IB-19B001

DELTA SERIES JUNE 2003

DELTA MOTOR

&

DELTA DRIVER

INSTRUCTION BOOK

INDUSTRIAL INDEXING SYSTEMS, Inc.

Revision - J
Approved By:

ER-6027

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Notes:

1) Appendix A, page A-4, dated September 2003, supersedes Appendix A, page A-4, dated June 2003.

2) Appendix B, page B-2, dated October 2003, supersedes Appendix B, page B-2, dated June 2003.

3) Section 5, page 5-9, dated March 2004, supersedes Section 5, page 5-9, dated June 2003. Section 8, page 8-3, dated March 2004, supersedes Section 8, page 8-3, dated June 2003.

4) Section 5, page 5-9, dated June 2004, supersedes Section 5, page 5-9, dated March 2004. Appendix B, pages B-4 and B-5, dated June 2004, supersedes Appendix B, pages B-4 and B-5, dated June 2003. C-329YYY supersedes C-320YYY. DINT-350 revision N supersedes DINT-350 revision K.

5) Appendix B, dated November 2004, supersedes Appendix B, dated June 2003.

6) Table of Contents, page vi dated August 2005, supersedes Table of Contents, page vi, dated June 2003. Section 5, page 5-9 dated August 2005, supersedes Section 5, page 5-9, dated June 2003. Appendix A, added DBM120 series motors. Appendix B, added cables for the DBM120 series motors.

7) Section 5, page 5-9, dated March 2006, supersedes Section 5, page 5-9, dated August 2005.

8) Appendix B, DINT-300 drawing, Revision M, supersedes Appendix B, DINT-300, Revision L.

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INTRODUCTION

Thank you for selecting Industrial Indexing Systems' Delta Series products. You join many other companies around the world in your choice of these powerful, flexible motion control products.

The small, lightweight Delta Drivers combine the latest in all-digital electronic design, SMT circuit board construction and clever engineering to deliver high performance, advanced features and reasonable cost. Compact, high power density motors provide low rotor inertia, making them the logical choice for positioning and indexing applications.

Delta Drivers have a wide array of features, including a powerful embedded high speed 32-bit RISC processor, membrane keypad, high visibility 5-digit LED display, built-in RS-232 port, 8 optically isolated inputs, 8 optically isolated outputs, S-curve profiling, auto servo tuning, fault history log and many more. Dozens of operational parameters can be programmed, either through the front panel or using your IBM-compatible computer. And the PC software allows quick set-up, a full range of diagnostics and PC oscilloscope functions to display speed and current waveforms on your computer.

High-resolution resolver feedback is standard on Delta products. Other available choices include encoder feedback and Power Off absolute feedback.

SECTION 1 - OVERVIEW

This manual is organized so that information is easy to find and easy to use. It begins by detailing how to identify the basic electrical characteristics of Delta Drivers and Delta Motors, and provides comprehensive product specifications.

The six available Modes of Operation are then described, complete with signal wiring and parameter set up. Sections on Power and Driver Wiring, Regen Resistor selection and Dynamic and Mechanical Braking follow. A Troubleshooting section can aid you in the unlikely event that anything goes wrong.

Motor and Driver Speed/Torque Curves follow this preliminary information, allowing you to match Drivers and Motors to your specific applications. A final section which contains cables and various Mechanical Drawings round out this manual.

1.1 IDENTIFYING DELTA PACKAGES

Delta packages can be identified as follows.

Your Delta package model number uses this designation:

DELTA-XYYYYABCD,

WHERE:

- X = motor series
  - Blank = standard
  - A = A series
  - B = B series
  - C = Custom
  - D = D series
  - E = E series
- YYYY = is the rated mechanical output wattage of the package
- A = H = 3000 rpm rated motor
  - M = 2000 rpm rated motor
  - L = 1500 rpm rated motor
  - C = custom speed
- B = R = resolver based system
  - RA = absolute resolver sensor based system
  - E = encoder based system
  - EA = absolute encoder sensor based system
- C = A = 220 VAC system, single or three phase
  - B = 120 VAC system, single phase (only for smallest drive and only up to 200 watts)
- D = motor and driver options where
  - B = integral brake option
  - I = 14 bit analog input
  - J = Sourcing I/O Expansion Board
  - K = Sinking I/O Expansion Board
  - 1X = 1 cycle resolver
  - others as defined in future

Example: A Delta package designated DELTA-120HRB is a 120-watt motor, with a 3000 rpm rated motor, a resolver based system, 120 VAC system. If this same package was equipped with an integral brake, it would be designated DELTA-120HRBB.

1.2 IDENTIFYING DELTA DRIVES

Delta Drivers can be identified as follows. This information is on the Driver label:

Your Delta Driver model number uses this designation:

DSD-CURRENT/ZYX,

WHERE:

- CURRENT = Peak Driver Current in amps (rms)
- Z = feedback method:
  - R = resolver feedback
  - E = encoder feedback
  - RA = absolute resolver feedback
  - EA = absolute encoder feedback
- Y = input voltage:
  - A = 220 VAC input (single or three phase)
  - B = 115 VAC input (single phase) - only available up to 200 watts
- X = option:
  - I = 14 bit analog input A & D converter
  - J = Sourcing I/O Expansion Board
  - K = Sinking I/O Expansion Board

Example: A Delta Driver designated DSD-8.5/RB has a peak current rating of 8.5 A rms, resolver feedback, and 115 VAC 1∅ input voltage.

1.3 IDENTIFYING DELTA MOTORS

Delta Motors can be identified as follows. This information is on the Motor label:

Your Delta Motor model number uses this designation:

DBM-SERIES WATTAGE/SPEED YZ,

WHERE:

- SERIES = Motor series
  - Blank = standard
  - A = A series
  - B = B series
  - C = Custom
  - D = D series
  - E = E series
- WATTAGE = Rated Motor Power in watts
- SPEED = Rated Motor Speed in hundreds of RPMs
- Y = feedback method:
  - R = resolver feedback
  - E = encoder feedback
  - RA = absolute resolver feedback
  - EA = absolute encoder feedback
- Z = B for a motor with an integral brake
  - T for windings with "Tropical" fungus protection
  - W for washdown sealing
  - 1X = 1 cycle resolver

Example: A Delta Motor designated DBM-120/30R is a 120-watt motor with a 3000 rpm rated speed and resolver feedback. If this same motor were equipped with an integral brake, it would be designated DBM-120/30RB. If the same motor was equipped with "Tropical" fungus protection, it would be designated DBM-120/30RT and with a brake, it would be designated DBM-120/30RBT.

SECTION 2 - SPECIFICATIONS

2.1 DRIVER SPECIFICATIONS

Delta Driver	DSD-1.5/RB	DSD-1.5/RA	DSD-4.25/RB	DSD-4.25/RA
Weight	3.3 lb 1.5 kg	3.3 lb 1.5 kg	3.3 lb 1.5 kg	3.3 lb 1.5 kg

Delta Driver	DSD-8.5/RB	DSD-8.5/RA	DSD-17.5/RA	DSD-35/RA	DSD-50/RA	DSD-70/RA	DSD-115/RA
Weight	3.3 lb 1.5 kg	3.3 lb 1.5 kg	5.5 lb 2.5 kg	10 lb 4.5 kg	10 lb 4.5 kg	24 lb 11 kg	35 lb 16 kg

2.1.1 MOTOR OUTPUT

Delta Driver	DSD-1.5/RB	DSD-1.5/RA	DSD-4.25/RB	DSD-4.25/RA
Motor Output	PWM, 3 Phase, sine wave			
Continuous Output Current	1.0 A rms	1.0 A rms	2.8 A rms	2.8 A rms
Max. Output Current See **Figure 2.1**	1.5 A rms	1.5 A rms	4.25 A rms	4.25 A rms
Motor Ripple Frequency	20 kHz	20 kHz	20 kHz	20 kHz

Delta Driver	DSD-8.5/RB	DSD-8.5/RA	DSD-17.5/RA	DSD-35/RA	DSD-50/RA	DSD-70/RA	DSD-115/RA
Motor Output	PWM, 3 Phase, sine wave						
Continuous Output Current	2.1 A rms	3.4 A rms	5.7 A rms	14.1 A rms	18.4 A rms	28.3 A rms	56.6 A rms
Max. Output Current See **Figure 2.1**	8.5 A rms	8.5 A rms	17.5 A rms	35.0 A rms	50.0 A rms	70.0 A rms	115.0 A rms
Motor Ripple Frequency	20 kHz	20 kHz	20 kHz	20 kHz	20 kHz	10 kHz	10 kHz

2.1.2 POWER SUPPLY

Delta Driver	**DSD-1.5/RB**	**DSD-1.5/RA**	**DSD-4.25/RB**	**DSD-4.25/RA**
Main Bus Power Supply Voltage	1 Phase, Nominal: 110 VAC, Max Range: 85-126 VAC, 50/60 Hz	1 Phase, Nominal: 220 VAC, Max Range: 170-264 VAC, 50/60 Hz	1 Phase, Nominal: 110 VAC, Max Range: 85-126 VAC, 50/60 Hz	1 Phase, Nominal: 220 VAC, Max Range: 170-264 VAC, 50/60 Hz
Main Supply Capacity	350 VA	350 VA	350 VA	350 VA
Control Voltage	Powered by main circuit supply			
Control Capacity	Powered by main circuit supply			
Main Circuit Heat Loss	17 W	17 W	17 W	17 W
Control Circuit Heat Loss	23 W	23 W	23 W	23 W
Regeneration Absorption Capacity	13 W + 17 J	13 W + 17 J	13 W + 17 J	13 W + 17 J

Delta Driver	**DSD-8.5/RB**	**DSD-8.5/RA**	**DSD-17.5/RA**	**DSD-35/RA**	**DSD-50/RA**	**DSD-70/RA**	**DSD-115/RA**
Main Bus Power Supply Voltage	1 Phase, Nominal: 110 VAC, Max Range: 85-126 50/60 Hz	1 Phase, Nominal: 220 VAC, Max Range: 170-264 VAC, 50/60 Hz		3 Phase, Nominal: 220 VAC, Max Range: 170-264 VAC, 50/60 Hz			
Main Supply Capacity	570 VA	1.2 KVA	2.5 KVA	5.3 KVA	6.7 KVA	13 KVA	25 KVA
Control Voltage	Powered by main circuit supply			Single phase, 170-264 VAC, 50/60 Hz			
Control Capacity	Powered by main circuit supply			70 VA		80 VA	110 VA
Main Circuit Heat Loss	20 W	27 W	47 W	110 W	130 W	250 W	400 W
Control Circuit Heat Loss	23 W	23 W	23 W	26 W	26 W	30 W	60 W
Regeneration Absorption Capacity	17 W + 17 J	24 W + 17 J	37 W + 22 J	160 W + 38 J	180 W + 54 J	300 W + 94 J	480 W + 188 J

2.1.3 CONTROL PERFORMANCE

Feedback	Resolver
Feedback Resolution	12000 bits/rev * number of resolver cycles ie. 2X resolver = 2*12000 bits/rev = 24000 bits/rev. See motor drawings in **Appendix A.6** for resolver type.
Feedback Accuracy	18 arc minutes spread for motors with 95 mm mounting face or smaller ±20 arc minutes for B series motors 8 arc minute spread for all other motors
Current Loop Update Rate	100 µsec
Velocity Loop Update Rate	400 µsec
Position Loop Update Rate	800 µsec
Speed Regulation	Load (0%-100%): ±0.02% Power (85-126 VAC or 170-264 VAC): ±0.02% Temperature (0-55°C/32-131°F): ±0.2%
Torque Regulation	Power (85-126 VAC or 170-264 VAC): ±2% Temperature (0-55°C/32-131°F): ±2%

Feedback	Encoder
Feedback Resolution	See motor/driver speed torque curves in **Appendix A.4** for encoder resolution**.**
Feedback Accuracy	Less than 2 arc minutes
Current Loop Update Rate	100 µsec
Velocity Loop Update Rate	400 µsec
Position Loop Update Rate	800 µsec
Speed Regulation	Load (0%-100%): ±0.02% Power (85-126 VAC or 170-264 VAC): ±0.02% Temperature (0-55°C/32-131°F): ±0.2%
Torque Regulation	Power (85-126 VAC or 170-264 VAC): ±2% Temperature (0-55°C/32-131°F): ±2%

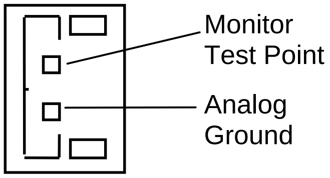
2.1.4 ENVIRONMENT

Storage Temperature	-10 to 70°C/14-158°F
Operating Temperature	0 to 55°C/32-131°F
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" by Underwriters Laboratories, Inc.

2.1.5 I/O CONTROL SIGNALS

Standard Sinking I/O	Control Input	24 VDC 8 ma: common to +24V, optically isolated
	Control Output	24 VDC 40 ma: common to 24G, optically isolated
Optional Sinking I/O DINT-300K	Control Input	24 VDC 6 ma: common to +24V, optically isolated
	Control Output	24 VDC 400 ma: common to 24G, optically isolated
Optional Sourcing I/O DINT-300S	Control Input	24 VDC 6 ma: common to 24G, optically isolated
	Control Output	24 VDC 400 ma: common to +24V, optically isolated
Internal Power Supply	24 VDC ± 15% 100 ma maximum, ground isolated	
External Power Supply	24 VDC ± 15%	

2.1.6 ANALOG I/O SIGNALS

REF1 and REF2	Maximum Input Voltage: ± 10 VDC Input Impedance: 18 kΩ A/D resolution: 1/1024 at ±10V (10 bit Standard, 14 bit Optional) Scaleable with setup parameter
Monitor Output	Maximum Voltage Swing: ± 3 VDC at 1 ma Output Impedance: 330 Ω Accuracy: ±8% Monitor Scaling Speed: 3V equals motor rated speed Torque: 3V equals motor peak torque C-722006 Monitor Cable Available 

2.1.7 HIGH SPEED DIGITAL I/O SIGNALS

Command Pulse FMA and /FMA FMB and /FMB	On voltage: 5 VDC ± 5% at 17 ma maximum Off voltage: 1 VDC ± 5% less than 1 ma 200 KHz maximum frequency in pulse-pulse or pulse-direction modes 50 KHz in AB quadrature mode Optically isolated
Pulse Output APD and /APD BPD and /BPD ZPD and /ZPD	RS422 output: AM26LS31 or equiv. 400 kHz maximum frequency

2.1.8 PROTECTION

Fault Checks	Under Voltage, Over Voltage, Motor Short, Output Short, Feedback Loss, Regeneration Resistor Over Temperature and Malfunction, Driver Over Temperature, Motor rms Torque (motor overheat) Driver Rated Current, Over Speed, Motor Stall, Dynamic or Mechanical Brake Failure, Following Error, Internal Watchdog Timer, Processor Diagnostics
Output Short Circuit Protection	The drives are suitable for use on a circuit capable of delivering not more than 5000 rms symmetrical amperes, 240 volts maximum when protected by a circuit breaker having an interrupting rating not less than 5000 rms symmetrical amperes, 240 volts maximum.

2.2 MOTOR SPECIFICATIONS

2.2.1 GENERAL

Duty	Continuous at rated speed and rated torque
Type	Permanent magnet synchronous
Insulation	Class F
Sealing	See motor drawings in **Appendix A.6, A.7 & A.8**
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

2.2.2 FEEDBACK DEVICE

Type: Resolver	Resolver control transformer See motor drawings in **Appendix A.6, A.7 & A.8**
Type: Encoder	ABZ plus UVW 5V line driver

2.2.3 OTHER

Weight Shaft Loading Brake Specifications Dimensions	See motor drawings in **Appendix A.6, A.7 & A.8**
Torque Ratings Speed Torque Curves	See specifications in **Appendix A.4**

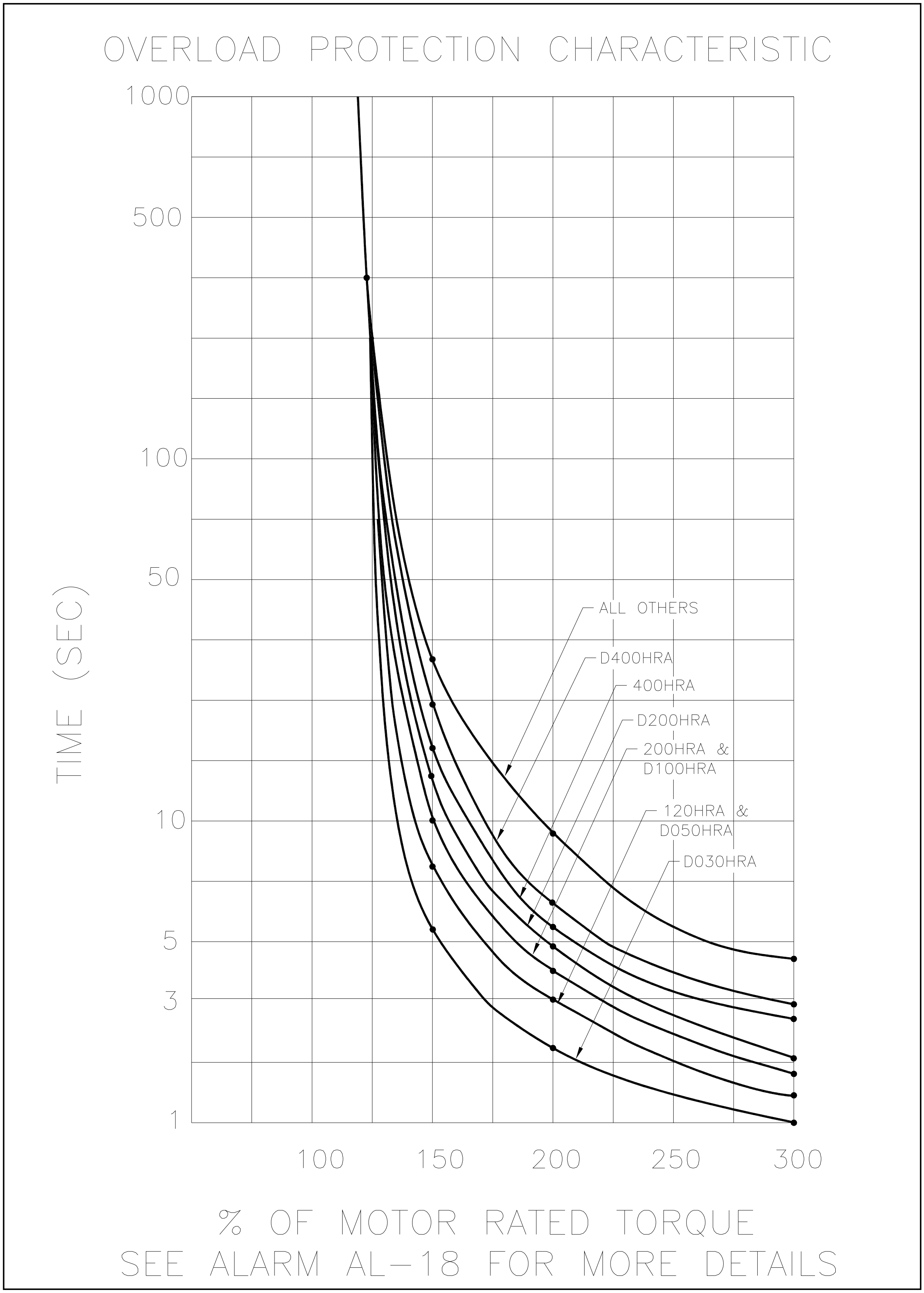


Figure 2.1 - Delta Overload Protection Characteristic

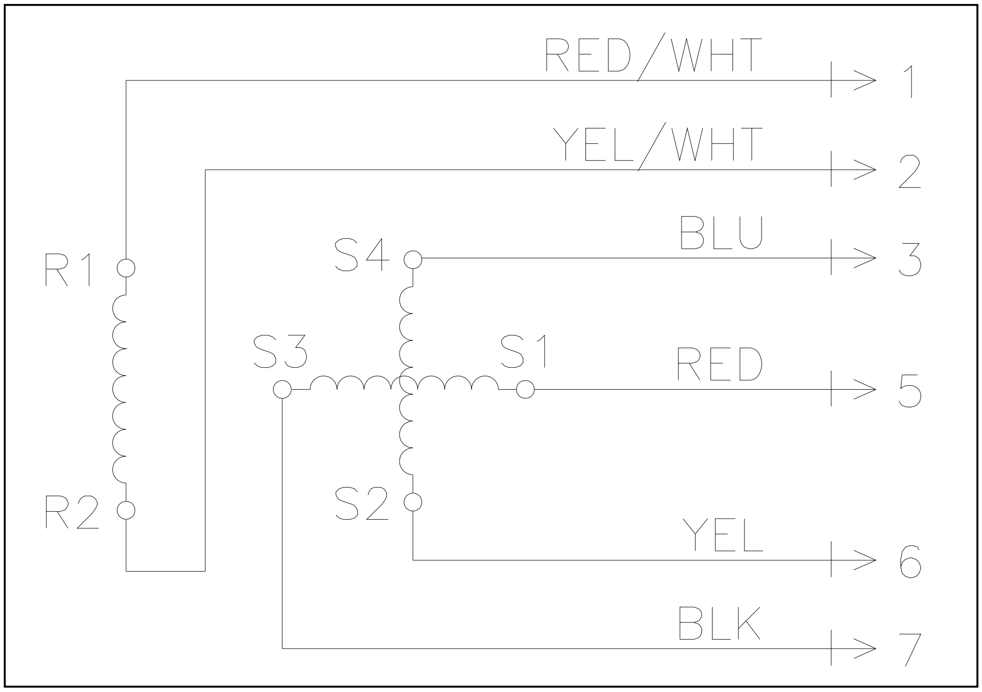


Figure 2.2 - Standard Resolver Wiring Connections for DBM-XXX/15R, DBM-500/30R and Larger

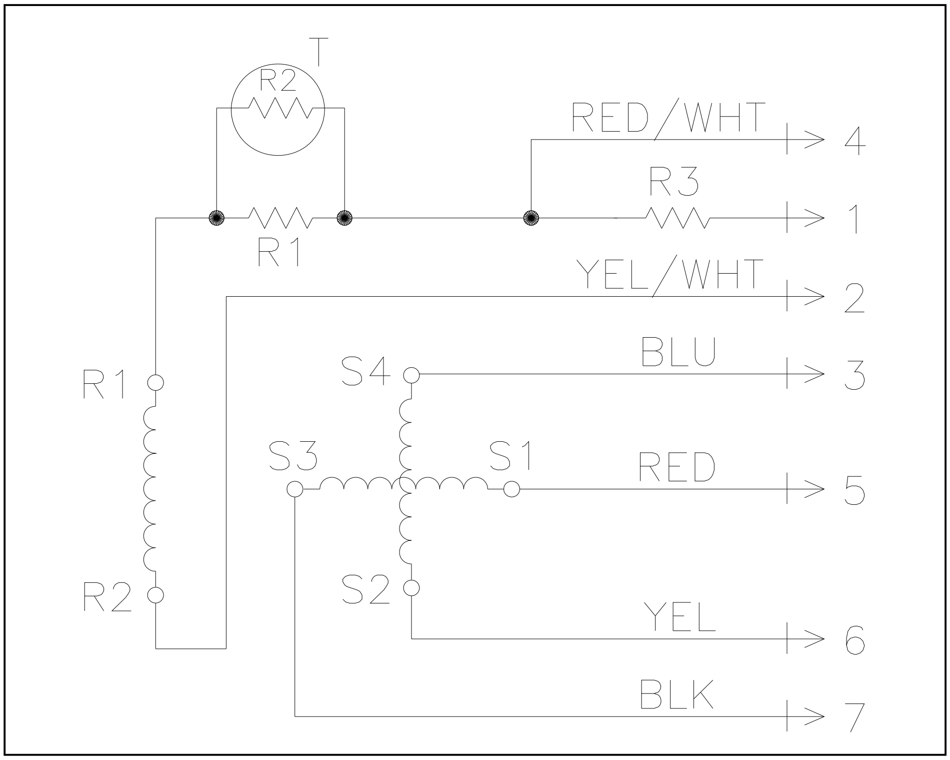


Figure 2.3 - Alternate Resolver Wiring Connections for DBM-XXX/15R, DBM-500/30R and Larger

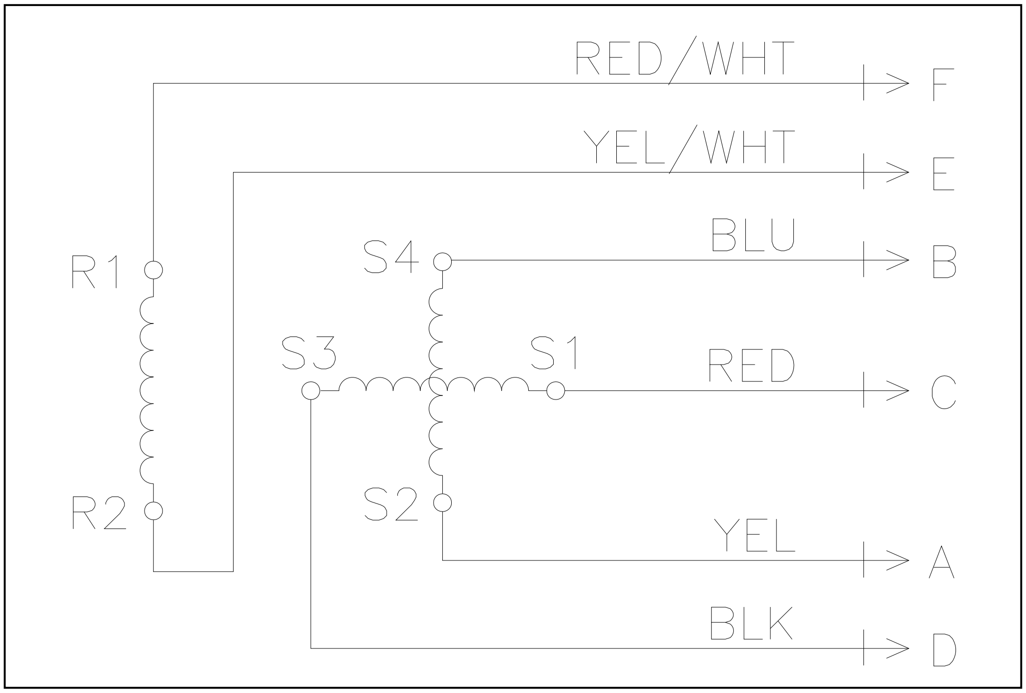


Figure 2.4 - Standard Resolver Wiring Connections for DBM-120/30R, DBM-200/30R, DBM-400/30R, DBM-BXXX/30R, DBM-D30/30R and DBM-D50/30R

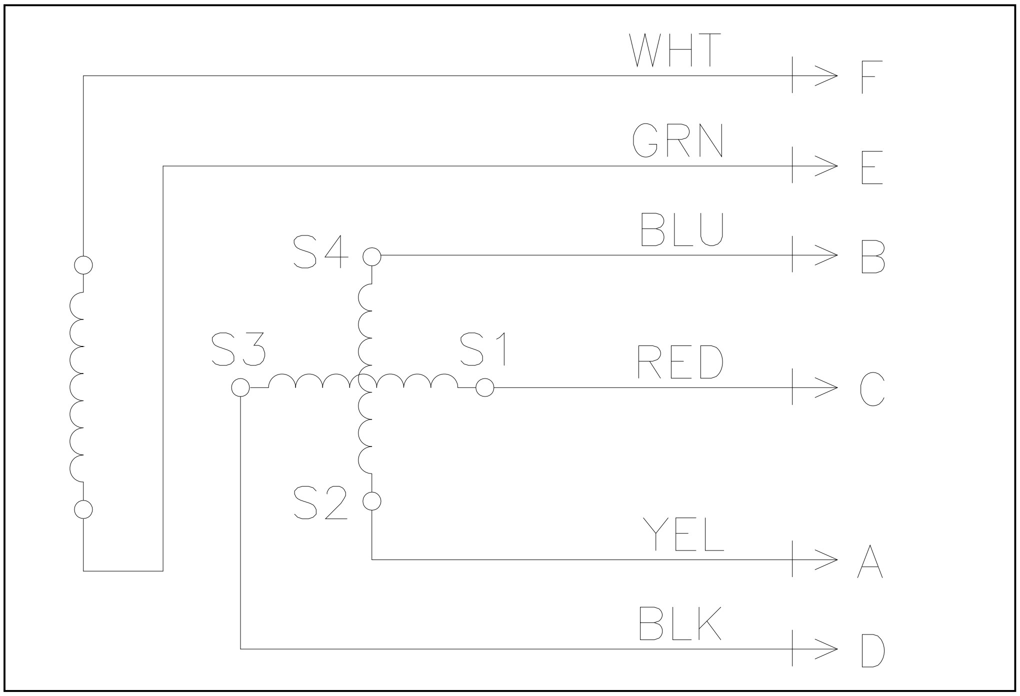


Figure 2.5 - Alternate Resolver Wiring Connections for DBM-120/30R, DBM-200/30R and DBM-400/30R

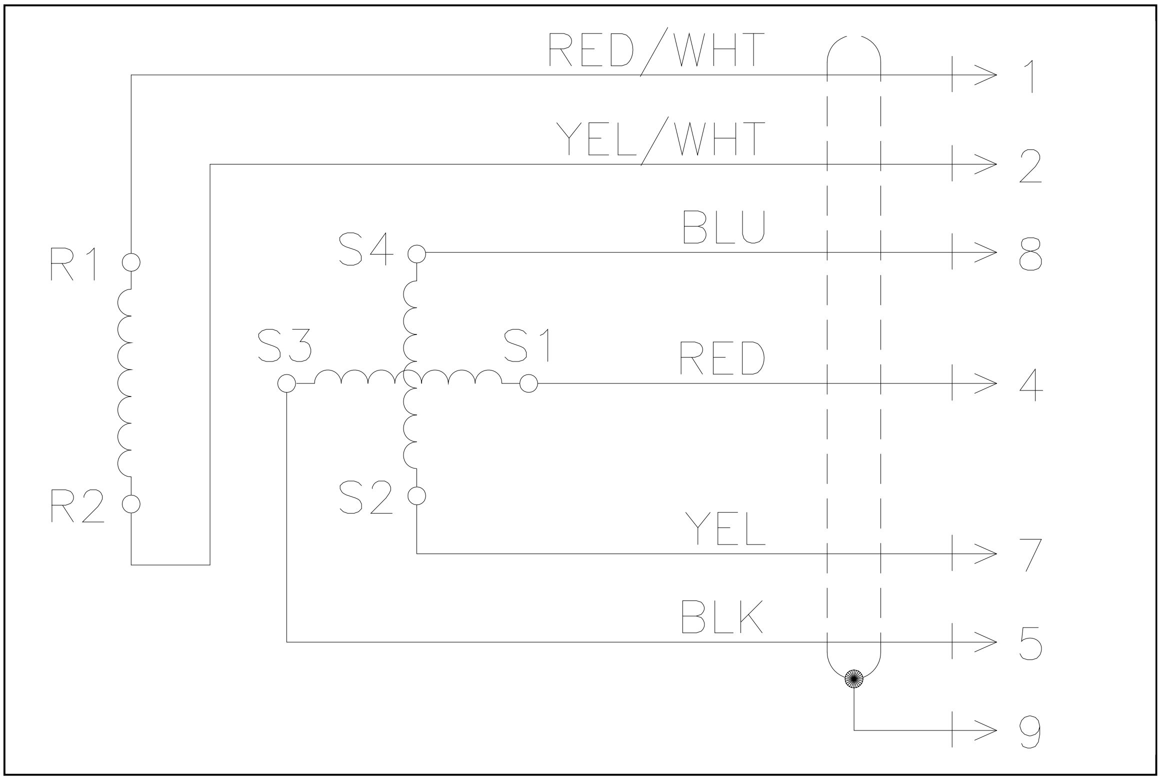


Figure 2.6 - Standard Resolver Wiring Connections for DBM-D100/30R Through DBM-D800/30R

SECTION 3 - PROGRAMMING THE DELTA DRIVER

The Delta Driver is a fully digital driver that has a rich set of motion control building blocks that are configurable using the driver's software. A built in keypad and display are used to set internal parameters that configure the driver's software building blocks into user defined motion functions.

An easy to use menu scheme allows the user to:

- Set the basic mode of operation
- Activate optional features
- Define I/O functions
- Monitor key parameters and alarms
- Adjust driver parameters
- Manual or automatic tuning of the motor and driver
- Manual testing of driver operation

The drivers keypad and display are shown in **Figure 3.1**. The functions are as follows:

- **LED DISPLAY** is a 5-digit unit that displays coded messages, alarms and parameter values. Messages are displayed in coded bit patterns, hexadecimal, decimal and coded letters.
- **UP-ARROW** ︽ is used to navigate around the minor menu loops, to increase the value of a parameter and in combination with other keys for special functions.
- **DOWN-ARROW** ︾ is used to navigate around the minor menu loops, to decrease the value of a parameter and in combination with other keys for special functions.
- **SELECT** SEL is used to identify which digit of the display is selected for modification (flashing). This key is also used in combination with the **CONFIRM** ↵ key to prepare a parameter for modification.
- **MODE** MODE is used to navigate the main menu loop and to return to the main menu loop from the minor loops.
- **CONFIRM** ↵ is used to confirm a parameter value and to set into non-volatile memory and to reset alarms. This key is also used in combination with the **SELECT** SEL key to prepare a parameter for modification.
- **FLASHING DECIMAL POINT** indicates that an alarm is active.

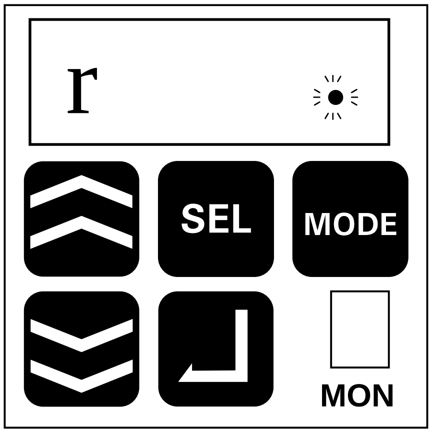


Figure 3.1 - Delta Driver Keypad and Display

3.1 NAVIGATING THE DRIVER'S MENU

The menu structure for programming the driver consists of a main menu loop with several minor menu loops and the Special Menu. The main menu loop and partial sections of the minor loops are shown in **Figure 3.2** below.

The major loop is shown vertically on the left side of the diagram. There are four major items on the main menu loop. Each of these items is the starting point for minor menu loops.

- **STATUS DISPLAY** minor menu loop contains drive and motor status displays such as motor speed, motor position, following error, etc.
- **DIAGNOSTIC DISPLAY** minor menu loop provides diagnostic information such as I/O status, alarms and alarm history.
- **ADJUST PARAMETER** minor menu loop contains parameters that are typically adjusted by the user. Parameters include speed scaling, servo tuning values and load inertia setting.
- **USER PARAMETER** minor menu loop contains basic configuration parameters that are usually set once per application such as control mode, motor type, electronic gear ratio and analog polarity.
- **HP PARAMETER** is a sub-menu loop from the **USER PARAMETER** minor menu. This sub-menu loop also contains configuration parameters that are less frequently used or modified.

The MODE key is used to move around the main menu loop. Once the main menu is positioned on the first parameter of a minor loop the ︽ and ︾ keys are used to move around the minor menu loop. When in the minor menu loop the ↵ and ︽ or the ↵ and ︾ keys move through the parameters in jumps of 10 rather then 1. The MODE mode key can be used to move from anywhere in the minor menu back to the main menu loop.

The HP parameter sub-menu is entered by putting the main menu loop on UP-01 and pressing and holding the SEL key then pressing both the ︽ and ︾ keys. Once in the HP sub-menu the ︽ and ︾ keys are used to move around the sub-menu. The MODE must be pressed twice quickly to move from the HP sub-menu back to the UP minor menu.

The Special Function Menu is used for Auto Tuning, manual jogging of the motor and forcing outputs. **Section 3.3** describes the Special Function Menu.

3.1 NAVIGATING THE DRIVER'S MENU (cont'd)

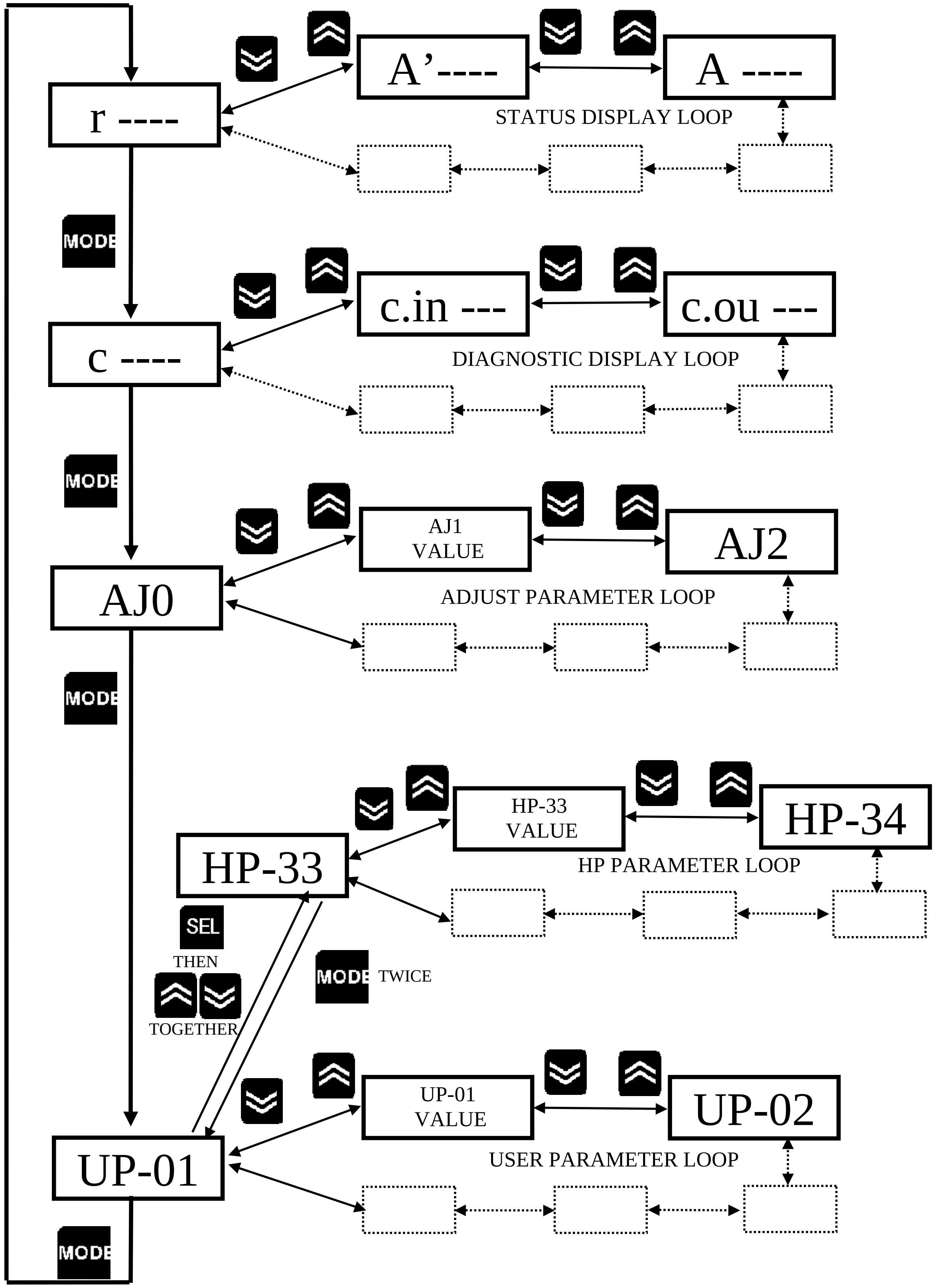


Figure 3.2 - Main Menu Loop and Minor Loops

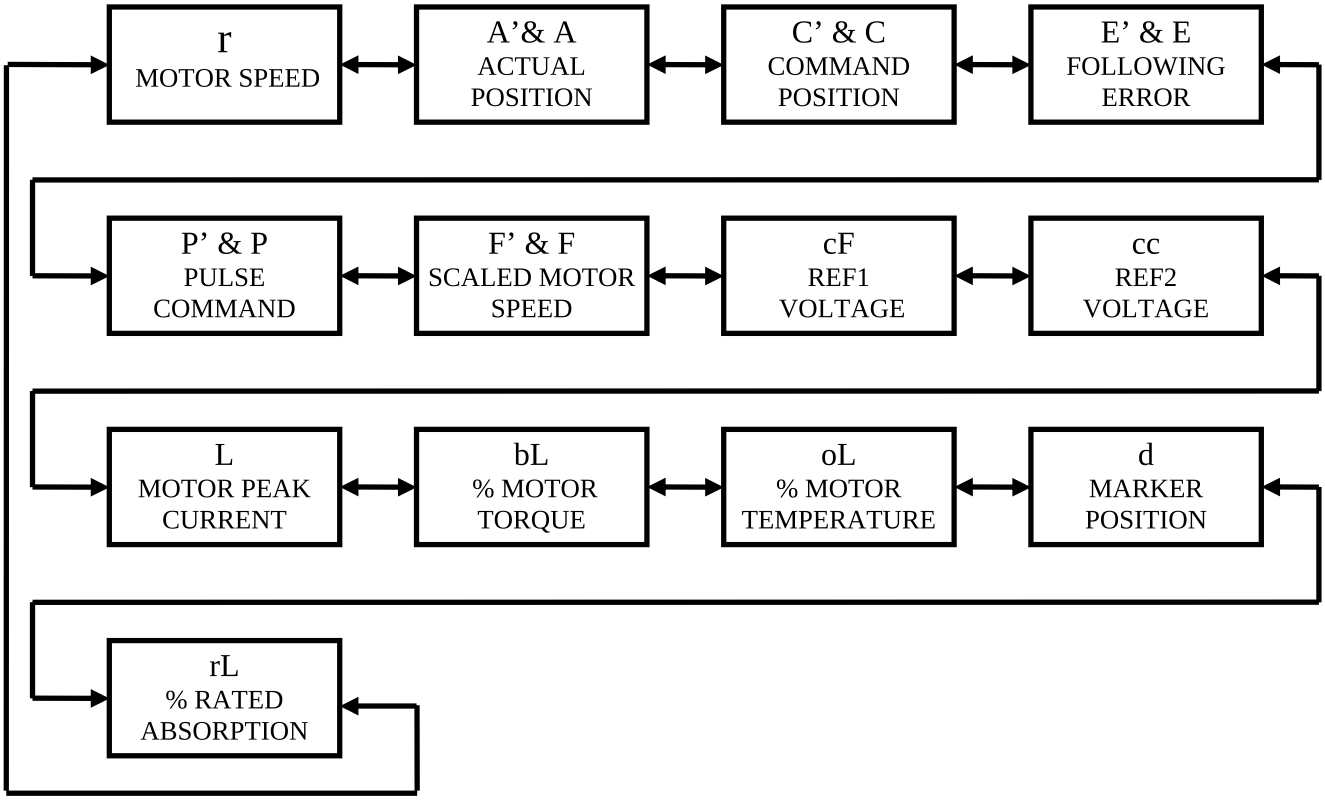
3.1.1 STATUS DISPLAY MENU LOOP

The Status Display Menu Loop provides a real time display of motor and driver status. The display format uses the left most digits for a coded message of the item to be displayed and the right most digits are the value. The coded item on the left will flash indicating negative (-) value. The sign convention is (+) is CCW and (-) is CW.

Some of the display values, such as A' & A, are too large for a single display so they are broken into two sections and are displayed on two successive menu displays. The prime (') symbol indicates the upper four (4) digits or most significant section and the non-prime symbol indicates lower four (4) digits. For example, if successive displays reads [A' 1466] and [A 6789], the ACTUAL POSITION is 14666789.

Parameters can only be read in the Status Display Menu. The driver is set to the (r) Motor Speed at power application. Any alarm will overwrite the display.

The Status Display Menu is organized as follows:



3.1.1 STATUS DISPLAY MENU LOOP (cont'd)

Status Display Descriptions:

DISPLAY ITEM	SYMBOL	RANGE & UNITS	CONTENTS
Motor rpm	**r**	±4000 RPM	Displays the speed of motor.
Actual Position	**A' A**	±9999999 Bits	Displays the actual position of the motor scaled by UP-05/UP-04 * 24000 bits/rev (driver is always 24000 bits/rev internally). With resolver feedback, the 0.0 position at power up is referenced to the nearest resolver 0.0. The Delta motors have a 2X resolver, and have two 0.0 points or markers per motor shaft rotation. When the count exceeds display range, 9999999 appears.
Command Position	**C' C**	±9999999 Bits	Displays the command position of the driver (scaled by UP-05/UP-04 similar to A' A above). When the count exceeds display range, 9999999 appears.
Following Error	**E' E**	±9999999 Bits	Displays the difference between command position and actual position (scaled by UP-05/UP-04 similar to A' A above). Used in position control modes only.
Pulse Command	**P' P**	+32767~ 32768 Pulses	Displays the pulse command input register in position control mode. This counter is a signed 16 bit counter with a range of +32767 to -32768. Counter rolls over when it reaches the maximum count (ring counter).
Scaled Motor Speed	**F' F**	±9999999 RPM	Displays the speed of the motor scaled by HP-41/HP-42. This used typically used to display "machine speed" if the speed exceeds display range, 9999999 appears.
REF1 Voltage	**cF**	±10.0 V	Displays the input voltage REF1 (speed command or speed limit depending on mode of operation).
REF2 Voltage	**cc**	±10.0 V	Displays the input voltage REF2 (torque command, torque limit or speed command depending on mode of operation).
Motor Peak Current	**L**	±160.0 A (peak)	Displays the output current to motor. "A (peak)" shows the peak value of AC current.
% Motor Torque	**bL**	0~255%	Displays the load ratio (output torque/rated torque) * 100%. The time constant for calculating this ratio is set by HP-33.
% Motor Temperature	**oL**	0~110%	Displays calculated motor temperature as a % of the maximum rating. The electronic motor thermal limit alarm activates at 110% (AL-17). **oL** initializes to 90% at power on.

3.1.1 STATUS DISPLAY MENU LOOP (cont'd)

Status Display Descriptions (cont'd):

DISPLAY ITEM	SYMBOL	RANGE & UNITS	CONTENTS
Marker Position	**d**	0~359.9 deg	Displays the motor shaft angle from the motor marker ZPD position. The driver has N marker ZPD positions depending on the resolver/encoder installed in the motor. (i.e. a motor with a 2X resolver has 2 ZPD positions per motor revolution, see motor drawings in **Appendix A.6, A.7 & A.8**). If the motor has 3X resolver and 3 ZPD positions, this display will go from 0.0 to 359.9 degrees 3 times per motor rotation.
% Rated Absorption	**rL**	0~100%	For DSD-1.5, DSD-4.25, DSD-8.5 and DSD-17.5 the display is (motor absorption torque/motor rated torque) * 100%. For DSD-35 and up the display is % rating of the regeneration resistor capacity (UL-31).

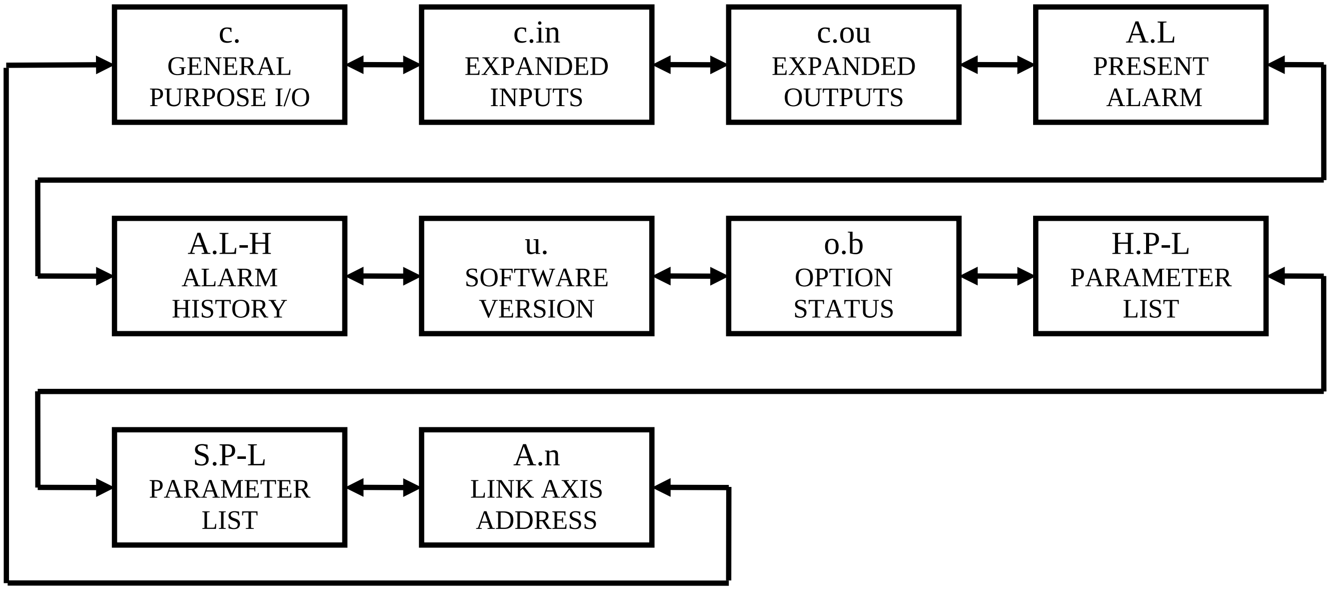
3.1.2 DIAGNOSTIC DISPLAY MENU LOOP

The Diagnostic Display Menu Loop provides a real time display of I/O points, alarms, alarm history and driver configurations. The display format uses the left most digits for a coded message of the item to be displayed and the right most digits are the value.

Some of the display values, such as A.L-H ALARM HISTORY require additional keystrokes to view the complete status. The additional keystrokes are described in the individual display descriptions.

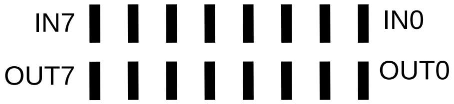
Parameters can only be read in the Diagnostic Display Menu, with the exception that the ALARM HISTORY can be cleared.

The Diagnostic Display Menu Loop is organized as follows:



3.1.2 DIAGNOSTIC DISPLAY MENU LOOP (cont'd)

Diagnostic Display Descriptions:

DISPLAY ITEM	SYMBOL	CONTENTS
General purpose I/O	**c.**	Displays the current I/O status using the vertical segment bars in the display. The top half of the segment bar are inputs and the bottom half are outputs. The right most vertical bar is IN0 (top half) and OUT0 (bottom half). The vertical bar just to the right of the **c.** is IN7 (top half) and OUT7 (bottom half). When the bar is illuminated the I/O point is ON. The I/O point can be inverted using HP-44 & HP-45. See the individual signal level I/O diagrams in **Section 4**. 
General Purpose Input	**c.in**	Not used for the modes described in the manual.
General Purpose Output	**c.out**	Not used for the modes described in the manual.
Alarm	**A.L**	Displays the current alarm if present. **A.L** with no numbers indicates that there is no current alarm. **A.L #** indicates a current alarm code **#**. Most alarms can be reset with the ↵ key. See **Section 10** for alarm code descriptions and reset method.
Alarm History	**A.L-H** **0-E**	Displays the alarm history log for the previous 15 alarms. When SEL key and ↵ key are concurrently pressed, the **AL-H** display changes to **N.- #**, where **N** is the position of the alarm in the history log (0 most current, E oldest) and # is the alarm code. The history log can be scrolled forward and backward using the ⇑ and ⇓ keys. The MODE key returns to the **A.L-H** display. Clearing the complete alarm history is possible with software revision 10 and above. To clear the alarm history, use the MODE ⇑ ⇓ keys to navigate the menu until the A.L-H is in the display. • Concurrently press the ↵ and SEL keys and the display changes to N.- #. • Concurrently press the ⇑ and ⇓ keys while holding down the SEL key and the display changes to AHcLr. • Concurrently press the ↵ and SEL and the display starts flashing indicating alarm clearing, then press ↵ to complete the clearing procedure. Double clicking MODE goes back to 0. - and another press of MODE returns to A.L-H.
Software Version	**u.**	Displays the revision of the operating system software.

3.1.2 DIAGNOSTIC DISPLAY MENU LOOP (cont'd)

Diagnostic Display Descriptions (cont'd):

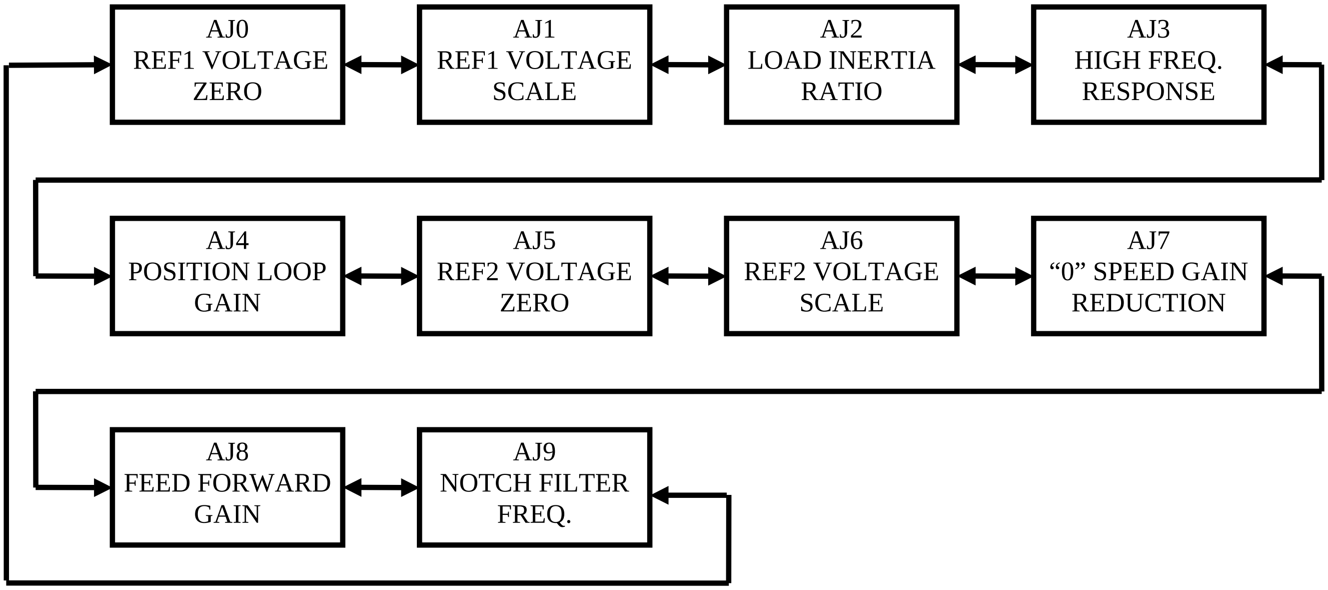
DISPLAY ITEM	SYMBOL	CONTENTS
Option Status	**o.b**	Displays the status of any option modules installed. 00: No options 02: 14 bit A/D converter
HP Parameter Change History	**H.P-L**	Displays a history of the HP parameters that have been changed. When SEL key and ↵ key are concurrently pressed the display changes to a list of HP-# parameters that have been changed. The history log is 65 deep. The history log can be scrolled forward and backward using the ⇈ and ⇊ keys.
SP Parameter Change List	**S.P-L**	Displays a history of the SP that have been changed. When SEL key and ↵ key are concurrently pressed the display changes to a list of SP-# parameters that have been changed. The history log is 65 deep. The history log can be scrolled forward and backward using the ⇈ and ⇊ keys.
Link Axis No.	**A.n**	N/A to the Delta driver without option module.

3.1.3 ADJUSTMENT PARAMETER MENU LOOP

The Adjustment Parameter Menu Loop provides access to setup and tuning parameters that are commonly used. Each parameter is displayed in two successive displays. The coded parameter name appears on the first display and the parameter value appears on the second display. The ⏫ key will always move from the parameter-coded name to the parameter value. The ⏬ key will always move from the parameter value to the coded parameter name. If the parameter value is negative, a (-) sign appears in the left most digit of the display.

Parameters can be read or written in the Adjust Parameter Menu Loop. The procedure to write into a parameter is found in **Section 3.2**.

The Adjustment Parameter Menu Loop is organized as follows:



The Adjustment Parameters have different meaning and content depending on the mode of operation of the driver. The detailed descriptions of the Adjustment Parameters are listed in **Section 4** of this manual as part of the description of each of the individual modes.

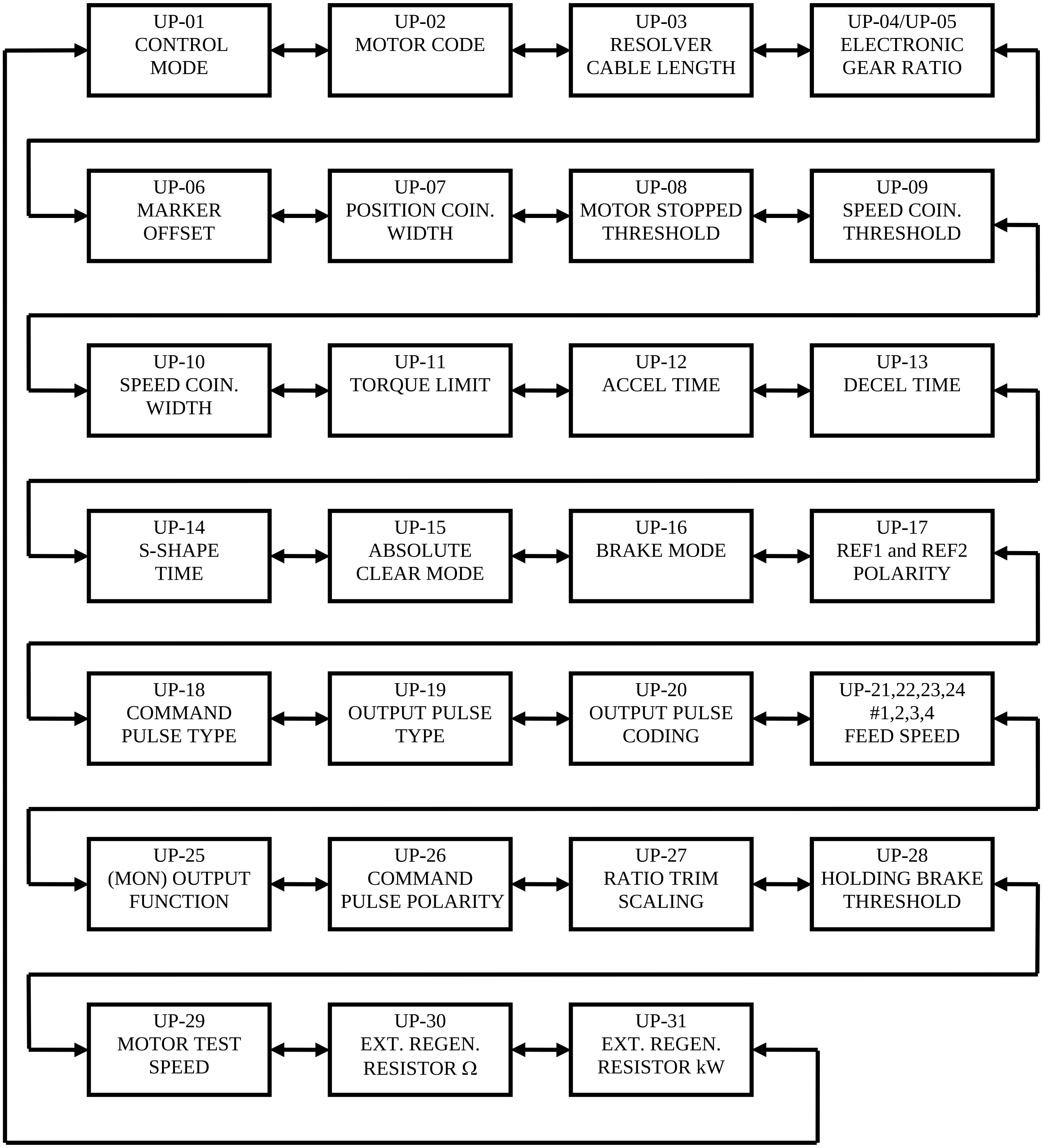
3.1.4 USER PARAMETER MENU LOOP

The User Parameter Menu Loop provides access to basic setup parameters that are commonly used. Each parameter is displayed in two successive displays. The coded parameter name appears on the first display and the parameter value appears on the second display. The ⏫ key will always move from the parameter-coded name to the parameter value. The ⏬ key will always move from the parameter value to the coded parameter name.

Parameters can be read or written in the User Parameter Menu Loop. The procedure to write into a parameter is found in **Section 3.2**.

3.1.4 USER PARAMETER MENU LOOP (cont'd)

The User Parameter Menu Loop is organized as follows:

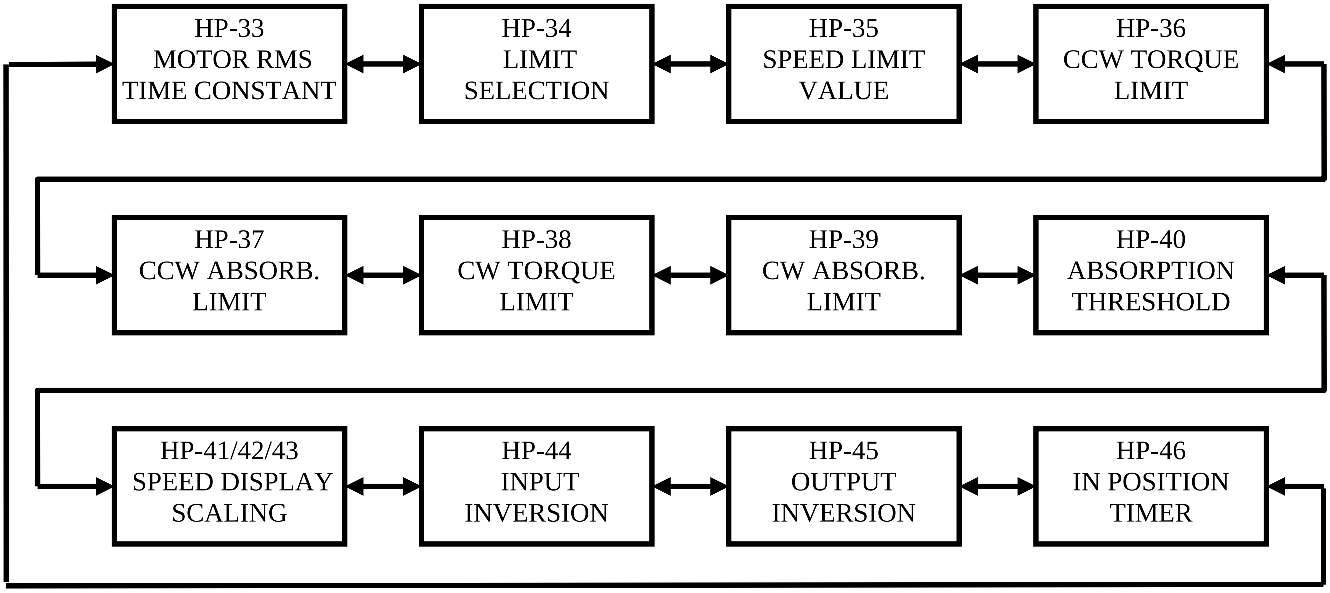


3.1.5 HP PARAMETER MENU LOOP

The HP Parameter Menu Loop provides access to basic setup parameters that are less commonly used. Each parameter is displayed in two successive displays. The coded parameter name appears on the first display and the parameter value appears on the second display. The ⏫ key will always move from the parameter-coded name to the parameter value. The ⏬ key will always move from the parameter value to the coded parameter name.

Parameters can be read or written in the HP Parameter Menu Loop. The procedure to write into a parameter is found in **Section 3.2**.

The HP Parameter Menu Loop is organized as follows:



3.2 WRITING NEW VALUES IN READ/WRITE PARAMETERS

Many parameters require adjustment or modification to properly configure the Delta driver. These parameters include AJ, UP and HP. The procedure for changing these parameters is the same and is described in this section. Although the parameter is changed in the display, pressing the ↵ key is required to log the new parameter value in the driver's non-volatile memory.

To change a parameter:

- Navigate the main menu using the ⏫ ⏬ MODE keys to get the parameter name to be changed in the display. See **Figure 3.2**.
- Press the ⏫ key to get the parameter value in the display.
- Concurrently press the SEL and ↵ keys to prepare the parameter for change. The least significant digit in the display will now be flashing, indicating that the least significant digit can be increased or decreased with the ⏫ ⏬ keys.
- Use the SEL key to move the flashing digit to the left to prepare another digit in the display for change. When the flashing digit reaches the left most position one more SEL key press will return the flashing digit to the right most position.
- Repeating the above steps, change the display to the new desired value.
- Press the ↵ to log the new parameter setting in the Delta driver's non-volatile memory.
- The ⏫ ⏬ MODE keys can again be used to navigate the main menu.

Changes in the AJ parameters take effect when the parameter is changed using the ⏫ ⏬ keys. The UP and HP parameters require pressing the ↵ key to have the parameter change take effect.

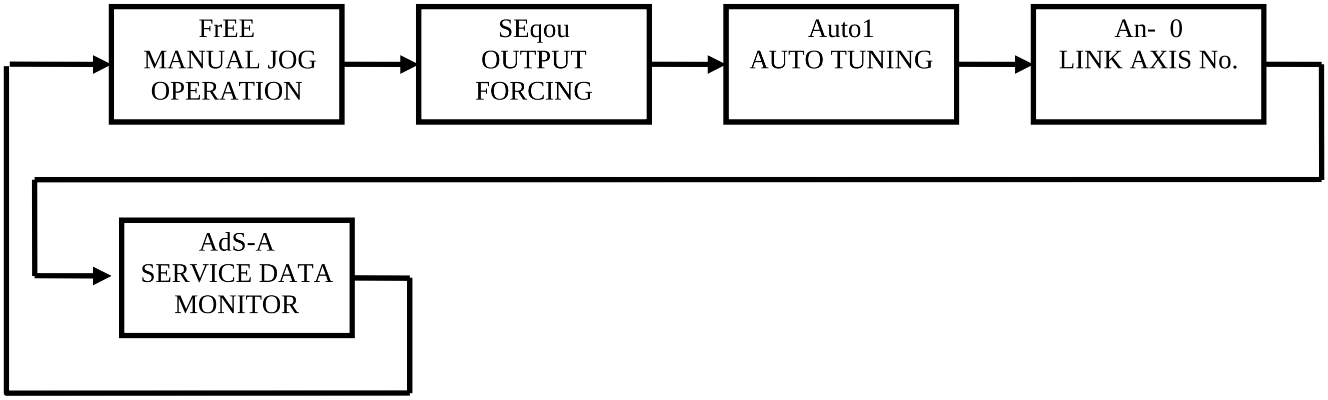
The following parameters require a power OFF, power ON cycle to have the parameter take effect:
AJ-9, UP-01, UP-02, UP-03, UP-04, UP-05 & UP-16.

3.3 NAVIGATING THE SPECIAL FUNCTION MENU LOOP

The Special Function Menu Loop provides special diagnostic and setup functions. Enter the Special Function Menu by concurrently pressing the ⇊ ⇈ ↵ keys for 5 seconds while the Main Menu status display shows motor speed [r 0]. The special menu will appear with the display showing [FrEE]. To exit the Special Function Menu double click the MODE key.

Once in the Special Menu the SEL key is used to move around the menu loop.

The Special Menu Loop is organized as follows:



3.3.1 MANUAL JOG OPERATION

The driver can be jogged manually using the front panel keyboard switches. The jog speed is set by UP-29 and the acel/decel rate is set by UP-12, UP-13 or UP-14. The normal brake sequencing of BRAKE OUTPUT and BRAKE CONFIRM must be observed during jog operation.

Caution should be used when manually jogging the motor. Be sure all personnel are clear of moving parts and that the motor' s movement is not restricted by ancillary moving mechanisms.

- Use the SEL key to locate the FrEE menu display in the Special Menu.
- Activate the servo by pressing ↵ key. The display shows the current jog speed [L 0]
- Jog the motor CCW using the ⇈ key or CW by using the ⇊ key. The motor continues to run as long as the key is held down.
- Pressing the ⇈ SEL keys together latches the motor in jog CCW until the ⇈ or ⇊ key is momentarily pressed to unlatch the jog operation and stop the motor. The ⇊ SEL keys provide similar latched jog operation in the CW direction.
- Deactivate the servo by pressing ↵ key. The display returns to [FrEE].

3.3.2 OUTPUT FORCING FUNCTION

The Delta driver has 8 outputs that are controlled by the driver. The functions of these outputs in normal operation are described in **Section 4**. The normal ON/OFF state of these outputs can by forced using the Output Forcing Function in the Special Menu.

Caution should be used when forcing output states. The outputs may activate ancillary equipment or cause other motion or events to occur. Forcing the output may create a danger to personnel or equipment.

- Use the SEL key to locate the SEqou menu display in the Special Menu.
- Outputs maintain their current state coming into the Output Forcing Function.
- Activate the Output Forcing Function by concurrently pressing SEL ↵ keys. The display shows [50x.-y] where x is the bit number of the output to be forced ON or OFF and y is the current state of the output where 1 = ON and 0 = OFF. The bit number x corresponds to the output number 0->7. The bit number can be changed using the ︾ ︽ keys.
- The selected bit number output is forced to toggle state with successive presses of the ↵ key.
- Pressing the MODE key returns to the Special Function Menu and the display reads [SEqou]. The active outputs return to their normal state rather than the forced state. Outputs that have no active function in the current driver mode of operation are left in the state set by the Output Forcing Function.

3.3.3 AUTO TUNING

The Delta provides an automatic servo parameter tuning function. Auto Tuning is accessed via the Special Function Menu. **Section 6** of this manual is dedicated to auto and manual tuning of the driver parameters. See **Section 6** for Auto Tuning procedure.

3.3.4 LINK AXIS NUMBER

The Link Axis Number is only used when the Delta Driver is fitted with the Link Axis option. See the appropriate technical manual for this option.

3.3.5 SERVICE DATA MONITOR

The Delta Driver contains detailed service information. The Service Data Monitor contains detailed coded information meant for a qualified IIS Technician. There is no user serviceable information in this menu item. Contact IIS for any service related issues.

SECTION 4 - DRIVER OPERATION MODES

The Delta Driver is programmable to work in six (6) different operating modes. The mode of operation is programmed into the driver using the keypad and display. The six (6) modes are:

Mode 1:	Speed Control
Mode 2:	Torque Control
Mode 3:	Pulse Position Control
Mode 4:	Speed/Torque/Position Control
Mode 5:	Speed Preset Control
Mode 6:	Electronic Gearing Control

The following sections describe the basic operation, the I/O functions and the programming parameters for each of the six (6) modes of operation.

4.1 SPEED CONTROL MODE 1

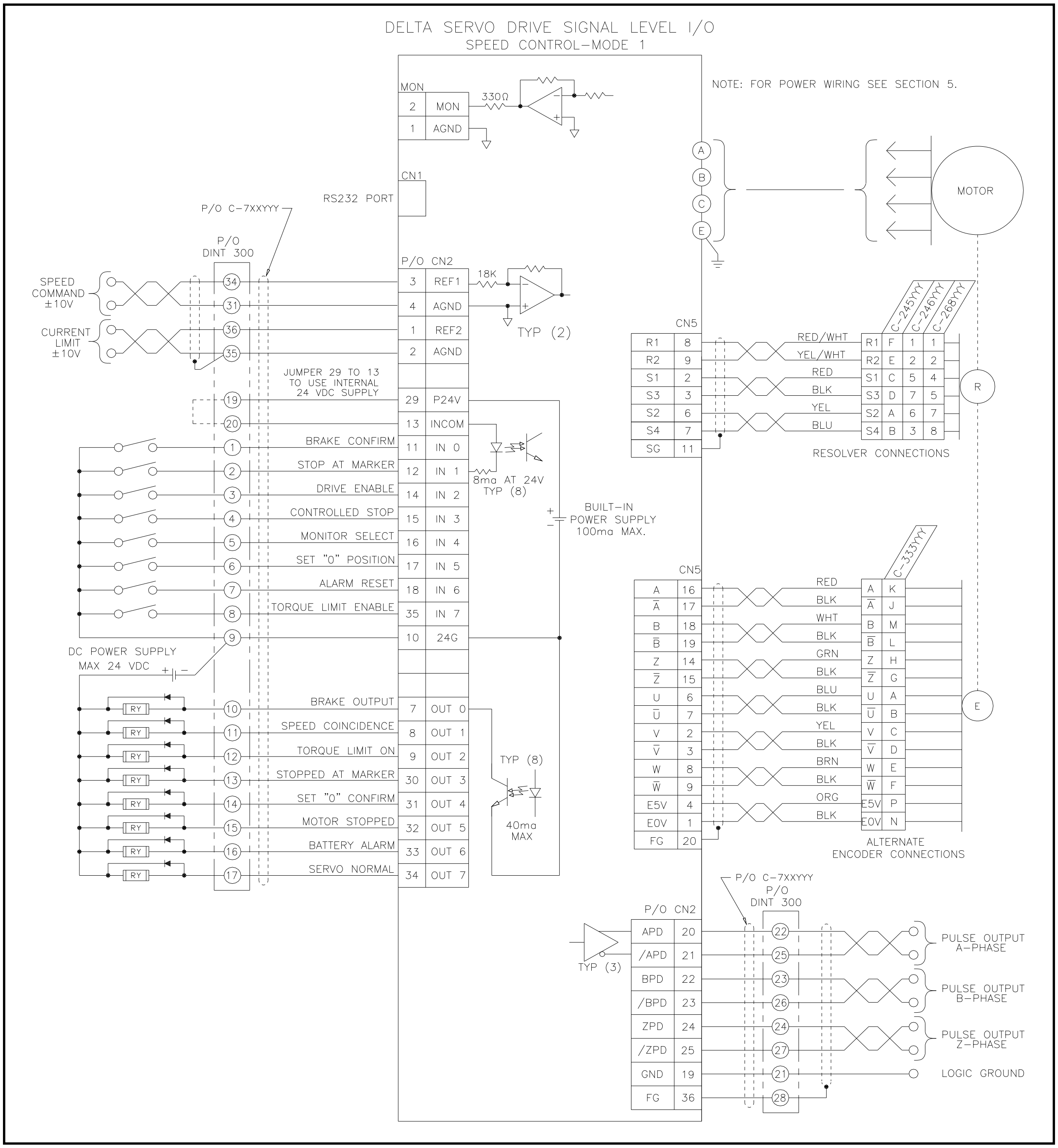
PRIMARY MOTION CONTROL FEATURES

- In the Speed Control Mode, the driver is a precision speed regulator that receives the speed command from an external analog source.
- The scaling and polarity of the analog speed command is fully programmable.
- The acceleration and deceleration used for changes in motor speed can be programmed to be either linear or S-shaped minimum jerk. The time to change speeds and the amount of S-shape rounding is programmable.

SECONDARY MOTION CONTROL FEATURES

- The torque of the motor can be limited via a second external analog voltage or by an internal parameter.
- The motor can be stopped and position locked at the current position or at the motor's marker pulse using an I/O point.

4.1.1 SIGNAL WIRING



4.1.2 SPEED CONTROL INPUT/OUTPUT

TYPE	NAME	FUNCTION
Analog Input	SPEED COMMAND (REF1)	SPEED COMMAND +/-10V input. Rotation is CCW for (+) voltage and CW for (-) voltage. Motor speed is directly proportional to voltage. • Direction of rotation is set with UP-17 • Acceleration/deceleration is set with UP-12, 13 &14 • Scaling of speed vs. voltage is set with AJ1 • Zero adjustment is set with AJO • SPEED COMMAND (REF1) voltage monitor on the status display "cF---"
	CURRENT LIMIT (REF2)	TORQUE LIMIT 0-10V input. The peak motor torque is limited proportionally with this voltage. • Scaling of torque vs. voltage is set with AJ6 • Zero adjustment is set with AJ5 • The method to cause limiting is set with HP-34 • TORQUE LIMIT (REF2) voltage monitor on the status display "cc---"
24V Input	BRAKE CONFIRM (IN0)	This input is a confirmation of the release of either a dynamic or static mechanical brake. See **Sections 8 & 9** for details of brake operation. • Brake modes of operation are set with UP-16 & UP-28
	STOP AT MARKER (IN1)	When this input is turned ON, the motor stops next motor MARKER or home position. There are two MARKERS per motor rotation located 180° apart. • Deceleration time is fixed at 0 time • Marker position can be shifted up to 180° using UP-6 • Driver switches to position control with position gain set by AJ4
	DRIVE ENABLE (IN2)	When this input is turned ON, the driver becomes operational if there are no faults and the BRAKE CONFIRM (IN0) input is correctly sequenced. • Brake output also is turned ON/OFF with this signal subject to settings of UP-16 and UP-28
	CONTROLLED STOP (IN3)	When this input is turned ON, the motor is decelerated to 0 speed ignoring the SPEED COMMAND (REF1) input. • Deceleration time is set by UP-13 & UP-14 • Driver switches to position control with position gain set by AJ4
	MONITOR SELECT (IN4)	When this input is turned ON, the monitor voltage output (MON) and PULSE OUTPUT change function. • MON function is set by UP-25 to speed or torque • PULSE OUTPUT function set by UP-20
	SET "0" POSITION (IN5)	When this input is turned ON for 30 ms or more, the driver internal position registers are set "0". • With an absolute system the home position setting is subject to UP-15
	ALARM RESET (IN6)	When this input is turned ON for 30 ms or more, all alarms are reset. • AL1 (driver overheated) and AL17 (motor overload) cannot be reset until the temperature drops to acceptable level • AL26 cannot be reset until power is cycled

4.1.2 SPEED CONTROL INPUT/OUTPUT (cont'd)

TYPE	NAME	FUNCTION
24V Input	TORQUE LIMIT ENABLE (IN7)	When this input is turned ON and HP-34 is set to 0X or 1X, the torque limit operates. • If HP-34 is set to 0X, the torque is limited by the TORQUE LIMIT (REF2) input voltage • If HP-34 is set to 1X, the torque limit is set by UP-11 • If HP-34 is set to 2X, the torque limit is on regardless of state of this input with the limit set by UP-11
24V Output	BRAKE OUTPUT (OUT0)	This output controls the operation of the dynamic brake or holding brake. • Brake modes of operation are set with UP-16 & UP-28
	SPEED COINCIDENCE (OUT1)	This output turns ON when the actual speed of the motor reaches the target speed. • Target speed can be set to a preset speed or the commanded speed with UP-09 • Detection width is be set with UP-10
	TORQUE LIMIT ON (OUT2)	This output turns ON when the motor torque is limited. The limit could be the peak torque limit of the motor or a lower valve causes by the following conditions. • HP-34 and TORQUE LIMIT ENABLE (IN7) input set the conditions for torque limiting • UP-11 or HP-36, HP-37, HP-38, HP-39 are the internal preset limit values
	STOPPED AT MARKER (OUT3)	This output turns ON when the motor completes the sequence initiated by the STOP AT MARKER (IN1) input.
	SET "0" CONFIRM (OUT4)	This output turns ON confirming that the SET "0" POSITION (IN5) input has been recognized and the internal position registers have been cleared.
	MOTOR STOPPED (OUT5)	This output turns ON when the motor speed drops below the internal preset speed set in UP-8.
	BATTERY ALARM (OUT6)	This output turns ON when the battery of absolute system drops below 3.2V. This output is a warning and the battery should be replaced promptly.
	SERVO NORMAL (OUT7)	This output turns ON 1.6 sec. after AC power ON and there are no alarms. • Does not turn OFF in the case of an AL24 (BATTERY ALARM)
Differential Output	PULSE OUTPUT (APD/APD) (BPD/BPD) (ZPD(/ZPD)	Programmable pulse train output from the driver. • Type of data output is set by UP-20 • Encoder equivalent output is set by UP-19 with scaling set by UP-04 & UP-05 • External display device with various driver data set by UP-20 • Motor absolute position if an absolute system is used • Motor position register is monitored with the status display "A'---" & "A---"

4.1.3 SPEED CONTROL PARAMETER SETUP

4.1.3.1 SPEED CONTROL ADJUSTMENT PARAMETERS

ADJUSTMENT PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
SPEED COMMAND ZERO (REF1)	**AJ0**	±10.00 V	Factory Preset	Sets the zero offset of the SPEED COMMAND (REF1) input. It can be set in two ways: 1. Automatically: by concurrently pressing SEL ↵ (all digits flash) and then pressing ↵. The driver will read the analog voltage REF1 and create an offset equal and opposite to the analog voltage present at the time. To get a true 0.00 offset, short REF1 to analog ground before doing the auto zero procedure. 2. Manually: by concurrently pressing SEL ↵ (all digits flash) and then concurrently pressing ⏫ SEL. Then adjust the individual digits with ⏫ ⏬.
SPEED COMMAND SCALE (REF1)	**AJ1**	3~40.00 V	10.00V	Sets the SPEED COMMAND (REF1) scaling. The value set in this parameter is the voltage needed at REF1 to bring the motor to the rated speed. For example, if the motor must turn at rated speed with 4.5 VDC input voltage (REF1), set AJ1 to 4.50.
LOAD INERTIA RATIO	**AJ2**	0~100.0	1.0 Times	Sets the baseline frequency response of the driver using the ratio of the load inertia/motor inertia for a rigidly coupled load. If the load is not rigidly coupled, the value entered may vary from the calculated value. If the value is set too high, the motor and driver may become unstable and oscillate. This parameter is set automatically during auto tuning.
HIGH FREQUENCY RESPONSE	**AJ3**	0.1~20.0	1.0	Sets the high frequency response of the driver. The higher the number the more responsive. If the value is set too high, the motor & driver may become unstable & oscillate. The value in AJ3 is unit less and works in concert with AJ2. This parameter is set automatically during auto tuning.
POSITION LOOP DC GAIN	**AJ4**	1~200	30	Sets the DC gain of the position control loop. A higher value in AJ4 results in stiffer, faster response. If the value is set too high, the motor & driver may become unstable & oscillate. This parameter is set automatically during auto tuning.

4.1.3.1 SPEED CONTROL ADJUSTMENT PARAMETERS (cont'd)

ADJUSTMENT PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
TORQUE COMMAND ZERO (REF2)	**AJ5**	±10.00 V	Factory Preset	Sets the zero offset of the TORQUE COMMAND (REF2) input. It can be set in two ways: 1. Automatically: by concurrently pressing SEL ↵ (all digits flash) and then pressing ↵**.** The driver will read the analog voltage REF2 and create an offset equal and opposite to the analog voltage present at the time. To get a true 0.00 offset, short REF2 to analog ground before doing the auto zero procedure. 2. Manually: by concurrently pressing SEL ↵ (all digits flash) and then concurrently pressing ⏫ SEL. Then adjust the individual digits with ⏫ ⏬.
TORQUE COMMAND SCALE (REF2)	**AJ6**	3~40.00 V	10.00V	Sets the TORQUE COMMAND (REF2) scaling. The value set in this parameter is the voltage needed at REF2 for the motor to develop maximum torque. For example, if it is required to have the maximum torque with 4.5 VDC input voltage (REF2), set AJ5 to 4.50.
ZERO SPEED GAIN REDUCTION	**AJ7**	0~10000	0	Sets the amount of gain reduction at zero speed. The gain is reduced when the motor is below the speed set in UP-08 and at the set values when the speed is above UP-08.
NOTCH FILTER FREQUENCY	**AJ9**	400~20000 rad/s	6000 rad/s	Sets the notch frequency of a velocity loop anti-resonance filter. This filter can be used to cancel machine or servo resonance. Power must be turned OFF then ON for this parameter to take effect.

4.1.3.2 SPEED CONTROL USER PARAMETERS

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
CONTROL MODE	**UP-01**	00~FF	00	Sets the control mode of operation for the driver as follows: 1 = Speed 2 = Torque 3 = Pulse Position 4 = Speed/Torque/Position 5 = Speed Preset 6 = Electronic Gearing The driver power must be cycled to register this parameter. Power must be turned OFF then ON for this parameter to take effect.
MOTOR CODE	**UP-02**	0000~FFFF	0000	Sets the internal driver parameters corresponding to the motor code. See **Appendix A** for motor codes. The driver power must be cycled to register this parameter. Power must be turned OFF then ON for this parameter to take effect.
RESOLVER CABLE LENGTH N/A FOR ENCODER	**UP-03**	1~120M	5M	Sets the driver resolver cable length compensation. The driver power must be cycled to register this parameter. Power must be turned OFF then ON for this parameter to take effect.
ELECTRONIC GEAR RATIO NUMERATOR	**UP-04**	1~32767	1	The COMMAND PULSE (FMA and FMB) input is multiplied by the ratio of UP-04/UP-05 before being processed by the driver. The driver internal command resolution is equal to the number of resolver cycles times 12000 bits/rev or the PPR of the encoder. (i.e. a motor with a 2X resolver has an internal resolution of 24000 bits/rev, see motor drawings in **Appendix A.6, A.7 & A.8**.) For example if a COMMAND PULSE INPUT of 1000 bits/rev is required with a 2X resolver, set UP-04=24000 and UP-05=1000. Power must be turned OFF then ON for this parameter to take effect. See **Application Note Section 13**.

4.1.3.2 SPEED CONTROL USER PARAMETERS (cont'd)

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
ELECTRONIC GEAR RATIO DENOMINATOR	**UP-05**	1~32767	1	The driver internal feedback resolution is multiplied by the ratio of UP-05/UP-04 before being sent to OUTPUT PULSE (APD and BPD). The driver internal resolution is equal to the number of resolver cycle times 12000 bits/rev. (i.e. a motor with a 2X resolver has an internal resolution of 24000 bits/rev, see motor drawings in **Appendix A.6, A.7 & A.8**.) For example if an OUTPUT PULSE of 1000 bits/rev is required with a 2X resolver, set UP-04=24000 and UP-05=1000. Power must be turned OFF then ON for this parameter to take effect. See **Application Note Section 13**.
MARKER OFFSET **RESOLVER ONLY	**UP-06**	0~11999 pulses	0 pulses	The electrical ZERO can be shifted with respect to the mechanical shaft position using UP-06. The Delta driver produces N number of ZERO states per motor rotation where N is equal to the number of resolver cycles. (i.e. a motor with a 2X resolver has 2 ZERO/rev. see motor drawings in **Appendix A.6, A.7 & A.8**.) To shift the electrical ZERO place the motor shaft at the desired electrical ZERO position. Read the status display "d" parameter in degrees and set UP-06="d"*12000/360. The electrical ZERO affects the ZPD output pulse and the STOP AT MARKER input stopping position.
MOTOR STOPPED THRESHOLD	**UP-08**	1~4000 r/min	50 r/min	When the motor is rotating at less than the speed set into UP-08, the MOTOR STOPPED output will be on.
SPEED COINCIDENCE THRESHOLD	**UP-09**	0~4000 r/min	0 r/min	If UP-09 is non-zero, the SPEED COINCIDENCE output comes on when the actual motor speed reaches the value set in UP-09. If UP-09 is zero, the SPEED COINCIDENCE output comes on when the actual motor speed reaches the commanded speed.
SPEED COINCIDENCE WIDTH	**UP-10**	1~4000 r/min	20 r/min	Sets the width of the sensing window allowable to get the SPEED COINCIDENCE output.
TORQUE LIMIT	**UP-11**	0~100.0%	100%	When the torque limit is applied, the motor torque is limited to the value set in UP-11. UP-11 is % of motor peak torque. See **HP-34** for torque limit method.
ACCEL TIME	**UP-12**	0~32.76 sec	0 sec	Sets the time from zero to rated speed with a linear acceleration profile. Ignored if UP-14 is not equal to 0.0.

4.1.3.2 SPEED CONTROL USER PARAMETERS (cont'd)

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
DECEL TIME	**UP-13**	0~32.76 sec	0 sec	Sets the time from rated speed to zero speed with a linear deceleration profile. Ignored if UP-14 is not equal to 0.0.
S-SHAPED TIME	**UP-14**	0~32.76 sec	0 sec	Sets the acel and decel time from the current speed to the new command speed using an S-shaped minimum jerk profile.
ABSOLUTE CLEAR MODE	**UP-15**	0~2	0	Selects the type of home 0.00 processing for absolute systems when the SET "0" POSITION input is energized or upon startup. 0: Makes current position of motor equal to 0.00. 1: Makes the current motor shaft rotation the 0 rotation while preserving the MARKER OFFSET. 2: No effect retains absolute position.
BRAKE MODE	**UP-16**	0~2	0	Selects the type of brake sequencing to be used when the driver ENABLE is turned OFF. Brake is applied immediately in the case of an alarm. 0: No brake or dynamic brake. If no brake, the motor will coast to a stop. If dynamic brake relay is installed, the motor and load will dynamically brake to a stop. 1: Mechanical holding brake is applied when the motor reaches the speed set in UP-28. The deceleration rate is controlled by UP-13 & UP-14. When the speed in UP-28 is reached, the driver applies maximum electronic braking torque for 200 ms. 2: Mechanical holding brake is applied when the motor reaches the speed set in UP-28. The driver applies maximum electronic breaking torque to decelerate the motor to the speed set in UP-28. Power must be turned OFF then ON for this parameter to take effect.
REF1 and REF2 POLARITY	**UP-17**	00~11	0 0	Sets the polarity of the analog reference inputs. 00: Both REF1 and REF2 normal 01: REF1 inverted, REF2 not inverted 10: REF1 not inverted, REF2 inverted 11: Both REF1 and REF2 inverted

4.1.3.2 SPEED CONTROL USER PARAMETERS (cont'd)

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
OUTPUT PULSE TYPE	**UP-19**	00~11	01	Sets the type of pulse output sequence and polarity of the PULSE OUTPUT. UP-20 must be set to xxxo for the PULSE OUTPUT to represent incremental actual position. 00: Pulse, Pulse encoding where APD pulses when the actual position increments and BPD pulses when the actual position decrements. 01: Quadrature encoding of APD and BPD with APD leading BPD for incrementing actual position. Each edge of the two pulse trains is counted as an output bit change. 10: Pulse, Pulse encoding where BPD pulses when the actual position increments and APD pulses when the actual position decrements. 11: Quadrature encoding of APD and BPD with BPD leading APD for incrementing actual position. Each edge of the two pulse trains is counted as an output bit change.
OUTPUT PULSE CODING	**UP-20**	0000~5533	0000	The first digit of UP-20 selects the parameter to be put on the driver external display when MONITOR SELECT I/O is OFF. Coding is as follows: 0: Motor speed in RPM 1: Actual motor position 2: Motor current 3: Calculated motor temperature 4: Motor distance to marker (°) 5: Machine speed in RPM The second digit of UP-20 selects the parameter to be put on the display when MONITOR SELECT I/O is ON. Coding is the same as the first digit above. The third digit selects the type of electronic coding for the OUTPUT PULSE when an absolute system is configured. This digit is only effective when the fourth digit is set to 3 or absolute motor position. The coding is as follows: 0: 32 bits 1: 23 bits + parity 2: 24 bits + parity 3: 31 bits + parity

4.1.3.2 SPEED CONTROL USER PARAMETERS (cont'd)

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
OUTPUT PULSE CODING (cont'd)	**UP-20** (cont'd)			The fourth digit sets the basic function of the OUTPUTS PULSES. The coding is as follows: 0: Incremental position as defined in UP-19 1: Output to optional drive display DPA-70 2: Output to optional drive display DPA-80 3: Absolute motor position
MONITOR OUTPUT FUNCTION	**UP-25**	000~111	010	Selects SPEED or TORQUE output and polarity of the MON test point. The first digit selects the MON output function when the MONITOR SELECT I/O is ON. 0: TORQUE 1: SPEED The second digit selects the MON output function when the MONITOR SELECT I/O is OFF. 0: TORQUE 1: SPEED The third digit selects the polarity of the MON output. 0: Normal 1: Invert
HOLDING BRAKE THRESHOLD	**UP-28**	0~100.0%	100%	When UP-16 is set to 0, UP-28 has no effect. When UP-16 is set to 1 or 2, the mechanical brake is applied when the motor speed falls below the value set in UP-28. The value in UP-28 is % of rated speed.
MOTOR TEST SPEED	**UP-29**	1~4000 r/min	50 RPM	The driver can be jogged manually by using the keypad. The jog speed is set with UP-29.
EXTERNAL REGEN RESISTOR VALUE (Software version 10 and above)	**UP-30**	0~100.0 ohms	0.0 ohms	Value of the optional external regen resistor. When external regen resistor is used, the value of the resistor is entered to allow the driver to calculate average power into the regen resistor. When the internal regen is used, enter 0.0. Power must be turned OFF then ON for this parameter to take effect. See **Section 7** for details on Regen Resistor selection. This parameter is used with DSD-35 and larger drivers.

4.1.3.2 SPEED CONTROL USER PARAMETERS (cont'd)

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
EXTERNAL REGEN RESISTOR WATTAGE (Software version 10 and above)	**UP-31**	0~327.67 Kw	0.0 Kw	Power rating of the optional external regen resistor. When external regen resistor is used, the power rating in Kw of the resistor is entered to allow the driver to calculate average power into the regen resistor. When the internal regen is used enter 0.0. Power must be turned OFF then ON for this parameter to take effect. See **Section 7** for details on Regen Resistor selection. This parameter is used with DSD-35 and larger drivers.

4.1.3.3 SPEED CONTROL SETUP PARAMETERS

SETUP PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
MOTOR RMS TORQUE TIME CONSTANT	**HP-33**	1~60 sec	30 sec	Sets the time constant for calculating motor rms torque that is displayed as parameter bL. Time constant should be set to approximately twice as long as the machine cycle.
TORQUE LIMIT SELECTION	**HP-34**	00~21	11	First digit is torque limit method: 0: Limited with REF2 analog input when TORQUE LIMIT ENABLE I/O is ON. 10V = Peak torque 1: Limit set by parameter UP-11 or HP-36 through HP-39 when UP-11=0 and when TORQUE LIMIT ENABLE I/O is ON. 2: Limit set by parameter UP-11 or HP-36 through HP-39 when UP-11=0 regardless of the state of the TORQUE LIMIT ENABLE I/O. Second digit is speed limit method: 0: N/A 1: N/A
CCW ROTATION TORQUE LIMIT	**HP-36**	0~100.0%	100%	Limits CCW rotation torque. 100% = Peak Torque See **HP-34**
CCW ROTATION ABSORPTION TORQUE LIMIT	**HP-37**	0~100.0%	100%	Limits CCW rotation absorption (braking) torque. 100% = Peak Torque See **HP-34**
CW ROTATION TORQUE LIMIT	**HP-38**	0~100.0%	100%	Limits CW rotation torque. 100% = Peak Torque See **HP-34**
CW ROTATION ABSORPTION TORQUE LIMIT	**HP-39**	0~100.0%	100%	Limits CW rotation absorption (braking) torque. 100% = Peak Torque See **HP-34**

4.1.3.3 SPEED CONTROL SETUP PARAMETERS (cont'd)

SETUP PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
SPEED DISPLAY ELECTRONIC RATIO NUMERATOR	**HP-41**	1~32767	1	Parameters HP-41/HP-42 form a fraction that is used to scale the scaled Motor Speed display "F". The motor speed is multiplied by the fraction then put on the display. This allows a speed display that is scaled to the speed of the actual machine rather than the speed of the motor. The scaling can also allow the driver to display speed in different units such as in/sec rather than the default motor RPM. Scales the driver display and optional external display if used.
SPEED DISPLAY ELECTRONIC RATIO DENOMINATOR	**HP-42**	1~32767	1	
SPEED DISPLAY DECIMAL POINT POSITION	**HP-43**	0~7	0	HP-43 sets the position of the decimal point in the optional external speed display. 0: No decimal point 1: Least significant digit ... 7: Most significant digit
INPUT INVERSION	**HP-44**	00~1FF	00	This parameter forms a hexadecimal bit mask that inverts the input when the bit is set to 1 and does not invert the input when the bit is 0. The LSB is for IN0 and so on. (i.e. HP-44=8C inverts inputs IN7, IN3 & IN2)
OUTPUT INVERSION	**HP-45**	00~FF	00	This parameter forms a hexadecimal bit mask that inverts the output when the bit is set to 1 and does not invert the output when the bit is 0. The LSB is for OUT0 and so on. (i.e. HP-45 = 4A inverts outputs OUT6, OUT3 & OUT1)

4.2 TORQUE CONTROL MODE 2

PRIMARY MOTION CONTROL FEATURES

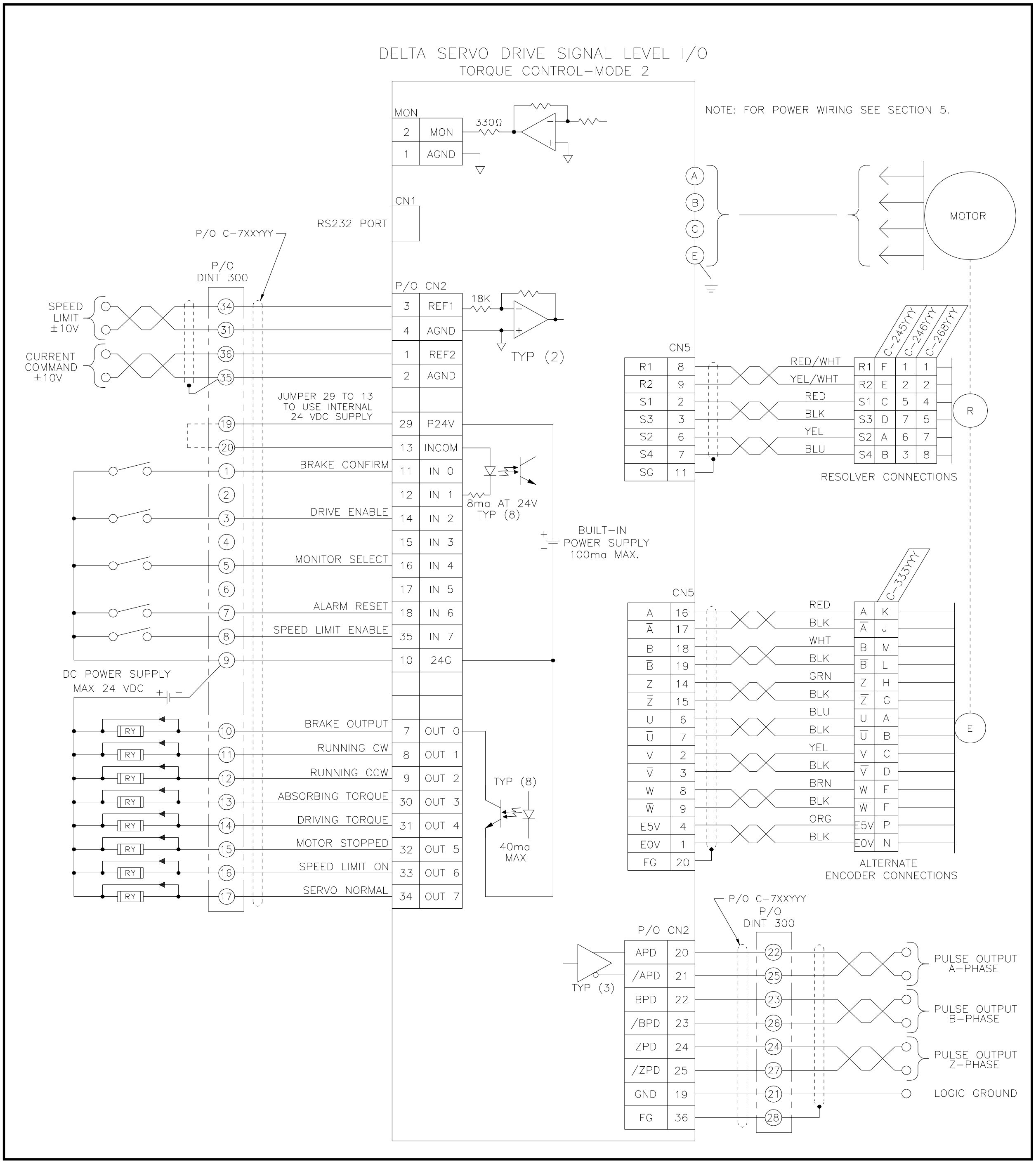
- In the Torque Control Mode, the driver is a precision torque regulator that receives the torque command from an external analog source.

- The scaling of and polarity of the analog torque command is fully programmable.

SECONDARY MOTION CONTROL FEATURES

- The speed of the motor can be limited using a second external analog voltage or by an internal parameter.

4.2.1 SIGNAL WIRING



4.2.2 TORQUE CONTROL INPUT/OUTPUT

TYPE	NAME	FUNCTION
Analog Input	SPEED LIMIT (REF1)	SPEED LIMIT 0-10V input. The motor speed is limited proportionally with this voltage. • Scaling of speed vs. voltage is set with AJ1 • Zero adjustment is set with AJ0 • The method to cause limiting is set with HP-34 • SPEED LIMIT (REF1) voltage monitor on the status display "cF---".
	TORQUE COMMAND (REF2)	TORQUE COMMAND +/-10V input. Torque is applied CCW for (+) voltage and CW for (-) voltage. Motor torque is directly proportional to voltage. • Direction of torque is set with UP-17 • Scaling of torque vs. voltage is set with AJ6 • Zero adjustment is set with AJ5 • TORQUE COMMAND (REF2) voltage monitor on the status display "cc---".
24V Input	BRAKE CONFIRM (IN0)	This input is a confirmation of the release of either a dynamic or static mechanical brake. See **Sections 8 & 9** for details of brake operation. • Brake modes of operation are set with UP-16 & UP-28
	DRIVE ENABLE (IN2)	When this input is turned ON, the driver becomes operational if there are no faults and the BRAKE CONFIRM (IN0) input is correctly sequenced. • Brake output also is turned ON/OFF with this signal subject to settings of UP-16 and UP-28
	MONITOR SELECT (IN4)	When this input is turned ON, the monitor voltage output (MON) and PULSE OUTPUT change function. • MON function is set by UP-25 to speed or torque • PULSE OUTPUT function set by UP-20
	ALARM RESET (IN6)	When this input is turned ON for 30 ms or more, all alarms are reset. • AL1 (driver overheated) and AL17 (motor overload) cannot be reset until the temperature drops to acceptable level • AL26 cannot be reset until power is cycled
	SPEED LIMIT ENABLE (IN7)	When this input is turned ON and HP-34 is set to X0 or X1, the speed limit operates. • If HP-34 is set to X0, the speed is limited by the SPEED LIMIT (REF1) input voltage • If HP-34 is set to X1, the speed limit is set by HP-35
24V Output	BRAKE OUTPUT (OUT0)	This output controls the operation of the dynamic brake or holding brake. • Brake modes of operation are set with UP-16 & UP-28
	RUNNING CW (OUT1)	This output turns ON when the motor is rotating CW above the stop detection speed set in UP-8.
	RUNNING CCW (OUT2)	This output turns ON when the motor is rotating CCW above the stop detection speed set in UP-8.

4.2.2 TORQUE CONTROL INPUT/OUTPUT (cont'd)

TYPE	NAME	FUNCTION
24V Output (cont'd)	ABSORBING TORQUE (OUT3)	This output turns ON when the motor is absorbing torque from the load (braking) and the level of absorption is above the value set in HP-40 and motor speed is above stop detection UP-08.
	DRIVING TORQUE (OUT4)	This output turns ON when the motor is driving torque into the load and the level of absorption is above the value set in HP-40 and motor speed is above stop detection UP-08.
	MOTOR STOPPED (OUT5)	This output turns ON when the motor speed drops below the internal preset speed set in UP-8.
	SPEED LIMIT ON (OUT6)	This output turns ON when the motor speed is limited to less than the peak rating of the motor. • HP-34 and SPEED LIMIT ENABLE (IN7) input set the conditions for speed limiting • HP-35 is the internal preset limit value
	SERVO NORMAL (OUT7)	This output turns ON 1.6 sec. after AC power ON and there are no alarms. • Does not turn OFF, in the case of an AL24 (BATTERY ALARM)
Differential Output	PULSE OUTPUT (APD/APD) (BPD/BPD) (ZPD(/ZPD)	Programmable pulse train output from the driver. • Type of data output is set by UP-20 • Encoder equivalent output is set by UP-19 with scaling set by UP-04 & UP-05 • External display device with various driver data set by UP-20 • Motor absolute position if an absolute system is used • Motor position register is monitored with the status display “A'---” & “A---”

4.2.3 TORQUE CONTROL PARAMETER SETUP

4.2.3.1 TORQUE CONTROL ADJUSTMENT PARAMETERS

ADJUSTMENT PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
SPEED LIMIT ZERO (REF1)	**AJ0**	±10.00 V	Factory Preset	Sets the zero offset of the SPEED LIMIT (REF1) input. It can be set in two ways: 1. Automatically: by concurrently pressing SEL ↵ (all digits flash) and then pressing ↵. The driver will read the analog voltage REF1 and create an offset equal and opposite to the analog voltage present at the time. To get a true 0.00 offset, short REF1 to analog ground before doing the auto zero procedure. 2. Manually: by concurrently pressing SEL ↵ (all digits flash) and then concurrently pressing ⏫ SEL. Then adjust the individual digits with ⏫ ⏬.
SPEED LIMIT SCALE (REF1)	**AJ1**	3~40.00 V	10.00V	Sets the SPEED LIMIT (REF1) scaling. The value set in this parameter is the voltage needed at REF1 to limit the motor speed to the rated speed. For example, if the motor speed is to be limited to rated speed with 4.5 VDC input voltage (REF1), set AJ1 to 4.50.
TORQUE COMMAND ZERO (REF2)	**AJ5**	±10.00 V	Factory Preset	Sets the zero offset of the TORQUE COMMAND (REF2) input. It can be set in two ways: 1. Automatically: by concurrently pressing SEL ↵ (all digits flash) and then pressing ↵. The driver will read the analog voltage REF2 and create an offset equal and opposite to the analog voltage present at the time. To get a true 0.00 offset, short REF2 to analog ground before doing the auto zero procedure. 2. Manually: by concurrently pressing SEL ↵ (all digits flash) and then concurrently pressing ⏫ SEL. Then adjust the individual digits with ⏫ ⏬.

4.2.3.1 TORQUE CONTROL ADJUSTMENT PARAMETERS (cont'd)

ADJUSTMENT PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
TORQUE COMMAND SCALE (REF2)	**AJ6**	3~40.00 V	10.00V	Sets the TORQUE COMMAND (REF2) scaling. The value set in this parameter is the voltage needed at REF2 for the motor to develop maximum torque. For example, if it is required to have the maximum torque with 4.5 VDC input voltage (REF2), set AJ5 to 4.50.
NOTCH FILTER FREQUENCY	**AJ9**	400~20000 rad/s	6000 rad/s	Sets the notch frequency of a velocity loop anti-resonance filter. This filter can be used to cancel machine or servo resonance. Power must be turned OFF then ON for this parameter to take effect.

4.2.3.2 TORQUE CONTROL USER PARAMETERS

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
CONTROL MODE	**UP-01**	00~FF	00	Sets the control mode of operation for the driver as follows: 1 = Speed 2 = Torque 3 = Pulse Position 4 = Speed/Torque/Position 5 = Speed Preset 6 = Electronic Gearing The driver power must be cycled to register this parameter. Power must be turned OFF then ON for this parameter to take effect.
MOTOR CODE	**UP-02**	0000~FFFF	0000	Sets the internal driver parameters corresponding to the motor code. See **Appendix A** for motor codes. The driver power must be cycled to register this parameter. Power must be turned OFF then ON for this parameter to take effect.
RESOLVER CABLE LENGTH N/A FOR ENCODER	**UP-03**	1~120M	5M	Sets the driver resolver cable length compensation. The driver power must be cycled to register this parameter. Power must be turned OFF then ON for this parameter to take effect.

4.2.3.2 TORQUE CONTROL USER PARAMETERS (cont'd)

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
ELECTRONIC GEAR RATIO NUMERATOR	**UP-04**	1~32767	1	The COMMAND PULSE (FMA and FMB) input is multiplied by the ratio of UP-04/UP-05 before being processed by the driver. The driver internal command resolution is equal to the number of resolver cycles times 12000 bits/rev or the PPR of the encoder. (i.e. a motor with a 2X resolver has an internal resolution of 24000 bits/rev, see motor drawings in **Appendix A.6, A.7 & A.8**.) For example if a COMMAND PULSE INPUT of 1000 bits/rev is required with a 2X resolver, set UP-04=24000 and UP-05=1000. Power must be turned OFF then ON for this parameter to take effect. See **Application Note Section 13**.
ELECTRONIC GEAR RATIO DENOMINATOR	**UP-05**	1~32767	1	The driver internal feedback resolution is multiplied by the ratio of UP-05/UP-04 before being sent to OUTPUT PULSE (APD and BPD). The driver internal resolution is equal to the number of resolver cycle times 12000 bits/rev. (i.e. a motor with a 2X resolver has an internal resolution of 24000 bits/rev, see motor drawings in **Appendix A.6, A.7 & A.8**.) For example if an OUTPUT PULSE of 1000 bits/rev is required with a 2X resolver, set UP-04=24000 and UP-05=1000. Power must be turned OFF then ON for this parameter to take effect. See **Application Note Section 13**.
MARKER OFFSET **RESOLVER ONLY	**UP-06**	0~11999 pulses	0 pulses	The electrical ZERO can be shifted with respect to the mechanical shaft position using UP-06. The Delta driver produces N number of ZERO states per motor rotation where N is equal to the number of resolver cycles. (i.e. a motor with a 2X resolver has 2 ZERO/rev. see motor drawings in **Appendix A.6, A.7 & A.8**.) To shift the electrical ZERO place the motor shaft at the desired electrical ZERO position. Read the status display "d" parameter in degrees and set UP-06="d"*12000/360. The electrical ZERO affects the ZPD output pulse and the STOP AT MARKER input stopping position.
MOTOR STOPPED THRESHOLD	**UP-08**	1~4000 r/min	50 r/min	When the motor is rotating at less than the speed set into UP-08 the MOTOR STOPPED output will be on. Software Version 13 and above.

4.2.3.2 TORQUE CONTROL USER PARAMETERS (cont'd)

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
ABSOLUTE CLEAR MODE	**UP-15**	0~2	0	Selects the type of home 0.00 processing for absolute systems when the SET "0" POSITION input is energized or upon startup. 0: Makes current position of motor equal to 0.00. 1: Makes the current motor shaft rotation the 0 rotation while preserving the MARKER OFFSET. 2: No effect retains absolute position.
BRAKE MODE	**UP-16**	0~2	0	Selects the type of brake sequencing to be used when the driver ENABLE is turned OFF. Brake is applied immediately in the case of an alarm. 0: No brake or dynamic brake. If no brake, the motor will coast to a stop. If dynamic brake relay is installed, the motor and load are dynamically braked to a stop. 1&2:Mechanical holding brake is applied when the motor reaches the speed set in UP-28. The deceleration rate is an uncontrolled coast of the motor and load. Power must be turned OFF then ON for this parameter to take effect.
REF1 and REF2 POLARITY	**UP-17**	00~11	0 0	Sets the polarity of the analog reference inputs. 00: Both REF1 and REF2 normal 01: REF1 inverted, REF2 not inverted 10: REF1 not inverted, REF2 inverted 11: Both REF1 and REF2 inverted
OUTPUT PULSE TYPE	**UP-19**	00~11	01	Sets the type of pulse output sequence and polarity of the PULSE OUTPUT. UP-20 must be set to xxxo for the PULSE OUTPUT to represent incremental actual position. 00: Pulse, Pulse encoding where APD pulses when the actual position increments and BPD pulses when the actual position decrements. 01: Quadrature encoding of APD and BPD with APD leading BPD for incrementing actual position. Each edge of the two pulse trains is counted as an output bit change. 10: Pulse, Pulse encoding where BPD pulses when the actual position increments and APD pulses when the actual position decrements.

4.2.3.2 TORQUE CONTROL USER PARAMETERS (cont'd)

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
OUTPUT PULSE TYPE (cont'd)	**UP-19** (cont'd)			11: Quadrature encoding of APD and BPD with BPD leading APD for incrementing actual position. Each edge of the two pulse trains is counted as an output bit change.
OUTPUT PULSE CODING	**UP-20**	0000~5533	0000	The first digit of UP-20 selects the parameter to be put on the driver external display when MONITOR SELECT I/O is OFF. Coding is as follows: 0: Motor speed in RPM 1: Actual motor position 2: Motor current 3: Calculated motor temperature 4: Motor distance to marker (°) 5: Machine speed in RPM The second digit of UP-20 selects the parameter to be put on the display when MONITOR SELECT I/O is ON. Coding is the same as the first digit above. The third digit selects the type of electronic coding for the OUTPUT PULSE when an absolute system is configured. This digit is only effective when the fourth digit is set to 3 or absolute motor position. The coding is as follows: 0: 32 bits 1: 23 bits + parity 2: 24 bits + parity 3: 31 bits + parity The fourth digit sets the basic function of the OUTPUTS PULSES. The coding is as follows: 0: Incremental position as defined in UP-19 1: Output to optional drive display DPA-70 2: Output to optional drive display DPA-80 3: Absolute motor position

4.2.3.2 TORQUE CONTROL USER PARAMETERS (cont'd)

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
MONITOR OUTPUT FUNCTION	**UP-25**	000~111	010	Selects SPEED or TORQUE output and polarity of the MON test point. The first digit selects the MON output function when the MONITOR SELECT I/O is ON. 0: TORQUE 1: SPEED The second digit selects the MON output function when the MONITOR SELECT I/O is OFF. 0: TORQUE 1: SPEED The third digit selects the polarity of the MON output. 0: Normal 1: Invert
HOLDING BRAKE THRESHOLD	**UP-28**	0~100.0%	100%	When UP-16 is set to 0, UP-28 has no effect. When UP-16 is set to 1 or 2, the mechanical brake is applied when the motor speed falls below the value set in UP-28. The value in UP-28 is % of rated speed.
MOTOR TEST SPEED	**UP-29**	1~4000 r/min	50 RPM	The driver can be jogged manually by using the keypad. The jog speed is set with UP-29 in RPM.
EXTERNAL REGEN RESISTOR VALUE (Software version 10 and above)	**UP-30**	0~100.0 ohms	0.0 ohms	Value of the optional external regen resistor. When external regen resistor is used, the value of the resistor is entered to allow the driver to calculate average power into the regen resistor. When the internal regen is used, enter 0.0. Power must be turned OFF then ON for this parameter to take effect. See **Section 7** for details on Regen Resistor selection. This parameter is used with DSD-35 and larger drivers.
EXTERNAL REGEN RESISTOR WATTAGE (Software version 10 and above)	**UP-31**	0~327.67 Kw	0.0 Kw	Power rating of the optional external regen resistor. When external regen resistor is used, the power rating in Kw of the resistor is entered to allow the driver to calculate average power into the regen resistor. When the internal regen is used, enter 0.0. Power must be turned OFF then ON for this parameter to take effect. See **Section 7** for details on Regen Resistor selection. This parameter is used with DSD-35 and larger drivers.

4.2.3.3 TORQUE CONTROL SETUP PARAMETERS

SETUP PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
MOTOR RMS TORQUE TIME CONSTANT	**HP-33**	1~60 sec	30 sec	Sets the time constant for calculating motor rms torque that is displayed as parameter bL. Time constant should be set to approximately twice as long as the machine cycle.
SPEED LIMIT SELECTION	**HP-34**	00~21	11	First digit is not used: 0: N/A 1: N/A 2: N/A Second digit is speed limit method: 0: Limited with REF1 analog input when SPEED LIMIT ENABLE I/O is ON. 10V = Peak speed 1: Limit set by parameter HP-35. When speed limit enable I/O is on.
SPEED LIMIT VALUE	**HP-35**	0~4000 r/min	4000 r/min	Sets the speed limit in RPM when speed limit is active.
ABSORPTION THRESHOLD	**HP-40**	0~100.0%	5%	Sets the absorption (braking) torque detection level to turn on the ABSORBING TORQUE output. 100% = peak torque
SPEED DISPLAY ELECTRONIC RATIO NUMERATOR	**HP-41**	1~32767	1	Parameters HP-41/HP-42 form a fraction that is used to scale the scaled Motor Speed display "F". The motor speed is multiplied by the fraction then put on the display. This allows a speed display that is scaled to the speed of the actual machine rather than the speed of the motor. The scaling can also allow the driver to display speed in different units such as in/sec rather than the default motor RPM. Scales the driver display and optional external display if used.
SPEED DISPLAY ELECTRONIC RATIO DENOMINATOR	**HP-42**	1~32767	1	
SPEED DISPLAY DECIMAL POINT POSITION	**HP-43**	0~7	0	HP-43 sets the position of the decimal point in the optional external speed display. 0: No decimal point 1: Least significant digit ... 7: Most significant digit
INPUT INVERSION	**HP-44**	000~1FF	000	This parameter forms a hexadecimal bit mask that inverts the input when the bit is set to 1 and does not invert the input when the bit is 0. The LSB is for IN0 and so on. (i.e. HP-44=8C inverts inputs IN7, IN3 & IN2)

4.2.3.3 TORQUE CONTROL SETUP PARAMETERS (cont'd)

SETUP PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
OUTPUT INVERSION	**HP-45**	00~FF	00	This parameter forms a hexadecimal bit mask that inverts the output when the bit is set to 1 and does not invert the output when the bit is 0. The LSB is for OUT0 and so on. (i.e. HP-45=4A inverts outputs OUT6, OUT3 & OUT1)

4.3 PULSE POSITION CONTROL MODE 3

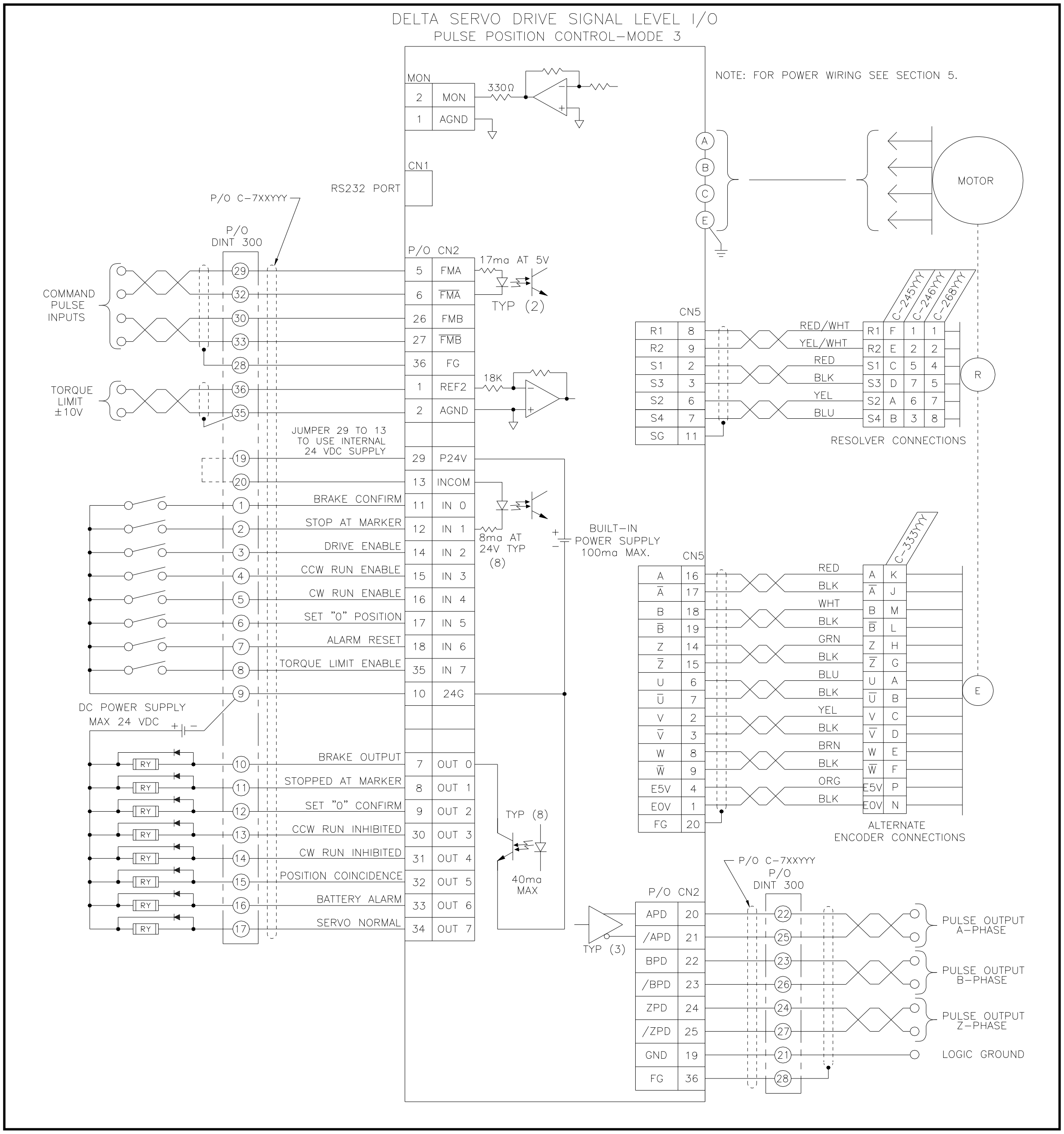
PRIMARY MOTION CONTROL FEATURES

- In the Pulse Position Mode, the driver is a position controller that receives position commands from a digital pulse train.
- The scaling, direction and type of input pulse train are programmable with internal parameters.

SECONDARY MOTION CONTROL FEATURES

- The torque of the motor can be limited via an external analog voltage or by an internal parameter.
- The motor can be stopped and position locked at the motor's marker pulse using an I/O point.
- CW and CCW direction limit I/O points are available to limit the mechanical motion of the mechanism.

4.3.1 SIGNAL WIRING



4.3.2 PULSE POSITION CONTROL INPUT/OUTPUT

TYPE	NAME	FUNCTION
5V Input	COMMAND PULSES (FMA/FMA) (FMB/FMB)	These two pulse trains inputs are the command for motor motion. • The pulse trains are interpreted in 3 possible ways set by UP-18 • The scaling of the pulse to motor movement is set with UP-04 & UP-05 • Command pulse register is monitored with the status display "P'---" & "P---".
24V Input	BRAKE CONFIRM (IN0)	This input is a confirmation of the release of either a dynamic or static mechanical brake. See **Sections 8 & 9** for details of brake operation. • Brake modes of operation are set with UP-16 & UP-28
	STOP AT MARKER (IN1)	When this input is turned ON, the motor stops next motor MARKER or home position. There are two MARKERS per motor rotation located 180° apart. • Deceleration time is fixed at 0 time • Marker position can be shifted up to 180° using UP-6 • Driver switches to position control with position gain set by AJ4
	DRIVE ENABLE (IN2)	When this input is turned ON, the driver becomes operational if there are no faults and the BRAKE CONFIRM (IN0) input is correctly sequenced. • Brake output also is turned ON/OFF with this signal subject to settings of UP-16 and UP-28
	CCW RUN ENABLE (IN3)	When this input is ON, the motor is enabled to run CCW if commanded by the COMMAND PULSES input. (Normally closed CCW direction limit)
	CW RUN ENABLE (IN4)	When this input is ON, the motor is enabled to run CW if commanded by the COMMAND PULSE input. (Normally closed CW direction limit)
	SET "0" POSITION (IN5)	When this input is turned ON for 30 ms or more, the driver internal position registers are set "0". • With an absolute system the home position setting is subject to UP-15
	ALARM RESET (IN6)	When this input is turned ON for 30 ms or more, all alarms are reset. • AL1 (driver overheated) and AL17 (motor overload) cannot be reset until the temperature drops to acceptable level • AL26 cannot be reset until power is cycled
	TORQUE LIMIT ENABLE (IN7)	When this input is turned ON and HP-34 is set to 0X or 1X, the torque limit operates. • If HP-34 is set to 0X, the torque is limited by the TORQUE LIMIT (REF2) input voltage • If HP-34 is set to 1X, the torque limit is set by UP-11 • If HP-34 is set to 2X, the torque limit is on regardless of state of this input with the limit set by UP-11

4.3.2 PULSE POSITION CONTROL INPUT/OUTPUT (cont'd)

TYPE	NAME	FUNCTION
24V Output	BRAKE OUTPUT (OUT0)	This output controls the operation of the dynamic brake or holding brake. • Brake modes of operation are set with UP-16 & UP-28
	STOPPED AT MARKER (OUT1)	This output turns ON when the motor completes the sequence initiated by the STOP AT MARKER (IN1) input.
	SET "0" CONFIRM (OUT2)	This output turns ON confirming that the SET "0" POSITION (IN5) input has been recognized and the internal position registers have been cleared.
	CCW RUN INHIBITED (OUT3)	This output turns on when CCW RUN ENABLE (IN3) is off causing CCW COMMAND PULSES to be inhibited.
	CW RUN INHIBITED (OUT4)	This output turns on when CW RUN ENABLE (IN4) is off causing CW COMMAND PULSES to be inhibited.
	POSITION COINCIDENCE (OUT5)	This output turns ON when the actual position of the motor equals commanded position of the motor. • Detection width is set with UP-7
	BATTERY ALARM (OUT6)	This output turns ON when the battery of absolute system drops below 3.2V. This output is a warning and the battery should be replaced promptly.
	SERVO NORMAL (OUT7)	This output turns ON 1.6 sec. after AC power ON and there are no alarms. • Does not turn OFF in the case of an AL24 (BATTERY ALARM)
Differential output	PULSE OUTPUT (APD/APD) (BPD/BPD) (ZPD(/ZPD)	Programmable pulse train output from the driver. • Type of data output is set by UP-20 • Encoder equivalent output is set by UP-19 with scaling set by UP-04 & UP-05 • External display device with various driver data set by UP-20 • Motor absolute position if an absolute system is used • Motor position register is monitored with the status display "A'---" & "A---"

4.3.3 PULSE POSITION CONTROL PARAMETER SETUP

4.3.3.1 PULSE POSITION CONTROL ADJUSTMENT PARAMETERS

ADJUSTMENT PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
LOAD INERTIA RATIO	**AJ2**	0~100.0	1.0 Times	Sets the baseline frequency response of the driver using the ratio of the load inertia/motor inertia for a rigidly coupled load. If the load is not rigidly coupled, the value entered may vary from the calculated value. If the value is set too high, the motor and driver may become unstable and oscillate. This parameter is set automatically during auto tuning.
HIGH FREQUENCY RESPONSE	**AJ3**	0.1~20.0	1.0	Sets the high frequency response of the driver. The higher the number the more responsive. If the value is set too high, the motor and driver may become unstable and oscillate. The value in AJ3 is unit less and works in concert with AJ2. This parameter is set automatically during auto tuning.
POSITION LOOP DC GAIN	**AJ4**	1~200	30 Rad/sec	Sets the DC gain of the position control loop. A higher value in AJ4 results in stiffer, faster response. If the value is set too high, the motor and driver may become unstable & oscillate. This parameter is set automatically during auto tuning.
TORQUE LIMIT ZERO (REF2)	**AJ5**	±10.00 V	Factory Preset	Sets the zero offset of the TORQUE LIMIT (REF2) input. It can be set in two ways: 1. Automatically: by concurrently pressing SEL ↵ (all digits flash) and then pressing ↵. The driver will read the analog voltage REF2 and create an offset equal and opposite to the analog voltage present at the time. To get a true 0.00 offset, short REF2 to analog ground before doing the auto zero procedure. 2. Manually: by concurrently pressing SEL ↵ (all digits flash) and then concurrently pressing ⇑ SEL. Then adjust the individual digits with ⇑ ⇓.

4.3.3.1 PULSE POSITION CONTROL ADJUSTMENT PARAMETERS (cont'd)

ADJUSTMENT PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
TORQUE LIMIT SCALE (REF2)	**AJ6**	3~40.00 V	10.00V	Sets the TORQUE LIMIT (REF2) scaling. The value set in this parameter is the voltage needed at REF2 for the motor to be limited to maximum torque. For example, if it is required to have the maximum torque with 4.5 VDC input voltage (REF2), set AJ5 to 4.50.
ZERO SPEED GAIN REDUCTION	**AJ7**	0~10000	0	Sets the amount of gain reduction at zero speed. The gain is reduced when the motor is below the speed set in UP-08 and at the set values when the speed is above UP-08.
FEED FORWARD GAIN	**AJ8**	0~2.0 Times	0 Times	Sets the feed forward gain in the position loop. A value of 1.0 results in 0.0 following error. Less than 1.0 will produce a lag between the actual motor position and the commanded position and greater than 1.0 produces a lead. The lead or lag will be proportional to speed at non 1.0 settings.
NOTCH FILTER FREQUENCY	**AJ9**	400~20000 rad/s	6000 rad/s	Sets the notch frequency of a velocity loop anti-resonance filter. This filter can be used to cancel machine or servo resonance. Power must be turned OFF then ON for this parameter to take effect.

4.3.3.2 PULSE POSITION CONTROL USER PARAMETERS

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
CONTROL MODE	**UP-01**	00~FF	00	Sets the control mode of operation for the driver as follows: 1 = Speed 2 = Torque 3 = Pulse Position 4 = Speed/Torque/Position 5 = Speed Preset 6 = Electronic Gearing The driver power must be cycled to register this parameter. Power must be turned OFF then ON for this parameter to take effect.
MOTOR CODE	**UP-02**	0000~FFFF	0000	Sets the internal driver parameters corresponding to the motor code. See **Appendix A** for motor codes. The driver power must be cycled to register this parameter. Power must be turned OFF then ON for this parameter to take effect.

4.3.3.2 PULSE POSITION CONTROL USER PARAMETERS (cont'd)

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
RESOLVER CABLE LENGTH N/A FOR ENCODER	**UP-03**	1~120M	5M	Sets the driver resolver cable length compensation. The driver power must be cycled to register this parameter. Power must be turned OFF then ON for this parameter to take effect.
ELECTRONIC GEAR RATIO NUMERATOR	**UP-04**	1~32767	1	The COMMAND PULSE (FMA and FMB) input is multiplied by the ratio of UP-04/UP-05 before being processed by the driver. The driver internal command resolution is equal to the number of resolver cycles times 12000 bits/rev or the PPR of the encoder. (i.e. a motor with a 2X resolver has an internal resolution of 24000 bits/rev, see motor drawings in **Appendix A.6, A.7 & A.8**.) For example if a COMMAND PULSE INPUT of 1000 bits/rev is required with a 2X resolver, set UP-04=24000 and UP-05=1000. Power must be turned OFF then ON for this parameter to take effect. See **Application Note Section 13**.
ELECTRONIC GEAR RATIO DENOMINATOR	**UP-05**	1~32767	1	The driver internal feedback resolution is multiplied by the ratio of UP-05/UP-04 before being sent to OUTPUT PULSE (APD and BPD). The driver internal resolution is equal to the number of resolver cycle times 12000 bits/rev. (i.e. a motor with a 2X resolver has an internal resolution of 24000 bits/rev, see motor drawings in **Appendix A.6, A.7 & A.8**.) For example if an OUTPUT PULSE of 1000 bits/rev is required with a 2X resolver, set UP-04=24000 and UP-05=1000. Power must be turned OFF then ON for this parameter to take effect. See **Application Note Section 13**.
MARKER OFFSET **RESOLVER ONLY	**UP-06**	0~11999 pulses	0 pulses	The electrical ZERO can be shifted with respect to the mechanical shaft position using UP-06. The Delta driver produces N number of ZERO states per motor rotation where N is equal to the number of resolver cycles. (i.e. a motor with a 2X resolver has 2 ZERO/rev. see motor drawings in **Appendix A.6, A.7 & A.8**.) To shift the electrical ZERO place the motor shaft at the desired electrical

4.3.3.2 PULSE POSITION CONTROL USER PARAMETERS (cont'd)

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
MARKER OFFSET **RESOLVER ONLY (cont'd)	**UP-06 (cont'd)**	0~11999 pulses	0 pulses	ZERO position. Read the status display "d" parameter in degrees and set UP-06="d"*12000/360. The electrical ZERO affects the ZPD output pulse and the STOP AT MARKER input stopping position.
POSITION COINCIDENCE WIDTH	**UP-07**	0~32767 pulses	50 pulses	Sets the width of the sensing window allowable to get the POSITION COINCIDENCE output. Pulse scaling in internal resolution or 12000* Resolver cycles.
MOTOR STOPPED THRESHOLD	**UP-08**	1~4000 r/min	50 r/min	When the motor is rotating at less than the speed set into UP-08 the MOTOR STOPPED output will be on. Software Version 13 and above.
TORQUE LIMIT	**UP-11**	0~100.0%	100%	When the torque limit is applied the motor torque is limited to the value set in UP-11. UP-11 is % of motor peak torque. See **HP-34** for torque limit method.
ABSOLUTE CLEAR MODE	**UP-15**	0~2	0	Selects the type of home 0.00 processing for absolute systems when the SET "0" POSITION input is energized or upon startup. 0: Makes current position of motor equal to 0.00. 1: Makes the current motor shaft rotation the 0 rotation while preserving the MARKER OFFSET. 2: No effect, retains absolute position
BRAKE MODE	**UP-16**	0~2	0	Selects the type of brake sequencing to be used when the driver ENABLE is turned OFF. Brake is applied immediately in the case of an alarm. 0: No brake or dynamic brake. If no brake, the motor will coast to a stop. If dynamic brake relay is installed, the motor and load are dynamically braked to a stop. 1&2: Mechanical holding brake is applied when the motor reaches the speed set in UP-28. The driver applies maximum electronic breaking torque to decelerate the motor to the speed set in UP-28. Power must be turned OFF then ON for this parameter to take effect.

4.3.3.2 PULSE POSITION CONTROL USER PARAMETERS (cont'd)

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
REF1 and REF2 POLARITY	**UP-17**	00~11	0 0	Sets the polarity of the analog reference inputs. 00: Both REF1 and REF2 normal 01: REF1 inverted, REF2 not inverted 10: REF1 not inverted, REF2 inverted 11: Both REF1 and REF2 inverted
COMMAND PULSE TYPE	**UP-18**	00~12	0 0	Sets the type of pulse sequence and polarity of the COMMAND PULSE inputs. 00: Pulse, Pulse decoding where FMA increments command position and FMB decrements command position. 01: Quadrature decoding of FMA and FMB with FMA leading FMB for incrementing command position. Quadrature decoding effectively multiplies the input frequency by 4 times. 02: Pulse and direction decoding where FMA is pulse train and FMB is direction. FMB OFF increments command position and ON decrements command position. 10: Pulse, Pulse decoding where FMB increments command position and FMA decrements command position. 11: Quadrature decoding of FMA and FMB with FMB leading FMA for incrementing command position. Quadrature decoding effectively multiplies the input frequency by 4 times. 12: Pulse and direction decoding where FMA is pulse train and FMB is direction. FMB ON increments command position and OFF decrements command position.
OUTPUT PULSE TYPE	**UP-19**	00~11	01	Sets the type of pulse output sequence and polarity of the PULSE OUTPUT. UP-20 must be set to xxxo for the PULSE OUTPUT to represent incremental actual position. 00: Pulse, Pulse encoding where APD pulses when the actual position increments and BPD pulses when the actual position decrements.

4.3.3.2 PULSE POSITION CONTROL USER PARAMETERS (cont'd)

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
OUTPUT PULSE TYPE (cont'd)	**UP-19** (cont'd)			01: Quadrature encoding of APD and BPD with APD leading BPD for incrementing actual position. Each edge of the two pulse trains is counted as an output bit change. 10: Pulse, Pulse encoding where BPD pulses when the actual position increments and APD pulses when the actual position decrements. 11: Quadrature encoding of APD and BPD with BPD leading APD for incrementing actual position. Each edge of the two pulse trains is counted as an output bit change.
OUTPUT PULSE CODING	**UP-20**	0000~5533	0000	The first digit of UP-20 selects the parameter to be put on the driver external display. Coding is as follows: 0: Motor speed in RPM 1: Actual motor position 2: Motor current 3: Calculated motor temperature 4: Motor distance to marker (°) 5: Machine speed in RPM The second digit of UP-20 is not used. The third digit selects the type of electronic coding for the OUTPUT PULSE when an absolute system is configured. This digit is only effective when the fourth digit is set to 3 or absolute motor position. The coding is as follows: 0: 32 bits 1: 23 bits + parity 2: 24 bits + parity 3: 31 bits + parity The fourth digit sets the basic function of the OUTPUTS PULSES. The coding is as follows: 0: Incremental position as defined in UP-19 1: Output to optional drive display DPA-70 2: Output to optional drive display DPA-80 3: Absolute motor position

4.3.3.2 PULSE POSITION CONTROL USER PARAMETERS (cont'd)

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
MONITOR OUTPUT FUNCTION	**UP-25**	000~111	010	Selects SPEED or TORQUE output and polarity of the MON test point. The first digit is not used. The second digit selects the MON output function. 0: TORQUE 1: SPEED The third digit selects the polarity of the MON output. 0: Normal 1: Invert
COMMAND PULSE POLARITY	**UP-26**	0~1	0	0: Move CCW with increment of command position 1: Move CW with increment of command position
HOLDING BRAKE THRESHOLD	**UP-28**	0~100.0%	100%	When UP-16 is set to 0, UP-28 has no effect. When UP-16 is set to 1 or 2, the mechanical brake is applied when the motor speed falls below the value set in UP-28. The value in UP-28 is % of rated speed.
MOTOR TEST SPEED	**UP-29**	1~4000 r/min	50 RPM	The driver can be jogged manually by using the keypad. The jog speed is set with UP-29 in RPM.
EXTERNAL REGEN RESISTOR VALUE (Software version 10 and above)	**UP-30**	0~100.0 ohms	0.0 ohms	Value of the optional external regen resistor. When external regen resistor is used, the value of the resistor is entered to allow the driver to calculate average power into the regen resistor. When the internal regen is used, enter 0.0. Power must be turned OFF then ON for this parameter to take effect. See **Section 7** for details on Regen Resistor selection. This parameter is used with DSD-35 and larger drivers.
EXTERNAL REGEN RESISTOR WATTAGE (Software version 10 and above)	**UP-31**	0~327.67 Kw	0.0 Kw	Power rating of the optional external regen resistor. When external regen resistor is used, the power rating in Kw of the resistor is entered to allow the driver to calculate average power into the regen resistor. When the internal regen is used, enter 0.0. Power must be turned OFF then ON for this parameter to take effect. See **Section 7** for details on Regen Resistor selection. This parameter is used with DSD-35 and larger drivers.

4.3.3.3 PULSE POSITION CONTROL SETUP PARAMETERS

SETUP PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
MOTOR RMS TORQUE TIME CONSTANT	**HP-33**	1~60 sec	30 sec	Sets the time constant for calculating motor rms torque that is displayed as parameter bL. Time constant should be set to approximately twice as long as the machine cycle.
TORQUE LIMIT SELECTION	**HP-34**	00~21	11	First digit is torque limit method: 0: Limited with REF2 analog input when TORQUE LIMIT ENABLE I/O is ON. 10V = Peak torque 1: Limit set by parameter UP-11 or HP-36 through HP-39 when UP-11 = 0 and when TORQUE LIMIT ENABLE I/O is ON. 2: Limit set by parameter UP-11 or HP-36 through HP-39 when UP-11 = 0 regardless of the state of the TORQUE LIMIT ENABLE I/O. Second digit is speed limit method: 0: N/A 1: N/A
CCW ROTATION TORQUE LIMIT	**HP-36**	0~100.0%	100%	Limits CCW rotation torque. 100% = Peak Torque See **HP-34**
CCW ROTATION ABSORPTION TORQUE LIMIT	**HP-37**	0~100.0%	100%	Limits CCW rotation absorption (braking) torque. 100% = Peak Torque See **HP-34**
CW ROTATION TORQUE LIMIT	**HP-38**	0~100.0%	100%	Limits CW rotation torque. 100% = Peak Torque See **HP-34**
CW ROTATION ABSORPTION TORQUE LIMIT	**HP-39**	0~100.0%	100%	Limits CW rotation absorption (braking) torque. 100% = Peak Torque See **HP-34**
SPEED DISPLAY ELECTRONIC RATIO NUMERATOR	**HP-41**	1~32767	1	Parameters HP-41/HP-42 form a fraction that is used to scale the scaled Motor Speed display "F". The motor speed is multiplied by the fraction, and then put on the display. This allows a speed display that is scaled to the speed of the actual machine rather than the speed of the motor. The scaling can also allow the driver to display speed in different units such as in/sec rather than the default motor RPM. Scales the display driver and optional external display if used.
SPEED DISPLAY ELECTRONIC RATIO DENOMINATOR	**HP-42**	1~32767	1	

4.3.3.3 PULSE POSITION CONTROL SETUP PARAMETERS (cont'd)

SETUP PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
SPEED DISPLAY DECIMAL POINT POSITION	**HP-43**	0~7	0	HP-43 sets the position of the decimal point in the optional external speed display. 0: No decimal point 1: Least significant digit ... 7: Most significant digit
INPUT INVERSION	**HP-44**	000~1FF	000	This parameter forms a hexadecimal bit mask that inverts the input when the bit is set to 1 and does not invert the input when the bit is 0. The LSB is for IN0 and so on. (i.e. HP-44=8C inverts inputs IN7, IN3 & IN2)
OUTPUT INVERSION	**HP-45**	00~FF	00	This parameter forms a hexadecimal bit mask that inverts the output when the bit is set to 1 and does not invert the output when the bit is 0. The LSB is for OUT0 and so on. (i.e. HP-45=4A inverts outputs OUT6, OUT3 & OUT1)
IN POSITION TIMER	**HP-46**	0~200 ms	20 ms	Sets the minimum width of the POSITION COINCIDENCE output.

4.4 SPEED/TORQUE/POSITION CONTROL MODE 4

PRIMARY MOTION CONTROL FEATURES

- In the Speed/Torque/ Position Mode, the driver can be switched between the three previously described control modes with two (2) I/O points.

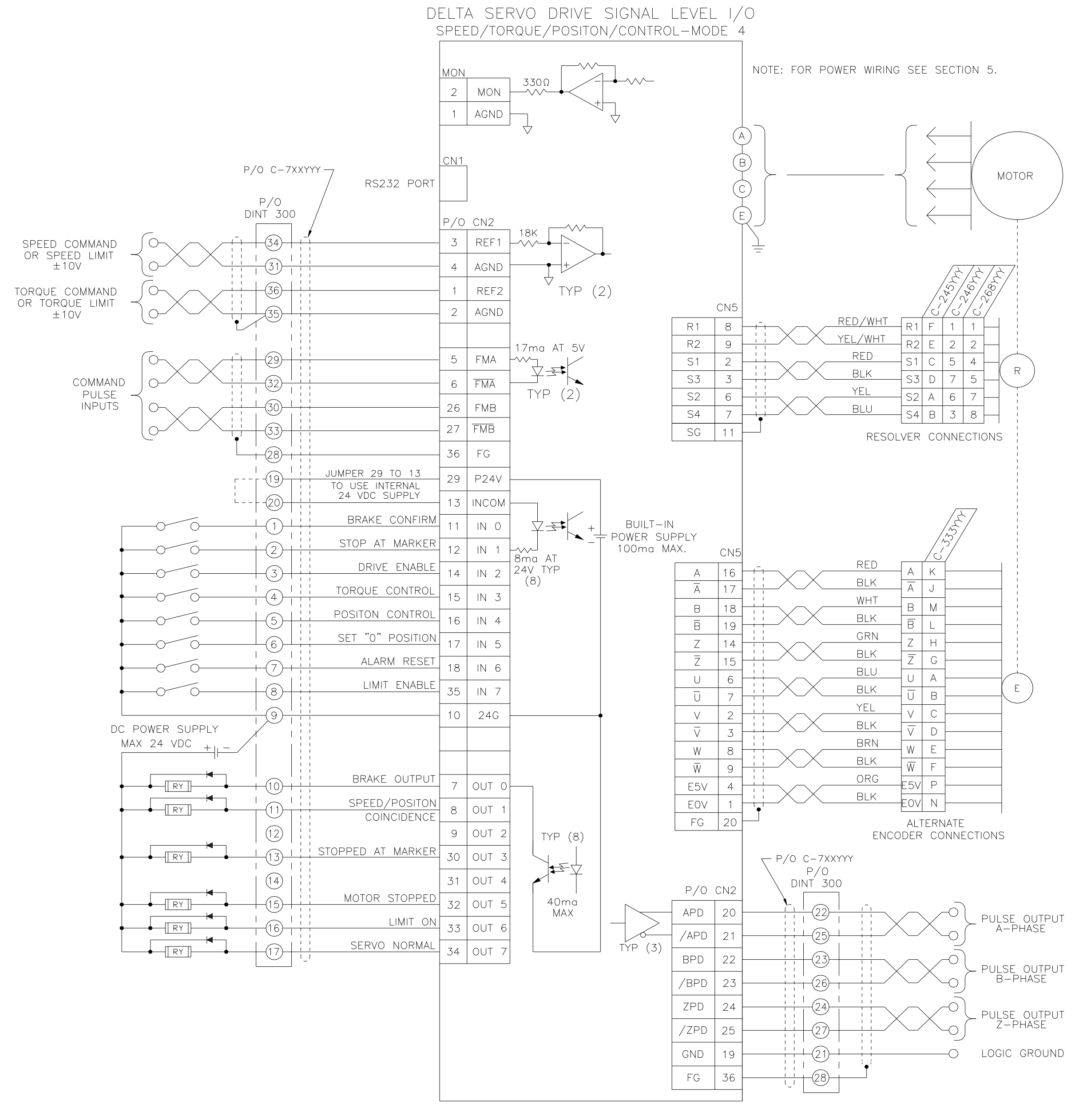
- In the speed and position mode, the torque of the motor can be limited via an external analog voltage or by an internal parameter.

- In the torque mode, the speed of the motor can be limited using an external analog voltage or by an internal parameter.

SECONDARY MOTION CONTROL FEATURES

- The motor can be stopped and position locked at the motor's marker pulse using an I/O point.

4.4.1 SIGNAL WIRING



4.4.2 SPEED/TORQUE/POSITION CONTROL INPUT/OUTPUT

TYPE	NAME	FUNCTION
Analog Input	SPEED COMMAND (REF1) or (Selected by IN3 & IN4)	SPEED COMMAND +/-10V input. Rotation is CCW for (+) voltage and CW for (-) voltage. Motor speed is directly proportional to voltage. • Direction of rotation is set with UP-17 • Acceleration/deceleration is set with UP-12, 13 &14 • Scaling of speed vs. voltage is set with AJ1 • Zero adjustment is set with AJO • SPEED COMMAND (REF1) voltage monitor on the status display "cF---"
	SPEED LIMIT (REF1)	SPEED LIMIT 0-10V input. The motor speed is limited proportionally with this voltage. • Scaling of speed vs. voltage is set with AJ1 • Zero adjustment is set with AJ0 • The method to cause limiting is set with HP-34 • SPEED LIMIT (REF2) voltage monitor on the status display "cF---".
	TORQUE COMMAND (REF2) or (Selected by IN3 & IN4)	TORQUE COMMAND +/-10V input. Torque is applied CCW for (+) voltage and CW for (-) voltage. Motor torque is directly proportional to voltage. • Direction of torque is set with UP-17 • Scaling of torque vs. voltage is set with AJ6 • Zero adjustment is set with AJ5 • TORQUE COMMAND (REF2) voltage monitor on the status display "cc---".
	TORQUE LIMIT (REF2)	TORQUE LIMIT 0-10V input. The peak motor torque is limited proportionally with this voltage. • Scaling of torque vs. voltage is set with AJ6 • Zero adjustment is set with AJ5 • The method to cause limiting is set with HP-34 • TORQUE LIMIT (REF2) voltage monitor on the status display "cc---".
5V Input	COMMAND PULSE (FMA/FMA) (FMB/FMB)	These two pulse trains inputs are the command for motor motion. • The pulse trains are interpreted in 3 possible ways set by UP-18 • The scaling of the pulse to motor movement is set with UP-04 & UP-05 • Command pulse register is monitored with the status display "P'---" & "P---".

4.4.2 SPEED/TORQUE/POSITION CONTROL INPUT/OUTPUT (cont'd)

TYPE	NAME	FUNCTION
24V Input	BRAKE CONFIRM (IN0)	This input is a confirmation of the release of either a dynamic or static mechanical brake. See **Sections 8 & 9** for details of brake operation. • Brake modes of operation are set with UP-16 & UP-28
	STOP AT MARKER (IN1)	When this input is turned ON, the motor stops next motor MARKER or home position. There are two MARKERS per motor rotation located 180° apart. • Deceleration time is fixed at 0 time • Marker position can be shifted up to 180° using UP-6 • Driver switches to position control with position gain set by AJ4
	DRIVE ENABLE (IN2)	When this input is turned ON, the driver becomes operational if there are no faults and the BRAKE CONFIRM (IN)) input is correctly sequenced. • Brake output also is turned ON/OFF with this signal subject to settings of UP-16 and UP-28
	TORQUE CONTROL (IN3)	When this input is ON, the motor is torque control mode. • When both this input and POSITION CONTROL (IN4) are OFF, the motor is in speed control mode
	POSITION CONTROL (IN4)	When this input is ON and TORQUE CONTROL (IN3) is OFF, the motor is in position control mode. • When both this input and TORQUE CONTROL (IN3) are OFF, the motor is in speed control mode
	SET "0" POSITION (IN5)	When this input is turned ON for 30 ms or more, the driver internal position registers are set "0". • With an absolute system, the home position setting is subject to UP-15
	ALARM RESET (IN6)	When this input is turned ON for 30 ms or more, all alarms are reset. • AL1 (driver overheated) and AL17 (motor overload) cannot be reset until the temperature drops to acceptable level • AL26 cannot be reset until power is cycled
	LIMIT ENABLE (IN7)	When in speed control mode or position control mode, this input is turned ON and HP-34 is set to 0X or 1X, the torque limit operates. • If HP-34 is set to 0X, the torque is limited by the TORQUE LIMIT (REF2) input voltage • If HP-34 is set to 1X, the torque limit is set by UP-11 • If HP-34 is set to 2X, the torque limit is on regardless of state of this input with the limit set by UP-11 When in torque control mode, this input is turned ON and HP-34 is set to X0 or X1, the speed limit operates. • If HP-34 is set to X0, the speed is limited by the SPEED LIMIT (REF1) input voltage • If HP-34 is set to X1, the speed limit is set by HP-35

4.4.2 SPEED/TORQUE/POSITION CONTROL INPUT/OUTPUT (cont'd)

TYPE	NAME	FUNCTION
24V Output	BRAKE OUTPUT (OUT0)	This output controls the operation of the dynamic brake or holding brake. • Brake modes of operation are set with UP-16 & UP-28
	SPEED/POSITION COINCIDENCE (OUT1)	In speed control mode, this output turns ON when the actual speed of the motor reaches the target speed. • Target speed can be set to a preset speed or the commanded speed with UP-09 • Detection width is be set with UP-10 In position control mode, this output turns ON when the actual position of the motor equals commanded position of the motor. • Detection width is set with UP-7
	STOPPED AT MARKER (OUT3)	This output turns ON when the motor completes the sequence initiated by the STOP AT MARKER (IN1) input.
	MOTOR STOPPED (OUT5)	This output turns ON when the motor speed drops below the internal preset speed set in UP-8.
	LIMIT ON (OUT6)	In speed control mode, this output turns ON when the motor torque is limited to less than the peak rating of the motor. • HP-34 and LIMIT ENABLE (IN7) input set the conditions for torque limiting • UP-11 is the internal preset limit value In torque control mode, this output turns ON when the motor speed is limited to less than the peak rating of the motor. • HP-34 and LIMIT ENABLE (IN7) input set the conditions for speed limiting • HP-35 is the internal preset limit value
	SERVO NORMAL (OUT7)	This output turns ON 1.6 sec. after AC power ON and there are no alarms. • Does not turn OFF in the case of an AL24 (BATTERY ALARM)
Differential output	PULSE OUTPUT (APD/APD) (BPD/BPD) (ZPD(/ZPD)	Programmable pulse train output from the driver. • Type of data output is set by UP-20 • Encoder equivalent output is set by UP-19 with scaling set by UP-04 & UP-05 • External display device with various driver data set by UP-20 • Motor absolute position if an absolute system is used • Motor position register is monitored with the status display "A'---" & "A---"

4.4.3 SPEED/TORQUE/POSITION CONTROL PARAMETER SETUP

4.4.3.1 SPEED/TORQUE/POSITION CONTROL ADJUSTMENT PARAMETERS

ADJUSTMENT PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
SPEED COMMAND (LIMIT) ZERO (REF1)	**AJ0**	±10.00 V	Factory Preset	Sets the zero offset of the SPEED COMMAND (REF1) input. It can be set in two ways: 1. Automatically: by concurrently pressing SEL ↵ (all digits flash) and then pressing ↵. The driver will read the analog voltage REF1 and create an offset equal and opposite to the analog voltage present at the time. To get a true 0.00 offset, short REF1 to analog ground before doing the auto zero procedure. 2. Manually: by concurrently pressing SEL ↵ (all digits flash) and then concurrently pressing ▲ SEL. Then adjust the individual digits with ▲ ▼.
SPEED COMMAND (LIMIT) SCALE (REF1)	**AJ1**	3~40.00 V	10.00V	Sets the SPEED COMMAND (REF1) scaling. The value set in this parameter is the voltage needed at REF1 to bring the motor to the rated speed. For example, if the motor must turn at rated speed with 4.5 VDC input voltage (REF1), set AJ1 to 4.50.
LOAD INERTIA RATIO	**AJ2**	0~100.0	1.0 Times	Sets the baseline frequency response of the driver using the ratio of the load inertia/motor inertia for a rigidly coupled load. If the load is not rigidly coupled, the value entered may vary from the calculated value. If the value is set too high, the motor and driver may become unstable and oscillate. This parameter is set automatically during auto tuning.
HIGH FREQUENCY RESPONSE	**AJ3**	0.1~20.0	1.0	Sets the high frequency response of the driver. The higher the number the more responsive. If the value is set too high, the motor and driver may become unstable and oscillate. The value in AJ3 is unit less and works in concert with AJ2. This parameter is set automatically during auto tuning.

4.4.3.1 SPEED/TORQUE/POSITION CONTROL ADJUSTMENT PARAMETERS (cont'd)

ADJUSTMENT PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
POSITION LOOP DC GAIN	**AJ4**	1~200	30 Rad/sec	Sets the DC gain of the position control loop. A higher value in AJ4 results in stiffer, faster response. If the value is set too high, the motor and driver may become unstable and oscillate. This parameter is set automatically during auto tuning.
TORQUE COMMAND (LIMIT) ZERO (REF2)	**AJ5**	±10.00 V	Factory Preset	Sets the zero offset of the TORQUE COMMAND (REF2) input. It can be set in two ways: 1. Automatically: by concurrently pressing SEL ↵ (all digits flash) and then pressing ↵. The driver will read the analog voltage REF2 and create an offset equal and opposite to the analog voltage present at the time. To get a true 0.00 offset, short REF2 to analog ground before doing the auto zero procedure. 2. Manually: by concurrently pressing SEL ↵ (all digits flash) and then concurrently pressing ⏫ SEL. Then adjust the individual digits with ⏫ ⏬.
TORQUE COMMAND (LIMIT) SCALE (REF2)	**AJ6**	3~40.00 V	10.00V	Sets the TORQUE COMMAND (REF2) scaling. The value set in this parameter is the voltage needed at REF2 for the motor to develop maximum torque. For example, if it is required to have the maximum torque with 4.5 VDC input voltage (REF2), set AJ5 to 4.50.
ZERO SPEED GAIN REDUCTION	**AJ7**	0~10000	0	Sets the amount of gain reduction at zero speed. The gain is reduced when the motor is below the speed set in UP-08 and at the set values when the speed is above UP-08.
FEED FORWARD GAIN	**AJ8**	0~2.0 Times	0 Times	Sets the feed forward gain in the position loop. A value of 1.0 results in 0.0 following error. Less than 1.0 will produce a lag between the actual motor position and the commanded position and greater than 1.0 produces a lead. The lead or lag will be proportional to speed at non 1.0 settings.
NOTCH FILTER FREQUENCY	**AJ9**	100~20000 rad/s	6000 rad/s	Sets the notch frequency of a velocity loop anti-resonance filter. This filter can be used to cancel machine or servo resonance. Power must be turned OFF then ON for this parameter to take effect.

4.4.3.2 SPEED/TORQUE/POSITION CONTROL USER PARAMETERS

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
CONTROL MODE	**UP-01**	00~FF	00	Sets the control mode of operation for the driver as follows: 1 = Speed 2 = Torque 3 = Pulse Position 4 = Speed/Torque/Position 5 = Speed Preset 6 = Electronic Gearing The driver power must be cycled to register this parameter. Power must be turned OFF then ON for this parameter to take effect.
MOTOR CODE	**UP-02**	0000~FFFF	0000	Sets the internal driver parameters corresponding to the motor code. See **Appendix A** for motor codes. The driver power must be cycled to register this parameter. Power must be turned OFF then ON for this parameter to take effect.
RESOLVER CABLE LENGTH N/A FOR ENCODER	**UP-03**	1~120M	5M	Sets the driver resolver cable length compensation. The driver power must be cycled to register this parameter. Power must be turned OFF then ON for this parameter to take effect.
ELECTRONIC GEAR RATIO NUMERATOR	**UP-04**	1~32767	1	The COMMAND PULSE (FMA and FMB) input is multiplied by the ratio of UP-04/UP-05 before being processed by the driver. The driver internal command resolution is equal to the number of resolver cycles times 12000 bits/rev or the PPR of the encoder. (i.e. a motor with a 2X resolver has an internal resolution of 24000 bits/rev, see motor drawings in **Appendix A.6, A.7 & A.8**.) For example if a COMMAND PULSE INPUT of 1000 bits/rev is required with a 2X resolver, set UP-04=24000 and UP-05=1000. Power must be turned OFF then ON for this parameter to take effect. See **Application Note Section 13**.

4.4.3.2 SPEED/TORQUE/POSITION CONTROL USER PARAMETERS (cont'd)

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
ELECTRONIC GEAR RATIO DENOMINATOR	**UP-05**	1~32767	1	The driver internal feedback resolution is multiplied by the ratio of UP-05/UP-04 before being sent to OUTPUT PULSE (APD and BPD). The driver internal resolution is equal to the number of resolver cycle times 12000 bits/rev. (i.e. a motor with a 2X resolver has an internal resolution of 24000 bits/rev, see motor drawings in **Appendix A.6, A.7 & A.8**.) For example if an OUTPUT PULSE of 1000 bits/rev is required with a 2X resolver, set UP-04=24000 and UP-05=1000. Power must be turned OFF then ON for this parameter to take effect. See **Application Note Section 13**.
MARKER OFFSET **RESOLVER ONLY	**UP-06**	0~11999 pulses	0 pulses	The electrical ZERO can be shifted with respect to the mechanical shaft position using UP-06. The Delta driver produces N number of ZERO states per motor rotation where N is equal to the number of resolver cycles. (i.e. a motor with a 2X resolver has 2 ZERO/rev. see motor drawings in **Appendix A.6, A.7 & A.8**.) To shift the electrical ZERO place the motor shaft at the desired electrical ZERO position. Read the status display "d" parameter in degrees and set UP-06="d"*12000/360. The electrical ZERO affects the ZPD output pulse and the STOP AT MARKER input stopping position.
POSITION COINCIDENCE WIDTH	**UP-07**	0~32767 pulses	50 pulses	Sets the width of the sensing window allowable to get the POSITION COINCIDENCE output. Pulse scaling in internal resolution or 12000* Resolver cycles.
MOTOR STOPPED THRESHOLD	**UP-08**	1~4000 r/min	50 r/min	When the motor is rotating at less than the speed set into UP-08 the MOTOR STOPPED output will be on.
SPEED COINCIDENCE THRESHOLD	**UP-09**	0~4000 r/min	0 r/min	If UP-09 is non-zero, the SPEED COINCIDENCE output comes on when the actual motor speed reaches the value set in UP-09. If UP-09 is zero, the SPEED COINCIDENCE output comes on when the actual motor speed reaches the commanded speed.
SPEED COINCIDENCE WIDTH	**UP-10**	1~4000 r/min	20 r/min	Sets the width of the sensing window allowable to get the SPEED COINCIDENCE output.

4.4.3.2 SPEED/TORQUE/POSITION CONTROL USER PARAMETERS (cont'd)

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
TORQUE LIMIT	**UP-11**	0~100.0%	100%	When the torque limit is applied the motor torque is limited to the value set in UP-11. UP-11 is % of motor peak torque. See **HP-34** for torque limit method.
ACCEL TIME	**UP-12**	0~32.76 sec	0 sec	Sets the time from zero to rated speed with a linear acceleration profile. Ignored if UP-14 is not equal to 0.0.
DECEL TIME	**UP-13**	0~32.76 sec	0 sec	Sets the time from rated speed to zero speed with a linear deceleration profile. Ignored if UP-14 is not equal to 0.0.
S-SHAPED TIME	**UP-14**	0~32.76 sec	0 sec	Sets the acel and decel time from the current speed to the new command speed using an S-shaped minimum jerk profile.
ABSOLUTE CLEAR MODE	**UP-15**	0~2	0	Selects the type of home 0.00 processing for absolute systems when the SET "0" POSITION input is energized or upon startup. 0: Makes current position of motor equal to 0.00. 1: Makes the current motor shaft rotation the 0 rotation while preserving the MARKER OFFSET. 2: No effect retains absolute position.
BRAKE MODE	**UP-16**	0~2	0	If operating in Speed control, see **UP-16 in Section 4.1.3.2**. If operating in Torque control, see **UP-16 in Section 4.2.3.2**. If operating in Position control, see **UP-16 in Section 4.3.3.2**.
REF1 and REF2 POLARITY	**UP-17**	00~11	0 0	Sets the polarity of the analog reference inputs. 00: Both REF1 and REF2 normal 01: REF1 inverted, REF2 not inverted 10: REF1 not inverted, REF2 inverted 11: Both REF1 and REF2 inverted
COMMAND PULSE TYPE	**UP-18**	00~12	0 0	Sets the type of pulse sequence and polarity of the COMMAND PULSE inputs. 00: Pulse, Pulse decoding where FMA increments command position and FMB decrements command position. 01: Quadrature decoding of FMA and FMB with FMA leading FMB for incrementing command position. Quadrature decoding effectively multiplies the input frequency by 4 times.

4.4.3.2 SPEED/TORQUE/POSITION CONTROL USER PARAMETERS (cont'd)

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
COMMAND PULSE TYPE (cont'd)	**UP-18 (cont'd)**			02: Pulse and direction decoding where FMA is pulse train and FMB is direction. FMB OFF increments command position and ON decrements command position. 10: Pulse, Pulse decoding where FMB increments command position and FMA decrements command position. 11: Quadrature decoding of FMA and FMB with FMB leading FMA for incrementing command position. Quadrature decoding effectively multiplies the input frequency by 4 times. 12: Pulse and direction decoding where FMA is pulse train and FMB is direction. FMB ON increments command position and OFF decrements command position.
OUTPUT PULSE TYPE	**UP-19**	00~11	01	Sets the type of pulse output sequence and polarity of the PULSE OUTPUT. UP-20 must be set to xxxo for the PULSE OUTPUT to represent incremental actual position. 00: Pulse, Pulse encoding where APD pulses when the actual position increments and BPD pulses when the actual position decrements. 01: Quadrature encoding of APD and BPD with APD leading BPD for incrementing actual position. Each edge of the two pulse trains are counted as an output bit change. 10: Pulse, Pulse encoding where BPD pulses when the actual position increments and APD pulses when the actual position decrements. 11: Quadrature encoding of APD and BPD with BPD leading APD for incrementing actual position. Each edge of the two pulse trains is counted as an output bit change.

