
590SP Digital DC Drive

Product Manual

Version 1 Firmware

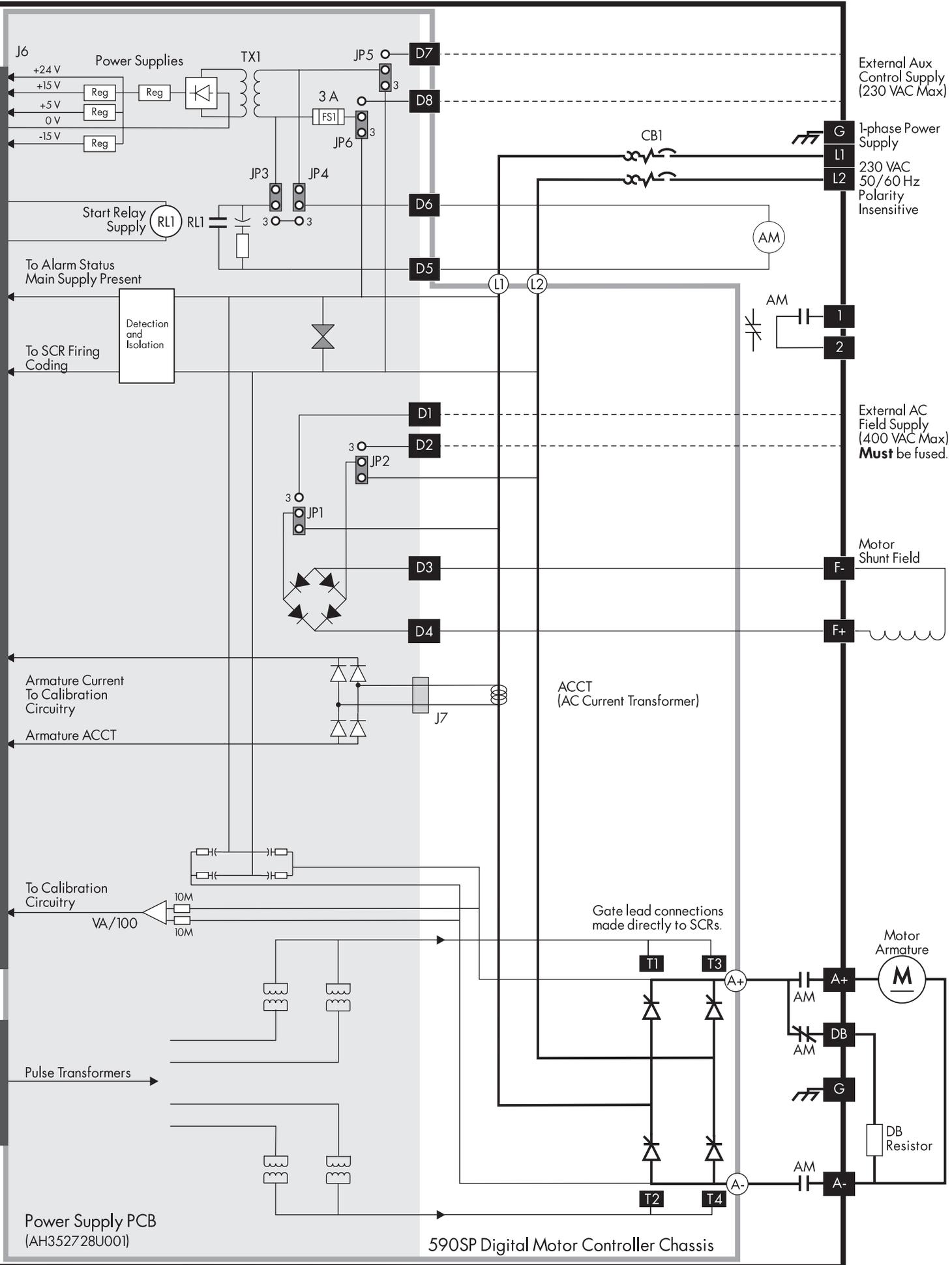
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591SP Digital DRV Block Diagram - Version 1 - Non-regenerative Default Configuration

Safety

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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

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Chapter 1 INTRODUCTION

SCOPE

This manual covers the 590SP Digital regenerative and the 591SP Digital 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 Digital 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.

The 590SP Digital 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 L 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 serves as a powerful diagnostic tool with access to all alarms and parameters within the drive. Light emitting diode [LED] indicators on the front panel display the drive's operating status.

You can configure the drive software either through the MMI or with ConfigEd Lite, a configuration program compatible with most IBM compatible personal computers (PCs) running Windows™.

Main Features

Microprocessor Control: A 16 bit microprocessor controls the drive and offers the following features:

- Communication through a serial link with other drives or a host computer allowing advanced systems for monitoring and updating parameters.
- Complex control algorithms not possible with simple analog devices
- Control circuitry built around standard software blocks
- Open-loop and closed-loop winder control
- Section PID control for loadcell or dancer position control



Figure 1.1 - 590SP Digital DC Drive (Open)



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

Digital Accuracy: All setpoints and variables are accessible either through analog inputs or digitally over a serial computer communications link giving greater control accuracy and repeatability than analog drives.

Feedback Options: The drive supports four types of speed feedback:

- Armature voltage feedback, a standard feature which requires no feedback device or external connections
- Analog AC or DC tachometer generators
- Fiber optic plastic (5701) or glass (5901) Microtach encoders
- Wire-ended electrical encoders

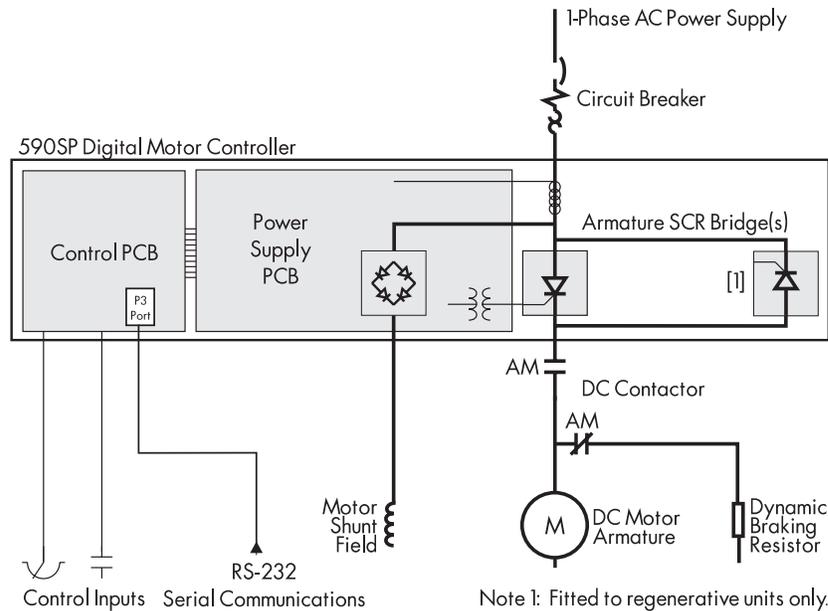


Figure 1.3 - 590SP Digital Block Diagram

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 Digital 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.

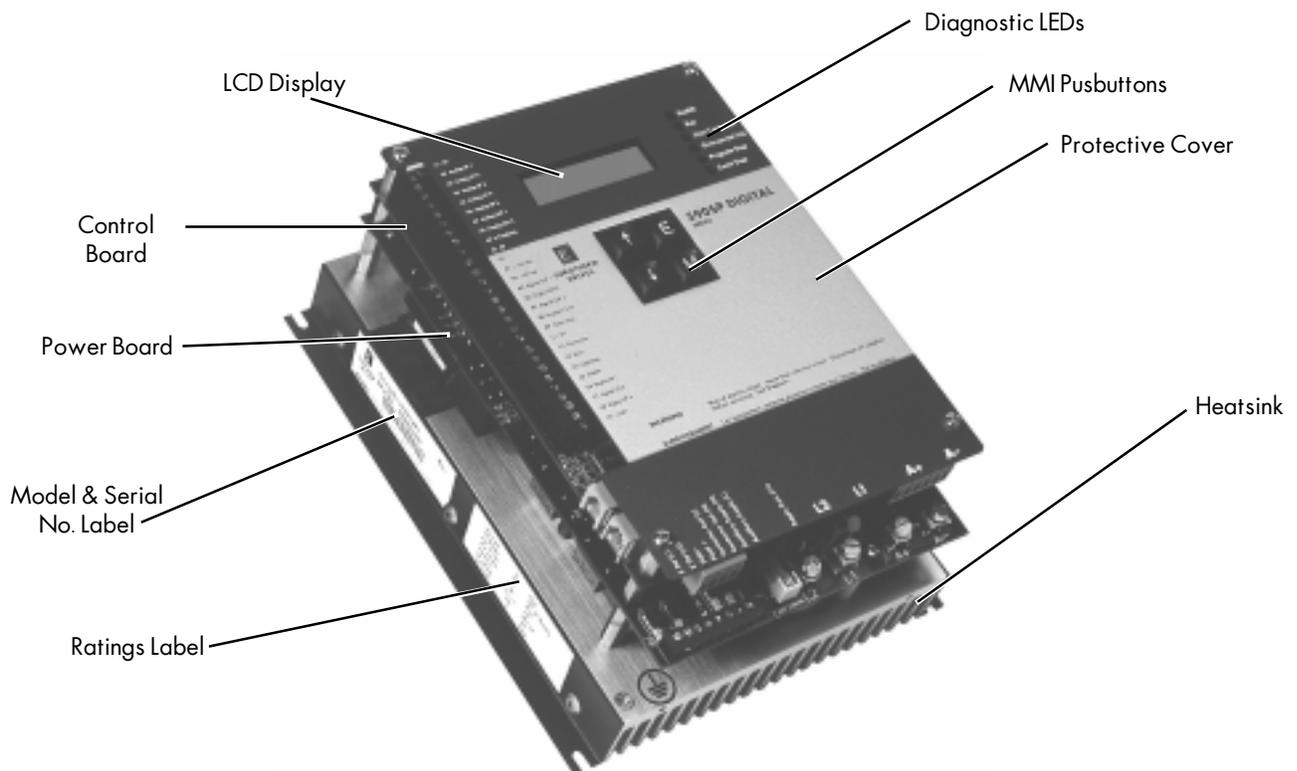


Figure 2.1 - 590SP Digital Drive Basic Part Identification

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 Digital drive 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
- 8/32 or M4 (as applicable) socket wrench and bolts and nuts needed to mount the drive to the panel.
- Small pair of electrical pliers
- Small wire cutters
- Pliers
- Wire strippers
- Wire crimping tool
- Spade and ring wire crimps

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 Digital drive next to other power equipment that may cause the drive to overheat.

Normal maximum ambient operating temperature is 45°C (113°F). Derate the controller above 45°C by 1% per °C to a maximum of 55°C (131°F). At 45°C, the drive dissipates 90 Watts when run at its maximum rated current of 27 amps. Figure 3.1 lists heat dissipations for the 590SP operating at different power levels.

Caution

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

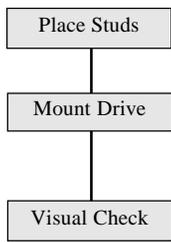
Motor Rating @ 180VDC	Motor Current	Power Loss @45°C
1Hp	6.1 Amps	22 Watts
2Hp	10.8 Amps	32 Watts
3Hp	16 Amps	50 Watts
5Hp	27 Amps	90 Watts

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

MOUNTING INSTRUCTIONS

The 590SP 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.

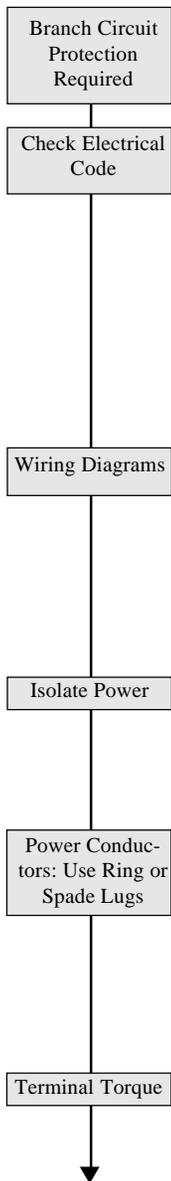


1. Insert the mounting studs from the rear of the panel. Attach lock washers and nuts part way onto the lower mounting studs. These help keep the drive in place while mounting.
2. Lower the bottom slots of the drive onto the lower studs behind the lock washers and nuts. Hold the drive in place with one 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, 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.



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 Digital drive 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.

The foldout drawing in Figure 3.3 at the end of this chapter shows the connections described in the following sections. The balloons **(A)** in the left margin of the following text help locate the circuit in the figure. In the left portion of Figure 3.3 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.

WARNING!

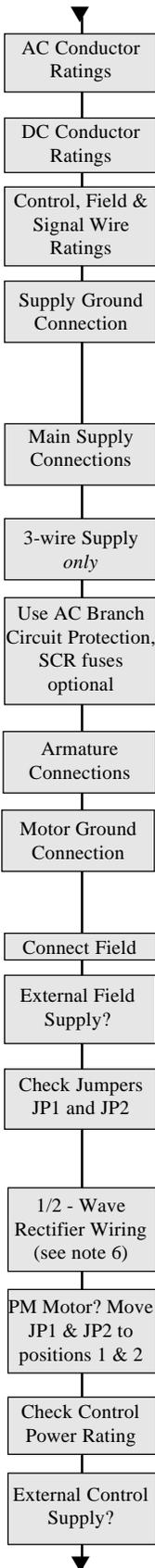
When working on wiring connections, completely isolate all power supplies from the drive on which you are working.

Terminal Torque Ratings

Figure 3.4 lists the tightening torque ratings for all user terminals, and the maximum wire size each terminal can accept. Terminate power conductors with ring or spade lugs. Do not overtighten connections when installing wires.

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-A8, B1-B9 and C1-C9	0.44 lb-ft (0.6 Nm) maximum

Figure 3.4 - 590SP Digital Terminal Tightening Torque Ratings and Wire Sizes.



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 full load motor current. The DC armature output conductors must have a minimum rating of 1.1 x full load motor current. UL requires the 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 3.4.

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 is at the bottom left corner of the heatsink (refer to Figure 3.5). The ground connection requires 10 AWG (4 mm²) 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 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 I²t rating of the thyristor. These ratings are listed in Appendix A, Technical Details.

The armature output and supply input connections are located at the bottom of the power board, as shown in Figure 3.5. If using an AC contactor, connect the motor armature directly to terminals A+ and A-. If using a DC contactor, wire the contactor's normally open poles between these terminals and motor armature (see Figure 3.3). Connect the motor ground wire to the AC supply ground connection at the bottom left corner of the heat sink. Use 10 AWG (4 mm²) 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 3.5 and number from left to right as shown in Figure 3.6.

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.

If the motor has a permanent magnet field, or if you are powering the field from a separate source, leave terminals D3 and D4 unconnected and move the field control jumpers JP1 and JP2 from positions 2 and 3 to positions 1 and 2.

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

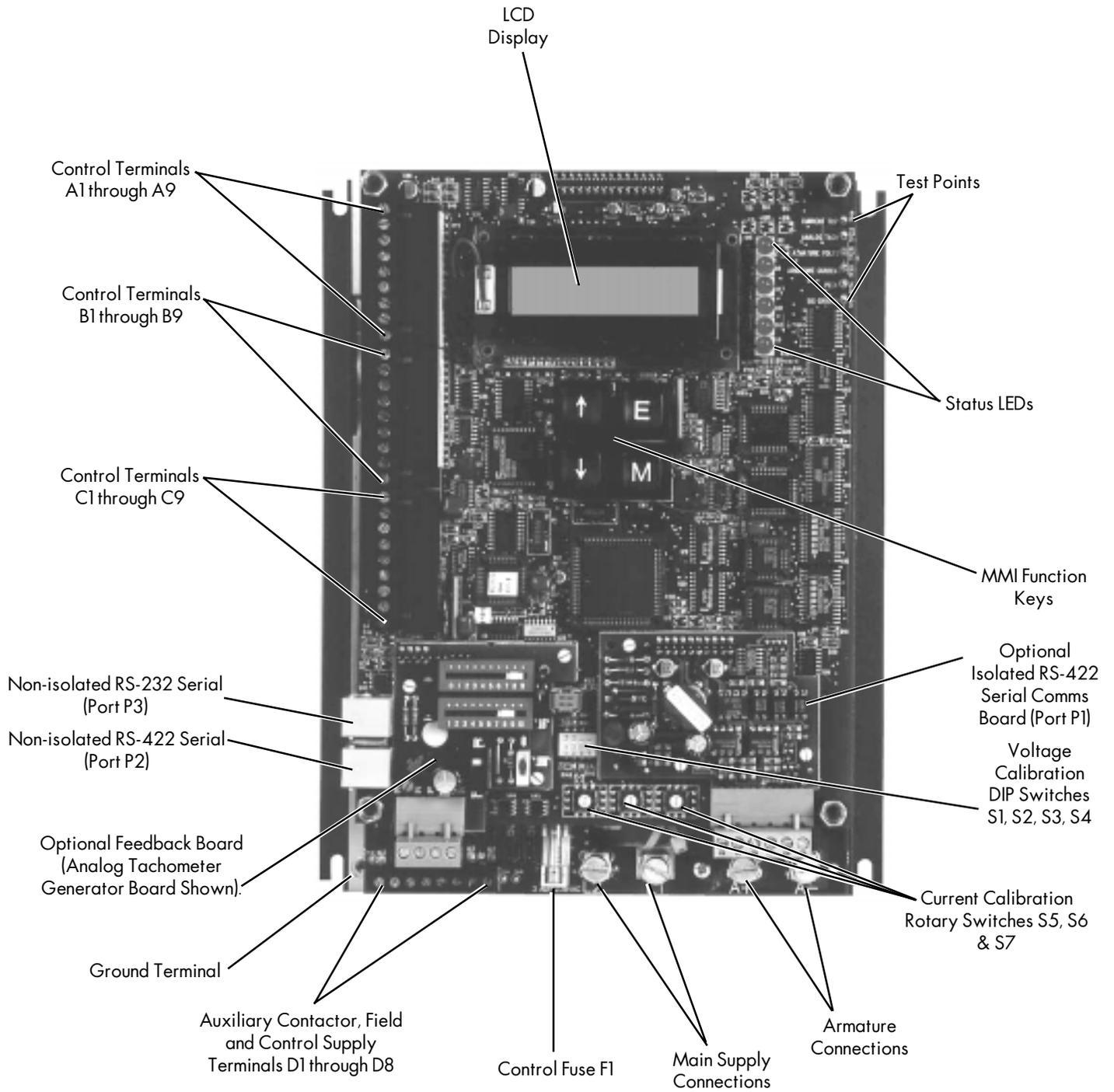


Figure 3.5 - 590SP Digital drive, Front View

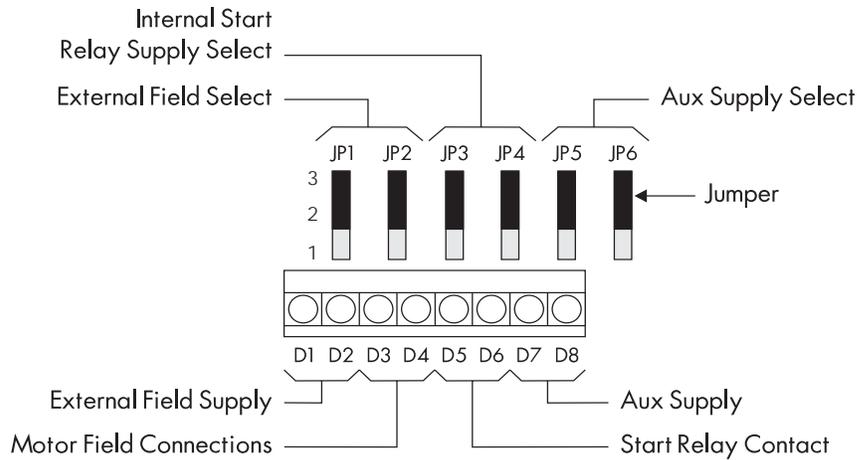


Figure 3.6- Auxiliary Control Jumpers

(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 1.6 amp fuse.

Motor Isolation

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 Digital drive *must* control this contactor to ensure that current flow is never interrupted while the thyristors are firing.

AC Contactor Wiring

H AC contactor wiring is shown in the upper right portion of the wiring diagram in Figure 3.3. 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 C5 (ENABLE) to terminal C9 (+24 VDC). Always isolate input power to the drive by dropping out the AC contactor power *before* servicing the equipment.

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

I Wire a suitably rated DC contactor between the drive output terminals (A+ and A-) and the motor armature. Connect terminal C5 (ENABLE) to terminal C9 (+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.

WARNING!

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

Dynamic Braking

The DC contactor wiring schematic in Figure 3.3 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.

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's zero speed output signal to the drive start logic to prevent the drive from restarting until the motor has reached standstill. This zero speed interlock relay logic is shown at **J** in Figure 3.3.

Check Jumpers JP5 and JP6

Drive *must* Control Contactor Coil

AC Contactor Wiring

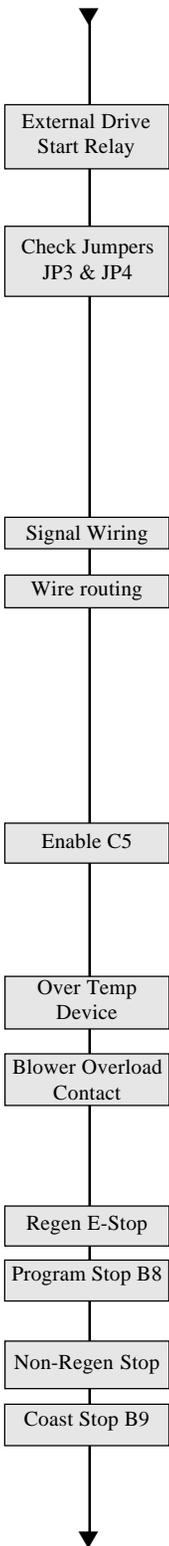
Jumper C5 to +24 VDC (terminal C9)

DC Contactor Wiring

Switch C5 to +24 VDC (C9) thru n/o contactor auxiliary

Dynamic Brake Contactor

Interlock Contactor to Zero Speed



The circuit at **(JJ)** shows the wiring scheme for dynamic braking for process stopping, or dynamic braking the motor whenever a stop is initiated.

Drive Start Relay

The drive powers an internally mounted start relay and switches this relay in and out only when the drive is 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 for 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.

Signal Wiring

All connections to terminal blocks A, B and C (see Figure 3.5) are signal connections and *must* be isolated from the supply power. Run all control wiring in conduit separate from power conductors and leave enough slack to easily replace the controller.

WARNING!

All connectors to terminal blocks A, B, and C *must* be isolated signal voltages. Never perform high voltage resistance or dielectric strength tests without first completely disconnecting the drive from the circuit being tested.

Enable

Terminal C5 (ENABLE) enables and disables firing 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 C5 to terminal C9 through a normally-opened auxiliary contact on the main contactor. **(K)**

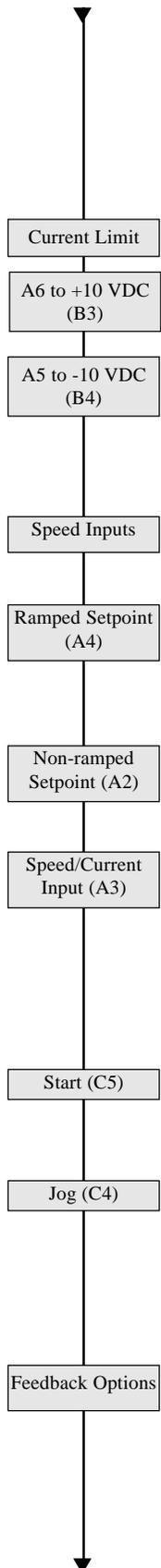
Thermistor

Terminals A1 and C1 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, connect the devices in series between terminals C1 (0V) and C2 (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 C2 and C1. **(L)**

Program And Coast Stop

For a regenerative emergency stop (590SP only), connect terminal B8 (PROGRAM STOP) to terminal C9 (+24 VDC) through a normally-opened contact of an emergency stop relay. Also connect terminal B9 (COAST STOP) to terminal C9 through a time-delayed off, normally-opened contact on the same emergency stop relay. Activating the E-Stop circuit removes +24 VDC from B8 and regenerates the motor power back into the main supply. The delayed off contact on B9 (COAST STOP) acts as a fail safe, allowing the drive to coast to a stop after the time delay. **(M)**

For non-regenerative drives (591SP) or for coast stopping with regenerative models, permanently jumper terminal B8 to C9 and connect terminal B9 to terminal C9 through a non-delayed, normally-opened contact of the emergency stop relay. Upon activating an emergency stop condition, the drive will coast stop immediately.

**WARNING!**

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

Current Limit

For most applications, connect terminal A6 (ANALOG INPUT 5) to terminal B3 (+10 VDC REFERENCE) and connect terminal A5 (ANALOG INPUT 4) to terminal B4 (-10 VDC REFERENCE). This sets the drive's positive and negative current limit clamps to +100% and -100% respectively for forward and reverse motor operation and allows you to adjust the MAIN CURRENT LIMIT parameter from 0 to 200%. If you need to control the main current limit externally, connect a 10kW potentiometer between terminal B3 (+10 VDC REFERENCE) and terminal B1 (0 VDC). Connect the wiper to terminal A6. You can then adjust the current limit from 0 to 200% if SETUP PARAMETERS:: CURRENT LOOP::MAIN CURR. LIMIT is set to 200.00%.

Speed Demand

For normal operation, connect the speed demand signal to terminal A4 (SETPOINT RAMP). This input is scaled so that +10 VDC input equals maximum forward speed demand (+100%), and -10 VDC input equals maximum reverse speed demand (-100%).

Connect the ends of an external 10kW potentiometer to terminal B3 (+10 VDC REFERENCE) and terminal B4 (-10 VDC REFERENCE) and the wiper to terminal A4. For non-reversing applications, the speed demand needs only to operate between 0 and +10 volts. Connect the high, or clockwise end of the potentiometer to B3 and the low or counterclockwise end to terminal A1 (SIGNAL GROUND).

Terminal A2 (SPEED SETPOINT NO. 1) is an additional, non-ramped speed demand input which sums with the drive's other speed inputs. Connect your speed demand to this terminal for non-ramped speed control.

Terminal A3 (SPEED SETPOINT NO. 2 or CURRENT DEMAND) is a hardwired input which functions either as a non-ramped speed or current demand. The state of control terminal C8 (I DMD. ISOLATE) determines the operating mode of the input. When tied to +24 VDC (terminal C9), A3 is a direct current demand input to the drive's current loop. When terminal C8 is left open-circuited, A3 is a non-ramped speed demand input and sums with the other drive speed loop inputs.

Start/Stop Input

Connecting terminal C9 through a normally-open contact to terminal C3 (RUN) provides normal start/stop control. When the contact is open, the drive will attempt to perform a controlled stop; when it is closed, the drive will start.

Jog Input

Terminal C4 (JOG) is connected through a normally-open contact to terminal C9 for jog applications. Interlock the jog relay contact with the run relay coils as shown at (JJ) in Figure 3.3.

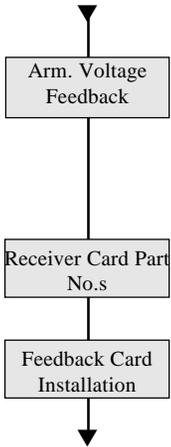
Armature Current Feedback Terminal

You can connect a meter to terminal A9 (ARMATURE CURRENT) to monitor the motor DC armature current. The output is hardwired and *not* software configurable. Refer to Appendix A for the terminal's output rating and signal scaling. This connection is optional.

Speed Feedback

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

- Armature voltage feedback (standard)
- Analog AC or DC tachometer generator
- Wire-ended electrical encoder
- Plastic (5701) or glass (5901) fiber optic Microtach encoder



The drive is shipped to run in armature voltage feedback which requires no 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 3.7) 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
• 5701 Microtach Encoder Receiver Card (Plastic)	AH058654U001
• 5901 Microtach Encoder Receiver Card (Glass)	AH386025U001

Feedback Receiver Card Installation

To install the receiver card on the drive control board:

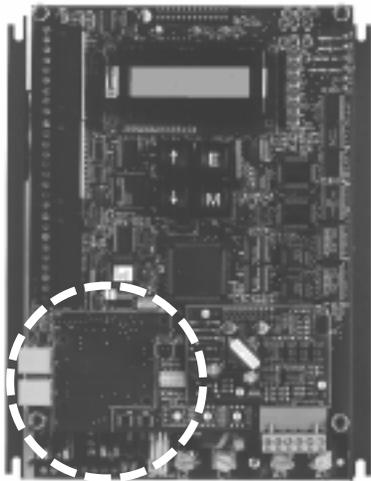


Figure 3.7 - Feedback Receiver Card Mounting Location

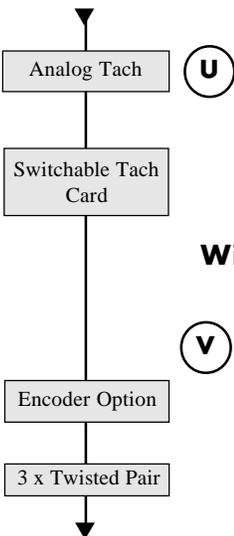
1. Remove the packaging from the feedback receiver card.

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 3.7.
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 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.

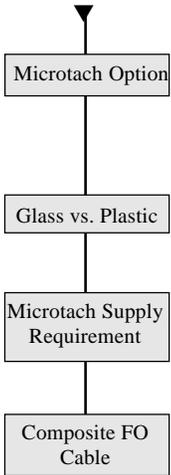
The board switch settings coarsely scale the feedback voltage (see Appendix A). Adjust parameters in the MMI to fine tune the speed feedback (refer to Chapter 4).

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 a wire-ended electrical encoder as feedback, be sure to use three-pair twisted, shielded cable and to ground the shields at the drive end only. Belden 8777 cable is recommended.

Microtachs



Fiber optic encoders (or Microtachs) come in either glass or plastic. While the 5901 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 and can be powered directly from the drive's +24 VDC supply or 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 for the 5701 plastic fiber optic Microtach only. 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.

CALIBRATION

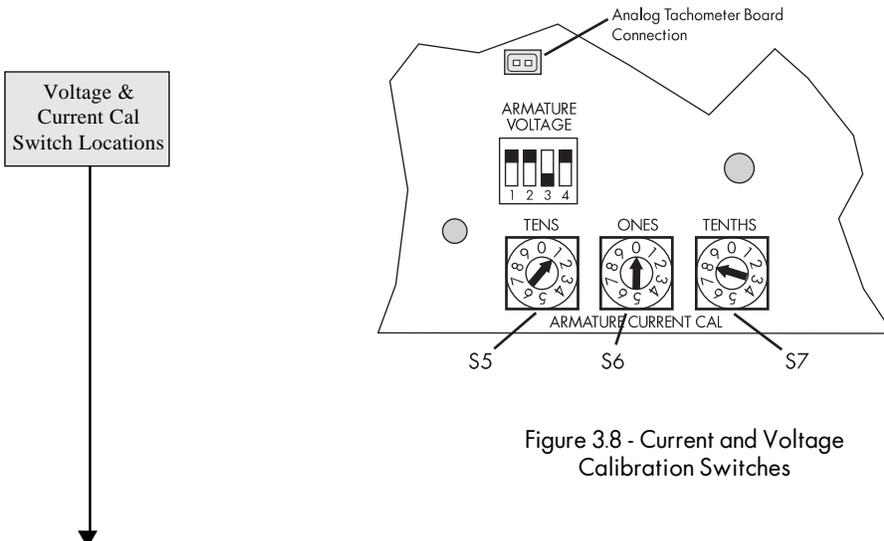
Calibrate the drive's armature current, armature voltage and speed feedback after installing and wiring the drive. Be sure to record these settings after they are correctly set and again after start up. The four DIP switches S1, S2, S3 and S4 scale the drive for the motor armature voltage. The rotary switches S5, S6 and S7 calibrate the drive for the motor current. The switches are located at the lower center of the control board, as shown in Figure 3.5. A close up view is shown in Figure 3.8.

WARNING!

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

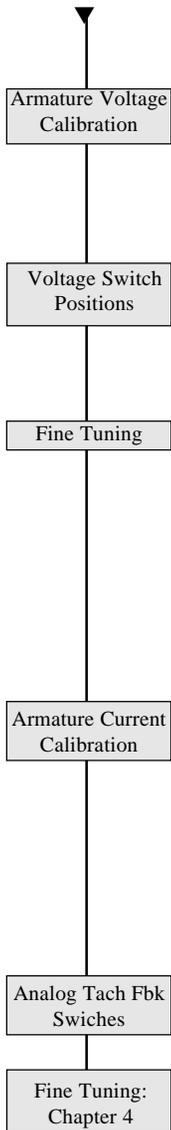
WARNING!

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



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

Figure 3.8 - Current and Voltage Calibration Switches



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.

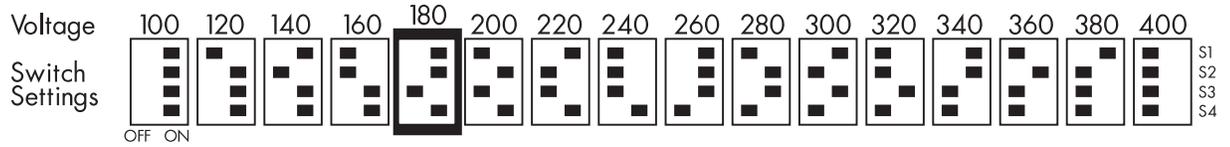


Figure 3.9 - Armature Voltage Calibration Switch Settings

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!

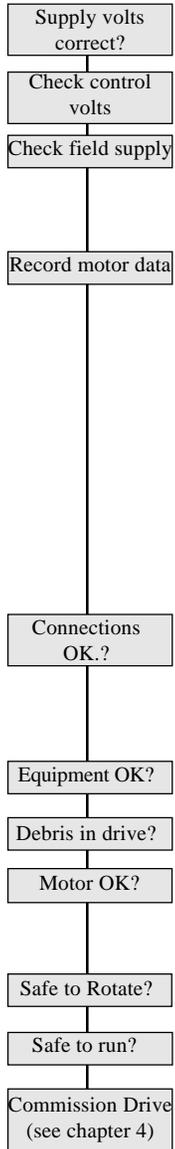
Do not set the current calibration switches above the drive or motor rating. Equipment damage may result.

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.

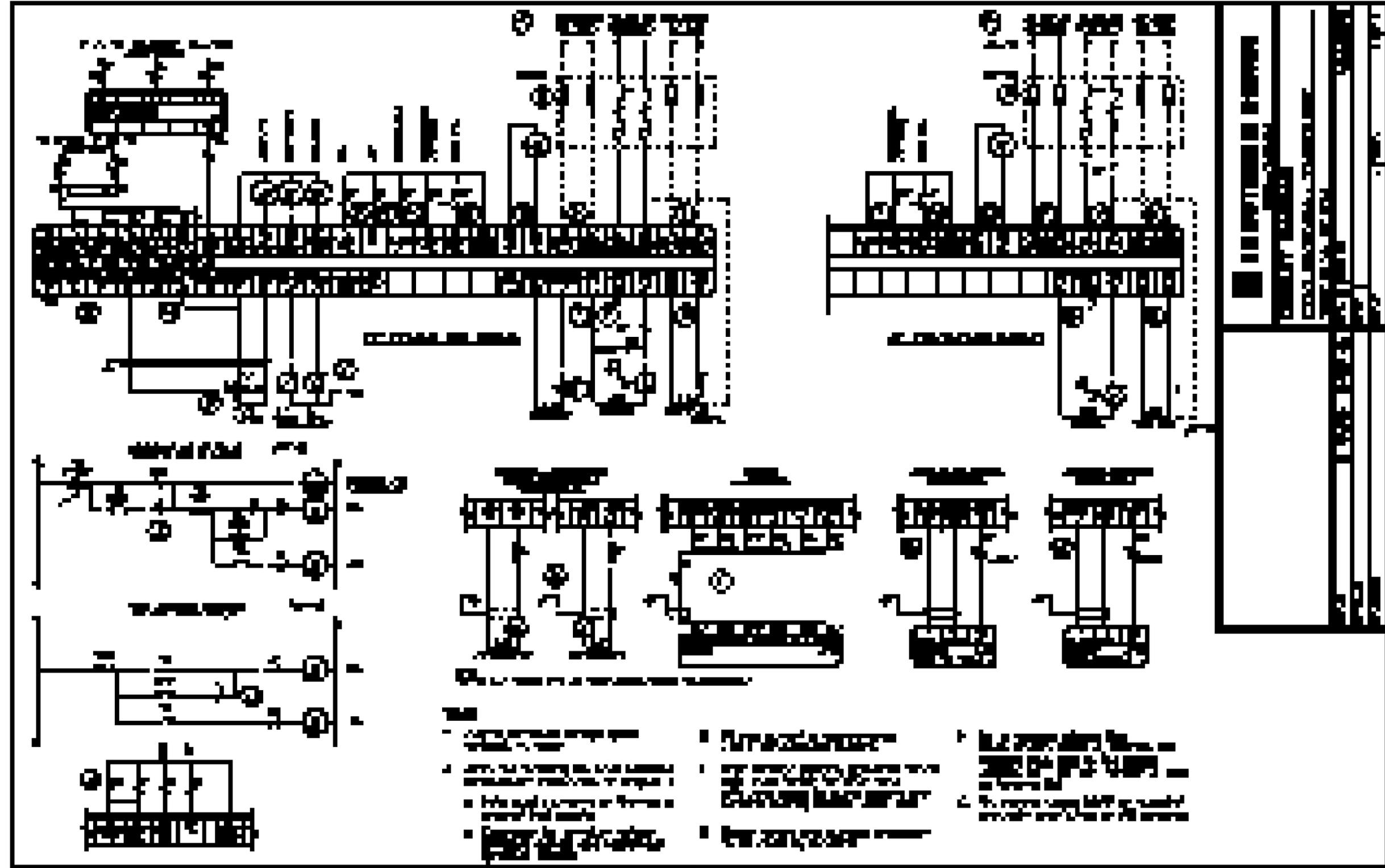
FINAL INSPECTIONS

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.



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
 - 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.

Figure 3.3 - Wiring Circuit Diagram for 590SP Digital Drive



- 1. Cable connections are made from the terminal block to the drive.
 - 2. The drive is connected to the motor.
 - 3. The motor is connected to the terminal block.
- The motor must be connected to the terminal block.

Chapter 4 START UP AND ADJUSTMENT

The 590SP Digital drive is shipped with a default configuration designed to control a shunt or permanent magnet field DC motor. You can adjust the drive's parameters or change its configuration to achieve optimum performance and perform specific control applications.

The drive can be tuned or configured using the drive's MMI, or by using a computer running the software package ConfigEd Lite. This chapter guides the user through the start up procedure using the MMI.

Follow these procedures only *after* installing and wiring your 590SP (see Chapter 3). Review Appendix B to become familiar with the MMI before proceeding.

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

RECOMMENDED TOOLS

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

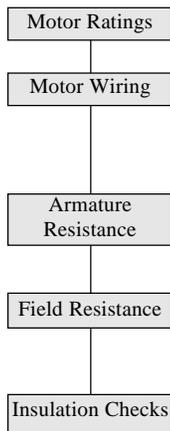
- IBM compatible PC with Microsoft Windows™ 3.0 or greater to run ConfigEd Lite
- Oscilloscope to monitor armature current waveform and speed feedback
- Voltmeter to monitor motor armature and field voltage and check control signal levels
- Ohmmeter to check signal continuity
- Clamp-on, Hall effect ammeter to measure armature and field currents
- Digital hand tachometer to check line or motor speed

WARNING!

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

CHECK MOTOR

After wiring and installing your 590SP, 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 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 M Ω . If available, use a megger to check for insulation faults in the motor armature and field windings.

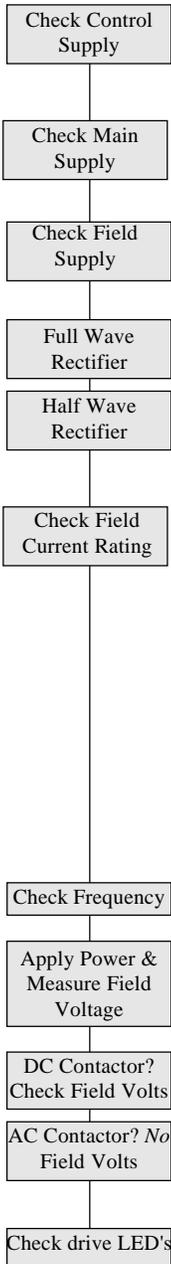
WARNING!

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

CHECK SUPPLY

WARNING!

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



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).
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 $\pm 10\%$ percent of supply requirements. Generally for a single phase DC drive, the maximum armature voltage is 78% of the AC supply voltage.
3. Check the motor field voltage against the supply. The 590SP 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 = $(0.90) \times \text{AC supply (or external field supply)}$
 - HALF WAVE DC field supply volts = $(0.45) \times \text{AC supply (or external field supply)}$
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 with the correct AC supply (Refer to drawing 3.6 in Chapter 3).

WARNING!

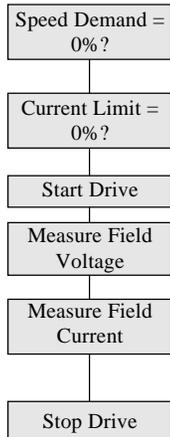
Failure to set the field supply correctly can cause dangerous overspeed conditions resulting in equipment damage or injury to personnel. Do not continue the start up until the motor field supply is correct.

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.
6. If a frequency meter is available, check that the supply frequency measures between 40 and 70 Hz.
7. Connect power to the drive. The MMI display should read 590SP DRIVE:: MENU LEVEL. Check the motor field voltage once power is on.
 - If a DC contactor is used and the drive is wired as in the left portion of Figure 3.3, 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 3.3, 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 B8 and B9) should be at +24 VDC, or TRUE.

INITIAL DRIVE START

WARNING!

Before performing the initial drive start up, 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.



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**. Ensure that the total speed setpoint to the drive is zero.
2. Set **SETUP PARAMETERS:: CURRENT LOOP:: CURRENT LIMIT** to 0.00%.
3. Start the drive. 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 your 590SP and should NOT be overlooked.

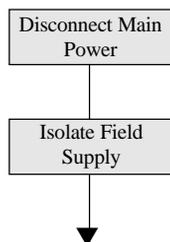
The AUTOTUNE function tunes the current loop automatically and sets the proportional gain, integral gain, and the discontinuous/continuous breakpoint for optimum drive response for a given motor. The drive cannot achieve peak performance without properly setting these parameters. Perform a complete AUTOTUNE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

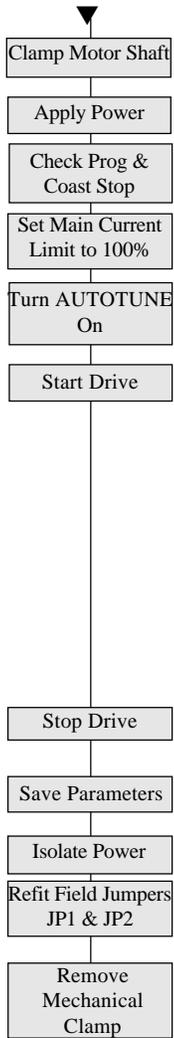
Make sure it is safe to power and turn the motor and that operation of the motor and the drive will not pose a danger to personnel or equipment.



1. Stop the drive by removing the RUN signal at terminal C3 (the RUN LED should be OFF), then disconnect the main supply power and the motor field supply source, if supplied externally.
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.
5. Make sure the PROGRAM STOP and COAST STOP LEDs are on (+24 VDC at terminals B8 and B9).
6. Make sure SETUP PARAMETERS:: CURRENT LOOP:: CURRENT LIMIT is set at 100%, the MMI default position.
7. Turn AUTOTUNE on by setting SETUP PARAMETERS:: CURRENT LOOP:: AUTOTUNE to ON.
8. Close main contactor by applying the RUN command at terminal C3. At this point, the 590SP will AUTOTUNE and automatically set 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 opens automatically, signaling the end of the procedure and returning the controller to a safe condition. If the motor turns during the procedure, AUTOTUNE ceases automatically causing an AUTOTUNE FAILURE alarm. Removing the RUN or ENABLE signals also aborts this procedure (in both cases, the main contactor is opened).
10. Remove the RUN signal.
11. At this point, save the parameters that have been generated; otherwise, a loss of power will mean the loss of these parameters. Remember, any parameters changed to allow the AUTOTUNE procedure to run should be reset to the operational values before performing a PARAMETER SAVE.
12. Isolate power, then replace the field jumper connections JP1 and JP2 to their correct positions.
13. Remove the mechanical clamp (if fitted) from the motor.

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 4.1).

NOTE. The waveform in Figure 4.1 shows the armature pulses for continuous conduction. During normal operation, the waveform will appear discontinuous with even zero spacing between each current pulse. For a continuous waveform, the maximum width of each pulse will be 8.3 mS on 60 Hertz supplies, and 10 mS on 50 Hertz supplies.

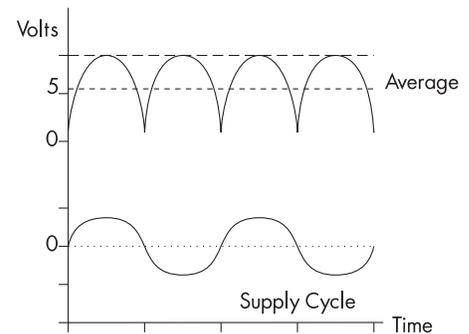
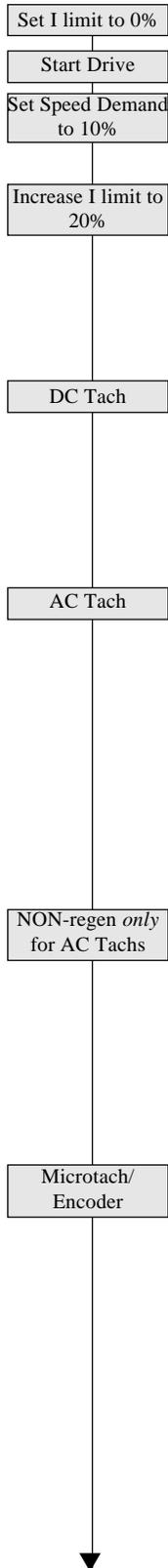


Figure 4.1 - Armature Current Waveform

MOTOR ROTATION CHECK

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



1. Set SETUP PARAMETERS:: CURRENT LOOP:: CURRENT LIMIT to 0%.
2. Start the drive and set your drive speed reference potentiometer to +1.0 VDC or +10%. Make certain that any trim speeds or additional setpoints are set to 0%. Check that DIAGNOSTICS:: SPT. SUM OUTPUT is indeed +10%. You can monitor all the drive's speed references under SETUP PARAMETERS:: SPEED LOOP:: SETPOINTS.
3. Slowly increase SETUP PARAMETERS:: CURRENT LOOP:: CURRENT LIMIT to approximately 20%.
4. The motor speed should increase 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.

This speed reference *must* be positive. If the motor ran away in reverse, provide a positive speed reference and reverse the field connections.

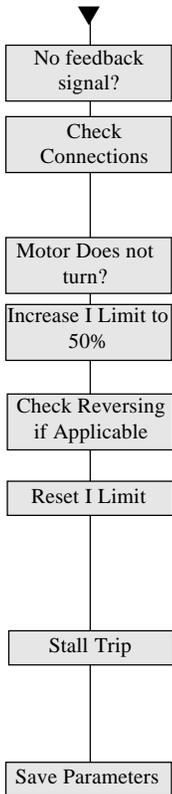
Caution

A runaway condition always exists when using an AC tachometer generator on a regenerative model DC controller, even if the speed reference is always positive. To avoid this problem, use the 591SP (non-regenerative) drive on a motor with an AC tachometer generator. Or, use the regenerative 590SP and disable the drive's reverse bridge thyristors under SETUP PARAMETERS:: CURRENT LOOP:: REGEN MODE.

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

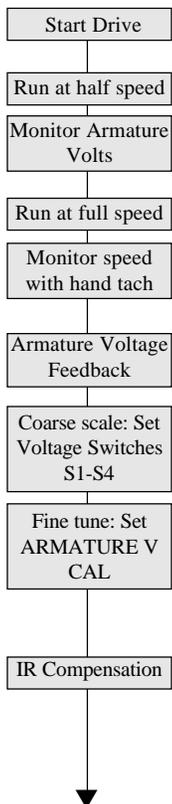


5. If the motor continues to run away after checking the feedback sign and field polarity check whether the drive actually receives its speed feedback signal. Monitor **DIAGNOSTICS:: TACH VOLTS** when using an analog tachometer generator. For Microtach or wire-ended encoders, check **DIAGNOSTICS:: ENCODER RPM**. 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.
6. If the motor does not turn at all, increase the **CURRENT LIMIT** to 50% or greater and monitor **DIAGNOSTIC:: CURRENT FEEDBACK**. If **CURRENT FEEDBACK** still reads 0.00%, turn the power off and check the armature connections. If the problem persists, refer to Chapter 7 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.
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.

9. Stop the drive then **SAVE PARAMETERS**.

SPEED FEEDBACK CALIBRATION



Start the drive, gradually increase the speed demand signal to 50% and monitor **DIAGNOSTICS:: TERMINAL VOLTS**, which is displayed in percentages. Measure the actual armature voltage on the drive output with a DC voltmeter. **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 180 volt armature should read 90 volts at 50% speed demand, and the MMI should display 50% under **TERMINAL VOLTS**. If the reading is outside this range, check the drive's voltage calibration switches before continuing.

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.

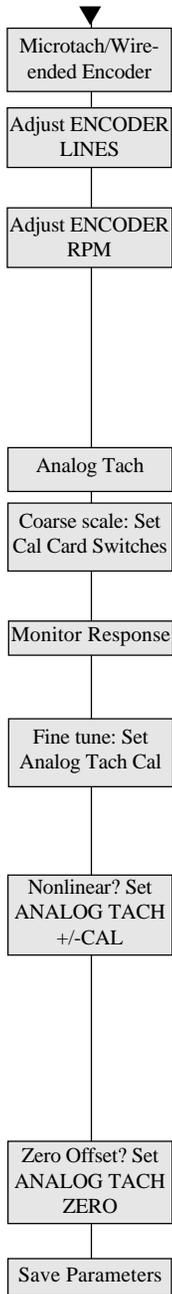
1. **ARMATURE VOLTAGE FEEDBACK**
 Armature voltage feedback uses the motor's back EMF as speed feedback and is the drive's default feedback setting. It requires no feedback device, isolator or additional external connections. The scaling parameter, **SETUP PARAMETERS:: CALIBRATION:: ARMATURE V CAL**, fine tunes the drive's armature voltage calibration and has a range of 1.1000 to 0.9800, corresponding to -10% to +2% trim. Changes outside this range require re-calibration of the motor voltage switch settings (switches S1 through S4) 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.

- Run the motor without a load. Monitor the actual speed with a hand tachometer.
- With the same speed setpoint, run the motor at full load and monitor the actual speed again with a hand tachometer.
- Adjust **IR COMPENSATION** until the full load speed is the same as the no load speed.

NOTE. Too much **IR COMPENSATION** causes instability.



2. MICROTACH or WIRE-ENDED ELECTRICAL ENCODERS

- Ensure that the CALIBRATION:: ENCODER LINES parameter equals the pulses per revolution rating of the encoder (1000 for Microtachs). You can read the feedback encoder rpm under DIAGNOSTICS:: ENCODER RPM in the MMI or in SAM under the FEEDBACK software block.
- 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. Speed match the motor through the ratio calculation:

$$\text{New ENCODER Rpm Setting} = \text{Present ENCODER Rpm Setting} \times \frac{\text{Desired Rpm}}{\text{Measured Rpm}}$$

3. AC/DC ANALOG TACHOMETER GENERATOR

- Settings on the analog tachometer generator feedback option card give a coarse scaling of the analog tachometer generator feedback voltage. Fine tune the feedback by adjusting drive software parameters.

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:

$$\text{New ANALOG TACH CAL Setting} = \text{Present ANALOG TACH CAL Setting} \times \frac{\text{Desired Rpm}}{\text{Measured Rpm}}$$

The gain range varies from 1.1000 to 0.9800, or -10% to +2% trim. Changes outside this range require a re-calibration of the feedback calibration card as described in Appendix A.

- 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.

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 ANALOG TACH ZERO to tune out the offset.

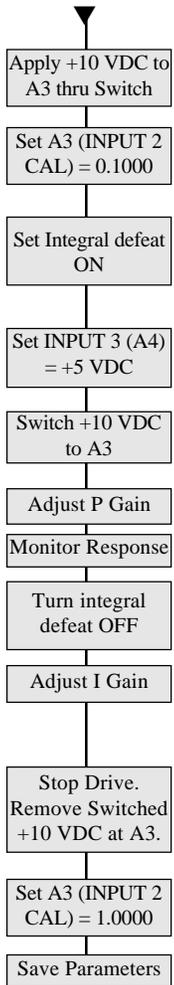
4. Save parameters when finished.

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 5.19 in Chapter 5).

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.



1. Connect terminal B3 (+10 VDC) through a switch to terminal A3. This will provide the step change input for verifying speed loop performance.
2. Calibrate terminal A3 for 10% output by setting `SETUP PARAMETERS:: SPEED LOOP:: SETPOINTS:: RATIO 2 (A3)` to 0.1000.
3. Set `SETUP PARAMETERS:: SPEED LOOP:: INT. DEFEAT` to ON. This disables the integral gain.
4. Run the motor at a typical operating speed through the speed ramp input, terminal A4. The speed should not exceed 50 percent.
5. Check the speed loop performance by making step changes using the switch at terminal A3. Increase `SETUP PARAMETERS:: SPEED LOOP:: PROP. GAIN` until the response is critically damped as illustrated above.
6. Once stable proportional control is attained, set `SETUP PARAMETERS:: SPEED LOOP:: INT. DEFEAT` to OFF.
7. Check the speed loop performance by making step changes using the switch at terminal A3. 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. That value may be too small for large inertia loads and cause the system to be unstable from the start.
8. Stop the drive and remove the switched signal from terminal A3.
9. Reset the calibration for terminal A3 back to 100% by setting `SYSTEM:: CONFIGURE I/O:: ANALOG INPUTS:: ANIN 2 (A3)` to 1.0000, then run normally.
10. Save parameters:

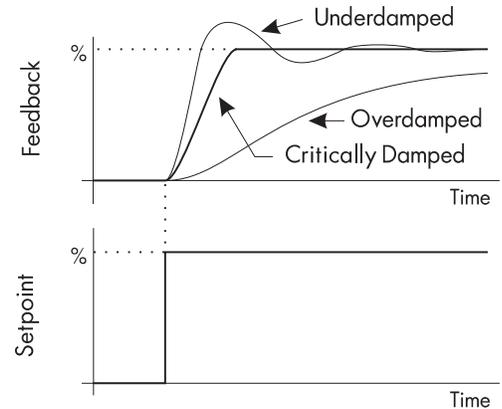


Figure 4.1- Armature Current Waveform

OTHER PARAMETERS

Other parameters, for example ramp rates, may be important for the process. Different ramp rates are available for various conditions:

Condition	Parameter Name	Menu
Speed Setpoint Change	RAMP ACCEL TIME and RAMP DECEL TIME	RAMPS
Jog Acceleration/Deceleration	RAMP RATE	JOG/SLACK
Controlled Stop Deceleration	STOP TIME	STOP RATES
Fast Stop Deceleration	PROGRAM STOP TIME	STOP RATES
Electronic MOP Control	INCREASE RATE and DECREASE RATE	RAISE/LOWER

Appendix C fully discusses the functionality and scaling of all drive parameters.

RECORDING PARAMETERS

It is important to have a hard copy of your drive parameters. This copy might consist of writing down the information on a chart, saving the parameters to a computer disk, or printing the parameters using an external computer. The parameter list in Appendix C has two empty columns for manually recording the drive parameters.

To save the parameters as either a hexadecimal ASCII file or as a text file ready for printing, connect a computer to the P3 serial port. Use a telecommunications program, such as Procomm™, Windows Terminal™, or other terminal emulation programs. Refer to "Using Microsoft® Windows™ to Document and Clone 590 Digital Drives" (HA352155) for

detailed instructions using Windows Terminal™ for uploading and downloading drive parameters. Appendix G also contains general information for using P3 to upload and download drive parameters.

PASSWORD PROTECTION

To safeguard the parameters you have set with the MMI, you can configure the 590 DRV in a password-protected mode. At the initial power up, the DISPLAY PASSWORD command is automatically cleared to zero. If the controller password is set at any value other than zero, the MMI is in a restricted mode and the MMI display can be displayed but not altered.

Entering a Password

To access the password configuration procedure from the main menu:

- PASSWORD
- M to enter the Password sub-menu
- M to enter the ENTER PASSWORD sub-menu
- ▲ to enter the password on the screen.

Changing a Password

590 DRVs are 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 may use the CHANGE PASSWORD function to set your own restricted password.

- PASSWORD
- M to enter Password sub-menu
- ▲ to CHANGE PASSWORD
- M to enter the CHANGE PASSWORD sub-menu
- ▲ 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 access to the password.

With password protection installed in your 590 DRV, the parameters available through the MMI can be viewed but not be altered without first entering that password. To edit parameters, you must reenter the password and repeat the procedure described above.

NOTE. Be sure to record the new password. If you lose your password, you will be unable to change parameters.

4-Button Reset

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

Chapter 5 TROUBLESHOOTING

The most valuable tools for finding and resolving faults are the MMI and the LED display. You can also monitor alarms and troubleshoot faults remotely through a computer interface if a RS422 serial communications option card (AH385826U001) is installed on the drive.

INITIAL TROUBLESHOOTING PROCEDURE

Most drive problems are encountered during commissioning or soon after start-up. Problems frequently result from incorrect installation or errors in configuring the drive. If you encounter a problem upon initial start up of your 590SP Digital drive, review the installation procedures in Chapter 3 and the start up and adjustment procedures in Chapter 4. If you have reviewed your installation and initial start up procedures and all seems to be in order, proceed to the troubleshooting methods in this chapter.

Use the flowchart in Figure 5.1 to begin troubleshooting.

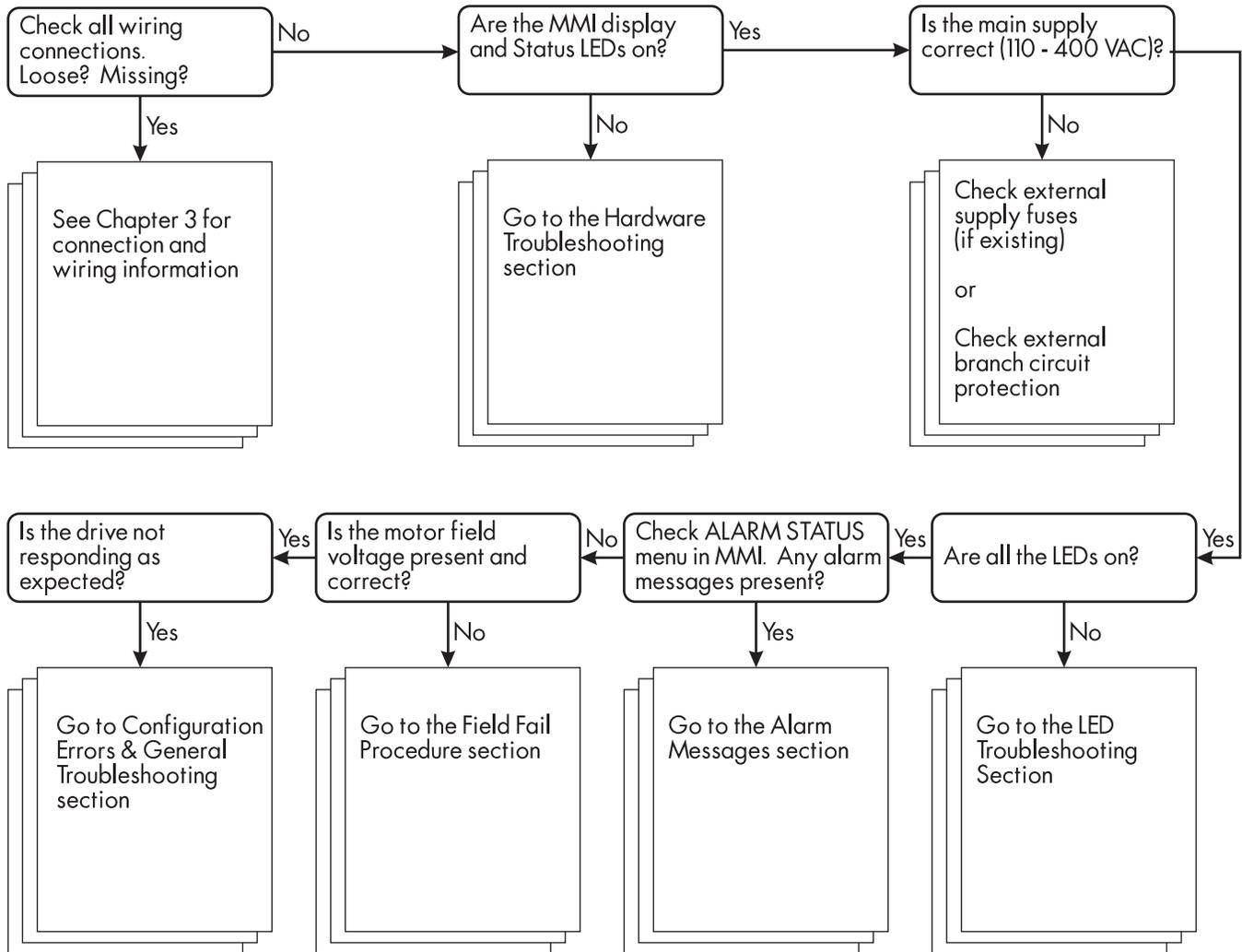


Figure 5.1 - Initial Troubleshooting Procedure

Recommended Tools

You will need the following tools for most troubleshooting procedures:

- Voltmeter
- Megger

If available, the following tools can provide more detailed information for problem-solving:

- Oscilloscope
- Hand tachometer

You may also need screwdrivers and/or wrenches to restore electrical connections that are incorrect or have come loose.

STATUS LED TROUBLESHOOTING

Six light emitting diode [LED] indicators are located just to the right of the MMI display. The LEDs indicate six status conditions on the drive: 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 18 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 start command, the start contactor energizes, the thyristor bridge circuit enables and the drive is healthy. The RUN LED turns OFF whenever 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 B8 (PROGRAM STOP) and B9 (COAST STOP). These terminals are normally switched to terminal C9 +24 VDC through an external emergency stop relay.

LED Name	Sample Displays				On ●	Off ○
HEALTH	●	○	○	●	●	●
RUN	○	○	○	○	○	●
START CONTACTOR	○	○	○	●	○	●
OVERCURRENT TRIP	●	●	○	●	●	●
PROGRAM STOP	●	●	●	●	○	●
COAST STOP	●	●	●	●	●	○

Normal Stop

Alarm

Alarm MMI display will show the first fault.

Alarm Overcurrent Trip

Drive Started but not enabled (C3)

Drive Stop Controlled stop input

Drive stop Coast stop input

Normal Run

Figure 5.2 - Sample LED Status Modes

All six LEDs are ON under normal running conditions. Figure 5.2 shows the LED states after common actions and other faults occur. An unlit LED indicates a problem that prevents controller operation and requires user attention. The table in Figure 5.3 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.
RUN	The drive is not enabled or in the RUN state.	The thyristor bi The main conta Another alarm
START CONTACTOR	The start contactor is open.	24 VDC signal terminal C3.
OVERCURRENT TRIP	Armature current has exceeded 300 percent full load.	The armature is Mechanical bir preventing free Field voltage to
PROGRAM STOP	24 VDC signal not present at terminal B8. The main contactor will drop out once the motor has completed a controlled stop.	Emergency stop external logic c preventing 24 ' present at B8. 24 VDC supply
COAST STOP	24 VDC signal not present at terminal B9. The main contactor is de-energized and the motor will coast to a stop.	Emergency stop external logic c preventing 24 ' present at B9. 24 VDC supply

Figure 5.3 - Status LED Troubleshooting Procedures

HEALTH, ALARM MESSAGES AND THE TRIP RESET

The controller continuously monitors 17 alarms while the drive is running. These alarms are gated together to provide an overall "controller healthy" logic variable. This variable corresponds to the ALARM STATUS software block output HEALTHY (tag number 122).

The default shipped drive configuration of the 590SP Digital drive tags the HEALTHY logic parameter to digital O/P 2 (terminal B6).

If a fault occurs while the controller is running, HEALTHY switches FALSE and the drive immediately inhibits the thyristor firing circuit. The drive then deenergizes the main contactor and the MMI displays the *last* fault registered, or the fault which interrupts controller operation. If TRIP RESET (parameter tag 305 set under the SETUP PARAMETERS:: INHIBIT ALARMS menu) is TRUE, the HEALTHY output remains FALSE until the RUN input (terminal C3) switches LOW, as shown in Figure 5.4. If a restart is attempted without first clearing the fault, HEALTHY will

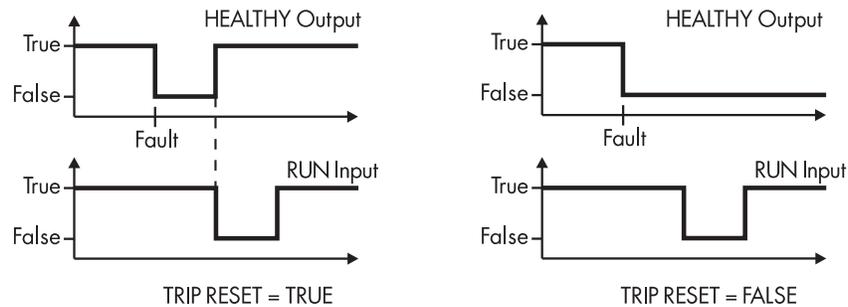


Figure 5.4 - HEALTHY Output Logic

again switch FALSE and the drive will not enable the thyristors and reenergize the main contactor. If TRIP RESET is FALSE, the drive cannot restart regardless of the state of the RUN input or whether or not the fault is cleared.

The tables in Figures 5.5 through 5.10 describe the different alarms the MMI displays when the drive trips out on a fault, the fault's symptoms and recommended corrective action.

DISPLAY MESSAGE	MEANING	POSS
*** ALARM *** 5703 RCV ERROR	Drive not receiving communications from external 5703 unit when configured as a slave device	Cable from 5703 into drive P3 port 5703 module r communication Drive incorrect 5703 peer-to-peer module failure
*** ALARM *** AUTOTUNE ABORTED	Enable, or Start/Run commands removed before AUTOTUNE procedure completed	Wrong AUTO1 followed AUTOTUNE inc minutes drive v AUTOTUNE mc
*** 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 wiring motor Permanent mag Separately sup

Figure 5.5 - Alarm Messages

DISPLAY MESSAGE	MEANING	POSS
*** ALARM *** ENABLE CONFIG.	Configuration procedure incomplete. CONFIGURE ENABLE left in enabled state	CONFIGURE E1 in ENABLE state Encoder or Mic option card inc control door Fiber optic cab distorted (benc example) result signal at Micro drive]. Fiber optic cab in too strong a 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 present for 60 seconds for alarm to operate). NOTE: Ripple from the speed loop from either the setpoint or feedback can cause unstable current.	Drive not AUT(current loop) SCR gate conn SCR defective SCR firing pcb Motor has ope Coupling betw feedback devi Feedback devi Bottom two LEI Microtach rece Speed loop ga
*** ALARM *** OVER I TRIP	Armature over current trip. Armature current has exceeded 300% of	Drive not AUT(current loop)

Figure 5.6 - Alarm Messages (Continued)

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.

Figure 5.7 - 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 fiel Armature open Motor maximu incorrectly cau to exceed nam Field weakenin incorrectly if u: speed range m
*** ALARM *** PHASELOCK	Drive SCR firing phase lock loop unable to lock to supply waveform	One or more pl too high or mis Supply wavefc Power supply f defective Supply frequen range
*** ALARM *** POWER FAILED	Main drive power or, auxiliary power is below 99 VAC.	Supply voltage Blown fuse. Loose wiring. A engaging. Defective pow
*** ALARM ***	Difference between armature	Wrong polarit:

Figure 5.8 - 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 5.9 - 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 Communication upload Corrupted EEPROM
INITIALIZING IA FBK CAL FAIL	Armature current feedback calibration fail during the power-up self test.	Armature current transformers m Control board
INITIALIZING INIT CAL FAIL	Initialization calibration failure of analog inputs during the power-up self test.	Control board Corrupted EEPROM Hitting the "E" b test threshold saved on power

Figure 5.10 - 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 a symbolic message appears, cycle power on the controller to clear the fault. If the message repeats, call Eurotherm Drives Customer Service.

DISPLAY MESSAGE	MEANING	POSSIBLE CAUSE	CORRECTION
0xF003	Pre-Ready Fault	Coding not present	Replace PCB If using an external encoder the coding
0xF100	CAM Full		Call Eurotherm Service.
0xFF01	Internal software error in slot-read()		Call Eurotherm Service.
0xFF02	Unimplemented micro opcode		Call Eurotherm Service.
0xFF03	Aux power fail	Controller power supply failure	Check the 1 controller.
0xFF04	"Trap" software interrupt		Call Eurotherm Service.
0xFF05	Internal software error in slot-read-pass()		Call Eurotherm Service.
0xFF05	Internal software error in slot-write()		Call Eurotherm Service.

Figure 5.11 - Symbolic Error Messages

ALARM PROCESS

The hexadecimal code for the first alarm is saved in HEALTH STORE. HEALTH STORE resets when the drive is restarted. The alarm is also saved in LAST ALARM and stored until another fault trips out the drive or if the control power is removed. All subsequent alarms are not displayed.

The first alarm as well as any subsequent alarms are stored in HEALTH WORD. HEALTH WORD 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.

You can monitor HEALTH WORD, HEALTH STORE, and LAST ALARM in the MMI under the ALARM STATUS menu.

Alarm Status

This table lists the bit assignments of alarms in HEALTH WORD and HEALTH STORE in the hexadecimal format. The table also indicates whether you can override the alarm with the SETUP PARAMETERS:: INHIBIT ALARMS menu and lists the delay time of each alarm, if any.

Bit	Alarm	Hex Value	Inhibit?	Delay Time
0	Overspeed	0x0001	---	---
1	Missing Pulse	0x0002	no	0.75 sec
2	not used	0x0004	---	---
3	not used	0x0008	---	---
4	Motor Overtemperature	0x0010	no	15 sec
5	Motor Overvolts	0x0020	no	---
6	Speed Feedback	0x0040	yes	0.1 sec
7	5701 Encoder Failure	0x0080	yes	---
8	not used	0x0100	---	---
9	Main Supply Failed	0x0200	no	---
10	Phase Locked Loop	0x0400	no	0.5 sec

Bit	Alarm	Hex Value	Inhibit?	Delay Time
11	P3 Port	0x0800	no	---
12	Stall Trip	0x1000	yes	---
13	Overcurrent Trip	0x2000	no	---
14	not used	0x4000	---	---
15	not used	0x8000	---	---

This example shows how HEALTH WORD, HEALTH STORE, and LAST ALARM are updated.

During operation, the controller trips on P3 PORT ALARM (0x0800), the drive loses three-phase power when an SCR fuse blows (0x0200) and the motor overheats causing the thermistor to open (0x0010). HEALTH WORD is:

$$0x0800 + 0x0200 + 0x0010 = 0x0A10.$$

HEALTH WORD	HEALTH STORE	LAST ALARM
0x0A10	0x0800	P3 PORT ALARM

During troubleshooting, the motor cools down and the thermistor closes.

HEALTH WORD	HEALTH STORE	LAST ALARM
0x0A00	0x0800	P3 PORT ALARM

The P3 PORT ALARM is cleared and the drive is restarted and immediately trips with a 3 PHASE FAILED alarm.

HEALTH WORD	HEALTH STORE	LAST ALARM
0x0200	0x0200	3 PHASE FAILED

The fuse is replaced and three-phase power is turned on.

HEALTH WORD	HEALTH STORE	LAST ALARM
0x0000	0x0200	3 PHASE FAILED

The drive is restarted.

HEALTH WORD	HEALTH STORE	LAST ALARM
0x0000	0x0000	3 PHASE FAILED

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

Many signals can be monitored in the MMI display. The diagnostic parameters are "read-only" and are very useful for tracing configuration problems. The following tables contain a description of each parameter and its range. Parameters denoted with an asterisk (*) are the controller's analog or digital I/O. The drive has been shipped with its I/O tagged to the parameter listed in the description field.

Parameter	Description
ACTUAL NEG I LIM	Overall negative current limit value
ACTUAL POS I LIM	Overall positive current limit value
ANIN 1 (A2)*	Speed setpoint no. 1.
ANIN 2 (A3)	Hardwired. Speed setpoint no. 2 or current demand if C8 =
ANIN 3 (A4)*	Speed setpoint no. 3 (ramped).
ANIN 4 (A5)*	Speed setpoint no. 4 or negative current clamp if C6 = ON
ANIN 5 (A6)*	Main current limit or positive current clamp if C6 = ON
ANOUT 1 (A7)*	Scaled speed feedback.
ANOUT 2 (A8)*	Total speed setpoint.
AT CURRENT LIMIT	Current demand is being restrained by the overall current l
AT STANDSTILL	AT ZERO SPEED and "AT ZERO SETPOINT"
AT ZERO SETPOINT	At zero speed demand
AT ZERO SPEED	At zero speed feedback
BACK EMF	Calculated motor back EMF including IR. compensation
CURRENT DEMAND	Current loop demand (speed error PI output or external cur by all the current limits)
CURRENT FEEDBACK	Scaled and filtered armature current
DIGIN 1 (C6)*	Symmetrical current clamps / Asymmetrical (bipolar) curre Bipolar).
DIGIN 2 (C7)*	Ramp hold input (ON = Hold).
DIGIN 3 (C8)*	Current demand isolate; giving speed or current mode of c Current mode)
DIGOUT 1 (B5)*	At zero speed.
DIGOUT 2 (B6)*	Drive healthy. Health is also displayed on a front panel LE when the start is low
DIGOUT 3 (B7)*	Drive ready to run (all alarms healthy and mains synchroni:

Figure 5.12 - Diagnostic Parameters

Parameter	Description
PID ERROR	Displays the difference between the setpoint (INPUT 1) and (INPUT 2) in the PID function block.
PID OUTPUT	Output of the PID function block.
POS I CLAMP	Positive current clamp
PROGRAM STOP	State of program stop (terminal B8). When B8 is at 24V this is FALSE and the program stop front panel LED is also ON
RAISE/LOWER O/P	Value of the raise / lower ramp function
RAMP OUTPUT	Setpoint ramp output
RAMPING	If the difference between the ramp input and the ramp output "RAMP THRESHOLD", then "RAMPING" is TRUE
SPEED DEMAND	Speed loop total setpoint after the ramp-to-zero block
SPEED ERROR	Speed loop error
SPEED FEEDBACK	Speed loop feedback
SPEED SETPOINT	Speed loop total setpoint including the ramp output before function
SPT. SUM OUTPUT	Setpoint summation output
STALL TRIP	Armature current is above "STALL THRESHOLD" and "AT ZERO SETPOINT"
START (C3)	Start / Run terminal
TACH INPUT [B2]	Scaled analog tachogenerator feedback
TERMINAL VOLTS	Scaled terminal volts

Figure 5.13 - Diagnostic Parameters (Continued)

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 5.14 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.

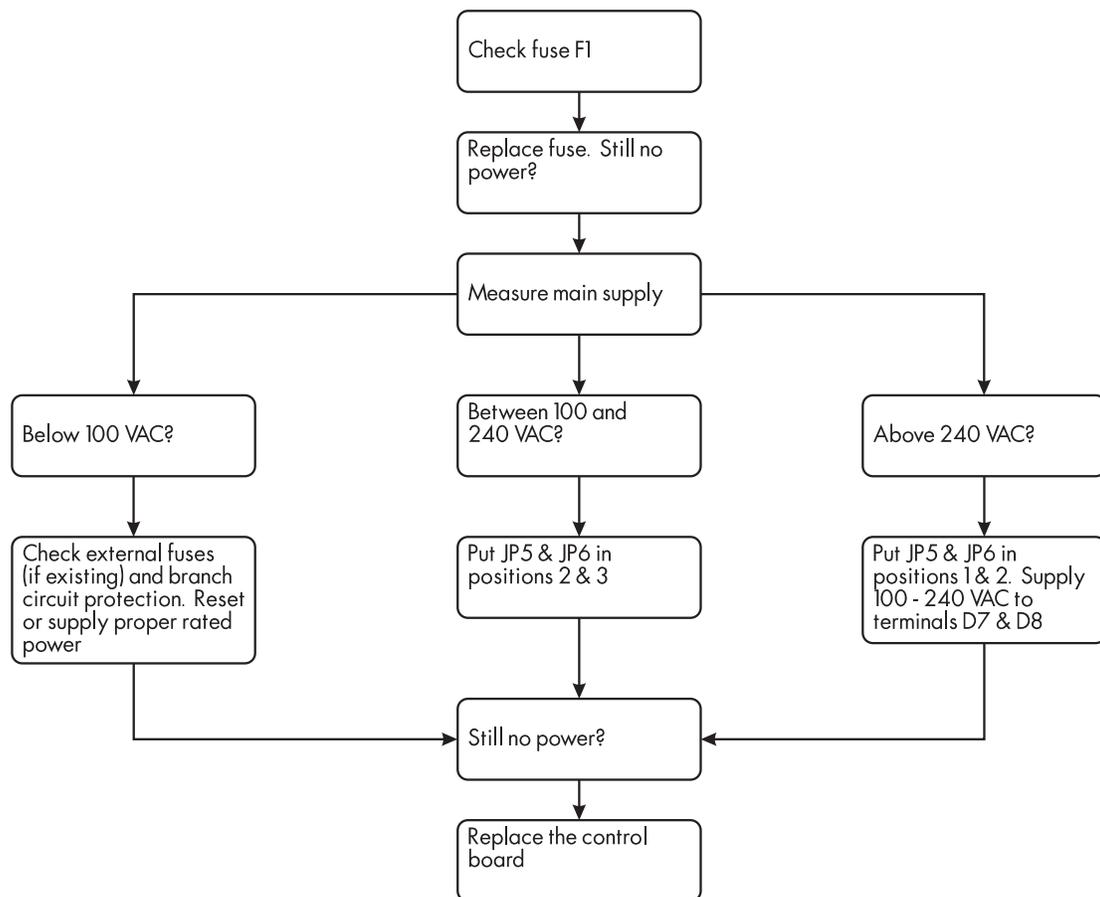


Figure 5.14 - Control Power Troubleshooting Flowchart

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 3.3 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.

