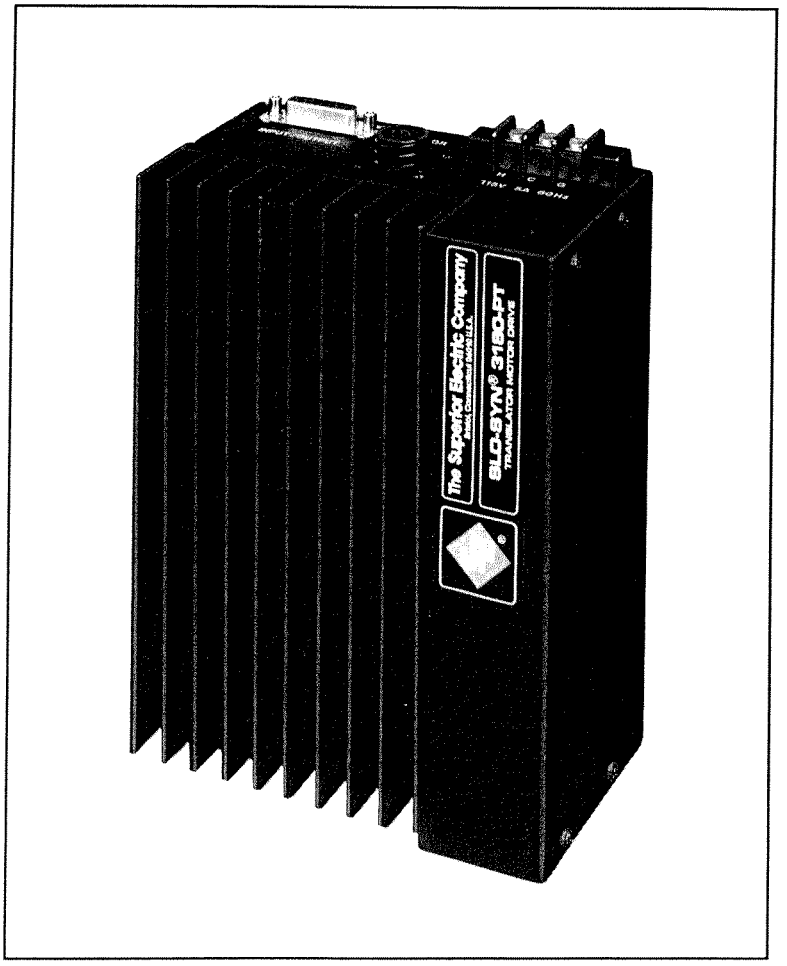
PRICE $6.25

# INSTRUCTION MANUAL for SLO-SYN® MICRO SERIES PACKAGED TRANSLATORS MODELS 3180-PT, 3180-PT10, 3810-PT125




WARNER ELECTRIC®

DANA

## TABLE OF CONTENTS

## 3180-PT MICRO-SERIES TRANSLATOR/DRIVE MODULE



## 3180-PT MICRO-SERIES TRANSLATOR

### WARNINGS:

- Voltages present in this unit can cause serious or fatal injury. Only qualified personnel should install or perform servicing procedures on this equipment.
- Voltage is present on unprotected pins when unit is operational.
- No short circuit protection for motor outputs is provided in this unit. The AC input is internally fused.
- Before making changes to the motor or control wiring, turn off all power to the unit, and disconnect its AC power source.
- When power is applied, all parts of the drive circuit should be considered hazardous.
- Allow at least ten minutes for capacitors to discharge as they will remain at high voltages for several minutes after power is removed.

### CAUTIONS:

- Assure motor compatibility before using the unit.
- Observe all cooling and temperature limitations. Heat sink temperature must be maintained between 0 and 80 degrees C. (32 and 176 degrees F). Unit must not be operated in ambient temperature below 0 degrees C (32 degrees F) or above 50 degrees C (122 degrees F).
- All Windings Off should be used with caution, as all holding torque is lost.
- Do not connect or disconnect motor or signal cables while AC power is applied.
- Do not apply AC power until connections have been made correctly.
- Do not exceed specified input voltage.
- Do not operate unit without the enclosures in place, as high voltages are present.

### LIMITS OF USE:

- Reconfiguration of the circuit in any fashion not shown in this manual will void the warranty.

**NOTE : 1. Clockwise and counterclockwise directions are properly oriented when viewing the motor from the label end.**

# EXPRESS START UP PROCEDURE

## STEPS NECESSARY TO BECOME OPERATIONAL

This Express Start Up Procedure outlines the minimum steps necessary to place the unit into operation. **FAILURE TO PERFORM THESE STEPS MAY RESULT IN DAMAGE TO THE DRIVE OR INJURY TO PERSONNEL.**

**CAUTION: Never connect or disconnect anything from the unit with the power on.**

1. Connect 120 volts ac, 50/60 Hz to the AC input terminal strip. The terminal labeled "H" is hot, "C" is common and "G" is ground.

2. Check to be sure that the motor used is compatible with the drive. A list of compatible motors is given in Section 3.3.

3. Set the correct current level for the motor being used per the instructions in Section 3.7.

4. Wire the motor per Section 2.2, "Motor Connections".

5. Caution: Always disconnect the ac power to the unit when connecting or disconnecting the motor connector or leads. **Be certain the "PWR ON" LED is OFF before unplugging the motor connector, or the drive will be damaged.**

6. Caution: Always operate the motor and the drive grounded. Be sure to twist the wires for each motor phase. Six twists per foot is a good guideline.

7. Connect the customer control logic to connector J1. Refer to Section 3.5.3 for connections and to Section 5 for descriptions of operation.

**FUSE AND MOTOR CONNECTOR PART NUMBERS FOR 3180 SERIES UNITS**

**FUSE:** Littelfuse part number 225005
2AG, 5 amperes, 125 volts, fast acting

**MOTOR CONNECTOR:** (mates with female connector J2 on drive)
Male Connector Body: AMP part number 206434-1
Pins (5 requires): AMP part number 66506-8
Cable Clamp: AMP part number 206062-1

# INSTALLATION GUIDELINES FOR REDUCED NOISE INTERFERENCE

## I General Comments

SLO-SYN Micro Series drives use modern solid-state electronics such as microprocessors to provide the features needed for advanced motion control applications. In some cases, these applications produce electromagnetic interference (EMI, or electrical "noise") that may cause inappropriate operation of the microprocessor logic used in the Micro Series product, or in any other computer-type equipment in the user's system.

The purpose of these guidelines is to help users avoid such problems at the start by applying "good engineering practices" when designing their systems. Following these guidelines will usually prevent EMI noise from interfering with drive operation.

## II Noise Sources

What causes electrical noise? In general, any equipment that causes arcs or sparks or that switches voltage or current at high frequencies can cause interference. In addition, ac utility lines are often "polluted" with electrical noise from sources outside a user's control (such as equipment in the factory next door).

The following are some of the more common causes of electrical interference:

- power from the utility ac line
- relays, contactors and solenoids
- light dimmers
- arc welders
- motors and motor starters
- induction heaters
- radio controls or transmitters
- switch-mode power supplies
- computer-based equipment
- high frequency lighting equipment
- dc servo and stepper motors and drives

## III Mounting Location

When selecting a mounting location, it is preferable to keep the drive away from obvious noise sources, such as those listed above. If possible, locate the drive in it's own metal enclosure to shield it and it's wiring from noise sources. If this cannot be done, keep the drive at least three feet from any noise sources.

