qualified personnel must know and observe the following standards and regulations:

IEC 364 resp. CENELEC HD 384 or DIN VDE 0100

IEC report 664 or DIN VDE 0110

National regulations for safety and accident prevention or VBG 4

- ◆ Read all available documentation before assembly and commissioning. Incorrect handling of products in this manual can result in injury and damage to persons and machinery. Strictly adhere to the technical information on the installation requirements.
- ◆ It is vital to ensure that all system components are connected to earth ground. Electrical safety is impossible without a low-resistance earth connection.
- ◆ The SERVOSTAR[®] product contains electro-statically sensitive components that can be damaged by incorrect handling. Discharge any electrical shock potential from you before touching the product. Avoid contact with high insulating materials (artificial fabrics, plastic film, etc.). Place the product on a conductive surface.
- ◆ During operation keep all covers and cabinet doors shut. Otherwise, there are deadly hazards that could possibly cause severe damage to health or the product.
- ◆ In operation, depending on the degree of enclosure protection, the product can have bare components that are live or have hot surfaces. Control and power cables can carry a high voltage even when the motor is not rotating.
- ◆ Never pull out or plug in the product while the system is live. There is a danger of electric arcing and danger to persons and contacts.
- ◆ After powering down the product, wait at least ten minutes before touching live sections of the equipment or undoing connections (e.g., contacts, screwed connections). Capacitors can store dangerous voltages for long periods of time after power has been switched off. To be safe, measure the contact points with a meter before touching.

When these symbols are seen in this manual, be alert to the potential for personal injury. Follow the recommended precautions and safe operating practices included with the alert symbols. Safety notices in this manual provide important information. Read and be familiar with these instructions before attempting installation, operation, or maintenance. The purpose of this section is to alert users to possible safety hazards associated with this equipment and the precautions that need to be taken to reduce the risk of personal injury and damage to the equipment. Failure to observe these precautions could result in serious bodily injury, damage to the equipment, or operational difficulty. The safety-alert symbols are:



Warning Alerts users to potential physical danger or harm. Failure to follow warning notices could result in personal injury or death.



Caution Directs attention to general precautions, which if not followed, could result in personal injury and/or equipment damage.



Note Highlights information critical to your understanding or use of the product.

Directive and Standard

The SERVOSTAR CD-LITE product series have been successfully tested and evaluated to meet UL/cUL 508C for both U.S. and Canadian markets. This standard describes the fulfillment by design of minimum requirements for electrically operated power conversion equipment, such as frequency converters and servo amplifiers, which is intended to eliminate the risk of fire, electric shock, or injury to persons, being caused by such equipment.

CE Mark Conformance

Servo drives are components that are intended to be incorporated into electrical plant and machines for industrial use. When the servo drives are built into machines or plants, drives cannot be operated until the machine or plant fulfills the requirements of the EC Directive on Machines 89/392/EEC and the EC Directive on EMC (89/336/EEC). EN 60204 and EN 292 must also be observed.

In connection with the Low Voltage Directive 73/23/EEC, the harmonized standards of the EN 50178 series are applied to the amplifiers, together with EN 60439-1, EN 60146 and EN 60204.

The manufacturer of the machine or plant is responsible for ensuring that they meet the limits required by the EMC regulations. Advice on the correct installation for EMC - such as shielding, grounding, arrangement of filters, treatment of connectors and the laying out of cabling - can be found within this documentation.

Conformance with the EC Directive on EMC 89/336/EEC and the Low Voltage Directive 73/23/EEC is mandatory for the supply of servo drives within the European Community.

An authorized testing laboratory in a defined configuration with the system components has tested the servo drives. Any divergence from the configuration and installation described in this documentation means that you are responsible for the performance of new measurements to ensure that the regulatory requirements are met.

Danaher Motion Kollmorgen's SERVOSTAR CD-LITE-Series drives and systems have been successfully tested and evaluated to the limits and requirements of the EC Directive on EMC (89/336/EEC) and the EC Directive on Low Voltage (72/73/EEC). The product lines have been evaluated to EN50178 and EN60204 as a component of a machine and other relevant standards.

The EMC of a system can be identified by emissions and immunity. Emissions refer to the generation of EMI (electromagnetic interference) and immunity refers to the susceptibility levels of the equipment. Limits were derived from generic standards EN55081-2 and EN55082-2 for heavy industrial environments. The SERVOSTAR CD-LITE series of drives have been tested for radiated emissions, conducted emissions, EFT, ESD, surge, conducted immunity, and radiated immunity. These tests have been done in accordance with EN55011, EN61000-4-2, ENV50140, IEC 1000-4-4, EN61000-4-5, and ENV50141.



Installation of the equipment is critical in designing for system and machine electromagnetic compatibility (EMC). You must apply the installation recommendations and the CE filtering Practices when mounting and installing the drive system for CE conformance.

LIMITED WARRANTY

Includes software provided by Kollmorgen

Seller warrants that the Goods sold hereunder are free from defects in material and workmanship for the product warranty period of each item of Goods (Product Warranty Periods are listed below). Seller warrants its Good(s) only to the original purchaser (the “Customer”), and in the case of original equipment manufacturers or distributors, only to their original consumer (the “Customer”). There are no warranties whatsoever on Goods built or acquired, wholly or partially, to a buyer’s designs or specifications

This express warranty is in lieu of and exclude all other warranties, express or implied, by operation or law or otherwise including THE WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE (WHETHER KNOWN TO SELLER OR NOT), all other such warranties being hereby expressly disclaimed by Seller and waived by Buyer.

Written notice of claimed defects shall have been given to Seller within the period set forth in the schedule below, and within thirty (30) days from the date any such defect is first discovered.

Product Warranty Schedules

Brand	Products	Warranty Period
Kollmorgen	Standard Brush-type Motors, Electronics and Accessories	12 months from date of manufacture
Kollmorgen	Standard Brushless Motors, Electronics and Accessories	24 months from date of manufacture
Kollmorgen	Standard Step Motors, Stepper Controls and Accessories	12 months from date of manufacture
Kollmorgen	Custom Motion Systems or components of any type	To be negotiated on a case-by-case basis, and set forth in the order.
Pacific Scientific	All Products	24 months from date of manufacture
Superior	All Products	12 months from date of manufacture

The Good or parts claimed to be defective must be returned to Seller, accompanied by a Return Material Authorization (RMA) issued by Seller’s facility responsible for supplying Goods, with transportation prepaid by Customer, with written specifications of the claimed defect.

If a warranty claim is valid, Seller shall pay reasonable one-way costs of transportation of the defective Goods from either the original destination or the location where defect occurred, whichever is closest to Seller’s facility. Under no circumstances shall Seller be liable for removal of Seller’s Goods from Buyer’s equipment or re-installation into Buyer's equipment.

NO PERSON, INCLUDING ANY AGENT, DISTRIBUTOR, OR REPRESENTATIVE OF SELLER, IS AUTHORIZED TO MAKE ANY REPRESENTATION OR WARRANTY ON BEHALF OF SELLER CONCERNING ANY GOODS MANUFACTURED BY SELLER, EXCEPT TO REFER PURCHASERS TO THIS WARRANTY.

General Indemnity

Buyer agrees to hold Seller harmless from any and all liability, and to pay all costs and attorney’s fees, for injury or damage to persons or property caused in any manner by Goods covered by the order while in possession or under the control of Buyer or Buyer’s successor in interest.

Use As Directed

The following guidelines describe the restrictions for proper use of the SERVOSTAR CD-LITE system:

- ◆ The amplifiers are components built into electrical equipment or machines and can only be commissioned as integral components of such equipment.
- ◆ The servo amplifiers are to be used only on earthed three-phase industrial mains supply networks (TN-system, TT-system with earthed neutral point).
- ◆ The servo amplifiers must not be operated on power supply networks without an earth or with an asymmetrical earth.
- ◆ If the servo amplifiers are used in residential areas, or in business or commercial premises, the user must implement additional filter measures.
- ◆ The servo amplifiers are only intended to drive specific brushless synchronous servomotors from Kollmorgen with closed-loop control of torque, speed, and position. The rated voltage of the motors must be at least as high as the DC-link voltage of the servo amplifier.
- ◆ The servo amplifiers may only be operated in a closed switchgear cabinet, taking into account the ambient conditions defined in the environmental specifications.

