Compumotor

M Drive User Guide

Compumotor Division
Parker Hannifin Corporation
p/n 88-002385-02 A

Parker

IMPORTANT

User Information

To ensure that the equipment described in this user guide, as well as all the equipment connected to and used with it, operates satisfactorily and safely, all applicable local and national codes that apply to installing and operating the equipment must be followed. Since codes can vary geographically and can change with time, it is the user's responsibility to identify and comply with the applicable standards and codes. WARNING: *Failure to comply with applicable codes and standards can result in damage to equipment and/or serious injury to personnel.*

Personnel who are to install and operate the equipment should study this user guide and all referenced documentation prior to installation and/or operation of the equipment.

In no event will the provider of the equipment be liable for any incidental, consequential, or special damages of any kind or nature whatsoever, including but not limited to lost profits arising from or in any way connected with the use of this user guide or the equipment.

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Since Parker Compumotor constantly strives to improve all of its products, we reserve the right to change this user guide and equipment mentioned therein at anyime without notice.

Technical Assistance *Contact your local automation technology center (ATC) or distributor, or ...*

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Compumotor Division
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COMPUMOTOR CORPORATION

M-SERIES MOTOR/DRIVER OPERATOR'S MANUAL

TABLE OF CONTENTS

COMPUMOTOR MOTOR/DRIVER SYSTEMS

INSTALLATION AND OPERATION MANUAL

1. INTRODUCTION

WARNING!

Compumotor Corporation has made a special effort in the design and construction of its products to make them both versatile and easy to use. The mechanical torque produced by these motor/ drivers is capable of damaging or destroying the equipment to which they are connected if improperly installed, operated, or serviced. Only persons qualified in servicing and installing hazardous voltage electrical and limited-travel mechanical systems should attempt this procedure.

The Compumotor Open-Frame Motor-Driver package is functionally similar to boxed-unit Compumotors: The motor is completely unchanged, and the driver package differs only in that it lacks the large finned heat sink, sheet metal cover, and end connector panel with its motor and indexer connectors.

2. INSPECTION

Carefully inspect the shipping carton(s) for any evidence of physical abuse or damage and note any findings on the Waybill at the time of receipt. In cases of severe damage, it is recommended that the shipment be rejected entirely. Compumotor Corporation cannot be responsible for in-transit damage.

3. UNPACKING

Use care in opening the shipping carton(s) so that the cables supplied are not cut or damaged. Verify the receipt of the following items:

Qty	Description
1	Compumotor with 10 foot (3M) Drive Cable
1	Driver (Power Amplifier/Translator) Module
1	3-wire AC Line Cord 6 feet (2M) with Ground Pin
1	Pulse Source Cable Kit
1	Standard Product Line Brochure

For an Open-Frame Motor-Driver Package verify the receipt of the

following items:

Qty	Description
1	Motor (with cable and connector)
1	Driver Printed Circuit Assembly
2	Screws, 4-40 X 3/4
2	Spacer, 3/8"
2	Washer, Insulation
1	Jumper (Berg type)
1	Installation Instructions

Verify that the above items have been included in your shipment for each motor driver (except the instruction manual) and that these items are not cracked, broken or otherwise damaged. It is a good idea to save the unit's packing materials in the event a unit needs to be returned to Compumotor.

4. MOUNTING THE MOTOR AND DRIVER

4.1. Standard Motor Driver

The three Series of Compumotor conform to NEMA Standard frame sizes as follows.

Compumotor Series	NEMA Standard Frame Size	Bolt Size	Bolt Grade SAE
M57	23	#8-32	3
M83	34	#10-32	3
M106	42	#10-32	3

The Compumotor should be mounted rigidly with the proper size and grade of hardware at all four corners, and the motor case should be connected to third wire ground.

The Compumotor's mounting surface acts as a heat sinking device which carries away thermal energy generated by self heating. Temperatures produced by the motor when not mounted may seem excessive, and are the result of the Compumotor having full power applied to the motor at all times, even when not rotating. This heating is normal. The motor temperature will drop considerably when the Compumotor is mounted.

The Driver may be mounted some distance from the motor if the wire lengths and minimum wire sizes listed in Appendix B are observed. Motor cable extensions are available from the factory.

Mount the Driver with the heatsink fins running vertically for best convection cooling (Figure 5). A minimum of 3 inches (7.62 cm) of clearance must surround the Driver on the heatsink top and four sides.

Route the motor cable carefully so that movements of the motor and any attached mechanism(s) will not cause interference. In addition, the motor cable should be routed away from equipment that is sensitive to electromagnetic interference.

4.2. Open Frame Motor Driver

It is necessary to mount the driver board heat sink to a metal surface to conduct heat away from the power transistors. The heat sink should be firmly attached to the mounting surface to provide good thermal conductivity. It is recommended that heat sink compound (such as Thermalloy No. 249) be applied between the heat sink and the mounting surface, particularly for the M83 and M106 drives. Refer to Appendix E for thermal data on the various drives available. Threaded mounting holes are provided on the bottom and the side of the heat sink as shown in Appendix G.

The end of the circuit board opposite the heat sink must also be secured. Spacers, screws, and insulation washers have been supplied for this purpose. Appendix C has dimensional details on circuit board mounting holes.

4.3. Environmental Considerations

The mounting location for the Compumotor and driver must be free from all liquids and protected from conductive chips and dust. The standard Compumotor is not suitable for explosive atmospheres, vacuum beyond 10^{-2} torr, or life-support equipment. The bearings in the motor are not sealed and must be protected from contaminants. Ambient conditions for the Driver are 32 to 122°F (0 to 50°C) and 20 to 90% humidity (non-condensing). The Compumotor can operate from 32 to 150°F (0 to 70°C).

Coil any excess cable at the Driver and secure it with a cable tie. This cable carries high voltage (150 VDC) and all wire runs must conform to all applicable local electrical codes and OSHA requirements. Check that the model number of the Compumotor and the Driver have the same type number (e.g. M83-93).

Standard Compumotor motor and indexer cables will not connect directly to the Driver printed circuit board. To do this, the standard connectors are removed and insulation displacement-type ramp connectors are used. Part numbers and vendor names for these connectors are listed in Appendix D.

Pin connections to the Open-Frame Motor-Driver are listed in Appendix E.

If intermediate cabling assemblies are used, it is not necessary

to remove the standard motor and indexer connectors. Part numbers for these assemblies may be found in Appendix D.

5. CONNECTING AC POWER

5.1. Standard Motor Drives

Select a source of 117 VAC power which is free from line drop outs and transient voltage spikes. The maximum current draw of the various Motor/Driver Systems is listed in Appendix B. Standard practices of sizing wire for these loads must be observed to minimize the voltage drop at the Driver.

Rotate the Motor Cable Connector until it slips into the mating connector on the Driver. Turn the locking collar clockwise until it is tight.

5.2. Open-Frame Motor Drives

CAUTION

High voltages are present on the driver circuit board. These must be allowed to discharge for five minutes after taking power off prior to handling the card.

Test equipment will be damaged if connected to the Driver board without using a power line isolation transformer. Repair of damaged or failed units should be referred to the Compumotor Repair Department.

Proper connection of the Motor is imperative to avoid damage to the Driver. An intermittent Motor connection will definitely cause Driver failure. Connector location may be found in Appendix F.

Before applying power to the Driver board, verify the Driver to Motor connections with an ohmmeter. Motor phase windings are typically about one ohm. There should be no continuity to the opposite phase or earth ground.

CAUTION

Hazardous voltages inside. Refer installation and servicing to qualified personnel only.
DO NOT CONNECT OR DISCONNECT THE MOTOR FROM THE DRIVER WHILE POWER IS ON. To do so will damage the Driver and void the warranty.

6. CHECKOUT

6.1. Proper Torque

A dummy load with an inertia approximating the one listed in Appendix A for your motor should be mounted securely to the motor

shaft for testing. Only collet-style mounting clamps are recommended for security and for concentricity between the load and the motor shaft.

Prior to energizing the Motor/Driver, manually turn the Compumotor shaft by grasping the outer radius of the dummy load. One should feel the magnetic detents characteristic of this type of AC synchronous motor employing permanent magnets.

