

CD SYNQNET

QUICK START GUIDE

Revision No: 7
Date: 22 December 2004

1. General

1.1 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 possibility 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.

1.2 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.

1.2.1 Product Warranty Schedules

<u>Brand</u>	<u>Products</u>	<u>Warranty Period</u>
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 Goods 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.

1.2.2 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.

1.2.3 Use As Directed

The following guidelines describe the restrictions for proper use of the SERVOSTAR CD SynqNet 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).

1.2.4 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.

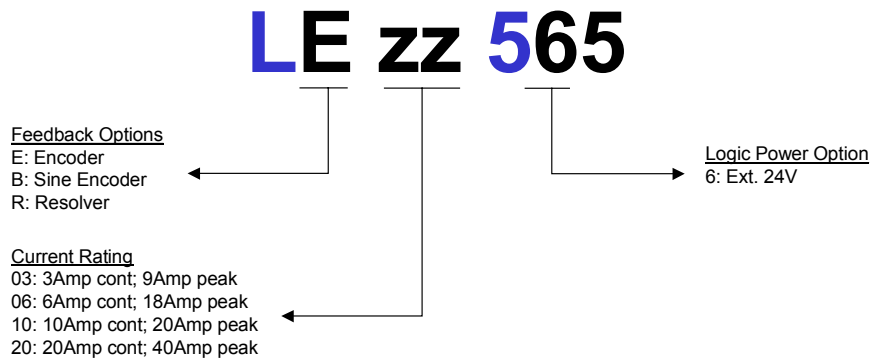
1.2.5 Limitation of liability

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

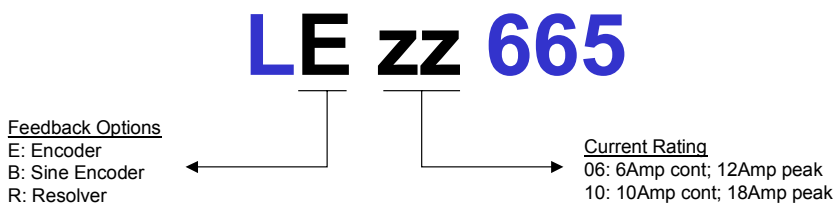
LIMITED SOLELY TO REPAIRING OR REPLACING (AT ITS OPTION AND AS SET FORTH IN SECTION 10 AND SECTION 11), AT ITS APPROVED REPAIR FACILITY, ANY GOODS OR PARTS WHICH PROVE TO SELLER'S SATISFACTION TO BE DEFECTIVE AS A RESULT OF DEFECTIVE MATERIALS OR WORKMANSHIP, IN ACCORDANCE WITH SELLER'S STATED WARRANTY. IN NO EVENT SHALL SELLER'S LIABILITY EXCEED THE TOTAL PURCHASE PRICE SET FORTH IN THIS ORDER.

1.3 Part number

300V Version Part Number Guide



600V Version Part Number Guide



1.4 Where to get support

Danaher Motion is committed to quality customer service. Our goal is to provide the customer with information and resources as soon as they are needed. In order to serve in the most effective way, contact your local sales representative for order status and delivery information, product information and literature, and application and field technical assistance. If you are unaware of your local sales representative, please contact us at:

Email: sep@danahermotion.com

Specify "SynqNet Support" in the subject line.

1.5 Manual Download Location

Complete product manuals can be downloaded from the Danaher Motion website, at www.DanaherMotion.com -> Customized Products -> Drives -> CD SynqNet

2. 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.

3. Installation Instructions

3.1 General

These installation steps are designed to lead you through the proper installation and setup of a SERVOSTAR CD SynqNet 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.

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 SynqNet 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 SYNQNET 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 SynqNet cable between the Motion Controller and connector C4.

3.2 Grounding

System grounding is essential for proper performance of the drive system. A ground bus bar may be used as a single point ground for the system. Safety grounding should be provided to all pieces of the system from a "star point." In addition to the safety grounding, a high frequency ground must be provided that connects the back panel to the enclosure and, ultimately, to earth ground. The objective is to provide an extremely low impedance path between the filters, drives, power supplies, and earth ground. This high frequency ground is accomplished with the use of a flat braid or copper bus bar. It is important not to rely on a standard wire for the high frequency ground. In general, a wire has an inductance of 8nH-per-inch, regardless of diameter. At higher frequencies, this unwanted inductance between grounds equates to limited filter performance. When connecting high frequency grounds, use the shortest braid possible.

3.3 Bonding

The proper bonding of shielded cables is imperative for minimizing noise emissions and increasing immunity levels of the drive system. Its effect is to reduce the impedance between the cable shield and the back panel. Kollmorgen recommends that all shielded cables be bonded to the back panel.

Power input wiring does not require shielding (screening) if the power is fed to the cabinet (enclosure) via metallized conduit. If metallized conduit is not implemented into the system, shielded cable is required on the power input wires and proper bonding technologies should be implemented.

The motor and feedback cables should have the shield exposed as close to the drive as possible. This exposed shield is bonded to the back panel using either non-insulated metallic cable clamps or cable bonding clamps offered by Phoenix Contact (and others).

3.4 CE Filtering

The SERVOSTAR drive system (drive, motor) has been designed to meet the CE standards. 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.