4.4.3.2 SPEED/TORQUE/POSITION CONTROL USER PARAMETERS (cont'd)

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
OUTPUT PULSE CODING	**UP-20**	0000~5533	0000	The first digit of UP-20 selects the parameter to be put on the driver external display. Coding is as follows: 0: Motor speed in RPM 1: Actual motor position 2: Motor current 3: Calculated motor temperature 4: Motor distance to marker deg) 5: Machine speed in RPM The second digit of UP-20 is not used. The third digit selects the type of electronic coding for the OUTPUT PULSE when an absolute system is configured. This digit is only effective when the fourth digit is set to 3 or absolute motor position. The coding is as follows: 0: 32 bits 1: 23 bits + parity 2: 24 bits + parity 3: 31 bits + parity The fourth digit sets the basic function of the OUTPUTS PULSES. The coding is as follows: 0: Incremental position as defined in UP-19 1: Output to optional drive display DPA-70 2: Output to optional drive display DPA-80 3: Absolute motor position
MONITOR OUTPUT FUNCTION	**UP-25**	000~111	010	Selects SPEED or TORQUE output and polarity of the MON test point. The first digit is not used. The second digit selects the MON output function. 0: TORQUE 1: SPEED The third digit selects the polarity of the MON output. 0: Normal 1: Invert
COMMAND PULSE POLARITY	**UP-26**	0~1	0	0: Move CCW with increment of command position 1: Move CW with increment of command position.

4.4.3.2 SPEED/TORQUE/POSITION CONTROL USER PARAMETERS (cont'd)

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
HOLDING BRAKE THRESHOLD	**UP-28**	0~100.0%	100%	When UP-16 is set to 0, UP-28 has no effect. When UP-16 is set to 1 or 2, the mechanical brake is applied when the motor speed falls below the value set in UP-28. The value in UP-28 is % of rated speed.
MOTOR TEST SPEED	**UP-29**	1~4000 r/min	50 RPM	The driver can be jogged manually by using the keypad. The jog speed is set with UP-29 in RPM.
EXTERNAL REGEN RESISTOR VALUE (Software version 10 and above)	**UP-30**	0~100.0 ohms	0.0 ohms	Value of the optional external regen resistor. When external regen resistor is used, the value of the resistor is entered to allow the driver to calculate average power into the regen resistor. When the internal regen is used, enter 0.0. Power must be turned OFF then ON for this parameter to take effect. See **Section 7** for details on Regen Resistor selection. This parameter is used with DSD-35 and larger drivers.
EXTERNAL REGEN RESISTOR WATTAGE (Software version 10 and above)	**UP-31**	0~327.67 Kw	0.0 Kw	Power rating of the optional external regen resistor. When external regen resistor is used, the power rating in Kw of the resistor is entered to allow the driver to calculate average power into the regen resistor. When the internal regen is used, enter 0.0. Power must be turned OFF then ON for this parameter to take effect. See **Section 7** for details on Regen Resistor selection. This parameter is used with DSD-35 and larger drivers.

4.4.3.3 SPEED/TORQUE/POSITION CONTROL SETUP PARAMETERS

SETUP PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
MOTOR RMS TORQUE TIME CONSTANT	**HP-33**	1~60 sec	30 sec	Sets the time constant for calculating motor rms torque that is displayed as parameter bL. Time constant should be set to approximately twice as long as the machine cycle.
SPEED/TORQUE LIMIT SELECTION	**HP-34**	00~21	11	First digit is torque limit method: 0: Limited with REF2 analog input when TORQUE LIMIT ENABLE I/O is ON. 10V = Peak torque 1: Limit set by parameter UP-11 or HP-36 through HP-39 when UP-11 = 0 and when TORQUE LIMIT ENABLE I/O is ON.

4.4.3.3 SPEED/TORQUE/POSITION CONTROL SETUP PARAMETERS (cont'd)

SETUP PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
SPEED/TORQUE LIMIT SELECTION (cont'd)	**HP-34** (cont'd)			2: Limit set by parameter UP-11 or HP-36 through HP-39 when UP-11 = 0 regardless of the state of the TORQUE LIMIT ENABLE I/O. Second digit is speed limit method: 0: Limited with REF1 analog input when SPEED LIMIT ENABLE I/O is ON. 10V = Peak speed 1: Limit set by parameter HP-35. Regardless of limit enable input.
SPEED LIMIT VALUE	**HP-35**	0~4000 r/min	4000 r/min	Sets the speed limit in RPM when speed limit is active.
CCW ROTATION TORQUE LIMIT	**HP-36**	0~100.0%	100%	Limits CCW rotation torque. 100% = Peak Torque See **HP-34**
CCW ROTATION ABSORPTION TORQUE LIMIT	**HP-37**	0~100.0%	100%	Limits CCW rotation absorption (braking) torque. 100% = Peak Torque See **HP-34**
CW ROTATION TORQUE LIMIT	**HP-38**	0~100.0%	100%	Limits CW rotation torque. 100% = Peak Torque See **HP-34**
CW ROTATION ABSORPTION TORQUE LIMIT	**HP-39**	0~100.0%	100%	Limits CW rotation absorption (braking) torque. 100% = Peak Torque See **HP-34**
SPEED DISPLAY ELECTRONIC RATIO NUMERATOR	**HP-41**	1~32767	1	Parameters HP-41/HP-42 form a fraction that is used to scale the scaled Motor Speed display "F". The motor speed is multiplied by the fraction, and then put on the display. This allows a speed display that is scaled to the speed of the actual machine rather than the speed of the motor. The scaling can also allow the driver to display speed in different units such as in/sec rather than the default motor RPM. Scales the driver display and optional external display if used.
SPEED DISPLAY ELECTRONIC RATIO DENOMINATOR	**HP-42**	1~32767	1	
SPEED DISPLAY DECIMAL POINT POSITION	**HP-43**	0~7	0	HP-43 sets the position of the decimal point in the optional external speed display. 0: No decimal point 1: Least significant digit ... 7: Most significant digit
INPUT INVERSION	**HP-44**	000~1FF	000	This parameter forms a hexadecimal bit mask that inverts the input when the bit is set to 1 and does not invert the input when the bit is 0. The LSB is for IN0 and so on. (i.e. HP-44=8C inverts inputs IN7, IN3 & IN2)

4.4.3.3 SPEED/TORQUE/POSITION CONTROL SETUP PARAMETERS (cont'd)

SETUP PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
OUTPUT INVERSION	**HP-45**	00~FF	00	This parameter forms a hexadecimal bit mask that inverts the output when the bit is set to 1 and does not invert the output when the bit is 0. The LSB is for OUT0 and so on. (i.e. HP-45=4A inverts outputs OUT6, OUT3 & OUT1)
IN POSITION TIMER	**HP-46**	0~200 ms	20 ms	Sets the minimum width of the POSITION COINCIDENCE output. Available in software version 009 and above.

4.5 SPEED PRESET CONTROL MODE 5

PRIMARY MOTION CONTROL FEATURES

- In the Speed Preset Control Mode, the driver is a precision speed regulator that receives the speed command from an external analog source or from internal speed presets selected by two (2) I/O points.

- The scaling and polarity of the analog speed command is fully programmable and the preset speeds are programmed into internal driver parameters.

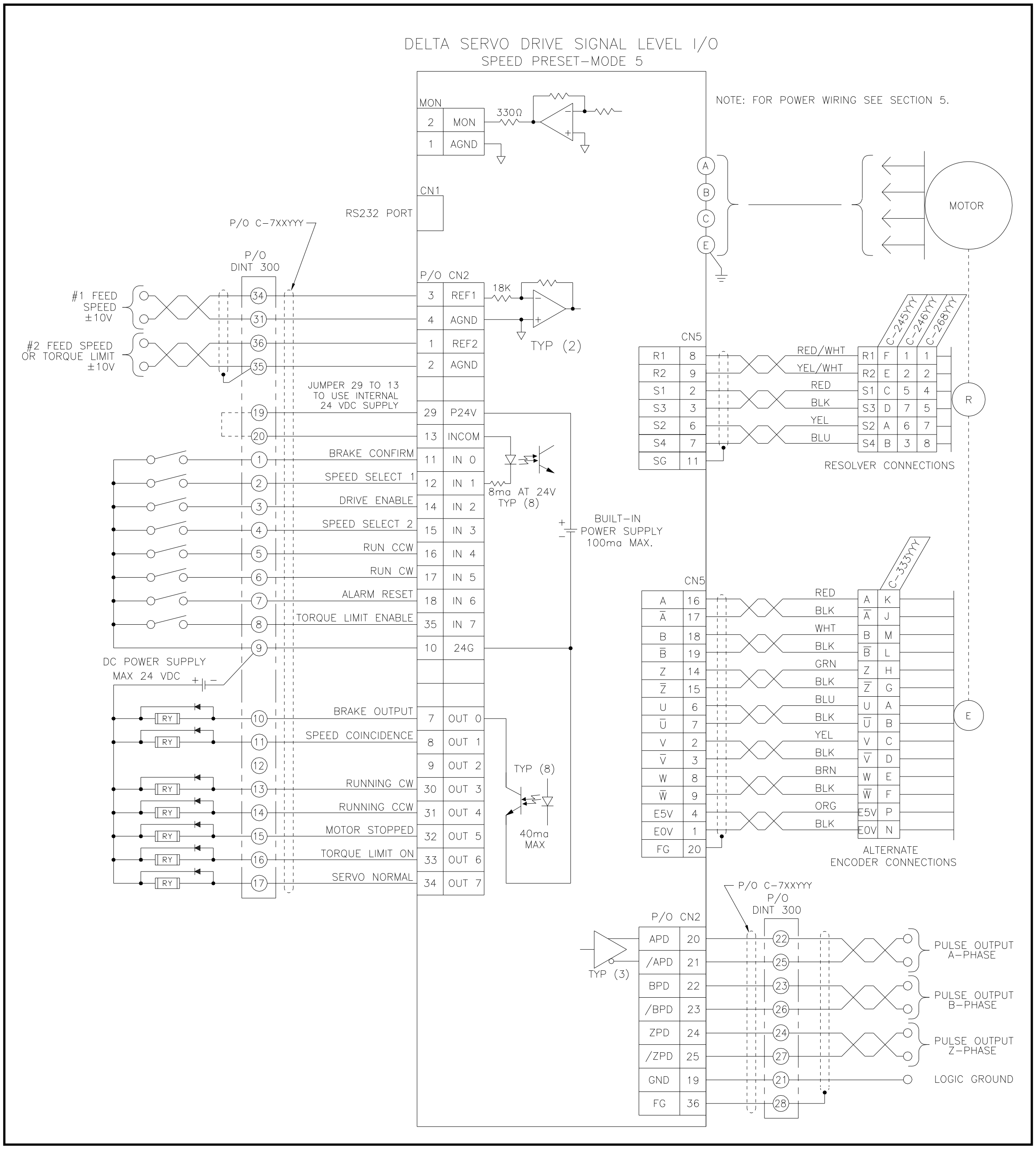
- Two(2) I/O points are used to start the motion and set the CW or CCW direction of rotation.

- The acceleration and deceleration used for changes in motor speed can be programmed to be either linear or S Shaped minimum jerk. The time to change speeds and the amount of S Shape rounding is fully programmable.

SECONDARY MOTION CONTROL FEATURES

- The torque of the motor can be limited via an external analog voltage or by an internal parameter.

4.5.1 SIGNAL WIRING



4.5.2 SPEED PRESET CONTROL INPUT/OUTPUT

<table>
<tr><th>TYPE</th><th>NAME</th><th>FUNCTION</th></tr>
<tr><td>Analog Input</td><td>#1 FEED SPEED (REF1)</td><td>#1 FEED SPEED +/-10V input is active if UP-21=0 and SPEED SELECT 1 (IN1) & SPEED SELECT 2 (IN3) are both OFF.
• Rotation is CCW for (+) voltage and CW for (-) voltage. Motor speed is directly proportional to voltage.
• Direction of rotation is set with UP-17
• Acceleration/deceleration is set with UP-12, 13 &14
• Scaling of speed vs. voltage is set with AJ1
• Zero adjustment is set with AJO
• #1 FEED SPEED (REF1) voltage monitor on the status display "cF---".</td></tr>
<tr><td></td><td>#2 FEED SPEED (REF2)
or (Selected by IN7)</td><td>#2 FEED SPEED +/-10V input is active if UP-22=0 and SPEED SELECT 1 (IN1) is ON & SPEED SELECT 2 (IN3) is OFF.
• Rotation is CCW for (+) voltage and CW for (-) voltage. Motor speed is directly proportional to voltage.
• Direction of rotation is set with UP-17
• Acceleration/deceleration is set with UP-12, 13 &14
• Scaling of speed vs. voltage is set with AJ6
• Zero adjustment is set with AJ5
• SPEED COMMAND (REF1) voltage monitor on the status display "cc---".</td></tr>
<tr><td></td><td>TORQUE LIMIT (REF2)</td><td>TORQUE LIMIT 0-10V input. The peak motor torque is limited proportionally with this voltage.
• Scaling of torque vs. voltage is set with AJ6
• Zero adjustment is set with AJ5
• The method to cause limiting is set with HP-34
• TORQUE LIMIT (REF2) voltage monitor on the status display "cc---".</td></tr>
<tr><td>24V Input</td><td>BRAKE CONFIRM (IN0)</td><td>This input is a confirmation of the release of either a dynamic or static mechanical brake. See Sections 8 & 9 for details of brake operation.
• Brake modes of operation are set with UP-16 & UP-28</td></tr>
<tr><td></td><td>SPEED SELECT 1 (IN1)</td><td><table>
<tr><th></th><th>#1</th><th>#2</th><th>#3</th><th>#4</th></tr>
<tr><td>FEED SELECTION</td><td>FEED
UP-21</td><td>FEED
UP-22</td><td>FEED
UP-23</td><td>FEED
UP-24</td></tr>
<tr><td>SPEED SELECT 1</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td></tr>
<tr><td>SPEED SELECT 2</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td></tr>
</table></td></tr>
<tr><td></td><td>DRIVE ENABLE (IN2)</td><td>When this input is turned ON, the driver becomes operational if there are no faults and the BRAKE CONFIRM input is correctly sequenced.
• Brake output also is turned ON/OFF with this signal subject to settings of UP-16 and UP-28.</td></tr>
<tr><td></td><td>SPEED SELECT 2 (IN3)</td><td>Feed speed selection, see (IN1) above.</td></tr>
</table>

4.5.2 SPEED PRESET CONTROL INPUT/OUTPUT (cont'd)

TYPE	NAME	FUNCTION
24V Input (cont'd)	RUN CCW (IN4) RUN CW (IN5)	These inputs initiate motor motion of the selected FEED SPEED in the direction specified by these two inputs. • If both inputs are OFF, the motor is in position mode at 0 speed with the position loop gain AJ4 • If No.1 or No.2 FEED SPEED is selected and the analog REF1 or REF2 is used, the direction of rotation from these two inputs can be reversed by the analog voltage polarity. No.1 FEED SPEED can also be reversed with UP-17.
	ALARM RESET (IN6)	When this input is turned ON for 30 ms or more, all alarms are reset. • AL1 (driver overheated) and AL17 (motor overload) cannot be reset until the temperature drops to acceptable level • AL26 cannot be reset until power is cycled
	TORQUE LIMIT ENABLE (IN7)	When this input is turned ON and HP-34 is set to 0X or 1X, the torque limit operates. • If HP-34 is set to 0X, the torque is limited by the TORQUE LIMIT (REF2) input voltage • If HP-34 is set to 1X, the torque limit is set by UP-11 • If HP-34 is set to 2X, the torque limit is on regardless of state of this input with the limit set by UP-11
24V Output	BRAKE OUTPUT (OUT0)	This output controls the operation of the dynamic brake or holding brake. • Brake modes of operation are set with UP-16 & UP-28
	SPEED COINCIDENCE (OUT1)	This output turns ON when the actual speed of the motor reaches the target speed. • Target speed can be set to a preset speed or the commanded speed with UP-09 • Detection width is be set with UP-10
	RUNNING CW (OUT3)	This output turns ON when the motor is rotating CW above the stop detection speed set in UP-8.
	RUNNING CCW (OUT4)	This output turns ON when the motor is rotating CCW above the stop detection speed set in UP-8.
	MOTOR STOPPED (OUT5)	This output turns ON when the motor speed drops below the internal preset speed set in UP-8.
	TORQUE LIMIT ON (OUT6)	This output turns ON when the motor torque is limited. The limit could be the peak torque limit of the motor or a lower valve causes by the following conditions. • HP-34 and TORQUE LIMIT ENABLE (IN7) input set the conditions for torque limiting • UP-11 or HP-36, HP-37, HP-38, HP-39 are the internal preset limit values
	SERVO NORMAL (OUT7)	This output turns ON 1.6 sec. after AC power ON and there are no alarms. • Does not turn OFF in the case of an AL24 (BATTERY ALARM)

4.5.2 SPEED PRESET CONTROL INPUT/OUTPUT (cont'd)

TYPE	NAME	FUNCTION
Differen-tial output	PULSE OUTPUT (APD/APD) (BPD/BPD) (ZPD(/ZPD)	Programmable pulse train output from the driver. • Type of data output is set by UP-20. • Encoder equivalent output is set by UP-19 with scaling set by UP-04 & UP-05. • External display device with various driver data set by UP-20 • Motor absolute position if an absolute system is used. • Motor position register is monitored with the status display "A'---" & "A---".

4.5.3 SPEED PRESET CONTROL PARAMETER SETUP

4.5.3.1 SPEED PRESET CONTROL ADJUSTMENT PARAMETERS

ADJUSTMENT PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
SPEED COMMAND ZERO (REF1)	**AJ0**	±10.00 V	Factory Preset	Sets the zero offset of the SPEED COMMAND (REF1) input. It can be set in two ways: 1. Automatically: by concurrently pressing SEL ↵ (all digits flash) and then pressing ↵. The driver will read the analog voltage REF1 and create an offset equal and opposite to the analog voltage present at the time. To get a true 0.00 offset, short REF1 to analog ground before doing the auto zero procedure. 2. Manually: by concurrently pressing SEL ↵ (all digits flash) and then concurrently pressing ⏫ SEL. Then adjust the individual digits with ⏫ ⏬.
SPEED COMMAND SCALE (REF1)	**AJ1**	3~40.00 V	10.00V	Sets the SPEED COMMAND (REF1) scaling. The value set in this parameter is the voltage needed at REF1 to bring the motor to the rated speed. For example, if the motor must turn at rated speed with 4.5 VDC input voltage (REF1), set AJ1 to 4.50.
LOAD INERTIA RATIO	**AJ2**	0~100.0	1.0 Times	Sets the baseline frequency response of the driver using the ratio of the load inertia/motor inertia for a rigidly coupled load. If the load is not rigidly coupled, the value entered may vary from the calculated value. If the value is set too high, the motor and driver may become unstable and oscillate. This parameter is set automatically during auto tuning.

4.5.3.1 SPEED PRESET CONTROL ADJUSTMENT PARAMETERS (cont'd)

ADJUSTMENT PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
HIGH FREQUENCY RESPONSE	**AJ3**	0.1~20.0	1.0	Sets the high frequency response of the driver. The higher the number the more responsive. If the value is set too high, the motor and driver may become unstable and oscillate. The value in AJ3 is unit less and works in concert with AJ2. This parameter is set automatically during auto tuning.
POSITION LOOP DC GAIN	**AJ4**	1~200	30 Rad/sec	Sets the DC gain of the position control loop. A higher value in AJ4 results in stiffer, faster response. If the value is set to high the motor and driver may become unstable and oscillate. This parameter is set automatically during auto tuning.
TORQUE COMMAND ZERO (REF2)	**AJ5**	±10.00 V	Factory Preset	Sets the zero offset of the TORQUE COMMAND (REF2) input. It can be set in two ways: 1. Automatically: by concurrently pressing SEL ↵ (all digits flash) and then pressing ↵. The driver will read the analog voltage REF2 and create an offset equal and opposite to the analog voltage present at the time. To get a true 0.00 offset, short REF2 to analog ground before doing the auto zero procedure. 2. Manually: by concurrently pressing SEL ↵ (all digits flash) and then concurrently pressing ⏫ SEL. Then adjust the individual digits with ⏫ ⏬.
TORQUE COMMAND SCALE (REF2)	**AJ6**	3~40.00 V	10.00V	Sets the TORQUE COMMAND (REF2) scaling. The value set in this parameter is the voltage needed at REF2 for the motor to develop maximum torque. For example if it is required to have the maximum torque with 4.5 VDC input voltage (REF2) set AJ5 to 4.50.
ZERO SPEED GAIN REDUCTION	**AJ7**	0~10000	0	Sets the amount of gain reduction at zero speed. The gain is reduced when the motor is below the speed set in UP-08 and at the set values when the speed is above UP-08.
NOTCH FILTER FREQUENCY	**AJ9**	400~20000 rad/s	6000 rad/s	Sets the notch frequency of a velocity loop anti-resonance filter. This filter can be used to cancel machine or servo resonance. Power must be turned OFF then ON for this parameter to take effect.

4.5.3.2 SPEED PRESET CONTROL USER PARAMETERS

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
CONTROL MODE	**UP-01**	00~FF	00	Sets the control mode of operation for the driver as follows: 1 = Speed 2 = Torque 3 = Pulse Position 4 = Speed/Torque/Position 5 = Speed Preset 6 = Electronic Gearing The driver power must be cycled to register this parameter. Power must be turned OFF then ON for this parameter to take effect.
MOTOR CODE	**UP-02**	0000~FFFF	0000	Sets the internal driver parameters corresponding to the motor code. See **Appendix A** for motor codes. The driver power must be cycled to register this parameter. Power must be turned OFF then ON for this parameter to take effect.
RESOLVER CABLE LENGTH N/A FOR ENCODER	**UP-03**	0~120M	5M	Sets the driver resolver cable length compensation. The driver power must be cycled to register this parameter. Power must be turned OFF then ON for this parameter to take effect.
ELECTRONIC GEAR RATIO NUMERATOR	**UP-04**	1~32767	1	The COMMAND PULSE (FMA and FMB) input is multiplied by the ratio of UP-04/UP-05 before being processed by the driver. The driver internal command resolution is equal to the number of resolver cycles times 12000 bits/rev or the PPR of the encoder. (i.e. a motor with a 2X resolver has an internal resolution of 24000 bits/rev, see motor drawings in **Appendix A.6, A.7 & A.8**.) For example if a COMMAND PULSE INPUT of 1000 bits/rev is required with a 2X resolver, set UP-04=24000 and UP-05=1000. Power must be turned OFF then ON for this parameter to take effect. See **Application Note Section 13**.

4.5.3.2 SPEED PRESET CONTROL USER PARAMETERS (cont'd)

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
ELECTRONIC GEAR RATIO DENOMINATOR	**UP-05**	1~32767	1	The driver internal feedback resolution is multiplied by the ratio of UP-05/UP-04 before being sent to OUTPUT PULSE (APD and BPD). The driver internal resolution is equal to the number of resolver cycle times 12000 bits/rev. (i.e. a motor with a 2X resolver has an internal resolution of 24000 bits/rev, see motor drawings in **Appendix A.6, A.7 & A.8**.) For example if an OUTPUT PULSE of 1000 bits/rev is required with a 2X resolver, set UP-04=24000 and UP-05=1000. Power must be turned OFF then ON for this parameter to take effect. See **Application Note Section 13**.
MARKER OFFSET **RESOLVER ONLY	**UP-06**	0~11999 pulses	0 pulses	The electrical ZERO can be shifted with respect to the mechanical shaft position using UP-06. The Delta driver produces N number of ZERO states per motor rotation where N is equal to the number of resolver cycles. (i.e. a motor with a 2X resolver has 2 ZERO/rev. see motor drawings in **Appendix A.6, A.7 & A.8**.) To shift the electrical ZERO place the motor shaft at the desired electrical ZERO position. Read the status display "d" parameter in degrees and set UP-06="d"*12000/360. The electrical ZERO affects the ZPD output pulse and the STOP AT MARKER input stopping position.
MOTOR STOPPED THRESHOLD	**UP-08**	1~4000 r/min	50 r/min	When the motor is rotating at less than the speed set into UP-08 the MOTOR STOPPED output will be on.
SPEED COINCIDENCE THRESHOLD	**UP-09**	0~4000 r/min	0 r/min	If UP-09 is non-zero, the SPEED COINCIDENCE output comes on when the actual motor speed reaches the value set in UP-09. If UP-09 is zero, the SPEED COINCIDENCE output comes on when the actual motor speed reaches the commanded speed.
SPEED COINCIDENCE WIDTH	**UP-10**	1~4000 r/min	20 r/min	Sets the width of the sensing window allowable to get the SPEED COINCIDENCE output.
TORQUE LIMIT	**UP-11**	0~100.0%	100%	When the torque limit is applied, the motor torque is limited to the value set in UP-11. UP-11 is % of motor peak torque. See **HP-34** for torque limit method.

4.5.3.2 SPEED PRESET CONTROL USER PARAMETERS (cont'd)

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
ACCEL TIME	**UP-12**	0~32.76 sec	0 sec	Sets the time from zero to rated speed with a linear acceleration profile. Ignored if UP-14 is not equal to 0.0.
DECEL TIME	**UP-13**	0~32.76 sec	0 sec	Sets the time from rated speed to zero speed with a linear deceleration profile. Ignored if UP-14 is not equal to 0.0.
S-SHAPED TIME	**UP-14**	0~32.76 sec	0 sec	Sets the acel and decel time from the current speed to the new command speed using an S-shaped minimum jerk profile.
ABSOLUTE CLEAR MODE	**UP-15**	0~2	0	Selects the type of home 0.00 processing for absolute systems when the SET "0" POSITION input is energized or upon startup. 0: Makes current position of motor equal to 0.00. 1: Makes the current motor shaft rotation the 0 rotation while preserving the MARKER OFFSET. 2: No effect retains absolute position.
BRAKE MODE	**UP-16**	0~2	0	Selects the type of brake sequencing to be used when the driver ENABLE is turned OFF. Brake is applied immediately in the case of an alarm. 0: No brake or dynamic brake. If no brake, the motor will coast to a stop. If dynamic brake relay is installed, the motor and load are dynamically braked to a stop. 1: Mechanical holding brake is applied when the motor reaches the speed set in UP-28. The deceleration rate is controlled by UP-13 & UP-14. When the speed in UP-28 is reached, the driver applies maximum electronic braking torque for 200 ms. 2: Mechanical holding brake is applied when the motor reaches the speed set in UP-28. The driver applies maximum electronic breaking torque to decelerate the motor to the speed set in UP-28. Power must be turned OFF then ON for this parameter to take effect.

4.5.3.2 SPEED PRESET CONTROL USER PARAMETERS (cont'd)

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
REF1 and REF2 POLARITY	**UP-17**	00~11	0 0	Sets the polarity of the analog reference inputs. 00: Both REF1 and REF2 normal 01: REF1 inverted, REF2 not inverted 10: REF1 not inverted, REF2 inverted 11: Both REF1 and REF2 inverted
OUTPUT PULSE TYPE	**UP-19**	00~11	01	Sets the type of pulse output sequence and polarity of the PULSE OUTPUT. UP-20 must be set to xxxo for the PULSE OUTPUT to represent incremental actual position. 00: Pulse, Pulse encoding where APD pulses when the actual position increments and BPD pulses when the actual position decrements. 01: Quadrature encoding of APD and BPD with APD leading BPD for ncrementing actual position. Each edge of the two pulse trains are counted as an output bit change. 10: Pulse, Pulse encoding where BPD pulses when the actual position increments and APD pulses when the actual position decrements. 11: Quadrature encoding of APD and BPD with BPD leading APD for incrementing actual position. Each edge of the two pulse trains is counted as an output bit change.
OUTPUT PULSE CODING	**UP-20**	0000~5533	0000	The first digit of UP-20 selects the parameter to be put on the driver external display. Coding is as follows: 0: Motor speed in RPM 1: Actual motor position 2: Motor current 3: Calculated motor temperature 4: Motor distance to marker deg 5: Machine speed in RPM The second digit of UP-20 is not used. The third digit selects the type of electronic coding for the OUTPUT PULSE when an absolute system is configured. This digit is only effective when the fourth digit is set to 3 or absolute motor position. The coding is as follows: 0: 32 bits 1: 23 bits + parity 2: 24 bits + parity 3: 31 bits + parity

4.5.3.2 SPEED PRESET CONTROL USER PARAMETERS (cont'd)

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
OUTPUT PULSE CODING (cont'd)	**UP-20 (cont'd)**			The fourth digit sets the basic function of the OUTPUTS PULSES. The coding is as follows: 0: Incremental position as define in UP-19 1: Output to optional drive display DPA-70 2: Output to optional drive display DPA-80 3: Absolute motor position
No. 1 FEED SPEED	**UP-21**	0~200.00%	100%	Sets the speed of the motor when SPEED SELECT 1 & 2 I/O are OFF. If UP-21 = 0, the speed is set with analog input REF1. If UP-21 is non-zero, the speed is equal to % of rated speed.
No. 2 FEED SPEED	**UP-22**	0~200.00%	50%	Sets the speed of the motor when SPEED SELECT 1 is ON & SPEED SELECT 2 is OFF. If UP-22 = 0, the speed is set with analog input REF2. If UP-22 is non-zero, the speed is equal to % of rated speed.
No. 3 FEED SPEED	**UP-23**	0~200.00%	25%	Sets the speed of the motor when SPEED SELECT 2 is ON & SPEED SELECT 1 is OFF. The speed is equal to % of rated speed set in UP-23.
No. 4 FEED SPEED	**UP-24**	0~200.00%	12.5%	Sets the speed of the motor when SPEED SELECT 2 is ON & SPEED SELECT 1 is ON. The speed is equal to % of rated speed set in UP-24.
MONITOR OUTPUT FUNCTION	**UP-25**	000~111	010	Selects SPEED or TORQUE output and polarity of the MON test point. The first digit is not used. The second digit selects the MON output function. 0: TORQUE 1: SPEED The third digit selects the polarity of the MON output. 0: Normal 1: Invert
HOLDING BRAKE THRESHOLD	**UP-28**	0~100.0%	100%	When UP-16 is set to 0, UP-28 has no effect. When UP-16 is set to 1 or 2, the mechanical brake is applied when the motor speed falls below the value set in UP-28. The value in UP-28 is % of rated speed.
MOTOR TEST SPEED	**UP-29**	1~4000 r/min	50 RPM	The driver can be jogged manually by using the keypad. The jog speed is set with UP-29 in RPM.

4.5.3.2 SPEED PRESET CONTROL USER PARAMETERS (cont'd)

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
EXTERNAL REGEN RESISTOR VALUE (Software version 10 and above)	**UP-30**	0~100.0 ohms	0.0 ohms	Value of the optional external regen resistor. When external regen resistor is used, the value of the resistor is entered to allow the driver to calculate average power into the regen resistor. When the internal regen is used, enter 0.0. Power must be turned OFF then ON for this parameter to take effect. See **Section 7** for details on Regen Resistor selection. This parameter is used with DSD-35 and larger drivers.
EXTERNAL REGEN RESISTOR WATTAGE (Software version 10 and above)	**UP-31**	0~327.67 Kw	0.0 Kw	Power rating of the optional external regen resistor. When external regen resistor is used, the power rating in Kw of the resistor is entered to allow the driver to calculate average power into the regen resistor. When the internal regen is used, enter 0.0. Power must be turned OFF then ON for this parameter to take effect. See **Section 7** for details on Regen Resistor selection. This parameter is used with DSD-35 and larger drivers.

4.5.3.3 SPEED PRESET CONTROL SETUP PARAMETERS

SETUP PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
MOTOR RMS TORQUE TIME CONSTANT	**HP-33**	1~60 sec	30 sec	Sets the time constant for calculating motor rms torque that is displayed as parameter bL. Time constant should be set to approximately twice as long as the machine cycle.
TORQUE LIMIT SELECTION	**HP-34**	00~21	11	First digit is torque limit method: 0: Limited with REF2 analog input when TORQUE LIMIT ENABLE I/O is ON. 10V = Peak torque 1: Limit set by parameter UP-11 or HP-36 through HP-39 when UP-11 = 0 and when TORQUE LIMIT ENABLE I/O is ON. 2: Limit set by parameter UP-11 or HP-36 through HP-39 when UP-11 = 0 regardless of the state of the TORQUE LIMIT ENABLE I/O. Second digit is speed limit method: 0: N/A 1: N/A

4.5.3.3 SPEED PRESET CONTROL USER PARAMETERS (cont'd)

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
CCW ROTATION TORQUE LIMIT	**HP-36**	0~100.0%	100%	Limits CCW rotation torque. 100% = Peak Torque See **HP-34**
CCW ROTATION ABSORPTION TORQUE LIMIT	**HP-37**	0~100.0%	100%	Limits CCW rotation absorption (braking) torque. 100% = Peak Torque See **HP-34**
CW ROTATION TORQUE LIMIT	**HP-38**	0~100.0%	100%	Limits CW rotation torque. 100% = Peak Torque See **HP-34**
CW ROTATION ABSORPTION TORQUE LIMIT	**HP-39**	0~100.0%	100%	Limits CW rotation absorption (braking) torque. 100% = Peak Torque See **HP-34**
SPEED DISPLAY ELECTRONIC RATIO NUMERATOR	**HP-41**	1~32767	1	Parameters HP-41/HP-42 form a fraction that is used to scale the scaled Motor Speed display "F". The motor speed is multiplied by the fraction then put on the display. This allows a speed display that is scaled to the speed of the actual machine rather than the speed of the motor. The scaling can also allow the driver to display speed in different units such as in/sec rather than the default motor RPM. Scales the driver display and optional external display if used.
SPEED DISPLAY ELECTRONIC RATIO DENOMINATOR	**HP-42**	1~32767	1	
SPEED DISPLAY DECIMAL POINT POSITION	**HP-43**	0~7	0	HP-43 sets the position of the decimal point in the optional external speed display. 0: No decimal point 1: Least significant digit ... 7: Most significant digit
INPUT INVERSION	**HP-44**	00~FF	00	This parameter forms a hexadecimal bit mask that inverts the input when the bit is set to 1 and does not invert the input when the bit is 0. The LSB is for IN0 and so on. (i.e. HP-44=8C inverts inputs IN7, IN3 & IN2)
OUTPUT INVERSION	**HP-45**	00~FF	00	This parameter forms a hexadecimal bit mask that inverts the output when the bit is set to 1 and does not invert the output when the bit is 0. The LSB is for OUT0 and so on. (i.e. HP-45=4B inverts outputs OUT6, OUT3 & OUT1)

4.6 ELECTRONIC GEARING CONTROL MODE 6

PRIMARY MOTION CONTROL FEATURES

- In the Electronic Gearing Mode, the driver is a follower type position controller that receives position commands from a digital pulse train.

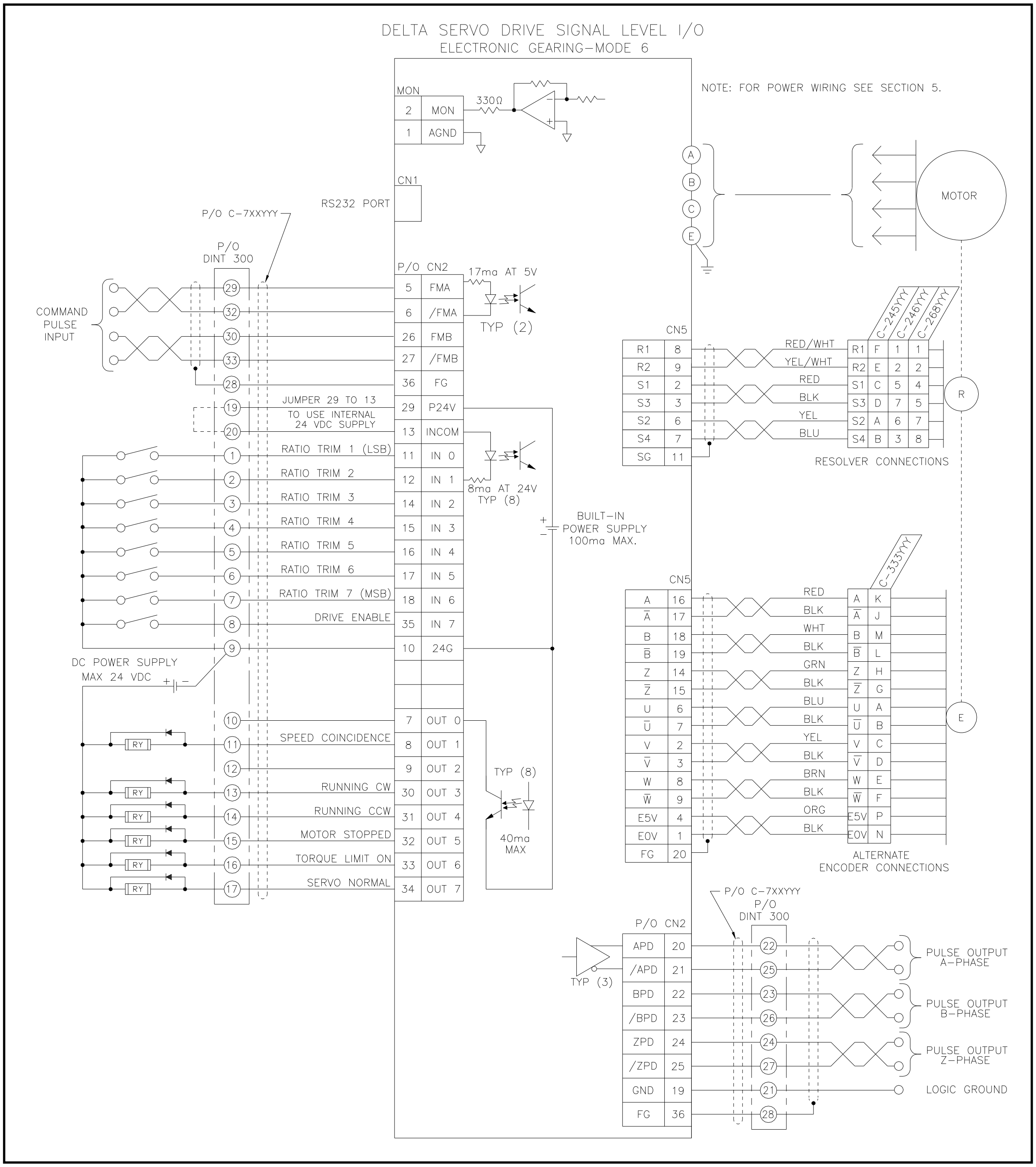
- The electronic ratio, direction and type of input pulse train are programmable with internal parameters.

- The electronic ratio of the input pulse train can be trimmed with seven (7) I/O points that form a signed binary number.

PRIMARY MOTION CONTROL FEATURES

- The torque of the motor can be limited using an internal parameter.

4.6.1 SIGNAL WIRING



4.6.2 ELECTRONIC GEARING CONTROL INPUT/OUTPUT

<table>
<tr><th>TYPE</th><th>NAME</th><th>FUNCTION</th></tr>
<tr><td>5V Input</td><td>COMMAND PULSE
(FMA/FMA)
(FMB/FMB)</td><td>These two pulse trains inputs are the command for motor motion.
• The pulse trains are interpreted in 3 possible ways set by UP-18.
• The scaling of the pulse to motor movement is set with UP-04 & UP-05.
• Command pulse register is monitored with the status display "P'---" & "P---".</td></tr>
<tr><td>24V Input</td><td>RATIO TRIM 1 (IN0)
Through
RATIO TRIM 7 (IN6)</td><td>The RATIO TRIM inputs form a binary code to trim the electronic ration between the PULSE COMMAND inputs and the motor motion.
• Nominal electronic ratio is set by UP-4 & UP-5
• Scaling of RATIO TRIM is set by UP-27
• RATIO TRIM 7 is also used for ALARM RESET
• Input settings
<table>
<tr><th></th><th colspan="7">RATIO TRIM</th></tr>
<tr><th>RATIO TRIM(S)</th><th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th></tr>
<tr><td>+ 63</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>+ 1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>- 1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>- 64</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
</table>
0 = OFF 1 = ON
• Ratio of COMMAND PULSES/REV to motor motion (24000/REV) is:
$UP\text{-}04/UP\text{-}05 * [1 + \frac{RATIO\ TRIM}{100} * UP\text{-}27]$</td></tr>
<tr><td>24V Input</td><td>DRIVE ENABLE (IN7)</td><td>When this input is turned ON, the driver becomes operational if there are no faults.</td></tr>
<tr><td rowspan="4">24V Output</td><td>SPEED COINCIDENCE (OUT1)</td><td>This output turns ON when the actual speed of the motor reaches the target speed.
• Target speed can be set to a preset speed or the commanded speed with UP-09
• Detection width is be set with UP-10</td></tr>
<tr><td>RUNNING CW (OUT3)</td><td>This output turns ON when the motor is rotating CW above the stop detection speed set in UP-8.</td></tr>
<tr><td>RUNNING CCW (OUT4)</td><td>This output turns ON when the motor is rotating CCW above the stop detection speed set in UP-8.</td></tr>
<tr><td>MOTOR STOPPED (OUT5)</td><td>This output turns ON when the motor speed drops below the internal preset speed set in UP-8.</td></tr>
<tr><td rowspan="2">24V Output (cont'd)</td><td>TORQUE LIMIT ON (OUT6)</td><td>This output turns ON when the motor torque is limited. The limit could be the peak torque limit of the motor or a lower valve causes by the following conditions.
• HP-34 and TORQUE LIMIT ENABLE (IN7) input set the conditions for torque limiting
• UP-11 or HP-36, HP-37, HP-38, HP-39 are the internal preset limit values</td></tr>
<tr><td>SERVO NORMAL (OUT7)</td><td>This output turns ON 1.6 sec. after AC power ON and there are no alarms.
• Does not turn OFF, in the case of an AL24 (BATTERY ALARM)</td></tr>
</table>

4.6.2 ELECTRONIC GEARING CONTROL INPUT/OUTPUT (cont'd)

TYPE	NAME	FUNCTION
Differen-tial output	PULSE OUTPUT (APD/APD) (BPD/BPD) (ZPD(/ZPD)	Programmable pulse train output from the driver. • Type of data output is set by UP-20 • Encoder equivalent output is set by UP-19 with scaling set by UP-04 & UP-05 • External display device with various driver data set by UP-20 • Motor absolute position if an absolute system is used • Command pulse register is monitored with the status display "A'---" & "A---"

4.6.3 ELECTRONIC GEARING CONTROL PARAMETER SETUP

4.6.3.1 ELECTRONIC GEARING CONTROL ADJUSTMENT PARAMETERS

ADJUSTMENT PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
LOAD INERTIA RATIO	**AJ2**	0~100.0	1.0 Times	Sets the baseline frequency response of the driver using the ratio of the load inertia/motor inertia for a rigidly coupled load. If the load is not rigidly coupled, the value entered may vary from the calculated value. If the value is set too high the motor and driver may become unstable and oscillate. This parameter is set automatically during auto tuning.
HIGH FREQUENCY RESPONSE	**AJ3**	0.1~20.0	1.0	Sets the high frequency response of the driver. The higher the number the more responsive. If the value is set too high, the motor and driver may become unstable and oscillate. The value in AJ3 is unit less and works in concert with AJ2. This parameter is set automatically during auto tuning.
POSITION LOOP DC GAIN	**AJ4**	1~200	30 Rad/sec	Sets the DC gain of the position control loop. A higher value in AJ4 results in stiffer, faster response. If the value is set too high, the motor and driver may become unstable and oscillate. This parameter is set automatically during auto tuning.
ZERO SPEED GAIN REDUCTION	**AJ7**	0~10000	0	Sets the amount of gain reduction at zero speed. The gain is reduced when the motor is below the speed set in UP-08 and at the set values when the speed is above UP-08.

4.6.3.1 ELECTRONIC GEARING CONTROL ADJUSTMENT PARAMETERS (cont'd)

ADJUSTMENT PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
FEED FORWARD GAIN	**AJ8**	0~2.0 Times	0 Times	Sets the feed forward gain in the position loop. A value of 1.0 results in 0.0 following error. Less than 1.0 will produce a lag between the actual motor position and the commanded position and greater than 1.0 produces a lead. The lead or lag will be proportional to speed at non 1.0 settings.
NOTCH FILTER FREQUENCY	**AJ9**	400~20000 rad/s	6000 rad/s	Sets the notch frequency of a velocity loop anti-resonance filter. This filter can be used to cancel machine or servo resonance. Power must be turned OFF then ON for this parameter to take effect.

4.6.3.2 ELECTRONIC GEARING CONTROL USER PARAMETERS

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
CONTROL MODE	**UP-01**	00~FF	00	Sets the control mode of operation for the driver as follows: 1 = Speed 2 = Torque 3 = Pulse Position 4 = Speed/Torque/Position 5 = Speed Preset 6 = Electronic Gearing The driver power must be cycled to register this parameter. Power must be turned OFF then ON for this parameter to take effect.
MOTOR CODE	**UP-02**	0000~FFFF	0000	Sets the internal driver parameters corresponding to the motor code. See **Appendix A** for motor codes. The driver power must be cycled to register this parameter. Power must be turned OFF then ON for this parameter to take effect.
RESOLVER CABLE LENGTH N/A FOR ENCODER	**UP-03**	0~120M	5M	Sets the driver resolver cable length compensation. The driver power must be cycled to register this parameter. Power must be turned OFF then ON for this parameter to take effect.

4.6.3.2 ELECTRONIC GEARING CONTROL USER PARAMETERS (cont'd)

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
ELECTRONIC GEAR RATIO NUMERATOR	**UP-04**	1~32767	1	The COMMAND PULSE (FMA and FMB) input is multiplied by the ratio of UP-04/UP-05 before being processed by the driver. The driver internal command resolution is equal to the number of resolver cycles times 12000 bits/rev or the PPR of the encoder. (i.e. a motor with a 2X resolver has an internal resolution of 24000 bits/rev, see motor drawings in **Appendix A.6, A.7 & A.8**.) For example if a COMMAND PULSE INPUT of 1000 bits/rev is required with a 2X resolver, set UP-04=24000 and UP-05=1000. Power must be turned OFF then ON for this parameter to take effect. See **Application Note Section 13**.
ELECTRONIC GEAR RATIO DENOMINATOR	**UP-05**	1~32767	1	The driver internal feedback resolution is multiplied by the ratio of UP-05/UP-04 before being sent to OUTPUT PULSE (APD and BPD). The driver internal resolution is equal to the number of resolver cycle times 12000 bits/rev. (i.e. a motor with a 2X resolver has an internal resolution of 24000 bits/rev, see motor drawings in **Appendix A.6, A.7 & A.8**.) For example if an OUTPUT PULSE of 1000 bits/rev is required with a 2X resolver, set UP-04=24000 and UP-05=1000. Power must be turned OFF then ON for this parameter to take effect. See **Application Note Section 13**.
MARKER OFFSET **RESOLVER	**UP-06**	0~11999 pulses	0 pulses	The electrical ZERO can be shifted with respect to the mechanical shaft position using UP-06. The Delta driver produces N number of ZERO states per motor rotation where N is equal to the number of resolver cycles. (i.e. a motor with a 2X resolver has 2 ZERO/rev. see motor drawings in **Appendix A.6, A.7 & A.8**.) To shift the electrical ZERO place the motor shaft at the desired electrical ZERO position. Read the status display "d" parameter in degrees and set UP-06="d"*12000/360. The electrical ZERO affects the ZPD output pulse and the STOP AT MARKER input stopping position.

4.6.3.2 ELECTRONIC GEARING CONTROL USER PARAMETERS (cont'd)

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
MOTOR STOPPED THRESHOLD	**UP-08**	1~4000 r/min	50 r/min	When the motor is rotating at less than the speed set into UP-08 the MOTOR STOPPED output will be on.
SPEED COINCIDENCE THRESHOLD	**UP-09**	0~4000 r/min	0 r/min	If UP-09 is non-zero, the SPEED COINCIDENCE output comes on when the actual motor speed reaches the value set in UP-09. If UP-09 is zero, the SPEED COINCIDENCE output comes on when the actual motor speed reaches the commanded speed.
SPEED COINCIDENCE WIDTH	**UP-10**	1~4000 r/min	20 r/min	Sets the width of the sensing window allowable to get the SPEED COINCIDENCE output.
TORQUE LIMIT	**UP-11**	0~100.0%	100%	When the torque limit is applied the motor torque is limited to the value set in UP-11. UP-11 is % of motor peak torque. See **HP-34** for torque limit method.
ABSOLUTE CLEAR MODE	**UP-15**	0~2	0	Selects the type of home 0.00 processing for absolute systems when the SET "0" POSITION input is energized or upon startup. 0: Makes current position of motor equal to 0.00. 1: Makes the current motor shaft rotation the 0 rotation while preserving the MARKER OFFSET. 2: No effect, retains absolute position
BRAKE MODE	**UP-16**	0~2	0	Selects the type of brake sequencing to be used when the driver ENABLE is turned OFF. Brake is applied immediately in the case of an alarm. 0: No brake or dynamic brake. If no brake, the motor will coast to a stop. If dynamic brake relay is installed, the motor and load are dynamically braked to a stop. 1&2:Mechanical holding brake is applied when the motor reaches the speed set in UP-28. The driver applies maximum electronic breaking torque to decelerate the motor to the speed set in UP-28.

4.6.3.2 ELECTRONIC GEARING CONTROL USER PARAMETERS (cont'd)

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
COMMAND PULSE TYPE	**UP-18**	00~12	0 0	Sets the type of pulse sequence and polarity of the COMMAND PULSE inputs. 00: Pulse, Pulse decoding where FMA increments command position and FMB decrements command position. 01: Quadrature decoding of FMA and FMB with FMA leading FMB for incrementing command position. Quadrature decoding effectively multiplies the input frequency by 4 times. 02: Pulse and direction decoding where FMA is pulse train and FMB is direction. FMB OFF increments command position and ON decrements command position. 10: Pulse, Pulse decoding where FMB increments command position & FMA decrements command position 11: Quadrature decoding of FMA and FMB with FMB leading FMA for incrementing command position. Quadrature decoding effectively multiplies the input frequency by 4 times. 12: Pulse and direction decoding where FMA is pulse train and FMB is direction. FMB ON increments command position and OFF decrements command position.
OUTPUT PULSE TYPE	**UP-19**	00~11	01	Sets the type of pulse output sequence and polarity of the PULSE OUTPUT. UP-20 must be set to xxxo for the PULSE OUTPUT to represent incremental actual position. 00: Pulse, Pulse encoding where APD pulses when the actual position increments and BPD pulses when the actual position decrements. 01: Quadrature encoding of APD and BPD with APD leading BPD for incrementing actual position. Each edge of the two pulse trains is counted as an output bit change.

4.6.3.2 ELECTRONIC GEARING CONTROL USER PARAMETERS (cont'd)

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
OUTPUT PULSE TYPE (cont'd)	**UP-19** (cont'd)			10: Pulse, Pulse encoding where BPD pulses when the actual position increments and APD pulses when the actual position decrements. 11: Quadrature encoding of APD and BPD with BPD leading APD for incrementing actual position. Each edge of the two pulse rains is counted as an output bit change.
OUTPUT PULSE CODING	**UP-20**	0000~5533	0000	The first digit of UP-20 selects the parameter to be put on the driver external display. Coding is as follows: 0: Motor speed in RPM 1: Actual motor position 2: Motor current 3: Calculated motor temperature 4: Motor distance to marker (°) 5: Machine speed in RPM The second digit of UP-20 is not used. The third digit selects the type of electronic coding for the OUTPUT PULSE when an absolute system is configured. This digit is only effective when the fourth digit is set to 3 or absolute motor position. The coding is as follows: 0: 32 bits 1: 23 bits + parity 2: 24 bits + parity 3: 31 bits + parity The fourth digit sets the basic function of the OUTPUTS PULSES. The coding is as follows: 0: Incremental position as defined in UP-19 1: Output to optional drive display DPA-70 2: Output to optional drive display DPA-80 3: Absolute motor position

4.6.3.2 ELECTRONIC GEARING CONTROL USER PARAMETERS (cont'd)

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
MONITOR OUTPUT FUNCTION	**UP-25**	000~111	010	Selects SPEED or TORQUE output and polarity of the MON test point. The first digit is not used. The second digit selects the MON output function. 0: TORQUE 1: SPEED The third digit selects the polarity of the MON output. 0: Normal 1: Invert
COMMAND PULSE POLARITY	**UP-26**	0~1	0	0: Move CCW with increment of command position 1: Move CW with increment of command position
RATIO TRIM SCALING	**UP-27**	0~2	0	UP-27 sets the scaling of the binary I/O code as follows: 0: scale = 0.01 1: scale = 0.1 2: scale = 1.0 Overall electronic ratio equation is as follows: Ratio of COMMAND PULSES/REV to motor motion (24000/REV) is: $UP\text{-}04/UP\text{-}05*[1+\frac{RATIO\ TRIM}{100}*UP\text{-}27]$ Where I/O is a 6-bit plus sign binary code from I/O points with a range of +/-63. (RATIO TRIM) See **Section 4.6.2**.
HOLDING BRAKE THRESHOLD	**UP-28**	0~100.0%	100%	When UP-16 is set to 0, UP-28 has no effect. When UP-16 is set to 1 or 2, the mechanical brake is applied when the motor speed falls below the value set in UP-28. The value in UP-28 is % of rated speed.
MOTOR TEST SPEED	**UP-29**	1~4000 r/min	50 RPM	The driver can be jogged manually by using the keypad. The jog speed is set with UP-29 in RPM.

4.6.3.2 ELECTRONIC GEARING CONTROL USER PARAMETERS (cont'd)

USER PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
EXTERNAL REGEN RESISTOR VALUE (Software version 10 and above)	**UP-30**	0~100.0 ohms	0.0 ohms	Value of the optional external regen resistor. When external regen resistor is used, the value of the resistor is entered to allow the driver to calculate average power into the regen resistor. When the internal regen is used, enter 0.0. Power must be turned OFF then ON for this parameter to take effect. See **Section 7** for details on Regen Resistor selection. This parameter is used with DSD-35 and larger drivers.
EXTERNAL REGEN RESISTOR WATTAGE (Software version 10 and above)	**UP-31**	0~327.67 Kw	0.0 Kw	Power rating of the optional external regen resistor. When external regen resistor is used, the power rating in Kw of the resistor is entered to allow the driver to calculate average power into the regen resistor. When the internal regen is used, enter 0.0. Power must be turned OFF then ON for this parameter to take effect. See **Section 7** for details on Regen Resistor selection. This parameter is used with DSD-35 and larger drivers.

4.6.3.3 ELECTRONIC GEARING CONTROL SETUP PARAMETERS

SETUP PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
MOTOR RMS TORQUE CALCULATION TIME CONSTANT	**HP-33**	1~60 sec	30 sec	Sets the time constant for calculating motor rms torque that is displayed as parameter bL. Time constant should be set to approximately twice as long as the machine cycle.
SPEED/TORQUE LIMIT SELECTION	**HP-34**	00~21	11	First digit is torque limit method: 0: N/A 1: N/A 2: Limit set by parameter UP-11 or HP-36 through HP-39 when UP-11 = 0. Second digit is speed limit method: 0: N/A 1: N/A
CCW ROTATION TORQUE LIMIT	**HP-36**	0~100.0%	100%	Limits CCW rotation torque. 100% = Peak Torque See **HP-34**
CCW ROTATION ABSORPTION TORQUE LIMIT	**HP-37**	0~100.0%	100%	Limits CCW rotation absorption (braking) torque. 100% = Peak Torque See **HP-34**
CW ROTATION TORQUE LIMIT	**HP-38**	0~100.0%	100%	Limits CW rotation torque. 100% = Peak Torque See **HP-34**

4.6.3.3 ELECTRONIC GEARING CONTROL SETUP PARAMETERS (cont'd)

SETUP PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
CW ROTATION ABSORPTION TORQUE LIMIT	**HP-39**	0~100.0%	100%	Limits CW rotation absorption (braking) torque. 100% = Peak Torque See **HP-34**
SPEED DISPLAY ELECTRONIC RATIO NUMERATOR	**HP-41**	1~32767	1	Parameters HP-41/HP-42 form a fraction that is used to scale the scaled Motor Speed display "F". The motor speed is multiplied by the fraction, and then put on the display. This allows a speed display that is scaled to the speed of the actual machine rather than the speed of the motor. The scaling can also allow the driver to display speed in different units such as in/sec rather than the default motor RPM. Scales the driver display and optional external display if used.
SPEED DISPLAY ELECTRONIC RATIO DENOMINATOR	**HP-42**	1~32767	1	
SPEED DISPLAY DECIMAL POINT POSITION	**HP-43**	0~7	0	HP-43 sets the position of the decimal point in the optional external speed display. 0: No decimal point 1: Least significant digit ... 7: Most significant digit
INPUT INVERSION	**HP-44**	000~1FF	000	This parameter forms a hexadecimal bit mask that inverts the input when the bit is set to 1 and does not invert the input when the bit is 0. The LSB is for IN0 and so on. (i.e. HP-44 = 8C inverts inputs IN7, IN3 & IN2)
OUTPUT INVERSION	**HP-45**	00~FF	00	This parameter forms a hexadecimal bit mask that inverts the output when the bit is set to 1 and does not invert the output when the bit is 0. The LSB is for OUT0 and so on. (i.e. HP-45 = 4A inverts outputs OUT6, OUT3 & OUT1)

SECTION 5 - POWER WIRING

The Delta driver and motors have three basic power wiring configurations. Each of the configurations is shown in the following power wiring diagrams (**Figures 5.4 through 5.6**). Each of the diagrams shows recommended circuit breaker, contactor and wire gauge.

5.1 CIRCUIT BREAKER

It is recommended that each driver be provided with a circuit breaker for protection of the driver and motor. All of the drives are suitable for use on a circuit capable of delivering not more than 5000 rms symmetrical amperes, 240 vac maximum when protected by a circuit breaker having an interrupting rating not less than 5000 rms symmetrical amperes, 240 volts maximum. Each of the driver wiring diagrams contains a chart of the recommended circuit breaker for each driver size.

The breaker is sized for the worst-case maximum power draw of the driver at the worst-case low line voltage. The charts contain specific vendor and size recommendations. Other types of circuit breakers 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.

Lower rating protections devices may be used that are sized for the motor power rating. Contact the IIS factory for specific recommendations.

5.2 CONTACTOR

The DSD-1.5 through DSD-17.5 driver sizes has an internal power bus contactor. The DSD-35 through DSD-115 sizes requires an external power bus contactor. The driver-wiring diagram for the larger size drivers contains a chart of the recommended contactor for each driver size.

The contactor is sized for the worst-case maximum power draw of the driver at the worst-case low line voltage. The charts contain specific vendor and size recommendations. Other types of contactors may be used provided the continuous ratings are equivalent and the maximum instantaneous rating is 10 to 15 times continuous. The driver is equipped with a soft start circuit to limit the contactor inrush current.

The coil voltage should be the same rating as the incoming line. The maximum current draw for the coil cannot exceed 0.25 amps. The contactor coil must be fitted with a transient voltage protection device. An RC type suppression device is preferred.

5.3 WIRE SIZES

It is required that each driver be installed with the appropriate size wire for proper operation. Each of the driver wiring diagrams contains a chart of the recommended wire gauges and terminal connection tightening torques 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. 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.

5.4 TRANSFORMERS

Isolating the driver from the facility power line with a transformer is recommended but not required. A transformer may be required to step down or step up the facility power line to meet the driver voltage specifications in **Section 2**.

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 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 Delta Package rating.
0.7 = motor/drive efficiency and single phase full wave rectifier factor

Example: Select transformer for a Delta-200HRA motor/drive package

$$\text{Transformer Capacity (VA)} = \frac{200}{0.7} = 285 \text{ VA}$$

For three phase transformer:

$$\text{Transformer Capacity (Watts)} = \frac{\text{Rated Mechanical Output (Watts)}}{0.85}$$

Where: Rated Mechanical Output is from Delta Package rating.
0.85 is motor/drive efficiency and three phase rectifier factor

5.4 TRANSFORMERS (cont'd)

Example: Select transformer for a Delta-6500HRA motor/drive package

$$\text{Transformer Capacity (VA)} = \frac{6500}{0.85} = 7647\ \text{VA}$$

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.

5.5 BRANCH CIRCUIT PROTECTION FOR CONTROL VOLTAGE R0,S0

The DSD-35 through DSD-115 requires a separate control voltage supply (R0 S0) for proper operation. The R0 S0 circuit is fused internal to the driver and need not be externally fused except to protect the control voltage wiring external to the driver using branch circuit protection guidelines. The control voltage circuit of multiple drivers can be fed from a single branch circuit.

5.6 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 physical 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** below.

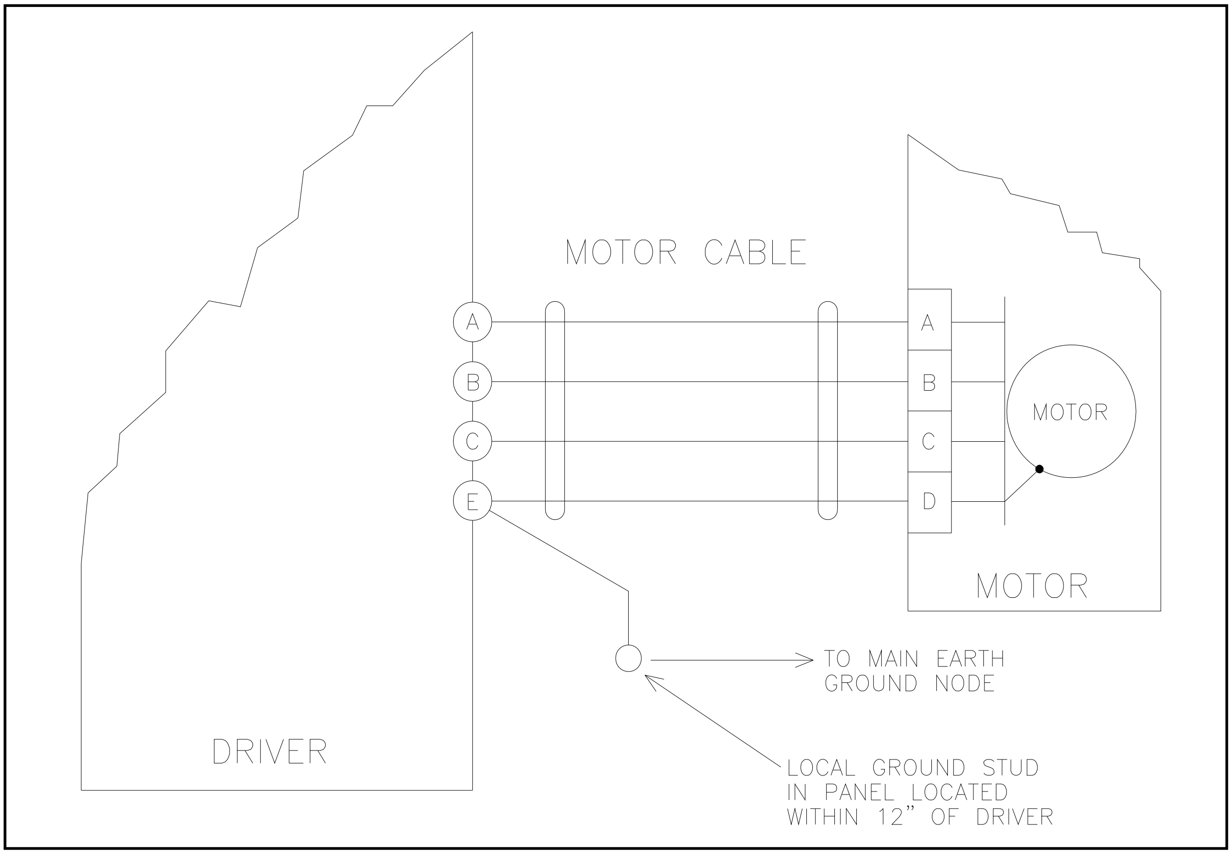


Figure 5.1 - Grounding Technique

NOTE

Multiple drivers can share a local ground stud if it is located within 12" of each drivers's Ⓔ terminal. The ground symbol ⏚ on each drive indicates that a connection must be made between the Ⓔ terminal of the drive and earth ground.

5.7 POWER SEQUENCING

The Delta drivers have provisions for power contactor sequencing. The power contactor is internal to the driver for the DSD-1.5, DSD-4.25, DSD-8.5 and DSD-17.5 sizes and external for the larger sizes. The sequencing of the power and control signals is shown in **Figures 5.2 and 5.3**.

If a mechanical brake or dynamic brake is used, the sequencing changes slightly. See **Sections 8 and 9** for details.

5.7 POWER SEQUENCING (cont'd)

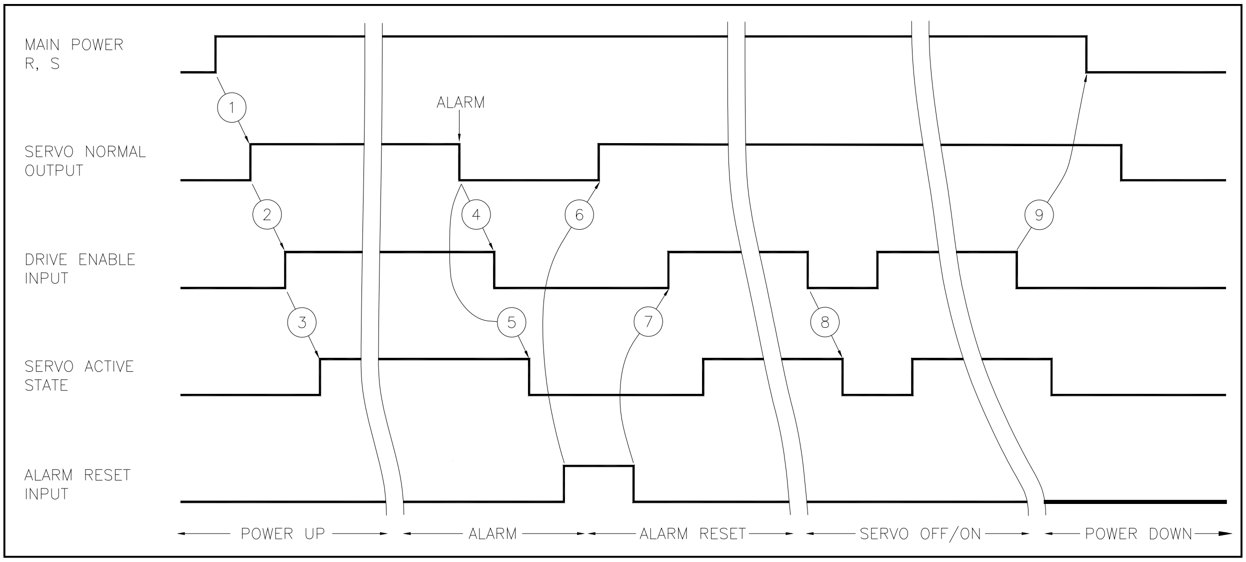


Figure 5.2 - Power and Control Signals for DSD-1.5 Through DSD-17.5 Drivers

1. At power application the driver initializes and does fault checks. If there are no faults, the SERVO NORMAL output will turn ON with a maximum delay of 2.5 seconds.
2. DRIVE ENABLE may be turned ON within 0.6 seconds of SERVO NORMAL.
3. The servo will become active within 800usec.
4. When an alarm is sensed, the SERVO NORMAL output is turned OFF and the DRIVE ENABLE must be turned OFF before alarm clearing can be accomplished.
5. The servo will become inactive within 800usec of the alarm.
6. ALARM RESET causes driver to check for clearing of the alarm condition and if all alarm states are clear, the SERVO NORMAL will turn ON within 30 ms.
7. ALARM RESET should be turned off before DRIVE ENABLE is turned ON.
8. The servo will become inactive within 800usec of DRIVE ENABLE being turned OFF.
9. DRIVE ENABLE should be turned off before the main power is removed to avoid an under voltage alarm, AL-03. Turning off main power while the DRIVE ENABLE is on will not damage the driver.

5.7 POWER SEQUENCING (cont'd)

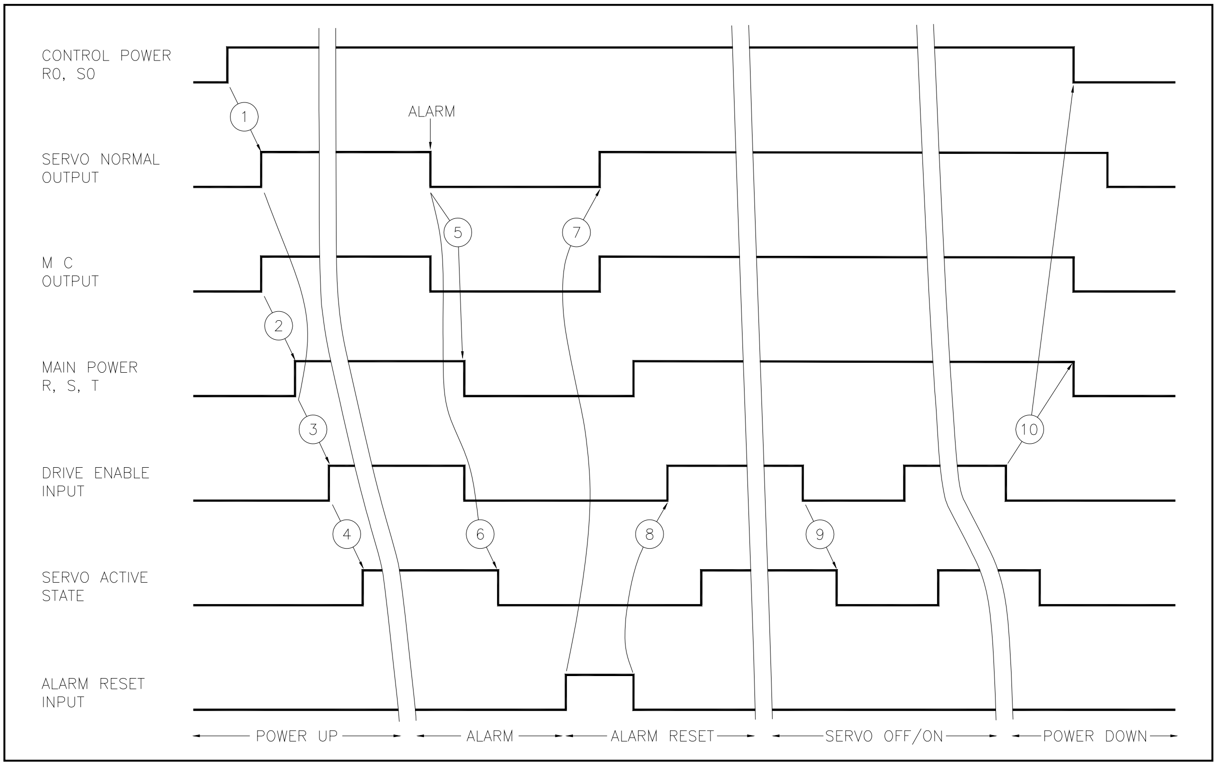
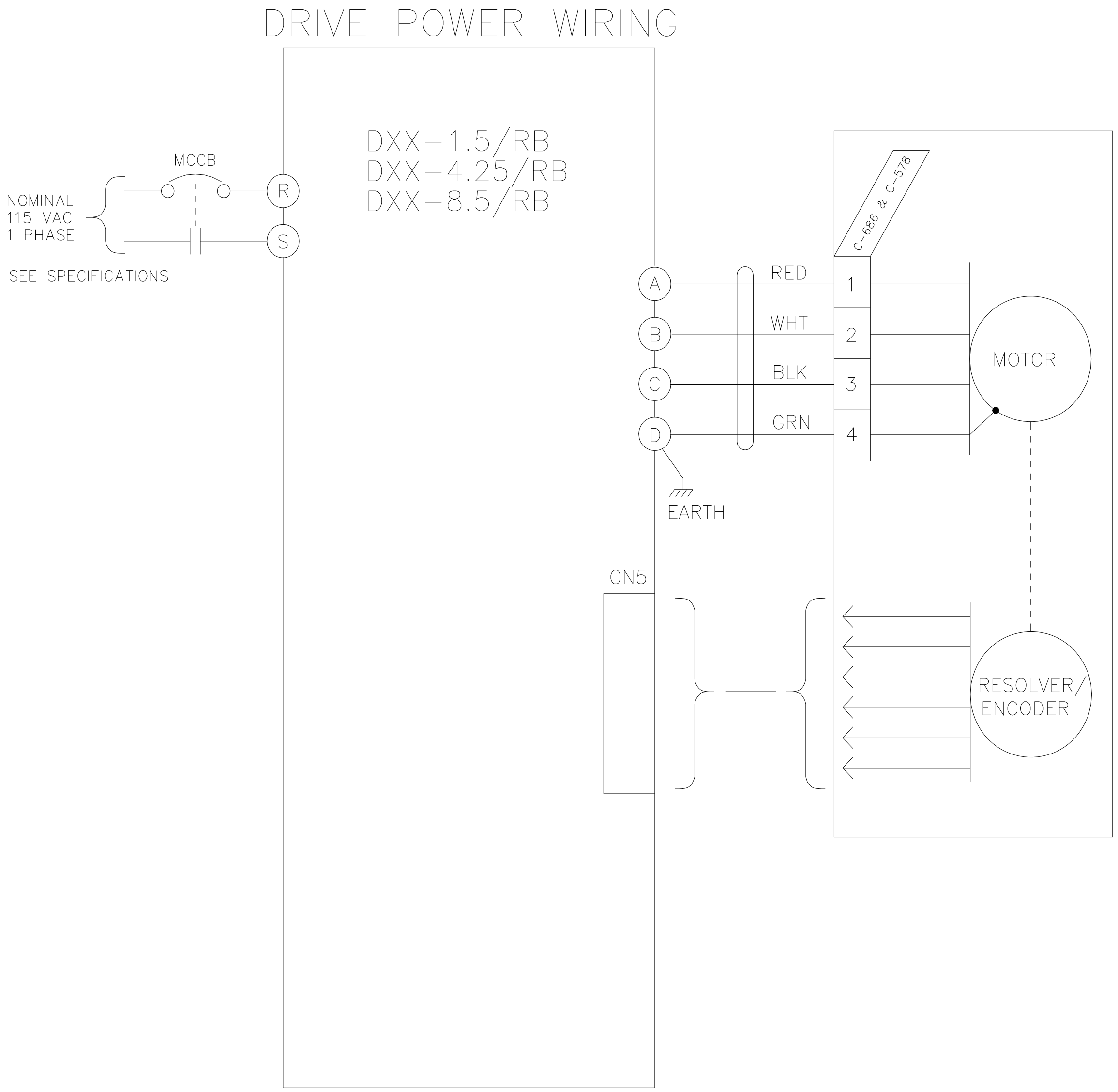


Figure 5.3 - Power and Control Signals for DSD-35 Through 115 Drivers

1. At power application the driver initializes and does fault checks. If there are no faults, the SERVO NORMAL and MC outputs will turn ON with a maximum delay of 2.5 seconds.
2. The main power is applied via the MC contactor.
3. DRIVE ENABLE may be turned ON within 0.6 seconds of SERVO NORMAL.
4. The servo will become active within 800usec.
5. When an alarm is sensed, the SERVO NORMAL and MC outputs are turned OFF. The DRIVE ENABLE must be turned OFF before alarm clearing can be accomplished.
6. The servo will become inactive within 800usec of the alarm.
7. ALARM RESET causes driver to check for clearing of the alarm condition and if all alarm states are clear, the SERVO NORMAL will turn ON within 30 ms.
8. ALARM RESET should be turned OFF before DRIVE ENABLE is turned ON.
9. The servo will become inactive within 800usec of DRIVE ENABLE being turned OFF.
10. DRIVE ENABLE should be turned off before the main power is removed to avoid an under voltage alarm, AL-03. Turning off main power while the DRIVE ENABLE is on will not damage the driver.

5.7 POWER SEQUENCING (cont'd)

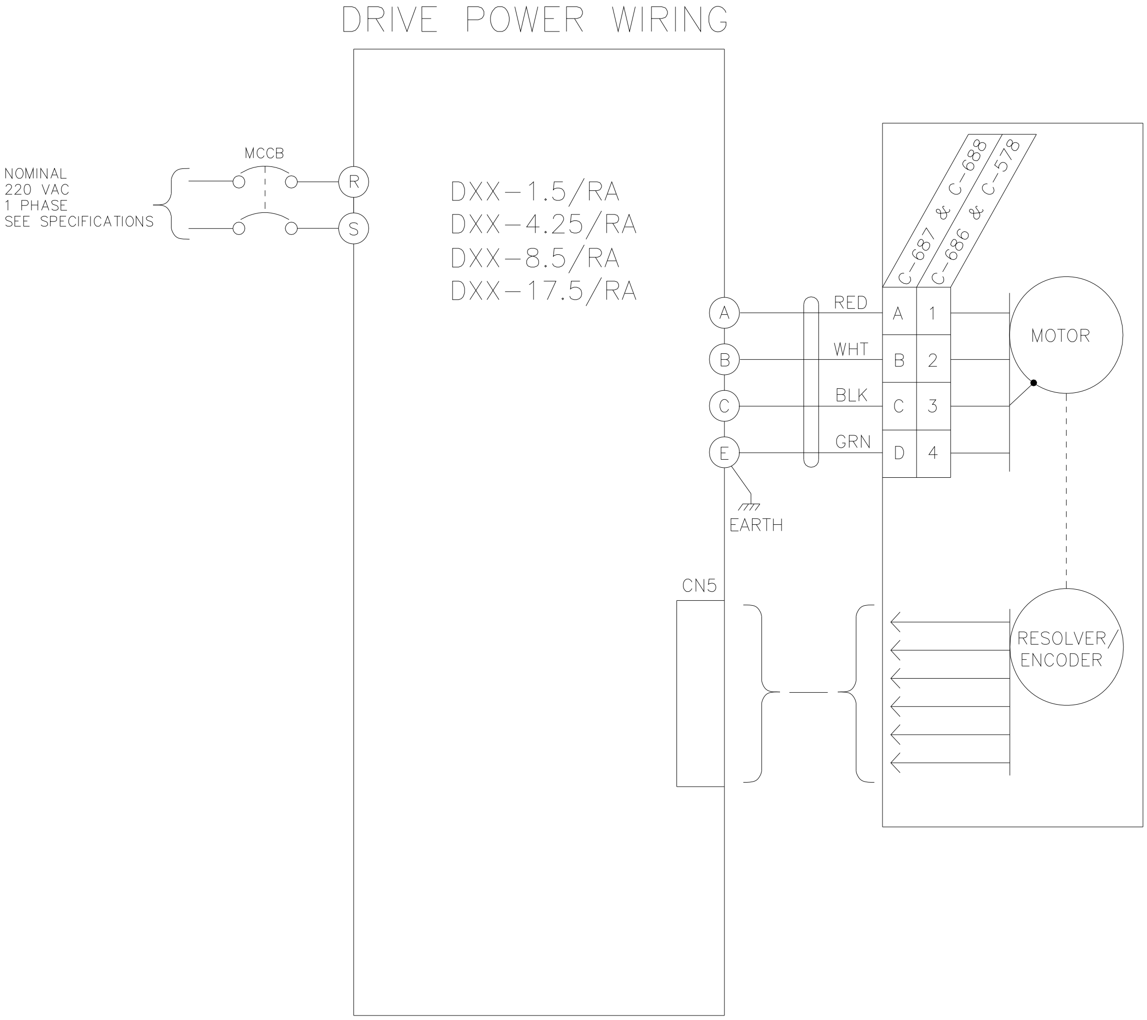


DRIVER	MCCB	R,S & EARTH CIRCUIT WIRE SIZE	REQUIRED TORQUE (LB−IN) ON POWER WIRING TERMINALS
DXX−1.5/RB DXX−4.25/RB	ABB−S271−K4NA 4 AMPS	14 AWG, 1.25 MM^2	12.00**
DXX−8.5/RB	ABB−S271−K8NA 8 AMPS	14 AWG, 1.25 MM^2	12.00**

** Field wiring connection shall be made by a UL LISTED and CSA Certified closed -loop terminal connector sized for the wire gauge involved. Connector must be fixed using the crimp tool specified by the connector manufacturer.

Figure 5.4 - DSD-1.5/RB Through DSD-8.5/RB Power Wiring

5.7 POWER SEQUENCING (cont'd)

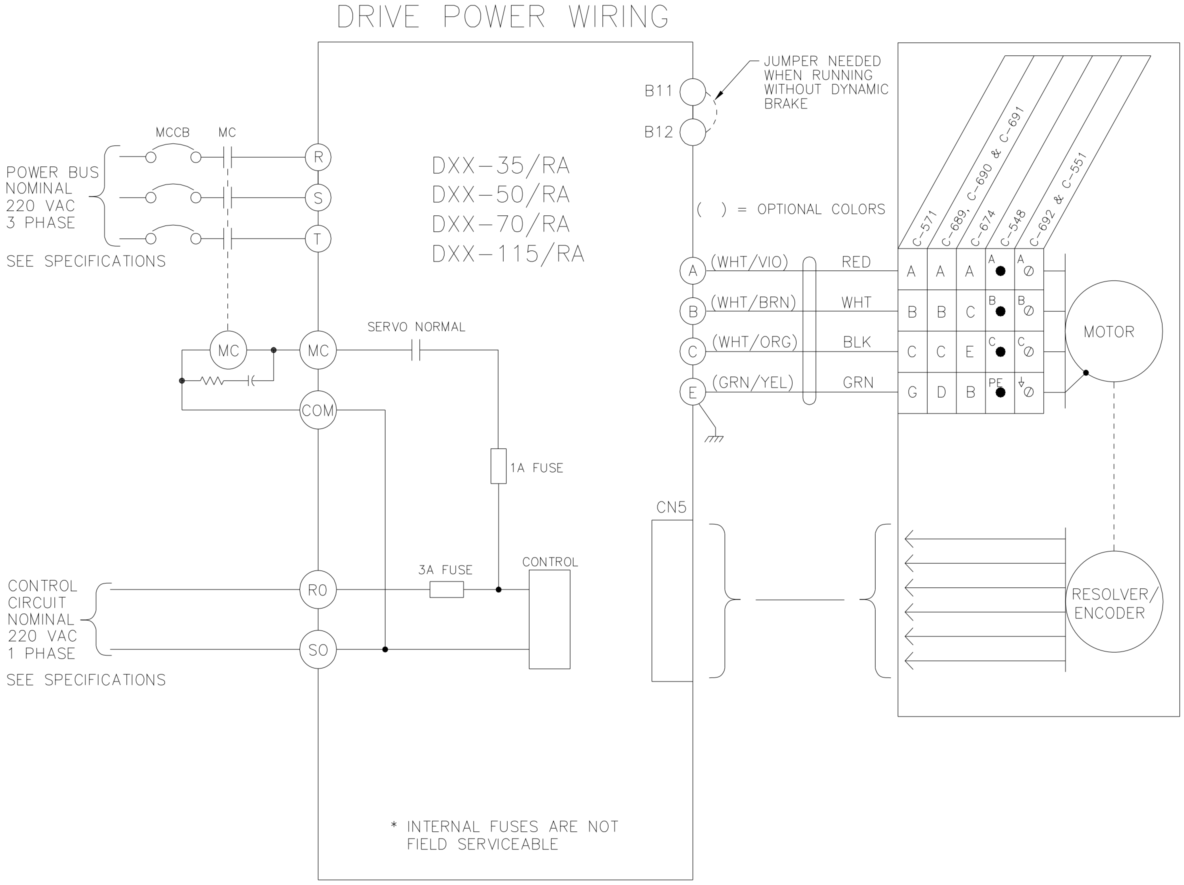


DRIVER	MCCB	R,S & EARTH CIRCUIT WIRE SIZE	REQUIRED TORQUE (LB-IN) ON POWER WIRING TERMINALS
DXX-1.5/RA & DXX-4.25/RA	(ABB) S272-K4	14 AWG, 1.25 MM^2	12.00**
DXX-8.5/RA	(ABB) S272-K8 (SQD) MG24448 8 AMPS	14 AWG, 1.25 MM^2	12.00**
DXX-17.5/RA	(ABB) S272-K16 (SQD) MG24451 16 AMPS	14 AWG, 1.25 MM^2	12.00**

** Field wiring connection shall be made by a UL LISTED and CSA Certified closed -loop terminal connector sized for the wire gauge involved. Connector must be fixed using the crimp tool specified by the connector manufacturer.

Figure 5.5 - DSD-1.5/RA Through DSD-17.5/RA Power Wiring

5.7 POWER SEQUENCING (cont'd)



DRIVER	MCCB	MC	R,S,T & EARTH CIRCUIT WIRE SIZE	RO, SO, MC, COM WIRE SIZE	REQUIRED TORQUE (LB-IN) ON POWER WIRING TERMINALS
DXX-35/RA	(ABB) S273-K16 (SQD) MG24468 16 AMPS	(SQD) LC1D18M7 W/ LAD4RCU	12 AWG, 2 MM^2	14 AWG, 1.25 MM^2	15.50
DXX-50/RA	(ABB) S273-K20 (SQD) MG24469 20 AMPS	(SQD) LC1D25M7 W/ LAD4RCU	12 AWG, 3.5 MM^2	14 AWG, 1.25 MM^2	15.50
DXX-70/RA	(ABB) S273-K32 (SQD) MG24471 30 AMPS	(SQD) LC1D32M7 W/ LAD4RCU	10 AWG, 5.5 MM^2	14 AWG, 1.25 MM^2	17.50**
DXX-115/RA	(ABB) S273-K63 (SQD) MG24474 63 AMPS	(SQD) LC1D65M7 W/ LA4DA2U	8 AWG, 16 MM^2	14 AWG, 1.25 MM^2	17.50**

** Field wiring connection shall be made by a UL LISTED and CSA Certified closed -loop terminal connector sized for the wire gauge involved. Connector must be fixed using the crimp tool specified by the connector manufacturer.

Figure 5.6 - DSD-35/RA Through DSD-115/RA Power Wiring

SECTION 6 - DRIVER TUNING

The Delta driver may be tuned using a built in Automatic Tuning Sequence or manually. The keypad and display are used in both cases to accomplish the tuning. The following parameters are used to tune the driver:

- AJ2 Load Inertia Ratio
- AJ3 High Frequency Response
- AJ4 Position Loop DC Gain

It is important to note that although the driver is the focus of the tuning activity the whole system of driver, motor and mechanical components are being tuned as a system. To be successful the system must be configured complete with all components that move during normal operation.

For the purposes of this section it is assumed that the user is proficient in navigating the Special Function Menu Loop, the Adjustment Parameter Menu Loop and adjusting parameters in those loops (See **Section 3**).

6.1 AUTO TUNING SEQUENCE

Parameters AJ2, AJ3, and AJ4 are set during the auto tuning sequence. Parameters AJ0 and AJ5, analog reference input offsets, are also set during auto tuning. The REF1 and REF2 analog inputs must be forced to 0.0 volts before executing the auto tuning sequence. During auto tuning the driver reads both REF1 and REF2 and sets the internal offsets AJ0 and AJ5 equal to and opposite to the value read during auto tuning. If the REF1 and REF2 inputs are not 0.0 volts during auto tuning, an unwanted offset will occur in the analog inputs.

The auto tuning sequence causes the motor to sharply rotate back and forth by an amount and at a speed set by the tuning parameters. The desired response is also set in the tuning parameters of the Special Function Menu Loop.

Auto tuning to an excessively high target response may result in unstable operation. Unstable operation will also result if the motor load is not rigidly attached or has backlash. If unstable operation results use the Adjustment Parameter menu to set AJ2, AJ3 and AJ4 back to the default settings. Try the Auto Tuning Sequence again with a lower value of target response.

If the Delta driver is used as a speed regulator (Speed Mode 1) in a system with a external position loop, the position loop must be disabled before driver auto tuning can be used. The gain and frequency response parameters of the external position loop will significantly influence the system response.

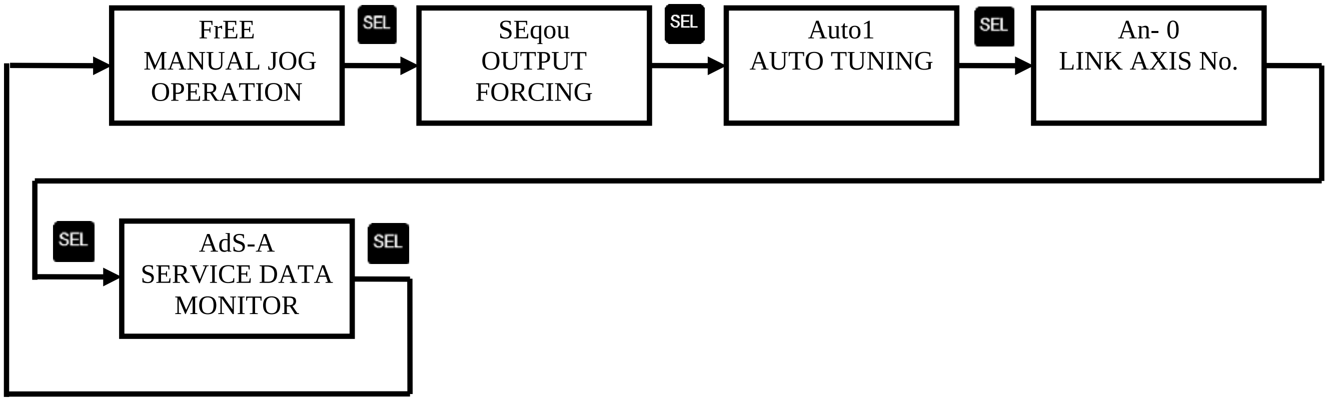
**** CAUTION ****

Must be used when executing the Auto Tuning Sequence. The motor moves through a sequence of reciprocal motions during the auto tuning. Be sure all personnel are clear of moving parts and that the mechanical systems will permit the full range of motion set in the auto tuning parameters Auto1, 2 & 3.

6.1.1 SPECIAL FUNCTION MENU LOOP

Enter the Special Function Menu Loop by concurrently pressing the ︾ ︽ ↵ keys for 5 seconds while the Main Menu status display shows motor speed [r   0]. The special menu will appear with the display showing [FrEE]. To exit the Special Function Menu double click the MODE key.

Once in the Special Function Menu Loop, use the SEL key is used to move to various menu items.



6.1.2 AUTO TUNING SETUP PARAMETERS

Verify the correct setting of the auto tuning setup parameters by using the ︽ and ︾ keys to navigate the auto menu. The menu loop will display the parameter name followed by the parameter value with successive presses of the ︽ key. Use the SEL and ↵ keys to select value to be modified. Then use ︽ and ︾ keys to adjust value, then confirm value with ↵ key.

TUNING PARAMETER	SYMBOL	SETTING RANGE	FACTORY SETTING	DESCRIPTION
ROTATION AMOUNT	**Auto1**	0~300 REV	2 REVS	Sets the amount of reciprocal rotation during the auto tuning sequence
TARGET RESPONSE	**Auto2**	1~1000 Hz	40 Hz	Sets the desired frequency response. The auto tuning software uses this value to set the desired response of the system. If the value is too high, unstable operation may result.
MAXIMUM SPEED	**Auto3**	1~4000 RPM	1000 RPM	Sets the speed of the reciprocal rotation during the auto tune sequence.

6.1.3 INITIATE AUTO TUNING

To initiate Auto Tuning use the SEL keys to get [Auto 1] in the display. With [Auto1] in the display press and hold the ↵ key followed by the ⇈ key. The [Auto1] in the display will flash indicating initiation of the Auto Tuning Sequence and the motor will begin the reciprocal rotation. The driver will continuously adjust the tuning parameters while the motor is moving. When the Auto Tuning Sequence is complete the display will stop flashing. The BRAKE CONFIRM input must be functional to initiate the Auto Tuning Sequence.

Exit the Special Function Menu with a double click of the MODE key.

6.2 MANUAL TUNING PROCEDURE

The Delta driver may be tuned manually using the Adjustment Parameter Menu Loop described in **Section 3.1.3**.

AJ2 Load inertia ratio, AJ3 High frequency response and AJ4 Position loop DC gains are the parameters that adjust the response of the driver. A qualified technician using a chart recorder or oscilloscope to view the performance of the system should do adjustment of these parameters.

1. Start the manual adjustment by setting AJ2 to the ratio of the load inertia to the motor rotor inertia. Set AJ3 and AJ4 to the default settings.

2. Connect an oscilloscope or chart recorder to the MON output on the driver front panel. Set UP-25 to 1x0 so the MON output is set to motor speed.

**** CAUTION ****

Must be used when executing the motor motion. Be sure all personnel are clear of moving parts and that the mechanical systems will permit the full range of motion.

3. Cause the system to move through the most aggressive, highest speed and highest acceleration, motion encountered in normal operation. The stimulus for this motion depends on the system configuration.

4. Adjust AJ2, AJ3 and AJ4 for the desired response using the Adjustment Parameter Loop.

Parameter AJ2 primarily provides the damping function in the system response. The larger the system inertia the larger the value of AJ2 required. If the load inertia is not rigidly attached to the motor shaft, the value of AJ2 may be smaller than the calculated value.

Parameter AJ3 sets the frequency of any small oscillations and overshoots that may be present. Too high a value can result in high frequency oscillations. AJ3 also sets the system frequency response to external stimulus.

Parameter AJ4 sets the basic gain of the control loop and should be set as high as practical without causing oscillations. This parameter primarily affects the stiffness of the system response or the conformance of the motor motion to the commanded motion.

6.3 NOTCH FILTER ADJUSTMENT

The Delta driver drive contains a Notch Filter, adjusted by parameter AJ9 that can be used to eliminate system natural resonance frequency oscillations. Natural frequency resonance oscillations can occur with a belt drive, a flexible coupling or any mechanical component that causes flexing or compliance in the motor drive train.

In general, the normal tuning of the driver will not eliminate the natural resonance without lowering the system response to an unacceptable level. If the natural frequency of the system can be determined, the Notch Filter, AJ9, can be set to that frequency to notch out that particular frequency thereby allowing higher gain settings and better response.

SECTION 7 - REGEN RESISTOR SELECTION

7.1 DRIVER REGENERATION CAPACITIES

The Delta 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 3 ways to absorb the energy from the load.

- Store the energy by charging the internal main DC bus capacitors (E_C)
- Use the energy internally to power the driver control circuitry (P_D)
- Dissipate the energy using a regeneration resistor (P_R)

The Delta driver energy absorption capacities are as shown in **Table 7.1**.

DRIVER SIZE	**INTERNAL REGEN CAPACITY** (P_R)	**INTERNAL POWER CONSUMPTION** (P_D)	**CHARGING CAPACITY** (E_C)
DSD-1.5/RB	0 W	13	17
DSD-1.5/RA	0 W	13	17
DSD-4.25/RB	0 W	13	17
DSD-4.25/RA	0 W	13	17
DSD-8.5/RA	0 W	24	17
DSD-8.5/RB	0 W	17	17
DSD-17.5/RA	0 W	37	22
DSD-35/RA	80 W	80	38
DSD-50/RA	80 W	100	54
DSD-70/RA	100 W	200	94
DSD-115/RA	180 W	300	188

Table 7.1 - Energy Absorption Capabilities

The Delta 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 400 VDC, the regeneration circuit is turned on to prevent the main DC power bus from rising to 420 VDC which will result in an over voltage alarm AL-02.

7.2 SELECTION OF 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.

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

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 AL-02.

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 (See **Table 7.1**)
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)
P_D = Driver internal power consumption watts (See **Table 7.1**)
T_f = System friction torque N-m
T_g = Net torque to hold up load against gravity N-m
P_R = Regen power watts (See **Table 7.1**)
t_a = Deceleration time
t_b = Move time See **Figure7.1**
t_c = Cycle time

* The above equations are reasonable approximations.

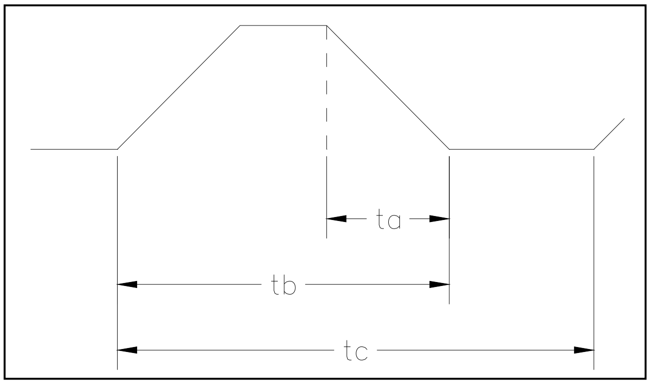


Figure 7.1

7.2 SELECTION OF REGENERATION RESISTOR (cont'd)

Drivers DSD-1.5, DSD-4.25, DSD-8.5 and DSD-17.5 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.

Drivers DSD-35 through DSD-115 contain internal regeneration resistors. If the internal regeneration resistor capacity is greater than P_R watts, no external resistor is needed. If the internal resistor is not large enough, an external resistor with a power rating of at least P_R watts must be connected. If an external regeneration resistor is needed, parameters UP-30 and UP-31 must be set to the values of the external resistor.

**** CAUTION ****

When installing an external regeneration resistor, UP-30 and UP-31 need to be set to the values of the external resistor.

Table 7.2 External resistor specifications.

DRIVER SIZE	RESISTANCE	MAX WATTAGE	WIRE GAUGE
DSD-1.5/RA	30~100 Ohms	300 W	14 AWG 1.25 mm²
DSD-1.5/RB	30~100 Ohms	300 W	14 AWG 1.25 mm²
DSD-4.25/RA	30~100 Ohms	300 W	14 AWG 1.25 mm²
DSD-4.25/RB	30~100 Ohms	300 W	14 AWG 1.25 mm²
DSD-8.5/RA	30~100 Ohms	300 W	14 AWG 1.25 mm²
DSD-8.5/RB	30~100 Ohms	300 W	14 AWG 1.25 mm²
DSD-17.5/RA	30~70 Ohms	400 W	14 AWG 1.25 mm²
DSD-35/RA	12.5~25 Ohms	2.4 KW	12 AWG 3.5 mm²
DSD-50/RA	12.5~25 Ohms	3 KW	12 AWG 3.5 mm²
DSD-70/RA	10~15 Ohms	5.5 KW	10 AWG 5.5 mm²
DSD-115/RA	6~15 Ohms	11 KW	8 AWG 16 mm²

Table 7.2 - External Resistor Specifications

Figures 7.2 and **7.3** shows how to connect an external regeneration resistor to the Delta drivers.

7.2 SELECTION OF REGENERATION RESISTOR (cont'd)

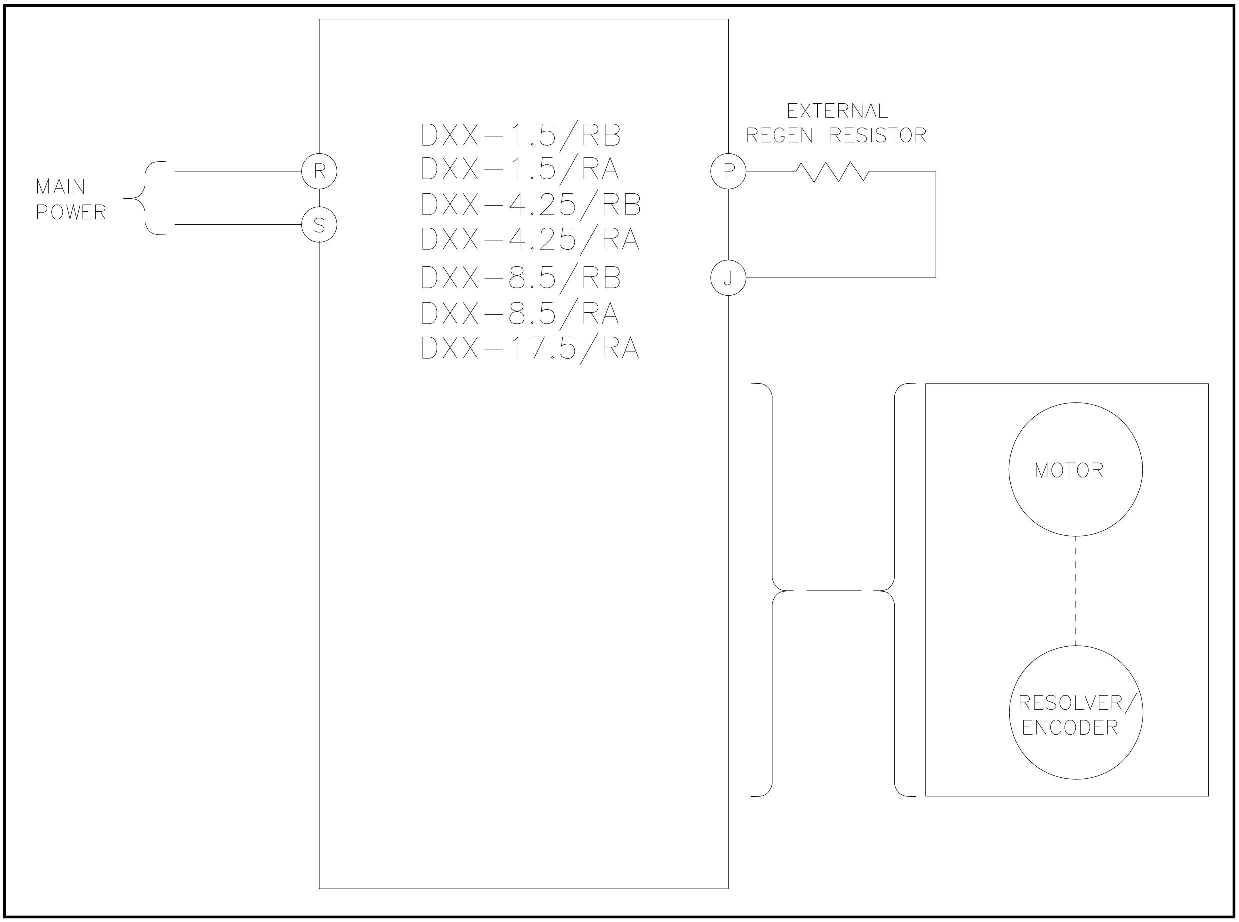


Figure 7.2 - Connection of an External Regen Resistor for Driver Sizes DSD-1.5 Through DSD-17.5

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7.2 SELECTION OF REGENERATION RESISTOR (cont'd)

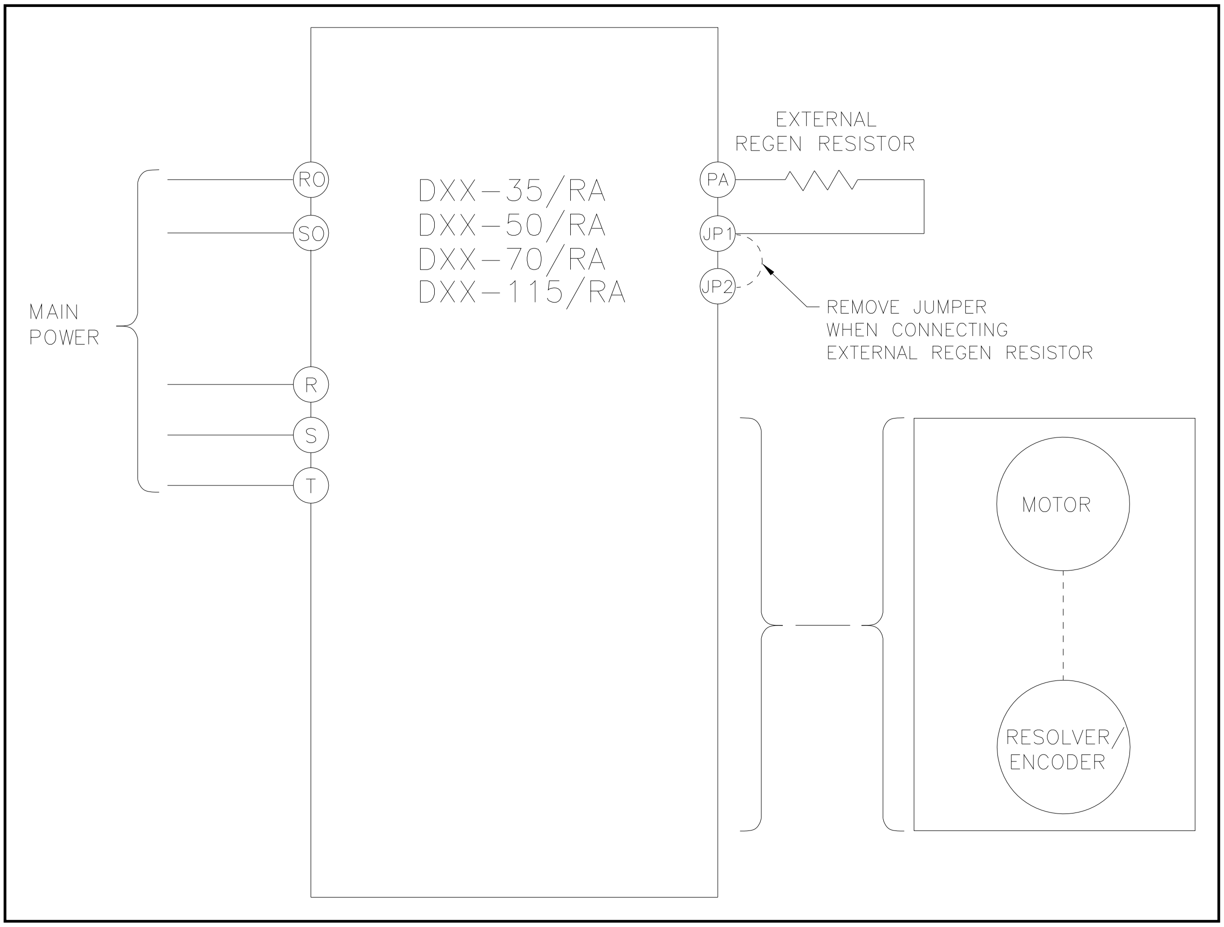


Figure 7.3 - Connection of an External Regen Resistor for Driver Sizes DSD-35 and Larger

The regeneration resistor is subjected to severe peak power loads during regeneration. The driver switches the regeneration resistor across the DC power bus using PWM techniques to regulate the DC power bus voltage during regeneration dumping. When the driver's switch is on the regeneration resistor is subjected to the following peak power:

PEAK POWER = (400 VDC)^2 / RESISTOR VALUE in ohms

Be sure to select a regeneration resistor that can sustain the required peak power and continuous power ratings.

**** CAUTION ****

When installing an external regeneration resistor, UP-30 and UP-31 need to be set to the values of the external resistor.

7.3 STANDARD REGENERATION RESISTOR PACKAGES

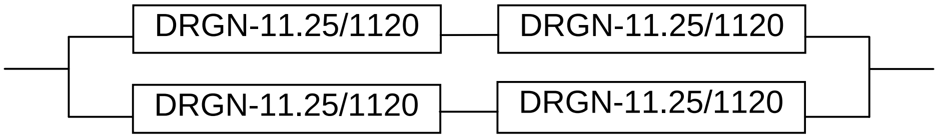
In general, wound metal ribbon resistors are recommended for this type of application. IIS offers a complete line of enclosed panel mounted regen resistor units to complement the Delta driver. Various combinations of series and parallel connections are allowed to provide adequate regen resistor capacity.

IIS P/N	Description	UP-30	UP-31
MFS30A300J*	30 Ohm 30 Watts	N/A	N/A
RGH200-30*	30 Ohm 200 Watts	30	0.20
DRGN-20/400*	20 Ohm 400 Watts	20	0.40
DRGN-45/420	45 Ohm 420 Watts	45	0.42
DRGN-22.5/655	22.5 Ohm 655 Watts	22.5	0.65
DRGN-15/880	15 Ohm 880 Watts	15	0.88
DRGN-11.25/1120	11.25 Ohm 1120 Watts	11.25	1.12

*Not UL/CE approved

EXAMPLE CALCULATION:

If 4 KW of regen were needed on a DSD-115 driver, four (4) DRGN-11.25/1120 units could be connected as follows to yield 11.25 Ohms at 4480 Watts.



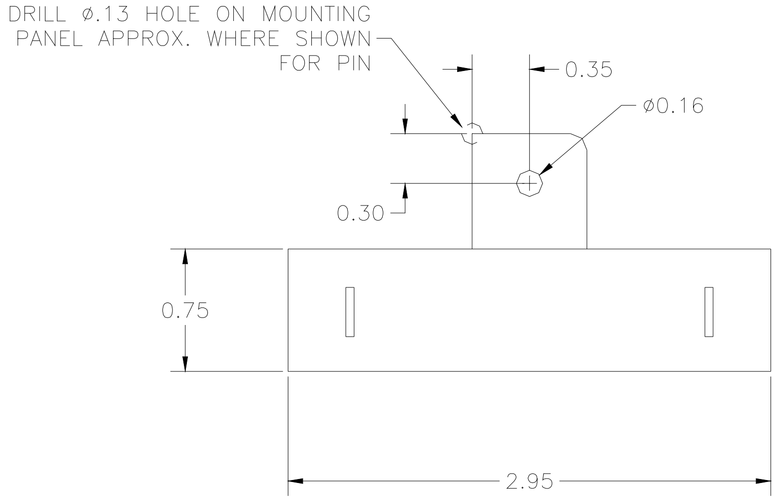
DRAWING NUMBER	**DESCRIPTION**
MFS30A300J	Resistor
RGH200-30	Regen Resistor
DRGN-20/400	Regen Resistor
DRGN-45/420	Regen Resistor
DRGN-45/420-2	Regen Resistor
DRGN-22.5/655	Regen Resistor
DRGN-15/880	Regen Resistor
DRGN-11.25/1120	Regen Resistor

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 %


DRILL Ø.13 HOLE ON MOUNTING PANEL APPROX. WHERE SHOWN FOR PIN

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TITLE	RESISTOR, 30 OHM, 30W
DRAWING NUMBER	MFS30A300J

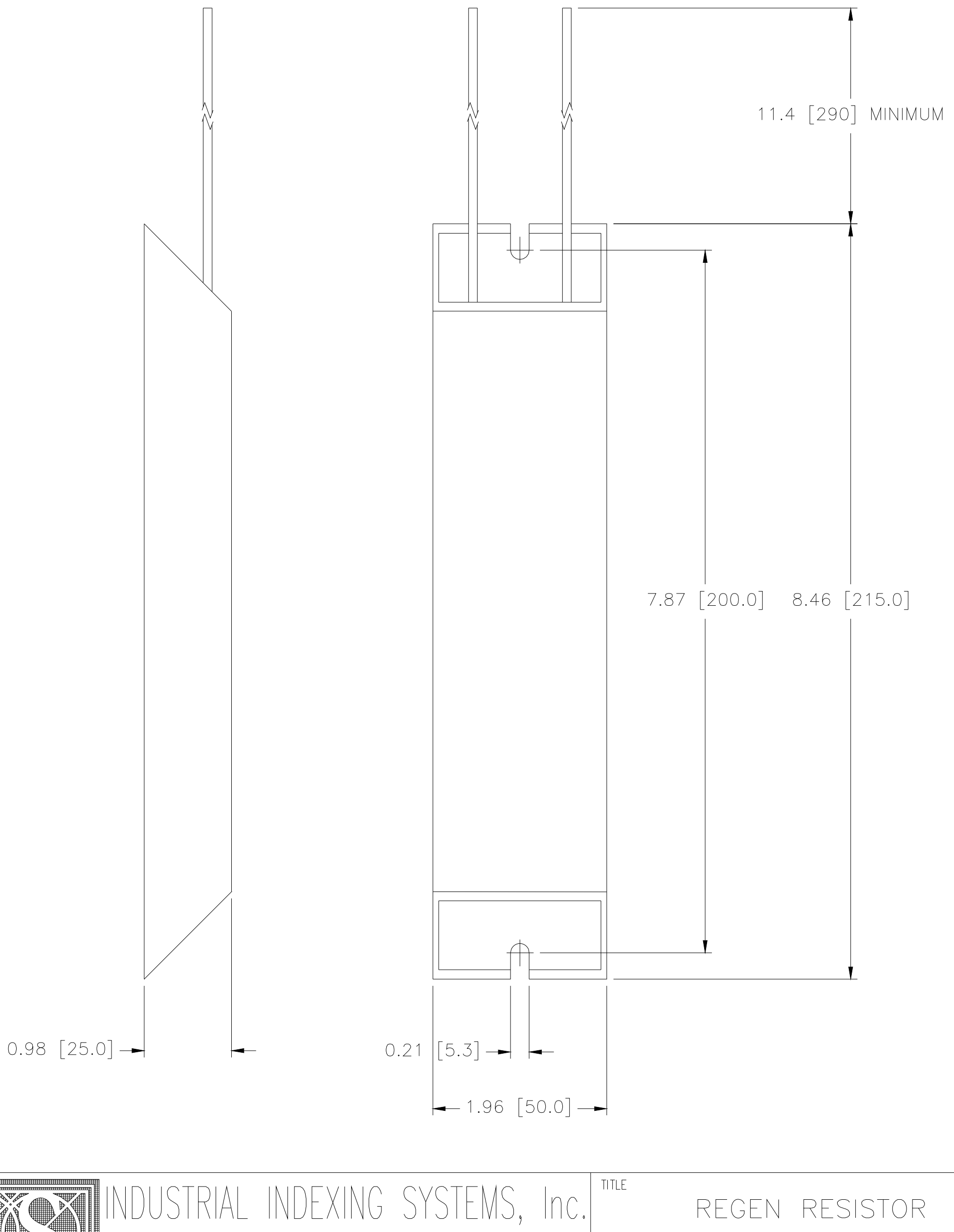
DIMENSIONS ARE INCHES [mm] | TOLERANCES X.XX± --- X.XXX± --- ∠ ± --- | REV 0 | ECN 03-322 | DATE 16JUL03 | SH. 1 OF 1

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%



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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

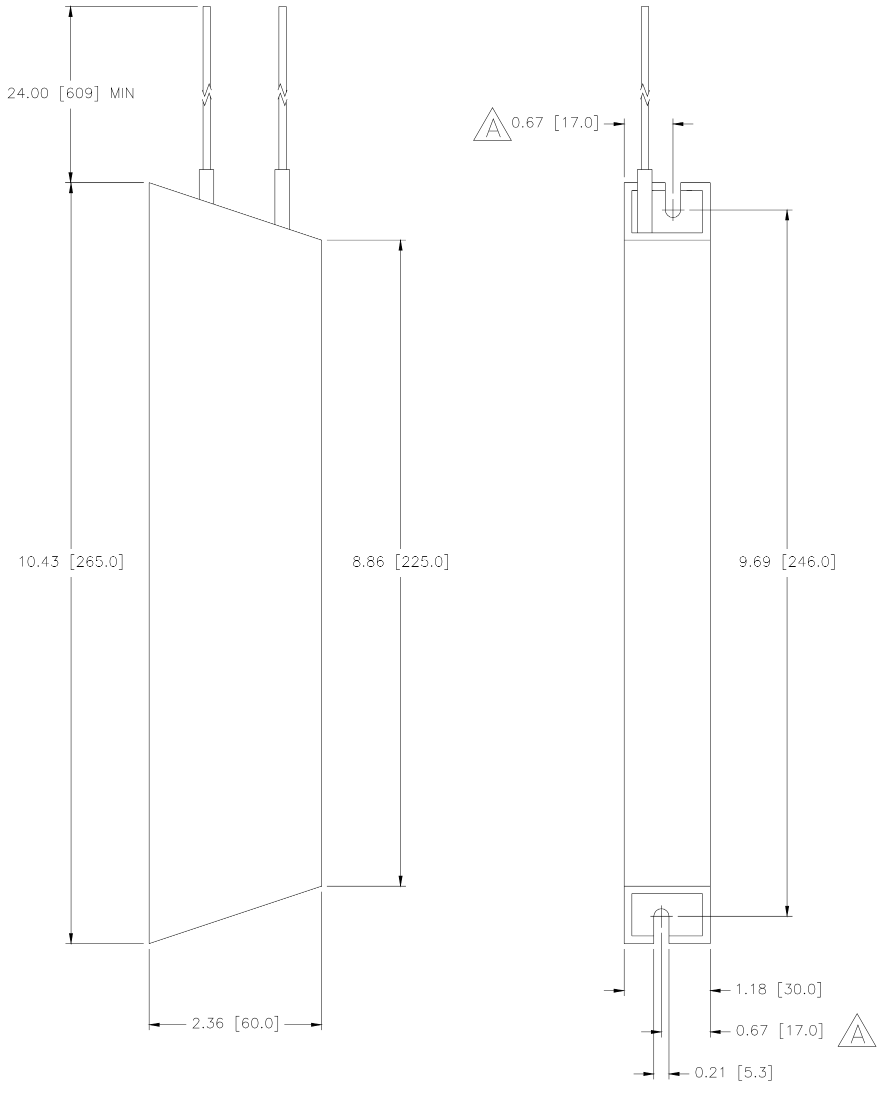
NOTES:

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.

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

SPECIFICATIONS	
RESISTANCE:	20 Ohms
CONTINUOUS POWER:	400 Watts
MAXIMUM VOLTAGE:	425 VDC
MAXIMUM PULSE CURRENT:	22 A
MAXIMUM RMS CURRENT:	4.5 A
DUTY CYCLE	15 %



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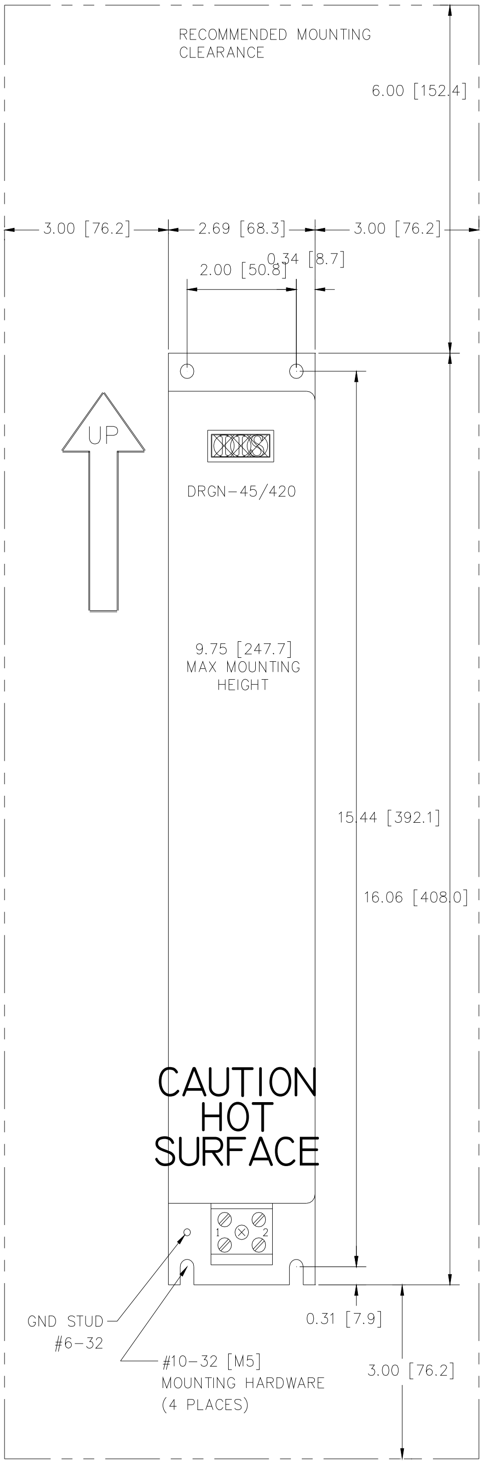
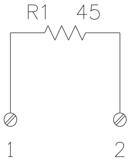
TITLE	REGEN RESISTOR
DRAWING NUMBER	DRGN-20/400

DIMENSIONS ARE INCHES [mm]	TOLERANCES X.XX± 0.01	X.XXX± 0.005	∠ ± 5°	REV A		ECN 01-259	DATE 28JUN01	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%





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TITLE

REGEN RESISTIOR

DRAWING NUMBER

DRGN-45/420

DIMENSIONS ARE INCHES [mm]

TOLERANCES X.XX± .02 [0.5] X.XXX± --

∠ ± 5°

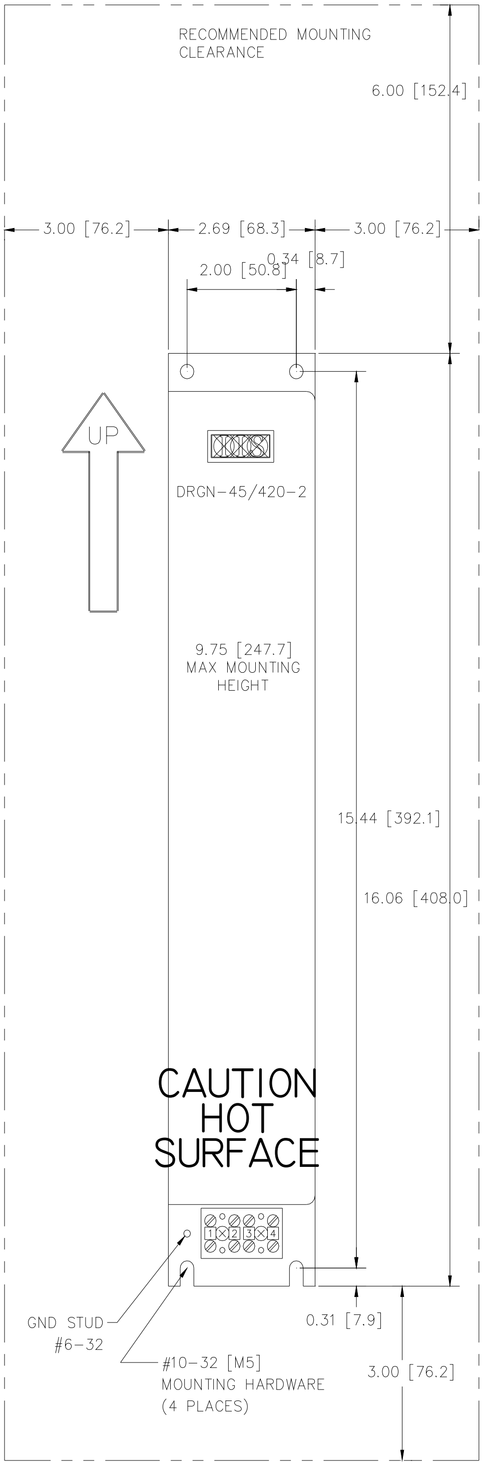
REV B

ECN 96-269

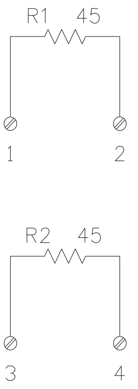
DATE 6/25/96

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%



SCHEMATIC



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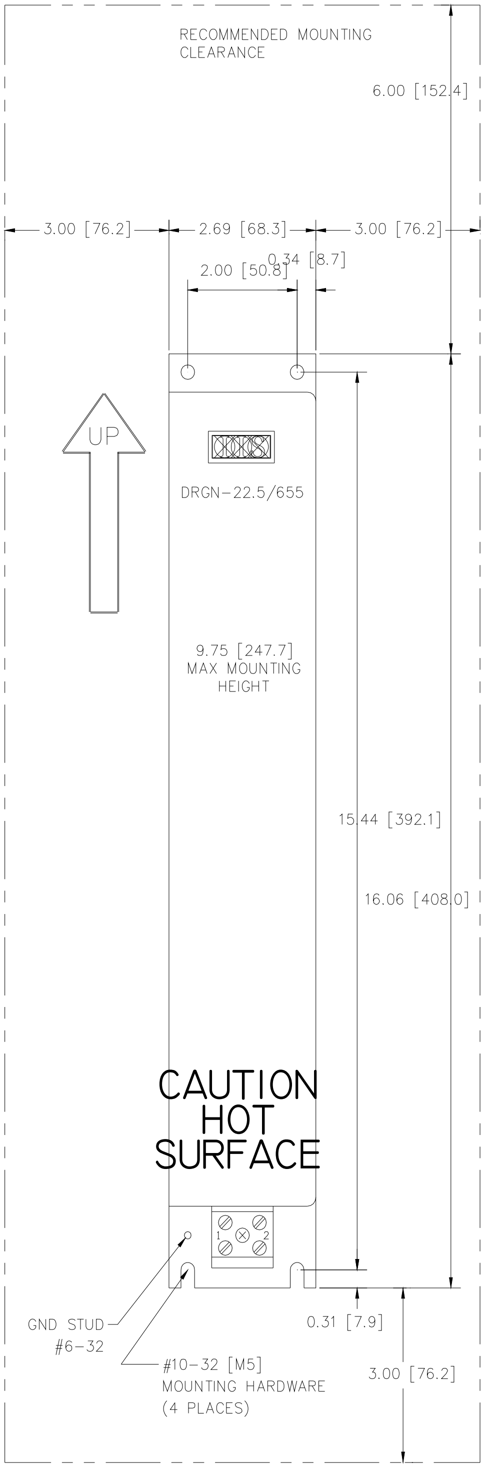
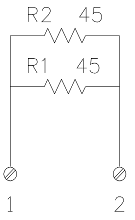
TITLE
REGEN RESISTIOR

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

SPECIFICATIONS	
RESISTANCE:	22.5 Ohms
CONTINUOUS POWER:	655 Watts
MAXIMUM VOLTAGE:	425 VDC
MAXIMUM PULSE CURRENT:	18.9 A
MAXIMUM RMS CURRENT:	5.4 A
DUTY CYCLE:	15%





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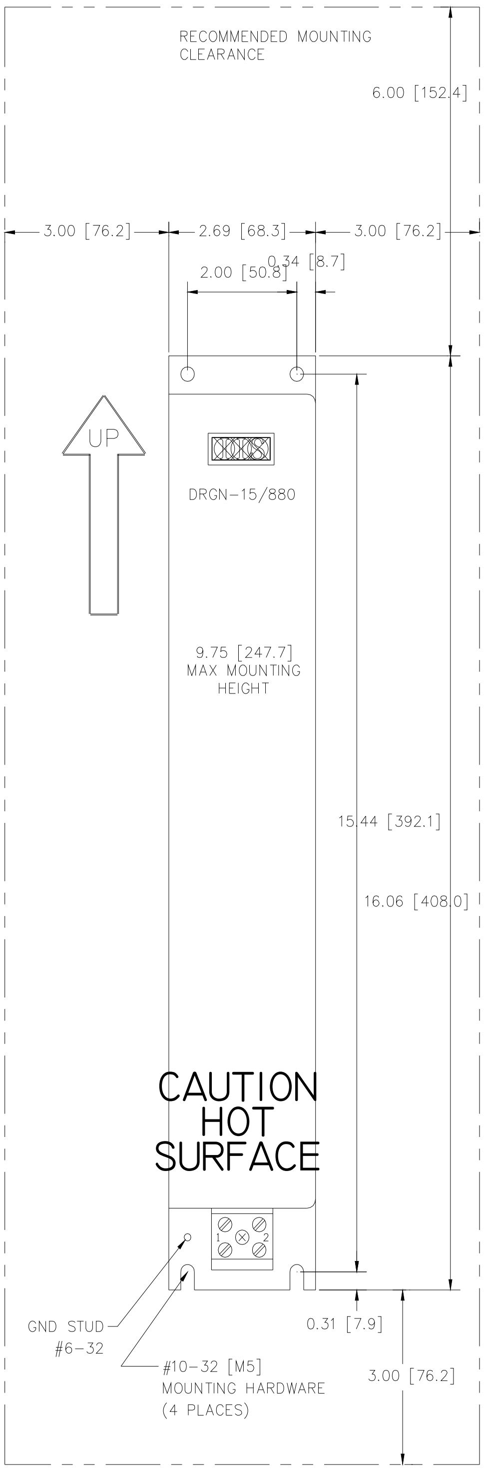
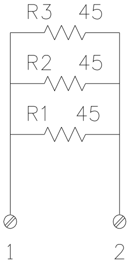
TITLE
REGEN RESISTIOR

DRAWING NUMBER
DRGN-22.5/655

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:	15 Ohms
CONTINUOUS POWER:	880 Watts
MAXIMUM VOLTAGE:	425 VDC
MAXIMUM PULSE CURRENT:	28.4 A
MAXIMUM RMS CURRENT:	7.6 A
DUTY CYCLE	15%





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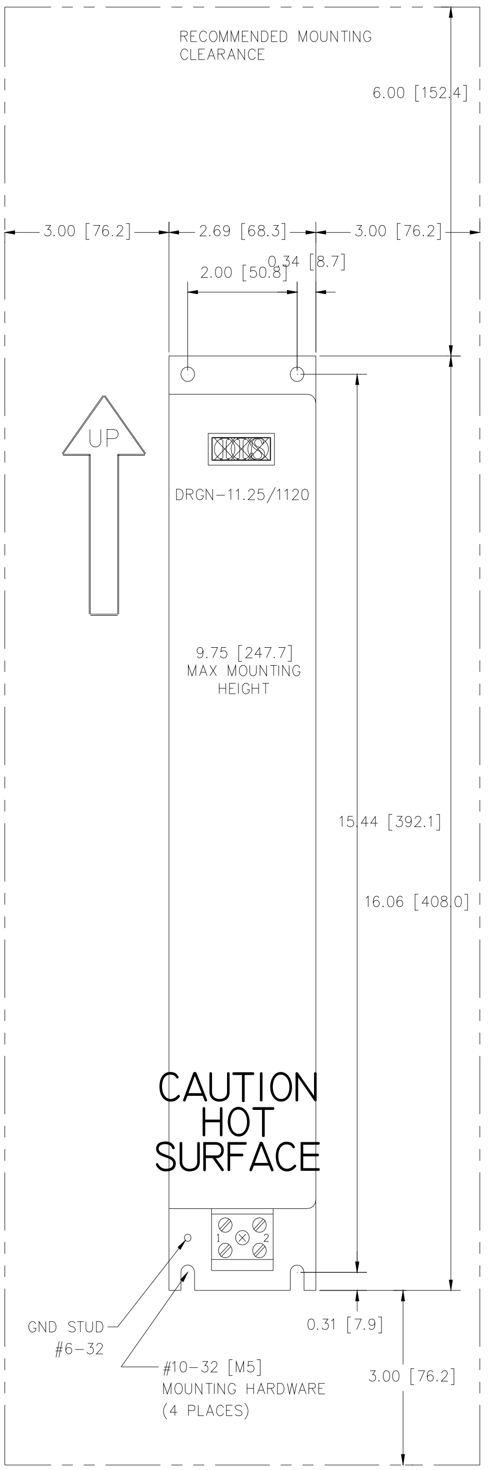
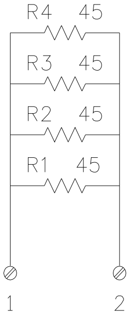
TITLE
REGEN RESISTIOR

DRAWING NUMBER
DRGN-15/880

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:	11.25 Ohms
CONTINUOUS POWER:	1120 Watts
MAXIMUM VOLTAGE:	425 VDC
MAXIMUM PULSE CURRENT:	38.7 A
MAXIMUM RMS CURRENT:	10 A
DUTY CYCLE	15%





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TITLE

REGEN RESISTIOR

DRAWING NUMBER

DRGN-11.25/1120

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

SECTION 8 - DYNAMIC BRAKES

The Delta driver is equipped with special circuitry and software to sequence a dynamic braking relay connected across the motor windings. It is very important for proper operation that the dynamic breaking relay contacts be open before the driver circuitry is turned on and that the driver is off before the dynamic braking relay contacts close. The driver in conjunction with external braking relays provide the proper sequencing to prevent driver damage.

If dynamic braking is not used, tie the BRAKE CONFIRM input ON for the DSD-1.5 through DSD-17.5 driver sizes. For DSD-35 and larger drivers, a jumper must be provided between B11 and B12. A B11 to B12 jumper is installed by the factory and must be removed if dynamic braking is to be used.

Parameter UP-16 should be set to the default value of 0 for dynamic braking or no brake connections.

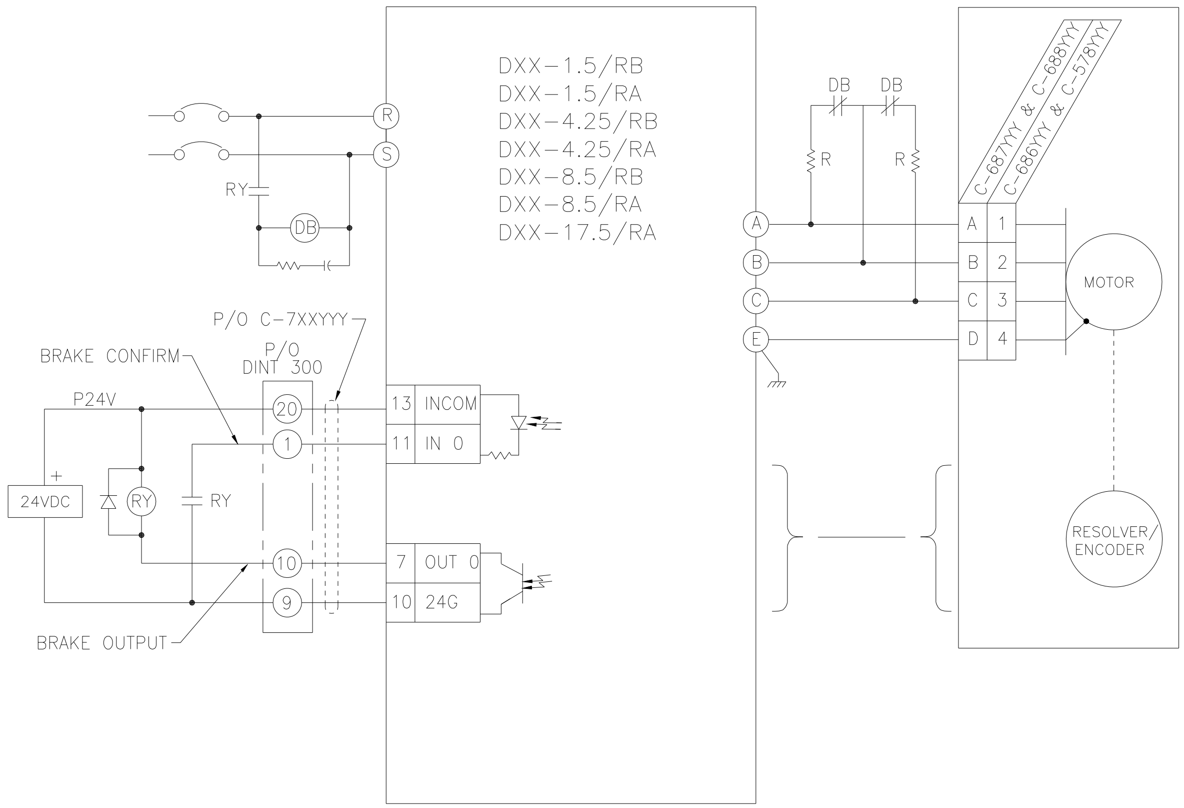
Be sure to select a dynamic braking resistor with a sufficient peak power rating.

$$\text{Resistor Peak Power} = \frac{150 * V^2}{R}$$

Where V = maximum motor voltage when dynamic braking is applied.

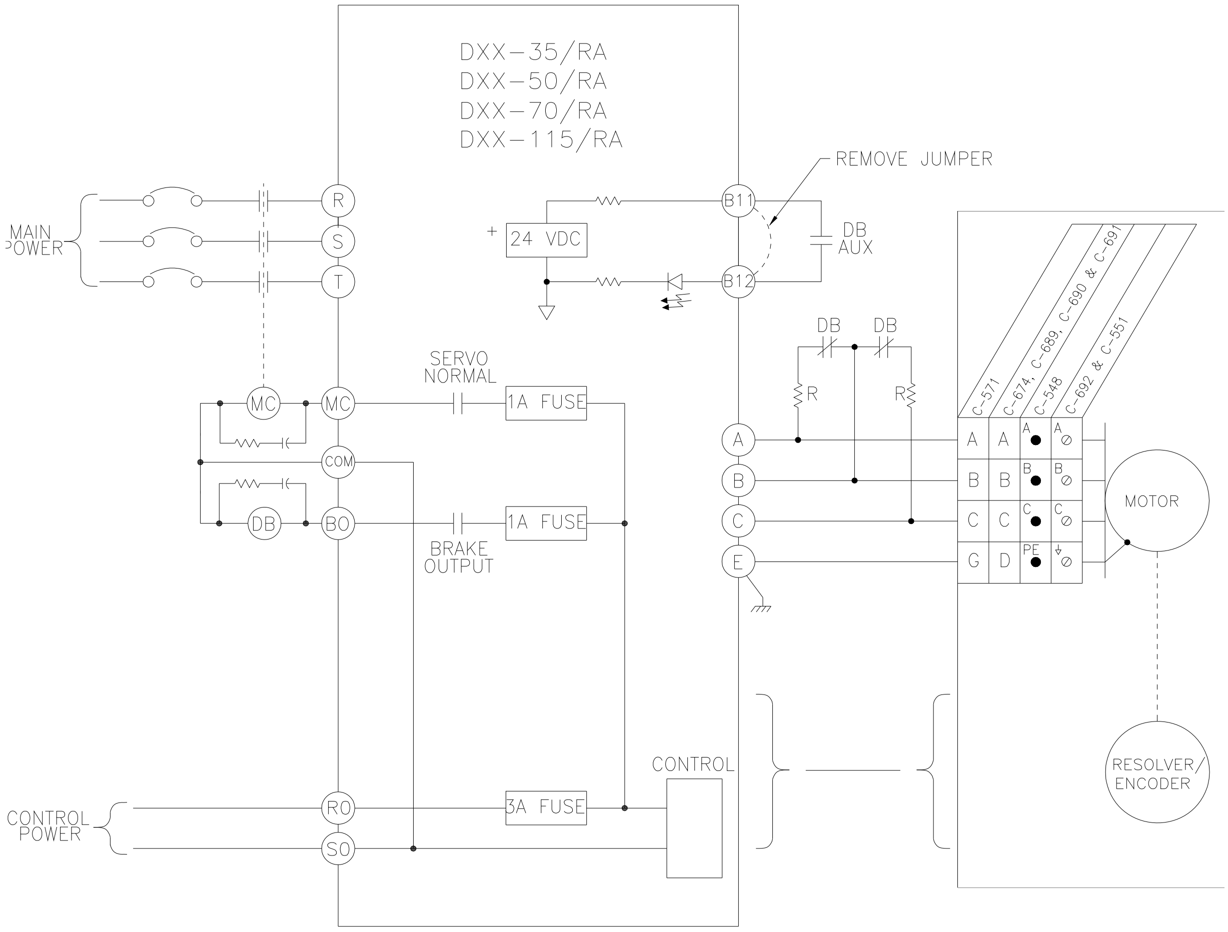
General rule: V = 300 * (motor speed @ braking) / (motor maximum speed rating)

Figures 8.1 and 8.2 show the connections for dynamic braking.



DRIVER	DB COIL	DB N.C. CONTACT	DB AUX N.O. CONTACT	RY COIL	RY CONTACT	MINIMUM RESISTOR VALUE R
DXX−1.5/RB	115 VAC	1.5 A RMS	24 VDC @ 8 MA	24 VDC 40 MA	115 VAC 1 A RMS	60 OHMS
DXX−1.5/RA	220 VAC	1.5 A RMS	24 VDC @ 8 MA	24 VDC 40 MA	220 VAC 0.5 A RMS	60 OHMS
DXX−4.25/RB	115 VAC	4.25 A RMS	24 VDC @ 8 MA	24 VDC 40 MA	115 VAC 1 A RMS	30 OHMS
DXX−4.25/RA	220 VAC	4.25 A RMS	24 VDC @ 8 MA	24 VDC 40 MA	115 VAC 1 A RMS	30 OHMS
DXX−8.5/RB	115 VAC	8.5 A RMS	24 VDC @ 8 MA	24 VDC 40 MA	220 VAC 0.5 A RMS	15 OHMS
DXX−8.5/RA	220 VAC	8.5 A RMS	24 VDC @ 8 MA	24 VDC 40 MA	220 VAC 0.5 A RMS	15 OHMS
DXX−17.5/RA	220 VAC	17.5 A RMS	24 VDC @ 8 MA	24 VDC 40 MA	220 VAC 0.5 A RMS	8 OHMS

Figure 8.1 - Dynamic Brake Connection for the DSD-1.5 Through DSD-17.5 Drivers



DRIVER	DB COIL	DB N.C. CONTACT	DB AUX N.O. CONTACT	MINIMUM RESISTOR VALUE R
DXX-35/RA	220 VAC	35 A RMS	24 VDC @ 25 MA	4 OHMS
DXX-50/RA	220 VAC	50 A RMS	24 VDC @ 25 MA	3 OHMS
DXX-70/RA	220 VAC	70 A RMS	24 VDC @ 25 MA	2 OHMS
DXX-115/RA	220 VAC	115 A RMS	24 VDC @ 25 MA	1 OHMS

Figure 8.2 - Dynamic Brake Connection for the DSD-35 Through DSD-115 Drivers

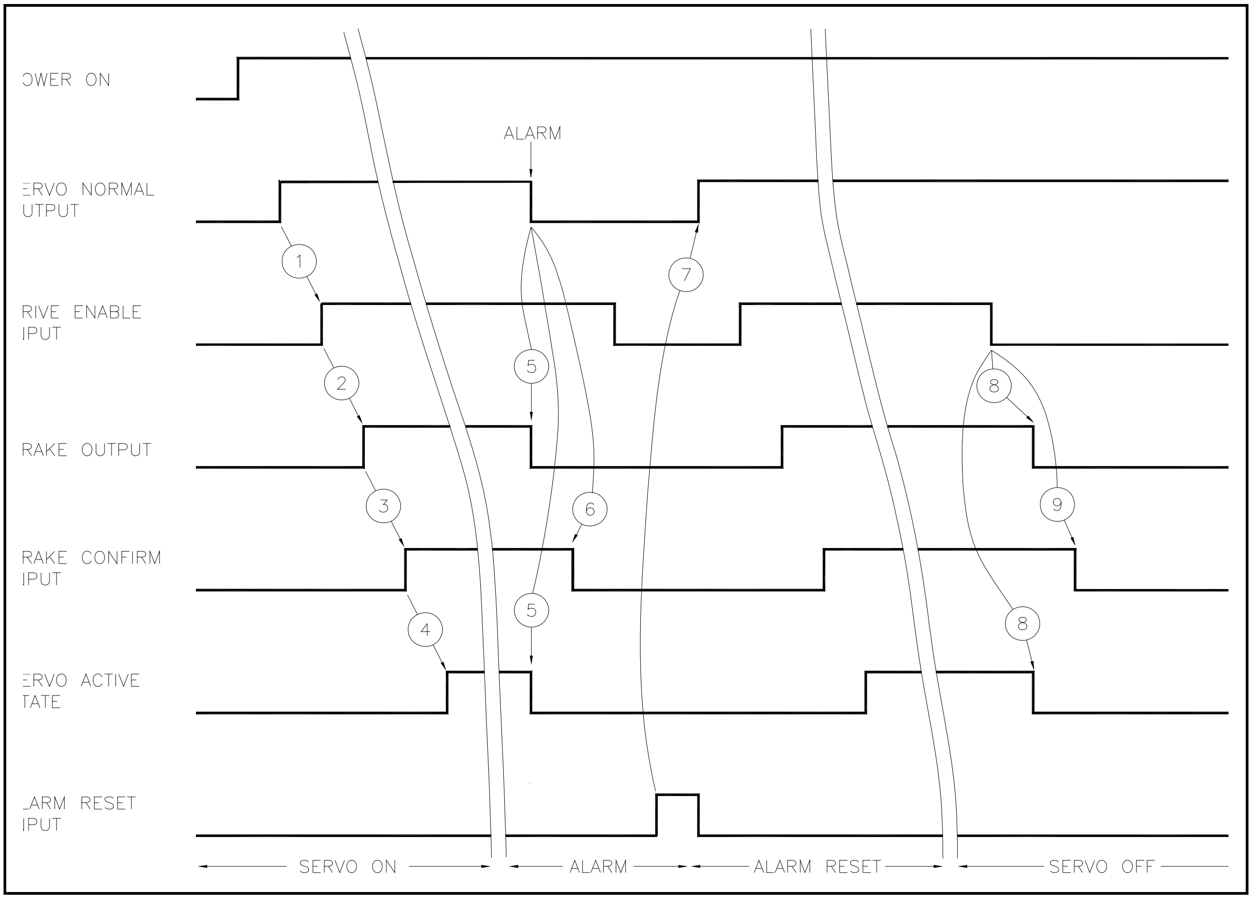


Figure 8.3 - Dynamic Braking Control Signals

1. DRIVE ENABLE may be turned ON within 0.6 seconds of SERVO NORMAL.
2. BRAKE turns on within 800usec. of DRIVE ENABLE.
3. BRAKE CONFIRM must be returned within 100ms. or AL-14 will be generated.
4. The servo will become active within 800usec of sensing BRAKE CONFIRM.
5. When an alarm is sensed, the SERVO NORMAL and BRAKE outputs are turned OFF. The DRIVE ENABLE must be turned OFF before alarm clearing can be accomplished.
6. The BRAKE CONFIRM turns OFF indicating the braking relay has toggled and dynamic braking is engaged.
7. ALARM RESET causes driver to check for clearing of the alarm condition and if all alarm states are clear the SERVO NORMAL will turn ON within 30 ms. ALARM RESET should be turned OFF before DRIVE ENABLE is turned ON.
8. The servo becomes inactive and the BRAKE output turns OFF within 800usec of DRIVE ENABLE being turned OFF.
9. The BRAKE CONFIRM turns OFF indicating the braking relay has toggled and dynamic braking is engaged.

SECTION 9 - MECHANICAL BRAKES

The Delta driver is equipped with special circuitry and software to sequence an electrically released mechanical brake. The full line of Delta motors are available with mechanical brakes to provide mechanical fail safe braking in the case of power loss and driver disable.

It is very important for proper operation to sequence the driver servo lock and mechanical brake to avoid loss of holding torque during the transition. The driver in conjunction with an external relay and brake power supply provide for the optimum sequencing to prevent loss of holding torque or driver damage.

9.1 NO MECHANICAL BRAKING

If a mechanical brake is not used, tie BRAKE CONFIRM input ON for the DSD-1.5 through DSD-17.5 driver sizes. For the DSD-35 and larger drivers, a jumper must be provided between B11 and B12. The factory installs a B11 to B12 jumper.

Set UP-16 to the default value of 0.

9.2 MECHANICAL BRAKING WITH HARD DECEL

The driver sequencing can be set to apply the mechanical brake immediately upon driver disable. Since the mechanical brake is applied immediately upon driver disable the deceleration of the motor will be abrupt and limited only by the brake torque and mechanical system.

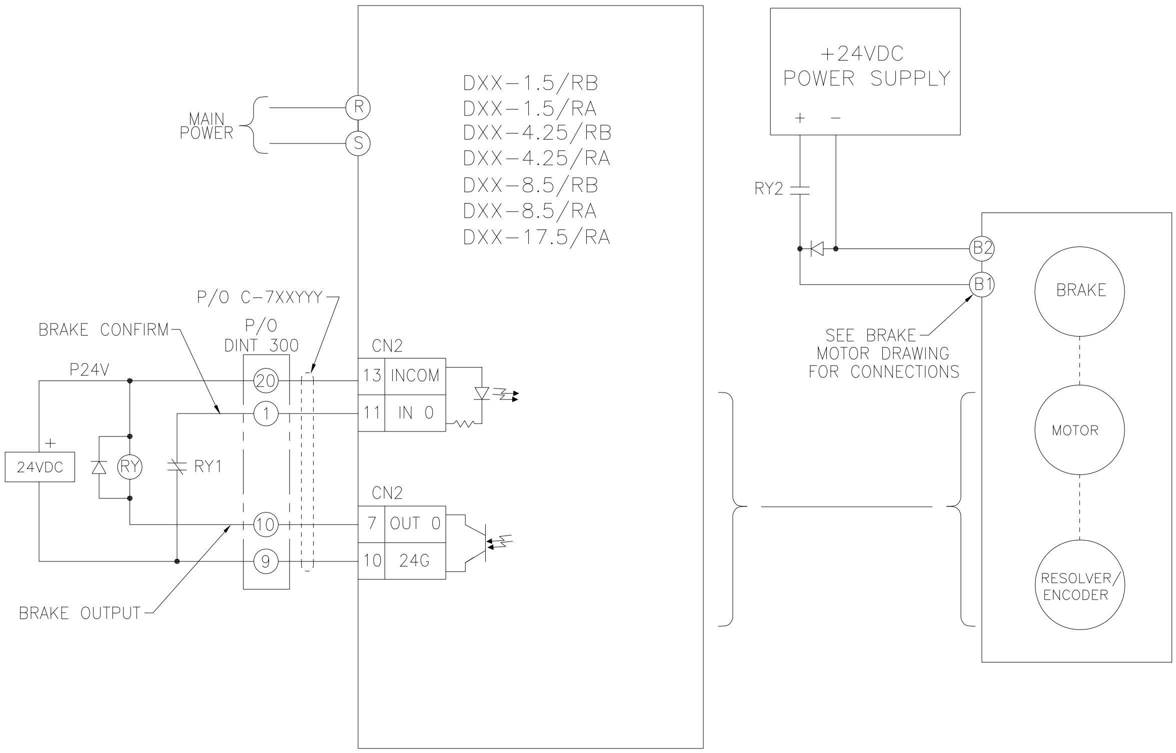
Connect the braking relay and power supply as shown in **Figures 9.1 or 9.2** and set UP-16 to a value of 02. The sequencing will be as shown in **Figure 9.3**.

9.3 MECHANICAL BRAKING WITH SOFT DECEL

The driver sequencing can be set to apply the mechanical brake after the driver has reduced the motor speed to a programmable set point. The decel rate is set by UP-13 and the speed set point at which the brake is applied is set by UP-28.

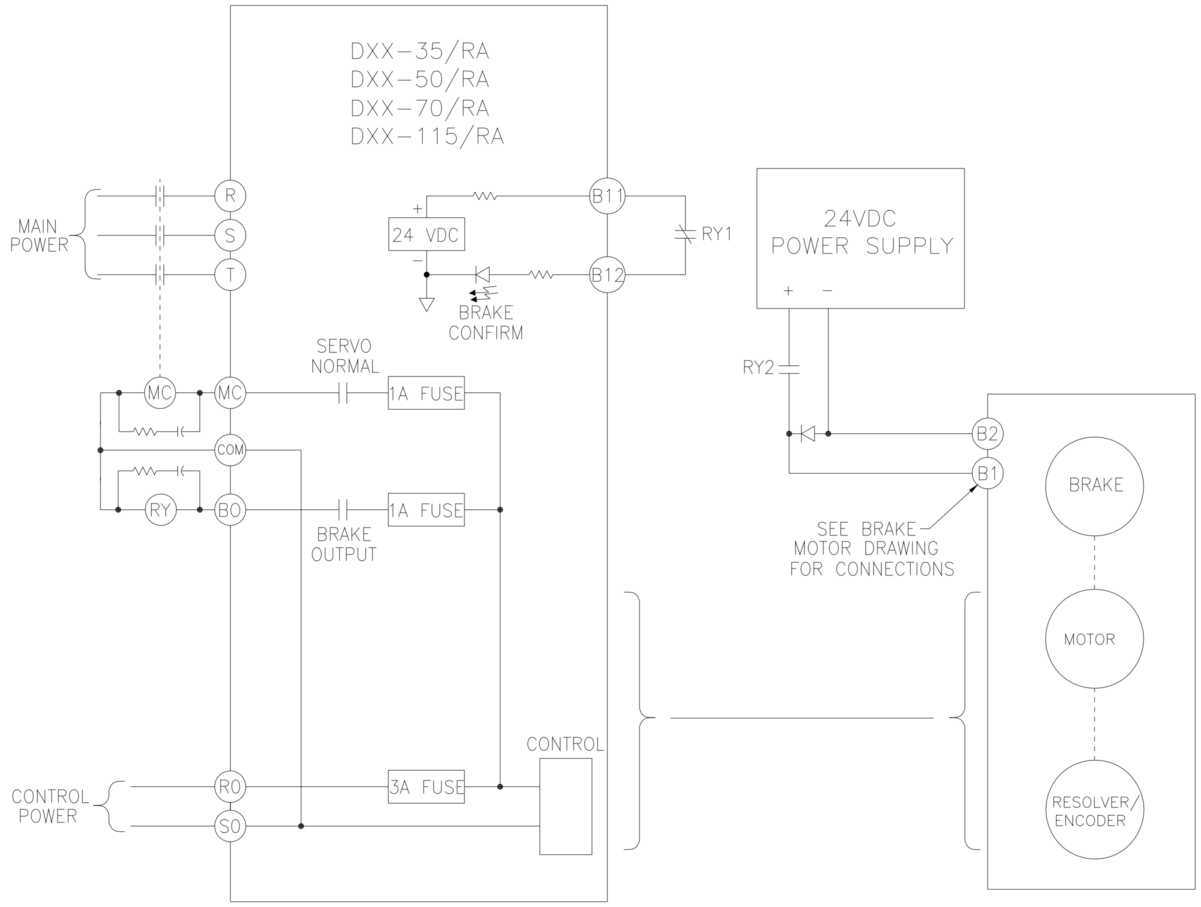
The mechanical brake is applied immediately upon driver alarm or loss of power.

Connect the braking relay and power supply as shown in **Figures 9.1 or 9.2** and set UP-16 to a value of 01. The sequencing will be as shown in **Figure 9.4**.



DRIVER	RY COIL	CONTACT RY1	CONTACT RY2	POWER SUPPLY
DXX−1.5/RB	24 VDC @ 40 ma MAX	24 VDC @ 8 ma	24 VDC @ 1 A	DMBPS−115/24
DXX−1.5/RA	24 VDC @ 40 ma MAX	24 VDC @ 8 ma	24 VDC @ 1 A	DMBPS−220/24
DXX−4.25/RB	24 VDC @ 40 ma MAX	24 VDC @ 8 ma	24 VDC @ 1 A	DMBPS−115/24
DXX−4.25/RA	24 VDC @ 40 ma MAX	24 VDC @ 8 ma	24 VDC @ 1 A	DMBPS−220/24
DXX−8.5/RB	24 VDC @ 40 ma MAX	24 VDC @ 8 ma	24 VDC @ 1 A	DMBPS−115/24
DXX−8.5/RA	24 VDC @ 40 ma MAX	24 VDC @ 8 ma	24 VDC @ 1 A	DMBPS−220/24
DXX−17.5/RA	24 VDC @ 40 ma MAX	24 VDC @ 8 ma	24 VDC @ 1 A	DMBPS−220/24

Figure 9.1 - Mechanical Brake Connection for the DSD-1.5 Through DSD-17.5 Drivers



DRIVER	RY COIL	CONTACT RY1	CONTACT RY2	POWER SUPPLY
DXX-35/RA	220 VAC @ 0.2 ARMS MAX	24 VDC @ 25 ma	24 VDC @ 1 A	DMBPS-220/220
DXX-50/RA	220 VAC @ 0.2 ARMS MAX	24 VDC @ 25 ma	24 VDC @ 1 A	DMBPS-220/220
DXX-70/RA	220 VAC @ 0.2 ARMS MAX	24 VDC @ 25 ma	24 VDC @ 1 A	DMBPS-220/220
DXX-115/RA	220 VAC @ 0.2 ARMS MAX	24 VDC @ 25 ma	24 VDC @ 1.5 A	DMBPS-220/220

Figure 9.2 - Mechanical Brake Connection for the DSD-35 Through DSD-115 Drivers

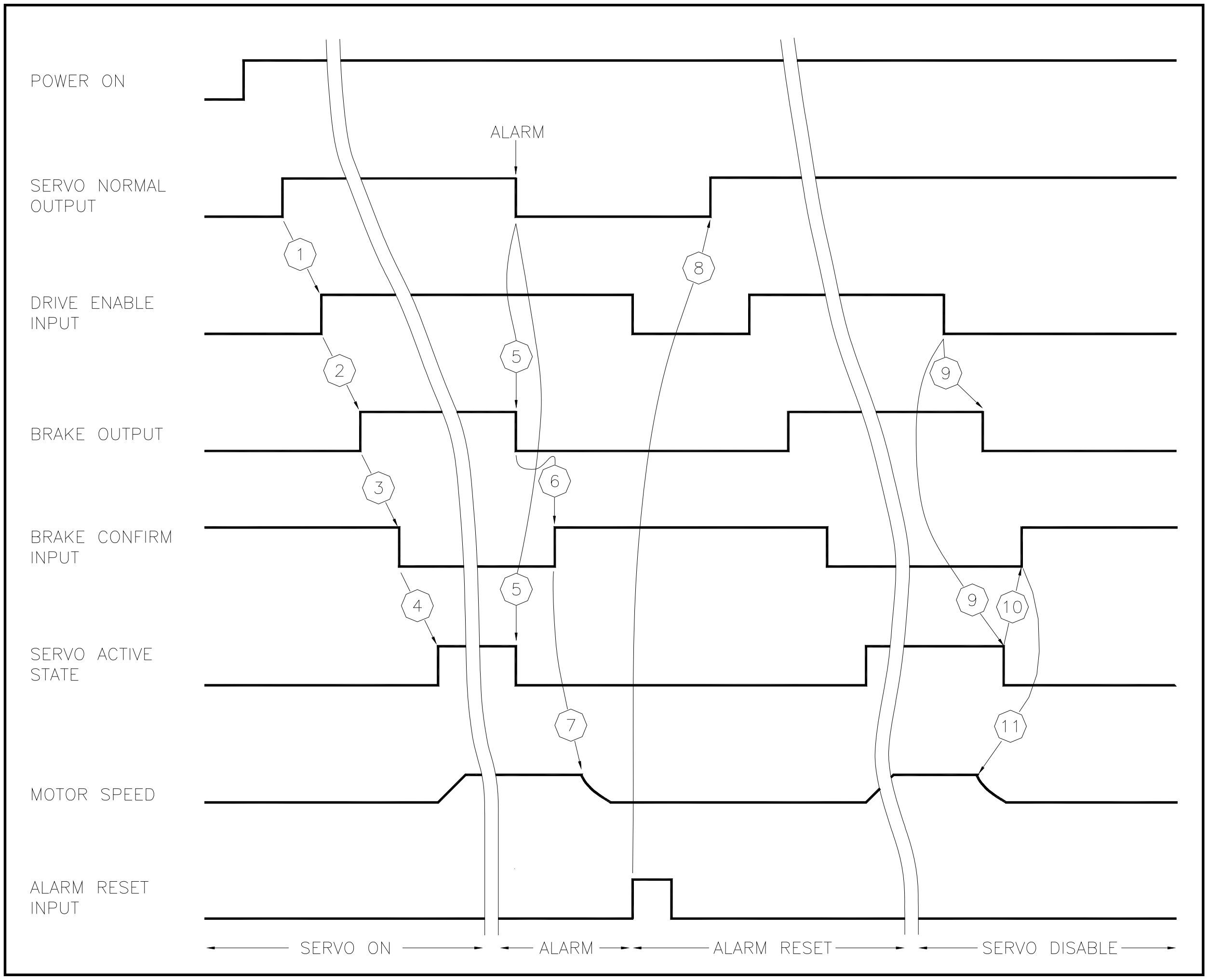


Figure 9.3 - Mechanical Brake Sequencing for Hard Decel

1. DRIVE ENABLE may be turned ON within 0.6 seconds of SERVO NORMAL.
2. BRAKE turns on within 800usec. of DRIVE ENABLE.
3. BRAKE CONFIRM must be returned within 100ms or AL-14 will be generated.
4. The servo will become active within 800usec of sensing BRAKE CONFIRM.
5. When an alarm is sensed, the SERVO NORMAL and BRAKE outputs are turned OFF and the servo becomes inactive.
6. The BRAKE CONFIRM turns ON indicating the braking relay has toggled.
7. The mechanical brake engages after a delay in the braking mechanism.
8. The DRIVE ENABLE must be turned OFF before alarm clearing can be accomplished. ALARM RESET causes driver to check for clearing of the alarm condition and if all alarm states are clear the SERVO NORMAL will turn ON within 30 ms. ALARM RESET should be turned OFF before DRIVE ENABLE is turned ON.
9. The servo applies maximum braking torque until the motor speed falls below UP-28. Then the brake output turns off. The servo goes inactive 200 ms later.
10. The BRAKE CONFIRM turns ON indicating the braking relay has toggled.
11. The mechanical brake engages after a delay in the braking mechanism.

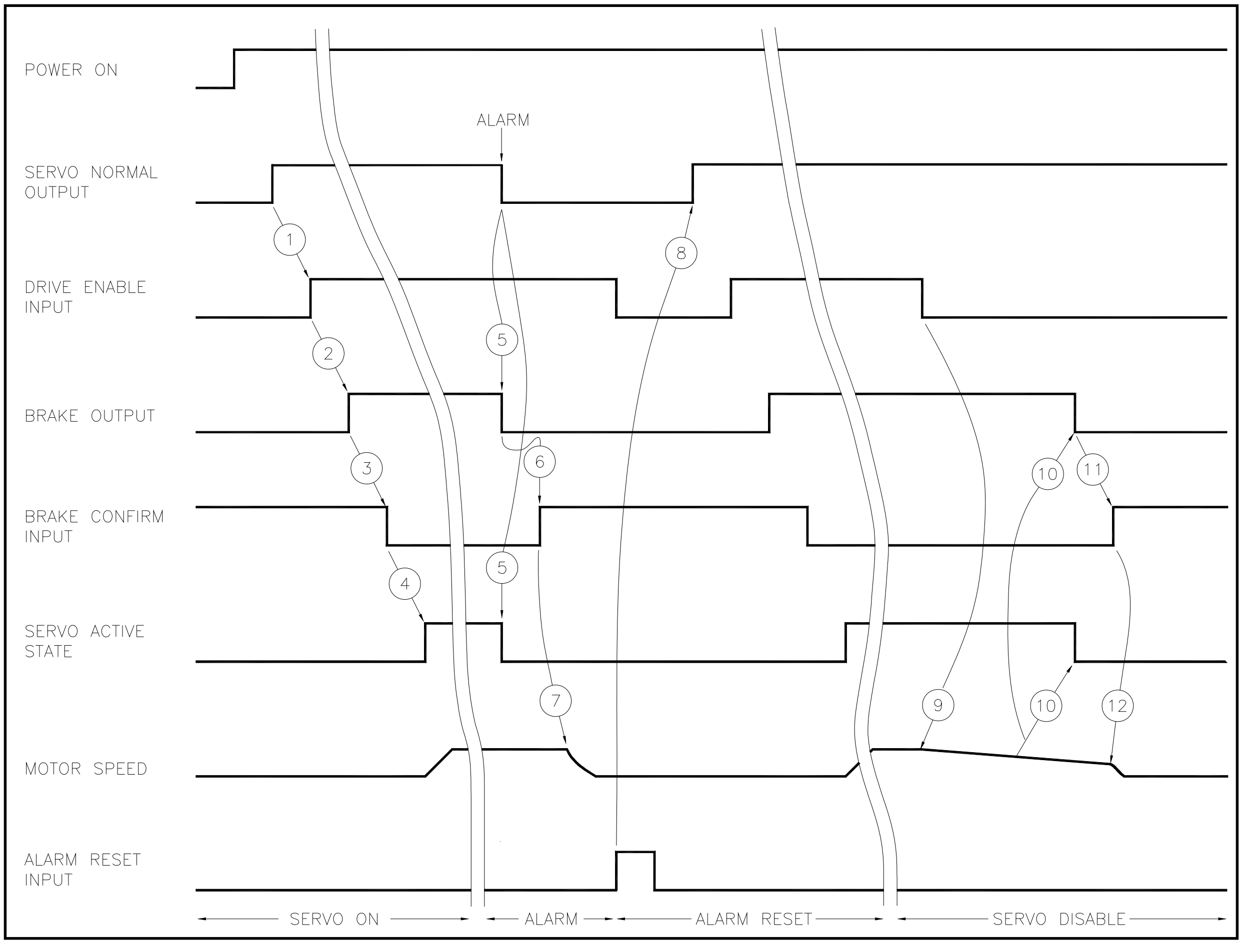


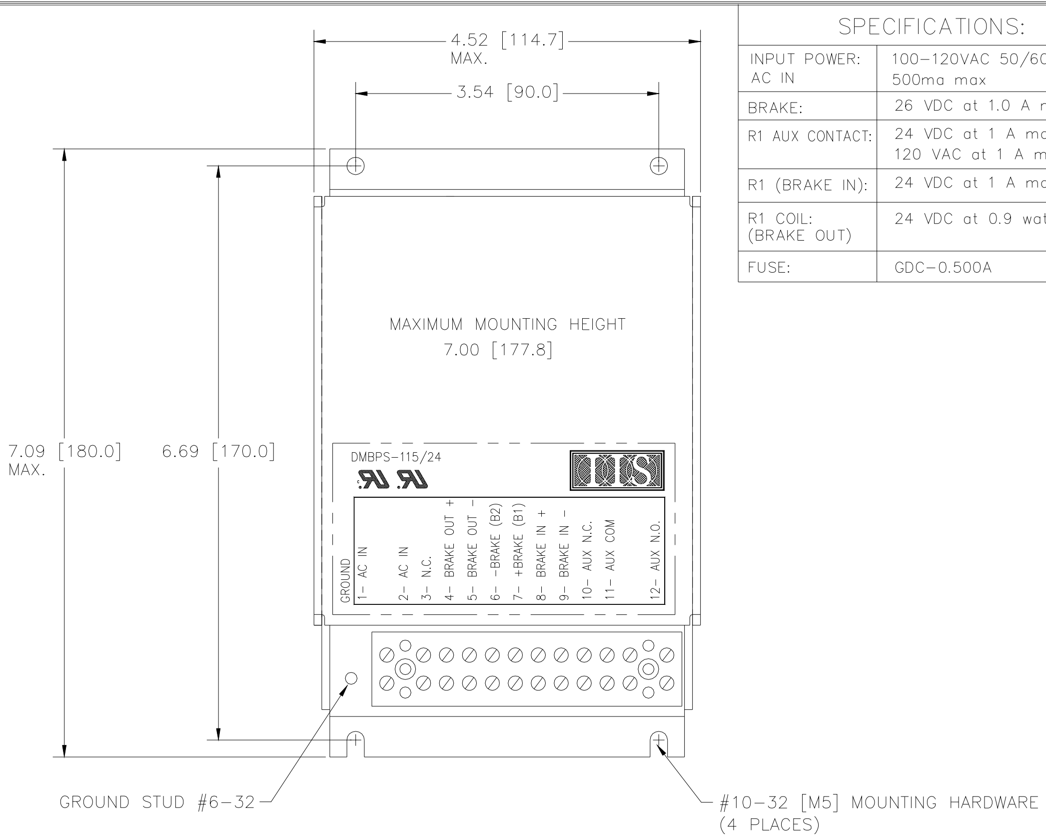
Figure 9.4 - Mechanical Brake Sequencing for Soft Decel

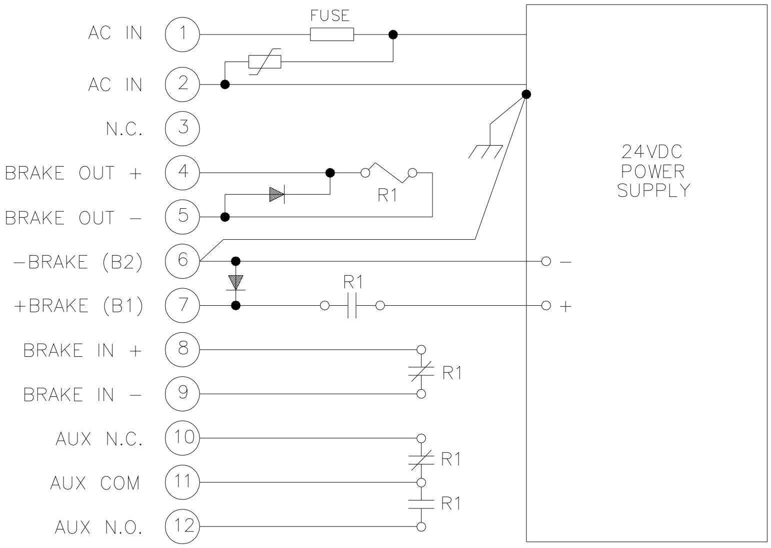
1. DRIVE ENABLE may be turned ON within 0.6 seconds of SERVO NORMAL.
2. BRAKE turns on within 800usec. of DRIVE ENABLE.
3. BRAKE CONFIRM must be returned within 100ms or AL-14 will be generated.
4. The servo will become active within 800usec of sensing BRAKE CONFIRM.
5. When an alarm is sensed, the SERVO NORMAL and BRAKE outputs are turned OFF and the servo becomes inactive.
6. The BRAKE CONFIRM turns ON indicating the braking relay has toggled.
7. The mechanical brake engages after a delay in the braking mechanism.
8. The DRIVE ENABLE must be turned OFF before alarm clearing can be accomplished. ALARM RESET causes driver to check for clearing of the alarm condition and if all alarm states are clear the SERVO NORMAL will turn ON within 30 ms. ALARM RESET should be turned OFF before DRIVE ENABLE is turned ON.
9. The servo starts to decelerate within 800usec of DRIVE ENABLE being turned OFF. Decel rate is specified in UP-13 and UP-14.
10. The servo becomes inactive and the BRAKE output turns OFF within 800usec of the motor speed dropping below the set point in UP-28.
11. The BRAKE CONFIRM turns ON indicating the braking relay has toggled.
12. The mechanical brake engages after a delay in the braking mechanism.

