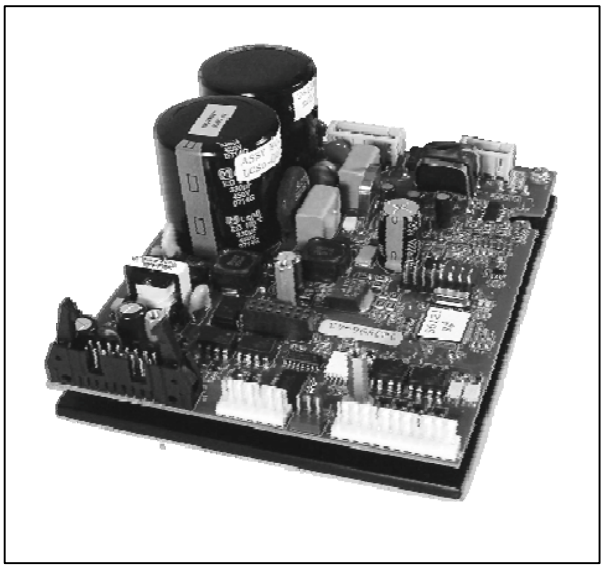
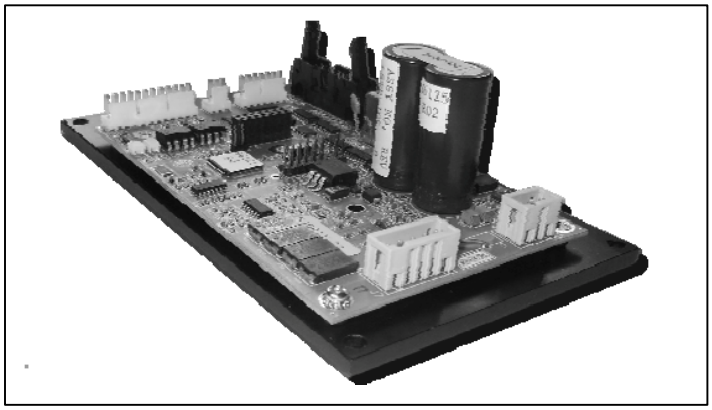
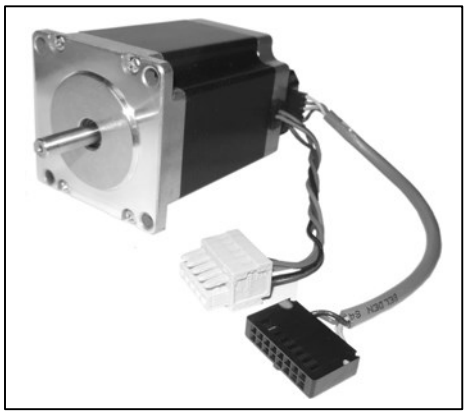
IB-30B001

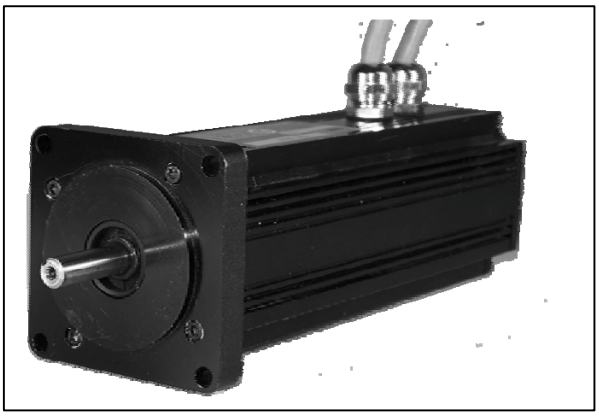
LUMINARY MOTION CONTROL SERIES **JUNE 2015**

Luminary Drives, Motors and Cables









INSTRUCTION BOOK

INDUSTRIAL INDEXING SYSTEMS, Inc.

Revision - A
Approved By:

ER-6043

ERRATA SHEET, IB-30B001 Rev. B — JANUARY 2020

Date	Rev.	ECN No.	DR	CHK	CHK
3/2/16	0	ECN-16-037 (See Note 1)	KY	CD	
3/16/16	A	ECN-16-043 (See Note 2)	KY	CD	
7/26/16	B	ECN-16-089 (See Note 3)	KY	CD	
1/26/17	C	ECN-17-011 (See Note 4)	KY	CD	
3/16/17	D	ECN-16-147 (See Note 5)	KY	CD	
6/8/17	E	ECN-17-065 (See Note 6)	KY	CD	
8/10/17	F	ECN-17-090 (See Note 7)	KY	CD	
1/22/20	G	ECN-18-046 (See Note 8)	KY	CD	

Notes:

1) Section 2, page 2-1, dated March 2016, supersedes Section 2, page 2-1, dated June 2015.
Section 5, page 5-5, dated March 2016, supersedes Section 5, page 5-5, dated June 2015.
Appendix C, dated March 2016, supersedes Appendix C, dated June 2015.

2) Appendix C, page C-5, dated March 16, 2016, supersedes Appendix C, page C-5, dated March 2016.

3) Table of Contents, pages ii & iii, dated July 2016, supersedes Table of Contents, pages ii & iii, date June 2015.
List of Illustrations, page iv, dated July 2016, supersedes List of Illustrations, page iv, dated June 2015.
Section 6, pages 6-25 thru 6-38, dated July 2016, supersedes Section 6, pages 6-25 thru 6-36, dated June 2015.
Section 8, pages 8-4 thru 8-6, dated July 2016, supersedes Section 8, pages 8-4 thru 8-6, dated June 2015.
Appendix D, pages D-5 thru D-8, dated July 2016, supersedes Appendix D, pages, D-5 thru D-8 dated June 2015.

4) Section 7, page 7-3, dated January 2017, supersedes Section 7, page 7-3, dated June 2015.

5) Section 2, page 2-1, dated March 2017, supersedes Section 2, page 2-1, dated March 2016.
Appendix A, page A-1, dated March 2017, supersedes Appendix A, page A-1, dated June 2015.

6) Section 2, page 2-1, dated June 2017, supersedes Section 2, page 2-1, dated March 2017.

7) Section 2, page 2-1, dated August 2017, supersedes Section 2, page 2-1, dated June 2017.

8) List of Illustrations, page v, dated January 2020, supersedes List of Illustrations, v, dated June 2015.
Section 1, page 1-1, dated October 2018, supersedes Section 1, page 1-1, date June 2015.
Section 2, dated October 2018, supersedes Section 2, dated August 2017.
Section 4, pages 4-1 & 4-2, dated October 2018, supersedes Section 4, pages 4-1 & 4-2, dated June 2015.
Section 5, pages 5-1, 5-3, 5-5 thru 5-8, 5-10, dated October 2018, supersedes Section 5, pages 5-1, 5-3, 5-5 thru 5-8, 5-10, dated June 2015.
Section 6, pages 6-5 & 6-20, dated October 2018, supersedes Section 6, pages 6-5 & 6-20, dated June 2015.
Appendix A, pages, pages A-1 & A-2, dates October 2018, supersedes Appendix A, page A-1 dated March 2017 & page A-2 dated June 2015.
Appendix B, pages B-18 & B-22 thru B-30, dated October 2018, supersedes Appendix B, pages B-18 & B-22 thru B-30, dated June 2015.
Appendix C, page C-6, dated January 2020, supersedes Appendix C, pages C-6, dated March 2016.
Appendix D, dated January 2020, supersedes Appendix D, dated June 2015.

INDUSTRIAL INDEXING SYSTEMS, Inc.

626 Fishers Run
Victor, New York 14564
iis-servo.com

Tel: (585) 924-9181 Fax: (585) 924-2169

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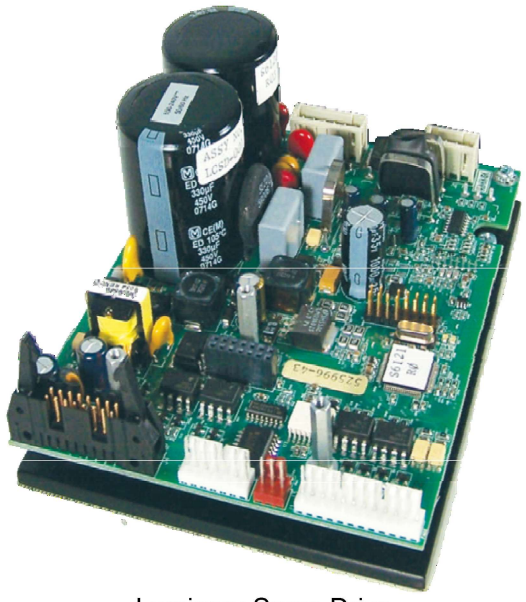
SECTION 1 - OVERVIEW

The Luminary Series Drives are a low cost / high performance drives for use in many applications where true position, velocity, and torque control are desired. The Luminary Drives can operate as a single axis analog drive or it can be connected to a Luminary Series Motion Controller for full configurability. In either mode of operation, access can be made to a wide variety of hardware features. The Luminary Drive has a wide range AC input that will accept from 100V AC to 240V AC for the servo product and 24V DC to 36V DC for the stepper product.

The Luminary Servo Drive series have all the benefits of a full servo drive and yet are cost competitive with a standard stepper control system. A standard analog input and encoder feedback provide the basic needs of a motor drive system. Use in standalone analog speed or torque mode controlled by a +/- analog input source. A feedback interface connector is provided to interface to a position controller for incremental or absolute moves.

The Luminary Series Stepper Drives are a low cost / high performance stepper drives for use in many applications where true position, velocity, and torque control are desired at low RPM's. The Luminary Stepper Drive series provide all the benefits of a full servo drives and yet is cost competitive with a DC motor control systems. The Luminary Stepper Drive series is based off our servo drive knowledge to minimize the heat produced by the stepper motor like standard stepping / micro-stepping systems do.



Luminary Servo Drive

Luminary Stepper Drive

The versatile Luminary Drives are digitally controlled drives that are capable of driving low cost Servo motors up to 3800 watts and stepper motors up to 5 Amps.

Optional interface cards can be added to the Luminary Drive to provide a standard or custom control scheme.

Currently four option cards are available.

1) The IIS device network interface for multi-axis connectivity gives the programmer full access to the motor, digital inputs, outputs and an analog input.

2) An analog output card for monitoring speed or torque.

3) The development port interface is provided to access the internal registers of the servo and the stepper drives. The USB serial interface option along with the L-Drive software provides a graphical PC interface to setup your motor/drive package and tune the system.

4) Register access is also provided with the RS485 option card using Modbus RTU communications. Once the system is setup, the parameters can be saved to flash on the Luminary Drive.

See **Appendix C** for option card details. Custom option cards can designed and built to meet special requirements.

1.1 INTERFACE COMPONENTS

1.1.1 STATUS INDICATORS

STATUS - Red and Green LEDs indicate the current operational status of the LUMINARY SERIES drive. (Details in Section 8)

1.1.2 ELECTRICAL CONNECTORS

MOTOR/POWER WIRING - These are terminal blocks used to wire the incoming line voltage as well as the motor power cable. (Details in **Section 4** & **Section 5**)

I**/O -** Pre defined optically isolated inputs and outputs as a stand-alone drive. Can be customized. (Details in **Section 7**.

MOTOR ENCODER - This is used for the single ended or differential encoder feedback from the motor to the drive.

ANALOG INPUT - These pins allow connection to the Analog input. When configured as a stand-alone drive, it is the torque or velocity command value.

ENCODER OUTPUT - These pins directly repeat the A / B / Z encoder tracks of the motor encoder. They are buffered in hardware so that no undo loading is put on the motor encoder signals. Allows the connection of a motor encoder to an external controller.

COMMUNICATIONS PORT – A variety of option cards are available to provide various communication methods to the Luminary Series drives. Refer to **Appendix C** and **D** of the manual for details.

DEVELOPMENT PORT - This connector is for use with option cards to setup and tune the motor/drive package using L-Drive on your PC. Also Modbus RTU over RS485 is available to access the internal registers.

SECTION 2 - PART NUMBER IDENTIFICATION

2.1 IDENTIFYING LUMINARY SERIES DRIVES

Luminary Series Drive part numbers are configured with the options using the scheme as follows. This information is on the Drive label:

Your Luminary Series Drive model number uses this designation:

LD-aaa/xzmmn-pyy-c

WHERE:

aaa = Continuous Driver Current in amps (rms)
- 330 = 3.3 Amps (Servo Only)
- 500 = 5.0 Amps (Servo or Stepper)
- 101 = 10.0 Amps (Servo Only)

x = Drive type:
- R = SERVO (5V Digital Inputs)
- S = SERVO (24V Digital Inputs)
- T = STEPPER (24V Digital Inputs)

z = Feedback method:
- E = Encoder Feedback

mm = Mounting plate: See **Appendix A** for further details
- 00 = No Plate
- 01 = Flat Plate (Standard AC-100619)(Replaced by 02)
- 02 = Flat Plate (Standard AC-100714)
- 0# = Flat Plate (where # is custom type, contact IIS for more information)
- 21 = "L" Plate (Standard AC-100603) (Replaced by 24)
- 22 = "L" Plate ((AC-100604 Drive/Motor Mount)
- 23 = "L" Plate ((AC-100604 Drive/Motor Mount)(customer supplied)
- 24 = "L" Plate (Standard AC-100720/AC-100721)
- 25 = "L" Plate, 10A (Standard AC-100739/AC-100721)
- 2# = "L" Plate (where # is custom type, contact IIS for more information)

n = primary option card:
- 0 = No option card
- A = Analog Output interface
- B = Digital Network Card (Isolated)
- *C = Digital Network Card (Obsolete, replaced by "B")*
- D = USB 2.0 communications interface card
- E = Reserved
- F = RS485 Communications Network Card
- H = Digital Network Card and LMC-400 Controller
- M = Multi axis controller LM-450

p = secondary option card: ***(SEE NOTES ON NEXT PAGE)***
- 0 or (Blank) = No secondary option card
- D = USB 2.0 communications interface card

yy = Setup parameters (contact IIS for more information)
- 00 or (Blank) = No setup
- ## = Setup used for motor drive package (see SU-6000##) (SU-6000## is created to customer specifications and application)

c = Special options (contact IIS for more information)
(Blank) = Standard
A = Reduced leakage current
letter = Custom option letter code

Example1: A Luminary Series Driver designated LD-330/SE01C is a Servo with a continuous current rating of 3.3 Amp rms with 24V inputs, Encoder feedback, and Flat plate, with network card.

Example2: A Luminary Series Driver designated LD-330/RE010-001 is a Servo with a continuous current rating of 3.3 Amp rms with 5V inputs, Encoder feedback, and Flat plate, no option card, no secondary option card, with setup parameters described in SU-600001.

Example3: A Luminary Series Driver designated LD-330/SE01C-D is a Servo with a continuous current rating of 3.3 Amp rms with 24V inputs, Encoder feedback, and Flat plate, with network card, with USB secondary option card.

NOTES:
For secondary option card:
The secondary option card is only available when the primary option card is one of the following:
A = Analog Output Interface
B = Digital Network Card (for use with LMC-400 controller)
H = Digital Network Card and LMC-400 controller

2.2 IDENTIFYING LUMINARY SERIES MOTORS

Luminary Motors can be identified in one of three ways. This information is on the motor label.

2.2.1 METHOD I (Servo motors only)

Your Luminary Motor model number uses this designation:

LSMxxx-wwww/yyzm

WHERE:

xxx = Flange size in millimeters

wwww = Rated Power in watts

yy = Rated Speed/100 (truncated to 2 digits)

z = Feedback Type
E = Encoder (ABZUVW)
B = Brake Motor

m = Mechanical Variations (Left blank means no modifications to motor).

F, C = Fan cooled, cable variation

Example: A Luminary Motor designated LSM60-400/30E is a 60 mm flange 400-watt motor with a 3000 rpm rated speed and encoder feedback.

2.2.2 METHOD II (Servo motors only)

Your Luminary Motor model number uses this designation:

ESMxxxy(w)-m

WHERE:

xxx = Flange size in millimeters

y = Stack length A, B, C, etc

w = Winding selection (Left blank if only one winding available)
I = Standard voltage
II = High voltage

m = Mechanical Variations (Left blank means no modifications to standard motor).
C = Connectors on motors that come standard with flying leads
C1 = Connector option (reference drawing)
C2 = Connector option

Example: A Luminary Motor designated ESM85C-C is an 85 mm flange motor. Is a 3-stack motor for this flange size and utilizes a standard voltage winding.

2.2.3 METHOD III (Stepper motors only)

Your Luminary Stepper Motor model number uses this designation:

LPM-cxx-wwweyyyz

WHERE:

c = Case type
N = NEMA

xx = Case size
17 = NEMA 17
23 = NEMA 23
34 = NEMA 34

www = Rated current per phase (R stands for decimal place)

e = Encoder style
A = Single ended 8192 count per rev (ABZ)

yyy = rated holding torque in oz-in

z = Mechanical variation
Blank = No option
A = 8 mm output shaft

Example: A Luminary Motor designated LPM-N23-2R8A270 is a NEMA 23 case size motor, with a current rating of 2.8A per phase, with a single ended 8192 bit/rev Encoder with ABZ outputs, and a holding torque of 270 oz-in.

SECTION 3 - INSTALLATION AND SAFETY

NRTL Certification

The Luminary Drive Series has been designed to the standards of UL508C. The series has not been evaluated by UL or other regulatory agencies. Contact IIS factory for details.

3.1 INSTALLING THE LUMINARY SERVO DRIVE

When installing the Luminary Drive into an enclosure you should follow the guidelines below. First consider what regulatory directives you should follow, such as UL, TUV, CE or other regulatory agencies, see **Sections 3.1.1 and 3.1.2**. Then select the electrical enclosure best suited for the system components, power dissipation in the electrical enclosure, and regulatory approvals. If you need any assistance with the installation of the Luminary drive or would like a quote for a full enclosure assembly, please contact INDUSTRIAL INDEXING SYSTEMS INC. When laying out the wiring of the electrical enclosure, be sure to route the wiring as explained in **3.1.3** and to keep in mind regulatory requirements. Before applying power to the system, follow all checks listed in **Section 3.1.4** and then follow the first time system power procedure in **Section 3.2**.

If you are replacing a drive in an existing electrical enclosure with a Luminary Drive, make sure you read through and follow all precautions and wiring requirements for the Luminary Drive. Always follow the first time system power up procedure after the installation of a new drive, even if the Luminary Drive you just installed was replacing an existing Luminary Drive, see **Section 3.2**.

3.1.1 REGULATORY AGENCY INSTALLATIONS

To comply with the agency approvals for electrical enclosure installation, you must follow all wiring guidelines, install proper safety devices, and follow all labeling requirements for the regulatory agency of your choice.

3.1.2 CHOOSING AN ELECTRICAL ENCLOSURE

If your installation requires CE approval, you must have a NEMA12 or IP6X electrical enclosure. Make sure the electrical enclosure you choose has the appropriate agency approvals for use. Using the information provided in **Sections 4.1.2, 5.3.1**, and the average running motor(s) current, find the power loss of the drive system. Add the power loss of the Luminary Drive system with all other components to come up with a full system power loss. Then using the information provided by the electrical enclosure manufacturer, derive the ambient temperature rise inside the electrical enclosure. Determine if you will need a cooling system for the electrical enclosure by keeping the temperature inside the electrical enclosure below 45 Degrees C in the final installation environment. If a cooling system is required be sure to use air filtration devices to keep dust, water vapors, or other contaminates from accumulating in the electrical enclosure.

Note: For the LD-500/R and the LD-500/S drives, a steel plate with equivalent area of 10" x 10" square of 10 gauge steel is needed to dissipate the heat loss of the drive at full load.

3.1.3 LUMINARY DRIVE AND REGEN RESISTOR MOUNTING

WHEN DRILLING, TAPPING, CUTTING, WELDING, OR OTHER ACTIVITY THAT MAY CAUSE METAL DEBRIS, THE LUMINARY DRIVE SHALL BE REMOVED FROM THE ELECTRICAL ENCLOSURE. THE LUMINARY DRIVE IS OF OPEN TYPE CONSTRUCTION AND FOREIGN MATTER COULD LODGE INTO THE CIRCUITRY OF THE UNIT.

When mounting the Luminary Drive in the electrical enclosure, leave at least 1 inch of space between the Luminary Drive and any other component. Tighten all mounting screws to the specified mounting torque using proper grounding methods. When routing the wiring in the electrical enclosure, be sure to follow proper codes, bending radii, wire gauge and separation of voltages.

When installing a Regen resistor, mount it in a location where there is free access to airflow and no flammable material is near the Regen resistor. Never mount the Regen resistor closer than 6 inches from any other device. Doing so can cause undo temperature rise to other components and impede airflow to the Regen resistor.

3.1.4 FINAL CHECKS PRIOR TO APPLYING POWER

1) Verify you have fuses or circuit breakers in line with each Luminary Drive in accordance with **Section 5.2.1**.

2) Verify the wiring to the Luminary drive power input connector meets **Section 5, Figure 5.1** and the correct voltages and wire gauges are used. If a transformer is used, verify it meets the information described in **Section 5.2.3**. Line filters may be needed on the AC power input to meet CE certifications.

3) If an external Regen resistor is used, verify it is mounted away from any flammable material and is wired to the Luminary drive in accordance with **Section 5, Figure 5.1**. Also verify the Regen resistor is mounted at least 6 inches away from any other components as described in **Section 3.1.3**.

4) Verify wiring of the electrical enclosure maintains separation of voltages. This will keep EMI from entering on to a low voltage cable. If EMI is present on a low voltage cable, it could cause intermittent operation of the Luminary drive.

5) Verify all E-STOPS and protective devices are installed and properly wired both inside and outside of the electrical enclosure.

6) All cables with internal shield shall have the shield connected to the electrical enclosure case. The electrical enclosure case shall be tied to earth ground. To tie the cables shield to the electrical enclosure, a small portion of the cable jacket is removed which exposes the shield braid. The shield braid shall be clamped to a conductive harness, which is then properly secured to the electrical enclosure.

7) The Luminary Drive is a high leakage current device. Make sure that the Earth Ground is attached properly as described in **Section 5.1**.

8) The Luminary Servo Drive has a floating DC BUS. Never touch any component's on the board when power is applied or. Never connect anything to the Luminary Servo Drive while power is applied.

3.2 POWERING UP A LUMINARY SERVO DRIVE FOR THE FIRST TIME

DANGER - HIGH VOLTAGE EXISTS WITHIN THE DRIVE AND ON THE REGEN RESISTOR CONNECTOR FOR UP TO 1 MINUTE AFTER AC POWER IS REMOVED.

CAUTION - THE LUMINARY SERVO DRIVE HAS A FLOATING DC BUS. NEVER TOUCH ANY COMPONENT ON THE BOARD WHEN POWER IS APPLIED OR YOU MAY GET SHOCKED. NEVER CONNECT ANYTHING TO COMPONENTS OR CONNECTORS NOT SPECIFIED IN THIS MANUAL.

DANGER - The Programming port and other components on the board are floating on a DC offset and can cause injury or death if touched with power applied

3.2.1 STEPS TO FIRST TIME POWER UP (Stand Alone Analog Mode)

CAUTION - NEVER assume the IO is in a safe state. If the ENABLE input is set without verifying the drive parameters, the motor could move in an unexpected manner.

1) Remove the Armature cable from Luminary drive. That way it will be safe to program the unit's parameters without worry of motor movement.

2) Connect the ISOCOM01 into the programming port of the Luminary drive. **Never connect anything to the programming port when power is applied! Never touch the programming port header when power is applied!**

3) Apply power to the system and connect a computer to the ISOCOM01 using the LDrive tool kit. Verify the parameters being sent down are for your motor drive package. See Section 6 for programming details. Contact IIS factory for more information.

4) Tuning the system and monitoring the system is all achieved using the ISOCOM01 and the LDrive software tool kit. Contact IIS factory for more information.

5) Disconnect power from the system. Plug the Armature cable back into the drive.

6) Reenergize power back to the system, and now you may tune the system using the L-Drive software tool kit over the RS232 link.

7) Once programming of the system is complete and saved to flash, disconnect power from the system and remove the ISOCOM01 from the programming port.

8) You are now ready to use your Luminary drive.

3.2.2 STEPS TO FIRST TIME POWER UP (Multi-Axis Network Mode)

CAUTION - NEVER assume the Program is cleared or correct for your system. If the drive is enabled without verifying the drive parameters, the motor could move in an unexpected manner.

1) Apply power to the system and connect a computer to the USB or RS232 port on the LMC400 using the EDE tool kit. Verify the parameters being sent down are for your motor drive package. See Section 6 for programming details. Contact IIS factory for more information.

2) Verify the status LED's of the communications port on the Multi-Axis connection and the LMC-400. The Green LED's should be LIT, and the Yellow LED should not be lit.

3) Tuning the system and monitoring the system is all achieved using the ISOCOM01 and the LDrive tool kit. Never connect anything to the programming port when power is applied! Never touch the programming port header when power is applied!
Once the tuning parameters are set properly, copy the data in L-Drive tool kit over into the EDE tuning parameters. Contact IIS factory for more information

4) Disconnect power from the system and remove the ISOCOM01.

5) You are now ready to use your Luminary Drive.

SECTION 4 - SPECIFICATIONS

4.1 DRIVE SPECIFICATIONS

4.1.1 MOTOR OUTPUT

Luminary Driver	LD-330/R LD-330/S		LD-500/R LD-500/S		LD-101/R LD-101/S		LD-500/T	
Motor Output	PWM, 3 Phase, sine wave		PWM, 3 Phase, sine wave		PWM, 3 Phase, sine wave		PWM, 4 Phase, sine wave	
Max Output Voltage	(At 230 VAC Line input) 200 VRMS		(At 230 VAC Line input) 200 VRMS		(At 230 VAC Line Input) 200 VRMS		(At 36 VDC Line input) 22 VRMS	
Maximum Speed (RPM)	6000		6000		6000		600	
PWM Frequency	8 KHz	16 KHz	8 KHz	16 KHz	8 KHz	16 KHz	8 KHz	16 KHz
Continuous Output Current	3.3 A rms	2.7 A rms	5.0 A rms	4.0 A rms	10.0 A rms	8.0 A rms	5.0 A rms	4.0 A rms
Maximum Output Current	6.0 A rms	4.8 A rms	9.0 A rms	7.2 A rms	18.0 A rms	14.4 A rms	5.5 A rms	4.4 A rms

4.1.2 MAIN POWER SUPPLY

Luminary Driver	LD-330/R LD-330/S		LD-500/R LD-500/S		LD-101/R LD-101/S		LD-500/T	
Main Power Supply	Single Phase (1∅) Nominal: 100 to 240 VAC, Max Range: 90-265 VAC, 50/60 Hz		Single Phase (1∅) Nominal: 100 to 240 VAC, Max Range: 90-265 VAC, 50/60 Hz		Single Phase (1∅) Nominal: 100 to 240 VAC, Max Range: 90-265 VAC, 50/60 Hz		Single Phase (1∅) Nominal: 24 to 36 VDC, Max Range: 20-48 VDC	
Input Voltage								
Continuous Input Current	5.7 A/1∅ Rms		8.7 A/1∅ Rms		17.3 A/1∅ Rms		8.7 A/1∅ Rms	
Max In-rush Current / Capacitance	48 A Rms		48 A Rms		60 A Rms		20000 uF	
PWM Frequency	8 KHz	16 KHz	8 KHz	16 KHz	8 KHz	16 KHz	8 KHz	16 KHz
Main Circuit Heat Loss	23 Watts	34 Watts	32 Watts	46 Watts	75 Watts	95 Watts	10 Watts	15 Watts
Main Supply Capacity	1.3 KVA	1.0 KVA	2.0 KVA	1.6 KVA	4.1 KVA	3.4 KVA	310VA	250VA
External Regen Absorption Capacity	400 Watts	400 Watts	600 Watts	600 Watts	800 Watts	800 Watts	0 Watts	0 Watts

Note: The LD-500/R and the LD-500/S drives require a steel mounting plate attached to the mounting plate supplied with the unit to reach full output current specifications. The steel plate needs to be an equivalent area of 10" x 10" of 10 gauge steel.

4.1.3 CONTROL PERFORMANCE

Feedback	Encoder - (ABZ plus UVW)
Feedback Resolution	See motor/driver speed torque curves in Appendix B for encoder resolution.
Feedback Accuracy	Less than 2 arc minutes
Current Loop Update Rate	62.5 usec
Velocity Loop Update Rate	250 usec
Position Loop Update Rate	500 usec
Speed Regulation	Load (0%-100%): ±0.02% Power (100-240 VAC): ±0.02% Temperature (0-45ºC/32-113ºF): ±0.2%
Torque Regulation	Power (100-240 VAC): ±2% Temperature (0-45ºC/32-113ºF): ±2%

4.1.4 ENVIRONMENT

Storage Temperature	-10 to 70ºC (14 to 158ºF)
Operating Temperature	0 to 45ºC (32 to 113ºF)
Humidity	35 to 90% Relative Humidity, non-condensing
Shock and Vibration	1 G or less
Operating Conditions	Free of dust, liquids, metallic particles and corrosive gases. Use in a pollution degree 2 environment.
Drive Enclosure	The drive is rated as "open type equipment"

4.1.5 WEIGHT

Luminary Drive	LD-330/R LD-330/S	LD-500/R LD-500/S	LD-101/R LD-101/S	LD-500/T
Without mounting plate	0.6 lb / 270 grams	0.66 lb / 300 grams	0.66 lb / 300 grams	0.20 lb / 90 grams

4.1.6 MOTOR ENCODER INPUTS

Drive Assembly Type	LCSD-001 and LCSD-003 **(Check the label on device)** (Differential Encoder Input Only)
A, B, Z U, V, W	Minimum On voltage: 3 VDC Maximum Off voltage: 1 VDC Typical Current draw per channel: 17ma Maximum Current draw per channel: 22ma 2 MHz maximum frequency A, B quadrature Optically isolated U V W Tracks required

Drive Assembly Type	LCSD-002 and LSTP-100 **(Check the label on device)** (Differential and Single Ended Encoder Input) (See section 5)
A, B, Z, U, V, W	**(Differential)** Minimum Differential voltage: 250mV from + input to – input Typical current draw per channel (Differential): 17ma Maximum current draw per channel (Differential): 23ma 2 MHz maximum frequency A, B quadrature • LCSD-002: U V W Tracks required • LSTP-100: U V W Tracks Not required **(Single Ended (Sinking))** Minimum Off voltage: 3.5 Vdc Maximum On voltage: 1 Vdc Typical current draw per channel: 3.2ma Maximum current draw per channel: 3.5ma 2 MHz maximum frequency A, B quadrature • LCSD-002: U V W Tracks required • LSTP-100: U V W Tracks Not required

4.1.7 INPUTS

INPUTS 1,2,3,4	Can be wired as sinking or sourcing (See **Section 7**). (Reference **Section 1** for part number of your device)	
Luminary Device Part Number (Type)	**R**	**S, T**
Input voltage rating	5Vdc	24Vdc
Minimum voltage applied for ON state	4Vdc	18Vdc
Maximum voltage applied for OFF state	1.2Vdc	3Vdc
Input current at rated voltage	15mA	12mA
Maximum voltage applied	7Vdc	30Vdc
Reverse polarity protected	YES	YES

4.1.8 OUTPUTS

OUTPUTS 1,2	Can be wired as sinking or sourcing (See **Section 7**)
Maximum "ON state" saturation voltage	1.2Vdc
Maximum "OFF state" voltage applied	40Vdc
Maximum current (sinking or sourcing)	40mA
Reverse polarity protected	NO
Inductive Loads	YES *Intermittent output current cannot exceed ratings.* *External reversing diode is required.* *(See **Section 7**)*

4.1.9 ENCODER OUTPUTS

A, /A, B, /B, Z, /Z	5 VDC, 40mA Maximum per output Wired as differential pairs. (See **Section 7**)

4.1.10 ANALOG INPUTS

Analog Inputs	Maximum Input Voltage: □ 12 VDC Analog to Digital response voltage: □ 10 VDC Input Impedance: 274 k□ Analog to Digital resolution: 12 bit *Note: Analog (–) input is referenced to earth with a 120 Ohm resistor*

4.1.11 PROTECTION

Fault Checks	Under Voltage, Over Voltage, Motor Short, Output Short, Feedback Loss, Regeneration Resistor Malfunction, Following Error, Internal Watchdog Timer, Processor Diagnostics, Communications Errors (Refer to **Section 8** for error codes)

4.2 MOTOR SPECIFICATIONS

4.2.1 GENERAL

Duty	Continuous at rated speed and rated torque
Type	Permanent magnet synchronous
Insulation	See motor drawings in **Appendix B**
Sealing	See motor drawings in **Appendix B**
Storage Temperature	-10 to +70ºC/14 to 158ºF
Ambient Operating Temperature	-10 to +40ºC/14 to 104ºF
Shock and Vibration	2 G's
Mounting	Motor can be mounted in any position

4.2.2 FEEDBACK DEVICE

Type: Encoder	ABZ plus UVW 5V line driver or sinking single ended (UVW tracks required for Servo Drives)

4.2.3 OTHER

Weight Shaft Loading Brake Specifications Dimensions	See motor drawings in **Appendix B**
Torque Ratings Speed Torque Curves	See specifications in **Appendix B**

SECTION 5 - CONNECTIONS / WIRING / POWER

5.1 CONNECTIONS

This section details the recommended power source requirements necessary for the Luminary drivers. **Figure 5.1 and Figure 5.2** show the required interconnections to all system components.

