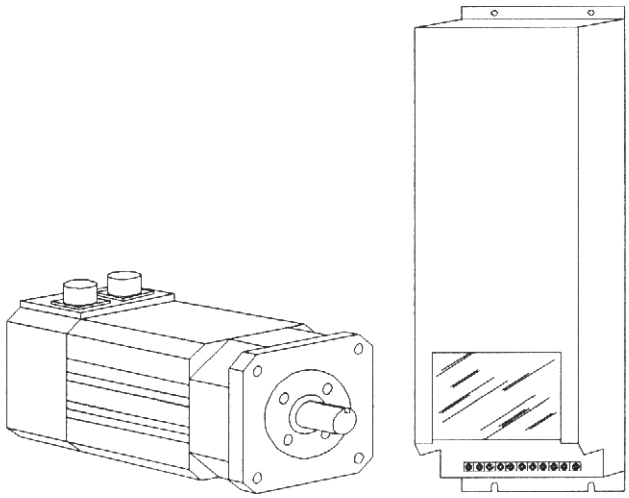
SERIES 7 MOTION DEVICES ALL DIGITAL DRIVE SERIES



USER'S GUIDE

MDPAK7 USED WITH IIS POSITIONER

INDUSTRIAL INDEXING SYSTEMS, Inc.

Revision - C
Approved By: RCB 1/6/99

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Notes:

1) Section 5, page 5-18, dated October 2002, supersedes Section 5, page 5-18, dated October 1998. Section 5, cable drawing C-320YYY Rev. F, supersedes Section 5, cable drawing C-320YYY Rev. C.

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INTRODUCTION

The Industrial Indexing Systems Series 7 All Digital Motion Devices are a group of brushless motor assemblies, drive packages, and transformers especially suited for indexing and positioning applications in which high torque-to-inertia ratios, high peak horsepower, and rapid acceleration/deceleration rates are required.

This manual describes proper installation, operation, and troubleshooting procedures for the Series 7 Motion Devices. The manual assumes no prior knowledge of Industrial Indexing System equipment. It does assume knowledge of proper mechanical, electrical, and electronic maintenance and safety procedures. Information in this manual is subject to change without prior notification.

The manual uses a variety of highlighted blocks to emphasize important information. Always pay careful attention to this information. The types of highlighted blocks used are:

WARNING

USED TO ALERT THE READER TO ACTIONS OR CONDITIONS WHICH MIGHT PRESENT HAZARDS OR CAUSE INJURY TO PERSONNEL.

CAUTION

USED TO ALERT THE READER TO ACTIONS WHICH MIGHT CAUSE LOSS OF MATERIALS OR DAMAGE TO EQUIPMENT.

NOTE

Used to identify unusual or unexpected conditions or to point out the need for alternate procedures. It is also used for emphasis when a CAUTION or WARNING is not required.

Industrial Indexing Systems fully supports all equipment it manufactures and supplies. If there are any problems with this equipment or if assistance is required for installation or operation, contact our Integrated Technical Services Department.

Assistance and training is available in our factory, for a fee. In addition, Industrial Indexing Systems can custom configure Series 7 Motion Devices for O.E.M. applications.

NOTES

SECTION 1 – DESCRIPTION

The Industrial Indexing Systems Series 7 All Digital Motion Devices are a group of brushless motor/drive packages especially suited for indexing and positioning applications in which high torque-to-inertia ratios, high peak horsepower, and rapid acceleration/deceleration rates are required. The drives are matched to the specific motors for optimum performance. The motors and drives are used in conjunction with a closed-loop controller to accurately fix the position of the motor shaft.

1.1 INDEXING DRIVE SYSTEM OVERVIEW

An indexing drive system (or indexing system) may be used in a variety of applications where accurate movement or positioning is required. A basic system consists of the main components illustrated in 1.

1. Input Device: The input device provides data to the controller. It is the interface between the operator (or system computer or programmable logic controller) and the indexing system. In a given system, there may be several input devices.
2. Controller: The controller receives data from the input device and issues

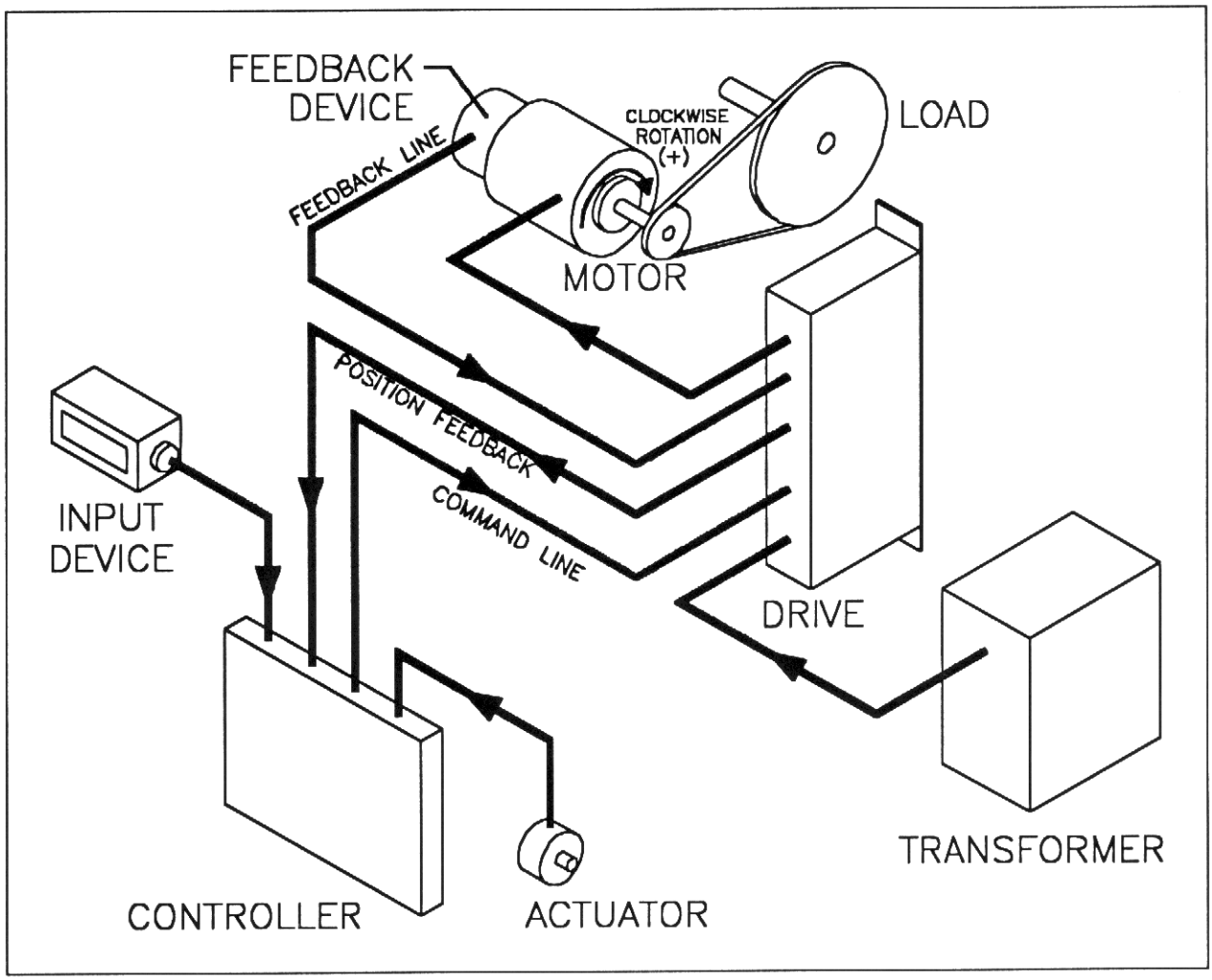


Figure 1.1 - Basic Indexing System

commands to the drive. It also accepts information from the feedback device. The programming and settings of the controller determine what types of commands are issued to the drive in response to the data inputs and feedback.

3. Actuator: The actuator supplies the signal which causes the controller to initiate the specified sequences.

4. Drive: The drive (also called a servo-amplifier) converts AC input power from the transformer into DC power and amplifies a low voltage velocity command signal from the controller into the necessary voltage and current to cause the motor shaft to rotate. The amount of power and polarity (positive or negative) of the voltage supplied to the motor is determined by the command signals from the controller.

5. Transformer: The transformer converts prime supply voltage into the required input voltage for the drive and isolates the drive from the prime supply ground.

6. Motor: The motor is the device being controlled by the indexing system. The system controls the position and speed of motor shaft rotation.

7. Load: The load is the object of the motion. It absorbs the work energy of the motor.

8. Feedback Device: The feedback device (encoder) monitors the position of the motor shaft and sends this information to the controller.

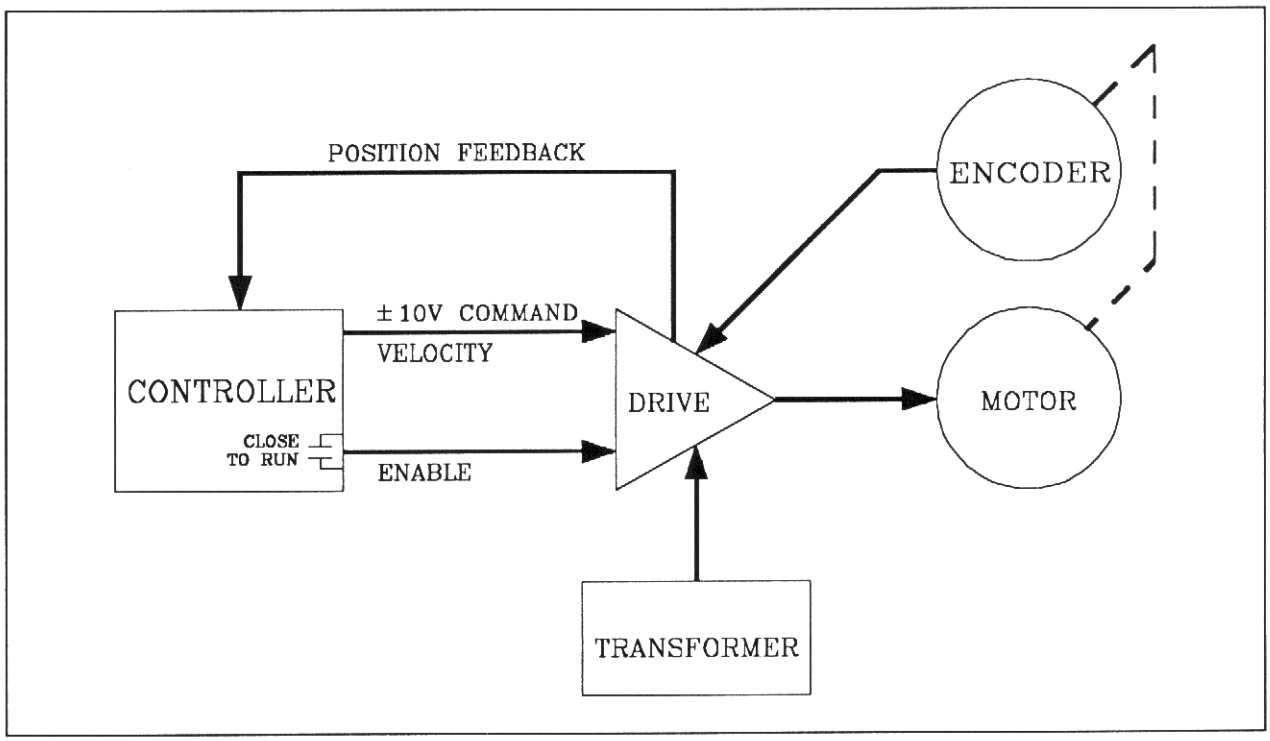


Figure 1.2 - Position Loop

The components of the basic indexing drive system form two information loops. The position loop is a closed-loop which consists of the controller, drive, motor, and feedback device. (The Series 7 motion devices use an encoder as the feedback device.) The controller, after receiving data from the input device, sends a command to the drive, which causes the motor shaft to move, which is monitored by the feedback device, which sends data to the controller, which sends a command to the drive, thus forming a closed position loop.

The velocity loop is also a closed-loop system. An input voltage to this loop changes the voltage applied to the motor (the drive output), which changes the velocity of the motor-shaft rotation, which changes the signal to the drive, which influences the drive output, thus forming a closed velocity loop.

The controller plans the trajectory of the motor shaft motion issues commands to the velocity loop to move the motor. While the motor is moving, the controller constantly monitors the shaft motion to verify the proper trajectory. The controller may modify the trajectory on the fly based on operator input, actuator signals or master slave position sensing.

1.2 MOTION DEVICES

The motion device components of the indexing drive system discussed in this manual include the drives, motors (Motor/Drive Packages) and transformers.

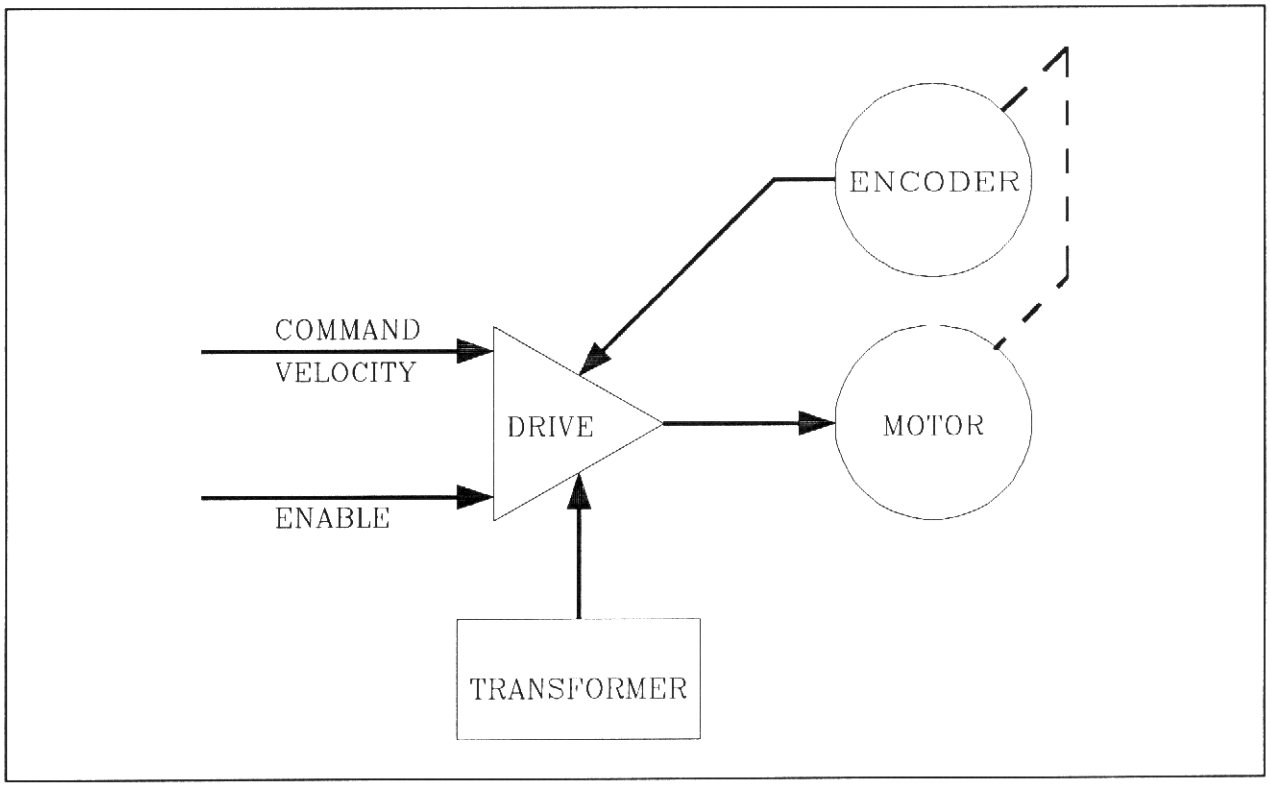


Figure 1.3 - Velocity Loop

1.2.1 PRE-ENGINEERED SYSTEMS

The combination of a specific drive and motor assembly (motor plus feedback device) is designated as a Motor/Drive Package (MDPAK™). Each of these packages has been pre-engineered and pre-tested to offer system-level performance. The components of each package are selected to work properly with each other at the rated performance levels. The Motor/Drive Packages and transformers are also selected to work properly with each other.

Selection of a MDPAK depends on the system requirements of speed, torque, peak torque, horsepower, and physical size. The specifications for all Series 7 motion devices are contained in **Section 3** to this manual. IIS offers free Servo Mechanical Analysis (SMA) software that models the mechanical load and motion profile then selects the proper MDPAK to meet those requirements.

1.2.2 ORDER/SHIPPING CORRELATION

When an order is placed with Industrial Indexing Systems, Inc., the motion devices are specified as a MDPAK, with the appropriate numerical designations. However, when the units are shipped, the individual components are specified — rather than the package designations — to make sure that all items are supplied properly. If several MDPAKs are ordered, there will be similar components in the shipment with no cross reference as to which Motor/Drive Package they belong to. To avoid confusion and potential error when the units are assembled by the customer, **Appendix D** of this manual include Bills of Materials for all Series 7 Motor/Drive Packages currently supplied by Industrial Indexing Systems, Inc. Similarly, the appendices for each of the other motion devices series manuals contain complete Bills of Materials and specifications for those series.

SECTION 2 - MDPAK7 SERIES DIGITAL MOTOR/DRIVE

The MDPAK7 Series Motor/Drive packages offer state of the art performance with full digital control. The all digital microprocessor drive circuitry combined with the latest rare earth motor technology results in improved system performance and stability even with inertia loads up to 10 times rotor inertia. All drive parameters, and status information are available either through an onboard keypad and display or through an optional serial communications adaptor. Once the drive parameters are set they are stored digitally for very stable performance regardless of temperature or voltage fluctuations.

ADVANCED FEATURES:

The MDPAK7 Series Motor/Drive can be used as part of a complete motion control system or as a stand alone speed, torque or position control.

- Fully digital drive
- Highly integrated electronics for higher MTBF
- Onboard keypad and LED display
- 2000 PPR high resolution encoder for precise control
- High frequency IGBT power stage for quiet efficient performance
- 260% overload for 2 seconds
- Sinewave commutation for smooth running
- Direct 220 VAC 3 phase line operation
- Internal regen resistor
- Encoder outputs for external positioning controller
- Sophisticated fault detection and reporting
- Optional RS232C and RS485 multi drop serial communications adaptor
- Auto tuning for stand alone applications
- Speed control range 2000:1 with +/- 0.1% linearity
- CW & CCW pulse inputs for simple positioning
- Programmable analog monitor output
- Internal 24 VDC supply for I/O points
- Optically isolated control inputs
- Four binary coded fault outputs for easy diagnostics
- Fault, servo ready and current limited outputs
- Programmable low speed output

The MDPAK7 Series Motor/Drive can be configured to run in several modes of operation. The various modes are configured using the onboard keypad and LED display. Switching between modes can be accomplished while the motor/drive is running by energizing inputs to the driver.

In all modes of operation, the motor/drive provides sophisticated fault detection to protect the motor, driver and load from damage. The faults are reported on the keypad display and on binary coded outputs for connection to external devices such as a computer or PLC.

The MDPAK7 also provides auto tuning functions in all modes. Auto tuning automatically adjusts critical driver parameters for optimum system operation. The tuning parameter can also be manually adjusted via the keypad/display or via the optional serial communications adaptor for special situations. When the MPDAK7 motor/drive is supplied as part of an IIS positioning system, the drive tuning has been preset at the factory and should not require adjustment.

The MDPAK7 motor/drive can be directly line operated from 220 VAC 3 phase main power. IIS offers a line of pre-engineering isolation transformers for various line voltages and frequencies.

2.1 EXTERNAL POSITION LOOP MODE

The MDPAK7 Motor/Drive in combination with an IIS closed loop positioning controller provides state of the art performance with full digital control.

In this mode, the driver is configured as a velocity loop that accepts a velocity command from the external positioning controller. The driver provides an encoder A quad B plus Marker signal that the external positioner uses for feedback. A 2000 pulse per revolution encoder inside the motor housing provides both velocity and position information. All IIS positioners multiply the encoder count by 4 yielding 8000 PPR.

The driver can be enabled/disabled by the positioning controller to provide zero torque for start up, faults or motor free running. The driver can also be configured to provide a programmable torque limit via an analog input or digital parameter settings.

When the driver is connected to an IIS multi-axis positioning controller, a cable interface adaptor (AC-100094) is used to provide direct ribbon cable and command cable connections. **Figure 2.1** is a block diagram illustrating these connections.

When the driver is connected to an IIS single axis positioning system, a direct single cable interface is used. **Figure 2.2** illustrates this connection.

2.2 SPEED CONTROL MODE

In this mode, the motor/drive is configured as a high performance speed regulator. The speed can be programmed via an analog voltage, simple potentiometer, digitally through the keypad/display or via the optional serial communications adaptor. The acceleration and deceleration rates are programmable for various rates as well as a Quasi-S shape or minimum jerk profiles.

While in Speed Control Mode the driver can be switched to zero speed, zero drift position lock. This provides full locked motor torque to hold the load from moving. The driver can also be switched to Torque Control Mode for tensioning or holding a load against a hard stop. The maximum motor torque is programmable via an external analog voltage, the keypad/display or serial port.

Various I/O points are available for switching to position lock, torque mode, torque limit and driver enable. Outputs include read, fault, low speed, torque limited and at speed.

2.3 TORQUE CONTROL MODE

In this mode, the motor/drive is configured as a torque regulator. The motor output torque is programmed via a ±10V external voltage or potentiometer. This configuration would be used for winding or tensioning systems where the torque is controlled at all motor speeds.

The driver can be programmed to limit the torque and/or speed during operation. The driver can also be switched to speed control mode during operation.

Various I/O points are available for switching modes, torque limiting and driver enable. Outputs include ready, fault, low speed, torque limited and at speed.

2.4 INTERNAL POSITION MODE

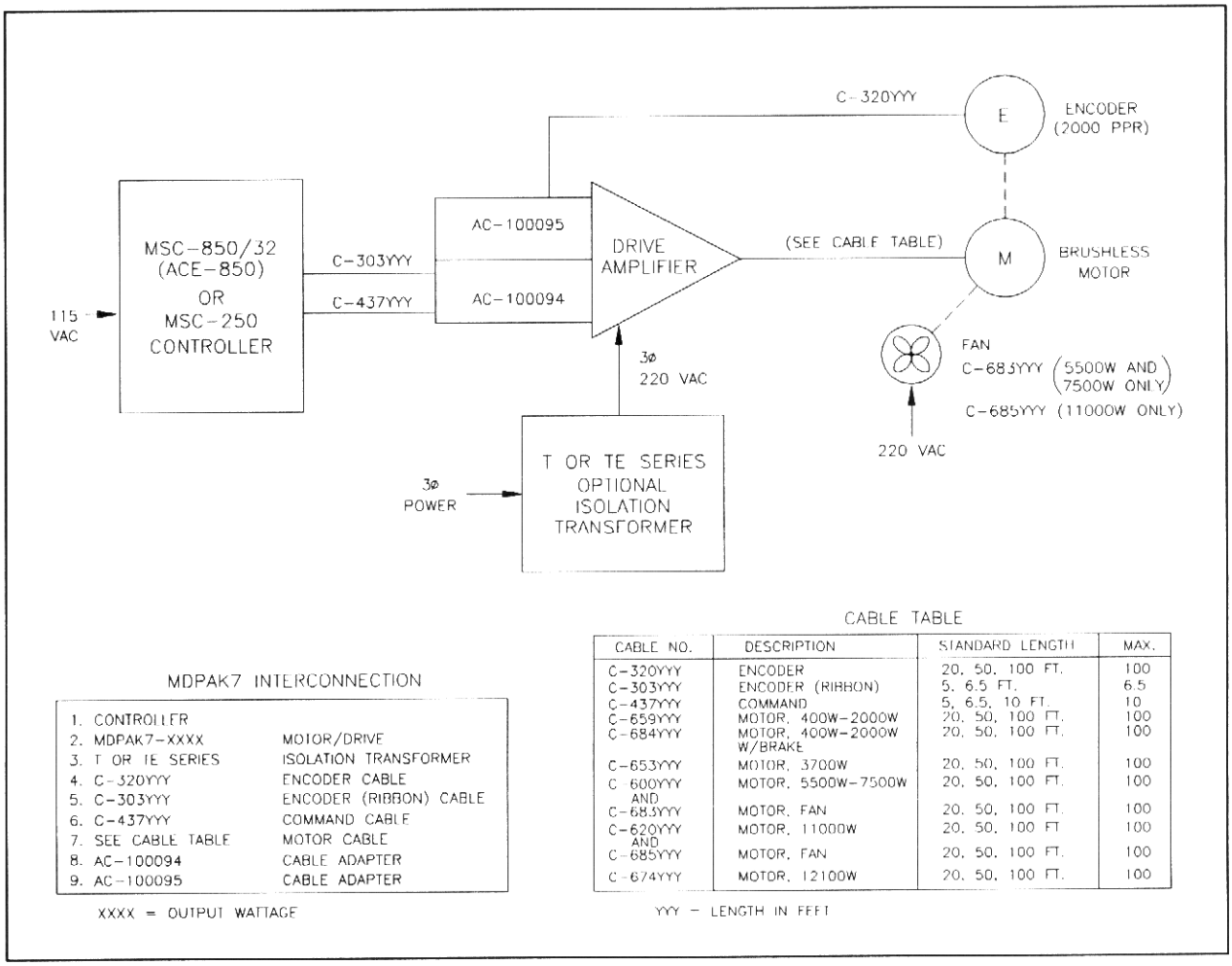
In this mode, the motor/drive form a high performance position loop than can be commanded by CW or CCW pulse signals similar to a stepper driver. The driver can also be configured to be a follower to a master encoder with a programmable gear ratio.

While in this mode the driver provides direction limits, speed limiting and torque limiting.

Various I/O points are available for switching modes, torque limiting and driver enable. Outputs include ready, fault, low speed, torque limited and in position.

NOTE

This manual describes the MDPAK7 series motor drive packages applied in External Position Loop Mode with an IIS positioning controller. The following sections of the manual describe the subset of MDPAK7 features used in External Position Loop Mode. A separate technical manual is available that describes all the features of the MDPAK7.



MDPAK7 INTERCONNECTION

1. CONTROLLER	
2. MDPAK7-XXXX	MOTOR/DRIVE
3. T OR TE SERIES	ISOLATION TRANSFORMER
4. C-320YYY	ENCODER CABLE
5. C-303YYY	ENCODER (RIBBON) CABLE
6. C-437YYY	COMMAND CABLE
7. SEE CABLE TABLE	MOTOR CABLE
8. AC-100094	CABLE ADAPTER
9. AC-100095	CABLE ADAPTER

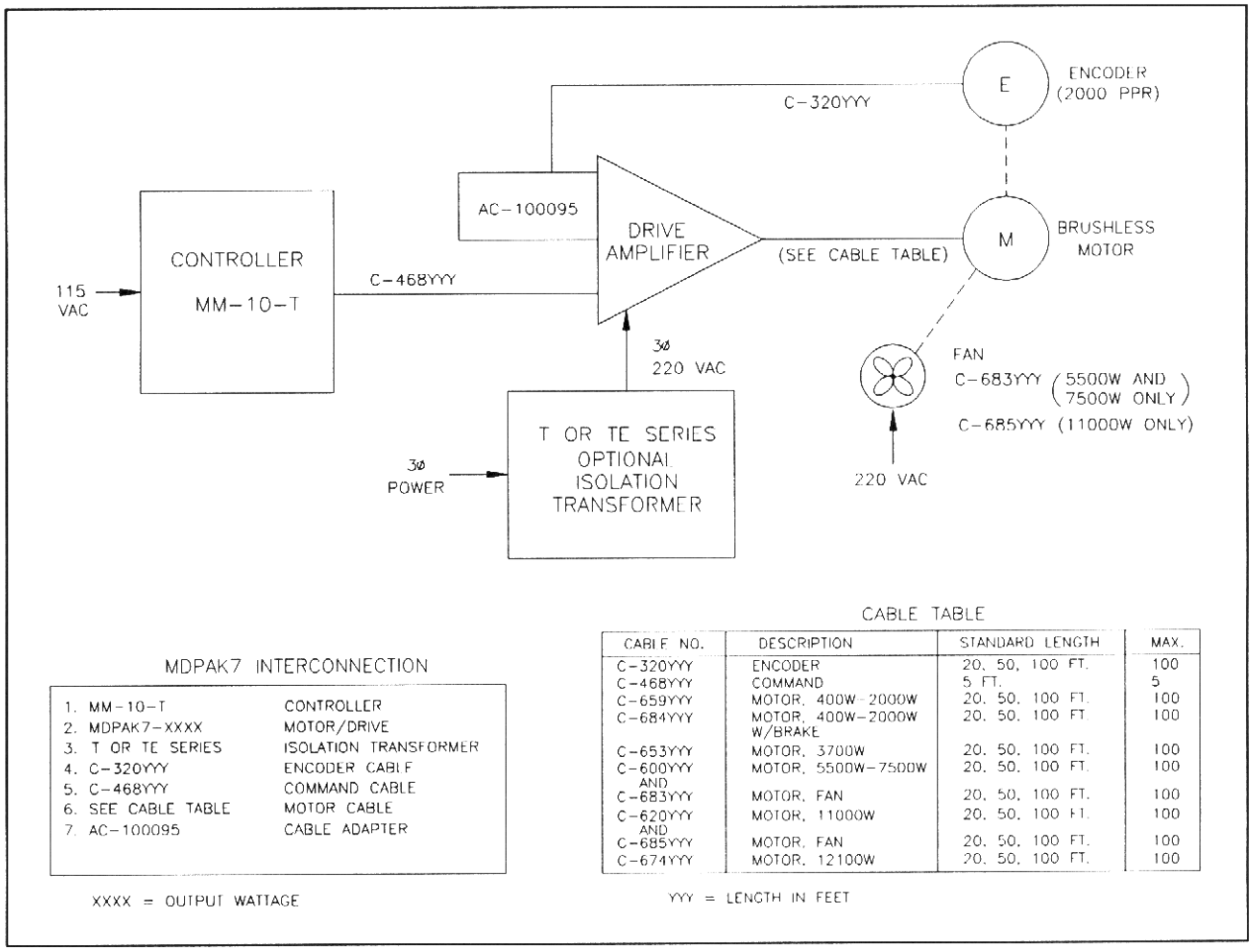
XXXX = OUTPUT WATTAGE

CABLE TABLE

CABLE NO.	DESCRIPTION	STANDARD LENGTH	MAX.
C-320YYY	ENCODER	20, 50, 100 FT.	100
C-303YYY	ENCODER (RIBBON)	5, 6.5 FT.	6.5
C-437YYY	COMMAND	5, 6.5, 10 FT.	10
C-659YYY	MOTOR, 400W-2000W	20, 50, 100 FT.	100
C-684YYY	MOTOR, 400W-2000W W/BRAKE	20, 50, 100 FT.	100
C-653YYY	MOTOR, 3700W	20, 50, 100 FT.	100
C 600YYY AND C-683YYY	MOTOR, 5500W-7500W MOTOR, FAN	20, 50, 100 FT. 20, 50, 100 FT.	100 100
C-620YYY AND C-685YYY	MOTOR, 11000W MOTOR, FAN	20, 50, 100 FT 20, 50, 100 FT.	100 100
C-674YYY	MOTOR, 12100W	20, 50, 100 FT.	100

YYY = LENGTH IN FEET

Figure 2.1 - MDPAK7 Connection To Multi-Axis Positioner



MDPAK7 INTERCONNECTION

1. MM-10-T	CONTROLLER
2. MDPAK7-XXXX	MOTOR/DRIVE
3. T OR TE SERIES	ISOLATION TRANSFORMER
4. C-320YYY	ENCODER CABLE
5. C-468YYY	COMMAND CABLE
6. SEE CABLE TABLE	MOTOR CABLE
7. AC-100095	CABLE ADAPTER

XXXX = OUTPUT WATTAGE

CABLE TABLE

CABLE NO.	DESCRIPTION	STANDARD LENGTH	MAX.
C-320YYY	ENCODER	20, 50, 100 FT.	100
C-468YYY	COMMAND	5 FT.	5
C-659YYY	MOTOR, 400W-2000W	20, 50, 100 FT.	100
C-684YYY	MOTOR, 400W-2000W W/BRAKE	20, 50, 100 FT.	100
C-653YYY	MOTOR, 3700W	20, 50, 100 FT.	100
C-600YYY	MOTOR, 5500W-7500W	20, 50, 100 FT.	100
AND C-683YYY	MOTOR, FAN	20, 50, 100 FT.	100
C-620YYY	MOTOR, 11000W	20, 50, 100 FT.	100
AND C-685YYY	MOTOR, FAN	20, 50, 100 FT.	100
C-674YYY	MOTOR, 12100W	20, 50, 100 FT.	100

YYY = LENGTH IN FEET

Figure 2.2 - MDPAK7 Connection To Single Axis Positioner

NOTES

SECTION 3 - SPECIFICATIONS

3.1 GENERAL SPECIFICATIONS MDPAK7 SERIES

Ambient temp.	0° to 40°C Motor	0° to 50°C Drive
Humidity	90%RH max. No condensation	
Altitude	1,000 m max. above sea level	
Installation environment	IP-65 Standard IP-67 Optional	Indoors, no dust accumulations, metal particles or corrosive gases. No splashing with liquids.
Vibration	1.0G max	0.5G max
Shock	50G, 3 times	1.5G max
Control power specifications	220^{+10}_{-10} VAC 1 phase 50/60 Hz	
Main power specifications	220^{+10}_{-10} VAC 3 phase 50/60 Hz	

Motor/Drive MDPAK7-	R400	R750	R1000	R1500	R2000	R3000
Motor type BLM7-	R0400	R0750	R1000	R1500	R2000	R3000
Driver type BSD7-	R0400	R0750	R1000	R1500	R2000	R3000
Rated output (W)	400	750	1000	1500	2000	3000
Driver peak motor current A RMS/phase	6.8	11.7	16.4	24.2	29.9	46.8
Driver rated motor current A RMS/phase	2.6	4.5	6.3	9.3	11.5	18.0
Rated torque (lb-ft) (lb-in) (N-m)	1.88 22.6 2.55	3.52 42.3 4.77	4.70 56.4 6.37	7.04 84.5 9.54	9.40 113.0 12.74	14.23 170.7 19.30
Maximum torque (lb-ft) (lb-in) (N-m) See **Figure 3.1**	4.90 58.8 6.64	9.17 110.0 12.43	12.25 147.0 16.61	18.33 220.0 24.85	24.50 294.0 33.22	37.00 444.0 51.18
Rated speed	1500 rpm					
Maximum speed	2000 rpm					
Feedback encoder	2000 pulse per revolution with index					
Inertia ($lb\text{-}ft\text{-}sec^2$) ($lb\text{-}in\text{-}sec^2$) ($Kg\text{-}m^2$)	.000192 2.3×10^{-3} 2.6×10^{-4}	.000537 6.3×10^{-3} 7.3×10^{-4}	.000766 9.2×10^{-3} 10.4×10^{-4}	.00100 1.2×10^{-2} 13.6×10^{-4}	.00200 2.4×10^{-2} 27.1×10^{-4}	.00275 3.3×10^{-2} 37.3×10^{-4}
Motor weight lb [kg]	16 [7]	26 [11]	29 [13]	34 [15]	53 [24]	64 [29]
Driver weight lb [kg]	18 [8]	18 [8]	18 [8]	18 [8]	20 [9]	22 [10]
Circuit Breaker ABB	S273-K16	S273-K16	S273-K20	S273-K20	S273-K20	S273-K32

Table 3.1 General Specifications

Motor/Drive MDPAK7-	R3700	M3700	R5500	R7500	R11000	R12100
Motor type BLM7-	R3700	M3700	R5500	R7500	R11000	R12100
Driver type BSD7-	R3700	R3700	R5500	R7500	R11000 R11000EC	R12100
Rated output (W)	3700	3700	5500	7500	11000	12100
Driver peak motor current A RMS/phase	54.6	54.6	65	100	120	120
Drive rated input current A RMS/phase					40	
Driver rated motor current A RMS/phase	21.0	21.0	25.0	38.5	46.2	56.0
Rated torque (lb-ft) (lb-in) (N-m)	17.36 208.00 23.54	17.36 208.00 23.54	25.75 309.00 34.97	35.17 422.00 47.76	51.67 620.00 70.17	68.00 816.00 92.20
Maximum torque (lb-ft) (lb-in) (N-m) See **Figure 3.1**	45.13 542.00 61.19	45.19 542.00 61.19	51.67 620.00 70.17	70.50 846.00 95.74	103.50 1242.00 140.56	122.40 1469.00 166.00
Rated speed	1500 rpm					1250 rpm
Maximum speed	2000 rpm					
Feedback encoder	2000 pulse per revolution with index					
Inertia ($lb\text{-}ft\text{-}sec^2$) ($lb\text{-}in\text{-}sec^2$) ($Kg\text{-}m^2$)	.00342 $4.2x10^{-2}$ $46.3x10^{-4}$	.00480 $5.8x10^{-2}$ $65.1x10^{-4}$	.00267 $3.2x10^{-2}$ $37.0x10^{-4}$	.00383 $4.6x10^{-2}$ $53.3x15^{-4}$	.00767 $9.2x10^{-2}$ $106x10^{-4}$	.0093 0.1116 0.32658
Motor weight lb [kg]	78 [35]	78 [35]	79.3 [36]	99.2 [45]	123.4 [56]	127 [58]
Driver weight lb [kg]	22 [10]	22 [10]	29.7 [13.4]	31.9 [14.5]	46.2 [21]	46.2 [21]
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.					
Circuit Breaker ABB	S273-K50	S273-K50	S273-K50	S273-K50	S273-K100	S273-K100
DC Bus Fuse	This fuse is located inside the drive and is not intended to be replaced in the field. The rating of the fuse for the drive type BSD7-R11000EC is 175A., 500 VAC. The brand that is used is Kyosan Clearup #50SHB175.					

Table 3.1 General Specifications Cont.

3.2 OVERLOAD THERMAL PROTECTION CHARACTERISTIC

The MDPAK7 overload thermal protection is an electronic thermal function designed to detect overload current and to estimate the extent of subsequent motor temperature rise.

CAUTION

IF THE OVERLOAD THERMAL PROTECTION IS ACTIVATED, THE MOTOR MUST BE ALLOWED TO COOL FOR AT LEAST 10 MINUTES.

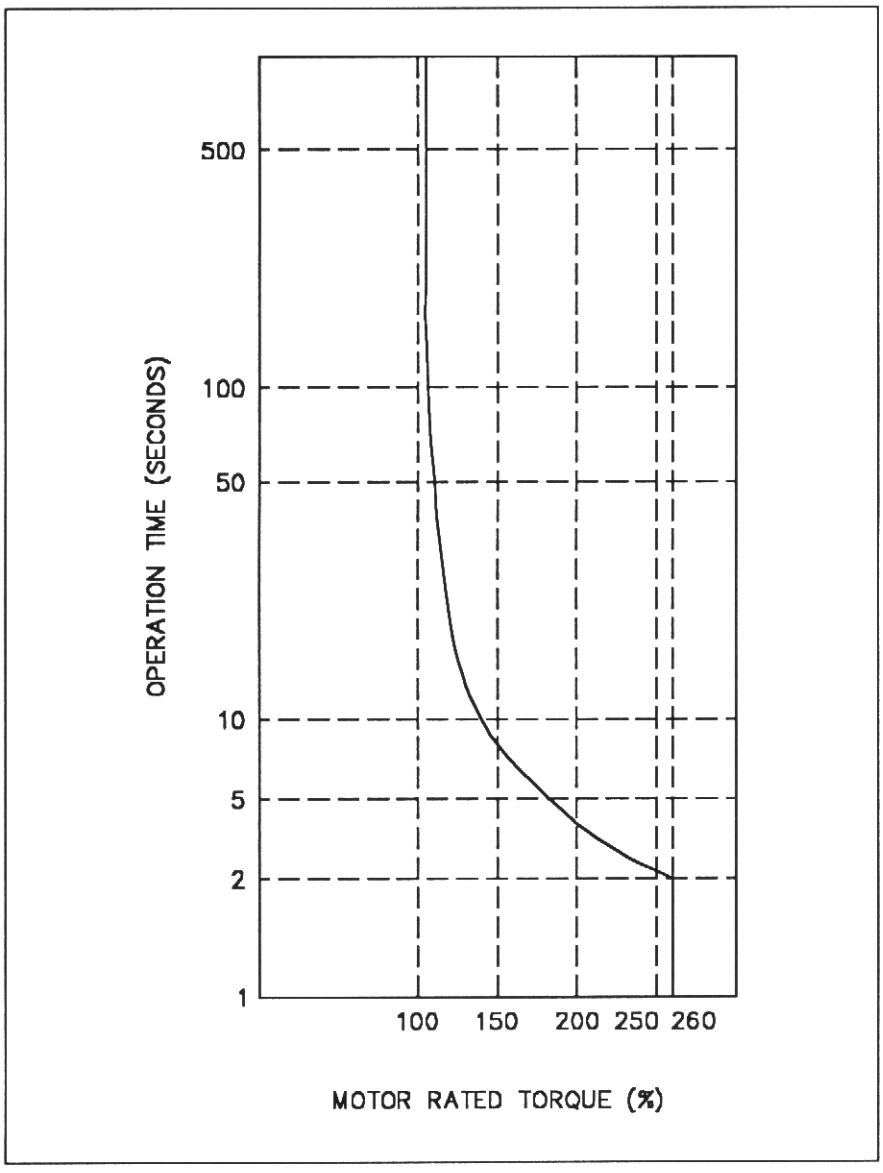


Figure 3.1

3.3 TORQUE-SPEED CHARACTERISTICS

DRAWING NUMBER	DESCRIPTION
MDPAK7-R400	Motor Drive Package
MDPAK7-R750	Motor Drive Package
MDPAK7-R1000	Motor Drive Package
MDPAK7-R1500	Motor Drive Package
MDPAK7-R2000	Motor Drive Package
MDPAK7-R3000	Motor Drive Package
MDPAK7-R3700	Motor Drive Package
MDPAK7-M3700	Motor Drive Package
MDPAK7-R5500	Motor Drive Package
MDPAK7-R7500	Motor Drive Package
MDPAK7-R11000	Motor Drive Package
MDPAK7-R12100	Motor Drive Package

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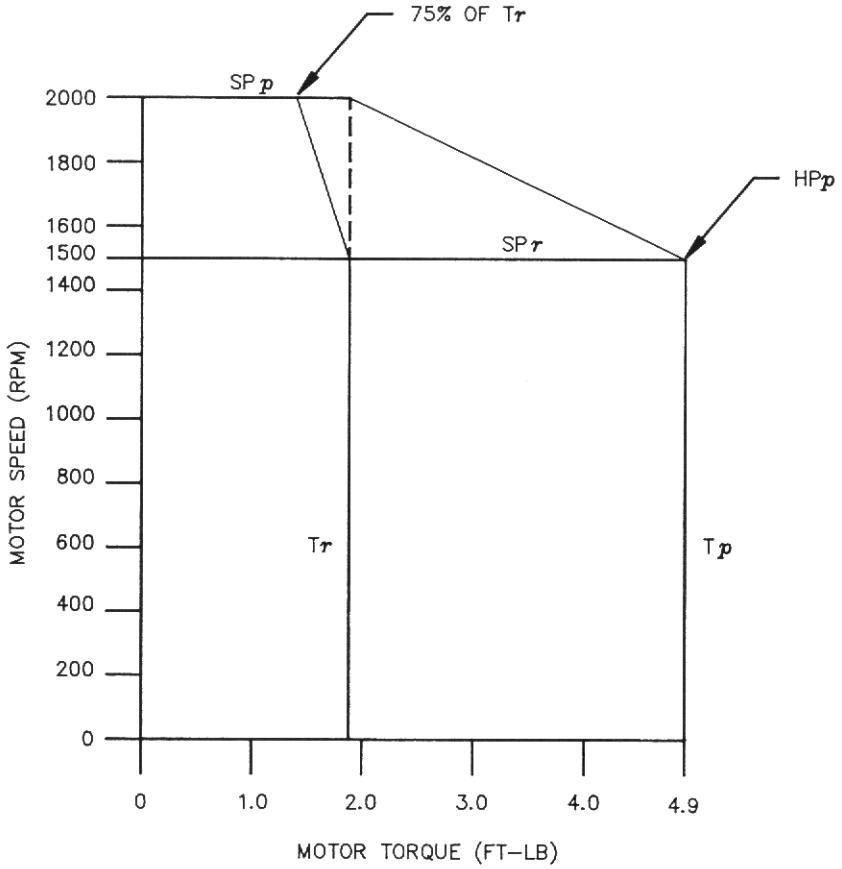

SPEED TEST POINT SCALING: SPEED (RPM) = $\frac{\text{OUTPUT VOLTS}}{10}$ * SSCL (PARAMETER SSCL DEFAULTS TO 2000 RPM)

TORQUE TEST POINT SCALING: TORQUE (%) = $\frac{\text{OUTPUT VOLTS}}{10}$ * 260% (RATED TORQUE)

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LIST OF MATERIALS

DESCRIPTION	PART NUMBER	QTY
MOTOR ASSEMBLY	BLM7-R0400	1
DRIVE	BSD7-R0400	1
MANUAL	IB-14B007	1

MOTOR DRIVE SPECIFICATIONS

RATED TORQUE	Tr	1.88	FT-LB
PEAK TORQUE	Tp	4.90	FT-LB
RATED SPEED	SPr	1500	RPM
PEAK SPEED	SPp	2000	RPM
PEAK HORSEPOWER	HPp	1.40	HP
ROTOR INERTIA	Jm	0.000192	FT-LB-SEC^2
OUTPUT POWER	W	400	WATT

CHECKED BY — DATE 11/19/93
APPROVED BY — DATE
APPROVED BY — DATE 12/3/93
MATERIAL: --------
FINISH: ---------

TITLE: MOTOR DRIVE PACKAGE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES: X.X± ----- ANGULAR ± --- ; X.XX± --- ; X.XXX± --

DRAWN BY: CAD
AutoCAD FILE LOCATION: Q:\CAD\MDPAK7
DRAWING NUMBER: MDPAK7-R400

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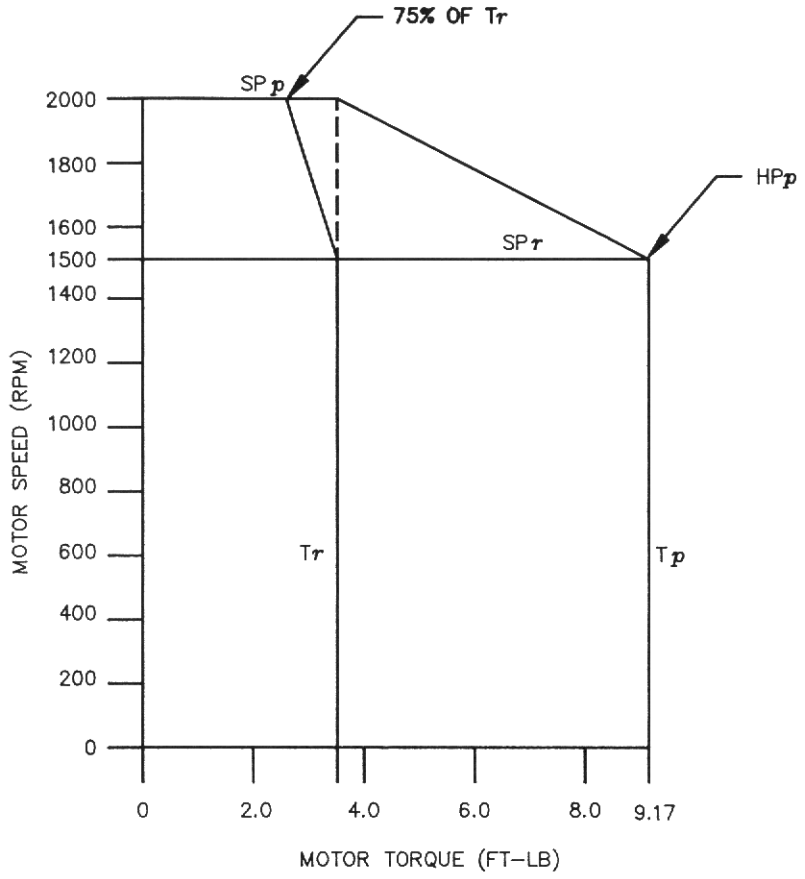