9.4 MECHANICAL BRAKE POWER SUPPLY

DRAWING NUMBER	DESCRIPTION
DMBPS-115/24	Mechanical Brake Power Supply
DMBPS-220/24	Mechanical Brake Power Supply
DMBPS-220/220	Mechanical Brake Power Supply

SPECIFICATIONS:	
INPUT POWER: AC IN	100–120VAC 50/60Hz 500ma max
BRAKE:	26 VDC at 1.0 A max.
R1 AUX CONTACT:	24 VDC at 1 A max./ 120 VAC at 1 A max.
R1 (BRAKE IN):	24 VDC at 1 A max.
R1 COIL: (BRAKE OUT)	24 VDC at 0.9 watts
FUSE:	GDC–0.500A





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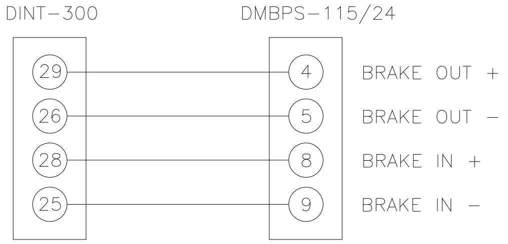
TITLE
MECHANICAL BRAKE POWER SUPPLY

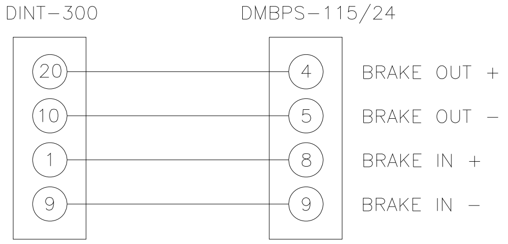
DRAWING NUMBER
DMBPS–115/24

DIMENSIONS ARE INCHES [mm]	TOLERANCES X.XX± 0.02	X.XXX± – – –	∠ ± – –	REV F		ECN 00–399	DATE 00–339	SH. 1 OF 2

FOR DELTAMAX AND DELTAPRO SOURCING I/O CONTROLLERS WITH DSD-8.5 AND DSD-17.5 DRIVES:



FOR DELTA DSD-8.5 AND DSD-17.5 DRIVES:



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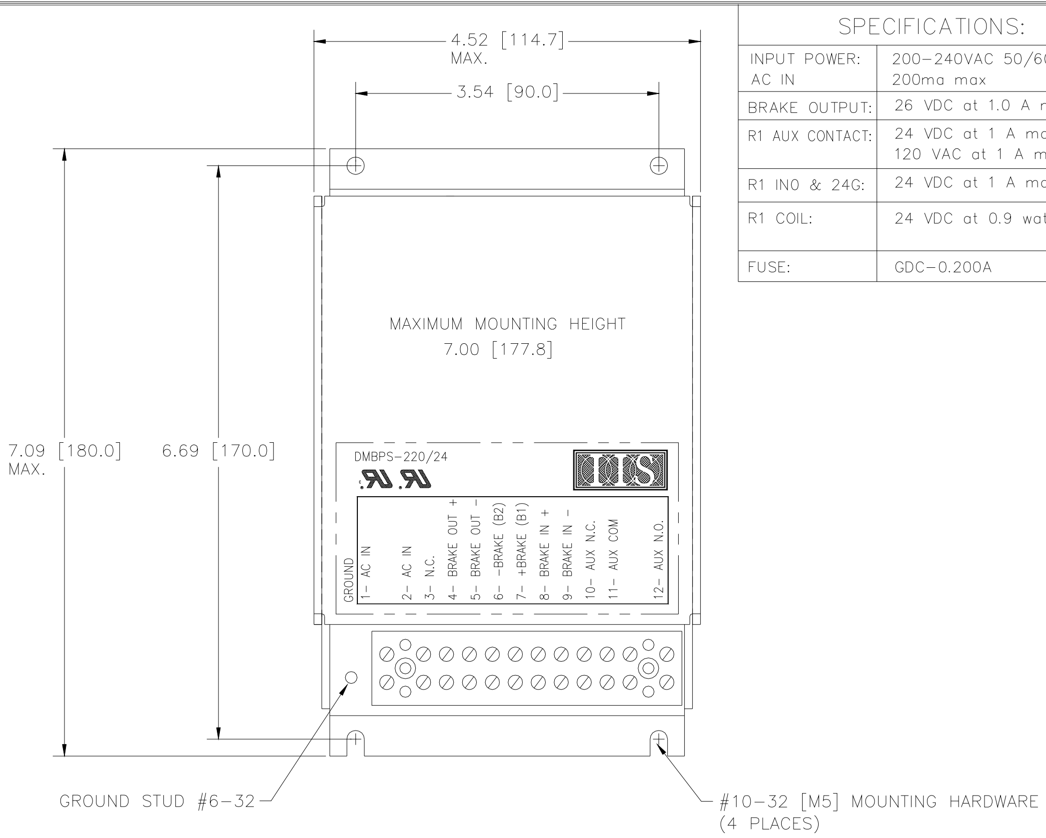
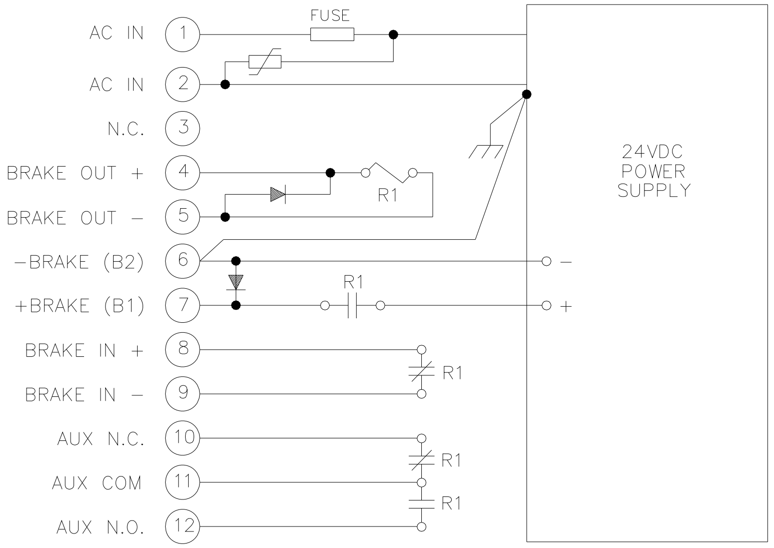
TITLE
MECHANICAL BRAKE POWER SUPPLY

DRAWING NUMBER
DMBPS-115/24

DIMENSIONS ARE INCHES [mm] | TOLERANCES X.XX± 0.02 X.XXX± -- ∠ ± -- | REV F | ECN 00-399 | DATE 00-399 | SH. 2 OF 2



SPECIFICATIONS:	
INPUT POWER: AC IN	200-240VAC 50/60Hz 200ma max
BRAKE OUTPUT:	26 VDC at 1.0 A max.
R1 AUX CONTACT:	24 VDC at 1 A max./ 120 VAC at 1 A max.
R1 INO & 24G:	24 VDC at 1 A max.
R1 COIL:	24 VDC at 0.9 watts
FUSE:	GDC-0.200A



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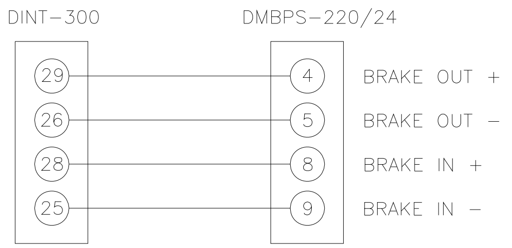
TITLE
MECHANICAL BRAKE POWER SUPPLY

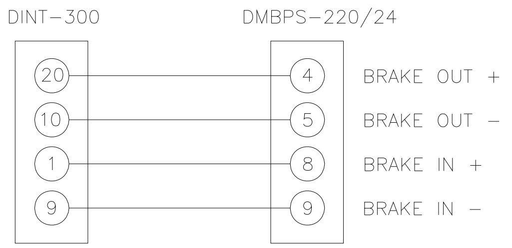
DRAWING NUMBER
DMBPS-220/24

DIMENSIONS ARE INCHES [mm] | TOLERANCES X.XX±0.02 | X.XXX± -- | ∠ ± -- | REV J | ECN 02-186 | DATE 19JUN96 | SH. 1 OF 2

FOR DELTAMAX AND DELTAPRO SOURCING I/O CONTROLLERS WITH DSD-8.5 AND DSD-17.5 DRIVES:



FOR DELTA DSD-8.5 AND DSD-17.5 DRIVES:



INDUSTRIAL INDEXING SYSTEMS, Inc.
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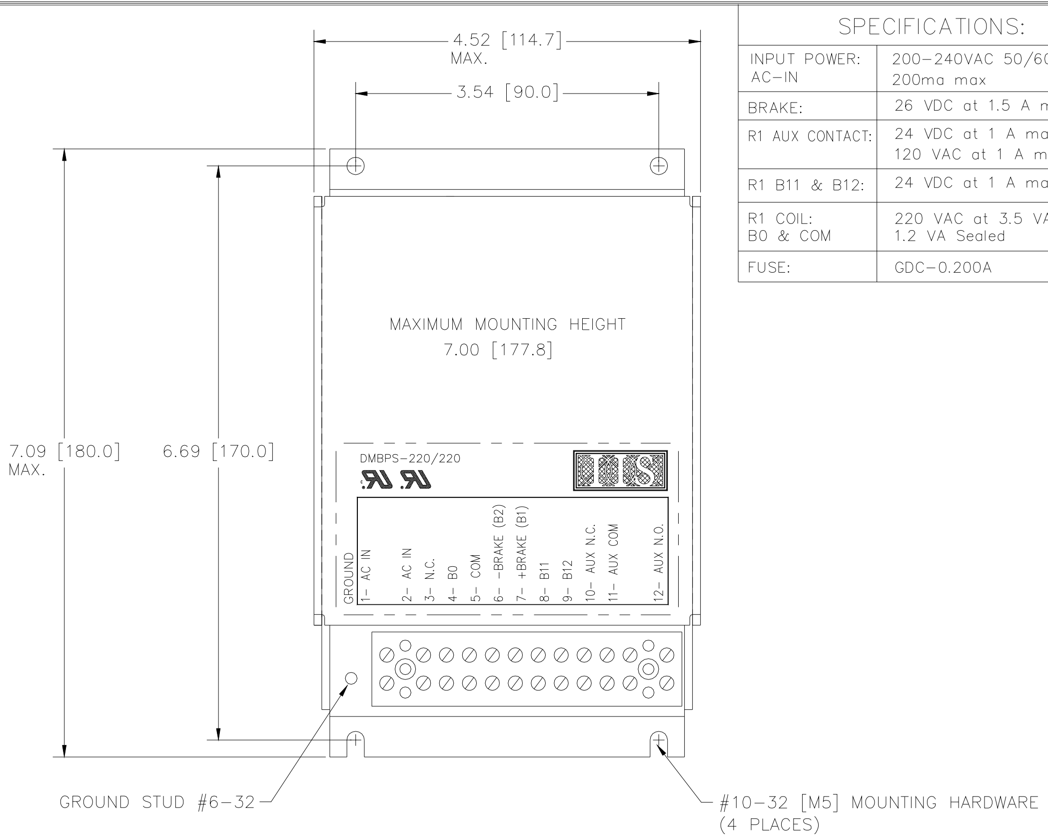
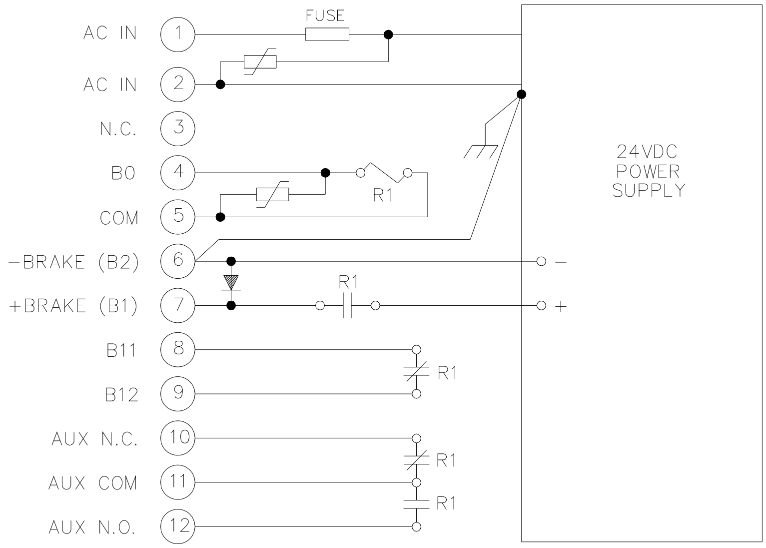
TITLE
MECHANICAL BRAKE POWER SUPPLY

DRAWING NUMBER
DMBPS-220/24

DIMENSIONS ARE INCHES [mm]
TOLERANCES X.XX± 0.02 X.XXX± --
∠ ± --
REV J
ECN 02-186
DATE 19JUN96
SH. 2 OF 2

SPECIFICATIONS:	
INPUT POWER: AC-IN	200-240VAC 50/60Hz 200ma max
BRAKE:	26 VDC at 1.5 A max.
R1 AUX CONTACT:	24 VDC at 1 A max./ 120 VAC at 1 A max.
R1 B11 & B12:	24 VDC at 1 A max.
R1 COIL: B0 & COM	220 VAC at 3.5 VA Inrush 1.2 VA Sealed
FUSE:	GDC-0.200A





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

TITLE
MECHANICAL BRAKE POWER SUPPLY

DRAWING NUMBER
DMBPS-220/220

DIMENSIONS ARE INCHES [mm]	TOLERANCES X.XX±0.02 X.XXX± --- ∠ ± --	REV H		ECN 00-399	DATE 19JUN96	SH.	1 OF 1

SECTION 10 - ALARM CODES

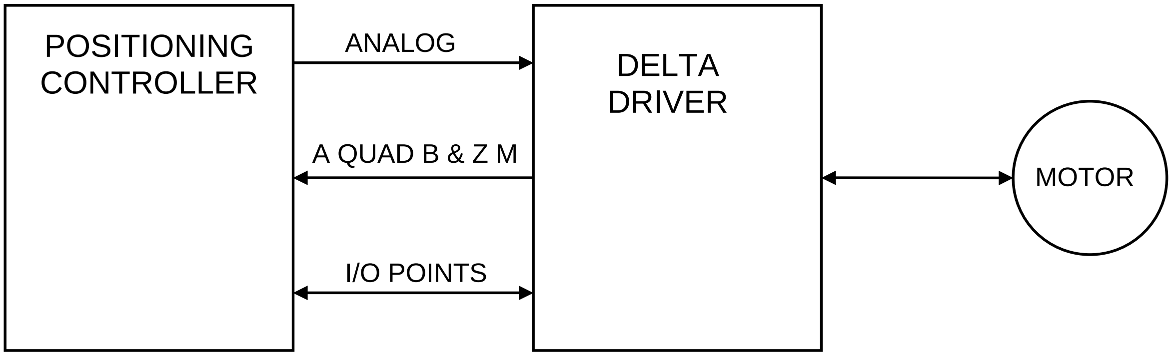
ALARM CODE	DESCRIPTION	REMEDY
HALt	Driver fatal fault	Replace driver.
AL -01 Internal Power Module Error	Driver has detected the following: • Overcurrent • Overheat • Gate voltage drop	Check if the motor wire (A/B/C) is shorted or grounded. Ambient temperature over 55° C. Indicates a fatal fault in the driver power stage. If motor wires are not shorted and temperature is below 55° C contact IIS factory.
AL -02 Overvoltage	DC power bus exceeds 420 VDC.	Power line voltage fluctuation above 264 VAC for "A" model drivers or 126 VAC for "B" model drivers. Excessive regeneration energy. Check line voltage fluctuations. Add additional external regeneration resistor.
AL -03 Under Voltage	DC power bus below 200 VDC.	Power line voltage fluctuation below 170 VAC for "A" model drivers or 85 VAC for "B" model drivers. Check line voltage fluctuations. Check for missing phase of AC line power for 3 phase models DSD-35 and above.
AL -06 Resolver Open	Resolver feedback signal (R1, R2) drops below 0.34 VAC.	Check for broken resolver wire or loose connection. Voltage between R1-R2 must be above 0.34VAC.
AL -07 Power Stage Error	Main control unit identifies a fault in the power stage of the driver.	Indicates a fatal fault in the driver power stage. Contact IIS factory.
AL -09 Regen Resistor Over Temperature	Excessive regen energy being dissipated by the internal or external regeneration resistor.	The frequency or rate of acceleration/deceleration may be too high. Excessive power line voltage. Add additional regen resistor capacity.
AL -10 Regen Resistor Open (DSD-35 and above only)	Regen transistor is ON for more than 50ms.	**WITH POWER OFF:** If an internal regen resistor is used, check that the resistance from P to JP2 is less than 20-30 ohms and that a jumper is installed from JP1 to JP2. If an external regen resistor is used, verify the regen resistor is the proper value and that all wiring to the resistor is secure.
AL -12 Watchdog timer	Internal CPU clock has stopped.	Unit is damaged. Contact IIS factory.
AL -14 Brake Alarm	Sequencing of the static or dynamic brake is faulty.	Check wiring connections of the static or dynamic brake. Verify that the external braking relay is functional.
AL -15 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 motor code UP-02 is set for the proper motor.

ALARM CODE	DESCRIPTION	REMEDY
AL -16 Speed amp Saturated	Internal speed loop is saturated and max. torque is applied for more than 3 sec.	Verify that motor shaft or machine system is not jammed. Check motor code UP-02 is set for the proper motor. Acel/decel rate is too large for the inertia load on the motor causing maximum torque during acel/decel.
AL -17 Motor overload	Calculated motor temperature exceeds rating 110%.	Verify that the average torque required to drive the load does not exceed the motor/driver continuous rating. Check if the duty cycle of the machine is too high. Check motor code UP-02 is set for the proper motor. $t = -Tm \left(1 - \frac{1.05^2}{\left(\frac{I}{IR}\right)^2}\right)$ Where: t = time in minutes I = motor current I_R = motor rated current T_M = thermal time constant of motor Status display oL is $\frac{I}{IR}$ x 100 See **Section 2**.
AL -18 Driver Overload	Motor current exceeds intermittent rating of driver or motor whichever is less.	Verify that motor shaft or machine system is not jammed. Check motor code UP-02 is set for the proper motor. Acel/decel rate is too large for the inertia load on the motor causing maximum torque during acel/decel. $t = \frac{K}{\left(\frac{I}{IR*1.2}\right) - 1}$ Where: t = time in seconds I = motor current I_R = motor rated current K = 1.5 for Delta-D30HRA 2.0 for Delta-120HRA & Delta-D50HRA 2.5 for Delta-200HRA & Delta-D100HRA 3.0 for Delta-D200HRA 3.5 for Delta-400HRA 4.0 for Delta-D400HRA 6.0 for all others See Overload Protection Characteristic Curve in **Section 2**.
AL -19 Resolver Error	Resolver feedback error.	Check resolver cable and connectors. Check if resolver is loose on motor shaft. Verify that resolver cable is separated from power wiring to prevent noise coupling to resolver signals.

ALARM CODE	DESCRIPTION	REMEDY
AL -20 Overspeed	Motor speed exceeds maximum rating by 120%.	Check resolver cable and connectors. Check if resolver is loose on motor shaft. Verify that resolver cable is separated from power wiring to prevent noise coupling to resolver signals. Overshoot is generated due to improper setting of AJ2, AJ3 & AJ4 parameters.
AL -21 Deviation counter overflow	Motor is unable to follow the commanded profile. Deviation counter exceed $\pm 2^{21}$.	Excessive load. Load inertia is too large for acceleration/deceleration rate. Position gain (AJ4) is too high. Torque limit is too low.
AL-22 Absolute encoder phase error	Absolute encoder CHA and CHB have been detected out of phase.	Replace motor.
AL-23 Absolute encoder disconnected	Absolute encoder connection is broken.	Check absolute encoder/resolver cable, C-253YYY. If cable is OK, replace motor.
AL-25 Option	Self-diagnostic checks of options failed.	14-bit A/D converter not functioning to specification. Return to factory.
AL-26 Parameter setting error	UP-01 (Control mode) or UP-02 (motor code) are not set or are set improperly.	Control Mode and motor code must be set to operate. Set UP-01 & UP-02 then cycle power to have the parameters take effect.
AL-27 Absolute encoder fault	CHA or CHB of absolute encoder is non-functional.	Check absolute encoder/resolver cable, C-253YYY. If cable is OK, replace motor.
AL-32 Absolute Home Position not set	Absolute Home Position has not been established. Also set with AL-6, 19, 22 and 23.	Check for cause of fault in the case of AL-6, 19, 22 and 23.
AL-33 Absolute Home Position setting error	Absolute Home setting procedure is not correctly completed. Also set with AL-6, 19, 22, 23 and 27.	Check for cause of fault in the case of AL-6, 19, 22, 23 and 27. Correct fault and set Absolute Home Position.
AL-36 Battery Missing	Battery has been disconnected when the power was OFF.	Check for detached battery or cable short.
AL-40 Encoder Signal Short	A, B, Z, U, W or V phases of encoder not functional.	Check encoder cable and connections.
AL-41 Encoder Communication error	Communication problem with absolute encoder	Check encoder cable, replace driver, motor.
AL-42 Encoder Power	Absolute encoder backup power low	Replace battery.
AL-43 Encoder Checksum	Encoder communication checksum error at power up	Replace motor/encoder.
AL-44 Battery Low	Absolute battery voltage has fallen below 2.8V.	Replace absolute battery.
AL-45 Absolute encoder error	Signal sequencing problem in the absolute encoder.	Replace motor.

SECTION 11 - CONNECTING A DELTA DRIVER TO AN EXTERNAL POSITIONING CONTROLLER

The Delta motors and drivers are commonly connected to external positioning controllers. An external positioning controller would typically use the encoder equivalent output of the Delta Driver for feedback and the analog speed or torque input for command. Several I/O points should be used for DRIVE ENABLE, SERVO NORMAL and RESET. Typical connections would be as follows:



The IIS MSC line of multi-axis positioning controllers can be easily connected to the Delta motor and driver using standard cables provided by IIS. Detailed connection diagrams (IC-065002) and the drawing for cable C-477YYY can be found in **Appendix B**.

The Delta Driver would typically be loaded with the following parameters to run with the IIS MSC line of positioning controllers.

Parameter	Description	Value
AJ0	REF1 Speed Command Zero	0.00
AJ1	Speed Command Scale	7.00
UP-01	Control Mode set to SPEED MODE	1
UP-04	Electronic Gear Ratio Numerator	24000
UP-05	Electronic Gear Ratio Denominator	4096
UP-12	Accel Time	0.00
UP-13	Decel Time	0.00
UP-14	S-Shaped Time	0.00
UP-17	REF1 & REF2 Polarity	00
UP-19	Output Pulse Coding	01

Many other parameters in the Delta Driver would be set per the motor type, resolver cable length, braking method, regen resistor, etc.

SECTION 12 - EMC INSTALLATION GUIDELINES FOR DELTA SERIES MOTORS AND DRIVERS

12.1 INTRODUCTION TO EMC GUIDELINES

This chapter provides guidance and requirements when installing IIS Delta Series motors and drivers into industrial control machinery required being CE marked. These guidelines are intended to provide the machine builder with the necessary EMC information, including parts and wiring techniques to comply with the European Community Standards for industrial control equipment. The final conformance to the standards for the overall machine remains the sole responsibility of the machine builder.

12.2 EMC REQUIREMENTS

In 1996, the European Community enacted standards concerning conducted and radiated emissions and immunity to various types of interference for industrial control equipment. The EMC Directive 89/336/EEC and harmonized standards define specific EMC levels and test procedures to gain conformance.

Emission Standards provide maximum levels of noise permitted to be generated by the equipment. Immunity Standards subject the equipment to various types of disturbances and verifies that the equipment continues to perform in a safe manner.

The IIS Delta Series motors and drivers have been tested and have been shown to comply with the following standards when installed per the guidelines in this section.

EMISSIONS STANDARDS:

EN55011 Class A	Power line conducted noise
EN55011 Class A	Radiated noise

IMMUNITY STANDARDS:

EN61000-4-2	Static discharge
ENV50140 & ENV50204	Electromagnetic irradiation
EN61000-4-4	Burst noise injected into power and signal wiring
EN61000-4-5	Lightning surge into power line
ENV50141	RF frequency injection into power and signal wiring
EN61000-4-8	Power frequency magnetic field
EN61000-4-11	Power line fluctuation and drop out

12.3 CONTROL ENCLOSURE

The Delta Series drivers must be installed in a suitable control enclosure that provides a good quality ground system and tight construction. The cabinets can be of welded construction, metal to metal conductive joints or have overlapping EMC gasketed joints. All joints and removable panels must have metal-to-metal ground contact. All hinged panels or doors must have a bonded ground wire from the hinged panel to the main body of the enclosure.

12.4 ENCLOSURE MOUNTING PANEL

It is highly recommended that a galvanized panel be used. Galvanized panels provide a continuous conductive surface that provides a low impedance ground plane for mounting the servo components.

The mounting panel must be grounded to the control enclosure with metal to metal joints, bolted together with external tooth lock washers or have multiple short ground jumper wires between the panel and the enclosure.

Painted panels can be used if the mounting area for the servo components and all grounding points have been masked off or have the paint removed.

All servo components that require grounding must use fasteners with external tooth lock washers.

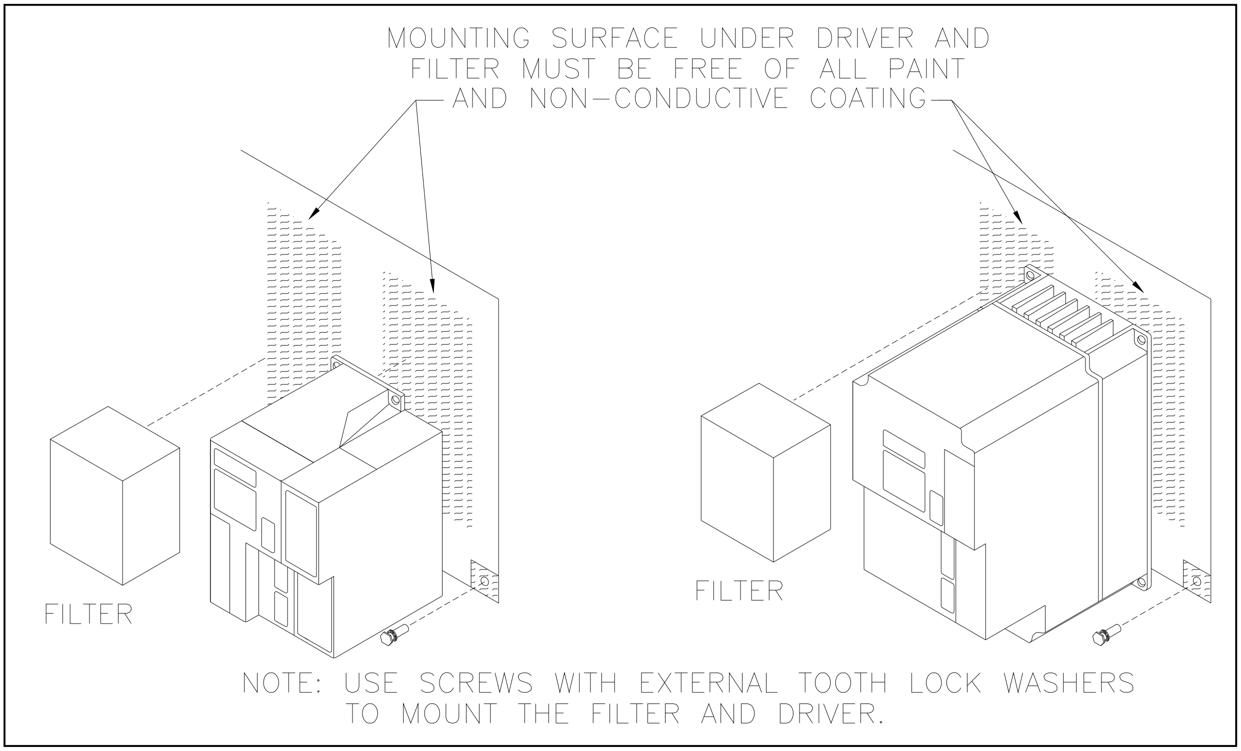
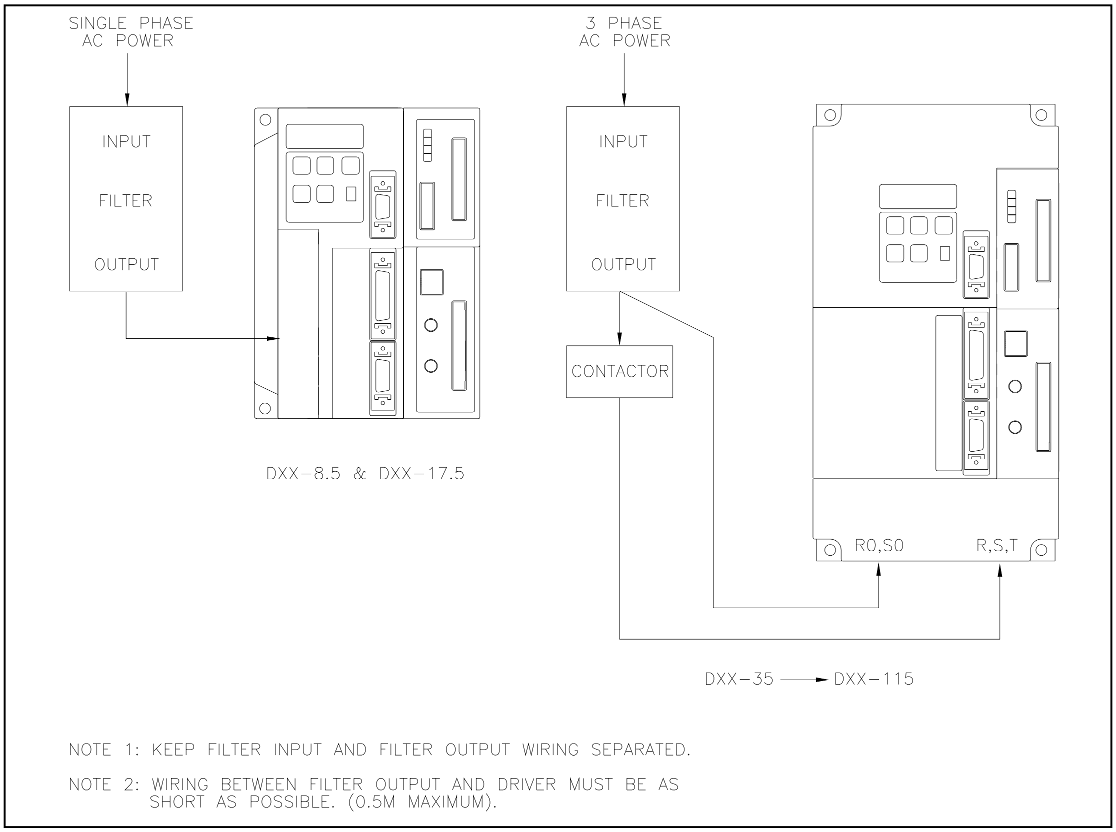


Figure 12.1 - Enclosure Mounting Panel

12.5 POWER LINE FILTER

A filter must be installed between the Delta Series Driver and the incoming power line to prevent conducted noise for getting onto the power line. It is recommended that a separate filter be used for each driver but it is possible to use a single larger filter to supply multiple drivers if the wiring between the filter and drivers is kept as short as possible.



NOTE 1: KEEP FILTER INPUT AND FILTER OUTPUT WIRING SEPARATED.

NOTE 2: WIRING BETWEEN FILTER OUTPUT AND DRIVER MUST BE AS SHORT AS POSSIBLE. (0.5M MAXIMUM).

Figure 12.2 - Power Line Filter

The following power line filters are recommended for use with the Delta Series motors and drivers:

Total Motor Capacity	Phase	SOSHIN ELECTRONICS
500W max.	1	HF2010A-PI
500W -> 1000W	1	HF2015A-PI
1000W ->1800W	3	HF3010A-PI
1800W -> 2600W	3	HF3020A-PI
2600W -> 3700W	3	HF3030A-PI
3700W -> 6500W	3	HF3040A-PI
6500W -> 11000W	3	HF3060A-TMA

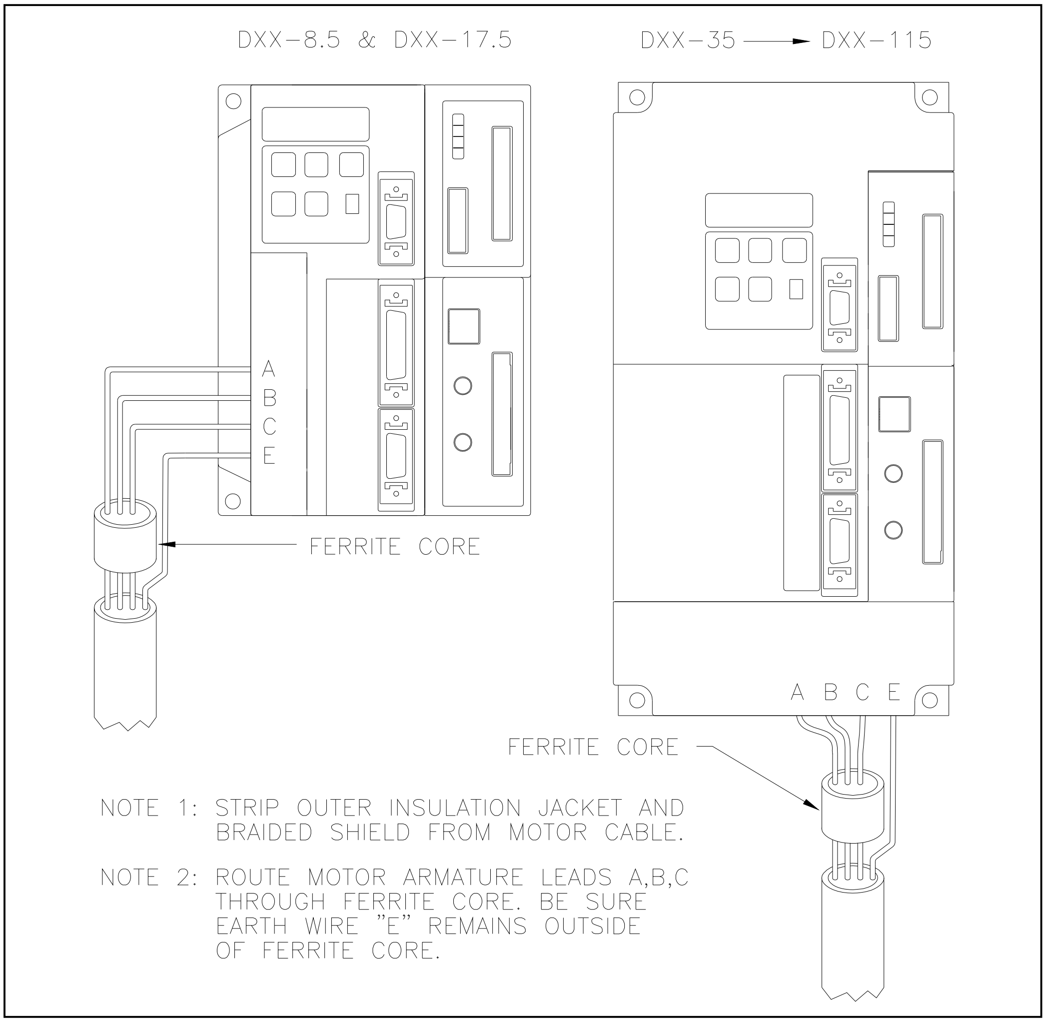
Total Motor Capacity	Phase	SCHAFFNER ELECTRONIC AG
500W max.	1	FN 2070-3
500W -> 1000W	1	FN 2070-6
1000W ->2200W	3	FN 258-16
2200W -> 3700W	3	FN 258-30
3700W -> 6500W	3	FN 258-42
6500W -> 11000W	3	FN 258-55

12.6 DRIVER OUTPUT (MOTOR ARMATURE) FILTER

The Delta Series Driver uses pulse width modulation (PWM) control of the motor windings. The PWM switching of the motor output generates transient voltages that must be suppressed before exiting the control enclosure. A simple ferrite core can be used as shown below.

The following ferrite core filters are recommended for use with the Delta Series motors and drivers:

Drive Size	Manufacturer	Part Number
DSD-1.5 -> DSD-70	TDK Corp.	ZCAT3035-1330
DSD-115	TOKIN Corp.	ESD-R-47DB



NOTE 1: STRIP OUTER INSULATION JACKET AND BRAIDED SHIELD FROM MOTOR CABLE.

NOTE 2: ROUTE MOTOR ARMATURE LEADS A,B,C THROUGH FERRITE CORE. BE SURE EARTH WIRE "E" REMAINS OUTSIDE OF FERRITE CORE.

Figure 12.3 - Driver Output (Motor Armature) Filter

12.7 SHIELDED MOTOR CABLE

The motor armature cable between the driver and motor must be shielded and grounded at both the driver and motor end. The motor armature cable length between the control enclosure and motor must be less than 50 meters or additional shield is necessary. The following shielded motor armature wire is recommended.

Motor Capacity	TAIYO Electric	OFLEX	BELDEN
500W max.	VCT-SB0.75SQ4C	891804CY	7411AS
500W -> 1000W	VCT-SB1.25SQ4C	891604CY	7423AS
1000W ->1800W	VCT-SB2.0SQ4C	891404CY	7436AS
1800W -> 2600W	VCT-SB3.5SQ4C	891204CY	7445AS
2600W -> 3700W	VCT-SB5.5SQ4C	891004CY	7447AS
3700W -> 11000W	VCT-SB14SQ4C	N/A	7450AS

Figures 12.4 and 12.5 show the recommended technique for grounding the motor armature cable.

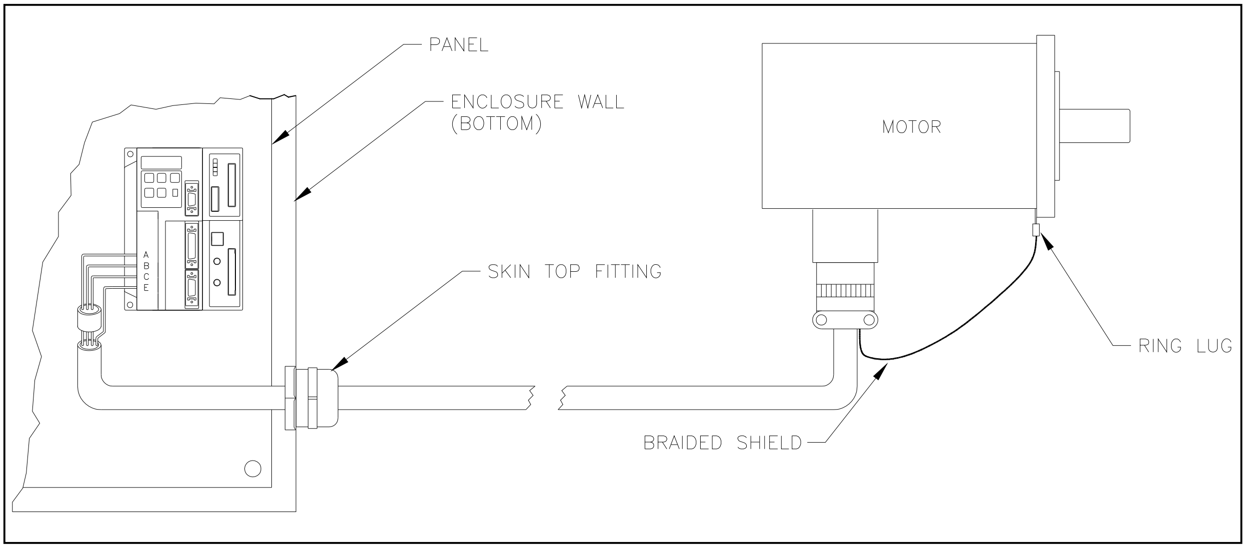


Figure 12.4 - Grounding Motor Armature Cable

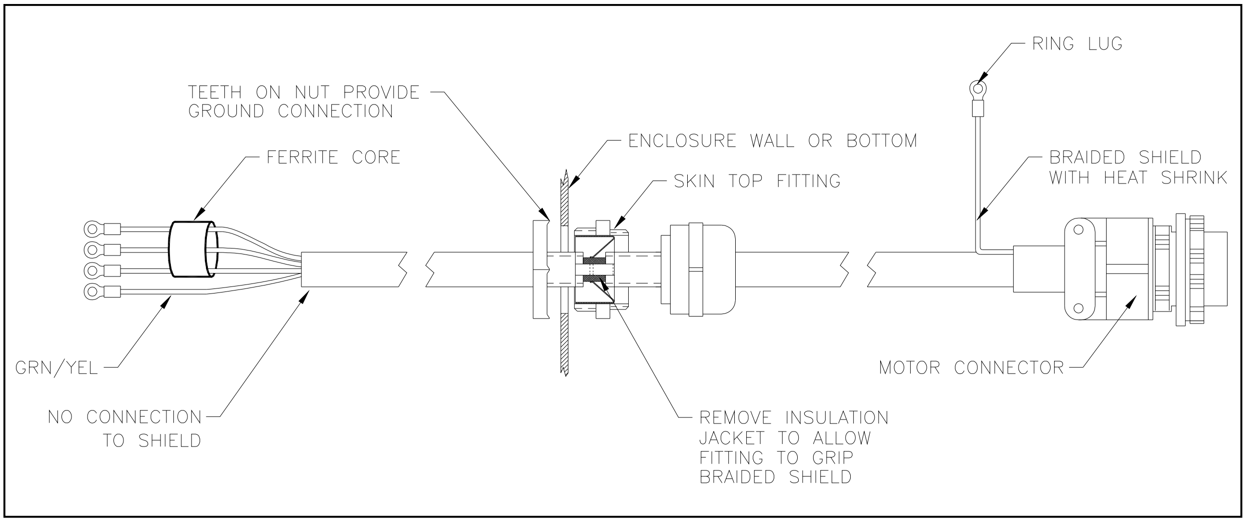


Figure 12.5 - Grounding Motor Armature Cable

12.7 SHIELDED MOTOR CABLE (cont'd)

The ground fittings shown in the figures above are made by OFLEX. The fittings are OFLEX SKINTOP MS-SC series P/N 5311-22x0; where x is a code for the wire diameter.

Figures 12.6 and 12.7 show an alternate method to ground the motor armature cable shield using saddle clamps.

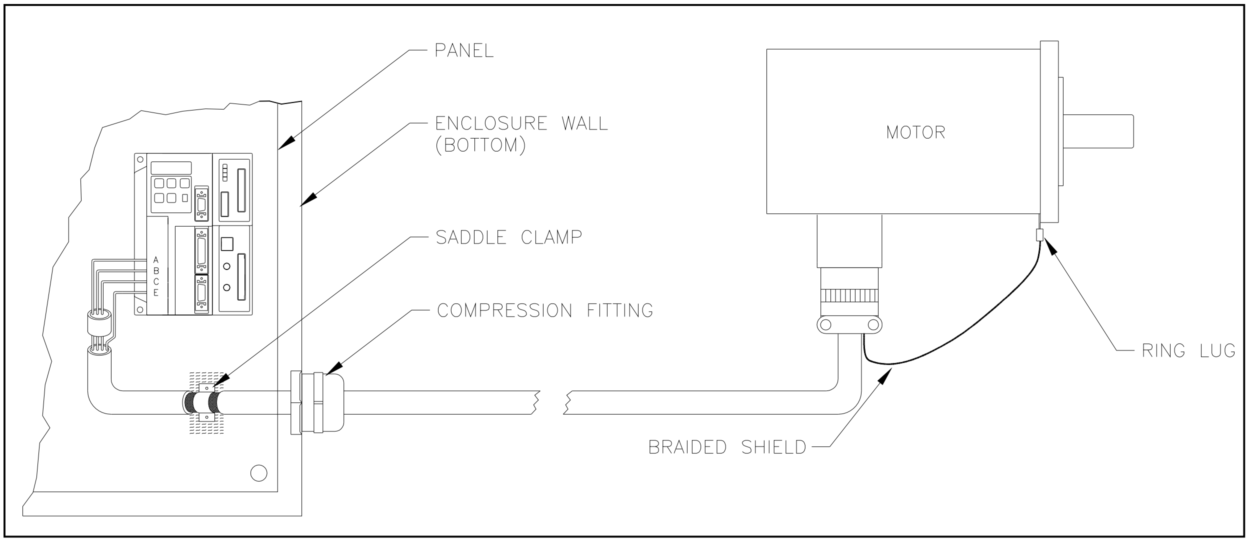


Figure 12.6 - Alternate Method to Ground the Motor Armature Cable

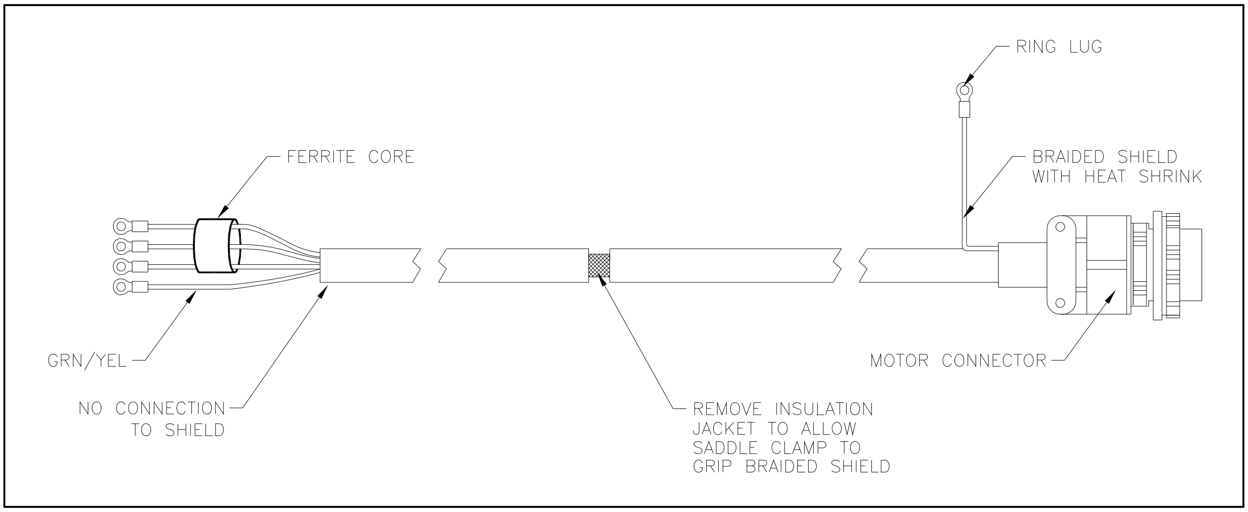


Figure 12.7 - Alternate Method to Ground the Motor Armature Cable

12.8 REGENERATION RESISTOR WIRING (OPTION)

If the regeneration resistor is located in the same enclosure as the driver, shielded wire is not necessary if the wiring is kept as short as possible. If the regeneration resistor is located in another enclosure, the regeneration resistor wire must be shielded and grounded in both enclosures. The SKINTOP ground fittings are shown in **Figure 12.8** but the saddle clamp method of grounding can also be used as shown in **Figure 12.9**.

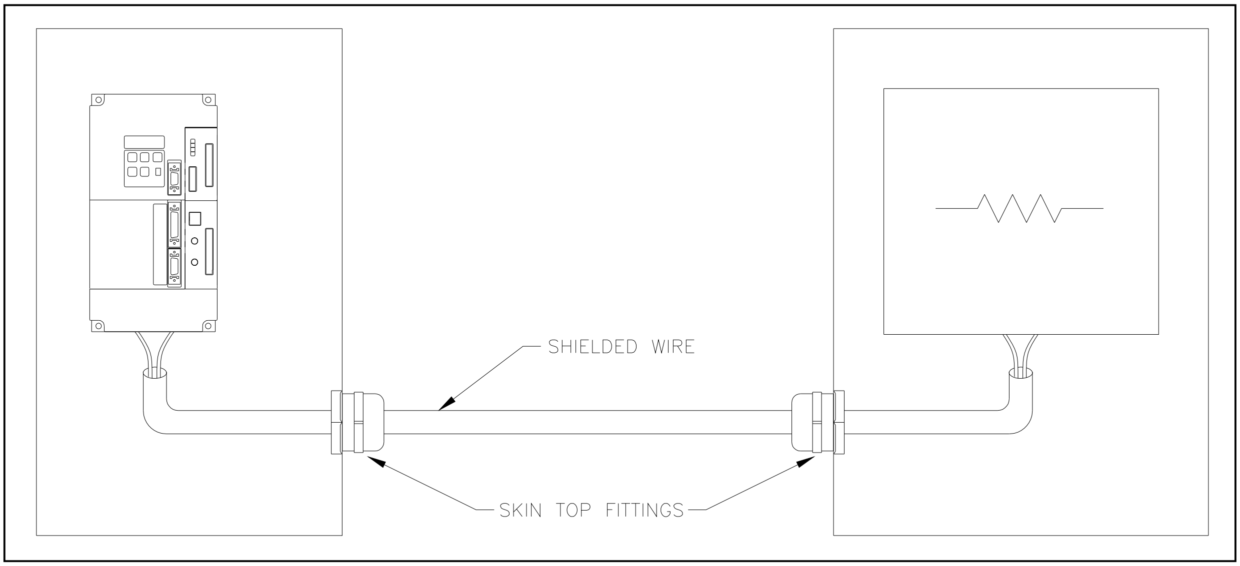


Figure 12.8 - SKINTOP Ground Fittings

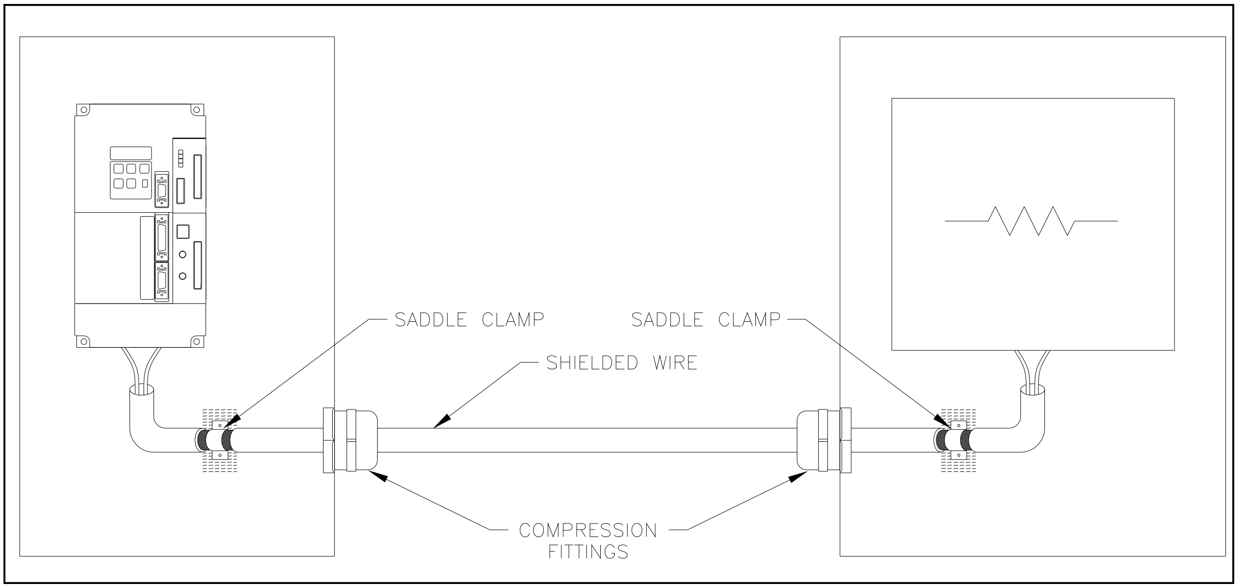


Figure 12.9 - Saddle Clamp Method of Grounding

12.9 DIGITAL CONTROL SIGNALS

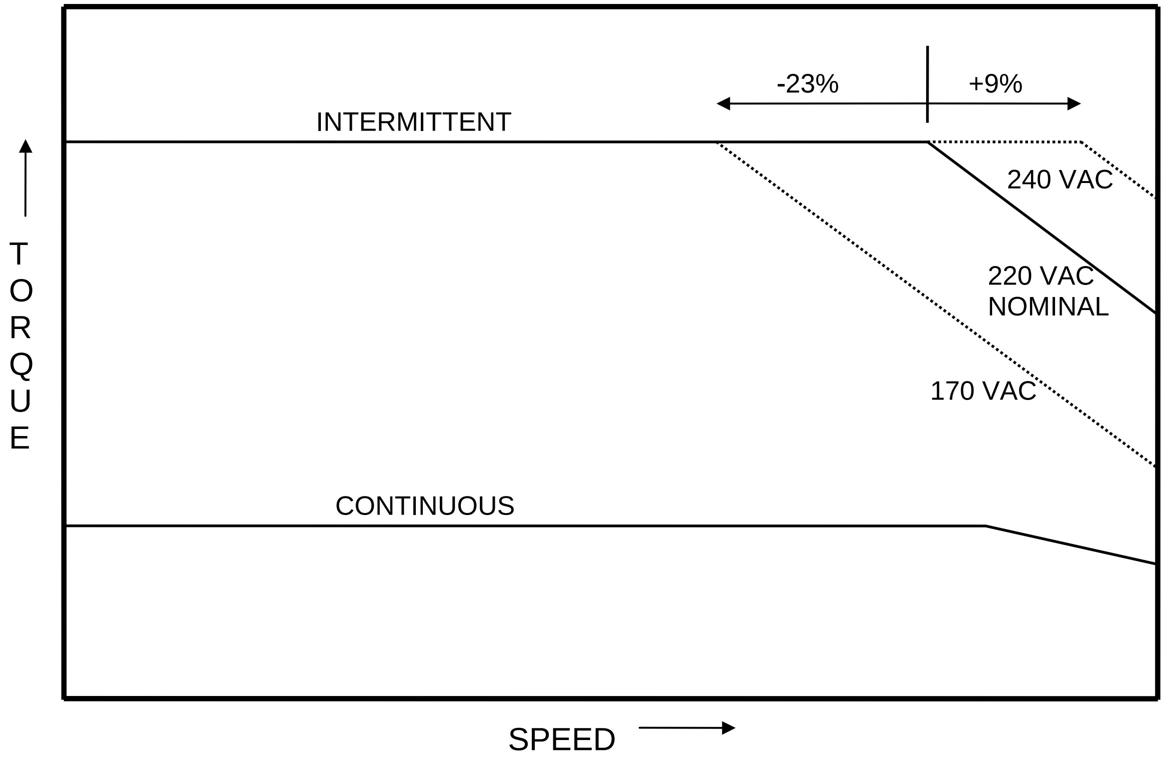
High speed, fast rise time signals used with the Delta driver, such as command pulse inputs or pulse outputs, radiate high frequency noise. This noise must be suppressed to prevent excessive EMC radiation.

If the positioning controller and Delta driver are in the same control enclosure, the cable between the two must be shielded and grounded at both ends. If the positioning controller is located in a separate control enclosure, the cable between enclosures must be a braided shielded cable with both enclosure entries grounded with SKINTOP fittings or saddle clamps.

SECTION 13 - APPLICATION NOTES

13.1 SPEED TORQUE CURVES

The Delta Driver speed/torque curves are shown with a nominal 115 VAC and 220 VAC, 50/60Hz incoming line voltage. The Delta Drivers however are rated at 85-126 VAC for the "B" models and 170-264 VAC for the "A" models. The intermittent torque rating at the high speed is nearly linearly related to the line voltage. Motor winding resistance, winding inductance and motor losses also play a role in rolling off the peak torque and higher speeds.



As the servo motor speed goes up, the counter EMF or generator action of the motor increases the voltage across the motor windings. The driver must provide a voltage greater than the motor voltage to produce current in the winding and therefore torque at the motor shaft. The intermittent torque curve rolls off when the motor voltage reaches the driver's internal DC bus voltage. The internal DC bus voltage is directly related to the incoming line voltage.

The roll off in the continuous torque curve is caused by motor heating due to internal losses in the motor, not line voltage.

Note that the speed/torque curves shown in the specifications represent the speed and torque being applied in the same direction, as is the case when the motor is driving the load.

When the speed and torque are in opposite directions, as is the case when the motor is braking the load, the motor is putting the load's mechanical energy back into the driver in the form of electrical energy. The result is that the driver internal voltage DC bus is pumped up rather than drained down, as is the case when the motor is driving the load. The driver has a higher bus voltage in this braking mode; therefore the intermittent zone of speed/torque curve is higher. This means that there is more high-speed torque available for braking/deceleration than there is for accelerating a load.

13.1 SPEED TORQUE CURVES (cont'd)

When the driver is braking the load it is absorbing the mechanical energy of the load and pumping up the internal voltage bus. If the energy absorption is great enough the driver switches in a regeneration resistor to dump some of the energy as heat. Repetitive or excessive absorption can overheat the regeneration resistor resulting in a fault condition. Absorption energy and the use of an internal or external regeneration resistor are discussed in detail in the Delta Driver Technical manual **Section 7**.

When reviewing a particular application, consideration of the line voltage fluctuation can be an important issue. Generally speaking, applications in the more developed countries in the world can be more aggressively sized because a stable 220 VAC line is readily available. In emerging countries the line voltage is not likely to be stable, so more conservative sizing is necessary. It may even be necessary to move up a size rating to be sure the application will run properly when the line voltage dips. This could be of particular concern for Original Equipment Manufacturers that ship machines around the globe.

**** CAUTION ****

It might appear tempting to simply use a transformer to raise the nominal line voltage to 240-250 VAC to avoid the low line problem. Raising the nominal line voltage poses the risk of overheating the driver's regeneration resistor in the case of heavy motor braking or in the case of a rise in the line voltage.

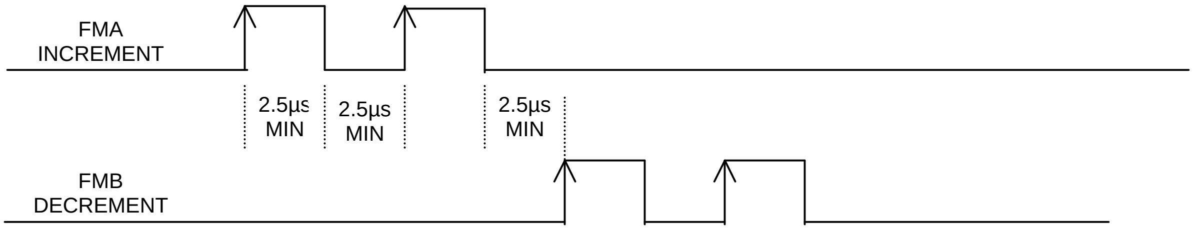
13.2 PULSE INPUT & OUTPUT

13.2.1 PULSE INPUTS FMA & FMB

The Delta driver can be use as a position controller in modes 3, 4 and 6. The position command to the Delta driver is provided by pulse inputs from an external source. The Delta driver, depending on the settings in UP-18, can configure the pulse inputs, FMA and FMB, in one of six ways. In the following descriptions an up arrow ? and down arrow ? indicates a pulse.

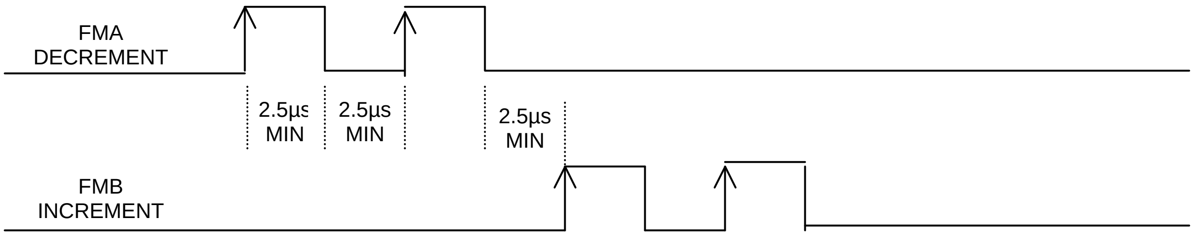
The direction of rotation of the motor is controlled by UP-26. With UP-26 = 0 the motor rotates CCW when the command position is incremented. With UP-26 = 1 the motor rotates CW when the command position is incremented.

PULSE-PULSE DECODING (UP-18 = 00) where FMA increments the command position and FMB decrements the command position. Maximum frequency of FMA and FMB is 200 KHZ.

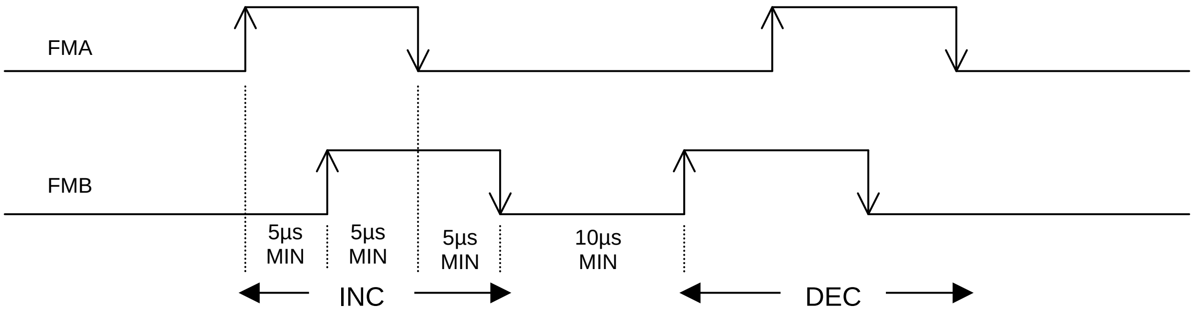


13.2.1 PULSE INPUTS FMA & FMB (cont'd)

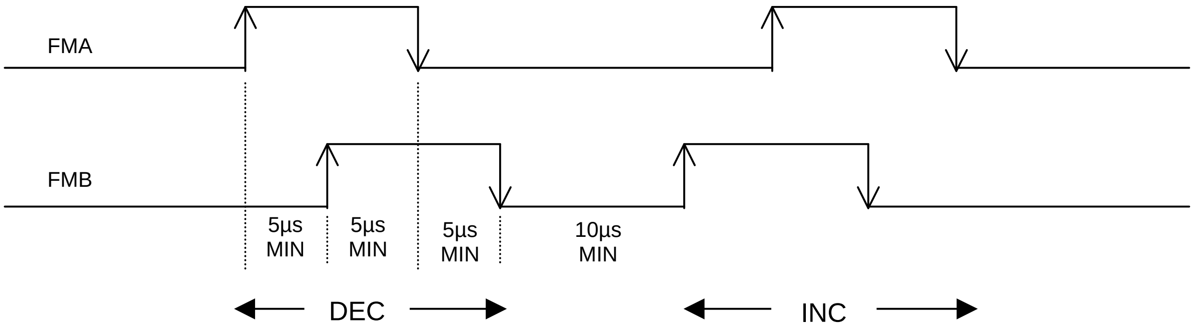
PULSE-PULSE DECODING (UP-18 = 10) where FMA decrements the command position and FMB increments the command position. Maximum frequency of FMA and FMB is 200 KHZ.



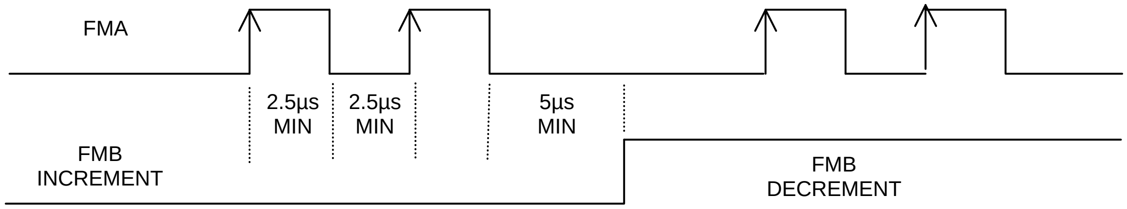
AB QUADRATURE DECODING (UP-18 = 01) where FMA leading FMB increments the command position, FMB leading FMA decrements the command position. Maximum frequency of FMA and FMB is 50 KHZ.



AB QUADRATURE DECODING (UP-18 = 11) where FMB leading FMA increments the command position, FMA leading FMB decrements the command position. Maximum frequency of FMA and FMB is 50 KHZ.

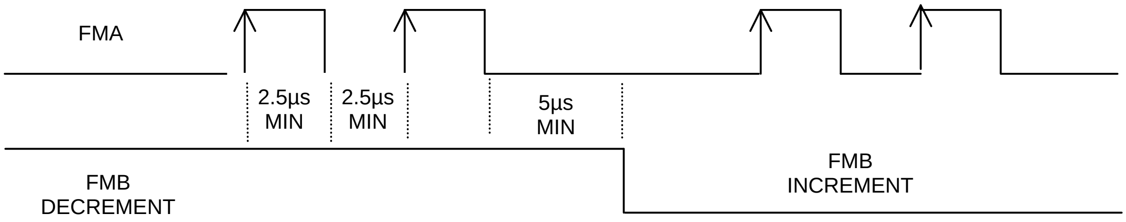


PULSE AND DIRECTION DECODING (UP-18 = 02) where FMA is pulse count and FMB is direction. Maximum frequency of FMA is 200 KHZ.



13.2.1 PULSE INPUTS FMA & FMB (cont'd)

PULSE AND DIRECTION DECODING (UP-18 = 12) where FMA is pulse count and FMB is direction. Maximum frequency of FMA is 200 KHZ.

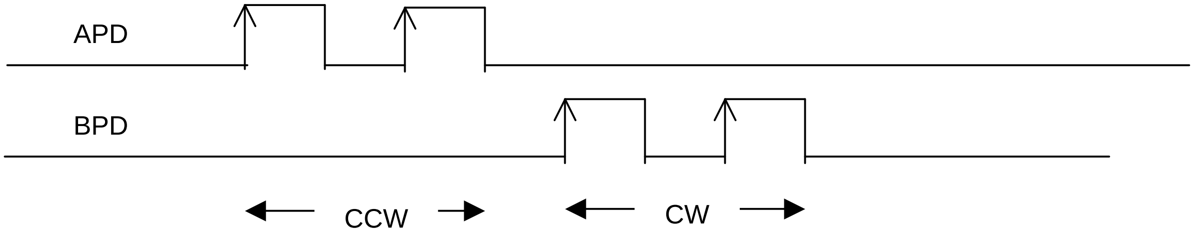


13.2.2 PULSE OUTPUTS APD, BPD & ZPD

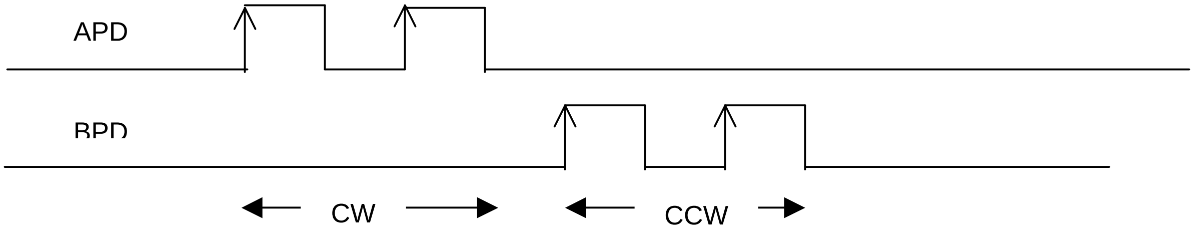
The pulse outputs of the Delta driver, APD, BPD & ZPD, are used primarily to provide motor position to an external controller. These outputs can provide other types of data depending on the setting of UP-20. For the purpose of this application note, UP-20 is assumed to be equal to 0000. The APD, BPD & ZPD outputs are RS422 compatible and are driven by a 26LS31 driver or equivalent. The width of the pulses is dependant on motor speed, resolver resolution and the setting of UP-04 and UP-05.

The ZPD pulse occurs when the motor's resolver is at 0 degrees. The Delta motors have various configurations of resolvers that provide 1, 2 or 3 electrical cycles per rotation of the motor shaft. Each resolver electrical cycle causes a 0 degree position and therefore a ZPD pulse. See individual motor data sheets for details. The ZPD pulse spacing will be (360º of motor rotation / # of resolver cycles) and the ZPD pulse width will be a multiple of 400µsec.

PULSE-PULSE DECODING (UP-19 = 00) where APD pulses when the motor actual position moves CCW and BDP pulses when the motor actual position moves CW. Maximum frequency of FMA and FMB is 400 KHZ.

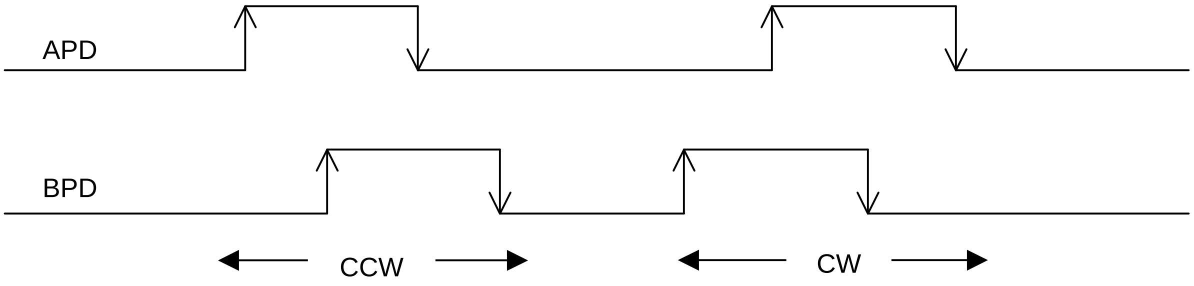


PULSE-PULSE DECODING (UP-19 = 10) where APD pulses when the motor actual position moves CW and BDP pulses when the motor actual position moves CCW. Maximum frequency of FMA and FMB is 400 KHZ.

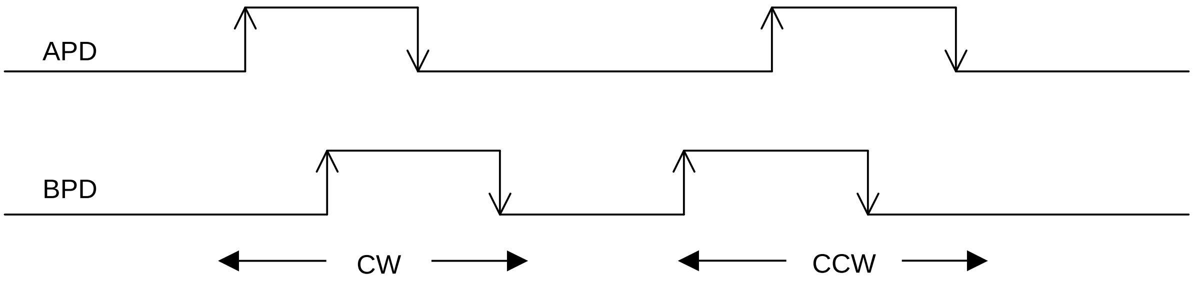


13.2.2 PULSE OUTPUTS APD, BPD & ZPD (cont'd)

AB QUADRATURE DECODING (UP-19 = 01) where APD leads BPD for CCW motor rotation. Maximum frequency of APD and BPD is 100 KHZ. This mode simulates an encoder output being read as 4X.



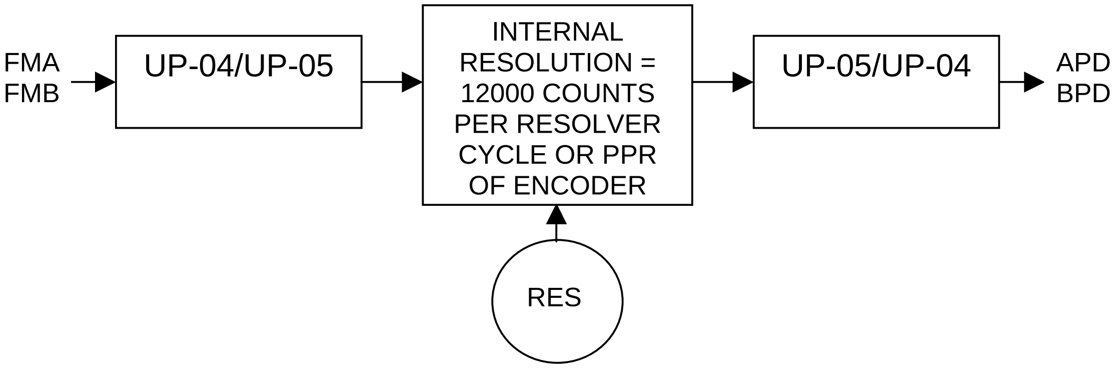
AB QUADRATURE DECODING (UP-19 = 11) where BPD leads APD for CCW motor rotation. Maximum frequency of APD and BPD is 100 KHZ. This mode simulates an encoder output being read as 4X.



13.2.3 SETTING THE RESOLUTION OF THE PULSE INPUTS AND OUTPUTS

The feedback resolver in the motor determines the internal resolution of the Delta driver. The driver resolution is 12000 counts per resolver electrical cycle. The Delta motors have one cycle (1X), two cycle (2X) or three cycle (3X) resolvers. (i.e. a 2X resolver has 2 electrical cycles per 1 rotation of the motor shaft). Delta driver can also have various encoder options with a different number of pulses per motor revolution (PPR).

The resolution of the pulse inputs and outputs are set by parameters UP-04 and UP-05.



13.2.3 SETTING THE RESOLUTION OF THE PULSE INPUTS AND OUTPUTS (cont'd)

Example #1: It is required to run a DBM-800/15R motor in a position loop with a command scaling of 1000 pulses per motor revolution.

The DBM-800/15R has a 2X resolver so the driver internal resolution is 2*12000 = 24000 counts/rev of the motor. The pulse inputs must be multiplied by a factor of 24 to yield one motor rotation for 1000 pulses input. Set UP-04 = 24000 and UP-05 = 1000 or any ratio equal to 24 such as UP-04 = 24 and UP-05 = 1. The pulse outputs will also be 1000 pulses per revolution of the motor because of the complementary effect of UP-05/UP-04.

Example #2: It is required to run a DBM-8600/22R motor in a position loop such that a command frequency of 20 KHz is equal to 1500 RPM. The pulse inputs will be configured as pulse and direction (UP-18 = 02).

The DBM-8600/22R has a 3X resolver so the driver internal resolution is 3*12000 = 36000 counts/rev of the motor. The internal frequency of the driver at a motor speed of 1500 RPM will be 1500 * 36000 / 60 = 900 KHZ. The pulse inputs must be multiplied by a factor of 45 to get 900 KHz or 1500 RPM. This yields UP-04 = 45000 and UP-05 = 1000 but the upper limit of UP-04 is 32767 so use any other ratio equal to 45 such as UP-04 = 45 and UP-05 = 1 or UP-04 = 90 and UP-05 = 2.

If the pulse outputs are configured as pulse-pulse (UP-19 = 00) one of the pulse outputs, depending on direction, will be 20 KHz for a motor speed of 1500 RPM because of the complementary effect of UP-05/UP-04.

If the pulse outputs are configured as AB quadrature (UP-19 = 01), each pulse output will be
5 KHz for a motor speed of 1500 RPM. Since each edge is counted there will be 20 K edges per second.

This setting of UP-04 and UP-05 yields a pulse input resolution of 36000/45 = 800 pulses per revolution of the motor shaft.

Example #3: It is required to run a DBM-B630/30R1X motor in a torque mode with an encoder equivalent feedback to an external positioning controller. The required resolution is 4096 counts quadrature per revolution of the motor. In this case the pulse inputs are not used.

The DBM-B630/22R has a 1X resolver so the driver internal resolution is 1*12000 = 12000 counts/rev of the motor. The internal driver resolution must be multiplied by 4096/12000 to yield a pulse output of 4096 per motor revolution. Set UP-04 = 12000 and UP-05 = 4096 or any other equivalent ratio such as UP-04 = 375 and UP-05 = 128.

APPENDIX A - MOTOR/DRIVER SPECIFICATIONS

"MOTORS WITH RESOLVERS" TABLE A.1
"MOTORS WITH BRAKES" TABLE A.2
"MOTORS WITH ENCODERS" TABLE A.3
"CABLES " (APPENDIX B) TABLE

A.1 MOTORS WITH RESOLVERS

DELTA PACKAGE	MOTOR	DRIVE	MOTOR CODE	RATED POWER (WATTS)	RATED SPEED (RPM)	RATED TORQUE (N-M)
D30HRA	DBM-D30/30R	DXX-1.5/RA	1201	30	3000	0.095
D30HRB	DBM-D30/30R	DXX-1.5/RB	1201	30	3000	0.095
D50HRA	DBM-D50/30R	DXX-1.5/RA	1202	50	3000	0.159
D50HRB	DBM-D50/30R	DXX-1.5/RB	1202	50	3000	0.159
D100HRA	DBM-D100/30R	DXX-4.25/RA	1203	100	3000	0.318
D100HRB	DBM-D100/30R	DXX-4.25/RB	1203	100	3000	0.318
120HRA	DBM-120/30R	DXX-4.25/RA	1305	120	3000	0.38
120HRB	DBM-120/30R	DXX-4.25/RB	1305	120	3000	0.38
200HRA	DBM-200/30R	DXX-8.5/RA	1306	200	3000	0.64
200HRB	DBM-200/30R	DXX-8.5/RB	1306	200	3000	0.64
D200HRA	DBM-D200/30R	DXX-8.5/RA	1204	200	3000	0.64
D200HRB	DBM-D200/30R	DXX-8.5/RB	1204	200	3000	0.64
B380HRA	DBM-B380/30R	DXX-8.5/RA	1404	380	3000	1.24
B380HRA1X	DBM-B380/30R1X	DXX-8.5/RA	11	380	3000	1.24
400LRA	DBM-400/15R	DXX-8.5/RA	1105	400	1500	2.55
400HRA	DBM-400/30R	DXX-8.5/RA	1307	400	3000	1.27
D400HRA	DBM-D400/30R	DXX-8.5/RA	1205	400	3000	1.27
500HRA	DBM-500/30R	DXX-8.5/RA	1308	500	3000	1.59
D600HRA	DBM-D600/30R	DXX-17.5/RA	1206	600	3000	1.91
B630HRA	DBM-B630/30R	DXX-8.5/RA	1405	630	3000	2.03
B630HRA1X	DBM-B630/30R1X	DXX-8.5/RA	12	630	3000	2.03
800LRA	DBM-800/15R	DXX-17.5/RA	1106	800	1500	5.10
800HRA	DBM-800/30R	DXX-17.5/RA	1309	800	3000	2.55
800HRAA	DBM-800/30RA	DXX-17.5/RAA	1309	800	3000	2.55
B800HRA	DBM-B800/30R	DXX-17.5/RA	1406	800	3000	2.60
D800HRA	DBM-D800/30R	DXX-17.5/RA	1207	800	3000	2.55
1000LRA	DBM-1000/15R	DXX-17.5/RA	1107	1000	1500	6.37
1000HRA	DBM-1400/30R	DXX-17.5/RA	1310	1000	3000	3.10
1050LRA1X	DBM-1500/15R1X	DXX-17.5/RA	10	1000	1500	6.37
B1060HRA	DBM-B1060/30R	DXX-17.5/RA	1407	1060	3000	3.39
1360HRA	DBM-1360/30R	DXX-17.5/RA	007	1360	3000	4.34
1400HRA	DBM-1400/30R	DXX-35/RA	1311	1400	3000	4.46
1500LRA	DBM-1500/15R	DXX-35/RA	1109	1500	1500	9.55
1500LRA1X	DBM-1500/15R1X	DXX-35/RA	10	1500	1500	9.55
B1600HRA	DBM-B1600/30R	DXX-35/RA	1408	1600	3000	5.08
1800HRA	DBM-1800/30R	DXX-35/RA	1312	1800	3000	5.73
B1900HRA	DBM-B1900/30R	DXX-35/RA	1409	1900	3000	6.21
2200LRA	DBM-2600/15R	DXX-35/RA	1110	2200	1500	14.08
2399HRA	DBM-2400/30R	DXX-35/RA	1313	2399	3000	7.64

A.1 MOTORS WITH RESOLVERS (cont'd)

DELTA PACKAGE	MOTOR	DRIVE	MOTOR CODE	RATED POWER (WATTS)	RATED SPEED (RPM)	RATED TORQUE (N-M)
2400HRA	DBM-2400/30R	DXX-50/RA	1314	2400	3000	7.64
2600LRA	DBM-2600/15R	DXX-50/RA	1111	2600	1500	16.60
2860MRA1X	DBM-3740/20R1X	DXX-35/RA	20	2860	2000	13.72
3300LRA	DBM-3700/15R	DXX-50/RA	1112	3000	1500	21.00
B3000HRA	DBM-B3000/30R	DXX-50/RA	1410	3000	3000	9.83
3400HRA	DBM-3700/30R	DXX-50/RA	1315	3400	3000	10.80
3700LRA	DBM-3700/15R	DXX-70/RA	1113	3700	1500	23.60
3700HRA	DBM-3700/30R	DXX-70/RA	1316	3700	3000	11.80
3740MRA1X	DBM-3740/20R1X	DXX-50/RA	21	3740	2000	17.94
B3950MRA	DBM-B3950/20R	DXX-50/RA	35	3950	2000	19.00
4200MRA1X	DBM-4200/20R	DXX-50/RA	49	4200	2000	20.20
B4400HRA	DBM-B4400/30R	DXX-70/RA	1412	4400	3000	14.36
5000LRA	DBM-5000/15R	DXX-115/RA	1115	5000	1500	31.80
5000HRA	DBM-5500/30R	DXX-70/RA	1317	5000	3000	15.90
5500HRA	DBM-5500/30R	DXX-115/RA	1318	5500	3000	17.50
B5600HRA	DBM-B5600/30R	DXX-115/RA	1413	5600	3000	18.04
6100CRA	DBM-6100/10R	DXX-50/RA	38	6100	1000	40.19
6500HRA	DBM-6500/30R	DXX-115/RA	1319	6500	3000	20.70
7500MRA	DBM-7500/20R	DXX-115/RA	1116	7500	2000	35.80
8600MRA	DBM-8600/22R	DXX-115/RA	002 & 004	8600	2200	37.25
10000MRA	DBM-10000/20R	DXX-115/RA	1117	10000	2000	47.70
10300LRA	DBM-10300/15R	DXX-115/RA	008	10300	1500	65.86
13500LRA	DBM-13500/15R	DXX-115/RA	30	13500	1500	86.77
14300CRA	DBM-14300/13R	DXX-115/RA	009	14300	1300	105.75

A.2 MOTORS WITH MECHANICAL BRAKES

DELTA PACKAGE	MOTOR	DRIVE	MOTOR CODE	RATED POWER (WATTS)	RATED SPEED (RPM)	RATED TORQUE (N-M)
120HRAB	DBM-120/30RB	DXX-4.25/RA	1305	120	3000	0.38
120HRBB	DBM-120/30RB	DXX-4.25/RB	1305	120	3000	0.38
200HRAB	DBM-200/30RB	DXX-8.5/RA	1306	200	3000	0.64
200HRBB	DBM-200/30RB	DXX-8.5/RB	1306	200	3000	0.64
400LRAB	DBM-400/15RB	DXX-8.5/RA	1105	400	1500	2.55
400HRAB	DBM-400/30RB	DXX-8.5/RA	1307	400	3000	1.27
500HRAB	DBM-500/30RB	DXX-8.5/RA	1308	500	3000	1.59
800LRAB	DBM-800/15RB	DXX-17.5/RA	1106	800	1500	5.10
800HRAB	DBM-800/30RB	DXX-17.5/RA	1309	800	3000	2.55
D800HEAAB	DBM-D800/30EAB	DXX-17.5/EAA	1701	800	3000	2.60
D800HRAB	DBM-D800/30RB	DXX-17.5/RA	1207	800	3000	2.55
1000LRAB	DBM-1000/15RB	DXX-17.5/RA	1107	1000	1500	6.37
1000HRAB	DBM-1400/30RB	DXX-17.5/RA	1310	1000	3000	3.10
1400HRAB	DBM-1400/30RB	DXX-35/RA	1311	1400	3000	4.46
1500LRAB	DBM-1500/15RB	DXX-35/RA	1109	1500	1500	9.55
1800HRAB	DBM-1800/30RB	DXX-35/RA	1312	1800	3000	5.73
1800HRAAB	DBM-1800/30RAB	DXX-35/RAA	1702	1800	3000	5.73
2200LRAB	DBM-2600/15RB	DXX-35/RA	1110	2200	1500	14.08
2400HRAB	DBM-2400/30RB	DXX-50/RA	1314	2400	3000	7.64
2600LRAB	DBM-2600/15RB	DXX-50/RA	1111	2600	1500	16.60
3300LRAB	DBM-3700/15RB	DXX-50/RA	1112	3000	1500	21.00
B3000HRAB	DBM-B3000/30RB	DXX-50/RA	1410	3000	3000	9.83
3400HRAB	DBM-3700/30RB	DXX-50/RA	1315	3400	3000	10.80
3700LRAB	DBM-3700/15RB	DXX-70/RA	1113	3700	1500	23.60
3700HRAB	DBM-3700/30RB	DXX-70/RA	1316	3700	3000	11.80
5000LRAB	DBM-5000/15RB	DXX-115/RA	1115	5000	1500	31.80
5000HRAB	DBM-5500/30RB	DXX-70/RA	1317	5000	3000	15.90
5500HRAB	DBM-5500/30RB	DXX-115/RA	1318	5500	3000	17.50
6500HRAB	DBM-6500/30RB	DXX-115/RA	1319	6500	3000	20.70
7500MRAB	DBM-7500/20RB	DXX-115/RA	1116	7500	2000	35.80
10000MRAB	DBM-10000/20RB	DXX-115/RA	1117	10000	2000	47.70

A.3 MOTORS WITH ENCODERS

DELTA PACKAGE	MOTOR	DRIVE	MOTOR CODE	RATED POWER (WATTS)	RATED SPEED (RPM)	RATED TORQUE (N-M)
B380HEA	DBM-B380/30E	DXX-8.5/EA	804	380	3000	1.24
85E400MEA	DBM85-E400/20E	DXX-8.5/EA	1020	400	2000	1.90
480LEA	DBM-480/15E	DXX-8.5/EA	01	480	1500	3.11
120E500LEA	DBM120-E1000H/20E	DXX-8.5/EA	1041	500	1000	5.10
85E525HEA	DBM85-E525/30E	DXX-8.5/EA	1012	525	3000	1.70
B630HEA	DBM-B630/30E	DXX-8.5/EA	805	630	3000	2.03
85E650MEA	DBM85-E750/20E	DXX-8.5/EA	1021	650	2000	3.00
C740LEA	DBM-C740/15E	DXX-8.5/EA	107	740	1500	4.77
85E750MEA	DBM85-E750/20E	DXX-17.5/EA	1022	750	2000	3.53
120E750LEA	DBM120-E1500H/20E	DXX-17.5/EA	1042	750	1000	7.90
120E750MEA	DBM120-E750/20E	DXX-8.5/EA	1030	750	2000	3.15
B800HEA	DBM-B800/30E	DXX-17.5/EA	806	800	3000	2.60
85E850HEA	DBM85-E850/30E	DXX-17.5/EA	1014	850	3000	2.75
85E1000MEA	DBM85-E1000/20E	DXX-17.5/EA	1023	1000	2000	4.80
120E1000MEA	DBM120-E1000/20E	DXX-17.5/EA	1031	1000	2000	5.30
B1060HEA	DBM-B1060/30E	DXX-17.5/EA	807	1060	3000	3.39
120E1100LEA	DBM120-E2200H/20E	DXX-35/EA	1043	1100	1000	11.50
85E1200HEA	DBM85-E1200/30E	DXX-17.5/EA	1015	1200	3000	3.90
120E1500LEA	DBM120-E3000H/20E	DXX-35/EA	1044	1500	1000	16.00
120E1500MEA	DBM120-E1500/20E	DXX-35/EA	1032	1500	2000	7.15
B1600HEA	DBM-B1600/30E	DXX-35/EA	808	1600	3000	5.08
B1900HEA	DBM-B1900/30E	DXX-35/EA	809	1900	3000	6.21
120E2000LEA	DBM120-E4000H/20E	DXX-35/EA	1045	2000	1000	20.50
120E2200MEA	DBM120-E2200/20E	DXX-35/EA	1033	2200	2000	10.70
B3000HEA	DBM-B3000/30E	DXX-50/EA	810	3000	3000	9.83
120E3000MEA	DBM120-E3000/20E	DXX-50/EA	1034	3000	2000	14.70
120E4000MEA	DBM120-E4000/20E	DXX-50/EA	1035	4000	2000	19.60
B4400HEA	DBM-B4400/30E	DXX-70/EA	812	4400	3000	14.36
B5600HEA	DBM-B5600/30E	DXX-115/EA	813	5600	3000	18.04

A.4 MOTOR/DRIVER SPEED TORQUE CURVES

DRAWING NUMBER	DESCRIPTION
120HRA	Delta Package
120HRB	Delta Package
200HRA	Delta Package
200HRB	Delta Package
400LRA	Delta Package
400HRA	Delta Package
480LEA	Delta Package
500HRA	Delta Package
800LRA	Delta Package
800HRA	Delta Package
1000LRA	Delta Package
1000HRA	Delta Package
1050LRA1X	Delta Package
1360HRA	Delta Package
1400HRA	Delta Package
1500LRA	Delta Package
1500LRA1X	Delta Package
1800HRA	Delta Package
2200LRA	Delta Package
2399HRA	Delta Package
2400HRA	Delta Package
2600LRA	Delta Package
2860MRA1X	Delta Package
3300LRA	Delta Package
3400HRA	Delta Package
3700LRA	Delta Package
3700HRA	Delta Package
3740MRA1X	Delta Package
4200MRA1X	Delta Package
5000LRA	Delta Package
5000HRA	Delta Package
5500HRA	Delta Package
6100CRA	Delta Package
6500HRA	Delta Package
7500MRA	Delta Package
8600MRA	Delta Package
10000MRA	Delta Package
10300LRA	Delta Package
13500LRA	Delta Package
14300CRA	Delta Package
B380HEA	Delta Package
B380HRA	Delta Package
B380HRA1X	Delta Package
B630HEA	Delta Package
B630HRA	Delta Package
B630HRA1X	Delta Package
B800HEA	Delta Package
B800HRA	Delta Package
B1060HEA	Delta Package
B1060HRA	Delta Package
B1600HEA	Delta Package
B1600HRA	Delta Package

A.4 MOTOR/DRIVER SPEED TORQUE CURVES (cont'd)

DRAWING NUMBER	DESCRIPTION
B1900HEA	Delta Package
B1900HRA	Delta Package
B3000HEA	Delta Package
B3000HRA	Delta Package
B3950MRA	Delta Package
B4400HEA	Delta Package
B4400HRA	Delta Package
B5600HEA	Delta Package
B5600HRA	Delta Package
C740LEA	Delta Package
D30HRA	Delta Package
D30HRB	Delta Package
D50HRA	Delta Package
D50HRB	Delta Package
D100HRA	Delta Package
D100HRB	Delta Package
D200HRA	Delta Package
D200HRB	Delta Package
D400HRA	Delta Package
D600HRA	Delta Package
D800HRA	Delta Package
85E400MEA	Delta Package
85E525HEA	Delta Package
85E650MEA	Delta Package
85E750MEA	Delta Package
85E850HEA	Delta Package
85E1000MEA	Delta Package
85E1200HEA	Delta Package
120E500LEA	Delta Package
120E750LEA	Delta Package
120E750MEA	Delta Package
120E1000MEA	Delta Package
120E1100LEA	Delta Package
120E1500LEA	Delta Package
120E1500MEA	Delta Package
120E2000LEA	Delta Package
120E2200MEA	Delta Package
120E3000MEA	Delta Package
120E4000MEA	Delta Package

A.5 DRIVER MOUNTING AND DIMENSIONS

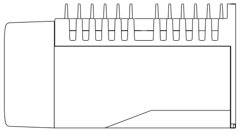
DRAWING NUMBER	DESCRIPTION
DELTA DRIVERS	
DSD-1.5/RA & RB	Delta Series Drive
DSD-4.25/RA & RB	Delta Series Drive
DSD-8.5/RA & RB	Delta Series Drive
DSD-17.5/RA	Delta Series Drive
DSD-35/RA	Delta Series Drive
DSD-50/RA	Delta Series Drive
DSD-70/RA	Delta Series Drive
DSD-115/RA	Delta Series Drive
DELTAMAX DRIVERS	
DMAX-1.5/RA & RB	Delta Series Drive
DMAX-4.25/RA & RB	Delta Series Drive
DMAX-8.5/RA & RB	Delta Series Drive
DMAX-17.5/RA	Delta Series Drive
DMAX-35/RA	Delta Series Drive
DMAX-50/RA	Delta Series Drive
DMAX-70/RA	Delta Series Drive
DMAX-115/RA	Delta Series Drive
DELTAPRO DRIVERS	
DPRO-1.5/RA & RB	Delta Series Drive
DPRO-4.25/RA & RB	Delta Series Drive
DPRO-8.5/RA & RB	Delta Series Drive
DPRO-17.5/RA	Delta Series Drive
DPRO-35/RA	Delta Series Drive
DPRO-50/RA	Delta Series Drive
DPRO-70/RA	Delta Series Drive
DPRO-115/RA	Delta Series Drive
DELTA S DRIVERS	
DS-1.5/RA & RB	Delta Series Drive
DS-4.25/RA & RB	Delta Series Drive
DS-8.5/RA & RB	Delta Series Drive
DS-17.5/RA	Delta Series Drive
DS-35/RA	Delta Series Drive
DS-50/RA	Delta Series Drive
DS-70/RA	Delta Series Drive
DS-115/RA	Delta Series Drive

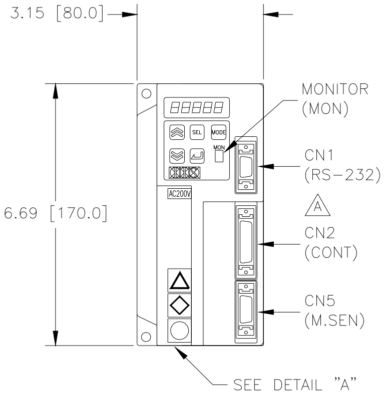
DATE	SYM	REVISION RECORD	DR	CK	CK
13SEP01	A	PER ECN 01-303	CWB	EB	CDR

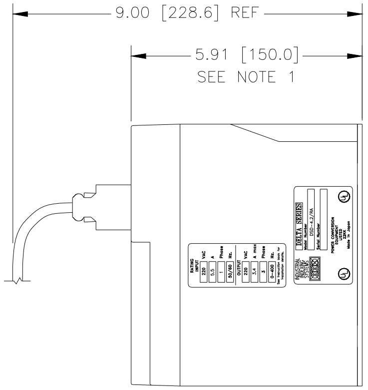
NOTES:

1.) RECOMMENDED CABINET DEPTH TO BE 10.00 [254.0].

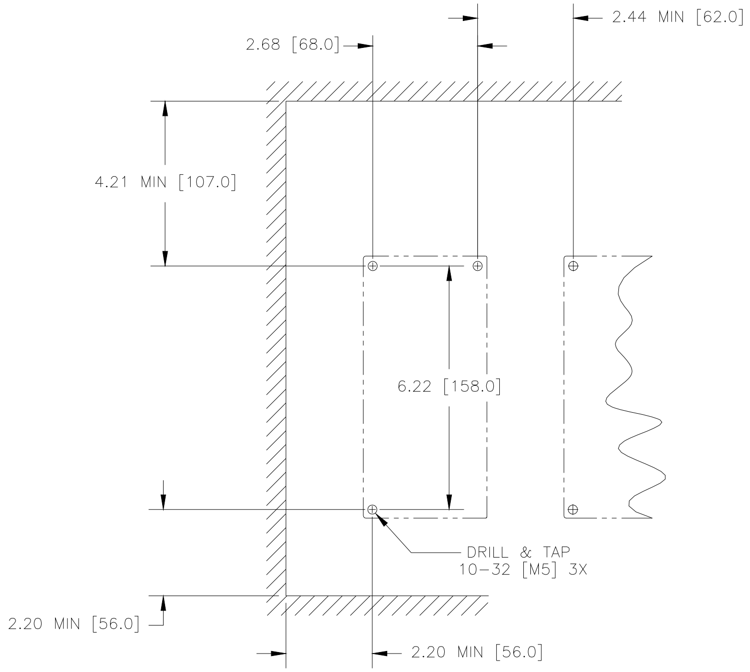
2.) THIS DRAWING ALSO COVERS THE FOLLOWING DRIVES:
DSD-1.5/EA, DSD-1.5/EAI AND DSD-1.5/EB, DSD-1.5/EBI,
DSD-1.5/RAI, DSD-1.5/RB AND DSD-1.5/RBI.

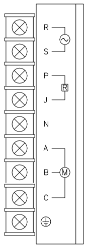




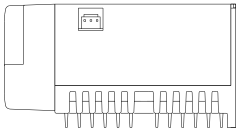


MOUNTING AND SPACING REQUIREMENTS





DETAIL A
TERMINAL COVER OPEN



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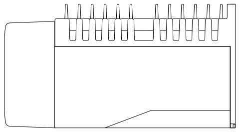
TITLE
DRIVE, DELTA SERIES

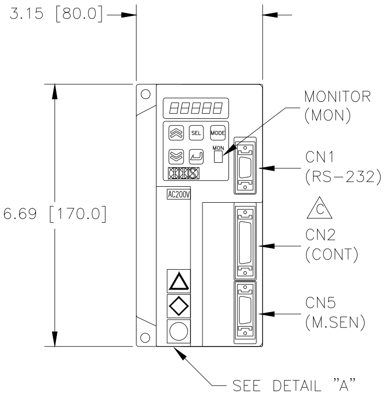
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)		DRAWN BY BOWMAN		DRAWING NUMBER	
TOLERANCES		AutoCAD FILE LOCATION Q:\CURRENT DWGS		DSD-1.5/RA	
X.X± ---	ANGULAR				
X.XX± 0.01 X.XXX± 0.005	± 0°30'	B	DATE 10AUG00	SCALE NTS	SHEET NO. 1 OF 1
				REVISION A	

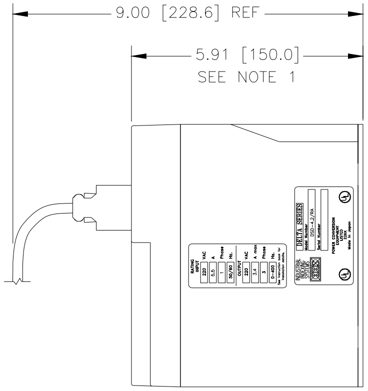
DATE	SYM	REVISION RECORD	DR	CK	CK
13SEP01	C	PER ECN 01-303	CWB	EB	CDR

B NOTES:

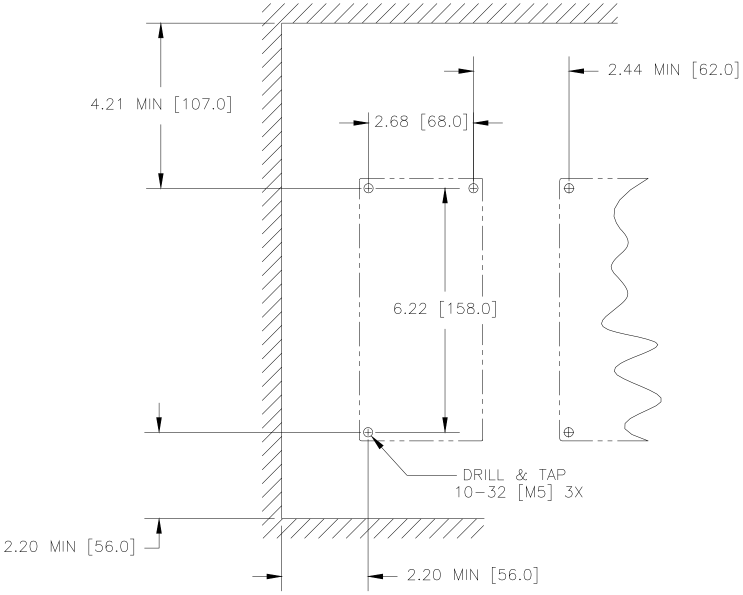
1.) RECOMMENDED CABINET DEPTH TO BE 10.00 [254.0].
2.) THIS DRAWING ALSO COVERS THE FOLLOWING DRIVES: DSD-4.25/EA, DSD-4.25/EB AND DSD-4.25/RB.

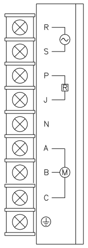




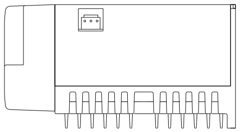


MOUNTING AND SPACING REQUIREMENTS





DETAIL A
TERMINAL COVER OPEN



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TITLE
DRIVE, DELTA SERIES

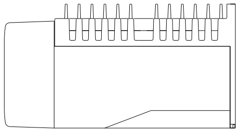
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'
B
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
DATE 16FEB00
SCALE NTS
DRAWING NUMBER DSD-4.25/RA
SHEET NO. 1 OF 1
REVISION C

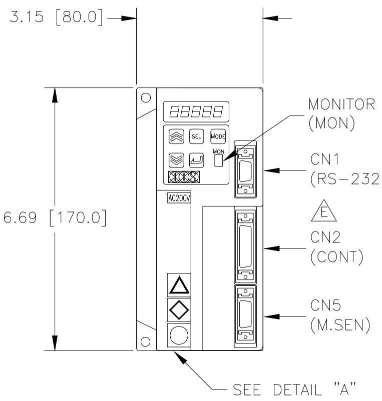
D NOTES:

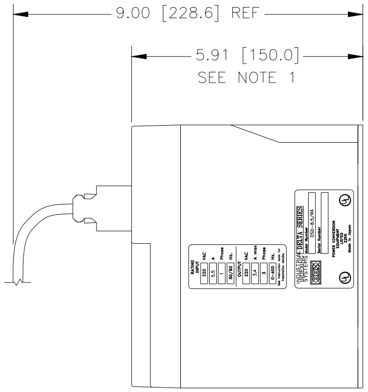
1.) RECOMMENDED CABINET DEPTH TO BE 10.00 [254.0].

2.) THIS DRAWING ALSO COVERS THE FOLLOWING DRIVES:
DSD-8.5/EA, DSD-8.5/EAI, DSD-8.5/EB, DSD-8.5/EBI,
DSD-8.5/RAI, DSD-8.5/RB AND DSD-8.5/RBI.

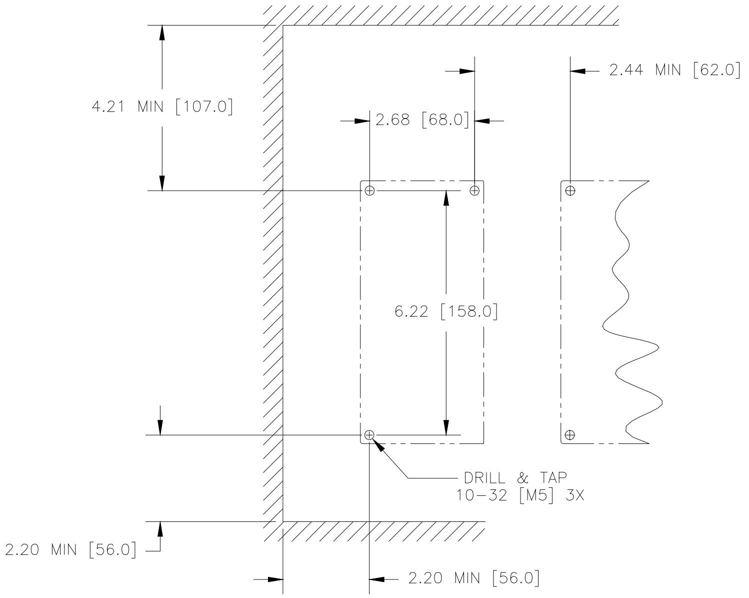
DATE	SYM	REVISION RECORD	DR	CK	CK
13SEP01	E	PER ECN 01-303	CWB	EB	CDR

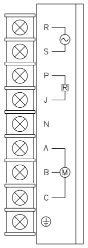






MOUNTING AND SPACING REQUIREMENTS





DETAIL A
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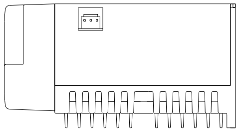

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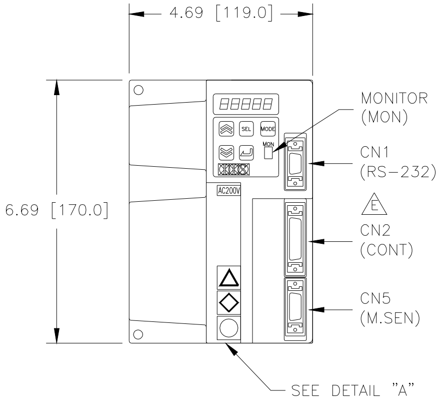
TITLE
DRIVE, DELTA SERIES

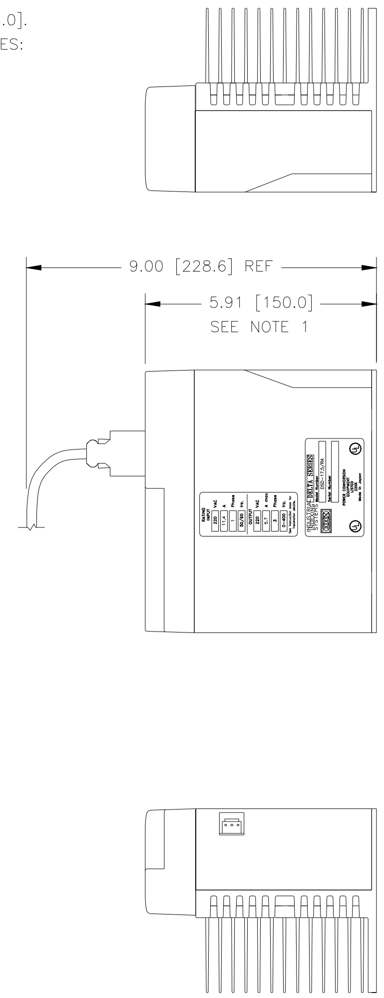
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'
B
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
DATE 09APR96
SCALE NTS
DRAWING NUMBER DSD-8.5/RA
SHEET NO. 1 OF 1
REVISION E

DATE	SYM	REVISION RECORD	DR	CK	CK
13SEP01	E	PER ECN 01-303	CWB	EB	CDR

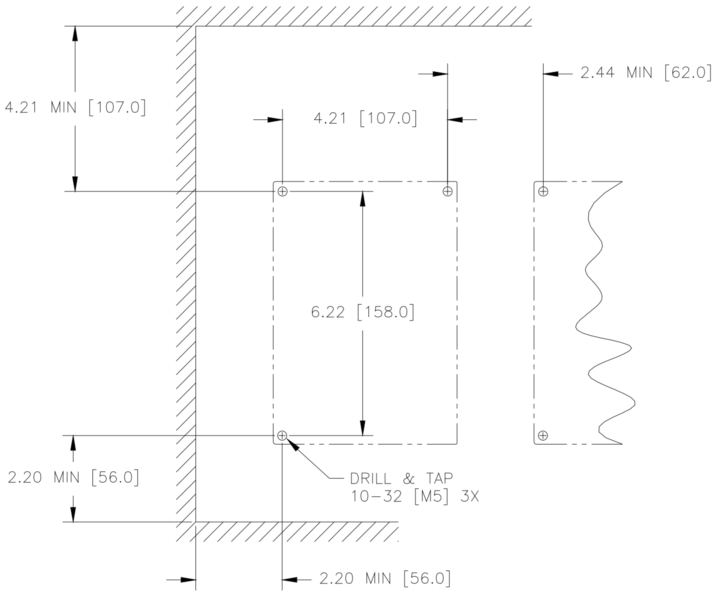
D NOTES:

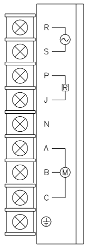
1.) RECOMMENDED CABINET DEPTH TO BE 10.00 [254.0].
2.) THIS DRAWING ALSO COVERS THE FOLLOWING DRIVES: DSD-17.5/AA, DSD-17.5/EA, DSD-17.5/EAI AND DSD-17.5/RAI.





MOUNTING AND SPACING REQUIREMENTS





DETAIL A
TERMINAL COVER OPEN

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TITLE
DRIVE, DELTA SERIES

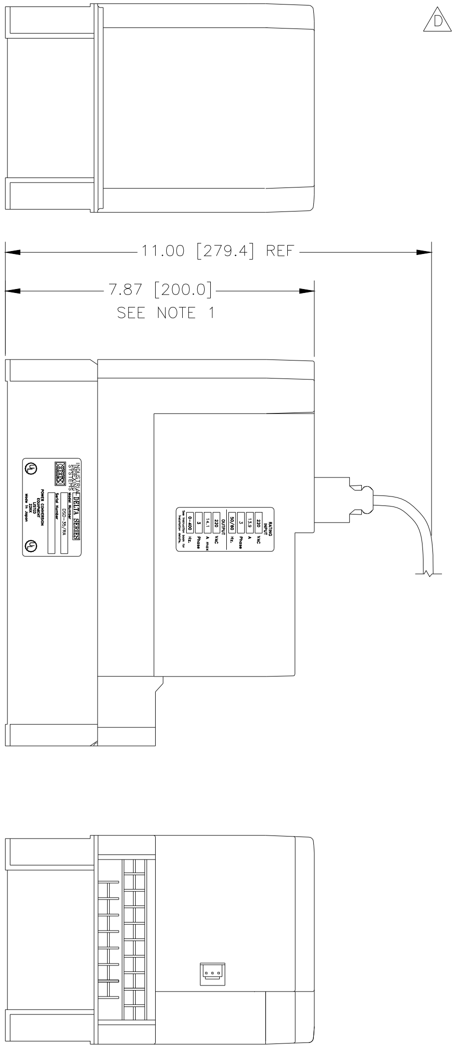
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 09APR96
SCALE NTS
DRAWING NUMBER DSD-17.5/RA
SHEET NO. 1 OF 1
REVISION E

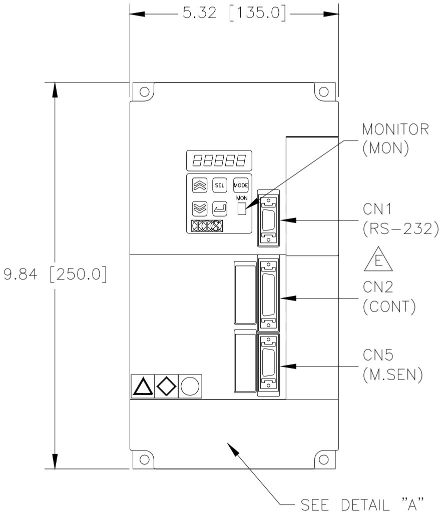
DATE	SYM	REVISION RECORD	DR	CK	CK
13SEP01	E	PER ECN 01-303	CWB	EB	CDR

D NOTES:

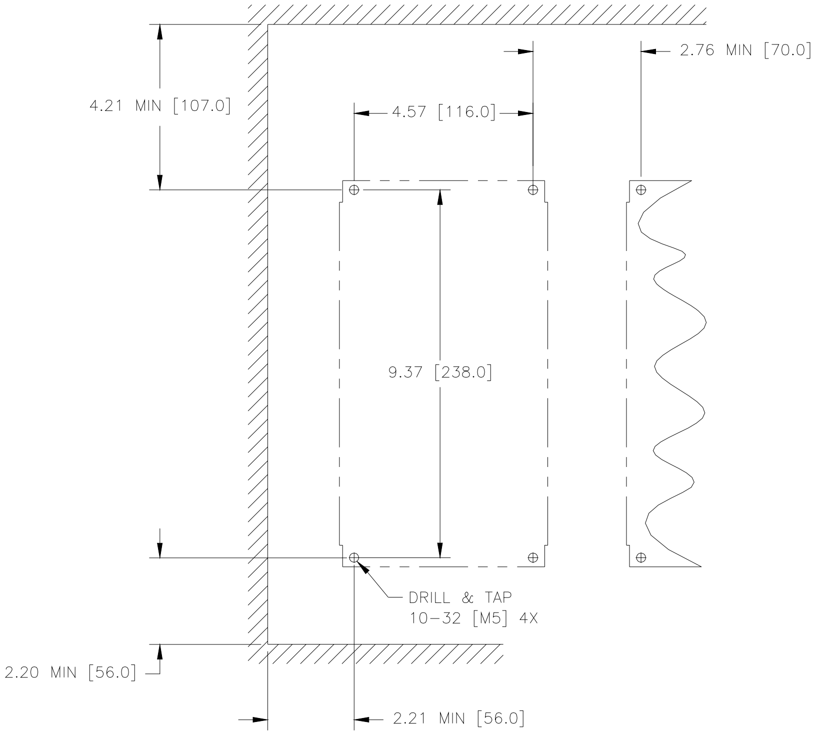
1.) RECOMMENDED CABINET DEPTH TO BE 12.00 [304.8].

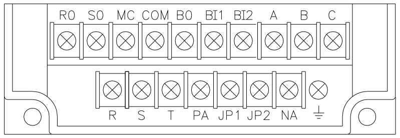
2.) THIS DRAWING ALSO COVERS THE FOLLOWING DRIVES: DSD-35/EA, DSD-35/EAI AND DSD-35/RAI.





MOUNTING AND SPACING REQUIREMENTS





DETAIL A D
PROTECTIVE COVER REMOVED

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TITLE
DRIVE, DELTA SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'

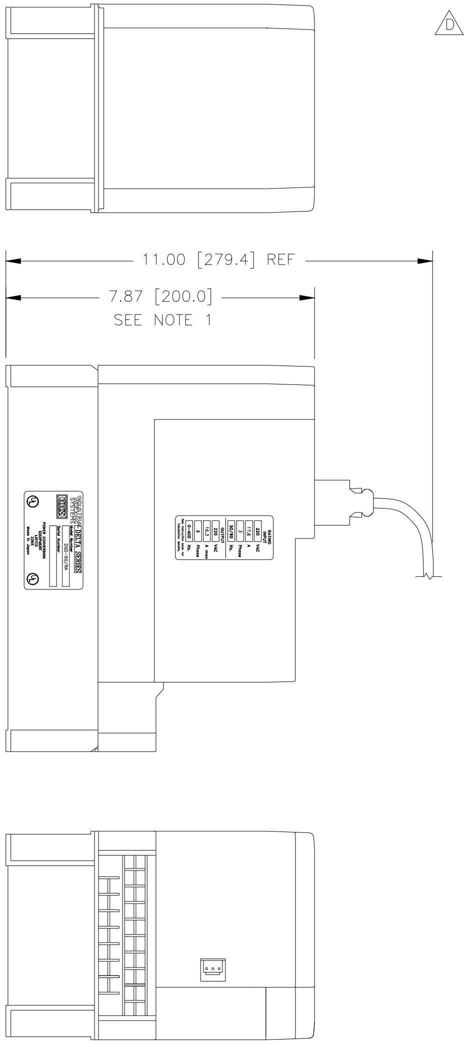
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 03APR96
SCALE NTS

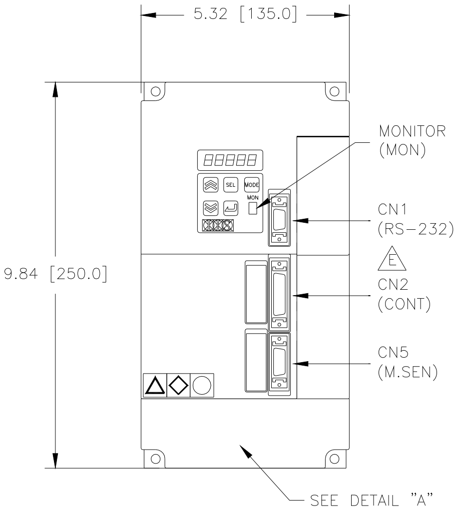
DRAWING NUMBER DSD-35/RA
SHEET NO. 1 OF 1
REVISION E

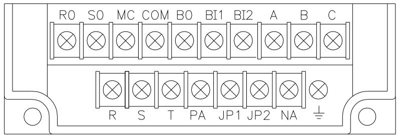
DATE	SYM	REVISION RECORD	DR	CK	CK
13SEP01	E	PER ECN 01-303	CWB	EB	CDR

D NOTES:

1.) RECOMMENDED CABINET DEPTH TO BE 12.00 [304.8].
2.) THIS DRAWING ALSO COVERS THE FOLLOWING DRIVES: DSD-50/EA, DSD-50/EAI AND DSD-50/RAI.

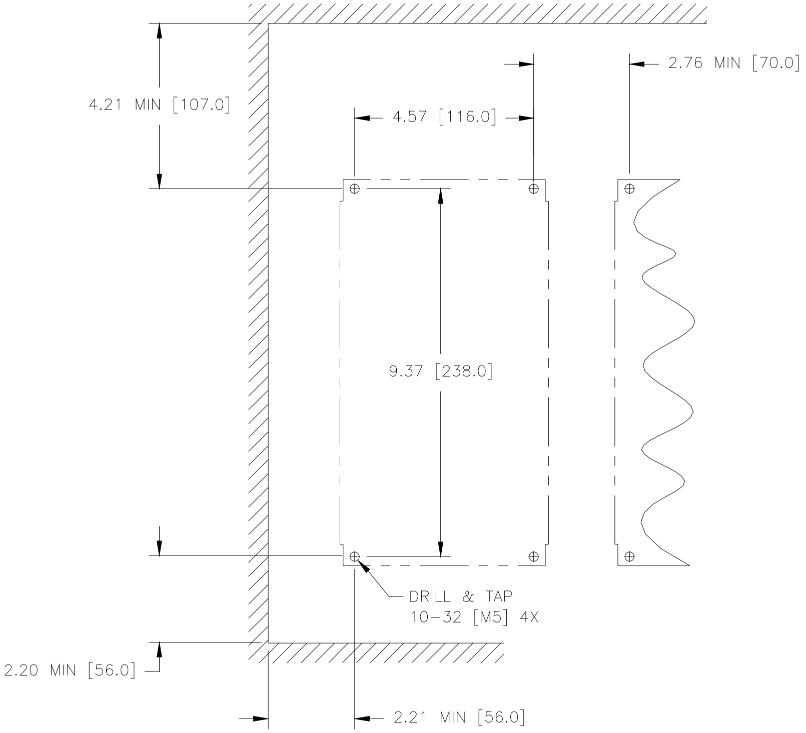






DETAIL A D
PROTECTIVE COVER REMOVED

MOUNTING AND SPACING REQUIREMENTS



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TITLE
DRIVE, DELTA SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
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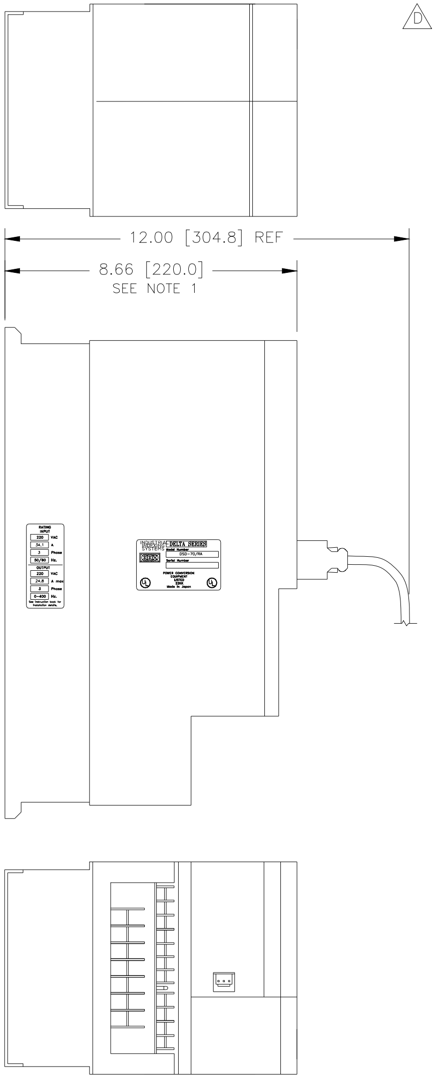
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 03APR96
SCALE NTS
DRAWING NUMBER DSD-50/RA
SHEET NO. 1 OF 1
REVISION E

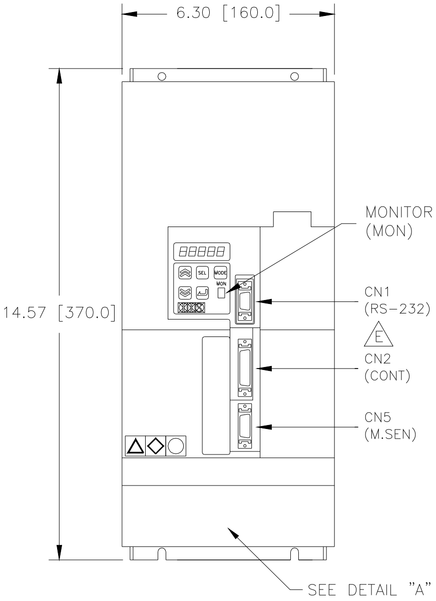
DATE	SYM	REVISION RECORD	DR	CK	CK
13SEP01	E	PER ECN 01-303	CWB	EB	CDR

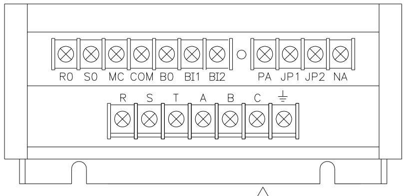
△D NOTES:

1.) RECOMMENDED CABINET DEPTH TO BE 12.00 [304.8].

2.) THIS DRAWING ALSO COVERS THE FOLLOWING DRIVES: DSD-70/EA, DSD-70/EAI AND DSD-70/RAI.

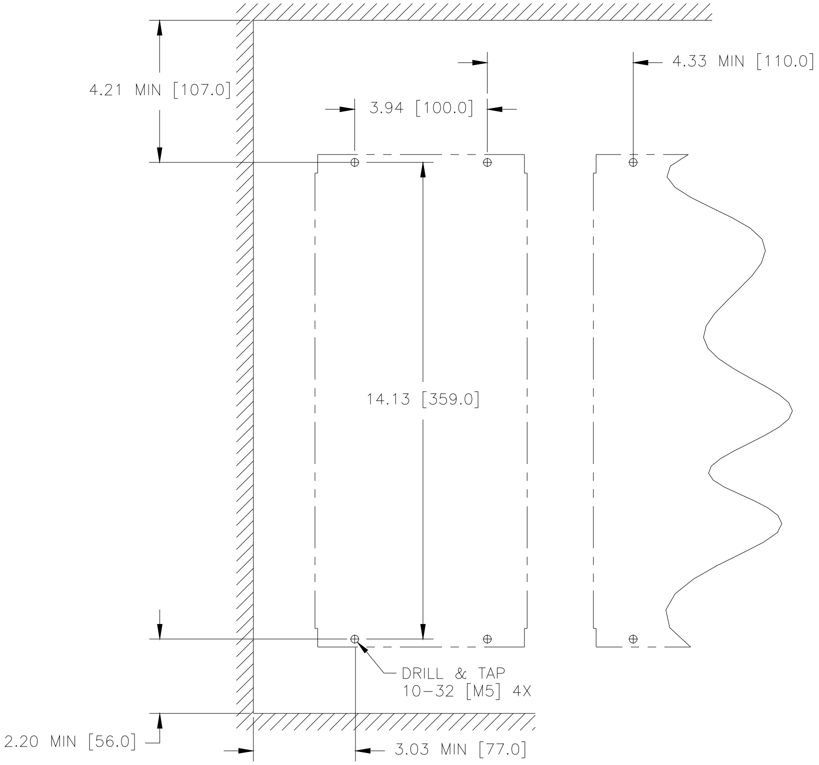






DETAIL A △D
PROTECTIVE COVER REMOVED

MOUNTING AND SPACING REQUIREMENTS



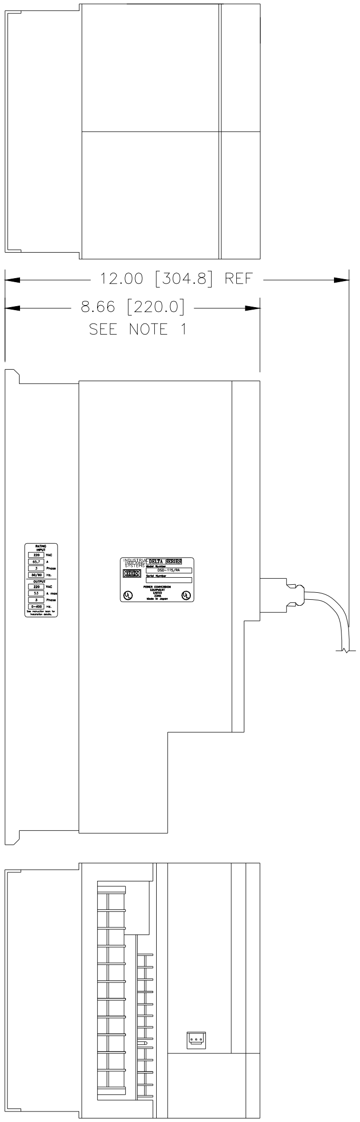
INDUSTRIAL INDEXING SYSTEMS, Inc.
www.iis-servo.com

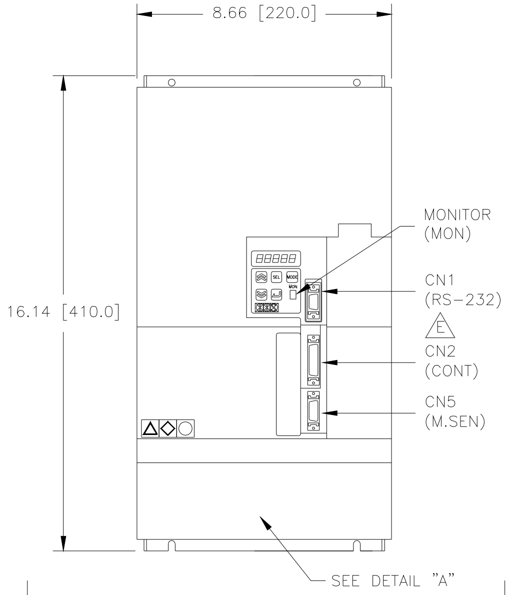
TITLE
DRIVE, DELTA SERIES

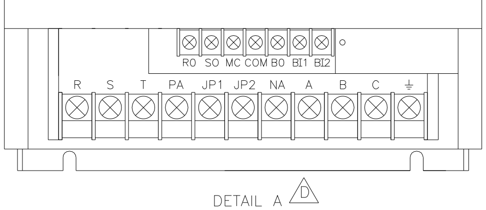
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'
B
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
DATE 08APR98
SCALE NTS
DRAWING NUMBER DSD-70/RA
SHEET NO. 1 OF 1
REVISION E

DATE	SYM	REVISION RECORD	DR	CK	CK
13SEP01	E	PER ECN 01-303	CWB	EB	CDR

D NOTES:
1.) RECOMMENDED CABINET DEPTH TO BE 12.00 [304.8].
2.) THIS DRAWING ALSO COVERS THE FOLLOWING DRIVES: DSD-115/EA, DSD-115/EAI AND DSD-115/RAI.

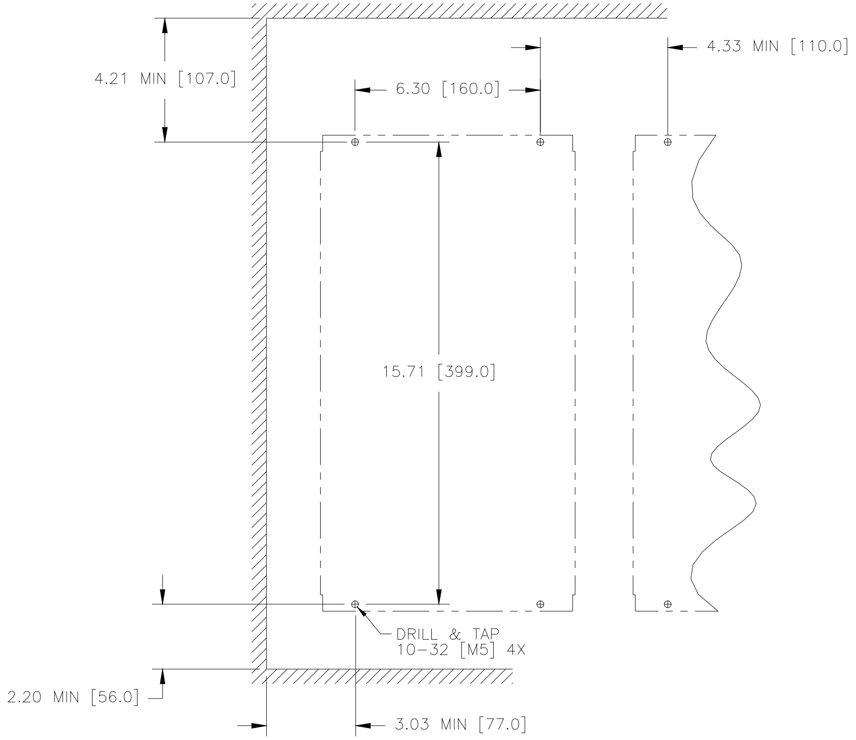






DETAIL A D
PROTECTIVE COVER REMOVED

MOUNTING AND SPACING REQUIREMENTS



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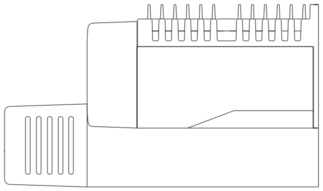
TITLE
DRIVE, DELTA SERIES

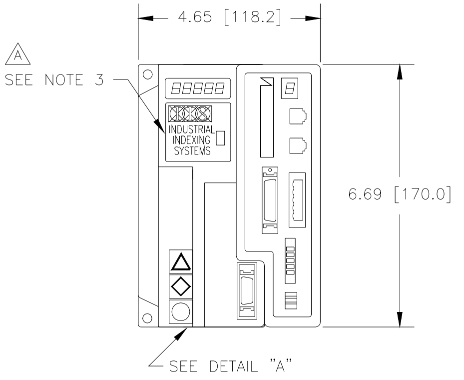
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'
B
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
DATE 09APR98
SCALE NTS
DRAWING NUMBER DSD-115/RA
SHEET NO. 1 OF 1
REVISION E

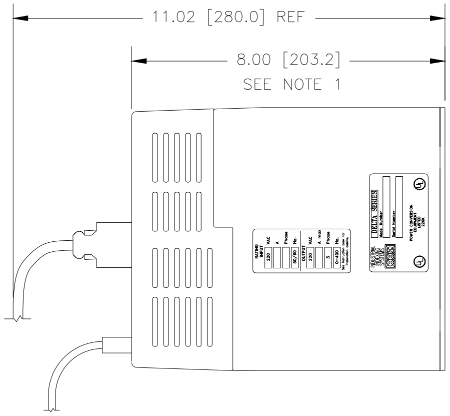
DATE	SYM	REVISION RECORD	DR	CK	CK
11JUL01	A	PER ECN 01-235	CWB	EB	CDR

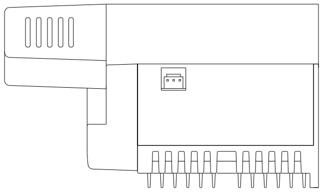
NOTES: △A

1.) MINIMUM CABINET DEPTH TO BE 12.00 [304.7].
2.) THIS DRAWING ALSO COVERS PRODUCTS:
DMAX-1.5/EA, DMAX-1.5/RAC, DMAX-1.5/RACS,
DMAX-1.5/RAD, DMAX-1.5/RAS AND DMAX-1.5/RB.
DMAX-1.5/RBD, DPRO-1.5/EA AND DPRO-1.5/EB,
DPRO-1.5/RAS AND DPRO-1.5/RB.
3.) KEYPAD OVERLAY SHOWN IS FOR DELTAPRO.
SEE DETAIL B FOR DELTAMAX KEYPAD.

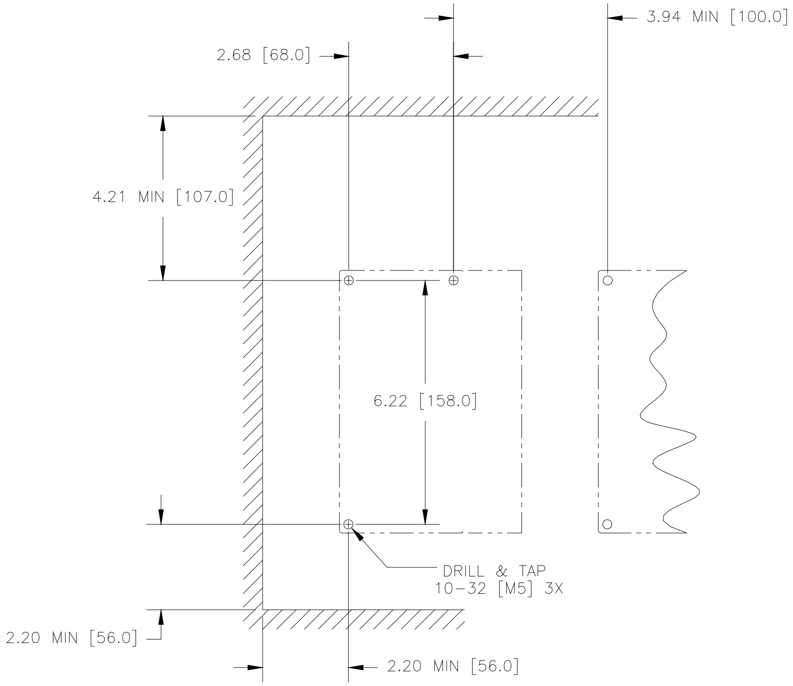


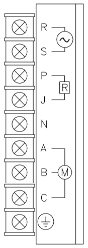






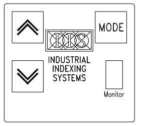
MOUNTING AND SPACING REQUIREMENTS





DETAIL A

TERMINAL COVER OPEN



DETAIL B △A

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

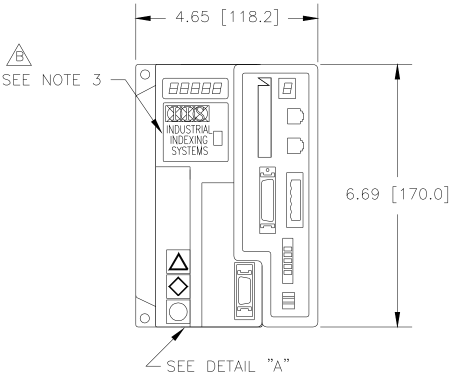
TITLE
DELTAMAX/DELTAPRO SERIES

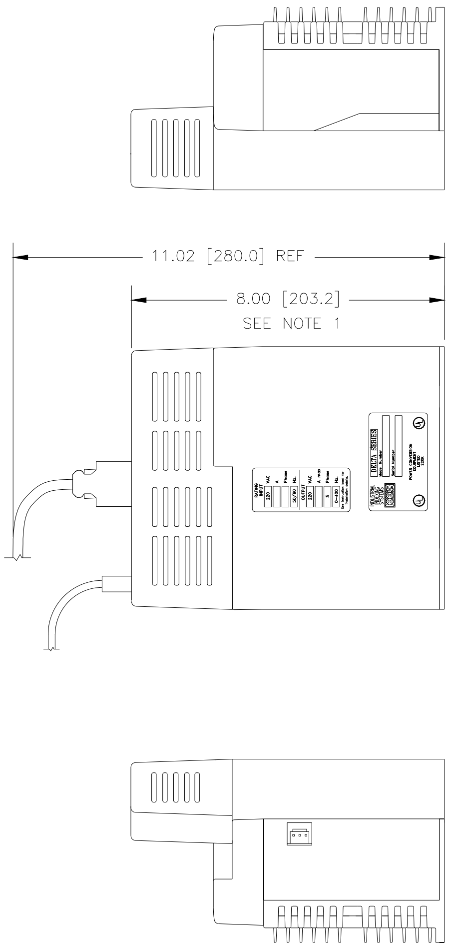
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
B
DRAWN BY: BOWMAN
AutoCAD FILE LOCATION: Q:\CURRENT DWGS
DATE: 10AUG00
SCALE: ---
DRAWING NUMBER: DMAX/DPRO-1.5/RA
SHEET NO.: 1 OF 1
REVISION: A

DATE	SYM	REVISION RECORD	DR	CK	CK
17JUL01	B	PER ECN 01-235	CWB	EB	CDR

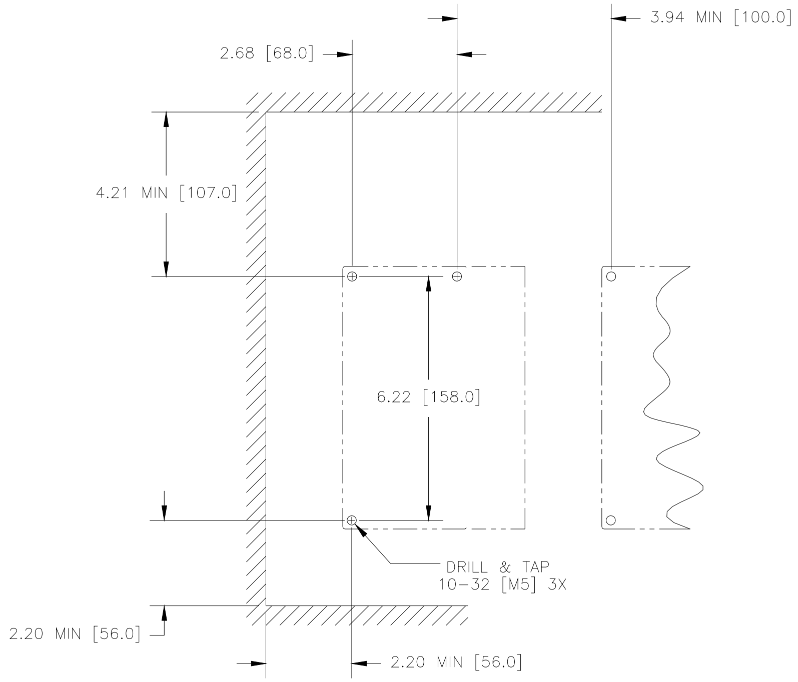
NOTES: △A △B

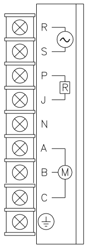
1.) MINIMUM CABINET DEPTH TO BE 12.00 [304.7].
2.) THIS DRAWING ALSO COVERS PRODUCTS:
DMAX-4.25/RAS, DMAX-4.25/RB, DMAX-4.25/RBS,
DPRO-4.25/EA, DPRO-4.25/EB AND DPRO-4.25/RB.
3.) KEYPAD OVERLAY SHOWN IS FOR DELTAPRO.
SEE DETAIL B FOR DELTAMAX KEYPAD.



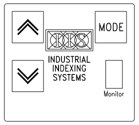


MOUNTING AND SPACING REQUIREMENTS





DETAIL A
TERMINAL COVER OPEN



DETAIL B △B

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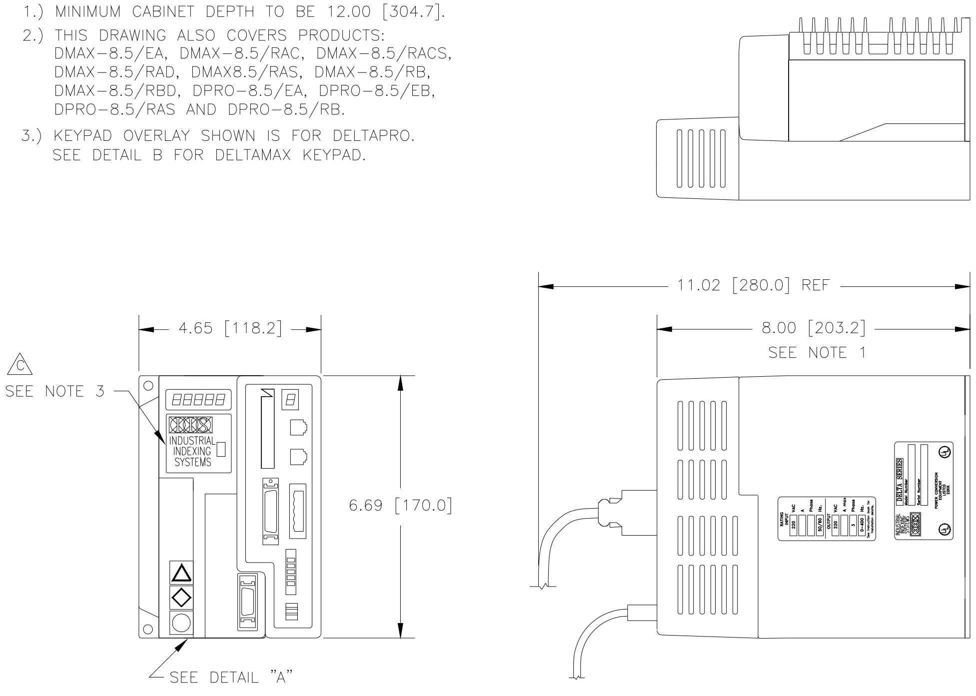
TITLE
DELTAMAX/DELTAPRO SERIES

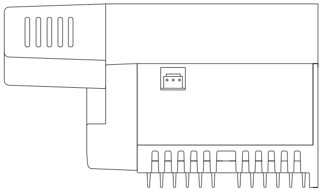
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)		DRAWN BY BOWMAN		DRAWING NUMBER DMAX/DPRO-4.25/RA
TOLERANCES		AutoCAD FILE LOCATION Q:\CURRENT DWGS		
X.X± --- X.XX± 0.01 X.XXX± 0.005	ANGULAR ± 0°30'	B DATE 04APR00	SCALE ---	SHEET NO. 1 OF 1 — REVISION B

DATE	SYM	REVISION RECORD	DR	CK	CK
17JUL01	C	PER ECN 01-235	CWB	EB	CDR

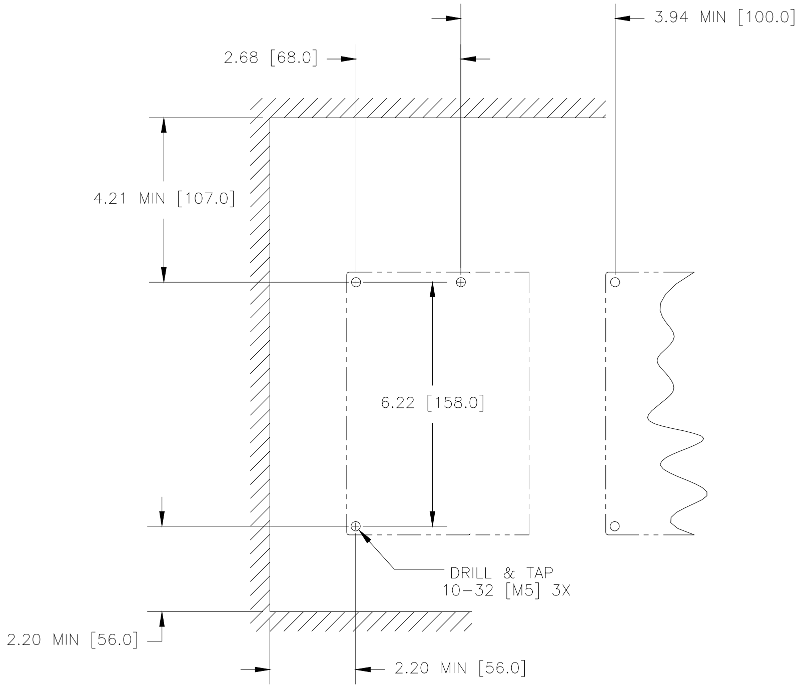
NOTES: C

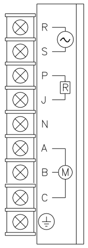
1.) MINIMUM CABINET DEPTH TO BE 12.00 [304.7].
2.) THIS DRAWING ALSO COVERS PRODUCTS: DMAX-8.5/EA, DMAX-8.5/RAC, DMAX-8.5/RACS, DMAX-8.5/RAD, DMAX8.5/RAS, DMAX-8.5/RB, DMAX-8.5/RBD, DPRO-8.5/EA, DPRO-8.5/EB, DPRO-8.5/RAS AND DPRO-8.5/RB.
3.) KEYPAD OVERLAY SHOWN IS FOR DELTAPRO. SEE DETAIL B FOR DELTAMAX KEYPAD.





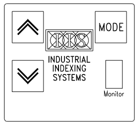
MOUNTING AND SPACING REQUIREMENTS





DETAIL A

TERMINAL COVER OPEN



DETAIL B C

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TITLE
DELTAMAX/DELTAPRO SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'

DRAWN BY
BOWMAN
AutoCAD FILE LOCATION
Q:\CURRENT DWGS
B
DATE
15MAY97
SCALE

DRAWING NUMBER
DMAX/DPRO-8.5/RA
SHEET NO.
1 OF 1
REVISION
C

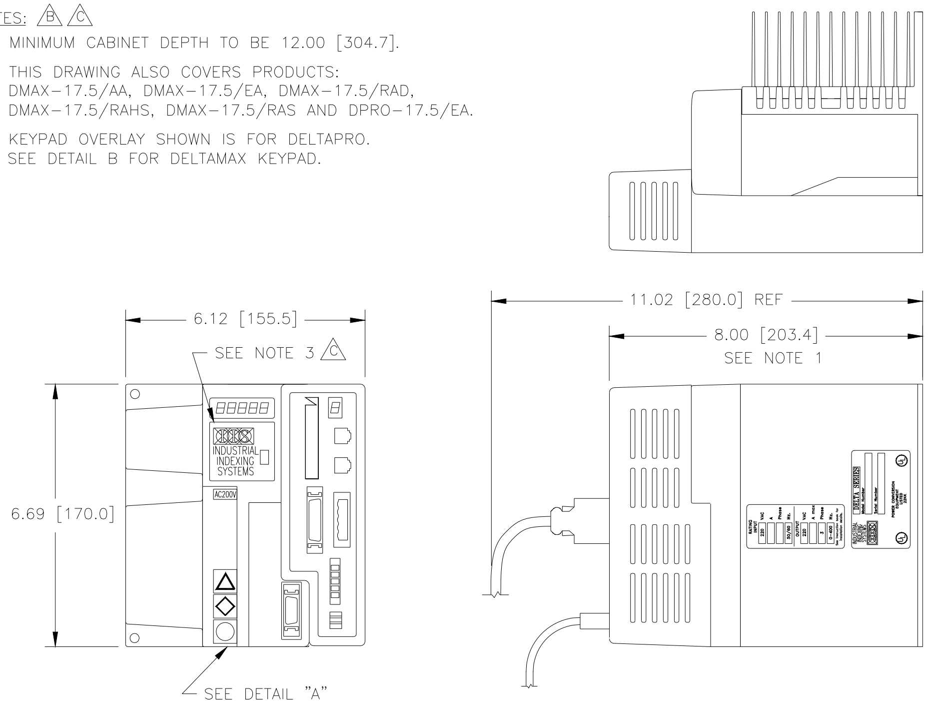
DATE	SYM	REVISION RECORD	DR	CK	CK
17JUL01	C	PER ECN 01-235	CWB	EB	CDR

NOTES: B C

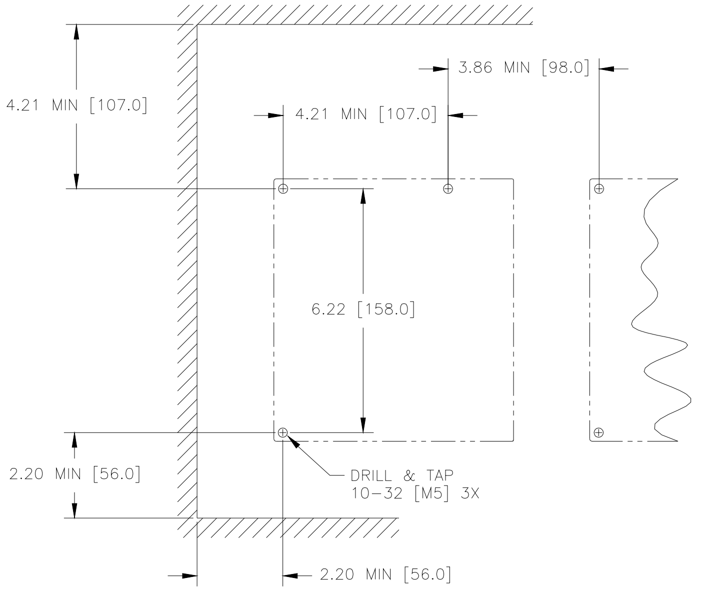
1.) MINIMUM CABINET DEPTH TO BE 12.00 [304.7].

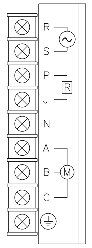
2.) THIS DRAWING ALSO COVERS PRODUCTS:
DMAX-17.5/AA, DMAX-17.5/EA, DMAX-17.5/RAD,
DMAX-17.5/RAHS, DMAX-17.5/RAS AND DPRO-17.5/EA.

3.) KEYPAD OVERLAY SHOWN IS FOR DELTAPRO.
SEE DETAIL B FOR DELTAMAX KEYPAD.

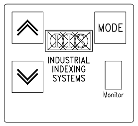


MOUNTING AND SPACING REQUIREMENTS





DETAIL A
TERMINAL COVER OPEN



DETAIL B C

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

TITLE
DELTAMAX/DELTAPRO SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 15MAY97
SCALE ---
DRAWING NUMBER DMAX/DPRO-17.5/RA
SHEET NO. 1 OF 1
REVISION C

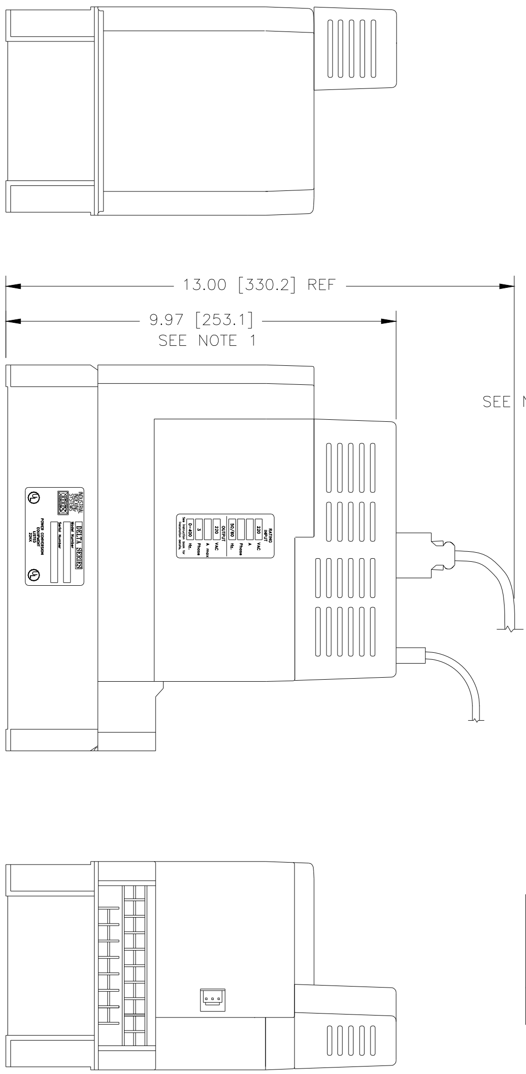
DATE	SYM	REVISION RECORD	DR	CK	CK
17JUL01	D	PER ECN 01-235	CWB	EB	CDR

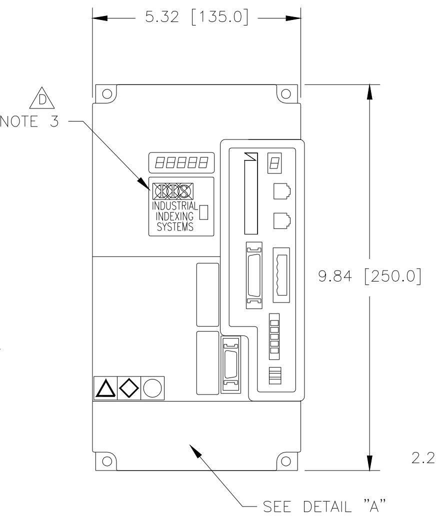
NOTES: △C △D

1.) MINIMUM CABINET DEPTH TO BE 14.00 [355.5].

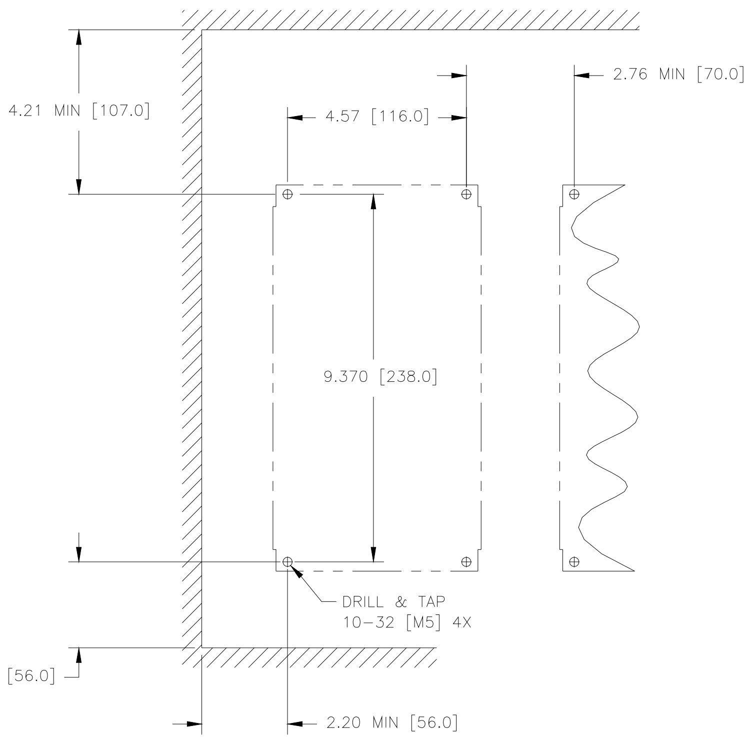
2.) THIS DRAWING ALSO COVERS PRODUCTS: DMAX-35/EA, DMAX-35/RAD, DPRO-35/EA AND DPRO-35/RAS.

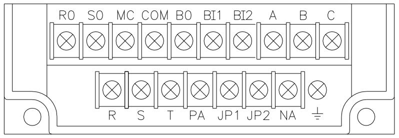
3.) KEYPAD OVERLAY SHOWN IS FOR DELTAPRO. SEE DETAIL B FOR DELTAMAX KEYPAD.



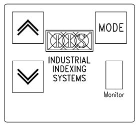


MOUNTING AND SPACING REQUIREMENTS





DETAIL A △B
PROTECTIVE COVER REMOVED



DETAIL B △D

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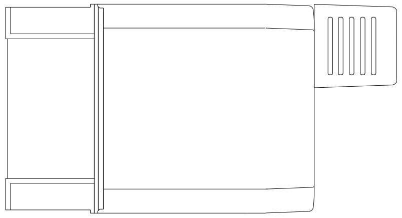
TITLE
DELTAMAX/DELTAPRO SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'

DRAWN BY
BOWMAN
AutoCAD FILE LOCATION
Q:\CURRENT DWGS
B
DATE
15MAY97
SCALE

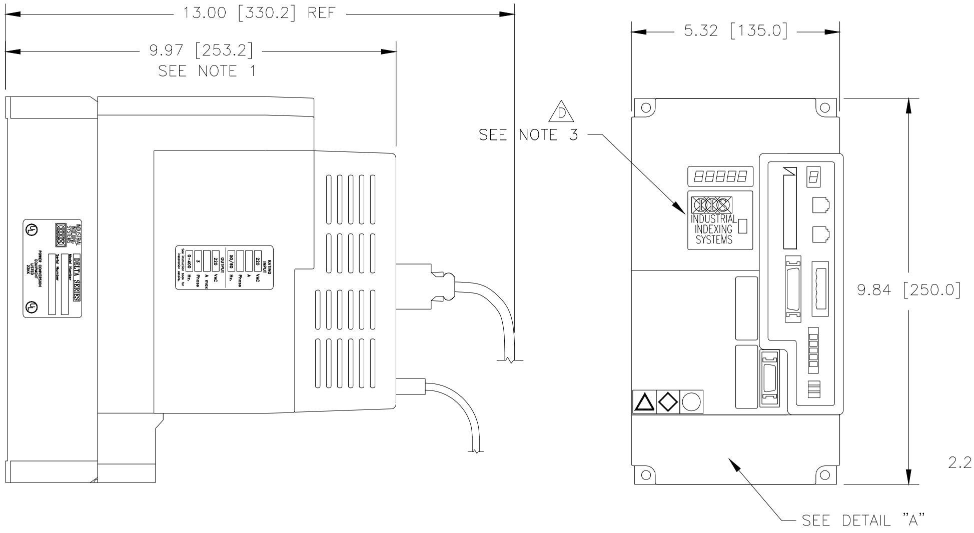
DRAWING NUMBER
DMAX/DPRO-35/RA
SHEET NO.
1 OF 1
REVISION
D

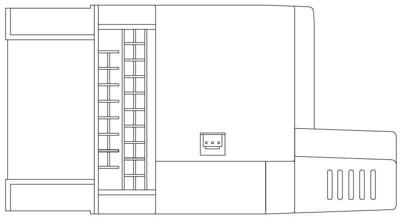
DATE	SYM	REVISION RECORD	DR	CK	CK
17JUL01	D	PER ECN 01-235	CWB	EB	CDR



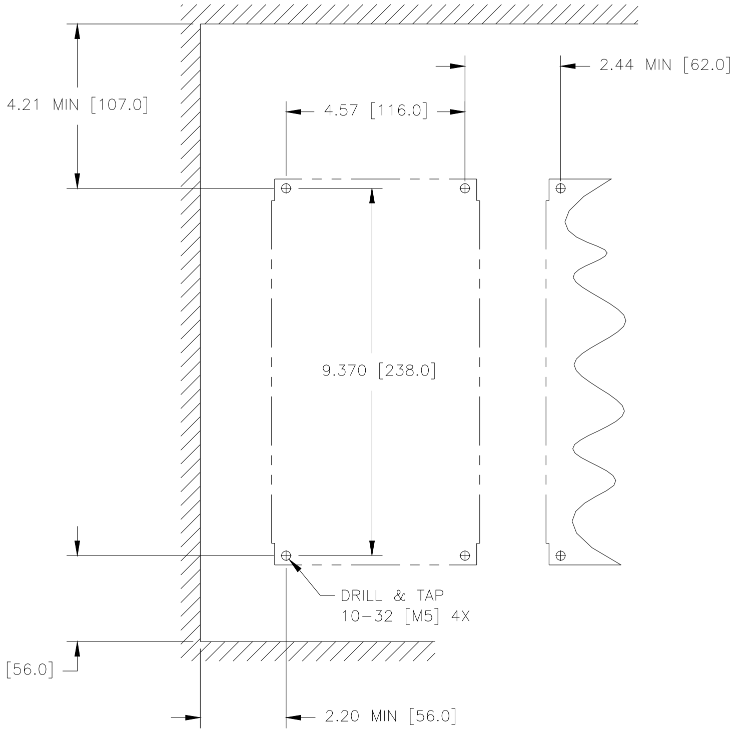
NOTES: △C △D

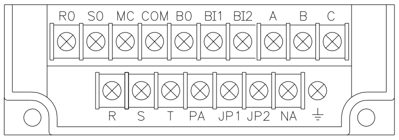
1.) MINIMUM CABINET DEPTH TO BE 14.00 [355.5].
2.) THIS DRAWING ALSO COVERS PRODUCTS: DMAX-50/EA, DMAX-50/RAD, DMAX-50/RAS, DPRO-50/EA AND DPRO-50/RAS.
3.) KEYPAD OVERLAY SHOWN IS FOR DELTAPRO. SEE DETAIL B FOR DELTAMAX KEYPAD.