NOTE

Motor/Drivers with serial numbers hgigher than 4,000 have an internal interlock built into the motor cable (Pins 3 and 7). The interlock will not allow power to be delivered to the motor connector while the motor is discon- nected. This is a safety feature to protect the operator from hazardous voltages that would otherwise be present. It is important that this interlock be supported should an extension or custom cable be used to drive the motor. Consult the factory for assis- tance prior to making any extension or custom cables.

Connect AC Power to the Motor/Driver.

It is not unusual for there to be a snap or pop caused by the in-rush energy charging the Motor/Driver power supply. Check that the rated holding torque is present at the Compumotor shaft. This may be done feel, as the magnetic detent torque will have increased by at least an order of magnitude. A standard torque wrench may be used in place of the dummy load if a quick, quantifiable result is desired. Should the torque under power be low or nonexistent, proceed to Section 11, Trouble Shooting (Page 10).

WARNING

DO NOT connect or disconnect the motor connector while the Motor/Driver is energized because an arc will result in the connector subsequently, and damage the Motor/Driver. To do so voids the Warranty. Multiple motors may be connected, one at a time, to the same driver by use of the Remote Power Shutdown and external switches. Consult the factory if this is required.

6.2. Pulse Source Connection

Prepare the Data Cable Kit according to the following procedures:

Signal	Wire Color Code	Connector Pin No.
Direction Input (+)	Green	A
Direction Return (-)	White	E
Step Input (+)	Red	B
Step Return (-)	Black	D
Remote Shutdown (+)	Blue	C
Shutdown Return (-)	Brown	F
Chassis Ground Shield (Drain)	Not connected at Driver End	

20 mA, TTL level

20 mA, TTL level

20 mA, TTL level

Check the data cable for continuity and possible shorts prior to use. Use a dummy load of 180 ohms to ensure that a minimum of 20 mA is available to drive each of the opto-isolators in the Driver (HP #HCPL 2530).

6.3. Pulse Generation

Set the pulse rate of your chosen pulse source to zero. Connect the Pulse Source Cable to the Driver. Make sure that the Remote Power Shut-down signal is not asserted (Logical "0" on Pin C).

Compumotors are designed to be accelerated and decelerated. Compumotor Corporation provides a complete line of preset indexers for creating the necessary velocity profiles and controlling total distance moved.

Gradually increase the pulse rate until the dummy load begins to rotate. Decrease again to zero and change the logic state of the Direction Input. Increase the pulse rate and observe the change in direction of the Compumotor shaft. Return the pulse rate to zero. Simple frequency counters are helpful at this stage to observe velocity changes.

6.4. Compumotor Pulse Generation

If you are using one of Compumotor Corporation's Preset Indexers with a 25,000 step per revolution Motor/Drive system, perform the following test:

150, 170 or 2100 Series Preset Indexers

1. Set the Mode Switch to "Preset".
2. Dial in "10" rev/sec^2 on the Acceleration thumbwheels.
3. Dial in "10.00" rev/sec (150 or 170 Series or "10.000" rev/sec (2100) on the Velocity thumbwheels.
4. Dial in "+20.000" revolutions on the Position thumbwheels (151 Series) or 500,000 steps (170 or 2100 Series).
5. Depress "START".

If using the Compumotor 2100 Series Indexer with RS-232C Computer Interface you may transmit the following the following command string to the 2100:

"E MN A10 V10 D500000 G" (Carriage Return)

All of the above will accelerate the motor at the rate of 10 rev/sec^2 until a velocity of 10 rev/sec. is reached (5 complete revolutions in one second). After completing a total of 15 revolutions, the motor will begin to decelerate, at the rate of 10 rev/sec^2, to a stop. When stopped, it will have completed exactly 20 revolutions in three seconds.

7. LIMITED-TRAVEL MECHANISM

Limited travel mecanisms are those that will do not allow infinite travel of the motor. These mechanisms include X-Y tables, transver lines, lead screws and so on. These mechanisms generally require load activated switches which signal the indexer of pending problems. Failure to use limit switches in these applications can damage the user's equipment. Applications not requireing limit switches are generally rotary applications, e.g., rotating mirrors or turning parts for broaching or cutting.

Before connecting the actual load to the shaft of the Compumotor, all limited-travel mechanisms must be protected by the use of electrical limit switches. If one of the Compumotor Preset Indexers is used, follow the instructions included with those units. In other cases, a limit switch must signal the need for a controlled deceleration at the maximum rate possible. This rate must be consistent with load inertia and maximum load of the motor.

Note that since the required limits are not the "End-of-Travel" type, they must be tripped far enough before the mechanical stop to allow the load to be safely decelerated. This distance may be determined empirically by initiating the deceleration cycle in the middle of travel and measuring the distance required to stop.

8. DYNAMIC CHARACTERISTICS OF THE COMPUMOTOR

A Compumotor M-Series Motor/Drive is a special case of a hybrid permanent magnet step motor driven by a 20 KHz, bi-polar, chopper power amplifier. Its complex wave-shaping circuitry allows significant compensation for many of the mechanical and electrical imbalances inherent in step motors. The digitally-controlled proportioning of current simultaneously between multiple windings gives high torque at low speed without the jarring accelerations of traditional step motors.

The precision of Compumotor's power proportioning techniques yields exceptional repeatability while maintaining the open-loop accuracy and ease of use characteristic of stepper motors. The Compumotor shares the dynamic response curve of the stepper motor and its stall characteristics. That is, full torque under acceleration is developed at a lag angle of approximately 1.8°. Loading which causes a larger lag angle will result in the motor losing position.

In cases of severe overloading, the rotor will lose synchronism with the stator and the rotor will stall and stop. The Compumotor has been designed to allow a continuous stall condition while overloaded without damage to the Compumotor or the driver. The motor may make considerable noise when stalled. This does not hurt the motor. If the motor is stalled, however, the rotating magnetic vector must be stopped by halting the input pulses, and the cause of the overload condition remedied before the Compumotor may be restarted and run successfully.

Up to 1.8° of dynamic error under acceleration will be recovered when a constant velocity is reached, or when the Compumotor is stopped. How much error is recovered is proportional to load friction and depends on the stick-slip characteristics of the load. The degree of recovery may, therefore, have to be determined empirically. If using Compumotors or step motors in multi-axis systems, the error under load (if excessive) could be compensated for in the master control system. Decelerating produces a similar error condition as the motor leads the load.

9. ENCODER OPTION

The M-Series -E option includes an optical incremental encoder with a 10 ft cable terminated with a 25 pin male "D" type connector. All Compumotor indexers which support position tracking have a 25 pin "D" connector socket for connection with the Compumotor supplied encoder, except for the Compumotor Model 430. The Model 430 Indexer uses screw terminal strips to make all of its logic level connections. The encoder connection is made on terminals 47 through 52. To make this connection the "D" connector on the end of the encoder cable must be removed and the wires must be stripped and tinned to facilitate connection to the screw terminals. The table below shows the color code and pinouts for the encoder cable.

Pin	Function	Color
1	Ch A+	Yellow
2	Ch A-	Wht/Yellow
3	Ch B+	Blue
4	Ch B-	Wht/Blue
5	Ch Z+	Orange
6	Ch Z-	Wht/Orange
8	Shield[1]	Drain wire
14	Common	Black
23	+5V	Red

All Compumotor supplied encoders are 1000 line, dual channel, complimentary output encoders. Output signals are all TTL (0-5V) level. Encoder extionsion cables should use shielded twisted pairs and the total cable length should not excede 50 feet.

10. PERIODIC MAINTENANCE

Periodically check the Compumotor mounting bolts and shaft couplings. The ball bearings used in the Compumotor are not sealed but are permanently lubricated and require no maintenance. There are no serviceable items in the Compumotor or maintenance items such as brushes.

The motor strain relief and cable should be inspected at appropriate intervals for signs of wearing or excessive force being applied to the cable. Tighten both cable connectors at the Driver. Check that the Driver heatsink is free of dust and dirt and has a free flow of air over its entire surface.

11. TROUBLESHOOTING

If problems develop in the operation of the Compumotor, refer to the following list of symptoms and causes to identify or localize the problem:

11.1. Motor Fails to Turn

Probable Causes:

(a) No AC power. Check to see if the motor is warm to the touch after 15 minutes of being turned on.
(b) Bad connections or bad cables.