SPEED TEST POINT SCALING: SPEED (RPM) = $\frac{\text{OUTPUT VOLTS}}{10}$ * SSCL (PARAMETER SSCL DEFAULTS TO 2000 RPM)

TORQUE TEST POINT SCALING: TORQUE (%) = $\frac{\text{OUTPUT VOLTS}}{10}$ * 260% (RATED TORQUE)

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LIST OF MATERIALS		
DESCRIPTION	PART NUMBER	QTY
MOTOR ASSEMBLY	BLM7-R0750	1
DRIVE	BSD7-R0750	1
MANUAL	IB-14B007	1

MOTOR DRIVE SPECIFICATIONS			
RATED TORQUE	Tr	3.52	FT-LB
PEAK TORQUE	Tp	9.17	FT-LB
RATED SPEED	SPr	1500	RPM
PEAK SPEED	SPp	2000	RPM
PEAK HORSEPOWER	HPp	2.61	HP
ROTOR INERTIA	Jm	0.000537	FT-LB-SEC^2
OUTPUT POWER	W	750	WATT

CHECKED BY [signature] DATE 11/19/93
APPROVED BY DATE
APPROVED BY [signature] DATE 12/22/93
MATERIAL ---
FINISH ---

TITLE: MOTOR DRIVE PACKAGE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES: X.X± ----- X.XX± --- X.XXX± -- ANGULAR ± --

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DRAWING NUMBER MDPAK7-R750

B | DATE 9/02/93 | SCALE --- | SHEET NO. 1 OF 1 | REVISION 0

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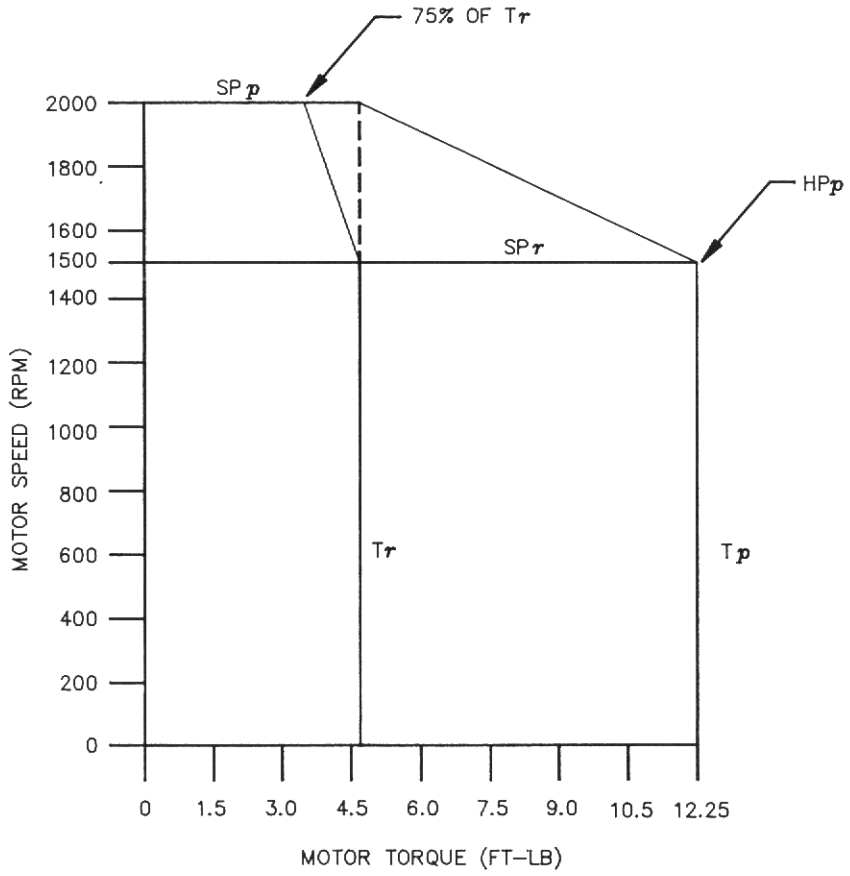

SPEED TEST POINT SCALING: SPEED (RPM) = $\frac{\text{OUTPUT VOLTS}}{10}$ * SSCL (PARAMETER SSCL DEFAULTS TO 2000 RPM)

TORQUE TEST POINT SCALING: TORQUE (%) = $\frac{\text{OUTPUT VOLTS}}{10}$ * 260% (RATED TORQUE)

INDUSTRIAL INDEXING SYSTEMS, Inc.
626 FISHERS RUN
VICTOR, NEW YORK 14564
(716) 924-9181 FAX: (716) 924-2169

LIST OF MATERIALS

DESCRIPTION	PART NUMBER	QTY
MOTOR ASSEMBLY	BLM7-R1000	1
DRIVE	BSD7-R1000	1
MANUAL	IB-14B007	1

MOTOR DRIVE SPECIFICATIONS

RATED TORQUE	Tr	4.70	FT-LB
PEAK TORQUE	Tp	12.25	FT-LB
RATED SPEED	SPr	1500	RPM
PEAK SPEED	SPp	2000	RPM
PEAK HORSEPOWER	HPp	3.5	HP
ROTOR INERTIA	Jm	0.000766	FT-LB-SEC^2
OUTPUT POWER	W	1000	WATT

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APPROVED BY: DATE:
APPROVED BY: [illegible] DATE: 12/3d/93
MATERIAL: --------
FINISH: --------

TITLE: MOTOR DRIVE PACKAGE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES: X.X± ----- ANGULAR ± --
X.XX± ---
X.XXX± --

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AutoCAD FILE LOCATION: Q:\CAD\MDPAK7

DRAWING NUMBER: MDPAK7-R1000

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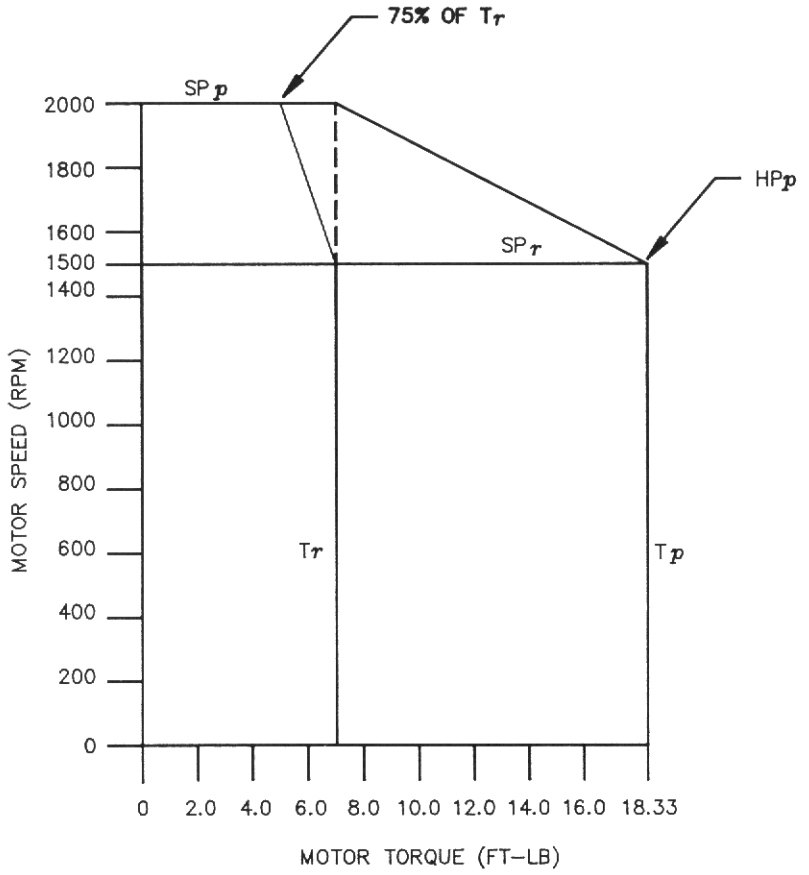

SPEED TEST POINT SCALING: SPEED (RPM) = $\frac{\text{OUTPUT VOLTS}}{10}$ * SSCL (PARAMETER SSCL DEFAULTS TO 2000 RPM)

TORQUE TEST POINT SCALING: TORQUE (%) = $\frac{\text{OUTPUT VOLTS}}{10}$ * 260% (RATED TORQUE)

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LIST OF MATERIALS

DESCRIPTION	PART NUMBER	QTY
MOTOR ASSEMBLY	BLM7-R1500	1
DRIVE	BSD7-R1500	1
MANUAL	IB-14B007	1

MOTOR DRIVE SPECIFICATIONS

RATED TORQUE	Tr	7.04	FT-LB
PEAK TORQUE	Tp	18.33	FT-LB
RATED SPEED	SPr	1500	RPM
PEAK SPEED	SPp	2000	RPM
PEAK HORSEPOWER	HPp	5.23	HP
ROTOR INERTIA	Jm	0.001000	FT-LB-SEC^2
OUTPUT POWER	W	1500	WATT

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APPROVED BY — DATE
APPROVED BY — DATE 12/20/93
MATERIAL ———
FINISH ———

TITLE: MOTOR DRIVE PACKAGE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES: X.X± ----- ANGULAR ± --- ; X.XX± ---- ; X.XXX± ---

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DRAWING NUMBER: MDPAK7-R1500

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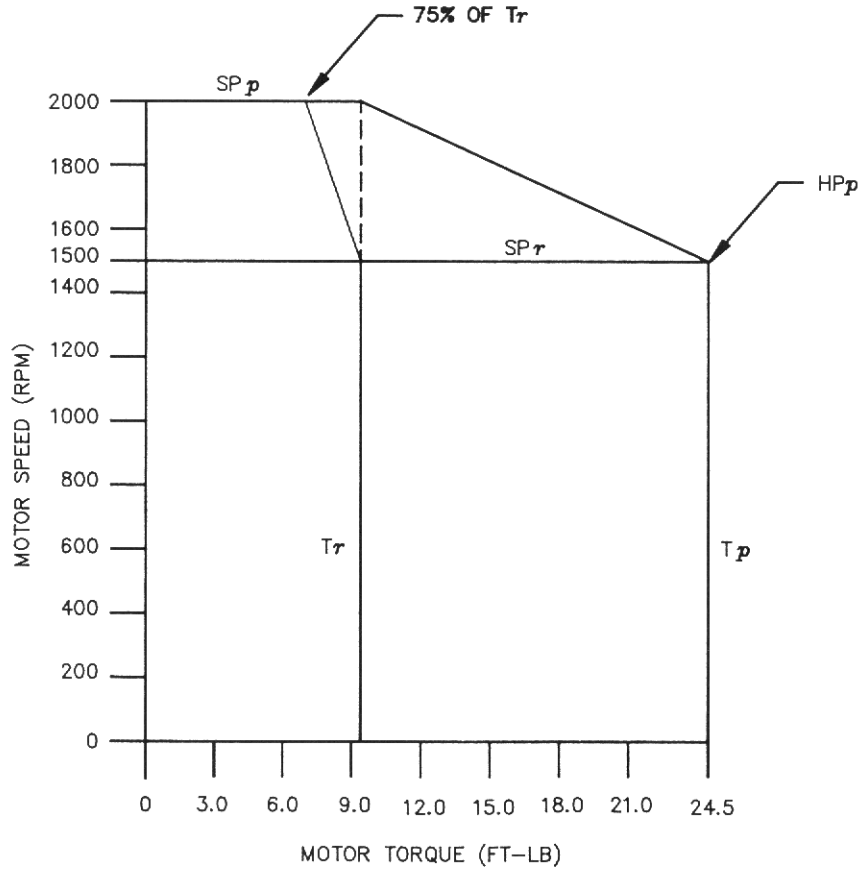

SPEED TEST POINT SCALING: SPEED (RPM) = $\frac{\text{OUTPUT VOLTS}}{10}$ * SSCL (PARAMETER SSCL DEFAULTS TO 2000 RPM)

TORQUE TEST POINT SCALING: TORQUE (%) = $\frac{\text{OUTPUT VOLTS}}{10}$ * 260% (RATED TORQUE)

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LIST OF MATERIALS

DESCRIPTION	PART NUMBER	QTY
MOTOR ASSEMBLY	BLM7-R2000	1
DRIVE	BSD7-R2000	1
MANUAL	IB-14B007	1

MOTOR DRIVE SPECIFICATIONS

RATED TORQUE	Tr	9.4	FT-LB
PEAK TORQUE	Tp	24.5	FT-LB
RATED SPEED	SPr	1500	RPM
PEAK SPEED	SPp	2000	RPM
PEAK HORSEPOWER	HPp	7.00	HP
ROTOR INERTIA	Jm	0.002000	FT-LB-SEC^2
OUTPUT POWER	W	2000	WATT

CHECKED BY [signature] DATE 11/7/94
APPROVED BY DATE
APPROVED BY [signature] DATE 12/30/93
MATERIAL ---
FINISH ---

TITLE: MOTOR DRIVE PACKAGE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES: X.X± ----- ANGULAR ± --- ; X.XX± --- ; X.XXX± --

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DRAWING NUMBER MDPAK7-R2000

B | DATE 9/02/93 | SCALE --- | SHEET NO. 1 OF 1 | REVISION 0

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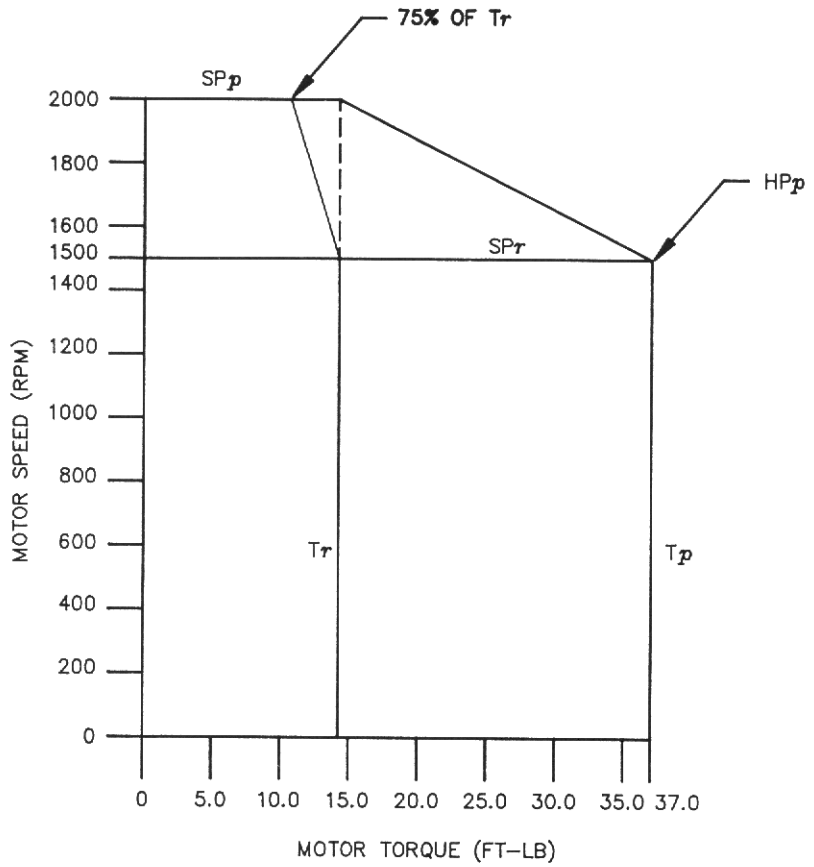

SPEED TEST POINT SCALING: SPEED (RPM) = $\frac{\text{OUTPUT VOLTS}}{10}$ * SSCL (PARAMETER SSCL DEFAULTS TO 2000 RPM)

TORQUE TEST POINT SCALING: TORQUE (%) = $\frac{\text{OUTPUT VOLTS}}{10}$ * 260% (RATED TORQUE)

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LIST OF MATERIALS

DESCRIPTION	PART NUMBER	QTY
MOTOR ASSEMBLY	BLM7-R3000	1
DRIVE	BSD7-R3000	1
MANUAL	IB-14B007	1

MOTOR DRIVE SPECIFICATIONS

RATED TORQUE	Tr	14.23	FT-LB
PEAK TORQUE	Tp	37.0	FT-LB
RATED SPEED	SPr	1500	RPM
PEAK SPEED	SPp	2000	RPM
PEAK HORSEPOWER	HPp	10.6	HP
ROTOR INERTIA	Jm	0.00275	FT-LB-SEC^2
OUTPUT POWER	W	3000	WATT

CHECKED BY | DATE

APPROVED BY | DATE

APPROVED BY | DATE 6/1/94

MATERIAL ---

FINISH ---

TITLE: MOTOR DRIVE PACKAGE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)

TOLERANCES: X.X± ---- X.XX± --- X.XXX± -- ANGULAR ± --

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AutoCAD FILE LOCATION: Q:\CAD\MDPAK7

DRAWING NUMBER: MDPAK7-R3000

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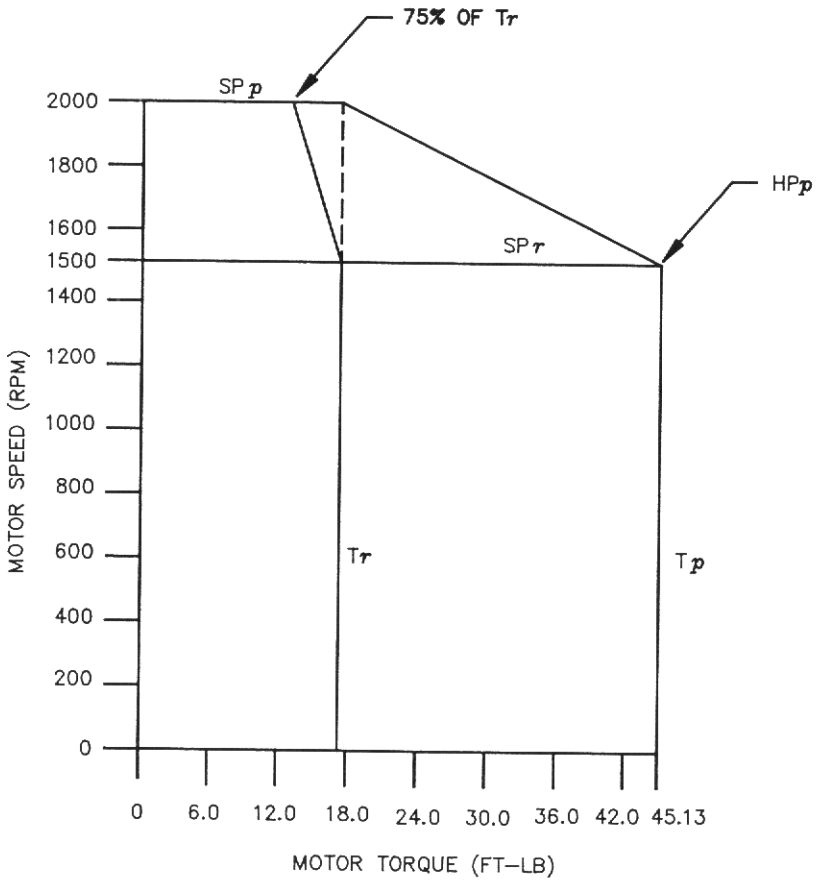

SPEED TEST POINT SCALING: SPEED (RPM) = $\frac{\text{OUTPUT VOLTS}}{10}$ * SSCL (PARAMETER SSCL DEFAULTS TO 2000 RPM)

TORQUE TEST POINT SCALING: TORQUE (%) = $\frac{\text{OUTPUT VOLTS}}{10}$ * 260% (RATED TORQUE)

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LIST OF MATERIALS

DESCRIPTION	PART NUMBER	QTY
MOTOR ASSEMBLY	BLM7-M3700	1
DRIVE	BSD7-R3700	1
MANUAL	IB-14B007	1

MOTOR DRIVE SPECIFICATIONS

RATED TORQUE	Tr	17.36	FT-LB
PEAK TORQUE	Tp	45.13	FT-LB
RATED SPEED	SPr	1500	RPM
PEAK SPEED	SPp	2000	RPM
PEAK HORSEPOWER	HPp	12.89	HP
ROTOR INERTIA	Jm	0.0048	FT-LB-SEC^2
OUTPUT POWER	W	3700	WATT

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APPROVED BY: DATE:
APPROVED BY: [illegible] DATE: 12/3/93
MATERIAL: --------
FINISH: ---------

TITLE: MOTOR DRIVE PACKAGE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES: X.X± ----- ANGULAR ±--- ; X.XX± --- ; X.XXX± --

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DRAWING NUMBER: MDPAK7-M3700
B | DATE: 9/02/93 | SCALE: --- | SHEET NO.: 1 OF 1 | REVISION: 0

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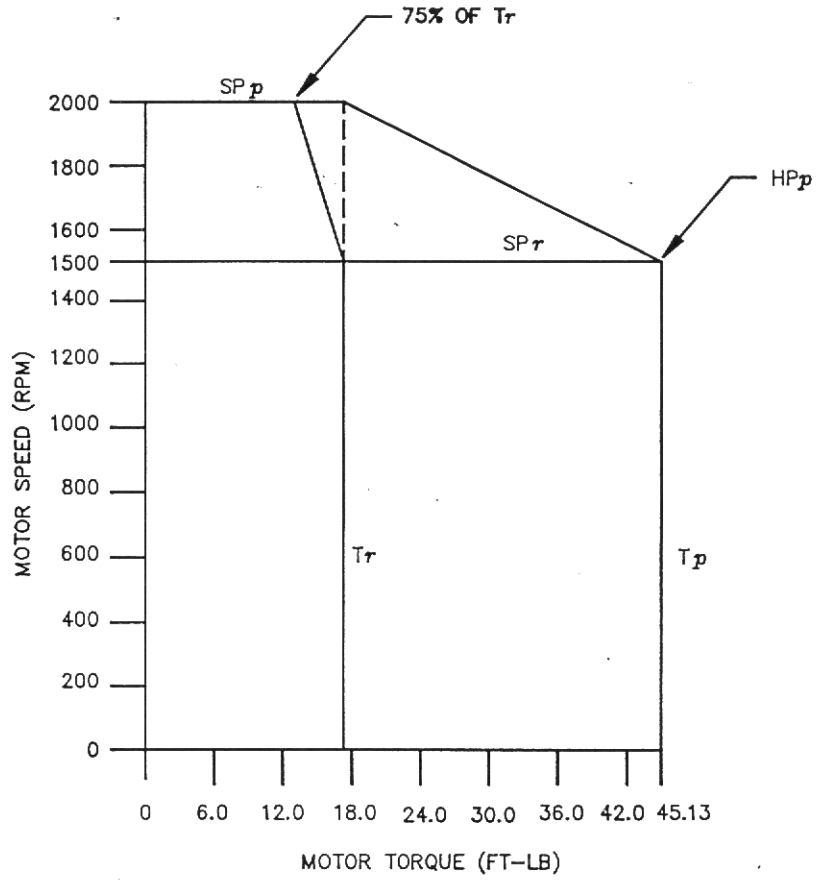

SPEED TEST POINT SCALING: SPEED (RPM) = $\frac{\text{OUTPUT VOLTS}}{10}$ * SSCL (PARAMETER SSCL DEFAULTS TO 2000 RPM)

TORQUE TEST POINT SCALING: TORQUE (%) = $\frac{\text{OUTPUT VOLTS}}{10}$ * 260% (RATED TORQUE)

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LIST OF MATERIALS

DESCRIPTION	PART NUMBER	QTY
MOTOR ASSEMBLY	BLM7-R3700	1
DRIVE	BSD7-R3700	1
MANUAL	IB-14B007	1

MOTOR DRIVE SPECIFICATIONS

RATED TORQUE	Tr	17.36	FT-LB
PEAK TORQUE	Tp	45.13	FT-LB
RATED SPEED	SPr	1500	RPM
PEAK SPEED	SPp	2000	RPM
PEAK HORSEPOWER	HPp	12.89	HP
ROTOR INERTIA	Jm	0.00342	FT-LB-SEC^2
OUTPUT POWER	W	3700	WATT

CHECKED BY: [illegible] DATE: 11/19/93
APPROVED BY: DATE:
APPROVED BY: JS DATE: 12/30/93
MATERIAL: ---------
FINISH: ---------

TITLE: MOTOR DRIVE PACKAGE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES: X.X± ----- ANGULAR ± --- ; X.XX± --- ; X.XXX± --

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DRAWING NUMBER: MDPAK7-R3700

B | DATE: 9/02/93 | SCALE: --- | SHEET NO.: 1 OF 1 | REVISION: 0

DATE	SYM	REVISION RECORD	DR	CK	CK
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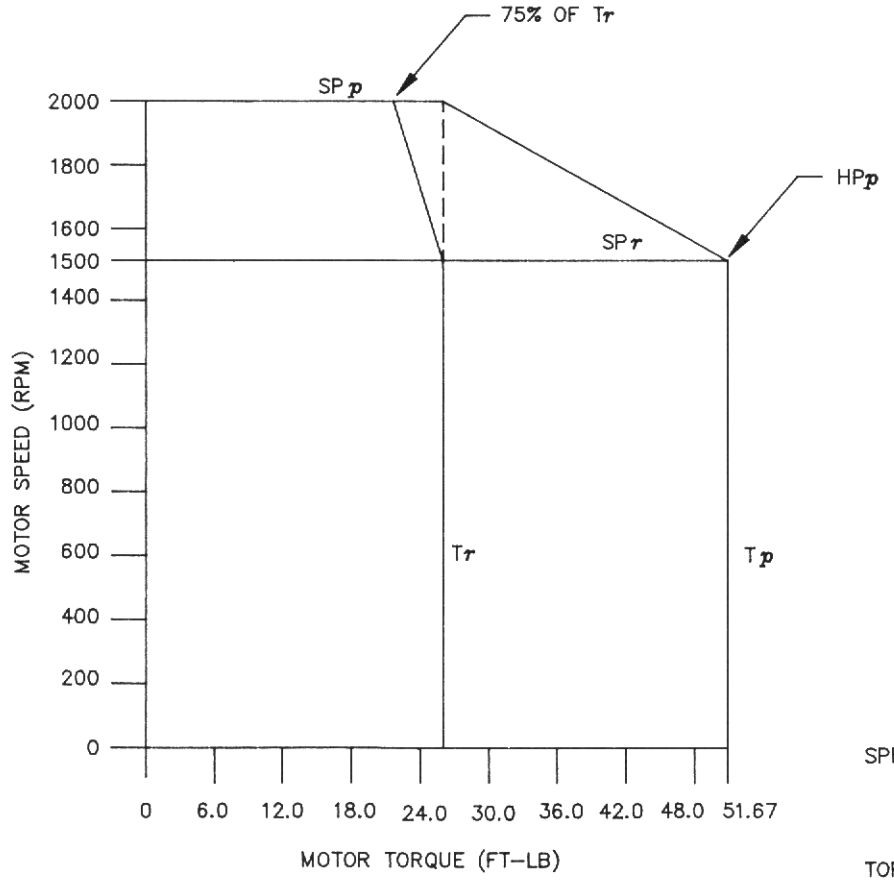

SPEED TEST POINT SCALING: SPEED (RPM) = $\frac{\text{OUTPUT VOLTS}}{10}$ * SSCL (PARAMETER SSCL DEFAULTS TO 2000 RPM)

TORQUE TEST POINT SCALING: TORQUE (%) = $\frac{\text{OUTPUT VOLTS}}{10}$ * 260% (RATED TORQUE)

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LIST OF MATERIALS

DESCRIPTION	PART NUMBER	QTY
MOTOR ASSEMBLY	BLM7–R5500F	1
DRIVE	BSD7–R5500	1
MANUAL	IB–14B007	1

MOTOR DRIVE SPECIFICATIONS

RATED TORQUE	Tr	25.75	FT–LB
PEAK TORQUE	Tp	51.67	FT–LB
RATED SPEED	SPr	1500	RPM
PEAK SPEED	SPp	2000	RPM
PEAK HORSEPOWER	HPp	12.89	HP
ROTOR INERTIA	Jm	0.XXXXX	FT–LB–SEC^2
OUTPUT POWER	W	5500	WATT

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APPROVED BY — DATE
APPROVED BY — DATE
MATERIAL: ———
FINISH: ———

TITLE: MOTOR DRIVE PACKAGE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES: X.X± ——— ANGULAR ± ——
X.XX± ———
X.XXX± ——

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DATE	SYM	REVISION RECORD	DR	CK	CK
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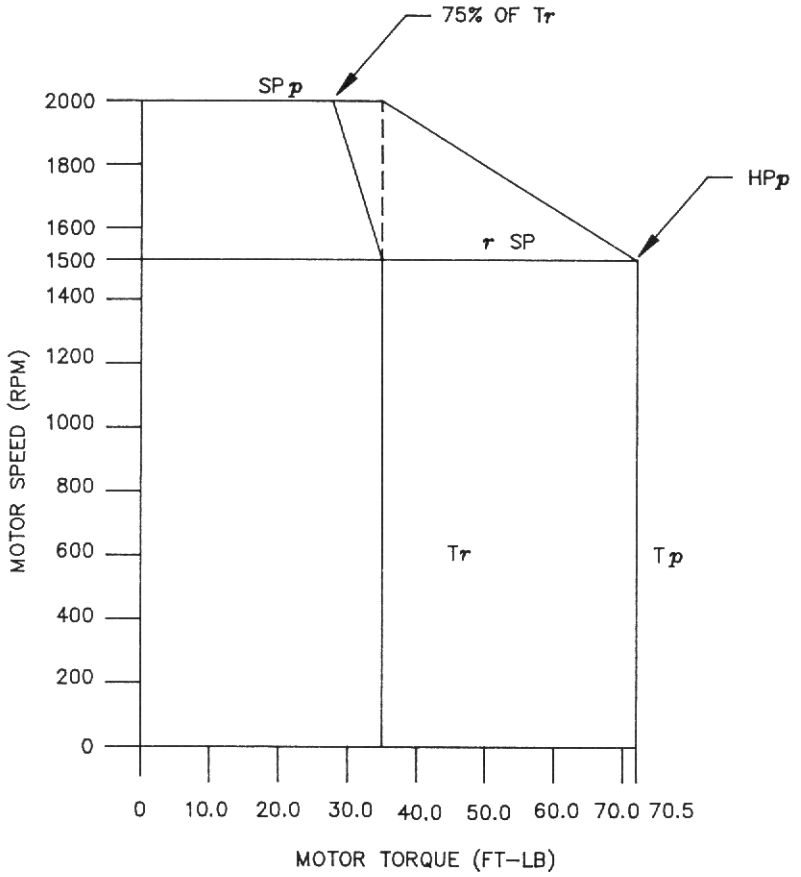

SPEED TEST POINT SCALING: SPEED (RPM) = $\frac{\text{OUTPUT VOLTS}}{10}$ * SSCL (PARAMETER SSCL DEFAULTS TO 2000 RPM)

TORQUE TEST POINT SCALING: TORQUE (%) = $\frac{\text{OUTPUT VOLTS}}{10}$ * 260% (RATED TORQUE)

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LIST OF MATERIALS

DESCRIPTION	PART NUMBER	QTY
MOTOR ASSEMBLY	BLM7–R7500F	1
DRIVE	BSD7–R7500	1
MANUAL	IB–14B007	1

MOTOR DRIVE SPECIFICATIONS

RATED TORQUE	Tr	35.17	FT–LB
PEAK TORQUE	Tp	70.50	FT–LB
RATED SPEED	SPr	1500	RPM
PEAK SPEED	SPp	2000	RPM
PEAK HORSEPOWER	HPp	XX.XX	HP
ROTOR INERTIA	Jm	0.XXXXX	FT–LB–SEC^2
OUTPUT POWER	W	7500	WATT

CHECKED BY DATE

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APPROVED BY DATE

MATERIAL ———

FINISH ———

TITLE: MOTOR DRIVE PACKAGE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)

TOLERANCES: X.X± ——— X.XX± ——— X.XXX± ——— ANGULAR ± ——

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AutoCAD FILE LOCATION: Q:\CAD\MDPAK7

DRAWING NUMBER: MDPAK7–R7500

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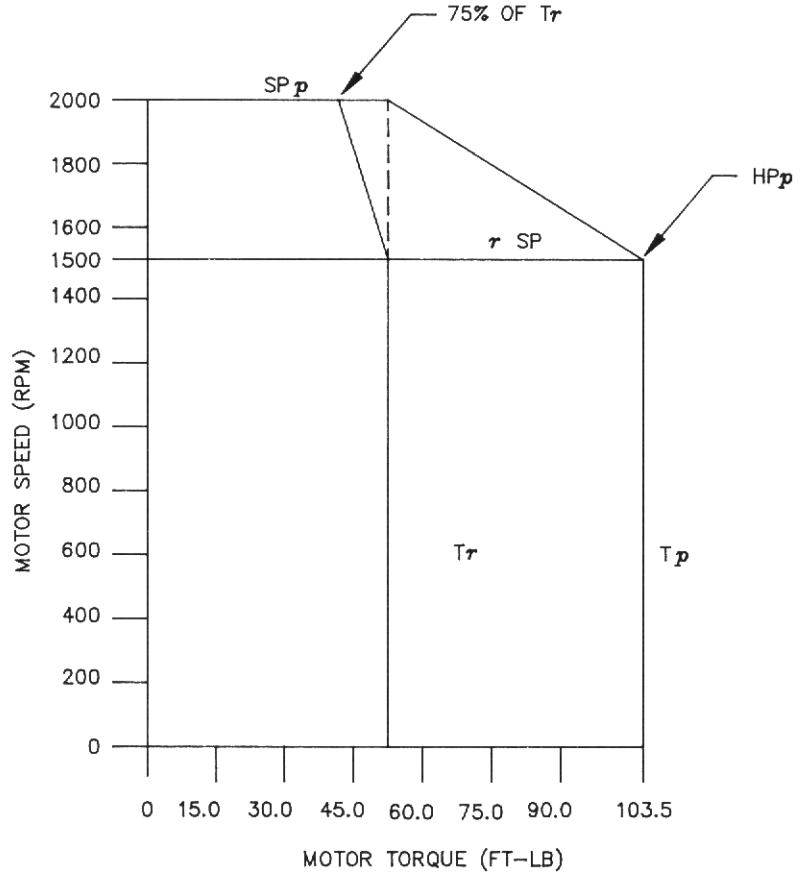

SPEED TEST POINT SCALING: SPEED (RPM) = $\frac{\text{OUTPUT VOLTS}}{10}$ * SSCL (PARAMETER SSCL DEFAULTS TO 2000 RPM)

TORQUE TEST POINT SCALING: TORQUE (%) = $\frac{\text{OUTPUT VOLTS}}{10}$ * 260% (RATED TORQUE)

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LIST OF MATERIALS

DESCRIPTION	PART NUMBER	QTY
MOTOR ASSEMBLY	BLM7–R11000F	1
DRIVE	BSD7–R11000	1
MANUAL	IB–14B007	1

MOTOR DRIVE SPECIFICATIONS

RATED TORQUE	Tr	51.66	FT–LB
PEAK TORQUE	Tp	103.50	FT–LB
RATED SPEED	SPr	1500	RPM
PEAK SPEED	SPp	2000	RPM
PEAK HORSEPOWER	HPp	XX.XX	HP
ROTOR INERTIA	Jm	0.XXXXX	FT–LB–SEC^2
OUTPUT POWER	W	11000	WATT

CHECKED BY | DATE
APPROVED BY | DATE
APPROVED BY | DATE
MATERIAL: ———
FINISH: ———

TITLE: MOTOR DRIVE PACKAGE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES: X.X± ——— ANGULAR ± ——
X.XX± ———
X.XXX± ——

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B | DATE 10/20/95 | SCALE ——— | SHEET NO. 1 OF 1 | REVISION 0

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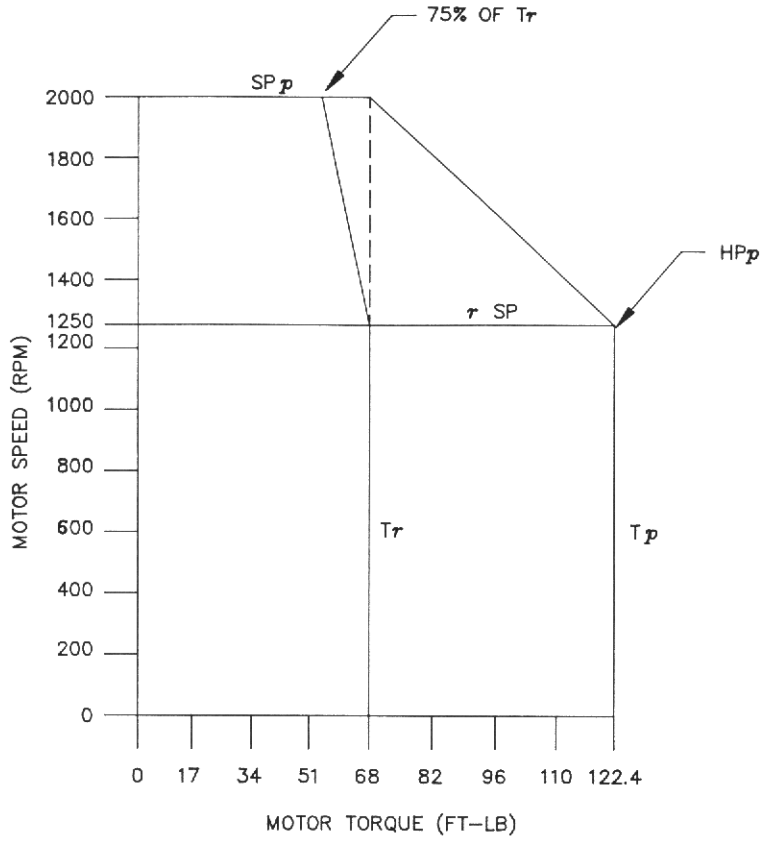

SPEED TEST POINT SCALING: SPEED (RPM) = $\frac{\text{OUTPUT VOLTS}}{10}$ * SSCL (PARAMETER SSCL DEFAULTS TO 2000 RPM)

TORQUE TEST POINT SCALING: TORQUE (%) = $\frac{\text{OUTPUT VOLTS}}{10}$ * 260% (RATED TORQUE)

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LIST OF MATERIALS

DESCRIPTION	PART NUMBER	QTY
MOTOR ASSEMBLY	BLM7-R12100	1
DRIVE	BSD7-R12100	1
MANUAL	IB-14B007	1

MOTOR DRIVE SPECIFICATIONS

RATED TORQUE	Tr	68	FT-LB
PEAK TORQUE	Tp	122.40	FT-LB
RATED SPEED	SPr	1250	RPM
PEAK SPEED	SPp	2000	RPM
PEAK HORSEPOWER	HPp	28.59	HP
ROTOR INERTIA	Jm	0.0093	FT-LB-SEC^2
OUTPUT POWER	W	12100	WATT

CHECKED BY	DATE
APPROVED BY FMS	DATE 10/7/98
APPROVED BY	DATE
MATERIAL ----------	
FINISH ----------	

TITLE: MOTOR DRIVE PACKAGE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)	DRAWN BY BOWMAN		DRAWING NUMBER MDPAK7-R12100
TOLERANCES: X.X± --- / X.XX± --- / X.XXX± ---	ANGULAR ± ---	AutoCAD FILE LOCATION Q:\DFTG\MDPAK7\TORQUE	
B	DATE 020CT98	SCALE ---	SHEET NO. 1 OF 1 / REVISION 0

