590SP *LINK* DC Drive

Product Manual

Version 1 Firmware

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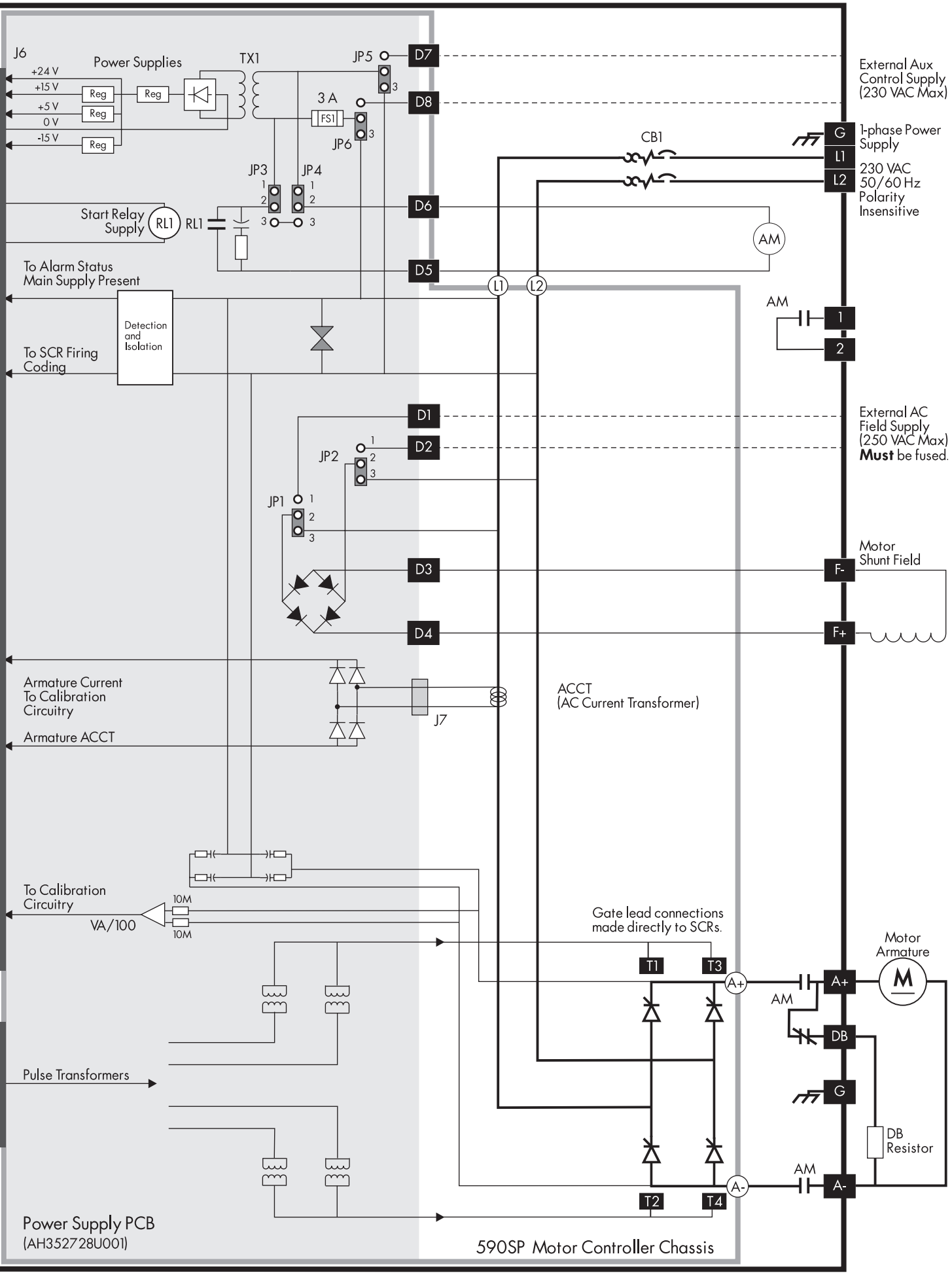

591SP *LINK* DRV Block Diagram – Version 1 – Non-regenerative
Default Configuration

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.

EUROTHERM DRIVES INCORPORATED – TERMS AND CONDITIONS (ABRIDGED)

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.

Delivery, Title and Risk

. . . 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. Warranty of equipment found within 12 months after delivery thereof to be defective by reason of faulty materials, workmanship, or design.

(i) The Customer will:

(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.

(ii) Eurotherm Drives, Inc. will:

(a) repair or (at its option) replace any equipment manufactured by Eurotherm Drives, Inc.

(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.

B. Eurotherm Drives, Inc. accepts no liability under this clause:

(i) for damage sustained in transit, (liability for which is dealt with in paragraph 8 hereof);

(ii) for defects caused

(a) by not following the instructions supplied with the equipment during installation, operation or maintenance or

(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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E. NO IMPLIED STATUTORY WARRANTY OR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE SHALL APPLY.

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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.

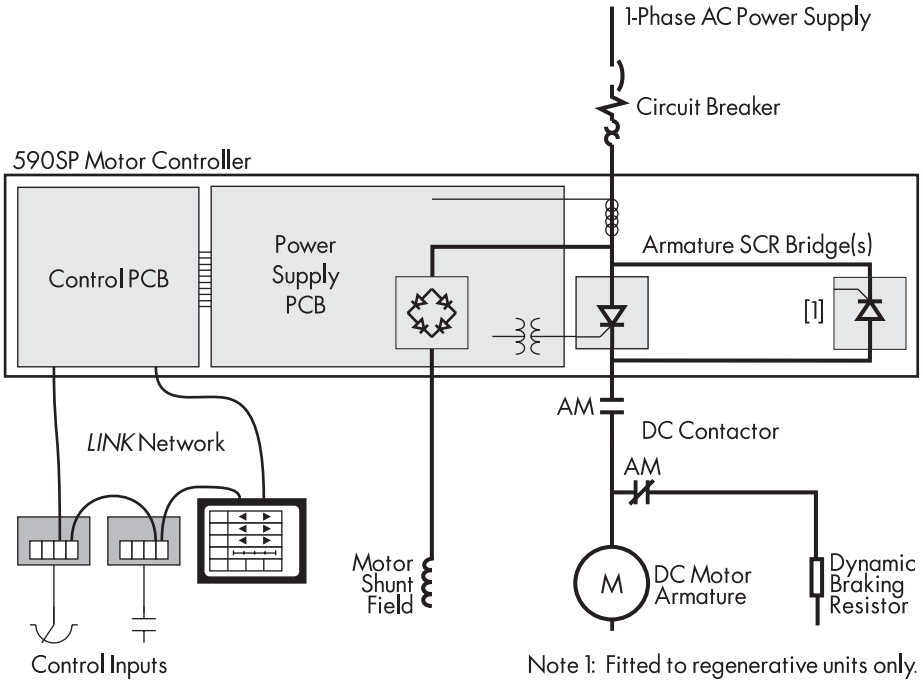


Figure 1.3 - 590SP *LINK* Block Diagram

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.

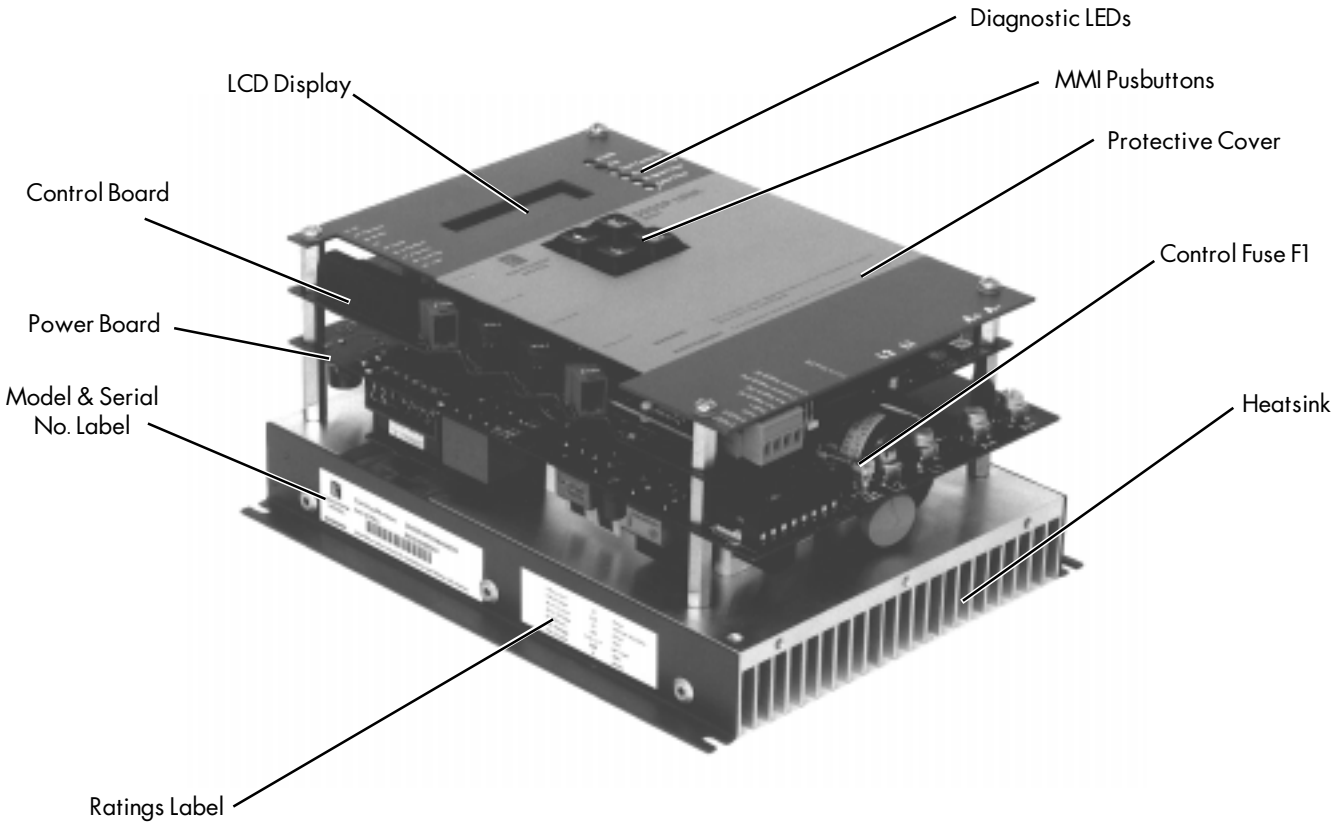


Figure 2.1 - 590SP *LINK* Drive Basic Part Identification

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.

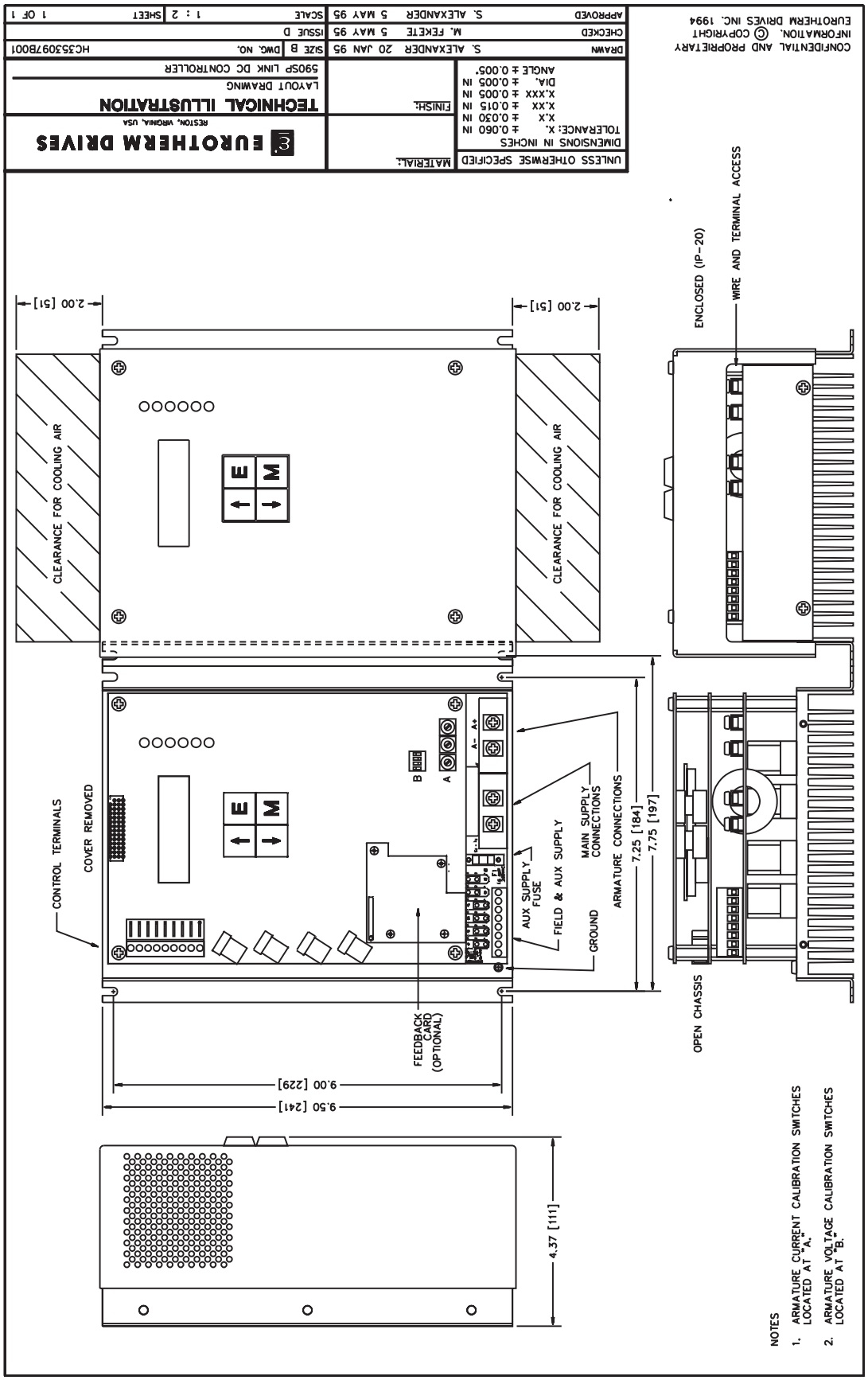


Figure 3.2 - 590SP *LINK* Controller Layout Drawing.

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.

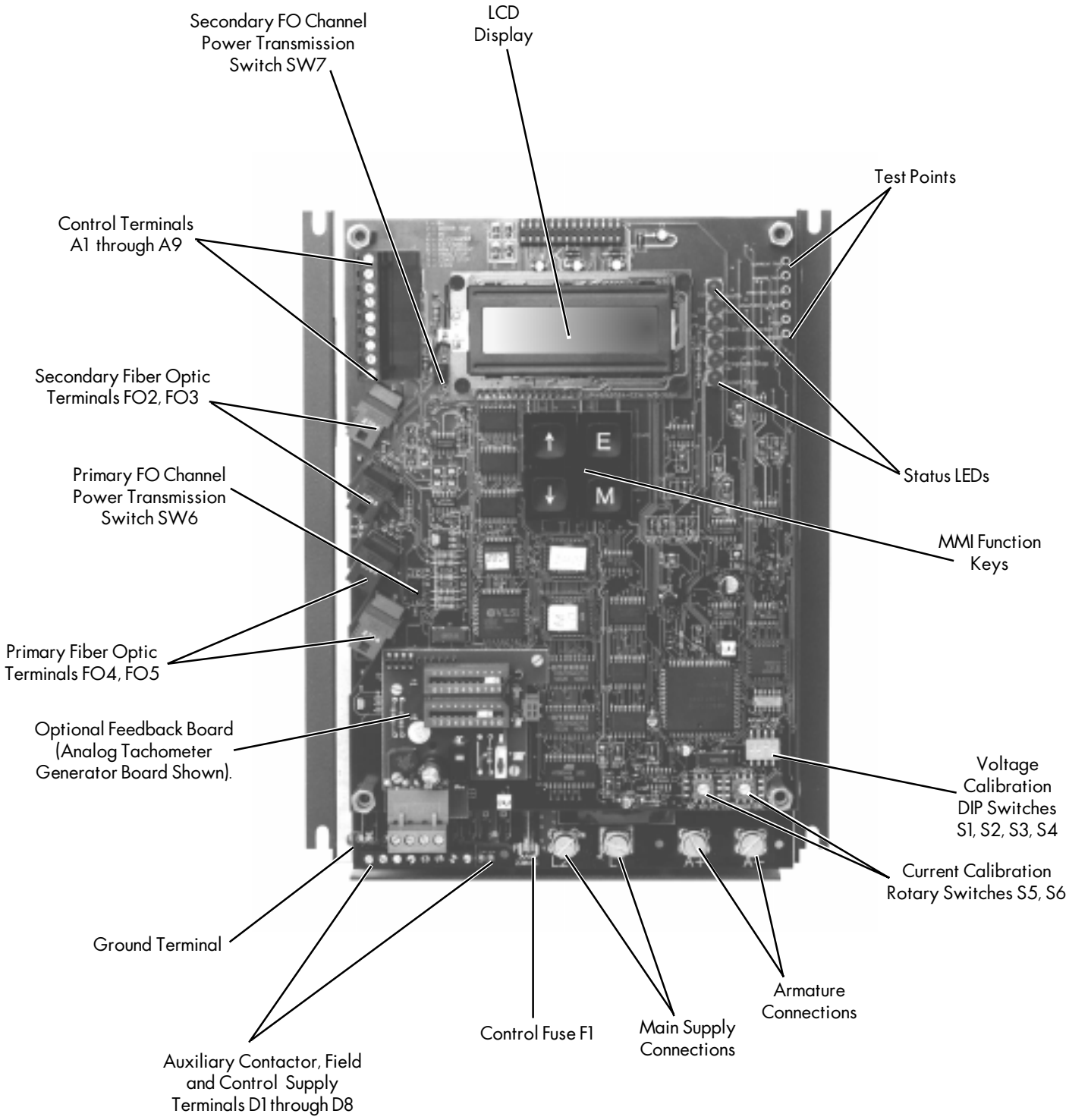


Figure 3.4 - 590SP *LINK* Drive, Front View

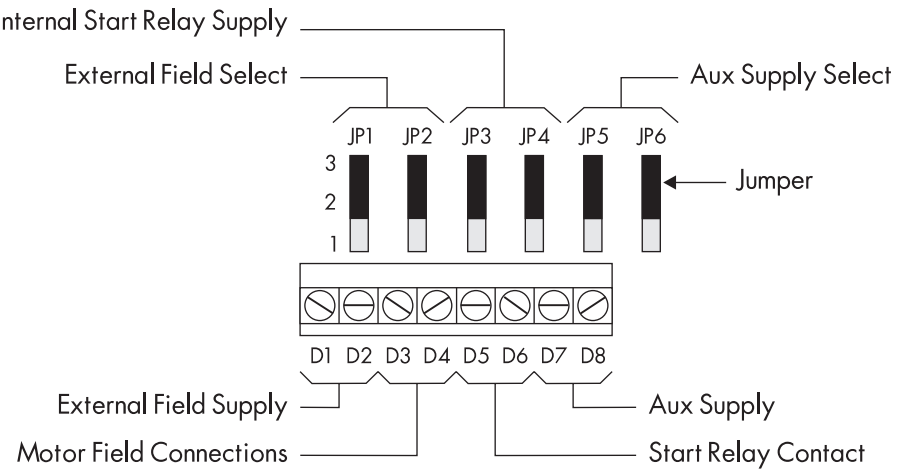


Figure 3.5- Auxiliary Control Jumpers

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.

Caution

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

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

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.

Drive Start Relay

External Drive Start Relay

Check Jumpers JP3 & JP4

(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

Signal Wiring

Wire routing

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

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

Over Temp Device

Blower Aux. Overload Contact

(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

Regen E-Stop

Program Stop A7

Non-Regen Stop

Coast Stop A8

(L)

(M)

(R)

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.

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.