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[1]When using the 430 Indexer. the shield wire should be connected to one of the screws in the case of the 430.

(c) Tripped or faulty limit switches - make sure that control signals are not being inhibited by limit inputs to a preset indexer or supervisory logic.

(d) Load is jammed - remove AC power from the Driver and verify that the load can be turned manually.

(e) No Step signal coming to Driver - check that a pulse train meeting all requirements for voltage, current and pulse width is available (3.5 to 6V @ mA minimum 25 mA maximum, 500 nsec pulse width minimum).

(f) Driver output is being turned off by Remove Power Shutdown Option - Pin C of the input cable to the Driver should not be high (TTL level) relative to Pin F.

(g) Blown driver AC line fuse. The motor and driver will be cold to the touch 30 minutes after the fuse blows. Disconnect AC power from the Driver and discount it from the surface to which it is attached. Remove the four Phillips-head screws which retain the sheet metal cover on the long sides of the Driver. Remove the four screws on the short edges of the end plates. Slip off the cover and inspect the fuse. If the fuse is blown, return the unit for repair.

NOTICE

Probing of the Driver with AC Power applied should never be done by anyone other than Compumotor qualified personnel. LETHAL VOLTAGES ARE PRESENT and there is no AC line isolation in the Driver.

11.2. Motor Stops During Acceleration

Probable Cause:

This condition indicates an overload condition caused by excessive torque requirements, too steep an acceleration ramp, or a gross mismatch of load inertia and rotor inertia. Refer to the Compumotor full-line catalog. A larger motor and/or lower accelerations may be indicated.

11.3. Motor Fails to Run Above 20 rps (1200 rpm)

This may be a torque problem but, more likely, it has to do with load/Compumotor interactions which can stimulate parametric oscillations and stall the Compumotor. The addition of friction, system dampening or mechanical redesign to minimize mechanical resonances may be required singly or in combination. Standard Compumotor indexers will not allow a motor velocity above 20 rps (1200 rpm).

11.4. Motor is Jerky, Noisy or Weak

Check that there are no mechanical problems at the load

causing highly variable loading conditions at the Compumotor shaft. Disconnect the Compumotor from the load and run it with a dummy load connected. If the problem persists, service repair is indicated.

12. FACTORY SERVICE

To return the Compumotor for repair or to order replacement parts, obtain the Model and Serial Numbers of the Motor and Driver. Call the Compumotor Service Department for return authorization. In California call collect (707) 778-1244; otherwise call toll free (800) 358-9068. Return the Compumotor and Driver, freight prepaid, to:

COMPUMOTOR CORPORATION
1179 North McDowell Boulevard
Petaluma, California 94952
Attn: Service Department
RMA # _____

Note: Please mark both packing slip and packing label with the Return Material Authorization number supplied by Compumotor.

13. FURTHER NOTES

Compumotor Corporation is dedicated to being a leader in digital motion control. We invite your questions, comments, or discussion of problems.

This manual has been designed to provide an introduction for the user with typical applications. Significant departures from the operating parameters outlined here are possible. If you have a volume requirement for our products (of over 250 per year), we would like to discuss your specific needs.

Call or write:

Technical Marketing Group
Compumotor Corporation
1179 N. McDowell Boulevard
Petaluma, California 94952

In California, call collect: (707) 778-1244
Outside California, call toll free: (800) 358-9068

14. SPECIFICATIONS

14.1. Environmental Specifications

Operation:Driver - 32-104°F (0-40°C) ambient assumes driver fins mounted vertically, convection cooling. Maximum fin temperature = 150°F (60°C).
10 to 90% Humidity, Non-condensing

Motor - 32-104°F (0-50°C) ambient - assumes convection cooling. Maximum case temperature (measured mid-case) = 230°F (110°C).
10 to 90 % Humidity, Non-condensing

Storage:-40 to 185°F (-40 to 85°C)

14.2. Electrical Specifications

Input Power:105 to 125 VAC 50/60 Hz with brownout protection

TTL Inputs:3.5 to 6.0 V pulse height
500 nsec pulse width minimum
20 mA minimum current
1 MHz maximum pulse rate

Driver Dimensions:See Appendix K
Driver Weight: 64 oz. (1.81 kg)
Motor Dimensions:See Appendix K
Motor Weight: See Table

MOTOR SPECIFICATION TABLE

MOTOR SERIES		M57			M83			M106	
MOTOR TYPE		51	83	102	62	93	135	120	178
Rotor Inertia	oz-in^2	0.48	1.28	1.75	3.50	6.70	10.2	21.5	44.0
	Kg-cm^2	.088	.234	320	0.64	1.23	1.87	3.92	8.05
Torque	oz-in	40	80	120	140	260	400	520	700
Motor Case Temp Rise: 1RPS	F°	52	58	54	54	65	61	85	81
	C°	(29)	(32)	(30)	(30)	(36)	(34)	(47)	(45)
(Free Air) 5RPS	F°	61	68	63	63	83	80	124	121
	C°	(34)	(38)	(35)	(35)	(46)	(44)	(69)	(67)
10RPS	F°	40	54	50	60	74	68	108	106
	C°	(22)	(30)	(28)	(33)	(41)	(38)	(60)	(59)
Maximum Driver Temperature Rise		18 (10)	22 (12)	25 (14)	20 (11)	38 (21)	40 (22)	36 (20)	43 (24)
Motor Case Dissipation-WATTS									
1 RPS		6	9	11	12	24	27	33	51
5 RPS		7	12	13	15	26	32	48	76
10 RPS		5	8	10	14	24	30	42	67
Max. Driver Input Current - AMPS		0.8	0.9	1.0	1.0	1.3	1.8	2.2	3.0
Motor Weight (with cable)	ozs	23	35	47	57	93	129	135	240
	(kg)	(0.65)	(0.99)	(1.33)	(1.62)	(2.64)	(3.66)	(3.83)	(6.80)

Appendix A: Dummy Load Parameters

Motor	Inertias: Rotor ($oz\text{-}in^2$)	Inertias: Dummy Load, Approx. ($oz\text{-}in^2$)	Dummy Load Dimensions for an Aluminum Disc: Diameter (in)	Dummy Load Dimensions for an Aluminum Disc: Thickness (in)
M57-51	0.48	2	4.00	0.063
M57-83	1.28	5	4.75	0.063
M57-102	1.75	7	4.50	0.125
M83-62	3.50	10	4.80	0.125
M83-93	6.70	15	5.30	0.125
M83-135	10.24	25	6.00	0.125
M106-120	21.50	50	7.20	0.125
M106-178	44.00	100	8.50	0.125

Note: These dummy load inertias are arbitrary and do not represent the minimum or the maximum inertias that can be applied to the motor.

Appendix B: MINIMUM Recommended Motor Wire Sizes

Motor Series	Maximum Current per Phase (A)	Less Than 100 ft.(20.5M)	100-200 Ft. (30.5-71M)
M57	1	22	20
M83	2	20	18
M106	3	18	16