NOTE: The Luminary series drive may be able to be HI-POT tested in the field. Contact Industrial Indexing Systems, Inc. if your system needs to be HI-POT tested.

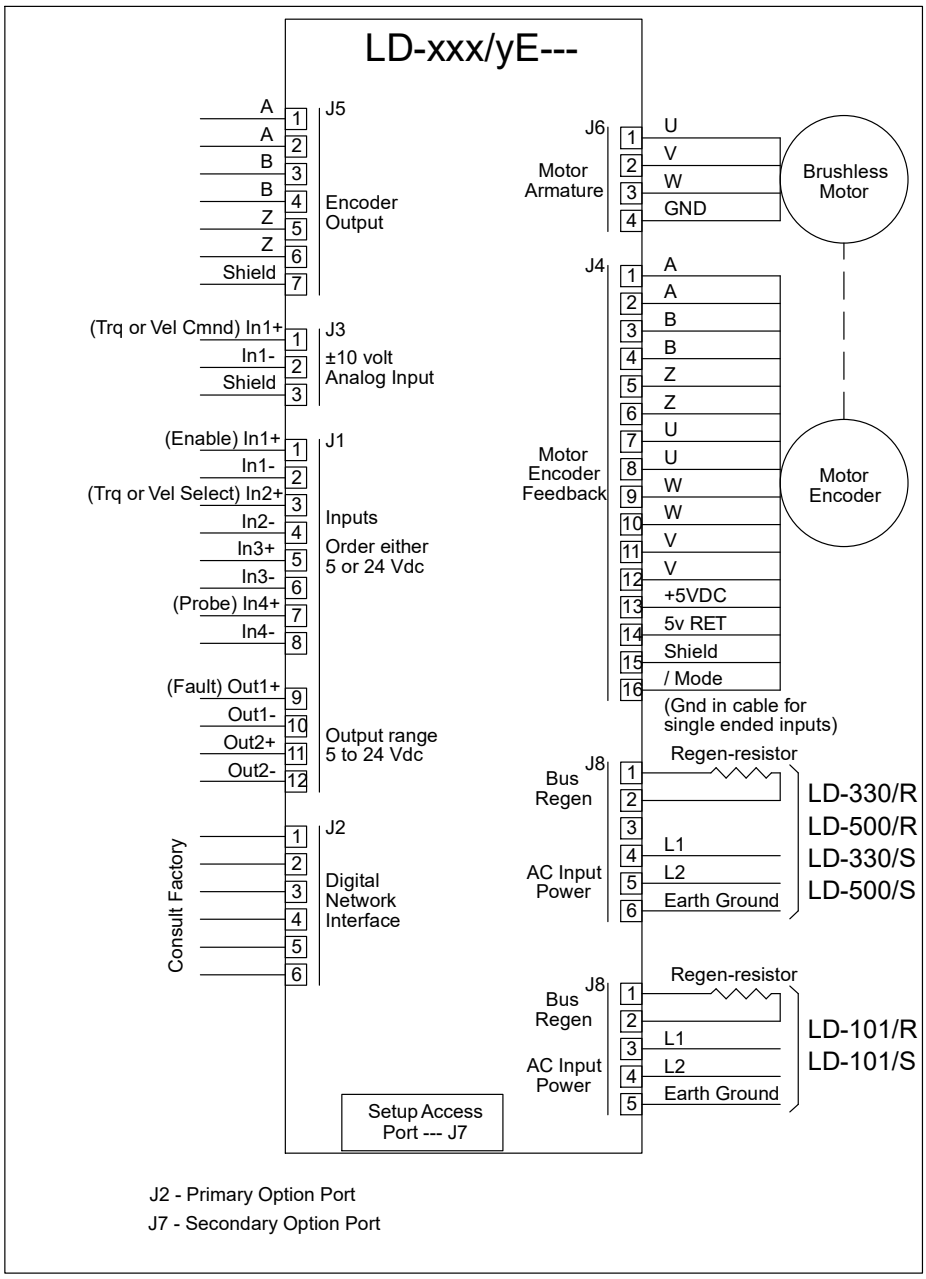


Figure 5.1 - Servo Drive Wiring Interconnect

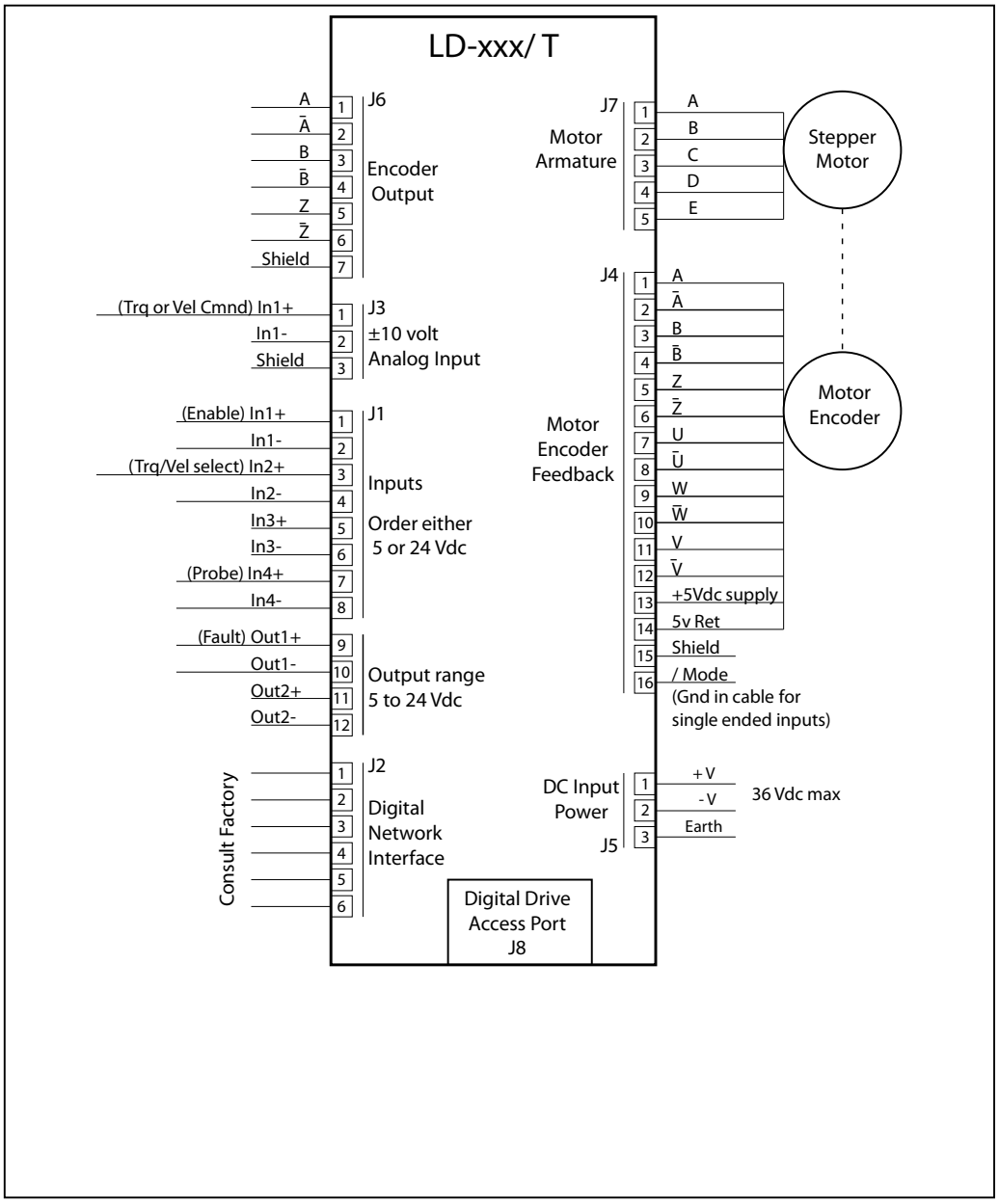


Figure 5.2 - Stepper Drive Wiring Interconnect

5.2 WIRING

Luminary Servo Drives:

Connect the Luminary drive main bus power (L1, L2) to the incoming line or transformer (See **Section 4.1.2 & Section 5.2.3**). See **Figure 5.1** for the required power wiring connections.

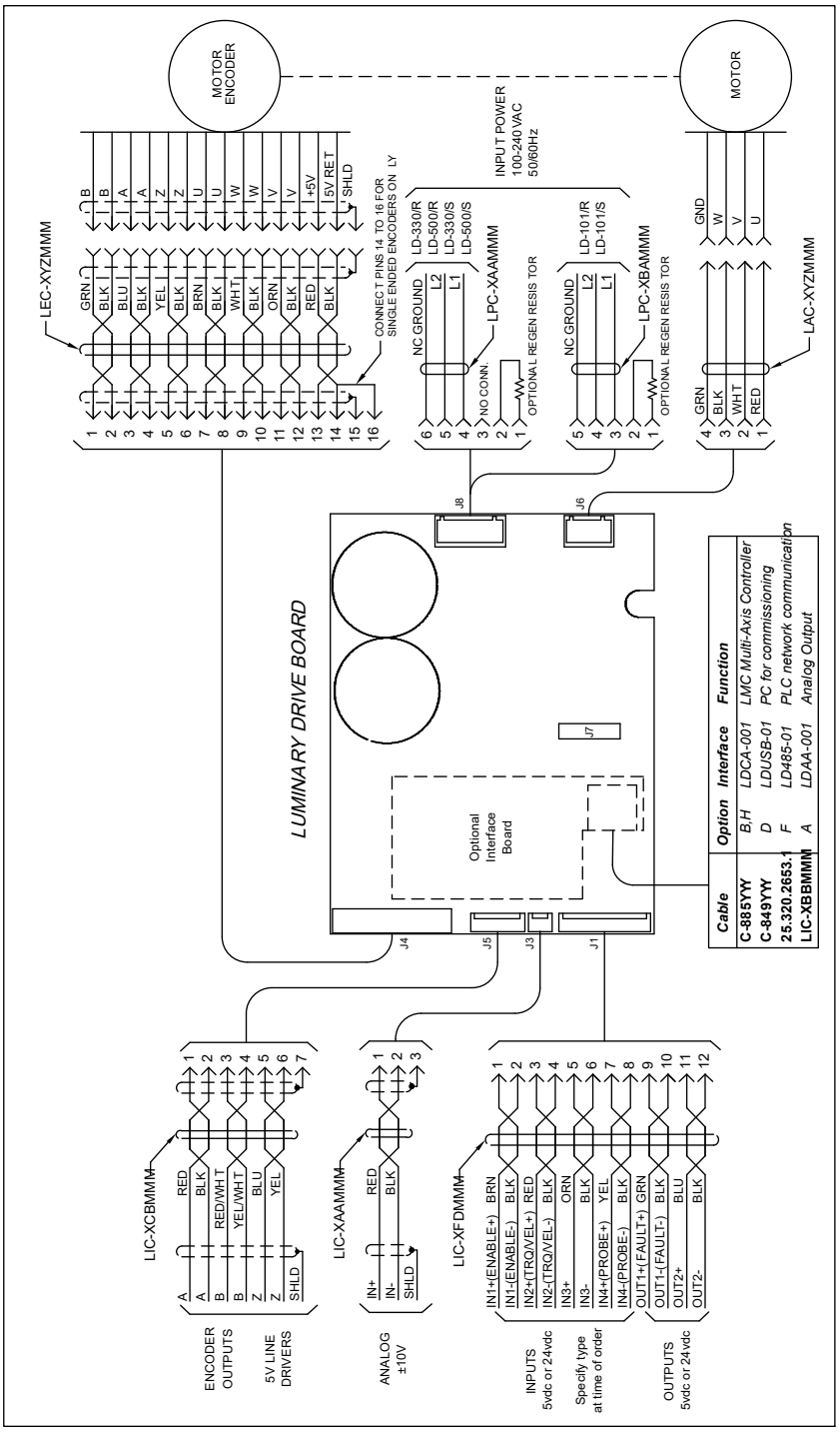


Figure 5.3 - Servo Drive System Interconnect

Luminary Stepper Drives:

Connect the Luminary drive main bus power (+, -) to the output of the DC power supply (See **Section 4.1.2**). See **Figure 5.2** for the required power wiring connections.

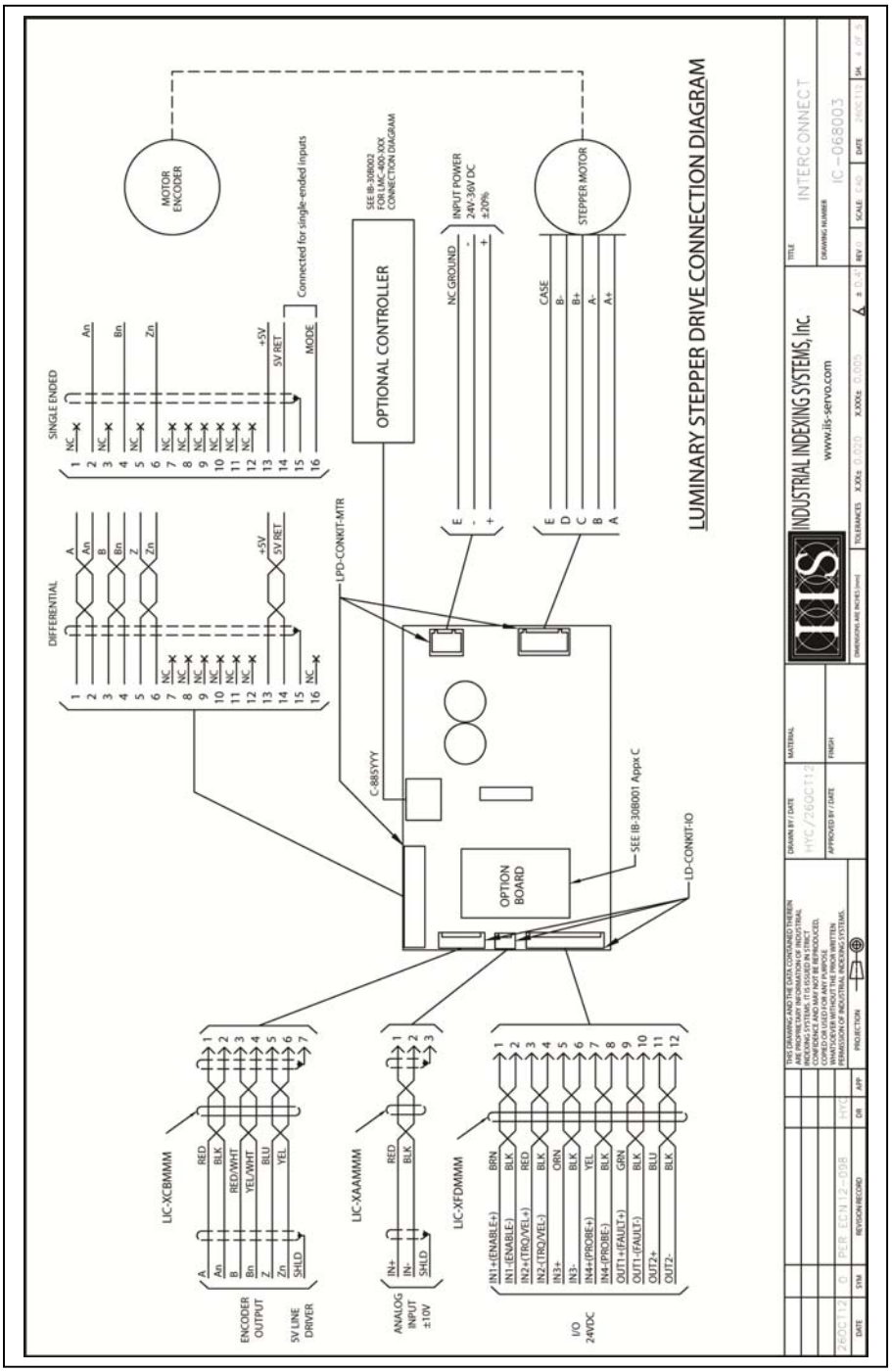


Figure 5.4 - Stepper Drive System Interconnect

5.2.1 SUPPLEMENTAL CIRCUIT PROTECTION

It is required that each driver/motor combination be provided with a circuit protector for each driver and motor pair. All of the drives are suitable for use on a circuit capable of delivering not more than 5000 rms symmetrical amperes (SCCR).

Luminary Servo Drives			
Drive Part No. LD-XXX/R LD-XXX/S	Motor Rated Current (Amps)	Circuit Protectors	
		Rating	Eaton CIRCUIT BREAKER
LD-330 LD-500 LD-101	0.5A to 1A	2A	FAZ-D2-2
LD-330 LD-500 LD-101	1.1A to 2A	4A	FAZ-D4-2
LD-330	2.1A and up	6A	FAZ-D6-2
LD-500 LD-101	2.1A to 3A	6A	FAZ-D6-2
LD-500 LD-101	3.1A to 4A	8A	FAZ-D8-2
LD-500	4.1A and up	10A	FAZ-D10-2
LD-101	5A to 8.5A	15A	FAZ-D15-2
LD-101	8.6A and up	20A	FAZ-D20-2
Luminary Stepper Drives			
Drive Part No.	Motor Rated Current (Amps)	Circuit Protectors	
		Rating	Eaton CIRCUIT BREAKER
LD-500/T*	1.1A to 2A	4A	FAZ-D4-2
LD-500/T*	2.1A to 3A	6A	FAZ-D6-2
LD-500/T*	3.1A and 4A	8A	FAZ-D6-2
LD-500/T*	4.1A to up	10A	FAZ-D10-2

Table 5.1 - Recommended Circuit Protector

***** *DC Power supplies that incorporate internal over-current protection do not require additional fuses or breakers between the power supply output and the Stepper drive. See the power supplies manufacturer's specifications for fuses or breakers between the input line and the power supply.*

5.2.1 SUPPLEMENTAL CIRCUIT PROTECTION (cont'd)

The circuit protector is sized for the worst-case maximum power draw of the driver at the worst-case low line voltage. The chart contains specific vendor and size recommendations. Other types of circuit protectors or fuses may be used provided the continuous ratings are equivalent, the instantaneous rating is 10 to 15 times continuous and can support 3 times continuous for at least 3 seconds. Contact Industrial Indexing Systems, Inc. for specific recommendations of circuit protective devices.

NOTE: Never use a fuse or circuit breaker greater than 6A for a LD-330/S drive.

Never use a fuse or circuit breaker greater than 10A for a LD-500/S drive.

Never use a fuse or circuit breaker greater than 10A for a LD-500/T drive.

Never use a fuse or circuit breaker greater than 20A for a LD-101/S drive.

5.2.2 WIRE SIZES

It is required that each driver be installed with the appropriate size wire for proper operation. **Table 5.2** shows a chart of recommended wire gauges for each driver size.

The wire is sized for the worst-case maximum power draw of the driver at the worst-case low line voltage. The charts contain specific METRIC and AWG size recommendations for stranded wire. All wires to supply earth to the drive shall be of the same wire size used for the AC source. Use only copper wire rated for 60/75 degree C or greater. The driver terminals are specifically designed to handle the recommended wire gauge with lug or ferrule terminations. See wiring diagrams for more details.

Drive Part No.	Rated Current (Amps)	Wire Size	
		(AWG)	(MM^2)
LD-330/R LD-330/S	6	18	1
LD-500/R LD-500/S	10	14	2
LD-101/R LD-101/S	20	12	3
LD-500/T	10	14	2

Table 5.2 - Recommended Power Wire Size

Note: A ferrule or lug must be applied to end of each wire using the crimp tool specified by the connector manufacturer. Use a ferrule sized for the wire gauge involved and crimped with a NRTL Certified tool.

5.2.3 TRANSFORMERS

A transformer may be required to step down or step up the facility power line to meet the driver voltage specifications in **Section 4**.

If a transformer is used, select a transformer with the following characteristics:

- Isolation type.
- Load regulation less than 10%.
- Ability to provide 3 times rated current for 3 to 5 seconds without saturation.
- Ability to drive load with a power factor of 0.85.
- Primary or secondary taps to provide -10%; nominal; +10%; supply voltage.

To achieve maximum performance from the driver, the power input to the driver should be as close to nominal driver input voltage rating as possible. The facility line voltage varies through wide ranges in many parts of the world and it is recommended to match the nominal facility voltage to the nominal input voltage rating of the driver with a transformer. This gives the system the maximum operating range with facility line voltage fluctuations.

If the line voltage is too low, intermittent under voltage or following error alarms may occur. A high line voltage will result in excessive regeneration dumping or intermittent over voltage alarms.

Buck boost transformers may be used to optimally match the facility line voltage to the driver line voltage rating. Buck boost transformers can be used with or without an isolation transformer. If buck boost transformers are used in conjunction with an isolation transformer, it is best to put the buck boost transformers on the primary side of the isolation transformer.

As a general rule the transformer rating can be calculated using the following formulas:

For single phase transformer:

$$\text{Transformer Capacity (VA)} = \frac{\text{Rated Mechanical Output (Watts)}}{0.7}$$

Where: Rated Mechanical Output is from Emerald Motor and Drive Package rating.
0.7 = motor/drive efficiency and single phase full wave rectifier factor

Example: Select transformer for a ESM60A-400/30E motor/drive package

$$\text{Transformer Capacity (VA)} = \frac{400}{0.7} = 570 \text{ VA}$$

One transformer can supply multiple motor/driver packages. Simply add the rated mechanical output of the motor/driver packages together and use the above formulas. If one transformer is used to supply multiple drivers, be sure to protect each driver with the appropriate circuit breaker or fuse.

IIS offers a full line of transformers for various line voltage and frequencies, enclosed and open frame types. Contact IIS Application Engineering Department for full details.

5.2.4 WIRING PRACTICES AND GROUNDING

All wiring must conform to accept standards such as NEMA and NEC codes. Signal and low voltage I/O wires must be physically separated from high voltage wires by at least 12 inches or separated by a suitable barrier such as steel conduit or wiring trough separator.

The driver must be adequately grounded for proper operation and to provide personnel safety. The proper grounding technique is shown in **Figure 5.1.**

5.3 DRIVER REGENERATION CAPACITIES

The Luminary motor and driver have the ability to act as a brake for a rotating load. This condition typically occurs during the deceleration of the load or when the system is stopping a vertical load such as an elevator or lift. In both cases, the driver may have to absorb the mechanical and potential energy in the system. The driver must absorb the energy if the energy in the load exceeds to mechanical losses in the system.

The driver has two ways to absorb the energy from the load.

- Store the energy by charging the internal main DC bus capacitors (E_C)
- Dissipate the energy using a regeneration resistor (P_R)

The Luminary driver internal energy absorption capacities are as shown in **Table 5.3**.

DRIVER SIZE	INTERNAL REGEN CAPACITY (P_R)	EXTERNAL REGEN CAPACITY (P_R)	CHARGING CAPACITY (E_C)
LD-330/R LD-330/S	0 W	400 W	2.6J
LD-500/R LD-500/S	0 W	600 W	3.8J
LD-101/R LD-101/S	0 W	800 W	4.5J
LD-500/T	0 W	0 W	0.2J

Table 5.3 - Energy Absorption Capabilities

Servo Drive System Regen and Overvoltage
The Luminary drivers are equipped with internal circuitry to detect a rise in the main DC power bus indicating energy absorption. If the DC power bus reaches approximately 410 VDC, the regeneration circuit is turned on to prevent the main DC power bus from rising to 430 VDC which will result in an over voltage alarm F02.

Stepper Drive System Overvoltage
The Luminary drivers are equipped with internal circuitry to detect a rise in the main DC power bus indicating energy absorption. If the DC power bus reaches approximately 52 VDC an over voltage alarm F02 will occur.

5.3.1 SELECTION OF AN EXTERNAL REGENERATION RESISTOR

The amount of energy stored in the moving components of the system must be calculated and compared to the energy absorption capacity of the driver to determine if an external regeneration resistor is required.

The stored energy is of two basic types, kinetic energy in the form of a moving mass and potential energy of a mass being held against gravity.

$E_k = 0.5 * (J_M + J_L) * (2 * \pi * N / 60)^2$

$E_P = (2 * \pi * N * T_g * t_b / 60)$

Calculate the system losses in the motor, driver and friction.

$E_L = (P_M + (\pi * N * T_f / 60)) * t_a$

Calculate the regeneration power.

$P_R = (E_k + E_P - E_L - E_C) / t_c$

If regeneration power P_R is greater than 0.0, a regeneration resistor will be needed to prevent the main DC power bus from generating an over voltage alarm F02.

Where:

E_k = Net kinetic energy Joules
E_P = Net Potential energy Joules
E_L = Energy loss due to friction Joules
E_C = Driver charging capacity Joules
J_M = Motor rotor inertia kg-m^2
J_L = Load inertia kg-m^2
N = Motor speed in RPM
P_M = Motor loss watts (10% of motor rating)
T_f = System friction torque N-m
T_g = Net torque to hold up load against gravity N-m
P_R = Regen power watts
t_a = Deceleration time
t_b = Move time
t_c = Cycle time

See **Figure 5.5**

* The above equations are reasonable approximations.

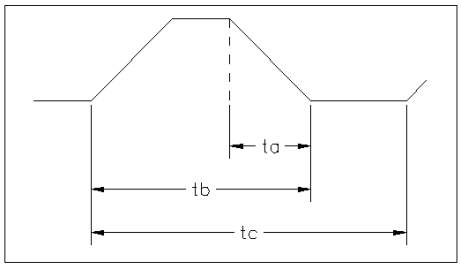


Figure 5.5

5.3.1 SELECTION OF AN EXTERNAL REGENERATION RESISTOR (cont'd)

The Luminary Drivers do not contain an internal regeneration resistor. If a regeneration resistor is required, an external resistor with a power rating of at least P_R watts must be connected.

DRIVER SIZE	$P_{R(INTERNAL)}$ Watts	$R_{R(EXTERNAL)}$ Min Ohms	P_R Max Watts	WIRE GAUGE
LD-330/S	0 W	30	400	14 AWG 2.0 mm^2
LD-500/S	0 W	30	600	14 AWG 2.0 mm^2
LD-101/S	0 W	30	800	14 AWG 2.0 mm^2
LD-500/T	0 W	NA	0 W	NA

Table 5.4 - Regeneration Resistor Selection Data

5.3.2 STANDARD REGENERATION RESISTOR PACKAGES

In general, wound metal ribbon resistors are recommended for this type of application. IIS offers a complete line of enclosed panel mounted regen resistor units to complement the Emerald driver. Various combinations of series and parallel connections are allowed to provide adequate regen resistor capacity.

IIS P/N	Description
MFS30A300J*	30 Ohm 30 Watts
RGH200-30*	30 Ohm 200 Watts
DRGN-45/420	45 Ohm 420 Watts
DRGN-45/420-2	45 Ohm 420 Watts (2 Resistors)

*Not UL/CE approved

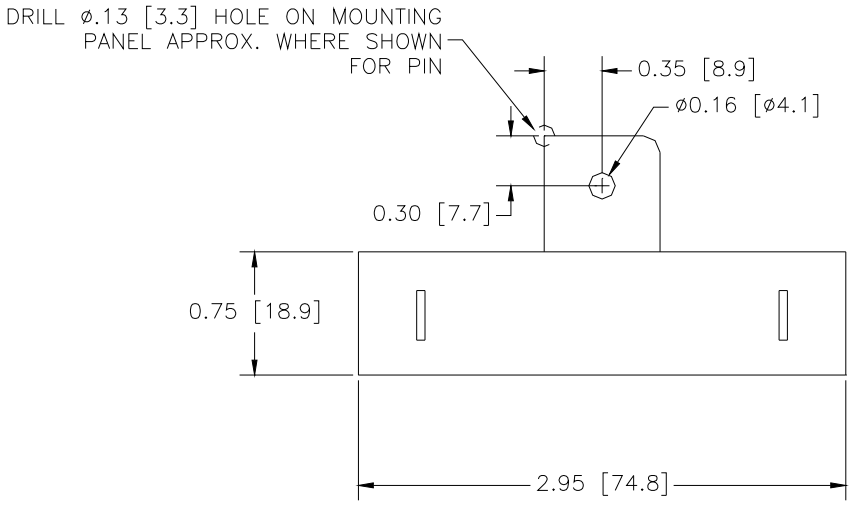
DRAWING NUMBER	DESCRIPTION
MFS30A300J	Resistor
RGH200-30	Regen Resistor
DRGN-45/420	Regen Resistor
DRGN-45/420-2	Regen Resistor

NOTES:

1.) THIS RESISTOR IS NOT UL OR CE APPROVED.

2.) RESISTOR MUST BE SECURELY MOUNTED ON LARGE HEATSINK SUCH AS ENCLOSURE WALL OR BACKPANEL.

SPECIFICATIONS	
RESISTANCE:	30 Ohms
CONTINUOUS POWER:	30 Watts
MAXIMUM VOLTAGE:	VDC
MAXIMUM PULSE CURRENT:	15 A
MAXIMUM RMS CURRENT:	1 A
DUTY CYCLE	6 %



INDUSTRIAL INDEXING SYSTEMS, Inc.
www.iis-servo.com

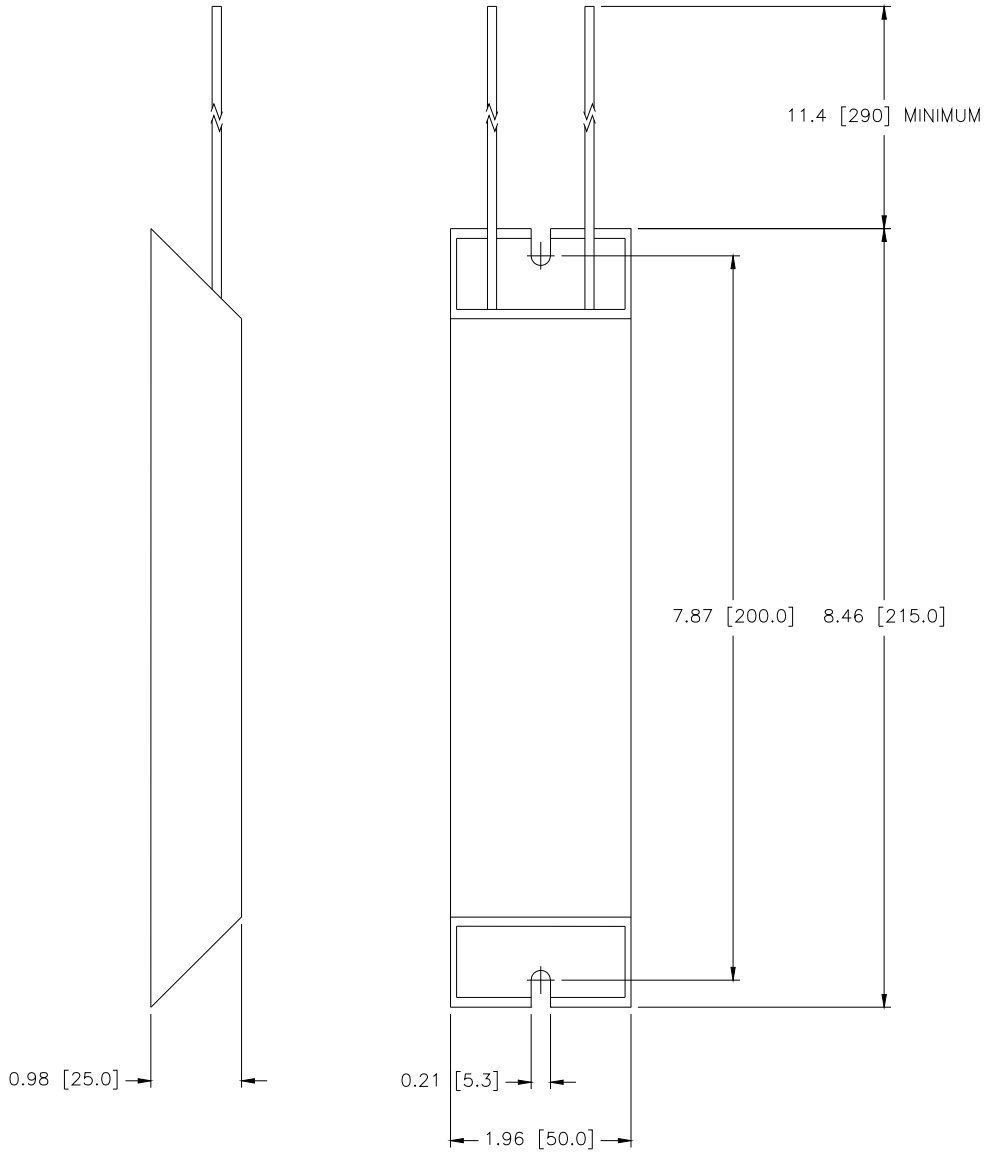
TITLE: RESISTOR, 30 OHM, 30W

DRAWING NUMBER: MFS30A300J

DIMENSIONS ARE INCHES [mm]	TOLERANCES X.XX±--- X.XXX±--- ∠ ±---	REV 0		ECN 03-322	DATE 16JUL03	SH. 1 OF 1

NOTES:
1.) RESISTOR MUST BE MOUNTED ON A FLAT SURFACE AT LEAST 12" X 12" IN FREE AIR TO MEET THE 200 WATT POWER DISSIPATION.
2.) THIS RESISTOR IS NOT UL OR CE APPROVED.