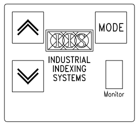


MOUNTING AND SPACING REQUIREMENTS





DETAIL A △B
PROTECTIVE COVER REMOVED



DETAIL B △D

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TITLE
DELTAMAX/DELTAPRO SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'
B
DRAWN BY
BOWMAN
AutoCAD FILE LOCATION
Q:\CURRENT DWGS
DATE
15MAY97
SCALE

DRAWING NUMBER
DMAX/DPRO-50/RA
SHEET NO.
1 OF 1
REVISION
D

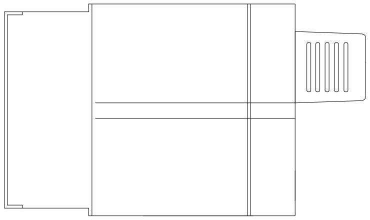
DATE	SYM	REVISION RECORD	DR	CK	CK
17JUL01	D	PER ECN 01-235	CWB	EB	CDR

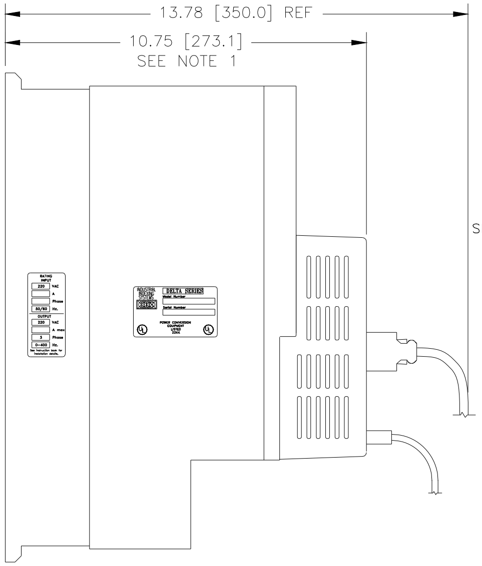
NOTES: △C △D

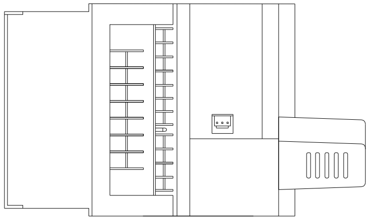
1.) MINIMUM CABINET DEPTH TO BE 16.00 [406.3].

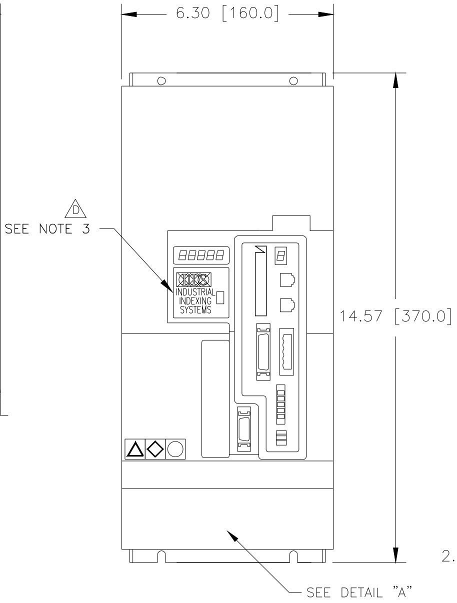
2.) THIS DRAWING ALSO COVERS PRODUCTS:
DMAX-70/EA, DMAX-70/RAD AND DPRO-70/EA.

3.) KEYPAD OVERLAY SHOWN IS FOR DELTAPRO.
SEE DETAIL B FOR DELTAMAX KEYPAD.

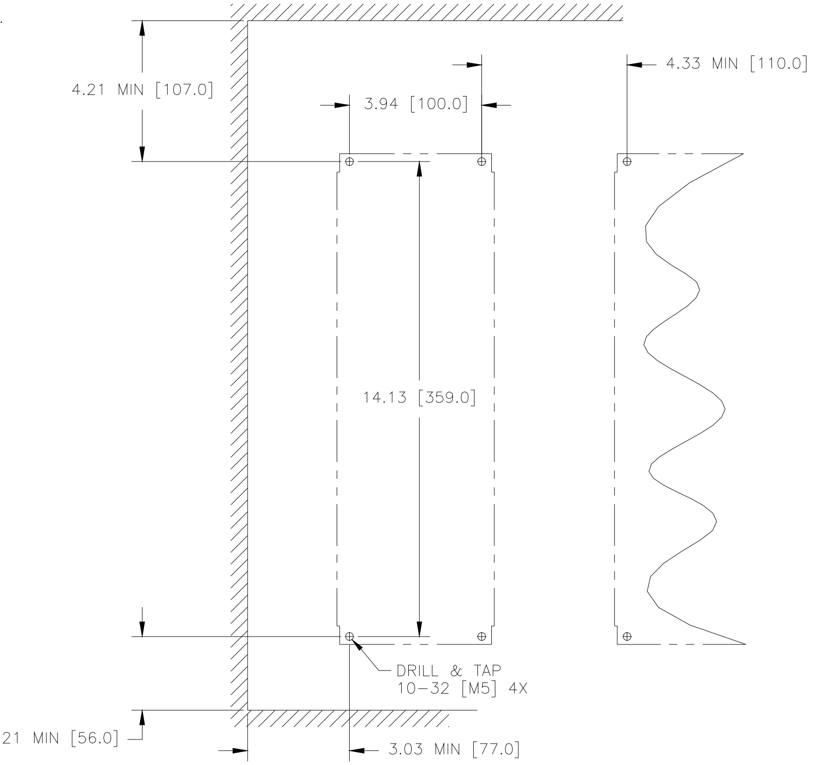


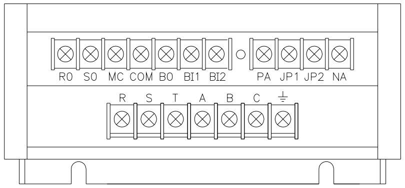




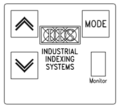


MOUNTING AND SPACING REQUIREMENTS





DETAIL A △B
PROTECTIVE COVER REMOVED



DETAIL B △D

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TITLE
DELTAMAX/DELTAPRO SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'

DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 15MAY97
SCALE ---

DRAWING NUMBER DMAX/DPRO-70/RA
SHEET NO. 1 OF 1
REVISION D

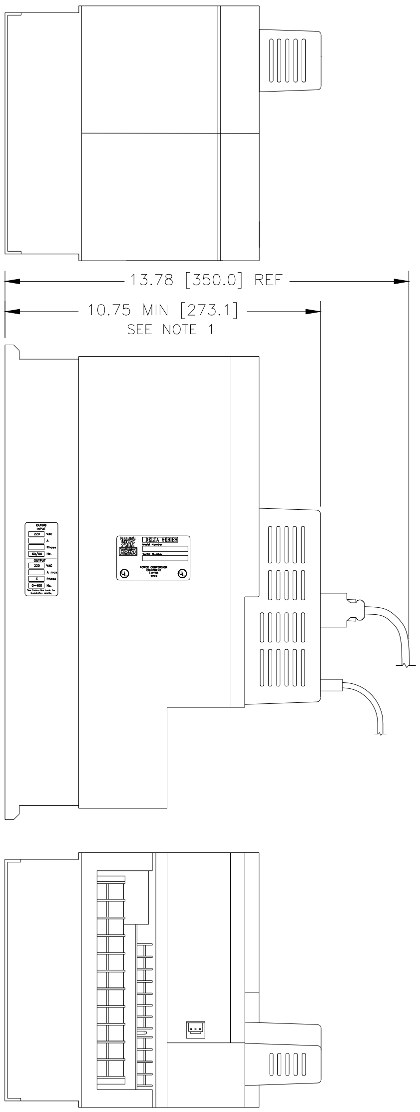
DATE	SYM	REVISION RECORD	DR	CK	CK
17JUL01	D	PER ECN 01-235	CWB	EB	CDR

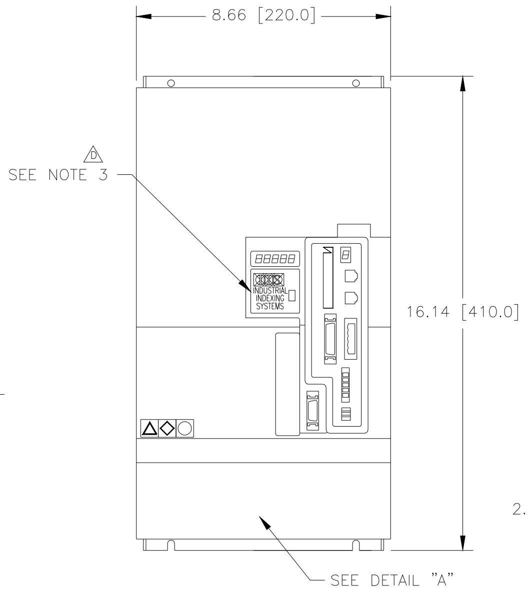
NOTES: △C △D

1.) MINIMUM CABINET DEPTH TO BE 16.00 [406.3].

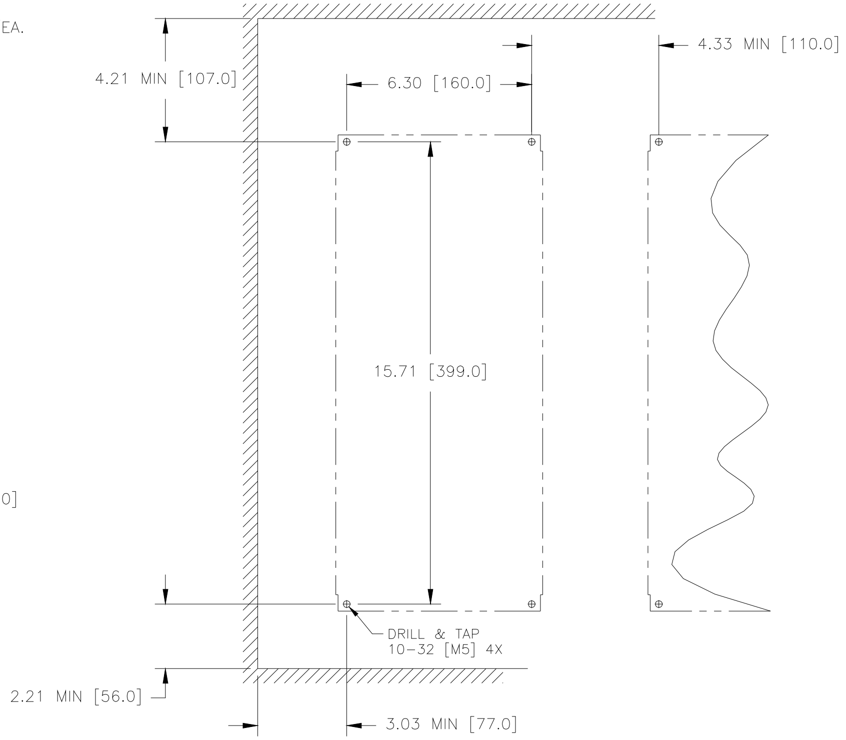
2.) THIS DRAWING ALSO COVERS PRODUCTS: DMAX-115/EA, DMAX-115/EAD, DMAX-115/RAD, DMAX-115/RAI, DMAX-115/RAS AND DPRO-115/EA.

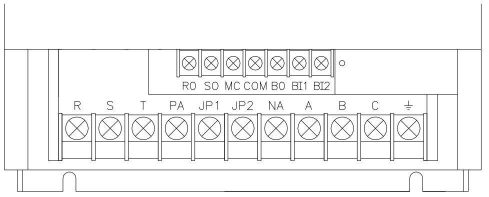
3.) KEYPAD OVERLAY SHOWN IS FOR DELTAPRO. SEE DETAIL B FOR DELTAMAX KEYPAD.



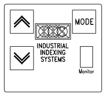


MOUNTING AND SPACING REQUIREMENTS





DETAIL A △B
PROTECTIVE COVER REMOVED



DETAIL B △D

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TITLE
DELTAMAX/DELTAPRO SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
B

DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
DATE 15MAY97
SCALE ---
DRAWING NUMBER DMAX/DPRO-115/RA
SHEET NO. 1 OF 1
REVISION D

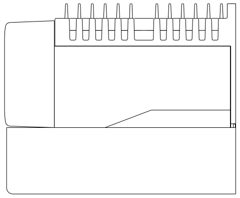
DATE	SYM	REVISION RECORD	DR	CK	CK
20JAN03	A	PER ECN 02-237	CWB		

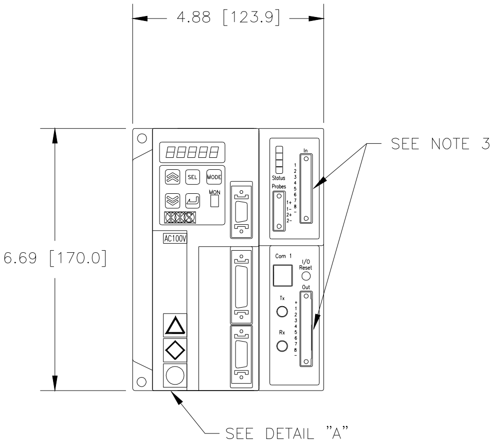
NOTES: △A

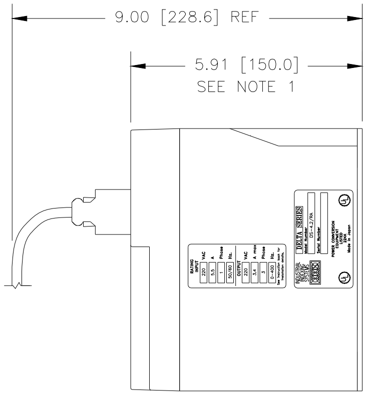
1.) RECOMMENDED CABINET DEPTH TO BE 10.00 [254.0].

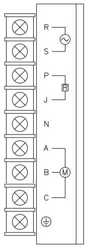
2.) THIS DRAWING ALSO COVERS PRODUCTS:
DS-1.5/RAI, DS-1.5/RAJ, DS-1.5/RAK, DS-1.5/RAIJ & DS-1.5/RAIK
DS-1.5/RB, DS-1.5/RBI, DS-1.5/RBJ, DS-1.5/RBK, DS-1.5/RBIJ & DS-1.5/RBIK
DS-1.5/EA, DS-1.5/EAI, DS-1.5/EAJ, DS-1.5/EAK, DS-1.5/EAIJ & DS-1.5/EAIK
DS-1.5/EB, DS-1.5/EBI, DS-1.5/EBJ, DS-1.5/EBK, DS-1.5/EBIJ & DS-1.5/EBIK

3.) SHOWN WITH OPTIONAL I/O BOARD INSTALLED (OPTION "J").

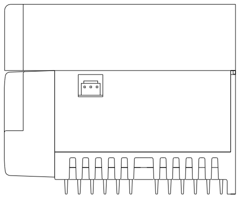




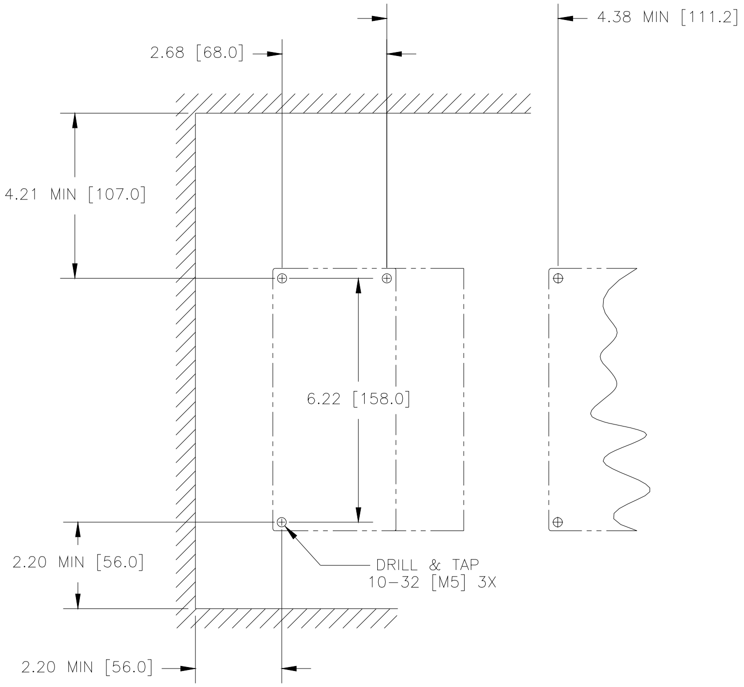




DETAIL A
TERMINAL COVER OPEN



MOUNTING AND SPACING REQUIREMENTS



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TITLE
DRIVE, DELTA S SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)		DRAWN BY BOWMAN		DRAWING NUMBER DS-1.5/RA
TOLERANCES		AutoCAD FILE LOCATION Q:\CURRENT DWGS		
X.X± --- X.XX± 0.01 X.XXX± 0.005	ANGULAR ± 0°30'	B	DATE 10AUG00	SCALE ---
			SHEET NO. 1 OF 1	REVISION A

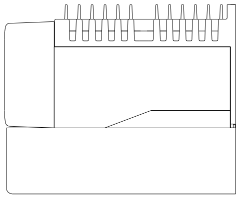
DATE	SYM	REVISION RECORD	DR	CK	CK
20JAN03	B	PER ECN 02-327	CWB		

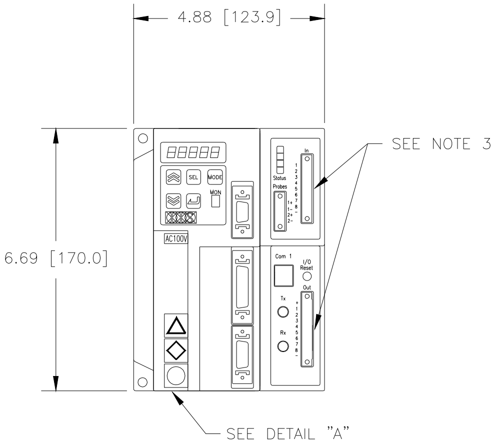
NOTES: Ⓐ Ⓑ

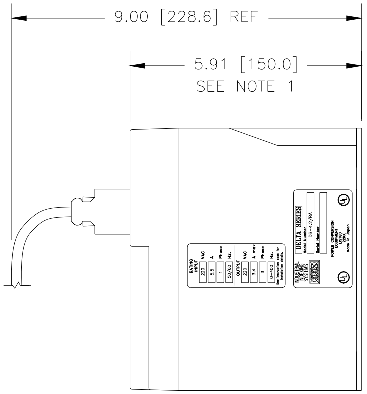
1.) RECOMMENDED CABINET DEPTH TO BE 10.00 [254.0].

2.) THIS DRAWING ALSO COVERS PRODUCTS:
DS-4.25/RAI, DS-4.25/RAJ, DS-4.25/RAK, DS-4.25/RAIJ & DS-4.25/RAIK
DS-4.25/RB, DS-4.25/RBI, DS-4.25/RBJ, DS-4.25/RBK, DS-4.25/RBIJ & DS-4.25/RBIK
DS-4.25/EA, DS-4.25/EAI, DS-4.25/EAJ, DS-4.25/EAK, DS-4.25/EAIJ & DS-4.25/EAIK
DS-4.25/EB, DS-4.25/EBI, DS-4.25/EBJ, DS-4.25/EBK, DS-4.25/EBIJ & DS-4.24/EBIK

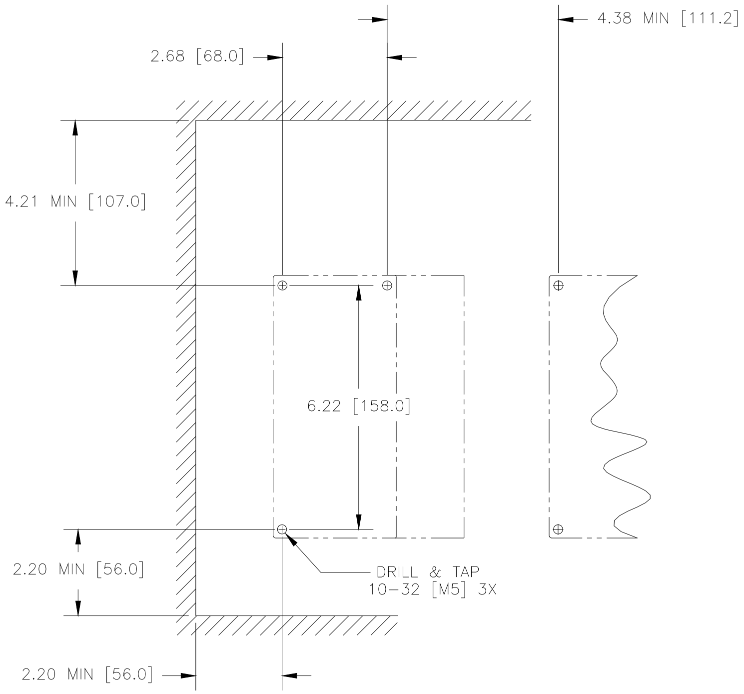
3.) SHOWN WITH OPTIONAL I/O BOARD INSTALLED (OPTION "J").

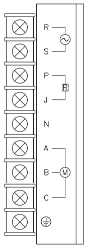




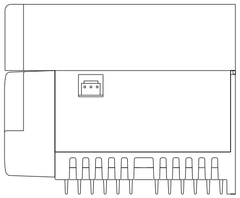


MOUNTING AND SPACING REQUIREMENTS





DETAIL A
TERMINAL COVER OPEN



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TITLE
DRIVE, DELTA S SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
B
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
DATE 17MAR00
SCALE ---
DRAWING NUMBER DS-4.25/RA
SHEET NO. 1 OF 1
REVISION B

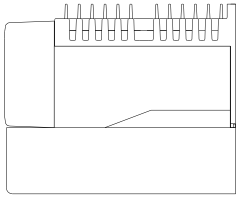
NOTES: △A △B

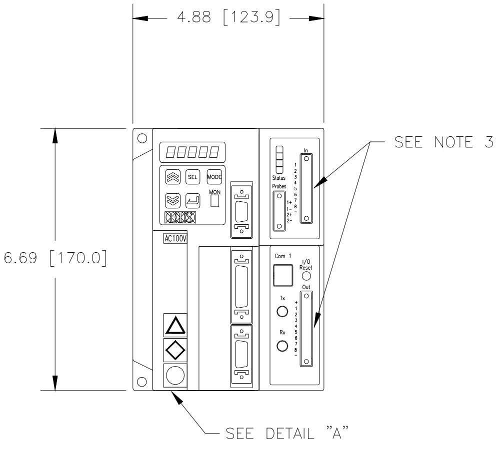
1.) RECOMMENDED CABINET DEPTH TO BE 10.00 [254.0].

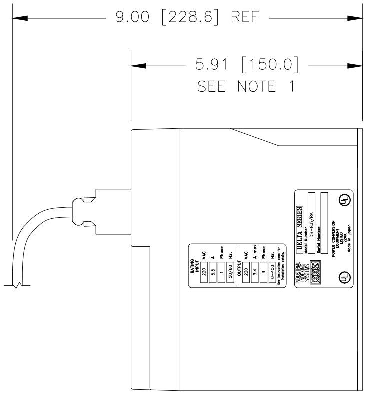
2.) THIS DRAWING ALSO COVERS PRODUCTS:
DS-8.5/RAI, DS-8.5/RAJ, DS-8.5/RAK, DS-8.5/RAIJ & DS-8.5/RAIK
DS-8.5/RB, DS-8.5/RBI, DS-8.5/RBJ, DS-8.5/RBK, DS-8.5/RBIJ & DS-8.5/RBIK
DS-8.5/EA, DS-8.5/EAI, DS-8.5/EAJ, DS-8.5/EAK, DS-8.5/EAIJ & DS-8.5/EAIK
DS-8.5/EB, DS-8.5/EBI, DS-8.5/EBJ, DS-8.5/EBK, DS-8.5/EBIJ & DS-8.5/EBIK

3.) SHOWN WITH OPTIONAL I/O BOARD INSTALLED (OPTION "J").

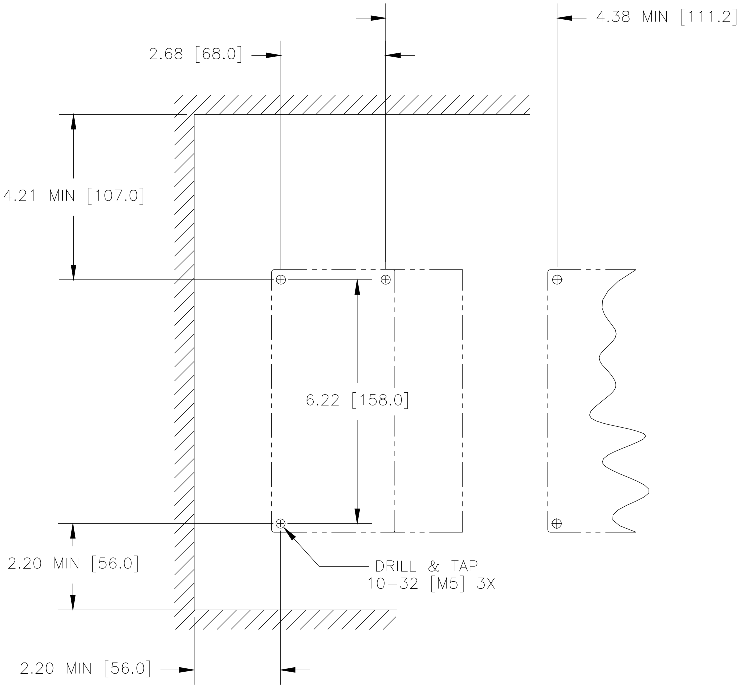
DATE	SYM	REVISION RECORD	DR	CK	CK
20JAN03	B	PER ECN 02-327	CWB		

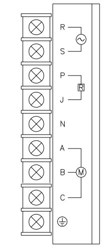




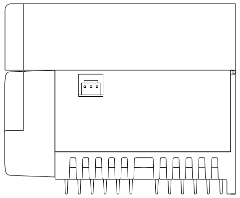


MOUNTING AND SPACING REQUIREMENTS





DETAIL A
TERMINAL COVER OPEN



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

TITLE
DRIVE, DELTA S SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'

B

DRAWN BY: BOWMAN
AutoCAD FILE LOCATION: Q:\CURRENT DWGS
DATE: 20JUL00
SCALE: ---
DRAWING NUMBER: DS-8.5/RA
SHEET NO.: 1 OF 1
REVISION: B

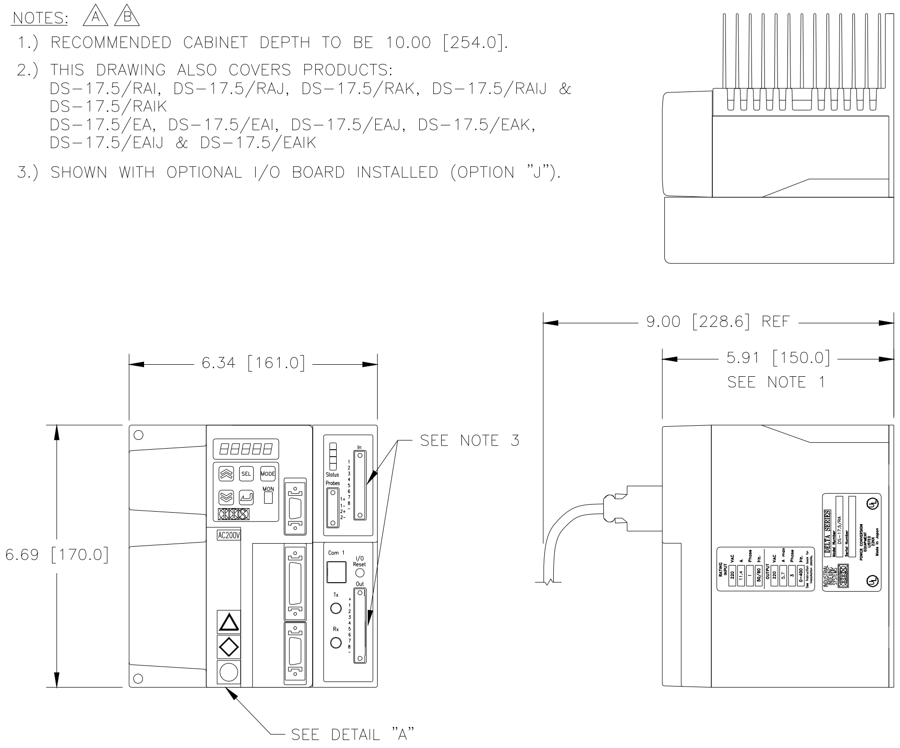
DATE	SYM	REVISION RECORD	DR	CK	CK
20JAN03	B	PER ECN 02-327	CWB		

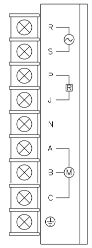
NOTES: △A △B

1.) RECOMMENDED CABINET DEPTH TO BE 10.00 [254.0].

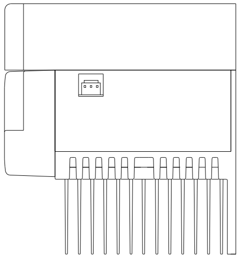
2.) THIS DRAWING ALSO COVERS PRODUCTS:
DS-17.5/RAI, DS-17.5/RAJ, DS-17.5/RAK, DS-17.5/RAIJ &
DS-17.5/RAIK
DS-17.5/EA, DS-17.5/EAI, DS-17.5/EAJ, DS-17.5/EAK,
DS-17.5/EAIJ & DS-17.5/EAIK

3.) SHOWN WITH OPTIONAL I/O BOARD INSTALLED (OPTION "J").

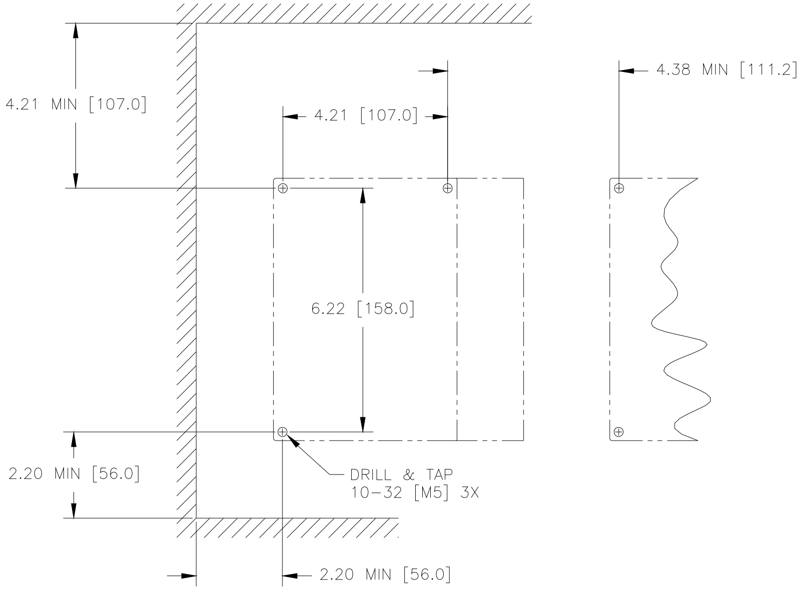




DETAIL A
TERMINAL COVER OPEN



MOUNTING AND SPACING REQUIREMENTS



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TITLE
DRIVE, DELTA S SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'

DRAWN BY
BOWMAN

AutoCAD FILE LOCATION
Q:\CURRENT DWGS

B

DATE
17MAR00

SCALE

DRAWING NUMBER
DS-17.5/RA

SHEET NO.
1 OF 1

REVISION
B

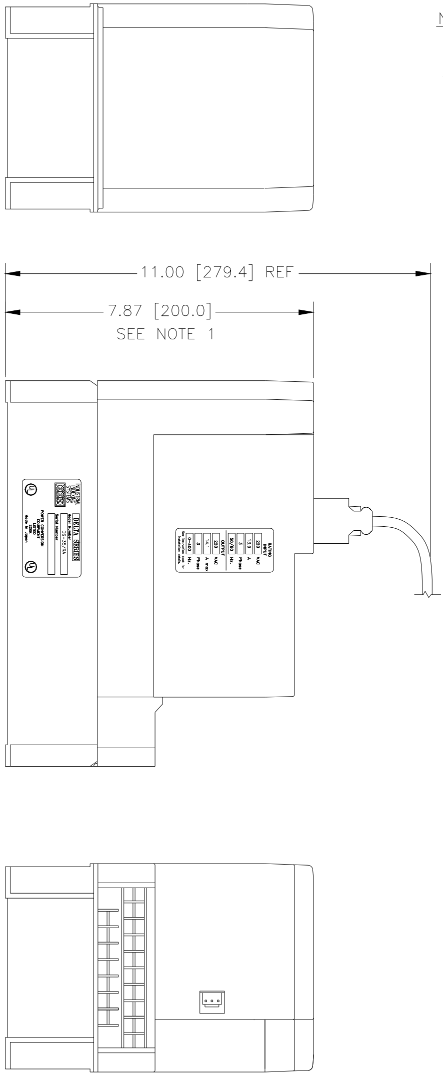
DATE	SYM	REVISION RECORD	DR	CK	CK
20JAN03	B	PER ECN 02-237	CWB		

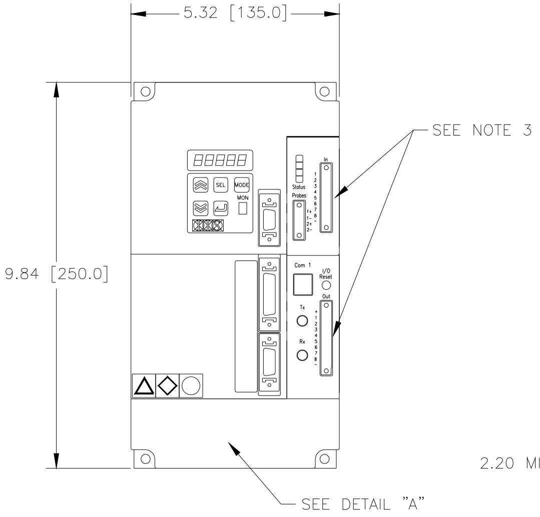
NOTES: △A △B

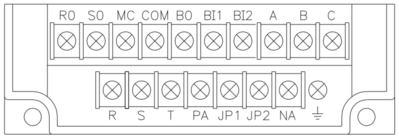
1.) RECOMMENDED CABINET DEPTH TO BE 12.00 [304.8].

2.) THIS DRAWING ALSO COVERS PRODUCTS:
DS-35/RAI, DS-35/RAJ, DS-35/RAK, DS-35/RAIJ &
DS-35/RAIK
DS-35/EA, DS-35/EAI, DS-35/EAJ, DS-35/EAK,
DS-35/EAIJ & DS-35/EAIK

3.) SHOWN WITH OPTIONAL I/O BOARD INSTALLED (OPTION "J").

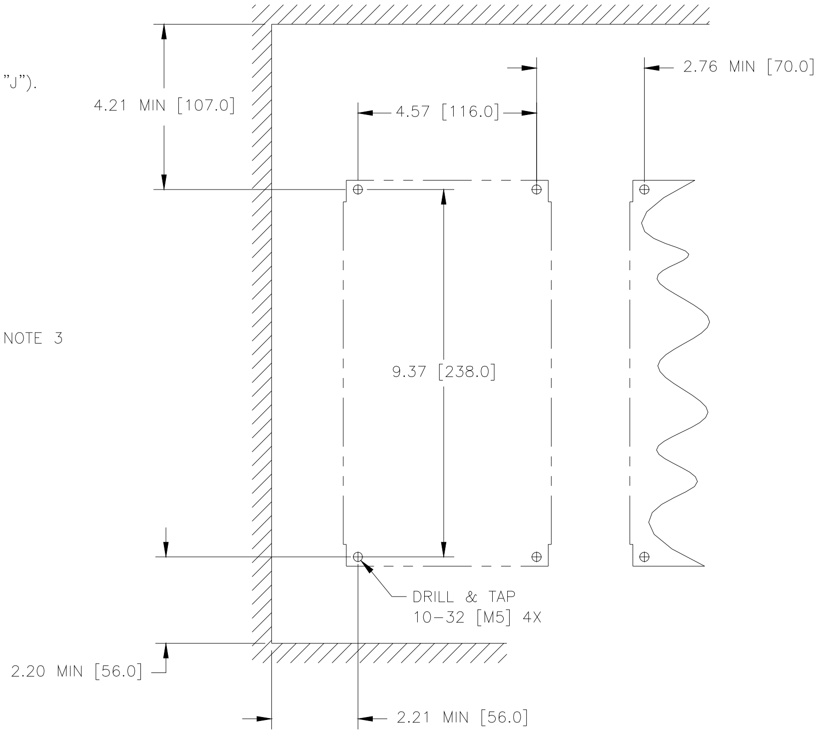






DETAIL A △A
PROTECTIVE COVER REMOVED

MOUNTING AND SPACING REQUIREMENTS



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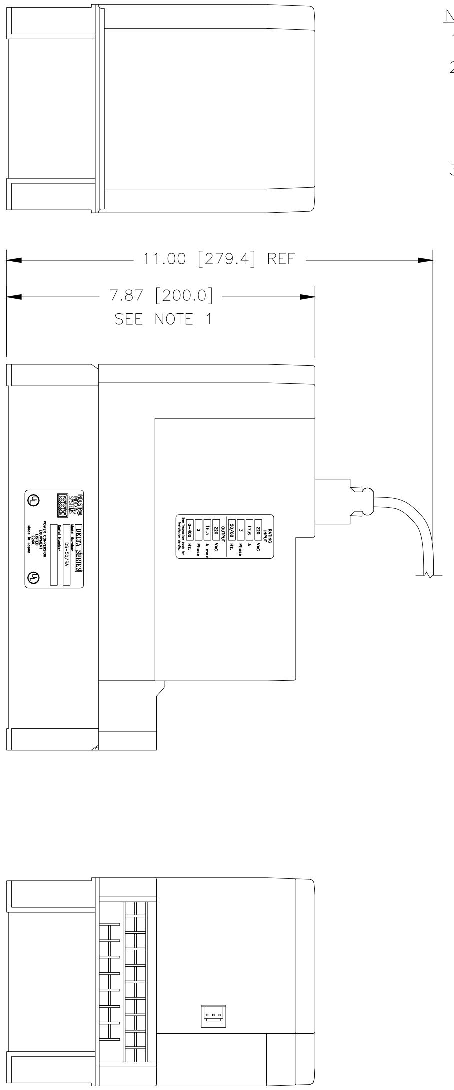
TITLE
DRIVE, DELTA S SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'

DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 17MAR00
SCALE ---

DRAWING NUMBER DS-35/RA
SHEET NO. 1 OF 1
REVISION B

DATE	SYM	REVISION RECORD	DR	CK	CK
20JAN03	B	PER ECN 02-327	CWB		

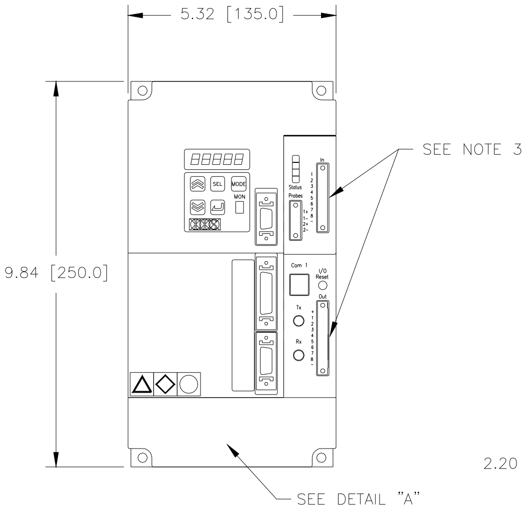


NOTES: A B

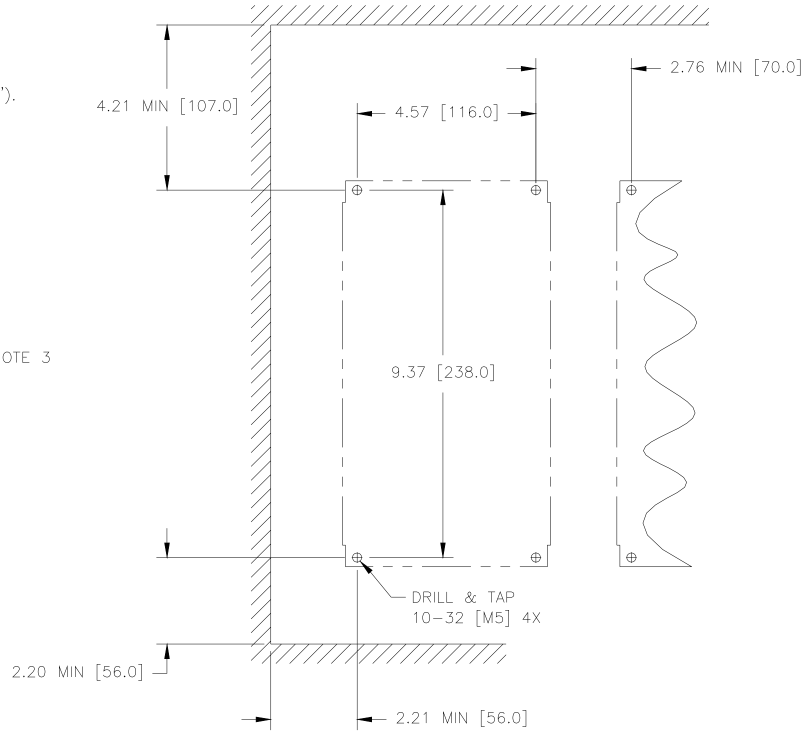
1.) RECOMMENDED CABINET DEPTH TO BE 12.00 [304.8].

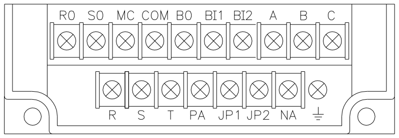
2.) THIS DRAWING ALSO COVERS PRODUCTS:
DS-50/RAI, DS-50/RAJ, DS-50/RAK, DS-50/RAIJ &
DS-50/RAIK
DS-50/EA, DS-50/EAI, DS-50/EAJ, DS-50/EAK,
DS-50/EAIJ & DS-50/EAIK

3.) SHOWN WITH OPTIONAL I/O BOARD INSTALLED (OPTION "J").



MOUNTING AND SPACING REQUIREMENTS





DETAIL A A
PROTECTIVE COVER REMOVED

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

TITLE
DRIVE, DELTA S SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 17MAR00
SCALE ---
DRAWING NUMBER DS-50/RA
SHEET NO. 1 OF 1
REVISION B

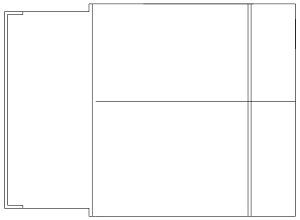
DATE	SYM	REVISION RECORD	DR	CK	CK
21JAN03	B	PER ECN 02-327	CWB		

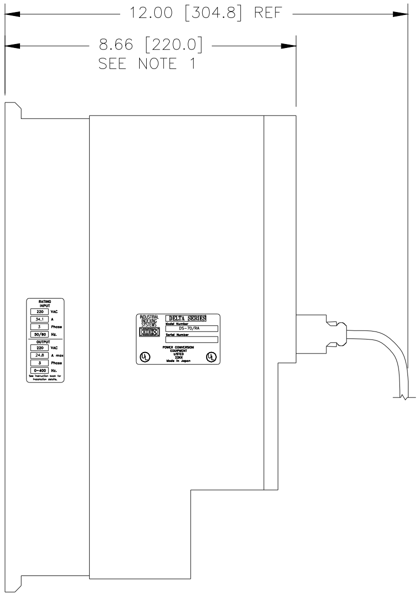
NOTES: △A △B

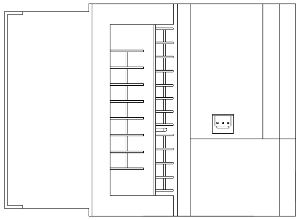
1.) RECOMMENDED CABINET DEPTH TO BE 12.00 [304.8].

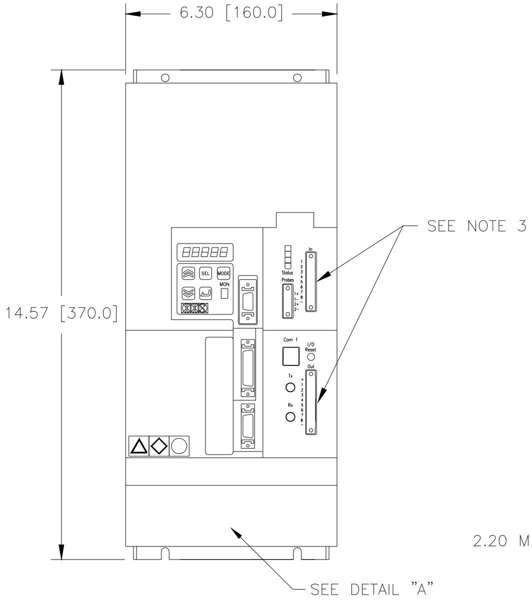
2.) THIS DRAWING ALSO COVERS PRODUCTS:
DS-70/RAI, DS-70/RAJ, DS-70/RAK, DS-70/RAIJ &
DS-70/RAIK
DS-70/EA, DS-70/EAI, DS-70/EAJ, DS-70/EAK,
DS-70/EAIJ & DS-70/EAIK

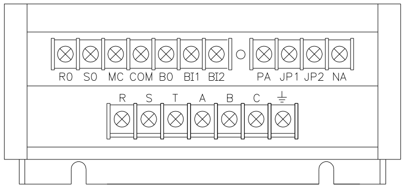
3.) SHOWN WITH OPTIONAL I/O BOARD INSTALLED (OPTION "J").





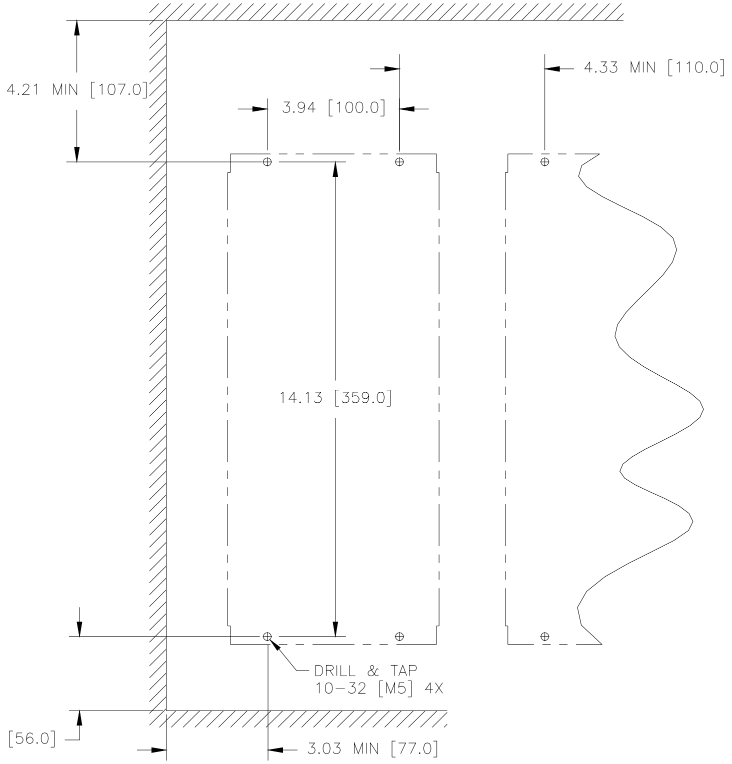






DETAIL A △A
PROTECTIVE COVER REMOVED

MOUNTING AND SPACING REQUIREMENTS



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TITLE
DRIVE, DELTA S SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'

DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 17MAR00
SCALE ---

DRAWING NUMBER DS-70/RA
SHEET NO. 1 OF 1
REVISION B

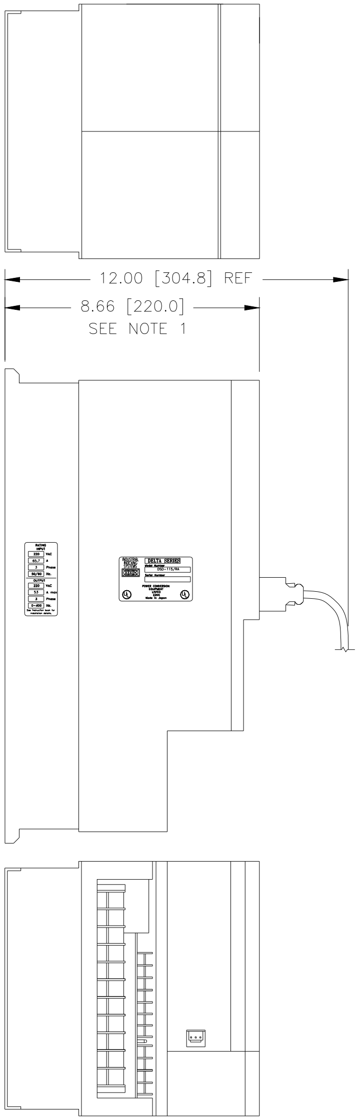
DATE	SYM	REVISION RECORD	DR	CK	CK
21JAN03	B	PER ECN 02-327	CWB		

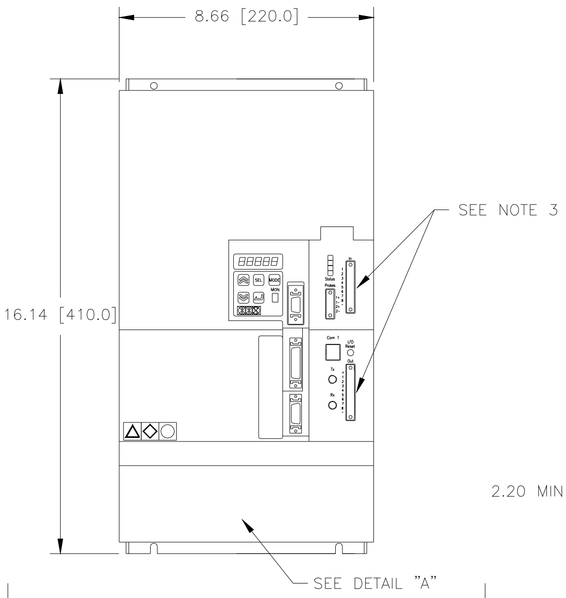
NOTES: A B

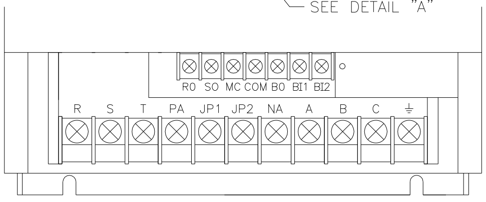
1.) RECOMMENDED CABINET DEPTH TO BE 12.00 [304.8].

2.) THIS DRAWING ALSO COVERS PRODUCTS:
DS-115/RAI, DS-115/RAJ, DS-115/RAK, DS-115/RAIJ & DS-115/RAIK
DS-115/EA, DS-115/EAI, DS-115/EAJ, DS-115/EAK, DS-115/EAIJ & DS-115/EAIK

3.) SHOWN WITH OPTIONAL I/O BOARD INSTALLED (OPTION "J").

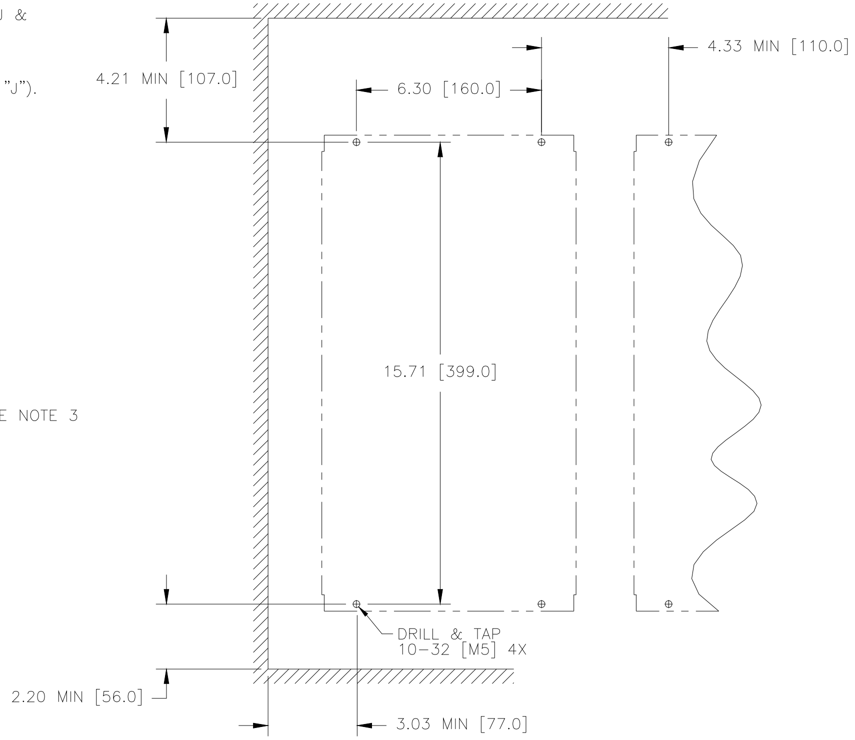






DETAIL A A
PROTECTIVE COVER REMOVED

MOUNTING AND SPACING REQUIREMENTS



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TITLE
DRIVE, DELTA S SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'

DRAWN BY
BOWMAN
AutoCAD FILE LOCATION
Q:\CURRENT DWGS
B
DATE
17MAR00
SCALE

DRAWING NUMBER
DS-115/RA
SHEET NO.
1 OF 1
REVISION
B

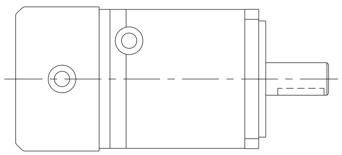
A.6 RESOLVER MOTOR DIMENSIONS

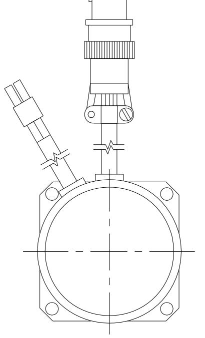
DRAWING NUMBER	DESCRIPTION
DBM-120/30R	Brushless Delta Series Motor
DBM-200/30R	Brushless Delta Series Motor
DBM-400/15R	Brushless Delta Series Motor
DBM-400/30R	Brushless Delta Series Motor
DBM-500/30R	Brushless Delta Series Motor
DBM-800/15R	Brushless Delta Series Motor
DBM-800/30R	Brushless Delta Series Motor
DBM-800/30RA	Brushless Delta Series Absolute Motor
DBM-1000/15R	Brushless Delta Series Motor
DBM-1360/30R	Brushless Delta Series Motor
DBM-1400/30R	Brushless Delta Series Motor
DBM-1500/15R	Brushless Delta Series Motor
DBM-1500/15R1X	Brushless Delta Series Motor
DBM-1800/30R	Brushless Delta Series Motor
DBM-2400/30R	Brushless Delta Series Motor
DBM-2600/15R	Brushless Delta Series Motor
DBM-3700/15R	Brushless Delta Series Motor
DBM-3700/30R	Brushless Delta Series Motor
DBM-3740/20R1X	Brushless Delta Series Motor
DBM-4200/20R	Brushless Delta Series Motor
DBM-5000/15R	Brushless Delta Series Motor
DBM-5500/30R	Brushless Delta Series Motor
DBM-6100/10R	Brushless Delta Series Motor
DBM-6500/30R	Brushless Delta Series Motor
DBM-7500/20R	Brushless Delta Series Motor
DBM-8600/22R	Brushless Delta Series Motor
DBM-10000/20R	Brushless Delta Series Motor
DBM-10300/15R	Brushless Delta Series Motor
DBM-13500/15R	Brushless Delta Series Motor
DBM-14300/13R	Brushless Delta Series Motor
DBM-B380/30R	Brushless Delta Series Motor
DBM-B380/30R1X	Brushless Delta Series Motor
DBM-B630/30R	Brushless Delta Series Motor
DBM-B630/30R1X	Brushless Delta Series Motor
DBM-B800/30R	Brushless Delta Series Motor
DBM-B1060/30R	Brushless Delta Series Motor
DBM-B1600/30R	Brushless Delta Series Motor
DBM-B1900/30R	Brushless Delta Series Motor
DBM-B3000/30R	Brushless Delta Series Motor
DBM-B3950/20R	Brushless Delta Series Motor
DBM-B4400/30R	Brushless Delta Series Motor
DBM-B5600/30R	Brushless Delta Series Motor
DBM-D30/30R	Brushless Delta Series Motor
DBM-D50/30R	Brushless Delta Series Motor
DBM-D100/30R	Brushless Delta Series Motor
DBM-D200/30R	Brushless Delta Series Motor
DBM-D400/30R	Brushless Delta Series Motor
DBM-D600/30R	Brushless Delta Series Motor
DBM-D800/30R	Brushless Delta Series Motor

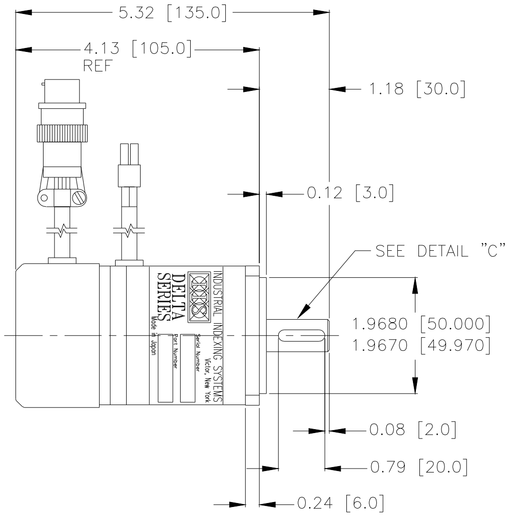
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	E	PER ECN 00-246	CWB	EB	CDR

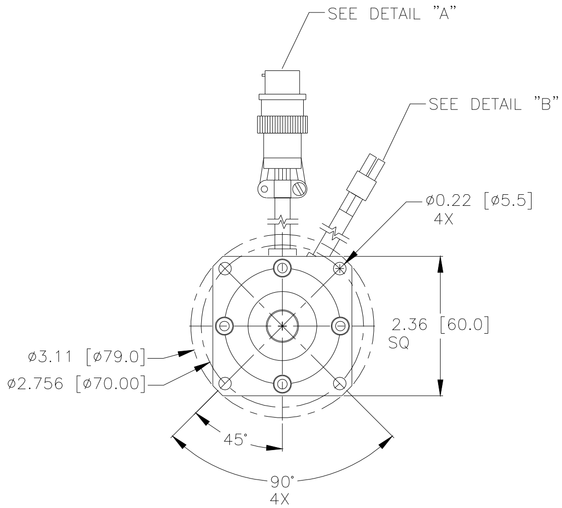
NOTES: △D

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 1.1 KG 2.4 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 49 N 11 LBS
6.) RADIAL LOAD 147 N 33 LBS
7.) RESOLVER 2X 24000 PPR
QTY 2 ZERO MARKERS.
8.) IP-30 SEALING.
9.) WIRE LEAD OPENINGS ARE UNSEALED.
10.) FLYING LEAD LENGTH 12"±2" [305±50].



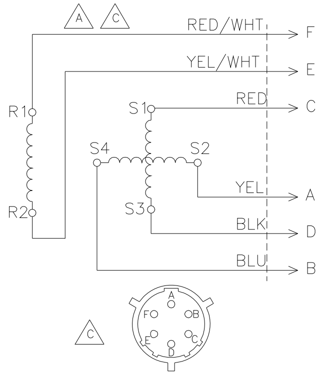






DETAIL A

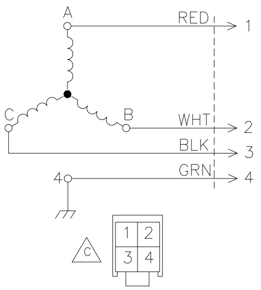
RESOLVER CONNECTION
ITT/CANON KPT01 J10 6P



VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: MS3116F-10-6S

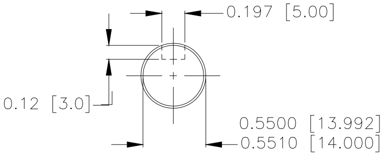
DETAIL B

ARMATURE CONNECTION
MOLEX 39-01-3049



VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: 39-01-2045

DETAIL C



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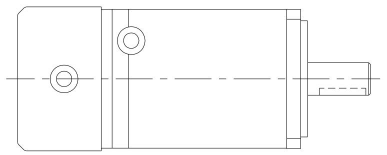
TITLE
MOTOR, BRUSHLESS, DELTA SERIES

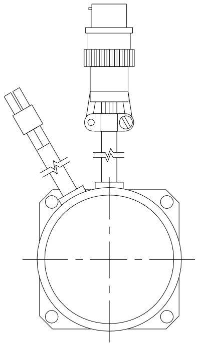
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 24APR96
SCALE NTS
DRAWING NUMBER DBM-120/30R
SHEET NO. 1 OF 1
REVISION E

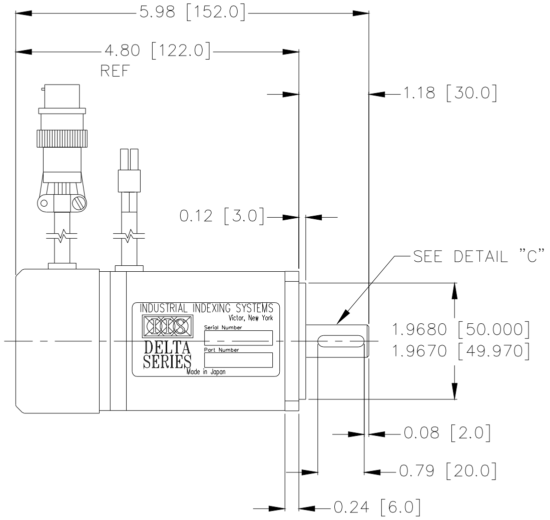
NOTES: D

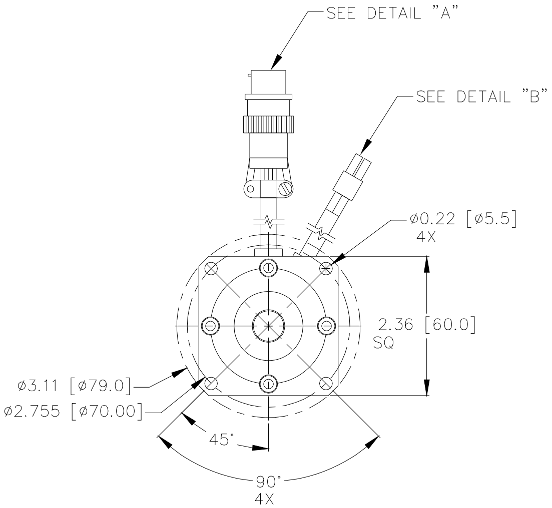
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 1.4 KG 3.1 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 74 N 16 LBS
6.) RADIAL LOAD 186 N 41 LBS
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-30 SEALING.
9.) WIRE LEAD OPENINGS ARE UNSEALED.
10.) FLYING LEAD LENGTH 12"±2" [305±50].

DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	E	PER ECN 00-246	CWB	EB	CDR



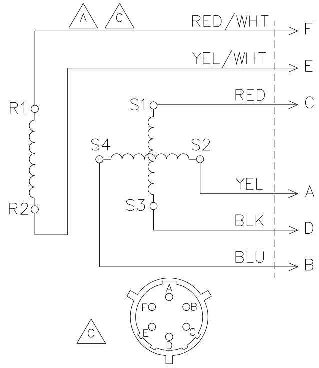






DETAIL A

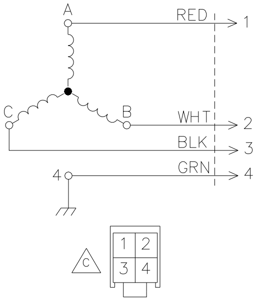
RESOLVER CONNECTION
ITT/CANON KPT01 J10 6P



VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: MS3116F-10-6S

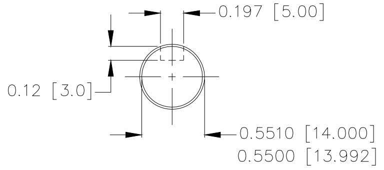
DETAIL B

ARMATURE CONNECTION
MOLEX 39-01-3049



VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: 39-01-2045

DETAIL C



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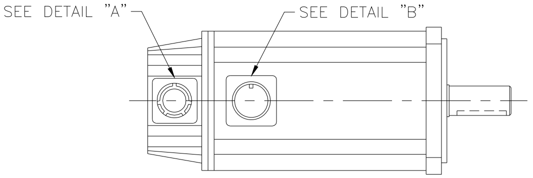
TITLE
MOTOR, BRUSHLESS, DELTA SERIES

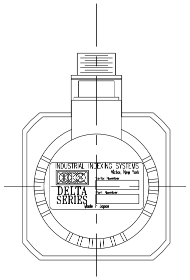
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 24APR96
SCALE NTS
DRAWING NUMBER DBM-200/30R
SHEET NO. 1 OF 1
REVISION E

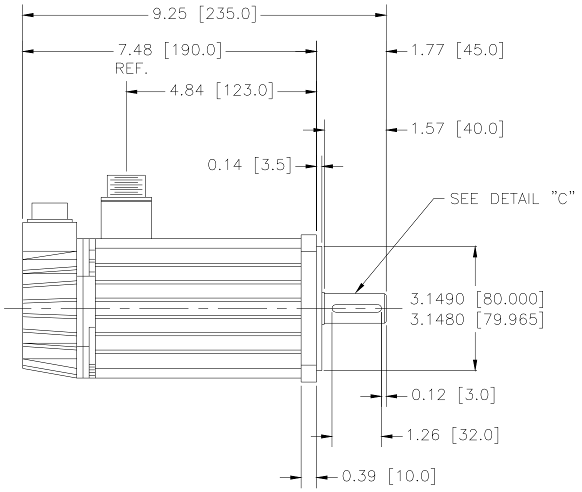
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	E	PER ECN 00-246	CWB	EB	CDR

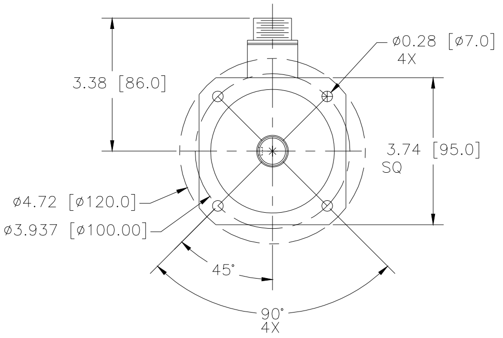
NOTES: D

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 4.5 KG 9.9 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 98 N 22 LBS
6.) RADIAL LOAD 559 N 126 LBS
7.) RESOLVER 2X 24000 PPR.
    QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.



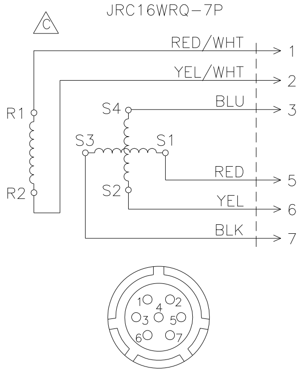






DETAIL A

RESOLVER CONNECTION
JRC16WRQ-7P

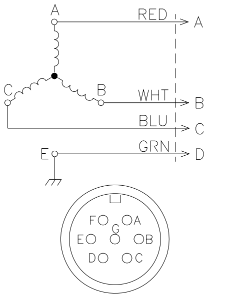


VIEW OF CONNECTOR

MATING SOCKET:
RESOLVER: JMSP1607F

DETAIL B

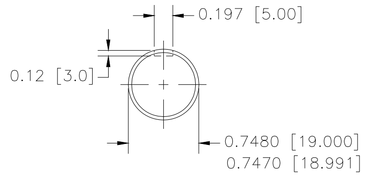
ARMATURE CONNECTION
MS3102A16S-1P



VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A16S-1S

DETAIL C



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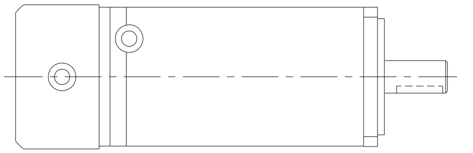
TITLE
MOTOR, BRUSHLESS, DELTA SERIES

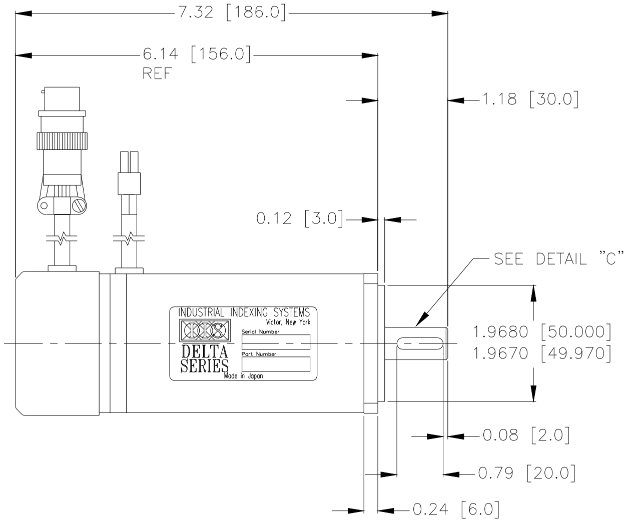
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)	DRAWN BY BOWMAN		DRAWING NUMBER DBM-400/15R
TOLERANCES	AutoCAD FILE LOCATION Q:\CURRENT DWGS		
X.X± --- X.XX± 0.01 X.XXX± 0.005	ANGULAR ± 0°30'	B	DATE 15FEB96	SCALE NTS	SHEET NO. 1 OF 1	REVISION E

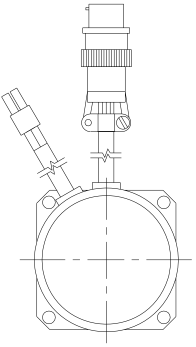
NOTES: D

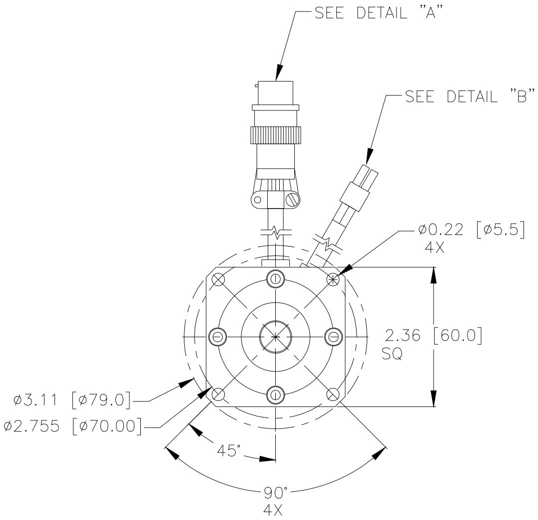
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 2.0 KG 4.4 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 84 N 18 LBS
6.) RADIAL LOAD 196 N 44 LBS
7.) RESOLVER 2X 24000 PPR. QTY 2 ZERO MARKERS.
8.) IP-30 SEALING.
9.) WIRE LEAD OPENINGS ARE UNSEALED.
10.) FLYING LEAD LENGTH 12"±2" [305±50].

DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	E	PER ECN 00-246	CWB	EB	CDR



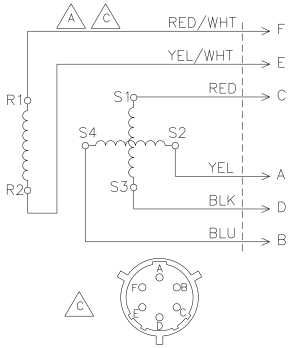






DETAIL A

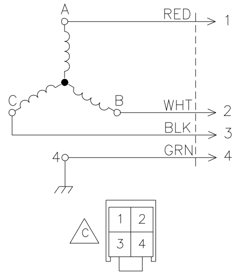
RESOLVER CONNECTION
ITT/CANON KPT01 J10 6P



VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: MS3116F-10-6S

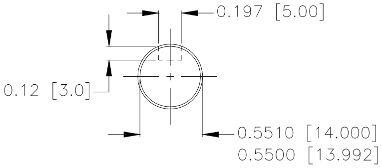
DETAIL B

ARMATURE CONNECTION
MOLEX 39-01-3049



VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: 39-01-2045

DETAIL C



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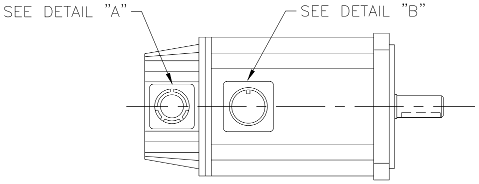
TITLE
MOTOR, BRUSHLESS, DELTA SERIES

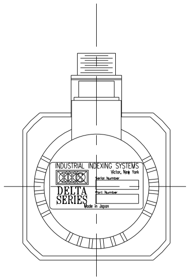
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
DRAWN BY BOWMAN
DRAWING NUMBER DBM-400/30R
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 24APR96
SCALE NTS
SHEET NO. 1 OF 1
REVISION E

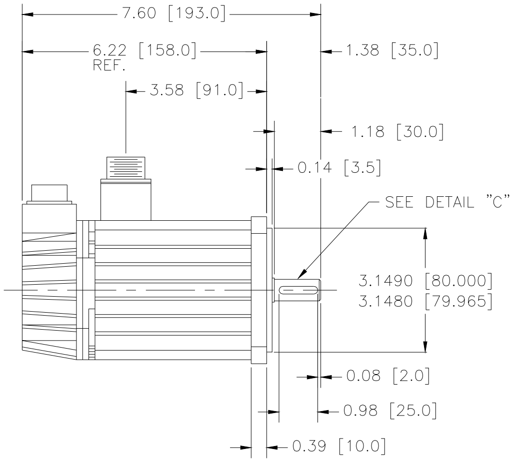
NOTES: D

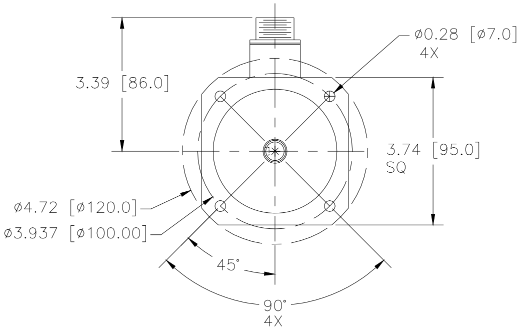
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 3.2 KG 7.1 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 49 N 11 LBS
6.) RADIAL LOAD 284 N 64 LBS
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.

DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	E	PER ECN 00-246	CWB	EB	CDR



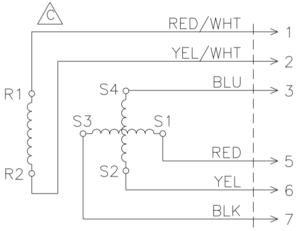


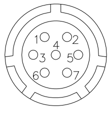




DETAIL A

RESOLVER CONNECTION
JRC16WRQ-7P



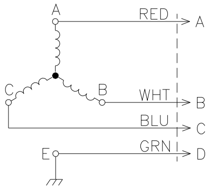


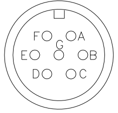
VIEW OF CONNECTOR

MATING SOCKET:
RESOLVER: JMSP1607F

DETAIL B

ARMATURE CONNECTION
MS3102A16S-1P

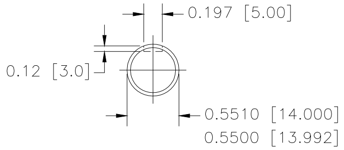




VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A16S-1S

DETAIL C



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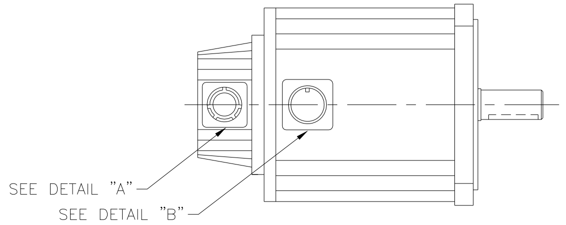
TITLE
MOTOR, BRUSHLESS, DELTA SERIES

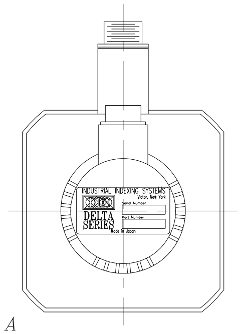
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
B
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
DATE 20FEB96
SCALE NTS
DRAWING NUMBER DBM-500/30R
SHEET NO. 1 OF 1
REVISION E

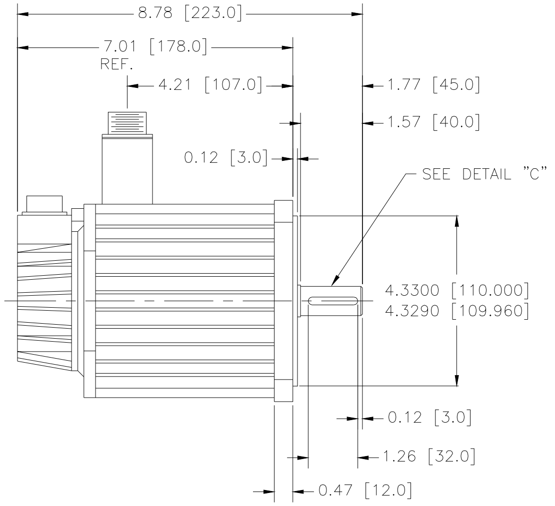
NOTES: D

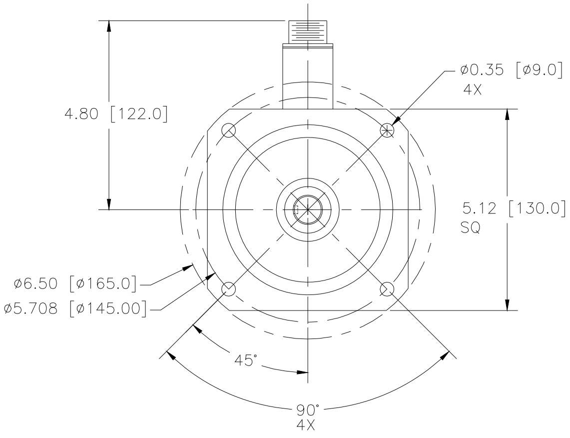
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 6.2 KG 13.7 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 118 N 27 LBS
6.) RADIAL LOAD 647 N 145 LBS
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.

DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	E	PER ECN 00-246	CWB	EB	CDR



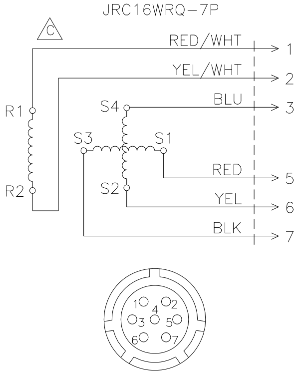






DETAIL A

RESOLVER CONNECTION
JRC16WRQ-7P

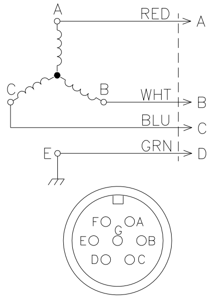


VIEW OF CONNECTOR

MATING SOCKET:
RESOLVER: JMSP1607F

DETAIL B

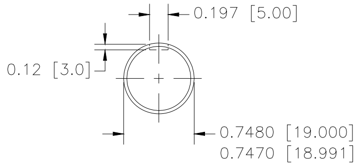
ARMATURE CONNECTION
JA3102A20-15PC-F0



VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A20-15S

DETAIL C



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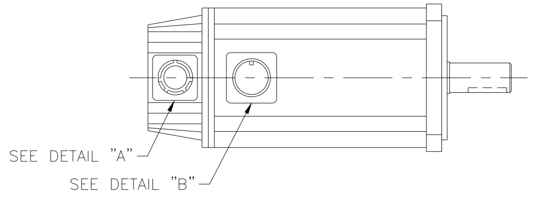
TITLE
MOTOR, BRUSHLESS, DELTA SERIES

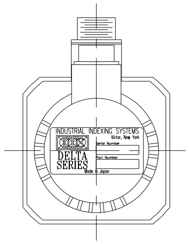
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY: BOWMAN
AutoCAD FILE LOCATION: Q:\CURRENT DWGS
B
DATE: 20FEB96
SCALE: NTS
DRAWING NUMBER: DBM-800/15R
SHEET NO. 1 OF 1
REVISION: E

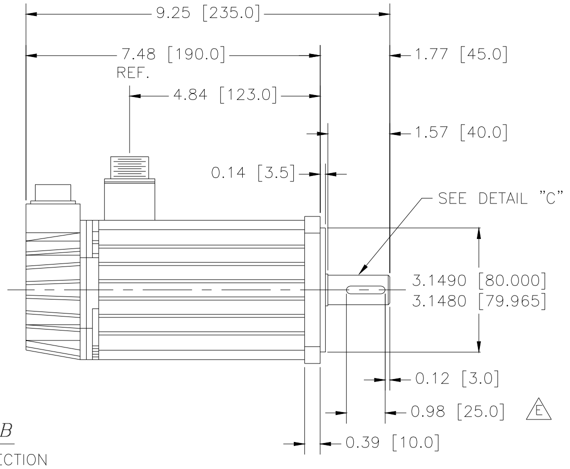
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	H	PER ECN 00-246	CWB	EB	CDR

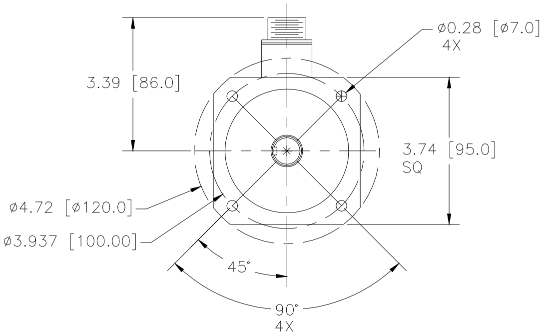
NOTES: ⚠F

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 4.5 KG 9.9 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 88 N 20 LBS
6.) RADIAL LOAD 441 N 99 LBS
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.



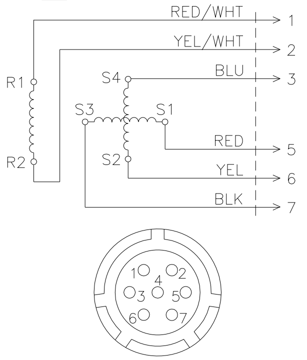






DETAIL A

RESOLVER CONNECTION
JRC16WRQ-7P
⚠D

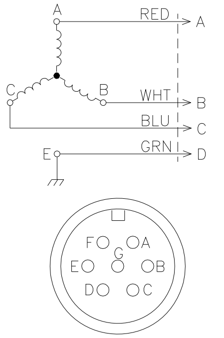


VIEW OF CONNECTOR

MATING SOCKET:
RESOLVER: JMSP1607F

DETAIL B

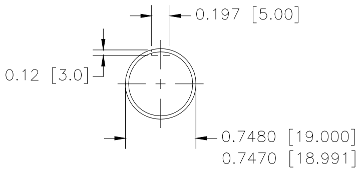
ARMATURE CONNECTION
MS3102A16S-1P



VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A16S-1S

DETAIL C



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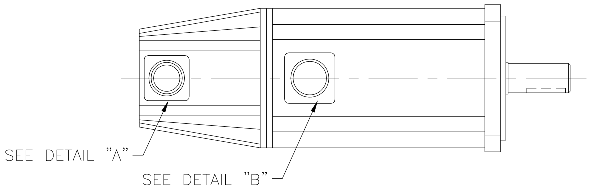
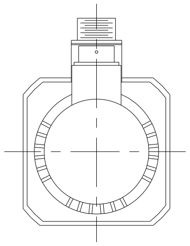
TITLE
MOTOR, BRUSHLESS, DELTA SERIES

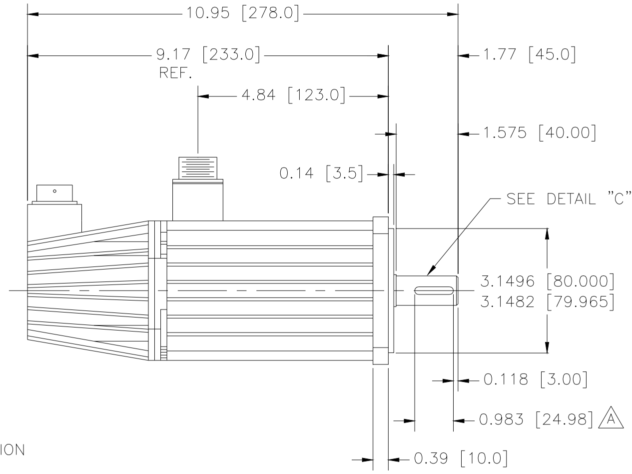
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)		DRAWN BY BOWMAN		DRAWING NUMBER
TOLERANCES		AutoCAD FILE LOCATION Q:\CURRENT DWGS		DBM-800/30R
X.X± --- X.XX± 0.01 X.XXX± 0.005	ANGULAR ± 0°30'	B	DATE 21FEB96	SCALE NTS
			SHEET NO. 1 OF 1	REVISION H

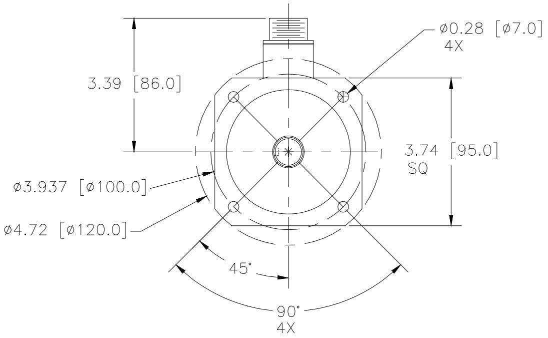
DATE	SYM	REVISION RECORD	DR	CK	CK
17JUN03	B	PER ECN 03-250	EB		

NOTES:
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 4.7 KG 10.3 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 88 N 20 LBS
6.) RADIAL LOAD 441 N 99 LBS



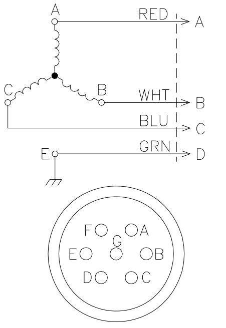






DETAIL B

ARMATURE CONNECTION
MS3102A16S-1P

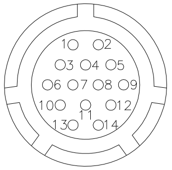


VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A16S-1S

DETAIL A

RESOLVER/ENCODER CONNECTION
JRC16WRQ-14P

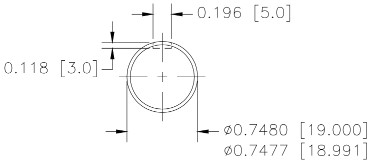


VIEW OF CONNECTOR

MATING SOCKET:
RESOLVER: JRC16WPQ-14S

DETAIL C

MOTOR SHAFT DETAIL



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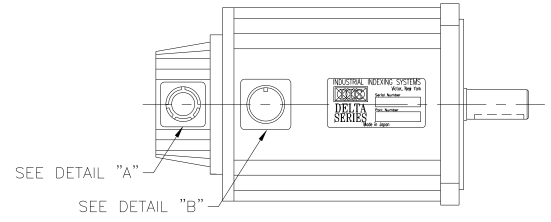
TITLE
MOTOR, DELTA SERIES, ABSOLUTE

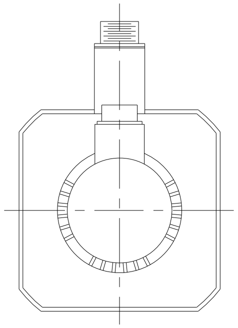
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'
B
DRAWN BY
BOWMAN
AutoCAD FILE LOCATION
Q:\CURRENT DWGS
DATE
06MAY97
SCALE
NTS
DRAWING NUMBER
DBM-800/30RA
SHEET NO.
1 OF 1
REVISION
B

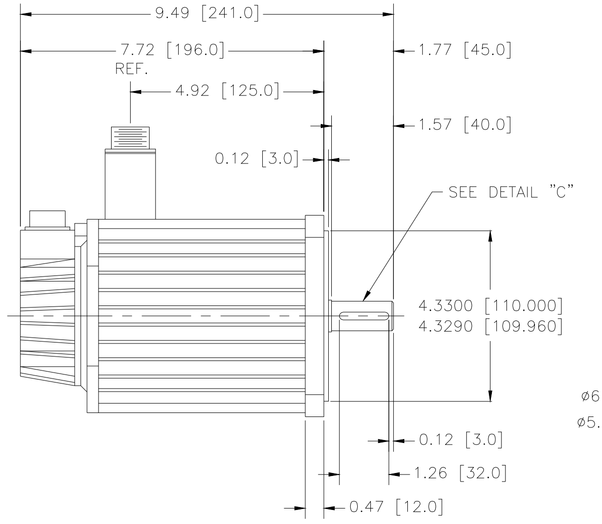
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	E	PER ECN 00-246	CWB	EB	CDR

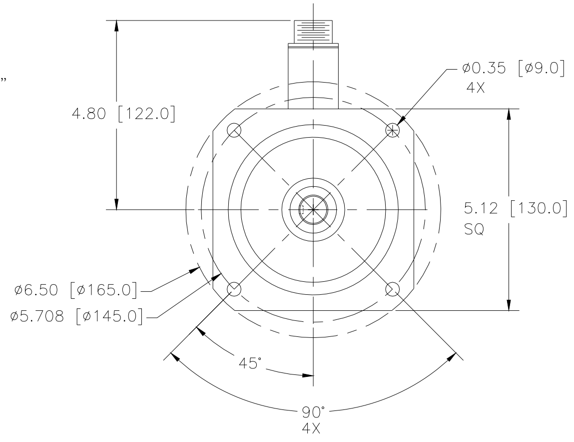
NOTES: △D

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 7.8 KG 17.2 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 118 N 27 LBS
6.) RADIAL LOAD 676 N 152 LBS
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.



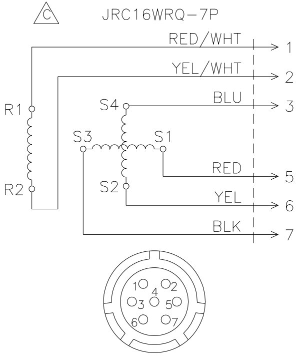






DETAIL A

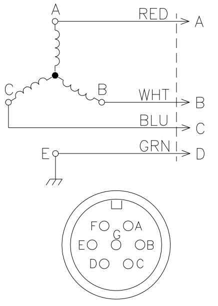
RESOLVER CONNECTION
JRC16WRQ-7P



VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: JMSP1607F

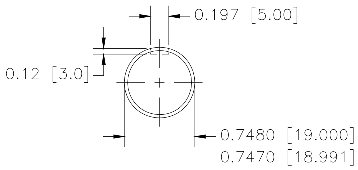
DETAIL B

ARMATURE CONNECTION
JA3102A20-15PC-F0



VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: MS3106A20-15S

DETAIL C



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

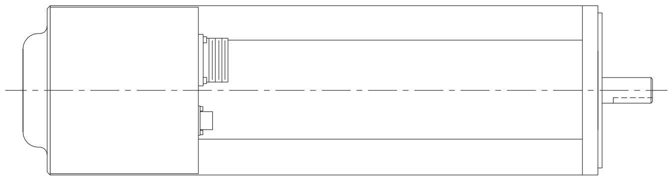
TITLE
MOTOR, BRUSHLESS, DELTA SERIES

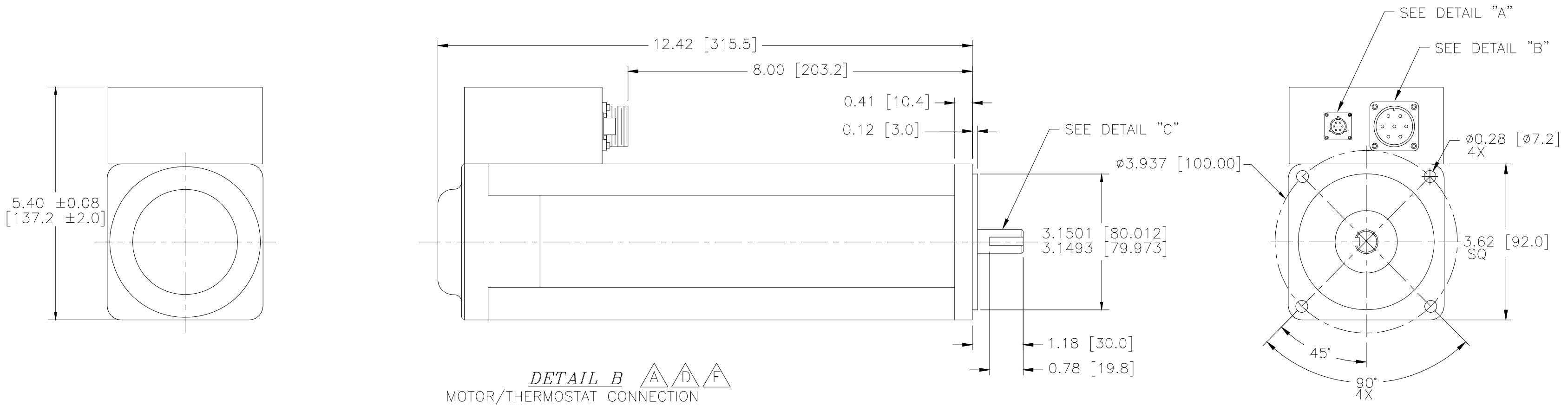
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 21FEB96
SCALE NTS
DRAWING NUMBER DBM-1000/15R
SHEET NO. 1 OF 1
REVISION E

DATE	SYM	REVISION RECORD	DR	CK	CK
27JAN03	F	PER ECN 03-009	CWB		

NOTES: △B

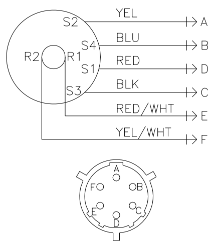
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT IS 7.3 KG 16.1 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 102 N 23 LBS.
6.) RADIAL LOAD 283 N 64 LBS.
7.) RESOLVER IS 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-65 SEALING.





DETAIL A

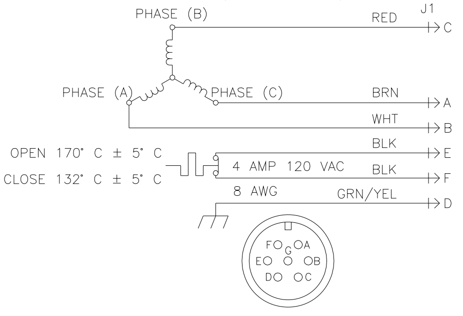
RESOLVER CONNECTION
MS3112E10-6P



VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: MS3116E10-6S

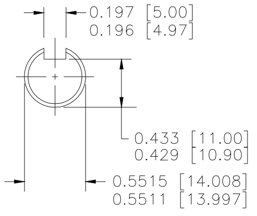
DETAIL B △A△D△F

MOTOR/THERMOSTAT CONNECTION
MS3102A20-15P



VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: MS3106A20-15S

DETAIL C △E



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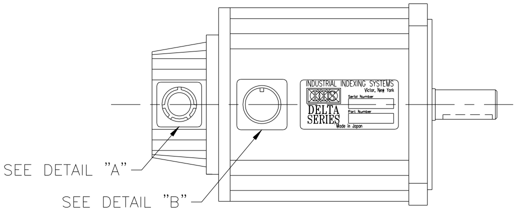
TITLE
MOTOR, BRUSHLESS, DELTA SERIES

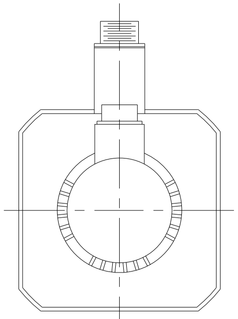
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'

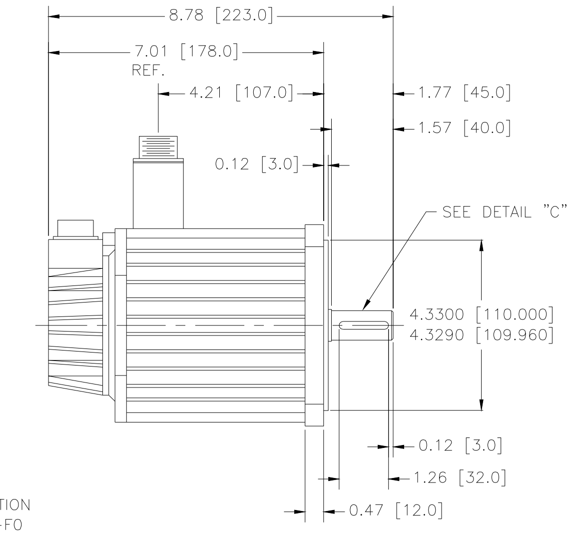
DRAWN BY BAIER
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 04SEP98
SCALE ---
DRAWING NUMBER DBM-1360/30R
SHEET NO. 1 OF 1
REVISION F

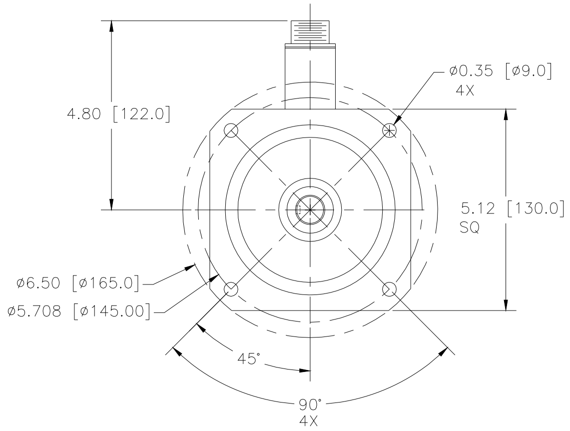
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	E	PER ECN 00-246	CWB	EB	CDR

NOTES: △D
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 6.2 KG 13.7 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 98 N 22 LBS
6.) RADIAL LOAD 510 N 115 LBS
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.



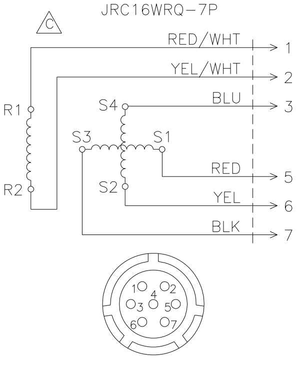






DETAIL A

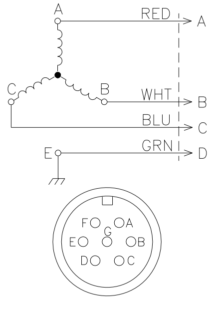
RESOLVER CONNECTION
JRC16WRQ-7P



VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: JMSP1607F

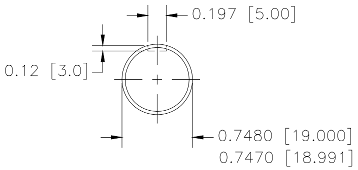
DETAIL B

ARMATURE CONNECTION
JA3102A20-15PC-F0



VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: MS3106A20-15S

DETAIL C



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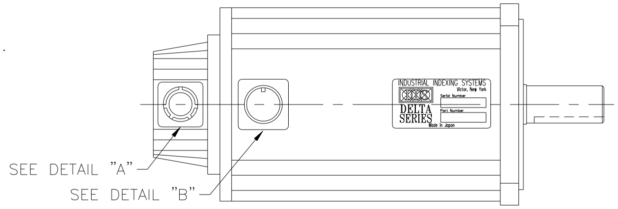
TITLE
MOTOR, BRUSHLESS, DELTA SERIES

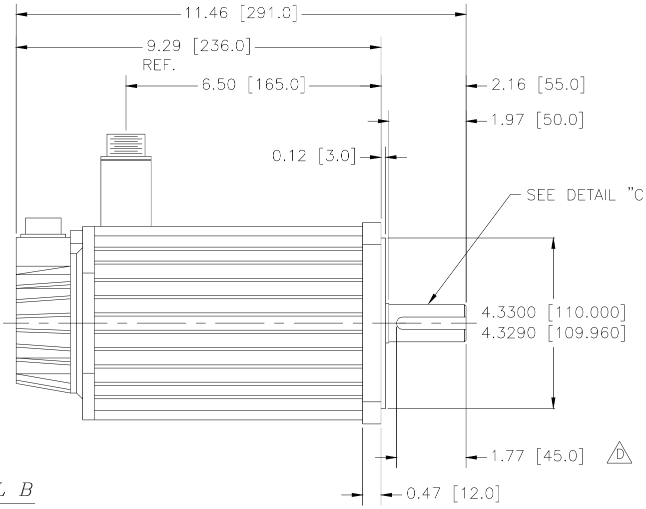
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
DRAWN BY BOWMAN
DRAWING NUMBER DBM-1400/30R
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 21FEB96
SCALE NTS
SHEET NO. 1 OF 1
REVISION E

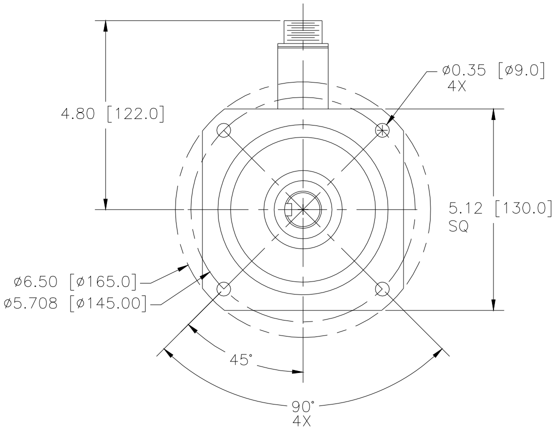
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	F	PER ECN 00-246	CWB	EB	CDR

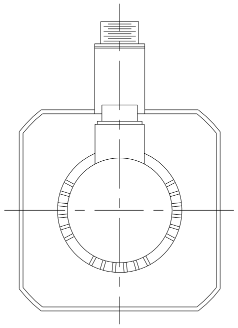
NOTES: E

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 11 KG 24.2 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 118 N 26 LBS
6.) RADIAL LOAD 706 N 158 LBS
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.



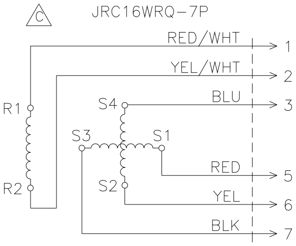


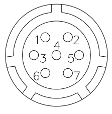




DETAIL A

RESOLVER CONNECTION
JRC16WRQ-7P

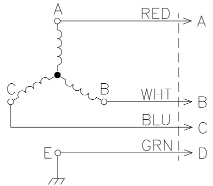


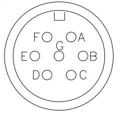


VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: JMSP1607F

DETAIL B

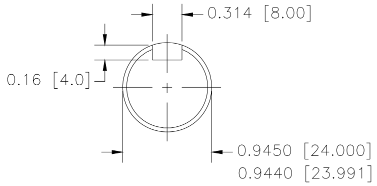
ARMATURE CONNECTION
JA3102A20-15PC-F0





VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: MS3106A20-15S

DETAIL C



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TITLE
MOTOR, BRUSHLESS, DELTA SERIES

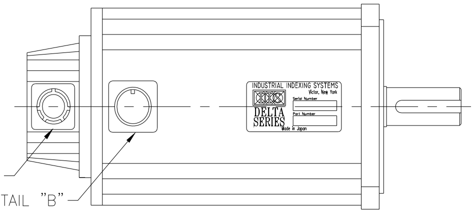
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'

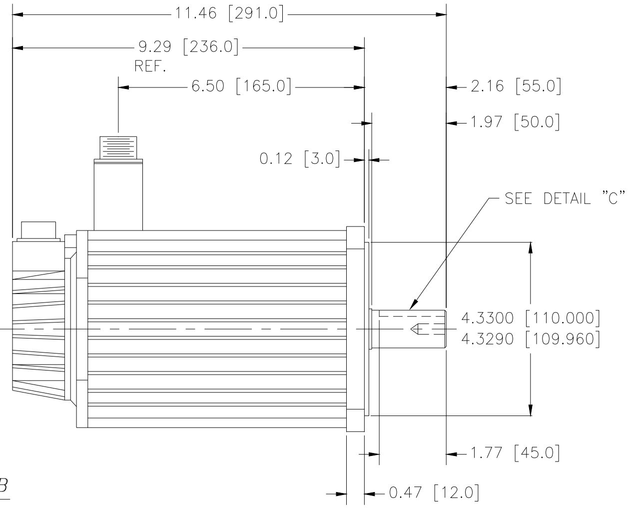
DRAWN BY: BOWMAN
AutoCAD FILE LOCATION: Q:\CURRENT DWGS
B
DATE: 21FEB96
SCALE: NTS
DRAWING NUMBER: DBM-1500/15R
SHEET NO.: 1 OF 1
REVISION: F

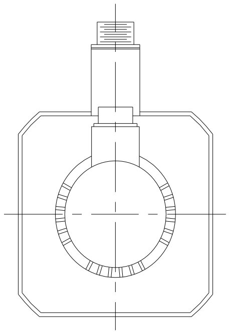
DATE	SYM	REVISION RECORD	DR	CK	CK
20JAN05	C	PER ECN 05-022	EB		

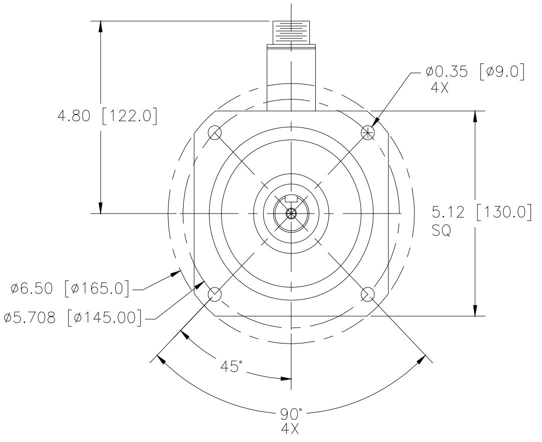
NOTES: A

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 11 KG 24.2 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 118 N 26 LBS
6.) RADIAL LOAD 706 N 158 LBS
7.) RESOLVER 1X 12000 PPR
QTY 1 ZERO MARKER.
8.) IP-44 SEALING.



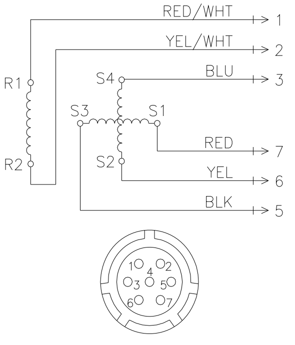






DETAIL A

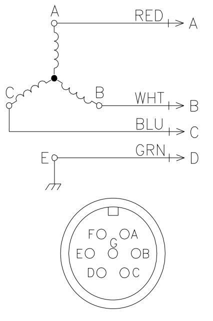
RESOLVER CONNECTION
JRC16WRQ-7P



VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: JMSP1607F

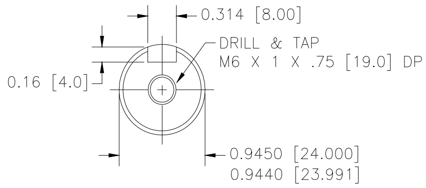
DETAIL B

ARMATURE CONNECTION
JA3102A20-15PC-F0



VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: MS3106A20-15S

DETAIL C



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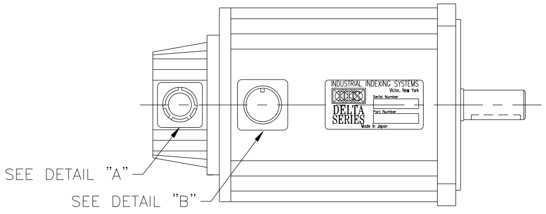
TITLE
MOTOR, BRUSHLESS, DELTA SERIES

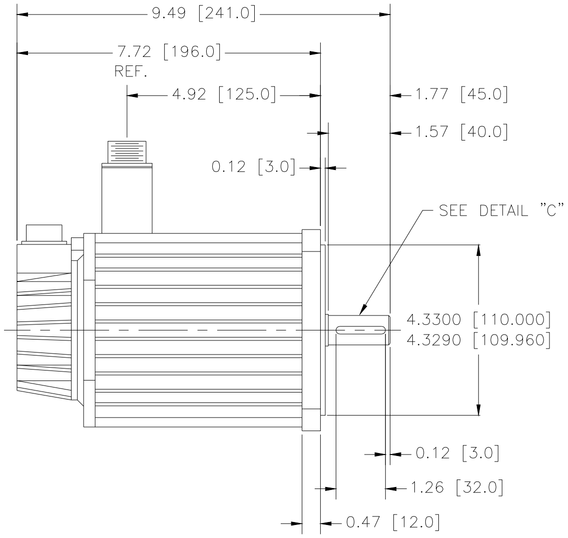
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)	DRAWN BY BOWMAN		DRAWING NUMBER
TOLERANCES	AutoCAD FILE LOCATION Q:\CURRENT DWGS		DBM-1500/15R1X
X.X± --- X.XX± 0.01 X.XXX± 0.005	ANGULAR ± 0°30'	B	DATE 16JUN99	SCALE NTS	SHEET NO. 1 OF 1	REVISION C

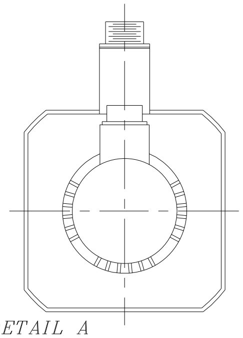
NOTES: △D

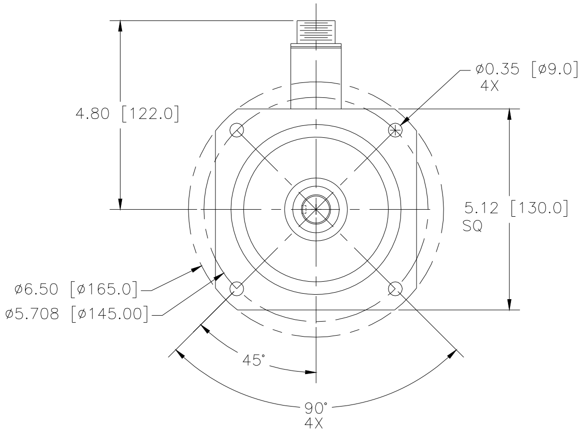
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 7.8 KG 17.2 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 98 N 22 LBS
6.) RADIAL LOAD 539 N 121 LBS
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.

DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	E	PER ECN 00-246	CWB	EB	CDR



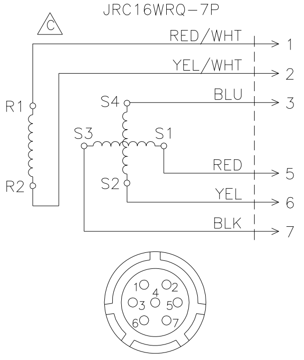






DETAIL A

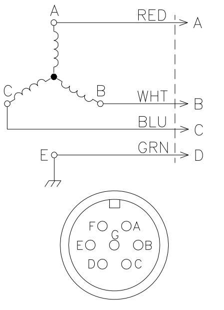
RESOLVER CONNECTION
JRC16WRQ-7P



VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: JMSP1607F

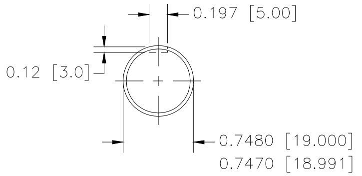
DETAIL B

ARMATURE CONNECTION
JA3102A20-15PC-F0



VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: MS3106A20-15S

DETAIL C



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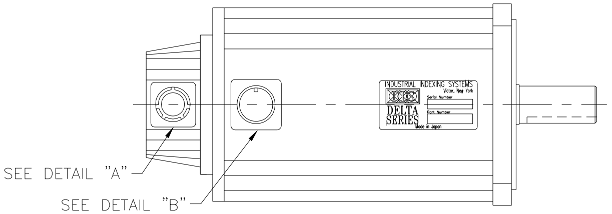
TITLE
MOTOR, BRUSHLESS, DELTA SERIES

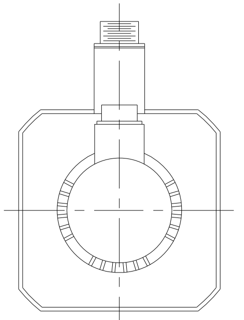
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
B
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
DATE 21FEB96
SCALE NTS
DRAWING NUMBER DBM-1800/30R
SHEET NO. 1 OF 1
REVISION E

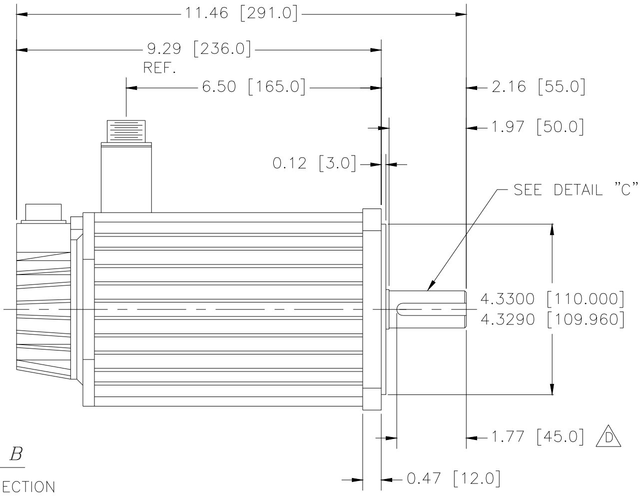
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	F	PER ECN 00-246	CWB	EB	CDR

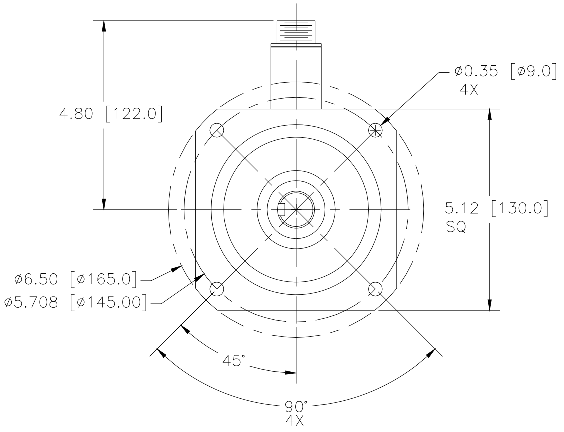
NOTES: E

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 11 KG 24.2 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 98 N 22 LBS
6.) RADIAL LOAD 559 N 125 LBS
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.



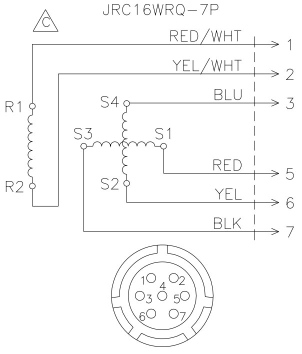






DETAIL A

RESOLVER CONNECTION
JRC16WRQ-7P

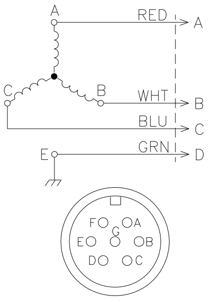


VIEW OF CONNECTOR

MATING SOCKET:
RESOLVER: JMSP1607F

DETAIL B

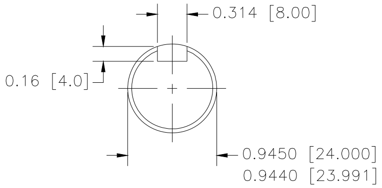
ARMATURE CONNECTION
JA3102A20-15PC-F0



VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A20-15S

DETAIL C



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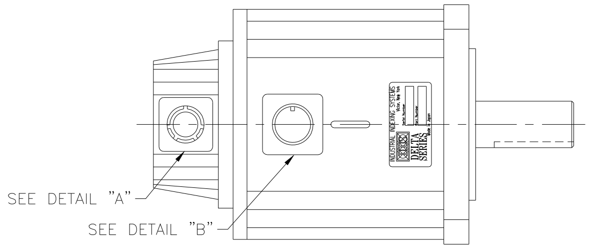
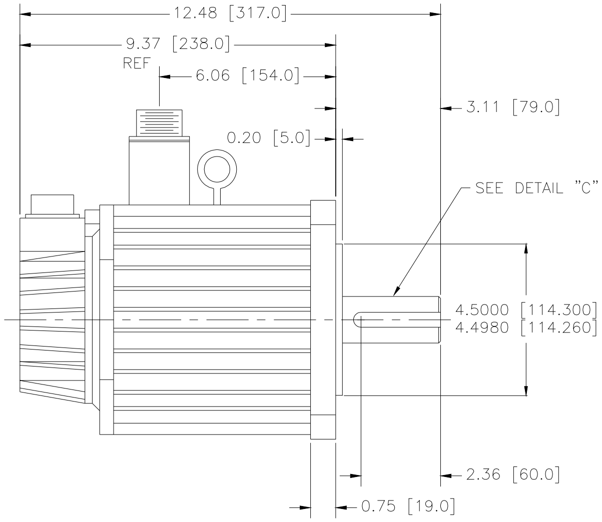
TITLE
MOTOR, BRUSHLESS, DELTA SERIES

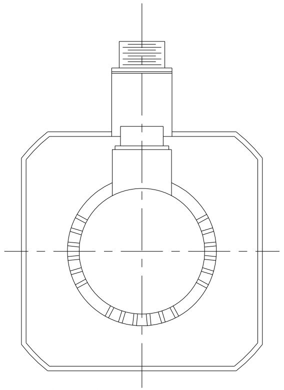
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'
B
DRAWN BY
BOWMAN
AutoCAD FILE LOCATION
Q:\CURRENT DWGS
DATE
21FEB96
SCALE
NTS
DRAWING NUMBER
DBM-2400/30R
SHEET NO.
1 OF 1
REVISION
F

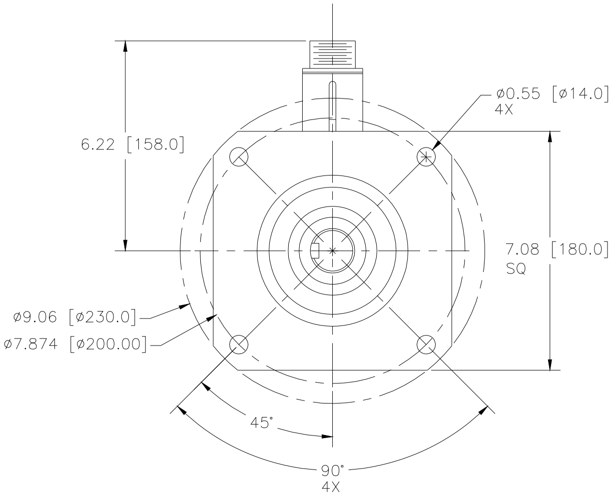
NOTES: △C
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 20.0 KG 44.1 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 284 N 64 LBS
6.) RADIAL LOAD 1350 N 303 LBS
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.

DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	D	PER ECN 00-246	CWB	EB	CDR



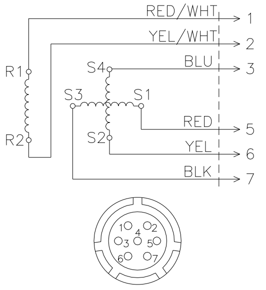






DETAIL A

RESOLVER CONNECTION
△B JRC16WRQ-7P

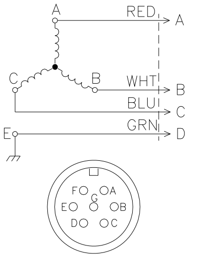


VIEW OF CONNECTOR

MATING SOCKET:
RESOLVER: JMSP1607F

DETAIL B

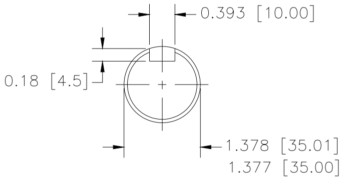
ARMATURE CONNECTION
MS3102A24-10P



VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A24-10S

DETAIL C



INDUSTRIAL INDEXING SYSTEMS, Inc.
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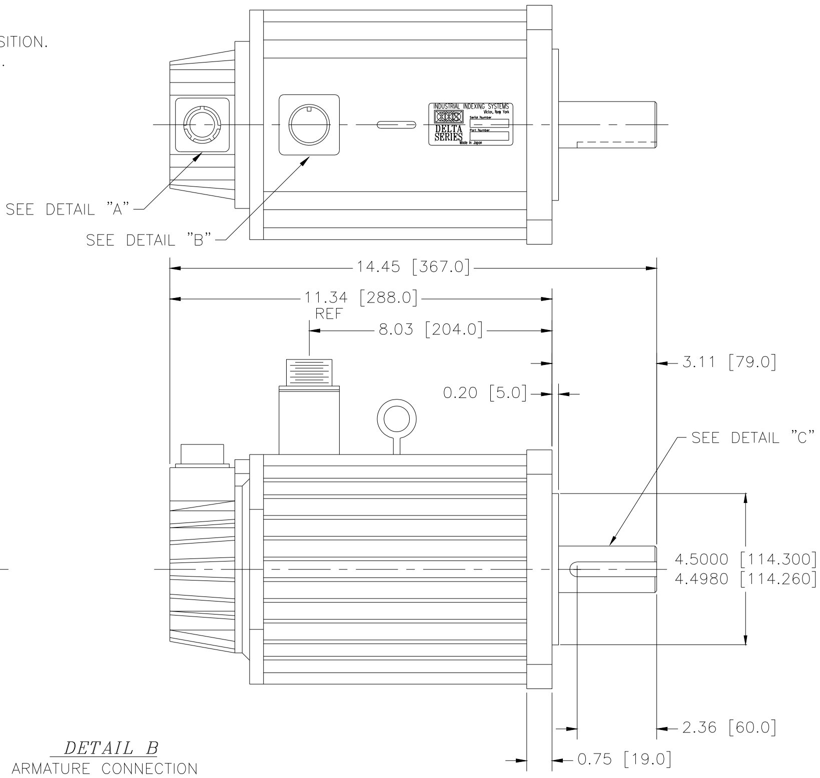
TITLE
MOTOR, BRUSHLESS, DELTA SERIES

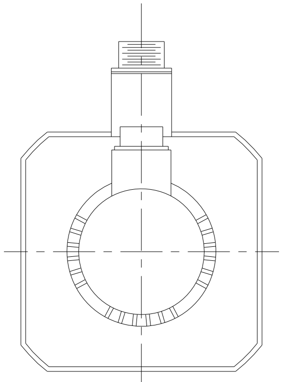
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
DRAWN BY BOWMAN
DRAWING NUMBER DBM-2600/15R
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 24APR96
SCALE NTS
SHEET NO. 1 OF 1
REVISION D

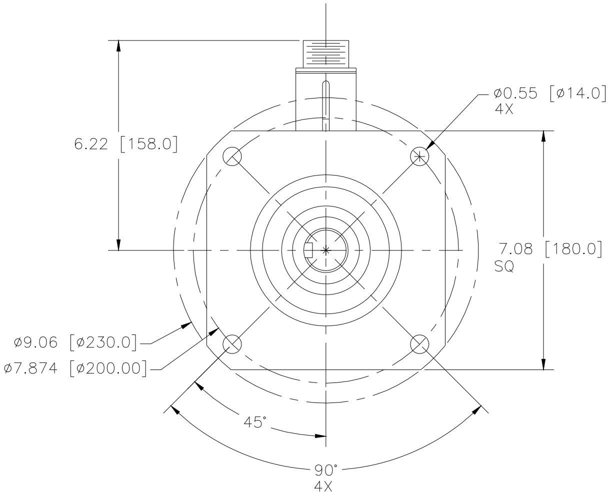
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	D	PER ECN 00-246	CWB	EB	CDR

NOTES: △C

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 27.0 KG 59.5 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 284 N 64 LBS
6.) RADIAL LOAD 1450 N 326 LBS
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.

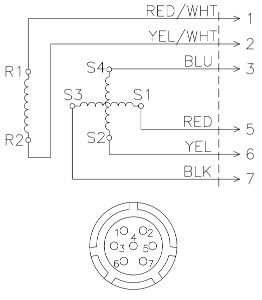






DETAIL A

RESOLVER CONNECTION
△B JRC16WRQ-7P

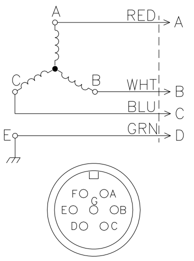


VIEW OF CONNECTOR

MATING SOCKET:
RESOLVER: JMSP1607F

DETAIL B

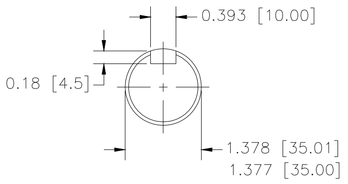
ARMATURE CONNECTION
MS3102A24-10P



VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A24-10S

DETAIL C



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www.iis-servo.com

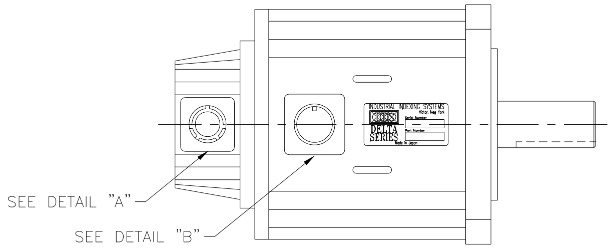
TITLE
MOTOR, BRUSHLESS, DELTA SERIES

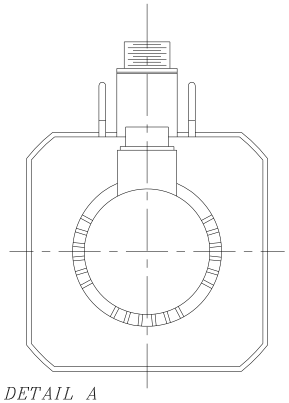
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
DRAWN BY BOWMAN
DRAWING NUMBER DBM-3700/15R
TOLERANCES
AutoCAD FILE LOCATION Q:\CURRENT DWGS
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
B
DATE 24APR96
SCALE NTS
SHEET NO. 1 OF 1
REVISION D

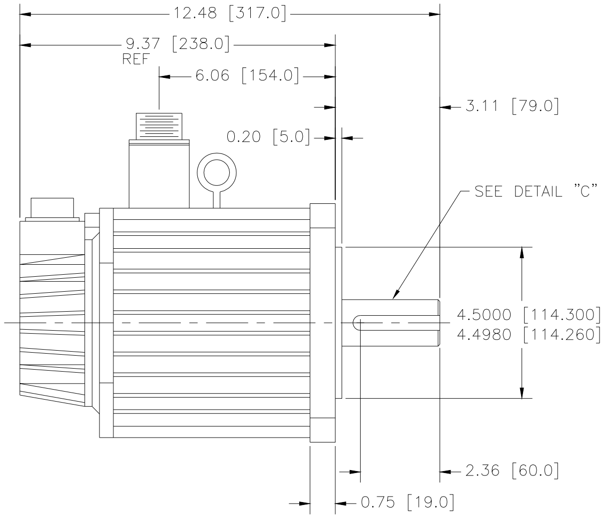
NOTES: D

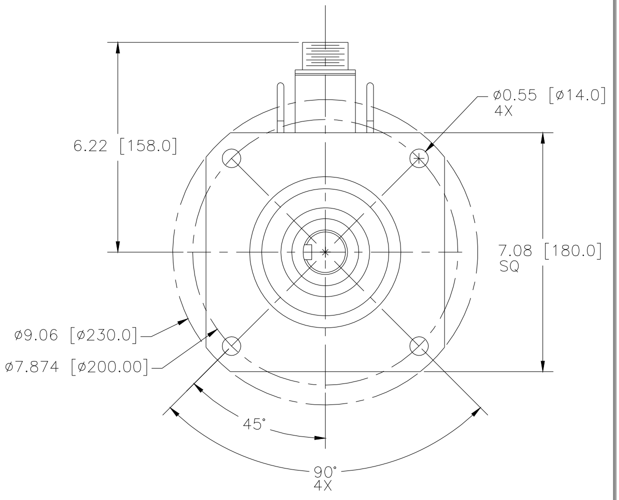
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 20 KG 44 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 235 N 52 LBS.
6.) RADIAL LOAD 1068 N 240 LBS.
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.

DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	E	PER ECN 00-246	CWB	EB	CDR



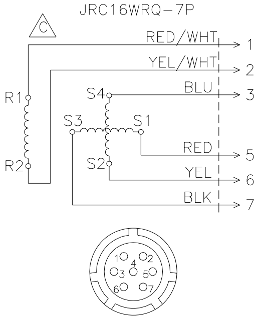






DETAIL A

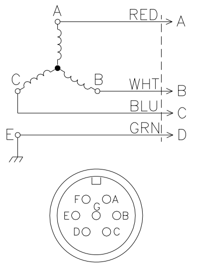
RESOLVER CONNECTION
JRC16WRQ-7P



VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: JMSP1607F

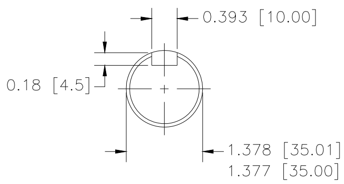
DETAIL B

ARMATURE CONNECTION
MS3102A24-10P



VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: MS3106A24-10S

DETAIL C



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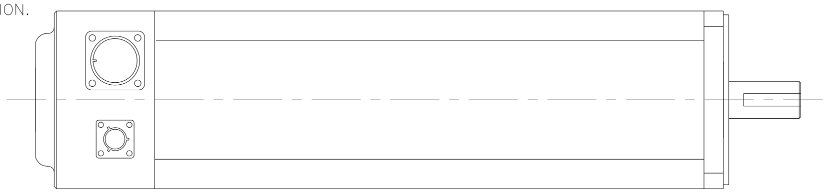
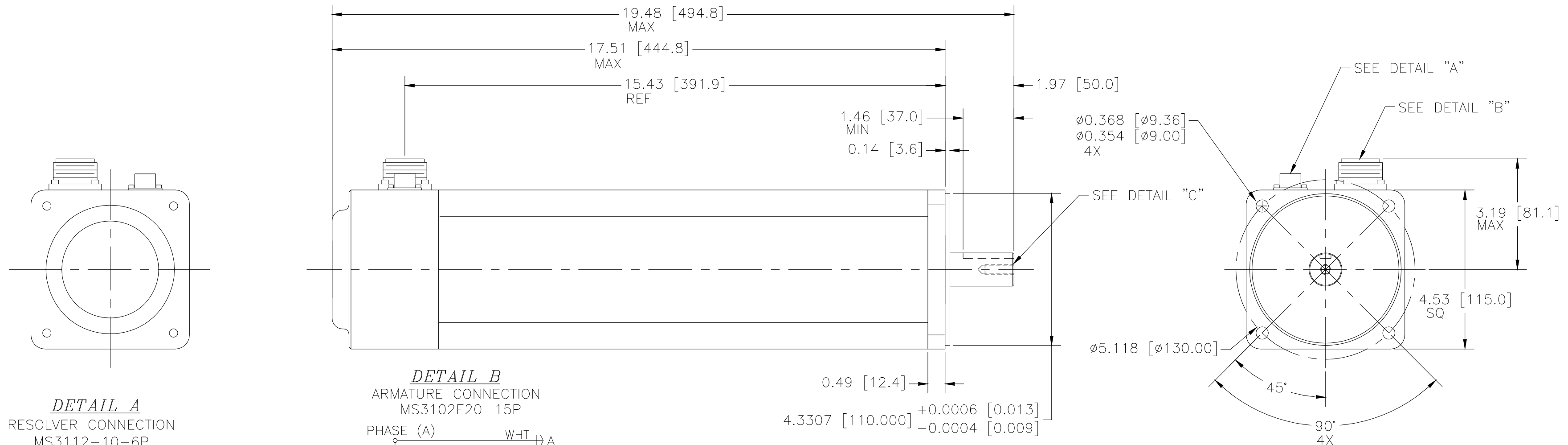
TITLE
MOTOR, BRUSHLESS, DELTA SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
B
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
DATE 28MAR96
SCALE NTS
DRAWING NUMBER DBM-3700/30R
SHEET NO. 1 OF 1
REVISION E

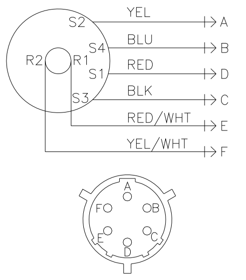
NOTES:
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 20 KG 44 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 183 N 41 LBS.
6.) RADIAL LOAD 510 N 114 LBS.
7.) RESOLVER IS 1X 12000 PPR.
QTY 1 ZERO MARKER.
8.) IP-65 SEALING.

DATE	SYM	REVISION RECORD	DR	CK	CK
25OCT01	B	PER ECN 01-374	CWB		



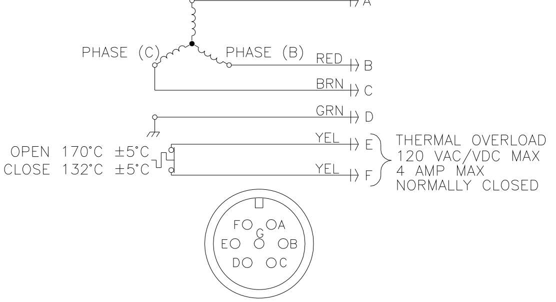


DETAIL A
RESOLVER CONNECTION
MS3112-10-6P



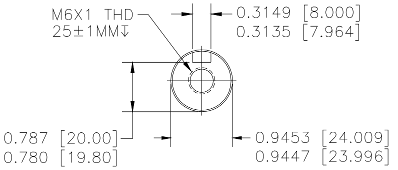
VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: MS3116F10-6S

DETAIL B
ARMATURE CONNECTION
MS3102E20-15P



VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: MS3106A24-10S

DETAIL C



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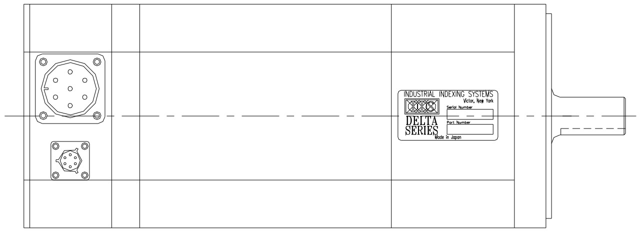
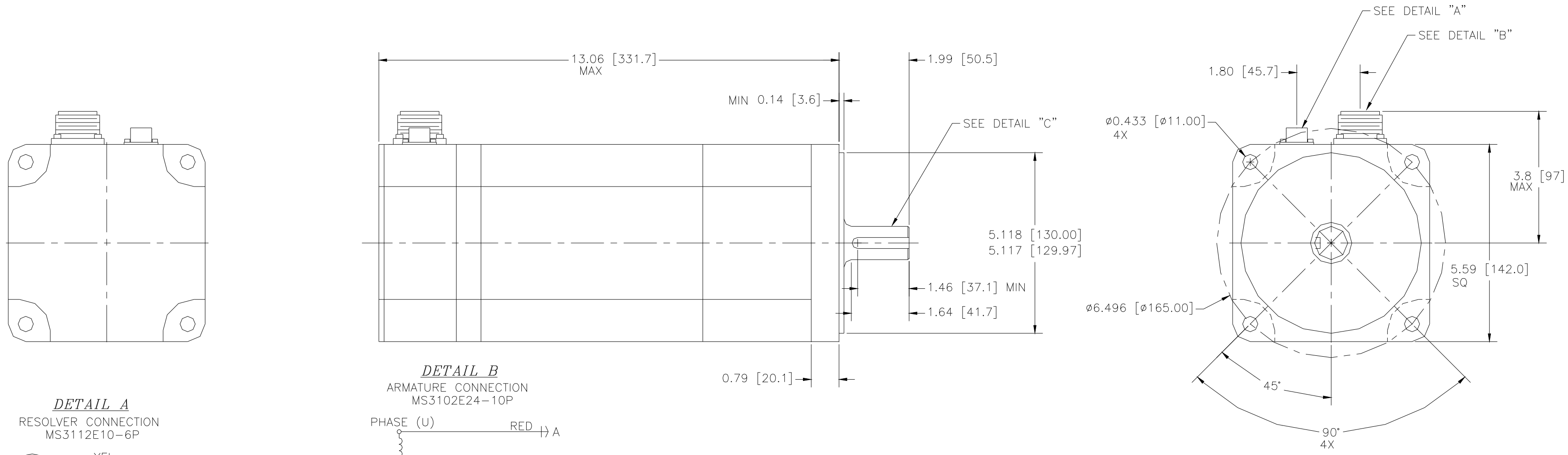
TITLE
MOTOR, BRUSHLESS, DELTA SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'
DRAWN BY
BOWMAN
AutoCAD FILE LOCATION
Q:\CURRENT DWGS
B
DATE
31AUG99
SCALE
NTS
DRAWING NUMBER
DBM-3740/20R1X
SHEET NO.
1 OF 1
REVISION
B

NOTES:
1.) ALL DIMENSIONS ARE IN INCHES [MM].
2.) AXIAL LOAD: 23 KG 50 LBS MAX.
3.) RADIAL LOAD: 68 KG 150 LBS MAX
@ 1.00 [25.4 MM] FROM FACE.
4.) MOTOR SEALED TO IP65.
5.) MOTOR SHAFT: 416 STAINLESS STEEL.
6.) MOTOR FINISH: BLACK MATT FINISH.
7.) MOTOR WEIGHT: 22.7 KG 50 LBS.

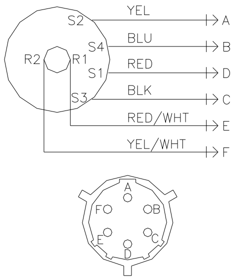
DATE	SYM	REVISION RECORD	DR	CK	CK
14SEP04	0	PER ECN 04-361	CWB		





DETAIL A

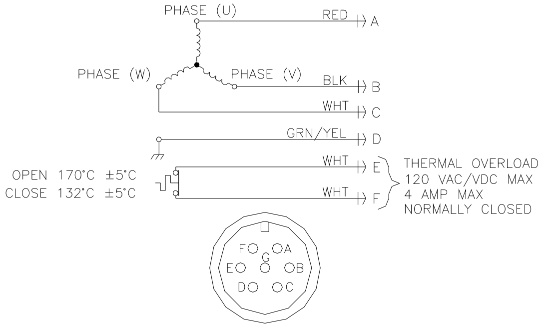
RESOLVER CONNECTION
MS3112E10-6P



VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: MS3116F10-6S

DETAIL B

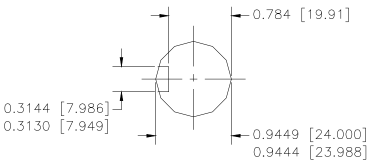
ARMATURE CONNECTION
MS3102E24-10P



VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: MS3106E24-10S

DETAIL C

MOTOR SHAFT DETAIL



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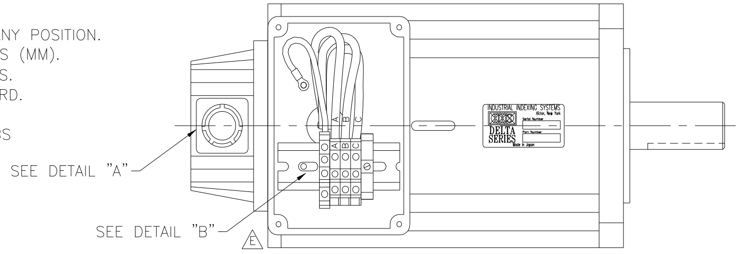
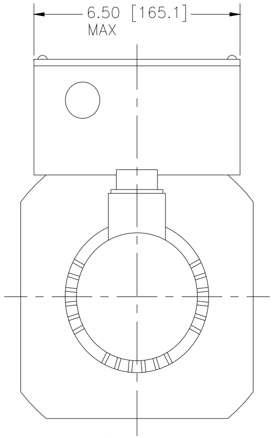
TITLE
MOTOR, DELTA SERIES

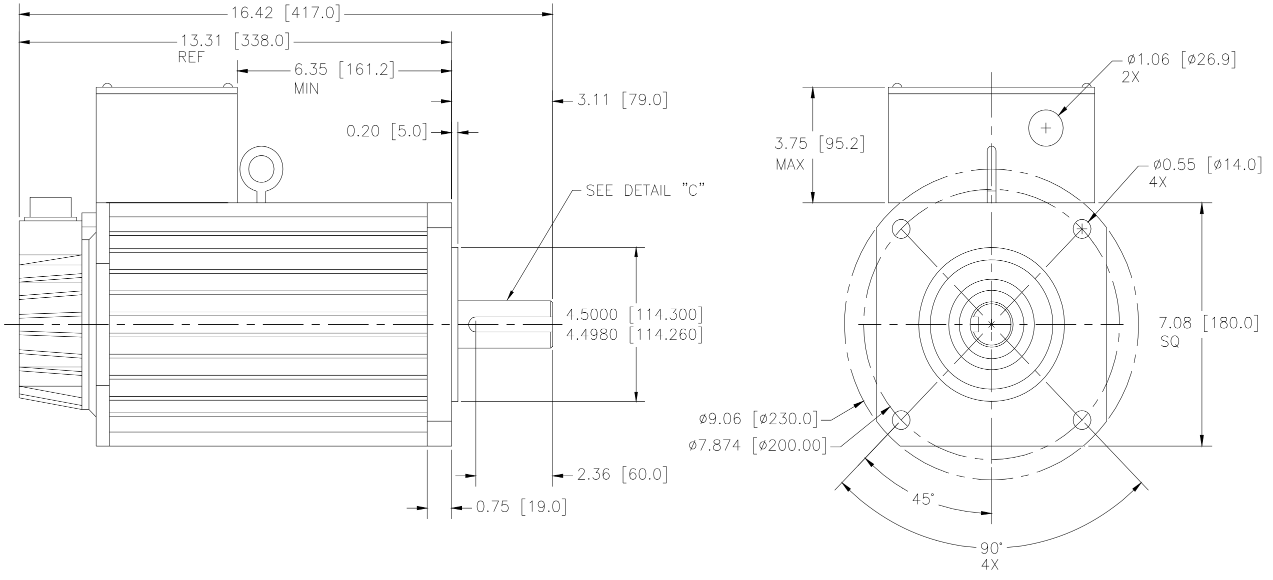
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 14SEP04
SCALE ---
DRAWING NUMBER DBM-4200/20R
SHEET NO. 1 OF 1
REVISION 0

DATE	SYM	REVISION RECORD	DR	CK	CK
17JUN04	E	PER ECN 04-255	CWB		

NOTES: △C
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 34 KG 75 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 284 N 64 LBS
6.) RADIAL LOAD 1520 N 342 LBS
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.

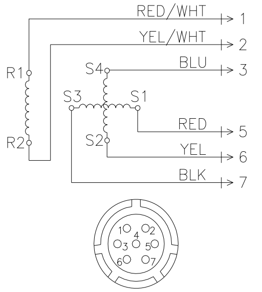






DETAIL A

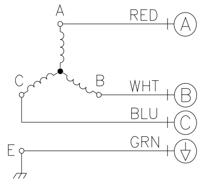
△B RESOLVER CONNECTION
JRC16WRQ-7P



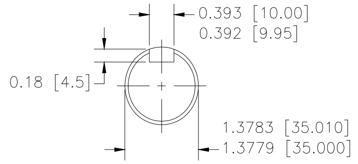
VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: JMSP1607F

DETAIL B

ARMATURE CONNECTION



DETAIL C



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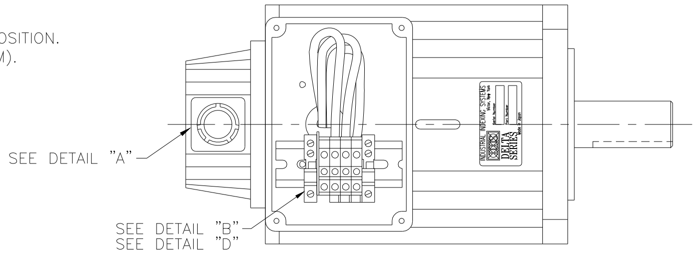
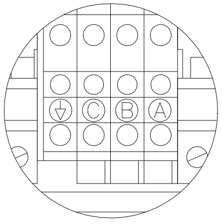
TITLE
MOTOR, BRUSHLESS, DELTA SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
DRAWN BY BOWMAN
DRAWING NUMBER DBM-5000/15R
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 28JUN96
SCALE NTS
SHEET NO. 1 OF 1
REVISION E

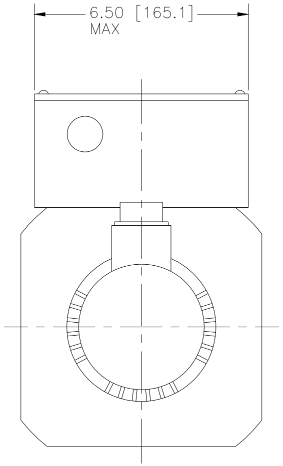
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	D	PER ECN 00-246	CWB	EB	CDR

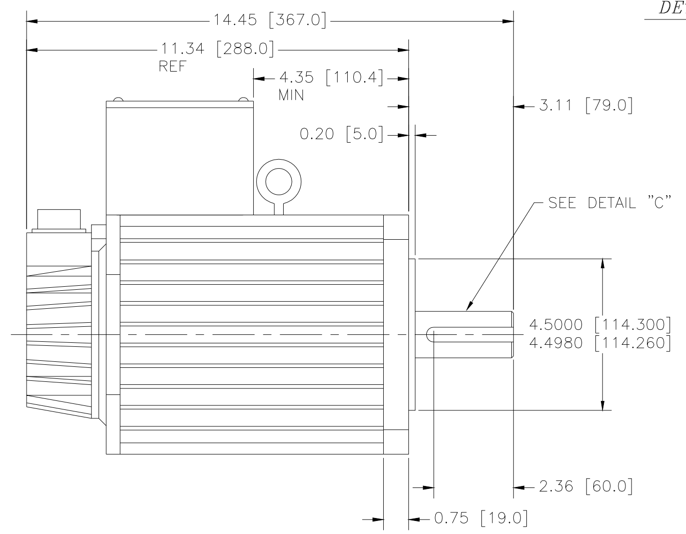
NOTES: ⚠C
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 27.0 KG 59.5 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 235 N 53 LBS
6.) RADIAL LOAD 1147 N 258 LBS
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.

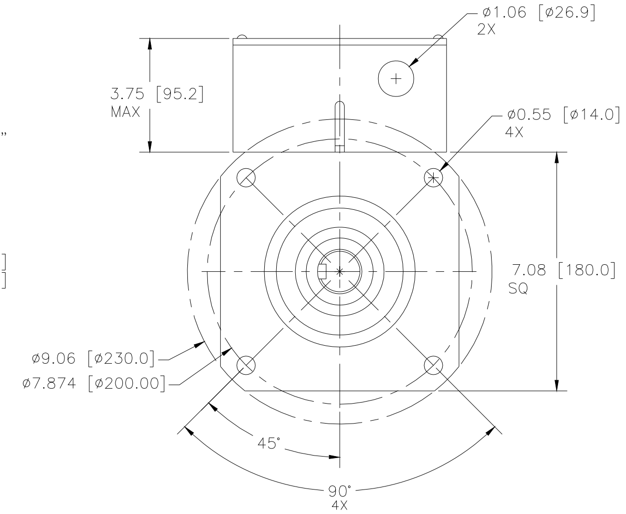




DETAIL D

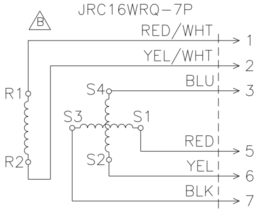


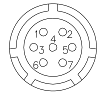




DETAIL A

RESOLVER CONNECTION
JRC16WRQ-7P



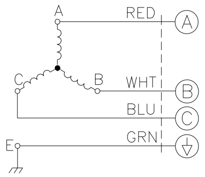


VIEW OF CONNECTOR

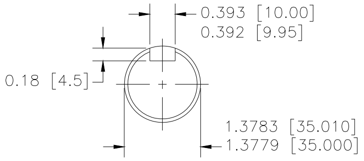
MATING SOCKET:
RESOLVER: JMSP1607F

DETAIL B

ARMATURE CONNECTION



DETAIL C



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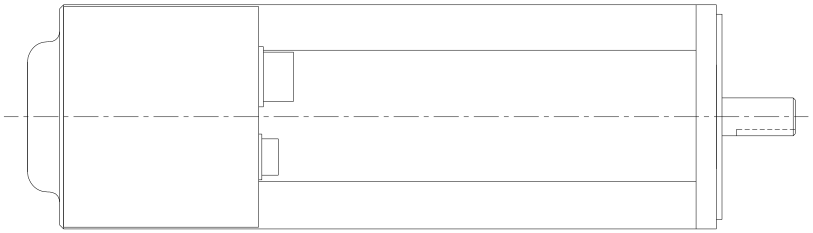
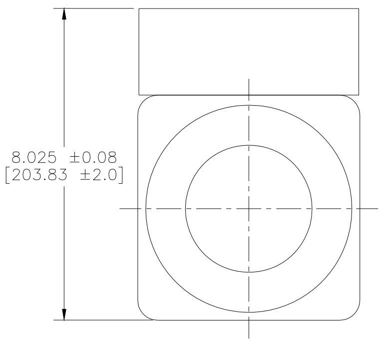
TITLE
MOTOR, BRUSHLESS, DELTA SERIES

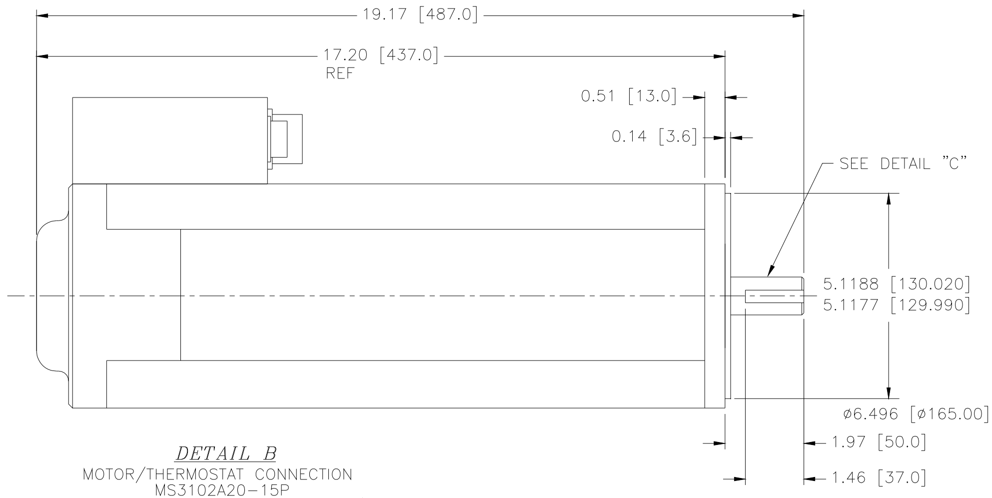
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'
B
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
DATE 28JUN96
SCALE NTS
DRAWING NUMBER DBM-5500/30R
SHEET NO. 1 OF 1
REVISION D

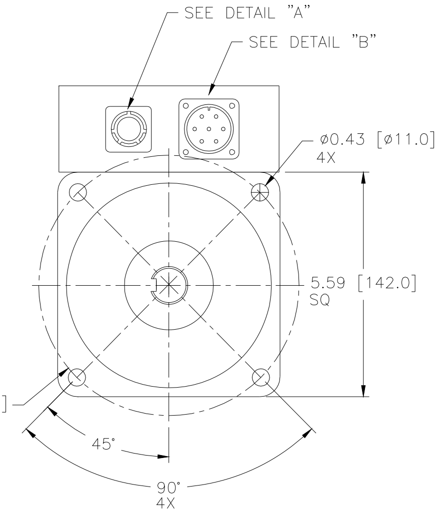
DATE	SYM	REVISION RECORD	DR	CK	CK
15JAN03	0	PER ECN 03-025	CWB		

NOTES:
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT IS 29.9 KG 66 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 332 N 75 LBS.
6.) RADIAL LOAD 887 N 200 LBS.
7.) RESOLVER IS 3X 36000 PPR. QTY 3 ZERO MARKERS.
8.) IP-65 SEALING.



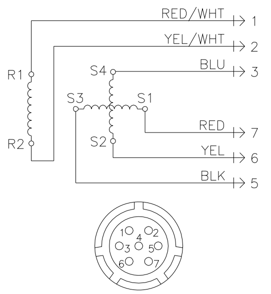






DETAIL A

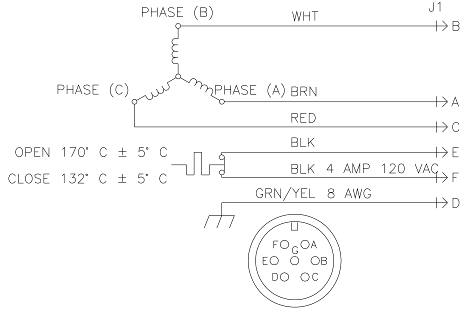
RESOLVER CONNECTION
JMR1607M



VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: JMSP1607F

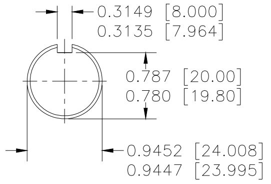
DETAIL B

MOTOR/THERMOSTAT CONNECTION
MS3102A20-15P



VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: MS3106A20-15S

DETAIL C



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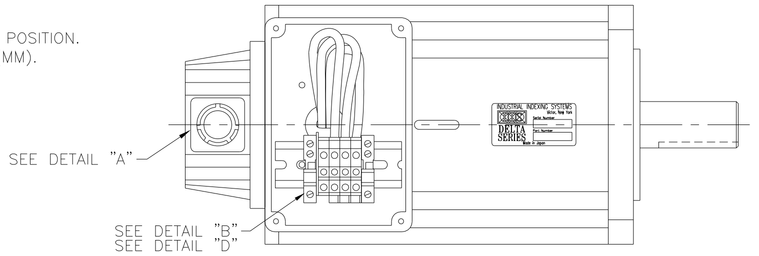
TITLE
MOTOR, BRUSHLESS, DELTA SERIES

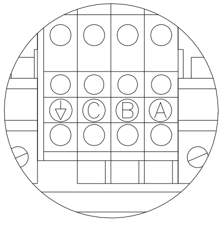
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 15JAN03
SCALE NTS
DRAWING NUMBER DBM-6100/10R
SHEET NO. 1 OF 1
REVISION 0

DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	D	PER ECN 00-246	CWB	EB	CDR

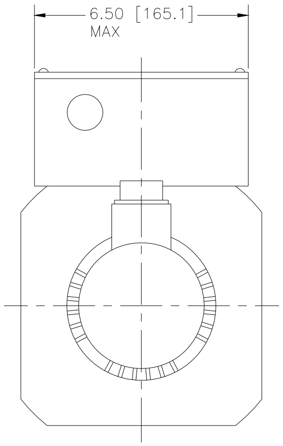
NOTES: △C

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 34 KG 75 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 235 N 52 LBS
6.) RADIAL LOAD 1205 N 270 LBS
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.





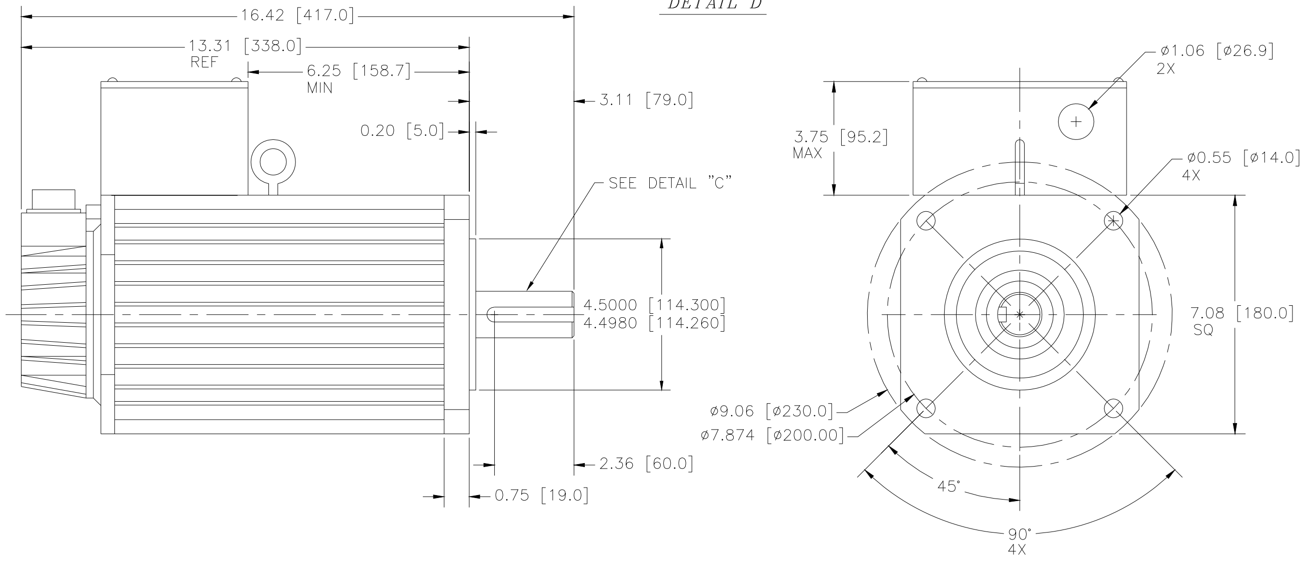
DETAIL D

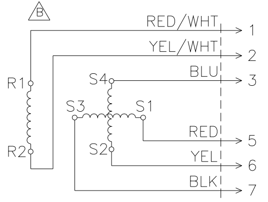


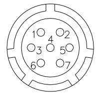
DETAIL A

RESOLVER CONNECTION

JRC16WRQ-7P





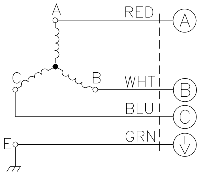


VIEW OF CONNECTOR

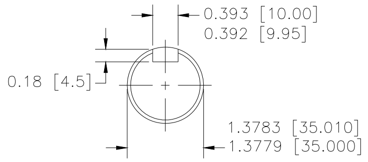
MATING SOCKET:
RESOLVER: JMSP1607F

DETAIL B

ARMATURE CONNECTION



DETAIL C



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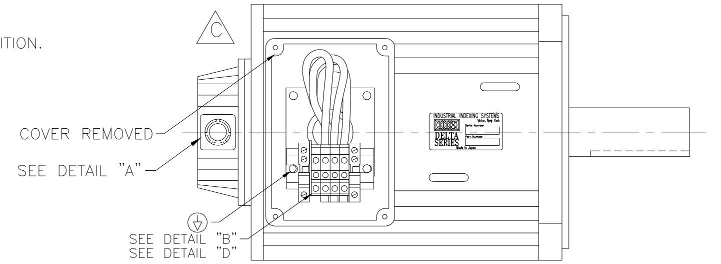
TITLE
MOTOR, BRUSHLESS, DELTA SERIES

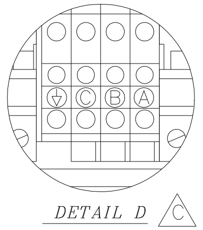
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 28JUN96
SCALE NTS
DRAWING NUMBER DBM-6500/30R
SHEET NO. 1 OF 1
REVISION D

DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	D	PER ECN 00-246	CWB	EB	CDR

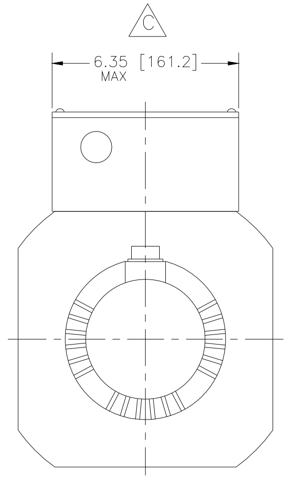
NOTES: C

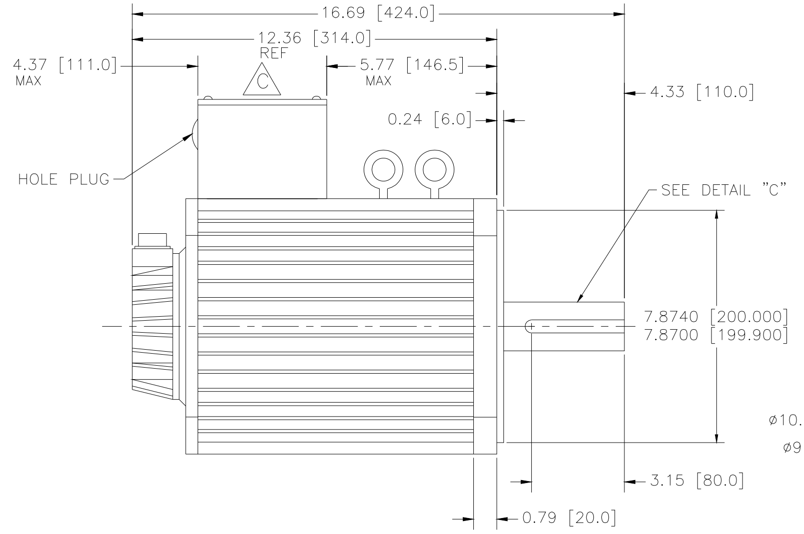
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 44 KG 97 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 294 N 66 LBS
6.) RADIAL LOAD 1372 N 308 LBS
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.

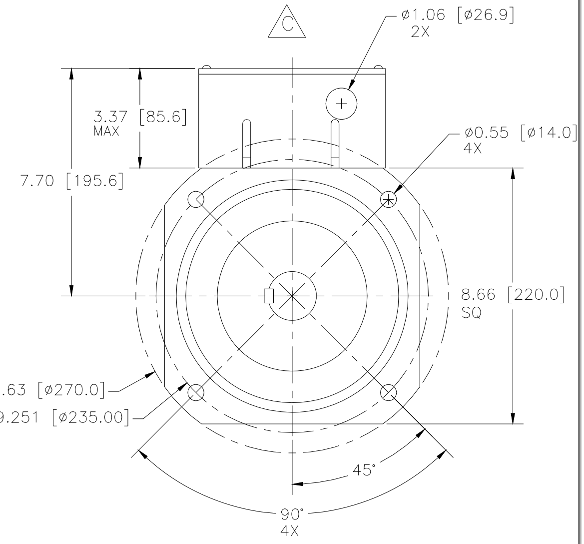




DETAIL D C

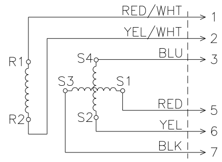


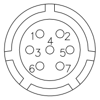




DETAIL A

RESOLVER CONNECTION
JRC16WRQ-7P

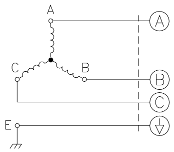




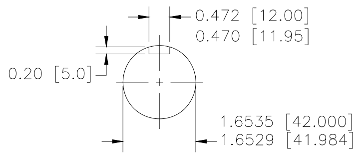
VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: JMSP1607F

DETAIL B

ARMATURE CONNECTION



DETAIL C



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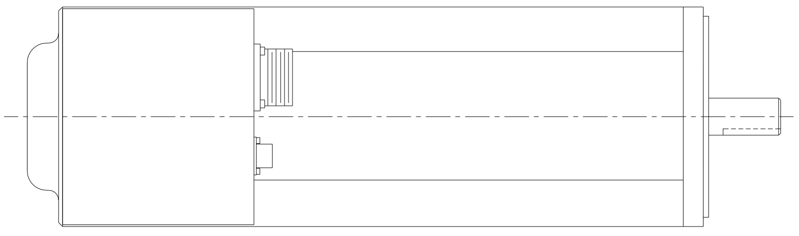
TITLE
MOTOR, BRUSHLESS, DELTA SERIES

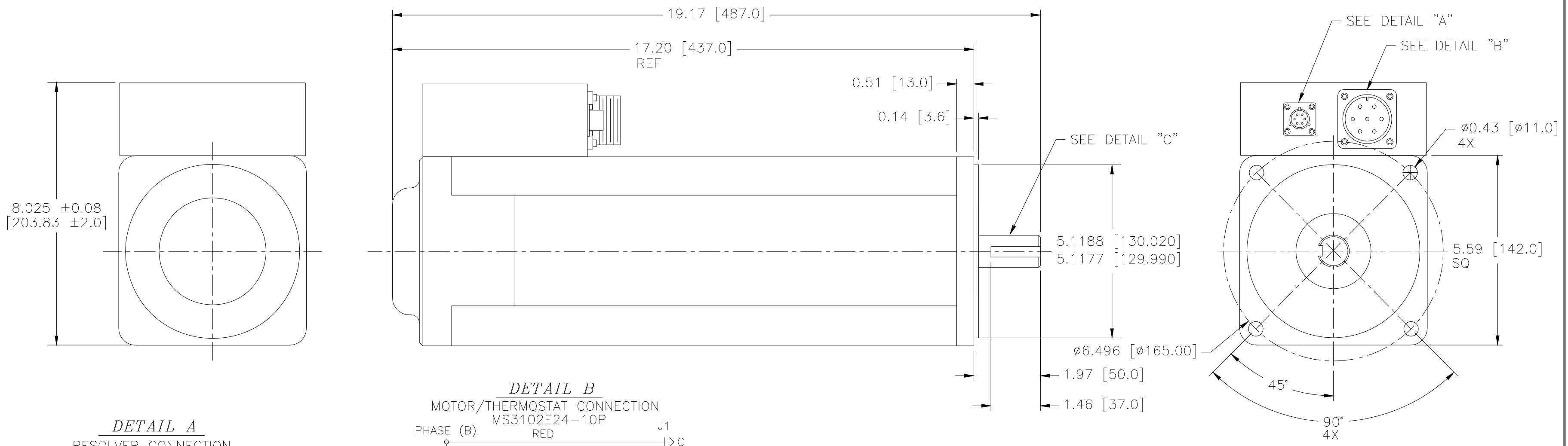
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 01JUL97
SCALE NTS
DRAWING NUMBER DBM-7500/20R
SHEET NO. 1 OF 1
REVISION D

NOTES: B

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT IS 29.9 KG 66 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 332 N 75 LBS.
6.) RADIAL LOAD 887 N 200 LBS.
7.) RESOLVER IS 3X 36000 PPR.
QTY 3 ZERO MARKERS.
8.) IP-65 SEALING.