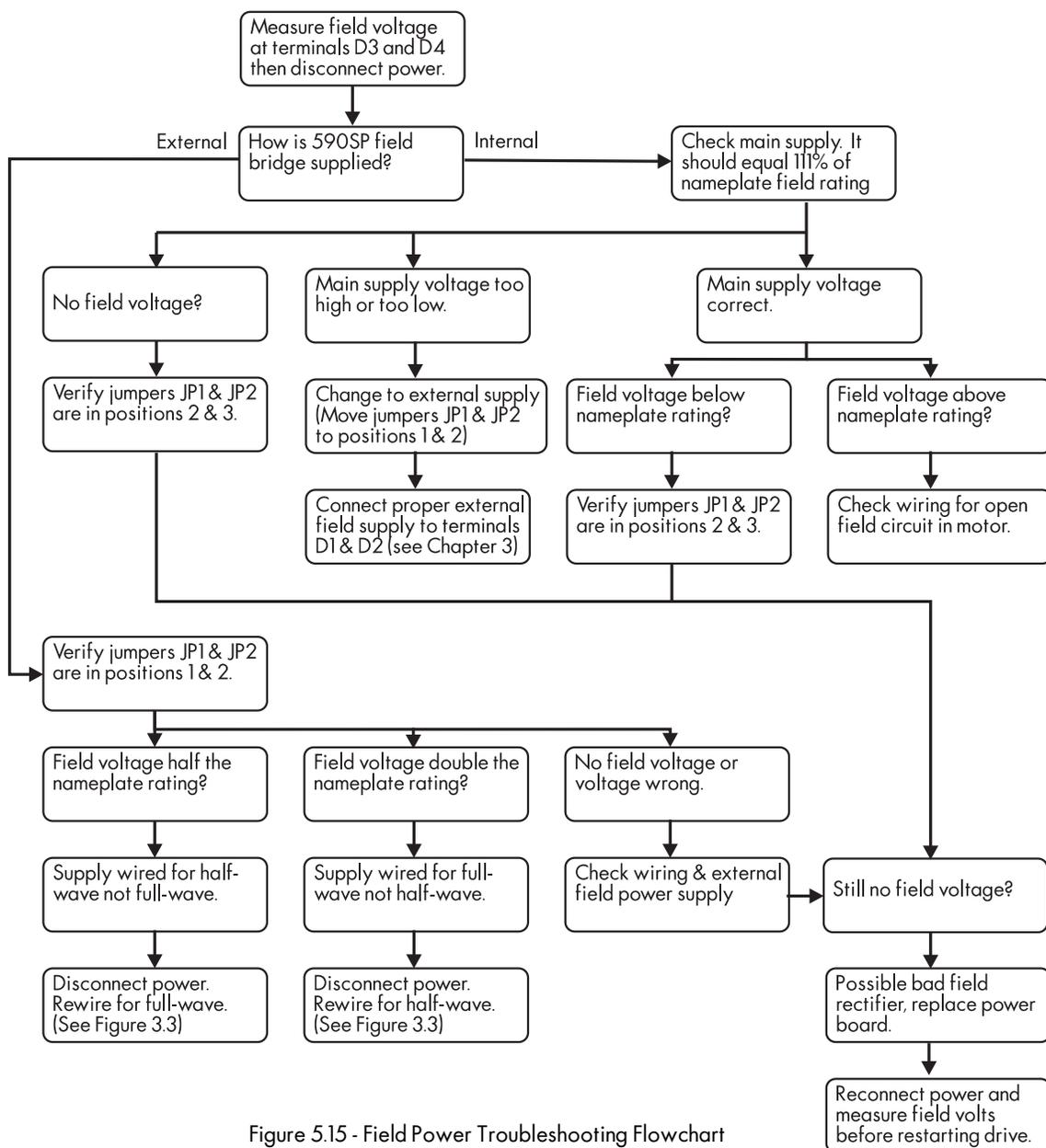


Figure 5.15 - Field Power Troubleshooting Flowchart

Contractor 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.

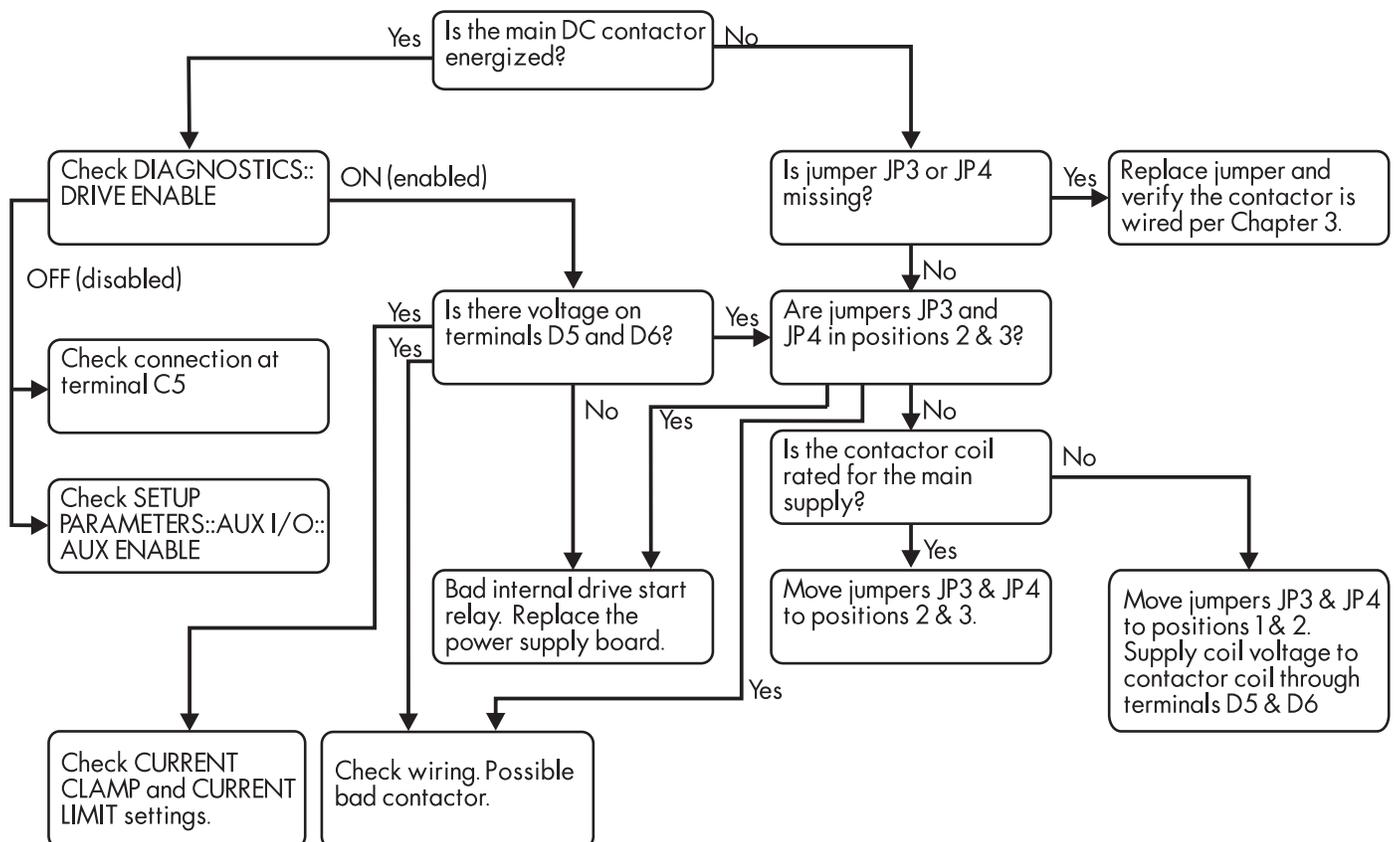


Figure 5.16 - Troubleshooting Flowchart for Faulty DC Contactor

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 5.17. 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.

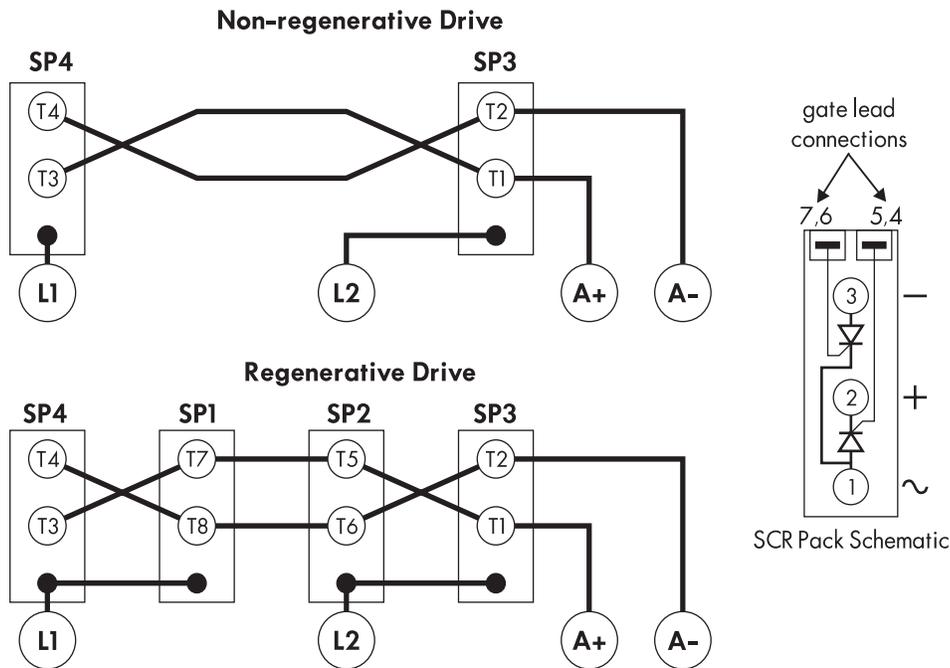


Figure 5.17 - SCR Layout

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 5.18 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 8 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 5.18 - 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 Ω . Insulation measurements should be greater than 10 $M\Omega$.

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

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.

CONFIGURATION ERRORS AND GENERAL TROUBLESHOOTING

Many of the problems are associated with configuration errors. You can avoid them by carefully following the directions in Appendix C and Appendix D.

Use the software block diagram (located on the inside cover) to track signals when troubleshooting software problems. Refer to the drawing at the end of Appendix D for a more detailed software block diagram. Trace the signal from its start and monitor it at each point along the path using the MMI display. That should uncover mis-tagged parameters, unwanted offsets, and mis-calibrated parameters.

The software package ConfigEd Lite displays drive configurations in graphical form on a personal computer (PC) monitor. You can track down configuration errors easily by referring to this graphical representation of your configuration. Use the ConfigEd Lite PRINT function to obtain a hard copy (refer to the ConfigEd Lite manual RG352747).

Caution

Because you can make configuration changes through the drive MMI, the configuration downloaded in your 590SP may not match the ConfigEd Lite file on your PC. Be certain to update your drive configuration data files with the ConfigEd Lite UPDATE command *before* printing out your configuration.

Common Performance Problems

Parameter Toggles Between Two Conditions

This problem occurs when two parameters write to a third parameter. The two parameters overwrite each other and fight for control of the problem parameter.

No SPEED DEMAND

If all the analog signals are connected to the proper terminals and have the correct sign, I DMD. ISOLATE may be set incorrectly. Monitor terminal C8; if it is OFF, at 0 VDC, terminal C8 may have been tagged for a nonstandard function. Monitor parameter SETUP PARAMETERS::CURRENT LOOP::I DMD. ISOLATE. It should be DISABLED for speed control. If I DMD. ISOLATE is ENABLED, only a signal at terminal A3, ANALOG I/P 2, will create a current demand needed to turn the motor.

SPEED SETPOINT has an Unwanted Offset

Terminal A8, TOTAL SPEED SETPOINT, is compiled from SETPOINTS 1 through 4. Monitor each setpoint individually in SETUP PARAMETERS::SPEED LOOP::SETPOINTS. If one is incorrect, i.e. has been left at an undesired value, simply "dial it" back to zero.

Signal Does Not Get Through the RAMP

When parameter RAMP HOLD is ON, the ramp output is held to its last input value. Set RAMP HOLD to OFF to allow the signal to change.

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 5.19. The table in Figure 5.20 shows the signal test point assignments and their scaling ranges.

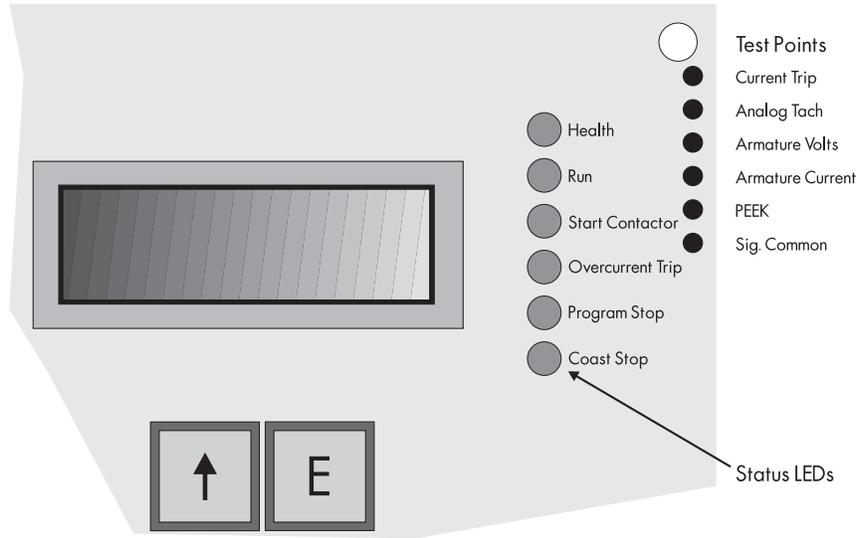


Figure 5.19 - Drive Status LEDs and Test Point Locations

Test Point	Signal Range	Test I
CURRENT TRIP	+5 VDC = OK/-15 VDC = tripped	ARMATURE CL [Unipolar or 2- CLAIBRATION (A9)]
ANALOG TACH	0 VDC = zero speed	
ARMATURE VOLTS	+4.2 VDC = ±100% full speed	ARMATURE CL [Bipolar or 4-q CLAIBRATION (A9)]
	0 VDC = 0% armature voltage	
SIG COMMON	+4.2 VDC = ±100% armature voltage	PEEK
	0 VDC common	

Figure 5.20 - Drive Test Point Descriptions and Scaling



CONTACTING CUSTOMER SERVICE

If you have reviewed your installation and start up procedures and followed the troubleshooting guide but still cannot solve a persistent problem, contact Eurotherm Drives Customer Service at (704) 588-3286. Make certain you have the following information available before calling:

Information	Source
Catalog number, revision number, serial number	590SP Serial Number Label (located on the left side of the drive heatsink base);
Horsepower, armature current and voltage, field current and voltage, full speed;	Motor Nameplate
Voltage per 1000 RPM (analog device), counts per revolution (digital device);	Speed Feedback Device Nameplate
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 6 SERVICE AND MAINTENANCE

Because of its solid state design, the 590SP Digital drive 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.

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

Perform regular preventive maintenance every six months to ensure long life and peak performance of the 590SP. 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.

Maintenance Procedure

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, B1 through B9 and C1 through C9) 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 the tightness of the feedback receiver card connections, if used.
 - c. 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 consists of five distinct parts:

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

An assembly diagram is shown in Figure 6.1. 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.

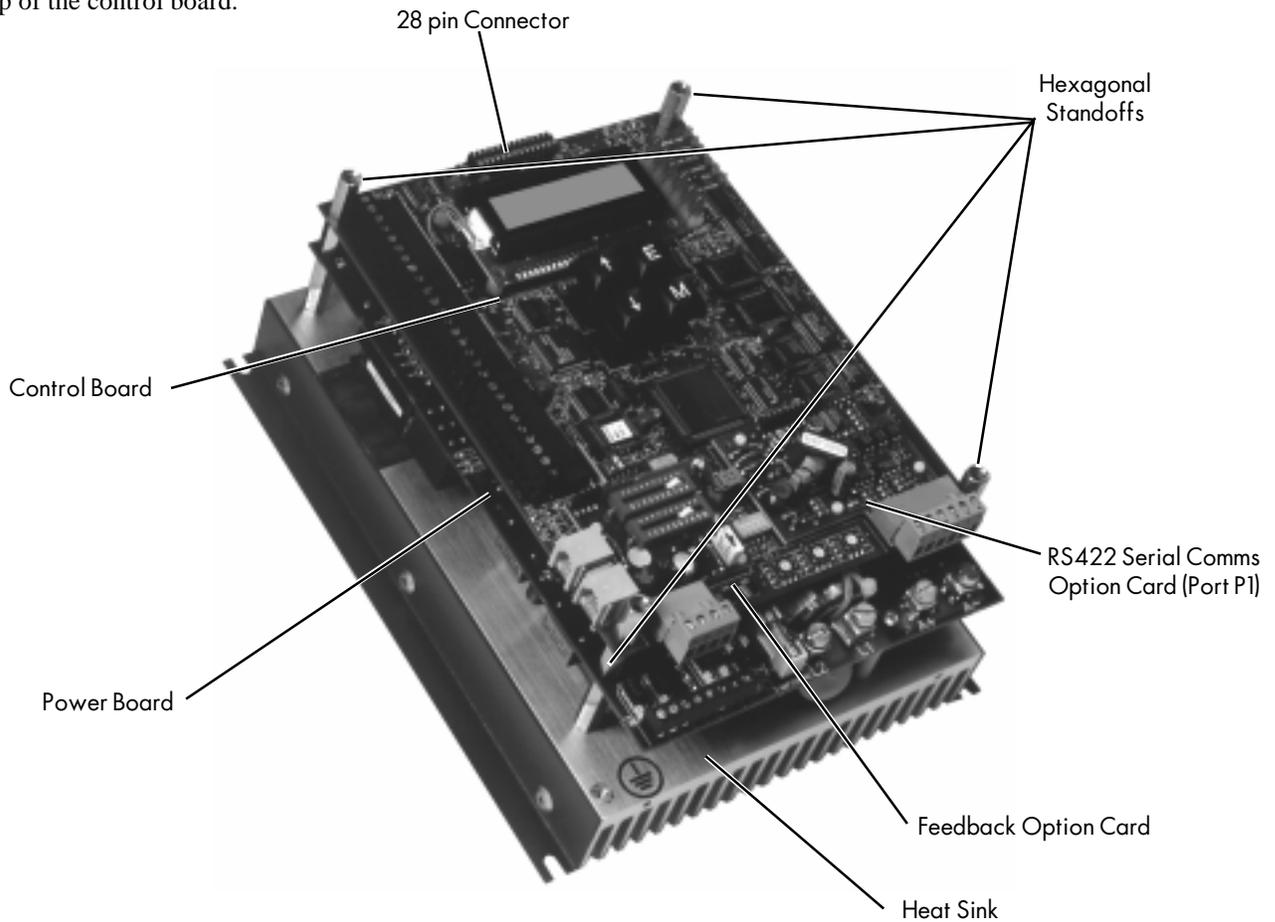


Figure 6.1 - 590SP Assembly Diagram

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 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 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. Isolate the 590SP 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 6.3). 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 8.2 and 8.3). 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.

Replacing Thyristors

NOTE. Before attempting to replace an SCR, perform the SCR troubleshooting procedure in Chapter 7 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, rethread 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 6.4). 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.

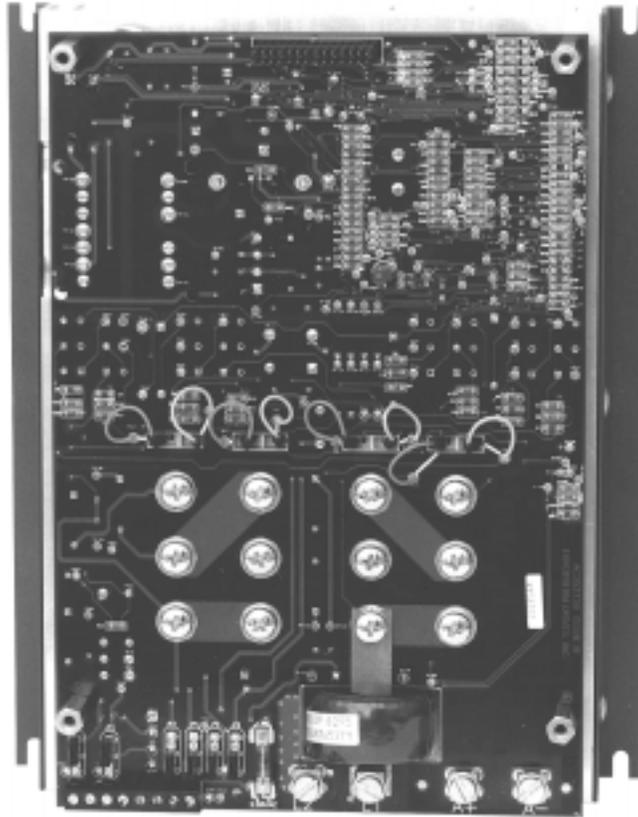


Figure 6.2 - Replacing the Power Board

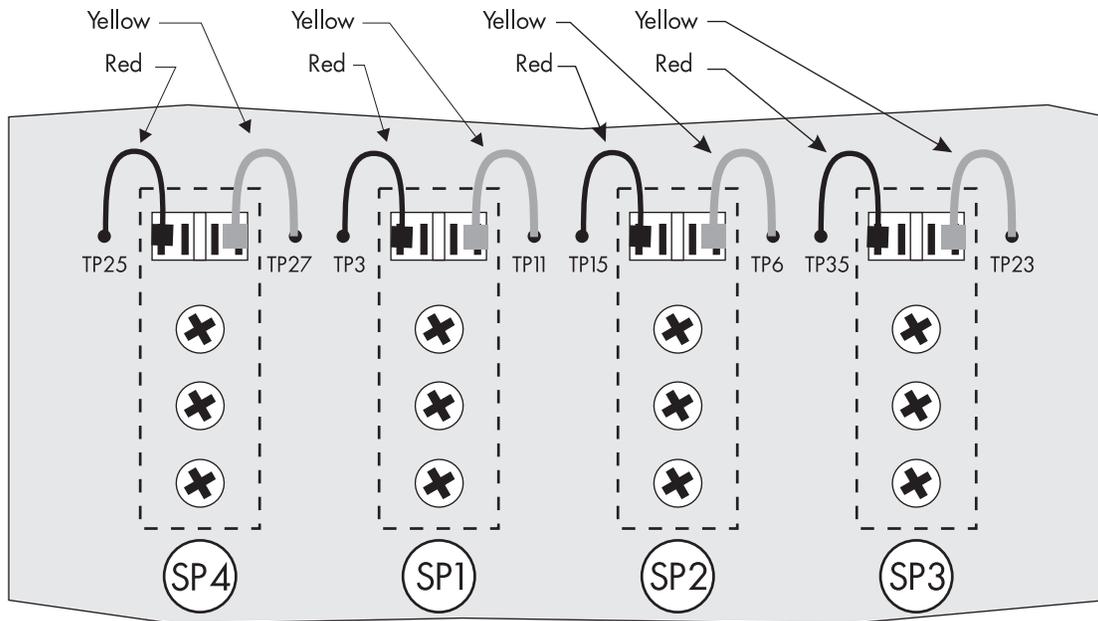


Figure 6.3 - SCR Gate Lead Terminal Connections

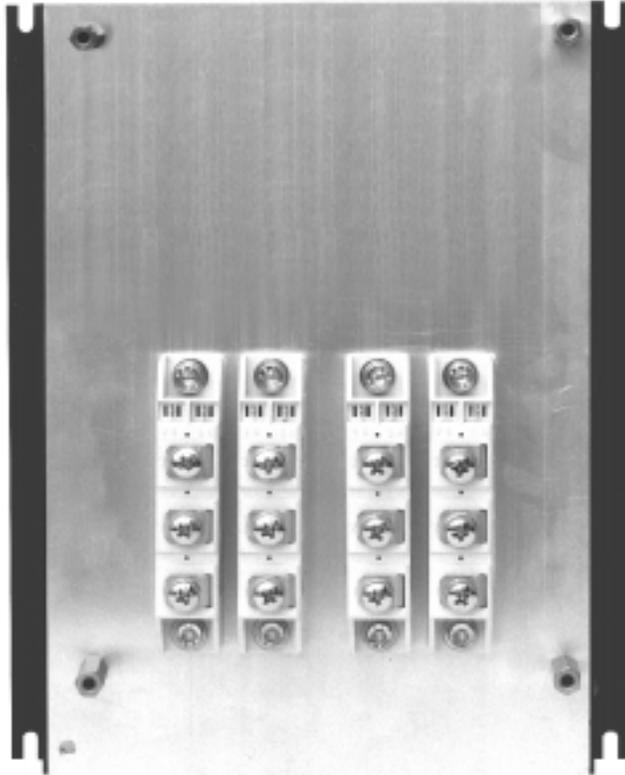


Figure 6.4 - Replacing the SCR Packs

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 Digital drive has features not available on the standard model. Refer to Appendix L for DRV specifications.

CONTROL CIRCUITS

Control circuitry is fully isolated from main power supply. A 16-bit microprocessor performs the majority of the control functions in the 590SP. External digital and analog I/O terminal communicate directly with the drive microprocessor. RS422 serial communication which provides access to all drive parameters for computer interfacing is available as an option.

Functions performed by the drive's microprocessor include:

- Current and speed loop processing
- Alarm recognition and first fault indication
- MMI display and keypad
- LED diagnostics
- Thyristor firing algorithms
- RS422 communication via intelligent peripherals (P1 and P2 ports)
- RS232 communication (P3 port)
- Speed and Current loop signal processing and setpoint summing and scaling.
- Digital to analog output via 10/12 bit D/A convertor
- Analog to digital conversion

POWER CIRCUITS

The 590SP provides DC armature control by either a fully regenerative (four quadrant), two-pulse thyristor bridge or a non-regenerative (two quadrant), 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 quadrant 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 Action	Fully Digital Fully isolated from power circuitry Software configurable through Man Machine Interface (MMI) or through independent Windows™ compatible software package ConfigEd Lite 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 Process PID for loadcell or dancer position control Winder control blocks Noncontrolled rectified field supply
Speed Control	Armature feedback with IR compensation (standard with each drive) Analog tachometer generator feedback option 5701 Microtach fiber optic encoder (plastic) feedback option 5901 Microtach fiber optic encoder (glass) feedback option Wire-ended electrical encoder feedback option

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 (Man Machine Interface) or through independent Windows™ software package ConfigEd Lite. RS422 serial communications is also available as an option.
Calibration	Drive normalized to motor ratings through voltage and current switch settings. Analog speed feedback scaled through switch settable calibration board with direct-read slide switches. (Refer to Chapter 3 for switch settings.) Fine tuning performed within drive software.
Protection	All models require external branch circuit protection
	DRV models: on board circuit breaker
	DC loop contactor (DRV models only)
	N/C DB pole (DRV models only)
	dV/dT protection (snubbers)
	High energy MOVs
	Overcurrent (instantaneous) alarm
	Overcurrent (inverse time— adjustable)
	Speed feedback failure alarm
	Motor overvoltage alarm
	Motor overspeed alarm
	Motor over temperature alarm
	SCR gate trigger failure
Motor stall detection alarm	
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 optional RS422 serial communications interface
	LED status indication.

SPECIFICATIONS

Storage and Operating Environment

Operating	Temperature 0 to 55°C (32 to 131°F). Derate linearly at 1% per degree Celsius above 45°C (113°F) 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, noncondensing, noncorrosive

Electrical Ratings

Protection	The armature bridge has electronic protection at 200 percent of full load current for 10 seconds, 150 percent 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, $\pm 10\%$ Power Supply Current: $(1.4 \times \text{calibrated DC armature current})$ 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, $\pm 10\%$ no special tapping required Primary Protection fuse: 3 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
Noncontrolled Field Rectifier Circuit	INPUT: 300 VAC Maximum OUTPUT: $0.90 \times \text{AC supply volts}$ (full-wave configuration) $0.45 \times \text{AC supply volts}$ (half-wave configuration). Maximum Loading: 3 amps DC (unfused)
Signal Resolution	10 bits (± 0.0001 accuracy)
Thyristor I ² t 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. Add up all the loads on the auxiliary supply to ensure that power demand is within the output specifications. If the demand exceeds the output capacity, add an auxiliary power supply to the system.

DC supply loading	5701 Microtach encoder and receiver option board	1.8 W or 75 mA	
	Electrical encoder and receiver option board	1.8 W or 75 mA	
	Serial link option board	1.0 W or 40 mA	
	Signal relay, typical	1.2 W or 50 mA	
	5702/1 repeater	1.2 W or 50 mA	
	5702/2 terminal rail repeater	1.2 W or 50 mA	
	5702/3 encoder to fiber optic converter	1.2 W or 50 mA	
	5702/5 splitter	1.8 W or 75 mA	
	5702/6 marker pulse repeater	1.2 W or 50 mA	
	5703/1 and 5703/2 Peer-to-peer communications option	1.7 W or 70 mA	
	<i>Sample configuration</i>	5701 Microtach encoder and receiver option board	1.8 W or 75 mA
		Serial link option board	1.0 W or 40 mA
		2 Signal relays	2.4 W or 100 mA
Total		5.2 W or 215 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	Motor HP
90VDC	0.25	4	180VDC	0.25
	0.33	5.2		0.33
	0.5	6.8		0.5
	0.75	9.6		0.75
	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 mm²) 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 mm²) to screw terminals; requires spade terminals for M5 screws, Terminal Rating: 40 amps, maximum.

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 - Auxiliary Control Jumpers

HARDWARE BLOCK DIAGRAM

Refer to the diagrams on the inside front cover for the 590SP and 590SP DRV digital drive terminal blocks and connections.

590SP SOFTWARE BLOCK DIAGRAM

A drawing of the drive software block diagram is printed on the manual's inside front cover. A more detailed diagram appears in the fold out drawing at the end of Appendix D. See Appendix C and Appendix M for a detailed description of each software block. Refer to Appendix D for instruction on configuring software within the drive through the MMI. You may also configure the drive using a personal computer with the Windows™ compatible software package ConfigEd Lite through the serial port P3.

RS422 COMMUNICATIONS

The 590SP has two RS422 communications ports:

1. P1, an optional, isolated main port. P1 interfaces through a separately ordered and mounted board (part no. AH385826U001) and enables the controller to communicate with a host computer or PLC. It offers the following features:
 - Serial communications multi-dropping permits connecting up to sixteen drives or devices to one computer serial port. Because most computers include a RS232 serial port, you must convert RS422 drive protocol to RS232 using a D240 Communications Converter Module (SD350549) available from Eurotherm Drives.
 - A bussed, digital wiring system replaces multi-wire analog cabling and reduces cable costs.
 - Digital transmission is less noise-prone than analog signals and improves data transmission accuracy. Using intelligent devices at either end of the serial link allows signal error checking, which virtually eliminates electrical noise induced data errors.
2. P2, a non-isolated, auxiliary port. P2 is integrated into the control board and allows the drive to communicate with other Eurotherm products *only*. Communication through a common buss and protocol assures compatibility with Eurotherm temperature and process controllers, supervisors, data loggers and other drives. Use the isolated P1 port for serial communications with other products.

Both ports include hardware to provide balanced line driver and receiver signal levels and provide full system support using the Eurotherm Drives bisynchronous communications protocol. This protocol is discussed more fully in Appendix H.

RS232 COMMUNICATIONS

The 590SP also has a RS232 serial communications port, system port (P3), which is integrated into the control board and allows uploading and downloading of drive configurations to and from a remote location using a personal computer (PC). You can also transfer, modify and save drive configurations with a PC running the Windows™ compatible software package ConfigEd Lite through this port. Refer to Appendix G for further information and the ConfigEd Lite manual, RG352747.

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 ground
A2	Analog input 1	Speed setpoint
A3	Analog input 2	Auxiliary speed setpoint/current demand
A4	Analog input 3	Ramped speed setpoint
A5	Analog input 4	Negative auxiliary current clamp
A6	Analog input 5	Main current limit/auxiliary current clamp pos.
A7	Analog output 1	Buffered speed feedback
A8	Analog output 2	Total speed setpoint/current demand
A9	Current meter output	Buffered current output
B1	0v	Signal ground
B2	No connection	Do <i>not</i> use as a connection point
B3	+10 VDC reference	External +10v reference
B4	-10 VDC reference	External -10v reference
B5	Digital output 1	Zero speed output
B6	Digital output 2	Drive healthy
B7	Digital output 3	Drive ready
B8	Program stop input	Controlled ramp stop
B9	Coast stop input	Coast stop
C1	0v	+24 VDC power ground
C2	Thermistor input	Motor temperature sensor
C3	Start/run input	Start/run
C4	Jog	Jog
C5	Enable input	Enable
C6	Digital input 1	Current clamp selection
C7	Digital input 2	Ramp hold
C8	Digital input 3	Current demand
C9	+24 VDC 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 supply external power to the drive's universal supply control transformer. Change jumpers JP5 and JP6 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
A+	Armature +	Motor connection for armature, positive
A-	Armature -	Motor connection for armature, negative
DB+	Dynamic Brake +	Dynamic Brake connection, positive (DRV units only)
F+	F+	Motor connection for field, positive (DRV units only)
F-	F-	Motor connection for field, negative (DRV units only)
G	Ground, supply	Ground connection for input supply
G	Ground, motor	Ground connection for motor ground (DRV units only)
L1	Line 1	input supply - single phase line
L2	Line 2	input supply - single phase neutral
1	M contact	Normally open auxiliary contact (DRV units only)
2	M contact	Normally open auxiliary contact (DRV units only)

TERMINAL SPECIFICATIONS

The following sections list the specifications for the input and output terminals.

Analog Input and Output Terminals

Resolution	10 bits plus sign; i.e. 10mV 0.1% of full scale deflection
Input Impedance	100k Ω with a 1 ms filter for terminal A3 and a 2 ms filter for the other terminals.
Maximum Input Sample Rate	5 ms; 3 ms for terminal A3
Input Overload Capability	+10% (11 VDC for terminal B2)
Output Capacity	10 VDC at 5 mA; Short circuit protected.
Output Update Rate	5 ms
Output Overdrive Capability	10% (11 VDC)

Digital Input Terminals

Input Voltage	+24 VDC (nominal); +30 VDC maximum
Input Impedance	4.7 k Ω
Sample Time	5 ms
Threshold	16 VDC (typical)
Input Voltage Low	< 6 VDC
Input Voltage High	> 18 VDC

Digital Output Terminals

Output Voltage	+24 VDC
Output Current	+50 mA maximum (Source)
Output Update Rate	5 ms
Output Impedance	Negligible up to 50 mA; NOT short circuit protected.

The terminals are active high and source current from the terminal to the load. The load must be connected between the output and the signal ground. A "free-wheel" diode is included in the output to protect the output transistor when switching inductive loads such as relays.

TERMINAL DESCRIPTIONS

A1/0V (Signal)

This terminal is the zero VDC reference for signals only, i.e., signals originating from terminal blocks A and B. It must *not* be used as a return point for currents originating from terminal block C.

A2/Analog Input 1

This terminal is the speed setpoint.

A3/Analog Input 2

This terminal serves as either the AUXILIARY SPEED SETPOINT or CURRENT DEMAND, as determined by the configuration of DIGITAL INPUT 3 at terminal C8. If C8 is an open circuit, the function is speed setpoint; if C8 is at +24v, the function is current demand. This input is hardwired and not software configurable.

A4/Analog Input 3

This terminal is the RAMPED SPEED SETPOINT.

A5/Analog Input 4

This terminal is the negative current clamp (see analog input 5, below).

A6/Analog Input 5

This terminal serves as either the MAIN CURRENT LIMIT or the POSITIVE CURRENT CLAMP, as determined by the configuration of DIGITAL INPUT 1 on terminal C6. If C6 is an open circuit, ANALOG INPUT 5 is the MAIN CURRENT LIMIT; if terminal C6 is at +24v, ANALOG INPUT 5 is the POSITIVE CURRENT CLAMP and ANALOG INPUT 4 is the NEGATIVE CURRENT CLAMP.

A7/Analog Output 1

This terminal is the SPEED FEEDBACK OUTPUT.

A8/Analog Output 2

This terminal is the TOTAL SPEED FEEDBACK.

A9/Current Meter Output

This terminal carries the BUFFERED ARMATURE CURRENT FEEDBACK, in either bipolar or unipolar form, as set with the SETUP PARAMETERS, CALIBRATION, ARMATURE I (A9) parameter with the MMI. The default output is ± 10 VDC equals $\pm 200\%$. This output is hardwired and not software configurable.

B1/0V (Signal)

This terminal is the ZERO VOLT REFERENCE for an analog tachometer generator signal only.

B2/Analog Tachometer Generator Input

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

B3/+10V Reference

This terminal is for the positive reference supply.

B4/-10V Reference

This terminal is for the negative reference supply.

B5/Digital Output 1

This terminal serves as the connection for ZERO SPEED detection, and provides +24V when at ZERO SPEED. It can be modified with the MMI using the SETUP PARAMETERS, STANDSTILL, ZERO THRESHLD parameter.

B6/Digital Speed Output 2

This terminal provides a latched +24 VDC signal for the DRIVE HEALTHY condition signal. DRIVE HEALTHY is TRUE whenever there are no software or hardware alarms present. It is reset when the RUN signal is removed from C3.

B7/Digital Output 3

This terminal provides a +24 VDC signal for the DRIVE READY message. DRIVE READY is TRUE whenever there are no software or hardware alarms present.

B8/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; when it is at zero volts or is an open circuit, the controller causes a controlled (or program) stop as defined in the SETUP PARAMETERS::STOP RATES parameters.

NOTE. Non-regenerative drives cannot perform program stops; they will instead coast to a stop.

B9/Coast Stop

This terminal is for uncontrolled stop input. When the COAST STOP input is at +24 VDC, the drive operates normally. When it is at zero volts or is an open circuit, the main contactor is open, the drive is not enabled (see description for terminal C5), and the motor coasts to a stop.

C1/0v (Power Common)

This terminal is the control and relay common. It is not connected to ground.

C2/Thermistor

This terminal is for motor over-temperature protection input. DC motors should be protected against sustained thermal overloads by fitting temperature-sensitive resistors or switches. Sensors should be connected in series between terminals C1 and C2. If the optional blower motor starter is installed, the auxiliary contact should also be connected in series with the sensors. Terminals C1 and C2 must be linked if over-temperature sensors are not used.

C3/Start/Run

This terminal is for the START/RUN input. When a +24V input is applied to this terminal, the controller will operate as long as there are no alarms, the PROGRAM STOP and COAST STOP signals are **true** (at +24 VDC), and the controller is enabled. When the input is removed, The drive stops in the time set by STOP TIME in SETUP PARAMETERS::STOP RATES.

C4/Jog

This terminal is for JOG/SLACK SPEED CONTROL. When a +24V signal is at this terminal and a 0 VDC signal is at terminal C3, the drive jogs. When the +24V is removed, the drive ramps to zero speed.

C5/Enable

This terminal inhibits controller operation electronically. If the enable input is at zero volts or open circuited, all control loops will be inhibited and the controller will not generate current. When switching power to the motor using a DC contactor, connect this terminal through an auxiliary, normally-opened contact on the contactor to C9 (+24 VDC). This terminal is internally connected to the auxiliary contact of the DC contactor on DRV models.

C6/Digital Input 1

This terminal selects the CURRENT CLAMP MODE. At zero volts, it sets ANALOG INPUT 5 (terminal A6) to be the main unipolar current limit. When ON (at +24V), ANALOG INPUT 5 is the POSITIVE CURRENT CLAMP and ANALOG INPUT 4 is the NEGATIVE CURRENT CLAMP.

C7/Digital Input 2

This terminal is for the RAMP HOLD signal. If the input is held ON (+24V), the RAMP GENERATOR OUTPUT is frozen at the last value regardless of the ramped setpoint input. When OFF (0V), the ramp output follows the RAMPED SETPOINT INPUT at the rate or change determined by the acceleration, deceleration ramp time, and "S-ramp" parameters.

C8/Digital Input 3

This terminal is the CURRENT DEMAND ISOLATE, which changes the drive operation from speed control to current control. When DIGITAL INPUT 3 is ON (+24V), ANALOG INPUT 2 provides the current demand and the speed loop is disconnected; when OFF (0V), the speed loop is in control and ANALOG INPUT 2 is an auxiliary speed setpoint.

C9/+24 VDC Supply

This terminal is for current output, which can be used to activate the DIGITAL INPUT, PROGRAM STOP, and COAST STOP terminals, and other +24 VDC devices. It has a maximum output of 700mA for a single board power supply.

NOTE: The load on terminal C9 combined with the other +24V loads must not exceed 700mA. See the Electrical Ratings information earlier in this appendix.

D1, D2/External AC Field Supply

The field bridge 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: 300 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: 250 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 JP3 and JP4 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 Auxiliary Supply

These terminals allow control power to be applied externally to the drive when the main supply exceeds 240 VAC. Move jumpers JP5 and JP6 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.

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.

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.

FEEDBACK OPTION CARDS

Both the standard and DRV models of the 590SP Digital drive are 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)

Recommended Spare Parts

Keep only one tachometer generator feedback card as a spare.

Installation Information

Figure A.3 shows a close up of the card. Terminal connections are also shown.

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:

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

This rating should be on the nameplate of the tachometer generator. Fine tuning is performed within the software (refer to the Calibrate Speed Feedback 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.

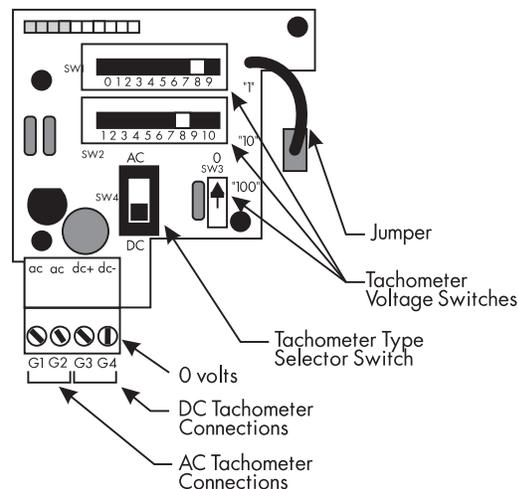


Figure A.3 - Switchable Analog Tachometer Feedback Card

5701 (plastic fiber optic) Microtach Receiver Card (AH058654U001)

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

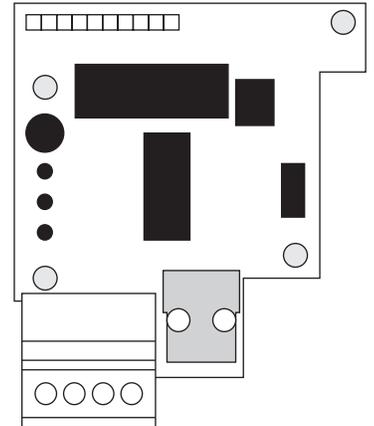


Figure A.4 - 5701 Microtach Receiver Card

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	CM059748U050	Composite plastic fiber optic cable (50 meters, 164 ft.)
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

Related 5701 Microtach Parts	
Part Number	Description
CM059748U050	Plastic composite fiber optic cable (50 meters, 164 ft.)
CM059748U150	Plastic composite fiber optic cable (150 meters, 492 ft.)
CM059748U200	Plastic composite fiber optic cable (200 meters, 656 ft.)
CM059748U300	Plastic composite fiber optic cable (300 meters, 984 ft.)
5401/1	Plastic fiber optic microtach repeater (NEMA 4)
5401/2	Plastic fiber optic microtach repeater (DIN rail mount)

NOTE. The 5701 Microtach encoder is limited to 130 feet (40 meters) transmission distance without a repeater

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.

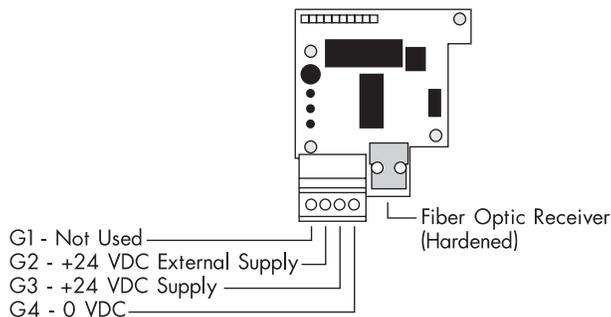


Figure A.5 - Terminal Designations for 5701 Microtach Receiver Card

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.5) if the controller +24 VDC supply is at capacity and unable to provide sufficient power.

Figure A.6 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.

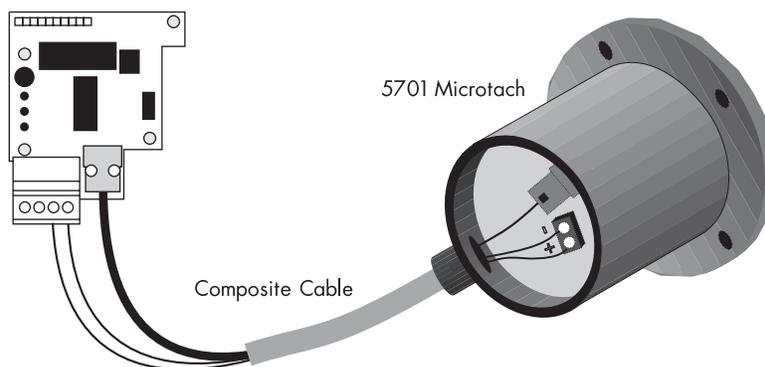


Figure A.6 - Connecting the 5701 Microtach to the 5701 Microtach Receiver Card

5901 (Glass) 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:

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.

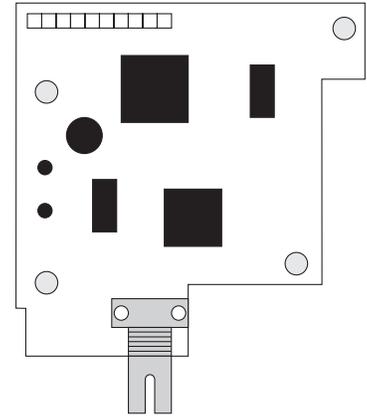


Figure A.7 - 5901 Microtach Receiver Card

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	Glass fiber optic microtach receiver board
6	CI352599	230 Micron glass ST crimp-cleave connector
6	CI352673	Cable anchor for 230 micron glass ST crimp-cl
6	CI352674	Crimp sleeve for 230 micron glass ST crimp-cl
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 encoder

NOTE. The 5901 glass fiber optic Microtach requires a glass fiber optic type ST termination kit for cutting, polishing and terminating either end of the glass fiber optic 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.

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.)

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.9 shows the Microtach receiver connected to the 5901 Microtach. The power terminals in the encoder are marked '+' and '-'.

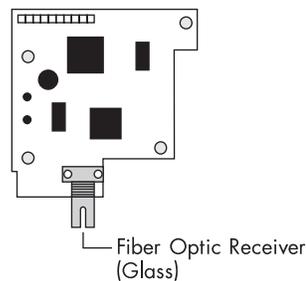


Figure A.8 - Terminal Designations for 5901 Microtach Receiver Card

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.

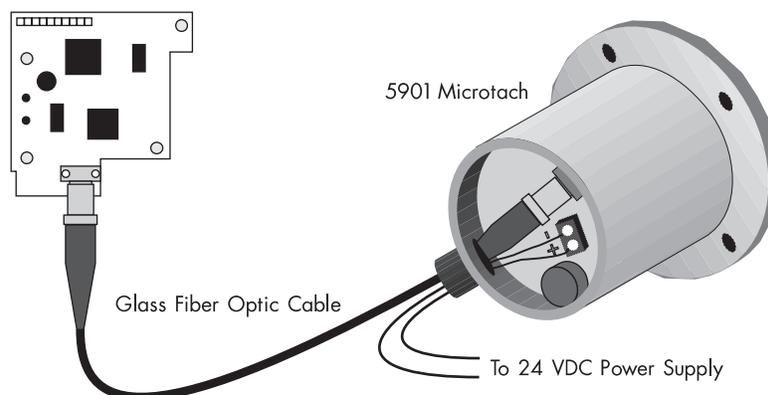


Figure A.9 - Connecting the 5901 Microtach to the 5901 Microtach Receiver Card

Electrical Encoder Receiver Card (AH387775Uxxx)

The 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.

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 PCB
AH387775U012	+12 VDC encoder receiver option PCB
AH387775U015	+15 VDC encoder receiver option PCB
AH387775U024	+24 VDC encoder receiver option PCB

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.

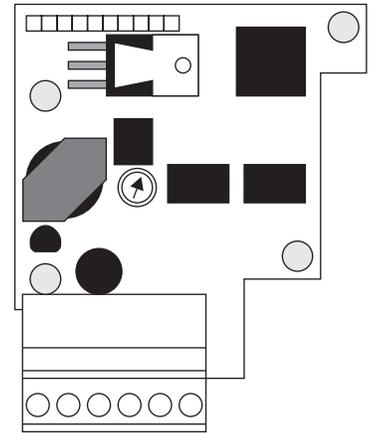


Figure A.10 - Encoder Receiver Card

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.11.
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.

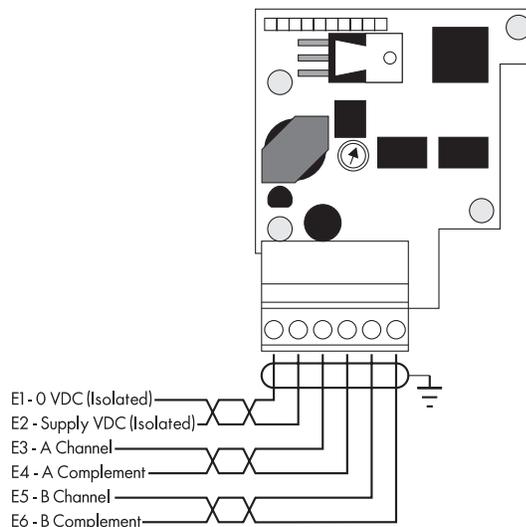


Figure A.11 - Encoder Receiver Card Terminal Designations

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.11.
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.12 - 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.13 - 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.14 - Dynapar Encoder Terminal Designations

Appendix B USING THE MAN MACHINE INTERFACE

DEFINITION & SCOPE

The Man Machine Interface (MMI) is the primary tool for communicating with the 590SP Digital drive. It allows the user to custom configure the drive, tune it for optimal performance and monitor its operation and diagnostic points.

The 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.

NOTE. You can also configure drive parameters with a personal computer using the Windows™ compatible software package ConfigEd Lite through serial port P3, or monitor and adjust parameters with a PC using the RS422 serial interface option through serial port P1.

USING THE MMI

The display of the MMI has a 2-line, 16-character liquid crystal readout designed to provide clear and simple feedback 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.

The `MENU::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 `MENU::LANGUAGE` to the other selection.

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. |

SOFTWARE OVERVIEW

A trained technician can adjust the drive using the MMI to tune motor performance and create configurations custom suited to the user's application. Appendix C discusses the parameters used to tune the drive. Appendix D shows the methods and techniques for configuring the internal connections, electronically changing control paths.

MMI Menu Structure

The menu tree structure of the MMI display has been designed to allow non-expert users to read and set parameters controlling the drive with a minimum of work and potential for confusion.

The core of the system is MENU LEVEL which contains the eight functional areas of the controller. The following list 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 status of the controller. (See Chapter 5, Troubleshooting.)
Set Up Parameters	Parameters for calibrating and tuning the controller to the application. (Refer to Appendix C, Setup Parameters.)
Password	Allows the user to set up password protection for the drive configuration. (See Chapter 4, Start-up and Adjustment.)
Alarm Status	Contains parameters for monitoring the fault status of the controller. (Refer to Chapter 5, Troubleshooting.)
Menus	Settings for changing 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, Start-up and Adjustment.)
Serial Links	Configures the RS232 and RS422 serial ports. (See Appendix H, Serial Communications.)
System	Contains the parameters for configuring the input and output terminals and internal connections. (See Appendix D, I/O Configuration.) This sub-menu also displays the firmware issue level and contains menus reserved for advanced drive troubleshooting. These advanced menus are available only in a restricted password mode. Only qualified Eurotherm Drives service personnel have access to these menus. SYSTEM also contains the miniLINK setup menu. Newer issue 590SP firmware has superceded most miniLINK functions. Refer to the appropriate miniLINK manual for miniLINK documentation.

Figure B.1 shows the complete MMI menu structure. When using the figure, the M key moves to the right, E moves to the left, and ▲ and ▼ move up and down the menu lists. The complete menu structure for the MMI is often not needed for most applications. To simplify your work with the MMI, you can use a reduced menu mode 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. MENU LEVEL is entered by pressing the M key from the default start up display. Pressing the ▲ key takes the user up through the categories in MENU LEVEL. To investigate the sub-menus, press the M key again.

Once at the appropriate 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. 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.

For 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

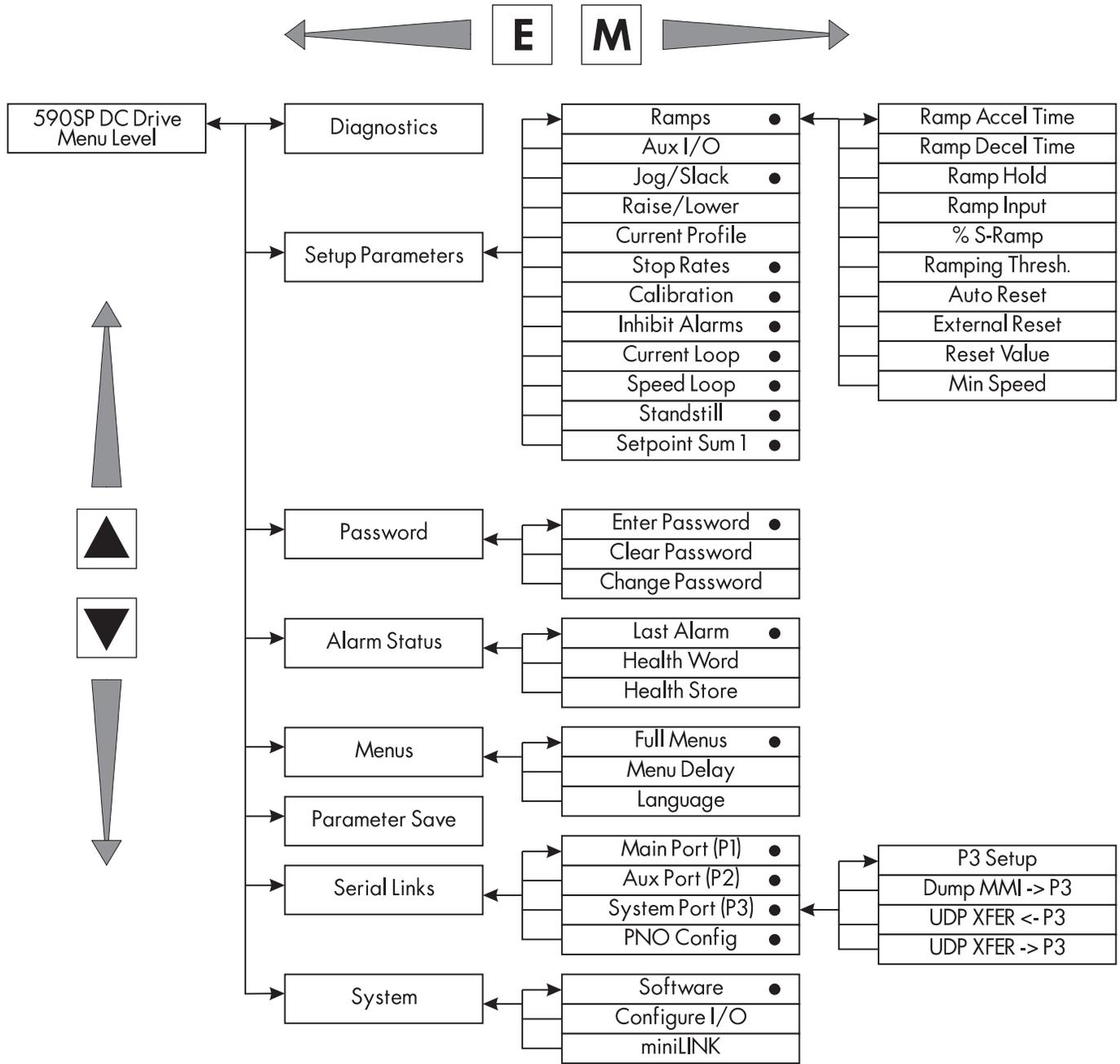
The 590SP is shipped with MMI settings that represent a common set of parameters for general use. These settings are listed in Appendix C. Use caution when modifying these settings to ensure the new settings are the most appropriate for your situation.

If you unintentionally change menu settings and cannot remember how to reset individual parameters, return all parameters to default by performing a four-button reset. To do so, hold down all four MMI buttons (M, E, ▲, ▼) while reapplying power to the drive. This restores the drive's default settings.

NOTE. These default settings do not match the "as-shipped" settings if Eurotherm Drives has modified the drive configuration at your request for your specific application.

WARNING!

If your 590SP was ordered with special features or configurations or you have entered non-default values in the MMI settings, a four-button reset will overwrite these settings. Before attempting to modify existing parameter settings, record them in this manual so you can reenter them later, if necessary. Or, upload the drive configuration as an ASCII file through the drive's P3 port using a personal computer. You may also update your configuration using the ConfigEd Lite software package.



● Displayed when FULL MENU is DISABLED.

Figure B.1 - Basic Menu Tree



Appendix C SETUP PARAMETERS

The shipping configuration in the 590 DRV Digital drive allows the user to start up and run a DC motor in simple speed control. The power of the 590SP, however, is its configurability and its ability to be tuned for optimum performance or for a specific control application. The parameters which are most frequently adjusted for tuning and performance are in the SETUP PARAMETERS MMI menu. They are categorized by sub-menus. Each sub-menu acts as a function block within the drive's overall software block diagram which processes logic signals and speed or current input signals.

This chapter describes the functionality of *all* the drive's parameters within SETUP PARAMETERS. The SPECIAL BLOCKS menu is not described in this chapter. Refer to Appendix M for descriptions of the SPECIAL BLOCKS function blocks and special application notes.

You can adjust the drive's parameter settings either through the MMI under the SETUP PARAMETERS sub-menu or by using a personal computer (PC) running the software package ConfigEd Lite (see the ConfigEd Lite Software Manual RG352747). You can also configure the drive— or connect and reconnect signals between drive function blocks and I/O terminals— either through the MMI or with a PC. For software configuration through the MMI, refer to Appendix D.

This chapter is arranged in the order the sub-menus, or function blocks, appear in the MMI. Each section contains a description of the function block's parameters, a schematic block diagram and a table listing all the block's parameters, a description of each parameter and the parameter's signal range and "as shipped" default value. The configuration tag number corresponding to each drive parameter also appears in the table. In addition, each section includes a drawing illustrating how to access the parameter function block through the MMI. Additional information, such as timing diagrams, follow the block diagram.

NOTE. The inside front cover contains a full drawing showing how all the drive's function blocks process input, output and control signals and how each block interfaces with the drive's overall control. A more detailed software block diagram appears in the fold-out drawing at the end of Appendix D.

Appendix I list all the drive's parameters by tag number. Appendix J presents the same table in menu order and Appendix K lists the parameters alphabetically.

Figure C.1 shows how to access the RAMPS function block through the MMI. Upon power-up, the MMI displays the software version and then the message shown at the top of the illustration. Pressing the "M" key changes the display to read the next block down. The ▼ key changes the menu location from DIAGNOSTICS to SETUP PARAMETERS. Pressing "M" again brings the display to the RAMPS menu. To change or monitor any of the RAMPS parameters, press "M", then press ▲ or ▼ to scroll through the RAMPS menu parameters.

The drive's parameters and function block inputs and outputs are defined as either a percentage if they are continuous, or as boolean (1 or 0) if they are discrete. Depending on how the drive is configured, these parameters can represent physical entities such as motor speed or current. Tagging function block inputs or outputs to other software function blocks or to real world signals defines what the function block inputs or outputs represent. For example, the output from RAISE/LOWER can represent current demand if sent to the current loop or a speed setpoint if sent to the speed loop.

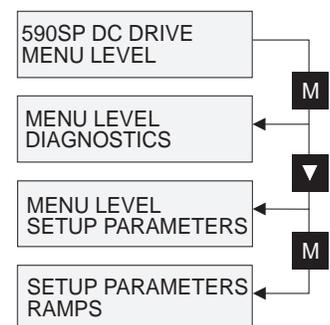
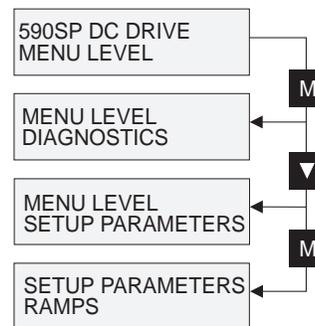


Figure C.1 - Sample MMI Path

RAMPS

The RAMPS parameters set the shape and duration of the ramp used for starting and changing speeds. The STOP RATES menu contains a separate deceleration rate for controlled stopping of the drive.

Note: This block is ignored by the drive unless SYSTEM:: CONFIGURE I/O:: BLOCK DIAGRAM:: RAMP O/P DEST is connected to a nonzero tag. The default connection is to tag 291.



Inputs and Outputs

The default inputs are ANALOG I/P 3 for a ramped speed input and DIGITAL I/P 2 for RAMP HOLD. The default output connection is to SETPOINT 3 in the speed loop.

The block has two outputs, RAMPING and RAMP OUTPUT.

Description

The input signal has a minimum speed clamp. MIN SPEED sets the minimum ramp input speed when the drive is enabled.

RAMP INPUT is routed to the JOG/SLACK block to be modified as determined by the JOG inputs. The S/Linear ramp block shapes the signal to produce the RAMP OUTPUT signal.

The RAMPING output becomes TRUE when the absolute value of the difference between RAMP OUTPUT and the JOG/SLACK block output exceeds RAMPING THRESH.

RAMP ACCEL TIME and RAMP DECEL TIME set the acceleration and deceleration times taken for input changes. %S RAMP adds a "S" shaped section to the linear ramp. When set to 0.00%, the ramp will be linear. As the percent is increased, up to 350 percent 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 parameters RAMP ACCEL TIME or RAMP DECEL TIME.

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

RAMP HOLD stops the ramp from changing. When DIGITAL I/P 2 is ON, the ramp stays at the last ramp value.

The reset signal can have two sources, a RUN signal or an external reset signal. When AUTO RESET is ENABLED, the ramp resets whenever a RUN signal is given at terminal C3. Connecting a digital input to EXTERNAL RESET allows an external source to reset the ramp.

Parameters

Tag	Parameter	Description	Range	Default
2	RAMP ACCEL TIME	Acceleration time for 100 percent change	0.1 - 600.0 Secs	10.0 Secs
3	RAMP DECEL TIME	Deceleration time for 100 percent change	0.1 - 600.0 Secs	10.0 Secs
118	RAMP HOLD	When ON, the ramp output is held at the last value. It is overridden by a ramp reset.	ON/OFF	OFF
5	RAMP INPUT	Input value	±100.00%	0.00%
266	%S RAMP	Percentage of the ramp with a S-shaped curve.	0.00 to 100.00%	2.50%
286	RAMPING THRESH.	Threshold used to determine whether the ramp is active.	0.00 - 100.00%	0.50%
287	AUTO RESET	When ENABLED, the ramp is reset whenever SYSTEM RESET is TRUE (tag 374), i.e. every time the drive is started	ENABLED/DISABLED	ENABLED
288	EXTERNAL RESET	When ENABLED, the ramp is reset to zero or RESET VALUE.	ENABLED/DISABLED	DISABLED
422	RESET VALUE	Ramp output value when the ramp is reset by an external reset. (When EXTERNAL RESET is ENABLED.)	±300.00%	0.00%
126	MIN SPEED	A bidirectional clamp connected directly to RAMP INPUT.	0.00 to 100.00%	0.00%

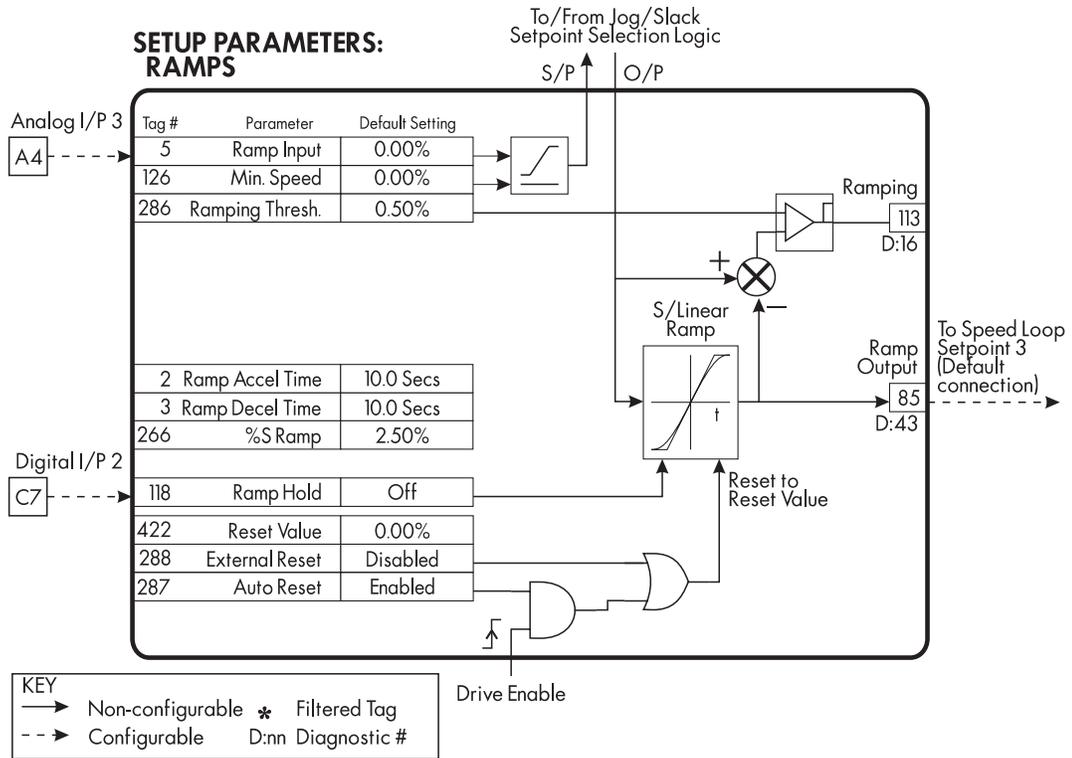


Figure C.2 - Ramps

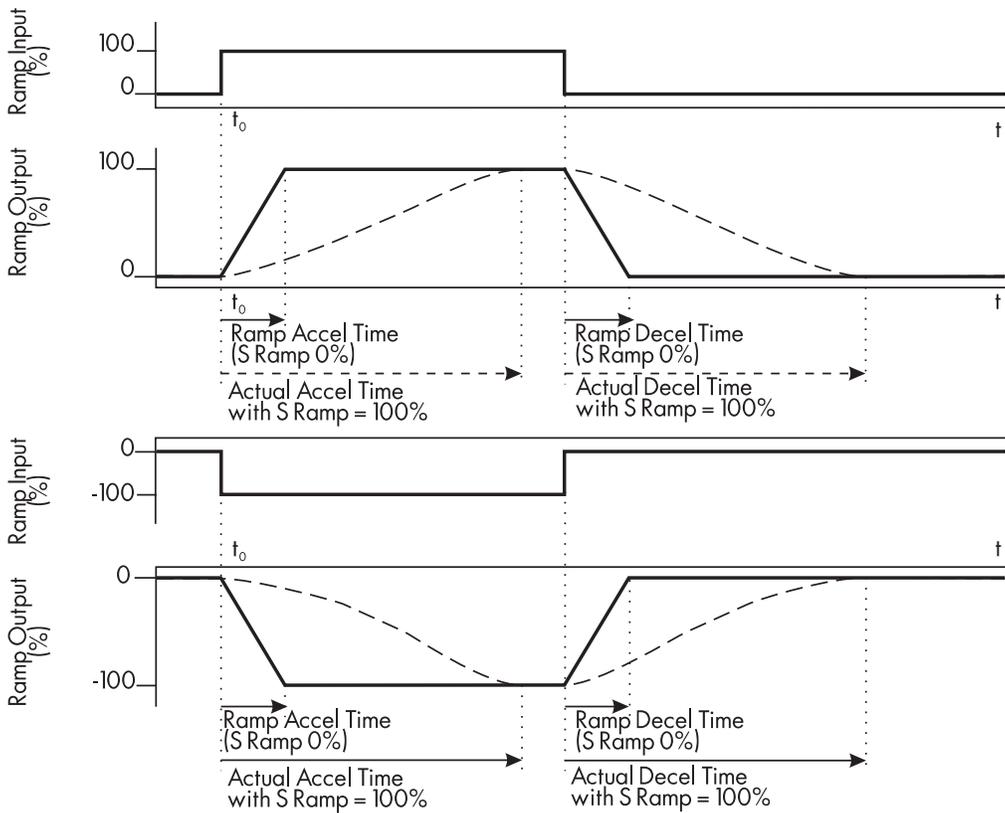


Figure C.3 - Ramp Accelerate and Decelerate Times

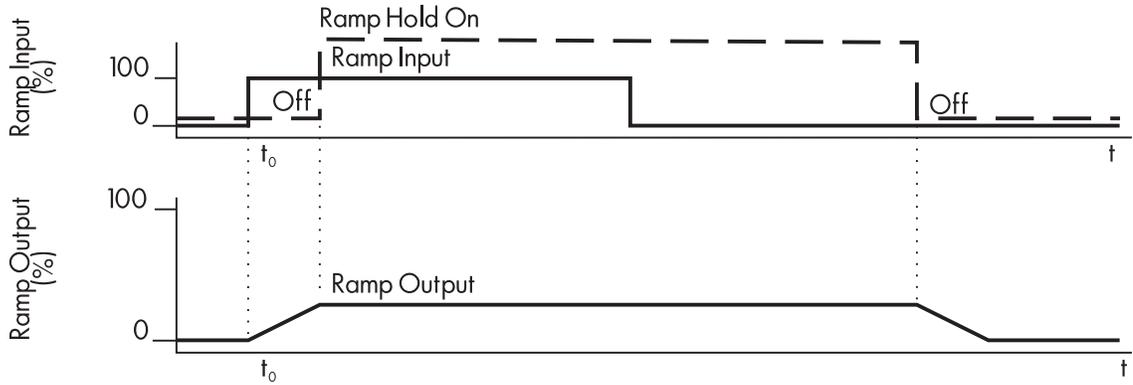


Figure C.4 - Ramp Hold

The ramp will function when a ramp input is present. When DIGITAL I/P 2 is ON, RAMP HOLD 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 is OFF, the ramp resumes.

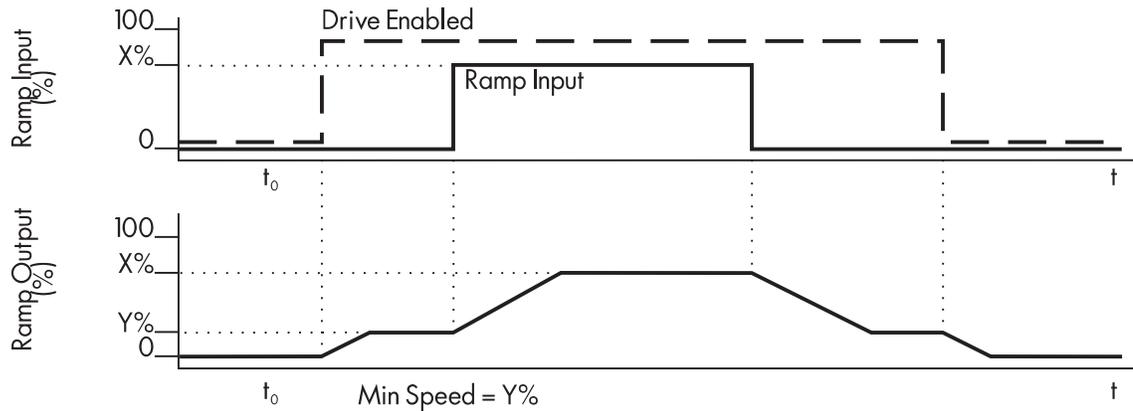


Figure C.5 - Minimum Speed

This figure shows the effect of setting MIN. SPEED above 0.00%. When the drive is enabled, the ramp output cannot fall below the value set by MIN. SPEED.

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

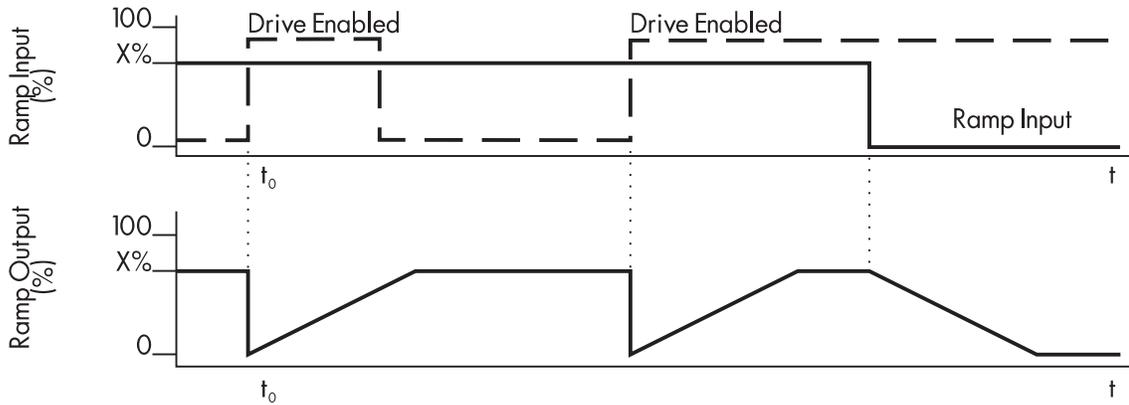


Figure C.6 - Auto Reset

When AUTO RESET is ENABLED, the ramp output resets to RESET VALUE each time the drive is enabled. In this example, RESET VALUE is 0.00%. It does not reset if the drive is disabled.

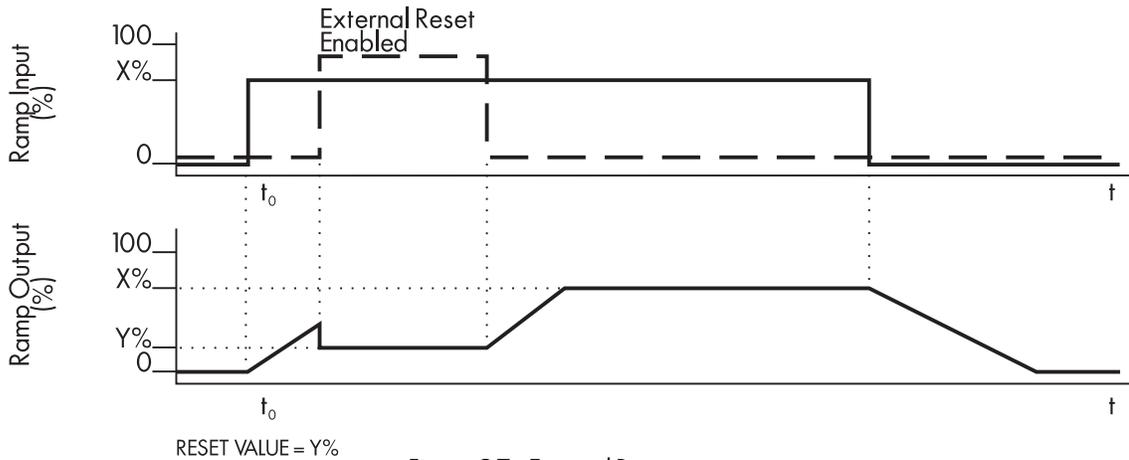


Figure C.7 - External Reset

The ramp input is set to X% at time t_0 . The ramp output will increase at the ramp rate. While EXTERNAL RESET is ENABLED, the ramp output resets to RESET VALUE. When EXTERNAL RESET is DISABLED, the ramp output continues to follow input signal.

AUX I/O

The AUX I/O parameters allow an external computer or PLC to access or control input and output terminals using serial communications (see Appendix H).

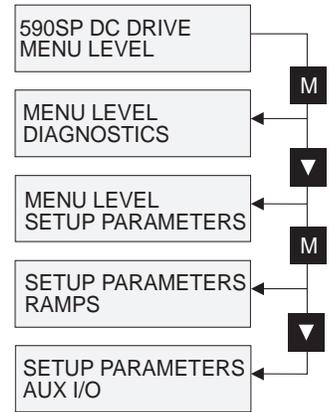
Inputs and Outputs

START, JOG, and ENABLE from digital input terminals C3, C4 and C5, respectively, connect directly to the AUX I/O block. Output signals are then sent to the drive start and drive enable logic and the JOG/SLACK function block.

Description

The external device sends its signal directly to the required tag (PNO). The auxiliary inputs for START, JOG, and ENABLE allow the normal terminal signal to be "ANDed" with a corresponding auxiliary signal from an external computer or PLC.

The remaining five auxiliary outputs allow external computers to directly control the output terminals. These connections are set in SYSTEM::CONFIGURE I/O.



Parameters

Tag	Parameter	Description	Range	Default
161	AUX START	Combined with START signal at terminal C3	ON/OFF	ON
227	AUX JOG	Combined with JOG signal at terminal C4	ON/OFF	ON
168	AUX ENABLE	Combined with ENABLE signal at terminal C5	ON/OFF	ON
94	AUX DIGOUT 1	Digital output 1	ON/OFF	OFF
95	AUX DIGOUT 2	Digital output 2	ON/OFF	OFF
96	AUX DIGOUT 3	Digital output 3	ON/OFF	OFF
128	ANOUT 1	Analog output 1	±100.00%	0.00%
129	ANOUT 2	Analog output 2	±100.00%	0.00%

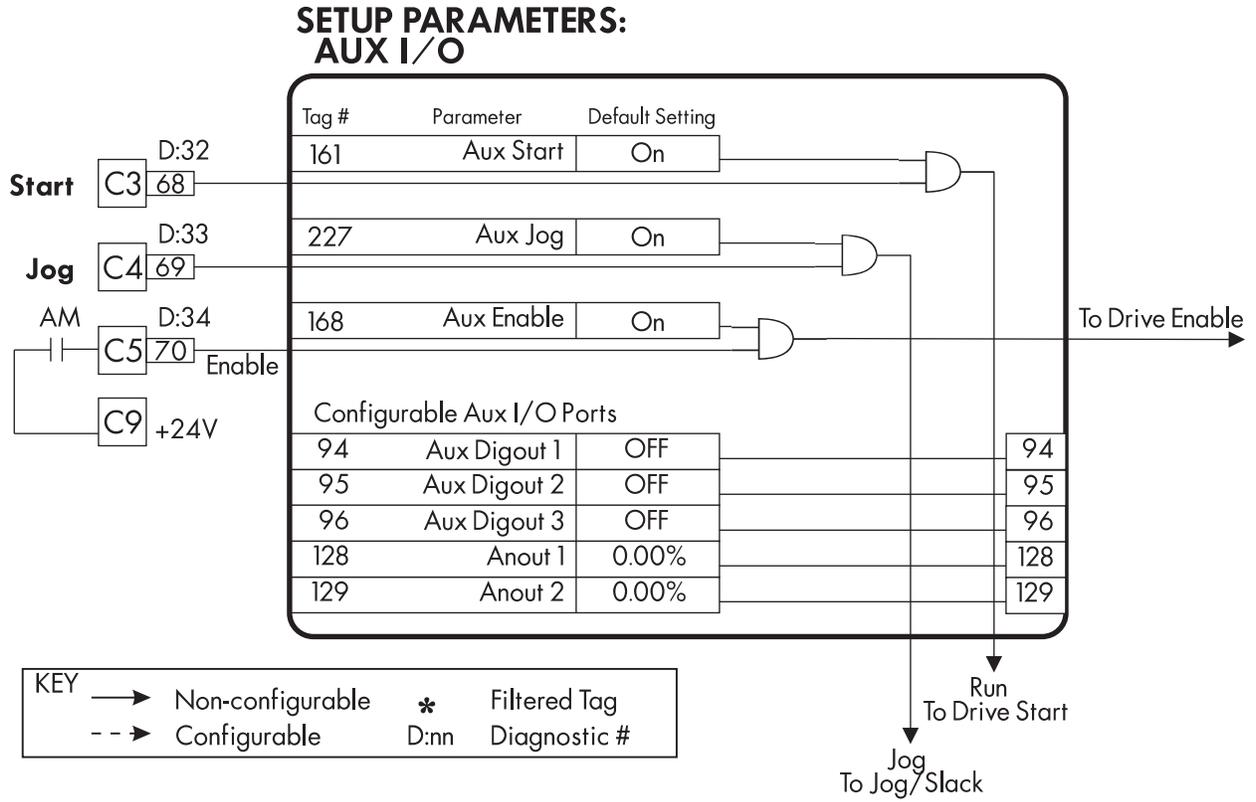


Figure C.8 - Aux I/O

JOG/SLACK

The JOG/SLACK parameters can modify or replace the ramp input speed demand to provide jog, take up slack and crawl speed functions. Use a spare digital input to switch between modes and achieve full functionality.

Inputs and Outputs

JOG/SLACK receive run and jog signals via AUX I/O and the speed demand from RAMPS. A mode input from an unused digital input terminal is optional. The output is connected to the S/Linear ramp in RAMPS.

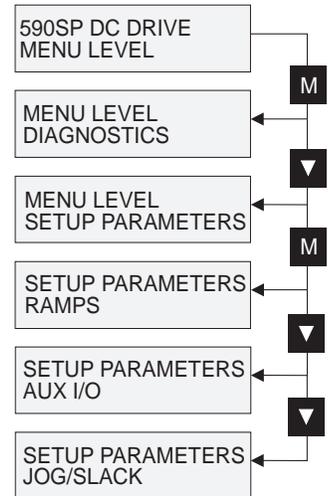
Description

The signal from RAMPS is modified as required by the MODE, JOG, and RUN settings. These settings are shown in the Setpoint Selection table in the block diagram.

When using the jog function and the RUN signal is OFF, then the jog speed demand replaces the input signal. MODE selects between jog setpoints 1 and 2. The jog RAMP RATE replaces the RAMP ACCEL TIME and RAMP DECEL TIME in RAMPS. %S RAMP is also set to 0.00%.

When running, the jog signal performs a "take up slack" function. When a jog signal is received, the take up slack setpoint is added to the ramp input. MODE and JOG settings work in concert to select between the two take-up slack setpoints.

In crawl speed mode, CRAWL SPEED replaces the ramp input as the output signal.