Kollmorgen guarantees the conformance of the servo amplifiers with the standards for industrial areas stated in this manual only if Danaher Motion Kollmorgen delivers the components (motors, cables, amplifiers etc).

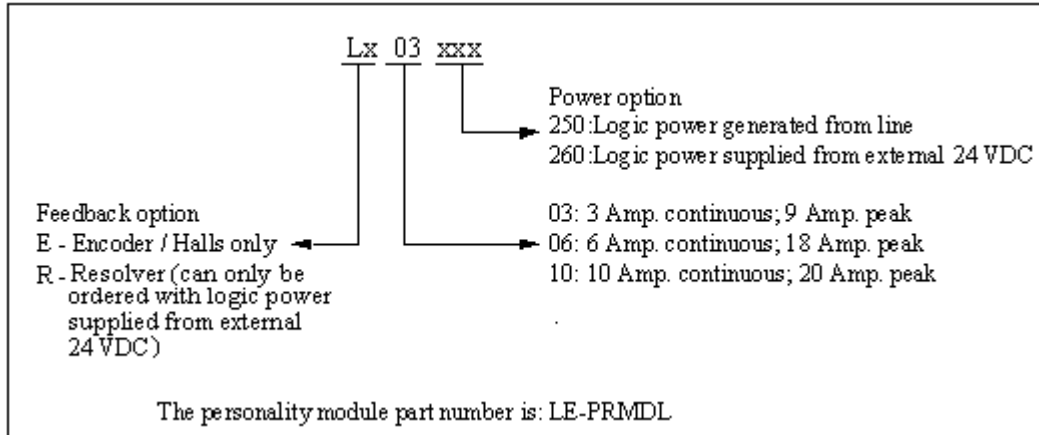
Software Warranty

Computer software programs that may be included in material or Goods sold to Buyer have been designed to perform a given set of tasks as defined in the documentation provided and are offered AS IS. It is Buyer's responsibility to determine if the features of the software programs are suitable for Buyer's requirements and must confirm that the software programs operate correctly. Buyer understands that such software programs are of such complexity that they may have inherent defects and that Seller makes no warranty that all software features will perform correctly as supplied. For Seller's software utilizing automation servers, improper reading and writing data to the automation server can cause the automation server software to malfunction and may cause the automation server and/or the program writing to the automation server to crash. Improperly reading and writing data to an automation server may cause the device controlled by that automation server to malfunction. Seller shall not be responsible for damage to any device or damage caused by any device due to the improper reading and/or writing of data to an automation server.

LIMITATION OF LIABILITY

NOTWITHSTANDING ANYTHING TO THE CONTRARY, SELLER SHALL NOT BE LIABLE FOR ANY SPECIAL, INCIDENTAL, INDIRECT OR CONSEQUENTIAL DAMAGES INCLUDING LOST PROFITS ARISING OUT OF THE PERFORMANCE, DELAYED PERFORMANCE OR BREACH OF PERFORMANCE OF THIS ORDER REGARDLESS WHETHER SUCH LIABILITY BE CLAIMED IN CONTRACT, EQUITY, TORT OR OTHERWISE. SELLER'S OBLIGATION IS LIMITED SOLELY TO REPAIRING OR REPLACING (AT ITS OPTION AND AS SET FORTH IN SECTION 10 AND SECTION 11), AT ITS APPROVED REPAIR FACILITY, ANY GOODS OR PARTS WHICH PROVE TO SELLER'S SATISFACTION TO BE DEFECTIVE AS A RESULT OF DEFECTIVE MATERIALS OR WORKMANSHIP, IN ACCORDANCE WITH SELLER'S STATED WARRANTY. IN NO EVENT SHALL SELLER'S LIABILITY EXCEED THE TOTAL PURCHASE PRICE SET FORTH IN THIS ORDER.

PART NUMBER



MANUAL AND SOFTWARE DOWNLOADS

Complete product manuals can be downloaded from the Danaher Motion website. The manuals are:

CD Lite User Manual
CD Lite Variable and Command Reference

The manual download location is:

http://www.motionvillage.com/products/technical_documentation/septech_docs.htm

SERVOSTAR® MOTIONLINK® is a Windows®-based computer program produced by Kollmorgen, enabling users to quickly set up CD Lite servo amplifiers and fine-tune their system performance via a RS-232 com port.

The software download location is:

http://www.motionvillage.com/products/software_downloads/motionlink/index.html

You can also find the Manuals in the PSP CD Literature Browser

Select Product: **CUSTOM**
 Document Type: **MANUALS**

CONTROL SPECIFICATIONS

Product Model	Control Specifications		
Current Loop	Update Rate	62.5 μ s (16 kHz)	
	Bandwidth	<1000Hz	
Commutation	Update Rate	62.5 μ s (16 kHz)	
	Output Waveform	Sinusoidal	
	Maximum frequency	400 Hz	
Velocity Loop	Update Rate	250 μ s (4 kHz)	
	Bandwidth	<400 Hz	
	Speed Command Resolution	Analog: 12 bit (\pm 11 bit)	
Minimum Speed			(1/2048) x VMAX
I/O Connector (C3 by pinout)			
Analog Input (2,3)	Maximum Voltage	\pm 12.5 V differential	
	Operating Voltage Range	\pm 10 V differential	
	Input Resolution	12 bit	
	Sensitivity	4.9 mV at 12 bit	
	Voltage Range	-8 to +8 V (Standard)/-10 to +10 V (Rescaled)	
	Input Impedance/CMR	> 10 k Ω /50 dB	
Fault Output Relay (5,6)	Long-term Drift	100 ppm (0.075%/ $^{\circ}$ C)	
	Max Capacity	1 A at 24 VDC	
Remote Enable (7,8) Digital Inputs(7,9,10,11)	Input Frequency	4.6 kHz (Opto-isolated)	
	Input Voltage Range	12 to 24 V Nominal	
	Min. On/Max. Off	10 V/1 V	
Configurable Digital Output (7,12)	Current Demand per Input	20 mA at 24 VDC	
	Output Voltage (max.)	0 to 48 V Nominal – Bi-directional (Open Collector)	
	(Min. On)	1 V	
Configurable Analog Output (13,4)	Max. Output Current	60 mA	
	Max Output Current	1 mA (1 k Ω internal series resistance)	
	Resolution	8 bit	
Encoder Equivalent Output (C4 by pinout)	Voltage range	- 10 V to +10 V	
	Encoder Equivalent Output (C4 by pinout)		
A/B/I & Complements (1,2,4,5,7,8)	Output Voltage (high level) at 25 $^{\circ}$ C	2.5 V min at 20 mA	
	Output Voltage (low level) at 25 $^{\circ}$ C	0.5 max at 20 mA	
	RS 485 Line Drive Type	DS26C31TM	

ELECTRICAL SPECIFICATIONS

Model	Output Continuous Current Per Phase (RMS/Phase) at 45 $^{\circ}$ C	Output Peak Current Per Phase (RMS/Phase)	AC Line Input Voltage (VAC)	Rated Input Power (kVA)	Rated Output Continuous Power (kVA)	Regen. Option
Lx03	3 Amps	9 Amp. (1 sec)	115 - 1phase	0.44	0.35	ERH-26
			230 - 1 phase	0.89	0.7	
			230 - 3 phase	1.4	1.1	
Lx06	6 Amps	18 Amp. (1 sec)	115 - 1phase	0.89	0.7	ERH-26
			230 - 1 phase	1.8	1.4	
			230 - 3 phase	2.8	2.2	
Lx10	10 Amps	20 Amp. (2 sec)	230 - 3 phase	4.6	3.5	ERH-26