## IV Wiring Practices - "Dos and Don'ts"

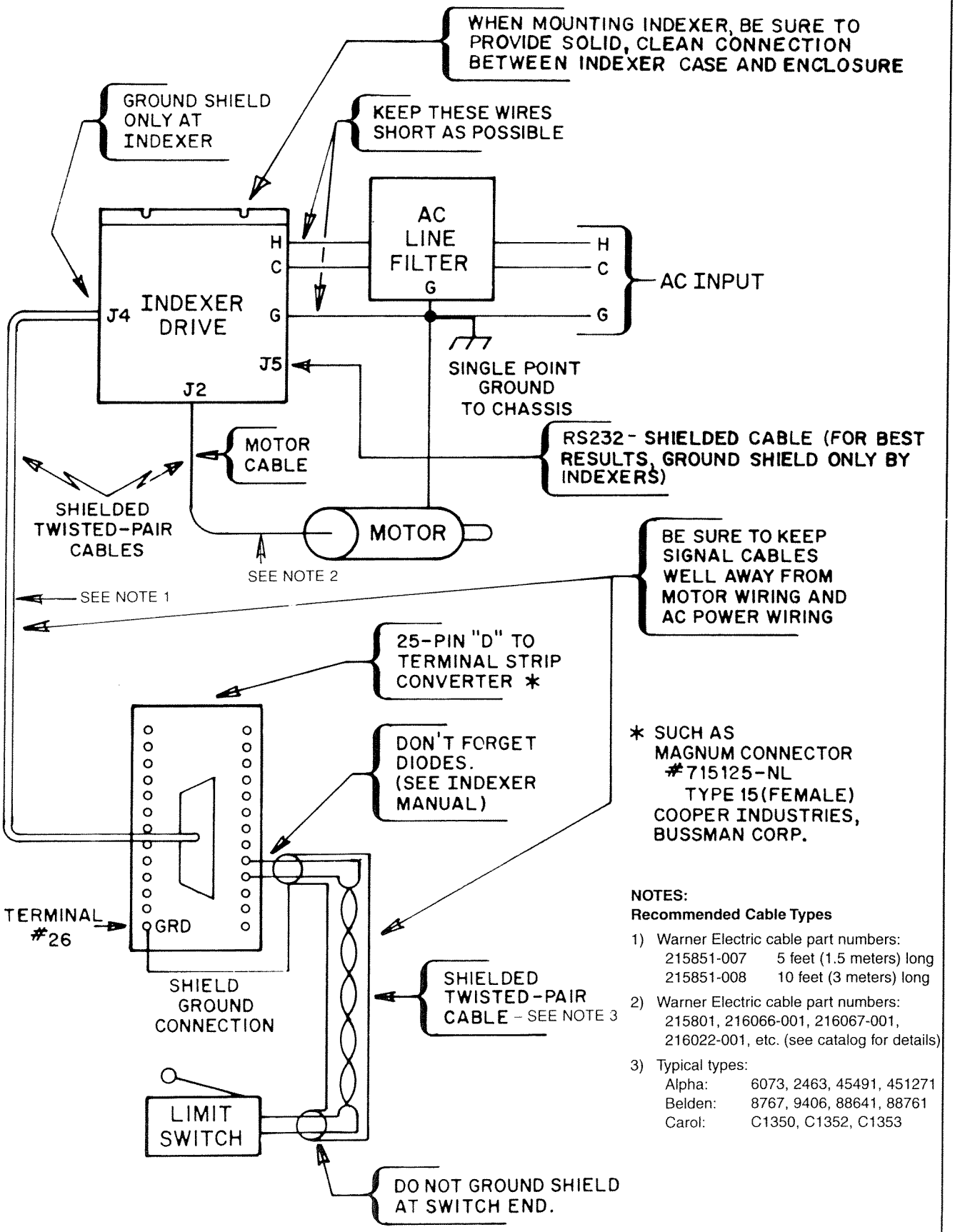
**Do** the following when installing or wiring your drive or indexer:

- **Do** keep the drive and its wiring as far away from noise sources as possible.
- **Do** provide a good, solid ground connection to the ac system earth ground conductor. Bond the drive case to the system enclosure.
- **Do** use a single-point grounding scheme for all related components of a system (this looks like a "hub and spokes" arrangement).
- **Do** keep the ground connection short and direct.
- **Do** use a line filter on the ac input (Corcom type 10B1, 10S1 or 10K1 or equivalent) for noisy ac lines. Particularly bad ac lines may need to be conditioned with a ferroresonant type isolation transformer to provide "clean" power to the drive or indexer.
- **Do** keep signal and drive wiring well separated. If the wires must cross, they should do so at right angles to minimize coupling. Power wiring includes ac wiring, motor wiring, etc. and signal wiring includes inputs and outputs (I/O), serial communications (RS232 lines), etc.
- **Do** use separate conduits or ducts for signal and I/O wiring. Keep all power wiring out of these signal line conduits.
- **Do** use shielded, twisted-pair cables for indexer I/O lines.
- **Do** ground shields only at one end, the indexer/drive end.
- **Do** use twisted-pair, shielded cable for the motor wiring.
- **Do** use solid-state relays instead of electromechanical contact types wherever possible to minimize noise generation.
- **Do** suppress all relays to prevent noise generation. Typical suppressors are capacitors or MOV's. See manufacturers literature for complete information.

**Do not** do the following when installing your drive or indexer:

- **Do not** install sensitive computer-based equipment (such as an indexer/drive) near a source of electromagnetic noise.
- **Do not** bundle power and signal lines together.
- **Do not** bundle motor cables and signal lines together.
- **Do not** fail to use shielded, twisted-pair cables for signals.
- **Do not** fail to properly connect the system grounds.
- **Do not** use "daisy-chained" grounds.
- **Do not** fail to ground signal cable shields at only one end.
- **Do not** assume that power from the ac line is adequately "clean".

# Recommended Wiring Practices




**NOTES:**
**Recommended Cable Types**

1) Warner Electric cable part numbers:
   215851-007 5 feet (1.5 meters) long
   215851-008 10 feet (3 meters) long
2) Warner Electric cable part numbers:
   215801, 216066-001, 216067-001, 216022-001, etc. (see catalog for details)
3) Typical types:
   Alpha: 6073, 2463, 45491, 451271
   Belden: 8767, 9406, 88641, 88761
   Carol: C1350, C1352, C1353

## V AC Line Filter

Use of an AC line filter on 3180 and 6180 Series drives **is recommended**.

Proper installation of the AC Line Filter is essential

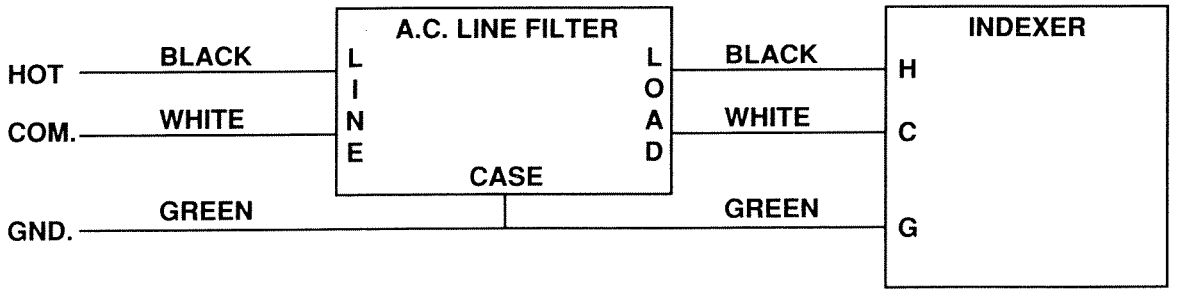
**WARNING: Improper installation of the ac line filter may cause electrical shock, which could result in death, serious bodily injury or property damage. To avoid electrical shock:**

- **The ac line filter must be installed by qualified personnel. Typical methods of locating and installing the line filter are shown.**
- **The ac line filter must be firmly fastened near the Indexer. Failure to do so may result in damage to the filter and system.**
- **The installer must properly insulate and protect the ac connections to assure that the wires are not exposed. Exposed wires could cause electrical shock,resulting in death, bodily injury or property damage.**

If you have any questions regarding installation of the line filter, contact an electrician before installing the device.

**For best performance:**

- The wire between the Filter and the Drive should be less than two feet (0.61 meter) long.