3.4.1 Input Power

The Kollmorgen SERVOSTAR CD SynqNet 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. Similarly, care should be taken when routing wires from the load side of the filter to the BUS Module. These lines may be noisy and should be separated from other sensitive cabling to avoid unwanted coupling of noise. Several manufacturers of these filters are listed below. They should be able to recommend the best filter design for most typical motor control applications. Kollmorgen has also provided specific filters recommendations that adequately attenuate the conducted noise to levels well below the CE limits. 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.

The following table shows recommended line filters:

Drive Model #	Recommended EMI Line Filter	Kollmorgen Part #
Lx03	Filter Concepts SF7 Schaffner FN258-7/07	n/a A-96776-001
Lx06	Filter Concepts SF15 Schaffner FN258-16/07	N/a A-96776-002
Lx10	Schaffner FN258-16/07	A-96776-002
Lx20		



The filters called out in the table on the previous page are used on a one-to-one correspondence with the drive. If drives are paralleled off one filter, it needs to be sized.

Drives can be ganged off one EMI filter as shown in the Filter and Bonding Diagrams.

3.4.2 Motor Line Filtering

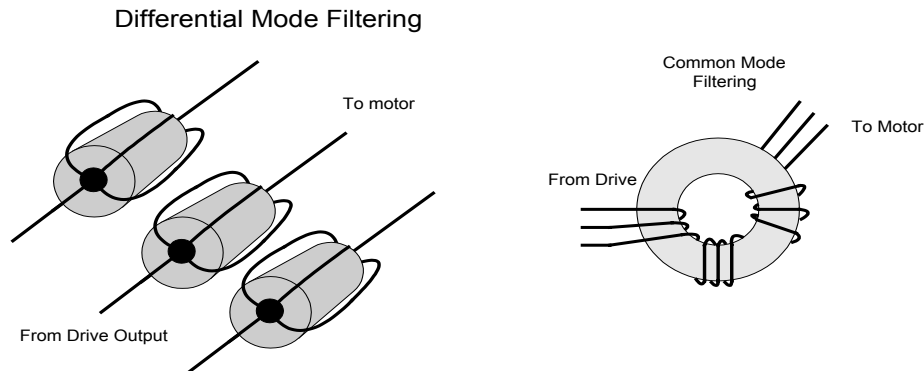
Motor filtering may not be necessary for CE compliance of SERVOSTAR systems. However, this additional filtering increases the reliability of the system. Poor non-metallic enclosure surfaces and lengthy, unbonded (or unshielded) motor cables that couple noise line-to-line (differential) are just some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



Never wrap a ground lead through a core.



Common mode currents occur from noise spikes created by the PWM switching frequency of the drive. The use of a ferrite or iron-powder core toroid, as shown in the figure above, places common mode impedance in the line between the motor and the drive. The use of a common mode choke on the motor leads may increase signal integrity of encoder outputs and associated I/O signals. The following is a list of toroidal and ferrite cores used to make common mode chokes:

Manufacturer	Manufacturer's Part #	Size
Micrometals	T400-26D	OD 4 in (102 mm), ID 2.25 in. (57.2 mm.) HT 1.3 in (33 mm.)
Micrometals	ST102-267	OD 1.025 in(26 mm) ID 0.6 in. (15.2 mm.) HT .475 in (12.1 mm.)
Micrometals	ST150-275B	OD 1.52 in (38.6 mm) ID 0.835 in. (21.2 mm.) HT .825 in (21 mm.)
Micrometals	ST200-275B	OD 2.01 in (51.1 mm) ID 1.24 in. (31.5 mm.) HT 1.025 in (26 mm.)
Magnetics	77930-A7	OD 1.09 in (27.7 mm) ID .555 in. (14.1 mm.) HT .472 in (11.99 mm.)
Fair-Rite	2643803802	OD 2.4 in (61 mm) ID 1.4 in. (35.55 mm.) HT 0.5 in (12.7 mm.)

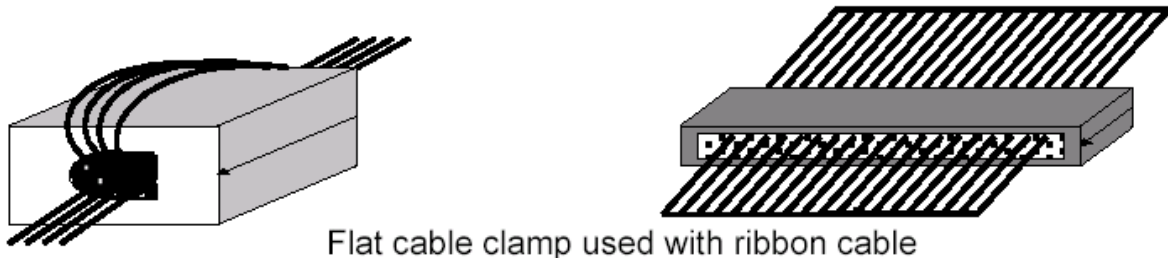
Manufacturer	Manufacturer's Part #	Danaher Motion Kollmorgen Part #	Description
Schaffner	RD7137-36-0m5	A-96843-005	500 μ H 3 phase common mode choke. 36 amps continuous.
Schaffner	RD8137-64-0m5	A-96843-010	500 μ H 3 phase common mode choke. 64 amps continuous.