HARDWARE SPECIFICATIONS

Amplifier Model		Lx03	Lx06	Lx10
Unit Weight	lbs / Kgs	3.56 / 1.61	4.9 / 2.22	5.94 / 2.69
Mounting Hardware	English (Metric)	10-32 (M4)		
	Applied Torque	20 lb-in (2.26 N-m)		
Connection Hardware	Line Screw Size/Torque	M3.5 / 12 lb-in (1.35 N-m)		
	BUS Screw Size/Torque			
	Motor Screw Size/Torque			
	Ground Screw Size/Torque			
Wire Size (AWG#)	Control Logic (AWG/ mm2)	28 – 16 / 0.5 – 1.5		
	Motor Line (AWG/ mm2)	14 / .25		
	Main Input (AWG/ mm2)	14 / 0.25	12 / 4	
	Configurable I/O wire gauge	22-18 AWG (.3-.75mm2) Ferrules recommended: 18 AWG Type H1 - 0/14 Weidmuller 4630.0 or equivalent 20 AWG Type H0 - 75/14 Weidmuller 4629.0 or equivalent		
	Spade Terminals	16/14 AWG (1.5mm2): Hollingsworth XSS0954S or SS20947SF or equivalent 12/10 AWG (4-6mm2): Hollingsworth XSS20836 or SS20832F or equivalent		
	Ring Terminals	8 AWG (10mm2): Hollingsworth R3027BF or equivalent 6 AWG (16mm2): Hollingsworth R4001BF or equivalent 4 AWG (25mm2): Hollingsworth R5100BF or equivalent 2 AWG (35mm2): Hollingsworth R7998BFN or equivalent		
Clearance	Side-to-Side	0.5 in (12.7mm)		
	Top/Bottom	2.5 in (63.5mm)		
Mating Connector Hardware	CK100 Kit	Includes: C1, C2, C4 (plus 2ft / 0.69m of stranded bus ribbon)		
	C3	Kollmorgen #: A-93899-013 Vendor Info: Weidmuller BL3.5/13		
	C5	Kollmorgen #: A-81014-004 Vendor Info: PCD ELFP04110		
	Connector Screw Torque	2.25 lb-in (0.25 m)		
	24V Logic (optional)	TBD (PCD ELFP02210 or equivalent)		

REGEN INFORMATION

Product Model		Lx03	Lx06	Lx10
External Shunt Regulator	Peak current (amps)	20		
	Minimum resistance (ohms)	20		
	Watts	200		
Application Information	Capacitance (Farads)	0.00082	0.00164	
	BUS Voltage (nominal) (VDC)	325		
	VHYS (Regen circuit turn-off) (VDC)	370		
	VMAX (Regen circuit turn-on) (VDC)	390		
External Regen Kits	ERH-26	✓	✓	✓

UNPACKING AND INSPECTION

Open the box and remove all the contents. Check to ensure there is no visible damage to any of the equipment.



Electronic components in this amplifier are design-hardened to reduce static sensitivity. However, proper procedures should be used when handling to avoid damage to equipment.



Remove all packing material and equipment from the shipping container. Be aware that some connector kits and other equipment pieces may be quite small and can be accidentally discarded if care is not observed when unpacking the equipment. Do not dispose of shipping materials until the packing list has been checked.



Upon receipt of the equipment, inspect components to ensure that no damage has occurred in shipment. If damage is detected, notify the carrier immediately. Check all shipping material for connector kits, documentation, diskettes, CD-ROM, or other small pieces of equipment.

CE FILTERING

The SERVOSTAR drive system (drive, motor) meets the CE Mark standards stated in the front of this manual. It is imperative for you to apply proper bonding and grounding techniques, described earlier in this section, when incorporating EMC noise filtering components for the purpose of meeting this standard.

Noise currents often occur in two types. The first is conducted emissions that are passed through ground loops. The quality of the system grounding scheme inversely determines the noise amplitudes in the lines. These conducted emissions are of a common-mode nature from line to neutral (or ground). The second is radiated high-frequency emissions usually capacitively coupled from line-to-line and are differential in nature.

To properly mount the filters, the enclosure should have an unpainted metallic surface. This allows for more surface area to be in contact with the filter housing and provides a lower impedance path between this housing and the back plane. The back panel, in turn, has a high frequency ground strap connection to the enclosure frame or earth ground.

Input Power

The Kollmorgen SERVOSTAR CD-LITE electronic system components require EMI filtering in the input power leads to meet the conducted emission requirements for the industrial environment. This filtering blocks conducted-type emissions from exiting onto the power lines and provides a barrier for EMI on the power lines.

Care must be taken to adequately size the system. The type of filter is based on the voltage and current rating of the system and whether the incoming line is single or three-phase. One input line filter is used for multi-axis control applications. These filters are mounted as close to the incoming power as possible so noise is not capacitively coupled into other signal leads and cables. The implementation of the EMI filter should be done in accordance with the following guidelines:

- Filter should be mounted on the same panel as the drive.
- Filter should be mounted as close as possible to incoming cabinet power.
- When mounting the filter to the panel, remove any paint or material covering. Use an unpainted metallic back panel, if possible.
- Filters are provided with an earth connection. All ground connections are tied to ground.
- Filters can produce high leakage currents. ***Filters must be earthed before connecting the supply!***
- Filters should not be touched for a period of 10 seconds after removing the supply.

Motor Line Filtering

Motor filtering may not be necessary for CE compliance of SERVOSTAR systems. However, this additional filtering increases the reliability of the system. Poor non-metallic enclosure surfaces and lengthy, unbonded (or unshielded) motor cables that couple noise line-to-line (differential) are just some of the factors that lead to the necessity of motor lead filtering.

Motor lead noise may be either common-mode or differential. The common-mode conducted currents occur between each motor lead and ground (line-to-neutral). Differential radiated currents exist from one motor lead to another (line-to-line). The filtering of the lines feeding the motor provide additional attenuation of noise currents that enter surrounding cables and equipment I/O ports in close proximity.

Differential mode currents commonly occur with lengthy motor cables. As the cable length increases, so does its capacitance and its ability to couple noise from line-to-line. While every final system is different and every application of the product causes a slightly different emission profile, it may become necessary to use differential mode chokes to provide additional noise attenuation to minimize the radiated emissions. The use of a ferrite core (placed at the drive end) on each motor lead (shown in the diagram below), attenuates differential mode noise and lower frequency (30-60 MHz) broadband emissions to within specifications. Kollmorgen recommends a Fair-Rite P/N 2643665702 (or equivalent) ferrite core. You should wrap each motor lead through the core several times.



Never wrap a ground lead through a core.

I/O Filtering

I/O filtering, while not a necessity for CE compliance, may be desired (depending on system installation, application, and integration with other equipment). It may be necessary to place ferrite cores on I/O lines to avoid unwanted signals entering and disturbing the drive system or other associated equipment. The following chart lists some ferrite parts that may be used for I/O filtering and noise attenuation. These parts are ideal for providing an in-line common mode impedance for I/O lines

Installation Instructions

These installation steps are designed to lead you through the proper installation and setup of a SERVOSTAR CD-LITE system. They were developed with the assumption that you have a fundamental understanding of basic electronics, computers, mechanics, and proper safety practices. However, you do not have to be an expert in motion control to install and operate the drive system. It is recommended that you read the entire manual completely before attempting installation or operation.



High voltage can present dangerous and hazardous conditions if not performed by a qualified electrician. Be certain to follow all national and local codes during installation. Follow all safety precautions outlined in the accompanying CD-ROM documentation.