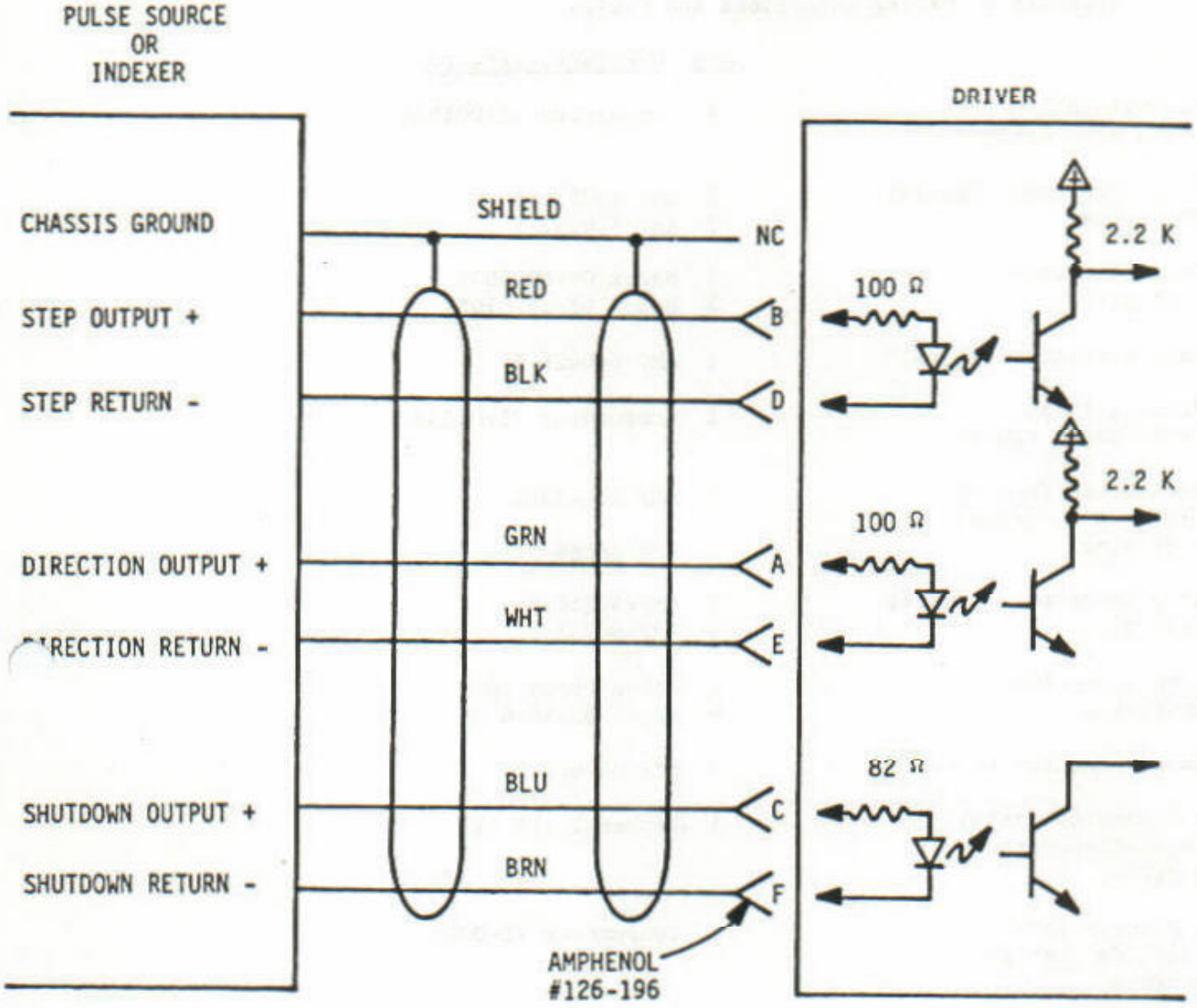
1. Cable runs of over 200 ft. (71) are not recommended.

2. Voltage drop per motor phase = (cable $\frac{\text{length (A)}}{100}$ x 2) X R

where R = wire resistance in ohms per 100 ft.

Wire Size (AWG)	R (ohms/100 ft)
16	.4
18	.64
20	1.0
22	1.6

Appendix C: Wiring Diagram - Driver to Indexer



Appendix D: Mating Connectors and Cables

Description	Qty	Manufacturer's P/N
Power harness (5") (mates with std. cord)	1	Compumotor 71-001536
3 Pin Ramp Connector (female)	1	AMP 640250-3
-connector pins[2]	3	AMP 640252-1
3 Pin Ramp Connector	1	Molex 09-50-3031
-connector pins[3]	3	Molex 08-50-0105
3 Pin Ramp connector (18 ga)[4]	1	AMP 640426-3
Motor Harness (5") (mates with motor cable)	1	Compumotor 71-001534
Motor Connector (female) (mates with motor cable)	1	AMP 206433-1
-connector pins	7	AMP 66569-3
6 Pin Ramp Connector (female)	2	AMP640250-6
-connector pins	6	AMP640252-1
6 Pin Ramp Connector	1	Molex 09-50-3061
-connector pins	6	Molex 08-50-0105
6 Pin Ramp connector (22ga)	2	AMP 640428-6
Indexer Connector (male) (mates with Compumotor indexer cable)	1	Amphenol 126-197
Indexer Harness (5") (mates with Compumotor indexer cable)	1	Compumotor 71-001535
Driver End Plate Assembly (all mating connectors, mounted)	1	Compumotor 71-01521

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[2]Assembly tool:

insulation diameter	AMP P/N
0.060-0.100"	90123-2
0.043-0.075"	90123-5

[3]Assembly tool Molex HTR-1031-C

[4]Assembly tool AMP P/N 59802-1

Appendix E: Connector Pinout List

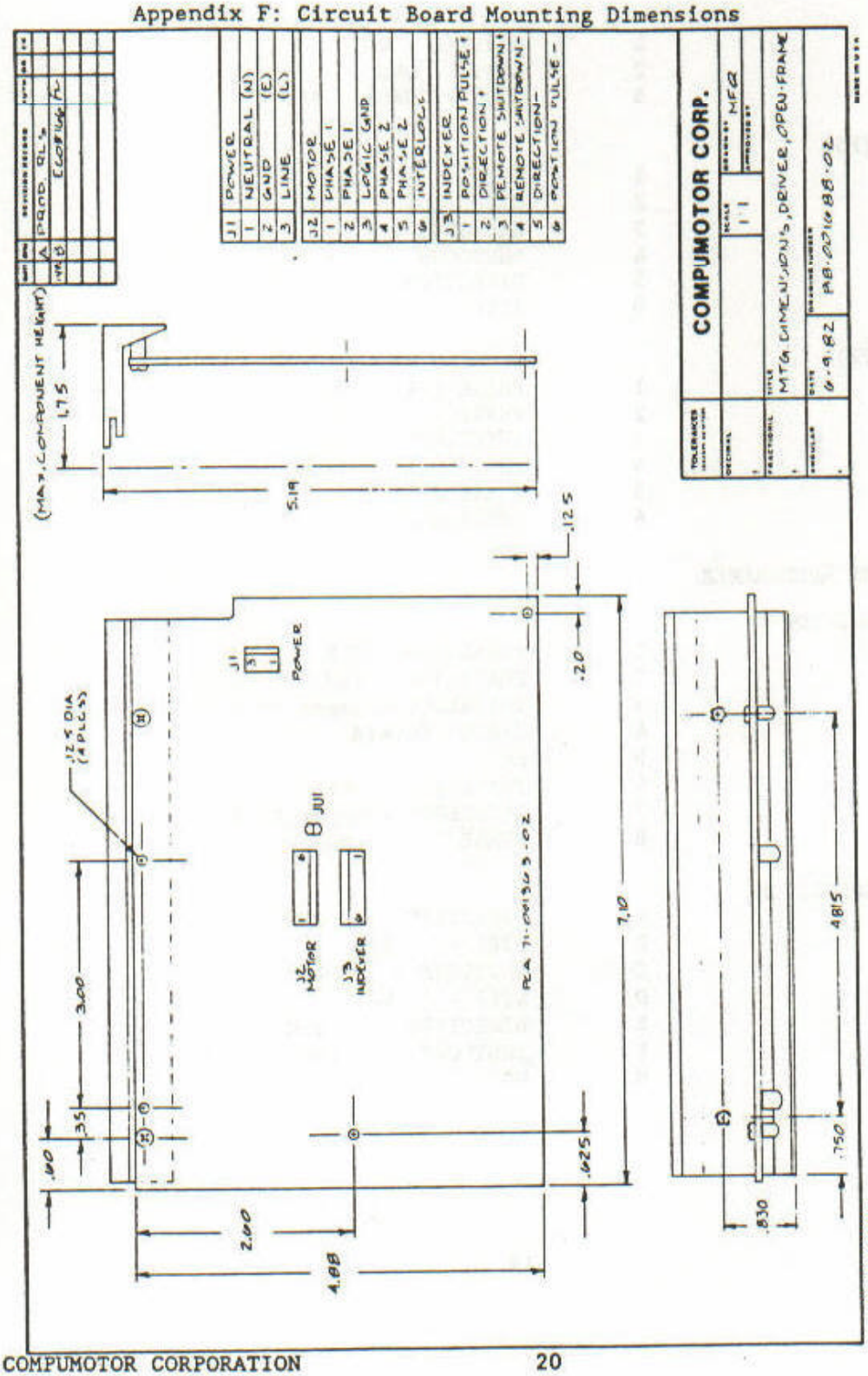
Circuit Board Connectors

	Pin	Signal/Wire Color
AC POWER (P1)		
	1	NEUTRAL WHT
	2	EARTH GRN
	3	HOT (117VAC) BLK
INDEXER INPUT (P3)		
	1	STEP + -
	2	DIRECTION + -
	3	SHUTDOWN + -
	4	SHUTDOWN - -
	5	DIRECTION - -
	6	STEP - -
MOTOR OUTPUT (P2)		
	1	PHASE 1 + -
	2	PHASE 1 - -
	3	INTERLOCK - -
	4	PHASE 2 + -
	5	PHASE 2 - -
	6	INTERLOCK + -