3.4.3 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

Manufacturer	Manufacturer's Part #	Danaher Motion Kollmorgen Part #	Description
Ferrishield	SS33B2032	A-96770-003	Clamp on core
Ferrishield	SS33B2036	A-96769-005	Clamp on core
Ferrishield	FA28B2480	A-96771-003	Clamp on core - flat cable clamp
Ferrishield	SA28B4340	A-96772-009	Clamp on core - flat cable clamp
* Fair-Rite	2643167251		

The following figure illustrates the use of multiple turns through a clamp-on core. The more turns created, the more impedance is added to the line. Avoid putting the shield in a clamp-on core. It is undesirable to place an impedance inline with the shield. The use of ribbon cable may be common in many cabinets. Some ferrite clamps are designed just for ribbon cable use.

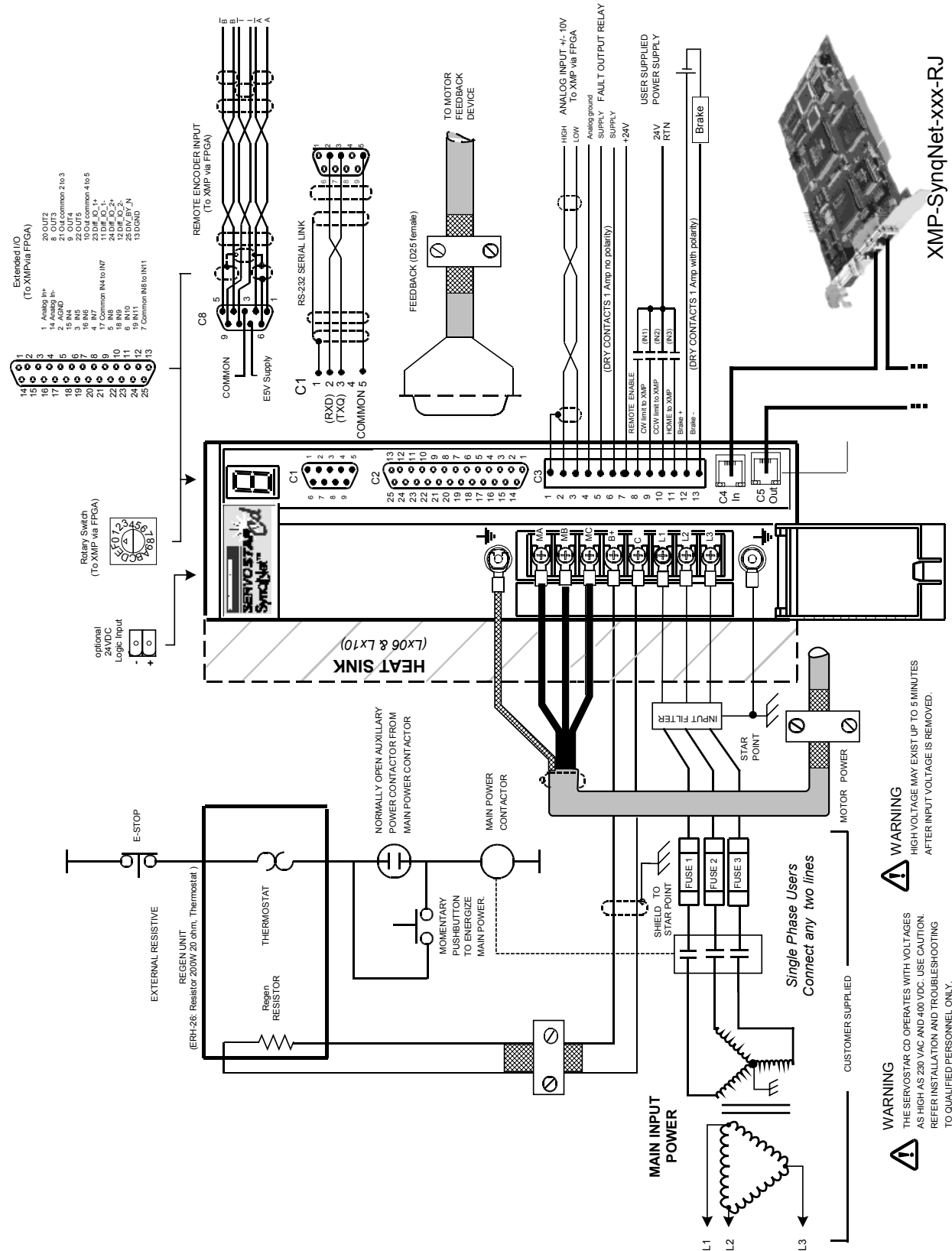


Flat cable clamp used with ribbon cable

4. Wiring

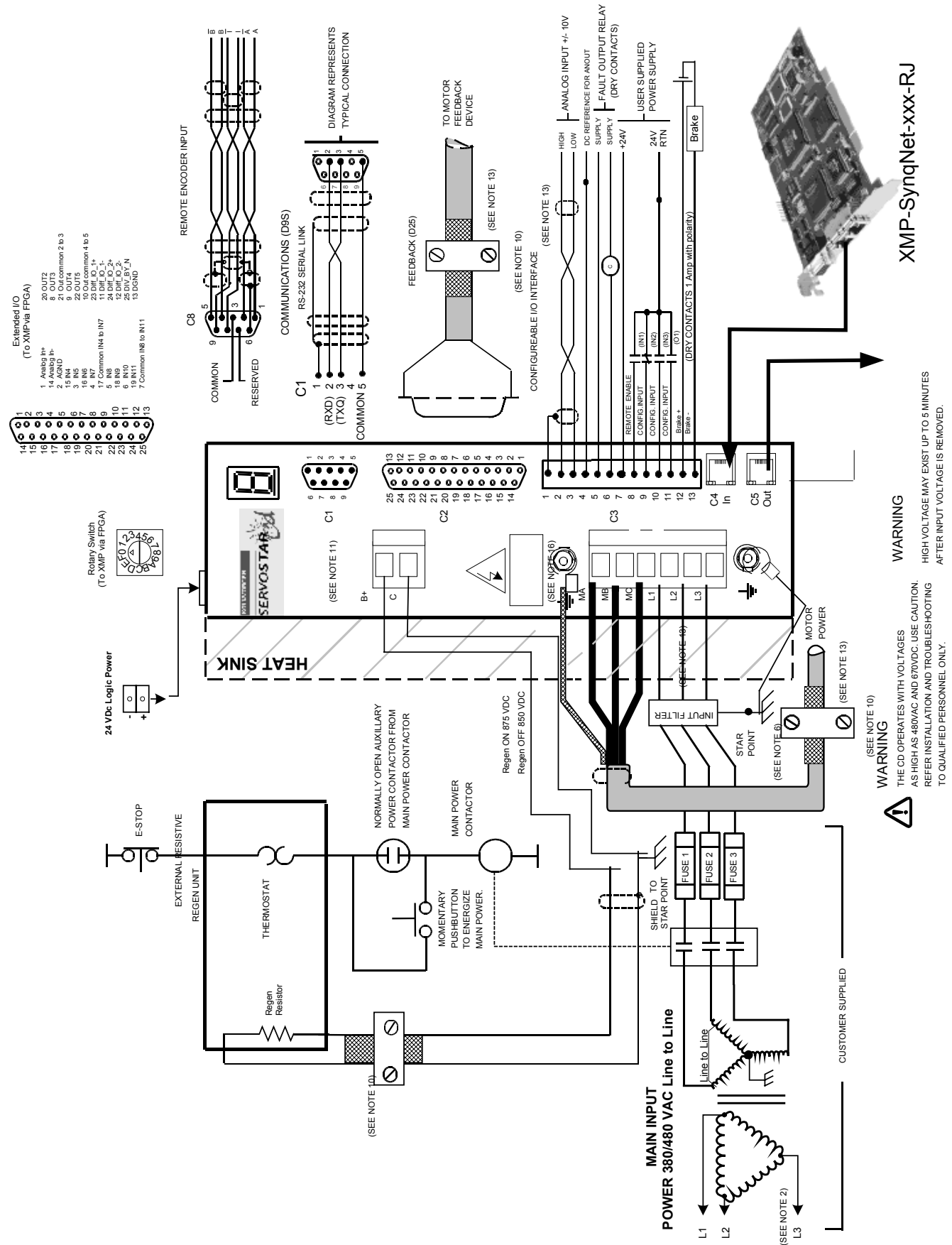
4.1 Wiring Diagram

4.1.1 300V Model: 3A, 6A, 10A



XMP-SynqNet-xxx-RJ

4.1.2 600V Model and 20A 300V Model



4.2 Connector Pin-Out

4.2.1 C1: RS232

Pin no	Function	Description	Comments
1	N.C.		
2	RxD	Receive	
3	TxD	Transmit	
4	N.C.		
5	DGND	Ground	Must be connected in order to equalize potential between controller and drive.
6	N.C.		
7	N.C.		
8	N.C.		
9	N.C.		

