# 590SP *LINK* DC Drive

## Product Manual

## Version 1 Firmware



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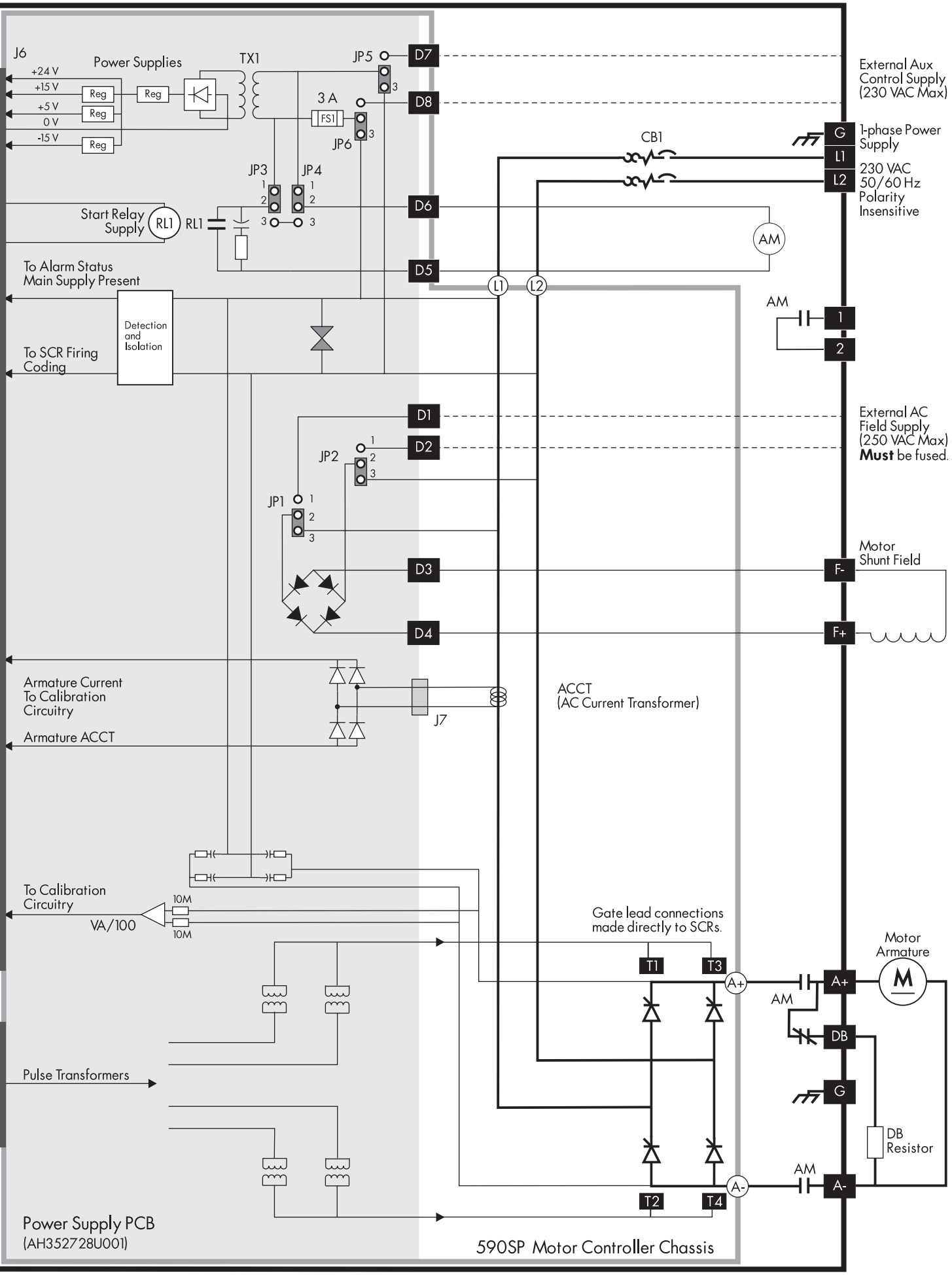


**591SP *LINK* DRV Block Diagram – Version 1 – Non-regenerative**
**Default Configuration**

# Safety

Procedures in this manual may contain Warnings, Cautions, and Notes. A Warning gives the reader information which, if disregarded, could cause injury or death. A Caution provides the reader with advice which, if disregarded, could cause damage to the equipment. A Note furnishes additional information for added emphasis or clarity.

The customer is responsible for assessing his or her ability to carry out the procedures in this manual. Make sure you understand a procedure and the precautions necessary to carry it out safely *before* beginning. If you are unsure of your ability to perform a function, or have questions about the procedures listed in this manual, contact Eurotherm Drives Customer Service at (704) 588-3246.

**WARNING!**

Only qualified personnel who thoroughly understand the operation of this equipment and any associated machinery should install, start-up, or attempt maintenance of this equipment.

**WARNING!**

This equipment uses hazardous voltages during operation. Never work on it or any other control equipment or motors without first removing *all* power supplies.

**Caution**

This equipment contains ESD (Electrostatic Discharge) sensitive parts. Observe static control precautions when handling, installing, and servicing this device.

**Caution**

This equipment was tested before it left our factory. However, before installation and start up, inspect all equipment for transit damage, loose parts, packing materials, etc.

**Caution**

Ruptured semiconductor devices may release toxic materials. Contact Eurotherm Drives or the semiconductor manufacturer for proper disposal procedures for semiconductors or other material.

NOTE. The installation of this equipment must comply with all applicable national and local electrical codes.

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The following text will in no way alter or void the contents of the Eurotherm Drives, Inc. - Terms and Conditions of Sale. It is only intended to clarify the responsibilities of each party.

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. . . DELIVERY TO COMMON CARRIER OR POSTAL AUTHORITIES AT RESTON, VIRGINIA SHALL CONSTITUTE DELIVERY AND PASSING OF TITLE TO THE CUSTOMER, WHO SHALL THEREAFTER BE RESPONSIBLE FOR DELAYS, LOSS OR DAMAGE IN TRANSIT.

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(a) notify Eurotherm Drives, Inc. within four weeks of the defect becoming apparent

(b) return the equipment forthwith, freight paid, to the premises of Eurotherm Drives, Inc. or

(c) at the option of Eurotherm Drives, Inc. make the equipment available at the Customer's premises for attention by Eurotherm Drives, Inc. personnel. Where the equipment is repaired on the Customer's premises, the Customer accepts liability for the payment of travel and subsistence expenses of Eurotherm Drives, Inc. personnel.

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(b) for goods not manufactured by Eurotherm Drives, Inc., convey to the Customer only the benefits it may recover under any guarantee the manufacturer gives to Eurotherm Drives, Inc.

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(ii) for defects caused

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(b) by wear and tear, accident or misuse, improper operation or neglect or

(c) by fitting any equipment which does not comply with Eurotherm Drives, Inc. recommendations or

(d) otherwise as a result of failure of the Customer to comply in full with any manual or handbook containing the technical specifications and operating instructions supplied by Eurotherm Drives, Inc. with the equipment;

(iii) where equipment has been used for an application other than that specified at the time the Order was acknowledged or not in accordance with Eurotherm Drives, Inc. instructions;

(iv) where the Customer has failed to observe the terms of payment for the equipment and all other obligations imposed by these terms and conditions.

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# Chapter 1 INTRODUCTION

## SCOPE

This manual covers the 590SP *LINK* regenerative and the 591SP *LINK* non-regenerative drives. Both models accept single phase supply power up to 400 VAC and are rated to 27 amps DC.

## OVERVIEW OF THE 590SP DIGITAL DRIVE

The 590SP *LINK* series drive is a digital single phase motor controller designed to power and control shunt field and permanent magnet DC motors from standard single phase 50/60 Hz supplies ranging from 110 to 400 VAC. Control of the 590 DRV *LINK* DC drive drive is fully digital and configurable *only* over a Eurotherm Drives *LINK* system fiber optic network through the *LINK* configuration software package (ConfigEd), and the diagnostic software package (SAM).

Figure 1.1 - 590SP *LINK* DC Drive (Open)

**Attention**

This manual assumes the user has purchased and is familiar with the software packages ConfigEd and SAM. The ability to configure, commission and troubleshoot this product is limited to the degree of understanding and experience with these software tools.

The 590SP *LINK* DC drive is available as an open frame device, or may be ordered with a steel protective IP20 rated enclosure. Figures 1.1 and 1.2 show the open and enclosed versions. The open version includes a protective metal cover mounted on the front to shield voltage sensitive IC chips on the control board from incidental electrostatic discharge.

NOTE. The IP20 rated enclosure protects the drive against objects (0.47”) 12 mm in diameter. It is *not* dust proof, oil resistant or drip proof.

A self contained “DRV” package model is also available. DRV models include an input supply two pole circuit breaker and a DC contactor mounted in a steel IP20 enclosure. Refer to Appendix F for information and technical details.

The drives are designed for simple, economical panel mounting using 8-32 or M4 studs. Disconnecting and reconnecting the controller, if necessary, is simplified by plug-in connectors. Standardized parts reduce the number of spare parts needed to maintain a multi-drive system.

The Man Machine Interface [MMI] display simplifies start up and troubleshooting by automatically displaying the first fault. It is a powerful diagnostic tool with access to all alarms and most parameters within the drive. Light emitting diode [LED] indicators on the front panel display the drive's operating status.

NOTE. For clarity, all references to MMI parameters, menus or sub-menus appear in this manual in capitalized TIMES NEW ROMAN type. Any reference to a function, feature or parameter associated with or accessible through ConfigEd or SAM appears in this manual in capitalized `COURIER` type.

Figure 1.2 - 590SP *LINK* DC Drive (with IP20 Cover)

## Main Features

**Microprocessor Control:** a 16 bit microprocessor controls the drive and offers:

- Real-time fiber optic communications
- Complex control algorithms not possible with simple analog devices
- Control circuitry built around standard software blocks.

**Digital Accuracy:** all setpoints and variables are sent as digital values over the *LINK* network giving greater control accuracy and repeatability than standard analog drives.

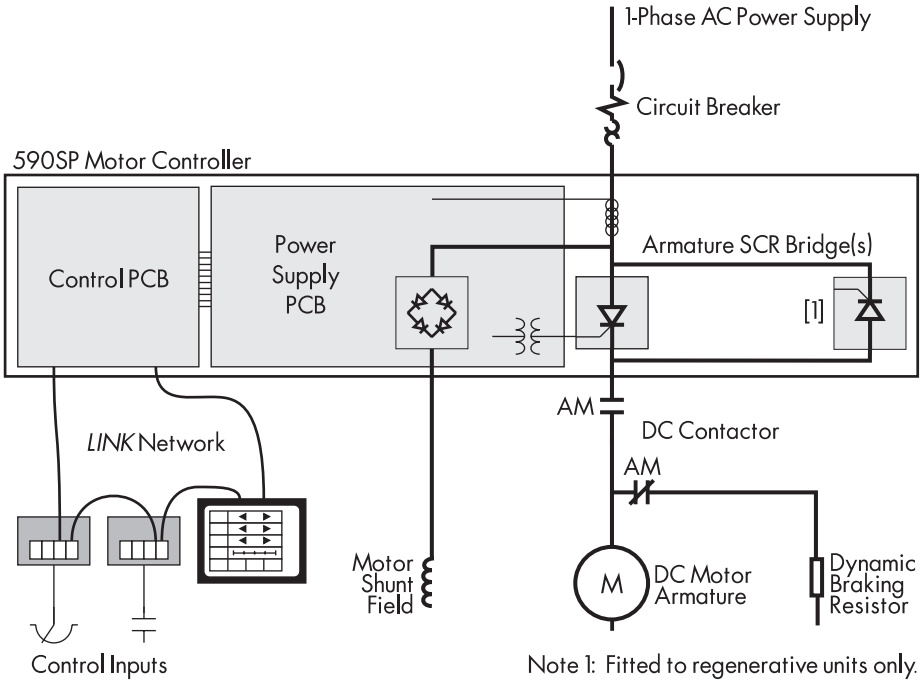



Figure 1.3 - 590SP *LINK* Block Diagram

**Feedback Options:** the drive supports four types of speed feedback:

- Armature voltage feedback (standard), which requires no feedback device, connections or isolator
- Analog AC or DC tachometer generators
- Wire-ended electrical encoders
- Plastic (5701) or glass (5901) fiber optic Microtach encoders

## Other Features

- **Power Isolation:** The 590SP's control circuitry is electrically isolated from the drive's power control, thus enhancing system interconnection and safety.
- **Frequency Auto Ranging:** The control circuitry automatically adjusts to accept supply frequencies from 40-70Hz and possesses high noise immunity from supply born interference.
- **Man-Machine Interface (MMI):** A two-line alphanumeric LCD display automatically displays the first fault the drive registers. A four button keypad greatly enhances troubleshooting, tuning and commissioning. Drive inputs and outputs and drive parameters are accessible through the LCD display and the keypad, or may be monitored or changed with a PC running the software package ConfigEd Lite.
- **Drive Status Indicators:** Six LEDs indicate the drive's alarm and run status.
- **Regenerative/Non-regenerative Control:** Regenerative (590SP) and non-regenerative (591SP) models are available. Regenerative controllers consist of two electronically controlled, full-wave thyristor bridges providing speed and torque control in both directions of rotation (4 quadrant control). Non-regenerative models have one full-wave bridge controlling speed and torque in one direction only (2 quadrant control).
- **Simple Calibration:** Switch selectable calibration for analog tachometer generator speed feedback, armature current and armature voltage. Fine tuning performed through drive software.
- **Current Loop Autotune:** Software driven automatic tuning of drive current loop with built in AUTOTUNE routine.

## HANDLING AND STORAGE

Carefully remove any packing material from around the drive. Save the box and foam inserts in case you ever need to return the drive. Improper packaging can cause transit damage.

Remove the drive from its packing case. Do not attempt to lift or move the drive by its terminal connections. Lift the drive instead by its heatsink and lay the drive on a flat surface. Take care not to damage any protruding terminal connections or components.

**Caution**

The IC devices mounted to the control board of the drive are *extremely* sensitive to stray voltage and electrostatic discharge. Do *not* remove the protective cover or the IP20 housing except for installation. With the IP20 housing or the protective cover removed, handle the drive only while you are properly grounded and protected against static electric discharge.

# Chapter 2 IDENTIFICATION

## BASIC PART IDENTIFICATION

The photo in Figure 2.1 shows the parts of the 590SP *LINK* Drive. The drive consists of three main parts: a control board, a power board and four thyristor, or silicon controlled rectifier (SCR) packs mounted on an aluminum heat sink. The regenerative model 590SP contains four SCR packs; non-regenerative models (591SP) are fitted with two. Each SCR pack contains two SCRs which convert the AC supply power into DC output power for armature control of a DC motor. The control board, power boards and the thyristor modules are electrically and physically isolated from each other. These boards and the SCR packs are the only replaceable electronic parts on the drive.



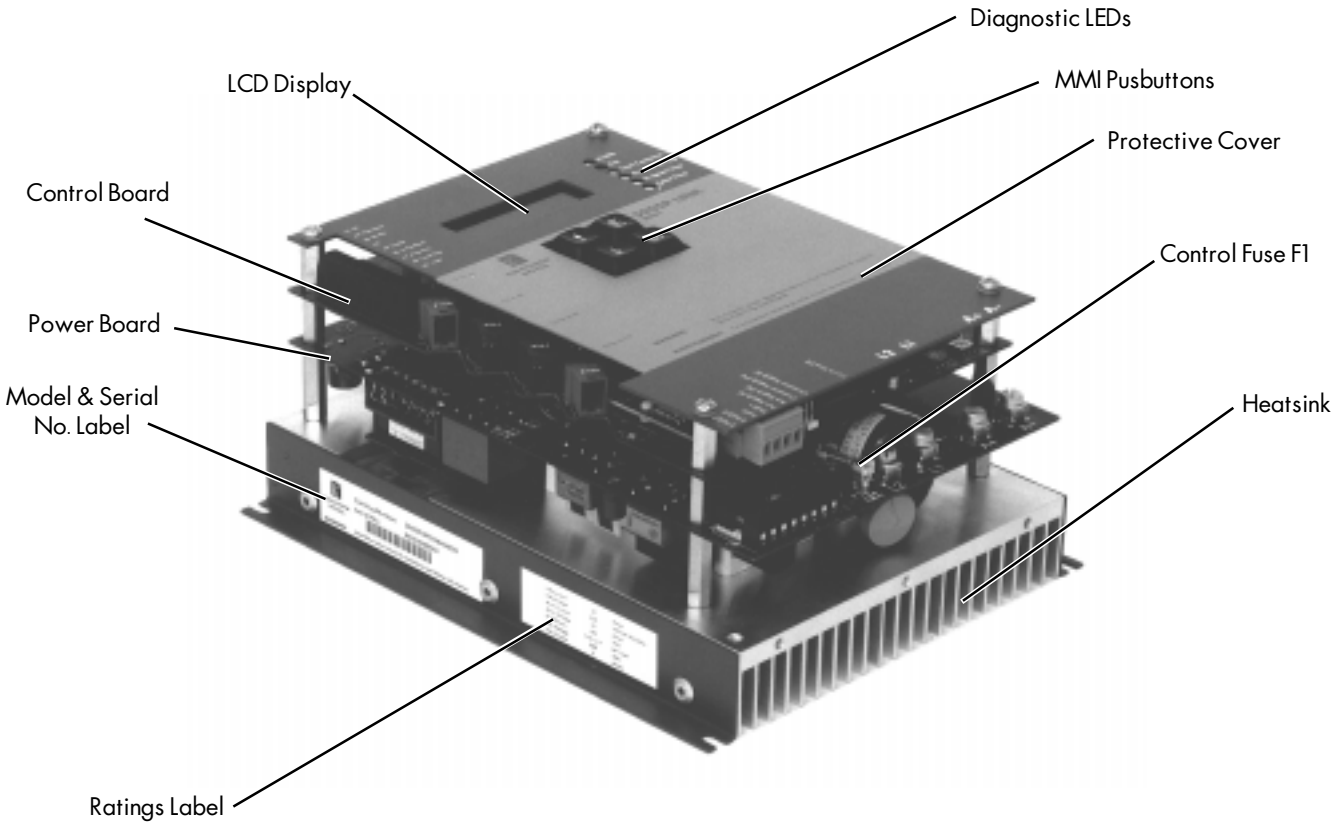



Figure 2.1 - 590SP *LINK* Drive Basic Part Identification

## LABELING

Two nameplate labels, located on the left hand side of the drive, give the serial number, model number and the ratings information.

NOTE. Please heed the warning labels on the front cover of the drive.

# Chapter 3 INSTALLATION AND WIRING

The 590SP *LINK* is designed for easy installation. Review these procedures *before* installing the drive. If you do not understand the instructions, or are unsure of your ability to perform the procedures, contact Eurotherm Drives Customer Service.

## RECOMMENDED TOOLS

Installing a 590SP drive requires the following hand tools:

- Socket wrench with a 6 inch extension
- M7 or 9/32" deep socket
- Phillips #2 Screwdriver
- Flat blade - 0.5 x 3.0 mm Screwdriver
- Flat blade - 0.6 x 3.5 mm Screwdriver
- Flat blade - 0.8 x 4.0 mm Screwdriver
- Small pair of electrical pliers
- Small wire cutters
- Pliers
- Wire strippers
- Wire crimping tool
- Spade and ring wire crimps
- 8/32 or M4 (as applicable) socket wrench and bolts and nuts needed to mount the drive to the panel.

## VENTILATION AND COOLING REQUIREMENTS

The drive must be able to dissipate the heat generated during use. Mount the unit vertically so that cool air will flow through the drive. As a rule, allow a minimum of 2.00" (51 mm) of clearance above and below the drive to ensure adequate free air flow. When mounting drives one above the other, allow at least 2.00" (51 mm) between the top and bottom drives. No free space is required between the drives when they are mounted side by side. Do not mount the 590SP *LINK* next to equipment that may cause the drive to overheat.

Normal maximum ambient operating temperature is 45°C (113°F). Derate the controller above this limit by 1% per °C to a maximum of 55°C. At 45°C, the drive dissipates 90 Watts when run at its maximum rated current of 27 amps.

**Caution**

Operation above 55°C (131°F) is not recommended.

Figure 3.1 lists heat dissipations for various standard motors.

| Motor Rating @ 180VDC | Motor Current | Power Loss @45°C |
|---|---|---|
| 1 Hp | 6.1 Amps | 22 Watts |
| 2 Hp | 10.8 Amps | 32 Watts |
| 3 Hp | 16 Amps | 50 Watts |
| 5 Hp | 27 Amps | 90 Watts |

Figure 3.1 - Drive Heat Dissipation for Standard Rated Motors (Motor Current Ratings Source: NEC 1990, Table 430-147)

## MOUNTING INSTRUCTIONS

The 590SP *LINK* is designed to mount directly onto a vertical, flat surface through four slots on the side of the heatsink. Refer to the outline drawing in Figure 3.2 for mounting centers and hardware recommendations. Supply and motor connections are made to the bottom of the drive's power board. Control wiring and fiber optic conductors can exit the left side of the drive or along the bottom. Allow for sufficient wire routing space when wiring. Leave excess slack or "service length" in the wiring harness.

NOTE. Mounting holes should be accurately placed.

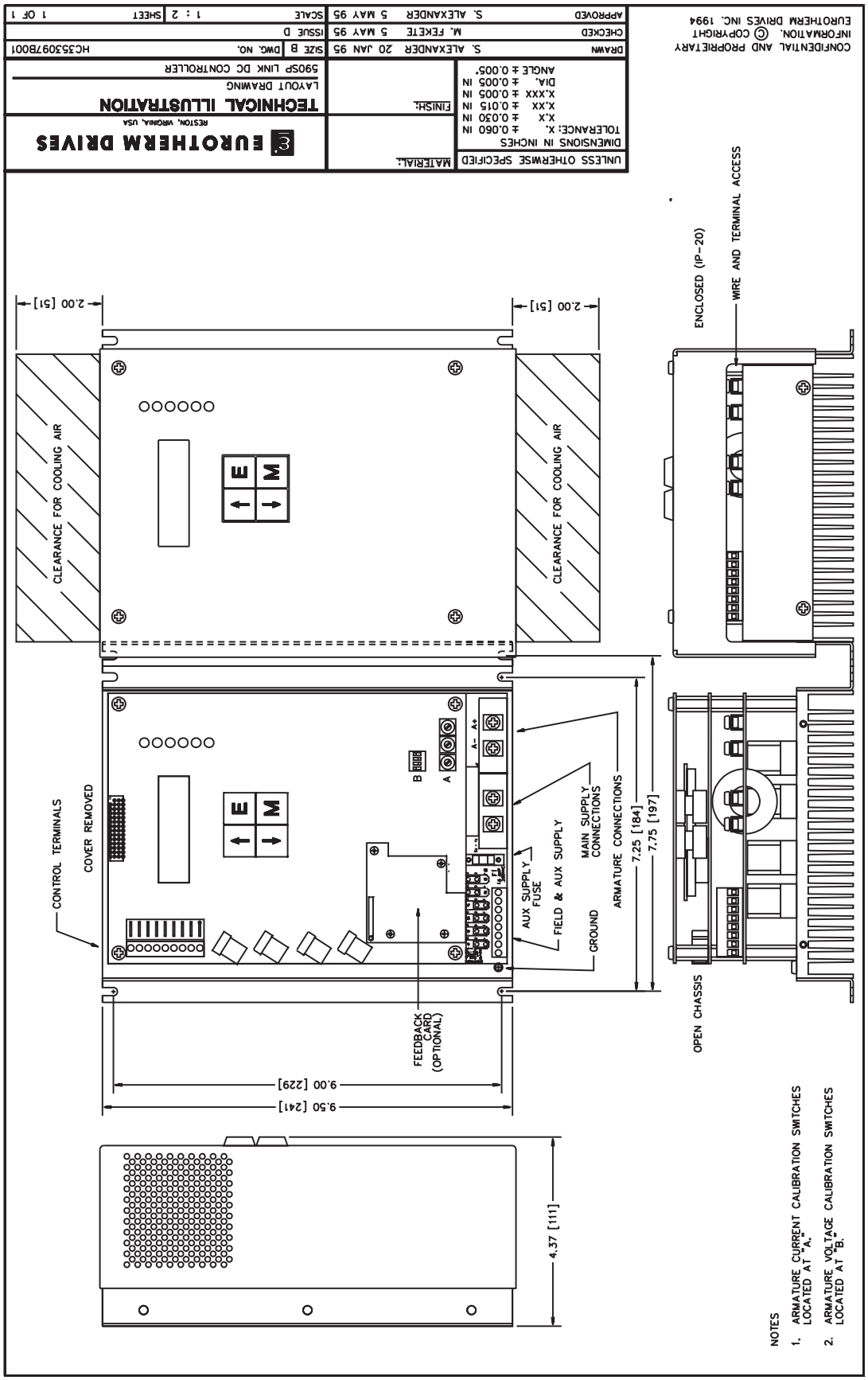



Figure 3.2 - 590SP *LINK* Controller Layout Drawing.

Place Studs

Mount Drive

Visual Check

1. Insert the mounting studs from the rear of the panel. Attach lock washers and nuts part way onto the lower mounting studs. These help keep the drive in place while mounting.
2. Lower the bottom slots of the drive onto the lower studs behind the lock washers and nuts. Hold the drive in place with one hand and lean the drive back onto the top two mounting studs with the other hand. Next, hold the drive firmly against the panel and attach lock washers and nuts on the top studs. Finger tighten the upper and lower stud nuts, then use a socket wrench to fasten all four nuts securely.
3. Check the drive and its housing for packing material, mounting debris or any other material that could damage and/or restrict the operation of the equipment.

NOTE. When mounting any component above the drive after mounting the 590SP *LINK*, cover the drive to keep metal or other debris from falling into the unit.



## WIRING PROCEDURES

Be certain to use the appropriate fusing and wire and to verify all connections. Observe *all* warning messages. Failure to follow safety precautions can lead to equipment damage and/or injury.

Branch Circuit Protection Required

Check Electrical Code

**WARNING!**

Make sure all wiring connections meet or exceed applicable local and national electrical codes. Be sure to fit branch circuit AC protection. Local codes may mandate external DC motor overload protection.

### Wiring Instructions

Instructions in this manual apply to a 590SP *LINK* configured for general purpose, speed control of a shunt or permanent magnet field DC motor. Wiring configurations for custom systems or for optional applications are too numerous and complex to include here. For system configurations, refer to the schematics shipped with those systems.

Wiring Diagrams

The foldout drawing in Figure 3.13 at the end of this chapter shows the connections described in the following sections. The balloons Ⓐ in the left margin of the following text help locate the circuit in the figure. In the left portion of the Figure 3.13 is a standard wiring schematic for DC contactor power isolation with a dynamic brake option. The right schematic shows wiring for AC contactor power isolation. The diagrams at the bottom depict the wiring required for the different speed feedback card options.

Take special care in wiring the drive and motor. Incorrect wiring is a common cause of start up problems and may lead to problems in the future. If you have questions about wiring procedures, contact Eurotherm Drives Customer Service.

Isolate Power

**WARNING!**

When working on wiring connections, completely isolate all power supplies from the drive on which you are working.

### Terminal Torque Ratings

Power Conductors: Use Ring or Spade Lugs

Figure 3.3 lists the tightening torques for all user terminals, and the maximum wire size the terminal can accept. Terminate power conductors with ring or spade lugs. Do not overtighten connections when installing wires.

Terminal Torque

| TERMINAL | TORQUE RATING |
|---|---|
| Power Terminals L1, L2, Ground, Output Terminals A1 &A2 | 2.5 lb-ft (3.5 Nm) maximum |
| Control Terminals D1-D8, Signal Terminals A1-A9 | 0.44 lb-ft (0.6 Nm) maximum |

Figure 3.3 - 590SP *LINK* Terminal Tightening Torque Ratings and Wire Sizes.

AC Conductor Ratings
DC Conductor Ratings
Control, Field & Signal Wire Ratings
Supply Ground Connection
Main Supply Connections
3-wire Supply *only* (A)
Use AC Branch Circuit Protection, SCR fuses optional (B)
Armature Connections (C)
Connect Field (D)
External Field Supply? (E)
Check Jumpers JP1 and JP2
1/2 - Wave Rectifier Wiring (see note 6)
Check Control Power Rating
External Control Supply? (F)
Check Jumpers JP5 and JP6

## Wire Ampacity and Supply Rating

The input supply conductors must be rated for 1.25 x AC INPUT CURRENT. The AC input current is approximately 1.5 x the full load motor current. The DC drive output armature wires must have a minimum rating of 1.1 x FULL LOAD MOTOR CURRENT. UL requires the DC armature conductors to be rated for 1.25 x FULL LOAD MOTOR CURRENT. Refer to the acceptable wire sizes for the terminals listed in Figure 3.3.

The motor field wiring should be at least 14 AWG. Signal wiring (conductors to terminal block A) and control power wiring must be 18 gauge or larger. The ground connection for the 590SP *LINK* is at the bottom left corner of the heatsink (refer to Figure 3.4). The ground connection requires 10 AWG (4 $mm^2$) wire, minimum terminated with a ring lug crimp.

## Main Supply and Armature Connections

Connect the AC power supply to terminals L1 and L2, and power input ground to the ground screw. The connections must be made through adequate branch AC circuit protection, as per applicable code.

**Caution**

The 590SP *LINK* is designed to accept a grounded supply. Supplying the drive from a two-wire, non-grounded supply is *not* recommended.

NOTE. Only branch AC circuit protection for the drive is required. Semiconductor fuses are optional. If you wish to use semiconductor fuses for the drive's thyristors, size the fuses according to the $I^2t$ rating of the thyristor. These ratings are listed in Appendix A, Technical Details.

Connect the motor armature to terminals A+ and A– . The armature output and supply input connections are located at bottom of the power board, as shown in Figure 3.4. Connect the motor ground wire to the AC supply ground connection at the bottom left corner of the heat sink. Use 10 AWG (4 $mm^2$) minimum wire and terminate with a spade crimp.

## Field Supply Connections

Connect the motor field (-) to terminal D3 and field (+) to terminal D4. When an external field is required (for example, when a 240 VDC field is required on a 240 VDC armature motor), connect the supply wires to terminals D1 and D2. Switch auxiliary control jumpers JP1 and JP2 from positions 2 and 3 to positions 1 and 2. These jumpers are on the lower left of the power board as shown in Figure 3.4 and number from left to right as shown in Figure 3.5.

**WARNING!**

The drive's on board field rectifier is completely non-controlled. Shutting off supply power or disabling the drive may *not* switch off the field supply. Check the field voltage after removing power and *before* servicing the drive.

If connecting the rectifier for half-wave rectification, be certain to wire the field as described in Note 6 of Figure 3.3.

## Control Power Wiring

The drive is shipped with the control power supplied by the main drive supply and accepts a voltage range of 110 to 240 VAC without changing the tapping. For main supplies exceeding 240 VAC, however, the control supply must be supplied externally through terminals D7 (neutral) and D8 (line). Move jumpers JP5 and JP6 from positions 2 and 3 to positions 1 and 2 to power the control transformer externally. The supply is protected by a 2 amp fuse.

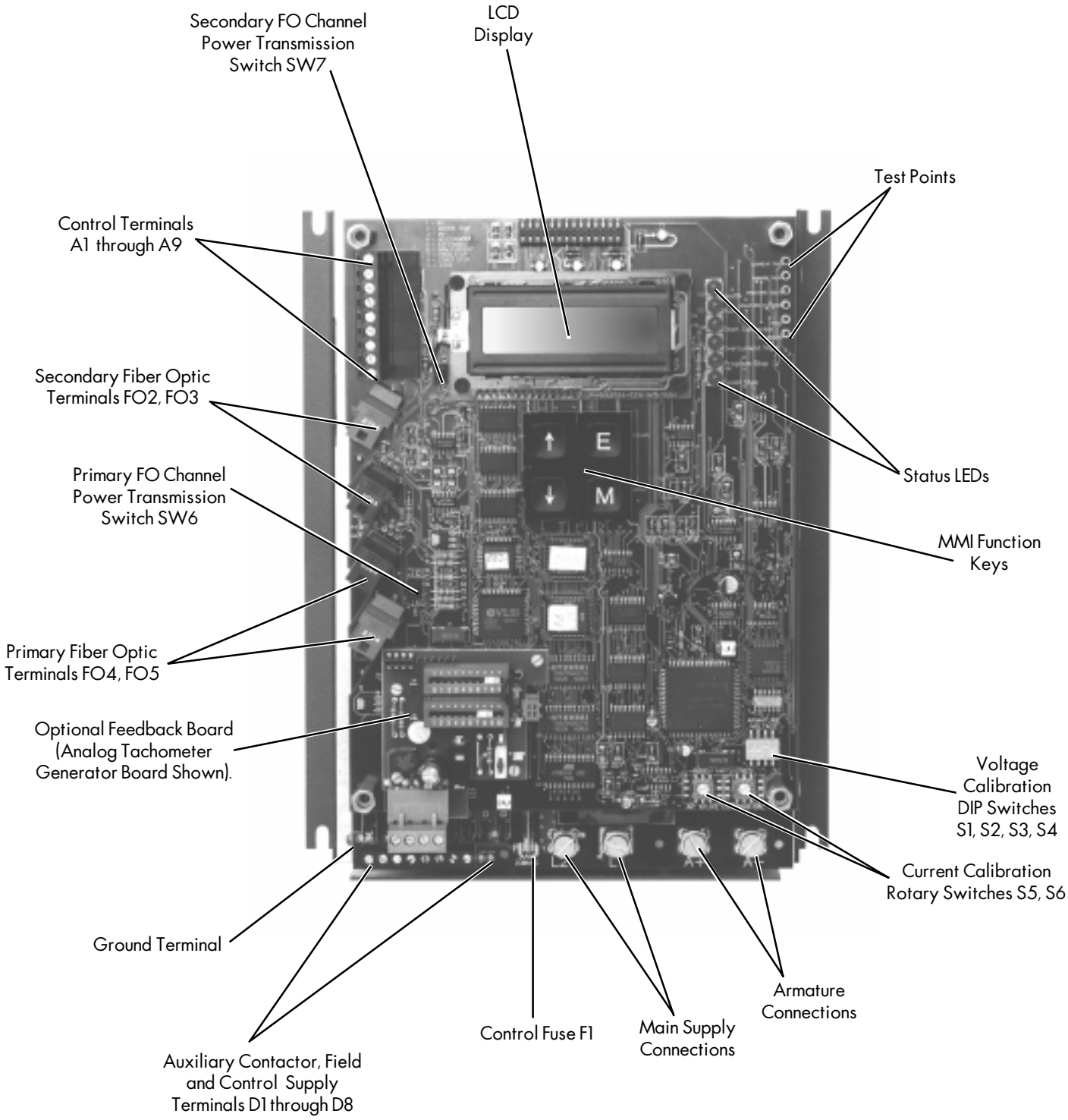



Figure 3.4 - 590SP *LINK* Drive, Front View

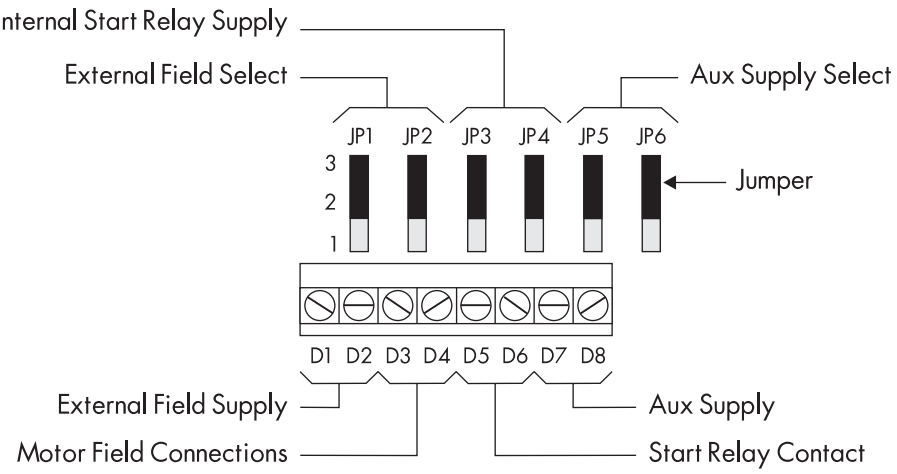



Figure 3.5- Auxiliary Control Jumpers

## Motor Isolation

Drive *must* Control Contactor Coil

(G)

Isolate the motor from power by either breaking the controller input supply with an AC contactor or the output power with a DC contactor. The 590SP *LINK* drive *must* control this contactor to ensure that current flow is never interrupted while the thyristors are firing.

### AC Contactor Wiring

AC Contactor Wiring

(H)

Use a two pole, normally opened contactor rated to handle the AC voltage and supply current. Wire the contactor poles between branch AC circuit protection and the supply input terminals (L1 and L2). Permanently enable the drive by jumpering terminal A5 (ENABLE) to terminal A9 (+24 VDC). Always isolate input power to the drive by dropping out the AC contactor power *before* servicing the equipment.

Jumper A5 to +24 VDC (terminal A9)

NOTE. The control supply *must* be supplied externally when using an AC contactor. Connect it as described above in Control Power Wiring.

### DC Contactor Wiring

DC Contactor Wiring

(I)

Wire a suitably rated DC contactor between the drive output terminals (A+ and A-) and the motor armature. Connect terminal A5 (ENABLE) to terminal A9 (+24 VDC) through a normally opened auxiliary of the main contactor. This keeps the drive disabled until the main contactor closes, and disables the drive when the contactor opens.

Switch A5 to +24 VDC (A9) thru n/o contactor auxiliary

**Caution**

When isolating the armature using a DC contactor, the field remains powered while the contactor is de-energized.

## Dynamic Braking

Dynamic Brake Contactor

The DC contactor wiring schematic in Figure 3.13 shows wiring for an optional dynamic braking application. Dynamic braking requires a DC contactor with an additional normally closed pole rated to carry full load current upon closing. The start-stop circuitry should be designed to prevent the contactor from closing until after the motor reaches zero speed.

Interlock Contactor to Zero Speed

(J)

NOTE. Dynamic brake contactor poles are rated to make, but not interrupt DC motor current. To avoid damaging the normally closed contact, interlock the drive *LINK* ZERO SPEED signal within the *LINK* configuration logic to the *LINK* ConfigEd DRIVE START logic block to prevent the drive from restarting until the motor has reached standstill. Or, interlock the start logic through hardware using relays and *LINK* digital modules as shown at the lower left of Figure 3.13.

Interlock A7 & A8 to A9 thru n/o Contact of ESR Relay

(R)

For dynamic braking with regenerative or non-rgenerative drives, wire terminals A7 and A8 as shown at the lower left of Figure 3.13.

External Drive Start Relay

Check Jumpers JP3 & JP4

Signal Wiring

Wire routing

Enable

Over Temp Device

Blower Aux. Overload Contact

Regen E-Stop

Program Stop A7

Non-Regen Stop

Coast Stop A8

Feedback Options

## Drive Start Relay

(G) The drive powers an internally mounted start relay and switches this relay in and out only when the thyristors are not conducting current. To properly control power to the motor, the drive *must* control power to the external AC or DC contactor coil through a contact off the internal start relay. If the external contactor coil voltage matches the main supply voltage, power the coil from the main drive supply by leaving jumpers JP3 and JP4 in the default positions 2 and 3, and wire the external contactor coil to terminals D5 (line) and D6 (neutral). If the coil rating differs from the main supply, isolate the drive start relay contact from the main supply by switching jumpers JP3 and JP4 to positions 1 and 2. Supply the required contactor line voltage to D5 and connect the external contactor coil between D6 and the external supply voltage return. These terminals and the internal drive start contact are rated 240 VAC. The current rating of the start relay contact is rated at 3 Amps, maximum. Use a slave contactor if coil inrush exceeds the maximum rating.

## Control Wiring

All connections to terminal block A (see Figure 3.4) are signal connections and must be isolated from the supply power. Run all control wiring in separate conduit from power conductors and leave enough slack to allow easy replacement of the controller.

### Enable

(H) (I) Terminal A5 (ENABLE) enables and disables the firing of the drive thyristors. If using an AC contactor, permanently enable the drive by tying this input to terminal A9 (+24 VDC). If using a DC contactor, connect terminal A5 to terminal A9 through a normally opened contact on the main contactor.

### Thermistor

(K) Terminals A1 and A3 are zero volt signal connections common to the return of the drive's +24 VDC internally regulated supply. If the motor is fitted with overtemperature sensing devices such as thermistors or thermostats, the devices should be connected in series between terminals A3 (0V) and A2 (THERMISTOR). If the motor has an external blower motor, wire an auxiliary contact from the blower starter's overload trip circuitry in series with the motor's over-temperature device and terminals A2 and A3.

### Program And Coast Stop

(L) (M) For a regenerative emergency stop (590SP *LINK* only), connect terminal A7 (PROGRAM STOP) to terminal A9 (+24 VDC) through a normally open contact of an emergency stop relay. Also connect terminal A8 (COAST STOP) to terminal A9 through a time-delayed on de-energize, normally opened contact from the same emergency stop relay. Activating the E-Stop circuit removes +24 VDC from A7 and regenerates the motor power back into the main supply. The delayed contact on A8 acts as a fail safe, allowing the drive to coast stop after the time delay.

(R) For non-regenerative drives or coast stopping, permanently jumper terminal A7 to A9 and connect terminal A8 to a non-delayed normally open contact of the emergency stop relay. The drive will drive coast stop immediately upon activating an emergency stop condition.

**WARNING!**

The emergency stop relay should not be considered part of the normal sequencing of the system and should normally be triggered in circumstances involving equipment damage or safety.

## Speed Feedback

The 590SP *LINK* accepts the following types of speed feedback device signals to run in speed control:

- armature voltage feedback,
- analog AC or DC tachometer generator,
- wire-ended electrical encoder, and
- plastic (5701) or glass (5901) fiber optic Microtach encoder

Arm. Voltage Feedback

Receiver Card Part No.s

Feedback Card Installation

The drive is shipped to run in armature voltage feedback which requires no option receiver card. The drive senses armature voltage from the drive output so no additional external connections are required. Each of the other speed feedback devices requires a receiver card, which are ordered separately. Each card mounts on the lower left portion of the control board of the drive (see Figure 3.6) and receives the speed signal from the feedback device. The part numbers for each type of card are listed below. Appendix A contains technical information on each feedback card.

| Feedback card | part no. |
|---|---|
| • Switchable Analog Tachometer Card | AH385870U001 |
| • 5 VDC Encoder Receiver Card | AH387775U005 |
| • 12 VDC Encoder Receiver Card | AH387775U012 |
| • 15 VDC Encoder Receiver Card | AH387775U015 |
| • 24 VDC Encoder Receiver Card | AH387775U024 |
| • Plastic Microtach Encoder 5701 Feedback | AH058654U001 |
| • Glass Microtach Encoder 5901 Feedback | AH386025U001 |

## Feedback Receiver Card Installation

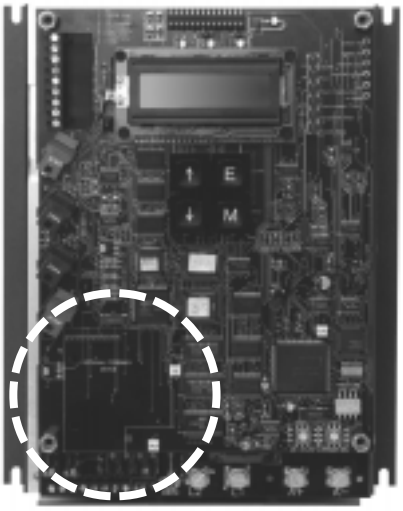


Figure 3.6 - Feedback Calibration Board Mounting Location

To install the receiver card on the drive control board:

1. Remove the packaging from the feedback receiver card.

**Caution**

Encoder and Microtach receiver boards contain electrostatic discharge (ESD) sensitive parts. Observe static control precautions when handling and installing the card.

2. Align the 10 pin connector on the option board with the controller pins on the lower left of the control board, as shown in Figure 3.6.
3. Carefully push the receiver card onto the pins. All four white support standoffs should engage the control board. If installing a switchable analog tachometer calibration card, be certain to connect the jumper on the right side of the card to pin J8 on the control board.
4. Refer to Appendix A for specific instructions on terminating the feedback device to the receiver option card.

Analog Tach

N

Switchable Tach Card

## Analog Tachometer Generators

The analog tachometer generator receiver card supports both AC and DC tachometer generators and has a calibration range of 10 to 199 volts. The signal cable for the analog tachometer generator *must* be shielded over its entire length.

NOTE. Ground the shield at the drive end only to avoid ground loops.

The board switch settings coarsely scales the feedback voltage (see Appendix A). Adjust parameters in the MMI or the *LINK* software to fine tune the speed feedback (refer to Chapter 4).

Encoder Option

O

3 x Twisted Pair

## Wire-ended Electrical Encoders

The drive accepts a standard, 4-channel, quadrature complimentary, wire-ended electrical encoder signal as speed feedback. Four feedback cards are available, each having a different supply voltage rating. Complimentary line driver encoders are recommended. Refer to Appendix A for typical encoder connection listings.

NOTE. When using an wire-ended electrical encoder as feedback, be sure to use 3 x pair twisted shielded cable, and to ground the shield at the drive end only. Belden 8777 cable is recommended.

### Microtachs

Microtach Option

P

Q

Glass vs. Plastic

Microtach Supply Requirement

Fiber optic encoders (or Microtachs) come in either glass or plastic. While the glass Microtachs (5901) can transmit a feedback signal over a long range without a repeater, they require a special termination tool to properly cut and polish the glass fiber optic cable. The 5701 Microtach is used with plastic fiber optic cable which needs only a set of pliers for termination. The signal range for plastic, however, is limited and may require a Microtach repeater. Repeater part numbers are listed in Appendix A.

Each type of Microtach requires its own receiver card, listed above. The 5701 may be powered directly from the drive's +24 VDC supply off of the card. The power consumption of the 5901 exceeds the drive's +24 VDC supply rating and must be supplied from an external source. Refer to Appendix A for terminal designations and technical and installation details.

One-half inch diameter composite plastic fiber optic cable is available. The cable includes two 16 AWG conductors with a plastic fiber optic conductor sheathed in a protective plastic coating. The cable is recommended when running plastic fiber optic within conduit. Refer to Appendix A for part numbers.

## *LINK* NETWORK CONNECTIONS

Simple, Tapped & Redundant Rings

R

The *LINK* fiber optic connections are shown in Figure 3.4. The drive has two pairs of communication ports, each with a RED transmit terminal and a BLACK receive terminal. The lower ports, FO4 (primary receive) and FO5 (primary transmit), support a simple ring network topology. The top ports, FO2 (secondary transmit) and FO3 (secondary receive), are used for redundant or tapped ring topologies. Simple, redundant and tapped *LINK* network rings are shown below in Figures 2.8, 2.9, and 2.10. Detailed information on each type of ring can be found in the *LINK* Overview Manual.

The 590SP *LINK* communicates over the *LINK* network over plastic fiber optic cable. The drive's fiber optic ports accept plastic (T&B) connectors which require only a set of pliers for termination to the plastic fiber optic cable. L5206-2-00 *LINK* fiber optic repeaters may be required if the fiber optic

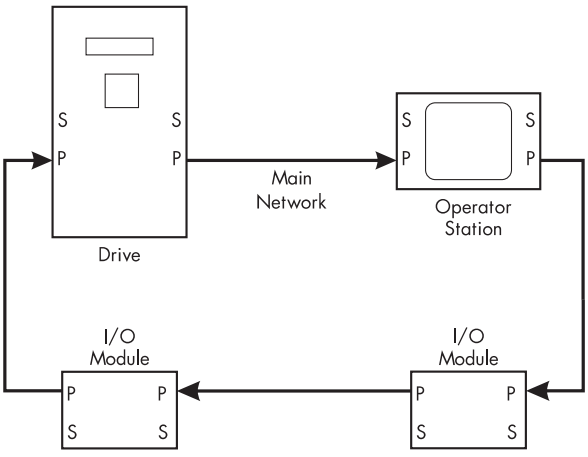



Figure 3.7 - Simple Fiber Optic Topology

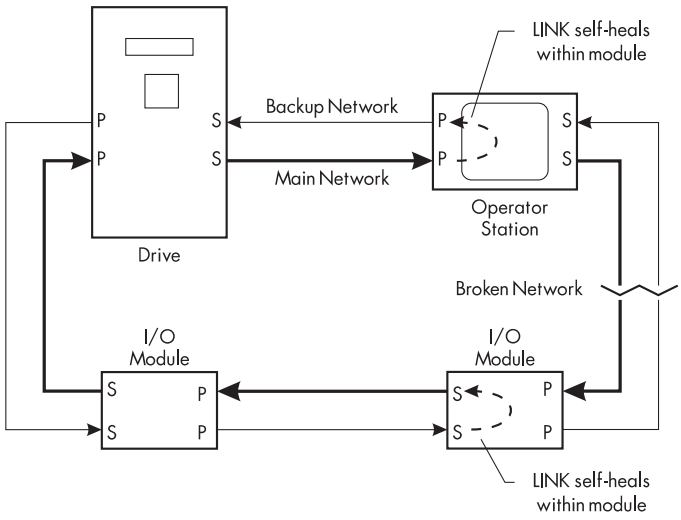



Figure 3.8 - Redundant Fiber Optic Topology

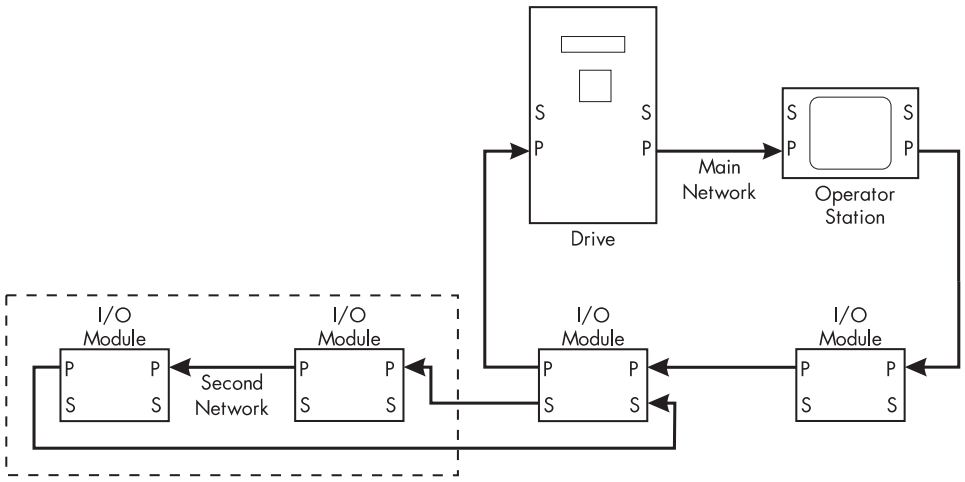



Figure 3.9 - Tapped Fiber Optic Topology

Transmission Distance

run exceeds the drive's transmission distance rating for plastic cable. Part numbers for plastic fiber optic connectors and signal repeaters are listed in Appendix G.

The transmission power level of each fiber optic transmitter can be adjusted by setting switches SW6 and SW7 on the drive's control board. These switches are adjacent to the fiber ports (see Figure 3.4). Transmission ranges are listed in Appendix A, Technical Description.

Being highly noise immune, the fiber optic cable may be installed with high voltage or control voltage cabling.

NOTE. Avoid installing the fiber optic cable in a manner which exceeds the cable's minimum bend radius, or otherwise damages the cable.

Seal off FO3 if not Used

When using a simple topology, seal off the black secondary channel receiver (FO3) with a plastic fiber optic connector so that the unused port's receiver avoids detecting stray light. The drive is shipped with such a connector fitted.

## CALIBRATION

Calibrate the drive's armature current, armature voltage and speed feedback after installing and wiring the drive. Be sure to record these settings after they are correctly set and again after start up.The four DIP switches S1, S2, S3 and S4 scale the drive for the motor armature voltage. The rotary switches S5 and S6 calibrate the drive for the motor current. The switches are located at the lower left of the control board, as shown in Figure 3.4. A close up view is shown in Figure 3.10.

Voltage & Current Cal Switch Locations

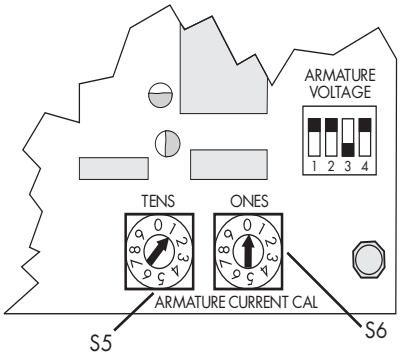



Figure 3.10 - Current and Voltage Calibration Switches

NOTE. Calibration for 2 HP, 180 VDC armature motor shown (Ratings Source: 1990 NEC, Table 430-147).

**WARNING!**

Do not make any changes in calibration settings with the drive contactor energized. Altering the drive calibration while running can cause mechanical damage and/or injury to personnel.

**WARNING!**

Do not exchange drives without first verifying that the new drive's calibration matches the motor's nameplate rating. Equipment damage or injury to personnel could result from incorrect calibrations.

## Armature Voltage Calibration

Armature Voltage Calibration

The armature voltage can be set over a range of 100 to 400 DC in 20 volt increments. Choose the setting closest to the motor's armature voltage rating. When in doubt, set it to the next highest setting. The default setting is 180 volts. Use Figure 3.12 to select different voltages.

Voltage Switch Positions

If necessary, adjust SETUP PARAMETERS:: CALIBRATION:: ARMATURE V CAL to refine the calibration to match the required armature voltage. Or, use SAM to tune the voltage feedback with set CAL ARMATURE VOLTAGE in the FEEDBACK software block.

Fine Tuning

NOTE. For 180 volt armatures, no change is needed. For 90 volt armatures, set the switches for 100 volts and set the armature voltage calibration to 1.1000 (100 ÷ 90).

Figure 3.11 - Armature Voltage Calibration Switch Settings

## Armature Current Calibration

Set the armature current rotary switches, S5 and S6, to match the motor's armature full load current nameplate rating. Armature current is set to the nearest amp ranging from 1 to 27 amps.

Armature Current Calibration

NOTE. The calibration clamps at 27 amps if set past this setting. Setting the switches to 00 causes a drive OVERCURRENT TRIP alarm.

**WARNING!**

Do not set the current calibration switches above the drive or motor rating. Equipment damage may result. Do not change the calibration settings when the main contactor is energized.

## Speed Feedback Calibration

Analog Tach Fbk Swiches

The speed feedback signal must be scaled to match the motor's top, or nominal running speed. Coarse calibration for AC or DC analog tachometer generators is done through switch settings on the switchable tachometer feedback option board. Consult Appendix A for calibration information.

Fine Tuning: Chapter 4

Fine tuning of an analog tachometer generator signal and calibration of wire-ended electrical and Microtach encoders is done through the drive software. Refer to Chapter 4, Start-up and Adjustment.

## FINAL INSPECTIONS

After wiring the drive, align all the conductors so that they are not damaged when installing the protective IP20 cover (if used). Once wiring is completed, perform the following checks. They can assure that the drive and motor can be safely powered up without injuring personnel or damaging equipment.

Supply volts correct?

Check control volts

Check field supply

Record motor data

Connections OK.?

Equipment OK?

Debris in drive?

Motor OK?

Safe to Rotate?

Safe to run?

Commission Drive (see chapter 4)

1. Check the main power supply voltage. Is the voltage within the supply rating of the drive?
2. Verify that the control power is within the acceptable range of 110 to 240 VAC.
3. Check the field voltage requirement of the motor. Is an external field supply required?
4. Record the motor nameplate information:
   - Armature Voltage,
   - Armature Current,
   - Field Voltage,
   - Field Current,
   - Full speed,
   - Tachometer Generator Rating or Encoder Resolution and Model Number,
   - Service Factor,
   - Model Number, and
   - Frame Size.
5. Check all external wiring circuits:
   - Supply connections,
   - Control connections, and
   - Motor connections.
6. Check for damaged equipment.
7. Look for any loose wire ends, drilling chips, etc. lodged in the drive or electrical equipment.
8. Inspect the motor, especially the commutator, for any debris. Ensure the brushes are properly seated and the brush spring tensions are adequate. If possible, check that the motor and blower (if fitted) can be turned freely by hand.
9. Check that rotation of the machinery in either direction will not cause a hazard.
10. Ensure all personnel are clear of other parts of the equipment that may be affected by powering up.
11. Verify that other equipment will not be adversely affected by powering up.
12. Refer to Chapter 4 for start up and commissioning procedures.