3.4 DRIVE DIMENSIONS

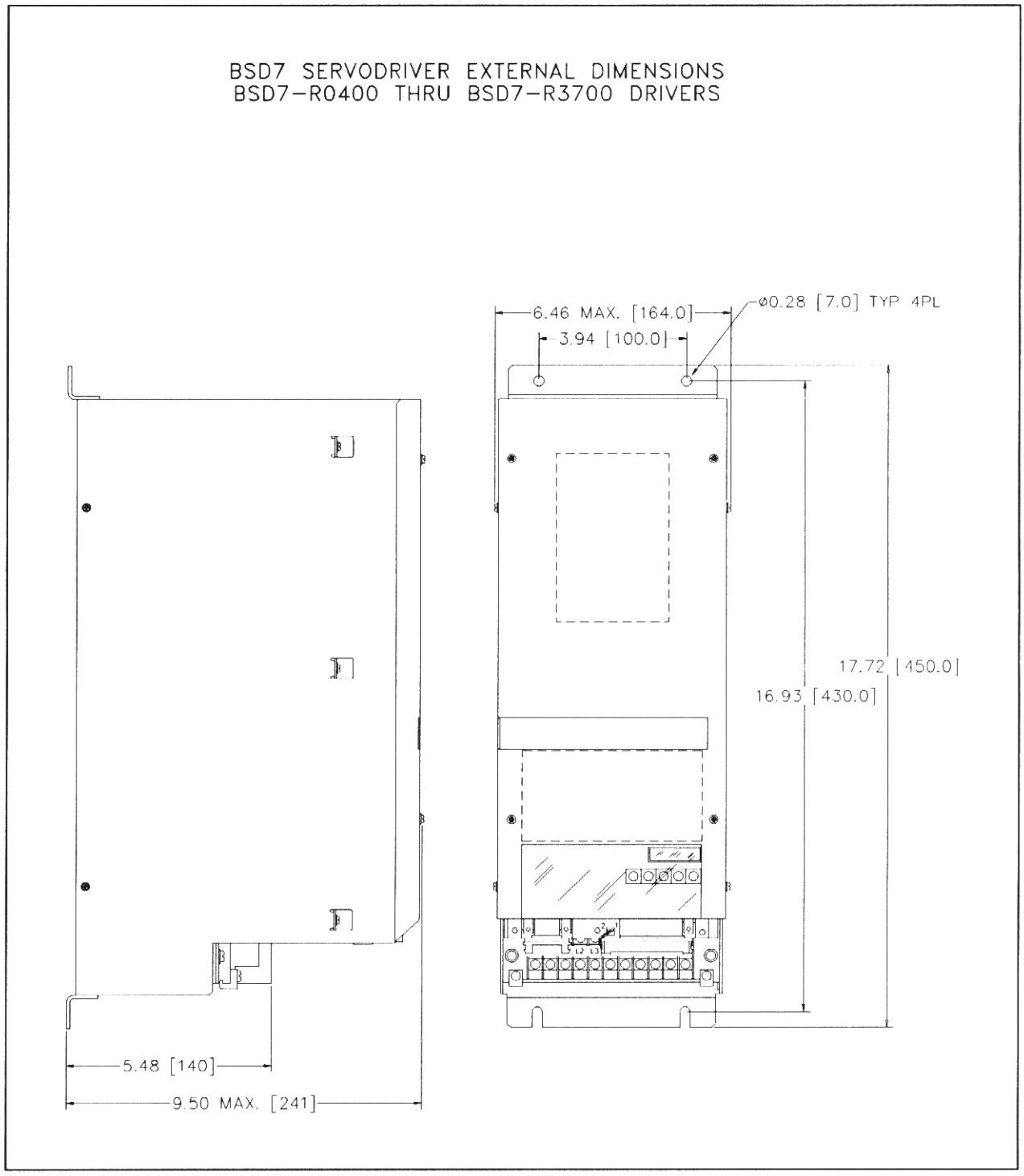


Figure 3.2 - Drive Dimensions

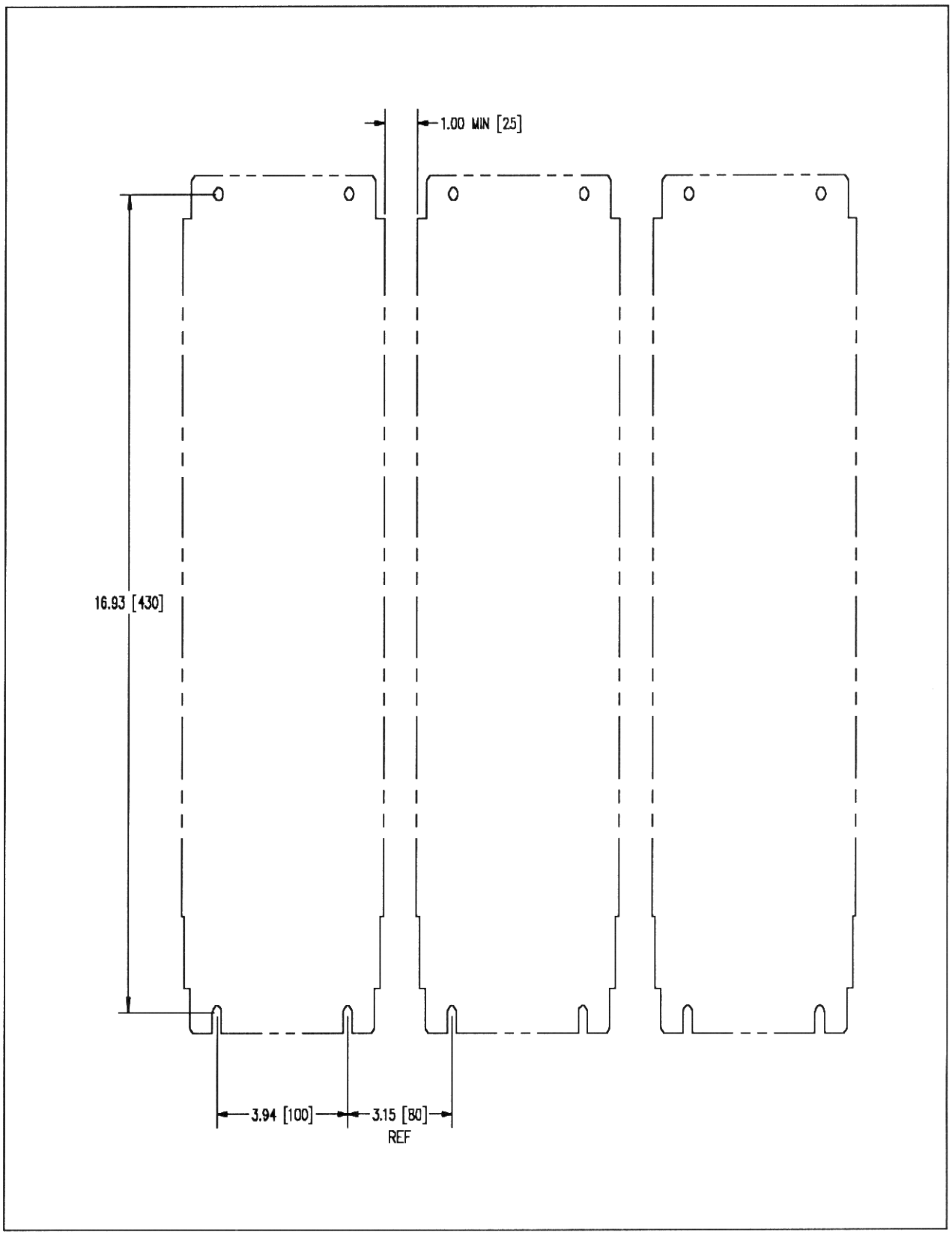


Figure 3.3 - BSD7-R0400 Thru BSD7-R3700 Drivers Mounting Plate

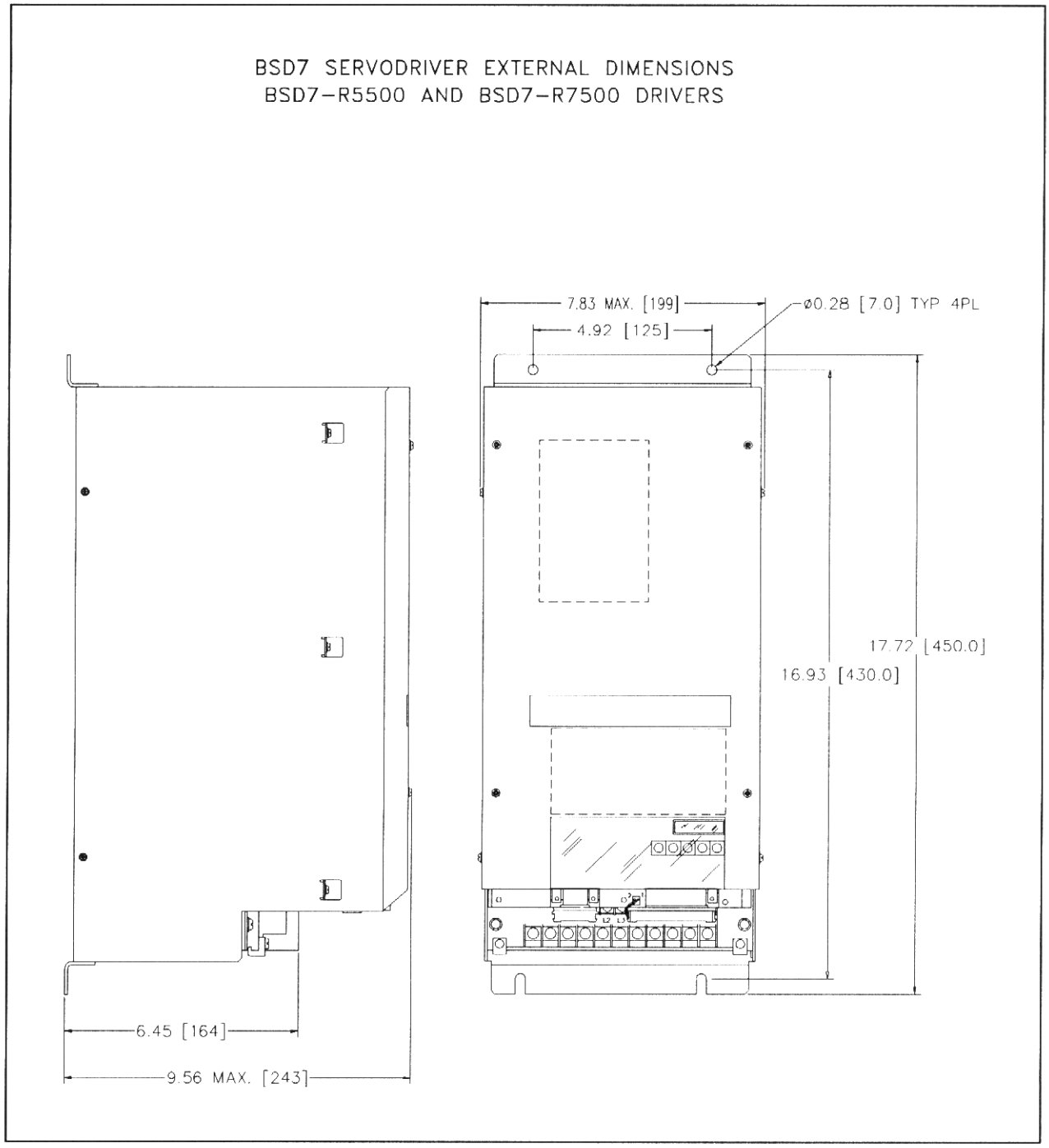


Figure 3.4 - Drive Dimensions

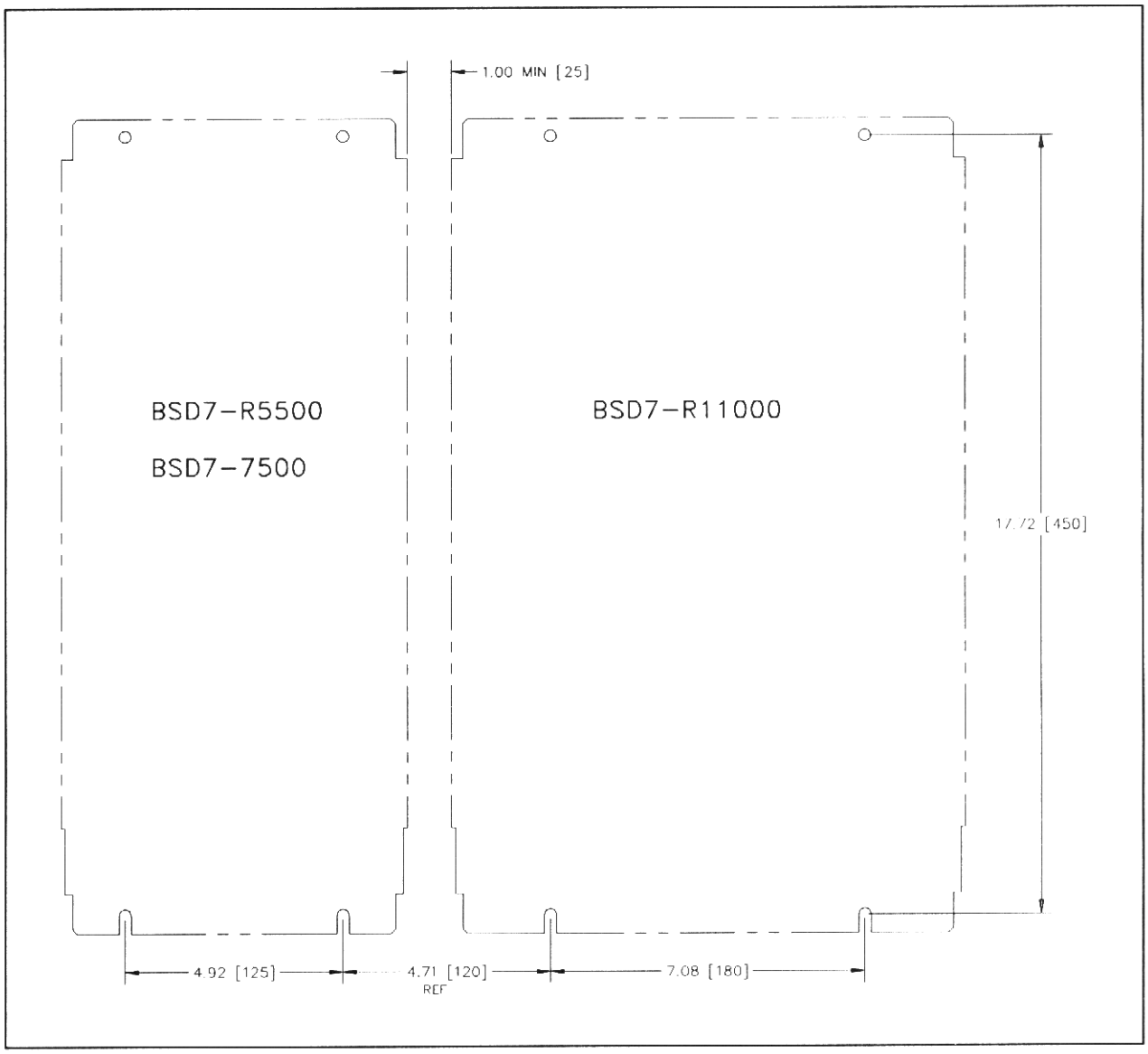


Figure 3.5 - BSD7-R5500, BSD7-R7500 and BSD7-R11000 Drive Mounting Plate

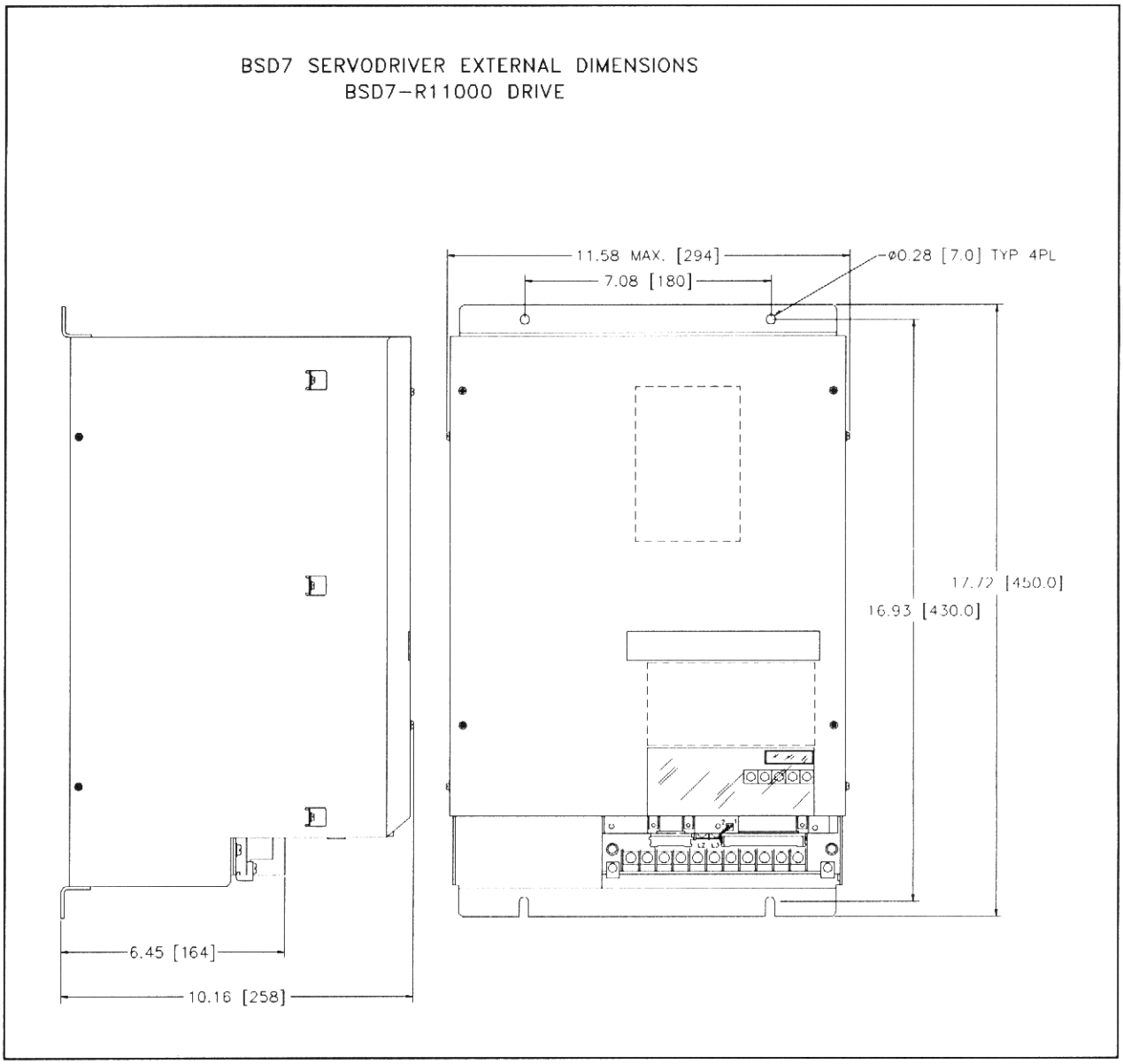


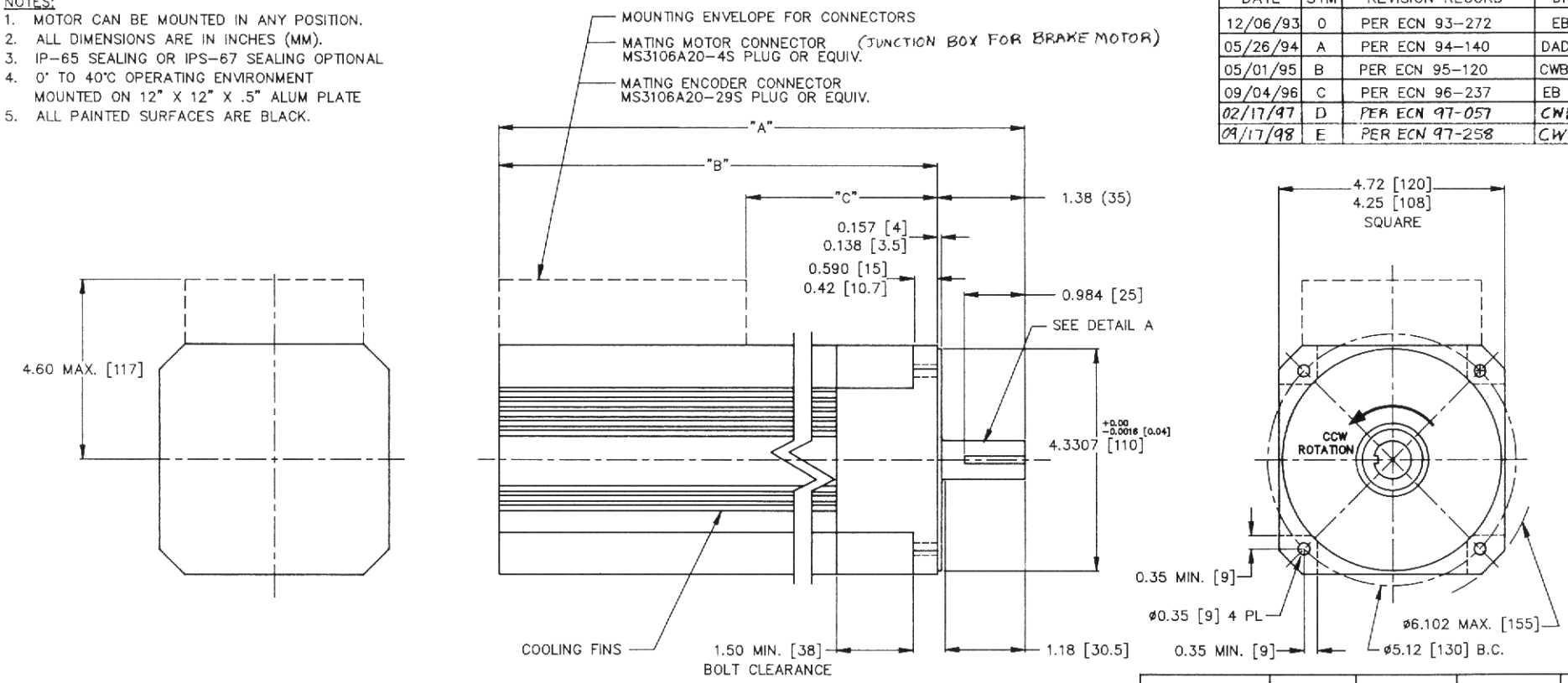
Figure 3.6 - Drive Dimensions

3.5 MOTOR DIMENSIONS AND SHAFT LOADING

DRAWING NUMBER	DESCRIPTION
IM-BLM7	MOTOR OUTLINE

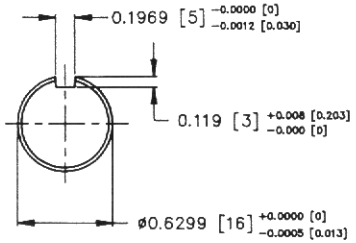
NOTES:
1. MOTOR CAN BE MOUNTED IN ANY POSITION.
2. ALL DIMENSIONS ARE IN INCHES (MM).
3. IP-65 SEALING OR IPS-67 SEALING OPTIONAL
4. 0° TO 40°C OPERATING ENVIRONMENT MOUNTED ON 12" X 12" X .5" ALUM PLATE
5. ALL PAINTED SURFACES ARE BLACK.

DATE	SYM	REVISION RECORD	DR	CK	CK
12/06/93	0	PER ECN 93-272	EB	DD	ELS
05/26/94	A	PER ECN 94-140	DAD	ELS	
05/01/95	B	PER ECN 95-120	CWB	EB	
09/04/96	C	PER ECN 96-237	EB		
02/17/97	D	PER ECN 97-057	CWB	EB	
09/17/98	E	PER ECN 97-258	CWB		



IIS PART NO.	WATTS	"A" DIM MAX	"B" DIM MAX	"C" DIM
BLM7-R400	400W	10.63 [270]	9.25 [235]	2.76 [70]
BLM7-R750	750W	12.80 [325]	11.41 [290]	4.92 [125]
C BLM7-H0750	750W	12.80 [325]	11.41 [290]	4.92 [125]
C BLM7B-H0750	750W	14.52 [369]	13.15 [334]	6.89 [175]

DETAIL "A"



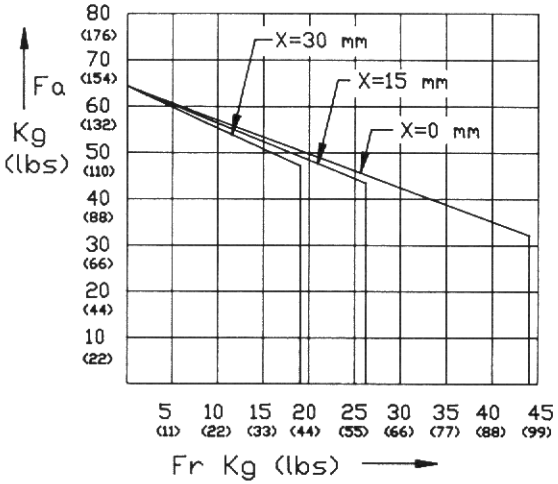
INDUSTRIAL INDEXING SYSTEMS, Inc.
626 FISHERS RUN
VICTOR, NEW YORK 14564
(716) 924-9181 FAX: (716) 924-2169

CHECKED BY E.BAIER	DATE 01/94
APPROVED BY ELS	DATE 01/94
APPROVED BY ELS	DATE 06/94
MATERIAL -----	
FINISH -----	

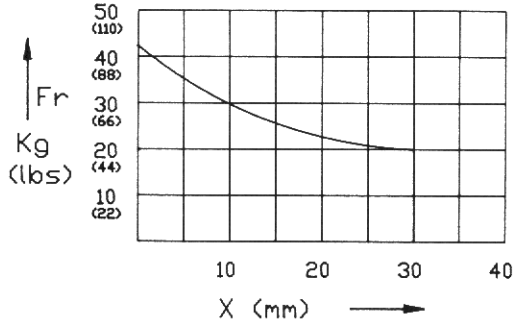
TITLE: MOTOR OUTLINE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)	DRAWN BY BAIER		DRAWING NUMBER IM-BLM7
TOLERANCES: X.X± .01, X.XX± .01, X.XXX± .005; ANGULAR ± --	AutoCAD FILE LOCATION Q:\DFTG\MDPAK7\MOTOR		
B	DATE 12/06/93	SCALE ---	SHEET NO. 1 OF 12 / REVISION E

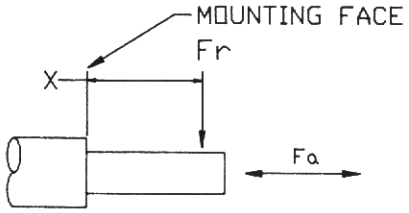
DATE	SYM	REVISION RECORD	DR	CK	CK
12/06/93	0	PER ECN 93-272	EB	EB	ELS
05/26/94	A	PER ECN 94-140	DAD	ELS	
05/01/95	B	PER ECN 95-120	CWB	CB	
09/04/96	C	PER ECN 96-237	EB	EB	
02/17/97	D	PER ECN 97-057	CWB	CB	
09/17/98	E	PER ECN 97-258	CWB	CB	



THRUST LOAD



RADIAL LOAD



R0400 & R0750

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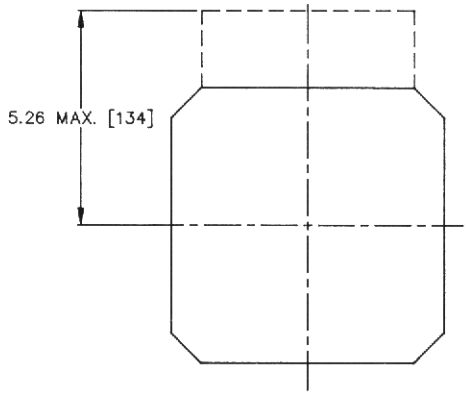
CHECKED BY	E.BAIER
DATE	01/94
APPROVED BY	ELS
DATE	01/94
APPROVED BY	ELS
DATE	06/94
MATERIAL	----------
FINISH	----------

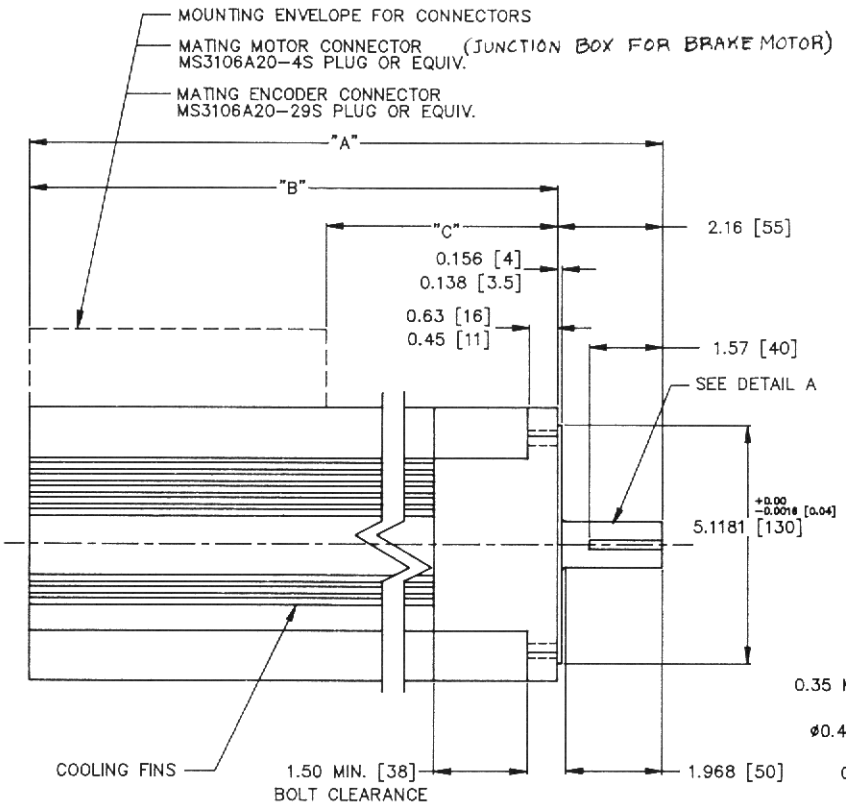
TITLE: MOTOR OUTLINE

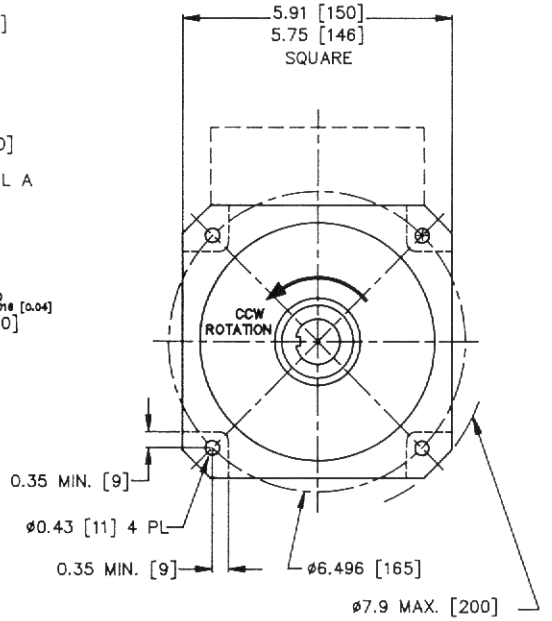
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)	
TOLERANCES	
X.X± -----	ANGULAR ± --
X.XX± ----	
X.XXX± ---	
DRAWN BY	BAIER
AutoCAD FILE LOCATION	Q:\DFTG\MDPAK7\MOTOR
DRAWING NUMBER	IM-BLM7
B	DATE 12/06/93
SCALE	3=1
SHEET NO.	2 OF 12
REVISION	E

NOTES:
1. MOTOR CAN BE MOUNTED IN ANY POSITION.
2. ALL DIMENSIONS ARE IN INCHES (MM).
3. IP-65 SEALING OR IPS-67 SEALING OPTIONAL
4. 0° TO 40°C OPERATING ENVIRONMENT
   MOUNTED ON 12" X 12" X .5" ALUM PLATE
5. ALL PAINTED SURFACES ARE BLACK.

DATE	SYM	REVISION RECORD	DR	CK	CK
12/06/93	0	PER ECN 93-272	EB	EB	ELS
05/26/94	A	PER ECN 94-140	DAD	ELS	
05/01/95	B	PER ECN 95-120	CWB	ELS	
03/04/96	C	PER ECN 96-237	EB	ELS	
02/17/97	D	PER ECN 97-057	CWB	EB	
09/17/98	E	PER ECN 97-258	CWB	ELS	

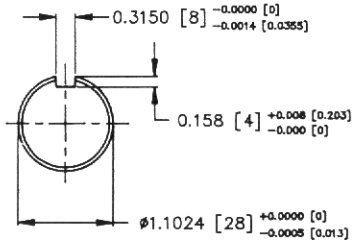






IIS PART NO.	WATTS	"A" DIM MAX	"B" DIM MAX	"C" DIM
BLM7-R1000	1000W	13.78 [350]	11.62 [295]	4.61 [117]
BLM7-R1500	1500W	14.66 [373]	12.50 [318]	5.47 [139]

DETAIL "A"



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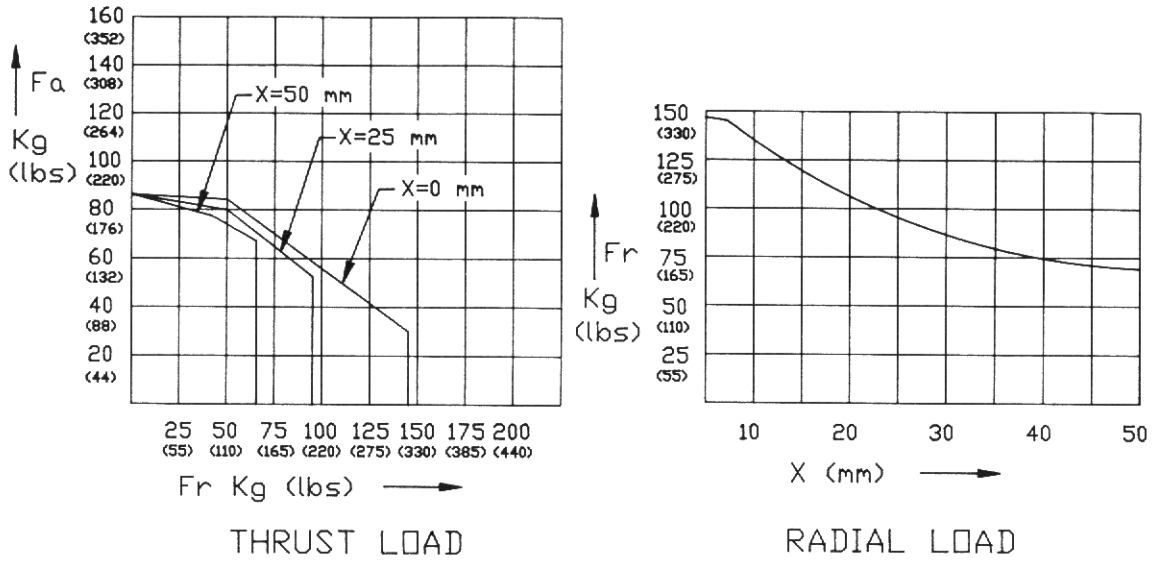
CHECKED BY E.BAIER	DATE 01/94
APPROVED BY ELS	DATE 01/94
APPROVED BY CWB	DATE 06/94
MATERIAL ----------	
FINISH ----------	

TITLE: MOTOR OUTLINE

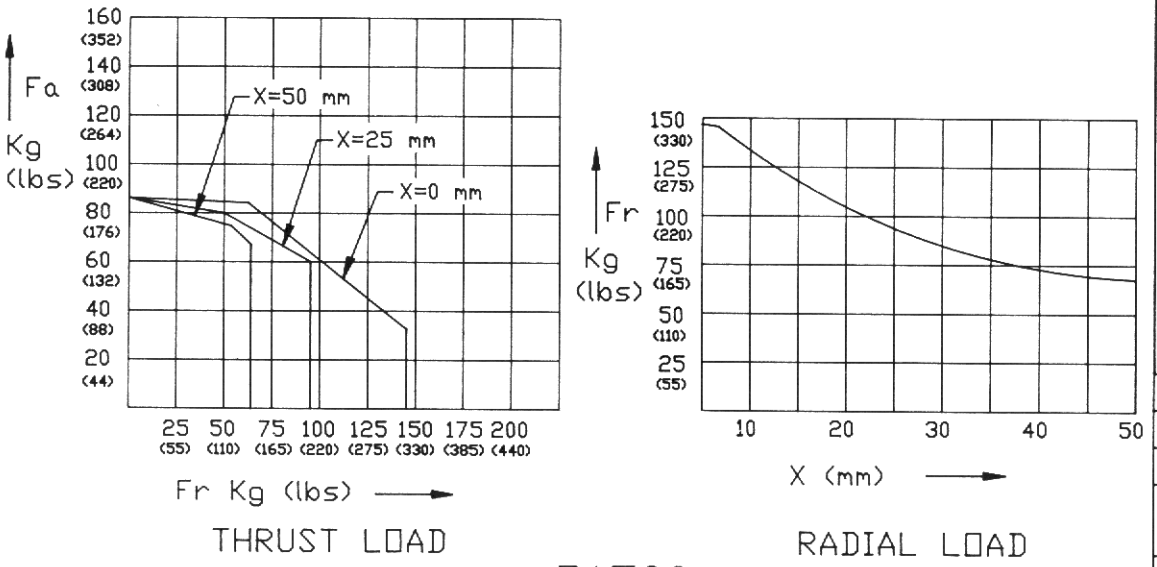
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)	DRAWN BY BAIER		DRAWING NUMBER IM-BLM7
TOLERANCES: X.X± ----- ANGULAR ± -- ; X.XX± --- ; X.XXX± --	AutoCAD FILE LOCATION Q:\DFTG\MDPAK7\MOTOR		
	B	DATE 12/06/93	SCALE ---	SHEET NO. 3 OF 12	REVISION E



THRUST LOAD

RADIAL LOAD

R1000

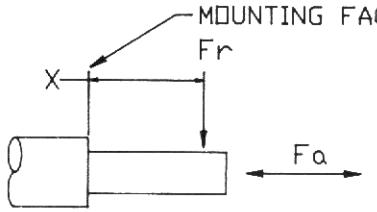


THRUST LOAD

RADIAL LOAD

R1500

DATE	SYM	REVISION RECORD	DR	CK	CK
12/06/93	0	PER ECN 93-272	EB	EB	ELS
05/26/94	A	PER ECN 94-140	DAD	ELS	
05/01/95	B	PER ECN 95-120	CWB	EB	
08/04/96	C	PER ECN 96-237	EB		
02/17/97	D	PER ECN 97-057	CWB	EB	
09/17/98	E	PER ECN 97-258	CWB		



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CHECKED BY E.BAIER	DATE 01/94	
APPROVED BY ELS	DATE 01/94	
APPROVED BY ELS	DATE 06/94	
MATERIAL ----------		
FINISH ----------		

TITLE: MOTOR OUTLINE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ----- ANGULAR
X.XX± ---
X.XXX± --
± --

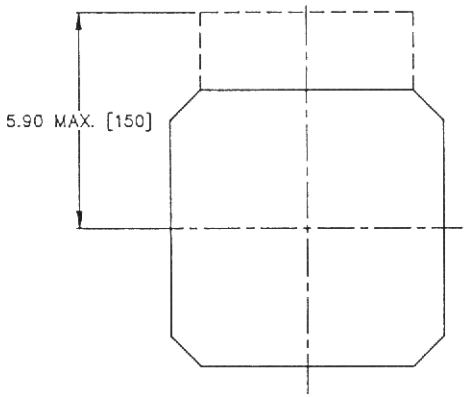
DRAWN BY: BAIER
AutoCAD FILE LOCATION: Q:\DFTG\MDPAK7\MOTOR

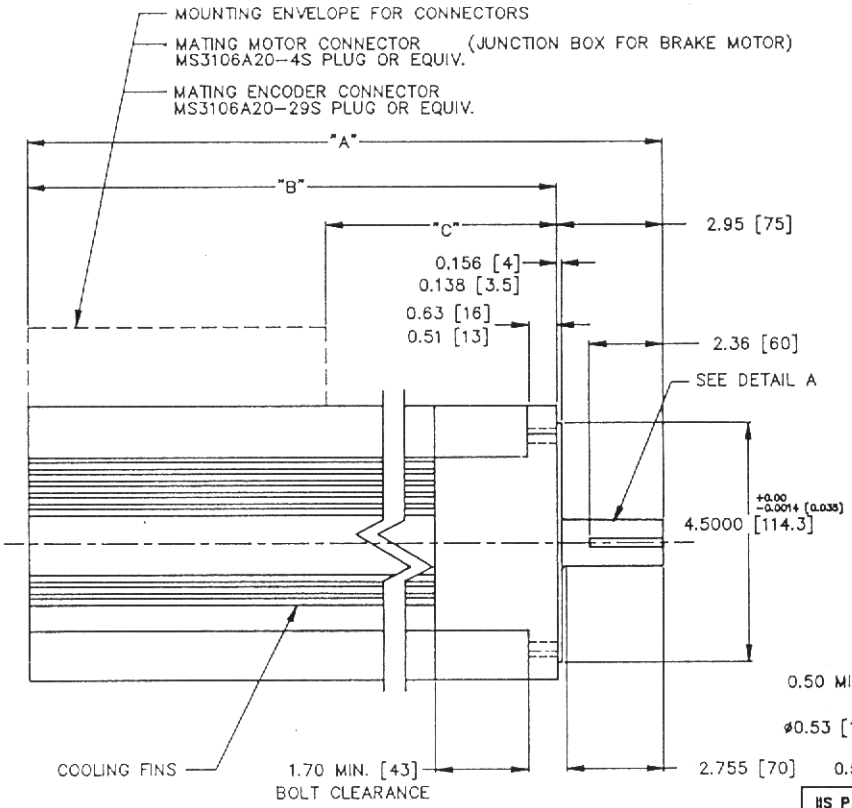
DRAWING NUMBER: IM-BLM7

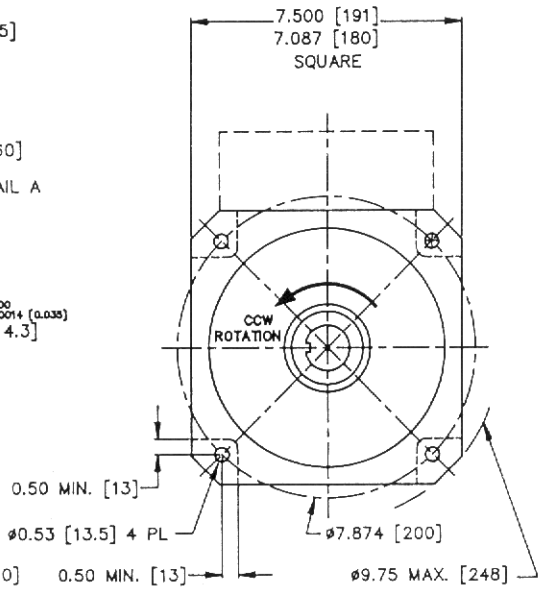
B | DATE 12/06/93 | SCALE 3=1 | SHEET NO. 4 OF 12 | REVISION E

NOTES:
1. MOTOR CAN BE MOUNTED IN ANY POSITION.
2. ALL DIMENSIONS ARE IN INCHES (MM).
3. IP-65 SEALING OR IPS-67 SEALING OPTIONAL
4. 0° TO 40°C OPERATING ENVIRONMENT
   MOUNTED ON 12" X 12" X .5" ALUM PLATE
5. ALL PAINTED SURFACES ARE BLACK.

DATE	SYM	REVISION RECORD	DR	CK	CK
12/06/93	0	PER ECN 93-272	EB	EB	ELS
05/26/94	A	PER ECN 94-140	DD	ELS	
05/01/95	B	PER ECN 95-120	CWB		
09/04/96	C	PER ECN 96-237	EB		
02/17/97	D	PER ECN 97-057	CWB		
09/17/98	E	PER ECN 97-258	CWB		

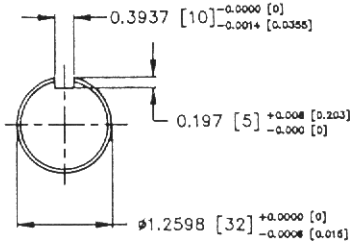






IIS PART NO.	WATTS	"A" DIM MAX	"B" DIM MAX	"C" DIM
BLM7-R2000	2000W	16.57 [421]	13.60 [346]	6.14 [156]
BLM7-R3000	3000W	17.95 [455]	15.00 [380]	7.60 [193]
BLM7B-R3000	3000W	19.52 [496]	16.57 [421]	14.19 [360]
BLM7-R3700	3700W	19.49 [495]	16.55 [420]	9.09 [231]
BLM7-M3700	3700W	17.33 [440]	14.38 [365]	11.06 [281]

DETAIL "A"



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(716) 924-9181 FAX: (716) 924-2169

CHECKED BY E.BAIER	DATE 01/94
APPROVED BY ELS	DATE 01/94
APPROVED BY ELS	DATE 06/94
MATERIAL ----------	
FINISH ----------	

TITLE: MOTOR OUTLINE

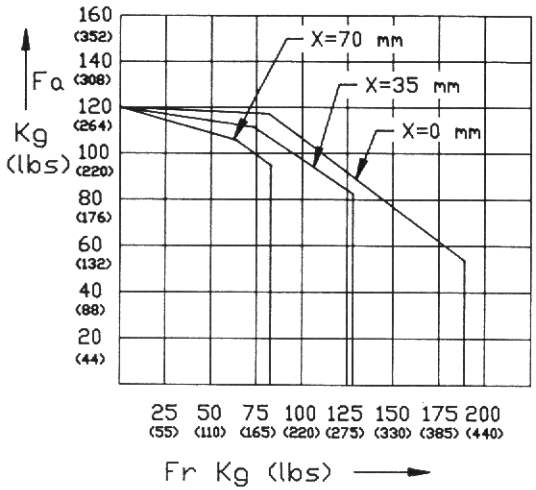
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ------ ANGULAR
X.XX± ---- ± --
X.XXX± ---

DRAWN BY BAIER
AutoCAD FILE LOCATION Q:\DFTG\MDPAK7\MOTOR

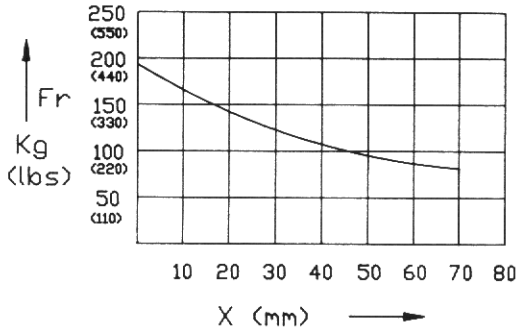
DRAWING NUMBER IM-BLM7

B | DATE 12/06/93 | SCALE ---

SHEET NO. 5 OF 12 | REVISION E

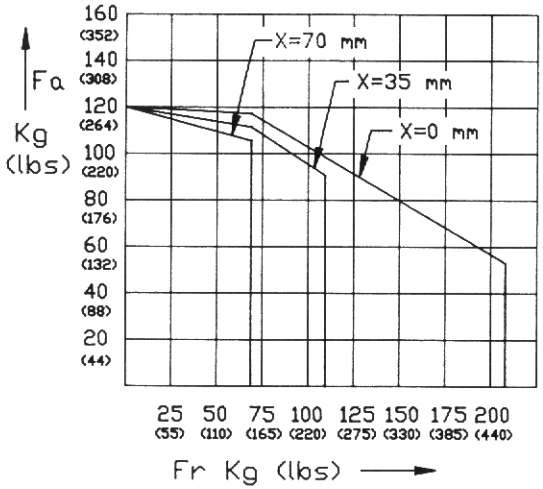


THRUST LOAD

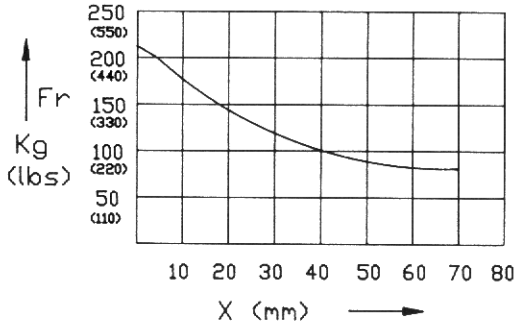


RADIAL LOAD

R2000



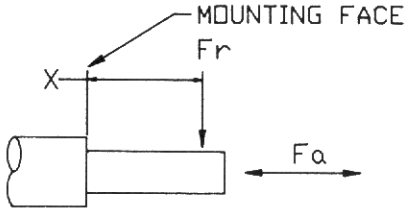
THRUST LOAD



RADIAL LOAD

△A R3000, R3700 & M3700

DATE	SYM	REVISION RECORD	DR	CK	CK
12/06/93	0	PER ECN 93-272	EB	EB	ES
05/26/94	A	PER ECN 94-140	DAD	ELS	
05/01/94	B	PER ECN 95-120	CWB		
09/04/96	C	PER ECN 96-237	EB		
02/17/97	D	PER ECN 97-057	CWB		
09/17/98	E	PER ECN 97-258	CWB		



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626 FISHERS RUN
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CHECKED BY E.BAIER	DATE 01/94	
APPROVED BY ELS	DATE 01/94	
APPROVED BY ELS	DATE 06/94	
MATERIAL ----------		
FINISH ----------		

TITLE: MOTOR OUTLINE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ----
X.XX± ---
X.XXX± --
ANGULAR ± --

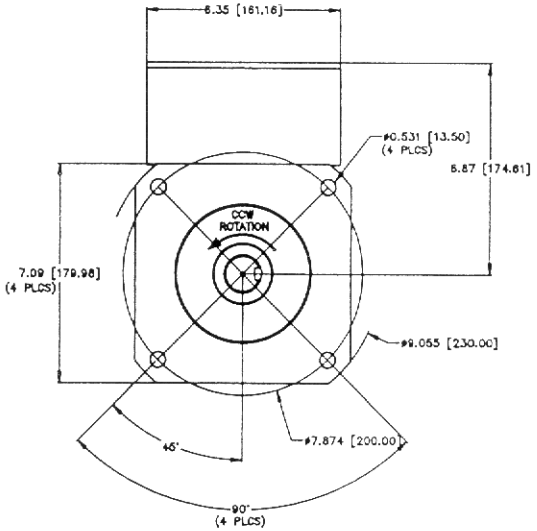
DRAWN BY: BAIER
AutoCAD FILE LOCATION: Q:\DFTG\MDPAK7\MOTOR

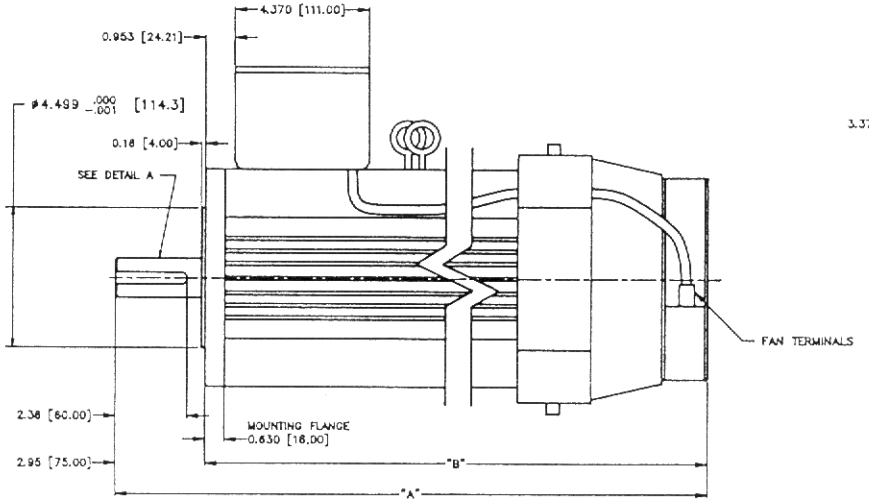
DRAWING NUMBER: IM-BLM7

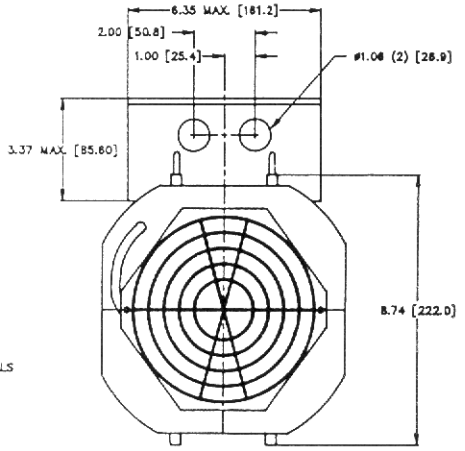
B | DATE 12/06/93 | SCALE 3=1 | SHEET NO. 6 OF 12 | REVISION E

NOTES:
1. MOTOR CAN BE MOUNTED IN ANY POSITION.
2. ALL DIMENSIONS ARE IN INCHES (MM).
3. IP-65 SEALING OR IPS-67 SEALING OPTIONAL
4. 0° TO 40°C OPERATING ENVIRONMENT
   MOUNTED ON 12" X 12" X .5" ALUM PLATE
5. ALL PAINTED SURFACES ARE BLACK.