4.2.2 C2: Feedback

Pin	Resolver	Encoder	Sine Encoder
1	Sine High	A	A
2	Sine Low	/A	/A
3	Shield	Shield	Shield
4	Cosine High	B	B
5	Cosine Low	/B	/B
6	Shield	Shield	Shield
7		E5V Return	E5V Return
8		E5V Return	E5V Return
9		H1B	EnDat /Data
10		H2B	EnDat /Clock
11		H3B	
12	Shield	Shield	Shield
13	Thermostat High	Thermostat High	Thermostat High
14	Shield	Shield	Shield
15	Ref. High Out	Index	Index
16	Ref. Low Out	/Index	/Index
17	Shield	Shield	Shield
18		E5V Supply	E5V Supply
19		E5V Supply	E5V Supply
20		E5V Supply	E5V Supply
21	Shield	Shield	Shield
22		H1A	EnDat Data
23		H2A	EnDat Clock
24		H3A	
25	Thermostat Low	Thermostat Low	Thermostat Low

4.2.3 C3: Front-Panel I/O

Pin no	Function	Description	Comments
1	Shield	Shield	
2	Analog in+	Differential analog input	±10Vdc
3	Analog in-		
4	AGND	Analog ground	
5	Fault relay	Fault relay dry contact	1 Amp
6	Fault relay	Fault relay dry contact	No polarity
7	CREF	Common rail for Digital inputs and outputs	
8	Enable	Remote Enable	Wired to DSP, sampled at 62.5μsec
9	CW	Positive limit	5-24V; Wired to SynqNet™ FPGA
10	CCW	Negative limit	5-24V; Wired to SynqNet™ FPGA
11	HOME	Home input	5-24V; Wired to SynqNet™ FPGA
12	Brake+	Brake relay positive terminal	Dry-contact for brake control
13	Brake-	Brake relay negative terminal	1 Amp