SPECIFICATIONS	
RESISTANCE:	30 Ohms
CONTINUOUS POWER:	200 Watts
MAXIMUM VOLTAGE:	425 VDC
MAXIMUM PULSE CURRENT:	14.0 A
MAXIMUM RMS CURRENT:	5.0 A
DUTY CYCLE	50%

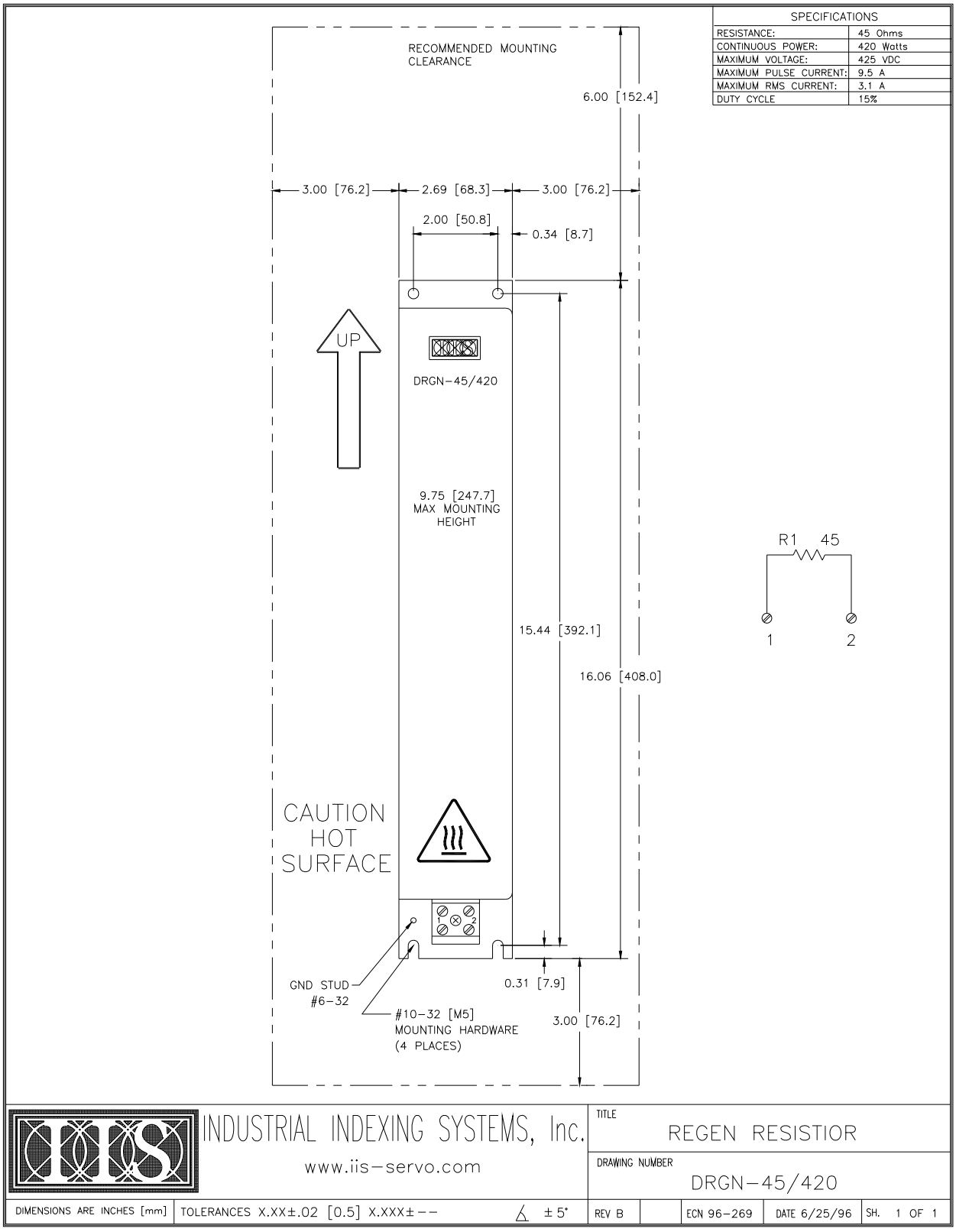


INDUSTRIAL INDEXING SYSTEMS, Inc.
www.iis-servo.com

TITLE: REGEN RESISTOR
DRAWING NUMBER: RGH200-30

DIMENSIONS ARE INCHES [mm] | TOLERANCES X.XX±0.01 X.XXX±0.005 △ ± --- | REV 0 | ECN 01-067 | DATE 27FEB01 | SH. 1 OF 1

SPECIFICATIONS	
RESISTANCE:	45 Ohms
CONTINUOUS POWER:	420 Watts
MAXIMUM VOLTAGE:	425 VDC
MAXIMUM PULSE CURRENT:	9.5 A
MAXIMUM RMS CURRENT:	3.1 A
DUTY CYCLE	15%

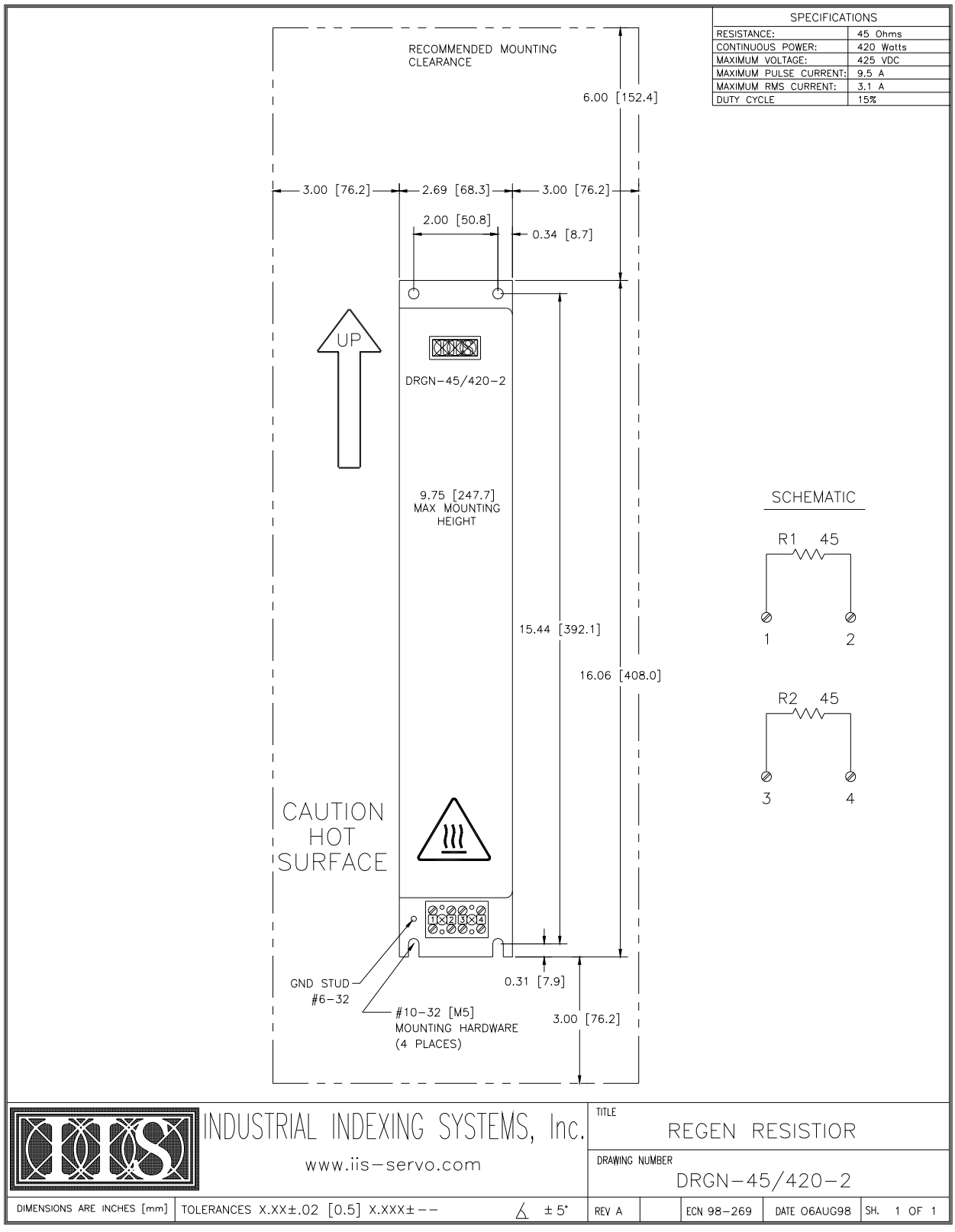


INDUSTRIAL INDEXING SYSTEMS, Inc.
www.iis-servo.com

TITLE: REGEN RESISTIOR

DRAWING NUMBER: DRGN-45/420

DIMENSIONS ARE INCHES [mm]	TOLERANCES X.XX±.02 [0.5] X.XXX±-- ∠ ±5°	REV B		ECN 96-269	DATE 6/25/96	SH. 1 OF 1


SPECIFICATIONS
RESISTANCE: 45 Ohms
CONTINUOUS POWER: 420 Watts
MAXIMUM VOLTAGE: 425 VDC
MAXIMUM PULSE CURRENT: 9.5 A
MAXIMUM RMS CURRENT: 3.1 A
DUTY CYCLE 15%
RECOMMENDED MOUNTING CLEARANCE
6.00 [152.4]
3.00 [76.2]
2.69 [68.3]
3.00 [76.2]
2.00 [50.8]
0.34 [8.7]
UP
DRGN-45/420-2
9.75 [247.7] MAX MOUNTING HEIGHT
15.44 [392.1]
16.06 [408.0]
CAUTION HOT SURFACE
GND STUD #6-32
#10-32 [M5] MOUNTING HARDWARE (4 PLACES)
0.31 [7.9]
3.00 [76.2]
SCHEMATIC
R1 45
1
2
R2 45
3
4
INDUSTRIAL INDEXING SYSTEMS, Inc.
www.iis-servo.com
TITLE
REGEN RESISTIOR
DRAWING NUMBER
DRGN-45/420-2
DIMENSIONS ARE INCHES [mm]
TOLERANCES X.XX±.02 [0.5] X.XXX±--
∠ ±5°
REV A
ECN 98-269
DATE 06AUG98
SH. 1 OF 1

SECTION 6 - SYSTEM PARAMETER IDNs

6.1 IDN LIST IN NUMERICAL ORDER

IDN	NAME (16 BIT DATA REGISTERS)
0001	Firmware SFO Number
0002	Firmware SFO Revision
0003	Communication Error Counter
0004	Drive Identification Number
0005	Drive Application Configuration Number
0006	DC Bus Voltage
0007	Drive On Delay Time
0008	Drive Off Delay Time
0009	Master Control Word
0010	Drive Status Word
0011	Torque Command Value
0012	Torque Feedback Value
0013	Position Loop Integral Action Time
0014	Velocity Loop Integral Action Time
0015	Current Loop Integral Action Time 1
0016	Current Loop Integral Action Time 2
0017	Position Loop Differential Time
0018	Velocity Loop Differential Time
0019	Positive Torque Limit
0020	Negative Torque Limit
0021	Motor Poles
0022	PWM Frequency
0023	Motor Code
0024	Motor Feedback Configuration
0025	Encoder Line Count
0026	Position Loop Kv Factor
0027	Motor Phase Angle
0028	Current Command Filter Rejection Frequency
0029	Current Command Filter Bandwidth
0030	Velocity Command Low Pass Filter Frequency
0031	Velocity Feedback Low Pass Filter Frequency
0032	Analog Input Velocity Scaling
0033	Digital Outputs 1
0034	Digital Outputs 2
0035	Analog Input 1
0036	Digital Inputs 1
0037	Digital Inputs 2
0038	Drive Fault Bitmap 1
0039	Drive Fault Bitmap 2
0040	Drive Fault Bitmap 3
0041	Drive Fault Bitmap 4
0042	Drive Fault Bitmap 5
0043	Drive Fault Bitmap 6
0044	Drive Fault Bitmap 7
0045	Drive Fault Bitmap 8
0046	Motor Velocity Command (RPMs)
0047	Motor Velocity Feedback (RPMs)
0048	Optional Communication Card Configuration Number
0049	Save Application Parameters To Flash
0050	Sampling – Interval
0051	Sampling - Number of Points To Sample

IDN	NAME (16 BIT DATA REGISTERS)
0052	Sampling – Actual Number of Points Sampled
0053	Sampling – Control
0054	Sampling – Pointe Sampled
0055	Sampling – Mark
0056	Sampling – Index
0057	Nominal Current Scaling Value
0058	Alignment Current Percent
0059	Observer Frequency
0060	Encoder Cable Type
0061	Z-Marker Commutation Enable
0062	Analog Output Type
0063	Analog Output Scale
0064	Analog Output Offset
0065	Analog Output Mode
0066	Analog Output Slew Rate
0067	Measurement Units
0068	Hall Phase Offset
1001 - 2000	Sampling Buffer Channel 1
2001 - 3000	Sampling Buffer Channel 2

IDN	NAME (32 BIT DATA REGISTERS)
0101	Position Command Value
0103	Position Feedback Value (Motor Feedback)
0105	Velocity Command Value
0107	Velocity Feedback Value
0109	Probe Trap Value
0111	Marker Trap Value
0113	Following Distance
0115	Monitoring Window
0117	Velocity Feed Forward Gain
0119	Acceleration Feed Forward Gain
0121	Bipolar Velocity Limit Value
0123	Bipolar Acceleration Limit Value
0125	Velocity Loop Proportional Gain
0127	Current Loop Proportional Gain 1
0129	Current Loop Proportional Gain 2
0131	Motor Peak Current
0133	Motor Rated Current
0135	Amplifier Peak Current
0137	Amplifier Rated Current
0139	Maximum Motor Speed
0141	Motor Rated Speed
0143	Motor Current Command (Amps)
0145	Motor Current Feedback (Amps)
0147	Sampling - Trigger Level
0149	Observer Dampening Gain

	NAME (16 BIT FACTORY REGISTERS)
9000	Password
9001	DC Bus Calibration Offset
9002	U Current Sensor Calibration Offset
9003	V Current Sensor Calibration Offset
9004	W Current Sensor Calibration Offset
9005	Analog Input Calibration Offset
9006	DC Bus Calibration Gain
9007	Analog Input Calibration Gain
9008	U Current Sensor
9009	V Current Sensor
9010	W Current Sensor
9011	Set Drive ID Number
9012	Boot Loader SFO Number
9013	Boot Loader SFO Revision
9014	A Current Sensor Calibration Offset
9015	B Current Sensor Calibration Offset
9016	C Current Sensor Calibration Offset
9017	D Current Sensor Calibration Offset
9018	A Current Sensor
9019	B Current Sensor
9020	C Current Sensor
9021	D Current Sensor
9022	Current Calibration Procedure

IDN	NAME (32 BIT FACTORY REGISTERS)
9101	U Current Sensor Calibration Gain
9103	V Current Sensor Calibration Gain
9105	W Current Sensor Calibration Gain
9107	A Current Sensor Calibration Gain
9109	B Current Sensor Calibration Gain
9111	C Current Sensor Calibration Gain
9113	D Current Sensor Calibration Gain

6.2 IDN DESCRIPTION - DATA REGISTORS for STANDARD PARAMETERS

0001: FIRMWARE SFO NUMBER

This parameter represents the software number (SFO) of the drive firmware.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 65535	1	No	-

0002: FIRMWARE SFO REVISION

This parameter represents the revision of the Firmware SFO Number (IDN 0001). If the revision returns a value with the most significant bit set (value > 32767) then the version of the software is an unreleased factory test version.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 32767	1	No	-

0003: COMMUNICATION ERROR COUNTER

This parameter is only valid when the LDCA-001 option card (See IDN 0005) is installed on the drive. Once communication is established, the communication error counter counts all of the invalid cyclic Master data transfer packets. In the case where more than 2 consecutive data packets are invalid, only the first two errors are counted and the drive reset its communications and waits for the Master to re-establish communications. The communication error counter counts up to a maximum of 65535. This means that if a value of 65535 is set in the counter, there may have been a noisy transmission over a long period of time. This value can be written back to zero or any other value by the controller.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 65535	1	Yes	0

0004: DRIVE IDENTIFICATION NUMBER

This parameter returns the hardware version of the drive.

ID NUMBER	DESCRIPTION
0:	UNDEFINED
1:	LD-330 (3.3 Amp)
2:	LD-500 (5.0 Amp)
3:	LD-??? (Custom)
4:	LD-101 (10.0 Amp)
5:	Reserved
6:	Reserved
7:	Reserved

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 7	1	No	Factory Set

0005: DRIVE APPLICATION CONFIGURATION NUMBER

This parameter returns the version number of the installed option card. NOTE: If this parameter is changed then the Defaults for all parameters are loaded and saved to Flash. All previous configuration parameters will be lost.

ID NUMBER	DESCRIPTION
0:	No Application Configured
1:	Analog Drive
2:	Luminary Multi Axis Digital Network Interface (Requires LDCA-002 Option Card – See IDN 0048)

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 2	1	Yes	0

0006: DC BUS VOLTAGE

The drive's DC (intermediate) bus voltage value is placed in this parameter.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 600	1 volt	No	-

0007: DRIVE ON DELAY TIME

After torque is activated "drive on delay time" is started. The drive follows the command values after the "drive on delay time" has elapsed.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 65535	1 ms	Yes	0

0008: DRIVE OFF DELAY TIME

When drive is disabled and Command Speed of 0 is reached, the torque remains activated in the drive until this waiting time is elapsed. This will give the application time to set a brake or some other output while torque is still applied to the load.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 65535	1 ms	Yes	0

0009: MASTER CONTROL WORD

This parameter allows the reading of the master control word form the drive.

BIT NUMBER	DESCRIPTION
Bit 0:	SVC_SM_ACK
Bit 1:	SVC_MS_HS
Bit 2:	Reserved
Bit 3:	Reserved
Bit 4:	Reserved
Bit 5:	Reserved
Bit 6:	AXIS ID 0
Bit 7:	AXIS ID 1
Bit 8:	OPMODE 0
Bit 9:	OPMODE 1
Bit 10:	OPMODE 2
Bit 11:	ARM PROBE TRAP
Bit 12:	ARM MARKER TRAP
Bit 13:	CLEAR FAULT
Bit 14:	DRIVE RUN
Bit 15:	DRIVE ENABLE

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes	-	-	No	-

0010: DRIVE STATUS WORD

This parameter allows the reading of the master control word form the drive.

BIT NUMBER	DESCRIPTION
Bit 0:	SVC_SM_HS
Bit 1:	SVC_MS_ACK
Bit 2:	Reserved
Bit 3:	Reserved
Bit 4:	DEVICE_TYPE
Bit 5:	DEVICE_TYPE
Bit 6:	DEVICE_TYPE
Bit 7:	Reserved
Bit 8:	OPMODE 0
Bit 9:	OPMODE 1
Bit 10:	OPMODE 2
Bit 11:	PROBE TRAP EXECUTED
Bit 12:	MARKER TRAP EXECUTED
Bit 13:	CLEAR FAULT
Bit 14:	DRIVE RUNNING
Bit 15:	DRIVE ENABLED

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes	-	-	No	-

0011: TORQUE COMMAND VALUE

During the torque control operation mode of the drive, torque command values are transferred from the control unit to the drive. This IDN is scaled as a percentage of the drive or motor's peak torque, whichever is less.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	-100.00 - +100.00	0.01%	No	-

0012: TORQUE FEEDBACK VALUE

The torque feedback value is transferred from the drive to the control unit. This IDN is scaled as a percentage of the drive or peak torque of motor, whichever is less.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	-100.00 - +100.00	0.01%	No	-

0013: POSITION LOOP INTEGRAL ACTION TIME

Sets the integral time constant for the position loop controller.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0.0 - 6553.5	0.1 msec	Yes	0.0

0014: VELOCITY LOOP INTEGRAL ACTION TIME

Sets the integral time constant for the velocity loop controller.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0.0 - 6553.5	0.1 msec	Yes	0.0

0015: CURRENT LOOP INTEGRAL ACTION TIME 1

Sets the integral time constant for the torque/force-producing current loop.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 65535	1 μsec	Yes	0

0016: CURRENT LOOP INTEGRAL ACTION TIME 2

Sets the integral time constant for the flux-producing current loop.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 65535	1 μsec	Yes	0

0017: POSITION LOOP DIFFERENTIAL TIME

Sets the derivative time for the position loop controller.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0.0 - 6553.5	0.1 msec	Yes	0

0018: VELOCITY LOOP DIFFERENTIAL TIME

Sets the derivative time for the velocity loop controller.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0.0 - 6553.5	0.1 msec	Yes	0.0

0019: POSITIVE TORQUE LIMIT

The positive torque limit value limits the maximum torque in the positive direction.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	0.00 - 100.00	0.01%	Yes	100.00

0020: NEGATIVE TORQUE LIMIT

The negative torque limit value limits the maximum torque in the negative direction.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	0.00 – -100.00	0.01%	Yes	-100.00

0021: MOTOR POLES

This parameter sets the number of motor magnetic poles.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	2 - 12		Yes	4

0022: PWM FREQUENCY

Sets the PWM switching frequency for the motor and the general purpose PWM output.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	8 or 16	kHz	Yes	16

0023: MOTOR CODE

This parameter is used to store a unique code the motor that can be read back at run time.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 65535		Yes	0

0024: MOTOR FEEDBACK CONFIGURATION

This parameter is used to change the direction of the motor feedback.

Bit supported by drive:

BIT NUMBER	DESCRIPTION
Bit 0:	Reserved
Bit 1:	0 - Motor Feedback is inverted. 1 - Motor Feedback is not inverted.
Bit 2 - 15:	Reserved

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes	0 or 1		Yes	1

0025: ENCODER LINE COUNT

This parameter sets the encoder line counts per rev. The position value update is 4 times the line count. (Quadrature)

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 65535		Yes	2000

0026: POSITION LOOP K_V - FACTOR

The K_V-factor determines the gain of the position loop regulator throughout the entire velocity range.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0.0 - 6553.5	0.1 (rad/sec)/rad	Yes	30.0

0027: MOTOR PHASE ANGLE

This IDN returns the motor's phase angle used for commutation. This is a read only IDN for display purposes.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes		0.1 Degree	No	

0028: CURRENT COMMAND REJECTION FREQUENCY

This parameter sets rejection frequency for a notch filter on the current loop command value.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	50 - 950	1 Hz	Yes	900

0029: CURRENT COMMAND REJECTION BANDWIDTH

This parameter sets bandwidth for a notch filter on the current loop command value.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 500	1 Hz	Yes	0

0030: VELOCITY COMMAND LOW PASS FILTER FREQUENCY

This parameter sets corner frequency for a low pass filter on the velocity loop command value. A value of '0' disables the filter.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 1000	1 Hz	Yes	0

0031: VELOCITY FEEDBACK LOW PASS FILTER FREQUENCY

This parameter sets corner frequency for a low pass filter on the velocity loop feedback value. A value of '0' disables the filter.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 1000	1 Hz	Yes	0

0032: ANALOG INPUT VELOCITY SCALING

Set the Scaling of the analog input for Velocity mode operation on an analog drive configuration.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0.00 - 10.00	0.01 Volts per 1000 RPM	Yes	0

0033: DIGITAL OUTPUTS 1

The state of the digital outputs 1 -16 can be read via this parameter. Bits Supported:

BIT NUMBER	DESCRIPTION
Bit 0:	Output 1
Bit 1:	Output 2
Bit 2:	Reserved
Bit 3:	Reserved
Bit 4:	Reserved
Bit 5:	Reserved
Bit 6:	Reserved
Bit 7:	Reserved
Bit 8:	Reserved
Bit 9:	Reserved
Bit 10:	Reserved
Bit 11:	Reserved
Bit 12:	Reserved
Bit 13:	Reserved
Bit 14:	Reserved
Bit 15:	Reserved

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes	0 - 65535		No	0

0034: DIGITAL OUTPUTS 2

The state of the digital outputs 17 -32 can be read via this parameter. Bits Supported:

BIT NUMBER	DESCRIPTION
Bit 0:	Reserved
Bit 1:	Reserved
Bit 2:	Reserved
Bit 3:	Reserved
Bit 4:	Reserved
Bit 5:	Reserved
Bit 6:	Reserved
Bit 7:	Reserved
Bit 8:	Reserved
Bit 9:	Reserved
Bit 10:	Reserved
Bit 11:	Reserved
Bit 12:	Reserved
Bit 13:	Reserved
Bit 14:	Reserved
Bit 15:	Reserved

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes	0 - 65535		No	0

0035: ANALOG INPUT 1

Read the counts from the Analog Input 1.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	-32767 - +32767	32768 Bits = 10.0 volts	No	-

0036: DIGITAL INPUTS 1

Reads the state of the Digital Inputs 1 - 16. Bit supported by drive:

BIT NUMBER	DESCRIPTION
Bit 0:	Input 1
Bit 1:	Input 2
Bit 2:	Input 3
Bit 3:	Input 4
Bit 4:	Reserved
Bit 5:	Reserved
Bit 6:	Reserved
Bit 7:	Reserved
Bit 8:	Reserved
Bit 9:	Reserved
Bit 10:	Reserved
Bit 11:	Reserved
Bit 12:	Reserved
Bit 13:	Reserved
Bit 14:	Reserved
Bit 15:	Reserved

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes			No	

0037: DIGITAL INPUTS 2

Reads the state of the Digital Inputs 17 - 32. Bit supported by drive:

BIT NUMBER	DESCRIPTION
Bit 0:	Reserved
Bit 1:	Reserved
Bit 2:	Reserved
Bit 3:	Reserved
Bit 4:	Reserved
Bit 5:	Reserved
Bit 6:	Reserved
Bit 7:	Reserved
Bit 8:	Reserved
Bit 9:	Reserved
Bit 10:	Reserved
Bit 11:	Reserved
Bit 12:	Reserved
Bit 13:	Reserved
Bit 14:	Reserved
Bit 15:	Reserved

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes	-		No	-

0038: DRIVE FAULT BITMAP 1

Returns a status bitmap of Faults 0 - 15. Some bits are reserved so see **Section 8** for a list of fault codes and their descriptions.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes	-	-	No	-

0039: DRIVE FAULT BITMAP 2

Returns a status bitmap of Faults 16 - 31. Some bits are reserved so see **Section 8** for a list of fault codes and their descriptions.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes	-	-	No	-

0040: DRIVE FAULT BITMAP 3

Returns a status bitmap of faults 32 - 47. Some bits are reserved so see **Section 8** for a list of fault codes and their descriptions.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes	-	-	No	-

0041: DRIVE FAULT BITMAP 4

Returns a status bitmap of faults 48 - 63. Some bits are reserved so see **Section 8** for a list of fault codes and their descriptions.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes	-	-	No	-

0042: DRIVE FAULT BITMAP 5

Returns a status bitmap of faults 64 - 79. Some bits are reserved so see **Section 8** for a list of fault codes and their descriptions.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes	-	-	No	-

0043: DRIVE FAULT BITMAP 6

Returns a status bitmap of faults 80 - 96. Some bits are reserved so see **Section 8** for a list of fault codes and their descriptions.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes	-	-	No	-

0044: DRIVE FAULT BITMAP 7

Returns a status bitmap of faults 97 - 111. Some bits are reserved so see **Section 8** for a list of fault codes and their descriptions.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes	-	-	No	-

0045: DRIVE FAULT BITMAP 8

Returns a status bitmap of faults 112 - 127. Some bits are reserved so see **Section 8** for a list of fault codes and their descriptions.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Binary	2 bytes	-	-	No	-

0046: MOTOR VELOCITY COMMAND (RPMs)

.
This parameter returns the motor command velocity in RPMs.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	-6000 to + 6000	1 RPM	No	0

0047: MOTOR VELOCITY FEEDBACK (RPMs)

.
This parameter returns the motor feedback velocity in RPMs.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	-6000 to + 6000	1 RPM	No	0

This parameter returns the version number of the installed option card.

ID NUMBER	DESCRIPTION
0:	LDCA-002
1:	LDAA-001
2:	Reserved
3:	Reserved
4:	Reserved
5:	Reserved
6:	Reserved
7:	No Option Card

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 7	1	No	7

0049: SAVE APPLICATION PARAMETERS TO FLASH

When read this parameter returns the version number of the installed option card.
When written to table below lists the command.

ID NUMBER	DESCRIPTION
0:	Do Nothing
1:	Save Current Parameters To Flash
2:	Load and Save Default Parameters to Flash

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 2	1	Y**	0

**Note: Not executable if Drive is setup with a Luminary Multi-Axis Configuration (Application Number IDN 0005 = 2)

0050: SAMPLING - INTERVAL

Reserved for LDrive communication.

0051: SAMPLING - NUMBER OF POINTSTO SAMPLE

Reserved for LDrive communication.

0052: SAMPLING - ACTUAL NUMBER OF POINTS SAMPLED

Reserved for LDrive communication.

0053: SAMPLING - CONTROL

Reserved for LDrive communication.

0054: SAMPLING - POINTS SAMPLED

Reserved for LDrive communication.

0055: SAMPLING - MARK

Reserved for LDrive communication.

0056: SAMPLING - INDEX

Reserved for LDrive communication.

0057: NOMINAL CURRENT SCALING VALUE

Reserved, maybe doesn't exist.

The L Drive setup and configuration software for the PC uses the above parameters. Contact IIS sales to obtain the L Drive software and necessary options to use this software.

0058: ALIGNMENT CURRENT PERCENT

The percentage of maximum current used during the alignment phase of encoder commutation. **Note: this IDN is for the stepper.**

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	-32767 - 32767	0.1 %	Y	20

0059: OBSERVER FREQUENCY

Specifies the natural frequency of the observer. **Note: this IDN is for the stepper.**

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 65535	Hz	Y	2000

0060: ENCODER CABLE TYPE

Sets the type of cable used on the encoder. **Note: this IDN is for the stepper.**

ID NUMBER	DESCRIPTION
0:	Differential
1:	Single ended

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 1	-	Y	1

0061: Z-MARKER COMMUTATION ENABLE

Used to turn off the Z-marker from the encoder. **Note: this IDN is for the stepper.**

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 1	-	Y	1

0062: ANALOG OUTPUT TYPE

Determines the parameter the LDAA-001 option card outputs as an analog voltage.