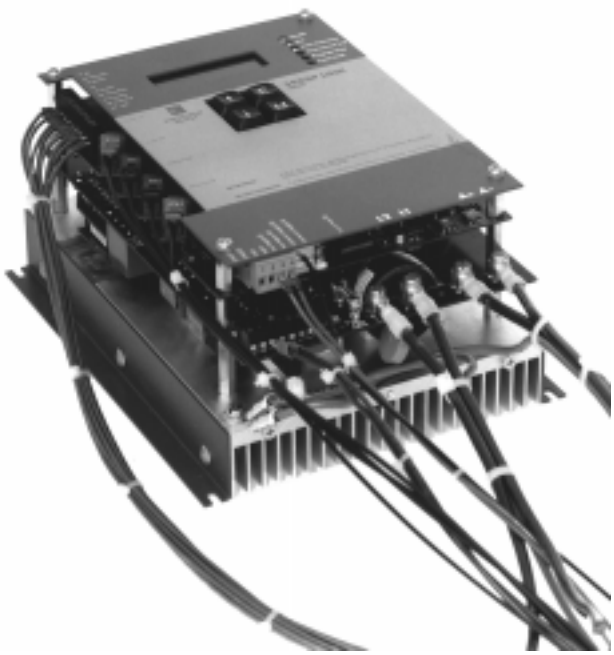
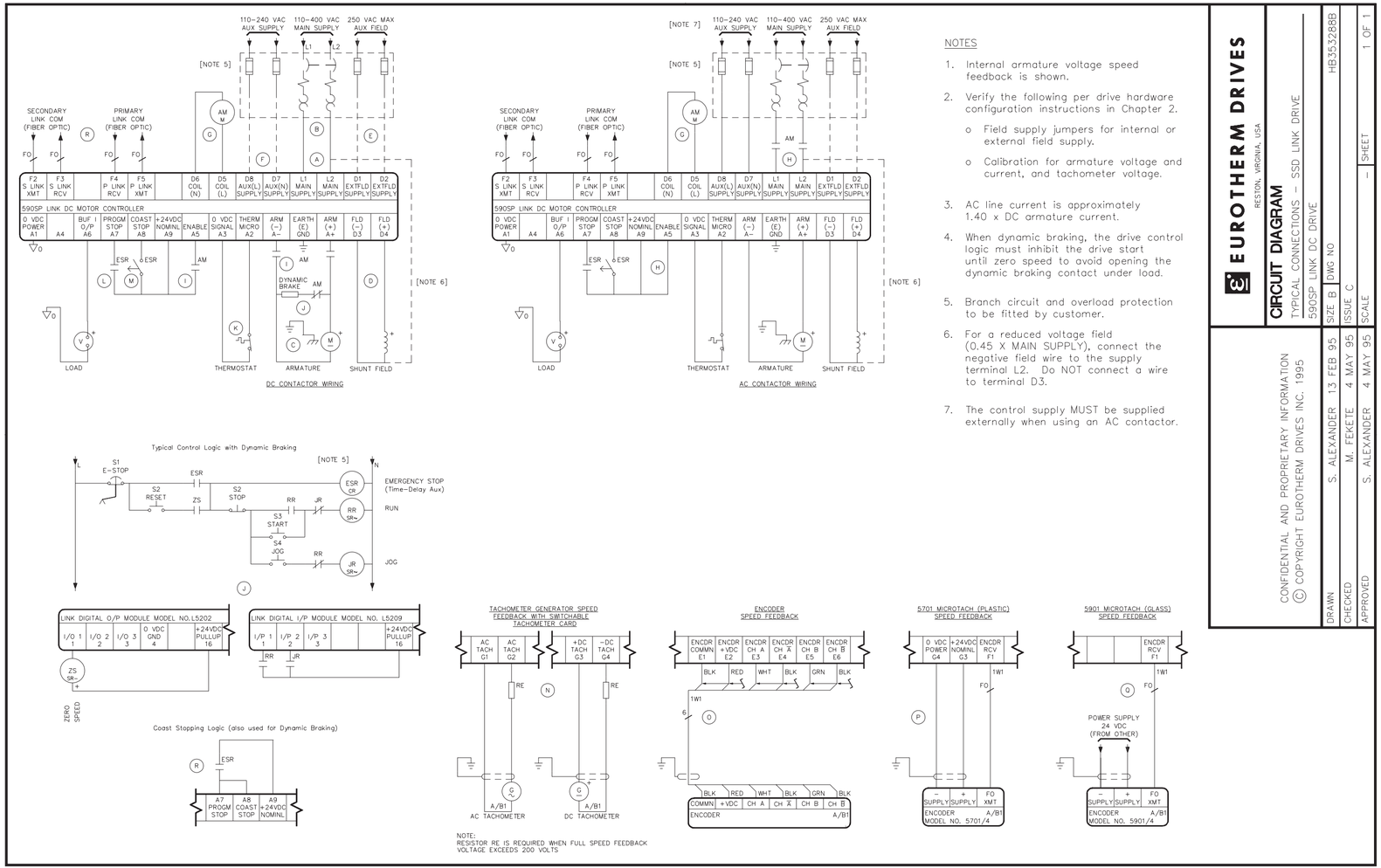


Figure 3.12 - Fully wired 590SP *LINK*

Figure 3.13 - Wiring Schematic for 590SP *LINK* DC Drive




EUROTHERM DRIVES
WORTHING, ENGLAND
RESTON, VIRGINIA, USA

CIRCUIT DIAGRAM
TYPICAL CONNECTIONS – SSD LINK DRIVE
590SP LINK DC DRIVE

| | | | |
|---|---|---|---|
| SIZE B | DWG NO | | HB353288B |
| ISSUE C | | | |
| SCALE | – | SHEET | 1 OF 1 |

| | | |
|---|---|---|
| DRAWN | S. ALEXANDER | 13 FEB 95 |
| CHECKED | M. FEKETE | 4 MAY 95 |
| APPROVED | S. ALEXANDER | 4 MAY 95 |

# Chapter 4 *LINK* INTERFACE

The 590SP *LINK* drive communicates to other *LINK* drives and devices such as input and output modules over the *LINK* fiber optic network. This network operates over a high speed, real-time fiber optic bus optimized for process control. Each drive and *LINK* device is called a network node and is assigned a unique address. The fiber optic network operates as a distributed process control system and connects from each node in a closed loop. High speed messages are sent from 590SP *LINK* drive drives and *LINK* devices on the network to other nodes on the loop. *All* logic signals (such as the DRIVE START command) and value signals (such as SPEED SETPOINT and SPEED FEEDBACK) must be sent and received over the *LINK* network.

You can only configure the drive to send signals to and receive signals from other devices on the *LINK* network with the Eurotherm Drives software package ConfigEd. The Eurotherm Drives software package SAM (Setup and Monitor) is used only to monitor and change logic and value signals and drive parameters. Both software packages are compatible with personal computers (PCs) running the Microsoft Windows™ operating system.

NOTE. A thorough understanding of both Eurotherm Drives *LINK* software packages ConfigEd and SAM is essential to configuring, running and obtaining maximum utility of the 590SP *LINK* drive. Consult the ConfigEd manual RG353321 and the *LINK* Overview Manual HA350678A.

## CHANGING DRIVE PARAMETERS WITH CONFIGED, SAM AND THE MMI

You can communicate with the drive and change its control parameters with the software tools SAM and ConfigEd, or directly with the drive MMI. The following sections describe how each software tool handles drive parameters.

NOTE. For clarity, all references to MMI parameters, menus or sub-menus appear in this manual in capitalized TIMES NEW ROMAN type. Any reference to a function, feature or parameter associated with or accessible through ConfigEd or SAM appears in this manual in capitalized COURIER type.



## ConfigEd

In ConfigEd, the drive parameters are grouped into 13 software blocks, each dedicated to a specific aspect of drive control. Use ConfigEd to make signal connections to and from the 590SP *LINK* drive over the *LINK* network. You can also use ConfigEd to download drive parameter values, or to install configuration changes.

- As with any other *LINK* module, installing a configuration to a drive or module stops the drive from processing, receiving or sending messages over the network. Configuration changes to the drive or any other *LINK* module can only be downloaded off-line, or while the *LINK* network is in a non-processing state.

**WARNING!**

The ConfigEd INSTALL function prevents all drives and modules on the ring from processing any data during the download period. To avoid injury to personnel and mechanical damage, it is therefore recommended to install *only* after all drives on the network have been stopped.

- DRIVE INPUTS: Each *LINK* drive software block *input* (or input slot) has an associated slot number and has read/write capability. You can write signals from a *LINK* source node address to any input slot. You can also configure a remote *LINK* destination node address to a signal at the drive input slot.
- DRIVE OUTPUTS: Some drive parameters are read only and have no associated input slot number. These are considered to be *LINK* drive software block *outputs* (or output slots). The distinction between drive slot inputs and outputs is shown in Figure 4.1.

**WARNING!**

Configure only those *LINK* signals to drive slots which need to be changed for control of the drive. Inadvertently writing to other drive slots can cause unexpected results, injury and/or equipment damage. Avoid creating *LINK* connections to parameter slots which normally do not need to be altered during normal running operation.

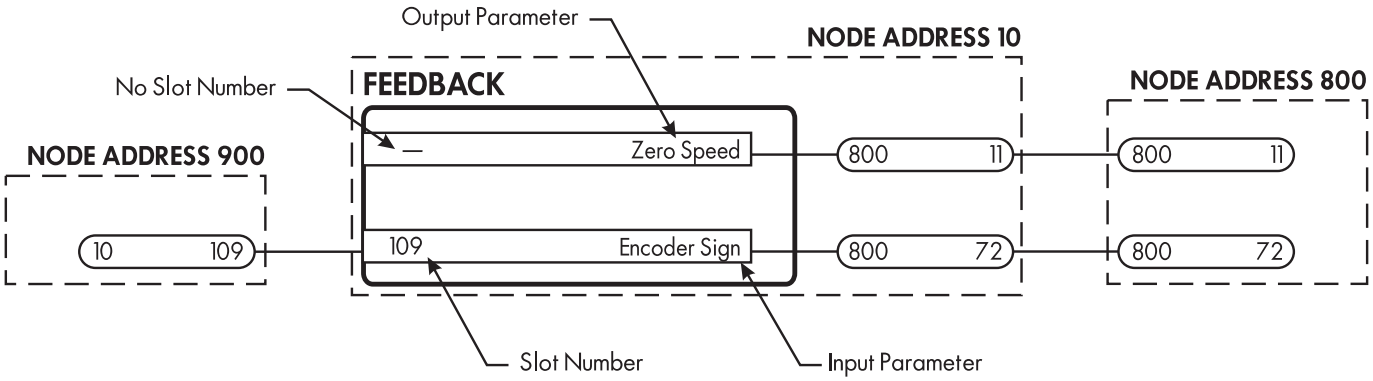



Figure 4.1 - Example of ConfigEd Software Block Inputs and Outputs

- Not all drive parameters available in ConfigEd have an associated input slot number and therefore cannot be written to over the *LINK* network.

## The MMI

You can access most key drive parameters through the MMI so that you can tune the drive and make parameters changes without a personal computer.

- *All* drive parameters and input values can be set in ConfigEd and downloaded to the drive using the `INSTALL` command. Many parameters, however, are accessible through ConfigEd but do not appear in the MMI menus. Accordingly, not all parameters available in ConfigEd can be changed in the MMI.
- You can change drive parameter values with the MMI increase/decrease (as discussed in Appendix B). However, if a *LINK* signal is configured to that drive parameter's slot, the signal will overwrite that value whenever that *LINK* signal changes state. This applies to any *LINK* drive input slot, regardless of data type.

## SAM

You can use SAM to monitor value signals, logic states and settings within the *LINK* system configuration. However, you cannot use SAM to make configuration changes.

- All *LINK* input and output parameters appearing in the graphical software blocks in ConfigEd are available in SAM.
- Appendix C presents a full discussion of each ConfigEd drive software block and lists the parameters and MMI equivalents. The appendix also includes a drawing showing the full software block functional block diagram. Appendix D lists the parameters alphabetically as they are grouped in the MMI. Appendix E gives the same listing, but groups the parameters by ConfigEd software block.

## COMMUNICATING WITH THE 590SP *LINK* DRIVE

You can access data from the *LINK* network with SAM or ConfigEd using your personal computer serial port through an RS-232 connection. *LINK* input, output and processing modules have a serial port; the drives do not. This means that you must connect a valid *LINK* network between the drive and a *LINK* module to install a drive configuration with ConfigEd, or change or monitor drive parameters using SAM. Figure 4.2 shows a two-node, simple topology network for accessing the 590SP *LINK* drive with a computer.

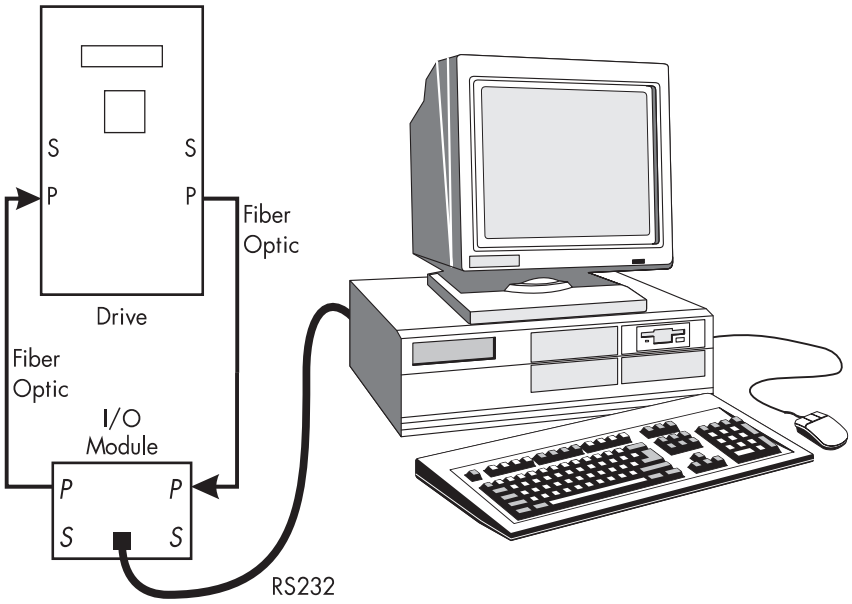



Figure 4.2 - Accessing a *LINK* Drive with a PC Through a Simple, Two Node Network



## *LINK* DATA TYPE AND SIGNAL SCALING

*LINK* signals are represented within the *LINK* software environment as ordinal, logic or value data. The ranges of these signals are described below.

| Data Type | Description | Range |
|---|---|---|
| Ordinal | Discrete, positive integer data. | 0 to 65,535 |
| Logic | Discrete, ordinal data limited to two states: TRUE (1) or FALSE (0). | 0 or 1 |
| Value | Continuous, "analog" data. Analog data is digitally represented in the *LINK* software as 16 bit floating point data, giving an accuracy of ±0.01%. | -100.00% to +100.00% |

NOTE. All 590SP *LINK* drive input slots can accept all three types of data. However, its input slot number determines how the data is handled. Slot numbers of certain ranges are assigned to interpret the data as either ordinal, logic or value data. Each input slot expects to receive the correct type of data and cannot filter out or reject the wrong type. Be certain to write the correct, expected type of data to each input slot. Consult Appendix C, or the tables in Appendices D and E for the type of data each drive input slot expects.

**Caution**

Writing incorrect data types to drive input slot can cause unexpected control resulting in machine or equipment damage or injury to personnel.

## Value Data Saturation

Any value data calculation performed within *LINK* must remain within the normalized range of ±100.00%. If a *LINK* calculation external to the drive produces a signal outside this range, the product of the calculation clamps to ±100.00%.

For example, if a trim signal is added to the drive's external current demand in *LINK* with an ADDER block, the inputs to the ADDER block must be scaled first so that the output always lies within the range of ±100.00%. In this instance,

a control signal of +80.00% added to a 30% trim signal produces a *LINK* sum of +100.00%, instead of +110.00% due to the clamping action of the normalization.

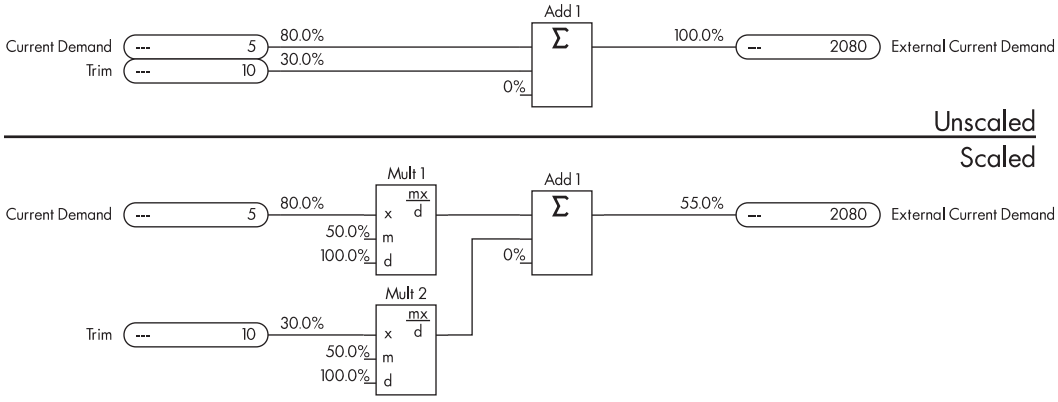



Figure 4.3 - Example of Value Data Saturation

To avoid saturation, scale the signals before the calculation as shown in the lower portion of Figure 4.3. The signal now will remain within the ±100.00% range. In this example, the actual current demand corresponding to a 55.00% EXTERNAL CURRENT DEMAND reference is 110.00% of the calibrated drive current, since the drive can produce twice the rated load current.

## Drive Signal Scaling and Over-Range

The 590SP *LINK* drive's speed and current setpoint and feedback value signals are normalized for the *LINK* data environment. SAM displays the signal's actual, real world value. This scaling is tabulated below.

| ***LINK* Drive Input Signal** | ***LINK* Input Value** | **Actual or SAM Value** |
|---|---|---|
| ALL Speed Setpoints | ±100.00% | ±120.00% setpoint |
| SPEED FEEDBACK | ±100.00% | ±120.00% speed feedback |
| EXTERNAL CURRENT DEMAND | ±100.00% | ±200.00% full load current |
| SPEED LOOP OUTPUT (CURRENT DEMAND in MMI) | ±100.00% | ±200.00% full load current |
| CURRENT FEEDBACK | ±100.00% | ±200.00% full load current |

### Speed Over-Range

All drive speed input and feedback parameters are scaled for 20% overspeed to maintain control at full speed. As a result all input signals connected the parameters must be scaled to 83.33% according to the formula:

$$\frac{\text{100.00\% (}\textit{LINK}\text{ Speed Reference)}}{\text{120.00\% (Drive Full Speed Reference)}} = 0.8333 \text{ or } 83.33\%$$

This applies to *all* drive speed reference signals (INPUT 0, INPUT 1, RAMP INPUT, SPEED DEMAND FAST INPUT), the drive's ZERO SPEED OFFSET, and to SPEED FEEDBACK, SETPOINT SUM, RAMP OUTPUT, and SPEED SETPOINT.

Figure 4.4 shows the effect of over-range scaling. The block diagram in the upper portion of the figure shows a speed reference signal configured to slot 2085 (SPEED DEMAND FAST INPUT) and a trim signal written to slot 2066 (INPUT 0). If the value at INPUT 0 is 100.00%, the drive cannot respond to a positive trim signal because TOTAL SETPOINT is already driven to its maximum. The trim signal is therefore ignored. Scaling the speed and trim signals by 83.33% with MULTIPLIER blocks from a remote source (address 900 as shown in the lower portion of the figure) corrects the problem. The 10% trim added to the speed reference of 100% now equals 110%, as desired.

Some *LINK* ConfigEd software blocks such as MASTER RAMP take this over-range scaling into account by multiplying their outputs by 83.33%. These outputs can then be connected directly to a drive speed input without further scaling.

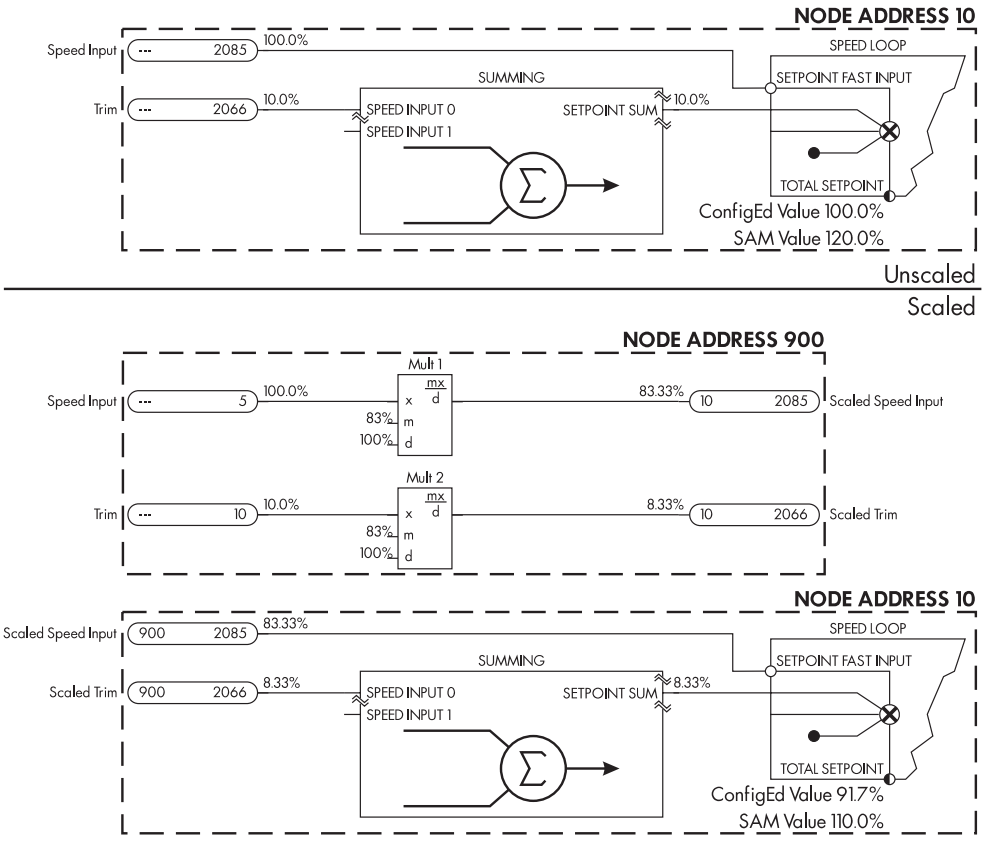



Figure 4.4 - SPEED LOOP Signal Scaling

NOTE. The drive's SPEED LOOP software block has an internal bipolar clamp on the speed demand of ± 105.00% maximum, which corresponds to a maximum *LINK* reference of ±87.50%. This allows ±5.00% trim range at full speed.

### Current Loop Scaling

The 590SP *LINK* drive current loop input and feedback signals are scaled to accommodate the 200% overload capability of the drive. Current loop setpoint, feedback and all current limiting parameters including INVERSE TIME are scaled as:

$$\frac{\text{100.00\% (}\textit{LINK}\text{ Current Input)}}{\text{200.00\% (Full Load Current)}} = \text{0.5000 or 50.00\%}$$

## DRIVE OUTPUT UPDATE RATES

When configuring an output slot for a drive output in ConfigEd, the software first prompts you for the destination address and slot number. You must then connect the drive output to this *LINK* output slot (refer to the section *Working With Drives* in Chapter 4 of the ConfigEd Manual, RG353321). The software then prompts you to select the CONNECTION TYPE, or the process speed of the *LINK* signal and offers four choices: FAST, MEDIUM, SLOW and SPECIAL. The transmission speeds, or update rates, of these settings are set in UPDATE RATES, located in the PARAMETERS drive software block. The settings are in units of "ticks", which are a function of the processing speed of the internal drive software.

NOTE. The default settings for UPDATE RATES are sufficient for most applications and normally should *not* be changed.

The processing capability of the receiving module on the *LINK* network is the limiting factor in determining which speed to select. If too many signal are sent at the FAST update rate to one module, the module will be unable to keep up with the processing demand and will most likely cease processing due to data overload, or crash. To avoid this problem, send only priority signals at the FAST rate and leave less critical signal update rates set to either SLOW, or MEDIUM. Refer to the list below as a guide to setting signal update rates:

| **Drive Signal** | **Recommended CONNECTION TYPE Setting** |
|---|---|
| SPEED FEEDBACK | Medium |
| ZERO SPEED | Fast |
| COMPOSITE PROGRAM STOP | Fast |
| HEALTH FLAG | Fast |
| UNLATCHED HEALTH FLAG | Fast |
| ARMATURE CURRENT | Medium |

SPECIAL is an extremely high speed update rate which clocks at the speed of the drive's current loop process rate. It is typically used when two independently driven motors are nipped together in a load share, master/slave arrangement where the master runs in speed control and the slave drive runs in torque control and follows the master's load, or ARMATURE CURRENT signal.

**Caution**

SPECIAL is reserved strictly for drive-to-drive signal connections. A receiving module *will* crash if a drive output signal is connected at this update rate.

## DRIVE MEMORY AND SAVING PARAMETER VALUES

The 590SP *LINK* drive has three types of memory for handling data.

1. RAM: The drive reserves this memory area for normal running operation. On power up, the drive downloads EEPROM parameter values to this memory. Any changes to the drive parameters through the MMI or SAM are stored here.
2. EEPROM: Holds ConfigEd drive configuration settings. All SAM or MMI parameter changes are stored here whenever a MMI PARAMETER SAVE or a SAM EEPROM PARAMETER SAVE is performed.
3. EPROM: Contains the code for handling the current loop, speed loop and internal code for running the drive, and the default parameter values used to reset the drive. The user cannot write to EPROM memory.

All of the drive setup parameters accessible through the MMI can be changed with ConfigEd through the INSTALL command, and can be monitored and changed with SAM. Changes made with SAM or the MMI are stored in RAM *only*. When control power is disconnected, those changes are lost unless they are first saved to EEPROM using the MMI's PARAMETER SAVE function, or EEPROM PARAMETER SAVE in SAM.

Each time the drive is powered up, the drive downloads the *last* parameter settings loaded into EEPROM to RAM. These values could be parameter settings saved using PARAMETER SAVE, or settings downloaded to EEPROM from ConfigEd using the INSTALL command. To ensure that your ConfigEd configuration and drive have the same parameter values, you must:

- Perform a parameter save using SAM or the MMI, and
- Perform an UPDATE using ConfigEd.

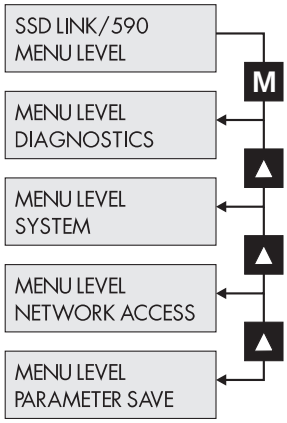



Figure 4.5 - MMI Path to PARAMETER SAVE

You can save parameter settings in the drive using the MMI or SAM, and back up the settings in your configuration files using the SAM and ConfigEd software packages. The software backup features are:

- Saving parameters with the MMI (PARAMETER SAVE), or through SAM (EEPROM PARAMETER SAVE): Uploads MMI and SAM drive parameter changes from RAM to the drive's EEPROM. These changes are reloaded into RAM upon power up.
- Saving parameters with SAM (BACKUP command):
  Creates a backup file containing all setup parameters stored EEPROM only. Any parameter changes not saved to EEPROM using the MMI PARAMETER SAVE function are not saved to the backup file. The file can be downloaded to the drive using the SAM RESTORE command.
- Saving parameters with ConfigEd (UPDATE command):
  Updates the *LINK* drive configuration file with parameters saved in EEPROM. Any parameter changes not saved to EEPROM are not updated in the drive's configuration files. You can reinstall the file to the drive using ConfigEd's INSTALL command.

Each method saves *only* the parameter settings stored in EEPROM.

Once final changes or tuning adjustments have been made using the MMI or SAM, it is strongly recommended to save those parameters using the SAVE PARAMETERS function within the MMI menu and then updating the drive configuration file using ConfigEd's UPDATE command.

**Caution**

A 590SP *LINK* drive downloads EEPROM parameter values to RAM any time a ConfigEd INSTALL command is performed on *any* node on the network.

## Saving Parameters with the MMI or through SAM

To perform a parameter save with the MMI, enter the PARAMETER SAVE menu and use the ▲ key to save parameters. Figure 4.5 shows the MMI path to SAVE PARAMETERS. In SAM, select the SAVE button under the SET EEPROM PARAMETER SAVE in the PARAMETERS software block. This SAM method saves the parameters, then automatically turns off; it does not need to be cleared. The DO NOT USE button is restricted for Eurotherm Drives service personnel use *only*.

Refer to discussion in Appendix C on PARAMETERS for an example on configuring multiple drives for EEPROM PARAMETER SAVE from a single source through SAM.

## DOCUMENTATION

It is highly recommended that you document the drive's setup parameters once the drive or drive system has been fully commissioned. This can be done using any of the following software features:

1. The ConfigEd PROJECT PRINT Command
   This command is located under the PROJECT pull down menu of the ConfigEd tool bar. ConfigEd PROJECT PRINT has the following features:
   - PROJECT PRINT: Prints the graphical depiction of the last saved version all selected *LINK* configuration files.
   - SAVE SOURCES: Updates the input source addresses of each slot within the printed module's configuration. If you have altered any *LINK* output slots destination addresses with ConfigEd, the new input slots automatically update to display the source slot addresses.
   - CLEAR UNUSED: Erases any source address numbers from *LINK* input slots if the source *LINK* output slot sending the data has been deleted.

- The SAVE SOURCES and CLEAR UNUSED features also apply to all *LINK* drive input slots of all *LINK* configurations printed. They help verify the validity of network connections and aid in troubleshooting system problems. A print out of the drive configuration also gives the drive's parameter values stored in EEPROM, provided an UPDATE is performed first.

2. The ConfigEd PROJECT DOCUMENT Command
   This function creates a text file on your personal computer hard disk which documents the connections and parameter values of all configuration files in a *LINK* project. It can be printed out and kept as a permanent record for troubleshooting.

**Caution**

The PROJECT PRINT and DOCUMENT commands operate only the *last* saved configuration file and can not reflect the configuration downloaded in the 590SP *LINK* drive or module. A configuration file saved on your hard disk can *not* be the actual configuration installed in a *LINK* drive or module. Look for the asterisk (*) in the PROJECT PRINT pop-up window indicating that a configuration has been changed and saved, but not installed.

**Caution**

A ConfigEd configuration file can not include the latest MMI or SAM changes to drive parameters. Be certain to SAVE PARAMETERS with the MMI or SAM, then UPDATE the configurations *before* executing PROJECT PRINT or DOCUMENT.

3. The ConfigEd FILE PRINT Command
   This function is located in the ConfigEd file menu. It prints out the configuration window open and active on your personal computer monitor *without* updating input slot information. FILE PRINT is located under the FILE pull down menu and provides a quick "screen print" facility. The print out reflects *only* what is displayed on the monitor and does not show any configuration or parameter changes unless a ConfigEd UPDATE and SAVE is executed first.

4. The SAM DOCUMENT MODULE Command
   This SAM feature creates a text file in the ConfigEd SCRATCHPAD listing the values of all SAM access points at the moment the module is documented. It effectively takes a snapshot of all SAM accessible drive slot inputs, parameter settings and software block outputs values.

5. The *LINK* Manager
   The *LINK* Manager is a database system used to install SAM and ConfigEd projects, and back up and maintain *LINK* system configurations. It is a separate software package requiring a modem and a PC running Microsoft Windows 3.1 software. It is recommended that you maintain a project database with *LINK* Manager and update all final changes to *LINK* system projects.

Consult the appropriate manual for further information on each of these software features.

# Chapter 5 START UP AND ADJUSTMENT

The 590SP *LINK* drive is shipped with a default configuration designed to control a shunt or permanent magnet field DC motor. You can adjust drive parameters to tune the drive to achieve optimum performance or to perform specific control applications.

You can tune the drive using the drive's MMI, or with a Microsoft Windows™ based PC and the SAM function within the *LINK* software package ConfigEd. This chapter takes you, step by step, through the start up procedure using the MMI. Refer to the ConfigEd manual RG353321 when starting up the drive using a PC.

Follow these procedures only *after* installing and wiring your 590SP *LINK* drive (see Chapter 3) and *after* reading Chapter 4. Review Appendix B to become familiar with the MMI before proceeding. Remember to use the M key (menu select) to enter a menu level, ▲ and ▼ to change parameter values or scroll through a menu level and E (the escape key) to back out of a menu level.

When an instruction refers to a MMI procedure, the menu levels are shown as a path with double colons "**::** " delimiting each lower menu level, for example:

SETUP PARAMETERS:: RAMPS:: ACCEL TIME

A flow chart on the left of each page marks each step of the start up procedure.

## RECOMMENDED TOOLS

Equipment recommended to set up your 590SP *LINK* drive and tune a motor include:

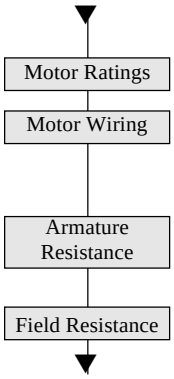
- IBM compatible personal computer with Microsoft Windows™ 3.1 or greater to run ConfigEd.
- Oscilloscope to monitor armature current waveform and speed feedback.
- Voltmeter to monitor motor armature and field voltage and check *LINK* system I/O levels.
- Ohmmeter to check signal continuity.
- Clamp-on, Hall effect ammeter to measure armature and field currents.
- Digital hand tachometer to check line or motor speed.
- Fiber optic light meter kit L5231 to measure *LINK* and Microtach fiber optic signal strength.

**WARNING!**

Confirm all wiring connections are correct before attempting start up procedures.

## CHECK MOTOR

After wiring and installing the drive, make these motor checks *before* applying power.




1. Check and record nameplate information from the motor for future reference.
2. Verify that the motor wiring agrees with the motor installation drawings, if available. Be sure to check the motor field wiring. Some motors have two winding fields requiring a series or parallel connection depending on the supply and torque requirements.
3. Use an ohmmeter to check insulation and continuity on the motor's armature and field. Use the following as a guide for measuring continuity through the armature and field:

   Armature resistance = 3 Ω or less for motors rated 5 Hp or less.

   $$\text{Field resistance} = \frac{\text{Motor nameplate field voltage}}{\text{Motor nameplate field current}}$$

Insulation Checks

Insulation checks help ensure that there are no shorts in the motor. Use an ohmmeter set to its highest setting and measure the resistance between each conductor and ground. All readings should be greater than 10 MW. If available, use a megger to check for insulation faults in the motor armature and field windings.

**WARNING!**

Disconnect or isolate motor connections from the controller before performing a megger insulation, or high voltage tests on the motor windings.

Voltage & Current Calibration

4. Make sure *all* calibration settings on the 590 *LINK* DRV calibration board are set to the correct values for your motor dataplate information (see the calibration board information in Chapter 3). The standard 590 *LINK* DRV comes equipped with a switch selectable calibration board; special applications can require the resistor-adjustable board.

## CHECK SUPPLY

**WARNING!**

Measure and verify the power supply to the drive *before* applying power to the input of the drive.

Check Control Supply

1. Check the control supply with an AC voltmeter. Ensure that the supply range is between 110 VAC and 240 VAC. Otherwise, use an external single phase 110 VAC to 240 VAC source (see Chapter 2).

Check Main Supply

2. Check the main supply with an AC voltmeter. The controller has a nominal supply rating of 110 VAC to 400 VAC. Measure the single-phase power supply to ensure a tolerance within ±10% percent of supply requirements. Generally for a single phase DC drive, the maximum armature voltage is 78% of the AC supply voltage.

Check Field Supply

3. Check the motor field voltage against the supply. The 590SP *LINK* drive supplies an unregulated DC field voltage through a non-controlled bridge rectifier circuit. You can configure the bridge as a full or half-wave rectifier depending on the motor field voltage requirement. (Refer to Figure 3.3 in Chapter 3). The full and half wave bridge DC voltage values are:

   FULL WAVE DC field supply volts = (0.90) x AC supply (or external field supply)

   HALF WAVE DC field supply volts = (0.45) x AC supply (or external field supply)

Full Wave Rectifier

Half Wave Rectifier

Check Field Current Rating

4. Verify that the drive field supply output does not exceed the voltage rating of the motor field. The drive is shipped with the rectifier bridge input connected internally to the main input power. If this voltage exceeds the field rating, switch the field supply jumpers, located on the drive power supply board, to the external terminal connections and supply the bridge externally with the correct AC supply (refer to Figures 3.4 and 3.5 in Chapter 3). This input is rated 240 VAC, maximum.

**WARNING!**

Failure to set the field supply correctly can cause dangerous overspeed conditions resulting in equipment damage or injury to personnel. Do not continue the start up until the motor field supply is correct.

5. Verify that the motor field current rating is no more than 3 Amps, the maximum DC current rating of the field rectifier. Most motor manufacturers list the field current on the motor nameplate.

Check Frequency

6. If a frequency meter is available, check that the supply frequency measures between 40 and 70 Hz.

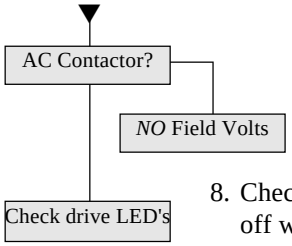
Apply Power & Measure Field Voltage

7. Connect power to the drive. The MMI display should read Connect power but do *not* start the drive. The drive should now receive control power and the MMI display should read RUNNING NETWORK DIAGNOSTICS or 590SP *LINK*:: MENU LEVEL. Check the motor field voltage once power is on.

DC Contactor?

Check Field Volts

- If a DC contactor is used and the drive is wired as in the left portion of Figure 3.13, the unit should now supply voltage to the motor field. Use a DC voltmeter to verify that this voltage is correct.




- If an AC contactor is used and the 590SP is wired as the right portion of Figure 3.13, the drive should receive control power, but the contactor should isolate main power from the unit and the field supply circuit. Hence, no field voltage will be present.

8. Check that the six diagnostic LED's show a normal stop condition (that is, the RUN and START LED's off with the other four illuminated) and that the motor is free to rotate. The PROGRAM and COAST STOP inputs (terminals A7 and A8) should be at +24 VDC, or TRUE.

## COMMISSION THE *LINK* NETWORK

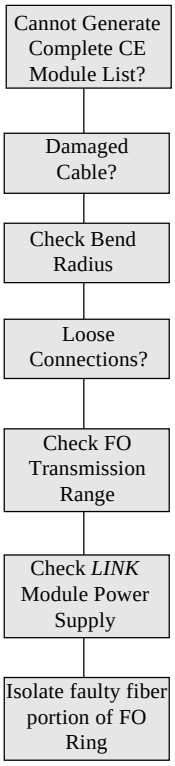
The *LINK* network must be healthy and running before continuing the start up. When control power is applied for the first time, the MMI displays the message RUNNING NETWORK DIAGNOSTICS and the HEALTH LED flashes indicating that the network is unhealthy (the fiber optic ring is broken) or not running, or both.

To access any node on the *LINK* network with SAM or ConfigEd you must be able to generate a complete `CE MODULE LIST`, which displays the status of all nodes on the fiber optic network, through the RS-232 port connection between your computer and a *LINK* module.

> NOTE. Because the 590SP *LINK* drive is not equipped with a RS-232 port, connect your PC's serial port to the RS-232 connection on a *LINK* I/O, processor or serial module.

You can only generate a full `CE MODULE LIST` if *all* nodes on the network are powered correctly and the fiber optic ring is communicating from node to node. Use either the `FULL UPDATE` or `PARTIAL UPDATE` commands in the `WINDOW` pull down menu in SAM or ConfigEd to generate the list.

If the `CE MODULE LIST` is incomplete, or you are unable to generate a list, check the following:




1. Verify that each node on the network properly transmits and receives a valid fiber optic light signal. If the network consists of a simple topology, only the primary red channel on each drive and *LINK* module should transmit light once control power is applied. Both the primary and secondary transmit channels should transmit light for redundant or tapped configured nodes.
2. Check for damaged fiber optic cables, sharp kinks or tight cable bends which have exceeded the minimum allowable bend radius.
3. Check for loose fiber optic T&B terminal connections.
4. Check the drive's fiber optic transmission power level. An attenuated signal can be too low to drive the receiver circuit on the next node on the fiber optic ring. A signal that's too strong can overdrive the next node's receiver circuit. Use the light meter kit L5231 to measure the dBm strength of the light signal and consult the document HW351772, included with the kit, to determine whether the strength of the signal falls within the accepted tolerance range. Adjust the transmission power level of each channel as needed by changing the settings of the transmission switches on the drive's control board. These switches are adjacent to the fiber ports as shown in Figure 3.10 and Figure 6.19. The transmission distances are listed in Appendix A.
5. Check the supply to each *LINK* drive and each *LINK* network module. The LEDs on all *LINK* modules on the ring should flash if they are powered correctly. Check the supply of each drive on the network. The display on each 590 DRV *LINK* drive should read RUNNING NETWORK:: DIAGNOSTICS.
6. If you are satisfied that all nodes on the network transmit and receive a valid fiber optic signal, and you are still unable to generate a complete `CE MODULE LIST`, break the network ring down into smaller loops. Try generating a `CE MODULE LIST` on this smaller network to isolate the faulty portion of the overall fiber optic loop.

> NOTE. Consult the ConfigEd or SAM user manuals if you are still unable to generate a complete `CE MODULE LIST` after completing the above procedures.

Once you have determined that the fiber optic ring is healthy, generate a complete `CE MODULE LIST` through the RS-232 communications port. The status of each module in the SAM or ConfigEd `MODULE LIST` should read `HALTED` or `PEER HALTED`. Use the `RESTART` command in either SAM or ConfigEd to start the halted module. After the halted module restarts, the other nodes on the network should switch from the `PEER HALTED` status to the OK status. The LED on each *LINK* module and each 590 DRV *LINK* drive Health LED should now glow steadily. The MMI should briefly display the message 590SP *LINK*:: ISSUE 1.X, then switch to 590SP *LINK*:: MENU LEVEL and allow pushbutton access to the main menu level.

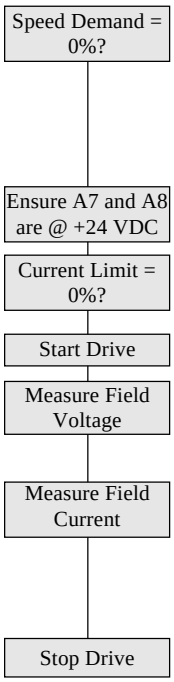
NOTE. After commissioning, the *LINK* network should remain healthy and automatically restart each time power is recycled. Each 590SP *LINK* drive should then allow access to the MMI. Consult Eurotherm Customer Service if the *LINK* network requires a restart after cycling power.

## INITIAL DRIVE START

**WARNING!**

Before starting the drive for the first time, make sure that your motor is uncoupled from the load, or ensure that the motor load can move without causing mechanical damage or danger to personnel.

NOTE. The fiber optic network must be healthy and *all* nodes on the *LINK* ring must have an OK status to commission or run the 590SP *LINK* drive.




1. Give a 0% speed demand to the drive. Check the drive speed reference inputs in the MMI under DIAGNOSTICS:: SETPOINT SUM OUTPUT and SPEED SETPOINT. If you are starting the drive using the drive using the ConfigEd SAM function, ensure that `TOTAL SETPOINT` under `SPEED LOOP` is zero. Also ensure that the SETPOINT 4 speed reference under SETUP PARAMETERS:: SPEED LOOP:: SETPOINTS is at 0%. This speed input is set only through the MMI and with the ConfigEd `INSTALL` command.
2. Ensure the PROGRAM STOP and COAST STOP LEDs are on (+24 VDC at terminals A7 and A8).
3. Set SETUP PARAMETERS:: CURRENT LOOP:: CURRENT LIMIT to 0.00%. Or, use SAM to set the drive `MAIN CURRENT LIMIT` to 0%.
4. Start the drive either by using a configured *LINK* system start input or by using SAM to set the *LINK* `DRIVE START` input TRUE. If the drive is wired with an AC contactor, the drive should now power the motor field. Measure the field voltage with a DC voltmeter and verify that it matches the motor nameplate rating.
4. Measure the motor field current if a Hall effect current meter is available, .

   NOTE. Because a DC motor's field impedance increases with temperature, the field current may read lower than the nameplate rating when the field is initially powered. The current should rise to its nominal value as the motor warms up.
5. Stop the drive.

## ADJUST CURRENT LOOP (AUTOTUNE)

**Caution**

This is an essential step in setting up the 590SP *LINK* drive and *should not* be overlooked.

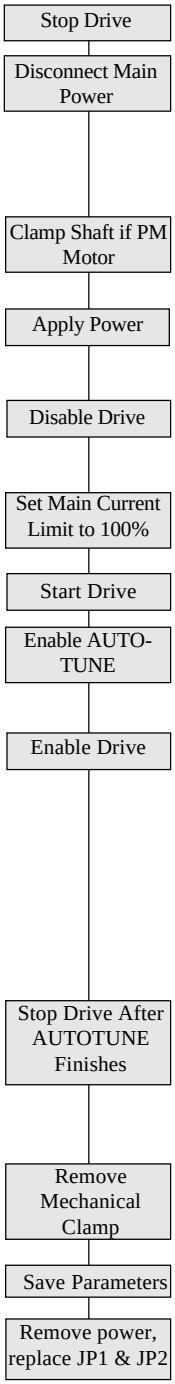
The AUTOTUNE function tunes the current loop automatically and sets the proportional gain, integral gain, and the discontinuous/continuous breakpoint for optimum drive response for a given motor. The drive cannot achieve peak performance without properly setting these parameters. Perform a complete AUTOTUNE procedure at least once with each controller/motor combination, or if the motor armature or field windings have been rewound.

NOTE. AUTOTUNE may not work on motors with either very long or very short time constants (for example, very short time constant permanent magnet motors). In these instances the current loop must be tuned manually. Contact Eurotherm Drives Customer Service for assistance.

AUTOTUNE can be used for shunt-wound, compound-wound, and permanent magnet motors. The shaft on compound-wound and permanent magnet motors must be locked for AUTOTUNE to work. For shunt wound motors, the shaft may need to be clamped if a residual field causes the motor to rotate during AUTOTUNE. Any rotation of the motor during the AUTOTUNE procedure causes AUTOTUNE to abort.

**WARNING!**

Make sure it is safe to power and turn the motor and that operation of the motor and the drive will not pose a danger to personnel or equipment.




1. Ensure that the drive is stopped, then disconnect the main supply power.
2. Disconnect the field voltage by removing jumpers JP1 and JP2.

**Caution**

Isolate the supply power *before* disconnecting the motor field from the drive.

3. The motor shaft may need to be clamped to prevent rotation during the AUTOTUNE procedure. If you are using a permanent magnet motor, it *must* be clamped.
4. Turn on the main supply power. Make sure the PROGRAM STOP and COAST STOP LEDs are on (+24 VDC at terminals A7 and A8).
5. Disable the drive by removing +24 VDC from terminal A5 (ENABLE) or by disabling the armature current with QUENCH under CURRENT LOOP in SAM. This can also be done with the MMI under SETUP PARAMETERS:: AUX I/O.
6. Set SETUP PARAMETERS:: CURRENT LOOP:: CURRENT LIMIT to 100%, the MMI default setting.
7. Start the drive, then enable AUTOTUNE by setting SETUP PARAMETERS:: CURRENT LOOP:: AUTOTUNE to ON, or by enabling AUTOTUNE with SAM in the CURRENT LOOP software block. The drive should start but should not generate motor current.
8. Enable the armature current. At this point, the 590 DRV *LINK* drive performs the AUTOTUNE function automatically, setting the following parameters:
   a. SETUP PARAMETERS:: CURRENT LOOP:: PROP. GAIN
   b. SETUP PARAMETERS:: CURRENT LOOP:: INT. GAIN
   c. SETUP PARAMETERS:: CURRENT LOOP:: DISCONTINUOUS

   These parameters give optimum performance of the current loop and should not be adjusted outside the AUTOTUNE algorithm.
9. Once AUTOTUNE is finished, the main contactor should open automatically, signaling the end of the procedure. The controller returns to a safe, stopped condition with the HEALTH, RUN and START CONTACTOR LED's turned off. If the motor rotates during the procedure, AUTOTUNE ceases automatically causing an AUTOTUNE FAILURE alarm. Removing the RUN or ENABLE signals during AUTOTUNE also aborts this procedure (in both cases, the armature current is disabled and the main contactor opens).
10. Remove the clamp, if fitted, from the motor.
11. Use the MMI or SAM to save parameters when finished, then BACKUP or UPDATE the drive's software configuration file with SAM or ConfigEd.
12. Remove power and replace the field supply jumpers JP1 and JP2.

## Armature Current Waveform Check

Because there is no field voltage, the drive conducts full load current through the armature during AUTOTUNE. You can monitor the armature current waveform with an oscilloscope to verify correct operation of the controller. Attach the oscilloscope leads to the Armature Current test point and the Sig. Ground test point. Refer to Figure 5.19 in Chapter 5 for the drive's test point locations. At full rated current, the armature current signal should average 5.0 volts. There should be two current pulses per mains cycle at all times. The pulses should be uniformly shaped and evenly spaced (see Figure 5.1).

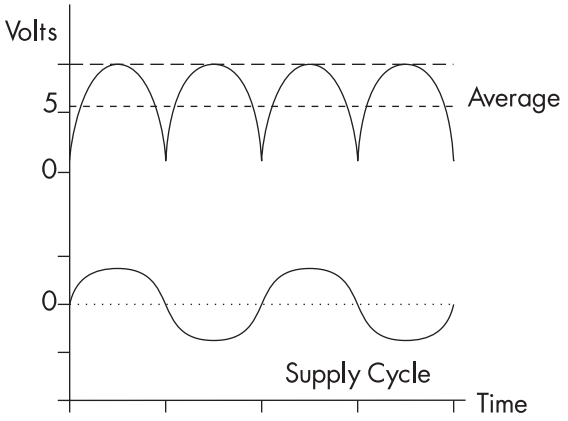



Figure 5.1 - Armature Current Waveform

NOTE. The waveform in Figure 5.1 shows the armature pulses for continuous conduction. During normal operation, the waveform will appear discontinuous with even zero spacing between each current pulse. The maximum width of each pulse will be 8.3 mS on 60 Hertz supplies, and 10 mS on 50 Hertz supplies for a continuous waveform.

## MOTOR ROTATION CHECK

This procedure verifies that the motor shaft rotates in control and in the desired direction.

Set I limit to 0%

Set Speed Demand to 10%

Start Drive

Increase I limit to 20%

DC Tach

AC Tach

1. Set SETUP PARAMETERS:: CURRENT LOOP:: CURRENT LIMIT to 0%.
2. Set your *LINK* system or SAM speed reference to +10%. Make certain that any trim speeds or additional setpoints are set to 0%. Verify that the MMI DIAGNOSTICS:: SPEED DEMAND is +10%, or monitor `TOTAL SETPOINT` under `SPEED LOOP` in SAM. You can monitor all the drive's speed references in the MMI in SETUP PARAMETERS:: SPEED LOOP:: SETPOINTS.
3. Start the drive, then slowly increase SETUP PARAMETERS:: CURRENT LOOP:: CURRENT LIMIT to approximately 20%.
4. The drive should regulate the motor to 10% speed in the desired direction. If the feedback or field polarity is incorrect, the motor will either run away, or run in control in the wrong direction. If either situation occurs, stop the drive, disconnect the main supply and external field supply (if used) and check the following:

   a. For motors fitted with analog DC tachometer generators:

   - Did the motor run away in the correct direction? Reverse the tachometer generator wires.
   - Did the motor run away in the wrong direction? Reverse the field connections.
   - Did the motor rotate in the wrong direction but at the correct speed? Reverse both the field and tachometer generator connections.

   b. For motors fitted AC tachometer generators:

   - Did the motor run away in the correct direction or in the wrong direction? Reapply power and check the speed setpoint. Because an AC tachometer generator provides a unipolar output regardless of direction of rotation, the drive is limited to speed control in one direction only.
   - For AC tachometer generator feedback, the speed reference *must* be positive. If the motor ran away in reverse, provide a positive speed reference and reverse the field connections.

NON-regen *only* for AC Tachs

**Caution**

A runaway condition always exists when using an AC tachometer generator on a regenerative DC controller, even for a positive speed reference. Use a non-regenerative drive with an AC tachometer generator to avoid this problem. For regenerative models, disable the drive's reverse bridge thyristors under SETUP PARAMETERS:: CURRENT LOOP:: REGEN MODE. This corresponds to SET CURRENT LOOP 2-QUAD MODE under the CURRENT LOOP software block in SAM.

- Did the motor rotate in the wrong direction but at the correct speed? Reverse the field connections.

Microtach/ Encoder

c. For motors fitted with 5701/5901 Microtachs or wire-ended electrical encoders:

- Did the motor run away in the correct direction? Reconnect the drive supply and change the feedback sign by setting SETUP PARAMETERS:: SPEED LOOP:: ENCODER SIGN to POSITIVE or NEGATIVE as required.
- Did the motor run away in the wrong direction? Reverse the field leads.
- Did the motor rotate in the wrong direction but at the correct speed? Reverse the field connections, reconnect the drive supply and reverse the feedback sign by setting ENCODER SIGN to POSITIVE or NEGATIVE as required.

**Caution**

When changing set up parameters (such as feedback polarity), be certain to save the change before disconnecting control power or the set up will be lost. Use SAM or ConfigEd to BACKUP or UPDATE the drive's software file *LINK* configuration.

No feedback signal?

5. If the motor continues to run away after checking the feedback sign and field polarity, check whether the drive is actually receiving its speed feedback signal. Monitor DIAGNOSTICS:: TACH VOLTS when using an analog tachometer generator, or monitor ANALOG TACH FEEDBACK in the FEEDBACK software block with SAM. For Microtach or wire-ended encoders, check DIAGNOSTICS:: ENCODER RPM, or DIGITAL TACH in the SAM FEEDBACK block. Verify the connections and supply wiring to the feedback device if it fails to generate a feedback signal. If the drive trips on either SPEED FEEDBACK alarm or ENCODER FAILED alarm, verify that the SPDFBK ALARM LEVEL, ENCODER RPM and ENCODER LINES parameters are properly set.

Motor Does not turn?

Check Connections

6. If the motor does not turn at all, increase the CURRENT LIMIT to 50% or greater and monitor DIAGNOSTICS:: CURRENT FEEDBACK in the MMI. If CURRENT FEEDBACK still reads 0.00%, turn the power off and check the armature connections. If the problem persists, refer to Chapter 6 for detailed troubleshooting information.

7. If the drive is regenerative and the application requires reverse rotation, provide a negative speed demand, start the drive and verify that the motor runs in the reverse direction.

Check Reversing if Applicable

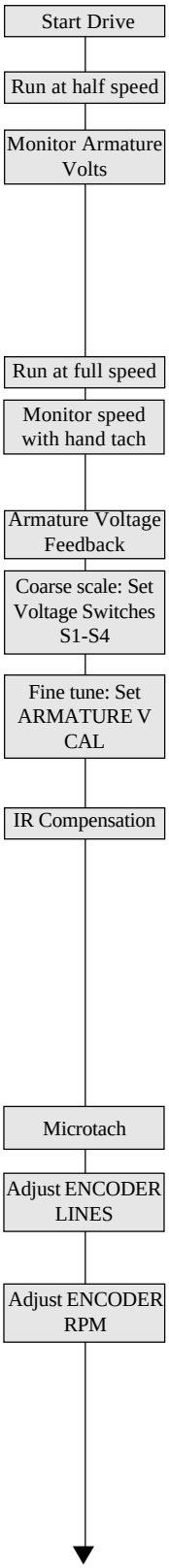
8. After you have correctly set the direction of rotation, reset CURRENT LIMIT to the desired value. If in doubt, set CURRENT LIMIT to 110% to correspond to 110 % full load current. If CURRENT LIMIT is set to a maximum 200%, and the motor runs into an overload condition, the current limit automatically reduces on an inverse time curve from the overload level down to 110% full load current.

   NOTE. The motor may overheat if it continues to rotate while at current limit. Thermal protection should be provided. If the motor is overloaded and there is insufficient controller current to maintain rotation, the motor will stall, and the controller will trip out on the STALL TRIP alarm if this alarm is enabled.

Save Parameters

9. Stop the drive, then use the MMI or SAM to save parameters when finished. BACKUP or UPDATE the drive's software configuration file with SAM or ConfigEd.

## SPEED FEEDBACK CALIBRATION




Start the drive and gradually increase the speed demand signal to 50 percent and monitor DIAGNOSTICS:: TERMINAL VOLTS, which is displayed as a percentage. (The SAM diagnostic is ARMATURE VOLTS under the SPEED LOOP software block.) Measure the actual armature voltage on the drive output with a DC voltmeter. The meter and TERMINAL VOLTS should read within 10% of the actual value. For example, when measuring armature volts at terminals A+ and A- with a digital volt meter, a 500 volt armature should read 250 volts at 50% speed demand, and the MMI should display 50% under TERMINAL VOLTS. If the reading is not within 10% of the expected value, check the drive's voltage calibration before continuing (see Chapter 3).

NOTE. When using field weakened motors, the TERMINAL VOLTS values will vary non-linearly over the full speed range of the motor. Below base speed, the motor armature voltage varies proportionately with motor speed. Above base speed, the armature voltage should remain constant as the motor speed increases.

Increase the speed demand to maximum and check the shaft speed accuracy with a hand tachometer. Measure the armature voltage. If fine adjustment is needed, adjust the drive's calibration as appropriate to the speed feedback selection.

1. ARMATURE VOLTAGE FEEDBACK
   Armature voltage feedback uses the motor's back EMF as speed feedback and is the drive's default feedback selection setting. It requires no feedback device, isolator or additional external connections. The scaling parameter, SETUP PARAMETERS:: CALIBRATION:: ARMATURE V CAL, fine tunes the drive's armature voltage calibration and has a range of 1.1000 to 0.9800, corresponding to -10% to +2% trim. The SAM equivalent is SET ARMATURE CAL in the FEEDBACK software block. Changes outside this range require re-calibration of the motor voltage switch settings on the switchable calibration card, or refitting resistors on the resistor calibration card as described in Chapter 3.

   IR COMPENSATION SETUP
   Properly setting the IR COMPENSATION parameter, or motor loss compensation, improves the speed accuracy when running in armature voltage feedback.

   a. Run the motor without a load. Monitor the actual speed with a hand tachometer.

   b. With the same speed setpoint, run the motor at full load and monitor the actual speed again with a hand tachometer.

   c. Adjust IR COMPENSATION until the full-load speed is the same as the no-load speed.

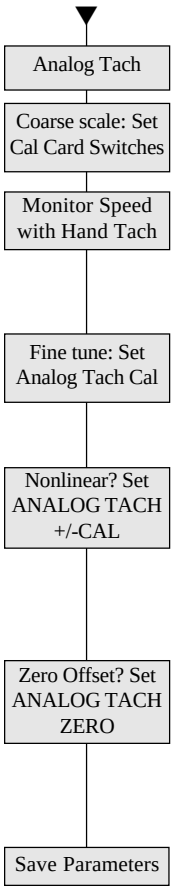
   NOTE. Too much IR COMPENSATION causes instability.

2. 5701/5901 MICROTACH OR WIRE-ENDED ELECTRICAL ENCODERS

   First, ensure that the CALIBRATION:: ENCODER LINES parameter equals the pulses per revolution rating of the encoder (1000 for Microtachs).

   Next, adjust the calibration parameter SETUP PARAMETERS:: CALIBRATION:: ENCODER RPM to accurately tune the motor rotational speed to the roll speed with a hand tachometer. Either feedback device gives an absolute rotational speed for which adjustment is unnecessary; however, the process may require an accurately set speed calibration. You can read the feedback encoder rpm under DIAGNOSTICS:: ENCODER RPM in the MMI or in SAM under the FEEDBACK software block. Speed match the motor through the ratio calculation:

$$\textbf{New ENCODER rpm Setting} = \frac{\textbf{Present ENCODER rpm Setting x Desired rpm}}{\textbf{Measured rpm}}$$




3. AC/DC ANALOG TACHOMETER GENERATOR FEEDBACK
   Settings on the analog tachometer generator feedback option card give a coarse scaling of the analog tachometer generator feedback voltage. Adjust drive software parameters to fine tune the feedback. Use a hand tachometer to measure the motor speed and adjust SETUP PARAMETERS:: CALIBRATION:: ANALOG TACH CAL to scale the overall feedback. Speed match the motor through the ratio calculation:

   $$\textbf{New ANALOG TACH CAL Setting} = \frac{\textbf{Present ANALOG TACH CAL Setting x Desired rpm}}{\textbf{Measured rpm}}$$

   The gain range varies from 1.1000 to 0.9800, or -10% to +2% trim. The SAM equivalent is located under the FEEDBACK software block. Changes outside this range require a re-calibration of the feedback calibration card as described in Chapter 3.