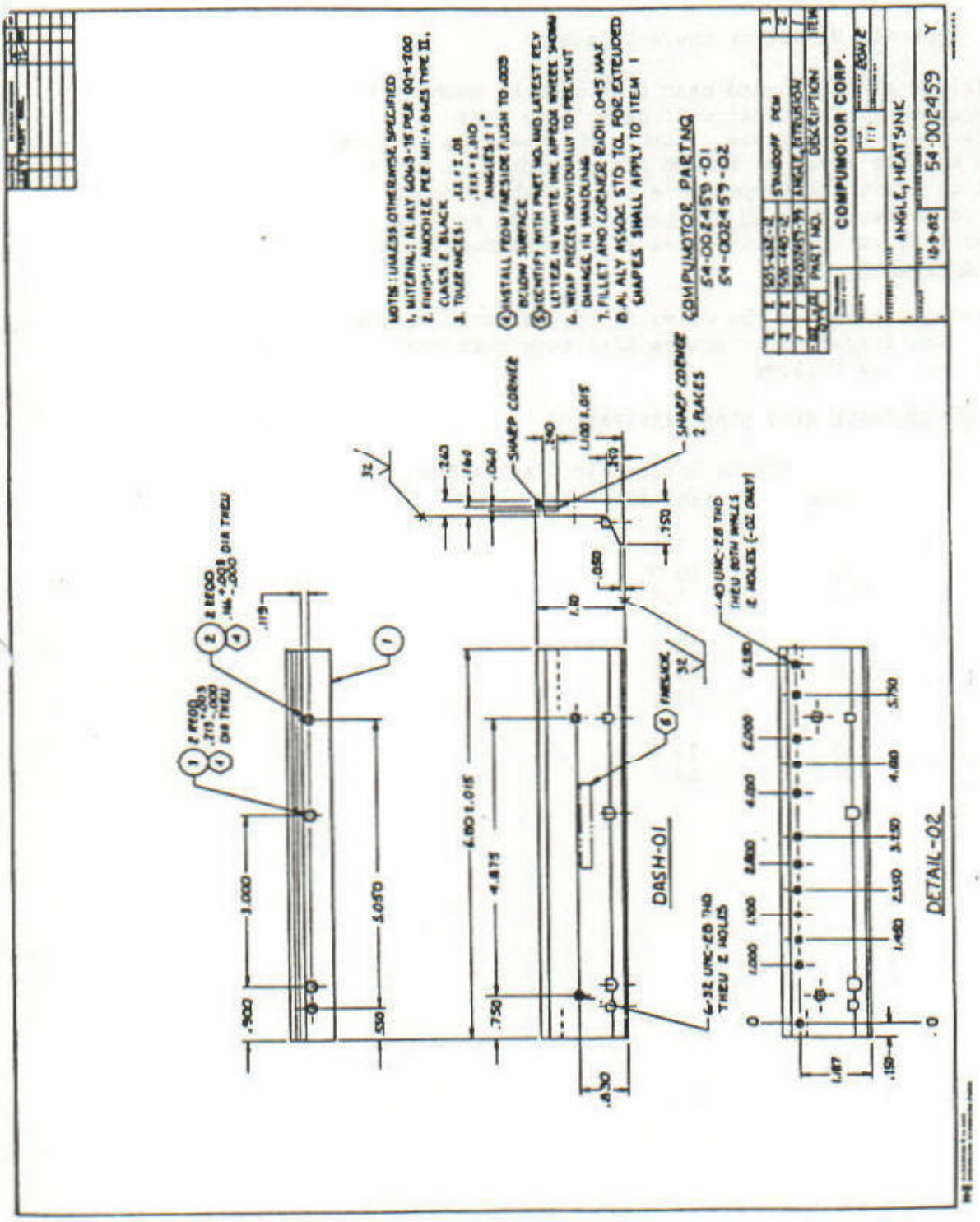
Off Board Mating Connectors

MOTOR CABLE CONNECTOR		
	1	PHASE 2 + BLK
	2	PHASE 1 - GRN
	3	INTERLOCK -Jumper to 7
	4	EARTH Shield
	5	nc
	6	PHASE 2 - RED
	7	INTERLOCK +Jumper to 3
	8	PHASE 1 + WHT
INDEXER CABLE CONNECTOR		
	A	DIRECTION + GRN
	B	STEP + RED
	C	SHUTDOWN + BLU
	D	STEP - WHT
	E	DIRECTION - BLK
	F	SHUTDOWN - BRN
	H	nc

Appendix F: Circuit Board Mounting Dimensions



Appendix G: Heatsink Mounting Dimensions



Appendix H: Driver Thermal Data

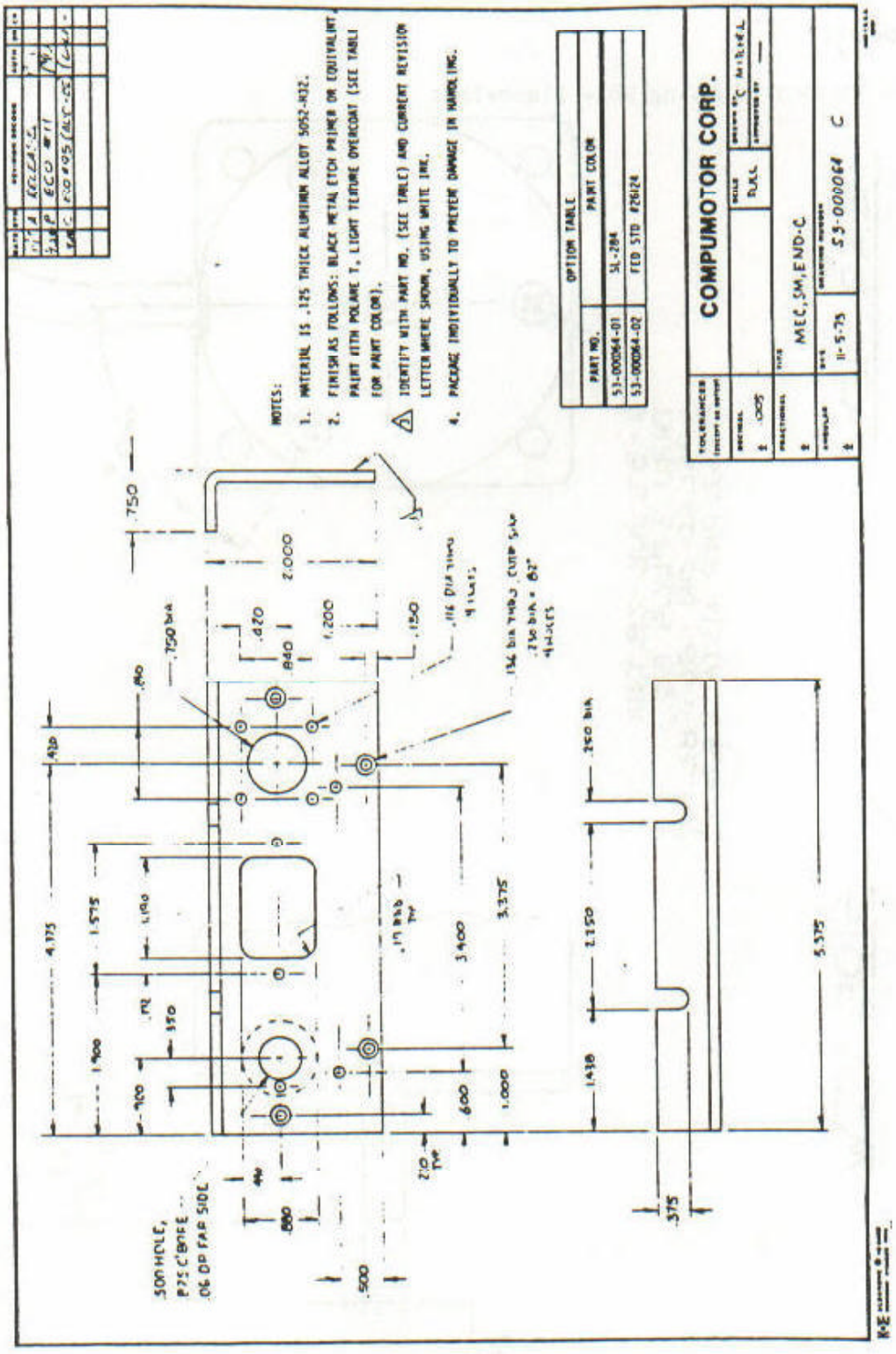
The open frame driver circuit board heat sink must be mounted to a thermally conductive surface that will carry away heat dissipated by the power transistors. Either the mounting surface must have enough surface area, or forced air cooling must carry away enough heat to limit the temperature rise of the circuit board heat sink to no more than 60 degrees C. If the circuit resides within an enclosure, the internal air temperature must remain below 50 degrees C.