ID NUMBER	DESCRIPTION
0:	Motor Speed
1:	Motor Torque

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 1	-	Y	-

0063: ANALOG OUTPUT SCALE

Determines the unit scaling for the analog output of the LDAA-001 option card. Note: Units are dependent on IDN 0062.

IDN 0062	DESCRIPTION	Units
0:	Motor Speed	V/100 RPM
1:	Motor Torque	V/Amp

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	-32768 - 32767	0.001 V/unit	Y	-

0064: ANALOG OUTPUT OFFSET

Determines the voltage zero offset for the analog output of the LDAA-001 option card.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	-10000 - 10000	0.001 V	Y	-

0065: ANALOG OUTPUT MODE

Determines the mode of operation for the analog output of the LDAA-001 option card.

ID NUMBER	DESCRIPTION
0:	Bipolar ± 10V
1:	Unipolar 0 to 10V (Absolute Value)

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 1	-	Y	-

0066: ANALOG OUTPUT SLEW RATE

Determines the slew rate for the analog output of the LDAA-001 option card. The minimum value is 0.001 V/ms and the maximum value is 20V/ms V/Unit.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	1 - 20000	0.001 V/ms	Y	-

0067: SET CUSTOM MEASUREMENT DISPLAY UNITS

Sets a *custom display interface* to show either metric or imperial units in a special operation mode. 0 is for metric and 1 is for imperial. *[customer specific idn, does not effect drive performance]*

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 1	-	Yes	1

0068: HALL PHASE OFFSET

Adds a forward shift to the angle used for encoder commutation. It effectively moves a point from where the motor hall channels were observed. Used in different zeroing procedures. (Ref. PIB-120002)

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 32767	32768bits = 1 Revolution	Yes	-

0069: COMMUNICATIONS WATCHDOG TIMEOUT

When the drive is in Mode 6, if the watchdog counter goes over this value, the drive will fault for a watchdog timeout error. Setting a value of 0 to this IDN disables the watchdog timeout feature.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 65535	1 bit = 1ms	Yes	3000

0070: COMMUNICATIONS WATCHDOG COUNTER

When the drive is in Mode 6, write a value of 0 to this IDN to kick the watchdog. Reading this IDN will return the current value of the counter. If this IDN counts over the value set in IDN 0068, the drive will fault for a watchdog timeout.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 1	1 bit = 1ms	Yes	-

0071: OUTPUT INVERSION

Invert the state of the digital output. Example: a value of 1 will invert the state of Digital output 1.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 65535	1 bit	Yes	0

0072: AVERAGE CYCLES

Sets number of average cycles used to calculate the value of IDN 0151. A value of 1 will disable the averaging feature.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	1 - 256	1 bit = 0.25ms	Yes	1

0073: VELOCITY COMMAND SOURCE

Selects command source for motor velocity in Mode 6. A value of 0 selects IDN 0046 as the source, a value of 1 selects IDN 0153 as the source.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 – 1	-	Yes	0

0101: POSITION COMMAND VALUE

During the position control drive operation mode, the position command values are transferred from the control unit to the drive according to the time pattern of the control unit cycle.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes	-2^{31} - $+2^{31}$ - 1	1 bit	No	-

0103: POSITION FEEDBACK VALUE

The position feedback value 1 is transferred from the drive to the control unit.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes	-2^{31} - $+2^{31}$ - 1	1 bit	No	-

0105: VELOCITY COMMAND VALUE

In the velocity control-operating mode in the drive, the control unit transfers the velocity command values to the drive.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes	-32768 - +32768	32768bits = 6000RPM	No -	

0107: VELOCITY FEEDBACK VALUE

The velocity feedback value is transferred from the drive to the control unit in order to allow the control unit to periodically display the velocity.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes	-32768 - +32768	32768bits = 6000RPM	No -	

0109: PROBE TRAP VALUE

Based on the configure Probe Feedback Source (IDN 33200) the drive stores position feedback value in the measuring cycle in this parameter following the positive edge of the input signal of probe 1 (see **IDN 00401**). This allows the control unit to read 'probe value 1 positive edge' at a later time.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes	-2^{31} - $+2^{31}$ - 1	1 bit	No	-

0111: MARKER TRAP VALUE

Based on the configured Probe Feedback Source (IDN 33200) the drive stores position feedback value in the measuring cycle in this parameter following the positive edge of the input signal of probe 2 (see **IDN 00402**). This allows the control unit to read 'probe value 2 positive edge' at a later time.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes	-2^{31} - $+2^{31}$ - 1	1 bit	No	-

0113: FOLLOWING DISTANCE

The drive uses the operation data of this IDN to store the distance between position command value and the position feedback value.

Following Distance = Position Command Value - Position Feedback Value

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes	-2^{31} - $+2^{31}$ - 1	1 bit	No	-

0115: MAX FOLLOWING DISTANCE

Sets the Max Absolute Limit the Following Distance can be before the drive faults. The drive will fault with an **FAULT CODE 70** (Following Error) if this limit is exceeded.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	4 bytes	0-$+2^{31}$ - 1		Yes	-2^{31} - 1

0117: VELOCITY FEED FORWARD GAIN

Velocity feed forward serves to reduce the velocity-dependent following error.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes	0.0 - 200.0	0.1%	Yes	0.0

0119: ACCELERATION FEED FORWARD GAIN

Acceleration feed forward serves to reduce acceleration / deceleration-dependent following error.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	4 bytes	0.0 - 6553.5	0.1 ($mAsec^2$/rad)	Phases 2, 3 and 4	0.0

0121: BIPOLAR VELOCITY LIMIT VALUE

The bipolar velocity limit value describes the maximum allowable velocity in both directions. If the velocity limit value is exceeded, the drive responds by setting the status '$n_{command} > n_{limit}$' in C3D (IDN 00013).

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes	0 - 32768	32768 bits = 6000 RPM	Phases 2, 3 and 4	32768

0123: BIPOLAR ACCELERATION LIMIT VALUE

The bipolar acceleration parameter limits the maximum acceleration ability of the drive symmetrically to the programmed value in both directions.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	4 bytes	0 - 25000.000	rad/sec/sec	Yes	25000.000

0125: VELOCITY LOOP PROPORTIONAL GAIN

Sets the proportional gain for the velocity loop controller.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	4 bytes	0.000 - 65.535	0.001 Amp/(rad/sec)	Yes	0.400

0127: CURRENT LOOP PROPORTIONAL GAIN 1

Sets the proportional gain for the torque/force-producing current loop.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	4 bytes	0.000 - 100.000	0.001 V/A	Yes	0.0

0129: CURRENT LOOP PROPORTIONAL GAIN 2

Sets the proportional gain for the flux-producing current loop.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	4 bytes	0.000 - 100.000	0.001 V/A	Yes	0.000

0131: MOTOR PEAK CURRENT

If the motor peak current is less than that of the amplifier, the amplifier is automatically limited to the level of the motor peak current. The setting range for this IDN is dependant on drive size and PWM frequency.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	4 bytes	See table above	0.001 A	Yes	0.000

0133: MOTOR RATED CURRENT

The motor rated current is the current at which the motor produces the rated torque according to the motor spec sheet. The setting range for this IDN is dependant on drive size and PWM frequency.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	4 bytes	See table above	0.001 A	Yes	0

0135: AMPLIFIER PEAK CURRENT

The amplifier peak current is limited by the hardware, which means that the current for the maximum attainable torque limit value is fixed as well. This value is dependent on drive size and PWM frequency.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	4 bytes		0.001 A peak	No	Depends on drive size

0137: AMPLIFIER RATED CURRENT

The amplifier rated current is equal to the allowable continuous current of the drive unit. This value is dependent on drive size and PWM frequency.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	4 bytes		0.001 A peak	No	Depends on drive size

0139: MAXIMUM MOTOR SPEED

The maximum motor speed is listed in the motor spec sheet provided by the manufacturer.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	4 bytes	0.0000 - 6000.0000	0.0001 RPM	Yes	0.0000

0141: MOTOR RATED SPEED

The rated motor speed is listed in the motor spec sheet provided by the manufacturer.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	4 bytes	0.0000 - 6000.0000	0.0001 RPM	Yes	0

0143: MOTOR CURRENT COMMAND (AMPS)

This parameter returns the motor command current in AMPs.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes	0 to +/- Max Drive Current	0.001 Amps	No	-

0145: MOTOR CURRENT FEEDBACK (AMPS)

This parameter returns the motor feedback current in AMPs.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes	0 to +/- Max Drive Current	0.001 Amps	No	-

0149: OBSERVER DAMPENING GAIN

This IDN modifies the response of the angle-tracking observer used for the position control. The smaller the value, the higher the peak overshoot of the estimated rotor angle but too small of a value will lead to long setting time. A value of 0.84 is recommended. Note this IDN is only for the stepper.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes	0 - 65535	0.001 Yes		0.84

0151: HIGH PRECISION MOTOR VELOCITY FEEDBACK (RPMs)

This parameter returns the motor feedback velocity in RPMs, averaged by the number of cycles defined by IDN 0072.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes	-6000.0 - 6000.0	0.1 RPM	NO	-

0153: HIGH PRECISION MOTOR VELOCITY COMMAND (RPMs)

This parameter sets the motor command velocity in RPMs when the drive is in Mode 6 and IDN 0073 = 1.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes	-6000.0 - 6000.0	0.1 RPM	YES	-

6.3 FACTORY - DRIVE CONFIGURATION REGISTERS

9000: PASSWORD

This IDN is used to enter a password to unlock factory configuration parameters.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 65535	None Yes		0

9001: DC BUS CALIBRATION OFFSET

This IDN is used to set a calibration offset for the DC Bus Voltage measurement. This IDN is write-protected until IDN 9000 Password is Set.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	-5000 to +5000	None	With Password	Factory set

9002: U CURRENT SENSOR CALIBRATION OFFSET

This IDN is used to set a calibration offset for the U leg current sensor. This IDN is write-protected until IDN 9000 Password is Set.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	-5000 to +5000	None	With Password	Factory set

9003: V CURRENT SENSOR CALIBRATION OFFSET

This IDN is used to set a calibration offset for the V leg current sensor. This IDN is write-protected until IDN 9000 Password is Set.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	-5000 to +5000	None	With Password	Factory Set

9004: W CURRENT SENSOR CALIBRATION OFFSET

This IDN is used to set a calibration offset for the W leg current sensor. This IDN is write-protected until IDN 9000 Password is Set.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	-5000 to +5000	None	With Password	Factory set

9005: ANALOG INPUT CALIBRATION OFFSET

This IDN is used to set a calibration offset for the Analog Input. This IDN is write-protected until IDN 9000 Password is Set.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	-5000 to +5000	1	With Password	Factory set

9006: DC BUS CALIBRATION GAIN

This IDN is used to set a calibration gain for the DC Bus Voltage measurement. This IDN is write-protected until IDN 9000 Password is Set.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 65535	1	With Password	Factory set

9007: ANALOG INPUT CALIBRATION GAIN

This IDN is used to set a calibration gain for the Analog Input. This IDN is write-protected until IDN 9000 Password is Set.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 65535	1	With Password	Factory set

9008: U CURRENT SENSOR

This IDN returns the current sensed by the U leg current sensor. The only scaling done on this value is the Calibration Gain and Offset.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	-32767 - 32767	1 No		-

9009: V CURRENT SENSOR

This IDN returns the current sensed by the V leg current sensor. The only scaling done on this value is the Calibration Gain and Offset.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	-32767 - 32767	1 No		-

9010: W CURRENT SENSOR

This IDN returns the current sensed by the W leg current sensor. The only scaling done on this value is the Calibration Gain and Offset.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	-32767 - 32767	1 No		-

9011: SET DRIVE IDENTIFICATION NUMBER

This parameter allows for the factory setting of the drive identification number. See parameter 0004 definition. This IDN is write-protected until IDN 9000 Password is Set.

9012: BOOTLOADER SFO NUMBER

This parameter represents the software number of the drive firmware boot loader.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 65535	1	No	-

9013: BOOTLOADER SFO REVISION

This parameter represents the revision of the software number (IDN 9012) of the drive firmware boot loader. If the revision returns a value with the most significant bit set (value > 32767), then the version of the software is an unreleased factory test version.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 32767	1	No	-

9014: A CURRENT SENSOR CALIBRATION OFFSET

This IDN is used to set a calibration offset for the A leg current sensor. This IDN is write-protected until IDN 9000 Password is Set. **Note: this IDN is for the stepper.**

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	-5000 - +5000	None	With Password	Factory Set

9015: B CURRENT SENSOR CALIBRATION OFFSET

This IDN is used to set a calibration offset for the B leg current sensor. This IDN is write-protected until IDN 9000 Password is Set. **Note: this IDN is for the stepper.**

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	-5000 - +5000	None	With Password	Factory Set

9016: C CURRENT SENSOR CALIBRATION OFFSET

This IDN is used to set a calibration offset for the C leg current sensor. This IDN is write-protected until IDN 9000 Password is Set. **Note: this IDN is for the stepper.**

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	-5000 - +5000	None	With Password	Factory Set

9017: D CURRENT SENSOR CALIBRATION OFFSET

This IDN is used to set a calibration offset for the D leg current sensor. This IDN is write-protected until IDN 9000 Password is Set. **Note: this IDN is for the stepper.**

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	-5000 - +5000	None	With Password	Factory Set

9018: A CURRENT SENSOR

This IDN returns the current sensed by the A leg current sensor. The only scaling done on this value is the Calibration Gain and Offset. **Note: this IDN is for the stepper.**

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	-32767 - +32767	1 No		-

9019: B CURRENT SENSOR

This IDN returns the current sensed by the B leg current sensor. The only scaling done on this value is the Calibration Gain and Offset. **Note: this IDN is for the stepper.**

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	-32767 - +32767	1 No		-

9020: C CURRENT SENSOR

This IDN returns the current sensed by the C leg current sensor. The only scaling done on this value is the Calibration Gain and Offset. **Note: this IDN is for the stepper.**

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	-32767 - +32767	1 No		-

9021: D CURRENT SENSOR

This IDN returns the current sensed by the D leg current sensor. The only scaling done on this value is the Calibration Gain and Offset. **Note: this IDN is for the stepper.**

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	2 bytes	-32767 - +32767	1 No		-

9022: CURRENT CALIBRATION PROCEDURE

This IDN is used for the auto-calibration of the servo drive. Writing a 1 will initialize the auto-calibration procedure. This IDN is write-protected until IDN 9000 Password is Set. **Note: this IDN is for the stepper.**

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Unsigned Decimal	2 bytes	0 - 1	-	With Password	-

9101: U CURRENT SENSOR CALIBRATION GAIN

This IDN is used to set a calibration gain for the U leg current sensor. This IDN is write-protected until IDN 9000 Password is Set.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes	-2^{31} - $+2^{31}-1$	None	With Password	Factory set

9103: V CURRENT SENSOR CALIBRATION GAIN

This IDN is used to set a calibration gain for the V leg current sensor. This IDN is write-protected until IDN 9000 Password is Set.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes	-2^{31} - $+2^{31}-1$	None	With Password	Factory set

9105: W CURRENT SENSOR CALIBRATION GAIN

This IDN is used to set a calibration gain for the W leg current sensor. This IDN is write-protected until IDN 9000 Password is Set.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes	-2^{31} - $+2^{31}-1$	None	With Password	Factory set

9107: A CURRENT SENSOR CALIBRATION GAIN

This IDN is used to set a calibration gain for the A leg current sensor. This IDN is write-protected until IDN 9000 Password is Set.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes	-2^{31} - $+2^{31}-1$	None	With Password	Factory set

9109: B CURRENT SENSOR CALIBRATION GAIN

This IDN is used to set a calibration gain for the B leg current sensor. This IDN is write-protected until IDN 9000 Password is Set.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes	-2^{31} - $+2^{31}-1$	None	With Password	Factory set

9111: C CURRENT SENSOR CALIBRATION GAIN

This IDN is used to set a calibration gain for the C leg current sensor. This IDN is write-protected until IDN 9000 Password is Set.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes	-2^{31} - $+2^{31}-1$	None	With Password	Factory set

9113: D CURRENT SENSOR CALIBRATION GAIN

This IDN is used to set a calibration gain for the D leg current sensor. This IDN is write-protected until IDN 9000 Password is Set.

IDN TYPE	DATA TYPE	DATA LENGTH	RANGE	SCALING/ RESOLUTION	WRITE ACCESS	DEFAULT
Operation Data	Signed Decimal	4 bytes	-2^{31} - $+2^{31}-1$	None	With Password	Factory set

SECTION 7 - IO

This section details the IO wiring and usage for the Luminary drivers. **Figure 5.1** shows the required interconnect to all system components.

7.1 DIGITAL INPUTS

There are four inputs available on the Luminary Drive. If the drive is setup as a stand-alone analog drive then the IO is predefined as shown in **Figure 7.1**. Other definitions of inputs in stand-alone mode may be custom defined with special firmware programming, contact IIS factory for details. In **Figure 7.2**, the definition shows the inputs for a multi-axis** configured drive, where inputs are defined with the motion control program developed using the EDE software.

Input definitions for Luminary drive in stand alone analog mode		
INPUT #	NAME	DESCRIPTION
1	ENABLE	When the input is on, the drive is enabled. Setting the input OFF, then back ON again will reset drive faults and re-enable the drive.
2	TORQUE / VELOCITY	When the input is OFF the drive is in VELOCITY mode, setting the input ON will put the drive in TORQUE mode. (Ref: **Section 8**)
3		No predefined function and is available for custom functions.
4		No predefined function and is available for custom functions.

Figure 7.1

Input definitions for Luminary drive in Multi-axis mode (requires use of LCMC-001 controller)		
INPUT #	NAME	DESCRIPTION
1		Generic Input
2		Generic Input
3		Generic Input
4	PROBE	Generic Input or a high-speed "trap the current motor position" input.

Figure 7.2

**Use the LDCA-001 option card to configure the drive as a network drive for multi-axis operations.

7.2 DIGITAL OUTPUTS

There a two outputs available on the Luminary drive. If the drive is configured as a stand-alone analog drive then the outputs are predefined as shown in **Figure 7.3**. Other definitions of these outputs in this mode may be loaded with custom firmware, contact IIS factory for details.

In **Figure 7.2**, the definition shows the inputs for a multi-axis** configured drive, where inputs are defined with the motion control program developed using the EDE software.

Output definitions for Luminary drive in stand alone analog mode		
OUTPUT #	NAME	DESCRIPTION
1	READY/FAULT	The output is ON when there is no fault on the drive, the output will turn OFF when the drive faults. On-board LEDs will flash the fault code. See section 8 for LED locations and fault codes.
2	---	No predefined function and is available for custom functions.

Figure 7.3

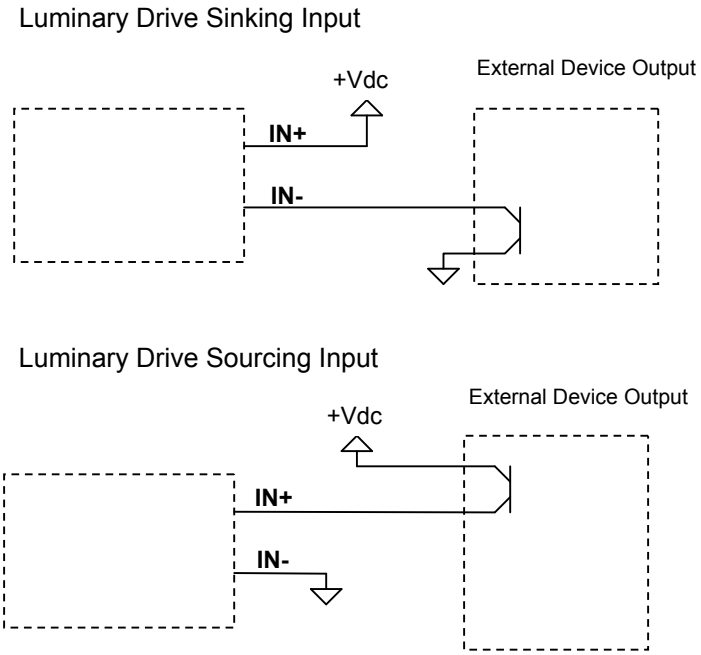
Output definitions for Luminary drive in Multi-axis mode (requires use of LCMC-001 controller)		
INPUT #	NAME	DESCRIPTION
1	---	Generic Output
2	---	Generic Output

Figure 7.4

7.3 I/O WIRING CONFIGURATIONS

Each input and output of the Luminary I/O can be wired as sinking or sourcing independently. See **Figure 7.5** for wiring descriptions. See **Section 4 and 5** for I/O electrical specifications.

DIGITAL INPUT WIRING



DIGITAL OUTPUT WIRING

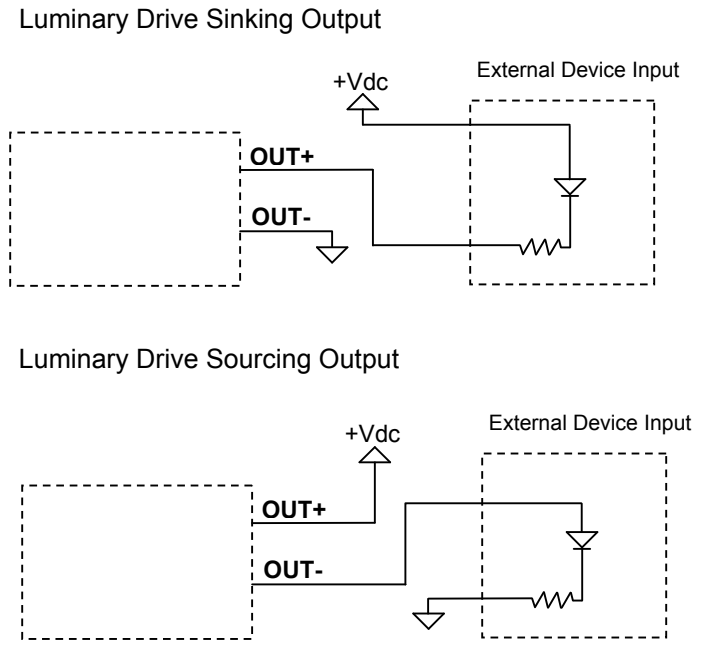
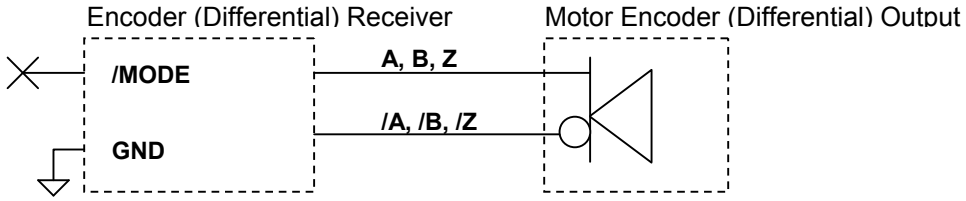


Figure 7.5

7.4 MOTOR ENCODER INPUT

The Motor Encoder input is designed to sense the state of A, B, Z, U, V, W tracks of the motor Encoder. These inputs are 5V logic and can be wired as differential or single ended. Each channel is to be connected as shown in **Figure 7.6**. Note that the MODE pin is tied to Encoder Ground to Enable the Single ended feature.

DIFFERENTIAL WIRING



SINGLE ENDED WIRING

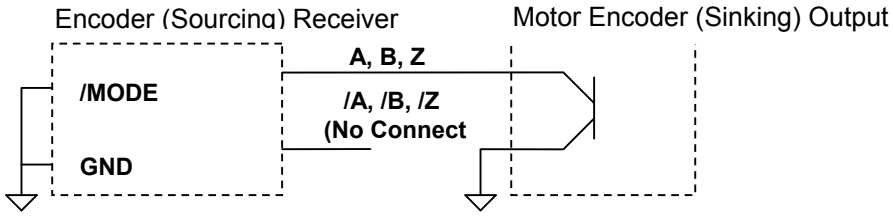


Figure 7.6

7.5 DRIVE ENCODER OUTPUT

The Encoder output is designed to repeat the state of A, B, and Z of the motor Encoder out to an external controller. These outputs are differential drivers of 5V only. Each channel is to be connected as shown in **Figure 7.7**.

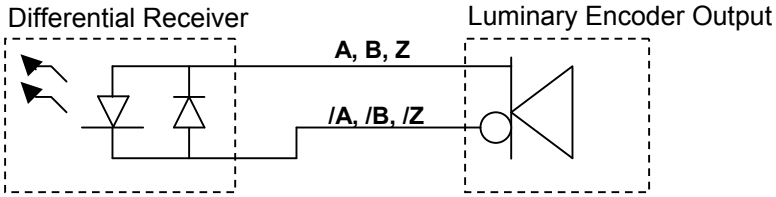


Figure 7.7

7.6 ANALOG INPUT

The Analog input is used to command torque or velocity when the drive is configured as stand alone analog mode. Digital input #2 is used to select either Velocity (in-active) or Torque Mode (active).

Note: When the drive is configured as a Multi-axis Drive, the analog becomes a generic analog input Controlled by the LMC-400 controller software.

The analog input is scaled using the Analog Input Velocity Scaling equation. The value is entered into the drive as parameter 0032 using L-Drive software on your PC, Scaling is calculated as follows.

7.6.1 VELOCITY MODE (STAND ALONE MODE):

Analog-Input-Velocity-Scaling-Value = (AV / (S / 1000RPM)) * 100

Where,

AV = Analog voltage at Maximum speed
S = Maximum Speed of the motor in RPM

Example A:
When the motor is to run at 3000RPM at a command voltage of 10.0V
Analog-Input-Velocity-Scaling = (10 / (3000 / 1000)) * 100 = 333

Example B:
When the motor is to run at 6000RPM at a command voltage of 5.0V
Analog-Input-Velocity-Scaling = (5 / (6000 / 1000)) * 100 = 83

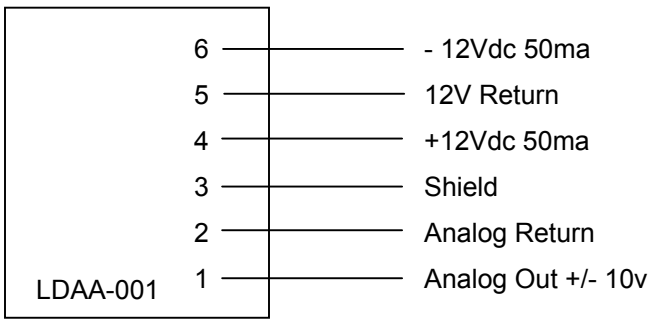
7.6.2 TORQUE MODE (STAND ALONE MODE):

Torque Mode is selected when digital input #2 is active. Torque produced at the motor shaft is directly proportional to the input voltage where 10 volt is 100% of the maximum torque on the motor. The sign of the input voltage controls torque direction.

7.7 ANALOG OUTPUT

Either velocity or torque can be monitored with the option card LDAA-001 installed on the LD drive by plugging it into the J2 connector. (**See Appendix C for installation details**.)

Interface connector pin call out:



SECTION 8 - STATUS INDICATORS AND FAULT CODES

8.1 DRIVE STATUS INDICATORS

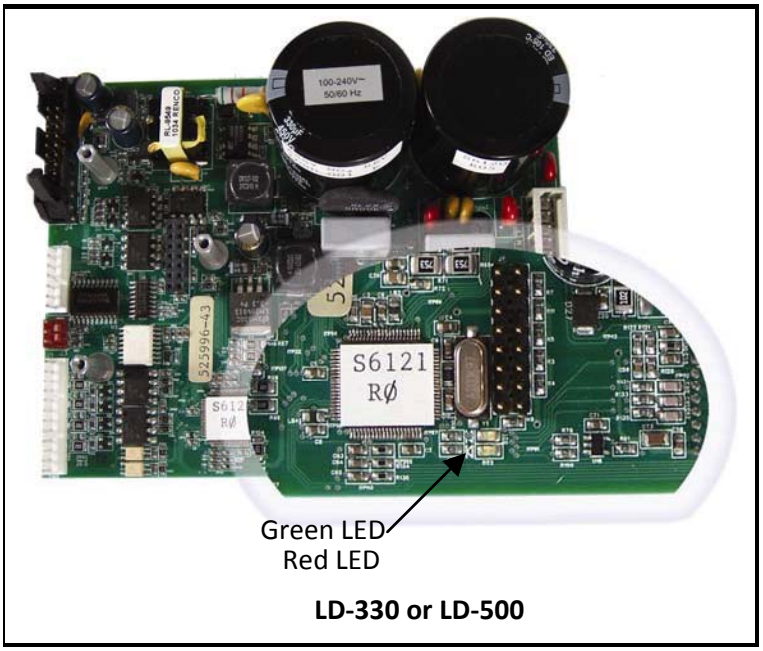


Figure 8.1- Servo Drive Status Indicator Locations

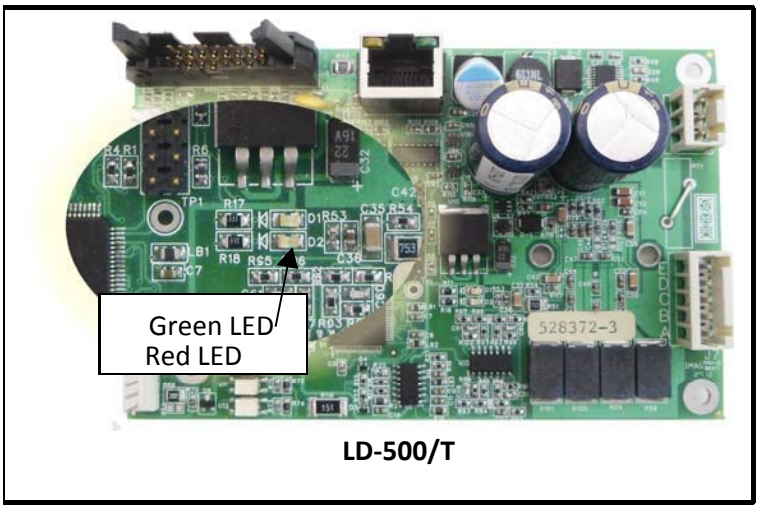


Figure 8.2- Stepper Drive Status Indicator Locations

8.1.1 INDICATOR OPERATIONS

GREEN LED	RED LED	DESCRIPTION	REMEDY
OFF	ON	Firmware memory checksum Failure	Consult Factory
FLASHING	OFF	Drive Disabled – Normal Operation	OK
ON	OFF	Drive Enabled – Normal Operation	OK
OFF ON OFF FLASH FOR 10's OFF OFF REPEAT	OFF ON OFF OFF FLASH FOR 1's OFF REPEAT	Coded flash sequences indicating a fault: The drive will momentarily flash both LEDs followed by a fault code. The Green will flash the 10's place first then the red will flash the 1's place. **These values define the fault code from 01 to 99.** *Note: If an LED does not flash for a place then that places value is 0. Fault code F01 would not flash the Green LED, just the Red LED one time.* **Flashing Example:** **Fault Code 25** **GREEN RED** OFF OFF **ON ON** OFF OFF **~~~~~~~F~~~~~~~** **ON** OFF OFF OFF **ON** OFF OFF OFF **~~~~~~~2~~~~~~~** OFF **ON** OFF OFF OFF **ON** OFF OFF OFF **ON** OFF OFF OFF **ON** OFF OFF OFF **ON** OFF OFF **~~~~~~~5~~~~~~~** REPEAT from top *The Green LED flashed twice then the RED LED flashed 5 times. This would indicate a Fault 25.*	Look up code on the Fault Code Chart

Table 8.1 - LED Status Indicator Sequences

8.2 FAULT CODE CHART

FAULT CODE	DESCRIPTION	REMEDY
F01 Internal Power Module Error	Driver has detected the following: • Over current • Over temp • Gate voltage drop	Check if the motor wire (A/B/C) is shorted or grounded. Ambient temperature over 45° C. Indicates a fatal fault in the driver power stage. If motor wires are not shorted and temperature is below 45° C, contact IIS factory.
F02 Overvoltage	DC power bus exceeds maximum bus voltage.	Power line voltage fluctuation above maximum. 240 VAC for Servo, 36 VDC for Stepper. Excessive regeneration energy. Check line voltage fluctuations. Add additional external regeneration resistor.
F03 Under Voltage	DC power bus below minimum bus voltage.	Power line voltage fluctuation below minimum. 110 VAC for Servo, 36 VDC for Stepper. Check line voltage fluctuations.
F07 Power Stage Error	Main control unit does not recognize the power stage of the driver.	Indicates a fatal fault in the driver power stage. Contact IIS factory.
F10 Regen Resistor Open	Regen power transistor is ON for more than 50ms.	**WITH POWER OFF FOR 5 MINUTES:** Verify with an ohmmeter that the regen resistor is the proper value and that all wiring to the resistor is secure. Verify the Regen resistor is properly sized. Verify the load is properly sized for the system. Verify the motor shaft is not being rotated by an external source.
F15 Excessive Current	Motor current exceeds the rating by 120%.	Check if the motor wire (A/B/C) is shorted or grounded. Verify that motor shaft or machine system is not jammed. Check that the proper motor parameters have been sent to the drive.
F16 Speed/Torque Saturated	Internal velocity control loop has saturated and the maximum torque was applied for more than 3 seconds.	Verify that motor shaft or machine system is not jammed. Check that the proper motor parameters have been sent to the drive. Acel/decel rate is too large for the inertia load on the motor, which reached maximum torque during acel/decel.
F17 Motor over current	Current in the motor has exceeded the limits of the motor specifications.	Verify that motor shaft or machine system is not jammed. Check that the proper motor parameters have been sent to the drive. Acel/decel rate is too large for the inertia load on the motor, which reached maximum torque during acel/decel.