   Use CALIBRATION:: ANALOG TACH -CAL and ANALOG TACH +CAL to tune out a nonlinear analog tachometer generator response *only*. Adjust ANALOG TACH +CAL for a non-linearity at the positive high volt (full speed forward) end of the response curve; change ANALOG TACH -CAL to tune out a non-linearity at the negative high volt (full speed reverse) end. These parameters vary over a range of 1.1000 to 0.9800, but are generally left at 1.0000. The SAM equivalents are located under the FEEDBACK software block.

   NOTE. It is usually unnecessary to change the ANALOG TACH -CAL and the ANALOG TACH +CAL parameters from their default value of 1.0000, except in cases of extreme non-linearity. For a tachometer whose observed accuracy is within the tachometer's rated accuracy, adjustment is not recommended and will complicate speed calibration.
   Some tachometer generators generate a nonzero voltage at zero speed. Use the MMI parameter ANALOG TACH ZERO to tune out the offset.

4. Use the MMI or SAM to save parameters when finished, then BACKUP or UPDATE the drive's software configuration file with SAM or ConfigEd.

## ADJUST SPEED LOOP

After calibrating the motor speed, tune the speed loop proportional gain (PROP. GAIN) and integral time constant (INT. TIME CONST) settings for optimum speed response. For this procedure, monitor the speed feedback with an oscilloscope at the Analog Tach test point pin on the control board (refer to Figure 6.20 in Chapter 6).

> NOTE. Adjust the speed loop only *after* tuning the current loop with AUTOTUNE. Make certain the motor is connected to the load it will normally be running.

PROP. GAIN scales the output based upon the input speed error. Increasing PROP. GAIN improves response time but also increases overshoot. INT. TIME CONST eliminates steady-state error. Reducing INT. TIME CONST improves response, but will cause instability if set too short.

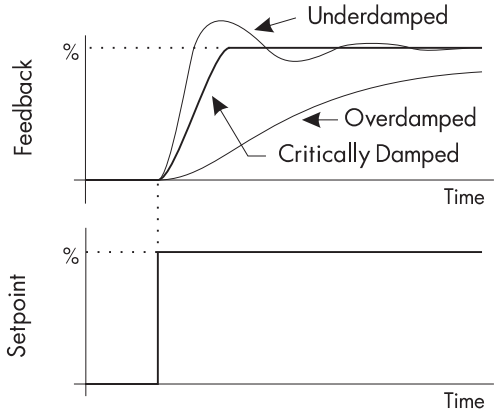
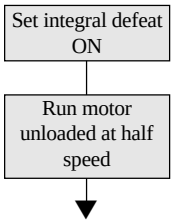
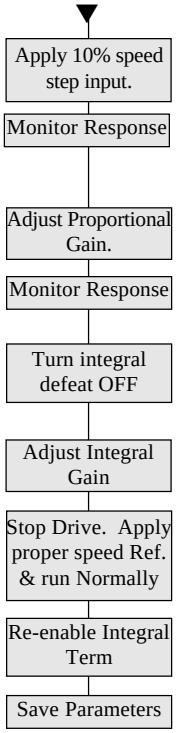



Figure 5.2 - Response to Step Input




1. While tuning the proportional gain, set SETUP PARAMETERS:: SPEED LOOP:: INT. DEFEAT to ON, or use SAM to disable the speed loop integral gain.
2. Run the motor at a typical operating speed using SAM, or a *LINK* analog reference. This speed reference should be constant (any varying trim signal should be switched out) and should not exceed 50% .




3. Toggle +1.0 VDC, or +10% speed, into an analog *LINK* input module, or switch in a +10% change in speed demand using SAM to provide a step change in speed for verifying the speed loop performance. Use the *non-ramped* speed inputs (either drive `INPUT 0` or `INPUT 1`) for the step change input.

   Check the speed loop performance with an oscilloscope as the total setpoint toggles between its speed demand and speed demand +10%. Monitor the speed feedback with an oscilloscope at the proper test point pin on the control board. Ideally, the speed response on the oscilloscope should be critically damped, or rapid changes with minimum overshoot (see Figure 5.2) with step changes to the speed demand. Increase SETUP PARAMETERS:: SPEED LOOP:: PROP. GAIN until the response is critically damped.

4. Once stable proportional control is attained, re-enable the speed loop integral control by setting SETUP PARAMETERS:: SPEED LOOP:: INT. DEFEAT to OFF in the MMI, or through SAM.

5. Check the speed loop performance again by making step changes to the drive speed demand. Reduce SETUP PARAMETERS:: SPEED LOOP:: INT. TIME CONST until the response is critically damped.

   NOTE. The default value for INT. TIME CONST is 0.5 seconds. This value can be too small for large inertia loads and cause the system to be unstable from the start.

6. Stop the drive and remove the step signal from the auxiliary *LINK* speed input, if used, and run normally. Be certain to re-enable the speed loop integral term.

7. Use the MMI or SAM to save parameters when finished, then BACKUP or UPDATE the drive's software configuration file with SAM or ConfigEd.

## OTHER PARAMETERS

Other parameters, for example ramp rates, can be important for process control. Different ramp rates are available for various conditions. The table below shows the drive ramp functions, their MMI location and their associated *LINK* input slots:

| Condition | MMI Parameter Name | *LINK* Software Block | *LINK* Slot Number | |
|---|---|---|---|---|
| Speed Setpoint Change | | RAMPS:: RAMP ACCEL TIME | RAMPS | 2089 |
| Speed Setpoint Change | | RAMPS:: RAMP DECEL TIME | RAMPS | 2090 |
| Speed Setpoint Change | | RAMPS:: % S RAMP | RAMPS | 2252 |
| Normal Controlled Stop | | STOP RATES:: STOP TIME | START - STOP | |
| 2226 | | | | |
| Deceleration | | | | |
| Fast Stop Deceleration | STOP RATES:: PROGRAM STOP TIME | START - STOP | 2132 | |

## SAVING PARAMETERS

After completing the final changes and tuning adjustments it is strongly recommended to:

1. Save the drive parameters using the MMI's SAVE PARAMETER function;
2. Update the drive's ConfigEd configuration file using ConfigEd's UPDATE command; and
3. Create a back up file of the drive using SAM's BACK UP function.

Refer to Chapter 3 for a discussion on drive memory and saving drive parameter values.

## PASSWORD PROTECTION

You can secure the 590 DRV *LINK* drive in a password-protected mode to safeguard the parameters you have set with the MMI. At initial power up, the password is set to the hexadecimal value 0x0000. The MMI is in a restricted mode if the controller password is set to any other value. In this mode, the MMI display can display parameters, but parameter

values cannot be altered using the four MMI pushbuttons. You can still, however, make parameter changes through SAM or with the `INSTALL` command in ConfigEd.

## Entering a Password

To access the password configuration procedure from the main menu:

- scroll to the PASSWORD menu,
- hit M to enter,
- hit M again to enter the ENTER PASSWORD sub-menu,
- scroll with ▼ or ▲ to enter the password number on the display.

## Changing a Password

The 590 DRV *LINK* drive is shipped with the default password 0x0000 which is displayed in the MMI. If the default password does not work, contact your supplier for the new password. Once you have entered the correct code, you can use the CHANGE PASSWORD function to set your own restricted password.

- PASSWORD
- M to enter Password sub-menu
- ▲ or ▼ to CHANGE PASSWORD
- M to enter the CHANGE PASSWORD sub-menu
- ▲ or ▼ to enter a different value (password)
- E to back out one step
- ▼ to move to CLEAR PASSWORD display
- M to clear the password

This clears from view the password you have entered, protecting the settings from those without authorized access. Save the password with the MMI PARAMETER SAVE function or through SAM.

With password protection installed, the parameters available through the MMI can be viewed but not altered without first entering the password. To edit parameters, you must reenter the password and repeat the procedure described above.

> NOTE. Be sure to record the new password. You will be unable to change parameters without your password.

### 4–BUTTON RESET

A 4-Button Reset downloads the drive's default parameters into the RAM memory and erases all customized settings. It is often used to reset the drive when troubleshooting procedures fail. See Appendix B for more information using the MMI and performing a 4-Button Reset.

# Chapter 6 TROUBLESHOOTING

This chapter is divided into five sections. The first section guides the user through initial troubleshooting procedures. The subsequent four sections deal with Status LED indicators, Alarm Messages, 590 DRV *LINK* drive hardware problems, and *LINK* configuration problems.

The MMI and the drive LED's offer the quickest way of finding simple drive and system faults. More advanced troubleshooting requires the SAM and ConfigEd software packages.

## INITIAL TROUBLESHOOTING PROCEDURE

Most drive problems are encountered during commissioning or soon after start up. These problems frequently result from *LINK* configuration errors in the *LINK* system software, or improperly set drive setup parameters. If you encounter a problem upon start up of your 590 DRV *LINK* drive, review the installation procedures in Chapter 3 and the start up and adjustment procedures in Chapter 5. Verify that the setup parameters are appropriate for the motor and the application. After you have checked the wiring, parameter setup values and your *LINK* configuration, proceed to the troubleshooting methods in this chapter.

Use the flowchart in Figure 6.1 to begin troubleshooting.

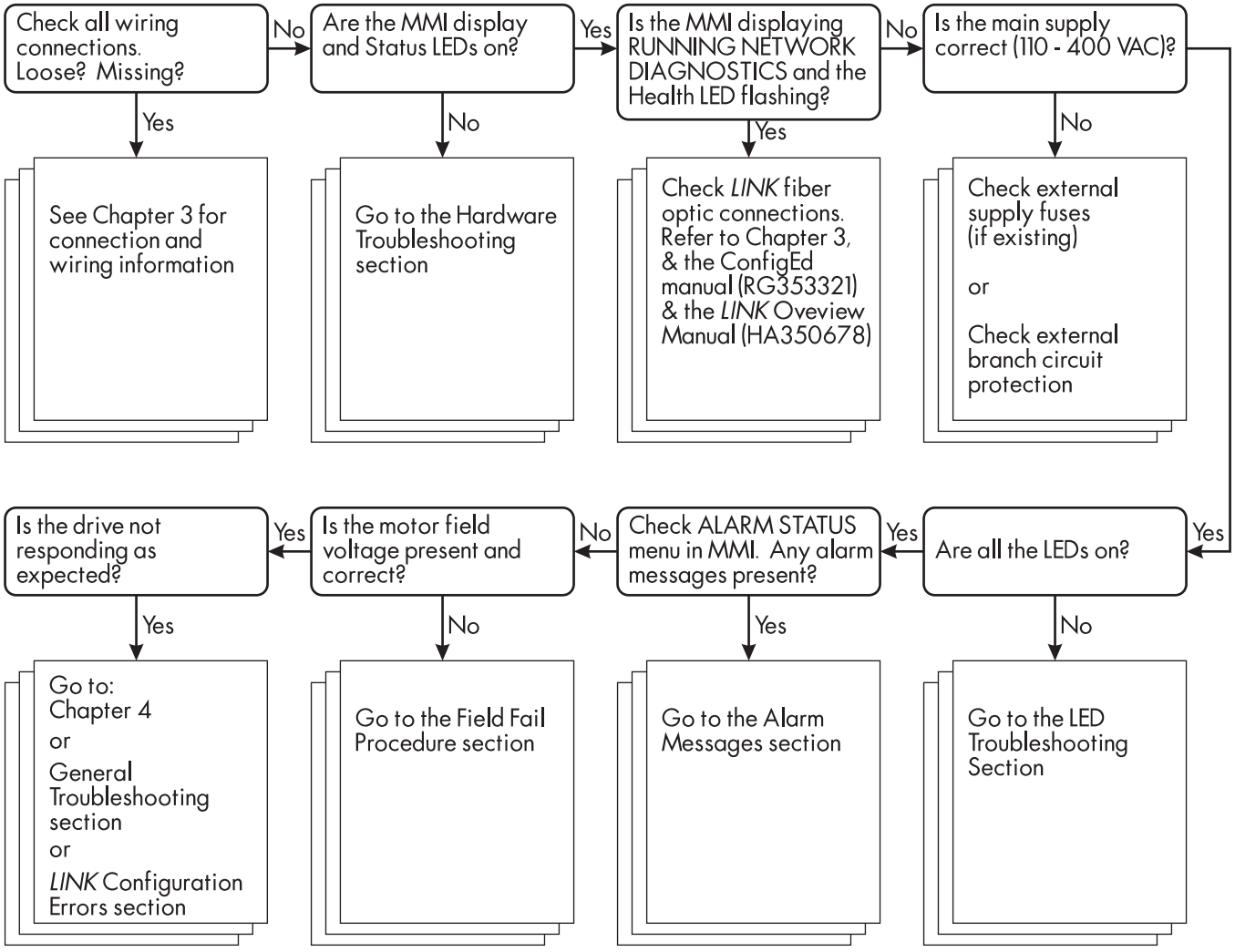



Figure 6.1 - Initial Troubleshooting Procedure

## RECOMMENDED TOOLS

You will need the following tools for most troubleshooting procedures:

- Voltmeter
- Megger
- IBM compatible personal computers running Windows™ version 3.1 or later and the software package ConfigEd

Use the following tools for more advanced problem-solving:

- Oscilloscope
- Hand tachometer

You may also need screwdrivers and/or wrenches for rewiring incorrect or loose electrical connections.

## STATUS LED TROUBLESHOOTING

Six light emitting diode [LED] indicators are located just to the right of the MMI display. The LEDs provide instant feedback on the status of the drive in six categories; health, run, start contactor, overcurrent trip, program stop, and coast stop.

## LED Functions

The HEALTH and RUN LEDs are software driven. The health LED turns on when control power is applied and remains on if the drive passes all 16 diagnostic alarm points the drive continuously monitors while running. If an alarm fault occurs, the drive's MMI displays the associated alarm message and the HEALTH LED turns off. The RUN LED turns on when the drive receives a *LINK* DRIVE START command (slot 52), the start contactor energizes, the thyristor bridge circuit enables and the drive is healthy. The RUN LED turns off if the drive is disabled. This LED also turns off if the drive's internal start relay de-energizes, or if an alarm occurs.

The four remaining LEDs, START CONTACTOR, OVERCURRENT TRIP, PROGRAM STOP, and COAST STOP, are hardware driven. The START CONTACTOR LED is on whenever the drive's internal start relay is energized. PROGRAM STOP and COAST STOP are on whenever +24 VDC is connected to terminals A7 (PROGRAM STOP) and A8 (COAST STOP). These terminals are normally switched to terminal A9 +24 VDC through an external emergency stop relay.

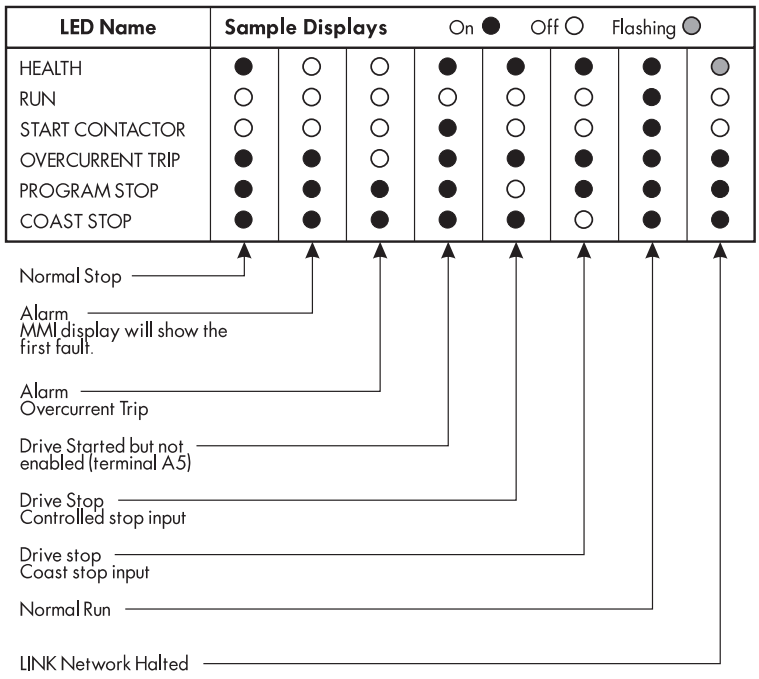



Figure 6.2 - Sample LED Status Modes

All six LEDs are on under normal running conditions. Figure 6.2 shows the LED states after common actions and other faults occur. An unlit LED indicates a problem preventing controller operation and requires user attention. The table in Figure 6.3 shows what to check when an LED is off.

| LED NAME | MEANING WHEN OFF | POSS |
|---|---|---|
| HEALTH | Fault has occurred and is shown by the other LED status' and the MMI display. | Any of the driv conditions. |
| | | AUTOTUNE ha unsuccessfully |
| | **MEANING WHEN FLASHING** | **POSS** |
| | Drive LINK network has failed or is unhealthy. | LINK network n halted. LINK ne failed or haltec |
| **LED NAME** | **MEANING WHEN OFF** | **POSS** |
| RUN | The drive is not enabled or in the RUN state. | The thyristor br |
| | | Another alarm |
| START CONTACTOR | The start contactor is open. | Internal drive s contactor. |
| OVERCURRENT TRIP | Armature current has exceeded 300 percent full load. The LCD display registers OVER I TRIP message. | Armature curre calibrated. |
| | | Mechanical bir preventing free |
| | | Field voltage to |
| | | ENABLE (A5) a START when us |
| PROGRAM STOP | 24 VDC signal not present at terminal A7. The main contactor drops out once the motor has completed a controlled stop. | Emergency sto external logic preventing 24 present at A7. |

Figure 6.3 - Status LED Troubleshooting Procedures

## HEALTH & ALARM MESSAGES

The controller continuously monitors 16 alarms while the drive is running. These alarms are combined to provide an overall "controller healthy" logic variable. This variable corresponds to the *LINK* outputs HEALTH FLAG and UNLATCHED HEALTH FLAG which are available in the ConfigEd software block HEALTH. The HEALTH software block and its outputs are discussed in depth in Appendix C.

If a fault occurs while the controller is running, the drive immediately inhibits the thyristor firing circuit, the main contactor de-energizes and the MMI displays the *last* fault registered, or the fault which interrupts controller operation. The tables in Figures 6.4 through 6.8 describe the different alarms the MMI displays when the drive trips out on a fault, the symptoms and recommended corrective action.

| DISPLAY MESSAGE | MEANING | POSS |
|---|---|---|
| *** ALARM *** AUTOTUNE ABORTED | Enable, or Start/Run commands removed before AUTOTUNE procedure completed | Wrong AUTOT followed |
| | | AUTOTUNE inc minutes drive v AUTOTUNE ma |
| *** ALARM *** AUTOTUNE ERROR | Motor rotation detected during Autotune process (speed feedback greater than 20%) or Field current detected during Autotune. (Field current greater than 6%) | Residual motor is disconnected |
| | | Series field wir motor |
| | | Permanent mag |
| | | Separately sup |
| *** ALARM *** ENCODER FAILED | Feedback hardware removed or not fitted when Encoder Feedback has been selected or Microtach feedback has fiber optic overdrive, underdrive, or phase lock alarm when Encoder Feedback has been selected (see Microtach Feedback) | Encoder or Mic option card inc control door |
| | | Fiber optic cab distorted (benc example) result signal at Micro drive]. |
| | | Fiber optic cab too strong a sig receiver [over |
| *** ALARM *** MISSING PULSE | Missing armature current pulse. Irregular armature current waveform detected. (Armature current must be 1.5 times the discontinuous current level and missing pulse must be | Drive not AUTC current loop) |
| | | SCR gate conn |
| | | SCR defective |

Figure 6.4 - Alarm Messages

| DISPLAY MESSAGE | MEANING | POSS |
|---|---|---|
| *** ALARM *** OVER I TRIP | Armature over current trip. Armature current has exceeded 300% of calibration value | Drive not AUT current loop) |
| | | Drive incorrect |
| | | Manual tuning loop unstable |
| | | Coupling betw feedback devi |
| | | Motor armatur |
| | | Loss of main su regeneration |
| | | Control Door c faulty |
| *** ALARM *** OVER SPEED | Drive speed feedback exceeded 125% of calibrated value | Improperly set parameters. |
| | | Wrong type of SPD FDBK SELE |
| | | Calibration bo analog tachom feedback. |
| | | Improper calib feedback, enc example. |
| | | Improper tunin parameters dri unstable |
| | | Coupling betw feedback devi |

Figure 6.5 - Alarm Messages (Continued)

| DISPLAY MESSAGE | MEANING | POSS |
|---|---|---|
| *** ALARM *** OVER VOLTS (VA) | Armature voltage exceeded 120% of calibrate value | Drive miscalibr armature volta |
| | | Drive miscalibr ratio [voltage r [current or field |
| | | Armature open |
| | | Motor maximu incorrectly cau to exceed nam |
| | | Field weakenin incorrectly if u speed range m |
| *** ALARM *** PHASE LOCK | Drive SCR firing phase lock loop unable to lock to supply waveform | One or more p too high or mis |
| | | Supply wavefo |
| | | Power supply p defective |
| | | Supply frequer range |
| *** ALARM *** POWER FAILED | Main drive power or, auxilary power is below 99 VAC. | Supply voltage |
| | | Blown fuse. |
| | | Loose wiring. A engaging. |
| | | Defective pow |
| *** ALARM *** | Difference between armature | Wrong polarit |

Figure 6.6 - Alarm Messages (Continued)

| DISPLAY MESSAGE | MEANING | POSS |
|---|---|---|
| *** ALARM *** STALL TRIP | Drive stall trip has operated<br><br>Note: The stall trip operates when: Arm. current> Stall Threshold, and the motor is At Zero Speed for a time longer than the Stall Trip Delay (default = 10s) | Stall timer set t acceleration |
| | | Field current be if the drive is ir mode. |
| | | Field connectic |
| | | Motor unable t torque |
| | | Mechanical bir |
| | | Field voltage is the drive is in f mode. |
| *** ALARM *** THERMISTOR | Motor thermistor / thermostat input open or high impedance, motor over temperature | Motor thermal wired to drive thermistor/the |
| | | Blower motor r direction (force |
| | | Blower filter cl |
| | | Motor operatir current |
| | | Drive miscalibr |
| | | Field miswired |

Figure 6.7 - Alarm Messages (Continued)

| DISPLAY MESSAGE | MEANING | POSS |
|---|---|---|
| INITIALIZING<br>CHECKSUM FAIL<br><br>UDP XFER -> P3<br>CHECKSUM FAIL | EEPROM memory failed check sum self test | Uploading of a |
| | | Communicatio<br>upload |
| | | Corrupted EEP |
| INITIALIZING<br>IA FBK CAL FAIL | Armature current feedback calibration fail during the power-up self test. | Armature curre<br>transformers m |
| | | Control board |
| INITIALIZING<br>INIT CAL FAIL | Initialization calibration failure of analog inputs during the power-up self test. | Control board |
| | | Corrupted EEP |
| | | Hitting the "E" b<br>test threshold .<br>saved on powe |

Figure 6.8 - Alarm Messages (Continued)

## SYMBOLIC ERROR MESSAGES

Symbolic error messages are caused by internal software or hardware errors and will have no obvious meaning to the end user. If the MMI displays any of the symbolic message listed in Figure 6.10, cycle power on the controller to clear the fault. If the message repeats, call Eurotherm Drives Customer Service.

| DISPLAY MESSAGE | MEANING | POSS |
|---|---|---|
| 0xF003 | Pre-Ready Fault | Coding not pre |
| 0xF100 | CAM Full | |
| 0xFF01 | Internal software error in slot–read() | |
| 0xFF02 | Unimplemented micro opcode | |
| 0xFF03 | Aux power fail | Controller pow |
| 0xFF04 | "Trap" software interrupt | |
| 0xFF05 | Internal software error in slot–read–pass() | |
| 0xFF05 | Internal software error in slot–write() | |

Figure 6.9 - Symbolic Error Messages

## HEALTH WORD, HEALTH STORE & THE ALARM STATUS MENU

Figure 6.11 lists the *LINK* ordinal value assignments for each of the 16 monitored drive alarms. Each alarm corresponds to an ordinal value indicated in the HEALTH STORE *LINK* output. Performing a GET operation on HEATH STORE in SAM returns the text message of the alarm. Each output also corresponds to a hexadecimal value indicated in the HEALTH STORE BITMAP *LINK* output. Both of these parameters are in the ConfigEd software block HEALTH and correspond, respectively, to LAST ALARM and HEALTH STORE in the MMI menu ALARM STATUS. The table below also indicates whether the faults can be overridden in the SETUP PARAMETERS::INHIBIT ALARMS MMI menu and also lists the delay time of each alarm.

| HEALTH STORE Ordinal Value | Alarm | Hex Value | Inhibit | Delay Time |
|---|---|---|---|---|
| 0 | no active alarms | 0x0000 | --- | --- |
| 1 | Overspeed | 0x0001 | no | 0.75sec |
| 2 | Missing Pulse | 0x0002 | no | 60 sec |
| 3 | not used | 0x004 | --- | --- |
| 4 | not used | 0x0008 | --- | --- |
| 5 | Motor Overtemperature | 0x0010 | no | 15 sec |
| 6 | Armature Overvolts | 0x0020 | --- | --- |
| 7 | Speed Feedback Fail | 0x0040 | yes | 0.1 sec |
| 8 | Encoder/Microtach Failed | 0x0080 | yes | 0.0 sec |
| 9 | not used | 0x0100 | --- | --- |
| 10 | Main Supply Failed | 0x0200 | no | 0.0 sec |
| 11 | Phase Lock Failure | 0x0400 | no | 0.5 sec |
| 12 | *LINK* Network Failed | 0x0800 | no | 0.0 sec |
| 13 | Stall Trip | 0x1000 | yes | 0.0 sec |
| 14 | Overcurrent Trip | 0x2000 | no | 0.0 sec |
| 15 | not used | 0x4000 | --- | --- |
| 16 | not used | 0x8000 | --- | --- |

Figure 6.10 - Drive Health Alarm Bits

## Alarm Process

The controller trips out on the first alarm it detects and displays that alarm in the MMI under ALARM STATUS:: LAST ALARM until another fault trips out the drive, or until control power is removed. The hexadecimal code for that alarm is saved in HEALTH STORE. HEALTH STORE resets when the drive is restarted. All subsequent alarms are not displayed.

The HEALTH WORD register holds the hexadecimal sum of all faults occurring since the drive was last started. It is updated continuously and shows the *current* condition of all alarms. As an alarm is cleared, HEALTH WORD reflects the new condition of all remaining alarms. Removing control power resets both HEALTH WORD and HEALTH STORE and resets LAST ALARM to NO ACTIVE ALARMS.

HEALTH WORD, HEALTH STORE, and LAST ALARM can be monitored in the MMI under the ALARM STATUS menu. A *LINK* L5203 serial module, or a L5203 *LINK* Gateway module, can read the hexadecimal values from the *LINK* outputs HEALTH WORD and HEALTH STORE BITMAP values over the *LINK* network for monitoring and further processing. You may also configure the HEALTH STORE ordinal *LINK* output to a *LINK* L5102 operator station to annunciate the drive alarm.

This example below shows how HEALTH WORD, HEALTH STORE, and LAST ALARM are updated. Assume that during normal operation, the following fault sequence occurs: the motor overheats and the drive first trips out on a motor overtemperature alarm (hex value 0x0010). The motor then cools down, the drive is restarted, but then immediately blows a thyristor fuse and trips out on a three phase failure alarm (0x0200) and a phase lock failure (0x0400). During such a sequence HEALTHWORD and HEALTH STORE and LAST ALARM will read:

Before the fault sequence occurs, the registers and LCD read:

| HEALTH WORD | HEALTH STORE | LAST ALARM | *LINK* HEALTH STORE Output |
|---|---|---|---|
| 0x0000 | 0x0000 | NO ACTIVE ALARMS | 0 |

When the motor overheats:

| HEALTH WORD | HEALTH STORE | LAST ALARM | *LINK* HEALTH STORE Output |
|---|---|---|---|
| 0x0010 | 0x0010 | MOTOR TEMP | 5 |

When the motor cools down, the registers and LCD read:

| HEALTH WORD | HEALTH STORE | LAST ALARM | *LINK* HEALTH STORE Output |
|---|---|---|---|
| 0x0000 | 0x0010 | MOTOR TEMP | 5 |

Upon restarting:

| HEALTH WORD | HEALTH STORE | LAST ALARM | *LINK* HEALTH STORE Output |
|---|---|---|---|
| 0x0000 | 0x0000 | MOTOR TEMP | 0 |

When the fuse blows, main power is lost *and* the phase lock alarm fails:

0x0200 + 0x0400 = 0x0600

| HEALTH WORD | HEALTH STORE | LAST ALARM | *LINK* HEALTH STORE Output |
|---|---|---|---|
| 0x0600 | 0x0200 | POWER FAILED | 10 |

After replacing the fuse and restarting:

| HEALTH WORD | HEALTH STORE | LAST ALARM | *LINK* HEALTH STORE Output |
|---|---|---|---|
| 0x0000 | 0x0200 | POWER FAILED | 10 |

NOTE. Before restarting a drive after troubleshooting the first alarm, it is good practice to monitor HEALTH WORD to assure all alarms have been cleared. This can reduce down time.

## DRIVE DIAGNOSTICS

You can monitor many analog and logic signals on the MMI display under the DIAGNOSTICS menu. Most are also available as a SAM monitor point. The MMI diagnostic points are "read only" and are very useful in troubleshooting. Figures 6.12 and 6.13 list the diagnostic points in alphabetical order. They also list the SAM equivalent diagnostic and give the SAM and MMI signal ranges and the equivalent ConfigEd software block parameters.

| MMI Diagnostic | Description | SAM Diagnostic | SAM/M |
|---|---|---|---|
| ACTUAL NEG I LIM | Overall negative current limit value | none | ± |
| ACTUAL POS I LIM | Overall positive current limit value | none | ± |
| AT CURRENT LIMIT | Current demand is clamped by the overall current limit | none | True |
| AT STANDSTILL | drive is at zero speed when speed demand is zero | STANDSTILL: Get At Standstill | True |
| AT ZERO SETPOINT | At zero speed demand | STANDSTILL: Get At Zero Setpoint | True |
| AT ZERO SPEED | speed feedback is below zero speed threshold | FEEDBACK:: Get At Zero Speed | True |
| BACK EMF | Calculated motor back EMF (armature volts minus IR compensation) | none | ± |
| CURRENT DEMAND | Current loop demand (speed error PI output or external current demand clamped by all the current limits) | CURRENT LOOP: Get Current Demand | ± |
| CURRENT FEEDBACK | Scaled and filtered armature current | CURRENT LOOP: Get Current Feedback | ± |
| DRIVE ENABLE | Current and speed loops are enabled/disabled. | CURRENT LOOP: Get Global Quench | Quenched |
| DRIVE START | LINK start command (slot 52). | START-STOP: Get Start | True |
| ENABLE | State of ENABLE terminal A5. | none | |

Figure 6.11 - Drive Diagnostics (Continued)

| MMI Diagnostic | Description | SAM Diagnostic | SAM/M |
|---|---|---|---|
| PROGRAM STOP | State of A7 AND Program Stop LINK input (slot 1122) | START-STOP: Get Composite Program Stop | True<br>Fals |
| RAMP OUTPUT | Setpoint ramp output | RAMPS: Get Ramp Output | ± |
| RAMPING | If the difference between the ramp input and the ramp output is greater than the "RAMP THRESHOLD", then "RAMPING" is TRUE | RAMPS: Get Ramping | true=ramp<br>ra |
| SPEED DEMAND | Speed Loop/Total Setpoint ouput AFTER Start-Stop block | none | ± |
| SPEED ERROR | difference between speed demand and speed feedback | SPEED LOOP: Get Speed Error | ± |
| SPEED FEEDBACK | Speed loop feedback | FEEDBACK: Get Speed Feedback | ± |
| SPEED SETPOINT | Speed Loop/Total Setpoint including the ramp ouput BEFORE the Start-Stop block | SPEED LOOP: Get Total Setpoint | ± |
| SPT. SUM OUTPUT | Setpoint summation output, sum of INPUT 0 and INPUT 1. | SUMMING: Setpoint Sum | ± |
| STALL TRIP | Armature current is above "STALL THRESHOLD" and "AT ZERO SPEED" but not AT ZERO SETPOINT | HEALTH: Stall Trip | OK / |
| START | status of slot 52, Drive | none | ON |

Figure 6.12 - Drive Diagnostics

## HARDWARE TROUBLESHOOTING

This section contains troubleshooting information and a flowchart for identifying and correcting hardware problems in the 590SP Digital drive.

NOTE. Repair of the 590SP is limited basic part replacement only. Troubleshooting and electronic component replacement at the board level is *not* recommended. Only the control and power boards, the control fuse F1 and the SCR packs are designed to be replaced. Refer to Chapter 6, Service and Maintenance, for drive assembly and disassembly instructions.

**Caution**

Completely isolate power before making any wiring changes, replacing fuses, or making any jumper changes.

## Control Power Missing

The drive derives its control power from an internal power supply circuit that requires a 110 to 240 VAC with a frequency range of 40 to 70 Hz. The power may be supplied internally off the main drive supply, or externally through terminals D7 and D8 if the main supply is greater than the control supply voltage rating.

The flowchart in Figure 6.13 shows the troubleshooting procedure for correcting a missing or low control power supply. The control power is missing when the drive's LCD display and its LED's are all out.

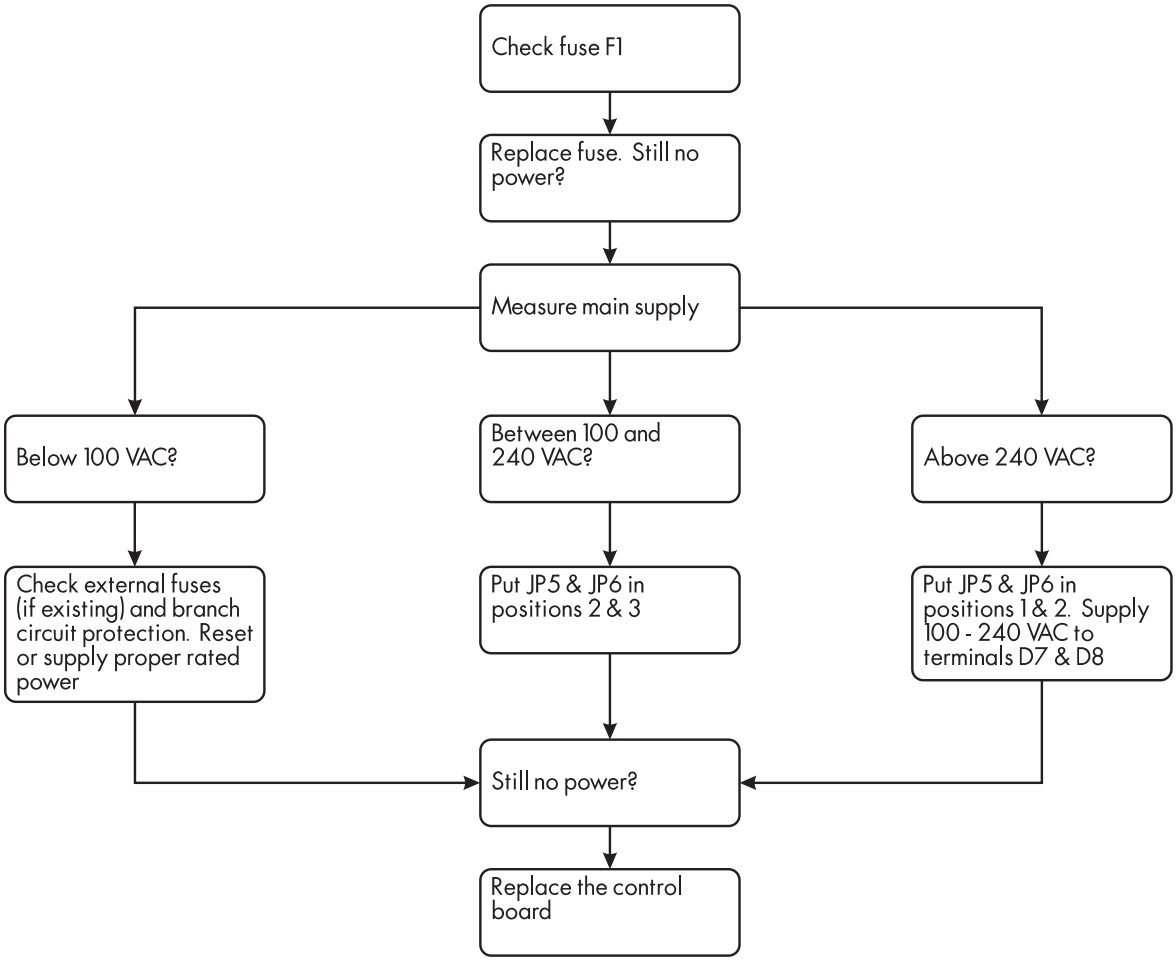



Figure 6.13 - 590 *LINK* DRV Hardware Control Power Troubleshooting Flowchart

## Field Fail Procedure

If the motor field supply fails while the drive is running a motor, the drive should trip on either an OVERSPEED alarm, or an OVERCURRENT TRIP alarm.

The drive is shipped to power the field through a single phase, full wave rectifier supplied internally off of the main supply. This rectifier can also be supplied externally though terminals D1 and D2. You may wire an externally supplied field for either full or half wave rectification. Refer to Figure 3.13 at the end Chapter 3 (Installation and Wiring) for a wiring diagram.

**Caution**

The 590SP field rectifier is *not* controlled. The field may be powered while the drive is off. Completely isolate all power supplies before making any wiring changes, replacing fuses, or making any jumper changes.

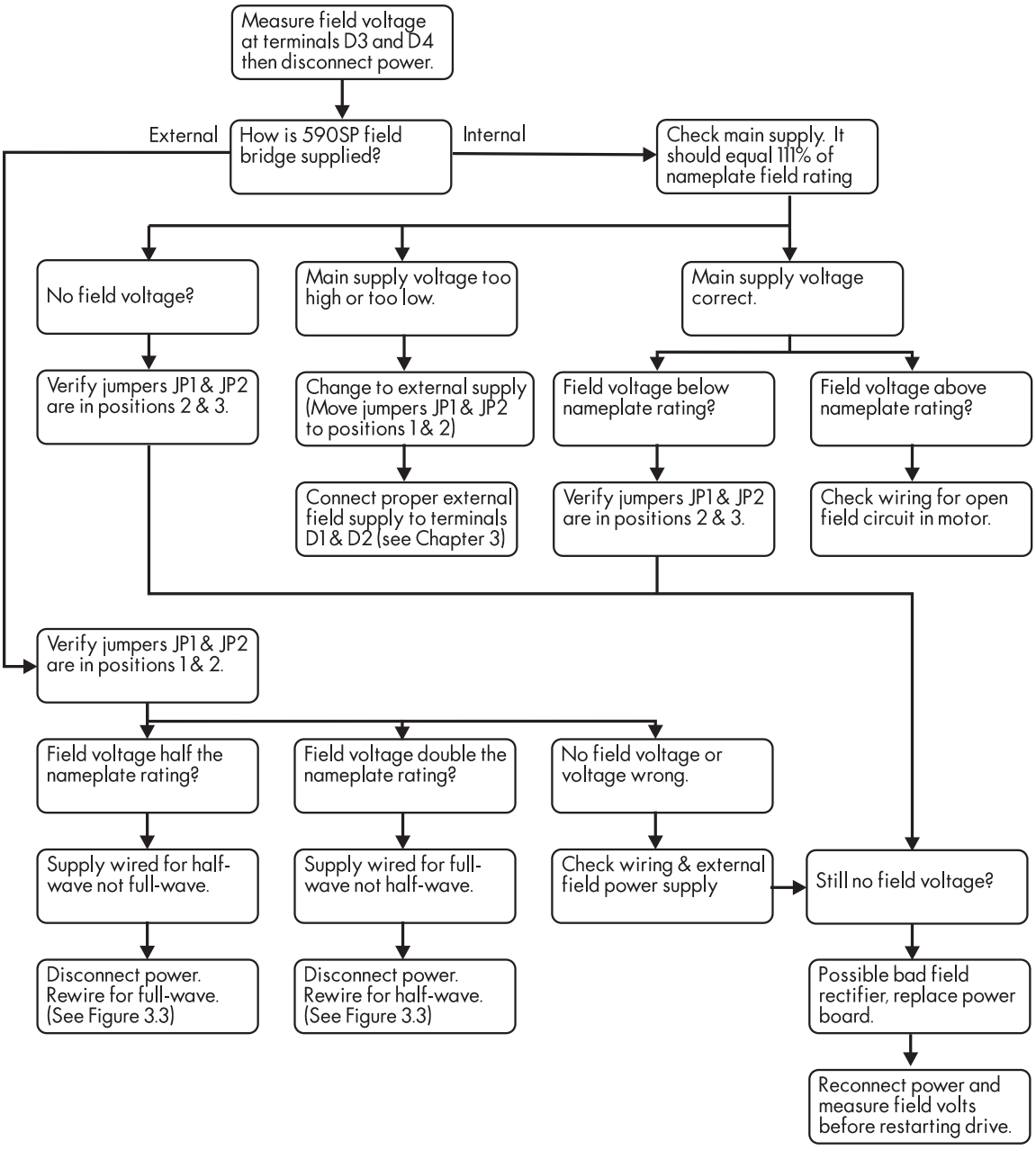



Figure 6.14 - 590 *LINK* DRV Field Troubleshooting Flowchart

## Contactor Failed Procedure

### AC Contactor

The drive controls the coil of the external contactor through a contact off its internal start relay. If the drive uses an AC contactor and there is a problem with the contactor coil or if the internal drive start relay is faulty, the drive should immediately trigger a MAIN SUPPLY FAILED alarm when it is started. If this occurs, check the following:

1. Check the contactor wiring.
2. Check the AC contactor coil rating. If it is rated for the main supply, set jumpers JP3 and JP4 to positions 2 and 3 (refer to the upper right portion of Figure 3.3).
3. If the coil voltage is rated different than the main power, supply the correct voltage to the contactor coil to through terminals D5 and D6 and set jumpers JP3 and JP4 to positions 1 and 2.

### DC Contactor (DRV Models)

If the drive controls a DC contactor and it is faulty, the drive will start when it receives a start signal but will generate no current since the armature leads remain unconnected to the drive. A similar situation can arise if the contactor is functional, and the drive is started but is left disabled. When either situation occurs, all the status LEDs will turn ON indicating a healthy, started state, but the motor will receive no power. In these instances, follow the flowchart below to troubleshoot the problem.

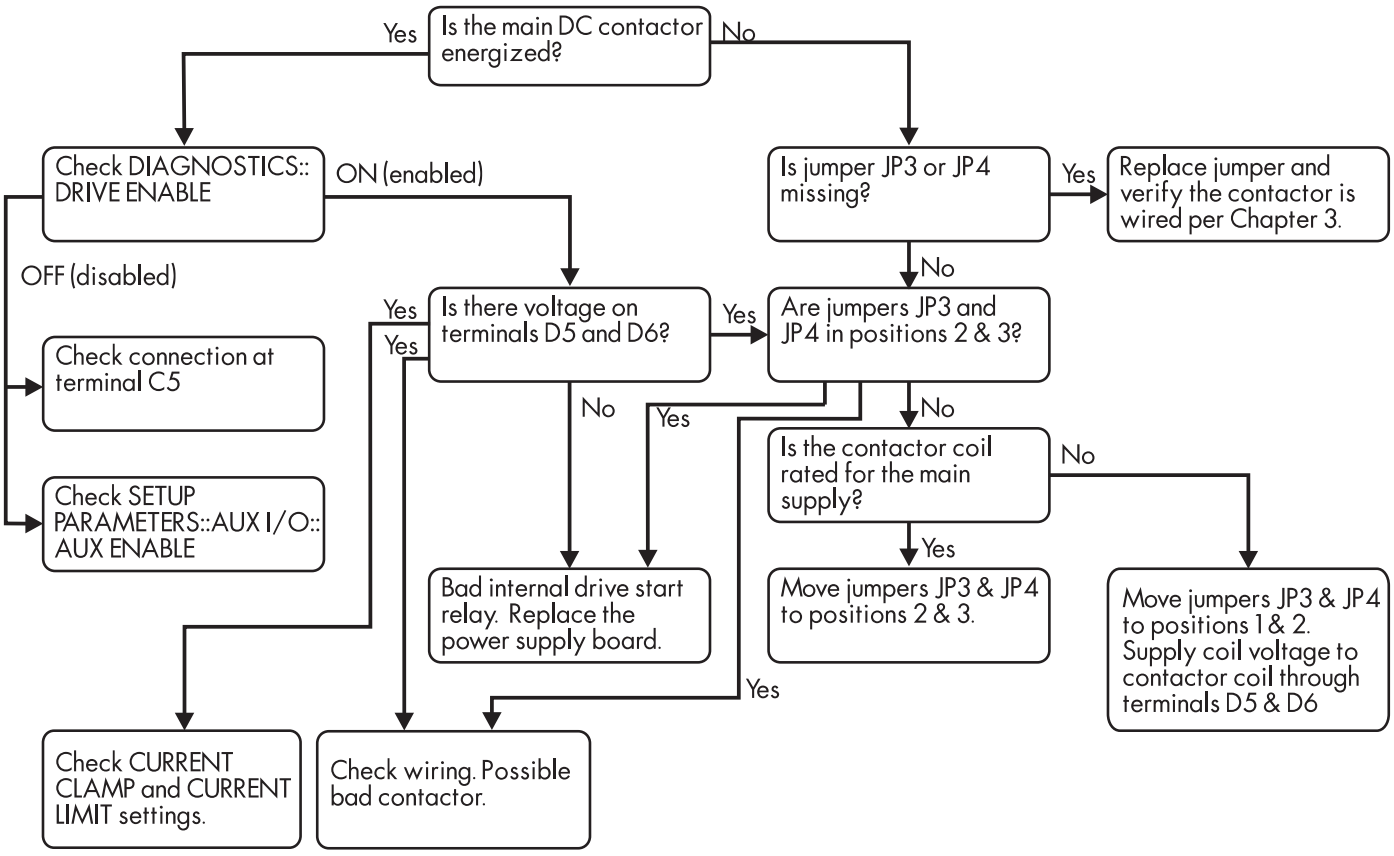



Figure 6.15 - 590 *LINK* DRV Contactor Troubleshooting Flowchart

## SCR Troubleshooting

Non-regenerative drives contain two SCR packs, SP3 and SP4, each containing two thyristors. Regenerative drives have two additional SCR packs, SP2 and SP1. The layout of the SCR packs is shown in Figure 6.16. The SCR packs are shown as they appear on the drive heatsink, from left to right. The thyristor gate leads, two per SCR pack, are oriented nearest to the top of the heatsink.

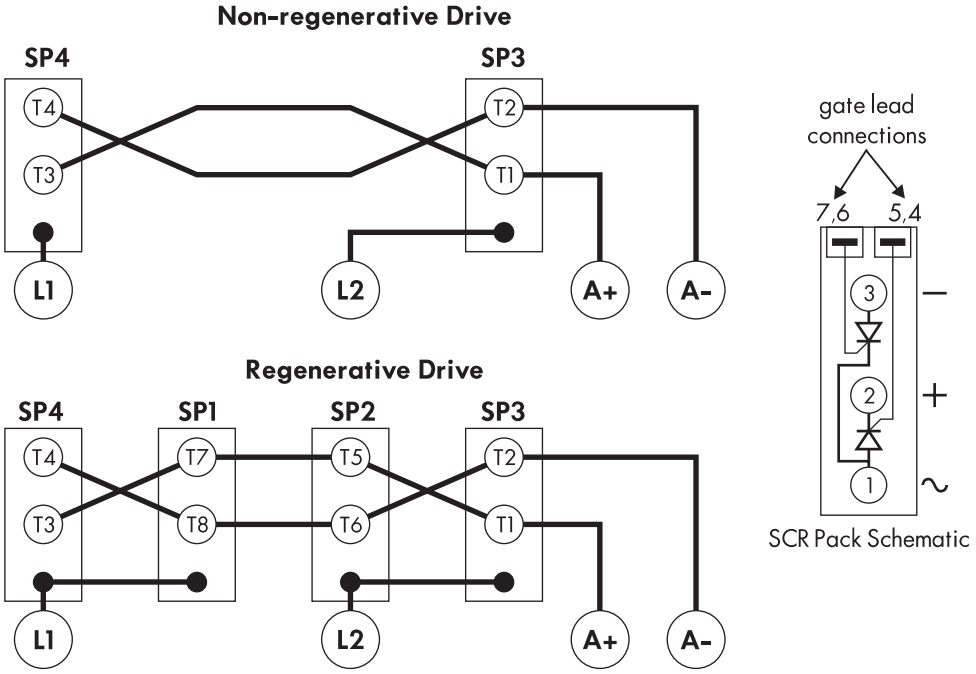



Figure 6.16 - SCR Layout

Disconnect power, then disconnect the motor armature leads from the drive and measure the resistance between each armature and supply terminal. Use the tables in Figure 6.17 to determine which SCR pack is bad. A good SCR will measure greater than 1 MW when read from the armature to the supply terminal. Bad (shorted) SCRs will measure 1 KW or less. Reverse the leads and repeat these measurements between the supply and armature terminals.

Remove the control board and disconnect the thyristor gate leads to measure the resistance between the gate and the cathode of each thyristor. You should measure between 9 and 20 W if the thyristor is good, and either infinite if open, or zero if shorted. Refer to Chapter 7 for instructions on how to remove the power board and replace faulty SCR packs.

| 591SP LINK (Non-regenerative) | | |
|---|---|---|
| ***TERMINAL*** | ***L1*** | ***L2*** |
| ***A+*** | ***T3 (SP4)*** | ***T1 (SP3)*** |
| ***A–*** | ***T4 (SP4)*** | ***T2 (SP3)*** |

| 590SP LINK (Regenerative) | | |
|---|---|---|
| ***TERMINAL*** | ***L1*** | ***L2*** |
| ***A+*** | ***T3 (SP4), T7(SP1)*** | ***T1 (SP3), T5 (SP2)*** |
| ***A–*** | ***T4 (SP4), T8 (SP1)*** | ***T2 (SP3), T6 (SP2)*** |

Figure 6.17 - SCR Test Charts

## MOTOR CHECKS

Several alarm messages are caused by problems with the motor. Most motor problems relate to insulation breakdown, overtemperature and armature brush and commutation problems. Check the motor armature and field with a megger to ensure that the motor winding insulation has not degraded and shorted one conductor to another or to ground. Continuity checks require an ohmmeter for determining whether motor windings or leads have opened or shorted. Continuity measurements should be less than one W. Insulation measurements should be greater than 10 MW.

NOTE. Armature resistance for motors less than 10 HP (7.5 KW) can measure up to 3 W.

**Caution**

Disconnect the motor leads from the drive before using a megger to check for motor ground faults.

Also check the motor commutator for flashover. Clean the commutator and motor brushes if worn or dirty. If the motor is fitted with a blower, change or clean the blower filter regularly.

## GENERAL TROUBLESHOOTING

This section discusses common performance problems you may encounter with the 590 DRV *LINK* drive. *LINK* configuration errors and improper drive parameter settings cause most performance problems.

Use the ConfigEd SAM feature to track signals when troubleshooting software problems. With a print out of the *LINK* software configuration, trace the signal from its external starting point (usually beginning at a *LINK* I/O module) and monitor it at each point along the path using your PC. This should uncover mis-addressed parameters, unwanted offsets, and mis-calibrated parameters.

### No SPEED DEMAND, or Motor Will Not Turn

1. Check all speed demand setpoints on the MMI under SETUP PARAMETERS:: SPEED LOOP:: SETPOINTS. Monitor the values of SETPOINTS 1 through 4. Use SAM to check the outputs SETPOINT SUM in the SUMMING block, TOTAL SETPOINT in the START-STOP block and the RAMP OUTPUT in RAMPS.
2. If using the drives RAMP INPUT (slot 2067), check whether the ramp is either held at zero output or reset to zero.
3. Check SETUP PARAMETERS::CURRENT LOOP::I DEMAND ISOLATE in the MMI, or use SAM to check the CURRENT DEMAND ENABLE parameter under EXTERNAL ENABLES software block. If this parameter is enabled and the drive receives no external current demand, the drive cannot produce armature current and, therefore, cannot generate torque to rotate the motor shaft. A speed setpoint of any value will not generate motor torque since the speed loop output has been switched out of the current loop demand input.
4. Check *all* the drive's current limit clamps: MAIN CURRENT LIMIT, POSITIVE CURRENT CLAMP, NEGATIVE CURRENT CLAMP, INVERSE TIME AIMING POINT and CURRENT PROFILE:: IMAX BRK1(SPD1) and IMAX BRK2(SPD2). Since each clamp can independently limit the motor current, all must be nonzero for the drive to produce current. All these current clamps are SAM accessible.
5. Check the *LINK* system configuration using the ConfigEd SAM feature to trace the desired speed reference signal. If a *LINK* analog input is used to derive the speed demand, check the input's external wiring. Also verify that the input channel in the *LINK* analog module's (L5201-2-02) configuration is enabled.
6. Check whether the drive is in current limit, or whether the motor is stalled.

### Motor Will Not Respond to a Change in Speed or Current Demand

Recheck the *LINK* system configurations for a properly connected reference signal. If a ConfigEd software block generates or processes the speed or current signal, verify that the source software block is being properly triggered. A software block which is not repetitively clocked will not update value outputs if its value inputs are changed. [Refer to the *LINK* Overview Manual (HA350678A) for an in depth discussion and examples on properly configuring and designing a *LINK* system.]

## Unwanted SPEED OFFSET

Use SAM and the MMI to monitor each speed input to the drive. The total speed demand to the drive speed loop is the sum of six possible inputs: INPUT 0, INPUT 1, RAMP INPUT, SETPOINT FAST INPUT, ZERO SPEED OFFSET and SETPOINT 4. You may alter or monitor the first three of these with the ConfigEd SAM feature or with the MMI. SETPOINT FAST INPUT can be monitored only with SAM. Especially check SETPOINT 4; you can only change and read this parameter with the MMI.

## Motor Speed Drift

Motor speed drift often occurs when the drive is speed matched incorrectly. Check the speed of the motor shaft with a hand tachometer and re-calibrate the speed according to the instructions in Chapter 5. Be certain that the drive receives a steady speed reference and that all speed trims are set to zero when speed matching.

If speed drift continues after re-calibration and an analog tachometer generator is used, check for tachometer generator non-linearity. Use the ANALOG TACH + CAL and ANALOG TACH - CAL to correct for poor regulation. Replace the tachometer generator if the non-linearity cannot be eliminated.

## *LINK* Configuration Errors

*LINK* software errors often cause many drive and system problems. They frequently result from mismatched *LINK* input and output slots. These errors result from an incorrect destination slot number or address in the source *LINK* output slot, or the wrong slot number in the *LINK* input, or destination slot. Avoid them by carefully cross-checking configuration slot number and address information in the *LINK* configuration diagrams.

1. DRIVE *LINK* SLOT DOES NOT RECEIVE SIGNAL: If no *LINK* slot connection exits, the destination slot never receives the intended, transmitted *LINK* signal. From your IBM compatible personal computer, enable the SAVE SOURCES and CLEAR UNUSED options and use PROJECT PRINT to print out the *LINK* configuration diagrams in ConfigEd. This feature updates the *LINK* destination input slots with *LINK* source output slot information and prints out the graphical configuration of your system. It tells the user whether *LINK* output slots are connected to nonexistent or incorrect input slots or addresses.

   NOTE. Be certain to use ConfigEd's UPDATE function before printing to ensure that you are indeed printing out the actual software configurations loaded in your system. You may also obtain a textual slot listing using the ConfigEd DOCUMENT function.

2. DRIVE PARAMETER TOGGLES BETWEEN TWO VALUES OR STATES: Check whether two signals are sent to the same drive slot. Because *LINK* messages are only sent when their value changes, the slot switches between the two when either changes state. The drive will oscillate between the two signals if they are sent at a periodic rate. Again, incorrect or mismatched slot addressing over the *LINK* network causes this problem. Cross-check *LINK* connections by first using UPDATE in SAM, then using SAVE SOURCES and the PROJECT PRINT command in ConfigEd.

3. *LINK* VALUE SIGNAL IS CLAMPED: All value signals within the *LINK* environment are normalized to ±1.0000, or ±100.00%. This means that if a *LINK* calculation mathematically produces a signal outside this range, the result of the calculation clamps to ±100.00%. When this occurs, the drive may not receive the full range of an intended signal. Refer to Chapter 4 for a discussion on *LINK* signal value saturation and value ranges.

4. INCORRECT PARAMETER SETTINGS: This problem usually occurs when the parameters are not saved or if they are overwritten when using the ConfigEd INSTALL or SAM RESTORE commands. Be sure to SAVE PARAMETERS with the MMI and update the Configuration files with ConfigEd UPDATE after you tune the drive and properly set its parameters. Refer to Chapter 4 for an explanation of these software features.

Consult the *LINK* Configuration Manual (RG353321s) and the *LINK* Overview Manual (HA350678A) for further information concerning *LINK* configuration.

## SAM DOCUMENT MODULE Command

DOCUMENT MODULE creates a text file in the SAM Scratchpad showing the values of all SAM access points at the moment the module is documented. The command effectively takes a snapshot of all SAM accessible drive slot inputs, parameter settings and software block outputs values. You may save the Scratchpad to a file or print out a hard copy.

## TEST POINTS

The drive has various test points located on the control board which can be used for signal monitoring with an oscilloscope. Test points locations are shown in Figure 6.18. The table in Figure 6.19 lists the signal test point scaling ranges.