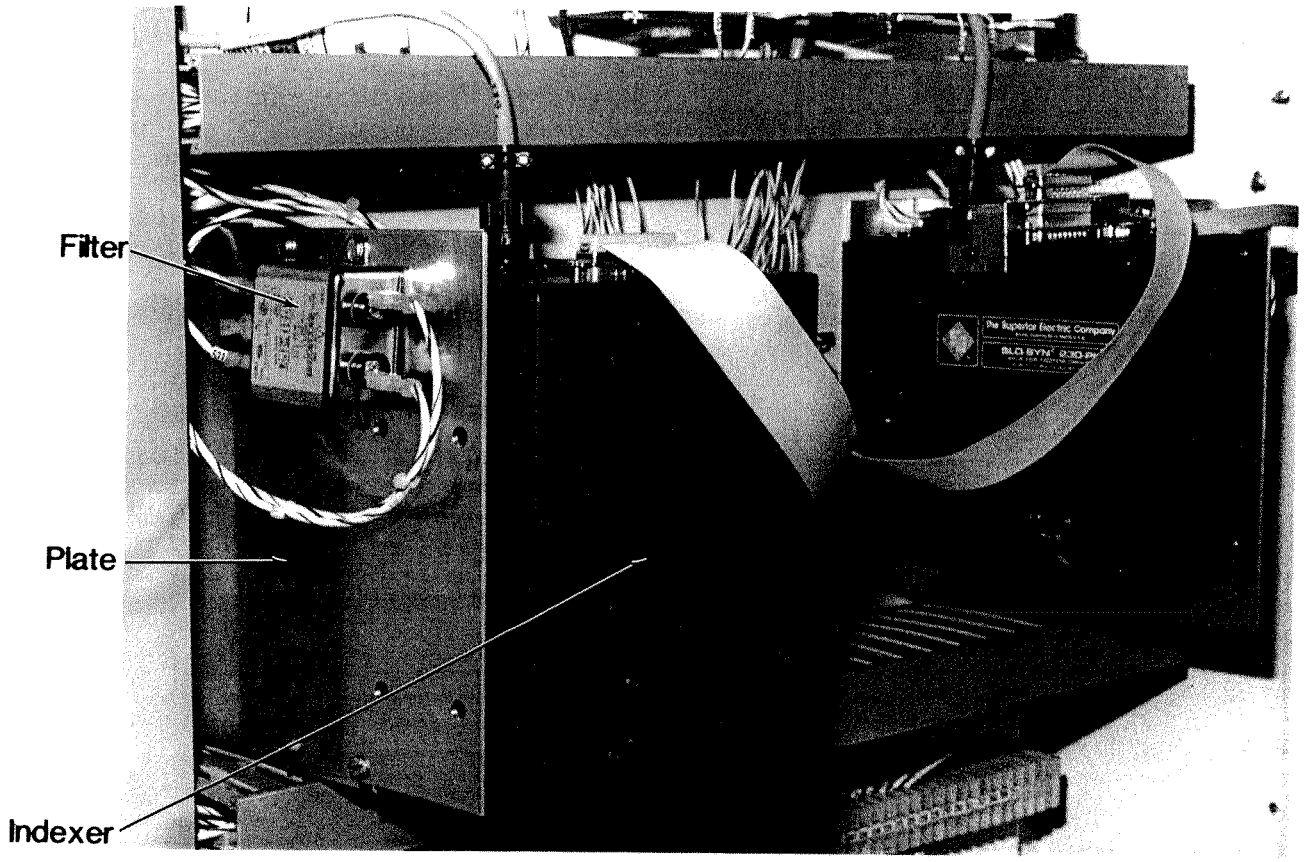



**Proper AC Line Filter Connections**

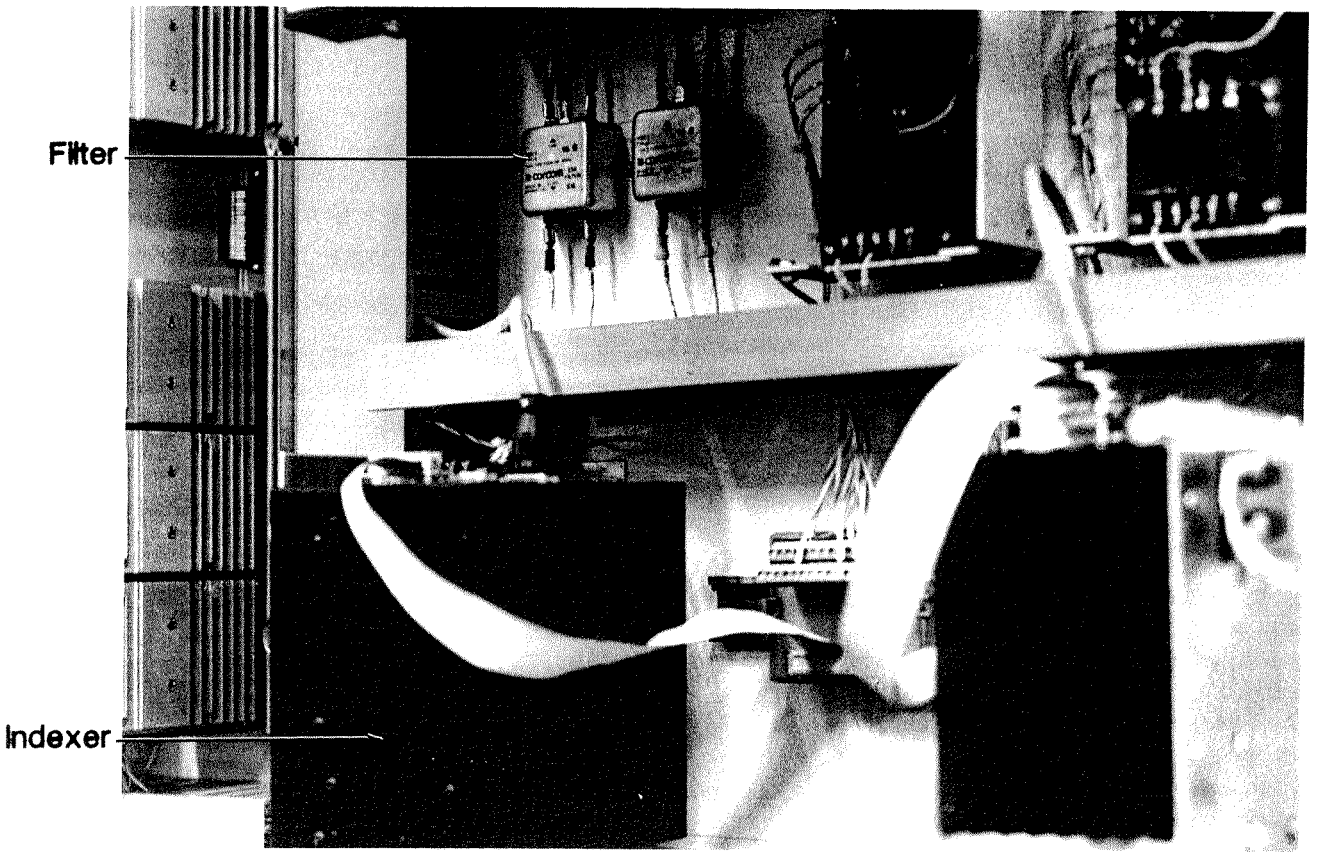
## VI Troubleshooting Guide

Electrical interference problems are common with today's computer-based controls, and such problems are often difficult to diagnose and cure. If such a problem occurs with your system, it is recommended that the following checks be made to locate the cause of the problem.

1. Check the quality of the line voltage using an oscilloscope and a line monitor, such as Warner Electric's VMS series. If line voltage problems exist, use appropriate line conditioning, such as line filters or isolation transformers.
2. Be certain all of the previous Do's and Don'ts are followed for location, grounding, wiring and relay suppression.
3. Double check the grounding connections to be sure they are good electrical connections and are as short and direct as possible.
4. Try operating the drive with all suspected noise sources switched off. If the drive functions properly, switch the noise sources on again, one at a time, and try to isolate which ones are causing the interference problems. When a noise source is located, try rerouting wiring, suppressing relays or other measures to eliminate the problem.




Filter Installed On Fabricated Plate Mounted On Indexer




Filter Mounted Adjacent To Indexer

# SECTION 1: INTRODUCTION

## 1.1 FEATURES OVERVIEW

The 3180-PT provides the following output capability:

| | MOTOR CURRENT PER PHASE | VA PER PHASE |
|---|---|---|
| 3180-PT | 3 Amps peak | 500 VA nominal |

The 3180-PT motor drive/translator package is a line operated, energy efficient, self-contained motor drive module. An integral power supply provides the necessary DC voltages required to operate the drive. This module is capable of driving a wide range of Warner Electric SLO-SYN stepping motors, and has several features including:

- Full/half, 1/10, or 1/125 step resolution, depending on model.
- Optically-isolated inputs.
- Speeds up to 10,000 full steps per second.
- Motor current adjustable from 0.5 to 3.0 amperes per phase.
- Reduce-current and boost-current functions.
- Power-On and fault LED indicators.
- Over-temperature protection.