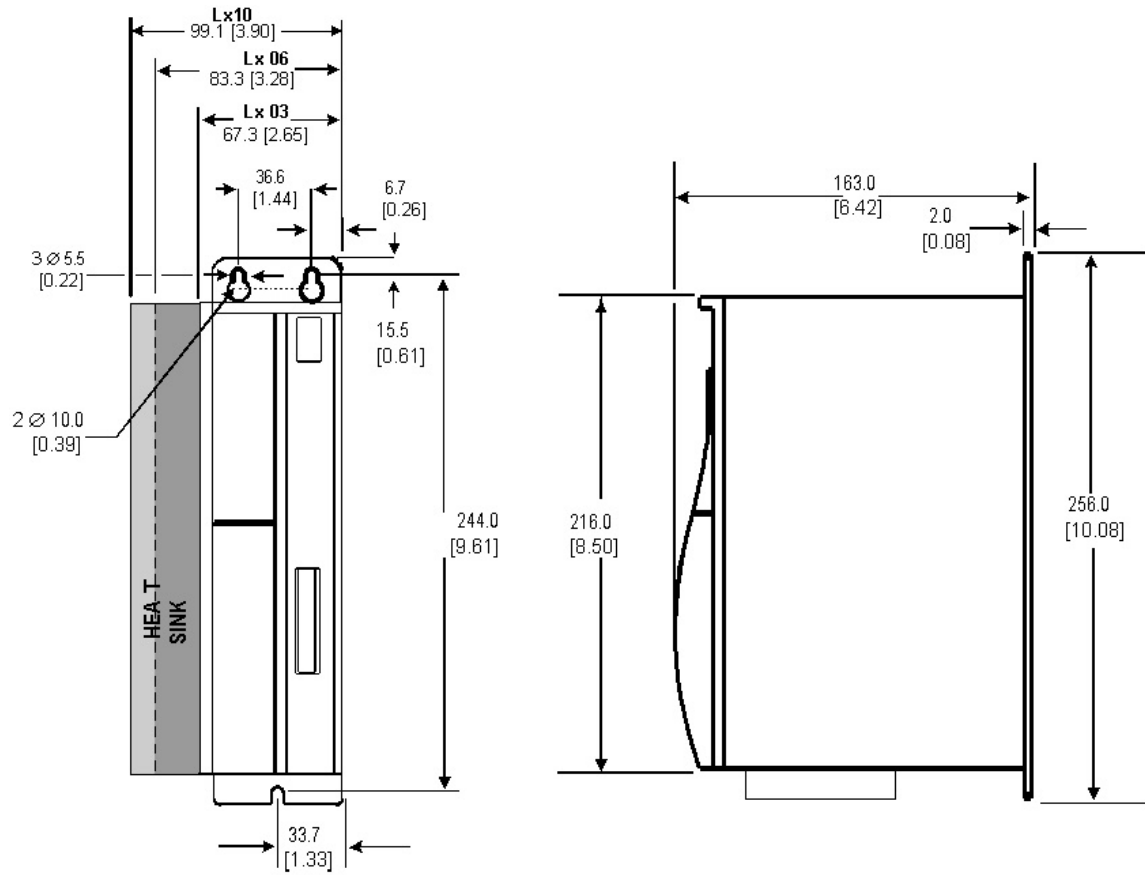
1. Open the box(es) and remove all the contents. Check to ensure there is no visible damage to any of the equipment.
2. Mount the SERVOSTAR CD-LITE to the back panel. Refer to the appropriate Outline Dimensions in this manual. **Metal-to-metal contact is important for electrical noise control!**
3. Wire the SERVOSTAR CD-LITE according to the appropriate System Wiring Diagram.
4. Connect solid earth ground to frames of all components.
5. Wire the main power (115/230 VAC). Wire the 24 volt supply to the connector at the top of the drive.
6. Wire user I/O at connector C3: At a minimum, 24 volts must be brought in to the enable circuit. Be certain that connector C3 is inserted correctly.
7. Wire the motor and feedback. Refer to the Feedback Wiring Diagram for additional information.
8. Wire Regen Resistor kit, if applicable.
9. Verify that all wiring is correct.
10. Verify that earth grounds are connected.
11. Verify all electrical and safety codes are met.
12. Connect the serial cable to connector C2 and PC. Refer to the appropriate System Wiring Diagram.
13. Install **MOTIONLINK** on the PC.



Startup processes can cause motor motion. Be certain that all applicable safety precautions are taken to ensure that no harm to personal or machine can occur.

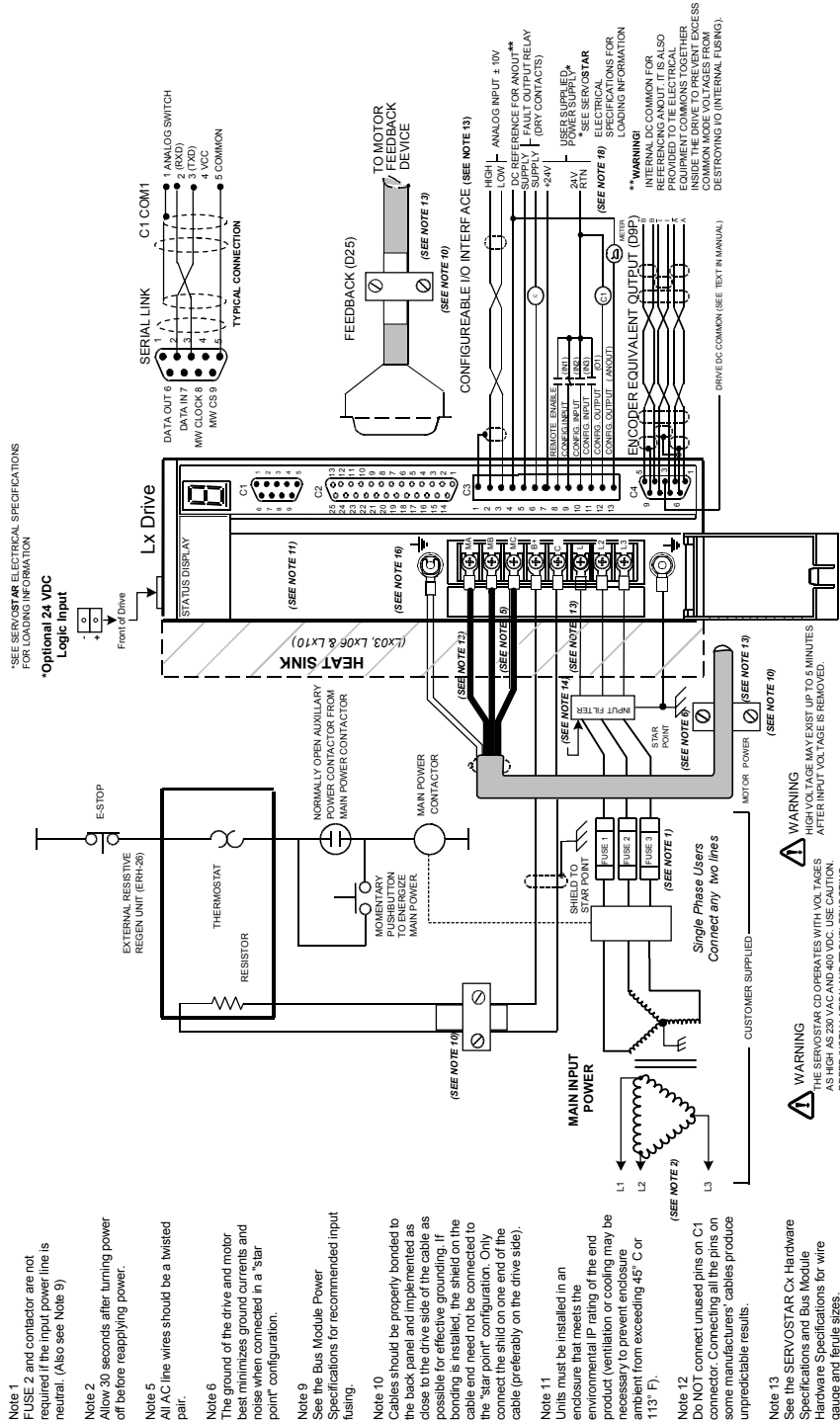
14. Using the Startup Wizard in **MOTIONLINK**:
 - A. Configure the SERVOSTAR CD-LITE for your particular motor, if this was not done at the factory. Refer to the **MOTIONLINK** Startup Wizard.
 - B. Enable the system.

OUTLINE DIMENSIONS



Wiring

WIRING DIAGRAM



Note 1
FUSE 2 and contactor are not required if the input power line is neutral. (Also see Note 9)

Note 2
Allow 30 seconds after turning power off before reapplying power.

Note 5
All A/C line wires should be a twisted pair.

Note 6
The ground of the drive and motor best minimizes ground currents and noise when connected in a 'Star point' configuration.

Note 9
See the Bus Module Power Specifications for recommended input fusing.

Note 10
Cables should be properly bonded to the back panel and implemented as close to the drive side of the cable as possible for effective grounding. If bonding is installed, the shield on the cable end need not be connected to the 'star point' configuration. Only connect the shield on one end of the cable (preferably on the drive side).

Note 11
Units must be installed in an enclosure that meets the environmental IP rating of the end product (ventilation or cooling may be necessary to prevent enclosure ambient from exceeding 45° C or 113° F).