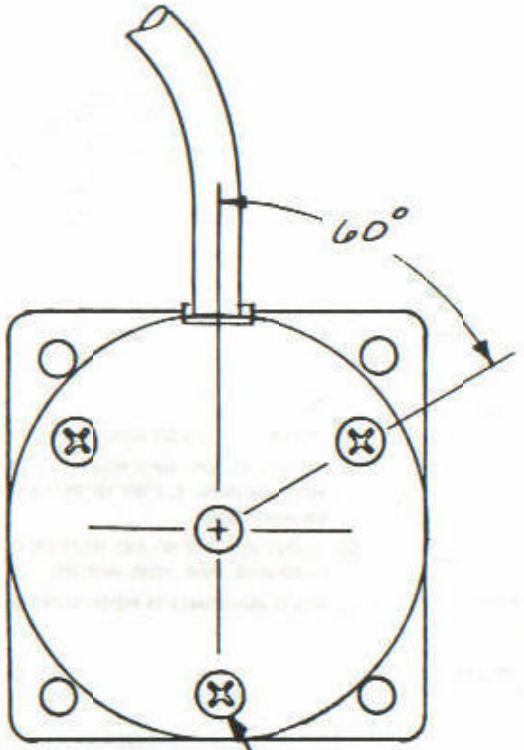
The amount of heat generated by the drive is proportional to the power delivered. The larger motor drives dissipate more heat than the smaller ones, as follows:

APPROXIMATE HEAT SINK DISSIPATION

Model Number	Static Torque oz-in	Heat Dissipation (WATTS)
M57-51	40	7.5
M57-83	80	10.0
M57-102	120	12.5
M83-62	140	15.0
M83-93	260	25.0
M83-135	400	35.0
M106-120	525	35.0
M106-178	700	55.0

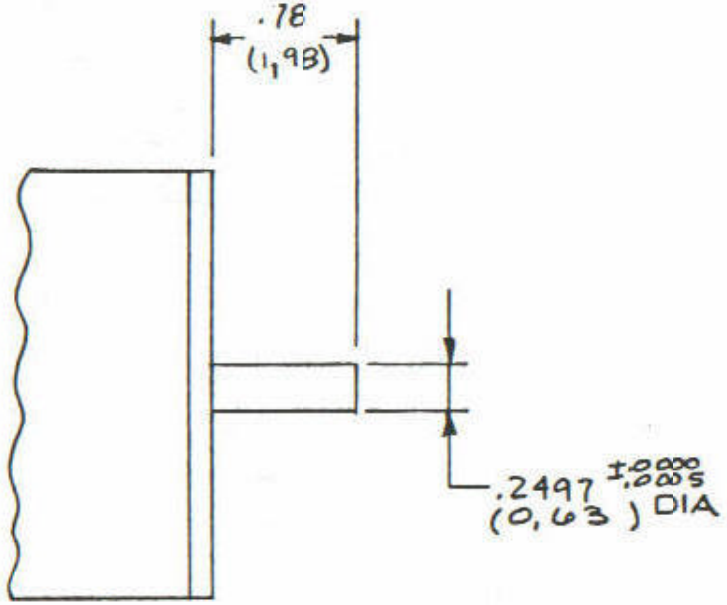
Appendix I: End Plate Mechanical Dimensions