## 1.2 INSPECTION PARTS LIST

The drive comes fully assembled as a single unit and is marked with the part number, either 3180-PT (full/half step), 3180-PT10 (1/10 microstep), or 3180-PT125 (1/125 microstep).

## 1.3 USING THIS MANUAL

This manual is an installation and operating guide to the 3180-PT motor drive. All the necessary information is provided for using the 3180-PT successfully.

We strongly recommend that this manual be read thoroughly and completely before attempting to install and operate equipment.

### 1.3.1 Organization

This manual is organized for the convenience of the operator. Section 2, "Mounting, Connections, and Pin Assignments," provides diagrams and reminders that are necessary, even for the experienced user and installer.

Complete specifications, listed in Section 3, will provide easily referenced information concerning all aspects of installation, power and interface requirements, as well as performance specifications.

Section 4 gives a functional description of the drive, and Section 5 explains in detail each of the input/output signals.

The remaining sections contain additional drawings and information useful for setting up and operating the drive.

### 1.3.2 Logic Conventions and Power Indicators

- All logic is LOW TRUE. This means that a logic function is **active when low** and inactive when high. The low true condition is designated by a bar. For example, in the case of $\overline{AWO}$ (All Windings Off), the windings are OFF when the input is low.
- A red Power On LED indicator detects the presence of the + Vdc drive logic power supply.
- A red Drive Fault LED indicator detects a drive over-temperature condition. During this condition, the power is removed from the motor windings so that no holding torque is being applied. Recovery from this condition necessitates removing and then reapplying the AC power source.
- The unit's AC input is internally fused. A blown AC input fuse will prevent the power supply from energizing any of its outputs, hence, the unit will not operate. Usually, the only reason this fuse will open ("blow") is if an internal failure occurs. If an open fuse occurs, return the unit to the factory for service. DO NOT REPLACE THE FUSE OR THE UNIT MAY BE FURTHER DAMAGED.

# SECTION 2

# MOUNTING, CONNECTIONS AND PIN ASSIGNMENTS

## 2.1 MOUNTING

The 3180-PT is mounted by affixing its enclosure to a flat surface in one of two possible configurations. Figure 2.1 shows the mounting hole locations and diameters. It is important to leave at least two inches of space between the drive's top, bottom, and sides to allow proper airflow for cooling.

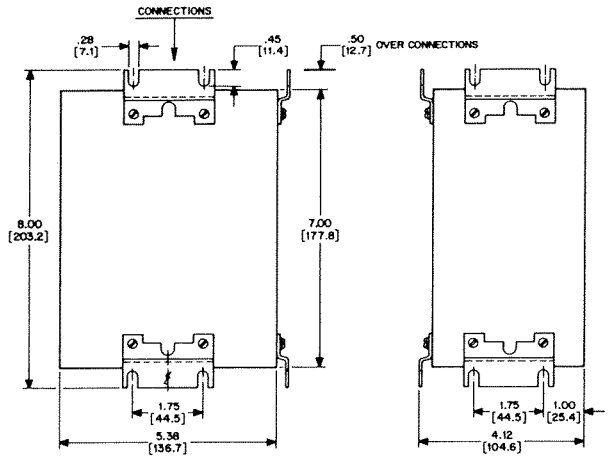
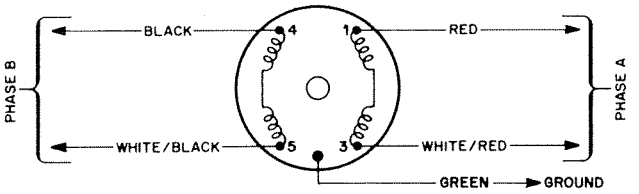



**Figure 2.1: Mounting Diagram**

**The heat sink should always be mounted with the fins oriented vertically, or proper cooling will not occur. Air flow through the unit should not be obstructed. Maximum drive heat sink temperature should not exceed 80 degrees C (176 degrees F).**

## 2.2 MOTOR CONNECTIONS

All motor connections are made via the 8-pin circular AMP connector. Figure 2.2 shows the possible motor wiring configurations. The diagrams in Figures 2.2.1 through 2.2.6 show the connections for each combination of cable and motor type.




**4-LEAD MOTORS, SERIES CONNECTION**
**Figure 2.2, Motor Connections**

J2: Motor Connections

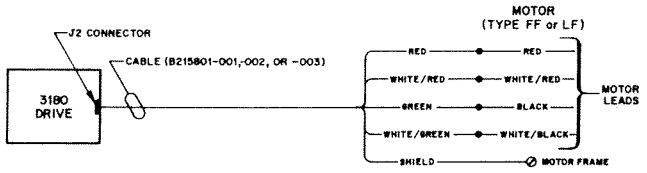
Cabling: Shielded, twisted-pair cable is highly recommended. Twist together the wires for each motor phase; six twists per foot is a good guideline.

Warner Electric Motor cables are available as follows:

| Length | (Unterminated Leads on Motor End) Part Number | (Plug on Motor End)* Part Number |
|---|---|---|
| 10 ft. (3m) | B215801-001 | B216066-001 |
| 25 ft. (7.6m) | B215801-002 | B216066-002 |
| 50 ft. (15.2m) | B215801-003 | B216066-003 |

*Mates with receptacle on M061, M062 and M063 motors that have receptacles (M061-CS08, etc.).

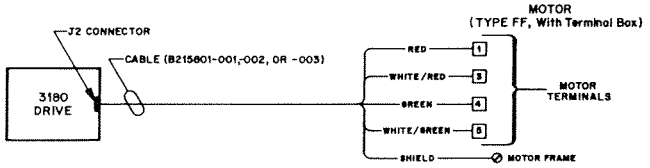
### 2.2.1 Connections Using LF or FF Type Motors (with Leads) and Warner Electric B215801-001, -002 or -003 Cables




3180 DRIVE / B215801-001, -002, or -003 CABLE / TYPE FF or LF MOTOR

**Figure 2.2.1**

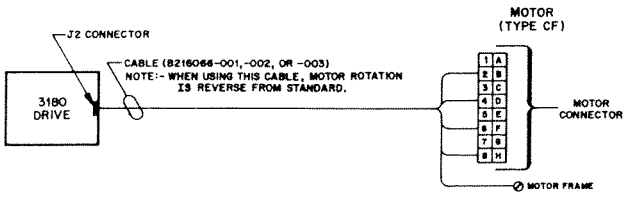
### 2.2.2 Connections Using FF Type Motors (with Terminal Boxes) and Warner Electric B215801-001, -002 or -003




3180 DRIVE / B215801-001, -002, or -003 CABLE / TYPE FF (With Term. Box) MOTOR

**Figure 2.2.2**

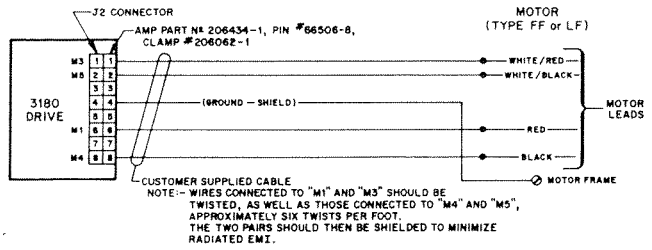
### 2.2.3 Connections Using CF Type Motors (with Connectors) and Warner Electric B216066-001, -002 or -003 Cables




3180 DRIVE / B216066-001, -002, or -003 CABLE / TYPE CF MOTOR

**Figure 2.2.3**

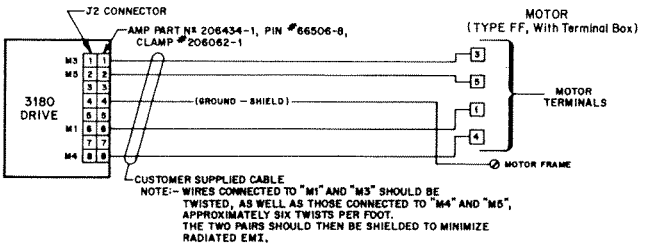
### 2.2.4 Connections Using LF or FF Type Motors (with Leads) and Customer Supplied Cables