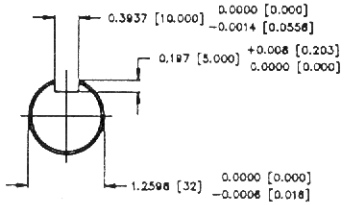
DATE	SYM	REVISION RECORD	DR	CK	CK
12/06/93	0	PER ECN 93-272	EB	EB	ELS
05/26/94	A	PER ECN 94-140	DD	ELS	
05/01/95	B	PER ECN 95-120	CWB	JB	WES
09/06/96	C	PER ECN 96-237	EB		
02/17/97	D	PER ECN 97-057	CWB	CB	
09/17/97	E	PER ECN 97-258	CWB	?'s	







DETAIL "A"
ENLARGED



IIS PART NO.	WATTS	"A" DIM MAX	"B" DIM MAX
BLM7-R5500F	5500	19.29 [490]	16.34 [415]
BLM7-R7500F	7500	21.85 [555]	18.89 [480]

B

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626 FISHERS RUN
VICTOR, NEW YORK 14564
(716) 924-9181 FAX: (716) 924-2169

CHECKED BY	DATE
APPROVED BY	DATE
APPROVED BY	DATE
MATERIAL	----------
FINISH	----------

TITLE: MOTOR OUTLINE

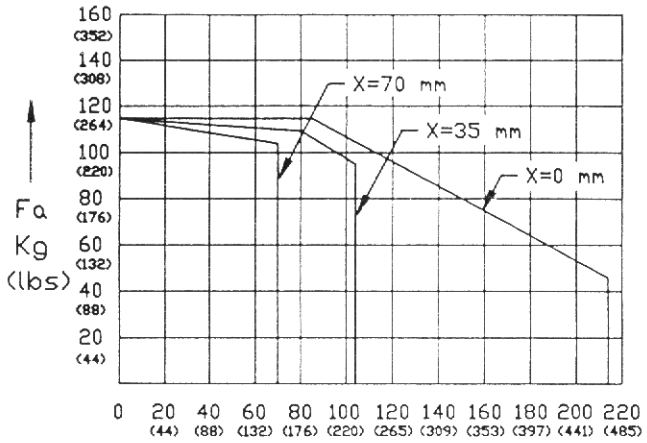
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES: X.X± ----- ANGULAR ± --- ; X.XX± --- ; X.XXX± --

DRAWN BY: BOWMAN
AutoCAD FILE LOCATION: Q:\DFTG\MDPAK7\MOTOR

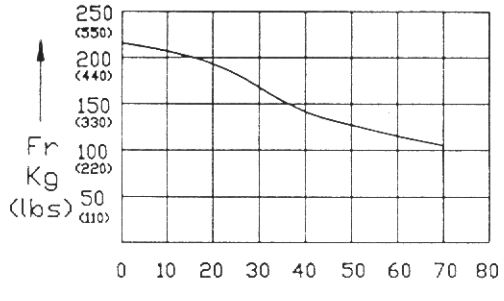
DRAWING NUMBER: IM-BLM7

B | DATE 12/06/93 | SCALE --- | SHEET NO. 7 OF 12 | REVISION E

DATE	SYM	REVISION RECORD	DR	CK	CK
12/06/93	0	PER ECN 93-272	EB	EB	ES
05/26/94	A	PER ECN 94-140	DAD	ELS	
05/01/95	B	PER ECN 95-120	CWB	RR	
09/04/96	C	PER ECN 96-237	EB	EB	
02/17/97	D	PER ECN 97-057	CWB	RR	
09/17/98	E	PER ECN 97-258	CWB	RSS	

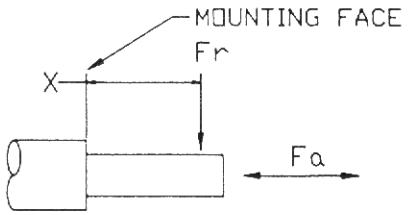


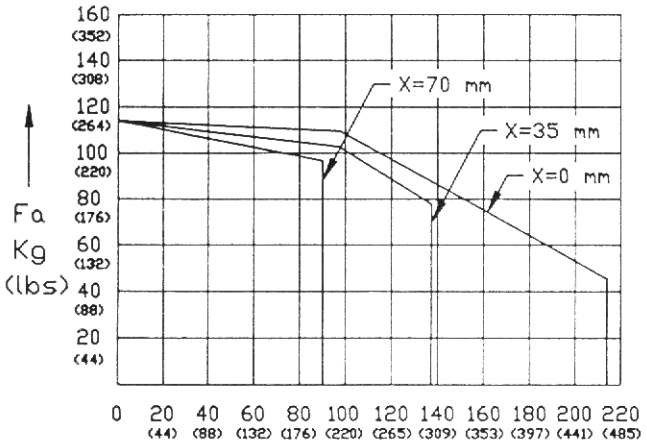
THRUST LOAD



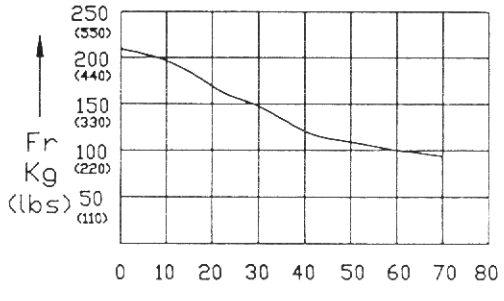
RADIAL LOAD

Ⓑ R5500





THRUST LOAD



RADIAL LOAD

Ⓑ R7500

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(716) 924-9181 FAX: (716) 924-2169

CHECKED BY | DATE
APPROVED BY | DATE
APPROVED BY | DATE
MATERIAL ----------
FINISH ----------

TITLE: MOTOR OUTLINE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES
X.X± ----- ANGULAR ± --
X.XX± ---
X.XXX± ---

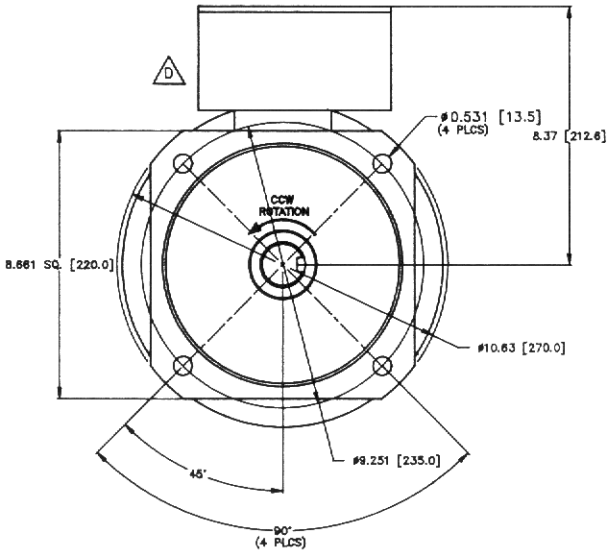
DRAWN BY: BOWMAN
AutoCAD FILE LOCATION: Q:\DFTG\MDPAK7\MOTOR

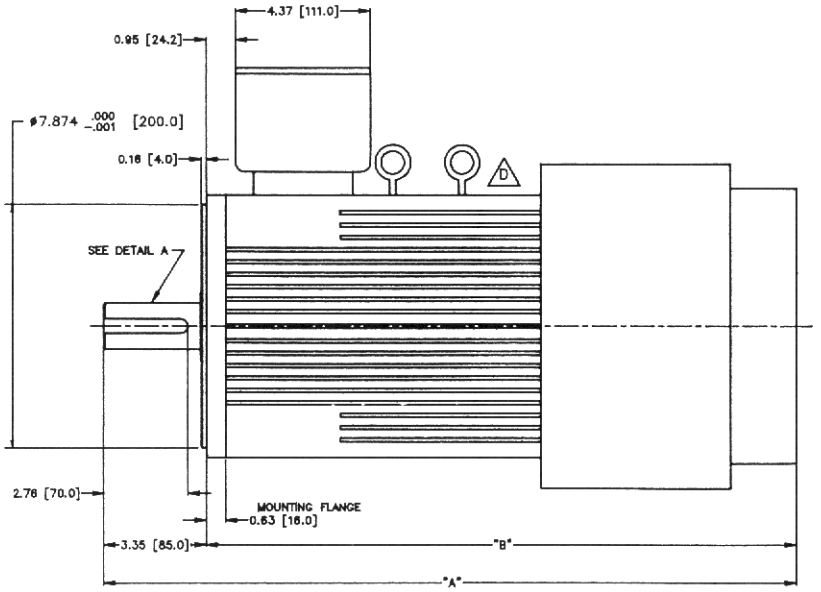
DRAWING NUMBER: IM-BLM7

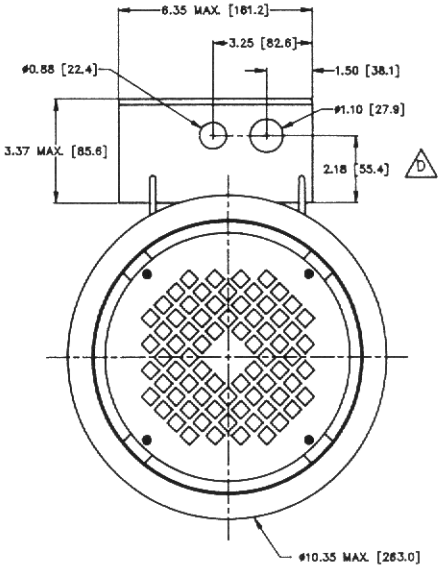
B | DATE 12/06/93 | SCALE 3=1 | SHEET NO. 8 of 12 | REVISION E

NOTES:
1. MOTOR CAN BE MOUNTED IN ANY POSITION.
2. ALL DIMENSIONS ARE IN INCHES (MM).
3. IP-65 SEALING OR IPS-67 SEALING OPTIONAL
4. 0° TO 40°C OPERATING ENVIRONMENT
   MOUNTED ON 12" X 12" X .5" ALUM PLATE
5. ALL PAINTED SURFACES ARE BLACK.

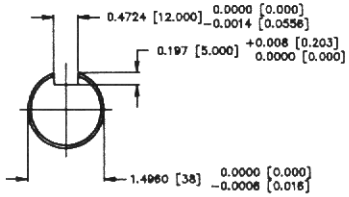
DATE	SYM	REVISION RECORD	DR	CK	CK
12/06/93	0	PER ECN 93-272	EB	EB	ELS
05/26/94	A	PER ECN 94-140	DD	ELS	
05/01/95	B	PER ECN 95-120	CWB	EB	
09/04/96	C	PER ECN 96-237	EB	JC	
02/17/97	D	PER ECN 97-057	CWB		
09/17/98	E	PER ECN 97-258	CWB	YC	







DETAIL "A"
ENLARGED



IIS PART NO.	WATTS	"A" DIM MAX	"B" DIM MAX
BLM7-R11000F	11000	22.59 [573.87]	19.25 [488.87]

B

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626 FISHERS RUN
VICTOR, NEW YORK 14564
(716) 924-9181 FAX: (716) 924-2169

CHECKED BY	DATE
APPROVED BY	DATE
APPROVED BY	DATE
MATERIAL	----------
FINISH	----------

TITLE: MOTOR OUTLINE

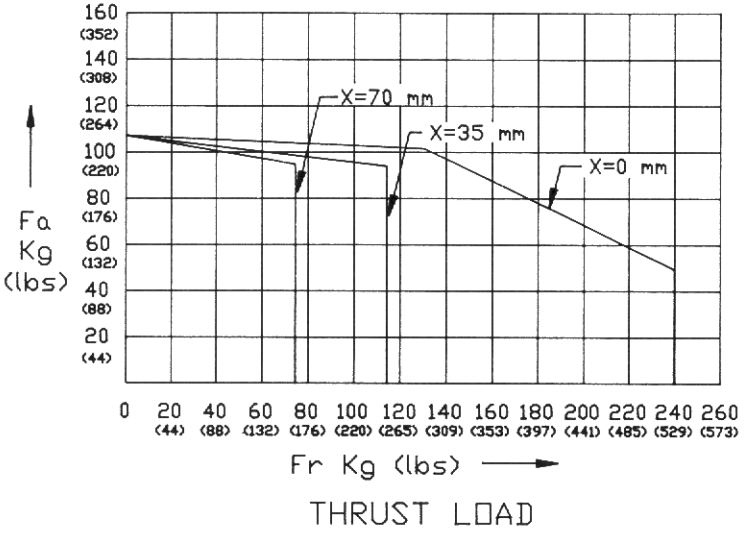
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES: X.X± ----- ANGULAR ± --- ; X.XX± --- ; X.XXX± --

DRAWN BY: BOWMAN
AutoCAD FILE LOCATION: Q:\DFTG\MDPAK7\MOTOR

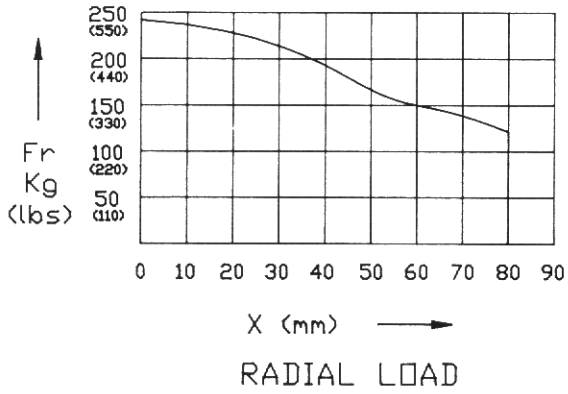
DRAWING NUMBER: IM-BLM7

B | DATE 12/06/93 | SCALE --- | SHEET NO. 9 OF 12 | REVISION E

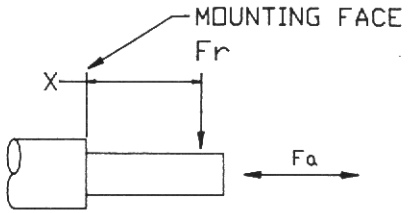
DATE	SYM	REVISION RECORD	DR	CK	CK
12/06/93	0	PER ECN 93-272	EB	EB	ELS
05/26/94	A	PER ECN 94-140	DAD	ELS	
05/01/95	B	PER ECN 95-120	CWB	EB	ELS
09/04/96	C	PER ECN 96-237	EB		
02/17/97	D	PER ECN 97-057	CWB	EB	
09/17/98	E	PER ECN 97-258	CWB	ELS	



THRUST LOAD



RADIAL LOAD



B R11000

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CHECKED BY	DATE
APPROVED BY	DATE
APPROVED BY	DATE
MATERIAL	----------
FINISH	----------

TITLE: MOTOR OUTLINE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)

TOLERANCES: X.X± ----- ANGULAR ± --; X.XX± ---; X.XXX± --

DRAWN BY: BOWMAN

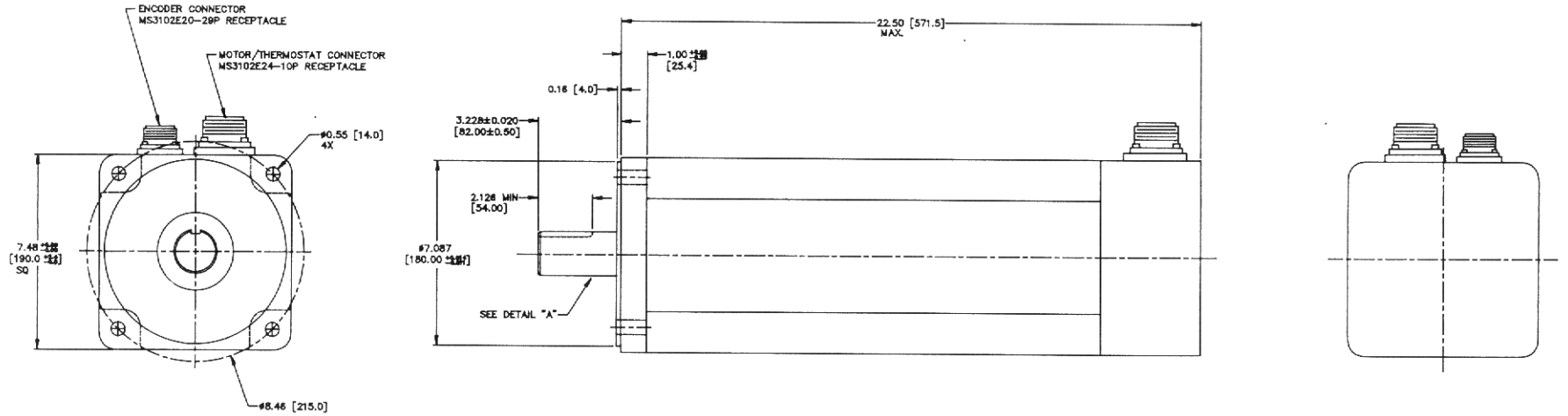
AutoCAD FILE LOCATION: Q:\DFTG\MDPAK7\MOTOR

DRAWING NUMBER: IM-BLM7

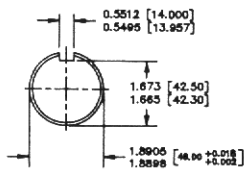
B | DATE 12/06/93 | SCALE 3=1 | SHEET NO. 10 OF 12 | REVISION E

NOTES:
1. MOTOR CAN BE MOUNTED IN ANY POSITION.
2. ALL DIMENSIONS ARE IN INCHES [MM].
3. IP-65 SEALING OR IPS-67 SEALING OPTIONAL
4. 0° TO 40°C OPERATING ENVIRONMENT
   MOUNTED ON 12" X 12" X .5" ALUM PLATE
5. ALL PAINTED SURFACES ARE BLACK.

DATE	SYM	REVISION RECORD	DR	CK	CK
12/06/93	0	PER ECN 93-272	EB	EB	ELS
05/26/94	A	PER ECN 94-140	DD	ELS	
05/01/95	B	PER ECN 95-120	CWB	EB	
09/04/96	C	PER ECN 96-237	EB	JC	
02/17/97	D	PER ECN 97-057	CWB	EB	
09/17/98	E	PER ECN 97-258	CWB	JC	



DETAIL "A"
MOTOR SHAFT DIMENSIONS



IIS PART NO.	WATTS
BLM7-R12100	12100

A

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CHECKED BY — DATE
APPROVED BY — DATE
APPROVED BY — DATE
MATERIAL: ----------
FINISH: ----------

TITLE: MOTOR OUTLINE

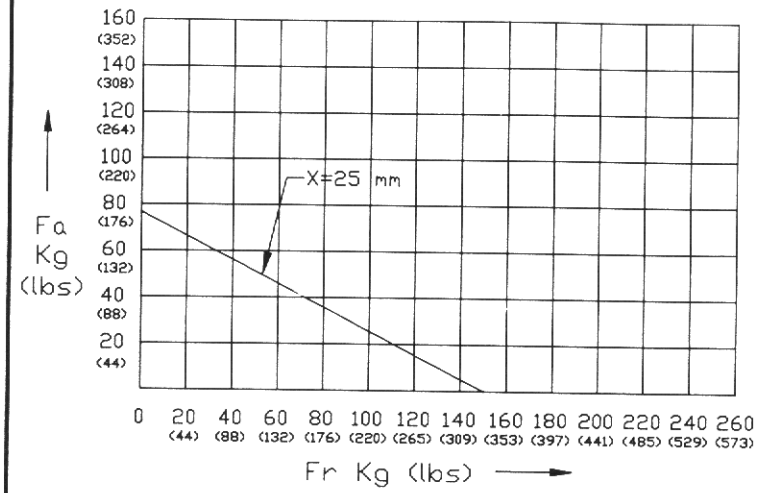
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES: X.X± ----- ANGULAR ± --
X.XX± ---
X.XXX± --

DRAWN BY: BOWMAN
AutoCAD FILE LOCATION: Q:\DFTG\MDPAK7\MOTOR

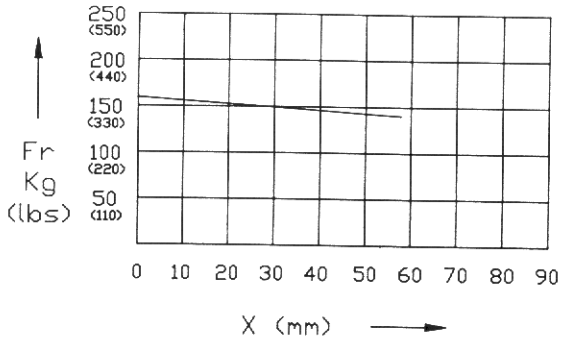
DRAWING NUMBER: IM-BLM7

B | DATE: 17SEP98 | SCALE: ---- | SHEET NO.: 11 OF 12 | REVISION: E

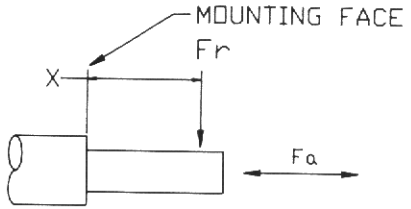
DATE	SYM	REVISION RECORD	DR	CK	CK
12/06/93	0	PER ECN 93-272	EB	EB	ELS
05/26/94	A	PER ECN 94-140	DAD	ELS	
05/01/95	B	PER ECN 95-120	CWB	EB	
09/04/96	C	PER ECN 96-237	EB	JC	
02/17/97	D	PER ECN 97-057	CWB		
09/17/98	E	PER ECN 97-258	CWB		



THRUST LOAD



RADIAL LOAD



(E) R12100

CHECKED BY	DATE
APPROVED BY	DATE
APPROVED BY	DATE
MATERIAL	----------
FINISH	----------

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TITLE: MOTOR OUTLINE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)	DRAWN BY: BOWMAN		DRAWING NUMBER: IM-BLM7
TOLERANCES: X.X± ---- X.XX± --- X.XXX± -- ANGULAR ± --	AutoCAD FILE LOCATION: Q:\DFTG\MDPAK7\MOTOR		
B	DATE: 17SEP98	SCALE: 3=1	SHEET NO.: 12 OF 12 / REVISION: E

3.6 SEQUENCE OF POWER ON

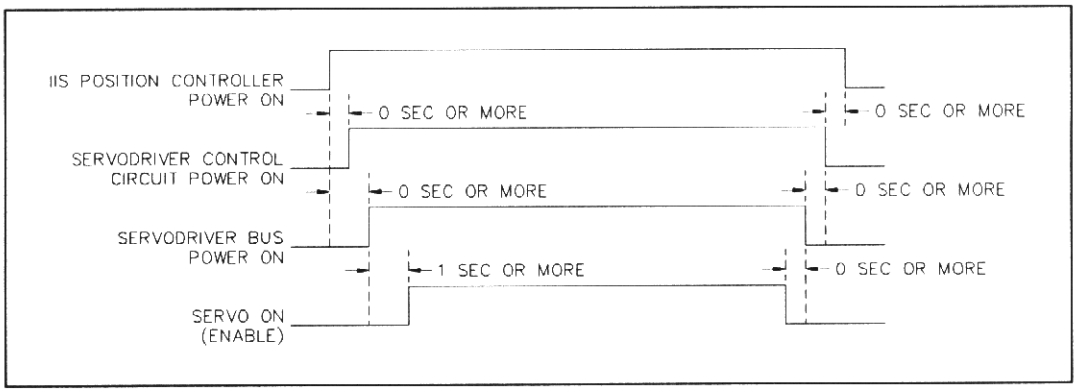


Figure 3.7

3.7 MODES OF OPERATION

The MDPAK7 series motor/drive packages are capable of running in four different modes of operation depending on the configuration of I/O points and parameter settings. The default mode of operation is External Position Loop Mode (EPLM). The drive can be reconfigured into any of the following modes using drive parameters and I/O points.

- External Position Loop Mode (EPLM)

Direct interface with IIS' line of positioning controllers
All digital parameter settings
Torque or speed loop control
Programmable or external analog torque limit
Programmable low speed output
Direct encoder feedback to positioner

- Torque Control Mode (TCM)

+/- 10V analog torque reference command
Programmable speed limit
Programmable torque command polarity and scale factor
Programmable or external analog torque limit
Switchable to speed mode with I/O point
Auto tuning functions

- **Speed Control Mode (SCM)**

+/- 10V analog speed reference command
Programmable speed limit
Programmable speed command polarity and scale factor
Programmable or external analog torque limit
Switchable to torque mode with I/O point
Switchable to zero drift position lock with I/O point
Two internal speed presets
Programmable linear or quasi-S shape accel/decel profiles
Speed reached and programmable low speed outputs
Direction of rotation control
    Programmable
    I/O points
    Analog signal polarity
Auto tuning functions

- **Internal Position Loop Mode (IPLM)**

CW & CCW pulse inputs with programmable scaling
Programmable speed limit
Programmable or external analog torque limit
Forward and reverse overtravel limits
Position error counter reset I/O point
Positioning complete output
Switchable to speed mode with I/O point
Auto tuning functions

NOTE

This manual describes the MDPAK7 series motor drive packages applied in External Position Loop Mode with an IIS positioning controller. The following sections of the manual describe the subset of MDPAK7 features used in External Position Loop Mode. A separate technical manual is available that describes all the features of the MDPAK7.

SECTION 4 - CONTROLS AND OPERATION

4.1 SETTING PARAMETERS

Industrial Indexing Systems' MDPAK7 servodrives use all-digital controls. The parameters are preset at the factory for nominal applications. In some cases, a custom set of parameters may be preset into the drive. If parameters need to be verified or changed, refer to the following section. Parameters are set by means of easy-to-use pushbutton switches and LED monitor display on the servodriver's front panel, or by using an optional serial communciation adaptor.

4.1.1 USING THE PUSHBUTTON SWITCHES

To change settings, lift up the acrylic panel at the bottom of the servodrives front panel until it is locked in its upward position.

After making parameter settings using the pushbuttons, lower the acrylic panel to its protective position. A slight force is needed to unlock the panel from its upward position.

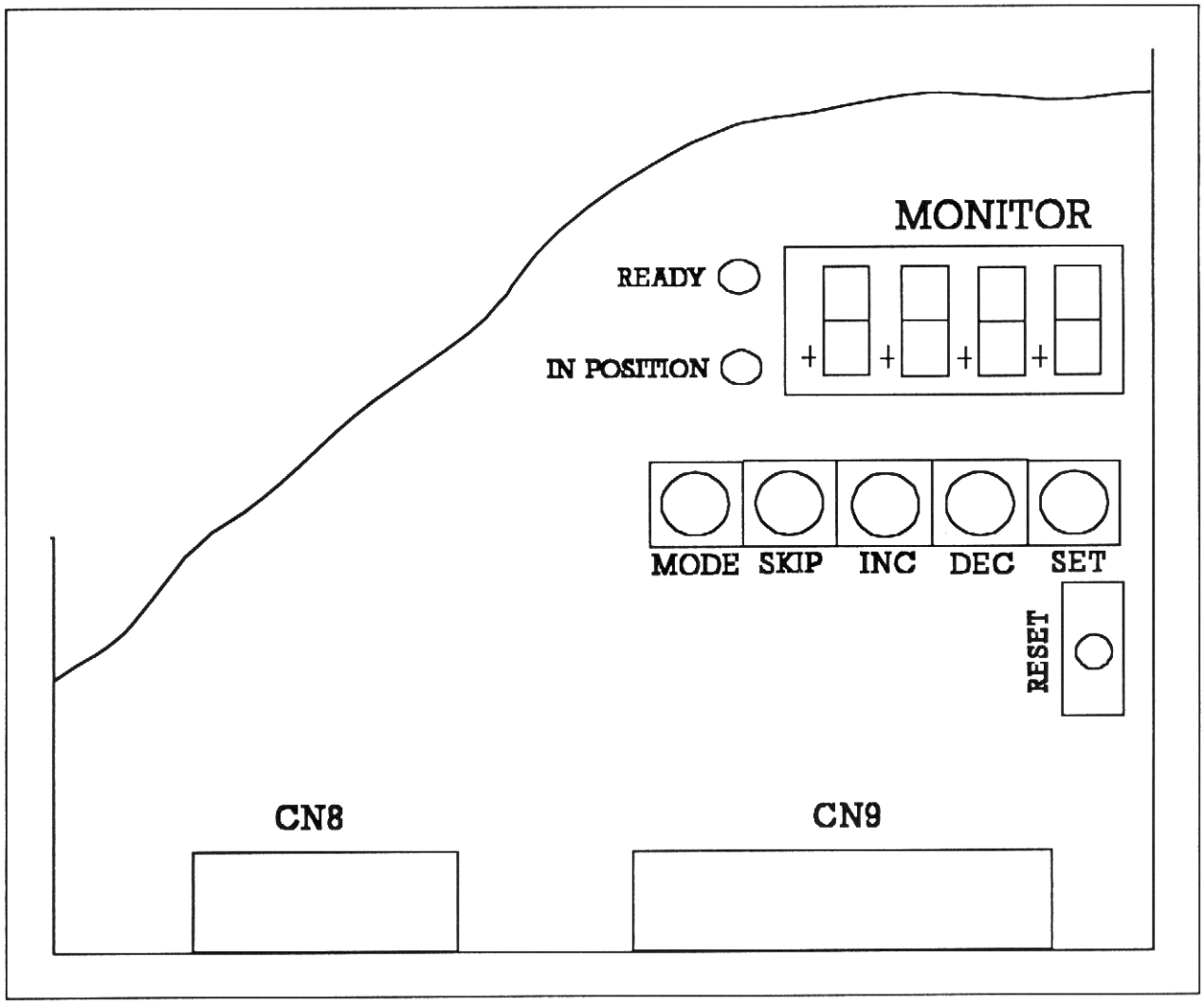


Figure 4.1 - Servo Drive Monitor & Pushbuttons

4.1.2 MONITOR DISPLAY CHARACTERS AND SWITCH FUNCTIONS

MONITOR LED: Displays <Parameter name>, <Parameter value> and <Operation state>. **Table 4.1** lists alphabet characters and numerals used for display.

Numerals	Alphabet Characters			
0	A	I	p	v
1	B	J	Q	W
2	b	K	q	X
3	C	L	R	Y
4	D	M	r	Z
5	d	N	S	- (minus)
6	E	n	T	+ (plus)
7	F	O	t	/
8	G	o	U	•
9	H	P	V	

Table 4.1 - LED Display Characters

- <Parameter value> is either a numeric value or alternative selection. See parameter descriptions and menu map for details.

- The display will change continually if any switch is pressed and held for more than one second.

- The display blinks when it changes from <Parameter name> to <Parameter value>, or from <Parameter value> to <Parameter name>.

[MODE] Button:

- When <Parameter name> is displayed:
  Each press of the MODE button causes the next succeeding <Parameter name> to be displayed. The MODE button sequences forward through the menu.

- When <Parameter value> or <Operation state> are displayed:
  Pressing the MODE button causes the display to change to next <Parameter name>.

- If the displayed <Parameter value> was modified, pressing the [MODE] button temporarily saves the <Parameter value> until the power is removed. Only the [SET] button stores <Parameter value> in the nonvolatile memory.

[SKIP] Button:

- When <Parameter name> is displayed:
  Each press of the [SKIP] button causes the previous <Parameter name> to be displayed. The [SKIP] button sequences backwards through the menu.

- When <Parameter name> is displayed:
  Display changes to <Operation state> when [MODE] and [SKIP] switches are pressed simultaneously. The programming menu is also set to the top.

[INC]/[DEC] Switch:

- When <Parameter value> is displayed:
  The lowest digit of <Parameter value> increases or decreases, or items for alternative selection are displayed alternately, as you press the [INC]/[DEC] switches. The displayed contents are reflected in the control of the system, but are not stored in nonvolatile memory. Accordingly, the contents will be lost when power is disconnected. All <Parameter values> return to the state before operation of these switches when power is reconnected. To store data in the system's nonvolatile memory, press the [SET] switch when <Parameter value> is displayed.

- When <Parameter value> is displayed:
  The higher digit of <Parameter value> increases or decreases (step change) by one when the [INC] or [DEC] and [SKIP] switches are pressed simultaneously. This is primarily used for large changes in the <Parameter values>.

[SET] Switch:

- When <Parameter name> is displayed:
  Pressing the [SET] button causes the display to change to <Parameter value>.

- When <Parameter value> is displayed:
  Pressing the [SET] button causes the <Parameter value> currently being displayed to be stored in the system's nonvolatile memory. After storing, the display moves to the next <Parameter name>.

CAUTION

TO SAVE THE REVISED PARAMETER VALUE IN NONVOLATILE MEMORY, DISPLAY THE <PARAMETER VALUE> AND PRESS THE [SET] SWITCH. ONLY THOSE PARAMETERS BEING DISPLAYED WILL BE SAVED IN NONVOLATILE MEMORY. IF THE REVISED CONTENTS ARE NOT SAVED IN NONVOLATILE MEMORY, THEY WILL BE LOST WHEN POWER TO THE SYSTEM IS DISCONNECTED, AND THE VALUE THAT WAS LAST [SET] INTO NONVOLATILE MEMORY WILL BE USED.

4.1.3 INITIALIZING PARAMETERS

All parameters are preset at the factory for nominal applications. In some cases, a custom set of parameters may be preset into the drive. If a custom set of parameters has been preset into the drive, a drawing with a part number starting with SU-49XXXX will be included in the system technical manual (TM-XXXXXX). Initializing all parameters using the following procedure will cause all parameters to go to the default values.

- How to initialize

1) Turn control power off. Press [Set] and [Reset] switches simultaneously.

2) Turn control power on while pressing both [SET] and [RESET] switches.

3) Release both switches at once. Initializing is completed when characters appear in the monitor LED.

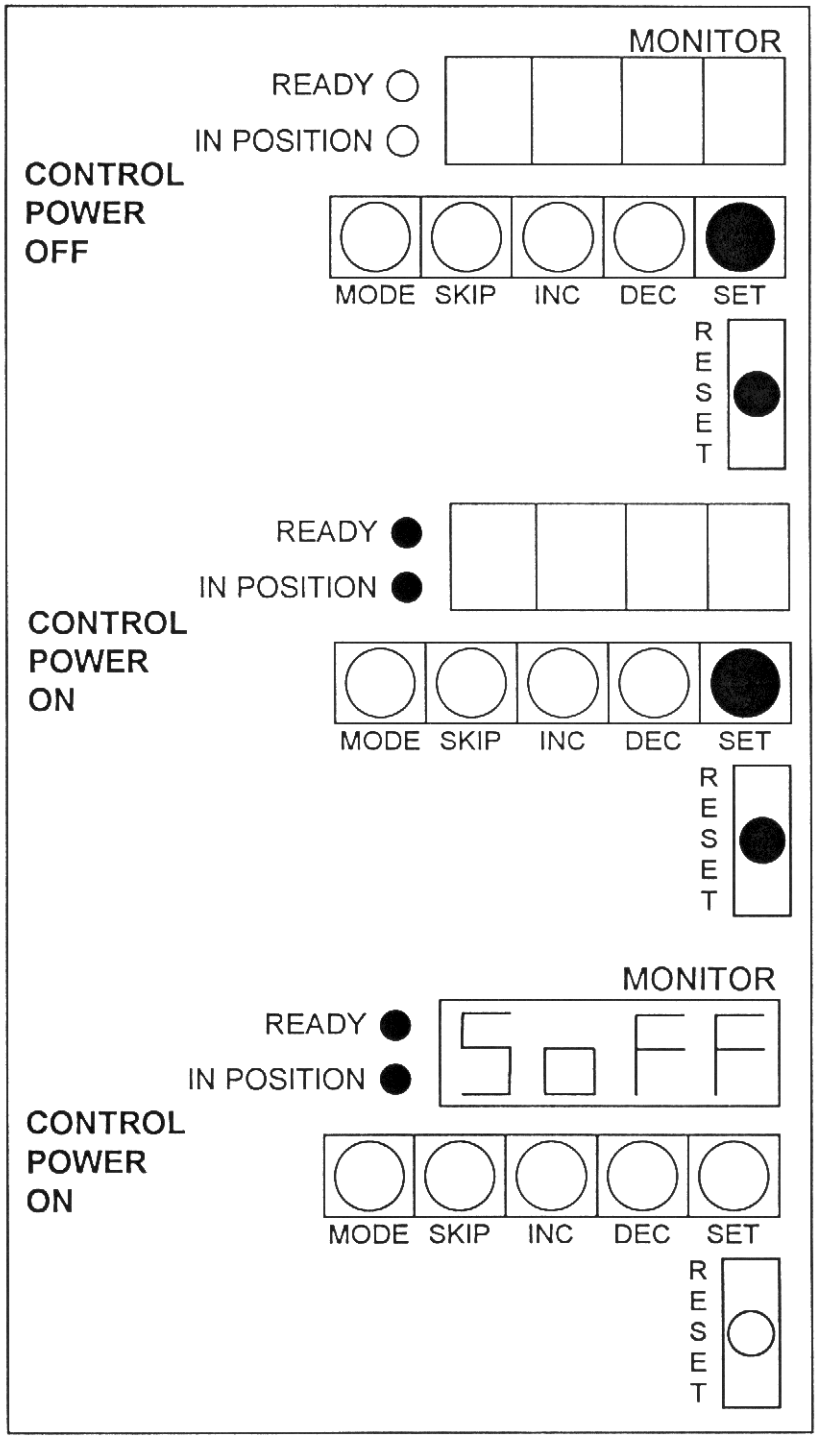


Figure 4.2

CAUTION

WHEN THE MDPAK7 SERVODRIVER IS INITAILIZED, ALL SYSTEM PARAMETERS ARE RESET TO THE DEFAULT VALUES. IF THE APPLICATION REQUIRES OTHER PARAMETER SETTINGS, MAKE NECESSARY CHANGES AFTER INITIALIZING THE SYSTEM.

4.1.4 OPERATION EXAMPLES (indicates flashing display)

Example 1) Changing display <Parameter name>

Switch operation	[MODE] [MODE] [SKIP] [SKIP]
Display	CtrL → CHG → AUto → CHG → Ctrl

Example 2) Changing display <Parameter name> then viewing <Parameter value>

Switch operation	[MODE] [SET] [MODE]
Display	SSCL → SLL → SLL → 1234 → SLL → S1

Example 3) Changing display <Parameter name> then move to top of menu <Operation state>

Switch operation	[MODE] [SKIP + MODE]
Display	Adt → tyPE → SoFF

Example 4) Changing <Parameter value> (Coarse tuning) and saving in nonvolatile memory

Switch operation	[SET] [SKIP + INC][SKIP + INC][SKIP + DEC] [SET]
Display	SLL → SLL → 1234 → 1334 → 1434 → 1334 → SLL → S1

Example 5) Changing <Parameter value> (Fine tuning) and saving in nonvolatile memory

Switch operation	[SET]	[INC]	[INC]	[DEC]	[SET]
Display	SLL → SLL → 1234 → 1235 → 1236 → 1235 → SLL → FLt				

Example 6) Changing <Parameter value> (Alternative) and saving in nonvolatile memory

Switch operation	[SET]	[INC]	[INC]	[INC]	[DEC]	[SET]
Display	AoUt → AoUt → SPd → trq → SPd → trq → SPd → AoUt → FLt					

Example 7) Changing <Parameter value> (Fine tuning) without saving in nonvolatile memory

Switch operation	[SET]	[INC]	[INC]	[DEC]	[MODE]
Display	SLL → SLL → 1234 → 1235 → 1236 → 1235 → SLL → FLt				

Example 8) Changing <Parameter value> (Alternative) without saving in nonvolatile memory

Switch operation	[SET]	[INC]	[INC]	[INC]	[DEC]	[MODE]
Display	AoUt → AoUt → SPd → trq → SPd → trq → SPd → AoUt → FLt					

CAUTION

IN EXAMPLES 7 AND 8, THE CHANGES MADE HAVE AN IMMEDIATE EFFECT ON THE OPERATION OF THE DRIVE BUT ARE NOT STORED IN NONVOLATILE MEMORY. CHANGES WILL BE LOST IF POWER IS REMOVED.

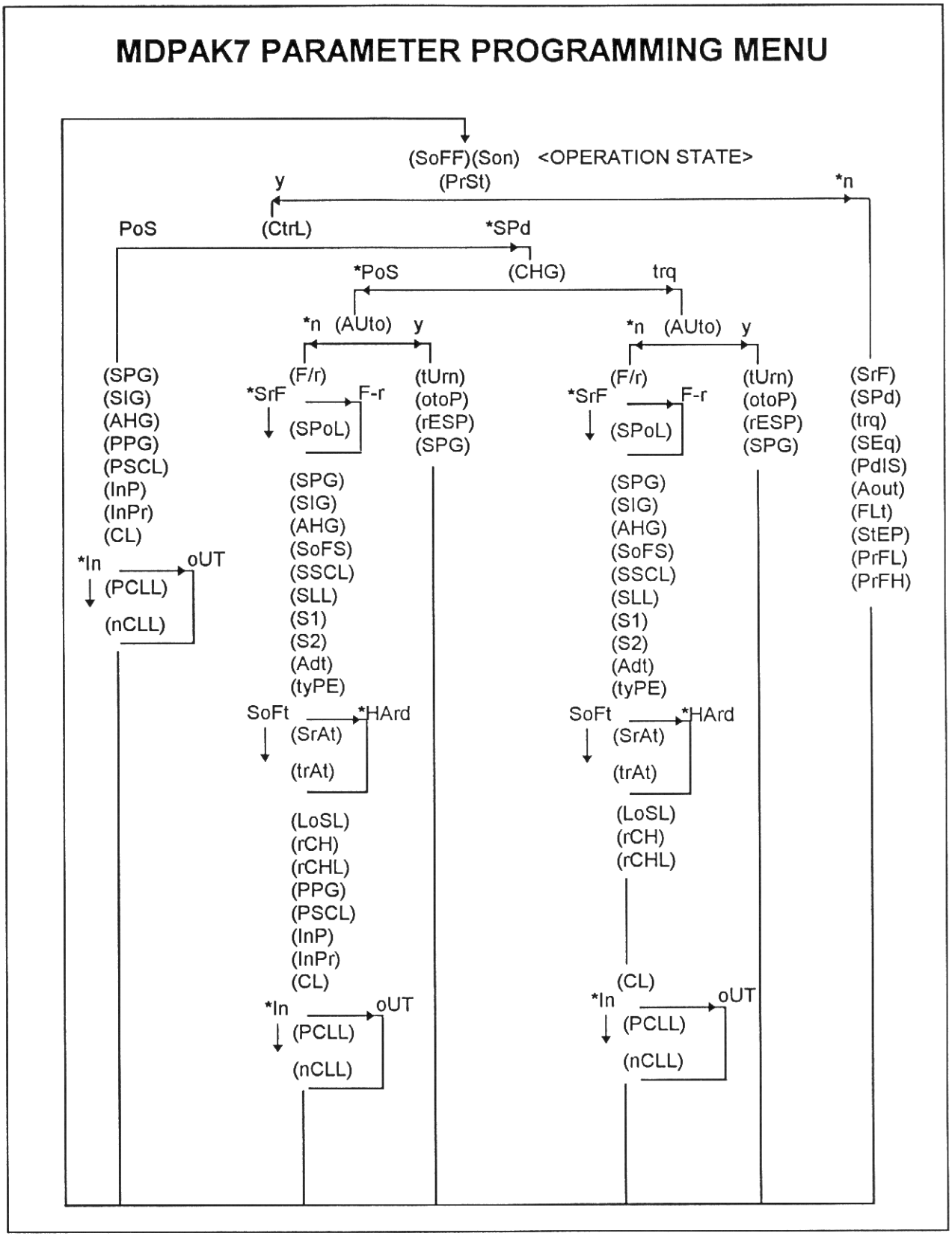

MDPAK7 PARAMETER PROGRAMMING MENU
(SoFF)(Son) <OPERATION STATE>
(PrSt)
y
*n
PoS
(CtrL)
*SPd
*PoS
(CHG)
trq
*n (AUto) y
*n (AUto) y
(SPG)
(SIG)
(AHG)
(PPG)
(PSCL)
(InP)
(InPr)
(CL)
*In
oUT
(PCLL)
(nCLL)
(F/r)
*SrF
F-r
(SPoL)
(tUrn)
(otoP)
(rESP)
(SPG)
(SPG)
(SIG)
(AHG)
(SoFS)
(SSCL)
(SLL)
(S1)
(S2)
(Adt)
(tyPE)
SoFt
*HArd
(SrAt)
(trAt)
(LoSL)
(rCH)
(rCHL)
(PPG)
(PSCL)
(InP)
(InPr)
(CL)
(SrF)
(SPd)
(trq)
(SEq)
(PdIS)
(Aout)
(FLt)
(StEP)
(PrFL)
(PrFH)

Figure 4.3

4.2 SYSTEM PARAMETERS

The MDPAK7 series motor/drive is preset at the factory to run in External Position Loop Mode (EPLM) for use with an IIS positioning system. The default parameters for this mode of operation are listed in **Appendix C.**

In some cases the parameters have been modified at the factory for specific application requirements. If the parameters have been modified from the defaults, a separate setup drawing (SU-49XXXX) will be included with the system documentation.

WARNING

MODIFYING THE DRIVE PARAMETERS SHOULD ONLY BE ATTEMPTED BY A QUALIFIED TECHNICIAN. INCORRECT SELECTIONS OR ADJUSTMENTS CAN SIGNIFICANTLY EFFECT THE DRIVE'S PERFORMANCE AND FUNCTION. IMPROPER SETTINGS MAY CAUSE ERRONEOUS MACHINE MOTIONS AND PERSONAL INJURY.

USE PARTICULAR CAUTION WHEN SETTING THE DRIVE GAIN PARAMETERS SPG, SIG, AHG AND PPG. IMPROPER SETTING CAN RESULT IN SEVERE MOTOR AND MACHINE VIBRATION.

4.2.1 SYSTEM PARAMETER DESCRIPTIONS

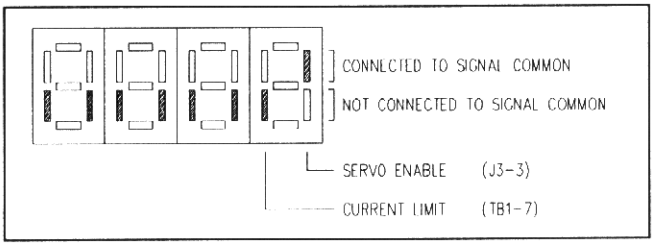
The system parameters shown in the following list are the parameters that may need to be adjusted for proper External Position Loop operation. All parameters not listed are set to their default values. A complete list of parameters is shown in **Appendix B.**

Parameter name	Valid mode	Contents of parameter	Default settings
Speed loop gain S P G	EPLM	Parameter value range: 0 0 0 . 0 - 9 9 9 . 9 Used to set proportional gain for the speed control loop. The greater the value, the faster the response. However, too rapid a response results in unstable control. See **Section 6** for details about optimum settings.	xxxx
Speed loop integral gain S I G	EPLM	Parameter value range: 0 . 0 0 0 - 9 . 9 9 9 Used to set integral gain for the speed control loop. The greater the value, the faster the response. However, too rapid a response results in unstable control. See **Section 6** for details about optimum settings.	xxxx

xxxx Default parameter value depends on motor/drive size. See **Appendix C** for default settings.

Parameter name	Valid mode	Contents of parameter	Default settings
Speed loop differential gain A H G	EPLM	Parameter value range: 0. 0 0 0 - 1. 0 0 0 0 Used to set differential gain for the speed control loop. The greater the value, the better the response in case of a mechanical load disturbance. However, too greater a value results in unstable control. See **Section 6** for details about optimum settings.	xxxx
Speed command offset S o F S	EPLM	Parameter value range: +0 1 0 0 / -0 1 0 0 rpm Used to set offset of analog speed command.	0 0 0 0
Speed command scaling S S C L	EPLM	Parameter value range: 0 4 2 0 - 4 2 0 0 rpm Used to set command speed for a 10 VDC command input.	2 0 0 0
Low speed signal output level L o S L	EPLM	Parameter value range: 0 0 0 0 / 0 1 0 0 rpm Used to set the speed for outputting low speed signal TB1-8.	0 0 3 0
Current limit command condition C L	EPLM	Parameter selection: o U t, I n The MDPAK7 driver has the ability to limit the maximum motor current (torque). The limit can be set internally by setting parameter CL = In; then programming PCLL and nCLL to a percent of rated current (torque). If CL = oUT the current (torque) is limited using an external analog voltage. Parameter current limit: I n External current limit command: o U t	I n
Positive current limit level (CCW) P C L L	EPLM	Parameter value range: 0 0 0 0 / 0 2 6 0 Positive current limit value, if C L = I n.	0 2 6 0
Negative current limit level (CW) n C L L	EPLM	Parameter value range: 0 0 0 0 / 0 2 6 0 Negative current limit value, if C L = I n.	0 2 6 0

4.3 MONITOR DISPLAY FUNCTIONS

Parameter name	Valid mode	Contents of parameter	Default settings
Speed reference display S r F	ALL	Parameter value range: 4 0 0 0 / -4 0 0 0 rpm Displays the commanded or reference speed into the drive. Speed display is in RPM with (-) being CW.	S S S S
Actual speed display S P d	ALL	Parameter value range: 4 0 0 0 / -4 0 0 0 rpm Displays actual motor speed in rpm with (-) being CW.	S S S
Motor torque command t r q	ALL	Parameter value range: 2 6 0 % / -2 6 0 % Displays instantaneous torque being commanded to motor (-) is CW.	T T T
Input signal monitor S E q	ALL	Used to monitor the on/off state of control input signals.  	8 8 8 8
Position display P d I S	ALL	Parameter value range: -9 9 9 9 / 9 9 9 9 Motor position is displayed on LED monitor. The number is reset to 0 0 0 0 when power is applied. The value increases as the motor-shaft turns CCW, and decreases as it turns CW. Display is calibrated as 2000 bits/rev.	PPPP
Analog monitor output A o U t	EPLM	Parameter selection: S P d, t r q Used to select the signal to be applied to analog monitor output (see **Section 6.2**). S P d: Speed feedback signal t r q: Current command signal	S P d
Fault history F L T	ALL	Parameter values: Fault code Used to display the last fault recorded. See **Section 7.2** for Fault codes.	F F F

Parameter name	Valid mode	Contents of parameter	Default settings
Step operation cycle S t E P	ALL	Parameter value range: 0 0 0 0 / 0 0 6 3 If a value other than 0 0 0 0 is set to this parameter, forward or reverse motor-shaft revolution immediately starts as Servo on CN9-33 is turned on, at the internally set speed or the speed set by means of the external analog speed command CN9-16. This parameter is not stored in the system's memory, even if [Set] is pressed.	0 0 0 0
P r F L	ALL	Position Command (Low Part)	0 0 0 0
P r F H	ALL	Position Command (High Part)	0 0 0 0

NOTES

SECTION 5 - INSTALLATION

5.1 PRECAUTIONS FOR INSTALLING THE SERVO MOTOR

1. The motor is designed to be used in an atmosphere free of corrosive or flammable liquids and gases, free from accumulations of liquids, dust and metal particles. IP65 sealing is standard on all motors. Optional IP67 sealing is available for demanding environments.

2. The MDPAK7 servomotors are hot to the touch when running at full capacity. Case temperatures of over 100°C are possible. Keep all materials not capable of withstanding 100°C temperatures away from the motor. The motor must have at least 6 inches of free air space from all surfaces for proper operation.