Table 8.2 - Fault Codes

8.2 FAULT CODES (cont'd)

FAULT CODE	DESCRIPTION	REMEDY
F25 Options Check	Self-diagnostic checks of an option failed or wrong option card installed.	Option card configured in program does not match installed option card. Option card not functioning to specification. Contact IIS factory.
F26 Motor Code Error	Selected motor code is invalid.	Verify motor code parameters. Verify I/O state to the drive when motor code is set by digital inputs.
F30 Self Calibration Complete	Drive has completed self calibration function, cycle power to drive.	Cycle power to the drive.
F40 Encoder Signal Short	U, V or W phases of encoder not functional.	Check encoder cable and connections.
F50 Cycle Power	A parameter has changed value that requires a power cycle of the drive.	Cycle power to the drive.
F51 Unsupported PWM Frequency	Drive has been configured to operate at a PWM frequency not supported.	Change PWM Frequency to a valid frequency for drive.
F70 Following Error	Motor is not following the commanded position	Check monitoring window Check for binding in mechanical travel of motor. Check the back EMF of the motor at the desired speed does not exceed the AC input voltage.
F72 Stored Parameter Failure	Drive calibration data has been lost.	Contact IIS Factory at (585 924 9181) or repair@iis-servo.com.
F74 Encoder Phase Error	Encoder A or B tracks are out of phase with U track.	Check encoder wiring. Make sure there are no loose connections. Make sure encoder cable is separated from any high-power wiring.
F75 W-Phase Over-Current	W-phase current exceeds the rating by 120%.	Check if the motor wire (A/B/C) is shorted or grounded. Verify that motor shaft or machine system is not jammed. Check that the proper motor parameters have been sent to the drive.
F80 Communication Error From Luminary Controller	Drive has detected at least 2 consecutive Cyclic Master Communication Packets in the communication from the controller	Check For Factory Specified Communication Cable. Verify proper grounding on controller and drive. Check if controller is operating normally. Replace Communication Cable if necessary.

8.2 FAULT CODES (cont'd)

F81 Communication Error From Luminary Controller	Drive has detected invalid data in the Cyclic Master Communication Packets in the communication from the controller.	Check For Factory Specified Communication Cable. Verify proper grounding on controller and drive. Check if controller is operating manually. Replace Communication Cable if necessary.
F86 Invalid Operation Mode	A request was made to switch to an invalid operation mode.	Check for a programming error.
F87 Communications Watchdog Timeout	The master talking to the drive has not kicked IDN 0070 within the time setting defined in IDN 0069.	Check the communications cabling. Check the master device of the communications. Check the setting in IDN 0069.

Table 8.2 - Fault Codes (cont'd)

8.3 SBI Communications Status Indicators

Figure 8.3 RJ-45 SBI Connector

GREEN LED	YELLOW LED	STATUS
OFF	ON	No Communication to Controller
ON	OFF	Communication to Controller Established – No Errors
ON	FLASH or DIM	Communications Packet Errors. Verify proper grounding of controller and drive (Sec 5.2). Verify proper communication cable and routing (Sec 5.2.4).

Table 8.3 - Communications Status Indicators

Note: The LD drive will only have these two indicators if the Drive Network option, which uses the SBI communications, is installed. Use the Drive Network option to interconnect to the multi-axis controller LMC-400. The SBI Communication feature is built-in to the LSTP stepper drive.

APPENDIX A - MOUNTING

A.1 MOUNTING PLATE OVERVIEW

There are several configurations available for the Luminary drive.

- "L" bracket
- Flat mounting plate, which is the standard configuration.
- Customer specific mounting configuration provided by IIS.
- No mounting plate (customer supplied heat sink), mounting pattern detailed in **Section A.2.3**.

A.2 MOUNTING PLATE SPECIFICATIONS

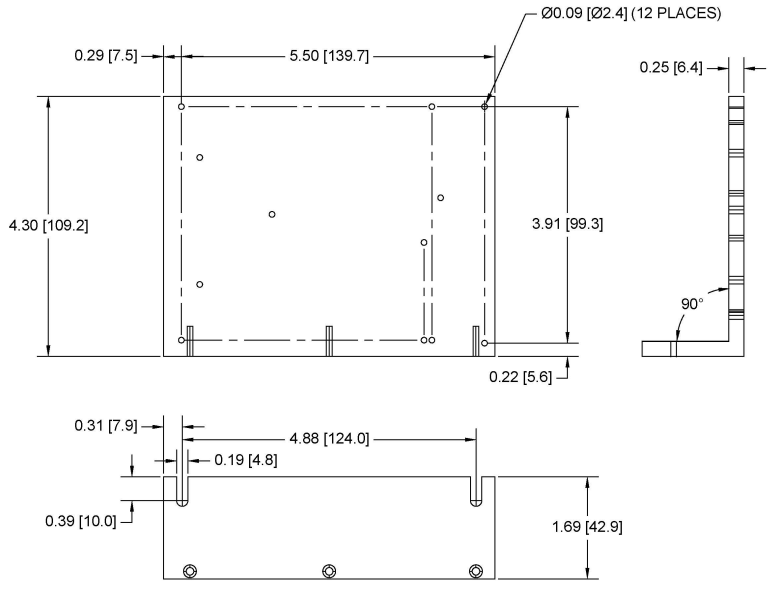
A.2.1 "L" BRACKET

Two mounting holes are located in the specified locations. Use M4 type screws.

> **NOTE:** The Servo drive must have airflow of 330 ft/min (33 cfm) across it to properly cool the drive.
>
> *CAUTION is required when handling the drive, it is a STATIC SENSITIVE product and the installer should follow all static control procedures when handling the drive.*

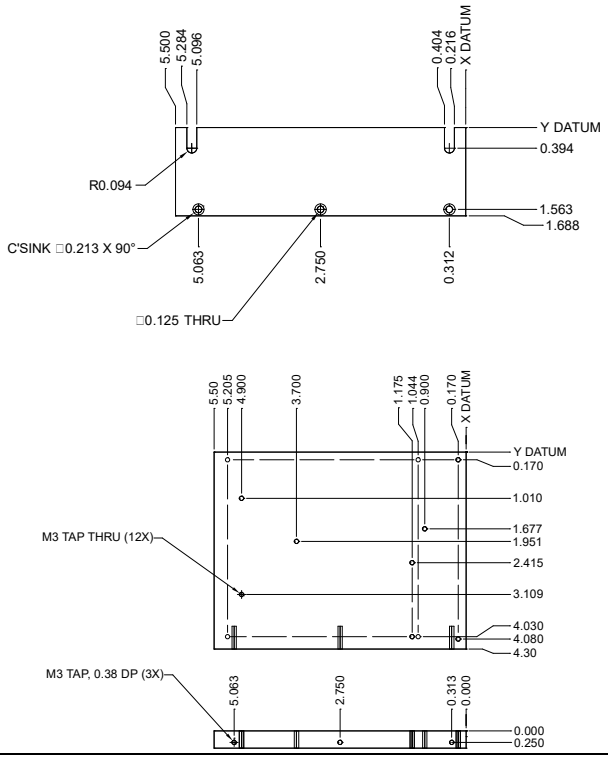
Always remove the drive when drilling into any metal or conductive material. If conductive material is dropped onto the drive and power is applied, damage or destruction of the device can occur.

3.3A and 5A Servo Drive



For a compact single axis positioner, the Luminary Controller (LMC-400) can be mounted on the opposing side of the "L" bracket.

10A Servo Drive



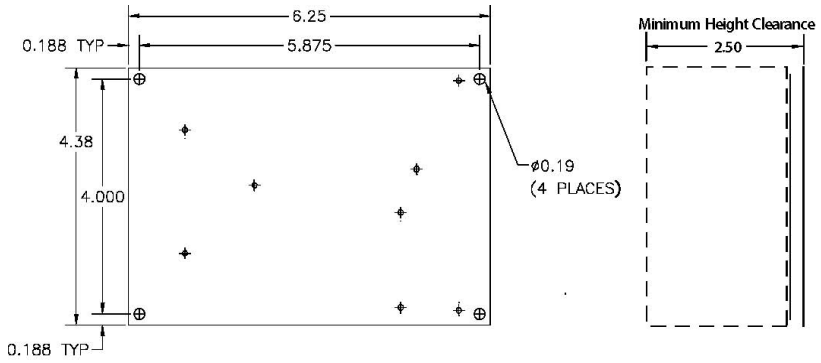
A.2.2 FLAT PLATE

Four mounting holes are located in the specified locations. Use M4 hardware.

The 5A and 10A Servo drive must be mounted down to an aluminum or steel plate; minimum size 10" by 10" by 3/16" thick to properly cool the drive.

CAUTION is required when handling the drive, it is a STATIC SENSITIVE product and the installer should follow all static control procedures when handling the drive.

Always remove the drive when drilling into any metal or conductive material. If conductive material is dropped onto the drive and power is applied, damage or destruction of the device can occur.



The LD series drive mounting dimensions and clearance when the flat mounting plate is used.

A.2.3 WHEN OPTING TO MOUNT ON YOUR OWN PLATE

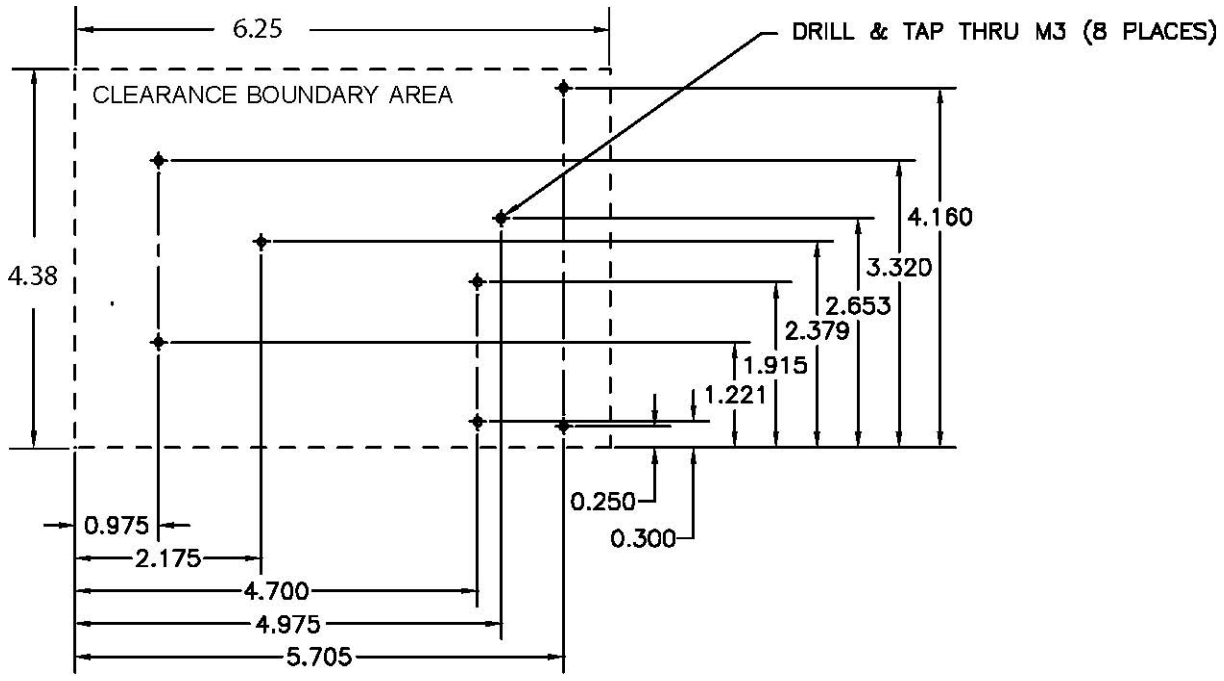
When the customer opts to use his or her own mounting plate the following information applies.

Use 8 mm male/female M3 standoffs in five locations to properly set the space between the board and the mounting surface. Use part number AA5171-08.0 or AL5171-08.0 available from LYN-TRON INC.

The mounting surface must be clean and flat within 0.010". Heat sink grease is to be applied on the two PC board components mounted on the bottom side of the board. Use product number CT40-5 available from ITW CHEMTRONICS or an equivalent.

To properly dissipate heat from the 3.3 amp LD series drive, a plate of aluminum measuring at least 8" by 8" by 3/16" thick is required to act as a heat sink.
To properly dissipate heat from the 5.0 amp LD series drive, a plate of aluminum measuring at least 10" by 10" by 3/16" thick is required to act as a heat sink.

CAUTION: These are STATIC SENSITIVE products. The installer should follow all anti-static control procedures when handling the drive.



Dimensions and clearances in inches for mounting the LD series drive board to a metal plate for heat dissipation.

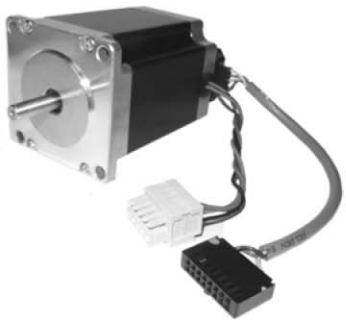
SECTION B - MOTORS / CABLES / ACCESSORIES

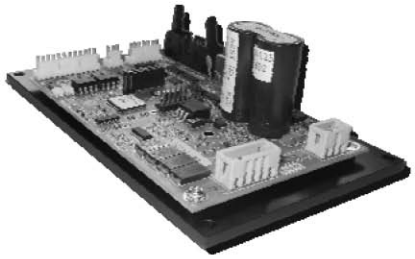
B.1 MOTOR OVERVIEW

- There are several motors available for use with the Luminary Series Drives.
- Motor -- Drive package details are shown below.
- If the available packages do not meet your needs, please contact IIS for more details.
- IIS will customize packages for your application, contact IIS sales for more details.

MOTOR -- DRIVE PACKAGES

SERVO based packages





STEPPER based packages

B.1.1 SERVO MOTOR/DRIVE PACKAGE SPECS AND SERVO MOTOR DRAWINGS

MOTOR PART NUMBER	LSM40-050/30E			
DRIVE PART NUMBER	Input Voltage	Rated Torque (Nm)	Speed (rpm) @Rated Torque	Peak Torque (Nm)
LD-330	115 Vac	0.32	2164	0.95
	230 Vac	0.32	3000	0.95
LD-500	115 Vac	0.32	2164	0.95
	230 Vac	0.32	3000	0.95

MOTOR PART NUMBER	ESM40-100/30E			
DRIVE PART NUMBER	Input Voltage	Rated Torque (Nm)	Speed (rpm) @Rated Torque	Peak Torque (Nm)
LD-330	115 Vac	0.32	2164	0.95
	230 Vac	0.32	3000	0.95
LD-500	115 Vac	0.32	2164	0.95
	230 Vac	0.32	3000	0.95

MOTOR PART NUMBER	ESM60-100/30E			
DRIVE PART NUMBER	Input Voltage	Rated Torque (Nm)	Speed (rpm) @Rated Torque	Peak Torque (Nm)
LD-330	115 Vac	0.32	2164	0.87
	230 Vac	0.32	3000	0.87
LD-500	115 Vac	0.32	2164	0.87
	230 Vac	0.32	3000	0.87

MOTOR PART NUMBER	ESM66-125/15E-1			
DRIVE PART NUMBER	Input Voltage	Rated Torque (Nm)	Speed (rpm) @Rated Torque	Peak Torque (Nm)
LD-330	115 Vac	0.32	2164	0.95
	230 Vac	0.32	3000	0.95
LD-500	115 Vac	0.32	2164	0.95
	230 Vac	0.32	3000	0.95

MOTOR PART NUMBER	LSM40A-xx			
DRIVE PART NUMBER	Input Voltage	Rated Torque (Nm)	Speed (rpm) @Rated Torque	Peak Torque (Nm)
LD-330	115 Vac	0.32	2164	0.95
	230 Vac	0.32	3000	0.95
LD-500	115 Vac	0.32	2164	0.95
	230 Vac	0.32	3000	0.95

MOTOR PART NUMBER	LSM60B-xx			
DRIVE PART NUMBER	Input Voltage	Rated Torque (Nm)	Speed (rpm) @Rated Torque	Peak Torque (Nm)
LD-330	115 Vac	0.64	1970	1.91
	230 Vac	0.64	3000	1.91
LD-500	115 Vac	0.64	1970	1.91
	230 Vac	0.64	3000	1.91

MOTOR PART NUMBER	LSM60C-xx			
DRIVE PART NUMBER	Input Voltage	Rated Torque (Nm)	Speed (rpm) @Rated Torque	Peak Torque (Nm)
LD-330	115 Vac	1.27	1582	2.55
	230 Vac	1.27	3000	2.55
LD-500	115 Vac	1.27	1582	3.78
	230 Vac	1.27	3000	3.78

MOTOR PART NUMBER	LSM80C-xx			
DRIVE PART NUMBER	Input Voltage	Rated Torque (Nm)	Speed (rpm) @Rated Torque	Peak Torque (Nm)
LD-330	115 Vac	1.49	1863	2.39
	230 Vac	1.49	3000	2.39
LD-500	115 Vac	1.91	1863	3.83
	230 Vac	1.91	3000	3.83

MOTOR PART NUMBER	ESM60A-xx			
DRIVE PART NUMBER	Input Voltage	Rated Torque (Nm)	Speed (rpm) @Rated Torque	Peak Torque (Nm)
LD-330	115 Vac	1.27	3000	2.82
	230 Vac	1.27	3000	2.82
LD-500	115 Vac	1.27	3000	3.82
	230 Vac	1.27	3000	3.82

MOTOR PART NUMBER	ESM80C-C			
DRIVE PART NUMBER	Input Voltage	Rated Torque (Nm)	Speed (rpm) @Rated Torque	Peak Torque (Nm)
LD-330	115 Vac	3.50	1150	6.22
	230 Vac	3.50	2000	6.22
LD-500	115 Vac	3.50	1150	9.95
	230 Vac	3.50	2000	9.95

MOTOR PART NUMBER	ESM80-600/30E			
DRIVE PART NUMBER	Input Voltage	Rated Torque (Nm)	Speed (rpm) @Rated Torque	Peak Torque (Nm)
LD-330	115 Vac			
	230 Vac			
LD-500	115 Vac			
	230 Vac			

MOTOR PART NUMBER	ESM80-750/30E			
DRIVE PART NUMBER	Input Voltage	Rated Torque (Nm)	Speed (rpm) @Rated Torque	Peak Torque (Nm)
LD-330	115 Vac	2.39	3000	4.17
	230 Vac	2.39	3000	4.17
LD-500	115 Vac	2.39	3000	4.17
	230 Vac	2.39	3000	4,17

MOTOR PART NUMBER	ESM85A			
DRIVE PART NUMBER	Input Voltage	Rated Torque (Nm)	Speed (rpm) @Rated Torque	Peak Torque (Nm)
LD-330	115 Vac	1.90	1770	4.00
	230 Vac	1.90	2000	4.00
LD-500	115 Vac	1.90	1770	5.70
	230 Vac	1.90	2000	5.70

MOTOR PART NUMBER	ESM85B			
DRIVE PART NUMBER	Input Voltage	Rated Torque (Nm)	Speed (rpm) @Rated Torque	Peak Torque (Nm)
LD-330	115 Vac	2.84	1855	4.73
	230 Vac	2.84	2000	4.73
LD-500	115 Vac	2.84	1855	7.57
	230 Vac	2.84	2000	7.57

MOTOR PART NUMBER	ESM85C			
DRIVE PART NUMBER	Input Voltage	Rated Torque (Nm)	Speed (rpm) @Rated Torque	Peak Torque (Nm)
LD-330	115 Vac	2.90	1730	4.68
	230 Vac	2.90	2000	4.68
LD-500	115 Vac	3.53	1730	7.48
	230 Vac	2.53	2000	7.48

MOTOR PART NUMBER	ESM90B-C			
DRIVE PART NUMBER	Input Voltage	Rated Torque (Nm)	Speed (rpm) @Rated Torque	Peak Torque (Nm)
LD-330	115 Vac	3.50	1200	5.90
	230 Vac	3.50	2600	9.44
LD-500	115 Vac	3.50	1200	5.90
	230 Vac	3.50	2600	9.44

MOTOR PART NUMBER	ESM125C(II)			
DRIVE PART NUMBER	Input Voltage	Rated Torque (Nm)	Speed (rpm) @Rated Torque	Peak Torque (Nm)
LD-330	115 Vac	7.00	510	11.25
	230 Vac	7.00	1260	18.02
LD-500	115 Vac	7.20	510	11.25
	230 Vac	7.20	1260	18.00