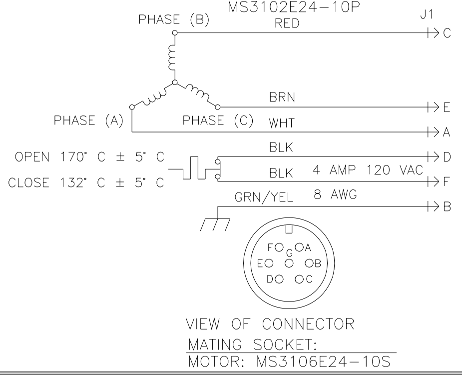
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	C	PER ECN 00-246	CWB	EB	CDR





DETAIL B

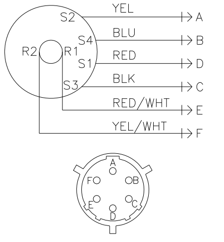
MOTOR/THERMOSTAT CONNECTION
MS3102E24-10P



VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: MS3106E24-10S

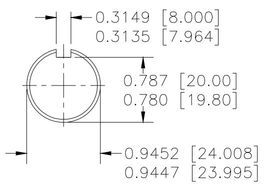
DETAIL A

RESOLVER CONNECTION
MS3112E10-6P



VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: MS3116F10-6S

DETAIL C



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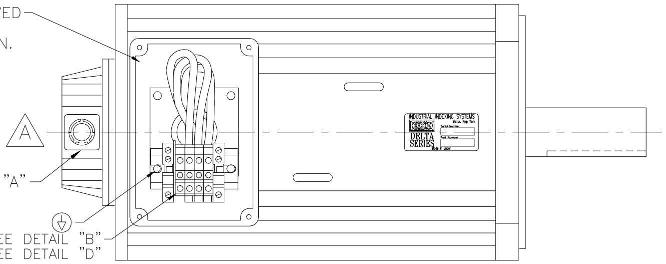
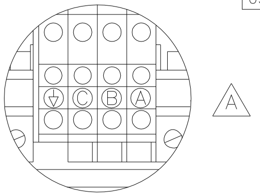
TITLE
MOTOR, BRUSHLESS, DELTA SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION
Q:\CURRENT DWGS
B
DATE 05JAN98
SCALE NTS
DRAWING NUMBER DBM-8600/22R
SHEET NO. 1 OF 1
REVISION C

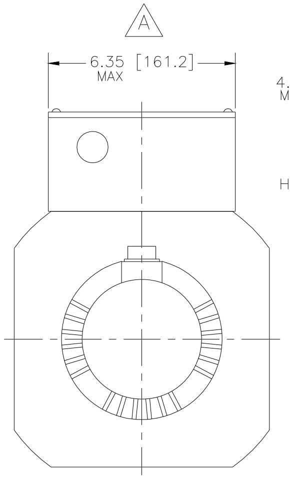
NOTES: △A
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 62 KG 137 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 294 N 66 LBS
6.) RADIAL LOAD 1470 N 330 LBS
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.

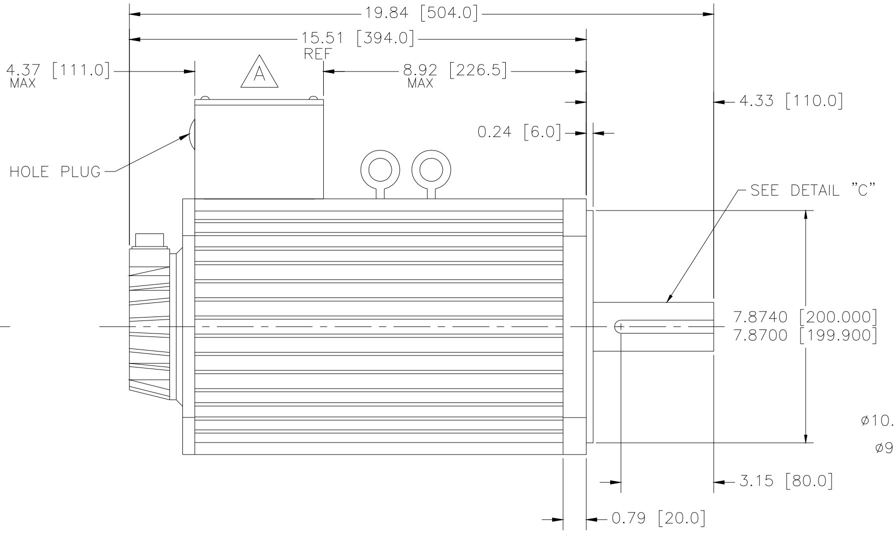
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	B	PER ECN 00-246	CWB	EB	CDR

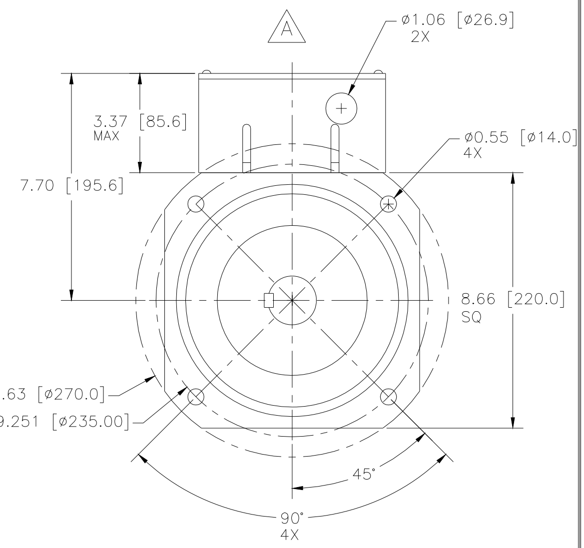




DETAIL D

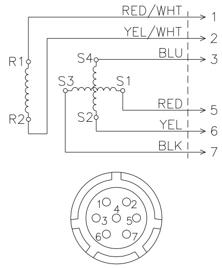






DETAIL A

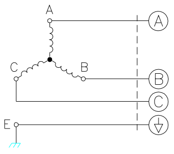
RESOLVER CONNECTION
JRC16WRQ-7P



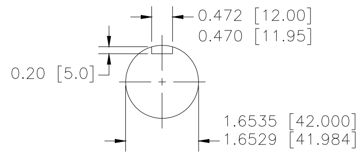
VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: JMSP1607F

DETAIL B

ARMATURE CONNECTION



DETAIL C



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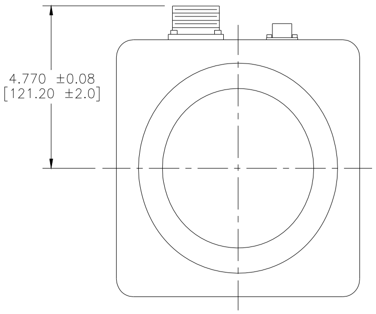
TITLE
MOTOR, BRUSHLESS, DELTA SERIES

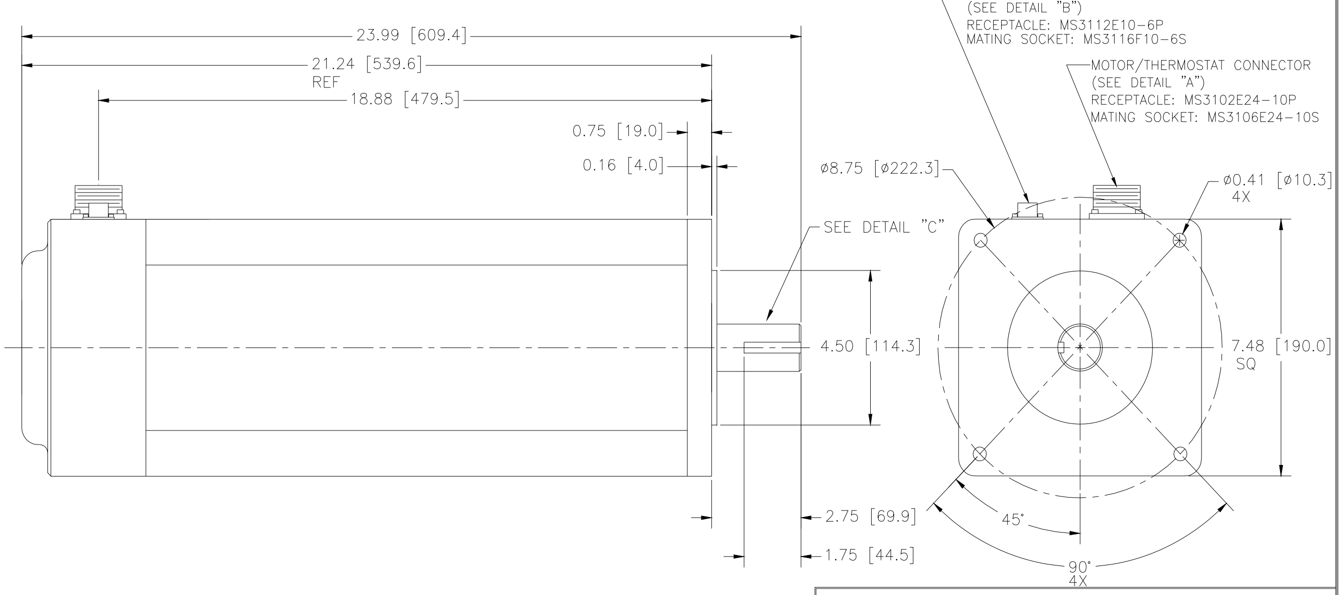
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 18AUG98
SCALE NTS
DRAWING NUMBER DBM-10000/20R
SHEET NO. 1 OF 1
REVISION B

DATE	SYM	REVISION RECORD	DR	CK	CK
07DEC99	A	PER ECN 99-014	CWB	ELS	CDR

NOTES: A

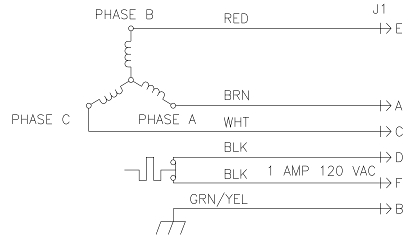
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT IS 62.6 KG 138 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 500 N 112 LBS.
6.) RADIAL LOAD 1330 N 300 LBS.
7.) RESOLVER IS 3X 36000 PPR.
QTY 3 ZERO MARKERS.
8.) IP-65 SEALING.





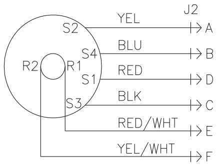
DETAIL A

MOTOR/THERMOSTAT CONNECTION



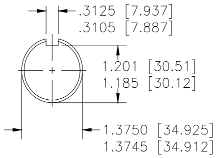
DETAIL B

RESOLVER CONNECTION



DETAIL C

MOTOR SHAFT DIMENSIONS



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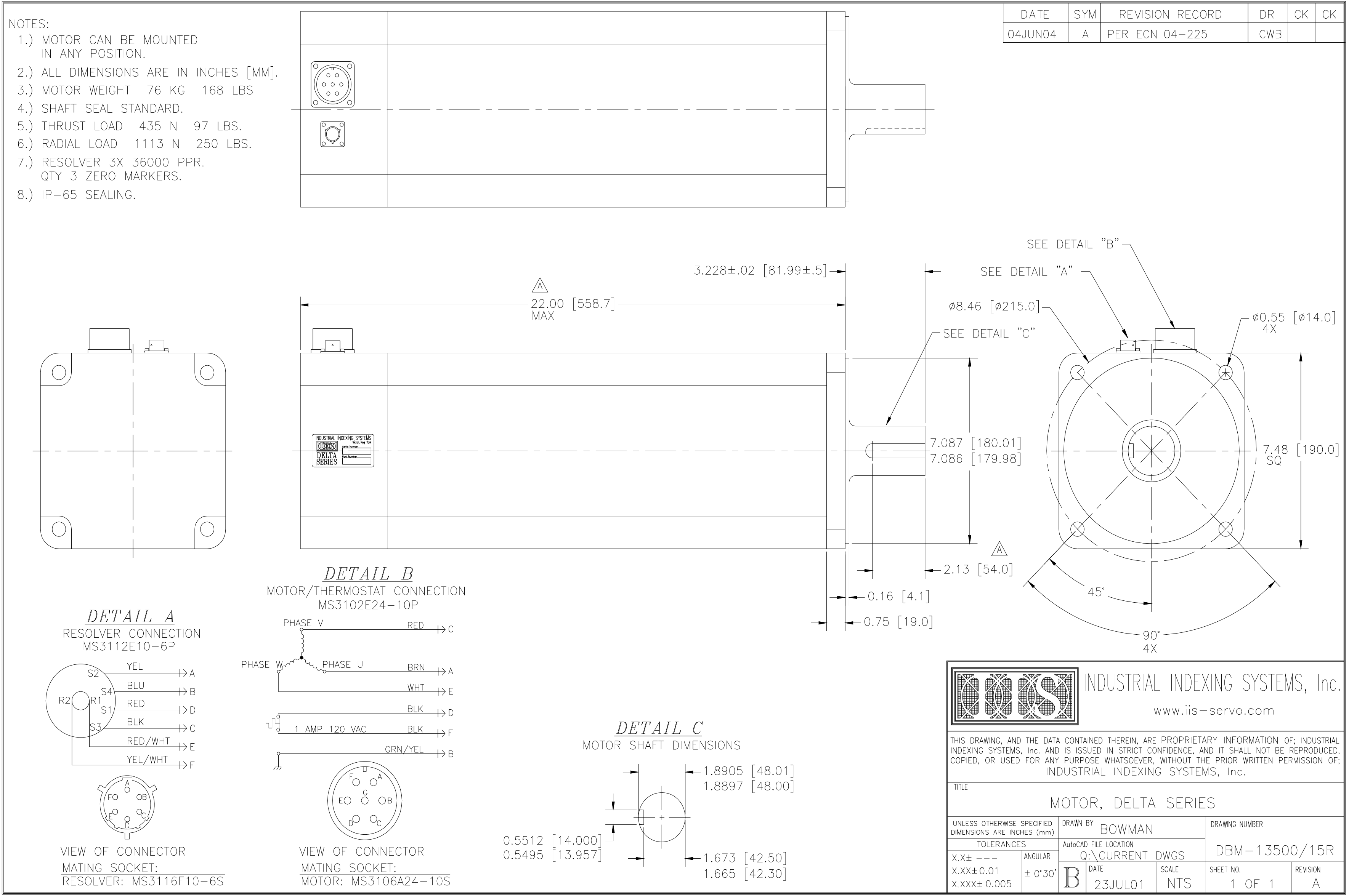
TITLE
MOTOR, BRUSHLESS, DELTA SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 25OCT98
SCALE NTS
DRAWING NUMBER DBM-10300/15R
SHEET NO. 1 OF 1
REVISION A

NOTES:
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 76 KG 168 LBS
4.) SHAFT SEAL STANDARD.
5.) THRUST LOAD 435 N 97 LBS.
6.) RADIAL LOAD 1113 N 250 LBS.
7.) RESOLVER 3X 36000 PPR. QTY 3 ZERO MARKERS.
8.) IP-65 SEALING.

DATE	SYM	REVISION RECORD	DR	CK	CK
04JUN04	A	PER ECN 04-225	CWB		



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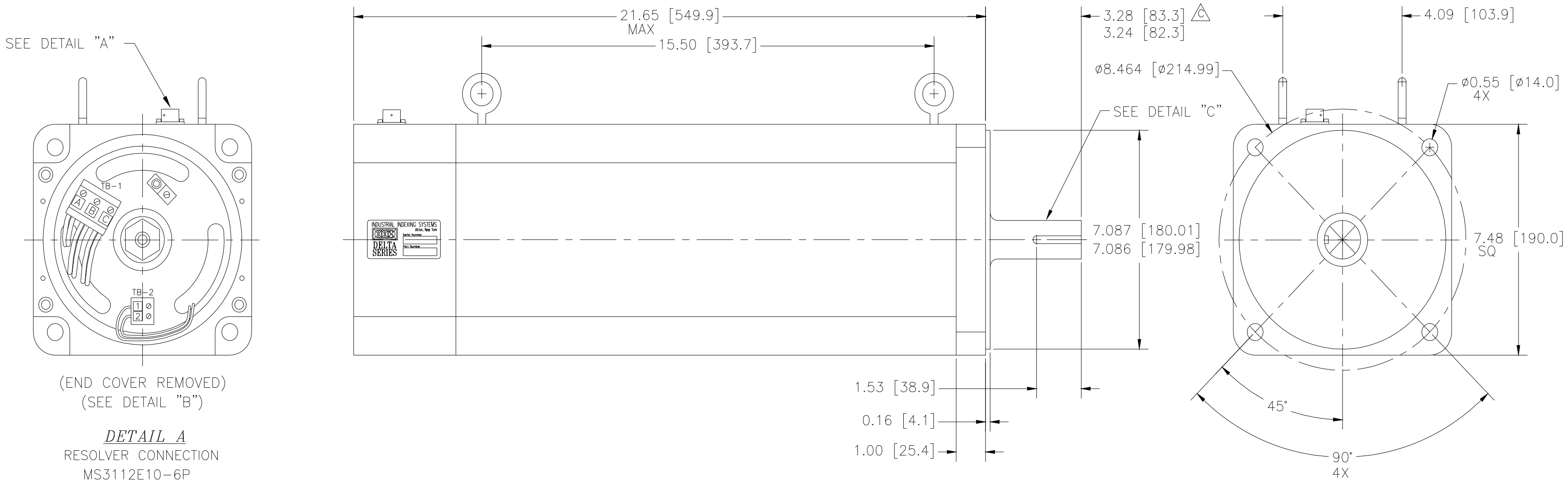
TITLE
MOTOR, DELTA SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'

DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 23JUL01
SCALE NTS
DRAWING NUMBER DBM-13500/15R
SHEET NO. 1 OF 1
REVISION A

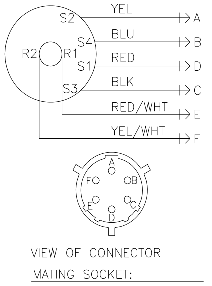
NOTES:
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 76 KG 168 LBS.
4.) SHAFT SEAL STANDARD.
5.) THRUST LOAD 435 N 97 LBS.
6.) RADIAL LOAD 1113 N 250 LBS.
7.) RESOLVER 3X 36000 PPR.
QTY 3 ZERO MARKERS.
8.) IP-65 SEALING.

DATE	SYM	REVISION RECORD	DR	CK	CK
15JUN05	C	PER ECN 05-131	CWB		



DETAIL A

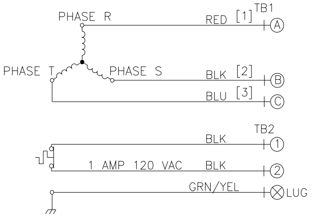
RESOLVER CONNECTION
MS3112E10-6P



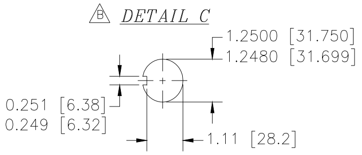
VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: MS3116F10-6S

DETAIL B

ARMATURE CONNECTION



DETAIL C



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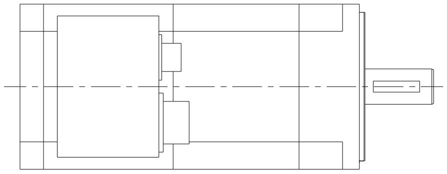
TITLE
MOTOR, DELTA SERIES

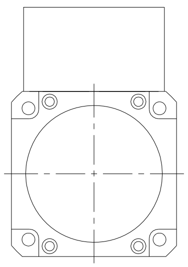
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'
B
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
DATE 16DEC99
SCALE NTS
DRAWING NUMBER DBM-14300/13R
SHEET NO. 1 OF 1
REVISION C

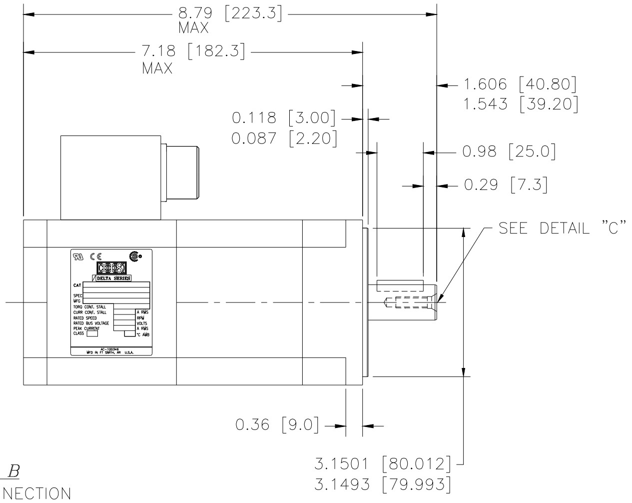
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	C	PER ECN 00-246	CWB	EB	CDR

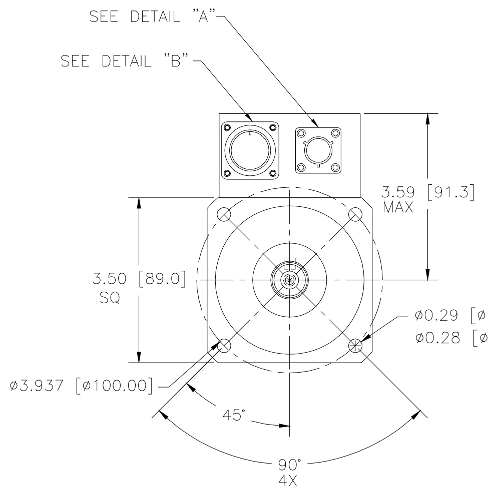
NOTES: B

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 4.1 KG 9 LBS.
4.) MOTOR SHAFT SEAL STANDARD.
5.) THRUST LOAD 289 N 64 LBS.
6.) RADIAL LOAD 267 N 60 LBS.
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-65 SEALING.



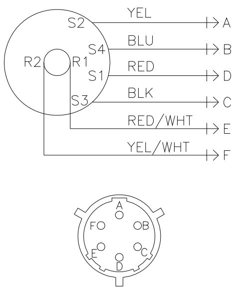






DETAIL A A

RESOLVER CONNECTION
MS3112E10-6P

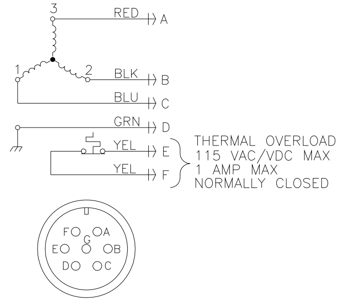


VIEW OF CONNECTOR

MATING SOCKET:
RESOLVER: MS3116F10-6S

DETAIL B

ARMATURE CONNECTION
MS3100A16S-1P

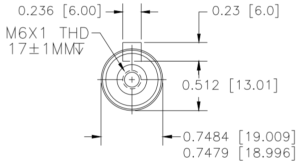


VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A16S-1S

DETAIL C

MOTOR SHAFT DIMENSIONS



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TITLE
MOTOR, DELTA SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'

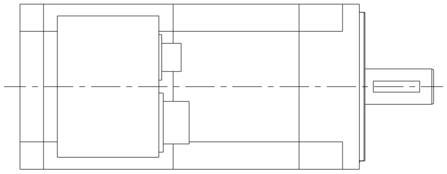
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 11JUN99
SCALE NTS

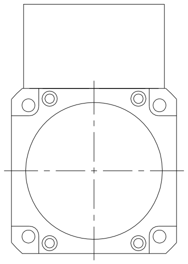
DRAWING NUMBER DBM-B380/30R
SHEET NO. 1 OF 1
REVISION C

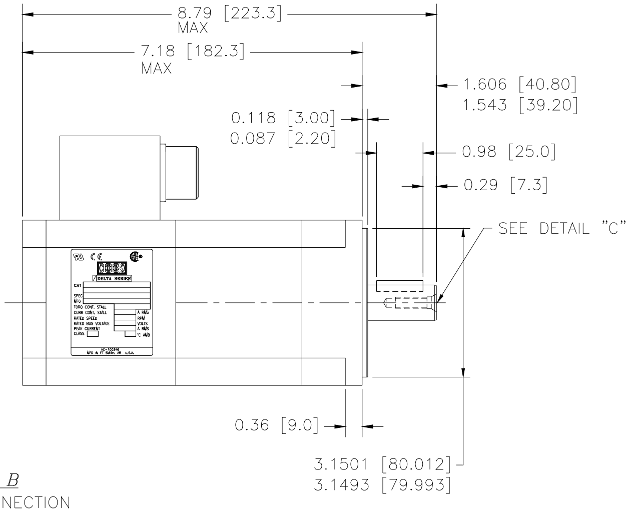
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	C	PER ECN 00-246	CWB	EB	CDR

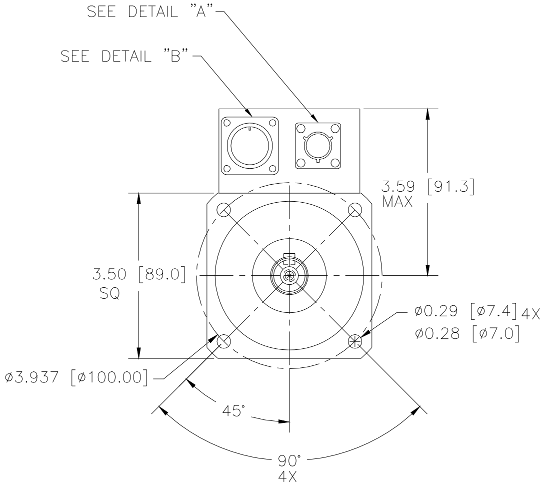
NOTES: B

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 4.1 KG 9 LBS.
4.) MOTOR SHAFT SEAL STANDARD.
5.) THRUST LOAD 289 N 64 LBS.
6.) RADIAL LOAD 267 N 60 LBS.
7.) RESOLVER 1X 12000 PPR.
QTY 1 ZERO MARKER.
8.) IP-65 SEALING.



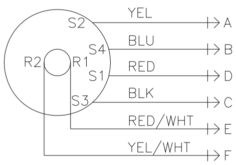


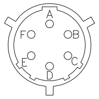




DETAIL A A

RESOLVER CONNECTION
MS3112E10-6P



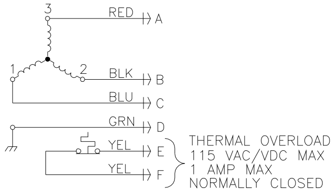


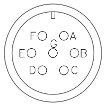
VIEW OF CONNECTOR

MATING SOCKET:
RESOLVER: MS3116F10-6S

DETAIL B

ARMATURE CONNECTION
MS3100A16S-1P



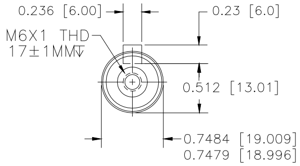


VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A16S-1S

DETAIL C

MOTOR SHAFT DIMENSIONS



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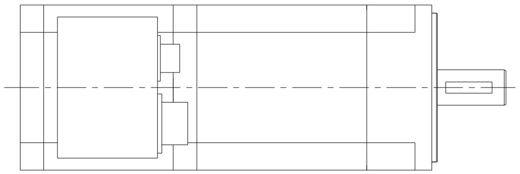
TITLE
MOTOR, DELTA SERIES

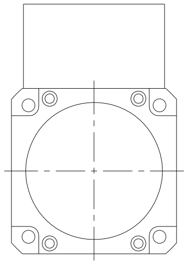
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)		DRAWN BY BOWMAN		DRAWING NUMBER DBM-B380/30R1X
TOLERANCES		AutoCAD FILE LOCATION Q:\CURRENT DWGS		
X.X± --- X.XX± 0.01 X.XXX± 0.005	ANGULAR ± 0°30'	B DATE 11JUN99	SCALE NTS	SHEET NO. 1 OF 1 — REVISION C

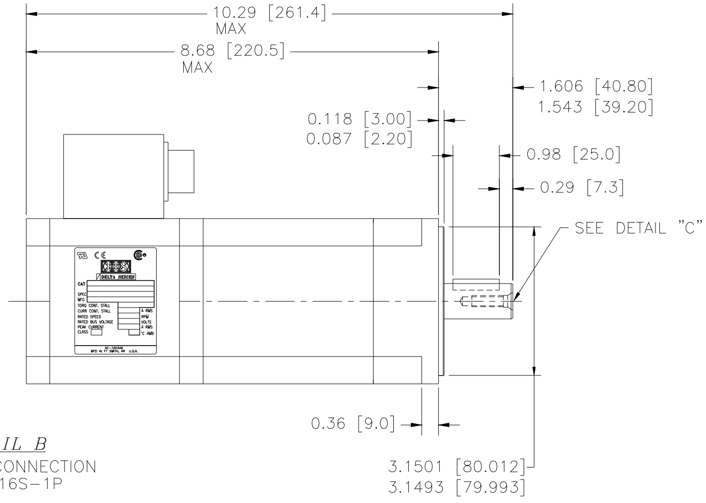
DATE	SYM	REVISION RECORD	DR	CK	CK
08AUG00	C	PER ECN 00-246	CWB	EB	CDR

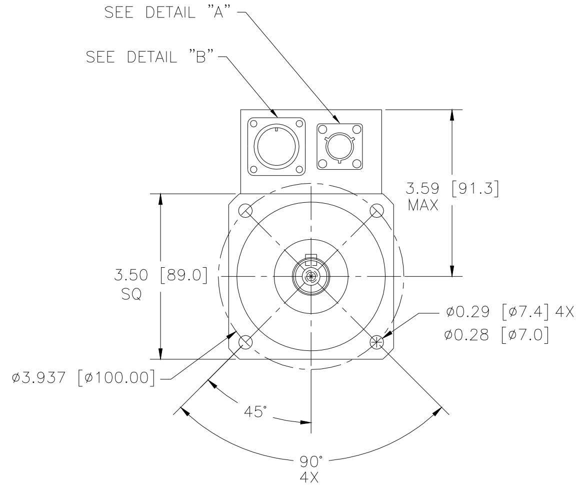
NOTES: B

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 6.4 KG 14 LBS.
4.) MOTOR SHAFT SEAL STANDARD.
5.) THRUST LOAD 289 N 64 LBS.
6.) RADIAL LOAD 267 N 60 LBS.
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-65 SEALING.



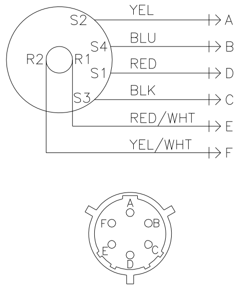






DETAIL A A

RESOLVER CONNECTION
MS3112E10-6P

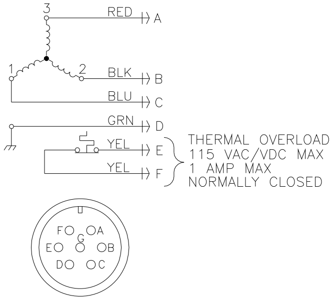


VIEW OF CONNECTOR

MATING SOCKET:
RESOLVER: MS3116F10-6S

DETAIL B

ARMATURE CONNECTION
MS3100A16S-1P

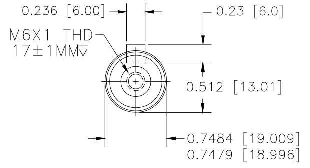


VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A16S-1S

DETAIL C

MOTOR SHAFT DIMENSIONS



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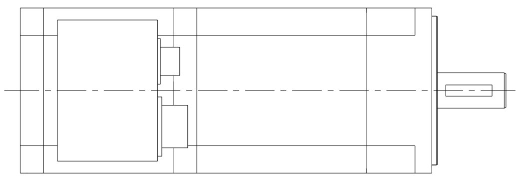
TITLE
MOTOR, DELTA SERIES

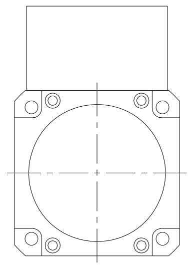
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'
DRAWN BY
BOWMAN
AutoCAD FILE LOCATION
Q:\CURRENT DWGS
B
DATE
08JAN99
SCALE
NTS
DRAWING NUMBER
DBM-B630/30R
SHEET NO.
1 OF 1
REVISION
C

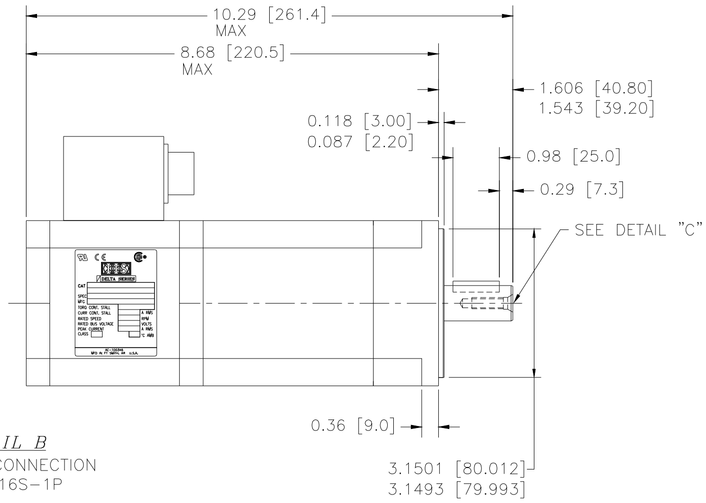
NOTES: B

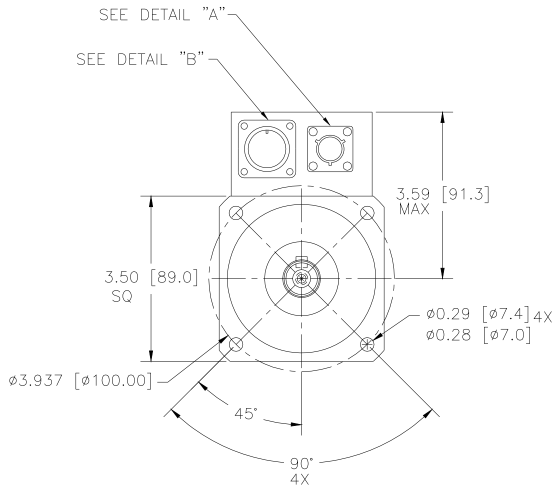
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 6.4 KG 14 LBS.
4.) MOTOR SHAFT SEAL STANDARD.
5.) THRUST LOAD 289 N 64 LBS.
6.) RADIAL LOAD 267 N 60 LBS.
7.) RESOLVER 1X 12000 PPR.
QTY 1 ZERO MARKER.
8.) IP-65 SEALING.

DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	C	PER ECN 00-246	CWB	EB	CDR



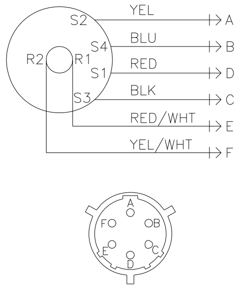






DETAIL A A

RESOLVER CONNECTION
MS3112E10-6P

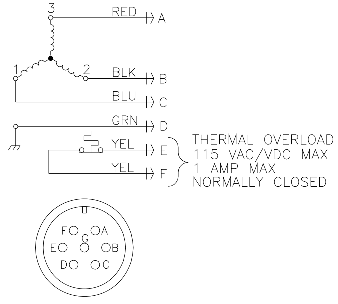


VIEW OF CONNECTOR

MATING SOCKET:
RESOLVER: MS3116F10-6S

DETAIL B

ARMATURE CONNECTION
MS3100A16S-1P

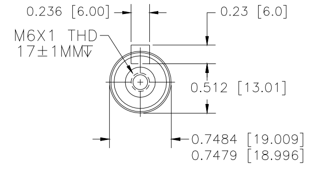


VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A16S-1S

DETAIL C

MOTOR SHAFT DIMENSIONS



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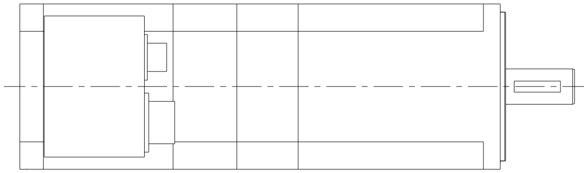
TITLE
MOTOR, DELTA SERIES

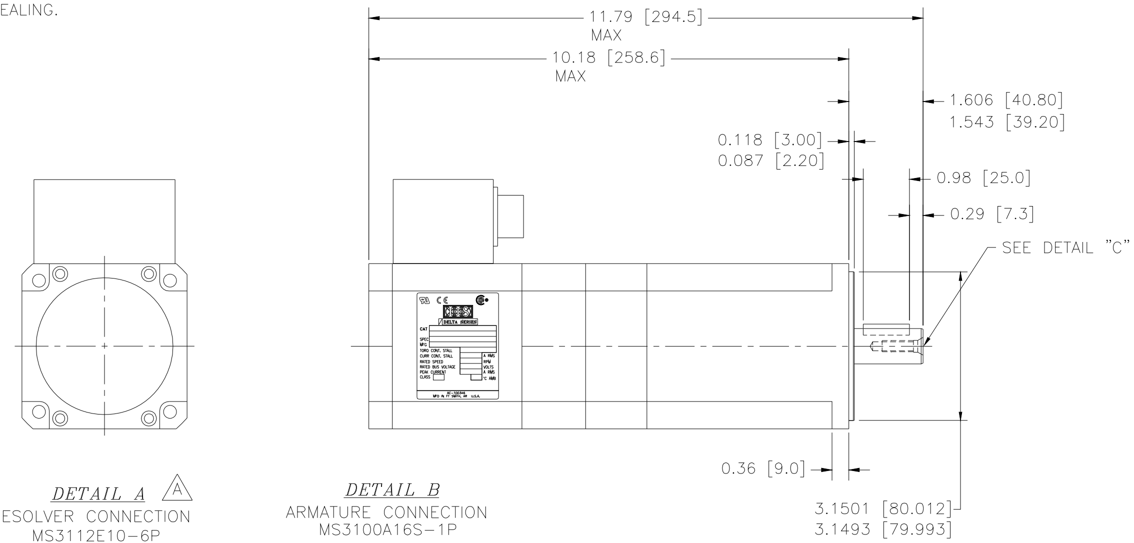
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'
B
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
DATE 08JAN99
SCALE NTS
DRAWING NUMBER DBM-B630/30R1X
SHEET NO. 1 OF 1
REVISION C

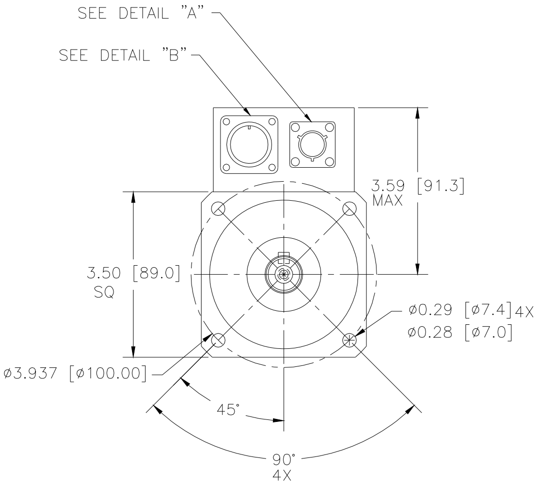
NOTES: △B

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 8.6 KG 19 LBS.
4.) MOTOR SHAFT SEAL STANDARD.
5.) THRUST LOAD 289 N 64 LBS.
6.) RADIAL LOAD 267 N 60 LBS.
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-65 SEALING.

DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	C	PER ECN 00-246	CWB	EB	CDR

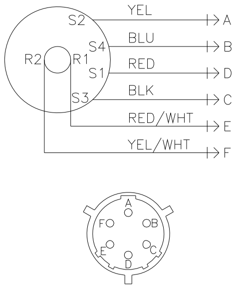






DETAIL A △A

RESOLVER CONNECTION
MS3112E10-6P

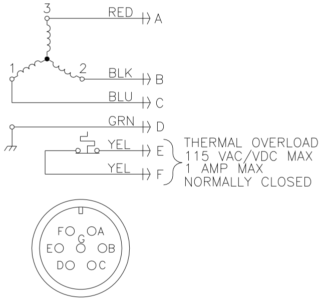


VIEW OF CONNECTOR

MATING SOCKET:
RESOLVER: MS3116F10-6S

DETAIL B

ARMATURE CONNECTION
MS3100A16S-1P

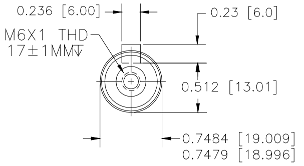


VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A16S-1S

DETAIL C

MOTOR SHAFT DIMENSIONS



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TITLE
MOTOR, DELTA SERIES

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TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'

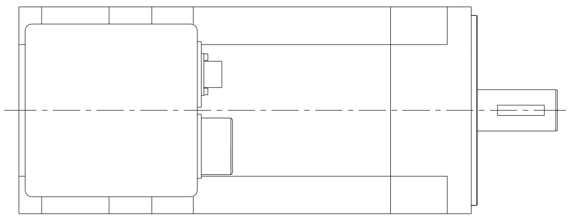
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 08JAN99
SCALE NTS

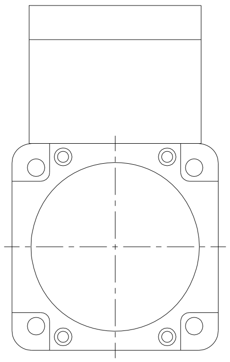
DRAWING NUMBER DBM-B800/30R
SHEET NO. 1 OF 1
REVISION C

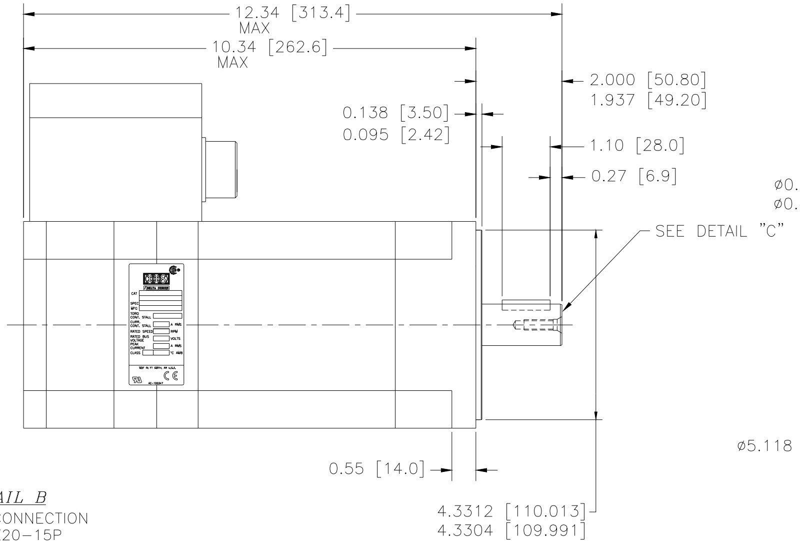
NOTES: △A

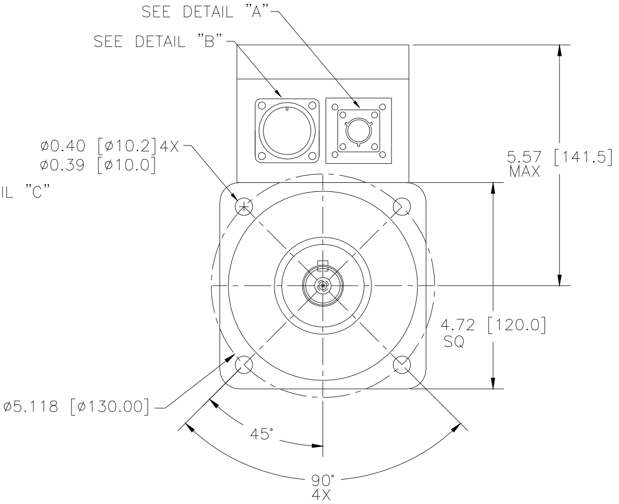
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 13.6 KG 30 LBS
4.) MOTOR SHAFT SEAL STANDARD.
5.) THRUST LOAD 653 N 146 LBS.
6.) RADIAL LOAD 712 N 160 LBS
7.) RESOLVER 2X 24000 PPR.
    QTY 2 ZERO MARKERS.
8.) IP-65 SEALING.

DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	B	PER ECN 00-246	CWB	EB	CDR



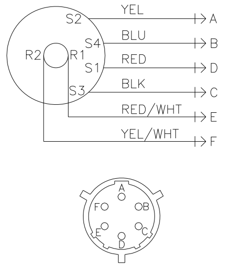






DETAIL A

RESOLVER CONNECTION
MS3112E10-6P

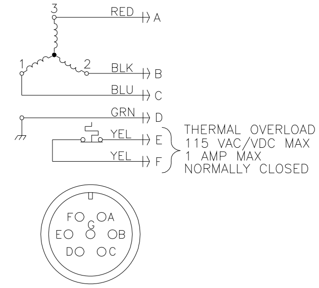


VIEW OF CONNECTOR

MATING SOCKET:
RESOLVER: MS3116F10-6S

DETAIL B

ARMATURE CONNECTION
MS3102E20-15P



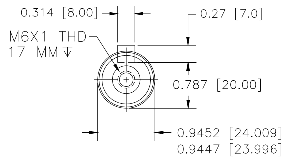
THERMAL OVERLOAD
115 VAC/VDC MAX
1 AMP MAX
NORMALLY CLOSED

VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A20-15S

DETAIL C

MOTOR SHAFT DIMENSIONS



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TITLE
MOTOR, DELTA SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'

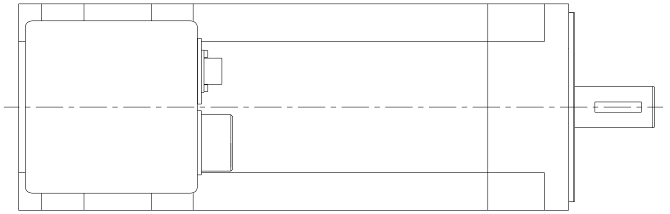
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 01NOV99
SCALE NTS

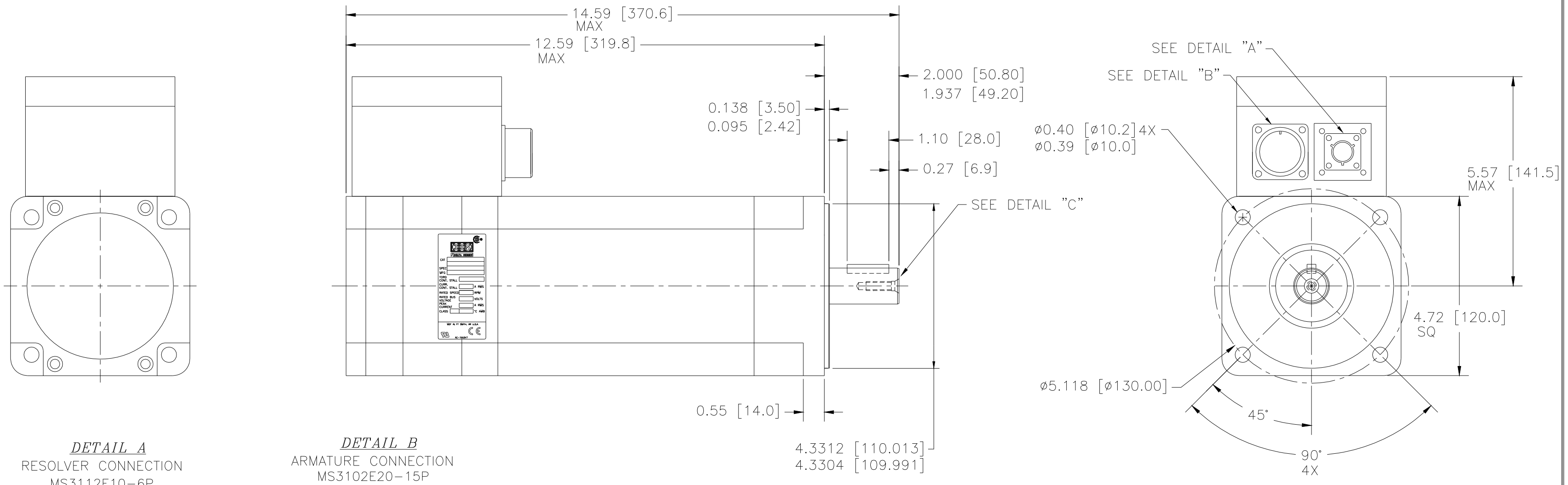
DRAWING NUMBER DBM-B1060/30R
SHEET NO. 1 OF 1
REVISION B

NOTES: A

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 18.6 KG 41 LBS.
4.) MOTOR SHAFT SEAL STANDARD.
5.) THRUST LOAD 653 N 146 LBS.
6.) RADIAL LOAD 712 N 160 LBS.
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-65 SEALING.

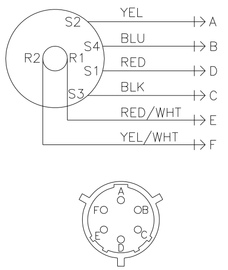
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	B	PER ECN 00-246	CWB	EB	CDR





DETAIL A

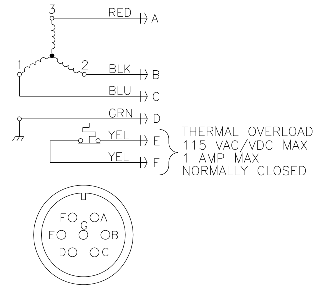
RESOLVER CONNECTION
MS3112E10-6P



VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: MS3116F10-6S

DETAIL B

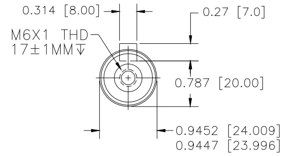
ARMATURE CONNECTION
MS3102E20-15P



VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: MS3106A20-15S

DETAIL C

MOTOR SHAFT DIMENSIONS



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TOLERANCES
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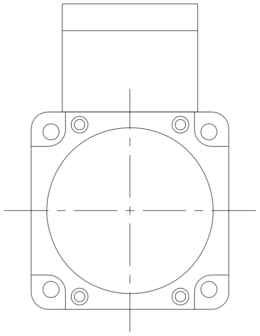
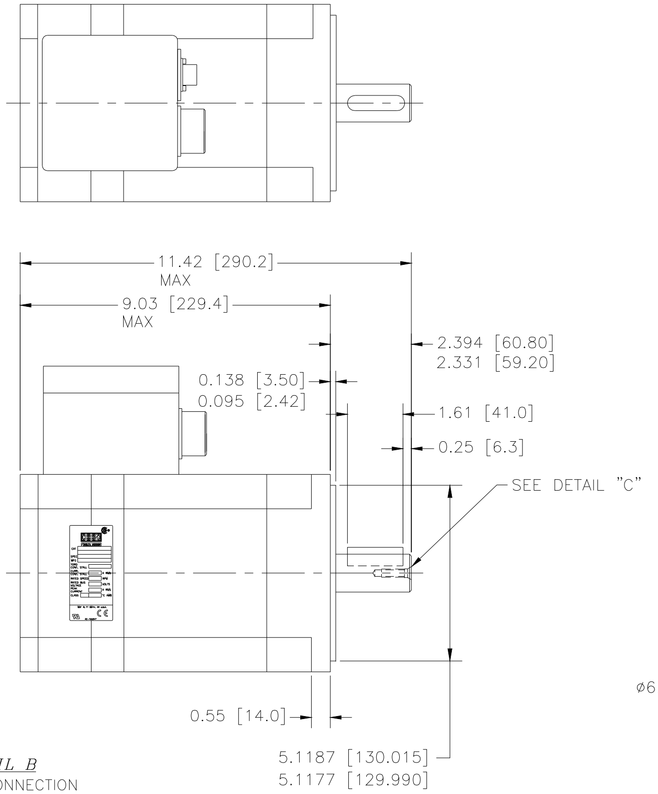
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 01NOV99
SCALE NTS
DRAWING NUMBER DBM-B1600/30R
SHEET NO. 1 OF 1
REVISION B

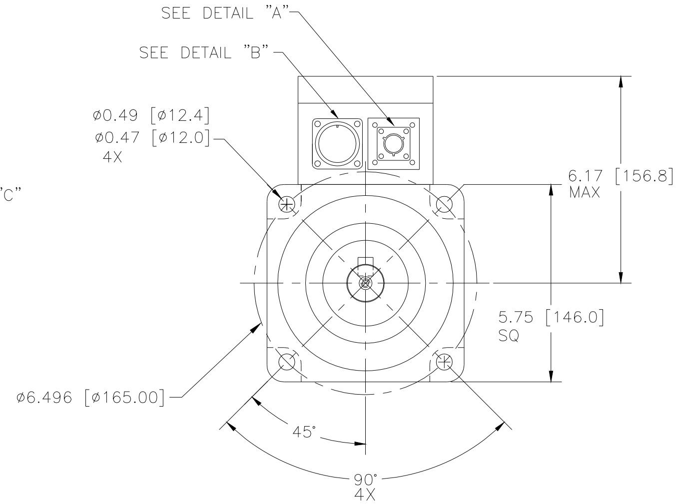
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	B	PER ECN 00-246	CWB	EB	CDR

NOTES: A

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 15 KG 33 LBS
4.) MOTOR SHAFT SEAL STANDARD.
5.) THRUST LOAD 890 N 200 LBS.
6.) RADIAL LOAD 1113 N 250 LBS.
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-65 SEALING.

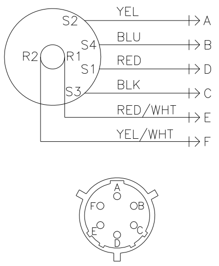






DETAIL A

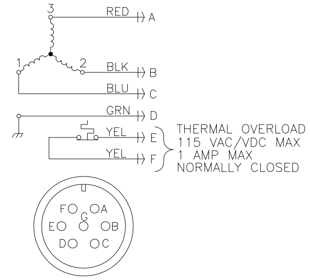
RESOLVER CONNECTION
MS3112E10-6P



VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: MS3116F10-6S

DETAIL B

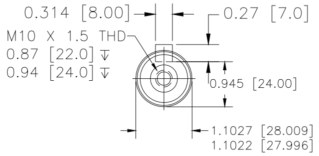
ARMATURE CONNECTION
MS3102E20-15P



VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: MS3106A20-15S

DETAIL C

MOTOR SHAFT DIMENSIONS



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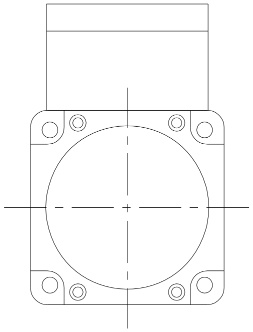
TITLE
MOTOR, DELTA SERIES

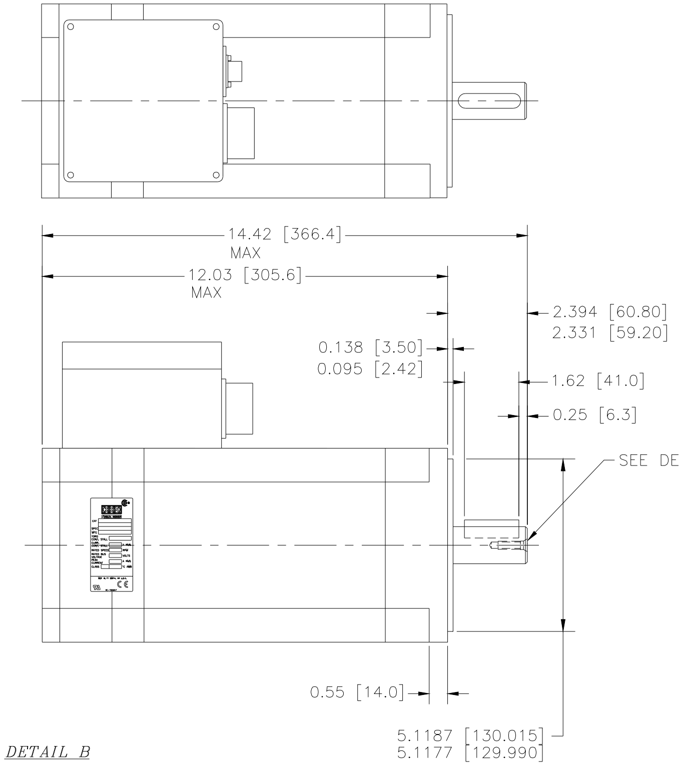
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 01NOV99
SCALE NTS
DRAWING NUMBER DBM-B1900/30R
SHEET NO. 1 OF 1
REVISION B

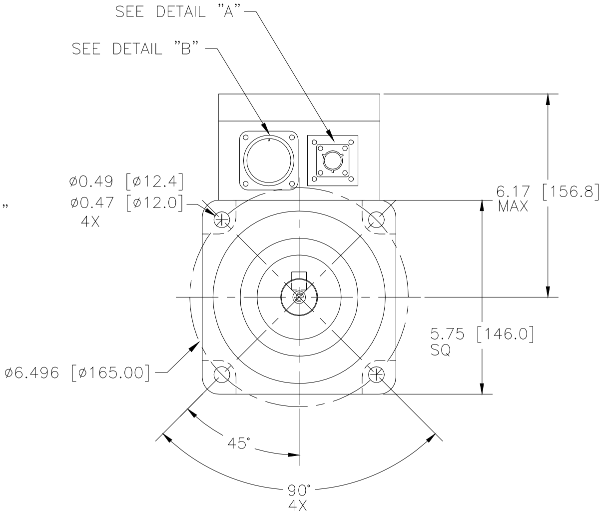
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	B	PER ECN 00-246	CWB	EB	CDR

NOTES: A

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 23.6 KG 52 LBS.
4.) MOTOR SHAFT SEAL STANDARD.
5.) THRUST LOAD 890 N 200 LBS.
6.) RADIAL LOAD 1113 N 250 LBS.
7.) RESOLVER 2X 24000 PPR. QTY 2 ZERO MARKERS.
8.) IP-65 SEALING.

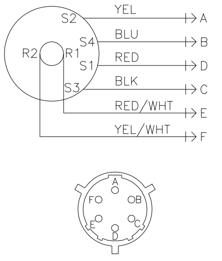






DETAIL A

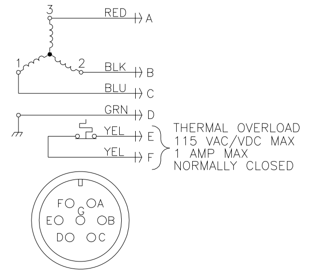
RESOLVER CONNECTION
MS3112E10-6P



VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: MS3116F10-6S

DETAIL B

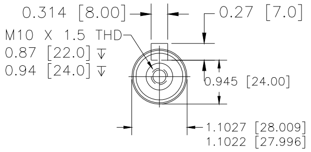
ARMATURE CONNECTION
MS3102E24-10P



VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: MS3106A24-10S

DETAIL C

MOTOR SHAFT DIMENSIONS



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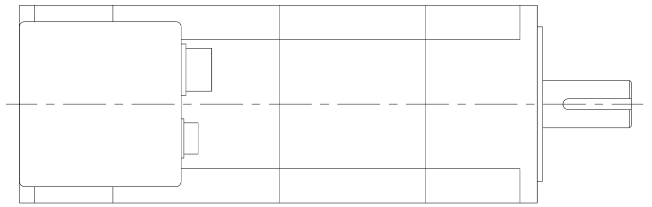
TITLE
MOTOR, DELTA SERIES

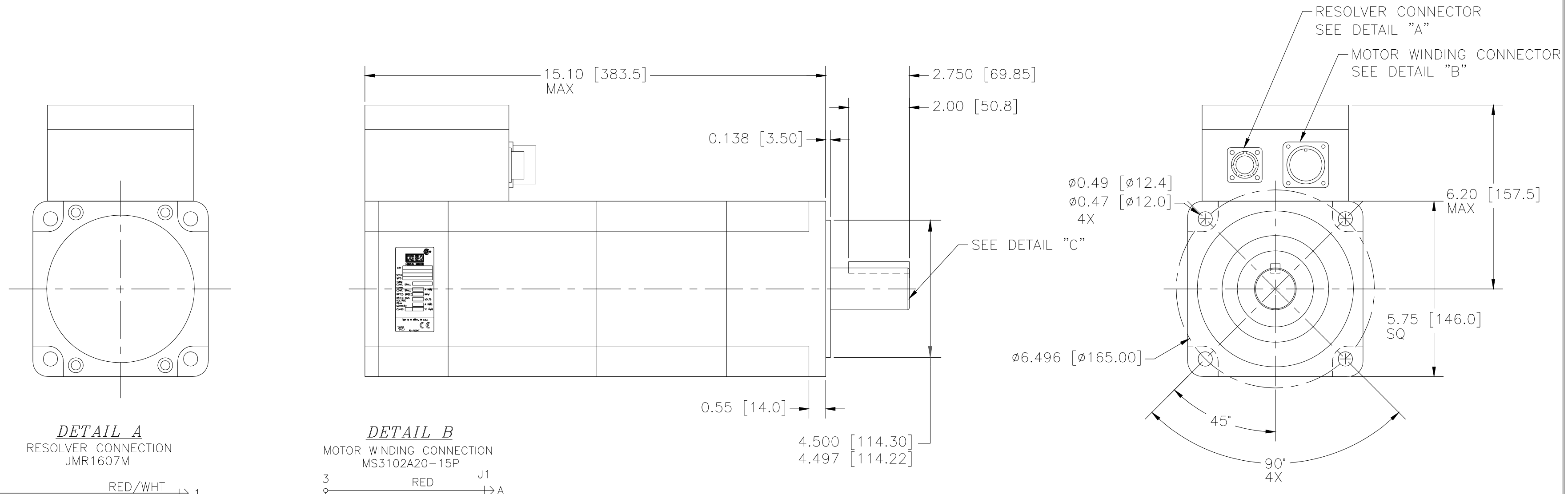
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
B
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
DATE 07DEC99
SCALE NTS
DRAWING NUMBER DBM-B3000/30R
SHEET NO. 1 OF 1
REVISION B

DATE	SYM	REVISION RECORD	DR	CK	CK
18OCT02	0	PER ECN 02-302	CWB		

NOTES:

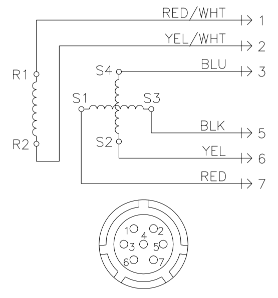
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 36 KG 82 LBS.
4.) MOTOR SHAFT SEAL STANDARD.
5.) THRUST LOAD 890 N 200 LBS.
6.) RADIAL LOAD 1113 N 250 LBS.
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKER.
8.) IP-65 SEALING.





DETAIL A

RESOLVER CONNECTION
JMR1607M

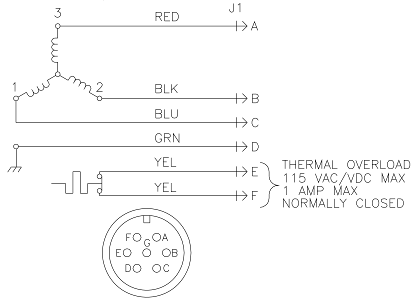


VIEW OF CONNECTOR

MATING SOCKET:
RESOLVER: JMSP1607F

DETAIL B

MOTOR WINDING CONNECTION
MS3102A20-15P

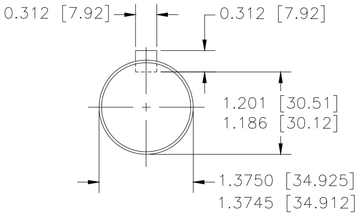


VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A20-15S

DETAIL C

MOTOR SHAFT DIMENSIONS



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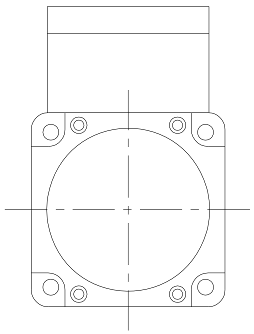
TITLE
MOTOR, DELTA SERIES

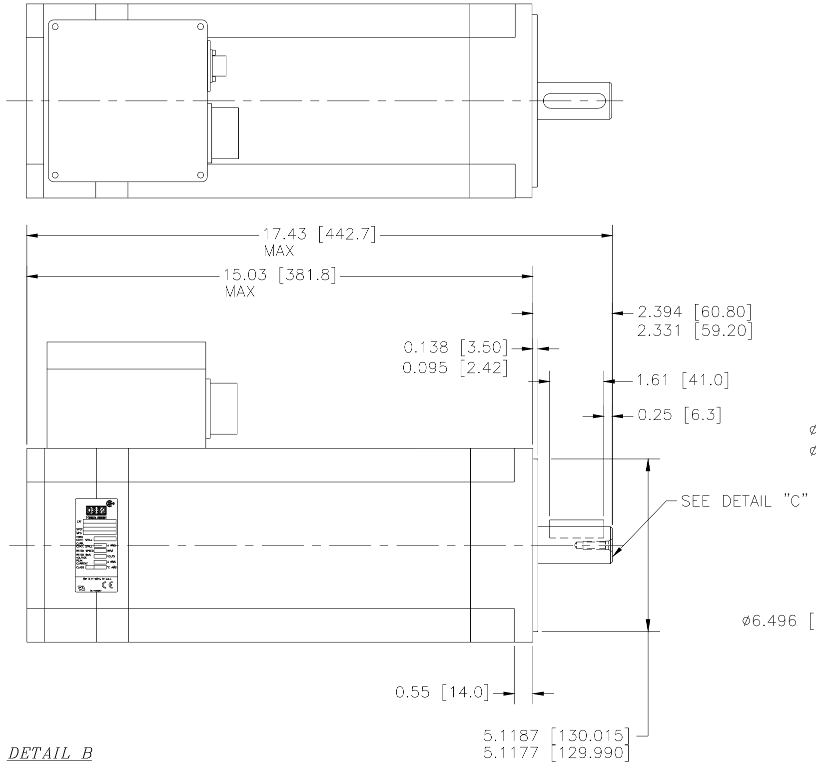
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 18OCT02
SCALE ---
DRAWING NUMBER DBM-B3950/20R
SHEET NO. 1 OF 1
REVISION 0

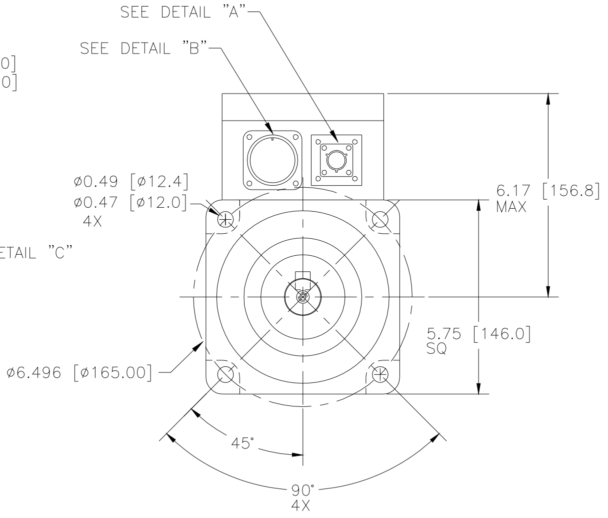
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	B	PER ECN 00-246	CWB	EB	CDR

NOTES: A

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 32.3 KG 71 LBS.
4.) MOTOR SHAFT SEAL STANDARD.
5.) THRUST LOAD 890 N 200 LBS.
6.) RADIAL LOAD 1113 N 250 LBS.
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-65 SEALING.

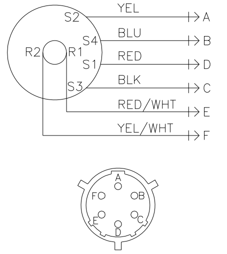






DETAIL A

RESOLVER CONNECTION
MS3112E10-6P

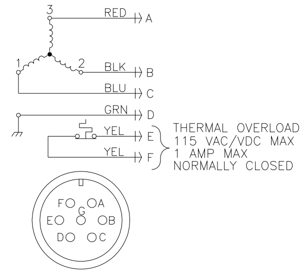


VIEW OF CONNECTOR

MATING SOCKET:
RESOLVER: MS3116F10-6S

DETAIL B

ARMATURE CONNECTION
MS3102E24-10P

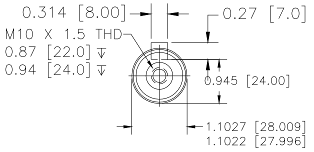


VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A24-10S

DETAIL C

MOTOR SHAFT DIMENSIONS



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TITLE
MOTOR, DELTA SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'

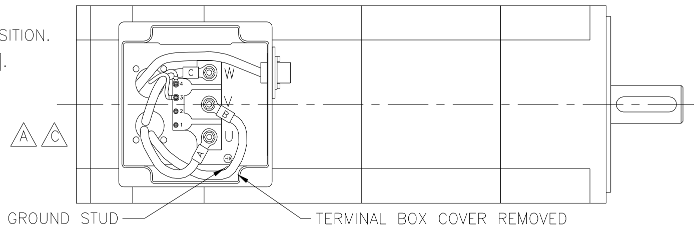
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 01NOV99
SCALE NTS

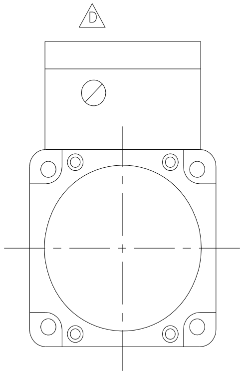
DRAWING NUMBER DBM-B4400/30R
SHEET NO. 1 OF 1
REVISION B

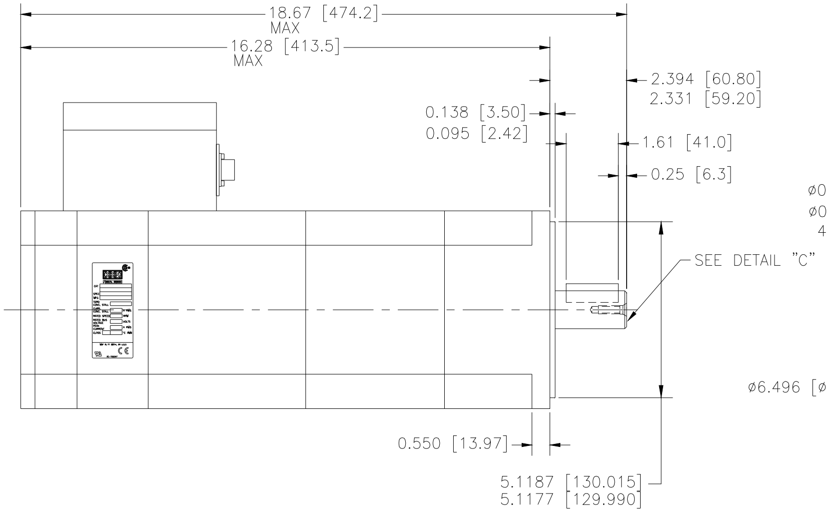
DATE	SYM	REVISION RECORD	DR	CK	CK
24MAR04	D	PER ECN 04-123	CWB		

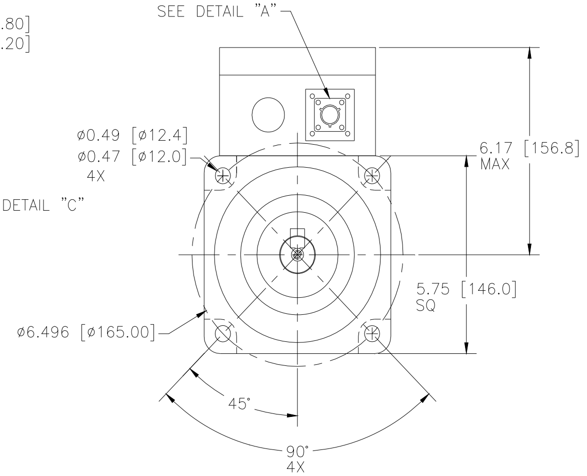
NOTES: A

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 36 KG 79 LBS.
4.) MOTOR SHAFT SEAL STANDARD.
5.) THRUST LOAD 890 N 200 LBS.
6.) RADIAL LOAD 1113 N 250 LBS.
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKER.
8.) IP-65 SEALING.



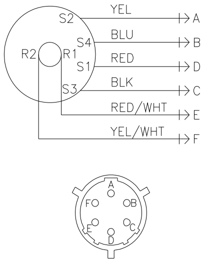






DETAIL A

RESOLVER CONNECTION
MS3112E10-6P

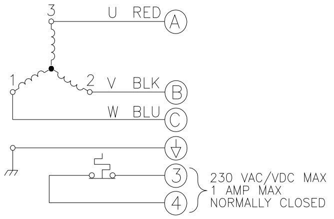


VIEW OF CONNECTOR

MATING SOCKET:
RESOLVER: MS3116F10-6S

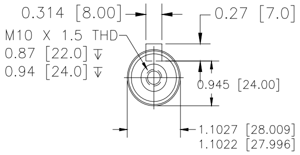
DETAIL B A C D

ARMATURE CONNECTION



DETAIL C

MOTOR SHAFT DIMENSIONS



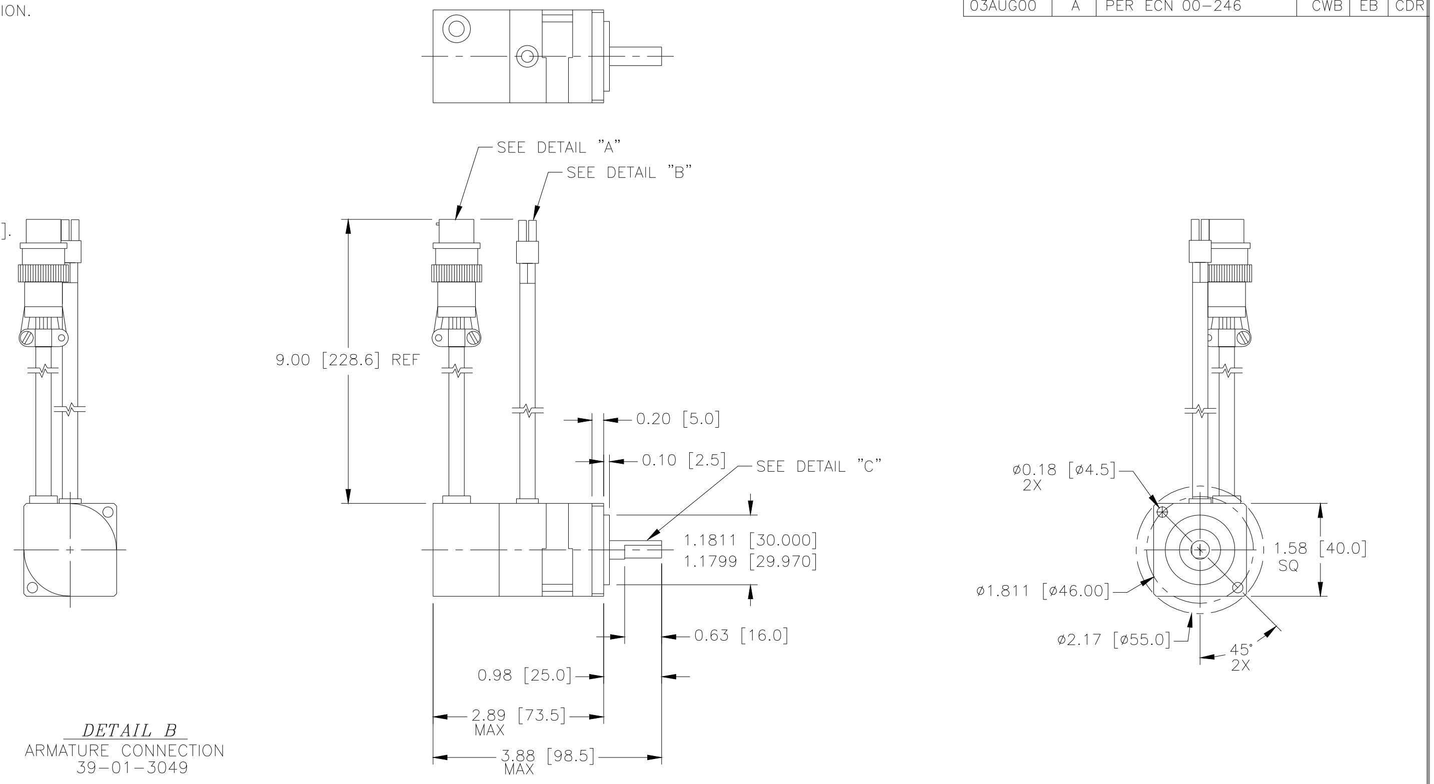
INDUSTRIAL INDEXING SYSTEMS, Inc.
www.iis-servo.com

TITLE
MOTOR, DELTA SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 01NOV99
SCALE NTS
DRAWING NUMBER DBM-B5600/30R
SHEET NO. 1 OF 1
REVISION D

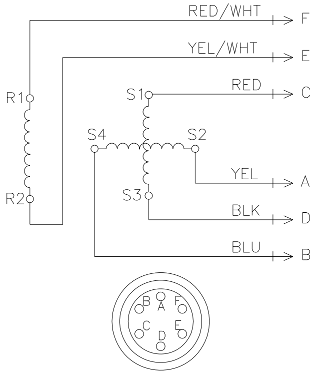
NOTES:
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 0.5 KG 1.1 LBS.
4.) NO SHAFT SEAL.
5.) THRUST LOAD 39 N 8.7 LBS
6.) RADIAL LOAD 78 N 17.5 LBS
7.) RESOLVER 2X 24000 PPR
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.
9.) FLYING LEAD LENGTH 9" ±2" [228 ±50].

DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	A	PER ECN 00-246	CWB	EB	CDR



DETAIL A

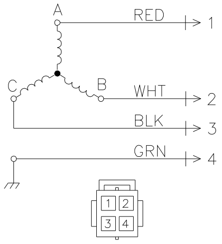
RESOLVER CONNECTION
MS3111J10-6P



VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: MS3116F-10-6S

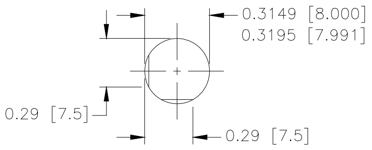
DETAIL B

ARMATURE CONNECTION
39-01-3049



VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: 39-01-2045

DETAIL C



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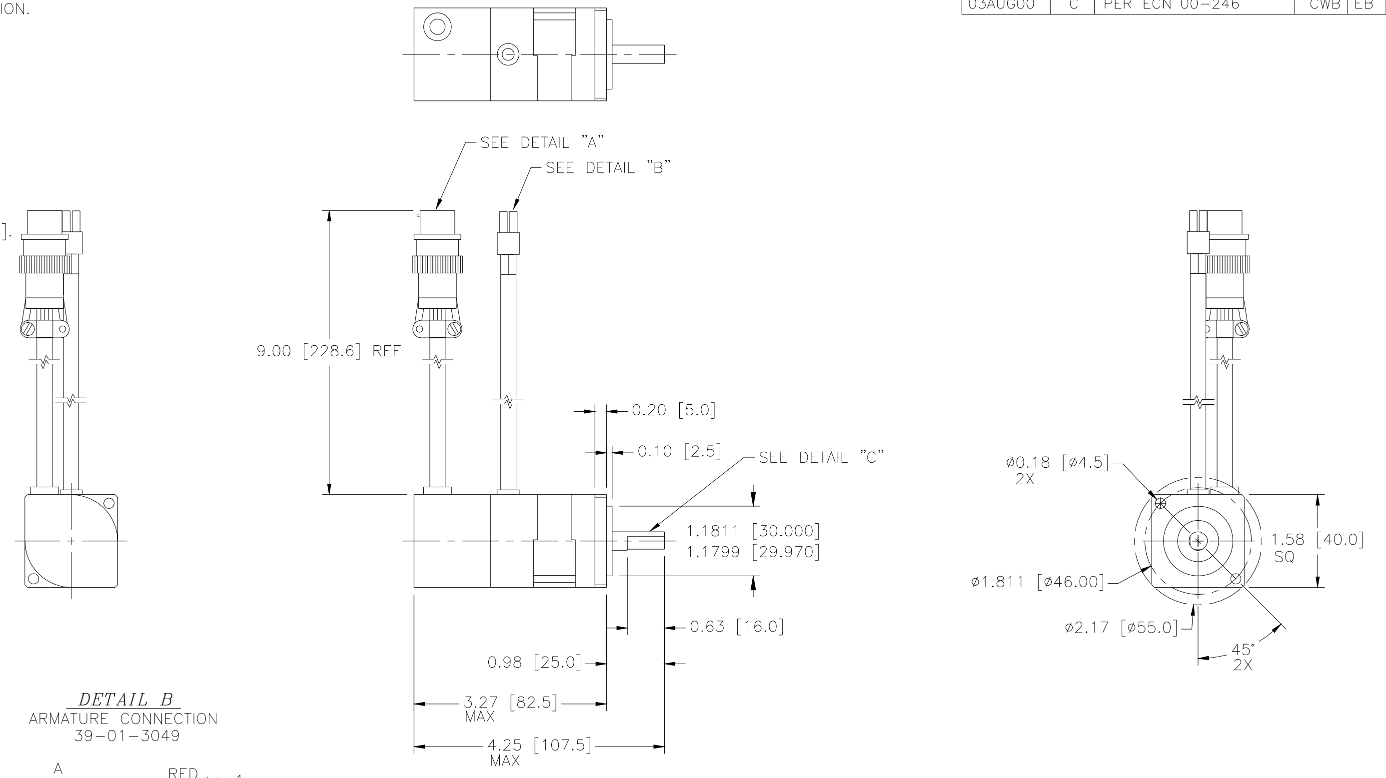
TITLE
MOTOR, BRUSHLESS, DELTA SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
B
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
DATE 14FEB00
SCALE NTS
DRAWING NUMBER DBM-D30/30R
SHEET NO. 1 OF 1
REVISION A

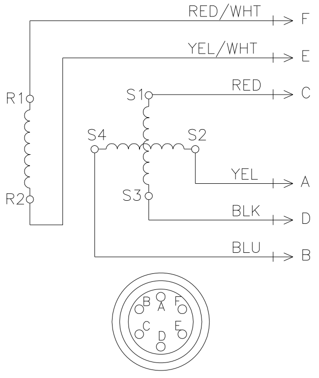
NOTES:
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 0.5 KG 1.1 LBS.
4.) NO SHAFT SEAL.
5.) THRUST LOAD 39 N 8.7 LBS
6.) RADIAL LOAD 78 N 17.5 LBS
7.) RESOLVER 2X 24000 PPR
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.
9.) FLYING LEAD LENGTH 9" ±2" [228 ±50].

DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	C	PER ECN 00-246	CWB	EB	CDR



DETAIL A

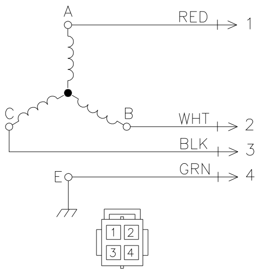
RESOLVER CONNECTION
MS3111J10-6P



VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: MS3116F-10-6S

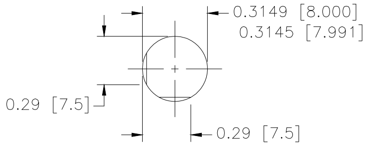
DETAIL B

ARMATURE CONNECTION
39-01-3049



VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: 39-01-2045

B DETAIL C



A

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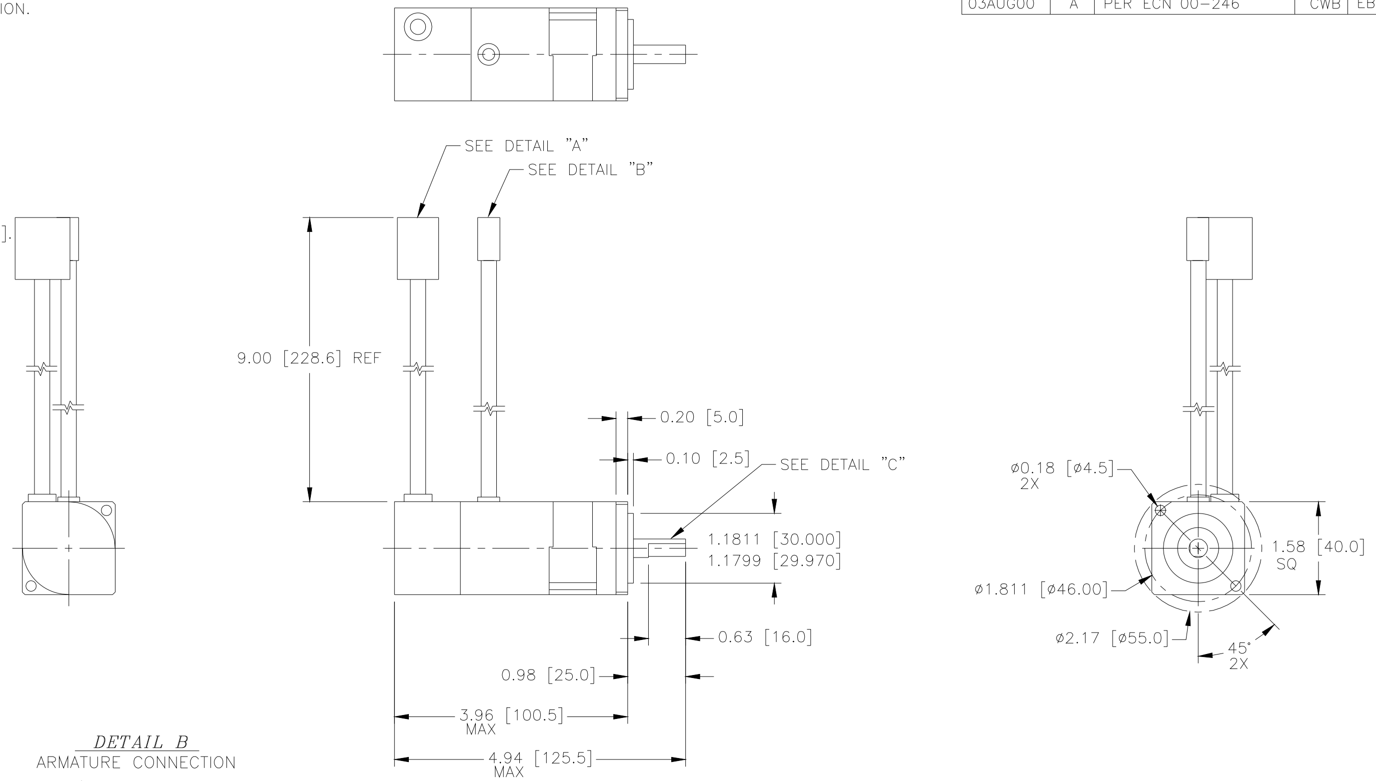
TITLE
MOTOR, BRUSHLESS, DELTA SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
DRAWN BY BOWMAN
DRAWING NUMBER DBM-D50/30R
TOLERANCES
AutoCAD FILE LOCATION Q:\CURRENT DWGS
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
B
DATE 30OCT98
SCALE NTS
SHEET NO. 1 OF 1
REVISION C

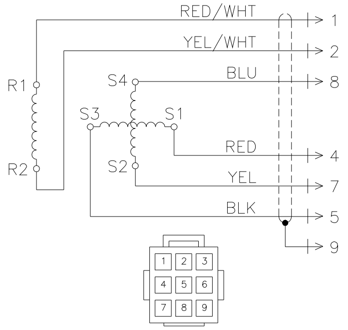
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	A	PER ECN 00-246	CWB	EB	CDR

NOTES:
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 0.6 KG 1.3 LBS.
4.) NO SHAFT SEAL.
5.) THRUST LOAD 39 N 8.7 LBS
6.) RADIAL LOAD 78 N 17.5 LBS
7.) RESOLVER 2X 24000 PPR
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.
9.) FLYING LEAD LENGTH 9" ±2" [228 ±50].



DETAIL A

RESOLVER CONNECTION

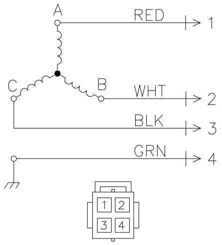


VIEW OF CONNECTOR

MATING SOCKET:
RESOLVER: YLP-09V

DETAIL B

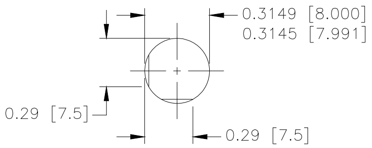
ARMATURE CONNECTION



VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: YLP-04V

DETAIL C



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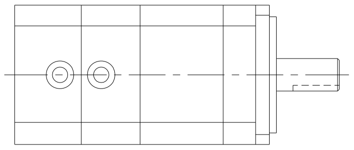
TITLE
MOTOR, BRUSHLESS, DELTA SERIES

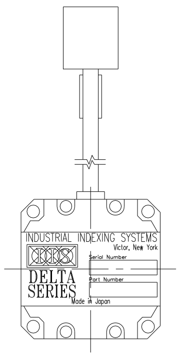
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
DRAWN BY: BOWMAN
DRAWING NUMBER: DBM-D100/30R
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR: ± 0°30'
AutoCAD FILE LOCATION: Q:\CURRENT DWGS
B
DATE: 15FEB00
SCALE: NTS
SHEET NO.: 1 OF 1
REVISION: A

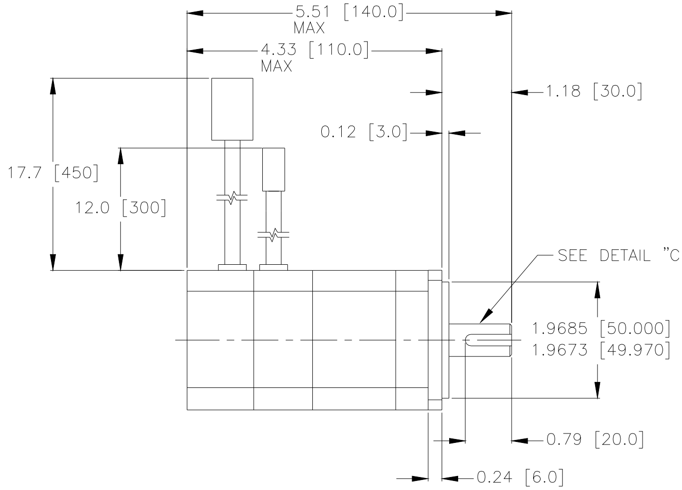
NOTES:

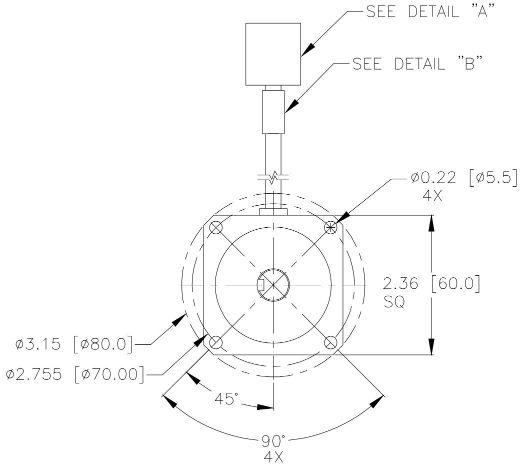
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 1.2 KG 2.6 LBS.
4.) NO SHAFT SEAL.
5.) THRUST LOAD 69 N 15.5 LBS.
6.) RADIAL LOAD 196 N 44 LBS.
7.) RESOLVER 2X 24000 PPR
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.
9.) FLYING LEAD LENGTH 12" ±2" [305 ±50].

DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	A	PER ECN 00-246	CWB	EB	CDR



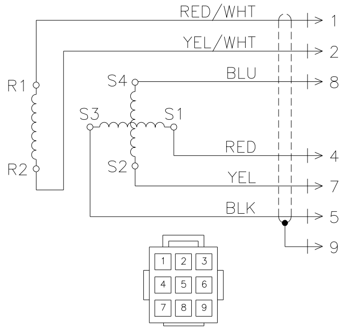






DETAIL A

RESOLVER CONNECTION

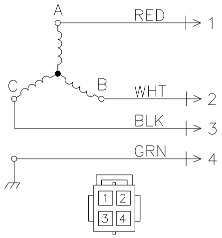


VIEW OF CONNECTOR

MATING SOCKET:
RESOLVER: YLP-09V

DETAIL B

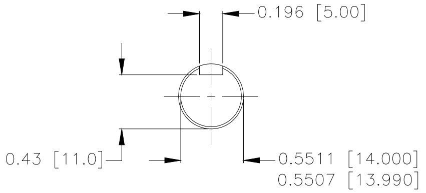
ARMATURE CONNECTION



VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: YLP-04V

DETAIL C



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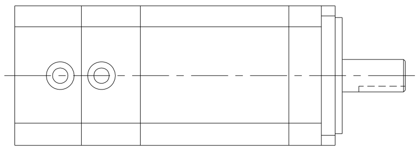
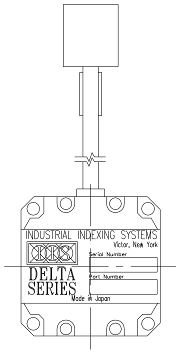
TITLE
MOTOR, BRUSHLESS, DELTA SERIES

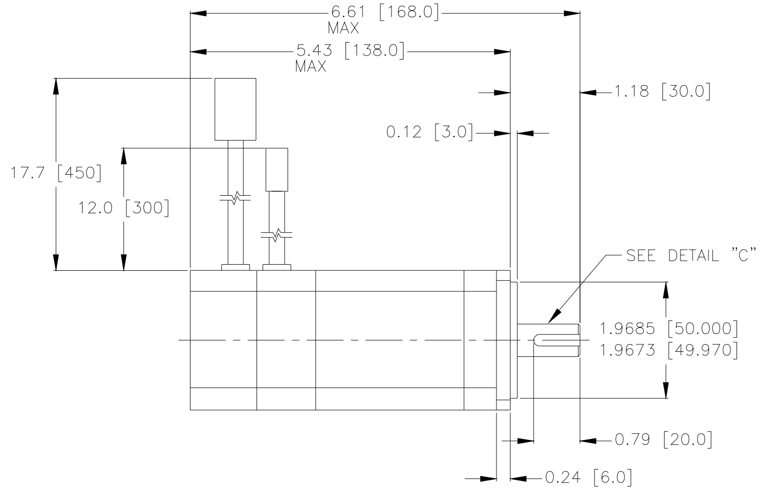
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 15FEB00
SCALE NTS
DRAWING NUMBER DBM-D200/30R
SHEET NO. 1 OF 1
REVISION A

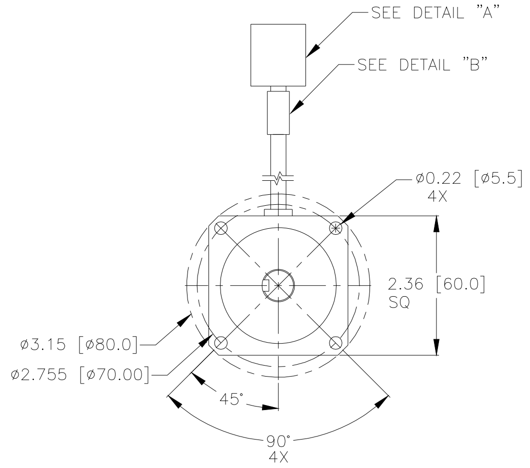
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	A	PER ECN 00-246	CWB	EB	CDR

NOTES:
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 1.7 KG 3.7 LBS.
4.) NO SHAFT SEAL.
5.) THRUST LOAD 69 N 15.5 LBS.
6.) RADIAL LOAD 196 N 44 LBS.
7.) RESOLVER 2X 24000 PPR
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.
9.) FLYING LEAD LENGTH 12" ±2" [305 ±50].

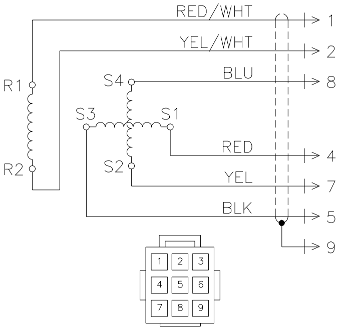






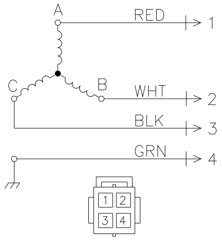


DETAIL A
RESOLVER CONNECTION



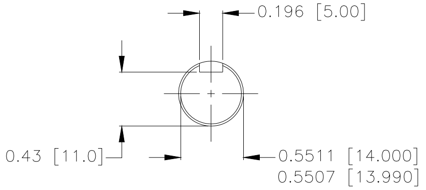
VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: YLP-09V

DETAIL B
ARMATURE CONNECTION



VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: YLP-04V

DETAIL C



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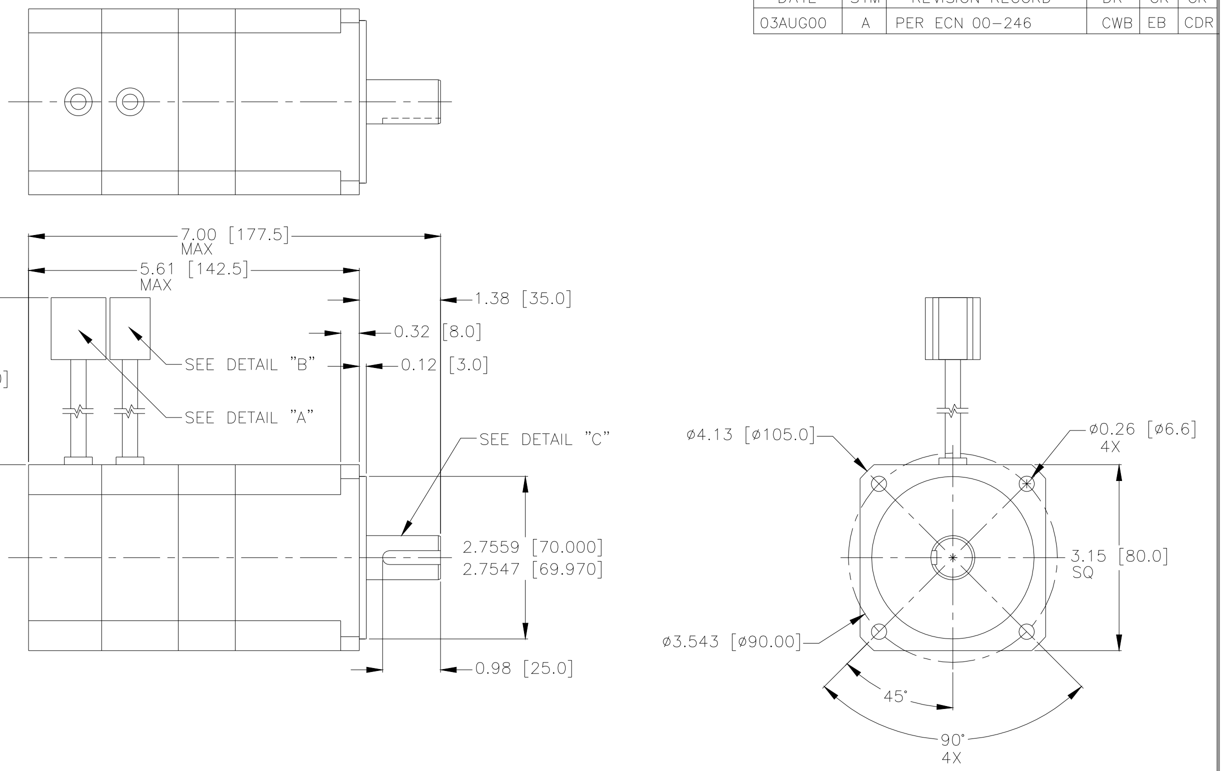
TITLE
MOTOR, BRUSHLESS, DELTA SERIES

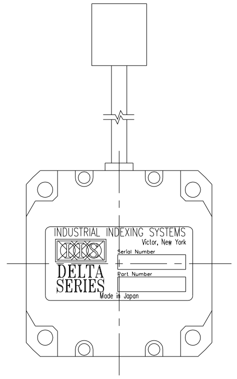
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 15FEB00
SCALE NTS
DRAWING NUMBER DBM-D400/30R
SHEET NO. 1 OF 1
REVISION A

DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	A	PER ECN 00-246	CWB	EB	CDR

NOTES:

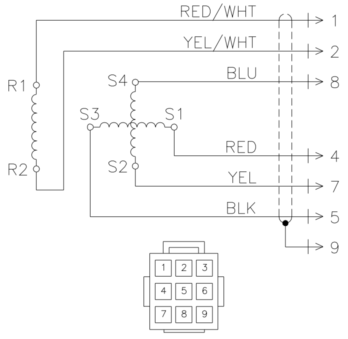
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 2.7 KG 6 LBS.
4.) NO SHAFT SEAL.
5.) THRUST LOAD 98 N 22 LBS.
6.) RADIAL LOAD 343 N 77 LBS.
7.) RESOLVER 2X 24000 PPR
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.
9.) FLYING LEAD LENGTH 12" ±2" [305 ±50].





DETAIL A

RESOLVER CONNECTION

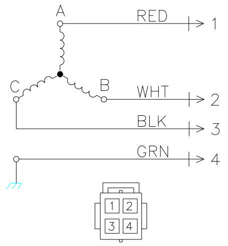


VIEW OF CONNECTOR

MATING SOCKET:
RESOLVER: YLP-09V

DETAIL B

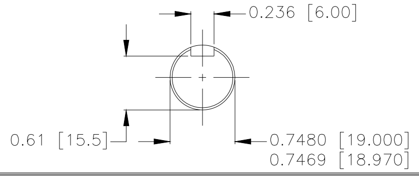
ARMATURE CONNECTION



VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: YLP-04V

DETAIL C



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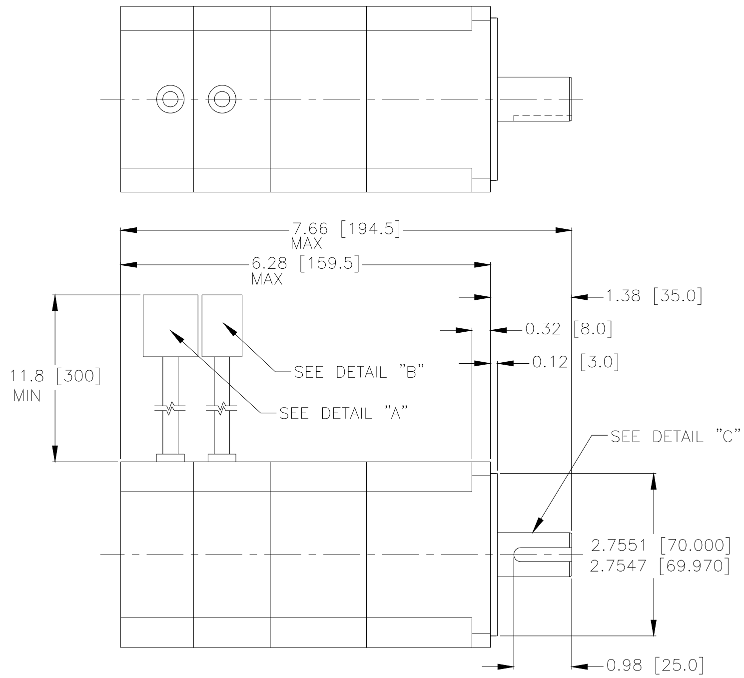
TITLE
MOTOR, BRUSHLESS, DELTA SERIES

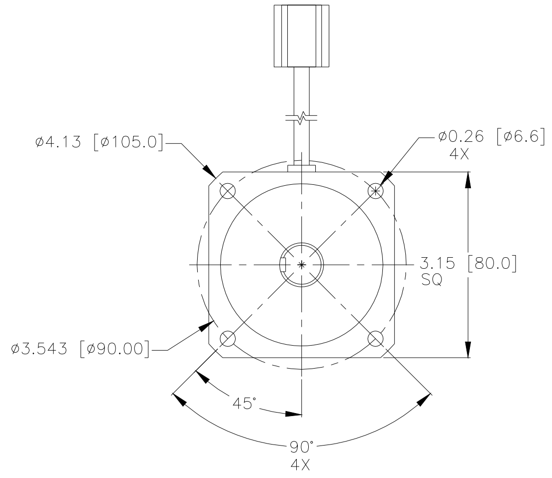
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'

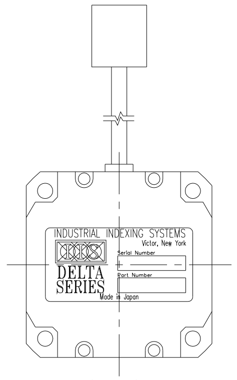
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 15FEB00
SCALE NTS
DRAWING NUMBER DBM-D600/30R
SHEET NO. 1 OF 1
REVISION A

DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	A	PER ECN 00-246	CWB	EB	CDR

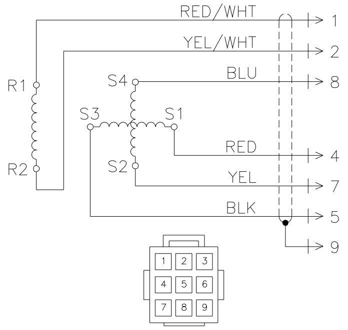
NOTES:
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 5.5 KG 12.1 LBS.
4.) NO SHAFT SEAL.
5.) THRUST LOAD 98 N 22 LBS.
6.) RADIAL LOAD 343 N 77 LBS.
7.) RESOLVER 2X 24000 PPR
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.
9.) FLYING LEAD LENGTH 12" ±2" [305 ±50].





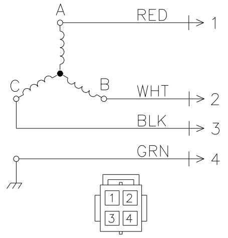


DETAIL A
RESOLVER CONNECTION



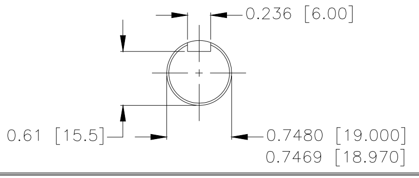
VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: YLP-09V

DETAIL B
ARMATURE CONNECTION



VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: YLP-04V

DETAIL C



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TITLE MOTOR, BRUSHLESS, DELTA SERIES					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)		DRAWN BY BOWMAN		DRAWING NUMBER DBM-D800/30R	
TOLERANCES		AutoCAD FILE LOCATION Q:\CURRENT DWGS			
X.X± --- X.XX± 0.01 X.XXX± 0.005	ANGULAR ± 0°30'	B	DATE 15FEB00	SCALE NTS	SHEET NO. 1 OF 1
					REVISION A

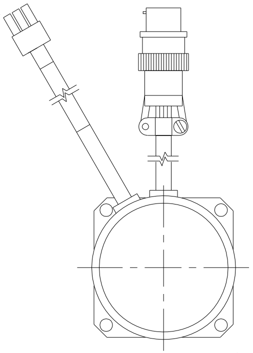
A.7 BRAKE MOTOR DIMENSIONS

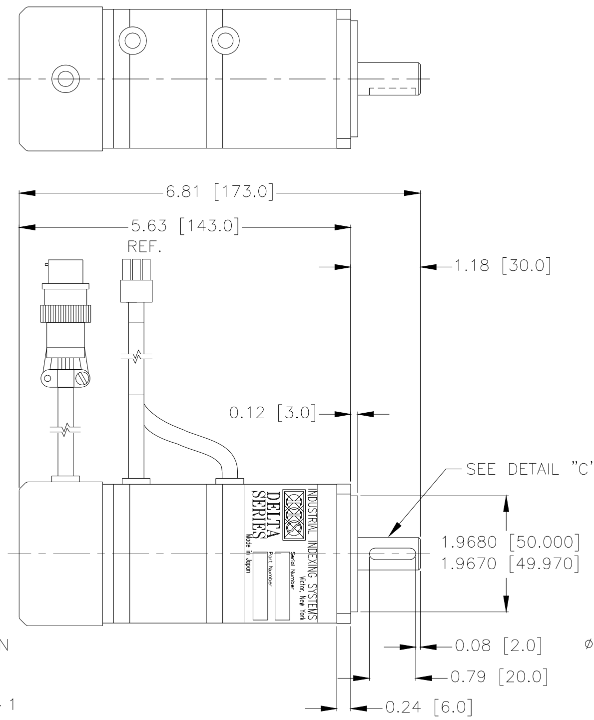
DRAWING NUMBER	DESCRIPTION
DBM-120/30RB	Brushless Delta Series Brake Motor
DBM-200/30RB	Brushless Delta Series Brake Motor
DBM-400/15RB	Brushless Delta Series Brake Motor
DBM-400/30RB	Brushless Delta Series Brake Motor
DBM-500/30RB	Brushless Delta Series Brake Motor
DBM-800/15RB	Brushless Delta Series Brake Motor
DBM-800/30RB	Brushless Delta Series Brake Motor
DBM-1000/15RB	Brushless Delta Series Brake Motor
DBM-1400/30RB	Brushless Delta Series Brake Motor
DBM-1500/15RB	Brushless Delta Series Brake Motor
DBM-1800/30RB	Brushless Delta Series Brake Motor
DBM-1800/30RAB	Brushless Delta Series Absolute Brake Motor
DBM-2400/30RB	Brushless Delta Series Brake Motor
DBM-2600/15RB	Brushless Delta Series Brake Motor
DBM-3700/15RB	Brushless Delta Series Brake Motor
DBM-3700/30RB	Brushless Delta Series Brake Motor
DBM-5000/15RB	Brushless Delta Series Brake Motor
DBM-5500/30RB	Brushless Delta Series Brake Motor
DBM-6500/30RB	Brushless Delta Series Brake Motor
DBM-7500/20RB	Brushless Delta Series Brake Motor
DBM-10000/20RB	Brushless Delta Series Brake Motor
DBM-B3000/30RB	Brushless Delta B Series Brake Motor
DBM-D800/30EAB	Brushless Delta D Series Absolute Brake Motor
DBM-D800/30RB	Brushless Delta D Series Brake Motor

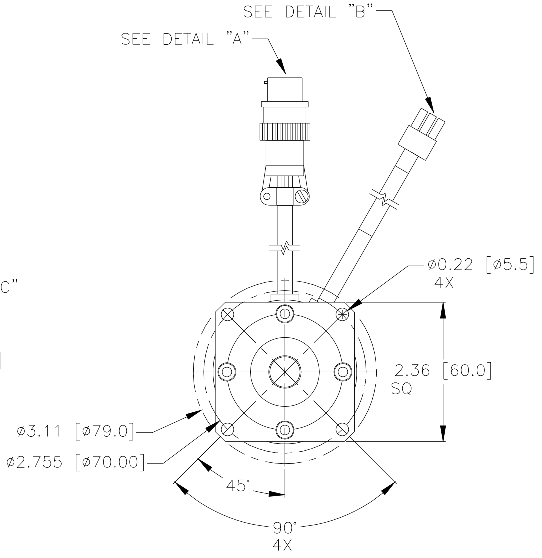
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	F	PER ECN 00-246	CWB	EB	CDR

NOTES: C E

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 1.6 KG 3.5 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 74 N 16 LBS
6.) RADIAL LOAD 147 N 33 LBS
7.) RESOLVER 2X 24000 PPR. QTY 2 ZERO MARKERS.
8.) IP-30 SEALING.
9.) WIRE LEAD OPENINGS ARE UNSEALED.
10.) FLYING LEAD LENGTH 12"±2" [305±50].
11.) BRAKE STATIC TORQUE: 1.27 N-M 0.94 LB-FT
BRAKE ELECTRICAL: 24 VDC 0.33 AMPS

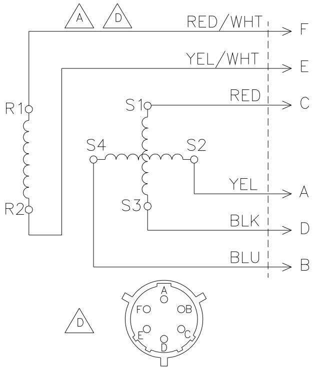






DETAIL A

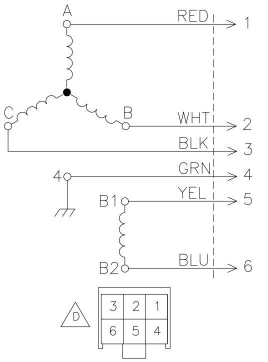
RESOLVER CONNECTION
ITT/CANON KPT01 J10 6P



VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: MS3116F-10-6S

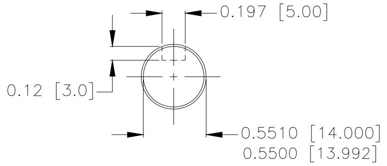
DETAIL B

ARMATURE CONNECTION
MOLEX 39-01-3069



VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: MOLEX 39-01-2065

DETAIL C



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TITLE
MOTOR, BRAKE, BRUSHLESS, DELTA SERIES

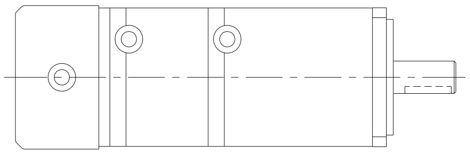
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'

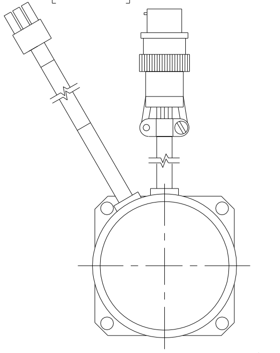
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 09MAY96
SCALE NTS
DRAWING NUMBER DBM-120/30RB
SHEET NO. 1 OF 1
REVISION F

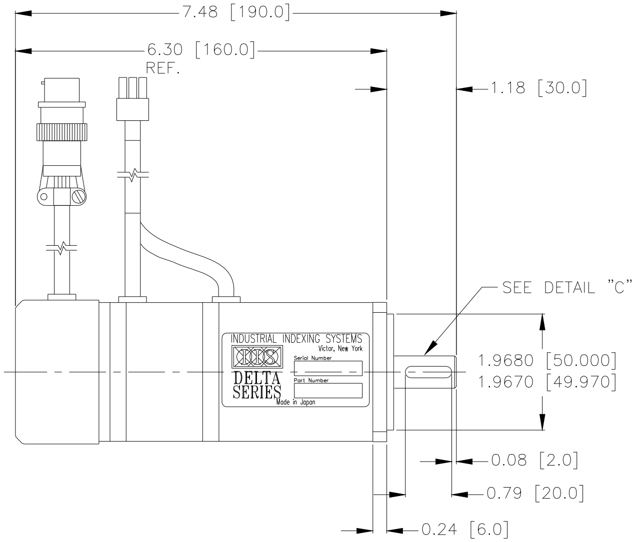
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	F	PER ECN 00-246	CWB	EB	CDR

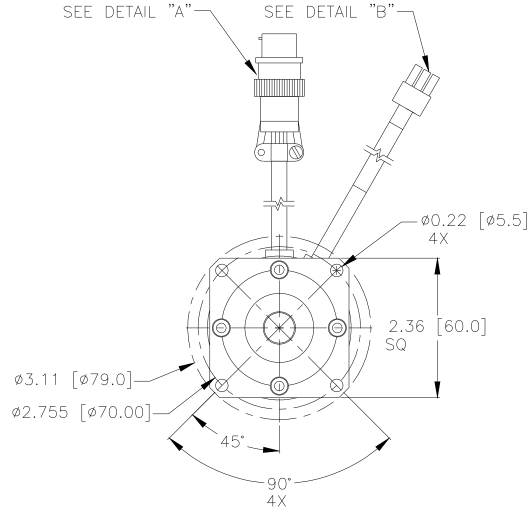
NOTES: △C △E

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 1.9 KG 4.2 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 74 N 16 LBS
6.) RADIAL LOAD 186 N 41 LBS
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-30 SEALING.
9.) WIRE LEAD OPENINGS ARE UNSEALED.
10.) FLYING LEAD LENGTH 12"±2" [305±50].
11.) BRAKE STATIC TORQUE:
1.27 N-M 0.94 LB-FT
BRAKE ELECTRICAL:
24 VDC 0.33 AMPS



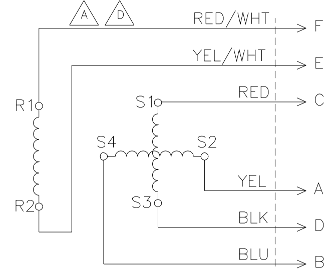


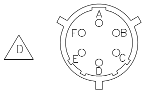




DETAIL A

RESOLVER CONNECTION
ITT/CANON KPT01 J10 6P
△A △D

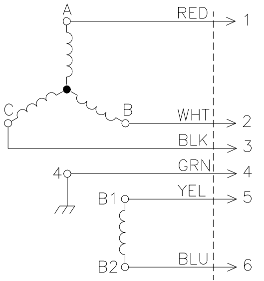


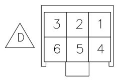


VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: MS3116F-10-6S

DETAIL B

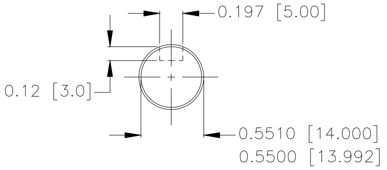
ARMATURE CONNECTION
MOLEX 39-01-3069





VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: MOLEX 39-01-2065

DETAIL C



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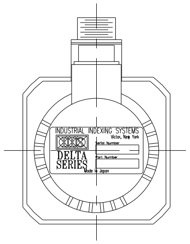
TITLE
MOTOR, BRAKE, BRUSHLESS, DELTA SERIES

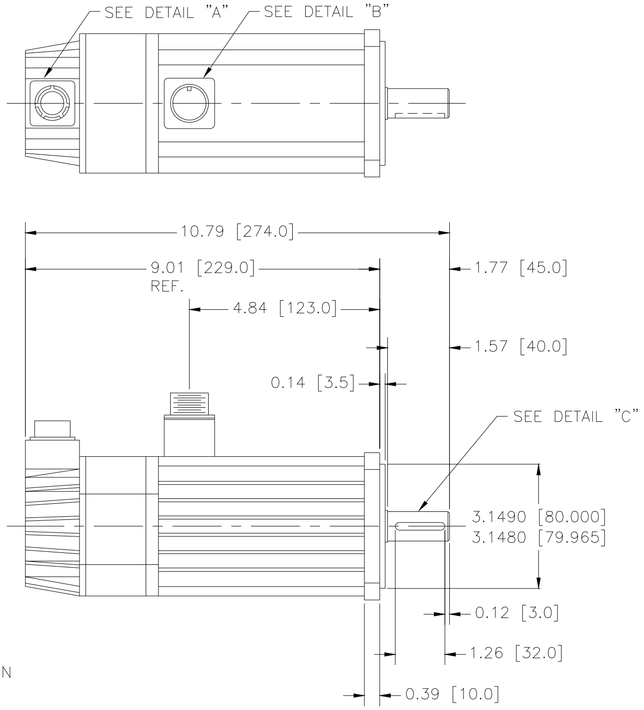
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 06MAY96
SCALE NTS
DRAWING NUMBER DBM-200/30RB
SHEET NO. 1 OF 1
REVISION F

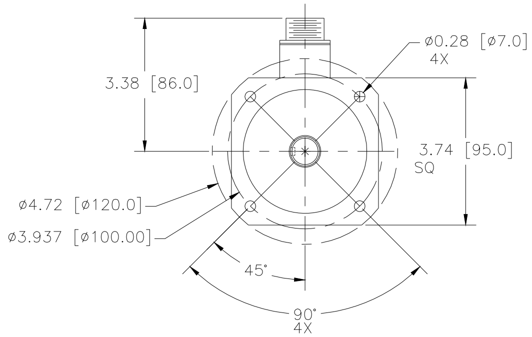
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	C	PER ECN 00-246	CWB	EB	CDR

NOTES: A B

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 5.3 KG 11.7 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 98 N 22 LBS
6.) RADIAL LOAD 559 N 126 LBS
7.) RESOLVER 2X 24000 PPR
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.
9.) BRAKE STATIC TORQUE: 1.9 N-M 1.4 LB-FT
BRAKE ELECTRICAL: 24 VDC 0.41 AMPS

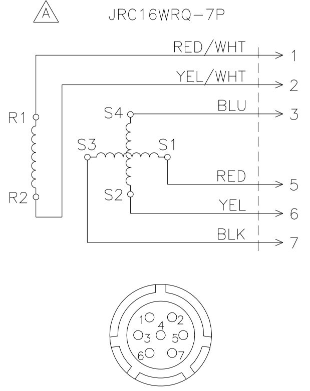






DETAIL A

RESOLVER CONNECTION
JRC16WRQ-7P

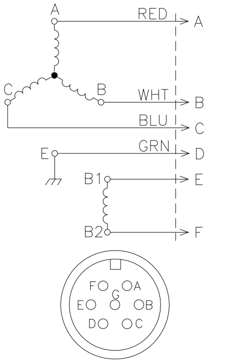


VIEW OF CONNECTOR

MATING SOCKET:
RESOLVER: JMSP1607F

DETAIL B

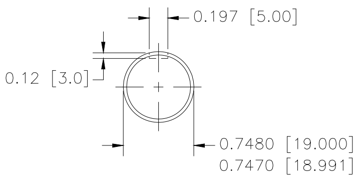
ARMATURE CONNECTION
MS3102A16S-1P



VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A16S-1S

DETAIL C



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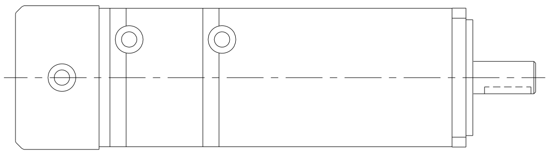
TITLE
MOTOR, BRAKE, BRUSHLESS, DELTA SERIES

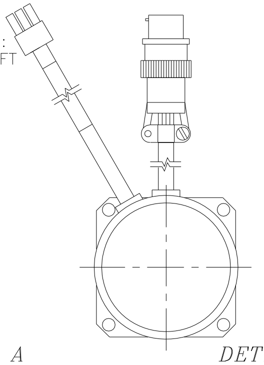
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)		DRAWN BY BOWMAN		DRAWING NUMBER	
TOLERANCES		AutoCAD FILE LOCATION Q:\CURRENT DWGS		DBM-400/15RB	
X.X± ---	ANGULAR				
X.XX± 0.01	± 0°30'	B	DATE 05MAY97	SCALE NTS	SHEET NO. 1 OF 1
X.XXX± 0.005					REVISION C

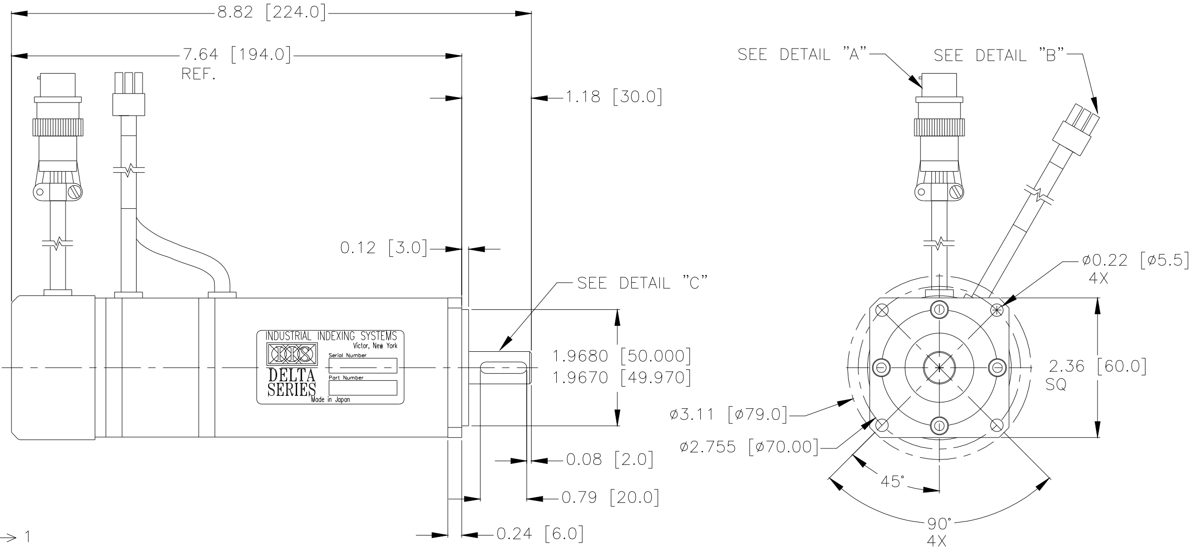
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	F	PER ECN 00-246	CWB	EB	CDR

NOTES: △C △E

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 2.5 KG 5.5 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 84 N 18 LBS
6.) RADIAL LOAD 196 N 44 LBS
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-30 SEALING.
9.) WIRE LEAD OPENINGS ARE UNSEALED.
10.) FLYING LEAD LENGTH:
12"±2" [305±50].
11.) BRAKE STATIC TORQUE:
1.27 N-M 0.94 LB-FT
BRAKE ELECTRICAL:
24 VDC 0.33 AMPS

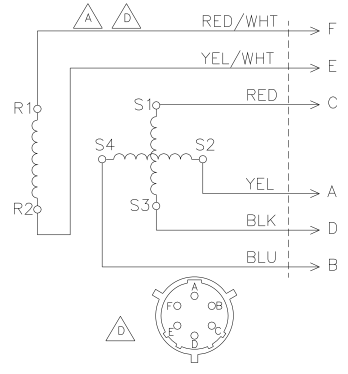






DETAIL A

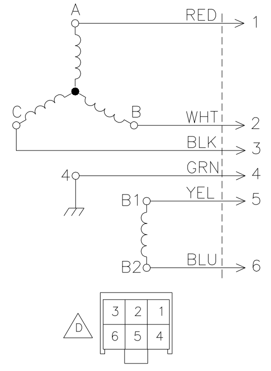
RESOLVER CONNECTION
ITT/CANON KPT01 J10 6P



VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: MS3116F-10-6S

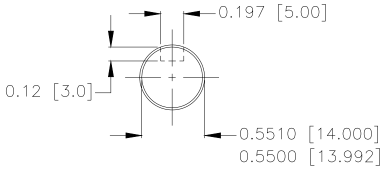
DETAIL B

ARMATURE CONNECTION
MOLEX 39-01-3069



VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: MOLEX 39-01-2065

DETAIL C



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TITLE
MOTOR, BRAKE, BRUSHLESS, DELTA SERIES

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TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'

DRAWN BY
BOWMAN

AutoCAD FILE LOCATION
Q:\CURRENT DWGS

B

DATE
27SEP96

SCALE
NTS

DRAWING NUMBER
DBM-400/30RB

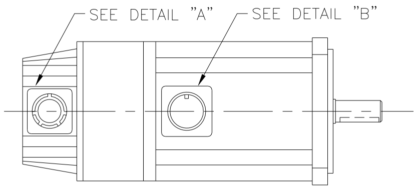
SHEET NO.
1 OF 1

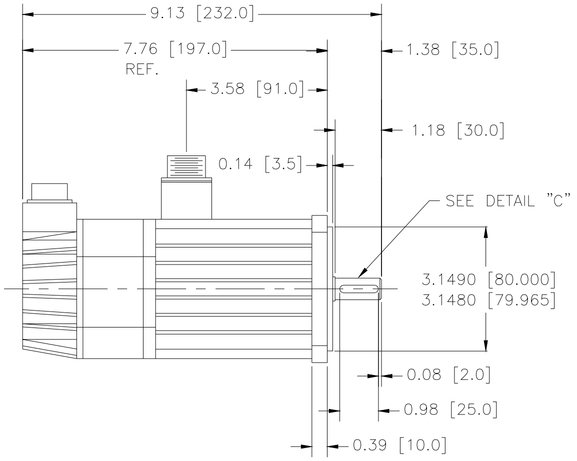
REVISION
F

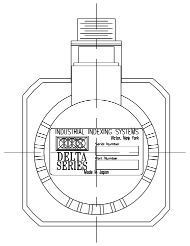
NOTES: △A △B

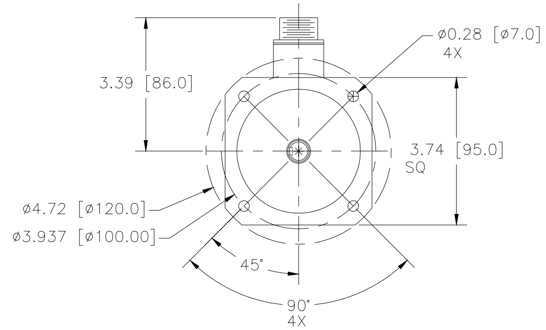
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 4.0 KG 8.8 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 49 N 11 LBS
6.) RADIAL LOAD 284 N 64 LBS
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS
8.) IP-44 SEALING.
9.) BRAKE STATIC TORQUE: 1.9 N-M 1.4 LB-FT
BRAKE ELECTRICAL: 24 VDC 0.41 AMPS

DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	C	PER ECN 00-246	CWB	EB	CDR



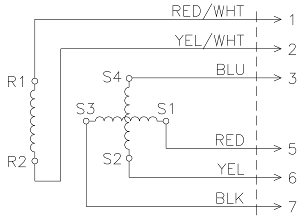


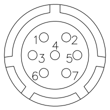




DETAIL A

RESOLVER CONNECTION
△A JRC16WRQ-7P



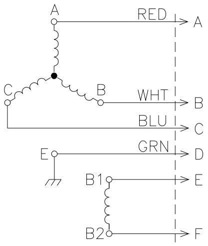


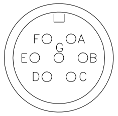
VIEW OF CONNECTOR

MATING SOCKET:
RESOLVER: JMSP1607F

DETAIL B

ARMATURE CONNECTION
MS3102A16S-1P

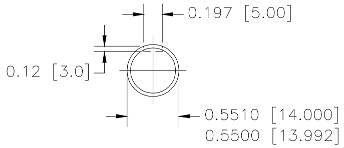




VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A16S-1S

DETAIL C



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TITLE
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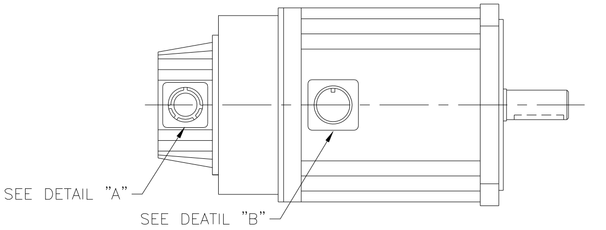
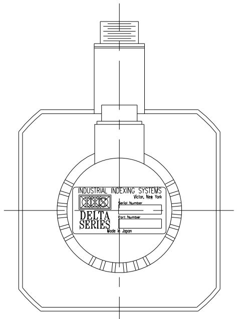
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 05MAY97
SCALE NTS
DRAWING NUMBER DBM-500/30RB
SHEET NO. 1 OF 1
REVISION C

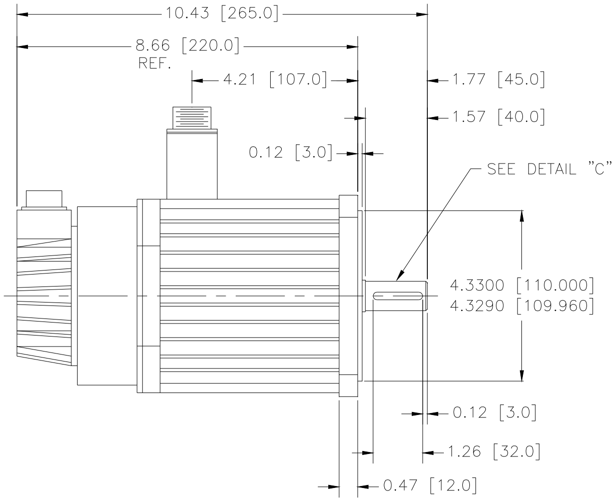
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	C	PER ECN 00-246	CWB	EB	CDR

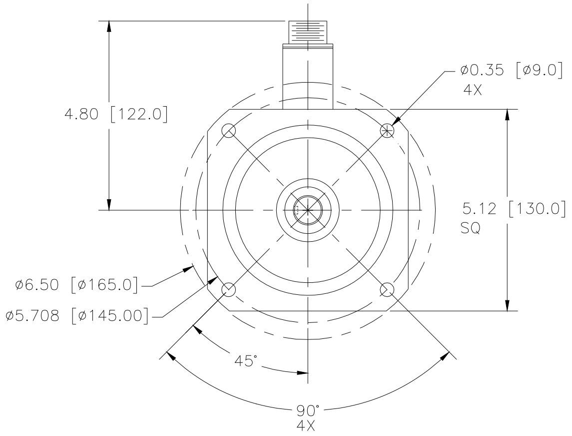
NOTES: △B

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 8.2 KG 18.1 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 118 N 27 LBS
6.) RADIAL LOAD 647 N 145 LBS
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.
9.) BRAKE STATIC TORQUE: 7.8 N-M 5.7 LB-FT
BRAKE ELECTRICAL: 24 VDC 0.63 AMPS



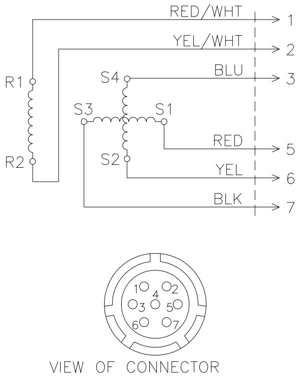






DETAIL A

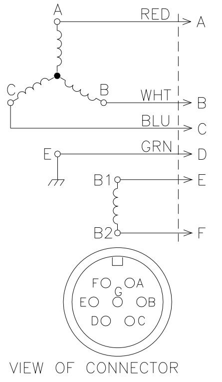
RESOLVER CONNECTION
△A JRC16WRQ-7P



MATING SOCKET:
RESOLVER: JMSP1607F

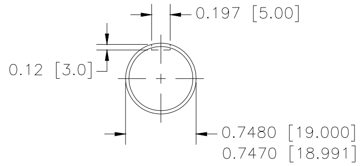
DETAIL B

ARMATURE CONNECTION
JA3102A20-15PC-F0



MATING SOCKET:
MOTOR: MS3106A20-15S

DETAIL C



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TITLE
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X.XX± 0.01
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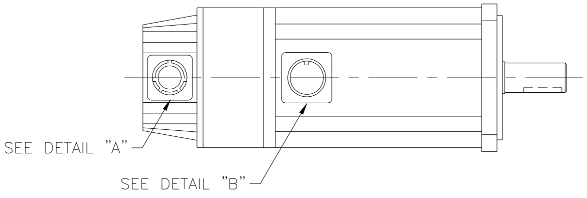
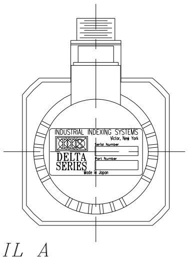
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 05MAY97
SCALE NTS
DRAWING NUMBER DBM-800/15RB
SHEET NO. 1 OF 1
REVISION C

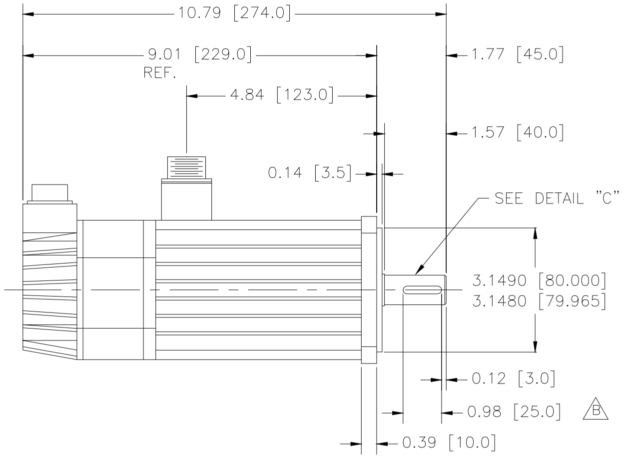
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	D	PER ECN 00-246	CWB	EB	CDR

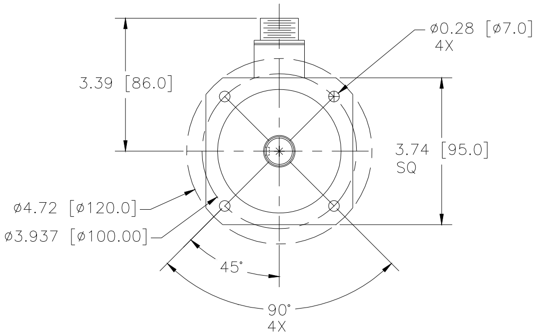
NOTES: △A △C

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 5.3 KG 11.7 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 88 N 20 LBS
6.) RADIAL LOAD 441 N 99 LBS
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.
9.) BRAKE STATIC TORQUE: 1.9 N-M 1.4 LB-FT
BRAKE ELECTRICAL: 24 VDC 0.41 AMPS



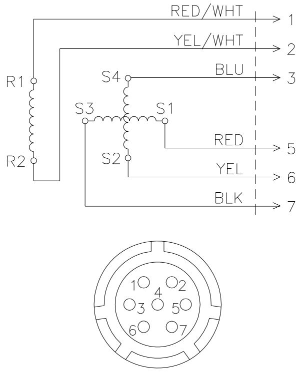






DETAIL A

△A RESOLVER CONNECTION
JRC16WRQ-7P

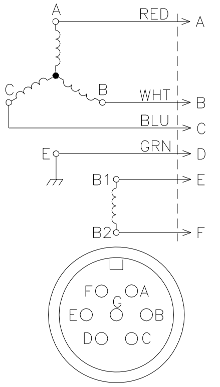


VIEW OF CONNECTOR

MATING SOCKET:
RESOLVER: JMSP1607F

DETAIL B

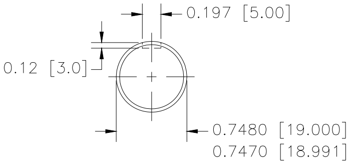
ARMATURE CONNECTION
MS3102A16S-1P



VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A16S-1S

DETAIL C



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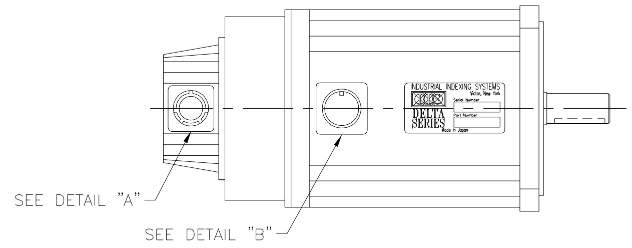
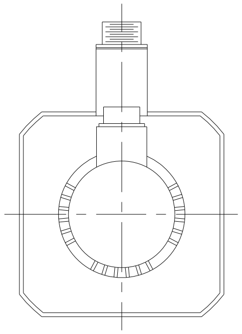
AutoCAD FILE LOCATION Q:\CURRENT DWGS
DATE 07MAY97
SCALE NTS
DRAWING NUMBER DBM-800/30RB
SHEET NO. 1 OF 1
REVISION D

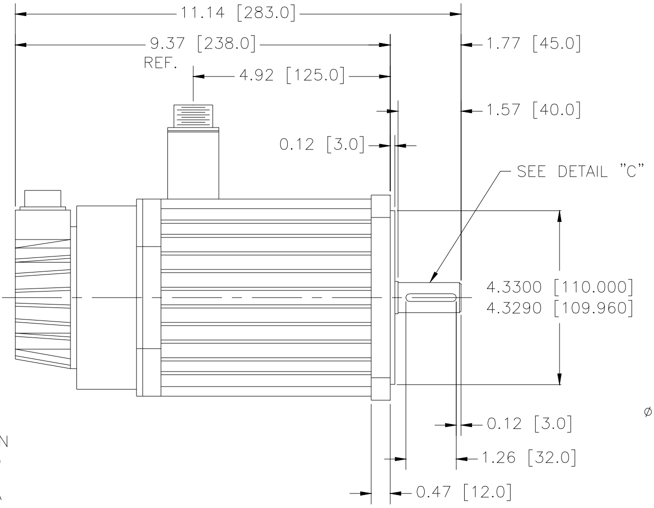
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	C	PER ECN 00-246	CWB	EB	CDR

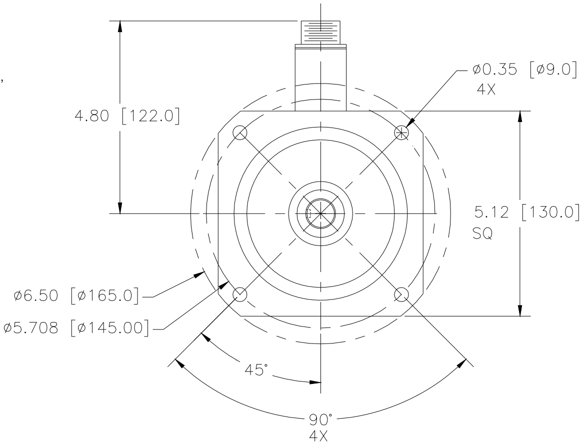
NOTES: A B

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 9.8 KG 21.6 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 118 N 27 LBS
6.) RADIAL LOAD 676 N 152 LBS
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.
9.) BRAKE STATIC TORQUE: 7.8 N-M 5.7 LB-FT
BRAKE ELECTRICAL: 24 VDC 0.63 AMPS





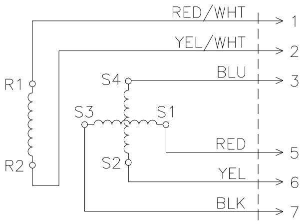


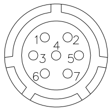


DETAIL A

RESOLVER CONNECTION

A JRC16WRQ-7P

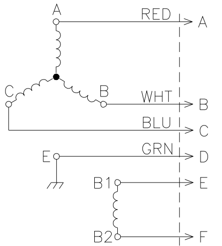


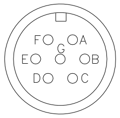


VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: JMSP1607F

DETAIL B

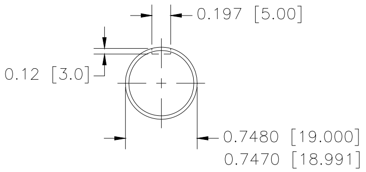
ARMATURE CONNECTION
JA3102A20-15PC-F0





VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: MS3106A20-15S

DETAIL C



INDUSTRIAL INDEXING SYSTEMS, Inc.
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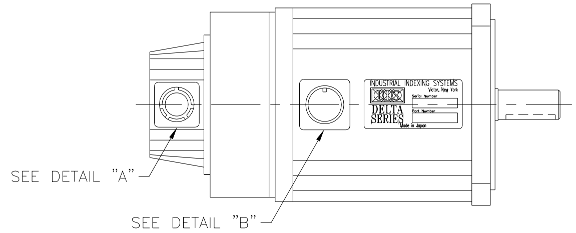
TITLE
MOTOR, BRAKE, BRUSHLESS, DELTA SERIES

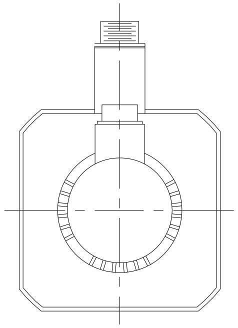
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
DRAWN BY BOWMAN
DRAWING NUMBER DBM-1000/15RB
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 07MAY97
SCALE NTS
SHEET NO. 1 OF 1
REVISION C

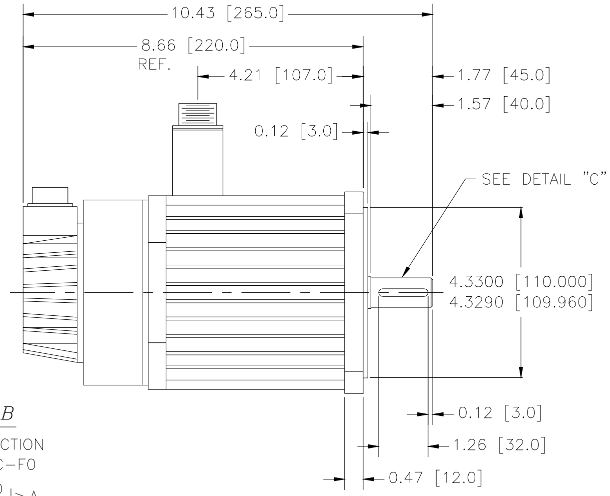
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	C	PER ECN 00-246	CWB	EB	CDR

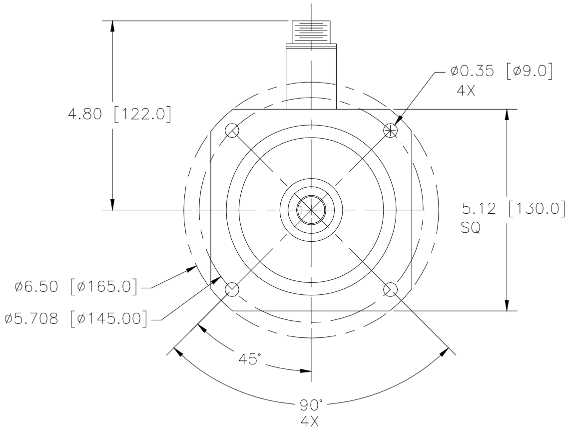
NOTES: B

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 8.2 KG 18.1 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 98 N 22 LBS
6.) RADIAL LOAD 510 N 115 LBS
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.
9.) BRAKE STATIC TORQUE: 7.8 N-M 5.7 LB-FT
BRAKE ELECTRICAL: 24 VDC 0.63 AMPS



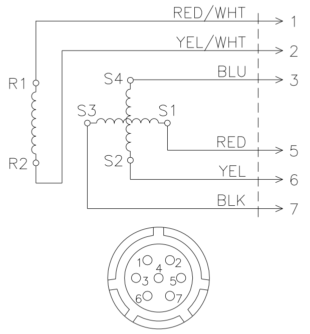






DETAIL A

RESOLVER CONNECTION
A JRC16WRQ-7P

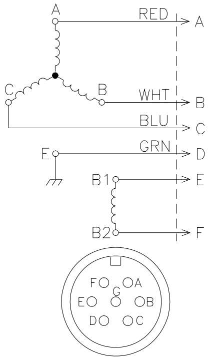


VIEW OF CONNECTOR

MATING SOCKET:
RESOLVER: JMSP1607F

DETAIL B

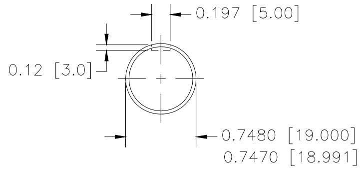
ARMATURE CONNECTION
JA3102A20-15PC-F0



VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A20-15S

DETAIL C



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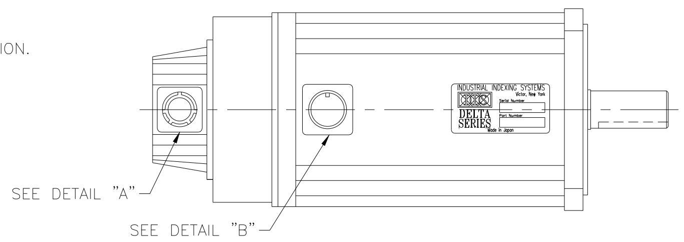
TITLE
MOTOR, BRAKE, BRUSHLESS, DELTA SERIES

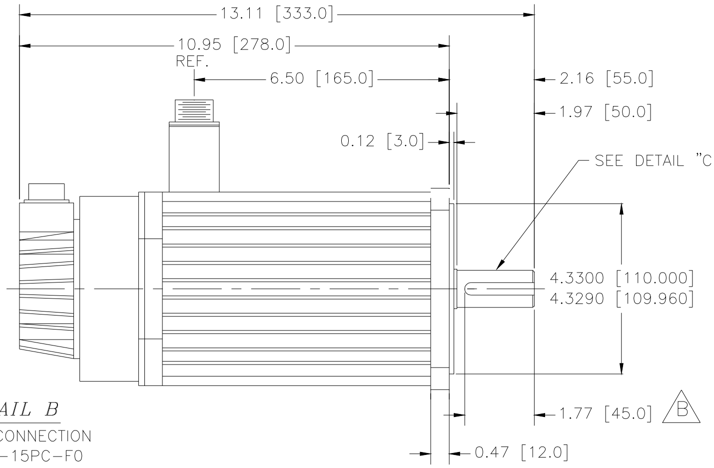
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 07MAY97
SCALE NTS
DRAWING NUMBER DBM-1400/30RB
SHEET NO. 1 OF 1
REVISION C

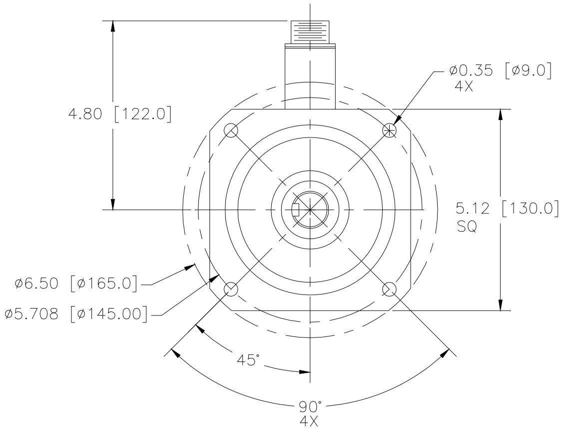
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	D	PER ECN 00-246	CWB	EB	CDR

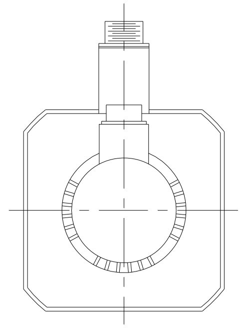
NOTES: C

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 13 KG 28.7 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 118 N 27 LBS
6.) RADIAL LOAD 706 N 159 LBS
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS
8.) IP-44 SEALING.
9.) BRAKE STATIC TORQUE: 7.8 N-M 5.7 LB-FT
BRAKE ELECTRICAL: 24 VDC 0.63 AMPS



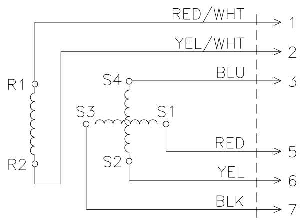


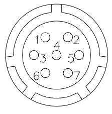




DETAIL A

RESOLVER CONNECTION
JRC16WRQ-7P

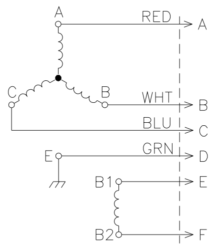


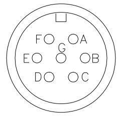


VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: JMSP1607F

DETAIL B

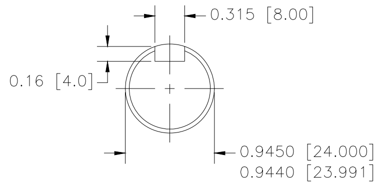
ARMATURE CONNECTION
JA3102A20-15PC-F0





VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: MS3106A20-15S

DETAIL C



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TITLE
MOTOR, BRAKE, BRUSHLESS, DELTA SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'
B

DRAWN BY
BOWMAN

AutoCAD FILE LOCATION
Q:\CURRENT DWGS

DATE
07MAY97

SCALE
NTS

DRAWING NUMBER
DBM-1500/15RB

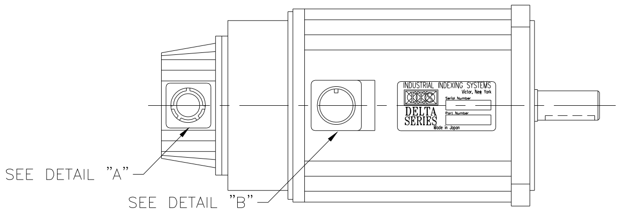
SHEET NO.
1 OF 1

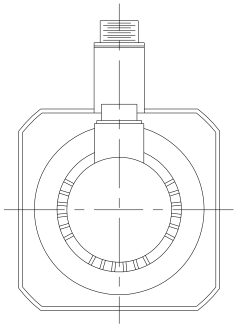
REVISION
D

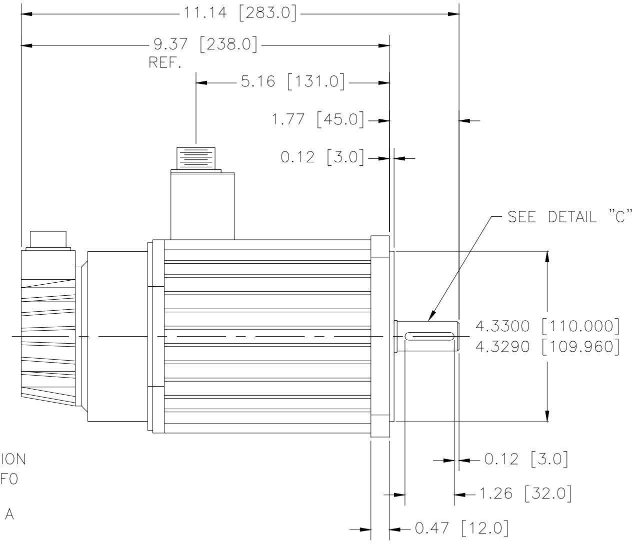
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	E	PER ECN 00-246	CWB	EB	CDR

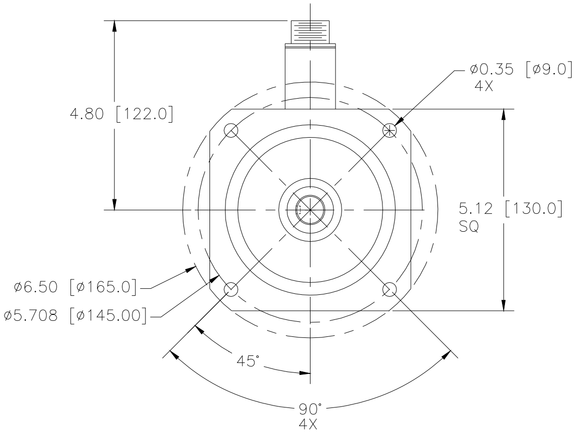
NOTES: △D

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 10.0 KG 22.1 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 98 N 22 LBS
6.) RADIAL LOAD 539 N 121 LBS
7.) RESOLVER 2X 24000 PPR.
    QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.
9.) BRAKE STATIC TORQUE 7.8 N-M 5.7 LB-FT
    BRAKE ELECTRICAL 24 VDC 0.63 AMPS





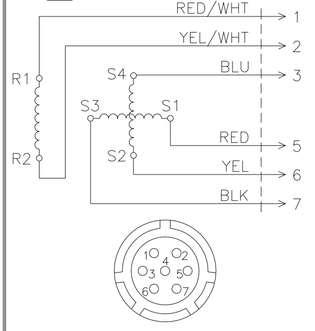




DETAIL A

RESOLVER CONNECTION
JRC16WRQ-7P

△C

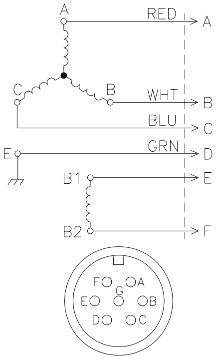


VIEW OF CONNECTOR

MATING SOCKET:
RESOLVER: JMSP1607F

DETAIL B

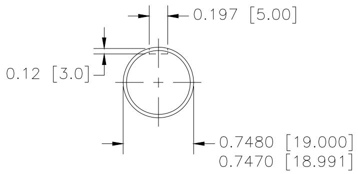
ARMATURE CONNECTION
JA3102A20-15PC-F0



VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A20-15S

DETAIL C



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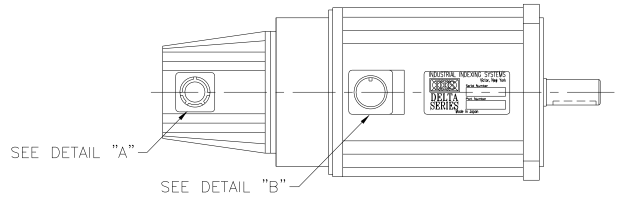
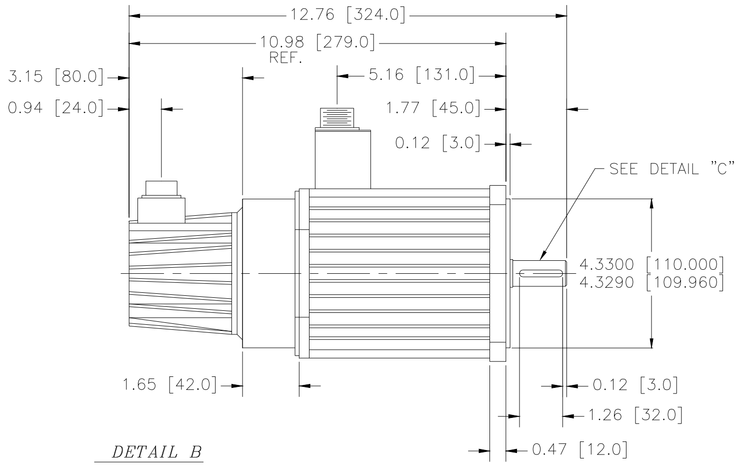
TITLE
MOTOR, BRAKE, BRUSHLESS, DELTA SERIES

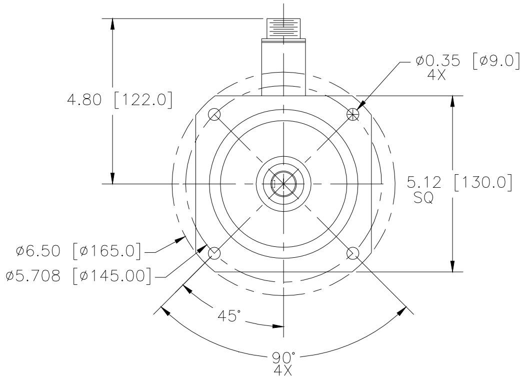
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
DRAWN BY: BOWMAN
DRAWING NUMBER: DBM-1800/30RB
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR: ± 0°30'
AutoCAD FILE LOCATION: Q:\CURRENT DWGS
B
DATE: 25APR96
SCALE: NTS
SHEET NO.: 1 OF 1
REVISION: E

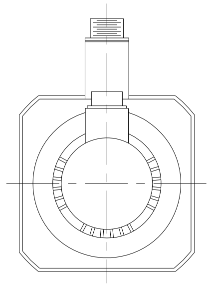
NOTES:
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 10.3 KG 22.7 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 98 N 22 LBS
6.) RADIAL LOAD 539 N 121 LBS
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.
9.) BRAKE STATIC TORQUE 7.8 N-M 5.7 LB-FT
BRAKE ELECTRICAL 24 VDC 0.63 AMPS

DATE	SYM	REVISION RECORD	DR	CK	CK
02FEB01	0	PER ECN 00-306	CWB	WS	
30MAR01	A	PER ECN 01-119	CWB		



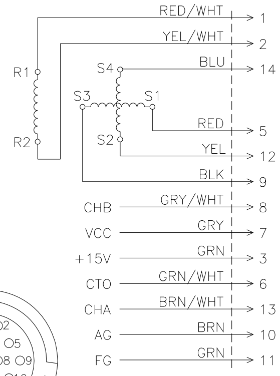


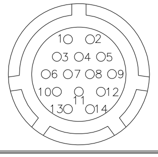




DETAIL A

ABSOLUTE
RESOLVER/ENCODER CONNECTION
JRC16WRQ-14P



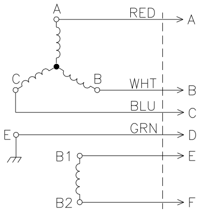


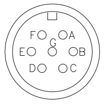
VIEW OF CONNECTOR

MATING SOCKET:
RESOLVER: JRC16WPQ-14S

DETAIL B

ARMATURE CONNECTION
JA3102A20-15PC-F0

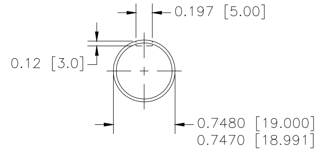




VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A20-15S

DETAIL C



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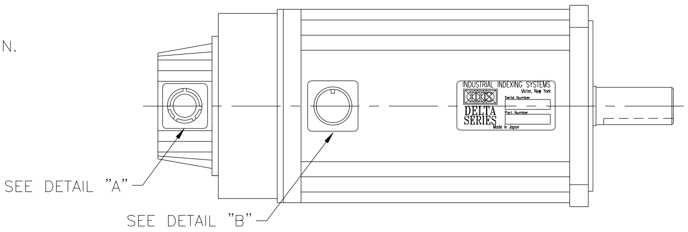
TITLE
MOTOR, BRAKE, BRUSHLESS, DELTA SERIES

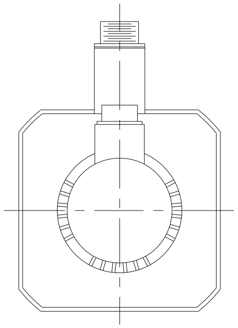
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 02FEB01
SCALE NTS
DRAWING NUMBER DBM-1800/30RAB
SHEET NO. 1 OF 1
REVISION A

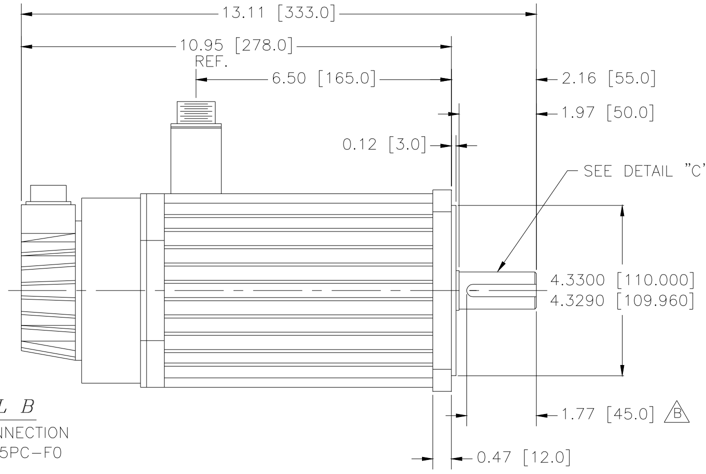
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	D	PER ECN 00-246	CWB	EB	CDR

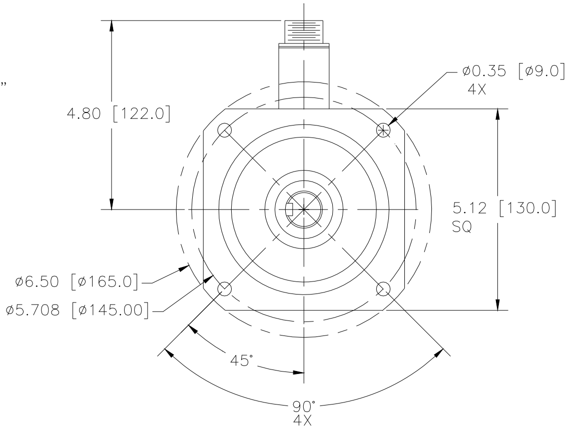
NOTES: △C

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 13 KG 28.6 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 98 N 22 LBS
6.) RADIAL LOAD 559 N 125 LBS
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.
9.) BRAKE STATIC TORQUE: 7.8 N-M 5.7 LB-FT
BRAKE ELECTRICAL: 24 VDC 0.63 AMPS