Feedback Options

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

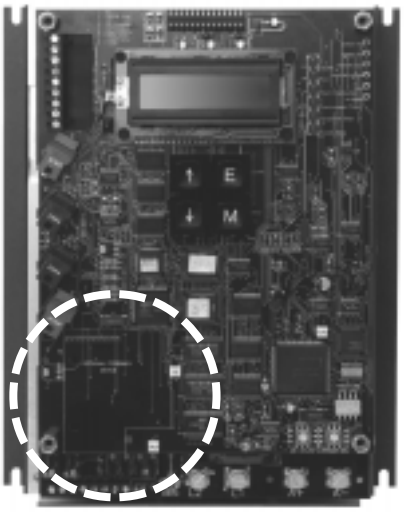


Figure 3.6 - Feedback Calibration Board Mounting Location

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

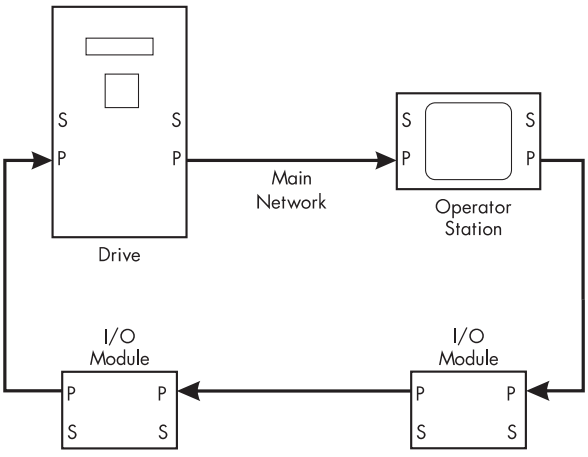


Figure 3.7 - Simple Fiber Optic Topology

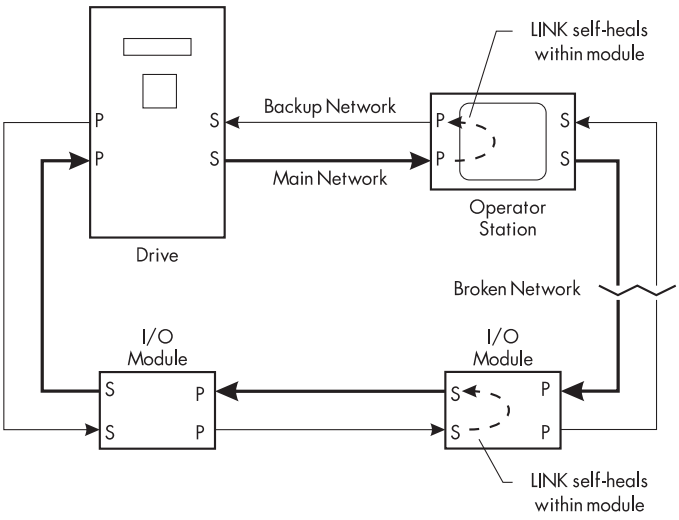


Figure 3.8 - Redundant Fiber Optic Topology

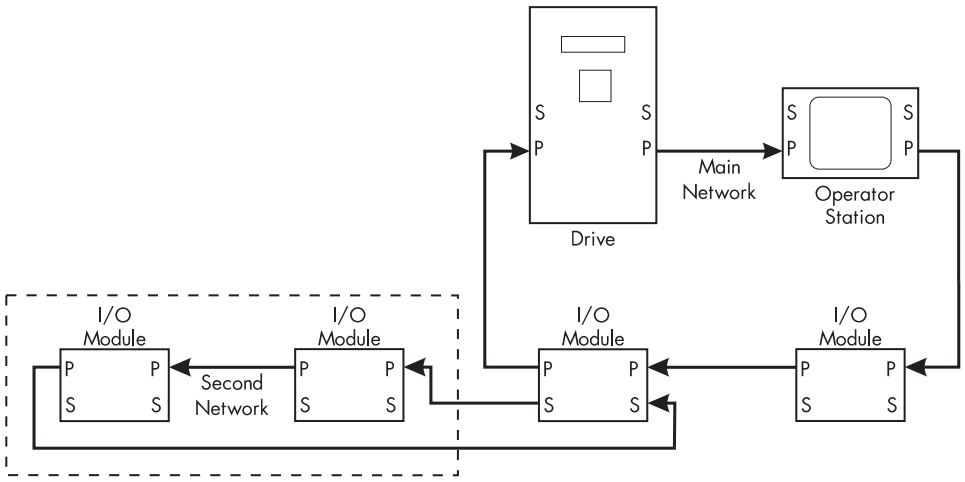


Figure 3.9 - Tapped Fiber Optic Topology

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

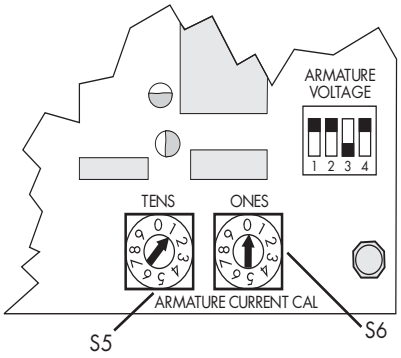


Figure 3.10 - Current and Voltage Calibration Switches

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

Armature Voltage Calibration

Voltage Switch Positions

Fine Tuning

Armature Current Calibration

Analog Tach Fbk Swiches

Fine Tuning: Chapter 4

Armature Voltage Calibration

The armature voltage can be set over a 100 to 400 VDC range 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 3.9 to select different voltages.

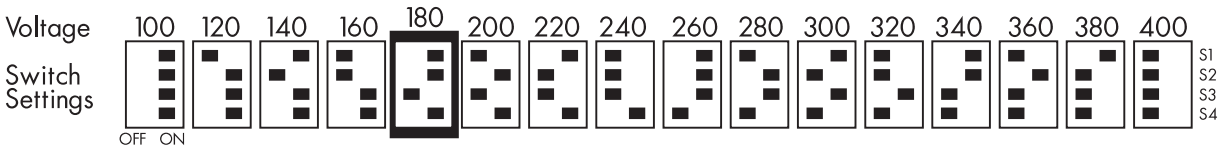


Figure 3.9 - Armature Voltage Calibration Switch Settings

If necessary, adjust SETUP PARAMETERS:: CALIBRATION:: ARMATURE V CAL to refine the calibration to match the required armature voltage.

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).

Armature Current Calibration

Set the armature current rotary switches, S5, S6 and S7, to match the motor's full load armature current nameplate rating. Armature current is set to the nearest tenth of an amp ranging from 0.1 to 27.0 amps.

NOTE. The calibration clamps at 27.0 amps if set past this setting. Setting the switches to 000 causes a drive OVERCURRENT TRIP alarm.

WARNING!

Do not set the current calibration switches above the drive or motor rating. Equipment damage may result.

Speed Feedback Calibration

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 analog tachometer generator signal and calibrating 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.

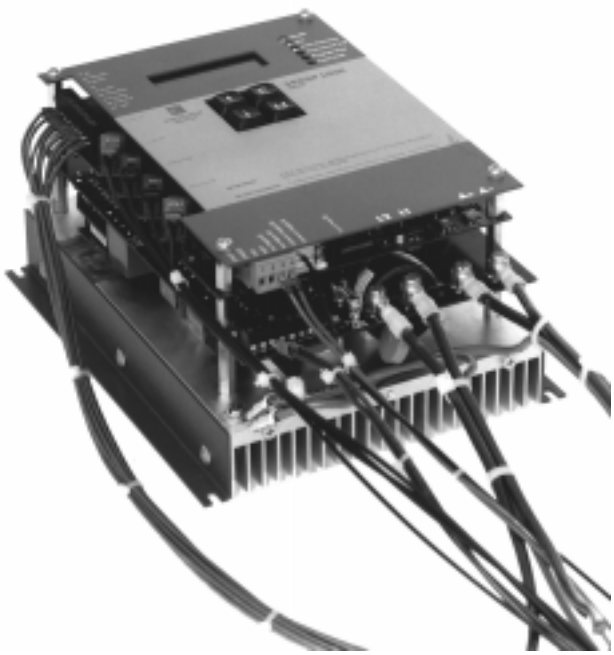
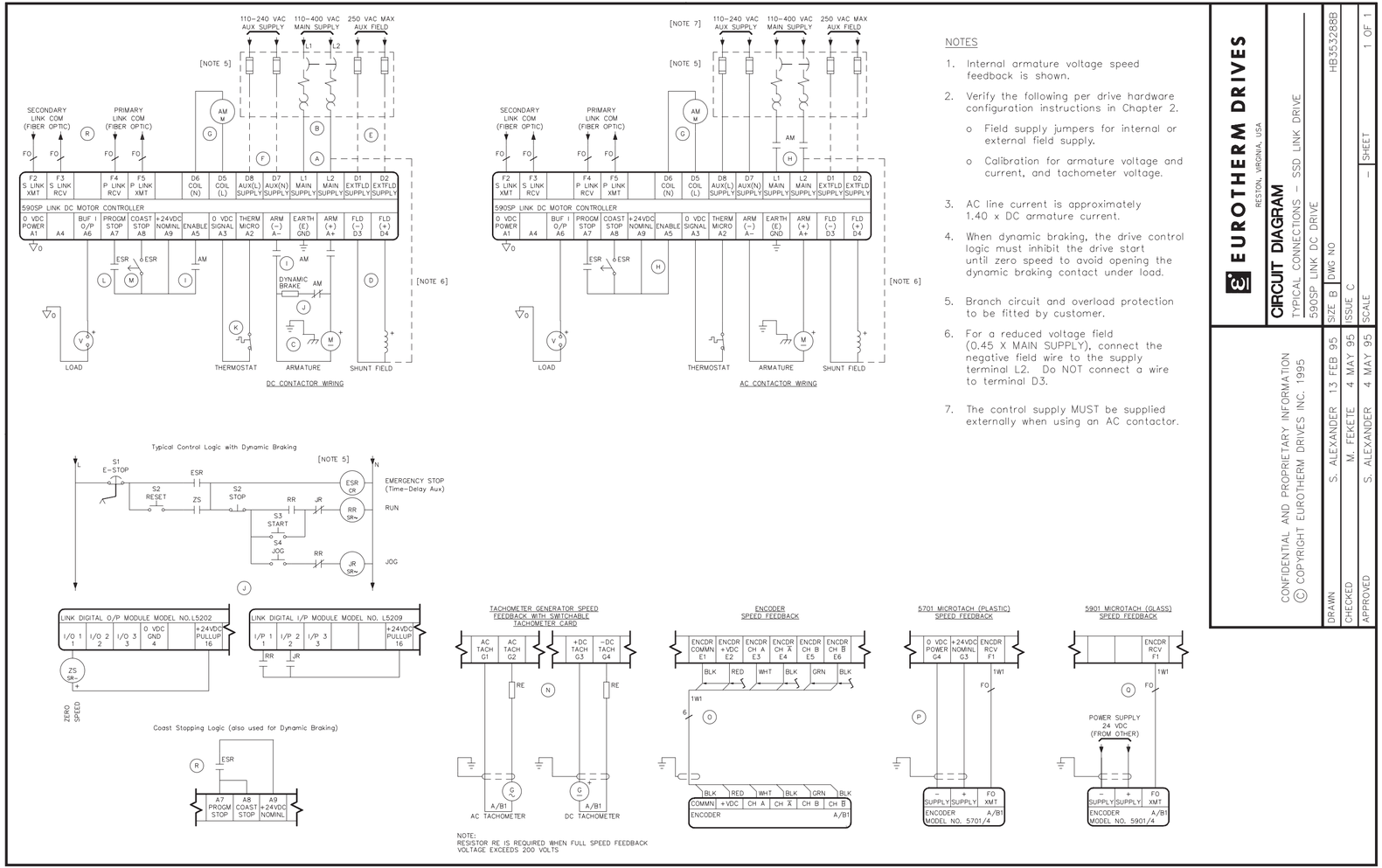


Figure 3.12 - Fully wired 590SP *LINK*

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



EUROTHERM DRIVES
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.

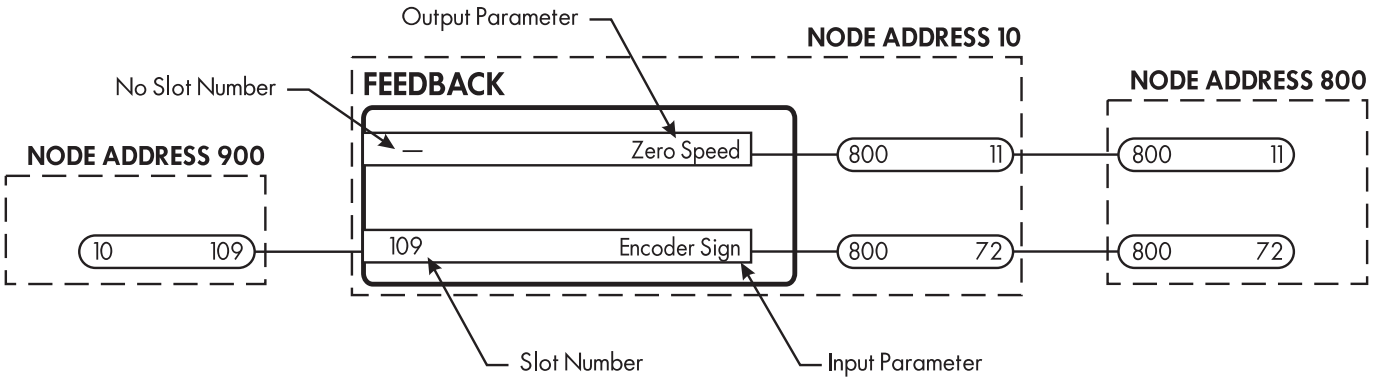


Figure 4.1 - Example of ConfigEd Software Block Inputs and Outputs

- 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.

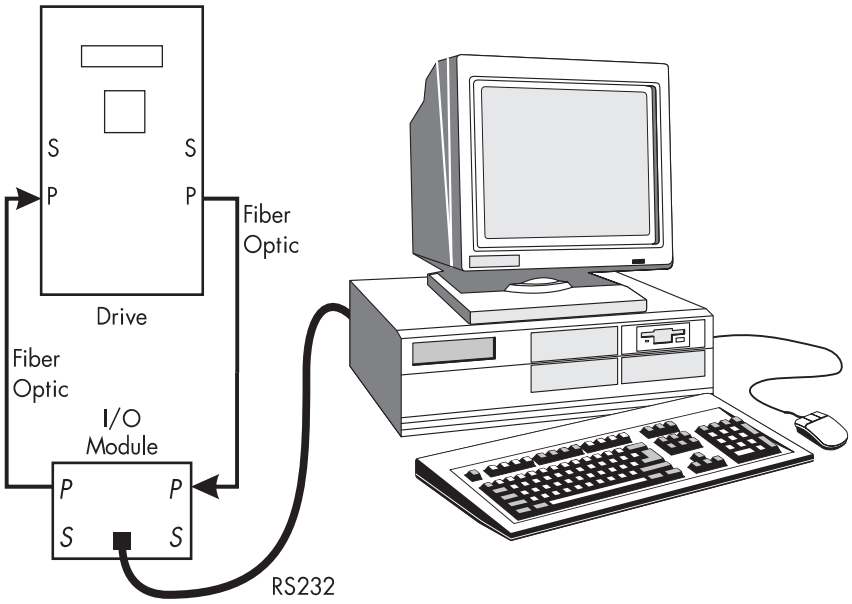


Figure 4.2 - Accessing a *LINK* Drive with a PC Through a Simple, Two Node Network

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.

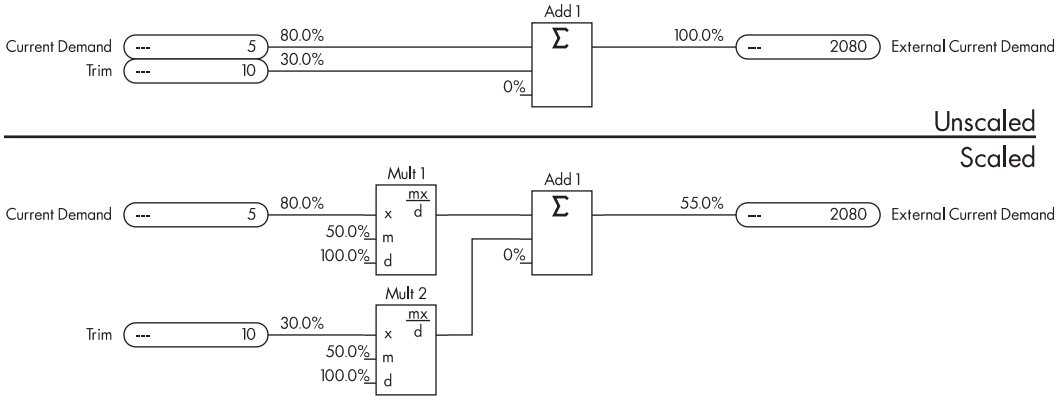


Figure 4.3 - Example of Value Data Saturation

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.

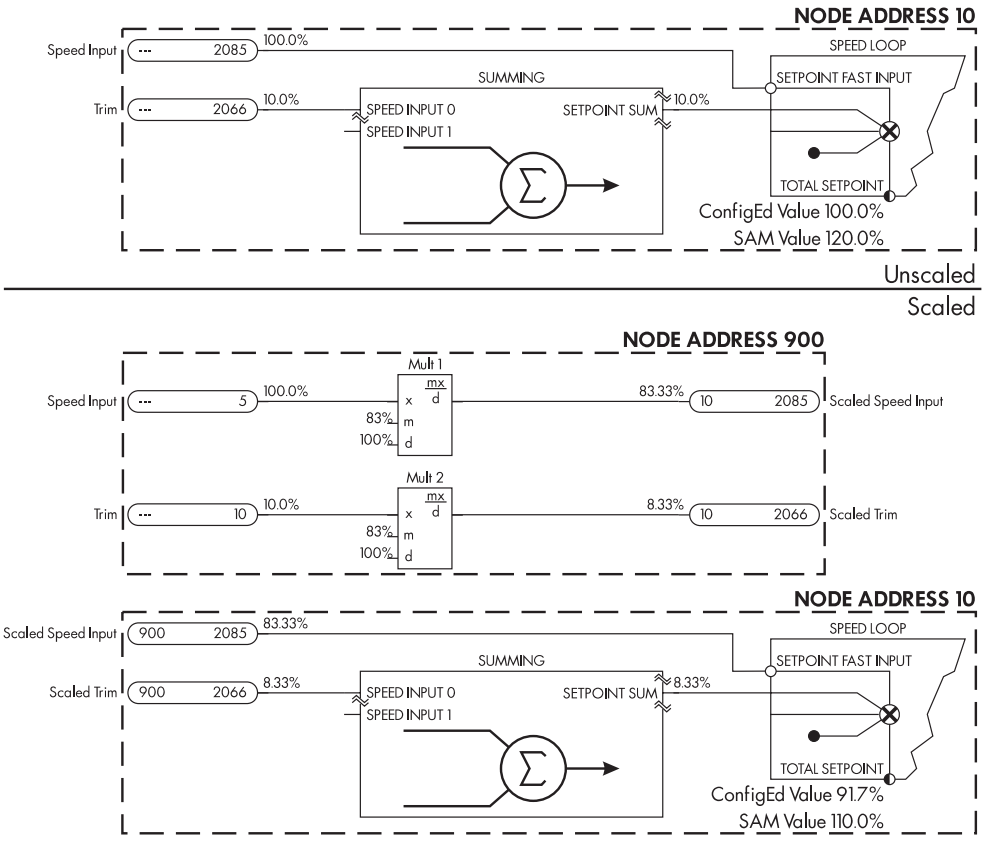


Figure 4.4 - SPEED LOOP Signal Scaling

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.

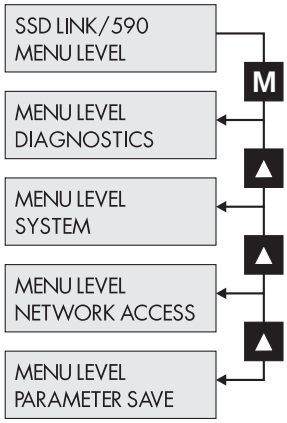


Figure 4.5 - MMI Path to PARAMETER SAVE

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:

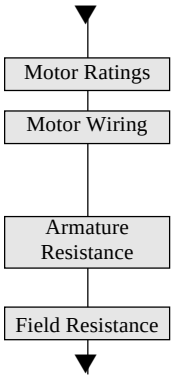
- IBM compatible personal computer with Microsoft Windows™ 3.1 or greater to run ConfigEd.
- Oscilloscope to monitor armature current waveform and speed feedback.
- Voltmeter to monitor motor armature and field voltage and check *LINK* system I/O levels.
- Ohmmeter to check signal continuity.
- Clamp-on, 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.

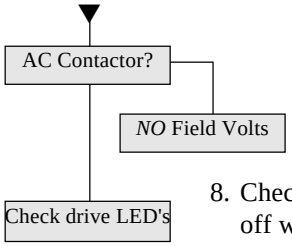
Apply Power & Measure Field Voltage

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

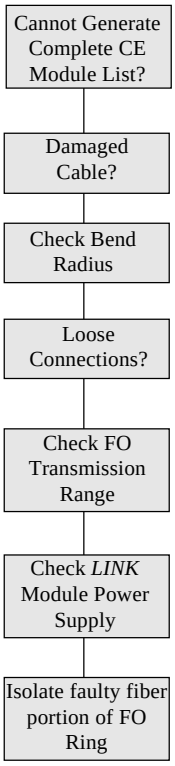
The *LINK* network must be healthy and running before continuing the start up. When control power is applied for the first time, the MMI displays the message RUNNING NETWORK DIAGNOSTICS and the HEALTH LED flashes indicating that the network is unhealthy (the fiber optic ring is broken) or not running,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

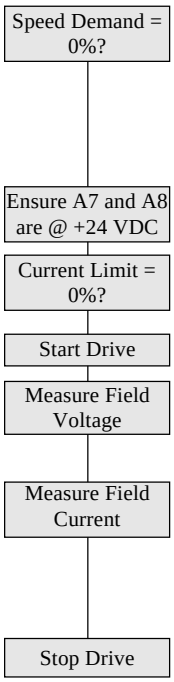
NOTE. After commissioning, the *LINK* network should remain healthy and automatically restart each time power is recycled. Each 590SP *LINK* drive should then allow access to the MMI. Consult Eurotherm Customer Service if the *LINK* network requires a restart after cycling power.

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.

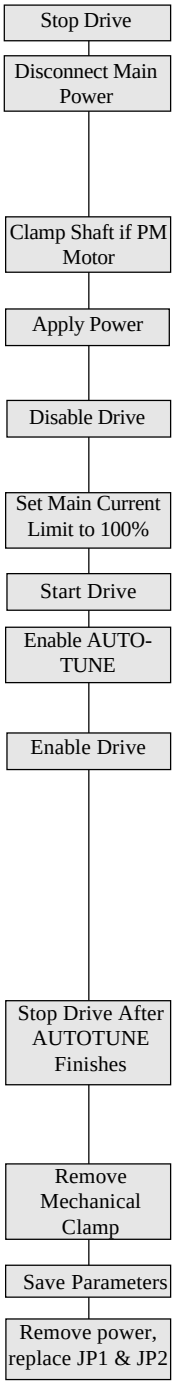
The AUTOTUNE function tunes the current loop automatically and sets the proportional gain, integral gain, and the discontinuous/continuous breakpoint for optimum drive response for a given motor. The drive cannot achieve peak performance without properly setting these parameters. Perform a complete AUTOTUNE 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).

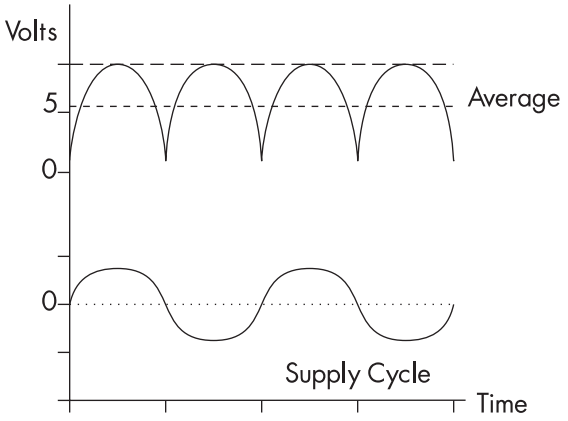


Figure 5.1 - Armature Current Waveform

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

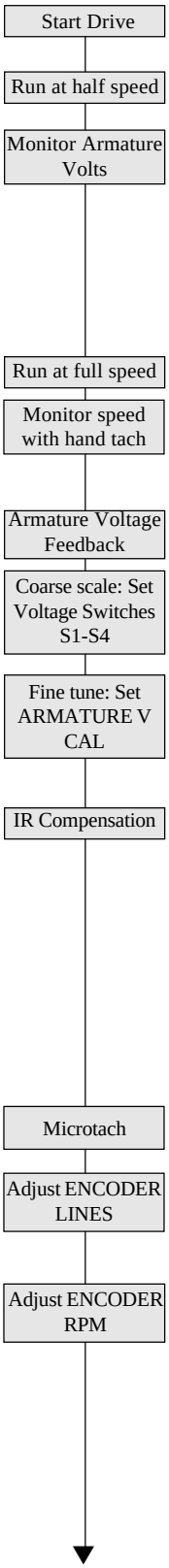
8. After you have correctly set the direction of rotation, reset CURRENT LIMIT to the desired value. If in doubt, set CURRENT LIMIT to 110% to correspond to 110 % full load current. If CURRENT LIMIT is set to a maximum 200%, and the motor runs into an overload condition, the current limit automatically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

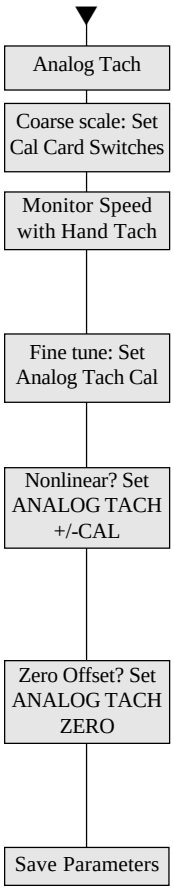
   NOTE. Too much IR COMPENSATION causes instability.