Note 12
Do NOT connect unused pins on C1 connector. Connecting all the pins on some manufacturers' cables produces unpredictable results.

Note 13
See the SERVOSTAR Cx Hardware Specifications and Bus Module Hardware Specifications for wire gauge and ferrule sizes.

Note 14
See CE Filtering Techniques for further information.

Note 16
See the SERVOSTAR LX Hardware Specifications and Bus Module Specifications for spade terminal sizes.

Note 17
This system is suitable for use on a circuit capable of delivering not more than 5000 RMS symmetrical amperes, 240 V maximum.

Note 18
A flyback diode is necessary for inductive loads connected across the O1 output.

WARNING
THE SERVOSTAR CD OPERATES WITH VOLTAGES AS HIGH AS 200 VAC AND 400 VDC. USE CAUTION, REFER TO INSTALLATION AND TROUBLESHOOTING TO QUALIFIED PERSONNEL ONLY.

WARNING
HIGH VOLTAGE MAY EXIST UP TO 5 MINUTES AFTER INPUT VOLTAGE IS REMOVED.

Single Phase Users
Connect any two lines

CUSTOMER SUPPLIED

MOTOR POWER

INPUT FILTER

START STOP

ENCODER EQUIVALENT OUTPUT (DRP)

CONTROL OUTPUT (ANOUT)

CONTROL INPUT (RTN)

POWER SUPPLY

REMOTE ENABLE

ANALOG INPUT

DC REFERENCE FOR ANOUT**

ANALOG SUPPLY

RELAY CONTACTS (DRY CONTACTS)

±24V

USER SUPPLIED ELECTRICAL CONNECTIONS FOR LOADING INFORMATION

**WARNING: INTERNAL DC COMMON FOR REFERENCING ANOUT. IT IS ALSO PROVIDED TO THE ELECTRICAL INSULATION OF THE DRIVE TO PREVENT EXCESS COMMON MODE VOLTAGES FROM DESTROYING I/O (INTERNAL FUSING).

DRIVE DC COMMON (SEE TEXT IN MANUAL)

ENCODER EQUIVALENT OUTPUT (DRP)

CONTROL OUTPUT (ANOUT)

CONTROL INPUT (RTN)

POWER SUPPLY

REMOTE ENABLE

ANALOG INPUT

DC REFERENCE FOR ANOUT**

ANALOG SUPPLY

RELAY CONTACTS (DRY CONTACTS)

±24V

USER SUPPLIED ELECTRICAL CONNECTIONS FOR LOADING INFORMATION

**WARNING: INTERNAL DC COMMON FOR REFERENCING ANOUT. IT IS ALSO PROVIDED TO THE ELECTRICAL INSULATION OF THE DRIVE TO PREVENT EXCESS COMMON MODE VOLTAGES FROM DESTROYING I/O (INTERNAL FUSING).

DRIVE DC COMMON (SEE TEXT IN MANUAL)

ENCODER EQUIVALENT OUTPUT (DRP)

CONTROL OUTPUT (ANOUT)

CONTROL INPUT (RTN)

POWER SUPPLY

REMOTE ENABLE

ANALOG INPUT

DC REFERENCE FOR ANOUT**

ANALOG SUPPLY

RELAY CONTACTS (DRY CONTACTS)

±24V

USER SUPPLIED ELECTRICAL CONNECTIONS FOR LOADING INFORMATION

**WARNING: INTERNAL DC COMMON FOR REFERENCING ANOUT. IT IS ALSO PROVIDED TO THE ELECTRICAL INSULATION OF THE DRIVE TO PREVENT EXCESS COMMON MODE VOLTAGES FROM DESTROYING I/O (INTERNAL FUSING).

DRIVE DC COMMON (SEE TEXT IN MANUAL)

ENCODER EQUIVALENT OUTPUT (DRP)

CONTROL OUTPUT (ANOUT)

CONTROL INPUT (RTN)

POWER SUPPLY

REMOTE ENABLE

ANALOG INPUT

DC REFERENCE FOR ANOUT**

ANALOG SUPPLY

RELAY CONTACTS (DRY CONTACTS)

±24V

USER SUPPLIED ELECTRICAL CONNECTIONS FOR LOADING INFORMATION

**WARNING: INTERNAL DC COMMON FOR REFERENCING ANOUT. IT IS ALSO PROVIDED TO THE ELECTRICAL INSULATION OF THE DRIVE TO PREVENT EXCESS COMMON MODE VOLTAGES FROM DESTROYING I/O (INTERNAL FUSING).

DRIVE DC COMMON (SEE TEXT IN MANUAL)

ENCODER EQUIVALENT OUTPUT (DRP)

CONTROL OUTPUT (ANOUT)

CONTROL INPUT (RTN)

POWER SUPPLY

REMOTE ENABLE

ANALOG INPUT

DC REFERENCE FOR ANOUT**

ANALOG SUPPLY

RELAY CONTACTS (DRY CONTACTS)

±24V

USER SUPPLIED ELECTRICAL CONNECTIONS FOR LOADING INFORMATION

**WARNING: INTERNAL DC COMMON FOR REFERENCING ANOUT. IT IS ALSO PROVIDED TO THE ELECTRICAL INSULATION OF THE DRIVE TO PREVENT EXCESS COMMON MODE VOLTAGES FROM DESTROYING I/O (INTERNAL FUSING).

DRIVE DC COMMON (SEE TEXT IN MANUAL)

ENCODER EQUIVALENT OUTPUT (DRP)

CONTROL OUTPUT (ANOUT)

CONTROL INPUT (RTN)

POWER SUPPLY

REMOTE ENABLE

ANALOG INPUT

DC REFERENCE FOR ANOUT**

ANALOG SUPPLY

RELAY CONTACTS (DRY CONTACTS)

±24V

USER SUPPLIED ELECTRICAL CONNECTIONS FOR LOADING INFORMATION

**WARNING: INTERNAL DC COMMON FOR REFERENCING ANOUT. IT IS ALSO PROVIDED TO THE ELECTRICAL INSULATION OF THE DRIVE TO PREVENT EXCESS COMMON MODE VOLTAGES FROM DESTROYING I/O (INTERNAL FUSING).

DRIVE DC COMMON (SEE TEXT IN MANUAL)

ENCODER EQUIVALENT OUTPUT (DRP)

CONTROL OUTPUT (ANOUT)

CONTROL INPUT (RTN)

POWER SUPPLY

REMOTE ENABLE

ANALOG INPUT

DC REFERENCE FOR ANOUT**

ANALOG SUPPLY

RELAY CONTACTS (DRY CONTACTS)

±24V

USER SUPPLIED ELECTRICAL CONNECTIONS FOR LOADING INFORMATION

**WARNING: INTERNAL DC COMMON FOR REFERENCING ANOUT. IT IS ALSO PROVIDED TO THE ELECTRICAL INSULATION OF THE DRIVE TO PREVENT EXCESS COMMON MODE VOLTAGES FROM DESTROYING I/O (INTERNAL FUSING).

DRIVE DC COMMON (SEE TEXT IN MANUAL)

ENCODER EQUIVALENT OUTPUT (DRP)

CONTROL OUTPUT (ANOUT)

CONTROL INPUT (RTN)

POWER SUPPLY

REMOTE ENABLE

ANALOG INPUT

DC REFERENCE FOR ANOUT**

ANALOG SUPPLY

RELAY CONTACTS (DRY CONTACTS)

±24V

USER SUPPLIED ELECTRICAL CONNECTIONS FOR LOADING INFORMATION

**WARNING: INTERNAL DC COMMON FOR REFERENCING ANOUT. IT IS ALSO PROVIDED TO THE ELECTRICAL INSULATION OF THE DRIVE TO PREVENT EXCESS COMMON MODE VOLTAGES FROM DESTROYING I/O (INTERNAL FUSING).