4.2.4 C4: SynqNet IN

Pin no	RJ45 In
1	TD2+
2	TVDD
3	TD2-
4	RD2+
5	TVDD
6	RD2-
7	NC
8	DGND

4.2.5 C5: SynqNet OUT

Pin no	RJ45 Out
1	TD1+
2	TVDD
3	TD1-
4	RD1+
5	TVDD
6	RD1-
7	NC
8	DGND

4.2.6 Extended I/O

Pin no	Function	Description	Comments
1	Analog in+	Differential analog input	±10Vdc
14	Analog in-		
2	AGND	Analog ground	
15	IN4	Digital Input #4	5V – 24V, Bi- polar Wired to SynqNet™ FPGA
3	IN5	Digital Input #5	5V – 24V, Bi- polar Wired to SynqNet™ FPGA
16	IN6	Digital Input #6	5V – 24V, Bi- polar Wired to SynqNet™ FPGA
4	IN7	Digital Input #7	5V – 24V, Bi- polar Wired to SynqNet™ FPGA
17	Common IN4 to IN7	Common IN4 to IN7	Common for Inputs 4 to 7
5	IN8	Digital Input #8	5V – 24V, Bi- polar Wired to SynqNet™ FPGA
18	IN9	Digital Input #9	5V – 24V, Bi- polar Wired to SynqNet™ FPGA
6	IN10	Digital Input #10	5V – 24V, Bi- polar Wired to SynqNet™ FPGA
19	IN11	Digital Input #11	5V – 24V, Bi- polar Wired to SynqNet™ FPGA
7	Common IN8 to IN11	Common IN8 to IN11	Common for Inputs 8 to 11
20	OUT2	Digital output #2	Open collector Wired to SynqNet™ FPGA
8	OUT3	Digital output #3	Open collector Wired to SynqNet™ FPGA
21	Out common 2 to 3	Out common 2 to 3	Common user ground for OUT2 and OUT3
9	OUT4	Digital output #4	Open collector Wired to SynqNet™ FPGA
22	OUT5	Digital output #5	Open collector Wired to SynqNet™ FPGA
10	Out common 4 to 5	Out common 4 to 5	Common user ground for OUT4 and OUT5
23	Diff_IO_1+	Differential RS422 I/O (high)	Direction (In or Out) programmable through SynqNet™.
11	Diff_IO_1-	Differential RS422 I/O (low)	
24	Diff_IO_2+	Differential RS422 I/O (high)	Direction (In or Out) programmable through SynqNet™.
12	Diff_IO_2-	Differential RS422 I/O (low)	
25	DIV_BY_N	Fast output, used for Divide-by-N signal	Open collector, with internal pull-up that may be dis-assembled.
13	DGND	Digital Ground	The DGND is the common for the output collector of this output. The input stage DGND at the user end has to be connected to this DGND.

4.2.7 C8: Secondary Encoder

Pin	Function
1	A Input + (High)
2	A Input - (Low)
3	DC Common
4	B Input + (High)
5	B Input - (Low)
6	Shield Connection
7	E5V Supply
8	Index +
9	Index -

4.3 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

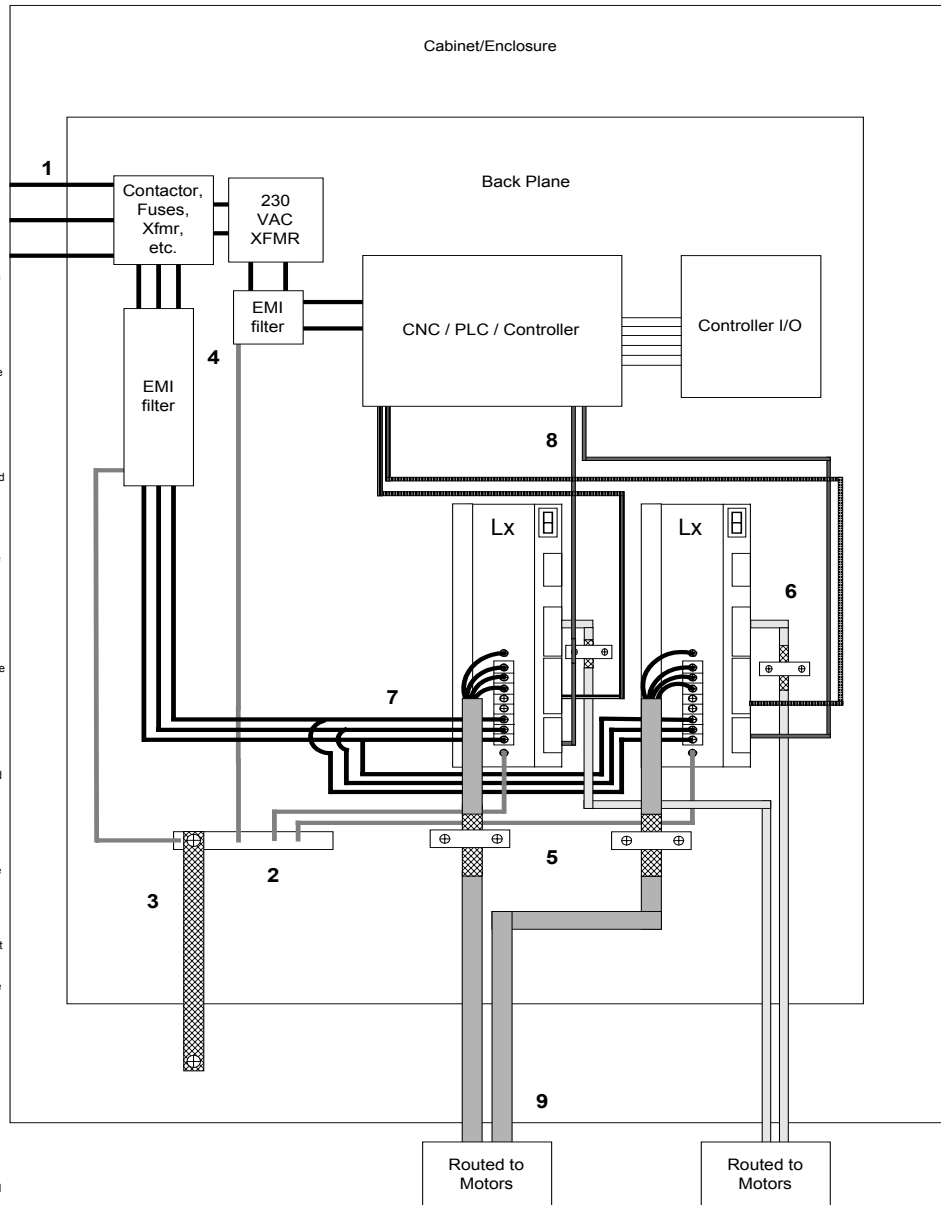
AC power lines that must be routed past other lines (such as motor cables or I/O lines) should cross at a 90° angle. This minimizes the coupling effect. Additionally, the power lines should be routed as close to the back panel as possible. Any noise currents on the lines are capacitively coupled to the 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.