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.

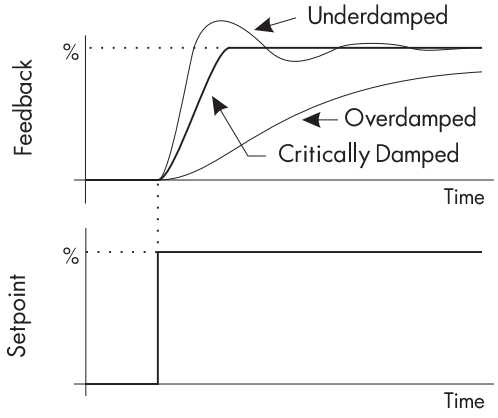
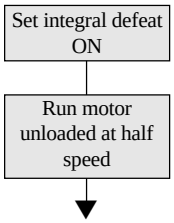
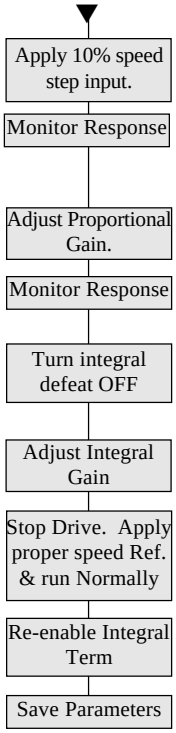


Figure 5.2 - Response to Step Input



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.

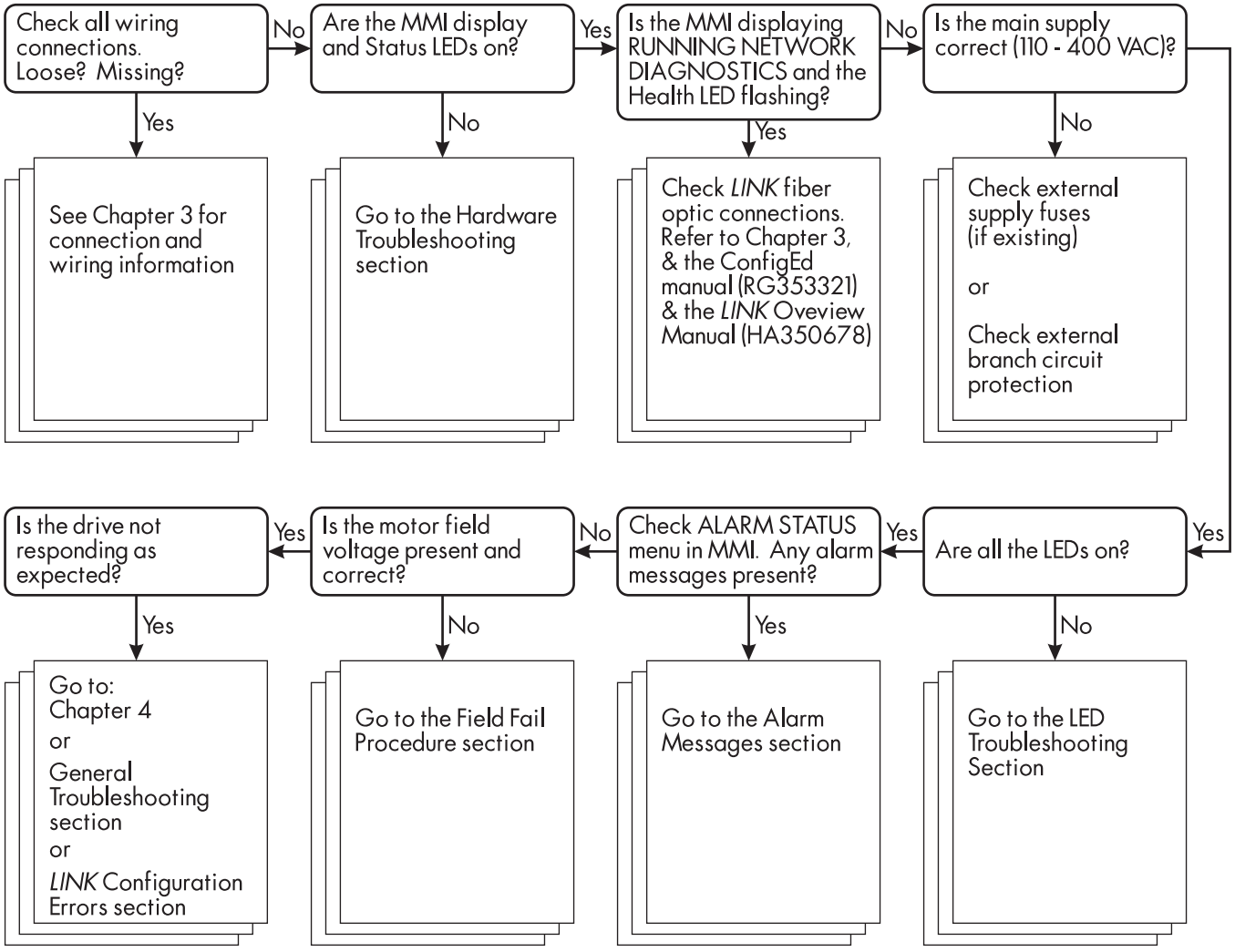


Figure 6.1 - Initial Troubleshooting Procedure

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.

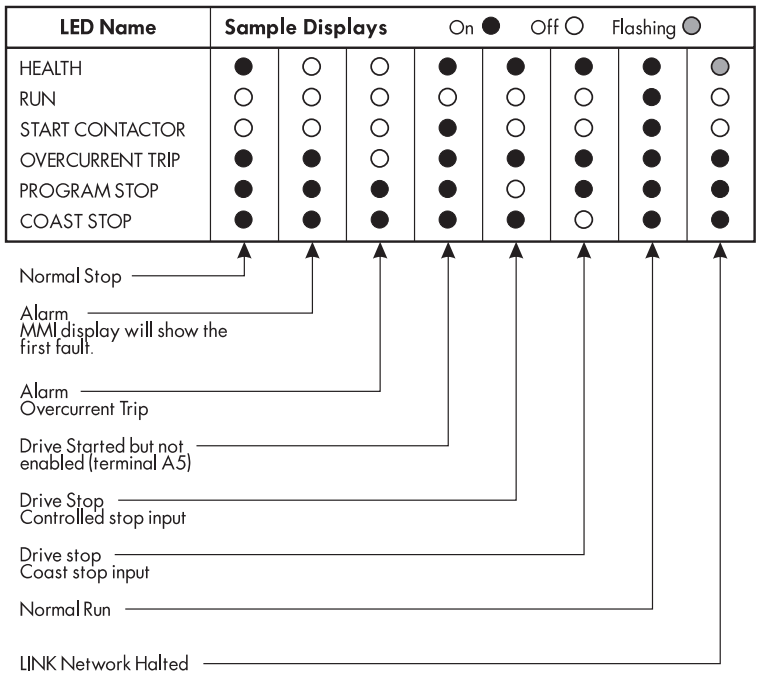


Figure 6.2 - Sample LED Status Modes

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, encc example.
		Improper tuning 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 us speed range m
*** ALARM *** PHASE LOCK	Drive SCR firing phase lock loop unable to lock to supply waveform	One or more ph 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 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 CHECKSUM FAIL UDP XFER -> P3 CHECKSUM FAIL	EEPROM memory failed check sum self test	Uploading of a
		Communicatio upload
		Corrupted EEP
INITIALIZING IA FBK CAL FAIL	Armature current feedback calibration fail during the power-up self test.	Armature curre transformers m
		Control board
INITIALIZING INIT CAL FAIL	Initialization calibration failure of analog inputs during the power-up self test.	Control board
		Corrupted EEP
		Hitting the "E" b test threshold . 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 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 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.

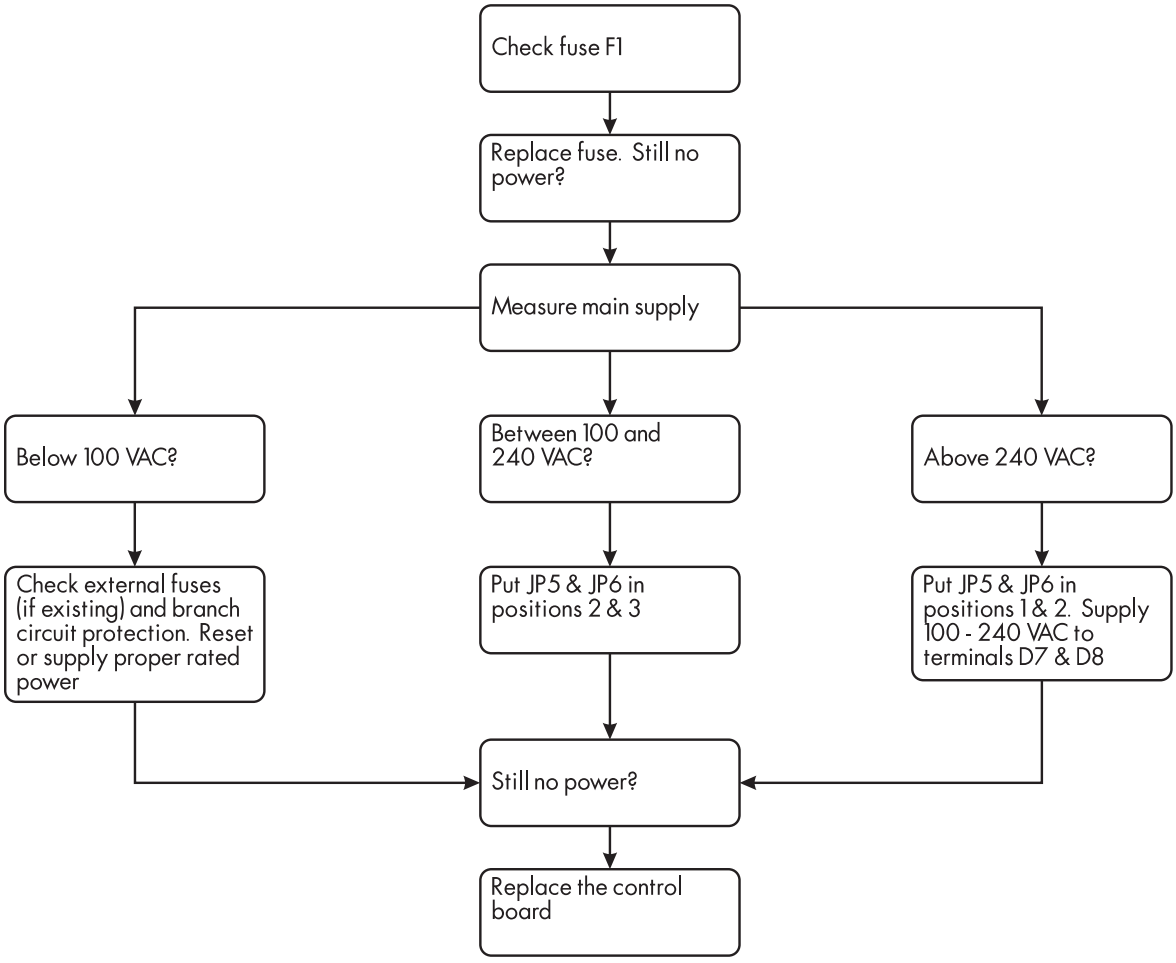


Figure 6.13 - 590 *LINK* DRV Hardware Control Power Troubleshooting Flowchart

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.

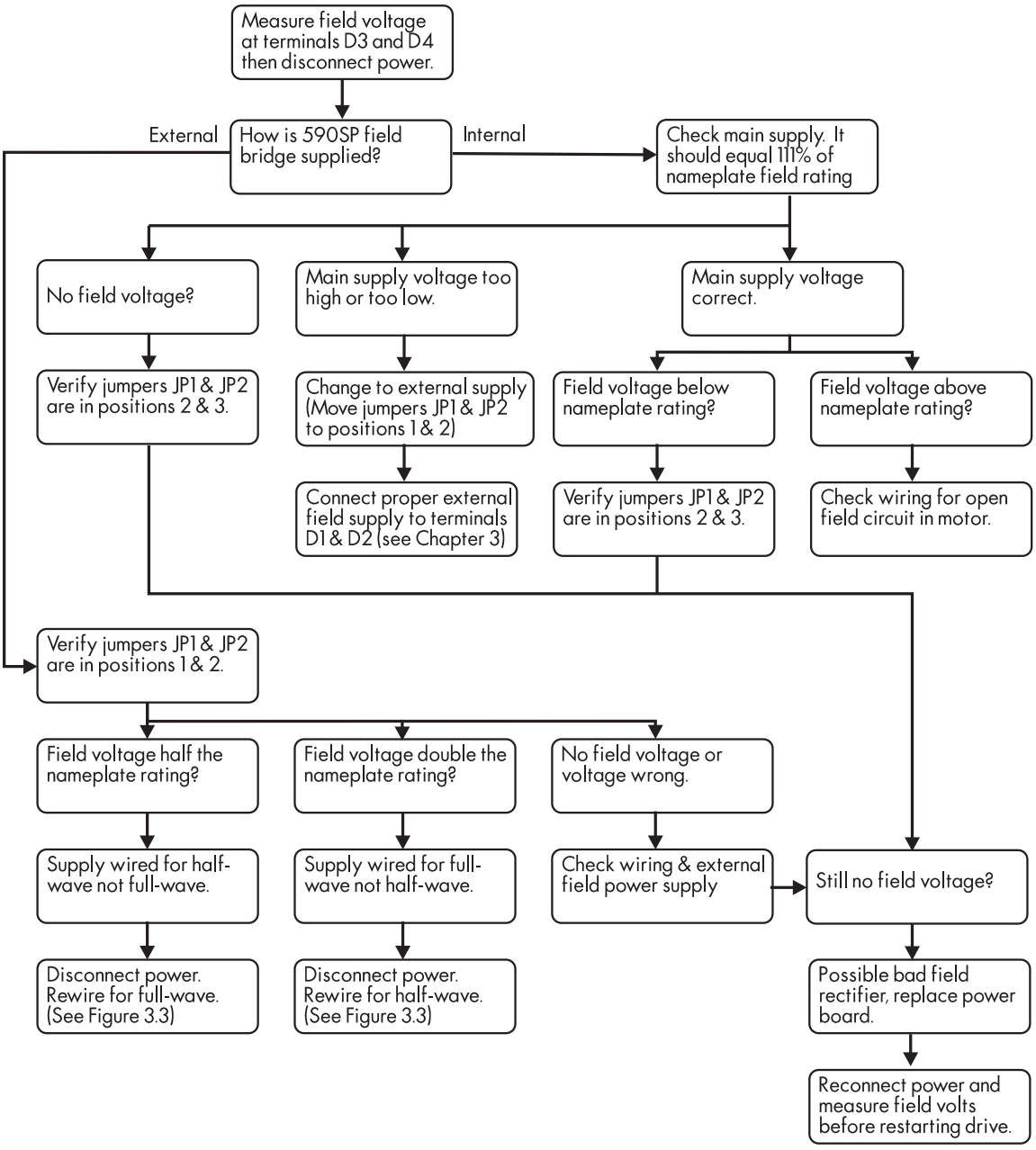


Figure 6.14 - 590 *LINK* DRV Field Troubleshooting Flowchart

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.

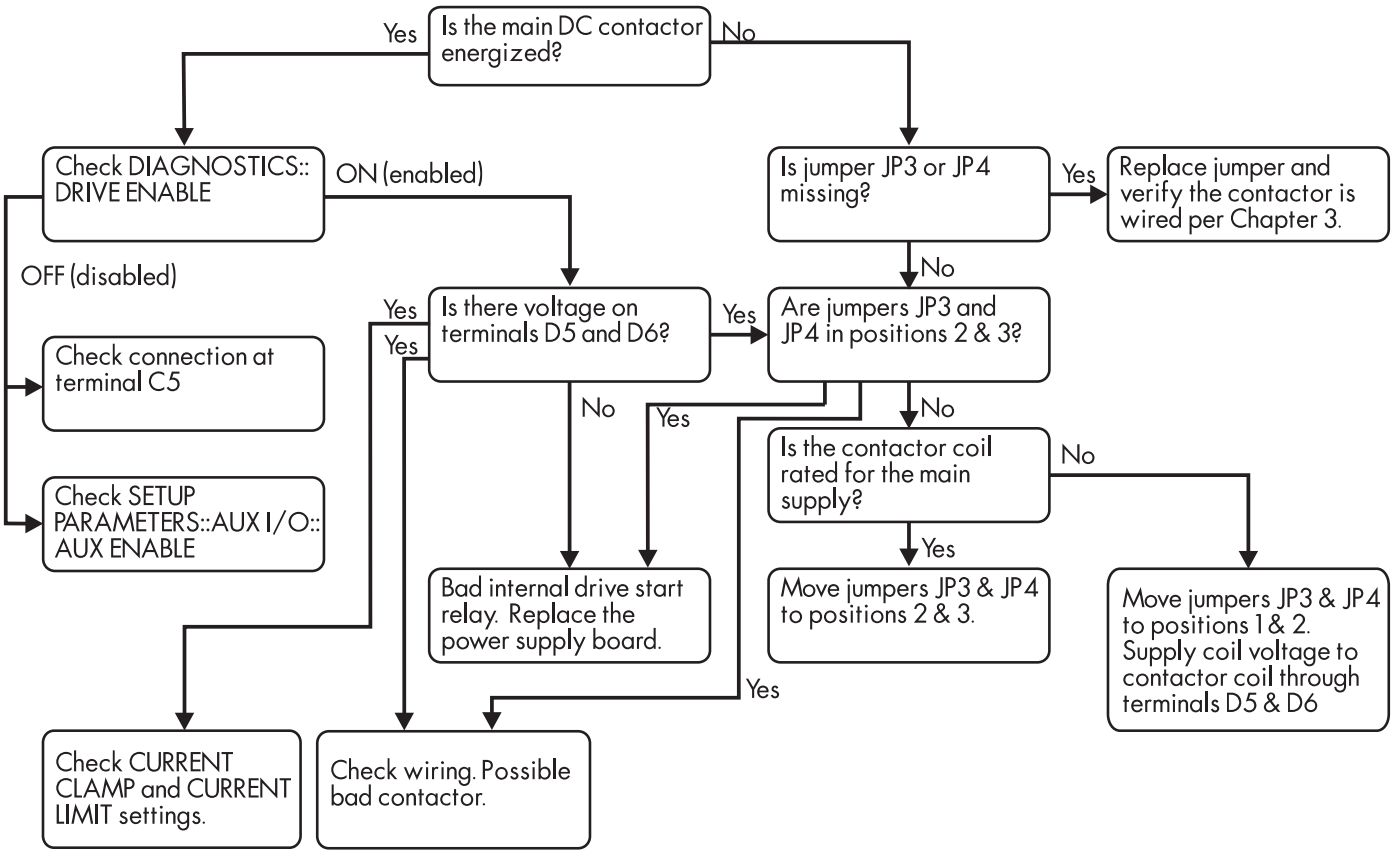


Figure 6.15 - 590 *LINK* DRV Contactor Troubleshooting Flowchart

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.

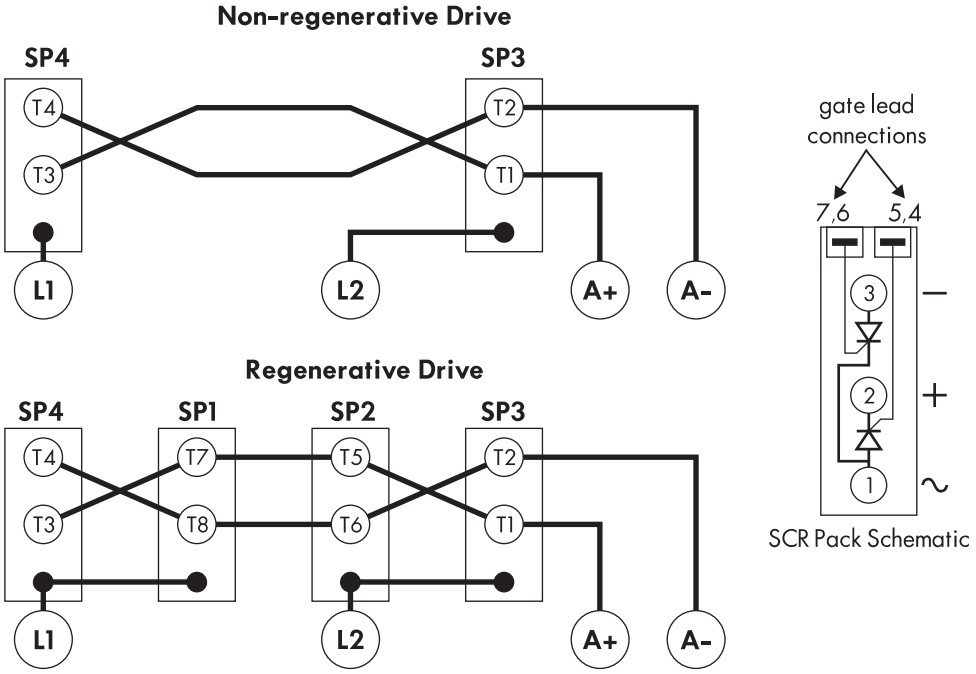


Figure 6.16 - SCR Layout

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.