DRIVE DC COMMON (SEE TEXT IN MANUAL)

ENCODER EQUIVALENT OUTPUT (DRP)

CONTROL OUTPUT (ANOUT)

CONTROL INPUT (RTN)

POWER SUPPLY

REMOTE ENABLE

ANALOG INPUT

DC REFERENCE FOR ANOUT**

ANALOG SUPPLY

RELAY CONTACTS (DRY CONTACTS)

±24V

USER SUPPLIED ELECTRICAL CONNECTIONS FOR LOADING INFORMATION

**WARNING: INTERNAL DC COMMON FOR REFERENCING ANOUT. IT IS ALSO PROVIDED TO THE ELECTRICAL INSULATION OF THE DRIVE TO PREVENT EXCESS COMMON MODE VOLTAGES FROM DESTROYING I/O (INTERNAL FUSING).

DRIVE DC COMMON (SEE TEXT IN MANUAL)

ENCODER EQUIVALENT OUTPUT (DRP)

CONTROL OUTPUT (ANOUT)

CONTROL INPUT (RTN)

POWER SUPPLY

REMOTE ENABLE

ANALOG INPUT

DC REFERENCE FOR ANOUT**

ANALOG SUPPLY

RELAY CONTACTS (DRY CONTACTS)

±24V

USER SUPPLIED ELECTRICAL CONNECTIONS FOR LOADING INFORMATION

**WARNING: INTERNAL DC COMMON FOR REFERENCING ANOUT. IT IS ALSO PROVIDED TO THE ELECTRICAL INSULATION OF THE DRIVE TO PREVENT EXCESS COMMON MODE VOLTAGES FROM DESTROYING I/O (INTERNAL FUSING).

DRIVE DC COMMON (SEE TEXT IN MANUAL)

ENCODER EQUIVALENT OUTPUT (DRP)

CONTROL OUTPUT (ANOUT)

CONTROL INPUT (RTN)

POWER SUPPLY

REMOTE ENABLE

ANALOG INPUT

DC REFERENCE FOR ANOUT**

ANALOG SUPPLY

RELAY CONTACTS (DRY CONTACTS)

±24V

USER SUPPLIED ELECTRICAL CONNECTIONS FOR LOADING INFORMATION

**WARNING: INTERNAL DC COMMON FOR REFERENCING ANOUT. IT IS ALSO PROVIDED TO THE ELECTRICAL INSULATION OF THE DRIVE TO PREVENT EXCESS COMMON MODE VOLTAGES FROM DESTROYING I/O (INTERNAL FUSING).

DRIVE DC COMMON (SEE TEXT IN MANUAL)

ENCODER EQUIVALENT OUTPUT (DRP)

CONTROL OUTPUT (ANOUT)

CONTROL INPUT (RTN)

POWER SUPPLY

REMOTE ENABLE

ANALOG INPUT

DC REFERENCE FOR ANOUT**

ANALOG SUPPLY

RELAY CONTACTS (DRY CONTACTS)

±24V

USER SUPPLIED ELECTRICAL CONNECTIONS FOR LOADING INFORMATION

**WARNING: INTERNAL DC COMMON FOR REFERENCING ANOUT. IT IS ALSO PROVIDED TO THE ELECTRICAL INSULATION OF THE DRIVE TO PREVENT EXCESS COMMON MODE VOLTAGES FROM DESTROYING I/O (INTERNAL FUSING).

DRIVE DC COMMON (SEE TEXT IN MANUAL)

ENCODER EQUIVALENT OUTPUT (DRP)

CONTROL OUTPUT (ANOUT)

CONTROL INPUT (RTN)

POWER SUPPLY

REMOTE ENABLE

ANALOG INPUT

DC REFERENCE FOR ANOUT**

ANALOG SUPPLY

RELAY CONTACTS (DRY CONTACTS)

±24V

USER SUPPLIED ELECTRICAL CONNECTIONS FOR LOADING INFORMATION

**WARNING: INTERNAL DC COMMON FOR REFERENCING ANOUT. IT IS ALSO PROVIDED TO THE ELECTRICAL INSULATION OF THE DRIVE TO PREVENT EXCESS COMMON MODE VOLTAGES FROM DESTROYING I/O (INTERNAL FUSING).

DRIVE DC COMMON (SEE TEXT IN MANUAL)

ENCODER EQUIVALENT OUTPUT (DRP)

CONTROL OUTPUT (ANOUT)

CONTROL INPUT (RTN)

POWER SUPPLY

REMOTE ENABLE

ANALOG INPUT

DC REFERENCE FOR ANOUT**

ANALOG SUPPLY

RELAY CONTACTS (DRY CONTACTS)

±24V

USER SUPPLIED ELECTRICAL CONNECTIONS FOR LOADING INFORMATION

**WARNING: INTERNAL DC COMMON FOR REFERENCING ANOUT. IT IS ALSO PROVIDED TO THE ELECTRICAL INSULATION OF THE DRIVE TO PREVENT EXCESS COMMON MODE VOLTAGES FROM DESTROYING I/O (INTERNAL FUSING).

DRIVE DC COMMON (SEE TEXT IN MANUAL)

ENCODER EQUIVALENT OUTPUT (DRP)

CONTROL OUTPUT (ANOUT)

CONTROL INPUT (RTN)

POWER SUPPLY

REMOTE ENABLE

ANALOG INPUT

DC REFERENCE FOR ANOUT**

ANALOG SUPPLY

RELAY CONTACTS (DRY CONTACTS)

±24V

USER SUPPLIED ELECTRICAL CONNECTIONS FOR LOADING INFORMATION

**WARNING: INTERNAL DC COMMON FOR REFERENCING ANOUT. IT IS ALSO PROVIDED TO THE ELECTRICAL INSULATION OF THE DRIVE TO PREVENT EXCESS COMMON MODE VOLTAGES FROM DESTROYING I/O (INTERNAL FUSING).

DRIVE DC COMMON (SEE TEXT IN MANUAL)

ENCODER EQUIVALENT OUTPUT (DRP)

CONTROL OUTPUT (ANOUT)

CONTROL INPUT (RTN)

POWER SUPPLY

REMOTE ENABLE

ANALOG INPUT

DC REFERENCE FOR ANOUT**

ANALOG SUPPLY

RELAY CONTACTS (DRY CONTACTS)

±24V

USER SUPPLIED ELECTRICAL CONNECTIONS FOR LOADING INFORMATION

**WARNING: INTERNAL DC COMMON FOR REFERENCING ANOUT. IT IS ALSO PROVIDED TO THE ELECTRICAL INSULATION OF THE DRIVE TO PREVENT EXCESS COMMON MODE VOLTAGES FROM DESTROYING I/O (INTERNAL FUSING).

DRIVE DC COMMON (SEE TEXT IN MANUAL)

ENCODER EQUIVALENT OUTPUT (DRP)

CONTROL OUTPUT (ANOUT)

CONTROL INPUT (RTN)

POWER SUPPLY

REMOTE ENABLE

ANALOG INPUT

DC REFERENCE FOR ANOUT**

ANALOG SUPPLY

RELAY CONTACTS (DRY CONTACTS)

±24V

USER SUPPLIED ELECTRICAL CONNECTIONS FOR LOADING INFORMATION

**WARNING: INTERNAL DC COMMON FOR REFERENCING ANOUT. IT IS ALSO PROVIDED TO THE ELECTRICAL INSULATION OF THE DRIVE TO PREVENT EXCESS COMMON MODE VOLTAGES FROM DESTROYING I/O (INTERNAL FUSING).