5. Basic Operation

5.1 Powering Up

One of the characteristics of SynqNet drives is that at power up, the drive DSP is held in a RESET state by the SynqNet FPGA in the drive. Upon power up, only a decimal point will appear in the display. The DSP reset is only released when a SynqNet RESET command is issued from the controller. Once this is done, the drive will come up.

The SynqNet RESET can be done in two ways:


- Using MotionConsole: Click on the RESET button in the Controller Summary window (on the ACTIONS tab)
- Using a DOS command:
 - Open a DOS PROMPT window in C:\MEI\XMP\Bin\ (assuming MotionConsole has been installed to C:\MEI)
 - Type RESET at the command prompt

5.2 Description of Switches

The CD SynqNet™ drive is equipped with a 10-pole rotary switch. The switch is connected to the SynqNet™ FPGA and its use is application specific; the switch does not play any part in drive addressing. The switch is mounted on the top of the drive.

5.3 Description of Display

Drive Status is indicated using the 7-segment LED that is located on the front panel. This display shows drive status and drive fault codes. In the case that more than one fault exists, fault codes are displayed on the 7-segment LED according to their priority. The following table shows the display codes, the description and the fault priority.

Description	Comments	Fault Display Priority
Decimal point only	After logic power is applied, the LED will show a decimal point only. The drive is not operational at this point; A SynqNet RESET needs to be executed in order to bring the drive to an operational state	
Steady '2' only	Torque Mode: the drive is configured and ready to be enabled	
Steady '2' with a decimal point	Torque Mode: the drive is configured and ready to be enabled	
Decimal point	The decimal point is on when the drive is enabled	
Flashing '2'	When using MENCTYPE 4 (WNS encoder initialization), this indicates that the drive is configured and ready to be enabled. The encoder initialization process will begin when the drive is enabled.	
Steady 'F'	Drive in foldback (current limiting)	
Flashing 'e' 	Flash memory checksum failure (at power up). Need to re-configure the drive's parameters and SAVE them in the flash memory.	1 (highest priority)
Flashing 'P'	Over-current. Results from either a short circuit on the motor power, or by excessive current loop gain. This fault can only be cleared by cycling the power of the drive	2
Flashing 'o'	Over-voltage. Generally caused by regenerative voltage when decelerating the motor. Use a regen resistor to absorb the regen energy.	3
Flashing 't'	Drive over-temperature	4
Flashing 'u'	Under-voltage	5
Alternating '1' and minus sign (-)	No comp: The drive is not configured. Load a configuration file and execute the CONFIG instruction.	6
E	EEPROM fault. This is a hardware failure	7
Alternating 'A' and '1'	Internal failure of positive analog supply voltage	8
Alternating 'A' and '2'	Internal failure of negative analog supply voltage	9
Alternating 'c' and '1'	SynqNet communications fault. Check that the SynqNet cables are in place.	10
Alternating 'r' and '4'	Encoder wire break	11
Alternating 'r' and '6'	Illegal Halls. A state of either '000' or '111' was detected on the Halls signals.	12
Alternating 'r' and '5'	Index line break	13
Alternating '4' and minus sign (-)	The commutation initialization process has failed. Read the WNSERR value (parameter 0x2F) to see what caused the failure.	14

Description	Comments	Fault Display Priority
Alternating 'r' and '1' and '0'	EnDat communications fault. Check that the EnDat encoder is connected, or check the MENCYPE parameter to verify that it is correctly set.	15
Alternating 'r' and '8'	A/B out of range. For a sine encoder and a resolver, the drive checks that $\sin^2 + \cos^2 = 1$, within tolerance. This fault indicates that the signal amplitudes are out of tolerance. This fault is not relevant for Encoder feedback.	16
Flashing 'H'	Motor over-temperature	17 (lowest priority)
Alternating 'A' and '3'	Internal failure of positive and negative analog supply voltages	
Three horizontal bars	Watchdog: drive firmware failure	

5.4 Drive Configuration

The drive functionality is set using various drive parameters and instructions, which are communicated over the serial port or over SynqNet™. The parameters are stored in non-volatile memory in the drive, to be used on each power-up.