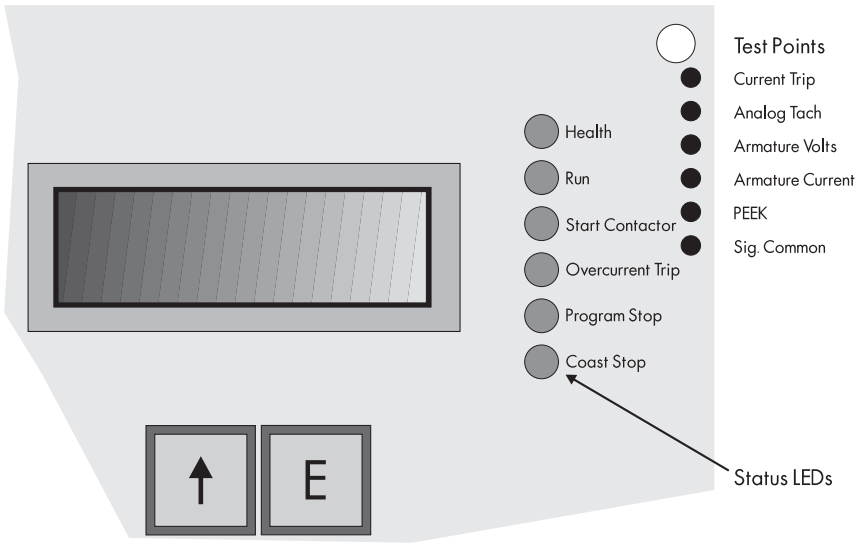


Figure 6.18 - Close up of the 590 *LINK* Control Board

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

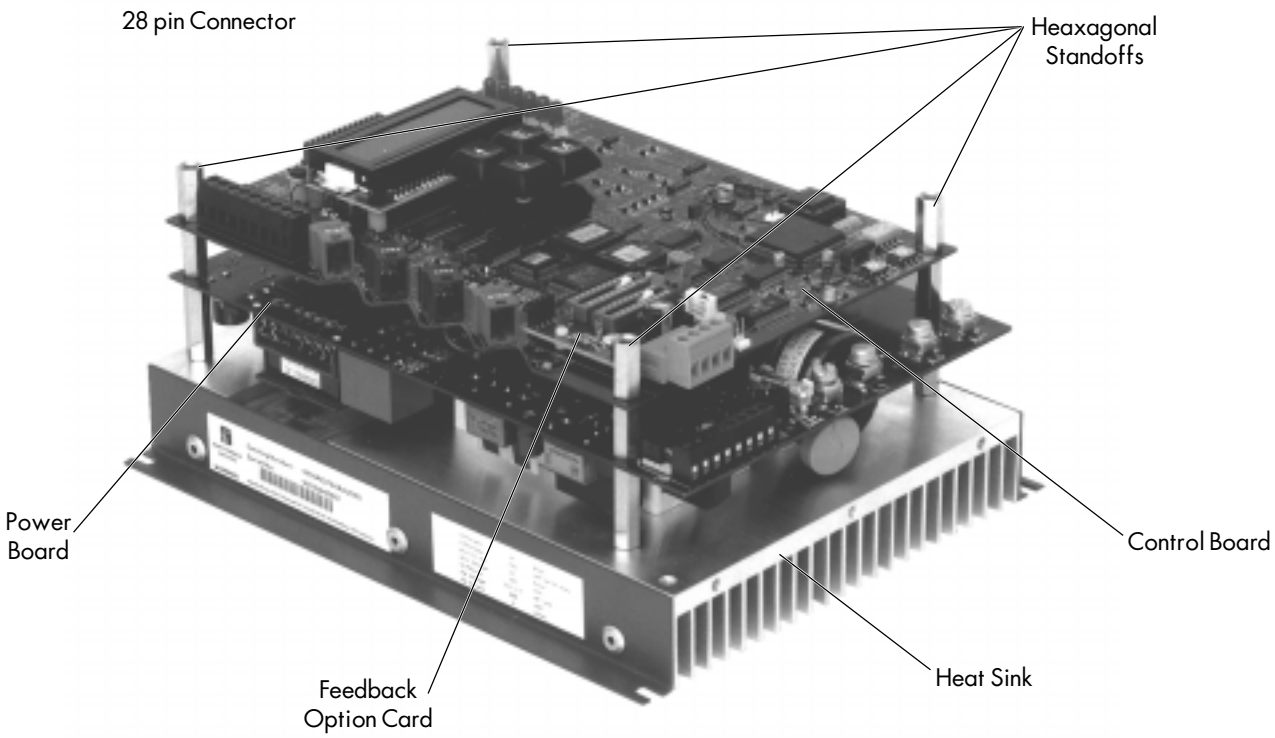


Figure 7.1- 590SP *LINK* Assembly Diagram

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.

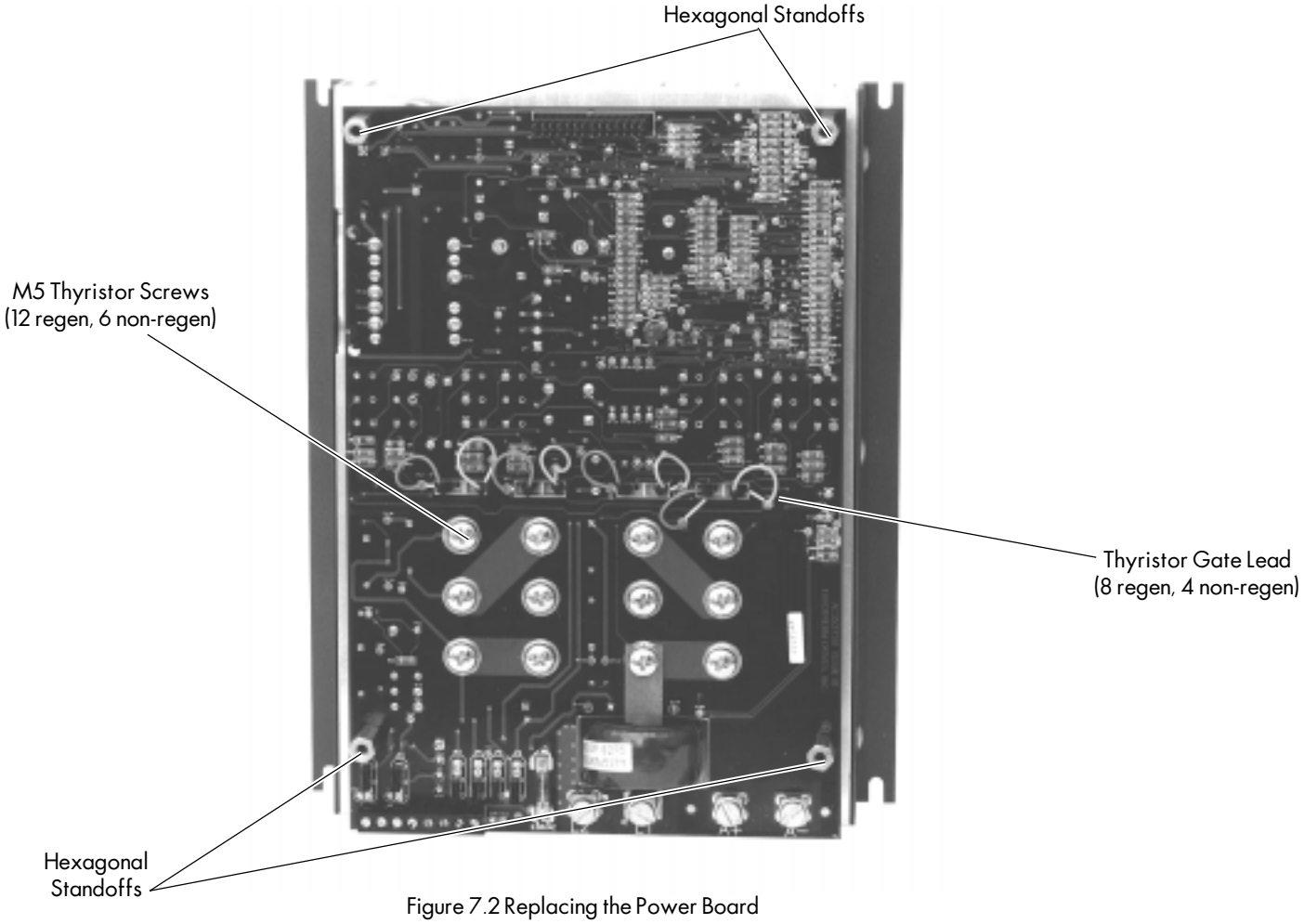


Figure 7.2 Replacing the Power Board

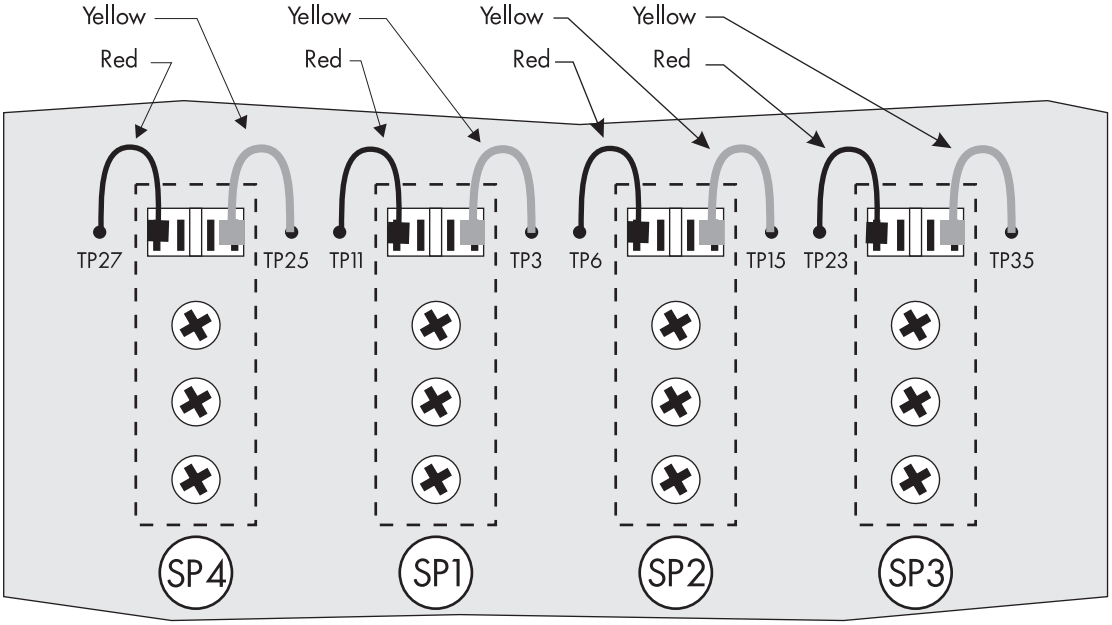


Figure 7.3 - SCR Gate Lead Terminal Connections

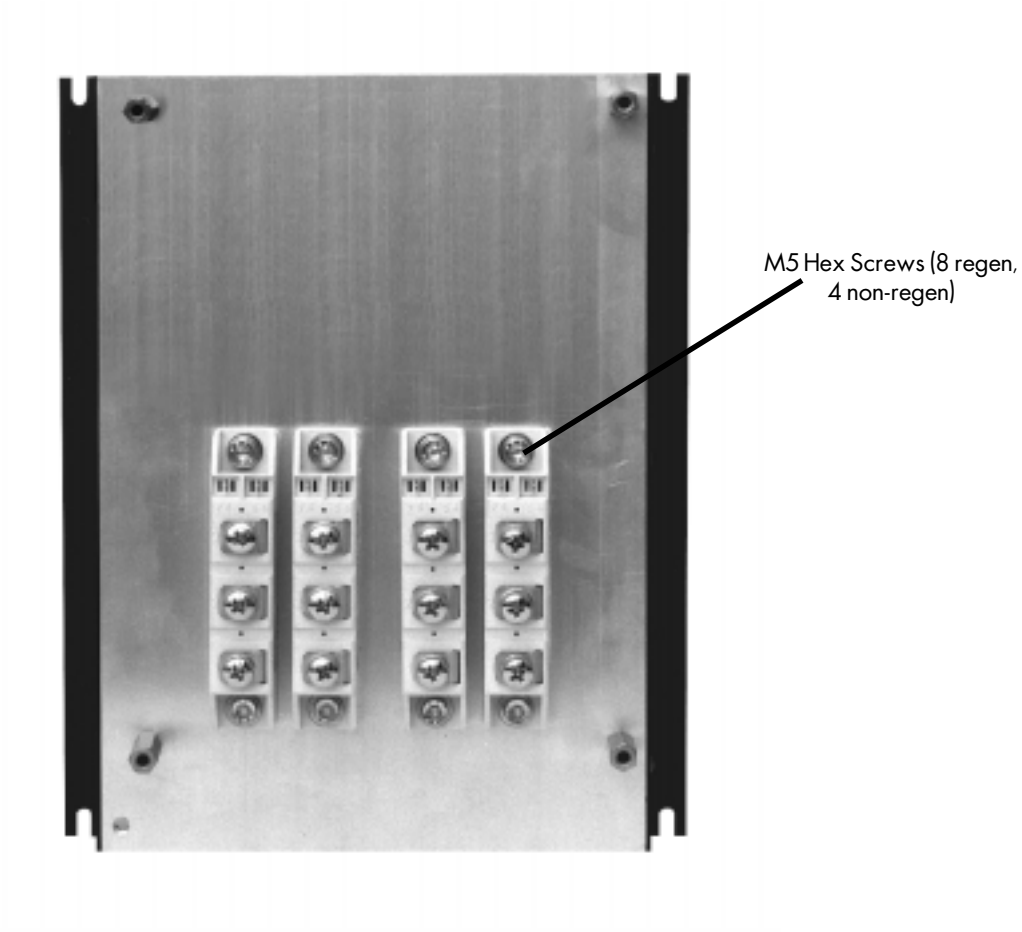


Figure 7.4 Replacing the SCR packs

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 Software configurable and distributive process controlled over fiber optic network Advanced PI with fully adaptive current loops for optimum dynamic performance Self-tuning current loop using Autotune algorithm Adjustable speed PI with integral defeat and adaptive gain profiling Non-controlled rectified field supply
Speed Control	5701 plastic Microtach fiber optic encoder feedback option 5901 glass Microtach fiber optic encoder feedback option Wire-ended electrical encoder feedback option Analog tachometer generator feedback option 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); Protect from direct sunlight 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); Requires external branch circuit AC protection; 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. Power Supply Voltage range: 110 - 400 volts AC nominal, ±10%. Power Supply Current: (1.4× calibrated DC armature current) amps AC rms; 37 amps AC rms, maximum.
Drive Control Supply	Single-phase, 40-70 Hertz, polarity insensitive; no adjustment necessary for frequency change. Control Supply Voltage range: 110 - 220 VAC to control transformer primary, ±10%; no special tapping required. 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. OUTPUT: 0.90 × AC supply volts (full-wave configuration); 0.45 × AC supply volts (half-wave configuration). 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; 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)

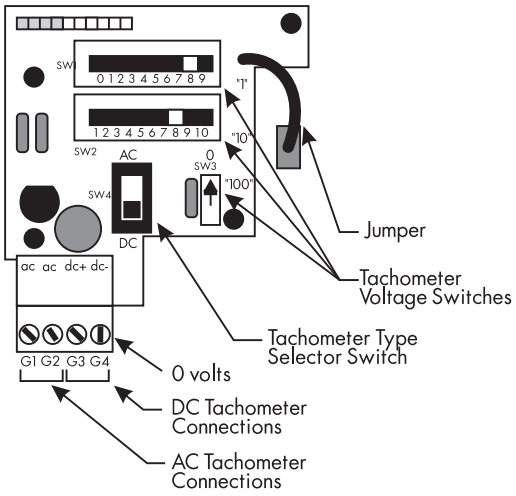


Figure A.4 - Switchable Analog Tachometer Feedback Card

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 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.

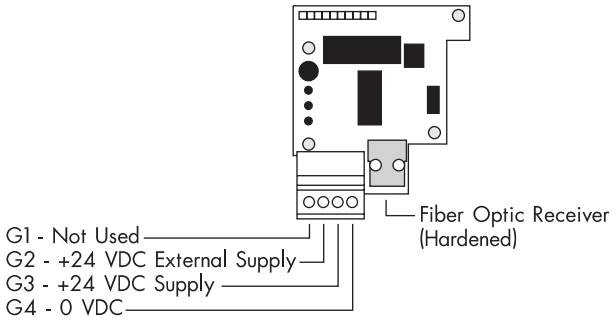


Figure A.5 - 5701 Microtach Receiver Card

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.

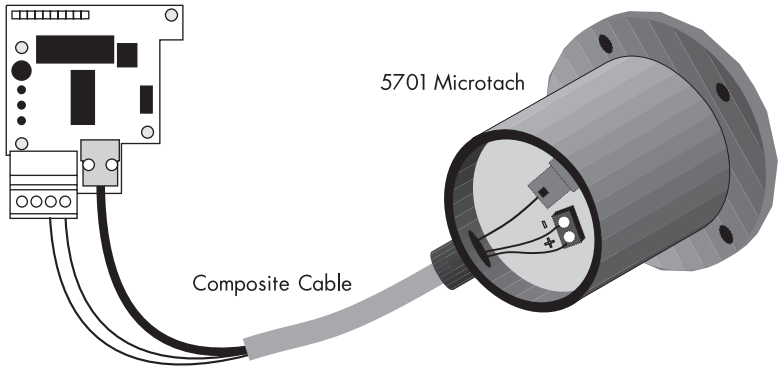


Figure A.8 - Connecting a 5701 Microtach to the 5701 Microtach Receiver Card

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:

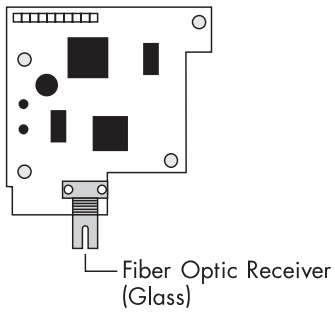


Figure A.9 - 5901 Microtach Receiver Card

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.

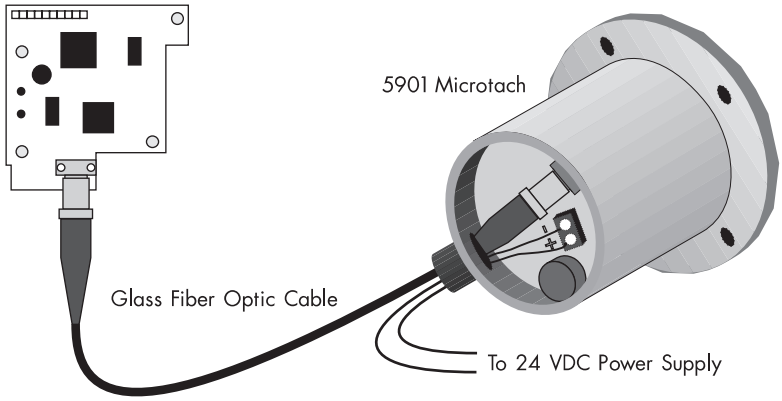


Figure A.12 - Connecting a 5901 Microtach to the 5901 Microtach Receiver Card

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.

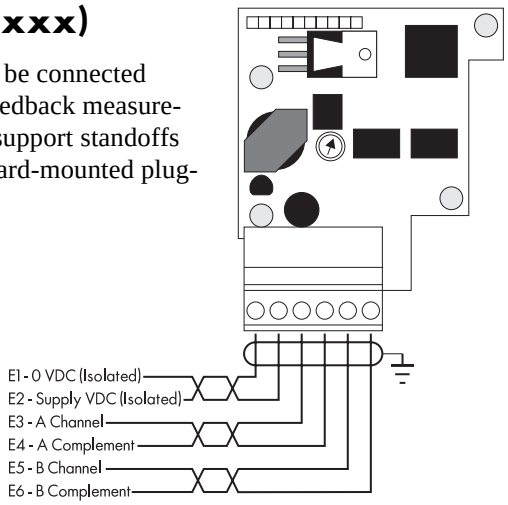


Figure A.13 - Wire-ended Encoder Receiver Card

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	625 525 526	EX625	60 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.

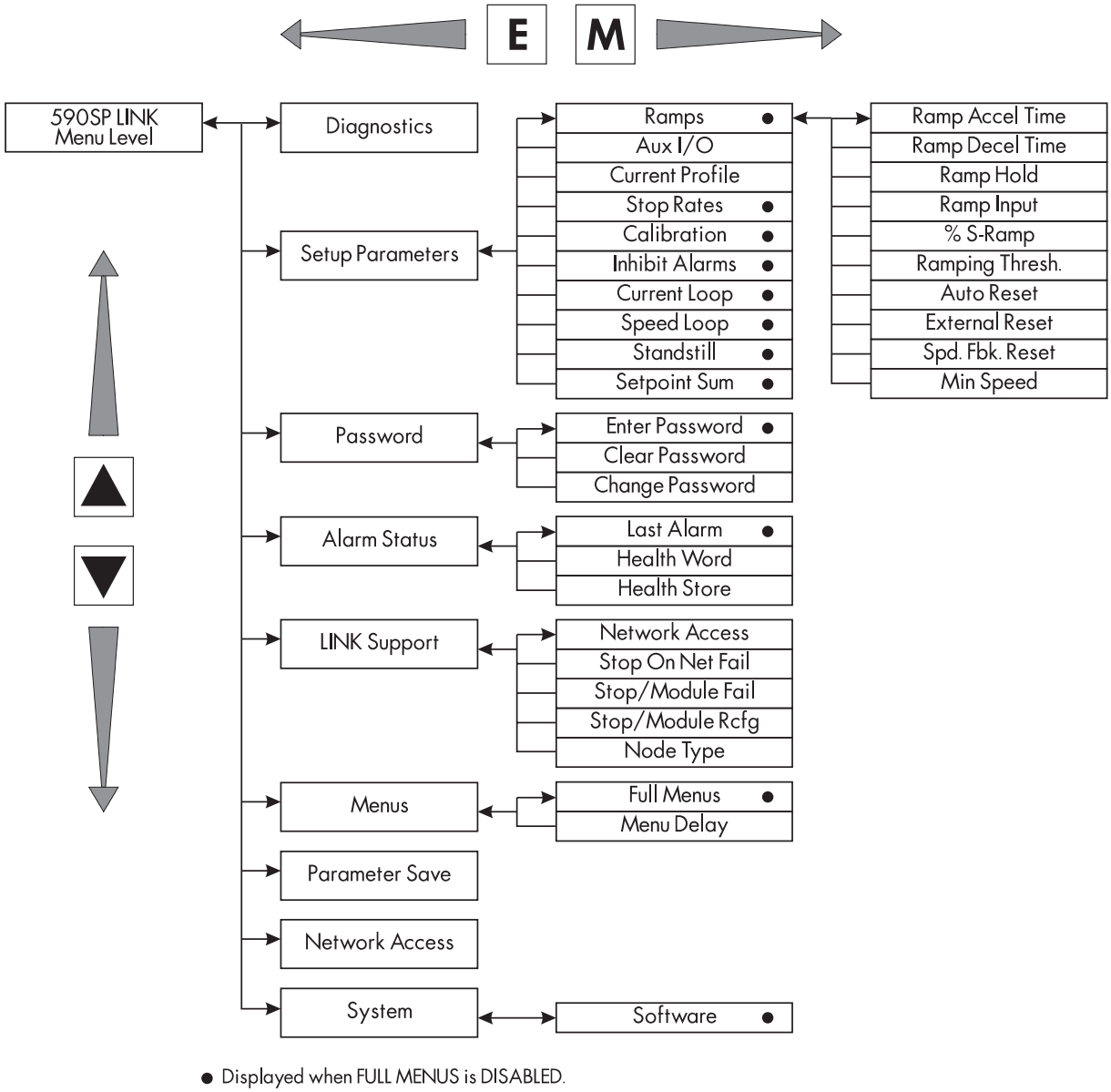


Figure B.1 - Basic Menu Tree

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.