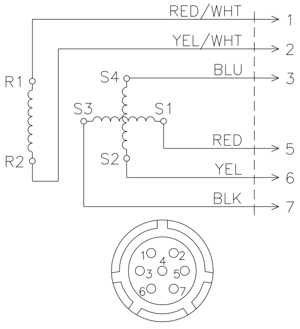






DETAIL A

RESOLVER CONNECTION
△A JRC16WRQ-7P

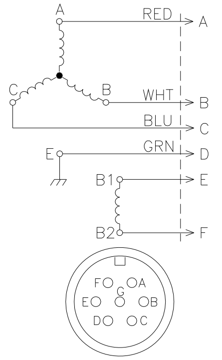


VIEW OF CONNECTOR

MATING SOCKET:
RESOLVER: JMSP1607F

DETAIL B

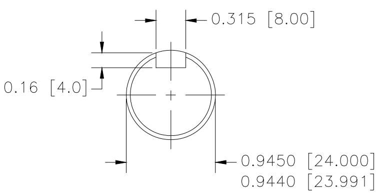
ARMATURE CONNECTION
JA3102A20-15PC-F0



VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A20-15S

DETAIL C



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TITLE
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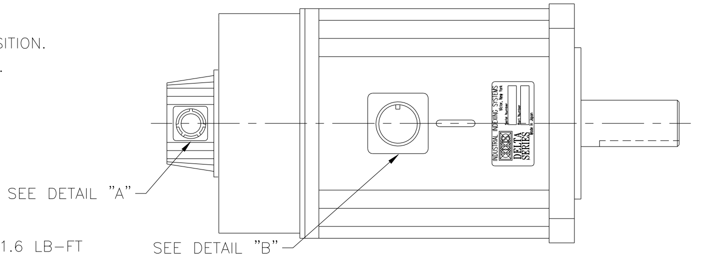
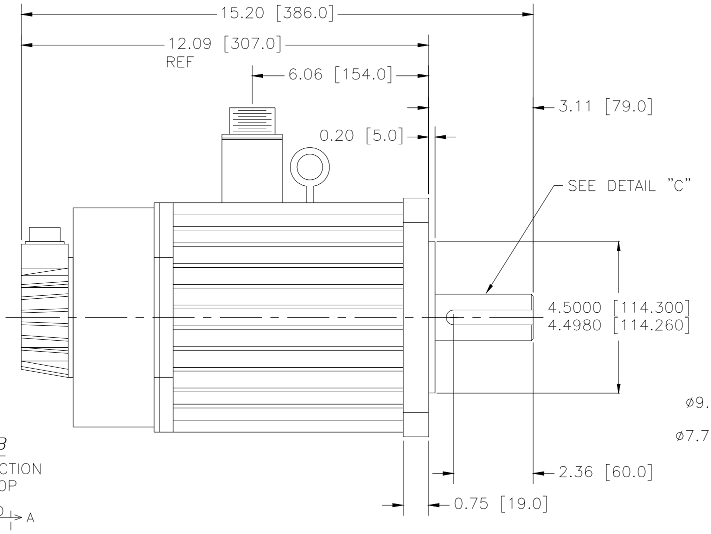
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'
B
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
DATE 07MAY97
SCALE NTS
DRAWING NUMBER DBM-2400/30RB
SHEET NO. 1 OF 1
REVISION D

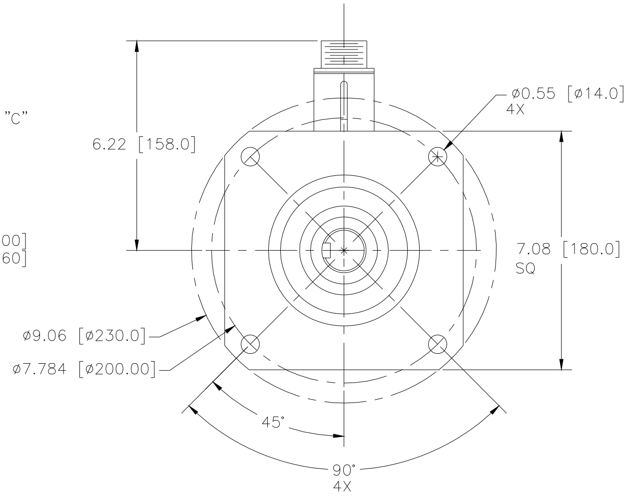
NOTES: ⚠B

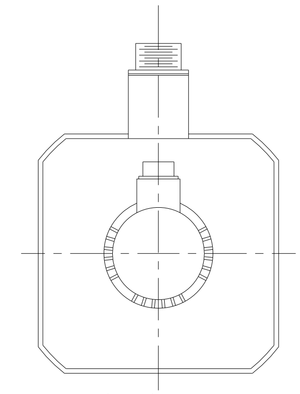
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 24 KG 52.9 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 284 N 64 LBS
6.) RADIAL LOAD 1350 N 303 LBS
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.
9.) BRAKE STATIC TORQUE: 29.4 N-M 21.6 LB-FT
BRAKE ELECTRICAL: 24 VDC 0.92 AMPS

DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	C	PER ECN 00-246	CWB	EB	CDR



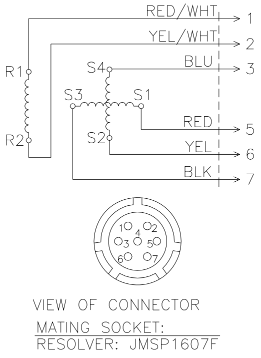






DETAIL A

RESOLVER CONNECTION
⚠A JRC16WRQ-7P

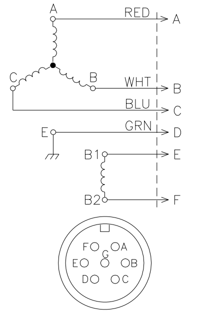


VIEW OF CONNECTOR

MATING SOCKET:
RESOLVER: JMSP1607F

DETAIL B

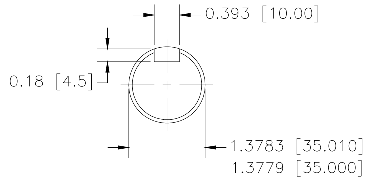
ARMATURE CONNECTION
MS3102A24-10P



VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A24-10S

DETAIL C



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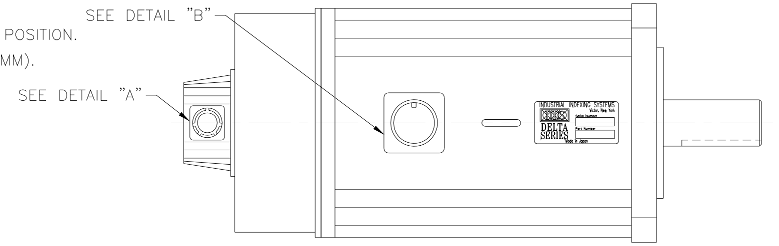
TITLE
MOTOR, BRAKE, BRUSHLESS, DELTA SERIES

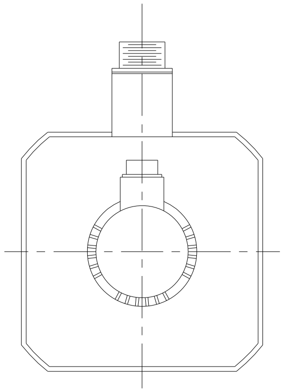
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)		DRAWN BY BOWMAN			DRAWING NUMBER
TOLERANCES		AutoCAD FILE LOCATION Q:\CURRENT DWGS			DBM-2600/15RB
X.X± ---	ANGULAR	B	DATE	SCALE	SHEET NO.	REVISION
X.XX± 0.01	± 0°30'		07MAY97	NTS	1 OF 1	C
X.XXX± 0.005						

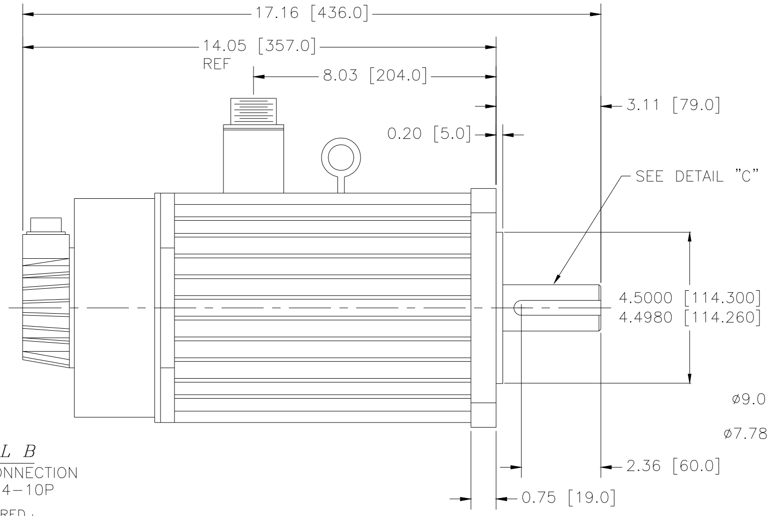
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	D	PER ECN 00-246	CWB	EB	CDR

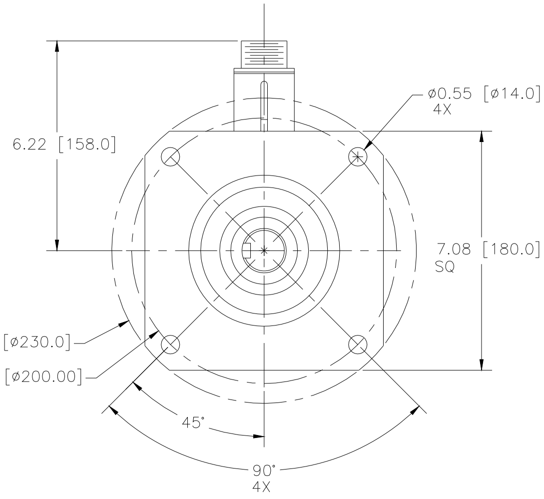
NOTES: C

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 31 KG 68.3 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 284 N 64 LBS
6.) RADIAL LOAD 1450 N 326 LBS
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.
9.) BRAKE STATIC TORQUE: 29.4 N-M 21.5 LB-FT
BRAKE ELECTRICAL: 24 VDC 0.92 AMPS



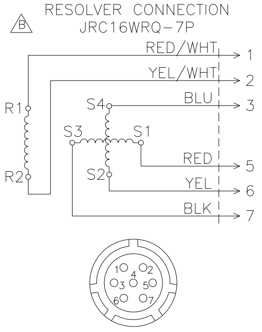






DETAIL A

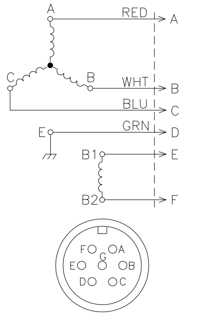
RESOLVER CONNECTION
JRC16WRQ-7P



VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: JMSP1607F

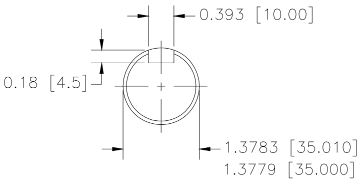
DETAIL B

ARMATURE CONNECTION
MS3102A24-10P



VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: MS3106A24-10S

DETAIL C



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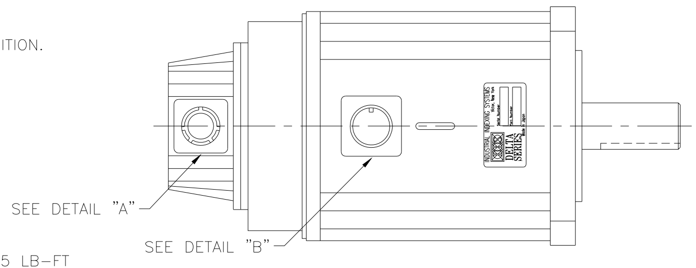
TITLE
MOTOR, BRAKE, BRUSHLESS, DELTA SERIES

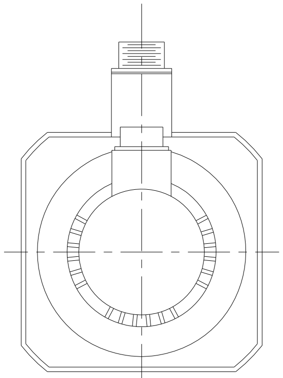
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
DRAWN BY: BOWMAN
DRAWING NUMBER: DBM-3700/15RB
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR: ± 0°30'
AutoCAD FILE LOCATION: Q:\CURRENT DWGS
B
DATE: 07MAY97
SCALE: NTS
SHEET NO.: 1 OF 1
REVISION: D

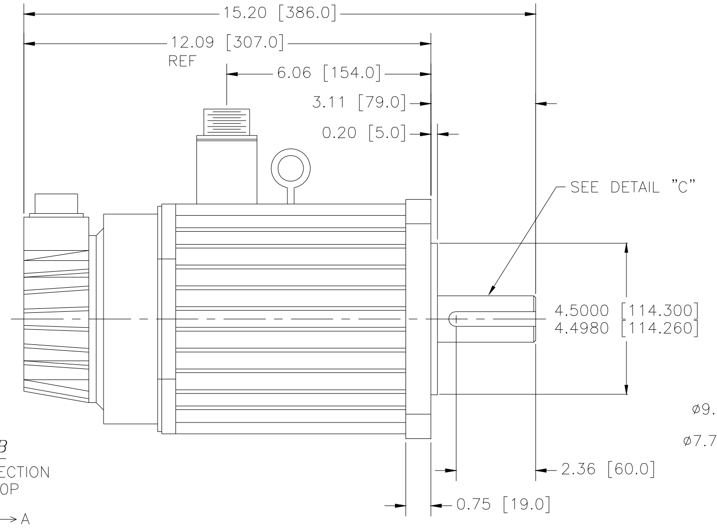
NOTES: C E

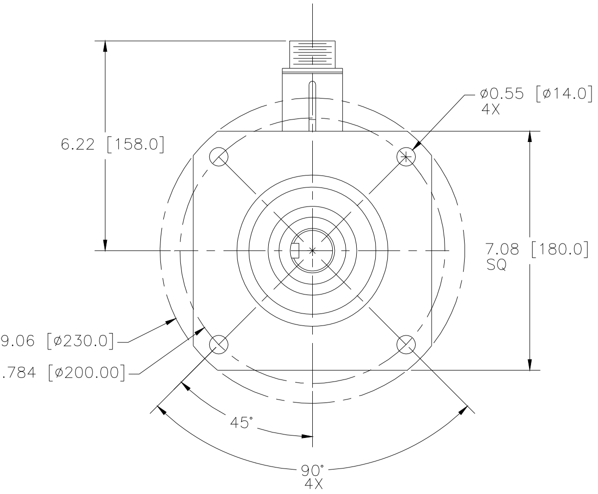
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 24.0 KG 53.0 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 235 N 53 LBS
6.) RADIAL LOAD 1068 N 240 LBS
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.
9.) BRAKE STATIC TORQUE 29.4 N-M 21.5 LB-FT
BRAKE ELECTRICAL 24 VDC 0.92 AMPS

DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	F	PER ECN 00-246	CWB	EB	CDR



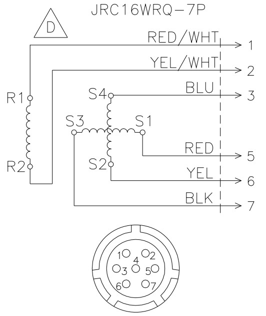






DETAIL A

RESOLVER CONNECTION
JRC16WRQ-7P

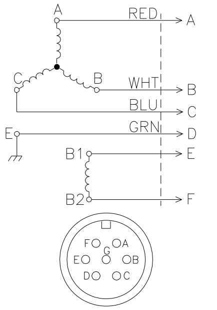


VIEW OF CONNECTOR

MATING SOCKET:
RESOLVER: JMSP1607F

DETAIL B

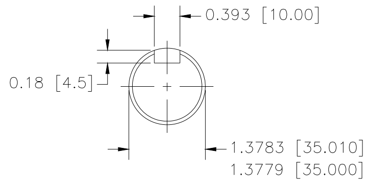
ARMATURE CONNECTION
MS3102A24-10P



VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A24-10S

DETAIL C



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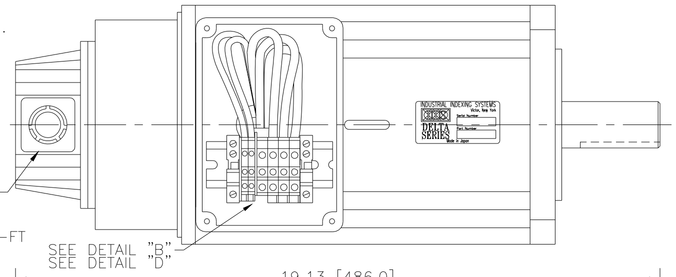
TITLE
MOTOR, BRUSHLESS, DELTA SERIES

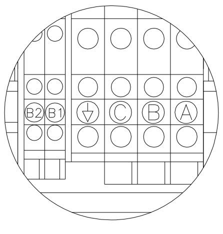
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 25APR96
SCALE NTS
DRAWING NUMBER DBM-3700/30RB
SHEET NO. 1 OF 1
REVISION F

DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	D	PER ECN 00-246	CWB	EB	CDR

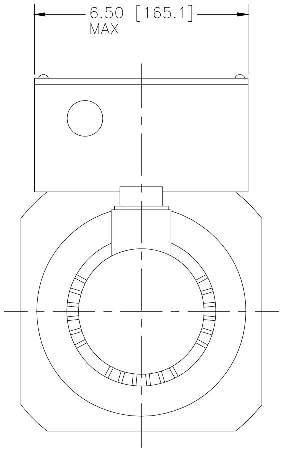
NOTES: △C

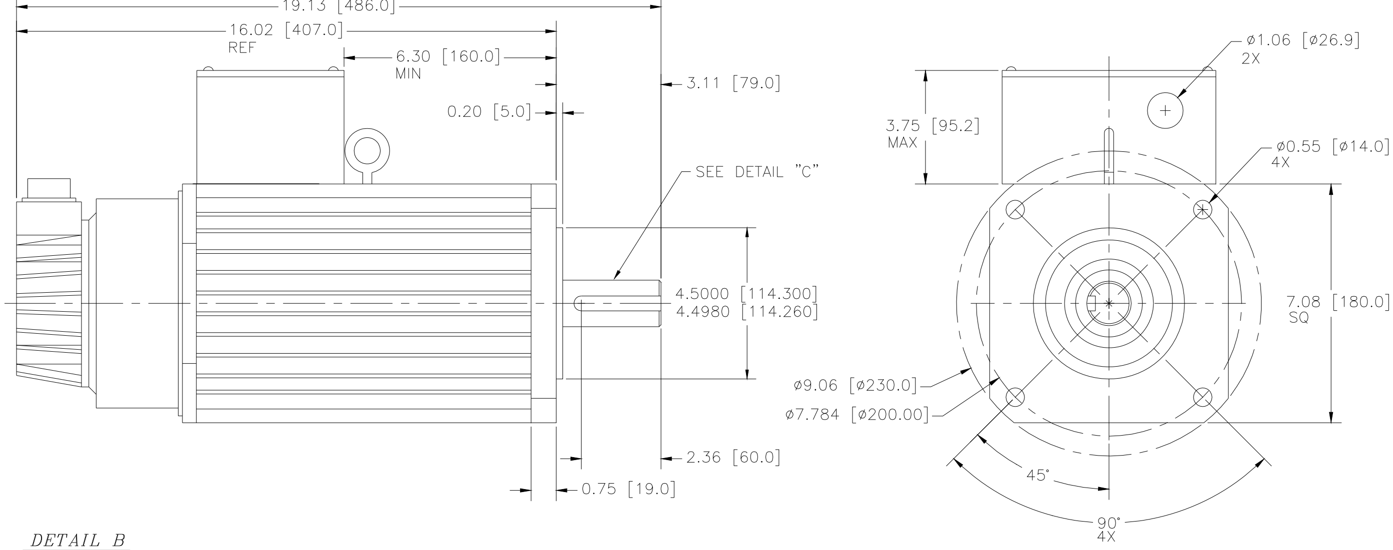
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 38 KG 84 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 284 N 63 LBS
6.) RADIAL LOAD 1520 N 341 LBS
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.
9.) BRAKE STATIC TORQUE 29.4 N-M 21.5 LB-FT
BRAKE ELECTRICAL 24 VDC 0.92 AMPS





DETAIL D

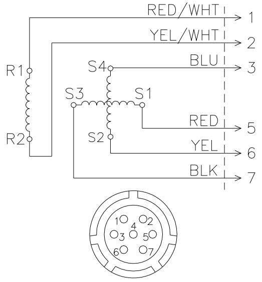




DETAIL A

RESOLVER CONNECTION

△B JRC16WRQ-7P

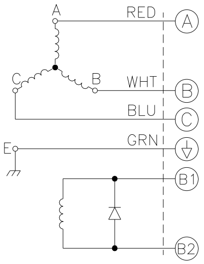


VIEW OF CONNECTOR

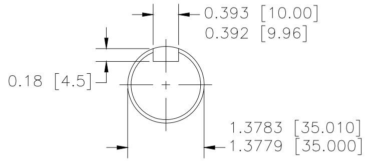
MATING SOCKET:
RESOLVER: JMSP1607F

DETAIL B

ARMATURE CONNECTION



DETAIL C



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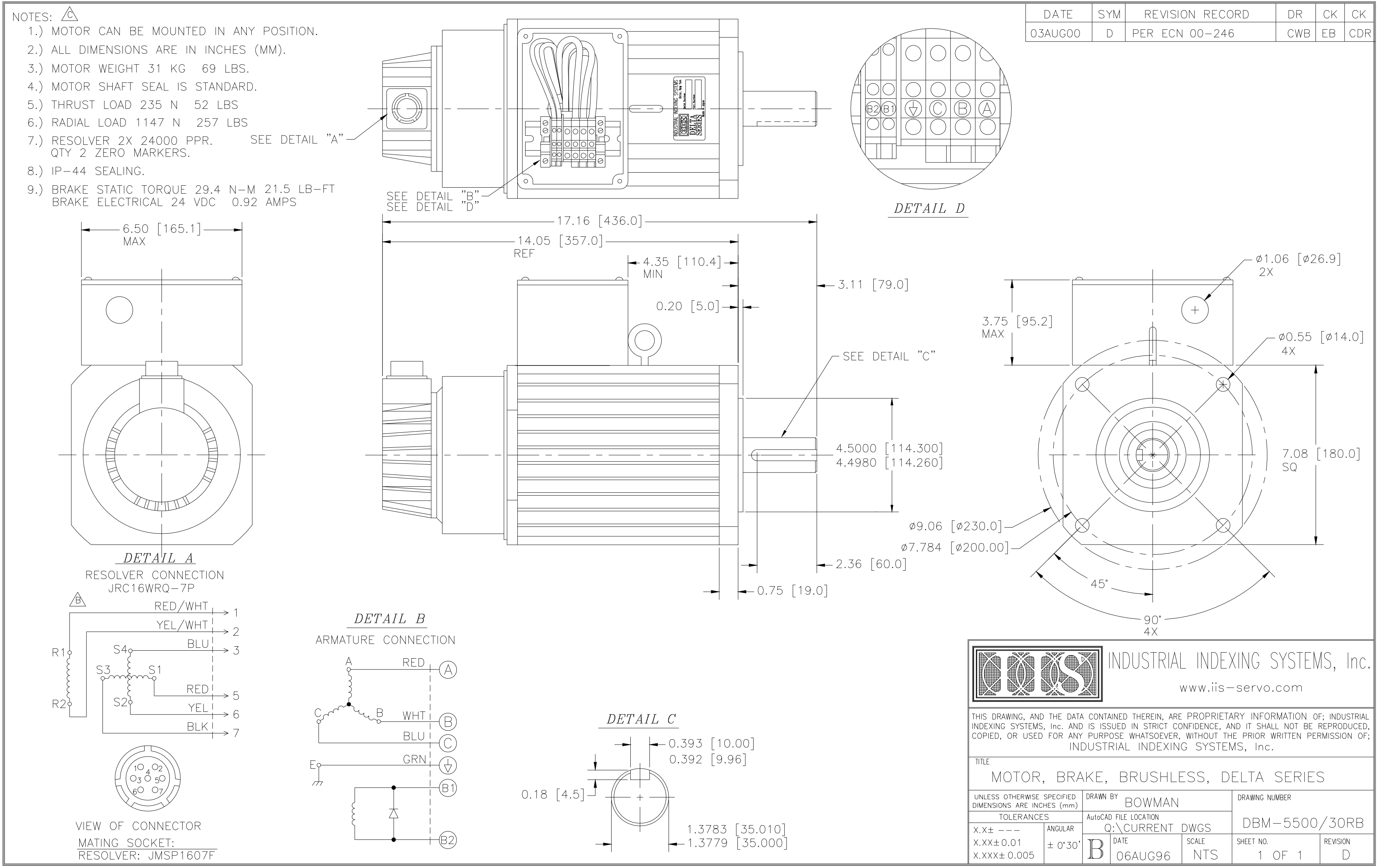
TITLE
MOTOR, BRAKE, BRUSHLESS, DELTA SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 06AUG96
SCALE NTS
DRAWING NUMBER DBM-5000/15RB
SHEET NO. 1 OF 1
REVISION D



NOTES: △C

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 31 KG 69 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 235 N 52 LBS
6.) RADIAL LOAD 1147 N 257 LBS
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.
9.) BRAKE STATIC TORQUE 29.4 N-M 21.5 LB-FT
BRAKE ELECTRICAL 24 VDC 0.92 AMPS

DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	D	PER ECN 00-246	CWB	EB	CDR

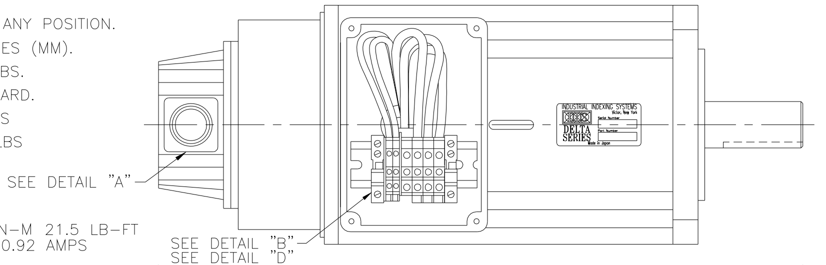
INDUSTRIAL INDEXING SYSTEMS, Inc.
www.iis-servo.com

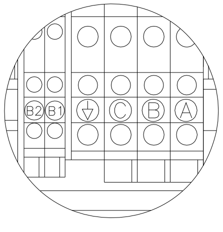
TITLE
MOTOR, BRAKE, BRUSHLESS, DELTA SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 06AUG96
SCALE NTS
DRAWING NUMBER DBM-5500/30RB
SHEET NO. 1 OF 1
REVISION D

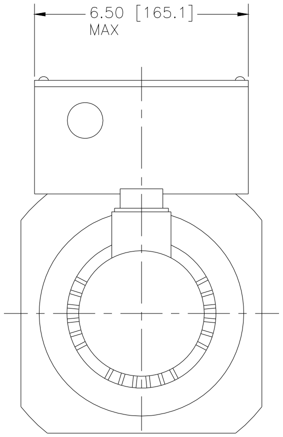
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	D	PER ECN 00-246	CWB	EB	CDR

NOTES: △C
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 38 KG 84 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 235 N 52 LBS
6.) RADIAL LOAD 1205 N 270 LBS
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.
9.) BRAKE STATIC TORQUE 29.4 N-M 21.5 LB-FT
BRAKE ELECTRICAL 24 VDC 0.92 AMPS



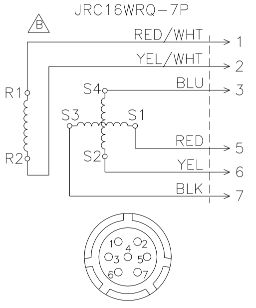


DETAIL D

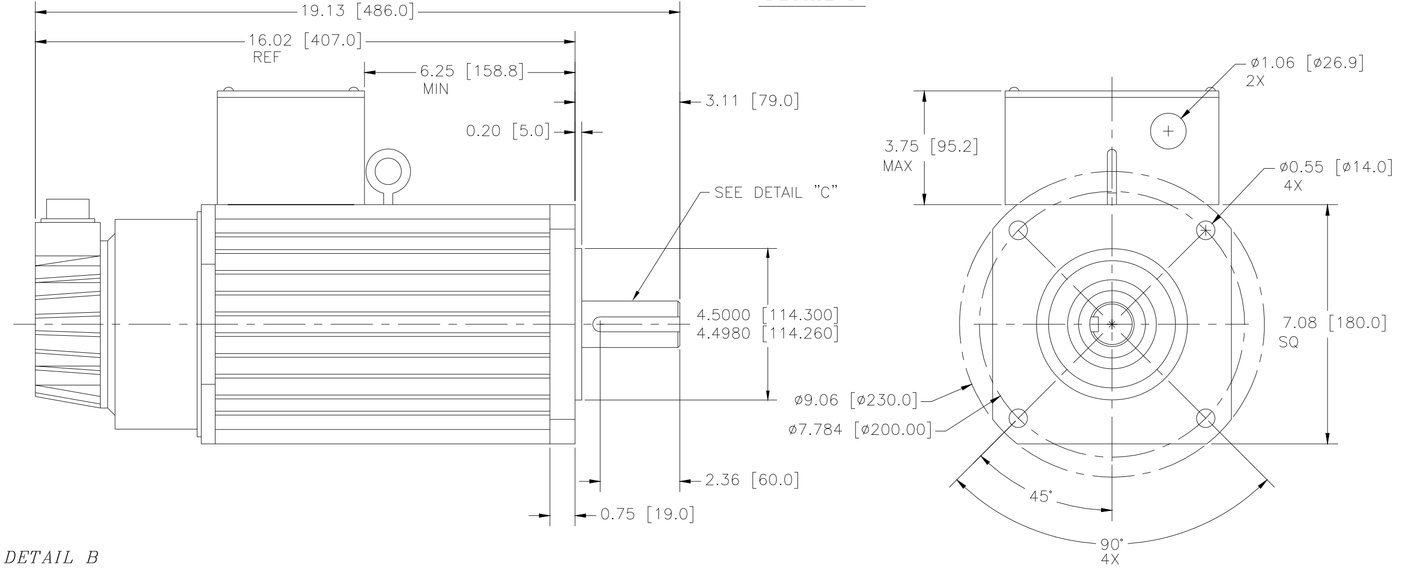


DETAIL A

RESOLVER CONNECTION
JRC16WRQ-7P

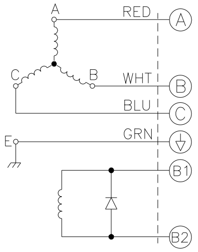


VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: JMSP1607F

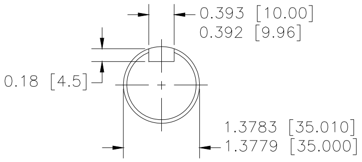


DETAIL B

ARMATURE CONNECTION



DETAIL C



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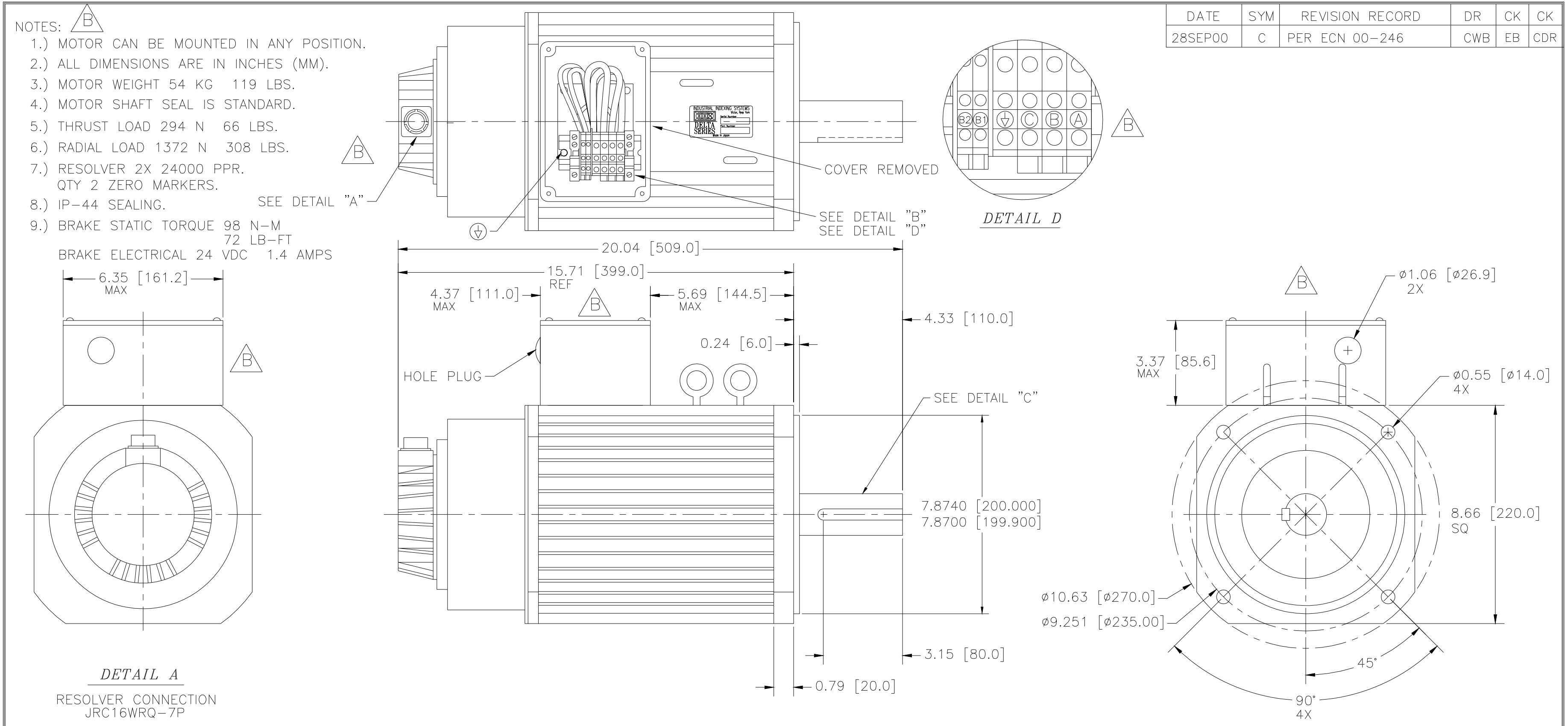
TITLE
MOTOR, BRAKE, BRUSHLESS, DELTA SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± --
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'
B
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
DATE 06AUG96
SCALE NTS
DRAWING NUMBER DBM-6500/30RB
SHEET NO. 1 OF 1
REVISION D

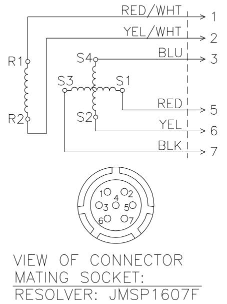
DATE	SYM	REVISION RECORD	DR	CK	CK
28SEP00	C	PER ECN 00-246	CWB	EB	CDR

NOTES: B
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 54 KG 119 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 294 N 66 LBS.
6.) RADIAL LOAD 1372 N 308 LBS.
7.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.
9.) BRAKE STATIC TORQUE 98 N-M
72 LB-FT
BRAKE ELECTRICAL 24 VDC 1.4 AMPS



DETAIL A

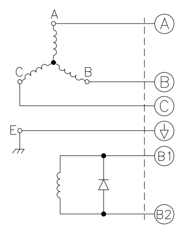
RESOLVER CONNECTION
JRC16WRQ-7P



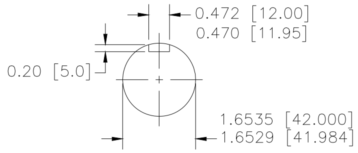
VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: JMSP1607F

DETAIL B

ARMATURE CONNECTION



DETAIL C



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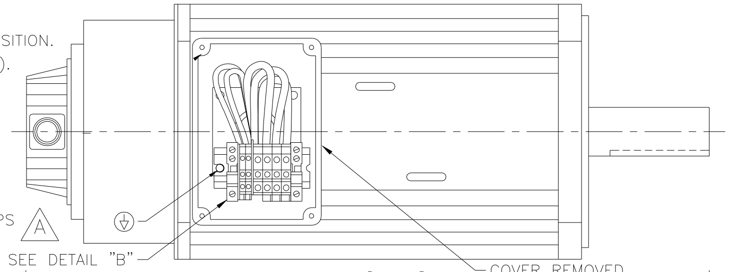
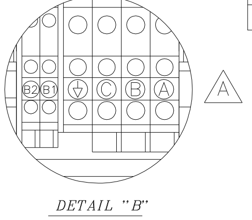
TITLE
MOTOR, BRAKE, BRUSHLESS, DELTA SERIES

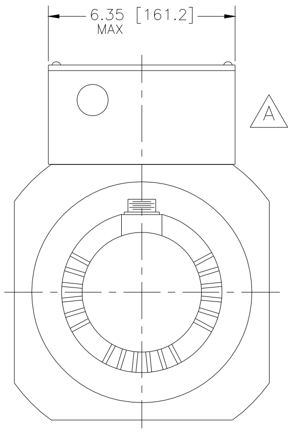
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)		DRAWN BY BOWMAN		DRAWING NUMBER
TOLERANCES		AutoCAD FILE LOCATION Q:\CURRENT DWGS		DBM-7500/20RB
X.X± --- X.XX± 0.01 X.XXX± 0.005	ANGULAR ± 0°30'	B DATE 14AUG97	SCALE NTS	SHEET NO. 1 OF 1 REVISION C

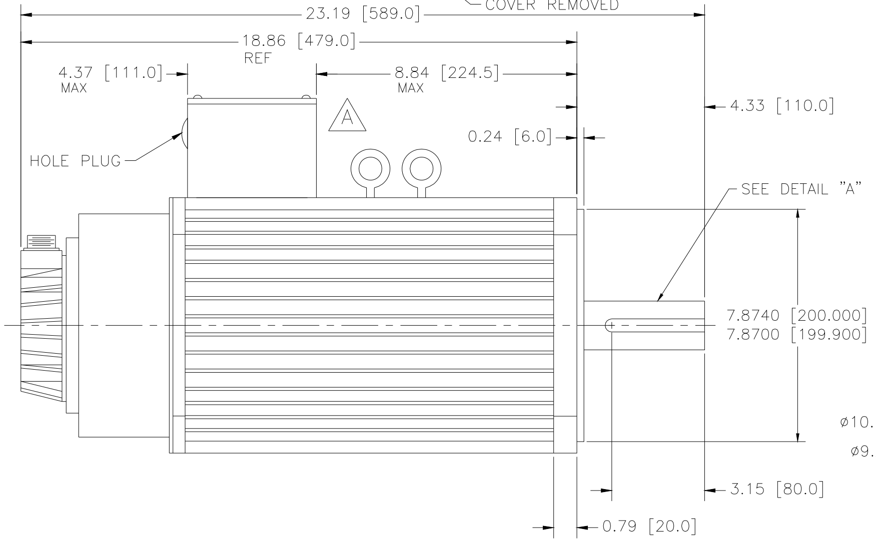
NOTES: A
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 73 KG 161 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 294 N 66 LBS.
6.) RADIAL LOAD 1470 N 330 LBS.
7.) BRAKE STATIC TORQUE 98 N-M
72 LB-FT
BRAKE ELECTRICAL 24 VDC 1.4 AMPS A
8.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
9.) IP-44 SEALING.

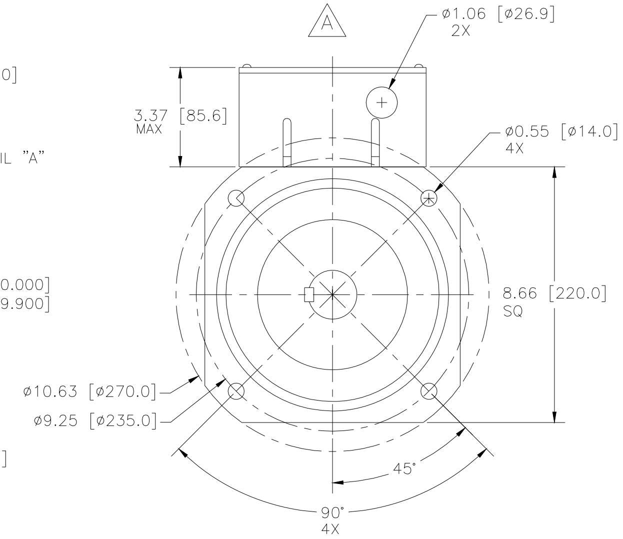
DATE	SYM	REVISION RECORD	DR	CK	CK
18AUG98	0	PER ECN 98-258	CWB	ELS	
07DEC99	A	PER ECN 99-414	CWB		



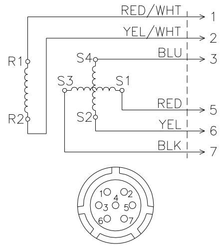






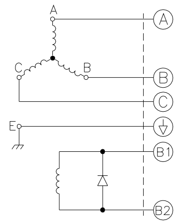


RESOLVER CONNECTION
JRC16WRQ-7P

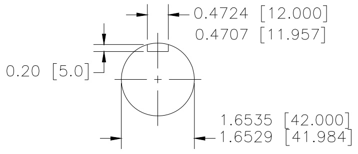


TOP VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: JMSP1607F

ARMATURE CONNECTION



DETAIL "A"



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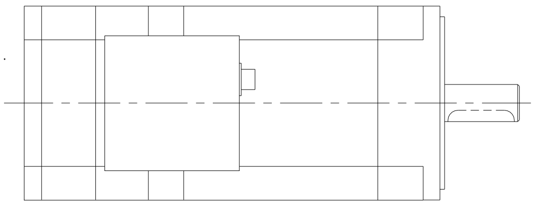
TITLE
MOTOR, BRAKE, BRUSHLESS, DELTA SERIES

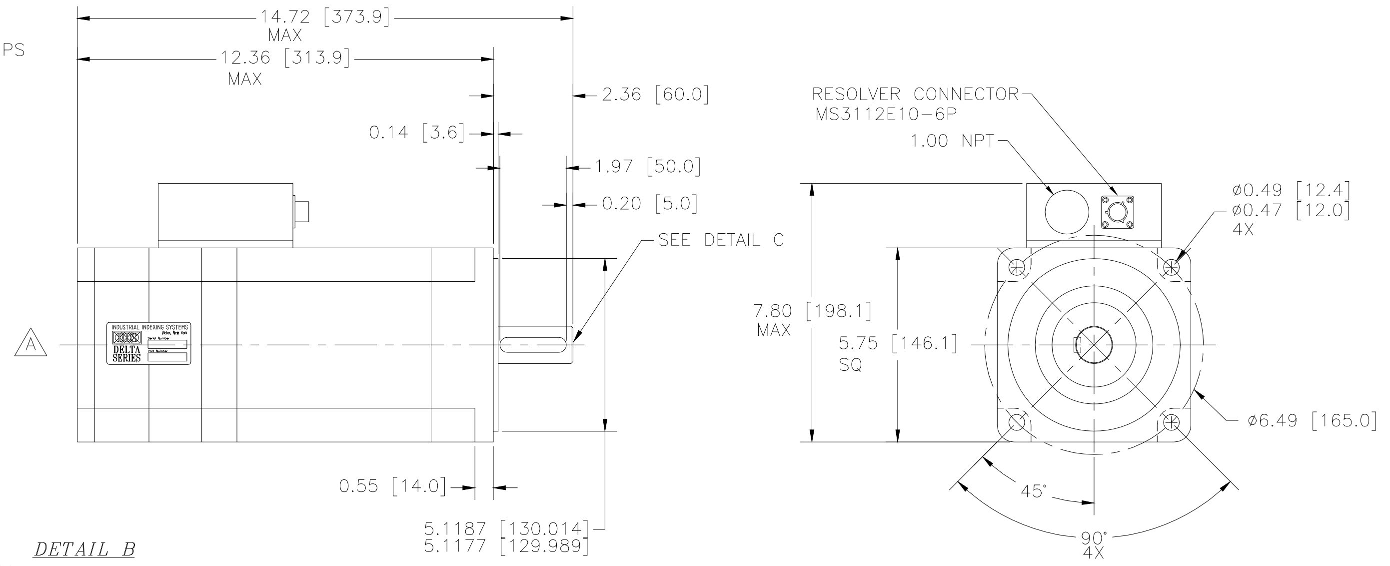
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 18AUG98
SCALE NTS
DRAWING NUMBER DBM-10000/20RB
SHEET NO. 1 OF 1
REVISION A

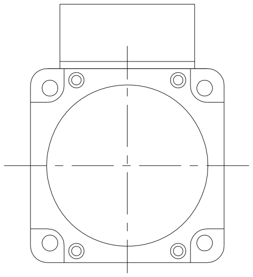
NOTES: B

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT [28 KG] 61 LBS
4.) IP-65 SEALING.
5.) RESOLVER 2X 24000 PPR.
QTY 2 ZERO MARKERS.
6.) SHAFT SEAL STANDARD.
7.) BRAKE STATIC TORQUE 22.5 N-M
16.7 LB-FT
BRAKE ELECTRICAL 24 VDC 1.3 AMPS

DATE	SYM	REVISION RECORD	DR	CK	CK
16JUN99	0	PER ECN 98-122	CWB	TO	
23JUL99	A	PER ECN 99-254	CWB	TO	
07DEC99	B	PER ECN 99-414	CWB		

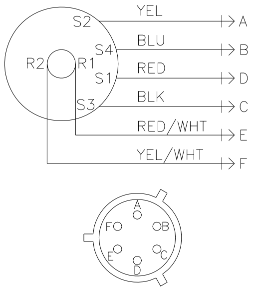






DETAIL A

RESOLVER CONNECTION

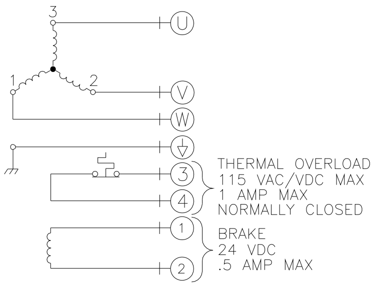


TOP VIEW OF CONNECTOR

MATING SOCKET:
RESOLVER: MS3116F10-6S

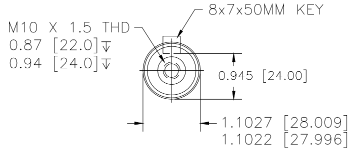
DETAIL B

ARMATURE CONNECTION



DETAIL C

MOTOR SHAFT DIMENSIONS



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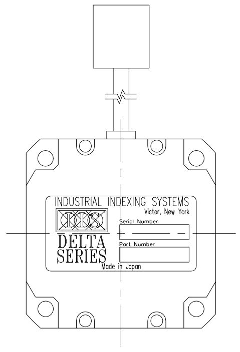
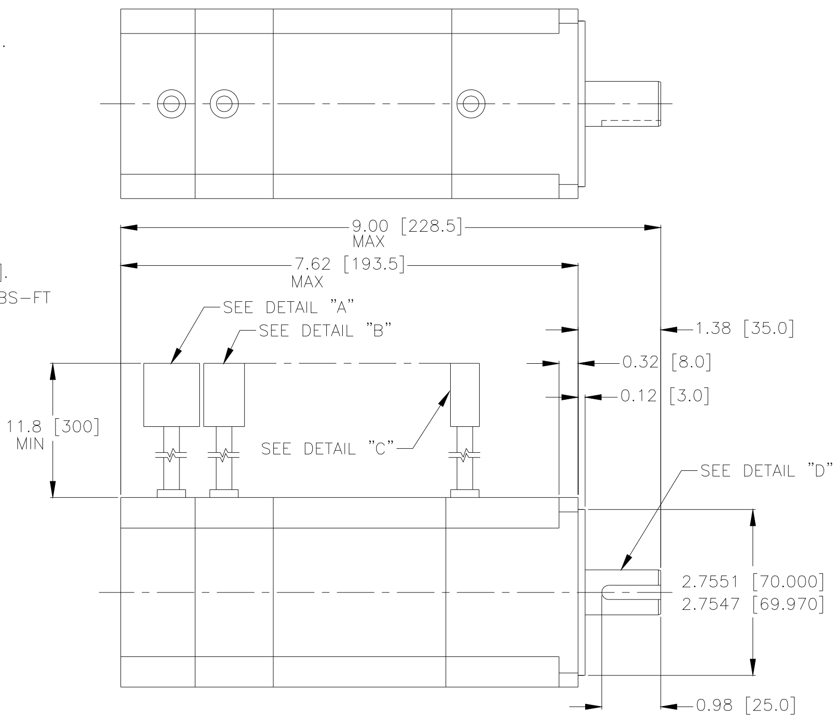
TITLE
MOTOR, BRAKE, BRUSHLESS, DELTA SERIES

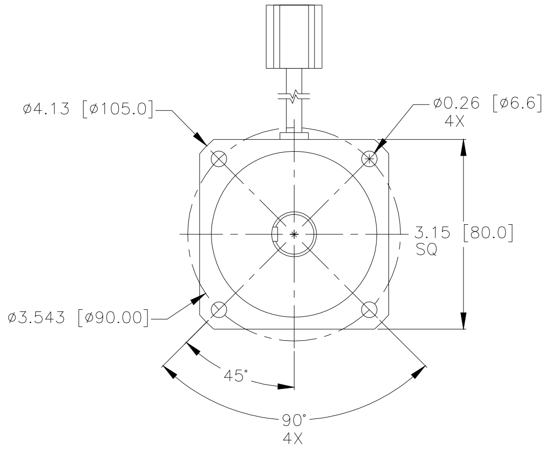
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 16JUN99
SCALE NTS
DRAWING NUMBER DBM-B3000/30RB
SHEET NO. 1 OF 1
REVISION B

NOTES:
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 4.2 KG 9.2 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 98 N 22 LBS.
6.) RADIAL LOAD 343 N 77 LBS.
7.) ABSOLUTE ENCODER
8.) IP-44 SEALING.
9.) WIRE LEAD OPENINGS ARE UNSEALED.
10.) FLYING LEAD LENGTH 12" ±2" [305 ±50].
11.) BRAKE STATIC TORQUE 2.55 N-M 1.88 LBS-FT
BRAKE ELECTRICAL 24 VDC 0.38 A.

DATE	SYM	REVISION RECORD	DR	CK	CK
02FEB01	0	PER ECN 00-306	CWB	WS	
30MAR01	A	PER ECN 01-118	CWB		



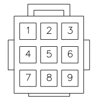




DETAIL A

ABSOLUTE ENCODER CONNECTION

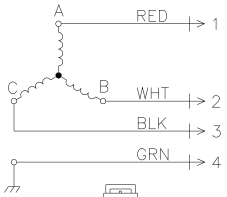
PIN#	SIGNAL	COLOR
1	NC	---
2	+5V	RED
3	GND	BLK
4	NC	---
5	VB	WHT
6	GND	BLK
7	SO/RQ	BLU
8	$\overline{SO/RQ}$	GRN
9	SHLD	

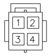


VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: YLP-09V

DETAIL B

ARMATURE CONNECTION

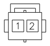




VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: YLP-04V

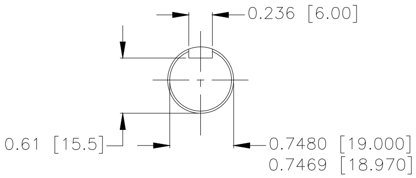
DETAIL C

BRAKE CONNECTION



VIEW OF CONNECTOR
MATING SOCKET:
BRAKE: YLP-02V

DETAIL D



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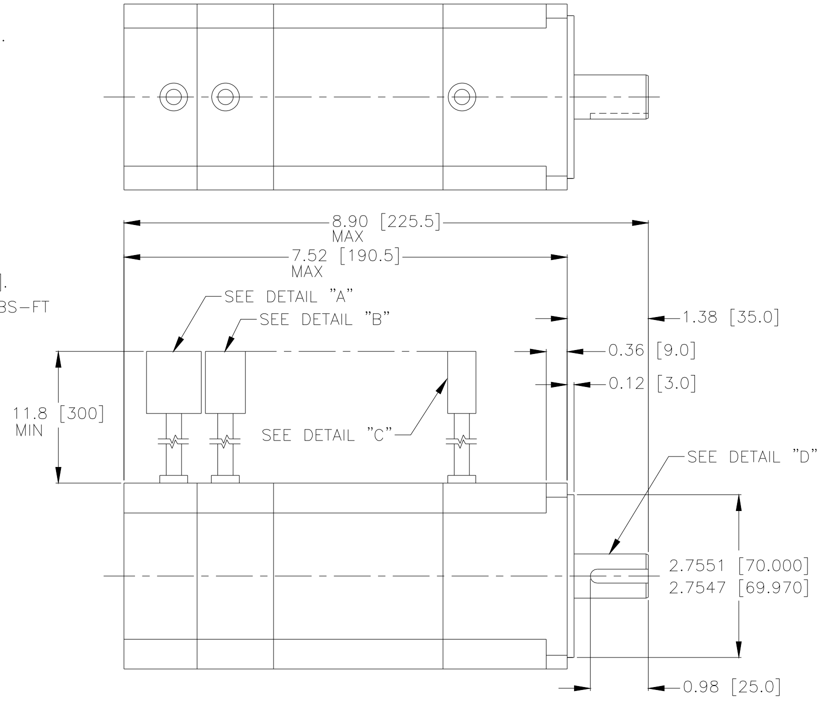
TITLE
MOTOR, BRAKE, DELTA SERIES, ABSOLUTE

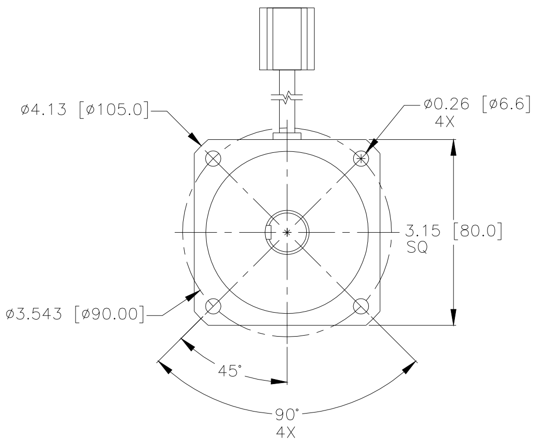
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 02FEB01
SCALE NTS
DRAWING NUMBER DBM-D800/30EAB
SHEET NO. 1 OF 1
REVISION A

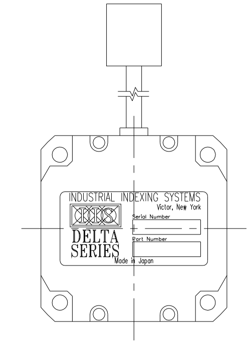
NOTES:

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 4.2 KG 9.2 LBS.
4.) MOTOR SHAFT SEAL IS STANDARD.
5.) THRUST LOAD 98 N 22 LBS.
6.) RADIAL LOAD 343 N 77 LBS.
7.) RESOLVER 2X 24000 PPR
QTY 2 ZERO MARKERS.
8.) IP-44 SEALING.
9.) WIRE LEAD OPENINGS ARE UNSEALED.
10.) FLYING LEAD LENGTH 12" ±2" [305 ±50].
11.) BRAKE STATIC TORQUE 2.55 N-M 1.88 LBS-FT
BRAKE ELECTRICAL 24 VDC 0.38 A.

DATE	SYM	REVISION RECORD	DR	CK	CK
20NOV00	A	PER ECN 00-246	CWB	EB	CDR

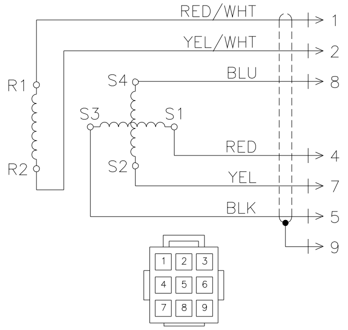






DETAIL A

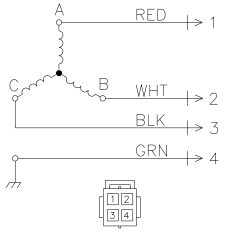
RESOLVER CONNECTION



VIEW OF CONNECTOR
MATING SOCKET:
RESOLVER: YLP-09V

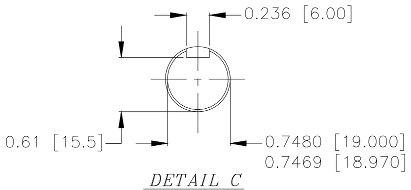
DETAIL B

ARMATURE CONNECTION



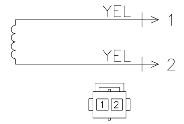
VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: YLP-04V

DETAIL D



DETAIL C

BRAKE CONNECTION



VIEW OF CONNECTOR
MATING SOCKET:
BRAKE: YLP-02V

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TITLE
MOTOR, DELTA SERIES

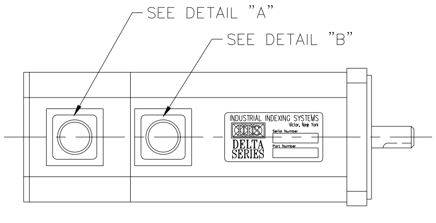
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'
DRAWN BY: BOWMAN
AutoCAD FILE LOCATION: Q:\CURRENT DWGS
B
DATE: 14JAN00
SCALE: NTS
DRAWING NUMBER: DBM-D800/30RB
SHEET NO.: 1 OF 1
REVISION: A

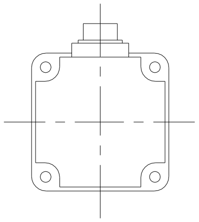
A.8 ENCODER MOTOR DIMENSIONS

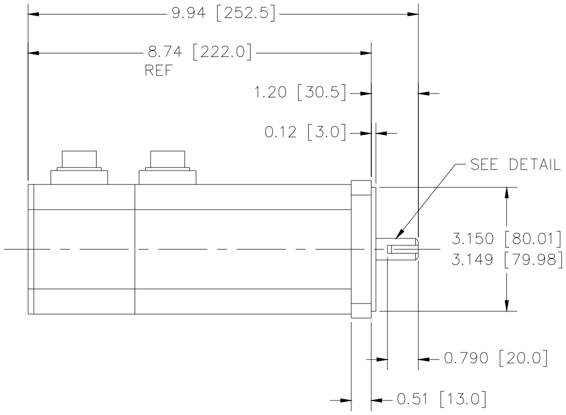
DRAWING NUMBER	DESCRIPTION
DBM-480/15E	Brushless Delta Series Motor
DBM-B380/30E	Brushless Delta Series Motor
DBM-B630/30E	Brushless Delta Series Motor
DBM-B800/30E	Brushless Delta Series Motor
DBM-B1060/30E	Brushless Delta Series Motor
DBM-B1600/30E	Brushless Delta Series Motor
DBM-B1900/30E	Brushless Delta Series Motor
DBM-B3000/30E	Brushless Delta Series Motor
DBM-B4400/30E	Brushless Delta Series Motor
DBM-B5600/30E	Brushless Delta Series Motor
DBM-C740/15E	Brushless Delta Series Motor
DBM85-E400/20E	Brushless Delta Series Motor
DBM85-E525/30E	Brushless Delta Series Motor
DBM85-E750/20E	Brushless Delta Series Motor
DBM85-E850/30E	Brushless Delta Series Motor
DBM85-E1000/20E	Brushless Delta Series Motor
DBM85-E1200/30E	Brushless Delta Series Motor
DBM120-E750/20E	Brushless Delta Series Motor
DBM120-E1000/20E	Brushless Delta Series Motor
DBM120-E1000H/20E	Brushless Delta Series Motor
DBM120-E1500/20E	Brushless Delta Series Motor
DBM120-E1500H/20E	Brushless Delta Series Motor
DBM120-E2200/20E	Brushless Delta Series Motor
DBM120-E2200H/20E	Brushless Delta Series Motor
DBM120-E3000/20E	Brushless Delta Series Motor
DBM120-E3000H/20E	Brushless Delta Series Motor
DBM120-E4000/20E	Brushless Delta Series Motor
DBM120-E4000H/20E	Brushless Delta Series Motor

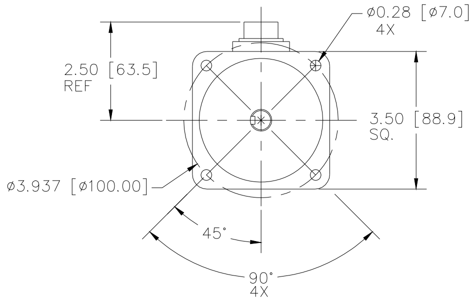
NOTES:
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) CERTIFIED TO MEET IP65 SEALING.
4.) MOTOR WEIGHT: 5.4 KG 12.0 LBS
5.) MOTOR SHAFT SEAL IS STANDARD.
6.) MOTOR FINISH: FDA WHITE COATING.
7.) MOTOR OUTPUT SHAFT: STAINLESS STEEL.
8.) THRUST LOAD: 111 N 25 LBS.
9.) RADIAL LOAD: 178 N 40 LBS.

DATE	SYM	REVISION RECORD	DR	CK	CK
11SEP01	0	PER ECN 01-302	CWB		



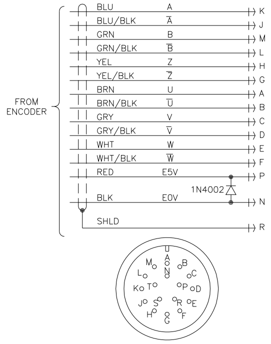






DETAIL A

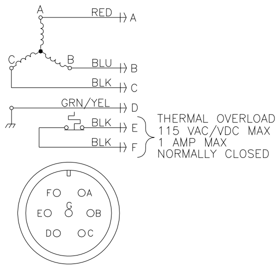
ENCODER CONNECTION
MS3102E20-29P



VIEW OF CONNECTOR
MATING SOCKET:
ENCODER: MS3106E20-29S

DETAIL B

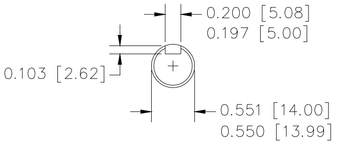
ARMATURE CONNECTION
MS3102E16S-1P



VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: MS3106E16S-1S

DETAIL C

MOTOR SHAFT DETAIL



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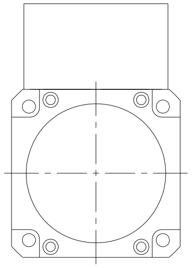
TITLE
MOTOR, DELTA SERIES, CUSTOM

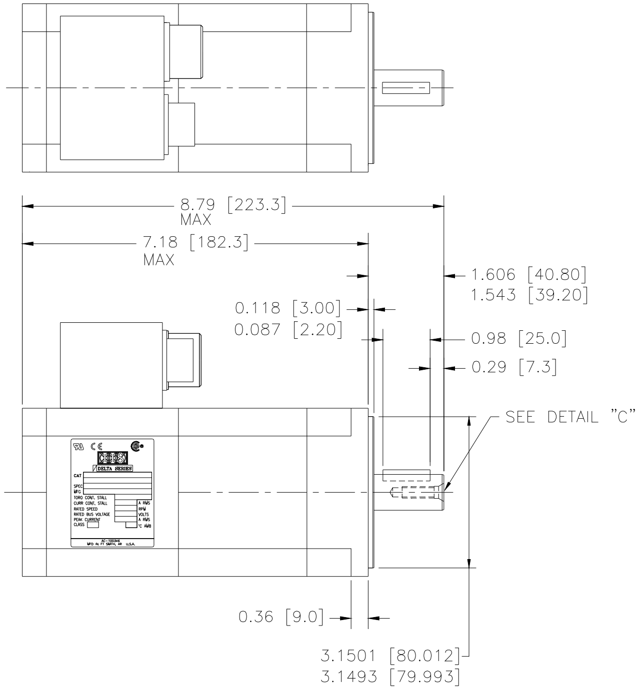
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
DRAWN BY: BOWMAN
DRAWING NUMBER: DBM-480/15E
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR: ± 0°30'
AutoCAD FILE LOCATION: Q:\CURRENT DWGS
B
DATE: 11SEP01
SCALE: ---
SHEET NO.: 1 OF 1
REVISION: 0

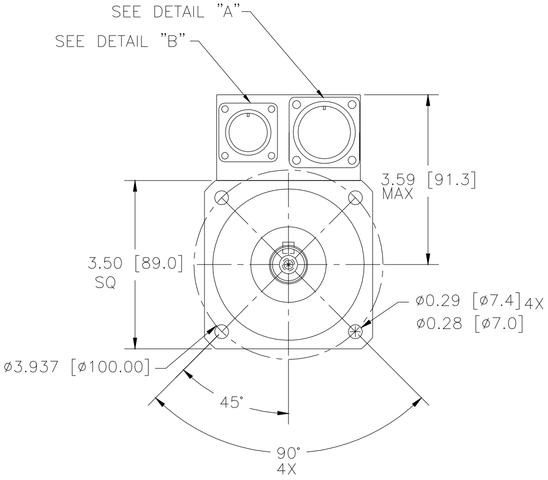
NOTES:

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 4.1 KG 9 LBS.
4.) MOTOR SHAFT SEAL STANDARD.
5.) THRUST LOAD 289 N 64 LBS.
6.) RADIAL LOAD 267 N 60 LBS.
7.) ENCODER 2048 LINE COUNT, 8192 PPR QTY 1 ZERO MARKER.
8.) IP-65 SEALING.

DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	A	PER ECN 00-248	CWB	EB	CDR

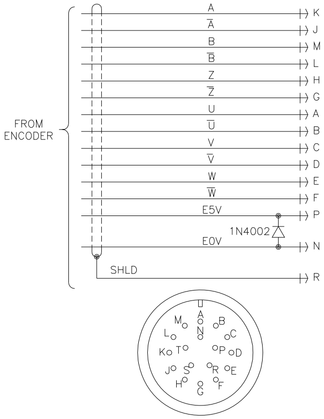






DETAIL A

ENCODER CONNECTION
MS3102E20-29P

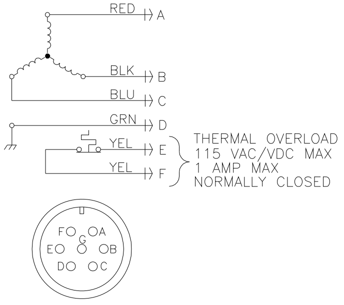


VIEW OF CONNECTOR

MATING SOCKET:
ENCODER: MS3106A20-29S

DETAIL B

ARMATURE CONNECTION
MS3100A16S-1P

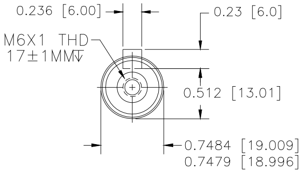


VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A16S-1S

DETAIL C

MOTOR SHAFT DIMENSIONS



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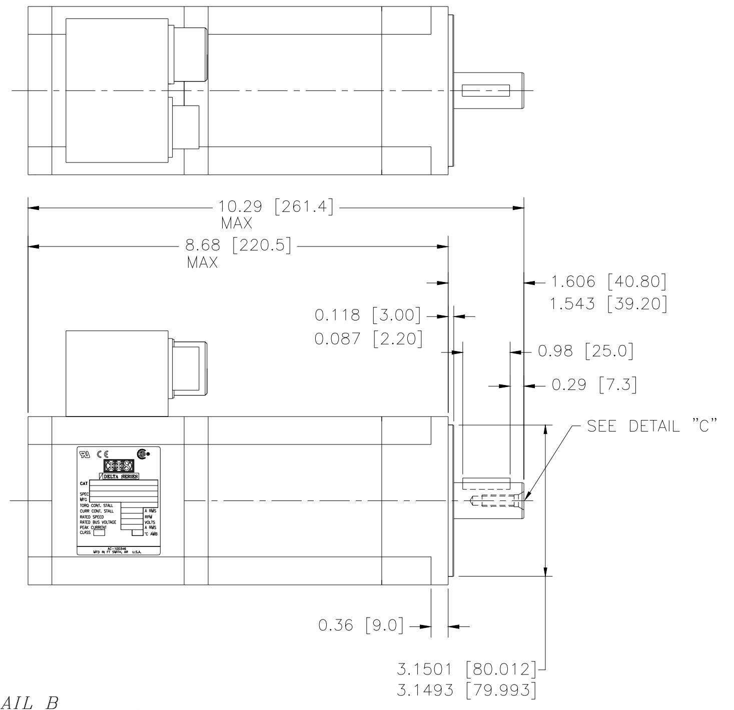
TITLE
MOTOR, DELTA SERIES

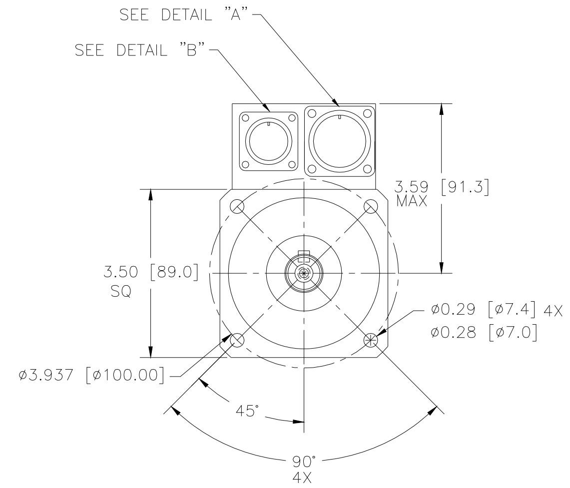
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 31DEC98
SCALE NTS
DRAWING NUMBER DBM-B380/30E
SHEET NO. 1 OF 1
REVISION A

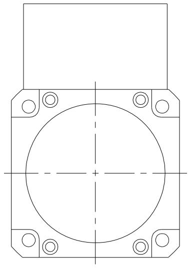
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	B	PER ECN 00-246	CWB	EB	CDR

NOTES:

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 6.4 KG 14 LBS.
4.) MOTOR SHAFT SEAL STANDARD.
5.) THRUST LOAD 289 N 64 LBS.
6.) RADIAL LOAD 267 N 60 LBS.
7.) ENCODER 2048 LINE COUNT 8192 PPR QTY 1 ZERO MARKER.
8.) IP-65 SEALING.

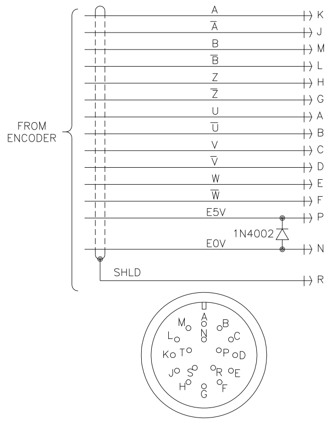






DETAIL A

ENCODER CONNECTION △A
MS3102E20-29P

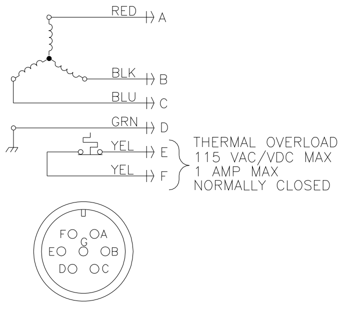


VIEW OF CONNECTOR

MATING SOCKET:
ENCODER: MS3106A20-29S

DETAIL B

ARMATURE CONNECTION △A
MS3100A16S-1P

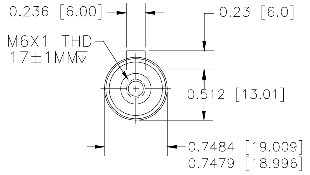


VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A16S-1S

DETAIL C

MOTOR SHAFT DIMENSIONS △A



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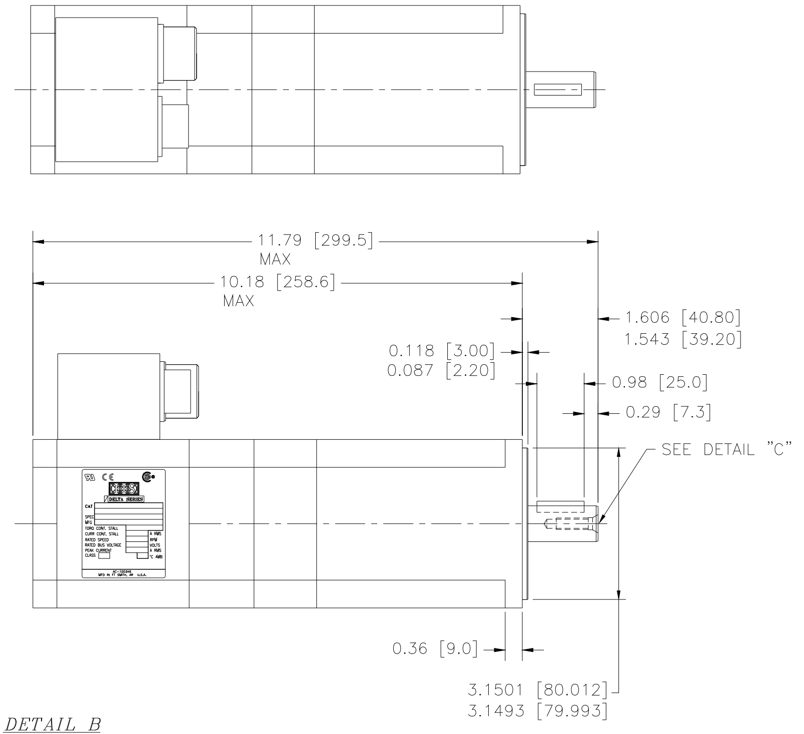
TITLE
MOTOR, DELTA SERIES

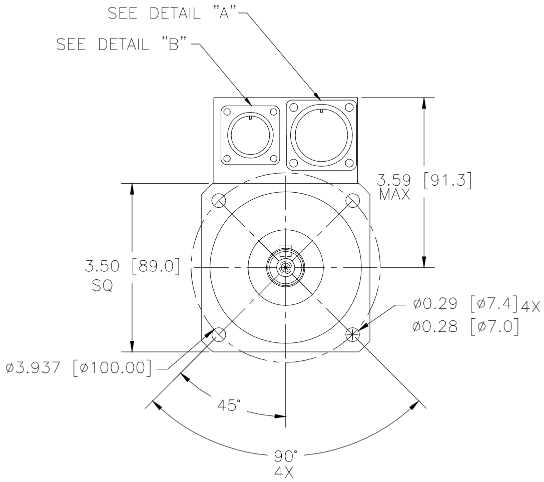
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY: BOWMAN
AutoCAD FILE LOCATION: Q:\CURRENT DWGS
B
DATE: 23OCT98
SCALE: NTS
DRAWING NUMBER: DBM-B630/30E
SHEET NO.: 1 OF 1
REVISION: B

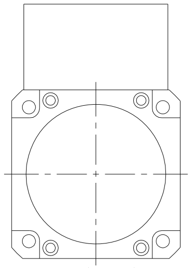
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	B	PER ECN 00-246	CWB	EB	CDR

NOTES:

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 8.6 KG 19 LBS.
4.) MOTOR SHAFT SEAL STANDARD.
5.) THRUST LOAD 289 N 64 LBS.
6.) RADIAL LOAD 267 N 60 LBS.
7.) ENCODER 2048 LINE COUNT, 8192 PPR QTY 1 ZERO MARKER.
8.) IP-65 SEALING.



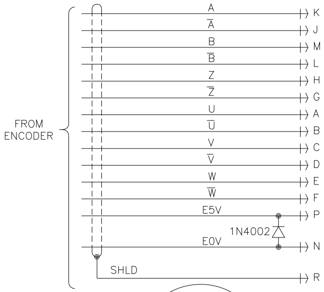


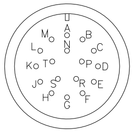


DETAIL A

ENCODER CONNECTION A

MS3102E20-29P





VIEW OF CONNECTOR

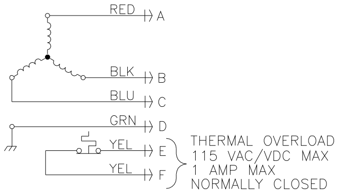
MATING SOCKET:

ENCODER: MS3106A20-29S

DETAIL B

ARMATURE CONNECTION A

MS3100A16S-1P



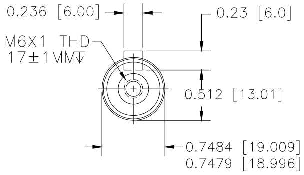
VIEW OF CONNECTOR

MATING SOCKET:

MOTOR: MS3106A16S-1S

DETAIL C

MOTOR SHAFT DIMENSIONS A



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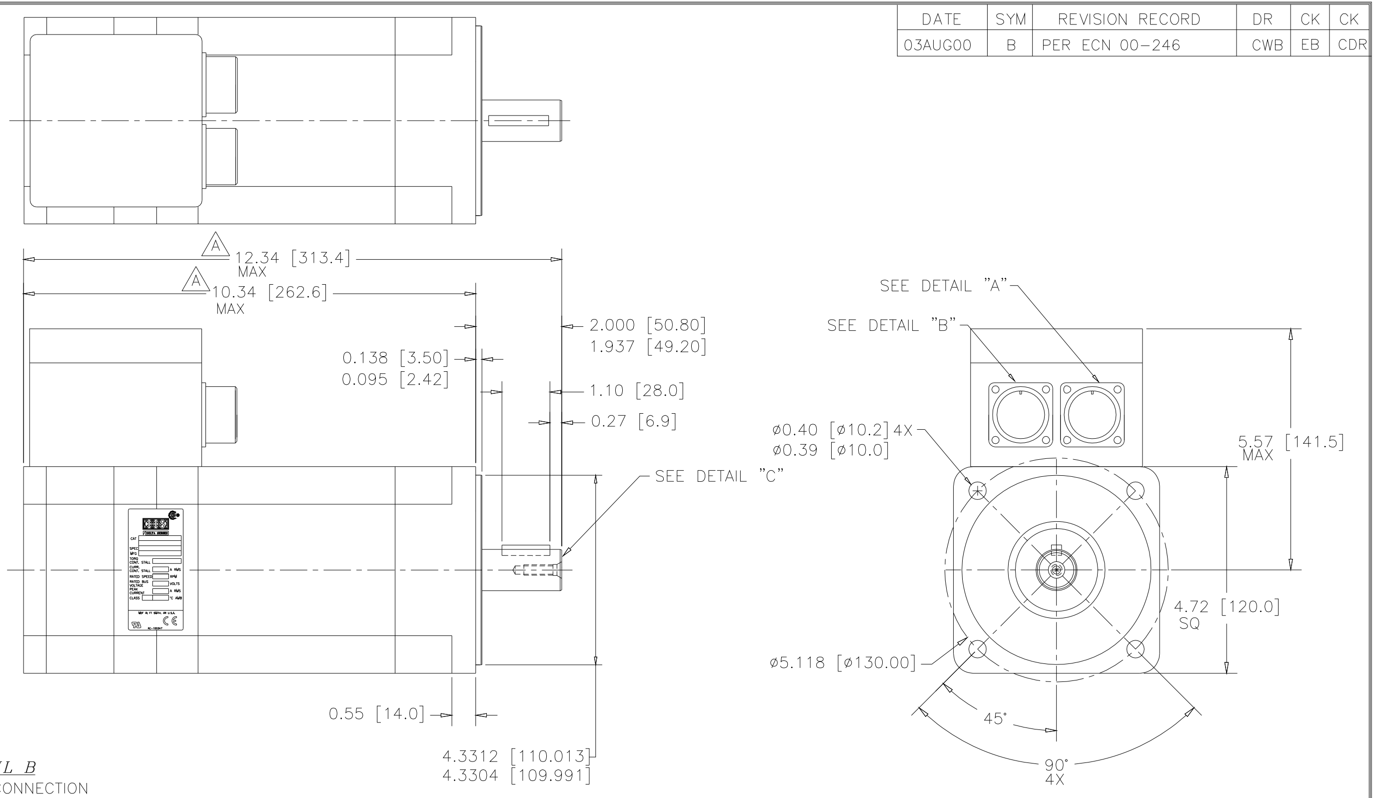
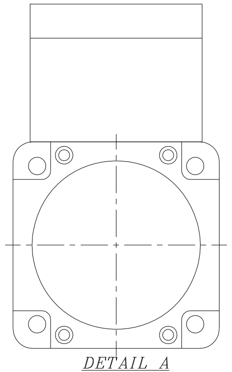
TITLE
MOTOR, DELTA SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 13MAR98
SCALE NTS
DRAWING NUMBER DBM-B800/30E
SHEET NO. 1 OF 1
REVISION B

NOTES:
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 13.6 KG 30 LBS
4.) MOTOR SHAFT SEAL STANDARD.
5.) THRUST LOAD 653 N 146 LBS.
6.) RADIAL LOAD 712 N 160 LBS
7.) ENCODER 2048 LINE COUNT, 8192 PPR
QTY 1 ZERO MARKER.
8.) IP-65 SEALING.

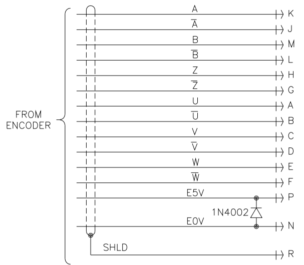
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	B	PER ECN 00-246	CWB	EB	CDR

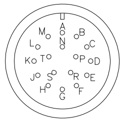




DETAIL A

ENCODER CONNECTION
MS3102E20-29P



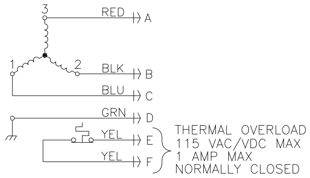


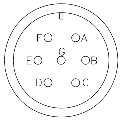
VIEW OF CONNECTOR

MATING SOCKET:
ENCODER: MS3106A20-29S

DETAIL B

ARMATURE CONNECTION
MS3102A20-15P



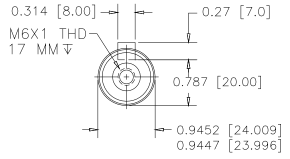


VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A20-15S

DETAIL C

MOTOR SHAFT DIMENSIONS



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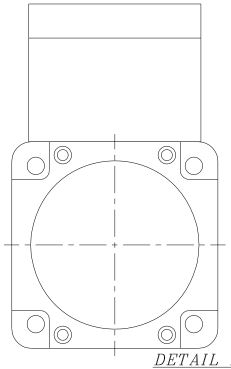
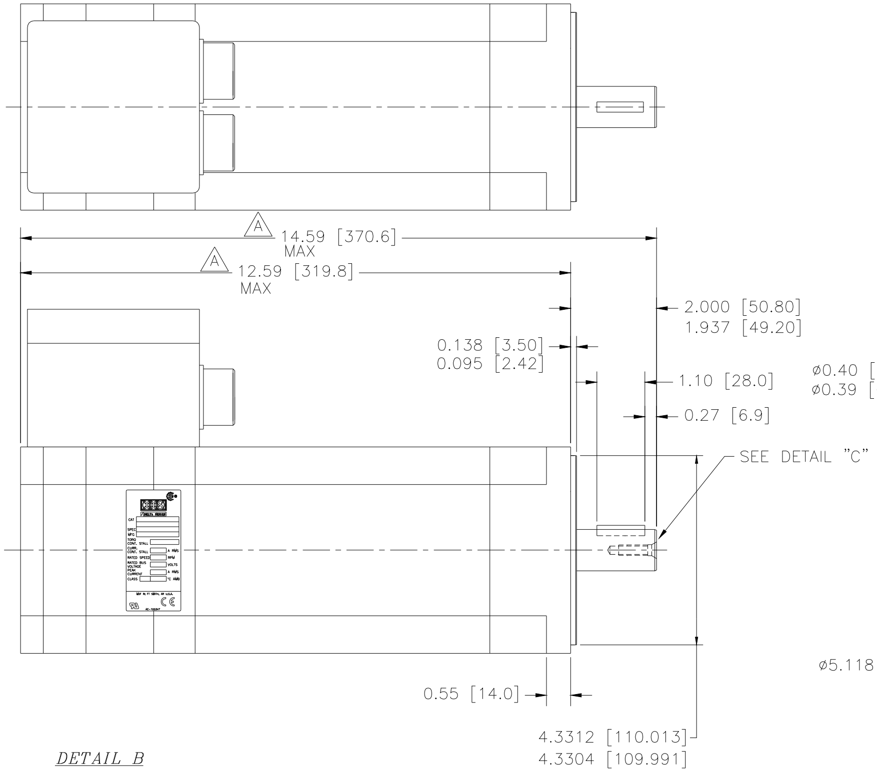
TITLE
MOTOR, DELTA SERIES

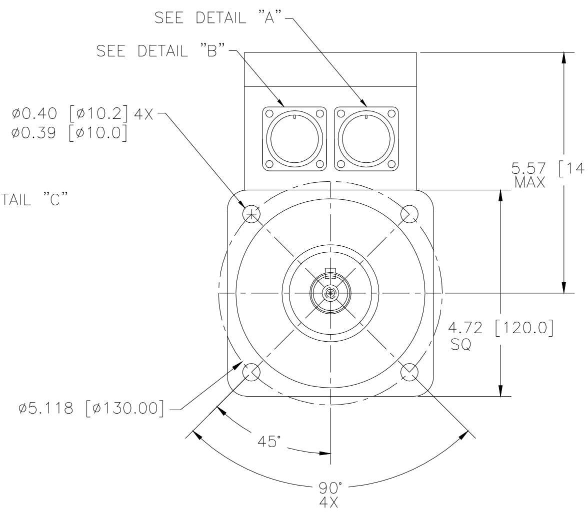
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)		DRAWN BY BOWMAN		DRAWING NUMBER DBM-B1060/30E	
TOLERANCES		AutoCAD FILE LOCATION Q:\CURRENT DWGS			
X.X± --- X.XX± 0.01 X.XXX± 0.005	ANGULAR ± 0°30'	B	DATE 30DEC98	SCALE NTS	SHEET NO. 1 OF 1	REVISION B

DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	B	PER ECN 00-246	CWB	EB	CDR

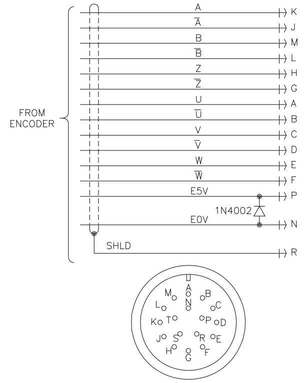
NOTES:
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 18.6 KG 41 LBS
4.) MOTOR SHAFT SEAL STANDARD.
5.) THRUST LOAD 653 N 146 LBS.
6.) RADIAL LOAD 712 N 160 LBS.
7.) ENCODER 2048 LINE COUNT, 8192 PPR
QTY 1 ZERO MARKER.
8.) IP-65 SEALING.





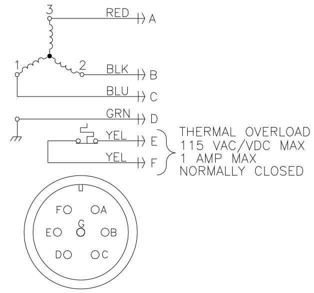


DETAIL A
ENCODER CONNECTION
MS3102E20-29P



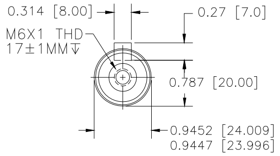
VIEW OF CONNECTOR
MATING SOCKET:
ENCODER: MS3106A20-29S

DETAIL B
ARMATURE CONNECTION
MS3102A20-15P



VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: MS3106A20-15S

DETAIL C
MOTOR SHAFT DIMENSIONS



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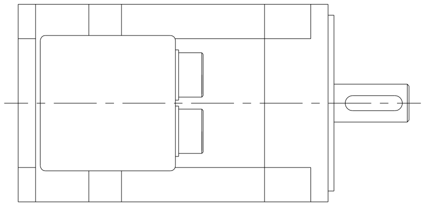
TITLE
MOTOR, DELTA SERIES

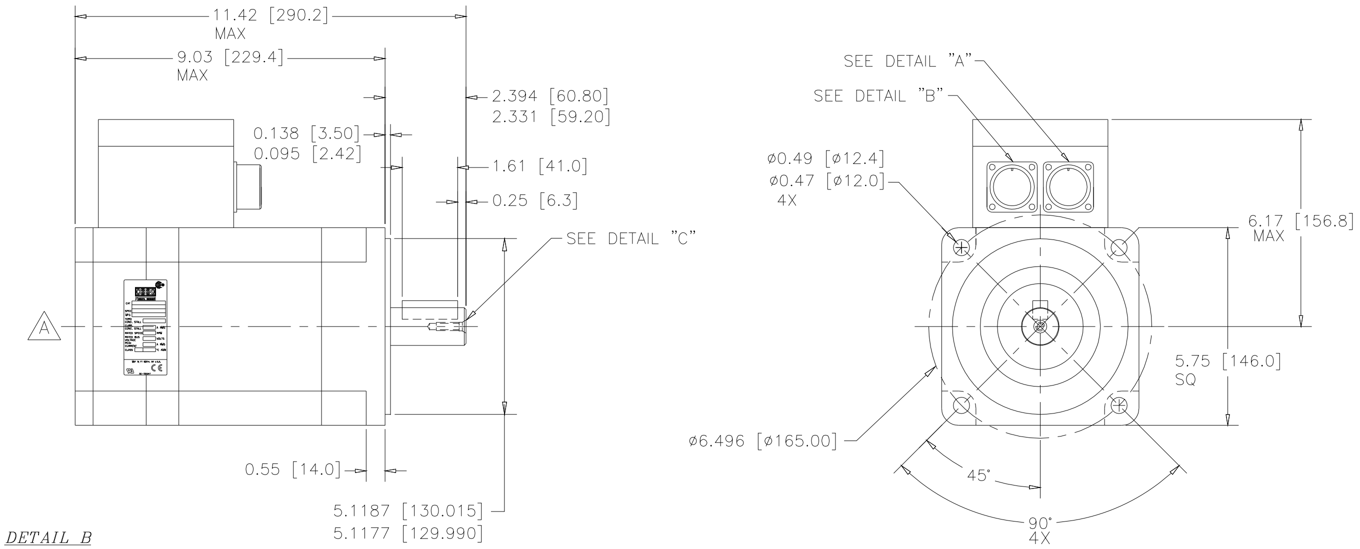
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 30DEC98
SCALE NTS
DRAWING NUMBER DBM-B1600/30E
SHEET NO. 1 OF 1
REVISION B

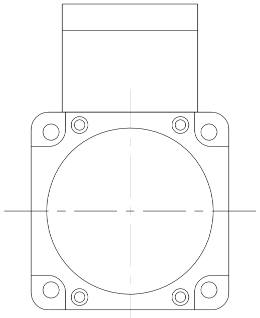
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	B	PER ECN 00-246	CWB	EB	CDR

NOTES:

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 15 KG 33 LBS.
4.) MOTOR SHAFT SEAL STANDARD.
5.) THRUST LOAD 890 N 200 LBS.
6.) RADIAL LOAD 1113 N 250 LBS.
7.) ENCODER 2048 LINE COUNT, 8192 PPR
QTY 1 ZERO MARKER.
8.) IP-65 SEALING.

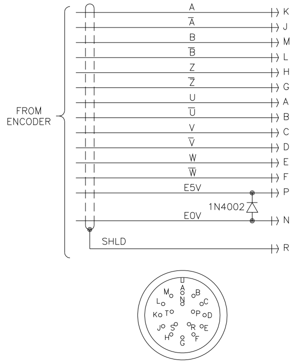






DETAIL A

ENCODER CONNECTION
MS3102E20-29P

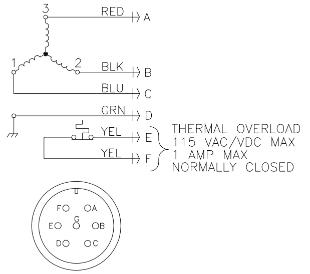


VIEW OF CONNECTOR

MATING SOCKET:
ENCODER: MS3106A20-29S

DETAIL B

ARMATURE CONNECTION
MS3102A20-15P

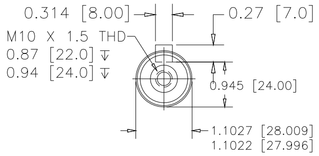


VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A20-15S

DETAIL C

MOTOR SHAFT DIMENSIONS



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TITLE
MOTOR, DELTA SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'

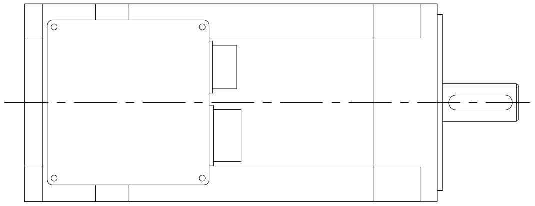
DRAWN BY
BOWMAN
AutoCAD FILE LOCATION
Q:\CURRENT DWGS
B
DATE
11JAN99
SCALE
NTS

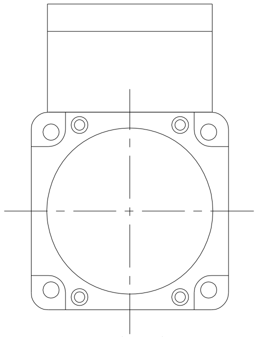
DRAWING NUMBER
DBM-B1900/30E
SHEET NO.
1 OF 1
REVISION
B

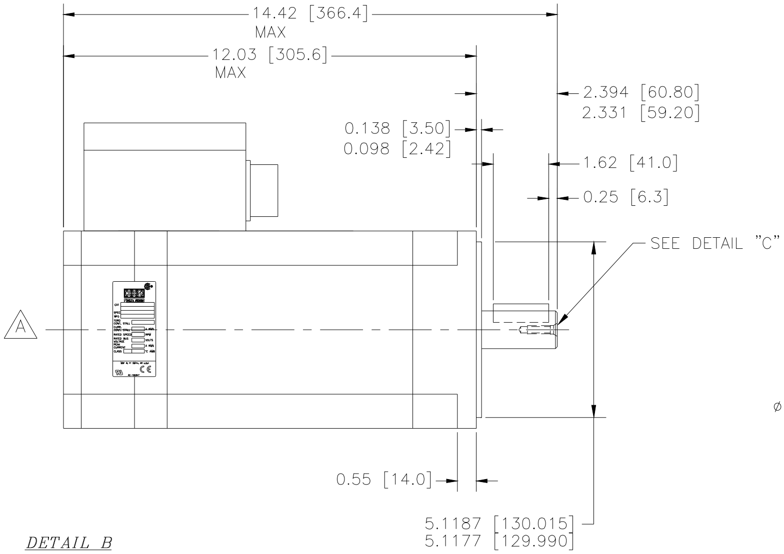
DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	B	PER ECN 00-246	CWB	EB	CDR

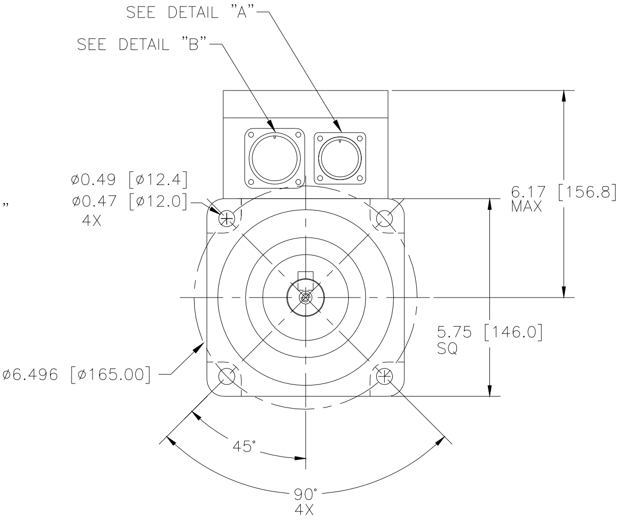
NOTES:

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 23.6 KG 52 LBS.
4.) MOTOR SHAFT SEAL STANDARD.
5.) THRUST LOAD 890 N 200 LBS.
6.) RADIAL LOAD 1113 N 250 LBS.
7.) ENCODER 2048 LINE COUNT, 8192 PPR QTY 1 ZERO MARKER.
8.) IP-65 SEALING.



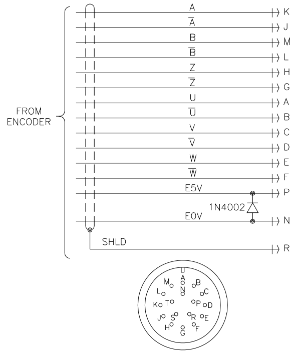






DETAIL A

ENCODER CONNECTION
MS3102E20-29P

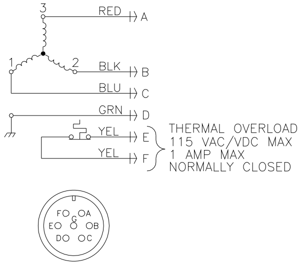


VIEW OF CONNECTOR

MATING SOCKET:
ENCODER: MS3106A20-29S

DETAIL B

ARMATURE CONNECTION
MS3102A24-10P

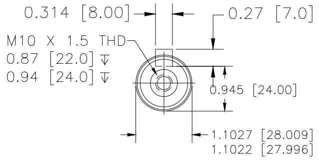


VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A24-10S

DETAIL C

MOTOR SHAFT DIMENSIONS



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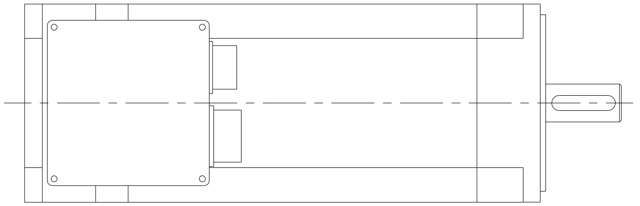
TITLE
MOTOR, DELTA SERIES

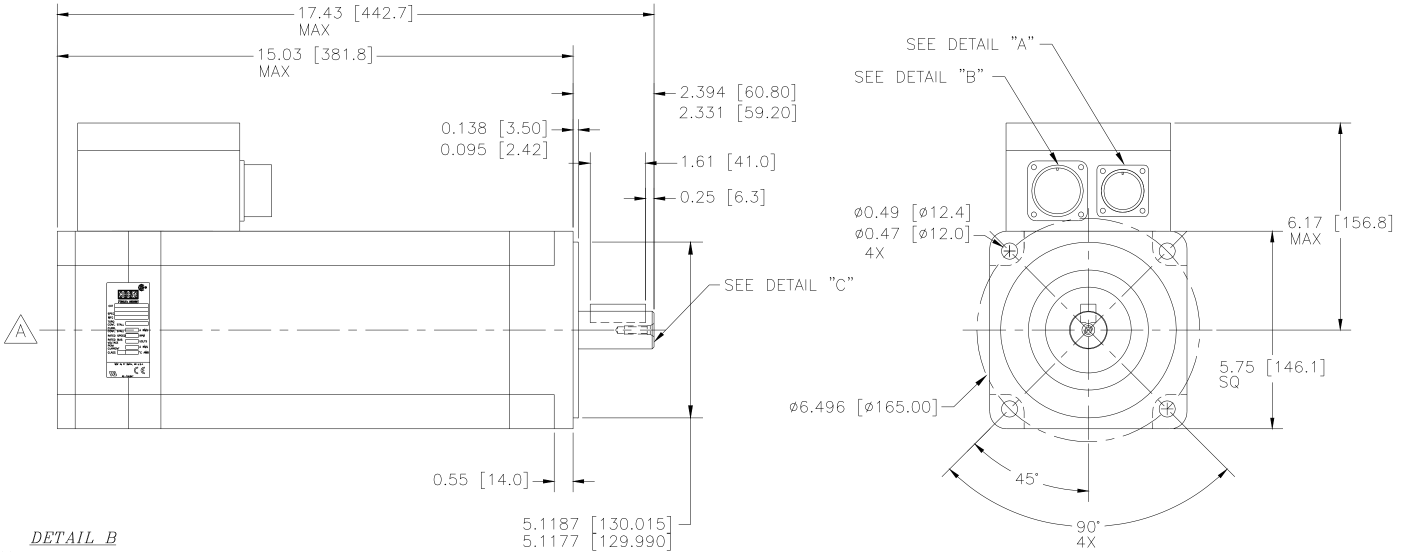
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
DRAWN BY: BOWMAN
DRAWING NUMBER: DBM-B3000/30E
TOLERANCES
AutoCAD FILE LOCATION: Q:\CURRENT DWGS
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR: ± 0°30'
B
DATE: 11JAN99
SCALE: NTS
SHEET NO.: 1 OF 1
REVISION: B

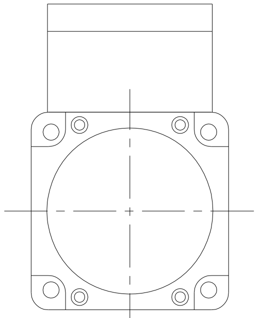
NOTES:

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 32.3 KG 71 LBS.
4.) MOTOR SHAFT SEAL STANDARD.
5.) THRUST LOAD 890 N 200 LBS.
6.) RADIAL LOAD 1113 N 250 LBS.
7.) ENCODER 2048 LINE COUNT, 8192 PPR QTY 1 ZERO MARKER.
8.) IP-65 SEALING.

DATE	SYM	REVISION RECORD	DR	CK	CK
03AUG00	B	PER ECN 00-246	CWB	EB	CDR

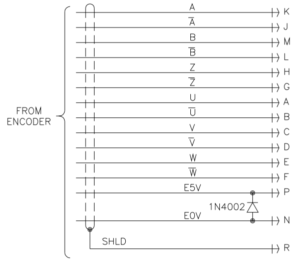


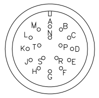




DETAIL A

ENCODER CONNECTION
MS3102E20-29P



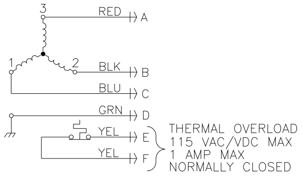


VIEW OF CONNECTOR

MATING SOCKET:
ENCODER: MS3106A20-29S

DETAIL B

ARMATURE CONNECTION
MS3102A24-10P

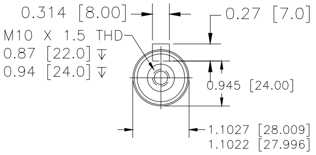


VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A24-10S

DETAIL C

MOTOR SHAFT DIMENSIONS



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TITLE
MOTOR, DELTA SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'

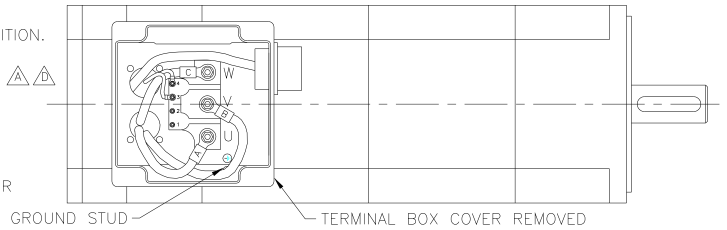
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 11JAN99
SCALE NTS

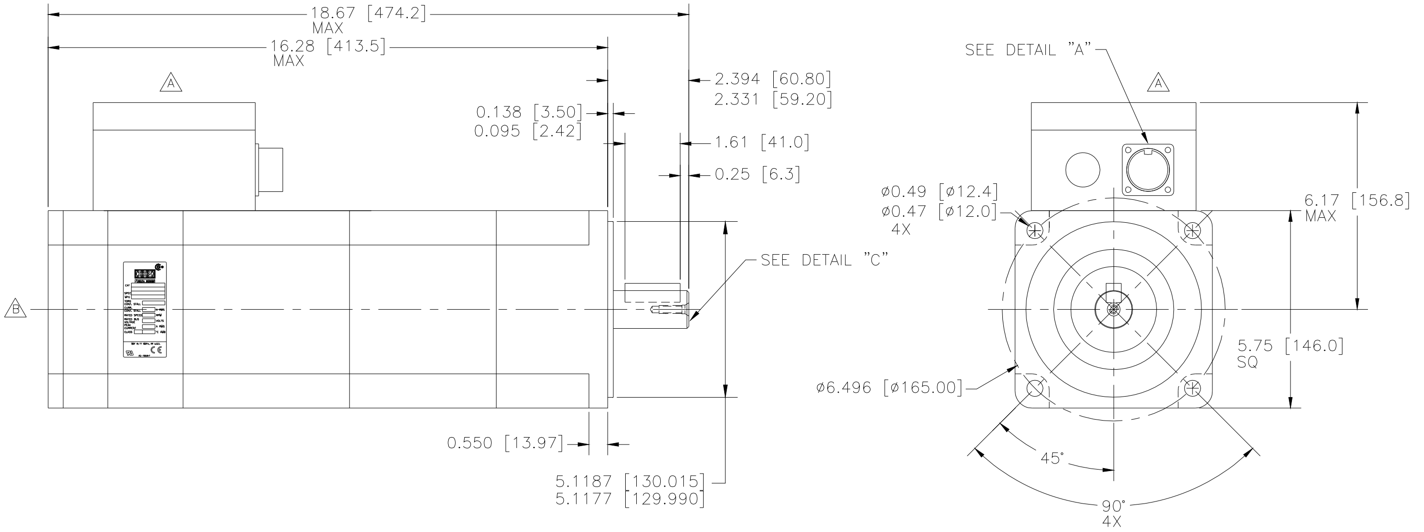
DRAWING NUMBER DBM-B4400/30E
SHEET NO. 1 OF 1
REVISION B

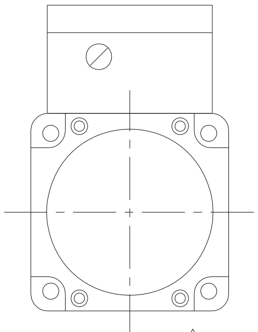
DATE	SYM	REVISION RECORD	DR	CK	CK
17AUG01	E	PER ECN 01-284	CWB	EB	CDR

NOTES: A

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 36 KG 79 LBS. A D
4.) MOTOR SHAFT SEAL STANDARD.
5.) THRUST LOAD 890 N 200 LBS.
6.) RADIAL LOAD 1113 N 250 LBS.
7.) ENCODER 2048 LINE COUNT, 8192 PPR
QTY 1 ZERO MARKER.
8.) IP-65 SEALING.

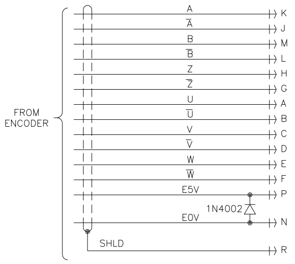


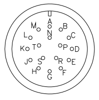




DETAIL A A

ENCODER CONNECTION
MS3102E20-29P



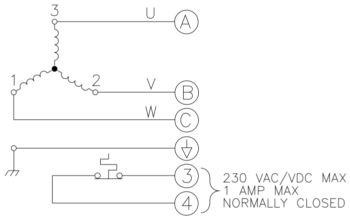


VIEW OF CONNECTOR

MATING SOCKET:
ENCODER: MS3106A20-29S

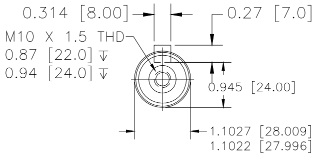
DETAIL B A D

ARMATURE CONNECTION



DETAIL C A

MOTOR SHAFT DIMENSIONS



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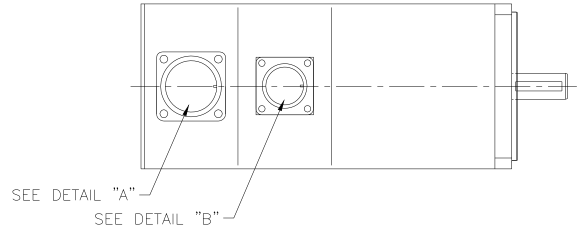
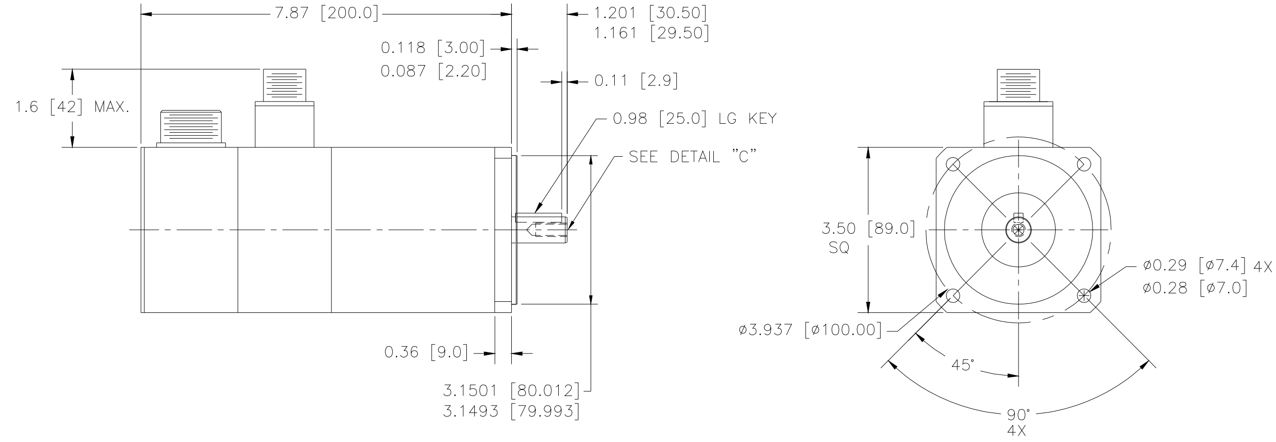
TITLE
MOTOR, DELTA SERIES

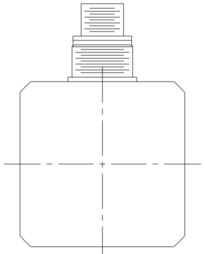
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
DRAWN BY: BOWMAN
DRAWING NUMBER: DBM-B5600/30E
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
B
AutoCAD FILE LOCATION: Q:\CURRENT DWGS
DATE: 02OCT97
SCALE: NTS
SHEET NO. 1 OF 1
REVISION: E

NOTES:
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 6 KG 13.2 LBS.
4.) THRUST LOAD 120 N 26.9 LBS.
5.) RADIAL LOAD 700 N 157.3 LBS.
6.) ENCODER 2500 LINE COUNT, 10,000 PPR, QTY 1 ZERO MARKER.
7.) IP-55 SEALING.
8.) MOTOR SHAFT SEAL IS STANDARD.

DATE	SYM	REVISION RECORD	DR	CK	CK
14FEB03	0	PER ECN 03-076	CWB		

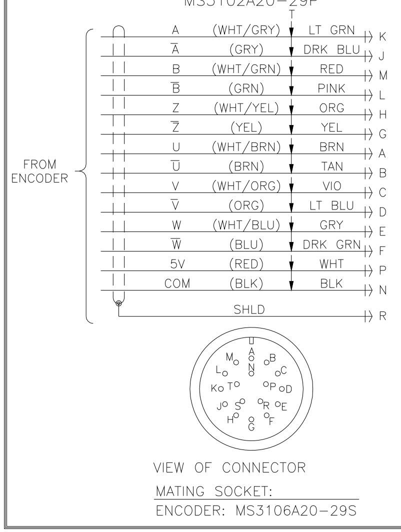






DETAIL A

ENCODER CONNECTION
MS3102A20-29P

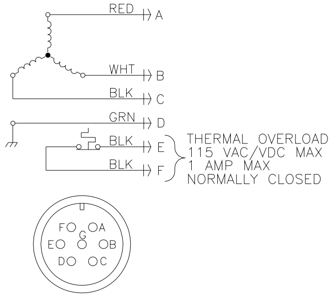


VIEW OF CONNECTOR

MATING SOCKET:
ENCODER: MS3106A20-29S

DETAIL B

ARMATURE CONNECTION
MS3102A16S-1P

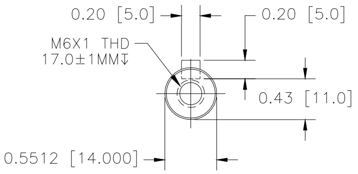


VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A16S-1S

DETAIL C

MOTOR SHAFT DIMENSIONS



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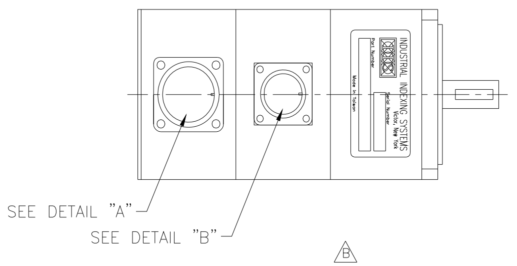
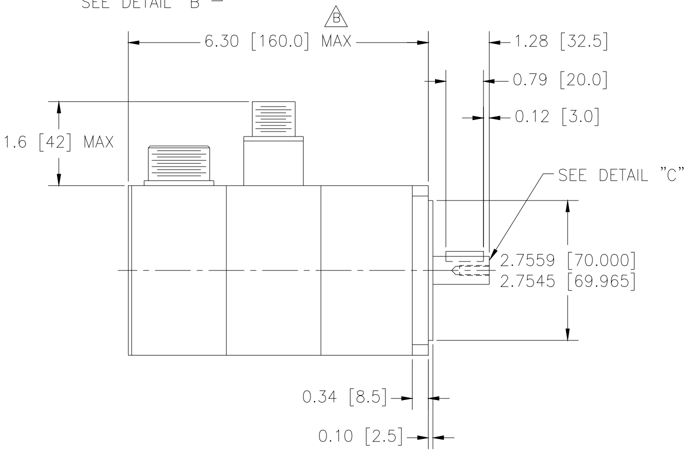
TITLE
MOTOR, DELTA SERIES

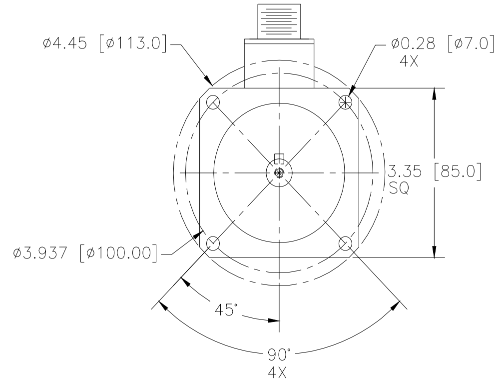
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
DRAWN BY BOWMAN
DRAWING NUMBER DBM-C740/15E
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 14FEB03
SCALE ---
SHEET NO. 1 OF 1
REVISION 0

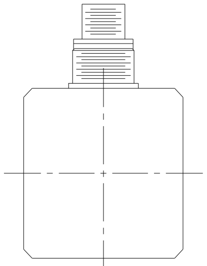
DATE	SYM	REVISION RECORD	DR	CK	CK
09JUL03	B	PER ECN 03-303	CWB		

NOTES:
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 3 KG 6.6 LBS.
4.) THRUST LOAD 120 N 26.9 LBS
5.) RADIAL LOAD 600 N 134.5 LBS
6.) ENCODER 2500 LINE COUNT, 10,000 PPR, QTY 1 ZERO MARKER.
7.) IP-55 SEALING.
8.) MOTOR SHAFT SEAL IS STANDARD.



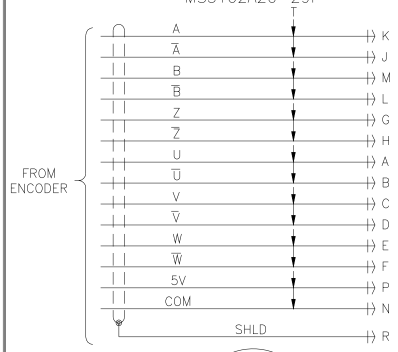


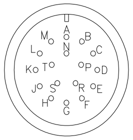




DETAIL A

ENCODER CONNECTION
MS3102A20-29P

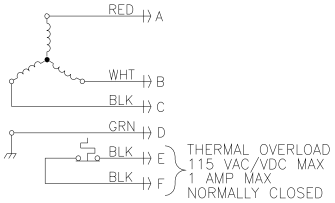


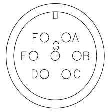


VIEW OF CONNECTOR
MATING SOCKET:
ENCODER: MS3106A20-29S

DETAIL B

ARMATURE CONNECTION
MS3102A16S-1P

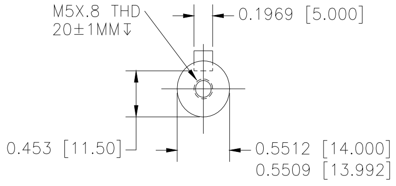




VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: MS3106A16S-1S

DETAIL C

MOTOR SHAFT DIMENSIONS



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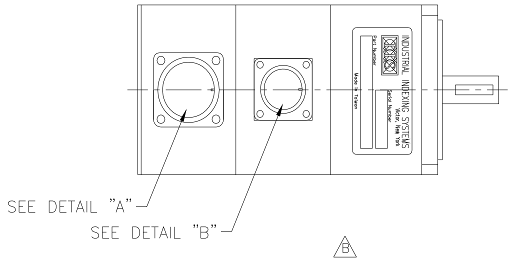
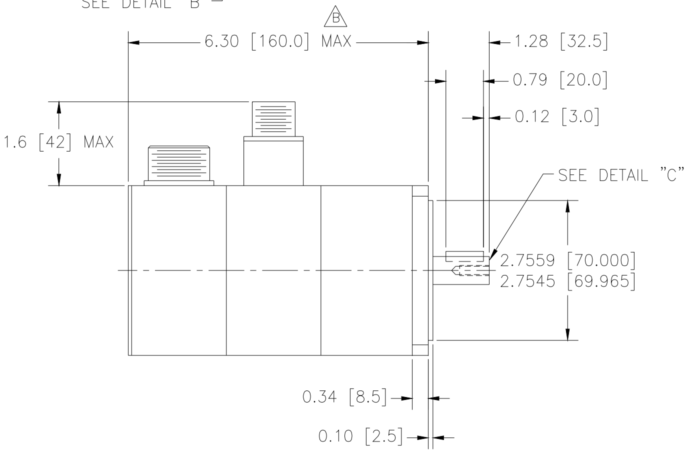
TITLE
MOTOR, DELTA SERIES

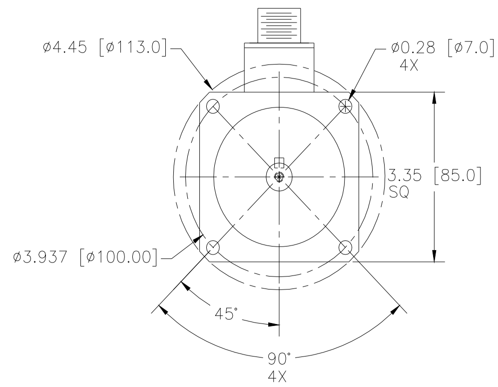
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)	DRAWN BY BOWMAN		DRAWING NUMBER	
TOLERANCES	AutoCAD FILE LOCATION Q:\CURRENT DWGS		DBM85-E400/20E	
X.X± --- X.XX± 0.01 X.XXX± 0.005	ANGULAR ± 0°30'	B	DATE 06MAR03	SCALE ---	SHEET NO. 1 OF 1	REVISION B

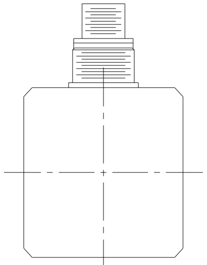
DATE	SYM	REVISION RECORD	DR	CK	CK
09JUL03	B	PER ECN 03-303	CWB		

NOTES:
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 3 KG 6.6 LBS.
4.) THRUST LOAD 120 N 26.9 LBS
5.) RADIAL LOAD 600 N 134.8 LBS
6.) ENCODER 2500 LINE COUNT, 10,000 PPR, QTY 1 ZERO MARKER.
7.) IP-55 SEALING.
8.) MOTOR SHAFT SEAL IS STANDARD.



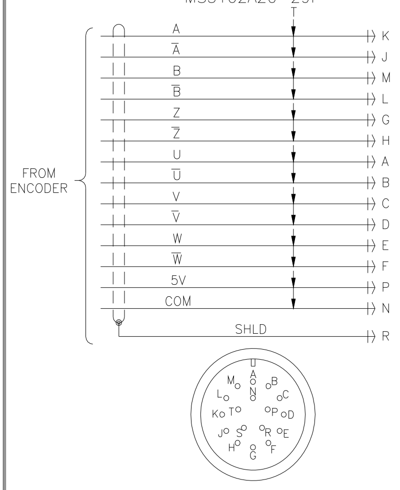






DETAIL A

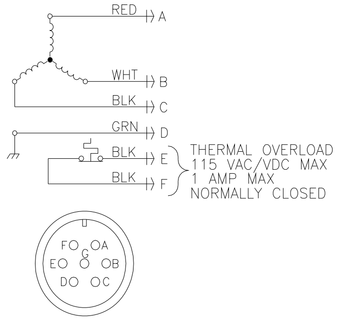
ENCODER CONNECTION
MS3102A20-29P



VIEW OF CONNECTOR
MATING SOCKET:
ENCODER: MS3106A20-29S

DETAIL B

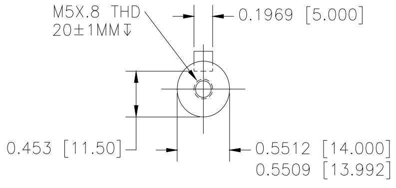
ARMATURE CONNECTION
MS3102A16S-1P



VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: MS3106A16S-1S

DETAIL C

MOTOR SHAFT DIMENSIONS



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TITLE
MOTOR, DELTA SERIES

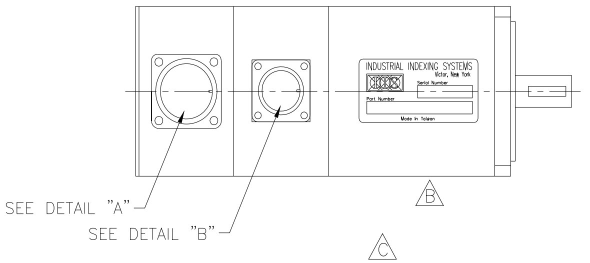
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'
DRAWN BY
BOWMAN
AutoCAD FILE LOCATION
Q:\CURRENT DWGS
B
DATE
11FEB03
SCALE

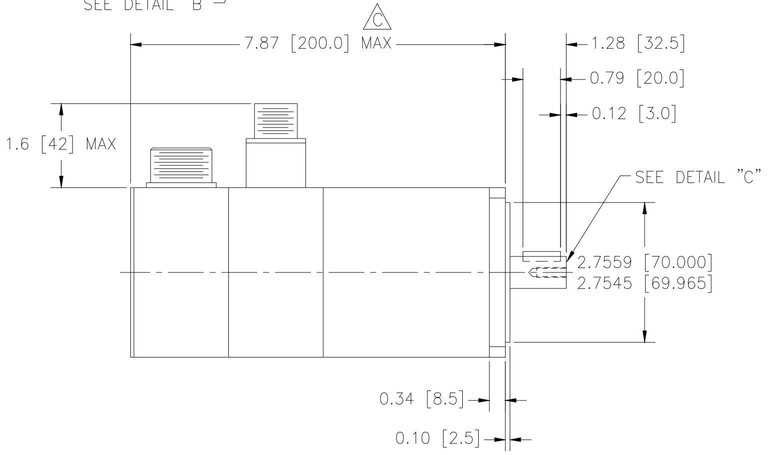
DRAWING NUMBER
DBM85-E525/30E
SHEET NO.
1 OF 1
REVISION
B

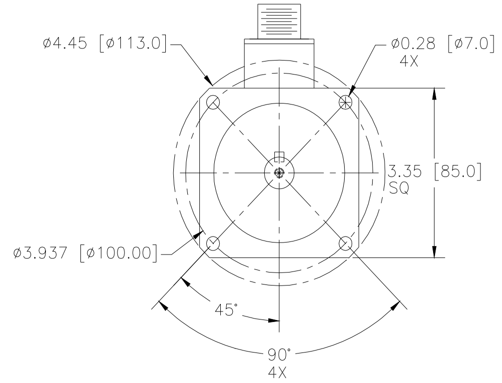
NOTES:

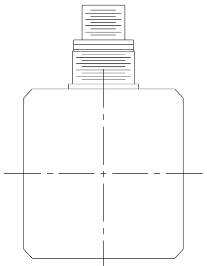
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 5 KG 11 LBS.
4.) THRUST LOAD 120 N 26.9 LBS
5.) RADIAL LOAD 700 N 157.3 LBS
6.) ENCODER 2500 LINE COUNT, 10,000 PPR, QTY 1 ZERO MARKER.
7.) IP-55 SEALING.
8.) MOTOR SHAFT SEAL IS STANDARD.

DATE	SYM	REVISION RECORD	DR	CK	CK
09JUL03	C	PER ECN 03-303	CWB		



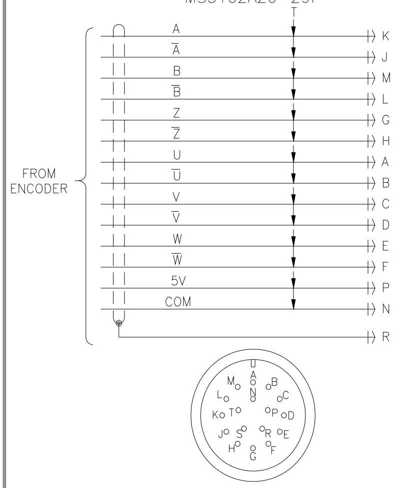






DETAIL A

ENCODER CONNECTION
MS3102A20-29P

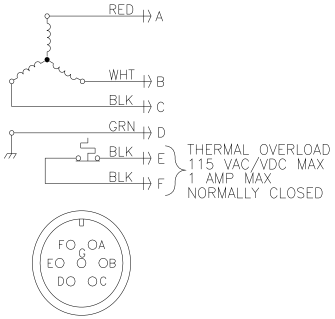


VIEW OF CONNECTOR

MATING SOCKET:
ENCODER: MS3106A20-29S

DETAIL B

ARMATURE CONNECTION
MS3102A16S-1P

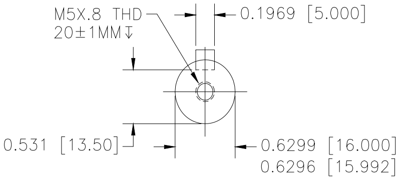


VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A16S-1S

DETAIL C

MOTOR SHAFT DIMENSIONS



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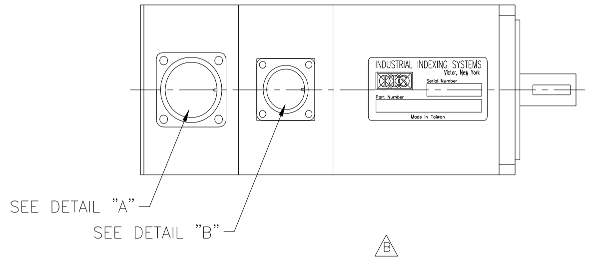
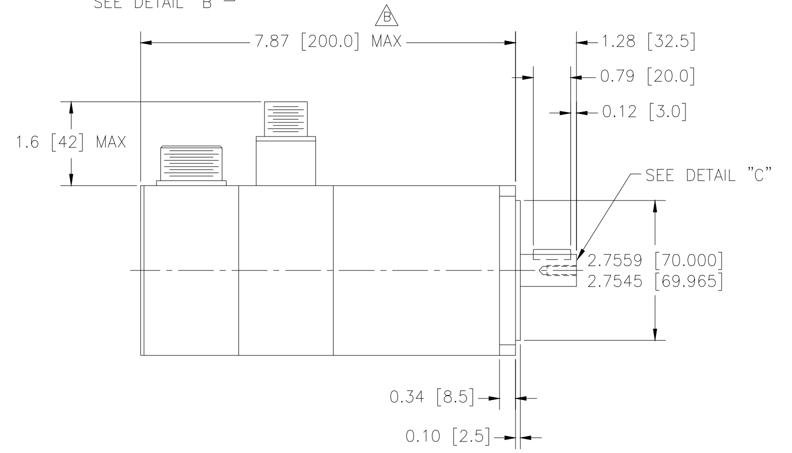
TITLE
MOTOR, DELTA SERIES

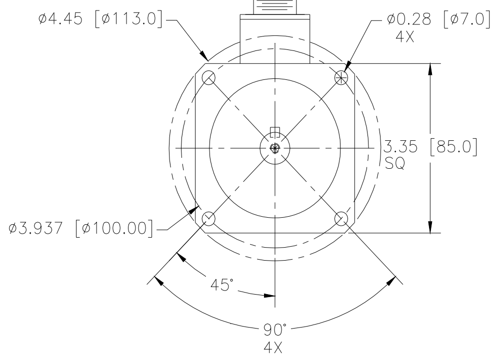
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)		DRAWN BY BOWMAN		DRAWING NUMBER	
TOLERANCES		AutoCAD FILE LOCATION Q:\CURRENT DWGS		DBM85-E750/20E	
X.X± --- X.XX± 0.01 X.XXX± 0.005	ANGULAR ± 0°30'	B	DATE 11FEB03	SCALE ---	SHEET NO. 1 OF 1	REVISION C

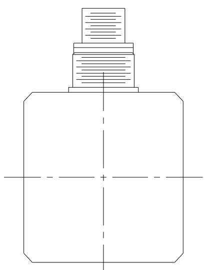
NOTES:
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 5 KG 11 LBS.
4.) THRUST LOAD 120 N 26.9 LBS
5.) RADIAL LOAD 700 N 157.3 LBS
6.) ENCODER 2500 LINE COUNT, 10,000 PPR, QTY 1 ZERO MARKER.
7.) IP-55 SEALING.
8.) MOTOR SHAFT SEAL IS STANDARD.

DATE	SYM	REVISION RECORD	DR	CK	CK
09JUL03	B	PER ECN 03-303	CWB		



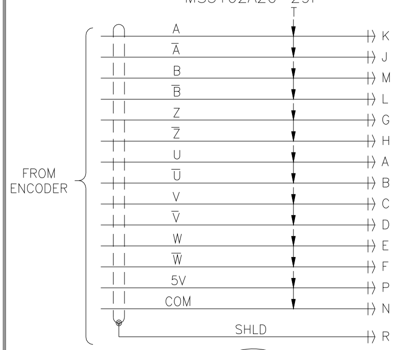


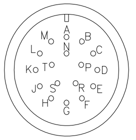




DETAIL A

ENCODER CONNECTION
MS3102A20-29P



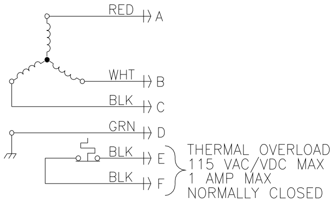


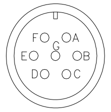
VIEW OF CONNECTOR

MATING SOCKET:
ENCODER: MS3106A20-29S

DETAIL B

ARMATURE CONNECTION
MS3102A16S-1P



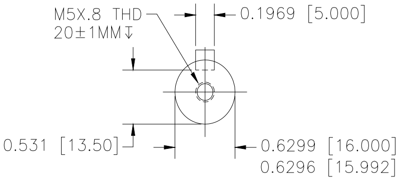


VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A16S-1S

DETAIL C

MOTOR SHAFT DIMENSIONS



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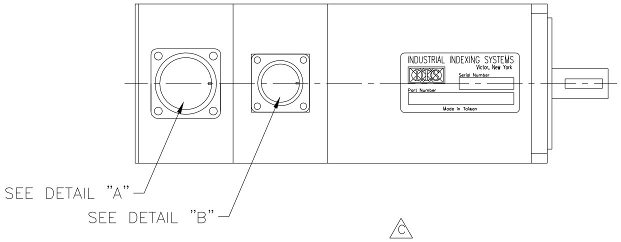
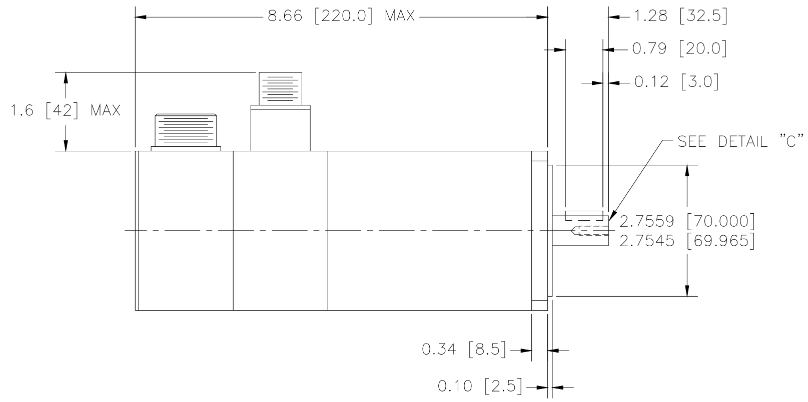
TITLE
MOTOR, DELTA SERIES

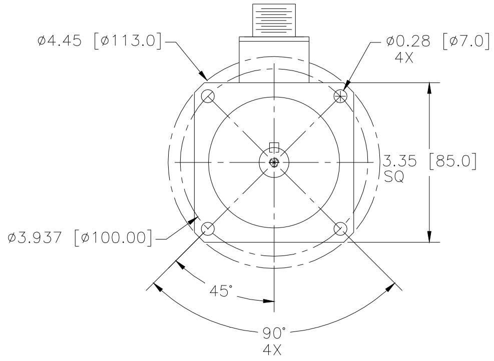
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)		DRAWN BY BOWMAN		DRAWING NUMBER	
TOLERANCES		AutoCAD FILE LOCATION Q:\CURRENT DWGS		DBM85-E850/30E	
X.X± ---	ANGULAR	B	DATE 11FEB03	SCALE ---	SHEET NO. 1 OF 1
X.XX± 0.01	± 0°30'				REVISION B
X.XXX± 0.005					

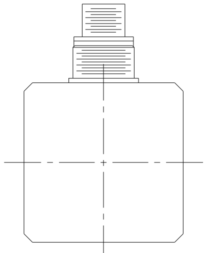
NOTES:
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 6 KG 13.2 LBS.
4.) THRUST LOAD 120 N 26.9 LBS
5.) RADIAL LOAD 700 N 157.3 LBS
6.) ENCODER 2500 LINE COUNT, 10,000 PPR, QTY 1 ZERO MARKER.
7.) IP-55 SEALING.
8.) MOTOR SHAFT SEAL IS STANDARD.

DATE	SYM	REVISION RECORD	DR	CK	CK
27JUN03	C	PER ECN 03-303	EB		



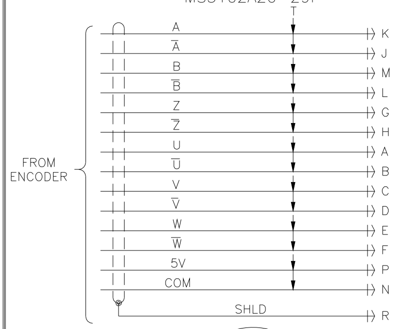


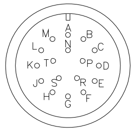




DETAIL A

ENCODER CONNECTION
MS3102A20-29P



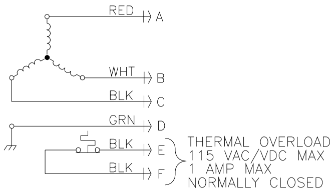


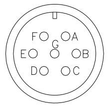
VIEW OF CONNECTOR

MATING SOCKET:
ENCODER: MS3106A20-29S

DETAIL B

ARMATURE CONNECTION
MS3102A16S-1P



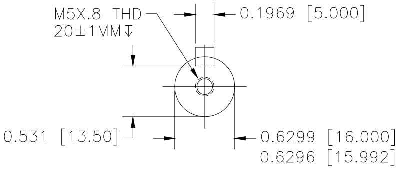


VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A16S-1S

DETAIL C

MOTOR SHAFT DIMENSIONS



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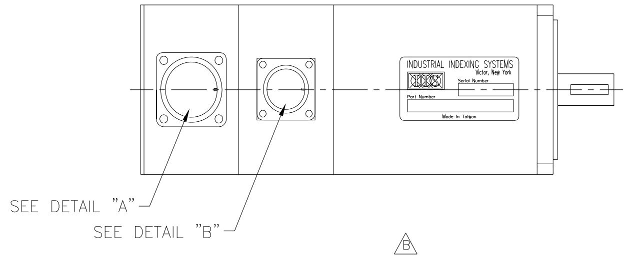
TITLE
MOTOR, DELTA SERIES

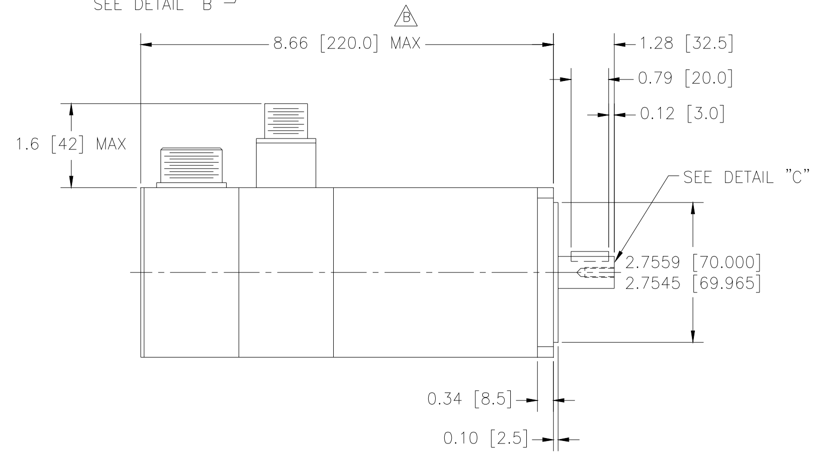
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
B
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
DATE 02JAN03
SCALE ---
DRAWING NUMBER DBM85-E1000/20E
SHEET NO. 1 OF 1
REVISION C

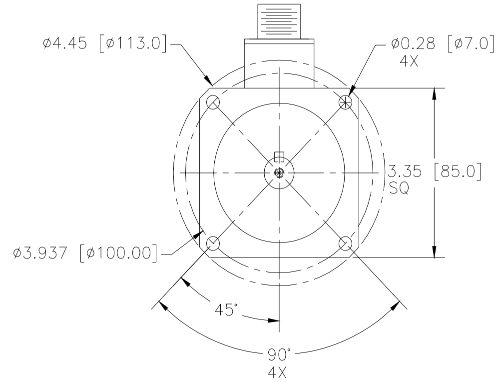
NOTES:

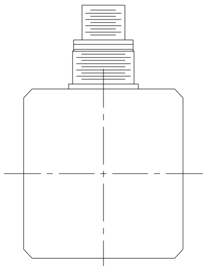
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES (MM).
3.) MOTOR WEIGHT 6 KG 13.2 LBS.
4.) THRUST LOAD 120 N 26.9 LBS
5.) RADIAL LOAD 700 N 157.3 LBS
6.) ENCODER 2500 LINE COUNT,
10,000 PPR, QTY 1 ZERO MARKER.
7.) IP-55 SEALING.
8.) MOTOR SHAFT SEAL IS STANDARD.

DATE	SYM	REVISION RECORD	DR	CK	CK
09JUL03	B	PER ECN 03-303	CWB		



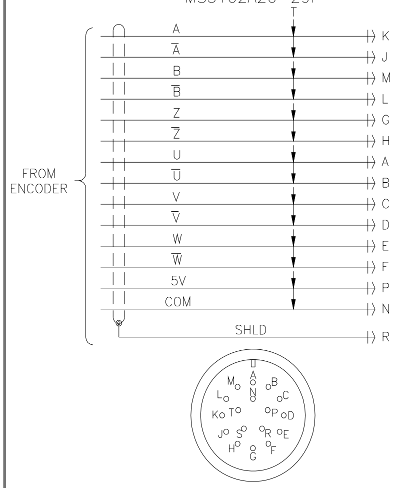






DETAIL A

ENCODER CONNECTION
MS3102A20-29P

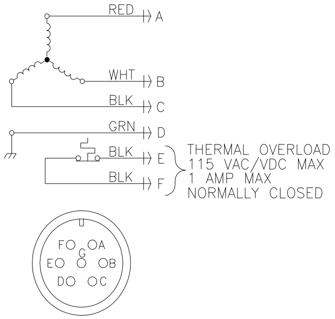


VIEW OF CONNECTOR

MATING SOCKET:
ENCODER: MS3106A20-29S

DETAIL B

ARMATURE CONNECTION
MS3102A16S-1P

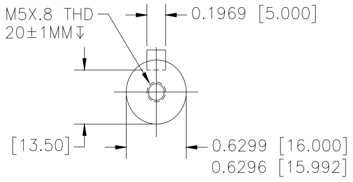


VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106A16S-1S

DETAIL C

MOTOR SHAFT DIMENSIONS



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TITLE
MOTOR, DELTA SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'

DRAWN BY
BOWMAN

AutoCAD FILE LOCATION
Q:\CURRENT DWGS

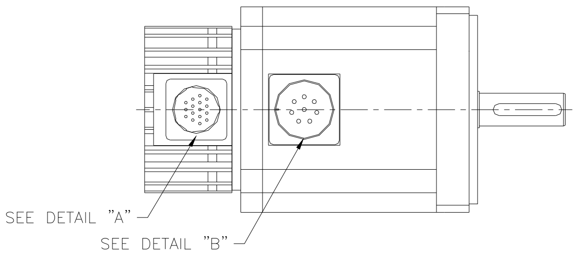
B
DATE
11FEB03
SCALE

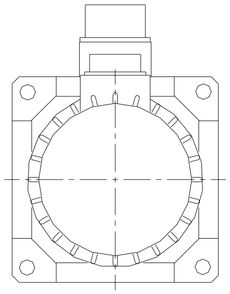
DRAWING NUMBER
DBM85-E1200/30E

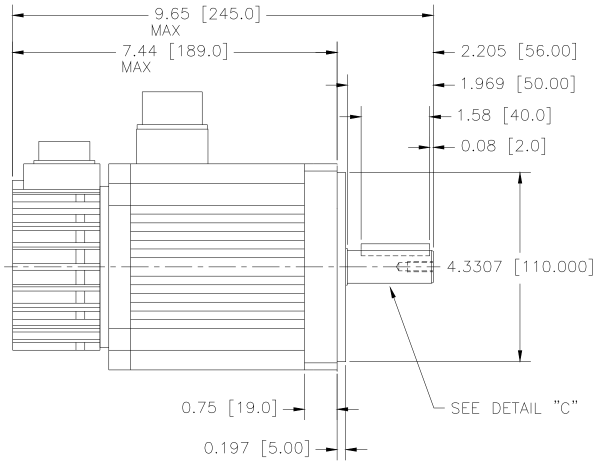
SHEET NO.
1 OF 1
REVISION
B

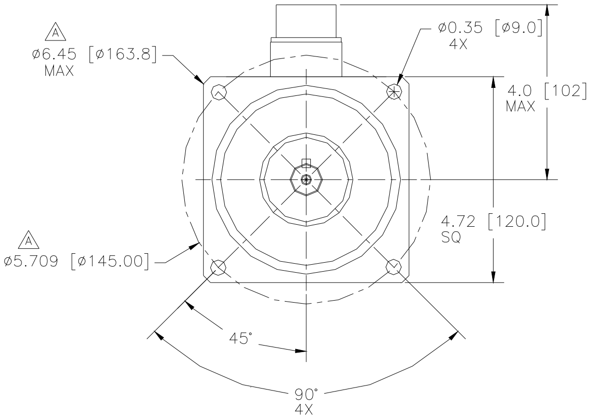
NOTES:
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 6.0 KG 13.2 LBS
4.) MOTOR SHAFT SEAL STANDARD.
5.) THRUST LOAD 300 N 67 LBS
6.) RADIAL LOAD 700 N 157 LBS
7.) ENCODER 2500 LINE COUNT 10000 PPR.
8.) IP-55 SEALING.

DATE	SYM	REVISION RECORD	DR	CK	CK
21APR04	A	PER ECN 04-155	CWB		

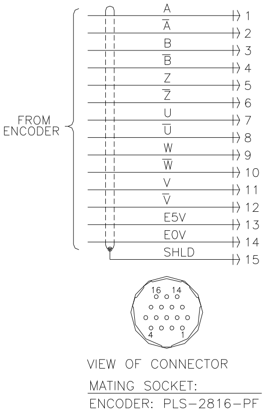




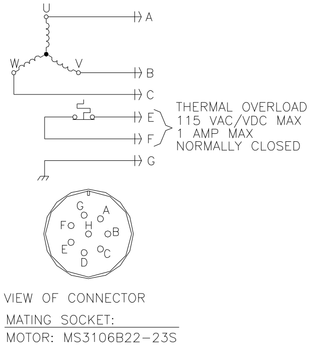




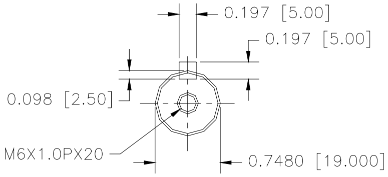
DETAIL A
ENCODER CONNECTION
PLS-2816-RM



DETAIL B
ARMATURE CONNECTION
MS3102B22-23P



DETAIL C
MOTOR SHAFT DIMENSIONS



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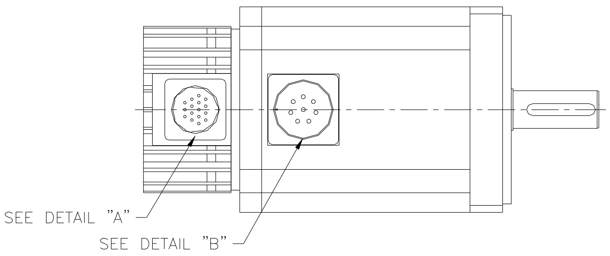
TITLE
MOTOR, DELTA SERIES

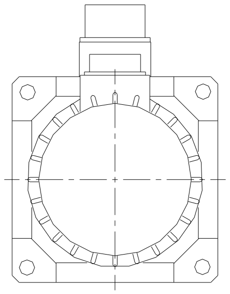
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 23JUN03
SCALE ---
DRAWING NUMBER DBM120-E750/20E
SHEET NO. 1 OF 1
REVISION A

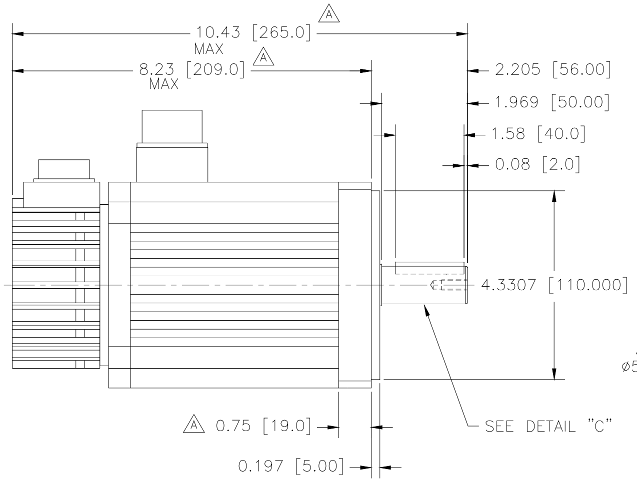
NOTES: B

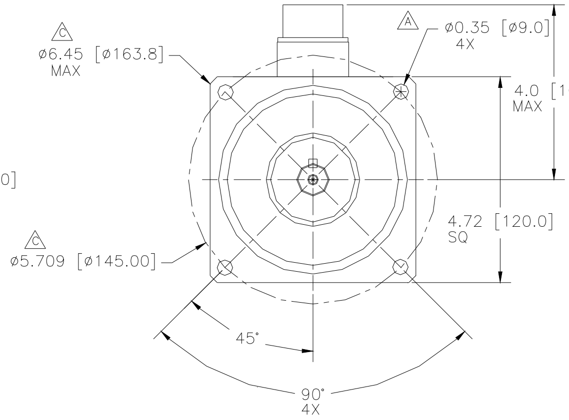
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 8 KG 18 LBS
4.) MOTOR SHAFT SEAL STANDARD.
5.) THRUST LOAD 400 N 90 LBS
6.) RADIAL LOAD 800 N 180 LBS
7.) ENCODER 2500 LINE COUNT 10000 PPR.
8.) IP-55 SEALING.

DATE	SYM	REVISION RECORD	DR	CK	CK
21APR04	C	PER ECN 04-155	CWB		



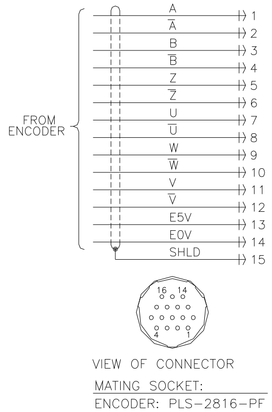






DETAIL A

ENCODER CONNECTION
PLS-2816-RM

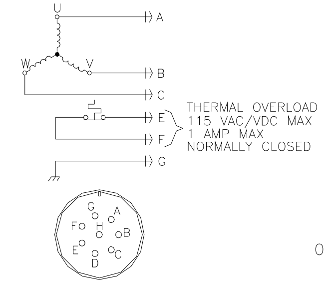


VIEW OF CONNECTOR

MATING SOCKET:
ENCODER: PLS-2816-PF

DETAIL B

ARMATURE CONNECTION
MS3102B22-23P

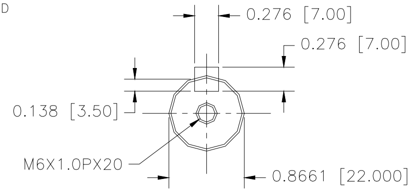


VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106B22-23S

DETAIL C

MOTOR SHAFT DIMENSIONS



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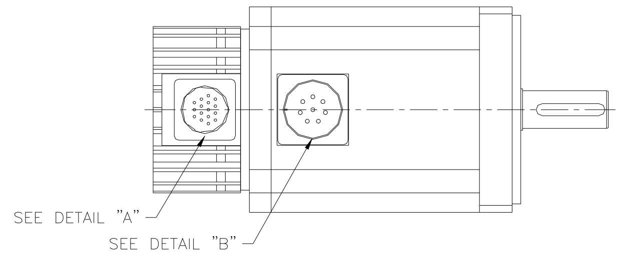
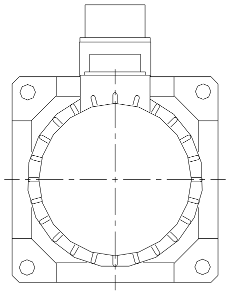
TITLE
MOTOR, DELTA SERIES

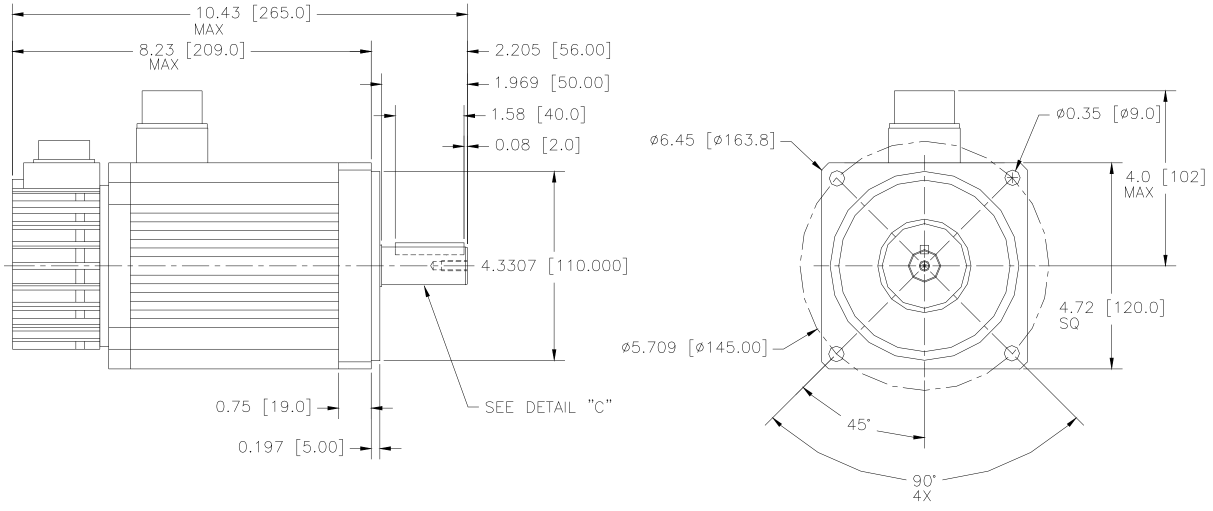
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
B
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
DATE 06MAY02
SCALE ---
DRAWING NUMBER DBM120-E1000/20E
SHEET NO. 1 OF 1
REVISION C

NOTES:
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 8 KG 18 LBS
4.) MOTOR SHAFT SEAL STANDARD.
5.) THRUST LOAD 400 N 90 LBS
6.) RADIAL LOAD 800 N 180 LBS
7.) ENCODER 2500 LINE COUNT 10000 PPR.
8.) IP-55 SEALING.

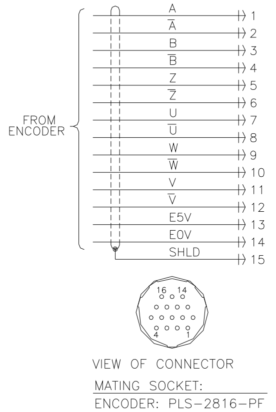
DATE	SYM	REVISION RECORD	DR	CK	CK
19APR05	0	PER ECN 05-158	CWB		



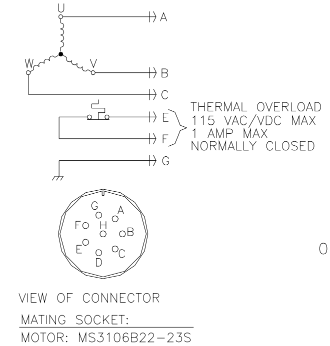




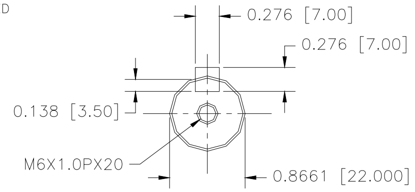
DETAIL A
ENCODER CONNECTION
PLS-2816-RM



DETAIL B
ARMATURE CONNECTION
MS3102B22-23P



DETAIL C
MOTOR SHAFT DIMENSIONS



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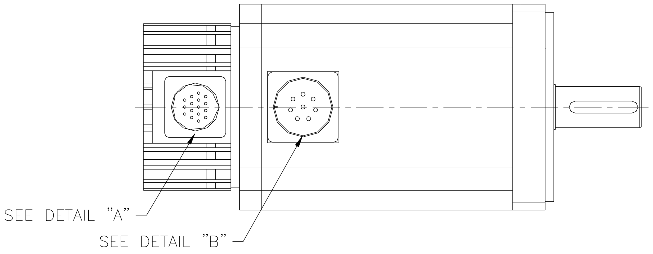
TITLE
MOTOR, DELTA SERIES

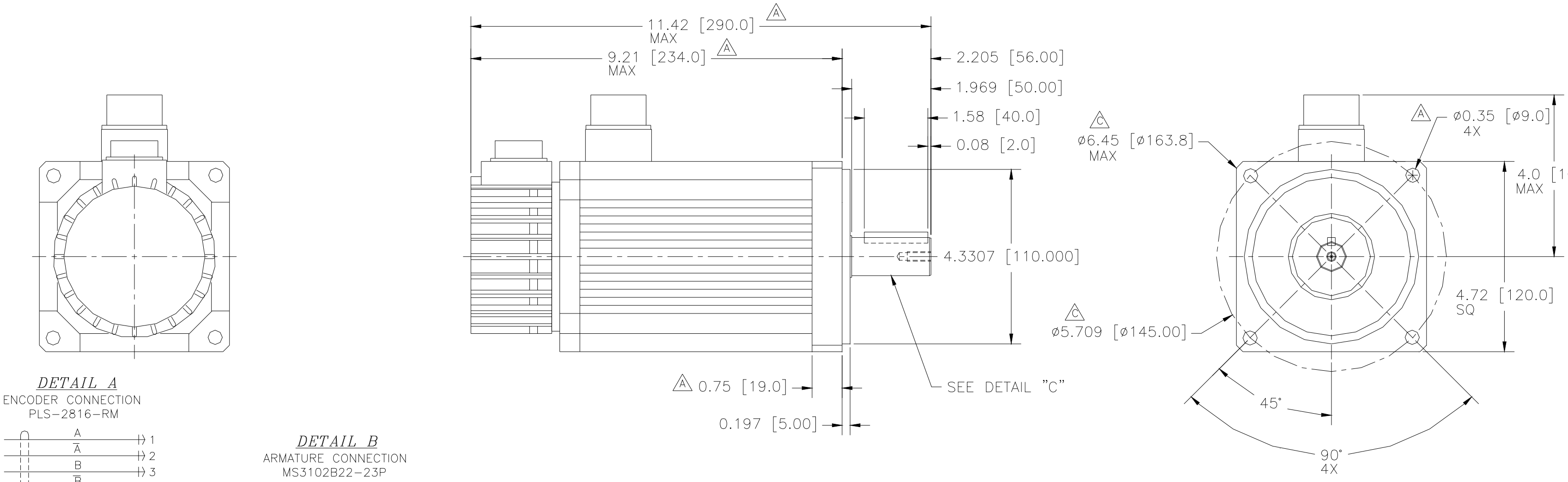
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 19APR05
SCALE ---
DRAWING NUMBER DBM120-E1000H/20E
SHEET NO. 1 OF 1
REVISION 0

NOTES: △B

1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 9.5 KG 21 LBS
4.) MOTOR SHAFT SEAL STANDARD.
5.) THRUST LOAD 500 N 112 LBS
6.) RADIAL LOAD 1000 N 225 LBS
7.) ENCODER 2500 LINE COUNT 10000 PPR.
8.) IP-55 SEALING.

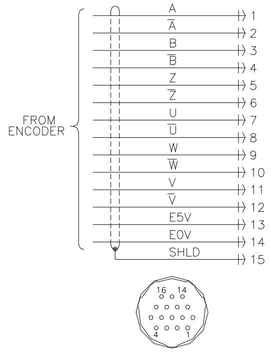
DATE	SYM	REVISION RECORD	DR	CK	CK
21APR04	C	PER ECN 04-155	CWB		





DETAIL A

ENCODER CONNECTION
PLS-2816-RM

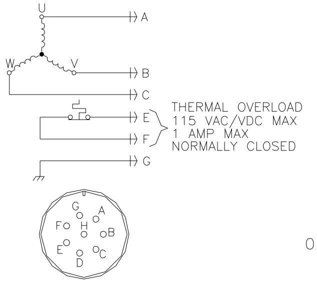


VIEW OF CONNECTOR

MATING SOCKET:
ENCODER: PLS-2816-PF

DETAIL B

ARMATURE CONNECTION
MS3102B22-23P

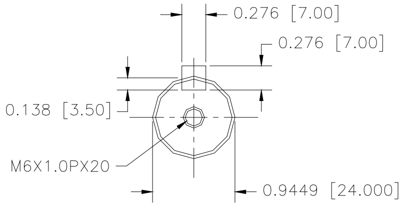


VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106B22-23S

DETAIL C

MOTOR SHAFT DIMENSIONS



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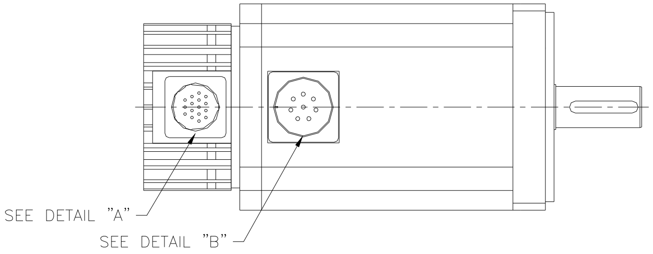
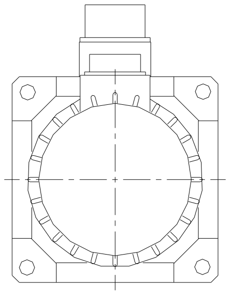
TITLE
MOTOR, DELTA SERIES

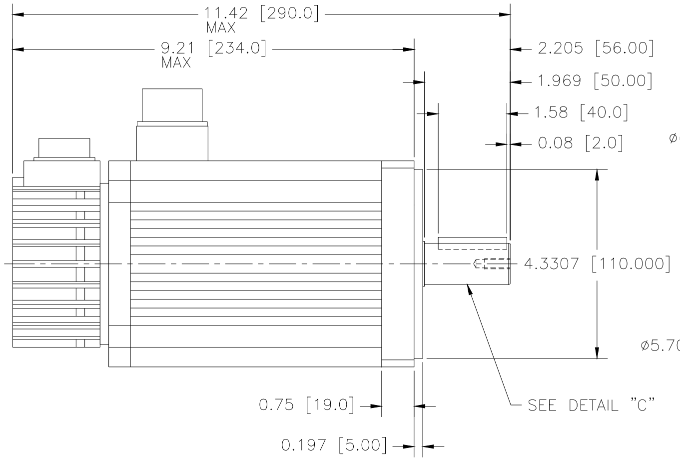
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
B
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
DATE 30APR02
SCALE ---
DRAWING NUMBER DBM120-E1500/20E
SHEET NO. 1 OF 1
REVISION C

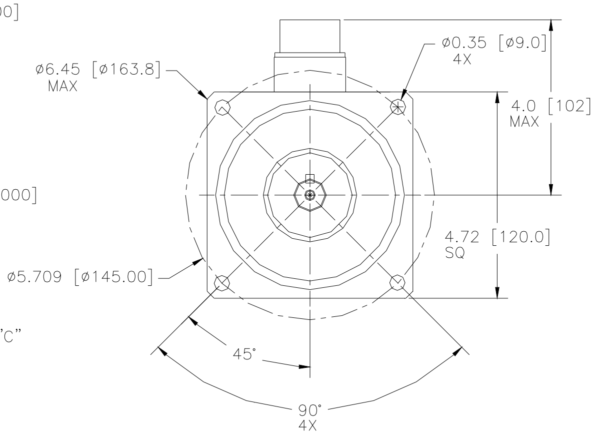
NOTES:
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 9.5 KG 21 LBS
4.) MOTOR SHAFT SEAL STANDARD.
5.) THRUST LOAD 500 N 112 LBS
6.) RADIAL LOAD 1000 N 225 LBS
7.) ENCODER 2500 LINE COUNT 10000 PPR.
8.) IP-55 SEALING.