B.1.2 SERVO MOTOR DRAWINGS

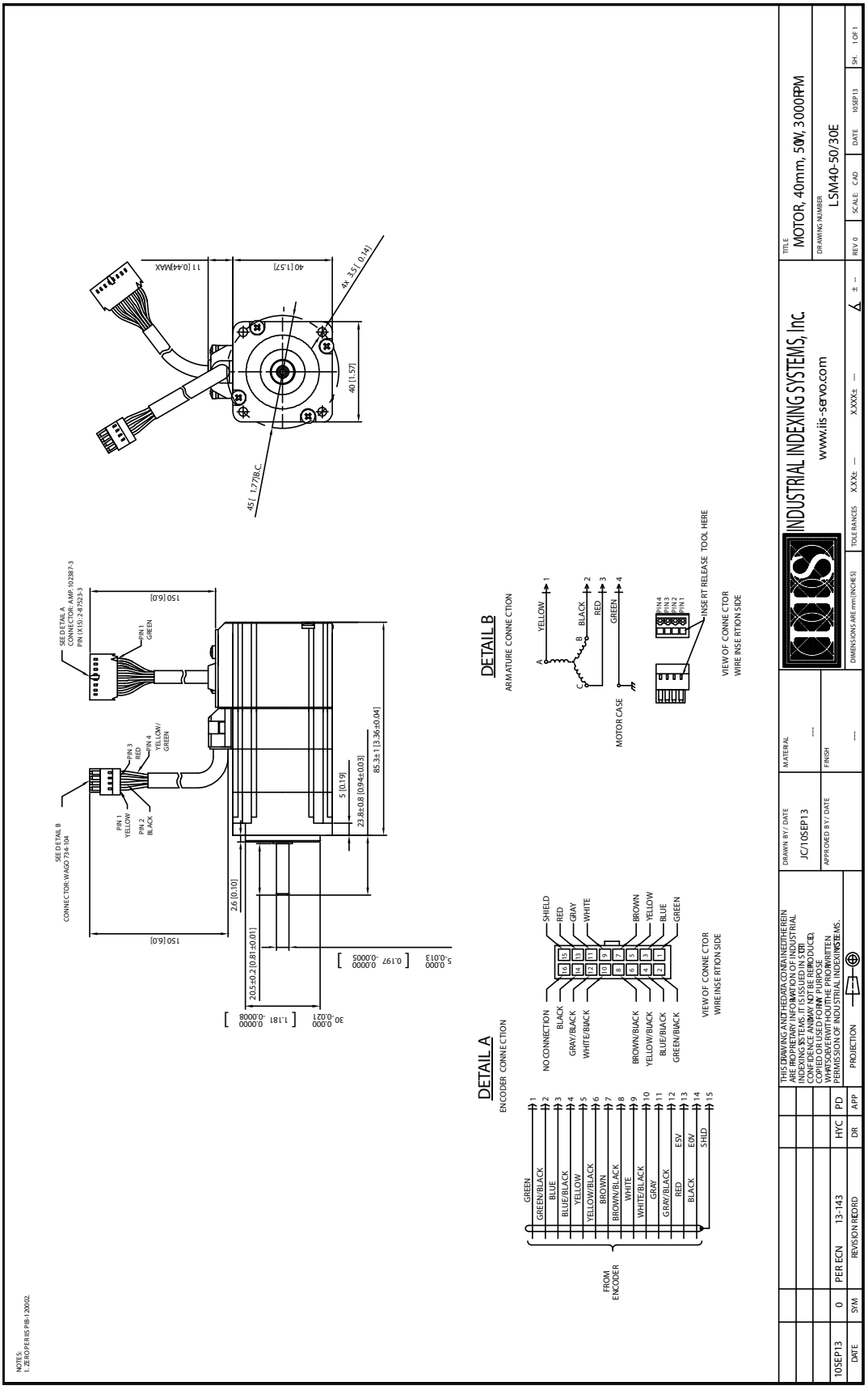


Figure B.1 – LSM40-50/30E

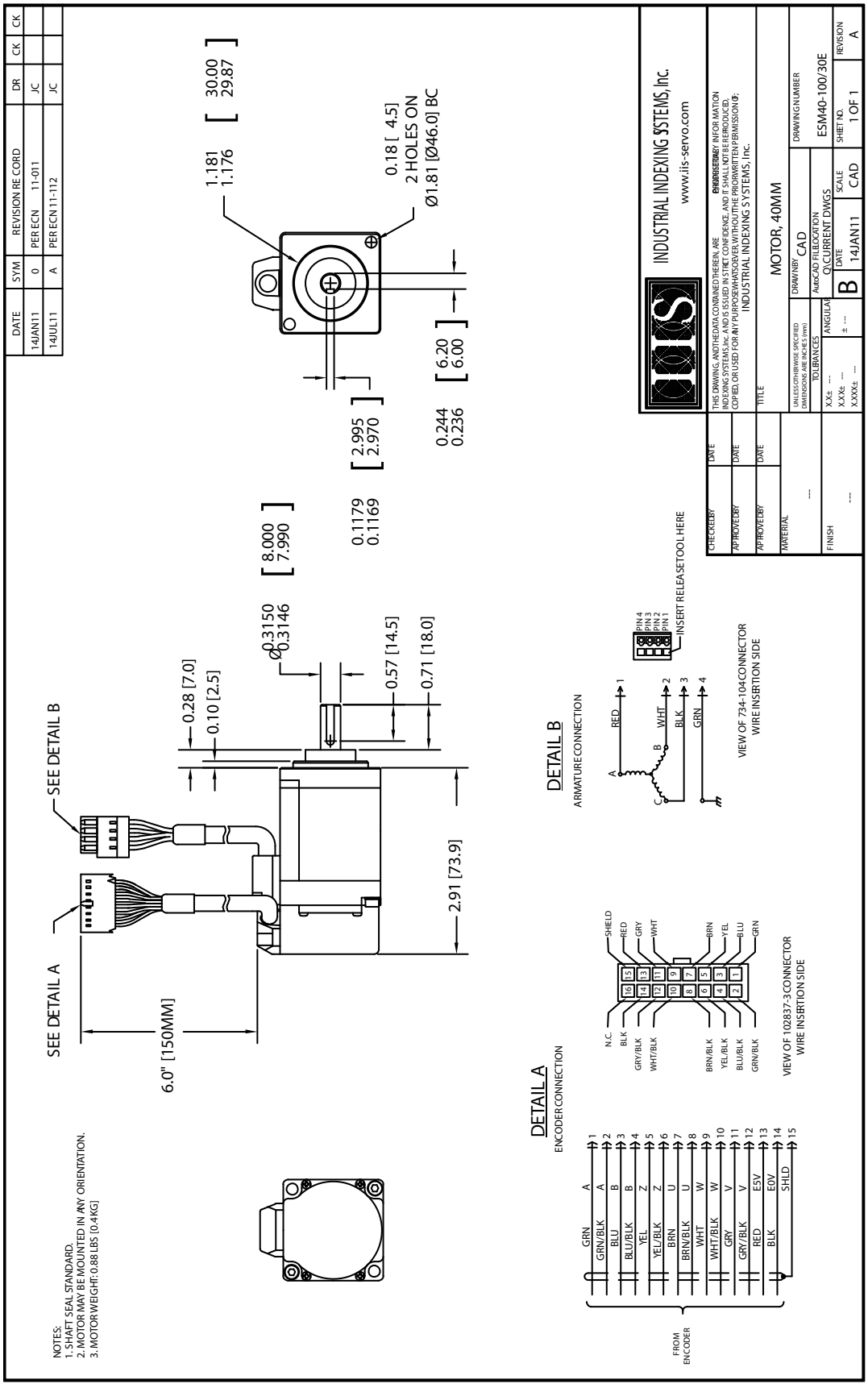


Figure B.2 – ESM40-100/30E

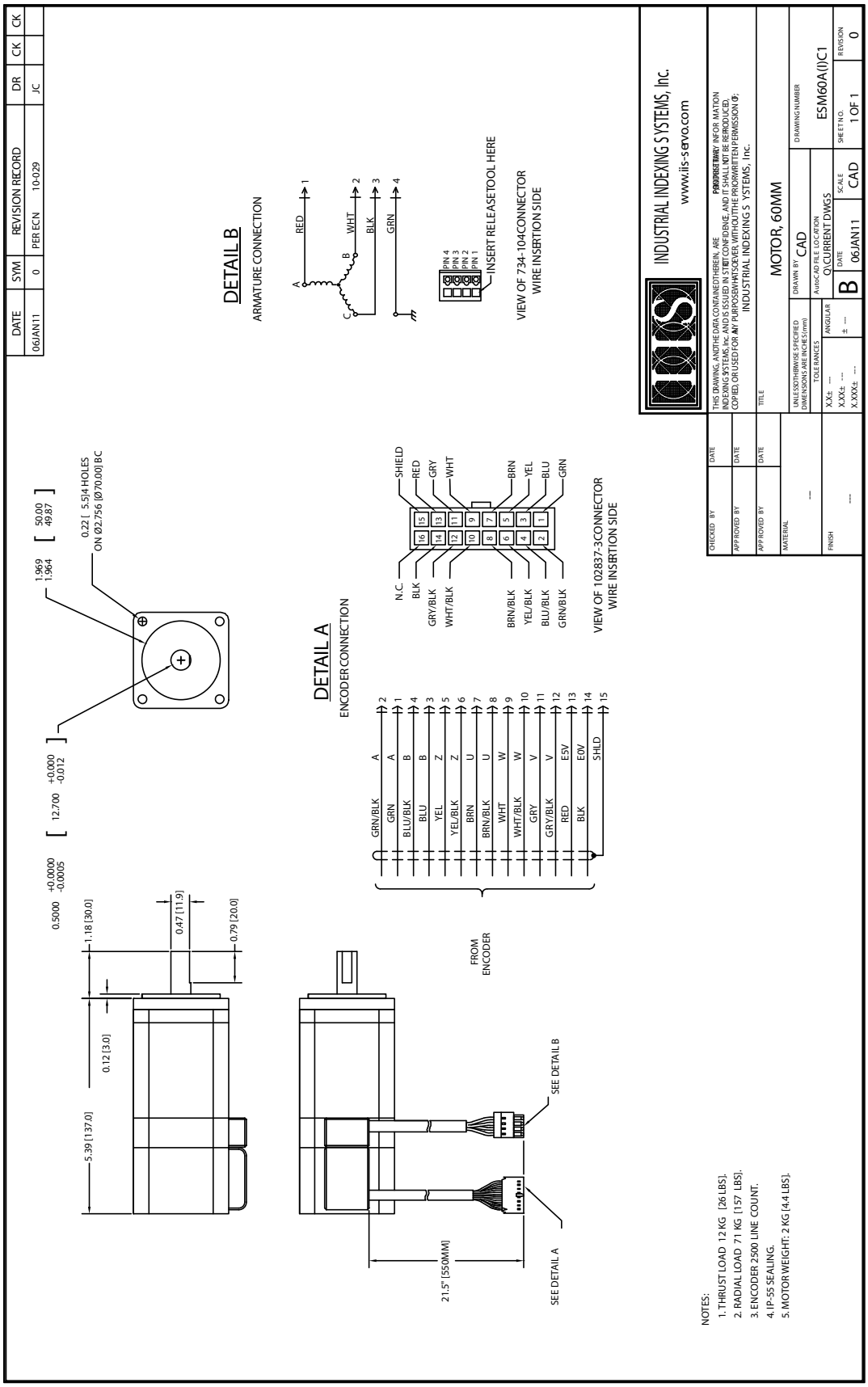


Figure B.3 – ESM60A(I)C1

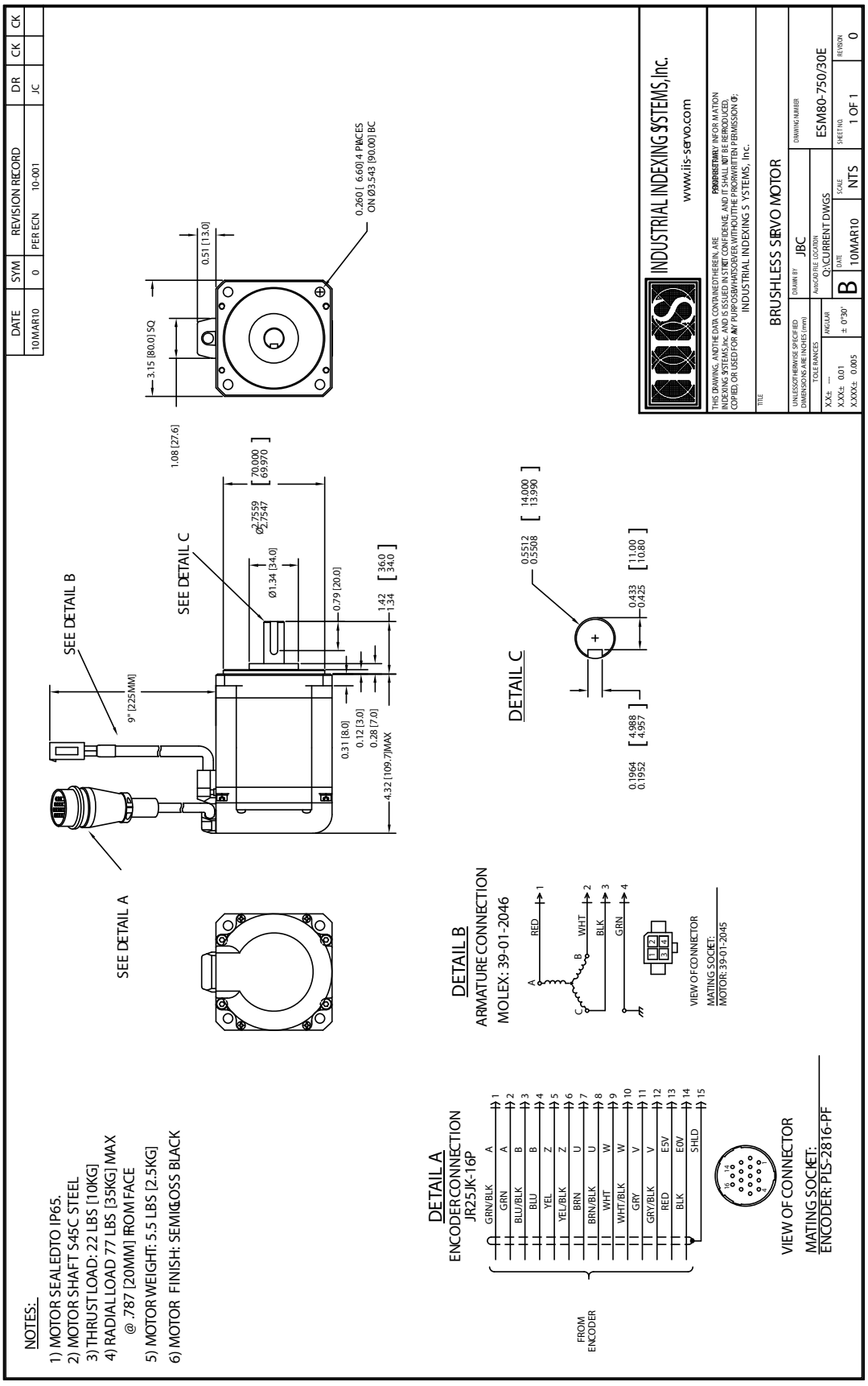


Figure B.4 – ESM80-750/30E

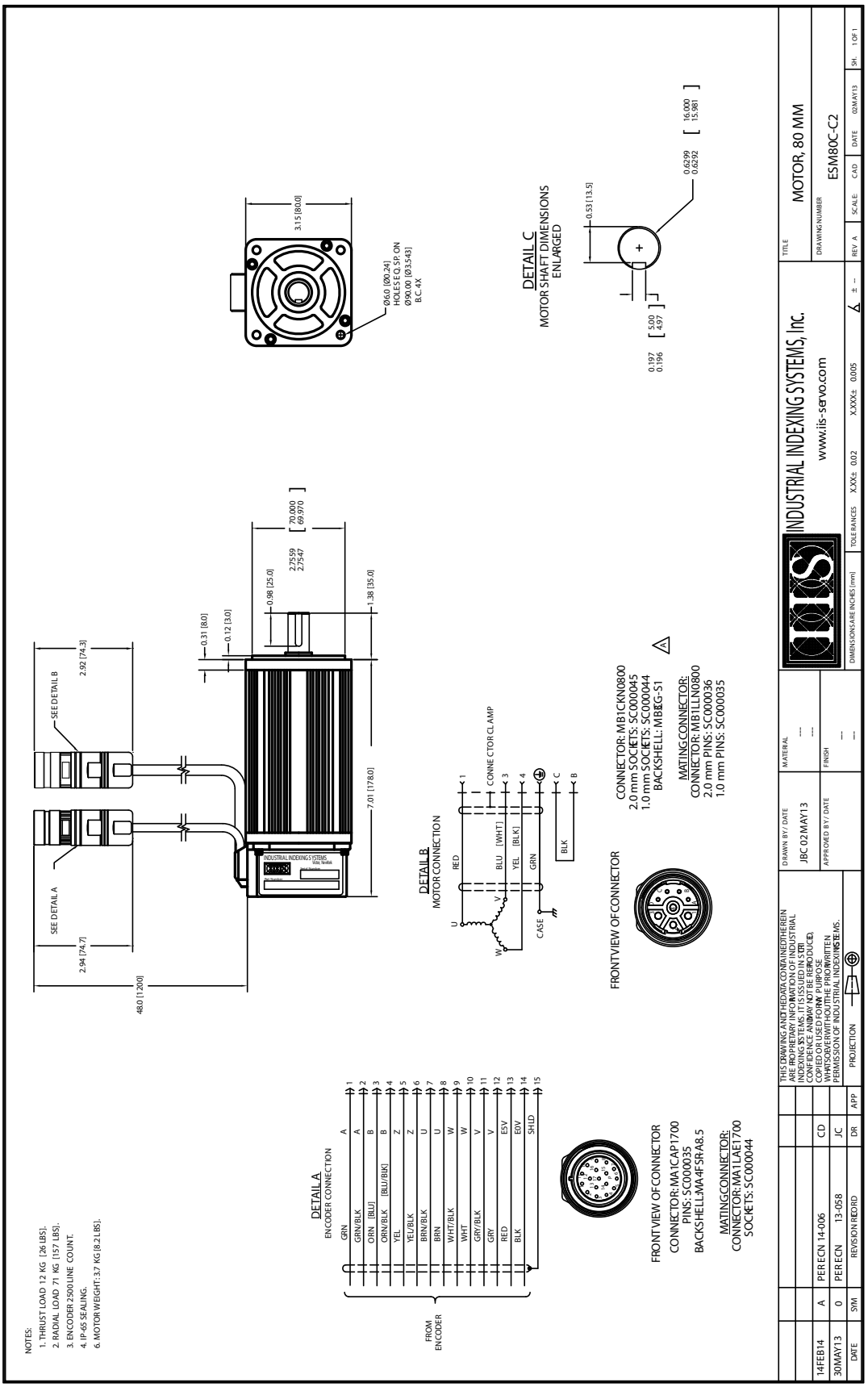


Figure B.5 – ESM80C-C2

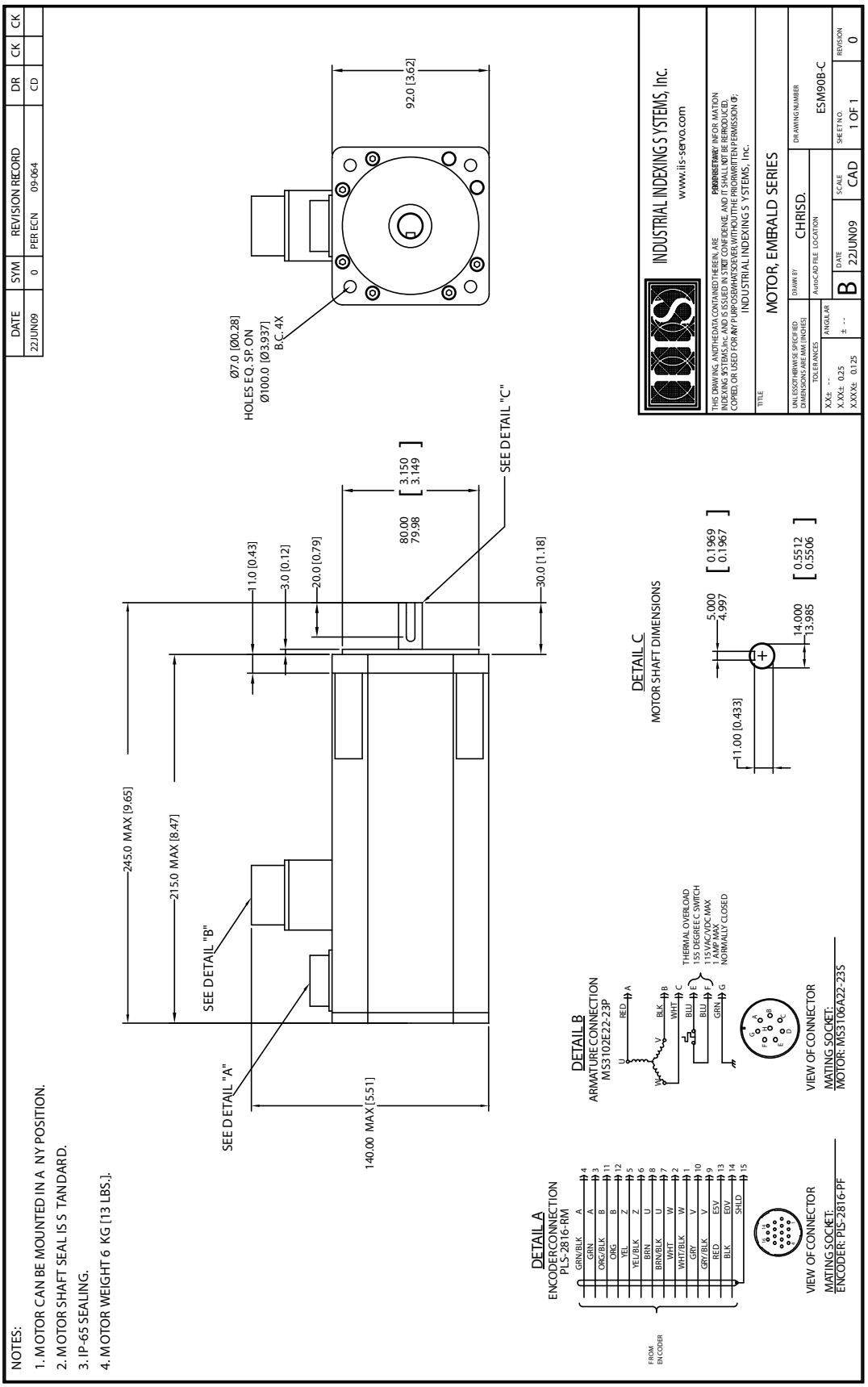
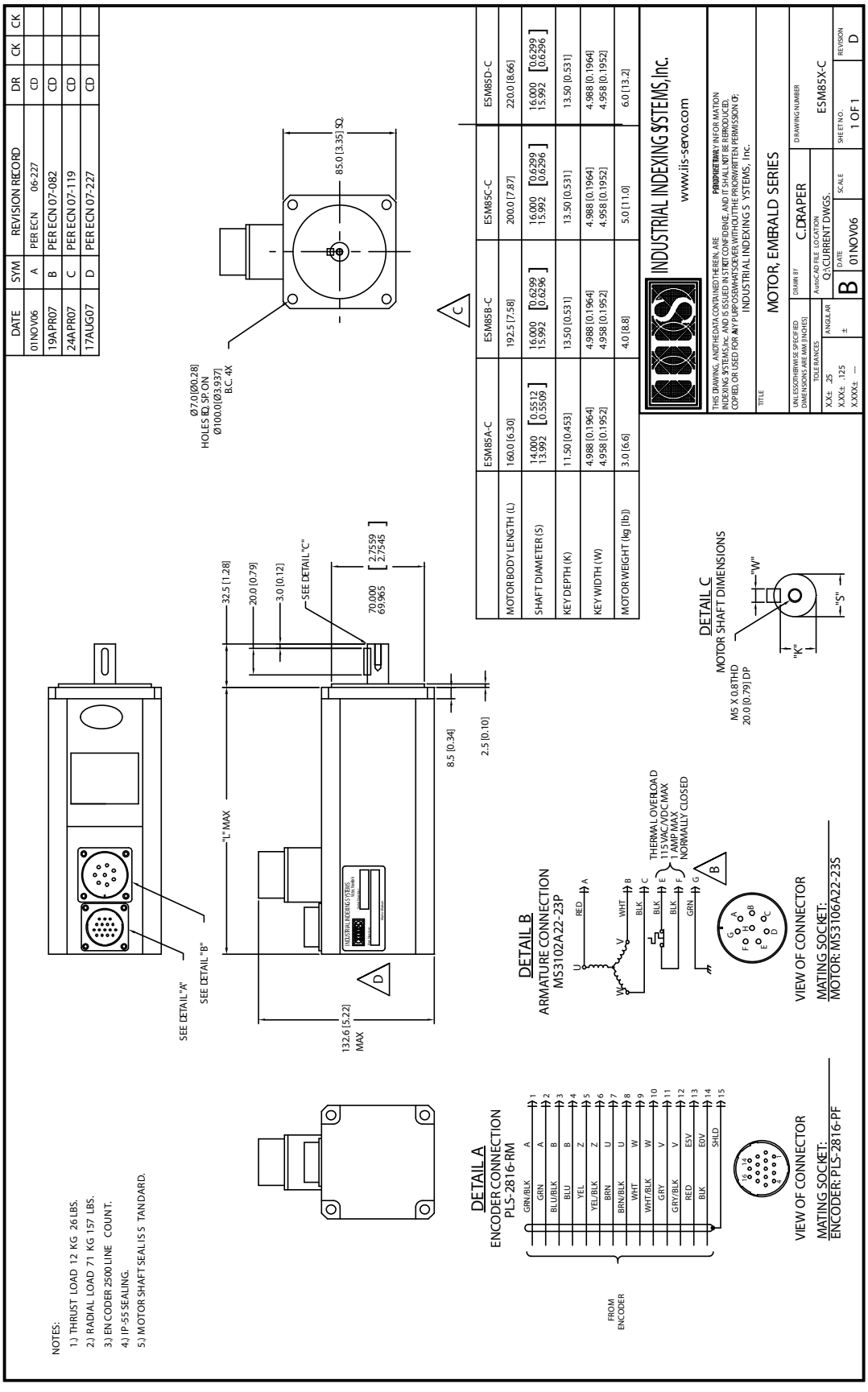


Figure B.6 – ESM90B-C



DATE	SYM	REVISION RECORD	DR	CK	CK
01NOV06	A	PER ECN 06-227	CD		
19APR07	B	PER ECN 07-082	CD		
24APR07	C	PER ECN 07-119	CD		
17AUG07	D	PER ECN 07-227	CD		

	ESM85A-C	ESM85B-C	ESM85C-C	ESM85D-C
MOTOR BODY LENGTH (L)	160.0 [6.30]	192.5 [7.58]	200.0 [7.87]	220.0 [8.66]
SHAFT DIAMETER (S)	14.000 [0.5512] 13.992 [0.5509]	16.000 [0.6299] 15.992 [0.6296]	16.000 [0.6299] 15.992 [0.6296]	16.000 [0.6299] 15.992 [0.6296]
KEY DEPTH (K)	11.50 [0.453]	13.50 [0.531]	13.50 [0.531]	13.50 [0.531]
KEY WIDTH (W)	4.988 [0.1964] 4.958 [0.1952]	4.988 [0.1964] 4.958 [0.1952]	4.988 [0.1964] 4.958 [0.1952]	4.988 [0.1964] 4.958 [0.1952]
MOTOR WEIGHT (kg [lb])	3.0 [6.6]	4.0 [8.8]	5.0 [11.0]	6.0 [13.2]

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UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE AS IN [INCHES]
TOLERANCES: ANGULAR ±
XX± .25
XXX± .125
XXXX± ---

DRAWN BY: C.DRAPER
AutoCAD FILE LOCATION: Q:\CURRENT DWGS\
DATE: 01NOV06
SCALE:
SHEET NO: 1 OF 1

TITLE: MOTOR, EMERALD SERIES
DRAWING NUMBER: ESM85X-C
REVISION: B D

Figure B.7 – ESM85X-C

B.1.3 STEPPER MOTOR/DRIVE PACKAGE SPECS AND STEPPER MOTOR DRAWINGS

MOTOR PART NUMBER	LPM-N17-1R3A030			
DRIVE PART NUMBER	Input Voltage	Rated Torque (Nm)	Speed (rpm) @Rated Torque	Peak Torque (Nm)
LD-500T	18 Vac –36 Vac	TBD	TBD	TBD

MOTOR PART NUMBER	LPM-N23-2R8A270			
DRIVE PART NUMBER	Input Voltage	Rated Torque (Nm)	Speed (rpm) @Rated Torque	Peak Torque (Nm)
LD-500T	18 Vac –36 Vac	1.00	100	1.18

MOTOR PART NUMBER	LPM-N23-3R0A382			
DRIVE PART NUMBER	Input Voltage	Rated Torque (Nm)	Speed (rpm) @Rated Torque	Peak Torque (Nm)
LD-500T	18 Vac	1.22	100	1.5

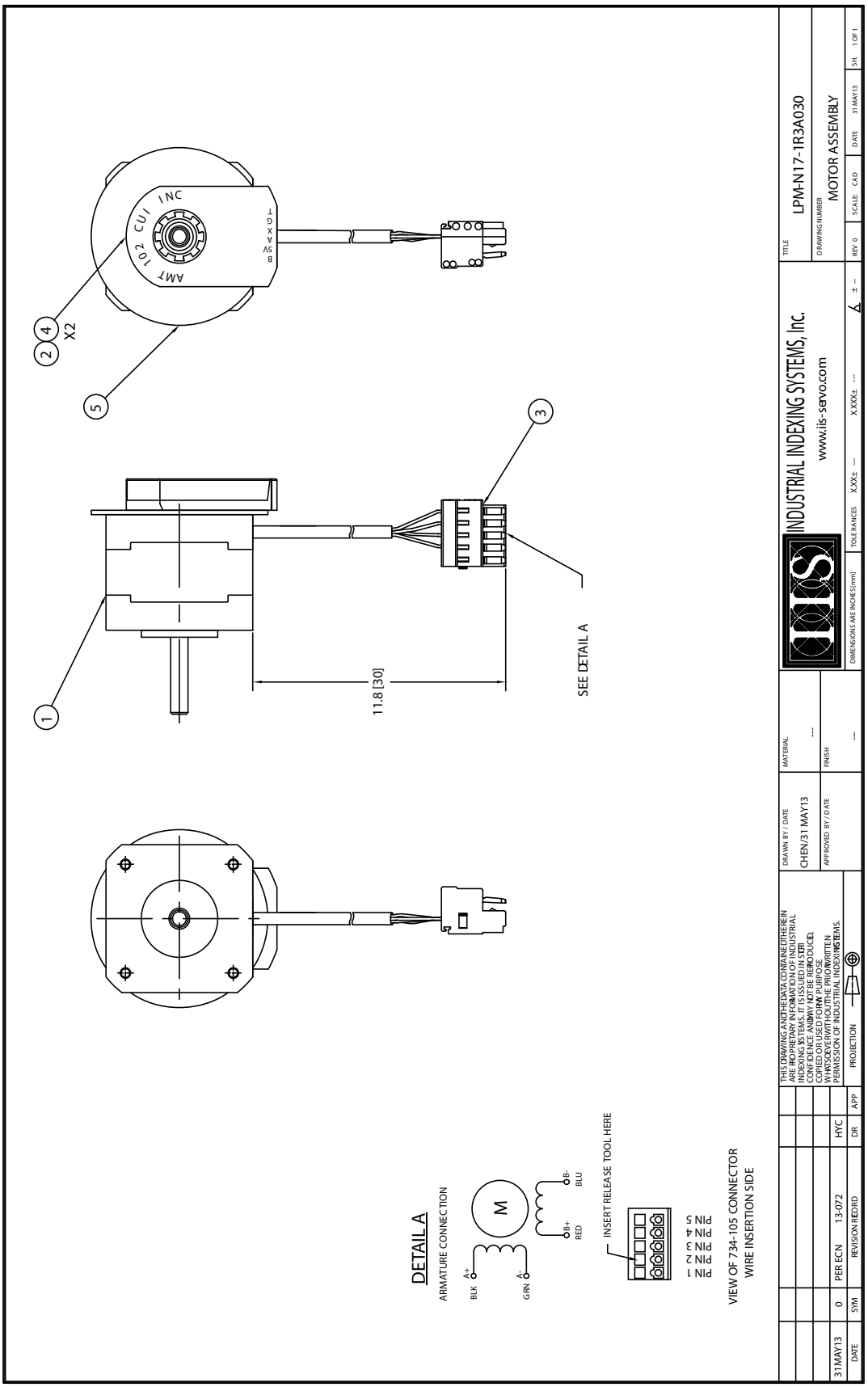


Figure B.8 – LPM-N17-1R3A030

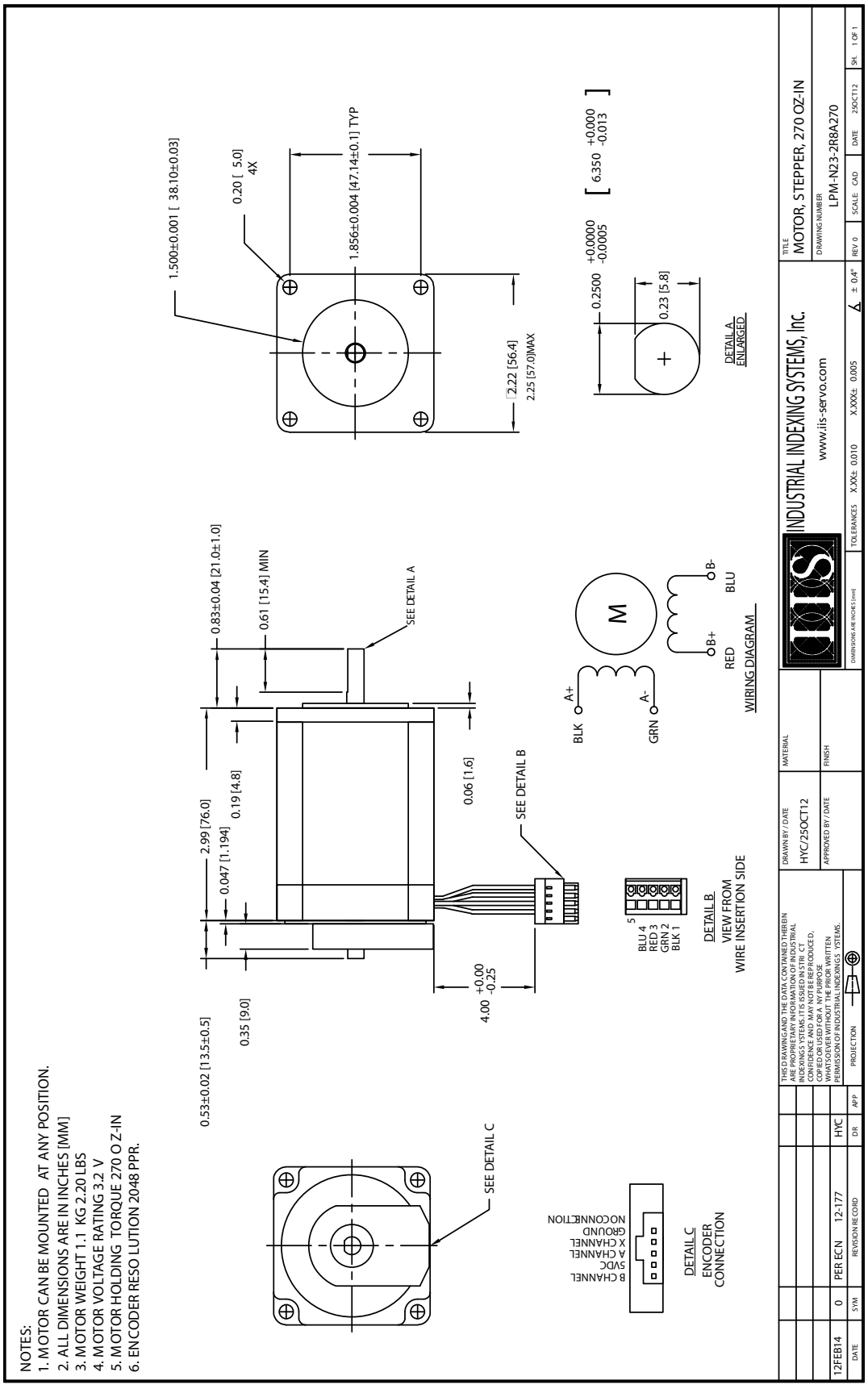


Figure B.9 – LPM-N23-2R8A270

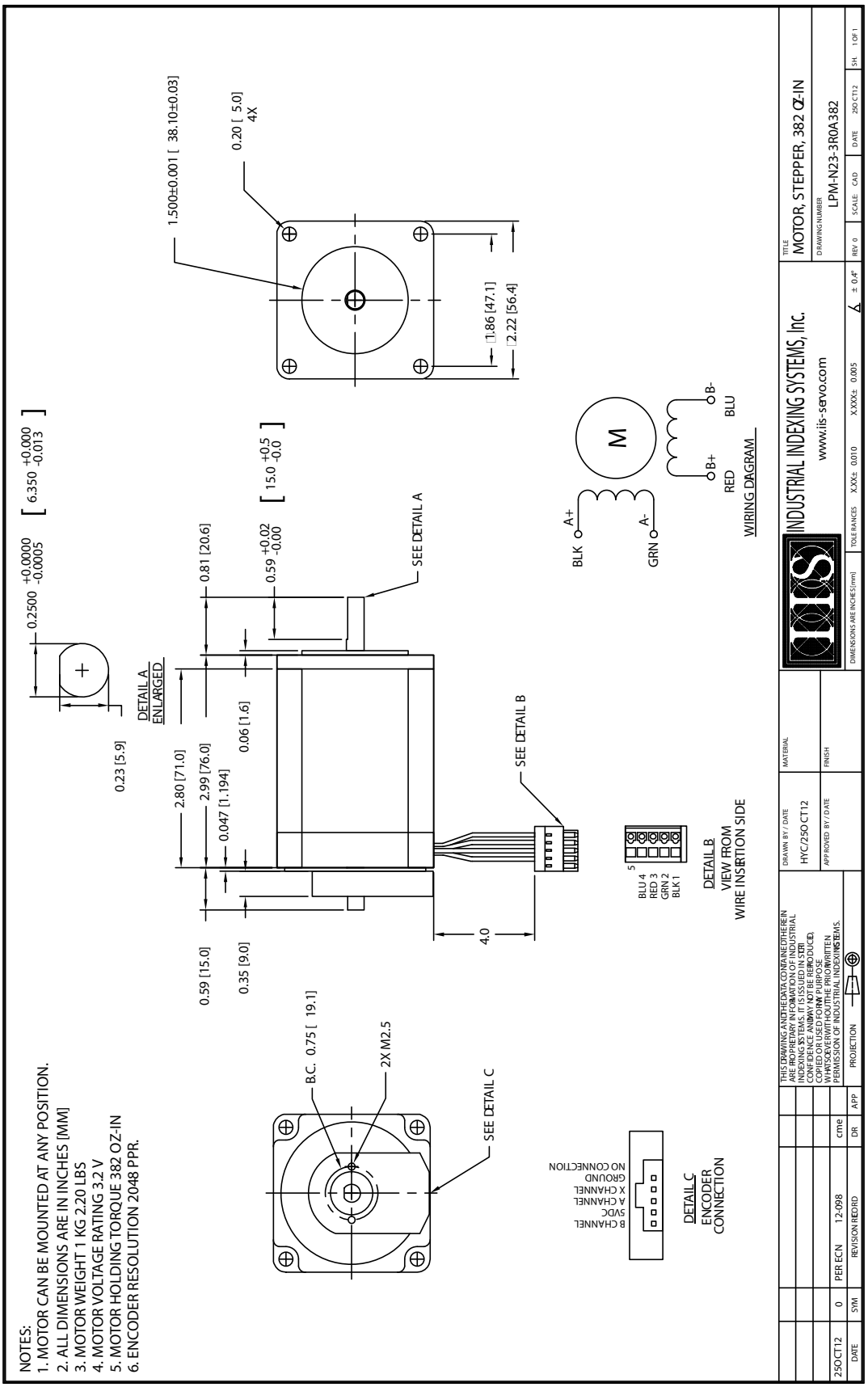


Figure B.10 – LPM-N23-3R0A382

B.2 CABLES FOR LD-330/X, LD-500/X, LD-101/X DRIVES

There are several standard cable sets that are available for purchase with the Luminary drive. Custom length cables for the OEM are available.

- LAC-XYZMMM series for armature motor cables
- LEC-XYZMMM series for encoder motor cables
- LPC-XYZMMM series for the power cables
- LIC-XYZMMM series for inputs/outputs
- LPAC-XYZMMM series for the stepper motor armature cable extension
- LPEC-XYZMMM series for the stepper motor encoder
- C-885YYY for multi axis digital network option card
- C-815015 USB serial communications (Digital Drive Option)
- Connector kits for motor/encoder/input/output connections (see **Section B.2.2**). OEM can purchase the connector kits to manufacture their own cables.

B.2.1 DRIVE TO MOTOR CABLE AND DRIVE TO IO CABLE CHART

Armature and encoder cable combinations are available to be able to split the cable at a enclosure terminal block or connect directly to the motor.