Parameters

Tag	Parameter	Description	Range	Default
218	JOG SPEED 1	Jog speed setpoint 1	±100.00%	5.00%
219	JOG SPEED 2	Jog speed setpoint 2	±100.00%	-5.00%
253	TAKE UP 1	Take up slack speed setpoint 1	±100.00%	5.00%
254	TAKE UP 2	Take up slack speed setpoint 2	±100.00%	-5.00%
225	CRAWL SPEED	Crawl speed setpoint	±100.00%	10.00%
228	MODE	Selects jog speed setpoints, take up setpoints, and the crawl setpoint.	TRUE/FALSE	FALSE
355	RAMP RATE	Ramp time for jogging. Acceleration and deceleration times are the same.	0.1 to 600.0 Secs	1.0 Secs

SETUP PARAMETERS: JOG / SLACK

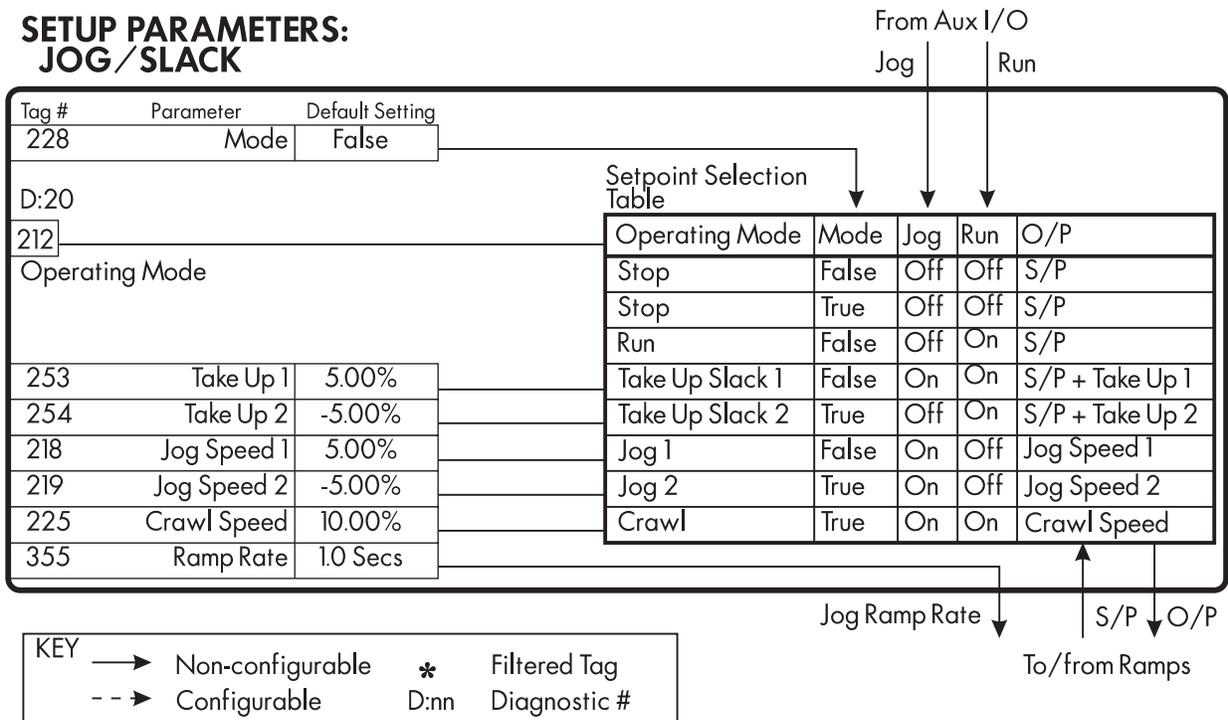


Figure C.9 - Jog/Slack

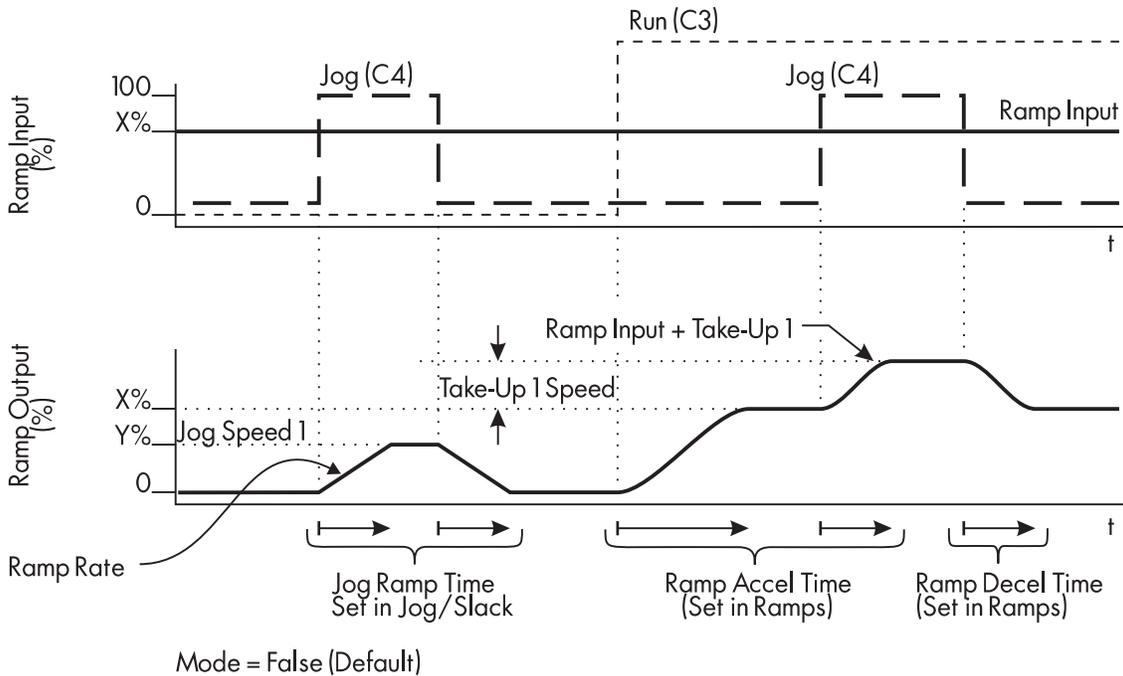


Figure C.10 - Jog/Slack Operation

RAISE/LOWER

RAISE/LOWER provides electronic motor operated potentiometer (MOP) functionality.

Note: This block is ignored by the drive unless SYSTEM:: CONFIGURE I/O:: BLOCK DIAGRAM:: RAISE/LOWER DEST is connected to a non-zero tag.

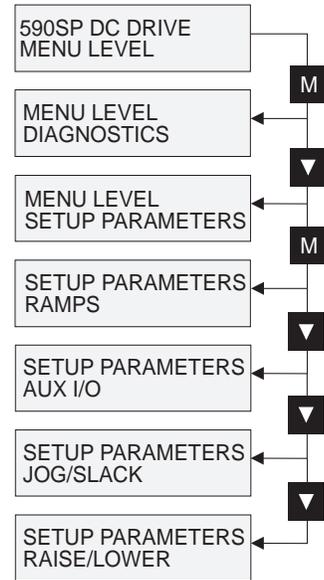
Inputs and Outputs

The default configuration has no inputs or outputs connected.

Description

RAISE INPUT, when TRUE, increases the output at the rate determined by INCREASE RATE. LOWER INPUT decreases the output as determined by DECREASE RATE. MIN VALUE and MAX VALUE limits the total change by the amounts set.

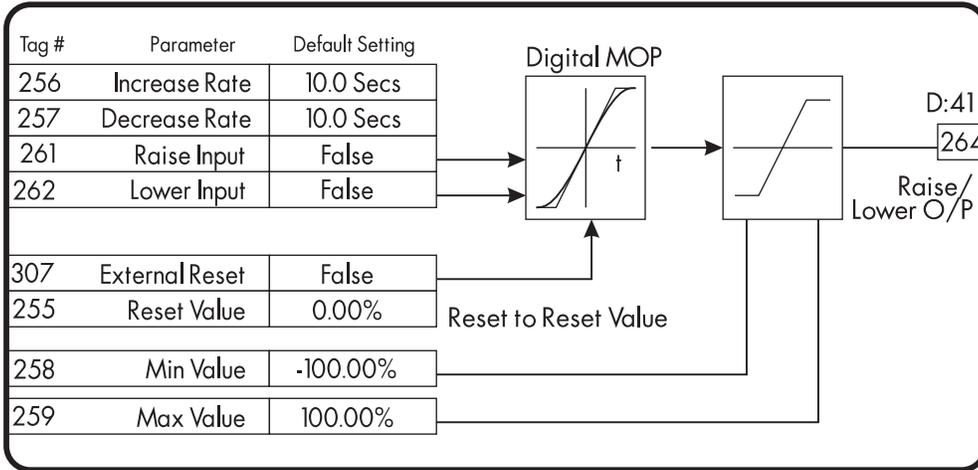
When EXTERNAL RESET is TRUE, the output is set to RESET VALUE.



Parameters

Tag	Parameter	Description	Range	Default
255	RESET VALUE	Loaded into the output on power-up or when EXTERNAL RESET is TRUE.	±300.00%	0.00%
256	INCREASE RATE	Rate of change of an increasing output value.	0.1 to 600.0 Secs	10.0 Secs
257	DECREASE RATE	Rate of change of a decreasing output value.	0.1 to 600.0 Secs	10.0 Secs
261	RAISE INPUT	Command to raise the output value.	TRUE/FALSE	FALSE
262	LOWER INPUT	Command to lower the output value.	TRUE/FALSE	FALSE
258	MIN VALUE	Minimum ramp output clamp.	±300.00%	-100.00%
259	MAX VALUE	Maximum ramp output clamp.	±300.00%	+100.00%
307	EXTERNAL RESET	When TRUE, sets the output to the RESET VALUE.	TRUE/FALSE	FALSE

SETUP PARAMETERS: RAISE/LOWER



KEY	
—>	Non-configurable
- ->	Configurable
*	Filtered Tag
D:n	Diagnostic #

Figure C.11 - Raise/Lower

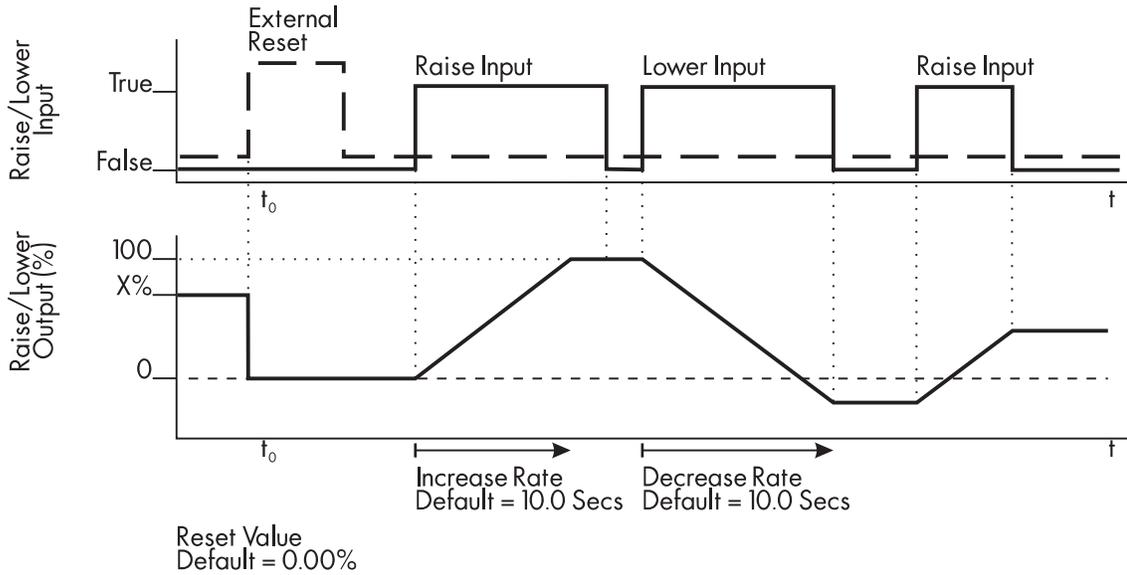


Figure C.12 - Raise/Lower Operation

These curves illustrate the raise/lower functionality. When EXTERNAL RESET is set TRUE, the raise/lower output resets to RESET VALUE (default = 0.00%). When RAISE INPUT is TRUE, the output increases at INCREASE RATE. The output cannot exceed MAX VALUE. The reverse is true when LOWER INPUT is TRUE. The lower input reduces the output at DECREASE RATE. The output cannot drop below MIN VALUE. Removing the raise or lower signal before the output reaches its maximum or minimum value prevents the ramp from changing and leaves it at its last output value. Setting both RAISE INPUT and LOWER INPUT to TRUE at the same time creates a ramp hold condition.

CURRENT PROFILE

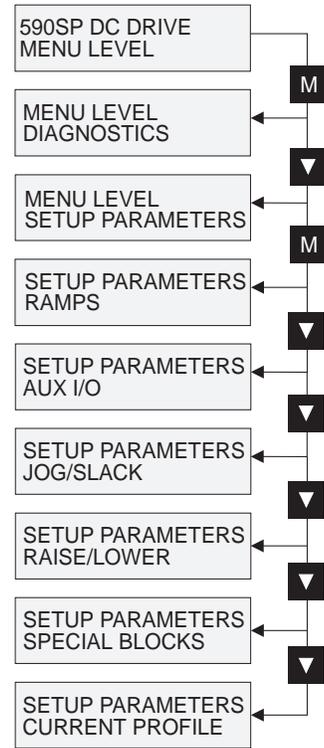
CURRENT PROFILE scales the current limit for applications where motors have a reduced ability to commutate the armature current at low field currents. Normally this is required when using field weakening.

Inputs and Outputs

SPEED FEEDBACK from the speed loop is the input. The output changes the CURRENT LIMIT CLAMP in the current loop.

Description

When SPEED FEEDBACK exceeds SPD BRK 1 (LOW), the current profile begins scaling the current limit as set by I MAX BRK1 (SPD1). As the SPEED FEEDBACK increases toward SPD BRK2 (HIGH), the current limit is reduced toward I MAX BRK2 (SPD2). When the speed exceeds SPD BRK2 (HIGH) the current limit remains at the I MAX BRK2 (SPD2) setting.



Parameters

Tag	Parameter	Description	Range	Default
32	SPD BRK 1 (LOW)	Speed breakpoint 1 where current profiling begins.	0.00 to 100.00%	100.00%
31	SPD BRK 2 (HIGH)	Speed breakpoint 2 where current profiling ends.	0.00 to 100.00%	100.00%
93	IMAX BRK 1 (SPD1)	Current limit value at or below SPD BRK 1.	0.00 to 200.00%	200.00%
33	IMAX BRK 2 (SPD2)	Current limit value at or above SPD BRK 2.	0.00 to 200.00%	200.00%

**SETUP PARAMETERS:
CURRENT PROFILE**

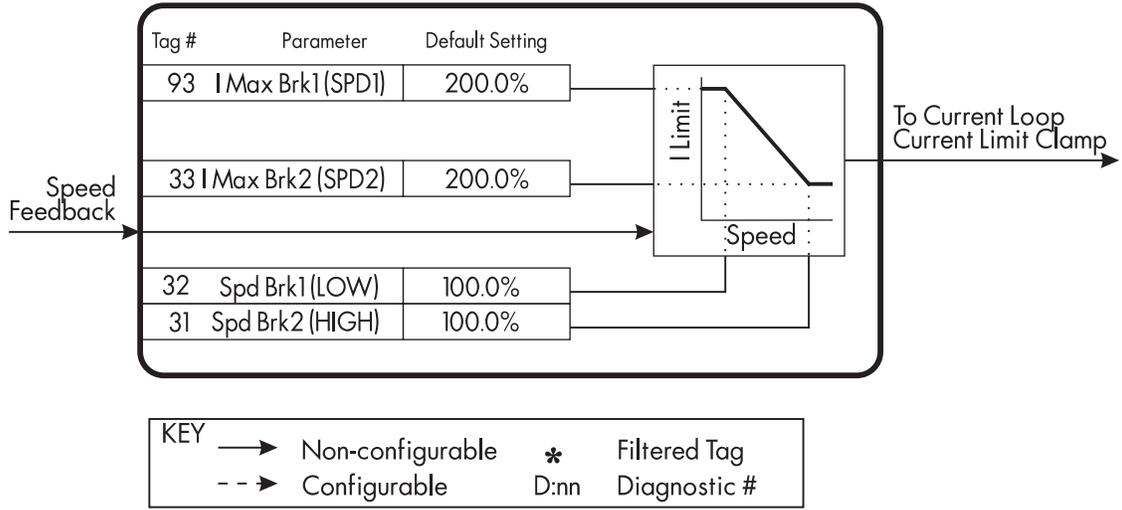


Figure C.16 - Current Profile

STOP RATES

The STOP RATES parameters are used when stopping using a normal stop or a program stop.

Inputs and Outputs

Inputs are SPEED SETPOINT and SPEED FEEDBACK from the speed loop, RUN from terminal C3, and PROGRAM STOP from terminal B8. The outputs are SPEED DEMAND to the speed loop, PROG STOP I LIMIT to the current loop, and signals to the coast stop and drive enable logic.

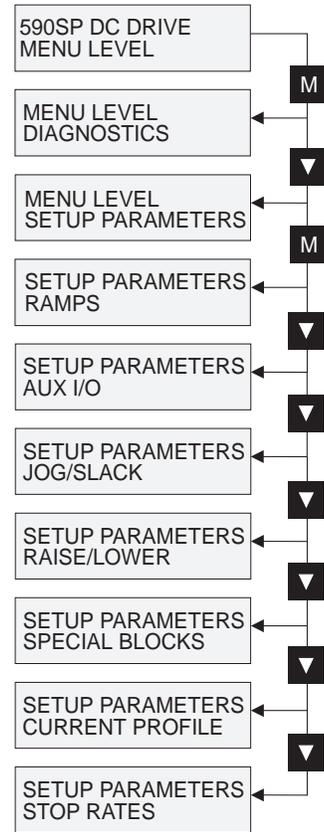
Description

A normal stop occurs when the RUN signal is removed from terminal C3. It ramps the speed demand to zero at a rate set by STOP TIME. Non-regenerative drives will stop no faster than the coast stop rate. Regenerative drives use STOP TIME to set the duration of the stop. After the stop, the contactor de-energizes and the drive disables. The STOP LIMIT timer starts when C3 goes to zero volts. If the drive speed has not reached STOP ZERO SPEED within the STOP LIMIT time, the contactor de-energizes and the drive disables.

During normal stops, CONTACTOR DELAY delays de-energizing the contactor after the motor reaches zero speed. When STOP ZERO SPEED is set above 0.25%, the drive disables during the contactor delay. Below 0.25%, the drive disables after the contactor delay. This is useful when using the jog function to prevent multiple operations of the contactor. CONTACTOR DELAY is overridden when terminal C5 is at zero volts.

PROGRAM STOP provides a controlled fast stop using regenerative drives. The stop time is set by PROGRAM STOP TIME. The timer starts once terminal B8 goes to zero volts. When the drive reaches STOP ZERO SPEED, the contactor de-energizes and the drive disables. PROGRAM STOP LIMIT sets the maximum time the program stop can take before the contactor de-energizes and the drive disables.

PROG STOP I LIM sets the current limit in the current loop during a program stop. Other current limits can override it.



Parameters

Tag	Parameter	Description	Range	Default
27	STOP TIME	Time to reach zero speed when performing a normal stop.	0.1 to 600.0 Secs	10.0 Secs
217	STOP LIMIT	The maximum time a controlled stop can take in a normal stop before the drive will coast stop.	0.0 to 600.0 Secs	60.0 Secs
302	CONTACTOR DELAY	The time the contactor stays energized after the STOP ZERO SPEED limit is reached.	0.1 to 600.0 Secs	1.0 Secs
26	PROG STOP TIME	Time to reach zero speed when performing a program stop.	0.1 to 600.0 Secs	0.1 Secs
216	PROG STOP LIMIT	The maximum time a program stop can take before the contactor is de-energized and the drive is disabled.	0.0 to 600.0 Secs	60.0 Secs
91	PROG STOP I LIM	Current limit when performing a program stop.	0.00 to 200.00%	100.00%
29	STOP ZERO SPEED	Threshold where the CONTACTOR DELAY timer starts.	0.00 to 100.00%	2.00%

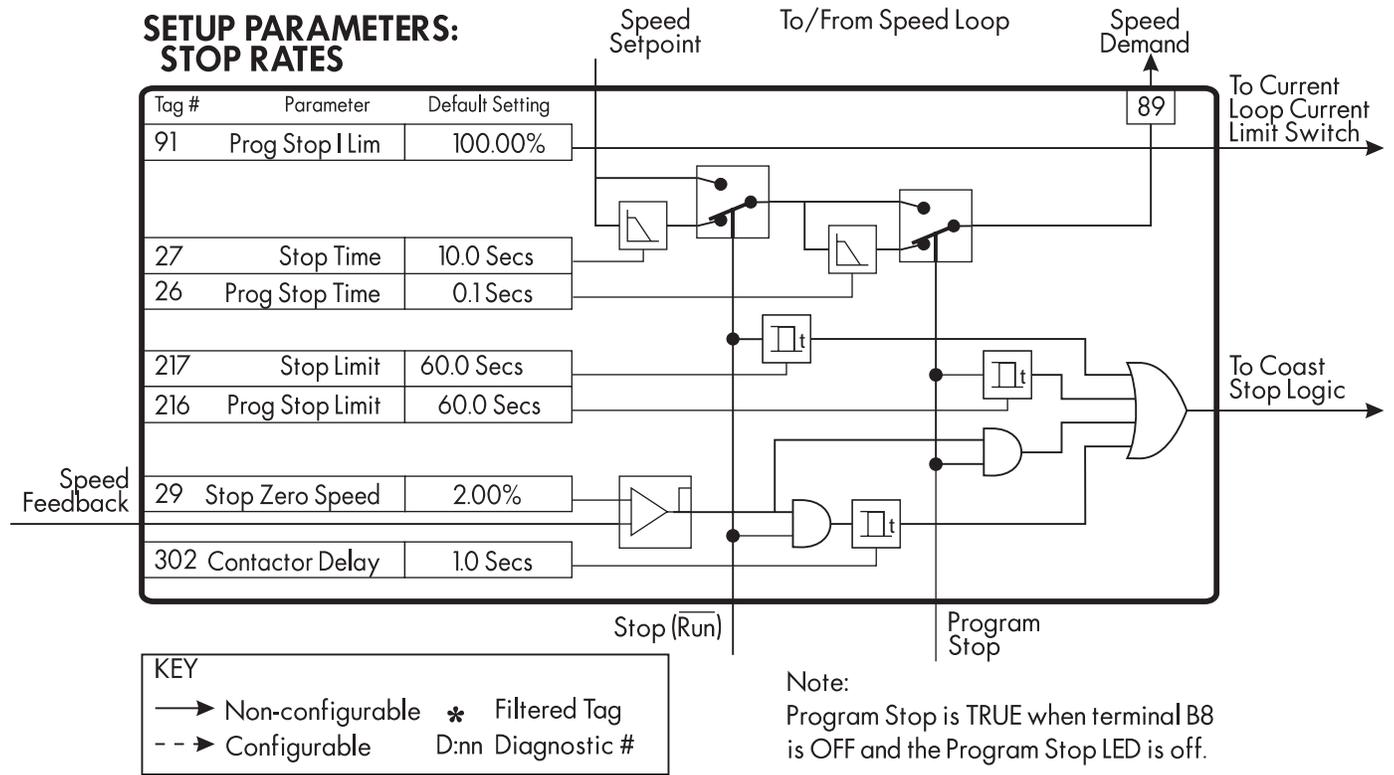


Figure C.17 - Stop Rates

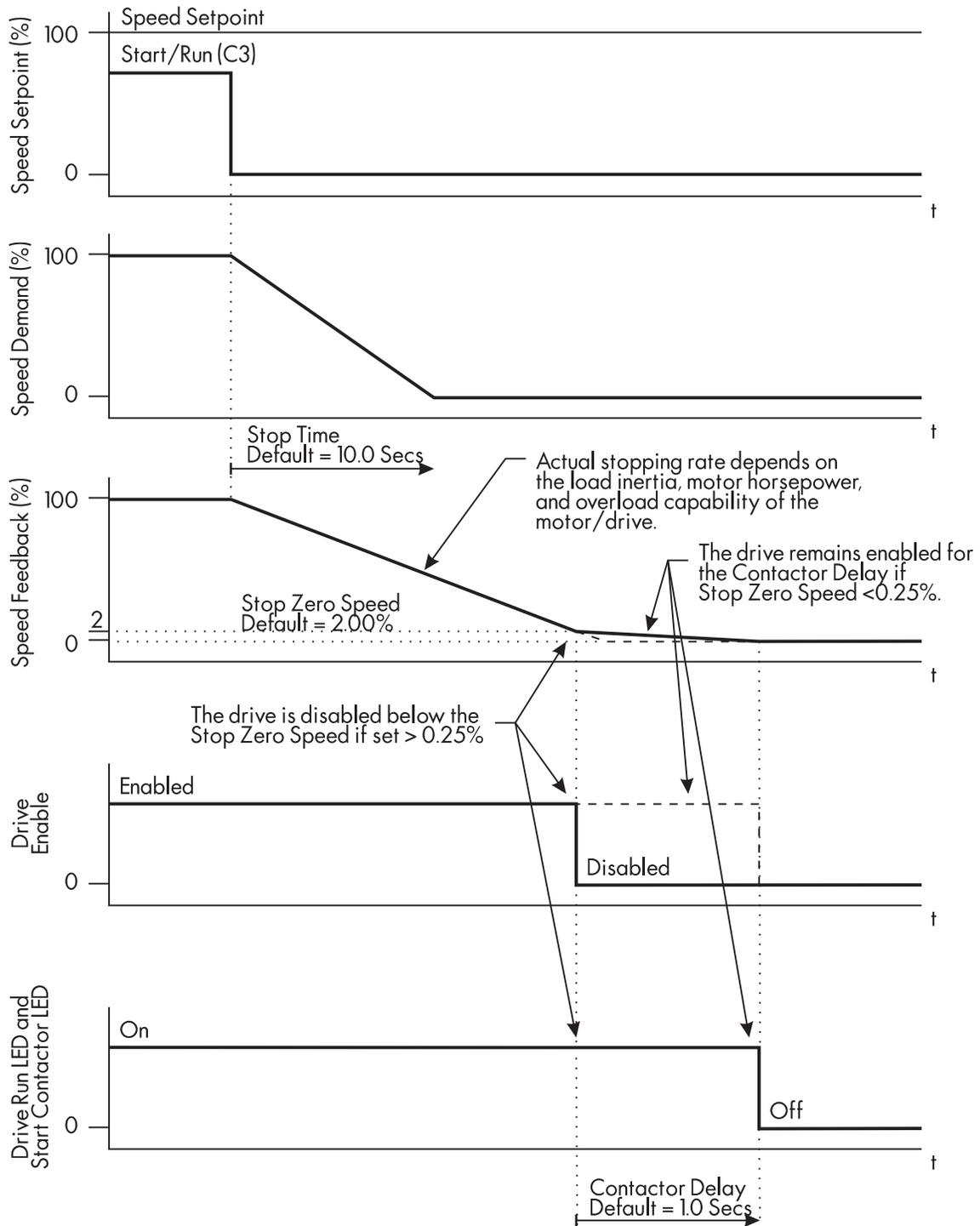


Figure C.18 - Sequences During a Normal Stop

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.

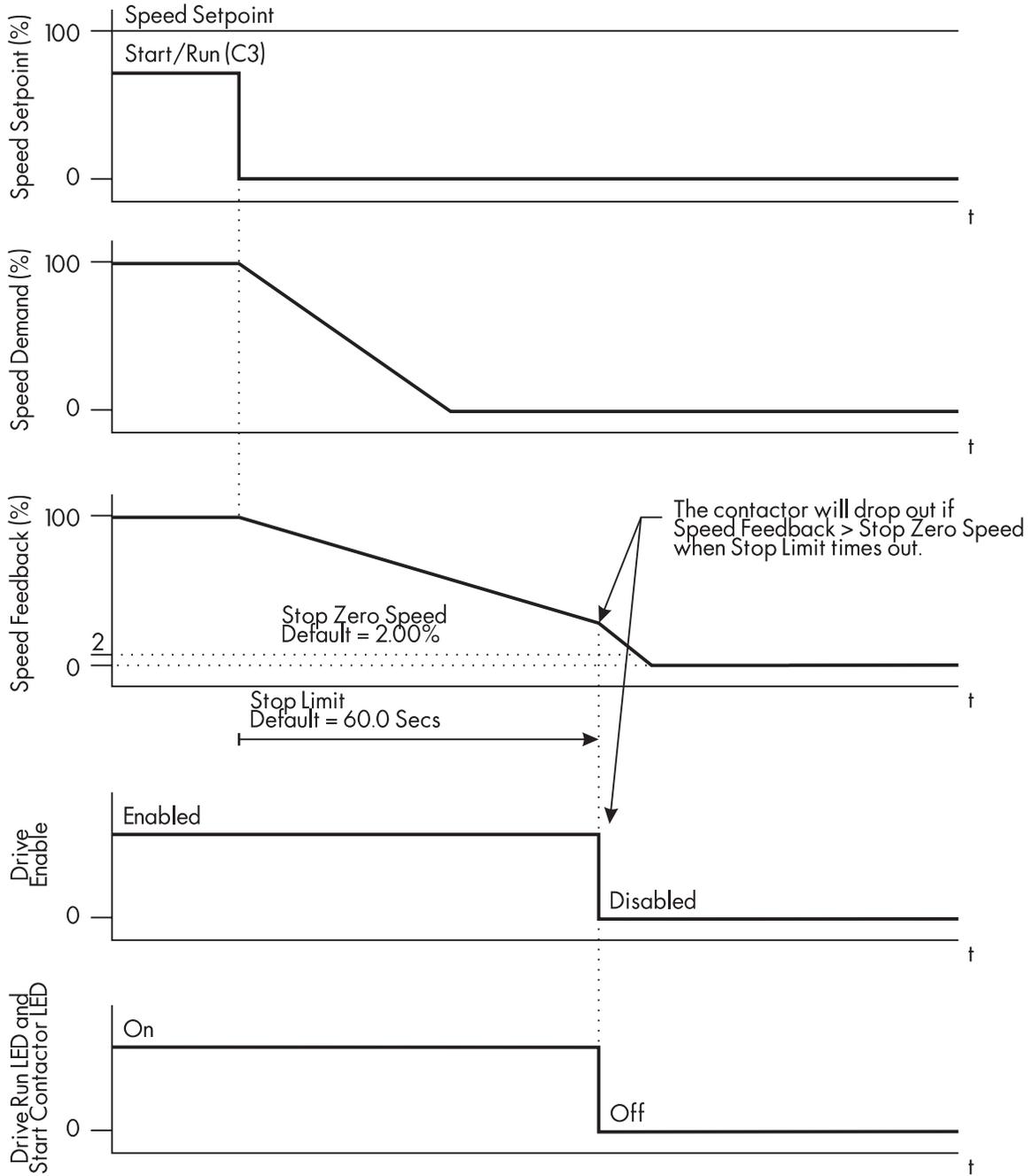


Figure C.19 - Sequences When a Normal Stop Times Out

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.

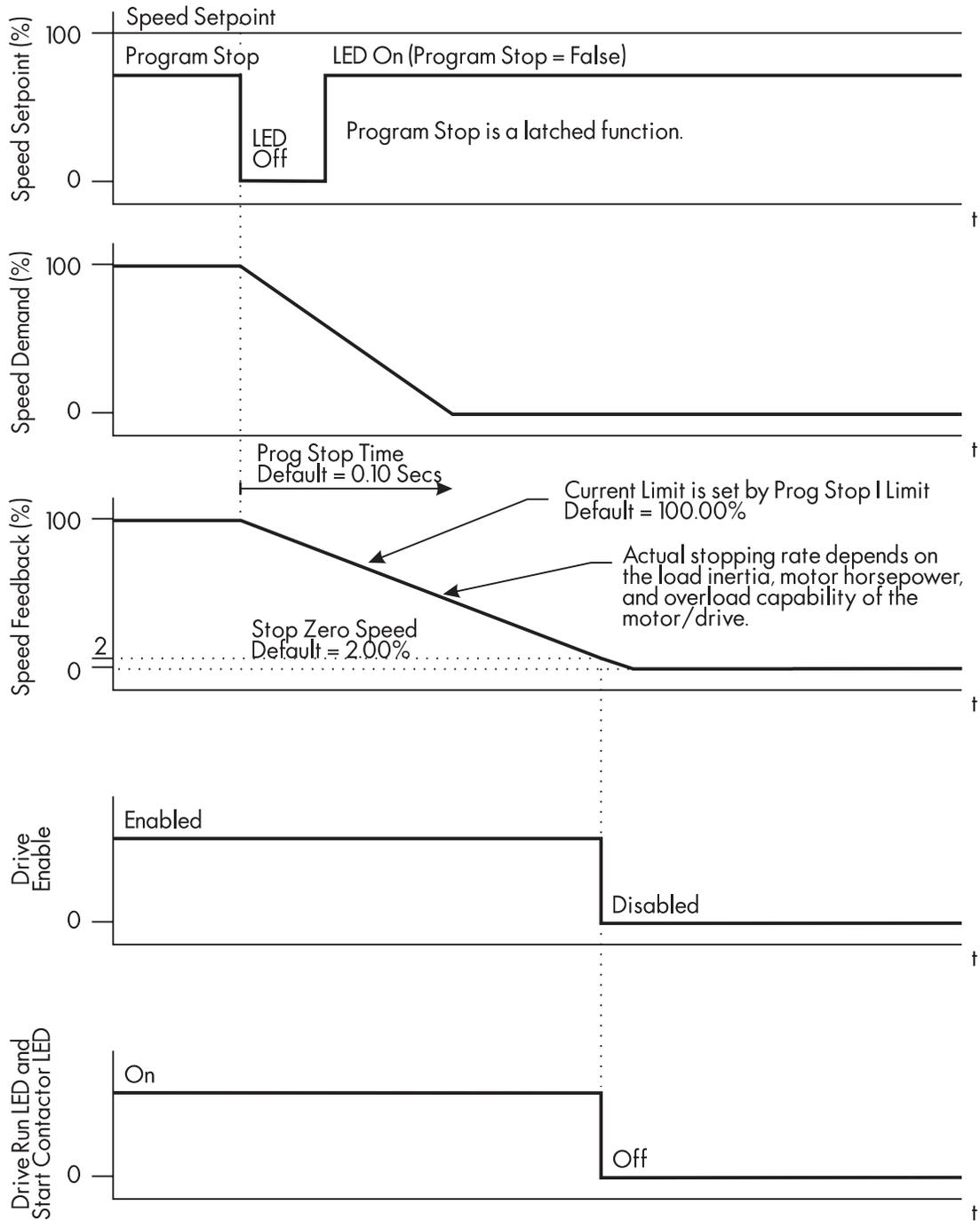


Figure C.20 - Sequences for a Program Stop

PROGRAM STOP is a latched function. Once a PROGRAM STOP signal is received (terminal B8 goes to zero volts), the stop continues even if 24 volts is reconnected to terminal B8.

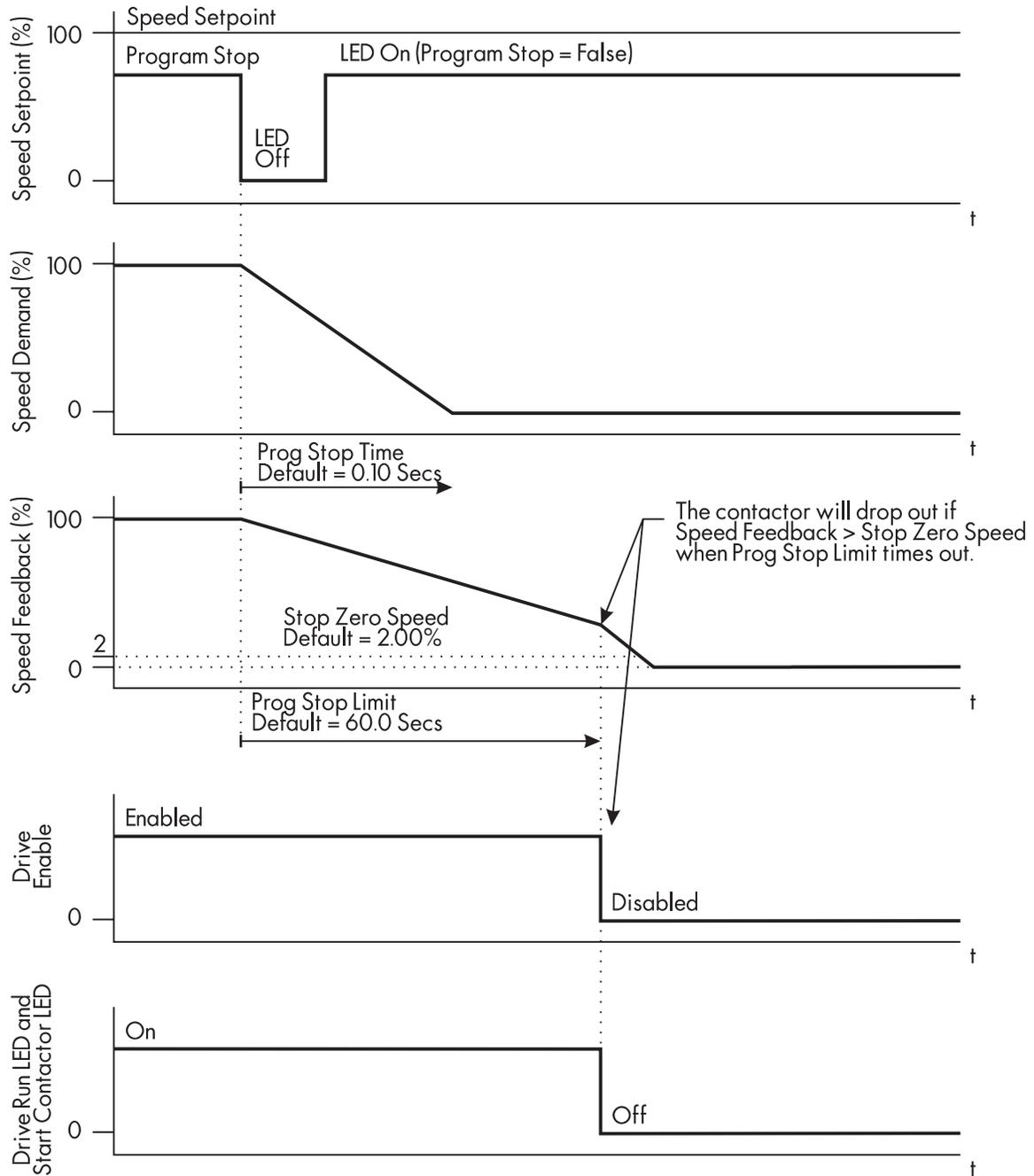


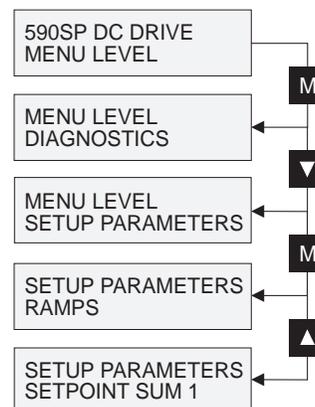
Figure C.21 - Sequences when a Program Stop Times Out

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.

SETPOINT SUM 1

SETPOINT SUM 1 allows the summing and scaling of three analog inputs to produce SPT. SUM OUTPUT.

Note: This block is ignored by the drive unless SYSTEM::
CONFIGURE I/O:: BLOCK DIAGRAM:: SPT SUM 1 DEST is
connected to a nonzero tag. The default connection is to tag 289.



Inputs and Outputs

ANALOG I/P 1, terminal A2, is the default input. The default output, SPT. SUM OUTPUT, connects to SETPOINT 1 in the speed loop.

Description

INPUT 0 and INPUT 1 have individual ratio and divider scalers, and signs. INPUT 1 has an additional deadband function set by DEADBAND WIDTH. When the input is within the deadband, the output clamps to zero to ignore any noise. This parameter is useful when digital setpoints are used (for example from a 5703, serial communications, or the RAISE LOWER function block). The inputs have symmetrical limits set by LIMIT. INPUT 2 has no scaling or limits.

The output after INPUT 0, INPUT 1, and INPUT 2 are summed is also clamped by LIMIT before producing SPT. SUM OUTPUT.

Parameters

Tag	Parameter	Description	Range	Default
6	RATIO 1	Multiplicative scaling for INPUT 1.	±3.0000	1.0000
208	RATIO 0	Multiplicative scaling for INPUT 0.	±3.0000	1.0000
8	SIGN 1	Polarity for INPUT 1.	POSITIVE/NEGATIVE	POSITIVE
292	SIGN 0	Polarity for INPUT 0.	POSITIVE/NEGATIVE	POSITIVE
419	DIVIDER 1	Divider scaling for INPUT 1.	±3.0000	1.0000
420	DIVIDER 0	Divider scaling for INPUT 0.	±3.0000	1.0000
131	DEADBAND WIDTH	Range within which the output is clamped at zero.	0.0 to 100.0%	0.0%
375	LIMIT	Symmetrical limit for intermediate scaling and the total output.	0.00 to 200.00%	105.00%
423	INPUT 2	INPUT 2 value.	±200.00%	0.00%
100	INPUT 1	INPUT 1 value.	±200.00%	0.00%
309	INPUT 0	INPUT 0 value.	±200.00%	0.00%

SETUP PARAMETERS: SETPOINT SUM 1

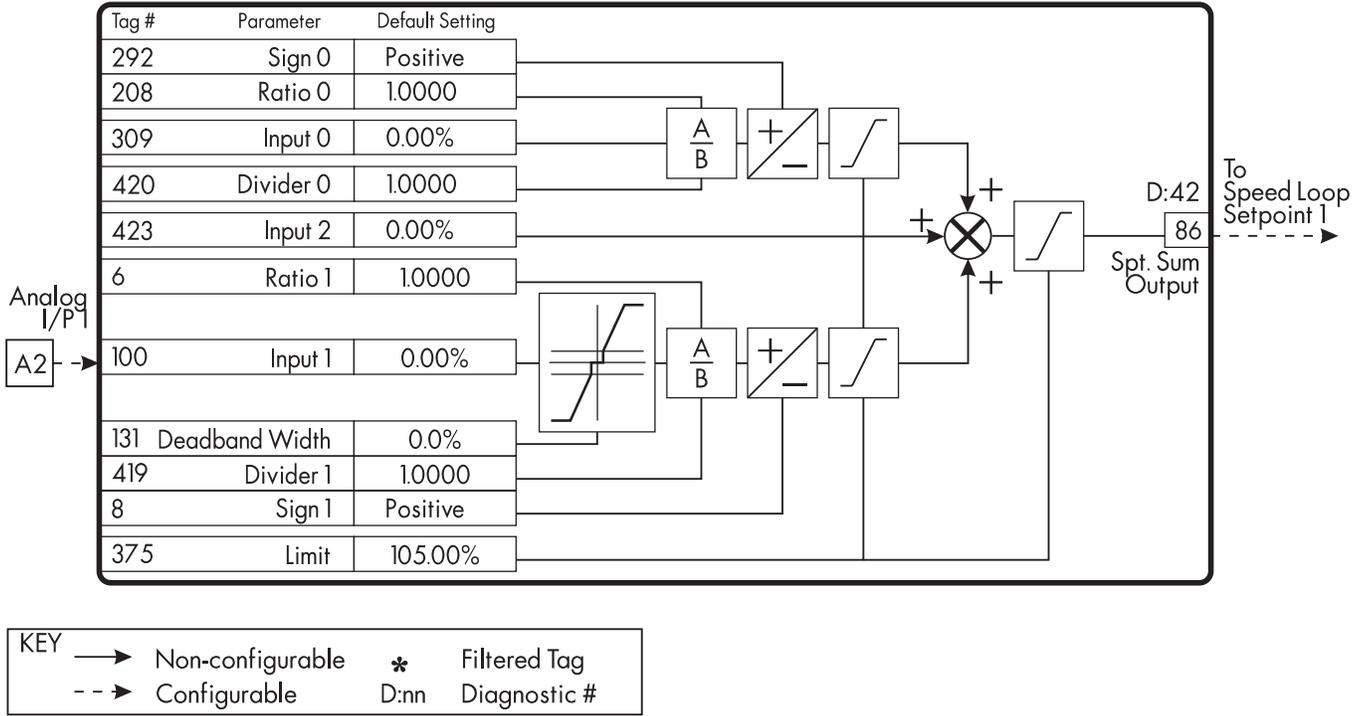


Figure C.22 - Setpoint Sum

STANDSTILL

STANDSTILL determines when the speed setpoint is zero and the motor has stopped.

Inputs and Outputs

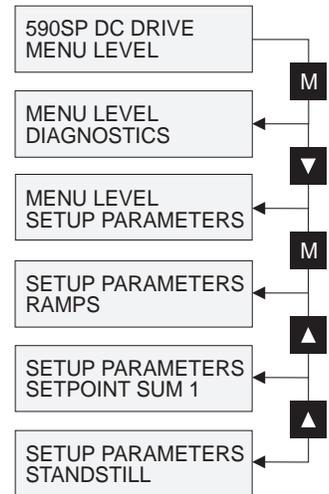
The inputs are SPEED FEEDBACK from the speed loop and SPEED SETPOINT from setpoints. The outputs are AT ZERO SPEED, AT STANDSTILL, and AT ZERO SETPOINT. AT ZERO SPEED is connected to DIGITAL O/P 1, terminal B5, in the default configuration. A "not at standstill" signal is sent to the drive enable logic.

Description

When SPEED FEEDBACK is less than ZERO THRESHOLD, the AT ZERO SPEED output is ON. AT ZERO SETPOINT is ON when SPEED SETPOINT is less than ZERO THRESHOLD. When both AT ZERO SPEED and AT ZERO SETPOINT are ON, AT STANDSTILL is ON signaling the motor has stopped.

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

STANDSTILL LOGIC is useful in maintaining absolute zero speed but can cause problems in web handling applications using tension feedback. At zero speed, the SCR's turn off allowing web tension to pull the driven roll in reverse. Once the drive no longer senses it is at zero speed, the SCR's turn back on causing the motor to move forward and regulate tension. An oscillation condition can result as the drive SCR's turn on and off trying to maintain a fixed position.



Parameters

Tag	Parameter	Description	Range	Default
11	STANDSTILL LOGIC	When enabled, inhibits the controller when at zero setpoint and zero speed.	ENABLED/DISABLED	DISABLED
12	ZERO THRESHOLD	Threshold for setting the zero setpoint and zero speed. Controls the zero speed relay output.	0.00 to 100.00%	2.00%

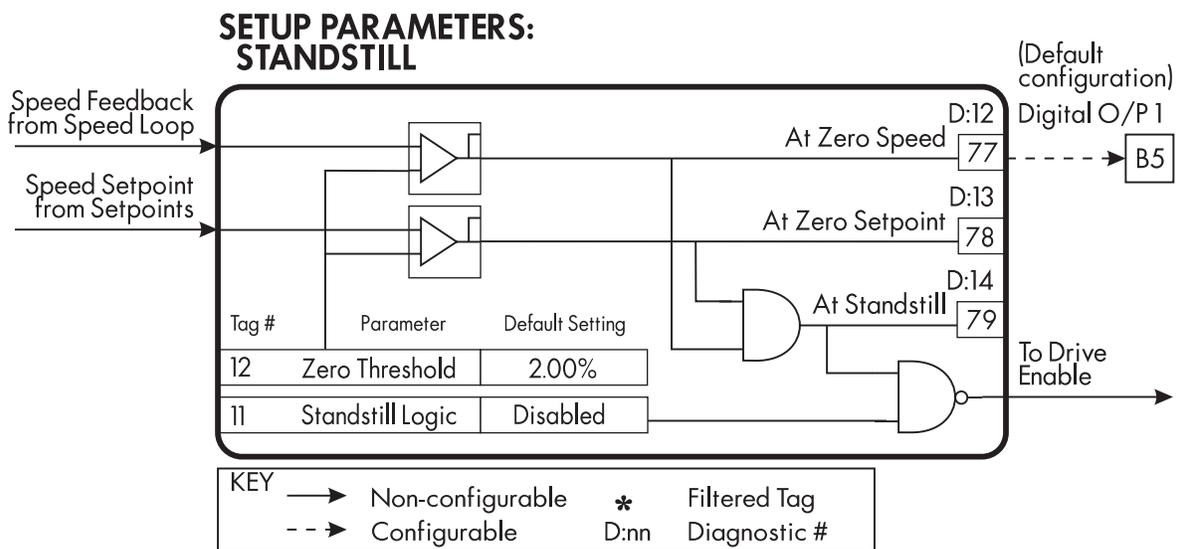


Figure C.23 - Standstill

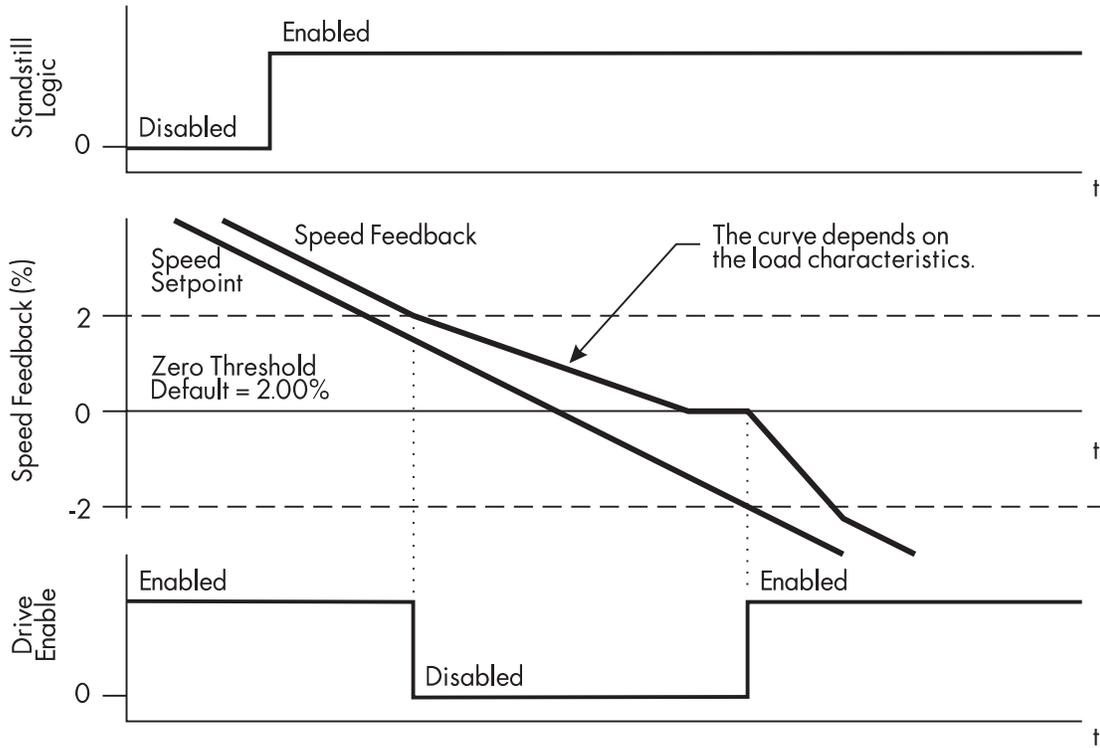


Figure C.24 - Standstill Logic

These curves show 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.

SPEED LOOP

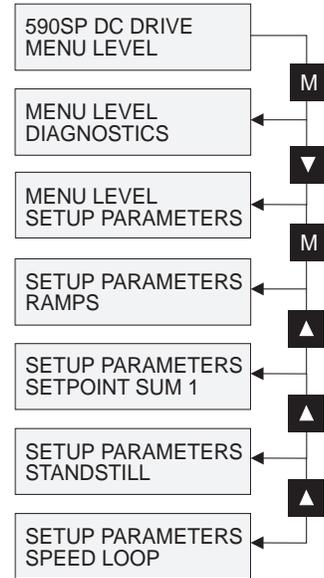
SPEED LOOP selects the speed feedback source and tunes the speed loop PI to produce a current demand.

Inputs and Outputs

The speed loop has four inputs:

1. SPEED DEMAND from STOP RATES
2. Speed feedback as either armature volts, analog tach, or encoder from CALIBRATION.
3. ZERO SPD OFFSET from CALIBRATION
4. DRIVE ENABLE from the drive enable logic

The two outputs are CURRENT DEMAND and SPEED ERROR.



Description

SPEED FBK SELECT determines the source of the speed feedback signal. The default, ARM VOLTS FBK, uses internal circuitry to derive speed feedback. The other selections require external devices to provide the feedback signal.

SPEED DEMAND is summed algebraically with SPEED FEEDBACK to yield SPEED ERROR. When the drive is enabled, SPEED ERROR is controlled by the PI loop. Proportional and integral profiling is performed in the ADVANCED::ADAPTION sub-menu described in the next section.

The resulting current demand signal is routed to the CURRENT LOOP block and to the ADVANCED::ZERO SPD. QUENCH sub-menu.

Parameters

Tag	Parameter	Description	Range	Default
14	PROP. GAIN	Proportional gain adjustment.	0.00 to 200.00	10.00
13	INT. TIME CONST.	Integral gain adjustment.	0.001 to 30.000 Secs	0.500 Secs
202	INT. DEFEAT	When ON it inhibits integral control yielding proportional control only.	ON/OFF	OFF
49	ENCODER SIGN	Allows the encoder or Microtach signal to be reversed.	POSITIVE/NEGATIVE	POSITIVE
47	SPEED FBK SELECT	Selects the source of the speed feedback signal.	ARM VOLTS FBK ANALOG TACH ENCODER ENCODER/ANALOG	ARM VOLTS FBK

SETUP PARAMETERS: SPEED LOOP

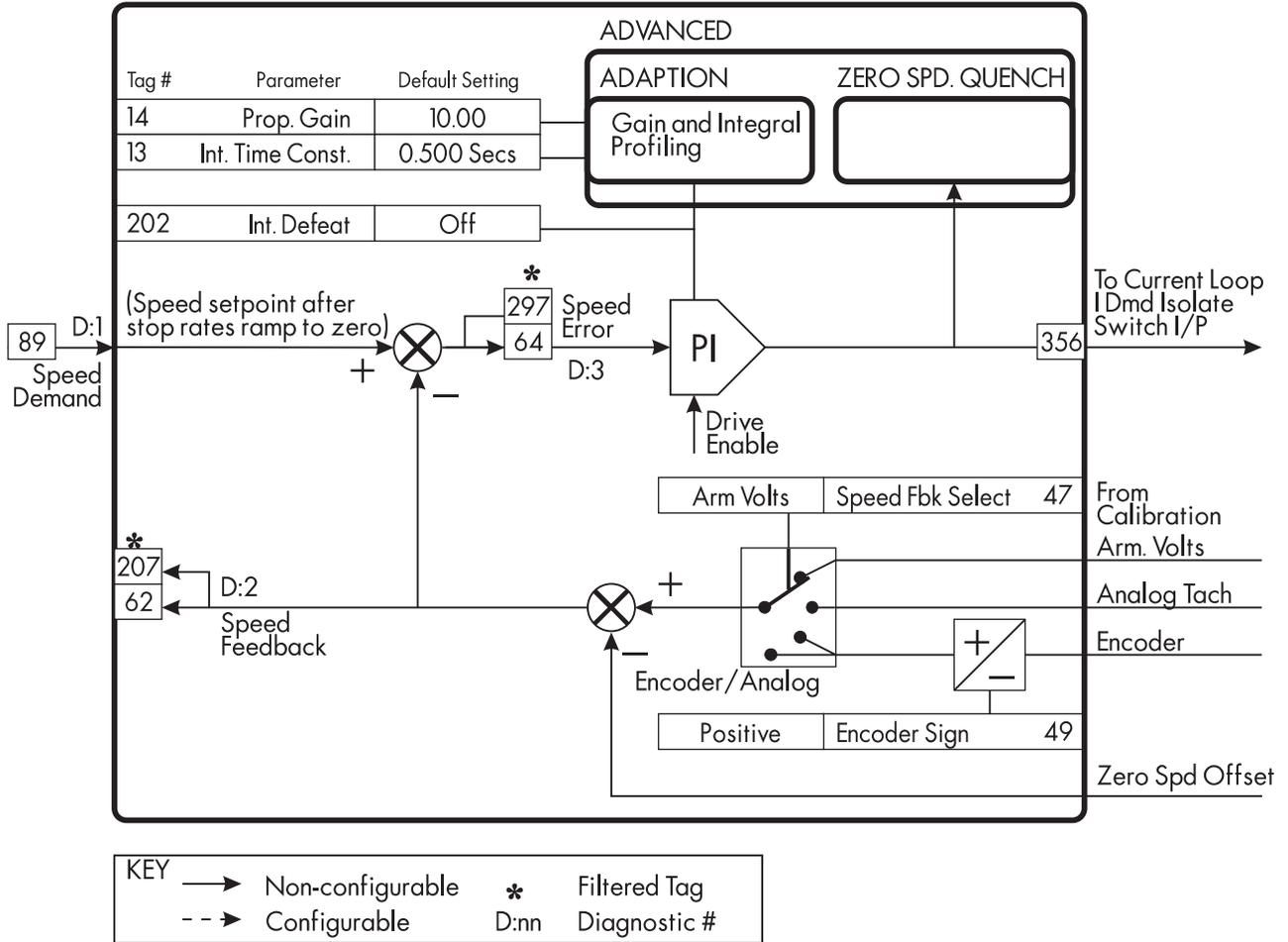


Figure C.25 - Speed Loop

SPEED LOOP::ADVANCED

ADVANCED has two sub-menus, ADAPTION and ZERO SPD. QUENCH. ADAPTION changes the proportional and integral profiles. ZERO SPD. QUENCH disables SCR firing when the drive is stopped.

Inputs and Outputs

ADVANCED has one input, RAMPING from RAMPS.

Inputs for ADAPTION are PROP. GAIN and INT. TIME CONST. from the speed loop. Its outputs are profiled proportional and integral gains for the speed loop.

Inputs for ZERO SPD. QUENCH are SPEED DEMAND, SPEED FEEDBACK, and CURRENT DEMAND. The output is a signal for disabling the armature SCR firing.

Description

I GAIN IN RAMP scales the integral gain when the drive is ramping. When RAMPING is TRUE, the integral gain from ADAPTION is switched through the I GAIN IN RAMP scaler. This can be used to prevent integral windup caused by very high inertia loads during ramping.

ADAPTION

ADAPTION allows you to profile the drive's speed loop proportional and integral gains to certain drive parameters. The gains change when the motor speed feedback reaches the thresholds determined by SPD BRK1 (LOW) and SPD BRK2 (HIGH).

At or below SPD BRK1 (LOW), the speed loop uses the PROP. GAIN and INT. TIME CONST. values set in ADAPTION as its PI loop gains. Between SPD BRK1 (LOW) and SPD BRK2 (HIGH), profiling occurs and the speed loop gains are determined by another parameter value according to the MODE selection. Above SPD BRK2 (HIGH) the PROP. GAIN and INT. TIME CONST. settings in SPEED LOOP are used.

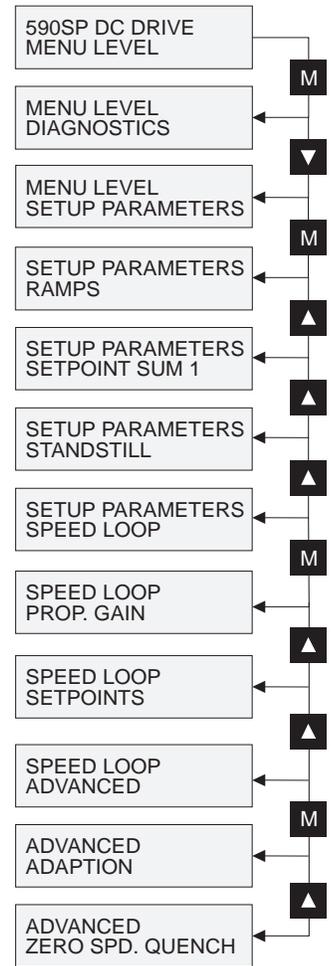
MODE selects the parameter for profiling the speed loop PI gains when the motor speed is between the two speed breakpoints. Mode 0 (the default) disables the profiling so that the speed loop uses PROP. GAIN and INT. TIME CONST. in SPEED LOOP as its PI loop gain settings, regardless of motor speed. Mode 1 uses SPEED FEEDBACK as the gain profiling source; mode 2 uses SPEED ERROR; and mode 3 uses CURRENT DEMAND.

ZERO SPD. QUENCH

ZERO SPD. QUENCH, when TRUE, disables the current loop when SPEED DEMAND, SPEED FEEDBACK, and CURRENT DEMAND have all dropped to the threshold levels set by ZERO SPD. LEVEL and ZERO IAD LEVEL. The speed loop remains enabled and the contactor stays energized. This permits the current loop to be enabled very quickly.

Parameters

Tag	Parameter	Description	Range	Default
274	I GAIN IN RAMP	Scales the integral gain during ramping.	0.0 to 2.0000	1.0000
ADAPTION				
268	MODE	Selects the speed breakpoint input signal.	0 to 3	0
269	SPD BRK1 (LOW)	Speed breakpoint 1 to start gain profiling.	0.00 to 100.00%	1.00%
270	SPD BRK2 (HIGH)	Speed breakpoint 2 to stop gain profiling.	0.00 to 100.00%	5.00%
271	PROP. GAIN	Proportional gain used below SPD BRK1 (LOW).	0.00 to 200.00	5.00
272	INT. TIME CONST.	Integral time constant used below SPD BRK1 (LOW).	0.001 to 30.000 Secs	0.500 Secs
ZERO SPD. QUENCH				
284	ZERO SPD. LEVEL	SPEED DEMAND and SPEED FEEDBACK thresholds for disabling the current loop.	0.00 to 200.00%	0.50%
285	ZERO IAD LEVEL	Current demand threshold for disabling the current loop.	0.00 to 200.00%	1.50%



SETUP PARAMETERS: SPEED LOOP: ADVANCED

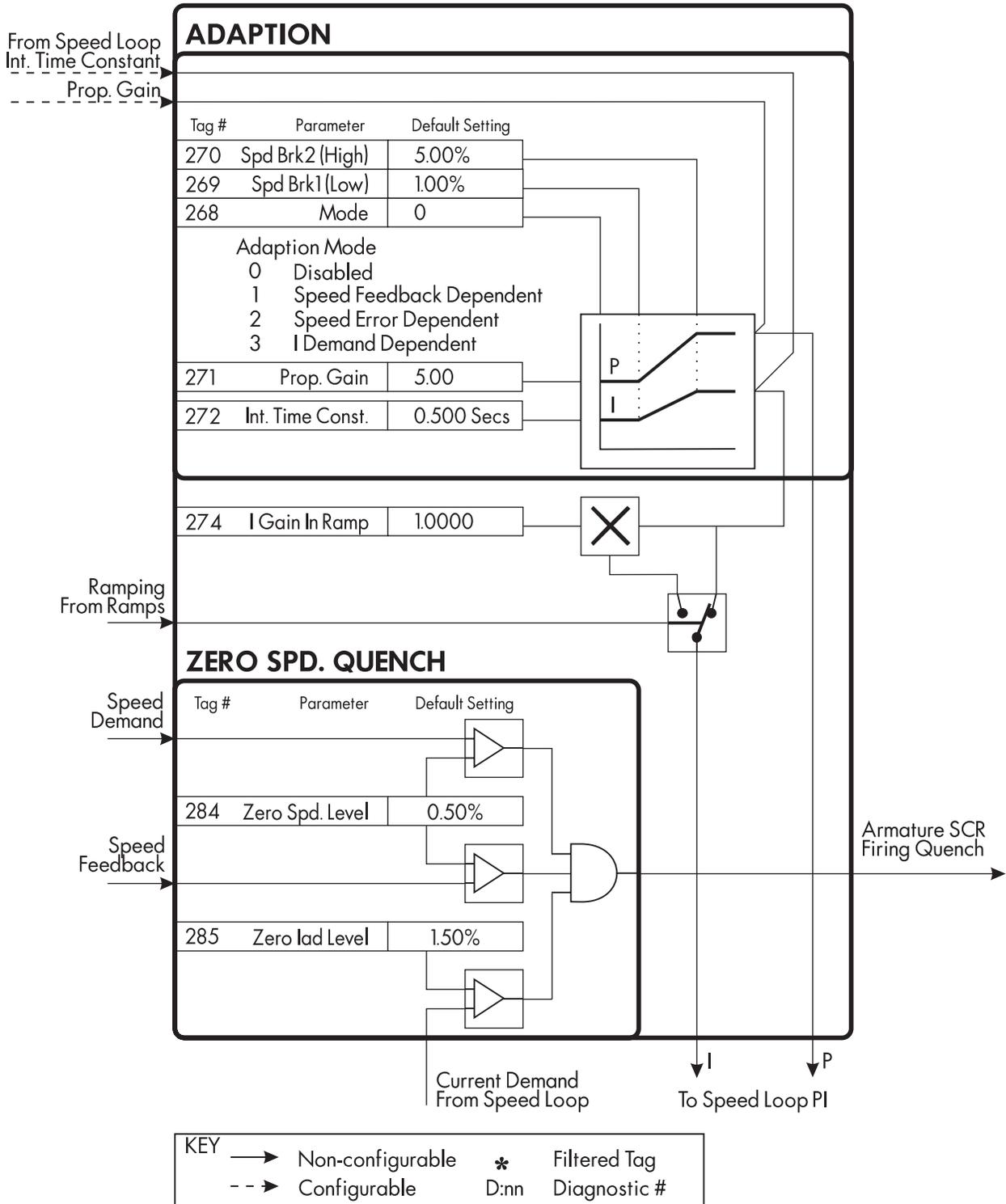


Figure C.26 - Speed Loop Advanced Parameters

SPEED LOOP::SETPOINTS

SETPOINTS combine four setpoints into a total speed setpoint.

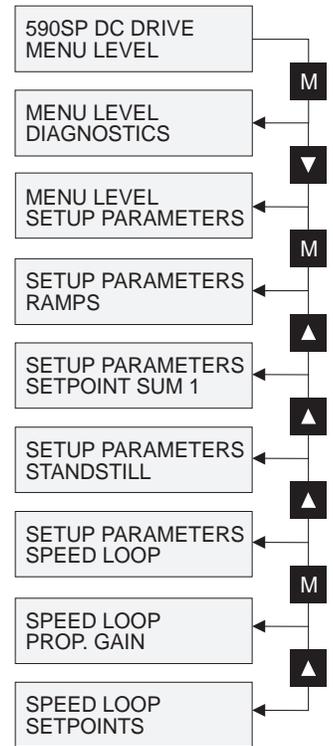
Inputs and Outputs

The default inputs to SETPOINTS are analog input 2, terminal A3, ratioed 5703 output, SPT. SUM O/P, RAMP OUTPUT, and I DMD ISOLATE. The output is SPEED SETPOINT.

Description

Speed setpoint 2 is connected directly to terminal A3. It is scanned synchronously with the current loop. RATIO 2 (A3) and SIGN 2 (A3) scale the input to become SETPOINT 2 (A3). SETPOINT 2 is summed with setpoints 1, 3, and 4. The result is clamped by MAX DEMAND and MIN DEMAND to create SPEED SETPOINT.

When I DMD ISOLATE is ON, the signal from terminal A3 is routed to the current loop and disconnected from SETPOINTS.



Parameters

Tag	Parameter	Description	Range	Default
289	SETPOINT 1	Speed setpoint 1	±105%	0.00%
9	SIGN 2 (A3)	Speed setpoint 2 sign.	POSITIVE/NEGATIVE	POSITIVE
7	RATIO 2 (A3)	Speed setpoint 2 ratio.	±3.0000	1.0000
290	SETPOINT 2 (A3)	Speed setpoint 2; non-configurable	±105%	0.00%
291	SETPOINT 3	Speed setpoint 3	±105%	0.00%
41	SETPOINT 4	Speed setpoint 4	±105%	0.00%
357	MAX DEMAND	Maximum output limit	0.00 to 105.00%	105.00%
358	MIN DEMAND	Minimum output limit	-105.00 to 0.00%	-105.00%

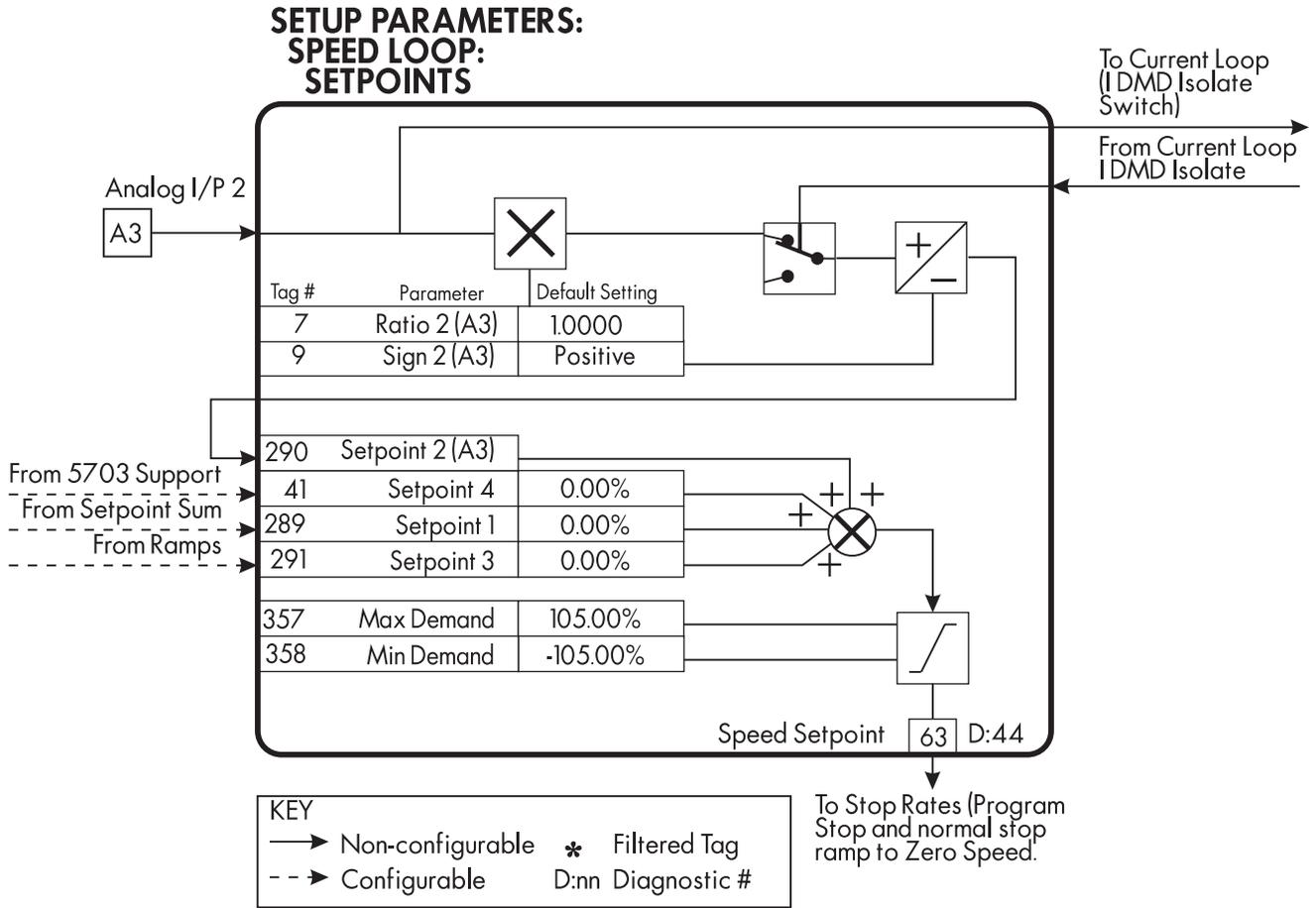


Figure C.27 - Speed Loop Setpoints

CURRENT LOOP

CURRENT LOOP takes the current demand, limits it through four clamps, and then uses a PI loop to control the output.

Inputs and Outputs

The inputs are current demand from the speed loop or terminal A3, current limit clamps from CURRENT PROFILE and the inverse time overload, and current feedback from CALIBRATION. The default configuration uses digital inputs 1 and 3 for switching modes and analog inputs 4 and 5 for setting current clamps.

Description

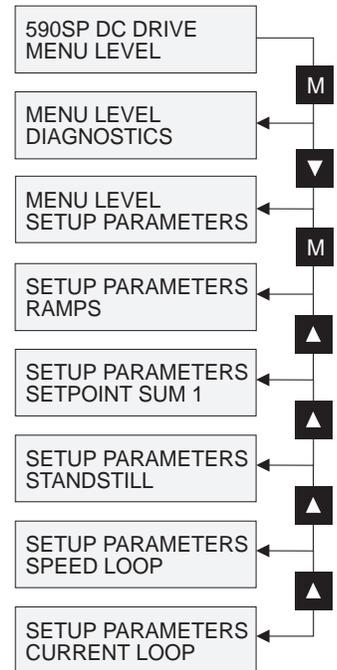
With I DMD. ISOLATE disabled, the current loop uses the current demand from the speed loop. When enabled, ANALOG I/P 2, terminal A3 supplies the current demand. With default scaling, 10 VDC on terminal A3 is 100% current demand. An additional current input, ADDITIONAL DEM, can be added to the current demand. Four separate clamps, current profile, inverse time overload, bipolar clamps, and main current clamps, can each limit the current demand.

With BIPOLAR CLAMPS disabled, the clamps are symmetrical and are set by POS. I CLAMP. When enabled, the clamps are asymmetrical, bipolar. In bipolar mode, POS. I CLAMP sets the maximum positive current and NEG. I CLAMP sets the maximum negative current. POS. I CLAMP must always be set algebraically higher

than NEG. I CLAMP. As a result, NEG. I CLAMP can be set to a positive value. CUR. LIMIT/SCALER scales both POS. I CLAMP and NEG. I CLAMP.

MAIN CURR. LIMIT sets symmetric clamps outside scaling from the CUR. LIMIT/SCALER parameter.

A non-regenerative controller should have set DISABLED for proper motor control. If REGEN MODE is DISABLED, negative current demands are clamped to zero. Current feedback is subtracted from the current demand and the result is controlled by the PI loop. The result provides SCR phase angle control.



Parameters

Tag	Parameter	Description	Range	Default
15	CUR. LIMIT/SCALER	Scales the bipolar/unipolar clamps.	0.00 to 200.00%	100.00%
421	MAIN CURR. LIMIT	Independent symmetric current clamp.	0.00 to 200.00%	200.00%
16	PROP. GAIN	Proportional gain for armature current PI loop.	0.00 to 200.00	45.00
17	INT. GAIN	Integral gain for armature current PI loop.	0.00 to 200.00	3.50
18	AUTOTUNE	Turns the AUTOTUNE procedure on.	ON/OFF	OFF
137	DISCONTINUOUS	Sets the boundary between the discontinuous and continuous regions of the current signal.	0.00 to 200.00%	12.00%
30	ADDITIONAL DEM	Additional current demand input.	±200.00%	0.00%
90	BIPOLAR CLAMPS	Selects between bipolar and unipolar clamps.	ENABLED/DISABLED	DISABLED
201	REGEN MODE	When disabled, sets the drive for non-regenerative operation.	ENABLED/DISABLED	ENABLED
301	POS. I CLAMP	Positive current clamp when BIPOLAR CLAMPS is ENABLED.	±100.00%	100.00%
48	NEG. I CLAMP	Negative current clamp when BIPOLAR CLAMPS is ENABLED.	±100.00%	-100.00%
119	I DMD. ISOLATE	When enabled, disables the speed loop and selects terminal A3 as the current demand input.	ENABLED/DISABLED	DISABLED

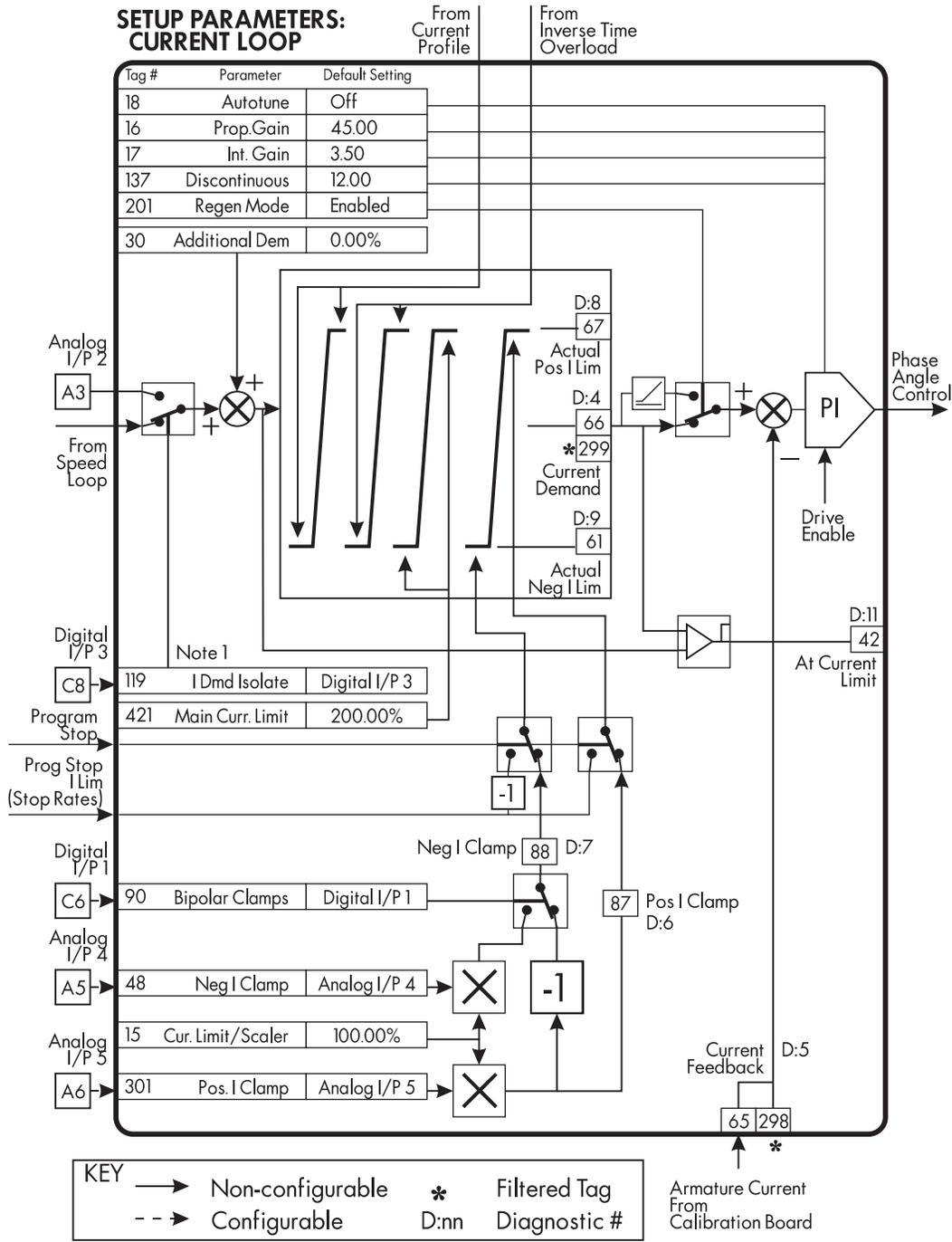


Figure C.28 - Current Loop

INHIBIT ALARMS

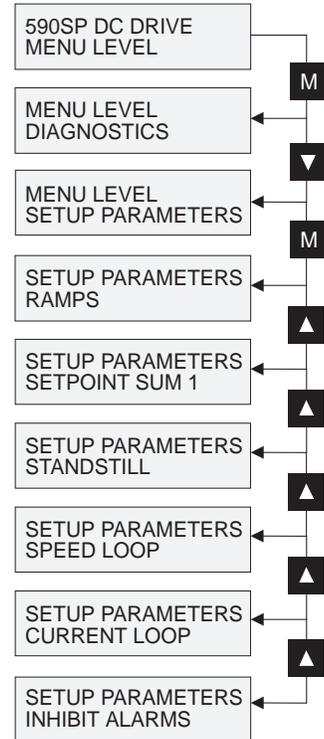
INHIBIT ALARMS allows you to disable certain alarms and leave drive operation uninterrupted if the related fault occurs.

Description

Caution

Do *not* inhibit any alarms if a danger to personnel or equipment may result.