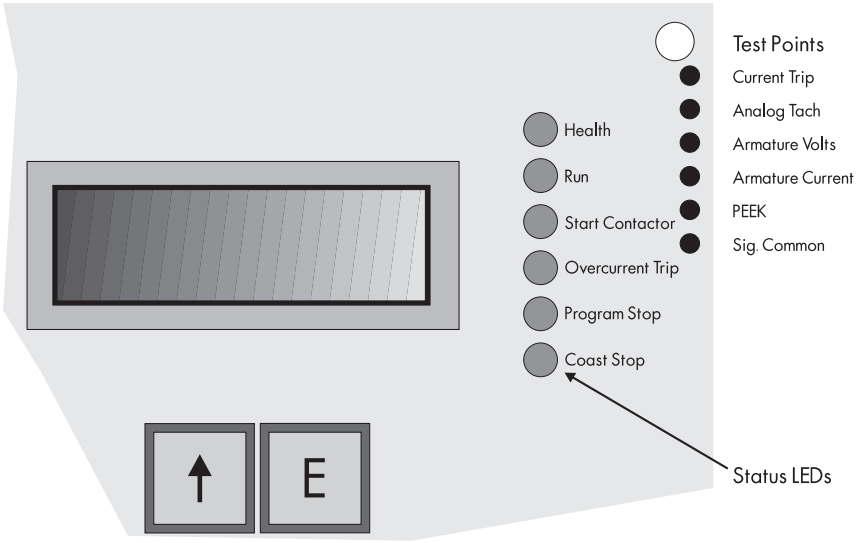



Figure 6.18 - Close up of the 590 *LINK* Control Board

| Test Point | Range |
|---|---|
| Current Trip | +5 VDC = OK<br>-15 VDC = Tripped |
| Analog Tach (modulus only) | 0 VDC = Zero Speed<br>+4.2 VDC = +/- 100% Full Speed |
| Armature Volts (modulus only) | 0 VDC = Zero Speed<br>+4.2 VDC = +/- 100% Armature Voltage |
| Armature Current (IA UNI-BIPOLAR set to unipolar) | 0 VDC = 0% Full Load Current (average)<br>+5 VDC = +100% Full Load Current (average) |
| Armature Current (IA UNI-BIPOLAR set to bipolar) | -5 VDC = -100% Full Load Current (average)<br>0 VDC = 0% Full Load Current (average)<br>+5 VDC = +100% Full Load Current (average) |
| Monitor point for PEEK diagnostic<br>(signal default tagged to drive speed feedback) | 0 volts = full speed reverse<br>2.2 volts = zero speed<br>4.4 volts = full speed forward |
| Sig. Common | 0 VDC Reference |

Figure 6.19 - Test Point Scaling

## CONTACTING CUSTOMER SERVICE

If you have reviewed your installation and start up procedures and the troubleshooting guide and still cannot solve the problem, contact Eurotherm Drives Customer Service at (704) 588-3246. Make certain you have the following information available before calling:

| Information | Source |
|---|---|
| Catalog number, revision number, serial number | 590SP *LINK* drive Serial Number Label (located on the left side of the drive heatsink base); |
| Motor horsepower, armature current and voltage, field current and voltage, base and top speed ratings | Motor Nameplate |
| Voltage per 1000 RPM (analog device), counts per revolution (digital device) | Speed Feedback Device nameplate |
| 8-Digit *LINK* Configuration Project Number (99xxxxxx) | System Drawings |
| Applications Information | System Drawings. |

Also, make certain to have information available on your particular application and the operating environment. When you are in contact with our service department, describe the problem in detail, the steps you have taken to rectify it, and the results of your efforts.

# Chapter 7 SERVICE AND MAINTENANCE

Because of its solid state design, the 590SP *LINK* has few items requiring service or maintenance. Service is typically a matter of basic modular component replacement, checking electrical connections and isolating problems in overall system applications.

**Caution**

Service procedures must be performed by qualified personnel with an understanding of the dangers inherent in high voltage applications and the precautions necessary when servicing industrial equipment. The customer is responsible for assessing the technical competency of in-house service personnel.

## WARRANTY INFORMATION

Detailed warranty information is contained in the Standard Conditions of Sale document IA058393C which is included with each order. An abbreviated version appears after the Warnings page in the front of this manual.

## REQUIRED TOOLS AND EQUIPMENT

Tools needed for routine service operations include:

- Socket wrench with a 6 inch extension
- M4 or 5/32" deep socket
- Phillips #2 Screwdriver
- Flat blade - 0.8 x 3.0 mm Screwdriver
- Small pair of electrical pliers
- M4 or 5/32" Hex key
- Small wire cutters
- Torque Wrench
- Wire strippers

## PREVENTIVE MAINTENANCE PROCEDURE

Perform regular preventive maintenance every six months to ensure long life and peak performance. Keep the drive and its components clean, check that it is operating in an environment with an acceptable ambient temperature, and make sure connections and mounting bolts have not loosened from vibration.

1. Remove the cover.
2. Inspect the control board for any loose debris or any track burns. Especially check around the supply input and armature output connections. Check for and remove any loose debris under the control and power boards.
3. Verify the tightness of the controller wiring connections:
   a. Check the integrity of the control terminal connections (A1 through A9) and the control power and field power terminal connections (D1 through D8) by gently tugging on the wires. The terminals should hold the wires firmly in place.
   b. Check for loose fiber optic *LINK* transmit and receive connections.
   c. Check the tightness of the feedback receiver card connections, if used.
   d. Use a torque wrench to tighten up the power and ground wires connected to the controller, if necessary. [Torque Rating: 1.8 - 2.6 Lb.-Ft. (2.4 - 3.5 Nm).]
4. Inspect all wiring and terminals for evidence of burning and/or abrasion. Check whether all components are properly seated on the control and power boards.
5. Be sure to replace the cover after inspecting or performing maintenance.

## CONTROLLER ASSEMBLY DESCRIPTION

The 590SP *LINK* breaks down into five distinct parts:

- Cover
- Control board
- Power board
- SCR Thyristor packs
- Controller heatsink

An assembly diagram is shown in Figure 7.1. The cover is attached to the drive by four captive M4 screws into silver colored, hexagonal standoffs at each corner of the board. Two additional sets of copper tinted standoffs secure the power and control boards together and mount the power board to the drive's heatsink. The control board is electrically isolated from the power board. Control signals to and from the power board pass through the 28 pin connector at the top of the control board.

The SCR packs (four for the regenerative, two for the non-regenerative model) each contain two thyristors and mount directly to the heatsink by M5 socket head or Phillips head screws. M5 Phillips head screws directly fasten the power

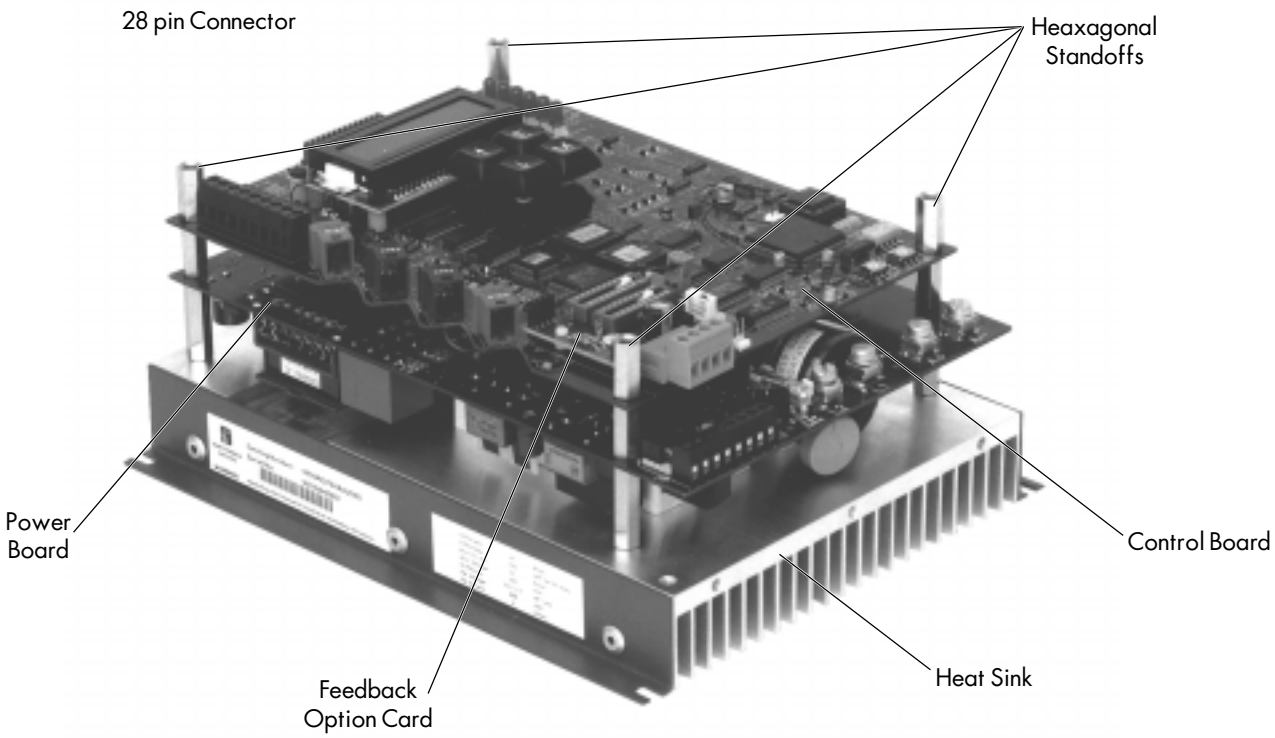



Figure 7.1- 590SP *LINK* Assembly Diagram

board's supply and output tracks directly to the SCRs. These screws, three per SCR pack, provide a strong electrical connection and tightly lock the board in place.

All power components— including the isolating power supply, pulse transformers and start relay— are mounted directly to the underside of the power board. Leads with plug-on terminals connect the pulse transformers to the SCRs.

## REMOVING THE DRIVE FROM ITS MOUNT

The drive is secured to the panel by four M4 or 8/32 screws. To remove the drive, first loosen but do not remove the bottom two screws. Hold the drive in place with one hand and remove the top two screws, then lift the drive off of the bottom two screws.

## PART REPLACEMENT

Part replacement of the 590SP *LINK* is limited *only* to the control fuse F1, control and power boards, and thyristor SCR packs. Do *not* replace any component on the control or power board.

**WARNING!**

Only qualified service personnel should attempt to repair or replace parts in the 590SP *LINK*. Isolate the 590SP *LINK* drive from *all* electrical power before attempting to work on its components.

## Replacing the Control Board

Remove the cover and the four standoffs. Gently grasp the control board by each side and remove the control board from the power board taking care not to bend the connector pins .

**Caution**

Components on the control board are highly sensitive to electrostatic discharge (ESD). Take care not to touch the control board unless you are properly grounded.

Gently attach the new control board, again taking care not to bend the connector pins. Reattach the four standoffs and the drive's outer cover.

## Replacing the Power Board

Unscrew the 12 M5 screws locking the control board to the SCR packs. Using a small pair of pliers, disconnect each of the eight yellow and red thyristor gate leads from the SCR pack gate pins (see Figure 7.3). Avoid pinching or damaging the gate lead wire insulation. Remove the power board.

**Caution**

This board has several fragile, components which can be damaged if mishandled.

Install the new power board making certain each thyristor gate lead connects to the correct SCR pack terminal (refer to Figures 6.2 and 6.3). Use a torque wrench to tighten the screws into the SCR packs. [Torque Rating: 1.8 - 2.6 Lb.-Ft. (2.4 - 3.5 Nm).] Replace the standoffs.

NOTE. SCR packs SP1 and SP2 and gate leads TP3, TP11, TP15 and TP6 are not installed on the non-regenerative model 591SP *LINK*.

## Replacing Thyristors

NOTE. Before attempting to replace an SCR, perform the SCR troubleshooting procedure in Chapter 5 to identify the defective SCR.

Remove the cover, control board and power board. Remove the bad SCR pack using a M4 hex key or #2 Phillips screwdriver. To avoid losing the screws, re-thread the screws into the heatsink after removing the SCR packs.

Apply conductive heatsink compound to the bottom of the new SCR pack and be certain to orient it properly on the heatsink. The gate lead terminals should be nearest to the top of the heatsink (refer to Figure 7.4). Install the new SCR pack using a torque wrench. [Torque Rating: 3.3 - 4.4 Lb.-Ft. (4.5 - 6.0 Nm).]

**Caution**

All connections must be made using the correct tightening torque. Overtightening could strip the threads in the heatsink or the SCR making them unusable.

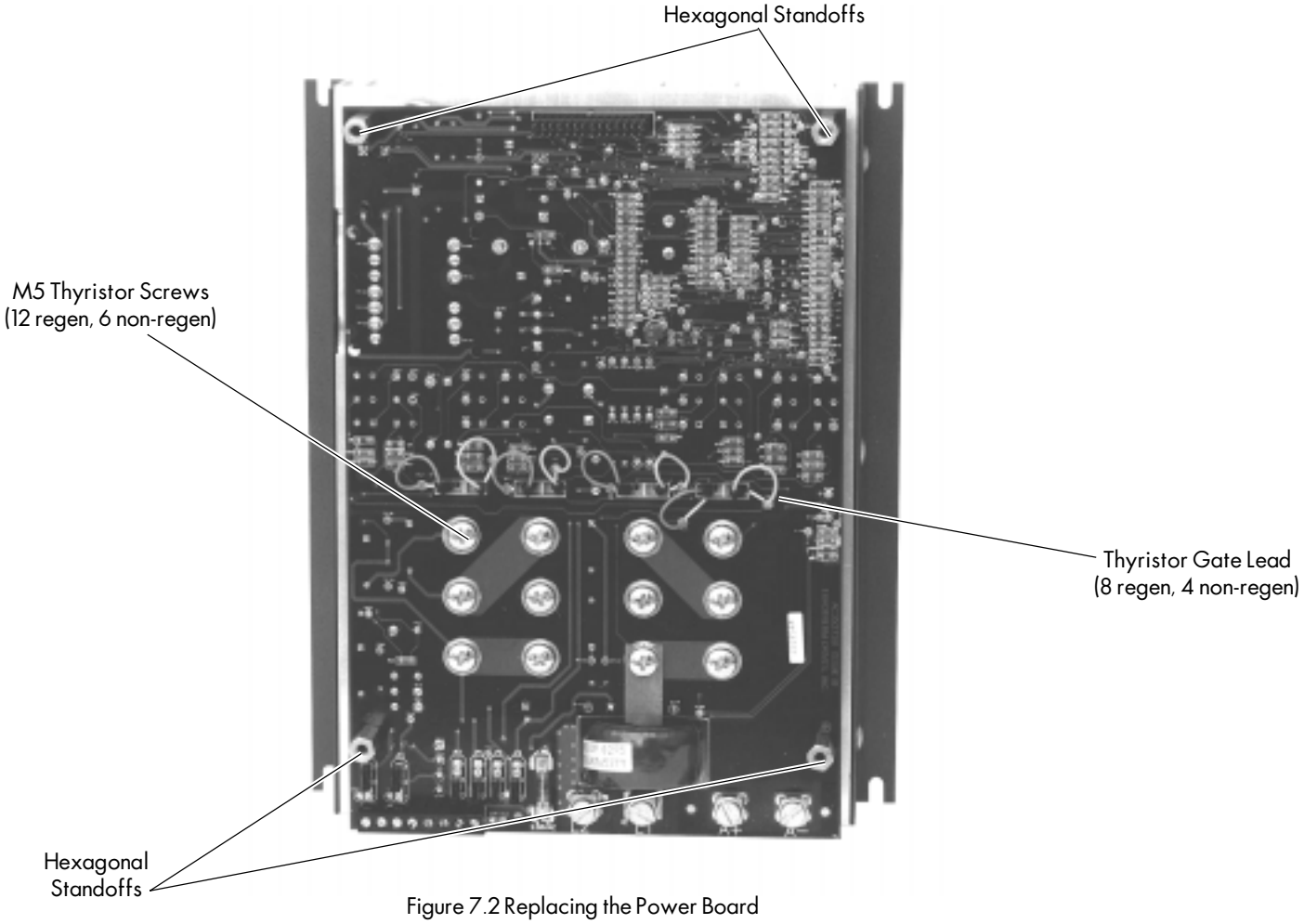



Figure 7.2 Replacing the Power Board

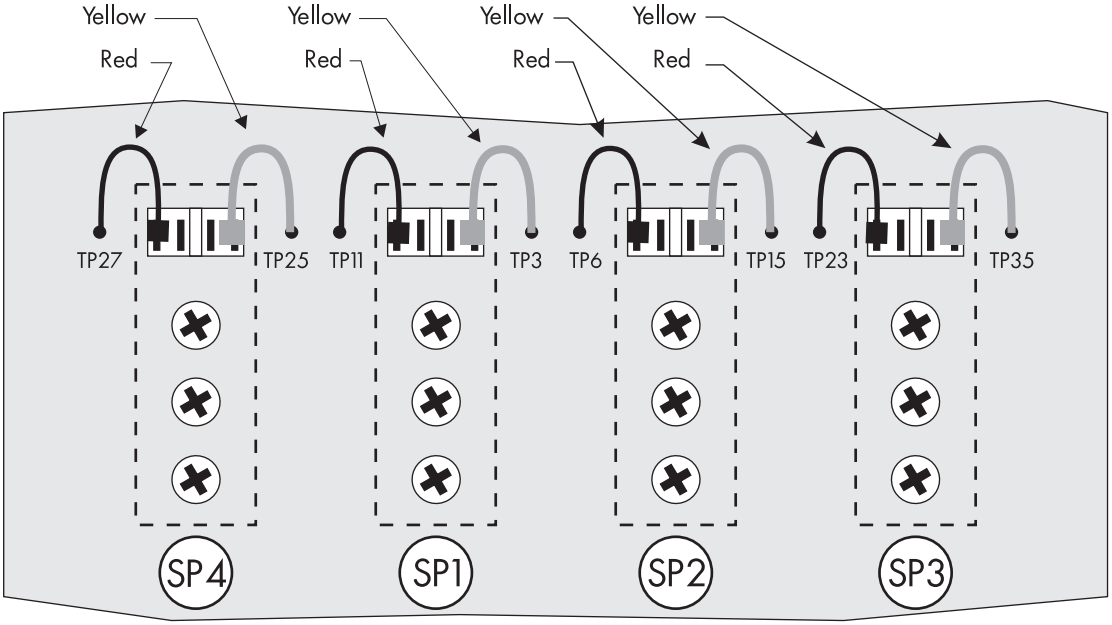



Figure 7.3 - SCR Gate Lead Terminal Connections

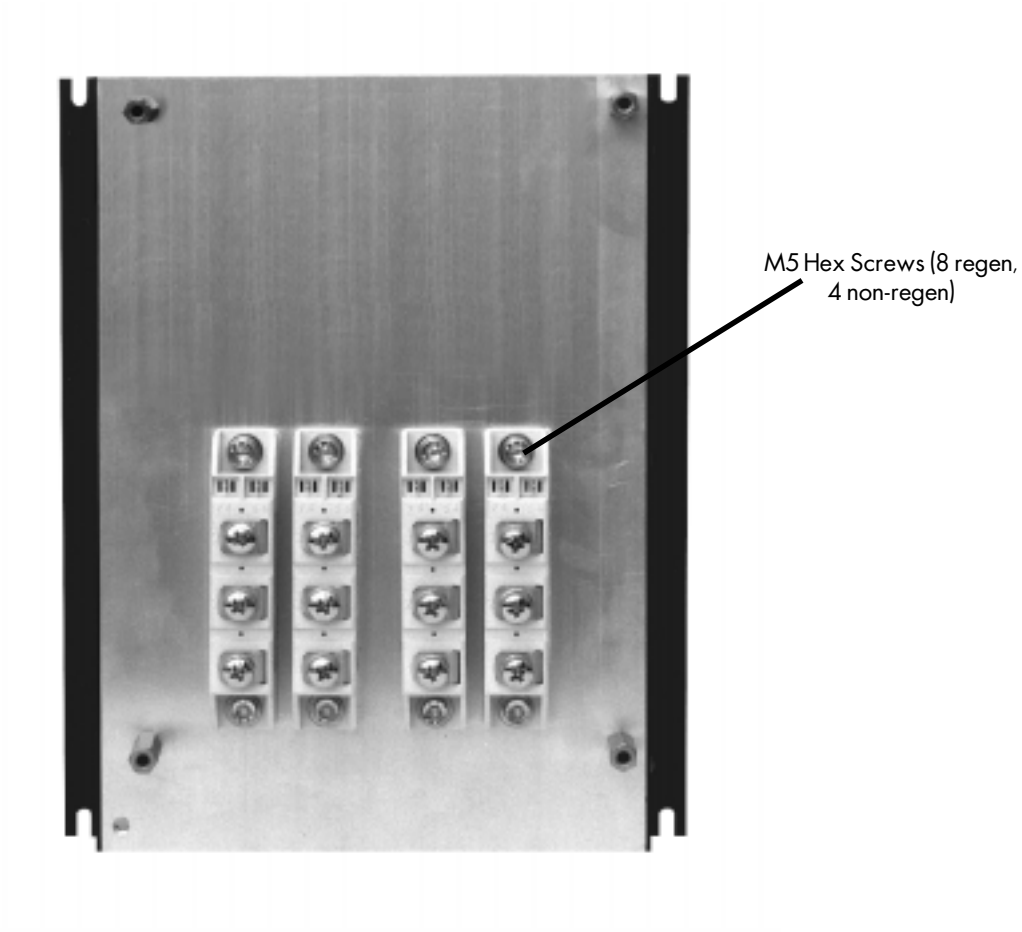



Figure 7.4 Replacing the SCR packs

# Appendix A TECHNICAL DESCRIPTION

This appendix lists the controller features and specifications and provides a description of the controller terminals.

> NOTE. The DRV option of the 590SP *LINK* has features not available on the standard 590SP *LINK*. Refer to Appendix F for DRV specifications.

## CONTROL CIRCUITS

A 16-bit microprocessor performs the majority of the control functions in the 590SP *LINK*. External *LINK* digital and analog input/output and processor modules communicate directly with the drive microprocessor over a fiber optic network to provide signal interfacing and input/output data scaling.

> NOTE. Other than the hardwired, low volt signal inputs ENABLE, THERMISTOR, PROGRAM and COAST STOP and the armature current output, all input and output control and communication with the drive is performed exclusively over the Eurotherm *LINK* fiber optic control network.

Functions performed by the drive's microprocessor include:

- Current and speed processing loops;
- Fault detection and alarm indication;
- MMI display and keypad;
- LED diagnostics;
- Thyristor firing algorithms;
- Speed and Current loop signal setpoint summing and scaling.



## POWER CIRCUITS

The 590SP *LINK* provides DC armature control by either a fully regenerative (four quad), two-pulse thyristor bridge or a non-regenerative (two quad), two-pulse thyristor bridge.

Each type of bridge includes suppression to limit the rise of volts across the thyristor, thus reducing the risk of false triggering and keeping the maximum applied voltage within the thyristor rating limits. The four quad bridge is configured to provide regenerative capability and reverse speed and torque operation.

The motor field rectifier is a non-controlled, full wave bridge circuit which may be wired externally for half-wave control.

## OVERVIEW OF FEATURES

| | |
|---|---|
| Control Circuits | Fully isolated from power supply |
| Control Action | Fully Digital<br>Software configurable and distributive process controlled over fiber optic network<br>Advanced PI with fully adaptive current loops for optimum dynamic performance<br>Self-tuning current loop using Autotune algorithm<br>Adjustable speed PI with integral defeat and adaptive gain profiling<br>Non-controlled rectified field supply |
| Speed Control | 5701 plastic Microtach fiber optic encoder feedback option<br>5901 glass Microtach fiber optic encoder feedback option<br>Wire-ended electrical encoder feedback option<br>Analog tachometer generator feedback option<br>Armature feedback with IR compensation (default shipped) |
| Speed Range | 100 to 1 typical when using tachometer generator feedback |

| | | |
|---|---|---|
| Steady State Error | 2% | Armature voltage feedback; |
| | 0.1% | Analog tachometer generator feedback; |
| | 0.01% | Wire-ended electrical encoder approved feedback; |
| | 0.01% | 5701/5901 Microtach fiber optic encoder feedback; |
| | 0.0% | (absolute) Quadraloc Mark II digital controller. |

Encoder Resolution
Maximum Microtach frequency 50 kHz;
Maximum encoder frequency 100 kHz;
Frequency (Hz) = Encoder Lines per Revolution × RPM ÷ 60.

Adjustments
All adjustments performed with software, either by on-board push buttons and liquid crystal display (the Man Machine Interface) or over the fiber optic network through the software package ConfigEd.

Calibration
Drive loops normalized to motor ratings through voltage and current switch settings. Analog speed feedback scaled through switch setable calibration board with direct-read slide switches. Fine tuning performed within drive software.

Protection
All models require external branch circuit protection;
DRV models: on board circuit protection;
DC loop contactor (DRV models only);
N/C DB pole (DRV models only);
dV/dT protection (snubbers);
High energy MOVs;
Overcurrent (instantaneous);
Overcurrent (inverse time— adjustable);
Speed feedback alarm failure;
Motor overvoltage alarm failure;
Motor overspeed alarm failure;
Motor over temperature;
SCR gate trigger failure;
Motor stall detection;
Zero speed detection;
Standstill "zero speed deadband" logic.

Diagnostics
Fully computerized with first fault latch and automatic display;
Digital LCD monitoring (MMI);
Full diagnostic information available through MMI and over *LINK* fiber optic network through SAM software;
LED status indication.

## SPECIFICATIONS

## Storage and Operating Environment

| | |
|---|---|
| Operating Temperature | 0 to 45°C (14 to 113°F);Derate linearly at 1% per degree celsius above 45°C to 55°C maximum. |
| Storage Temperature | -20 to 70°C (-4 to 158°F);<br>Protect from direct sunlight<br>Ensure a dry, corrosive-free environment. |
| Altitude | Controllers rated for use below 500 meters ( 1640 feet). Derate controllers above 500 meters at 1% per 200 meters (656 feet) to a maximum altitude of 5000 meters (16,400 feet). |
| Humidity | 85% relative humidity maximum. |
| Atmosphere | Nonflammable, non-condensing. |

## Electrical Ratings

| | |
|---|---|
| Protection | The armature bridge has electronic protection at 200% full load current for 10 seconds, 150 % for 30 seconds (software adjustable);<br>Requires external branch circuit AC protection;<br>An external motor overload device fitted to the controller output may be required by local codes. |
| Drive Power Supply | Single-phase, 40-70 Hertz, phase rotation insensitive, 3-wire supply (hot, neutral, ground); no adjustment necessary for frequency change.<br>Power Supply Voltage range: 110 - 400 volts AC nominal, ±10%.<br>Power Supply Current: (1.4× calibrated DC armature current) amps AC rms;<br>37 amps AC rms, maximum. |
| Drive Control Supply | Single-phase, 40-70 Hertz, polarity insensitive; no adjustment necessary for frequency change.<br>Control Supply Voltage range: 110 - 220 VAC to control transformer primary, ±10%; no special tapping required.<br>Primary Protection fuse: 2 amps @ 250 volts (FS1). |
| Control and Signal Terminals | 22 to 14 AWG (0.5 to 2 $mm^2$), compression terminals. Crimped terminations recommended. |
| Power Terminals | 16 to 8 AWG (1.5 to 10 $mm^2$), screw terminals. Require #10 (M5) ring or spade terminals. |
| Non-controlled Field Rectifier | INPUT: 240 VAC Maximum.<br>OUTPUT: 0.90 × AC supply volts (full-wave configuration);<br>0.45 × AC supply volts (half-wave configuration).<br>Maximum Loading: 3 amps DC (unfused). |
| *LINK* Signal Resolution | 10 bits (±0.0001 accuracy). |
| Thyristor $I^2t$ rating | 1100 $A^2$ sec. |
| Drive DC supply | +24 VDC nominal, internally regulated;<br>Maximum available output capacity: 17 VA (700 mA). |

## DC Supply Loading

The following list shows the DC loading of Eurotherm Drives products. Ensure that the loading does not exceed the +24 VDC supply rating. Add an auxiliary power supply if the demand exceeds the output capacity.

| | |
|---|---|
| 5701 Plastic Microtach encoder/receiver option board | 1.8 VA or 75 mA |
| Wire-ended electrical encoder and receiver option board | 1.8 VA or 75 mA |
| 5702/1 Microtach repeater | 1.2 VA or 50 mA |
| 5702/2 Microtach terminal rail repeater | 1.2 VA or 50 mA |
| 5702/3 Microtach to fiber optic converter | 1.2 VA or 50 mA |
| 5702/5 Microtach splitter | 1.8 VA or 75 mA |
| 5702/6 Microtach marker pulse repeater | 1.2 VA or 50 mA |
| *LINK* processor, analog and digital I/O modules and repeaters: | |
| L5201-2-02-013 analog I/O | 4 VA or 167 mA |
| L5202-2-01-013 digital I/O | 4 VA or 167 mA |
| L5207-2-00-013 processor | 4 VA or 167 mA |
| L5209-2-02-013 digital input | 4 VA or 167 mA |
| *LINK* fiber optic repeater L5206 | 1.4 VA or 63 mA |
| 5904 Universal Fiber Optic Repeater | supply consumption varies with load options |

| | | |
|---|---|---|
| *Sample configuration* | 5901 Microtach encoder/receiver option board | 1.8 VA or 75 mA |
| | 5702/1 Microtach repeater | 1.2 VA or 50 mA |
| | L5201-2-02-013 analog I/O | 4 VA or 167 mA |
| | L5209-2-02-013 digital input | 4 VA or 167 mA |
| | L5207-2-00-013 processor | 4 VA or 167 mA |
| | Total | 15 VA or 626 mA |

## Controller Output Ratings

Armature Current — 27 amps DC, maximum. Figure A.1 lists approximate armature currents for typical, low horsepower motors. (Source: 1990 NEC, Table 430-147.)

| MOTOR ARMATURE VOLTAGE | MOTOR HP | MOTOR FLC AMPS | MOTOR ARMATURE VOLTAGE | MOT HI |
|---|---|---|---|---|
| 90VDC | 0.25 | 4 | 180VDC | 0.2 |
| | 0.33 | 5.2 | | 0.3 |
| | 0.5 | 6.8 | | 0.5 |
| | 0.75 | 9.6 | | 0.7 |
| | 1 | 12.2 | | 1 |
| | | | | 1.5 |
| | | | | 2 |
| | | | | 3 |
| | | | | 5 |

Figure A.1 - Typical Low-volt Motor Armature Current Ratings

NOTE. The armature power bridge circuits in all 590SP models are *not* equipped with a "free-wheeling" or fly back rectifier. Accordingly, some motors may require derating, particularly at low speeds due to the higher current form factor that this type of supply produces. Consult the motor manufacturer for derating information.

Armature Voltage — 380 VDC maximum with 400 VAC input
180 VDC with 230 VAC input
90 VDC with 115 VAC input

Power Loss — 90 Watts at 45°C (113°F) ambient at maximum output of 27 Amps DC. Refer to Figure 3.1 for power dissipations at lower currents.

## Terminal Ratings

Signal, Control and Field Supply Terminations — 22 AWG to 14 AWG (0.5 to 2 $mm^2$) minimum to compression terminals, wire crimps recommended,
Terminal Rating: 15 amps, maximum.

Supply Input and Output Armature Terminations — 16 AWG to 8 AWG (1.5 to 10 $mm^2$) to screw terminals; requires spade terminals for M5 screws,
Terminal Rating: 40 amps, maximum.

Fiber Optic Terminals — 65.6 ft. (20 meters) maximum transmission distance over 1000 micron diameter polypropylene core (2 mm acrylic jacket) fiber optic cable.

## Dimensions

Overall Dimensions 9.50" (241mm) H x 7.50" (191mm) W x 4.17" (106mm) D

Weight 10 lbs. (4.5 Kgs.)

Refer to Appendix L for 590SP DRV dimensions.

## Auxiliary Control Jumpers

Jumpers are located on the lower left of the power board as shown in Figure 3.5.

| Jumpers | Positions 1 & 2 | Positions 2 & 3 |
|---|---|---|
| JP1 & JP2 | Field rectifier supply external | Field rectifier supply internal |
| JP3 & JP4 | Drive start relay contact switching external power | Drive start relay contact switching internal power |
| JP5 & JP6 | Control power external | Control power internal |

Figure A.2 - Fiber Optic Transmission Distances

## Fiber Optic Transmission Distances

| SWITCH POSITION | TRANSMISSION POWER | TRANSMISSIC |
|---|---|---|
| Middle | Low | 0 to 20 m (0 |
| Left | Medium | 21 to 40 m (68 |
| Right | High | 41 to 60 m (134 |

Figure A.3 - Auxiliary Control Jumpers

## 590SP *LINK* SOFTWARE BLOCK DIAGRAM

Refer to the diagrams on the inside front cover of this manual for the 590SP *LINK* slot connections. Appendix C presents a block-by- block discussion of the software block diagram.

## TERMINAL LISTING

The controller terminals are summarized below. A more detailed description and the ratings of each terminal follows this listing.

### CONTROL TERMINALS

| Number | Name | Purpose |
|---|---|---|
| A1 | 0v | Signal commmon |
| A2 | Thermistor input | Motor temperature sensor input |
| A3 | 0v | Signal common |
| A4 | No connection | |
| A5 | Enable input | Drive enable input |
| A6 | Current meter output | Buffered current output: ±10 VDC = ±200% current |
| A7 | Program stop input | Controlled ramp stop |
| A8 | Coast stop input | Coast stop |
| A9 | +24v supply | |

### FIELD AND CONTROL SUPPLY

| | | |
|---|---|---|
| + D1 | External AC Field supply | |
| + D2 | External AC Field Supply | |
| D3 | Field - | External connection for negative motor field lead |
| D4 | Field + | External connection for positive motor field lead |
| * D5 | Start Relay N/O contact | |
| * D6 | Start Relay N/O contact | |
| ** D7 | External control supply, neutral | |
| ** D8 | External control supply, line | |

+ These terminals supply external power to the drive's field rectifier input. Leave jumpers JP1 and JP2 positions 1 and 2 to supply the rectifier with the drive AC supply voltage. Move jumpers JP1 and JP2 to positions 2 and 3 and supply the rectifier through terminals D1 and D2 if the field rectifier requires a voltage different from the drive supply voltage.

* These terminals connect to a normally-open contact on the drive's intrernal start relay. It *must* switch power to the coil an external AC or DC contactor for supply/motor isolation. If the rating of the external contactor coil matches the drives main supply power, set jumpers JP3 and JP4 to positions 2 and 3. Switch these jumpers to positions 1 and 2 if the coil requires a different supply voltage.

** These terminals supply external power to the drive's universal supply control transformer. Change the control transformer jumpers JP3 and JP4 from positions 1 and 2 to 2 and 3 and supply the control voltage through terminals D7 and D8 if the input supply voltage exceeds 240 VAC.

### POWER CONNECTIONS

| Number | Name | Purpose |
|---|---|---|
| L1 | Line 1 | input supply - single phase line |
| L2 | Line 2 | input supply - single phase neutral |
| G | Ground, supply | Ground connection for input supply |
| A+ | Armature + | Motor connection for armature, positive |
| A- | Armature - | Motor connection for armature, negative |
| DB+ | Dynamic Brake + | Dynamic Brake connection, positive (DRV units only) |
| G | Ground, motor | Ground connection for motor ground (DRV units only) |
| F+ | F+ | Motor connection for field, positive (DRV units only) |
| F- | F- | Motor connection for field, negative (DRV units only) |
| 1 | M contact | Normally open auxiliary contact (DRV units only) |
| 2 | M contact | Normally open auxiliary contact (DRV units only) |

### *LINK* FIBER OPTIC CONNECTIONS

| Number | Name/Purpose |
|---|---|
| FO2 | *LINK* Transmit Secondary Channel (red) |
| FO3 | *LINK* Receive Secondary Channel (black) |
| FO4 | *LINK* Receive Primary Channel (black) |
| FO5 | *LINK* Transmit Primary Channel (red) |

## TERMINAL DESCRIPTIONS AND SPECIFICATIONS

**A1/0V (Signal)**

ZERO VOLT DC SIGNAL REFERENCE. Connection point for external +24 VDC contactor coil, if used.

**A2/Thermistor**

This terminal is for sensing motor overtemperature. DC motors should have temperature-sensitive resistors or switches attached to protect against sustained thermal overloads. These sensors should be normally-closed type, and should open on overtemperature. Connect these sensors in series between terminals A1 and A2. The drive trips out on a THERMISTOR alarm if the resistance between A1 and A2 rises above 1.8K Ohms, ±200 Ohms. If the motor is fitted with a cooling blower motor, connect an auxiliary contact from the blower motor starter in series with the sensors. Connect terminal A1 to A2 if overtemperature sensors are not used.

**A3/0V (Signal)**

Connection point for motor overtemperature series connection, if used.

**A4**

No connection. Do *not* use as a jumpering or connection point for external wiring.

**A5/Enable**

This terminal is a hardwired inhibit for the drive speed and current control loops. Connecting A5 to +24 VDC enables the speed and current loops. Shorting A5 to system 0 VDC or leaving the terminal open circuit disables both loops clamping the output current to zero. FOR DRV MODELS ONLY: A5 is wired internally to an auxiliary normally-open contact on the on-board DC contactor so that the controller inhibits thyristor firing when the contactor opens.

**A6/Buffered Armature Current**

This terminal provides an armature current reading for indication and diagnostic use. It is scaled to ±10VDC = ±200% full load scaled armature current.

Rating: +/-10VDC at +/-5 mA, short circuit protected; 5ms update rate.

**A7/Program Stop**

This terminal is for a controlled ramp stop input. When the PROGRAM STOP input is held at +24 VDC, the drive operates as configured. Breaking the +24 VDC connection causes a controlled (or program) stop as defined in the SETUP PARAMETERS::STOP RATES parameters.

NOTE. Disconnecting A7 on a non-regenerative drive while running causes the motor to coast to rest.

**A8/Coast Stop**

This terminal is for an uncontrolled, coast stop input. When held at +24 VDC, the drive operates normally. When shorted to zero volts or open circuited, the drive instantly inhibits the thyristors and interrupts current flow, then drops out the main contactor allowing the motor to coast to rest.

**A9/+24 VDC Supply**

This terminal is used to activate the ENABLE, PROGRAM STOP, and COAST STOP terminals, and power other +24 VDC devices.

Maximum output: 700mA.

> NOTE. Ensure that the load on terminal A9 combined with the other +24 VDC loads does not exceed 700mA. See the Electrical Ratings information earlier in this appendix.

**L1, L2/Single Phase Supply**

Connection for the single-phase input supply. The nominal supply range: 110 or 440 VAC. The screw terminals are rated to 40 amps maximum.

**A+, A-/Armature**

These terminals and the associated ground terminal provide the connection point for the motor armature. The screw terminals are rated to 40 amps maximum.

**D1, D2/External AC Field Supply**

The field bidge is normally supplied off the main input power. If the motor field requires a different AC supply voltage, move jumpers JP1 and JP2 from position 2 and 3 to 1 and 2 and connect an external field supply to these terminals.

Rating: 240 VAC maximum, 3 amps maximum.



**D3,D4/Motor Field**

These terminals provide the connection point for the motor field. When connected as a full wave rectifier circuit, the DC output voltage is 0.90 X AC field supply input. If connected as a half wave rectifier, the DC output voltage is 0.45 X AC field supply input.

Rating: 300 VDC, 3 amp maximum.

**D5, D6/Drive Start Relay Contact**

These terminals provide access to the normally-opened contact of the drive's internal start relay. This contact allows the drive to control an external main contactor. If the main contactor coil voltage matches the drive supply power, the coil may be powered internally by setting jumpers JP 5 and JP6 to positions 2 and 3 and connecting the coil between terminals D5 (AC coil supply) and D6 (neutral). If the coil voltage differs from the main supply, set the jumpers to positions 1 and 2 and connect the required supply voltage in series to the coil through D5 and D6.

Rating: 250 VAC, 3 amps maximum. Use a slave contactor if coil inrush exceeds maximum rating.

**D7 and D8/Control Auxilary Supply**

These terminals allow control power to be applied externally to the drive when the main supply exceeds 240 VAC. Move jumpers JP3 and JP4 from positions 1 and 2 to 2 and 3 and connect the supply line terminal D7 and supply neutral to D8.

Terminal rating: 250 VAC, 3 amps maximum.

## FEEDBACK OPTION CARDS

The 590SP *LINK* drive is preconfigured to run in armature voltage feedback control, which requires no feedback device. Accordingly, each is shipped without a feedback option card. Order one of the four cards described below when using an analog tachometer generator, Microtach or wired-ended encoder for speed feedback.

## Switchable Tachometer Feedback card (AH385870U001)

The switchable tachometer generator feedback board supports AC and DC analog tachometer generators. It can be used with analog tachometer generators with a feedback voltage range of 10 to 199 volts at full speed.

### Features

- Simplified calibration using switches to scale the feedback voltage.
- 0.1% steady state accuracy.

### Specifications

| | |
|---|---|
| DC power supply loading | 50 mA |
| Tachometer generator supply range | 10 to 199 volts AC/DC |
| Terminal Wire Size | 22 to 14 AWG (0.5 to 1.5 $mm^2$) |
| Terminal Tightening Torque | 5.3 lb-in (0.6 Nm) |

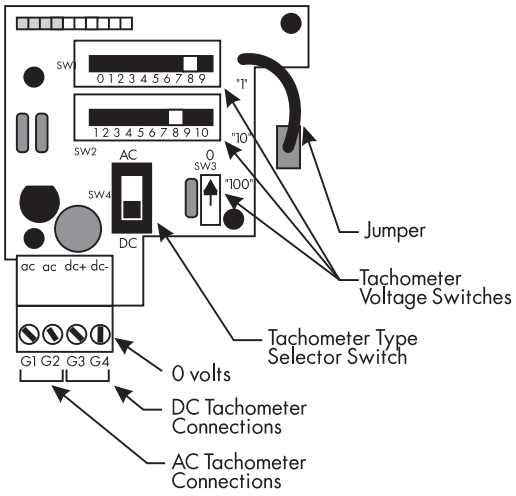



Figure A.4 - Switchable Analog Tachometer Feedback Card

### Recommended Spare Parts

Keep only one tachometer generator feedback card as a spare.

### Installation Information

Figure A.4 shows a close up of the card. Terminal connections are also shown.

1. For DC analog tachometer generators, connect the negative lead to terminal G4 and the positive lead to G3.
2. Connect AC analog tachometers leads to terminals G1 and G2. These inputs are polarity insensitive.

   NOTE. Be certain to wire the tachometer generator leads to the feedback card with shielded cable and to ground the shield at one end only, to avoid creating ground loops.

### Calibration

1. Set the tachometer generator type by setting SW4 up for AC tachometer generators, or down for DC tachometer generators.
2. Set the ones and tens switches to the calibration volts by sliding the appropriate 10-position switch to the correct value. To add one hundred volts, switch the two-position switch (SW3) down. This *coarsely* scales the analog tachometer generator signal.

   In general, the voltage output of an analog AC or DC tachometer generator is a function of speed or is rated in volts per 1000 rpms so that:

$$\text{SPEED FEEDBACK VOLTAGE}_{Max}(\text{volts}) = \text{MOTOR SPEED}_{Max}(\text{RPM}) \times 1$$

   This rating should be on the nameplate of the tachometer generator. Fine tuning is performed within the software (refer to the *Speed Feedback Calibration* section in Chapter 4).

   If the full speed feedback voltage exceeds 200 VDC, use an external resistive scaling network to drop the feedback voltage to within this range.
3. For AC tachometer generators, the switch settings will be about 1.3 times greater than the voltage measured at the input terminals G1 and G2 due to the rectifier offset.

# 5701 (Plastic Fiber Optic) Microtach Receiver Card (AH058654U001)

The 5701 Microtach Receiver Option is used with the 5701 Microtach encoder to provide a highly accurate speed feedback measurement. The option uses the Eurotherm Drives patented fiber optic 5701 encoder output transmission circuitry for noise immune data transfer over *plastic* fiber optic cable. A convenient board-mounted, plug-in terminal block and fiber optic receiver terminal are provided for field connections.

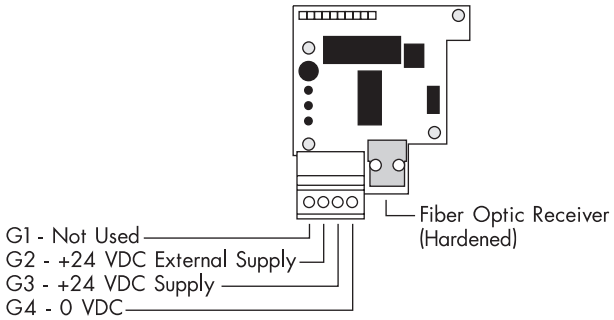



Figure A.5 - 5701 Microtach Receiver Card

## Features

- Electrically noise immune plastic fiber optic cable to transmit the speed feedback signal from the 5701 Microtach encoder.
- 0.01% steady state accuracy through the use of the 5701 Microtach encoder or a standard encoder interfaced to the 5702/3 encoder to fiber optic converter unit.
- Supplies +24 VDC to the 5701 Microtach encoder.
- Plastic fiber optic cable requires only a standard set of pliers to attach the cable to the T&B connectors.

## Specifications

| | |
|---|---|
| DC Power Supply Loading | 75 mA |
| Maximum Frequency | 50 kHz |
| Fiber Optic Cable Type | .0394 inch (1 mm) OD plastic fiber optic |
| Terminal Wire Size | 14 - 22 AWG (0.5 - 1.5mm$^2$) |
| Terminal Tightening Torque | 5.3 lb-in (0.6 Nm) |

| Recommended 5701 Microtach Spare Parts | | |
|---|---|---|
| **Quantity** | **Part Number** | **Description** |
| 1 | AH058654U001 | Plastic fiber optic microtach receiver board |
| 1 | CM0597 48U050 | Composite plastic fiber optic cable (50 meters, 164 |
| 1 | CI055069 | Plastic fiber optic T&B termination plug - red |
| 1 | LA385204 | Plastic fiber optic cable cutter |
| 1 | L5231 | Fiber optic light meter with T&B adaptor |
| 1 | 5701/4 | Plastic fiber optic microtach encoder |

Figure A.6 - Recommended 5701 Microtach Spare Parts

| Related 5701 Microtach Parts | |
|---|---|
| **Part Number** | **Description** |
| CM0597 48U050 | Plastic composite fiber optic cable (50 meters, 164 ft.) |
| CM0597 48U150 | Plastic composite fiber optic cable (150 meters, 492 ft.) |
| CM0597 48U200 | Plastic composite fiber optic cable (200 meters, 656 ft.) |
| CM0597 48U300 | Plastic composite fiber optic cable (300 meters, 984 ft.) |
| 5702/1 | Plastic fiber optic microtach repeater (NEMA 1) |
| 5702/2 | Plastic fiber optic microtach repeater (DIN rail mount) |

Figure A.7 - Related 5701 Microtach Spare Parts

## 5701 Installation Information

**Caution**

This option contains ESD sensitive parts. Observe static control precautions when handling, installing, and servicing this option.

1. Use the Fiber Optic Cable Cutter (LA385204) to dress the fiber optic cable connecting to the option card. The cable must be cleanly and squarely cut to work properly. The Microtach encoder end of the fiber optic cable requires a red fiber optic plug (CI055069) for termination.
2. Loosen the screws on the metal fiber optic connector on the feedback board and insert the cable. Carefully push the cable into the connector until it is fully engaged. Retighten the screws.
3. Refer to Chapter 4 for calibration instructions.

The 5701 Microtach encoder is a 1000 PPR incremental encoder with digitally encoded fiber optic output. The option card supplies +24 VDC power to the encoder and decodes the fiber optic encoder signal. The controller supplies the +24 VDC through terminals G3 and G4. Connect an external +24 VDC supply through the option card to terminal G2 (see Figure A.6) if the controller +24 VDC supply is at capacity and unable to provide sufficient power.

Figure A.8 shows the Microtach receiver connected to the 5701 Microtach. The power terminals in the encoder are marked '+' and '-'.

The 5701 Microtach encoder has several mounting options. See the catalog for the mounting option you require.

**Caution**

The 5701 Microtach encoder is not suitable for use in a hazardous area.

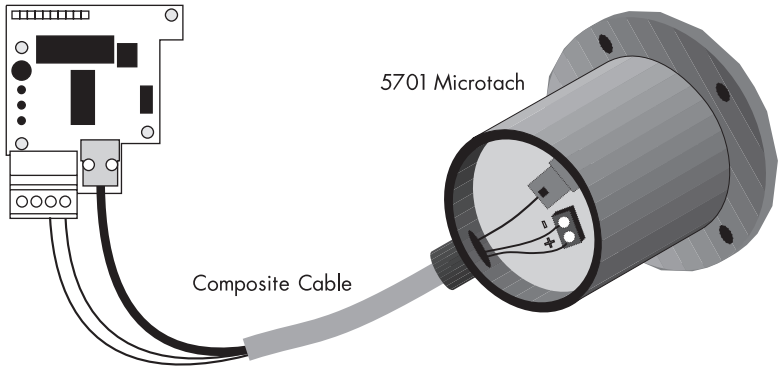



Figure A.8 - Connecting a 5701 Microtach to the 5701 Microtach Receiver Card

# 5901 (Glass Fiber Optic) Microtach Receiver Card (AH386025U001)

The 5901 Microtach Receiver Option is used with the 5901 Microtach encoder to provide highly accurate speed feedback measurement. It provides all the features of the 5701 Microtach with the additional advantage of *glass* fiber optic cable. A convenient board-mounted plug-in terminal block and fiber optic receiver terminal are provided for field connections. The 5901 Microtach Receiver Option board offers the following advantages:

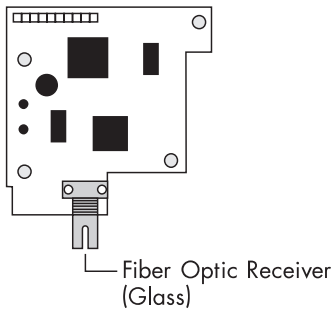



Figure A.9 - 5901 Microtach Receiver Card

## Features

- Electrically noise immune glass fiber optic cable to transmit the speed feedback signal from the 5901 Microtach encoder.
- Glass fiber optic cable allows long transmission distances without repeaters.
- 0.01 % steady state accuracy through the use of the 5901 Microtach encoder.

## Specifications

| | |
|---|---|
| DC Power Supply Loading | 125mA |
| Maximum Frequency | 50K Hz |
| Fiber Optic Cable Type | 62.5 to 250 micron diameter glass fiber optic cable using ST fiber optic connectors |
| Terminal Wire Size | 14 - 22 AWG (0.5 - 1.5 $mm^2$) |
| Terminal Tightening Torque | 5.3 pound-inches (0.6 Nm) |

| Recommended 5901 Microtach Spare Parts | | |
|---|---|---|
| **Quantity** | **Part Number** | **Description** |
| 1 | AH386025U001 | Plastic fiber optic microtach receiver board |
| 12 | CI352599 | Composite plastic fiber optic cable (50 meters |
| 12 | CI352673 | Plastic fiber optic T&B termination plug - red |
| 12 | CI352674 | Plastic fiber optic cable cutter |
| 1 | JA352597 | Crimp & cleave glass fiber optic ST terminatio |
| 1 | JA352398 | ST Fiber optic light meter adaptor |
| 1 | L5231 | Fiber optic light meter with T&B adaptor |
| 1 | 5901/4 | Glass fiber optic microtach enoder |

Figure A.10 - Recommended 5701 Microtach Spare

| Related 5901 Microtach Parts | |
|---|---|
| **Part Number** | **Description** |
| CM352600U103 | 200 micron diameter, non-terminated glass fiber optic cable (100 meters, 3281 ft.) |
| CM352692U102 | 230 micron diameter, ST terminated one-end only, glass fiber opti (100 meters, 328 ft.) |
| CM352692U251 | 230 micron diameter, ST terminated one-end only, glass fiber opti (25 meters, 82 ft.) |
| CM352692U501 | 230 micron diameter, ST terminated one-end only, glass fiber opti (50 meters, 164 ft.) |
| CM352692U751 | 230 micron diameter, ST terminated one-end only, glass fiber opti (75 meters, 246 ft.) |

Figure A.11 - Related 5701 Microtach Spare Parts

NOTE. 200 micron glass fiber optic cable requires a glass fiber optic type ST termination kit for cutting, polishing and terminating either end of the cable.

NOTE. The L5231 light meter ships with a T&B adaptor installed for measuring plastic fiber optic light transmission. Order the ST fiber optic adaptor (JB352398) to measure glass fiber optic transmission with the same light meter.

NOTE. The 5901 Microtach is limited to 150 meters (492 ft.) for 62.5 to 125 micron diameter glass cable, and 1000 meters (3280 ft.) for 200 micron diameter glass cable

## 5901 Installation Information

**Caution**

This option contains ESD sensitive parts. Observe static control precautions when handling, installing, and servicing this option.

1. Use the connector kit JA352597 to properly terminate ST terminals to both ends of the glass fiber optic cable. Each ST terminal requires a cleave crimp, a cable anchor and crimp sleeve.
2 After attaching the cable ST terminals, connect the cable to the Microtach and receiver card.
3. Refer to Chapter 4 for calibration instructions.
4. The 5901 Microtach encoder is a 1000 PPR incremental encoder with digitally encoded fiber optic output. Power the encoder from the drive's +24 VDC supply (terminals C1 and C9) or from an external supply if the drive's +24 VDC power rail is at capacity . Figure A.12 shows the Microtach receiver connected to the 5901 Microtach. The power terminals in the encoder are marked '+' and '-'.
5 The 5901 Microtach encoder has several mounting options. See the catalog for the mounting option you require.

**Caution**

The 5901 Microtach encoder is not suitable for use in a hazardous area.

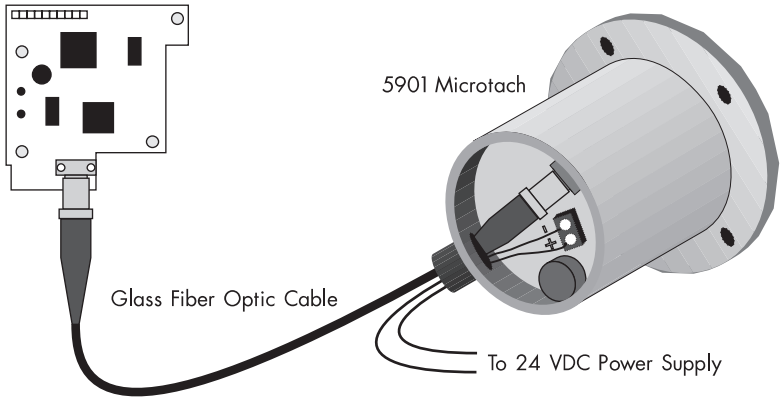



Figure A.12 - Connecting a 5901 Microtach to the 5901 Microtach Receiver Card

## Wire-ended Encoder Receiver Card (AH387775Uxxx)

The Wire-ended Encoder Receiver Option allows standard encoders to be connected directly to the motor controller and to provide highly accurate speed feedback measurement. It mounts directly to the Main Control Board by means of four support standoffs and a 10-pin interface connector built into the board. A convenient board-mounted plug-in terminal block is provided for field connections.

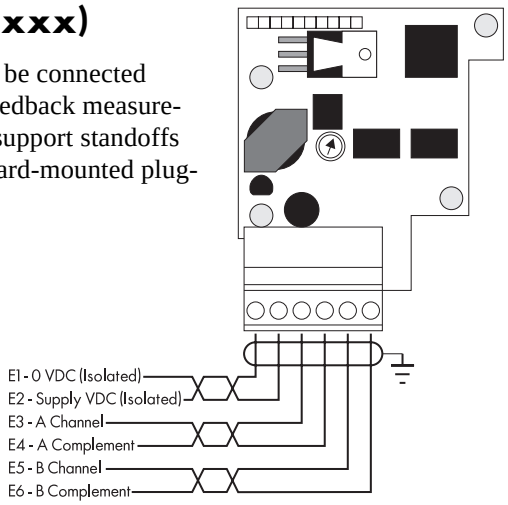



Figure A.13 - Wire-ended Encoder Receiver Card

### Features

- Contains two optically isolated differential inputs for channels A and B.
- Decoding logic to interface the encoder to the microprocessor
- Supplies fixed voltage, isolated encoder power.

Four cards are available, each designed for a specific encoder voltage supply requirement.

| Catalog Number | Description |
|---|---|
| AH387775U005 | +5 VDC encoder receiver option card |
| AH387775U012 | +12 VDC encoder receiver option card |
| AH387775U015 | +15 VDC encoder receiver option card |
| AH387775U024 | +24 VDC encoder receiver option card |

### Specifications

| | |
|---|---|
| Maximum Frequency | 100 K Hz |
| Receiver Current | 10 mA per channel |
| Input Format | Two differential channels in quadrature |
| | (3.5 V minimum) |
| Encoder Supply | 2 Watts maximum |
| Motor Controller DC Power Supply Loading | 1.4 times output power |
| Terminal Wire Size, Maximum | 16 AWG |
| Terminal Tightening Torque | 3.5 pound-inches (0.4 Nm) |

### Recommended Spare Parts

Keep one Encoder Receiver board as a spare for each type of encoder used. Ensure that the spare's output supply matches the encoder's supply voltage input. Supplying an encoder with an incorrect supply can damage the encoder.

### Electrical Encoder Installation Information

**Caution**

This option contains ESD sensitive parts. Observe static control precautions when handling, installing, and servicing this option.

1. Connect the encoder as shown in Figure A.7.
2. Install all wiring as instructed in the Eurotherm Drives Installation Note Sheet (HG050610). Also refer to drawing HG351946, the Installation Notes which are shipped with the card. Exercise special care wiring the encoders to the option board due to the low signal levels. Be sure to use three channel twisted pair shielded cable. Belden 8777 cable is recommended. The shielded cable must be grounded at the controller *only*.
3. Refer to Chapter 4 for calibration instructions.

## Application Notes

External Power Supply

In cases when the encoder receiver card or the drive cannot supply enough power for the encoder, use an external power supply connected directly to the encoder. The supply should be isolated from ground; that is, neither the 0 VDC nor the +VDC should be connected to ground.

Single Ended Encoders

When using single ended encoders:

1. Connect the A and B channels to terminals E3 and E5 as shown in Figure A.7.
2. Jumper terminals E4 (A Complement) and E6 (B Complement) to E1 (0 VDC).

## Encoder Types

Avtron Manufacturing, Inc.