6-32 UNC-2B THD
THRU 3 PLCS EQ
SPACED ON 1.865 BC. W/
6-32 PHP INSTALLED

REAR VIEW

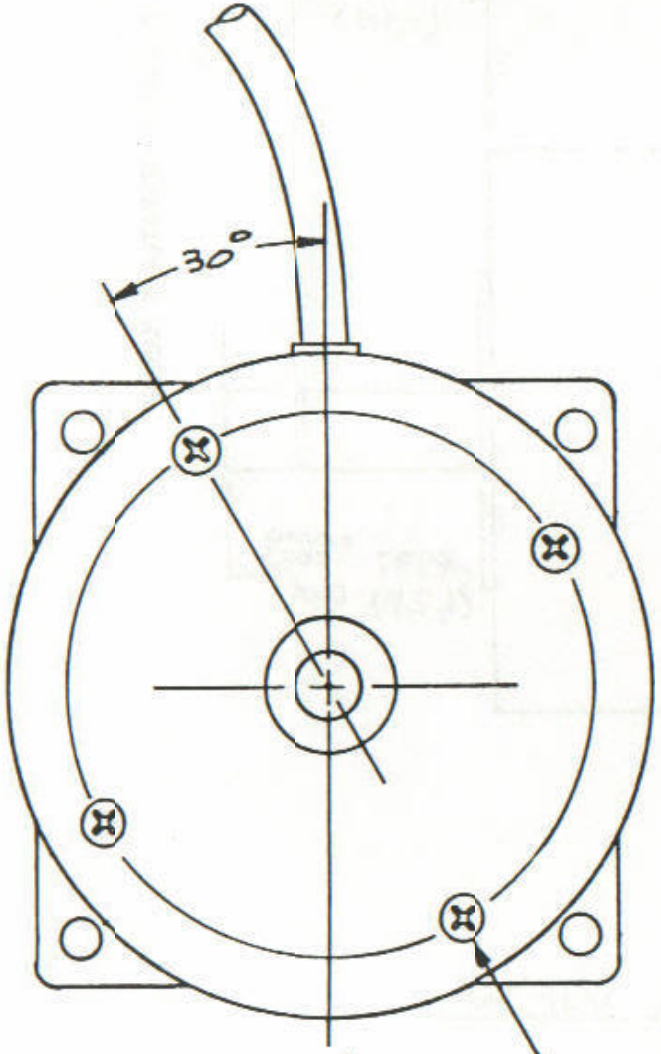


SIDE VIEW

ENCODER MTG HOLES

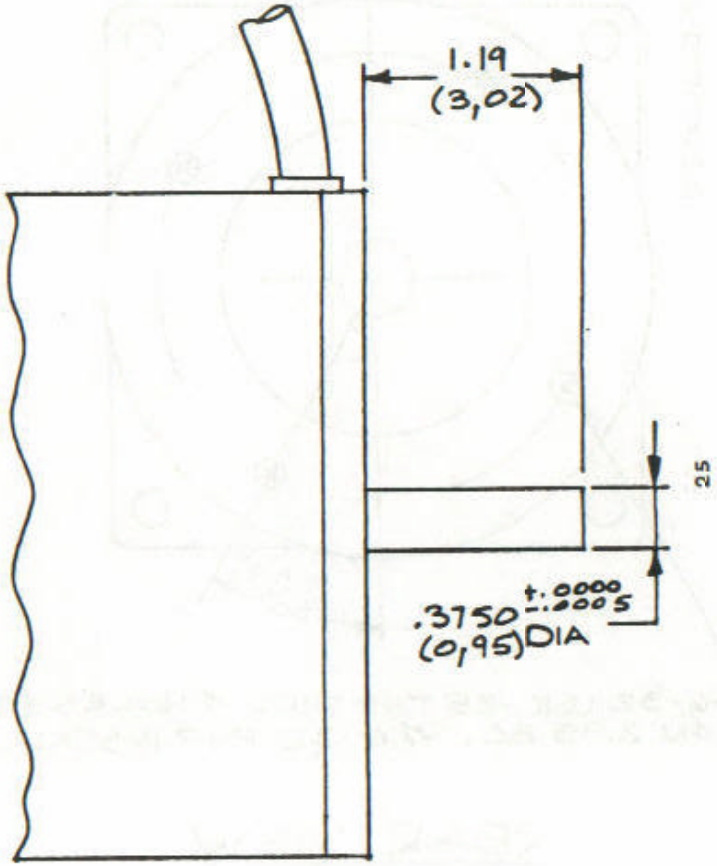
DIM. DWG.
M 53 SERIES
MOTOR, ENCODER

DWG NO 88-003852-01
REV A



6-32 UNC-2B THD
THRU 4 PLCS EQ
SPACED ON 2.952
B.C. 6-32 PHP
INSTALLED

REAR VIEW

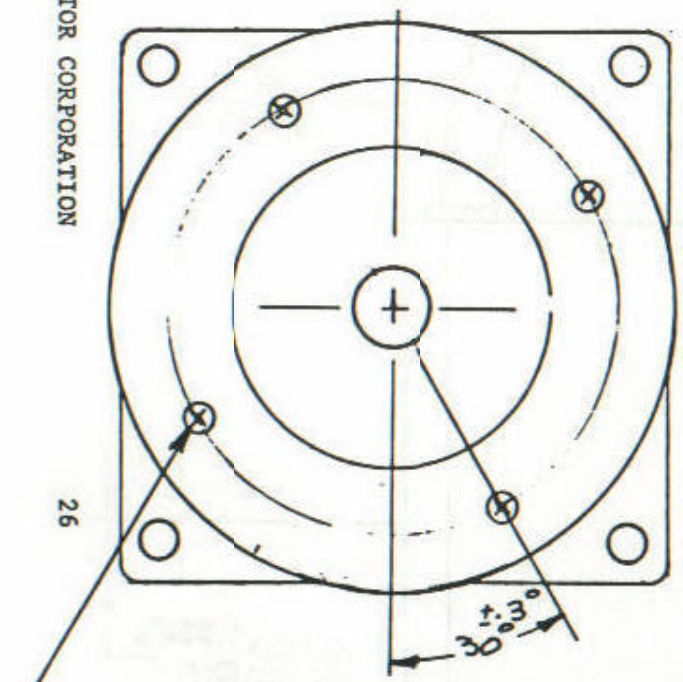


SIDE VIEW

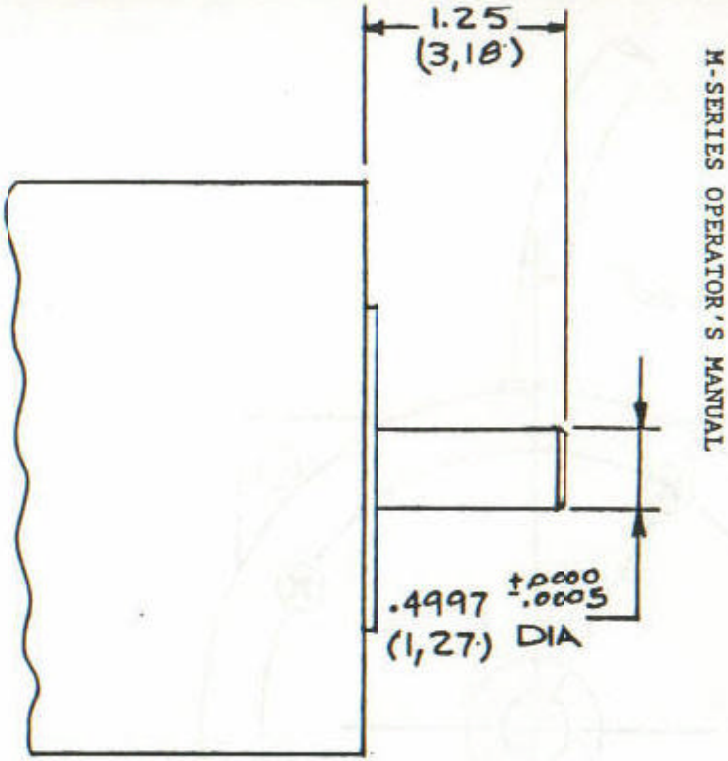
ENCODER MTG HOLES

DIM. DWG.
M 83 SERIES
MOTOR, ENCODER

DWG NO 88-003850
REV A



REAR VIEW



SIDE VIEW

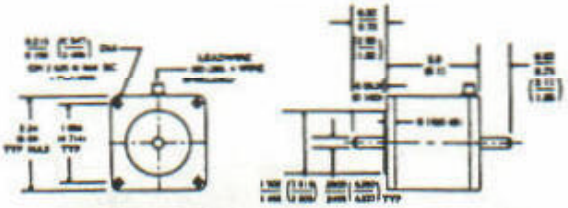
ENCODER MTG HOLES

DIM. DWG.
M1066-178
MOTOR, ENCODER

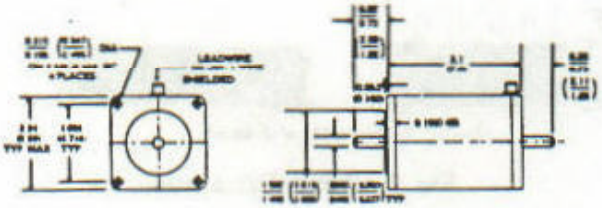
DWG NO 88-003854-01
REV A

Appendix K: Motor/Driver Dimensions

M57-51 40 OZ-IN (0.30 N-M) STATIC TORQUE



M57-83 80 OZ-IN (0.55 N-M) STATIC TORQUE



M57-102 120 OZ-IN (0.85 N-M) STATIC TORQUE

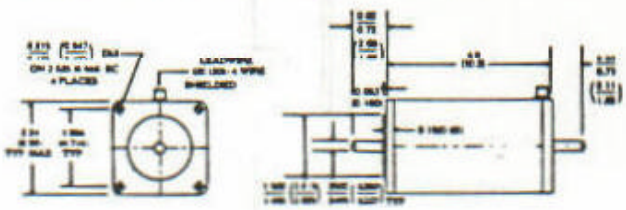
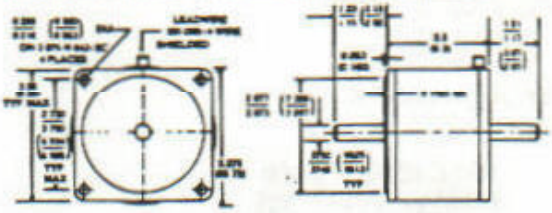
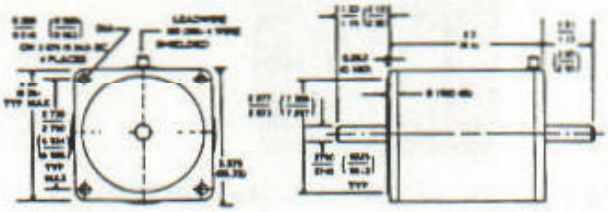