Option	From LD Drive	Termination	To Motor Arm	To Motor Enc	I/O
A0 (Split)	LAC-DAAMMM	Terminal Block	LAC-ABAMMM	--	--
B0 (Split)	LAC-DAAMMM	Terminal Block	LAC-BBAMMM	--	--
C0 (Split)	LAC-DAAMMM	Terminal Block	LAC-CBAMMM	--	--
A1	LAC-AAAMMM			--	--
B1	LAC-BAAMMM			--	--
C1	LAC-CAAMMM			--	--
D0 (Split)	LEC-DAAMMM	Terminal Block	--	LEC-ABAMMM	--
E0 (Split)	LEC-DAAMMM	Terminal Block	--	LEC-CBAMMM	--
D1	LEC-AAAMMM				--
E1	LEC-CAAMMM				--
F	LIC-AAAMMM	Terminal Block	--	--	PLC
K	LPAC-AAAMMM (Stepper)			--	--
L	LPEC-AAAMMM (Stepper)			-	--

Figure B.11 - Cable Selection Chart

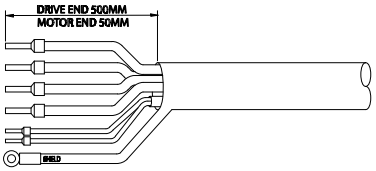


FIG. 1 EITHER END FERRULED WITH SHIELD

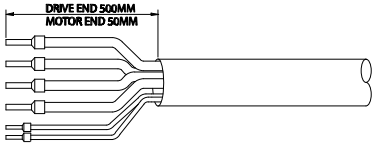


FIG. 2 EITHER END FERRULED WITHOUT SHIELD

FIG. 3 EITHER END WITH NO TERMINATION

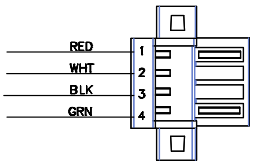


FIG. 4 MOTOR END WITH WAGO

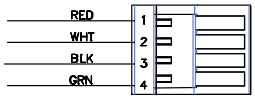


FIG. 5 DRIVE END WITH WAGO

WAGO CONNECTOR WIRING VIEW

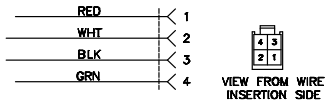


FIG. 6 MOTOR END WITH MOLEX

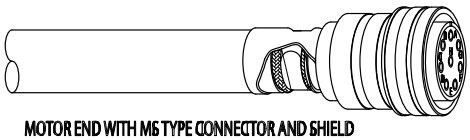


FIG. 7 MOTOR END WITH MS TYPE CONNECTOR AND SHIELD

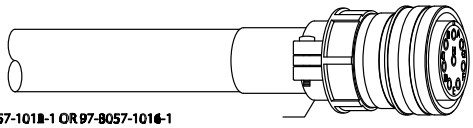


FIG. 8 MOTOR END WITH MS TYPE CONNECTOR WITHOUT SHIELD

LAC-XYZMMM

LENGTH IN METERS
- 001=1M [0.6 FT]
- 003=3M [9.8 FT]
- 004=4M [13.1 FT]

MOTOR CABLE TYPE & DRIVE SIZE
SEE TABLE 1 (1)
- A=4 CONDUCTOR NON SHIELDED (18 AWG)
- B=4 CONDUCTOR SHIELDED (18 AWG)
- C=4 CONDUCTOR NON SHIELDED (18 AWG) SMALL DIAMETER

DRIVE END TERMINATION
- A=4 PIN WAGO 784-104 (FIG. 5)
- B=FERRULES (FIG. 1 & 2)
- B=NO TERMINATION (FIG. 8)

MOTOR END TERMINATION
SEE TABLE 1 (2)
- A=4 PIN WAGO 784-804 W/ 784-604 (FIG. 4)
- B=4 PIN MOLEX 8901-4945 (FIG. 10)
- C=MS3106A18-10S (FIG. 9) & TABLE 1.0
- D=FERRULES (FIG. 1 & 2)
- E=NO TERMINATION (FIG. 8)
- F=MS3106A24-10S (FIG. 10) & TABLE 1.0

LAC=LUMINARY ARMATURE CABLE
CABLE PART NUMBER TABLE

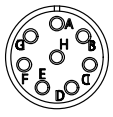


FIG. 9 MS3106A18-1S CONNECTOR

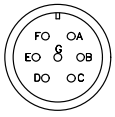


FIG. 10 MS3106A24-10S CONNECTOR

CONNECTOR WIRING VIEW

	CABLE TYPE (1)			CONNECTOR (2)			FUNCTION
	A,C	E,F,H,J	B,D	A	B	F,H,J	
COLOR	RED	BLK-1	WHT/VIO	PIN A	PIN A	PIN A	U PHASE
	WHT	BLK-2	WHT/BRN	PIN B	PIN B	PIN B	V PHASE
	BLK	BLK-3	WHT/ORN	PIN C	PIN C	PIN C	W PHASE
	GRN	BLK-4	WHT/RED	PIN E	PIN E	PIN F	GROUND

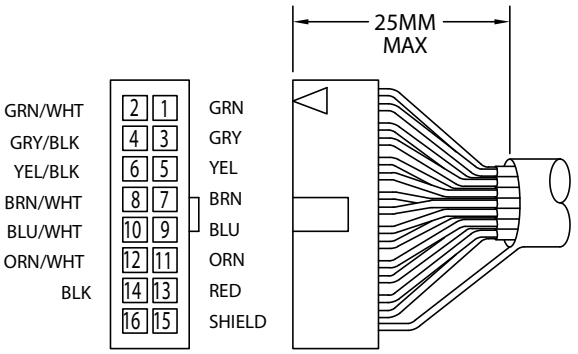
TABLE 1

INDUSTRIAL INDEXING SYSTEMS, Inc.
www.iis-servo.com

TITLE: CABLE, ARMATURE
DRAWING NUMBER: LAC-XYZMMM

DIMENSIONS ARE MM [INCHES] | TOLERANCES X.XX± -- X.XXX± -- ∠ ± -- | REV E | ECN 15-078 | DATE 28MAY15 | SH. 1 OF 1

Figure B.12 - LAC Armature Cable Selection Guide



DRIVE END WITH 102387-3 CONNECTOR FIG. 1

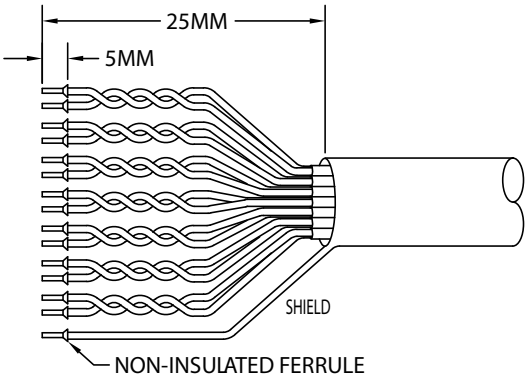
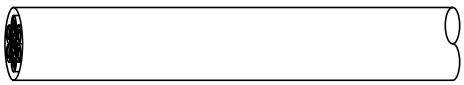


FIG. 3 DRIVE END WITH FERRULES



EITHER END WITH NO TERMINATION FIG. 2

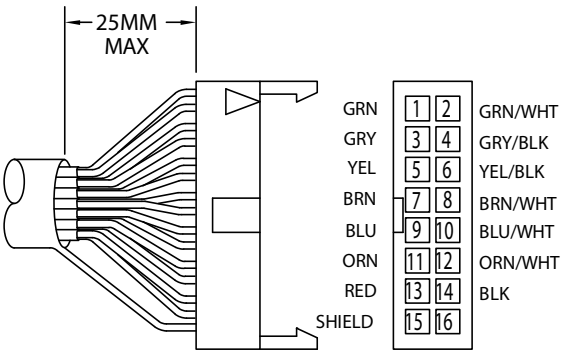


FIG. 4 ENCODER END WITH XG4E-1631 CONNECTOR

LEC-XYZMMM

LENGTH IN METERS
151=1.5M [4.9 FT]
201=2M [7.6 FT]
301=3M [9.8 FT]
401=4M [13.1]

ENCODER CABLE TYPE
A=7 PAIR, 24 AWG, WITH OVERALL SHIELD

DRIVE END TERMINATION
A=16 PIN FEMALE DRIVE MATE (FIG. 1)
102387-3 CONNECTOR
1-87523-6 PIN (QTY 15)
B=FERRULES (FIG. 3)
C=NO TERMINATION (FIG. 2)

ENCODER END TERMINATION
A=16 PIN MALE PLUG (FIG 4)
XG4E-1631 CONNECTOR
XG4S-1604 STRAIN RELIEF
B=NO TERMINATION (FIG. 2)
C=PLS-2816-PF OR EQUIV. (FIG. 5 & 6)

LEC=LUMINARY ENCODER CABLE

CABLE PART NUMBER TABLE

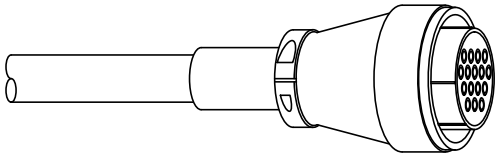


FIG. 5 ENCODER END WITH PLS-2816-PF CONNECTOR

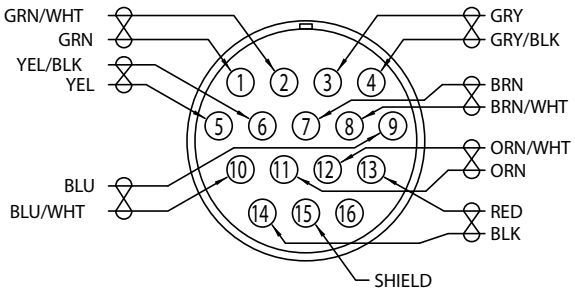


FIG. 6 WIRING VIEW DETAILS FOR PLS-2816-PF CONNECTOR

INDUSTRIAL INDEXING SYSTEMS, Inc.
www.iis-servo.com

TITLE: CABLE, ENCODER
DRAWING NUMBER: LEC-XYZMMM

DIMENSIONS ARE MM [INCHES]	TOLERANCES X.XX± -- X.XXX± -- ∠ ± --	REV 0		ECN 11-???	DATE 10SEP11	SH. 1 OF 1

Figure B.13 - LEC Encoder Cable Selection Guide

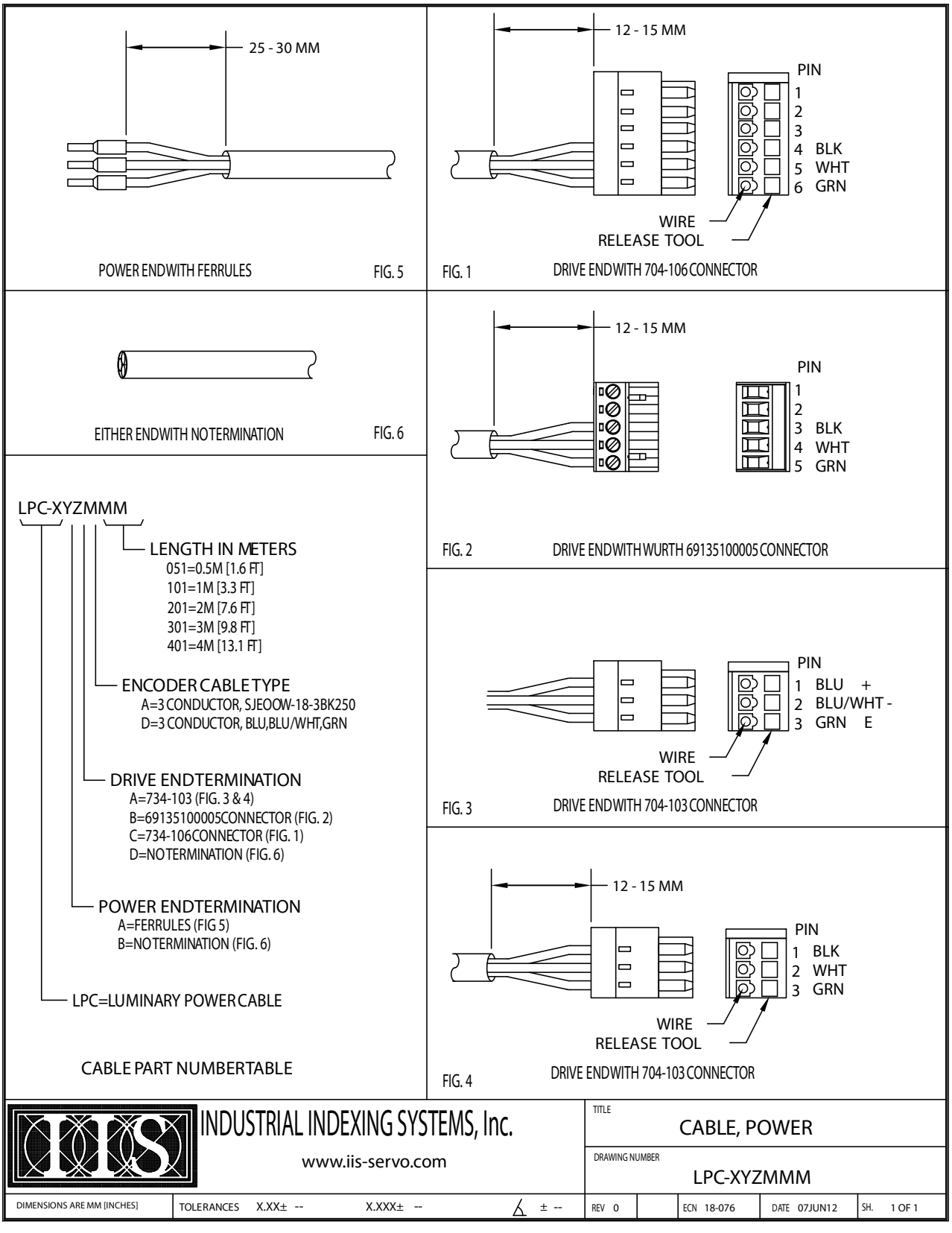
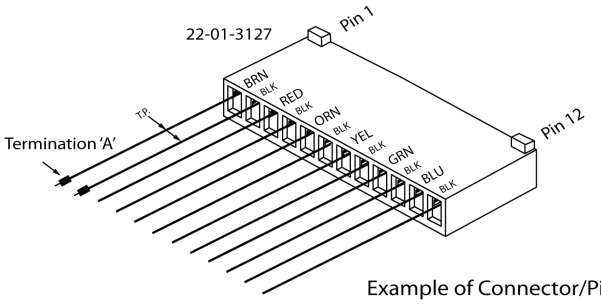
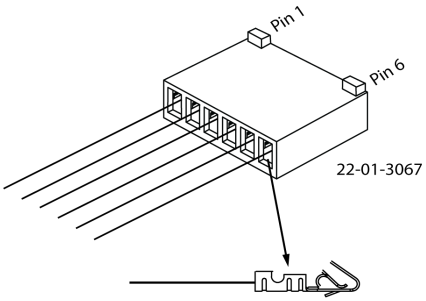


Figure B.14 - LPC Power Cable Selection Guide



Example of Connector/Pin Orientation



Molex Mini KK 254 pin
P/N: 08-55-0102
Wire: 22-30 AWG
Capacity: 4.0 amps
Contact: Selective Gold (Au),
Nickel (Ni) Under Plating
Crimp Tool: Molex 63811-8200

Available Connector Kits:
Cable assemblies can be made to order or connector kits can be purchased. Kits will contain either signal or power connectors with pins for each unit.

Connector Kit	*Electrical Unit*
LC-CONKIT	LMC Controller I/O
LD-CONKIT-ANA	Analog Out I/O
LD-CONKIT-IO	LD Drive I/O
LD-CONKIT-MTR	LD-Drive Power
LPD-CONKIT-MTR	LSTP Drive Power

Luminary Interface Cables

L I C - X Y Z M M M

Length
- 051 0.5 meter
- 101 1.0 meter
- 151 1.5 meter
- 201 2.0 meter

Cable
- A - 1 pair, shielded, 24AWG
- B - 3 pair, shielded, 24AWG
- C - 4 pair, shieided, 24AWG
- D - 6 pair, unshielded, 24AWG
- E - 7 pair, shielded, 24AWG

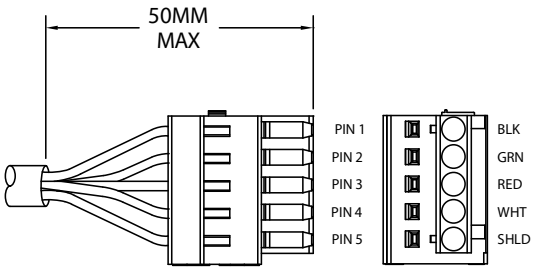
Unit Connector

Sockets	P/N	Location
A - 3 position	22-01-3037	(LD-xxx-J3)
B - 6 position	22-01-3067	(LD-xxx-J2)
C - 7 position	22-01-3077	(LD-xxx-J5)
D - 8 position	22-01-3087	(LMC-xxx-J2, J3)
E - 10 position	22-01-3107	(LMC-xxx-J4)
F - 12 position	22-01-3127	(LD-xxx-J1)

Termination
- A - Ferrules
- B - No Termination

Figure B.15 - LIC-XYZMMM Drawing

*See **Section B.2.2** for connector kits*



DRIVE END WITH 734-105 CONNECTOR FIG. 1

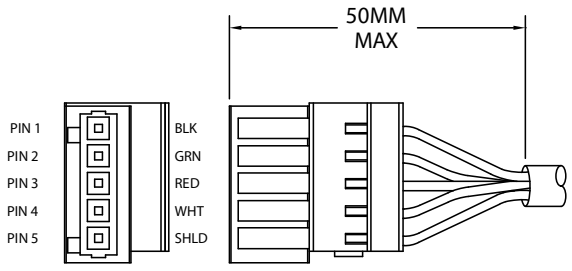


FIG. 3 MOTOR END WITH 734-305 CONNECTOR

EITHER END WITH NO TERMINATION FIG. 2

LPAC-XYZMMM

LENGTH IN METERS
101=1M [3.3 FT]
201=2M [7.6 FT]
301=3M [9.8 FT]
401=4M [13.1 FT]

ARMATURE CABLE TYPE
A=5302UE: 4COND. W/ SHLD, 18 AWG

DRIVE END TERMINATION
A=5 PIN FEMALE PLUG (FIG .1)
WAGO 734-105 CONNECTOR
B=NO TERMINATION (FIG. 2)

MOTOR END TERMINATION
A=5 PIN MALE RECPTACLE (FIG 3)
WAGO 734-305 CONNECTOR
B=NO TERMINATION (FIG. 2)

LPAC=LUMINARY STEPPER ARMATURE CABLE

CABLE PART NUMBER TABLE

INDUSTRIAL INDEXING SYSTEMS, Inc.
www.iis-servo.com

TITLE: CABLE, ARMATURE
DRAWING NUMBER: LPAC-XYZMMM

DIMENSIONS ARE MM [INCHES]	TOLERANCES X.XX± -- X.XXX± -- ∠ ± --	REV 0		ECN 13-072	DATE 02JUN13	SH. 1 OF 1

Figure B.16 - LPAC-XYZMMM Drawing

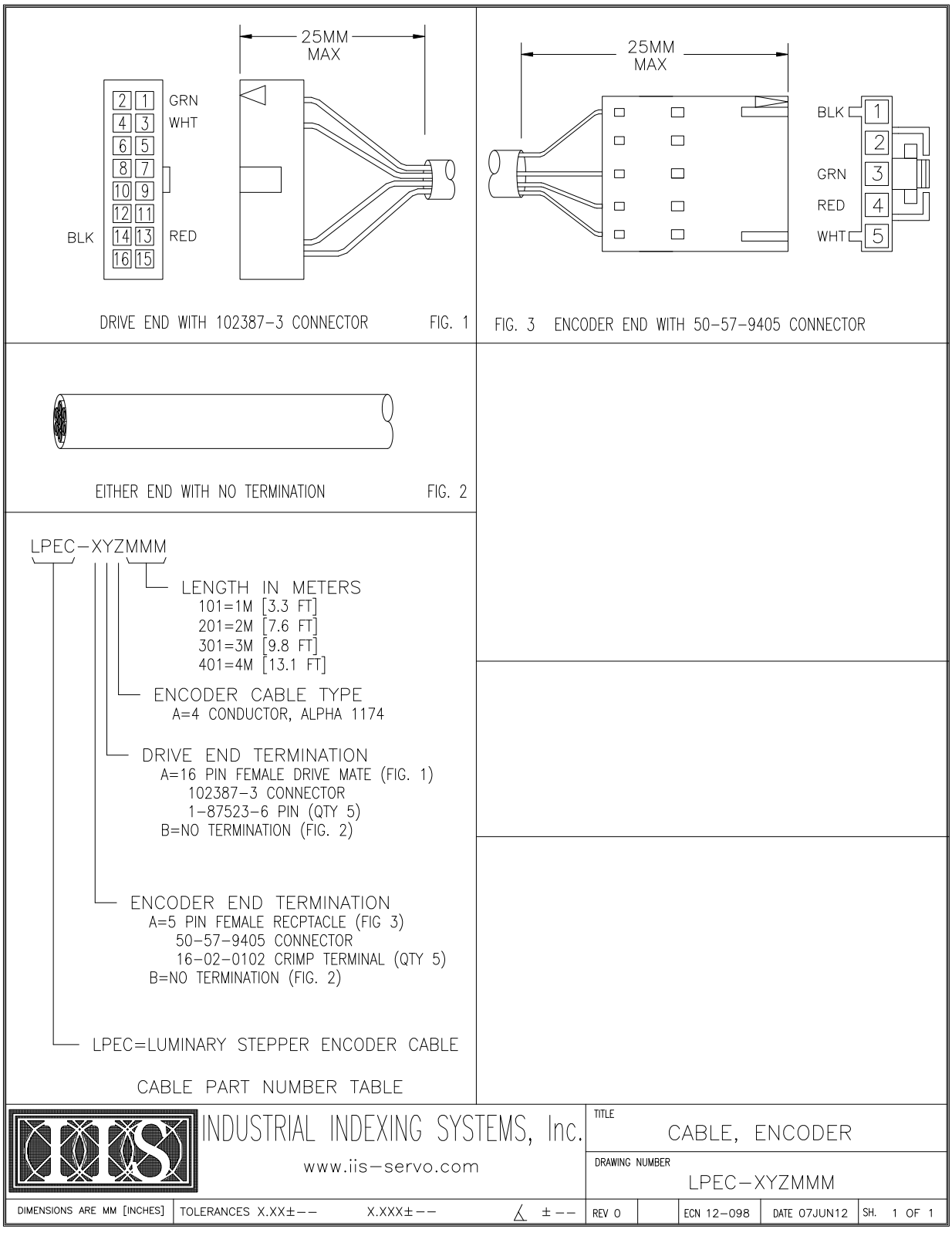


Figure B.17 - LPEC-XYZMMM Drawing

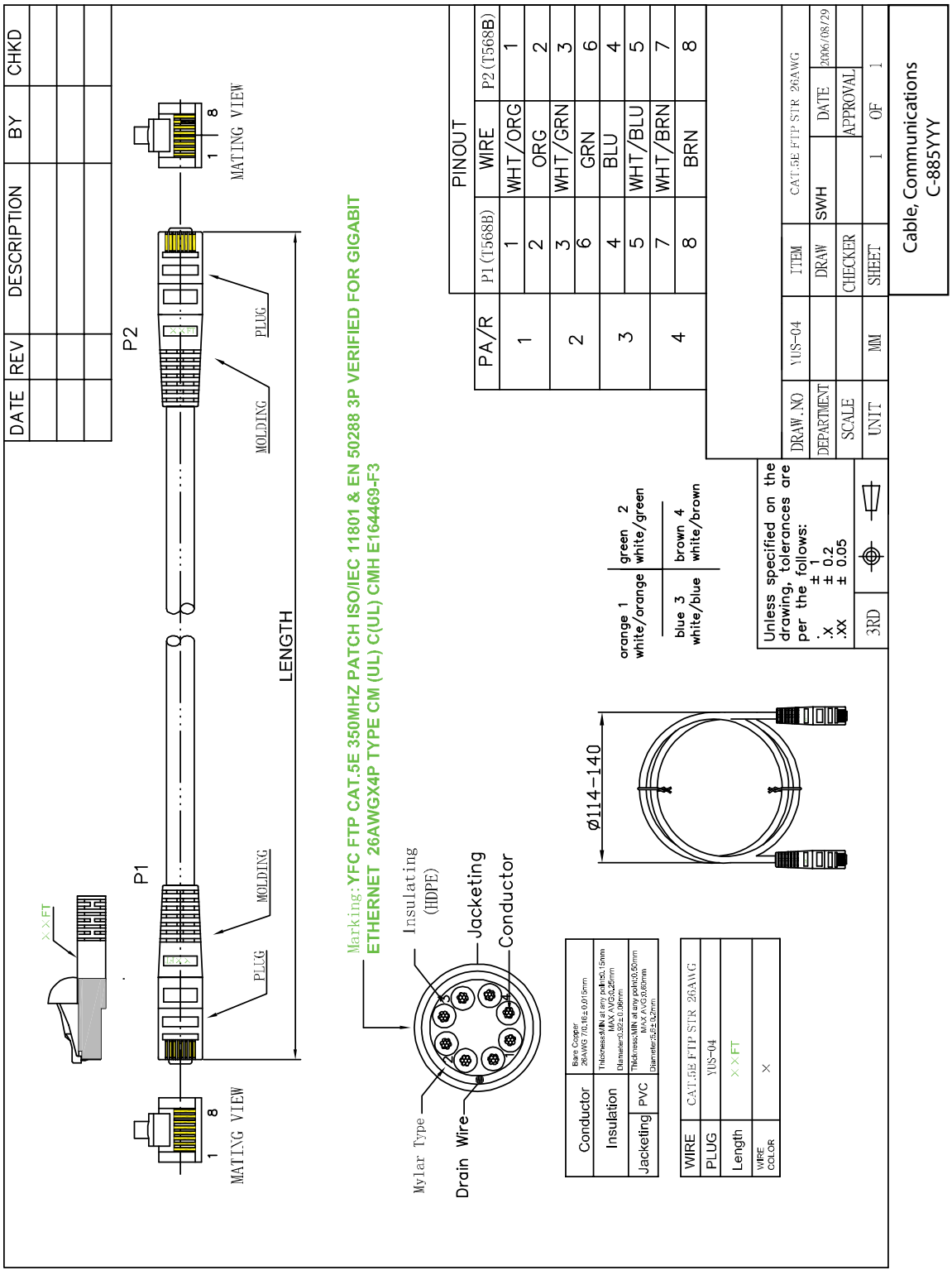


Figure B.18 - C-885YYY Drawing

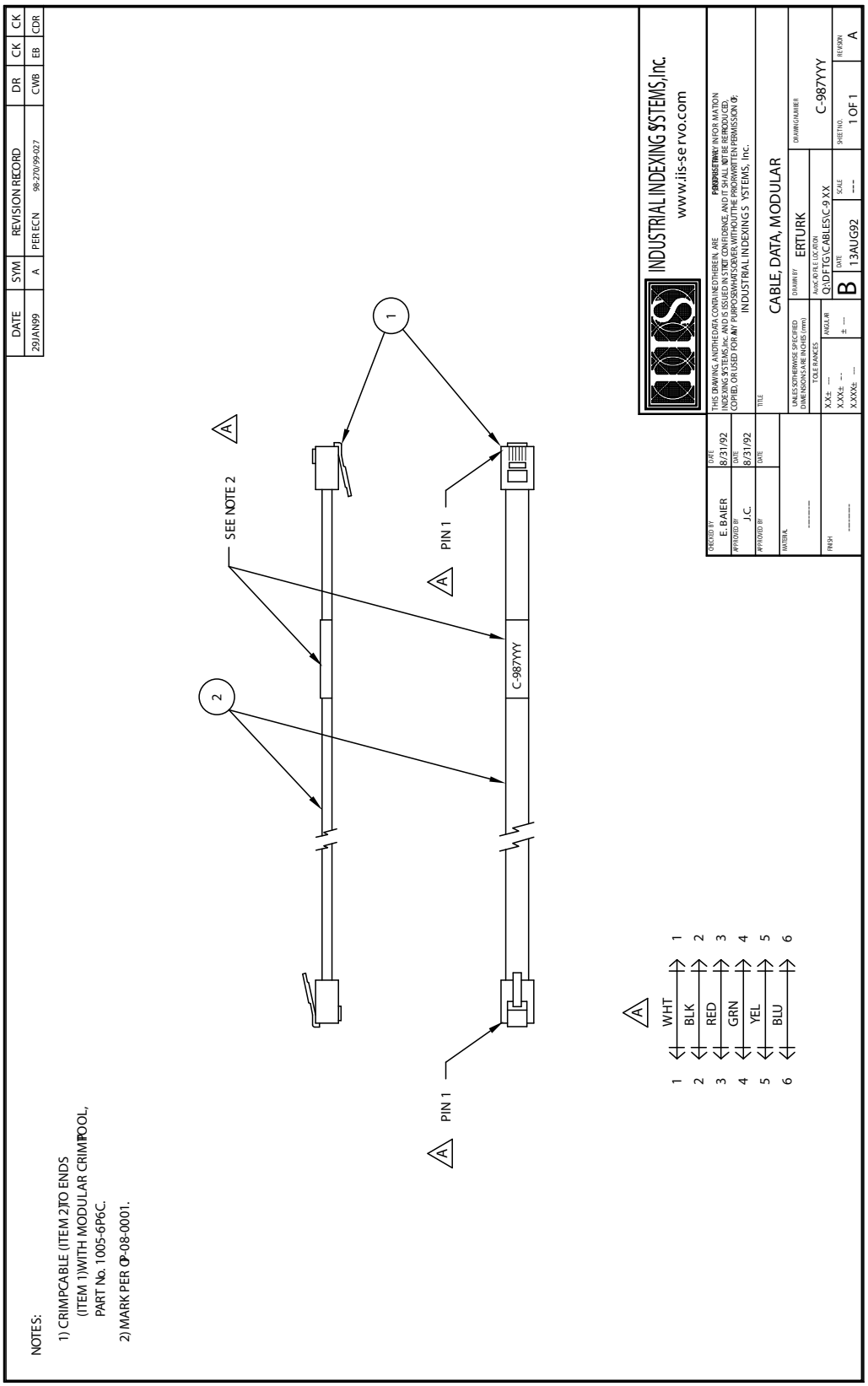


Figure B.19 - C-987YYY Drawing

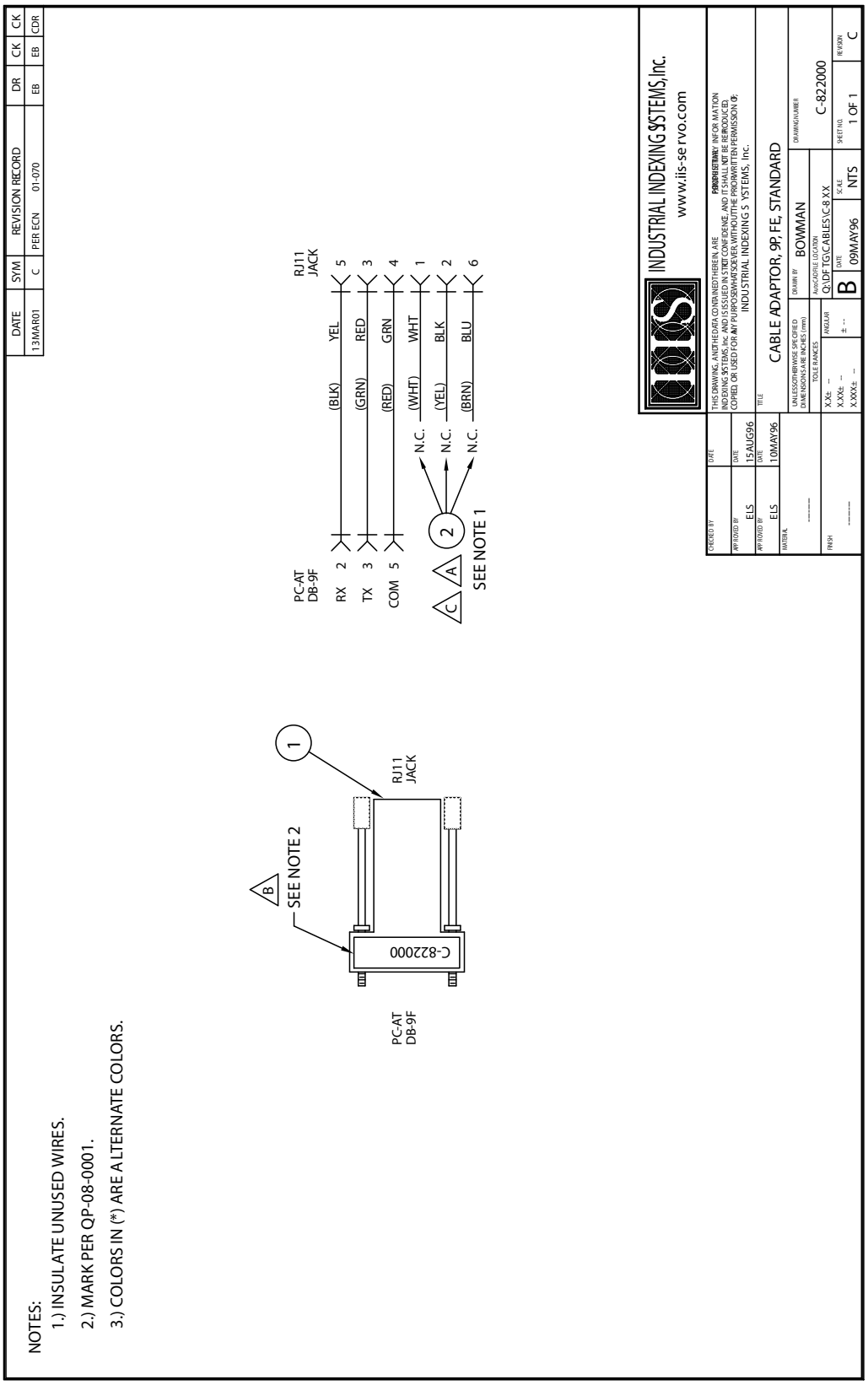


Figure B.20 - C-822000 Drawing

B.2.2 CONNECTOR KITS

As an alternative to purchasing complete cable sets, customers can assemble the system's cables using the Luminary connector kits.