DRIVE DC COMMON (SEE TEXT IN MANUAL)

ENCODER EQUIVALENT OUTPUT (DRP)

CONTROL OUTPUT (ANOUT)

CONTROL INPUT (RTN)

POWER SUPPLY

REMOTE ENABLE

ANALOG INPUT

DC REFERENCE FOR ANOUT**

ANALOG SUPPLY

RELAY CONTACTS (DRY CONTACTS)

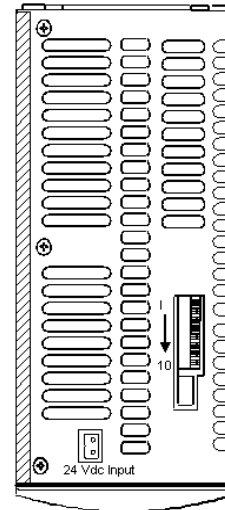
CONNECTOR PIN-OUT

C1 Serial Port		
Pin	Function	Note
1	Analog switch	For Personality Module
2	RXD	From pin 3 on PC
3	TXD	From pin 2 on PC
4	Vcc	For Personality Module
5	Common	
6	Data out	For Personality Module
7	Data in	For Personality Module
8	MW Clock	For Personality Module
9	MW CS	For Personality Module

C4 Encoder Equivalent Output	
Pin	Function
1	Channel A Output + (High)
2	Channel A Output - (Low)
3	DC Common
4	Channel B Output + (High)
5	Channel B Output - (Low)
6	Shield
7	Index Output + (High)
8	Index Output + (low)
9	Shield

C2 Feedback Connector		
Pin	Resolver	Encoder
1	Sine High	High A
2	Sine Low	Low /A
3	Shield	Shield
4	Cosine High	High B
5	Cosine Low	Low /B
6	Shield	Shield
7		Encoder 5V Return
8		Encoder 5V Return
9		H1B
10		H2B
11		H3B
12	Shield	Shield
13	Thermostat High	Thermostat High
14	Shield	Shield
15	Ref. High	Out Index
16	Ref. Low Out	/Index
17	Shield	Shield
18		Encoder 5V Supply
19		Encoder 5V Supply
20		Encoder 5V Supply
21	Shield	Shield
22		H1A
23		H2A
24		H3A
25	Thermostat Low	Thermostat Low

DIP SWITCH



24VDC
Optional Logic Supply Input

C3: I/O			
Pin	Function	Torque Loop	Velocity Loop
1	Analog input shielded	-	-
2	Analog input high +10	-	-
3	Analog input low -10	-	-
4	N/A	-	-
5	Fault output relay	-	-
6	Fault output relay	-	-
7	+24	-	-
8	Remote enable	-	-
9	IN1	-	CW
10	IN2	-	CCW
11	IN3	-	-
12	O1	Foldback	Foldback
13	Configurable Output (See ANOUT)	-	-

Configuration (DIP) Switch		
Switch #	Function	Settings
1	ANZERO	0 to 1 transition executes ANZERO (see command in VarCom)
2	Modes	4=0 3=0 2=0 A/B/(Z) Hall (MENCTYPE 0 5 or 6)
3		4=0 3=0 2=1 Halls Only six step (MENCTYPE 10)
4		Other combinations are reserved
5	Reserved	0
6	Serial Baud Rate	0 = 9600 bps 1 = 19200 bps
7	Reserved	Must Be set to 0 during regular operation For Ember mode: 7, 9 = OFF 8, 10 = ON
8		
9		
10		

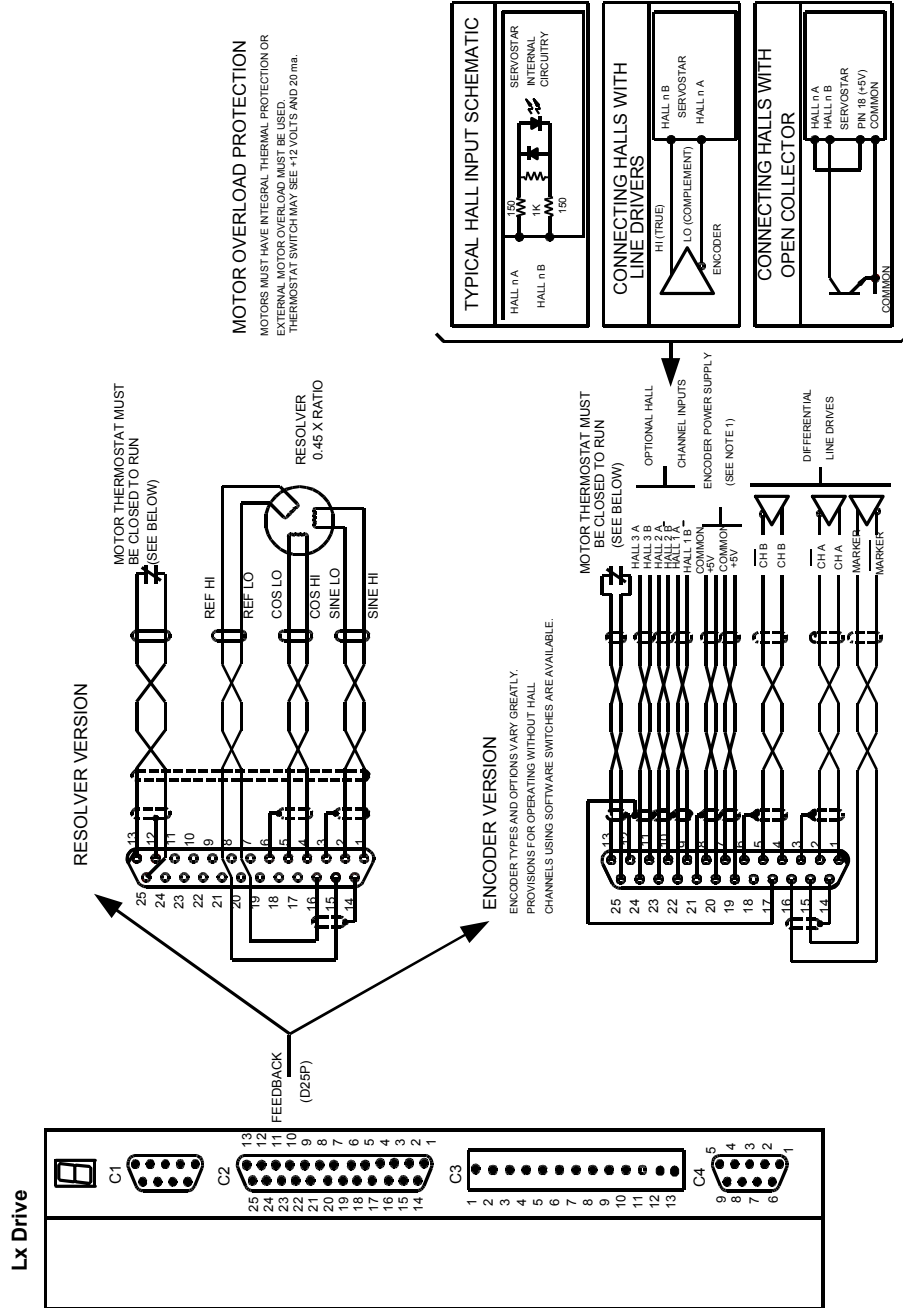


If CREF is +24 VDC, INn should be 24 Return for 1 logic. If CREF is 24 Return VDC, INn should be +24 VDC for 1 logic.