Fig. 1—M57 Series Motor Dimensions

M83-62 140 OZ-IN (1.00 N-M) STATIC TORQUE



M83-93 260 OZ-IN (1.85 N-M) STATIC TORQUE



M83-135 400 OZ-IN (2.80 N-M) STATIC TORQUE

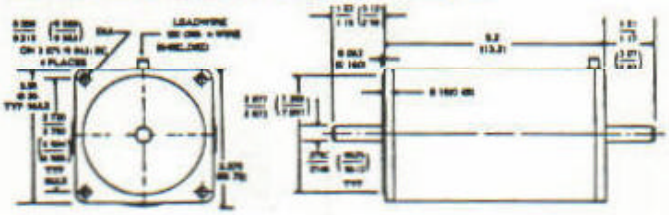


Fig. 2—M83 Series Motor Dimensions

M106-120 525 OZ-IN (3.70 N-M) STATIC TORQUE

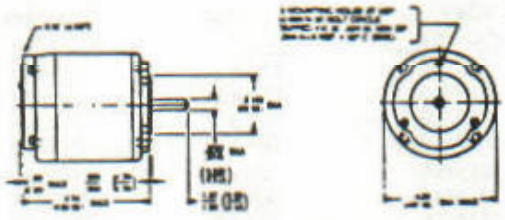


Fig. 3—M106 Series Face Mount

M106-178 700 OZ-IN (4.96 N-M) STATIC TORQUE

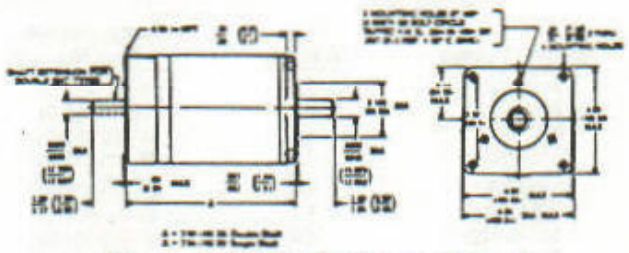


Fig. 4—M106 Series Flange Mount

Reserved for Appendix K

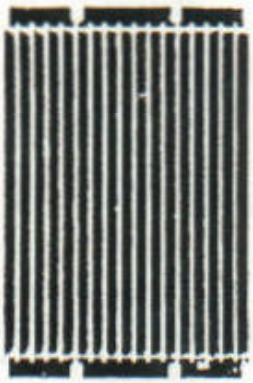


Fig. 5—Driver with Heatsink Mounted Vertically

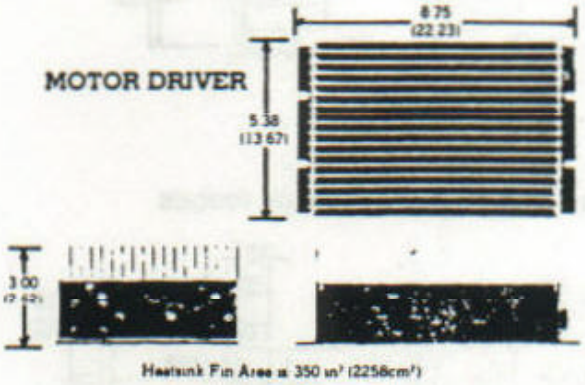


Fig. 6—Driver Dimensions

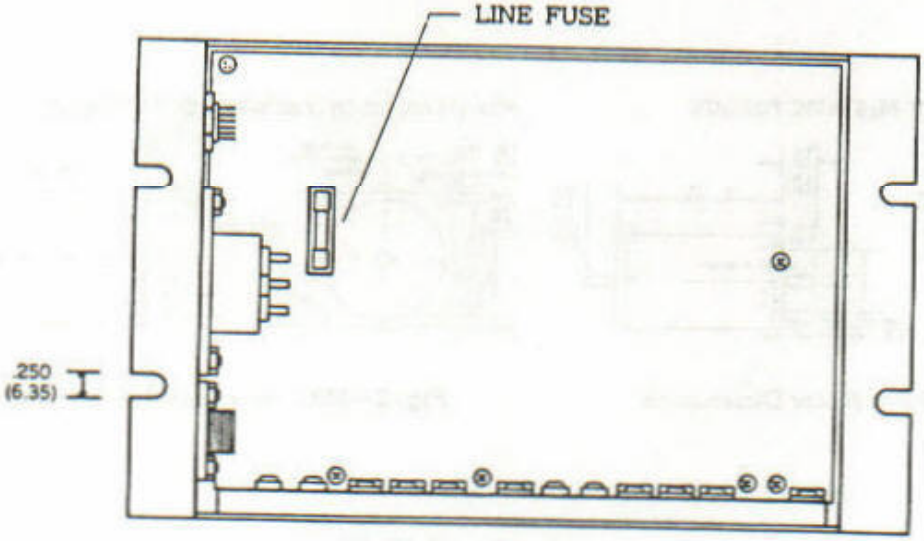
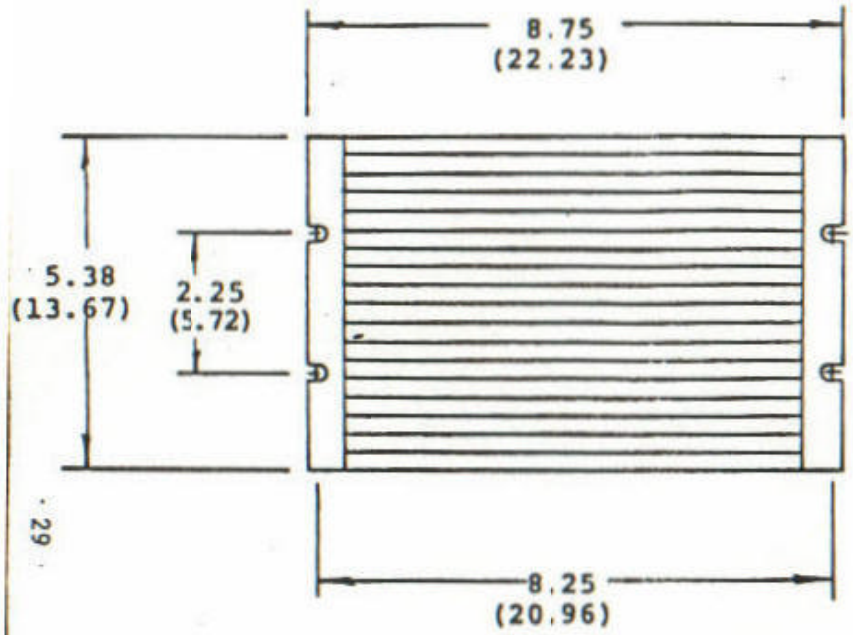


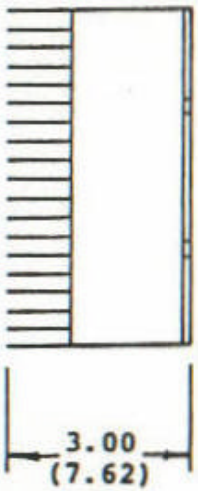
Fig. 7—Line Fuse Location

LINE FUSE REPLACEMENT CHART

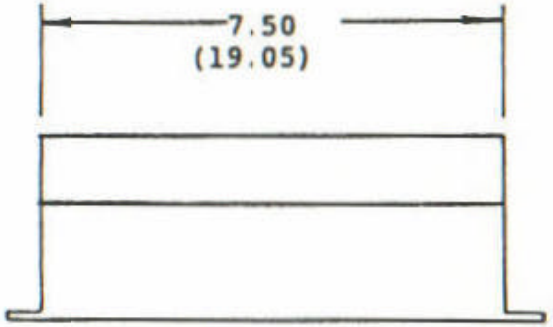
Motor/Driver	Fuse Rating	Compumotor Part No.	Little Fuse Part No.	Bussman Part No.	Schurter Part No.
M57-51	3A	45-001833-01	212.003	GMA 3	34.1520
M57-83	3A	45-001833-01	212.003	GMA 3	34.1520
M57-102	3A	45-001833-01	212.003	GMA 3	34.1520
M83-62	3A	45-001833-01	212.003	GMA 3	34.1520
M83-93	5A	45-001501-01	212.005	GMA 5	34.1523
M83-135	5A	45-001501-01	212.005	GMA 5	34.1523
M106-120	5A	45-001501-01	212.005	GMA 5	34.1523
M106-178	5A	45-001501-01	212.005	GMA 5	34.1523

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	PROD RLS E.R. #134		





HEATSINK FIN AREA IS
350 IN^2 (2258 CM^2)



.29

TOLERANCES UNLESS OTHERWISE SPECIFIED		
FRACTIONS ±	DEC ±	ANGLES ±

APPROVALS	DATE
DRAWN	
CHECKED	

COMPUMOTOR CORPORATION

MOUNTING DIMENSIONS
TYPE II DRIVER

SCALE	SIZE	DRAWING NO.
NTS	A	88-001541

DO NOT SCALE DRAWING | SHEET 1