3180 DRIVE / CUSTOMER SUPPLIED CABLE / TYPE FF or LF MOTOR

**Figure 2.2.4**

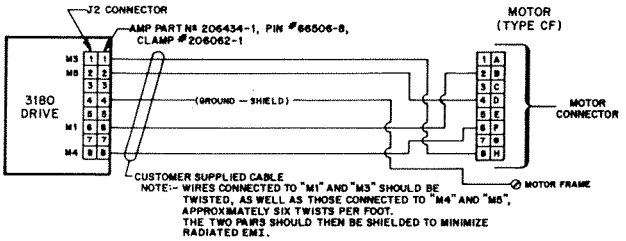
### 2.2.5 Connections Using FF Type Motors (with Terminal Boxes) and Customer Supplied Cables




3180 DRIVE / CUSTOMER SUPPLIED CABLE / TYPE FF (With Term.Box) MOTOR

**Figure 2.2.5**

### 2.2.6 Connections Using CF Type Motors (with Connectors) and Customer Supplied Cables




3180 DRIVE / CUSTOMER SUPPLIED CABLE / TYPE CF MOTOR

**Figure 2.2.6**

## 2.3 CONNECTION DIAGRAMS

**2.3.1 J1: Signal I/O Connections (15-pin "D" type, female)** (see 3.5.3.2 or 5.1 through 5.15. for pin assignments)

**2.3.2 J2: Motor** (see 3.5.2.1 for pin assignments)

**2.3.3 J3: AC Power Input** (see 3.5.1.2 for terminal assignments)

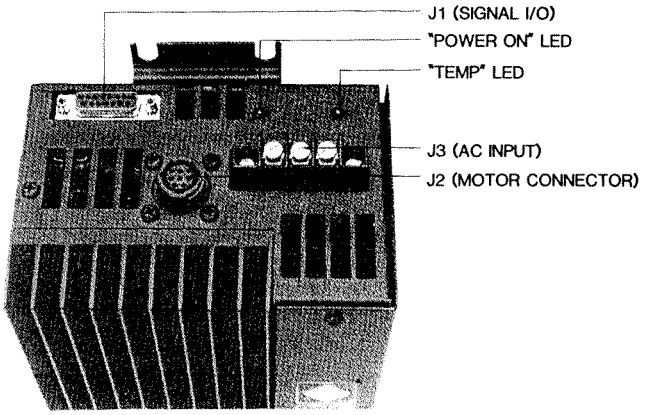



FIGURE 2.3, SIGNAL I/O, MOTOR AND POWER CONNECTORS

# SECTION 3: SPECIFICATIONS

## 3.1 DRIVE DESCRIPTION

- Bipolar, speed adjustable, 2-phase, line operated chopper drive with translator.
- Full, half, 1/10, or 1/125 step (Step resolution dependent on model type).
- Power semiconductor type: N-channel FET
- Chopping frequency: 20 Khz.
- Control signals are optically isolated from the motor drive circuit.

## 3.2 DRIVE PERFORMANCE

Resolution: Half-step or full-step (3180-PT)
1/10 microstep (3180-PT10)
1/125 microstep (3180-PT125)

Step Rate: 0 to 10,000 full-steps/sec. (3180-PT)
0 to 20,000 half-steps/sec. (3180-PT)
0 to 100,000 1/10 microsteps/sec. (3180-PT10)
0 to 1,250,000 1/125 microsteps/sec. (3180-PT125)

Speed/torque: See Section 6 for typical Speed/Torque curves.

## 3.3 MOTOR COMPATIBILITY

**3180-PT**

Motor types: Warner Electric F Series motors are recommended.
Frame Sizes: M061 to M112
No. of Leads: 4
Min. Inductance: 8.0 mH
Max. Inductance: 64 mH
Voltage to Motor: 170-190 Volts
Max. Motor Cable Length: 100 ft. (30.5 meters)

**MOTORS FOR USE WITH 3180 MODELS**

| Warner Type Number | 3180 CURRENT SETTING (AMPERES)* |
|---|---|
| M061-CF408<br>M061-LF408 | 0.5 |
| M062-CF402<br>M062-LF402 | 1.0 |
| M063-CF401<br>M063-LF401 | 1.0 |
| M091-FF401 | 1.0 |
| M092-FF402 | 2.0 |
| M093-FF402 | 3.0 |
| M112-FF401 | 3.0 |
| MH112-FJ4201 | 3.0 |

*Use this number to set the drive's "nominal" current as described in Section 3.7.

## 3.4 DRIVE MECHANICAL SPECIFICATIONS

Size
(inches): 6.29 L x 5.67 W x 7.69 H (Height over connectors, excluding mounting flanges. Height with flanges is 8.0 inches)
(mm): 159.7 L x 144.0 W x 195.3 H
Weight:

| | lbs | kg |
|---|---|---|
| 3180-PT: | 5 | 2.3 |

## 3.5 ELECTRICAL SPECIFICATIONS

### 3.5.1 AC INPUT

#### 3.5.1.1. Power and Voltages

AC Input Range: 102-132 Vac. 60Hz
Fuse Rating: 125 volts, 5 amps
Drive power dissipation (worst case)
3180-PT: 70 watts

#### 3.5.1.2. AC Input Connections

J3: 3 pin screw terminal strip

| Pin | Assignment |
|---|---|
| "H" | Hot (black) |
| "C" | Common or Neutral (white) |
| "G" | Ground (green) |

### 3.5.2 OUTPUT TO MOTOR

#### 3.5.2.1 Motor Connections

J2: 8-pin twist-lock circular female AMP connector.

| Pin | Assignment |
|---|---|
| 1 | M3 |
| 2 | M5 |
| 3 | No connection |
| 4 | Ground |
| 5 | No connection |
| 6 | M1 |
| 7 | No connection |
| 8 | M4 |

NOTE: Motor phase A is M1 and M3, and phase B is M4 and M5.

Mates to male connector, AMP part number 206434-1, (AMP pin part number 66506-8 and AMP cable clamp part number 206062-1).

### 3.5.3 CONTROL SIGNAL INTERFACE

#### 3.5.3.1 Signal Requirements

All connections are made via the J1 15-pin female "D" type connector. Signal requirements for pin #3 (pulse):
Min. pulse width, low: 250 nanoseconds
Min. pulse width, high: 250 nanoseconds

#### 3.5.3.2 Pin Assignment for J1

| Pin # | Assignment |
|---|---|
| 1 | All Windings Off (AWO) |
| 2 | CW/CCW (Direction) |
| 3 | Pulse In (PU) |
| 4 | Reduce Current |
| 5 | Reset |
| 6 | Boost Current |
| 7 | (N.C.) |
| 8 | (N.C.) |
| 9 | Half/Full (H/F) |
| 10 | (N.C.) |
| 11 | Opto Supply In |
| 12 | (N.C.) |
| 13 | Drive Fault + |
| 14 | Drive Fault – |
| 15 | (N.C.) |

**Notes:**
1. **N.C. = No Connection**
2. **The Drive Fault signal (pins 13, 14) is an output from the drive: all others are inputs.**

### 3.5.3.3 Optical Isolation

All control signal inputs and outputs on J1 are optically isolated.

Power required for opto-isolators: 4.5 to 6 VDC, 14mA min. to 20 mA max. per input, except for pulse (pin #3), which draws 7mA min. to 10mA max.

Logic "sinking" is required to activate the optically-isolated signals. The user must supply his own power source for driving the opto-isolators.

Two suggested methods of driving the signal inputs are shown in Figure 3.1 below.