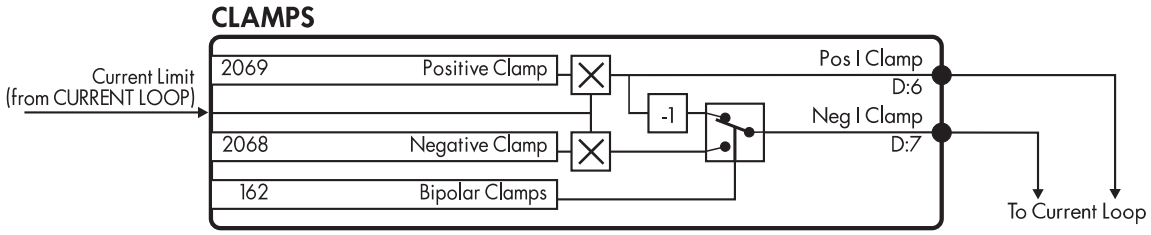


Figure C.1 - CLAMPS Software Block

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

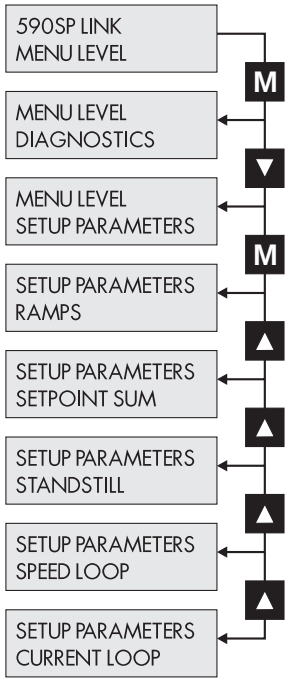
The CURRENT LOOP software block calculates the signal that produces the firing phase angle for the drive's thyristors. The current demand is supplied from either the SPEED LOOP software block in speed control applications or, externally, for direct torque control of the motor. Four different clamps limit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

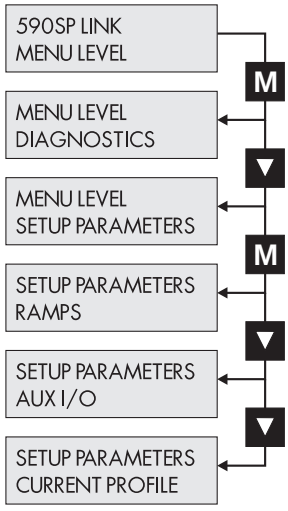
The main output is the motor ARMATURE CURRENT. It can be monitored as an analog voltage on control board terminal A6. Terminal A6 is usually reserved for a meter display. Armature current is also available as a test point (see Figure 5.20). ARMATURE CURRENT can be either unipolar or bipolar depending 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.

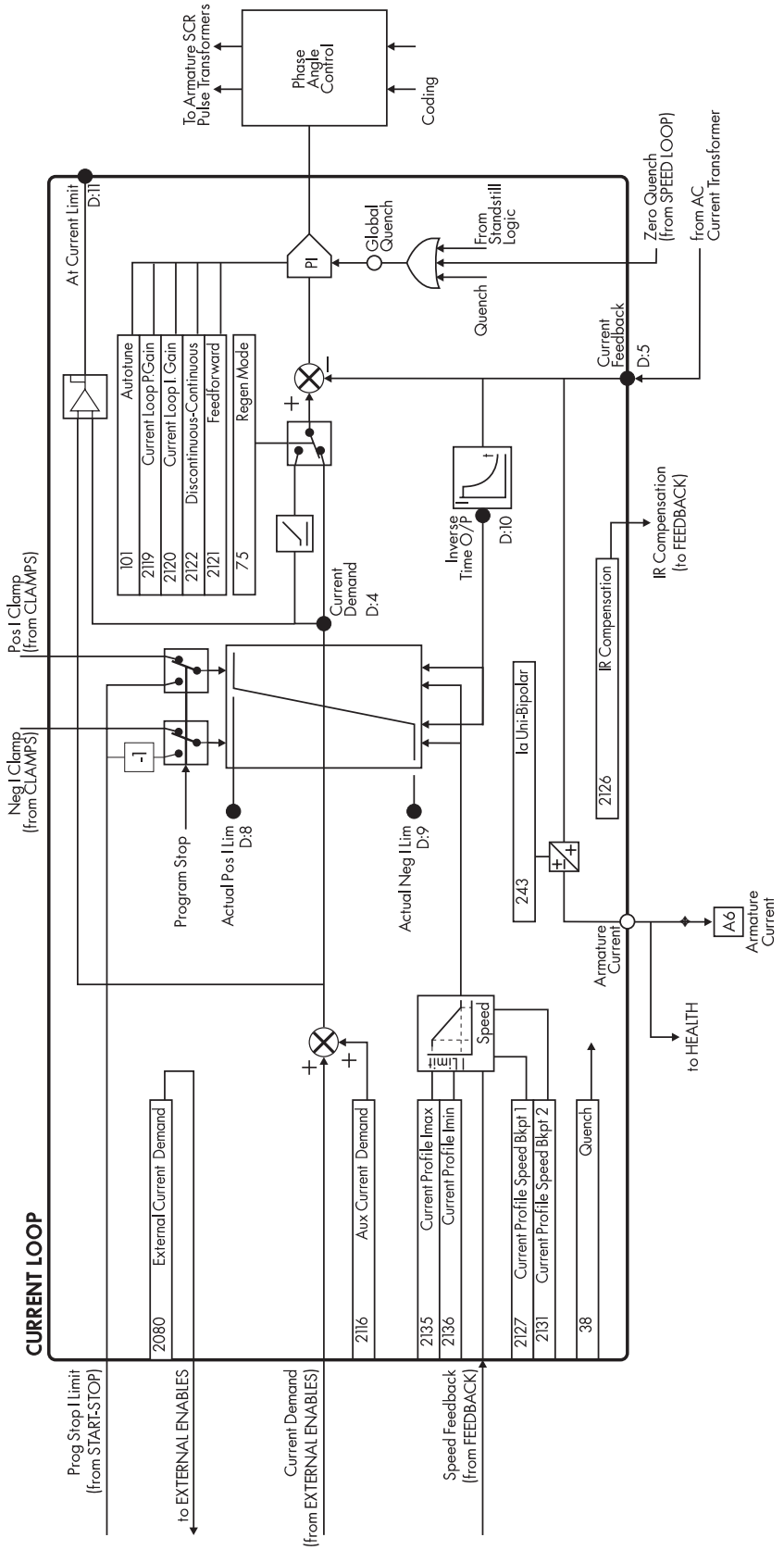


Figure C.2 - CURRENT LOOP Software Block

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).

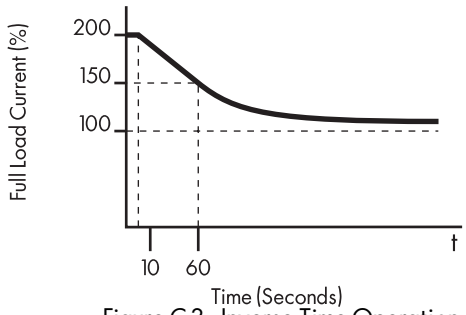


Figure C.3 - Inverse Time Operation

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 Bipolar=ON	1=ON (bipolar) 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 Unquenched=current ON	1=quenched (OFF) 0=unuenched (ON)	enabled (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 Unquenched=current ON	1=current OFF 0=current ON	DRIVE ENABLE
ARMATURE CURRENT	Drive armature current feedback.	±100% = ±200% Current Fbk if IA UNI-BIPOLAR set to bipolar; 0 to 100% = 0 to 200% Current Fbk if IA UNI-BIPOLAR set to unipolar.	±100.00% (bipolar) or 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.

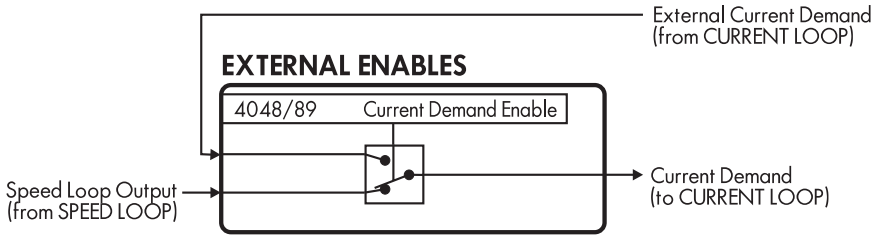


Figure C.4 - EXTERNAL ENABLES Software Block

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.

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) 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.

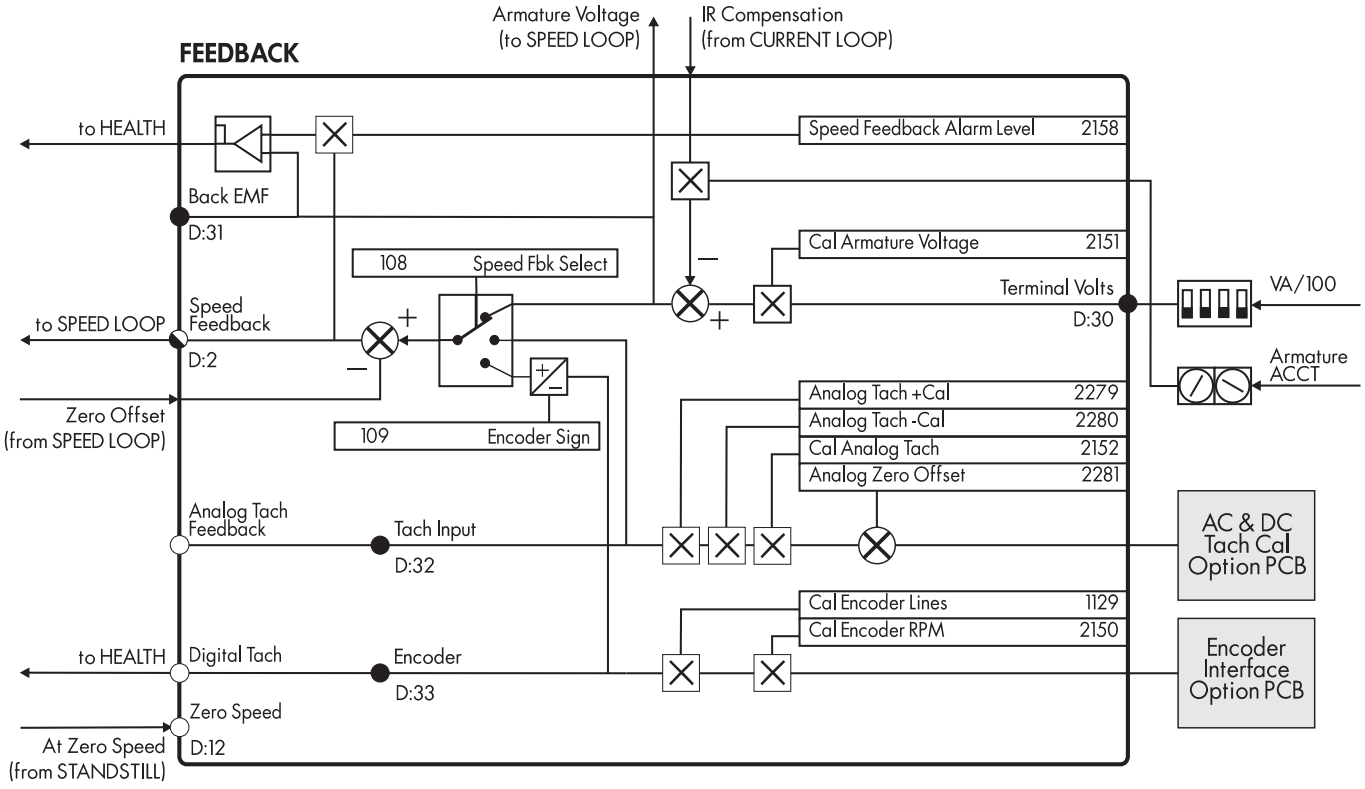


Figure C.5 - FEEDBACK Software Block

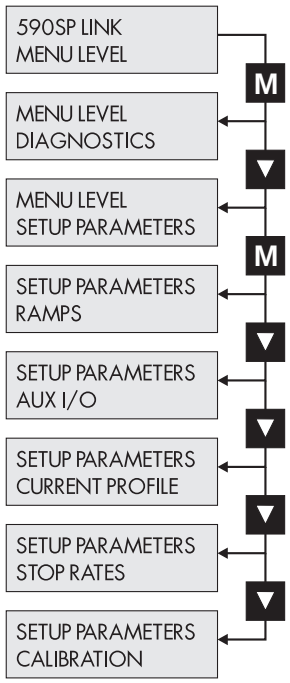
Description

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.

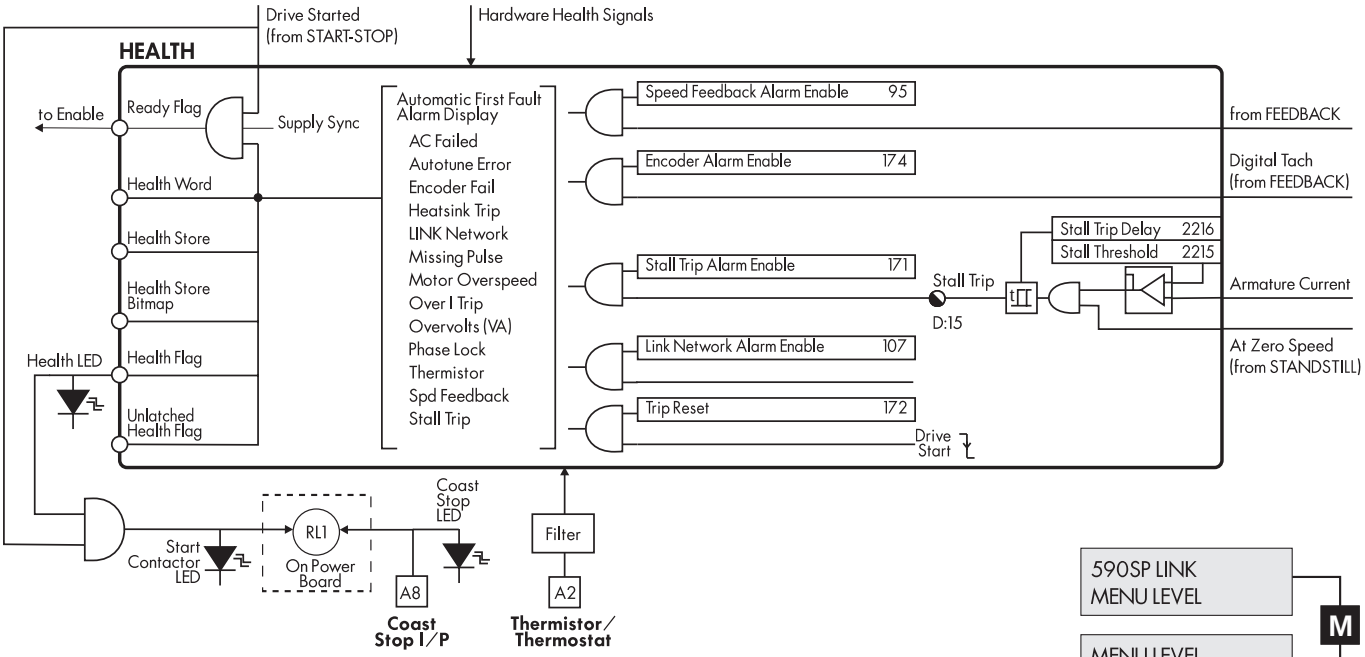
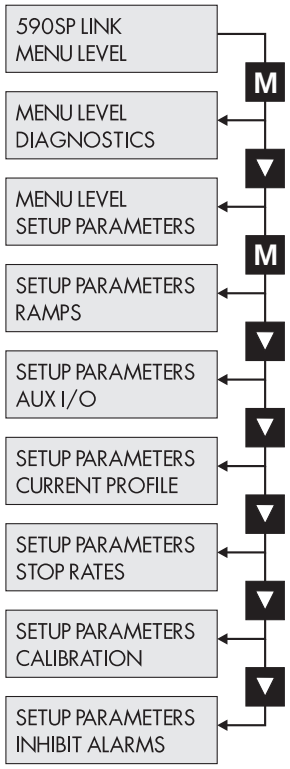


Figure C.6 - HEALTH Software Block



Description

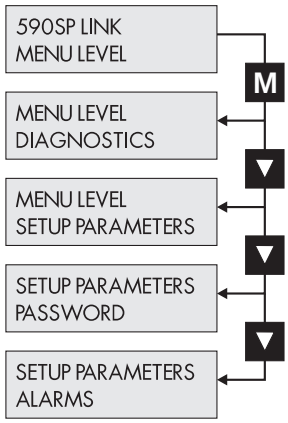
STALL TRIP DELAY and STALL THRESHOLD set the time delay and the stall current alarm trip level respectively. The STALL TRIP ALARM trips when STALL TRIP ALARM is enabled and the scaled armature current exceeds the STALL THRESHOLD for a time period exceeding the STALL TRIP DELAY.

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.



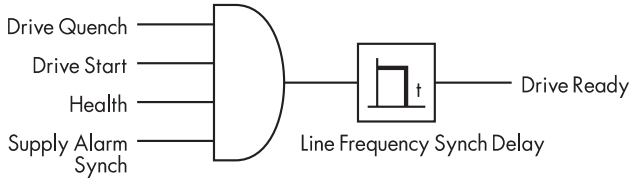


Figure C.7 - READY Flag Logic

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.

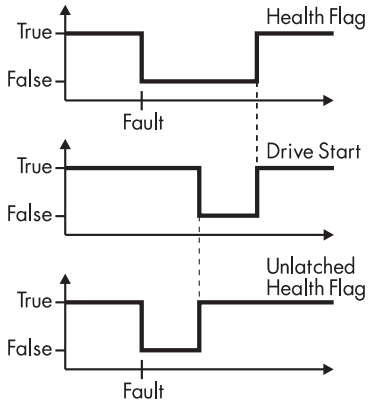


Figure C.8 - HEALTH FLAG Logic

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 0x0 = UNHEALTHY	1 = HEALTHY 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 ORDINAL	ALARM STATUS:: 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:: 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:: HEALTH WORD
READY FLAG	Indicates drive is started, healthy and ready to produce current.	READY/NOT READY	1 = READY 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 0x0 = UNHEALTHY	1 = HEALTHY 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 1 = TRIPPED	*** ALARM *** 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.

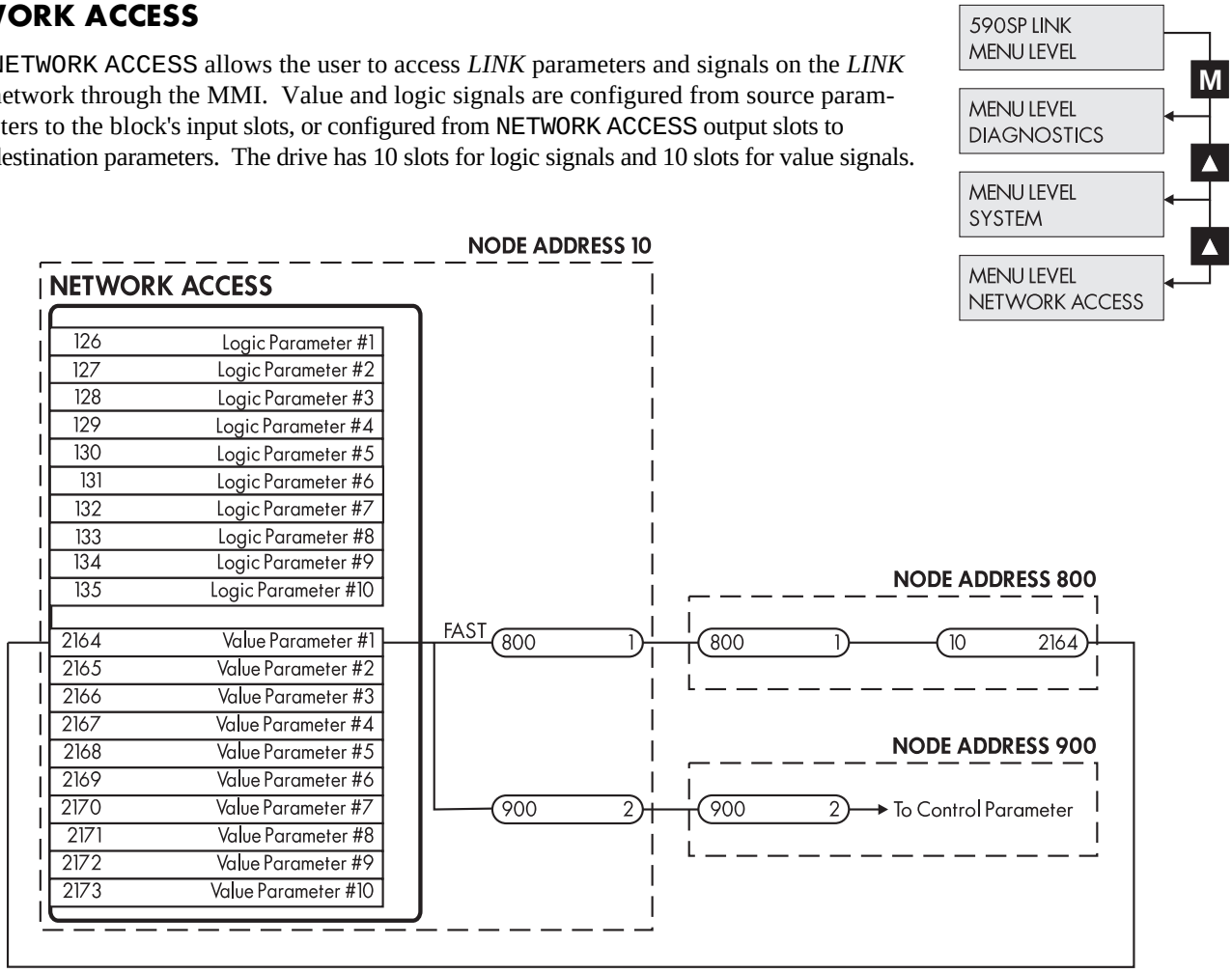


Figure C.9 - Configuring a *LINK* Node Parameter Using NETWORK ACCESS

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

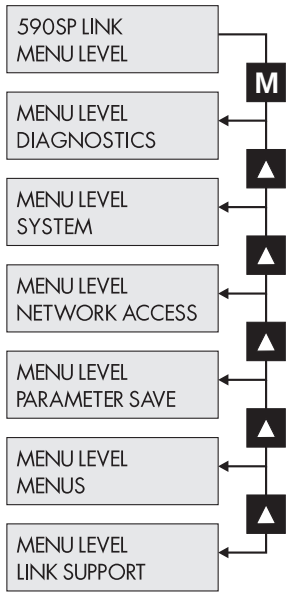
Input Parameters

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.