All the Avtron encoders, models M738, M785, M938, and M939, use the same color code and terminal numbers for interconnection. The standard column lists the normal color code and terminal numbers. The M193 does not have terminal numbers but uses the same color code.

| Option Terminal | Standard | M193A |
|---|---|---|
| E1: 0 VDC | A - BLK | BLK |
| E2: +VDC Supply | B - RED | RED |
| E3: A | D - GRN | GRN |
| E4: A Complement | G - YEL | YEL |
| E5: B | E - BLU | BLU |
| E6: B Complement | H - GRY | GRY |

Figure A.14 - Avtron Encoder Terminal Designations

BEI Optical Encoder

Models E25, H25 and L25 use encoders with the 12 or 15 VDC supply. Use the M16 plug columns for connecting E25, H25, L25 and H40 encoders.

| Option Terminal | M16 Plug | M18 Plug | Model H38 |
|---|---|---|---|
| E1: 0 VDC | F | F | 2 |
| E2: +VDC Supply | D | D | 3 |
| E3: A | A | A | 4 |
| E4: A Complement | C | H | 7 |
| E5: B | B | B | 5 |
| E6: B Complement | E | I | 8 |

Figure A.15 - BEI Encoder Terminal Designations

Dynapar

The table below lists the series of Dynapar Optical Encoders compatible with the Encoder Receiver Option. Use encoders with the line driver output for 12 or 15 VDC operation.

| Option Terminal | 625<br>525<br>526 | EX625 | 60<br>60P | 90 |
|---|---|---|---|---|
| E1: 0 VDC | F | C | C | BLK |
| E2: +VDC Supply | D | V+ | E | WHT (B/W) |
| E3: A | A | A | B | RED |
| E4: A Complement | H | A Complement | G | WHT (R/W) |
| E5: B | B | B | D | ORG |
| E6: B Complement | I | B Complement | H | WHT (O/W) |

Figure A.16 - Dynapar Encoder Terminal Designations

# Appendix B USING THE MAN MACHINE INTERFACE (MMI)

## DEFINITION & SCOPE

The Man Machine Interface (MMI) consists of a two line alphanumeric liquid crystal display (LCD) and a four button keypad mounted on the front of the drive. Drive parameters are monitored in the MMI display window and changed using the four-button keypad. The keypad allows the user to scroll through the various menus and view or modify parameters.

Customers may use a personal computer (PC) running the software package ConfigEd to change drive parameters or use the SAM feature of ConfigEd to monitor drive signals. However, the MMI offers the user a quick and easy method of adjusting drive parameters, tuning the drive, diagnosing faults and monitoring drive operation without using a PC.

> NOTE. The MMI displays drive alarms, diagnostic values and allows you to alter drive parameter settings. You cannot use the MMI to configure signals to and from the drive over the *LINK* network. Refer to the *LINK* ConfigEd manual (RG353321) and the *LINK* Overview manual (HA350678A) for instructions on configuring logic and value signals to and from the drive.

## USING THE MMI

### Access and Adjustment

The MMI is located under a hinged cover at the top of the 590 controller (see Figure 2.3). To open the cover, reach to the top of the control door and locate an indentation at the top center of the panel. Lightly grasp the cover at the indentation and gently pull out and downward.

The display of the MMI has a 2-line, 16-character liquid crystal readout designed to provide clear and simple feed-back to the user. The upper line of the display shows the current menu or parameter. The lower line shows the next menu or parameter or the value/status of the parameter shown on the upper line.

A contrast potentiometer allows the user to adjust the intensity of the MMI display. It is located under the lower panel below the calibration card (see Figure 6.19). The MENUS::MENU DELAY parameter adjusts the rate MMI items change. Increasing the value for MENU DELAY slows the rate the menus change.

English is the default language displayed in the MMI. It can be changed to a second language, French, by changing the parameter MENUS::LANGUAGE to the other selection.

### Operation

The four buttons below the MMI display allow the user to scroll through the various menus and view or modify the parameters. In so doing, the user can easily find information and adjust drive parameters to fit the application of the drive. Key functions are as follows:

| | |
|---|---|
| M/menu select | Enters the menu or chooses the parameter shown on the second line of the MMI display. This key will not alter any parameters. |
| E/escape | Exits the current selection and returns to the preceding menu. This key will not alter any parameters. |
| ▲/up arrow | Scroll up through the menus or parameters displayed on the lower line of the display. When displaying a modifiable parameter on the upper line, ▲ either increases its value or selects another option. These options are shown on the lower line of the MMI display. |
| ▼/down arrow | Scroll down through the menus or parameters displayed on the lower line of the display. When a modifiable parameter is displayed on the upper line, ▼ either decreases its value or selects another option. |

## MMI MENU STRUCTURE

The MMI menu is structured as a nested tree and has been designed for users to easily read and set drive parameters.

The main level of the menu system is MENU LEVEL which contains nine main control menus of the MMI. The following list briefly describes the functions performed in each MENU LEVEL category and refers to the section within the manual that discusses the menu in depth.

| Menu Level | Description |
|---|---|
| Diagnostics | Contains the parameters for monitoring the performance or status of the controller. Parameters may be monitored but not changed in this menu. (See Chapter 5, Troubleshooting.) |
| Setup Parameters | Parameters for calibrating and tuning the controller for a specific application. (See Appendix C, *LINK* Software Block Diagrams.) |
| Password | Allows the user to set password protection for the drive configuration. (See Chapter 5, Start-up and Adjustment.) |
| Alarm Status | Contains parameters for monitoring the fault status of the controller. (See Chapter 5, Troubleshooting.) |
| *LINK* Support | Contains *LINK* network configuration information. (Refer to the discussion on PARAMETERS in Appendix C.) |
| Menus | Settings for adjusting the MMI user interface. (Refer to this appendix. See below. ) |
| Parameter Save | Menus for saving the current configuration and settings to EEPROM. (See Chapter 4, The *LINK* Interface) |
| Network Access | Reserved for *LINK* system configuration parameters external to the drive to be displayed in the MMI. (Refer to Appendix C.) |
| System | Displays the software issue level. Also contains menus reserved for advanced drive troubleshooting and are available only in a restricted password mode. Only qualified Eurotherm Drives personnel have access to these menus. |

Figure B.1 shows the complete MMI menu structure. The complete menu tree is often not needed for most applicaFigure B.1 shows the complete MMI menu structure. The complete menu tree is often not needed for most applications. To simplify your work with the MMI, you can reduce the menu tree size by setting MENUS::FULL MENUS to DISABLED. The reduced list of menus is identified in Figure B.1 by the "▯" in the right side of the menu box.

The parameter MENU DELAY in MENUS sets the delay, or response time of the LCD when any pushbuttons is pressed. The default is set to 30 and can also be adjusted with the MENU SPEED parameter in ConfigEd under the PARAMETERS software block. A higher value increases the menu delay time. The setting is unavailable in SAM.

Enter MENU LEVEL by pressing the M key from the default start up display. Scroll through the menus within the main level by pressing the ▲ or ▼ key. Press the M key again to enter any of the menus within the main MENU LEVEL.

Upon scrolling to the desired sub-menu item, use the M key again to choose the parameter or option sub-menu, then use the ▲ and ▼ keys once again to modify the value or option, or select another sub-menu. When finished, use the E key to back out of the menu structure, first to the sub-menu, then the main menus until you reach the starting screen, MENU LEVEL.

> EXAMPLE. From the default start up menu, press M to enter MENU LEVEL; press the ▼ key once to advance to the SETUP PARAMETERS menu item. Press the M key again to enter the SETUP PARAMETERS sub-menu. Use the ▲ or ▼ key to scroll through RAMPS, AUX I/O, etc.

## DEFAULT SETTINGS (4-BUTTON RESET)

All 590SP *LINK* drives are shipped with a common set of default parameter settings designed for standard speed control of a DC motor. These default settings are listed in Appendecies C, D, E and F. They are stored in the drive's EPROM, a memory location inaccessible to the user. As such, you can reload, but cannot alter the default settings.

If necessary, you can reload default settings by performing a 4-button reset. A 4-button reset is useful when you have incorrectly changed many parameter settings and wish to quickly reload default settings rather than individually change each parameter back to its original value.

To reset the drive's parameters, hold down all four MMI buttons (M, E, ▲, ▼) while reapplying control power. This downloads the default settings from the drive's EPROM memory to the drive's operating memory location (RAM). Any parameter values previously saved in EEPROM using PARAMETER SAVE remain unchanged.

NOTE. The default settings overwrite the EEPROM settings only when performing a PARAMETER SAVE subsequent to a 4-button reset.

**Caution**

Be certain to save the default drive parameters to EEPROM with PARAMETER SAVE *immediately after* performing a 4-button reset. Otherwise, any incorrect parameters settings will reload to RAM when control power is cycled.

Refer to Chapter 4 for details on saving parameters, drive memory locations and documenting configurations.

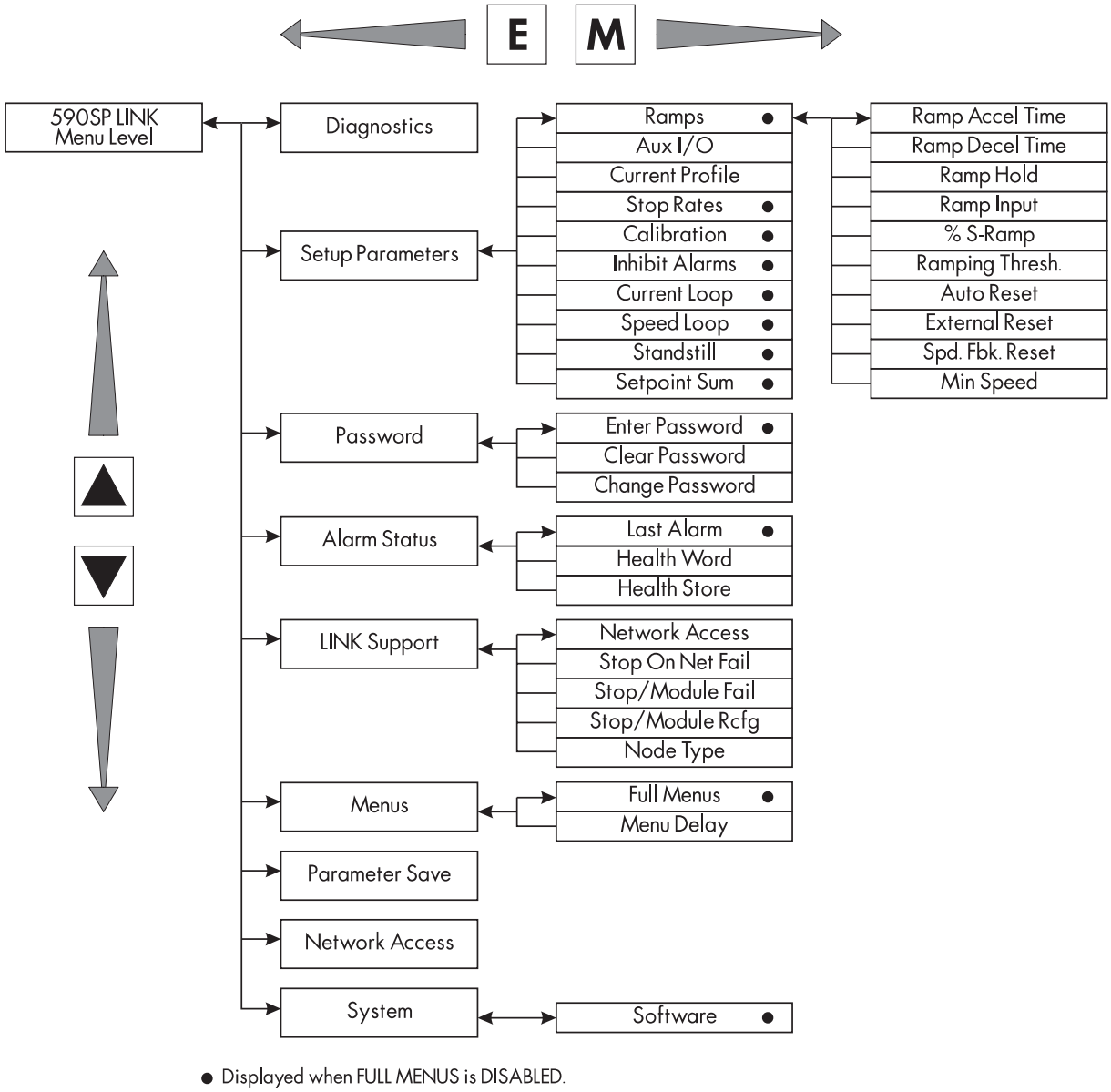



Figure B.1 - Basic Menu Tree

# Appendix C *LINK* SOFTWARE BLOCK DIAGRAMS

The 590SP *LINK* drive parameters are organized in the ConfigEd software block diagram into 13 software blocks. Each software block is dedicated to a specific aspect of drive control. The sections in this appendix discuss each of these 13 software blocks. They include a block diagram showing the software block's I/O slots and their corresponding MMI parameters. They also contain illustrations, demonstrating the steps required to access the parameter through the MMI, and tables, describing each parameter and its MMI equivalent. Where relevant, a section will include timing diagrams.

The fold out drawing at the back of this section shows the drive's complete ConfigEd software block diagram. A diagram of the MMI menu tree appears in Appendix B and a complete parameter listing, sorted alphabetically, appears in Appendix D (grouped by MMI menu) and Appendix E (arranged by ConfigEd software block title).

The software block diagram of the 590SP *LINK* is broken down by control function, whereas the MMI menu structure is organized on the basis of keypad function with each menu dedicated to a different MMI function. In most cases, the ConfigEd software blocks have an MMI menu or sub-menu equivalent. For instance, the ConfigEd software block RAMPS corresponds directly to the MMI sub-menu SETUP PARAMETER:: RAMPS.

> NOTE. Some drive parameters can be set only through ConfigEd, and cannot be accessed through the MMI, or through SAM.
>
> NOTE. For clarity, all references to MMI parameters, menus or sub-menus appear in this manual in capitalized TIMES NEW ROMAN type. Any reference to a function, feature or parameter associated with or accessible through ConfigEd or SAM appears in this manual in capitalized COURIER type.

This list shows the *LINK* software block equivalent of each MMI menu or sub-menu.

| ConfigEd Software Block | MMI Menu or Sub-menu |
|---|---|
| *LINK* outputs of *all* software blocks | DIAGNOSTICS |
| CLAMPS | (in MMI SETUP PARAMETERS:: CURRENT LOOP) |
| CURRENT LOOP | SETUP PARAMETERS:: CURRENT LOOP |
| none (within CURRENT LOOP) | SETUP PARAMETERS:: CURRENT PROFILE |
| * none (within CURRENT LOOP) | SETUP PARAMETERS:: INVERSE TIME |
| none | SETUP PARAMETERS:: AUX I/O |
| EXTERNAL ENABLES | (in MMI SETUP PARAMETERS:: CURRENT LOOP) |
| FEEDBACK | SETUP PARAMETERS:: CALIBRATION |
| HEALTH | ALARM STATUS |
| HEALTH | SETUP PARAMETERS:: INHIBIT ALARMS |
| NETWORK ACCESS | NETWORK ACCESS |
| PARAMETERS | *LINK* SUPPORT |
| PARAMETERS | MENUS |
| PARAMETERS (EEPROM parameter save) | PARAMETER SAVE |
| * PEEK | SYSTEM:: PEEK |
| RAMPS | SETUP PARAMETERS:: RAMPS |
| SPEED LOOP | SETUP PARAMETERS:: SPEED LOOP |
| STANDSTILL | SETUP PARAMETERS:: STANDSTILL |
| START-STOP | SETUP PARAMETERS:: STOP RATES |
| SUMMING | SETUP PARAMETERS:: SETPOINT SUM |
| none | PASSWORD |

* These menus appear only in the restricted password mode.

## CLAMPS

NOTE. The CLAMPS software block parameters are located in the CURRENT LOOP MMI sub-menu.

The CLAMPS software block limits the positive and negative current demand of CURRENT LOOP.

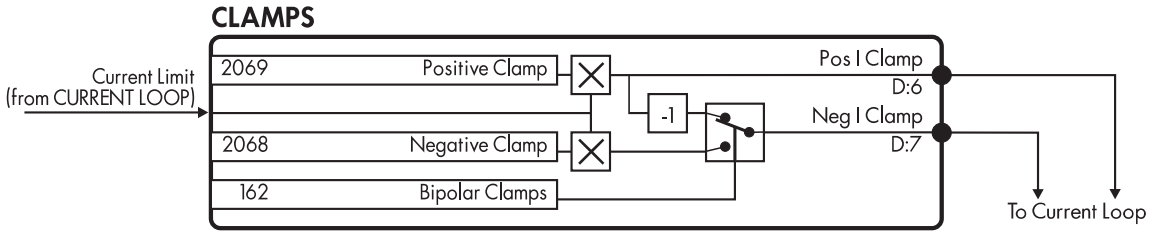



Figure C.1 - CLAMPS Software Block

CURRENT LIMIT (from CURRENT LOOP) symmetrically scales the positive and negative clamp parameters. By default, BIPOLAR CLAMPS is DISABLED and the clamps are symmetrical. Only POSITIVE CLAMP sets the clamp limits. When BIPOLAR CLAMPS is ENABLED, the clamps are asymmetrical so that POSITIVE CLAMP sets the maximum positive current demand and NEGATIVE CLAMP sets the maximum negative current demand.

**Caution**

Always set POSITIVE CLAMP algebraically higher than NEGATIVE CLAMP. Otherwise, NEGATIVE CLAMP can be inadvertently set to a positive value which can cause a runaway condition.

CLAMPS acts independently of the other drive current limit parameters. A lower current limit parameter value will override a CLAMPS setting.

### Input Parameters

| Slot | Name | Description | MMI/SAM Range | *LINK* Range | Default |
|---|---|---|---|---|---|
| 2069 | POSITIVE CLAMP | Positive current clamp when BIPOLAR CLAMPS is ENABLED. Clamps both the positive and negative current demand when BIPOLAR CLAMPS is DISABLED. | ±100.00% | ±100.00% | 100.00% |
| 2068 | NEGATIVE CLAMP | Negative current clamp when BIPOLAR CLAMPS is ENABLED. Has no affect when BIPOLAR CLAMPS is DISABLED. | ±100.00% | ±100.00% | -100.00% |
| 162 | BIPOLAR CLAMPS | Selects between bipolar and unipolar clamps. DISABLED: POSITIVE CLAMP symmetrically clamps current demand. ENABLED: POSITIVE CLAMP & NEGATIVE CLAMP work independently. | ENABLED/DISABLED | 1=ENABLED 0=DISABLED | DISABLED |

## CURRENT LOOP

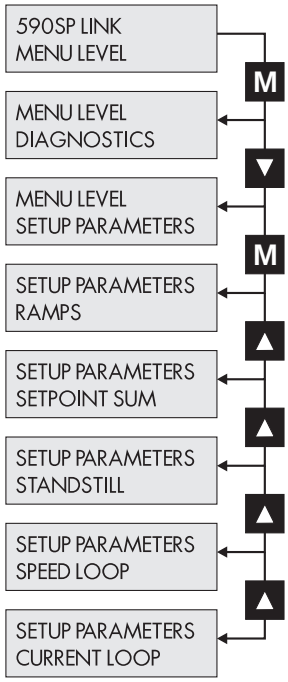
The CURRENT LOOP software block calculates the signal that produces the firing phase angle for the drive's thyristors. The current demand is supplied from either the SPEED LOOP software block in speed control applications or, externally, for direct torque control of the motor. Four different clamps limit the current demand: positive and negative clamps, current profile and inverse time overload.

### Inputs and Outputs

The inputs are:

- SPEED LOOP OUTPUT from SPEED LOOP;
- current feedback sensed from the AC current transformer;
- the positive and negative current limit clamps from the CLAMPS;
- AUX CURRENT DEMAND for adding in an auxiliary current demand;
- QUENCH, an enable/disable input; and
- EXTERNAL CURRENT DEMAND, which allows the user to provide a direct current demand for torque control.

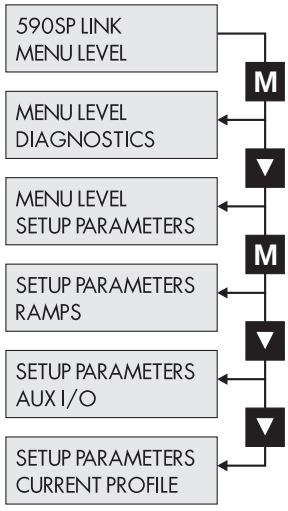
The main output is the motor ARMATURE CURRENT. It can be monitored as an analog voltage on control board terminal A6. Terminal A6 is usually reserved for a meter display. Armature current is also available as a test point (see Figure 5.20). ARMATURE CURRENT can be either unipolar or bipolar depending on the setting of IA UNI-BIPOLAR. In general, this parameter is set to bipolar for regnerative drives and unipolar for nonregenerative models. GLOBAL QUENCH indicates whether the current loop is enabled and producing armature current.




### Description

When running in armature voltage feedback, the drive uses the motor back EMF as speed feedback. Back EMF equals armature volts minus armature current losses. The amount of armature current loss compensation is set by IR COMPENSATION.

EXTERNAL ENABLES supplies the input current demand to CURRENT LOOP. The default signal is for speed control and SPEED LOOP OUTPUT is supplied. For current control, set CURRENT DEMAND ENABLE to TRUE and connect the current demand directly to EXTERNAL CURRENT DEMAND.




> NOTE. The SAM parameter and MMI diagnostic CURRENT DEMAND corresponds to the *LINK* input EXTERNAL CURRENT DEMAND when CURRENT DEMAND ENABLE is TRUE, and corresponds to SPEED LOOP OUTPUT when CURRENT DEMAND ENABLE is FALSE.

AUX CURRENT DEMAND is available for adding a current trim signal.

Four separate clamps — current profile, positive clamp, negative clamp, and inverse time overload — limit the current demand. They function independently. The lowest setting clamps the current demand during normal control.

> NOTE. During a program stop, PROGRAM STOP I LIMIT overrides *all* current limit settings.

CURRENT LIMIT symmetrically scales the parameters POSITIVE CLAMP and NEGATIVE CLAMP. Both POSITIVE CLAMP and NEGATIVE CLAMP are located in the CLAMPS software block.

Current Profile scales the current limit for applications where motors have a reduced ability to commutate the armature current at low field currents. Normally this is required when using field weakening.

> NOTE. The MMI has a dedicated sub-menu, SETUP PARAMETERS:: CURRENT PROFILE for the current profiling parameters.

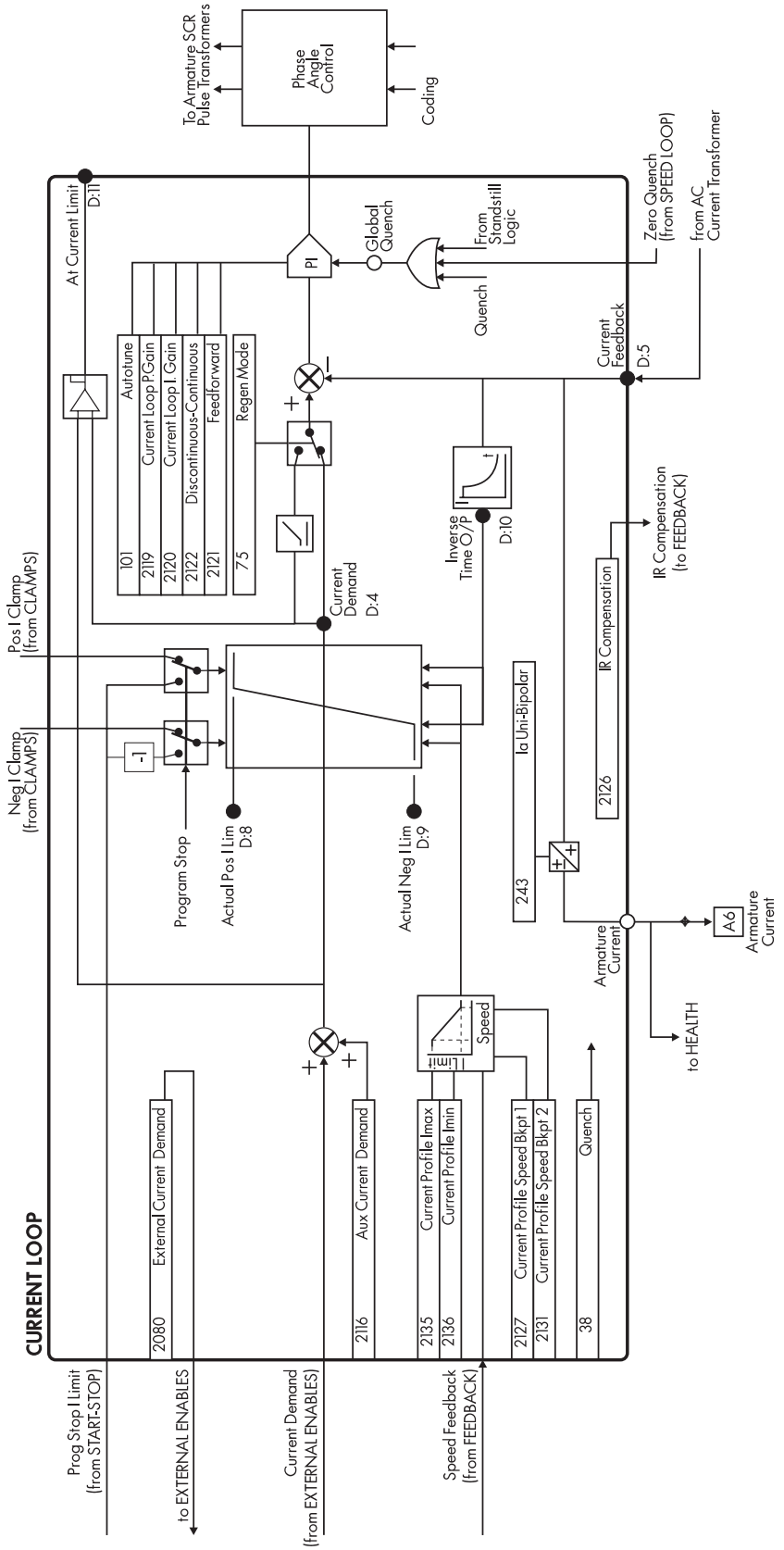



Figure C.2 - CURRENT LOOP Software Block

INVERSE TIME sets a time dependent threshold for overload current capability. The drive can produce current over this amount based on an inverse time curve. If set for 110%, the drive can produce 200% full load current for 10 seconds, drop to 150% for 60 seconds, then diminish to 110% rated current. The drive will then run at 110% full load current indefinitely.

**Caution**

Setting INVERSE TIME beyond its default setting of 110% can cause motor and equipment damage and possible injury to personnel. Do not change this parameter without first consulting with the Eurotherm Drives service department.

REGEN MODE changes a regenerative drive to non-regenerative (2-quad mode) control by disabling the reverse thyristor bridge. This prevents regenerative drive operation and the ability to run the motor in reverse.

The AUTOTUNE function automatically tunes the current loop to a specific motor for optimum response. It sets the PROPORTIONAL GAIN, INTEGRAL GAIN and DISCONTINUOUS parameters (refer to the AUTOTUNE procedure in Chapter 4).

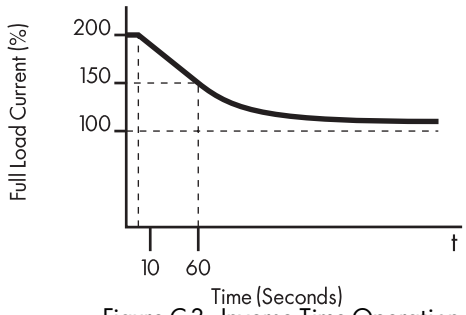


Figure C.3 - Inverse Time Operation

Four current profiling parameters allow the user to customize the current demand over a defined speed range. When SPEED FEEDBACK exceeds CURRENT PROFILE SPEED BKPT 1, the current profile begins scaling the current demand as set by CURRENT PROFILE I MAX. As SPEED FEEDBACK increases toward CURRENT PROFILE SPEED BKPT 2, the current demand drops to CURRENT PROFILE I MIN. The current demand remains at this point if speed exceeds CURRENT PROFILE SPEED BKPT 2.

**Input Parameters**

| Slot | Name | Description | MMI/SAM Range | *LINK* Range | Default |
|---|---|---|---|---|---|
| 101 | AUTOTUNE | Toggles the AUTOTUNE procedure on and off. | ON/OFF | 1=ON, 0=OFF | OFF |
| 2116 | AUX CURRENT DEMAND | Additional current demand input. Corresponds to the ADDITIONAL DEM in the MMI. | ±200.00% | ±100.00% | 0.00% |
| 2081 | CURRENT LIMIT | Symmetrically limits the current demand. | 0.00 to 200.00% | 0.00 to 100.00% | 100.00% |
| 75 | REGEN MODE | When disabled, sets the drive for non-regenerative, 2-quad mode operation. | ENABLED/DISABLED | 1=ENABLED (regen) 0=DISABLED (non-regen) | ENABLED |
| 2120 | CURRENT LOOP I GAIN | Integral gain for armature current PI loop. | 0.00 to 200.00 | 0.00 to 100.00% | 3.50 |
| 2119 | CURRENT LOOP P GAIN | Proportional gain for armature current PI loop. | 0.00 to 200.00 | 0.00 to 100.00% | 45.00 |
| 2135 | CURRENT PROFILE I MAX | Current limit value at or below SPEED BKPT 1 IMAX BRK 1 (SPD1) in CURRENT PROFILE MMI sub-menu | 0.00 to 200.00% | 0 to 100.00% | 200.00% |
| 2136 | CURRENT PROFILE I MIN | Current limit value between SPEED BKPT 1 and SPEED BKPT 2 (IMAX BRK 2 (SPD2) in CURRENT PROFILE MMI sub-menu). | 0.00 to 200.00% | 0 to 100.00% | 200.00% |
| 2127 | CURRENT PROFILE SPEED BKPT 1 | Speed breakpoint 1 where current profiling begins. SPD BRK 1 (LOW) in CURRENT PROFILE MMI sub-menu. | 0.00 to 100.00% | 0 to 100.00% | 100.00% |
| 2131 | CURRENT PROFILE SPEED BKPT 2 | Speed breakpoint 2 where current profiling begins. SPD BRK 2 (HIGH) in CURRENT PROFILE MMI sub-menu. | 0.00 to 100.00% | 0 to 100.00% | 100.00% |
| 2122 | DISCONTINUOUS-CONTINUOUS | Sets the boundary between the discontinuous and continuous regions of the current signal. | 0.00 to 200.00% | 0.00 to 100.00% | 12.00% |
| # 2080 | EXTERNAL CURRENT DEMAND | External current demand input. Enabled only when CURRENT DEMAND ENABLE input is TRUE. | ±200.00% | ±100.00% | 0.00% |

### Input Parameters

| | Slot | Name | Description | MMI/SAM Range | *LINK* Range | Default |
|---|---|---|---|---|---|---|
| * | 2121 | FEEDFORWARD | Feed forward term used for open loop current control. Indicates whether a successful AUTOTUNE has been performed. 2.00= no AUTOTUNE, 9.22 = drive has been AUTOTUNE-ed. | 0.10 to 50.00 | 0.00 to 100.00% | 2.00 |
| | 243 | IA UNI-BIPOLAR | Changes CURRENT FEEDBACK output from bipolar to unipolar. Corresponds to MMI parameter ARMATURE I in CALIBRATION sub-menu. | Unipolar=OFF<br>Bipolar=ON | 1=ON (bipolar)<br>0=OFF (unipolar) | bipolar |
| * | 2138 | INVERSE TIME | Sets the amount of current the drive can produce indefinitely on a time-inverse overload current capability curve from 200% full load current. | ±200.00% | ±100.00% | +110.00% |
| | 2126 | IR COMP | Offsets the motor IR drop to improve speed regulation when running in armature voltage feedback. Locatedin the CALIBRATION sub-menu in the MMI. | 0.00 to 100.00% | 0 to 100.00% | 0.00% |
| # | 38 | QUENCH | Resets the drive's speed and current loops to zero. | Quenched=current OFF<br>Unquenched=current ON | 1=quenched (OFF)<br>0=unuenched (ON) | enabled<br>(unquenched) |

# These parameters cannot be changed through the MMI.

* MMI parameter available only in the password protected mode.

### Output Parameters

| *LINK* Name | Description | SAM Range | *LINK* Range | Diagnostic |
|---|---|---|---|---|
| GLOBAL QUENCH | AND-ed function output of ConfigEd QUENCH input A5, enable, drive healthy and MMI parameter AUX ENABLE. | Quenched=current OFF<br>Unquenched=current ON | 1=current OFF<br>0=current ON | DRIVE ENABLE |
| ARMATURE CURRENT | Drive armature current feedback. | ±100% = ±200% Current Fbk if IA UNI-BIPOLAR set to bipolar;<br>0 to 100% = 0 to 200% Current Fbk if IA UNI-BIPOLAR set to unipolar. | ±100.00% (bipolar)<br>or<br>0 to 100% (unipolar) | CURRENT FEEDBACK |

## EXTERNAL ENABLES

EXTERNAL ENABLES has only one input, CURRENT DEMAND ENABLE, which switches the current demand input to CURRENT LOOP from SPEED LOOP OUTPUT to EXTERNAL CURRENT DEMAND. Set CURRENT DEMAND ENABLE to ENABLE to select EXTERNAL CURRENT DEMAND when running in torque control. Set it to DISABLE when running in speed control.

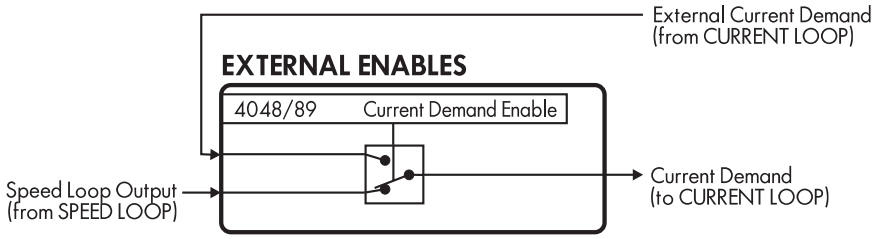



Figure C.4 - EXTERNAL ENABLES Software Block

NOTE. When the CURRENT DEMAND ENABLE slot is enabled, the drive tranfers control of Current Demand to the EXTERNAL CURRENT DEMAND input (slot 2080) only after the *LINK* network updates the data at slot 2080. Until then, the SPEED LOOP OUTPUT writes to the Current Demand.

C

### Input Parameters

| Slot | Name | Description | MMI/SAM Range | *LINK* Range | Default |
|---|---|---|---|---|---|
| 89/4048 | CURRENT DEMAND ENABLE | Switches the current demand of CURRENT LOOP from SPEED LOOP OUTPUT to EXTERNAL CURRENT DEMAND. Equivalent to I DMD. ISOLATE MMI sub-menu CURRENT LOOP. | external/internal | 1=external (enable)<br>0=internal (disable) | internal |

## FEEDBACK

The FEEDBACK software block selects and calibrates the motor speed feedback. Refer to the Speed Calibration section in Chapter 4 for instructions on adjusting these parameters.

NOTE. The FEEDBACK parameters can be found in the MMI under the SETUP PARAMETERS:: CALIBRATION sub-menu.

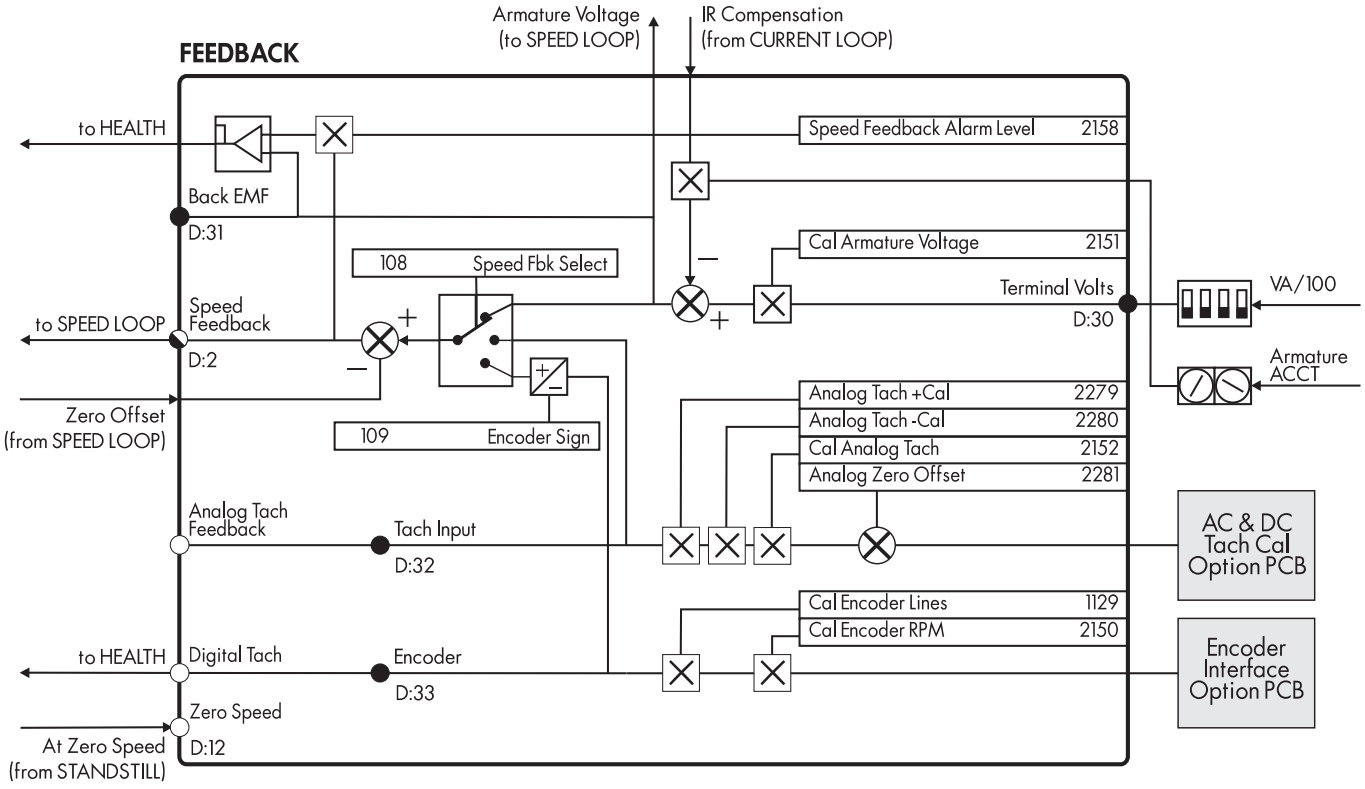



Figure C.5 - FEEDBACK Software Block

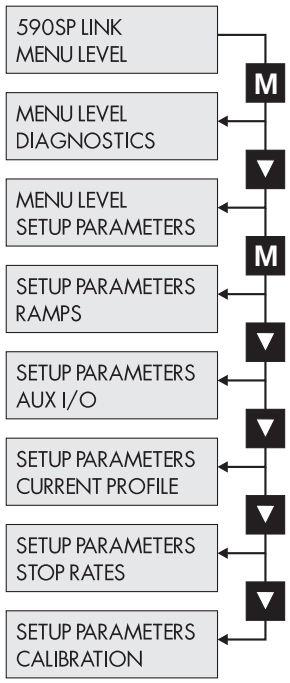
### Description

SPEED FEEDBACK SELECT determines the speed feedback source. The default, ARMATURE VOLTAGE FEEDBACK, uses internal circuitry to derive speed feedback. Select ENCODER when using either a Microtach or a wire-ended electrical encoder for speed feedback. Select ANALOG TACH when using an AC or DC tachometer generator to measure motor speed.

CAL ANALOG TACH, ANALOG TACH +CAL, ANALOG TACH -CAL and ANALOG ZERO OFFSET calibrate analog AC and DC tachometer generators. ENCODER RPM and ENCODER LINES scale electrical encoders and Microtachs. CAL ARMATURE VOLTAGE tunes the armature volt calibration switch settings on the drive control board.

The feature ANALOG TACH AVERAGING averages the current tachometer generator signal with the previous average to generate a more stable feedback signal. When enabled, it improves steady state speed stability but may degrade dynamic speed response of the drive. To enable this feature, you must use ConfigEd and download it to the drive with the INSTALL command. It can be set through the MMI in the restricted password mode. It cannot be set in SAM.

The drive compares the BACK EMF with the scaled SPEED FEEDBACK. If the scaled SPEED FEEDBACK is greater than the SPEED FEEDBACK ALARM LEVEL, the drive triggers a SPEED FEEDBACK ALARM.



### Input Parameters

| | Slot | Input Parameter | Description | MMI/SAM Range | *LINK* Range | Default |
|---|---|---|---|---|---|---|
| * | --- | ANALOG TACH AVERAGING | Averages tach feedback signal to produce a more stable feedback signal. | ENABLE/DISABLE | --- | DISABLED |
| | 2279 | ANALOG TACH +CAL | Scales the motor speed feedback curve for non-linearity at high forward speed. | 0.9800 to 1.1000 | 89.00 to 100.00% | 1.0000 |
| | 2280 | ANALOG TACH -CAL | Scales the motor speed feedback curve for non-linearity at high reverse speed. | 0.9800 to 1.1000 | 89.00 to 100.00% | 1.0000 |
| | 2281 | ANALOG ZERO OFFSET | Nulls out nonzero tachometer generator feedback voltage at zero speed. | ±5.000% | ±5.000% | 0.2000% |
| | 2152 | CAL ANALOG TACH | Scales the motor speed to read 100% at the actual required speed. | 0.9800 to 1.1000 | 89.00 to 100.00% | 1.0000 |
| | 2151 | CAL ARMATURE VOLTAGE | Scales the armature volts to read 100% at the base motor armature voltage. Fine tunes the armature voltage switch scaling. | 0.9800 to 1.1000 | 89.00 to 100.00% | 1.0000 |
| | 1129 | CAL ENCODER LINES | Set to the encoder's lines per revolution. | 10 to 5000 lines | 0 to 5000 ordinal | 1000 lines |
| | 2150 | CAL ENCODER RPM | Set to the motor's maximum speed. For use with electrical encoder or Microtach feedback. | 0 to 6000 RPM | 0 to 32,767 ordinal | 1000 RPM |
| | 109 | ENCODER SIGN | Allows the speed feedback signal to be reversed. The MMI equivalent for this parameter is located in the SPEED LOOP sub-menu. | POSITIVE/NEGATIVE | 1=POSITIVE 0=NEGATIVE | POSITIVE |
| | 2158 | SPEED FEEDBACK ALARM LEVEL | The threshold that the difference between speed feedback and back EMF voltage must exceed before the speed feedback alarm activates. | 0.0 to 100.00% | 0.00 to 100.00% | 50.0% |
| | 108 | SPEED FEEDBACK SELECT | Selects the source of the speed feedback signal. The MMI equivalent for this parameter is located in the SPEED LOOP sub-menu. | 0=ARM VOLTS FBK 1=ANALOG TACH 2=ENCODER | 0 to 2 ordinal | ARM VOLTS FBK |

* MMI parameter available only in the password protected mode.

### Output Parameters

| *LINK* Name | Description | SAM Range | *LINK* Range | MMI Diagnostic |
|---|---|---|---|---|
| ANALOG TACH FEEDBACK | Scaled analog tachometer generator feedback | ±120.00% | ±100.00% | TACH INPUT |
| DIGITAL SPEED FEEDBACK | Digital encoder feedback. | ±6000 rpm | ±100.00% | ENCODER |
| SPEED FEEDBACK | Scaled speed feedback. | ±120% | ±100.00% | SPEED FEEDBACK |
| ZERO SPEED | Logic signal indicating whether speed feedback is greater than the STANDSTILL THRESHOLD. | TRUE/FALSE | 1/0 | AT ZERO SPEED |

C

## HEALTH

The HEALTH software block contains latched and unlatched bits indicating the health status of the drive, a drive ready signal and registers used for decoding specific drive alarm messages. You can also inhibit several of the 14 continuously monitored drive alarms so that drive operation is not interrupted if the alarm trips.

NOTE. The HEALTH output parameters are found in the ALARM STATUS menu of the MMI. You can inhibit alarms in the MMI under the SETUP PARAMETERS:: INHIBIT ALARMS sub-menu.

**WARNING**

Do not inhibit alarms if there is any danger to personnel or equipment.

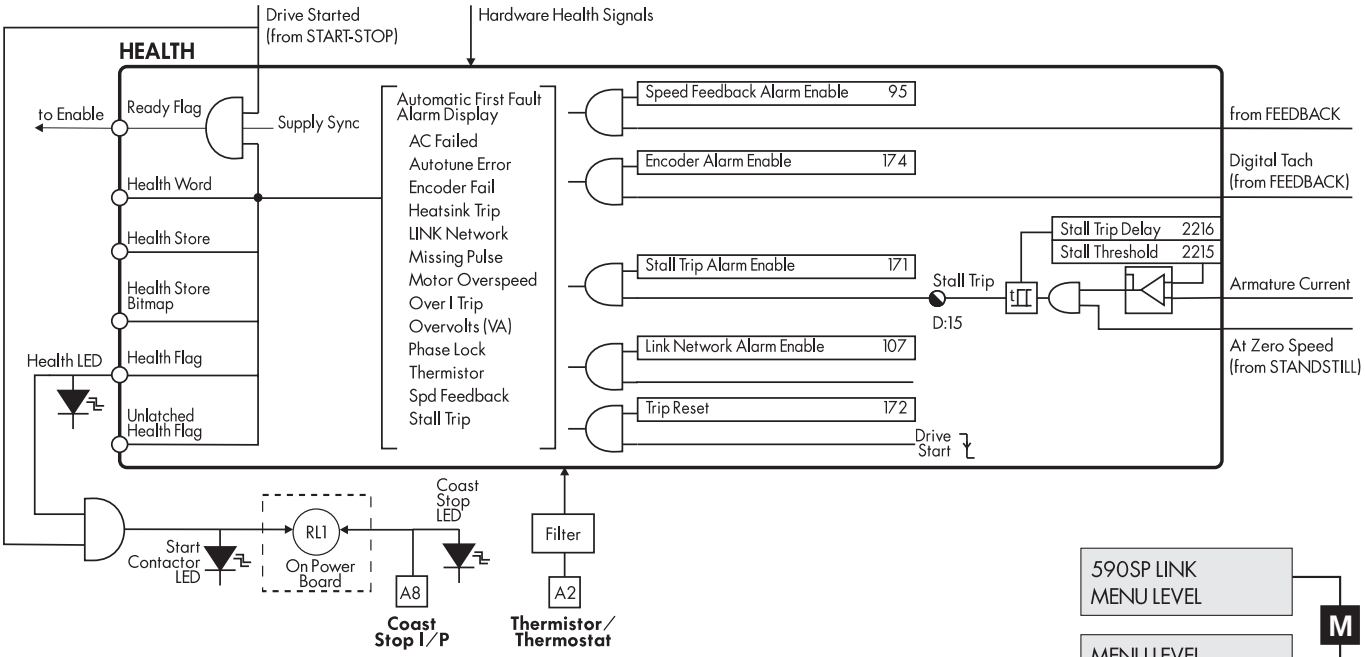
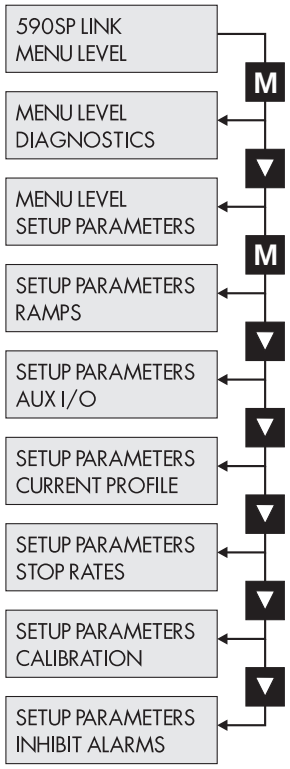



Figure C.6 - HEALTH Software Block




### Description

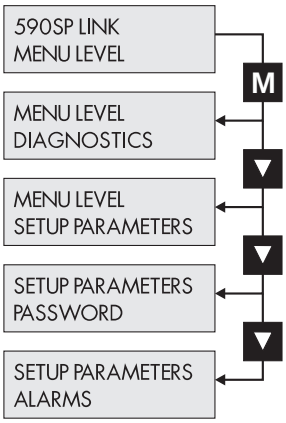
STALL TRIP DELAY and STALL THRESHOLD set the time delay and the stall current alarm trip level respectively. The STALL TRIP ALARM trips when STALL TRIP ALARM is enabled and the scaled armature current exceeds the STALL THRESHOLD for a time period exceeding the STALL TRIP DELAY.

Setting *LINK* NETWORK to inhibit prevents the drive from indicating a *LINK* network fault. This has the same effect as setting either *LINK* FAIL STOP SELECT, MODULE FAILED STOP SELECT, or MODULE RCFG STOP SELECT in the PARAMETERS block to IGNORE. The drive continues to run after a *LINK* network error occurs even though the fiber optic network cannot transmit or receive data. The drive will transmit the fault over the LINK network if its transmit fiber optic connection remains unbroken.

**Caution**

The drive will not respond to system controls if a *LINK* network failure occurs while *LINK* NETWORK is inhibited.

DRIVE READY indicates that the drive is ready to conduct armature current. This output goes TRUE after the following sequence: the DRIVE START input goes TRUE, the main contactor closes and a time delay elapses allowing the drive circuitry time to synchronize to the main supply. DRIVE READY is typically used to control mechanical brakes.



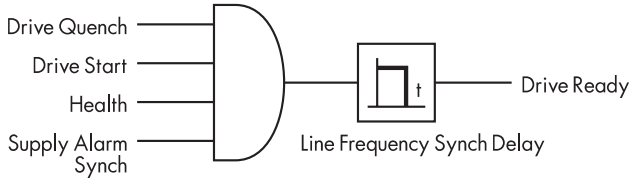




Figure C.7 - READY Flag Logic

HEALTH FLAG and UNLATCHED HEALTH FLAG indicate the health status of the drive and are reset by the rising or falling edge of the DRIVE START signal.

TRIP RESET allows the drive to be restarted after a fault occurs. When TRUE, faults are cleared any time DRIVE START goes FALSE. The drive trips out when fault occurs again. When FALSE, the faults are latched permanently and HEALTH FLAG and UNLATCHED HEALTH FLAG remain FALSE regardless of the state of DRIVE START. TRIP RESET must be set TRUE to reset the health flags and to restart the drive.

Each alarm is assigned a number, 1 through 16. HEALTH STORE outputs the number of the first drive fault recorded since the drive was last started. If multiple alarms occur, HEALTH STORE indicates the fault which trips out the drive. GET HEALTH STORE in SAM, and LAST ALARM in the ALARM STATUS MMI menu, annunciates the alarm. HEALTH STORE BITMAP provides a hexadecimal code for this fault. HEALTH WORD is the hexadecimal sum of all faults occurring since control power was last applied to the drive. When the fault is cleared and the drive is restarted, HEALTH STORE resets to 0 (OK in SAM). LAST ALARM in the MMI annunciates the alarm until the control power is cycled, or when the ▼ key is hit. Refer to Chapter 5 for a discussion on the alarm process.

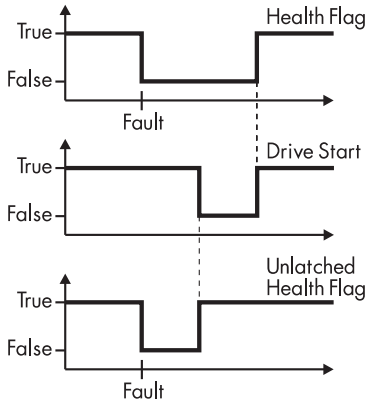



Figure C.8 - HEALTH FLAG Logic

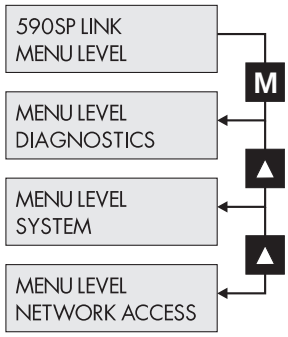
**Input Parameters**

| Slot | Name | Description | MMI/SAM Range | *LINK* Range | Default |
|---|---|---|---|---|---|
| 174 | ENCODER ALARM ENABLE | Enables the encoder option board alarm. | ENABLED/INHIBITED | 1=enable 0=inhibit | ENABLED |
| 107 | *LINK* NETWORK ALARM ENABLE | Enables the *LINK* NETWORK alarm. | ENABLED/INHIBITED | 1=enable 0=inhibit | ENABLED |
| 95 | SPEED FEEDBACK ALARM ENABLE | Enables the speed feedback alarm. | ENABLED/INHIBITED | 1=enable 0=inhibit | ENABLED |
| 171 | STALL TRIP ALARM ENABLE | Enables the stall trip alarm. | ENABLED/INHIBITED | 1=enable 0=inhibit | INHIBITED |
| 2216 | STALL TRIP DELAY | Stall Trip Alarm delay time. The MMI equivalent for this parameter is located in the CALIBRATION sub-menu. | 0.1 to 600.0 Secs | 0.017 to 100.00% | 10.0 Secs |
| 2215 | STALL THRESHOLD | Stall current feedback threshold. The MMI equivalent for this parameter is located in the CALIBRATION sub-menu. | 0.00 to 200.00% | 0.00 to 100.00% | 95.00% |
| 172 | TRIP RESET | When FALSE, faults are latched permanently and HEALTH FLAG and UNLATCHED HEALTH FLAG remains OFF. Set TRIP RESET true to clear faults. When TRUE, faults are cleared whenever drive DRIVE START is toggled FALSE. | TRUE/FALSE | 1=enable | TRUE 0=inhibit |

**Output Parameters**

| *LINK* Name | Description | SAM Range | *LINK* Range | Diagnostic |
|---|---|---|---|---|
| HEALTH FLAG | Initially TRUE; goes FALSE when the drive detects a fault. Resets on the *rising* edge of DRIVE START. | 0x1 = HEALTHY<br>0x0 = UNHEALTHY | 1 = HEALTHY<br>0 = UNHEALTHY | none |
| HEALTH STORE | 16 bit word which encodes the first fault the drive detects since the *last* start command. | Annuciated alarm (text) | 1 to 16<br>ORDINAL | ALARM STATUS::<br>LAST ALARM |
| HEALTH STORE BITMAP | Hexadecimal value of the alarm causing the faults. The assignments are listed in Chapter 5. | see Chapter 5 | see Chapter 5 | ALARM STATUS::<br>HEALTH STORE |
| HEALTH WORD BITMAP | Register holding the hexadecimal sum of all faults occurring since the drive was last started. As an alarm is cleared, HEALTH WORD reflects the new condition of all remaining alarms. (Refer to Chapter 5 for an example of this feature.) | see Chapter 5 | see Chapter 5 | ALARM STATUS::<br>HEALTH WORD |
| READY FLAG | Indicates drive is started, healthy and ready to produce current. | READY/NOT READY | 1 = READY<br>0 = NOT READY | none |
| UNLATCHED HEALTH | Initially TRUE; goes FALSE when the drive detects a fault. Resets on the *falling* edge of DRIVE START. | 0x1 = HEALTHY<br>0x0 = UNHEALTHY | 1 = HEALTHY<br>0 = UNHEALTHY | none |
| STALL TRIP | Indicates a stall trip conidition. TRUE when current feedback exceeds STALL THRESHOLD while drive is at zero speed for a period longer than STALL TRIP DELAY. Active only when STALL TRIP ALARM ENABLE is TRUE. | NORMAL/TRIPPED | 0 = NORMAL<br>1 = TRIPPED | *** ALARM ***<br>STALL TRIPPED |

## NETWORK ACCESS




NETWORK ACCESS allows the user to access *LINK* parameters and signals on the *LINK* network through the MMI. Value and logic signals are configured from source parameters to the block's input slots, or configured from NETWORK ACCESS output slots to destination parameters. The drive has 10 slots for logic signals and 10 slots for value signals.

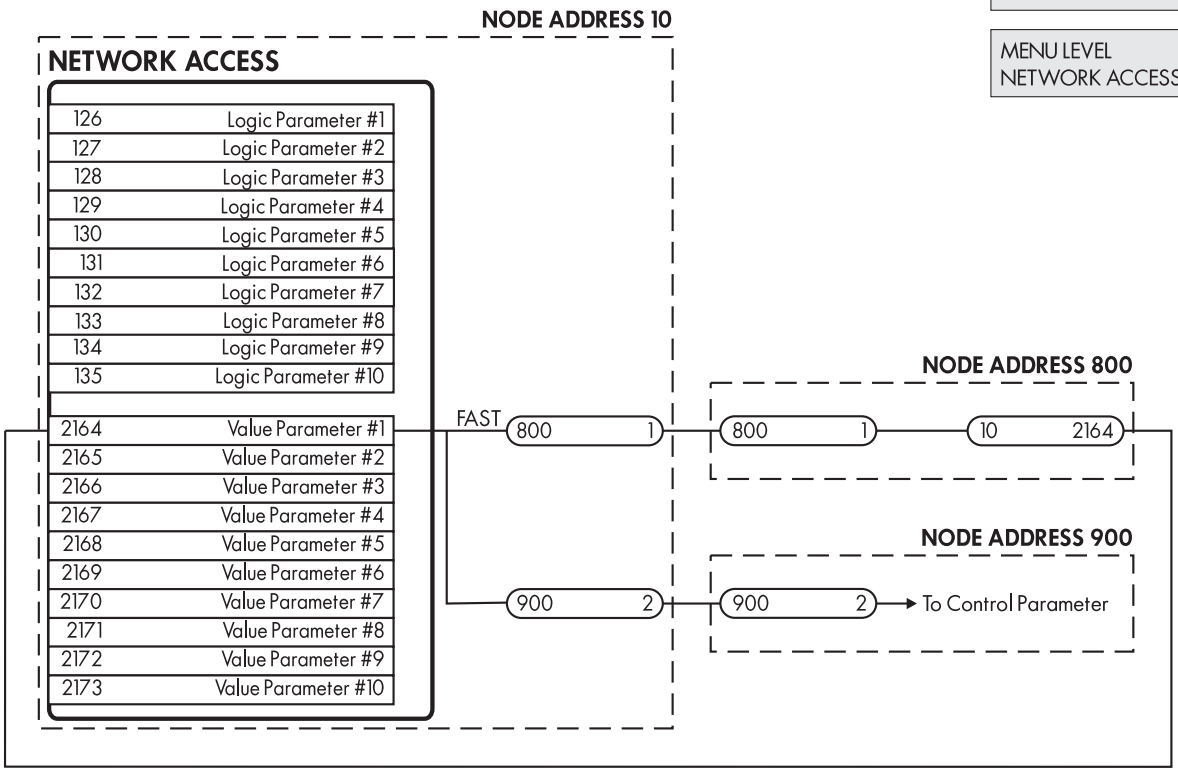



Figure C.9 - Configuring a *LINK* Node Parameter Using NETWORK ACCESS

To use the MMI to display a *LINK* network signal, connect the source to an appropriate logic or value slot in NETWORK ACCESS.

To use the MMI to change a parameter on the *LINK* network, connect the NETWORK ACCESS parameter to the desired address and slot. The MMI will not display the setting without *LINK*ing the output to the input as shown in Figure C.9. Set the output connection type to *fast* for a responsive MMI update.

Although you may set and display external *LINK* parameters from this menu, the MMI menu text cannot be changed.