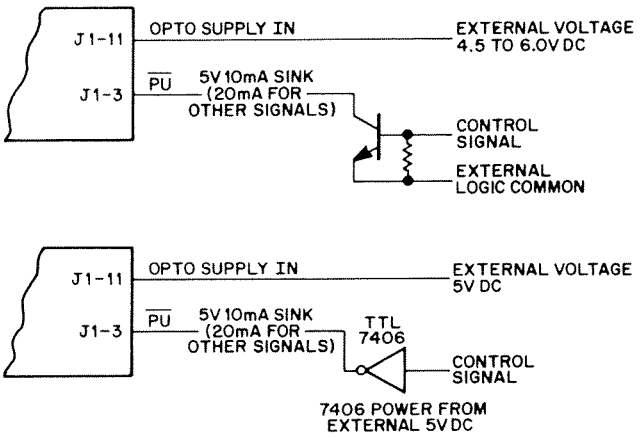



**FIGURE 3.1 TWO SUGGESTED METHODS FOR DRIVING OPTICALLY-ISOLATED SIGNALS**

## 3.6 ENVIRONMENTAL SPECIFICATIONS

| | |
|---|---|
| Operating Temp: | + 32 F to + 122 F (0 C to + 50 C) Free-Air Ambient |
| Storage Temp: | – 40 F to + 167 F ( – 40 C to + 75 C) |
| Humidity: | 95% max., noncondensing |
| Altitude: | 10,000 feet max. (3048 meters) |
| Cooling: | Will operate up to 122 degrees F (50 degrees C) so long as maximum heatsink temperature of 176 degrees F (80 degrees C) is maintained; forced-air (fan) cooling may be required. |

## 3.7 CURRENT SETTINGS

The current applied per motor phase is switch-selectable by a "DIP" switch accessible through a marked opening on the side of the drive (see Figure 3.2).

**NOTE: Before making this adjustment, be sure to disconnect the drive's 120 volt AC power source and wait 10 minutes for the power supply capacitors to discharge. Set the switch as follows for the appropriate current, based on the motor's rating:**

| CURRENT (AMPS) | | | SWITCH POSITION | | | |
|---|---|---|---|---|---|---|
| NOMINAL | REDUCE | BOOST | S1 | S2 | S3 | S4 |
| 2.0 | 1.0 | 3.0 | OFF | OFF | OFF | OFF |
| 1.5 | 0.75 | 2.25 | ON | OFF | OFF | OFF |
| 1.0 | 0.5 | 1.5 | OFF | ON | OFF | OFF |
| 0.5 | 0.25 | 0.75 | OFF | OFF | ON | OFF |
| 3.0 | 1.5 | 3.0 | OFF | OFF | OFF | ON |

Boost and Reduce functions are controlled via the appropriate input signals.

Note: When using BOOST, be sure that the motor maximum shell temperature is not exceeded. In some cases, it may be necessary to limit boost duty cycle to keep the motor below its maximum shell temperature, which is 105 degrees C (221 degrees F) for "M"-type motors and 125 degrees C (257 degrees F) for "MH"-type motors.

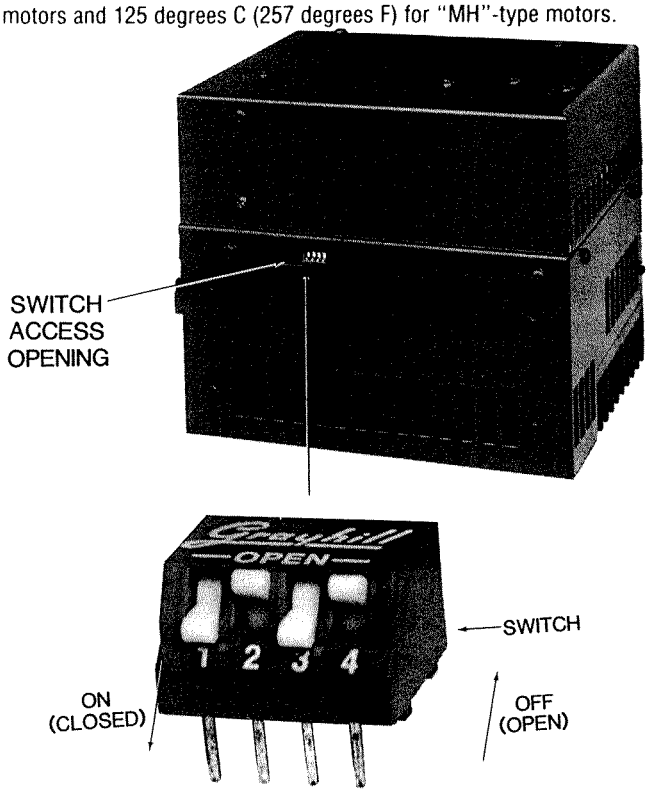



**Figure 3.2 Current Setting DIP Switch for 3180 Series Drive**

# SECTION 4: FUNCTIONAL DESCRIPTION

## 4.1 OVERVIEW

The 3180-PT drives electronically convert input pulses into drive signals of the proper sequence and power required to operate a stepping motor: one input pulse being "translated" into one motor step. To drive the motor, a technique called "chopping" is used. Compared to older drive techniques, chopping gives improved motor performance while allowing the drive circuitry to dissipate less power. The voltage applied to the motor windings is turned on and off very rapidly, or **chopped** so that the desired current is produced.

The translator circuitry accepts a single pulse at a time as an input and determines which windings (phases) of the motor must be turned on and off in order to advance the motor shaft one step. The translator circuit is fully self-contained and is not accessible through any of the function pins.

## 4.2 SIGNAL DESCRIPTION

Input pulses, one for each desired motor step, are received by the translator circuit on the PULSE IN ($\overline{PU}$) pin.

Two input control signals alter the sequence of motor windings which will be energized. The CW/$\overline{CCW}$ pin controls which direction the motor will move and the HALF/$\overline{FULL}$ (H/$\overline{F}$) pin determines whether a half or full step is taken. (Note: H/$\overline{F}$ is only active on the 3180-PT; the microstepping versions, 3180-PT10 and 3180-PT125 obviously do not use this signal.)

Even when the motor is stationary, current is flowing through one or two of the windings. The magnetic field produced by this current holds the shaft firmly with a force specified as the "holding torque." The input control signal, ALL WINDINGS OFF ($\overline{AWO}$), turns off all current to the motor, thus allowing the shaft to be turned manually.

Additional motor torque for acceleration may be obtained by using the $\overline{BOOST}$ input. This increases current per phase by 50%, up to a maximum of 3 amperes.

If desired, current may be decreased by 50% using the $\overline{REDUCE}$ input. This function allows for cooler motor operation at standstill in cases where the resulting lower holding torque can be accommodated.

## SECTION 5: CONTROL SIGNAL DESCRIPTIONS

(Reference Figure 2.3)

Connector J1, 15-pin "D" type connector, female

### 5.1 $\overline{AWO}$ ($\overline{ALL\ WINDINGS\ OFF}$) – Pin 1

A logical low turns off all power to the motor windings.

**WARNING:**
**Holding torque is eliminated when this signal is active. Insure that the motor load, when released by this command, will not injure property or personnel.**

### 5.2 CW/$\overline{CCW}$ (DIRECTION) – Pin 2

A logical high or an open connection causes the motor shaft to step in the clockwise direction as viewed from the label end of the motor. A logical low results in counterclockwise rotation.

### 5.3 $\overline{PU}$ ($\overline{PULSE\ IN}$) – Pin 3

A low to high (positive going edge) transition on this pin causes the motor to take one step. Maximum frequency is 1.25MHZ.

### 5.4 $\overline{REDUCE\ CURRENT}$ – Pin 4

A logical low decreases motor current to 50% of the value set by "DIP" switch S1.

### 5.5 $\overline{RESET}$ – Pin 5

A logical low stops the translator and returns it to start-up conditions of motor phase current states. Windings remain energized.

### 5.6 $\overline{BOOST\ CURRENT}$ – Pin 6

A logical low increases current to 1.5 times the value set by "DIP" switch S1, up to 3.0 amperes maximum.

### 5.7 NOT CONNECTED – Pin 7

### 5.8 NOT CONNECTED – Pin 8

### 5.9 H/$\overline{F}$ (HALF/$\overline{FULL}$) – Pin 9

A logical low causes the motor to step the full step angle indicated in its specifications. A logical high (open) causes the motor to take a "half step" equal to half of its specified step angle. When operated in half-step mode the motor provides smoother motion with finer resolution, but at approximately 30% less torque. Note: This input is only used on the 3180-PT full-step, half-step translator drives. It is inactive on the 3180-PT10 and 3180-PT125 microstepping drives.

### 5.10 NOT CONNECTED – Pin 10

### 5.11 OPTO SUPPLY IN – Pin 11

Connection for opto-isolator power supply positive terminal. See Section 3.5.3.3 for details.