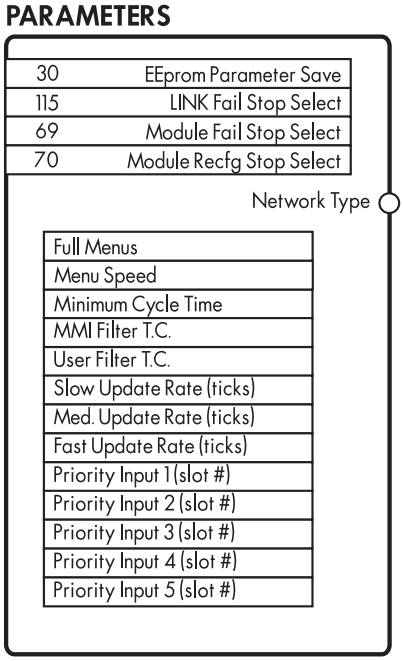


Figure C.10 - PARAMETERS Software Block

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.

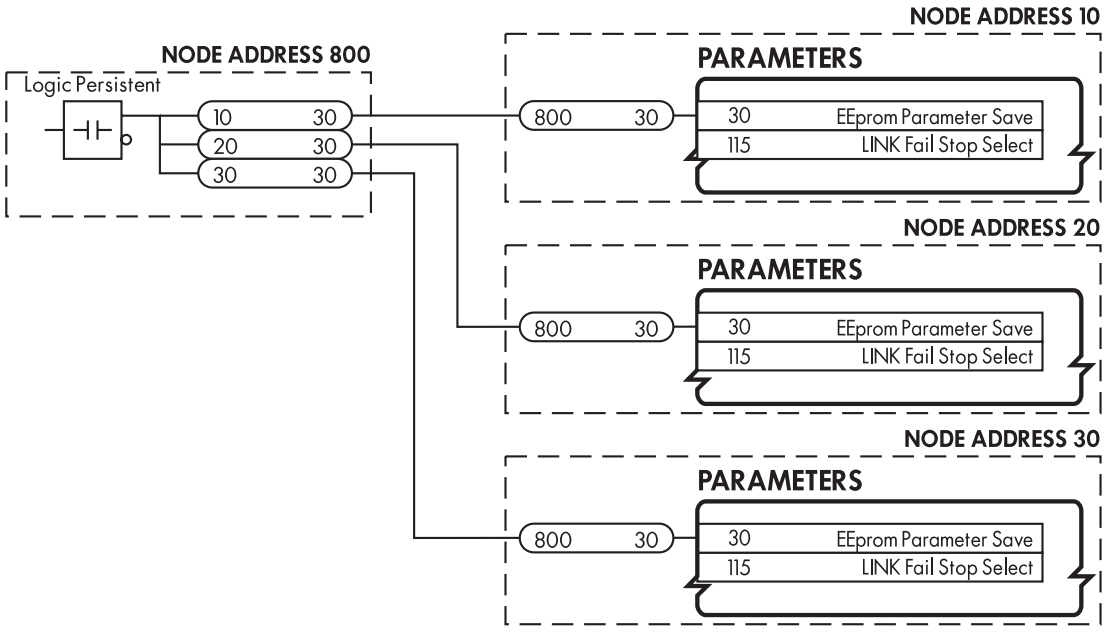


Figure C.11 - Configuration to SAVE PARAMETERS to Multiple Drives Remotely Using SAM.

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) 0=INACTIVE 2=FAILED	0
# 115	*LINK* FAIL STOP SELECT	Drive response on event of a *LINK* network failure.	DISABLE ENABLE REGEN STOP ENABLE COAST STOP	0 = disable 1 = program stop 2 = coast stop	2 (enable regen stop)
# 69	MODULE FAIL STOP SELECT	Drive response on event of a *LINK* module failure.	DISABLE ENABLE REGEN STOP ENABLE COAST STOP	0 = disable 1 = program stop 2 = coast stop	2 (enable regen stop)
# 70	MODULE RCFG STOP SELECT	Drive response on event of a *LINK* module reconfiguration.	DISABLE ENABLE REGEN STOP ENABLE COAST STOP	0 = disable 1 = program stop 2 = coast stop	2 (enable regen stop)

These parameters cannot be changed through the MMI.

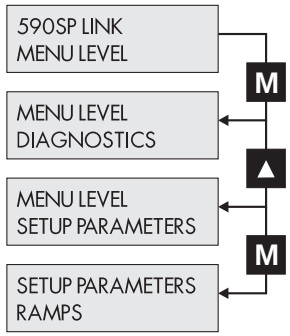
Output Parameters

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 3=tapped 7=redundant 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.

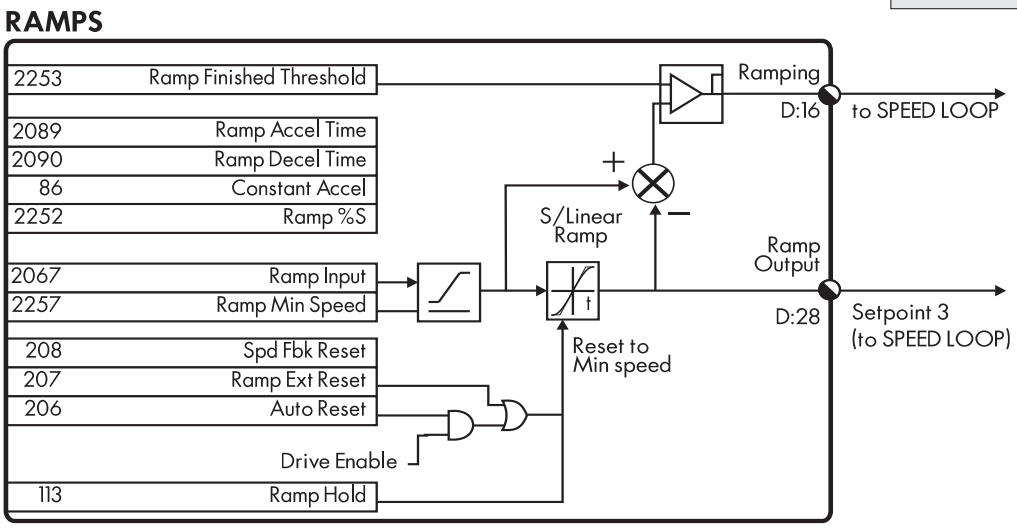


Figure C.12 - RAMPS Software Block

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.

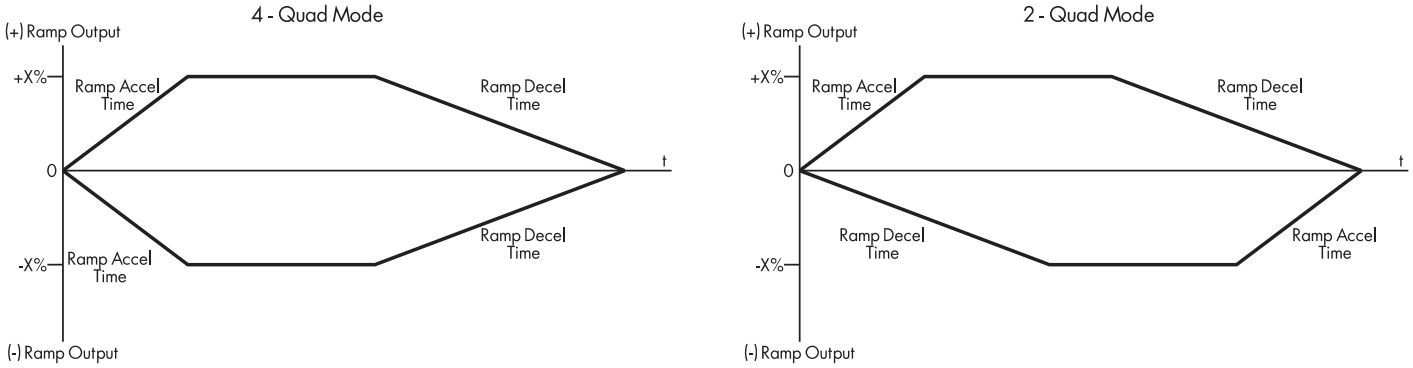


Figure C.13 - CONSTANT ACCEL (2-Quad Vs. 4-Quad Ramp).
CONSTANT ACCEL ENABLED in left diagram (default); CONSTANT ACCEL DISABLED in right diagram.

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 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 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 0=disabled	ENABLED
113	RAMP HOLD	When ON, the ramp output is held at the last value. Overridden by a ramp reset.	ON= hold 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 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 |ramp output - ramp input| > ramp threshold	TRUE/FALSE	1=ramping 0=held or reset	RAMPING
RAMP OUTPUT	Output value sent to SPEED LOOP	±120%	±100.00%	RAMP OUTPUT

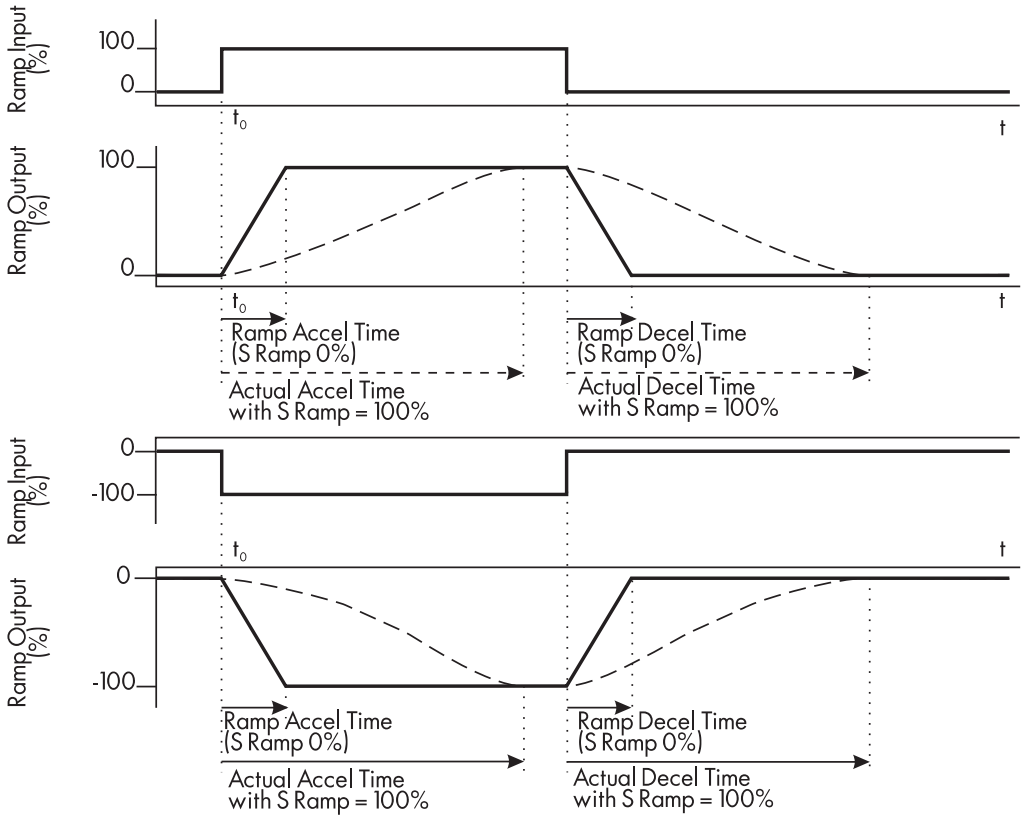


Figure C.14 - Ramp Accelerate and Decelerate Times

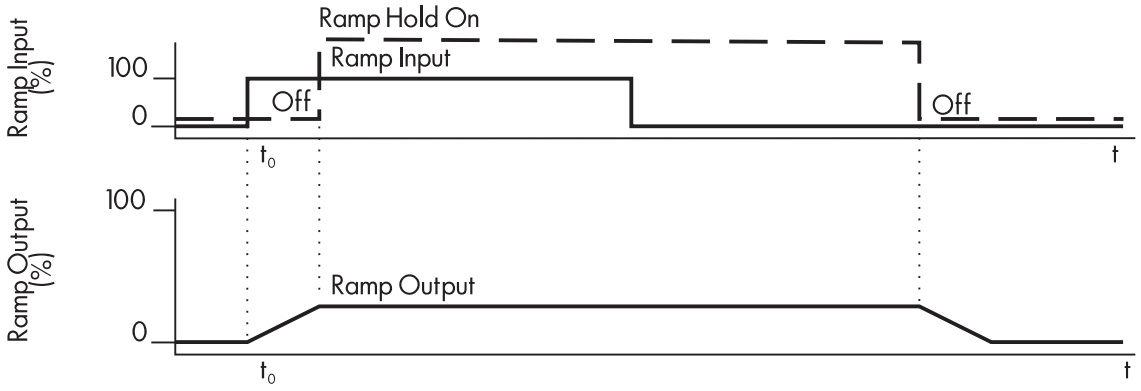


Figure C.15 - Ramp Hold

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.

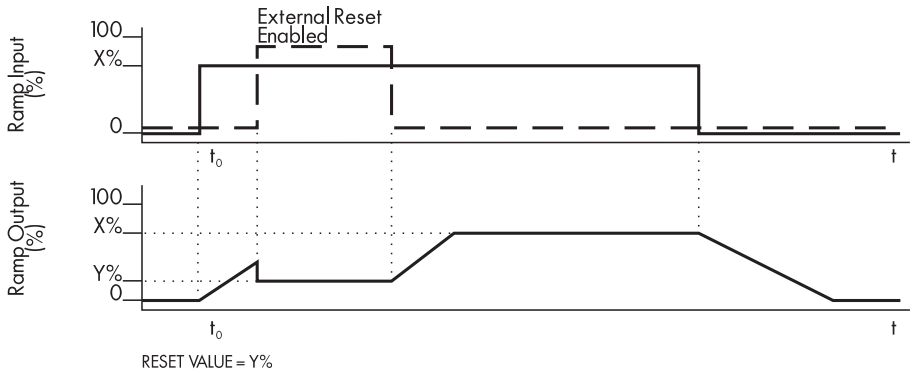


Figure C.16- External Reset

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.

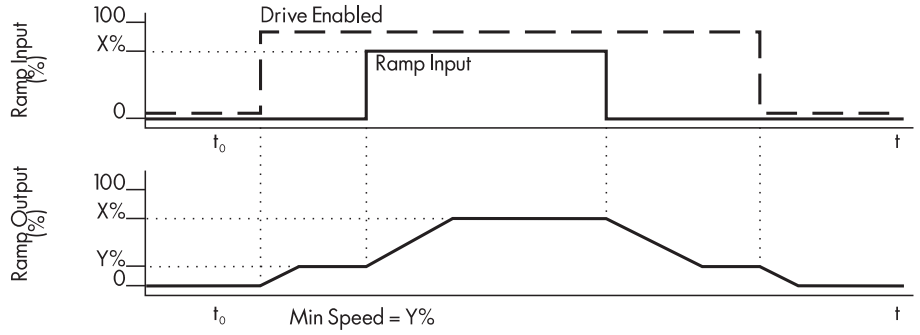


Figure C.17 - Minimum Speed

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%.

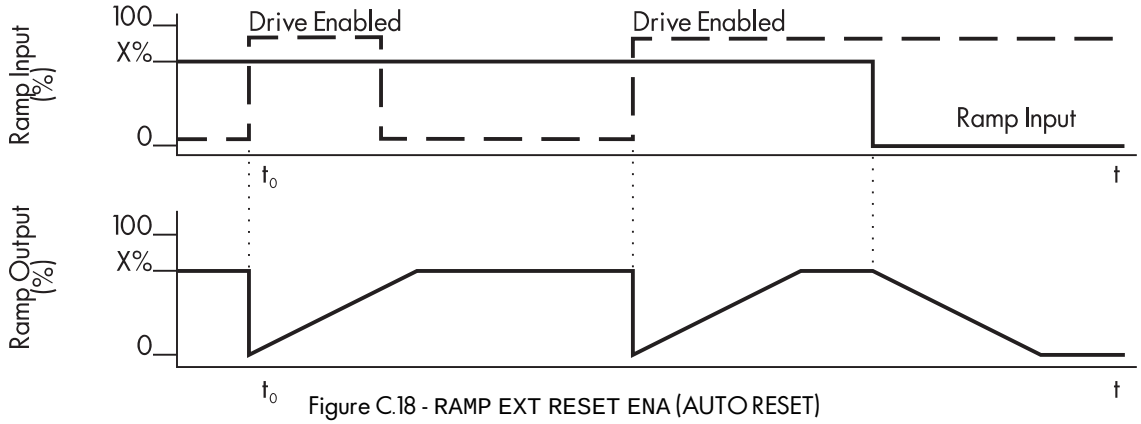


Figure C.18 - RAMP EXT RESET ENA (AUTO RESET)

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.

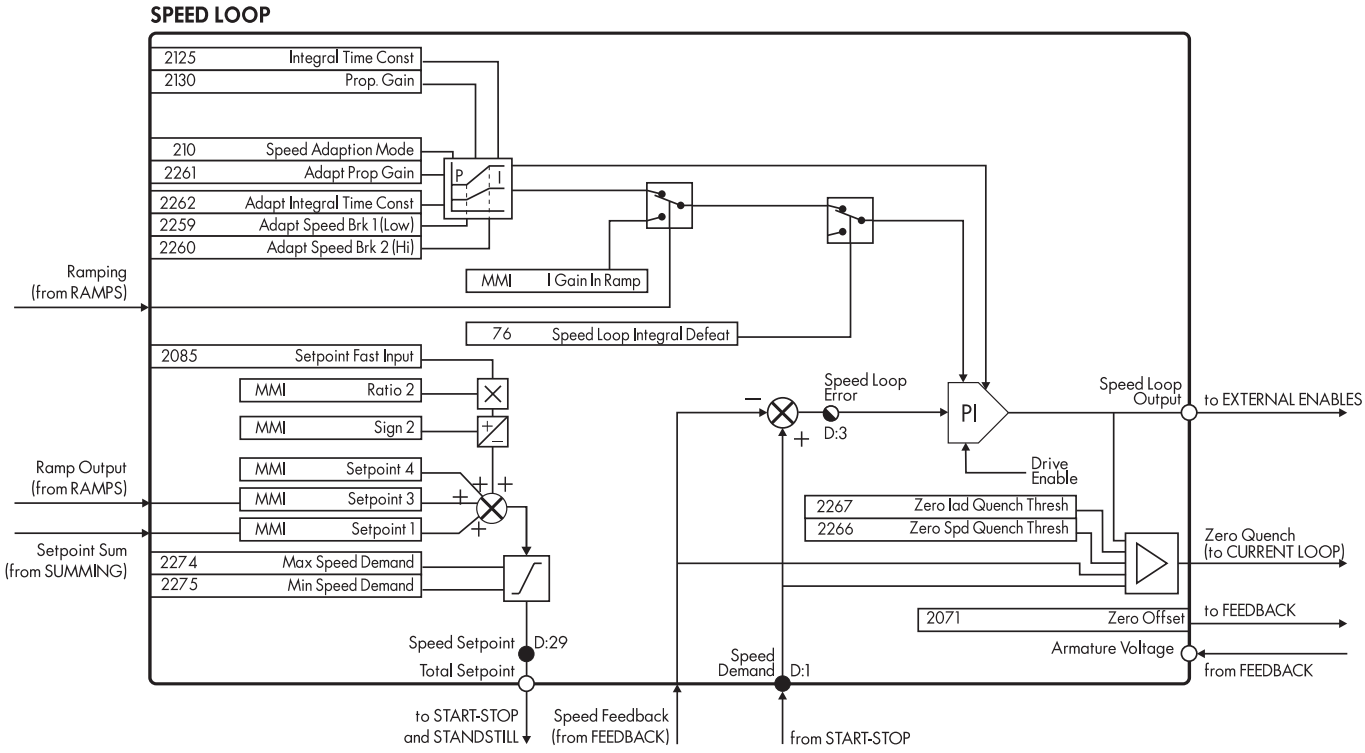
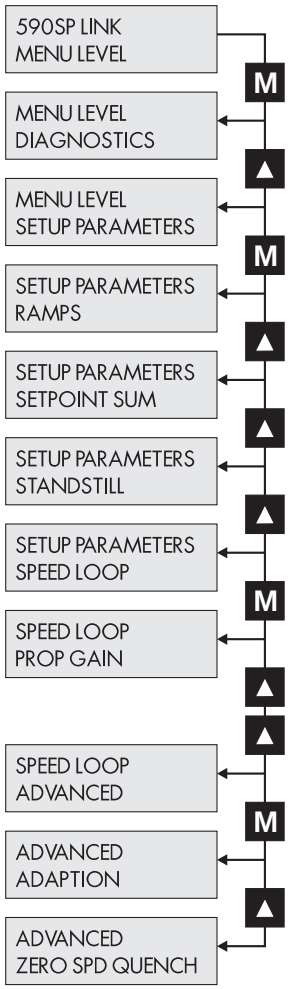


Figure C.19 - SPEED LOOP Control Parameters



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 1=speed feedback 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) OFF (integral defeat is OFF)	0=OFF 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.