5.5 Enabling the Drive

The drive is enabled by a combination of 4 signals or states:

- Remote Enable. The state of this signal can be checked using the REMOTE parameter.
- SynqNet™ Enable, generated from the SynqNet FPGA.
- The Software Enable is generated by one of the SynqNet™ instructions/mechanisms.
- The drive can be enabled only when no faults exist.

By default, the Software Enable is *disabled* at power up.

6. Electrical Specifications

6.1 300V Model

Product Model		Lx03	Lx06	Lx10	Lx20
Main Input Power	Voltage (VAC _{L-L}) Nominal ±10%	110 to 230		230	
	115VAC	1φ or 3φ		3φ only	
	230VAC	1φ or 3φ		3φ only	
	Line Frequency	47-63			
	KVA at 115	0.44 (1φ) 0.6 (3φ)	0.89 (1φ) 1.1 (3φ)		2.4 (3φ only)
	KVA at 230 VAC	0.88 (1φ) 1.4 (3φ)	1.8 (1φ) 2.8 (3φ)		4.6 (3φ only)
	Continuous Current (amps)	6.2 (1φ) 4 (3φ)	10 (1φ) 7.8 (3φ)		13 (3φ only)
	Peak Current (amps) for 500 mSec	18.6 (1φ) 12 (3φ)	30 (1φ) 23.4 (3φ)		26 (3φ only)
	Peak Current (amps) for 2Sec	12.4 (1φ) 8 (3φ)	20 (1φ) 15.6 (3φ)		26 (3φ only)
	Line Fuses (FRN-R, LPN, or equivalent)	10	15		15
Logic Input Power Lx XX 565 Models only	+24 VDC Ext. Logic Voltage (volts)	22 to 27			
	+24 VDC Ext. Logic Current (amps sink)	600mA			
	+24 VCD Ext. Logic Current (amps max surge)	TBD			
SoftStart	Max. Surge Current (amps)	30			
	Max. Charge Time (sec)	0.25			
Protection Functions	Fault Contact Rating	1A			
	Fault Contact Closing Period (mSec)	Close = 3 mS, Open = 2 mS			
	OverTemperature trip	80°C (176°F)			
Rated Main Output (Ma, Mb, Mc)	Continuous Power (KVA) at 115 VAC Line Input (45°C (113°F) Ambient)	0.35 (1φ) 0.55 (3φ)	0.7 (1φ) 1.1 (3φ)		1.8 (3φ)
	Continuous Power (KVA) at 230 VAC Line Input (45°C (113°F) Ambient)	0.7 (1φ) 1.1 (3φ)	1.4 (1φ) 2.2 (3φ)		3.5 (3φ)
	Continuous Current (Arms)	3	6	10	20
	Peak Current (Arms) for 500 mSec	9	18	20	40
	Peak Current (Arms) for 2 Sec	6	12	TBD	TBD
	PWM Frequency (kHz)	16	8	8	8
	PWM Motor Current Ripple (kHz)	32	16	16	16
	Form Factor (rms/avg)	≤1.01			
Protective Functions	UnderVoltage Trip (nominal)	90 VDC			
	OverVoltage Trip	430 VDC			
	OverTemperature Trip	80°C (176°F)			
	Internal heat dissipation (watts)	60	80		132
Environment	Operation temperature	5°C (41°F) to 45°C (113°F)			
	Storage temperature	0°C (32°F) to 70°C (158°F)			
	Ambient humidity	10% to 90%			
	Atmosphere	Without corrosive gasses or dust			
	Altitude	Derate 5% per 1000 ft. (300m) above 3300 ft. (1000m)			
	Vibration	0.5 g			

6.1.1 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		
	V _{HYS} (Regen circuit turn-off) (VDC)	370		
	V _{MAX} (Regen circuit turn-on) (VDC)	390		
External Regen Kits	ERH-26	✓	✓	✓