CAUTION

USE PROTECTIVE GUARDS TO PREVENT HUMAN CONTACT WITH ROTATING COMPONENTS AND HOT MOTOR SURFACES.

3. Do not disassemble the motor. Disassembly may cause damage to internal encoder or rotor magnets.

4. Do not paint the motor. The surfaces of the motor are specially design to dissipate heat. Painting may cause motor overheating and failure.

5. When connecting the load to the servo motors shaft be sure to observe the thrust and radial load guidelines for that particular motor. See **Section 3.5** for thrust and radial load specifications.

6. Do not use a rigid coupling to connect the motor shaft to the load. Contact IIS for coupling recommendations.

7. Never apply high voltage directly to the motor or encoder. The motor is designed to be driven by the appropriate MDPAK7 driver.

8. Do not connect a motor to a driver other than the one specifically designed for the motor. Damage to the motor and/or driver may result. Always match the motor and driver wattage for proper operation. See **Section 3** for specifications and **Appendix D** for proper combinations.

9. Do not subject the motor shaft to a sharp blow. Do not force the motor shaft axially in or out of the motor case. Excessive sharp blows or axial loading may damage the encoder. See **Section 3.5** for maximum axial loading.

5.2 PRECAUTIONS FOR MOUNTING THE SERVO DRIVER

1. The driver is designed to be used in an atmosphere free from corrosive or flammable liquids or gases, free from accumulations of liquids, dust and metal particles.

2. The driver is designed to be mounted vertically on a metal surface such as the mounting panel of an electrical enclosure. When mounting the BSD7-R11000EC inside an enclosure, the bottom of the enclosure must be solid. **Figures 5.1 and 5.2** illustrate proper mounting and spacing.

3. Do not disassemble the servo driver. The driver contains sensitive electrical circuits.

4. Do not connect a driver to a motor not specifically designed for the driver. Damage to the motor and/or driver may result. Always match the driver and motor wattage for proper operation. See **Section 3** for specifications and **Appendix D** for proper combinations.

5. Be sure to verify the main power to the driver is within specification. IIS offers a full line of voltage matching transformers. See **Section 3** for specifications and **Section 5.12** for voltage matching transformers.

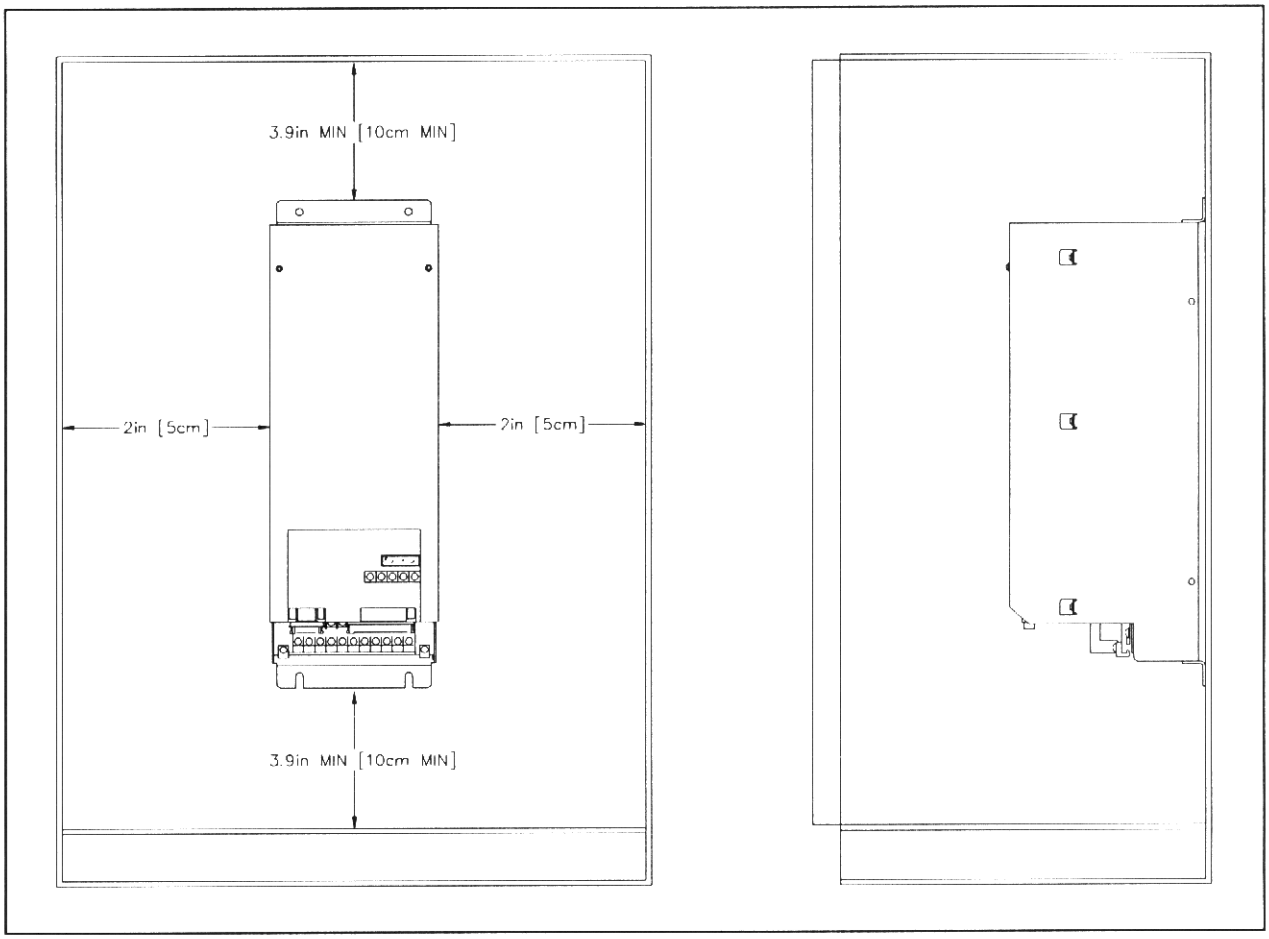


Figure 5.1

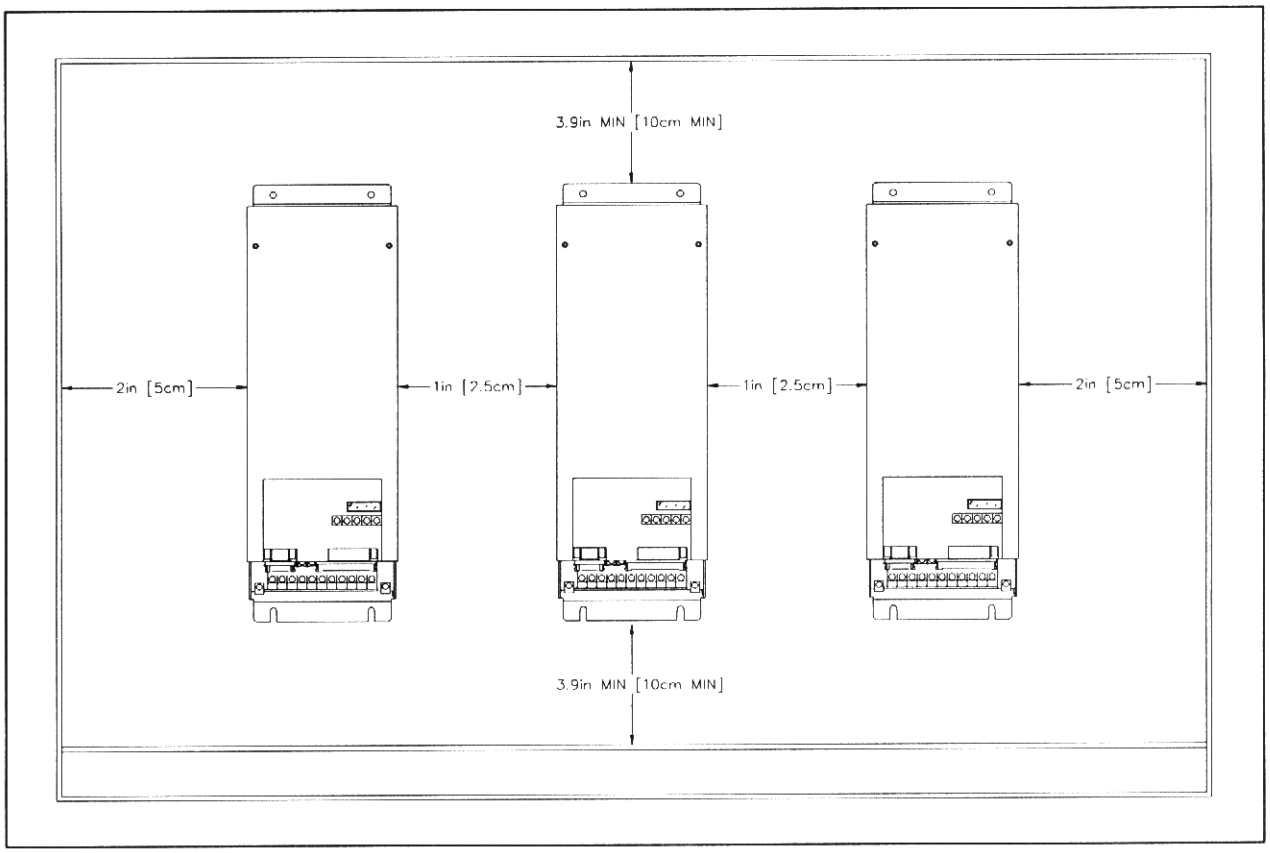

3.9in MIN [10cm MIN]
2in [5cm]
1in [2.5cm]
1in [2.5cm]
2in [5cm]
3.9in MIN [10cm MIN]

Figure 5.2

5.3 DRIVER COOLING CONSIDERATIONS IN AN UNVENTILATED CABINET

When the servo driver is installed in an unventilated cabinet, all necessary heat dissipation must be done using the cabinet's surface. Use the following formula to calculate the cabinet-surface area required for convection cooling.

$$S = \frac{1.95 \times P(W)}{50 - Tmax\ (°C)}$$

Where,
- $S(ft^2)$: Cabinet surface area except its bottom
- P(W) : Total heat dissipation for all servo drivers mounted in cabinet. Heat dissipation equals 10% of the motor's rated capacity.
- Tmax (°C) : Maximum temperature around cabinet

Example: Two 1 kW drivers are to be installed in a cabinet and the maximum outside ambient temperature is 40°C (104°F).

$$P(W) = (0.1 \times 1000) + (0.1 \times 1000)\ 200$$

$$S = \frac{1.95 \times 200}{(50 - 40)} = 40\ (ft^2)$$

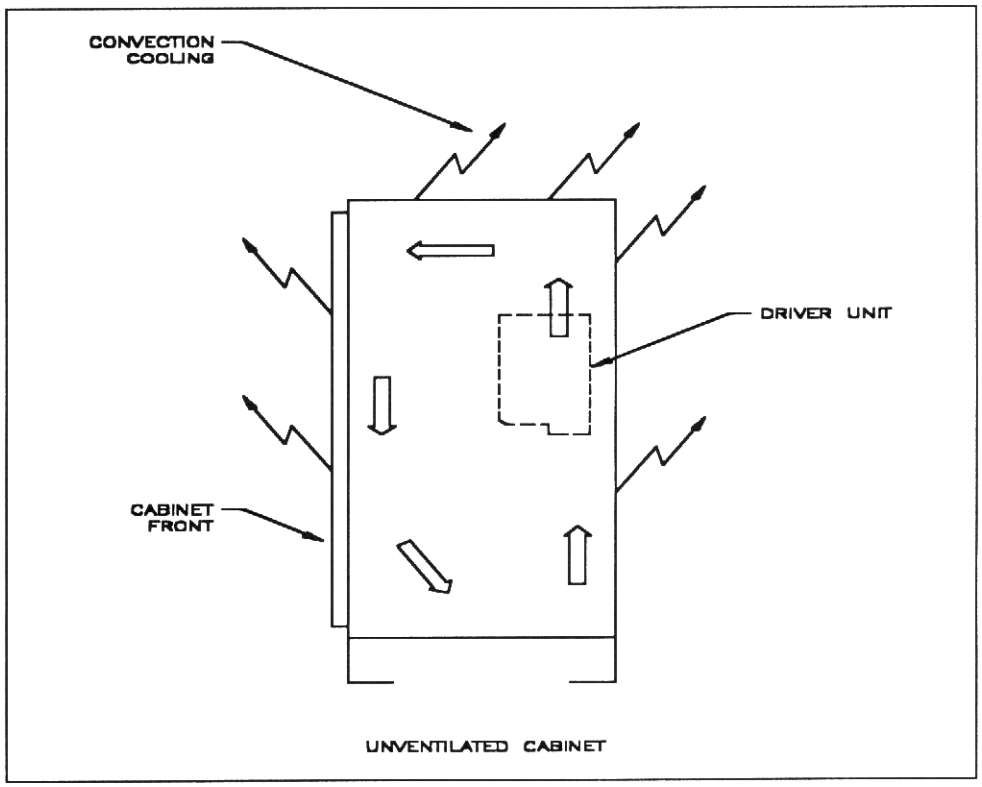


Figure 5.3

5.4 DRIVER COOLING CONSIDERATIONS IN A VENTILATED CABINET

When a fan-cooled cabinet is used to house the servo drivers, all heat dissipation must be removed be means of a fan that circulates air from the cabinet's inlet to outlet. The following blower capacity is necessary:

$$Q = \frac{1.88\ P(W)}{50 - Tmax}$$

Where,
- $Q(ft^3/min)$: Fan's capacity
- P(W) : Total heat dissipation for all servo drivers mounted in cabinet. Heat dissipation equals 10% of MDPAK7 rated capacity.
- Tmax (°C) : Maximum temperature around cabinet.

Example: Two 1 kW drivers are to be installed in a cabinet and the maximum ambient temperature is 40°C (104°F).

$$P(W) = (0.1 \times 1000) + (0.1 \times 1000)$$

$$S = \frac{1.88 \times 200}{(50 - 40)} = 38\ (ft^3/min)$$

NOTE

When forced ventilation is used, be sure to protect against loss of ventilation as a result of air filter or duct blockage.

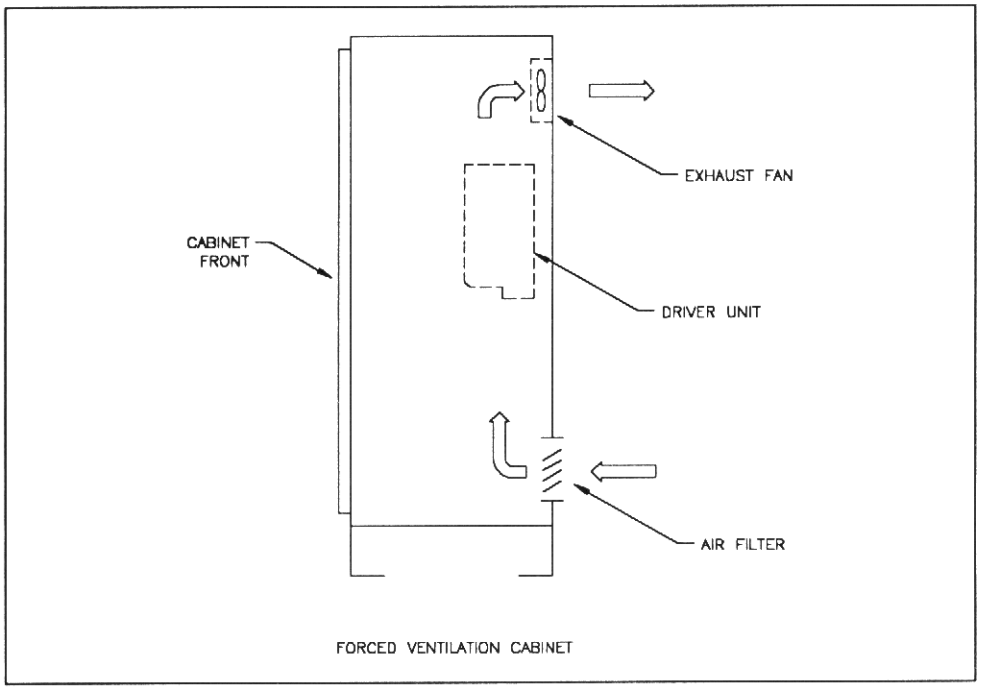


Figure 5.4

5.5 WIRING PRECAUTIONS

1. Be careful when wiring the MDPAK7 motor and driver to one another, to the power supply, ground and the positioning controller. Miswiring not only will prevent the motor/driver from producing optimum results, it can also cause the system and its components to fail. Observe all precautions listed in **Section 5.1** and **Section 5.2** before you begin wiring the motor and driver to the ground, power supply and your system's controller.

2. **Figures 5.5 and 5.6** illustrate a sample wiring configuration that will ensure optimum performance. Refer to it when connecting your system's components.

3. Keep your system's control power, servo bus power and motor wiring separate (at least 12 in [30 cm]) from the control circuit and sensor wires. If these wires must cross, run them at right angles.

4. To prevent line surges from damaging system components, connect a surge suppressor (RC filter for ac; diode for dc) to all solenoid coils, magnet contactors and relay coils.

5. Wiring between the driver and the motor should not exceed 30 meters (100 ft).

6. The motor's ground wire must be connected to terminal E of the driver, not directly to ground.

7. The driver's terminal E must be connected directly to ground using at least 12 AWG wire [5.5 min^2].

8. It is recommended, but not required, that an isolation transformer be installed between the power supply and the servodriver. This device will significantly reduce the likelihood of damage to the driver as a result of ground faults or current leaks.

9. Connect power to the positioning controller and driver control power before connecting power to the servo bus or connect both simultaneously. Do not connect servo bus power first (See **Section 3.6**).

10. Use twisted-pair wires to connect an external regenerative resistor to the system, if such a device is used (See **Section 5.11**).

11. Use shielded wires for all signal lines.

12. Use twisted-pair shielded wires for the encoder cable and pulse cable to positioning controller.

13. The motor is rated for IP65 or IP67 sealing. If the motor is used in such an environment, be sure the cables to the motor are properly sealed. Standard IIS cables are not IP67 rate. Consult factory for details.

14. Use 60/75°C copper wire only.

15. Tighten terminals X1, X2, L1, L2, L3, PA, PB, PC, U, V, W to 17.7 in-lb torque. When making connections to these terminals use a UL recognized pressure ring lug on the ends of the wires before connecting. Use the proper tool as specified by the ring lug manufacturer to connect the terminals to the wire.

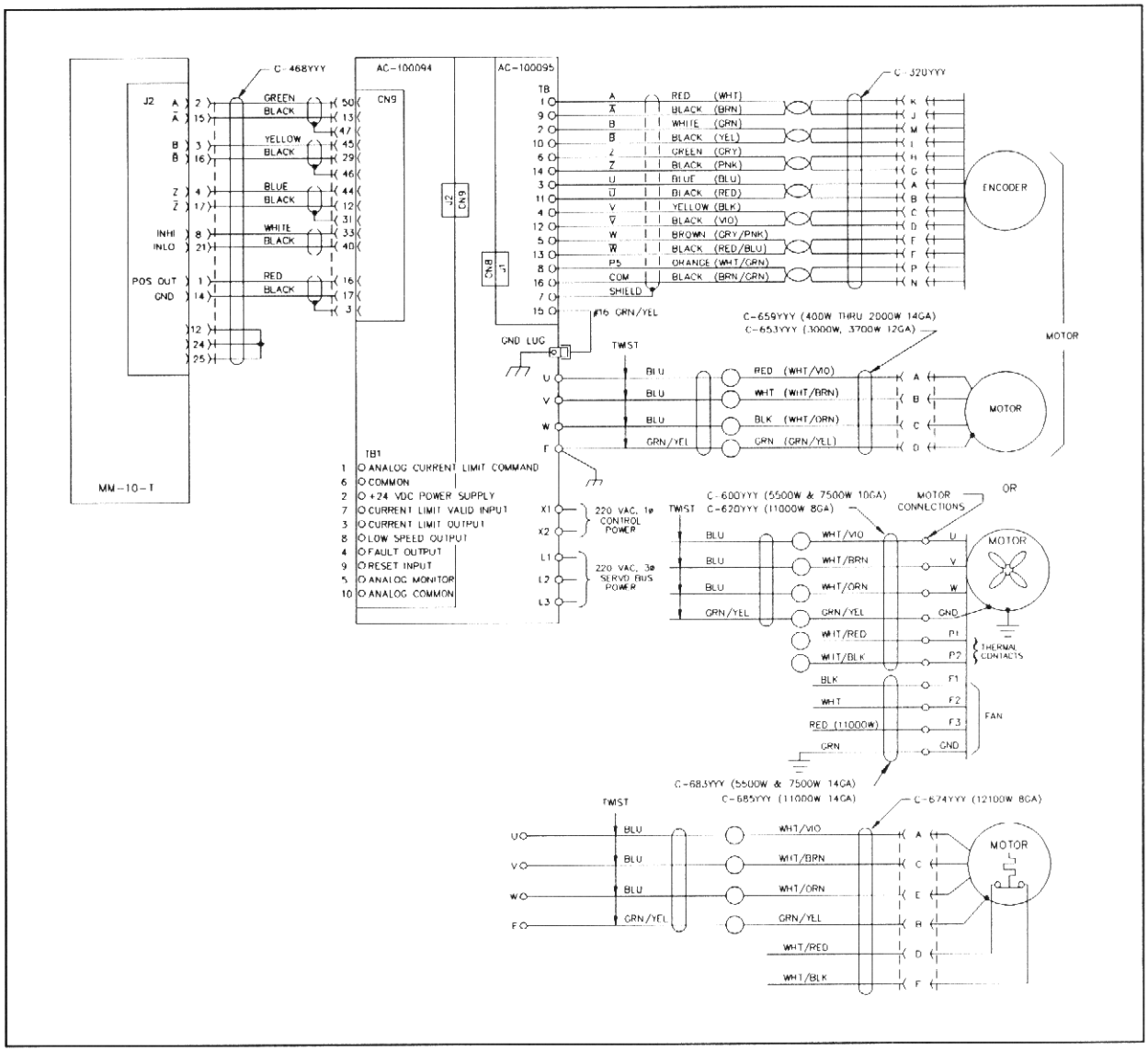


Figure 5.5 - MM-10-T Wiring Configuration

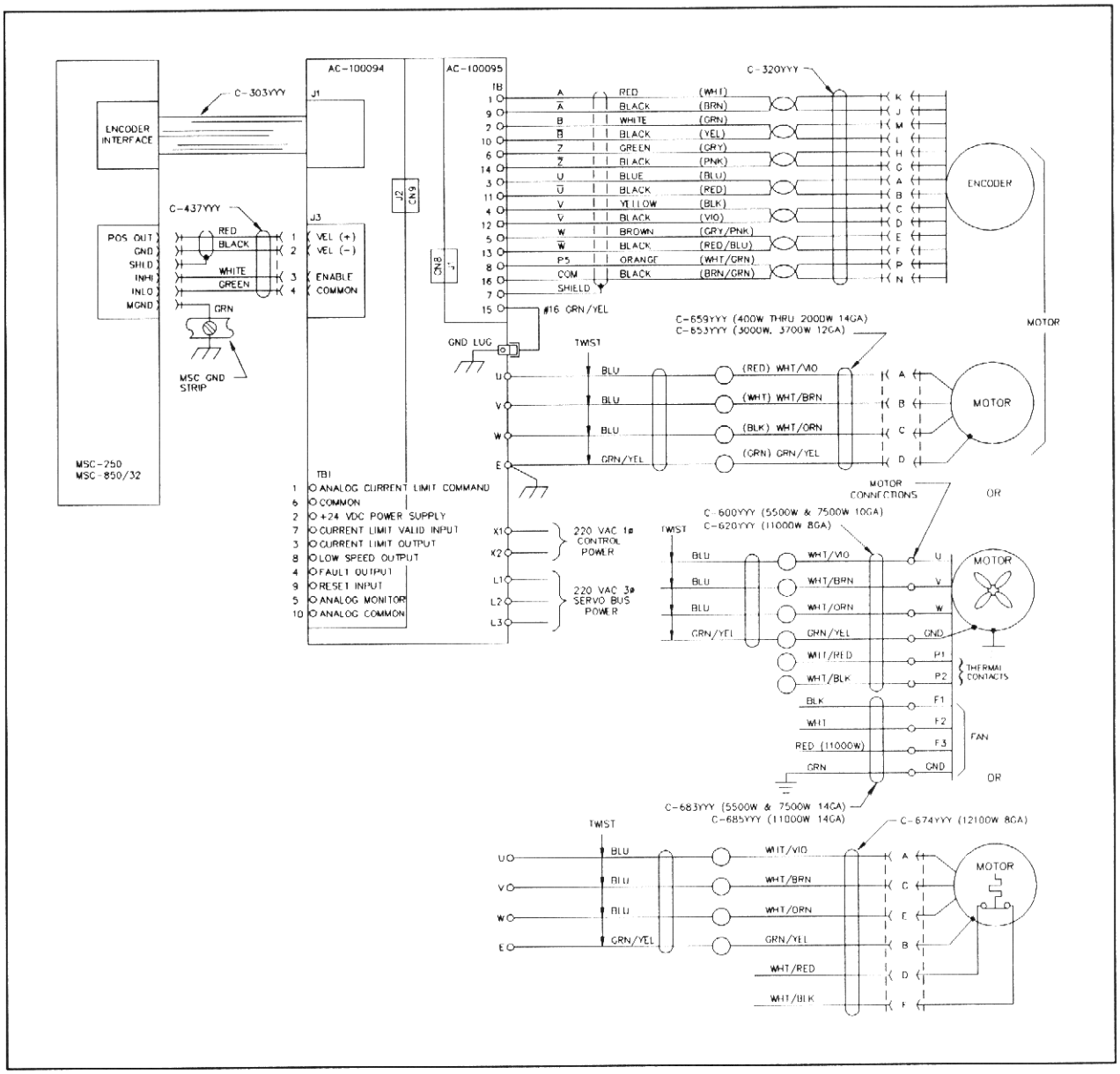


Figure 5.6 - MSC Wiring Configuration

5.6 CONTROL SIGNAL WIRING

NOTE

This manual describes the MDPAK7 series motor/drive packages applied in External Position Loop Mode with an IIS positioning controller. The following section of this manual describes installation of the MDPAK7 assuming connection to an IIS positioning controller using the AC-100094 and AC-100095 cable adaptors. More complete information on internal connectors is available in Appendix A.

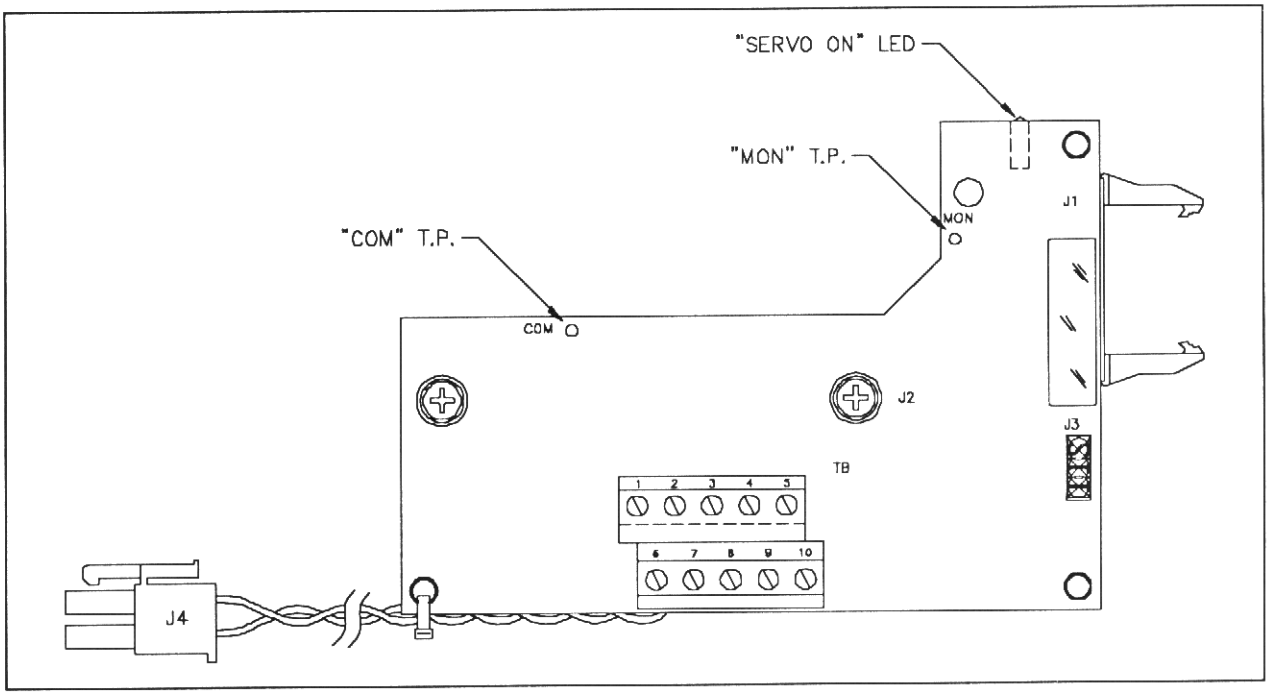
Figures 5.5 and 5.6 show overall wiring configurations of the MPDAK7 used with an IIS positioning controller. MDPAK7 connectors CN8 and CN9 provide the interface for all control signals.

The AC-10095 Cable Adaptor option is used to interface the encoder to connector CN8 on the MDPAK7 driver. The AC-100095 cable adaptor provides convenient screw terminal connectors for the encoder connections.

The AC-100094 Positioner Interface option is used to interface an IIS multi-axis positioning controller to connector CN9 on the MDPAK7 driver. The AC-100094 Positioner Interface provides convenient ribbon cable and quick disconnect plug interface to the positioning controller.

The AC-100094 also has Monitor and Com test points and an LED indicator for drive enable command from the positioning controller.

If the AC-100094 and AC-100095 adaptors are not used, **Appendix A** is a complete list of I/O control signals on CN8 and CN9.



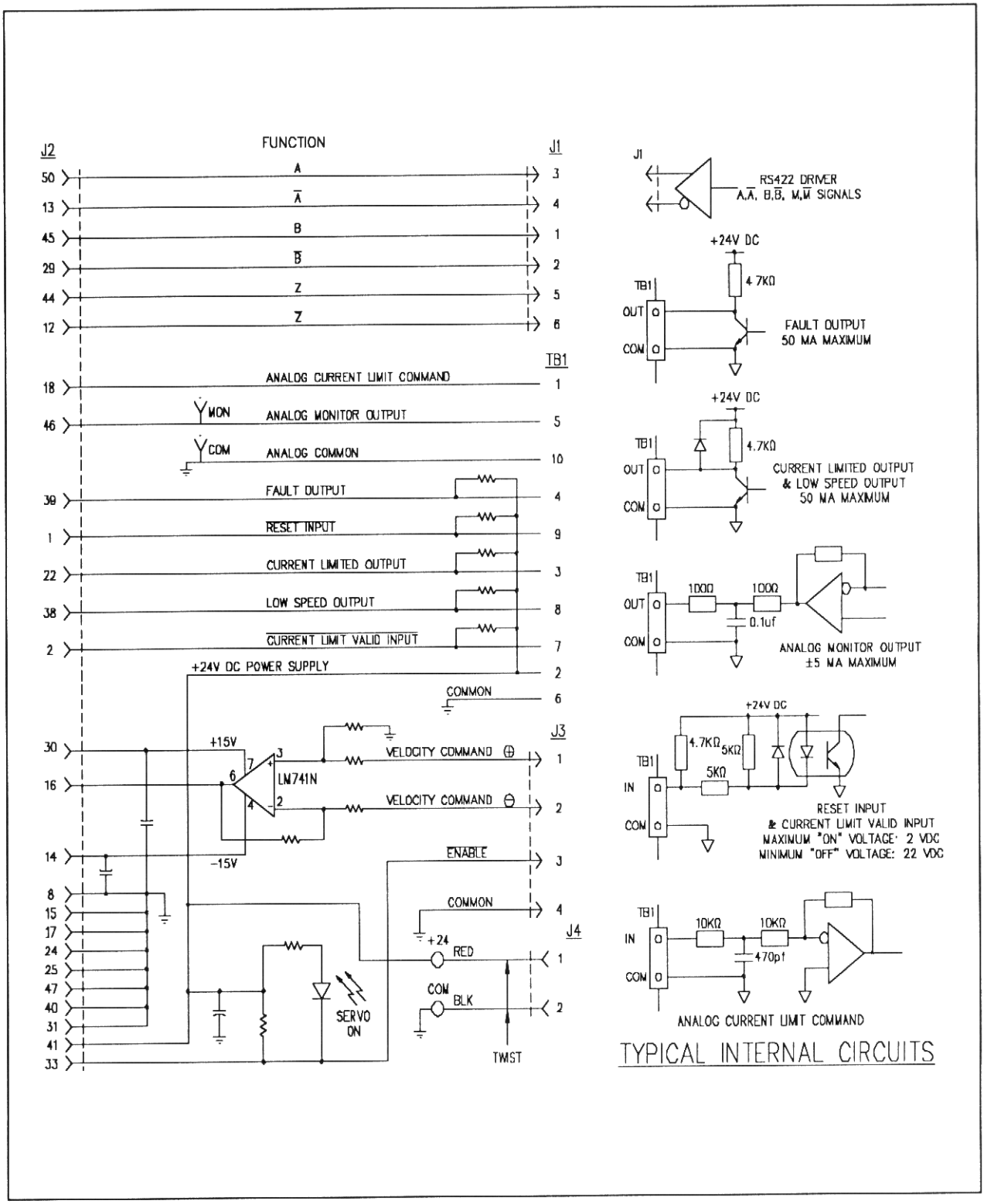
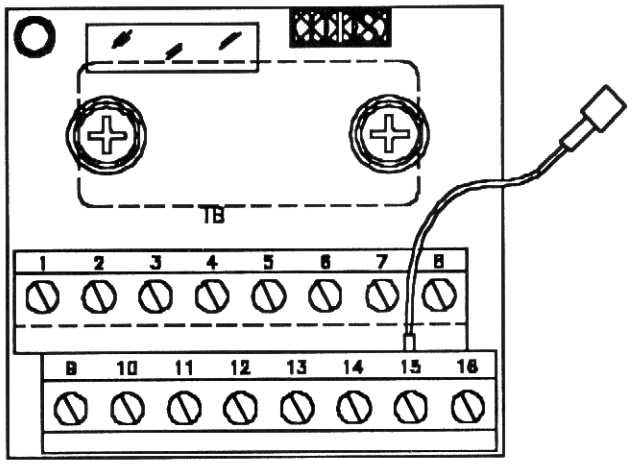


Figure 5.7 - AC-100094 Positioner Interface



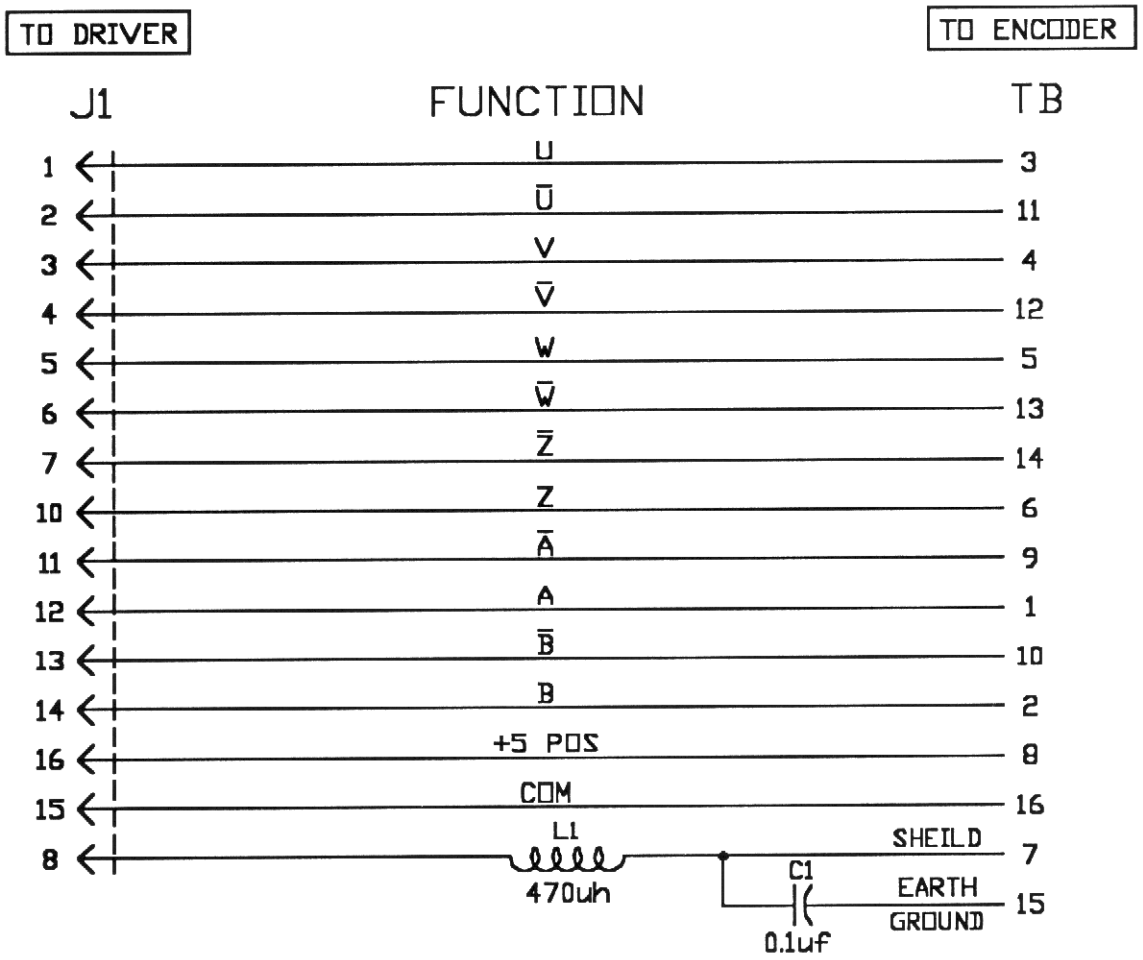


Figure 5.8 - AC-100095 Cable Adaptor

5.6.1 CONTROL INPUT SIGNALS ON AC-100094 INTERFACE

Pin No.	Control signal	Valid control mode	Functions
TB1-9	Reset	ALL	Fault output and fault codes except S E r are reset, after a fault, by connecting this pin to signal common with the Servo on (ENABLE) signal turned off.
TB1-7	Current limit valid	ALL	When this is connected to signal common, torque is limited to the level set using the analog torque limit command or the value set on internal parameters P C L L and n C L L. The selection is set by internal parameter C L.
J3-3	Servo on (Enable)	ALL	Servodrive becomes active when this is connected to signal common and no faults are present.
J3-4	Signal common		
J3-1(+) J3-2(-)	Analog speed command	EPLM	Speed command input Analog voltage -10V to +10V. Positive voltage rotates motor CCW. Motor Speed = (Command Voltage) / 10 x (Parameter S S C L)
TB1-6	Signal common		
TB1-1	Analog current limit command	ALL	Current limit command input. Analog voltage 0-10V. If internal parameter C L is set to o U t and pin TB1-7 is connected to signal common, the current will be limited as follows: Current limit value = (Command voltage) / 10 x 260%
TB1-10	Analog common		

5.6.2 CONTROL OUTPUT SIGNALS ON AC-100094 INTERFACE

Pin No.	Control signal	Valid control mode	Functions
TB1-2	24VDC power	ALL	24VDC power supply output for driving the control signals. Current is 200mA max.
TB1-4	Fault	ALL	This pin is normally connected to signal common, and is open when fault is detected. When open, the main circuit is automatically shut off in the driver, and the motor becomes free. See reset.
TB1-3	Current is limited	ALL	This pin is connected to signal common when the output current reaches the preset value.
TB1-8	Low speed signal	ALL	This pin is connected to signal common when motor speed drops below the specified value. Conditions are set by internal parameter L o S L.
TB1-5 & TP-MON	Analog monitor speed feedback or torque command	ALL	This output pin is an analog test point for either actual motor speed or motor commanded torque. Selection is made by internal parameter A o U t being set to S P d or t r q. Speed feedback signal: $\text{Speed (rpm)} = \frac{\text{Output volts x S S C L}}{10}$ Torque command: $\text{Torque (\%)} = \frac{\text{Output volts}}{10} \times 260\%$ (Rated torque)

5.6.3 MDPAK7 CABLES

CABLE P/N	FUNCTION	STANDARD LENGTHS	MAX LENGTH
C-303YYY	Feedback Cable	5, 6.5 ft	6.5 ft
C-320YYY	Encoder Cable	20, 50, 100 ft	100 ft
C-437YYY	Command Cable	5, 6.5 ft	6.5 ft
C-468YYY	Command Cable	5 ft	5 ft
C-659YYY	Motor Cable (400W - 2000W)	20, 50, 100 ft	100 ft
C-684YYY	Motor Cable (400W - 2000W with Brake)	20, 50, 100ft	100ft
C-653YYY	Motor Cable (3000W - 3700W)	20, 50, 100 ft	100 ft
C-600YYY & C-683YYY	Motor Cable (5500W - 7500W) Fan Cable (5500W - 7500W)	20, 50, 100ft	100ft
C-620YYY & C-685YYY	Motor Cable (11000W) Fan Cable (11000W)	20, 50, 100ft	100ft
C-674YYY	Motor Cable (12100W)	20, 50, 100ft	100ft

CONSULT FACTORY FOR NON-STANDARD LENGTHS

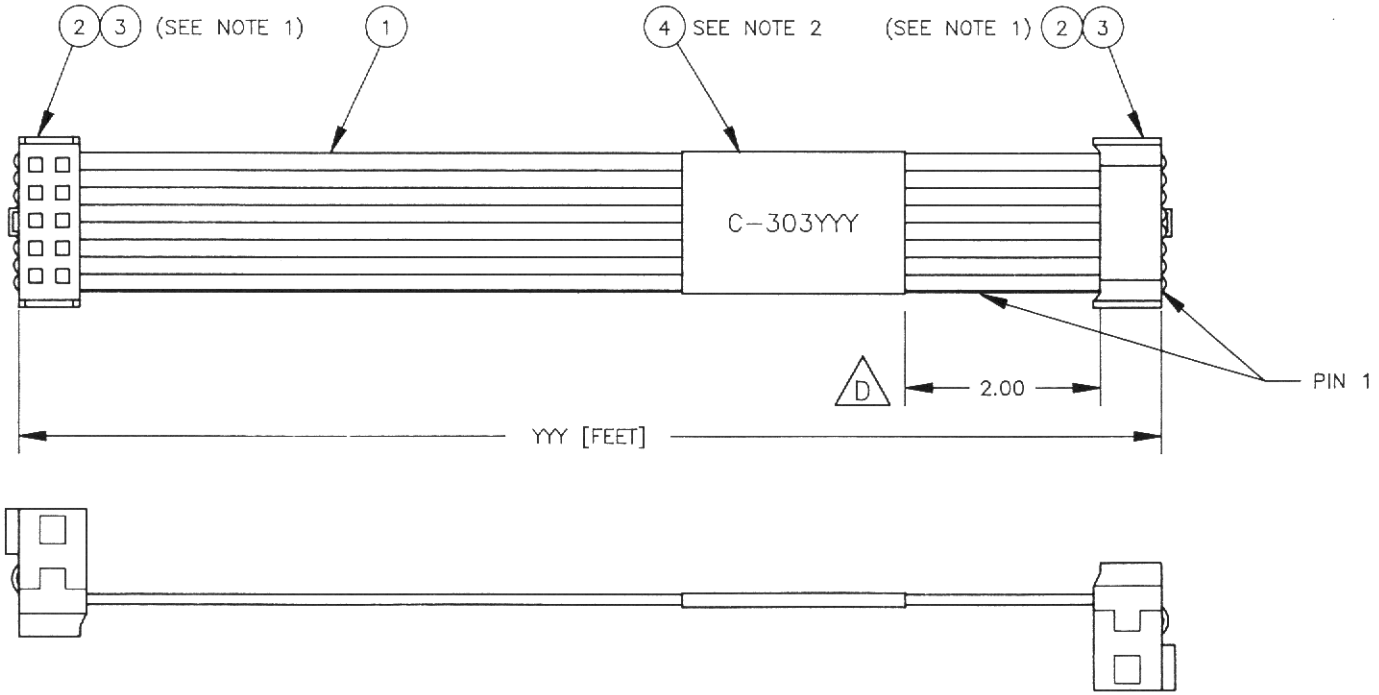
C-303YYY
BILL OF MATERIALS

COMPONENT	REFERENCE	DESCRIPTION
171-10CSA	1	CABLE, RIBBON, 10 COND
609-1041	2	CON, PLUG, RIBBON, 10 P, W/SR

NOTES:

1. INSTALL ITEM 2 USING ROBINSON NUGENT CABLING TOOL CT-1 OR EQUIVALENT
2. MARK ITEM 4 WITH CABLE NUMBER AND LOCATE APPROXIMATELY WHERE SHOWN. △D

DATE	SYM	REVISION RECORD	DR	CK	CK
5/89	A	ECN 89-0107	EB	CE	
8/89	B	ECN 89-0022	DD	CE	
6/93	C	ECN 93-131	EB	WES	
3/95	D	ECN 95-060	EB		



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CHECKED BY	DATE 5/12/94
APPROVED BY W.E.S.	DATE 7/21/94
APPROVED BY	DATE
MATERIAL ----------	
FINISH ----------	

TITLE: CABLE, ENCODER

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)	DRAWN BY BAIER		DRAWING NUMBER C-303YYY
TOLERANCES: X.X± --- ANGULAR ± -- ; X.XX± 0.01 ; X.XXX± 0.005	AutoCAD FILE LOCATION G:\CABLES\		
	B	DATE 6/21/93 SCALE ---	SHEET NO. 1 OF 1 REVISION D

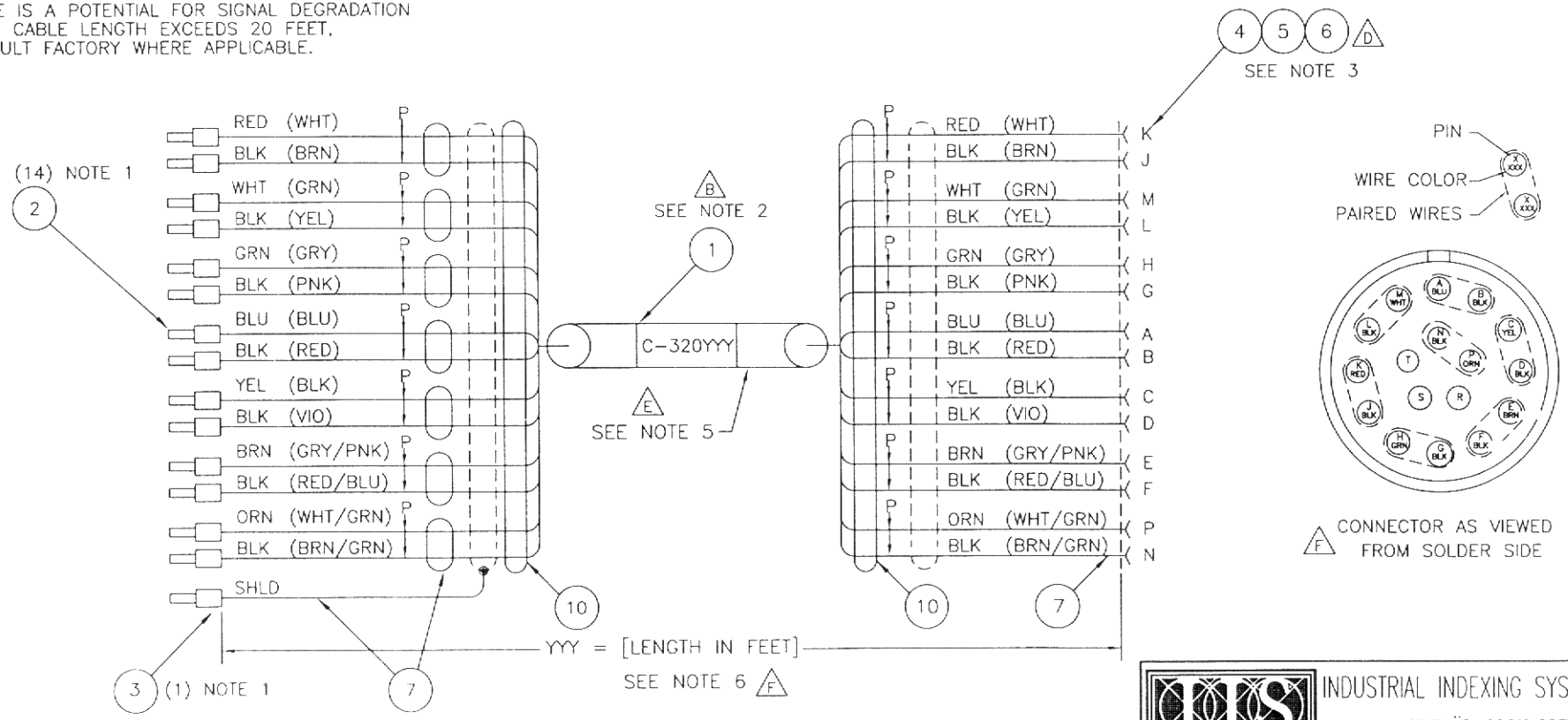
C-320YYY
BILL OF MATERIALS

COMPONENT	REFERENCE	DESCRIPTION
8307	1	CABLE, 7 TW PAIR, SHLD, 22 AWG
6907.0	2	FERRULE, #20, ORN
4631.0	3	FERRULE, #16, RED
MS3106A20-29S	4	CONNECTOR, MS, CABLE, 17 PIN
97-3057-1012-1	5	STRAIN RELIEF, #20 SHELL SIZE
9779-513-10	6	BOOT, MS, .56 O.D. CABLE
FIT221-1/8	7	HEATSHRINK TUBING, 1/8 IN
FIT221-1/2	10	HEATSHRINK TUBING, 1/2 IN.