DATE	SYM	REVISION RECORD	DR	CK	CK
19APR05	0	PER ECN 05-157	CWB		





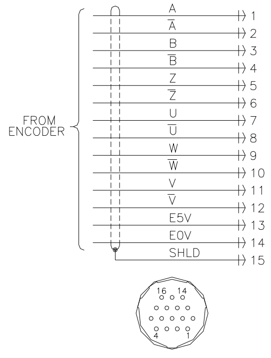




DETAIL A

ENCODER CONNECTION

PLS-2816-RM



VIEW OF CONNECTOR

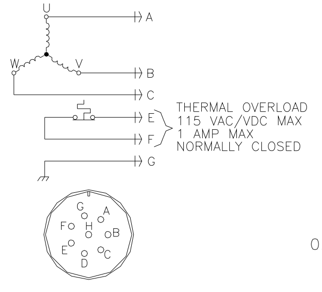
MATING SOCKET:

ENCODER: PLS-2816-PF

DETAIL B

ARMATURE CONNECTION

MS3102B22-23P



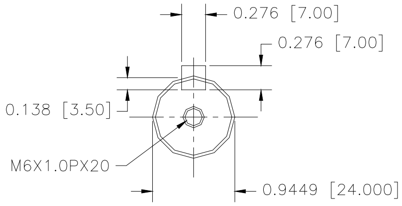
VIEW OF CONNECTOR

MATING SOCKET:

MOTOR: MS3106B22-23S

DETAIL C

MOTOR SHAFT DIMENSIONS



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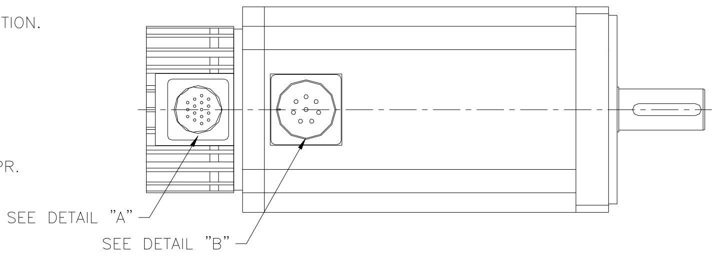
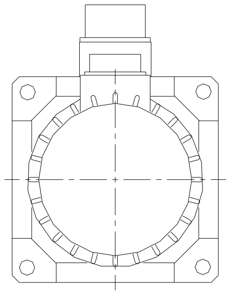
TITLE
MOTOR, DELTA SERIES

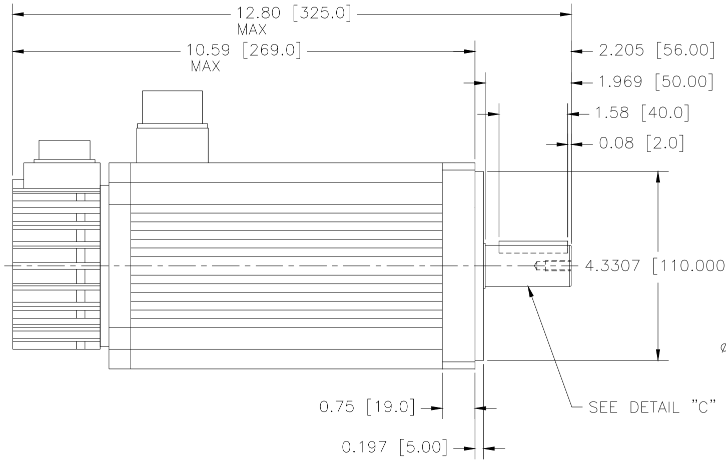
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
B
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
DATE 19APR05
SCALE ---
DRAWING NUMBER DBM120-E1500H/20E
SHEET NO. 1 OF 1
REVISION 0

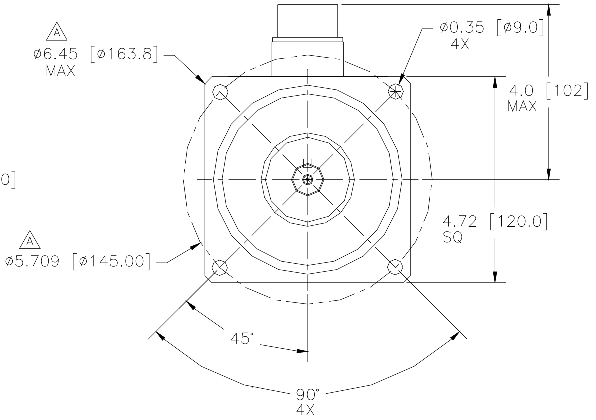
DATE	SYM	REVISION RECORD	DR	CK	CK
21APR04	A	PER ECN 04-155	CWB		

NOTES:
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 11.0 KG 24 LBS
4.) MOTOR SHAFT SEAL STANDARD.
5.) THRUST LOAD 500 N 112 LBS
6.) RADIAL LOAD 1000 N 225 LBS
7.) ENCODER 2500 LINE COUNT 10000 PPR.
8.) IP-55 SEALING.

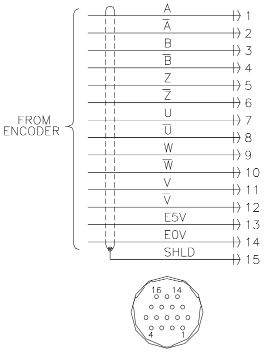






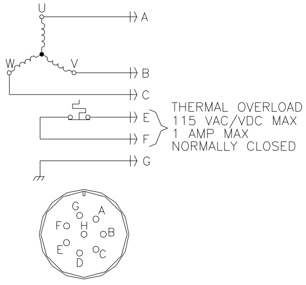


DETAIL A
ENCODER CONNECTION
PLS-2816-RM



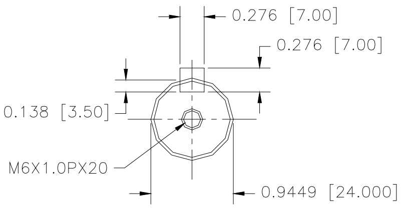
VIEW OF CONNECTOR
MATING SOCKET:
ENCODER: PLS-2816-PF

DETAIL B
ARMATURE CONNECTION
MS3102B22-23P



VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: MS3106B22-23S

DETAIL C
MOTOR SHAFT DIMENSIONS



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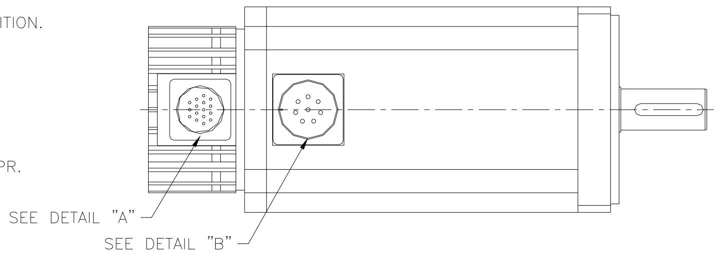
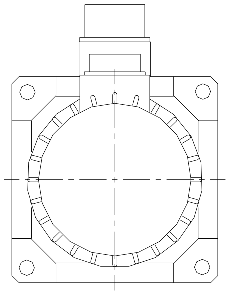
TITLE
MOTOR, DELTA SERIES

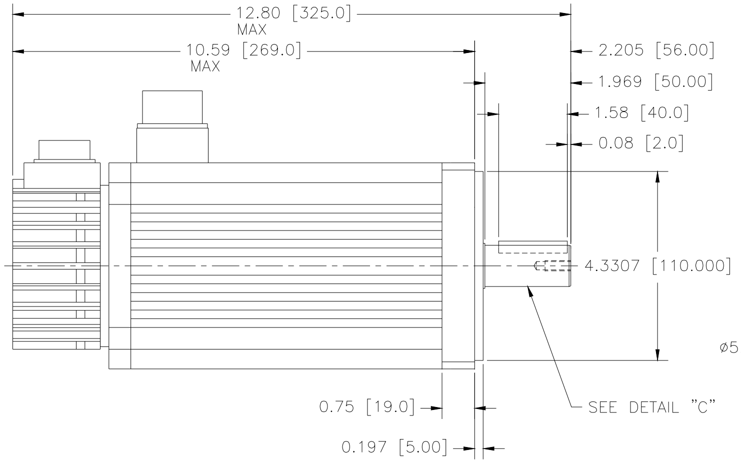
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 23JUN03
SCALE ---
DRAWING NUMBER DBM120-E2200/20E
SHEET NO. 1 OF 1
REVISION A

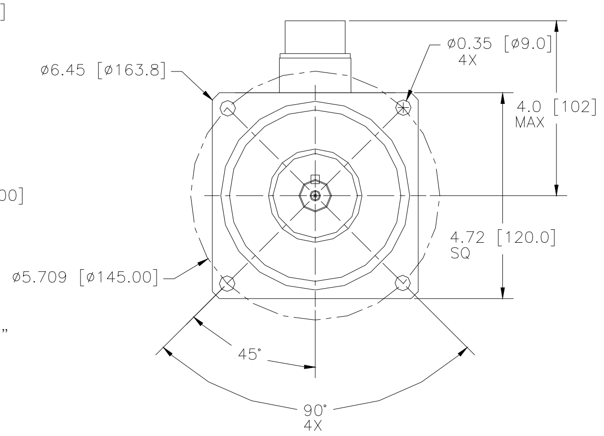
DATE	SYM	REVISION RECORD	DR	CK	CK
20JAN05	0	PER ECN 05-018	CWB		

NOTES:
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 11.0 KG 24 LBS
4.) MOTOR SHAFT SEAL STANDARD.
5.) THRUST LOAD 500 N 112 LBS
6.) RADIAL LOAD 1000 N 225 LBS
7.) ENCODER 2500 LINE COUNT 10000 PPR.
8.) IP-55 SEALING.

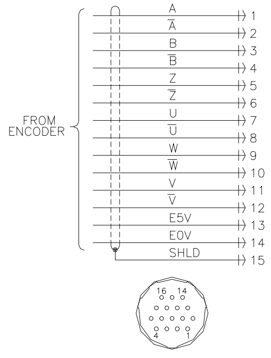








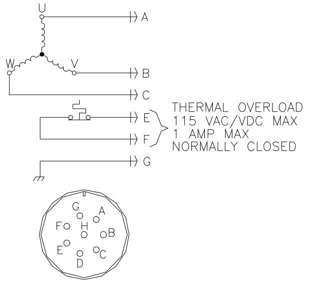
DETAIL A
ENCODER CONNECTION
PLS-2816-RM



VIEW OF CONNECTOR

MATING SOCKET:
ENCODER: PLS-2816-PF

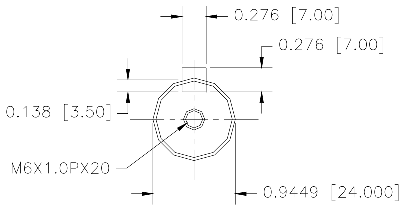
DETAIL B
ARMATURE CONNECTION
MS3102B22-23P



VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106B22-23S

DETAIL C
MOTOR SHAFT DIMENSIONS



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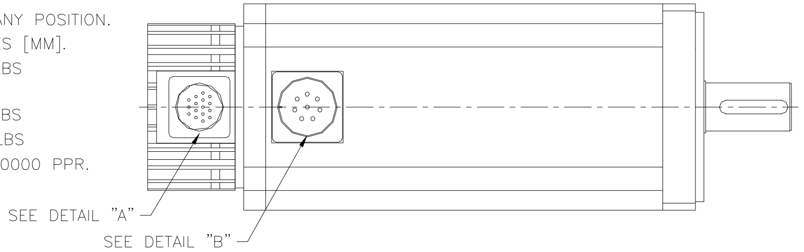
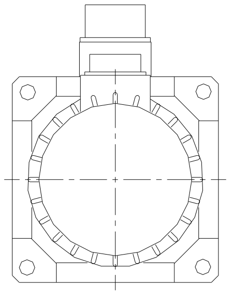
TITLE
MOTOR, DELTA SERIES

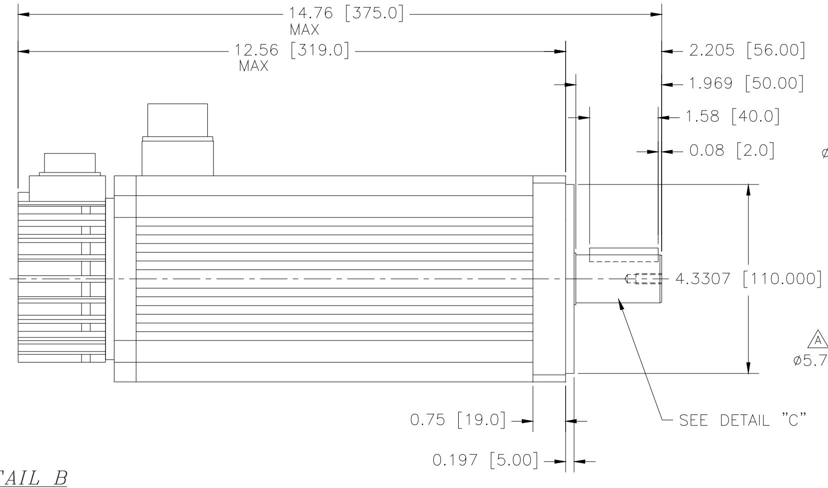
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 20JAN05
SCALE ---
DRAWING NUMBER DBM120-E2200H/20E
SHEET NO. 1 OF 1
REVISION 0

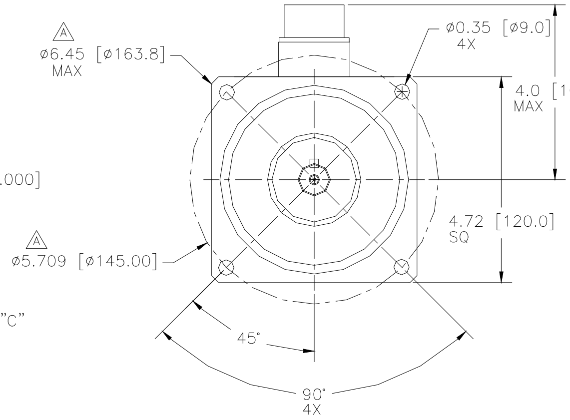
DATE	SYM	REVISION RECORD	DR	CK	CK
21APR04	A	PER ECN 04-155	CWB		

NOTES:
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 15 KG 33 LBS
4.) MOTOR SHAFT SEAL STANDARD.
5.) THRUST LOAD 500 N 112 LBS
6.) RADIAL LOAD 1000 N 225 LBS
7.) ENCODER 2500 LINE COUNT 10000 PPR.
8.) IP-55 SEALING.

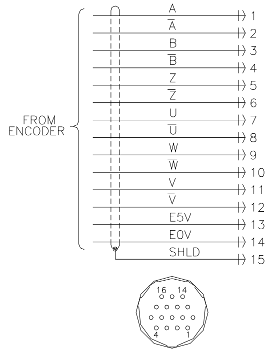








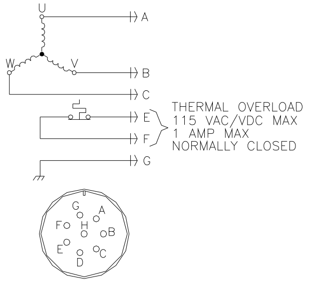
DETAIL A
ENCODER CONNECTION
PLS-2816-RM



VIEW OF CONNECTOR

MATING SOCKET:
ENCODER: PLS-2816-PF

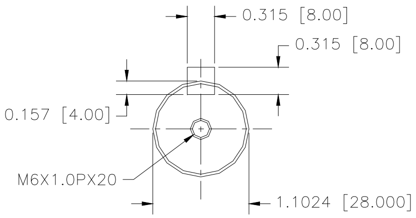
DETAIL B
ARMATURE CONNECTION
MS3102B22-23P



VIEW OF CONNECTOR

MATING SOCKET:
MOTOR: MS3106B22-23S

DETAIL C
MOTOR SHAFT DIMENSIONS



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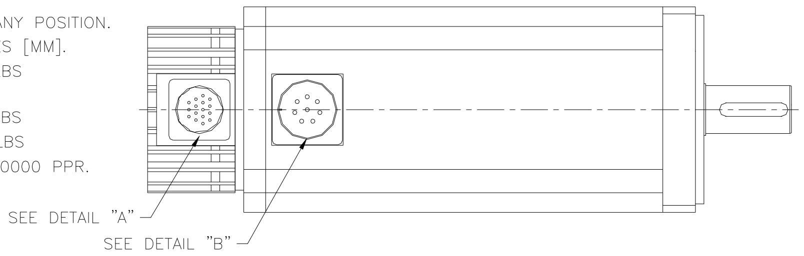
TITLE
MOTOR, DELTA SERIES

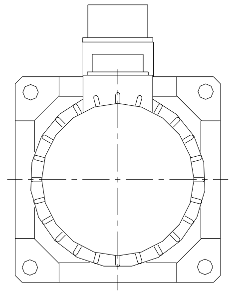
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'
DRAWN BY
BOWMAN
AutoCAD FILE LOCATION
Q:\CURRENT DWGS
B
DATE
23JUN03
SCALE

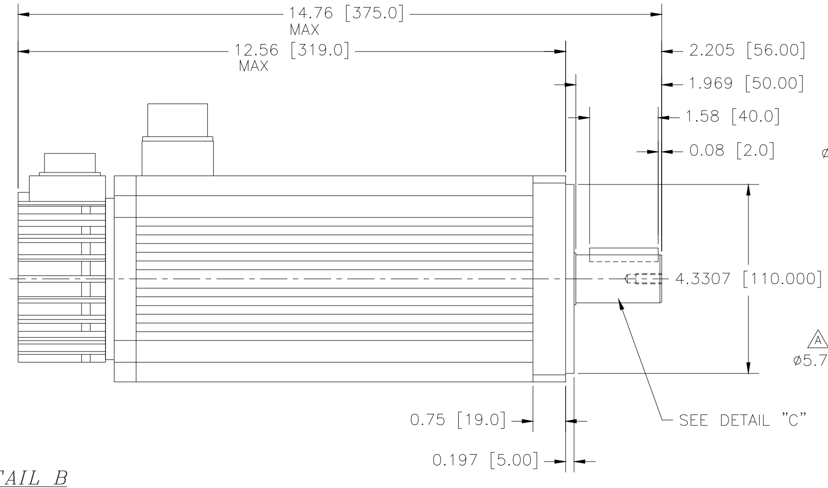
DRAWING NUMBER
DBM120-E3000/20E
SHEET NO.
1 OF 1
REVISION
A

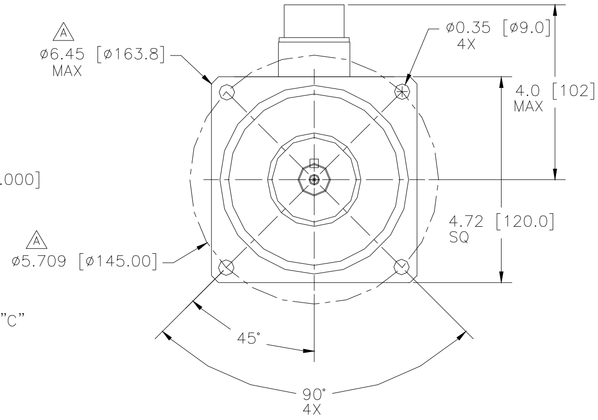
DATE	SYM	REVISION RECORD	DR	CK	CK
21APR04	A	PER ECN 04-155	CWB		

NOTES:
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 15 KG 33 LBS
4.) MOTOR SHAFT SEAL STANDARD.
5.) THRUST LOAD 500 N 112 LBS
6.) RADIAL LOAD 1000 N 225 LBS
7.) ENCODER 2500 LINE COUNT 10000 PPR.
8.) IP-55 SEALING.



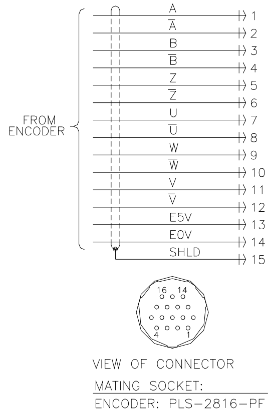






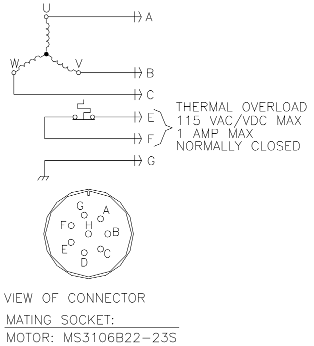
DETAIL A

ENCODER CONNECTION
PLS-2816-RM



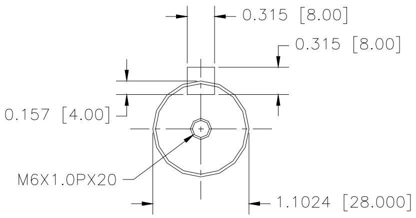
DETAIL B

ARMATURE CONNECTION
MS3102B22-23P



DETAIL C

MOTOR SHAFT DIMENSIONS



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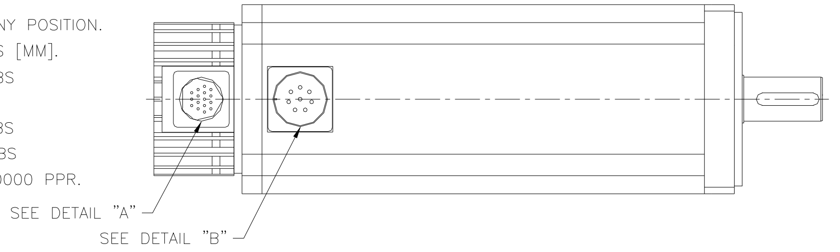
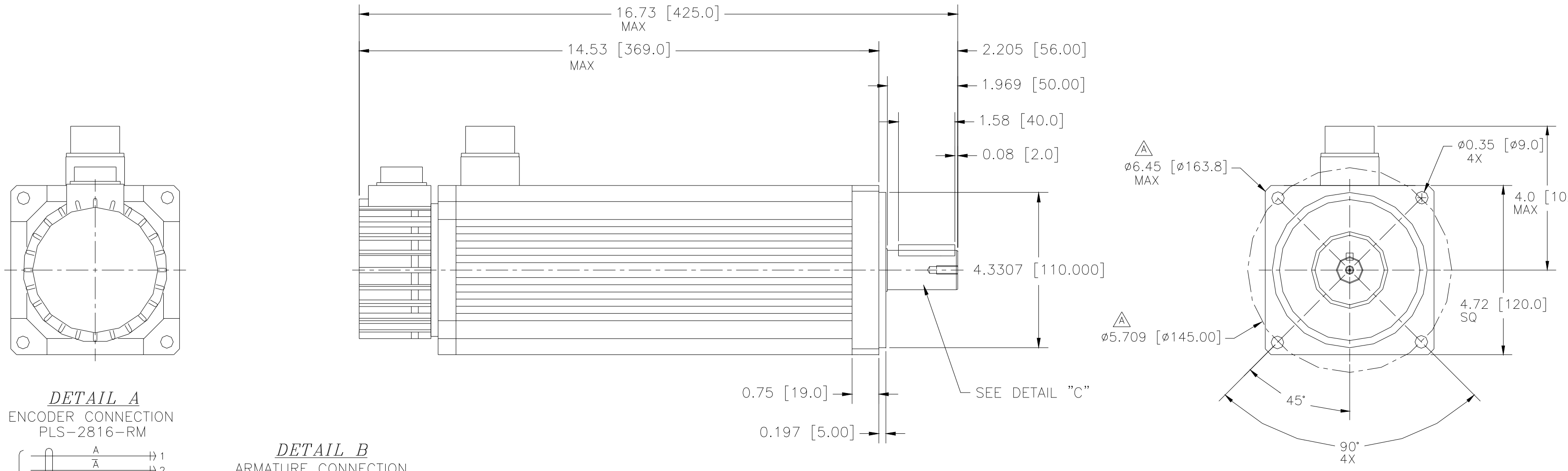
TITLE
MOTOR, DELTA SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 15MAR04
SCALE ---
DRAWING NUMBER DBM120-E3000H/20E
SHEET NO. 1 OF 1
REVISION A

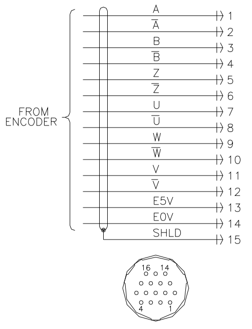
DATE	SYM	REVISION RECORD	DR	CK	CK
21APR04	A	PER ECN 04-155	CWB		

NOTES:
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 18 KG 40 LBS
4.) MOTOR SHAFT SEAL STANDARD.
5.) THRUST LOAD 500 N 112 LBS
6.) RADIAL LOAD 1000 N 225 LBS
7.) ENCODER 2500 LINE COUNT 10000 PPR.
8.) IP-55 SEALING.



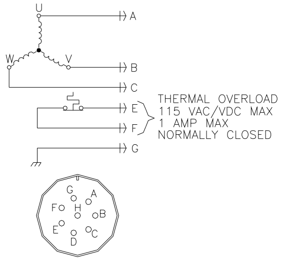


DETAIL A
ENCODER CONNECTION
PLS-2816-RM



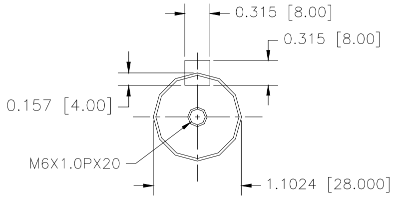
VIEW OF CONNECTOR
MATING SOCKET:
ENCODER: PLS-2816-PF

DETAIL B
ARMATURE CONNECTION
MS3102B22-23P



VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: MS3106B22-23S

DETAIL C
MOTOR SHAFT DIMENSIONS



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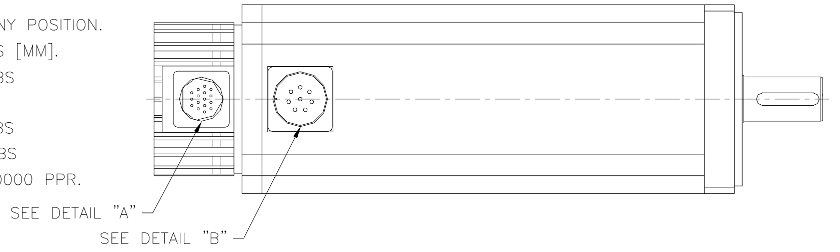
TITLE
MOTOR, DELTA SERIES

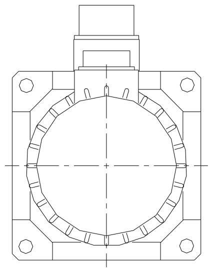
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.05
ANGULAR
± 0°30'

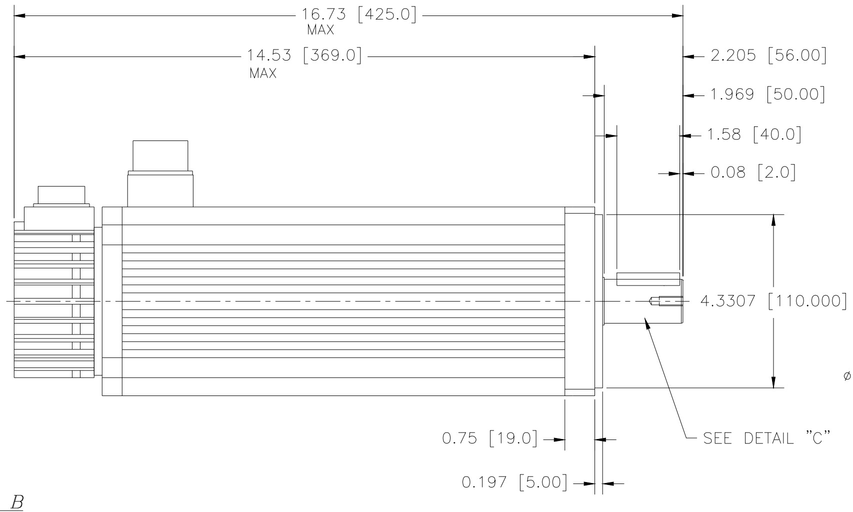
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 23JUN03
SCALE ---
DRAWING NUMBER DBM120-E4000/20E
SHEET NO. 1 OF 1
REVISION A

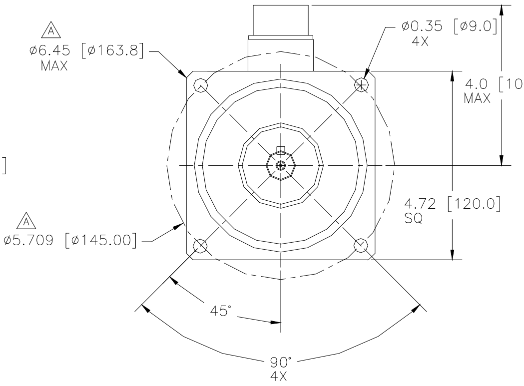
DATE	SYM	REVISION RECORD	DR	CK	CK
21APR04	A	PER ECN 04-155	CWB		

NOTES:
1.) MOTOR CAN BE MOUNTED IN ANY POSITION.
2.) ALL DIMENSIONS ARE IN INCHES [MM].
3.) MOTOR WEIGHT 18 KG 40 LBS
4.) MOTOR SHAFT SEAL STANDARD.
5.) THRUST LOAD 500 N 112 LBS
6.) RADIAL LOAD 1000 N 225 LBS
7.) ENCODER 2500 LINE COUNT 10000 PPR.
8.) IP-55 SEALING.

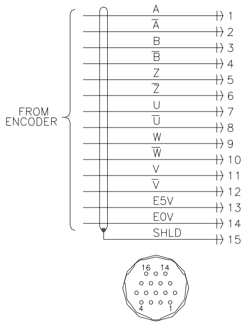






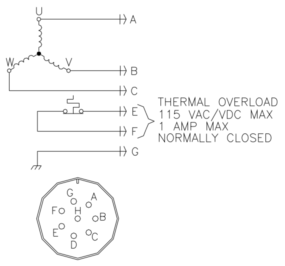


DETAIL A
ENCODER CONNECTION
PLS-2816-RM



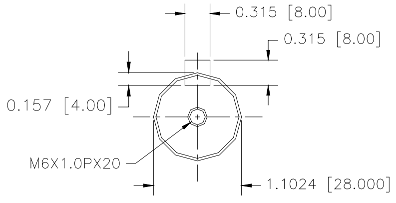
VIEW OF CONNECTOR
MATING SOCKET:
ENCODER: PLS-2816-PF

DETAIL B
ARMATURE CONNECTION
MS3102B22-23P



VIEW OF CONNECTOR
MATING SOCKET:
MOTOR: MS3106B22-23S

DETAIL C
MOTOR SHAFT DIMENSIONS



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TITLE
MOTOR, DELTA SERIES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.05
ANGULAR ± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 26JAN04
SCALE ---
DRAWING NUMBER DBM120-E4000H/20E
SHEET NO. 1 OF 1
REVISION A

APPENDIX B - CABLES AND ACCESSORIES

"CABLES FOR MOTORS WITH RESOLVERS" TABLE B.1
"CABLES FOR MOTORS WITH BRAKES" TABLE B.2
"CABLES FOR MOTORS WITH ENCODERS" TABLE B.3
"ACCESSORIES " TABLE B.4

B.1 CABLE PART NUMBERS FOR MOTORS WITH RESOLVERS

DELTA PACKAGE	RESOLVER CABLE	MOTOR CABLE
D30HRA	C-245YYY	C-686YYY
D30HRB	C-245YYY	C-686YYY
D50HRA	C-245YYY	C-686YYY
D50HRB	C-245YYY	C-686YYY
D100HRA	C-268YYY	C-578YYY
D100HRB	C-268YYY	C-578YYY
120HRA	C-245YYY	C-686YYY
120HRB	C-245YYY	C-686YYY
200HRA	C-245YYY	C-686YYY
200HRB	C-245YYY	C-686YYY
D200HRA	C-268YYY	C-578YYY
D200HRB	C-268YYY	C-578YYY
B380HRA	C-245YYY	C-687BYYY
B380HRA1X	C-245YYY	C-687BYYY
400LRA	C-246YYY	C-687YYY
400HRA	C-245YYY	C-686YYY
D400HRA	C-268YYY	C-578YYY
500HRA	C-246YYY	C-687YYY
D600HRA	C-268YYY	C-578YYY
B630HRA	C-245YYY	C-687BYYY
B630HRA1X	C-245YYY	C-687BYYY
800LRA	C-246YYY	C-688YYY
800HRA	C-246YYY	C-687YYY
800HRAA	C-253YYY	C-687YYY
B800HRA	C-245YYY	C-687BYYY
D800HRA	C-268YYY	C-578YYY
1000LRA	C-246YYY	C-688YYY
1000HRA	C-246YYY	C-688YYY
1050LRA1X	C-246YYY	C-689YYY
B1060HRA	C-245YYY	C-688BYYY
1360HRA	C-245YYY	C-688YYY
1400HRA	C-246YYY	C-689YYY
1500LRA	C-246YYY	C-689YYY
1500LRA1X	C-246YYY	C-689YYY
B1600HRA	C-245YYY	C-689BYYY
1800HRA	C-246YYY	C-689YYY
B1900HRA	C-245YYY	C-689BYYY
2200LRA	C-246YYY	C-690YYY
2399HRA	C-246YYY	C-689YYY
2400HRA	C-246YYY	C-689YYY
2600LRA	C-246YYY	C-690YYY
2860MRA1X	C-245YYY	C-689YYY

B.1 CABLE PART NUMBERS FOR MOTORS WITH RESOLVERS (cont'd)

DELTA PACKAGE	RESOLVER CABLE	MOTOR CABLE
3300LRA	C-246YYY	C-691YYY
B3000HRA	C-245YYY	C-691BYYY
3400HRA	C-246YYY	C-691YYY
3700LRA	C-246YYY	C-691YYY
3700HRA	C-246YYY	C-691YYY
3740MRA1X	C-245YYY	C-689BYYY
B3950MRA	C-246YYY	C-689BYYY
B4400HRA	C-245YYY	C-691BYYY
4200MRA1X	C-263YYY & C-245CYYY	C-691BCEYYY
5000LRA	C-246YYY	C-692YYY
5000HRA	C-246YYY	C-551YYY
5500HRA	C-246YYY	C-692YYY
B5600HRA	C-245YYY	C-548YYY
6100CRA	C-262YYY	C-689BYYY
6500HRA	C-246YYY	C-692YYY
7500MRA	C-246YYY	C-548YYY
8600MRA	C-245YYY	C-674YYY
10000MRA	C-246YYY	C-548YYY
10300LRA	C-245YYY	C-674YYY
13500LRA	C-200YYY	C-674YYY
14300CRA	C-245YYY	C-692YYY

The C-245YYY, C-246YYY and C-268YYY cables have connectors on each end. This may not be the optimum way to implement field wiring of the resolver. IIS offers the C-262YYY, C-263YYY and C-269YYY cables that have a connector at the motor end and ferrules at the driver end. By using these cables in combination with the DINT-350 terminal strip adapter with ribbon cable, the field wiring can be done without pulling a connector through the field-wiring conduit.

C-245YYY → C-263YYY + DINT-350
C-246YYY → C-262YYY + DINT-350
C-268YYY → C-269YYY + DINT-350

Where YYY is the cable length in feet.

Motor cables are standard with ring lugs on the driver end of the cable. The ring lugs can be replaced with ferrules for terminal strip interface by simply adding an "F" to the standard cable number. For example, a C-689050 50ft motor cable has ring lugs but a C-689F050 has ferrule termination on the driver end.

All motor cables are available with full shielding for CE compliance. Simply add the letters "CE" into the motor cable part number. For example, the C-688020 20ft motor cable for CE compliance is C-688CE020. A C-688BF030 30ft cable with ferrules would be C-688BFCE030.

B.2 CABLE PART NUMBERS FOR MOTORS WITH MECHANICAL BRAKES

DELTA PACKAGE	RESOLVER CABLE	MOTOR CABLE
120HRAB	C-245YYY	C-686BYYY
120HRBB	C-245YYY	C-686BYYY
200HRAB	C-245YYY	C-686BYYY
200HRBB	C-245YYY	C-686BYYY
400LRAB	C-246YYY	C-687BYYY
400HRAB	C-245YYY	C-686BYYY
500HRAB	C-246YYY	C-687BYYY
800LRAB	C-246YYY	C-688BYYY
800HRAB	C-246YYY	C-687BYYY
D800HEAAB*	C-277YYY	C-578YYY & C-585YYY
D800HRAB*	C-268YYY	C-578YYY & C-585YYY
1000LRAB	C-246YYY	C-688BYYY
1000HRAB	C-246YYY	C-688BYYY
1400HRAB	C-246YYY	C-689BYYY
1500LRAB	C-246YYY	C-689BYYY
1800HRAB	C-246YYY	C-689BYYY
1800HRAAB	C-253YYY	C-689B777
2200LRAB	C-246YYY	C-690BYYY
2400HRAB	C-246YYY	C-689BYYY
2600LRAB	C-246YYY	C-690BYYY
3300LRAB	C-246YYY	C-691BYYY
B3000HRAB*	C-245YYY	C-575BYYY & C-576YYY
3400HRAB	C-246YYY	C-691BYYY
3700LRAB	C-246YYY	C-691BYYY
3700HRAB	C-246YYY	C-691BYYY
5000LRAB	C-246YYY	C-692YYY
5000HRAB	C-246YYY	C-551BYYY
5500HRAB	C-246YYY	C-692YYY
6500HRAB	C-246YYY	C-692YYY
7500MRAB	C-246YYY	C-548YYY
10000MRAB	C-246YYY	C-548YYY

*****The DBM-D800/30EAB, DBM-D800/30RAB and DBM-B3000/30RB motors have 2 motor cables.

The C-245YYY, C-246YYY and C-268YYY cables have connectors on each end. This may not be the optimum way to implement field wiring of the resolver. IIS offers the C-262YYY, C-263YYY and C-269YYY cables that have a connector at the motor end and ferrules at the driver end. By using these cables in combination with the DINT-350 terminal strip adapter with ribbon cable, the field wiring can be done without pulling a connector through the field-wiring conduit.

C-245YYY → C-263YYY + DINT-350
C-246YYY → C-262YYY + DINT-350
C-268YYY → C-269YYY + DINT-350

Where YYY is the cable length in feet.

Motor cables are standard with ring lugs on the driver end of the cable. The ring lugs can be replaced with ferrules for terminal strip interface by simply adding an "F" to the standard cable number. For example, a C-689050 50ft motor cable has ring lugs but a C-689F050 has ferrule termination on the driver end.

All motor cables are available with full shielding for CE compliance. Simply add the letters "CE" into the motor cable part number. For example, the C-688020 20ft motor cable for CE compliance is C-688CE020. A C-688BF030 30ft cable with ferrules would be C-688BFCE030.

B.3 CABLE PART NUMBERS FOR MOTORS WITH ENCODERS

DELTA PACKAGE	ENCODER CABLE	MOTOR CABLE
B380HEA	C-333YYY	C-687BYYY
85E400MEA	C-333YYY	C-687BYYY
480LEA	C-333YYY	C-687BYYY
120E500LEA	C-351YYY	C-571BYYY
85E525HEA	C-333YYY	C-687BYYY
B630HEA	C-333YYY	C-687BYYY
85E650MEA	C-333YYY	C-687BYYY
C740LEA	C-333YYY	C-687BYYY
120E750LEA	C-351YYY	C-571BYYY
120E750MEA	C-351YYY	C-571BYYY
85E750MEA	C-333YYY	C-687BYYY
B800HEA	C-333YYY	C-687BYYY
85E850HEA	C-333YYY	C-687BYYY
120E1000MEA	C-351YYY	C-571BYYY
85E1000MEA	C-333YYY	C-687BYYY
B1060HEA	C-333YYY	C-688BYYY
120E1100LEA	C-351YYY	C-571BYYY
85E1200HEA	C-333YYY	C-687BYYY
120E1500LEA	C-351YYY	C-571BYYY
120E1500MEA	C-351YYY	C-571BYYY
B1600HEA	C-333YYY	C-689BYYY
B1900HEA	C-333YYY	C-689BYYY
120E2000LEA	C-351YYY	C-571BYYY
120E2200MEA	C-351YYY	C-571BYYY
120E3000MEA	C-351YYY	C-571BYYY
B3000HEA	C-333YYY	C-691BYYY
120E4000MEA	C-351YYY	C-571BYYY
B4400HEA	C-333YYY	C-691BYYY
B5600HEA	C-333YYY	C-548YYY

The C-333YYY (C-351YYY) cable has connectors on both ends. This may not be the optimum way to implement field wiring for the encoder. IIS offers the C-329YYY (C-350YYY) cable, which has a connector at the motor end and ferrules at the driver end. By using the C-329YYY (C-350YYY) cable in combination with the DINT-350 terminal strip adapter with ribbon cable, the field wiring can be done without pulling a connector through the field-wiring conduit.

C-333YYY → C-329YYY + DINT-350
C-351YYY → C-350YYY + DINT-350

Where YYY is the cable length in feet.

NOTE

The C-329YYY or C-350YYY cable must be used for encoder cable lengths in excess of 20 ft.

Motor cables are standard with ring lugs on the driver end of the cable. The ring lugs can be replaced with ferrules for terminal strip interface by simply adding an "F" to the standard cable number. For example, a C-689050 50ft motor cable has ring lugs but a C-689F050 has ferrule termination on the driver end.

All motor cables are available with full shielding for CE compliance. Simply add the letters "CE" into the motor cable part number. For example, the C-688020 20ft motor cable for CE compliance is C-688CE020. A C-688BF030 30ft cable with ferrules would be C-688BFCE030.

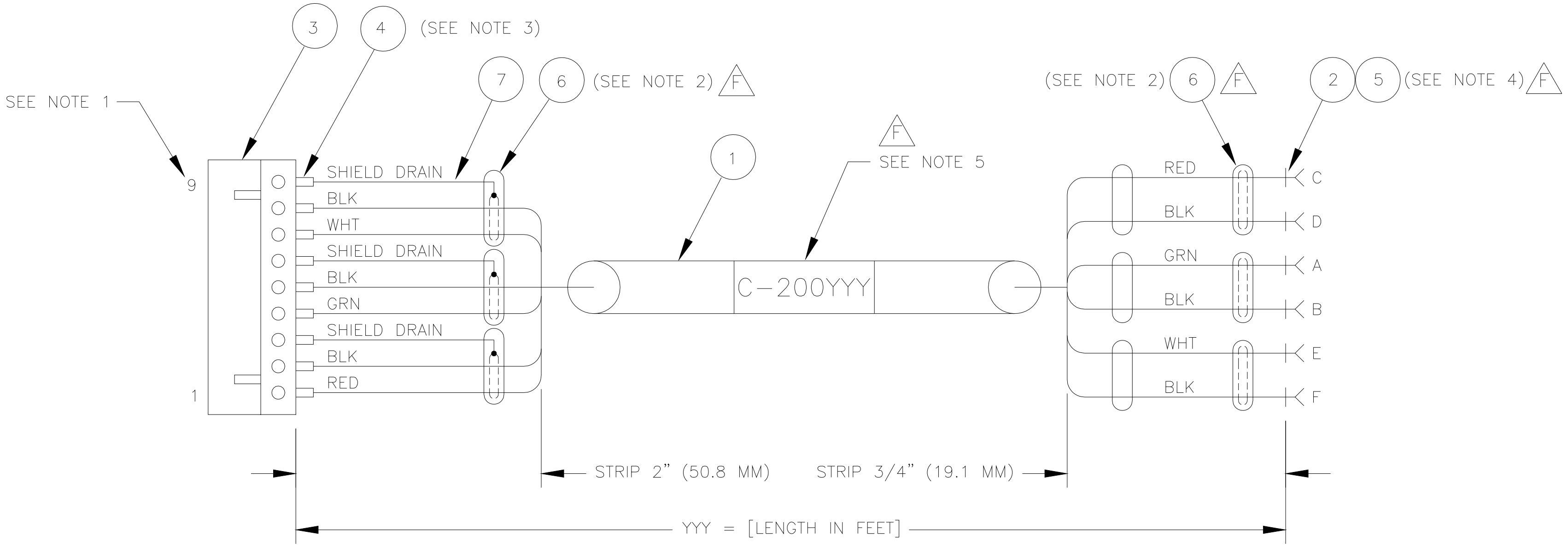
B.4 ACCESSORIES

DRAWING NUMBER	DESCRIPTION
C-263YYY	Resolver Cable
C-269YYY	Resolver Cable
C-329YYY	Encoder Cable
C-337YYY	Encoder Cable
C-338YYY	Encoder Cable
C-350YYY	Encoder Cable
C-477YYY	Command Cable
C-545YYY	Motor Cable
C-715006	High Speed I/O Cable w/ Double Connector
C-716006	I/O Cable w/ Double Connector
C-718006	High Speed I/O Cable w/ Connector & Flying Lead
C-719006	I/O Cable w/ Connector & Flying Lead
C-722YYY	Monitor Test Point Cable
C-7290001.6	Delta Battery Cable
C-750YYY	I/O Cable
C-752YYY	SERCOS Fiber Optic Cable, Armored Coating
C-753YYY	SERCOS Fiber Optic Cable
C-820YYY	Communication Cable
C-822YYY	Adaptor Cable
C-987YYY	Modular Data Cable
DELTA-B-3.6/2	Delta Battery Pack
DINT-300	Interface
DINT-300K	Interface
DINT-300S	Interface
DINT-350	Interface
IC-065002	Interconnection
IC-066000	Interconnection

DATE	SYM	REVISION RECORD	DR	CK	CK
20JUN00	F	PER ECN 00-188	CWB	EB	CDR

NOTES:

1. PIN NUMBERS SHOWN FOR REFERENCE ONLY.
2. HEAT SHRINK TUBING [ITEM 6] OVER FOIL END (6 PLACES).
3. CRIMP FERRULES USING WEIDMULLER CRIMP TOOL PZ4 OR EQUIVALENT.
4. HEAT SHRINK TUBING [ITEM 5] OVER SOLDER JOINT (6 PLACES).
5. MARK PER QP-08-0001.



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CHECKED BY E. BAIER DATE 3/6/89
APPROVED BY C.M.E. DATE 3/7/89
APPROVED BY DATE
MATERIAL ----------
FINISH ----------

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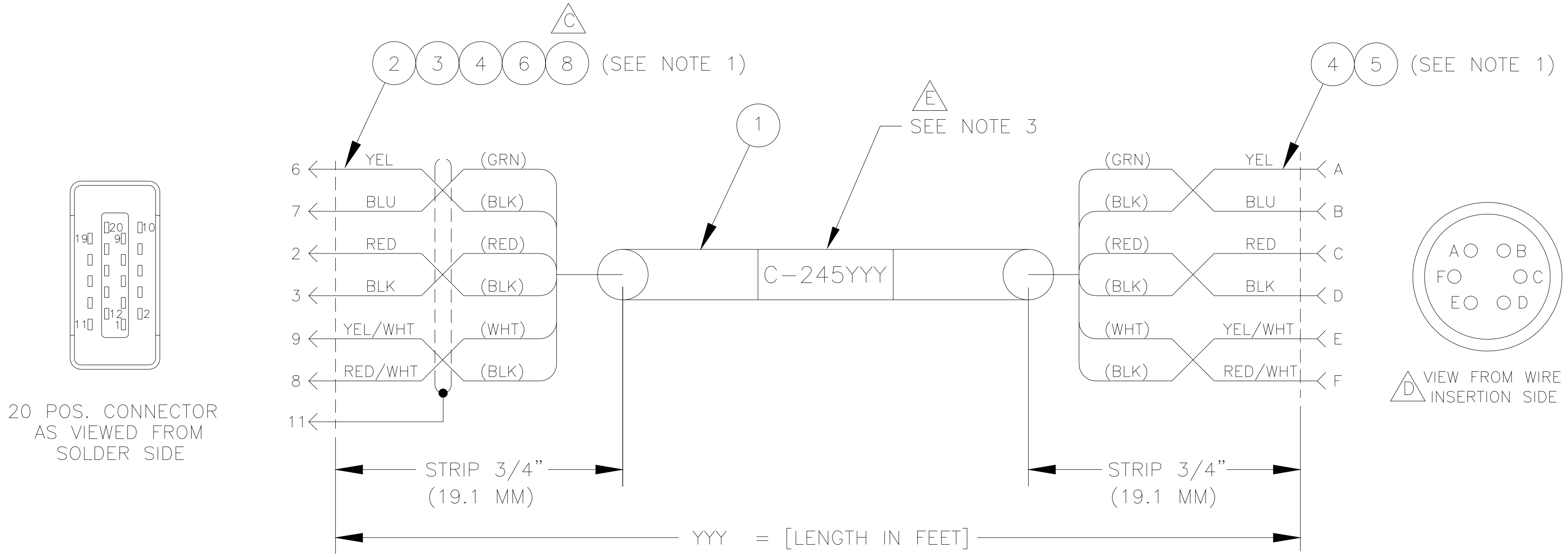
TITLE CABLE, RESOLVER

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± ---
X.XXX± ---
ANGULAR ± ---
DRAWN BY BAIER
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 21JUN93
SCALE ---
DRAWING NUMBER C-200YYY
SHEET NO. 1 OF 1
REVISION F

DATE	SYM	REVISION RECORD	DR	CK	CK
19JUL00	E	PER ECN 00-246	CWB	EB	CDR

NOTES:

1. HEAT SHRINK TUBING [ITEM 4] OVER SOLDER JOINT (13 PLACES)
2. COLORS IN (   ) INDICATE ALTERNATE CABLE COLORS.
3. MARK PER QP-08-0001.



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CHECKED BY E.BAIER	DATE 4/15/96
APPROVED BY JC	DATE 4/15/96
APPROVED BY	DATE
MATERIAL -----------	
FINISH -----------	

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TITLE

CABLE, RESOLVER

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)		DRAWN BY BOWMAN		DRAWING NUMBER C-245YYY
TOLERANCES		AutoCAD FILE LOCATION Q:\CURRENT DWGS		
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				REVISION E

DATE	SYM	REVISION RECORD	DR	CK	CK
22FEB05	0	PER ECN 05-051	CWB		

NOTES:
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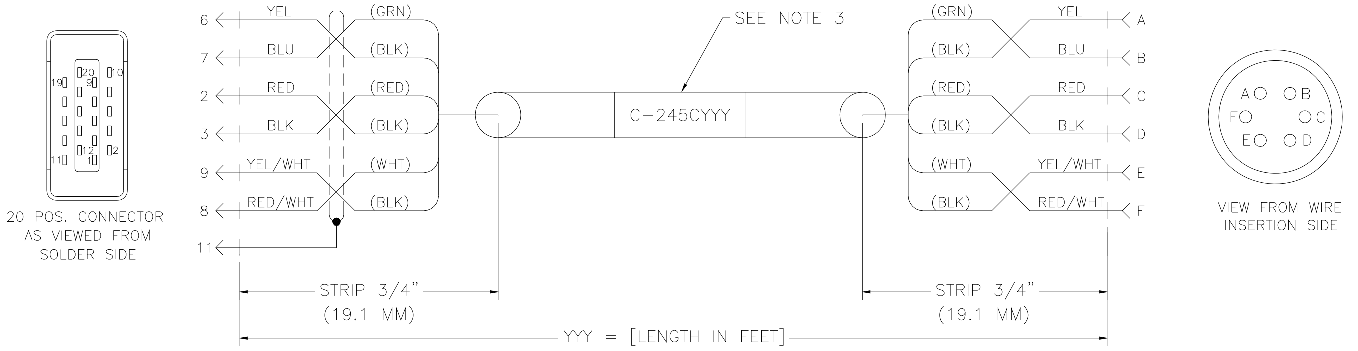
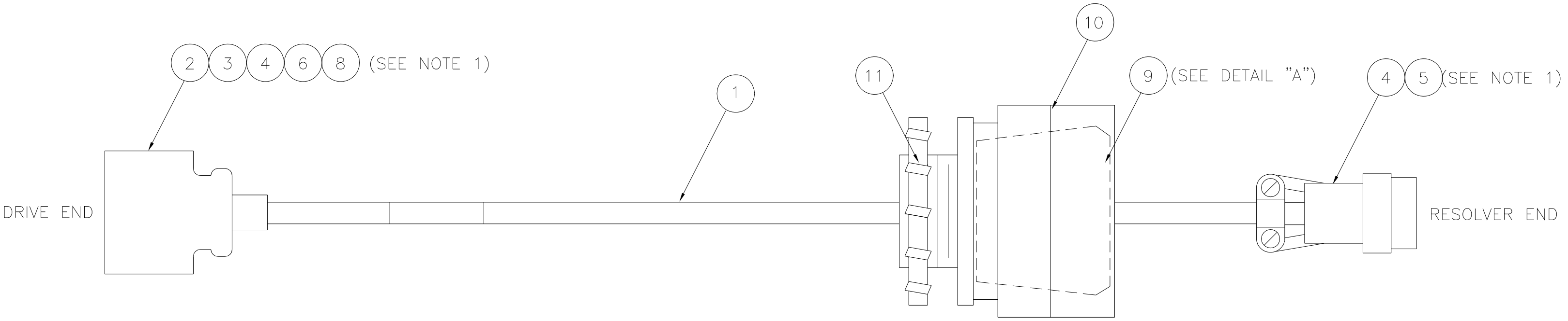
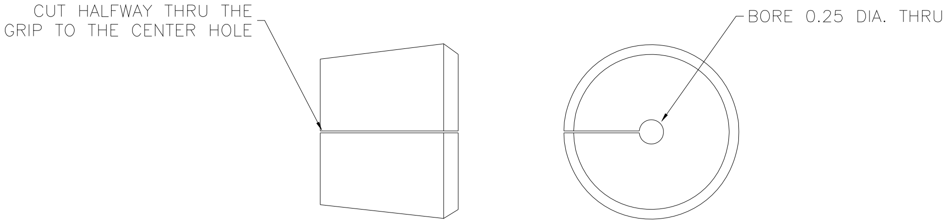
2. COLORS IN ( ) INDICATE ALTERNATE CABLE COLORS.
3. MARK PER QP-08-0001.







DETAIL A
CORD GRIP DETAIL

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CHECKED BY
DATE
APPROVED BY
DATE
APPROVED BY
DATE
MATERIAL

FINISH

TITLE
CABLE, RESOLVER

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
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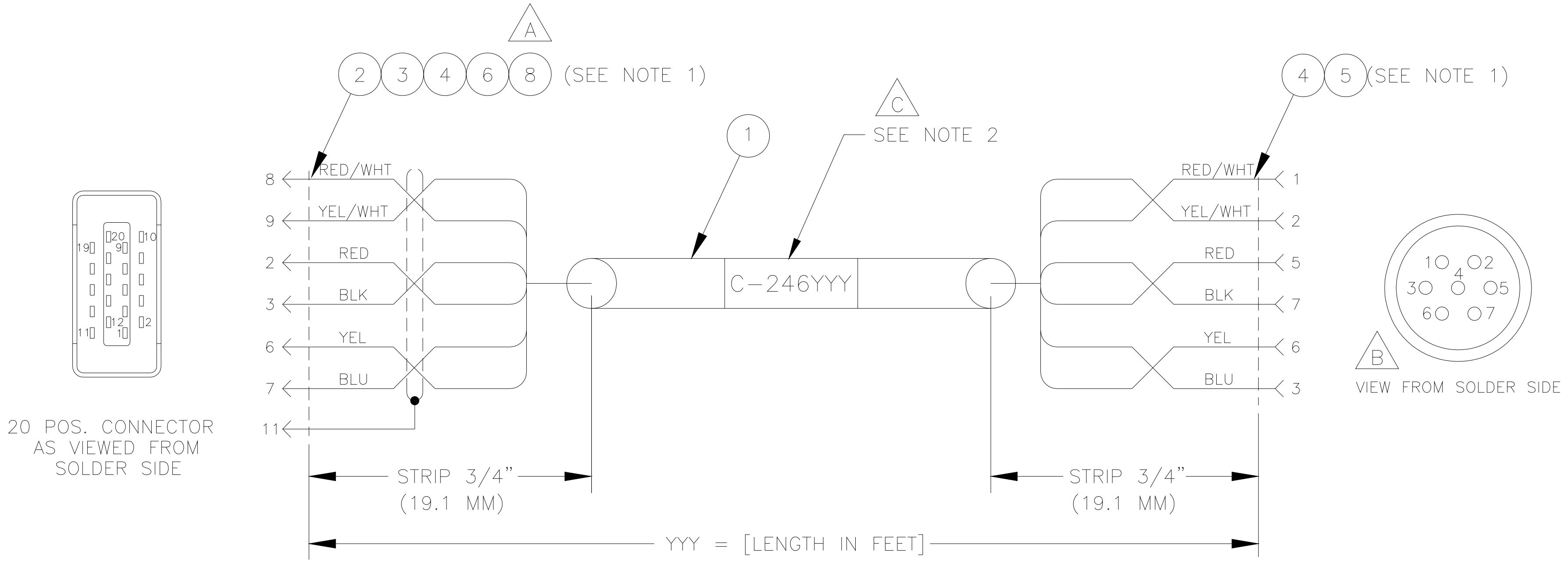
DATE 22FEB05
SCALE ---
DRAWING NUMBER C-245CYYY
SHEET NO. 1 OF 1
REVISION 0

DATE	SYM	REVISION RECORD	DR	CK	CK
19JUL00	C	PER ECN 00-246	CWB	EB	CDR

NOTES:

1. HEAT SHRINK TUBING [ITEM 4] OVER SOLDER JOINT (13 PLACES)
2. MARK PER QP-08-001.



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APPROVED BY ELS	DATE 10DEC99
APPROVED BY ELS	DATE 24APR96
MATERIAL -----------	
FINISH -----------	

TITLE
CABLE, RESOLVER

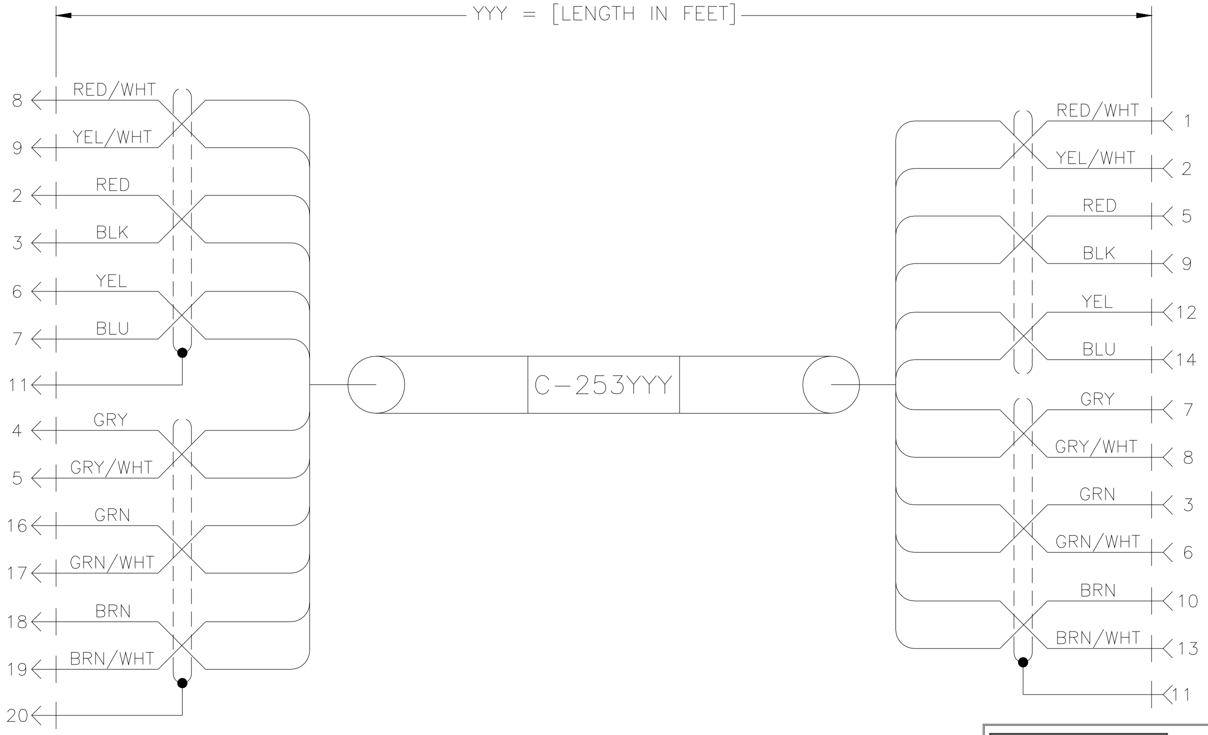
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± ---

DRAWN BY
BOWMAN
AutoCAD FILE LOCATION
Q:\CURRENT DWGS
B
DATE
26APR96
SCALE

DRAWING NUMBER
C-246YYY
SHEET NO.
1 OF 1
REVISION
C

DATE	SYM	REVISION RECORD	DR	CK	CK
06MAY97	0	PER ECN 97-151	CWB		

NOTES:
1. PIN NUMBERS SHOWN FOR REFERENCE ONLY



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TITLE
CABLE, RESOLVER

MATERIAL

FINISH

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'

DRAWN BY
BOWMAN

AutoCAD FILE LOCATION
Q:\CURRENT DWGS

B

DATE
06MAY97

SCALE

DRAWING NUMBER
C-253YYY

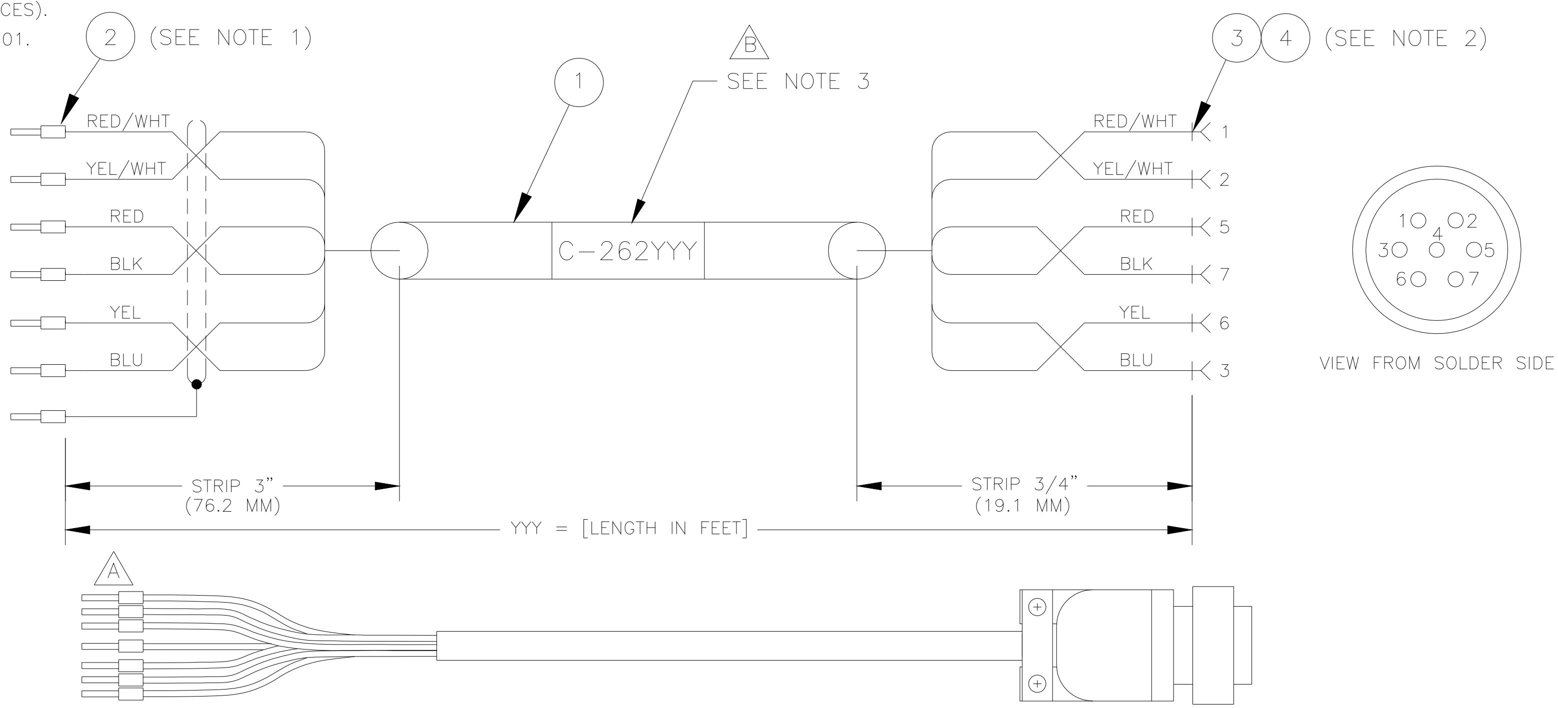
SHEET NO.
1 OF 1

REVISION
0

DATE	SYM	REVISION RECORD	DR	CK	CK
19JUL00	B	PER ECN 00-246	CWB	EB	CDR

NOTES:

1. CRIMP ITEM 2 USING WEIDMULLER TOOL PZ-4 OR EQUIVALENT.
2. HEAT SHRINK TUBING [ITEM 4] SOLDER JOINT (7 PLACES).
3. MARK PER QP-08-0001.



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CHECKED BY CD	DATE 6/10/98
APPROVED BY JC	DATE 6/10/98
APPROVED BY	DATE
MATERIAL ----------	
FINISH ----------	

TITLE
CABLE, RESOLVER TO DINT-350

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
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X.XX± 0.01
X.XXX± 0.005
ANGULAR ± ---
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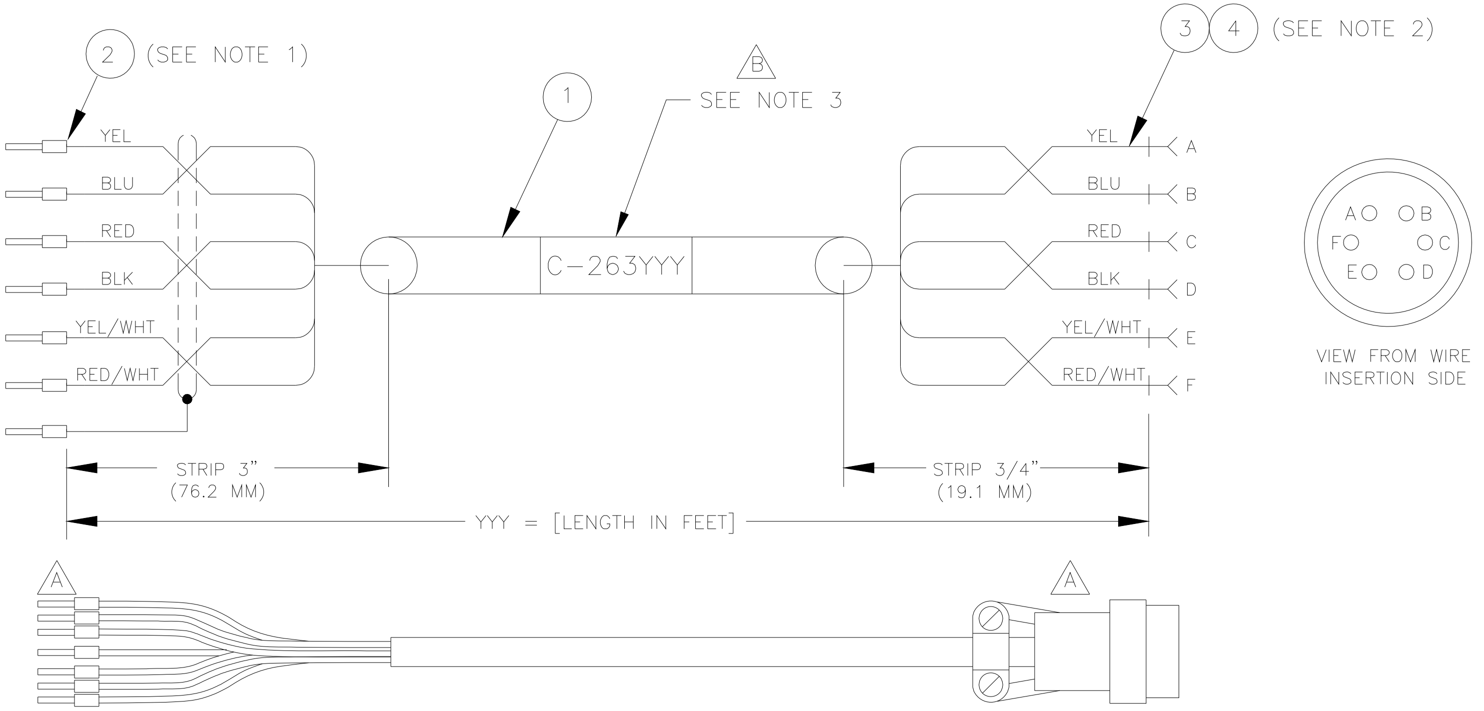
DRAWN BY BAIER
AutoCAD FILE LOCATION Q:\CURRENT DWGS
DATE 27MAY98
SCALE ---
DRAWING NUMBER C-262YYY
SHEET NO. 1 OF 1
REVISION B

DATE	SYM	REVISION RECORD	DR	CK	CK
19JUL00	B	PER ECN 00-246	CWB	EB	CDR

NOTES:

1. INSTALL ITEM 2 USING WEIDMULLER CRIMP TOOL PZ-4 OR EQUIVALENT.
2. HEAT SHRINK TUBING [ITEM 4] OVER SOLDER JOINT (7 PLACES).
3. MARK PER QP-08-0001.



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CHECKED BY CD DATE 6/10/98
APPROVED BY JC DATE 6/10/98
APPROVED BY DATE
TITLE CABLE, RESOLVER
MATERIAL ----------
FINISH ----------
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
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X.XX± 0.01
X.XXX± 0.005
ANGULAR ± ---
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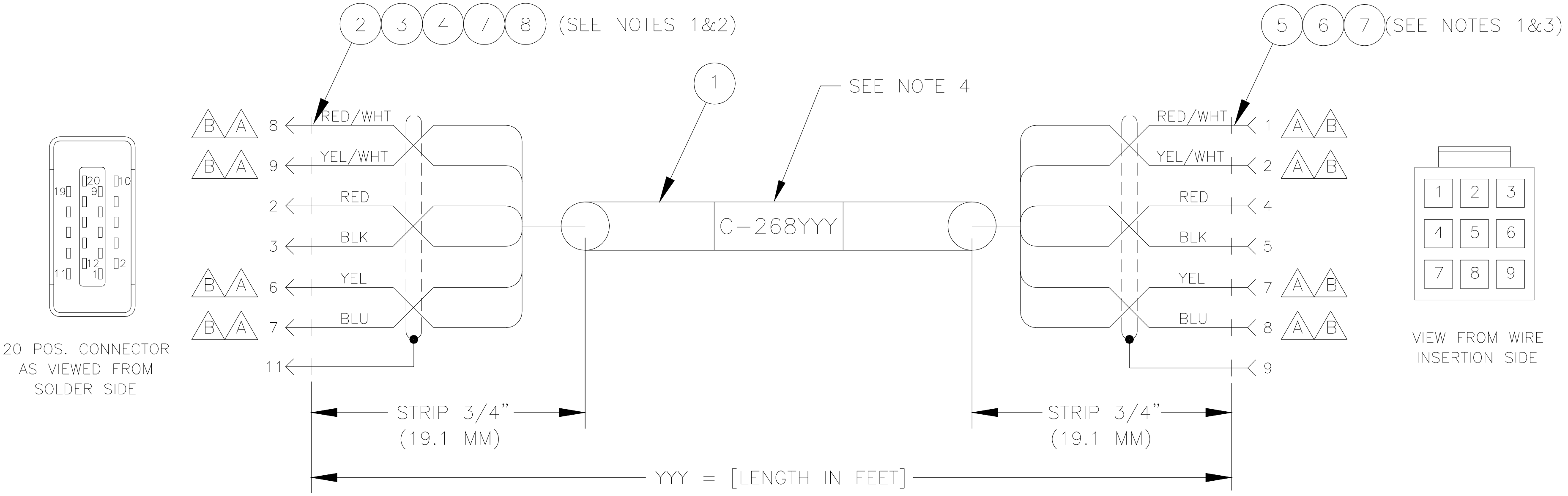
DATE 27MAY98
SCALE ---
DRAWING NUMBER C-263YYY
SHEET NO. 1 OF 1
REVISION B

DATE	SYM	REVISION RECORD	DR	CK	CK
14DEC00	B	PER ECN 00-414	EB	JC	CDR

NOTES:
1. PIN NUMBERS SHOWN FOR REFERENCE ONLY.
2. HEAT SHRINK TUBING [ITEM 4] OVER SOLDER JOINT (7 PLACES).
3. CRIMP USING JST CRIMP TOOL #YC-520.
4. MARK PER QP-08-0001.



INDUSTRIAL INDEXING SYSTEMS, Inc.
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CHECKED BY T.O'BRIEN DATE 2/23/00
APPROVED BY DATE
APPROVED BY JC DATE 12/18/00
MATERIAL ----------
FINISH ----------

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TITLE
CABLE, RESOLVER

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± ---

DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 15FEB00
SCALE ---
DRAWING NUMBER C-268YYY
SHEET NO. 1 OF 1
REVISION B

DATE	SYM	REVISION RECORD	DR	CK	CK
27DEC00	A	PER ECN 00-432	CWB	CD	CDR

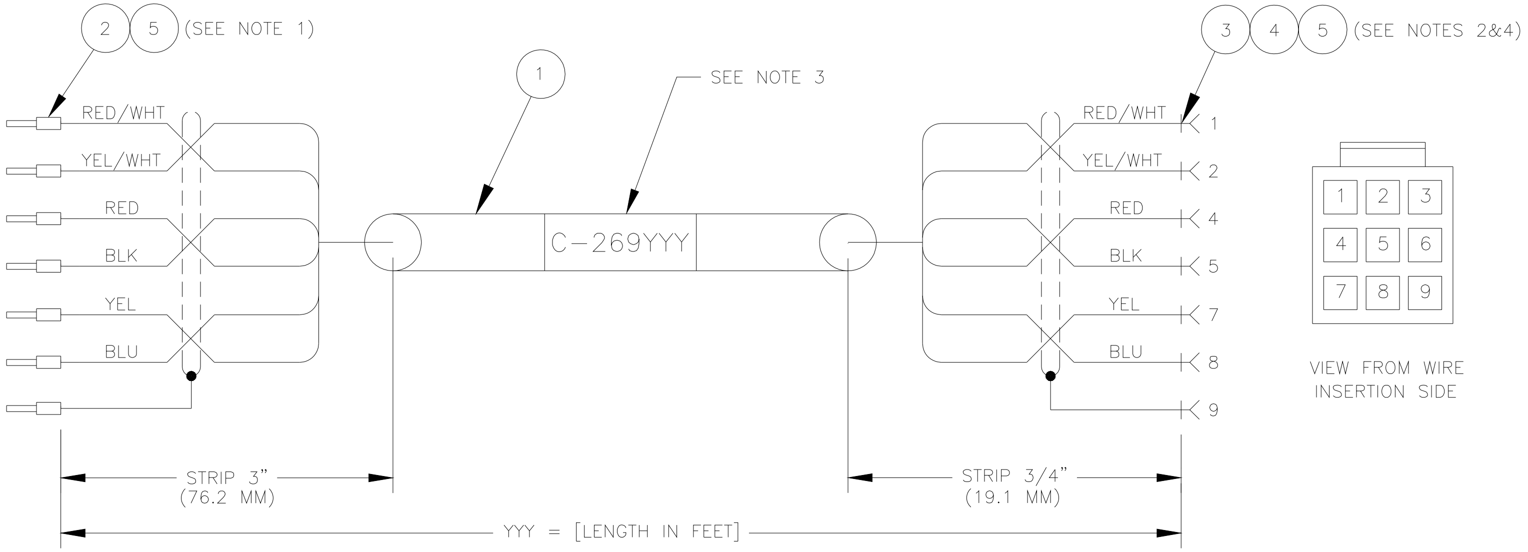
NOTES: A

1.) CRIMP ITEM 2 USING WEIDMULLER TOOL PZ-4 OR EQUIVALENT.

2.) CRIMP ITEM 3 USING JST CRIMP TOOL YC-520.

3.) MARK PER QP-08-0001.

4.) PIN NUMBERS SHOWN FOR REFERENCE ONLY.



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CHECKED BY | DATE
APPROVED BY | DATE
APPROVED BY | DATE
MATERIAL ----------
FINISH ----------

TITLE
CABLE, RESOLVER

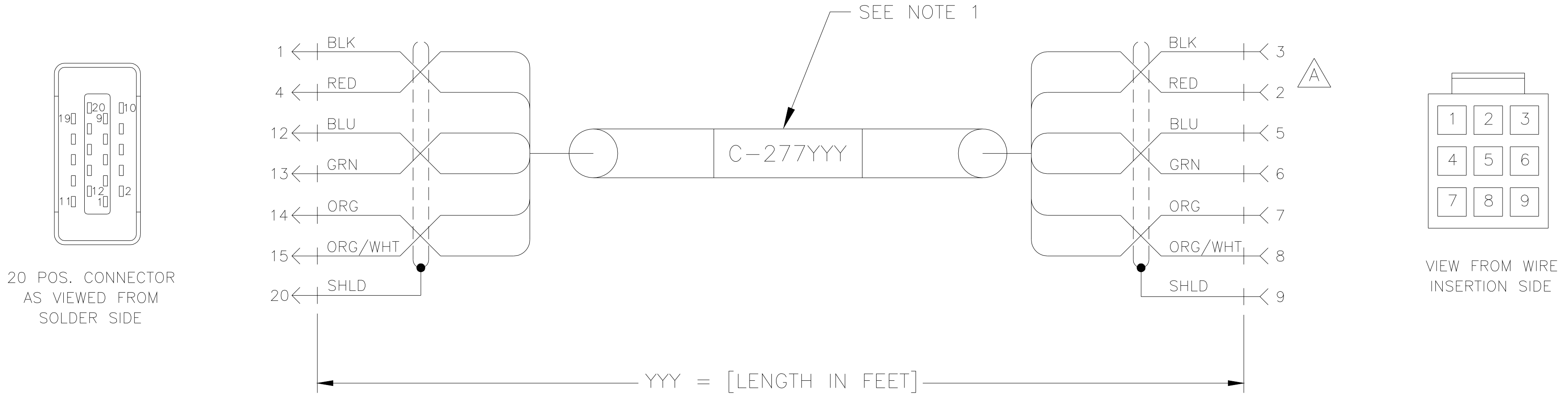
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± ---

DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 15FEB00
SCALE ---
DRAWING NUMBER C-269YYY
SHEET NO. 1 OF 1
REVISION A

DATE	SYM	REVISION RECORD	DR	CK	CK
27MAR01	A	PER ECN 01-115	CWB		

NOTES:

1. MARK PER QP-08-0001.



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CHECKED BY PK DATE 1/25/01
APPROVED BY DATE
APPROVED BY DATE
MATERIAL ----------
FINISH ----------

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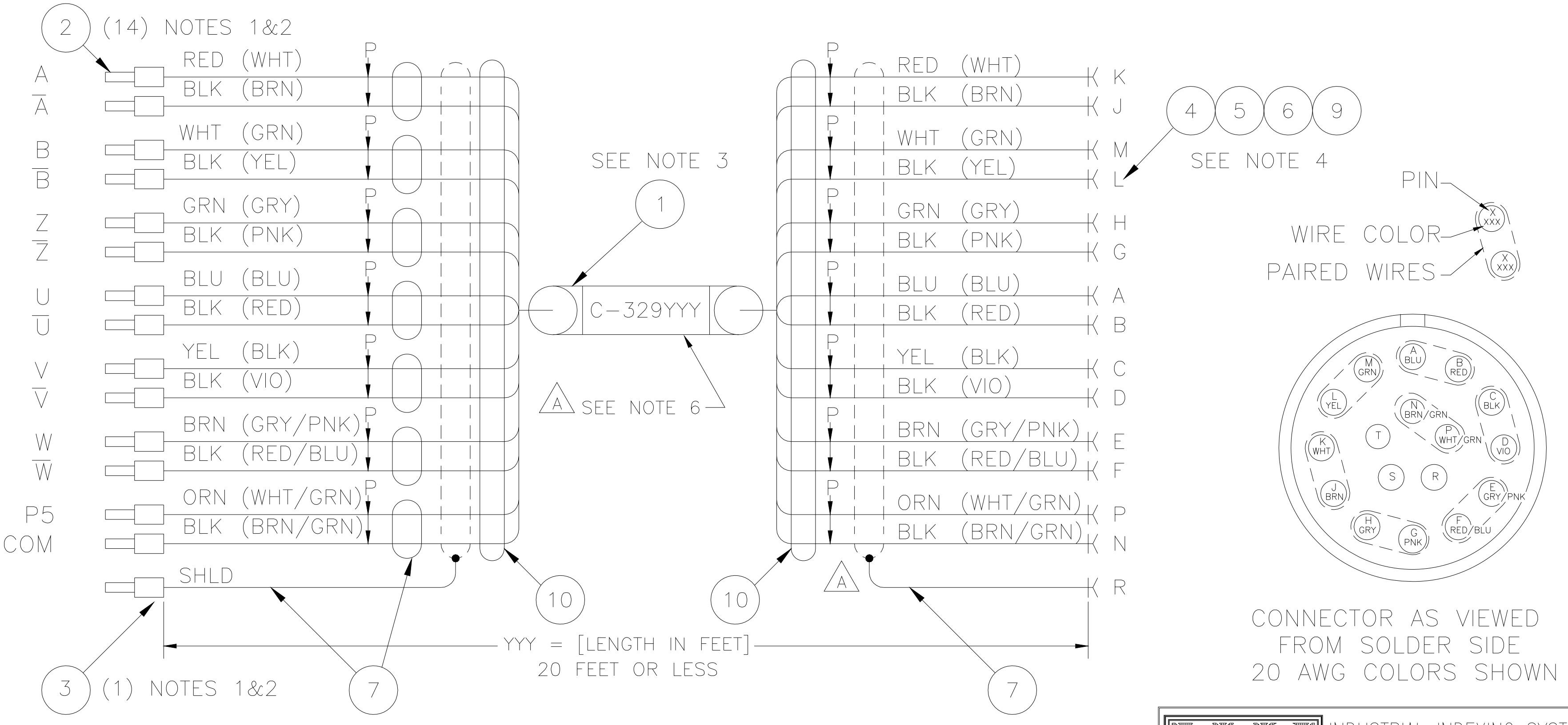
TITLE CABLE, RESOLVER

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY BAIER
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 22JAN01
SCALE ---
DRAWING NUMBER C-277YYY
SHEET NO. 1 OF 1
REVISION A

DATE	SYM	REVISION RECORD	DR	CK	CK
18MAY04	A	PER ECN 04-197	CWB		



NOTES:

1. INSTALL ITEM 2 & 3 USING WEIDMULLER CRIMP TOOL PZ4 OR EQUIV.
2. ALTERNATE CONSTRUCTION; STRIP AND TIN 1/4".
3. COLORS SHOWN (COLOR) INDICATES ASSEMBLIES MANUFACTURED WITH RAW MATERIAL "P.N 35814".
4. ITEM 6 SUPPLIED AS PART OF CONNECTOR, ITEM 4.
5. IF CRIMP TYPE CONNECTOR IS USED: INSTALL ITEM 4 USING AMP TOOL #90277-1.
6. MARK PER QP-08-0001.

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CHECKED BY
DATE
APPROVED BY
DATE
APPROVED BY
DATE
MATERIAL

FINISH

TITLE
CABLE, ENCODER

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± ---
X.XXX± ---
ANGULAR
± ---

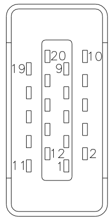
DRAWN BY
BOWMAN
AutoCAD FILE LOCATION
Q:\CURRENT DWGS
B
DATE
17JUL95
SCALE

DRAWING NUMBER
C-329YYY
SHEET NO.
1 OF 1
REVISION
A

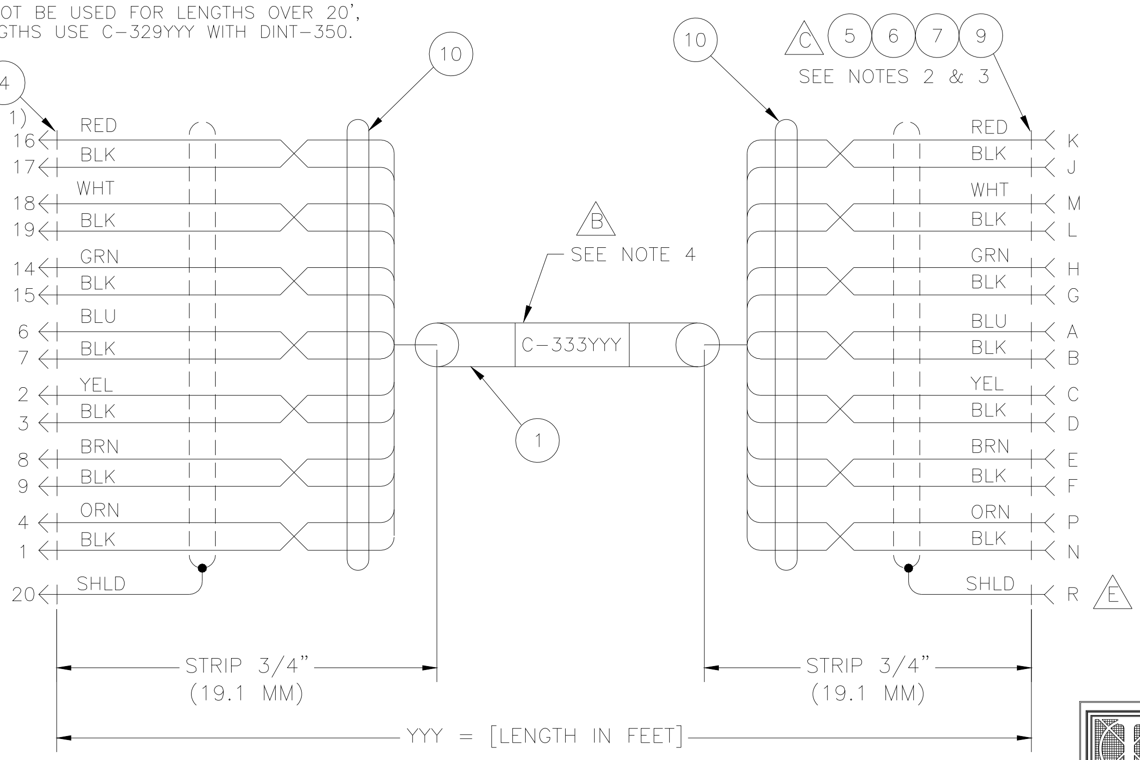
DATE	SYM	REVISION RECORD	DR	CK	CK
17JAN05	F	PER ECN 04-529	CWB		

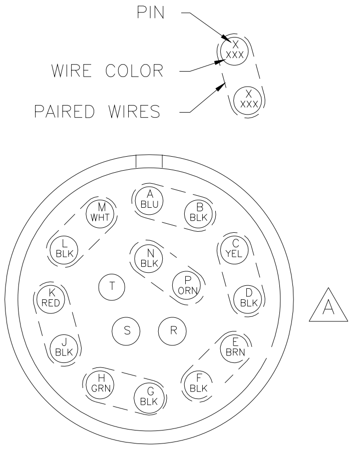
NOTES: B

1. HEAT SHRINK TUBING [ITEM 4] OVER SOLDER JOINTS.
2. ITEM 6 SUPPLIED AS PART OF CONNECTOR, ITEM 5.
3. IF CRIMP TYPE CONNECTOR IS USED:
   INSTALL ITEM 4 USING AMP TOOL #90277-1.
4. MARK PER QP-08-0001.
5. THIS CABLE CANNOT BE USED FOR LENGTHS OVER 20', FOR LONGER LENGTHS USE C-329YYY WITH DINT-350. D F



CONNECTOR AS VIEWED FROM SOLDER SIDE





CONNECTOR AS VIEWED FROM SOLDER SIDE

INDUSTRIAL INDEXING SYSTEMS, Inc.
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CHECKED BY	DATE
APPROVED BY CD	DATE 14NOV98
APPROVED BY WES	DATE 10AUG97
MATERIAL ----------	
FINISH ----------	

TITLE
CABLE, ENCODER

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± ---
X.XXX± ---
ANGULAR ± ---

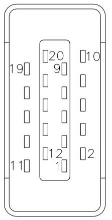
DRAWN BY BAIER
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B DATE 08AUG97
SCALE ---

DRAWING NUMBER C-333YYY
SHEET NO. 1 OF 1
REVISION F

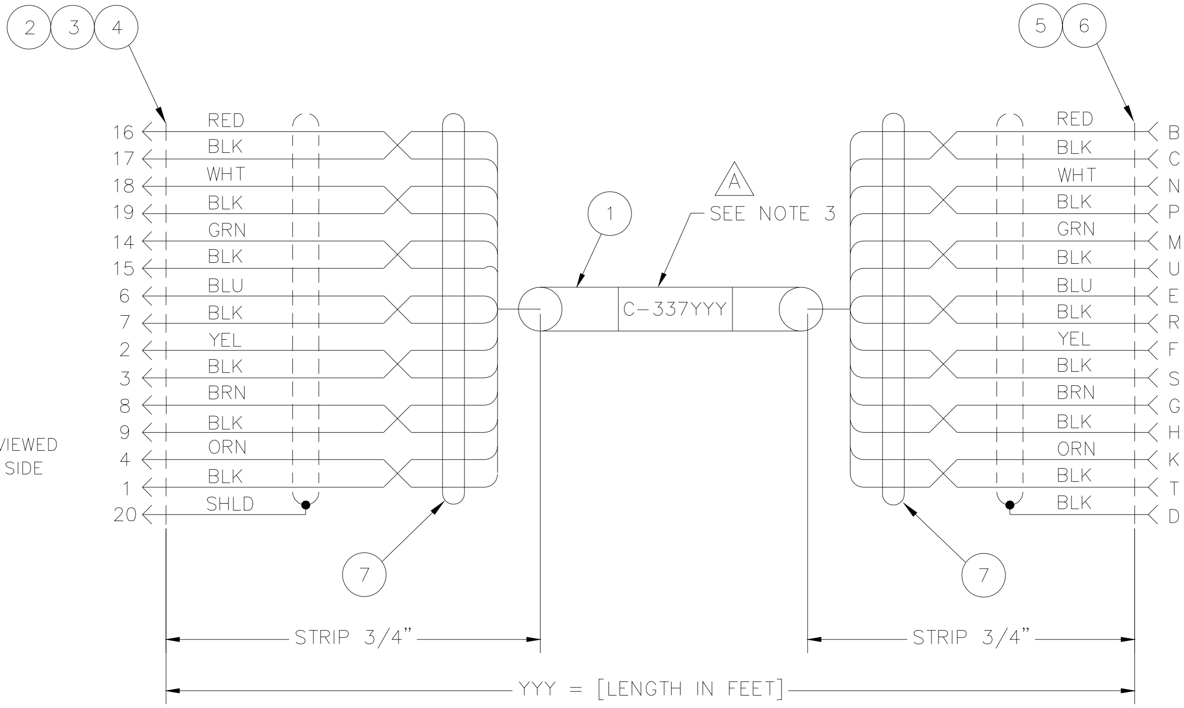
NOTES: A

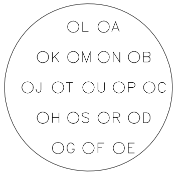
1. PIN NUMBERS SHOWN FOR REFERENCE ONLY.
2. HEAT SHRINK TUBING [ITEM 4] OVER SOLDER JOINTS.
3. MARK PER QP-08-0001.

DATE	SYM	REVISION RECORD	DR	CK	CK
05FEB03	A	PER ECN 03-075	CWB		



CONNECTOR AS VIEWED
FROM SOLDER SIDE





CONNECTOR AS VIEWED
FROM SOLDER SIDE

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

CHECKED BY | DATE
APPROVED BY | DATE
APPROVED BY | DATE

MATERIAL

FINISH

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TITLE
CABLE, ENCODER

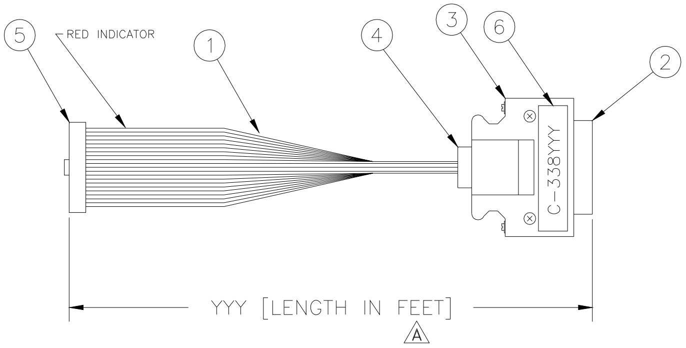
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'

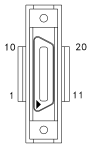
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 24SEP97
SCALE ---
DRAWING NUMBER C-337YYY
SHEET NO. 1 OF 1
REVISION A

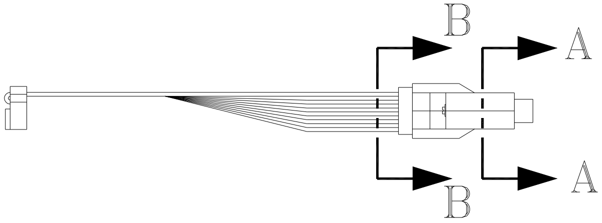
NOTES:

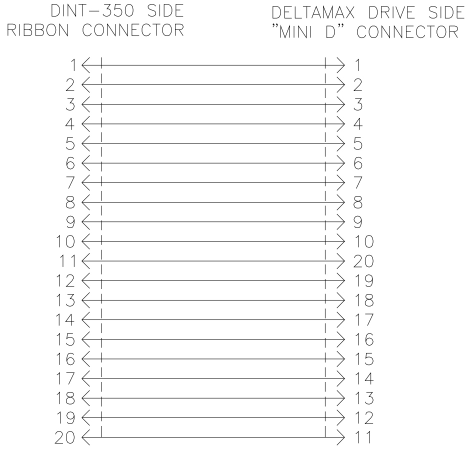
1) SPLIT ONE END OF THE FLAT CABLE IN HALF (10 CONDUCTORS) APPROXIMATELY 3/4" BACK.

DATE	SYM	REVISION RECORD	DR	CK	CK
15FEB99	A	PER ECN 99-040	EB	EB	CDR









DINT-350 SIDE RIBBON CONNECTOR	DELTAMAX DRIVE SIDE "MINI D" CONNECTOR
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	20
12	19
13	18
14	17
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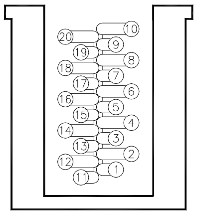
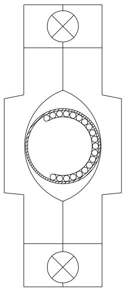
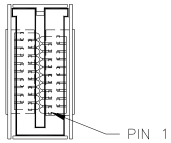
16	15
17	14
18	13
19	12
20	11



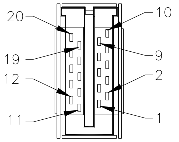
ENLARGED VIEW SHOWING 'U' RETAINER AND CABLE/ PIN ORINETATION



SECTION B-B SHOWING FLAT CABLE



SECTION A-A SHOWING FLAT CABLE INSERTED



20 POSITION CONNECTOR VIEWED FROM WIRE INSERTION SIDE

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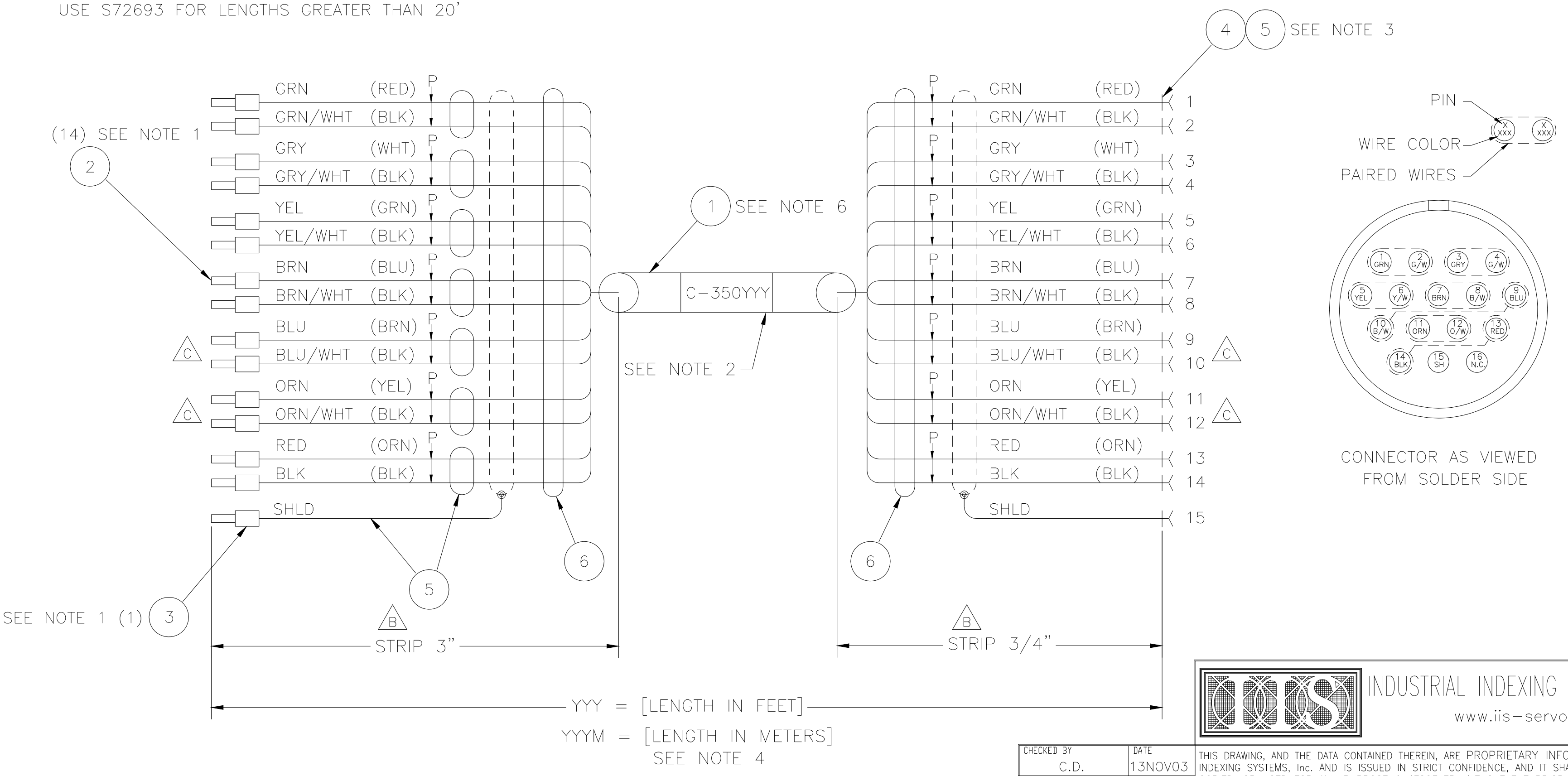
CHECKED BY E.BAIER DATE 30JUN98
APPROVED BY DATE
APPROVED BY DATE
MATERIAL ------------
FINISH ------------

TITLE CABLE, DINT-350 TO DRIVE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± ---
X.XXX± ---
ANGULAR ± ---
DRAWN BY BAIER
AutoCAD FILE LOCATION Q:\CURRENT DWGS
DRAWING NUMBER C-338YYY
C
DATE 28MAY98
SCALE ---
SHEET NO. 1 OF 1
REVISION A

DATE	SYM	REVISION RECORD	DR	CK	CK
14MAY04	C	PER ECN 04-192	CWB		

NOTES:
1. INSTALL ITEM 2 & 3 USING WEIDMULLER CRIMP TOOL PZ4 OR EQUIV.
2. MARK PER QP-08-0001.
3. HEAT SHRINK (ITEM 5) OVER SOLDER JOINTS, 15 PLACES.
4. USE FACTORY CABLES FOR LENGTHS OF 3 METER AND 6 METER, USE S72693 FOR LENGTHS GREATER THAN 20'
5. THERE IS A POTENTIAL FOR SIGNAL DEGRADATION WHEN CABLE LENGTH EXCEEDS 20 FEET, CONSULT FACTORY WHERE APPLICABLE.
6. COLORS IN ( ) INDICATE ALTERNATE CABLE COLORS.



CONNECTOR AS VIEWED FROM SOLDER SIDE

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

CHECKED BY C.D. DATE 13NOV03

APPROVED BY DATE

APPROVED BY DATE

MATERIAL ----------

FINISH ----------

TITLE

CABLE, ENCODER

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)

TOLERANCES

X.X± ---
X.XX± ---
X.XXX± ---

ANGULAR ± ---

DRAWN BY CASSANO

AutoCAD FILE LOCATION Q:\CURRENT DWGS

B

DATE 08OCT03

SCALE ---

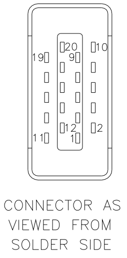
DRAWING NUMBER C-350YYY

SHEET NO. 1 OF 1

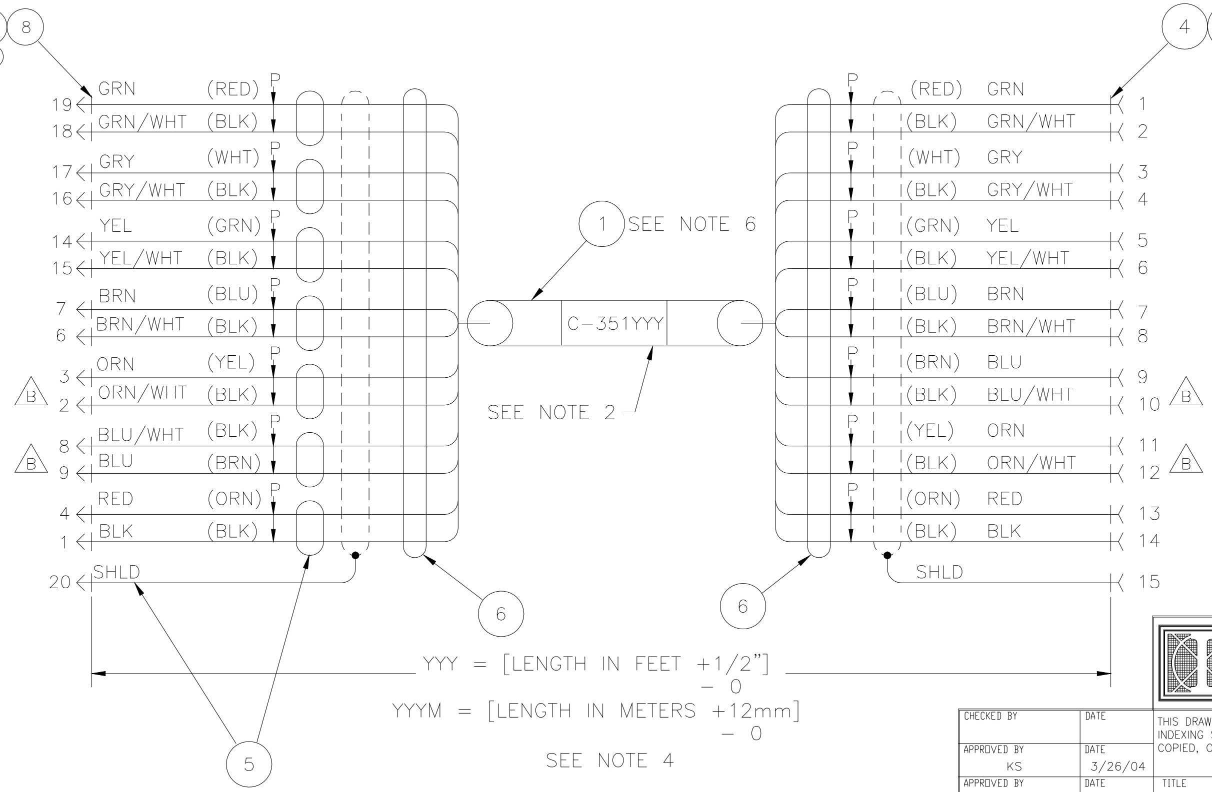
REVISION C

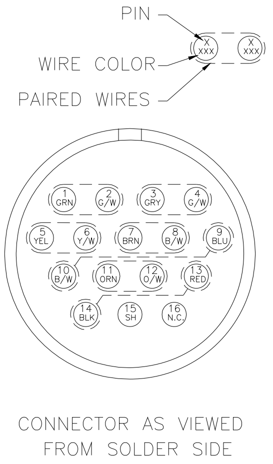
NOTES:
1. HEAT SHRINK TUBING [ITEM 7] OVER SOLDER JOINTS.
2. MARK PER QP-08-0001.
3. HEAT SHRINK (ITEM 5) OVER SOLDER JOINTS, 15 PLACES.
4. USE FACTORY CABLES FOR LENGTHS OF 3 METER AND 6 METER, USE S72693 FOR LENGTHS GREATER THAN 20'
5. THERE IS A POTENTIAL FOR SIGNAL DEGRADATION WHEN CABLE LENGTH EXCEEDS 20 FEET, CONSULT FACTORY WHERE APPLICABLE.
6. COLORS IN ( ) INDICATE ALTERNATE CABLE COLORS.

DATE	SYM	REVISION RECORD	DR	CK	CK
14MAY04	B	PER ECN 04-192	JBC		



CONNECTOR AS VIEWED FROM SOLDER SIDE





CONNECTOR AS VIEWED FROM SOLDER SIDE

INDUSTRIAL INDEXING SYSTEMS, Inc.
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CHECKED BY	DATE
APPROVED BY KS	DATE 3/26/04
APPROVED BY	DATE
MATERIAL -----------	
FINISH -------	

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TITLE
CABLE, ENCODER

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± --
X.XX± --
X.XXX± --
ANGULAR
± --

DRAWN BY CASSANO
AutoCAD FILE LOCATION Q\CURRENT DWGS
B
DATE 08OCT03
SCALE NTS
DRAWING NUMBER C-351YYY
SHEET NO. 1 OF 1
REVISION B

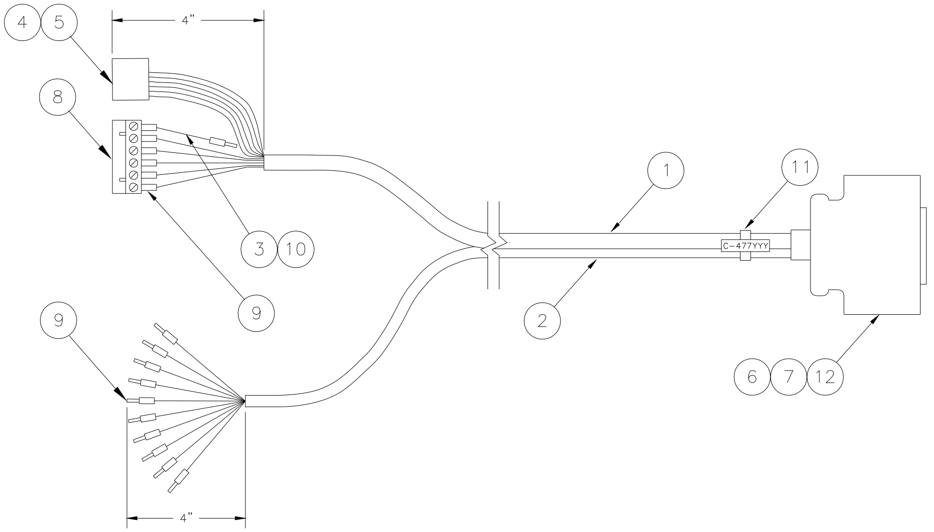
DATE	SYM	REVISION RECORD	DR	CK	CK
31JUL96	0	PER ECN 96-119	CWB	ELS	CDR

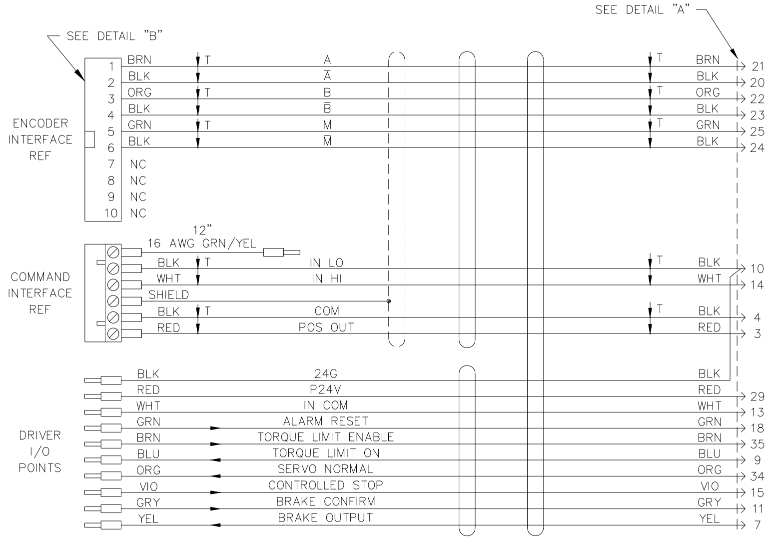
NOTES

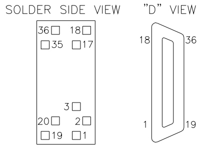
1) USE AMP CRIMP TOOL 90277-1 OR EQUIV
   FOR INSTALLATION OF ITEM 5.

2) ALTERNATE CONSTRUCTION:
   STRIP AND TIN .25".

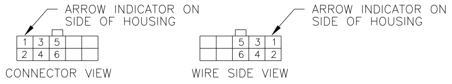
3) CRIMP FERRULES USING
   WEIDMULLER CRIMP TOOL PZ-4
   OR EQUIVALENT.







DETAIL A



DETAIL B

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

CHECKED BY	DATE
APPROVED BY ELS	DATE 8/1/96
APPROVED BY	DATE

TITLE
CABLE, COMMAND

MATERIAL

FINISH

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)

TOLERANCES
X.X± ---
X.XX± ---
X.XXX± ---
ANGULAR
± ---

DRAWN BY BOWMAN

AutoCAD FILE LOCATION
Q:\CURRENT DWGS

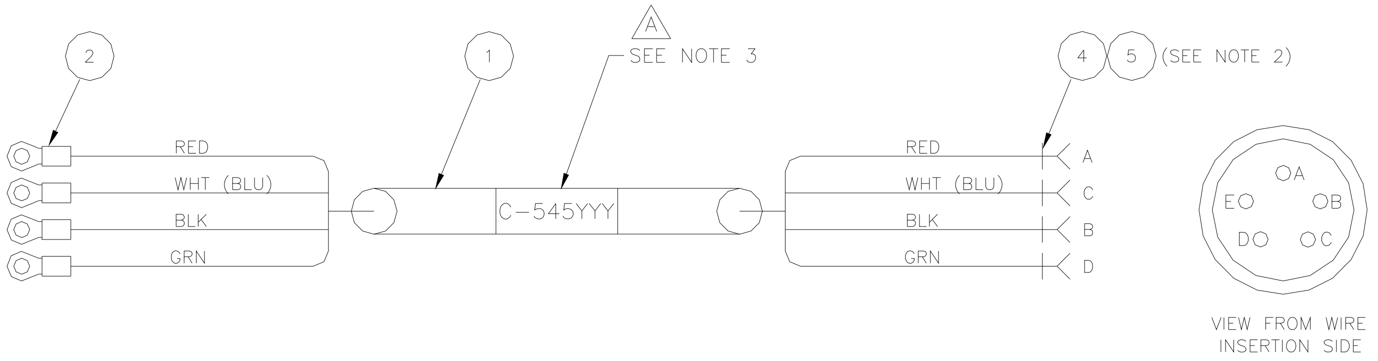
DRAWING NUMBER
C-477YYY

B	DATE	SCALE	SHEET NO.	REVISION
	31JUL96	---	1 OF 1	0

DATE	SYM	REVISION RECORD	DR	CK	CK
05FEB03	A	PER ECN 03-075	CWB		

NOTES: A

1. INSTALL ITEM 2 USING PANDUIT CRIMP TOOL CT-550 OR EQUIVALENT.
2. HEAT SHRINK TUBING (ITEM 5) OVER SOLDER JOINT 4 PLACES.
3. MARK PER QP-08-0001.



VIEW FROM WIRE INSERTION SIDE

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CHECKED BY | DATE
APPROVED BY | DATE
APPROVED BY | DATE
MATERIAL ___________
FINISH ___________

TITLE: CABLE, MOTOR

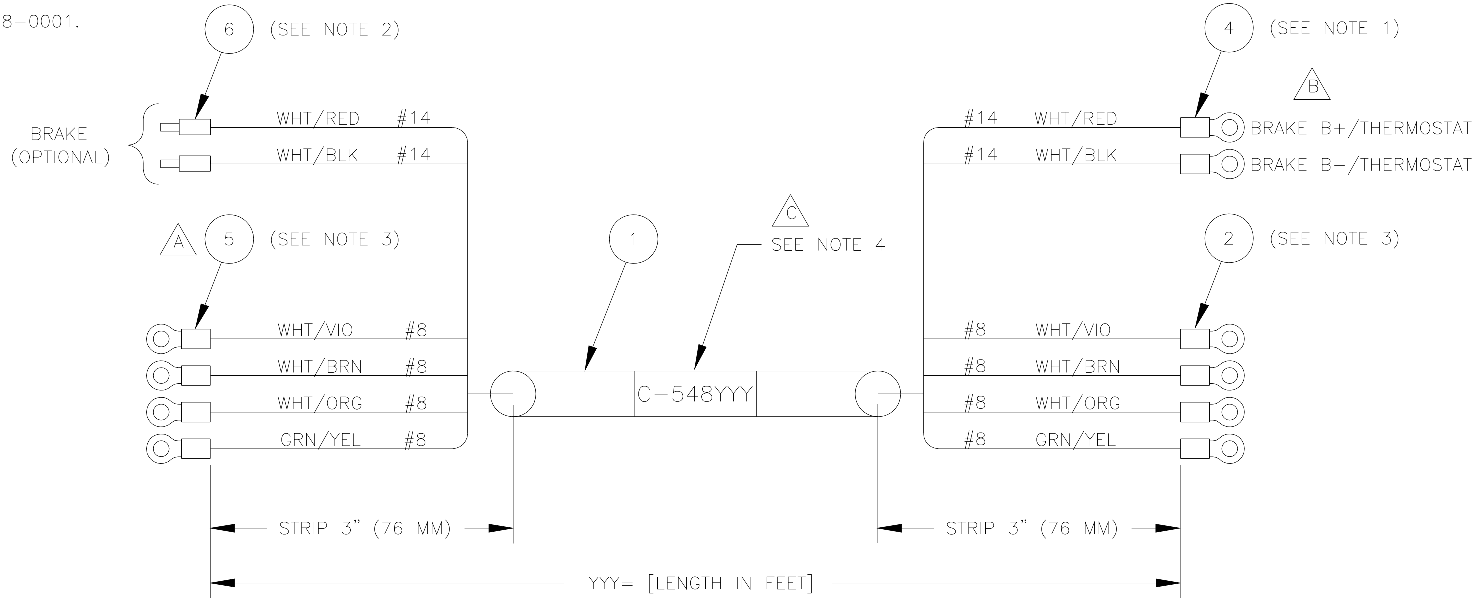
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'

DRAWN BY: BOWMAN
AutoCAD FILE LOCATION: Q:\CURRENT DWGS
B
DATE: 24SEP97
SCALE: ---
DRAWING NUMBER: C-545YYY
SHEET NO.: 1 OF 1
REVISION: A

DATE	SYM	REVISION RECORD	DR	CK	CK
18AUG97	C	PER ECN 00-246	CWB	EB	CDR

NOTES:

1. INSTALL ITEM 4 USING WEIDMULLER CRIMP TOOL CT-550 OR EQUIVALENT.
2. INSTALL ITEM 6 USING WEIDMULLER CRIMP TOOL PZ-4 OR EQUIVALENT.
3. INSTALL ITEMS 2 AND 5 USING PANDUIT CRIMP TOOL CT-720 OR EQUIVALENT.
4. MARK PER QP-08-0001.



INDUSTRIAL INDEXING SYSTEMS, Inc.
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CHECKED BY	DATE
10/30/97	E.BAIER
APPROVED BY	DATE
12/20/97	E.BAIER
APPROVED BY	DATE

MATERIAL

FINISH

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TITLE
CABLE, MOTOR

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± ---

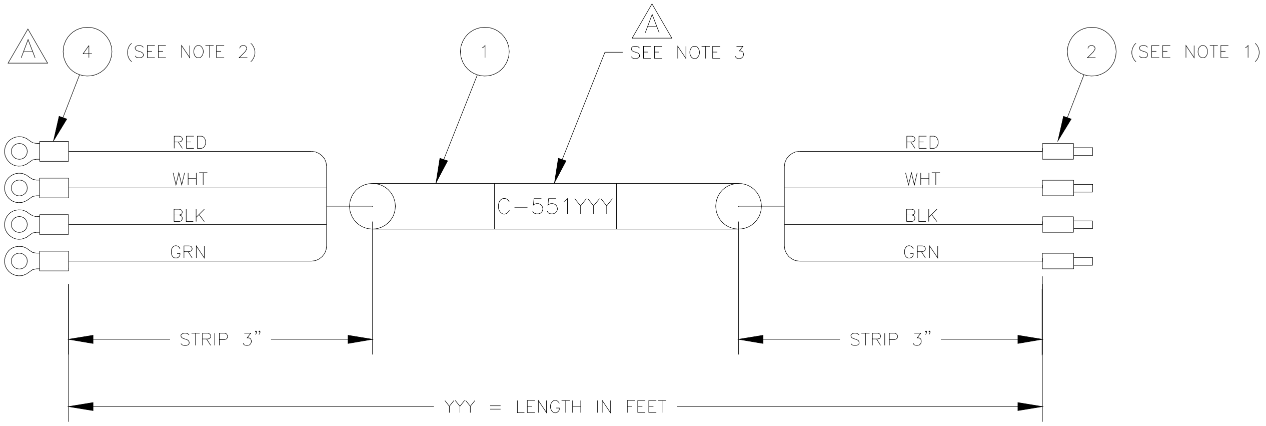
DRAWN BY
BOWMAN
AutoCAD FILE LOCATION
Q:\CURRENT DWGS
B
DATE
18AUG97
SCALE

DRAWING NUMBER
C-548YYY
SHEET NO.
1 OF 1
REVISION
C

DATE	SYM	REVISION RECORD	DR	CK	CK
15FEB99	A	PER ECN 99-019	EB	ELS	CDR

NOTES:

1. INSTALL ITEM 2 USING WEIDMULLER CRIMP TOOL PZ-16 OR EQUIVALENT.
2. INSTALL ITEM 4 USING PANDUIT CRIMP TOOL CT-550 OR EQUIVALENT.
3. MARK PER QP-08-0001.



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APPROVED BY	DATE	
APPROVED BY E.L.S.	DATE 18FEB99	TITLE CABLE, MOTOR
MATERIAL ----------		
FINISH ----------		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
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AutoCAD FILE LOCATION Q:\CURRENT DWGS
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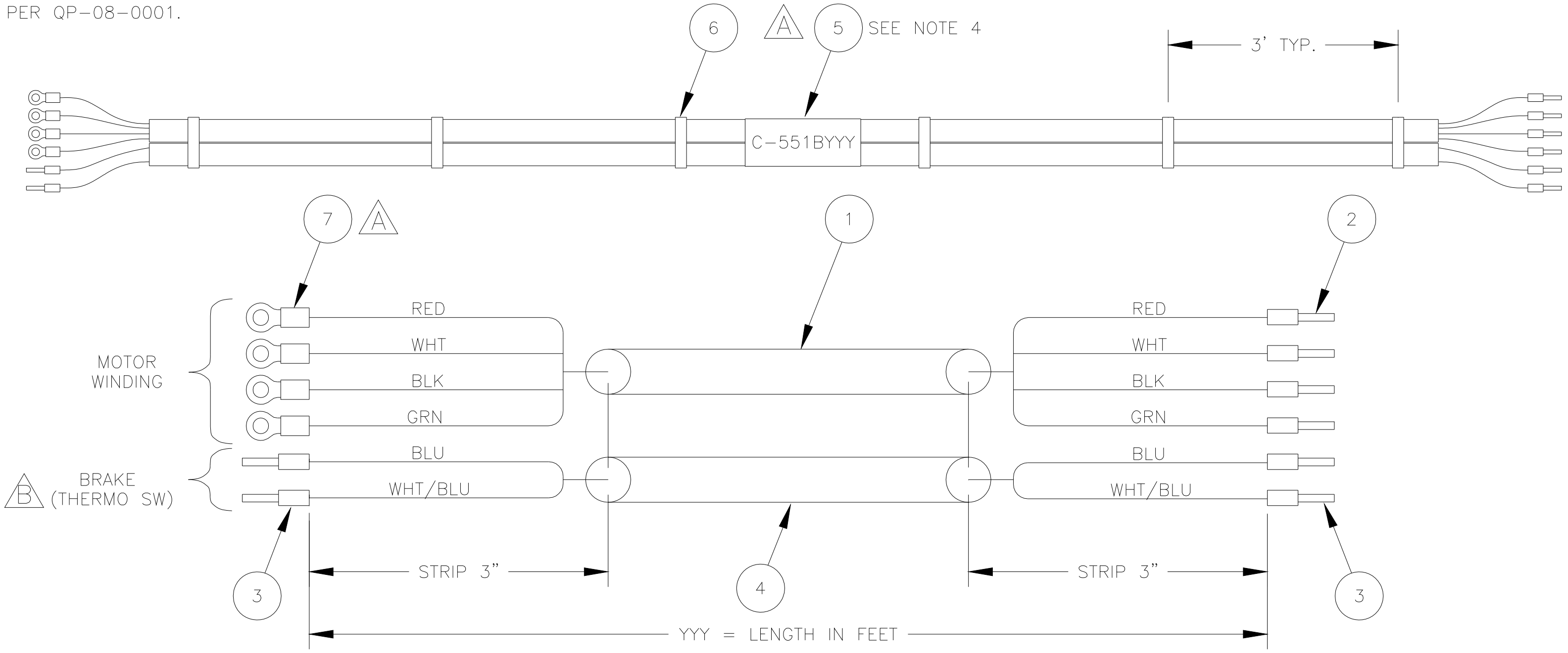
DATE 12JAN98
SCALE ---
DRAWING NUMBER C-551YYY
SHEET NO. 1 OF 1
REVISION A

DATE	SYM	REVISION RECORD	DR	CK	CK
21NOV02	B	PER ECN 02-367	CWB		

NOTES:

1. INSTALL ITEM 2 USING WEIDMULLER CRIMP TOOL PZ-16 OR EQUIVALENT.
2. INSTALL ITEM 3 USING WEIDMULLER CRIMP TOOL PZ-4 OR EQUIVALENT.
3. INSTALL ITEM 7 USING PANDUIT CRIMP TOOL CT-550 OR EQUIVALENT.
4. MARK PER QP-08-0001.



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APPROVED BY	DATE	
APPROVED BY	DATE	TITLE CABLE, MOTOR W/BRAKE

MATERIAL

FINISH

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
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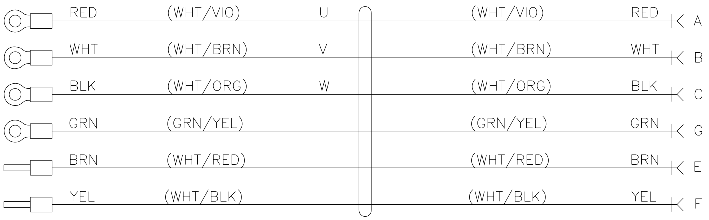
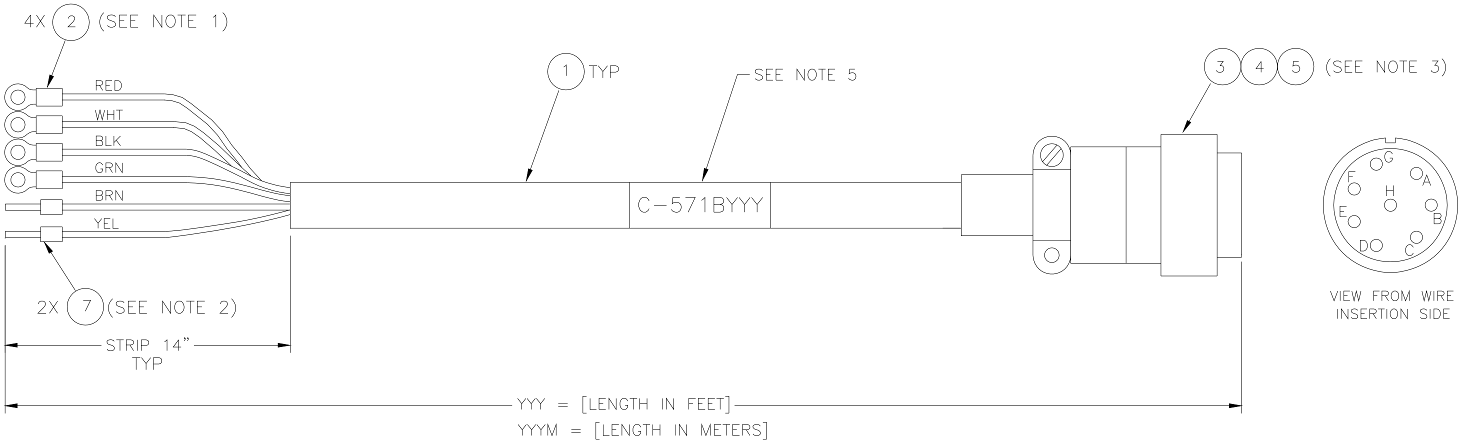
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 12JAN98
SCALE ---
DRAWING NUMBER C-551BYYY
SHEET NO. 1 OF 1
REVISION B

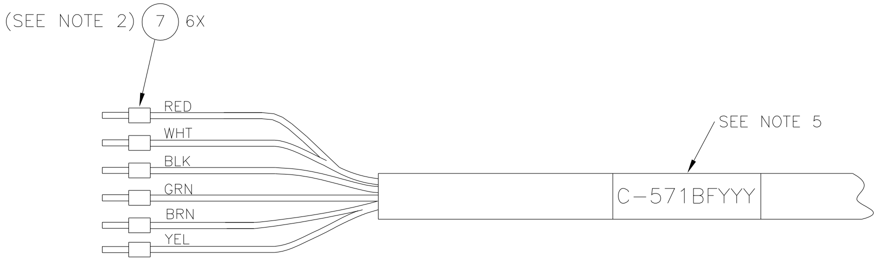
DATE	SYM	REVISION RECORD	DR	CK	CK
24MAR04	A	PER ECN 04-120	CWB		

NOTES:

1. INSTALL ITEM 2 USING PANDUIT CRIMP TOOL CT-550 OR EQUIVALENT.
2. INSTALL ITEM 6 USING WEIDMULLER CRIMP TOOL PZ16S OR EQUIVALENT.
3. HEAT SHRINK TUBING ITEM 5 OVER SOLDER JOINT 6 PLACES.
4. COLORS IN ( ) INDICATE ALTERNATE CABLE COLORS.
5. MARK PER QP-08-0001.







'F' OPTION

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CHECKED BY
DATE
APPROVED BY
DATE
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DATE
MATERIAL

FINISH

TITLE
CABLE, MOTOR

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
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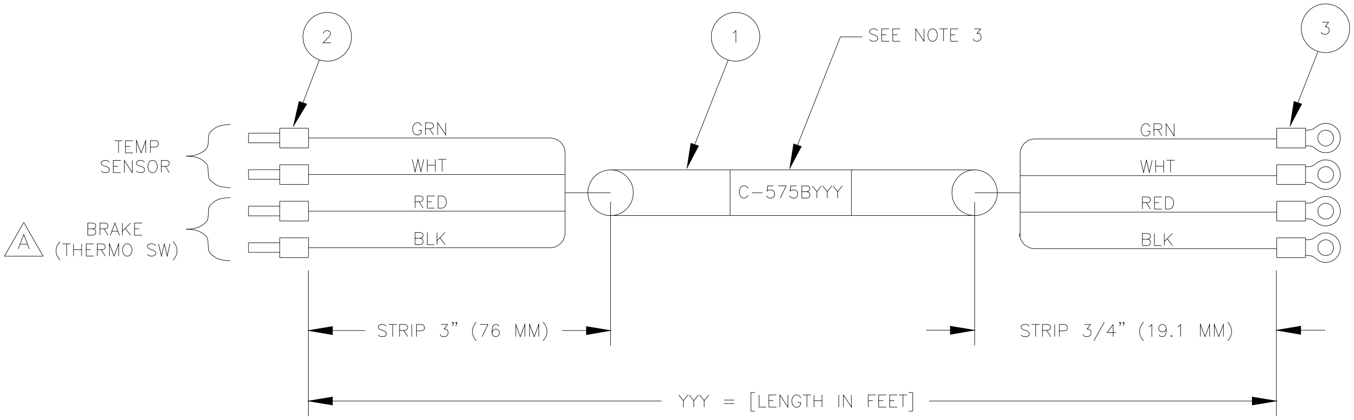
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 03DEC03
SCALE ---
DRAWING NUMBER C-571BYYY
SHEET NO. 1 OF 1
REVISION A

NOTES:

1. INSTALL ITEM 3 USING PANDUIT CRIMP TOOL CT-550 OR EQUIVALENT.
2. INSTALL ITEM 2 USING WEIDMULLER CRIMP TOOL PZ-4 OR EQUIVALENT.
3. MARK PER QP-08-0001.

DATE	SYM	REVISION RECORD	DR	CK	CK
21NOV02	A	PER ECN 02-367	CWB		



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CHECKED BY | DATE
APPROVED BY | DATE
APPROVED BY | DATE

MATERIAL ------------
TITLE CABLE, BRAKE
FINISH ------------

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
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X.XXX± 0.005
ANGULAR ± ---
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
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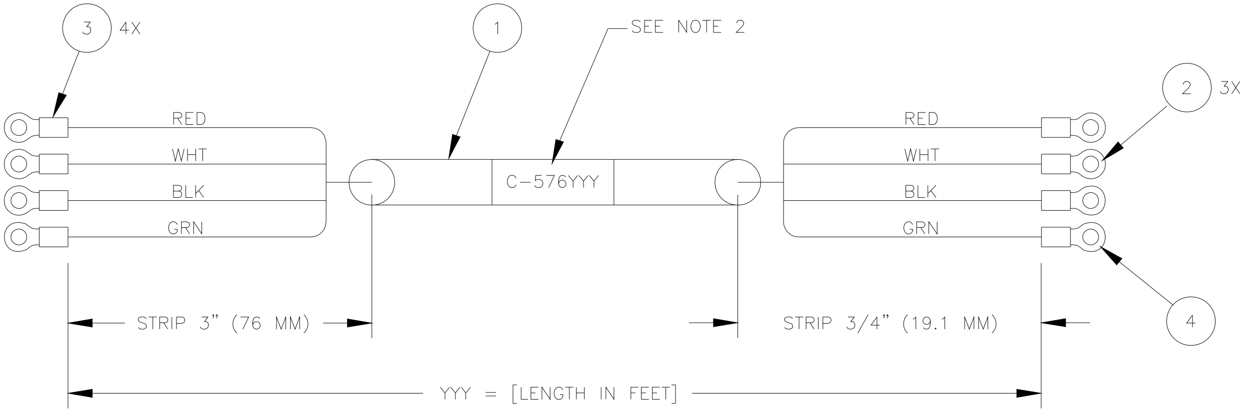
DATE 18JUN99
SCALE ---
DRAWING NUMBER C-575BYYY
SHEET NO. 1 OF 1
REVISION A

DATE	SYM	REVISION RECORD	DR	CK	CK
18JUN99	0	PER ECN 99-199	CWB		

NOTES:

1. INSTALL ITEMS 2 – 4 USING PANDUIT CRIMP TOOL CT-550 OR EQUIVALENT.
2. MARK PER QP-08-0001.



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APPROVED BY
DATE
APPROVED BY
DATE
MATERIAL

FINISH

TITLE
CABLE, MOTOR

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
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AutoCAD FILE LOCATION Q\CURRENT DWGS
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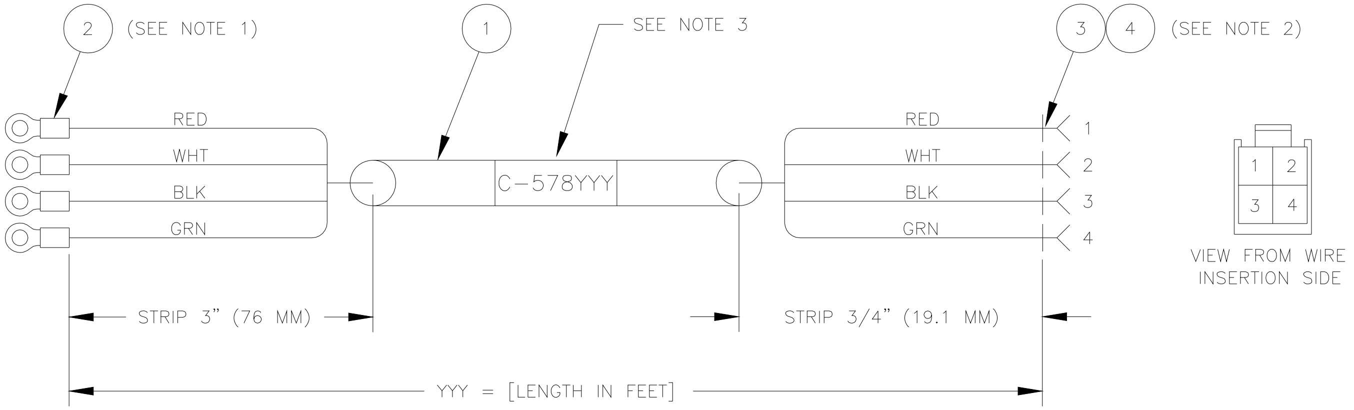
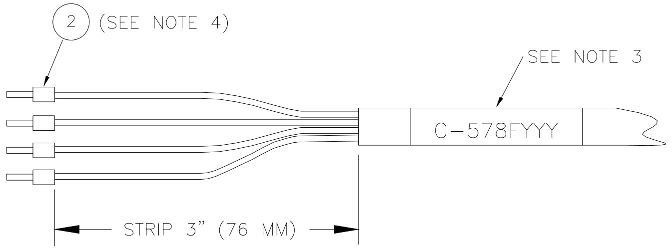
DATE 18JUN99
SCALE NTS
DRAWING NUMBER C-576YYY
SHEET NO. 1 OF 1
REVISION 0

DATE	SYM	REVISION RECORD	DR	CK	CK
30MAY03	B	PER ECN 03-248	EB	CD	CDR

NOTES: △A

1.) INSTALL ITEM 2 USING PANDUIT CRIMP TOOL CT-550 OR EQUIVALENT.
2.) CRIMP ITEM 3 USING JST CRIMP TOOL YC-530.
3.) MARK PER QP-08-001.
4.) INSTALL ITEM 2 USING WEIDMULLER CRIMP TOOL PZ-4 OR EQUIVALENT. △B





'F' OPTION △B

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CHECKED BY T.O'BRIEN DATE 2/23/00
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MATERIAL ------------
FINISH ------------

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TITLE CABLE, MOTOR

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± ---
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B DATE 15FEB00
SCALE ---
DRAWING NUMBER C-578YYY
SHEET NO. 1 OF 1
REVISION B

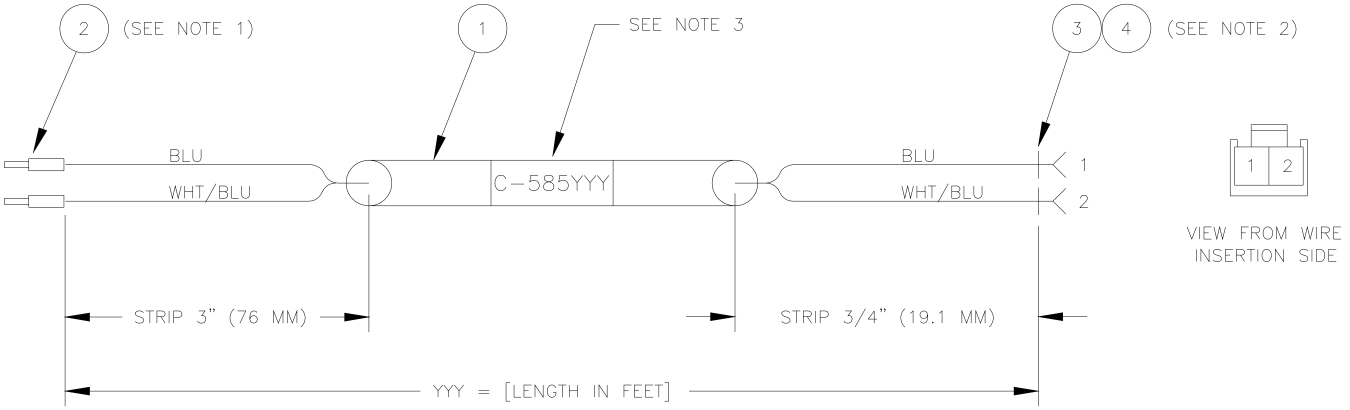
DATE	SYM	REVISION RECORD	DR	CK	CK
27DEC00	A	PER ECN 00-430	CWB	CD	CDR

NOTES: △A

1.) INSTALL FERRULE (ITEM 2) USING WEIDMULLER CRIMP TOOL PZ-4 OR EQUIVALENT.

2.) CRIMP ITEM 3 USING JST CRIMP TOOL YC-530.

3.) MARK PER QP-08-001.



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CHECKED BY
DATE
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DATE
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MATERIAL

FINISH

TITLE
CABLE, MOTOR

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
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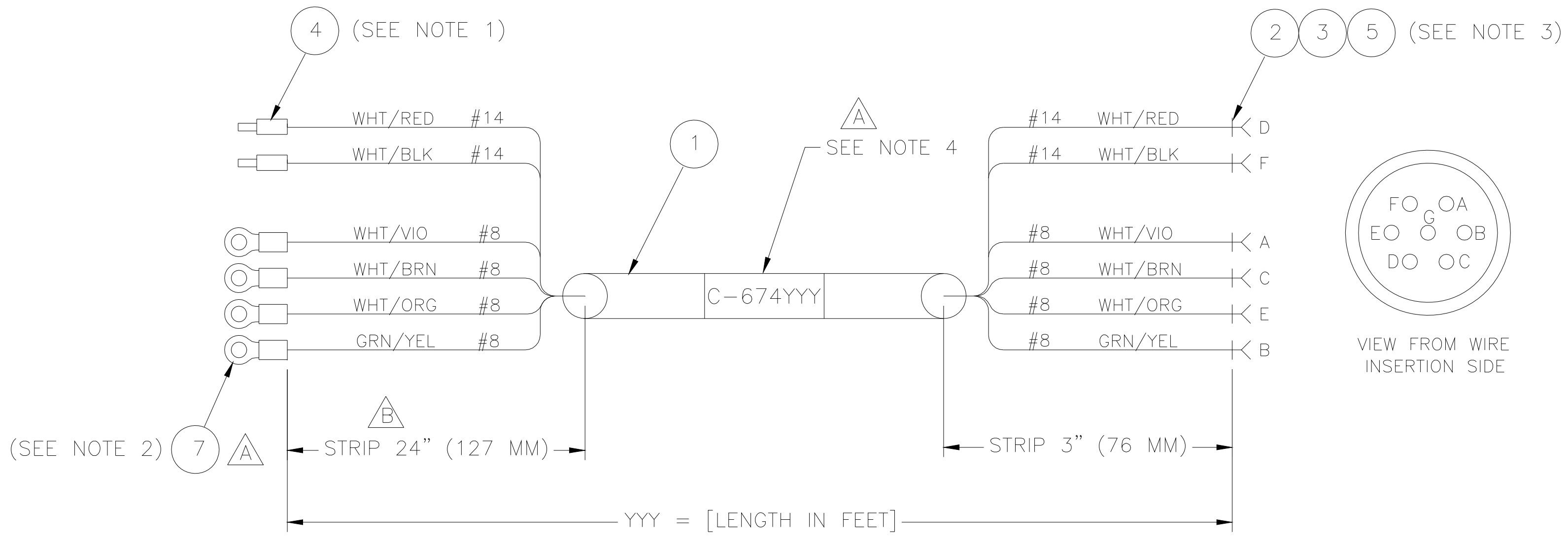
AutoCAD FILE LOCATION
Q:\CURRENT DWGS
B
DATE
29NOV00
SCALE

DRAWING NUMBER
C-585YYY
SHEET NO.
1 OF 1
REVISION
A

DATE	SYM	REVISION RECORD	DR	CK	CK
30SEP04	B	PER ECN 04-404	CWB		

NOTES:

1. INSTALL ITEM 4 USING WEIDMULLER CRIMP TOOL PZ-4 OR EQUIVALENT.
2. △A INSTALL ITEM 7 USING WEIDMULLER CRIMP TOOL CT-720 OR EQUIVALENT.
3. HEAT SHRINK TUBING (ITEM 5) OVER SOLDER JOINT.
4. △A MARK PER QP-08-0001.



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CHECKED BY WES DATE 17NOV93
APPROVED BY DATE
APPROVED BY ELS DATE 15FEB99
MATERIAL -----------
FINISH -----------

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TITLE CABLE, MOTOR

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± ---
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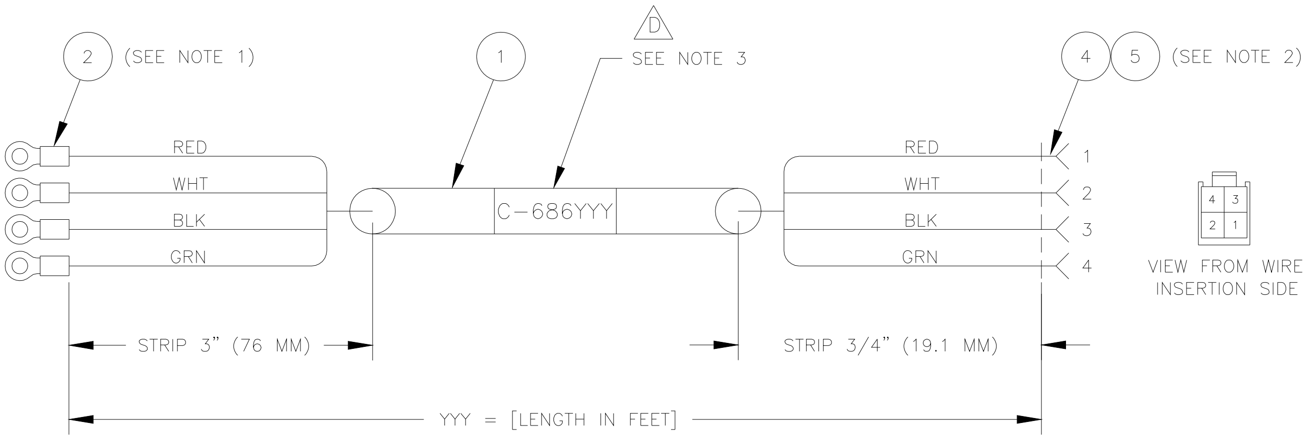
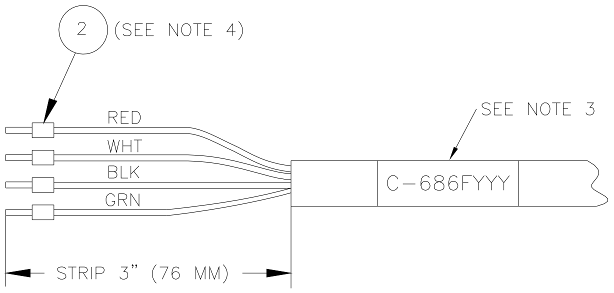
AutoCAD FILE LOCATION Q:\CURRENT DWGS
DRAWING NUMBER C-674YYY
B
DATE 11NOV93
SCALE ---
SHEET NO. 1 OF 1
REVISION B

DATE	SYM	REVISION RECORD	DR	CK	CK
02DEC03	E	PER ECN 03-462	CWB		

NOTES:

1. INSTALL ITEM 2 USING PANDUIT CRIMP TOOL CT-550 OR EQUIVALENT.
2. CRIMP WIRE INTO TERMINAL (ITEM 5) USING MOLEX HAND CRIMP TOOL NO. 11-01-0125 OR EQUIVALENT.
3. MARK PER QP-08-0001.
4. <u>'F' OPTION:</u> INSTALL ITEM 2 USING PANDUIT CRIMP TOOL PZ16S OR EQUIVALENT.





E 'F' OPTION

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CHECKED BY E.BAIER	DATE 4/15/96
APPROVED BY JC	DATE 4/15/96
APPROVED BY ELS	DATE 7/30/96
MATERIAL -----------	
FINISH -----------	

TITLE CABLE, MOTOR

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± ---

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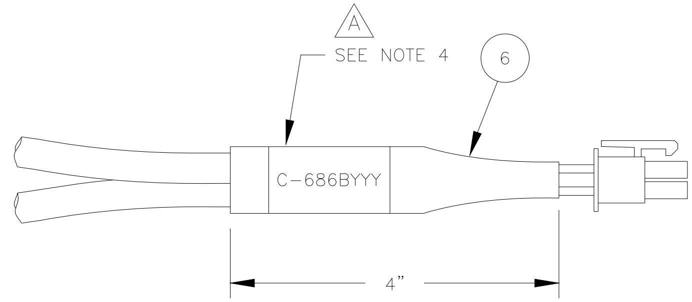
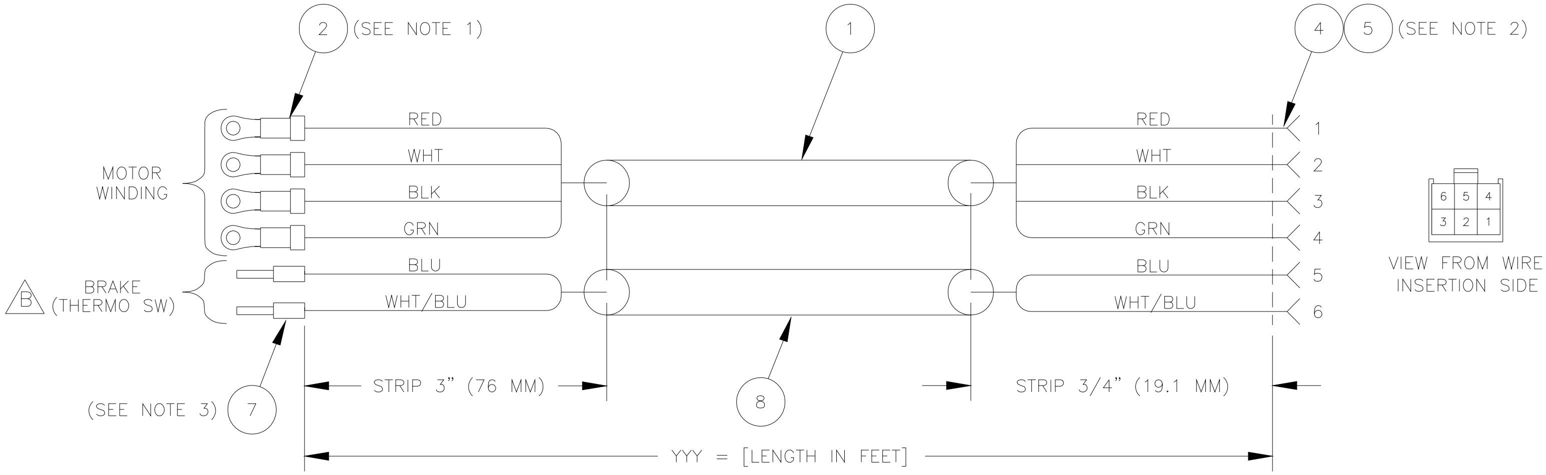
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 08FEB96
SCALE ---
DRAWING NUMBER C-686YYY
SHEET NO. 1 OF 1
REVISION E

DATE	SYM	REVISION RECORD	DR	CK	CK
21NOV02	B	PER ECN 02-367	CWB		

NOTES:

1. INSTALL ITEM 2 USING PANDUIT CRIMP TOOL CT-550 OR EQUIVALENT.
2. CRIMP WIRE INTO TERMINAL (ITEM 4) USING MOLEX HAND CRIMP TOOL NO. 11-01-0125 OR EQUIVALENT.
3. INSTALL ITEM 7 USING WEIDMULLER CRIMP TOOL PZ-4, 2 PLACES.
4. MARK PER QP-08-0001.





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DATE
APPROVED BY ELS
DATE 7/31/98
APPROVED BY
DATE
MATERIAL -----------
FINISH -----------

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TITLE
CABLE, MOTOR W/BRAKE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± ---
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AutoCAD FILE LOCATION Q:\CURRENT DWGS
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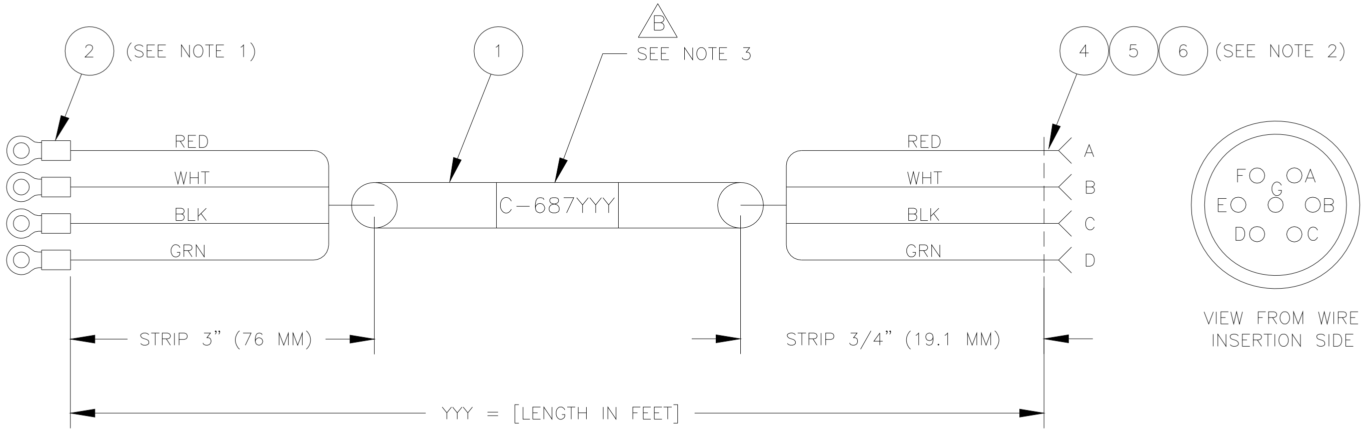
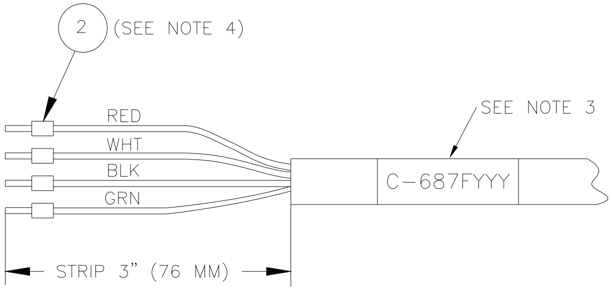
DATE 09MAY96
SCALE ---
DRAWING NUMBER C-686BYYY
SHEET NO. 1 OF 1
REVISION B

DATE	SYM	REVISION RECORD	DR	CK	CK
02DEC03	C	PER ECN 03-462	CWB		

NOTES:

1. INSTALL ITEM 2 USING PANDUIT CRIMP TOOL CT-550 OR EQUIVALENT.
2. HEAT SHRINK TUBING (ITEM 5) OVER SOLDER JOINT 4 PLACES.
3. MARK PER QP-08-0001.
4. <u>'F' OPTION:</u> INSTALL ITEM 2 USING PANDUIT CRIMP TOOL PZ16S OR EQUIVALENT.





C 'F' OPTION

INDUSTRIAL INDEXING SYSTEMS, Inc.
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CHECKED BY E.BAIER	DATE 26APR96
APPROVED BY ELS	DATE 26APR96
APPROVED BY ELS	DATE 30JUL96
MATERIAL -----------	
FINISH -----------	

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TITLE
CABLE, MOTOR

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
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BOWMAN
AutoCAD FILE LOCATION
Q:\CURRENT DWGS
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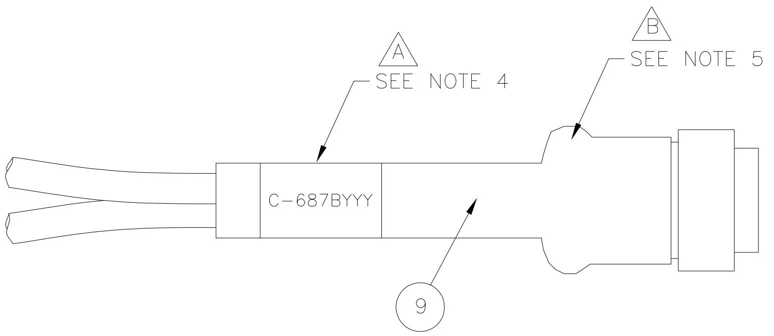
DATE
26APR96
SCALE

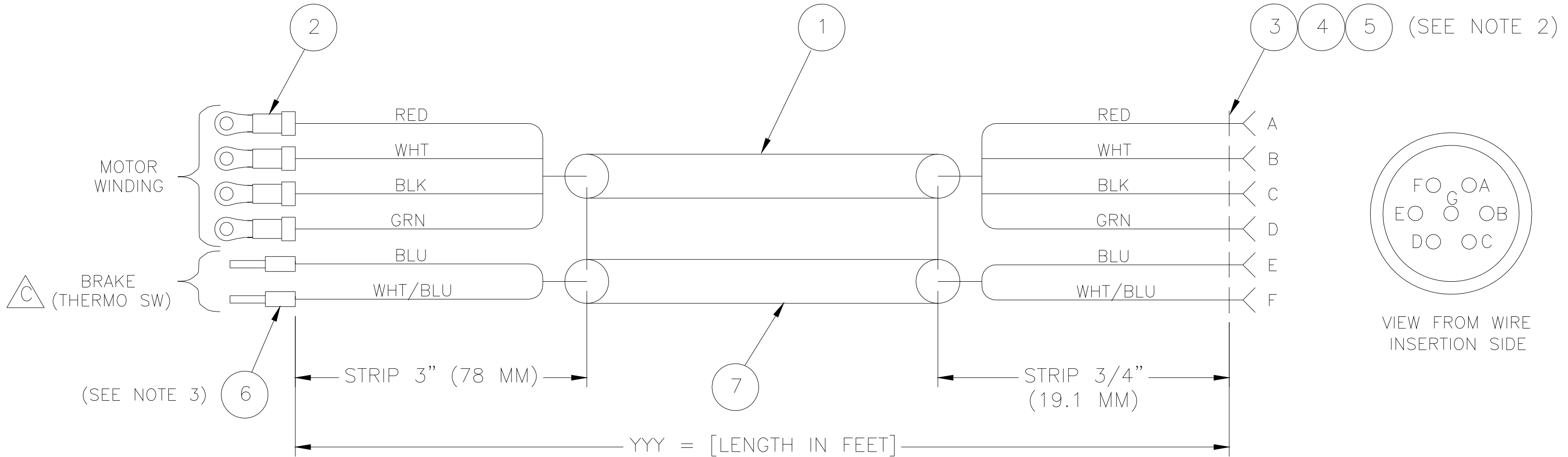
DRAWING NUMBER
C-687YYY
SHEET NO.
1 OF 1
REVISION
C

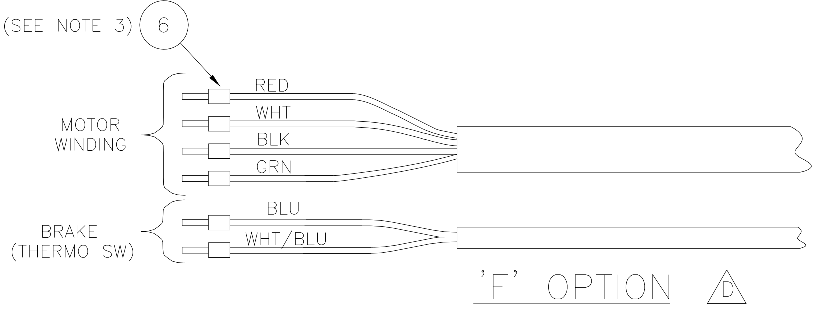
NOTES: △B

1. INSTALL ITEM 2 USING PANDUIT CRIMP TOOL CT-550 OR EQUIVALENT.
2. HEAT SHRINK TUBING (ITEM 5) OVER SOLDER JOINT 6 PLACES.
3. INSTALL ITEM 6 USING WEIDMULLER CRIMP TOOL PZ-4 OR EQUIVALENT.
4. MARK PER QP-08-0001.
5. INSTALL 1" HEATSHRINK OVER CABLE AND BACKSHELL. REPLACE CONNECTOR SCREWS WITH HS0608MPP (6/32 X 1/2").

DATE	SYM	REVISION RECORD	DR	CK	CK
27MAR03	D	PER ECN 03-152	EB		







'F' OPTION △D

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CHECKED BY:
DATE:
APPROVED BY: ELS
DATE: 7/31/96
APPROVED BY:
DATE:
MATERIAL: ----------
FINISH: ----------
TITLE: CABLE, MOTOR W/BRAKE
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
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X.XXX± 0.005
ANGULAR ± ---
DRAWN BY: BOWMAN
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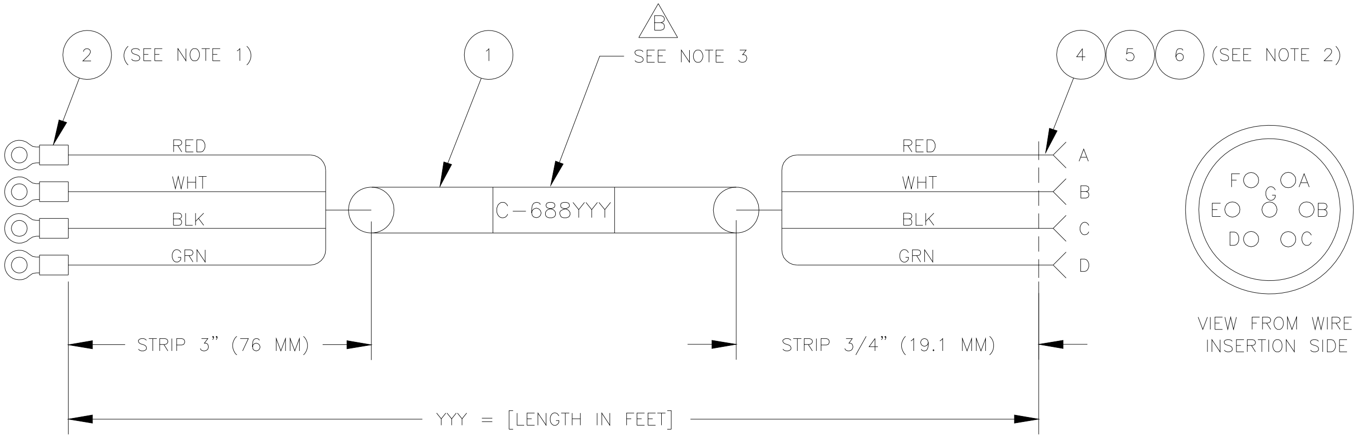
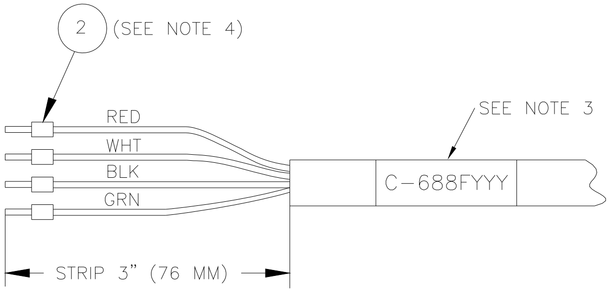
DATE: 25JUL00
SCALE: ---
DRAWING NUMBER: C-687BYYY
SHEET NO. 1 OF 1
REVISION: D

DATE	SYM	REVISION RECORD	DR	CK	CK
02DEC03	C	PER ECN 03-462	CWB		

NOTES:

1. INSTALL ITEM 2 USING PANDUIT CRIMP TOOL CT-550 OR EQUIVALENT.
2. HEAT SHRINK TUBING (ITEM 5) OVER SOLDER JOINT 4 PLACES.
3. MARK PER QP-08-0001.
4. <u>'F' OPTION:</u> INSTALL ITEM 2 USING PANDUIT CRIMP TOOL PZ16S OR EQUIVALENT.





C 'F' OPTION

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www.iis-servo.com

CHECKED BY E.BAIER	DATE 26APR96
APPROVED BY ELS	DATE 26APR96
APPROVED BY ELS	DATE 30JUL96
MATERIAL -----------	
FINISH -----------	

TITLE
CABLE, MOTOR

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± ---

DRAWN BY BOWMAN
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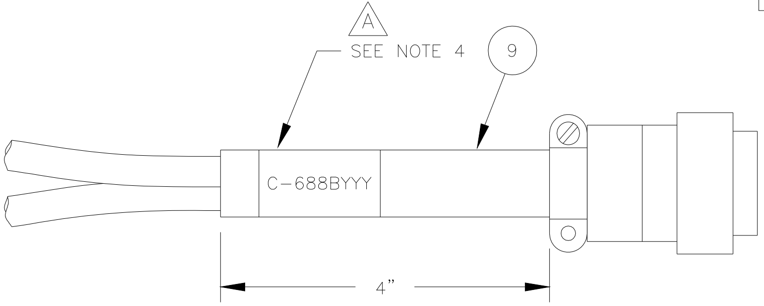
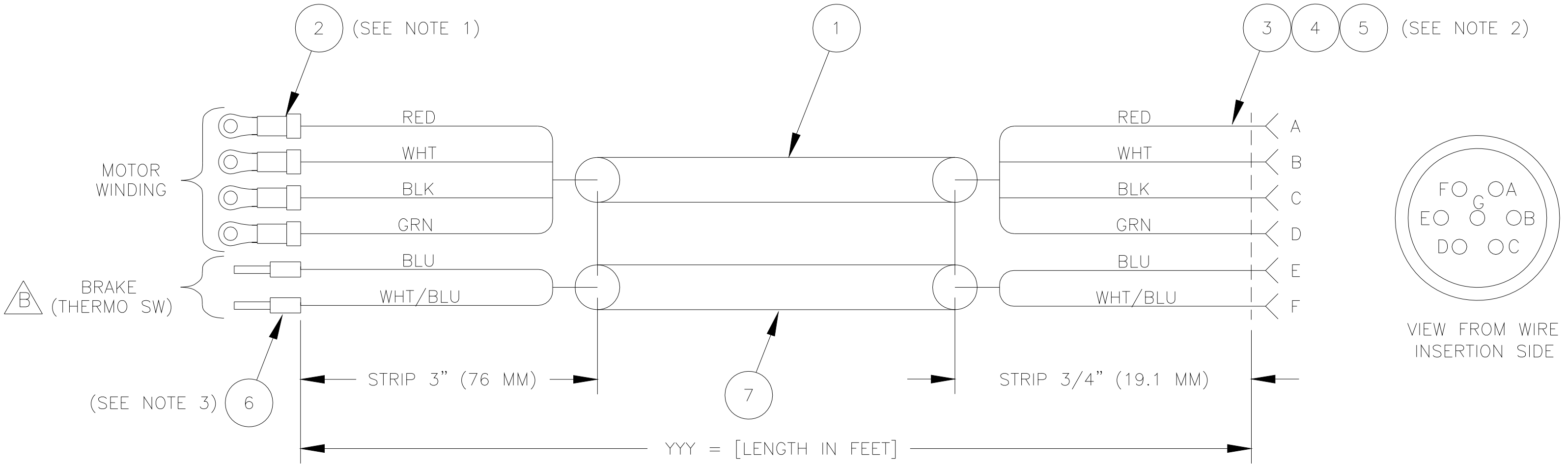
DATE 26APR96
SCALE ---
DRAWING NUMBER C-688YYY
SHEET NO. 1 OF 1
REVISION C

DATE	SYM	REVISION RECORD	DR	CK	CK
21NOV02	B	PER ECN 02-367	CWB	EB	CDR

NOTES:

1. INSTALL ITEM 2 USING PANDUIT CRIMP TOOL CT-550 OR EQUIVALENT.
2. HEAT SHRINK TUBING (ITEM 5) OVER SOLDER JOINT 6 PLACES.
3. INSTALL ITEM 6 USING WEIDMULLER CRIMP TOOL PZ-4 OR EQUIVALENT.
4. MARK PER QP-08-0001.