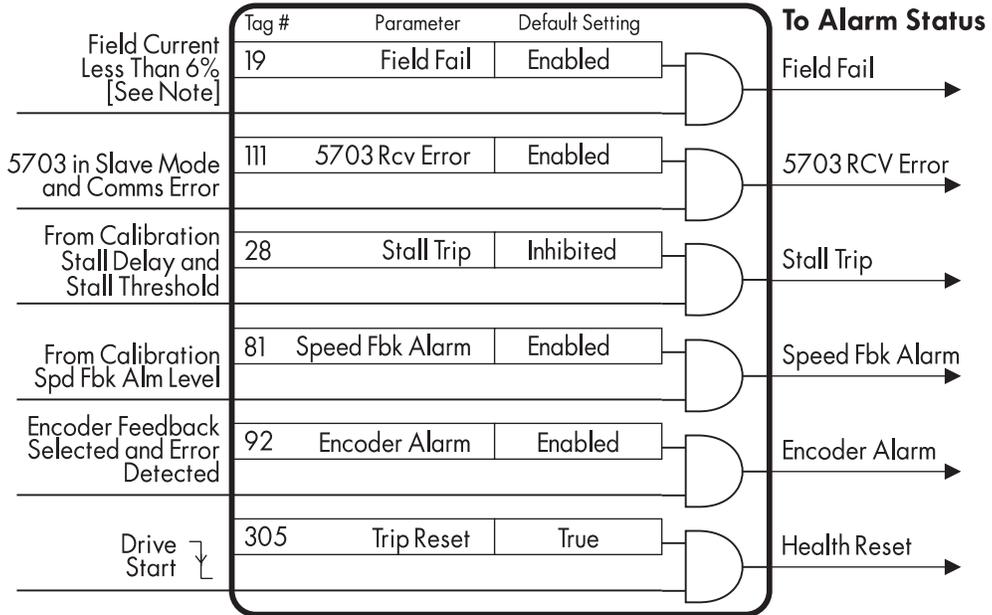
The stall trip alarm can be inhibited in applications requiring extended operation at zero speed.



Parameters

Tag	Parameter	Description	Range	Default
111	5703 RCV ERROR	When INHIBITED, disables 5703 serial communications receive error.	ENABLED/INHIBITED	ENABLED
28	STALL TRIP	When INHIBITED, stops the stall trip alarm from tripping out contactor.	ENABLED/INHIBITED	INHIBITED
305	TRIP RESET	When FALSE, faults are latched permanently and the HEALTHY output remains OFF even when toggling the RUN input, terminal C3. To reset the drive, TRIP RESET must be set to TRUE. When TRUE, faults are cleared whenever a RUN signal is given to terminal C3.	TRUE/FALSE	TRUE
81	SPEED FBK ALARM	When INHIBITED, disables the speed feedback alarm.	ENABLED/INHIBITED	ENABLED
92	ENCODER ALARM	When INHIBITED, disables the encoder option board alarm.	ENABLED/INHIBITED	ENABLED

SETUP PARAMETERS: INHIBIT ALARMS



Note: Field fail threshold is 6% in current control and 12% in voltage control.

KEY	→	Non-configurable	*	Filtered Tag
	- - →	Configurable	D:nn	Diagnostic #

Figure C.29 - Inhibit Alarms

CALIBRATION

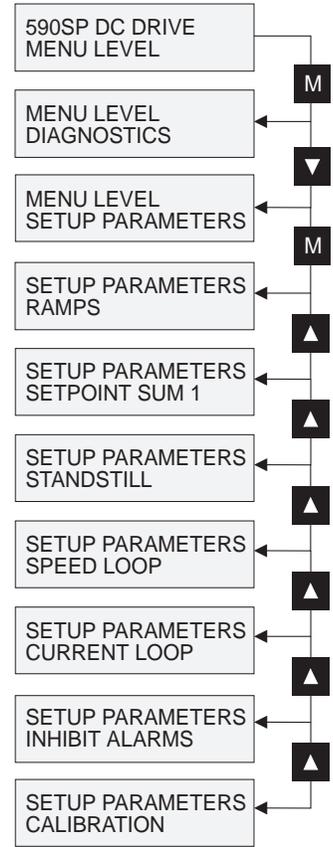
The CALIBRATION block scales the signals from the calibration card and speed feedback board.

Description

Each input signal from the calibration board and the speed feedback board can be digitally scaled to provide greater precision.

Back EMF is created by subtracting armature current losses (IR COMPENSATION) from armature volts. This result is subtracted from speed feedback to trigger the speed feedback alarm.

The armature current signal is used to set the stall trip alarm.



Parameters

Tag	Parameter	Description	Range	Default
20	ARMATURE V CAL.	Scales the armature volts to read 100% at the actual required voltage.	0.9800 to 1.1000	1.0000
21	IR COMPENSATION	Offsets the motor's IR drop to improve regulation when using armature voltage feedback.	0.00 to 100.00%	0.00%
22	ENCODER RPM	Set to the motor's maximum speed. For use with encoder feedback.	0 to 6000 RPM	1000 RPM
24	ENCODER LINES	Set to the encoder's lines per revolution.	10 to 5000 lines	1000 lines
23	ANALOG TACH CAL	Scales the motor speed to read 100% at the actual required speed.	0.9800 to 1.1000	1.0000
10	ZERO SPD. OFFSET	Used to set speed feedback to zero when the motor is not moving.	±5.00%	0.00%
25	ARMATURE I (A9)	Selects the current meter output, terminal A9, as bipolar or unipolar.	UNIPOLAR/BIPOLAR	BIPOLAR
180	SPDFBK ALM LEVEL	The threshold that the difference between speed feedback and back EMF voltage must exceed before the speed feedback alarm will activate.	0.0 to 100.0%	50.0%
263	STALL THRESHOLD	Stall current feedback threshold.	0.00 to 200.00%	95.00%
224	STALL TRIP DELAY	Delay time before the stall output becomes TRUE.	0.1 to 32.7 Secs	10.0 Secs
182	FIELD I CAL.	Scales the motor's field current to read 100% at the actual field current value.	0.9800 to 1.1000	1.0000

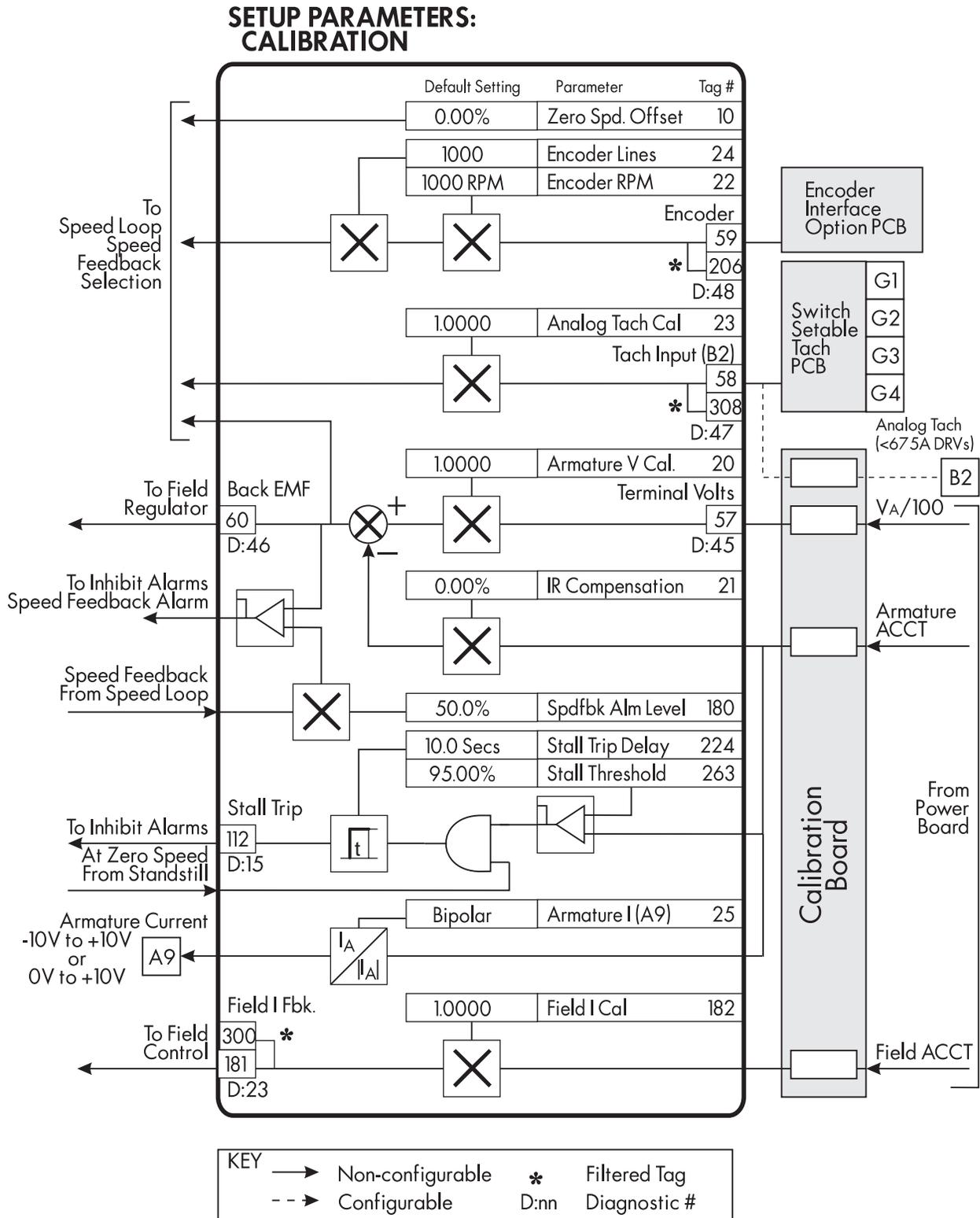


Figure C.30 - Calibration



Appendix D I/O CONFIGURATION - SYSTEM MENU

INTRODUCTION

To customize performance and get optimum use out of the 590SP Digital drive, you must configure, or reroute software connections to and from the drive's inputs and outputs and to and from the drive's software blocks. You can configure the drive and change software block parameter values either through the MMI or with a personal computer (PC) running the software package ConfigEd Lite (see the ConfigEd Lite Software Manual RG352747).

NOTE. For a description of each of the drive's software blocks accessible under the SETUP PARAMETERS menu, refer to Appendix C.

This chapter describes how to scale and configure drive input and output signals through the MMI under the SYSTEM::CONFIGURE I/O sub-menus ANALOG INPUTS, ANALOG OUTPUTS, DIGITAL INPUTS and DIGITAL OUTPUTS. Serial communication through the drive's P3 communications port can be re-configured through the CONFIGURE 5703 sub-menu. The sub-menus BLOCK DIAGRAM, and INTERNAL LINKS allow advanced configuration between parameters within the drive software blocks and I/O.

The chapter is arranged in the order the sub-menus (or function blocks) appear in the MMI under SYSTEM::CONFIGURE I/O. Each section describes the function block's parameters and contains a schematic block diagram of the function block. It also includes a table which lists the block's parameters, gives each parameter's signal range and default value and provides a brief description of each parameter. The configuration tag number associated with each drive parameter also appears in the table. In addition, each section includes a drawing illustrating how to access the parameter function block through the MMI. Configuration examples follow each function diagram.

NOTE. The inside front cover contains a full drawing showing how all the drive's function blocks process input, output and control signals and how each block interfaces with the drive's overall control. A more detailed software block diagram appears in the fold-out drawing at the end of this appendix (Figure D.20).

MMI Access to CONFIGURE I/O

Figure D.1 shows how to access the CONFIGURE I/O::ANALOG INPUTS sub-menu through the MMI. Upon power-up, the MMI briefly displays the software version and then changes to the message shown at the top of the figure. Pressing the "M" key changes the display to read the next block in the menu tree, DIAGNOSTICS. The ▲ key scrolls display up from DIAGNOSTICS to SYSTEM. Pressing "M" at SYSTEM puts the user in SOFTWARE, the first sub-menu of the SYSTEM menu. Press ▼ to scroll down to CONFIGURE I/O and "M" again to enter that sub-menu. Scroll down to ANALOG INPUTS by pressing ▼ and press "M" for configuration access to the drive's analog I/O. Press ▲ or ▼ to scroll through the analog I/O parameters. Hit "E" to return to the main CONFIGURE I/O menu level, then use the ▲ and ▼ keys to scroll to the other sub-menus within CONFIGURE I/O.

Parameter types

Each drive parameter is associated with a unique address, or "tag." When "connecting" any parameter to drive inputs, outputs, or links, this tag is designated as the source or destination address. Appendix I list all the drive's parameters by tag number. Appendix J presents the same table in menu order and Appendix K sorts the parameters alphabetically.

There are only two types of parameters : logic or value. Logic parameters are boolean— or either ON (1) or OFF (0). The MMI displays logic signals in a variety

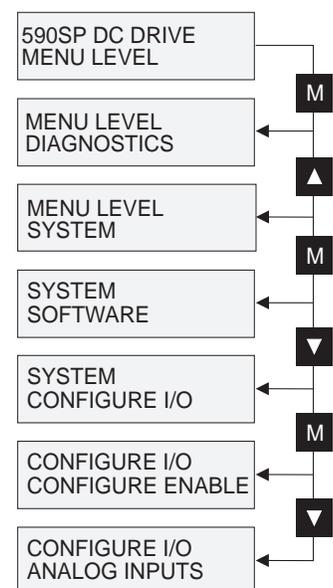


Figure D.1 - Sample MMI Path

ways, each associated with the ON and OFF state like ENABLED/ DISABLED, TRUE/FALSE, POSITIVE/ NEGATIVE, or EVEN/ODD.

Value parameters have a signal range which depends on its function. The display is normally formatted as appropriate (for example in percent). In all cases these values will not exceed five digits. For example, 100.00% is handled by the controller as 10000 and 30.00 as 3000. Other value parameters can be HEX numbers, ordinals, and lists. The ranges of these values depend on the parameter type.

Configuration procedure

Before making any configuration changes with the MMI, you must set CONFIGURE ENABLE to ENABLED. After completing all the changes, it must be reset to DISABLED to accept the changes.

NOTE. The drive disallows making configuration changes while running and will trip out on the alarm failure CONFIGURATION ENABLED if the drive is started while CONFIGURE ENABLE is ENABLED.

To make configuration changes with the MMI, follow the procedure below:

1. Set parameter CONFIGURE ENABLE to ENABLED.
2. Find the input or output you want to change.
3. Change the source and/or destination tag as required.
4. Set the or analog or digital I/O parameter calibrations as needed.
5. Set parameter CONFIGURE ENABLE to DISABLED.
6. SAVE PARAMETERS.

Caution

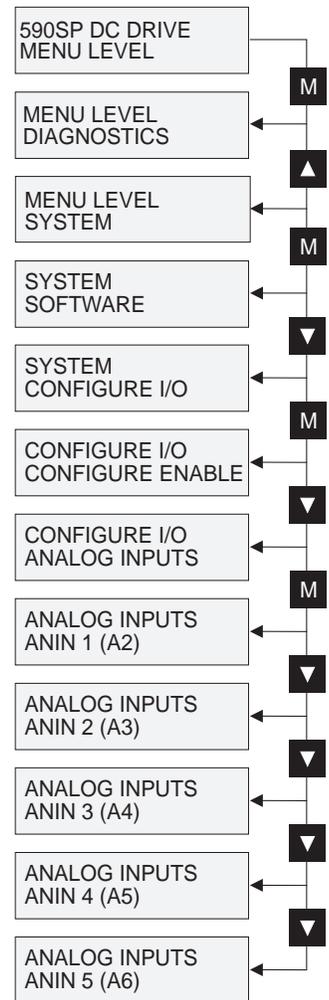
Be sure to save parameters after making configuration changes. All changes made will be lost if power is cycled prior to saving parameters.

ANALOG INPUTS

The 590 series controller has five analog inputs. Analog input 2 can be scaled but its destination is fixed. All the other inputs are fully configurable.

Parameters

Tag	Parameter	Description	Range	Default
ANIN 1 (A2)				
230	CALIBRATION	Input scaling ratio.	±3.0000	1.0000
231	MAX VALUE	Maximum value of the scaled input.	±300.00%	100.00%
232	MIN VALUE	Minimum value of the scaled input.	±300.00%	-100.00%
246	DESTINATION TAG	Destination tag for the scaled input signal. The default is setpoint sum INPUT1.	0 to 499	100
ANIN 2 (A3)				
Analog input 2 connects directly into the speed loop / current loop. It is scanned synchronously with the current loop, about every 3.33 msecs. The other inputs are scanned about every 7 msecs. This input should be used for any signal whose response is critical, for example a trim input from a Microloc, a cut to length application, etc.				
233	CALIBRATION	Input scaling ratio.	±3.0000	1.0000
234	MAX VALUE	Maximum value of the scaled input.	±200.00%	100.00%
235	MIN VALUE	Minimum value of the scaled input.	±200.00%	-100.00%
ANIN 3 (A4)				
236	CALIBRATION	Input scaling ratio.	±3.0000	1.0000
237	MAX VALUE	Maximum value of the scaled input.	±300.00%	100.00%
238	MIN VALUE	Minimum value of the scaled input.	±300.00%	-100.00%
249	DESTINATION TAG	Destination tag for the scaled input signal. The default is RAMP INPUT.	0 to 499	5
ANIN 4 (A5)				
239	CALIBRATION	Input scaling ratio.	±3.0000	1.0000
240	MAX VALUE	Maximum value of the scaled input.	±300.00%	100.00%
241	MIN VALUE	Minimum value of the scaled input.	±300.00%	-100.00%
250	DESTINATION TAG	Destination tag for the scaled input signal. The default is NEG. I CLAMP.	0 to 499	48
ANIN 5 (A6)				
242	CALIBRATION	Input scaling ratio.	±3.0000	1.0000
243	MAX VALUE	Maximum value of the scaled input.	±300.00%	100.00%
244	MIN VALUE	Minimum value of the scaled input.	±300.00%	-100.00%
247	DESTINATION TAG	Destination tag for the scaled input signal. The default is POS. I CLAMP.	0 to 499	301



**SYSTEM:
CONFIGURE I/O**

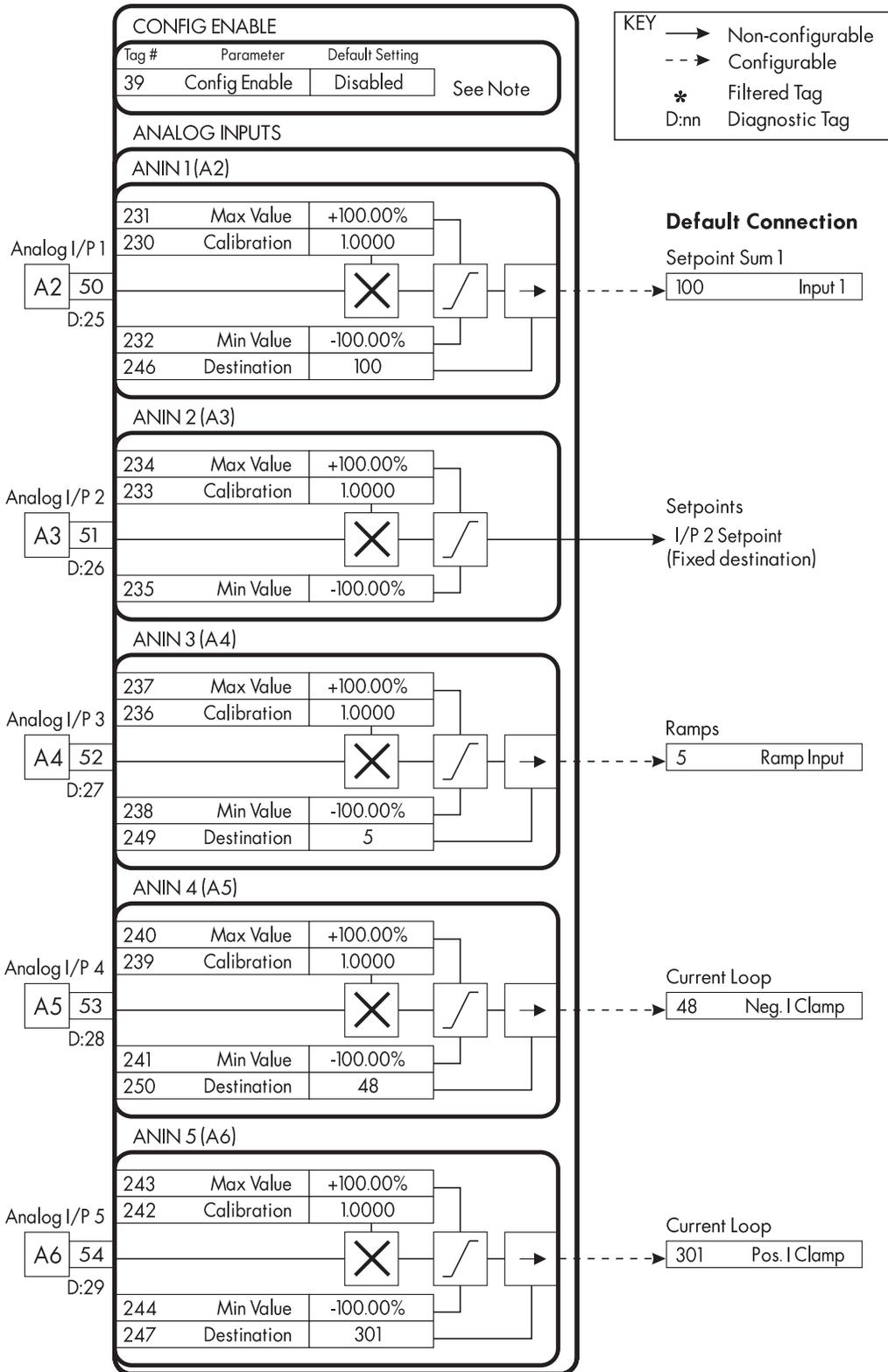


Figure D.2 - Analog Inputs Block Diagram

Analog Inputs - Examples

Inputs can be connected to any writable parameter. The read/write status of each parameter is listed in the right-hand column in Appendices G, H, and I. RO is read only and RW is read/write.

Controlling the accel time of the drive ramp through analog input 1

In this example, an operator wishes to control the acceleration time of the drive speed ramp over a 0 to 30 second range with an external potentiometer. The ends of the pot are connected to the drive's 0 to +10 VDC supply (terminals A1 and B3) and the wiper of the pot to terminal A2. Because the range of both the acceleration and deceleration times are scaled as 0 to 100.00% = 600.0 secs, the signal needs to be scaled to give 30 seconds at 100.00%, or when the potentiometer is turned up to +10 VDC. Otherwise, the pot will have a large, unresponsive deadband range and a small but highly sensitive adjustment range at its low end making accurate setting difficult.

$$\frac{30 \text{ seconds}}{600.0 \text{ seconds}} = \frac{\text{CALIBRATION}}{100.00\%}, \quad \text{CALIBRATION} = 5.00\%$$

1. Set CONFIGURE I/O::CONFIGURE ENABLE to ENABLE.
2. Find the tag numbers for the RAMP ACCEL TIME using the table in Appendix I (tag number 2).
3. Set ANIN 1 (A2)::DESTINATION TAG to 2 (RAMP ACCEL TIME).
4. Set ANIN 1 (A2)::CALIBRATION to 0.0500 (5.00%).
5. Set MAX CLAMP to 100.00%. (Default)
6. Set MIN CLAMP to 0.00%. (Default)
7. Reset CONFIGURE I/O::CONFIGURE ENABLE to DISABLE.

Analog input 1 (terminal A2) now controls the speed ramp acceleration rate over a range of 0 to 30 seconds. An input of 10 volts yields a 30 second acceleration time. The deceleration rate of the speed ramp remains fixed at its default setting of 10 seconds.

NOTE. If you wish to control *both* the accel and decel time from a single external source, you must configure the Analog Input 1 block output to two destinations using an internal link. Refer to the INTERNAL LINKS section appearing later in this chapter.

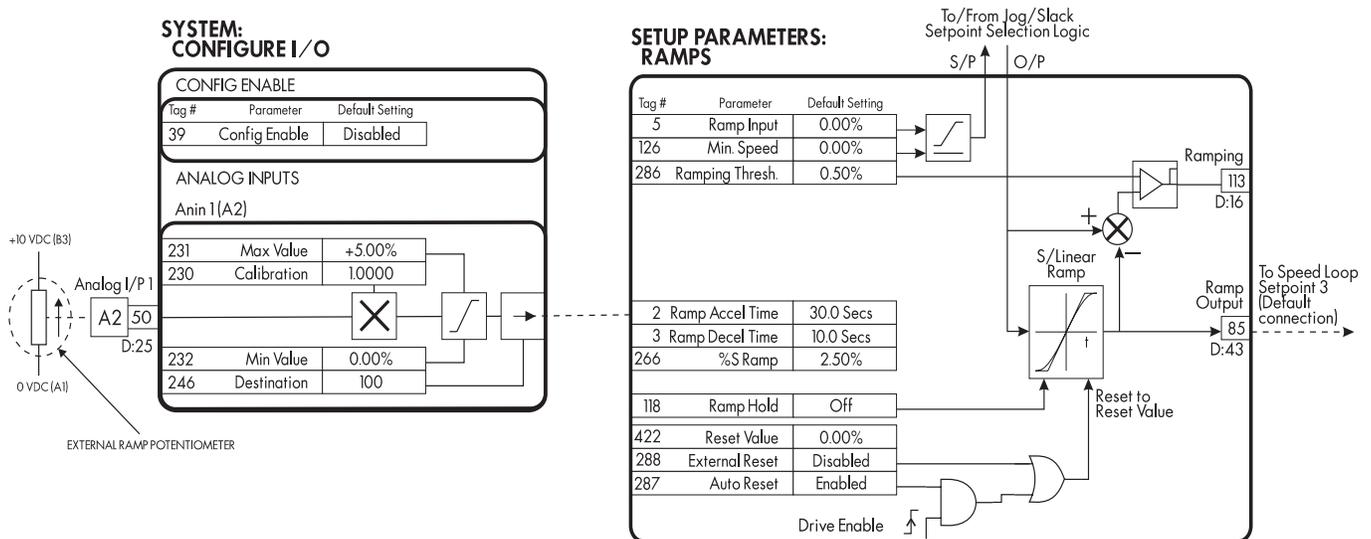


Figure D.3 - Controlling the Ramp Accel Time Using an External Potentiometer Wired to an Analog Input

Using analog input 1 with digital input 1 for reversing a unipolar setpoint

1. Set CONFIGURE I/O::CONFIGURE ENABLE to ENABLE.
2. Set ANIN 3 (A4)::DESTINATION TAG to 0. This step disconnects input 3 from RAMP INPUT.
3. Set BLOCK DIAGRAM::SPT SUM O/P DEST to 5
4. Set DIGIN 1 (C6)::DESTINATION TAG to 8
5. Reset CONFIGURE I/O::CONFIGURE ENABLE to DISABLE.

This configuration allows a unipolar signal, 0 to +10 volt for example, at analog input 1 to control forward and reverse motor control. Analog input 1 connects to SETPOINT SUM 1:: INPUT 1 by default. Motor direction is changed by switching the input signal at digital input 1. When HIGH, SETPOINT SUM 1:: SIGN 1 is POSITIVE causing forward direction. When LOW, it is NEGATIVE causing reverse direction. SETPOINT SUM 1:: SPT. SUM OUTPUT connects to RAMP INPUT to allow smooth acceleration and deceleration.

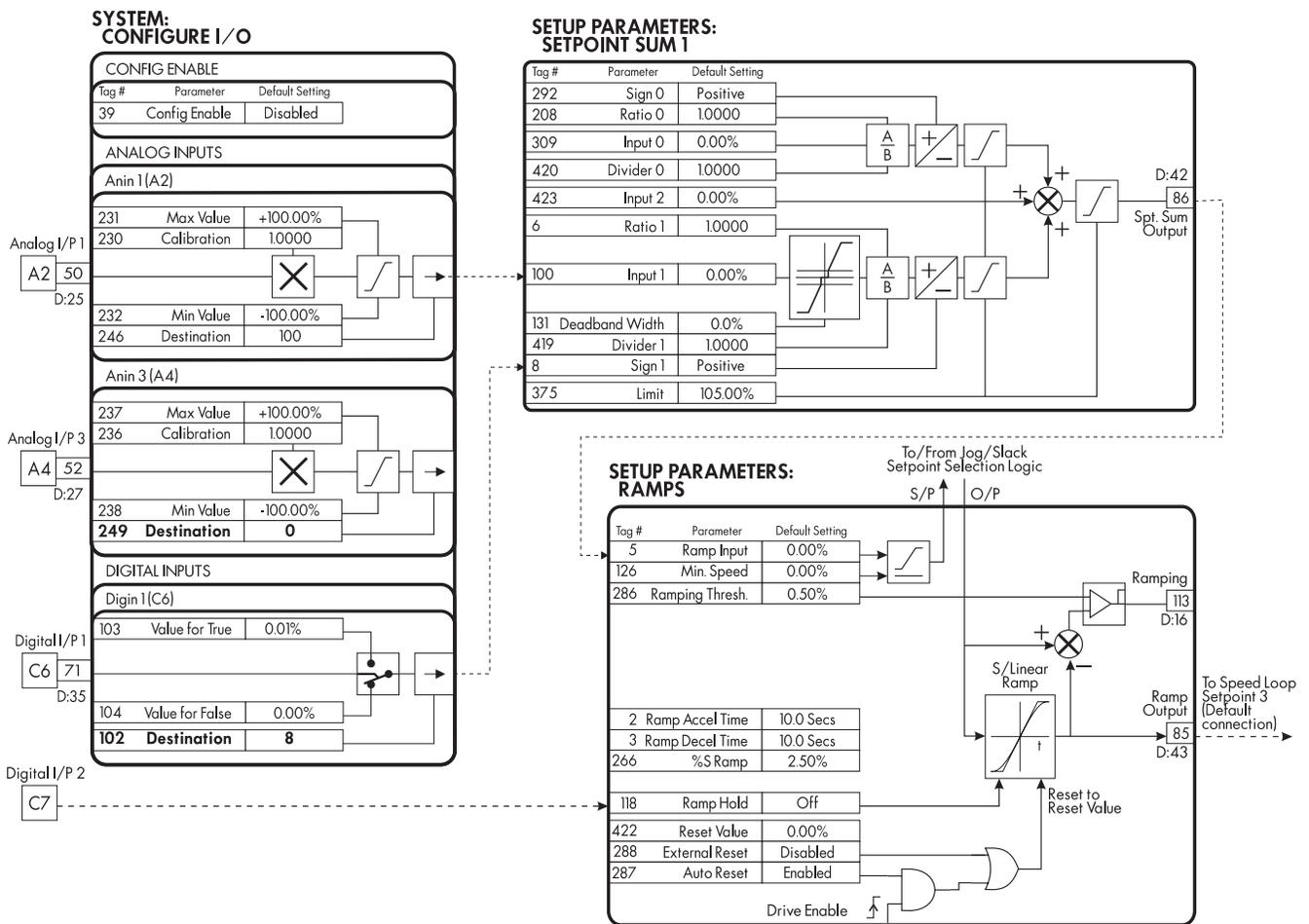


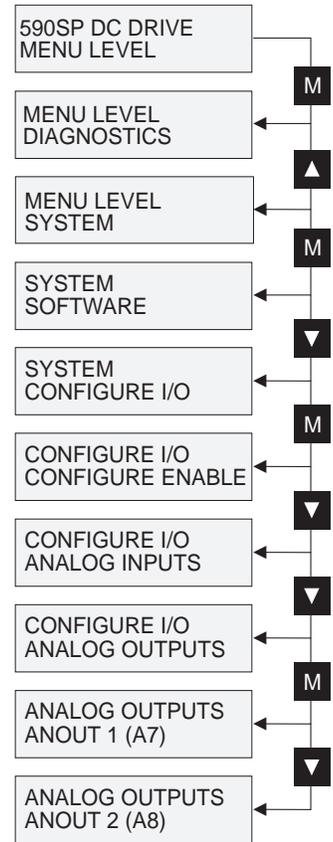
Figure D.4 - Bipolar Output from a Unipolar Input Using an Analog and a Digital Input

ANALOG OUTPUTS

The 590 series controller has two configurable analog outputs.

Parameters

Tag	Parameter	Description	Range	Default
ANOUT 1 (A7)				
245	% TO GET 10V	Scaler value to get a 10 volt output.	±300.00%	100.00%
362	MODULUS	When TRUE, all output is positive, (negative values are made positive).	TRUE/FALSE	FALSE
464	OFFSET	Offset to shift the output value.	±100.00%	0.00%
251	SOURCE TAG	Source tag for the output signal. The default is speed feedback.	0 to 499	62
ANOUT 2 (A8)				
248	% TO GET 10V	Scaler value to get a 10 volt output.	±300.00%	100.00%
363	MODULUS	When TRUE, all output is positive, (negative values are made positive).	TRUE/FALSE	FALSE
465	OFFSET	Offset to shift the output value.	±100.00%	0.00%
252	SOURCE TAG	Source tag for the output signal. The default is speed setpoint.	0 to 499	63



SYSTEM: CONFIGURE I/O: ANALOG OUTPUTS

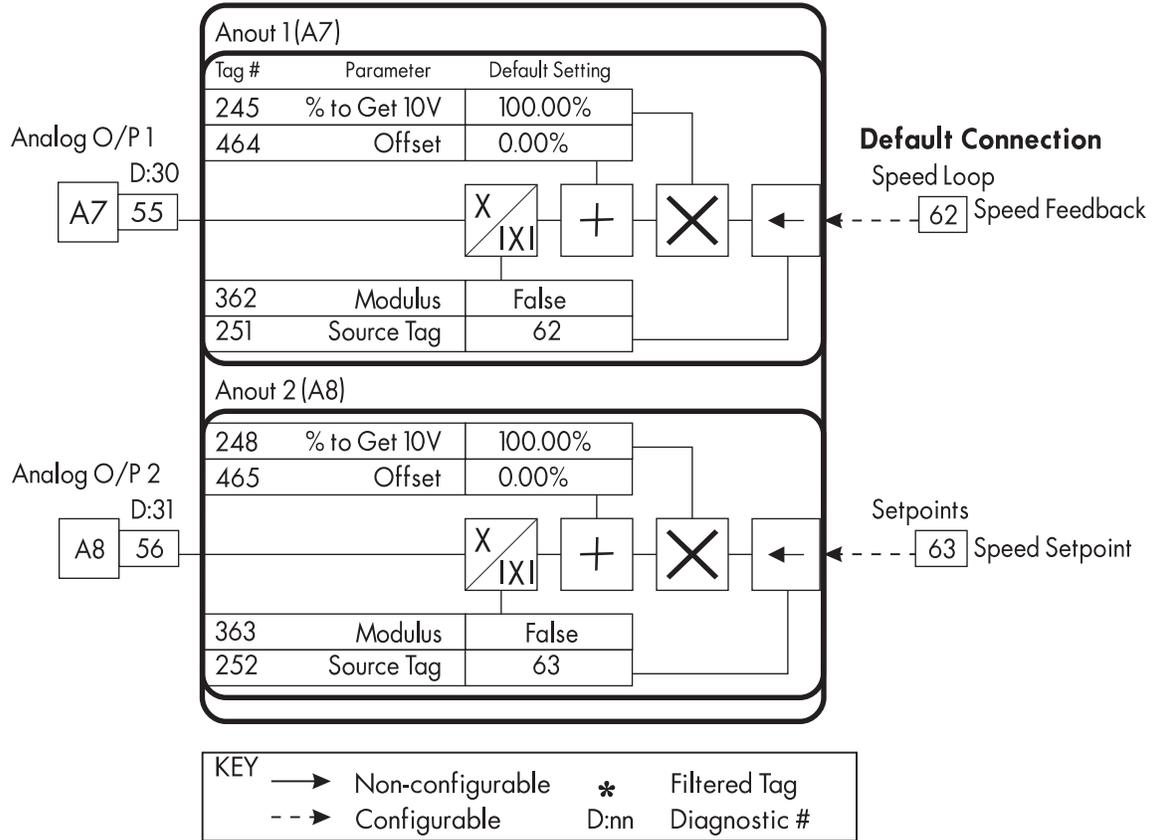


Figure D.5 - Analog Outputs Block Diagram

Analog Outputs - Examples

The source of an analog output signal can be read from any parameter. It is important to remember that other parameters do not "send" signals to the output terminal. An output terminal "retrieves" the signal from the parameter described by its SOURCE TAG parameter.

The % TO GET 10 VDC value is based on the range of the source. It can be set positive or negative which will set the sign of the output. For parameters whose values are not in percent, the range is based on the unformatted quantity reformatted into percent. For example, tag number 300 would become 3.00%.

MODULUS will determine whether the output is bipolar or unipolar. When TRUE, the output is unipolar (will not go negative). Negative values will be clamped to zero.

Reading FIELD I FBK. through analog output 1

1. Set CONFIGURE I/O::CONFIGURE ENABLE to ENABLE.
2. Find the tag number associated with field current feedback in the parameter list in Appendix I. (It is 300.)
3. Set ANALOG OUTPUTS::ANOUT 1 (A7):: SOURCE TAG to 300.
4. Set ANALOG OUTPUTS::ANOUT 1 (A7):: % TO GET 10 VDC to 100% (Default).
5. Reset CONFIGURE I/O::CONFIGURE ENABLE to DISABLE.

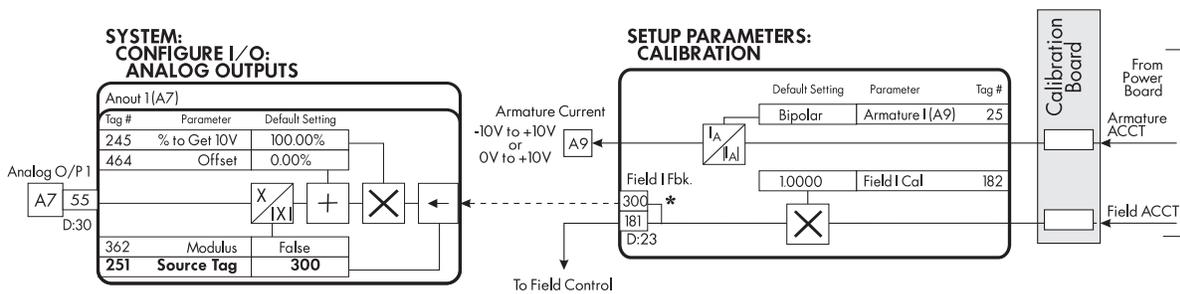


Figure D.6 - Reading FIELD I FBK Using an Analog Output

Connecting the serial link to analog output 1

This allows analog output 1 to read values written by an external device to PNO 58 (ASCII 3A) which is AUX ANOUT 1.

1. Set CONFIGURE I/O::CONFIGURE ENABLE to ENABLE.
2. Find the tag number for AUX ANOUT 1 in the parameter list in Appendix I. (It is 128.)
3. Set ANALOG OUTPUTS::ANOUT 1 (A7):: SOURCE TAG to 128.
4. Set ANALOG OUTPUTS::ANOUT 1 (A7):: % TO GET 10V to 100% (Default).
5. Reset CONFIGURE I/O::CONFIGURE ENABLE to DISABLE.

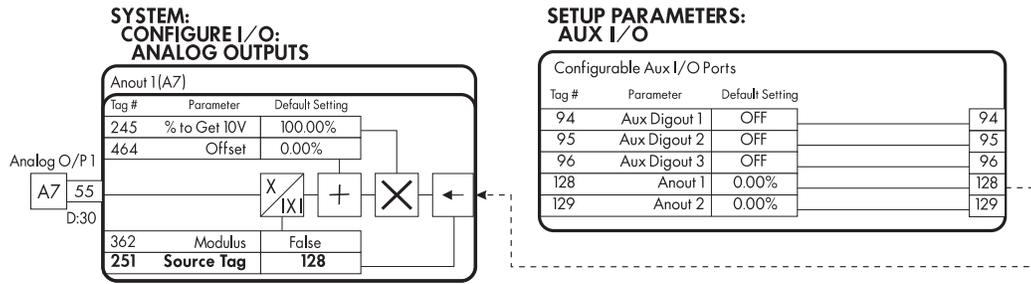


Figure D.7 - Reading a Serial Communications Signal Using an Analog Output

Connecting current demand to analog output 2

1. Set CONFIGURE I/O::CONFIGURE ENABLE to ENABLE.
 2. Find the tag number for current demand in the parameter list in Appendix I. (It is 66.)
 3. Set ANALOG OUTPUTS::ANOUT 2 (A8):: SOURCE TAG to 66.
 4. Set ANALOG OUTPUTS::ANOUT 2 (A8):: % TO GET 10V to 200%.
 5. Reset CONFIGURE I/O::CONFIGURE ENABLE to DISABLE.
- Setting % TO GET 10V at 200% results in 5 volts output when current feedback is at 100%.

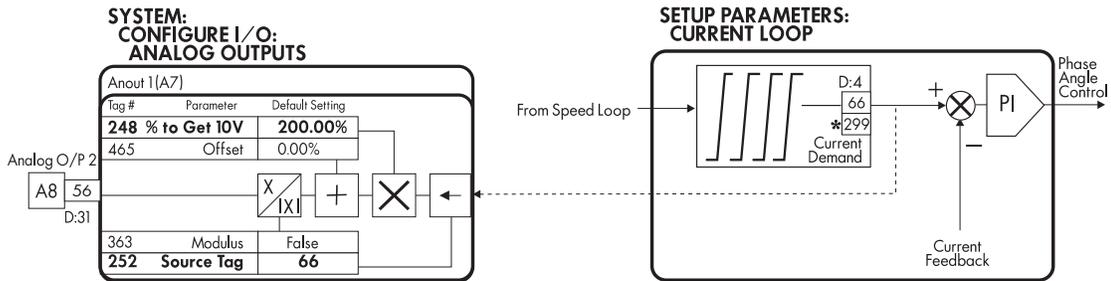


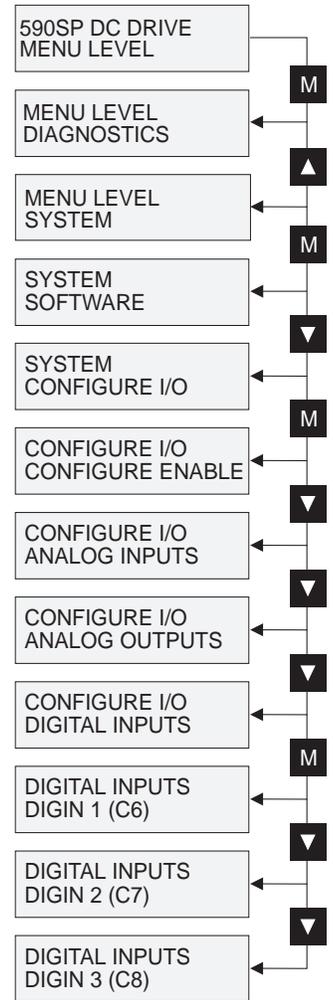
Figure D.8 - Reading Current Demand Using an Analog Output

DIGITAL INPUTS

The 590 series controller has three configurable digital inputs.

Parameters

Tag	Parameter	Description	Range	Default
DIGIN 1 (C6)				
103	VALUE FOR TRUE	Value sent to the destination when terminal C6 is at 24VDC.	±300.00%	0.01%
104	VALUE FOR FALSE	Value sent to the destination when terminal C6 is at 0VDC.	±300.00%	0.00%
102	DESTINATION TAG	Destination tag for the input signal. The default is BIPOLAR CLAMPS.	0 to 499	90
DIGIN 2 (C7)				
106	VALUE FOR TRUE	Value sent to the destination when terminal C7 is at 24VDC.	±300.00%	0.01%
107	VALUE FOR FALSE	Value sent to the destination when terminal C7 is at 0VDC.	±300.00%	0.00%
105	DESTINATION TAG	Destination tag for the input signal. The default is RAMP HOLD.	0 to 499	118
DIGIN 3 (C8)				
109	VALUE FOR TRUE	Value sent to the destination when terminal C8 is at 24VDC.	±300.00%	0.01%
110	VALUE FOR FALSE	Value sent to the destination when terminal C8 is at 0VDC.	±300.00%	0.00%
108	DESTINATION TAG	Destination tag for the input signal. The default is IDMD ISOLATE.	0 to 499	119



**SYSTEM:
CONFIGURE I/O:
DIGITAL INPUTS**

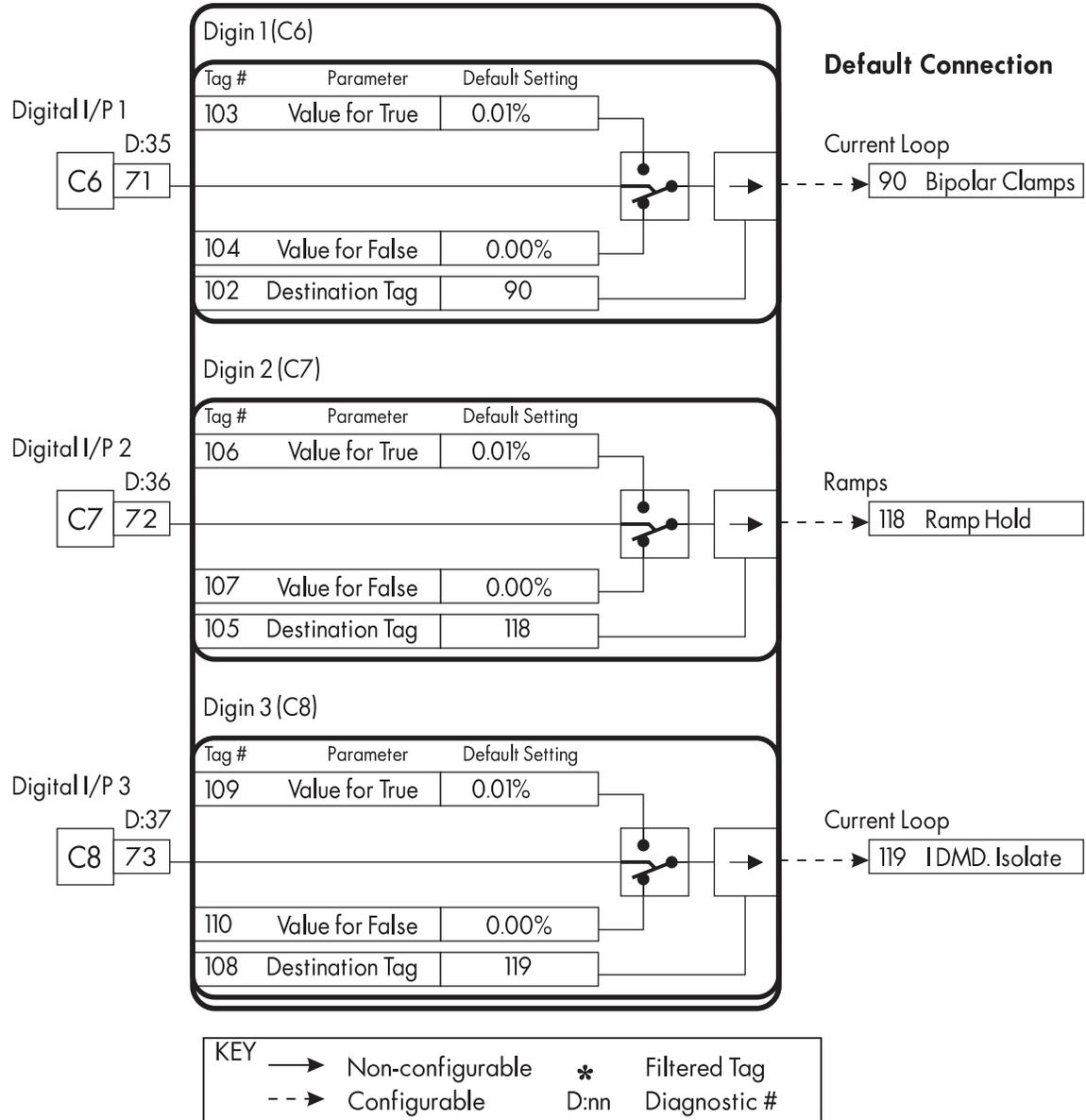


Figure D.9 - Digital Inputs Block Diagram

Digital Inputs - Examples

Digital inputs can be connected to read/write parameters only. These inputs are useful for switching states of LOGIC parameters. LOGIC parameters are those whose ranges are ON/OFF, TRUE/FALSE, ENABLED/DISABLED, etc. They can also send two fixed values to a VALUE parameter as determined by the state of the input terminal.

Using digital inputs with LOGIC parameters

The default connections in the 590SP Digital drive allow the digital inputs to switch LOGIC parameters. These are the connections from terminal C6 to tag 90 (BIPOLAR CLAMPS), C7 to tag 118 (RAMP HOLD), and C8 to tag 119 (I DMD. ISOLATE). In each case, the state of the terminal switches the destination parameter on or off by sending a 1 or 0. Since the format of the VALUE FOR TRUE and VALUE FOR FALSE parameters is in percent, 0 is equal to 0.00% and 1 is equal to 0.01%.

Inverting the Input Signal

1. Set CONFIGURE I/O::CONFIGURE ENABLE to ENABLE.
2. Set DIGIN 1 (C6)::VALUE FOR TRUE to 0.00%.
3. Set VALUE FOR FALSE to 0.01%.
4. Reset CONFIGURE I/O::CONFIGURE ENABLE to DISABLE.

Digital input 1 now sends a 0 when the input signal is TRUE and 1 when it is FALSE.

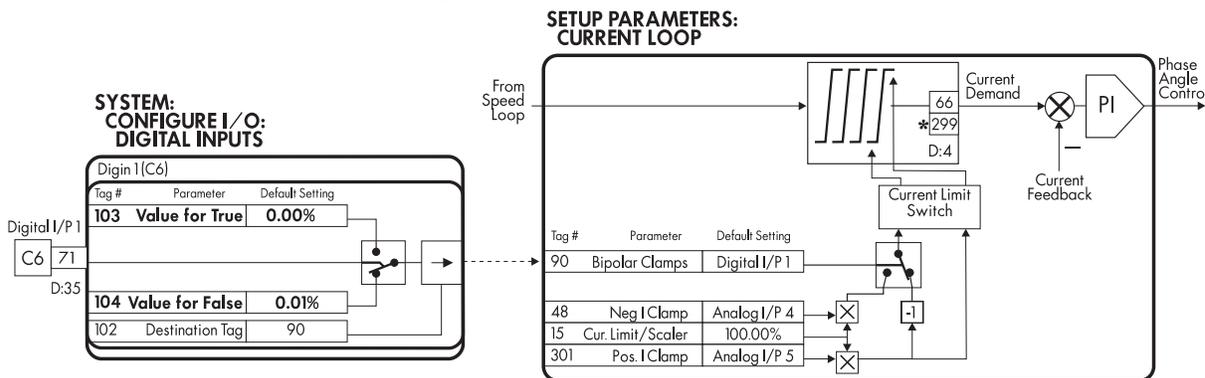


Figure D.10 - Inverted Signal Using a Digital Input

Connecting digital input 1 to speed loop prop gain

1. Set CONFIGURE I/O::CONFIGURE ENABLE to ENABLE.
2. Find the tag number for the speed loop prop gain in the parameter list in Appendix I. (It is 14.)
3. Set DIGIN 1 (C6)::DESTINATION TAG to 14.
4. Set VALUE FOR TRUE to 10.00.
5. Set VALUE FOR FALSE to 30.00
6. Reset CONFIGURE I/O::CONFIGURE ENABLE to DISABLE.

Digital input 1 now sets SPEED LOOP::PROP. GAIN to two values depending upon its state. When it is HIGH, PROP. GAIN is at 10.00 and when LOW, PROP. GAIN is at 30.00.

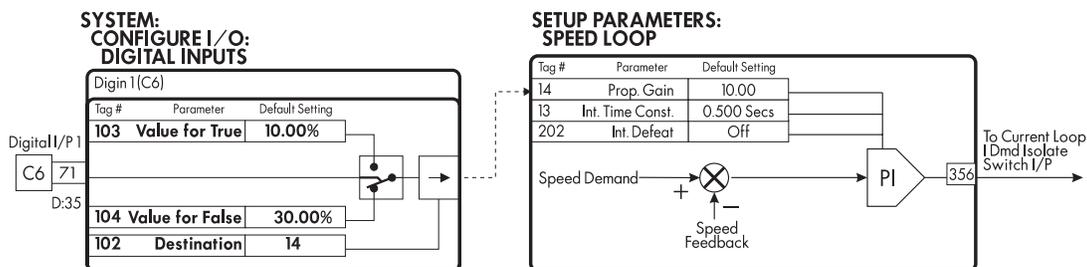


Figure D.11 - Changing a Value Parameter Using a Digital Input

Using digital inputs to switch signal sources

1. Set CONFIGURE I/O::CONFIGURE ENABLE to ENABLE.
2. Find the tag number for LINK 1's source tag in the parameter list in Appendix H. (It is 364.)
3. Set DIGIN 1 (C6)::DESTINATION TAG to 364.
4. Find the tag number for AUX I/O::ANOUT 2 in the parameter list in Appendix H. (It is 129.)
5. Set DIGIN 1 (C6)::VALUE FOR TRUE to 1.29%.
6. Find the tag number for AUX I/O::ANOUT 1 in the parameter list in Appendix H. (It is 128.)
7. Set DIGIN 1 (C6)::VALUE FOR FALSE to 1.28%.
8. Find the tag number for SETPOINT SUM::INPUT 0 in the parameter list in Appendix H. (It is 309.)
9. Set LINK 1::DESTINATION TAG to 309.
10. Set AUX I/O::ANOUT 1 to 10%.
11. Set AUX I/O::ANOUT 2 to 20%.
12. Reset CONFIGURE I/O::CONFIGURE ENABLE to DISABLE.

This example uses an internal link to route two signals to INPUT 0. The state of digital input 1 determines the number held by LINK 1 :: SOURCE TAG. When TRUE, it is 129. When FALSE, the tag is 128. LINK 1 :: SOURCE TAG retrieves the value from ANOUT 1 or 2 depending on the tag and routes it to SETPOINT SUM 1:: INPUT 0. The signal switches between 10 and 20 percent. This is useful for switching between two jog setpoints.

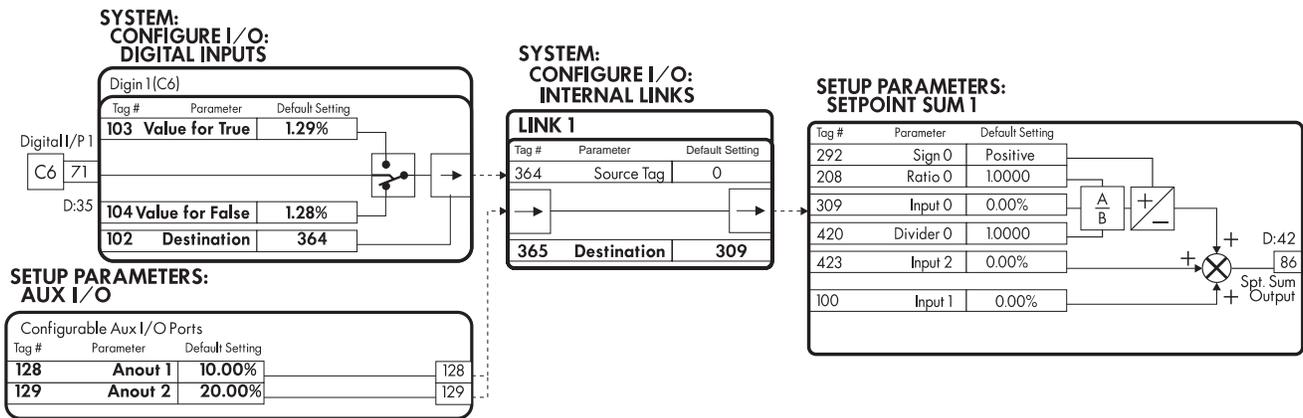


Figure D.12 - Switching Signal Sources Using a Digital Input

Using digital inputs for jog forward and jog reverse functionality

1. Set CONFIGURE I/O::CONFIGURE ENABLE to ENABLE.
2. Find the tag number for JOG/SLACK:: MODE tag in the parameter list in Appendix H. (It is 228.)
3. Set DIGIN 1 (C6)::DESTINATION TAG to 228.
4. Reset CONFIGURE I/O::CONFIGURE ENABLE to DISABLE.

This configuration allows jog forward and jog reverse functionality. When terminal C4 is energized, the drive jogs forward using JOG SPEED 1, 5.00%. When both C4 and C6 are energized, OPERATING MODE switches to JOG 2. In this mode, the drive jogs in reverse using JOG SPEED 2, -5.00%.

See the Jog/Slack section in Appendix C for more information using this feature.

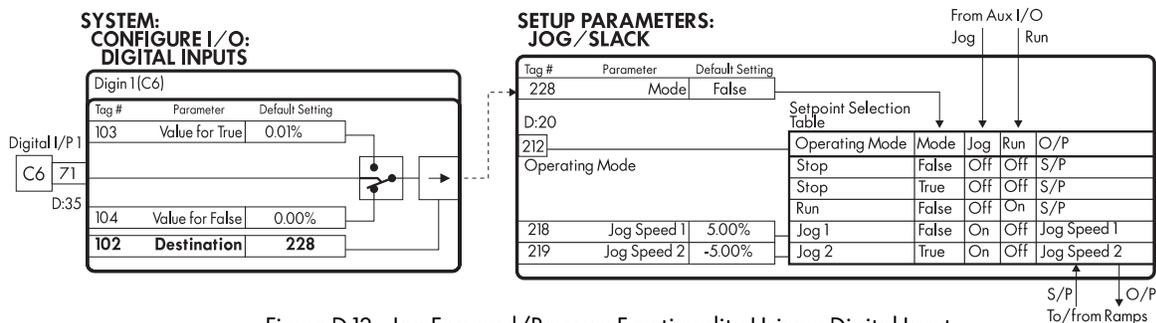


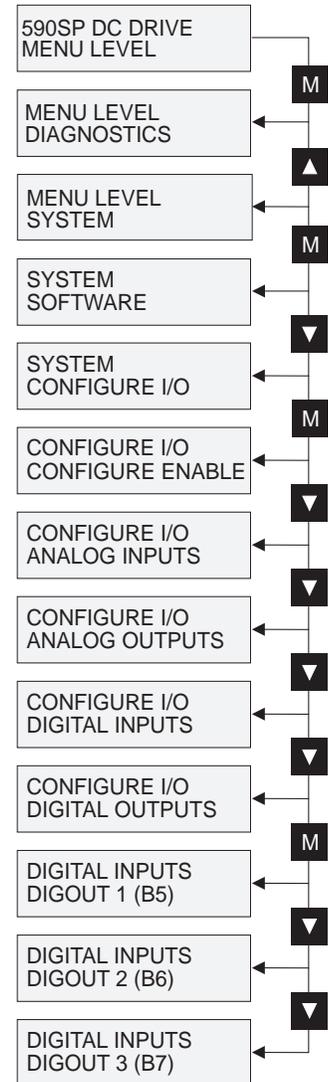
Figure D.13 - Jog Forward/Reverse Functionality Using a Digital Input

DIGITAL OUTPUTS

The 590 series controller has three digital outputs. Each output is configurable.

Parameters

Tag	Parameter	Description	Range	Default
DIGOUT 1 (B5)				
195	THRESHOLD (>)	The threshold the source value must exceed for the output to be at 24VDC.	±300.00%	0.00%
43	MODULUS	When TRUE, the absolute value of the source value is used for the threshold test.	TRUE/FALSE	TRUE
97	SOURCETAG	Source tag of the value used to set the output. The default is AT ZERO SPEED.	0 to 499	77
359	INVERTED	When TRUE, inverts the output.	TRUE/FALSE	FALSE
DIGOUT 2 (B6)				
196	THRESHOLD (>)	The threshold the source value must exceed for the output to be at 24VDC.	±300.00%	0.00%
44	MODULUS	When TRUE, the absolute value of the source value is used for the threshold test.	TRUE/FALSE	TRUE
98	SOURCETAG	Source tag of the value used to set the output. The default is the HEALTH FLAG (LED).	0 to 499	122
360	INVERTED	When TRUE, inverts the output.	TRUE/FALSE	FALSE
DIGOUT 3 (B7)				
197	THRESHOLD (>)	The threshold the source value must exceed for the output to be at 24VDC.	±300.00%	0.00%
45	MODULUS	When TRUE, the absolute value of the source value is used for the threshold test.	TRUE/FALSE	TRUE
99	SOURCETAG	Source tag of the value used to set the output. The default is the READY FLAG.	0 to 499	125
361	INVERTED	When TRUE, inverts the output.	TRUE/FALSE	FALSE



SYSTEM: CONFIGURE I/O: DIGITAL OUTPUTS

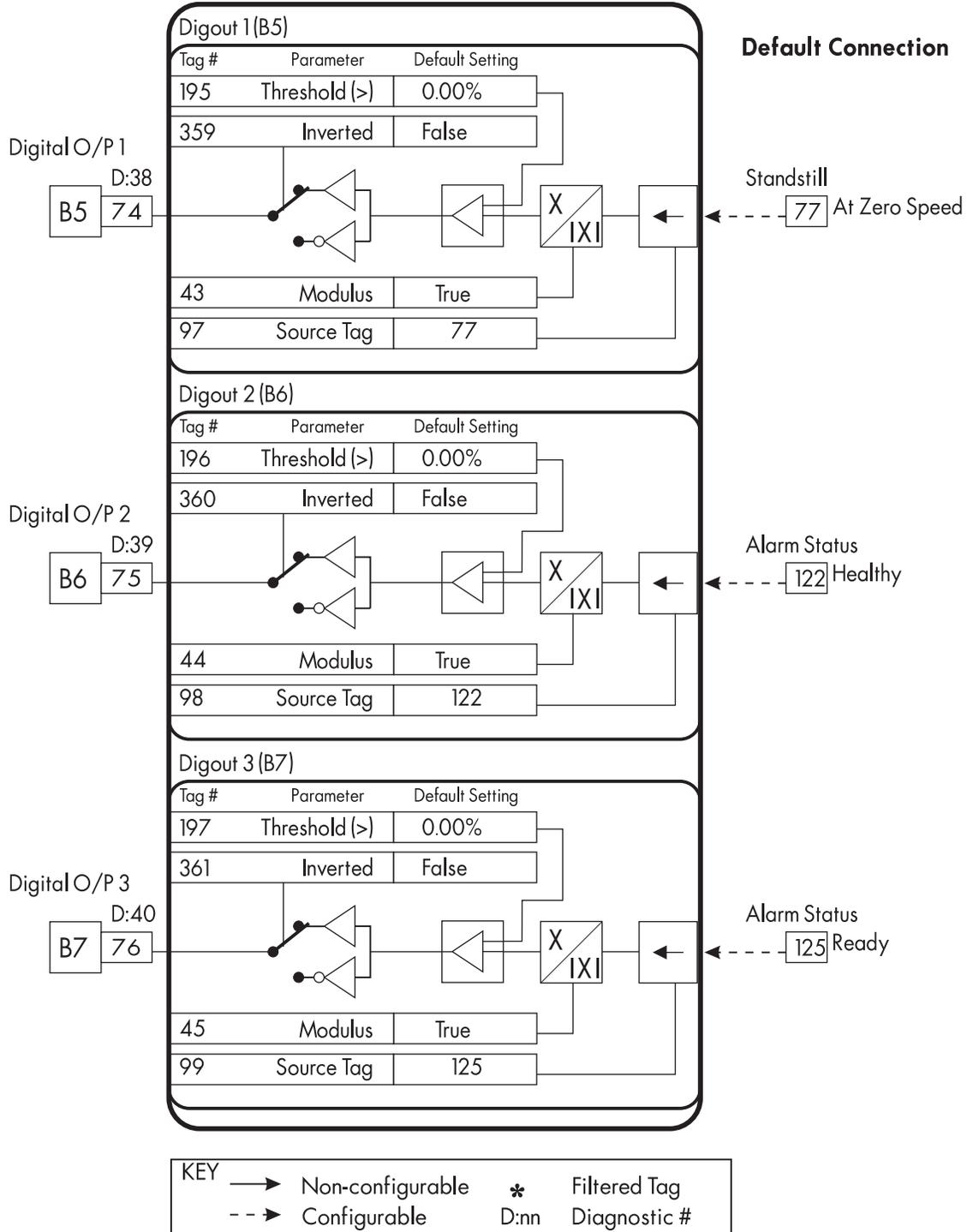


Figure D.14 - Digital Outputs Block Diagram

Digital Outputs - Examples

Digital outputs can read all parameters (the same as the analog outputs). When used with a VALUE parameter, MODULUS removes the sign from the value (so -100 becomes 100). The THRESHOLD (>) parameter determines when the output is HIGH or LOW. The input signal must exceed the parameter for the output to go HIGH. INVERTED, when TRUE, inverts the result of the output from the threshold test.

Reading speed feedback through digital output 1

In this example, the output will be HIGH when the absolute value of the speed feedback is larger than 50%.

1. Find the tag number for speed feedback in the parameter list in Appendix I. (It is 62.)
2. Set DIGITAL OUTPUTS::DIGOUT 1 (B5):: SOURCE TAG to 62.
3. Set DIGITAL OUTPUTS::DIGOUT 1 (B5):: THRESHOLD(>) to 50%.
4. Set DIGITAL OUTPUTS::DIGOUT 1 (B5):: MODULUS to TRUE (Default).
5. Set DIGITAL OUTPUTS::DIGOUT 1 (B5):: INVERTED to FALSE (Default).

This option is useful for generating an up-to-speed output.

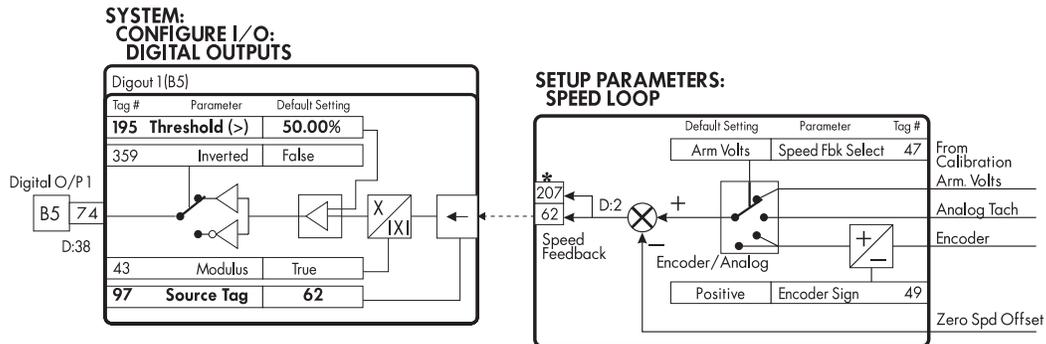


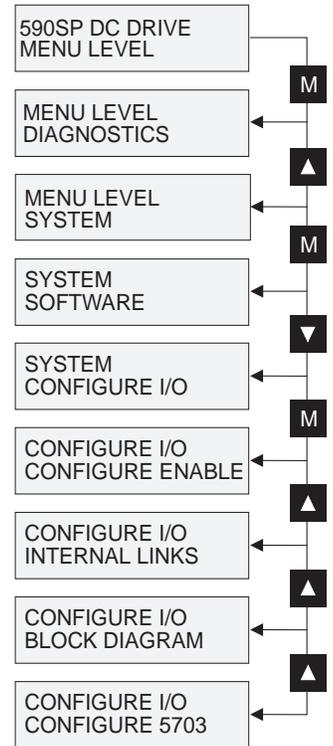
Figure D.15 - Reading Speed Feedback a Digital Output

CONFIGURE 5703

The 5703 peer-to-peer communication option transfers parameters from drive to drive through the serial port, P3. See Appendix E for additional information on the option.

Parameters

Tag	Parameter	Description	Range	Default
134	SOURCETAG	Source tag of the value to be sent to the 5703. The default is SPEED DEMAND.	0 to 499	89
135	DESTINATIONTAG	Destination tag of the value received from the 5703. The default is SETPOINT 4 in the speed loop.	0 to 499	41



SYSTEM: CONFIGURE I/O: CONFIGURE 5703

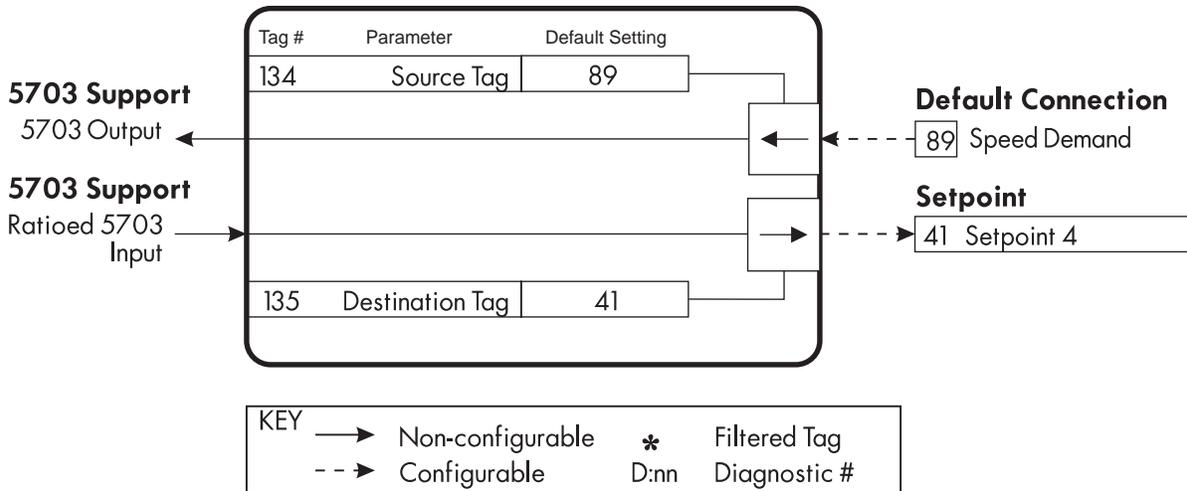


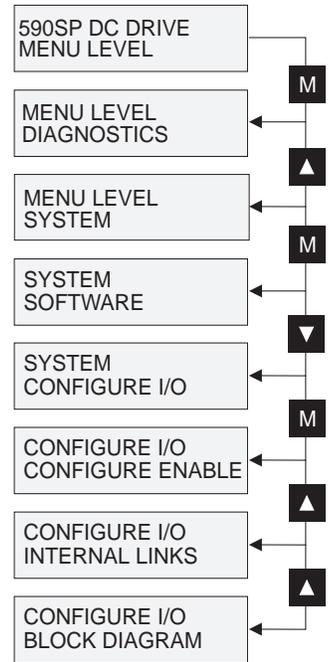
Figure D.16 - Configure 5703 Block Diagram

BLOCK DIAGRAM

The parameters in Block Diagram connect the outputs of Raise/Lower, Ramps, Setpoint Sum 1, and the Special Blocks functions to destinations as required. These functions are only executed when the destinations are connected to a nonzero tag. If a function is not required, set its destination to tag 0. This causes the processor to ignore the function and reduces processor loading.

Parameters

Tag	Parameter	Description	Range	Default
260	RAISE/LOWER DEST	RAISE/LOWER output destination. The default is no connection.	0 to 499	0
293	RAMP O/P DEST	RAMPS output destination. The default is SETPOINT 3 in the speed loop.	0 to 499	291
294	SPT SUM 1 DEST	SETPOINT SUM 1 output destination. The default is SETPOINT 1 in the speed loop.	0 to 499	289
400	PID O/P DEST	PID output destination. The default is no connection.	0 to 499	0
431	DIAMETER	DIAMETER CALC. output destination. The default is no connection.	0 to 499	0
442	TAPER	TAPER CALC. output destination. The default is no connection.	0 to 499	0
450	SETPOINT SUM 2	SETPOINT SUM 2 output destination. The default is no connection.	0 to 499	0
435	POS. ICLAMP	TORQUE CALC. positive clamp output destination. The default is no connection.	0 to 499	0
436	NEG. ICLAMP	TORQUE CALC. negative clamp output destination. The default is no connection.	0 to 499	0



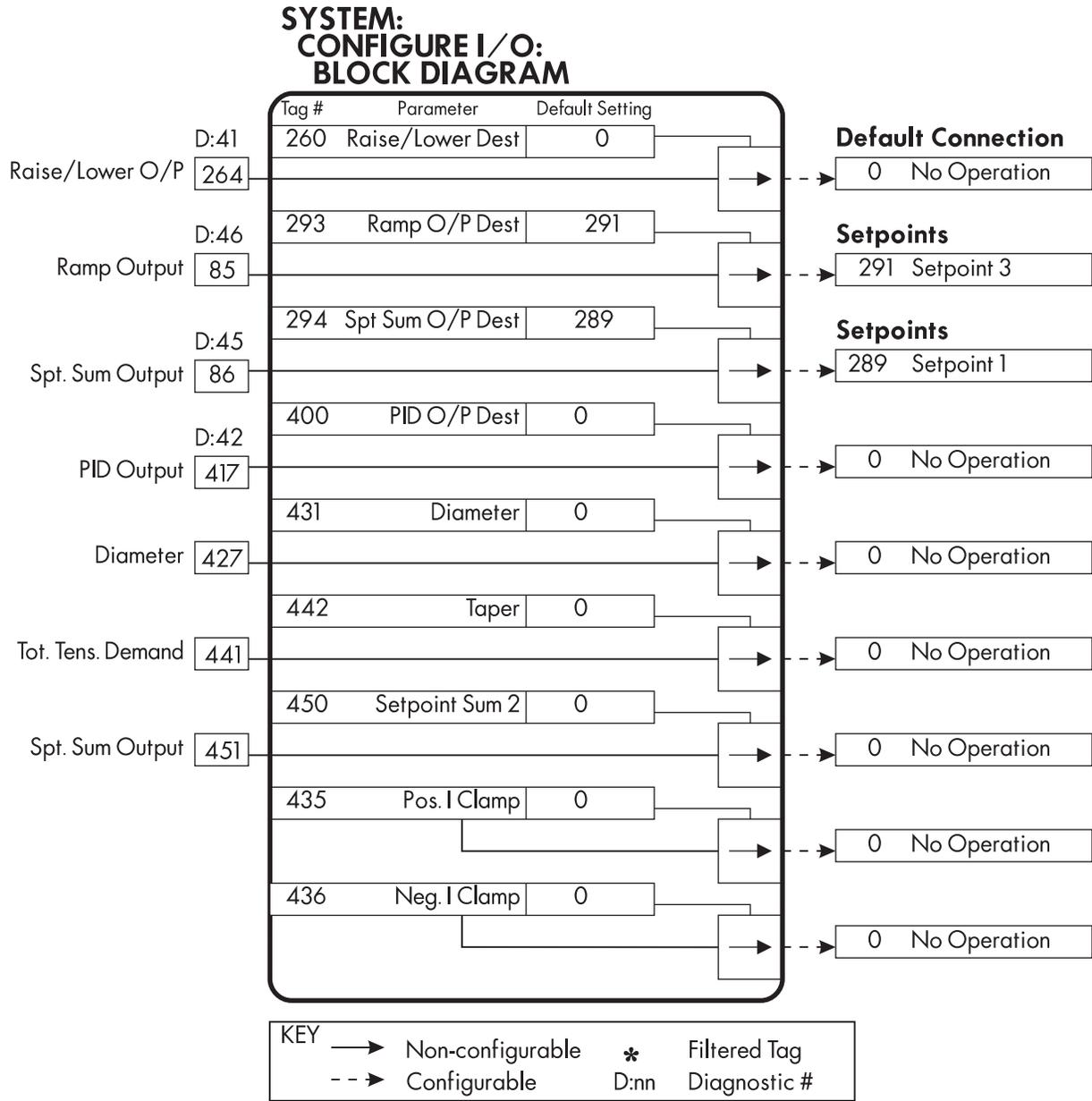


Figure D.17 - Block Diagram

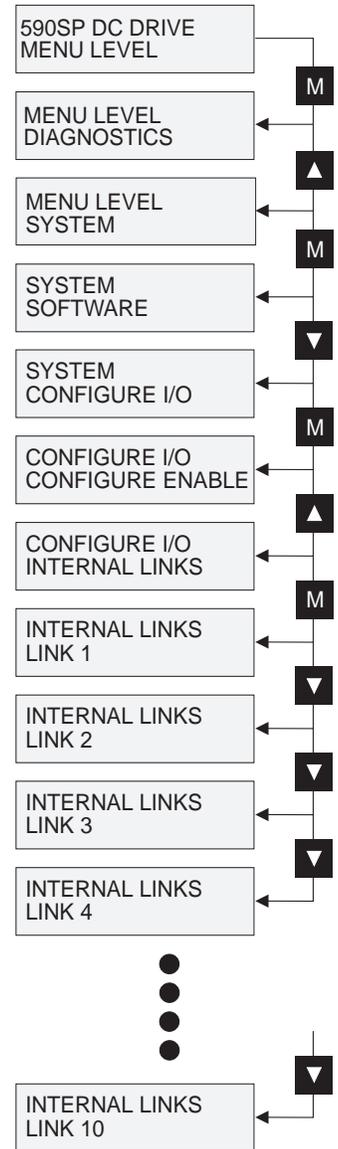
INTERNAL LINKS

The drive has ten INTERNAL LINKS. They have two common uses; connecting an internal input to an internal output and connecting an input terminal to multiple destinations.

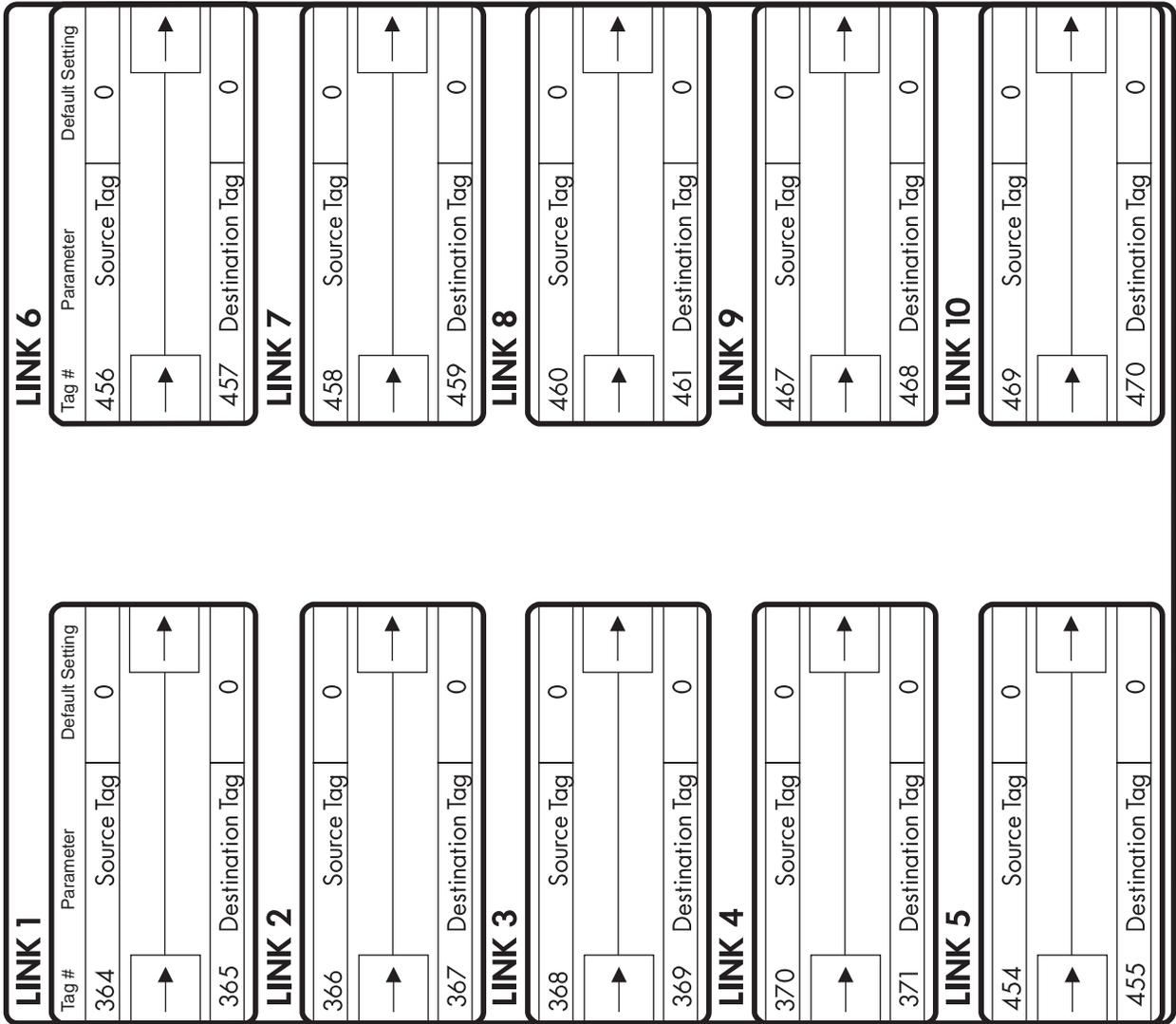
None of the links are connected in the default configuration.