Luminary Drive Type	LD-330/XZ LD-500/XZ	LD-101/XZ	LD-500/T
Connector Kits	LD-CONKIT-MTR LD-CONKIT-I/O	LD-CONKIT-MTR10A LD-CONKIT-I/O	LPD-CONKIT-MTR LD-CONKIT-I/O

Connector Kit	Parts	Description	Quantity
LD-CONKIT-MTR	102387-3	16 Pin Ribbon Connector	1
-	1-87523-6	Female Pins (note 1)	16
-	734-104	4 Pin Female Connector	1
-	734-106	6 Pin Female Connector	1
LD-CONKIT-MTR10A	102387-3	16 Pin Ribbon Connector	1
	1-87523-6	Female Pins	16
	734-104	4 Pin Female Connector	1
	691351500005	5 Pin Female Connector	1
LD-CONKIT-I/O	22-01-3037	3 Pos Connector	1
-	22-01-3077	7 Pos Connector	1
-	22-01-3127	12 Pos Connector	1
-	08-55-0102	Socket Pins (note 2)	25
LPD-CONKIT-MTR	102387-3	16 Pin Ribbon Connector	1
-	1-87523-6	Female Pins (note 1)	16
-	734-103	3 Pin Female Connector	1
-	734-105	5 Pin Female Connector	1
LD-CONKIT-ANA	22-01-3067	6 Pos Connector	1
-	08-55-0102	Socket Pins (note 2)	6

Note 1: Use crimping tool AMP 91516-1
Note 2: Use Molex MINI-KK crimp tool (63811-8200)

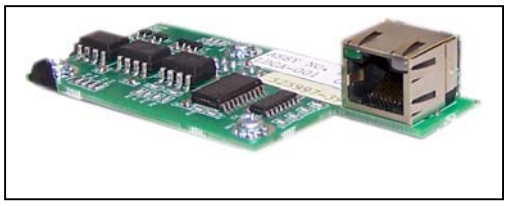
B.3 ACCESSORIES

- ISOCOM Isolated serial port for LD drive
- LDCA-001 Drive network interface for use with the LMC-400 controller (See Appendix C)
- LDAA-001 Analog output for the LD drive (See Appendix C)
- OPI-4.3 4" Touch screen
- OPI-7.0 7" Touch screen
- L-Drive Configuration and tuning PC software
- EDE Motion controller development software
- Firmware downloader

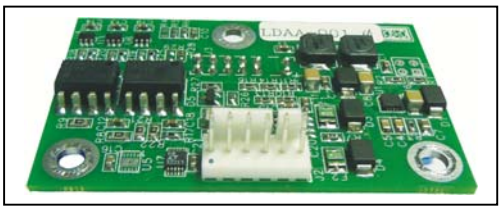
APPENDIX C - OPTION CARDS

C.1 OPTION CARD OVERVIEW

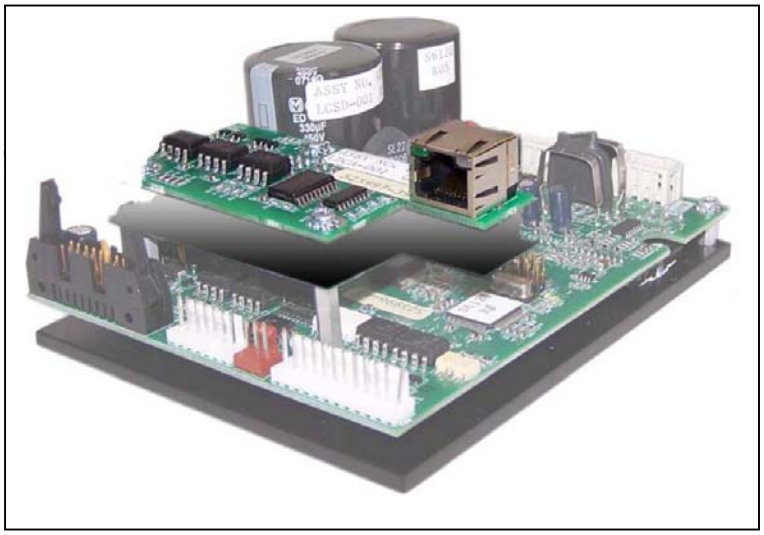
The Option cards described here are used to extend the functionality of Luminary Series Drives. Only one option card can be installed at one time. Other option cards may be available, check with factory.
Custom option cards can be engineered to fulfill your external interfacing needs,
Consult IIS sales to discuss the details of your application.



The SBI Network Device Communications interface is for use with the LMC-400 Luminary Controller allowing up to four Luminary devices to be networked in a single application.



The Analog Output Interface gives the user an analog representation of the selected output. By configuring with the L-Drive PC toolkit, select either motor velocity or motor torque as an analog output. The output is scaled to the industry standard of –10Vdc to +10Vdc



The Option Cards are securely installed onto the LD drive. The option card size and shape can vary depending on the customization requirements.

The option card interface port resides on the main board at J2 using three standoff posts.

C.2 OPTION CARD SPECIFICATIONS

C.2.1 SBI NETWORK DEVICE COMMUNICATION INTERFACE

Used to connect the Luminary Drive as a slave device to a Luminary Motion Controller LMC-400. Up to four LD drives can be networked to create a synchronized and coordinated multi-axis motion control system.

(ref: IB-30B002 manual for the LMC-400 controller)

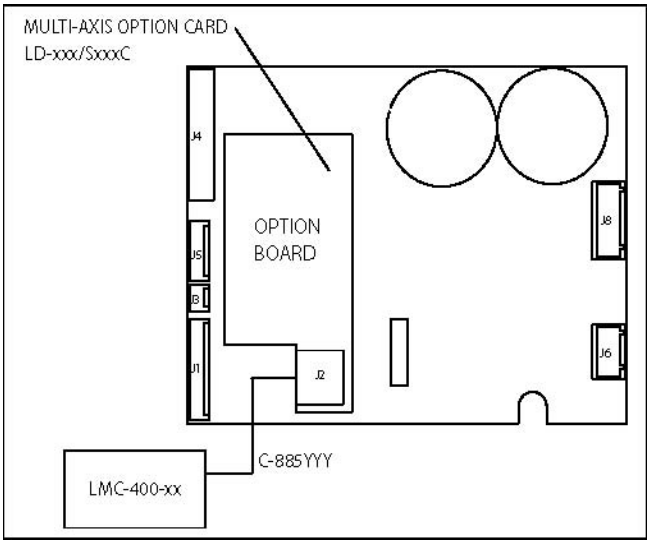


Figure C.1 - LMC-400 Connected to The LD Drive With The C-885YYY Cable

LDCA-001 (J2) SBI Network Device Port Specifications:
Input Type: Differential
Input Voltage range: 0 to 5V
Output Type: Differential
Output Voltage range: 0 to 5V
Output Current (per channel): 20mA
Connector type: RJ-45 shielded

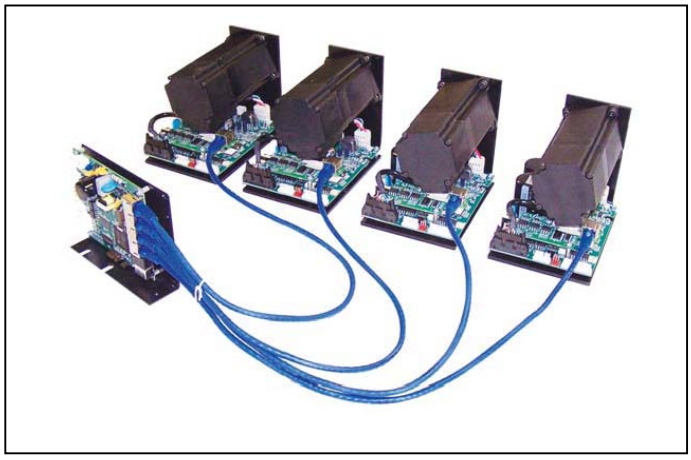


Figure C.2 - LMC-400-21 Controller Wired to Four LD Drives With The LDCA-001 Option Card Installed

C.2.2 ANALOG OUTPUT OPTION CARD (LDAA-001)

To convert an internal signal of an LD drive to an analog value, to be monitored by external means. Power supply rails of ±12Vdc are available for use by external equipment.

Specifications:
Output Type: Analog
Output resolution: 12 bit
Output Voltage range: -12V to +12V maximum, -10V to +10V rated
Output Current: 10mA maximum
Output short circuit: Temporary, less than 5 seconds
Output zero offset: □0.1V maximum, □0.05V typical
Output gain error: □0.5V maximum, □0.1V typical

Power supply output:
Output voltage: ±12V dc
Output current: 40mA per channel maximum

Connections to J2:
Pin 1 – Analog Output
Pin 2 – Analog Ground
Pin 3 – Shield
Pin 4 – (+12V) Output
Pin 5 – Analog Ground
Pin 6 – (–12V) Output

***Note**: Do not apply power to the +12V or –12V pins or damage may occur to the analog output card.*

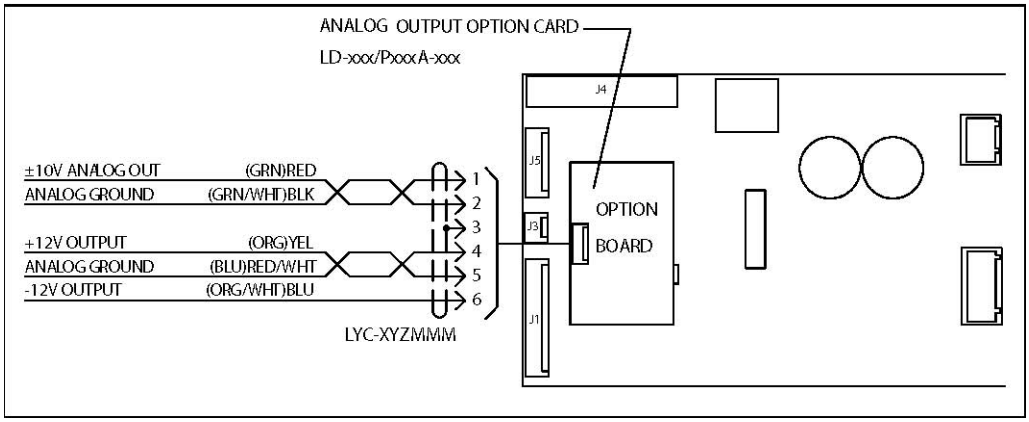


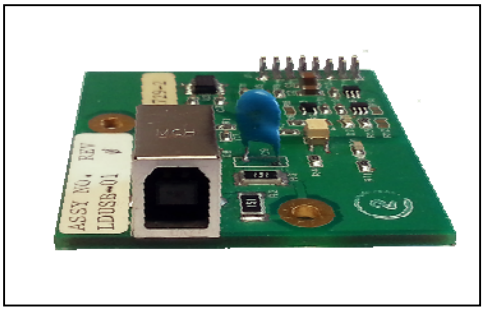
Figure C.3 - LDAA-001 Connection For Analog Signal Plus a Small 12 VDC Power Source For Interfacing to AUX System

Option Card Setup:
Configuring of the device is necessary before use of the Analog Output card. This can be done by the customer using the L-Drive tool kit and the USB option, or by IIS at time of shipment using a setup file created for your application. Consult IIS Factory for more details.

Programming parameters: See **Section 6** for more details.

IDN-0062 – Analog Output Selection
IDN-0063 – Analog Output Scaling
IDN-0064 – Analog Output Zero Offset
IDN-0065 – Analog Output Mode
IDN-0066 – Analog Output Slew Rate
IDN-0067 – Analog Output Filter

C.2.3 USB COMMUNICATIONS OPTION CARD (LDUSB-01)



The USB option card configures the LD drive as a digital controlled device by using a serial USB connection. The USB interface option uses a serial protocol call Modbus RTU to read and write the internal registers outlined in **Section 6** of this manual. The USB option card can be used to read and write drive parameters regardless of the drives mode setting. However, to control the drives motion profile using the USB option card, the mode must be set to "6". Note: The LD drive application mode must be set to mode 6 to enable this functionality.

See **Appendix D** for details outlining the use of USB option.

See **Section 2.1** for ordering this option for the LD servo drive.

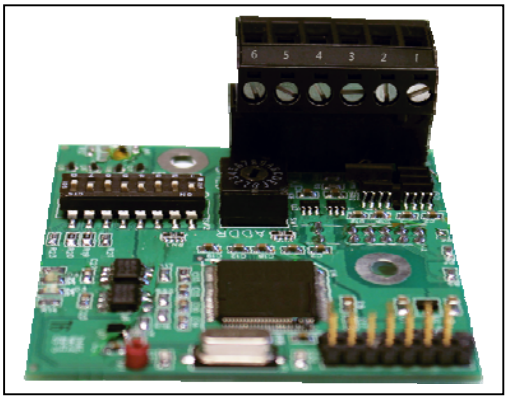
Figure C.4 USB Communications Interface

Specifications:
Communications Type: USB 2.0 slave
USB voltage input: 4.0V minimum, 5.25V maximum.

LED descriptions:
GREEN: 5V power from the USB master (PC)
YELLOW: USB communications activity

Programming parameters: See **Section 6** and **Appendix D** for more details

C.2.4 RS-485 COMMUNICATIONS OPTION CARD (LD485-01)



The RS-485 option card configures the LD drive as a digital controlled device by using a serial RS-485 connection. The RS-485 interface option uses a serial protocol call Modbus RTU to read and write the internal registers outlined in **Section 6** of this manual. Note: The LD drive application mode must be set to **mode 6** to enable this functionality.

See **Appendix D** for details outlining the use of RS-485 option.

See **Section 2.1** when ordering this option for the LD servo drive.

Figure C.5 - RS-485 Communications Interface

J3 Interface Specifications:
Communications Type: RS-422 / RS-485 slave
Signal voltage input differential: 0.2V minimum, 7V maximum.
Signal voltage output differential: 1.5V minimum, 5V maximum.
Output Drive current: ±60mA
Output short circuit protected: Yes

Status LED descriptions:
GREEN: Communications ready, flashing indicates communications activity on this drive
RED: Communications timeout
YELLOW: Communications active on the RS485 Ring

Mode Switch SW1 settings:
Switch 1 - Baud setting 0
Switch 2 - Baud setting 1
Switch 3 - Baud setting 2

Switch 4 - Half duplex Switch 0
Switch 5 - Half duplex Switch 1

Switch 6 - Pull Up terminating resistor (1K ohm)
Switch 7 - Terminating resistor (165 ohm)
Switch 8 - Pull Down terminating resistor (1K ohm)

Baud rate	Baud switch 0	Baud switch 1	Baud switch 2
9600	off	off	off
19200	ON	off	off
38400	ON	ON	off
57600	off	off	ON
115200	ON	off	ON

Duplex mode	Half duplex Switch 0	Half duplex Switch 1
Half	ON	ON
Full	off	off

C.2.4 RS-485 COMMUNICATIONS OPTION CARD (LD485-01) (cont'd)

Termination Resistors:
Enable resistors according to the network configuration. At a minimum switch 7 should be set on for the last slave interface on your network

Modbus address SW2 switch setting:
Dial setting from 0 to F (0 to 15 decimal value)

J3 Interface Connections:

Half Duplex:	**Full Duplex:**
Pin 1 - SIG +	Pin 1 - TX +
Pin 2 - SIG –	Pin 2 - TX –
Pin 3 - GND	Pin 3 - GND
Pin 4 - No connect	Pin 4 - RX +
Pin 5 - No connect	Pin 5 - RX –
Pin 6 - SHIELD	Pin 6 - SHIELD

Note: RS-485 GND (Pin 3) is biased to Earth (Pin 6 on drive power connector) with a 150 Ohm resistor.

For more information on RS-485 networking refer to this link:

http://www.ti.com/lit/an/slla272c/slla272c.pdf

Programming parameters: See **Section 6** and **Appendix D** for more details

APPENDIX D - USING LUMINARY DIGITAL DRIVE

D.1 OBJECTIVE

This section will explain the process of communicating with, setting up, and using a Luminary Drive in digital mode. Two ways you can access the Luminary drive digitally are the USB option card or the RS-485 option card. To set the initial parameters of the drive, IIS provides a PC based software tool called L-Drive that uses the USB option card. The L-Drive PC tool allows read and write access to all the tuning registers and displays the real-time velocity and torque responses in chart form. When accessing the digital drive with a PLC controller the RS-485 option allows the user to network multiple Luminary Drives to control Velocity and/or Torque. Both interfaces use the Modbus protocol.

D.2 INSTALLING THE SOFTWARE AND DRIVERS

D.2.1 INSTALLING LDRIVE AND THE USB DRIVER

1. Install LDRIVE on your computer; call IIS for this free application if you need it. During part of the install, you will be asked to install the USB driver for the CP210X USB to UART bridge. Select install.

NOTE: The CP2102/9 Virtual COM Port (VCP) device drivers allow a CP2102/9-based device to appear to the PC's application software as a COM port. Application software running on the PC accesses the CP2102/9-based device as it would access a standard hardware COM port.

2. The driver can also be found at: https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers

3. Now install a USB A/B cable from the Luminary drive to the PC. The USB to UART driver should now finish installing.

4. Once fully installed, the USB to UART device should show up as an available COM PORT under the device manager of your PC. The COM port number listed here is what you will need to use to communicate with LDRIVE or your own application program.

5. Reference instruction manual IM-3289 for information on LDRIVE software.

D.3 MODBUS COMMUNICATIONS

D.3.1 SUPPORTED MODBUS FUNCTIONS

1. The Luminary Drive Series uses the RTU (Remote Terminal Unit) transmission mode with the drive set to address node 1.

2. Currently, there are three supported Modbus functions:
   4 (READ_INPUT_REGISTERS),
   6 (WRITE_SINGLE_REGISTER), and
   16 (WRITE_MULTIPLE_REGISTERS).

3. The data is stored as 16 bit values. Some data ranges are 32 bits in length. To properly read and write these values, please see **Section D.4**.

4. The communications is fixed at 19200 baud, 8 data bits, even parity and 1 stop bit.

5. To read data use MODBUS function 4 READ_INPUT_REGISTERS). The Input Registers are at reference 3x. The address is then the 4-digit number found in **Section 6**.

6. To write data use MODBUS functions 6 and 16. (PRESET_SINGLE_REGISTER) and (WRITE_MULTIPLE_REGISTERS). The Holding Registers are at reference 4x. The address is then the 4-digit number found in **Section 6**.

7. Examples:

Read Input Registers

SERIAL REQUEST	
	(hex)
Function	04
Starting Address Hi	00
Starting Address Lo	02
No. of Registers Hi	00
No. of Registers Lo	01

SERIAL RESPONSE	
	(hex)
Function	04
Byte Count	02
Input Register 2 Hi	00
Input Register 2 Lo	02

Table D.1 - Reading The Drive's Revision Number

Write Single Register

SERIAL REQUEST	
	(hex)
Function	06
Register Address Hi	00
Register Address Lo	36
Register Value Hi	00
Register Value Lo	01

SERIAL RESPONSE	
	(hex)
Function	06
Register Address Hi	00
Register Address Lo	36
Register Value Hi	00
Register Value Lo	01

Table D.2 - Writing to The Drive's Digital Inputs

8. For more information about the Modbus protocol, go to http://www.modbus.org/specs.php.

D.4 BASIC PROGRAMMING

D.4.1 SETTING THE DRIVE INTO DIGITAL MODE

1. To set the Luminary drive into digital control mode, set the Application Mode (IDN 0005) to "6". Changing of the application mode will set all motor parameters and tuning parameters back to factory default settings.

2. Whenever the application mode is changed, all default settings for this application mode are written to flash, so there will be a delay and communications may be interrupted. Reconnecting back to the device will be possible again within 3 seconds.

D.4.2 SETTING MOTOR PARAMETERS

1. There are 11 parameters associated with defining the motor to run with the Luminary Digital drive. These parameters define the motor protection values, current response, and Attributes of the motor.

2. Parameter definitions:

NOTE: These MUST be set properly, or damage to the motor or driver board is possible.
See Section 6 of the manual for more information on these parameters.

IDN	Name	Length	Definition
0021	Motor Poles	16bit	Number of electrical poles in the motor.
0025	Encoder Line Count	16bit	The line count of the AB phases of the motor encoder.
0022	PWM Frequency	16bit	PWM frequency the drive will use 8KHz or 16KHz. Note: 16KHz will reduce the drives output current capabilities, but will reduce the audible noise of the motor. See section 4 of the manual for details.
0015	Curr Loop Int Time 1	16bit	Set this to a value of 3142 always
0016	Curr Loop Int Time 2	16bit	Set this to a value of 3142 always
0127	Curr Loop Gain 1	32bit	Calculated from the Winding Inductance of the motor. (2000 * Winding Inductance (mH))
0129	Curr Loop Gain 2	32bit	Set the same as IDN 0127
0131	Motor Rated Curr	32bit	Amps RMS peak (ARMS * 1.414) (Continuous rated current)
0133	Motor Max Curr	32bit	Amps Max RMS peak (ARMS Max * 1.414) (intermittent rated current)
0141	Motor Rated Vel	32bit	RPM (Continuous rated velocity)
0139	Motor Max Vel	32bit	RPM (intermittent rated velocity)

D.4.3 SETTING MOTOR TUNING PARAMETERS

1. There are 14 parameters associated with the tuning to run with the Luminary drive.

2. Parameter definitions:

IDN	Name	Length	Definition
0014	Vel Loop Int	16bit	The gain used to add the accumulated velocity error to the current control loop. (Normal range is between 18.0ms and 120.0ms)
0018	Vel Loop Diff	16bit	The gain used to add in the slope of the velocity error to the current control loop. (Normal 0.0ms)
0028	Curr Rej Frequency	16bit	Frequency at which the current feedback is rejected (Normal range is 300Hz to 900Hz)
0029	Curr Rej Bandwidth	16bit	Bandwidth at which the current feedback is rejected (Normal range is 150Hz to 300Hz or disabled at 0)
0030	Vel Cmd Low Pass	16bit	Frequency at which the velocity command change is allowed. Acts like a low pass filter. (Normal range is 150Hz to 450Hz or disabled at 0)
0031	Vel Fbk Low Pass	16bit	Frequency at which the velocity feedback change is allowed. Acts like a low pass filter. (Normal range is 150Hz to 450Hz or disabled at 0)
0007	Drive On Delay	16bit	Delay time from when the drive is enabled to when first motion can occur (Normal range is 25ms to 150ms)
0008	Drive Off Delay	16bit	Delay time allowing a decel before the motor is disabled (Normal range is 25ms to 150ms)
0019	Pos Torque Limit	16bit	Maximum allowable torque applied in the CW direction (Normal range 30.00% to 100.00%)
0020	Neg Torque Limit	16bit	Maximum allowable torque applied in the CCW direction (Normal range -30.00% to -100.00%)
0125	Vel Loop Prop Gain	32bit	The gain that adds in a proportional value of the instantaneous error to control loop (Normal range 0.100 to 10.000)
0119	Accel Feed Forward	32bit	The percent of acceleration error fed directly back into the control loop (Normal range 0.0%)
0123	Bipolar Acc Limit	32bit	Acceleration/Deceleration limit (Normal range 25.000 to 6300.000)

*Note: See **Section 6** of the manual for more information on these parameters.*

D.5 DRIVE OPERATION

D.5.1 BASICS OF THE DIGITAL DRIVE

1. In the Digital Control mode, the drive commands are precise and repeatable. Unlike the analog version instead of looking at the state of the pins of the drive and using analog to digital conversions, it uses the register values addressed as IDNs. Ten registers are used to control the basic operation of the drive in Digital Control Mode.

IDN	Name	Length	Definition
0011	Torque Command	16bit	Percentage of peak torque applied to the motor
0033	Digital Outputs 1	16bit	Read to see the state of the drive. A value of 0 is normal, 1 is faulted.
0036	Digital Inputs 1	16bit	Set the state of the 4 inputs to the drive. Input 1 (bit 0): Drive Enable Input 2 (bit 1): Velocity/Torque Mode. When bit 1 is on, the drive will be in Torque Mode Input 3 (bit 2): Not defined at this time Input 4 (bit 3): Not defined at this time
0046	Velocity Command	16bit	Sets the speed of the drive in RPM.
0069	Watchdog Timeout	16bit	The number of milliseconds before the comm port indicates a communications fault (F87). The fault is disabled when set to 0.
0070	Watchdog Reset	16bit	Resets the counter that's used by IDN 00 69 for communication faults. Any value written to this register will set the count to 0.
0072	Number of Average	16bit	Sets number of average cycles for IDN 151.
0073	Select Velocity Command Source	16bit	Set source for Velocity command, either IDN 46 or IDN 153.
0151	High Precision Velocity Feedback	32bit	Averaged Velocity feedback value. Amount of averaging is set by IDN 72, and has one inferred decimal place. Example: a value of 2996 means 299.6 RPM
0153	High Precision Velocity Command	32bit	Sets the command speed of the drive in RPM, with one inferred decimal place. Example: a value of 3005 means 300.5 RPM.

2. If the drive is in the faulted state, the Enable Input needs to be toggled to clear the fault.

D.5.2 VELOCITY MODE

1. When input 2 (bit 1) in IDN 36 is OFF when the drive is enabled the drive will be in Velocity mode.

   IDN 0036 = 0000, Drive OFF, Velocity Mode
   IDN 0036 = 0001, Drive ON, Velocity Mode

2. The register Digital Outputs 1 IDN 0033 bit 0 defines if the drive is in normal state or faulted state.

   IDN 0033 = 0001, Drive in normal state
   IDN 0033 = 0000, Drive in faulted state

   To clear this faulted state, Input 1 (bit 0) needed to be toggled in IDN 0036

3. To command the drive to run as velocity, first set the tuning to a safe region. So the tuning should be as follows for a safe running system, then adjustments can be made to fit your application.

IDN	Name	Setting	Decimal places
0014	Vel Loop Int	310	1
0018	Vel Loop Diff	0	1
0028	Curr Rej Frequency	900	0
0029	Curr Rej Bandwidth	0	0
0030	Vel Cmd Low Pass	300	0
0031	Vel Fbk Low Pass	300	0
0007	Drive On Delay	25	0
0008	Drive Off Delay	0	0
0019	Pos Torque Limit	10000	2
0020	Neg Torque Limit	-10000	2
0125	Vel Loop Prop Gain	150	3
0119	Accel Feed Forw	0	1
0123	Bipolar Acc Limit	25000	3

4. Now select the source for commanding the motor velocity by setting IDN 0073. A value of 0 for IDN 0072 means the velocity command will be set using IDN 0046. A value of 1 for IDN 0072 means the velocity command will be set using IDN 0153.

5. Now set the velocity command you wish the motor to run at, either by IDN 0046 or by IDN 0153, as selected by the value of IDN 0073.
   Example for IDN 0046:
   A value set to IDN 0046 of 305 means to run the motor at 305 RPM.
   Example for IDN 0153:
   A value set to IDN 0153 of 305 means to run the motor at 30.5 RPM.

6. Reading the velocity feedback of the motor is able to be read by IDN 0047 and/or by IDN 0151.
   IDN 0047 is an instantaneous reading with accuracy of up to ±1 RPM.
   IDN 0151 is an averaged reading with accuracy of up to ±0.1 RPM.
   The amount of averaging is set with IDN 0072 set to its maximum averaging of 256 cycles in IDN 0072, the reading of the velocity feedback using IDN 0151 will be very stable, but sacrificing response time of the change in IDN 0151.
   Response time is calculated by:
   (0.25ms) X (IDN 0072).
   A value of 256 cycles, it will take IDN 0151 64ms to respond to motor shaft velocity changes.

D.5.2 VELOCITY MODE (cont'd)

7. Now set the motor to Enable by setting IDN 0036 to 1.

NOTES ON SYSTEM TUNING

8. Once all the parameters are setup for the motor, you can tune the system using Velocity mode. Just be careful on changing the settings for the tuning and try not to make large changes in a value while motor is running.
9. If the motor is growling or making a lot of noise, most likely the Vel Loop Prop Gain IDN 0125 is set too high. If the motion is sluggish then the value of Vel Loop Prop Gain IDN 0125 is most likely set too low.
10. Bring the value of integral portion (Vel Loop Int IDN 0014) lower will reduce the following error, but reducing it too far can make the system unstable. A value of 0 is valid and will disable the integral portion of the velocity loop.
11. If you are getting following errors, this means the following error is above the Monitoring Window IDN 0115. It is common to the encoder count per rev of the motor. Which is calculated as (Encoder Line Count IDN 0025 * 4). You may decrease this value for precision applications, increasing this value above 2 times the encoder count per rev is not recommended as a system fault may go undetected for an unsafe period of time.

D.5.3 TORQUE MODE

1. When input 2 (bit 1) in IDN 36 is ON when the drive is enabled the drive will be in Torque mode.

   IDN 0036 = 0002, Drive OFF, Torque Mode
   IDN 0036 = 0003, Drive ON, Torque Mode

2. The register Digital Outputs 1 IDN 0033 bit 0 defines if the drive is in normal state or faulted state.

   IDN 0033 = 0001, Drive in normal state
   IDN 0033 = 0000, Drive in faulted state

   To clear this faulted state, Input 1 (bit 0) needed to be toggled in IDN 0036

3. Before operation of the system is set into torque mode. The tuning of the system should be completed as described in Section D.5.2 Velocity Mode. The velocity parameters will not matter, but its good practice to leave reasonable values in the tuning parameters.

CAUTION: It is possible to damage the motor by commanding an excess amount of current. As it uses peak current not rated current of the motor.

4. To use torque mode, set Torque Command IDN 0011 in percent of the Motor or drive's peak torque value. The peak motor current is defined as Motor Peak Current IDN 0131 or Amplifier Peak Current IDN 0135, which ever is less. Typically the value of Motor Peak Current IDN 0131 is 3 times the rating of Motor Rated Current IDN 0133. This means the maximum value that should be set as the Torque Command IDN 0011 is 3300 (33.00%). This would be equal to the rated current of the motor and the drive will hold this current continuously.

D.6 COMMUNICATIONS WATCHDOG

This mode has the safety feature of a communications watchdog, so if the commanding device (PC or other) fails to update the watchdog register within the watchdog timeout value, the drive will shut down with a fault code 87.

To enable the watchdog feature, set Watchdog Timeout IDN 0069 with a time period in ms. Recommended to be 3 seconds, a value of 3000.

The Commanding device must then continuously set Watchdog Counter IDN 0070 to a value of 0 within this time frame (IDN 0069).

To clear the fault, Disable and re-enable the drive as defined in Section D.5 Drive Operation.

It is possible to disable the watchdog feature by setting the Watchdog Timeout IDN 0069 to a value of 0. But this is not advisable, as the drive will then continue to do whatever the last command was when the communications between the drive and the controller stops or disconnects. IIS only recommends Watchdog Timeout IDN 0069 to be a value between 500 and 3000.

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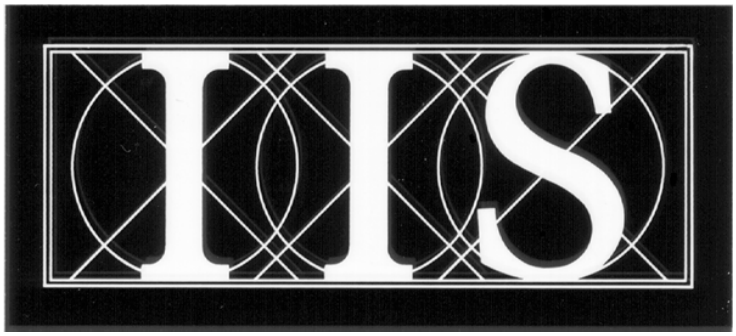

INDUSTRIAL INDEXING SYSTEMS, INC.
626 FISHERS RUN
VICTOR, NEW YORK 14564
(585) 924-9181
FAX: (585) 924-2169
www.IIS.servo.com

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