### Input Parameters

| Slot | Name | Description | MMI/SAM Range | *LINK Range* | Default |
|---|---|---|---|---|---|
| 126 | LOGIC PARAMETER #1 | Input for displaying a *LINK* source logic parameter. | TRUE/FALSE | 1/0 | FALSE |
| 127 | LOGIC PARAMETER #2 | Input for displaying a *LINK* source logic parameter. | TRUE/FALSE | 1/0 | FALSE |
| 128 | LOGIC PARAMETER #3 | Input for displaying a *LINK* source logic parameter. | TRUE/FALSE | 1/0 | FALSE |
| 129 | LOGIC PARAMETER #4 | Input for displaying a *LINK* source logic parameter. | TRUE/FALSE | 1/0 | FALSE |
| 130 | LOGIC PARAMETER #5 | Input for displaying a *LINK* source logic parameter. | TRUE/FALSE | 1/0 | FALSE |
| 131 | LOGIC PARAMETER #6 | Input for displaying a *LINK* source logic parameter. | TRUE/FALSE | 1/0 | FALSE |
| 132 | LOGIC PARAMETER #7 | Input for displaying a *LINK* source logic parameter. | TRUE/FALSE | 1/0 | FALSE |

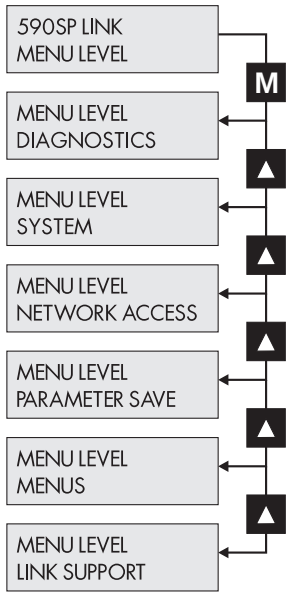
**Input Parameters**

| Slot | Name | Description | MMI/SAM Range | *LINK* Range | Default |
|---|---|---|---|---|---|
| 133 | LOGIC PARAMETER #8 | Input for displaying a *LINK* source logic parameter. | TRUE/FALSE | 1/0 | FALSE |
| 134 | LOGIC PARAMETER #9 | Input for displaying a *LINK* source logic parameter. | TRUE/FALSE | 1/0 | FALSE |
| 135 | LOGIC PARAMETER #10 | Input for displaying a *LINK* source logic parameter. | TRUE/FALSE | 1/0 | FALSE |
| 2164 | VALUE PARAMETER #1 | Input for displaying a *LINK* source value parameter. | ±100.00% | ±100.00% | 0.00% |
| 2165 | VALUE PARAMETER #2 | Input for displaying a *LINK* source value parameter. | ±100.00% | ±100.00% | 0.00% |
| 2166 | VALUE PARAMETER #3 | Input for displaying a *LINK* source value parameter. | ±100.00% | ±100.00% | 0.00% |
| 2167 | VALUE PARAMETER #4 | Input for displaying a *LINK* source value parameter. | ±100.00% | ±100.00% | 0.00% |
| 2168 | VALUE PARAMETER #5 | Input for displaying a *LINK* source value parameter. | ±100.00% | ±100.00% | 0.00% |
| 2169 | VALUE PARAMETER #6 | Input for displaying a *LINK* source value parameter. | ±100.00% | ±100.00% | 0.00% |
| 2170 | VALUE PARAMETER #7 | Input for displaying a *LINK* source value parameter. | ±100.00% | ±100.00% | 0.00% |
| 2171 | VALUE PARAMETER #8 | Input for displaying a *LINK* source value parameter. | ±100.00% | ±100.00% | 0.00% |
| 2172 | VALUE PARAMETER #9 | Input for displaying a *LINK* source value parameter. | ±100.00% | ±100.00% | 0.00% |
| 2173 | VALUE PARAMETER #10 | Input for displaying a *LINK* source value parameter. | ±100.00% | ±100.00% | 0.00% |

**Output Parameters**

| *LINK* Name | Description | MMI/SAM Range | *LINK* Range |
|---|---|---|---|
| LOGIC PARAMETER #1 | Output for setting a *LINK* destination logic parameter. | TRUE/FALSE | 1/0 |
| LOGIC PARAMETER #2 | Output for setting a *LINK* destination logic parameter. | TRUE/FALSE | 1/0 |
| LOGIC PARAMETER #3 | Output for setting a *LINK* destination logic parameter. | TRUE/FALSE | 1/0 |
| LOGIC PARAMETER #4 | Output for setting a *LINK* destination logic parameter. | TRUE/FALSE | 1/0 |
| LOGIC PARAMETER #5 | Output for setting a *LINK* destination logic parameter. | TRUE/FALSE | 1/0 |
| LOGIC PARAMETER #6 | Output for setting a *LINK* destination logic parameter. | TRUE/FALSE | 1/0 |
| LOGIC PARAMETER #7 | Output for setting a *LINK* destination logic parameter. | TRUE/FALSE | 1/0 |
| LOGIC PARAMETER #8 | Output for setting a *LINK* destination logic parameter. | TRUE/FALSE | 1/0 |
| LOGIC PARAMETER #9 | Output for setting a *LINK* destination logic parameter. | TRUE/FALSE | 1/0 |
| LOGIC PARAMETER #10 | Output for setting a *LINK* destination logic parameter. | TRUE/FALSE | 1/0 |
| VALUE PARAMETER #1 | Output for setting a *LINK* destination value parameter. | ±100.00% | ±100.00% |
| VALUE PARAMETER #2 | Output for setting a *LINK* destination value parameter. | ±100.00% | ±100.00% |
| VALUE PARAMETER #3 | Output for setting a *LINK* destination value parameter. | ±100.00% | ±100.00% |
| VALUE PARAMETER #4 | Output for setting a *LINK* destination value parameter. | ±100.00% | ±100.00% |
| VALUE PARAMETER #5 | Output for setting a *LINK* destination value parameter. | ±100.00% | ±100.00% |
| VALUE PARAMETER #6 | Output for setting a *LINK* destination value parameter. | ±100.00% | ±100.00% |
| VALUE PARAMETER #7 | Output for setting a *LINK* destination value parameter. | ±100.00% | ±100.00% |
| VALUE PARAMETER #8 | Output for setting a *LINK* destination value parameter. | ±100.00% | ±100.00% |
| VALUE PARAMETER #9 | Output for setting a *LINK* destination value parameter. | ±100.00% | ±100.00% |
| VALUE PARAMETER #10 | Output for setting a *LINK* destination value parameter. | ±100.00% | ±100.00% |

## PARAMETERS




The PARAMETERS software block allows you to configure how the drive will respond when the *LINK* network stops processing. You can set these parameters in ConfigEd only. You can monitor the settings in the MENUS MMI menu.

### Description

Whenever a *LINK* module or drive enters a halted state, the *LINK* network stops sending messages. The network stops processing in these situations:

- MODULE RECONFIGURATION
  When downloading a configuration to module or drive using the ConfigEd INSTALL command, the drive or module enters a HALTED state and cannot process or transmit any new network messages. All other modules or drives on the network enter a PEER HALTED state.
- MODULE FAILED
  An internal error has caused a module or drive to fail. As with reconfiguration, the node stops processing and transmitting new network messages.
- *LINK* FAILED
  The *LINK* fiber optic network is broken and message transmission is interrupted, or one or several nodes are receiving an unacceptably high number of error messages.

The drive can be configured to respond to a communication failure in any of the following ways:

- IGNORE the event and continue running;
- switch to a program stop (regenerative drives only); or
- switch to a coast stop.

The default setting for all three *LINK* failed functions is REGEN STOP..

The *LINK* network only sends messages when data changes state. If the network stops communicating, none of the drive's input parameters change. As a result, the drive is unlikely to maintain the intended control of the motor.

**WARNING!**

Unless provision has been made to control the drive in the event of a *LINK* failure, do *not* set either of these parameters to the IGNORE mode.

PARAMETERS also has an ordinal output, NETWORK TYPE, indicating the drive's preconfigured node type. The node type is set in the EDIT menu in ConfigEd and can be monitored, but not changed in either SAM or the MMI.

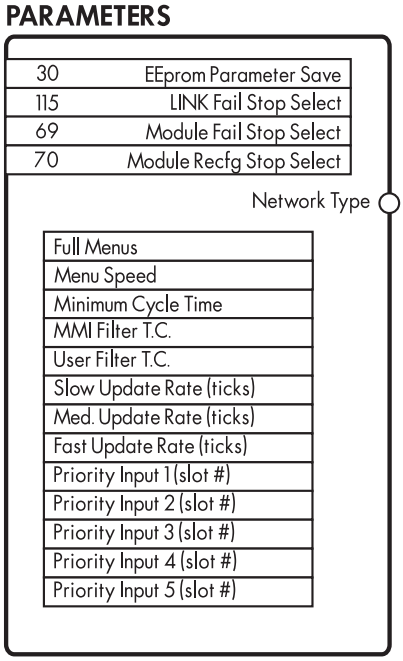



Figure C.10 - PARAMETERS Software Block

EEPROM PARAMETER SAVE is also available in the PARAMETERS block and is equivalent to PARAMETER SAVE in the MMI. Use this input when configuring drives on a *LINK* network to remotely save parameters in all drives using SAM. (See Figure C.11.) Setting Logic Persistent in address 800 TRUE signals each drive to save the parameter changes in RAM to EEPROM.

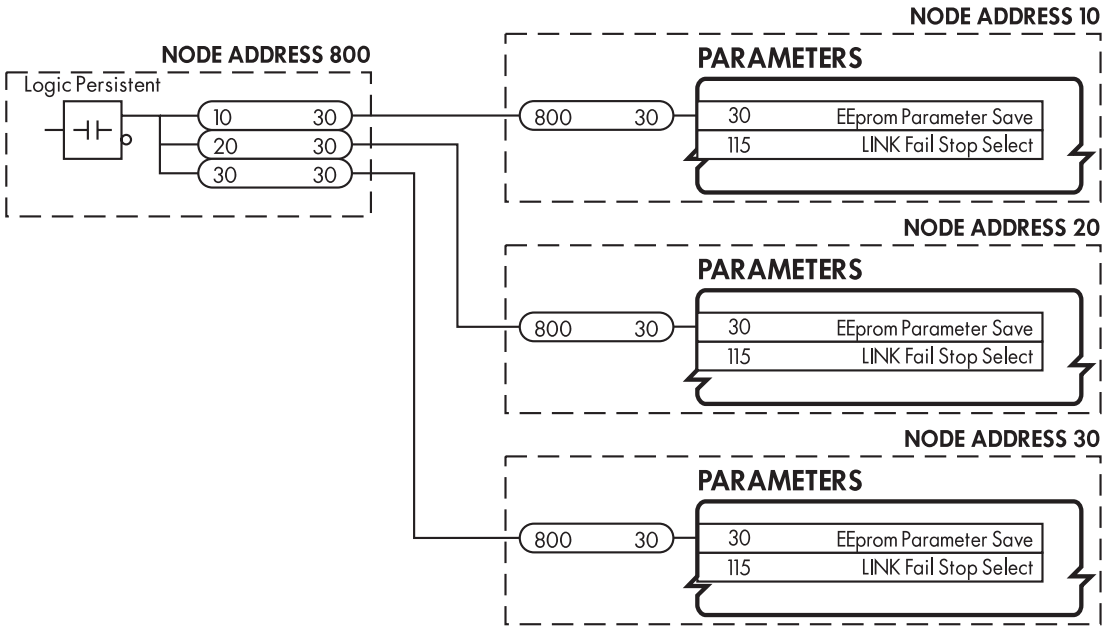



Figure C.11 - Configuration to SAVE PARAMETERS to Multiple Drives Remotely Using SAM.

### Input Parameters

| Slot | Name | Description | MMI/SAM Range | *LINK* Range | Default |
|---|---|---|---|---|---|
| 30 | EEPROM PARAMETER SAVE | Saves parameter values set in the drive's RAM memory to the drive's EEPROM memory. Equivalent to MMI PARAMETER SAVE function. | SAVE/FINISHED | 1=ACTIVE (save)<br>0=INACTIVE<br>2=FAILED | 0 |
| # 115 | *LINK* FAIL STOP SELECT | Drive response on event of a *LINK* network failure. | DISABLE<br>ENABLE REGEN STOP<br>ENABLE COAST STOP | 0 = disable<br>1 = program stop<br>2 = coast stop | 2 (enable regen stop) |
| # 69 | MODULE FAIL STOP SELECT | Drive response on event of a *LINK* module failure. | DISABLE<br>ENABLE REGEN STOP<br>ENABLE COAST STOP | 0 = disable<br>1 = program stop<br>2 = coast stop | 2 (enable regen stop) |
| # 70 | MODULE RCFG STOP SELECT | Drive response on event of a *LINK* module reconfiguration. | DISABLE<br>ENABLE REGEN STOP<br>ENABLE COAST STOP | 0 = disable<br>1 = program stop<br>2 = coast stop | 2 (enable regen stop) |

# These parameters cannot be changed through the MMI.

### Output Parameters

| *LINK* Name | Description | SAM Range | *LINK* Range | MMI Diagnostic |
|---|---|---|---|---|
| NETWORK TYPE | Type of *LINK* network node, as set in the EDIT menu in ConfigEd. | simple/tapped/ redundant/aux tap | 2=simple<br>3=tapped<br>7=redundant<br>11=aux tapped | *LINK* SUPPORT:: NODE TYPE |

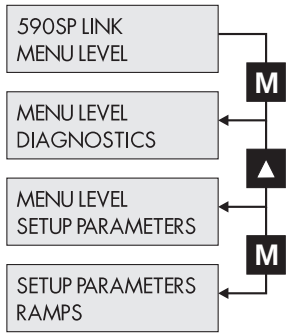
## PEEK

The PEEK software block is reserved for qualified Eurotherm Drives personnel only. It is used for advanced trouble-shooting and drive control. Parameters within this software block can be accessed through the MMI under SYSTEM:: PEEK. This sub-menu appears only in the password restricted mode.

## RAMPS

The RAMPS software block sets the start and stop time duration and other control functions of the ramp input. It only affects the ConfigEd RAMP INPUT speed signal. It is combined with the other speed inputs in the SPEED LOOP to produce the TOTAL SETPOINT signal. Other speed inputs to the drive are not ramped. The START-STOP software block contains a separate deceleration rate for a controlled fast stop.

RAMP MIN SPEED sets the minimum ramp input speed when the drive is enabled. RAMPING toggles TRUE when the absolute value of the difference between RAMP OUTPUT and RAMP INPUT exceeds RAMPING THRESH.



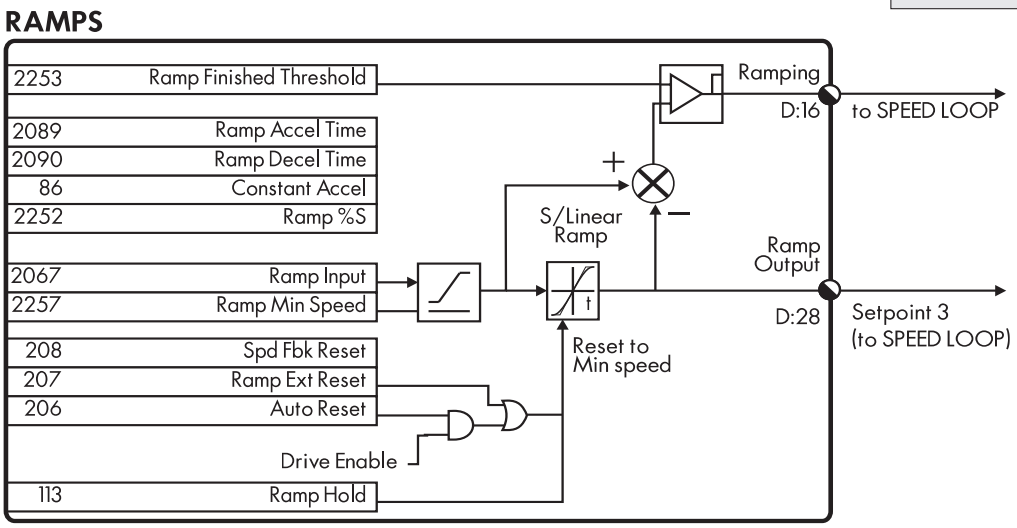




Figure C.12 - RAMPS Software Block

RAMPS shapes the RAMP INPUT signal to produce the RAMP OUTPUT signal. RAMP ACCEL TIME and RAMP DECEL TIME set the acceleration and deceleration times taken for input changes. RAMP S % integrates the ramp output signal to further smooth out the ramp signal. When set to 0.00%, the ramp will be linear. As the RAMP S % is increased, up to 350% of the ramp time is added to the linear ramp creating more gradual starting and stopping. The formula for the actual ramp time is shown below. Ramp Time is the value of the parameters RAMP ACCEL TIME or RAMP DECEL TIME.

$$\text{Actual Ramp Time} = \text{Ramp Time} \times (3.5 \times \%S\ \text{RAMP}/100 + 1)$$

The *LINK* logic slot RAMP HOLD stops the ramp from changing. When TRUE, RAMP OUTPUT remains its last value.

You can reset the ramp three ways:

1. Reset the ramp every time the *LINK* DRIVE START input goes TRUE when AUTO RESET is enabled. Setting AUTO RESET FALSE leaves RAMP OUTPUT at its last value before the start signal was removed.
2. Reset the ramp when the speed feedback reaches the STANDSTILL THRESHOLD level set in STANDSTILL when SPD FBK RESET is enabled.
3. Reset the ramp manually using RAMP EXTERNAL RESET.

CONSTANT ACCEL determines whether the ramp operates in two or four quad mode. When set TRUE (the default), RAMP ACCEL TIME sets the ramp time for increasing speed, regardless of direction. RAMP DECEL TIME sets the

ramp time for decreasing speed, again regardless of direction. When set FALSE, RAMP ACCEL TIME sets the ramp time of a signal moving from an algebraically lower to high speed, regardless of direction. Similarly, RAMP DECEL TIME sets the ramp time of a signal moving from an algebraically higher to lower speed, regardless of direction.

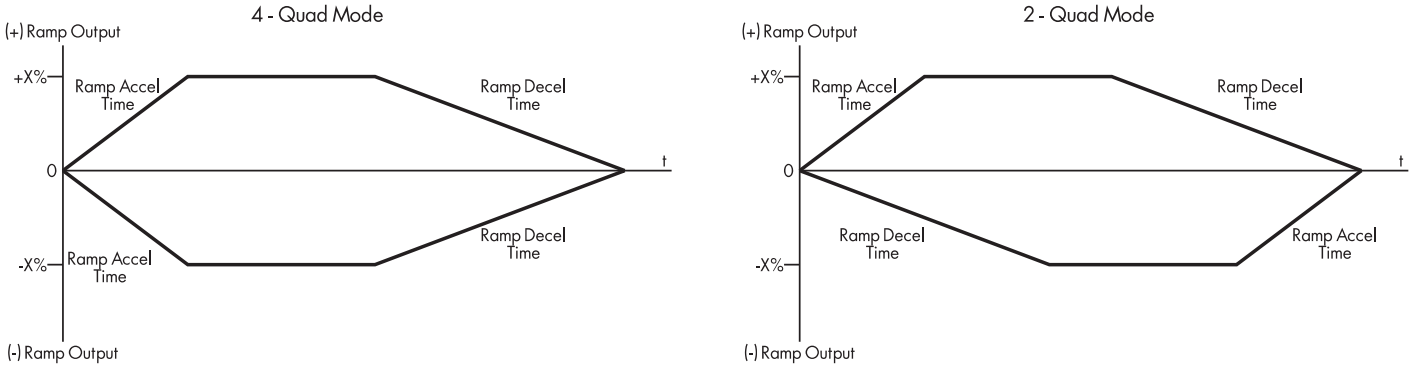



Figure C.13 - CONSTANT ACCEL (2-Quad Vs. 4-Quad Ramp).
CONSTANT ACCEL ENABLED in left diagram (default); CONSTANT ACCEL DISABLED in right diagram.

NOTE. Overspeed and *LINK* Signal Scaling:
Like other *LINK* speed inputs, RAMP INPUT accepts an overspeed range of ±20.00% to accommodate continuous operation of the drive speed control loop. Therefore, scale all *LINK* speed reference signals by 0.8333 to account for this overspeed capability so that an 83.33% *LINK* signal yields a 100% speed reference to RAMP INPUT. Refer to Chapter 3 for more information on *LINK* data ranges and signal scaling.

**Input Parameters**

| Slot | Name | Description | MMI/SAM Range | *LINK* Range | Default |
|---|---|---|---|---|---|
| 206 | EXTERNAL RESET | Allows an external *LINK* signal to reset the ramp. | ENABLED/DISABLED | 1=reset<br>0=ramping | DISABLED |
| 2257 | MIN SPEED | A bidirectional clamp connected directly to the RAMP INPUT. | ±120% | ±100.00% | 0.00% |
| * 86 | CONSTANT ACCEL | Changes the ramping action from 4 quad to 2 quad control when FALSE. | ENABLED/DISABLED | 1=enable<br>0=disabled | ENABLED |
| 2089 | RAMP ACCEL TIME | Acceleration time for 100 percent change of the RAMP INPUT. | 0.1 - 600.0 Secs | 0.00 to 100.00% | 10.0 Secs |
| 2090 | RAMP DECEL TIME | Deceleration time for 100 percent change of the RAMP INPUT. | 0.1 - 600.0 Secs | 0.00 to 100.00% | 10.0 Secs |
| 207 | AUTO RESET | When ENABLED, the ramp is reset every time the drive is started. | ENABLED/DISABLED | 1=enable<br>0=disabled | ENABLED |
| 113 | RAMP HOLD | When ON, the ramp output is held at the last value. Overridden by a ramp reset. | ON= hold<br>OFF= ramp | 1= hold/0= ramp | OFF |
| 2067 | RAMP INPUT | Input value. | ±120% | ±100.00% | 0.00% |
| 2252 | RAMP S% | Percentage of the ramp with a S-shaped curve. | 0.00 - 100.00% | 0.00 to 100.00% | 5.00% |
| 286 | RAMPING THRESH. | Threshold used to determine whether the ramp is active. | 0.00 - 100.00% | 0.00 to 100.00% | 0.50% |
| 208 | SPD FBK RESET | Ramp resets when speed feedback reaches the drive's ZERO SPEED THRESHOLD. | ENABLED/DISABLED | 1=enable<br>0=disabled | DISABLED |

* MMI parameter available only in the restricted password mode.

**Output Parameters**

| *LINK* Name | Description | SAM Range | *LINK* Range | MMI Diagnostic |
|---|---|---|---|---|
| RAMPING | TRUE when<br>\|ramp output - ramp input\| > ramp threshold | TRUE/FALSE | 1=ramping<br>0=held or reset | RAMPING |
| RAMP OUTPUT | Output value sent to SPEED LOOP | ±120% | ±100.00% | RAMP OUTPUT |

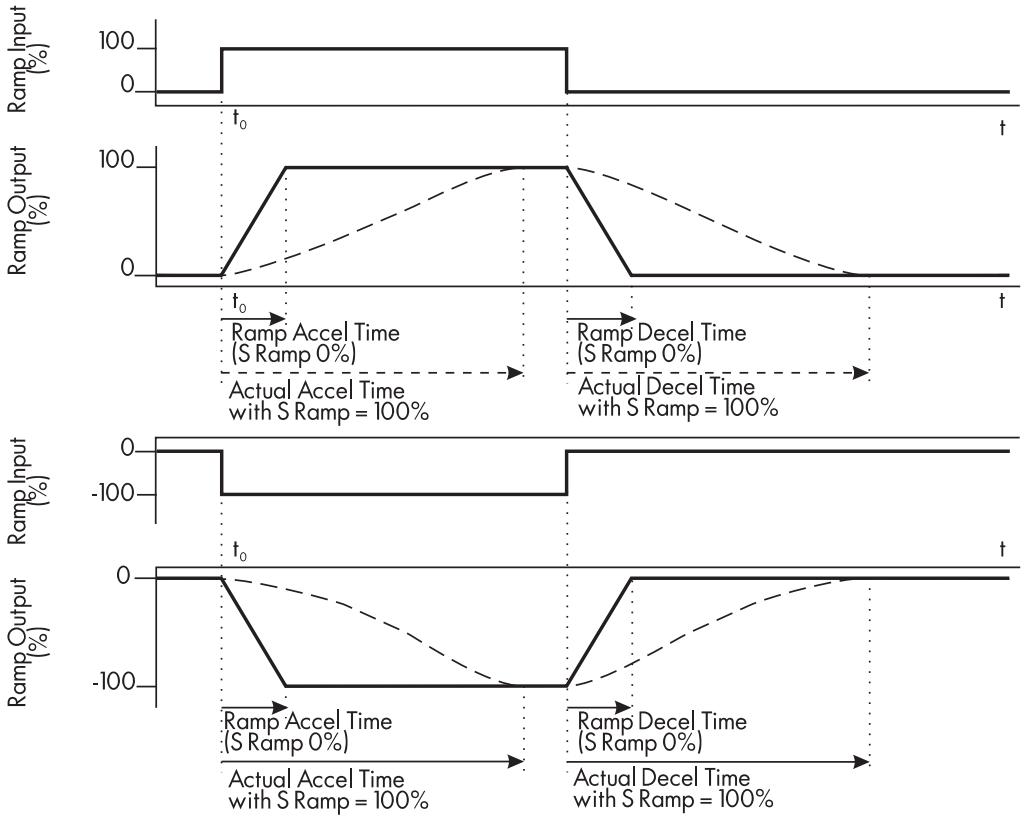



Figure C.14 - Ramp Accelerate and Decelerate Times

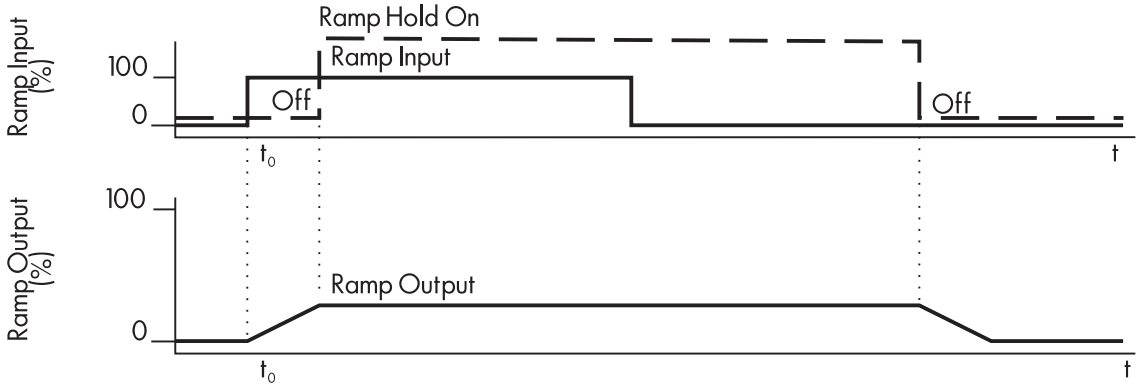



Figure C.15 - Ramp Hold

Ramping occurs when the ramp is not in the hold state and the ramp input changes. When set TRUE, the RAMP HOLD input stops the ramp output from changing. Even when the ramp input signal is removed, RAMP HOLD keeps the ramp output from changing. Once RAMP HOLD toggles FALSE, the ramping resumes.

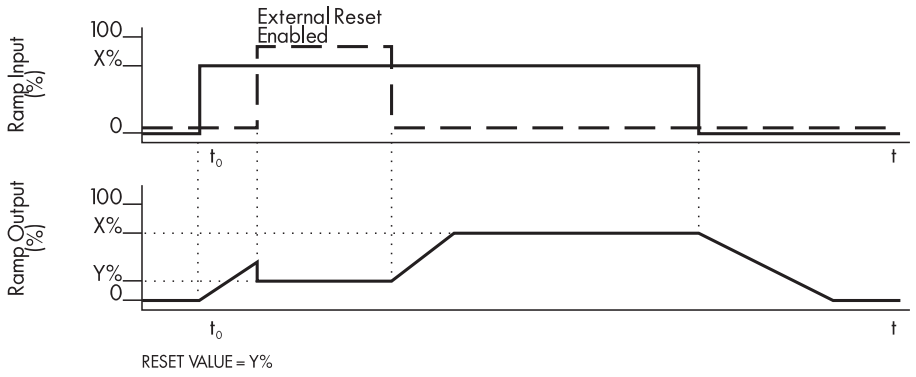



Figure C.16- External Reset

The ramp input is set to X% at time $t_0$. The output increases to the ramp input value at the RAMP ACCEL TIME. The ramp output resets to RAMP MIN SPEED (or Y%) when RAMP EXT RESET is set TRUE. When set FALSE, the ramp output continues to follow the input signal.

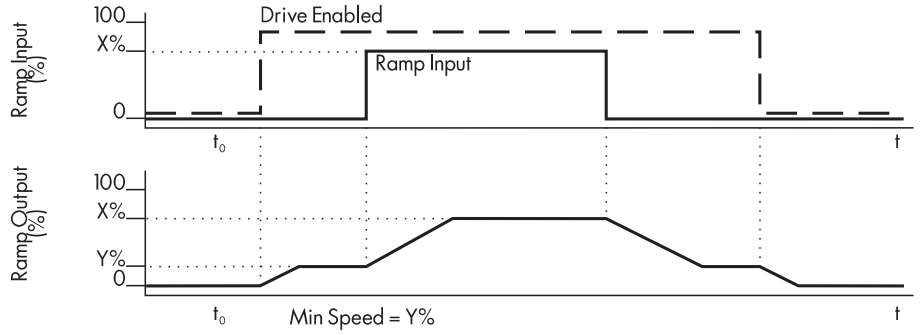



Figure C.17 - Minimum Speed

Figure C.17 shows the effect of setting RAMP MIN SPEED above 0.00% to a value Y%. When the drive is enabled, the ramp output cannot fall below the value set by RAMP MIN SPEED.

Notice the ramp rates are used when changing the output from minimum speed to zero speed. Notice also that in this example, RAMP OUTPUT only increases to X% since the ramp input signal is limited to X%.

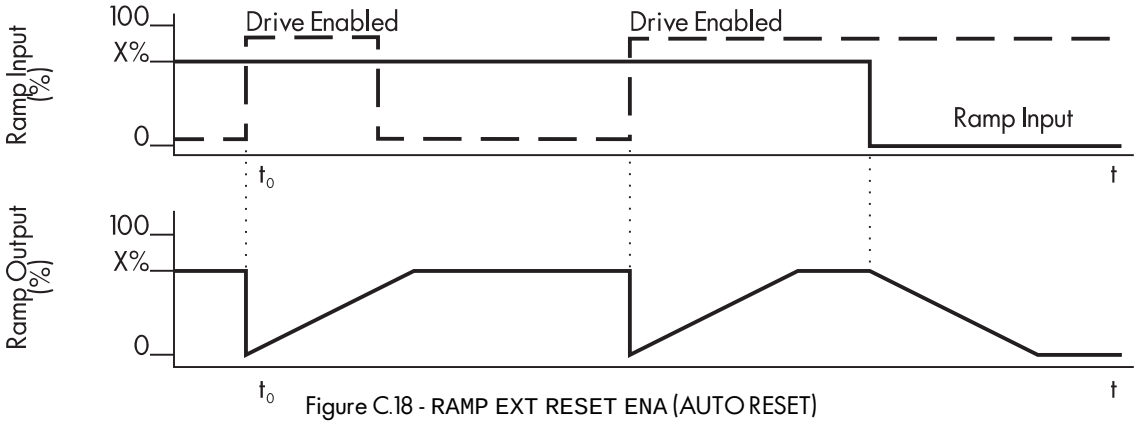



Figure C.18 - RAMP EXT RESET ENA (AUTO RESET)

When RAMP EXT RESET ENA (or AUTO RESET in the MMI) is enabled, the ramp output resets to RAMP MIN SPEED each time the drive is enabled. In this example, RAMP MIN SPEED is 0.00%. It does not reset if the drive is disabled.

## SPEED LOOP

The SPEED LOOP block processes the drive's speed demand and speed feedback to produce the current demand for the current loop. Parameters within the block select the type of speed feedback source, tune the speed loop gains and clamp and scale the speed setpoints.

## Description

ZERO OFFSET is added to the Speed Feedback signal to remove motor creep at zero speed. This parameter is not a speed reference input and is used *only* to the keep the motor shaft from rotating.

**Caution**

The drive *will not* trigger an OVERSPEED ALARM if OVERSPEED LEVEL is set above the default setting of 118.00%. Do *not* change this parameter. The MMI parameter is accessible in the password protect mode only.

SETPOINT FAST INPUT is sampled during each execution of the speed loop. Use this input when the process requires a very high performance controller in conjunction with external control loops. This input can be scaled with RATIO 2. You may invert its sign with SIGN 2. Both RATIO 2 and SIGN 2 are unavailable in SAM, but may be changed with the MMI or through ConfigEd INSTALL.

TOTAL SETPOINT is the sum of:

- SETPOINT SUM (the sum of INPUT 0 and INPUT 1 from SUMMING),
- RAMP OUTPUT,
- SETPOINT FAST INPUT, and
- SETPOINT 4, a speed reference which has no *LINK* slot, but can be set with ConfigEd INSTALL or through the MMI.

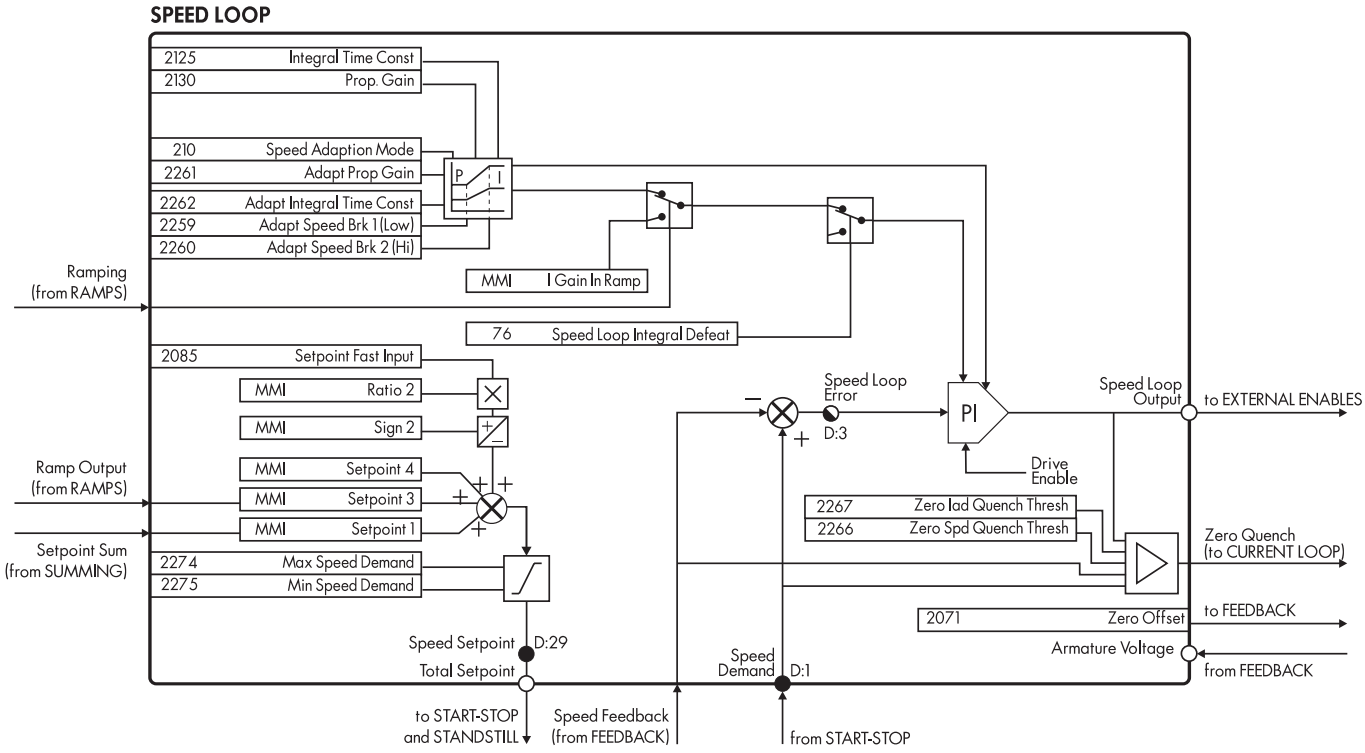
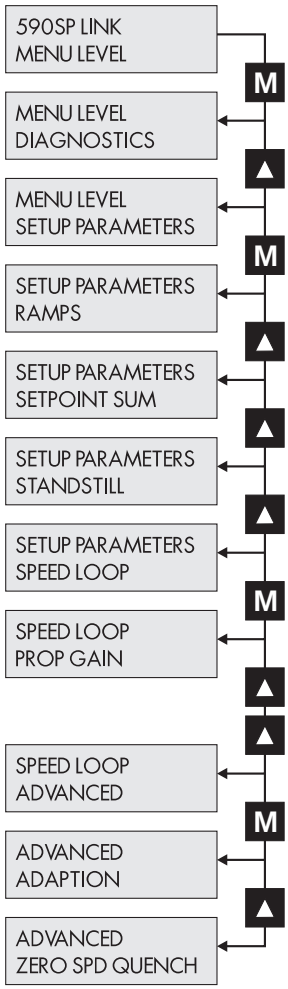



Figure C.19 - SPEED LOOP Control Parameters




You can monitor each of the speed signals in the MMI under the SETUP PARAMETERS:: SPEED LOOP:: SETPOINTS sub-menu. The parameters available in this sub-menu are listed below.

**MMI SPEED LOOP::SETPOINTS Parameters**

| Slot | MMI Name | Description |
|---|---|---|
| — | SETPOINT 1 | Connected to SETPOINT SUM output from the SUMMING software block. |
| — | SIGN 2 | Speed setpoint 2 (SETPOINT FAST INPUT) sign. Set in the MMI or with ConfigEd INSTALL in SUMMING. Inaccessible through SAM. |
| — | RATIO 2 | Speed setpoint 2 (SETPOINT FAST INPUT) ratio. Set in the MMI or with ConfigEd INSTALL in SUMMING. Inaccessible through SAM. |
| 2085 | SETPOINT 2 | High speed *LINK* SETPOINT FAST INPUT. Cannot be changed through the MMI. |
| — | SETPOINT 3 | Connected to RAMP OUTPUT in MMI, & output of RAMPS in *LINK*. |
| — | SETPOINT 4 | Independent reference. Set in the MMI or with ConfigEd INSTALL. Inaccessible through SAM. |

TOTAL SETPOINT is sent to START-STOP. The START-STOP block applies a stopping ramp to TOTAL SETPOINT during a normal stop or an emergency stop. The signal is then sent back to SPEED LOOP as Speed Demand. SPEED FEEDBACK is subtracted from the Speed Demand to give SPEED ERROR. The loop's PI terms then process SPEED ERROR to generate SPEED LOOP OUTPUT (or the drive's current demand when the drive is in speed control).

NOTE. Overspeed and *LINK* Signal Scaling:
All *LINK* speed inputs accept an overspeed range of ±20.00% to accommodate continuous operation of the drive speed control loop. Therefore, scale all *LINK* speed reference signals by 0.8333 to account for this overspeed capability so that an 83.33% *LINK* signal yields a 100% speed reference. Refer to Chapter 3 for more information on *LINK* data ranges and signal scaling.

## Adaption Parameters

Adaption changes the SPEED LOOP proportional and integral profiles for optimum drive response upon reaching speed demand breakpoints. It improves controller response for high inertia loads which vary with speed. ADAPT SPEED BRK1 (LOW) and ADAPT SPEED BRK2 (HIGH) determine the speed range for profiling. For a speed demand at or above ADAPT SPEED BRK1 (LOW), ADAPT PROP GAIN and ADAPT INTEGRAL TIME CONST, set the speed loop PI gains. For speeds at or above ADAPT SPEED BRK2 (HIGH), the original PI gain values are used. Between the two speeds, SPEED FEEDBACK, SPEED ERROR or SPEED LOOP OUTPUT profiles the PI gain according to the SPEED ADAPTION MODE setting.

SPEED ADAPTION MODE selects the input source. Mode 0 (default) disables the profiling so that the SPEED LOOP PI uses the original PROP. GAIN and INTEGRAL TIME CONST parameters settings regardless of the speed demand. Mode 1 uses SPEED FEEDBACK as the gain profiling source between the two speed breakpoints, mode 2 uses SPEED ERROR, mode 3 uses CURRENT DEMAND (SPEED LOOP OUTPUT).

NOTE. Most common motor load cycles do not require adaptive speed loop profiling.

## Zero Speed Parameters

The Zero Speed parameters allow the drive to disable the CURRENT LOOP at zero speed without disabling the SPEED LOOP or de-energizing the contactor. This allows the CURRENT LOOP to be enabled quickly. When SPEED SETPOINT and SPEED FEEDBACK fall below ZERO SPD QUENCH THRESH and when SPEED LOOP OUTPUT falls below ZERO Ia QUENCH THRESH, ZERO SPEED QUENCH disables the CURRENT LOOP.

## Other Parameters

I GAIN IN RAMP scales the integral gain while the drive is ramping. When RAMPING is TRUE, INTEGRAL TIME CONST is scaled by I GAIN IN RAMP. This can be used to prevent integral windup caused by very high inertia loads during ramping.

INERTIA COMP adds a portion of the derivative of the SPEED FEEDBACK signal to the SPEED LOOP summing junction. This can improve dynamic response of a high inertia load drive.

NOTE. Too much INERTIA COMP causes instability.

SPEED LOOP INTEGRAL DEFEAT switches INTEGRAL TIME CONST to zero when enabled and lets PROP. GAIN control the speed loop PI alone.

### Main Input Parameters

| Slot | Name | Description | MMI/SAM Range | *LINK* Range | Default |
|---|---|---|---|---|---|
| 2125 | INTEGRAL TIME CONST | Integral gain adjustment. | .001 to 30.000 secs | 0.00 to 100.00% | 0.500 secs |
| 2274 | MAX DEMAND | Maximum output limit clamp. | 0.00 to+105.00% | 0.00 to +87.50% | 105.00% |
| 2275 | MIN DEMAND | Minimum output limit clamp. | -105.00 to 0.00% | -87.50 to 0.00% | -105.00% |
| * 2217 | OVERSPEED LEVEL | Level at which SPD FBK ALARM trips. Set in CALIBRATION MMI sub-menu. | 0.00 to 200.00% | 0 to 100.00% | 118.00% |
| 2130 | PROP GAIN | Proportional gain adjustment. | 0.00 to 200.00 | 0.00 to 100.00% | 10.00 |
| # 2085 | SETPOINT FAST INPUT | Speed Input sampled at SPEED LOOP tick rate. | ±105.00% | ±87.50% | 0.00% |
| 2071 | ZERO OFFSET | Offset to null out speed demand at zero speed. | ±5.00% | ±100.00% | 0.00% |

* MMI parameter available only in the password protected mode.

ConfigEd parameter reserved for authorized use only.

# This parameter cannot be changed through the MMI.

### Zero Speed Quench Input Parameters

| Slot | Name | Description | MMI/SAM Range | *LINK* Range | Default |
|---|---|---|---|---|---|
| 2267 | ZERO Ia QUENCH THRESH | Current Loop quenches if Current Demand < ZERO IAD LEVEL | 0.00 to 200.00% | 0.00 to 100.00% | 1.50% |
| 2266 | ZERO SPD QUENCH THRESH | Zero speed quench level for Current Loop. Current Loop resets if Speed Demand *and* Speed Feedback < ZERO SPEED LEVEL. | 0.00 to 200.00% | 0.00 to 100.00% | 0.50% |

### Adaption Input Parameters

| Slot | Name | Description | MMI/SAM Range | *LINK* Range | Default |
|---|---|---|---|---|---|
| 2262 | ADAPT INT TIME CONST | Integral time constant used during adaption. | 0.001 to 30.000 Secs | 0.00 to 100.00% | 0.500 Secs |
| 2261 | ADAPT PROP GAIN | Proportional gain used during adaption. | 0.00 to 200.00 | 0.00 to 100.00% | 5.00 |
| 2259 | ADAPT SPD BRK1 (LOW) | Speed breakpoint 1 to start gain profiling. | 0.00 to 100.00% | 0.00 to 100.00% | 1.00% |
| 2260 | ADAPT SPD BRK2 (HI) | Speed breakpoint 2 to stop gain profiling. | 0.00 to 100.00% | 0.00 to 100.00% | 5.00% |
| 210 | SPEED ADAPTION MODE | Selects the speed breakpoint input signal. | 0=disabled<br>1=speed feedback<br>2=speed error, 3=current demand | 0 to 3 ordinal | 0 |

### Other Input Parameters

| Slot | Name | Description | MMI/SAM Range | *LINK* Range | Default |
|---|---|---|---|---|---|
| 2263 | I GAIN IN RAMP | Scales the integral gain during ramping. | 0.0 to 2.0000 | 0.00 to 100.00% | 1.0000 |
| 76 | SPEED LOOP INTEGRAL DEFEAT | When ON, it inhibits integral control yielding proportion control only. | ON (integral defeat is ON)<br>OFF (integral defeat is OFF) | 0=OFF<br>1=ON | OFF |

### Output Parameters

| *LINK* Name | Description | SAM Range | *LINK* Range | Diagnostic |
|---|---|---|---|---|
| ARMATURE VOLTAGE | Scaled motor armature voltage feedback. | ±200.00% | ±100.00% | TERMINAL VOLTS |
| SPEED LOOP ERROR | Difference between Speed Demand and Speed Feedback. | ±100% | ±100.00% | SPEED ERROR |
| SPEED LOOP OUTPUT | Output of speed loop PI. Current Demand in speed control mode. | ±120.00% | ±100.00 | CURRENT DEMAND |
| TOTAL SETPOINT | Sum of all of drive's speed references: SUMMING OUTPUT, RAMP OUPUT, SETPOINT FAST INPUT, SETPOINT 4. | ±120.00% | ±100.00 | SPEED SETPOINT |

## STANDSTILL

The STANDSTILL software block determines whether the motor shaft has stopped turning based on Speed Demand and Speed Feedback.

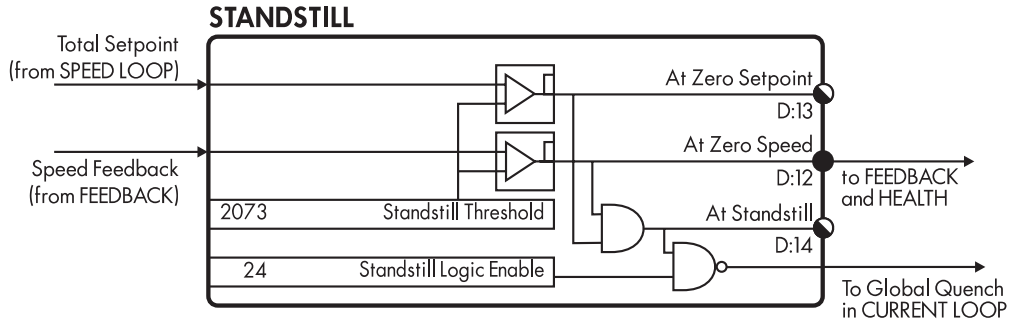



Figure C.20 - STANDSTILL Software Block

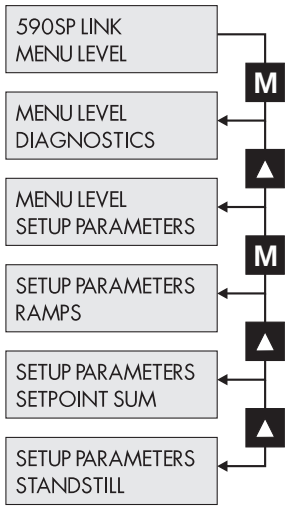


When SPEED FEEDBACK falls below the STANDTILL THRESHOLD setting (ZERO THRESHOLD in the MMI), ZERO SPEED switches TRUE. The *LINK* output ZERO SPEED signal is available in the FEEDBACK software block.

AT ZERO SETPOINT is on when TOTAL SETPOINT is less than STANDTILL THRESHOLD. When both AT ZERO SPEED and AT ZERO SETPOINT are ON, AT STANDSTILL switches true signaling that the motor has stopped rotating.

When STANDSTILL LOGIC ENABLE is TRUE and the drive is At Standstill, the SCR firing circuits are disabled, but the main contactor remains energized and the RUN LED remains on. The drive remains in this state until standstill drops out, or when the speed setpoint or speed feedback rise above the zero threshold.

Standstill Logic is useful in maintaining an absolute zero speed, but can cause problems in some web handling applications. At standstill, current flow is inhibited allowing the web tension to pull back on the roll. Movement of the shaft raises the speed feedback and the drive SCRs turn back on since the drive senses it is no longer at zero speed. The drive forces the motor to pull forward against the web, which again, drops the speed feedback below the threshold. The SCRs switch off again, and the web pulls back on the roll. The motor will then oscillate as the drive SCRs turn on and off trying to maintain a fixed roll position.




### Input Parameters

| | Slot | Input Parameter | Description | Range | *LINK* Range | Default |
|---|---|---|---|---|---|---|
| * | — | SOURCE TAG | Determines the drive parameter used to compare with the STANDSTILL THRESHOLD value. Cannot be set through SAM. | — | — | tag 89 (speed feedback) |
| | 24 | STANDSTILL LOGIC ENABLE | When enabled, inhibits the controller when at zero setpoint and zero speed. | ENABLED/DISABLED | 0=DISABLED 1=ENABLED | DISABLED |
| | 2073 | STANDSTILL THRESHOLD | Threshold for setting the zero setpoint and zero speed. Corresponds the ZERO THRESHOLD in the MMI. | 0.00 to 5.00% | 0.00 to 100.00% | 2.00% |

* MMI parameter available only in the password protected mode.

### Output Parameters

| *LINK* Output | Description | SAM Range | *LINK* Range | Diagnostic |
|---|---|---|---|---|
| AT STANDSTILL | Speed demand and speed feedback below STANDSTILL THRESHOLD. | TRUE/FALSE | 1=TRUE 0=FALSE | AT STANDSTILL |
| AT ZERO SETPOINT | Drive speed demand below STANDSTILL THRESHOLD. | TRUE/FALSE | 1=TRUE 0=FALSE | AT ZERO SETPOINT |

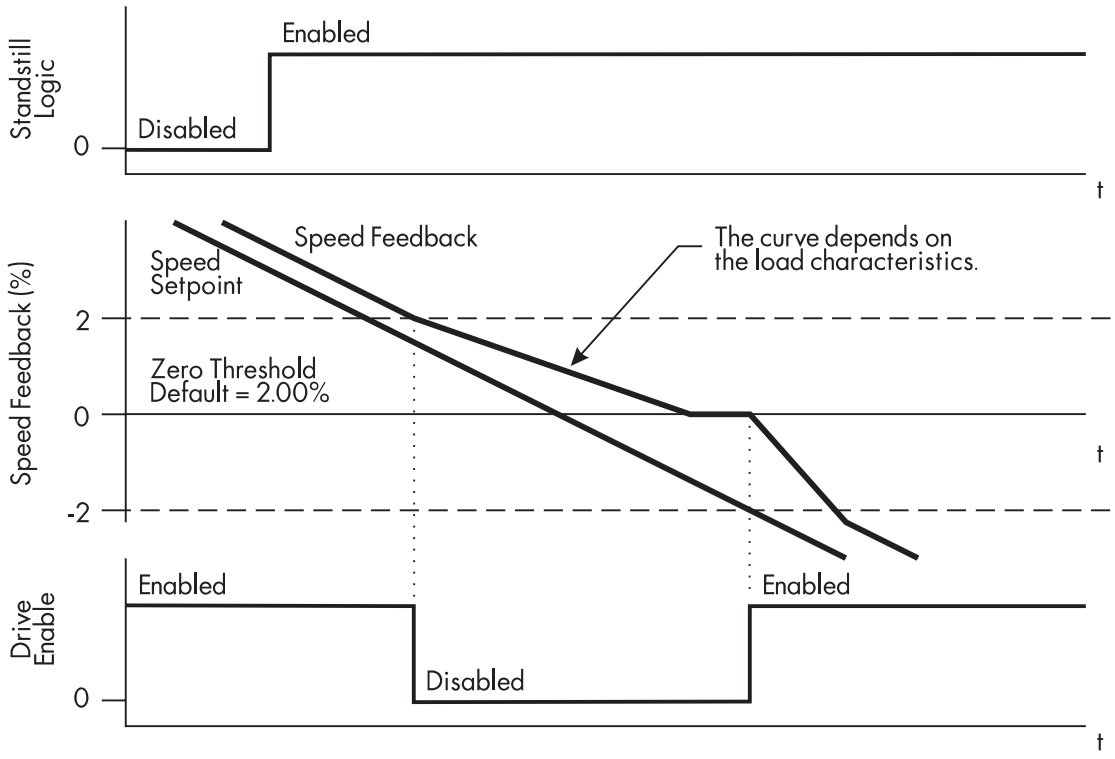


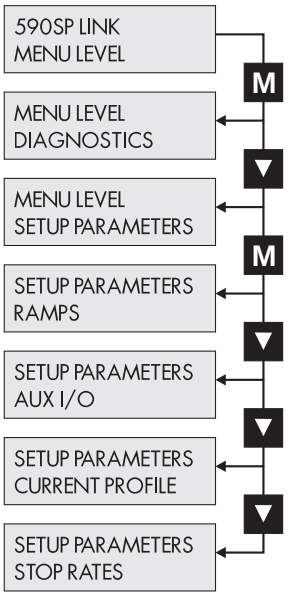

Figure C.21 - STANDSTILL Logic

Figure C.21 shows the drive's operation when STANDSTILL LOGIC is enabled. When both the speed feedback and speed setpoint signals are within the ZERO THRESHOLD, the drive is disabled.

## START-STOP

The START-STOP software block contains the parameters for controlling the drive when it is stopping.

NOTE. All START-STOP parameters are found in the MMI SETUP PARAMETERS:: STOP RATES and the AUX I/O sub-menus.




## Inputs and Outputs

The block's value inputs are SPEED FEEDBACK from FEEDBACK and TOTAL SET-POINT from SPEED LOOP.

The block's logic inputs include the *LINK* software slot inputs DRIVE START and PROGRAM STOP, and the hardwired Program Stop (terminal A7). AUX START and AUX ENABLE are both accessible only through the MMI.

The START-STOP value output is the final Speed Demand signal that is sent to SPEED LOOP. There is no *LINK* output for this signal and it cannot be monitored in SAM. The logic outputs are COMPOSITE PROGRAM STOP and DRIVE STARTED.



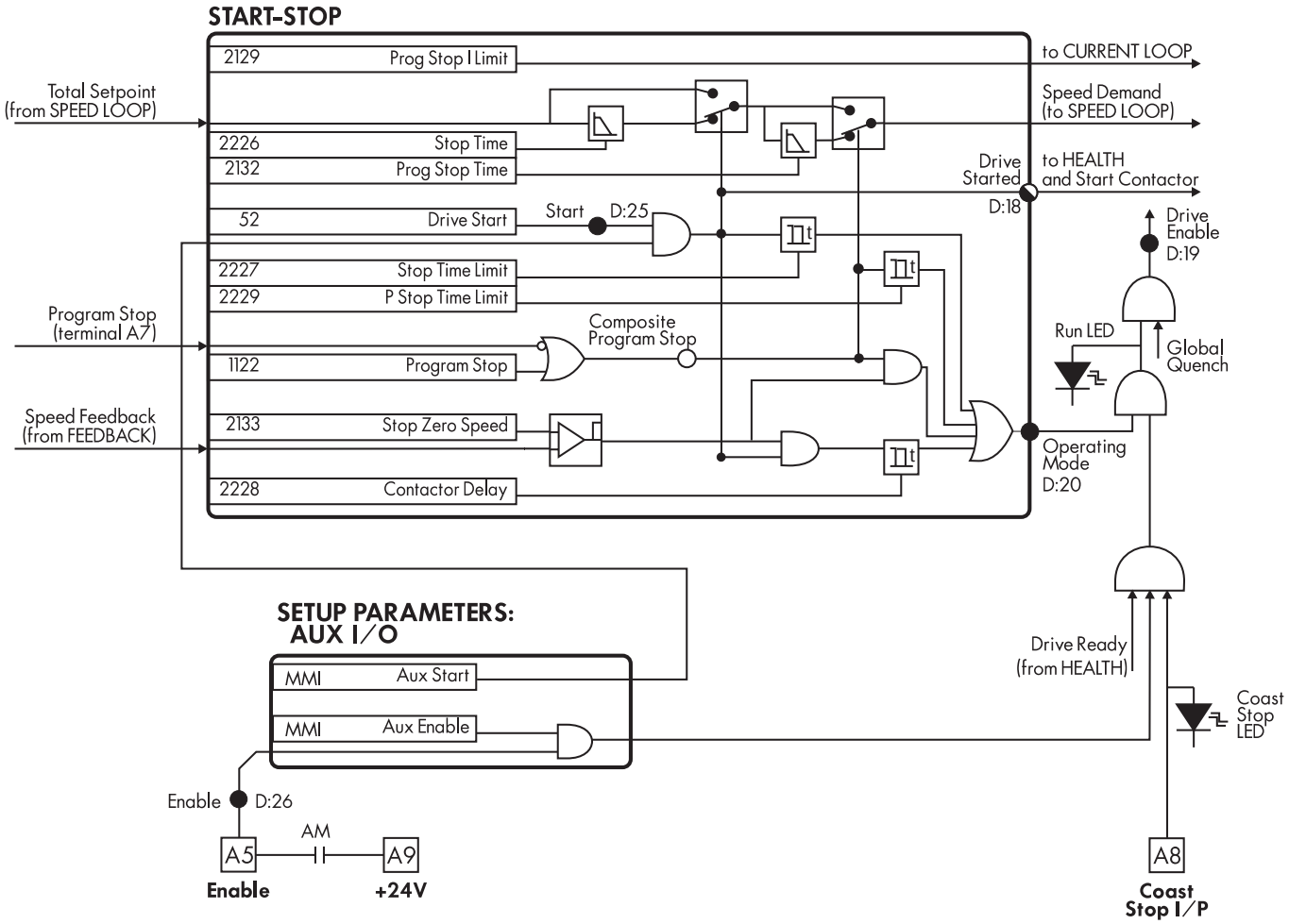



Figure C.22- START-STOP Software Block

## Description

DRIVE START must be set TRUE for the drive to run. DRIVE START is AND-ed with the drive's healthy signal and AUX START.