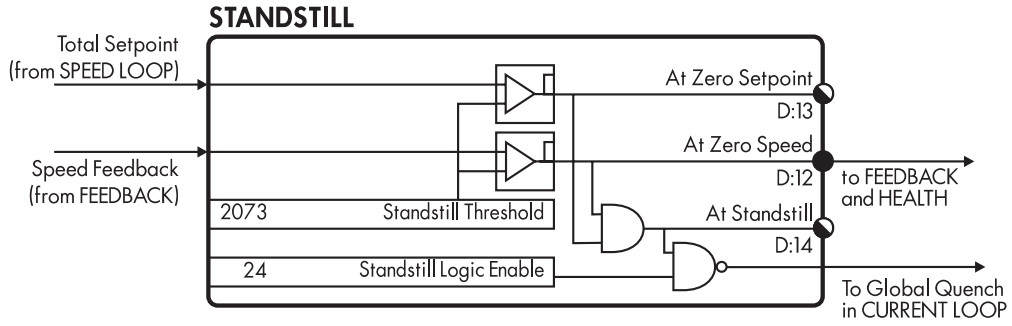


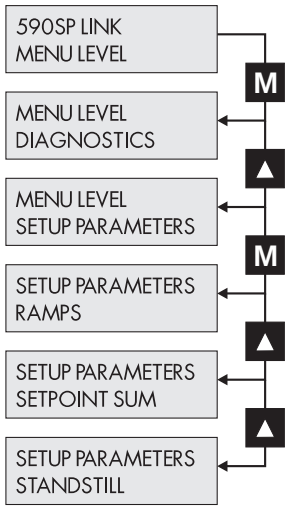
Figure C.20 - STANDSTILL Software Block

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

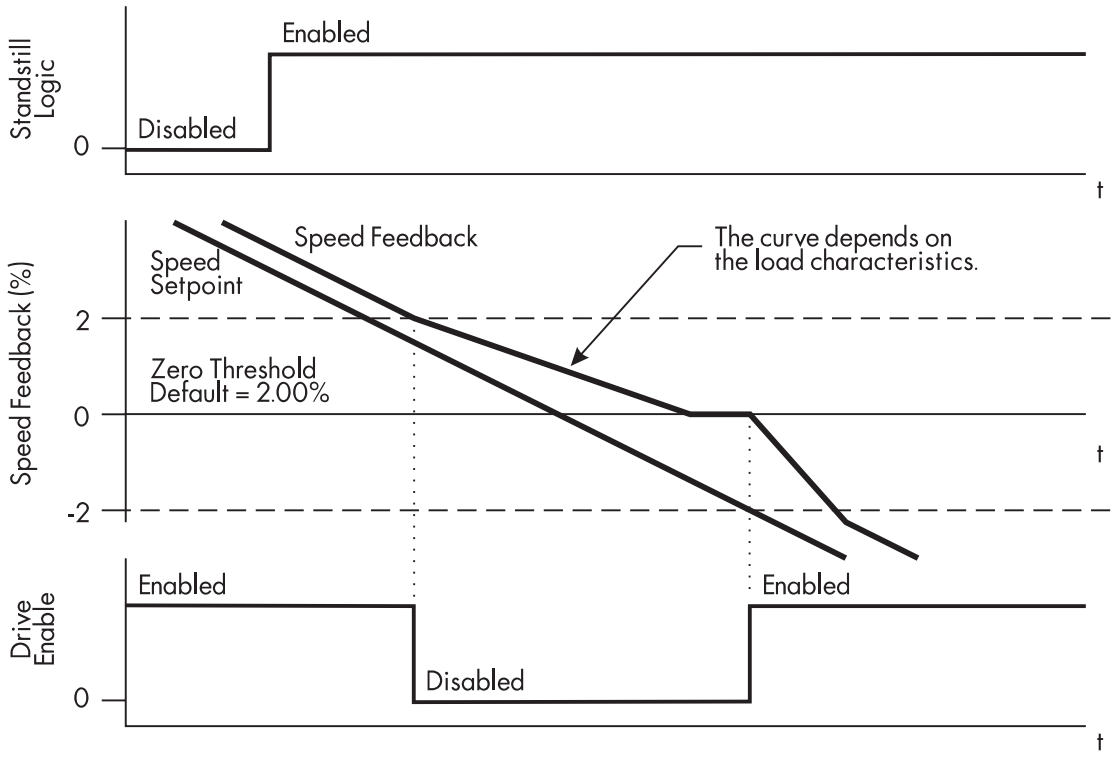


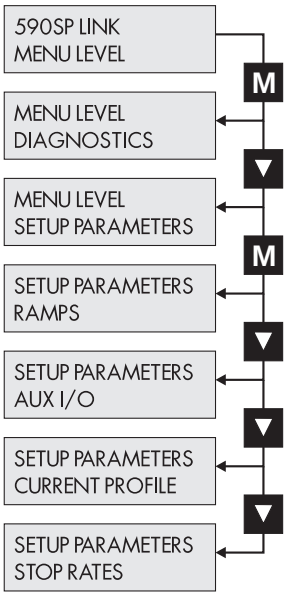
Figure C.21 - STANDSTILL Logic

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.

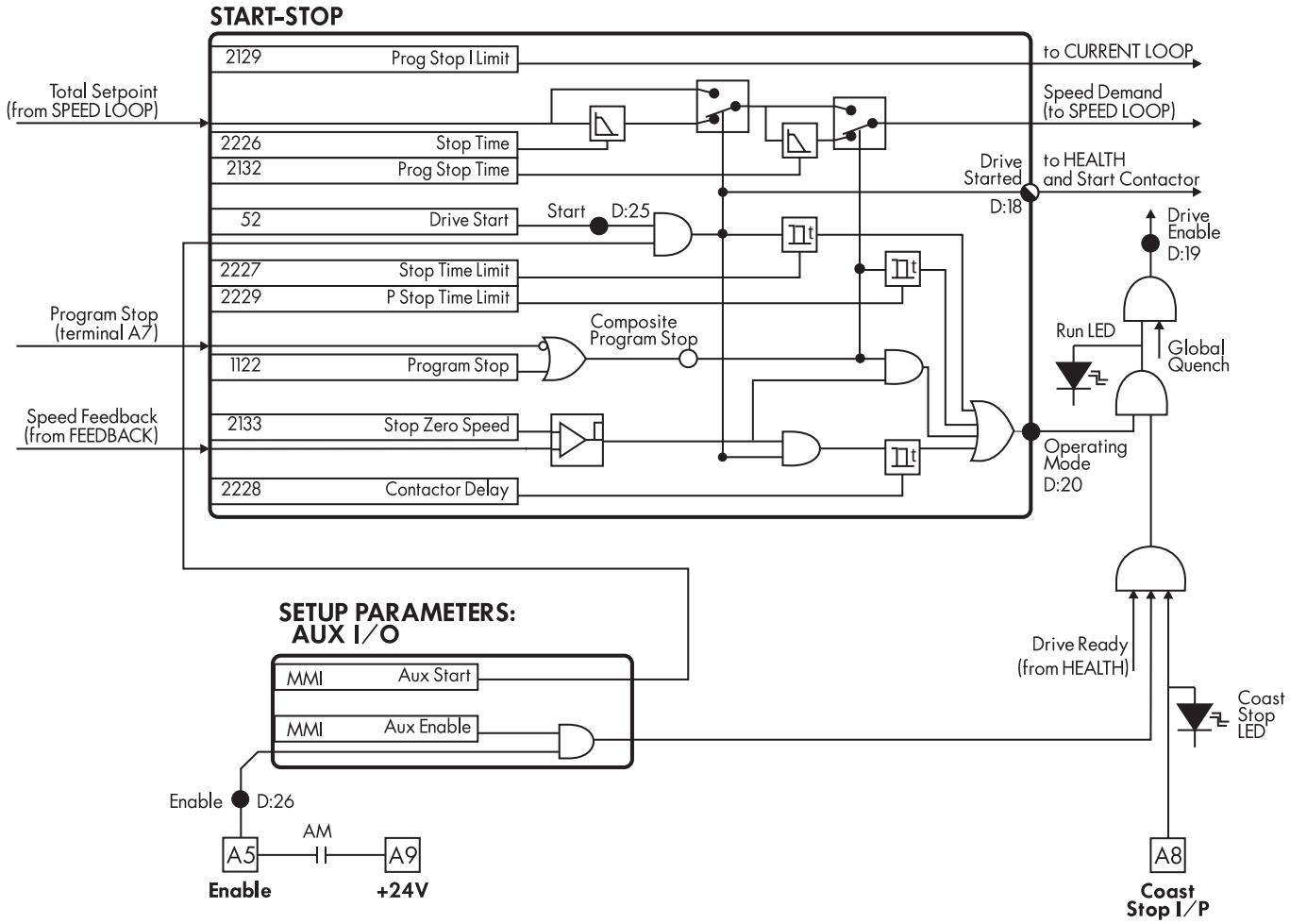


Figure C.22- START-STOP Software Block

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

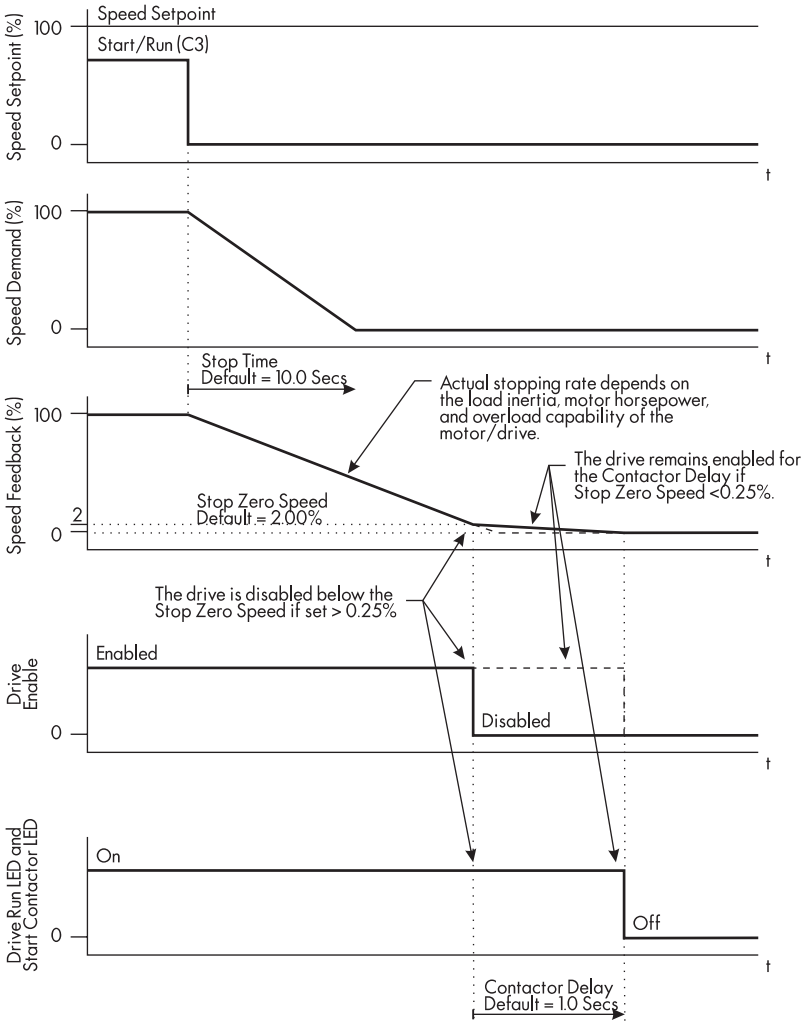


Figure C.23 - Sequences During a Normal Stop

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.

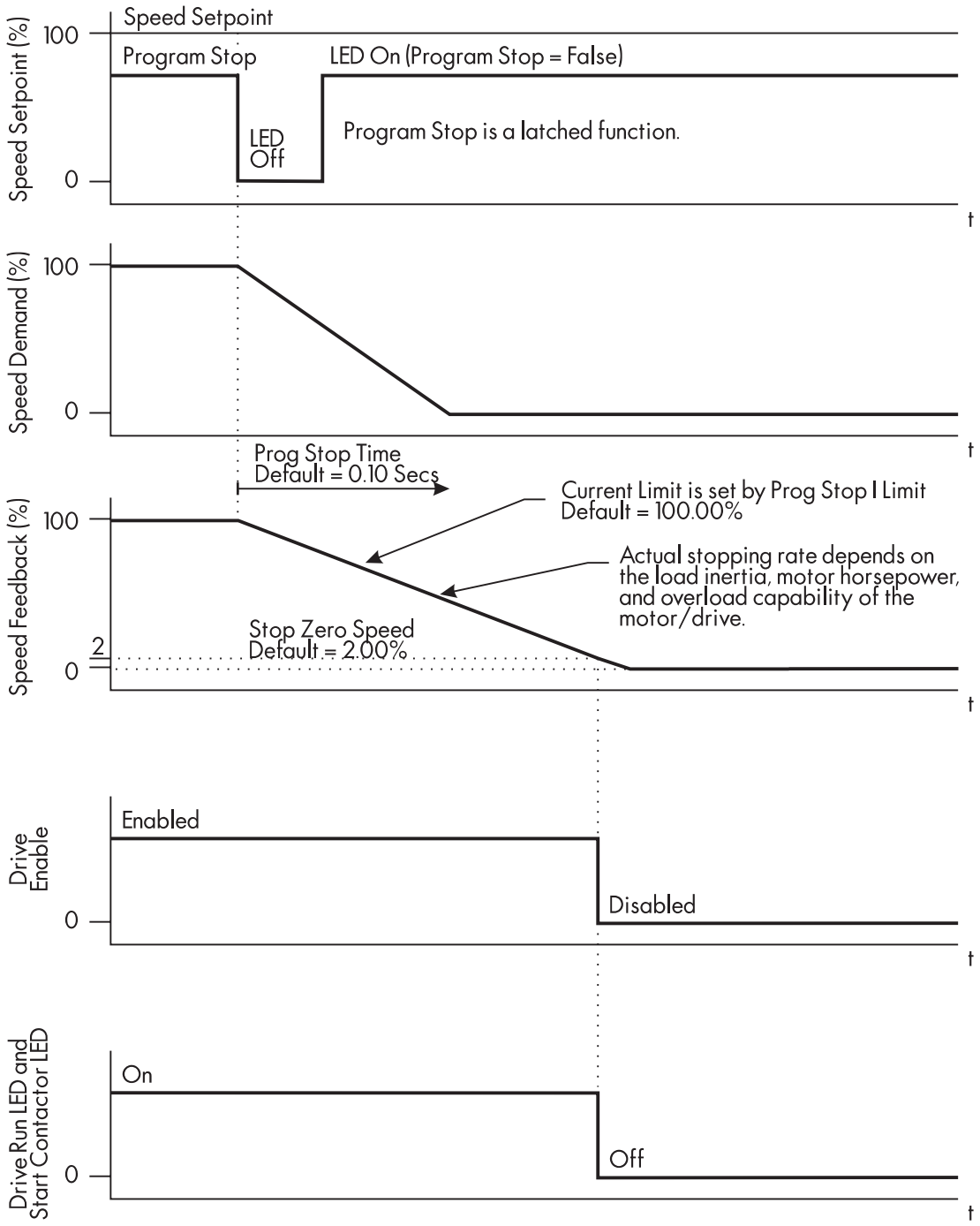


Figure C.24 - Sequences for a Program Stop

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.

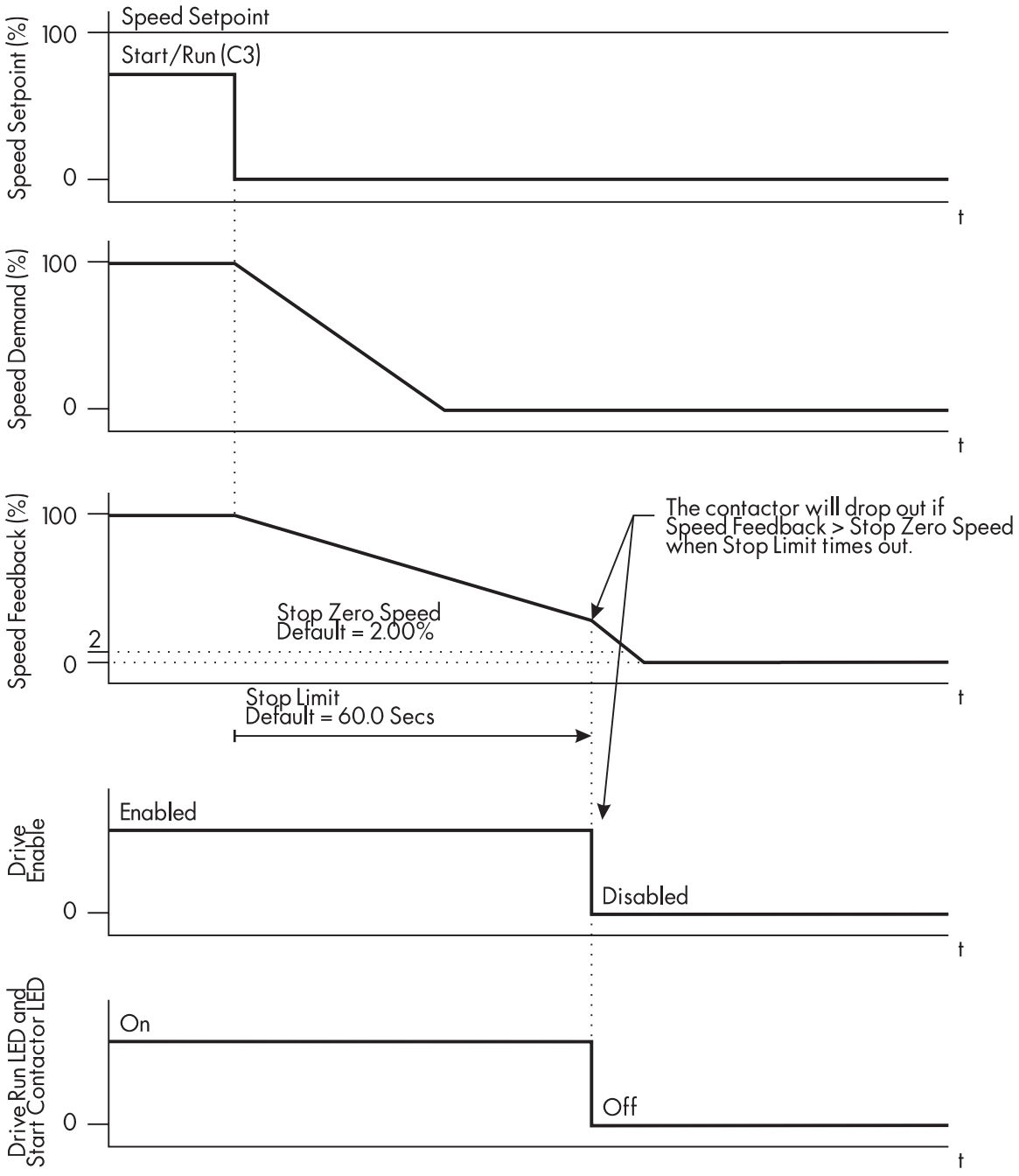


Figure C.25 - Sequences When a Normal Stop Times Out

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.

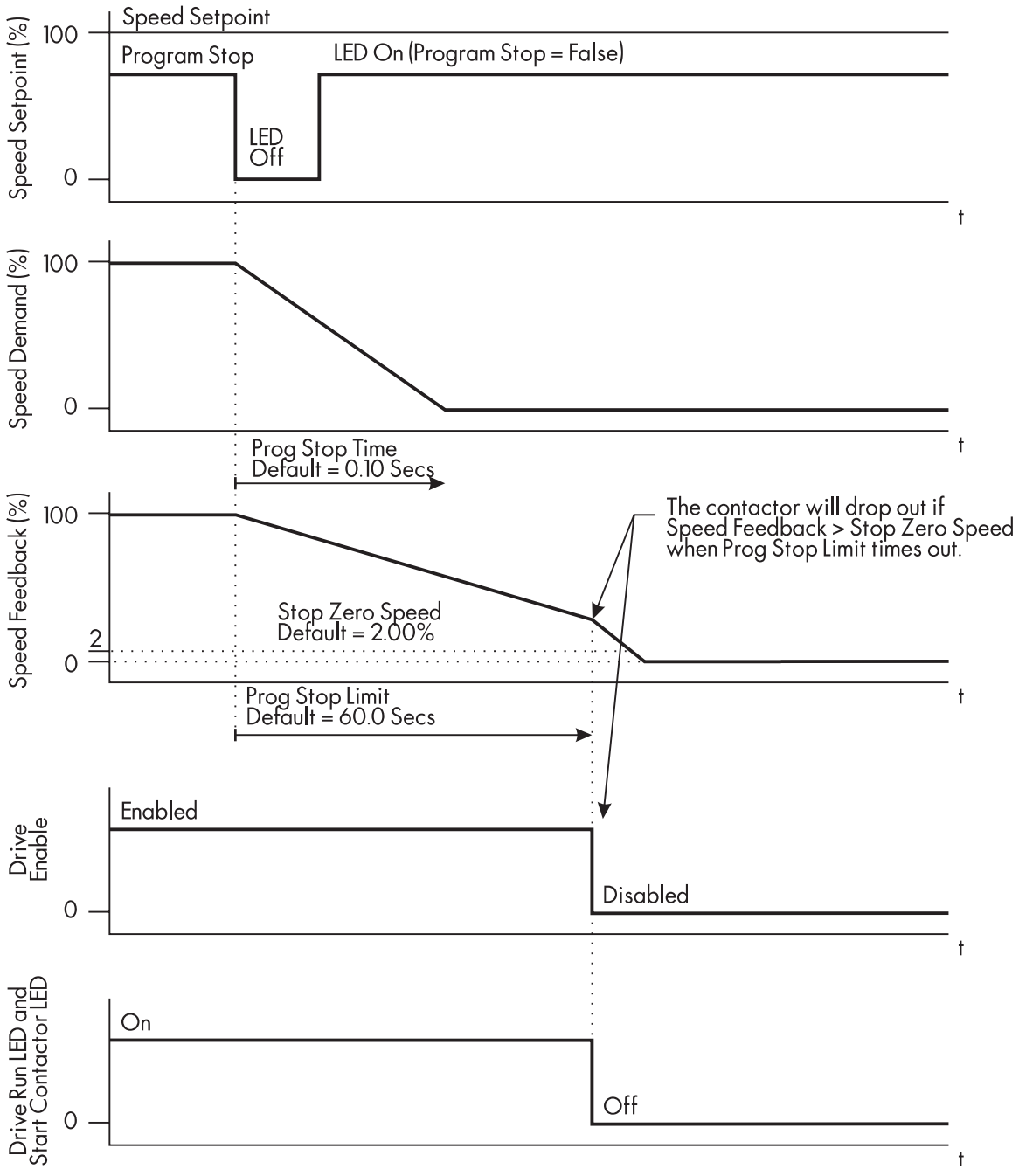


Figure C.26 - Sequences when a Program Stop Times Out

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.