NOTES:

1. INSTALL ITEM 2 & 3 USING WEIDMULLER CRIMP TOOL PZ4 OR EQUIV.
2. COLORS IN ( ) INDICATE ALTERNATE CABLE COLORS.
3. (D) ITEM 6 SUPPLIED AS PART OF STRAIN RELIEF, ITEM 5.
4. IF CRIMP TYPE CONNECTOR IS USED:
   INSTALL ITEM 4 USING AMP TOOL #90277-1.
5. MARK PER QP-08-0001.
6. (F) THERE IS A POTENTIAL FOR SIGNAL DEGRADATION WHEN CABLE LENGTH EXCEEDS 20 FEET, CONSULT FACTORY WHERE APPLICABLE.

DATE	SYM	REVISION RECORD	DR	CK	CK
10JUL02	F	PER ECN 02-222	EB	EB	CDR



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CHECKED BY: WJ	DATE: 8/12/02	
APPROVED BY: ELS	DATE: 1/93	
APPROVED BY: JBC	DATE: 1/93	
MATERIAL: ---		
FINISH: ---		

TITLE: CABLE, ENCODER

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TOLERANCES: X.X± --- ; X.XX± --- ; X.XXX± --- ; ANGULAR ± ---	AutoCAD FILE LOCATION: Q:\DFTG\CABLES\C-3XX		
	B	DATE: 23JAN93	SCALE: ---
		SHEET NO.: 1 OF 1	REVISION: F

C-437YYY
BILL OF MATERIALS

COMPONENT	REFERENCE	DESCRIPTION
8722	1	CABLE, 2 PAIR SHLD, 20 AWG
AWG-16-GRN/YEL	2	WIRE, #16 GRN/YEL, STRANDED
25.320.3453.1	3	CONNECTOR, PLUG, 4 PIN
25.320.3653.1	4	CONNECTOR, PLUG, 6 PIN
4631.0	5	FERRULE, #16, RED
6907.0	6	FERRULE, #20, ORN
PLM1M	7; MARK C-437 LENGTH IN FEET	CABLE TIE LABEL
TFE-20-TW	8	TUBING, CLEAR TEFLON, #20

NOTES:

1. ALTERNATE CONSTRUCTION: STRIP AND TIN 1/4" (6.4 MM)
2. PIN NUMBERS SHOWN FOR REFERENCE ONLY
3. CRIMP FURRELS USING WEIDMULLER
   CRIMP TOOL PZ4 OR EQUIVALENT

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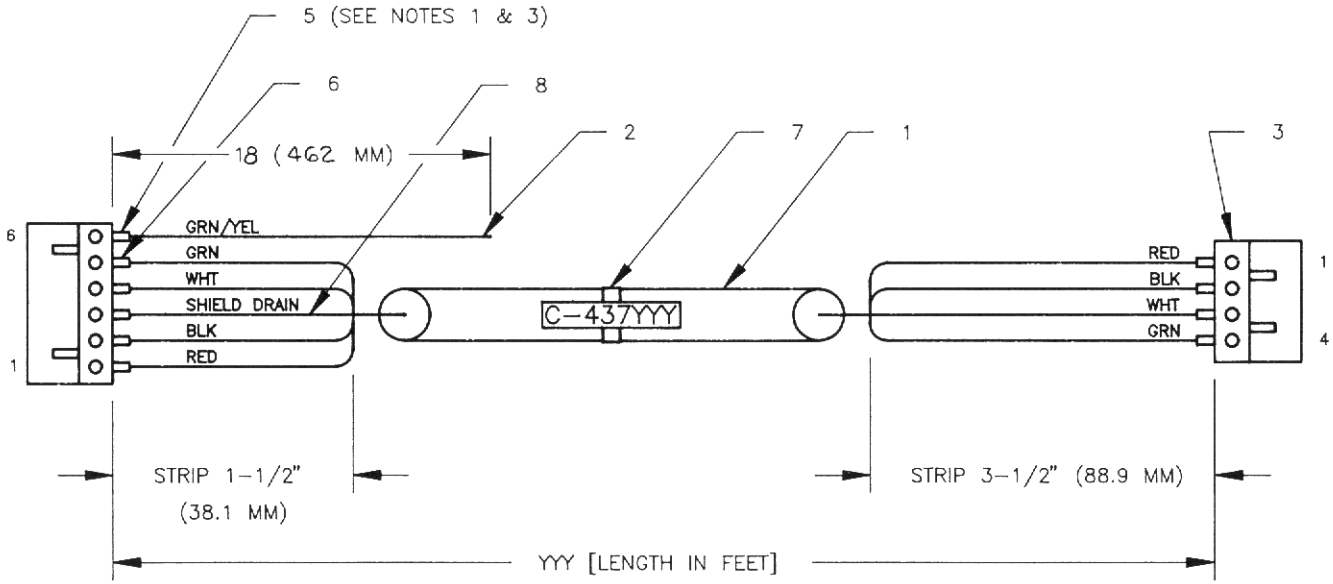
6/23/93	A	ECN 93-131	EB	WEJ	



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CHECKED BY: E.BAIER	DATE: 3/89
APPROVED BY: C.M.E.	DATE: 3/89
APPROVED BY: WEJ	DATE: 7/2/93
MATERIAL: ----------	
FINISH: ----------	

TITLE: CABLE, COMMAND

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)

TOLERANCES: X.X± --- ; X.XX± 0.05 ; X.XXX± 0.001 ; ANGULAR ± ---

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DRAWING NUMBER: C-437YYY

B | DATE: 6/23/93 | SCALE: --- | SHEET NO.: 1 OF 1 | REVISION: B

C-468YYY
BILL OF MATERIALS

COMPONENT	REFERENCE	DESCRIPTION
8778	1	CABLE, 6 PAIR SHLD, 22 AWG
AWG-22-BLK	2	WIRE, #22 BLACK, STRANDED
745134-1	3	CONNECTOR HOOD, 25 PIN
745209-3	4	CONNECTOR, FEMALE, 25 PIN D
MR-50F	5	CONNECTOR, 50 PIN, FEMALE
MR-50L	6	HOOD, 50 PIN CONNECTOR
FIT221-1/8	7	HEATSHRINK TUBING, 1/8 IN
TFE-20-TW	8	TUBING, CLEAR TEFLON, #20
PLM1M	9; MARK C-468 LENGTH IN FEET	CABLE TIE LABEL

NOTES:

1. INSTALL ITEM 3 USING AMP IDT TOOL OR EQUIVALENT.

DATE	SYM	REVISION RECORD	DR	CK	CK
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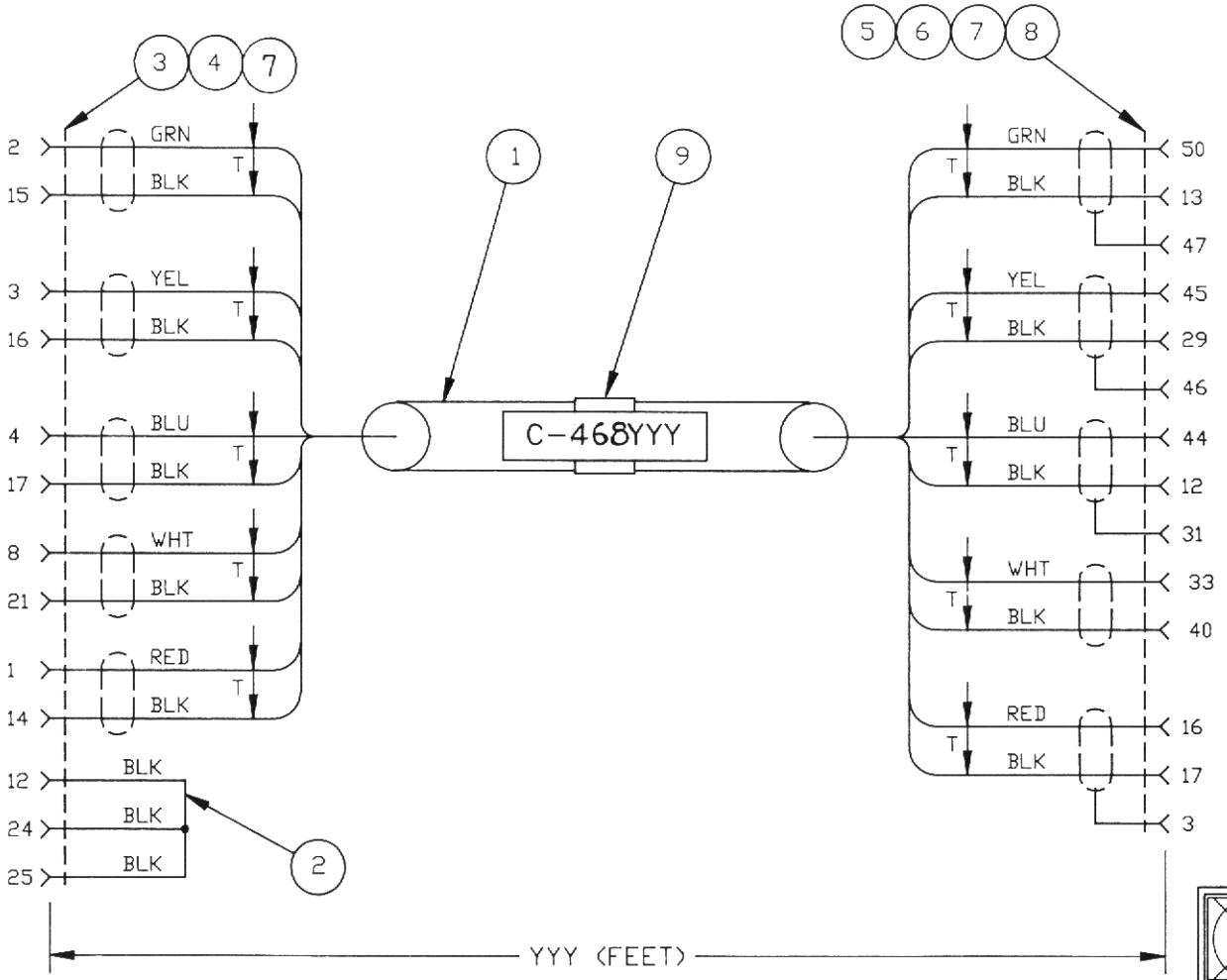

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CHECKED BY F	DATE 8/3/93	
APPROVED BY	DATE	
APPROVED BY	DATE	
MATERIAL ----------		
FINISH ----------		

TITLE: CABLE, COMMAND

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)

TOLERANCES: X.X± ---- ; X.XX± --- ; X.XXX± -- ; ANGULAR ± --

DRAWN BY: CAD

AutoCAD FILE LOCATION: G:\CABLES\C-468

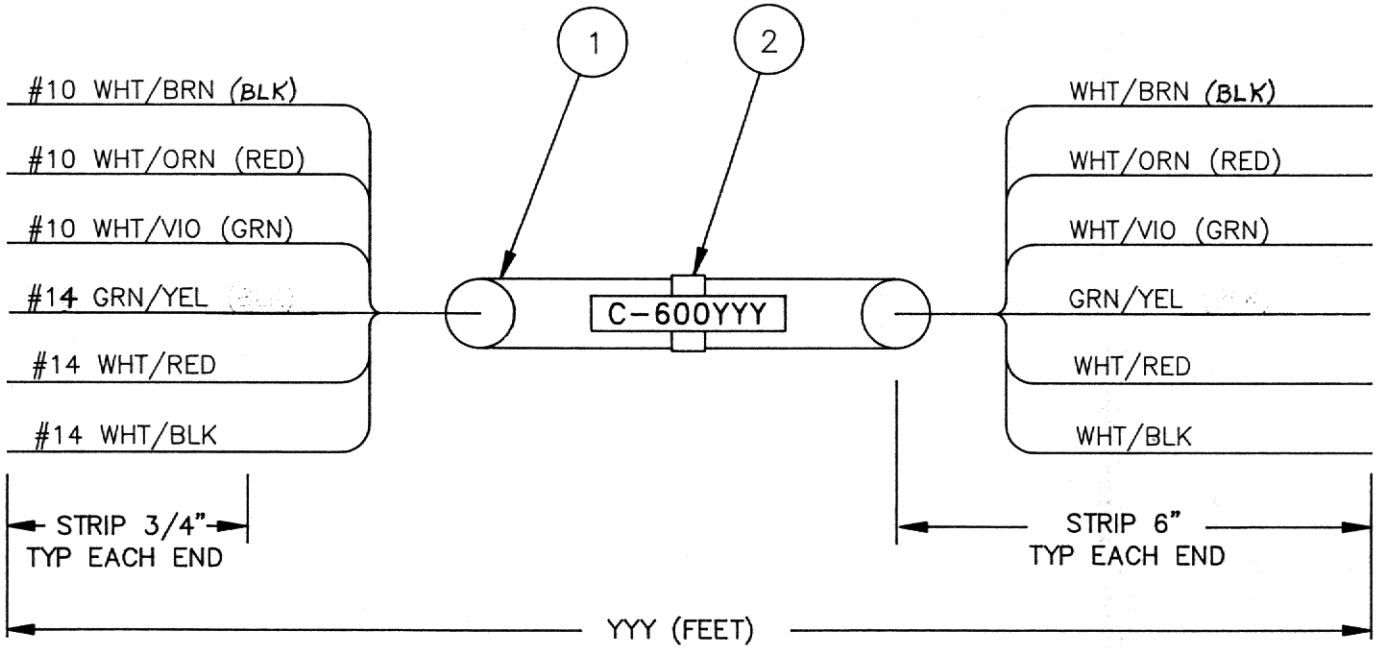
DRAWING NUMBER: C-468YYY

SIZE	DATE	SCALE	SHEET NO.	REVISION
B	08/03/93	---	1 OF 1	0

C-600YYY
BILL OF MATERIALS

COMPONENT	REFERENCE	DESCRIPTION
S72440	1	CABLE, 6 COND, 3-10 AWG, 3-14 AWG
PLM1M	2; MARK C-600 LENGTH IN FEET	CABLE TIE LABEL

DATE	SYM	REVISION RECORD	DR	CK	CK
2/83	A	REDREW	SS	ELS	
9/86	B	ECN-86-0171	DD	SB	
10/27/93	C	ECN-93-0267	MC	ELS	
12 JULY 95	D	PER ECN 95-154	CWB	CB	



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(716) 924-9181 FAX: (716) 924-2169

CHECKED BY: ELS	DATE: 2/83
APPROVED BY: SB	DATE: 9/86
APPROVED BY:	DATE:
MATERIAL: ----------	
FINISH: ----------	

TITLE: CABLE, MOTOR

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)

TOLERANCES: X.X± ----- ANGULAR ± --- ; X.XX± ---- ; X.XXX± ---

DRAWN BY: S.S./M.C.

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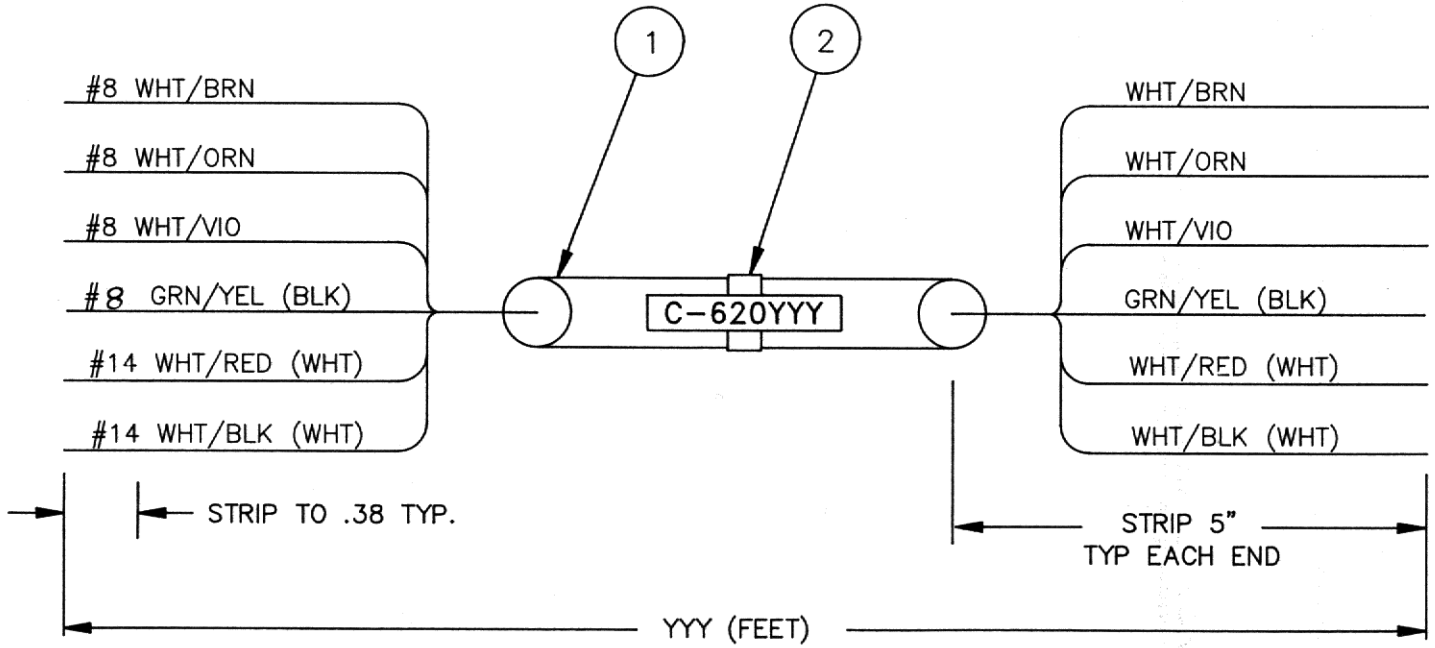
DRAWING NUMBER: C-600YYY

C-620YYY
BILL OF MATERIALS

COMPONENT	REFERENCE	DESCRIPTION
S7226R2	1	CABLE, 6 COND. 4-8 AWG, 2-14 AWG
PLM1M	2; MARK C-620 LENGTH IN FEET	CABLE TIE LABEL

DATE	SYM	REVISION RECORD	DR	CK	CK
01/9/87	A	ECN-87-0004	RT	WK	
10/88	B	ECN-88-0163	DD	SB	
9/29/93	C	ECN-93-0267	MC	CB	WEI



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CHECKED BY W.K.	DATE 1/87
APPROVED BY S.B.	DATE 10/88
APPROVED BY WEI	DATE 11/93
MATERIAL ----------	
FINISH ----------	

TITLE: CABLE, MOTOR

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)

TOLERANCES: X.X± ----- ANGULAR ± ---; X.XX± ----; X.XXX± ---

DRAWN BY: RT

AutoCAD FILE LOCATION: G:\CAD\CABLES

DRAWING NUMBER: C-620YYY

SIZE	DATE	SCALE	SHEET NO.	REVISION
B	1/9/87	---	1 OF 1	C

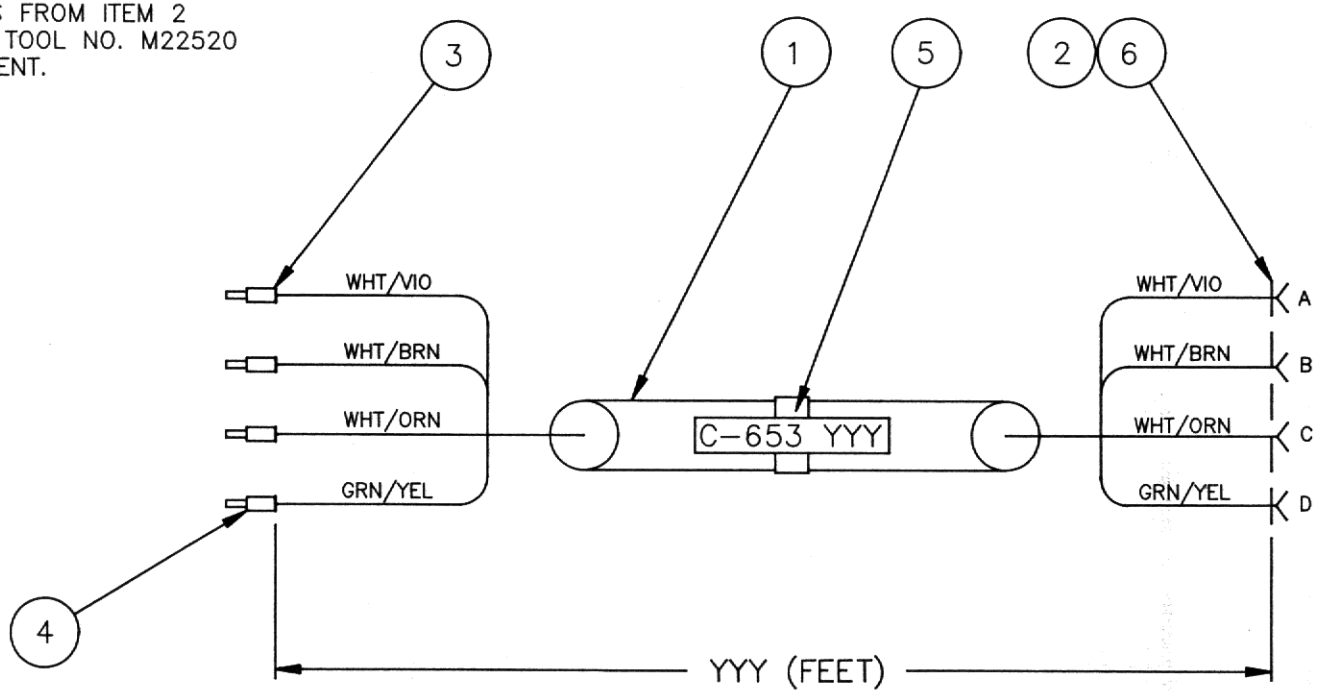
C-653YYY
BILL OF MATERIALS

COMPONENT	REFERENCE	DESCRIPTION
S72443	1	CABLE, 6 COND, 12 AWG
MS3106A20-4S	2	CONNECTOR, CABLE, 4 PIN FEMALE
4633.0	3	FERRULE, #12, GRA
4632.0	4	FERRULE, #14, BLU
PLM1M	5; MARK C-653 LENGTH IN FEET	CABLE TIE LABEL
97-3057-1012-1	6	STRAIN RELIEF, #20 SHELL SIZE

DATE	SYM	REVISION RECORD	DR	CK	CK
8/14/90	A	ECN-89-0195	EB	JC	JF
9/29/93	B	ECN-93-0267	MC	EB	WE

NOTES:

1. INSTALL ITEMS 3 & 4 USING WEIDMULLER CRIMP TOOL PZ-4 OR EQUIVALENT.
2. ALTERNATE CONSTRUCTION: STRIP & TIN .25"
3. INSTALL PINS FROM ITEM 2 USING DMC TOOL NO. M22520 OR EQUIVALENT.



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APPROVED BY J.T.F.	DATE 8/90
APPROVED BY WEI	DATE 11/22/97
MATERIAL ---------	
FINISH ---------	

TITLE: CABLE-MOTOR

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)

TOLERANCES: X.X± ----- ANGULAR ± --- ; X.XX± ----- ; X.XXX± ---

DRAWN BY: E. BAIER

AutoCAD FILE LOCATION: G:\CAD\CABLES

DRAWING NUMBER: C-653YYY

B	DATE	SCALE	SHEET NO.	REVISION
	8/15/90	----	1 OF 1	B

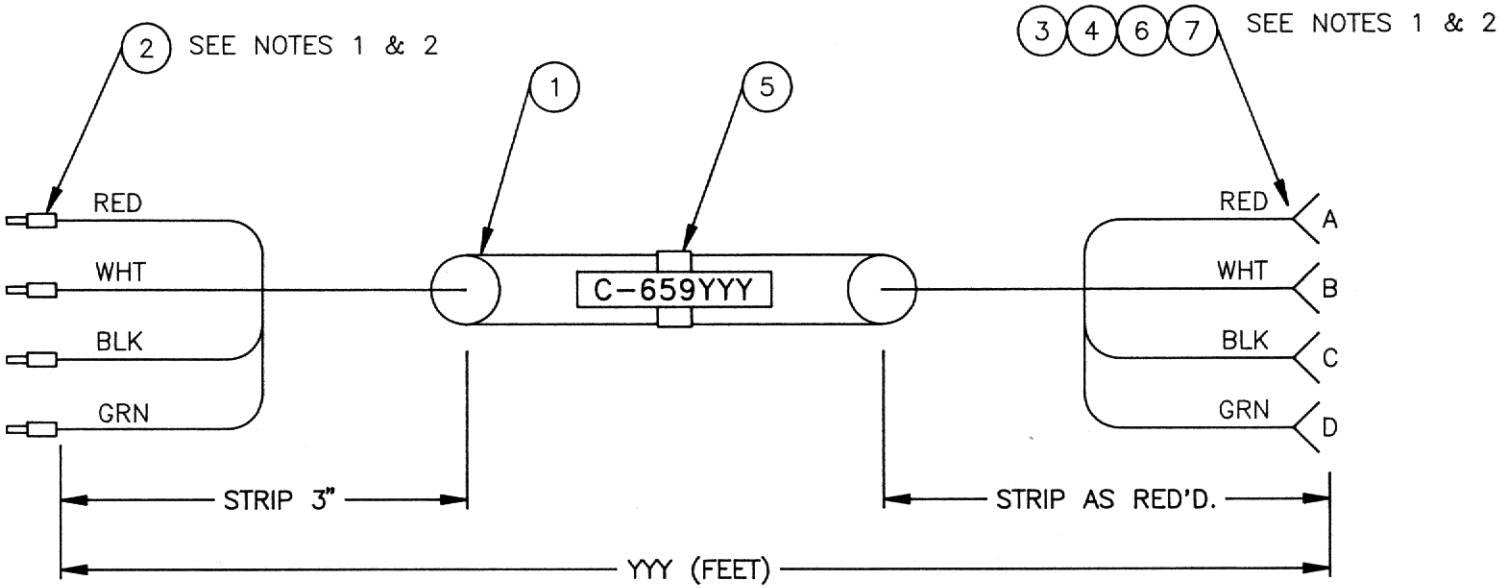
C-659YYY
BILL OF MATERIALS

COMPONENT	REFERENCE	DESCRIPTION
SJO-14/4	1	CABLE, 4 COND, 14 AWG
4632.0	2	FERRULE, #14, BLU
MS3106A20-4S	3	CONNECTOR, CABLE, 4 PIN FEMALE
97-3057-1012-1	4	STRAIN RELIEF, #20 SHELL SIZE
PLM1M	5; MARK C-659 LENGTH IN FEET	CABLE TIE LABEL
9779-513-12	6	BOOT, MS, .63 O.D. CABLE
9779-513-10	7	BOOT, MS, .56 O.D. CABLE

NOTES:

1. INSTALL ITEM 2 USING WEIDMULLER CRIMP TOOL PZ-4 OR EQUIVALENT.
2. ALTERNATE CONSTRUCTION STRIP & TIN .25"

DATE	SYM	REVISION RECORD	DR	CK	CK
12/18/90	A	ECN-90-0221	ME	JTF	
9/29/93	B	ECN-93-0267	MC	EB	WEI



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CHECKED BY E.B.	DATE 12/90
APPROVED BY J.T.F.	DATE 12/90
APPROVED BY WEI	DATE 11/93
MATERIAL ---------	
FINISH ---------	

TITLE: MOTOR CABLE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)
TOLERANCES: X.X± ------ X.XX± ---- X.XXX± --- ANGULAR ± ---

DRAWN BY: MIKE E.
AutoCAD FILE LOCATION: G:\CAD\CABLES

DRAWING NUMBER: C-659YYY

B | DATE 12/18/90 | SCALE --- | SHEET NO. 1 OF 1 | REVISION B

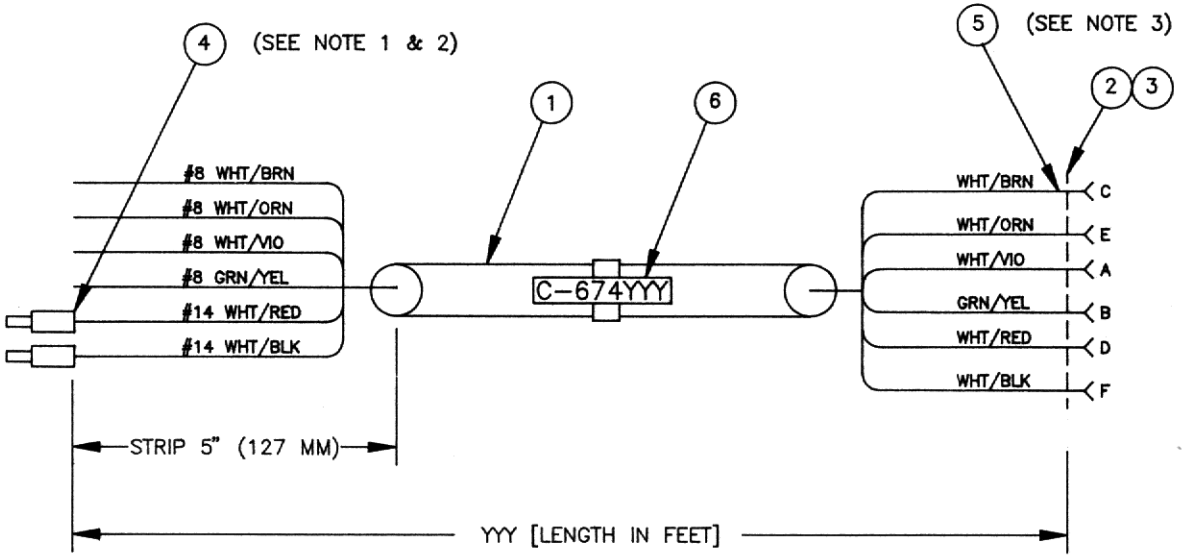
C-674YYY
BILL OF MATERIALS

COMPONENT	REFERENCE	DESCRIPTION
S72426R2	1	CABLE, 4-8ga, 2-14ga
MS3106A24-10S	2	CONNECTOR, 7 PIN FEMALE
97-3057-1016-1	3	STRAIN RELIEF, #24 SHELL SIZE
4632.0	4	FERRULE, #14, BLU
FIT221-1/4	5	HEATSHRINK TUBING, 1/4 IN
PLM1M	6; MARK C-674 LENGTH IN FEET	CABLE TIE LABEL

NOTES:

1. INSTALL ITEM 2 USING WEIDMULLER CRIMP TOOL PZ-4 OR EQUIVALENT
2. ALTERNATE CONSTRUCTION; STRIP AND TIN 1/4"
3. HEAT SHRINK TUBING (ITEM 5) OVER SOLDER JOINT

DATE	SYM	REVISION RECORD	DR	CK	CK
11/93	0	ECN 93-0184	EB	WJ	



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CHECKED BY	DATE
APPROVED BY	DATE 11/17/93
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 ± ---

DRAWN BY: G.Baier

AutoCAD FILE LOCATION: G:\CAD\CABLES\

DRAWING NUMBER: C-674YYY

B | DATE 11/11/93 | SCALE ---- | SHEET NO. 1 OF 1 | REVISION 0

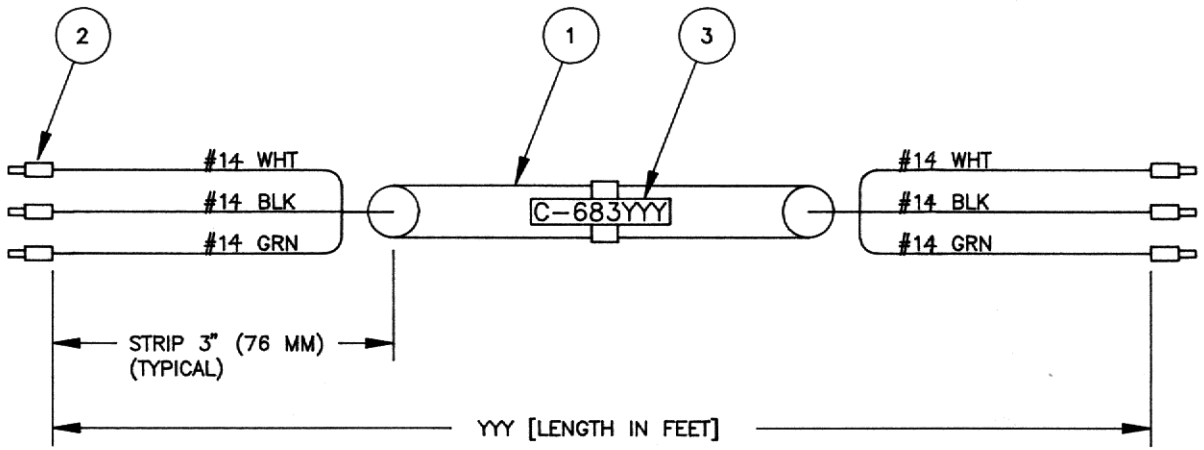
C-683YYY
BILL OF MATERIALS

COMPONENT	REFERENCE	DESCRIPTION
SJTO-14/3	1	CABLE, 3 COND, 14 AWG
4632.0	2	FERRULE, #14, BLU
PLM1M	3; MARK C-683 LENGTH IN FEET	CABLE TIE LABEL

NOTES:

1. INSTALL ITEM 2 USING WEIDMULLER CRIMP TOOL PZ–4 OR EQUIVALENT
2. ALTERNATE CONSTRUCTION; STRIP AND TIN 1/4"

DATE	SYM	REVISION RECORD	DR	CK	CK
11JULY95	0	PER ECN 95–117	CWB	LB	



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CHECKED BY: DBart — DATE: 7/14/95	
APPROVED BY — DATE	
APPROVED BY — DATE	
MATERIAL: ----------	TITLE: CABLE, MOTOR
FINISH: ----------	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm) — TOLERANCES: X.X± ---- / X.XX± 0.01 / X.XXX± 0.005 — ANGULAR ± ----
	DRAWN BY: CWB — AutoCAD FILE LOCATION: G:\CAD\CABLES\
	B — DATE: 11JULY95 — SCALE: ---
	DRAWING NUMBER: C–683YYY — SHEET NO.: 1 OF 1 — REVISION: 0

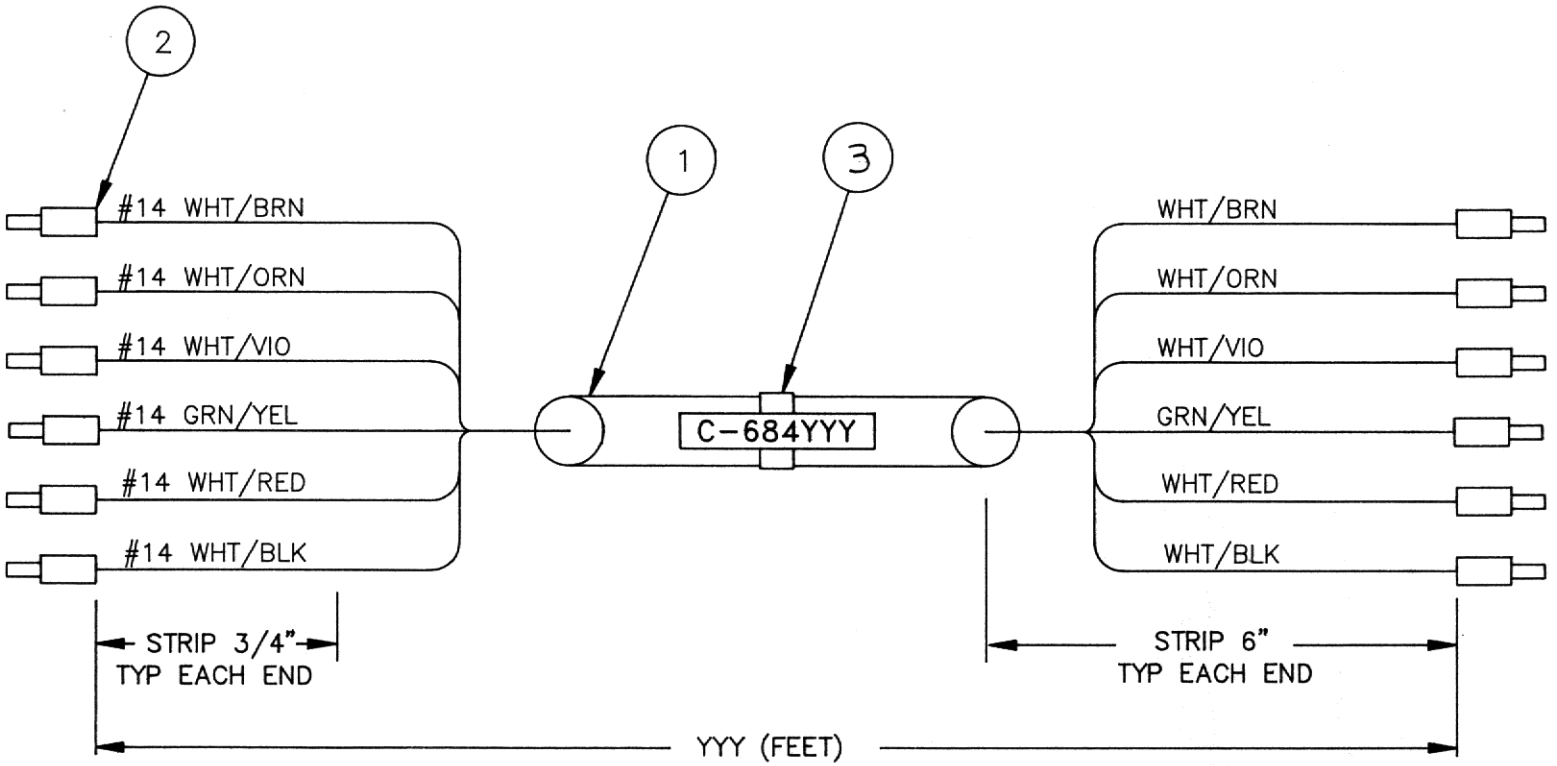
C-684YYY
BILL OF MATERIALS

COMPONENT	REFERENCE	DESCRIPTION
S72627	1	CABLE, 6 COND, 14 AWG, CUSTOM
4632.0	2	FERRULE, #14, BLU
PLM1M	3; MARK C-684 LENGTH IN FEET	CABLE TIE LABEL

NOTES:

1. ALTERNATE CONSTRUCTION:
   STRIP & TIN .25"
2. INSTALL ITEM 2 USING
   WEIDMULLER CRIMP TOOL
   PZ-4 OR EQUIVALENT.

DATE	SYM	REVISION RECORD	DR	CK	CK
08AUG95	0	ECN-95-190	EB	BS	



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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± ----- ANGULAR ± --- ; X.XX± ---- ; X.XXX± --

DRAWN BY: G.BAIER
AutoCAD FILE LOCATION: G:\CAD\CABLES

SIZE	DATE	SCALE	SHEET NO.	REVISION
B	08AUG95	---	1 OF 1	0

DRAWING NUMBER: C-684YYY

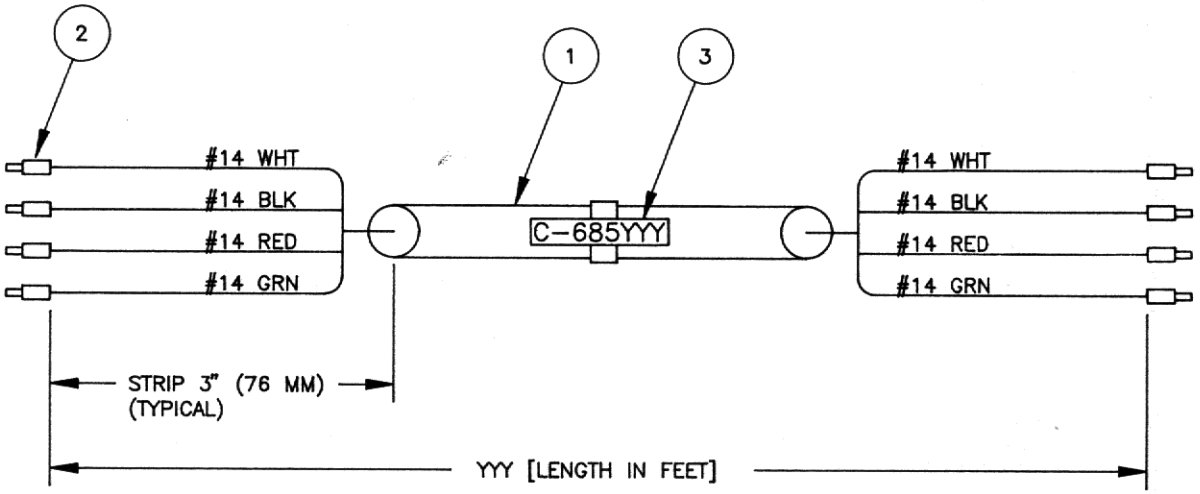
C-685YYY
BILL OF MATERIALS

COMPONENT	REFERENCE	DESCRIPTION
SJO-14/4	1	CABLE, 4 COND, 14 AWG
4632.0	2	FERRULE, #14, BLU
PLM1M	3; MARK C-685 LENGTH IN FEET	CABLE TIE LABEL

NOTES:

1. INSTALL ITEM 2 USING WEIDMULLER CRIMP TOOL PZ–4 OR EQUIVALENT
2. ALTERNATE CONSTRUCTION; STRIP AND TIN 1/4"

DATE	SYM	REVISION RECORD	DR	CK	CK
22SEP95	0	PER ECN 95–216	CWB	YK	



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CHECKED BY: CBW	DATE: 9/29/95
APPROVED BY	DATE
APPROVED BY	DATE
MATERIAL: ----------	
FINISH: ----------	

TITLE: CABLE, MOTOR

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES (mm)	DRAWN BY: CWB		DRAWING NUMBER: C-685YYY	
TOLERANCES: X.X± ---, X.XX± 0.01, X.XXX± 0.005	ANGULAR: ± -----	AutoCAD FILE LOCATION: G:\CAD\CABLES\		
B	DATE: 22SEP95	SCALE: ---	SHEET NO.: 1 OF 1	REVISION: 0

5.7 MINIMUM RECOMMENDED WIRE GUAGES

MOTOR/DRIVE	MOTOR CABLE	SERVO BUS POWER	CONTROL POWER	EARTH GROUND (E)	ENCODER CABLE	FAN CABLE
MDPAK7-R400	14 AWG (3.5 mm^2)	14 AWG (3.5 mm^2)	16 AWG (2.2 mm^2)	12 AWG (5.5 mm^2)	24 AWG (.2 mm^2)	N/A
MDPAK7-R750	14 AWG (3.5 mm^2)	14 AWG (3.5 mm^2)	16 AWG (2.2 mm^2)	12 AWG (5.5 mm^2)	24 AWG (.2 mm^2)	N/A
MDPAK7-R1000	14 AWG (3.5 mm^2)	14 AWG (3.5 mm^2)	16 AWG (2.2 mm^2)	12 AWG (5.5 mm^2)	24 AWG (.2 mm^2)	N/A
MDPAK7-R1500	14 AWG (3.5 mm^2)	14 AWG (3.5 mm^2)	16 AWG (2.2 mm^2)	12 AWG (5.5 mm^2)	24 AWG (.2 mm^2)	N/A
MDPAK7-R2000	14 AWG (3.5 mm^2)	14 AWG (3.5 mm^2)	16 AWG (2.2 mm^2)	12 AWG (5.5 mm^2)	24 AWG (.2 mm^2)	N/A
MDPAK7-R3000	12 AWG (3.5 mm^2)	12 AWG (3.5 mm^2)	16 AWG (2.2 mm^2)	12 AWG (5.5 mm^2)	24 AWG (.2 mm^2)	N/A
MDPAK7-R3700	12 AWG (5.5 mm^2)	12 AWG (5.5 mm^2)	16 AWG (2.2 mm^2)	12 AWG (5.5 mm^2)	24 AWG (.2 mm^2)	N/A
MDPAK7-M3700	12 AWG (5.5 mm^2)	12 AWG (5.5 mm^2)	16 AWG (2.2mm^2)	12 AWG (5.5mm^2)	24 AWG (.2mm^2)	N/A
MDPAK7-R5500 5.5 mm^2	10 AWG (8 mm^2)	10 AWG (8 mm^2)	16 AWG (2.2 mm^2)	10 AWG (8 mm^2)	24 AWG (.2 mm^2)	14 AWG (3.5 mm^2)
MDPAK7-R7500 8 mm^2	10 AWG (8 mm^2)	10 AWG (8 mm^2)	16 AWG (2.2 mm^2)	10 AWG (8 mm_2)	24 AWG (.2 mm^2)	14 AWG (3.5 mm^2)
MDPAK7-R11000 14 mm^2	8 AWG (14 mm^2)	8 AWG (14 mm^2)	16 AWG (2.2 mm^2)	8 AWG (14 mm^2)	24 AWG (.2 mm^2)	14 AWG (3.5 mm^2)
MDPAK7-R12100	8 AWG (14 mm^2)	8 AWG (14 mm^2)	16 AWG (2.2 mm^2)	8 AWG (14 mm^2)	24 AWG (.2 mm^2)	N/A

CAUTION

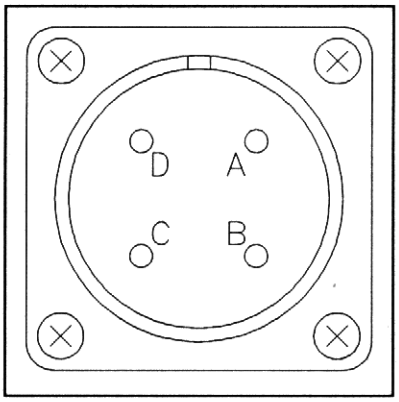
WHEN SELECTING THE ENCODER CABLE BE SURE TO USE A LOW CAPACITANCE CABLE WITH A BRAIDED OVERALL SHIELD. (CONDUCTOR RESISTANCE PER FOOT X CABLE LENGTH X 0.25) < 0.3

NOTE

IIS can supply pre-made cables for all MDPAK7 applications. Section 5.6 describes standard cables and Figures 5.5 and 5.6 show typical interconnection diagrams.