### 5.12 NOT CONNECTED – Pin 12

### 5.13 DRIVE FAULT (+) – Pin 13

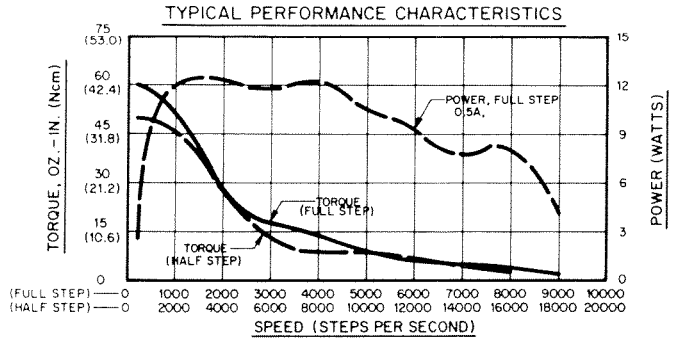
Used with pin 14. This par is an optically-isolated output that is activated (like a switch closure) if the drive shuts down due to overtemperature.

### 5.14 DRIVE FAULT (–) – Pin 14

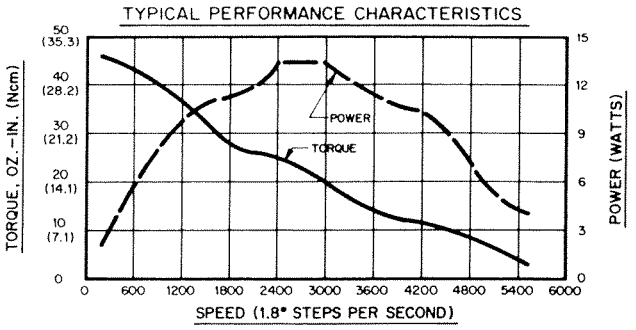
See pin 13, above.

### 5.15 NOT CONNECTED – Pin 15

# SECTION 6: SPEED/TORQUE CURVES

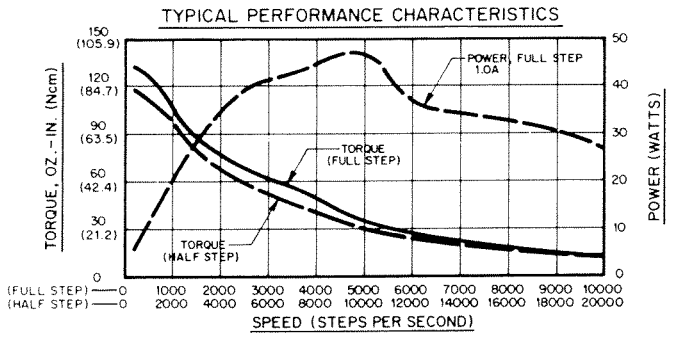



FULL/HALF STEP

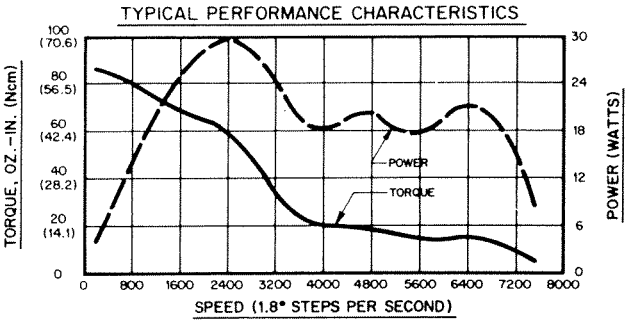



MICROSTEP

**M061-CF408 AND M061-LF408 MOTORS**

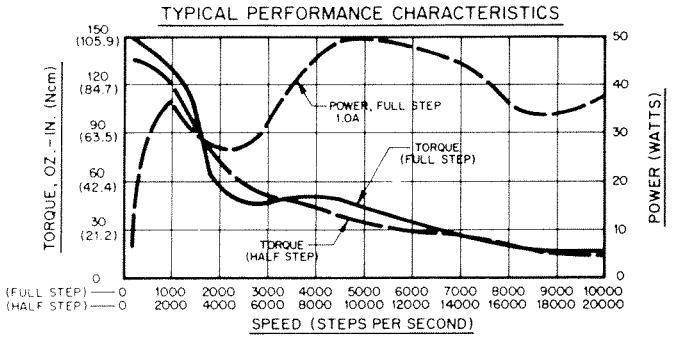



FULL/HALF STEP

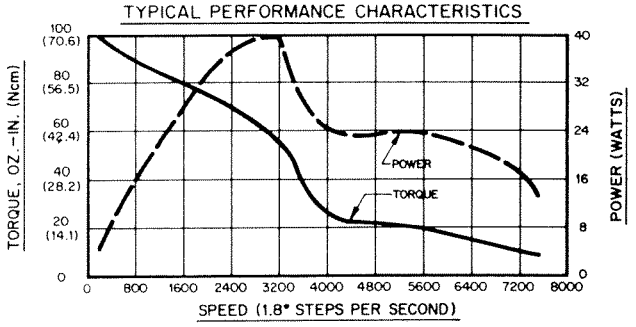



MICROSTEP

**M062-CF402 AND M062-LF402 MOTORS**




FULL/HALF STEP

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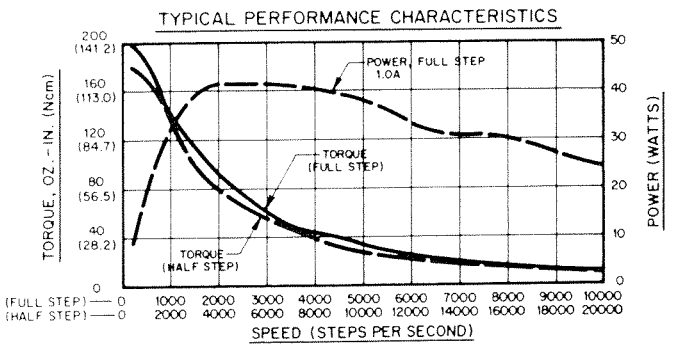
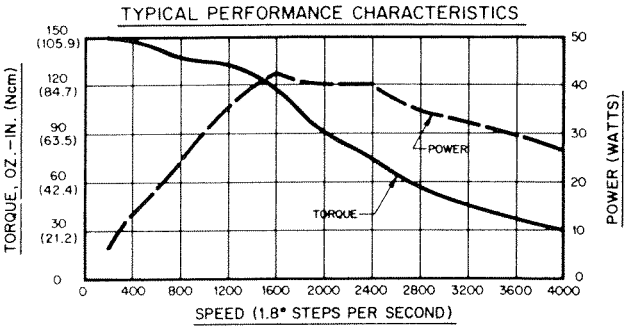
**M063-CF401 AND M063-LF401 MOTORS**

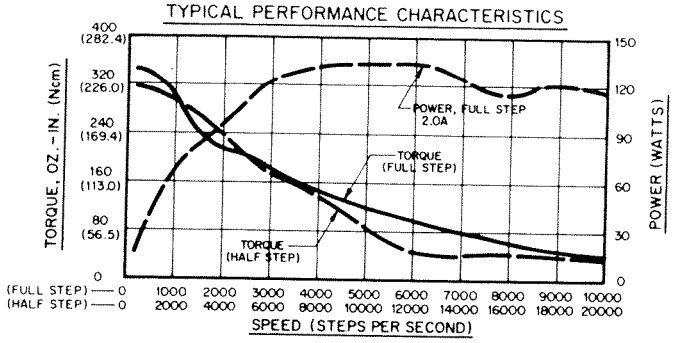



FULL/HALF STEP

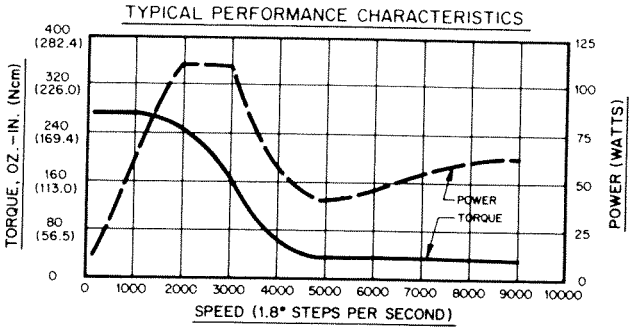



MICROSTEP

**M091-FF401 MOTOR**




FULL/HALF STEP

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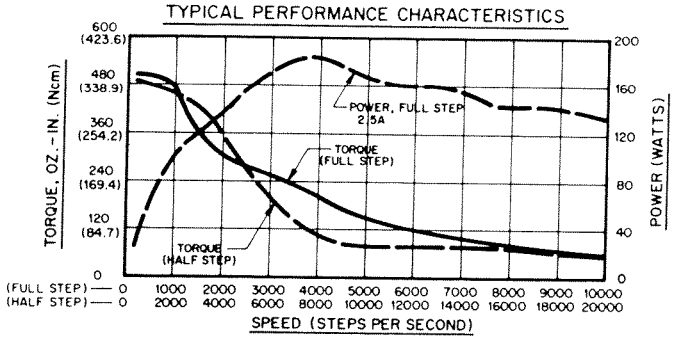
**M092-FF402 MOTOR**