Parameters

Tag	Parameter	Description	Range	Default
LINK 1				
364	SOURCE TAG	Source tag of the input value.	0 to 499	0
365	DESTINATION TAG	Dest. tag of the input value.	0 to 499	0
LINK 2				
366	SOURCE TAG	Source tag of the input value.	0 to 499	0
367	DESTINATION TAG	Dest. tag of the input value.	0 to 499	0
LINK 3				
368	SOURCE TAG	Source tag of the input value.	0 to 499	0
369	DESTINATION TAG	Dest. tag of the input value.	0 to 499	0
LINK 4				
370	SOURCE TAG	Source tag of the input value.	0 to 499	0
371	DESTINATION TAG	Dest. tag of the input value.	0 to 499	0
LINK 5				
454	SOURCE TAG	Source tag of the input value.	0 to 499	0
455	DESTINATION TAG	Dest. tag of the input value.	0 to 499	0
LINK 6				
456	SOURCE TAG	Source tag of the input value.	0 to 499	0
457	DESTINATION TAG	Dest. tag of the input value.	0 to 499	0
LINK 7				
458	SOURCE TAG	Source tag of the input value.	0 to 499	0
459	DESTINATION TAG	Dest. tag of the input value.	0 to 499	0
LINK 8				
460	SOURCE TAG	Source tag of the input value.	0 to 499	0
461	DESTINATION TAG	Dest. tag of the input value.	0 to 499	0
LINK 9				
467	SOURCE TAG	Source tag of the input value.	0 to 499	0
468	DESTINATION TAG	Dest. tag of the input value.	0 to 499	0
LINK 10				
469	SOURCE TAG	Source tag of the input value.	0 to 499	0
470	DESTINATION TAG	Dest. tag of the input value.	0 to 499	0



**SYSTEM:
CONFIGURE I/O:
INTERNAL LINKS**



KEY

- Non-configurable
- - - Configurable
- * Filtered Tag
- D:nn Diagnostic #

Figure D.18 - Internal Links Block Diagram

Internal Links - Example

Controlling both the accel and decel times of the drive ramp through analog input 1

This example is similar to the first example in the Analog Inputs section of this chapter. As before, the ends of the external pot are connected to the drive's 0 to +10 VDC supply (terminals A1 and B3), the wiper of the pot is connected to terminal A2 and the calibration parameter of the Analog Input 1 is set to 5.00% to scale the input signal to 30 seconds, maximum. However, in this instance INTERNAL LINK 1 is used to allow the external pot to control *both* the acceleration and deceleration time of the ramp.

1. Set CONFIGURE I/O::CONFIGURE ENABLE to ENABLE.
2. Find the tag numbers for both RAMP ACCEL TIME and RAMP DECEL TIME in the parameter list in Appendix I. (They are 2 and 3.)
3. Set ANIN 1 (A2)::DESTINATION TAG to 2 (RAMP ACCEL TIME).
4. Set ANIN 1 (A2)::CALIBRATION to 0.0500 (5.00%).
5. Set MAX CLAMP to 100.00%. (Default)
6. Set MIN CLAMP to 0.00%.
7. Exit the ANALOG INPUTS sub-menu and scroll down to INTERNAL LINKS. Enter INTERNAL LINKS.
8. Set the SOURCE TAG of LINK 1 to tag number 2, RAMP ACCEL TIME, which is also the destination tag of the output of the block Analog Input 1.
9. Set the DESTINATION TAG of LINK to tag number 3, RAMP DECEL TIME.
10. Reset CONFIGURE I/O::CONFIGURE ENABLE to DISABLE.

Analog Input 1 (terminal A2) now controls *both* the speed ramp acceleration and deceleration times over a range of 0 to 30 seconds. An input of 10 VDC sets the ramp up and down times 30 seconds.

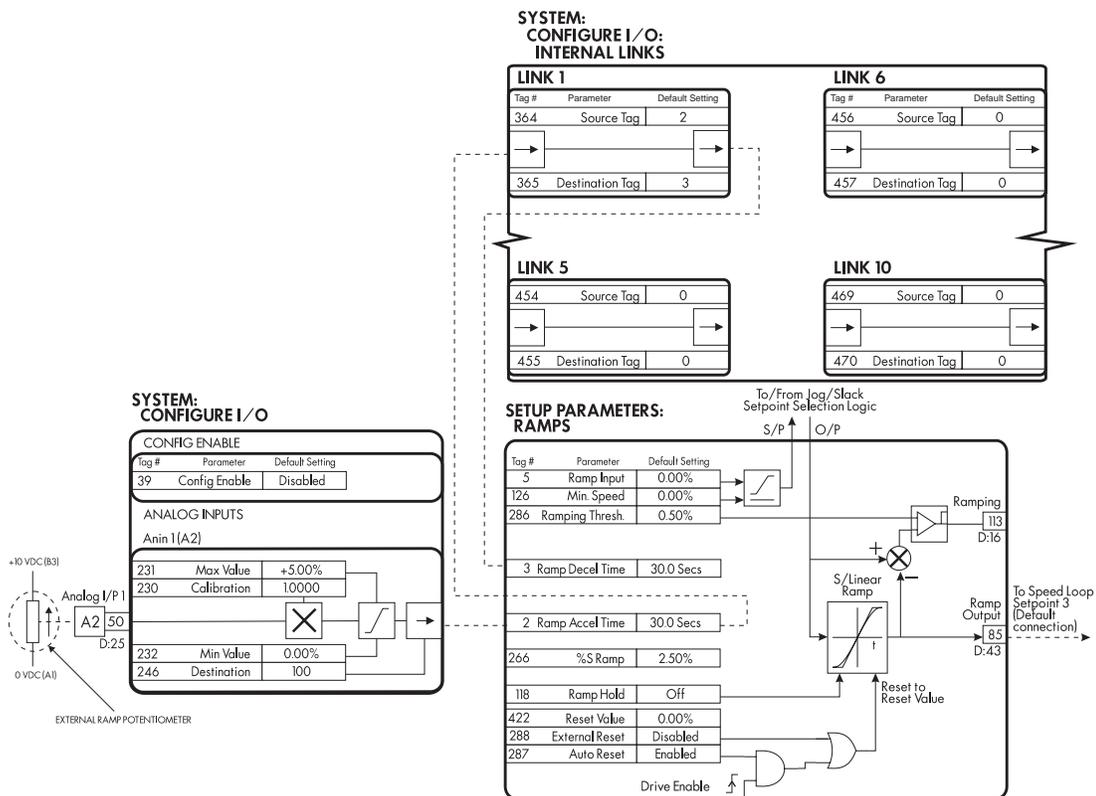
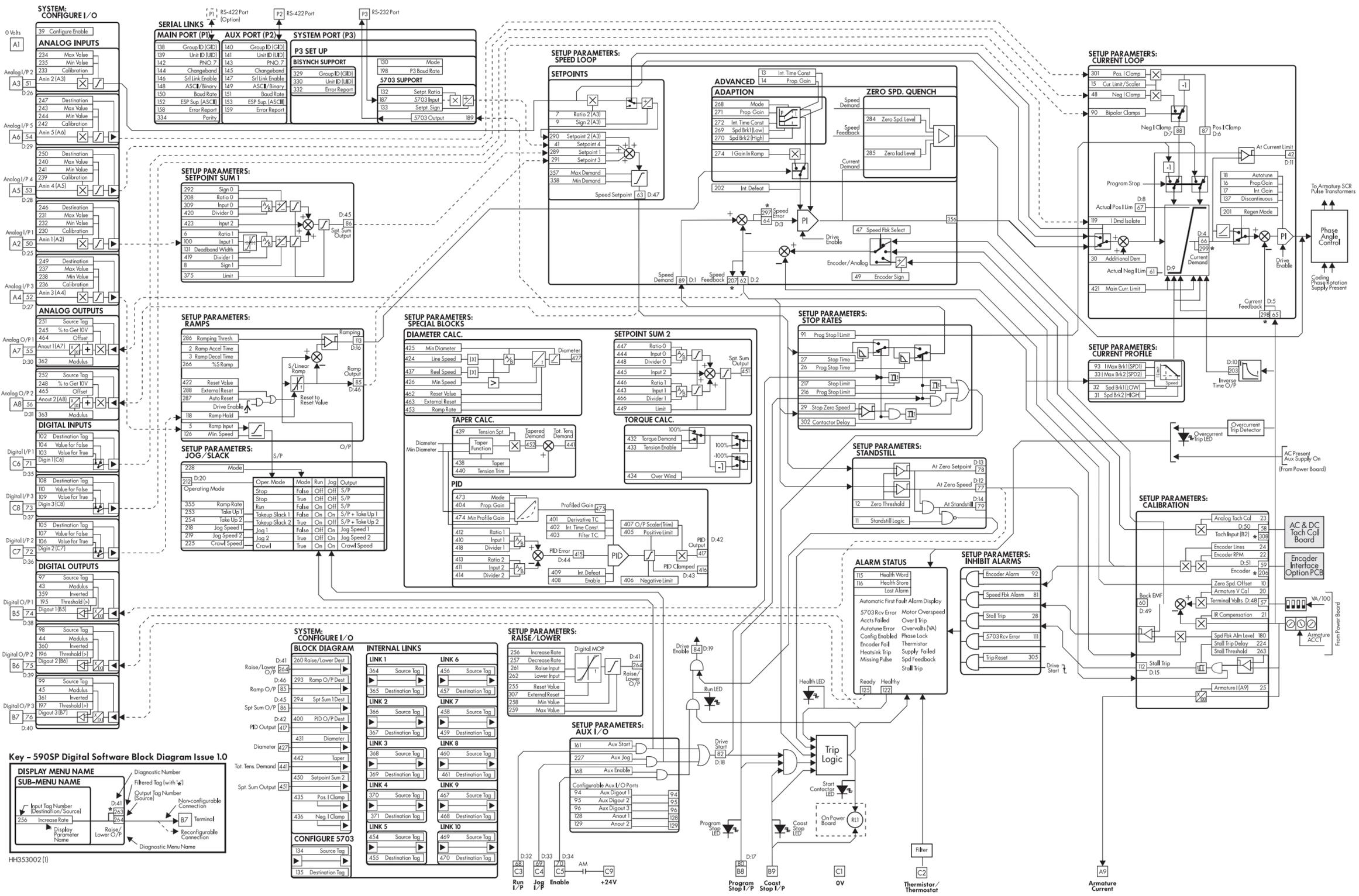


Figure D.19 - Controlling both the Ramp Accel and Decel Time Using an External Potentiometer Wired to an Analog Input



Figure D.20 - 590SP Digital Software Block Diagram



Key - 590SP Digital Software Block Diagram Issue 1.0

DISPLAY MENU NAME
 SUB-MENU NAME

Input Tag Number (Destination/Source)
 Increase Rate
 Display Parameter Name

Diagnostic Number
 Filtered Tag (with 'w')
 Output Tag Number (Source)
 Non-configurable Connection
 Reconfigurable Connection
 Terminal

Diagrams use these symbols to indicate connections between menu items and their underlying parameters or hardware terminals.

H#H353002 (1)

Appendix E MMI PARAMETER LIST

The following listing of version 3.2 MMI parameters contains the default MMI values. Use it to keep track of any modifications you may make during installation and commissioning. Any parameters changed by the factory before shipping are listed in the column SETTING 1.

NOTE. The default settings (column 1) overwrite any configuration changes made by either the factory or by the customer if you perform a four-button reset . Before performing a reset, write down your custom settings in the columns provided so that you may reenter them if they are inadvertently overwritten or lost.

TAG	PARAMETER NAME	DEFAULT	SETTING 1	SETTING 2	SETTING 3
SETUP PARAMETERS					
SETUP PARAMETERS::RAMPS					
2	RAMP ACCEL TIME	10.0 SECS			
3	RAMP DECEL TIME	10.0 SECS			
118	RAMP HOLD	OFF			
5	RAMP INPUT	0.00%			
266	% S-RAMP	2.50%			
286	RAMPING THRESH.	0.50%			
287	AUTO RESET	ENABLED			
288	EXTERNAL RESET	DISABLED			
422	RESET VALUE	0.00%			
126	MIN SPEED	0.00%			
SETUP PARAMETERS::AUX I/O					
161	AUX START	ON			
227	AUX JOG	ON			
168	AUX ENABLE	ON			
94	AUX DIGOUT 1	OFF			
95	AUX DIGOUT 2	OFF			
96	AUX DIGOUT 3	OFF			
128	ANOUT 1	0.00%			
129	ANOUT 2	0.00%			
SETUP PARAMETERS::JOG/SLACK					
218	JOG SPEED 1	5.00%			
219	JOG SPEED 2	-5.00%			
253	TAKE UP 1	5.00%			
254	TAKE UP 2	-5.00%			
225	CRAWL SPEED	10.00%			
228	MODE	FALSE			
355	RAMP RATE	1.0 SECS			
SETUP PARAMETERS::RAISE/LOWER					
255	RESET VALUE	0.00%			
256	INCREASE RATE	10.0 SECS			
257	DECREASE RATE	10.0 SECS			
261	RAISE INPUT	FALSE			

TAG	PARAMETER NAME	DEFAULT	SETTING 1	SETTING 2	SETTING 3
SETUP PARAMETERS::RAISE/LOWER (continued)					
258	MIN VALUE	-100.00%			
259	MAX VALUE	100.00%			
307	EXTERNAL RESET	FALSE			
SETUP PARAMETERS::SPECIAL BLOCKS					
Setup Parameters::Special Blocks::Diameter Calc.					
424	LINE SPEED	0.00%			
437	REEL SPEED	0.00%			
425	MIN DIAMETER	10.00%			
426	MIN SPEED	5.00%			
462	RESET VALUE	10.00%			
463	EXTERNAL RESET	DISABLED			
453	RAMP RATE	5.0 SECS			
427	DIAMETER	0.00%			
Setup Parameters::Special Blocks::Taper Calc.					
438	TAPER	0.00%			
439	TENSION SPT.	0.00%			
452	TAPERED DEMAND	0.00%			
440	TENSION TRIM	0.00%			
441	TOT.TENS.DEMAND	0.00%			
Setup Parameters::Special Blocks::Torque Calc.					
432	TORQUE DEMAND	0.00%			
433	TENSION ENABLE	ENABLED			
434	OVER WIND	ENABLED			
Setup Parameters::Special Blocks::Setpoint Sum 2					
445	INPUT 2	0.00%			
443	INPUT 1	0.00%			
444	INPUT 0	0.00%			
446	RATIO 1	1			
447	RATIO 0	1			
466	DIVIDER 1	1			
448	DIVIDER 0	1			
449	LIMIT	100.00%			
451	SPT SUM OUTPUT	0.00%			
Setup Parameters::Special Blocks::PID					
404	PROP. GAIN	1			
402	INT. TIME CONST.	5.00 SECS			
401	DERIVATIVE TC	0.000 SECS			
405	POSITIVE LIMIT	100.00%			
406	NEGATIVE LIMIT	-100.00%			
407	O/P SCALER(TRIM)	0.2			
410	INPUT 1	0.00%			
411	INPUT 2	0.00%			
412	RATIO 1	1			

TAG	PARAMETER NAME	DEFAULT	SETTING 1	SETTING 2	SETTING 3
Setup Parameters::Special Blocks::PID (continued)					
413	RATIO 2	1			
418	DIVIDER 1	1			
414	DIVIDER 2	1			
408	ENABLE	ENABLED			
409	INT. DEFEAT	OFF			
403	FILTER T.C.	0.100 SECS			
473	MODE	0			
474	MIN PROFILE GAIN	20.00%			
475	PROFIED GAIN	0			
SETUP PARAMETERS::CURRENT PROFILE					
32	SPD BRK1 (LOW)	100.00%			
31	SPD BRK2 (HIGH)	100.00%			
93	IMAX BRK1(SPD1)	200.00%			
33	IMAX BRK2(SPD2)	200.00%			
SETUP PARAMETERS::STOP RATES					
27	STOP TIME	10.0 SECS			
217	STOP LIMIT	60.0 SECS			
302	CONTACTOR DELAY	1.0 SECS			
26	PROG STOP TIME	0.1 SECS			
216	PROG STOP LIMIT	60.0 SECS			
91	PROG STOP LIM	100.00%			
29	STOP ZERO SPEED	2.00%			
SETUP PARAMETERS::CALIBRATION					
20	ARMATURE V CAL.	1			
21	IR COMPENSATION	0.00%			
22	ENCODER RPM	1000 RPM			
24	ENCODER LINES	1000			
23	ANALOG TACH CAL	1			
10	ZERO SPD. OFFSET	0.00%			
25	ARMATURE I (A9)	BIPOLAR			
180	SPDFBK ALM LEVEL	50.00%			
263	STALL THRESHOLD	95.00%			
224	STALL TRIP DELAY	10.0 SECS			
188	OVER SPEED LEVEL	125.00%			
182	FIELD I CAL.	1			
SETUP PARAMETERS::INHIBIT ALARMS					
19	FIELD FAIL	ENABLED			
111	5703 RCV ERROR	ENABLED			
28	STALL TRIP	INHIBITED			
305	TRIP RESET	TRUE			
81	SPEED FBK ALARM	ENABLED			
92	ENCODER ALARM	ENABLED			
SETUP PARAMETERS::CURRENT LOOP					
15	CUR LIMIT/SCALER	100.00%			
421	MAIN CURR. LIMIT	200.00%			

TAG	PARAMETER NAME	DEFAULT	SETTING 1	SETTING 2	SETTING 3
SETUP PARAMETERS::CURRENT LOOP (continued)					
16	PROP. GAIN	45			
17	INT. GAIN	3.5			
18	AUTOTUNE	OFF			
137	DISCONTINUOUS	12.00%			
30	ADDITIONAL DEM	0.00%			
90	BIPOLAR CLAMPS	DISABLED			
201	REGEN MODE	ENABLED	Disabled (Non-regen units only.)		
301	POS. I CLAMP	0.00%			
48	NEG. I CLAMP	0.00%			
119	IDMD. ISOLATE	DISABLED			
SETUP PARAMETERS::SPEED LOOP					
14	PROP. GAIN	10			
13	INT. TIME CONST.	0.500 SECS			
202	INT. DEFEAT	OFF			
49	ENCODER SIGN	POSITIVE			
47	SPEED FBK SELECT	ARM VOLTS FBK			
Setup Parameters::Speed Loop::Advanced					
Setup Parameters::Speed Loop::Advanced::Adaption					
268	MODE	0			
269	SPD BRK1 (LOW)	1.00%			
270	SPD BRK2 (HIGH)	5.00%			
271	PROP. GAIN	5			
272	INT. TIME CONST.	0.500 SECS			
Setup Parameters::Speed Loop::Advanced::Zero Spd. Quench					
284	ZERO SPD. LEVEL	0.50%			
285	ZERO IAD LEVEL	1.50%			
Setup Parameters::Speed Loop::Setpoints					
289	SETPOINT 1	0.00%			
289	SETPOINT 1	0.00%			
9	SIGN 2 (A3)	POSITIVE			
7	RATIO 2 (A3)	1			
290	SETPOINT 2 (A3)	0.00%			
291	SETPOINT 3	0.00%			
41	SETPOINT 4	0.00%			
357	MAX DEMAND	105.00%			
358	MIN DEMAND	-105.00%			
SETUP PARAMETERS::STANDSTILL					
11	STANDSTILL LOGIC	DISABLED			
12	ZERO THRESHOLD	2.00%			
SETUP PARAMETERS::SETPOINT SUM 1					
6	RATIO 1	1			
208	RATIO 0	1			
8	SIGN 1	POSITIVE			

TAG	PARAMETER NAME	DEFAULT	SETTING 1	SETTING 2	SETTING 3
SETUP PARAMETERS::SETPOINT SUM 1 (continued)					
292	SIGN 0	POSITIVE			
419	DIVIDER 1	1			
420	DIVIDER 0	1			
131	DEADBAND WIDTH	0.00%			
375	LIMIT	105.00%			
423	INPUT 2	0.00%			
100	INPUT 1	0.00%			
309	INPUT 0	0.00%			
PASSWORD					
120	ENTER PASSWORD	0x0000			
121	CHANGE PASSWORD	0x0000			
ALARM STATUS					
115	HEALTH WORD	0x4210			
116	HEALTH STORE	0x0000			
MENUS					
37	FULL MENU	ENABLED			
38	MENU DELAY	30			
	LANGUAGE	ENGLISH			
PARAMETER SAVE					
SERIAL LINKS					
SERIAL LINKS::MAIN PORT (P1)					
146	SRL LINK ENABLE	ENABLED			
138	GROUP ID (GID)	0			
139	UNIT ID (UID)	0			
148	ASCII / BINARY	ASCII			
150	BAUD RATE	9600			
152	ESP SUP. (ASCII)	DISABLED			
144	CHANGE BAND (BIN)	0.00%			
158	ERROR REPORT	0x00C0			
142	PNO. 7	0xFFFF			
334	PARITY	EVEN			
SERIAL LINKS::AUX PORT (P2)					
147	SRL LINK ENABLE	ENABLED			
140	GROUP ID (GID)	0			
141	UNIT ID (UID)	0			
149	ASCII / BINARY	ASCII			
151	BAUD RATE	9600			
153	ESP SUP. (ASCII)	DISABLED			
145	CHANGE BAND (BIN)	0.00%			
159	ERROR REPORT	0x00C0			
143	PNO. 7	0xFFFF			

TAG	PARAMETER NAME	DEFAULT	SETTING 1	SETTING 2	SETTING 3
SERIAL LINKS::SYSTEM PORT (P3)					
	DUMP MMI -> P3				
	UDP XFER <- P3				
	UDP XFER -> P3				
Serial Links::System Port (P3)::P3 Setup					
130	MODE	DISABLED			
198	P3 BAUD RATE	9600			
Serial Links::System Port (P3)::P3 Setup::5703 Support					
132	SETPT. RATIO	0			
133	SETPT. SIGN	POSITIVE			
187	5703 INPUT	0.00%			
189	5703 OUTPUT	0.00%			
Serial Links::System Port (P3)::P3 Setup::Bisynch Support					
329	GROUP ID (GID)	0			
330	UNIT ID (UID)	0			
332	ERROR REPORT	0x00C0			
SERIAL LINKS::PNO CONFIG					
312	PNO 112	0			
313	PNO 113	0			
314	PNO 114	0			
315	PNO 115	0			
316	PNO 116	0			
317	PNO 117	0			
318	PNO 118	0			
319	PNO 119	0			
320	PNO 120	379			
321	PNO 121	380			
322	PNO 122	381			
323	PNO 123	382			
324	PNO 124	383			
325	PNO 125	384			
326	PNO 126	385			
327	PNO 127	0			
SYSTEM					
	SOFTWARE	ISSUE: 3.2			
SYSTEM::CONFIGURE I/O					
39	CONFIGURE ENABLE	DISABLED			
System::Configure I/O::Analog Inputs					
System::Configure I/O::Analog Inputs::ANIN 1 (A2)					
230	CALIBRATION	1			
231	MAX VALUE	100.00%			
232	MIN VALUE	-100.00%			
246	DESTINATION TAG	100			

TAG	PARAMETER NAME	DEFAULT	SETTING 1	SETTING 2	SETTING 3
System::Configure I/O::Analog Inputs (continued)					
System::Configure I/O::Analog Inputs::ANIN 2 (A3)					
233	CALIBRATION	1			
234	MAX VALUE	100.00%			
235	MIN VALUE	-100.00%			
System::Configure I/O::Analog Inputs::ANIN 3 (A4)					
236	CALIBRATION	1			
237	MAX VALUE	100.00%			
238	MIN VALUE	-100.00%			
249	DESTINATION TAG	5			
System::Configure I/O::Analog Inputs::ANIN 4 (A5)					
239	CALIBRATION	1			
240	MAX VALUE	100.00%			
241	MIN VALUE	-100.00%			
250	DESTINATION TAG	48			
System::Configure I/O::Analog Inputs::ANIN 5 (A6)					
242	CALIBRATION	1			
243	MAX VALUE	100.00%			
244	MIN VALUE	-100.00%			
247	DESTINATION TAG	301			
System::Configure I/O::Analog Outputs					
System::Configure I/O::Analog Outputs::ANOUT 1 (A7)					
245	% TO GET 10V	100.00%			
362	MODULUS	FALSE			
464	OFFSET	0.00%			
251	SOURCE TAG	62			
System::Configure I/O::Analog Outputs::ANOUT 2 (A8)					
248	% TO GET 10V	100.00%			
363	MODULUS	FALSE			
465	OFFSET	0.00%			
252	SOURCE TAG	63			
System::Configure I/O::Digital Inputs					
System::Configure I/O::Digital Inputs::DIGIN 1 (C6)					
103	VALUE FOR TRUE	0.01%			
104	VALUE FOR FALSE	0.00%			
102	DESTINATION TAG	90			
System::Configure I/O::Digital Inputs::DIGIN 2 (C7)					
106	VALUE FOR TRUE	0.01%			
107	VALUE FOR FALSE	0.00%			
105	DESTINATION TAG	118			
System::Configure I/O::Digital Inputs::DIGIN 3 (C8)					
109	VALUE FOR TRUE	0.01%			
110	VALUE FOR FALSE	0.00%			
108	DESTINATION TAG	119			

TAG	PARAMETER NAME	DEFAULT	SETTING 1	SETTING 2	SETTING 3
System::Configure I/O::Digital Outputs					
System::Configure I/O::Digital Outputs::DIGOUT 1 (B5)					
195	THRESHOLD (>)	0.00%			
43	MODULUS	TRUE			
97	SOURCE TAG	77			
359	INVERTED	FALSE			
System::Configure I/O::Digital Outputs::DIGOUT 2 (B6)					
196	THRESHOLD (>)	0.00%			
44	MODULUS	TRUE			
98	SOURCE TAG	122			
360	INVERTED	FALSE			
System::Configure I/O::Digital Outputs::DIGOUT 3 (B7)					
197	THRESHOLD (>)	0.00%			
45	MODULUS	TRUE			
99	SOURCE TAG	125			
361	INVERTED	FALSE			
System::Configure I/O::Configure 5703					
134	SOURCE TAG	89			
135	DESTINATION TAG	41			
System::Configure I/O::Block Diagram					
260	RAISE/LOWER DEST	0			
293	RAMP O/P DEST	291			
294	SPT SUM 1 DEST	289			
400	PID O/P DEST	0			
431	DIAMETER	0			
442	TAPER	0			
450	SETPOINT SUM 2	0			
435	POS. I CLAMP	0			
436	NEG. I CLAMP	0			
System::Configure I/O::Internal Links					
System::Configure I/O::Internal Links::LINK 1					
364	SOURCE TAG	0			
365	DESTINATION TAG	0			
System::Configure I/O::Internal Links::LINK 2					
366	SOURCE TAG	0			
367	DESTINATION TAG	0			
System::Configure I/O::Internal Links::LINK 3					
368	SOURCE TAG	0			
369	DESTINATION TAG	0			
System::Configure I/O::Internal Links::LINK 4					
370	SOURCE TAG	0			
371	DESTINATION TAG	0			
System::Configure I/O::Internal Links::LINK 5					
454	SOURCE TAG	0			
455	DESTINATION TAG	0			

TAG	PARAMETER NAME	DEFAULT	SETTING 1	SETTING 2	SETTING 3
System::Configure I/O::Internal Links (continued)					
System::Configure I/O::Internal Links::LINK 6					
456	SOURCE TAG	0			
457	DESTINATION TAG	0			
System::Configure I/O::Internal Links::LINK 7					
458	SOURCE TAG	0			
459	DESTINATION TAG	0			
System::Configure I/O::Internal Links::LINK 8					
460	SOURCE TAG	0			
461	DESTINATION TAG	0			
System::Configure I/O::Internal Links::LINK 9					
467	SOURCE TAG	0			
468	DESTINATION TAG	0			
System::Configure I/O::Internal Links::LINK 10					
469	SOURCE TAG	0			
470	DESTINATION TAG	0			
SYSTEM::miniLINK					
339	VALUE 1	0.00%			
340	VALUE 2	0.00%			
341	VALUE 3	0.00%			
SYSTEM::miniLINK					
342	VALUE 4	0.00%			
343	VALUE 5	0.00%			
344	VALUE 6	0.00%			
345	VALUE 7	0.00%			
379	VALUE 8	0.00%			
380	VALUE 9	0.00%			
381	VALUE 10	0.00%			
382	VALUE 11	0.00%			
383	VALUE 12	0.00%			
384	VALUE 13	0.00%			
385	VALUE 14	0.00%			
346	LOGIC 1	OFF			
347	LOGIC 2	OFF			
348	LOGIC 3	OFF			
349	LOGIC 4	OFF			
350	LOGIC 5	OFF			
351	LOGIC 6	OFF			
352	LOGIC 7	OFF			
353	LOGIC 8	OFF			



Appendix F SPARE PARTS LISTS

This appendix contains the spare parts lists for standard and DRV model 590SP Digital 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 and the ratings labels 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.

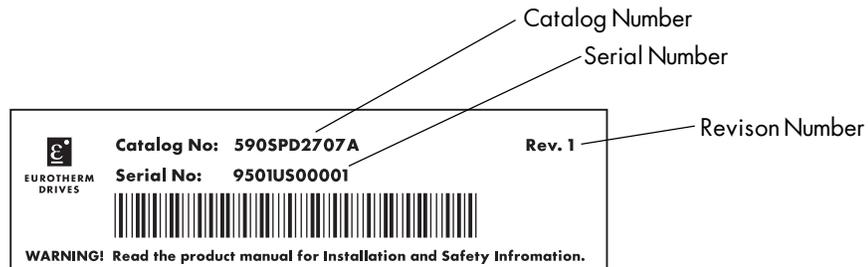


Figure F.1 - Sample Serial Number Label

READING THE SPARE PARTS LISTS

Each model of 590SP Digital drive has a parts list which describes all replaceable parts and quantities used, gives its Eurotherm Drives part number and lists the revision in which the part was used.

Description
591SPD2707AA 5 hp Non-Regenerative Single Phase Drive , Open Ch
590SP Digital Control Board
590SP Power Supply Board (100-400 VAC)
590SP Digital ESD Cover
SCR Pack, 1200 V, 32 A
Heatsink Compound (tube)
Control Fuse (1.6 Amp, 240 VAC)

Description
590SPD2707AA 5 hp Regenerative Single Phase Drive , Open Chassis
590SP Digital Control Board
590SP Power Supply Board (100-400 VAC)
590SP Digital ESD Cover
SCR Pack, 1200 V, 32 A
Heatsink Compound (tube)
Control Fuse (1.6 Amp, 240 VAC)

Description
591SPD2707BA 5 hp Non-Regenerative Single Phase Drive, Enclosed
590SP Digital Control Board
590SP Power Supply Board (100-400 VAC)
590SP Digital IP20 Cover
SCR Pack, 1200 V, 32 A
Heatsink Compound (tube)
Control Fuse (1.6 Amp, 240 VAC)

Description
590SPD2707BA 5 hp Regenerative Single Phase Drive, Enclosed Chas
590SP Digital Control Board
590SP Power Supply Board (100-400 VAC)
590SP Digital IP20 Cover
SCR Pack, 1200 V, 32 A
Heatsink Compound (tube)
Control Fuse (1.6 Amp, 240 VAC)

Description
955SPD-4N51 5 hp Non-Regenerative Single Phase DRV, 240 VAC (27
590SP Digital Control Board
590SP Power Supply Board (100-400 VAC)
Switchable Tachogenerator Calibration Card
590SP Digital DRV Cover (IP20)
Contactora (3 Pole, 600 VDC, 40 amps)
Circuit Breaker (2 pole, 480 VAC, 40 amp)
SCR Pack, 1200 V, 32 A
Heatsink Compound (tube)
Control Fuse (1.6 Amp, 240 VAC)

Description
955SPD-4R1 5 hp Regenerative Single Phase DRV, 240 VAC (27A)
590SP Digital Control Board
590SP Power Supply Board (100-400 VAC)
Switchable Tachogenerator Calibration Card
590SP Digital DRV Cover (IP20)
Contactora (3 Pole, 600 VDC, 40 amps)
Circuit Breaker (2 pole, 480 VAC, 40 amp)
SCR Pack, 1200 V, 32 A
Heatsink Compound (tube)
Control Fuse (1.6 Amp, 240 VAC)

Appendix G RS232 SYSTEM PORT (P3)

SERIAL LINKS::SYSTEM PORT (P3)::P3 SETUP

The SYSTEM PORT(P3) is a RS232 serial communications port to the 590SP Digital drive. The port is used off-line for transferring and saving drive configuration files using a personal computer (PC) running a serial communications program, or on-line with the Eurotherm Drives model 5703 Peer-to-Peer Communications Converter. You can also use the P3 port to transfer configuration files with a PC running the Windows™ compatible software package ConfigEd Lite. (Refer to the ConfigEd Lite manual RG352747.)

The parameters, tags and signal ranges associated with SYSTEM PORT (P3) are listed below.

Parameters

Tag	Parameter	Description	Range	Default
130	MODE	Determines the function of the 5703 unit if present.	DISABLED/ 5703 MASTER/ 5703 SLAVE	DISABLED
198	P3 BAUDRATE	Transmission rate	300 - 57600	9600

5703 SUPPORT

132	SETPT. RATIO	Input scaling ratio	±3.0000	0.0000
133	SETPT. SIGN	Input sign	POSITIVE/NEGATIVE	POSITIVE
187	5703 INPUT	Value written to the drive	±300.00	0.00%
189	5703 OUTPUT	Value read by the 5703 out of the drive.	±300.00	0.00%

BISYNCH SUPPORT

329	GROUP ID (GID)	Group identification number.	0 to 7	0
330	UNIT ID (UID)	Unit identification number.	0 to 15	0
332	ERROR REPORT	Communications error code.		0x00C0

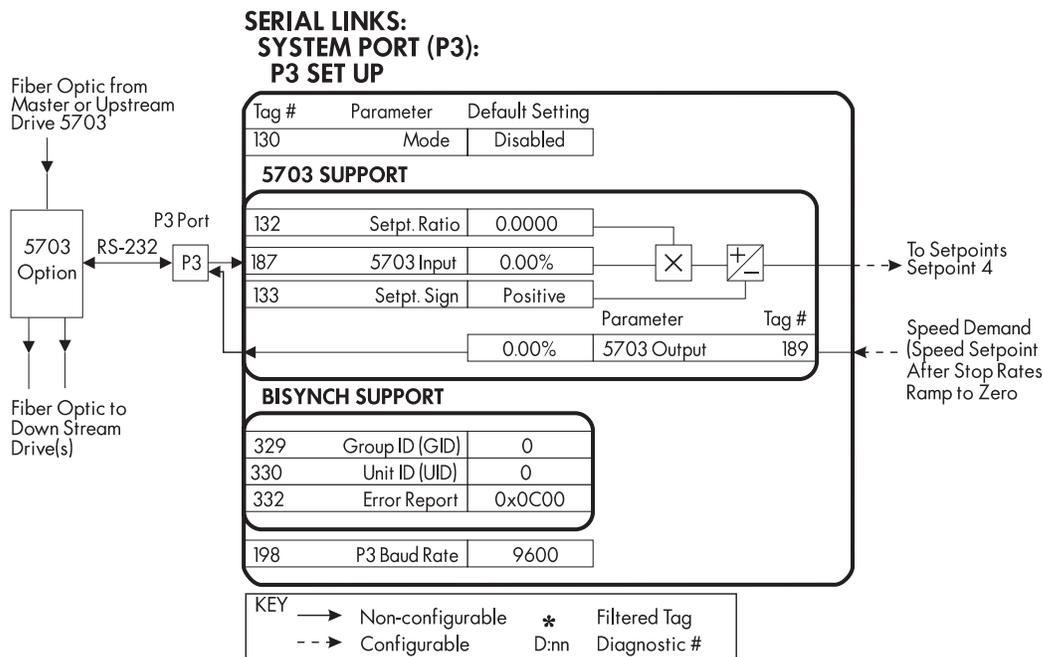
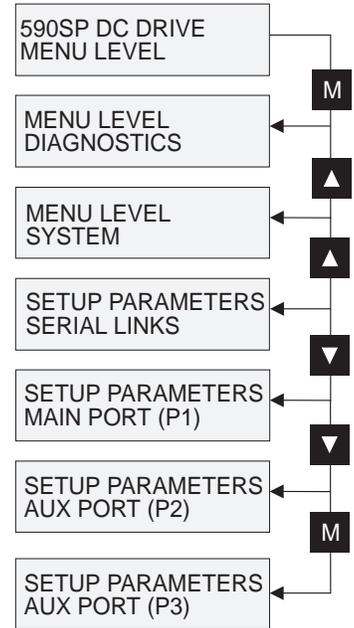


Figure G.1 - P3 Set Up Block Diagram

UDP (UPLOAD-DOWNLOAD PROTOCOL) SUPPORT

Use the P3 port to transfer ASCII files containing the drive's configuration and parameter settings between the 590SP and a host computer.

The transfer uses a simple ASCII file structure and XON / XOFF protocol. Most communications packages use this protocol. Host computers successfully tested include IBM PCs XT/AT, running both Windows™ and MS-DOS® and Psion Organiser 3, among others.

Transferring data from the 590SP to a host computer is defined as **downloading**; transferring data in the other direction, or from a host computer to the 590SP, is known as **uploading**.

UDP Menu Parameter Settings

The MMI menu path below shows the parameters settings required for UDP file transfer.

- SERIAL LINKS
 - SYSTEM PORT (P3)
 - P3 SETUP
 - MODE DISABLED 5703 Setup Mode.
 - 5703 SUPPORT Sub-menu for 5703 parameters.
 - P3 BAUD RATE Baud rate for the P3 Port.
 - DUMP MMI -> P3 Transfer the MMI text file from drive to the host computer.
 - UDP XFER <- P3 Transfer configuration parameter file from host computer to drive (upload).
 - UDP XFER -> P3 Transfer configuration parameter file from drive to host computer (download).

NOTE. When transferring, or uploading or downloading files, remember to disable the 5703 mode.

Communication Port Setup

For UDP data and text file transfers, set the host computer communication port settings as follows:

9600 Baud	8 bits
1 Stop bit	XON/XOFF handshaking
NO parity	UDP transfer procedure

NOTE. Set the drive's P3 BAUD RATE to match the computer's communication port transmission rate.

Caution

The P3 Communications port has +24 VDC on two pins. Use the correct cable (Eurotherm Drives part number CM351909) to avoid damaging the host computer. This cable is described on page E-3.

Download MMI (DUMP MMI -> P3)

Follow these steps to transfer an ASCII *text description only* of the MMI from the 590SP to a host computer. This information fully documents *all* the 590SP's parameter and configuration settings in a clear and easy to read ASCII text format. You can print out the file as permanent documentation or to troubleshoot performance problems.

NOTE. The MMI dump documents the drive's *current* settings, *not* the settings stored in EEPROM.

1. Connect the 590SP P3 port using the appropriate lead to the host computer.
2. Ensure that the drive's P3 MODE is set to DISABLE.
3. Save the 590SP's parameter settings using PARAMETER SAVE to ensure that the drive's EEPROM parameters matches the drive's current parameter settings.
4. Using a standard communications package, prepare the host computer to receive an ASCII file. Set the host computer's communications port parameters to the settings listed above. Be sure the baud rate setting at both ends of the serial communications setup match. Use the file extension .MMI to differentiate it from .UDP format files.
5. Enable the host computer to begin receiving data.

- Start the MMI text download from the 590SP by selecting “DUMP MMI—> P3”.

NOTE. Enabling the transmitting port in a serial communications setup initiates data transfer. Therefore, enable the receiving port—the host computer, in this case— *before* beginning communication at the transmitting port, or the drive's P3 port.

- The file ends with the CTRL-Z character. This character automatically closes the file in some serial communications software packages. If not, close the file manually once the 590SP MMI indicates that it has finished transferring data and when the host computer has stopped scrolling text.

The file can now be treated as any ASCII text file.

UDP Download (UDP XFER -> P3)

A UDP download transfers the actual parameter and configuration settings from the 590SP to a host computer. This file fully records *all* the 590SP's settings stored in EEPROM in a binary format and can be used as a back up file if the current drive settings are lost or if the drive is replaced.

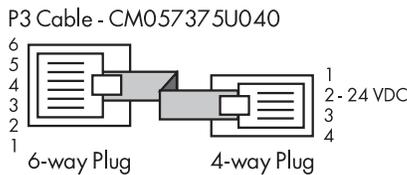
NOTE. A UDP download documents the drive's settings stored in EEPROM since the *last* PARAMETER SAVE was performed. Any parameter or configuration changes *not* saved to the EEPROM are not recorded within the UDP file.

- Connect the 590SP P3 port using the appropriate lead to the host computer.
- Ensure that the drive's P3 MODE is set to DISABLE.
- Save the 590SP's parameter settings using PARAMETER SAVE to ensure that the drive's EEPROM parameters matches the drive's current parameter settings.
- Using a standard communications package, prepare the host computer to receive an ASCII file. Set the host computer's communications port parameters to the settings listed above. Be sure the baud rate setting at both ends of the serial communications setup match. Use the file extension .UDP to differentiate it from .MMI text files.
- Enable the host computer to begin receiving data.
- Start the UDP download from the 590SP by selecting “UDP XFER—> P3”.

NOTE. Enabling the transmitting port in a serial communications setup initiates data transfer. Therefore, enable the receiving port—the host computer, in this case— *before* beginning communication at the transmitting port, or the drive's P3 port.

- The file ends with the CTRL-Z character. This character automatically closes the file in some serial communications software packages. If not, close the file manually once the 590SP MMI indicates that it has finished transferring data and when the host computer has stopped scrolling text. The last line of the file should read :00000001FF.

The file can now be treated as any ASCII data file.



P3 Port Connector
(Looking into the connector
on the drive)

6 - way Connector to DB9/DB25 Connector

6 - way Connector	4 - way Connector	P3 Pin	P3 Signal	Cable	DB - 9		DB - 25	
					Female	Male	Female	Male
5	1	1	0 VDC	Black	5	5	7	7
4	2	2	24 VDC	Red	N/C	N/C	N/C	N/C
3	3	3	TX	Green	2	3	2	3
2	4	4	RX	Yellow	3	2	3	2

UDP Upload (UDP XFER ← P3)

A UDP Upload transfers a parameter file from the host computer to the 590SP. This information is written directly to EEPROM, so all the drive's current settings will be overwritten.

1. Connect the 590SP P3 port using the appropriate lead to the host computer.
2. Ensure that the drive's P3 MODE is set to DISABLE.
3. Using a standard communications package, prepare the host computer to send an ASCII file. Set the host computer's communications port parameters to the settings listed above. Be sure the baud rate setting at both ends of the serial communications setup match.
4. Start uploading to the 590SP by selecting "UDP XFER ← P3"
5. When the 590SP says "RECEIVING", begin the file transmission at the host computer.
6. The file ends in a :00000001FF which the 590SP uses to close the file.
7. As the MMI should indicate, reset the 590SP by pressing the 'E' key.

Serial Link Port P3 Lead

Caution

There is 24 volts on Pin 2 of the P3 Port. This may damage your PC or the 590SP if connected to the serial port.

5703 (PEER-TO-PEER COMMUNICATIONS OPTION) SUPPORT

The 5703 Peer-to-Peer Communications Option (catalog No. 655-RS232) passes a 16-bit signal between drives through a fiber-optic link and the P3 port on each 590SP. Otherwise, port P3 is used off-line for uploading and downloading of configuration data. The drive's P3 port operates at RS232 compatible signal levels and the 5703 converts the electrical RS232 signals to fiber optic for transmission over plastic fiber optic cable to a 5703 located at another drive, then back again for RS232 reception.

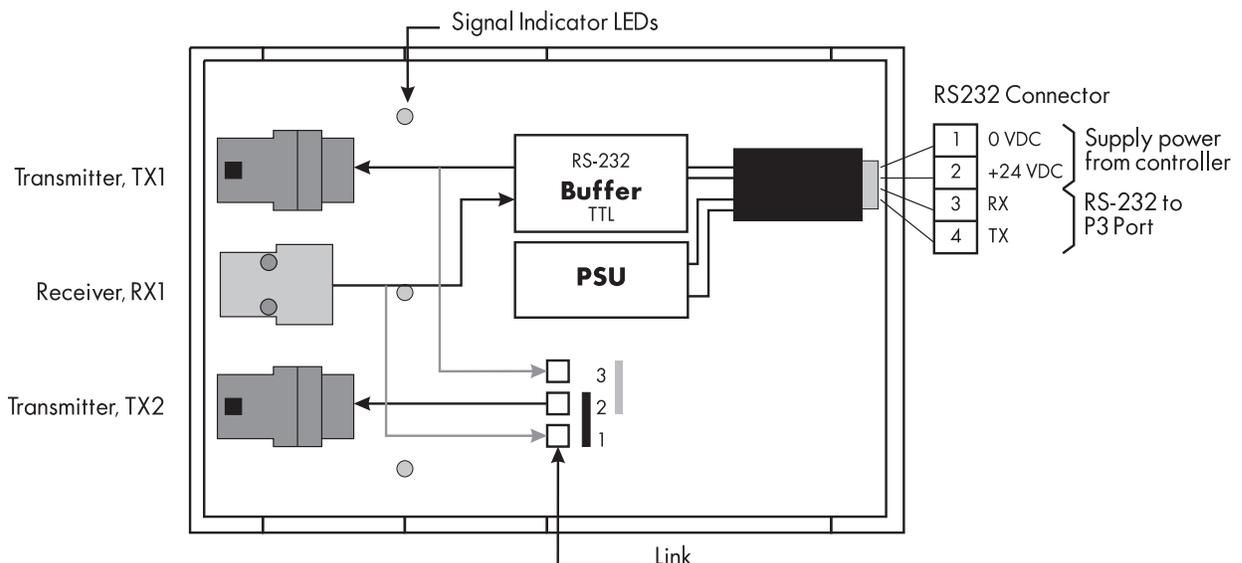


Figure G.2 - 5703 Layout

Normally, an analog signal setpoint is used to speed coordinate several drives. The 5703 allows one signal to be digitally transmitted from drive-to-drive over fiber optic cable. This introduces highly accurate speed setpoint tracking between drive sections without the signal drift and induced noise problems inherent with analog control. For accurate speed tracking, encoder speed feedback is required.

The 5703 also supports master/slave ratioed speed locking, although the unit is not intended to supplant Quadraloc—which integrates external speed/phase and position locked loops—in applications requiring absolute speed or position control.

Hardware Description

The 5703 is housed in a DIN rail mountable box and is provided with a “ribbon” cable to connect into the controller’s RS232 port. Fiber optic cable interconnects the speed signal from unit to unit. A connection diagram is shown in Figure G.3.

NOTE. To limit transmission errors, the ribbon cable length must not exceed 4 meters.

The 5703 unit converts RS232 electric data signals into light; it does not alter or modify the signals in any other way. The drive software within the motor controller interprets the received electrical data as a speed reference signal.

The 5703 has one fiber optic receiver and two fiber optic transmitters. The fiber optic receiver RX1 receives data from the “preceding” unit. The primary transmitter TX1 always sends data to the “follower” unit from the “master” unit transmitting through the 5703’s RS232 port. The additional fiber optic transmitter TX2 retransmits the incoming signal at RX1, or provides a second output signal for the “master” RS232 reference, giving the unit wide functionality. A link determines the function of the TX2. When the link is connected to positions 1 and 2, TX2 repeats the signal received at RX1. When connected to positions 2 and 3, it sends the same output signal as TX1, or the data transmitted through the RS232 port. Figure G.2 shows the 5703 board layout and the two link positions.

The settings under the MMI sub-menu 5703 SUPPORT determine how the drive interprets the data transmitted and received between the 590SP P3 port the 5703 RS232 port. Refer to the Installation Instructions (HG351943) included with the Peer-to-Peer Communications Option for further configuration settings and application information.

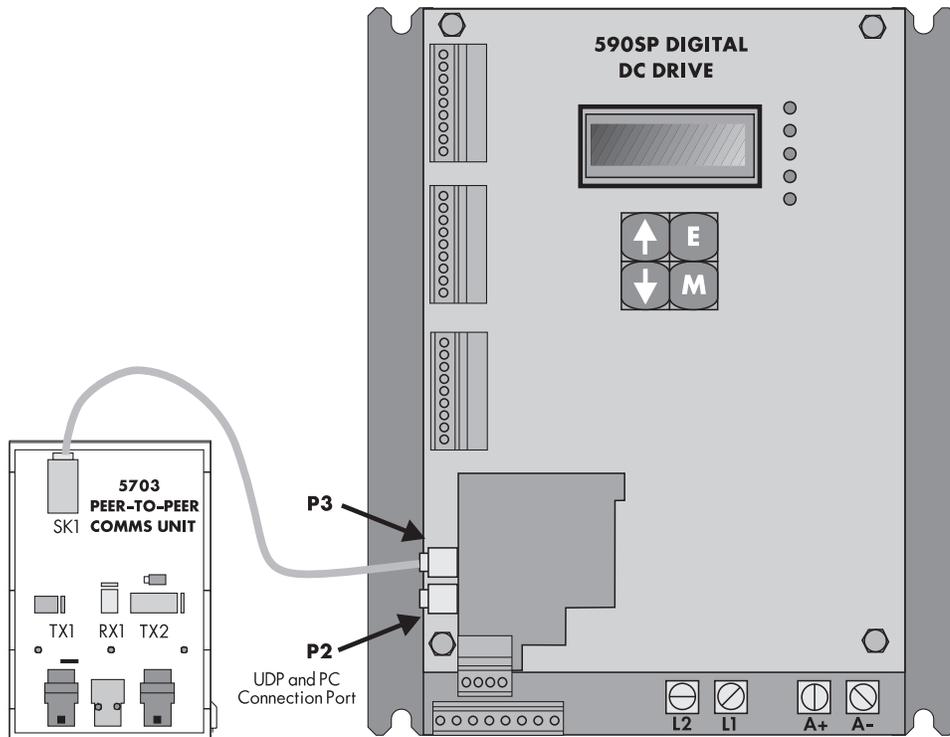


Figure G.3 - 5703 Connection Drawing (Shown on a 590SP)



Appendix H RS422 COMMUNICATIONS (PORTS P1 & P2)

The supervisory communications optional interface makes supervising and monitoring 590SPs simple. It provides an isolated RS422 serial data port that can be installed on each drive. These serial links can be bussed together to allow an intelligent device to monitor or update the parameters of a network of drives. Refer to the documentation shipped with the option for detailed technical and wiring information.

The 590SP supports both ASCII and Binary Communications.

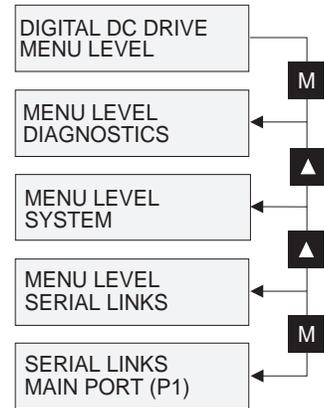
Using this link, a supervisory computer can perform periodic setpoint updating, control sequencing, and data collection while each drive is in continuous local control.

SERIAL LINKS::MAIN PORT (P1)

The MAIN PORT (P1) requires an optional communications board (catalog number 654D-RS422). It provides an isolated RS422 communications port required for interfacing to PLCs, supervisory computers, etc.

Parameters

Tag	Parameter	Description	Range	Default
146	SRL LINK ENABLE	Enables or disables the P1 port.	ENABLED/DISABLED	DISABLED
138	GROUP ID (GID)	Group identification number	0 to 7	0
139	UNIT ID (UID)	Unit identification number	0 to 15	0
148	ASCII/BINARY	Sets the transmission mode to ASCII or Binary.	ASCII/BINARY	ASCII
150	BAUD RATE	The transmission rate.	300 - 19200	9600
152	ESP SUP. (ASCII)	Enables support of Eurotherm's ESP supervisory software format.	ENABLED/DISABLED	DISABLED
144	CHANGE BAND (BIN)	The threshold a value must change before a it will be read by the serial link.	0 - 327.67%	0.00%
158	ERROR REPORT	Communications error code.		0x00C0
334	PARITY	Parity	EVEN/ODD	EVEN
142	PNO. 7	Sets the multiparameter polling status of each PNO block.	0x0000 to 0xFFFF	0xFFFF



SERIAL LINKS: MAIN PORT (P1)

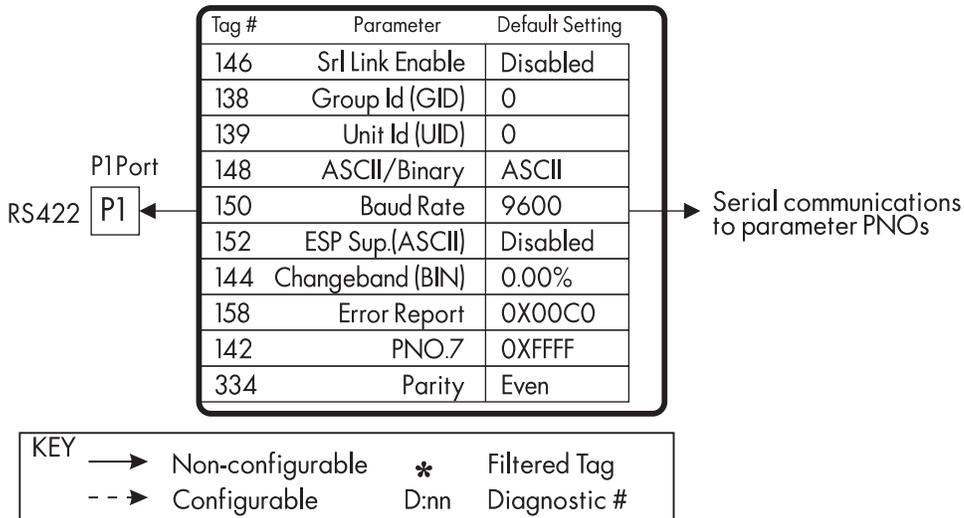


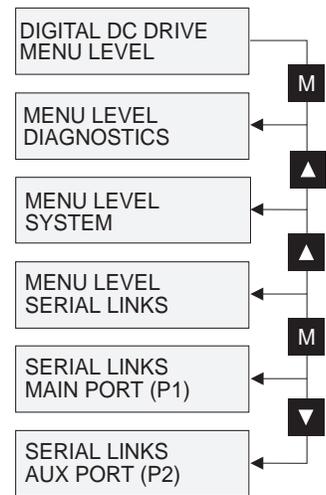
Figure H.1 - Main Port (P1) Block Diagram

SERIAL LINKS::AUX PORT (P2)

The AUX PORT (P2) provides a non-isolated RS422 serial port to the 590SP. This port is designed for use with other Eurotherm Drives products only. The isolated communications option for the P1 port should be used for all foreign communication requirements.

Parameters

Tag	Parameter	Description	Range	Default
147	SRL LINK ENABLE	Enables or disables the P2 port.	ENABLED/DISABLED	DISABLED
140	GROUP ID (GID)	Group identification number	0 to 7	0
141	UNIT ID (UID)	Unit identification number	0 to 15	0
149	ASCII/BINARY	Sets the transmission mode to ASCII or Binary.	ASCII/BINARY	ASCII
151	BAUD RATE	The transmission rate.	300 - 19200	9600
153	ESP SUP. (ASCII)	Enables support of Eurotherm's ESP supervisory software format.	ENABLED/DISABLED	DISABLED
145	CHANGEBAND (BIN)	The threshold a value must change before a it will be read by the serial link.	0 - 327.67%	0.00%
159	ERROR REPORT	Communications error code.		0x00C0
143	PNO.7	Sets the multiparameter polling status of each PNO block.	0x0000 to 0xFFFF	0xFFFF



SERIAL LINKS: AUX PORT (P2)

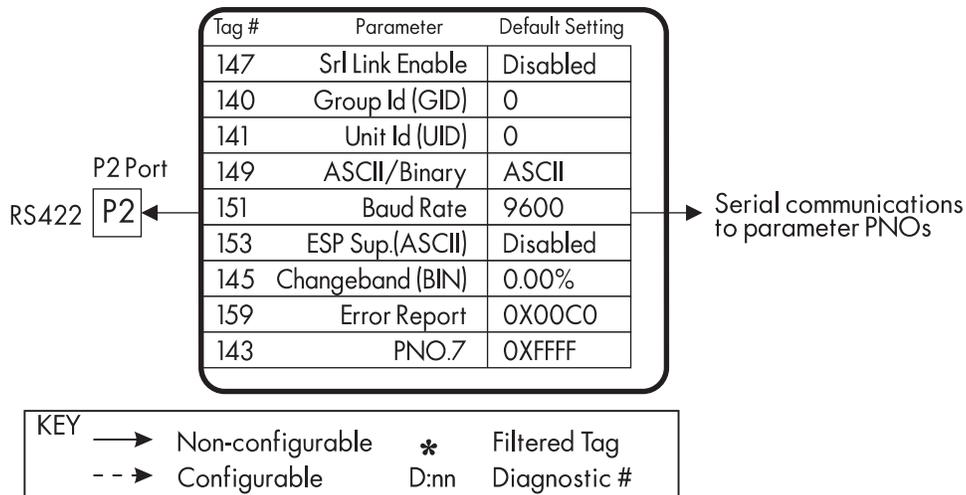


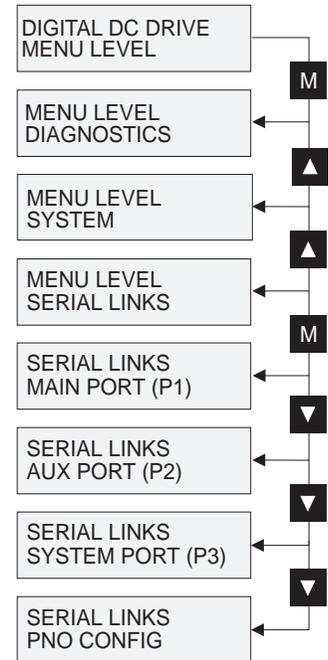
Figure H.2 - Aux Port (P2) Block Diagram

SERIAL LINKS::PNO CONFIG

Provides user configurable serial link parameters. To configure these PNOs, SYSTEM:: CONFIGURE I/O:: CONFIGURE ENABLE must be set to ENABLED. When the parameter is enabled, the serial communication link is disabled. Communications restarts once CONFIGURE ENABLE is set back to DISABLED.

Parameters

Tag	Parameter	Description	Range	Default
312	PNO 112	User configurable to any tag.	0 to 499	0
313	PNO 113		0 to 499	0
314	PNO 114		0 to 499	0
315	PNO 115		0 to 499	0
316	PNO 116		0 to 499	0
317	PNO 117		0 to 499	0
318	PNO 118		0 to 499	0
319	PNO 119		0 to 499	0
320	PNO 120		0 to 499	379
321	PNO 121		0 to 499	380
322	PNO 122		0 to 499	381
323	PNO 123		0 to 499	382
324	PNO 124		0 to 499	383
325	PNO 125		0 to 499	384
326	PNO 126		0 to 499	385
327	PNO 127		0 to 499	0



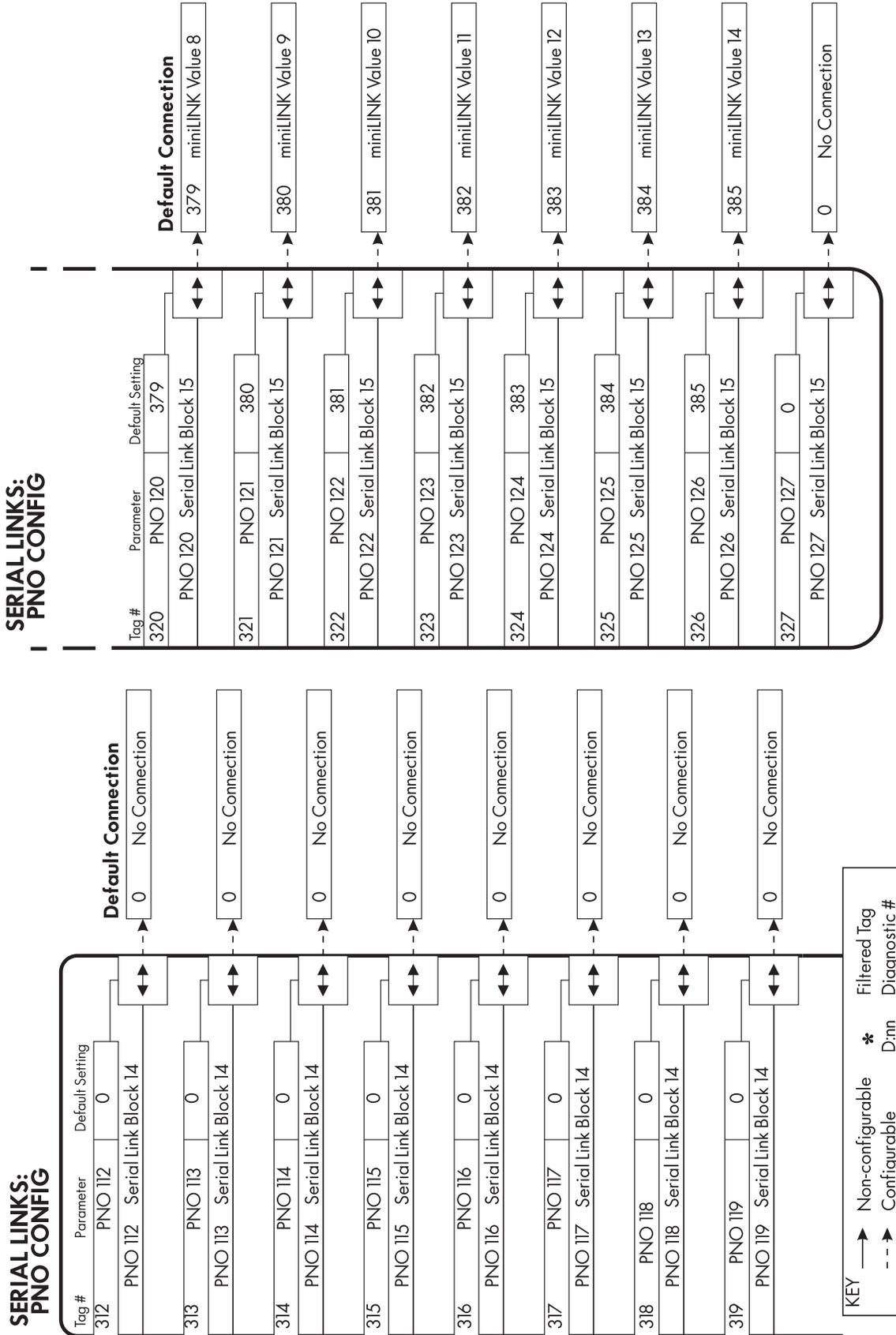


Figure H.3 - PNO Config Block Diagram

COMMUNICATIONS STANDARD

The communications protocol used by Eurotherm group instruments, including Eurotherm Drives, comes under the heading of Binary Synchronous Communications Data Link Control (BSCDLC). The communication mode conforms to the following American National Standard definition:

ANSI standard x3.28

Revision 1976

Establishment and Termination Control Procedures Subcategory 2.5

Two-way Alternate, Non switched Multipoint with Centralized Operation and Fast Select.

Message Transfer Control Procedure Subcategory B1

Message Associated Blocking, with Longitudinal Checking and Single Acknowledgment.

The standard is known by the abbreviation

ANSI - x3.28 - 2.5 - B1.

It is part of an internationally recognized ANSI standard protocol called BISYNCH (Binary Synchronous) and known by the abbreviation x3.28. The standard is widely used by manufacturers of computers, computer peripherals, and communications equipment.

Multi Drop Supervisory Link

Transmission Standard	RS422 (bidirectional)
Protocol	ANSI-X3.28-2.5-B1
Data Rates	300,600,1200,2400,4800, 9600 or 19200 baud
Character Format (300 to 9600 baud)	ASCII + 1 start, 1 parity and 1 stop bit. [10 BIT]
Parity	Binary - 1 start, 7 data, 1 control, 1 parity, and 1 stop bit [11 BIT] Even

Digital Communications

Electrical connections	4-wire differential
No. of drivers and receivers allowed per line	1 driver 16 receivers
Maximum cable length	4000 ft/1200 meters

ASCII (AMERICAN STANDARD CODE FOR INFORMATION INTERCHANGE)

ASCII is a binary code which represents letters, digits, and control signals (collectively called characters). The code, originated by the American National Standards Institute (ANSI), has become a worldwide standard for information interchange. The code uses a seven-bit binary word to represent all the letters, digits, punctuation marks, and control signals. A complete list of these codes is at the end of this appendix.

Protocol

The protocol defines the string, or sequence of characters called a message, which must be sent between communicating instruments to produce specific responses. The sequence of characters usually comprises control characters, an instrument address, a parameter mnemonic, and data.

Control Characters

Control characters are ASCII binary codes which define actions rather than information. Below lists the six ASCII codes used.

ASCII-HEX	Parameter Code	Description
02	(STX)	Start of text
03	(ETX)	End of text
04	(EOT)	End of transmission
05	(ENQ)	Inquiry
06	(ACK)	Positive acknowledge
15	(NAK)	Negative acknowledge

Instrument Address

The 590SP or associated Eurotherm instrument has an address, the first digit being the “group” number (GID) in the range 0 to 7, the second a “unit” number (UID) in the range 0 to F. This yields 128 different addresses from 00 to FF.

Parameter Mnemonic

Each Eurotherm instrument has parameters defined within its program structure, which are specified by a two character mnemonic. Instruments exchange information by using these mnemonics.

Examples are:

Mnemonic	Description
10	Analog input 1
0F	Instrument health word
09	Drive speed demand

Complete tables of the 590SP mnemonics are given in Serial Link Mnemonics and Parameter Number Allocation sections.

Data

Data consists of three types:

- i. Numerical Data The parameter refers to either a positive or negative number such as a level, setpoint, gain, or result within the instrument.
- ii. Boolean Data A Boolean parameter, such as a switch, can be monitored or set as enabled or disabled from the serial link. It is accessed as part of a status word as defined below.
- iii. Status Information The parameter refers to a binary word. Each bit within the word is a significant switch within the program structure.

Examples of numerical data are:

Mnemonic	Parameter Name	Description
23	Speed loop error	A number in the range $\pm 100.00\%$
0B	Current demand	A number in the range $\pm 200.00\%$
22	Digital tach	A number in the range ± 6000 RPM

Examples of status information are:

Mnemonic	Parameter Name	Bit	Description
0F	Health word	1	Missing pulse alarm
		9	Three-phase present
		13	Current trip alarm

The Serial Link Mnemonics and Parameter Number Allocation sections contain complete information on the data types and the status words.

Data Format

The 590SP uses an ASCII free-format mode of operation for data transfer to make it easy to implement with languages such as BASIC, PASCAL, FORTRAN, and assembler languages. As a result, users can create simple supervisory systems to run on an IBM PC.

Numerical Data (Format 21 - Free Format Numeric)

Numerical data is transferred by transmitting a string of characters. The length of the string is determined by the value itself. No leading or trailing zeros are needed to normalize the string length. That is:

1	can be sent as	1.00, 1.0, 1., or 1
-2.2	can be sent as	-2.20 or -2.2
19.99	is sent as	19.99

Status Information (Format 23 - Hexadecimal)

Status information is transmitted by encoding the data into a hexadecimal format. The number of characters in the encoded data determines the length of the string. The hexadecimal data is preceded by a '>' sign to differentiate it from numerical data.

Note: Hexadecimal refers to the common practice of computing in the base of 16 rather than the base of 10. The sixteen numbers used are 0 to 9 and A to F. As a result, an 8 bit byte is represented by two characters in the range 00 to FF, while a 16 bit word is represented by four characters in the range 0000 to FFFF.

Data Transfer Sequence

The data transfer sequence in the ASCII mode offers the following facilities:

- i. Asking questions (known as polling)
 - a. Single parameter poll
 - b. Continuous polling of one parameter
 - c. Sequential polling down the parameter list (fast polling)
- ii. Setting parameters (known as selection)
 - a. Single parameter update
 - b. Continuous updating of one or more individual parameters

Serial Data Transmission

When an ASCII character is sent by serial data transmission, the bit pattern is transmitted in a fixed order. Start and stop bits indicate the start and finish of that pattern.

The seven bit ASCII code is usually extended by one bit called the parity bit. The parity bit shows whether the total number of bits in each character code is odd or even. Eurotherm protocol requires that the parity bit indicates even parity; that is, the parity bit is set if the number of bits in an ASCII character is odd. The serial data pattern also allows the use of multiple stop bits. Eurotherm protocol; however, dictates that there is only one stop bit if the data rate is greater than 110 baud. The 590SP and its instruments use 300 to 9600 baud.

Reading Information by Computer

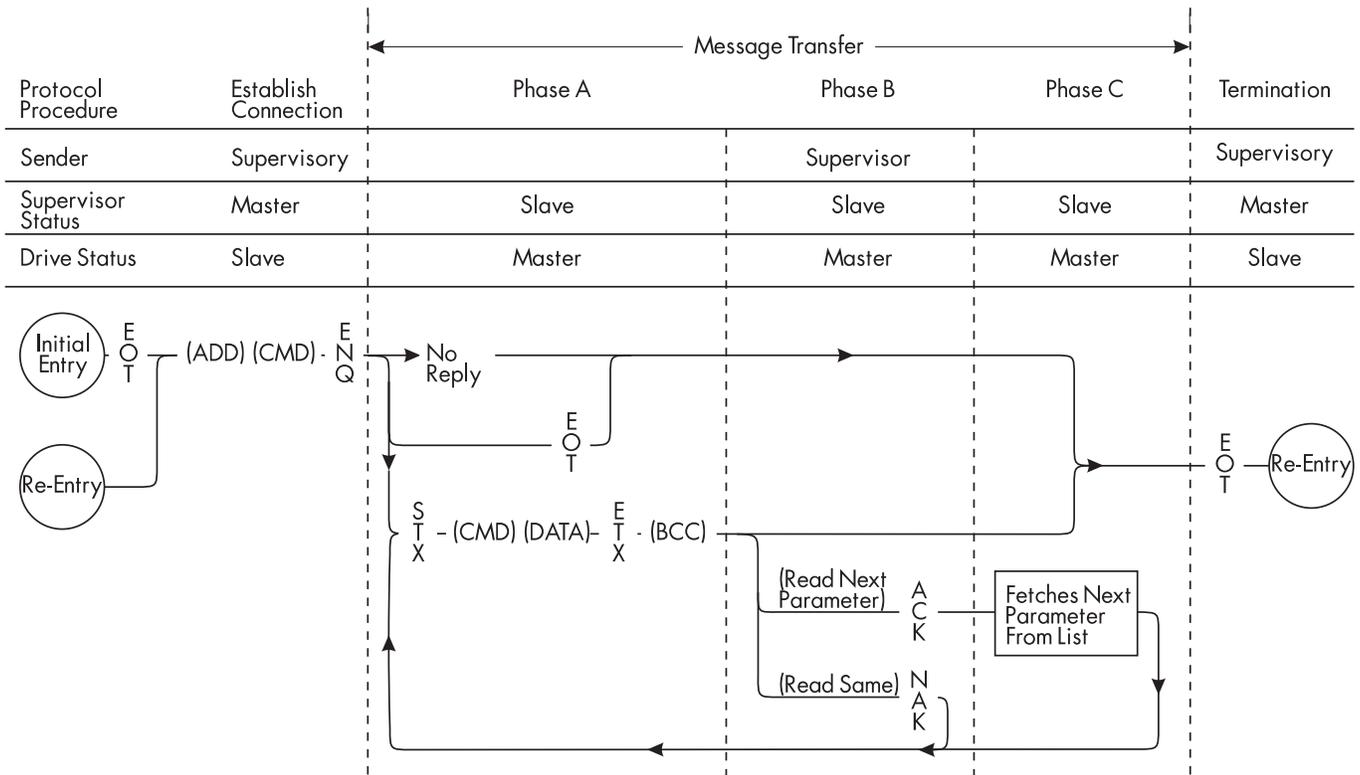


Figure H.4 - Poll Sequence for Transmitting Data from the 590 DRV Controller to the Supervisor.

Reading Information by Computer

Inquiry

The computer initially has master status, with the 590SP in slave status. It begins by transmitting a message, known as the “establish connection” message, which is represented by the following format:

(EOT) (GID) (GID) (UID) (UID) (C1) (C2) (ENQ)

These symbols are defined as follows:

(EOT) This control character resets all instruments on the link and causes them to examine the next four transmitted characters to see if they correspond with their group/unit address identifiers.

(GID) These characters represent the required group address identifier (repeated for security).

(UID) These characters represent the required unit address identifier (repeated for security).

Together the (GID) and (UID) define the address of a particular instrument. If, for example, GID = 3 and UID = 4, then the instrument to be addressed is number 34.

(C1)(C2) These characters specify the parameter by mnemonic.

(ENQ) This character indicates the end of the message, and that it is an inquiry.

Transmitting this message initiates a response procedure from the 590SP.

Valid Response Message

After the message has been sent, the computer adopts slave status and expects to receive a reply from the 590SP. In so doing, the 590SP assumes master status and, if the 590SP has successfully received the message in full, it responds in the following form:

(STX) (C1) (C2) (D1) (D2) (D3)...(DN) (ETX) (BCC)

which constitutes a message defined as:

(STX) Start of text

(C1)(C2) Parameter specified by mnemonic

(D1 to DN) Value of the requested parameter (the string may be of any length as determined by the data). The 590SP responds with the shortest message which represents the data value. If the data value is an integer (decimal part is 0), then it does not send a decimal point. Trailing zeros in the decimal numbers are not sent.

(ETX) End of text

(BCC) Block check character - verification digit which is the character generated by taking the exclusive OR of the ASCII values of all the characters transmitted after and excluding (STX) up to and including (ETX).

For example, in a message where (D1) to (DN) is 5 characters:

(BCC) = (C1) EOR (C2) EOR (D1) EOR (D2) EOR (D3) EOR (D4) EOR (D5) EOR (ETX)

where EOR = Exclusive OR

The computer must check this (BCC) before accepting the reply as valid. Also, the software must be able to extract the number from the data string taking into account the protocol of the data transmission.

Note: If the 590SP receives the message but does not recognize the mnemonic, it will respond with (EOT). The (EOT) returns control to the computer.

Further Inquiry and Termination

The computer then assumes master status again and has three optional responses:

i. Repeat Parameter Facility (NAK)

If the computer transmits a (NAK) after the valid reply, it causes the 590SP to re-send the parameter that it just sent. This allows the computer to continually monitor a parameter without having to reestablish the connection.

ii. Scroll Mode Facility (ACK)

If the computer transmits an (ACK) after a valid reply, it causes the 590SP to fetch the next parameter from the parameter list. This facility enables the computer to continuously sequence through all the parameters of the 590SP.

iii. Terminate Communication (EOT)

The termination procedure is entered when an instrument is no longer required, when a 590SP does not respond to a message, or when a 590SP replies with an (EOT) character. The computer assumes master status and transmits an (EOT) character to enable all the instruments on the data link to be responsive to the next GID-UID address parameter.

No Response

Under certain circumstances, the computer may not receive a response from the 590SP. This could be due to any of the following reasons:

- i. Group/Unit address identifiers are not recognized.
- ii. An error (for example parity) is found in one or more of the characters up to and including (ENQ).
- iii. Communications loop failure perhaps due to noise or selecting the wrong baud rate.
- iv. Hardware failure.
- v. Parameter SERIAL LINKS::MAIN PORT (P1)::SRL LINK ENABLE is disabled.

In these cases the computer should be programmed to “time-out”, that is, wait for a response for a short time (160 msec minimum) before trying again.

Sending information from the computer

Establish Connection

Connection is established when a 590SP sends:

(EOT) (GID) (GID) (UID) (UID)

followed immediately by the data transfer

(STX) (C1) (C2) (D1) (D2) (D3).....(DN) (ETX) (BCC)

Note: The data transfer message is identical to that transmitted by a 590SP when giving a valid reply.

The symbols of this message are defined as follows:

(STX) Start of text character

(C1)(C2) Parameter specified by mnemonic

(D1 to DN) Parameter value

(ETX) End of text character

(BCC) Block Check Character - verification check digit which is the exclusive OR of (C1) to (ETX) inclusive and must be calculated by the computer before transmission.

Responses

After completing the transmission, the 590SP responds to it by sending (ACK), (NAK), or by giving no reply.

- i. Positive acknowledgment (ACK)

After the 590SP receives the message, it performs the following tasks:

- a. Checks for any parity errors in the message.
- b. Verifies that the (BCC) character corresponds to the data pattern received.
- c. Verifies that the (C1), (C2) command characters are a valid mnemonic that may be written to.
- d. Verifies that the data (D1 to DN) is valid and not out-of-range.
- e. Updates the parameter with the new value contained in the message.

Only when all these tasks have been successfully completed does the 590SP send the (ACK) response to the computer. This signifies that the message was correctly received and implemented. If any of the checks fail, the 590SP immediately sends a negative acknowledgment.

Note: When data is out-of-range, the drive returns (NAK) and discards the data.

ii. Negative acknowledgment (NAK)

If the message fails any of the above checks, the 590SP sends (NAK) response to the computer. This signifies that the message received by the 590SP contained an error and it has not updated the parameter. At this point, the computer may repeat the command by sending the data transfer string without reestablishing connection until it receives an (ACK) response.

iii. No Reply

The computer may not receive a response from the 590SP. This could be due to any of the following reasons:

- a. Group/Unit address identifiers are not recognized.
- b. An error (e.g. parity) is found in one or more of the characters up to and including (BCC).
- c. Communications loop failure perhaps due to noise or selecting the wrong baud rate.
- d. Hardware failure.
- e. Parameter SERIAL LINKS::MAIN PORT (P1)::SRL LINK ENABLE is disabled.

In these cases the computer should be programmed to 'time-out', that is, wait for a response for a short time (160 msec minimum) before trying again.

Termination

The computer uses the termination procedure when it wishes to stop selecting one 590SP and establish connection with another. This is achieved by sending the 'establish connection' sequence. The computer retains master status and transmits an (EOT) character to reset all instruments on the data link to be responsive to the next GID-UID address parameter.

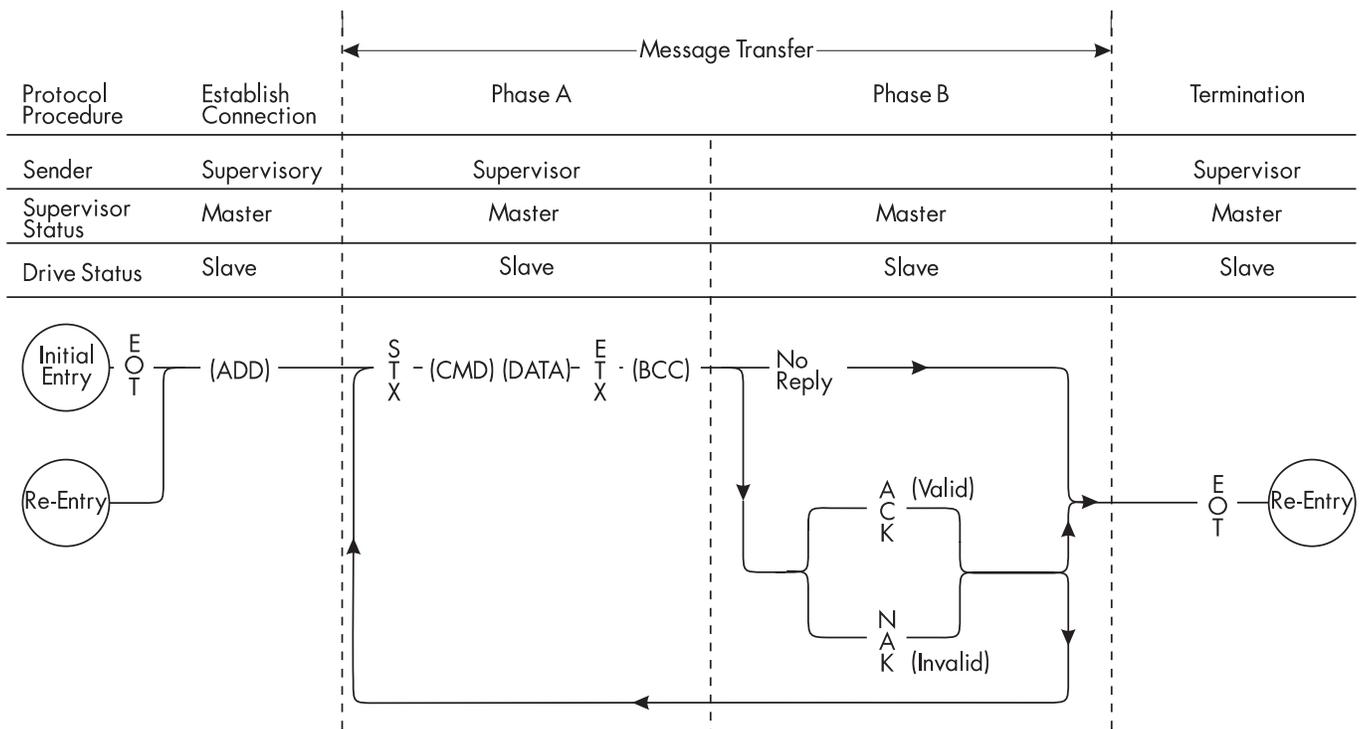


Figure H.5 - Selection Sequence for Transmitting Data from the Supervisor to the 590 DRV Controller

BINARY COMMUNICATIONS

This mode is similar to the ASCII mode. This section concentrates on presenting parts that are different from the ASCII mode.