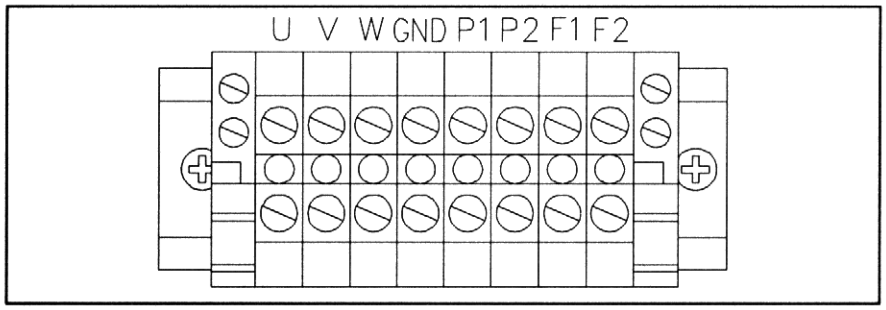
5.8 MDPAK7 CONNECTORS

5.8.1 MOTOR CONNECTOR: CABLE VIEW INTO MOTOR BLM7-R0400 THRU BLM7-R3700

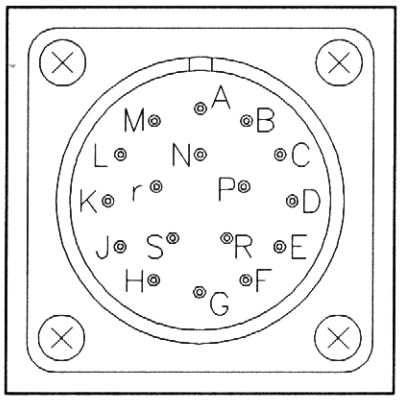


Motor mating connector: MS3106A20-4S

5.8.2 MOTOR CONNECTOR: VIEW INTO JUNCTION BOX BLM7-R5500 THRU BLM7-R11000

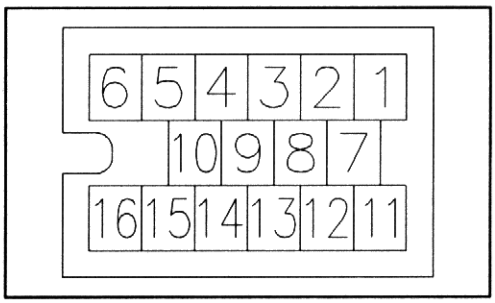


5.8.3 ENCODER CONNECTOR: CABLE VIEW INTO MOTOR



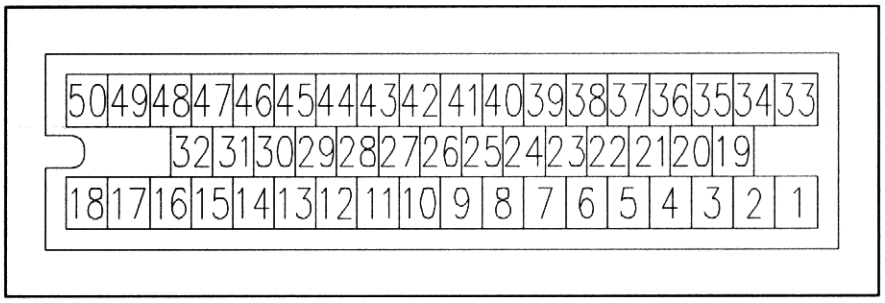
Motor mating connector: MS3106A20-29S

5.8.4 SENSOR CONNECTOR CN8: CABLE VIEW LOOKING INTO DRIVER



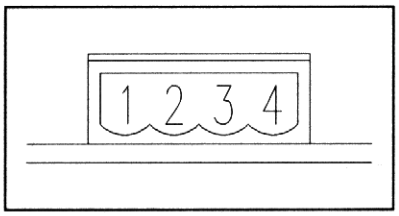
CN8 mating connector: MR-16M/MR-16L

5.8.5 CONTROL SIGNAL CONNECTOR CN9: CABLE VIEW LOOKING INTO DRIVER



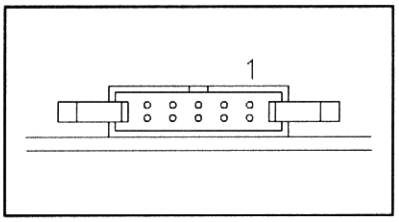
CN9 mating connector: MR-50F/MR-50L

5.8.6 COMMAND CONNECTOR J3 (AC-100094): CABLE VIEW LOOKING INTO BOARD



J3 mating connector: 25.320.3453.1

5.8.7 FEEDBACK CONNECTOR J1 (AC-100095): CABLE VIEW LOOKING INTO BOARD



J1 mating connector: 609-1041

5.9 REGENERATIVE RESISTANCE UNIT

The MDPAK7 servodriver has a built-in regenerative resistance unit. Nevertheless, when the servo system will be used for frequent acceleration and deceleration along with large inertia loads, it may become necessary to use an external regenerative resistance. This is necessary to compensate for the increased energy produced when decelerating the larger inertial loads.

The following tables and illustrations contain performance guidelines for using the MDPAK7 built-in regenerative resistance unit. If the needs of your system exceed these standards, refer to **Section 5.10.**

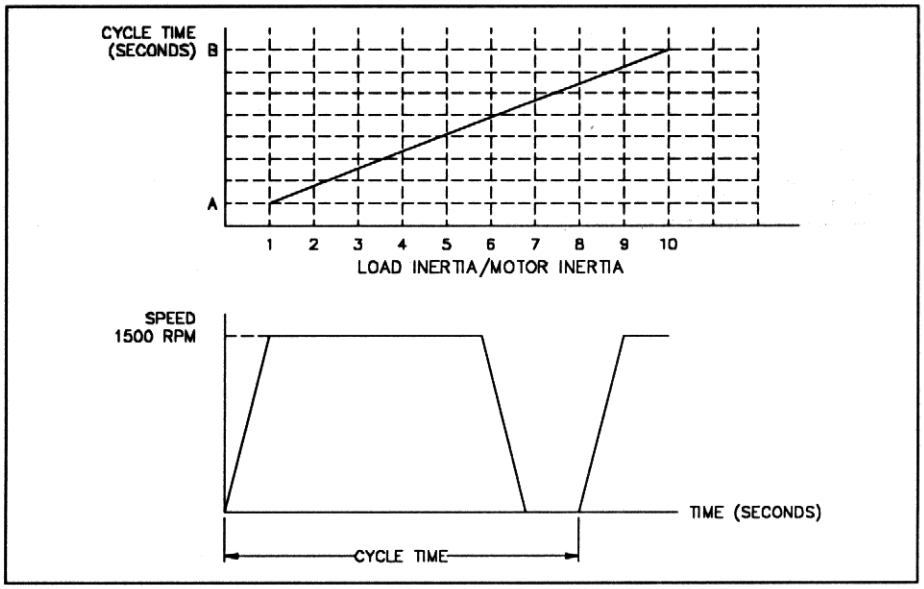


Figure 5.9 - Cycle Time

MDPAK	CYCLE TIME		INTERNAL RESISTOR	
	A sec	B sec	OHMS	WATTS
MDPAK7-R400	0.15	0.80	50	120
MDPAK7-R750	0.43	2.38	50	120
MDPAK7-R1000	0.31	1.68	30	220
MDPAK7-R1500	0.39	2.15	30	220
MDPAK7-R2000	.079	4.34	20	220
MDPAK7-R3000	1.06	5.81	20	220
MDPAK7-R3700	1.33	7.29	20	220
MDPAK7-M3700	2.00	10.9	20	220
MDPAK7-R5500	0.63	3.43	10	440
MDPAK7-R7500	0.66	3.62	7.5	600
MDPAK7-R11000	0.79	4.32	5	1000
MDPAK7-R12100	0.79	4.32	5	1000

5.10 EXTERNAL REGENERATIVE RESISTOR

In determining the appropriate size and power rating for the external regenerative resistor, three calculations must be made:

1. Average Power Dissipation:

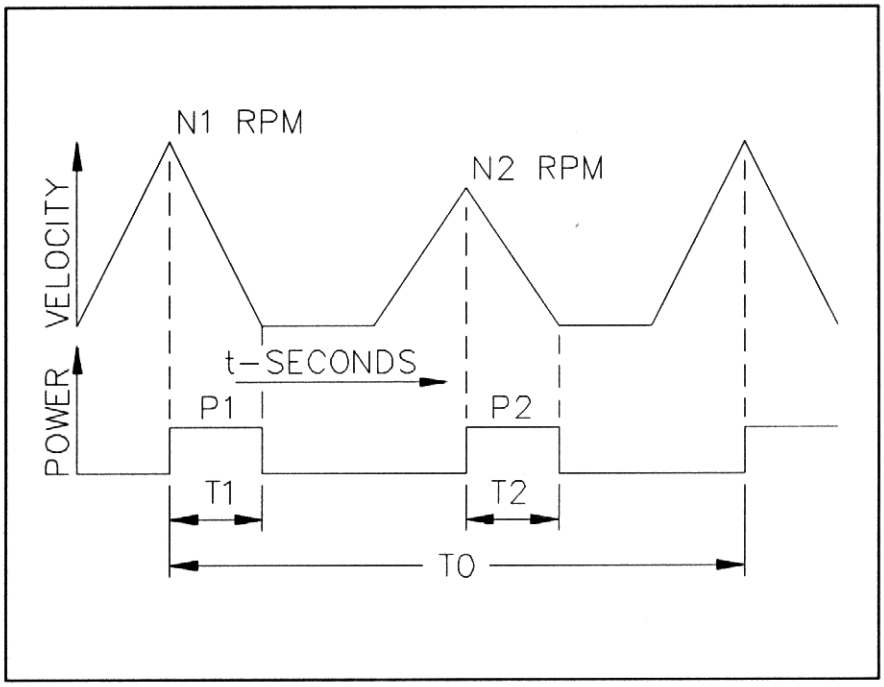


Figure 5.10 - External Regenerative Resistor

$P1 = 0.00742 * I * (N1)^2$

$P2 = 0.00742 * I * (N2)^2$

.
.
.

$PX = \ldots$

$$P_{AVE} = \frac{P1 + P2 + \ldots + Px}{To} = (WATTS)$$

I = TOTAL SYSTEM INERTIA (lb-ft-sec^2)

N = CHANGE IN SPEED (RPM)

P_X = POWER DISSIPATION (WATT-SEC)

P_{AVE} = AVERAGE POWER DISSIPATION (WATTS)

T_0 = TOTAL CYCLE TIME (SEC)

2. Maximum intermittant power dissipation:

$P_{MAX} = .00742 * I * (N_{MAX})^2$

P_{MAX} = MAXIMUM INTERMITTANT POWER (WATT-SEC)

I = TOTAL SYSTEM INERTIA (lb-ft-sec^2)

N_{MAX} = HIGHEST MOTOR SPEED DURING MACHINE CYCLE

The regenerative resistor must be capable of dissipating the average power P_{AVE} and the maximum intermittant power P_{MAX}.

3. Resistor value and wattage:

$P_{RES} = P_{AVE} * K$

P_{RES} = POWER RATING OF RESISTOR (WATTS)

P_{AVE} = AVERAGE POWER DISSIPATION (WATTS)

K = SAFETY FACTOR

K = 1 FOR FAN COOLED

K = 2 FOR FREE AIR COOLED

The resistance value for the external regenerative resistor is per **Table 5.1**.

MDPAK7	MINIMUM REGENERATIVE RESISTOR VALUE OHMS
MDPAK7-R400	50
MDPAK7-R750	50
MDPAK7-R1000	30
MDPAK7-R1500	30
MDPAK7-R2000	20
MDPAK7-R3000	20
MDPAK7-R3700	20
MDPAK7-M3700	20
MDPAK7-R5500	10
MDPAK7-R7500	7.5
MDPAK7-R11000	5
MDPAK7-R12100	5

Table 5.1

5.11 CONNECTING EXTERNAL REGENERATIVE RESISTOR

Main terminal strip with internal regenerative resistor connected.

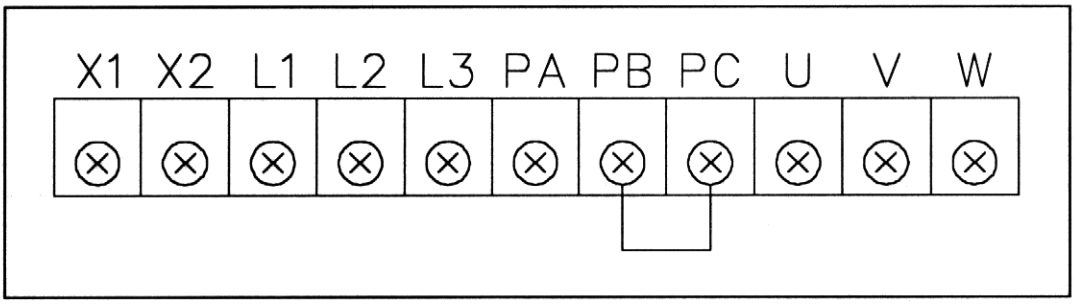


Figure 5.11

Main terminal strip with external regenerative resistor connected.

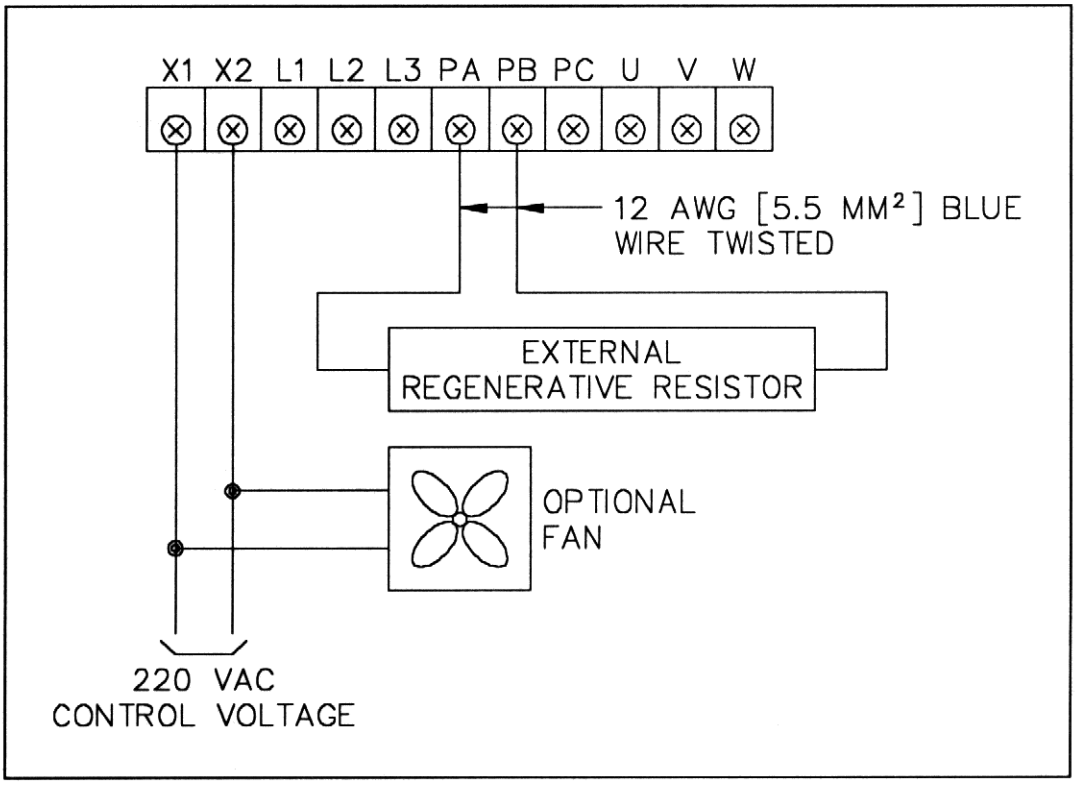


Figure 5.12

5.12 OPTIONAL TRANSFORMERS

The MDPAK7 operates directly from a 3 phase power source provided the voltage and frequency specifications in **Section 3** are met. Although it is not required, it is recommended that a 3 phase isolation transformer be used to isolate the power mains from the servo system.

IIS offers a complete line of isolation transformers that not only provide isolation but also provide primary and secondary taps to optimize line voltage conditions. Open frame and enclosed transformers are available. Both the 1 phase control power and 3 phase servo bus power can be connected to the transformer secondary.

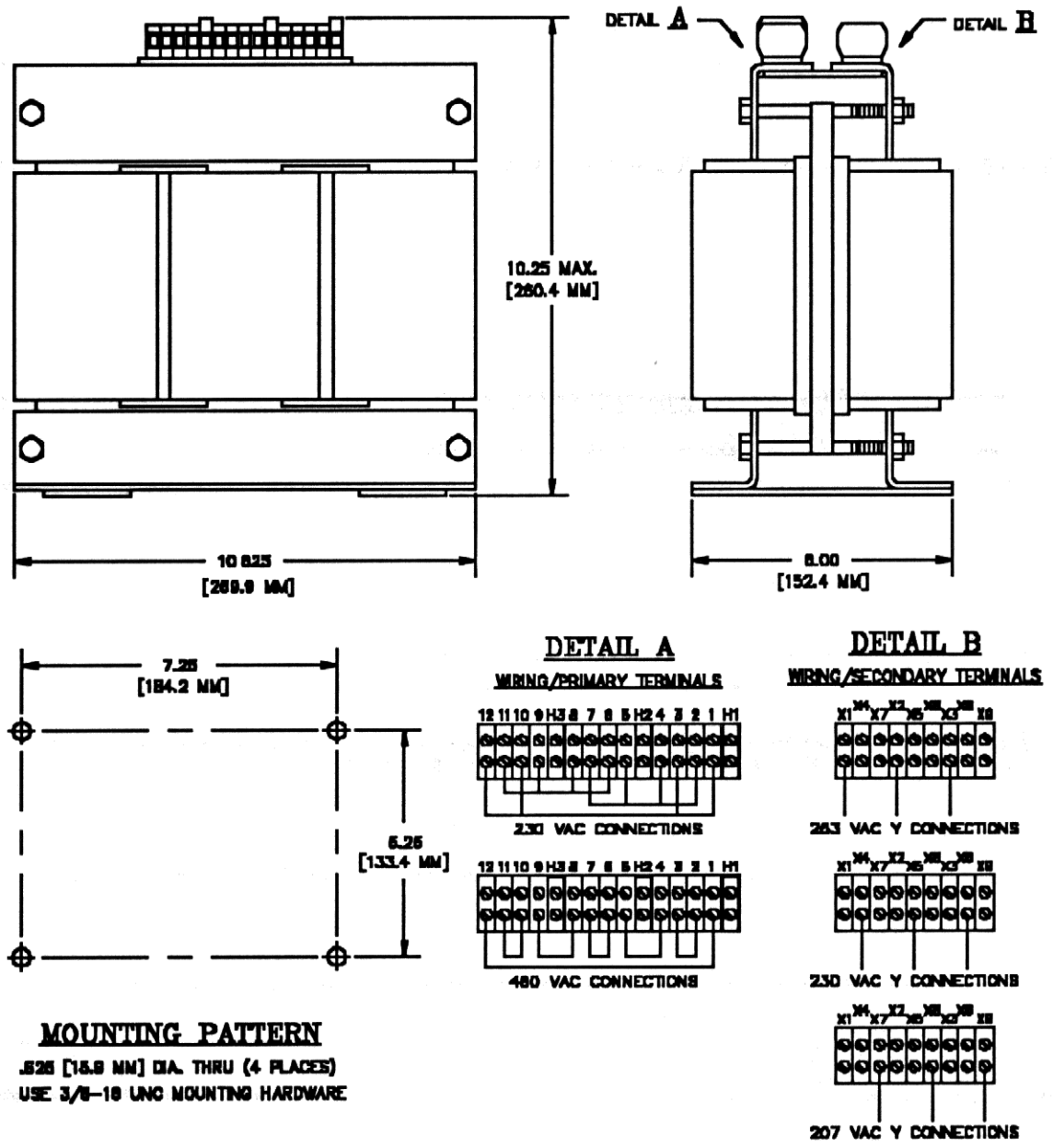
This section shows the standard transformers offered by IIS. Transformers with different primary voltages and frequencies are available. Consult the factory for specific requirements.

Several MDPAK7s can be powered with a single transformer. Power rating of the transformer is determined as follows:

$$P_{OUT} = \frac{P_1 + P_2 + P_x}{.9} = (\text{WATTS})$$

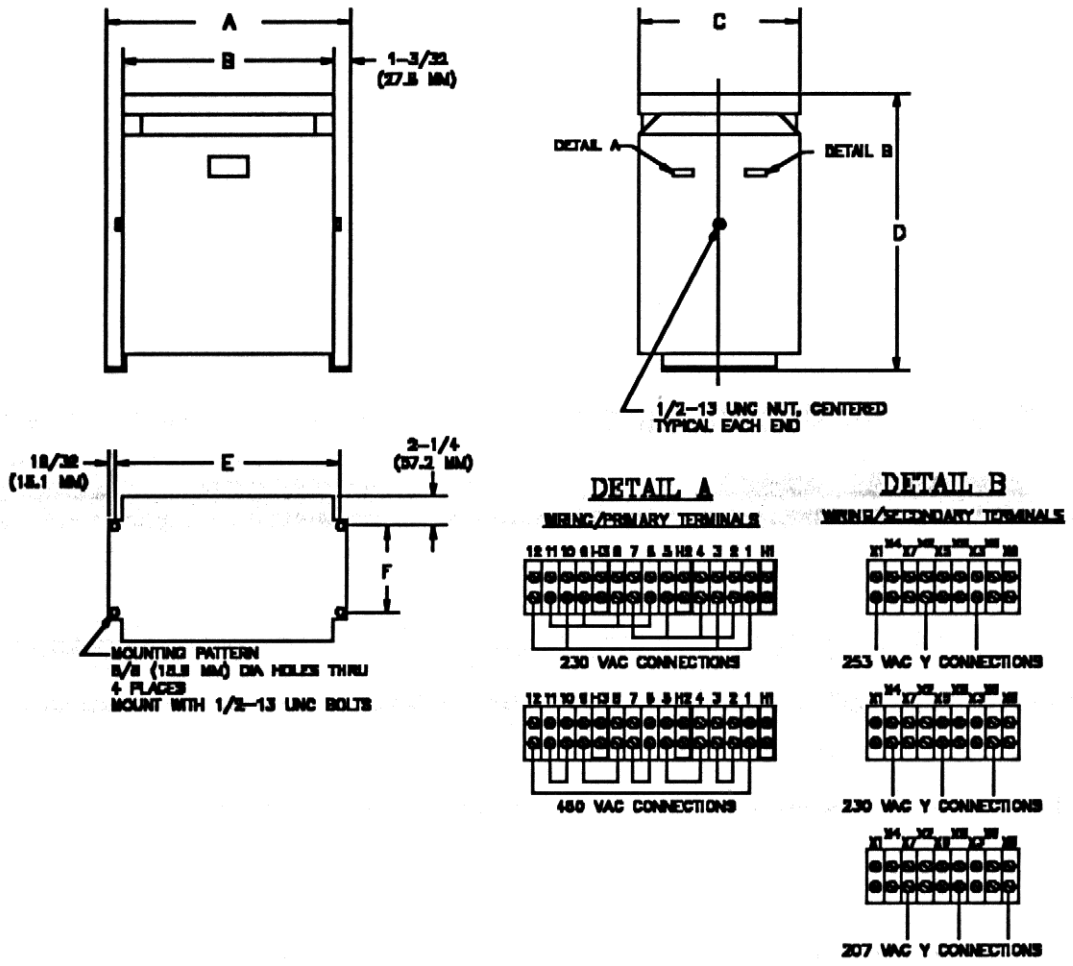
P_{OUT} = Output power of transformer (Watts)
P_x = Rated output power of MDPAK7

Select a transformer with at least as much power output as P_{OUT} above from **Figure 5.13** or **Figure 5.14**.



TRANSFORMER	FREQ. (HZ)	PHASE	OUTPUT POWER (WATTS)	TEMP. RISE (°C)	WEIGHT (LBS.)
T-300/3-3	60	3	1000	150	80
T-300/5-3	60	3	1500	150	80
T-300/7.5-3	60	3	2200	150	80

Figure 5.13 - Panel-Mount Transformer Dimensions and Connections



TRANSFORMER	FREQ. (HZ)	PHASE	OUTPUT POWER (WATTS)	TEMP. RISE (°C)	WEIGHT (LBS.)	A	B	C	D	E	F
TE-300/7.5-3	60	3	2250	150	110	18.19 (462)	16.00 (406)	8.00 (203)	21.00 (533)	17.00 (432)	3.50 (89)
TE-300/15-3	60	3	4500	150	125	18.19 (462)	16.00 (406)	8.00 (203)	21.00 (533)	17.00 (432)	3.50 (89)
TE-300/30-3	60	3	9000	150	175	22.19 (564)	20.00 (508)	12.00 (305)	21.00 (533)	21.00 (533)	7.50 (191)
TE-300/58-3	60	3	15000	150	215	28.19 (716)	26.00 (660)	16.00 (406)	27.00 (686)	27.00 (686)	11.50 (292)
TE-300/75-3	60	3	22500	150	400	28.19 (716)	26.00 (660)	16.00 (406)	27.00 (686)	27.00 (686)	11.50 (292)
TE-300/95-3	60	3	28500	150	400	28.19 (716)	26.00 (660)	16.00 (406)	27.00 (686)	27.00 (686)	11.50 (292)

DIMENSIONS = INCHES
(MILLIMETERS)

Figure 5.14 - Free-Standing Transformer Dimensions and Connections

NOTES

SECTION 6 - START-UP

CAUTION

BEFORE TURNING POWER ON THE MDPAK7 FOR THE FIRST TIME, VERIFY ALL WIRING OF THE MOTOR/DRIVE PER THE CONNECTION DIAGRAMS IN SECTION 5 OF THIS MANUAL.

NOTE

All driver system parameters have been preset at the factory to the settings shown in Appendix C. If the complete system supplied by the factory requires settings other than the defaults, a special parameter setting drawing will be supplied in the system manual. If the parameters don't match the parameter settings in the manual, call the factory for assistance.

6.1 PARAMETER SETTINGS

Setting the system response involves adjustment of five basic parameters. In a closed loop system, the parameters do interact with each other and the mechanical system. Adjustment of these parameters should only be attempted by a qualified technician or with telephone support from the IIS factory.

The five parameters are:

1. Positioning controller Position Loop Gain.

   All IIS positioning controllers have the ability to adjust the Position Loop Gain to meet the application requirements. The MDPAK7 driver has 2000 pulses per revolution of the motor which results in 8000 PPR in the positioning controller. Most applications are run with a Position Loop Gain of 20 Volts/motor revolution or 20 Volts/8000 counts. Consult the technical manual for the positioning controller and set the Position Loop Gain to approximately 20 Volts/8000 counts.

   The Position Loop Gain will need to be set higher for fast high acceleration rate applications and set lower for slower moving high inertia loads.

2. Driver Speed Command Scaling SSCL.

   The SSCL or Speed Command Scaling is the DC scale factor of the driver. The DC gain is measured in (command volts / RPM of the motor). The default setting is 10 Volts/2000 RPM. This setting will run applications that require motor speeds up to the rated speed of the MDPAK7 series which is 1500 RPM. In applications that require higher motor speeds, the SSCL must be raised such that (SSCL = 1.25 * desired speed).

3. Driver Speed Loop Gain SPG.

   The SPG or Speed Loop Gain is the DC closed loop gain of the speed loop. The higher the gain the better the load mechanical motion actually follows the command profile. In general, the SPG would be higher in large inertia systems or in very high response systems. Too high a gain will, however, result in oscillation. Too low a gain will result in a sluggish response.

4. Driver Speed Loop Integral Gain SIG.

   The SIG or Speed Loop Integral Gain is the frequency response setting for the speed loop. The higher the number the higher the frequency response. In general, low inertia high response systems require higher settings with the risk of oscillation if the setting is too high. Lower settings will result in a more stable response in high inertia systems.

5. Speed Loop Differential Gain AHG.

   The AHG or Speed Loop Differential Gain sets the response of the system to external disturbances. The higher the value the more responsive the system. AHG can be used to dampen the system response to torque or speed changes. The AHG parameter will generally round off the sharp transitions in the motion profile. Lower values will result in a more stable system.

If it is determined that the factory settings in **Appendix C** are not adequate for the application, use **Table 6.1** as a guideline for initial gain parameter settings.

Load inertia/motor inertia	1	3	5	10
S P G	30	50	80	80
S I G	0.2	0.2	0.2	0.1
A H G	0.3	0.3	0.3	0.3

Table 6.1

6.2 PARAMETER ADJUSTMENTS

1. Disconnect J3 on the AC-100094 Positioner Interface.

2. Turn on the driver control power only and verify all parameter settings are set to the defaults shown in **Appendix C**.

3. Modify the SPG, SIG and AHG parameters per **Table 6.1** to establish a baseline setting for the gain parameters.

4. Set the SSCL parameter for the desired motor speed per **Section 6.1**.

5. Set the positioning controller Position Loop Gain per the instruction manual provided with the positioning controller. Use the guidelines in **Section 6.1** to set the Position Loop Gain.

6. Turn off system power.

7. Reconnect J3 and turn on system power including position controller, drive control power and servo bus power.

8. Connect an oscilloscope to the MON and COM test points on the AC-100094 interface. See **Figure 6.1**.

9. Set the A o u t parameter to S P d using the keypad/display. This will program the MON test point to be motor actual speed.

10. Start position controller motion sequence using the manual supplied with position controller.

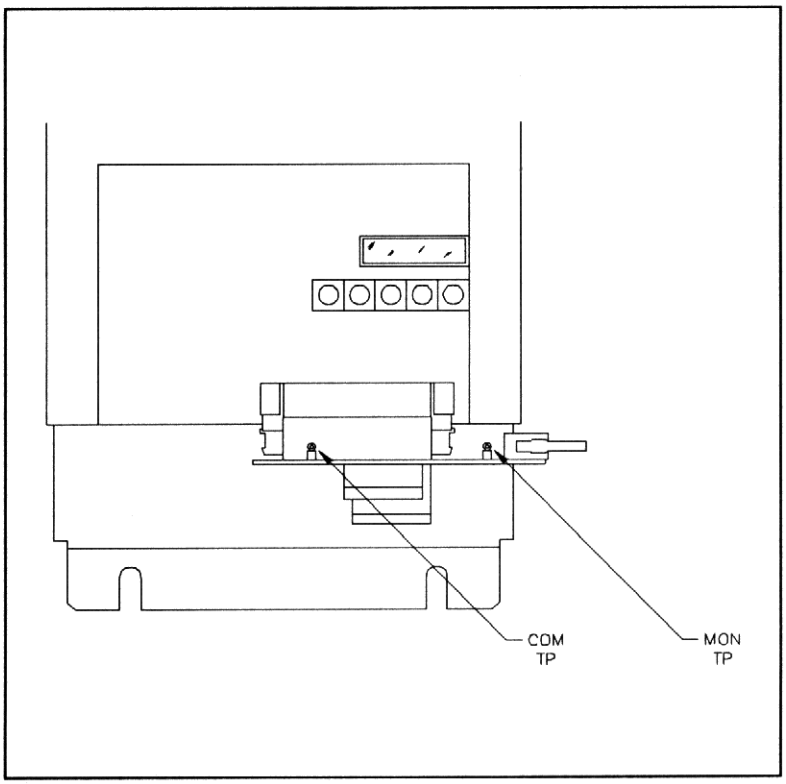


Figure 6.1

11. Monitor the oscilloscope trace and adjust parameter SPG with the goal of obtaining the ideal profile shape shown in **Figure 6.2**. Use **Figures 6.3 and 6.4** to adjust SPG. Generally raising the SPG will sharpen the profile shape until the gain is too high and the system becomes unstable.

12. Monitor the oscilloscope trace and adjust parameter SIG with the goal of obtaining the ideal profile shape shown in **Figure 6.2**. Use **Figures 6.5 and 6.6** to adjust SIG. Generally raising the SIG will eliminate large low frequency oscillations. Too high a setting in SIG will cause the system to become unstable.

13. Monitor the oscilloscope trace and adjust parameter AHG with the goal of obtaining the ideal profile shape shown in **Figure 6.2**. Use **Figures 6.7 and 6.8** to adjust AHG. Generally raising the AHG will dampen any settling disturbance or ringing. Too high a setting in AHG will cause the system to become unstable.

14. Be sure to press the SET button on all final parameter settings so they are recorded in non-volatile memory.

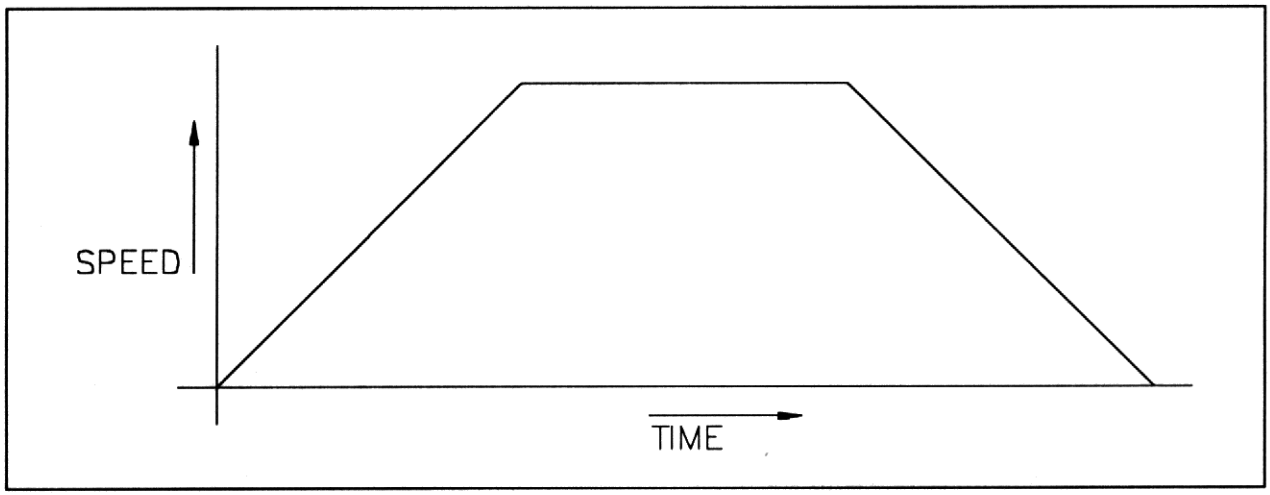


Figure 6.2 - Ideal Profile Shape

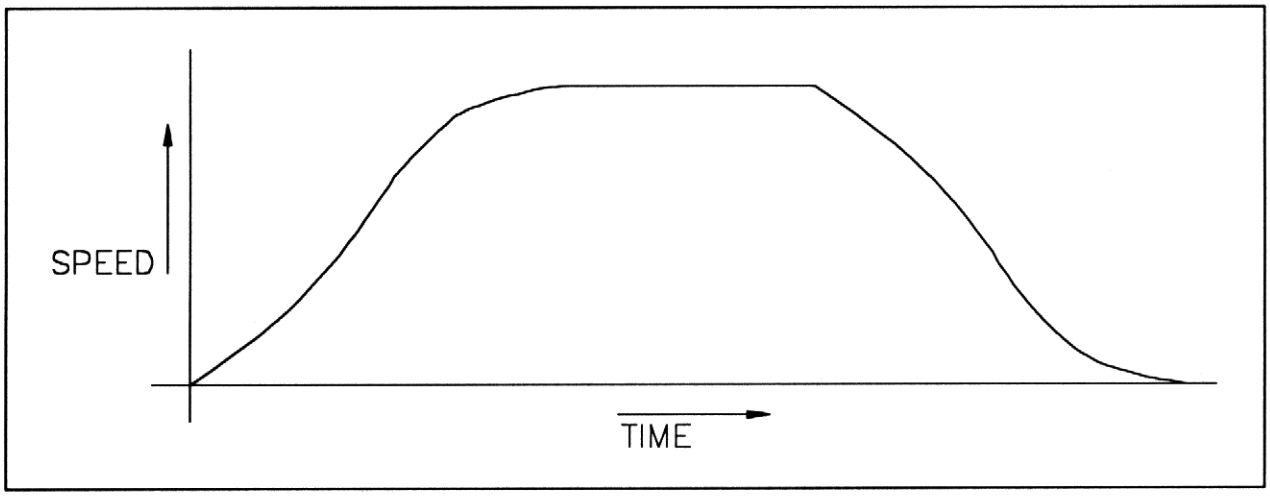


Figure 6.3 - SPG Too Low

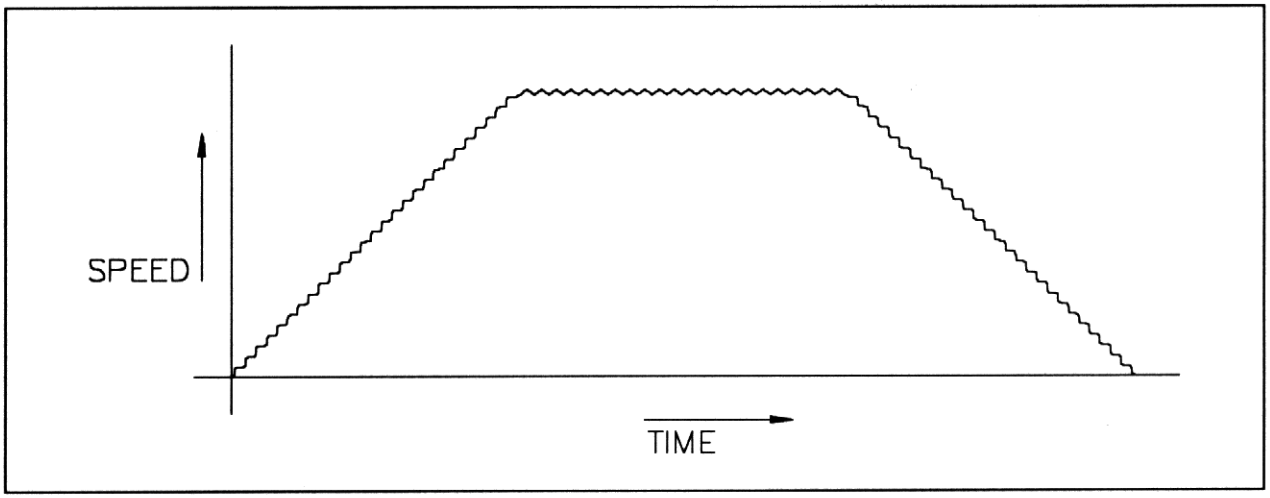


Figure 6.4 - SPG Too High

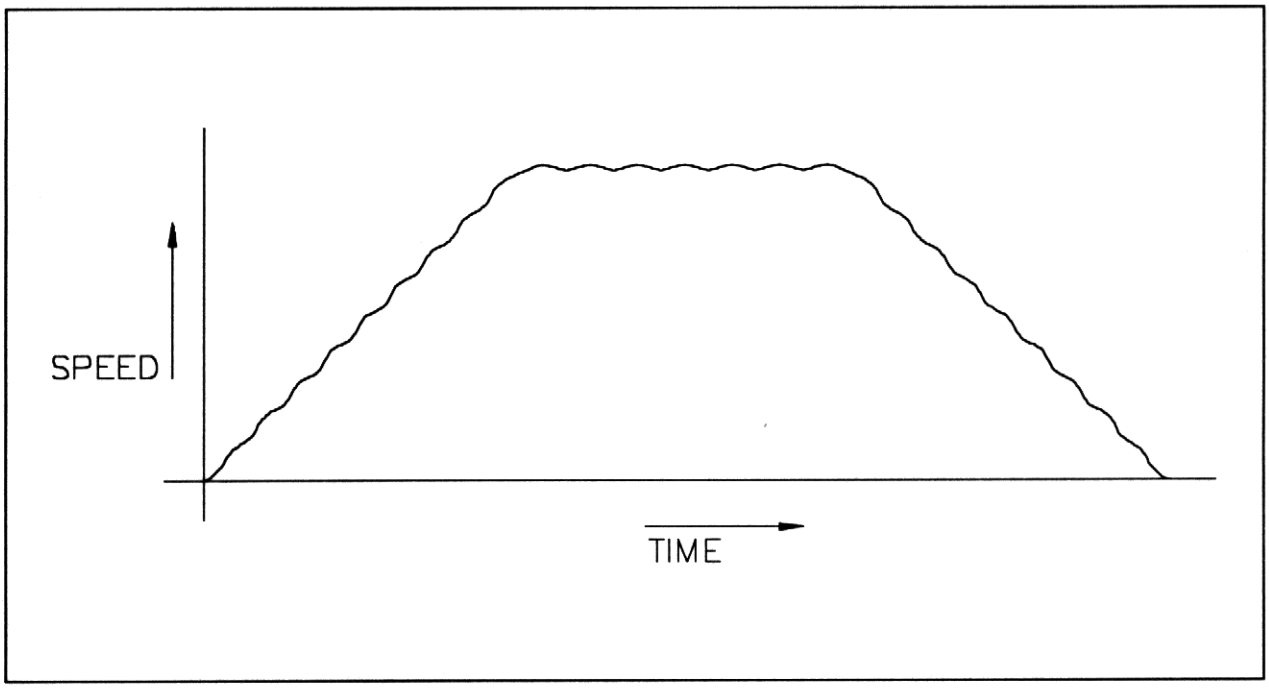


Figure 6.5 - SIG Too Low

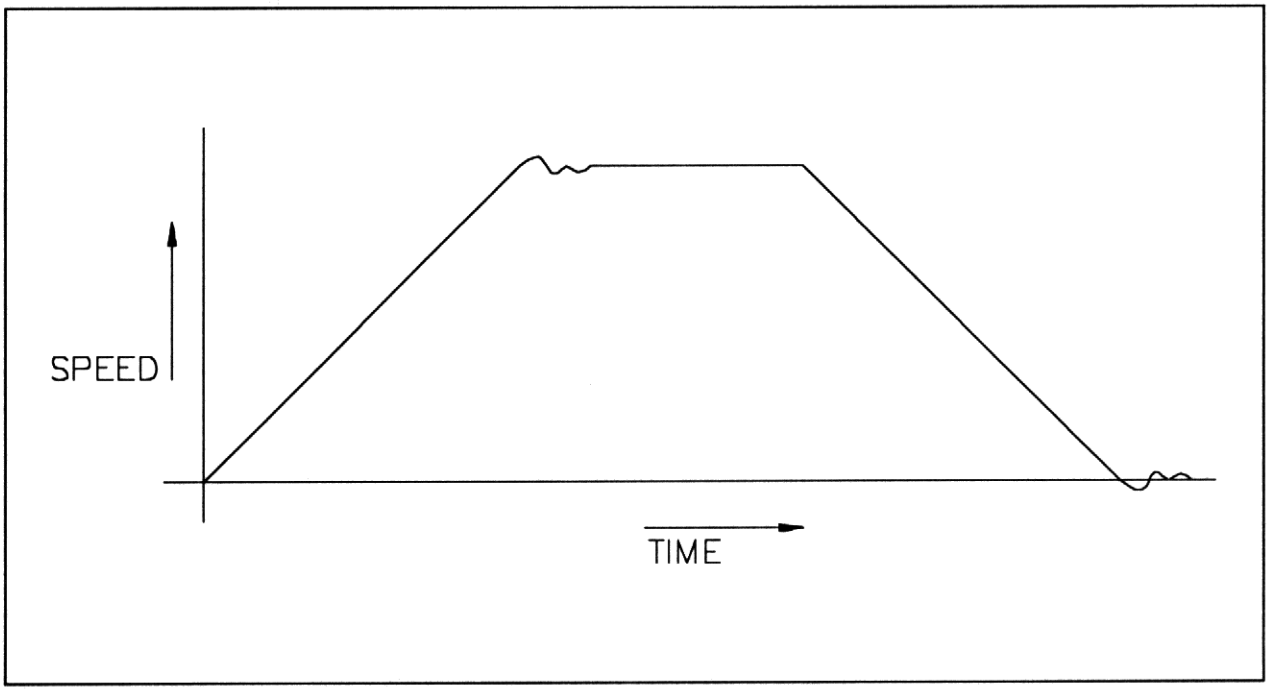


Figure 6.6 - SIG Too High

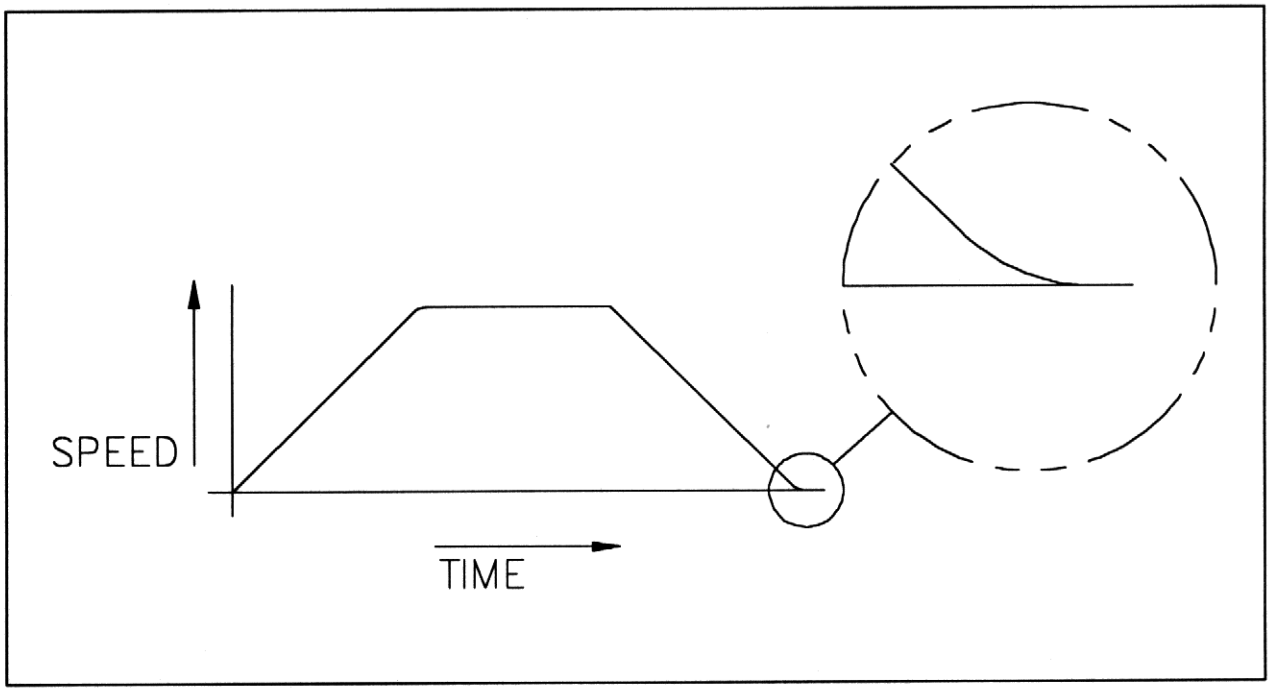


Figure 6.7 - AHG Too Low

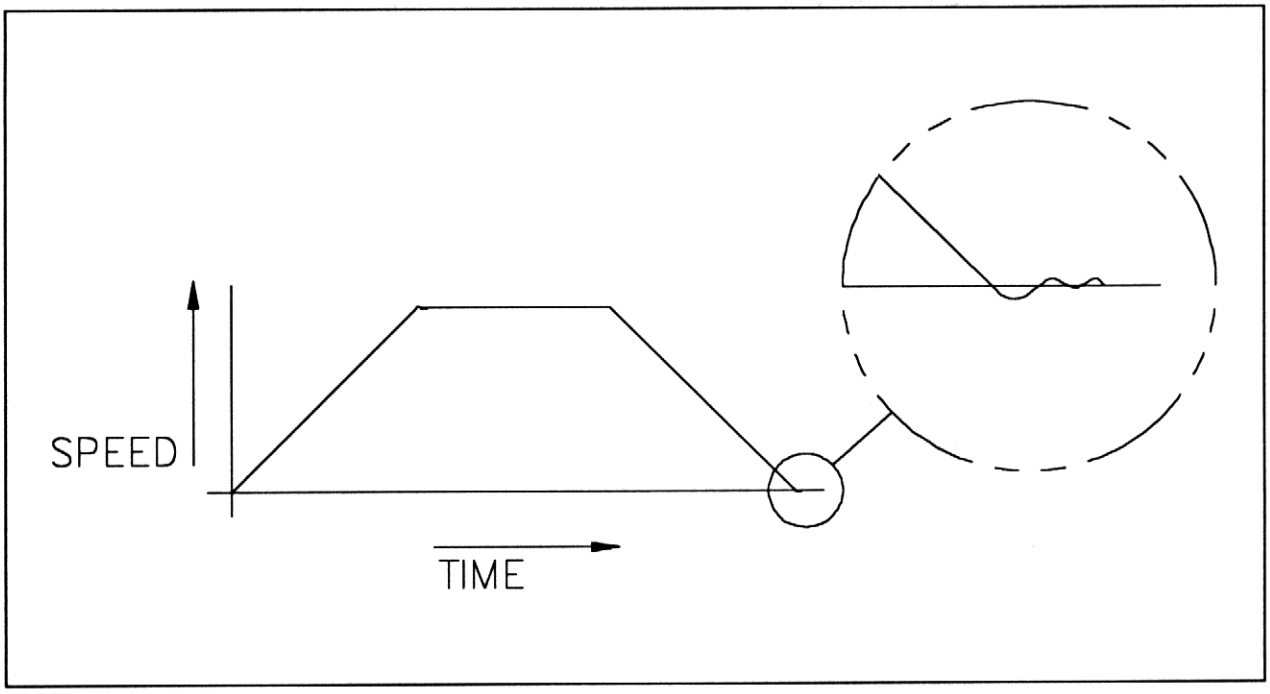


Figure 6.8 - AHG Too High

SECTION 7 - TROUBLESHOOTING

7.1 MEASUREMENT TEST POINTS

Measuring signal	T (torque command)	N (speed feedback signal)
Measuring points	Analog monitor output test points "MON" (TP2), and "COM" (TP4) signal common, are located on the drive control board next to CN9.	
	If the drive is fitted with an AC-100094 cable adaptor circuit board, the "MON" and "COM" test points on the adaptor circuit board may be more convenient to use.	
Measuring level	Max. ±10V/± max. torque	Max. ±10V/±max. speed
Parameter setting	Set AoUt to trq.	Set AoUt to SPd.