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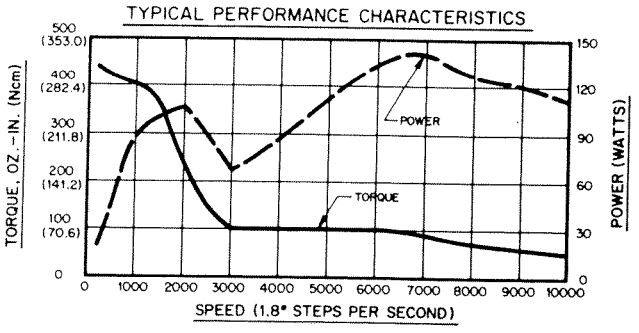


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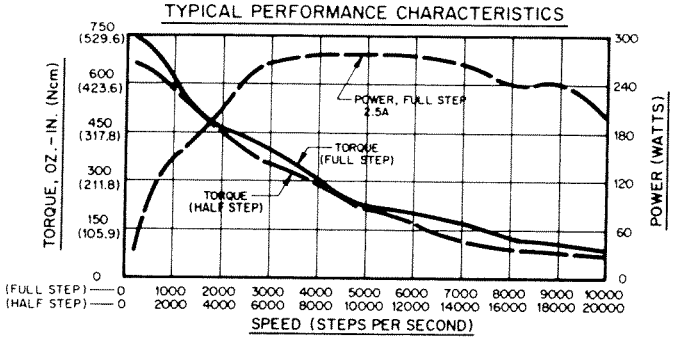
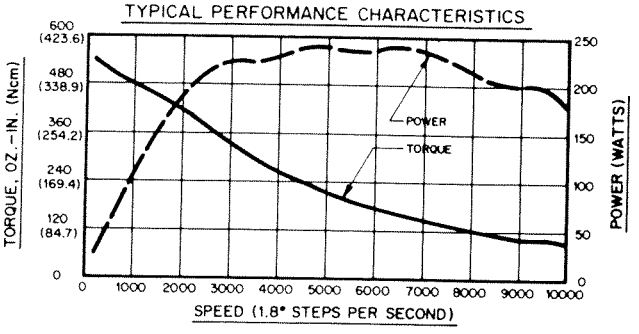
**M093-FF402 MOTOR**

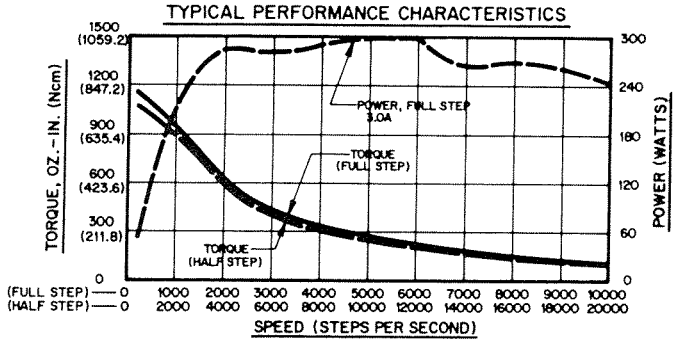



FULL/HALF STEP

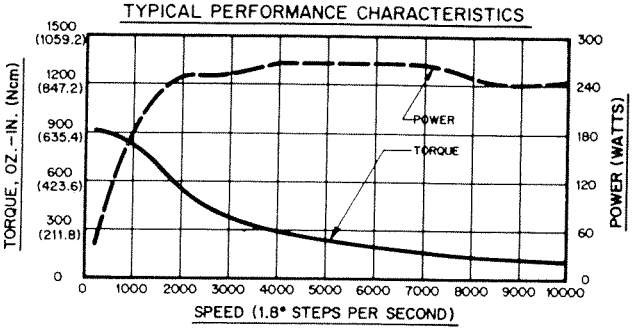



MICROSTEP

**M112-FF401 MOTOR**




FULL/HALF STEP




MICROSTEP

**MH112-FJ4201 MOTOR**

## 6.1 MOTOR PERFORMANCE

All stepping motors exhibit instability at their natural frequency and harmonics of that frequency. Typically, this instability will occur at speeds between 50 and 500 full steps per second and, depending on the dynamic motor load parameters, can cause excessive velocity modulation or improper positioning.

There are also other instabilities which may cause a loss of torque at stepping rates outside the range of natural resonance frequencies. One such instability is broadly identified as mid-range instability. This is identified by the dotted area (....) on the speed torque curves.

Usually, the dampening of the system and acceleration/deceleration through the resonance areas aids in reducing instability to a level that provides smooth shaft velocity and accurate positioning. If instability does cause unacceptable performance under actual operating conditions, the following techniques can be used to reduce velocity modulation.

1. Avoid constant speed operation at the motor's unstable frequencies. Select a base speed that is above the motor's resonant frequencies and adjust acceleration and deceleration to move the motor through unstable regions quickly.

2. The motor winding current can be reduced as discussed in Section 3.7. Lowering the current will reduce torque proportionally. The reduced energy delivered to the motor can decrease velocity modulation.

3. Use half-step mode of operation (3180-PT only). Note that this also halves the shaft speed for a given input pulse rate. Microstepping (3180-PT10 and 3180-PT125) inherently provides smoother operation, and reduces the effects of instability.

# SECTION 7: TROUBLESHOOTING

**WARNING:**

**Motors connected to this drive can develop high torque and large amounts of mechanical energy.**

**Keep clear of the motor shaft, and all parts mechanically linked to the motor shaft.**

**Turn off the power to the drive before performing work on parts mechanically coupled to the motor.**

If installation and operation instructions have been followed carefully, this unit should perform correctly. If motor fails to step properly, the following checklist will be helpful.

In General:

- Check all installation wiring carefully for wiring errors or poor connections.
- Check to see that the proper AC voltage level is being supplied to the unit.
- Be sure the motor is compatible for use with this unit.

## 7.1 IF MOTOR DIRECTION (CW, CCW) IS REVERSED, Check:

Connections between the drive and the motor. Motor wires may have been reversed accidentally on one phase. For example, swap the positions of the M1 and M3 (red and white/red wires).

## 7.2 IF THE MOTOR MOTION IS ERRATIC, Check:

Input pulses not of proper level or width.

Supply voltage out of tolerance.

Operation in area of motor instability (dotted portion of torque/speed curve).

## 7.3 IF TORQUE IS LOW, Check:

$\overline{\text{AWO}}$ (All Windings Off) active or $\overline{\text{REDUCED CURRENT}}$ active.

Improper supply voltage.

Operation in area of motor instability (dotted portion of torque/speed curve).

If a malfunction occurs that cannot be corrected by making these corrections, contact Warner Electric.

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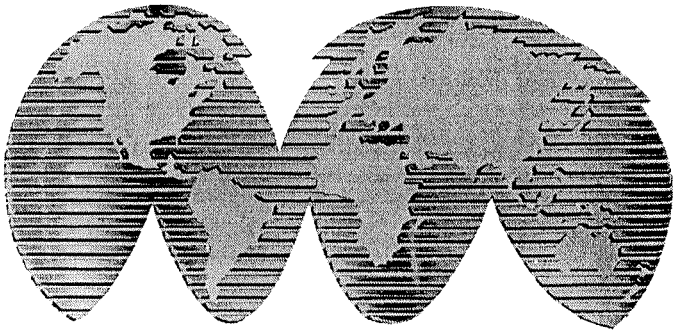

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