6.2 600V Model

Product Model		Lx06665	Lx10665
Main Input Power	Voltage (VAC _{L-L}) Nominal ±10%	380VAC Line-to-Line or 480VAC Line-to-Line 3φ only	
	Line Frequency (hz)	47-63	
	KVA at 380VAC	4.6	7.5
	KVA at 480VAC	5.8	9
	Continuous Current (amps)	10 (3φ)	16 (3φ)
	Line Fuses (FRN-R, LPN, or equivalent)	20Amp	25Amp
Logic Input Power	+24 VDC Ext. Logic Voltage (volts)	22 to 27	
	+24 VDC Ext. Logic Current (amps sink)	1.0	
	+24 VDC Ext. Logic Current (amps max surge)	2.6	
SoftStart	Max. Surge Current (amps)	135 (For 380VAC); 170 (For 480VAC)	
	Max. Charge Time (sec)	0.25	
Protection Functions	Fault Contact Rating	1A	
	Fault Contact Closing Period (mSec)	Close = 3 mS, Open = 2 mS	
	OverTemperature trip	80°C (176°F)	
Rated Main Output (Ma, Mb, Mc)	Continuous Power (KVA) at 380VAC Line Input (45°C (113°F) Ambient)	2.2	3.5
	Continuous Power (KVA) at 480VAC Line Input (45°C (113°F) Ambient)	2.9	4.6
	Continuous Current (Arms)	6	10
	Peak Current (Arms)	12 (for 2 Sec)	18 (for 500 mSec)
	Peak Current (Arms) for 2 Sec	12	12
	PWM Frequency (kHz)	8	8
	PWM Motor Current Ripple (kHz)	16	16
Protective Functions	UnderVoltage Trip (nominal)	370 VDC	
	OverVoltage Trip	890 VDC	
	OverTemperature Trip (On heat sink)	80°C (176°F)	
	Internal heat dissipation (watts)	130	
Environment	Operation temperature	5°C (41°F) to 45°C (113°F)	
	Storage temperature	0°C (32°F) to 70°C (158°F)	
	Ambient humidity	10% to 90%	
	Atmosphere	Without corrosive gasses or dust	
	Altitude	Derate 5% per 1000 ft. (300m) above 3300 ft. (1000m)	
	Vibration	0.5 g	

6.2.1 Regen Information

External Shunt Regulator	Peak current (amps)	15
	Minimum resistance (ohms)	70 Recommended: 80 - 90
	Watts	200
Application Information	Capacitance (Farads)	0.000470 (470μF)
	BUS Voltage (nominal) (VDC)	540 (380VAC); 680 (480VAC)
	V _{HYS} (Regen circuit turn-off) (VDC)	855
	V _{MAX} (Regen circuit turn-on) (VDC)	875

7. Hardware Specifications

7.1 300V Model

Amplifier Model		Lx03	Lx06	Lx10	Lx20
Unit Weight	Lbs./Kgs.	3.56/1.61	4.9/2.22	5.94/2.69	8.73 / 3.97
Mounting Hardware	English (Metric)	10-32 (M4)			
	Applied Torque	20 lb-in. (2.26 Nm.)			
Connection Hardware	Line Screw Size/Torque	M3.5/12 lb-in. (1.35 Nm.)			
	BUS Screw Size/Torque				
	Motor Screw Size/Torque				
	Ground Screw Size/Torque				
Wire Size (AWG#)	Control Logic (AWG/ mm ²)	16 / 1.5			
	Motor Line (AWG/ mm ²)	14 / 2.5			
	Main Input (AWG/ mm ²)	14 / 2.5	12 / 4		
	Configurable I/O wire gauge	22-18 AWG (0.3-0.75 mm ²) Ferrules recommended: 18 AWG Type H0 - 75/14 Weidmuller 4629.0 or equivalent 20 AWG Type H0 - 5/14 Weidmuller 6907.0 or equivalent 22 AWG Type H0 - 34/12 Weidmuller 902577 or equivalent			
	Spade Terminals	16/14 AWG (1.5 mm ²): Hollingsworth XSS0954S OR SS20947SF or equivalent 12/10 AWG (4-6 mm ²): Hollingsworth XSS20836 OR SS20832F or equivalent			
Clearance Distance	Side-to-Side	0.5in (12.7mm)			
	Top/Bottom	2.5in (63.5mm)			
Mating Connector Hardware	CK100 Kit	Includes: C1, C2, C4, C7 (plus 2 ft./0.69 m. of stranded bus ribbon), C8			
	C3	Kollmorgen #: A-93899-013 Vendor Info: Weidmuller BL3.5/13 Cat.No. 161574			
	C5	Kollmorgen #: A-81014-004 Vendor Info: PCD ELFP04110			
	Connector Screw Torque	2.25 lb-in. (0.25 m.)			
	24 V Logic (optional)	Kollmorgen #: A-81014-002 Vendor Info: PCD ELFP02210 (or equiv.)			

7.2 600V Model

Unit Weight	Lbs./Kgs.	8.36 / 3.8
Mounting Hardware	English (Metric)	10-32 (M4)
	Applied Torque	20 lb-in. (2.26 Nm.)
Connection Hardware	Ground Screw Size/Torque	M3.5/12 lb-in. (1.35 Nm.)
Wire Size (AWG#)	Control Logic (AWG/ mm ²)	16 / 1.5
	Motor Line (AWG/ mm ²)	14 / 2.5
	Main Input (AWG/ mm ²)	12 / 4
	Configurable I/O wire gauge	22-18 AWG (0.3-0.75 mm ²) Ferrules recommended: 18 AWG Type H0 - 75/14 Weidmuller 4629.0 or equivalent 20 AWG Type H0 - 5/14 Weidmuller 6907.0 or equivalent 22 AWG Type H0 - 34/12 Weidmuller 902577 or equivalent
Clearance Distance	Side-to-Side	0.5in (12.7mm)
	Top/Bottom	2.5in (63.5mm)
Mating Connector Hardware	CK100 Kit	Includes: C1, C2, C4, C7 (plus 2 ft./0.69 m. of stranded bus ribbon), C8
	C3	Kollmorgen #: A-93899-013 Vendor Info: Weidmuller BL3.5/13 Cat.No. 161574
	Connector Screw Torque	2.25 lb-in. (0.25 m.)
	Motor Power Connector	Phoenix Contact # 1880038
	Regen Connector	Phoenix Contact # 1848892
	24 V Logic	PCD ELFP02210