A normal stop occurs when DRIVE START signal switches FALSE. It ramps TOTAL SETPOINT to zero at a rate set by STOP TIME. This ramp is independent of the RAMP DECEL TIME in RAMPS. A motor powered by a non-regenerative drive (591SP *LINK*) stops no faster than its natural coast stop rate. Regenerative drive powered motors ramp down at the STOP TIME rate. If the drive speed has not reached the STOP ZERO SPEED within the STOP LIMIT time, the current loop disables, the contactor de-energizes and the drive coasts to rest.

> NOTE. The overall start signal is *not* internally latched Zero Speed. If DRIVE START is set FALSE, then immediately TRUE, the drive will restart before the shaft has stopped rotating. Interlock the start signal with the drive's ZERO SPEED output through external LINK logic to prevent a restart before reaching Zero Speed.

During normal stops, CONTACTOR DELAY delays de-energizing the contactor after the motor speed feedback reaches STOP ZERO SPEED. When STOP ZERO SPEED is set above 0.25%, the drive disables during the CONTACTOR DELAY time. If set below 0.25%, the drive disables after the delay. This is useful in preventing multiple operations of the contactor while jogging. Disabling the drive immediately overrides the CONTACTOR DELAY timer.

PROGRAM STOP provides an independently controlled fast stop for the regenerative 590SP *LINK* drive. This function is usually reserved for emergency stop conditions and completely overrides the normal stop drive functions. It is triggered when the hardwired terminal A7 goes to 0 VDC (is open circuited) or if the *LINK* software logic PROGRAM STOP input toggles TRUE. COMPOSITE PROGRAM STOP is TRUE if either PROGRAM STOP is TRUE or terminal A7 becomes open circuited. The MMI diagnostic PROGRAM STOP corresponds to this software block output.

Set PROGRAM STOP to FALSE to control program stop solely through terminal A7. The Program Stop LED on the front of the drive is driven directly by terminal A7 and disregards the state of the *LINK* PROGRAM STOP input.

**WARNING!**

For safety reasons, it is preferable to control the drive program stop action solely by hardwired control through terminal A7. Refer to Chapter 2 for program stop wiring.

PROGRAM STOP TIME sets the ramp time of a program stop and overrides STOP TIME or RAMP DECEL TIME. PROGRAM STOP LIMIT begins timing when COMPOSITE PROGRAM STOP goes TRUE and determines the maximum program stop time duration before the drive disables and switches to a coast stop.

PROG STOP I LIM sets the current limit in CURRENT LOOP during a program stop. It is independent of the current clamp settings in the CLAMPS or CURRENT LOOP software blocks.

### Input Parameters

| Slot | Name | Description | MMI/SAM Range | *LINK* Range | Default |
|---|---|---|---|---|---|
| — | AUX ENABLE | Drive current enabled when ON, +24VDC is at terminal A5 *and* current loop is unquenched (*LINK* slot 38 is TRUE) *and* drive is healthy. Under AUX I/O in MMI. | ON/OFF | — | ON |
| — | AUX START | Drive starts when ON *and* *LINK* start signal, slot 52 is TRUE *and* the drive is healthy. Under AUX I/O in MMI. | ON/OFF | — | ON |
| 2228 | CONTACTOR DELAY | The time the contactor stays energized after the STOP ZERO SPEED limit is reached. | 0.1 to 600.0 Secs | 0.0 to 100.00% | 1.0 Secs |
| 52 | DRIVE START | *LINK* Drive Start signal. Logic AND-ed with AUX START Monitored in the MMI under DIAGNOSTICS:: START. | TRUE/FALSE | 1=true/0=false | FALSE |
| 1122 | PROGRAM STOP | Initiates a Program Stop when TRUE. Signal is logic OR-ed with the hardwired program stop terminal A7. | TRUE/FALSE | 1=true/0=false | FALSE |
| 2129 | PROG STOP I LIM | Current limit when performing a program stop. | 0.00 to 200.00% | 0.0 to 100.00% | 100.00% |

### Input Parameters

| Slot | Parameter | Description | MMI/SAM Range | *LINK* Range | Default |
|---|---|---|---|---|---|
| 2229 | PROG STOP LIMIT | The maximum time allowed for a program stop before the drive disables and the contactor de-energizes. | 0.0 to 600.0 Secs | 0.0 to 100.00% | 60.0 Secs |
| 2132 | PROG STOP TIME | Time to reach zero speed when performing a program stop. | 0.1 to 600.0 Secs | 0.0 to 100.00% | 0.1 Secs |
| 2227 | STOP LIMIT | Limits the maximum time a controlled stop can take during a normal stop before the drive will coast stop. | 0.0 to 600.0 Secs | 0.0 to 100.00% | 60.0 Secs |
| 2226 | STOP TIME | Time to reach zero speed when performing a normal stop from 100% full speed. | 0.1 to 600.0 Secs | 0.0 to 100.00% | 10.0 Secs |
| 2133 | STOP ZERO SPEED | Speed feedback threshold which triggers the CONTACTOR DELAY timer. | 0.00 to 100.00% | 0.0 to 100.00% | 2.00% |

### Output Parameters

| *LINK* Output | Description | SAM Range | *LINK* Range | MMI Diagnostic |
|---|---|---|---|---|
| COMPOSITE PROGRAM STOP | OR-ed result of terminal A7 (Program Stop) and Program Stop input slot. | ACTIVE/INACTIVE | 1=ACTIVE/0=INACTIVE | PROGRAM STOP |
| DRIVE STARTED | Output of drive start condition. | ON/OFF | 1=ON/0=OFF | DRIVE START |

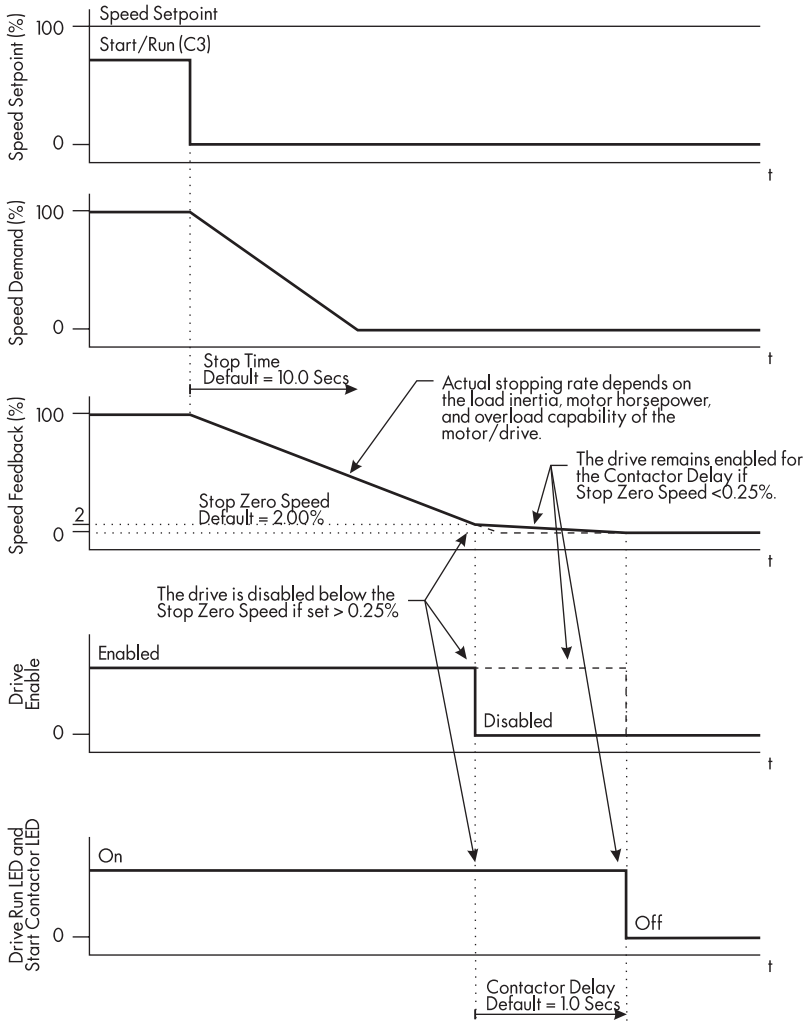



Figure C.23 - Sequences During a Normal Stop

STOP ZERO SPEED settings below 0.25% will keep the drive enabled after reaching STOP ZERO SPEED for the CONTACTOR DELAY time. This setup is useful in jog applications.

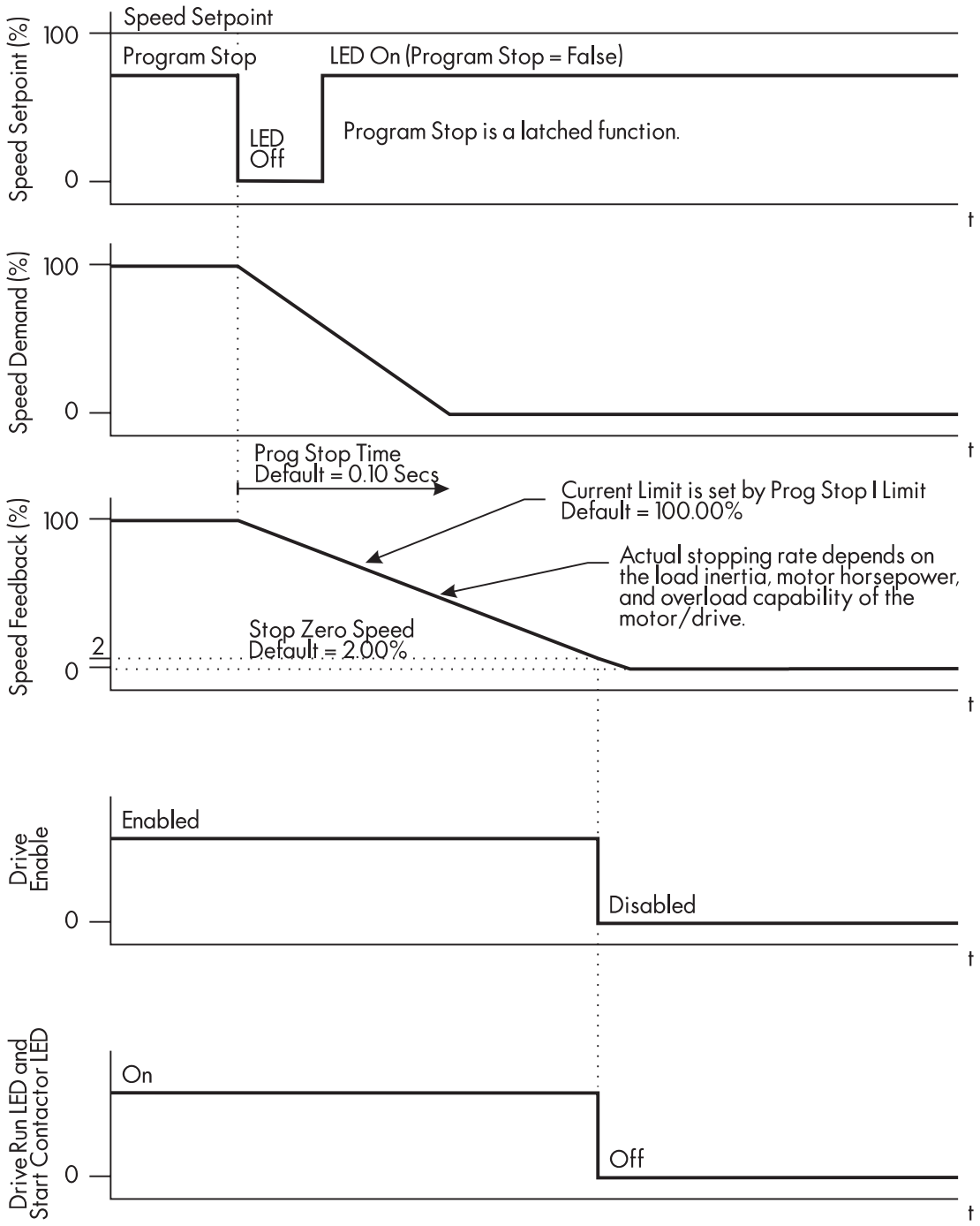



Figure C.24 - Sequences for a Program Stop

PROGRAM STOP is a latched function. Once a PROGRAM STOP signal is received; that is, terminal A7 open circuits or PROGRAM STOP is toggled TRUE, the stop continues even if 24 volts is reconnected to terminal or PROGRAM STOP goes FALSE.

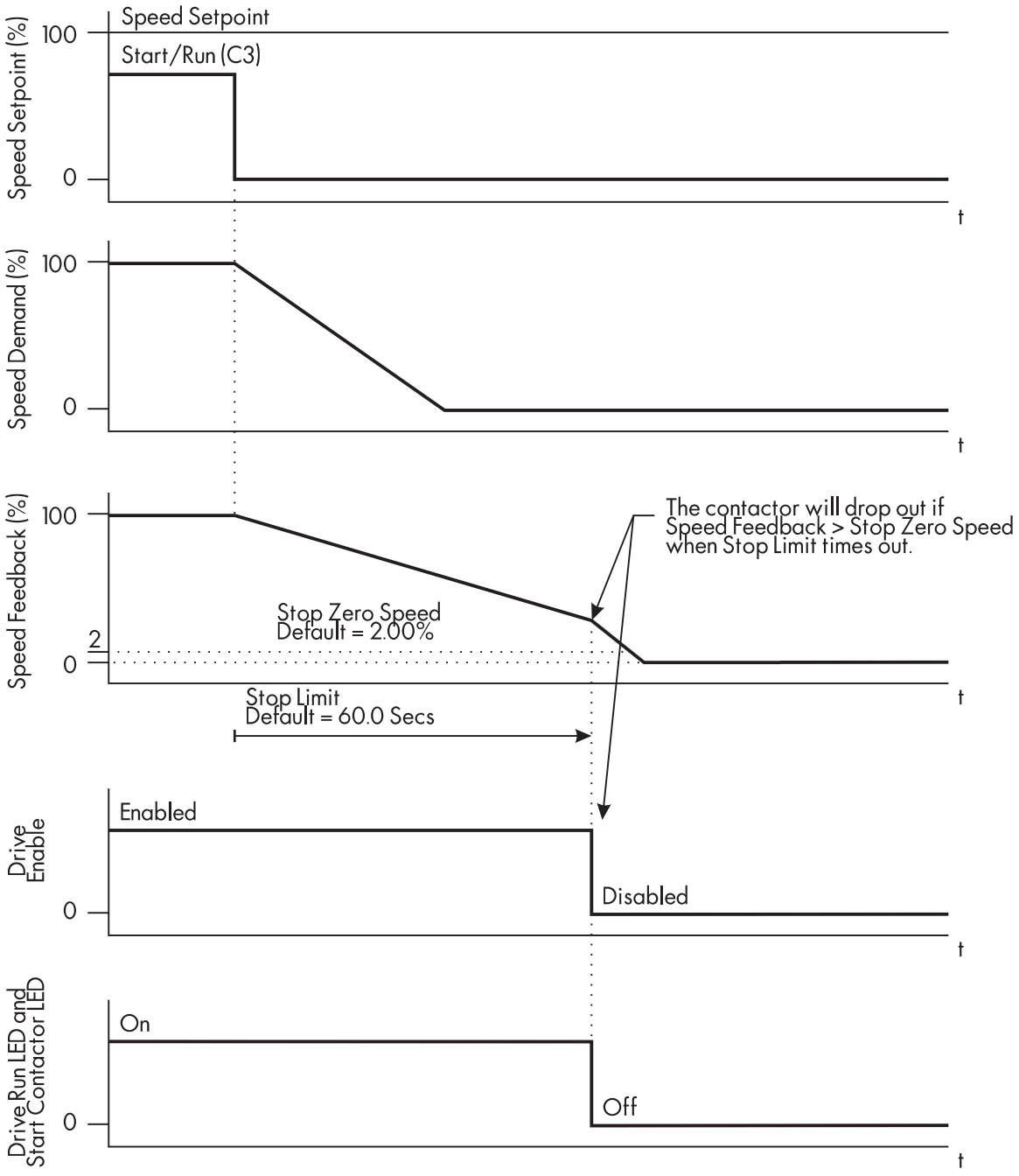



Figure C.25 - Sequences When a Normal Stop Times Out

These curves illustrate the sequence when a normal stop takes longer than the `STOP LIMIT` time. The drive disables and the contactor de-energizes at that time.

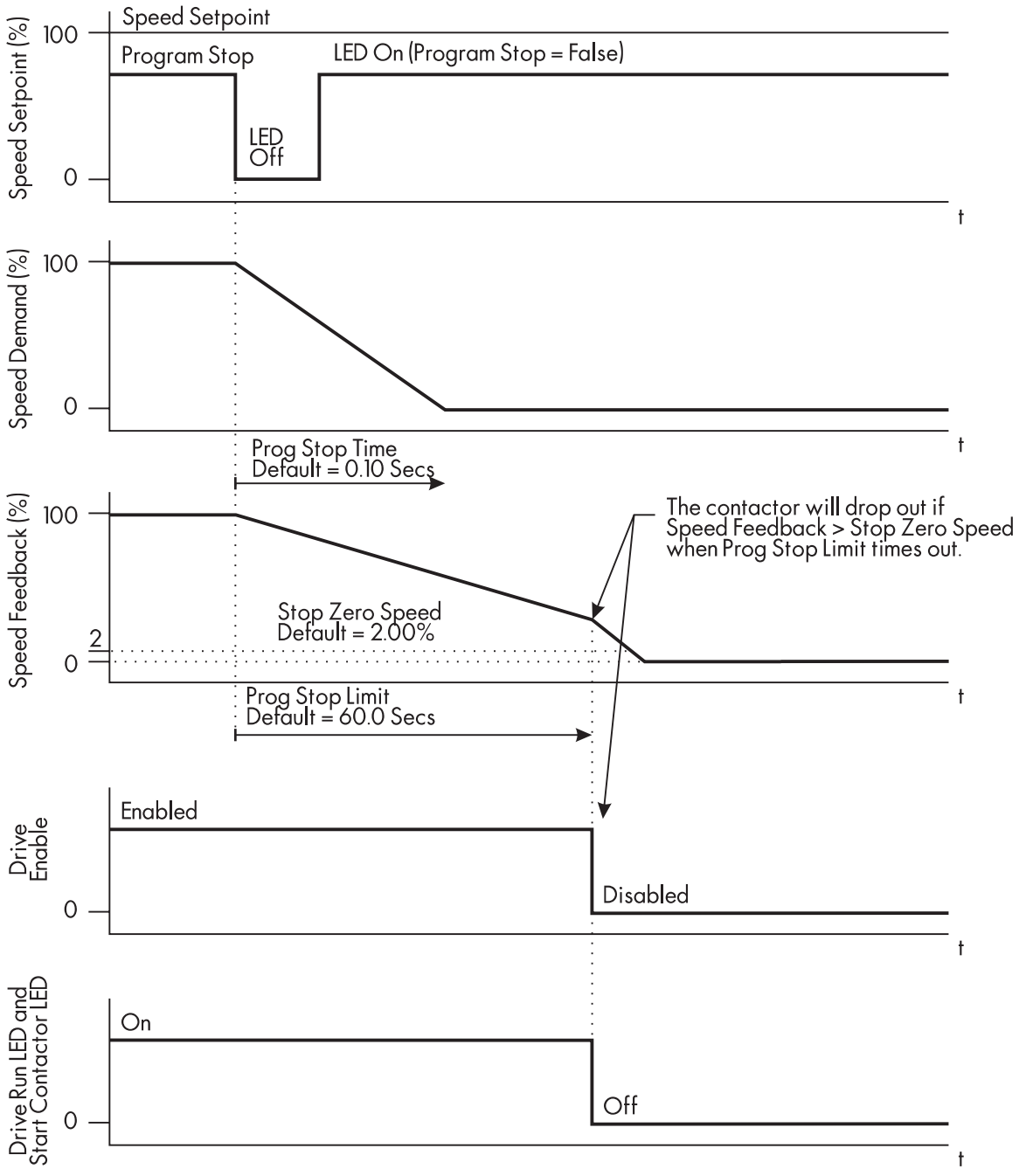



Figure C.26 - Sequences when a Program Stop Times Out

The time out logic is the same for both a normal stop and a program stop. `PROGRAM STOP LIMIT`, however, sets the maximum duration of a program stop before the contactor de-energizes and the drive disables.

## SUMMING

The SUMMING block scales and sums two non-ramped speed inputs, INPUT 0 and INPUT 1. The block has a single output, SETPOINT SUM, which sums with the other speed setpoints in the SPEED LOOP to produce TOTAL SETPOINT.

NOTE. The SUMMING software block corresponds to the MMI sub-menu SETUP PARAMETERS:: SETPOINT SUM.

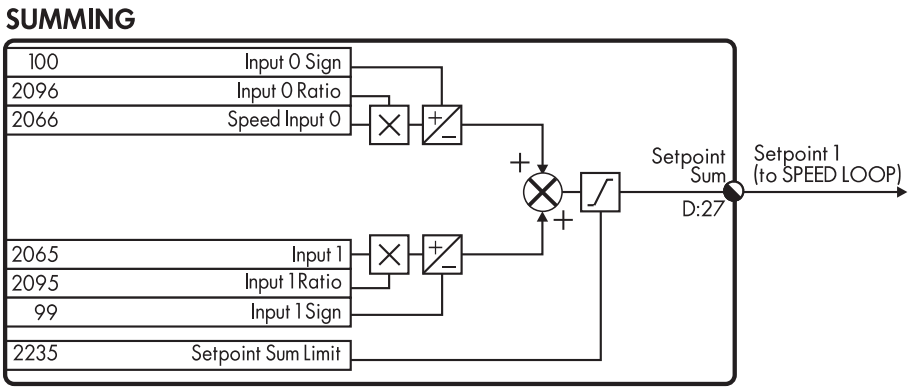
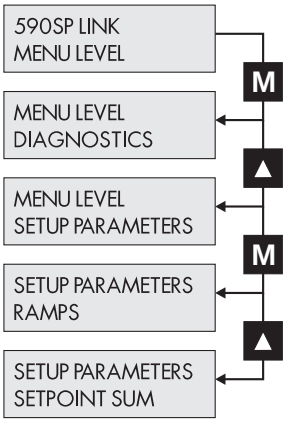



Figure C.27 - SUMMING Software Block




INPUT 0 and INPUT 1 have independent ratio scaling and sign inverting capability. You can also clamp SETPOINT SUM with SUM LIMIT. INPUT 1 has a DEADBAND WIDTH function set only through the MMI. For an input within the deadband, the output clamps to zero.

NOTE. Overspeed and *LINK* Signal Scaling:
Like other speed inputs, INPUT 0 and INPUT 1 can accept an overspeed range of ±20% to accommodate continuous operation of the drive speed control loop. Therefore, scale all *LINK* speed reference signals by 0.8333 to account for this overspeed capability so that an 83.33% *LINK* signal yields a 100% speed reference to INPUT 0 or INPUT 1. Refer to Chapter 3 for more information concerning *LINK* data ranges and signal scaling.

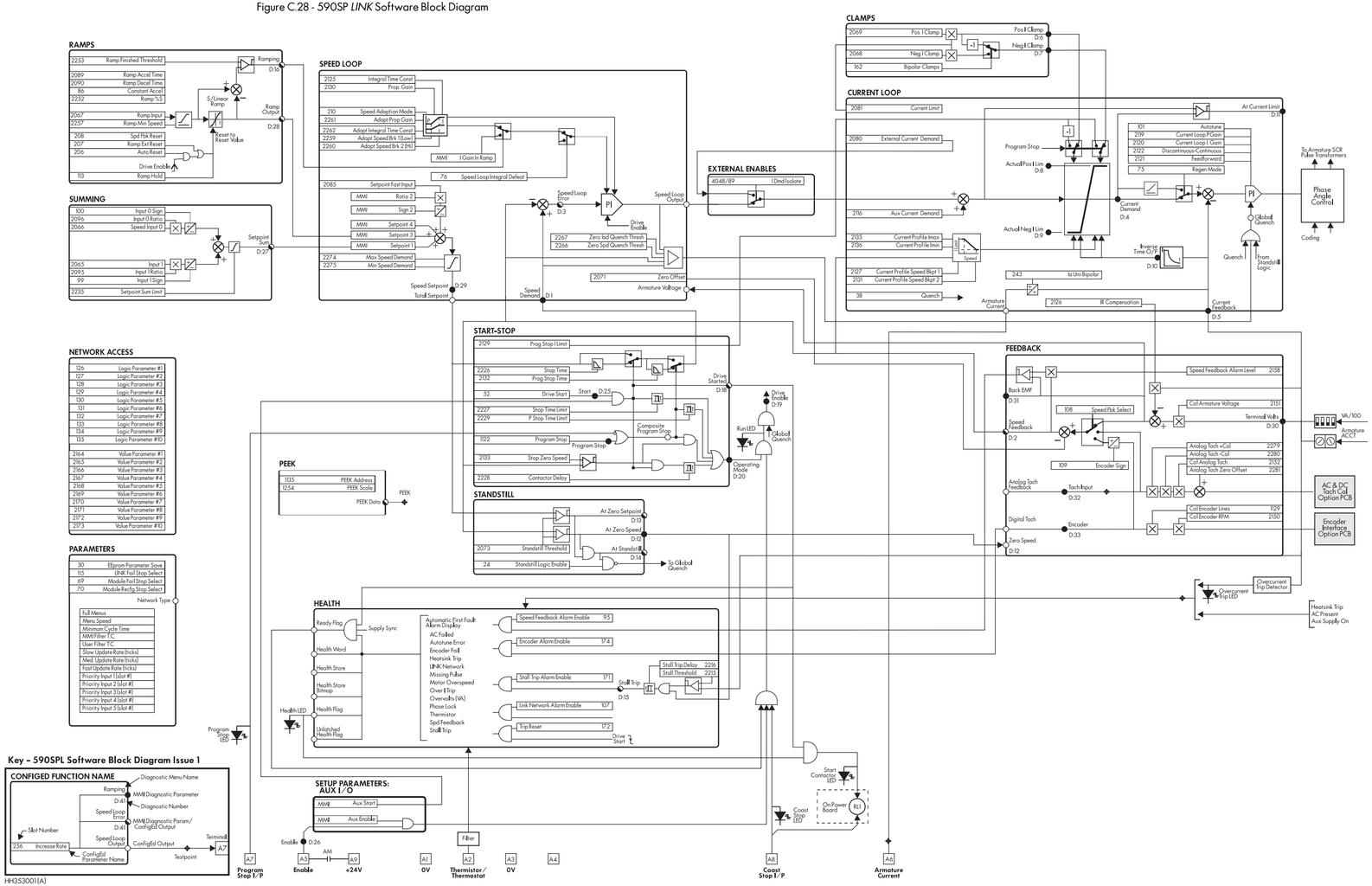
### Input Parameters

| Slot | Name | Description | MMI/SAM Range | *LINK* Range | Default |
|---|---|---|---|---|---|
| — | DEADBAND WIDTH | Symmetrical range within which the output is clamped at zero. | 0.0 to 100.0% | 0.0 to 100.0% | 0.0% |
| 2066 | INPUT 0 | INPUT 0 value. | ±105.00% | ±87.50% | 0.00% |
| 2065 | INPUT 1 | INPUT 1 value. | ±105.00% | ±87.50% | 0.00% |
| 2096 | RATIO 0 | Multiplier scaling for INPUT 0 | 0 to 3.000 | 0 to 100.00% | 1.0000 |
| 2095 | RATIO 1 | Multiplier scaling for INPUT 1 | 0 to 3.000 | 0 to 100.00% | 1.0000 |
| 100 | SIGN 0 | Polarity for INPUT 0. | POSITIVE/NEGATIVE | 1= NEGATIVE 0= POSITIVE | POSITIVE |
| 99 | SIGN 1 | Polarity for INPUT 1. | POSITIVE/NEGATIVE | 1= NEGATIVE 0= POSITIVE | POSITIVE |
| 2235 | SUM LIMIT | Symmetrical limit for the total sum output. | 0.00 to 105% | 0 to 87.5% | 105.00% |

### Output Parameters

| *LINK* Name | Description | SAM Range | *LINK* Range | MMI Diagnostic |
|---|---|---|---|---|
| SETPOINT SUM | Sum of INPUT 1 and INPUT 0 after scaling and sign and SUM LIMIT parameters are applied. Corresponds to SETPOINT 1 in the MMI SPEED LOOP. | ±105.00% | ±87.50% | SPT. SUM OUTPUT |

Figure C.28 - 590SP *LINK* Software Block Diagram

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# Appendix D PARAMETER LIST BY MMI NAME

| | MMI Equivalent | LINK Slot/Output | Slot No. | LINK Signal Range | SAM or MMI Range | Default |
|---|---|---|---|---|---|---|
| | **ALARM STATUS** | | | | | |
| | ALARM STATUS::HEALTH STORE | Health/Health Store Bitmap | output | 0 to 32,767 ordinal | see Figure 5.10, Health Alarm Bits | ---- |
| | ALARM STATUS::HEALTH WORD | Health/Health Word | output | 0 to 65,535 ordinal | refer to Alarm Process in Chapter 5 | ---- |
| | ALARM STATUS::LAST ALARM | Health/Health Store | output | 0 to 16 ordinal | annunciated alarm | ---- |
| | **DIAGNOSTICS** | | | | | |
| | DIAGNOSTICS::ACTUAL NEG I LIM | no corresponding LINK output available | n/a | n/a | ±200% | ---- |
| | DIAGNOSTICS::ACTUAL POS I LIM | no corresponding LINK output available | n/a | n/a | ±200% | ---- |
| | DIAGNOSTICS::AT CURRENT LIMIT | no corresponding LINK output available | n/a | n/a | true/false | ---- |
| | DIAGNOSTICS::AT STANDSTILL | Standstill/At Standstill | output | 1=true/0=false | 1=@ standstill/ 0= not @ standstill | ---- |
| | DIAGNOSTICS::AT ZERO SETPOINT | Standstill/At Zero Setpoint | output | 1=true/0=false | 1=@ zero sp/ 0= not @ zero sp | ---- |
| | DIAGNOSTICS::AT ZERO SPEED | Feedback/Zero Speed | output | 1=true/0=false | true/false | ---- |
| | DIAGNOSTICS::BACK EMF | no corresponding LINK output available | n/a | n/a | ±150% | ---- |
| | DIAGNOSTICS::CURRENT DEMAND | Speed Loop/Speed Loop Output | output | ±100% | ±200% | ---- |
| | DIAGNOSTICS::CURRENT FEEDBACK | Current Loop/Armature Current | output | ±100% | ±200% | ---- |
| | DIAGNOSTICS::DRIVE ENABLE | Current Loop/Global Quench | output | 1=enable/0=disable | enabled/disabled (quenched) | ---- |
| | DIAGNOSTICS::DRIVE START | Start-Stop/Drive Started | output | 1/0 | on/off | ---- |
| | DIAGNOSTICS::ENABLE | Current Loop/Quench | 38 | 1 = Ia off / 0= Ia on | off (quenched)/on (unquenched) | unquenched (Ia on) |
| | DIAGNOSTICS::ENCODER | Feedback/Digital Tach | output | ±100% | ±6000 rpm | ---- |
| | DIAGNOSTICS::INVERSE TIME O/P | Current Loop/Inverse Time | 2138 | 0 to +100% | 0 to +200% | ---- |
| | DIAGNOSTICS::NEG I CLAMP | Clamps/Negative Clamp | 2068 | ±100% | ±200% | -100.00% |
| | DIAGNOSTICS::OPERATING MODE | no corresponding LINK output available | n/a | 0,1 ordinal | stop (0)/run (1) | ---- |
| | DIAGNOSTICS::POS I CLAMP | Clamps/Positive Clamp | 2069 | ±100% | ±200% | 100.00% |
| | DIAGNOSTICS::PROGRAM STOP | Start-Stop/Composite Program Stop | output | 1=active,0=inactive | active/inactive | ---- |
| | DIAGNOSTICS::RAMP OUTPUT | Ramps/Ramp Output | output | ±100% | ±120.00% | ---- |
| | DIAGNOSTICS::RAMPING | Ramps/Ramping | output | 1=true/0=false | true (ramping)/false (not ramping) | ---- |
| | DIAGNOSTICS::SPEED DEMAND | Start-Stop/Start-Stop Output | n/a | ±100% | ±120% | ---- |
| | DIAGNOSTICS::SPEED ERROR | Speed Loop/Speed Loop Error | output | ±100% | ±100% | ---- |
| | DIAGNOSTICS::SPEED FEEDBACK | Feedback/Speed Feedback | output | ±100% | ±120.0% | ---- |
| | DIAGNOSTICS::SPEED SETPOINT | Speed Loop/Total Setpoint | output | ±100% | ±120% | ---- |
| | DIAGNOSTICS::SPT. SUM OUTPUT | Summing/Setpoint Sum | output | ±87.5% | ±105% | 0.00% |
| | DIAGNOSTICS::STALL TRIP | Health/Stall Trip | output | 1=tripped/0=normal | tripped/normal (OK) | normal (OK) |
| | DIAGNOSTICS::TACH INPUT | Feedback/Analog Tach Feedback | output | ±100% | ±150% | ---- |
| | DIAGNOSTICS::TERMINAL VOLTS | Speed Loop/Armature Voltage | output | ±100% | ±200% | ---- |
| | **LINK SUPPORT** | | | | | |
| # | LINK SUPPORT::ADDRESS | no corresponding LINK output available | n/a | n/a | 1 through 3000 | ---- |
| # | LINK SUPPORT::NODE TYPE (read only in MMI and in SAM) | Parameters/Network Type | output | 2, 3, 7, 11 ordinal | simple (2)/red (3)/tap (7)/aux tap (11) | simple |
| # | LINK SUPPORT::STOP ON NET FAIL (not setable in MMI) | Parameters/LINK Fail Stop Select | 115 | 0,1,2 ordinal | coast (0)/no stop (1)/regen (2) | ena. regen stop |
| # | LINK SUPPORT::STOP/MODULE FAIL (not setable in MMI) | Parameters/Module Fail Stop Select | 69 | 0,1,2 ordinal | coast/no stop/regen | ena. regen stop |
| # | LINK SUPPORT::STOP/MODULE RCFG (not setable in MMI) | Parameters/Module Recfg Stop Select | 70 | 0,1,2 ordinal | coast/no stop/regen | ena. regen stop |
| | | | | | | |

* These MMI parameters available only in the password protect mode.
\# These parameters cannot be changed through the MMI.
† These ConfigEd parameters are reserved for authorized use only.
+ Parameter inaccessible through SAM.

# Appendix D PARAMETER LIST BY MMI NAME (Continued)

| | MMI Equivalent | LINK Slot/Output | Slot No. | LINK Signal Range | SAM or MMI Range | Default |
|---|---|---|---|---|---|---|
| | **MENUS** | | | | | |
| | MENUS::FULL MENUS | Parameters/Full Menus | n/a | enabled/disabled | enabled/disabled | enabled |
| | MENUS::MENU DELAY | Parameters/Menu Speed | n/a | 0 to 65,535 ordinal | 0 to 5000 | 30 |
| | **NETWORK ACCESS** | | | | | |
| | NETWORK ACCESS::LOGIC PARAM. 1 | Network Access/Logic Parameter #1 | 126 | 1=true/0=false | true/false | false |
| | NETWORK ACCESS::LOGIC PARAM. 10 | Network Access/Logic Parameter #10 | 135 | 1=true/0=false | true/false | false |
| | NETWORK ACCESS::LOGIC PARAM. 2 | Network Access/Logic Parameter #2 | 127 | 1=true/0=false | true/false | false |
| | NETWORK ACCESS::LOGIC PARAM. 3 | Network Access/Logic Parameter #3 | 128 | 1=true/0=false | true/false | false |
| | NETWORK ACCESS::LOGIC PARAM. 4 | Network Access/Logic Parameter #4 | 129 | 1=true/0=false | true/false | false |
| | NETWORK ACCESS::LOGIC PARAM. 5 | Network Access/Logic Parameter #5 | 130 | 1=true/0=false | true/false | false |
| | NETWORK ACCESS::LOGIC PARAM. 6 | Network Access/Logic Parameter #6 | 131 | 1=true/0=false | true/false | false |
| | NETWORK ACCESS::LOGIC PARAM. 7 | Network Access/Logic Parameter #7 | 132 | 1=true/0=false | true/false | false |
| | NETWORK ACCESS::LOGIC PARAM. 8 | Network Access/Logic Parameter #8 | 133 | 1=true/0=false | true/false | false |
| | NETWORK ACCESS::LOGIC PARAM. 9 | Network Access/Logic Parameter #9 | 134 | 1=true/0=false | true/false | false |
| | NETWORK ACCESS::VALUE PARAM. 1 | Network Access/Value Paramater #1 | 2164 | ±100% | ±100% | 0.00% |
| | NETWORK ACCESS::VALUE PARAM. 10 | Network Access/Value Paramater #10 | 2173 | ±100% | ±100% | 0.00% |
| | NETWORK ACCESS::VALUE PARAM. 2 | Network Access/Value Paramater #2 | 2165 | ±100% | ±100% | 0.00% |
| | NETWORK ACCESS::VALUE PARAM. 3 | Network Access/Value Paramater #3 | 2166 | ±100% | ±100% | 0.00% |
| | NETWORK ACCESS::VALUE PARAM. 4 | Network Access/Value Paramater #4 | 2167 | ±100% | ±100% | 0.00% |
| | NETWORK ACCESS::VALUE PARAM. 5 | Network Access/Value Paramater #5 | 2168 | ±100% | ±100% | 0.00% |
| | NETWORK ACCESS::VALUE PARAM. 6 | Network Access/Value Paramater #6 | 2169 | ±100% | ±100% | 0.00% |
| | NETWORK ACCESS::VALUE PARAM. 7 | Network Access/Value Paramater #7 | 2170 | ±100% | ±100% | 0.00% |
| | NETWORK ACCESS::VALUE PARAM. 8 | Network Access/Value Paramater #8 | 2171 | ±100% | ±100% | 0.00% |
| | NETWORK ACCESS::VALUE PARAM. 9 | Network Access/Value Paramater #9 | 2172 | ±100% | ±100% | 0.00% |
| | PARAMETER SAVE | Parameters/EEPROM Parameter Save | 30 | 1=save/0=cancel | saving/finished | ---- |
| †* | RESERVED::MIN MMI CYCLE TM | Parameters/Minimum Cycle Time | n/a | 0 to 65,535 ordinal | 0 to 65,535 | 80 |
| †* | RESERVED::MMI FILTER T.C. | Parameters/MMI Filter T.C. | n/a | 0 to 65,535 ordinal | 0 to 65,535 | 20 |
| †* | RESERVED::USER FILTER T.C. | Parameters/User Filter T.C. | n/a | 0 to 65,535 ordinal | 0 to 65,535 | 20 |
| | **SETUP PARAMETERS::AUX I/O** | | | | | |
| | AUX ENABLE | Start-Stop/Drive Start | 52 | 1/0 | on/off | ---- |
| | AUX START | Start-Stop/Drive Start | 52 | 1/0 | on/off | |
| | **SETUP PARAMETERS::CALIBRATION** | | | | | |
| | ANALOG TACH +CAL | Feedback/Analog Tach + Cal | 2279 | 89 to 100% | 0.98 to 1.10 | 1.0000 |
| | ANALOG TACH -CAL | Feedback/Analog Tach - Cal | 2280 | 89 to 100% | 0.98 to 1.10 | 1.0000 |
| | ANALOG TACH CAL | Feedback/Cal Analog Tach | 2152 | 89 to 100% | 0.98 to 1.10 | 1.0000 |
| | ANALOG TACH ZERO | Feedback/Analog Tach Zero | 2281 | ±100% | ±5.00 | 0.00% |
| | ARMATURE I | Current Loop/Ia Uni-bipolar | 243 | unipolar/bipolar | 1=bipolar/0=unipolar | bipolar |
| | ARMATURE V CAL | Feedback/Cal Armature Voltage | 2151 | 89 to 100% | 0.98 to 1.10 | 1.0000 |
| | ENCODER LINES | Feedback/Cal Encoder Lines | 1129 | 10 to 5000 | 10 to 5000 ordinal | 1000 |
| | ENCODER RPM | Feedback/Cal Enacoder RPM | 2150 | 0 to 6000 | 0 to 32,767 oridnal | 1000 rpm |
| | IR COMPENSATION | Current Loop/IR Comp | 2126 | 0 to +100% | 0 to +100% | 0.00% |

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\+ Parameter inaccessible through SAM.

# Appendix D PARAMETER LIST BY MMI NAME (Continued)

| | MMI Equivalent | LINK Slot/Output | Slot No. | LINK Signal Range | SAM or MMI Range | Default |
|---|---|---|---|---|---|---|
| | **SETUP PARAMETERS::CALIBRATION (Continued)** | | | | | |
| †* | OVER SPEED LEVEL | Speed Loop/Overspeed Level | 2217 | 0 to +100% | 0 to +200% | 118.00% |
| | SPD FBK ALRM LEVEL | Feedback/Speed Feedback Alarm Level | 2158 | 0 to 100% | 0 to 100% | 50.0% |
| | STALL THRESHOLD | Health/Stall Threshold | 2215 | 0 to +100% | 0 to +200% | 95.00% |
| | STALL TRIP DELAY | Health/Stall Trip Delay | 2216 | 0 to +100% | 0.1 to 600.0 secs | 10.0 secs |
| | ZERO SPD OFFSET | Speed Loop/Zero Offset | 2071 | ±100% | ±5.00% | 0.00% |
| | **SETUP PARAMETERS::CURRENT LOOP** | | | | | |
| | ADDITIONAL DEM | Current Loop/Aux Current Demand | 2116 | ±100% | ±200% | 0.00% |
| | AUTOTUNE | Current Loop/Autotune | 101 | 1=active/0=inactive | on (active)/off (inactive) | off (inactive) |
| | BIPOLAR CLAMPS | Clamps/BipolarClamps | 162 | 1=enable/0=disable | enabled/disabled | enabled |
| | CURRENT LIMIT | Current Loop/Current Limit | 2081 | 0 to +100% | 0 to +200% | 100.00% |
| † | DISCONTINUOUS | Current Loop/Discontinuous-Continuous | 2122 | 0 to +100% | 0 to +200 | 12.00 |
| †* | FEED FORWARD | Current Loop/Feedforward | 2121 | 0 to +100% | 0.10 to 50.00 | 2.00 |
| | I DMD. ISOLATE | External Enables/Current Demand Enable | 89/4048 | 1=external/0= internal | disabled/enabled | internal (disabled) |
| | INT. GAIN | Current Loop/Current Loop I Gain | 2120 | 0 to +100% | 0 to 200 | 3.50 |
| | NEG. I CLAMP | Clamps/Negative Clamp | 2068 | ±100% | ±200% | -100.00% |
| | POS. I CLAMP | Clamps/Positive Clamp | 2069 | ±100% | ±200% | 100.00% |
| | PROP. GAIN | Current Loop/Current Loop P Gain | 2119 | 0 to +100% | 0 to 200 | 45.00 |
| | REGEN MODE | Current Loop/Regen Mode | 75 | 1=regen/0=non-regen | 1=enabled (regen) /0=disabled | enabled (regen) |
| | **SETUP PARAMETERS::CURRENT PROFILE** | | | | | |
| | IMAX BRK1 (SPD1) | Current Loop/Current Profile I Max | 2135 | 0 to +100% | 0 to +200% | +200.00% |
| | IMAX BRK2 (SPD2) | Current Loop/Current Profile I Min | 2136 | 0 to +100% | 0 to +200% | +200.00% |
| | SPD BRK1 (LOW) | Current Loop/Current Profile Speed Bkpt 1 | 2127 | 0 to +100% | 0 to +100% | +100.00% |
| | SPD BRK2 (HIGH) | Current Loop/Current Profile Speed Bkpt 2 | 2131 | 0 to +100% | 0 to +100% | +100.00% |
| | **SETUP PARAMETERS::INHIBIT ALARMS** | | | | | |
| | ENCODER ALARM | Health/Encoder Alarm Enable | 174 | 1=inhibit/0=enable | inhibited/enabled | enabled |
| | LINK NETWORK | Health/Link Network Alarm Enable | 107 | 1=inhibit/0=enable | inhibited/enabled | enabled |
| | SPEED FBK ALARM | Health/Speed Feedback Alarm Enable | 95 | 1=inhibit/0=enable | inhibited/enabled | enabled |
| | STALL TRIP | Health/Stall Trip Alarm Enable | 171 | 1=inhibit/0=enable | inhibited/enabled | inhibited |
| | TRIP RESET | Health/Trip Reset | 172 | 1=active/0=inactive | active (true)/inactive (false) | TRUE (active) |
| | **SETUP PARAMETERS::INVERSE TIME** | | | | | |
| * | AIMING POINT | Current Loop/Inverse Time | 2138 | 0 to +100% | 0 to +200% | 110% |
| †*+ | DELAY | Current Loop/Inverse Time Delay | 2207 | n/a | MMI: 0.1 - 600.0 sec | 10.0 secs |
| †*+ | RATE | Current Loop/Inverse Time Rate | 2208 | n/a | MMI: 0.1 - 600.0 sec | 60.0 secs |
| | **SETUP PARAMETERS::RAMPS** | | | | | |
| | % S-RAMP | Ramps/Ramp S % | 2252 | 0 to +100% | 0 to +100% | 5.00% |
| | CONSTANT ACCEL | Ramps/Ramp Constant Accel | 86 | 1=inactive/0=active | inactive/active | inactive |
| | EXTERNAL RESET | Ramps/Ramp External Reset | 207 | 1/0 | enabled/disabled | disabled |
| | MIN SPEED | Ramps/Ramp Min Speed | 2257 | 0 to +100.00% | 0 to +120.00% | 0.00% |
| | RAMP ACCEL TIME | Ramps/Ramp Accel Time | 2089 | 0 to +100% | 0.1 - 600.0 sec | 10.0 secs |
| | RAMP DECEL TIME | Ramps/Ramp Decel Time | 2090 | 0 to +100% | 0.1 - 600.0 sec | 10.0 secs |

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# These parameters cannot be changed through the MMI.
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+ Parameter inaccessible through SAM.

# Appendix D PARAMETER LIST BY MMI NAME (Continued)

| | MMI Equivalent | LINK Slot/Output | Slot No. | LINK Signal Range | SAM or MMI Range | Default |
|---|---|---|---|---|---|---|
| | **SETUP PARAMETERS::RAMPS (Continued)** | | | | | |
| | RAMP HOLD | Ramps/Ramp Hold | 113 | 0=ramp/1=hold | ramp/hold | ramp |
| | RAMP INPUT | Ramps/Ramp Input | 2067 | ±100% | ±120.00% | 0.00% |
| | RAMPING THRESH | Ramps/Ramp Finished Thresh | 2253 | 0 to +100% | 0 to +100% | 0.50% |
| | SPD. FBK. RESET | Ramps/Speed Fbk Reset | 208 | 1=enable/0-disable | enabled/disabled | disabled |
| | SETUP PARAMETERS::RAMPS:AUTO RESET | Ramps/Ramp Ext Reset Enable | 206 | 1=enable/0-disable | enabled/disabled | enabled |
| | **SETUP PARAMETERS::SETPOINT SUM** | | | | | |
| | INPUT 0 | Summing/Speed Input 0 | 2066 | ±100% | ±120% | 0.00% |
| | INPUT 1 | Summing/Speed Input 1 | 2065 | ±100% | ±120% | 0.00% |
| | LIMIT | Summing/Sum Limit | 2235 | 0 to +87.5% | 0 to +105% | 105.00% |
| | RATIO 0 | Summing/Input 0 Ratio | 2096 | ±100% | ±3.0000 | 1.0000 |
| | RATIO 1 | Summing/Input 1 Ratio | 2095 | ±100% | ±3.0000 | 1.0000 |
| | SIGN 0 | Summing/Input 0 Sign | 100 | 1=positive/0=negative | negative/positive | positive |
| | SIGN 1 | Summing/Input 1 Sign | 99 | 1=positive/0=negative | negative/positive | positive |
| | **SETUP PARAMETERS::SPEED LOOP** | | | | | |
| | ADVANCED::ADAPTATION::INT TIME CONST | Speed Loop/Adapt Integral Time Const | 2262 | 0 to +100% | .001 to 30 secs | 0.500 secs |
| | ADVANCED::ADAPTATION::MODE | Speed Loop/Speed Adaptation Mode | 210 | 0,1,2,3 ordinal | MODE 0,1,2,3 | 0 |
| | ADVANCED::ADAPTATION::PROP. GAIN | Speed Loop/Adapt Prop Gain | 2261 | 0 to +100% | 0 to 200 | 5.00 |
| | ADVANCED::ADAPTATION::SPD BRK1 (LOW) | Speed Loop/Adapt Speed Brk 1 (low) | 2259 | 0 to +100% | 0 to +100% | 1.00% |
| | ADVANCED::ADAPTATION::SPD BRK2 (HIGH) | Speed Loop/Adapt Speed Brk 2 (high) | 2260 | 0 to +100% | 0 to +100% | 5.00% |
| | ADVANCED::I COMP | no corresponding LINK input slot available | n/a | n/a | ±100% | 0.00% |
| +* | ADVANCED::I GAIN IN RAMP | Speed Loop/I Gain In Ramp | 2263 | 0 to +100% | 0 to 2.0000 | 1.0000 |
| | ADVANCED::ZERO SPD QUENCH::ZERO IAD LEVEL | Speed Loop/Zero Ia Quench Thresh | 2267 | 0 to +100% | 0 to +200% | 0.50% |
| | ADVANCED::ZERO SPD QUENCH::ZERO SPD LEVEL | Speed Loop/Zero Speed Quench Thresh | 2266 | 0 to +100% | 0 to +200% | 1.50% |
| | ENCODER SIGN | Feedback/Encoder Sign | 109 | 1=positive/0=negative | positive/negative | positive |
| | INT. DEFEAT | Speed Loop/Integral Defeat | 76 | 1=on/0=off | on (integral defeated)/off | off |
| | INT. TIME CONST. | Speed Loop/Integral Time Constant | 2125 | 0 to +100% | .001 to 30 secs | 0.500 secs |
| | PROP. GAIN | Speed Loop/Prop. Gain | 2130 | 0 to +100% | 0 to 200 | 10.00 |
| | SETPOINTS::MAX DEMAND | Speed Loop/Max Speed Demand | 2274 | 0 to +87.5% | 0 to +105% | 105.00% |
| | SETPOINTS::MIN DEMAND | Speed Loop/Min Speed Demand | 2275 | -87.5 to 0% | -105 to 0% | -105.00% |
| | SETPOINTS::RATIO 2 | no corresponding LINK input slot available | n/a | n/a | ±3.0000 | 1.0000 |
| # | SETPOINTS::SETPOINT 1 | Summing/Setpoint Sum | output | ±87.5% | ±105% | 0.00% |
| # | SETPOINTS::SETPOINT 2 | Speed Loop/Setpoint Fast Input | 2085 | ±87.5% | ±105% | 0.00% |
| #+ | SETPOINTS::SETPOINT 3 | Ramps/Ramp Output | output | ±100% | MMI: ±120.00% | 0.00% |
| | SETPOINTS::SETPOINT 4 | no corresponding LINK input slot available | n/a | n/a | ±105% | 0.00% |
| | SETPOINTS::SIGN 2 | no corresponding LINK input slot available | n/a | n/a | positive/negative | positive |
| | SPEED FBK SELECT | Feedback/Speed Feedback Select | 108 | 0,1,2 ordinal | arm (0)/tach (1)/enc (2) | arm volt fbk |
| | **SETUP PARAMETERS::STANDSTILL** | | | | | |
| * | SOURCE TAG | no corresponding LINK input slot available | n/a | n/a | ---- | 89 |
| | STANDSTILL LOGIC | Standstill/Standstill Logic Enable | 24 | 1=enable/0-disable | enabled/disabled | disabled |
| | ZERO THRESHOLD | Standstill/Standstill Threshold | 2073 | 0 to +100% | 0 to +5.00% | 2.00% |
| | | | | | | |

* These MMI parameters available only in the password protect mode.
\# These parameters cannot be changed through the MMI.
† These ConfigEd parameters are reserved for authorized use only.
\+ Parameter inaccessible through SAM.

# Appendix D PARAMETER LIST BY MMI NAME (Continued)

| | MMI Equivalent | LINK Slot/Output | Slot No. | LINK Signal Range | SAM or MMI Range | Default |
|---|---|---|---|---|---|---|
| | **SETUP PARAMETERS::STOP RATES** | | | | | |
| | SETUP PARAMETERS::STOP RATES::CONTACTOR DELAY | Start-Stop/Contactor Delay | 2228 | 0 to +100% | 0.1 to 600.0 secs | 1.0 secs |
| | SETUP PARAMETERS::STOP RATES::PROG STOP I LIM | Start-Stop/Prog Stop I Limit | 2129 | 0 to +100% | 0 to +200% | 100.00% |
| | SETUP PARAMETERS::STOP RATES::PROG STOP LIMIT | Start-Stop/P Stop Time Limit | 2229 | 0 to +100% | 0.0 to 600.0 secs | 60.0 secs |
| | SETUP PARAMETERS::STOP RATES::PROG STOP TIME | Start-Stop/Prog Stop Time | 2132 | 0 to +100% | 0.1 to 600.0 secs | 60.0 secs |
| | SETUP PARAMETERS::STOP RATES::STOP LIMIT | Start-Stop/Stop Time Limit | 2227 | 0 to +100% | 0.0 to 600.0 secs | 60.0 secs |
| | SETUP PARAMETERS::STOP RATES::STOP TIME | Start-Stop/Stop Time | 2226 | 0 to +100% | 0.1 to 600.0 secs | 10.0 secs |
| | SETUP PARAMETERS::STOP RATES::STOP ZERO SPEED | Start-Stop/Stop Zero Speed | 2133 | 0 to +100% | 0 to +100% | 2.00% |
| | **SYSTEM::PEEK** | | | | | |
| †* | PEEK DATA | Peek/Peek Data | output | n/a | n/a | ---- |
| †* | PEEK SCALE | Peek/Peek Scale | 1254 | 0 to 65535 | n/a | 800 |
| †* | PEEK TAG | Peek/Peek Address | 1135 | 0 to 65535 | n/a | 120 |
| | **PARAMETERS INACCESSIBLE THROUGH THE MMI** | | | | | |
| | not available in MMI | Health/Health Flag | output | 1=true/0=false | 0x01=healthy /0x00=tripped | ---- |
| | not available in MMI | Health/Ready Flag | output | 1=ready/0=not ready | SAM: ready/not ready | ---- |
| | not available in MMI | Health/Unlatched Health Flag | output | 1=true/0=false | 0x01=healthy /0x00=tripped | ---- |
| | not available in MMI | Start-Stop/Program Stop | 1122 | 1=active,0=inactive | SAM: active/inactive | n/a |
| | not available in MMI or SAM | Current Loop/External Current Demand | 2080 | ±100% | n/a | 0.00% |
| | not available in MMI or SAM, set only in ConfigEd | Feedback/Analog Tach Averaging | ---- | n/a | n/a | enabled |
| † | not available in MMI or SAM, set only in ConfigEd | Parameters/Fast Update Rates (ticks) | n/a | 0 to 65,535 ordinal | n/a | 10 ticks |
| † | not available in MMI or SAM, set only in ConfigEd | Parameters/Med. Update Rates (ticks) | n/a | 0 to 65,535 ordinal | n/a | 50 ticks |
| † | not available in MMI or SAM, set only in ConfigEd | Parameters/Priority Input 1 (slot #) | n/a | 0 to 65,535 ordinal | n/a | 0 |
| † | not available in MMI or SAM, set only in ConfigEd | Parameters/Priority Input 2 (slot #) | n/a | 0 to 65,535 ordinal | n/a | 0 |
| † | not available in MMI or SAM, set only in ConfigEd | Parameters/Priority Input 3 (slot #) | n/a | 0 to 65,535 ordinal | n/a | 0 |
| † | not available in MMI or SAM, set only in ConfigEd | Parameters/Priority Input 4 (slot #) | n/a | 0 to 65,535 ordinal | n/a | 0 |
| † | not available in MMI or SAM, set only in ConfigEd | Parameters/Priority Input 5 (slot #) | n/a | 0 to 65,535 ordinal | n/a | 0 |
| † | not available in MMI or SAM, set only in ConfigEd | Parameters/Slow Update Rates (ticks) | n/a | 0 to 65,535 ordinal | n/a | 100 ticks |
| † | not available in MMI or SAM, set only in ConfigEd | Peek/Peek Tag Number | n/a | 0 to 65535 | n/a | 150 |
| †#+ | not available in MMI or SAM, set only in ConfigEd | Ramps/Ramp Ouput Dest Tag | n/a | 0 to 65535 | n/a | 291 |

* These MMI parameters available only in the password protect mode.
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† These ConfigEd parameters are reserved for authorized use only.
\+ Parameter inaccessible through SAM.