Specifications

Character Format

Each byte is transmitted as 11 bits rather than the 10-bit format used by the ASCII mode. This is because a control bit is used to indicate control characters or data characters. The format is represented by the following:

- 1 Start bit (LOW)
- 7 Data bits (LSB first)
- 1 Control bit
- 1 Even parity bit
- 1 Stop bit (HIGH)

Note: The control bit is 0 for control characters and 1 for data characters.

The Message

Messages received from the supervisor can be in any of several modes. They can be divided into two categories; the first is “main messages” and the second is “continuation messages.” Before presenting the format of these messages, the following defines the symbols used in the messages. These symbols are divided into two parts, control characters and data characters.

Control Characters

- (EOT) Indicates the end of transmission. The master sends it at the start of a new message to clear the line.
- (STX) Start of text character.
- (ENQ) Inquiry character. The master sends it as the last character of any type of a polling message.
- (ETX) End of text character. It is followed by another character containing the checksum.
- (ETB) End of block character. The 590SP sends it instead of the (ETX) when it wishes to reply to a multi parameter inquiry. The (ETB) indicates the end of a block, but not the end of a message. Each block contains information on up to eight parameters. The (ETB) is used in replies to inquiry polling and multiparameter polling (these are explained below).
- (ACK) Positive acknowledgment character.
- (NAK) Negative acknowledgment character.

Data Characters

- (INO) Instrument number. It contains the address of the slave drive and is equivalent to combining the GID and UID characters of the ASCII mode.
- (PNO) Parameter number. It is equivalent to combining the C1 and C2 characters of the ASCII mode and is sent as a hexadecimal number rather than two ASCII characters.
- (D1), (D2) and (D3) These three characters contain both the value and the mode number. The format is explained in the Types of Messages section.

- (CCC) Connection check control character. It contains the checksum of all the characters following the (EOT) character in the message.
- (BCC) Verification digit generated by taking the exclusive OR of the ASCII values of all characters transmitted after and excluding (STX) up to and including (ETX)

Types of Messages

The two types of messages are main messages and continuation messages.

Main Messages

The main messages are subdivided into four types. They are:

Selection

The supervisor writes to one parameter,

(EOT) (INO) (CCC) (STX) (PNO) (D1) (D2) (D3) (ETX) (BCC)

where the (BCC) character contains the checksum of all characters following the (STX).

Note: (CCC) is the checksum of the characters following an (EOT) and is therefore equal to (INO) in selection and inquiry-polling messages.

Polling

The supervisor requests to read the value of one parameter.

(EOT) (INO) (PNO) (CCC) (ENQ)

Inquiry Polling

The supervisor requests to read all the parameters in block 1 that have changed since the last read by an amount greater than or equal to changeband, PNO 4.

(EOT) (INO) (CCC) (ENQ)

Multiparameter polling

The supervisor requests to read a given number of parameters. That number is referred to as the count number (CNO). It is included in the request message. The drive sends the reply in blocks of up to 8 parameters.

(EOT) (INO) (PNO) (CNO) (CCC) (ENQ)

Multiparameter polling can also perform pseudo-inquiry polling. A pseudo-inquiry poll occurs on blocks defined by PNO 7 when (PNO) is set to the first parameter in a block (for example 8, 16, 24, etc.) and (CNO) is set to 8. See the table for Block 0 in the List of PNO Assignments section of this chapter for detailed information about PNO 7.

Continuation messages

In addition to the above, there are two types of continuation messages (sent by the supervisor). These are:

Next (send next item from a list) (ACK)

Only valid if sent following a multiparameter poll.

Repeat (repeat last reply) (NAK)

Only valid if sent following any type of poll. It requests a repetition of the previous reply.

Data Format

Data values are presented in three consecutive characters, D1, D2 and D3. These characters include the mode name and the value read from or written to one of the parameters. A data character is represented by setting its MSB (bit 7). The contents of these characters are as follows:

D1	2 through 6	Mode number: 0 = XXXX. 1 = XXX.X 2 = XX.XX 3 = X.XXX 4 = .XXXX
	0 and 1	Bits 14 and 15 of the value.
D2	0 through 6	Bits 7 through 13 of the value.
D3	0 through 6	Bits 0 through 6 of the value.

Transmission Rate

The transmission rate can be set to 300, 600, 1200, 2400, 4800, 9600, or 19200 baud.

Serial Transmission

During serial communications, the 590SP drive acts as a slave and replies to messages sent from a master. It responds by transmitting a reply of one character or more than one character.

One character response

The character can be:

(ACK) Sent after receiving a correct message.

(NAK) or (EOT) Sent after detecting a fault.

More than one character response

This message is sent to reply to any type of a polling message. The reply is in the form:

(STX) (PNO) (D1) (D2) (D3) (ETX) (BCC)

For multiparameter polling, the reply can consist of more than one message. It is divided into a group of messages (blocks). The (ETX) character is only sent at the end of the last message. In other messages, the (ETX) is replaced by an (ETB) to indicate an end of a block rather than the end of reply, as explained earlier.

NEW SERIAL LINK FEATURES

1. There are more PNO numbers available.
2. Serial port P1 (isolated RS422/-485) supports even (default) or odd parity.
3. The new serial link PNO numbers include some dedicated parameters, similar to those already present in previous versions of software, and also 16 configurable parameters. The 16 configurable parameters have PNO's 112 to 127 (ASCII mnemonics 70 to 7F). These can be made to point to any TAG number, either via the MMI under SERIAL LINKS::PNO CONFIG, or via the serial link. PNO's 96 to 111 (ASCII mnemonics 60 to 6F) are pointers associated with PNO's 112 to 127.

For example:

If PNO 96 = 123, then PNO 112 will access TAG number 123.

If PNO 100 = 234, then PNO 116 will access TAG number 234

List of PNO Assignments

Block 0

PNO	Access	Description																		
0	R/O	Instrument Identifier. Same as ASCII mnemonic II.																		
1	R/W	Error report. Same as ASCII mnemonic EE. Writing any value resets this PNO to its default (decimal 192).																		
2		Reserved																		
3		Reserved																		
4	R/W	Change band. In an inquiry poll or pseudo-inquiry poll (see PNO 7), a value must have changed by an amount equal to or greater than the change band before it will be reported. Change band is measured in the smallest units applicable to each parameter. For example, if CHANGE BAND = 10, then a parameter with one decimal point must change by 1.0, and a parameter with two decimal points must change by 0.10 before they will be reported.																		
5	R/O	Serial link configuration. <table border="0"> <tr> <td>Bit nos.</td> <td>Description</td> </tr> <tr> <td>0 - 3</td> <td>0 = 300</td> </tr> <tr> <td></td> <td>1 = 600</td> </tr> <tr> <td></td> <td>2 = 1200</td> </tr> <tr> <td></td> <td>3 = 2400</td> </tr> <tr> <td></td> <td>4 = 4800</td> </tr> <tr> <td></td> <td>5 = 9600 (default)</td> </tr> <tr> <td></td> <td>6 = 19200</td> </tr> <tr> <td>4 - 15</td> <td>Reserved</td> </tr> </table>	Bit nos.	Description	0 - 3	0 = 300		1 = 600		2 = 1200		3 = 2400		4 = 4800		5 = 9600 (default)		6 = 19200	4 - 15	Reserved
Bit nos.	Description																			
0 - 3	0 = 300																			
	1 = 600																			
	2 = 1200																			
	3 = 2400																			
	4 = 4800																			
	5 = 9600 (default)																			
	6 = 19200																			
4 - 15	Reserved																			
6		Reserved																		
7	R/W	Control word for multiparameter polling. For the purpose of multiparameter polling, the PNOs are arranged in 16 blocks of 8. Bit 0 of this parameter controls block 0 (PNO 0 to 7), bit 1 controls block 1 (PNO 8 to 15) bit 15 controls block 15 (PNO 120 to 127). When a bit is 1 (default), a multiparameter poll on this block operates normally, as defined in the Types of Messages section. When a bit is 0, a multiparameter poll on this block, with PNO = multiple of 8, and CNO = 8, performs an inquiry poll instead (a pseudo-inquiry poll).																		

Block 1

PNO	ASCII mnemonic	TAG	Access type	Bit data format	ASCII data format	Binary	Limits	Description
8	08	063	R/O	-	21	xxx.xx		Speed Setpoint
9	09	089	R/O	-	21	xxx.xx		Speed Demand
10	0A	062	R/O	-	21	xxx.xx		Speed Feedback
11	0B	066	R/O	-	21	xxx.xx		Current Demand
12	0C	065	R/O	-	21	xxx.xx		Current Feedback
13	0D	183	R/O	-	21	xxx.xx		Field Demand
14	0E	181	R/O	-	21	xxx.xx		Field Feedback
15	0F	115	R/O	-	23	xxxxx		Health Word
				0				Over Speed
				1				Missing Pulse
				2				Field Over Current
				3				Fin Over Temperature
				4				Motor Over Temperature
				5				Over Volts
				6				Speed Feedback
				7				Encoder Fail
				8				Field Fail
				9				Three Phase
				10				Phase Lock Loop
				11				5703 Receive Error
				12				Stall Trip
				13				Over Current Trip
				14				Cal. Card
				15				ACCTS Failed.

Block 2

PNO	ASCII mnemonic	TAG	Access type	Bit data format	ASCII data format	Binary	Limits	Description
16	10	050	R/O	-	21	xxx.xx		Analog I/P 1
17	11	051	R/O	-	21	xxx.xx		Analog I/P 2
18	12	052	R/O	-	21	xxx.xx		Analog I/P 3
19	13	053	R/O	-	21	xxx.xx		Analog I/P 4
20	14	054	R/O	-	21	xxx.xx		Analog I/P 5
21	15	067	R/O	-	21	xxx.xx		Actual +ve Current Limit
22	16	061	R/O	-	21	xxx.xx		Actual -ve Current Limit
23	17	040	R/O	-	23	xxxxx		
-		068		0				Start Input
-		069		1				Jog Input
-		070		2				Enable Input
-		071		3				Digital Input 1
-		072		4				Digital Input 2
-		073		5				Digital Input 3
-		-		6				Program Stop Input
-		-		7				Coast Stop Input
-		074		8				Digital Output 1
-		075		9				Digital Output 2
-		076		10				Digital Output 3
-		-		11-15				Reserved



Block 3

PNO	ASCII mnemonic	TAG	Access type	Bit data format	ASCII data format	Binary	Limits	Description
24	18	030	R/W		21	xxx.xx	±200.00	Additional Current Demand
25	19	015	R/W		21	xxx.xx	0/200.00	Main Current Limit
26	1A	087	R/O		21	xxx.xx	0/200.00	+ve Current Clamp
27	1B	088	R/O		21	xxx.xx	0/200.00	-ve Current Clamp
28	1C	016	R/W		21	xxx.xx	0/200.00	Current Loop P Gain
29	1D	017	R/W		21	xxx.xx	0/200.00	Current Loop I Gain
30	1E	171	R/W		21	xxx.xx	0/100.00	Field Current Setpoint
31	1F	116	R/O		23	xxxxx		Health Store
				0				Over Speed
				1				Missing Pulse
				2				Field Over Current
				3				Fin Over Temperature
				4				Motor Over Temperature
				5				Field Over Volts
				6				Speed Feedback
				7				Encoder Fail
				8				Field Fail
				9				Three Phase
				10				Phase Lock Loop
				11				5703 Receive Error
				12				Stall Trip
				13				Over Current Trip
				14				Cal. Card
				15				ACCTS Failed.

Block 4

PNO	ASCII mnemonic	TAG	Access type	Bit data format	ASCII data format	Binary	Limits	Description
32	20	060	R/O		21	xxx.xx		Armature Volts
33	21	058	R/O		21	xxx.xx		Analog Tach
34	22	059	R/O		21	xxxxx		Encoder
35	23	064	R/O		21	xxx.xx		Speed Error
36	24	132	R/W		21	x.xxxx	±3.0000	P3 Setpoint Ratio
37	25	014	R/W		21	xxx.xx	0/200.00	Speed Loop P Gain
38	26	013	R/W		21	xx.xxx	0.001/30.000	Speed Loop Time Constant (SEC)
39	27				23	xxxxx		
		161	R/W	0			0/1	Aux. Start
		168	R/W	1			0/1	Aux. Enable
		-		2-7				Reserved
		288	R/W	8			0/1	External Ramp Reset
		287	R/W	9			0/1	Auto Reset
		113	R/O	10				Ramping
		303	R/W	11			0/1	Reset Ramp to Speed Feedback

Block 5

PNO	ASCII mnemonic	TAG	Access type	Bit data format	ASCII data format	Binary	Limits	Description
40	28	006	R/W		21	x.xxxx	±3.0000	Ratio 1
41	29	007	R/W		21	x.xxxx	±3.0000	Ratio 2
42	2A	086	R/O		21	xxx.xx		Set Point Sum Output
43	2B	002	R/W		21	xxx.x	0.1/600.0	Ramp Accel. Time
44	2C	003	R/W		21	xxx.x	0.1/600.0	Ramp Decel. Time
45	2D	085	R/O		21	xxx.xx	-	Ramp Output
46	2E	041	R/W		21	xxx.xx	±105.00	Speed Setpoint 4
47	2F				23	xxxxxx		
		082	R/O	0				Drive Start
		084	R/O	1				Drive Enable
		122	R/O	2				Health Flag
		125	R/O	3				Ready
				4 - 7				Reserved
		079	R/O	8				At Standstill
		112	R/O	9				Stall Trip Warning
				10 - 15				Reserved

Block 6

PNO	ASCII mnemonic	TAG	Access type	Bit data format	ASCII data format	Binary	Limits	Description
48	30	026	R/W		21	xxx.x	0.1/600.0	P-Stop time
49	31	027	R/W		21	xxx.x	0.1/600.0	N-Stop time
50	32	091	R/W		21	xxx.xx	0/200.00	P-Stop Current Limit
51	33	029	R/W		21	xxx.xx	0/100.00	Stop Zero Speed Threshold
52	34	005	R/W		21	xxx.xx	±100.00	Ramp Input
53	35	100	R/W		21	xxx.xx	±200.00	Setpoint Sum Input 1
54	36	309	R/W		21	xxx.xx	±200.00	Setpoint Sum Input 0
55	37				23	xxxxxx		
		94	R/W	0			0/1	Aux. Digital Output 1
		95	R/W	1			0/1	Aux. Digital Output 2
		96	R/W	2			0/1	Aux. Digital Output 3
		-		3 - 7				Reserved
		292	R/W	8			0/1	Sign 0
		8	R/W	9			0/1	Sign 1
		9	R/W	10			0/1	Sign 2
				11 - 15				Reserved

Block 7

PNO	ASCII mnemonic	TAG	Access type	Bit data format	ASCII data format	Binary	Limits	Description
56	38	055	R/O		21	xxx.xx		Analog Output 1
57	39	056	R/O		21	xxx.xx		Analog Output 2
58	3A	128	R/W		21	xxx.xx	±100.00	Aux. Analog Output 1
59	3B	129	R/W		21	xxx.xx	±100.00	Aux. Analog Output 2
60	3C	266	R/W		21	xxx.xx	0/100.00	% S-Ramp
61	3D	264	R/O		21	xxx.xx		Raise / Lower Output
62	3E	255	R/W		21	xxx.xx	±300.00	Raise / Lower Reset Value
63	3F	-			23	xxxxxx		
-		261	R/W	0			0/1	Raise / Lower Raise Input
-		262	R/W	1			0/1	Raise / Lower Lower Input
-		307	R/W	2			0/1	Raise / Lower Reset

Block 8

PNO	ASCII mnemonic	TAG	Access type	Bit data format	ASCII data format	Binary	Limits	Description
64	40	218	R/W		21	xxx.xx	±100.00	Jog Speed 1
65	41	219	R/W		21	xxx.xx	±100.00	Jog Speed 2
66	42	253	R/W		21	xxx.xx	±100.00	Take Up 1
67	43	254	R/W		21	xxx.xx	±100.00	Take Up 2
68	44	225	R/W		21	xxx.xx	±100.00	Crawl Speed
71	47	-			23	xxxxx		
-		228	R/W	0			0/1	Jog Mode
-		227	R/W	1			0/1	Auxiliary Jog

Block 9

PNO	ASCII mnemonic	TAG	Access type	Bit data format	ASCII data format	Binary	Limits	Description
72	48	208	R/W		21	x.xxxx	±3.0000	Ratio 0
73	49	309	R/W		21	xxx.xx	±200.00	Input 0
74	4A	48	R/W		21	xxx.xx	±100.00	Pre-set -ve Current Limit
75	4B	301	R/W		21	xxx.xx	±100.00	Pre-set +ve Current Limit

Block 10

PNO	ASCII mnemonic	TAG	Access type	Bit data format	ASCII data format	Binary	Limits	Description
80	50	103	R/W		21	xxx.xx	±300.00	Value for TRUE Digital Input 1
81	51	104	R/W		21	xxx.xx	±300.00	Value for FALSE Digital Input 1
82	52	106	R/W		21	xxx.xx	±300.00	Value for TRUE Digital Input 2
83	53	107	R/W		21	xxx.xx	±300.00	Value for FALSE Digital Input 2
84	54	109	R/W		21	xxx.xx	±300.00	Value for TRUE Digital Input 3
85	55	110	R/W		21	xxx.xx	±300.00	Value for FALSE Digital Input 3

Block 11

PNO	ASCII mnemonic	TAG	Access type	Bit data format	ASCII data format	Binary	Limits	Description
88	58	339	R/W		21	xxx.xx	±300.00	Value 1
89	59	340	R/W		21	xxx.xx	±300.00	Value 2
90	5A	341	R/W		21	xxx.xx	±300.00	Value 3
91	5B	342	R/W		21	xxx.xx	±300.00	Value 4
92	5C	343	R/W		21	xxx.xx	±300.00	Value 5
93	5D	344	R/W		21	xxx.xx	±300.00	Value 6
94	5E	345	R/W		21	xxx.xx	±300.00	Value 7
95	5F	-			23	xxxxx		
-		346	R/W	0			0/1	Logic 1
-		347	R/W	1			0/1	Logic 2
-		348	R/W	2			0/1	Logic 3
-		349	R/W	3			0/1	Logic 4
-		350	R/W	4			0/1	Logic 5
-		351	R/W	5			0/1	Logic 6
-		352	R/W	6			0/1	Logic 7
-		353	R/W	7			0/1	Logic 8

Block 12

PNO	ASCII mnemonic	TAG	Access type	Bit data format	ASCII data format	Binary	Limits	Description
96	60	312	R/W		21	xxxxx		Pointer for PNO 112
97	61	313	R/W		21	xxxxx		Pointer for PNO 113
98	62	314	R/W		21	xxxxx		Pointer for PNO 114
99	63	315	R/W		21	xxxxx		Pointer for PNO 115
100	64	316	R/W		21	xxxxx		Pointer for PNO 116
101	65	317	R/W		21	xxxxx		Pointer for PNO 117
102	66	318	R/W		21	xxxxx		Pointer for PNO 118
103	67	319	R/W		21	xxxxx		Pointer for PNO 119

Block 13

PNO	ASCII mnemonic	TAG	Access type	Bit data format	ASCII data format	Binary	Limits	Description
104	68	320	R/W		21	xxxxx		Pointer for PNO 120
105	69	321	R/W		21	xxxxx		Pointer for PNO 121
106	6A	322	R/W		21	xxxxx		Pointer for PNO 122
107	6B	323	R/W		21	xxxxx		Pointer for PNO 123
108	6C	324	R/W		21	xxxxx		Pointer for PNO 124
109	6D	325	R/W		21	xxxxx		Pointer for PNO 125
110	6E	326	R/W		21	xxxxx		Pointer for PNO 126
111	6F	327	R/W		21	xxxxx		Pointer for PNO 127

Block 14

PNO	ASCII mnemonic	TAG	Access type	Bit data format	ASCII data format	Binary	Limits	Description
112	70	PNO 96	†		†	†	†	Configurable PNO 0
113	71	PNO 97	†		†	†	†	Configurable PNO 1
114	72	PNO 98	†		†	†	†	Configurable PNO 2
115	73	PNO 99	†		†	†	†	Configurable PNO 3
116	74	PNO 100	†		†	†	†	Configurable PNO 4
117	75	PNO 101	†		†	†	†	Configurable PNO 5
118	76	PNO 102	†		†	†	†	Configurable PNO 6
119	77	PNO 103	†		†	†	†	Configurable PNO 7

Block 15

PNO	ASCII mnemonic	TAG	Access type	Bit data format	ASCII data format	Binary	Limits	Description
120	78	PNO 104	†		†	†	†	Configurable PNO 8
121	79	PNO 105	†		†	†	†	Configurable PNO 9
122	7A	PNO 106	†		†	†	†	Configurable PNO 10
123	7B	PNO 107	†		†	†	†	Configurable PNO 11
124	7C	PNO 108	†		†	†	†	Configurable PNO 12
125	7D	PNO 109	†		†	†	†	Configurable PNO 13
126	7E	PNO 110	†		†	†	†	Configurable PNO 14
127	7F	PNO 111	†		†	†	†	Configurable PNO 15

† = These fields depend on the destination TAG number

Inquiry polling

In normal inquiry polling mode, block 1 is polled.

References

- 1 HP022047C. Eurotherm International Bisynch Communications Handbook.
- 2 (additions) 570 Product Manual. Part nos. HA056929 (main body), HA058040

SERIAL LINK MNEMONICS & PARAMETER NUMBER ALLOCATION

Eurotherm Group Standard Parameters

Each of the Eurotherm Group instruments which support ASCII protocol contains a minimum set of parameters. These are known as the Prime Set and allow access to the following:

Mnemonic	Description	Access	Function
BL	Buffer Length	R/O	Returns 4646 ₁₆ indicating that both transmit and receive buffers are 46 ₁₆ bytes long.
CI	Configuration Information	R/O	Returns 4CCC ₁₆ indicating that the drive supports both fixed and variable length data formats, and that the drive is a single-function device.
EE	Error Report	R/W	Returns one of the following to indicate the status of serial link transmissions: 00C0 No errors 01C7 Unknown mnemonic 02C2 Block check character fail 03C1 Parity error on received data 03C2 Framing or overrun error 05C8 Attempt to write to a read-only mnemonic 07C7 Invalid message format 08C8 Value in selection message out of range Writing any value to mnemonic EE resets it to 00C0.
II	Instrument Identifier	R/W	Returns the value of a parameter, the default value of which is 5900.
MN	Mode Number	R/O	Returns a fixed value 08C1 (the full Eurotherm standard is not supported).
VO	Version Number	R/O	Returns the software version number in the upper two characters, and the release number in the lower two characters. For example issue 2.3 returns 0203.

In addition to the Prime Set, each drive or instrument supports an application set of parameters to allow fast access to commonly required variables such as process variables, setpoints, and PI gains.

All parameters can be found by polling the instrument identifier parameter and then sequentially polling until the instrument identifier parameter is repeated. This will result in a circular list that contains all supported by the instrument.

Common ASCII Codes

ASCII CODES		ASCII-HEX
STX	Start of Text	02
ETX	End of Text	03
EOT	End of Transmission	04
ENQ	Inquiry	05
ACK	Positive Acknowledge	06
NAK	Negative Acknowledge	15
	Space	20
-	Minus Sign	2D
.	Decimal Point	2E
0		30
1		31
2		32
3		33
4		34
5		35
6		36
7		37
8		38
9		39
>	(greater than)	3E

HEX-ASCII Table (complete list)

00	NUL	20	space	40	@	60	,
01	SOH	21	!	41	A	61	a
02	STX	22	"	42	B	62	b
03	ETX	23	£	43	C	63	c
04	EOT	24	\$	44	D	64	d
05	ENQ	25	%	45	E	65	e
06	ACK	26	&	46	F	66	f
07	BEL	27	'	47	G	67	g
08	BS	28	(	48	H	68	h
09	HT	29	)	49	I	69	i
0A	LF	2A	*	4A	J	6A	j
0B	VT	2B	+	4B	K	6B	k
0C	FF	2C	,	4C	L	6C	l
0D	CR	2D	-	4D	M	6D	m
0E	SO	2E	.	4E	N	6E	n
0F	SI	2F	/	4F	O	6F	o
10	DLE	30	0	50	P	70	p
11	DC1(X-ON)	31	1	51	Q	71	q
12	DC2	32	2	52	R	72	r
13	DC3(XOFF)	33	3	53	S	73	s
14	DC4	34	4	54	T	74	t
15	NAK	35	5	55	U	75	u
16	SYN	36	6	56	V	76	v
17	ETB	37	7	57	W	77	w
18	CAN	38	8	58	X	78	x
19	EM	39	9	59	Y	79	y
1A	SUB	3A	:	5A	Z	7A	z
1B	ESC	3B	;	5B	[	7B	{
1C	FS	3C	<	5C	/	7C	|
1D	GS	3D	=	5D	]	7D	}
1E	RS	3E	>	5E	^	7E	~
1F	US	3F	?	5F	-	7F	DEL



APPLICATION NOTES

It is possible to make serial communications operate without following all the recommendations in this section; however, the recommendations will promote greater reliability.

Host Computer

If possible, avoid using host computers which take their transmitter to a high impedance state (tri-state) when idling. If it is unavoidable, then it is essential to use properly screened cable, such as suggested below.

Terminations

The drive farthest from the host computer should have a terminating resistor. The terminating resistor should be changed to match the characteristic impedance of the cable, typically 100 to 150Ω. The resistors on all other drives should be removed.

Cable Routing

Daisy chain one drive to the next; avoid spurs. Connect the host computer at one end of the daisy-chain. The host computer's TX+ terminal connects to all the RX+ terminals along the daisy chain. Its RX+ terminal connects to all the drive's TX+ terminals in the chain. This same pattern is followed for the TX- and RX- terminals. See Figure H.6 for an illustration of the wiring scheme.

Grounding

Connect the screens of both pairs of wires to ground at the host computer. If possible, connect the host computer's transmitter/receiver zero volts reference to ground.

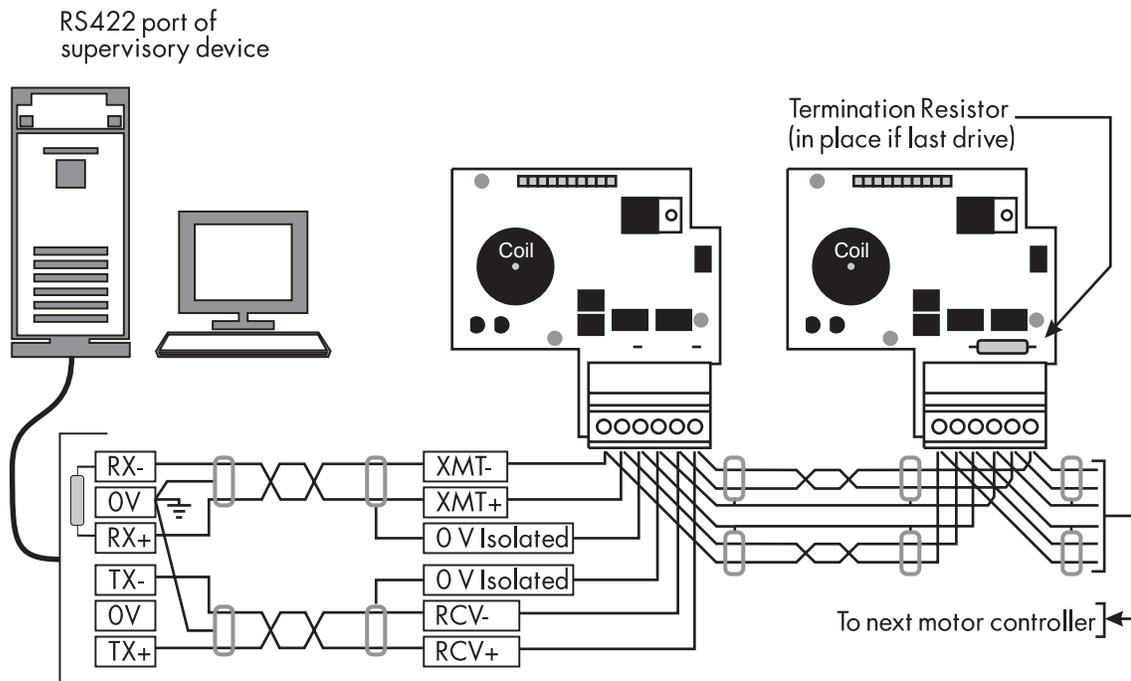


Figure H.6 - Serial Link Connections

Serial Link Cable Selection

Use cable which has two twisted pairs, with each pair individually screened, as shown below. The characteristic impedance should be between 100 and 150Ω

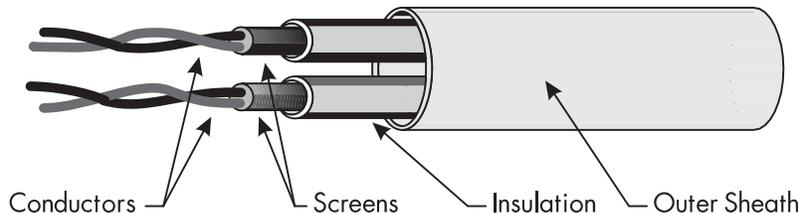


Figure H.7 - Shielded Cable Illustration





Appendix I PARAMETER LIST BY TAG NUMBER

TAG	PARAMETER NAME	MENU	DEFAULT	MIN	MAX	
0	Trash Can			0	0	RW
1	Eeprom Checksum			-	-	
2	RAMP ACCEL TIME	SETUP PARAMETERS::RAMP S	10.0 SECS	1	6000	RW
3	RAMP DECEL TIME	SETUP PARAMETERS::RAMP S	10.0 SECS	1	6000	RW
4	CONSTANT ACCEL	SETUP PARAMETERS::RAMP S	ENABLED	0	1	RW
5	RAMP INPUT	SETUP PARAMETERS::RAMP S	0.00%	-10000	10000	RW
6	RATIO 1	SETUP PARAMETERS::SETPOINT SUM 1	1	-30000	30000	RW
7	RATIO 2 [A3]	SETUP PARAMETERS::SPEED LOOP::SETPOINTS	1	-30000	30000	RW
8	SIGN 1	SETUP PARAMETERS::SETPOINT SUM 1	POSITIVE	0	1	RW
9	SIGN 2 [A3]	SETUP PARAMETERS::SPEED LOOP::SETPOINTS	POSITIVE	0	1	RW
10	ZERO SPD. OFFSET	SETUP PARAMETERS::CALIBRATION	0.00%	-500	500	RW
11	STANDSTILL LOGIC	SETUP PARAMETERS::STANDSTILL	DISABLED	0	1	RW
12	ZERO THRESHOLD	SETUP PARAMETERS::STANDSTILL	2.00%	0	10000	RW
13	INT. TIME CONST.	SETUP PARAMETERS::SPEED LOOP	0.500 SECS	1	30000	RW
14	PROP. GAIN	SETUP PARAMETERS::SPEED LOOP	10	0	20000	RW
15	CUR.LIMIT/SCALER	SETUP PARAMETERS::CURRENT LOOP	100.00%	0	20000	RW
16	PROP. GAIN	SETUP PARAMETERS::CURRENT LOOP	45	0	20000	RW
17	INT. GAIN	SETUP PARAMETERS::CURRENT LOOP	3.5	0	20000	RW
18	AUTOTUNE	SETUP PARAMETERS::CURRENT LOOP	OFF	0	1	RW
19	UNUSED	UNUSED				
20	ARMATURE V CAL.	SETUP PARAMETERS::CALIBRATION	1	9800	11000	RW
21	IR COMPENSATION	SETUP PARAMETERS::CALIBRATION	0.00%	0	10000	RW
22	ENCODER RPM	SETUP PARAMETERS::CALIBRATION	1000 RPM	0	6000	RW
23	ANALOG TACH CAL	SETUP PARAMETERS::CALIBRATION	1	9800	11000	RW
24	ENCODER LINES	SETUP PARAMETERS::CALIBRATION	1000	10	5000	RW
25	ARMATURE I [A9]	SETUP PARAMETERS::CALIBRATION	BIPOLAR	0	1	RW
26	PROG STOP TIME	SETUP PARAMETERS::STOP RATES	0.1 SECS	1	6000	RW
27	STOP TIME	SETUP PARAMETERS::STOP RATES	10.0 SECS	1	6000	RW
28	STALL TRIP	SETUP PARAMETERS::INHIBIT ALARMS	INHIBITED	0	1	RW
29	STOP ZERO SPEED	SETUP PARAMETERS::STOP RATES	2.00%	0	10000	RW
30	ADDITIONAL DEM	SETUP PARAMETERS::CURRENT LOOP	0.00%	-20000	20000	RW
31	SPD BRK2 [HIGH]	SETUP PARAMETERS::CURRENT PROFILE	100.00%	0	10000	RW
32	SPD BRK1 [LOW]	SETUP PARAMETERS::CURRENT PROFILE	100.00%	0	10000	RW
33	IMAX BRK 2[SPD2]	SETUP PARAMETERS::CURRENT PROFILE	200.00%	0	20000	RW
34	UNUSED	UNUSED				
35	UNUSED	UNUSED				
36	IFB DELAY	SYSTEM:RESERVED	20	0	255	RW
37	FULL MENUS	MENUS	ENABLED	0	1	RW
38	MENU DELAY	MENUS	30	0	65535	RW
39	CONFIGURE ENABLE	SYSTEM::CONFIGURE I/O	DISABLED	0	1	RW
40	System I/O Digital			-	-	
41	SETPOINT 4	SETUP PARAMETERS::SPEED LOOP::SETPOINTS	0.00%	-10500	10500	RW
42	AT CURRENT LIMIT	DIAGNOSTICS	FALSE	0	1	RO
43	MODULUS	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 1 [B5]	TRUE	0	1	RW
44	MODULUS	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 2 [B6]	TRUE	0	1	RW
45	MODULUS	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 3 [B7]	TRUE	0	1	RW
46	Reserved					
47	SPEED FBK SELECT	SETUP PARAMETERS::SPEED LOOP	ARM VOLTS FBK	0	3	RW
48	NEG. 1 CLAMP	SETUP PARAMETERS::CURRENT LOOP	0.00%	-10000	10000	RW
49	ENCODER SIGN	SETUP PARAMETERS::SPEED LOOP	POSITIVE	0	1	RW
50	ANIN 1 [A2]	DIAGNOSTICS	0.00 VOLTS	-10000	10000	RO
51	ANIN 2 [A3]	DIAGNOSTICS	0.00 VOLTS	-10000	10000	RO
52	ANIN 3 [A4]	DIAGNOSTICS	0.00 VOLTS	-10000	10000	RO
53	ANIN 4 [A5]	DIAGNOSTICS	0.00 VOLTS	-10000	10000	RO
54	ANIN 5 [A6]	DIAGNOSTICS	0.00 VOLTS	-10000	10000	RO
55	ANOUT 1 [A7]	DIAGNOSTICS	0.00 VOLTS	-10000	10000	RO
56	ANOUT 2 [A8]	DIAGNOSTICS	0.00 VOLTS	-10000	10000	RO
57	TERMINAL VOLTS	DIAGNOSTICS	0.00%	-12500	12500	RO
58	Analog Tach Feedback Unfiltered			-	-	RO
59	Encoder Feedback Unfiltered			-	-	RO
60	BACK EMF	DIAGNOSTICS	0.00%	-15000	15000	RO
61	ACTUAL NEG I LIM	DIAGNOSTICS	0.00%	-20000	20000	RO
62	Speed Feedback Unfiltered			-	-	RO
63	SPEED SETPOINT	DIAGNOSTICS	0.00%	-30000	30000	RO
64	Speed Loop Error Unfiltered			-	-	RO
65	Current Feedback Unfiltered			-	-	RO

TAG	PARAMETER NAME	MENU	DEFAULT	MIN	MAX	
66	Current Demand Unfiltered			-	-	RO
67	ACTUAL POS I LIM	DIAGNOSTICS	0.00%	-20000	20000	RO
68	START (C3)	DIAGNOSTICS	OFF	0	1	RO
69	JOG INPUT (C4)	DIAGNOSTICS	OFF	0	1	RO
70	ENABLE (C5)	DIAGNOSTICS	OFF	0	1	RO
71	DIGIN 1 (C6)	DIAGNOSTICS	OFF	0	1	RO
72	DIGIN 2 (C7)	DIAGNOSTICS	OFF	0	1	RO
73	DIGIN 3 (C8)	DIAGNOSTICS	OFF	0	1	RO
74	DIGOUT 1 (B5)	DIAGNOSTICS	ON	0	1	RO
75	DIGOUT 2 (B6)	DIAGNOSTICS	ON	0	1	RO
76	DIGOUT 3 (B7)	DIAGNOSTICS	OFF	0	1	RO
77	AT ZERO SPEED	DIAGNOSTICS	TRUE	0	1	RO
78	AT ZERO SETPOINT	DIAGNOSTICS	TRUE	0	1	RO
79	AT STANDSTILL	DIAGNOSTICS	TRUE	0	1	RO
80	PROGRAM STOP	DIAGNOSTICS	TRUE	0	1	RO
81	SPEED FBK ALARM	SETUP PARAMETERS::INHIBIT ALARMS	ENABLED	0	1	RW
82	DRIVE START	DIAGNOSTICS	OFF	0	1	RO
83	Main Contactor		Off	0	1	RO
84	DRIVE ENABLE	DIAGNOSTICS	DISABLED	0	1	RO
85	RAMP OUTPUT	DIAGNOSTICS	0.00%	-10000	10000	RO
86	SPT SUM OUTPUT	DIAGNOSTICS	0.00%	-20000	20000	RO
87	POS. I CLAMP	DIAGNOSTICS	0.00%	-20000	20000	RO
88	NEG. I CLAMP	DIAGNOSTICS	0.00%	-20000	20000	RO
89	SPEED DEMAND	DIAGNOSTICS	0.00%	-10500	10500	RO
90	BIPOLAR CLAMPS	SETUP PARAMETERS::CURRENT LOOP	DISABLED	0	1	RW
91	PROG STOP I LIM	SETUP PARAMETERS::STOP RATES	100.00%	0	20000	RW
92	ENCODER ALARM	SETUP PARAMETERS::INHIBIT ALARMS	ENABLED	0	1	RW
93	IMAX BRK I (SPDI)	SETUP PARAMETERS::CURRENT PROFILE	200.00%	0	20000	RW
94	AUX DIGOUT 1	SETUP PARAMETERS::AUX I/O	OFF	0	1	RW
95	AUX DIGOUT 2	SETUP PARAMETERS::AUX I/O	OFF	0	1	RW
96	AUX DIGOUT 3	SETUP PARAMETERS::AUX I/O	OFF	0	1	RW
97	SOURCE TAG	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 1 (B5)	77	0	499	RW
98	SOURCE TAG	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 2 (B6)	122	0	499	RW
99	SOURCE TAG	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 3 (B7)	125	0	499	RW
100	INPUT 1	SETUP PARAMETERS::SETPOINT SUM 1	0.00%	-20000	20000	RW
101	MIN BS DEAD TIME	SYSTEM::RESERVED	500	0	6000	RW
102	DESTINATION TAG	SYSTEM::CONFIGURE I/O::DIGITAL INPUTS::DIGIN 1 (C6)	90	0	499	RW
103	VALUE FOR TRUE	SYSTEM::CONFIGURE I/O::DIGITAL INPUTS::DIGIN 1 (C6)	0.01%	-30000	30000	RW
104	VALUE FOR FALSE	SYSTEM::CONFIGURE I/O::DIGITAL INPUTS::DIGIN 1 (C6)	0.00%	-30000	30000	RW
105	DESTINATION TAG	SYSTEM::CONFIGURE I/O::DIGITAL INPUTS::DIGIN 2 (C7)	118	0	499	RW
106	VALUE FOR TRUE	SYSTEM::CONFIGURE I/O::DIGITAL INPUTS::DIGIN 2 (C7)	0.01%	-30000	30000	RW
107	VALUE FOR FALSE	SYSTEM::CONFIGURE I/O::DIGITAL INPUTS::DIGIN 2 (C7)	0.00%	-30000	30000	RW
108	DESTINATION TAG	SYSTEM::CONFIGURE I/O::DIGITAL INPUTS::DIGIN 3 (C8)	119	0	499	RW
109	VALUE FOR TRUE	SYSTEM::CONFIGURE I/O::DIGITAL INPUTS::DIGIN 3 (C8)	0.01%	-30000	30000	RW
110	VALUE FOR FALSE	SYSTEM::CONFIGURE I/O::DIGITAL INPUTS::DIGIN 3 (C8)	0.00%	-30000	30000	RW
111	5703 RCV ERROR	SETUP PARAMETERS::INHIBIT ALARMS	ENABLED	0	1	RW
112	STALL TRIP	DIAGNOSTICS	OK	0	1	RO
113	RAMPING	DIAGNOSTICS	FALSE	0	1	RO
114	Alarm Sequence State			-	-	RO
115	HEALTH WORD	ALARM STATUS	0x4210	0	FFFF	RO
116	HEALTH STORE	ALARM STATUS	0x0000	0	FFFF	RO
117	Health Inhibit Diagnostic			0	FFFF	RO
118	RAMP HOLD	SETUP PARAMETERS::RAMP S	OFF	0	1	RW
119	IDMD. ISOLATE	SETUP PARAMETERS::CURRENT LOOP	DISABLED	0	1	RW
120	ENTER PASSWORD	PASSWORD	0x0000	0	FFFF	RW
121	CHANGE PASSWORD	PASSWORD	0x0000	0	FFFF	RW
122	Health Flag (LED)		0	0	1	RO
123	PEEK DATA	SYSTEM::PEEK	0x0078	24	FFFF	RW
124	PEEK SCALE	SYSTEM::PEEK	8	0	65535	RW
125	Ready Flag (LED)		0	0	1	RO
126	MIN SPEED	SETUP PARAMETERS::RAMP S	0.00%	0	10000	RW
127	Dump Enable		0	0	1	RW
128	ANOUT 1	SETUP PARAMETERS::AUX I/O	0.00%	-10000	10000	RW
129	ANOUT 2	SETUP PARAMETERS::AUX I/O	0.00%	-10000	10000	RW
130	MODE	SERIAL LINKS::SYSTEM PORT (P3)::P 3 SETUP	DISABLED	0	4	RW

Appendix I Parameter List by Tag Number

TAG	PARAMETER NAME	MENU	DEFAULT	MIN	MAX	
131	DEADBAND WIDTH	SETUP PARAMETERS::SETPOINT SUM 1	0.00%	0	10000	RW
132	SETP.T. RATIO	SERIAL LINKS::SYSTEM PORT (P3)::P3 SETUP::5703 SUPPORT	0	-30000	30000	RW
133	SETP.T. SIGN	SERIAL LINKS::SYSTEM PORT (P3)::P3 SETUP::5703 SUPPORT	POSITIVE	0	1	RW
134	SOURCE TAG	SYSTEM::CONFIGURE I/O::CONFIGURE 5703	89	0	499	RW
135	DESTINATION TAG	SYSTEM::CONFIGURE I/O::CONFIGURE 5703	41	0	499	RW
136	FEED FORWARD	SETUP PARAMETERS::CURRENT LOOP	2	10	5000	RW
137	DISCONTINUOUS	SETUP PARAMETERS::CURRENT LOOP	12.00%	0	20000	RW
138	GROUP ID (GID)	SERIAL LINKS::MAIN PORT (P1)	0	0	7	RW
139	UNIT ID (UID)	SERIAL LINKS::MAIN PORT (P1)	0	0	15	RW
140	GROUP ID (GID)	SERIAL LINKS::AUX PORT (P2)	0	0	7	RW
141	UNIT ID (UID)	SERIAL LINKS::AUX PORT (P2)	0	0	15	RW
142	PNO. 7	SERIAL LINKS::MAIN PORT (P1)	0xFFFF	0	FFFF	RW
143	PNO. 7	SERIAL LINKS::AUX PORT (P2)	0xFFFF	0	FFFF	RW
144	CHANGE BAND (BIN)	SERIAL LINKS::MAIN PORT (P1)	0.00%	0	32767	RW
145	CHANGE BAND (BIN)	SERIAL LINKS::AUX PORT (P2)	0.00%	0	32767	RW
146	SRL LINK ENABLE	SERIAL LINKS::MAIN PORT (P1)	ENABLED	0	1	RW
147	SRL LINK ENABLE	SERIAL LINKS::AUX PORT (P2)	ENABLED	0	1	RW
148	ASCII / BINARY	SERIAL LINKS::MAIN PORT (P1)	ASCII	0	1	RW
149	ASCII / BINARY	SERIAL LINKS::AUX PORT (P2)	ASCII	0	1	RW
150	BAUD RATE	SERIAL LINKS::MAIN PORT (P1)	9600	300	19200	RW
151	BAUD RATE	SERIAL LINKS::AUX PORT (P2)	9600	300	19200	RW
152	ESP SUP. (ASCII)	SERIAL LINKS::MAIN PORT (P1)	DISABLED	0	1	RW
153	ESP SUP. (ASCII)	SERIAL LINKS::AUX PORT (P2)	DISABLED	0	1	RW
154	||	SYSTEM::RESERVED	0x5900	0	FFFF	RW
155	Serial Link Version Number					
156	Config Info					
157	Block Length					
158	ERROR REPORT	SERIAL LINKS::MAIN PORT (P1)	0x00C0	-	-	RW
159	ERROR REPORT	SERIAL LINKS::AUX PORT (P2)	0x00C0	-	-	RW
160	Mode Number					
161	AUX START	SETUP PARAMETERS::AUX I/O	ON	0	1	RW
162	MIN MMI CYCLE TM	SYSTEM::RESERVED	80	0	65535	RW
163	ILOOP PI MODE	SYSTEM::RESERVED	2	0	2	RW
164	TOGGLE PERIOD	SYSTEM::RESERVED	160	0	FFFF	RW
165	TOGGLE REF 1	SYSTEM::RESERVED	0.00%	-30000	30000	RW
166	SEL. INT/CUR/SPD	SYSTEM::RESERVED	2	0	3	RW
167	TOGGLE REF 2	SYSTEM::RESERVED	0.00%	-30000	30000	RW
168	AUX ENABLE	SETUP PARAMETERS::AUX I/O	ON	0	1	RW
169	UNUSED	UNUSED				
170	UNUSED	UNUSED				
171	UNUSED	UNUSED				
172	UNUSED	UNUSED				
173	UNUSED	UNUSED				
174	UNUSED	UNUSED				
175	UNUSED	UNUSED				
176	UNUSED	UNUSED				
177	UNUSED	UNUSED				
178	UNUSED	UNUSED				
179	UNUSED	UNUSED				
180	SPDFBK ALM LEVEL	SETUP PARAMETERS::CALIBRATION	50.00%	0	10000	RW
181	UNUSED	UNUSED				
182	UNUSED	UNUSED				
183	UNUSED	UNUSED				
184	UNUSED	UNUSED				
185	UNUSED	UNUSED				
186	UNUSED	UNUSED				
187	5703 INPUT	SERIAL LINKS::SYSTEM PORT (P3)::P3 SETUP::5703 SUPPORT	0.00%	-30000	30000	RW
188	OVER SPEED LEVEL	SETUP PARAMETERS::CALIBRATION	125.00%	0	20000	RW
189	5703 OUTPUT	SERIAL LINKS::SYSTEM PORT (P3)::P3 SETUP::5703 SUPPORT	0.00%	-30000	30000	RO
190	PEAK HW SLOPE	SYSTEM::RESERVED	163	0	65535	RW
191	UNUSED	UNUSED				
192	UNUSED	UNUSED				
193	TICK LENGTH	SYSTEM::RESERVED	3502	0	65535	RO
194	DISC ADAPT POT	SYSTEM::RESERVED	2341	0	10000	RW
195	THRESHOLD (>)	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 1 (B5)	0.00%	-30000	30000	RW

TAG	PARAMETER NAME	MENU	DEFAULT	MIN	MAX	
196	THRESHOLD (>)	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 2 [B6]	0.00%	-30000	30000	RW
197	THRESHOLD (>)	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 3 [B7]	0.00%	-30000	30000	RW
198	P3 BAUD RATE	SERIAL LINKS::SYSTEM PORT [P3]::P3 SETUP	9600	300	57600	RW
199	DELAY	SETUP PARAMETERS::INVERSE TIME	10.0 SECS	1	6000	RW
200	RATE	SETUP PARAMETERS::INVERSE TIME	60.0 SECS	1	6000	RW
201	REGEN MODE	SETUP PARAMETERS::CURRENT LOOP	ENABLED	0	1	RW
202	INT. DEFEAT	SETUP PARAMETERS::SPEED LOOP	OFF	0	1	RW
203	INVERSE TIME O/P	DIAGNOSTICS	200.00%	0	20000	RO
204	AIMING POINT	SETUP PARAMETERS::INVERSE TIME	110.00%	0	20000	RW
205	dI/dI	SYSTEM::RESERVED	35.00%	0	20000	RW
206	ENCODER	DIAGNOSTICS	0 RPM	0	6000	RO
207	SPEED FEEDBACK	DIAGNOSTICS	0.00%	-30000	30000	RO
208	RATIO 0	SETUP PARAMETERS::SETPOINT SUM 1	1	-30000	30000	RW
209	UNUSED	UNUSED				
210	UNUSED	UNUSED				
211	HEALTH INHIBIT	SYSTEM::RESERVED	0x0000	0	FFFF	RW
212	OPERATING MODE	DIAGNOSTICS	STOP	0	7	RO
213	ZERO CUR OFFSET	SYSTEM::RESERVED	0	0	65535	RW
214	ZCD THRESHOLD	SYSTEM::RESERVED	6	0	65535	RW
215	G&L Power Meter					
216	PROG STOP LIMIT	SETUP PARAMETERS::STOP RATES	60.0 SECS	0	6000	RW
217	STOP LIMIT	SETUP PARAMETERS::STOP RATES	60.0 SECS	0	6000	RW
218	JOG SPEED 1	SETUP PARAMETERS::JOG/SLACK	5.00%	-10000	10000	RW
219	JOG SPEED 2	SETUP PARAMETERS::JOG/SLACK	-5.00%	-10000	10000	RW
220	12 BIT DAC	SYSTEM::RESERVED	DISABLED	0	1	RW
221	MMI FILTER T.C.	SYSTEM::RESERVED	80	0	65535	RW
222	PRED STEP	SYSTEM::RESERVED	3	0	65535	RW
223	SCAN THRESHOLD	SYSTEM::RESERVED	4	0	65535	RW
224	STALL TRIP DELAY	SETUP PARAMETERS::CALIBRATION	10.0 SECS	1	6000	RW
225	CRAWL SPEED	SETUP PARAMETERS::JOG/SLACK	10.00%	-10000	10000	RW
226	PEAK HW OFFSET	SYSTEM::RESERVED	195	0	20000	RW
227	AUX JOG	SETUP PARAMETERS::AUX I/O	ON	0	1	RW
228	MODE	SETUP PARAMETERS::JOG/SLACK	FALSE	0	1	RW
229	PRECSN/RESTR CHK	SYSTEM::RESERVED	2	0	3	RW
230	CALIBRATION	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 1 [A2]	1	-30000	30000	RW
231	MAX VALUE	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 1 [A2]	100.00%	-30000	30000	RW
232	MIN VALUE	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 1 [A2]	-100.00%	-30000	30000	RW
233	CALIBRATION	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 2 [A3]	1	-30000	30000	RW
234	MAX VALUE	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 2 [A3]	100.00%	-30000	30000	RW
235	MIN VALUE	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 2 [A3]	-100.00%	-30000	30000	RW
236	CALIBRATION	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 3 [A4]	1	-30000	30000	RW
237	MAX VALUE	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 3 [A4]	100.00%	-30000	30000	RW
238	MIN VALUE	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 3 [A4]	-100.00%	-30000	30000	RW
239	CALIBRATION	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 4 [A5]	1	-30000	30000	RW
240	MAX VALUE	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 4 [A5]	100.00%	-30000	30000	RW
241	MIN VALUE	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 4 [A5]	-100.00%	-30000	30000	RW
242	CALIBRATION	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 5 [A6]	1	-30000	30000	RW
243	MAX VALUE	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 5 [A6]	100.00%	-30000	30000	RW
244	MIN VALUE	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 5 [A6]	-100.00%	-30000	30000	RW
245	% TO GET 10V	SYSTEM::CONFIGURE I/O::ANALOG OUTPUTS::ANOUT 1 [A7]	100.00%	-30000	30000	RW
246	DESTINATION TAG	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 1 [A2]	100	0	499	RW
247	DESTINATION TAG	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 5 [A6]	301	0	499	RW
248	% TO GET 10V	SYSTEM::CONFIGURE I/O::ANALOG OUTPUTS::ANOUT 2 [A8]	100.00%	-30000	30000	RW
249	DESTINATION TAG	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 3 [A4]	5	0	499	RW
250	DESTINATION TAG	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 4 [A5]	48	0	499	RW
251	SOURCE TAG	SYSTEM::CONFIGURE I/O::ANALOG OUTPUTS::ANOUT 1 [A7]	62	0	499	RW
252	SOURCE TAG	SYSTEM::CONFIGURE I/O::ANALOG OUTPUTS::ANOUT 2 [A8]	63	0	499	RW
253	TAKE UP 1	SETUP PARAMETERS::JOG/SLACK	5.00%	-10000	10000	RW
254	TAKE UP 2	SETUP PARAMETERS::JOG/SLACK	-5.00%	-10000	10000	RW
255	RESET VALUE	SETUP PARAMETERS::RAISE/LOWER	0.00%	-30000	30000	RW
256	INCREASE RATE	SETUP PARAMETERS::RAISE/LOWER	10.0 SECS	1	6000	RW
257	DECREASE RATE	SETUP PARAMETERS::RAISE/LOWER	10.0 SECS	1	6000	RW
258	MIN VALUE	SETUP PARAMETERS::RAISE/LOWER	-100.00%	-30000	30000	RW
259	MAX VALUE	SETUP PARAMETERS::RAISE/LOWER	100.00%	-30000	30000	RW
260	RAISE/LOWER DEST	SYSTEM::CONFIGURE I/O::BLOCK DIAGRAM	0	0	499	RW

Appendix I Parameter List by Tag Number

TAG	PARAMETER NAME	MENU	DEFAULT	MIN	MAX	
261	RAISE INPUT	SETUP PARAMETERS::RAISE/LOWER	FALSE	0	1	RW
262	LOWER INPUT	SETUP PARAMETERS::RAISE/LOWER	FALSE	0	1	RW
263	STALL THRESHOLD	SETUP PARAMETERS::CALIBRATION	95.00%	0	20000	RW
264	RAISE/LOWER O/P	DIAGNOSTICS	0.00%	-30000	30000	RO
265	ANALOG IP OFFSET	SYSTEM::RESERVED	2	-30000	30000	RW
266	% S-RAMP	SETUP PARAMETERS::RAMP S	2.50%	0	10000	RW
267	Reserved					
268	MODE	SETUP PARAMETERS::SPEED LOOP::ADVANCED::ADAPTION	0	0	3	RW
269	SPD BRK1 (LOW)	SETUP PARAMETERS::SPEED LOOP::ADVANCED::ADAPTION	1.00%	0	10000	RW
270	SPD BRK2 (HIGH)	SETUP PARAMETERS::SPEED LOOP::ADVANCED::ADAPTION	5.00%	0	10000	RW
271	PROP. GAIN	SETUP PARAMETERS::SPEED LOOP::ADVANCED::ADAPTION	5	0	20000	RW
272	INT. TIME CONST.	SETUP PARAMETERS::SPEED LOOP::ADVANCED::ADAPTION	0.500 SECS	1	30000	RW
273	POS. LOOP P GAIN	SETUP PARAMETERS::SPEED LOOP::ADVANCED	0.00%	-20000	20000	RW
274	I GAIN IN RAMP	SETUP PARAMETERS::SPEED LOOP::ADVANCED	1	0	20000	RW
275	I COMP	SETUP PARAMETERS::SPEED LOOP::ADVANCED	0.00%	-10000	10000	RW
276	PLL PROP	SYSTEM::RESERVED	80	0	20000	RW
277	PLL INT	SYSTEM::RESERVED	32	0	20000	RW
278	PLL Error		0	-	-	RO
279	ARM ENDSTOP	SYSTEM::RESERVED	12200	0	20000	RW
280	HF C/O DISC GAIN	SYSTEM::RESERVED	1800	0	20000	RW
281	HF C/O FILTER TC	SYSTEM::RESERVED	3	0	20000	RW
282	BEMF THRESHOLD	SYSTEM::RESERVED	4	0	20000	RW
283	SCAN TC	SYSTEM::RESERVED	10	0	20000	RW
284	ZERO SPD. LEVEL	SETUP PARAMETERS::SPEED LOOP::ADVANCED::ZERO SPD. QUENCH	0.50%	0	20000	RW
285	ZERO IAD LEVEL	SETUP PARAMETERS::SPEED LOOP::ADVANCED::ZERO SPD. QUENCH	1.50%	0	20000	RW
286	RAMPING THRESH.	SETUP PARAMETERS::RAMP S	0.50%	0	10000	RW
287	AUTO RESET	SETUP PARAMETERS::RAMP S	ENABLED	0	1	RW
288	EXTERNAL RESET	SETUP PARAMETERS::RAMP S	DISABLED	0	1	RW
289	SETPOINT 1	SETUP PARAMETERS::SPEED LOOP::SETPOINTS	0.00%	-10500	10500	RW
290	SETPOINT 2 (A3)	SETUP PARAMETERS::SPEED LOOP::SETPOINTS	0.00%	-10500	10500	RO
291	SETPOINT 3	SETUP PARAMETERS::SPEED LOOP::SETPOINTS	0.00%	-10500	10500	RW
292	SIGN 0	SETUP PARAMETERS::SETPOINT SUM 1	POSITIVE	0	1	RW
293	RAMP O/P DEST	SYSTEM::CONFIGURE I/O::BLOCK DIAGRAM	291	0	499	RW
294	SPT SUM 1 DEST	SYSTEM::CONFIGURE I/O::BLOCK DIAGRAM	289	0	499	RW
295	User Filter Input		0	-30000	30000	RW
296	User Filter Output		0	-30000	30000	RO
297	SPEED ERROR	DIAGNOSTICS	0.00%	-30000	30000	RO
298	CURRENT FEEDBACK	DIAGNOSTICS	0.00%	-30000	30000	RO
299	CURRENT DEMAND	DIAGNOSTICS	0.00%	-30000	30000	RO
300	UNUSED	UNUSED				
301	POS. I CLAMP	SETUP PARAMETERS::CURRENT LOOP	0.00%	-10000	10000	RW
302	CONTACTOR DELAY	SETUP PARAMETERS::STOP RATES	1.0 SECS	1	6000	RW
303	Reserved					
304	Reserved			0	1	RW
305	TRIP RESET	SETUP PARAMETERS::INHIBIT ALARMS	TRUE	0	1	RW
306	SOURCE TAG	SETUP PARAMETERS::STANDSTILL	89	0	499	RW
307	EXTERNAL RESET	SETUP PARAMETERS::RAISE/LOWER	FALSE	0	1	RW
308	TACH INPUT (B2)	DIAGNOSTICS	0.00%	-30000	30000	RO
309	INPUT 0	SETUP PARAMETERS::SETPOINT SUM 1	0.00%	-20000	20000	RW
310	AUTOCAL	SYSTEM::RESERVED	ENABLED	0	1	RW
311	I AINST OFFSET	SYSTEM::RESERVED	2	0	20000	RW
312	PNO 112	SERIAL LINKS::PNOCONFIG	0	0	499	RW
313	PNO 113	SERIAL LINKS::PNOCONFIG	0	0	499	RW
314	PNO 114	SERIAL LINKS::PNOCONFIG	0	0	499	RW
315	PNO 115	SERIAL LINKS::PNOCONFIG	0	0	499	RW
316	PNO 116	SERIAL LINKS::PNOCONFIG	0	0	499	RW
317	PNO 117	SERIAL LINKS::PNOCONFIG	0	0	499	RW
318	PNO 118	SERIAL LINKS::PNOCONFIG	0	0	499	RW
319	PNO 119	SERIAL LINKS::PNOCONFIG	0	0	499	RW
320	PNO 120	SERIAL LINKS::PNOCONFIG	379	0	499	RW
321	PNO 121	SERIAL LINKS::PNOCONFIG	380	0	499	RW
322	PNO 122	SERIAL LINKS::PNOCONFIG	381	0	499	RW
323	PNO 123	SERIAL LINKS::PNOCONFIG	382	0	499	RW
324	PNO 124	SERIAL LINKS::PNOCONFIG	383	0	499	RW
325	PNO 125	SERIAL LINKS::PNOCONFIG	384	0	499	RW

TAG	PARAMETER NAME	MENU	DEFAULT	MIN	MAX	
326	PNO 126	SERIAL LINKS::PNOCONFIG	385	0	499	RW
327	PNO 127	SERIAL LINKS::PNOCONFIG	0	0	499	RW
328	ESP SUP. (ASCII)	SERIAL LINKS::SYSTEM PORT (P3)::P3 SETUP::BISYNCH SUPPORT	DISABLED	0	1	RW
329	GROUP ID (GID)	SERIAL LINKS::SYSTEM PORT (P3)::P3 SETUP::BISYNCH SUPPORT	0	0	7	RW
330	UNIT ID (UID)	SERIAL LINKS::SYSTEM PORT (P3)::P3 SETUP::BISYNCH SUPPORT	0	0	15	RW
331	CHANGEBAND (BIN)	SERIAL LINKS::SYSTEM PORT (P3)::P3 SETUP::BISYNCH SUPPORT	0.00%	0	32767	RW
332	ERROR REPORT	SERIAL LINKS::SYSTEM PORT (P3)::P3 SETUP::BISYNCH SUPPORT	0x00C0	-	-	RW
333	PNO 7	SERIAL LINKS::SYSTEM PORT (P3)::P3 SETUP::BISYNCH SUPPORT	0xFFFF	0	FFFF	RW
334	PARITY	SERIAL LINKS::MAIN PORT (P1)	EVEN	0	1	RW
335	DISABLE MEAN FBK	SYSTEM::RESERVED	FALSE	0	1	RW
336	CHANGEOVER BIAS	SYSTEM::RESERVED	0x4780	-	-	RW
337	Thermistor State (Warning)			0	1	RO
338	Reserved			0	1	RO
339	VALUE 1	SYSTEM::miniLINK	0.00%	-30000	30000	RW
340	VALUE 2	SYSTEM::miniLINK	0.00%	-30000	30000	RW
341	VALUE 3	SYSTEM::miniLINK	0.00%	-30000	30000	RW
342	VALUE 4	SYSTEM::miniLINK	0.00%	-30000	30000	RW
343	VALUE 5	SYSTEM::miniLINK	0.00%	-30000	30000	RW
344	VALUE 6	SYSTEM::miniLINK	0.00%	-30000	30000	RW
345	VALUE 7	SYSTEM::miniLINK	0.00%	-30000	30000	RW
346	LOGIC 1	SYSTEM::miniLINK	OFF	0	1	RW
347	LOGIC 2	SYSTEM::miniLINK	OFF	0	1	RW
348	LOGIC 3	SYSTEM::miniLINK	OFF	0	1	RW
349	LOGIC 4	SYSTEM::miniLINK	OFF	0	1	RW
350	LOGIC 5	SYSTEM::miniLINK	OFF	0	1	RW
351	LOGIC 6	SYSTEM::miniLINK	OFF	0	1	RW
352	LOGIC 7	SYSTEM::miniLINK	OFF	0	1	RW
353	LOGIC 8	SYSTEM::miniLINK	OFF	0	1	RW
354	EEProm Write		0	0	2	RW
355	RAMP RATE	SETUP PARAMETERS::JOG/SLACK	1.0 SECS	1	6000	RW
356	Speed Loop Output		0	-20000	20000	RO
357	MAX DEMAND	SETUP PARAMETERS::SPEED LOOP::SETPOINTS	105.00%	0	10500	RW
358	MIN DEMAND	SETUP PARAMETERS::SPEED LOOP::SETPOINTS	-105.00%	-10500	0	RW
359	INVERTED	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 1 [B5]	FALSE	0	1	RW
360	INVERTED	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 2 [B6]	FALSE	0	1	RW
361	INVERTED	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 3 [B7]	FALSE	0	1	RW
362	MODULUS	SYSTEM::CONFIGURE I/O::ANALOG OUTPUTS::ANOUT 1 [A7]	FALSE	0	1	RW
363	MODULUS	SYSTEM::CONFIGURE I/O::ANALOG OUTPUTS::ANOUT 2 [A8]	FALSE	0	1	RW
364	SOURCE TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 1	0	0	499	RW
365	DESTINATION TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 1	0	0	499	RW
366	SOURCE TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 2	0	0	499	RW
367	DESTINATION TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 2	0	0	499	RW
368	SOURCE TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 3	0	0	499	RW
369	DESTINATION TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 3	0	0	499	RW
370	SOURCE TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 4	0	0	499	RW
371	DESTINATION TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 4	0	0	499	RW
372	Raise Lower Delta		0	-	-	RO
373	System Ramp Delta		0	-	-	RO
374	System Reset		0	0	1	RO
375	LIMIT	SETUP PARAMETERS::SETPOINT SUM 1	105.00%	0	20000	RW
376	Running		0	0	1	RO
377	UDP Length			-	-	RW
378	UDP Base			-	-	RW
379	VALUE 8	SYSTEM::miniLINK	0.00%	-30000	30000	RW
380	VALUE 9	SYSTEM::miniLINK	0.00%	-30000	30000	RW
381	VALUE 10	SYSTEM::miniLINK	0.00%	-30000	30000	RW
382	VALUE 11	SYSTEM::miniLINK	0.00%	-30000	30000	RW
383	VALUE 12	SYSTEM::miniLINK	0.00%	-30000	30000	RW
384	VALUE 13	SYSTEM::miniLINK	0.00%	-30000	30000	RW
385	VALUE 14	SYSTEM::miniLINK	0.00%	-30000	30000	RW
386	FILTER T.C.	SYSTEM::RESERVED	20	0	20000	RW
387	Reserved					
388	SYNC OFFSET	SYSTEM::RESERVED	0	-30000	30000	RW
389	Reserved					
390	Reserved					

Appendix I Parameter List by Tag Number

TAG	PARAMETER NAME	MENU	DEFAULT	MIN	MAX	
391	Reserved					
392	Reserved					
393	Reserved					
394	Reserved					
395	Reserved					
396	Reserved					
397	Reserved					
398	Reserved					
399	Reserved					
400	PID O/P DEST	SYSTEM::CONFIGURE I/O::BLOCK DIAGRAM	0	0	499	RW
401	DERIVATIVE TC	SETUP PARAMETERS::SPECIAL BLOCKS::PID	0.000 SECS	0	10000	RW
402	INT. TIME CONST.	SETUP PARAMETERS::SPECIAL BLOCKS::PID	5.00 SECS	1	10000	RW
403	FILTER T.C.	SETUP PARAMETERS::SPECIAL BLOCKS::PID	0.100 SECS	0	10000	RW
404	PROP. GAIN	SETUP PARAMETERS::SPECIAL BLOCKS::PID	1	0	1000	RW
405	POSITIVE LIMIT	SETUP PARAMETERS::SPECIAL BLOCKS::PID	100.00%	0	10500	RW
406	NEGATIVE LIMIT	SETUP PARAMETERS::SPECIAL BLOCKS::PID	-100.00%	-10500	0	RW
407	O/P SCALER(TRIM)	SETUP PARAMETERS::SPECIAL BLOCKS::PID	0.2	-30000	30000	RW
408	ENABLE	SETUP PARAMETERS::SPECIAL BLOCKS::PID	ENABLED	0	1	RW
409	INT. DEFEAT	SETUP PARAMETERS::SPECIAL BLOCKS::PID	OFF	0	1	RW
410	INPUT 1	SETUP PARAMETERS::SPECIAL BLOCKS::PID	0.00%	-30000	30000	RW
411	INPUT 2	SETUP PARAMETERS::SPECIAL BLOCKS::PID	0.00%	-30000	30000	RW
412	RATIO 1	SETUP PARAMETERS::SPECIAL BLOCKS::PID	1	-30000	30000	RW
413	RATIO 2	SETUP PARAMETERS::SPECIAL BLOCKS::PID	1	-30000	30000	RW
414	DIVIDER 2	SETUP PARAMETERS::SPECIAL BLOCKS::PID	1	-30000	30000	RW
415	PID ERROR	DIAGNOSTICS	0.00%	-10500	10500	RO
416	PID CLAMPED	DIAGNOSTICS	FALSE	0	1	RO
417	PID OUTPUT	DIAGNOSTICS	0.00%	-31500	31500	RO
418	DIVIDER 1	SETUP PARAMETERS::SPECIAL BLOCKS::PID	1	-30000	30000	RW
419	DIVIDER 1	SETUP PARAMETERS::SETPOINT SUM 1	1	-30000	30000	RW
420	DIVIDER 0	SETUP PARAMETERS::SETPOINT SUM 1	1	-30000	30000	RW
421	MAIN CURR. LIMIT	SETUP PARAMETERS::CURRENT LOOP	200.00%	0	20000	RW
422	RESET VALUE	SETUP PARAMETERS::RAMP S	0.00%	-30000	30000	RW
423	INPUT 2	SETUP PARAMETERS::SETPOINT SUM 1	0.00%	-20000	20000	RW
424	LINE SPEED	SETUP PARAMETERS::SPECIAL BLOCKS::DIAMETER CALC.	0.00%	-10500	10500	RW
425	MIN DIAMETER	SETUP PARAMETERS::SPECIAL BLOCKS::DIAMETER CALC.	10.00%	0	10000	RW
426	MIN SPEED	SETUP PARAMETERS::SPECIAL BLOCKS::DIAMETER CALC.	5.00%	0	10000	RW
427	DIAMETER	SETUP PARAMETERS::SPECIAL BLOCKS::DIAMETER CALC.	0.00%	0	10000	RO
428	Modulus of Line Speed		0.00%	0	10500	RO
429	Modulus of Reel Speed		0.00%	0	10500	RO
430	Diameter Unfiltered		0.00%	0	10000	RO
431	DIAMETER	SYSTEM::CONFIGURE I/O::BLOCK DIAGRAM	0	0	499	RW
432	TORQUE DEMAND	SETUP PARAMETERS::SPECIAL BLOCKS::TORQUE CALC.	0.00%	-20000	20000	RW
433	TENSION ENABLE	SETUP PARAMETERS::SPECIAL BLOCKS::TORQUE CALC.	ENABLED	0	1	RW
434	OVER WIND	SETUP PARAMETERS::SPECIAL BLOCKS::TORQUE CALC.	ENABLED	0	1	RW
435	POS. I CLAMP	SYSTEM::CONFIGURE I/O::BLOCK DIAGRAM	0	0	499	RW
436	NEG. I CLAMP	SYSTEM::CONFIGURE I/O::BLOCK DIAGRAM	0	0	499	RW
437	REEL SPEED	SETUP PARAMETERS::SPECIAL BLOCKS::DIAMETER CALC.	0.00%	-10500	10500	RW
438	TAPER	SETUP PARAMETERS::SPECIAL BLOCKS::TAPER CALC.	0.00%	-10000	10000	RW
439	TENSION SPT.	SETUP PARAMETERS::SPECIAL BLOCKS::TAPER CALC.	0.00%	0	10000	RW
440	TENSION TRIM	SETUP PARAMETERS::SPECIAL BLOCKS::TAPER CALC.	0.00%	-10000	10000	RW
441	TOT.TENS.DEMAND	SETUP PARAMETERS::SPECIAL BLOCKS::TAPER CALC.	0.00%	-10000	10000	RO
442	TAPER	SYSTEM::CONFIGURE I/O::BLOCK DIAGRAM	0	0	499	RW
443	INPUT 1	SETUP PARAMETERS::SPECIAL BLOCKS::SETPOINT SUM 2	0.00%	-30000	30000	RW
444	INPUT 0	SETUP PARAMETERS::SPECIAL BLOCKS::SETPOINT SUM 2	0.00%	-30000	30000	RW
445	INPUT 2	SETUP PARAMETERS::SPECIAL BLOCKS::SETPOINT SUM 2	0.00%	-30000	30000	RW
446	RATIO 1	SETUP PARAMETERS::SPECIAL BLOCKS::SETPOINT SUM 2	1	-30000	30000	RW
447	RATIO 0	SETUP PARAMETERS::SPECIAL BLOCKS::SETPOINT SUM 2	1	-30000	30000	RW
448	DIVIDER 0	SETUP PARAMETERS::SPECIAL BLOCKS::SETPOINT SUM 2	1	-30000	30000	RW
449	LIMIT	SETUP PARAMETERS::SPECIAL BLOCKS::SETPOINT SUM 2	100.00%	0	20000	RW
450	SETPOINT SUM 2	SYSTEM::CONFIGURE I/O::BLOCK DIAGRAM	0	0	499	RW
451	SPT SUM OUTPUT	SETUP PARAMETERS::SPECIAL BLOCKS::SETPOINT SUM 2	0.00%	-20000	20000	RO
452	TAPERED DEMAND	SETUP PARAMETERS::SPECIAL BLOCKS::TAPER CALC.	0.00%	0	10000	RO
453	RAMP RATE	SETUP PARAMETERS::SPECIAL BLOCKS::DIAMETER CALC.	5.0 SECS	1	6000	RW
454	SOURCE TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 5	0	0	499	RW
455	DESTINATION TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 5	0	0	499	RW

TAG	PARAMETER NAME	MENU	DEFAULT	MIN	MAX	
456	SOURCE TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 6	0	0	499	RW
457	DESTINATION TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 6	0	0	499	RW
458	SOURCE TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 7	0	0	499	RW
459	DESTINATION TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 7	0	0	499	RW
460	SOURCE TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 8	0	0	499	RW
461	DESTINATION TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 8	0	0	499	RW
462	RESET VALUE	SETUP PARAMETERS::SPECIAL BLOCKS::DIAMETER CALC.	10.00%	0	10000	RW
463	EXTERNAL RESET	SETUP PARAMETERS::SPECIAL BLOCKS::DIAMETER CALC.	DISABLED	0	1	RW
464	OFFSET	SYSTEM::CONFIGURE I/O::ANALOG OUTPUTS::ANOUT 1 (A7)	0.00%	-10000	10000	RW
465	OFFSET	SYSTEM::CONFIGURE I/O::ANALOG OUTPUTS::ANOUT 2 (A8)	0.00%	-10000	10000	RW
466	DIVIDER 1	SETUP PARAMETERS::SPECIAL BLOCKS::SETPOINT SUM 2	1	-30000	30000	RW
467	SOURCE TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 9	0	0	499	RW
468	DESTINATION TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 9	0	0	499	RW
469	SOURCE TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 10	0	0	499	RW
470	DESTINATION TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 10	0	0	499	RW
471	UNUSED	UNUSED				
472	Speed Feedback State (Warning)		0	0	1	RO
473	MODE	SETUP PARAMETERS::SPECIAL BLOCKS::PID	0	0	4	RW
474	MIN PROFILE GAIN	SETUP PARAMETERS::SPECIAL BLOCKS::PID	20.00%	0	10000	RW
475	PROFILED GAIN	SETUP PARAMETERS::SPECIAL BLOCKS::PID	0	0	1000	RO
476	UNUSED	UNUSED				
	LANGUAGE	MENUS	ENGLISH			RW
	UP TO ACTION	PARAMETER SAVE				RW
	DUMP MMI -> P3	SERIAL LINKS::SYSTEM PORT (P3)				RW
	UDP XFER <- P3	SERIAL LINKS::SYSTEM PORT (P3)				RW
	UDP XFER -> P3	SERIAL LINKS::SYSTEM PORT (P3)				RW
	SOFTWARE	SYSTEM	ISSUE: 3.2			RW

Appendix J PARAMETER LIST BY MENU

TAG	PARAMETER NAME	MENU	DEFAULT	MIN	MAX	
116	HEALTH STORE	ALARM STATUS	0x0000	0	FFFF	RO
115	HEALTH WORD	ALARM STATUS	0x4210	0	FFFF	RO
61	ACTUAL NEG I LIM	DIAGNOSTICS	0.00%	-20000	20000	RO
67	ACTUAL POS I LIM	DIAGNOSTICS	0.00%	-20000	20000	RO
50	ANIN 1 [A2]	DIAGNOSTICS	0.00 VOLTS	-10000	10000	RO
51	ANIN 2 [A3]	DIAGNOSTICS	0.00 VOLTS	-10000	10000	RO
52	ANIN 3 [A4]	DIAGNOSTICS	0.00 VOLTS	-10000	10000	RO
53	ANIN 4 [A5]	DIAGNOSTICS	0.00 VOLTS	-10000	10000	RO
54	ANIN 5 [A6]	DIAGNOSTICS	0.00 VOLTS	-10000	10000	RO
55	ANOUT 1 [A7]	DIAGNOSTICS	0.00 VOLTS	-10000	10000	RO
56	ANOUT 2 [A8]	DIAGNOSTICS	0.00 VOLTS	-10000	10000	RO
42	AT CURRENT LIMIT	DIAGNOSTICS	FALSE	0	1	RO
79	AT STANDSTILL	DIAGNOSTICS	TRUE	0	1	RO
78	AT ZERO SETPOINT	DIAGNOSTICS	TRUE	0	1	RO
77	AT ZERO SPEED	DIAGNOSTICS	TRUE	0	1	RO
60	BACK EMF	DIAGNOSTICS	0.00%	-15000	15000	RO
299	CURRENT DEMAND	DIAGNOSTICS	0.00%	-30000	30000	RO
298	CURRENT FEEDBACK	DIAGNOSTICS	0.00%	-30000	30000	RO
71	DIGIN 1 [C6]	DIAGNOSTICS	OFF	0	1	RO
72	DIGIN 2 [C7]	DIAGNOSTICS	OFF	0	1	RO
73	DIGIN 3 [C8]	DIAGNOSTICS	OFF	0	1	RO
74	DIGOUT 1 [B5]	DIAGNOSTICS	ON	0	1	RO
75	DIGOUT 2 [B6]	P	ON	0	1	RO
76	DIGOUT 3 [B7]	DIAGNOSTICS	OFF	0	1	RO
84	DRIVE ENABLE	DIAGNOSTICS	DISABLED	0	1	RO
82	DRIVE START	DIAGNOSTICS	OFF	0	1	RO
70	ENABLE [C5]	DIAGNOSTICS	OFF	0	1	RO
206	ENCODER	DIAGNOSTICS	0 RPM	0	6000	RO
203	INVERSE TIME O/P	DIAGNOSTICS	200.00%	0	20000	RO
69	JOG INPUT [C4]	DIAGNOSTICS	OFF	0	1	RO
88	NEG. I CLAMP	DIAGNOSTICS	0.00%	-20000	20000	RO
212	OPERATING MODE	DIAGNOSTICS	STOP	0	7	RO
416	PID CLAMPED	DIAGNOSTICS	FALSE	0	1	RO
415	PID ERROR	DIAGNOSTICS	0.00%	-10500	10500	RO
417	PID OUTPUT	DIAGNOSTICS	0.00%	-31500	31500	RO
87	POS. I CLAMP	DIAGNOSTICS	0.00%	-20000	20000	RO
80	PROGRAM STOP	DIAGNOSTICS	TRUE	0	1	RO
264	RAISE/LOWER O/P	DIAGNOSTICS	0.00%	-30000	30000	RO
85	RAMP OUTPUT	DIAGNOSTICS	0.00%	-10000	10000	RO
113	RAMPING	DIAGNOSTICS	FALSE	0	1	RO
89	SPEED DEMAND	DIAGNOSTICS	0.00%	-10500	10500	RO
297	SPEED ERROR	DIAGNOSTICS	0.00%	-30000	30000	RO
207	SPEED FEEDBACK	DIAGNOSTICS	0.00%	-30000	30000	RO
63	SPEED SETPOINT	DIAGNOSTICS	0.00%	-30000	30000	RO
86	SPT SUM OUTPUT	DIAGNOSTICS	0.00%	-20000	20000	RO
112	STALL TRIP	DIAGNOSTICS	OK	0	1	RO
68	START [C3]	DIAGNOSTICS	OFF	0	1	RO
308	TACH INPUT [B2]	DIAGNOSTICS	0.00%	-30000	30000	RO
57	TERMINAL VOLTS	DIAGNOSTICS	0.00%	-12500	12500	RO
37	FULL MENUS	MENUS	ENABLED	0	1	RW
	LANGUAGE	MENUS	ENGLISH			RW
38	MENUDELAY	MENUS	30	0	65535	RW
	UP TO ACTION	PARAMETER SAVE				RW
121	CHANGE PASSWORD	PASSWORD	0x0000	0	FFFF	RW
120	ENTER PASSWORD	PASSWORD	0x0000	0	FFFF	RW
149	ASCII / BINARY	SERIAL LINKS::AUX PORT [P2]	ASCII	0	1	RW
151	BAUD RATE	SERIAL LINKS::AUX PORT [P2]	9600	300	19200	RW
145	CHANGE BAND (BIN)	SERIAL LINKS::AUX PORT [P2]	0.00%	0	32767	RW
159	ERROR REPORT	SERIAL LINKS::AUX PORT [P2]	0x00CO	-	-	RW
153	ESP SUP. [ASCII]	SERIAL LINKS::AUX PORT [P2]	DISABLED	0	1	RW
140	GROUP ID [GID]	SERIAL LINKS::AUX PORT [P2]	0	0	7	RW
143	PNO. 7	SERIAL LINKS::AUX PORT [P2]	0xFFFF	0	FFFF	RW
147	SRL LINK ENABLE	SERIAL LINKS::AUX PORT [P2]	ENABLED	0	1	RW
141	UNIT ID [UID]	SERIAL LINKS::AUX PORT [P2]	0	0	15	RW
148	ASCII / BINARY	SERIAL LINKS::MAIN PORT [P1]	ASCII	0	1	RW