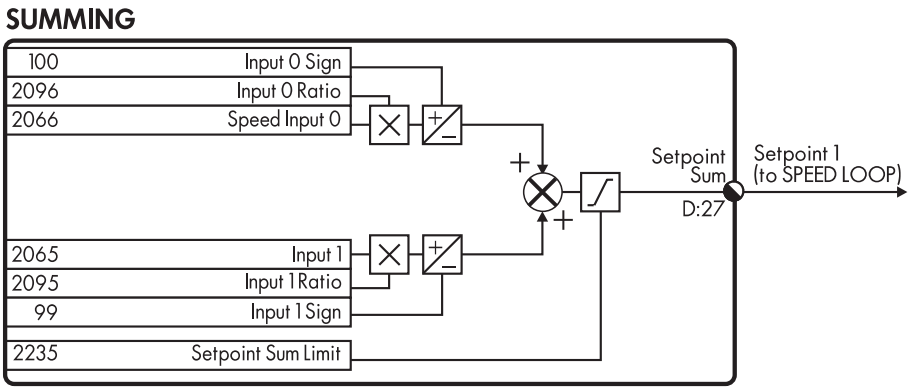
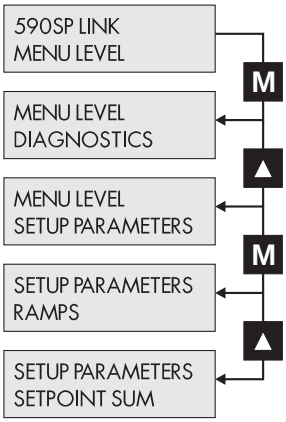


Figure C.27 - SUMMING Software Block



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.

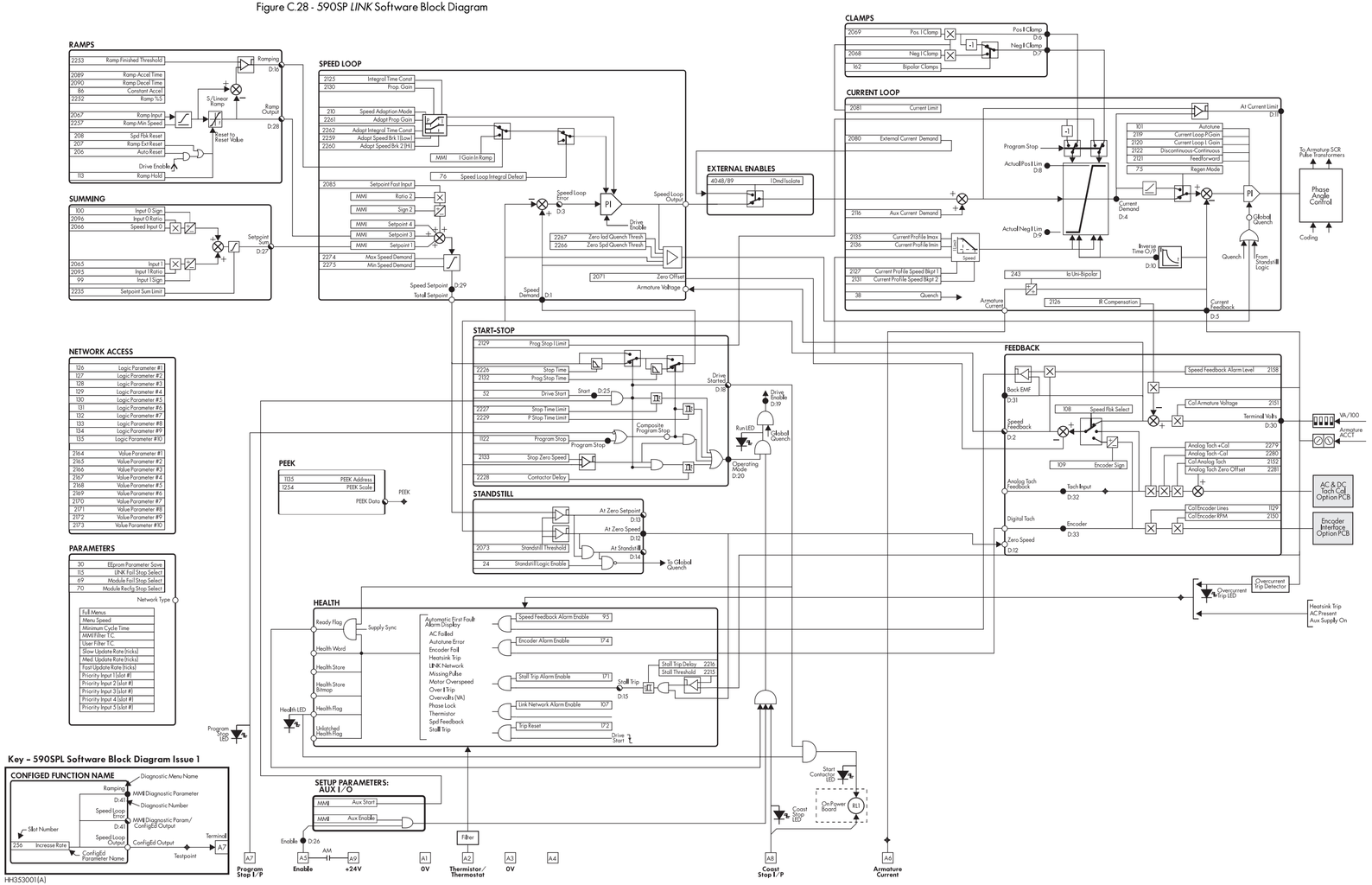
Input Parameters

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



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

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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
	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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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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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%

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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

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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

* 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
	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%

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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
	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	----

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+ 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.

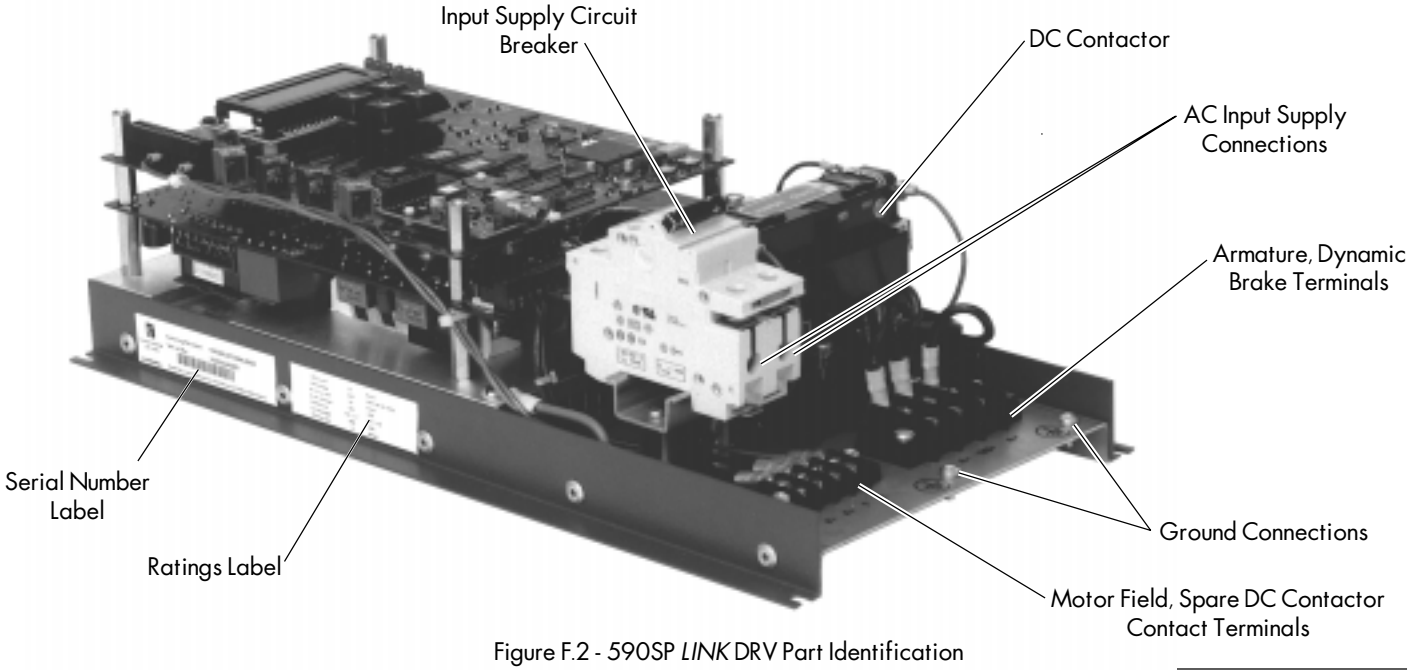


Figure F.2 - 590SP *LINK* DRV Part Identification

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 (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) AC circuit protection included 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 no adjustment necessary for frequency change Power Supply Voltage range: 220 to 240 VAC Power Supply current: (1.4 × calibrated DC armature current) amps AC rms 37 amps AC rms, maximum
Drive control supply	Single-phase, 40-70 Hertz, phase rotation insensitive; no adjustment necessary for frequency change Control Supply Voltage range: 100 - 240 VAC to control transformer primary, no special tapping required Primary Protection fuse: 2 amps @ 250 volts (FS1)
Internal Circuit Breaker Protection	2-pole, 40 amp, 480 VAC circuit breaker Interrupt Rating:10 KAIC
Noncontrolled Field Rectifier	Standard: 200 VDC with 220 to 240 VAC input (full wave configuration, or 0.9 x AC input) Maximum Loading: 3 amps DC (unfused)
DC Contactor Ratings	Normally-opened poles: 40 amps DC, 500 VDC, maximum Normally-closed pole: 70 amps, 500 VDC (make only), maximum 23 amps, 160 VDC (break only), maximum Spare normally-opened contact: 10 amps, 240 VAC maximum Coil rating: 220-240 VAC, 120 VA inrush, 28 VA sealed

Output Ratings

Armature Current	27 amps DC, maximum (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

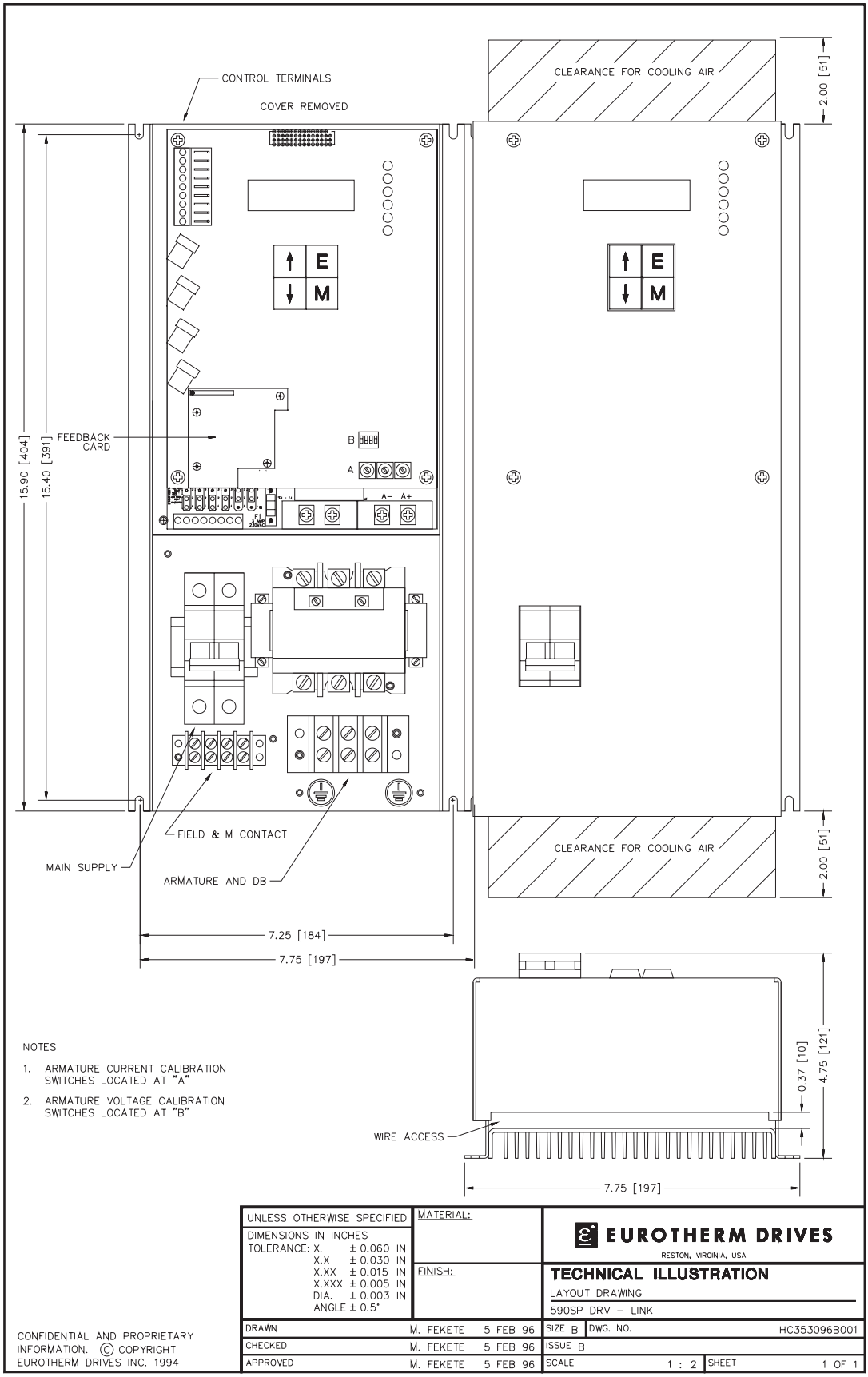


Figure F.4 - 590SP *LINK* DRV Layout Diagram

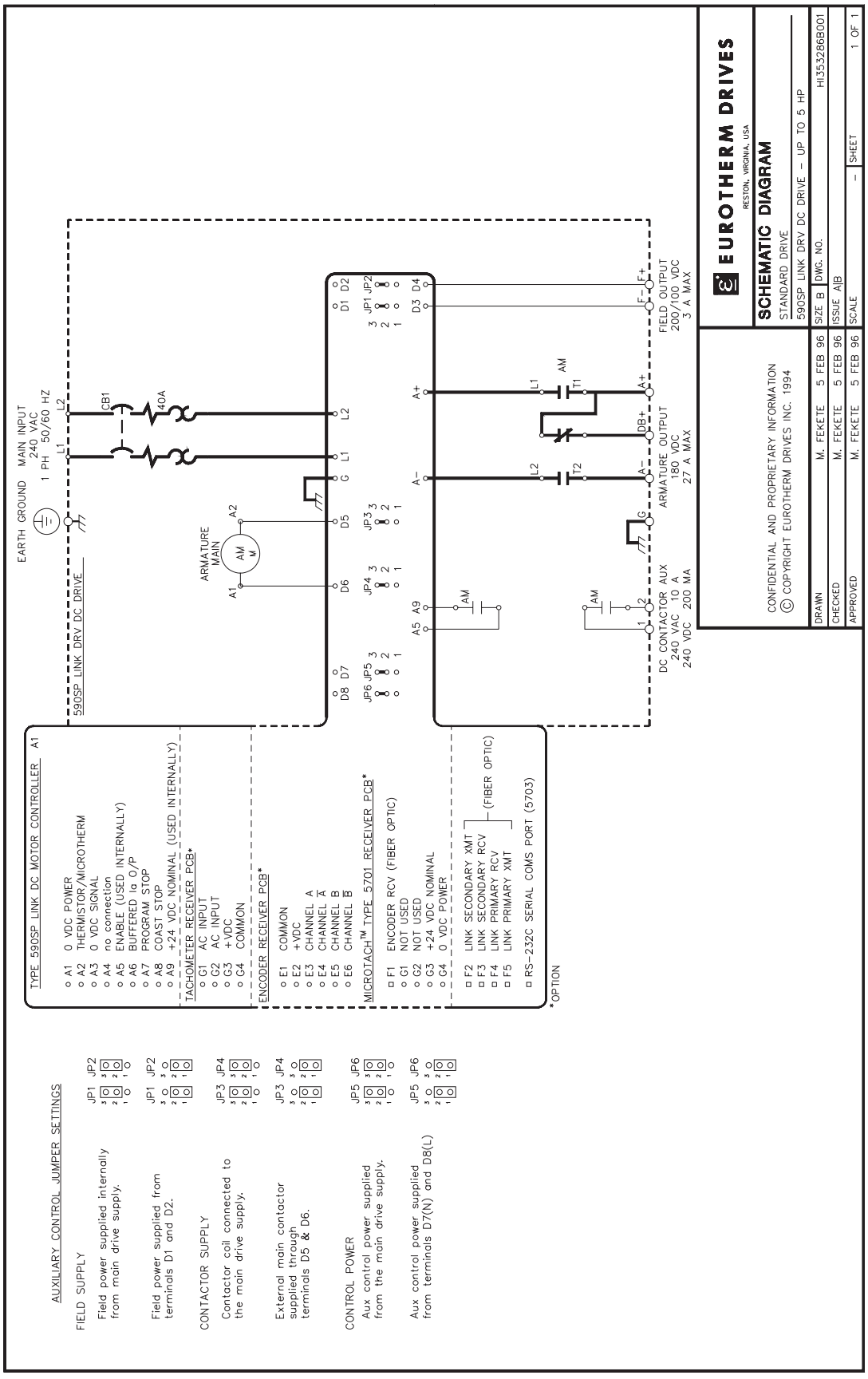
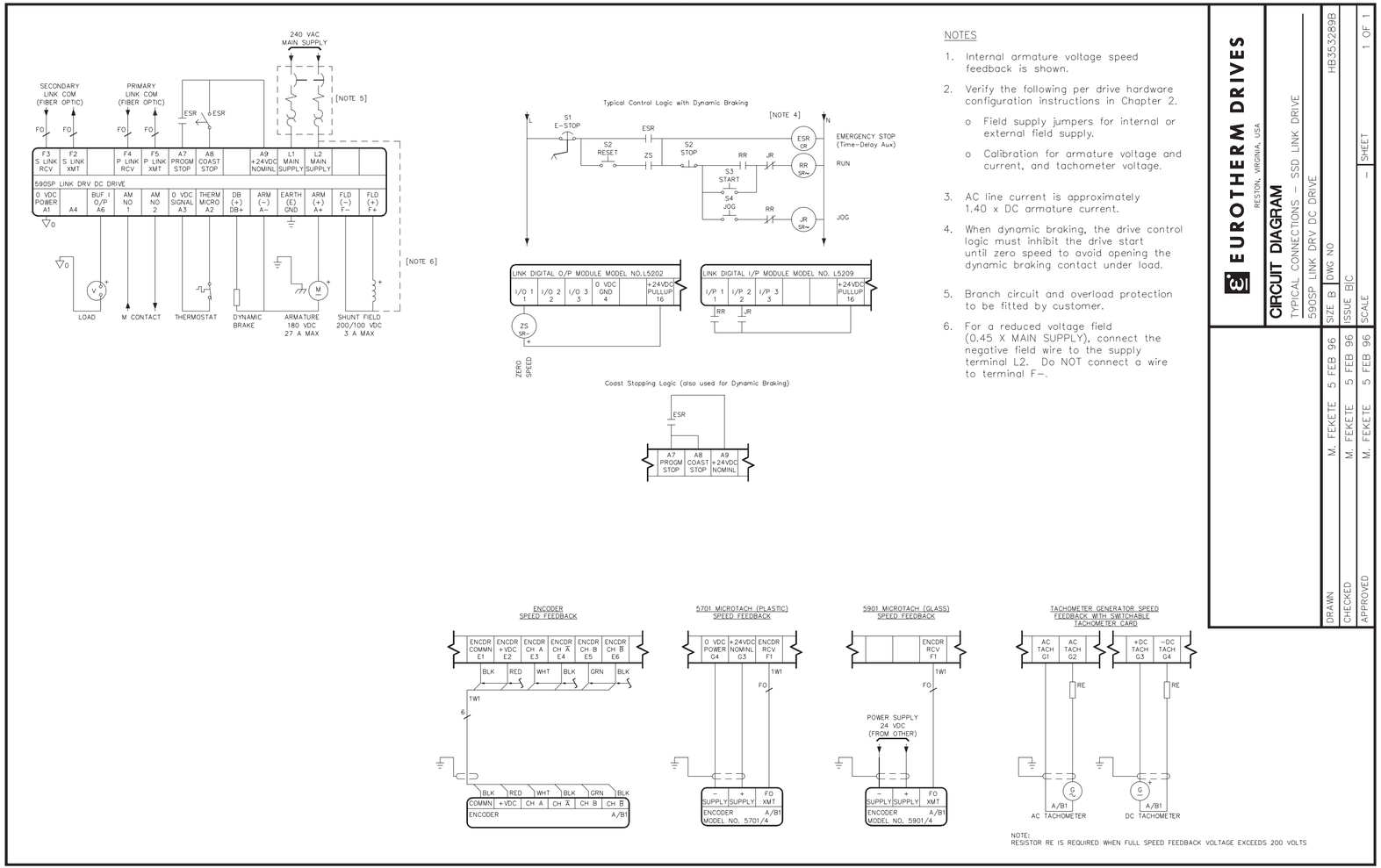


Figure F.5 - 590SP *LINK* DRV Schematic Diagram

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

DRAWN	M. FEKETE	5 FEB 96	
CHECKED	M. FEKETE	5 FEB 96	
APPROVED	M. FEKETE	5 FEB 96	

HB353289B
SIZE B | DWG NO
ISSUE B/C
SCALE –
SHEET 1 OF 1

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.

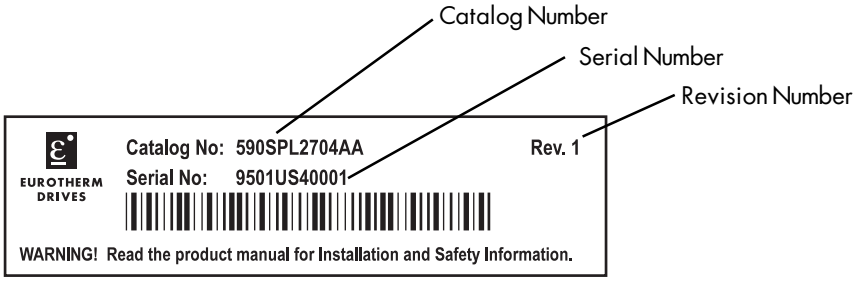


Figure G.1 - Sample Serial Number Label

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)

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