# APPENDIX E PARAMETER LIST BY PARAMETER NAME

| | LINK Slot/Output | Slot No. | MMI Equivalent | LINK Signal Range | SAM or MMI Range | Default |
|---|---|---|---|---|---|---|
| | **CLAMPS** | | | | | |
| | Clamps/BipolarClamps | 162 | SETUP PARAMETERS::CURRENT LOOP::BIPOLAR CLAMPS | 1=enable/0=disable | enabled/disabled | enabled |
| | Clamps/Negative Clamp | 2068 | DIAGNOSTICS::NEG I CLAMP | ±100% | ±200% | -100.00% |
| | Clamps/Negative Clamp | 2068 | SETUP PARAMETERS::CURRENT LOOP::NEG. I CLAMP | ±100% | ±200% | -100.00% |
| | Clamps/Positive Clamp | 2069 | DIAGNOSTICS::POS I CLAMP | ±100% | ±200% | 100.00% |
| | Clamps/Positive Clamp | 2069 | SETUP PARAMETERS::CURRENT LOOP::POS. I CLAMP | ±100% | ±200% | 100.00% |
| | **CURRENT LOOP** | | | | | |
| | Current Loop/Armature Current | output | DIAGNOSTICS::CURRENT FEEDBACK | ±100% | ±200% | ---- |
| | Current Loop/Autotune | 101 | SETUP PARAMETERS::CURRENT LOOP::AUTOTUNE | 1=active/0=inactive | on (active)/off (inactive) | off (inactive) |
| | Current Loop/Aux Current Demand | 2116 | SETUP PARAMETERS::CURRENT LOOP::ADDITIONAL DEM | ±100% | ±200% | 0.00% |
| | Current Loop/Current Limit | 2081 | SETUP PARAMETERS::CURRENT LOOP::CURRENT LIMIT | 0 to +100% | 0 to +200% | 100.00% |
| | Current Loop/Regen Mode | 75 | SETUP PARAMETERS::CURRENT LOOP::REGEN MODE | 1=regen/0=non-regen | 1=enabled (regen) /0=disabled | enabled (regen) |
| | Current Loop/Current Loop I Gain | 2120 | SETUP PARAMETERS::CURRENT LOOP::INT. GAIN | 0 to +100% | 0 to 200 | 3.50 |
| | Current Loop/Current Loop P Gain | 2119 | SETUP PARAMETERS::CURRENT LOOP::PROP. GAIN | 0 to +100% | 0 to 200 | 45.00 |
| | Current Loop/Current Profile I Max | 2135 | SETUP PARAMETERS::CURRENT PROFILE::IMAX BRK1 (SPD1) | 0 to +100% | 0 to +200% | +200.00% |
| | Current Loop/Current Profile I Min | 2136 | SETUP PARAMETERS::CURRENT PROFILE::IMAX BRK2 (SPD2) | 0 to +100% | 0 to +200% | +200.00% |
| | Current Loop/Current Profile Speed Bkpt 1 | 2127 | SETUP PARAMETERS::CURRENT PROFILE::SPD BRK1 (LOW) | 0 to +100% | 0 to +100% | +100.00% |
| | Current Loop/Current Profile Speed Bkpt 2 | 2131 | SETUP PARAMETERS::CURRENT PROFILE::SPD BRK2 (HIGH) | 0 to +100% | 0 to +100% | +100.00% |
| † | Current Loop/Discontinuous-Continuous | 2122 | SETUP PARAMETERS::CURRENT LOOP::DISCONTINUOUS | 0 to +100% | 0 to +200 | 12.00 |
| | Current Loop/External Current Demand | 2080 | not available in MMI or SAM | ±100% | n/a | 0.00% |
| †* | Current Loop/Feedforward | 2121 | SETUP PARAMETERS::CURRENT LOOP::FEED FORWARD | 0 to +100% | 0.10 to 50.00 | 2.00 |
| | Current Loop/Global Quench | output | DIAGNOSTICS::DRIVE ENABLE | 1=enable/0=disable | enabled/disabled (quenched) | ---- |
| | Current Loop/Ia Uni-bipolar | 243 | SETUP PARAMETERS::CALIBRATION::ARMATURE I | unipolar/bipolar | 1=bipolar/0=unipolar | bipolar |
| | Current Loop/Inverse Time | 2138 | DIAGNOSTICS::INVERSE TIME O/P | 0 to +100% | 0 to +200% | ---- |
| * | Current Loop/Inverse Time | 2138 | SETUP PARAMETERS::INVERSE TIME::AIMING POINT | 0 to +100% | 0 to +200% | 110% |
| †*+ | Current Loop/Inverse Time Delay | 2207 | SETUP PARAMETERS::INVERSE TIME::DELAY | n/a | MMI: 0.1 - 600.0 sec | 10.0 secs |
| †*+ | Current Loop/Inverse Time Rate | 2208 | SETUP PARAMETERS::INVERSE TIME::RATE | n/a | MMI: 0.1 - 600.0 sec | 60.0 secs |
| | Current Loop/IR Comp | 2126 | SETUP PARAMETERS::CALIBRATION::IR COMPENSATION | 0 to +100% | 0 to +100% | 0.00% |
| | Current Loop/Quench | 38 | DIAGNOSTICS::ENABLE | 1 = Ia off / 0= Ia on | off (quenched)/on (unquenched) | unquenched (Ia on) |
| | **EXTERNAL ENABLES** | | | | | |
| | External Enables/Current Demand Enable | 89/4048 | SETUP PARAMETERS::CURRENT LOOP::I DMD. ISOLATE | 1=external/0= internal | disabled/enabled | internal (disabled) |
| | **FEEDBACK** | | | | | |
| | Feedback/Analog Tach + Cal | 2279 | SETUP PARAMETERS::CALIBRATION::ANALOG TACH +CAL | 89 to 100% | 0.98 to 1.10 | 1.0000 |
| | Feedback/Analog Tach - Cal | 2280 | SETUP PARAMETERS::CALIBRATION::ANALOG TACH -CAL | 89 to 100% | 0.98 to 1.10 | 1.0000 |
| | Feedback/Analog Tach Averaging | ---- | not available in MMI or SAM, set only in ConfigEd | n/a | n/a | enabled |
| | Feedback/Analog Tach Feedback | output | DIAGNOSTICS::TACH INPUT | ±100% | ±150% | ---- |
| | Feedback/Analog Tach Zero | 2281 | SETUP PARAMETERS::CALIBRATION::ANALOG TACH ZERO | ±100% | ±5.00 | 0.00% |
| | Feedback/Cal Analog Tach | 2152 | SETUP PARAMETERS::CALIBRATION::ANALOG TACH CAL | 89 to 100% | 0.98 to 1.10 | 1.0000 |
| | Feedback/Cal Armature Voltage | 2151 | SETUP PARAMETERS::CALIBRATION::ARMATURE V CAL | 89 to 100% | 0.98 to 1.10 | 1.0000 |
| | Feedback/Cal Enacoder RPM | 2150 | SETUP PARAMETERS::CALIBRATION::ENCODER RPM | 0 to 6000 | 0 to 32,767 oridnal | 1000 rpm |
| | Feedback/Cal Encoder Lines | 1129 | SETUP PARAMETERS::CALIBRATION::ENCODER LINES | 10 to 5000 | 10 to 5000 ordinal | 1000 |

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+ Parameter inaccessible through SAM.

# APPENDIX E PARAMETER LIST BY PARAMETER NAME (CONTINUED)

| | LINK Slot/Output | Slot No. | MMI Equivalent | LINK Signal Range | SAM or MMI Range | Default |
|---|---|---|---|---|---|---|
| | **FEEDBACK (Continued)** | | | | | |
| | Feedback/Digital Tach | output | DIAGNOSTICS::ENCODER | ±100% | ±6000 rpm | ---- |
| | Feedback/Encoder Sign | 109 | SETUP PARAMETERS::SPEED LOOP::ENCODER SIGN | 1=positive/0=negative | positive/negative | positive |
| | Feedback/Speed Feedback | output | DIAGNOSTICS::SPEED FEEDBACK | ±100% | ±120.0% | ---- |
| | Feedback/Speed Feedback Alarm Level | 2158 | SETUP PARAMETERS::CALIBRATION::SPD FBK ALRM LEVEL | 0 to 100% | 0 to 100% | 50.0% |
| | Feedback/Speed Feedback Select | 108 | SETUP PARAMETERS::SPEED LOOP::SPEED FBK SELECT | 0,1,2 ordinal | arm (0)/tach (1)/enc (2) | arm volt fbk |
| | Feedback/Zero Speed | output | DIAGNOSTICS::AT ZERO SPEED | 1=true/0=false | true/false | ---- |
| | **HEALTH** | | | | | |
| | Health/Encoder Alarm Enable | 174 | SETUP PARAMETERS::INHIBIT ALARMS::ENCODER ALARM | 1=inhibit/0=enable | inhibited/enabled | enabled |
| | Health/Health Flag | output | not available in MMI | 1=true/0=false | 0x01=healthy /0x00=tripped | ---- |
| | Health/Health Store | output | ALARM STATUS::LAST ALARM | 0 to 16 ordinal | annunciated alarm | ---- |
| | Health/Health Store Bitmap | output | ALARM STATUS::HEALTH STORE | 0 to 32,767 ordinal | see Figure 5.10, Health Alarm Bits | ---- |
| | Health/Health Word | output | ALARM STATUS::HEALTH WORD | 0 to 65,535 ordinal | refer to Alarm Process in Chapter 5 | ---- |
| | Health/Link Network Alarm Enable | 107 | SETUP PARAMETERS::INHIBIT ALARMS::LINK NETWORK | 1=inhibit/0=enable | inhibited/enabled | enabled |
| | Health/Ready Flag | output | not available in MMI | 1=ready/0=not ready | SAM: ready/not ready | ---- |
| | Health/Speed Feedback Alarm Enable | 95 | SETUP PARAMETERS::INHIBIT ALARMS::SPEED FBK ALARM | 1=inhibit/0=enable | inhibited/enabled | enabled |
| | Health/Stall Threshold | 2215 | SETUP PARAMETERS::CALIBRATION::STALL THRESHOLD | 0 to +100% | 0 to +200% | 95.00% |
| | Health/Stall Trip | output | DIAGNOSTICS::STALL TRIP | 1=tripped/0=normal | tripped/normal (OK) | normal (OK) |
| | Health/Stall Trip Alarm Enable | 171 | SETUP PARAMETERS::INHIBIT ALARMS::STALL TRIP | 1=inhibit/0=enable | inhibited/enabled | inhibited |
| | Health/Stall Trip Delay | 2216 | SETUP PARAMETERS::CALIBRATION::STALL TRIP DELAY | 0 to +100% | 0.1 to 600.0 secs | 10.0 secs |
| | Health/Trip Reset | 172 | SETUP PARAMETERS::INHIBIT ALARMS::TRIP RESET | 1=active/0=inactive | active (true)/inactive (false) | TRUE (active) |
| | Health/Unlatched Health Flag | output | not available in MMI | 1=true/0=false | 0x01=healthy /0x00=tripped | ---- |
| | **NETWORK ACCESS** | | | | | |
| | Network Access/Logic Parameter #1 | 126 | NETWORK ACCESS::LOGIC PARAM. 1 | 1=true/0=false | true/false | false |
| | Network Access/Logic Parameter #2 | 127 | NETWORK ACCESS::LOGIC PARAM. 2 | 1=true/0=false | true/false | false |
| | Network Access/Logic Parameter #3 | 128 | NETWORK ACCESS::LOGIC PARAM. 3 | 1=true/0=false | true/false | false |
| | Network Access/Logic Parameter #4 | 129 | NETWORK ACCESS::LOGIC PARAM. 4 | 1=true/0=false | true/false | false |
| | Network Access/Logic Parameter #5 | 130 | NETWORK ACCESS::LOGIC PARAM. 5 | 1=true/0=false | true/false | false |
| | Network Access/Logic Parameter #6 | 131 | NETWORK ACCESS::LOGIC PARAM. 6 | 1=true/0=false | true/false | false |
| | Network Access/Logic Parameter #7 | 132 | NETWORK ACCESS::LOGIC PARAM. 7 | 1=true/0=false | true/false | false |
| | Network Access/Logic Parameter #8 | 133 | NETWORK ACCESS::LOGIC PARAM. 8 | 1=true/0=false | true/false | false |
| | Network Access/Logic Parameter #9 | 134 | NETWORK ACCESS::LOGIC PARAM. 9 | 1=true/0=false | true/false | false |
| | Network Access/Logic Parameter #10 | 135 | NETWORK ACCESS::LOGIC PARAM. 10 | 1=true/0=false | true/false | false |
| | Network Access/Value Paramater #1 | 2164 | NETWORK ACCESS::VALUE PARAM. 1 | ±100% | ±100% | 0.00% |
| | Network Access/Value Paramater #2 | 2165 | NETWORK ACCESS::VALUE PARAM. 2 | ±100% | ±100% | 0.00% |
| | Network Access/Value Paramater #3 | 2166 | NETWORK ACCESS::VALUE PARAM. 3 | ±100% | ±100% | 0.00% |
| | Network Access/Value Paramater #4 | 2167 | NETWORK ACCESS::VALUE PARAM. 4 | ±100% | ±100% | 0.00% |
| | Network Access/Value Paramater #5 | 2168 | NETWORK ACCESS::VALUE PARAM. 5 | ±100% | ±100% | 0.00% |
| | Network Access/Value Paramater #6 | 2169 | NETWORK ACCESS::VALUE PARAM. 6 | ±100% | ±100% | 0.00% |
| | Network Access/Value Paramater #7 | 2170 | NETWORK ACCESS::VALUE PARAM. 7 | ±100% | ±100% | 0.00% |
| | Network Access/Value Paramater #8 | 2171 | NETWORK ACCESS::VALUE PARAM. 8 | ±100% | ±100% | 0.00% |
| | Network Access/Value Paramater #9 | 2172 | NETWORK ACCESS::VALUE PARAM. 9 | ±100% | ±100% | 0.00% |
| | Network Access/Value Paramater #10 | 2173 | NETWORK ACCESS::VALUE PARAM. 10 | ±100% | ±100% | 0.00% |

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+ Parameter inaccessible through SAM.

# APPENDIX E PARAMETER LIST BY PARAMETER NAME (CONTINUED)

| | LINK Slot/Output | Slot No. | MMI Equivalent | LINK Signal Range | SAM or MMI Range | Default |
|---|---|---|---|---|---|---|
| | **PARAMETERS** | | | | | |
| | Parameters/EEPROM Parameter Save | 30 | PARAMETER SAVE | 1=save/0=cancel | saving/finished | ---- |
| † | Parameters/Fast Update Rates (ticks) | n/a | not available in MMI or SAM, set only in ConfigEd | 0 to 65,535 ordinal | n/a | 10 ticks |
| | Parameters/Full Menus | n/a | MENUS::FULL MENUS | enabled/disabled | enabled/disabled | enabled |
| # | Parameters/LINK Fail Stop Select | 115 | LINK SUPPORT::STOP ON NET FAIL (not setable in MMI) | 0,1,2 ordinal | coast (0)/no stop (1)/regen (2) | ena. regen stop |
| † | Parameters/Med. Update Rates (ticks) | n/a | not available in MMI or SAM, set only in ConfigEd | 0 to 65,535 ordinal | n/a | 50 ticks |
| | Parameters/Menu Speed | n/a | MENUS::MENU DELAY | 0 to 65,535 ordinal | 0 to 5000 | 30 |
| †* | Parameters/Minimum Cycle Time | n/a | RESERVED::MIN MMI CYCLE TM | 0 to 65,535 ordinal | 0 to 65,535 | 80 |
| †* | Parameters/MMI Filter T.C. | n/a | RESERVED::MMI FILTER T.C. | 0 to 65,535 ordinal | 0 to 65,535 | 20 |
| # | Parameters/Module Fail Stop Select | 69 | LINK SUPPORT::STOP/MODULE FAIL (not setable in MMI) | 0,1,2 ordinal | coast/no stop/regen | ena. regen stop |
| # | Parameters/Module Recfg Stop Select | 70 | LINK SUPPORT::STOP/MODULE RCFG (not setable in MMI) | 0,1,2 ordinal | coast/no stop/regen | ena. regen stop |
| # | Parameters/Network Type | output | LINK SUPPORT::NODE TYPE (read only in MMI and in SAM) | 2, 3, 7, 11 ordinal | simple (2)/red (3)/tap (7)/aux tap (11) | simple |
| † | Parameters/Priority Input 1 (slot #) | n/a | not available in MMI or SAM, set only in ConfigEd | 0 to 65,535 ordinal | n/a | 0 |
| † | Parameters/Priority Input 2 (slot #) | n/a | not available in MMI or SAM, set only in ConfigEd | 0 to 65,535 ordinal | n/a | 0 |
| † | Parameters/Priority Input 3 (slot #) | n/a | not available in MMI or SAM, set only in ConfigEd | 0 to 65,535 ordinal | n/a | 0 |
| † | Parameters/Priority Input 4 (slot #) | n/a | not available in MMI or SAM, set only in ConfigEd | 0 to 65,535 ordinal | n/a | 0 |
| † | Parameters/Priority Input 5 (slot #) | n/a | not available in MMI or SAM, set only in ConfigEd | 0 to 65,535 ordinal | n/a | 0 |
| † | Parameters/Slow Update Rates (ticks) | n/a | not available in MMI or SAM, set only in ConfigEd | 0 to 65,535 ordinal | n/a | 100 ticks |
| †* | Parameters/User Filter T.C. | n/a | RESERVED::USER FILTER T.C. | 0 to 65,535 ordinal | 0 to 65,535 | 20 |
| † | **PEEK** | | | | | |
| †* | Peek/Peek Address | 1135 | SYSTEM::PEEK::PEEK TAG | 0 to 65535 | n/a | 120 |
| †* | Peek/Peek Data | output | SYSTEM::PEEK::PEEK DATA | n/a | n/a | ---- |
| †* | Peek/Peek Scale | 1254 | SYSTEM::PEEK::PEEK SCALE | 0 to 65535 | n/a | 800 |
| † | Peek/Peek Tag Number | n/a | not available in MMI or SAM, set only in ConfigEd | 0 to 65535 | n/a | 150 |
| | **RAMPS** | | | | | |
| | Ramps/Ramp Accel Time | 2089 | SETUP PARAMETERS::RAMPS::RAMP ACCEL TIME | 0 to +100% | 0.1 - 600.0 sec | 10.0 secs |
| | Ramps/Ramp Constant Accel | 86 | SETUP PARAMETERS::RAMPS::CONSTANT ACCEL | 1=inactive/0=active | inactive/active | inactive |
| | Ramps/Ramp Decel Time | 2090 | SETUP PARAMETERS::RAMPS::RAMP DECEL TIME | 0 to +100% | 0.1 - 600.0 sec | 10.0 secs |
| | Ramps/Ramp Ext Reset Enable | 206 | SETUP PARAMETERS::RAMPS:AUTO RESET | 1=enable/0-disable | enabled/disabled | enabled |
| | Ramps/Ramp External Reset | 207 | SETUP PARAMETERS::RAMPS::EXTERNAL RESET | 1/0 | enabled/disabled | disabled |
| | Ramps/Ramp Finished Thresh | 2253 | SETUP PARAMETERS::RAMPS::RAMPING THRESH | 0 to +100% | 0 to +100% | 0.50% |
| | Ramps/Ramp Hold | 113 | SETUP PARAMETERS::RAMPS::RAMP HOLD | 0=ramp/1=hold | ramp/hold | ramp |
| | Ramps/Ramp Input | 2067 | SETUP PARAMETERS::RAMPS::RAMP INPUT | ±100% | ±120.00% | 0.00% |
| | Ramps/Ramp Min Speed | 2257 | SETUP PARAMETERS::RAMPS::MIN SPEED | 0 to +100.00% | 0 to +120.00% | 0.00% |
| †#+ | Ramps/Ramp Ouput Dest Tag | n/a | not available in MMI or SAM, set only in ConfigEd | 0 to 65535 | n/a | 291 |
| | Ramps/Ramp Output | output | DIAGNOSTICS::RAMP OUTPUT | ±100% | ±120.00% | ---- |
| #+ | Ramps/Ramp Output | output | SETUP PARAMETERS::SPEED LOOP::SETPOINTS::SETPOINT 3 | ±100% | MMI: ±120.00% | 0.00% |
| | Ramps/Ramp S % | 2252 | SETUP PARAMETERS::RAMPS::% S-RAMP | 0 to +100% | 0 to +100% | 5.00% |
| | Ramps/Ramping | output | DIAGNOSTICS::RAMPING | 1=true/0=false | true (ramping)/false (not ramping) | ---- |
| | Ramps/Speed Fbk Reset | 208 | SETUP PARAMETERS::RAMPS::SPD. FBK. RESET | 1=enable/0-disable | enabled/disabled | disabled |

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+ Parameter inaccessible through SAM.

# APPENDIX E PARAMETER LIST BY PARAMETER NAME (CONTINUED)

| | LINK Slot/Output | Slot No. | MMI Equivalent | LINK Signal Range | SAM or MMI Range | Default |
|---|---|---|---|---|---|---|
| | **SPEED LOOP** | | | | | |
| | Speed Loop/Adapt Integral Time Const | 2262 | ...SPEED LOOP::ADVANCED::ADAPTATION::INT TIME CONST | 0 to +100% | .001 to 30 secs | 0.500 secs |
| | Speed Loop/Adapt Prop Gain | 2261 | ...SPEED LOOP::ADVANCED::ADAPTATION::PROP. GAIN | 0 to +100% | 0 to 200 | 5.00 |
| | Speed Loop/Adapt Speed Brk 1 (low) | 2259 | ...SPEED LOOP::ADVANCED::ADAPTATION::SPD BRK1 (LOW) | 0 to +100% | 0 to +100% | 1.00% |
| | Speed Loop/Adapt Speed Brk 2 (high) | 2260 | ...SPEED LOOP::ADVANCED::ADAPTATION::SPD BRK2 (HIGH) | 0 to +100% | 0 to +100% | 5.00% |
| | Speed Loop/Armature Voltage | output | DIAGNOSTICS::TERMINAL VOLTS | ±100% | ±200% | ---- |
| +* | Speed Loop/I Gain In Ramp | 2263 | SETUP PARAMETERS::SPEED LOOP::ADVANCED::I GAIN IN RAMP | 0 to +100% | 0 to 2.0000 | 1.0000 |
| | Speed Loop/Integral Defeat | 76 | SETUP PARAMETERS::SPEED LOOP::INT. DEFEAT | 1=on/0=off | on (integral defeated)/off | off |
| | Speed Loop/Integral Time Constant | 2125 | SETUP PARAMETERS::SPEED LOOP::INT. TIME CONST. | 0 to +100% | .001 to 30 secs | 0.500 secs |
| | Speed Loop/Max Speed Demand | 2274 | SETUP PARAMETERS::SPEED LOOP::SETPOINTS::MAX DEMAND | 0 to +87.5% | 0 to +105% | 105.00% |
| | Speed Loop/Min Speed Demand | 2275 | SETUP PARAMETERS::SPEED LOOP::SETPOINTS::MIN DEMAND | -87.5 to 0% | -105 to 0% | -105.00% |
| †* | Speed Loop/Overspeed Level | 2217 | SETUP PARAMETERS::CALIBRATION::OVER SPEED LEVEL | 0 to +100% | 0 to +200% | 118.00% |
| | Speed Loop/Prop. Gain | 2130 | SETUP PARAMETERS::SPEED LOOP::PROP. GAIN | 0 to +100% | 0 to 200 | 10.00 |
| # | Speed Loop/Setpoint Fast Input | 2085 | SETUP PARAMETERS::SPEED LOOP::SETPOINTS::SETPOINT 2 | ±87.5% | ±105% | 0.00% |
| | Speed Loop/Speed Adaptation Mode | 210 | ...SPEED LOOP::ADVANCED::ADAPTATION::MODE | 0,1,2,3 ordinal | MODE 0,1,2,3 | 0 |
| | Speed Loop/Speed Loop Error | output | DIAGNOSTICS::SPEED ERROR | ±100% | ±100% | ---- |
| | Speed Loop/Speed Loop Output | output | DIAGNOSTICS::CURRENT DEMAND | ±100% | ±200% | ---- |
| | Speed Loop/Total Setpoint | output | DIAGNOSTICS::SPEED SETPOINT | ±100% | ±120% | ---- |
| | Speed Loop/Zero Ia Quench Thresh | 2267 | ...SPEED LOOP::ADVANCED::ZERO SPD QUENCH::ZERO IAD LEVEL | 0 to +100% | 0 to +200% | 0.50% |
| | Speed Loop/Zero Offset | 2071 | SETUP PARAMETERS::CALIBRATION::ZERO SPD OFFSET | ±100% | ±5.00% | 0.00% |
| | Speed Loop/Zero Speed Quench Thresh | 2266 | ...SPEED LOOP::ADVANCED::ZERO SPD QUENCH::ZERO SPD LEVEL | 0 to +100% | 0 to +200% | 1.50% |
| | **STANDSTILL** | | | | | |
| | Standstill/At Standstill | output | DIAGNOSTICS::AT STANDSTILL | 1=true/0=false | 1=@ standstill/ 0= not @ standstill | ---- |
| | Standstill/At Zero Setpoint | output | DIAGNOSTICS::AT ZERO SETPOINT | 1=true/0=false | 1=@ zero sp/ 0= not @ zero sp | ---- |
| | Standstill/Standstill Logic Enable | 24 | SETUP PARAMETERS::STANDSTILL::STANDSTILL LOGIC | 1=enable/0-disable | enabled/disabled | disabled |
| | Standstill/Standstill Threshold | 2073 | SETUP PARAMETERS::STANDSTILL::ZERO THRESHOLD | 0 to +100% | 0 to +5.00% | 2.00% |
| | **START-STOP** | | | | | |
| | Start-Stop/Composite Program Stop | output | DIAGNOSTICS::PROGRAM STOP | 1=active,0=inactive | active/inactive | ---- |
| | Start-Stop/Contactor Delay | 2228 | SETUP PARAMETERS::STOP RATES::CONTACTOR DELAY | 0 to +100% | 0.1 to 600.0 secs | 1.0 secs |
| | Start-Stop/Drive Start | 52 | SETUP PARAMETERS::AUX I/O::AUX START | 1/0 | on/off | |
| | Start-Stop/Drive Start | 52 | SETUP PARAMETERS::AUX I/O::AUX ENABLE | 1/0 | on/off | ---- |
| | Start-Stop/Drive Started | output | DIAGNOSTICS::DRIVE START | 1/0 | on/off | ---- |
| | Start-Stop/P Stop Time Limit | 2229 | SETUP PARAMETERS::STOP RATES::PROG STOP LIMIT | 0 to +100% | 0.0 to 600.0 secs | 60.0 secs |
| | Start-Stop/Prog Stop I Limit | 2129 | SETUP PARAMETERS::STOP RATES::PROG STOP I LIM | 0 to +100% | 0 to +200% | 100.00% |
| | Start-Stop/Prog Stop Time | 2132 | SETUP PARAMETERS::STOP RATES::PROG STOP TIME | 0 to +100% | 0.1 to 600.0 secs | 60.0 secs |
| | Start-Stop/Program Stop | 1122 | not available in MMI | 1=active,0=inactive | SAM: active/inactive | n/a |
| | Start-Stop/Start-Stop Output | n/a | DIAGNOSTICS::SPEED DEMAND | ±100% | ±120% | ---- |
| | Start-Stop/Stop Time | 2226 | SETUP PARAMETERS::STOP RATES::STOP TIME | 0 to +100% | 0.1 to 600.0 secs | 10.0 secs |
| | Start-Stop/Stop Time Limit | 2227 | SETUP PARAMETERS::STOP RATES::STOP LIMIT | 0 to +100% | 0.0 to 600.0 secs | 60.0 secs |
| | Start-Stop/Stop Zero Speed | 2133 | SETUP PARAMETERS::STOP RATES::STOP ZERO SPEED | 0 to +100% | 0 to +100% | 2.00% |
| | | | | | | |
| | | | | | | |
| | | | | | | |

* These MMI parameters available only in the password protect mode.

\# These parameters cannot be changed through the MMI.

† These ConfigEd parameters are reserved for authorized use only.

\+ Parameter inaccessible through SAM.

# APPENDIX E PARAMETER LIST BY PARAMETER NAME (CONTINUED)

| | LINK Slot/Output | Slot No. | MMI Equivalent | LINK Signal Range | SAM or MMI Range | Default |
|---|---|---|---|---|---|---|
| | **SUMMING** | | | | | |
| | Summing/Input 0 Ratio | 2096 | SETUP PARAMETERS::SETPOINT SUM::RATIO 0 | ±100% | ±3.0000 | 1.0000 |
| | Summing/Input 0 Sign | 100 | SETUP PARAMETERS::SETPOINT SUM::SIGN 0 | 1=positive/0=negative | negative/positive | positive |
| | Summing/Input 1 Ratio | 2095 | SETUP PARAMETERS::SETPOINT SUM::RATIO 1 | ±100% | ±3.0000 | 1.0000 |
| | Summing/Input 1 Sign | 99 | SETUP PARAMETERS::SETPOINT SUM::SIGN 1 | 1=positive/0=negative | negative/positive | positive |
| | Summing/Setpoint Sum | output | DIAGNOSTICS::SPT. SUM OUTPUT | ±87.5% | ±105% | 0.00% |
| # | Summing/Setpoint Sum | output | SETUP PARAMETERS::SPEED LOOP::SETPOINTS::SETPOINT 1 | ±87.5% | ±105% | 0.00% |
| | Summing/Speed Input 0 | 2066 | SETUP PARAMETERS::SETPOINT SUM::INPUT 0 | ±100% | ±120% | 0.00% |
| | Summing/Speed Input 1 | 2065 | SETUP PARAMETERS::SETPOINT SUM::INPUT 1 | ±100% | ±120% | 0.00% |
| | Summing/Sum Limit | 2235 | SETUP PARAMETERS::SETPOINT SUM::LIMIT | 0 to +87.5% | 0 to +105% | 105.00% |
| | **MMI PARAMETERS INACCESSIBLE THROUGH LINK** | | | | | |
| | no corresponding LINK input slot available | n/a | SETUP PARAMETERS::SPEED LOOP::ADVANCED::I COMP | n/a | ±100% | 0.00% |
| | no corresponding LINK input slot available | n/a | SETUP PARAMETERS::SPEED LOOP::SETPOINTS::SETPOINT 4 | n/a | ±105% | 0.00% |
| | no corresponding LINK input slot available | n/a | SETUP PARAMETERS::SPEED LOOP::SETPOINTS::RATIO 2 | n/a | ±3.0000 | 1.0000 |
| | no corresponding LINK input slot available | n/a | SETUP PARAMETERS::SPEED LOOP::SETPOINTS::SIGN 2 | n/a | positive/negative | positive |
| * | no corresponding LINK input slot available | n/a | SETUP PARAMETERS::STANDSTILL::SOURCE TAG | n/a | ---- | 89 |
| | no corresponding LINK output available | n/a | DIAGNOSTICS::ACTUAL NEG I LIM | n/a | ±200% | ---- |
| | no corresponding LINK output available | n/a | DIAGNOSTICS::ACTUAL POS I LIM | n/a | ±200% | ---- |
| | no corresponding LINK output available | n/a | DIAGNOSTICS::AT CURRENT LIMIT | n/a | true/false | ---- |
| | no corresponding LINK output available | n/a | DIAGNOSTICS::BACK EMF | n/a | ±150% | ---- |
| | no corresponding LINK output available | n/a | DIAGNOSTICS::OPERATING MODE | 0,1 ordinal | stop (0)/run (1) | ---- |
| # | no corresponding LINK output available | n/a | LINK SUPPORT::ADDRESS | n/a | 1 through 3000 | ---- |

* These MMI parameters available only in the password protect mode.
\# These parameters cannot be changed through the MMI.
† These ConfigEd parameters are reserved for authorized use only.
+ Parameter inaccessible through SAM.

# Appendix F 590SP *LINK* DRV OPTION

The 590SP *LINK* DRV is an enclosed drive package. It includes a standard 590SP *LINK* drive wired with its own AC input supply circuit breaker and DC output power isolating contactor. The drive, contactor and breaker are mounted on a mounting plate, contained in an IP20 rated steel enclosure and shipped as a complete package. The DRV operates on 230 VAC *only*.

> NOTE. The IP20 standard protects against objects (0.47") 12 mm in diameter. It is, however, *not* dust proof, oil resistant or drip proof.

Figure F.1 - 590SP *LINK* DRV (with IP20 Cover)

## DESCRIPTION OF THE 590SP DRV

The 590SP *LINK* DRV is shown with the IP20 cover in Figure F.1 and without the cover in Figure F.2. The 590SP *LINK* or 591SP *LINK* drive cannot be removed from the DRV unit's steel base.

The main AC supply connects directly to the two-pole circuit breaker. The motor field and armature conductors terminate to screw terminals mounted below the contactor and circuit breaker. A normally-opened auxiliary off of the internal DC contactor is also wired to the screw terminals. Input supply ground and output motor ground connections terminate directly onto the DRV base.

> NOTE. The 590SP *LINK* DRV contains a standard 590SP *LINK* controller. Refer to the appropriate section of this manual for installation, commissioning, troubleshooting, and service procedures.

## DRV MOUNTING INSTRUCTIONS

The 590SP *LINK* DRV should be mounted on a vertical flat surface using the slots in each corner of the base. The layout drawing in Figure F.3 provides mounting dimensions.

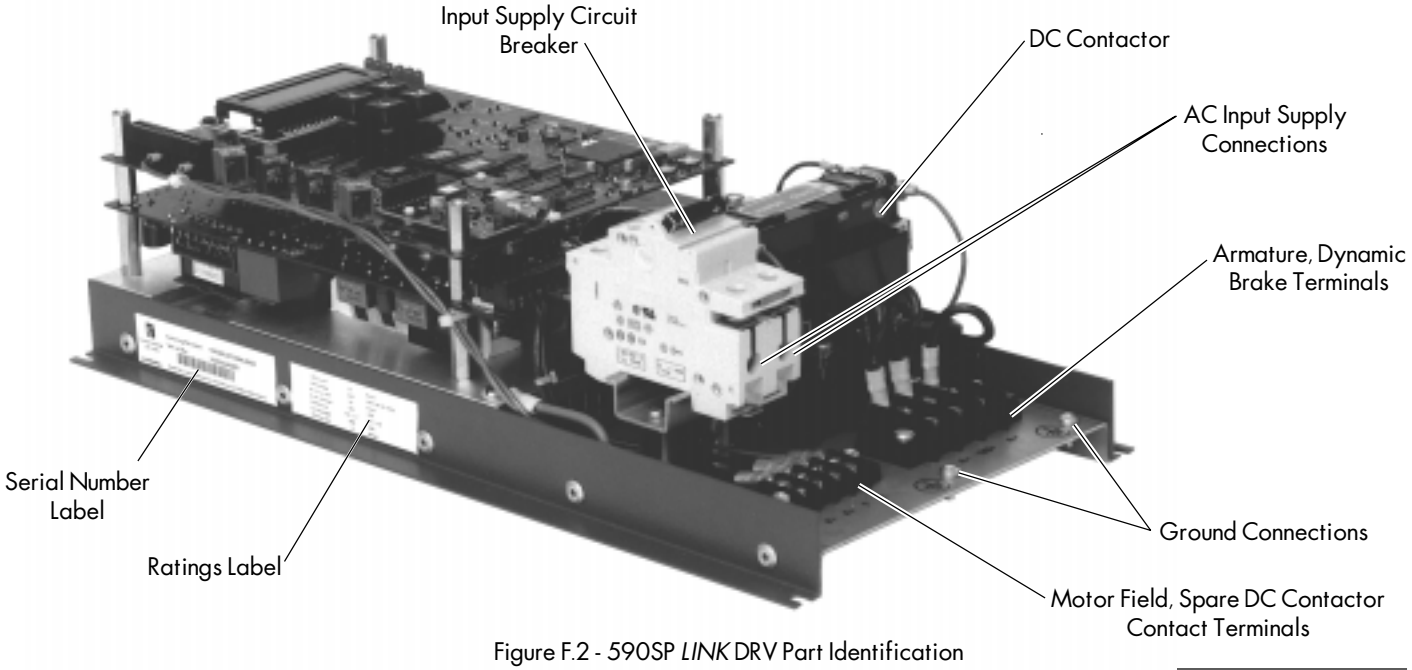



Figure F.2 - 590SP *LINK* DRV Part Identification

## DRV WIRING PROCEDURES

**Caution**

Make certain all wiring complies with national or local electric codes. The 590SP DRV has an AC supply circuit breaker rated for supplementary protection *only*. Install motor DC overload protection, as required.

Follow the wiring guidelines in Chapter 3 for most connections. Refer to the wiring diagram in Figure F.5 at the end of this appendix. A schematic diagram of the 590SP DRV appears in Figure F.4. The differences in wiring the DRV model of the 590SP are discussed below.

**Power Wiring:** The main AC input supply connects directly to the two pole circuit breaker. The motor armature connects to terminals A+ and A-; the field connects to terminals F+ and F-. These terminals are mounted to the DRV base.

**Motor Field Supply:** The 590SP *LINK* DRV has an on board field rectifier used to supply the motor field. The unit is shipped with jumpers JP1 and JP2 in positions 2 and 3 so that the main power supply supplies the rectifier. If the field requires an input supply rated different than the main supply, connect this supply to terminals D1 and D2 and move jumpers JP1 and JP2 to positions 1 and 2 .

**WARNING!**

The drive's field rectifier is *non-controlled*. If supplying the field rectifier through terminals D1 and D2, the field will remain powered after the contactor is de-energized *and* when the input supply circuit breaker is switched off. Check the field voltage after removing power and *before* servicing the drive.

**Power Conductor Ampacity and Terminal Torque:** Rate the supply and output conductors according to the procedures in Chapter 3. Figure F.3 lists the terminal torque ratings and terminal wire size range. Terminals A+, A- and DB+ require spade lugs for #10 screws. Terminals F+, F- and armature contactor spare terminals 1 and 2 require #5 screw spade lugs.

| TERMINAL | TORQUE RATING | |
|---|---|---|
| *A+, A–, DB+, Ground* | *1.4 lb–ft (1.9 Nm)* | *14 to 10 A* |
| *F+, F–, 1, 2* | *0.66 lb–ft (0.9 Nm)* | *14 A* |
| *Circuit Breaker (L1, L2)* | *3.0 lb–ft (4.0 Nm)* | *14 to 10 A* |

Figure F.3 - DRV Terminal Tightening Torque Ratings and Wires Sizes

**Grounding:** The DRV model provides separate ground screws for the input supply and the motor. Both are screw terminations located on the DRV base.

NOTE. The 590SP *LINK* DRV is designed to accept a three-wire supply, that is, line, neutral and ground. Supplying the drive from a two-wire, non-grounded supply is *not* recommended.

**Control Wiring:** The 590SP *LINK* DRV is shipped with jumpers JP5 and JP6 preset in positions 2 and 3 so that the DRV derives its control supply off the main input supply.

**Drive Start Relay:** The DC contactor coil is rated at 240 VAC and should match the supply input. Leave jumpers JP3 and JP4 in the preset positions 2 and 3 so that the main supply powers the coil through the drive's internal drive start relay.

**Signal Wiring (Terminal Block A):** Because the DRV model isolates power to the motor with a DC contactor, the hardwired drive enable terminal (A5) is pre-wired from the +24 VDC terminal (A9) through a normally opened, auxiliary contact on the contactor. An additional auxiliary normally opened auxiliary contact, rated at 10 amps, is available as a spare at terminals 1 and 2.

NOTE. Refer to Chapter 3 for wiring instructions all other signal wiring connections.

**Calibration, Speed Feedback and *LINK* Fiber Optic Wiring:** Speed feedback, *LINK* fiber optic wiring and calibration for the DRV model are identical to the 590SP *LINK* open chassis model. Refer to Chapter 3.

## DRV TECHNICAL DETAILS

Because the 590SP *LINK* DRV is a packaged version of the open chassis model, the DRV version has the same features and environmental ratings as the 590SP *LINK*. Differences relate to the DRV's electrical ratings due to its single voltage supply range. Refer to Appendix A for features technical details of the 590SP *LINK* drive. Specifications unique to the 590SP *LINK* DRV are listed below.

### Terminal Ratings

| | |
|---|---|
| Terminals A+, A- and DB+ ampacity | 30 amps, maximum |
| Terminals F+, F- and 1 and 2 ampacity | 15 amps, maximum<br>(Refer to Figure F.3 for wire size and torque rating.) |

### Dimensions

| | |
|---|---|
| Overall Dimensions | 16.10" (409 mm) H x 7.75" (197 mm) W x 4.38" (111 mm) D |
| Weight | 15 lbs. (6.8) kgs |

### Electrical Ratings

| | |
|---|---|
| Protection | The armature bridge has electronic protection at 200 percent of full load current for 10 seconds, 150 percent for 60 seconds (software adjustable)<br>AC circuit protection included<br>An external motor overload device fitted to the controller output may be required as per local code |
| Drive power supply | Single-phase, 40-70 Hertz, phase rotation insensitive<br>no adjustment necessary for frequency change<br>Power Supply Voltage range: 220 to 240 VAC<br>Power Supply current: (1.4 × calibrated DC armature current) amps AC rms<br>37 amps AC rms, maximum |
| Drive control supply | Single-phase, 40-70 Hertz, phase rotation insensitive; no adjustment necessary for frequency change<br>Control Supply Voltage range: 100 - 240 VAC to control transformer primary, no special tapping required<br>Primary Protection fuse: 2 amps @ 250 volts (FS1) |
| Internal Circuit Breaker Protection | 2-pole, 40 amp, 480 VAC circuit breaker<br>Interrupt Rating:10 KAIC |
| Noncontrolled Field Rectifier | Standard: 200 VDC with 220 to 240 VAC input<br>(full wave configuration, or 0.9 x AC input)<br>Maximum Loading: 3 amps DC (unfused) |
| DC Contactor Ratings | Normally-opened poles: 40 amps DC, 500 VDC, maximum<br>Normally-closed pole: 70 amps, 500 VDC (make only), maximum<br>23 amps, 160 VDC (break only), maximum<br>Spare normally-opened contact: 10 amps, 240 VAC maximum<br>Coil rating: 220-240 VAC, 120 VA inrush, 28 VA sealed |

### Output Ratings

| | |
|---|---|
| Armature Current | 27 amps DC, maximum<br>(Refer to Figure A.1 for the approximate armature current for 180 VDC motors) |
| Armature Voltage | Standard: 180 VDC with 220 to 240 VAC input |

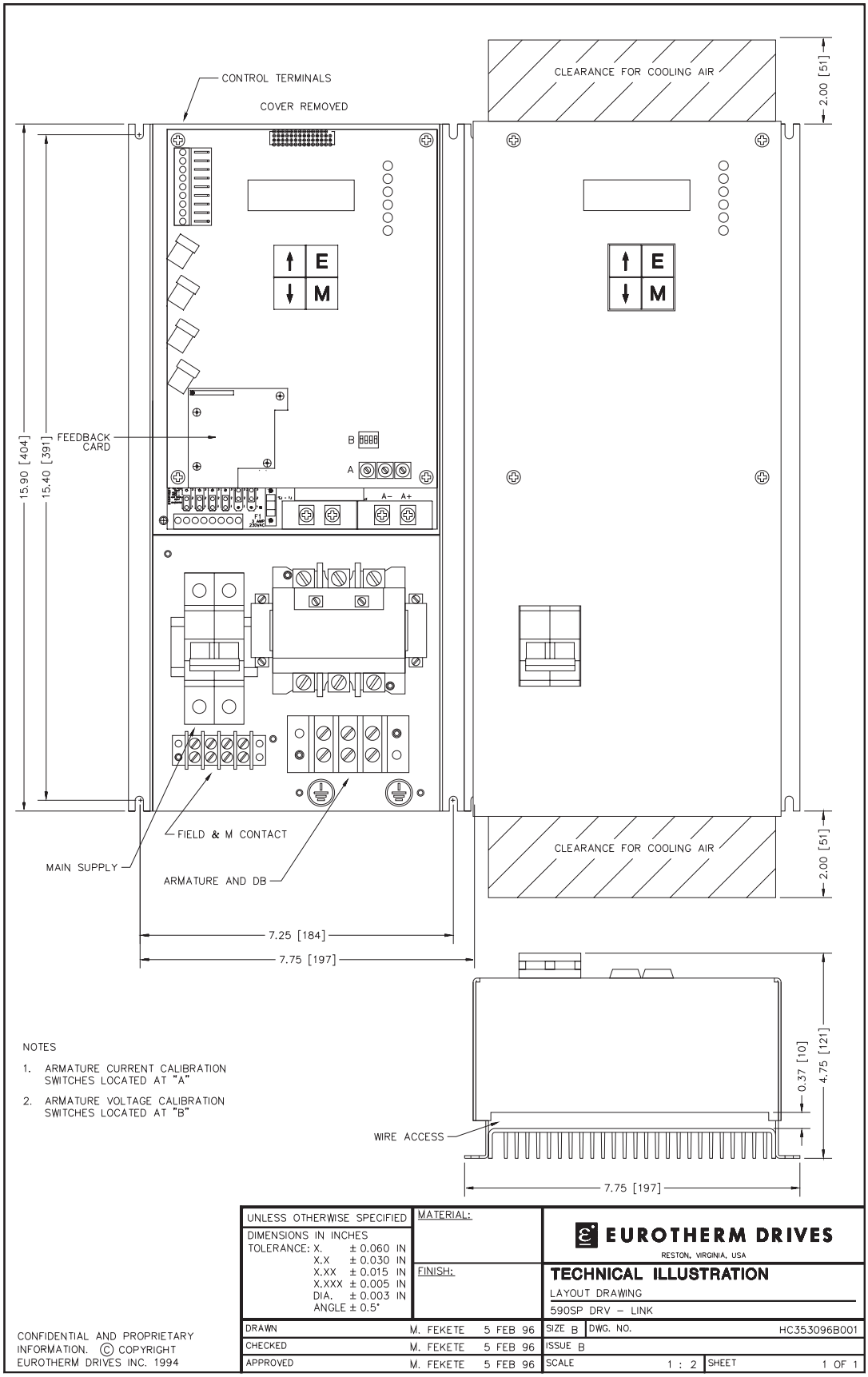



Figure F.4 - 590SP *LINK* DRV Layout Diagram

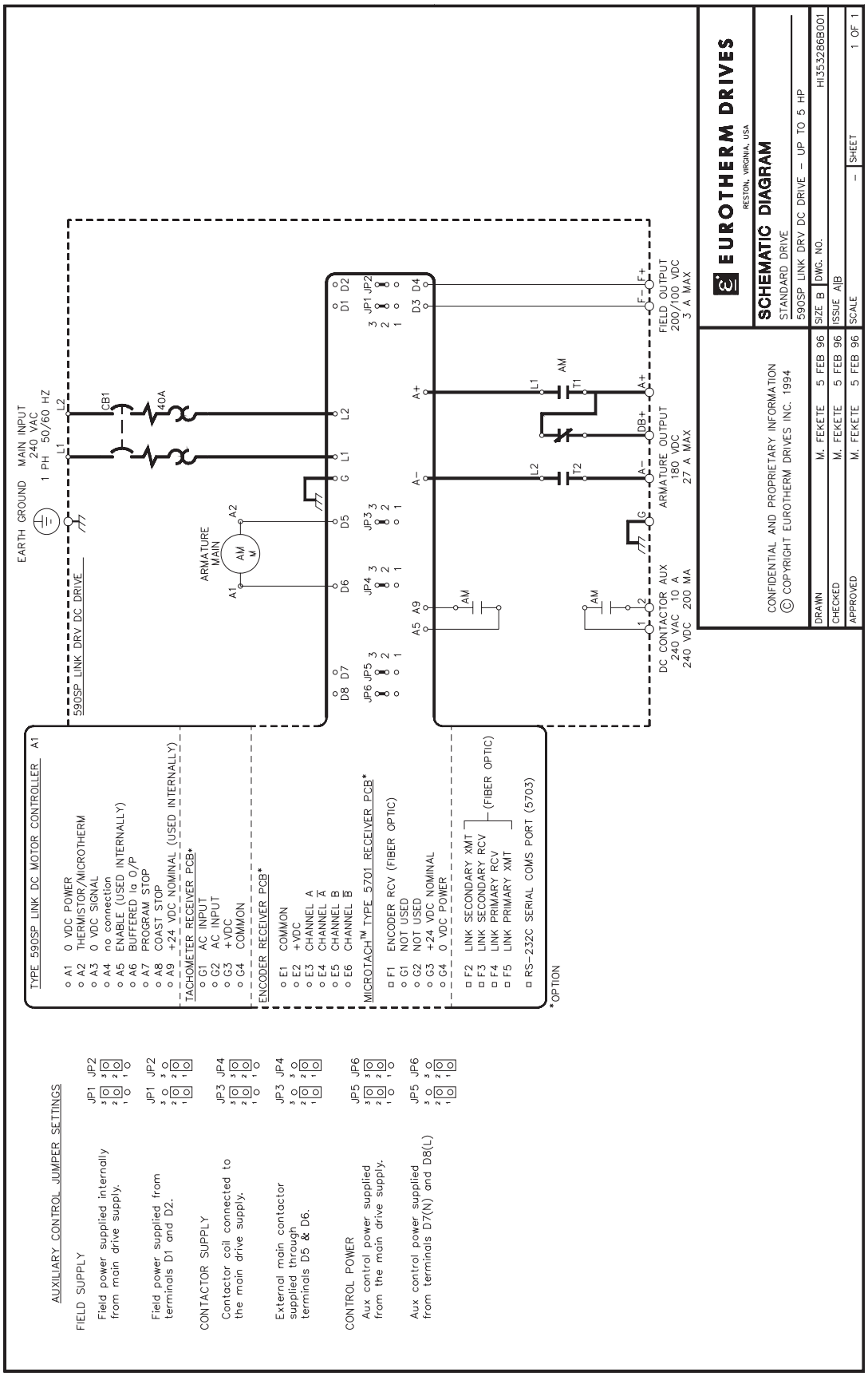
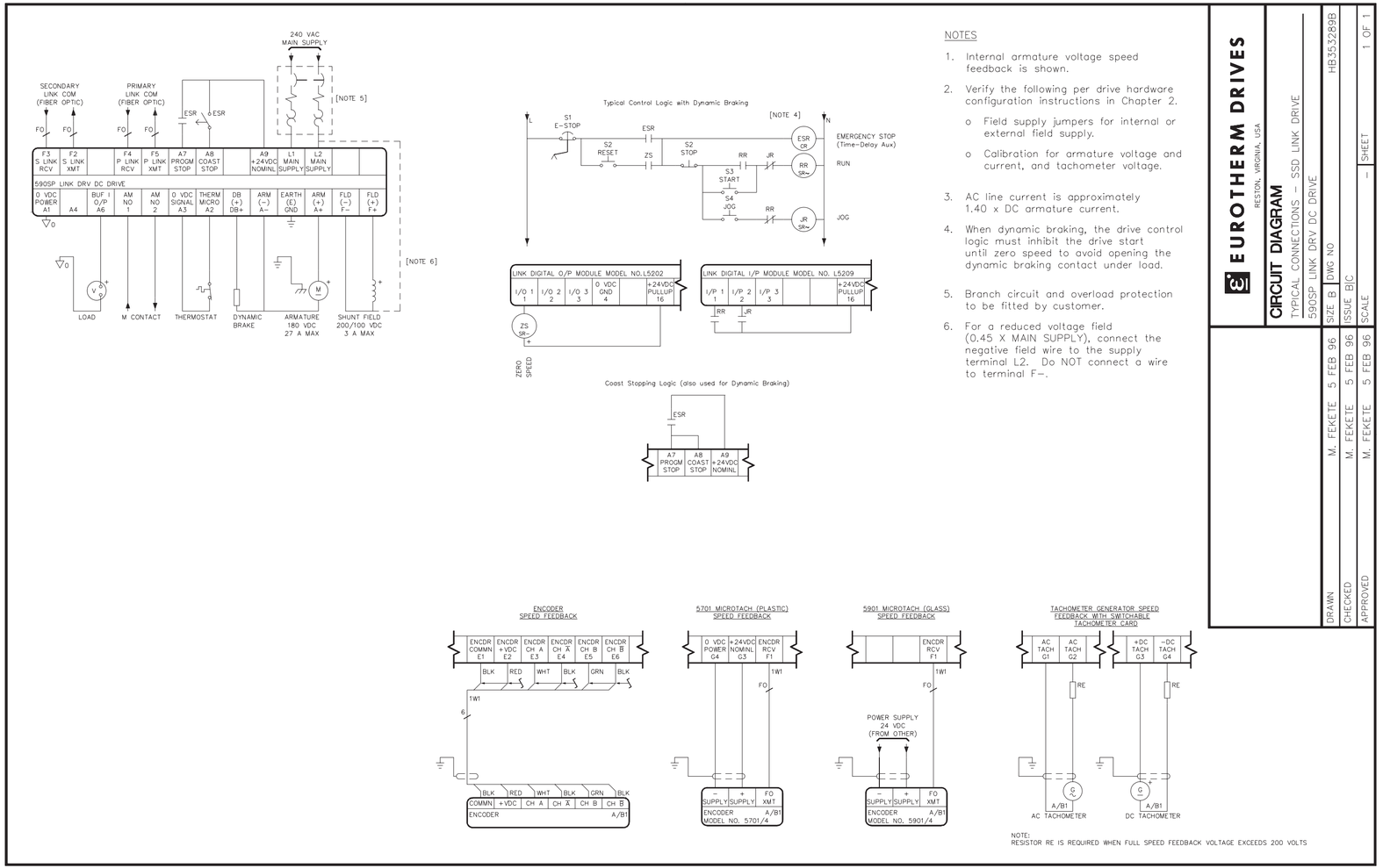



Figure F.5 - 590SP *LINK* DRV Schematic Diagram

F




NOTES

1. Internal armature voltage speed feedback is shown.
2. Verify the following per drive hardware configuration instructions in Chapter 2.
   - o Field supply jumpers for internal or external field supply.
   - o Calibration for armature voltage and current, and tachometer voltage.
3. AC line current is approximately 1.40 x DC armature current.
4. When dynamic braking, the drive control logic must inhibit the drive start until zero speed to avoid opening the dynamic braking contact under load.
5. Branch circuit and overload protection to be fitted by customer.
6. For a reduced voltage field (0.45 X MAIN SUPPLY), connect the negative field wire to the supply terminal L2. Do NOT connect a wire to terminal F−.

NOTE:
RESISTOR RE IS REQUIRED WHEN FULL SPEED FEEDBACK VOLTAGE EXCEEDS 200 VOLTS

EUROTHERM DRIVES
RESTON, VIRGINIA, USA

CIRCUIT DIAGRAM
TYPICAL CONNECTIONS – SSD LINK DRIVE
590SP LINK DRV DC DRIVE

| | | | |
|---|---|---|---|
| | | DWG NO | HB353289B |
| | | ISSUE | BC |
| | | SCALE | – |
| | | SHEET | 1 OF 1 |
| DRAWN | M. FEKETE | 5 FEB 96 | |
| CHECKED | M. FEKETE | 5 FEB 96 | |
| APPROVED | M. FEKETE | 5 FEB 96 | |

# Appendix G SPARE PARTS LISTS

This appendix contains the spare parts lists for open and DRV model 590SP *LINK* drives. Refer to Appendix A, Technical Details, for feedback option card part numbers.

## ORDERING SPARE PARTS

When ordering spare parts or requesting technical assistance from Eurotherm Drives, please provide the unit's **catalog** number and **revision** number. Both numbers are printed on the drive's serial number label. Both the serial number label and the rating label are located on the left side of the base of the drive. Chapter 1 contains illustrations of the label locations. The figure below shows the locations of both numbers on the label.

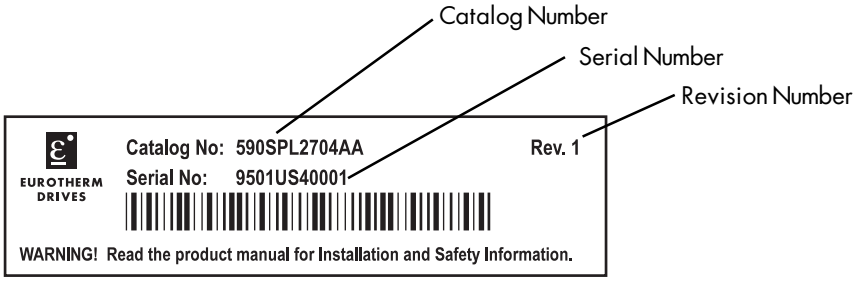



Figure G.1 - Sample Serial Number Label

## READING THE SPARE PARTS LISTS

Each model of 590SP *LINK* has a parts list which describes the part and quantity used, gives its Eurotherm Drives part number and lists the revision in which the part was used.

| **591SPL2706AA 5 hp Non- Regenerative Single Phase Dri** |
|---|
| Description |
| Control Board (T&B Connector) |
| Power Supply Board (110 - 400 VAC) |
| Cover, Protective |
| SCR Pack, 1200 V, 32 A |
| Heatsink Compound (tube) |
| Control Fuse (2 Amp, 250 VAC) |

Figure G.2 - 591SP *LINK* Spares List (Open Chassis)

| **590SPL2706AA 5 hp Regenerative Single Phase Drive , ( ** |
|---|
| Description |
| Control Board (T&B Connector) |
| Power Supply Board (110 - 400 VAC) |
| Cover, Protective |
| SCR Pack, 1200 V, 32 A |
| Heatsink Compound (tube) |
| Control Fuse (2 Amp, 250 VAC) |

Figure G.3 - 590SP *LINK* Spares List (Open Chassis)

G

| **591SPL2706BA 5 hp Non-Regenerative Single Phase Driv** |
|---|
| Description |
| Control Board (T&B Connector) |
| Power Supply Board (110 - 400 VAC) |
| Cover, IP20 |
| End Plate |
| SCR Pack, 1200 V, 32 A |
| Heatsink Compound (tube) |
| Control Fuse (2 Amp, 250 VAC) |

Figure G.4 - 591SP *LINK* Spares List (IP20 Cover)

| **590SPL2706BA 5 hp Regenerative Single Phase Drive , E** |
|---|
| Description |
| Control Board (T&B Connector) |
| Power Supply Board (110 - 400 VAC) |
| Cover, IP20 |
| End Plate |
| SCR Pack, 1200 V, 32 A |
| Heatsink Compound (tube) |
| Control Fuse (2 Amp, 250 VAC) |

Figure G.5 - 590SP *LINK* Spares List (IP20 Cover)

| **955SPL-4N51 5 hp Non-Regenerative Single Phase DRV,** |
|---|
| Description |
| Control Board (T&B Connector) |
| Power Supply Board (110 - 400 VAC) |
| DRV Cover, IP20 |
| Contactor (3 Pole, 600 VDC, 40 amps) |
| Circuit Breaker (2 pole, 480 VAC, 40 amp) |
| SCR Pack, 1200 V, 32 A |
| Heatsink Compund (tube) |
| Control Fuse (2 Amp, 250 VAC) |

Figure G.6 - 591SP *LINK* DRV Spares List

| **955SPL-4R51 5 hp Regenerative Single Phase DRV, 240 V** |
|---|
| Description |
| Control Board (T&B Connector) |
| Supply Board (110 - 240 VAC) |
| DRV-IP20 Cover |
| Contactor (3 Pole, 600 VDC, 40 amps) |
| Circuit Breaker (2 pole, 480 VAC, 40 amp) |
| SCR Pack |
| Heatsink Compund (tube) |
| Control Fuse (2 Amp, 250 VAC) |

Figure G.7 - 590SP *LINK* DRV Spares List

## SPEED FEEDBACK OPTIONS & FIBER OPTIC RELATED PARTS

| Speed Feedback Card Option |
|---|
| Switchable Analog Tachometer Generator Calibration Card |
| +5 VDC Wire-ended Encoder Receiver Card |
| +12 VDC Wire-ended Encoder Receiver Card |
| +15 VDC Wire-ended Encoder Receiver Card |
| +24 VDC Wire-ended Encoder Receiver Card |
| 5701 Microtach Receiver Card (Plastic Fiber Optic) |
| 5901 Microtach Receiver Card (Glass Fiber Optic) |

Figure G.8 - Speed Feedback Option Cards

| Fiber Optic Connectors and Repeaters |
|---|
| BLACK (receiver) plastic fiber optic connector |
| RED (transmitter) plastic fiber optic connector |
| LINK plastic fiber optic repeater |
| Universal Fiber Optic Converter |

* Refer to Appendix A

Figure G.9 - Fiber Optic Connectors and Repeaters