TAG	PARAMETER NAME	MENU	DEFAULT	MIN	MAX	
150	BAUD RATE	SERIAL LINKS::MAIN PORT (P1)	9600	300	19200	RW
144	CHANGE BAND (BIN)	SERIAL LINKS::MAIN PORT (P1)	0.00%	0	32767	RW
158	ERROR REPORT	SERIAL LINKS::MAIN PORT (P1)	0x00C0	-	-	RW
152	ESP SUP. (ASCII)	SERIAL LINKS::MAIN PORT (P1)	DISABLED	0	1	RW
138	GROUP ID (GID)	SERIAL LINKS::MAIN PORT (P1)	0	0	7	RW
334	PARITY	SERIAL LINKS::MAIN PORT (P1)	EVEN	0	1	RW
142	PNO. 7	SERIAL LINKS::MAIN PORT (P1)	0xFFFF	0	FFFF	RW
146	SRL LINK ENABLE	SERIAL LINKS::MAIN PORT (P1)	ENABLED	0	1	RW
139	UNIT ID (UID)	SERIAL LINKS::MAIN PORT (P1)	0	0	15	RW
312	PNO 112	SERIAL LINKS::PNOCONFIG	0	0	499	RW
313	PNO 113	SERIAL LINKS::PNOCONFIG	0	0	499	RW
314	PNO 114	SERIAL LINKS::PNOCONFIG	0	0	499	RW
315	PNO 115	SERIAL LINKS::PNOCONFIG	0	0	499	RW
316	PNO 116	SERIAL LINKS::PNOCONFIG	0	0	499	RW
317	PNO 117	SERIAL LINKS::PNOCONFIG	0	0	499	RW
318	PNO 118	SERIAL LINKS::PNOCONFIG	0	0	499	RW
319	PNO 119	SERIAL LINKS::PNOCONFIG	0	0	499	RW
320	PNO 120	SERIAL LINKS::PNOCONFIG	379	0	499	RW
321	PNO 121	SERIAL LINKS::PNOCONFIG	380	0	499	RW
322	PNO 122	SERIAL LINKS::PNOCONFIG	381	0	499	RW
323	PNO 123	SERIAL LINKS::PNOCONFIG	382	0	499	RW
324	PNO 124	SERIAL LINKS::PNOCONFIG	383	0	499	RW
325	PNO 125	SERIAL LINKS::PNOCONFIG	384	0	499	RW
326	PNO 126	SERIAL LINKS::PNOCONFIG	385	0	499	RW
327	PNO 127	SERIAL LINKS::PNOCONFIG	0	0	499	RW
	DUMP MMI -> P3	SERIAL LINKS::SYSTEM PORT (P3)				RW
	UDP XFER -> P3	SERIAL LINKS::SYSTEM PORT (P3)				RW
	UDP XFER <- P3	SERIAL LINKS::SYSTEM PORT (P3)				RW
130	MODE	SERIAL LINKS::SYSTEM PORT (P3)::P3 SETUP	DISABLED	0	4	RW
198	P3 BAUD RATE	SERIAL LINKS::SYSTEM PORT (P3)::P3 SETUP	9600	300	57600	RW
187	5703 INPUT	SERIAL LINKS::SYSTEM PORT (P3)::P3 SETUP::5703 SUPPORT	0.00%	-30000	30000	RW
189	5703 OUTPUT	SERIAL LINKS::SYSTEM PORT (P3)::P3 SETUP::5703 SUPPORT	0.00%	-30000	30000	RO
132	SETPT. RATIO	SERIAL LINKS::SYSTEM PORT (P3)::P3 SETUP::5703 SUPPORT	0	-30000	30000	RW
133	SETPT. SIGN	SERIAL LINKS::SYSTEM PORT (P3)::P3 SETUP::5703 SUPPORT	POSITIVE	0	1	RW
332	ERROR REPORT	SERIAL LINKS::SYSTEM PORT (P3)::P3 SETUP::BISYNCH SUPPORT	0x00C0	-	-	RW
329	GROUP ID (GID)	SERIAL LINKS::SYSTEM PORT (P3)::P3 SETUP::BISYNCH SUPPORT	0	0	7	RW
330	UNIT ID (UID)	SERIAL LINKS::SYSTEM PORT (P3)::P3 SETUP::BISYNCH SUPPORT	0	0	15	RW
128	ANOUT 1	SETUP PARAMETERS::AUX I/O	0.00%	-10000	10000	RW
129	ANOUT 2	SETUP PARAMETERS::AUX I/O	0.00%	-10000	10000	RW
94	AUX DIGOUT 1	SETUP PARAMETERS::AUX I/O	OFF	0	1	RW
95	AUX DIGOUT 2	SETUP PARAMETERS::AUX I/O	OFF	0	1	RW
96	AUX DIGOUT 3	SETUP PARAMETERS::AUX I/O	OFF	0	1	RW
168	AUX ENABLE	SETUP PARAMETERS::AUX I/O	ON	0	1	RW
227	AUX JOG	SETUP PARAMETERS::AUX I/O	ON	0	1	RW
161	AUX START	SETUP PARAMETERS::AUX I/O	ON	0	1	RW
23	ANALOG TACH CAL	SETUP PARAMETERS::CALIBRATION	1	9800	11000	RW
25	ARMATURE I (A9)	SETUP PARAMETERS::CALIBRATION	BIPOLAR	0	1	RW
20	ARMATURE V CAL	SETUP PARAMETERS::CALIBRATION	1	9800	11000	RW
24	ENCODER LINES	SETUP PARAMETERS::CALIBRATION	1000	10	5000	RW
22	ENCODER RPM	SETUP PARAMETERS::CALIBRATION	1000 RPM	0	6000	RW
21	IR COMPENSATION	SETUP PARAMETERS::CALIBRATION	0.00%	0	10000	RW
180	SPDFBK ALM LEVEL	SETUP PARAMETERS::CALIBRATION	50.00%	0	10000	RW
263	STALL THRESHOLD	SETUP PARAMETERS::CALIBRATION	95.00%	0	20000	RW
224	STALL TRIP DELAY	SETUP PARAMETERS::CALIBRATION	10.0 SECS	1	6000	RW
10	ZERO SPD. OFFSET	SETUP PARAMETERS::CALIBRATION	0.00%	-500	500	RW
30	ADDITIONAL DEM	SETUP PARAMETERS::CURRENT LOOP	0.00%	-20000	20000	RW
18	AUTOTUNE	SETUP PARAMETERS::CURRENT LOOP	OFF	0	1	RW
90	BIPOLAR CLAMPS	SETUP PARAMETERS::CURRENT LOOP	DISABLED	0	1	RW
15	CUR.LIMIT/SCALER	SETUP PARAMETERS::CURRENT LOOP	100.00%	0	20000	RW
137	DISCONTINUOUS	SETUP PARAMETERS::CURRENT LOOP	12.00%	0	20000	RW
119	IDMD. ISOLATE	SETUP PARAMETERS::CURRENT LOOP	DISABLED	0	1	RW
17	INT. GAIN	SETUP PARAMETERS::CURRENT LOOP	3.5	0	20000	RW
421	MAIN CURR. LIMIT	SETUP PARAMETERS::CURRENT LOOP	200.00%	0	20000	RW
48	NEG. I CLAMP	SETUP PARAMETERS::CURRENT LOOP	0.00%	-10000	10000	RW
301	POS. I CLAMP	SETUP PARAMETERS::CURRENT LOOP	0.00%	-10000	10000	RW

Appendix J Parameter List by Menu

TAG	PARAMETER NAME	MENU	DEFAULT	MIN	MAX	
16	PROP. GAIN	SETUP PARAMETERS::CURRENT LOOP	45	0	20000	RW
201	REGEN MODE	SETUP PARAMETERS::CURRENT LOOP	ENABLED	0	1	RW
93	IMAX BRK1(SPD1)	SETUP PARAMETERS::CURRENT PROFILE	200.00%	0	20000	RW
33	IMAX BRK2(SPD2)	SETUP PARAMETERS::CURRENT PROFILE	200.00%	0	20000	RW
32	SPD BRK1 (LOW)	SETUP PARAMETERS::CURRENT PROFILE	100.00%	0	10000	RW
31	SPD BRK2 (HIGH)	SETUP PARAMETERS::CURRENT PROFILE	100.00%	0	10000	RW
111	5703 RCV ERROR	SETUP PARAMETERS::INHIBIT ALARMS	ENABLED	0	1	RW
92	ENCODER ALARM	SETUP PARAMETERS::INHIBIT ALARMS	ENABLED	0	1	RW
81	SPEED FBK ALARM	SETUP PARAMETERS::INHIBIT ALARMS	ENABLED	0	1	RW
28	STALL TRIP	SETUP PARAMETERS::INHIBIT ALARMS	INHIBITED	0	1	RW
305	TRIP RESET	SETUP PARAMETERS::INHIBIT ALARMS	TRUE	0	1	RW
225	CRAWL SPEED	SETUP PARAMETERS::JOG/SLACK	10.00%	-10000	10000	RW
218	JOG SPEED 1	SETUP PARAMETERS::JOG/SLACK	5.00%	-10000	10000	RW
219	JOG SPEED 2	SETUP PARAMETERS::JOG/SLACK	-5.00%	-10000	10000	RW
228	MODE	SETUP PARAMETERS::JOG/SLACK	FALSE	0	1	RW
355	RAMP RATE	SETUP PARAMETERS::JOG/SLACK	1.0 SECS	1	6000	RW
253	TAKE UP 1	SETUP PARAMETERS::JOG/SLACK	5.00%	-10000	10000	RW
254	TAKE UP 2	SETUP PARAMETERS::JOG/SLACK	-5.00%	-10000	10000	RW
257	DECREASE RATE	SETUP PARAMETERS::RAISE/LOWER	10.0 SECS	1	6000	RW
307	EXTERNAL RESET	SETUP PARAMETERS::RAISE/LOWER	FALSE	0	1	RW
256	INCREASE RATE	SETUP PARAMETERS::RAISE/LOWER	10.0 SECS	1	6000	RW
262	LOWER INPUT	SETUP PARAMETERS::RAISE/LOWER	FALSE	0	1	RW
259	MAX VALUE	SETUP PARAMETERS::RAISE/LOWER	100.00%	-30000	30000	RW
258	MIN VALUE	SETUP PARAMETERS::RAISE/LOWER	-100.00%	-30000	30000	RW
261	RAISE INPUT	SETUP PARAMETERS::RAISE/LOWER	FALSE	0	1	RW
255	RESET VALUE	SETUP PARAMETERS::RAISE/LOWER	0.00%	-30000	30000	RW
266	% S-RAMP	SETUP PARAMETERS::RAMPS	2.50%	0	10000	RW
287	AUTO RESET	SETUP PARAMETERS::RAMPS	ENABLED	0	1	RW
288	EXTERNAL RESET	SETUP PARAMETERS::RAMPS	DISABLED	0	1	RW
126	MIN SPEED	SETUP PARAMETERS::RAMPS	0.00%	0	10000	RW
2	RAMP ACCEL TIME	SETUP PARAMETERS::RAMPS	10.0 SECS	1	6000	RW
3	RAMP DECEL TIME	SETUP PARAMETERS::RAMPS	10.0 SECS	1	6000	RW
118	RAMP HOLD	SETUP PARAMETERS::RAMPS	OFF	0	1	RW
5	RAMP INPUT	SETUP PARAMETERS::RAMPS	0.00%	-10000	10000	RW
286	RAMPING THRESH.	SETUP PARAMETERS::RAMPS	0.50%	0	10000	RW
422	RESET VALUE	SETUP PARAMETERS::RAMPS	0.00%	-30000	30000	RW
131	DEADBAND WIDTH	SETUP PARAMETERS::SETPOINT SUM 1	0.00%	0	10000	RW
420	DIVIDER 0	SETUP PARAMETERS::SETPOINT SUM 1	1	-30000	30000	RW
419	DIVIDER 1	SETUP PARAMETERS::SETPOINT SUM 1	1	-30000	30000	RW
309	INPUT 0	SETUP PARAMETERS::SETPOINT SUM 1	0.00%	-20000	20000	RW
100	INPUT 1	SETUP PARAMETERS::SETPOINT SUM 1	0.00%	-20000	20000	RW
423	INPUT 2	SETUP PARAMETERS::SETPOINT SUM 1	0.00%	-20000	20000	RW
375	LIMIT	SETUP PARAMETERS::SETPOINT SUM 1	105.00%	0	20000	RW
208	RATIO 0	SETUP PARAMETERS::SETPOINT SUM 1	1	-30000	30000	RW
6	RATIO 1	SETUP PARAMETERS::SETPOINT SUM 1	1	-30000	30000	RW
292	SIGN 0	SETUP PARAMETERS::SETPOINT SUM 1	POSITIVE	0	1	RW
8	SIGN 1	SETUP PARAMETERS::SETPOINT SUM 1	POSITIVE	0	1	RW
427	DIAMETER	SETUP PARAMETERS::SPECIAL BLOCKS::DIAMETER CALC.	0.00%	0	10000	RO
463	EXTERNAL RESET	SETUP PARAMETERS::SPECIAL BLOCKS::DIAMETER CALC.	DISABLED	0	1	RW
424	LINE SPEED	SETUP PARAMETERS::SPECIAL BLOCKS::DIAMETER CALC.	0.00%	-10500	10500	RW
425	MIN DIAMETER	SETUP PARAMETERS::SPECIAL BLOCKS::DIAMETER CALC.	10.00%	0	10000	RW
426	MIN SPEED	SETUP PARAMETERS::SPECIAL BLOCKS::DIAMETER CALC.	5.00%	0	10000	RW
453	RAMP RATE	SETUP PARAMETERS::SPECIAL BLOCKS::DIAMETER CALC.	5.0 SECS	1	6000	RW
437	REEL SPEED	SETUP PARAMETERS::SPECIAL BLOCKS::DIAMETER CALC.	0.00%	-10500	10500	RW
462	RESET VALUE	SETUP PARAMETERS::SPECIAL BLOCKS::DIAMETER CALC.	10.00%	0	10000	RW
401	DERIVATIVE TC	SETUP PARAMETERS::SPECIAL BLOCKS::PID	0.000 SECS	0	10000	RW
418	DIVIDER 1	SETUP PARAMETERS::SPECIAL BLOCKS::PID	1	-30000	30000	RW
414	DIVIDER 2	SETUP PARAMETERS::SPECIAL BLOCKS::PID	1	-30000	30000	RW
408	ENABLE	SETUP PARAMETERS::SPECIAL BLOCKS::PID	ENABLED	0	1	RW
403	FILTER T.C.	SETUP PARAMETERS::SPECIAL BLOCKS::PID	0.100 SECS	0	10000	RW
410	INPUT 1	SETUP PARAMETERS::SPECIAL BLOCKS::PID	0.00%	-30000	30000	RW
411	INPUT 2	SETUP PARAMETERS::SPECIAL BLOCKS::PID	0.00%	-30000	30000	RW
409	INT. DEFEAT	SETUP PARAMETERS::SPECIAL BLOCKS::PID	OFF	0	1	RW
402	INT. TIME CONST.	SETUP PARAMETERS::SPECIAL BLOCKS::PID	5.00 SECS	1	10000	RW
474	MIN PROFILE GAIN	SETUP PARAMETERS::SPECIAL BLOCKS::PID	20.00%	0	10000	RW

TAG	PARAMETER NAME	MENU	DEFAULT	MIN	MAX	
473	MODE	SETUP PARAMETERS::SPECIAL BLOCKS::PID	0	0	4	RW
406	NEGATIVE LIMIT	SETUP PARAMETERS::SPECIAL BLOCKS::PID	-100.00%	-10500	0	RW
407	O/P SCALER(TRIM)	SETUP PARAMETERS::SPECIAL BLOCKS::PID	0.2	-30000	30000	RW
405	POSITIVE LIMIT	SETUP PARAMETERS::SPECIAL BLOCKS::PID	100.00%	0	10500	RW
475	PROFILED GAIN	SETUP PARAMETERS::SPECIAL BLOCKS::PID	0	0	1000	RO
404	PROP. GAIN	SETUP PARAMETERS::SPECIAL BLOCKS::PID	1	0	1000	RW
412	RATIO 1	SETUP PARAMETERS::SPECIAL BLOCKS::PID	1	-30000	30000	RW
413	RATIO 2	SETUP PARAMETERS::SPECIAL BLOCKS::PID	1	-30000	30000	RW
448	DIVIDER 0	SETUP PARAMETERS::SPECIAL BLOCKS::SETPOINT SUM 2	1	-30000	30000	RW
466	DIVIDER 1	SETUP PARAMETERS::SPECIAL BLOCKS::SETPOINT SUM 2	1	-30000	30000	RW
444	INPUT 0	SETUP PARAMETERS::SPECIAL BLOCKS::SETPOINT SUM 2	0.00%	-30000	30000	RW
443	INPUT 1	SETUP PARAMETERS::SPECIAL BLOCKS::SETPOINT SUM 2	0.00%	-30000	30000	RW
445	INPUT 2	SETUP PARAMETERS::SPECIAL BLOCKS::SETPOINT SUM 2	0.00%	-30000	30000	RW
449	LIMIT	SETUP PARAMETERS::SPECIAL BLOCKS::SETPOINT SUM 2	100.00%	0	20000	RW
447	RATIO 0	SETUP PARAMETERS::SPECIAL BLOCKS::SETPOINT SUM 2	1	-30000	30000	RW
446	RATIO 1	SETUP PARAMETERS::SPECIAL BLOCKS::SETPOINT SUM 2	1	-30000	30000	RW
451	SPT SUM OUTPUT	SETUP PARAMETERS::SPECIAL BLOCKS::SETPOINT SUM 2	0.00%	-20000	20000	RO
438	TAPER	SETUP PARAMETERS::SPECIAL BLOCKS::TAPER CALC.	0.00%	-10000	10000	RW
452	TAPERED DEMAND	SETUP PARAMETERS::SPECIAL BLOCKS::TAPER CALC.	0.00%	0	10000	RO
439	TENSION SPT.	SETUP PARAMETERS::SPECIAL BLOCKS::TAPER CALC.	0.00%	0	10000	RW
440	TENSION TRIM	SETUP PARAMETERS::SPECIAL BLOCKS::TAPER CALC.	0.00%	-10000	10000	RW
441	TOT.TENS.DEMAND	SETUP PARAMETERS::SPECIAL BLOCKS::TAPER CALC.	0.00%	-10000	10000	RO
434	OVER WIND	SETUP PARAMETERS::SPECIAL BLOCKS::TORQUE CALC.	ENABLED	0	1	RW
433	TENSION ENABLE	SETUP PARAMETERS::SPECIAL BLOCKS::TORQUE CALC.	ENABLED	0	1	RW
432	TORQUE DEMAND	SETUP PARAMETERS::SPECIAL BLOCKS::TORQUE CALC.	0.00%	-20000	20000	RW
49	ENCODER SIGN	SETUP PARAMETERS::SPEED LOOP	POSITIVE	0	1	RW
202	INT. DEFEAT	SETUP PARAMETERS::SPEED LOOP	OFF	0	1	RW
13	INT. TIME CONST.	SETUP PARAMETERS::SPEED LOOP	0.500 SECS	1	30000	RW
14	PROP. GAIN	SETUP PARAMETERS::SPEED LOOP	10	0	20000	RW
47	SPEED FBK SELECT	SETUP PARAMETERS::SPEED LOOP	ARM VOLTS FBK	0	3	RW
274	I GAIN IN RAMP	SETUP PARAMETERS::SPEED LOOP::ADVANCED	1	0	20000	RW
272	INT. TIME CONST.	SETUP PARAMETERS::SPEED LOOP::ADVANCED::ADAPTION	0.500 SECS	1	30000	RW
268	MODE	SETUP PARAMETERS::SPEED LOOP::ADVANCED::ADAPTION	0	0	3	RW
271	PROP. GAIN	SETUP PARAMETERS::SPEED LOOP::ADVANCED::ADAPTION	5	0	20000	RW
269	SPD BRK1 (LOW)	SETUP PARAMETERS::SPEED LOOP::ADVANCED::ADAPTION	1.00%	0	10000	RW
270	SPD BRK2 (HIGH)	SETUP PARAMETERS::SPEED LOOP::ADVANCED::ADAPTION	5.00%	0	10000	RW
285	ZERO IAD LEVEL	SETUP PARAMETERS::SPEED LOOP::ADVANCED::ZERO SPD. QUENCH	1.50%	0	20000	RW
284	ZERO SPD. LEVEL	SETUP PARAMETERS::SPEED LOOP::ADVANCED::ZERO SPD. QUENCH	0.50%	0	20000	RW
357	MAX DEMAND	SETUP PARAMETERS::SPEED LOOP::SETPOINTS	105.00%	0	10500	RW
358	MIN DEMAND	SETUP PARAMETERS::SPEED LOOP::SETPOINTS	-105.00%	-10500	0	RW
7	RATIO 2 (A3)	SETUP PARAMETERS::SPEED LOOP::SETPOINTS	1	-30000	30000	RW
289	SETPOINT 1	SETUP PARAMETERS::SPEED LOOP::SETPOINTS	0.00%	-10500	10500	RW
290	SETPOINT 2 (A3)	SETUP PARAMETERS::SPEED LOOP::SETPOINTS	0.00%	-10500	10500	RO
291	SETPOINT 3	SETUP PARAMETERS::SPEED LOOP::SETPOINTS	0.00%	-10500	10500	RW
41	SETPOINT 4	SETUP PARAMETERS::SPEED LOOP::SETPOINTS	0.00%	-10500	10500	RW
9	SIGN 2 (A3)	SETUP PARAMETERS::SPEED LOOP::SETPOINTS	POSITIVE	0	1	RW
11	STANDSTILL LOGIC	SETUP PARAMETERS::STANDSTILL	DISABLED	0	1	RW
12	ZERO THRESHOLD	SETUP PARAMETERS::STANDSTILL	2.00%	0	10000	RW
302	CONTACTOR DELAY	SETUP PARAMETERS::STOP RATES	1.0 SECS	1	6000	RW
91	PROG STOP I LIM	SETUP PARAMETERS::STOP RATES	100.00%	0	20000	RW
216	PROG STOP LIMIT	SETUP PARAMETERS::STOP RATES	60.0 SECS	0	6000	RW
26	PROG STOP TIME	SETUP PARAMETERS::STOP RATES	0.1 SECS	1	6000	RW
217	STOP LIMIT	SETUP PARAMETERS::STOP RATES	60.0 SECS	0	6000	RW
27	STOP TIME	SETUP PARAMETERS::STOP RATES	10.0 SECS	1	6000	RW
29	STOP ZERO SPEED	SETUP PARAMETERS::STOP RATES	2.00%	0	10000	RW
	SOFTWARE	SYSTEM	ISSUE: 3.2			RW
39	CONFIGURE ENABLE	SYSTEM::CONFIGURE I/O	DISABLED	0	1	RW
230	CALIBRATION	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 1 (A2)	1	-30000	30000	RW
246	DESTINATION TAG	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 1 (A2)	100	0	499	RW
231	MAX VALUE	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 1 (A2)	100.00%	-30000	30000	RW
232	MIN VALUE	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 1 (A2)	-100.00%	-30000	30000	RW
233	CALIBRATION	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 2 (A3)	1	-30000	30000	RW
234	MAX VALUE	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 2 (A3)	100.00%	-30000	30000	RW
235	MIN VALUE	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 2 (A3)	-100.00%	-30000	30000	RW
236	CALIBRATION	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 3 (A4)	1	-30000	30000	RW

Appendix J Parameter List by Menu

TAG	PARAMETER NAME	MENU	DEFAULT	MIN	MAX	
249	DESTINATION TAG	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 3 [A4]	5	0	499	RW
237	MAX VALUE	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 3 [A4]	100.00%	-30000	30000	RW
238	MIN VALUE	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 3 [A4]	-100.00%	-30000	30000	RW
239	CALIBRATION	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 4 [A5]	1	-30000	30000	RW
250	DESTINATION TAG	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 4 [A5]	48	0	499	RW
240	MAX VALUE	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 4 [A5]	100.00%	-30000	30000	RW
241	MIN VALUE	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 4 [A5]	-100.00%	-30000	30000	RW
242	CALIBRATION	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 5 [A6]	1	-30000	30000	RW
247	DESTINATION TAG	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 5 [A6]	301	0	499	RW
243	MAX VALUE	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 5 [A6]	100.00%	-30000	30000	RW
244	MIN VALUE	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 5 [A6]	-100.00%	-30000	30000	RW
245	% TO GET 10V	SYSTEM::CONFIGURE I/O::ANALOG OUTPUTS::ANOUT 1 [A7]	100.00%	-30000	30000	RW
362	MODULUS	SYSTEM::CONFIGURE I/O::ANALOG OUTPUTS::ANOUT 1 [A7]	FALSE	0	1	RW
464	OFFSET	SYSTEM::CONFIGURE I/O::ANALOG OUTPUTS::ANOUT 1 [A7]	0.00%	-10000	10000	RW
251	SOURCE TAG	SYSTEM::CONFIGURE I/O::ANALOG OUTPUTS::ANOUT 1 [A7]	62	0	499	RW
248	% TO GET 10V	SYSTEM::CONFIGURE I/O::ANALOG OUTPUTS::ANOUT 2 [A8]	100.00%	-30000	30000	RW
363	MODULUS	SYSTEM::CONFIGURE I/O::ANALOG OUTPUTS::ANOUT 2 [A8]	FALSE	0	1	RW
465	OFFSET	SYSTEM::CONFIGURE I/O::ANALOG OUTPUTS::ANOUT 2 [A8]	0.00%	-10000	10000	RW
252	SOURCE TAG	SYSTEM::CONFIGURE I/O::ANALOG OUTPUTS::ANOUT 2 [A8]	63	0	499	RW
431	DIAMETER	SYSTEM::CONFIGURE I/O::BLOCK DIAGRAM	0	0	499	RW
436	NEG. I CLAMP	SYSTEM::CONFIGURE I/O::BLOCK DIAGRAM	0	0	499	RW
400	PID O/P DEST	SYSTEM::CONFIGURE I/O::BLOCK DIAGRAM	0	0	499	RW
435	POS. I CLAMP	SYSTEM::CONFIGURE I/O::BLOCK DIAGRAM	0	0	499	RW
260	RAISE/LOWER DEST	SYSTEM::CONFIGURE I/O::BLOCK DIAGRAM	0	0	499	RW
293	RAMP O/P DEST	SYSTEM::CONFIGURE I/O::BLOCK DIAGRAM	291	0	499	RW
450	SETPPOINT SUM 2	SYSTEM::CONFIGURE I/O::BLOCK DIAGRAM	0	0	499	RW
294	SPT SUM 1 DEST	SYSTEM::CONFIGURE I/O::BLOCK DIAGRAM	289	0	499	RW
442	TAPER	SYSTEM::CONFIGURE I/O::BLOCK DIAGRAM	0	0	499	RW
135	DESTINATION TAG	SYSTEM::CONFIGURE I/O::CONFIGURE 5703	41	0	499	RW
134	SOURCE TAG	SYSTEM::CONFIGURE I/O::CONFIGURE 5703	89	0	499	RW
102	DESTINATION TAG	SYSTEM::CONFIGURE I/O::DIGITAL INPUTS::DIGIN 1 [C6]	90	0	499	RW
104	VALUE FOR FALSE	SYSTEM::CONFIGURE I/O::DIGITAL INPUTS::DIGIN 1 [C6]	0.00%	-30000	30000	RW
103	VALUE FOR TRUE	SYSTEM::CONFIGURE I/O::DIGITAL INPUTS::DIGIN 1 [C6]	0.01%	-30000	30000	RW
105	DESTINATION TAG	SYSTEM::CONFIGURE I/O::DIGITAL INPUTS::DIGIN 2 [C7]	118	0	499	RW
107	VALUE FOR FALSE	SYSTEM::CONFIGURE I/O::DIGITAL INPUTS::DIGIN 2 [C7]	0.00%	-30000	30000	RW
106	VALUE FOR TRUE	SYSTEM::CONFIGURE I/O::DIGITAL INPUTS::DIGIN 2 [C7]	0.01%	-30000	30000	RW
108	DESTINATION TAG	SYSTEM::CONFIGURE I/O::DIGITAL INPUTS::DIGIN 3 [C8]	119	0	499	RW
110	VALUE FOR FALSE	SYSTEM::CONFIGURE I/O::DIGITAL INPUTS::DIGIN 3 [C8]	0.00%	-30000	30000	RW
109	VALUE FOR TRUE	SYSTEM::CONFIGURE I/O::DIGITAL INPUTS::DIGIN 3 [C8]	0.01%	-30000	30000	RW
359	INVERTED	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 1 [B5]	FALSE	0	1	RW
43	MODULUS	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 1 [B5]	TRUE	0	1	RW
97	SOURCE TAG	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 1 [B5]	77	0	499	RW
195	THRESHOLD (>)	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 1 [B5]	0.00%	-30000	30000	RW
360	INVERTED	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 2 [B6]	FALSE	0	1	RW
44	MODULUS	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 2 [B6]	TRUE	0	1	RW
98	SOURCE TAG	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 2 [B6]	122	0	499	RW
196	THRESHOLD (>)	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 2 [B6]	0.00%	-30000	30000	RW
361	INVERTED	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 3 [B7]	FALSE	0	1	RW
45	MODULUS	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 3 [B7]	TRUE	0	1	RW
99	SOURCE TAG	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 3 [B7]	125	0	499	RW
197	THRESHOLD (>)	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 3 [B7]	0.00%	-30000	30000	RW
365	DESTINATION TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 1	0	0	499	RW
364	SOURCE TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 1	0	0	499	RW
367	DESTINATION TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 2	0	0	499	RW
366	SOURCE TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 2	0	0	499	RW
369	DESTINATION TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 3	0	0	499	RW
368	SOURCE TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 3	0	0	499	RW
371	DESTINATION TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 4	0	0	499	RW
370	SOURCE TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 4	0	0	499	RW
455	DESTINATION TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 5	0	0	499	RW
454	SOURCE TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 5	0	0	499	RW
457	DESTINATION TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 6	0	0	499	RW
456	SOURCE TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 6	0	0	499	RW
459	DESTINATION TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 7	0	0	499	RW
458	SOURCE TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 7	0	0	499	RW

TAG	PARAMETER NAME	MENU	DEFAULT	MIN	MAX	
461	DESTINATION TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 8	0	0	499	RW
460	SOURCE TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 8	0	0	499	RW
468	DESTINATION TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 9	0	0	499	RW
467	SOURCE TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 9	0	0	499	RW
470	DESTINATION TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 10	0	0	499	RW
469	SOURCE TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 10	0	0	499	RW
346	LOGIC 1	SYSTEM::miniLINK	OFF	0	1	RW
347	LOGIC 2	SYSTEM::miniLINK	OFF	0	1	RW
348	LOGIC 3	SYSTEM::miniLINK	OFF	0	1	RW
349	LOGIC 4	SYSTEM::miniLINK	OFF	0	1	RW
350	LOGIC 5	SYSTEM::miniLINK	OFF	0	1	RW
351	LOGIC 6	SYSTEM::miniLINK	OFF	0	1	RW
352	LOGIC 7	SYSTEM::miniLINK	OFF	0	1	RW
353	LOGIC 8	SYSTEM::miniLINK	OFF	0	1	RW
339	VALUE 1	SYSTEM::miniLINK	0.00%	-30000	30000	RW
340	VALUE 2	SYSTEM::miniLINK	0.00%	-30000	30000	RW
341	VALUE 3	SYSTEM::miniLINK	0.00%	-30000	30000	RW
342	VALUE 4	SYSTEM::miniLINK	0.00%	-30000	30000	RW
343	VALUE 5	SYSTEM::miniLINK	0.00%	-30000	30000	RW
344	VALUE 6	SYSTEM::miniLINK	0.00%	-30000	30000	RW
345	VALUE 7	SYSTEM::miniLINK	0.00%	-30000	30000	RW
379	VALUE 8	SYSTEM::miniLINK	0.00%	-30000	30000	RW
380	VALUE 9	SYSTEM::miniLINK	0.00%	-30000	30000	RW
381	VALUE 10	SYSTEM::miniLINK	0.00%	-30000	30000	RW
382	VALUE 11	SYSTEM::miniLINK	0.00%	-30000	30000	RW
383	VALUE 12	SYSTEM::miniLINK	0.00%	-30000	30000	RW
384	VALUE 13	SYSTEM::miniLINK	0.00%	-30000	30000	RW
385	VALUE 14	SYSTEM::miniLINK	0.00%	-30000	30000	RW

Appendix K PARAMETER LIST BY PARAMETER NAME

TAG	PARAMETER NAME	MENU	DEFAULT	MIN	MAX	
187	5703 INPUT	SERIAL LINKS::SYSTEM PORT [P3]::P3 SETUP::5703 SUPPORT	0.00%	-30000	30000	RW
189	5703 OUTPUT	SERIAL LINKS::SYSTEM PORT [P3]::P3 SETUP::5703 SUPPORT	0.00%	-30000	30000	RO
111	5703 RCV ERROR	SETUP PARAMETERS::INHIBIT ALARMS	ENABLED	0	1	RW
61	ACTUAL NEG I LIM	DIAGNOSTICS	0.00%	-20000	20000	RO
67	ACTUAL POS I LIM	DIAGNOSTICS	0.00%	-20000	20000	RO
30	ADDITIONAL DEM	SETUP PARAMETERS::CURRENT LOOP	0.00%	-20000	20000	RW
23	ANALOG TACH CAL	SETUP PARAMETERS::CALIBRATION	1	9800	11000	RW
50	ANIN 1 [A2]	DIAGNOSTICS	0.00 VOLTS	-10000	10000	RO
51	ANIN 2 [A3]	DIAGNOSTICS	0.00 VOLTS	-10000	10000	RO
52	ANIN 3 [A4]	DIAGNOSTICS	0.00 VOLTS	-10000	10000	RO
53	ANIN 4 [A5]	DIAGNOSTICS	0.00 VOLTS	-10000	10000	RO
54	ANIN 5 [A6]	DIAGNOSTICS	0.00 VOLTS	-10000	10000	RO
128	ANOUT 1	SETUP PARAMETERS::AUX I/O	0.00%	-10000	10000	RW
55	ANOUT 1 [A7]	DIAGNOSTICS	0.00 VOLTS	-10000	10000	RO
129	ANOUT 2	SETUP PARAMETERS::AUX I/O	0.00%	-10000	10000	RW
56	ANOUT 2 [A8]	DIAGNOSTICS	0.00 VOLTS	-10000	10000	RO
25	ARMATURE I [A9]	SETUP PARAMETERS::CALIBRATION	BI POLAR	0	1	RW
20	ARMATURE V CAL	SETUP PARAMETERS::CALIBRATION	1	9800	11000	RW
149	ASCII / BINARY	SERIAL LINKS::AUX PORT [P2]	ASCII	0	1	RW
148	ASCII / BINARY	SERIAL LINKS::MAIN PORT [P1]	ASCII	0	1	RW
42	AT CURRENT LIMIT	DIAGNOSTICS	FALSE	0	1	RO
79	AT STANDSTILL	DIAGNOSTICS	TRUE	0	1	RO
78	AT ZERO SETPOINT	DIAGNOSTICS	TRUE	0	1	RO
77	AT ZERO SPEED	DIAGNOSTICS	TRUE	0	1	RO
287	AUTO RESET	SETUP PARAMETERS::RAMPS	ENABLED	0	1	RW
18	AUTOTUNE	SETUP PARAMETERS::CURRENT LOOP	OFF	0	1	RW
94	AUX DIGOUT 1	SETUP PARAMETERS::AUX I/O	OFF	0	1	RW
95	AUX DIGOUT 2	SETUP PARAMETERS::AUX I/O	OFF	0	1	RW
96	AUX DIGOUT 3	SETUP PARAMETERS::AUX I/O	OFF	0	1	RW
168	AUX ENABLE	SETUP PARAMETERS::AUX I/O	ON	0	1	RW
227	AUX JOG	SETUP PARAMETERS::AUX I/O	ON	0	1	RW
161	AUX START	SETUP PARAMETERS::AUX I/O	ON	0	1	RW
60	BACK EMF	DIAGNOSTICS	0.00%	-15000	15000	RO
151	BAUD RATE	SERIAL LINKS::AUX PORT [P2]	9600	300	19200	RW
150	BAUD RATE	SERIAL LINKS::MAIN PORT [P1]	9600	300	19200	RW
90	BIPOLAR CLAMPS	SETUP PARAMETERS::CURRENT LOOP	DISABLED	0	1	RW
230	CALIBRATION	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 1 [A2]	1	-30000	30000	RW
233	CALIBRATION	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 2 [A3]	1	-30000	30000	RW
236	CALIBRATION	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 3 [A4]	1	-30000	30000	RW
239	CALIBRATION	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 4 [A5]	1	-30000	30000	RW
242	CALIBRATION	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 5 [A6]	1	-30000	30000	RW
121	CHANGE PASSWORD	PASSWORD	0x0000	0	FFFF	RW
145	CHANGE BAND (BIN)	SERIAL LINKS::AUX PORT [P2]	0.00%	0	32767	RW
144	CHANGE BAND (BIN)	SERIAL LINKS::MAIN PORT [P1]	0.00%	0	32767	RW
39	CONFIGURE ENABLE	SYSTEM::CONFIGURE I/O	DISABLED	0	1	RW
302	CONTACTOR DELAY	SETUP PARAMETERS::STOP RATES	1.0 SECS	1	6000	RW
225	CRAWL SPEED	SETUP PARAMETERS::JOG/SLACK	10.00%	-10000	10000	RW
15	CUR.LIMIT/SCALER	SETUP PARAMETERS::CURRENT LOOP	100.00%	0	20000	RW
299	CURRENT DEMAND	DIAGNOSTICS	0.00%	-30000	30000	RO
298	CURRENT FEEDBACK	DIAGNOSTICS	0.00%	-30000	30000	RO
131	DEADBAND WIDTH	SETUP PARAMETERS::SETPOINT SUM 1	0.00%	0	10000	RW
257	DECREASE RATE	SETUP PARAMETERS::RAISE/LOWER	10.0 SECS	1	6000	RW
401	DERIVATIVE TC	SETUP PARAMETERS::SPECIAL BLOCKS::PID	0.000 SECS	0	10000	RW
246	DESTINATION TAG	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 1 [A2]	100	0	499	RW
249	DESTINATION TAG	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 3 [A4]	5	0	499	RW
250	DESTINATION TAG	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 4 [A5]	48	0	499	RW
247	DESTINATION TAG	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 5 [A6]	301	0	499	RW
135	DESTINATION TAG	SYSTEM::CONFIGURE I/O::CONFIGURE 5703	41	0	499	RW
102	DESTINATION TAG	SYSTEM::CONFIGURE I/O::DIGITAL INPUTS::DIGIN 1 [C6]	90	0	499	RW
105	DESTINATION TAG	SYSTEM::CONFIGURE I/O::DIGITAL INPUTS::DIGIN 2 [C7]	118	0	499	RW
108	DESTINATION TAG	SYSTEM::CONFIGURE I/O::DIGITAL INPUTS::DIGIN 3 [C8]	119	0	499	RW
365	DESTINATION TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 1	0	0	499	RW
367	DESTINATION TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 2	0	0	499	RW
369	DESTINATION TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 3	0	0	499	RW
371	DESTINATION TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 4	0	0	499	RW



TAG	PARAMETER NAME	MENU	DEFAULT	MIN	MAX	
455	DESTINATION TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 5	0	0	499	RW
457	DESTINATION TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 6	0	0	499	RW
459	DESTINATION TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 7	0	0	499	RW
461	DESTINATION TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 8	0	0	499	RW
468	DESTINATION TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 9	0	0	499	RW
470	DESTINATION TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 10	0	0	499	RW
427	DIAMETER	SETUP PARAMETERS::SPECIAL BLOCKS::DIAMETER CALC.	0.00%	0	10000	RO
431	DIAMETER	SYSTEM::CONFIGURE I/O::BLOCK DIAGRAM	0	0	499	RW
71	DIGIN 1 [C6]	DIAGNOSTICS	OFF	0	1	RO
72	DIGIN 2 [C7]	DIAGNOSTICS	OFF	0	1	RO
73	DIGIN 3 [C8]	DIAGNOSTICS	OFF	0	1	RO
74	DIGOUT 1 [B5]	DIAGNOSTICS	ON	0	1	RO
75	DIGOUT 2 [B6]	DIAGNOSTICS	ON	0	1	RO
76	DIGOUT 3 [B7]	DIAGNOSTICS	OFF	0	1	RO
137	DISCONTINUOUS	SETUP PARAMETERS::CURRENT LOOP	12.00%	0	20000	RW
420	DIVIDER 0	SETUP PARAMETERS::SETPOINT SUM 1	1	-30000	30000	RW
448	DIVIDER 0	SETUP PARAMETERS::SPECIAL BLOCKS::SETPOINT SUM 2	1	-30000	30000	RW
419	DIVIDER 1	SETUP PARAMETERS::SETPOINT SUM 1	1	-30000	30000	RW
418	DIVIDER 1	SETUP PARAMETERS::SPECIAL BLOCKS::PID	1	-30000	30000	RW
466	DIVIDER 1	SETUP PARAMETERS::SPECIAL BLOCKS::SETPOINT SUM 2	1	-30000	30000	RW
414	DIVIDER 2	SETUP PARAMETERS::SPECIAL BLOCKS::PID	1	-30000	30000	RW
84	DRIVE ENABLE	DIAGNOSTICS	DISABLED	0	1	RO
82	DRIVE START	DIAGNOSTICS	OFF	0	1	RO
	DUMP MMI -> P3	SERIAL LINKS::SYSTEM PORT [P3]				RW
408	ENABLE	SETUP PARAMETERS::SPECIAL BLOCKS::PID	ENABLED	0	1	RW
70	ENABLE [C5]	DIAGNOSTICS	OFF	0	1	RO
206	ENCODER	DIAGNOSTICS	0 RPM	0	6000	RO
92	ENCODER ALARM	SETUP PARAMETERS::INHIBIT ALARMS	ENABLED	0	1	RW
24	ENCODER LINES	SETUP PARAMETERS::CALIBRATION	1000	10	5000	RW
22	ENCODER RPM	SETUP PARAMETERS::CALIBRATION	1000 RPM	0	6000	RW
49	ENCODER SIGN	SETUP PARAMETERS::SPEED LOOP	POSITIVE	0	1	RW
120	ENTER P ASSWORD	P ASSWORD	0x0000	0	FFFF	RW
159	ERROR REPORT	SERIAL LINKS::AUX P ORT [P2]	0x00C0	-	-	RW
158	ERROR REPORT	SERIAL LINKS::MAIN P ORT [P1]	0x00C0	-	-	RW
332	ERROR REPORT	SERIAL LINKS::SYSTEM P ORT [P3]::P3 S ETUP::B I S Y N C H S U P P O R T	0x00C0	-	-	RW
153	ESP SUP. [ASCII]	SERIAL LINKS::AUX P ORT [P2]	DISABLED	0	1	RW
152	ESP SUP. [ASCII]	SERIAL LINKS::MAIN P ORT [P1]	DISABLED	0	1	RW
307	EXTERNAL RESET	SETUP PARAMETERS::RAISE/LOWER	FALSE	0	1	RW
288	EXTERNAL RESET	SETUP PARAMETERS::RAMP S	DISABLED	0	1	RW
463	EXTERNAL RESET	SETUP PARAMETERS::SPECIAL BLOCKS::DIAMETER CALC.	DISABLED	0	1	RW
403	FILTER T.C.	SETUP PARAMETERS::SPECIAL BLOCKS::PID	0.100 SECS	0	10000	RW
37	FULL MENUS	MENUS	ENABLED	0	1	RW
140	GROUP ID [GID]	SERIAL LINKS::AUX P ORT [P2]	0	0	7	RW
138	GROUP ID [GID]	SERIAL LINKS::MAIN P ORT [P1]	0	0	7	RW
329	GROUP ID [GID]	SERIAL LINKS::SYSTEM P ORT [P3]::P3 S ETUP::B I S Y N C H S U P P O R T	0	0	7	RW
116	HEALTH STORE	ALARM STATUS	0x0000	0	FFFF	RO
115	HEALTH WORD	ALARM STATUS	0x4210	0	FFFF	RO
119	IDMD. ISOLATE	SETUP PARAMETERS::CURRENT LOOP	DISABLED	0	1	RW
274	I GAIN IN RAMP	SETUP PARAMETERS::SPEED LOOP::ADVANCED	1	0	20000	RW
93	IMAX BRK1[SPD1]	SETUP PARAMETERS::CURRENT PROFILE	200.00%	0	20000	RW
33	IMAX BRK2[SPD2]	SETUP PARAMETERS::CURRENT PROFILE	200.00%	0	20000	RW
256	INCREASE RATE	SETUP PARAMETERS::RAISE/LOWER	10.0 SECS	1	6000	RW
309	INPUT 0	SETUP PARAMETERS::SETPOINT SUM 1	0.00%	-20000	20000	RW
444	INPUT 0	SETUP PARAMETERS::SPECIAL BLOCKS::SETPOINT SUM 2	0.00%	-30000	30000	RW
100	INPUT 1	SETUP PARAMETERS::SETPOINT SUM 1	0.00%	-20000	20000	RW
410	INPUT 1	SETUP PARAMETERS::SPECIAL BLOCKS::PID	0.00%	-30000	30000	RW
443	INPUT 1	SETUP PARAMETERS::SPECIAL BLOCKS::SETPOINT SUM 2	0.00%	-30000	30000	RW
423	INPUT 2	SETUP PARAMETERS::SETPOINT SUM 1	0.00%	-20000	20000	RW
411	INPUT 2	SETUP PARAMETERS::SPECIAL BLOCKS::PID	0.00%	-30000	30000	RW
445	INPUT 2	SETUP PARAMETERS::SPECIAL BLOCKS::SETPOINT SUM 2	0.00%	-30000	30000	RW
409	INT. DEFEAT	SETUP PARAMETERS::SPECIAL BLOCKS::PID	OFF	0	1	RW
202	INT. DEFEAT	SETUP PARAMETERS::SPEED LOOP	OFF	0	1	RW
17	INT. GAIN	SETUP PARAMETERS::CURRENT LOOP	3.5	0	20000	RW
172	INT. GAIN	SETUP PARAMETERS::FIELD CONTROL::FLD CURRENT VARS	1.28	0	10000	RW
402	INT. TIME CONST.	SETUP PARAMETERS::SPECIAL BLOCKS::PID	5.00 SECS	1	10000	RW

Appendix K Parameter List by Parameter Name

TAG	PARAMETER NAME	MENU	DEFAULT	MIN	MAX	
13	INT. TIME CONST.	SETUP PARAMETERS::SPEED LOOP	0.500 SECS	1	30000	RW
272	INT. TIME CONST.	SETUP PARAMETERS::SPEED LOOP::ADVANCED::ADAPTION	0.500 SECS	1	30000	RW
203	INVERSE TIME O/P	DIAGNOSTICS	200.00%	0	20000	RO
359	INVERTED	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 1 [B5]	FALSE	0	1	RW
360	INVERTED	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 2 [B6]	FALSE	0	1	RW
361	INVERTED	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 3 [B7]	FALSE	0	1	RW
21	IR COMPENSATION	SETUP PARAMETERS::CALIBRATION	0.00%	0	10000	RW
69	JOG INPUT (C4)	DIAGNOSTICS	OFF	0	1	RO
218	JOG SPEED 1	SETUP PARAMETERS::JOG/SLACK	5.00%	-10000	10000	RW
219	JOG SPEED 2	SETUP PARAMETERS::JOG/SLACK	-5.00%	-10000	10000	RW
	LANGUAGE	MENUS	ENGLISH			RW
375	LIMIT	SETUP PARAMETERS::SETPOINT SUM 1	105.00%	0	20000	RW
449	LIMIT	SETUP PARAMETERS::SPECIAL BLOCKS::SETPOINT SUM 2	100.00%	0	20000	RW
424	LINE SPEED	SETUP PARAMETERS::SPECIAL BLOCKS::DIAMETER CALC.	0.00%	-10500	10500	RW
346	LOGIC 1	SYSTEM::miniLINK	OFF	0	1	RW
347	LOGIC 2	SYSTEM::miniLINK	OFF	0	1	RW
348	LOGIC 3	SYSTEM::miniLINK	OFF	0	1	RW
349	LOGIC 4	SYSTEM::miniLINK	OFF	0	1	RW
350	LOGIC 5	SYSTEM::miniLINK	OFF	0	1	RW
351	LOGIC 6	SYSTEM::miniLINK	OFF	0	1	RW
352	LOGIC 7	SYSTEM::miniLINK	OFF	0	1	RW
353	LOGIC 8	SYSTEM::miniLINK	OFF	0	1	RW
262	LOWER INPUT	SETUP PARAMETERS::RAISE/LOWER	FALSE	0	1	RW
421	MAIN CURR. LIMIT	SETUP PARAMETERS::CURRENT LOOP	200.00%	0	20000	RW
357	MAX DEMAND	SETUP PARAMETERS::SPEED LOOP::SETPOINTS	105.00%	0	10500	RW
259	MAX VALUE	SETUP PARAMETERS::RAISE/LOWER	100.00%	-30000	30000	RW
231	MAX VALUE	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 1 [A2]	100.00%	-30000	30000	RW
234	MAX VALUE	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 2 [A3]	100.00%	-30000	30000	RW
237	MAX VALUE	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 3 [A4]	100.00%	-30000	30000	RW
240	MAX VALUE	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 4 [A5]	100.00%	-30000	30000	RW
243	MAX VALUE	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 5 [A6]	100.00%	-30000	30000	RW
38	MENU DELAY	MENUS	30	0	65535	RW
358	MIN DEMAND	SETUP PARAMETERS::SPEED LOOP::SETPOINTS	-105.00%	-10500	0	RW
425	MIN DIAMETER	SETUP PARAMETERS::SPECIAL BLOCKS::DIAMETER CALC.	10.00%	0	10000	RW
474	MIN PROFILE GAIN	SETUP PARAMETERS::SPECIAL BLOCKS::PID	20.00%	0	10000	RW
126	MIN SPEED	SETUP PARAMETERS::RAMPS	0.00%	0	10000	RW
426	MIN SPEED	SETUP PARAMETERS::SPECIAL BLOCKS::DIAMETER CALC.	5.00%	0	10000	RW
258	MIN VALUE	SETUP PARAMETERS::RAISE/LOWER	-100.00%	-30000	30000	RW
232	MIN VALUE	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 1 [A2]	-100.00%	-30000	30000	RW
235	MIN VALUE	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 2 [A3]	-100.00%	-30000	30000	RW
238	MIN VALUE	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 3 [A4]	-100.00%	-30000	30000	RW
241	MIN VALUE	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 4 [A5]	-100.00%	-30000	30000	RW
244	MIN VALUE	SYSTEM::CONFIGURE I/O::ANALOG INPUTS::ANIN 5 [A6]	-100.00%	-30000	30000	RW
130	MODE	SERIAL LINKS::SYSTEM PORT [P3]:P3 SETUP	DISABLED	0	4	RW
228	MODE	SETUP PARAMETERS::JOG/SLACK	FALSE	0	1	RW
473	MODE	SETUP PARAMETERS::SPECIAL BLOCKS::PID	0	0	4	RW
268	MODE	SETUP PARAMETERS::SPEED LOOP::ADVANCED::ADAPTION	0	0	3	RW
362	MODULUS	SYSTEM::CONFIGURE I/O::ANALOG OUTPUTS::ANOUT 1 [A7]	FALSE	0	1	RW
363	MODULUS	SYSTEM::CONFIGURE I/O::ANALOG OUTPUTS::ANOUT 2 [A8]	FALSE	0	1	RW
43	MODULUS	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 1 [B5]	TRUE	0	1	RW
44	MODULUS	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 2 [B6]	TRUE	0	1	RW
45	MODULUS	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 3 [B7]	TRUE	0	1	RW
88	NEG. I CLAMP	DIAGNOSTICS	0.00%	-20000	20000	RO
48	NEG. I CLAMP	SETUP PARAMETERS::CURRENT LOOP	0.00%	-10000	10000	RW
436	NEG. I CLAMP	SYSTEM::CONFIGURE I/O::BLOCK DIAGRAM	0	0	499	RW
406	NEGATIVE LIMIT	SETUP PARAMETERS::SPECIAL BLOCKS::PID	-100.00%	-10500	0	RW
407	O/P SCALER(TRIM)	SETUP PARAMETERS::SPECIAL BLOCKS::PID	0.2	-30000	30000	RW
464	OFFSET	SYSTEM::CONFIGURE I/O::ANALOG OUTPUTS::ANOUT 1 [A7]	0.00%	-10000	10000	RW
465	OFFSET	SYSTEM::CONFIGURE I/O::ANALOG OUTPUTS::ANOUT 2 [A8]	0.00%	-10000	10000	RW
212	OPERATING MODE	DIAGNOSTICS	STOP	0	7	RO
434	OVER WIND	SETUP PARAMETERS::SPECIAL BLOCKS::TORQUE CALC.	ENABLED	0	1	RW
198	P3 BAUD RATE	SERIAL LINKS::SYSTEM PORT [P3]:P3 SETUP	9600	300	57600	RW
334	PARITY	SERIAL LINKS::MAIN PORT [P1]	EVEN	0	1	RW
266	% S-RAMP	SETUP PARAMETERS::RAMPS	2.50%	0	10000	RW
245	% TO GET 10V	SYSTEM::CONFIGURE I/O::ANALOG OUTPUTS::ANOUT 1 [A7]	100.00%	-30000	30000	RW



TAG	PARAMETER NAME	MENU	DEFAULT	MIN	MAX	
248	% TO GET 10V	SYSTEM::CONFIGURE I/O::ANALOG OUTPUTS::ANOUT 2 [A8]	100.00%	-30000	30000	RW
416	PID CLAMPED	DIAGNOSTICS	FALSE	0	1	RO
415	PID ERROR	DIAGNOSTICS	0.00%	-10500	10500	RO
400	PID O/P DEST	SYSTEM::CONFIGURE I/O::BLOCK DIAGRAM	0	0	499	RW
417	PID OUTPUT	DIAGNOSTICS	0.00%	-31500	31500	RO
312	PNO 112	SERIAL LINKS::PNOCONFIG	0	0	499	RW
313	PNO 113	SERIAL LINKS::PNOCONFIG	0	0	499	RW
314	PNO 114	SERIAL LINKS::PNOCONFIG	0	0	499	RW
315	PNO 115	SERIAL LINKS::PNOCONFIG	0	0	499	RW
316	PNO 116	SERIAL LINKS::PNOCONFIG	0	0	499	RW
317	PNO 117	SERIAL LINKS::PNOCONFIG	0	0	499	RW
318	PNO 118	SERIAL LINKS::PNOCONFIG	0	0	499	RW
319	PNO 119	SERIAL LINKS::PNOCONFIG	0	0	499	RW
320	PNO 120	SERIAL LINKS::PNOCONFIG	379	0	499	RW
321	PNO 121	SERIAL LINKS::PNOCONFIG	380	0	499	RW
322	PNO 122	SERIAL LINKS::PNOCONFIG	381	0	499	RW
323	PNO 123	SERIAL LINKS::PNOCONFIG	382	0	499	RW
324	PNO 124	SERIAL LINKS::PNOCONFIG	383	0	499	RW
325	PNO 125	SERIAL LINKS::PNOCONFIG	384	0	499	RW
326	PNO 126	SERIAL LINKS::PNOCONFIG	385	0	499	RW
327	PNO 127	SERIAL LINKS::PNOCONFIG	0	0	499	RW
143	PNO. 7	SERIAL LINKS::AUX PORT [P2]	0xFFFF	0	FFFF	RW
142	PNO. 7	SERIAL LINKS::MAIN PORT [P1]	0xFFFF	0	FFFF	RW
87	POS. I CLAMP	DIAGNOSTICS	0.00%	-20000	20000	RO
301	POS. I CLAMP	SETUP PARAMETERS::CURRENT LOOP	0.00%	-10000	10000	RW
435	POS. I CLAMP	SYSTEM::CONFIGURE I/O::BLOCK DIAGRAM	0	0	499	RW
405	POSITIVE LIMIT	SETUP PARAMETERS::SPECIAL BLOCKS::PID	100.00%	0	10500	RW
475	PROFILED GAIN	SETUP PARAMETERS::SPECIAL BLOCKS::PID	0	0	1000	RO
91	PROG STOP I LIM	SETUP PARAMETERS::STOP RATES	100.00%	0	20000	RW
216	PROG STOP LIMIT	SETUP PARAMETERS::STOP RATES	60.0 SECS	0	6000	RW
26	PROG STOP TIME	SETUP PARAMETERS::STOP RATES	0.1 SECS	1	6000	RW
80	PROGRAM STOP	DIAGNOSTICS	TRUE	0	1	RO
16	PROP. GAIN	SETUP PARAMETERS::CURRENT LOOP	45	0	20000	RW
173	PROP. GAIN	SETUP PARAMETERS::FIELD CONTROL::FLD CURRENT VARS	0.1	0	10000	RW
404	PROP. GAIN	SETUP PARAMETERS::SPECIAL BLOCKS::PID	1	0	1000	RW
14	PROP. GAIN	SETUP PARAMETERS::SPEED LOOP	10	0	20000	RW
271	PROP. GAIN	SETUP PARAMETERS::SPEED LOOP::ADVANCED::ADAPTION	5	0	20000	RW
261	RAISE INPUT	SETUP PARAMETERS::RAISE/LOWER	FALSE	0	1	RW
260	RAISE/LOWER DEST	SYSTEM::CONFIGURE I/O::BLOCK DIAGRAM	0	0	499	RW
264	RAISE/LOWER O/P	DIAGNOSTICS	0.00%	-30000	30000	RO
2	RAMP ACCEL TIME	SETUP PARAMETERS::RAMP S	10.0 SECS	1	6000	RW
3	RAMP DECEL TIME	SETUP PARAMETERS::RAMP S	10.0 SECS	1	6000	RW
118	RAMP HOLD	SETUP PARAMETERS::RAMP S	OFF	0	1	RW
5	RAMP INPUT	SETUP PARAMETERS::RAMP S	0.00%	-10000	10000	RW
293	RAMP O/P DEST	SYSTEM::CONFIGURE I/O::BLOCK DIAGRAM	291	0	499	RW
85	RAMP OUTPUT	DIAGNOSTICS	0.00%	-10000	10000	RO
355	RAMP RATE	SETUP PARAMETERS::JOG/SLACK	1.0 SECS	1	6000	RW
453	RAMP RATE	SETUP PARAMETERS::SPECIAL BLOCKS::DIAMETER CALC.	5.0 SECS	1	6000	RW
113	RAMPING	DIAGNOSTICS	FALSE	0	1	RO
286	RAMPING THRESH.	SETUP PARAMETERS::RAMP S	0.50%	0	10000	RW
208	RATIO 0	SETUP PARAMETERS::SETPOINT SUM 1	1	-30000	30000	RW
447	RATIO 0	SETUP PARAMETERS::SPECIAL BLOCKS::SETPOINT SUM 2	1	-30000	30000	RW
6	RATIO 1	SETUP PARAMETERS::SETPOINT SUM 1	1	-30000	30000	RW
412	RATIO 1	SETUP PARAMETERS::SPECIAL BLOCKS::PID	1	-30000	30000	RW
446	RATIO 1	SETUP PARAMETERS::SPECIAL BLOCKS::SETPOINT SUM 2	1	-30000	30000	RW
413	RATIO 2	SETUP PARAMETERS::SPECIAL BLOCKS::PID	1	-30000	30000	RW
7	RATIO 2 [A3]	SETUP PARAMETERS::SPEED LOOP::SETPOINTS	1	-30000	30000	RW
210	RATIO OUT/IN	SETUP PARAMETERS::FIELD CONTROL::FLD VOLTAGE VARS	90.00%	0	10000	RW
437	REEL SPEED	SETUP PARAMETERS::SPECIAL BLOCKS::DIAMETER CALC.	0.00%	-10500	10500	RW
201	REGEN MODE	SETUP PARAMETERS::CURRENT LOOP	ENABLED	0	1	RW
255	RESET VALUE	SETUP PARAMETERS::RAISE/LOWER	0.00%	-30000	30000	RW
422	RESET VALUE	SETUP PARAMETERS::RAMP S	0.00%	-30000	30000	RW
462	RESET VALUE	SETUP PARAMETERS::SPECIAL BLOCKS::DIAMETER CALC.	10.00%	0	10000	RW
171	SETPOINT	SETUP PARAMETERS::FIELD CONTROL::FLD CURRENT VARS	100.00%	0	10000	RW
289	SETPOINT 1	SETUP PARAMETERS::SPEED LOOP::SETPOINTS	0.00%	-10500	10500	RW

Appendix K Parameter List by Parameter Name

TAG	PARAMETER NAME	MENU	DEFAULT	MIN	MAX	
290	SETPOINT 2 (A3)	SETUP PARAMETERS::SPEED LOOP::SETPOINTS	0.00%	-10500	10500	RO
291	SETPOINT 3	SETUP PARAMETERS::SPEED LOOP::SETPOINTS	0.00%	-10500	10500	RW
41	SETPOINT 4	SETUP PARAMETERS::SPEED LOOP::SETPOINTS	0.00%	-10500	10500	RW
450	SETPOINT SUM 2	SYSTEM::CONFIGURE I/O::BLOCK DIAGRAM	0	0	499	RW
132	SETPT. RATIO	SERIAL LINKS::SYSTEM PORT [P3]::P3 SETUP::5703 SUPPORT	0	-30000	30000	RW
133	SETPT. SIGN	SERIAL LINKS::SYSTEM PORT [P3]::P3 SETUP::5703 SUPPORT	POSITIVE	0	1	RW
292	SIGN 0	SETUP PARAMETERS::SETPOINT SUM 1	POSITIVE	0	1	RW
8	SIGN 1	SETUP PARAMETERS::SETPOINT SUM 1	POSITIVE	0	1	RW
9	SIGN 2 (A3)	SETUP PARAMETERS::SPEED LOOP::SETPOINTS	POSITIVE	0	1	RW
	SOFTWARE	SYSTEM	ISSUE: 3.2			RW
251	SOURCE TAG	SYSTEM::CONFIGURE I/O::ANALOG OUTPUTS::ANOUT 1 (A7)	62	0	499	RW
252	SOURCE TAG	SYSTEM::CONFIGURE I/O::ANALOG OUTPUTS::ANOUT 2 (A8)	63	0	499	RW
134	SOURCE TAG	SYSTEM::CONFIGURE I/O::CONFIGURE 5703	89	0	499	RW
97	SOURCE TAG	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 1 (B5)	77	0	499	RW
98	SOURCE TAG	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 2 (B6)	122	0	499	RW
99	SOURCE TAG	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 3 (B7)	125	0	499	RW
364	SOURCE TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 1	0	0	499	RW
366	SOURCE TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 2	0	0	499	RW
368	SOURCE TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 3	0	0	499	RW
370	SOURCE TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 4	0	0	499	RW
454	SOURCE TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 5	0	0	499	RW
456	SOURCE TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 6	0	0	499	RW
458	SOURCE TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 7	0	0	499	RW
460	SOURCE TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 8	0	0	499	RW
467	SOURCE TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 9	0	0	499	RW
469	SOURCE TAG	SYSTEM::CONFIGURE I/O::INTERNAL LINKS::LINK 10	0	0	499	RW
32	SPD BRK1 (LOW)	SETUP PARAMETERS::CURRENT PROFILE	100.00%	0	10000	RW
269	SPD BRK1 (LOW)	SETUP PARAMETERS::SPEED LOOP::ADVANCED::ADAPTION	1.00%	0	10000	RW
31	SPD BRK2 (HIGH)	SETUP PARAMETERS::CURRENT PROFILE	100.00%	0	10000	RW
270	SPD BRK2 (HIGH)	SETUP PARAMETERS::SPEED LOOP::ADVANCED::ADAPTION	5.00%	0	10000	RW
180	SPDFBK ALM LEVEL	SETUP PARAMETERS::CALIBRATION	50.00%	0	10000	RW
89	SPEED DEMAND	DIAGNOSTICS	0.00%	-10500	10500	RO
297	SPEED ERROR	DIAGNOSTICS	0.00%	-30000	30000	RO
81	SPEED FBK ALARM	SETUP PARAMETERS::INHIBIT ALARMS	ENABLED	0	1	RW
47	SPEED FBK SELECT	SETUP PARAMETERS::SPEED LOOP	ARM VOLTS FBK	0	3	RW
207	SPEED FEEDBACK	DIAGNOSTICS	0.00%	-30000	30000	RO
63	SPEED SETPOINT	DIAGNOSTICS	0.00%	-30000	30000	RO
294	SPT SUM 1 DEST	SYSTEM::CONFIGURE I/O::BLOCK DIAGRAM	289	0	499	RW
86	SPT SUM OUTPUT	DIAGNOSTICS	0.00%	-20000	20000	RO
451	SPT SUM OUTPUT	SETUP PARAMETERS::SPECIAL BLOCKS::SETPOINT SUM 2	0.00%	-20000	20000	RO
147	SRL LINK ENABLE	SERIAL LINKS::AUX PORT [P2]	ENABLED	0	1	RW
146	SRL LINK ENABLE	SERIAL LINKS::MAIN PORT [P1]	ENABLED	0	1	RW
263	STALL THRESHOLD	SETUP PARAMETERS::CALIBRATION	95.00%	0	20000	RW
112	STALL TRIP	DIAGNOSTICS	OK	0	1	RO
28	STALL TRIP	SETUP PARAMETERS::INHIBIT ALARMS	INHIBITED	0	1	RW
224	STALL TRIP DELAY	SETUP PARAMETERS::CALIBRATION	10.0 SECS	1	6000	RW
11	STANDSTILL LOGIC	SETUP PARAMETERS::STANDSTILL	DISABLED	0	1	RW
68	START (C3)	DIAGNOSTICS	OFF	0	1	RO
217	STOP LIMIT	SETUP PARAMETERS::STOP RATES	60.0 SECS	0	6000	RW
27	STOP TIME	SETUP PARAMETERS::STOP RATES	10.0 SECS	1	6000	RW
29	STOP ZERO SPEED	SETUP PARAMETERS::STOP RATES	2.00%	0	10000	RW
308	TACH INPUT (B2)	DIAGNOSTICS	0.00%	-30000	30000	RO
253	TAKEUP 1	SETUP PARAMETERS::JOG/SLACK	5.00%	-10000	10000	RW
254	TAKEUP 2	SETUP PARAMETERS::JOG/SLACK	-5.00%	-10000	10000	RW
438	TAPER	SETUP PARAMETERS::SPECIAL BLOCKS::TAPER CALC.	0.00%	-10000	10000	RW
442	TAPER	SYSTEM::CONFIGURE I/O::BLOCK DIAGRAM	0	0	499	RW
452	TAPERED DEMAND	SETUP PARAMETERS::SPECIAL BLOCKS::TAPER CALC.	0.00%	0	10000	RO
433	TENSION ENABLE	SETUP PARAMETERS::SPECIAL BLOCKS::TORQUE CALC.	ENABLED	0	1	RW
439	TENSION SPT.	SETUP PARAMETERS::SPECIAL BLOCKS::TAPER CALC.	0.00%	0	10000	RW
440	TENSION TRIM	SETUP PARAMETERS::SPECIAL BLOCKS::TAPER CALC.	0.00%	-10000	10000	RW
57	TERMINAL VOLTS	DIAGNOSTICS	0.00%	-12500	12500	RO
195	THRESHOLD (>)	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 1 (B5)	0.00%	-30000	30000	RW
196	THRESHOLD (>)	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 2 (B6)	0.00%	-30000	30000	RW
197	THRESHOLD (>)	SYSTEM::CONFIGURE I/O::DIGITAL OUTPUTS::DIGOUT 3 (B7)	0.00%	-30000	30000	RW
432	TORQUE DEMAND	SETUP PARAMETERS::SPECIAL BLOCKS::TORQUE CALC.	0.00%	-20000	20000	RW



TAG	PARAMETER NAME	MENU	DEFAULT	MIN	MAX	
441	TOT.TENS.DEMAND	SETUP PARAMETERS::SPECIAL BLOCKS::TAPER CALC.	0.00%	-10000	10000	RO
305	TRIP RESET	SETUP PARAMETERS::INHIBIT ALARMS	TRUE	0	1	RW
	UDP XFER -> P3	SERIAL LINKS::SYSTEM PORT (P3)				RW
	UDP XFER <- P3	SERIAL LINKS::SYSTEM PORT (P3)				RW
141	UNIT ID (UID)	SERIAL LINKS::AUX PORT (P2)	0	0	15	RW
139	UNIT ID (UID)	SERIAL LINKS::MAIN PORT (P1)	0	0	15	RW
330	UNIT ID (UID)	SERIAL LINKS::SYSTEM PORT (P3)::P3 SETUP::BISYNCH SUPPORT	0	0	15	RW
	UP TO ACTION	PARAMETER SAVE				RW
339	VALUE 1	SYSTEM::miniLINK	0.00%	-30000	30000	RW
340	VALUE 2	SYSTEM::miniLINK	0.00%	-30000	30000	RW
341	VALUE 3	SYSTEM::miniLINK	0.00%	-30000	30000	RW
342	VALUE 4	SYSTEM::miniLINK	0.00%	-30000	30000	RW
343	VALUE 5	SYSTEM::miniLINK	0.00%	-30000	30000	RW
344	VALUE 6	SYSTEM::miniLINK	0.00%	-30000	30000	RW
345	VALUE 7	SYSTEM::miniLINK	0.00%	-30000	30000	RW
379	VALUE 8	SYSTEM::miniLINK	0.00%	-30000	30000	RW
380	VALUE 9	SYSTEM::miniLINK	0.00%	-30000	30000	RW
381	VALUE 10	SYSTEM::miniLINK	0.00%	-30000	30000	RW
382	VALUE 11	SYSTEM::miniLINK	0.00%	-30000	30000	RW
383	VALUE 12	SYSTEM::miniLINK	0.00%	-30000	30000	RW
384	VALUE 13	SYSTEM::miniLINK	0.00%	-30000	30000	RW
385	VALUE 14	SYSTEM::miniLINK	0.00%	-30000	30000	RW
104	VALUE FOR FALSE	SYSTEM::CONFIGURE I/O::DIGITAL INPUTS::DIGIN 1 (C6)	0.00%	-30000	30000	RW
107	VALUE FOR FALSE	SYSTEM::CONFIGURE I/O::DIGITAL INPUTS::DIGIN 2 (C7)	0.00%	-30000	30000	RW
110	VALUE FOR FALSE	SYSTEM::CONFIGURE I/O::DIGITAL INPUTS::DIGIN 3 (C8)	0.00%	-30000	30000	RW
103	VALUE FOR TRUE	SYSTEM::CONFIGURE I/O::DIGITAL INPUTS::DIGIN 1 (C6)	0.01%	-30000	30000	RW
106	VALUE FOR TRUE	SYSTEM::CONFIGURE I/O::DIGITAL INPUTS::DIGIN 2 (C7)	0.01%	-30000	30000	RW
109	VALUE FOR TRUE	SYSTEM::CONFIGURE I/O::DIGITAL INPUTS::DIGIN 3 (C8)	0.01%	-30000	30000	RW
285	ZERO IAD LEVEL	SETUP PARAMETERS::SPEED LOOP::ADVANCED::ZERO SPD. QUENCH	1.50%	0	20000	RW
284	ZERO SPD. LEVEL	SETUP PARAMETERS::SPEED LOOP::ADVANCED::ZERO SPD. QUENCH	0.50%	0	20000	RW
10	ZERO SPD. OFFSET	SETUP PARAMETERS::CALIBRATION	0.00%	-500	500	RW
12	ZERO THRESHOLD	SETUP PARAMETERS::STANDSTILL	2.00%	0	10000	RW



Appendix L 590SP DIGITAL DRV OPTION

The 590SP Digital DRV is an enclosed drive package. It includes a standard 590SP Digital 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.

DESCRIPTION OF THE 590SP DRV

The 590SP DRV is shown with the IP20 cover in Figure L.1 and without the cover in Figure L.2. The 590SP or 591SP 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 DRV contains a standard 590SP controller. Refer to the appropriate section of this manual for installation, commissioning, troubleshooting, and service procedures.



Figure L.1 - 590SP Digital DRV (with IP20 Cover)

DRV MOUNTING INSTRUCTIONS

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

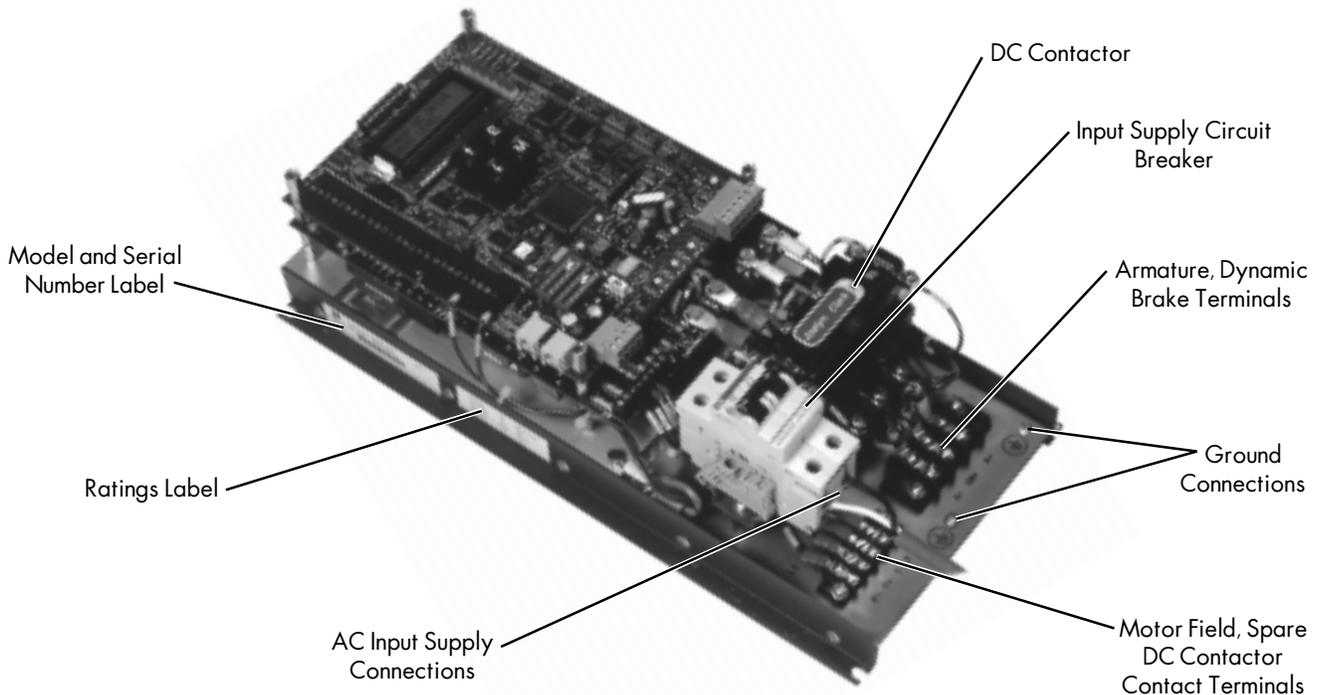


Figure L.2 - 590SP Digital DRV (without Cover)

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 2 for most connections. Refer to the wiring diagram in Figure L.5 at the end of this appendix. A schematic diagram of the 590SP DRV appears in Figure L.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 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 breaker 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!

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 L.6 lists the terminal torque ratings and terminal wire size range. Terminals A+, A- and

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

Figure L.6 - DRV Terminal Tightening Torque Ratings and Wires Sizes

DB+ require spade lugs for #10 screws. Terminals F+, F- and armature contactor spare terminals 1 and 2 require #5 screw spade lugs.

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 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 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 Blocks A, B and C): Because the DRV model isolates power to the motor with a DC contactor, the hardwired drive enable terminal (C5) is pre-wired from the +24 VDC terminal (C9) through a normally opened, auxiliary contact on the internal DC contactor. A normally opened auxiliary contact, rated at 10 amps, is available as a spare at terminals 1 and 2, adjacent to field connection terminals on the mounting base.

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

Calibration and Speed Feedback Wiring: Speed feedback wiring and calibration for the DRV model are identical to the 590SP. Refer to Chapter 3.