OPERATION MODES

Status Display	Operation Mode
1	Analog Velocity
3	Analog Torque

FEEDBACK DIAGRAM

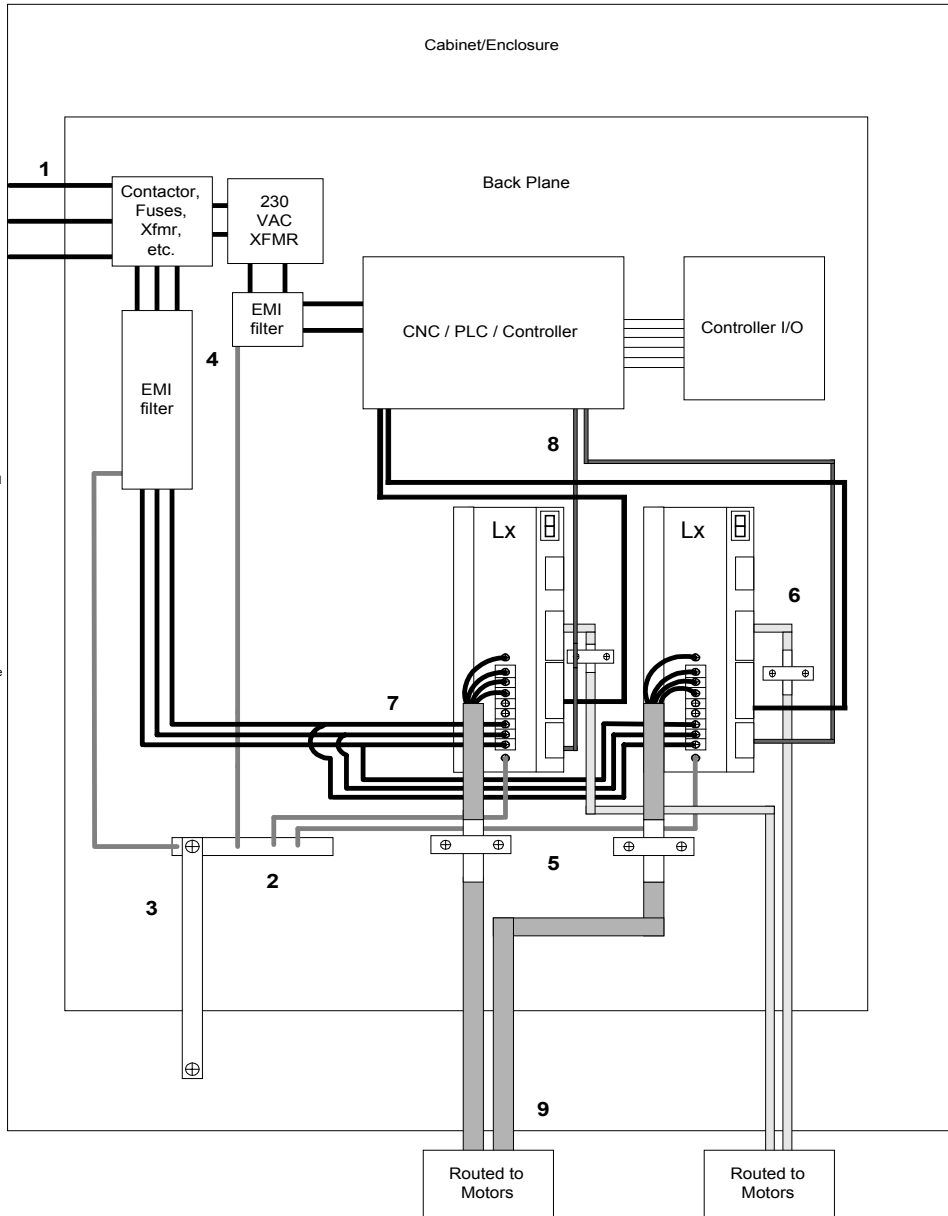


NOTES:

- 1- TWO ENCODER SUPPLY CONNECTIONS ARE PROVIDED TO ALLOW FOR EITHER 5V OR 12V OPERATION. THE 5V SHOULD BE USED IN LOW CURRENT ENCODERS USING SHORT CABLE LENGTH.

FILTERING AND BONDING DIAGRAM

- Note 1**
Input power enters enclosure from metal conduit. This eliminates the need for shielded input power cable.
- Note 2**
Single point ground. A bus bar (ground bus) is an excellent way to achieve this.
- Note 3**
High frequency ground between non-conductive back panel and enclosure. Also, a high frequency ground is required between the enclosure and earth ground.
- Note 4**
EMI filter grounding. Safety grounds must be provided on the filters. Hazard potentials exist even when the power is off because of the capacitors internal to the filters.
- Note 5**
Bonding of motor cables. The use of armored (screened) motor cables bonded as close to the drive as possible are essential for CE compliance and strongly recommended to better the overall performance and reliability of the system.
- Note 6**
Feedback cable bonding is required for CE compliance. As with the motor cables, the feedback cables should be bonded to the back panel. This bonding does two things. First, it cuts down radiation from the drive, which may be in the form of high frequency energy resulting from internal processor clocks. Second, it provides immunity for the drive. Since the feedback device is located internal to the motor, it is going to pick up some noise currents and transmit them along the feedback cable. The bonding directs the currents from the shield of the feedback cable to back panel ground. This reduces the amount of noise entering the drive.
- Note 7**
AC power lines that must be routed past other lines (such as motor cables or I/O lines) should cross at a 90° angle. This minimizes the coupling effect. Additionally, the power lines should be routed as close to the back panel as possible. Any noise currents on the lines are capacitively coupled to the ground plane and not to other lines.
- Note 8**
Control (I/O) signals should be kept separate from all power and motor cables, if possible. Keep control wiring as short as possible and use screened wire. Bonding is also recommended but not required for CE compliance. A separation distance of 20 cm. (8 in.) is sufficient in most cases. Where control cables must cross power cables, they should cross at a 90° angle.
- Note 9**
Motor cables and feedback cables exiting the cabinet going to the motor should be separated as much as possible. Ideally, the use of separate conduits provides good isolation, which can limit coupling of noise from motor to feedback cables.



Troubleshooting

FATAL FAULTS ERROR CODES

Status Display	Error Message	Possible Cause	Fatal	Non-Fatal	Error #
	No fault				0
t	Power stage over temperature	Overload, fan malfunction, power stage failure	*		1
o	Over voltage	Excessive_omm. rate	*		2
P	Over current **	Power stage surge current	*		3
r1	Resolver line break (resolver)	Break in resolver input lines detected	*		4.1
r2	RDC error (resolver)	Resolver to digital error	*		4.2
r4	A/B line break (encoder)	Break in encoder A/B input lines detected	*		4.4
r6	Illegal halls (encoder)	Illegal hall combination detected	*		4.6
u	Under voltage	Bus voltage is too low	*		5
H	Motor over temperature	Motor overload caused overheating	*		6
A1	Positive analog supply fail	Failure in +12V supply	*		7.1
A2	Negative analog supply fail	Failure in -12V supply	*		7.2
J	Over Speed	Velocity \geq VOSPD	*		8
J1	Over Speed (1.8*VLIM)	Velocity \geq 1.8 x VLIM	*		8.1
e	EEPROM checksum fail	EEPROM checksum invalid on power up	*		10
F	Foldback	System in FoldBack mode	*	*	12

**The Over Current fault can only be cleared by cycling power. The other faults can be cleared by toggling the Enable.

NON-FATAL ERROR CODES

Error Message	Possible Cause	Fatal	Ion-Fatal	Error #
NO_ERROR	No error was recorded		*	0
UNKNOWN_COMMAND	Undefined command		*	20
CHECKSUM_ERROR	Error on_omm. Message checksum (ackmode 2)		*	22
DRIVE_ACTIVE	Drive needs to be inactive for the requested command or variable		*	23
VALUE_OUT_OF_RANGE	Variable value out of range		*	25
SYNTAX_ERROR	Communication message syntax error		*	28
NOT_PROGRAMMABLE	Variable is read-only		*	36
CONFIG_FAIL_CURRENT	CONFIG failed due to current loop design failure		*	37.01
CONFIG_FAIL_MENCOFF	CONFIG failed due to MENCOFF		*	37.03
CONFIG_FAIL_MSPEED	CONFIG failed due to MSPEED		*	37.04
VEL_CONFIG_FAILED	The velocity loop can't be con-figured with given parameters		*	41
ARGUMENT_NOT_BINARY	Variable argument must be a power of 2		*	46
BURNIN_ACTIVE	Requested function cannot be executed during Burnin (factory function)		*	47
BURNIN_NOT_ACTIVE	Burnin (factory function) cannot be stopped if it is not active		*	48
NOT_AVAILABLE	The requested variable value is not available; refer to the description of the variable in section 1 to determine why.		*	51

NO MESSAGE FAULTS

Status Display	Fault Description	Fatal Error	Non-Fatal Error	Flashing Display	Steady Display
≡	Watchdog	*		*	
-1	No Compensation	*		*	
-2	Invalid Velocity Control	*		*	
-6	Failure while writing to the personality module		*	*	
-7	Failure while reading from the personality module		*	*	
L 1	Hardware CW limit switch open		*	*	
L 2	Hardware CCW limit switch open		*	*	
L 3	Hardware CW and CCW limit switches open		*	*	
A 3	Positive and negative analog supply fail	*		*	
I	RAM failure (during init)	*			*
c	EPROM checksum (during init)	*			*
8	Test LED			*	

SUPPORT

Danaher Motion is committed to quality customer service by providing information and resources as soon as they are needed. Contact your local sales representative for order status and delivery information, product information and literature, and application and field technical assistance. If you do not know who your local sales representative is, contact Customer Support.

Danaher Motion Customer Support
Continental US Customers: 1-800-777-3786
International Customers: (815) 226-2222
Email: customer.support@danahermotion.com
Website: www.danahermotion.com