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CHECKED BY
DATE

APPROVED BY ELS
DATE 7/31/96

APPROVED BY
DATE

MATERIAL ----------

FINISH ----------

TITLE CABLE, MOTOR W/BRAKE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± ---

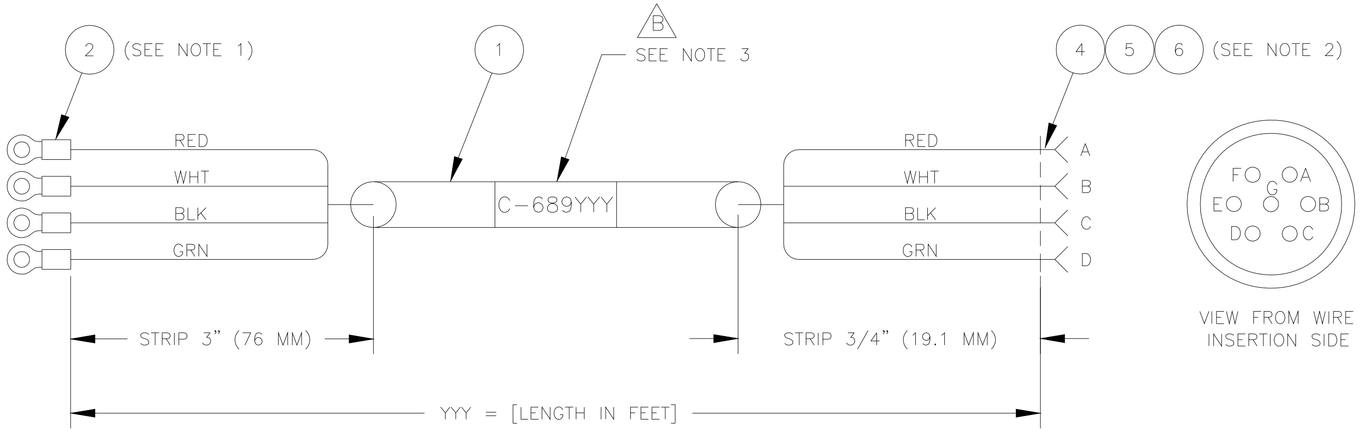
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 08MAY96
SCALE ---

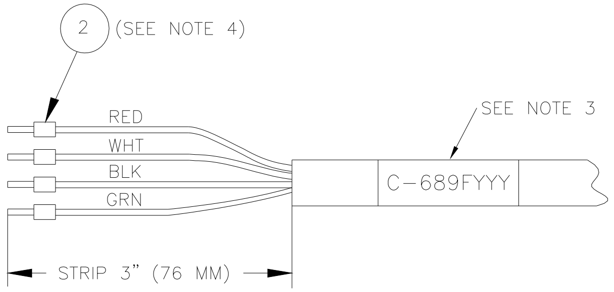
DRAWING NUMBER C-688BYYY
SHEET NO. 1 OF 1
REVISION B

DATE	SYM	REVISION RECORD	DR	CK	CK
13JUN03	C	PER ECN 03-268	EB	EB	CDR

NOTES:

1. INSTALL ITEM 2 USING PANDUIT CRIMP TOOL CT-550 OR EQUIVALENT.
2. HEAT SHRINK TUBING (ITEM 5) OVER SOLDER JOINT 4 PLACES.
3. MARK PER QP-08-0001.
4. 'F' OPTION: INSTALL ITEM 2 USING PANDUIT CRIMP TOOL PZ16S OR EQUIVALENT.





C 'F' OPTION

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CHECKED BY E.BAIER	DATE 26APR96
APPROVED BY ELS	DATE 26APR96
APPROVED BY ELS	DATE 30JUL96
MATERIAL ----------	
FINISH ----------	

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TITLE CABLE, MOTOR

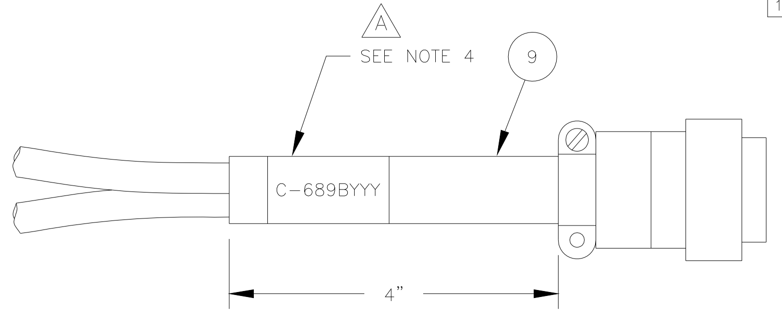
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± ---

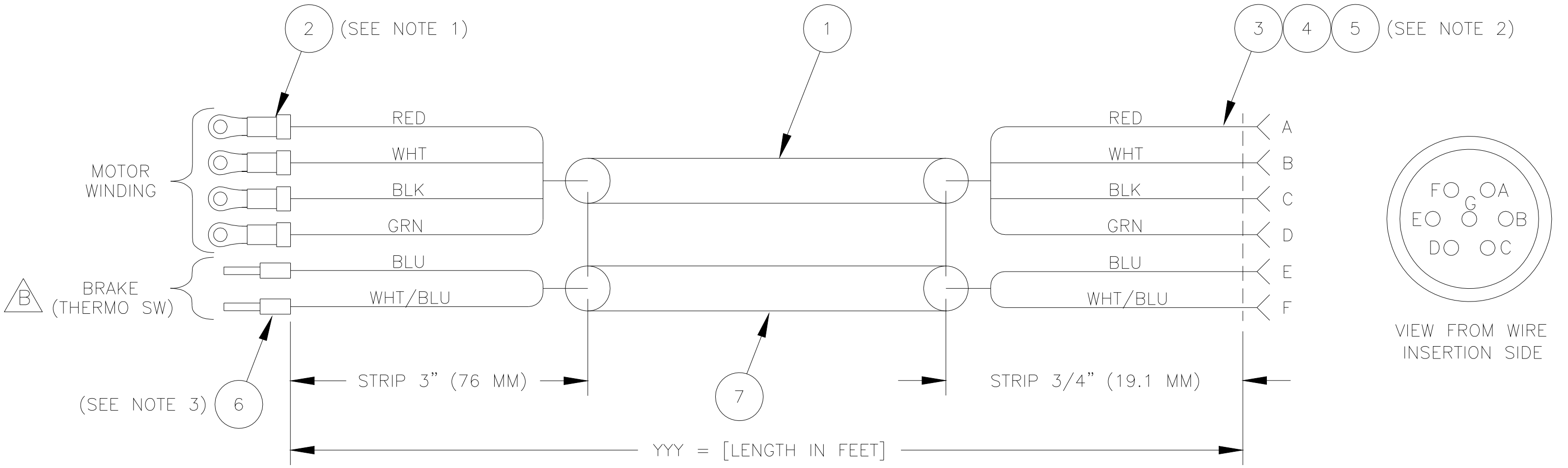
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B DATE 26APR96
SCALE ---
DRAWING NUMBER C-689YYY
SHEET NO. 1 OF 1
REVISION C

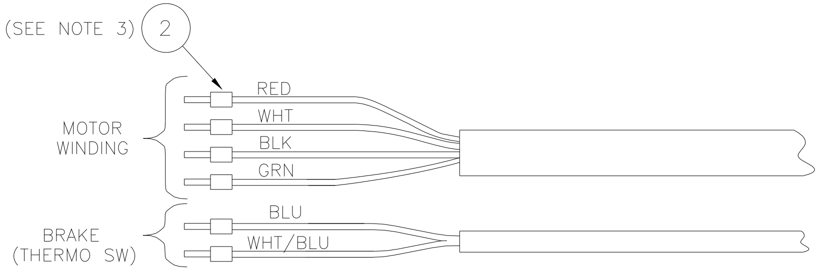
DATE	SYM	REVISION RECORD	DR	CK	CK
13JUN03	C	PER ECN 03-268	EB		

NOTES:

1. INSTALL ITEM 2 USING PANDUIT CRIMP TOOL CT-550 OR EQUIVALENT.
2. HEAT SHRINK TUBING (ITEM 5) OVER SOLDER JOINT 6 PLACES.
3. INSTALL ITEM 6 USING WEIDMULLER CRIMP TOOL PZ-4 OR EQUIVALENT.
4. MARK PER QP-08-0001.







'F' OPTION C

INDUSTRIAL INDEXING SYSTEMS, Inc.
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CHECKED BY BAIER DATE 7/26/96

APPROVED BY ELS DATE 7/26/96

APPROVED BY DATE

MATERIAL -----------

FINISH -----------

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TITLE
CABLE, MOTOR W/BRAKE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± ---

DRAWN BY BOWMAN

AutoCAD FILE LOCATION Q:\CURRENT DWGS

B DATE 08MAY96

SCALE ---

DRAWING NUMBER C-689BYYY

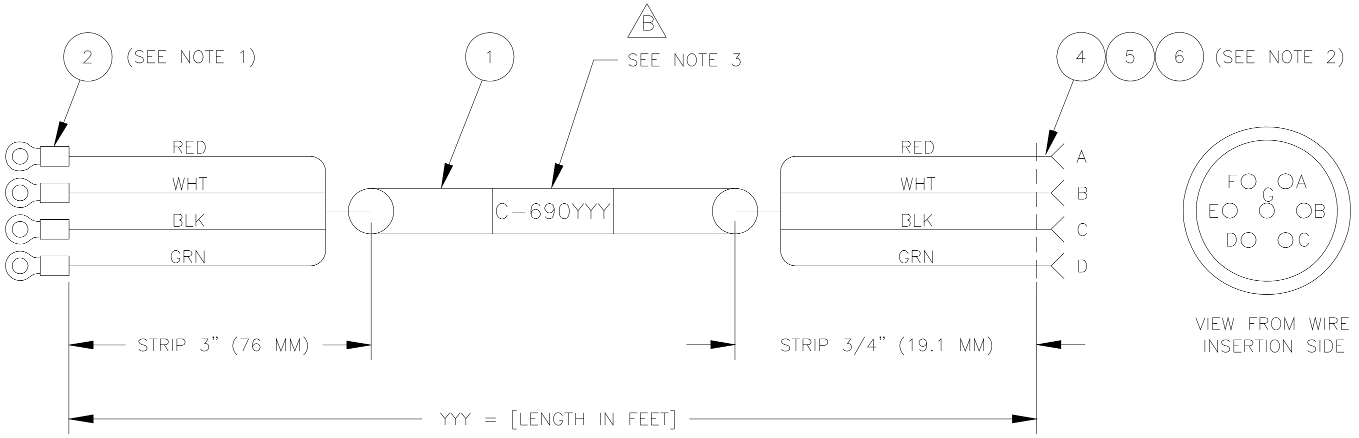
SHEET NO. 1 OF 1

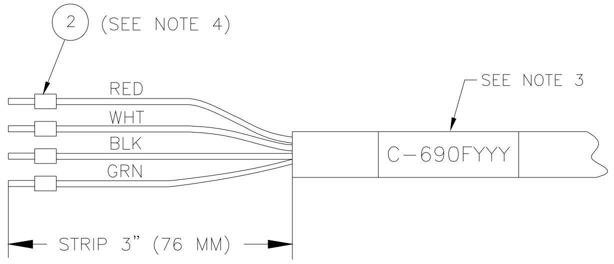
REVISION C

DATE	SYM	REVISION RECORD	DR	CK	CK
31MAY02	C	PER ECN 00-182	EB	EB	CDR

NOTES:

1. INSTALL ITEM 2 USING PANDUIT CRIMP TOOL CT-550 OR EQUIVALENT.
2. HEAT SHRINK TUBING (ITEM 5) OVER SOLDER JOINT 4 PLACES.
3. MARK PER QP-08-0001.
4. 'F' OPTION: INSTALL ITEM 2 USING PANDUIT CRIMP TOOL PZ16S OR EQUIVALENT.





C 'F' OPTION

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CHECKED BY: E.BAIER — DATE: 26APR96
APPROVED BY: ELS — DATE: 26APR96
APPROVED BY: ELS — DATE: 30JUL96
MATERIAL: ----------
FINISH: ----------

TITLE: CABLE, MOTOR

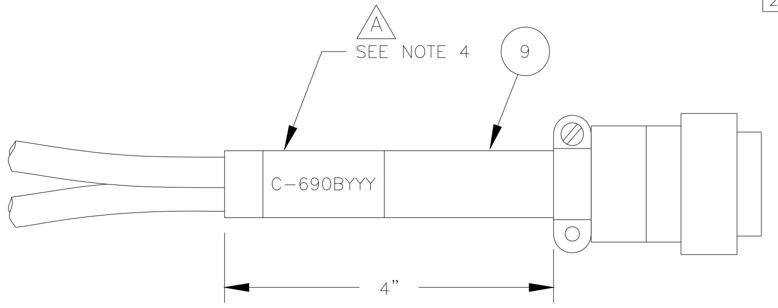
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± ---

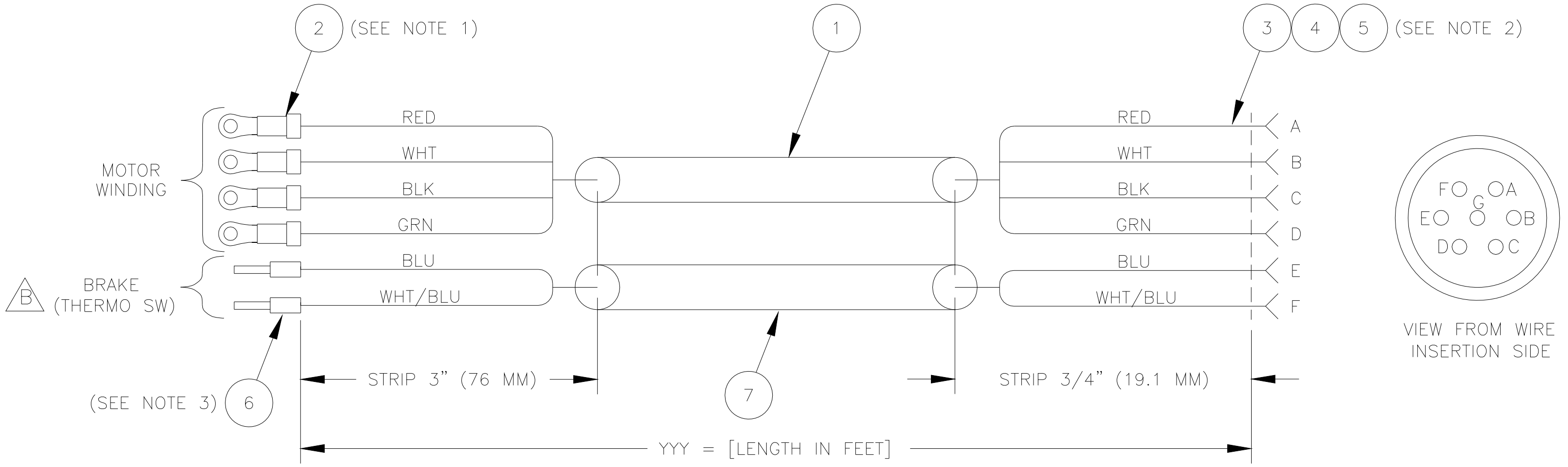
DRAWN BY: BOWMAN
AutoCAD FILE LOCATION: Q:\CURRENT DWGS
B
DATE: 26APR96
SCALE: ---
DRAWING NUMBER: C-690YYY
SHEET NO.: 1 OF 1
REVISION: C

DATE	SYM	REVISION RECORD	DR	CK	CK
21NOV02	B	PER ECN 02-367	CWB		

NOTES:

1. INSTALL ITEM 2 USING PANDUIT CRIMP TOOL CT-550 OR EQUIVALENT.
2. HEAT SHRINK TUBING (ITEM 5) OVER SOLDER JOINT 6 PLACES.
3. INSTALL ITEM 6 USING WEIDMULLER CRIMP TOOL PZ-4 OR EQUIVALENT.
4. MARK PER QP-08-0001.





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CHECKED BY: BAIER — DATE: 7/26/96
APPROVED BY: ELS — DATE: 7/26/96
APPROVED BY: — DATE:
MATERIAL: ----------
FINISH: ----------

TITLE: CABLE, MOTOR W/BRAKE

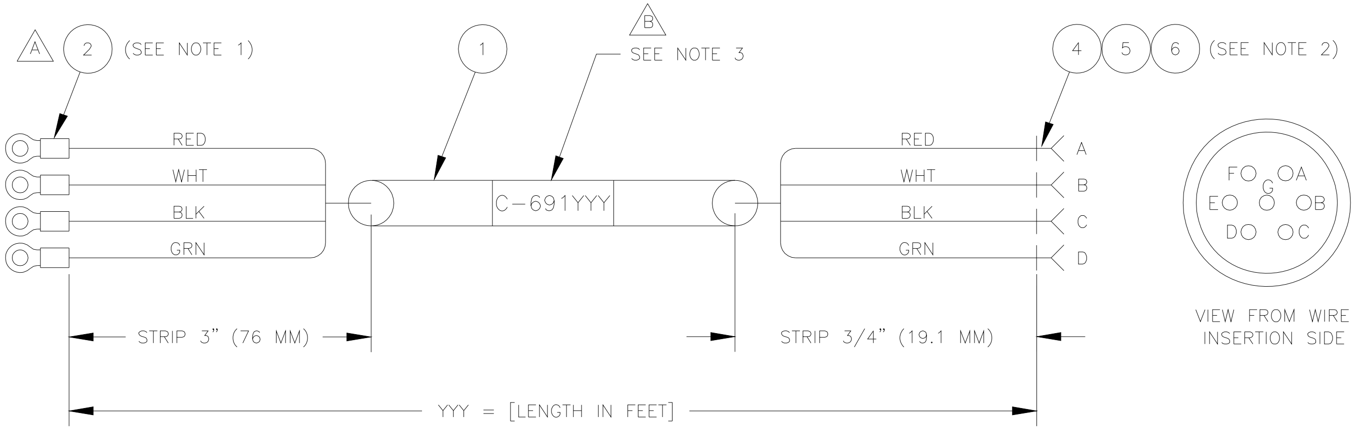
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± ---

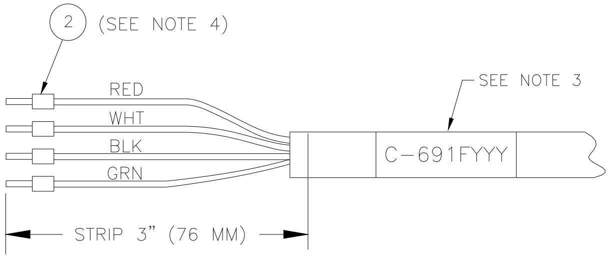
DRAWN BY: BOWMAN
AutoCAD FILE LOCATION: Q:\CURRENT DWGS
B
DATE: 08MAY96
SCALE: ---
DRAWING NUMBER: C-690BYYY
SHEET NO. 1 OF 1
REVISION: B

DATE	SYM	REVISION RECORD	DR	CK	CK
31MAY02	C	PER ECN 02-182	EB	EB	CDR

NOTES:

1. INSTALL ITEM 2 USING PANDUIT CRIMP TOOL CT-550 OR EQUIVALENT.
2. HEAT SHRINK TUBING (ITEM 5) OVER SOLDER JOINT 4 PLACES.
3. MARK PER QP-08-0001.
4. 'F' OPTION: INSTALL ITEM 2 USING PANDUIT CRIMP TOOL PZ16S OR EQUIVALENT.





C 'F' OPTION

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CHECKED BY	DATE
APPROVED BY 20FEB98	DATE T.O'BRIEN
APPROVED BY 26APR96	DATE ELS
MATERIAL -----------	
FINISH -----------	

TITLE
CABLE, MOTOR

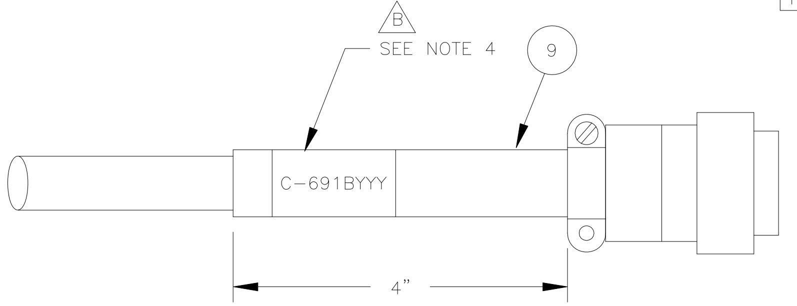
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± ---

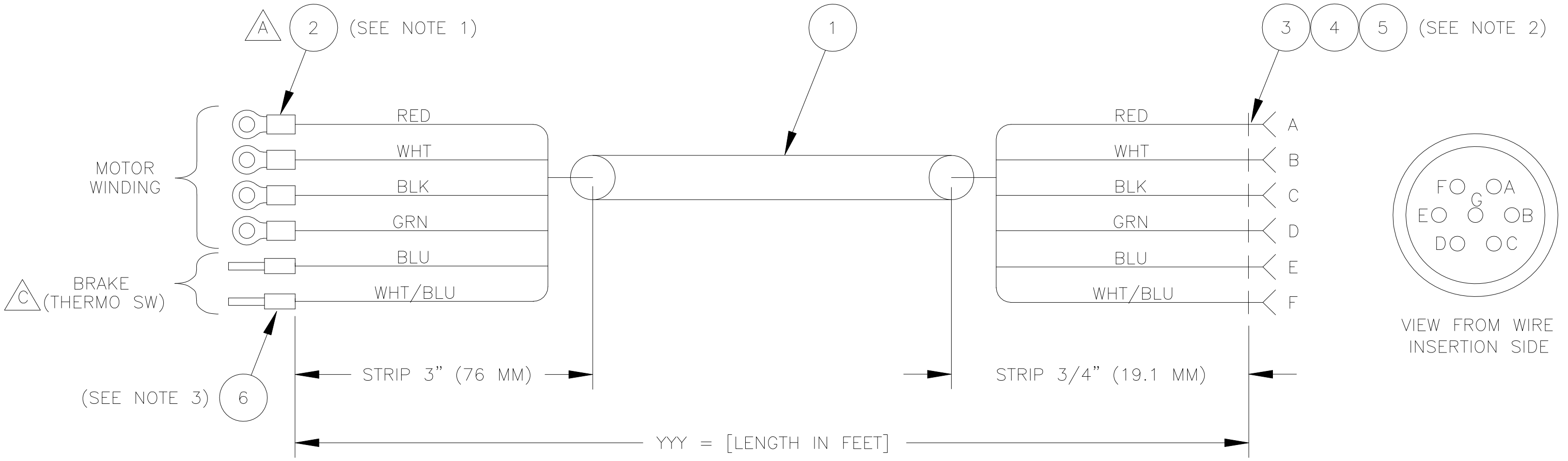
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 26APR96
SCALE ---
DRAWING NUMBER C-691YYY
SHEET NO. 1 OF 1
REVISION C

DATE	SYM	REVISION RECORD	DR	CK	CK
11MAY06	D	PER ECN 06-104	KY		

NOTES:

1. INSTALL ITEM 2 USING PANDUIT CRIMP TOOL CT-550 OR EQUIVALENT.
2. HEAT SHRINK TUBING (ITEM 5) OVER SOLDER JOINT 6 PLACES.
3. INSTALL ITEM 6 USING WEIDMULLER CRIMP TOOL PZ-4 OR EQUIVALENT.
4. MARK PER QP-08-0001.





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CHECKED BY	DATE
APPROVED BY T.O'BRIEN	DATE 2/20/98
APPROVED BY ELS	DATE 7/26/96
MATERIAL ----------	
FINISH ----------	

TITLE
CABLE, MOTOR W/BRAKE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)

TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± ---

DRAWN BY
BOWMAN

AutoCAD FILE LOCATION
Q:\CURRENT DWGS

B

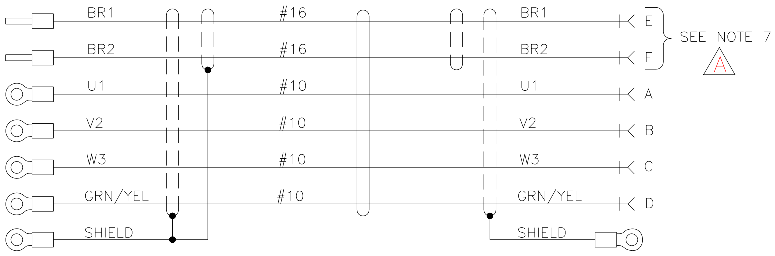
DATE	SCALE	SHEET NO.	REVISION
08MAY96	---	1 OF 1	D

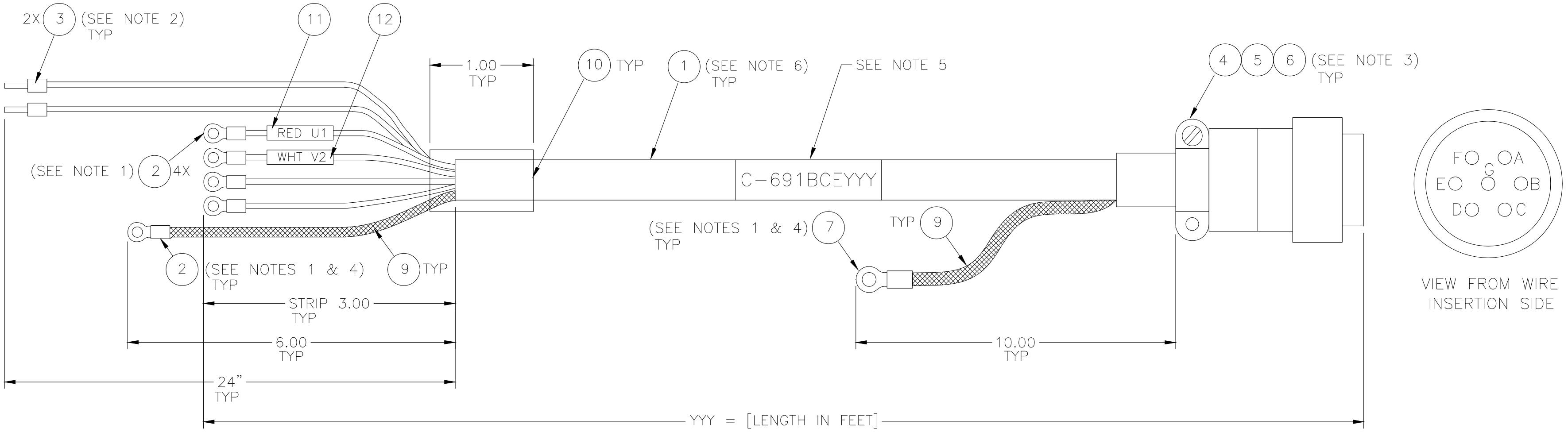
DRAWING NUMBER
C-691BYYY

NOTES:

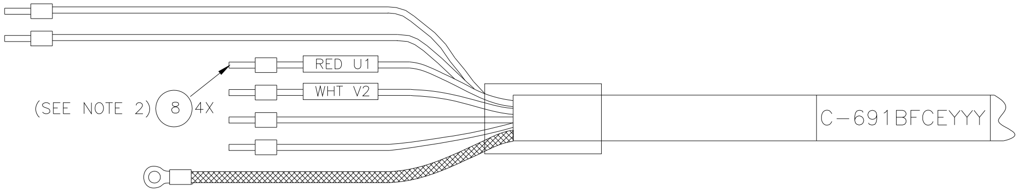
1. INSTALL ITEMS 2 & 7 USING PANDUIT CRIMP TOOL CT-550 OR EQUIVALENT.
2. INSTALL ITEMS 3 & 8 USING WEIDMULLER CRIMP TOOL PZ16S OR EQUIVALENT.
3. HEAT SHRINK TUBING ITEM 5 OVER SOLDER JOINT 6 PLACES.
4. USE ALL STRANDS OF BRAID AND DRAIN WIRE FROM CABLE WHEN TERMINATING LUG.
5. MARK PER QP-08-0001.
6. MINIMUM BEND RADIUS:
   A FIXED INSTALLATION 3.30
   FREE MOVEMENT 6.60
   CONTINUOUS FLEXING 8.0
7. BR1 AND BR2 WIRES ARE NOT TO BE USED ON SOME MOTORS. A SEE MOTOR DRAWING FOR CONNECTION DETAILS.

DATE	SYM	REVISION RECORD	DR	CK	CK
17MAR05	A	PER ECN 05-028	EB		





VIEW FROM WIRE INSERTION SIDE



'F' OPTION

INDUSTRIAL INDEXING SYSTEMS, Inc.
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CHECKED BY	DATE
APPROVED BY	DATE
APPROVED BY	DATE
MATERIAL ----------	
FINISH ----------	

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TITLE
CABLE, MOTOR, SHIELDED

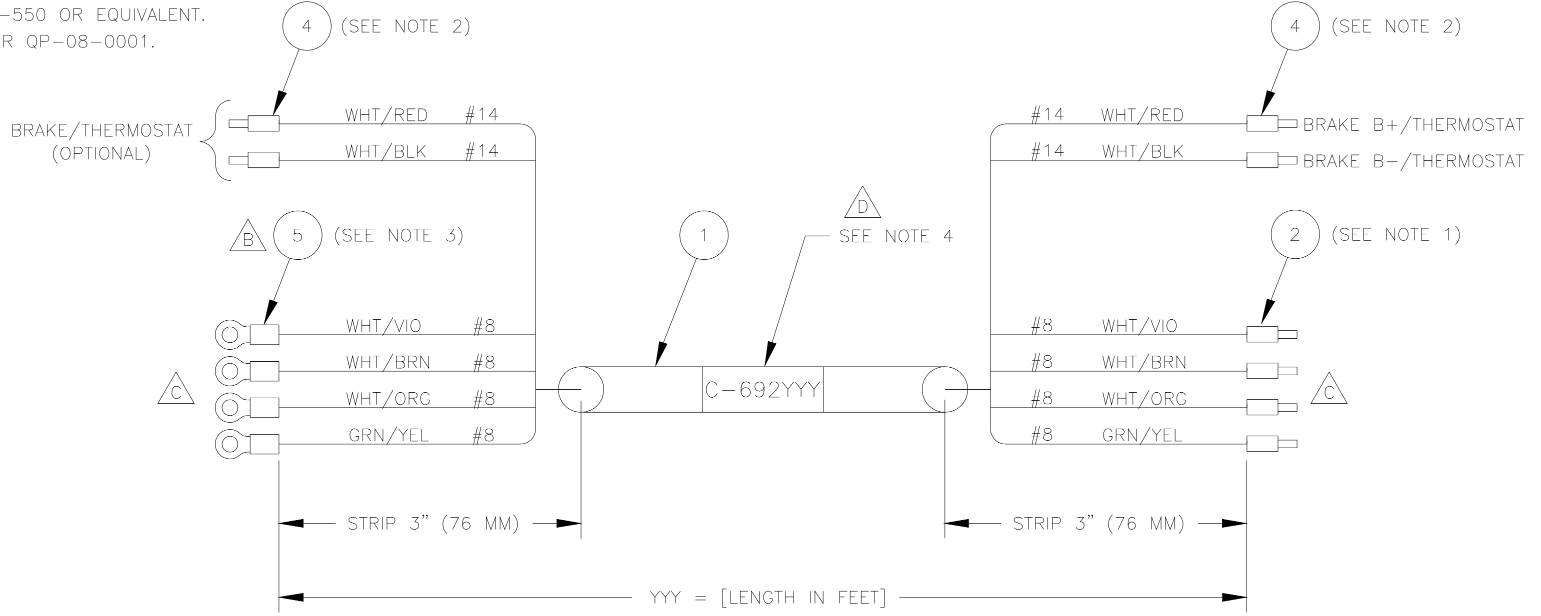
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± ---
X.XXX± ---
ANGULAR ± ---

DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 26MAR03
SCALE ---
DRAWING NUMBER C-691BCEYYY
SHEET NO. 1 OF 1
REVISION A

DATE	SYM	REVISION RECORD	DR	CK	CK
20JUL00	D	PER ECN 00-246	CWB	EB	CDR

NOTES:

1. INSTALL ITEM 2 USING WEIDMULLER CRIMP TOOL PZ-16 OR EQUIVALENT.
2. INSTALL ITEM 4 USING WEIDMULLER CRIMP TOOL PZ-4 OR EQUIVALENT.
3. INSTALL ITEM 5 USING PANDUIT CRIMP TOOL CT-550 OR EQUIVALENT.
4. MARK PER QP-08-0001.



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CHECKED BY	DATE
APPROVED BY WES	DATE 30JAN97
APPROVED BY ELS	DATE 26APR96
MATERIAL ----------	
FINISH ----------	

TITLE
CABLE, MOTOR

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)	DRAWN BY BOWMAN		DRAWING NUMBER C-692YYY
TOLERANCES	AutoCAD FILE LOCATION Q:\CURRENT DWGS		
X.X± --- X.XX± 0.01 X.XXX± 0.005	ANGULAR ± ---	B DATE 26APR96	SCALE ---
		SHEET NO. 1 OF 1	REVISION D

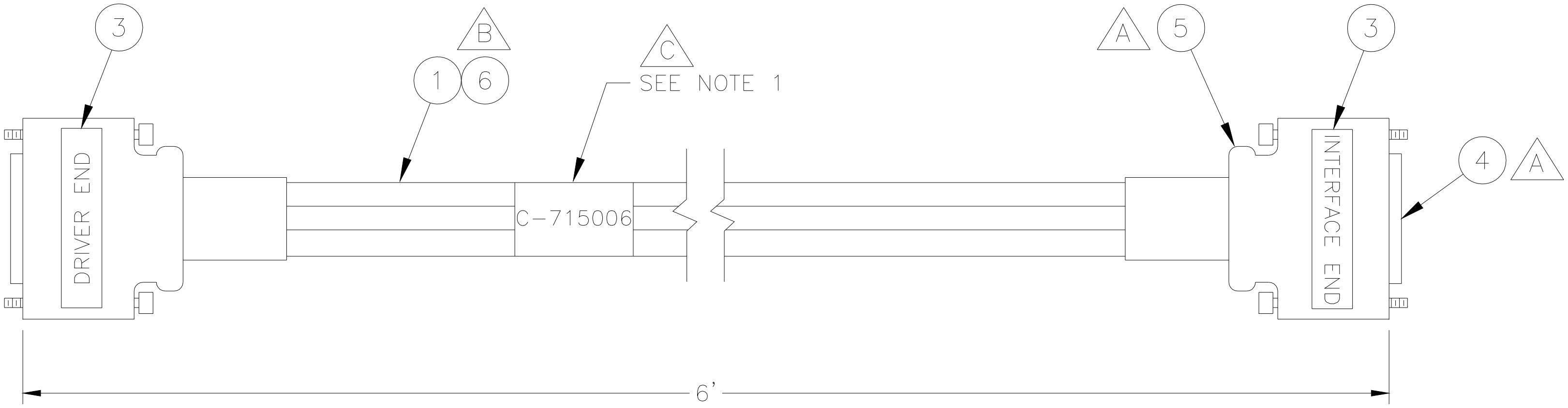
DATE	SYM	REVISION RECORD	DR	CK	CK
11JUN03	E	PER ECN 03-267	EB		

NOTES: D

1.) MARK PER QP-08-0001.

2.) SHEET 2 OF THIS DRAWING IDENTIFIES DELTA CONTROL SIGNALS.

3.) SHEET 3 OF THIS DRAWING IDENTIFIES. DELTA S I/O SIGNAL.



A1

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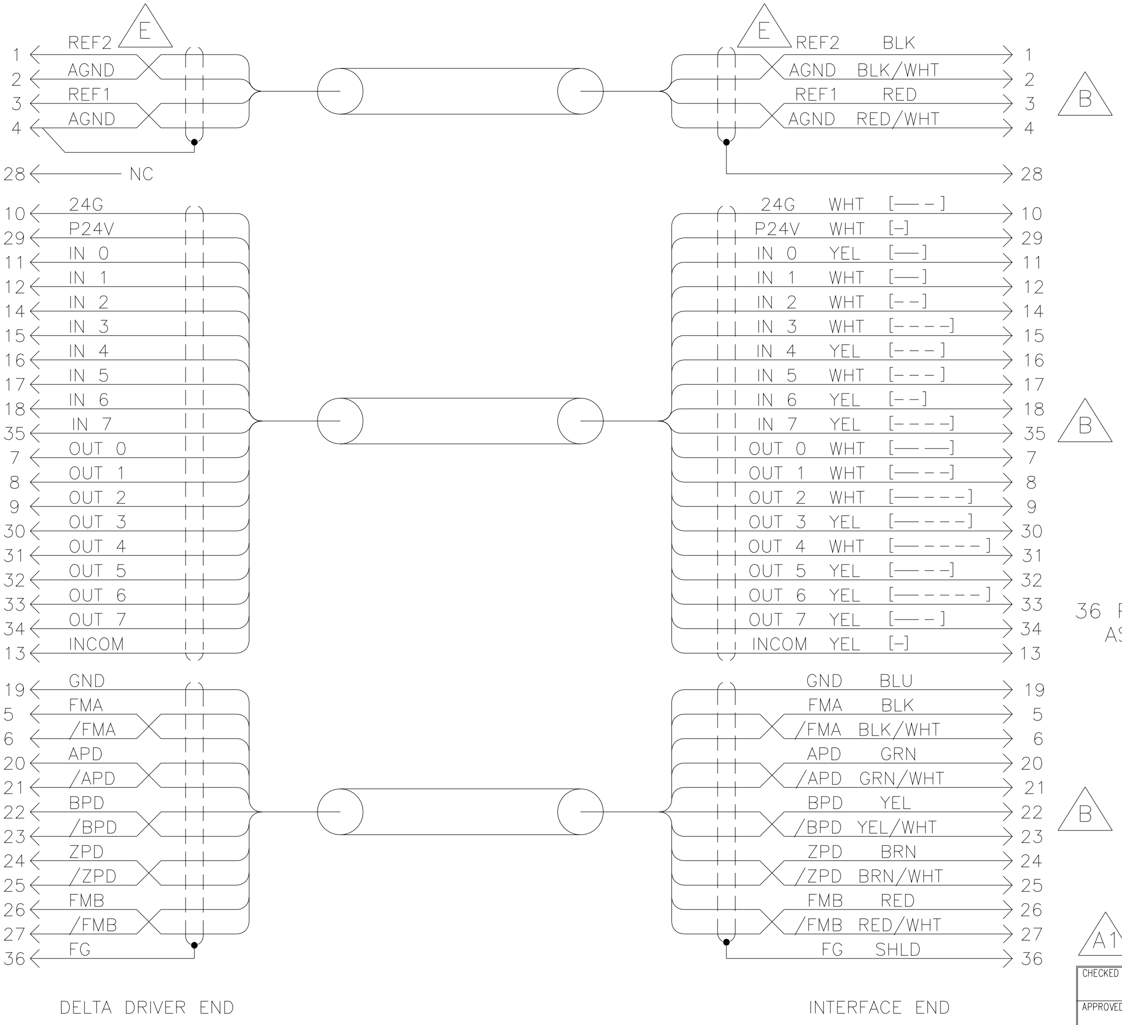
CHECKED BY	DATE
APPROVED BY JC	DATE 8/27/96
APPROVED BY ELS	DATE 3/29/96
MATERIAL -----------	
FINISH -----------	

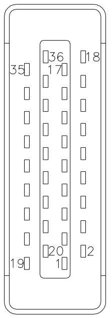
TITLE
CABLE, DELTA CONTROL/DELTA S I/O

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± ---

DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 28MAR96
SCALE ---
DRAWING NUMBER C-715006
SHEET NO. 1 OF 3
REVISION E

DATE	SYM	REVISION RECORD	DR	CK	CK
11JUN03	E	PER ECN 03-267	EB		





36 POS. CONNECTOR
AS VIEWED FROM
SOLDER SIDE
(2 PLACES)

CONNECTIONS FOR DELTA DRIVE

A1

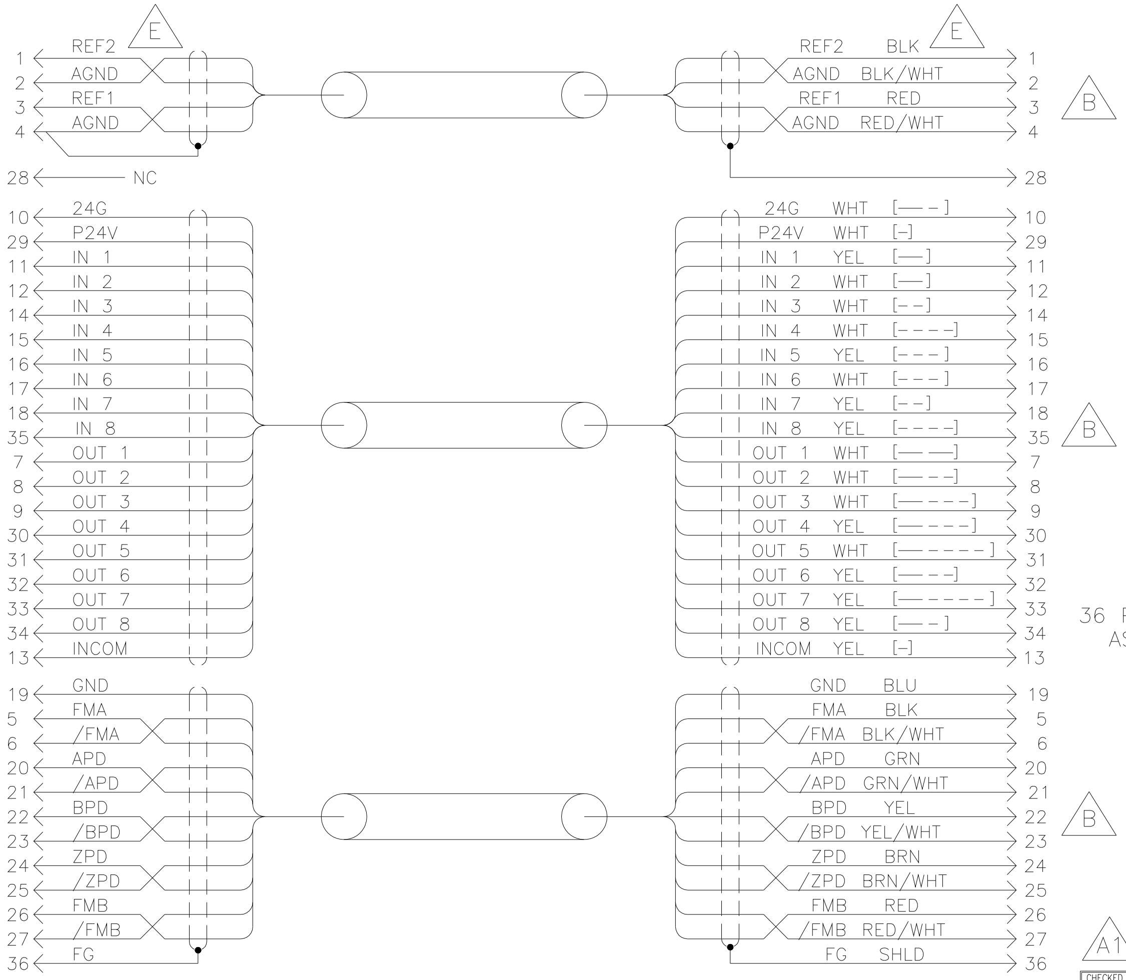
INDUSTRIAL INDEXING SYSTEMS, Inc.
www.iis-servo.com

CHECKED BY	DATE
APPROVED BY JC	DATE 8/27/96
APPROVED BY ELS	DATE 3/29/96
MATERIAL ___________	
FINISH ___________	

TITLE
CABLE, DELTA CONTROL/DELTA S I/O

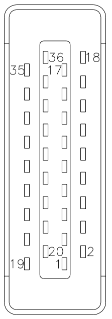
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)	DRAWN BY BOWMAN		DRAWING NUMBER C-715006
TOLERANCES	AutoCAD FILE LOCATION Q:\CURRENT DWGS		
X.X± --- X.XX± 0.01 X.XXX± 0.005	ANGULAR ± ---	B DATE 28MAR96	SCALE ---
		SHEET NO. 2 OF 3	REVISION E

DATE	SYM	REVISION RECORD	DR	CK	CK
11JUN03	E	PER ECN 03-267	EB		



DELTA S DRIVER END

INTERFACE END



36 POS. CONNECTOR
AS VIEWED FROM
SOLDER SIDE
(2 PLACES)

CONNECTIONS FOR DELTA S DRIVE

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

CHECKED BY
DATE

APPROVED BY JC
DATE 8/27/96

APPROVED BY ELS
DATE 3/29/96

MATERIAL ----------

FINISH ----------

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TITLE
CABLE, DELTA CONTROL/DELTA S I/O

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± ---

DRAWN BY BOWMAN
AutoCAD FILE LOCATION
Q:\CURRENT DWGS

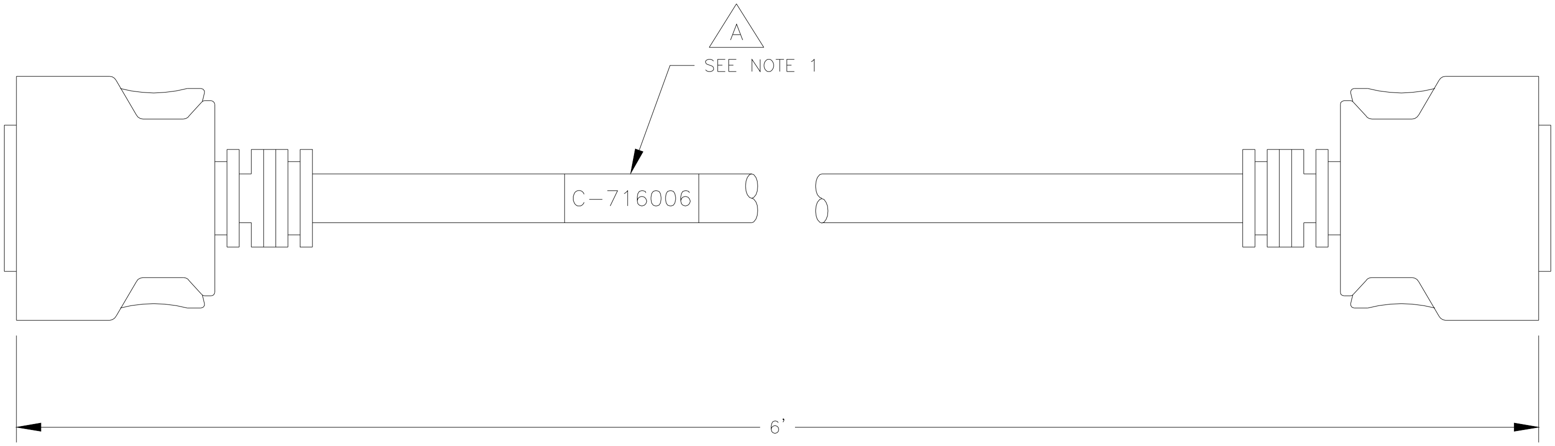
DRAWING NUMBER
C-715006

B
DATE 28MAR96
SCALE ---
SHEET NO. 3 OF 3
REVISION E

NOTES:

1. MARK PER QP-08-0001.

DATE	SYM	REVISION RECORD	DR	CK	CK
22JUL03	C	PER ECN 03-318	EB		



01

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CHECKED BY	DATE
APPROVED BY E.BAIER	DATE 13DEC96
APPROVED BY ELS	DATE 29MAR96
MATERIAL -----------	
FINISH -----------	

TITLE
CABLE, DMAX/DPRO CONTROL

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± ---

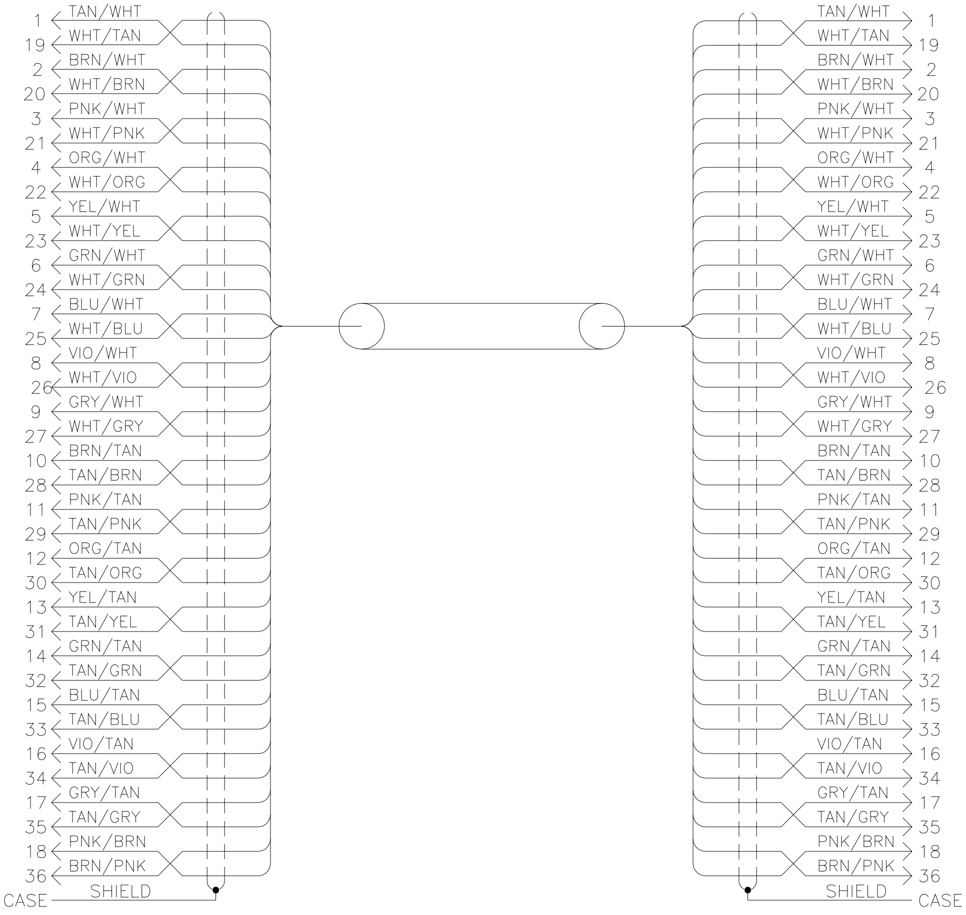
DRAWN BY BAIER
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 28MAR96
SCALE ---
DRAWING NUMBER C-716006
SHEET NO. 1 OF 2
REVISION C

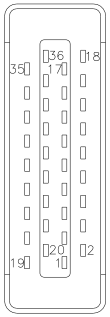
DATE	SYM	REVISION RECORD	DR	CK	CK
22JUL03	C	PER ECN 03-318	EB		

NOTES:

1) REFER TO DINT-300 DRAWINGS FOR INDIVIDUAL PIN FUNCTIONALITY.

B SHEET 2 – DELTAMAX/DELTAPRO
SHEET 3 – DELTA/DELTA XP
SHEET 4 – DELTA S





36 POS. CONNECTOR
AS VIEWED FROM
SOLDER SIDE
(2 PLACES)

01

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CHECKED BY
DATE
APPROVED BY E.BAIER
DATE 13DEC96
APPROVED BY ELS
DATE 29MAR96
MATERIAL ———————————
FINISH ———————————

TITLE
CABLE, DMAX/DPRO CONTROL

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ———
X.XX± ———
X.XXX± ———
ANGULAR ± ———
DRAWN BY BAIER
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 28MAR96
SCALE ———
DRAWING NUMBER C-716006
SHEET NO. 2 OF 2
REVISION C

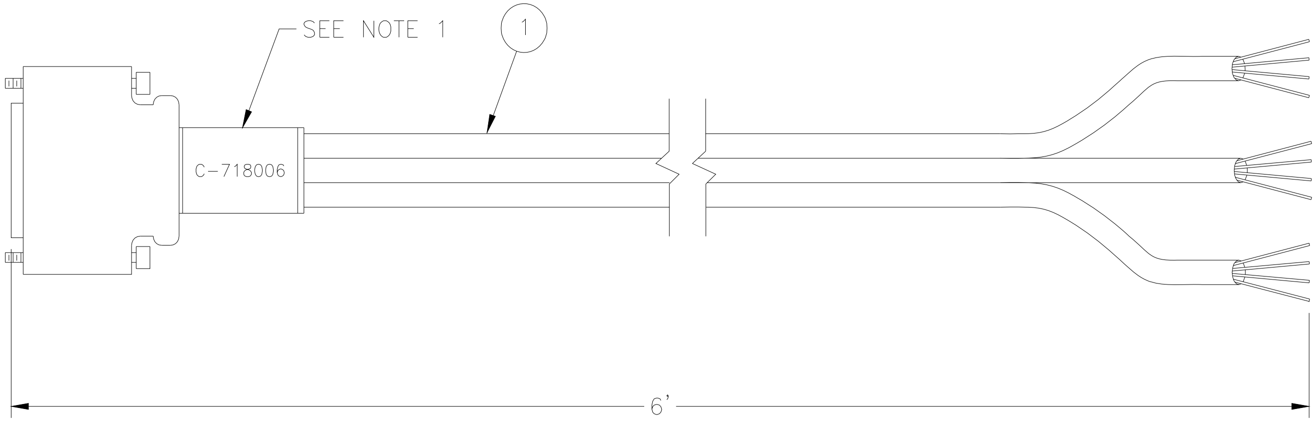
DATE	SYM	REVISION RECORD	DR	CK	CK
02MAR01	A	PER ECN 01-086	CWB	EB	CDR

NOTES:

1.) MARK PER QP-08-0001.

2.) SHEET 2 OF THIS DRAWING IDENTIFIES DELTA CONTROL SIGNALS.

3.) SHEET 3 OF THIS DRAWING IDENTIFIES DELTA S I/O SIGNALS.



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CHECKED BY | DATE
APPROVED BY | DATE
APPROVED BY | DATE
MATERIAL

FINISH

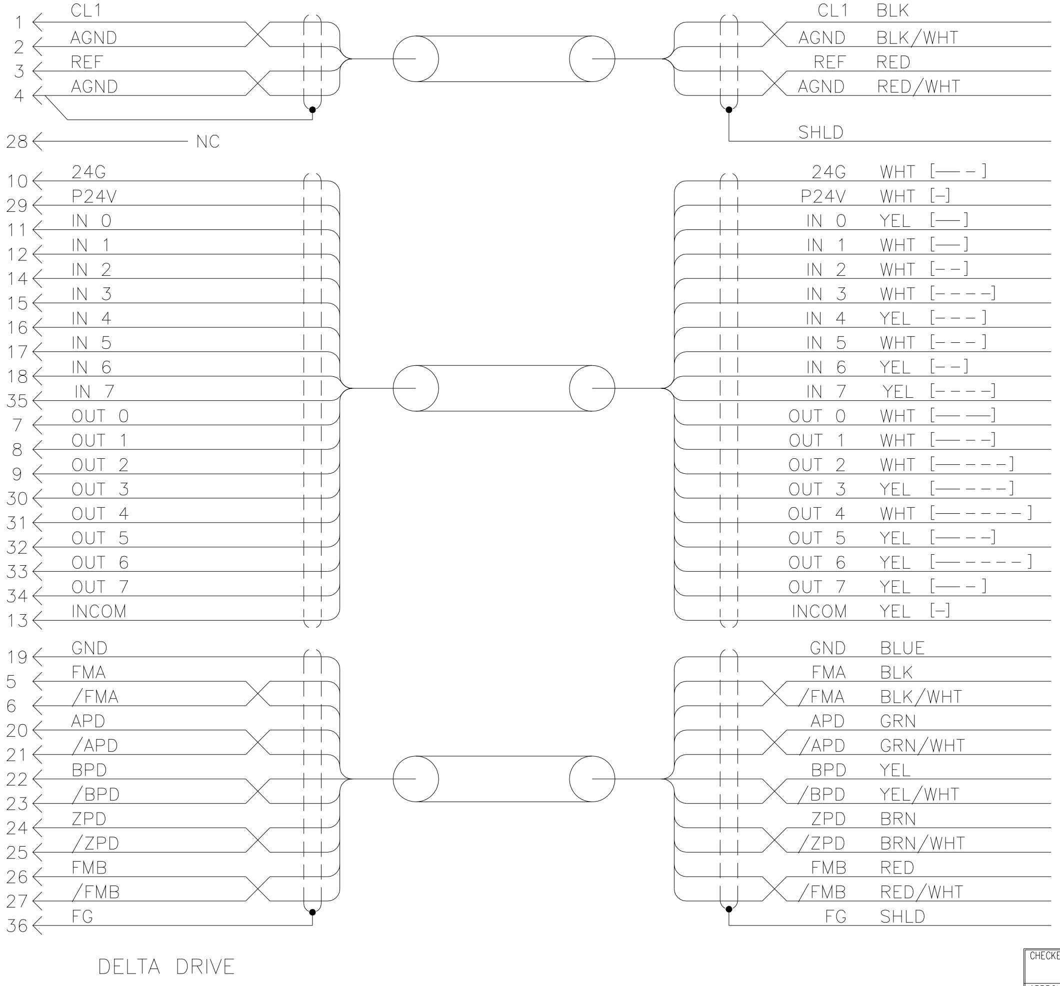
TITLE
CABLE, DELTA CONTROL/DELTA S I/O

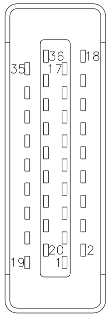
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± ---

DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 10MAY96
SCALE ---

DRAWING NUMBER C-718006
SHEET NO. 1 OF 3
REVISION A

DATE	SYM	REVISION RECORD	DR	CK	CK
02MAR01	A	PER ECN 01-086	CWB	EB	CDR





36 POS. CONNECTOR
AS VIEWED FROM
SOLDER SIDE
(2 PLACES)

CONNECTIONS FOR DELTA DRIVE

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

CHECKED BY DATE
APPROVED BY DATE
APPROVED BY DATE
MATERIAL

FINISH

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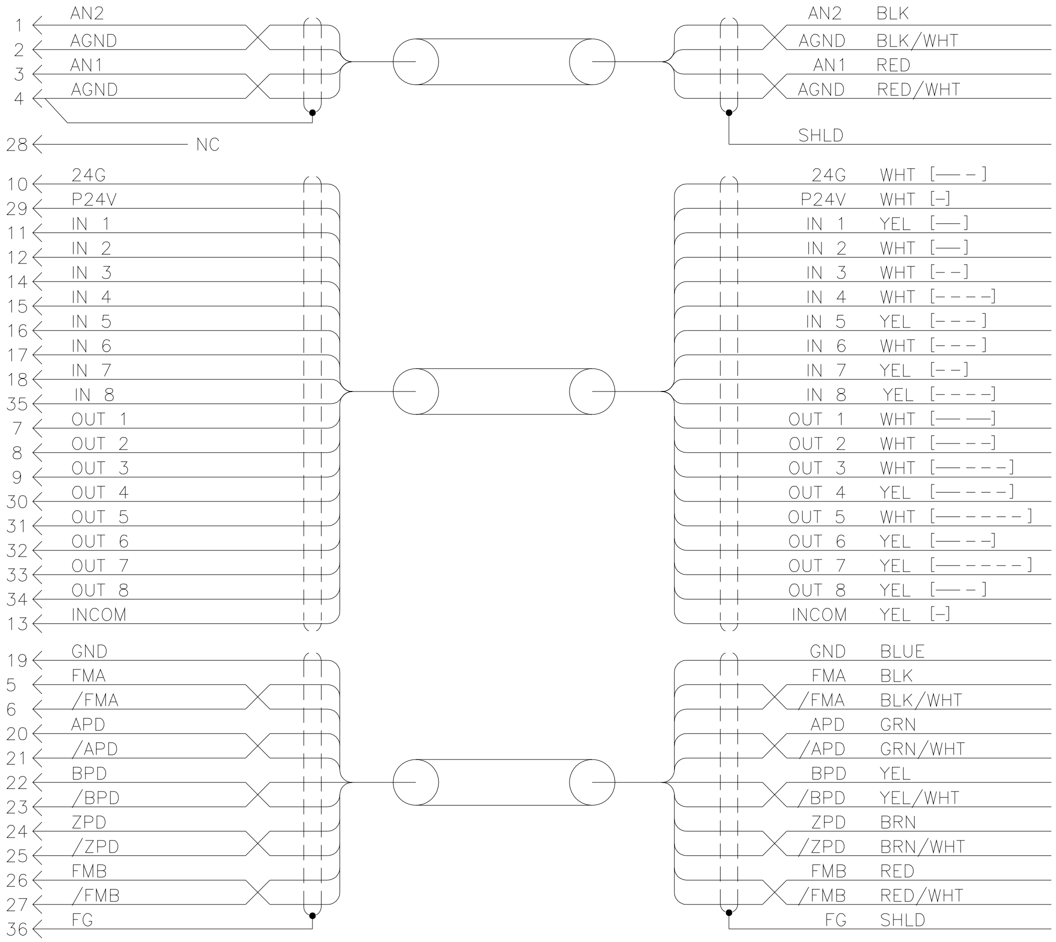
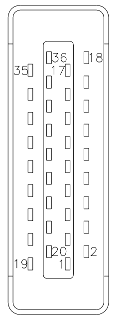
TITLE
CABLE, DELTA CONTROL/DELTA S I/O

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± ---
X.XXX± ---
ANGULAR
± ---
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 10MAY96
SCALE ---
DRAWING NUMBER C-718006
SHEET NO. 2 OF 3
REVISION A

DATE	SYM	REVISION RECORD	DR	CK	CK
02MAR01	A	PER ECN 01-086	CWB	EB	CDR



DELTA S DRIVE



36 POS. CONNECTOR
AS VIEWED FROM
SOLDER SIDE
(2 PLACES)

CONNECTIONS FOR DELTA S DRIVE

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CHECKED BY DATE
APPROVED BY DATE
APPROVED BY DATE
MATERIAL ___________
FINISH ___________

TITLE CABLE, DELTA CONTROL/DELTA S I/O

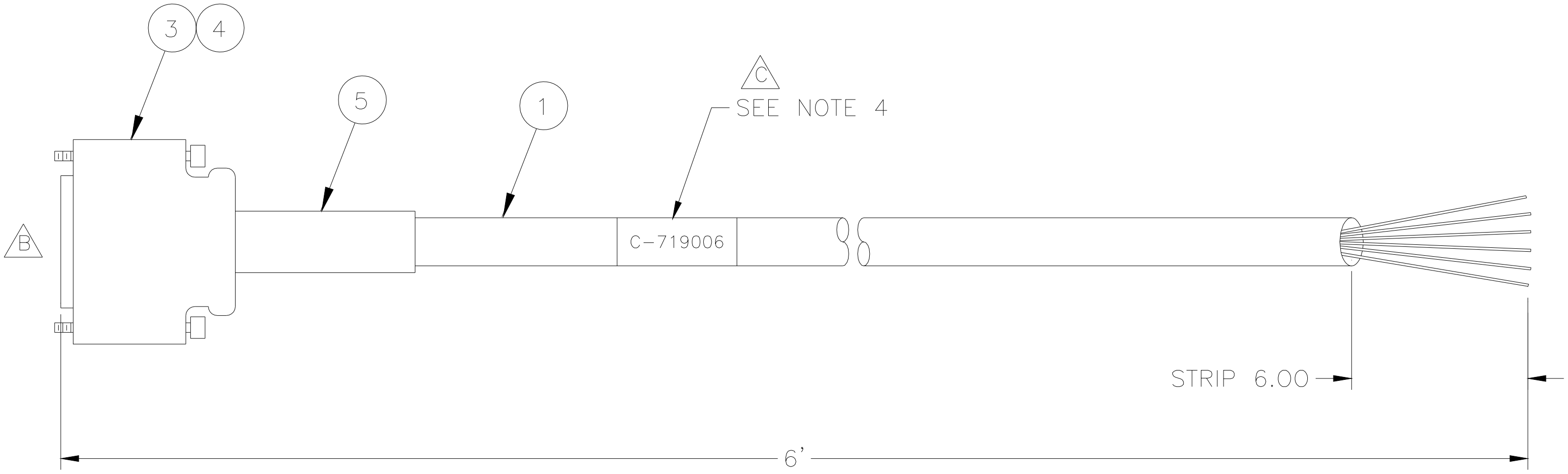
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± ---
X.XXX± ---
ANGULAR ± ---

DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 10MAY96
SCALE ---
DRAWING NUMBER C-718006
SHEET NO. 3 OF 3
REVISION A

DATE	SYM	REVISION RECORD	DR	CK	CK
11JUN03	D	PER ECN 03-267	EB		

NOTES:

1. 36 PIN 'C' PLUG TO FLYING LEADS.
2. ELECTRICAL SPECIFACTIONS:
   VOLTAGE RATING: 50 V
   CURRENT RATING: 1 A
   WITHSTANDING VOLTAGE: 500 Vrms FOR 1 MINUTE
3. ENVIRONMENTAL SPECIFACTIONS:
   TEMPERATURE RATING: -20°C TO +75°C
   FLAMMABILITY RATING: N.E.C. 725, CL2
4. MARK PER QP-08-0001.



INDUSTRIAL INDEXING SYSTEMS, Inc.
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CHECKED BY | DATE
APPROVED BY | DATE
APPROVED BY | DATE

TITLE
CABLE, CONTROL

MATERIAL

FINISH

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± ---

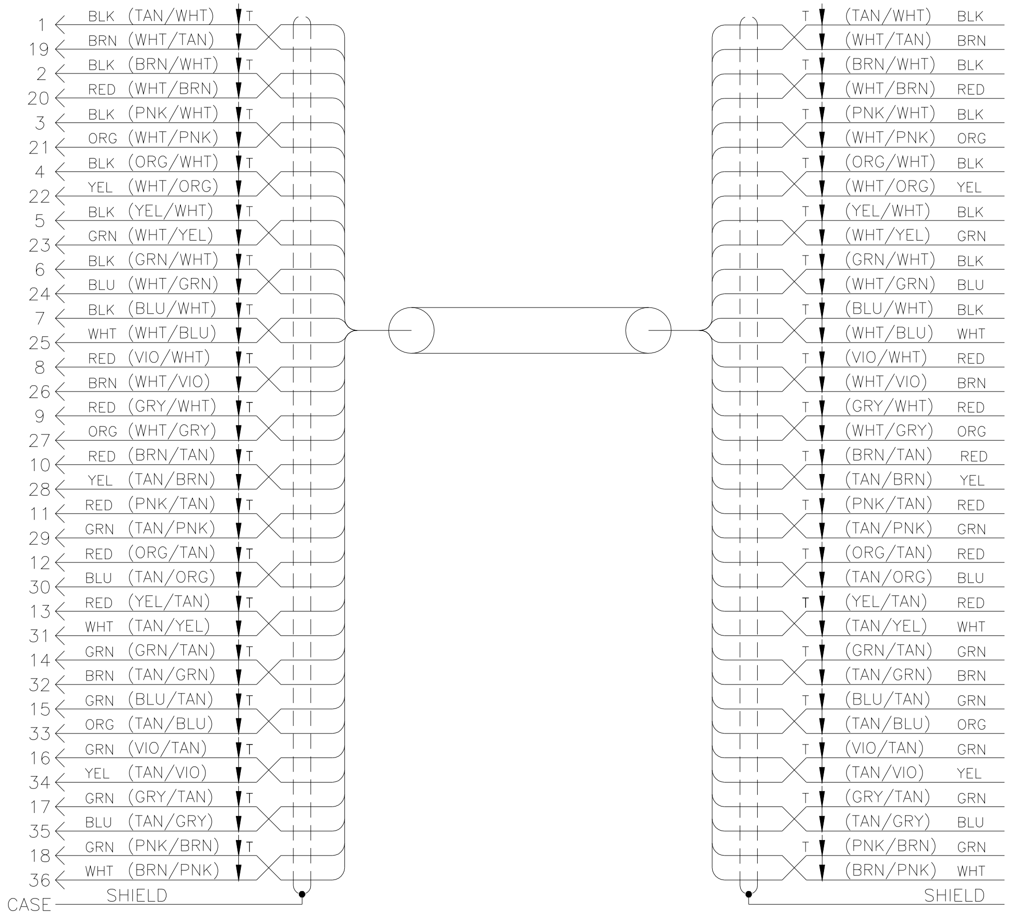
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 13MAY96
SCALE ---
DRAWING NUMBER C-719006
SHEET NO. 1 OF 2
REVISION D

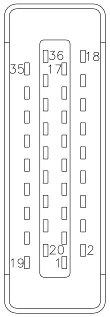
DATE	SYM	REVISION RECORD	DR	CK	CK
11JUN03	D	PER ECN 02-267	EB		

NOTES:

1) REFER TO DINT-300 DRAWINGS FOR INDIVIDUAL PIN FUNCTIONALITY.

D SHEET 2 – DELTAMAX/DELTAPRO
SHEET 3 – DELTA/DELTA XP
SHEET 4 – DELTA S





36 POS. CONNECTOR
AS VIEWED FROM
SOLDER SIDE
(2 PLACES)

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

CHECKED BY | DATE
APPROVED BY | DATE
APPROVED BY | DATE
MATERIAL ———————————
FINISH ———————————

TITLE
CABLE, CONTROL

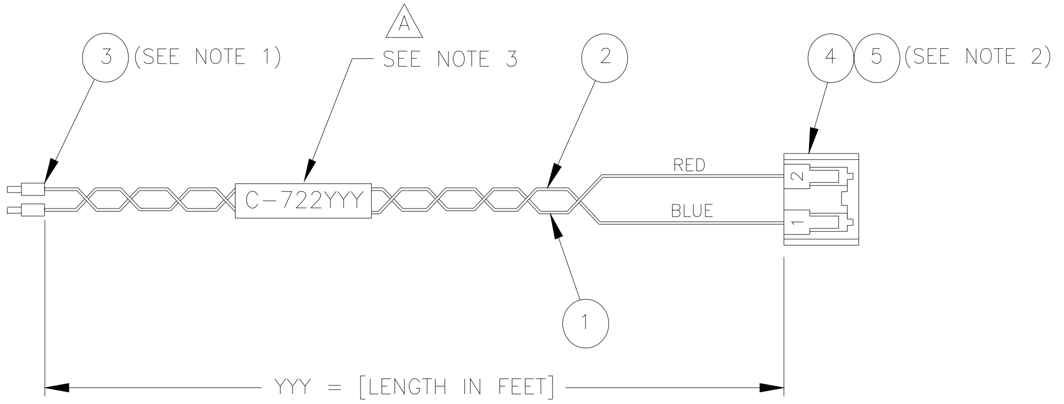
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ———
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± ———

DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 13MAY96
SCALE ———
DRAWING NUMBER C-719006
SHEET NO. 2 OF 2
REVISION D

DATE	SYM	REVISION RECORD	DR	CK	CK
21JUL00	A	PER ECN 00-246	CWB	EB	CDR

NOTES:

1. INSTALL ITEM 3 USING WEIDMULLER CRIMP TOOL PZ-4 OR EQUIVALENT.
2. CRIMP ITEM 4 USING YRS-260 CRIMP TOOL OR EQUIVALENT (2 PLACES).
3. MARK PER QP-08-0001.



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CHECKED BY | DATE
APPROVED BY | DATE
APPROVED BY JC | DATE 7/23/96
MATERIAL ----------
FINISH ----------

TITLE
CABLE, MONITOR, DELTA SERIES

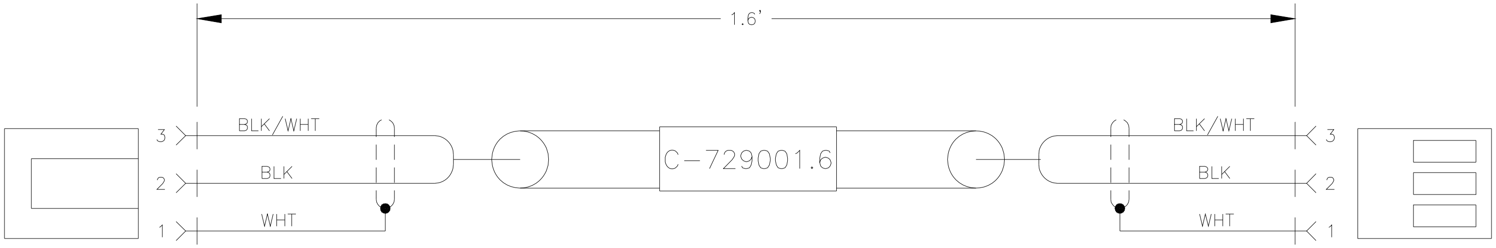
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± ---

DRAWN BY BAIER
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 23JUL96
SCALE ---
DRAWING NUMBER C-722YYY
SHEET NO. 1 OF 1
REVISION A

DATE	SYM	REVISION RECORD	DR	CK	CK
06MAY97	0	PER ECN 97-151	CWB		

NOTES:

1. PIN NUMBERS SHOWN FOR REFERENCE ONLY
2. MARK PER QP-08-0001.



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CHECKED BY	DATE
APPROVED BY	DATE
APPROVED BY	DATE
MATERIAL ------------	
FINISH ---------	

TITLE

CABLE, DELTA BATTERY

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)

TOLERANCES

X.X± ---
X.XX± --
X.XXX± --

ANGULAR
± --

DRAWN BY CWB

AutoCAD FILE LOCATION Q\CURRENT DWGS

B

DATE 06MAY97

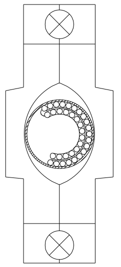
SCALE NTS

DRAWING NUMBER C-729001.6

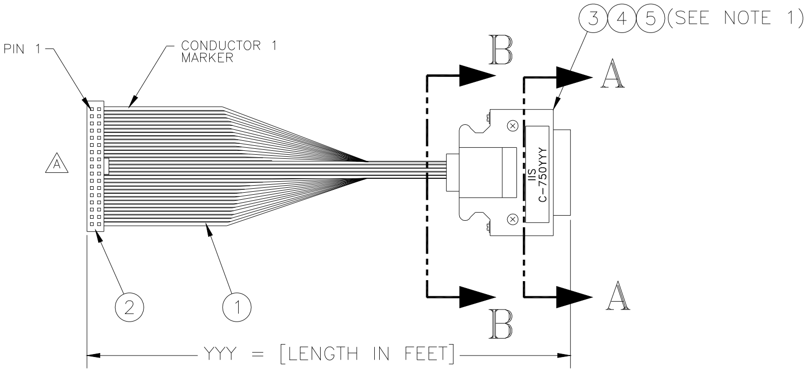
SHEET NO. 1 OF 1

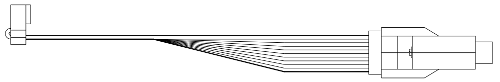
REVISION 0

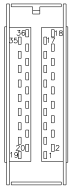
DATE	SYM	REVISION RECORD	DR	CK	CK
03MAY00	0	PER ECN 00-085	CWB	PK	
13JUN00	A	PER ECN 00-181	CWB		



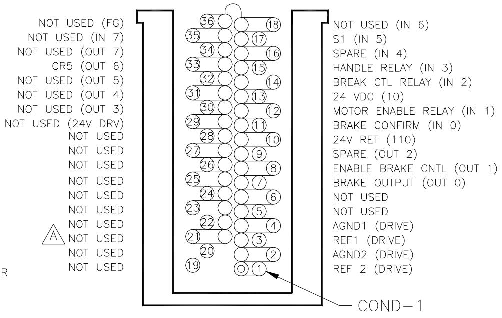
SECTION B-B
SHOWING FLAT CABLE





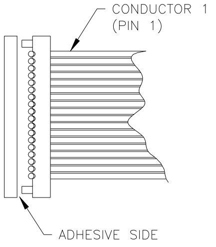


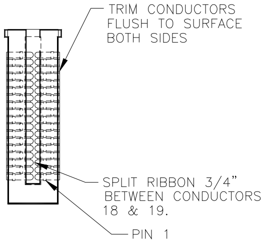
36 POSITION CONNECTOR
VIEWED FROM WIRE
INSERTION SIDE



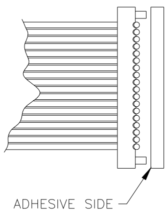
RELAY BOARD SIDE RIBBON CONNECTOR		DELTAMAX DRIVE SIDE "MINI D" CONNECTOR
1	REF 2 (DRIVE)	1
2	AGND 2 (DRIVE)	2
3	REF 1 (DRIVE)	3
4	AGND 1 (DRIVE)	4
5	NOT USED	5
6	NOT USED	6
7	BRAKE OUTPUT (OUT 0)	7
8	ENABLE BRAKE CNTL (OUT 1)	8
9	SPARE (OUT 2)	9
10	24 V RET (110)	10
11	BRAKE CONFIRM (IN 0)	11
12	MOTOR ENABLE RELAY (IN 1)	12
13	24 VDC (10)	13
14	BRAKE CTL RELAY (IN 2)	14
15	HANDLE RELAY (IN 3)	15
16	SPARE (IN 4)	16
17	JOG UP (IN 5)	17
18	JOG DWN (IN 6)	18
19	NOT USED (FG)	36
20	NOT USED (IN 7)	35
21	HANDLE SWITCH (OUT 7)	34
22	CR 2 (OUT 6)	33
23	OVERLOAD IND. (OUT 5)	32
24	DIAGNOSTIC IND. (OUT 4)	31
25	SYSTEM READY IND. (OUT 3)	30
26	NOT USED (24V DRV)	29
27	NOT USED	28
28	NOT USED	27
29	NOT USED	26
30	NOT USED	25
31	NOT USED	24
32	NOT USED	23
33	NOT USED	22
34		21
		20
		19

NOTES:
1.) MARK PER QP-08-0001.





SECTION A-A
SHOWING FLAT CABLE
INSERTED



INDUSTRIAL INDEXING SYSTEMS, Inc.
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CHECKED BY
DATE
APPROVED BY
DATE
APPROVED BY
DATE
MATERIAL

FINISH

TITLE
CABLE, COMMUNICATIONS

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± --
X.XX± --
X.XXX± --
ANGULAR
± --

DRAWN BY BOWMAN
AutoCAD FILE LOCATION
Q\DFTG\CABLES\C7XX
C
DATE 03MAY00
SCALE NTS
DRAWING NUMBER C-750YYY
SHEET NO. 1 OF 1
REVISION A

DATE	SYM	REVISION RECORD	DR	CK	CK
07JAN05	B	PER ECN 04-441	EB		

NOTES:

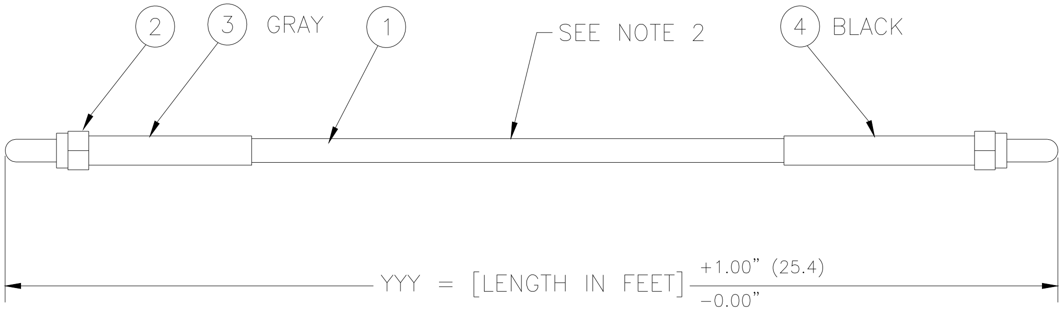
1.) ASSEMBLE PER QP-08-0006.

2.) MARK PER QP-08-0001.

3.) TEST USING TEST PROCEDURE TST-0061.

4.) MINIMUMM BEND RADIUS – 1.58 (40 MM)
LOSS INCREMENT=< 0.5dB
(QUARTER BEND)

5.) REPEATED BENDING ENDURANCE: 5000 TIMES MIN.
LOSS INCREMENT=< 1dB
(IN CONFORMITY TO JIS C 6861)



INDUSTRIAL INDEXING SYSTEMS, Inc.
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CHECKED BY CD DATE 3/7/01
APPROVED BY J.CARTER DATE 3/7/01
APPROVED BY DATE

TITLE
CABLE, SERCOS FIBER OPTIC, EXTERNAL

MATERIAL ---------
FINISH ---------

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± ---
X.XXX± ---
ANGULAR ± ---

DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\DFTG\CABLES\C-7XX
DRAWING NUMBER C-752YYY
B
DATE 10MAY00
SCALE ---
SHEET NO. 1 OF 1
REVISION B

DATE	SYM	REVISION RECORD	DR	CK	CK
07JAN05	C	PER ECN 04-441	EB		

NOTES:

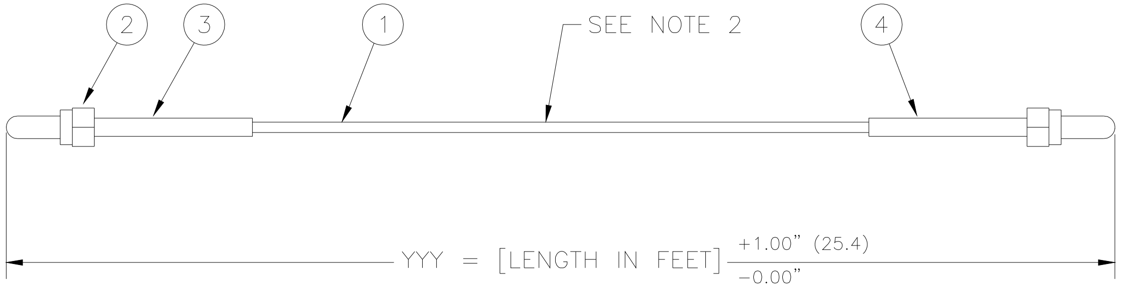
1.) ASSEMBLE PER QP-08-0006.

2.) MARK PER QP-08-0001.

3.) TEST USING TEST PROCEDURE TST-0061.

4.) MINIMUN BEND RADIUS - .98 (25 MM)
LOSS INCREMENT=<0.5 dB
(QUARTER BEND)

5.) REPEATED BENDING ENDURANCE: 5000 TIMES MIN.
LOSS INCREMENT=< 1dB
(IN CONFORMITY TO JIS C 6861)



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

CHECKED BY | DATE

APPROVED BY | DATE

APPROVED BY J.CARTER | DATE 3/7/01

TITLE
CABLE, SERCOS FIBER OPTIC, INTERNAL

MATERIAL
SPEC SHT: GHCP 4001

FINISH

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)

TOLERANCES
X.X± ---
X.XX± ---
X.XXX± ---

ANGULAR
± ---

DRAWN BY BOWMAN

AutoCAD FILE LOCATION Q:\DFTG\CABLES\C-7XX

B

DATE 10MAY00

SCALE ---

DRAWING NUMBER C-753YYY

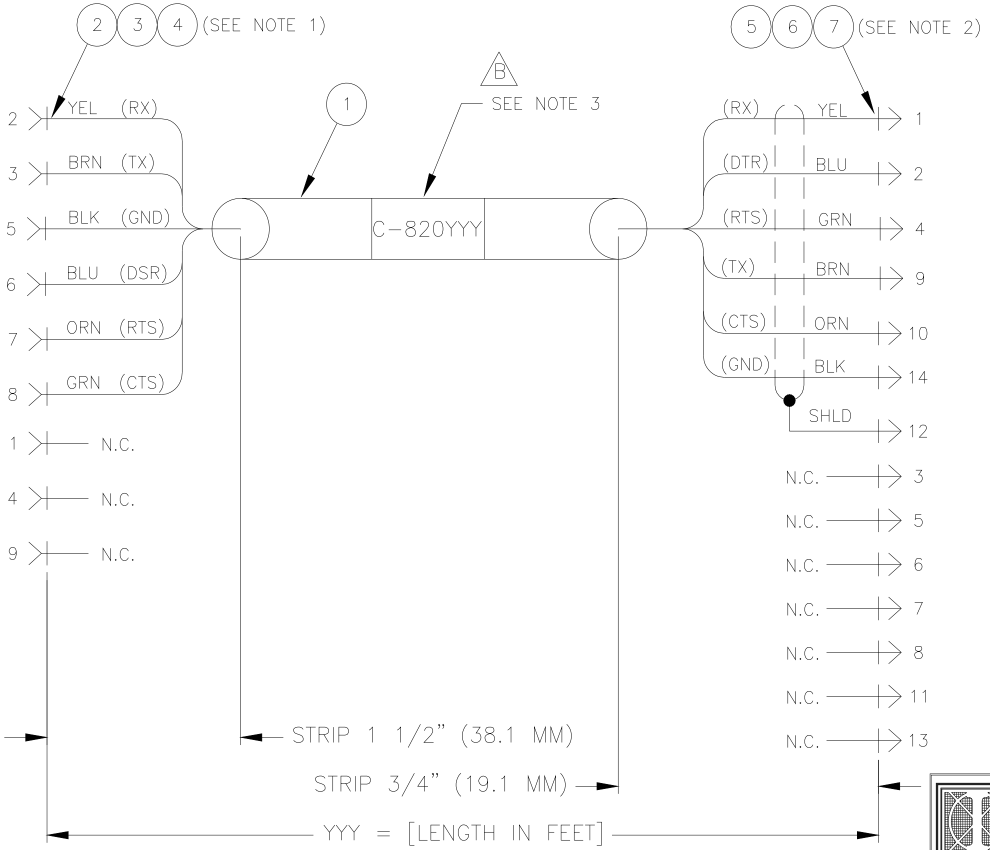
SHEET NO. 1 OF 1

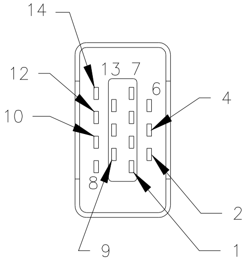
REVISION C

DATE	SYM	REVISION RECORD	DR	CK	CK
21JUL00	B	PER ECN 00-246	CWB	EB	CDR

NOTES:

1. INSTALL ITEM 2 USING AMP IDT TOOL OR EQUIVALENT.
2. HEAT SHRINK TUBING OVER SOLDER JOINT (7 PLACES).
3. MARK PER QP-08-0001.





14 POS. CONNECTOR
AS VIEWED FROM
SOLDER SIDE

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

CHECKED BY | DATE
APPROVED BY EB | DATE 4/26/96
APPROVED BY JC | DATE 4/4/96
MATERIAL -----------
FINISH -----------

TITLE
CABLE, COMMUNICATION

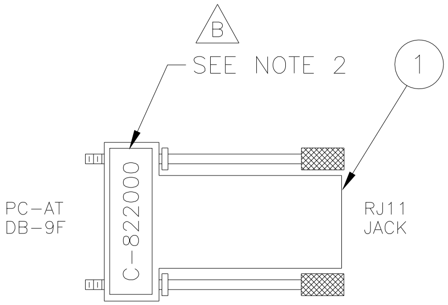
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± ---
DRAWN BY BAIER
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 01APR96
SCALE ---
DRAWING NUMBER C-820YYY
SHEET NO. 1 OF 1
REVISION B

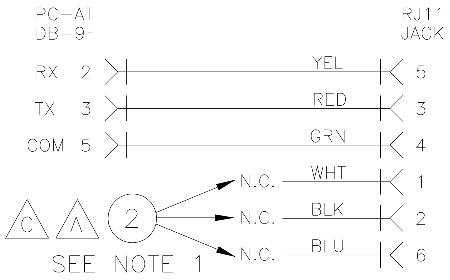
DATE	SYM	REVISION RECORD	DR	CK	CK
13MAR01	C	PER ECN 01-070	EB	EB	CDR

NOTES:

1.) INSULATE UNUSED WIRES.

2.) MARK PER QP-08-0001.





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www.iis-servo.com

CHECKED BY	DATE
APPROVED BY ELS	DATE 15AUG96
APPROVED BY ELS	DATE 10MAY96
MATERIAL --------	
FINISH --------	

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TITLE
CABLE ADAPTOR, 9P, FE, STANDARD

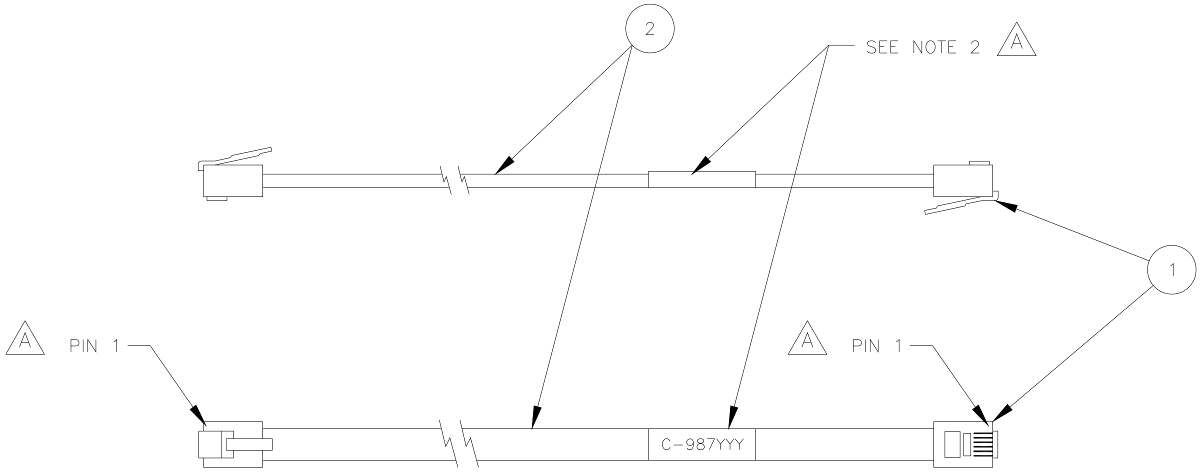
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± --
X.XX± --
X.XXX± --
ANGULAR
± --

DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\DFTG\CABLES\C-8XX
B
DATE 09MAY96
SCALE NTS
DRAWING NUMBER C-822000
SHEET NO. 1 OF 1
REVISION C

DATE	SYM	REVISION RECORD	DR	CK	CK
29JAN99	A	PER ECN 98-270/99-027	CWB	EB	CDR

NOTES:

1) CRIMP CABLE (ITEM 2) TO ENDS (ITEM 1) WITH MODULAR CRIMP TOOL, PART No. 1005-6P6C.
2) MARK PER OP-08-0001.



A

1	WHT	1
2	BLK	2
3	RED	3
4	GRN	4
5	YEL	5
6	BLU	6

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CHECKED BY E. BAIER DATE 8/31/92
APPROVED BY J.C. DATE 8/31/92
APPROVED BY DATE

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TITLE
CABLE, DATA, MODULAR

MATERIAL

FINISH

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± ---
X.XXX± ---
ANGULAR ± ---

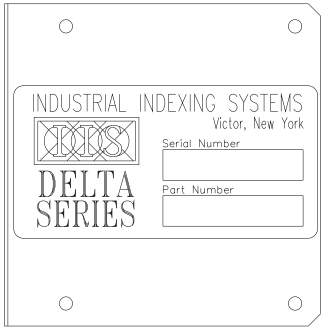
DRAWN BY ERTURK
AutoCAD FILE LOCATION Q:\DFTG\CABLES\C-9XX
B
DATE 13AUG92
SCALE ---

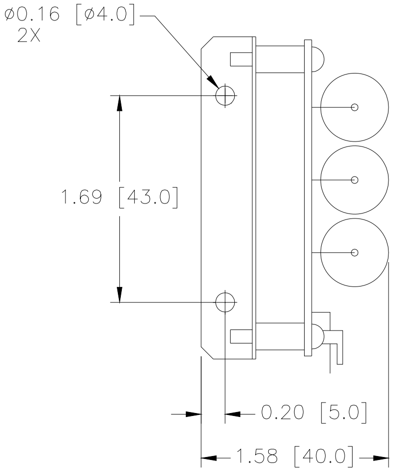
DRAWING NUMBER C-987YYY
SHEET NO. 1 OF 1
REVISION A

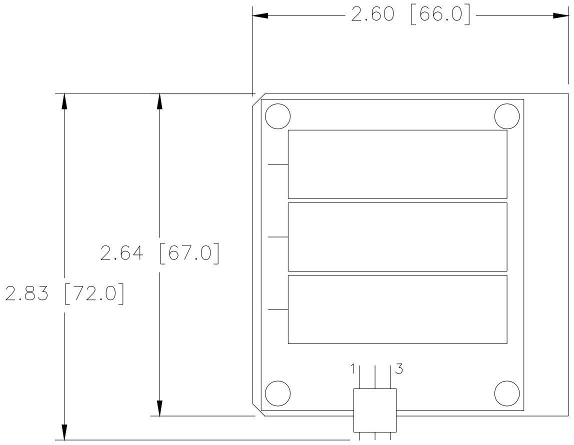
DATE	SYM	REVISION RECORD	DR	CK	CK
06MAY97	0	PER ECN 97-151	CWB		

NOTES:

1. PIN NUMBERS SHOWN FOR REFERENCE ONLY.







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www.iis-servo.com

CHECKED BY | DATE
APPROVED BY | DATE
APPROVED BY | DATE
MATERIAL

FINISH

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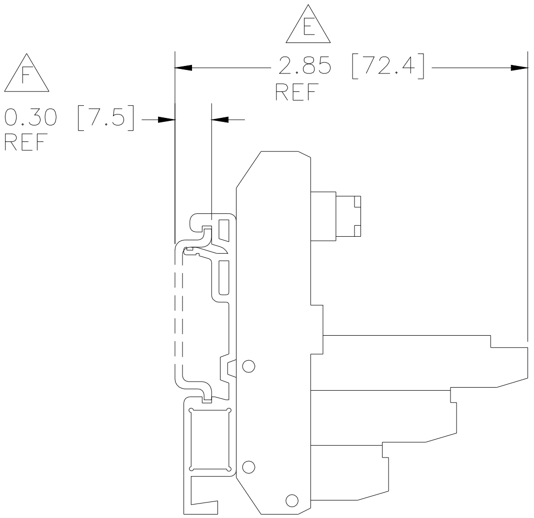
TITLE
BATTERY PACK, DELTA

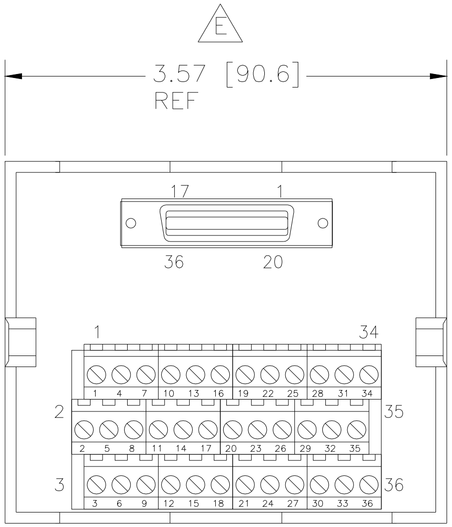
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± ---
X.XXX± ---
ANGULAR ± ---
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 06MAY97
SCALE ---
DRAWING NUMBER DELTA-B-3.6/2
SHEET NO. 1 OF 1
REVISION 0

DATE	SYM	REVISION RECORD	DR	CK	CK
13JUN06	M	PER ECN 06-181	CD		

NOTES: H

1. SHEET 2 OF THIS DRAWING IDENTIFIES DELTAMAX/DELTAPRO TO DINT-300 SIGNALS.
2. SHEET 3 OF THIS DRAWING IDENTIFIES DELTA DRIVE TO DINT-300 SIGNALS.
3. SHEET 4 OF THIS DRAWING IDENTIFIES DELTA S DRIVE TO DINT-300 SIGNALS.





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TITLE
DELTA SERIES TO DINT-300 SIGNALS

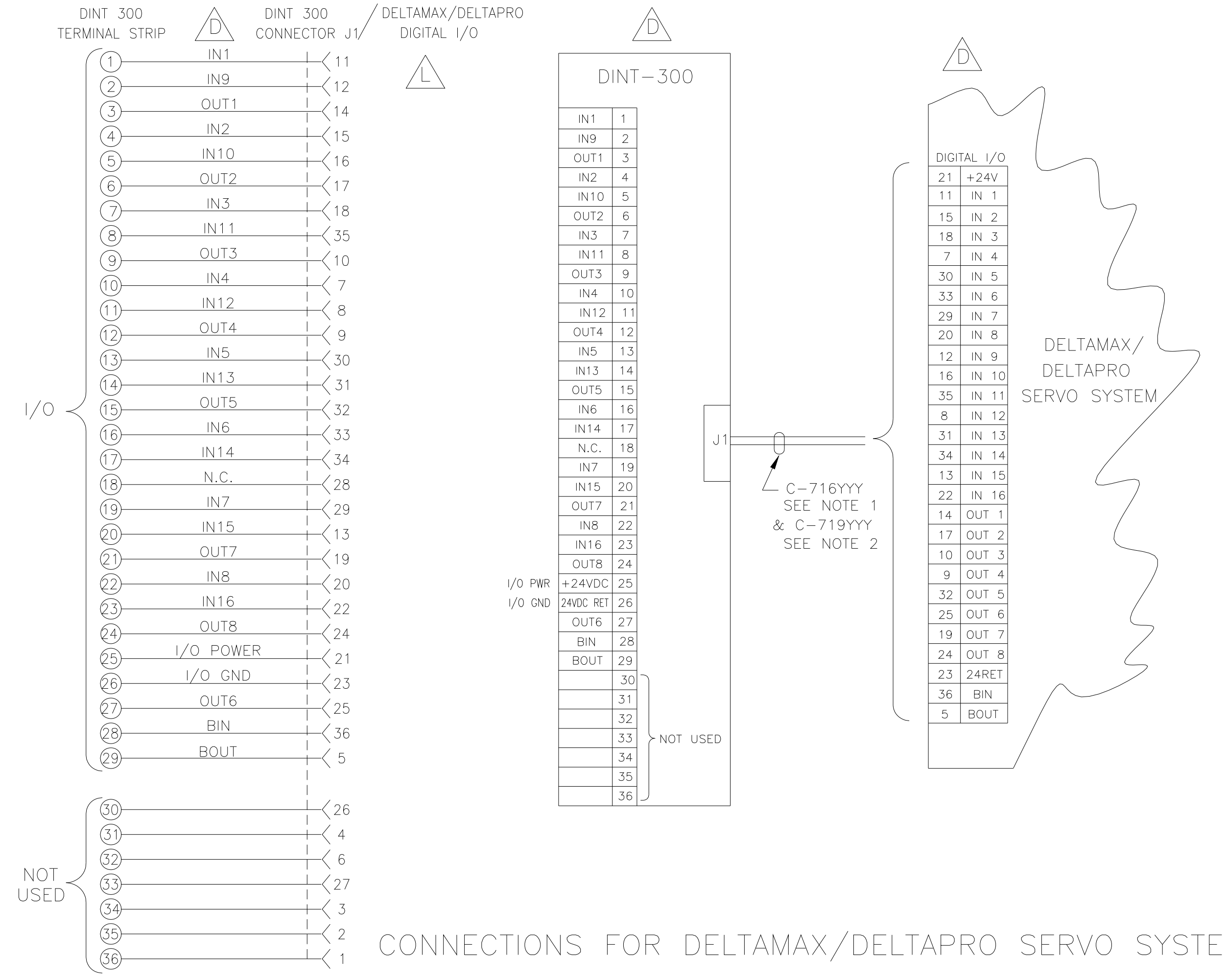
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'

DRAWN BY BAIER
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 08APR96
SCALE NTS
DRAWING NUMBER DINT-300
SHEET NO. 1 OF 5
REVISION M

DATE	SYM	REVISION RECORD	DR	CK	CK
13JUN06	M	PER ECN 06-181	EB		

NOTES:

1. C-716 IS APPLICATION DEPENDENT.
   L C-716 IS NOT SHIELDED - FOR USE WITH 24V DC I/O ONLY
2. C-719 IS TERMINATED AT ONE END ONLY AND IS APPLICATION DEPENDENT.
   L C-719 IS NOT SHIELDED - FOR USE WITH 24V DC I/O ONLY.



DINT 300 TERMINAL STRIP		DINT 300 CONNECTOR J1
1	IN1	11
2	IN9	12
3	OUT1	14
4	IN2	15
5	IN10	16
6	OUT2	17
7	IN3	18
8	IN11	35
9	OUT3	10
10	IN4	7
11	IN12	8
12	OUT4	9
13	IN5	30
14	IN13	31
15	OUT5	32
16	IN6	33
17	IN14	34
18	N.C.	28
19	IN7	29
20	IN15	13
21	OUT7	19
22	IN8	20
23	IN16	22
24	OUT8	24
25	I/O POWER	21
26	I/O GND	23
27	OUT6	25
28	BIN	36
29	BOUT	5
30		26
31		4
32		6
33		27
34		3
35		2
36		1

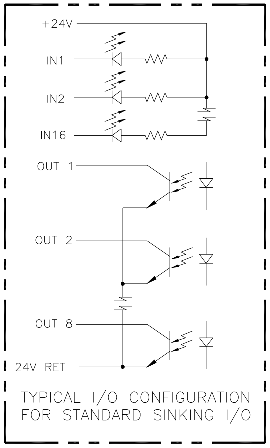
DINT-300

	IN1	1
	IN9	2
	OUT1	3
	IN2	4
	IN10	5
	OUT2	6
	IN3	7
	IN11	8
	OUT3	9
	IN4	10
	IN12	11
	OUT4	12
	IN5	13
	IN13	14
	OUT5	15
	IN6	16
	IN14	17
	N.C.	18
	IN7	19
	IN15	20
	OUT7	21
	IN8	22
	IN16	23
	OUT8	24
I/O PWR	+24VDC	25
I/O GND	24VDC RET	26
	OUT6	27
	BIN	28
	BOUT	29
		30
		31
		32
		33
		34
		35
		36

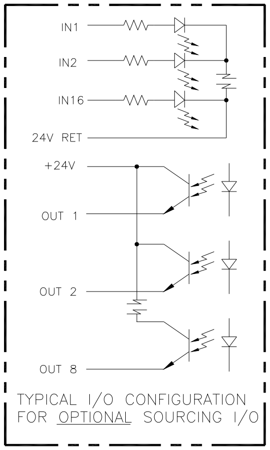
30–36: NOT USED

DIGITAL I/O	
21	+24V
11	IN 1
15	IN 2
18	IN 3
7	IN 4
30	IN 5
33	IN 6
29	IN 7
20	IN 8
12	IN 9
16	IN 10
35	IN 11
8	IN 12
31	IN 13
34	IN 14
13	IN 15
22	IN 16
14	OUT 1
17	OUT 2
10	OUT 3
9	OUT 4
32	OUT 5
25	OUT 6
19	OUT 7
24	OUT 8
23	24RET
36	BIN
5	BOUT

CONNECTIONS FOR DELTAMAX/DELTAPRO SERVO SYSTEM



TYPICAL I/O CONFIGURATION FOR STANDARD SINKING I/O



TYPICAL I/O CONFIGURATION FOR *OPTIONAL* SOURCING I/O

INDUSTRIAL INDEXING SYSTEMS, Inc.
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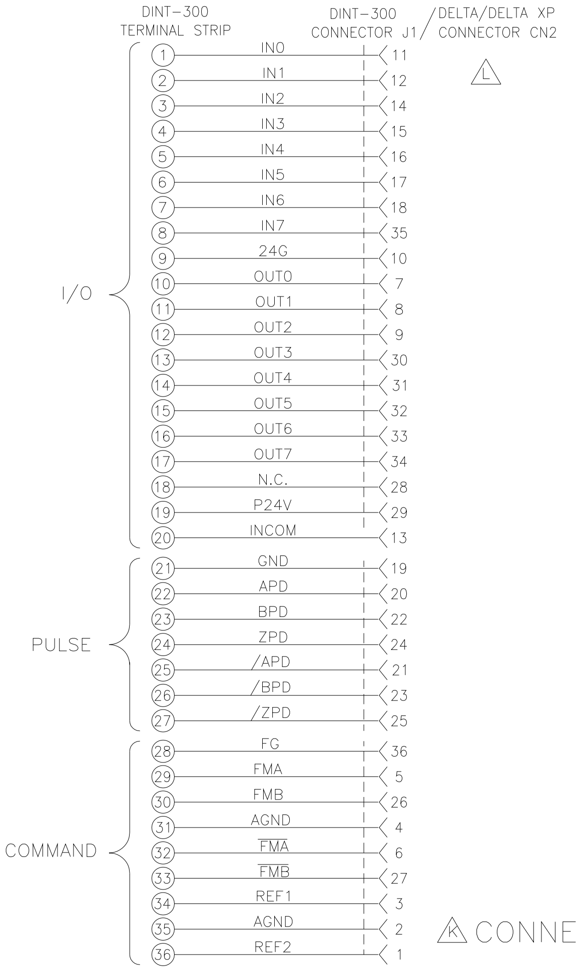
TITLE
DELTA SERIES TO DINT-300 SIGNALS

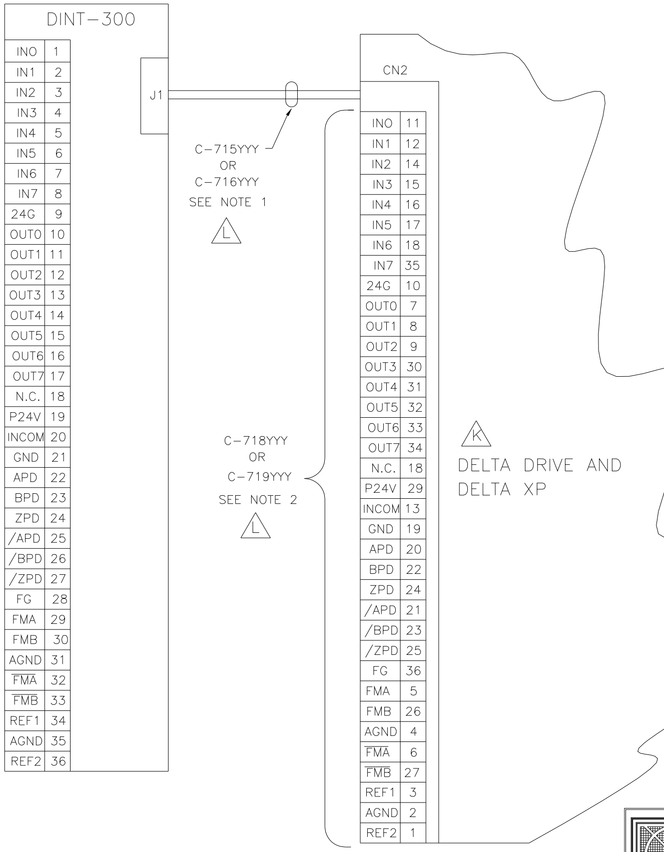
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY BAIER
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 08APR96
SCALE NTS
DRAWING NUMBER DINT-300
SHEET NO. 2 OF 5
REVISION M

DATE	SYM	REVISION RECORD	DR	CK	CK
13JUN03	M	PER ECN 06-181	EB		

NOTES:

1. C-715 OR C-716 ARE APPLICATION DEPENDENT.
   △L C-715 IS SHIELDED FOR HIGH SPEED PULSE SIGNALS.
   C-716 IS NOT SHIELDED - FOR USE WITH 24V DC I/O ONLY
2. C-718 OR C-719 ARE TERMINATED AT ONE END ONLY
   △L AND ARE APPLICATION DEPENDENT.
   C-718 IS SHIELDED FOR HIGH SPEED PULSE SIGNALS.
   C-719 IS NOT SHIELDED - FOR USE WITH 24V DC I/O ONLY.





△K CONNECTIONS FOR DELTA DRIVE AND DELTA XP

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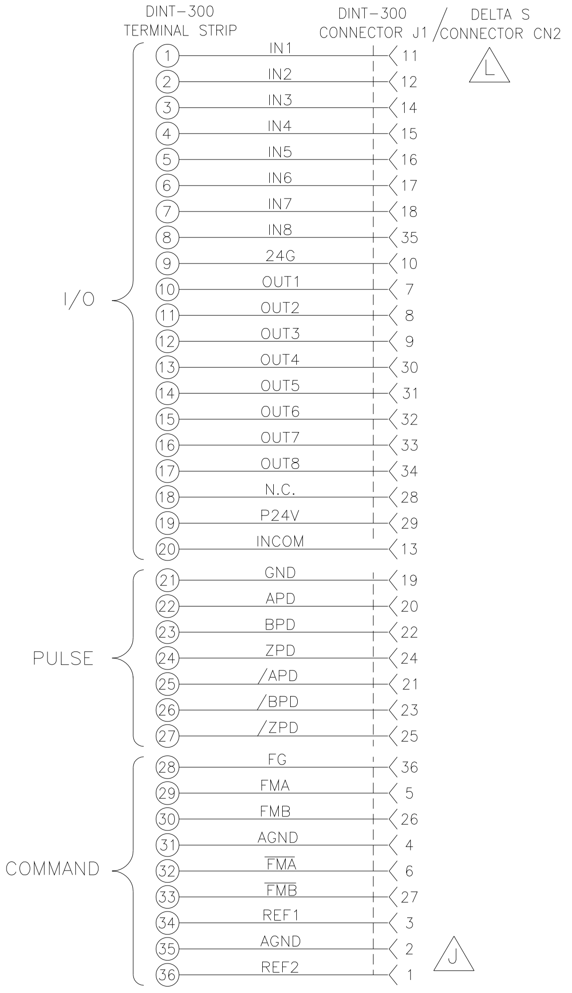
TITLE
DELTA SERIES TO DINT-300 SIGNALS

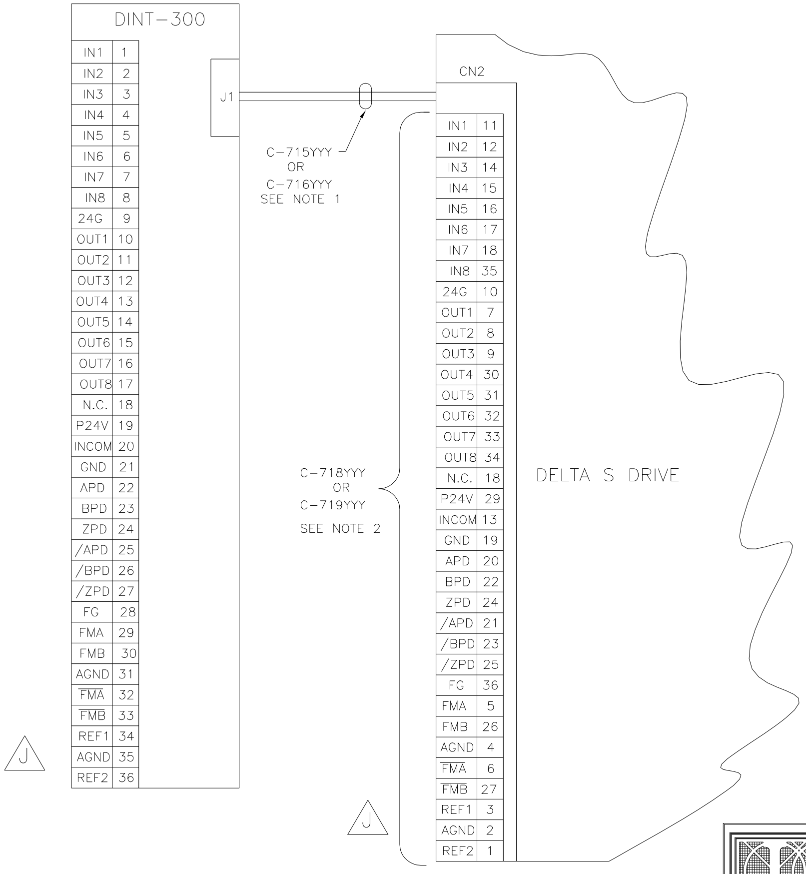
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY BAIER
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 08APR96
SCALE NTS
DRAWING NUMBER DINT-300
SHEET NO. 3 OF 5
REVISION M

DATE	SYM	REVISION RECORD	DR	CK	CK
13JUN03	M	PER ECN 06-181	EB		

NOTES:

1. C-715 OR C-716 ARE APPLICATION DEPENDENT.
   C-715 IS SHIELDED FOR HIGH SPEED PULSE SIGNALS.
   C-716 IS NOT SHIELDED FOR USE WITH 24V DC I/O ONLY
2. C-718 OR C-719 ARE TERMINATED AT ONE END ONLY AND ARE APPLICATION DEPENDENT.
   C-718 IS SHIELDED FOR HIGH SPEED PULSE SIGNALS.
   C-719 IS NOT SHIELDED FOR USE WITH 24V DC I/O ONLY.





CONNECTIONS FOR DELTA S DRIVE

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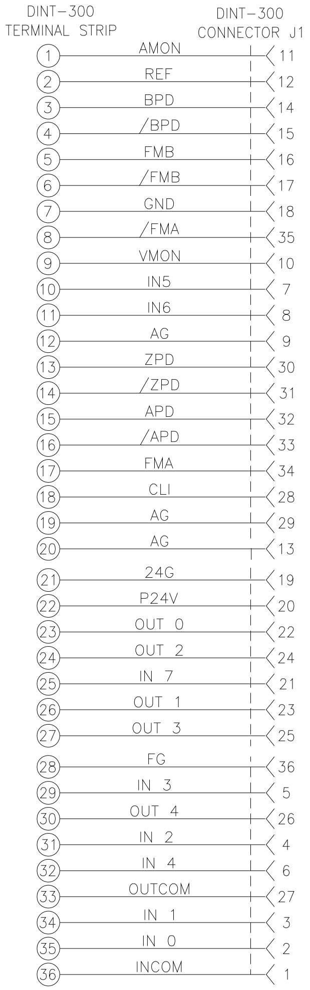
TITLE
DELTA SERIES TO DINT-300 SIGNALS

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
B
DRAWN BY BAIER
AutoCAD FILE LOCATION Q:\CURRENT DWGS
DATE 08APR96
SCALE NTS
DRAWING NUMBER DINT-300
SHEET NO. 4 OF 5
REVISION M

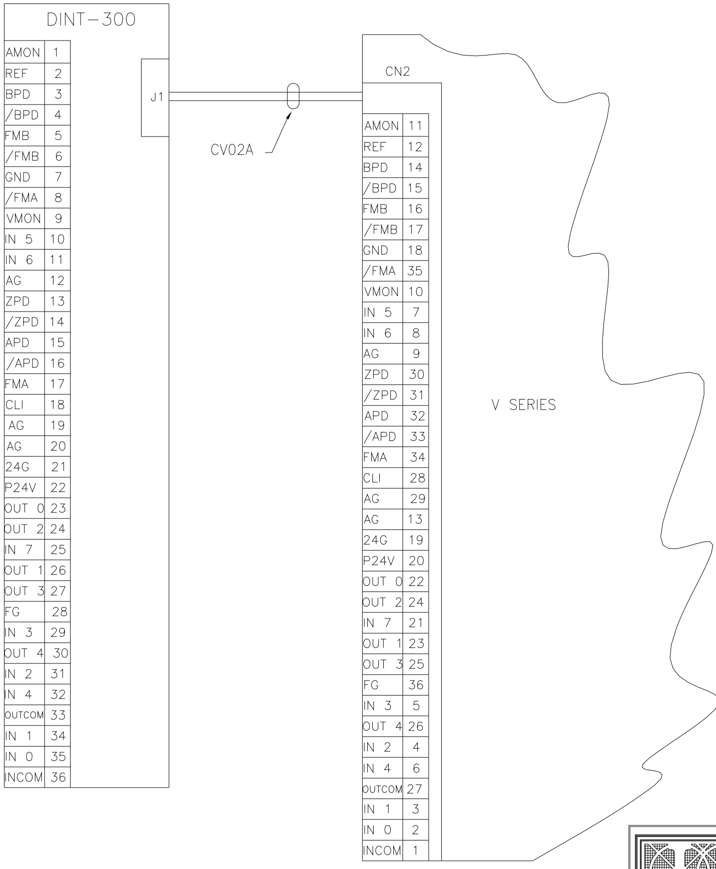
NOTES:

1. USE CABLE CV02A

DATE	SYM	REVISION RECORD	DR	CK	CK
13JUN03	M	PER ECN 06-181	CD		



DINT-300 TERMINAL STRIP		DINT-300 CONNECTOR J1
1	AMON	11
2	REF	12
3	BPD	14
4	/BPD	15
5	FMB	16
6	/FMB	17
7	GND	18
8	/FMA	35
9	VMON	10
10	IN5	7
11	IN6	8
12	AG	9
13	ZPD	30
14	/ZPD	31
15	APD	32
16	/APD	33
17	FMA	34
18	CLI	28
19	AG	29
20	AG	13
21	24G	19
22	P24V	20
23	OUT 0	22
24	OUT 2	24
25	IN 7	21
26	OUT 1	23
27	OUT 3	25
28	FG	36
29	IN 3	5
30	OUT 4	26
31	IN 2	4
32	IN 4	6
33	OUTCOM	27
34	IN 1	3
35	IN 0	2
36	INCOM	1



DINT-300

AMON	1
REF	2
BPD	3
/BPD	4
FMB	5
/FMB	6
GND	7
/FMA	8
VMON	9
IN 5	10
IN 6	11
AG	12
ZPD	13
/ZPD	14
APD	15
/APD	16
FMA	17
CLI	18
AG	19
AG	20
24G	21
P24V	22
OUT 0	23
OUT 2	24
IN 7	25
OUT 1	26
OUT 3	27
FG	28
IN 3	29
OUT 4	30
IN 2	31
IN 4	32
OUTCOM	33
IN 1	34
IN 0	35
INCOM	36

CN2

AMON	11
REF	12
BPD	14
/BPD	15
FMB	16
/FMB	17
GND	18
/FMA	35
VMON	10
IN 5	7
IN 6	8
AG	9
ZPD	30
/ZPD	31
APD	32
/APD	33
FMA	34
CLI	28
AG	29
AG	13
24G	19
P24V	20
OUT 0	22
OUT 2	24
IN 7	21
OUT 1	23
OUT 3	25
FG	36
IN 3	5
OUT 4	26
IN 2	4
IN 4	6
OUTCOM	27
IN 1	3
IN 0	2
INCOM	1

CONNECTIONS FOR TOSHIBA V SERIES

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

TITLE
V SERIES TO DINT-300 SIGNALS

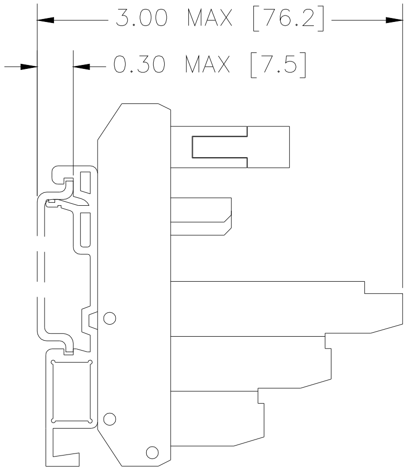
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY BAIER
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 08APR96
SCALE NTS
DRAWING NUMBER DINT-300
SHEET NO. 5 OF 5
REVISION M

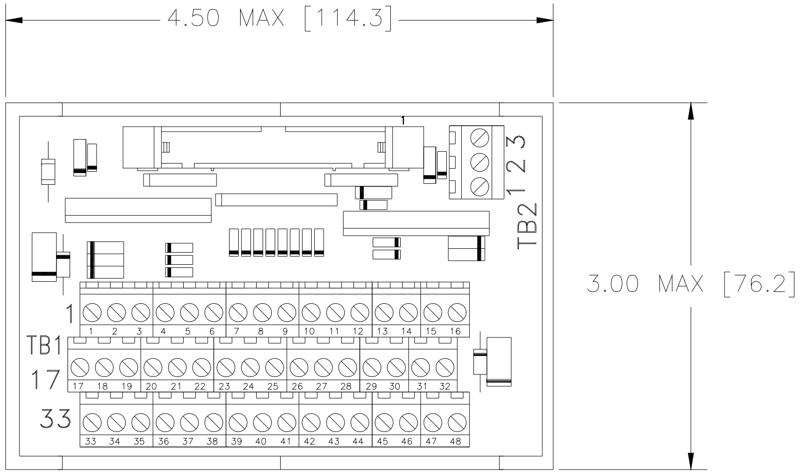
DATE	SYM	REVISION RECORD	DR	CK	CK
01SEP05	B	PER ECN 05-296	CWB		

NOTES:

1) CONNECTION CABLE SUPPLIED SEPARATELY.

2) OPERATING TEMPERATURE RANGE: 0 TO 50°C NON-CONDENSING.





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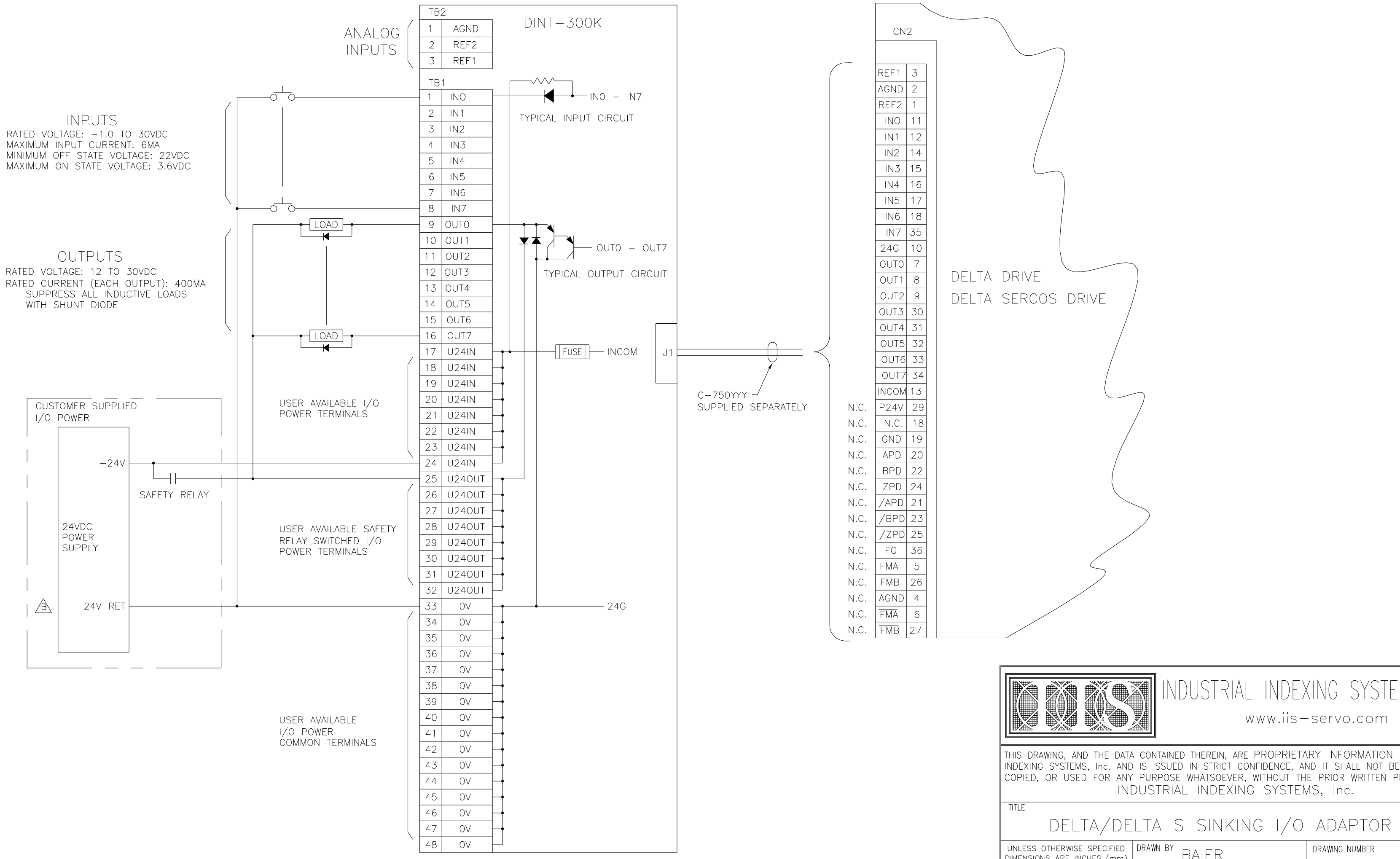
TITLE
DELTA/DELTA S SINKING I/O ADAPTOR

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± ---
X.XXX± ---
ANGULAR
± --

DRAWN BY BAIER
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 21OCT02
SCALE NTS

DRAWING NUMBER DINT-300K
SHEET NO. 1 OF 2
REVISION B

DATE	SYM	REVISION RECORD	DR	CK	CK
01SEP05	B	PER ECN 05-296	CWB		



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TITLE
DELTA/DELTA S SINKING I/O ADAPTOR

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± ---
X.XXX± ---
ANGULAR
± ---

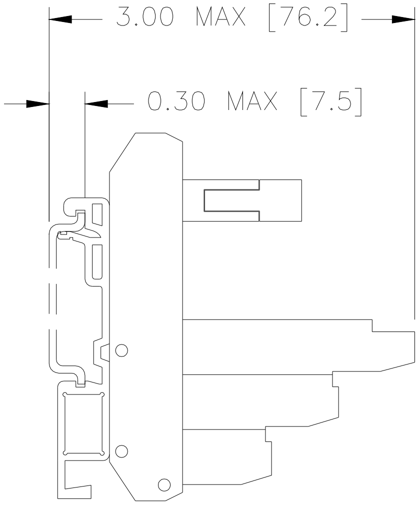
DRAWN BY BAIER
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 21OCT02
SCALE ---

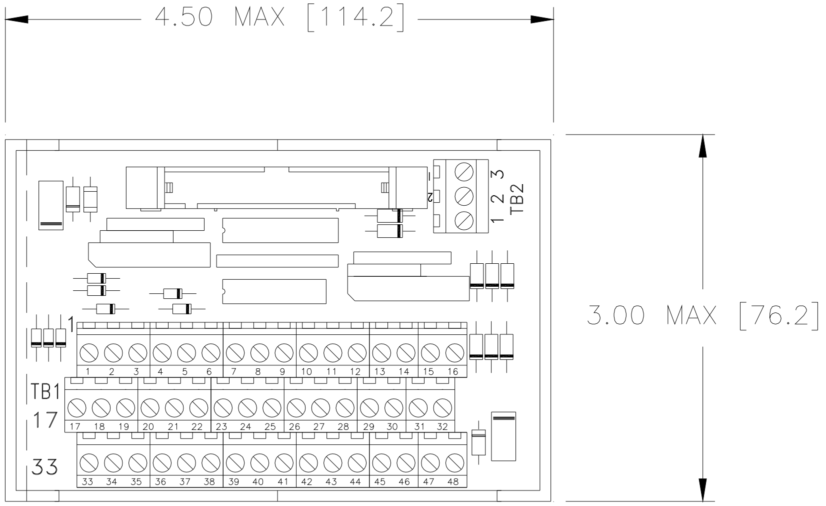
DRAWING NUMBER DINT-300K
SHEET NO. 2 OF 2
REVISION B

DATE	SYM	REVISION RECORD	DR	CK	CK
22AUG03	C	PER ECN 03-358	CWB		

NOTES:

1) CONNECTION CABLE SUPPLIED SEPARATELY.
2) OPERATING TEMPERATURE RANGE: 0 TO 50°C NON-CONDENSING.





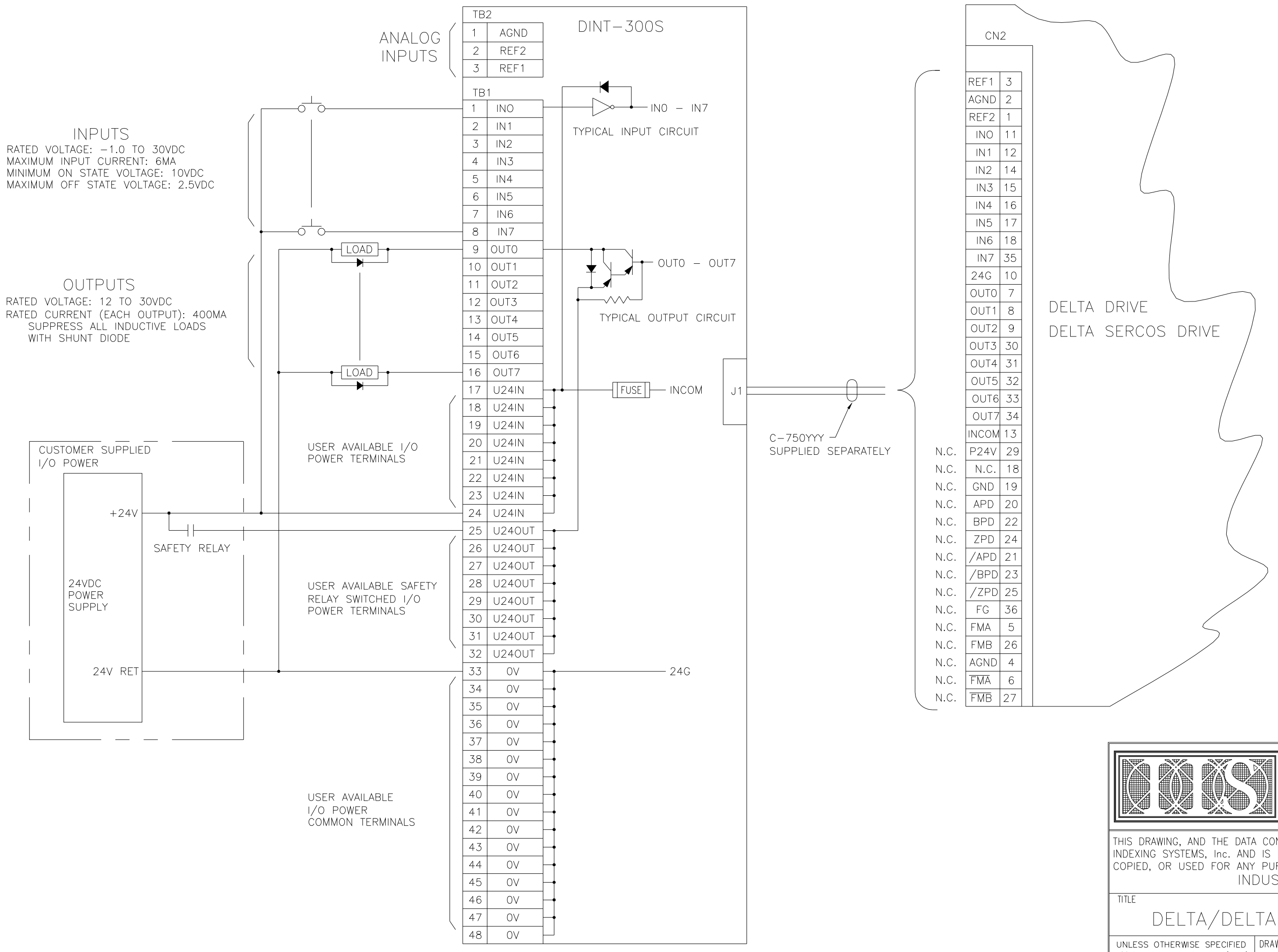
INDUSTRIAL INDEXING SYSTEMS, Inc.
www.iis-servo.com

TITLE
DELTA/DELTA S SOURCING I/O ADAPTOR

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± 0.01
X.XXX± 0.005
ANGULAR
± 0°30'

DRAWN BY BAIER
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 08MAY02
SCALE NTS
DRAWING NUMBER DINT-300S
SHEET NO. 1 OF 2
REVISION C

DATE	SYM	REVISION RECORD	DR	CK	CK
22AUG03	C	PER ECN 03-358	CWB		



INPUTS
RATED VOLTAGE: -1.0 TO 30VDC
MAXIMUM INPUT CURRENT: 6MA
MINIMUM ON STATE VOLTAGE: 10VDC
MAXIMUM OFF STATE VOLTAGE: 2.5VDC

OUTPUTS
RATED VOLTAGE: 12 TO 30VDC
RATED CURRENT (EACH OUTPUT): 400MA
SUPPRESS ALL INDUCTIVE LOADS WITH SHUNT DIODE

TB2

1	AGND
2	REF2
3	REF1

TB1

1	IN0
2	IN1
3	IN2
4	IN3
5	IN4
6	IN5
7	IN6
8	IN7
9	OUT0
10	OUT1
11	OUT2
12	OUT3
13	OUT4
14	OUT5
15	OUT6
16	OUT7
17	U24IN
18	U24IN
19	U24IN
20	U24IN
21	U24IN
22	U24IN
23	U24IN
24	U24IN
25	U24OUT
26	U24OUT
27	U24OUT
28	U24OUT
29	U24OUT
30	U24OUT
31	U24OUT
32	U24OUT
33	0V
34	0V
35	0V
36	0V
37	0V
38	0V
39	0V
40	0V
41	0V
42	0V
43	0V
44	0V
45	0V
46	0V
47	0V
48	0V

CN2

	REF1	3
	AGND	2
	REF2	1
	IN0	11
	IN1	12
	IN2	14
	IN3	15
	IN4	16
	IN5	17
	IN6	18
	IN7	35
	24G	10
	OUT0	7
	OUT1	8
	OUT2	9
	OUT3	30
	OUT4	31
	OUT5	32
	OUT6	33
	OUT7	34
	INCOM	13
N.C.	P24V	29
N.C.	N.C.	18
N.C.	GND	19
N.C.	APD	20
N.C.	BPD	22
N.C.	ZPD	24
N.C.	/APD	21
N.C.	/BPD	23
N.C.	/ZPD	25
N.C.	FG	36
N.C.	FMA	5
N.C.	FMB	26
N.C.	AGND	4
N.C.	$\overline{FMA}$	6
N.C.	$\overline{FMB}$	27

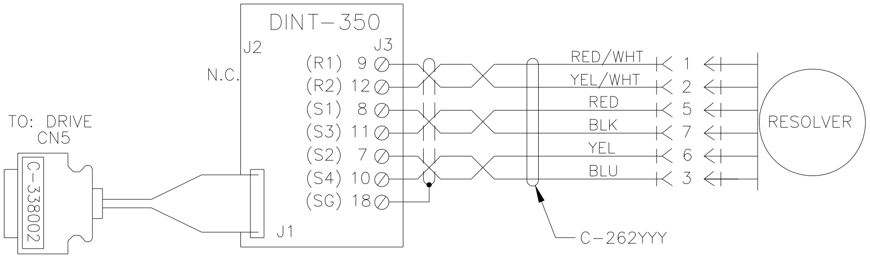
INDUSTRIAL INDEXING SYSTEMS, Inc.
www.iis-servo.com

TITLE
DELTA/DELTA S SOURCING I/O ADAPTOR

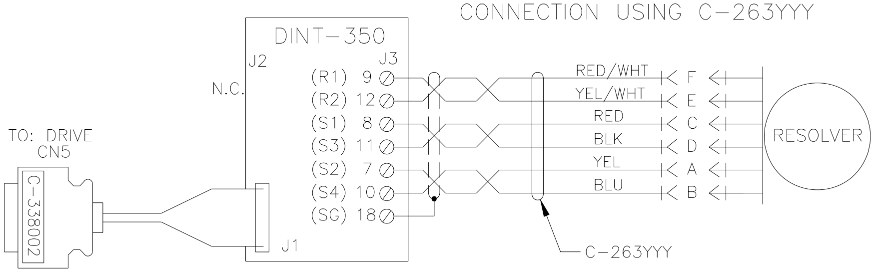
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± ---
X.XXX± ---
ANGULAR ± ---
DRAWN BY BAIER
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 08MAY02
SCALE ---
DRAWING NUMBER DINT-300S
SHEET NO. 2 OF 2
REVISION C

DATE	SYM	REVISION RECORD	DR	CK	CK
27MAY04	N	PER ECN 04-220	CWB		

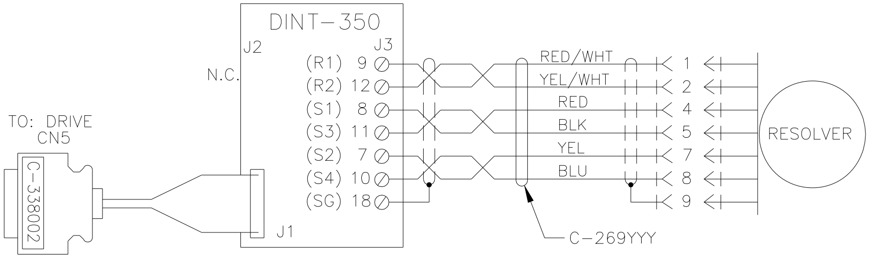
TYPICAL RESOLVER TO DINT-350 CONNECTION USING C-262YYY

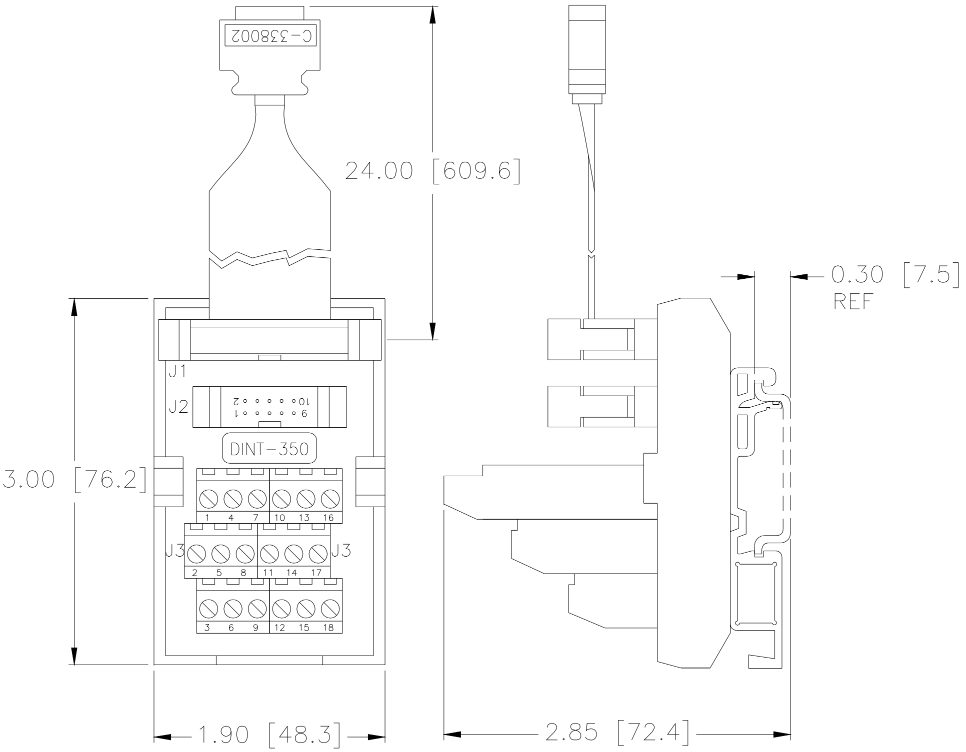


TYPICAL RESOLVER TO DINT-350 CONNECTION USING C-263YYY



TYPICAL RESOLVER TO DINT-350 CONNECTION USING C-269YYY





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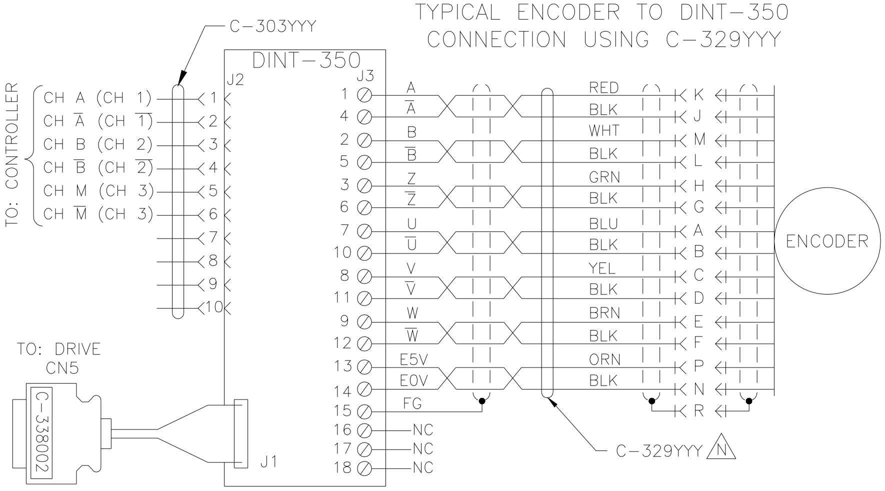
TITLE
INTERFACE ASSEMBLY

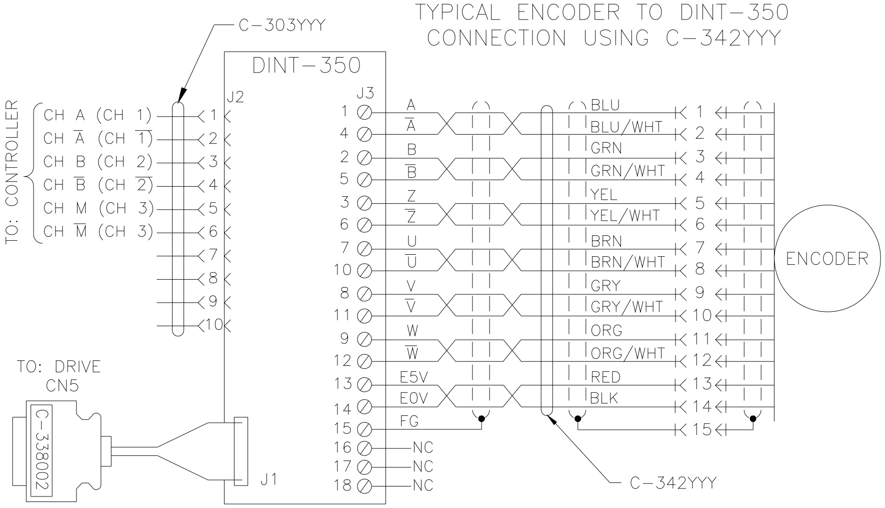
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± --
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q\CURRENT DWGS
B
DATE 25FEB98
SCALE NTS
DRAWING NUMBER DINT-350
SHEET NO. 1 OF 3
REVISION N

DATE	SYM	REVISION RECORD	DR	CK	CK
27MAY04	N	PER ECN 04-220	CWB		

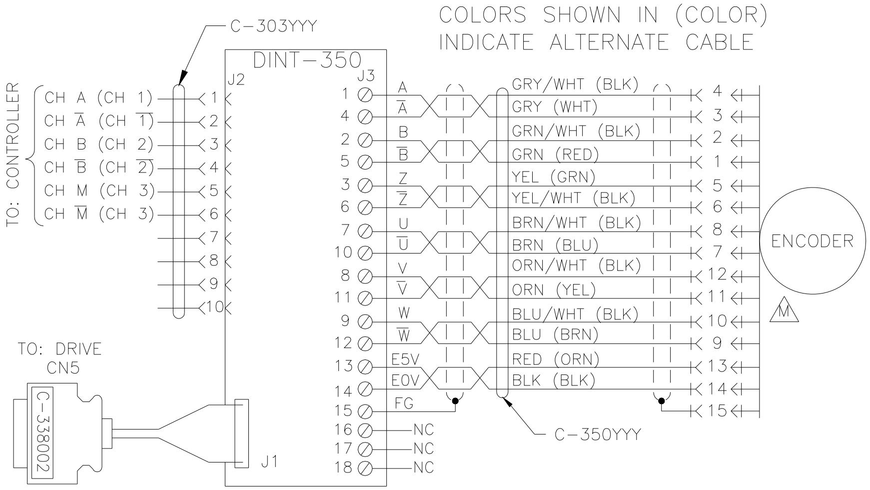
TYPICAL ENCODER TO DINT-350 CONNECTION USING C-329YYY



TYPICAL ENCODER TO DINT-350 CONNECTION USING C-342YYY



TYPICAL ENCODER TO DINT-350 CONNECTION USING C-350YYY COLORS SHOWN IN (COLOR) INDICATE ALTERNATE CABLE



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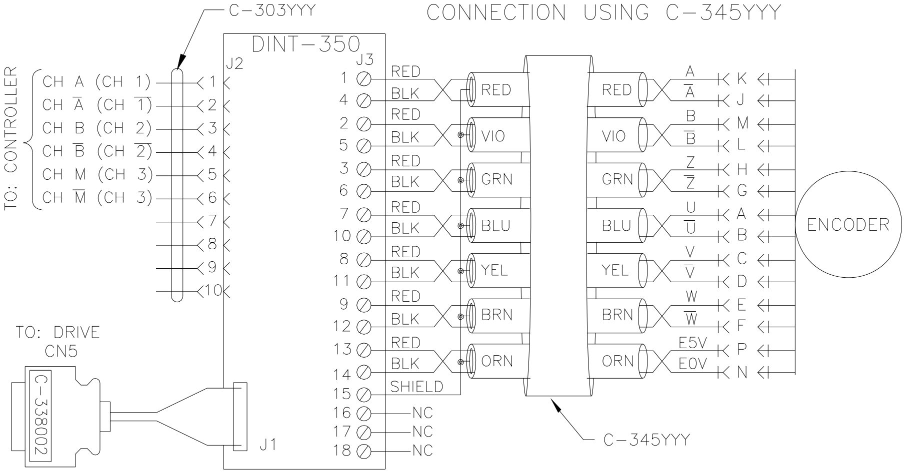
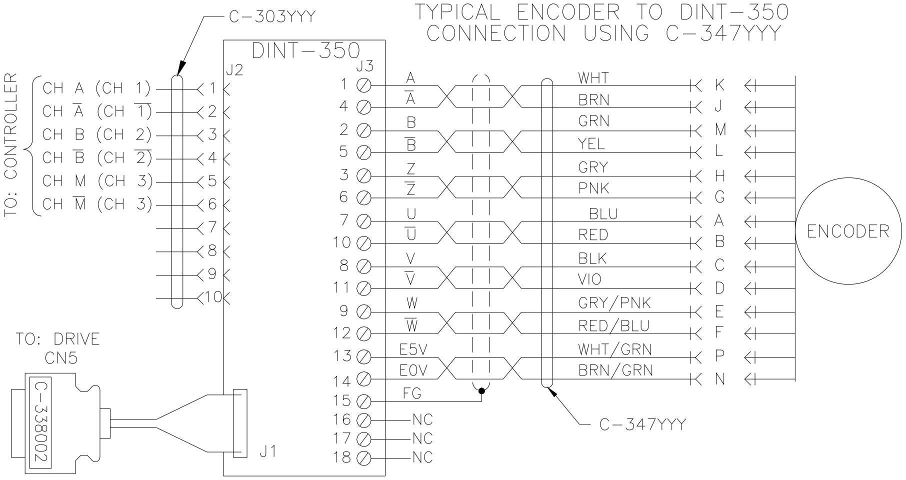
TOLERANCES
X.X± --
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q\CURRENT DWGS
B
DATE 25FEB98
SCALE NTS
DRAWING NUMBER DINT-350
SHEET NO. 2 OF 3
REVISION N

DATE	SYM	REVISION RECORD	DR	CK	CK
27MAY04	N	PER ECN 04-220	CWB		

TYPICAL ENCODER TO DINT-350 CONNECTION USING C-345YYY



TYPICAL ENCODER TO DINT-350 CONNECTION USING C-347YYY



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INTERFACE ASSEMBLY

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± --
X.XX± 0.01
X.XXX± 0.005
ANGULAR ± 0°30'
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q\CURRENT DWGS
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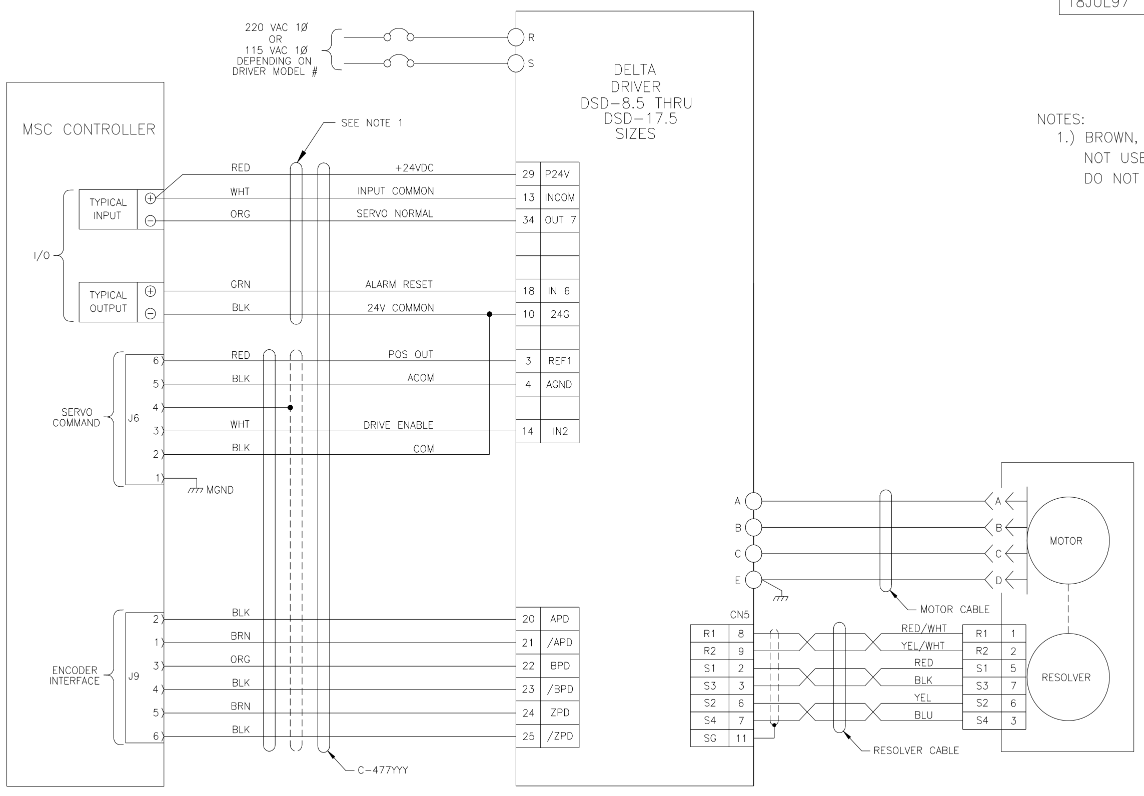
DATE 25FEB98
SCALE NTS
DRAWING NUMBER DINT-350
SHEET NO. 3 OF 3
REVISION N

DATE	SYM	REVISION RECORD	DR	CK	CK
11APR97	0	PER ECN 97-106	CWB	ELS	
18JUL97	A	PER ECN 97-231	EB		



NOTES:
1.) BROWN, BLUE, VIOLET AND YELLOW WIRES ARE NOT USED AND SHOULD BE TERMINATED SO THEY DO NOT SHORT TO GROUND OR ANY OTHER CIRCUIT.

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CHECKED BY ELS	DATE 4/11/97
APPROVED BY	DATE
APPROVED BY	DATE
MATERIAL --------------	
FINISH ------------	

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TITLE
INTERCONNECTION, DELTA DRIVE TO MSC FAMILY CONTROLLER

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± ---
X.XXX± ---
ANGULAR
± --
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q\CURRENT DWGS
B
DATE 11APR97
SCALE NTS
DRAWING NUMBER IC-065002
SHEET NO. 1 OF 2
REVISION A

DATE	SYM	REVISION RECORD	DR	CK	CK
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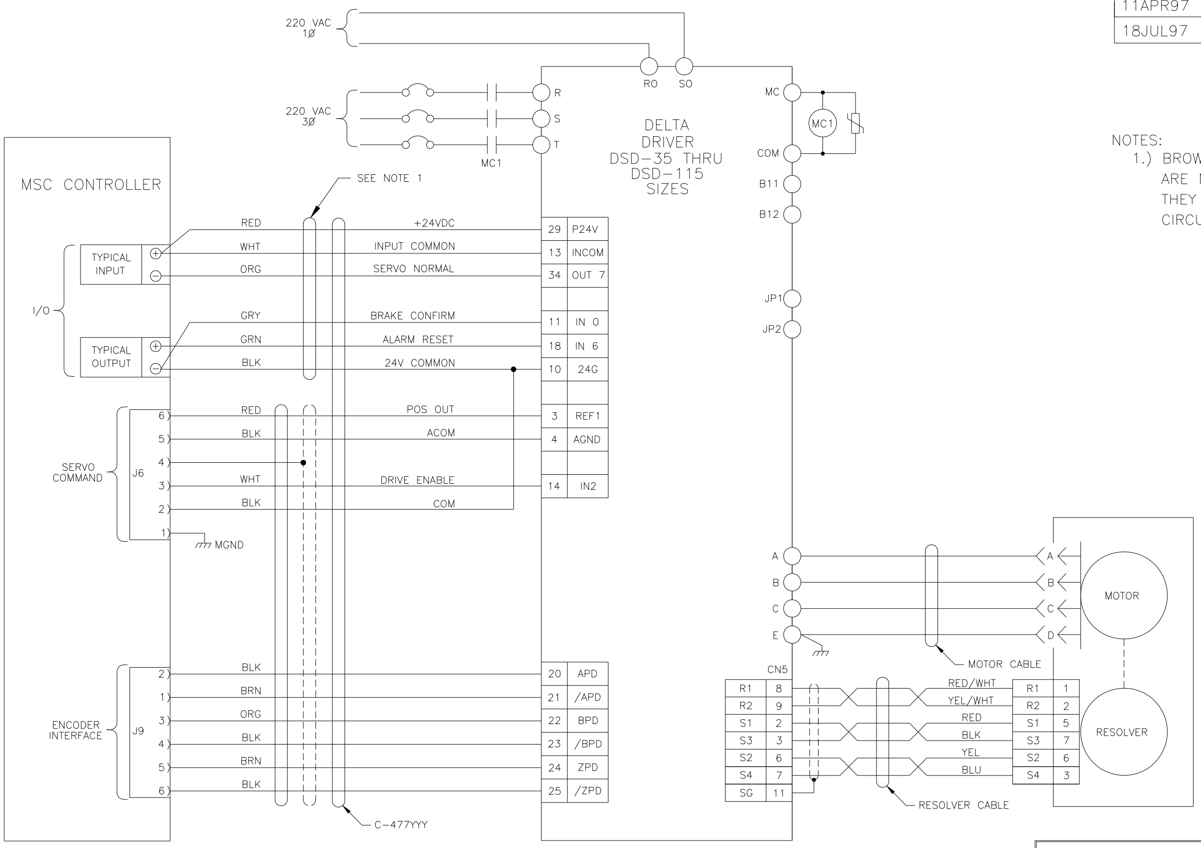
18JUL97	A	PER ECN 97-231	EB		



NOTES:

1.) BROWN, BLUE, VIOLET, GRAY AND YELLOW WIRES ARE NOT USED AND SHOULD BE TERMINATED SO THEY DO NOT SHORT TO GROUND OR ANY OTHER CIRCUIT.

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DATE 4/11/97
APPROVED BY
DATE
APPROVED BY
DATE
MATERIAL
FINISH

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TITLE
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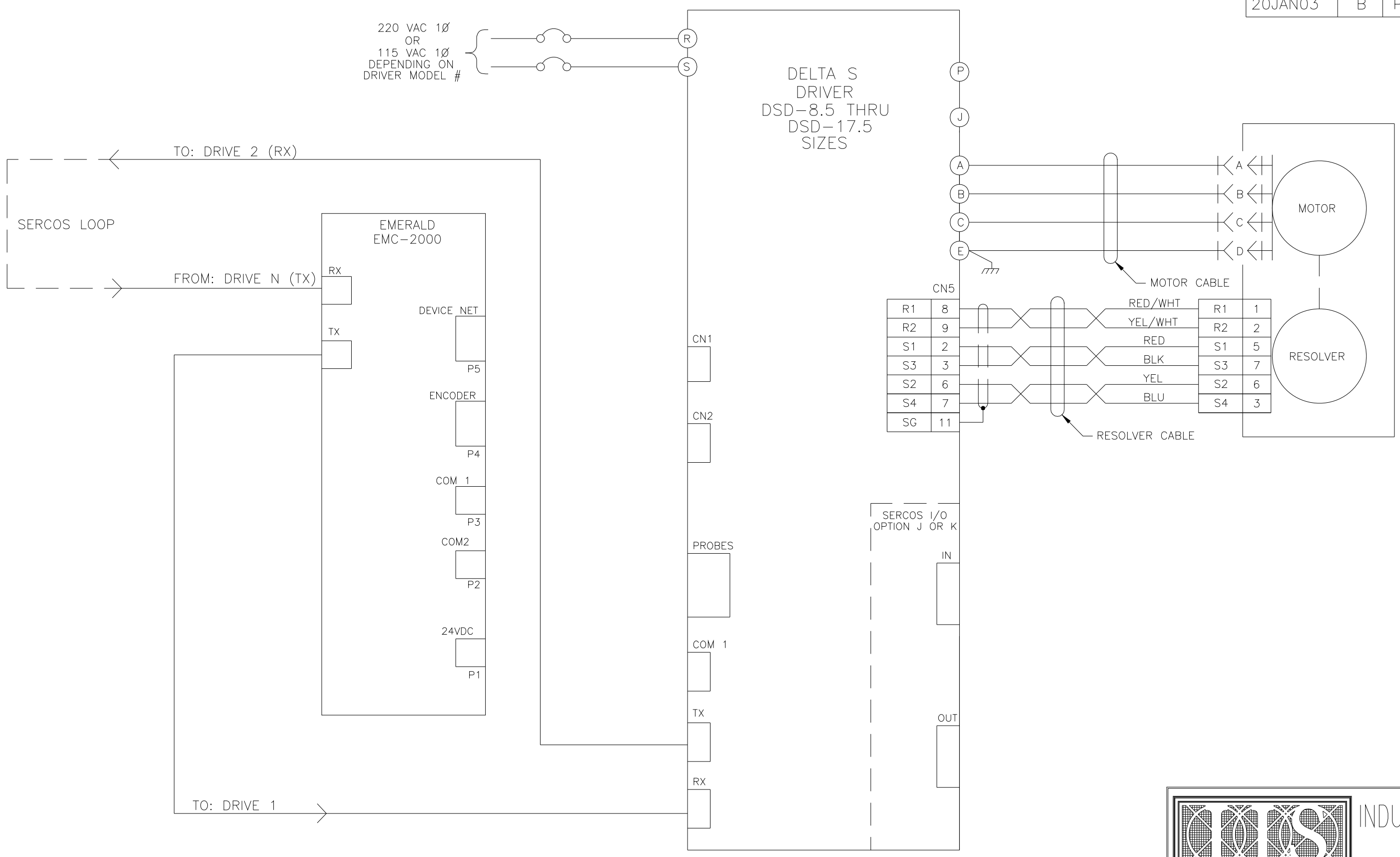
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± ---
X.XXX± ---
ANGULAR ± --
DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q\CURRENT DWGS
B
DATE 11APR97
SCALE NTS
DRAWING NUMBER IC-065002
SHEET NO. 2 OF 2
REVISION A

DATE	SYM	REVISION RECORD	DR	CK	CK
19FEB01	0	PER ECN 01-071	CWB	JWC	
15MAR01	A	PER ECN 01-107	CWB	WES	
20JAN03	B	PER ECN 02-327	CWB		



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FINISH ----------	

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TITLE
INTERCONNECTION, DELTA S DRIVE TO EMERALD CONTROLLER

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ---
X.XX± ---
X.XXX± ---
ANGULAR
± ---

DRAWN BY BOWMAN
AutoCAD FILE LOCATION Q:\CURRENT DWGS
B
DATE 19FEB01
SCALE ---
DRAWING NUMBER IC-066000
SHEET NO. 1 OF 3
REVISION B

DATE	SYM	REVISION RECORD	DR	CK	CK
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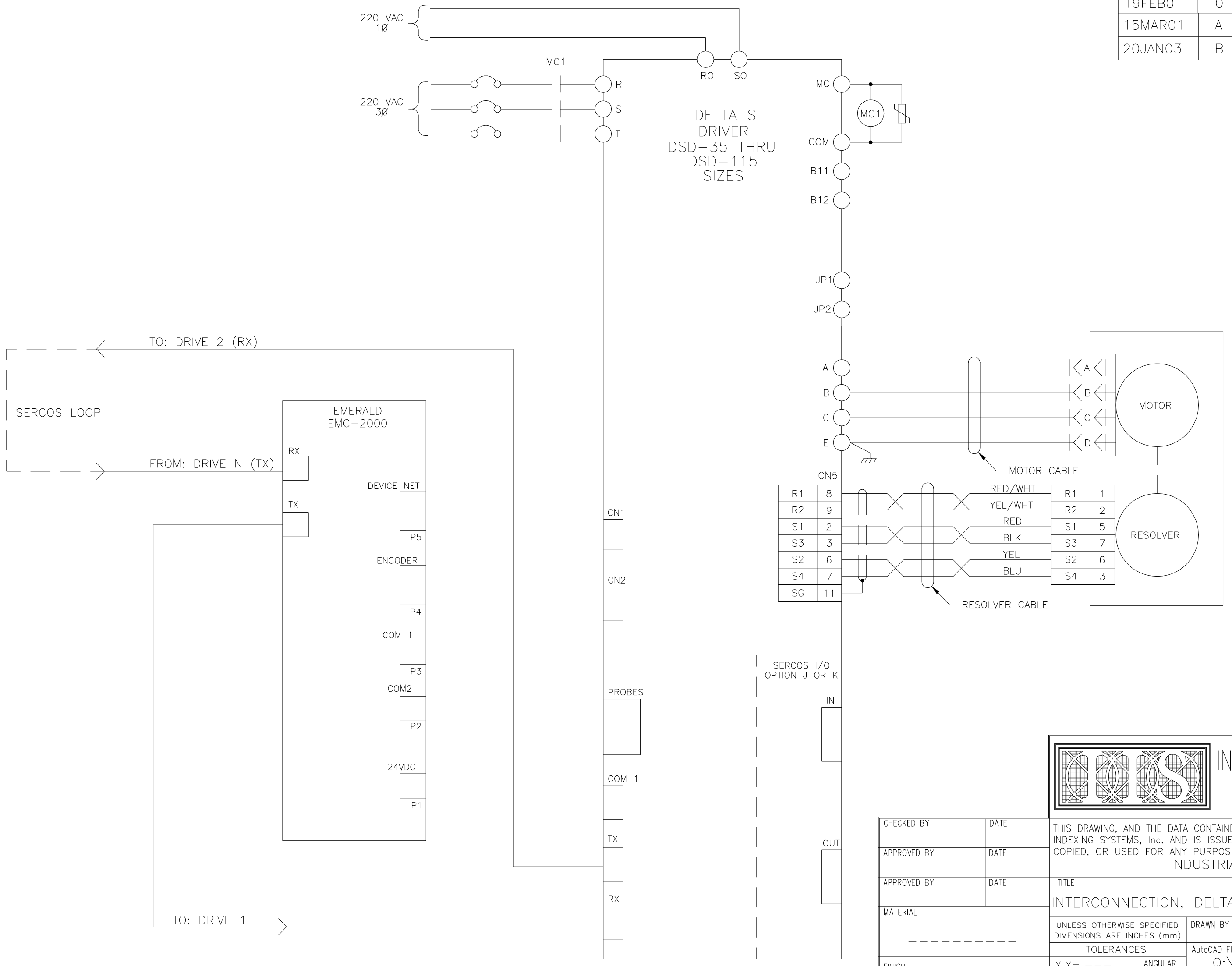
15MAR01	A	PER ECN 01-107	CWB	WES	
20JAN03	B	PER ECN 02-327	CWB		



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ANGULAR ± ---

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SCALE ---
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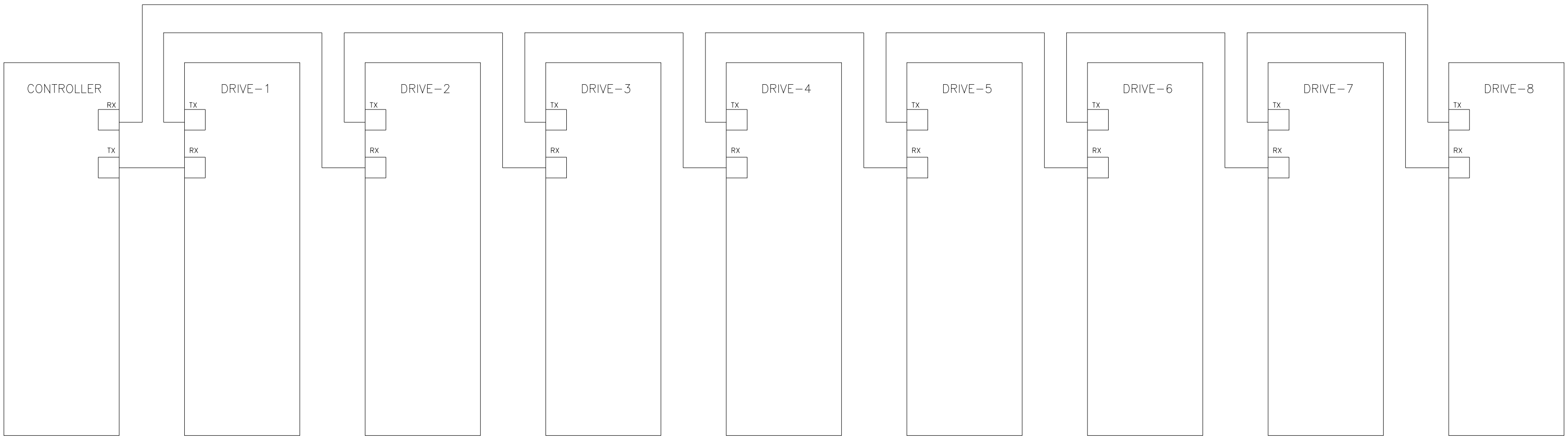
19FEB01	0	PER ECN 01-071	CWB	JWC	
15MAR01	A	PER ECN 01-107	CWB	WES	
20JAN03	B	PER ECN 02-327	CWB		



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DATE 19FEB01
SCALE ---
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REVISION B

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FAX: (585) 924-2169

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