7.2 FAULT MESSAGES

Message	Fault Code	Item	Cause	Check	Action
o C	0001	Over-current	Excessive current in the main circuit.	Fault or short in main circuit cable between motor and drive ground.	Check external wiring of main circuit.
				Defective drive.	Replace drive.
				Short inside motor.	Measure resistance between motor leads and frame. If 10KΩ or less, replace motor.

Message	Fault Code	Item	Cause	Check	Action
o P	0010	Over-voltage	High input power voltage.	Check power voltage.	Use correct power voltage.
			A large load inertia was decelerated too quickly.	Check load conditions and operating pattern.	Decrease load inertia & increase deceleration time.
U P	0011	Under-voltage	Low power voltage.	Check power voltage and wiring.	Use correct power voltage.
				Check servo on sequencing with main power application.	Correct sequencing. Servo on cannot be applied until 1 sec after main power application.
o L	0100	Over-load	Load torque exceeds rated motor torque.	Measure voltage of torque command (MON to COM test points with A.Vt=trq). RMS average 3.3V results in an overload.	Reduce load torque or increase motor/drive size so that RMS average of "T" torque command is 3.3V maximum.
				Hunting oscillation due to improper gain adjustment.	Adjust driver gain to eliminate vibration. - See **Section 6.1.**
			Improper connection of main circuit between motor and drive.	Check connections.	Correct main circuit wiring.
			Machine run with brake on.	Check brake circuit.	Continue to use motor/brake if brake works properly and the specified level of braking torque is present. Replace motor/brake.
			Deteriorated lubrication due to degraded grease on bearings.	Abnormal resistance when motor shaft is turned by hand.	Replace motor.

Message	Fault Code	Item	Cause	Check	Action
o H	0101	Drive over-heat, regen-erative resistor over-heat	Driver overheats due to high ambient temperatures.	Ambient temperatures exceeds 50°C (122°F).	Lower temperature below 50°C.
			Regenerative energy is excessive because regeneration frequency is too high with large load inertia.	Check load conditions and operation pattern.	Install an external regeneration discharge resisitor (option) suitable for operating conditions.
					Decrease regenerative energy by changing motion or load conditions.
S E r	0110	Encoder abnor-mal	Wrong connection; break in encoder circuit.	Check encoder wiring. Be sure encoder wiring is not routed next to power wiring.	Correct encoder wiring. Separate encoder wiring from power wiring.
o S	0111	Over-speed	Drive abnormal. Encoder abnormal.	Check if encoder signal is correct by using the Pdls parameter.	Replace drive or motor/encoder.
E E r (Internal Position Loop Control)	1000	Exces-sive position error	Load is too large using internal position control; command and actual positions have excessive discrepancy.	Check load conditions and operation pattern.	Decrease load to reduce position error.
L L o C	1001	Motor lock	Motor is locked.	Check for mechanical problem.	Remove locking load from motor.
o t r (Internal Position Loop Control)	1010	Over-travel	Input of fwd/rvs overtravel limit switch is open to signal common.	Check operation command.	Correct overtravel condition.
P r E r	1100	ROM abnor-mal	Defective ROM in the driver.	Be sure ROM is inserted securely.	Initialize parameters.

NOTES

APPENDIX A
CONTROL INPUT SIGNALS

Pin No.	Control signal	Circuit Type	Valid control mode	Functions
CN9-1	Reset	I	ALL	Fault output and fault codes except S E r are reset, after a fault, by connecting this pin to signal common with the Servo on (ENABLE) signal turned off.
- 2	Current limit valid	I	ALL	When this is connected to signal common, torque is limited to the level set using the analog torque limit command or the value set on internal parameters P C L L and n C L L. The selection is set by internal parameter C L.
-33	Servo on (Enable)	I	ALL	Servodrive becomes active when this is connected to signal common and no faults are present.
-34	Control mode switching	I	SCM, TCM	When this is connected to signal common, control is switched to C H G position (P o S) or torque (t r q) control. Speed control is selected in the open state when internal parameter C t r L is set to S P d.
-24	Signal common	N/A		
-35	Forward start	I	SCM	Rotates forward when the pin is connected to signal common (when internal parameter F / r is set to F - r).
	Forward overtravel	I	IPLM	Forward pulse command becomes valid when this pin is connected to signal common. The forward overtravel switch (normally closed) should be connected externally. If a limit-switch is not used, the pin must be permanently connected to signal common.
-19	Reverse start	I	SCM	Rotates in reverse direction when the pin is connected to signal common (if internal parameter F / r is set to F - r).
	Reverse overtravel	I	IPLM	Reverse pulse command becomes valid when this pin is connected to signal common. The reverse overtravel switch (normally closed) should be connected externally. If a limit-switch is not used, the pin should be permanently connected to signal common.

Pin No.	Control signal	Circuit Type	Valid control mode	Functions
-20	Error counter clear	I	IPLM	When this pin is connected to signal common, all remaining pulses for positioning are cleared instantly. The motor stops immediately.
-25	Signal common	N/A		
-36	Speed 1	I	SCM	Causes motor to run when connected to signal common. Motor runs in the direction and at the speed set in internal parameter S1.
-21	Speed 2	I	SCM	Causes motor to run when connected to signal common. Motor runs in the direction and at the speed set in internal parameter S2.
-40	Signal common	N/A		
-16	Analog speed command	II	SCM, EPLM	Speed command input. Analog voltage -10V to +10V. Positive voltage rotates motor CCW. $\text{Motor Speed} = \frac{\text{(Command Voltage)}}{10} \times \text{(Parameter S S C L)}$
-15	Signal common	N/A		
-18	Analog current limit command	II	ALL	Current limit command input. Analog voltage 0-10V. If internal parameter C L is set to o U t and pin CN9-2 is connected to signal common, the current will be limited as follows: $\text{Current limit value} = \frac{\text{(Command voltage)}}{10} \times 260\%$
-17	Signal common	N/A		
-27	Forward pulse command (+)	III	IPLM	Motor runs in CCW direction with this pulse input.
-28	Forward pulse command (-)	III		
-42	Reverse pulse command (+)	III	IPLM	Motor runs in CW direction with this pulse input.
-43	Reverse pulse command(-)	III		

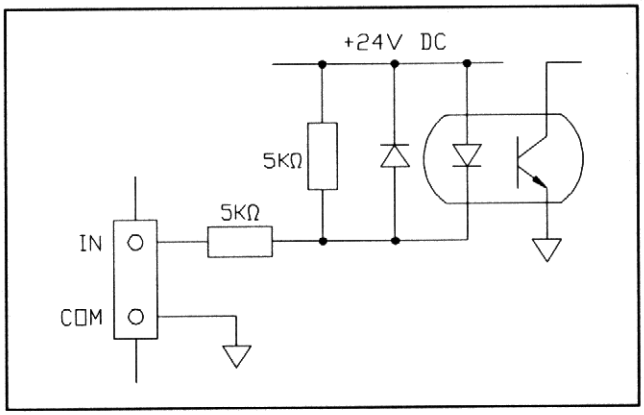
CONTROL OUTPUT SIGNALS

Pin No.	Control signal	Circuit Type	Valid control mode	Functions
-41	24VDC power	N/A	ALL	24VDC power supply output for driving the control signals. Current is 200mA max.
- 7	Servo ready	VI	ALL	This pin is connected to the signal common when the servo is turned on and the operating state is entered.
-39	Fault	VI	ALL	This pin is normally connected to signal common, and is open when a fault is detected. When open, the main circuit is automatically shut off in the driver, and the motor becomes free. See reset.
-22	Current is limited	VI	ALL	This pin is connected to signal common when the output current reaches the preset value.
-23	Speed reach signal	VI	SCM	This pin is connected to signal common when motor speed reaches the specified value. Output conditions are set by internal parameters r C H & r C H L.
	Positioning complete signal	VI	IPLM	This pin is connected to signal common when positioning is completed. Conditions of "complete" are set by internal parameters I n P and I n P r.
-38	Low speed signal	VI	ALL	This pin is connected to signal common when motor speed drops below the specified value. Conditions are set by internal parameter L o S L.
-30	+15VDC power for speed command	IV	ALL	Used for commanding analog voltages. Capacity is limited; do not use for other purposes.
-14	-15VDC power for speed command	IV	ALL	Used for commanding analog voltages. Capacity is limited; do not use for other purposes.
- 6	Fault code 3	VII	ALL	Fault code outputs are used to indicate the type of fault present. These pins are connected to signal common when no fault is present. See **Section 7.2** for fault codes.
- 4	Fault code 2	VII		
- 5	Fault code 1	VII		
-37	Fault code 0	VII		
- 8	Signal common	N/A		

Pin No.	Control signal	Circuit Type	Valid control mode	Functions
-46	Analog monitor speed feedback or torque command	V	ALL	This output pin is an analog test point for either actual motor speed or motor commanded torque. Selection is made by internal parameter A o U t being set to S P d or t r q. Speed feedback signal: $\text{Speed (rpm)} = \frac{\text{Output volts} \times \text{S S C L}}{10}$ Torque command: $\text{Torque(\%)} = \frac{\text{Output volts}}{10} \times 260\%$ (Rated torque)
-47	Analog monitor common	N/A		
- 3	Frame ground	N/A		Connected to the driver's frame.

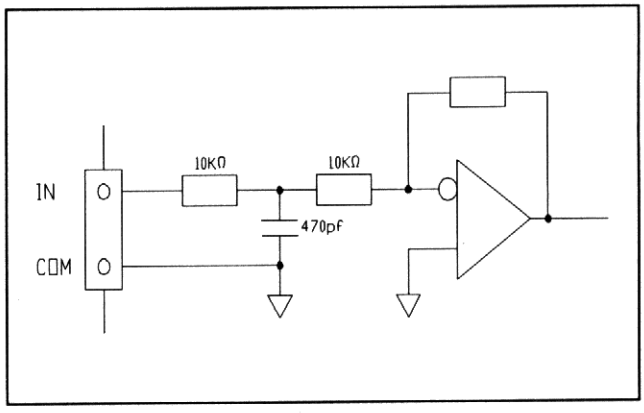
I. CONTROL INPUT CIRCUIT

MAX VOLTAGE OPEN: 25 VDC
MAX CURRENT "ON": 5 MA
MAX "ON" VOLTAGE: 2 VDC
MIN "OFF" VOLTAGE: 22 VDC



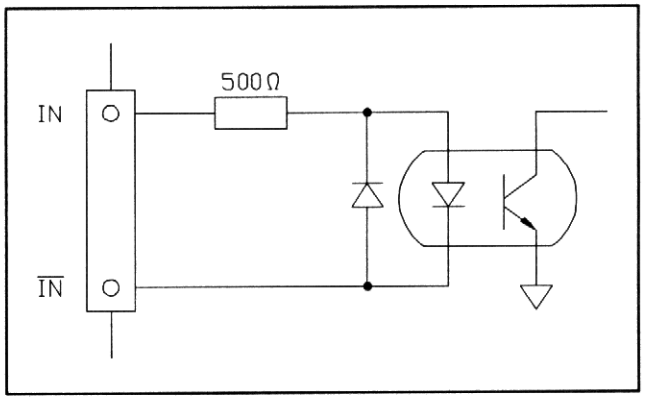
II. ANALOG COMMAND INPUT CIRCUIT

MAX INPUT VOLTAGE: ±10 VDC
INPUT RESISTANCE: 20 KΩ



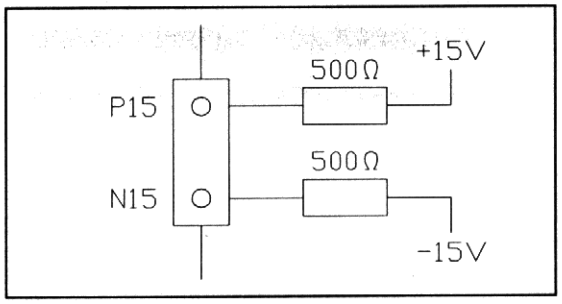
III. PULSE COMMAND INPUT CIRCUIT

MAX INPUT CURRENT: 15 MA
MIN INPUT CURRENT "ON": 5 MA
MAX INPUT CURRENT "OFF": 0.1 MA



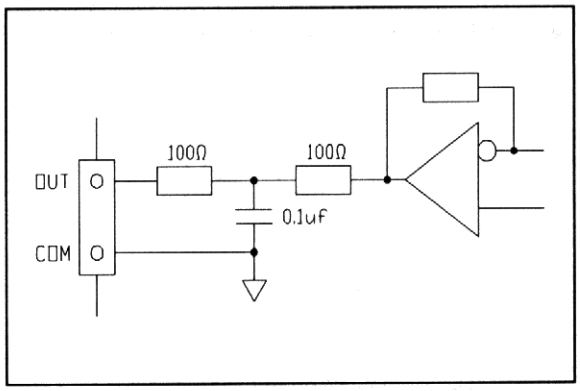
IV. POWER SUPPLY FOR ANALOG COMMAND

OPEN CIRCUIT VOLTAGE: ±15 VDC ±5%
MAX LOAD CURRENT: 10 MA



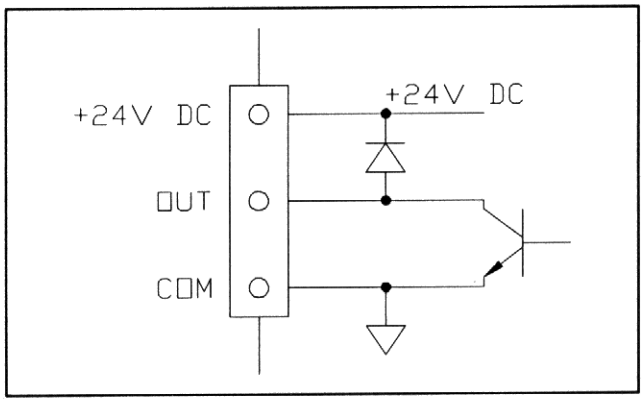
V. ANALOG MONITOR CIRCUIT

MAXIMUM OUTPUT VOLTAGE: ±10 VDC
MAXIMUM OUTPUT CURRENT: 5 MA



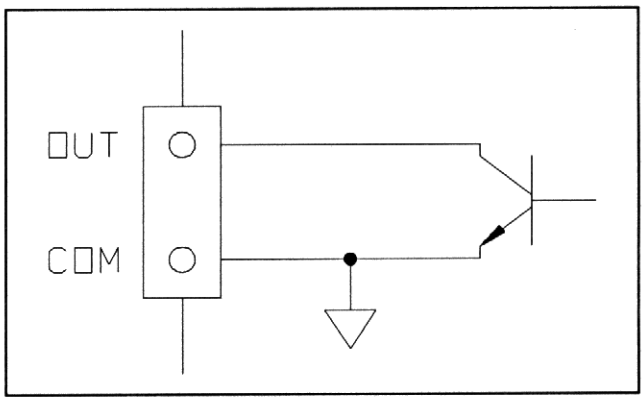
VI. CONTROL OUTPUT CIRCUIT

MAXIMUM VOLTAGE: 24 VDC
MAXIMUM CURRENT: 50 MA
MAXIMUM "OFF" LEAKAGE: .1 MA



VII. FAULT CODE OUTPUT CIRCUIT

MAXIMUM VOLTAGE: 24 VDC
MAXIMUM CURRENT: 50 MA
MAXIMUM "OFF" LEAKAGE: 0.1 MA



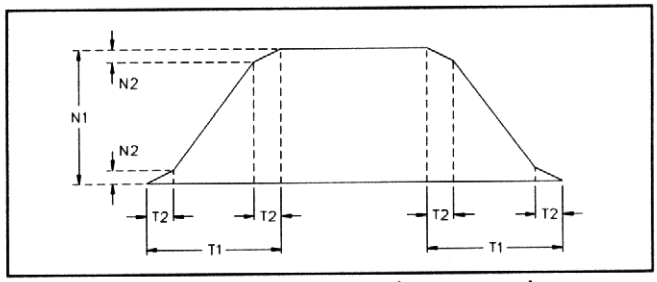
APPENDIX B
SYSTEM PARAMETERS

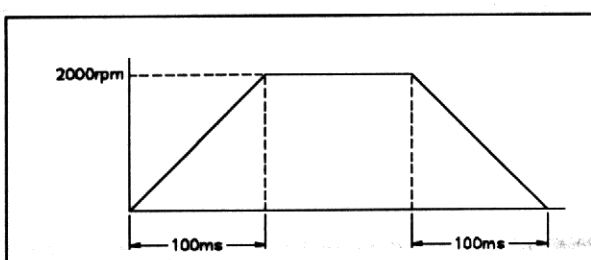
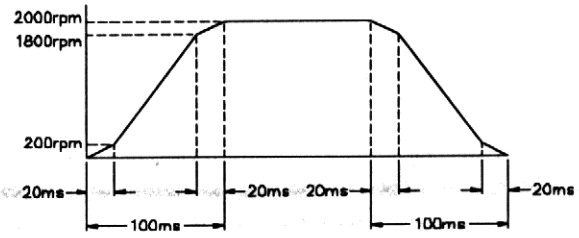
Parameter name	Valid mode	Contents of parameter	Default settings
Control type 1 C t r L	ALL	Parameter selection: S P d, P o S Used to select basic mode of operation of drive. Select S P d for SCM, TCM or EPLM modes. Select P o S for IPLM.	S P d
Control type 2 C H G	SCM, TCM, EPLM	Parameter selection: P o S, t r q Used to further select mode of operation if C t r L = S P d. Select P o S for SCM or EPLM modes. Select t r q for TCM. Hardware input CN9-34 is used to further select drive operation as follows: When C H G = P o S & CN9-34 = open; the drive is in SCM or EPLM depending on other parameters and hardware inputs. When C H G = P o S & CN9-34 = connected to signal common; the drive is in position lock of SCM mode. When C H G = t r q & CN9-34 = connected to signal common; the drive is in TCM mode. When C H G = t r q & CN9-34 = open; the drive is in SCM or EPLM.	P o S
Auto tuning enable A U t o	SCM, TCM, IPLM	Parameter selection: y or n Automatically sets three parameters of speed loop gain: S P G, S I G and A H G. See **Section 6** for details on automatic tuning.	n
Auto tuning movable range t U r n	SCM, TCM, IPLM	Parameter value range: 0 0 0 0 - 0 0 5 0 Revs Used to set the number of motor-shaft revolutions when performing automatic tuning. The motor turns in both directions within the range set.	0 0 1 0
Auto tuning rotation speed o t o P	SCM, TCM, IPLM	Parameter value range: 0 0 0 0 - 2 0 0 0 Used to set motor rpm when performing automatic tuning. The motor turns in both direction at the set speed.	0 5 0 0

Parameter name	Valid mode	Contents of parameter	Default settings
Auto tuning response level r E S P	SCM, TCM, IPLM	Parameter value range: 1,2,3 This sets the target response level for automatic tuning. 1. High response (motor step response guideline, 20mS) 2. Medium response (motor step response guideline, 30mS) 3. Low response (motor step response guideline, 40mS)	0 0 0 3
Forward/ reverse type F / r	SCM, EPLM	Parameter selection: S r F, F - r Used to select the direction of motor-shaft rotation. When S r F is selected, motor direction is determined by polarity of voltage used in external analog speed command. Voltage polarity and motor direction are determined by S P o L. When F - r is selected: motor direction is determined by user settings for Forward start or Reverse start control inputs. Voltage polarity of analog speed command is ignored. F/r must be set to SrF for EPLM.	S r F
Analog command polarity S P o L	SCM, TCM, EPLM	Parameter selection: P, n Used to set polarity of analog command input. When S P o L is P positive voltage on analog command input results in CCW rotation or CCW torque depending on mode of operation. Negative voltage is CW. When S P o L is n positive voltage on analog command input results in CW rotation or CW torque depending on mode of opeartion. Negative voltage is CCW. S P o L must be set to P for EPLM.	P

Parameter name	Valid mode	Contents of parameter	Default settings
Speed loop gain S P G	SCM, EPLM, IPLM	Parameter value range: 0 0 0 . 0 - 9 9 9 . 9 Used to set proportional gain for the speed control loop. The greater the value, the faster the response. However, too rapid a response results in unstable control. See **Section 6.4** for details about optimum settings.	xxxx
Speed loop integral gain S I G	SCM, EPLM, IPLM	Parameter value range: 0 . 0 0 0 - 9 . 9 9 9 Used to set integral gain for the speed control loop. The greater the value, the faster the response. However, too rapid a response results in unstable control. See **Section 6.4** for details about optimum settings.	xxxx
Speed loop differential gain A H G	SCM, EPLM, IPLM	Parameter value range: 0. 0 0 0 - 1. 0 0 0 Used to set differential gain for the speed control loop. The greater the value, the better the response in case of a disturbance. However, too greater a value results in unstable control. See **Section 6.4** for details about optimum settings.	xxxx
Speed command offset S o F S	SCM, EPLM	Parameter value range: +0 1 0 0 / -0 1 0 0 rpm Used to set offset of analog speed command.	0 0 0 0
Speed command scaling S S C L	SCM, EPLM	Parameter value range: 0 4 2 0 - 4 2 0 0 rpm Used to set command speed for a 10 VDC command input.	2 0 0 0
Speed limit level S L L	ALL	Parameter value range: 0 0 1 0 / 2 1 0 0 rpm Used to limit the motor's speed.	2 0 0 0
Speed command 1 S 1	SCM	Parameter value range: 2 0 0 0 / -2 0 0 0 rpm Used to set the command speed "Speed 1". If the speed limit level has been set, the speed is limited to that level. This value is selected as the speed command only after control input pin "speed 1" has been connected to signal common (CN9-36).	0 0 0 0

xxxx Default parameter value depends on motor/drive size. See Appendix A for default settings.

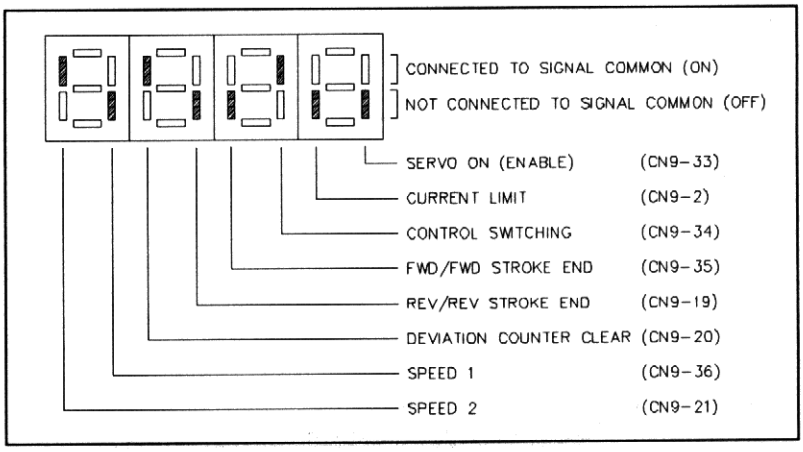
Parameter name	Valid mode	Contents of parameter	Default settings
Speed command 2 S 2	SCM	Parameter value range: 2 0 0 0 / -2 0 0 0 rpm Used to set the command speed "Speed 2". If the speed limit level has been set, the speed is limited to that level. This value is selected as the speed command only after control input pin "speed 2" has been connected to signal common (CN9-21).	0 0 0 0
Acel/Decel shape t Y P E	SCM	Parameter selection: S o F t, H A r d Used to select linear or Quasi-S-shaped acceleration/deceleration rate. Select: H A r d for linear shape Select: S o F t for Quasi-S-shaped	H A r d
Acceleration/ deceleration time A d t	SCM	Parameter value range: 0 0. 0 0 / 3 0. 0 0 sec Used to set the total time for the acceleration/deceleration rate when selecting the internal speed setting.	0 0. 0 0
Quasi-S-shaped acceleration/ deceleration rate S r A t	SCM	Parameter value range: 0 1 0. 0 / 0 4 0. 0 % Used to set the speed change point for the S-shaped acceleration/deceleration. The change acel/decel rate speed setpoint is specified as S r A t % of command speed S1, S2 or analog input.	0 1 0. 0
Quasi-S-shaped acceleration/ deceleration time t r A t	SCM	Parameter value range: 0 1 0.0 / 0 4 0. 0 % Used to set the speed change time for the S-shaped acceleration/deceleration. The change acel/decel rate time setpoint is specified as t r A t % of total acel/decel time A d t.  N1 = S 1, S 2 or Analog speed command N2 = N1 * S r A t / 100 T1 = A d t T2 = T1 * t r A t / 100	0 1 0. 0

Parameter name	Valid mode	Contents of parameter	Default settings
Note: Acceleration/deceleration shape and time can be set by means of parameters type S r A t, t r A t and A d t. Linear acc/dec  Speed command: 2000 rpm t Y P E : H A r d A d t : 0 0. 1 0		Quasi-S-shaped acc/dec  Speed command: 2000 rpm t Y P E : S o F t A d t : 0 0. 1 0 t r A t : 0 2 0. 0 S r A t : 0 1 0. 0	
Low speed signal output level L o S L	ALL	Parameter value range: 0 0 0 0 / 0 1 0 0 rpm Used to set the speed for outputting low speed signal CN9-38.	0 0 3 0
Speed reach signal output condition r C H	SCM, EPLM	Parameter selection: C n S t, S r F This is used to set conditions for outputting the speed reach signal CN9-23. C n S t: The speed set by the parameter "speed reach signal output level" is used as the speed reached value. S r F: This is invalid when in the TCM. When in the SCM, the analog speed command is used as the speed reached value.	C n S t
Speed reach signal output level r C H L	SCM, EPLM	Parameter value range: 0 1 0 0 / 2 0 0 0 rpm This setting is valid when the parameter "speed reach signal output condition" is set to C n S t.	2 0 0 0

Parameter name	Valid mode	Contents of parameter	Default settings
Position loop gain P P G	SCM, IPLM	Parameter value range: 0. 0 0 0 / 9. 9 9 9 Used to set proportional gain for the position control loop. The greater the value, the faster the response. However, too high a value results in unstable control.	0. 0 0 0
Position command scaling P S C L	IPLM	Parameter value range: 0 1 0 0 / 4 0 0 0 Used to set the number of command pulses per motor-shaft revolution. This parameter should be set according to the required positioning resolution and speed reduction ratio of the machine. Motor travel (rev.) = Command pulse number (p) / PSCL Motor speed (rps) = Command pulse frequency (pps) / PSCL	2 0 0 0
Positioning completed signal output condition I n P	IPLM	Parameter selection: n H y S, H y S Used to select output condition for sending the completed signal CN9-23. n H y S: Positioning completed signal immediately goes off when position error pulse exceeds positioning completed range, and comes on when it returns within the range. H y S: Positioning completed signal goes off when position error pulse exceeds positioning completed range by 10 pulses, and immediately comes on when it returns within the range.	n H y S
Positioning completed range I n P r	IPLM	Parameter value range: 0 0 0 0 / 9 9 9 9 pulses Positioning completed signal CN9-23 is output when position error enters positioning completed range.	0 0 0 0

Parameter name	Valid mode	Contents of parameter	Default settings
Current limit command condition C L	ALL	Parameter selection: o U t, I n The MDPAK7 driver has the ability to limit the maximum motor current (torque). The limit can be set internally by setting parameter CL = In and then programming PCLL and nCLL to a percent of rated current (torque). If CL = oUT the current (torque) is limited using an external analog voltage. Parameter current limit: I n External current limit command: o U t	I n
Positive current limit level (CCW) P C L L	ALL	Parameter value range: 0 0 0 0 / 0 2 6 0 Positive current limit value, if C L = I n.	0 2 6 0
Negative current limit level (CW) n C L L	ALL	Parameter value range: 0 0 0 0 / 0 2 6 0 Negative current limit value, if C L = I n.	0 2 6 0

MONITOR DISPLAY FUNCTIONS

Parameter name	Valid mode	Contents of parameter	Default settings
Speed reference display S r F	ALL	Parameter value range: 4 0 0 0 / -4 0 0 0 rpm Displays the commanded or reference speed into the drive. Speed display is in RPM with (-) being CW.	S S S S
Actual speed display S P d	ALL	Parameter value range: 4 0 0 0 / -4 0 0 0 rpm Displays actual motor speed in rpm with (-) being CW.	S S S
Motor torque command t r q	ALL	Parameter value range: 2 6 0 % / -2 6 0 % Displays instantaneous torque being commanded to motor (-) is CW.	T T T
Input signal monitor S E q	ALL	Used to monitor the on/off state of control input signals.  	8 8 8 8
Position display P d I S	ALL	Parameter value range: -9 9 9 9 / 9 9 9 9 Motor position is displayed on LED monitor. The number is reset to 0 0 0 0 when power is applied. The value increases as the motor-shaft turns CCW, and decreases as it turns CW.	PPPP
Analog monitor output A o U t	EPLM	Parameter selection: S P d, t r q Used to select the signal to be applied to analog monitor output (see **Section 6.4**). S P d: Speed feedback signal t r q: Current command signal	S P d

Parameter name	Valid mode	Contents of parameter	Default settings
Fault history F L T	ALL	Parameter values: Fault code Used to display the last fault recorded. See **Section 7.2** for Fault codes.	F F F
Step operation cycle S t E P	ALL	Parameter value range: 0 0 0 0 / 0 0 6 3 If a value other than 0 0 0 0 is set to this parameter, forward or reverse motor-shaft revolution immediately starts as Servo on CN9-33 is turned on, at the internally set speed or the speed set by means of the external analog speed command CN9-16. S t E P parameter is move time where t(sec) = S t E P * .25. This parameter is not stored in the system's memory, even if [Set] is pressed.	0 0 0 0
P r F L	ALL	Position Command (Low Part)	0 0 0 0
P r F H	ALL	Position Command (High Part)	0 0 0 0

NOTES

APPENDIX C
DRIVE PARAMETER DEFAULTS

DRAWING NUMBER	DESCRIPTION
SU-049001	Amplifier Setup, MDPAK7-R400
SU-049002	Amplifier Setup, MDPAK7-R750
SU-049003	Amplifier Setup, MDPAK7-R1000
SU-049004	Amplifier Setup, MDPAK7-R1500
SU-049005	Amplifier Setup, MDPAK7-R2000
SU-049008	Amplifier Setup, MDPAK7-R3000
SU-049006	Amplifier Setup, MDPAK7-R3700
SU-049006	Amplifier Setup, MDPAK7-M3700
SU-049009	Amplifier Setup, MDPAK7-R5500
SU-049011	Amplifier Setup, MDPAK7-R7500
SU-049013	Amplifier Setup, MDPAK7-R11000
SU-049015	Amplifier Setup, MDPAK7-R12100

SU-049001
MDPAK7-R400

PARA	DESCRIPTION	DEFAULT
PrSt	Parameter Set	n
Ctrt	Control Type	SPd
CHG	Control Change	PoS
AUto	Auto Tuning	n
Fr	Forward/Reverse	SrF
SPoL	Speed Polarity	P
SPG	Speed Loop Proportional Gain	016.8
SIG	Speed Loop Integral Gain	0.178
AHG	Speed Loop Differential Gain	0.323
SoFS	Speed Command Offset	0000
SSCL	Speed Command Scale	2000
SLL	Speed Level Limit	2000
S1	Speed Command 1	0000
S2	Speed Command 2	0000
Adt	Acel/decel Time	00.00
TyPE	Acel/decel Type	HArd
SrAt	Quasi S Acel Rate	010.0
trAt	Quasi S Acel Rate	010.0
LoSL	Low Speed Signal Output	0030
rCH	Speed Signal Output Condition	CnSt
rCHL	Speed Signal Output Level	2000
PPG	Position Loop Gain	0.400
PSCL	Position Command Scaling	2000
1nP	Position Complete Output	nHyS
1nPr	Position Complete Range	0000
CL	Current Limit	In
PCLL	Positive (CCW) Current Limit	0260
nCLL	Negative (CW) Current Limit	0260

SU-049002
MDPAK7-R750

PARA	DESCRIPTION	DEFAULT
PrSt	Parameter Set	n
Ctrt	Control Type	SPd
CHG	Control Change	PoS
AUto	Auto Tuning	n
Fr	Forward/Reverse	SrF
SPoL	Speed Polarity	P
SPG	Speed Loop Proportional Gain	024.8
SIG	Speed Loop Integral Gain	0.178
AHG	Speed Loop Differential Gain	0.323
SoFS	Speed Command Offset	0000
SSCL	Speed Command Scale	2000
SLL	Speed Level Limit	2000
S1	Speed Command 1	0000
S2	Speed Command 2	0000
Adt	Acel/decel Time	00.00
TyPE	Acel/decel Type	HArd
SrAt	Quasi S Acel Rate	010.0
trAt	Quasi S Acel Rate	010.0
LoSL	Low Speed Signal Output	0030
rCH	Speed Signal Output Condition	CnSt
rCHL	Speed Signal Output Level	2000
PPG	Position Loop Gain	0.400
PSCL	Position Command Scaling	2000
1nP	Position Complete Output	nHyS
1nPr	Position Complete Range	0000
CL	Current Limit	In
PCLL	Positive (CCW) Current Limit	0260
nCLL	Negative (CW) Current Limit	0260

SU-049003
MDPAK7-R1000

PARA	DESCRIPTION	DEFAULT
PrSt	Parameter Set	n
Ctrt	Control Type	SPd
CHG	Control Change	PoS
AUto	Auto Tuning	n
Fr	Forward/Reverse	SrF
SPoL	Speed Polarity	P
SPG	Speed Loop Proportional Gain	027.6
SIG	Speed Loop Integral Gain	0.178
AHG	Speed Loop Differential Gain	0.323
SoFS	Speed Command Offset	0000
SSCL	Speed Command Scale	2000
SLL	Speed Level Limit	2000
S1	Speed Command 1	0000
S2	Speed Command 2	0000
Adt	Acel/decel Time	00.00
TyPE	Acel/decel Type	HArd
SrAt	Quasi S Acel Rate	010.0
trAt	Quasi S Acel Rate	010.0
LoSL	Low Speed Signal Output	0030
rCH	Speed Signal Output Condition	CnSt
rCHL	Speed Signal Output Level	2000
PPG	Position Loop Gain	0.400
PSCL	Position Command Scaling	2000
1nP	Position Complete Output	nHyS
1nPr	Position Complete Range	0000
CL	Current Limit	In
PCLL	Positive (CCW) Current Limit	0260
nCLL	Negative (CW) Current Limit	0260

SU-049004
MDPAK7-R1500

PARA	DESCRIPTION	DEFAULT
PrSt	Parameter Set	n
Ctrt	Control Type	SPd
CHG	Control Change	PoS
AUto	Auto Tuning	n
Fr	Forward/Reverse	SrF
SPoL	Speed Polarity	P
SPG	Speed Loop Proportional Gain	023.5
SIG	Speed Loop Integral Gain	0.178
AHG	Speed Loop Differential Gain	0.323
SoFS	Speed Command Offset	0000
SSCL	Speed Command Scale	2000
SLL	Speed Level Limit	2000
S1	Speed Command 1	0000
S2	Speed Command 2	0000
Adt	Acel/decel Time	00.00
TyPE	Acel/decel Type	HArd
SrAt	Quasi S Acel Rate	010.0
trAt	Quasi S Acel Rate	010.0
LoSL	Low Speed Signal Output	0030
rCH	Speed Signal Output Condition	CnSt
rCHL	Speed Signal Output Level	2000
PPG	Position Loop Gain	0.400
PSCL	Position Command Scaling	2000
1nP	Position Complete Output	nHyS
1nPr	Position Complete Range	0000
CL	Current Limit	In
PCLL	Positive (CCW) Current Limit	0260
nCLL	Negative (CW) Current Limit	0260

SU-049005
MDPAK7-R2000

PARA	DESCRIPTION	DEFAULT
PrSt	Parameter Set	n
Ctrt	Control Type	SPd
CHG	Control Change	PoS
AUto	Auto Tuning	n
Fr	Forward/Reverse	SrF
SPoL	Speed Polarity	P
SPG	Speed Loop Proportional Gain	036.1
SIG	Speed Loop Integral Gain	0.178
AHG	Speed Loop Differential Gain	0.323
SoFS	Speed Command Offset	0000
SSCL	Speed Command Scale	2000
SLL	Speed Level Limit	2000
S1	Speed Command 1	0000
S2	Speed Command 2	0000
Adt	Acel/decel Time	00.00
TyPE	Acel/decel Type	HArd
SrAt	Quasi S Acel Rate	010.0
trAt	Quasi S Acel Rate	010.0
LoSL	Low Speed Signal Output	0030
rCH	Speed Signal Output Condition	CnSt
rCHL	Speed Signal Output Level	2000
PPG	Position Loop Gain	0.400
PSCL	Position Command Scaling	2000
1nP	Position Complete Output	nHyS
1nPr	Position Complete Range	0000
CL	Current Limit	In
PCLL	Positive (CCW) Current Limit	0260
nCLL	Negative (CW) Current Limit	0260

SU-049008
MDPAK7-R3000

PARA	DESCRIPTION	DEFAULT
PrSt	Parameter Set	n
Ctrt	Control Type	SPd
CHG	Control Change	PoS
AUto	Auto Tuning	n
Fr	Forward/Reverse	SrF
SPoL	Speed Polarity	P
SPG	Speed Loop Proportional Gain	032.4
SIG	Speed Loop Integral Gain	0.178
AHG	Speed Loop Differential Gain	0.323
SoFS	Speed Command Offset	0000
SSCL	Speed Command Scale	2000
SLL	Speed Level Limit	2000
S1	Speed Command 1	0000
S2	Speed Command 2	0000
Adt	Acel/decel Time	00.00
TyPE	Acel/decel Type	HArd
SrAt	Quasi S Acel Rate	010.0
trAt	Quasi S Acel Rate	010.0
LoSL	Low Speed Signal Output	0030
rCH	Speed Signal Output Condition	CnSt
rCHL	Speed Signal Output Level	2000
PPG	Position Loop Gain	0.400
PSCL	Position Command Scaling	2000
1nP	Position Complete Output	nHyS
1nPr	Position Complete Range	0000
CL	Current Limit	In
PCLL	Positive (CCW) Current Limit	0260
nCLL	Negative (CW) Current Limit	0260

SU-049006
MDPAK7-R3700/M3700

PARA	DESCRIPTION	DEFAULT
PrSt	Parameter Set	n
Ctrt	Control Type	SPd
CHG	Control Change	PoS
AUto	Auto Tuning	n
Fr	Forward/Reverse	SrF
SPoL	Speed Polarity	P
SPG	Speed Loop Proportional Gain	033.2
SIG	Speed Loop Integral Gain	0.178
AHG	Speed Loop Differential Gain	0.323
SoFS	Speed Command Offset	0000
SSCL	Speed Command Scale	2000
SLL	Speed Level Limit	2000
S1	Speed Command 1	0000
S2	Speed Command 2	0000
Adt	Acel/decel Time	00.00
TyPE	Acel/decel Type	HArd
SrAt	Quasi S Acel Rate	010.0
trAt	Quasi S Acel Rate	010.0
LoSL	Low Speed Signal Output	0030
rCH	Speed Signal Output Condition	CnSt
rCHL	Speed Signal Output Level	2000
PPG	Position Loop Gain	0.400
PSCL	Position Command Scaling	2000
1nP	Position Complete Output	nHyS
1nPr	Position Complete Range	0000
CL	Current Limit	In
PCLL	Positive (CCW) Current Limit	0260
nCLL	Negative (CW) Current Limit	0260

SU-049009
MDPAK7-R5500

PARA	DESCRIPTION	DEFAULT
PrSt	Parameter Set	n
Ctrt	Control Type	SPd
CHG	Control Change	PoS
AUto	Auto Tuning	n
Fr	Forward/Reverse	SrF
SPoL	Speed Polarity	P
SPG	Speed Loop Proportional Gain	025.3
SIG	Speed Loop Integral Gain	0.178
AHG	Speed Loop Differential Gain	0.323
SoFS	Speed Command Offset	0000
SSCL	Speed Command Scale	2000
SLL	Speed Level Limit	2000
S1	Speed Command 1	0000
S2	Speed Command 2	0000
Adt	Acel/decel Time	00.00
TyPE	Acel/decel Type	HArd
SrAt	Quasi S Acel Rate	010.0
trAt	Quasi S Acel Rate	010.0
LoSL	Low Speed Signal Output	0030
rCH	Speed Signal Output Condition	CnSt
rCHL	Speed Signal Output Level	2000
PPG	Position Loop Gain	0.400
PSCL	Position Command Scaling	2000
1nP	Position Complete Output	nHyS
1nPr	Position Complete Range	0000
CL	Current Limit	In
PCLL	Positive (CCW) Current Limit	0200
nCLL	Negative (CW) Current Limit	0200

SU-049011
MDPAK7-R7500

PARA	DESCRIPTION	DEFAULT
PrSt	Parameter Set	n
Ctrt	Control Type	SPd
CHG	Control Change	PoS
AUto	Auto Tuning	n
Fr	Forward/Reverse	SrF
SPoL	Speed Polarity	P
SPG	Speed Loop Proportional Gain	022.3
SIG	Speed Loop Integral Gain	0.178
AHG	Speed Loop Differential Gain	0.323
SoFS	Speed Command Offset	0000
SSCL	Speed Command Scale	2000
SLL	Speed Level Limit	2000
S1	Speed Command 1	0000
S2	Speed Command 2	0000
Adt	Acel/decel Time	00.00
TyPE	Acel/decel Type	HArd
SrAt	Quasi S Acel Rate	010.0
trAt	Quasi S Acel Rate	010.0
LoSL	Low Speed Signal Output	0030
rCH	Speed Signal Output Condition	CnSt
rCHL	Speed Signal Output Level	2000
PPG	Position Loop Gain	0.400
PSCL	Position Command Scaling	2000
1nP	Position Complete Output	nHyS
1nPr	Position Complete Range	0000
CL	Current Limit	In
PCLL	Positive (CCW) Current Limit	0200
nCLL	Negative (CW) Current Limit	0200

SU-049013
MDPAK7-R11000

PARA	DESCRIPTION	DEFAULT
PrSt	Parameter Set	n
Ctrt	Control Type	SPd
CHG	Control Change	PoS
AUto	Auto Tuning	n
Fr	Forward/Reverse	SrF
SPoL	Speed Polarity	P
SPG	Speed Loop Proportional Gain	033.6
SIG	Speed Loop Integral Gain	0.178
AHG	Speed Loop Differential Gain	0.323
SoFS	Speed Command Offset	0000
SSCL	Speed Command Scale	2000
SLL	Speed Level Limit	2000
S1	Speed Command 1	0000
S2	Speed Command 2	0000
Adt	Acel/decel Time	00.00
TyPE	Acel/decel Type	HArd
SrAt	Quasi S Acel Rate	010.0
trAt	Quasi S Acel Rate	010.0
LoSL	Low Speed Signal Output	0030
rCH	Speed Signal Output Condition	CnSt
rCHL	Speed Signal Output Level	2000
PPG	Position Loop Gain	0.400
PSCL	Position Command Scaling	2000
1nP	Position Complete Output	nHyS
1nPr	Position Complete Range	0000
CL	Current Limit	In
PCLL	Positive (CCW) Current Limit	0200
nCLL	Negative (CW) Current Limit	0200

SU-049015
MDPAK7-R12100

PARA	DESCRIPTION	DEFAULT
PrSt	Parameter Set	n
Ctrt	Control Type	SPd
CHG	Control Change	PoS
AUto	Auto Tuning	n
Fr	Forward/Reverse	SrF
SPoL	Speed Polarity	P
SPG	Speed Loop Proportional Gain	33.6
SIG	Speed Loop Integral Gain	0.178
AHG	Speed Loop Differential Gain	0.323
SoFS	Speed Command Offset	0000
SSCL	Speed Command Scale	2000
SLL	Speed Level Limit	2000
S1	Speed Command 1	0000
S2	Speed Command 2	0000
Adt	Acel/decel Time	00.00
TyPE	Acel/decel Type	HArd
SrAt	Quasi S Acel Rate	010.0
trAt	Quasi S Acel Rate	010.0
LoSL	Low Speed Signal Output	0030
rCH	Speed Signal Output Condition	CnSt
rCHL	Speed Signal Output Level	2000
PPG	Position Loop Gain	0.400
PSCL	Position Command Scaling	2000
1nP	Position Complete Output	nHyS
1nPr	Position Complete Range	0000
CL	Current Limit	In
PCLL	Positive (CCW) Current Limit	0200
nCLL	Negative (CW) Current Limit	0200

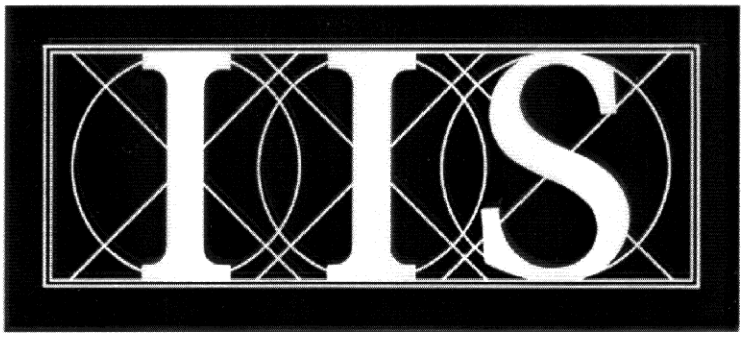
APPENDIX D

MDPAK™ BILL OF MATERIALS

MDPAK™	DRIVER P/N	MOTOR P/N
MDPAK7-R400	BSD7-R0400	BLM7-R0400
MDPAK7-R750	BSD7-R0750	BLM7-R0750
MDPAK7-R1000	BSD7-R1000	BLM7-R1000
MDPAK7-R1500	BSD7-R1500	BLM7-R1500
MDPAK7-R2000	BSD7-R2000	BLM7-R2000
MDPAK7-R3000	BSD7-R3000	BLM7-R3000
MDPAK7-R3700	BSD7-R3700	BLM7-R3700
MDPAK7-M3700	BSD7-R3700	BLM7-M3700
MDPAK7-R5500	BSD7-R5500	BLM7-R5500F
MDPAK7-R7500	BSD7-R7500	BLM7-R7500F
MDPAK7-R11000	BSD7-R11000	BLM7-R11000F
MDPAK7-R12100	BSD7-R12100	BLM7-R12100

NOTES

IB-14B007



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