DRV TECHNICAL DETAILS

Because the 590SP DRV is a packaged version of the open chassis model, the DRV version has the same features and environmental ratings as the 590SP. 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 Digital drive. Specifications unique to the 590SP 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 L.6 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: 3 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.2 for the approximate armature current for 180 VDC motors)
Armature Voltage	Standard: 180 VDC with 220 to 240 VAC input

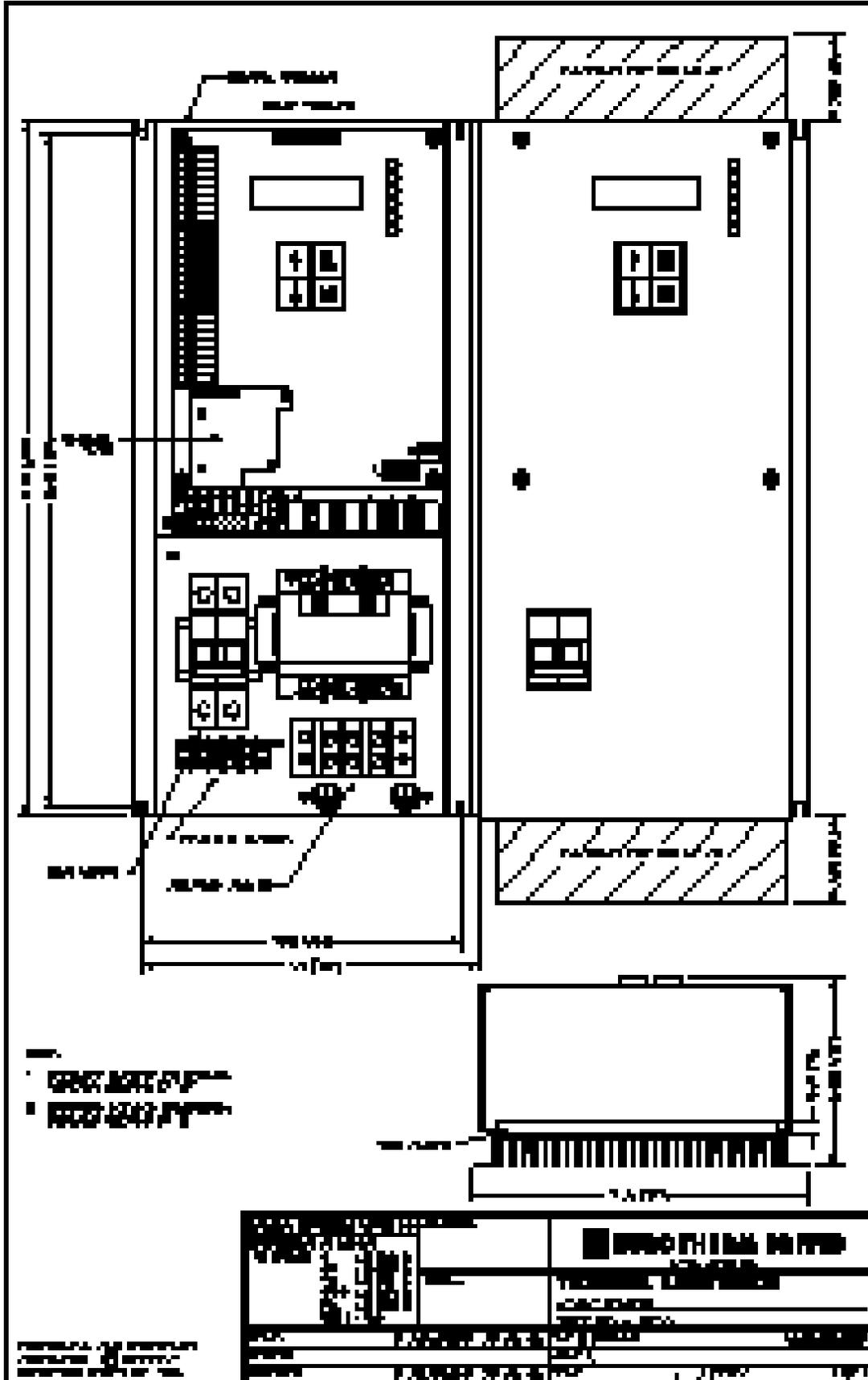


Figure L.3 - 590SP Digital DRV Layout Diagram

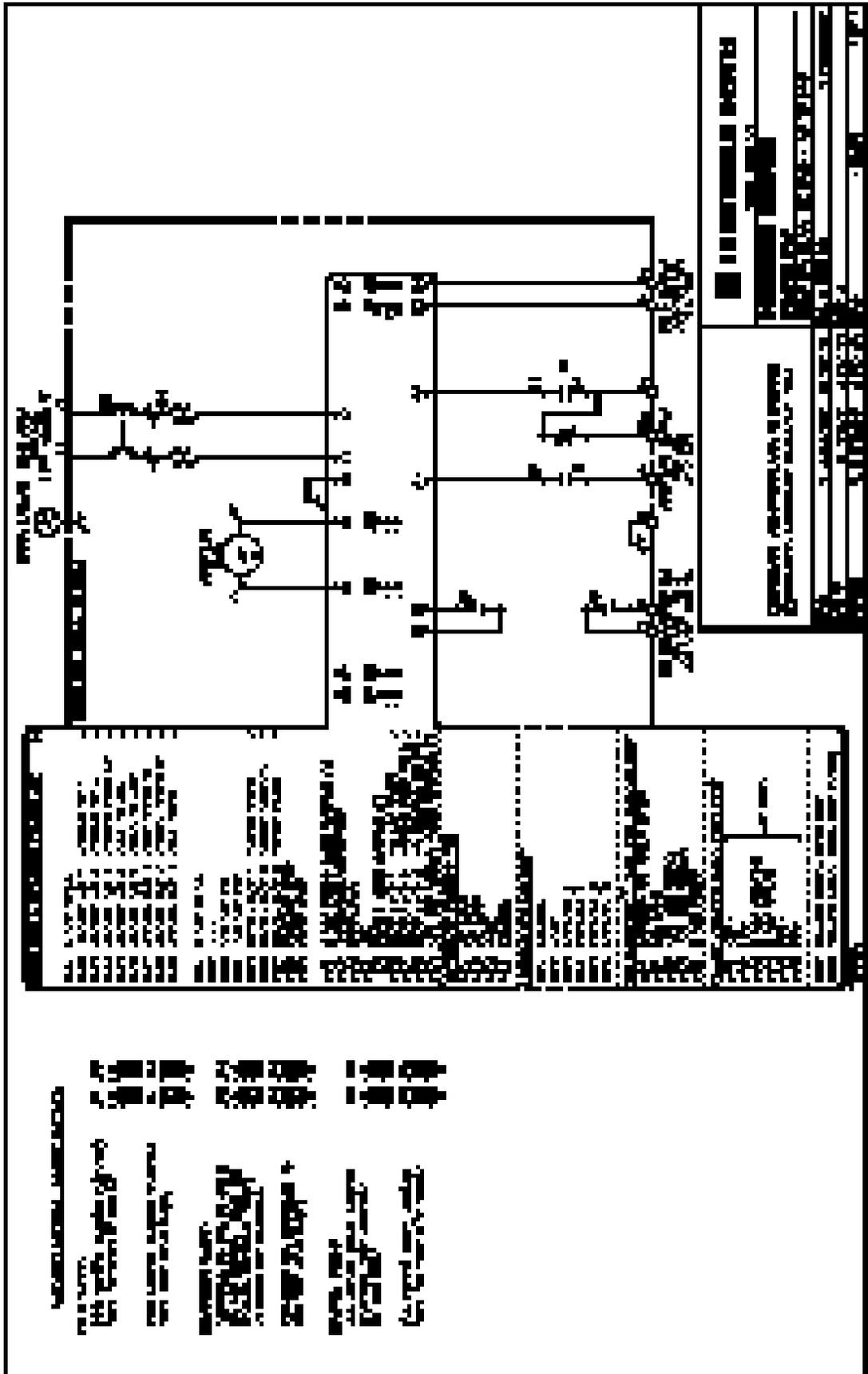
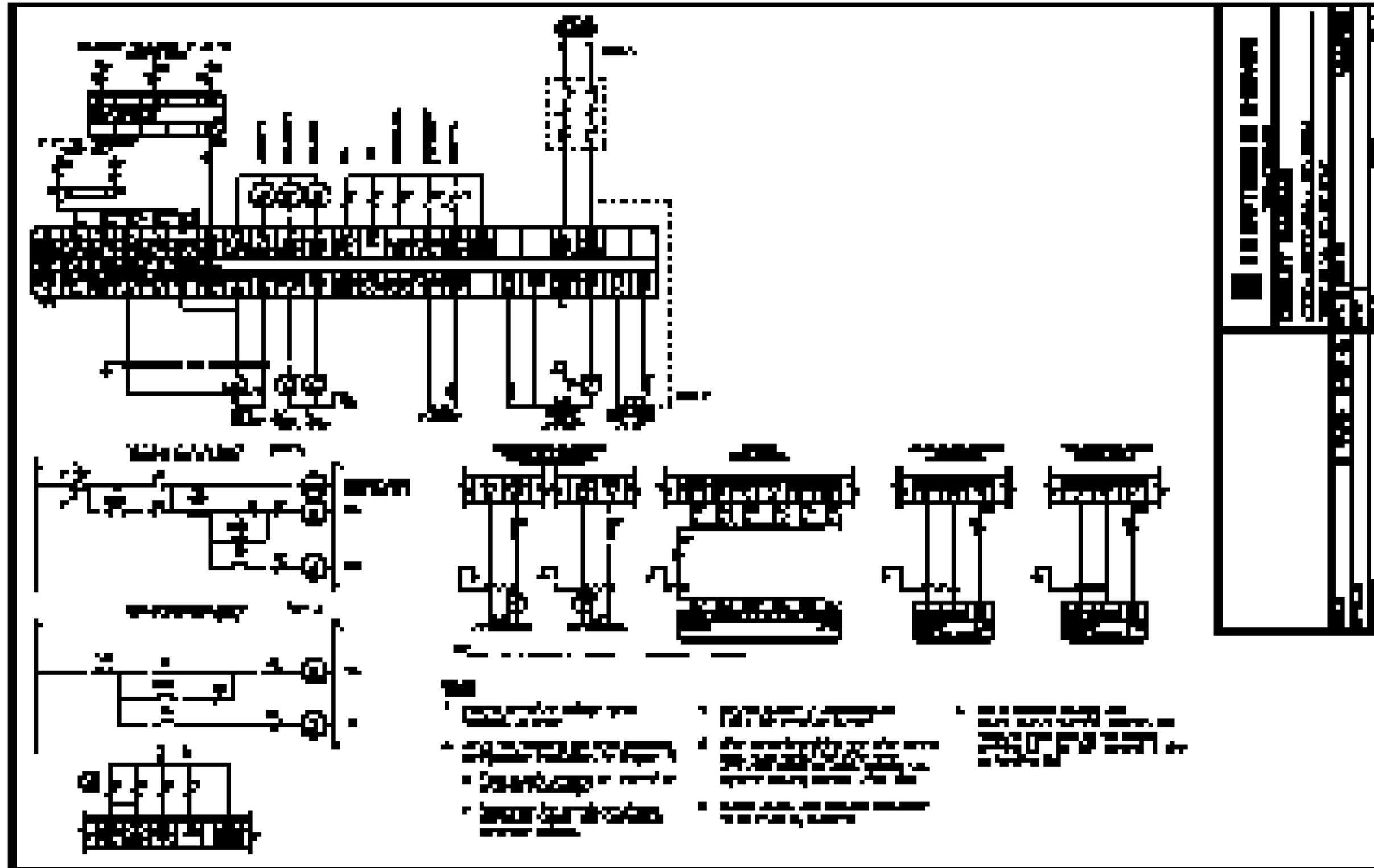


Figure L.4 - 590SP Digital DRV Schematic Diagram





Figure L.5 - Wiring Circuit Diagram for 590SP Digital DRV Drive



Appendix M SPECIAL BLOCKS AND APPLICATION NOTES

INTRODUCTION

The SPECIAL BLOCKS menu contains five function blocks used to add winder and section control capability to the 590SP Digital drive: DIAMETER CALC., TAPER CALC., TORQUE CALC., SETPOINT SUM 2, and PID.

This chapter is arranged in the order these menus appear in the MMI. Each section contains a description of the function block, a block diagram and a list of parameters. In addition, a drawing at the beginning of each section illustrates how to access the function block through the MMI. Additional information and diagrams are placed after the block diagram.

Tag numbers are associated with each function block parameter and are used to configure the 590SP Digital drive. Each function block diagram lists the tag number, MMI parameter name, description, signal range and default value.

Application notes begin on page M-11. They contain sample open-loop winder applications (CPW), closed-loop winder applications (SPW), and section control applications (SC).

DIAMETER CALC.

DIAMETER CALC. is used to calculate roll diameters in winder applications. It calculates diameter by dividing the LINE SPEED by REEL SPEED. The resulting diameter is a percentage of the maximum full roll diameter. A lead section, adjacent line section, or surface driven speed sensing device is required to supply the line speed signal. The winder or unwind drive's motor speed feedback provides the reel speed input.

NOTE. This block is ignored by the drive unless SYSTEM::CONFIGURE I/O::BLOCK DIAGRAM::DIAMETER is connected to a non-zero tag.

The ratio of the minimum core diameter to the maximum roll diameter determines the operating range of the diameter calculator. MIN DIAMETER is set to that ratio using the expression:

$$\text{Minimum Core Outside Diameter} \div \text{Maximum Full Roll Diameter} \times 100\%$$

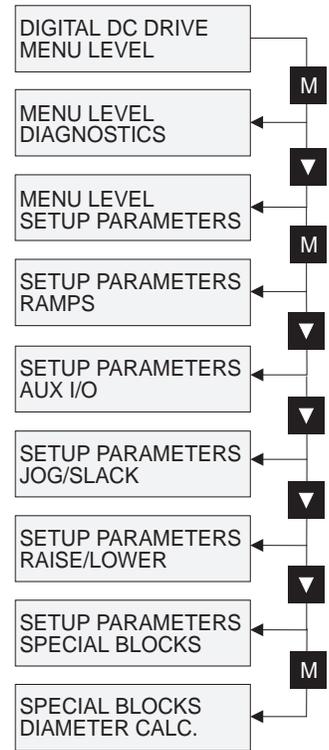
The magnitude of LINE SPEED is compared with MIN SPEED to determine when the diameter calculator will operate. When LINE SPEED is above MIN SPEED the calculator is on; below MIN SPEED, DIAMETER is held at the last calculated diameter.

When EXTERNAL RESET is TRUE, RESET VALUE is used as the diameter output.

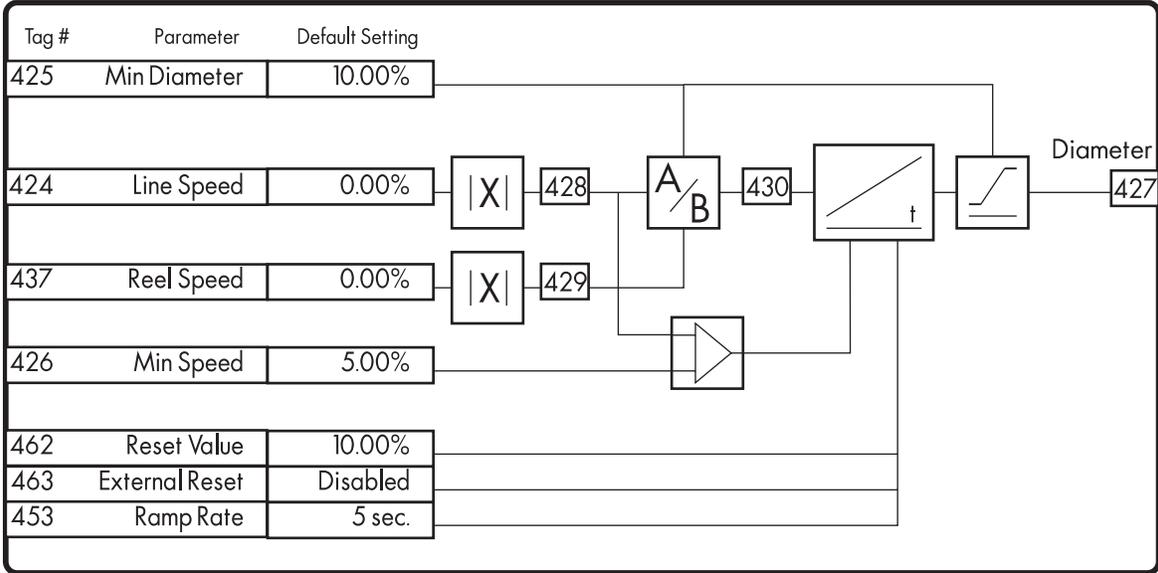
NOTE. In turret winder applications, LINE SPEED will usually be above MIN SPEED. During roll changes, EXTERNAL RESET must be held TRUE for the new spindle until the web has been transferred and the diameter is calculated properly. RESET VALUE must be set to the appropriate new core value for a rewind or new roll diameter for an unwind.

RAMP RATE adjusts the filtering of the diameter output. Its setting is the time it takes for a 100 percent change in DIAMETER. For example, at the default setting of 5.0 seconds, a 50 percent step change in diameter would take 2.5 seconds for the output diameter output to display the change.

Tag Parameter	Description		
Range			
424 Line Speed	The line speed input from analog input 3.	±105.00%	0.00%
437 Reel Speed	The winder speed from the Speed Feedback signal.	±105.00%	0.00%
425 Min Diameter	Set to the minimum core diameter as a percentage of the maximum roll diameter. Used in the diameter calculation and as a clamp for the diameter output.	0.00 - 100.00%	10.00%
426 Min Speed	The threshold for line speed below which the block stops calculating new diameters.	0.00 - 100.00%	5.00%
462 Reset Value	This is the diameter preset used when changing rolls. It is the value of the diameter loaded when External Reset is Enabled.	0.00 - 100.00%	10.00%
463 External Reset	Sets the diameter to Reset Value when Enabled.	Enabled/Disabled	Disabled
453 Ramp Rate	Linear filter used to smooth the diameter output.	0.1 - 600.0 Secs	5.0 Secs
427 Diameter	Output of the Diameter Calc. function block.	0.00 - 100.00%	



**SETUP PARAMETERS:
SPECIAL BLOCKS:
DIAMETER CALC.**



KEY	—>	Non-configurable	*	Filtered Tag
	- ->	Configurable	D:nn	Dagnostic #

Figure M.1 - Diameter Calculator



TAPER CALC.

TAPER CALC. uses two inputs, tension setpoint and taper setpoint, to create the tension demand. The operator usually controls these setpoints.

NOTE. This block is ignored by the drive unless SYSTEM:: CONFIGURE I/O:: BLOCK DIAGRAM:: TAPER is connected to a non-zero tag.

Taper is a common requirement for winders. It reduces the tension as the roll diameter increases. A profiler adjusts the tension using the equation:

$$(100\% - \text{TAPER} \times (1 - \text{MIN DIAMETER} \div \text{DIAMETER}))$$

to yield a hyperbolic taper output. MIN DIAMETER and DIAMETER are linked internally to DIAMETER CALC. The profile is displayed in Figure M.2.

The result is multiplied by TENSION SPT to get TAPER DEMAND. When the taper setpoint is at 100 percent the motor produces constant torque, that is a constant current from core to full roll, and the tension falls off as the roll builds.

TENSION TRIM allows the tension demand to be adjusted for example when using closed loop trim. The result is TOT. TENS. DEMAND.

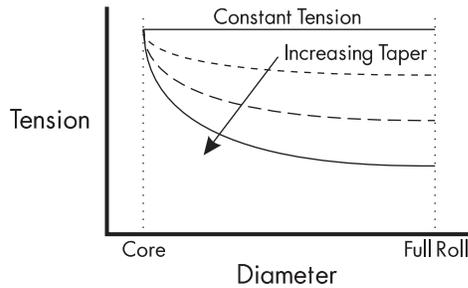
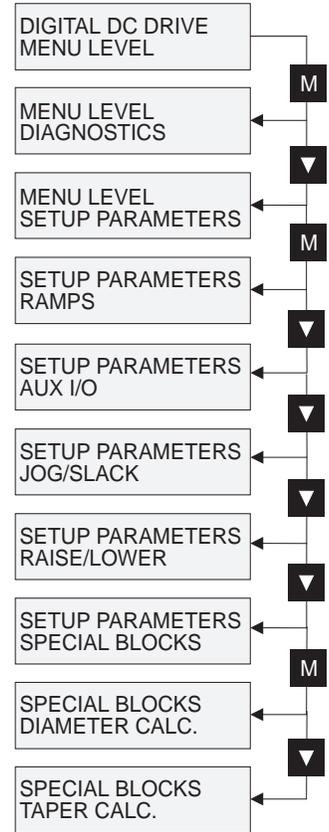
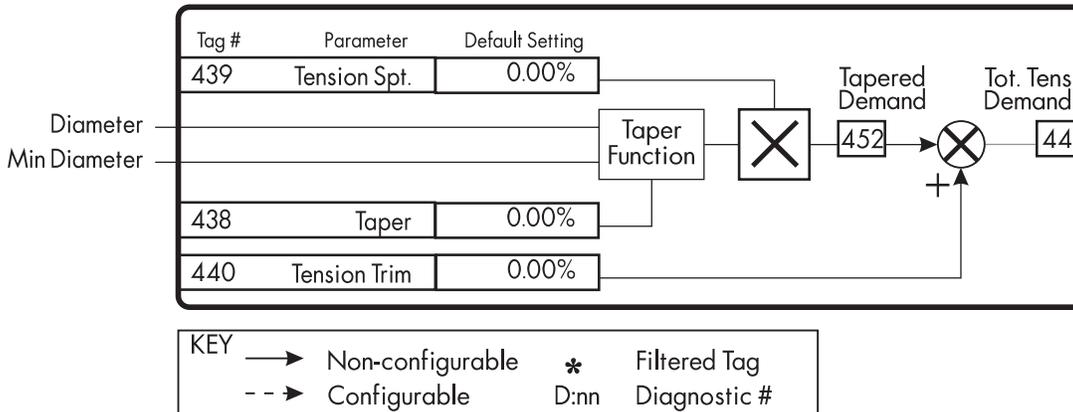


Figure M.2 - Taper Profile



Tag	Parameter	Description	Range	Default
438	Taper	Taper setpoint input for determining the amount of taper in the tension demand.	±100.00%	0.00%
439	Tension Spt.	Tension setpoint input.	0.00 - 100.00%	0.00%
452	Taper Demand	Tension demand before adding Tension Trim.	0.00 - 100.00%	
440	Tension Trim	Tension Trim input.	±100.00%	0.00%
441	Tot. Tens. Demand	Output of the Taper Calc. function block.	±100.00%	

SETUP PARAMETERS: SPECIAL BLOCKS: TAPER CALC.



KEY	—>	Non-configurable	* Filtered Tag
	-->	Configurable	D:nn Diagnostic #

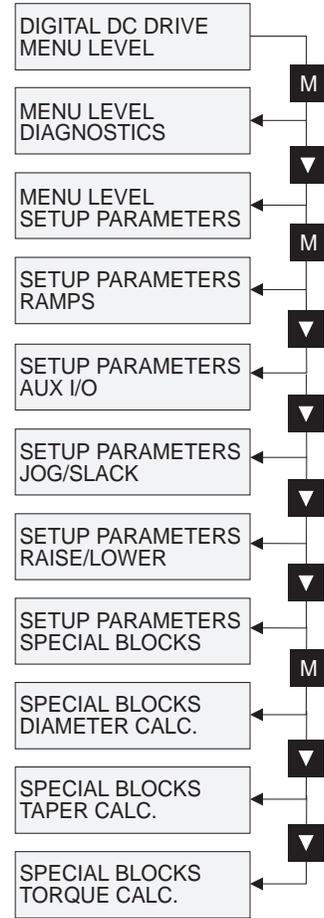
Figure M.3 - Tension Demand



TORQUE CALC.

This block performs two functions. First, it switches the drive from speed mode to tension mode using the TENSION ENABLE switch. Second, it switches the current limits as required for over or under winding. When TENSION ENABLE is ENABLED, one current clamp (chosen by OVER WIND) uses the TENSION DEMAND signal and the other uses the default value.

NOTE. This block is ignored by the drive unless SYSTEM:: CONFIGURE I/O:: BLOCK DIAGRAM:: POS. I CLAMP and NEG. I CLAMP is connected to a non-zero tag.



Tag	Parameter	Description	Range	Default
432	Torque Demand	Torque Calc. block input signal.	±100.00%	0.00%
433	Tension Enable	When enabled, connects the Torque Demand input to the current limit clamps.	Enabled/Disabled	Enabled
434	Over Wind	Reverses the sign of the output clamps for over/under winding.	Enabled/Disabled	Enabled

SETUP PARAMETERS: SPECIAL BLOCKS: TORQUE CALC.

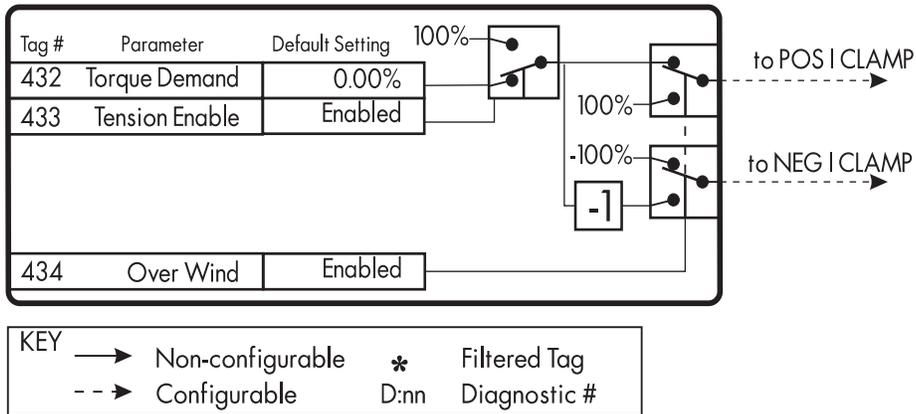


Figure M.4 - Torque Calculator

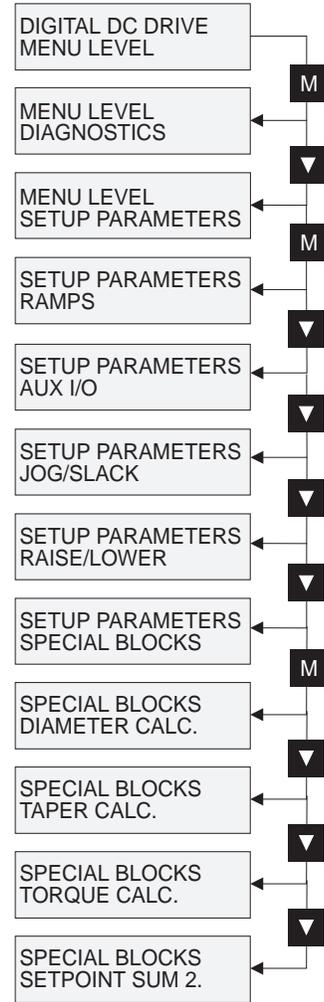


SETPOINT SUM 2

SETPOINT SUM 2 allows two scalable inputs and one unscalable input to be combined. These are used for friction compensations in CPW and basic summing for SPW.

Inputs 0 and 1 can be scaled individually using their respective ratio and divider parameters. LIMIT sets symmetrical clamps for inputs 0 and 1 and the final output.

NOTE. This block is ignored by the drive unless SYSTEM::CONFIGURE I/O::BLOCK DIAGRAM::SETPOINT SUM 2 is connected to a non-zero tag.



Tag	Parameter	Description	Range	Default
445	Input 2	Unscaled input.	±300.00%	0.00%
443	Input 1	Scaled input.	±300.00%	0.00%
444	Input 0	Scaled input.	±300.00%	0.00%
446	Ratio 1	Multiplier term for Input 1.	±3.0000	1.0000
447	Ratio 0	Multiplier term for Input 0.	±3.0000	1.0000
466	Divider 1	Divider term for Input 1.	±3.0000	1.0000
448	Divider 0	Divider term for Input 0.	±3.0000	1.0000
449	Limit	Symmetrical limit for Inputs 0 and 1 as well as the Setpoint Sum 2 block output.	0.00 - 200.00%	100.00%
451	Spt. Sum Output	Output of the Setpoint Sum 2 block.	±200.00%	



**SETUP PARAMETERS:
SPECIAL BLOCKS:
SETPOINT SUM 2**

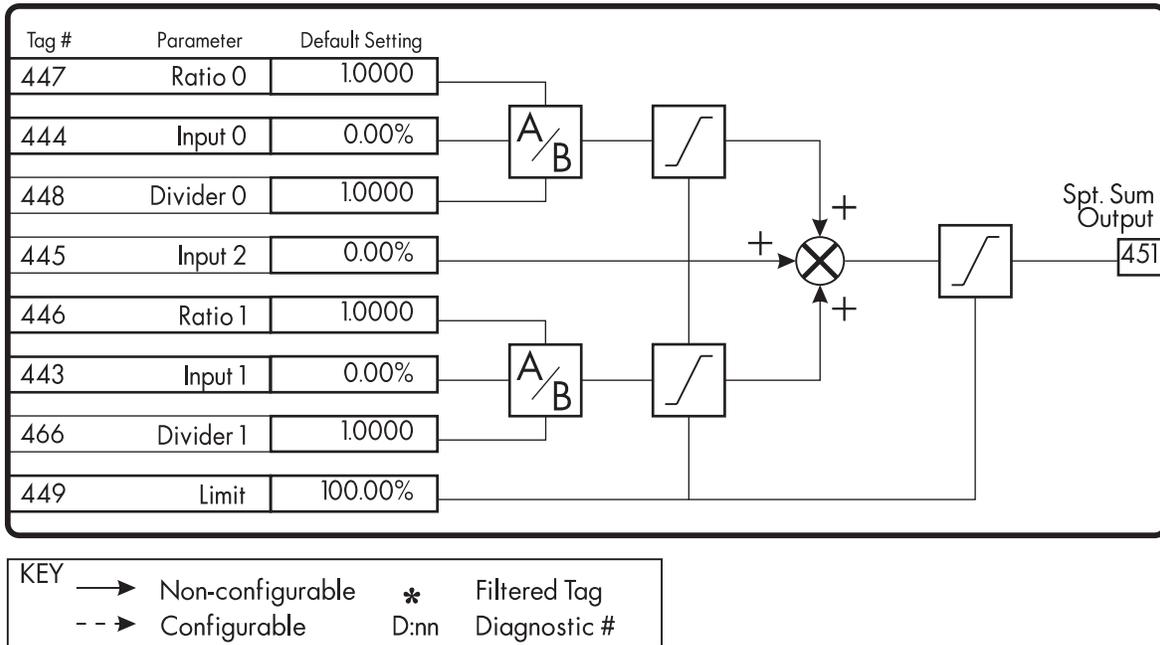


Figure M.5- Setpoint Sum 2



PID

The PID block executes a Proportional + Integral + Derivative control algorithm with an added filter to attenuate high-frequency noise. P, PD, PI, or PID can be selected as required. The algorithm modifies the error between the setpoint and the feedback with the proportional, integral, and derivative terms. The error is clamped internally to ± 105 percent maximum.

NOTE. This block is ignored by the drive unless SYSTEM:: CONFIG-URE I/O:: BLOCK DIAGRAM:: PID is connected to a non-zero tag.

The proportional, integral, and derivative terms are scaled by the PROP. GAIN, INT. TIME CONST., and DERIVATIVE TC, respectively. An additional gain profiler can modify the proportional gain as the roll diameter changes. Figure M.8 shows how the proportional gain changes when using the profiler.

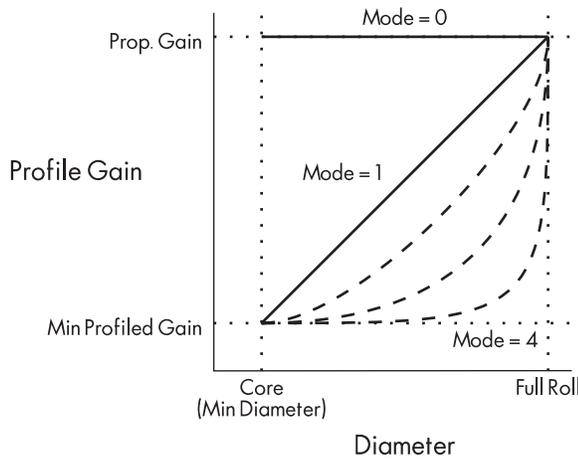
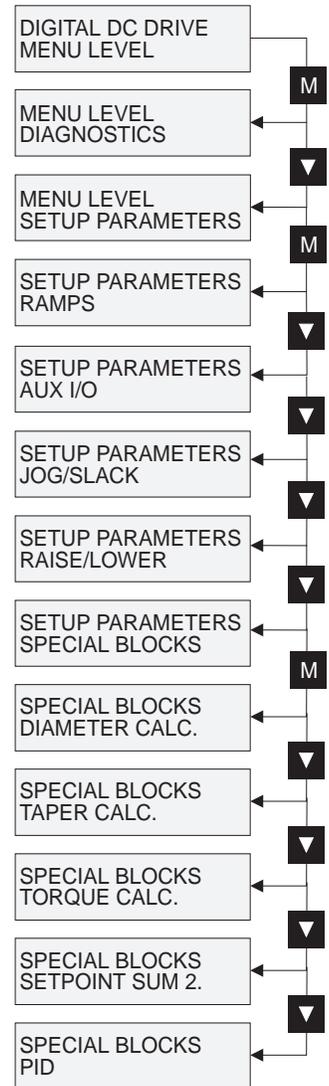


Figure M.6 - Gain Profiler

Proportional gain scales the output based upon the input error. Increasing PROP. GAIN will improve the response time while increasing overshoot. MODE selects the proportional gain profile. When set to 0, the proportional gain remains constant over the entire roll. Changing the value of MODE increases the profile as shown in Figure M.8. PROP. GAIN and MIN PROFILE GAIN set the maximum and minimum gains over the range of diameters as the roll builds.

Integral eliminates steady-state error. Reducing INT. TIME CONST. improves response; however, if it is set too short, it will cause instability. The integral value is clamped internally by the settings of POSITIVE LIMIT and NEGATIVE LIMIT. It is also held at the last value when the PID CLAMPED output is TRUE. Setting INTEGRAL DEFEAT to ON will disable the integral gain term.

Tag	Parameter	Description	Range	Default
410	Input 1	PID setpoint input.	$\pm 300.00\%$	0.00%
412	Ratio 1	Multiplier term for Input 1.	± 3.0000	1.0000
418	Divider 1	Divider term for Input 1.	± 3.0000	1.0000
411	Input 2	PID feedback input.	$\pm 300.00\%$	0.00%
413	Ratio 2	Multiplier term for Input 2.	± 3.0000	1.0000
414	Divider 2	Divider term for Input 2.	± 3.0000	1.0000
409	Integral Defeat	When On the integral term is disabled.	Off/On	Off
408	Enable	Enables or disables the PID output.	Disabled/Enabled	Enabled
417	PID Output	Output of the PID block.	$\pm 315.00\%$	
415	PID Error	The difference between Input 1 and Input 2.	$\pm 105.00\%$	
416	PID Clamped	Signals that one of the PID limits has been reached.	False/True	
404	Prop. Gain	Maximum limit of the proportional gain.	0.0 - 100.0	1.0



**SETUP PARAMETERS:
SPECIAL BLOCKS:
PID**

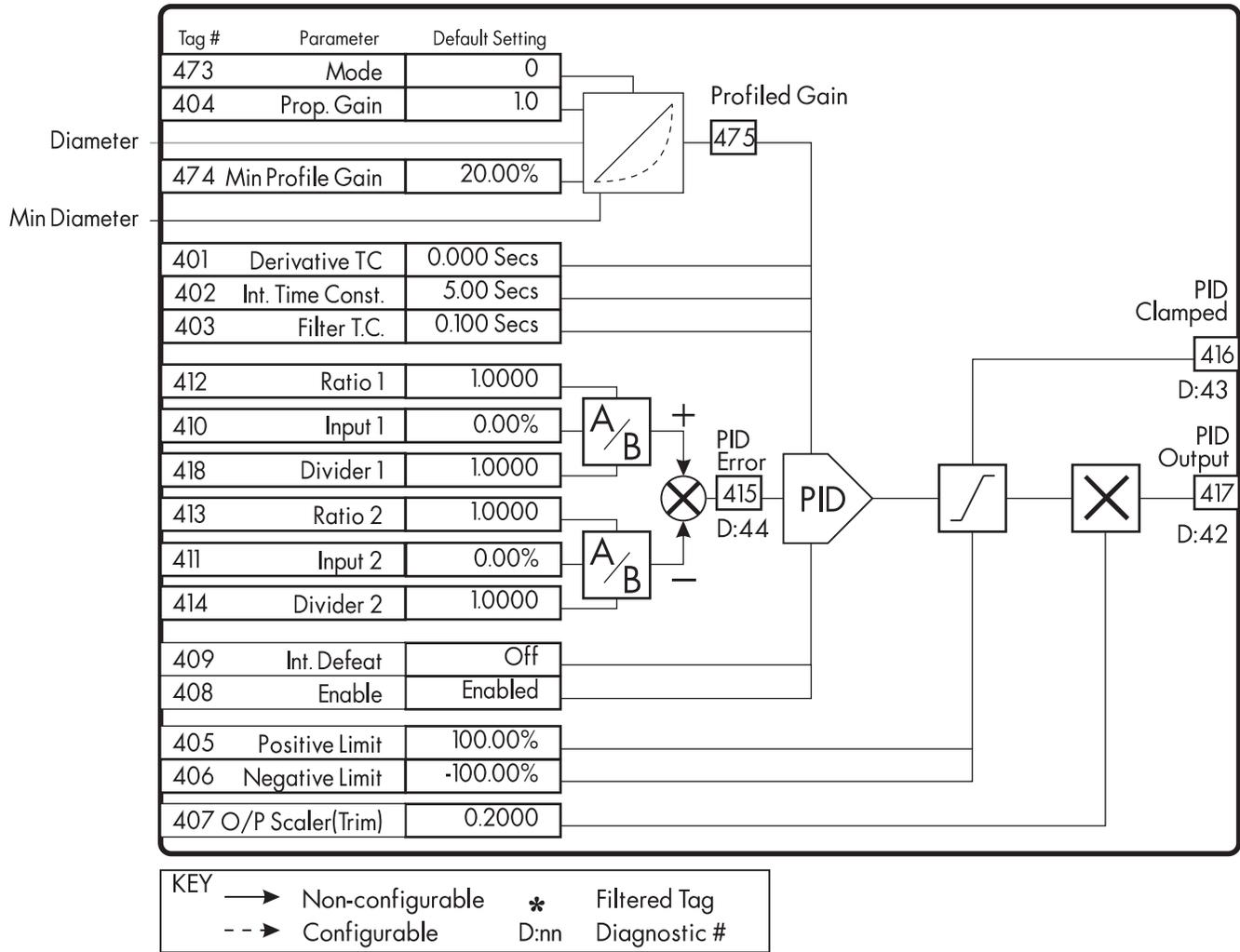


Figure M.7- Setpoint Sum 2

Tag	Parameter	Description	Range	Default
475	Profiled Gain	The proportional gain after profiling. If Mode = 0, then Profiled Gain equals Prop. Gain.	0.0 - 100.0	
473	Mode	Determines the shape of the proportional gain profile. The higher the setting, the steeper the curve of the profiled gain.	0 - 4	0
474	Min Profile Gain	The minimum gain of the proportional gain profiler when Mode is greater than 0.	0.00 - 100.00%	20.00%
402	Int. Time Const.	Integral time constant value.	0.01 - 100.00 Secs	5.00 Secs
401	Derivative TC	Derivative time constant value. When set to 0.000, the derivative term is removed.	0.00 - 10.000 Secs	0.000 Secs
403	Filter T.C.	A first-order filter for removing high frequency noise from the PID output. When set to 0.00, the filter is removed.	0.00 - 10.000 Secs	0.100 Secs
405	Positive Limit	Positive limit of the PID output.	0.00 - 105.00%	+100.00%
406	Negative Limit	Negative limit of the PID output.	-105.00 - 0.00%	-100.00%
407	Output Scaler (Trim)	Sets the percentage of PID output to be used as trim.	±3.0000	0.2000



Derivative gain instantaneously boosts the PID output signal. Increasing DERIVATIVE TC decreases the damping which causes overshoot and oscillations in most cases resulting in an unacceptable system response.

NOTE. For most applications, derivative gain is never used and is usually left at its default value of 0.000 seconds.

Derivative gain can improve response in some dancer tension controlled systems, particularly those systems with high inertia dancers which need an instantaneous response to overcome the weight of the dancer roll. For loadcell controlled tension systems, derivative gain is almost *never* used.

Figure M.6 shows the types of system responses possible. In underdamped systems, the output oscillates and the settling time increases. Critically damped systems have no overshoot or oscillations. They reach the setpoint within the desired response time. Overdamped systems do not oscillate but do not reach the setpoint within the desired response time.

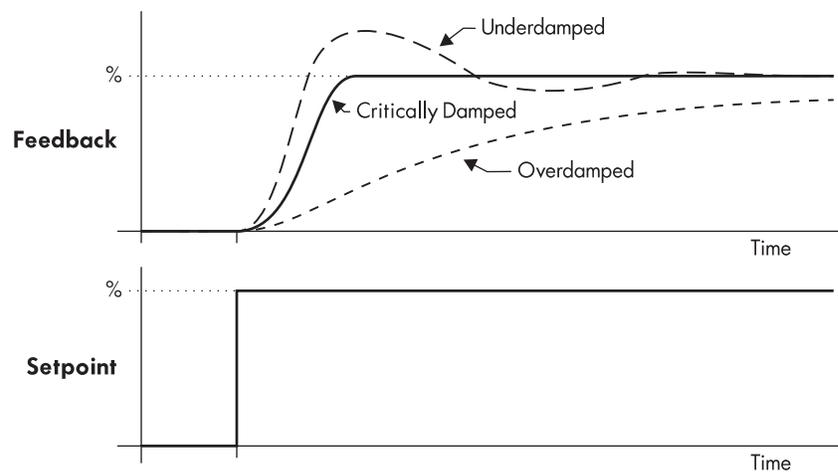


Figure M.8 - System Response to a Step-function Input

FILTER T.C. is a first-order filter used to attenuate high-frequency noise. Increasing its value reduces the affect of high-frequency feedback changes.

PID ENABLE, when DISABLED, sets the proportional, integral, and derivative terms to zero, yielding a zero output. This is used when a turret winder is in speed mode during a roll change, for example.

O/P SCALER (TRIM) scales the PID output to produce the speed trim. It sets the amount of overspeed the PID trim produces and the polarity of the trim. The polarity should be positive when the feedback devices are upstream of the drive and negative when downstream of the drive.

The trim range value depends on the nature of the web. It needs to be greater for an extensible web than for a non-extensible web. In addition, the extensible web will require a higher control loop gain which comes with the greater trim range. If required, trim ranges for two different types of web can be selected by configuring an unused digital input to set two different values of trim range (see Extensible/Non-extensible Webs on page M-37).

Operators can read the PID error, PID output, setpoint, and feedback in the drive's MMI by monitoring the following values.

1. PID ERROR is displayed in DIAGNOSTICS::PID ERROR.
2. PID OUTPUT is displayed in DIAGNOSTICS::PID OUTPUT.
3. The setpoint is monitored at SETUP PARAMETERS::SPECIAL BLOCKS::PID::INPUT 1.
4. The feedback is monitored at SETUP PARAMETERS::SPECIAL BLOCKS::PID::INPUT 2.

APPLICATION NOTES

The following sections contain sample configurations using the SPECIAL BLOCKS functionality. They also have operating suggestions for using 590SP features.

NOTE. To use these configurations, the drive must be provided with firmware version 3.X or later.

Each section contains a simplified block diagram showing the configuration's connections. The user must make those connections before the control options will function. These configurations are available from Eurotherm Drives on disk as an ASCII file for uploading to the drive.

NOTE. The following configurations are samples. Users can customize them for their applications or use the SPECIAL BLOCKS functionality as needed.

WARNING

The control terminals of the drive are fully isolated from all power circuits and should not be connected to other non-isolated circuits. In the interests of safety and to minimize electrical noise, it is recommended that the drive 0 volts common terminal be connected to ground either directly at the drive or at one point in the system.

590 Terminal Designations

Figure M.9 lists the types and functions of the 590SP series DC motor controller terminals when using Current Programmed Winder, Speed Programmed Winder, or Section Control configurations described later in this chapter.

Drive Terminal	Software Reference	Current Programmed Winder Function	Sp V
A2	Analog Input 1	Preset Diameter	Prese
A3	Analog Input 2	Not Connected	Tensi
A4	Analog Input 3	Line Speed Reference	Line S
A5	Analog Input 4	Tension Setpoint	Tensi
A6	Analog Input 5	Taper Setpoint	Tape
A7	Analog Output 1	Reel Speed Output	Danc
A8	Analog Output 2	Diameter Output	Diam
C4	Jog	Tension Enable	Jog
C6	Digital Input 1	Overwind	Over
C7	Digital Input 2	Preset Enable	Prese
C8	Digital Input 3	Not Connected	Tensi

Figure M.9 - Terminal Functions

OPEN-LOOP WINDER (CPW)

This configuration provides standard features used in center winder applications including: diameter calculation with memory and preset, tension and taper, loss compensation, and over/under winding. It can control unwinds or rewinds for single-spindle and turret winders. The configuration uses four function blocks in the SPECIAL BLOCKS menu; DIAMETER CALC., TAPER CALC., TORQUE CALC., and SETPOINT SUM 2.

NOTE. This configuration does not support field weakening. A configuration containing field range compensation is available. Call Eurotherm Drives Customer Support at (703) 471-4565 for detailed instructions using this option.

A current programmed winder, CPW, provides constant tension center winder control by programming the motor armature current. The tension control is open-loop, that is, it does not use a dancer or loadcell feedback signal. The drive maintains constant tension by controlling the motor torque. It keeps the torque proportional to the tension demand and compensates for changing roll diameter with additional compensation for frictional losses.

NOTE. For accurate tension control, frictional losses must be small (and repeatable) compared to the torque required to provide web tension.

Description

Figures M.11 and M.13 show typical winder and unwind applications. The diameter is reset before starting a new roll by using terminal A2, EXTERNAL DIAMETER PRESET, for the diameter setting and C7, PRESET ENABLE, to select the preset diameter. The drive starts when terminal C3, RUN, is set ON. Setting terminal C4 to ON selects tension mode. Once the line gets above a minimum speed the diameter calculator begins calculating the roll diameter.

NOTE. This configuration has disabled the JOG function, normally operated by terminal C4. Other configurations can retain the JOG function.

In tension mode, an overspeed (underspeed for unwinds) is added to saturate the speed loop because the web holds the winder at line speed. With the speed loop saturated, the drive is current limited by the torque demand. If the web breaks, the winder increases to the speed loop limits, preventing a runaway.

Terminal C6, OVERWIND, changes the polarity of the torque demand and overspeed for overwinding or underwinding.

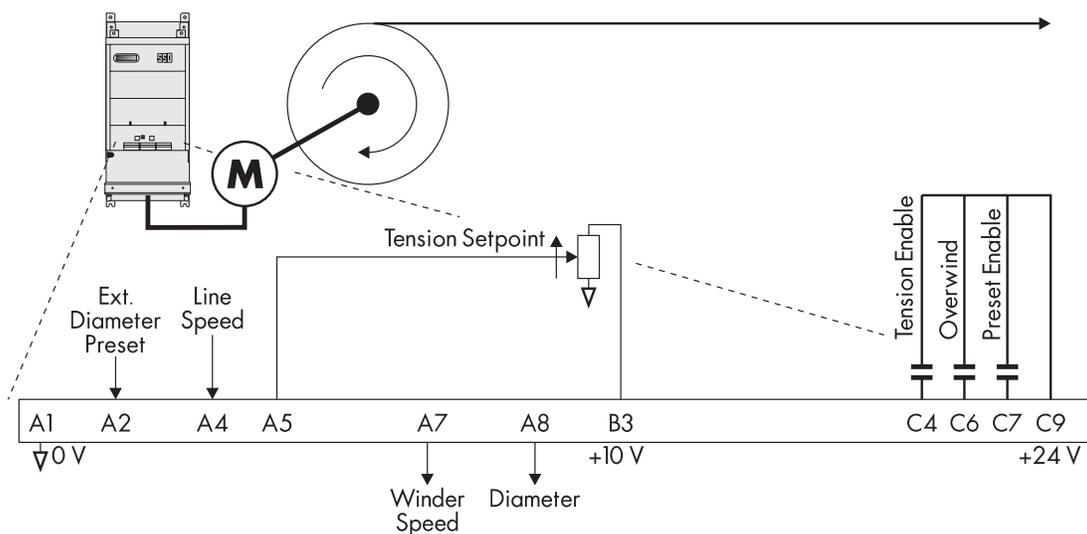


Figure M.10 - Unwind Application

TAPER CALC. uses signals from terminals A5, TENSION SETPOINT, and A6, TAPER SETPOINT, to produce the tension demand. SETPOINT SUM 2 multiplies the tension demand by diameter to produce the torque demand. The torque demand is then combined with compensations for frictional losses to produce the final torque used to control the motor. Taper is generally used only on winders to reduce telescoping and produce an even wind as the roll builds.

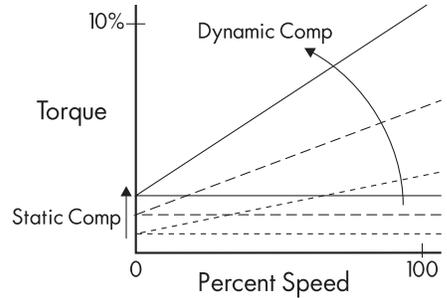


Figure M.11 - Friction Loss Compensation

Loss compensations have static and dynamic components. The static part is a fixed value for overcoming static loss or stiction. The dynamic part is proportional to speed. It compensates for the dynamic loss or windage. Figure M.11 shows the static and dynamic compensations. The combined losses increase torque demand in rewinds and decrease it in unwinds.

TORQUE CALC. uses the torque demand from SETPOINT SUM 2 to control the current limits. It controls the positive or negative current limits depending on the selection of overwinding or underwinding. The current limit is only controlled by the torque demand when C4 is ON, otherwise the current limit is at the normal maximum value for speed mode.

Turret Winder Applications

Turret winders use two spindles to transfer the web from one spindle to the other without stopping the line. Each spindle requires its own drive. An unwind splices from the emptying roll to a new, full roll. A rewind transfers the web from the full roll to a new core.

To achieve this, the winders must operate in two modes, speed mode and tension mode. Speed mode is required to match the surface speed of the new core or new, full roll to the line speed for the splice. Tension mode is required after the splice or transfer.

Before starting in speed mode, the operator sets the diameter to core for a rewind or to the diameter of the new roll for an unwind by inputting the correct value in terminal A2, EXTERNAL DIAMETER PRESET. Setting C7, PRESET ENABLE, to ON keeps the diameter at the preset diameter until the transfer is completed.

Then the spindle is started using terminal C3, RUN. The drive ramps up to the correct speed so the roll's surface speed matches the line speed. The splice or transfer can occur at that point. When the web is transferred to the new roll or core, tension mode is enabled by setting terminal C4 to ON and the old roll is stopped. At this point, C7 is set OFF to allow the diameter calculator to calculate the correct diameter. The new roll continues in tension mode until the next roll change.

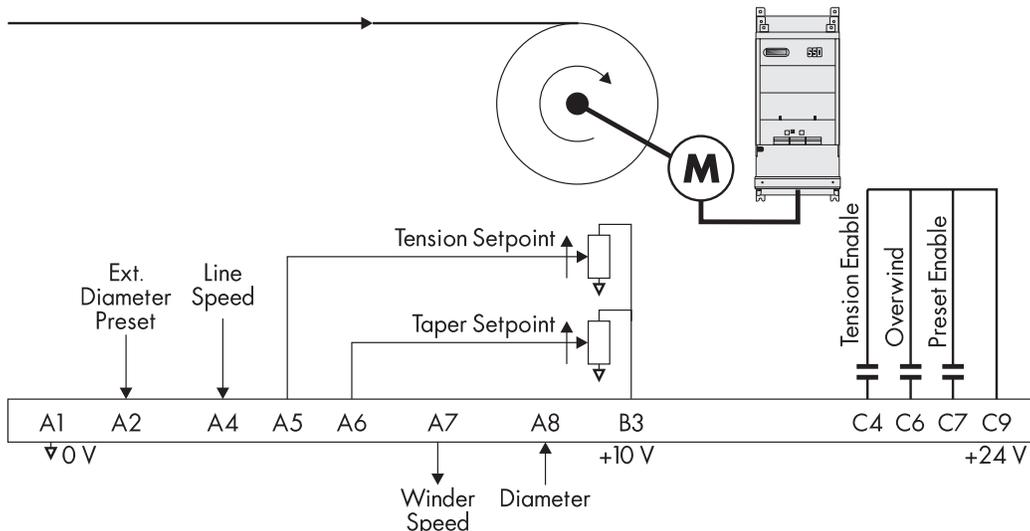


Figure M.12 - Rewind Application



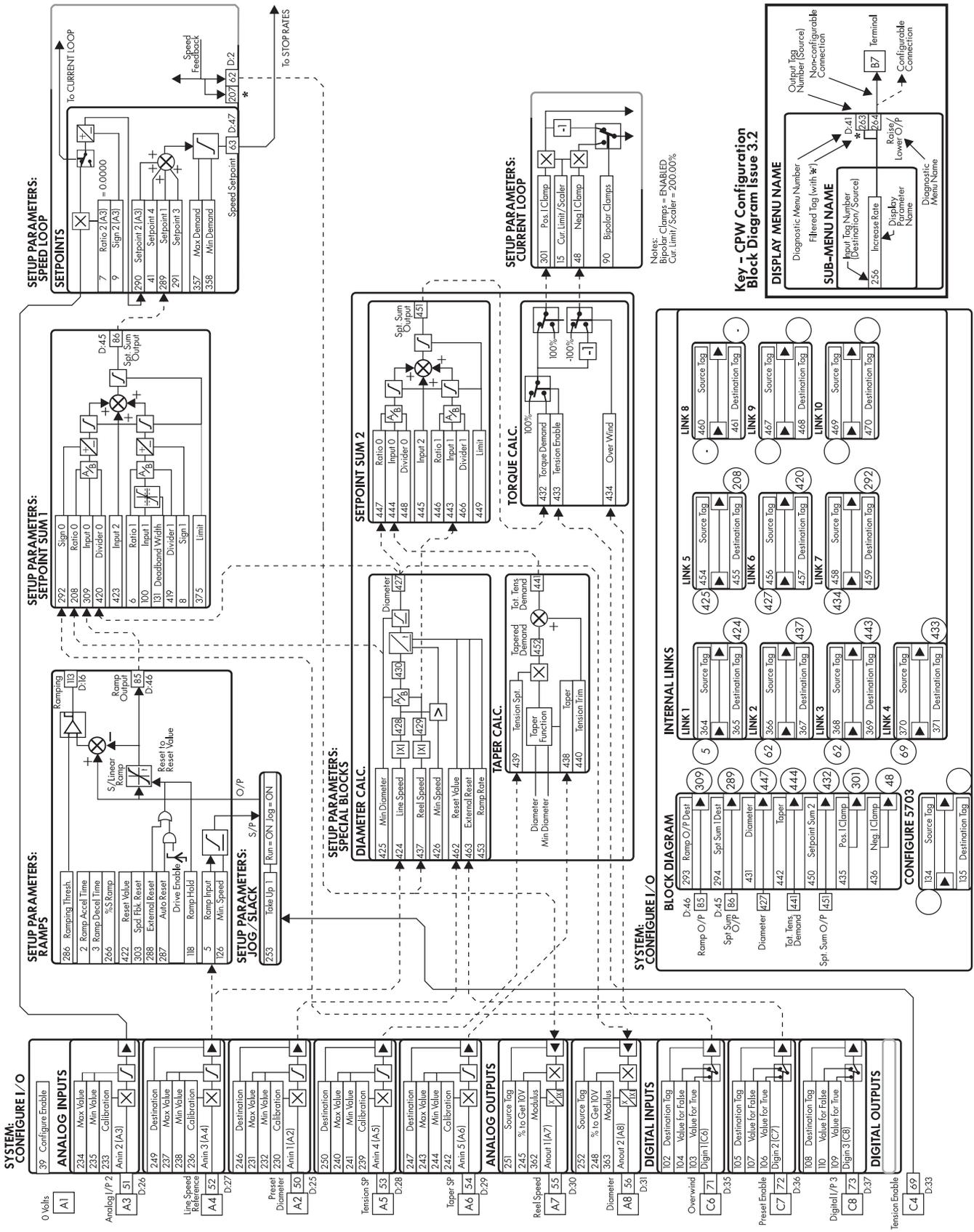


Figure M.13 - CPW Configuration Block Diagram

Installation

These parameters are located in the SYSTEM::CONFIGURE I/O menu.

Block Diagram Parameters

Parameter Name	Tag	Description
RAMP O/P DEST	= 309	SETPOINT SUM 1::INPUT 0
DIAMETER	= 447	SETPOINT SUM 2::RATIO 0
TAPER	= 444	SETPOINT SUM 2::INPUT 0
SETPOINT SUM 2	= 432	TORQUE CALC.::TORQUE DEMAND
POS. I CLAMP	= 301	CURRENT LOOP::POS. I CLAMP
NEG. I CLAMP	= 48	CURRENT LOOP::NEG. I CLAMP

Internal Links

LINK 1:: SOURCE TAG	= 5	RAMPS::RAMP INPUT
DESTINATION TAG	= 424	DIAMETER::LINE SPEED
LINK 2:: SOURCE TAG	= 62	Speed Feedback Unfiltered
DESTINATION TAG	= 437	DIAMETER CALC.::REEL SPEED
LINK 3:: SOURCE TAG	= 429	Modulus of Reel Speed
DESTINATION TAG	= 443	SETPOINT SUM 2::INPUT 1
LINK 4:: SOURCE TAG	= 69	Jog Input
DESTINATION TAG	= 433	TORQUE CALC.::TENSION ENABLE
LINK 5:: SOURCE TAG	= 425	DIAMETER CALC.::MIN DIAMETER
DESTINATION TAG	= 208	SETPOINT SUM 1::RATIO 0
LINK 6:: SOURCE TAG	= 427	DIAMETER CALC.::DIAMETER
DESTINATION TAG	= 420	SETPOINT SUM 1::DIVIDER 0
LINK 7:: SOURCE TAG	= 434	TORQUE CALC.::OVER WIND
DESTINATION TAG	= 292	SETPOINT SUM 1::SIGN 0

Terminal I/O

ANIN 1:: DESTINATION TAG	= 462	DIAMETER CALC.::RESET VALUE
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NOTE. The analog input 1 connection is only required for applications using multiple core sizes.

ANIN 3:: DESTINATION TAG	= 5	RAMPS::RAMP INPUT
ANIN 4:: DESTINATION TAG	= 439	TAPER CALC.:: TENSION SPT.
ANIN 5:: DESTINATION TAG	= 438	TAPER CALC.:: TAPER
DIGIN 1::DESTINATION TAG	= 434	TORQUE CALC.::OVER WIND
DIGIN 2::DESTINATION TAG	= 463	DIAMETER CALC.::EXTERNAL RESET

Other Parameters

Set SETUP PARAMETERS::CURRENT LOOP::BIPOLAR CLAMPS to ENABLED.
 Set SETUP PARAMETERS::CURRENT LOOP::CURR. LIMIT/SCALER to 200%.
 Set SETUP PARAMETERS::SPEED LOOP::SETPOINTS::RATIO 2 (A3) to 0.0000.

Input Signal Descriptions

Diameter Preset

For a simple rewind, the only diameter preset required may be one core diameter. This diameter can be set directly by changing SETUP PARAMETERS::SPECIAL BLOCKS::DIAMETER CALC.::RESET VALUE. For this to work, terminal A2's DESTINATION TAG must be connected to a destination other than 462.

For an unwind or rewind using varying new core sizes or parent roll sizes, the diameter must be set for each roll. Configure terminal A2, EXTERNAL DIAMETER PRESET, to set RESET VALUE by setting analog input 1's DESTINATION TAG to 462. A 0 to +10 volt signal now provides the preset where +10 volts is the full or maximum roll diameter. That signal can be generated by an operator potentiometer, a Eurotherm Drives 5570 Ranger ultrasonic transducer (catalog number 311-LB), or other diameter input device.

Line Speed Reference

A line speed reference is required for the diameter calculator to work. It should be scaled to produce +10 volts at full speed and connected into terminal A4, LINE SPEED. If this signal comes from a source other than a Eurotherm Drives motor controller, it may need to be scaled and isolated. This signal is connected to parameter SETUP PARAMETERS:: SPECIAL BLOCKS:: DIAMETER CALC:: LINE SPEED. If type 5703 Peer-to-Peer Communications Modules are used, digital line speed signal may be substituted for the 0 - 10 volt analog signal.

Tension Setpoint

The tension setpoint of 0 to +10 volts is connected to terminal A5, TENSION SP. Typically this signal could come from a potentiometer supplied from the drive's +10 volt terminal, B3. This signal is connected to parameter SETUP PARAMETERS:: SPECIAL BLOCKS:: TAPER CALC:: TENSION SPT. If the serial communications option is installed, the tension setpoint could be generated by a PLC, supervisory computer, or 5721 operator station.

Taper Setpoint

A taper setpoint, if required, of 0 to +10 volts should be connected to A6, TAPER SETPOINT. The range of taper can be set by the MAX VALUE and MIN VALUE for the analog input in the CONFIGURE I/O menu. This signal is connected to parameter SETUP PARAMETERS:: SPECIAL BLOCKS:: TAPER CALC:: TAPER. If the serial communications option is installed, the taper setpoint could be generated by a PLC, supervisory computer, or 5721 operator station.

Tension Enable

Connecting 24 VDC to terminal C4 selects tension mode. When used with a run signal at terminal C3, C4 adds an overspeed, TAKE UP 1, to saturate the speed loop.

Overwind/Underwind

Digital input terminal C6, OVERWIND, selects the winding direction, ON for overwinding and OFF for underwinding. If only unidirectional winding is required, set the winding direction manually using parameter SETUP PARAMETERS:: SPECIAL BLOCKS:: OVER WIND. Remember to disconnect terminal C6 by changing its DESTINATION TAG to 0 in the CONFIGURE I/O menu.

Preset Enable

24 VDC at digital input terminal C7, PRESET ENABLE, selects the PRESET ENABLE. When ON, the diameter memory is preset to the diameter preset input value or minimum diameter as described earlier.

For a simple rewind, an operator can use a pushbutton to reset to core when the full roll is removed and a new roll is started. For an unwind, the operator presets the new roll diameter using either a potentiometer, a 5570 Ranger ultrasonic transducer, or some other diameter input device.

Current Limit

CUR. LIMIT/SCALER is set to 200 percent. Set MAIN CURR. LIMIT to suit the application, normally 120 percent.

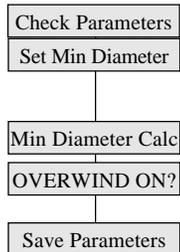
Startup Procedure

The following procedures describe the steps for starting up CPW winders.

Speed Mode

Initial Setup

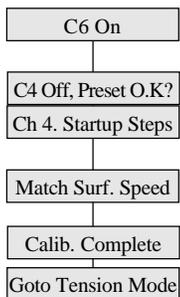
These steps customize the drive for the calibration phase.



1. Check that all parameters are set to the default values described in the installation section.
2. Set MIN DIAMETER to the core as a percentage of full roll. If there is more than one core size, it should be set to the smallest, for example, if the smallest core is 3.5 inches and the maximum full roll is 42 inches then MIN DIAMETER is:
$$3.5 / 42 * 100 = 8.33 \text{ percent}$$
3. Set OVERWIND to ON by connecting +24 volts to terminal C6 (or via the MMI if C6 is being used for some other function).
4. Save the parameters.

Calibration

This section calibrates the drive in speed mode.



1. Connect 24 VDC to terminal C7, DIAMETER PRESET ENABLE, to force the diameter hold to stay on (this is for initial calibration only).
2. Ensure C4 is OFF (tension mode) and monitor SPECIAL BLOCKS:: DIAMETER CALC:: DIAMETER to see that the diameter is preset to core. If the diameter does not equal the minimum diameter, momentarily jumper +24 volts to C7, DIAMETER PRESET ENABLE.
3. Start up the drive as described in Chapter 4, that is, AUTOTUNE the current loop, optimize the speed loop, etc. Use terminal A4, LINE SPEED REFERENCE, as the speed demand input.
4. Load an empty core into the winder and match the core surface speed to the line speed using the 590 encoder or tachometer calibration as appropriate.

At this point the drive and winder should be functioning correctly in speed control. When starting up turret winders, repeat the above procedure for the second spindle.

Tension Mode

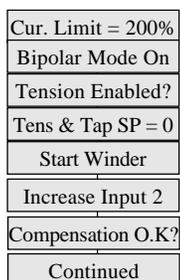
The winder is calibrated in two phases; first, the static losses are determined and, second, the dynamic losses.

WARNING

Some of the following procedures require manually turning or stopping the spindles. Any suggestions of turning or stopping the winder spindle by hand while the motor is energized should only be performed by experienced personnel who are capable of evaluating the potential hazards and who are totally satisfied that the procedure is safe.

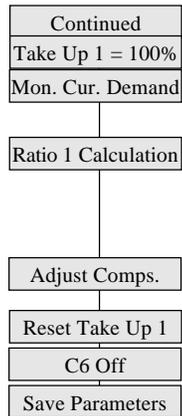
NOTE. Unwind applications require loss compensations to be negative.

Static Losses



1. Verify that CUR. LIMIT/SCALER is set to 200 percent and BIPOLAR MODE is ENABLED.
2. Set tension enable, C4, to ON.
3. Set TENSION SETPOINT, A5, and TAPER SETPOINT, A6, to zero.
4. Start the winder with the tension enabled by connecting +24 volts into terminal C3, RUN. The winder should not turn because there is no tension demand and, as yet, no compensations.
5. Slowly increase SETUP PARAMETERS::SPECIAL BLOCKS::SETPOINT SUM 2::INPUT 2 (static compensation) until the spindle turns and then reduce it gradually until it just stops turning. Now the motor should have nearly enough current to make the spindle break away. It should be possible to start and stop the spindle by hand with very little effort.

Dynamic Losses

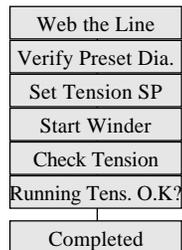


- Set JOG/SLACK::TAKE UP 1 to 100 percent and increase the tension setpoint signal. The spindle should run up to full speed.
- Reduce the tension setpoint signal to 0.00% and monitor DIAGNOSTICS:: CURRENT DEMAND. Set SETPOINT SUM 2:: RATIO 1 (dynamic compensation) using the formula:

$$\text{RATIO 1} = ((\text{CURRENT DEMAND} \div 2) - \text{SETPOINT SUM 2::INPUT 2}) \times 100$$
 Now the motor should have just enough current to keep the spindle running. If the friction is increased slightly using light pressure on the shaft, it should be possible to reduce the speed and the spindle should maintain the reduced speed after removing the pressure. Check the loss compensation throughout the speed range. If the speed changes at high speeds, adjust RATIO 1; if the speed changes at low speeds, adjust INPUT 2 until they are optimized.
- Reset JOG/SLACK:: TAKE UP 1 to 10 percent.
- Set EXTERNAL PRESET ENABLE, C6, to OFF.
- Save the parameters.

Unwind

After completing the initial start-up, verify the unwind is accurately tuned for all diameters and speeds by using the following procedure.



- Web the line from the full roll.
- Verify the diameter is preset to full roll.
- Set TENSION SETPOINT to a suitable value for the web material.
- Start the unwind.
- Check the tension at standstill.
- Start the line and check the running tension. As the roll builds down, verify the diameter calculator output is operating correctly. The line must be running above MIN SPEED for the diameter calculator to operate.

Rewind

After completing the initial start-up, verify the rewind is accurately tuned for all diameters and speeds by using the following procedure.



- Fit an empty core.
- Web the line and transfer onto the winder core.
- Verify the diameter is preset to core.
- Set TENSION SETPOINT and TAPER SETPOINT to suitable values for the web material.
- Start the rewind.
- Check the tension at standstill
- Start the line and check the running tension. As the roll builds up, verify the diameter calculator output is operating correctly. The line must be running above MIN SPEED for the diameter calculator to operate.

CLOSED-LOOP SPEED PROGRAMMED WINDER (SPW)

A speed programmed winder, SPW, provides closed-loop center winder control. It programs the motor speed using either loadcell or dancer feedback for tension control.

This configuration provides standard features used in center winder applications including: diameter calculation with memory and preset, tension and taper, PID for loadcell tension or dancer position control, and over/under winding. It can control unwinds or rewinds for single-spindle and turret winders. The configuration uses four function blocks in the SPECIAL BLOCKS; DIAMETER CALC., TAPER CALC., SETPOINT SUM 2, and PID.

Description

Figures M.15 and M.16 show typical SPW applications. SPW applications use closed-loop trim to modify the winder speed. Line speed is conditioned in RAMPS before being combined with the tension trim in SETPOINT SUM 2. The result, SPT. SUM OUTPUT, is scaled by DIAMETER and MIN DIAMETER in SETPOINT SUM 1 to produce the speed demand.

TAPER CALC.:: TOT. TENS DEMAND uses inputs to terminals A5, TENSION SETPOINT, and A6, TAPER SETPOINT, to produce a diameter compensated tension demand. It produces either the tension setpoint for loadcell applications or dancer loading signal for dancer applications. TAPER SETPOINT is not used in unwind applications.

Terminal C6, OVERWIND, switches the speed demand sign for overwinding or underwinding. The winder can change directions by changing the LINE SPEED signal at terminal A4 to the opposite sign.

Loadcell Applications

In loadcell applications, the controller attempts to keep the tension at the loadcell constant by varying the winder speed. The setting at terminal A5, TENSION SETPOINT, sets the desired loadcell tension. In TAPER CALC., the tension setpoint is compensated for diameter and taper. The output, TOT. TENS DEMAND, is the PID setpoint signal at PID:: INPUT 1.

PID compares the setpoint, PID:: INPUT 1, with TENSION FEEDBACK from terminal A3. The output, PID OUTPUT, is the tension loop trim used in SETPOINT SUM 2.

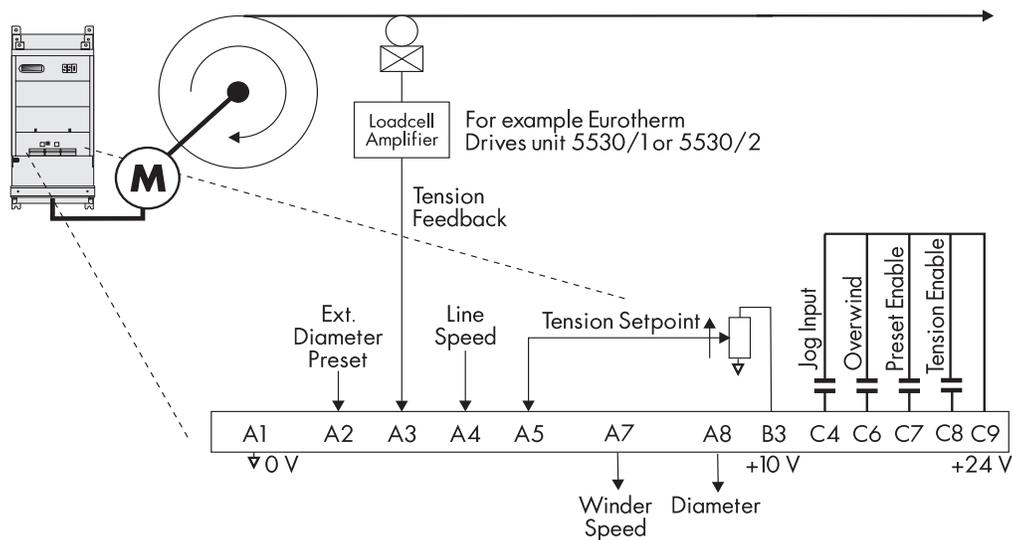


Figure M.14 - Unwind SPW Application with Loadcell Feedback



Dancer Position Applications

In dancer position applications, the controller attempts to keep the dancer stationary by varying the winder speed. TAPER CALC. uses signals from terminals A5, TENSION SETPOINT, and A6, TAPER SETPOINT, to produce the dancer loading. Dancer loading affects web tension by setting the force the dancer exerts on the web.

The PID setpoint, PID:: INPUT 1, is a fixed value set in the MMI representing the desired position of the dancer. The user must remove the connection to PID:: INPUT 1 to manually set the dancer position. PID compares PID:: INPUT 1 with the actual dancer position, TENSION FEEDBACK at terminal A3. The output, PID OUTPUT, is the position loop trim used in SETPOINT SUM 2.

Turret Winder Applications

Turret winders use two spindles to transfer the web from one spindle to the other without stopping the line. Each spindle requires its own drive. An unwind splices from the emptying roll to a new, full roll. A rewind transfers the web from the full roll to a new core.

To achieve this, the winders must operate in two modes, speed mode and tension mode. Speed mode is required to match the surface speed of the new core or new, full roll to the line speed for the splice. Tension mode is required after the splice or transfer.

Before starting in speed mode, the operator sets the diameter to core for a rewind or to the diameter of the new roll for an unwind by inputting the correct value in terminal A2, EXTERNAL DIAMETER PRESET. Setting C7, PRESET ENABLE, to ON keeps the diameter at the preset diameter until the transfer is completed.

Then the spindle is started using terminal C3, RUN. The drive ramps up to the correct speed so the roll's surface speed matches the line speed. The splice or transfer can occur at that point. When the web is transferred to the new roll or core, tension mode is enabled by setting terminal C8, TENSION ENABLE, to ON and the old roll is stopped. At this point, C7 is set OFF to allow the diameter calculator to calculate the correct diameter. The new roll continues in tension mode until the next roll change.

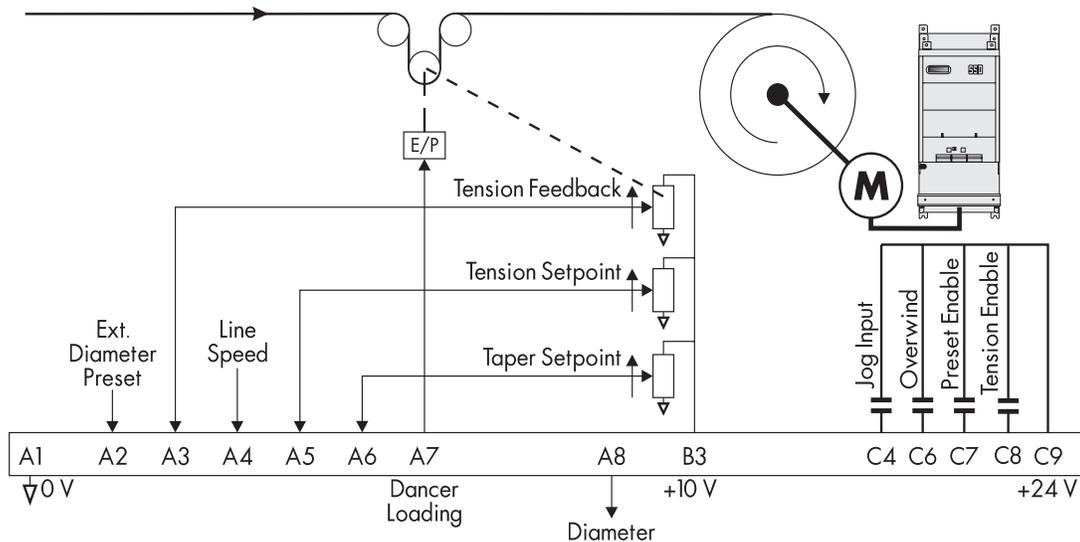


Figure M.15 - Rewind SPW Application with Dancer Position Feedback

Installation

These parameters are located in the SYSTEM::CONFIGURE I/O menu.

Block Diagram Parameters

Parameter Name	Tag	Description
RAMP O/P DEST	= 444	SETPOINT SUM 2::INPUT 0
SPT SUM 1 DEST	= 289	SPEED LOOP::SETPOINT 1
PID O/P DEST	= 443	SETPOINT SUM 2::INPUT 1
DIAMETER	= 420	SETPOINT SUM 1::DIVIDER 0
TAPER	= 410	PID::INPUT 1 (for loadcell feedback only)
SETPOINT SUM 2	= 309	SETPOINT SUM 1::INPUT 0

Internal Links

LINK 1:: SOURCE TAG	= 51	ANIN 2 (A3)
DESTINATION TAG	= 411	PID::INPUT 2
LINK 2:: SOURCE TAG	= 5	RAMPS::RAMP INPUT
DESTINATION TAG	= 424	DIAMETER CALC::LINE SPEED
LINK 3:: SOURCE TAG	= 62	Unfiltered Speed Feedback
DESTINATION TAG	= 437	DIAMETER CALC::REEL SPEED
LINK 4:: SOURCE TAG	= 425	DIAMETER CALC::MIN DIAMETER
DESTINATION TAG	= 208	SETPOINT SUM 1::RATIO 0

Terminal I/O

ANIN 1:: DESTINATION TAG	= 462	DIAMETER CALC::RESET VALUE
ANIN 3:: DESTINATION TAG	= 5	RAMPS::RAMP INPUT
ANIN 4:: DESTINATION TAG	= 439	TAPER CALC::TENSION SPT.
CALIBRATION	= 0.9000	
ANIN 5:: DESTINATION TAG	= 438	TAPER CALC::TAPER
DIGIN 1::DESTINATION TAG	= 292	SETPOINT SUM 1::SIGN 0
DIGIN 2::DESTINATION TAG	= 463	DIAMETER CALC::EXTERNAL RESET
DIGIN 3::DESTINATION TAG	= 408	PID::ENABLE
ANOUT 1::SOURCE TAG	= 441	TAPER CALC::TOT. TENS DEMAND
ANOUT 2::SOURCE TAG	= 427	DIAMETER CALC::DIAMETER

Other Parameters

CURRENT LOOP::BIPOLAR CLAMPS	= ENABLED
SPECIAL BLOCKS::PID::DIVIDER 2	= 0.1000.
SPEED LOOP::SETPOINTS::RATIO 2 (A3)	= 0.0000.

Input Signal Descriptions

Diameter Preset

For a simple rewind, the only diameter preset required may be one core diameter. This diameter can be set directly by changing SETUP PARAMETERS::SPECIAL BLOCKS::DIAMETER CALC::RESET VALUE. For this to work, terminal A2's DESTINATION TAG must be connected to a destination other than 462.

For an unwind or rewind using varying new core sizes or parent roll sizes, the diameter must be set for each roll. Configure terminal A2, EXTERNAL DIAMETER PRESET, to set RESET VALUE by setting analog input 1's DESTINATION TAG to 462. A 0 to +10 volt signal now provides the preset where +10 volts is the full or maximum roll diameter. That signal can be generated by an operator potentiometer, a Eurotherm Drives 5575 Ranger ultrasonic transducer (catalog number 5575-LB), or other diameter input device.

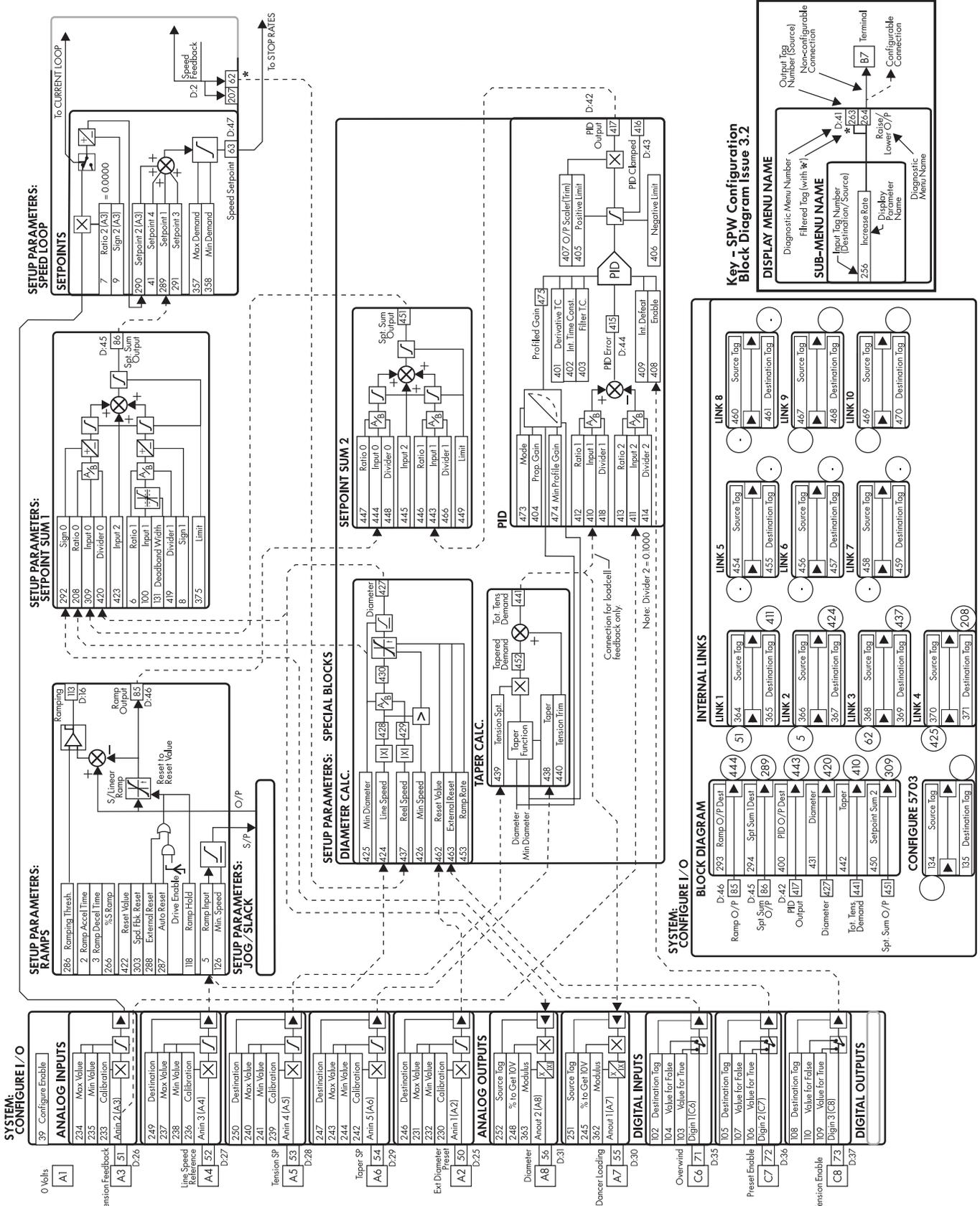


Figure M.16 - SPW Configuration Block Diagram

Tension Feedback

The loadcell tension feedback or dancer position signal is connected to terminal A3, TENSION FEEDBACK. Full tension should be scaled to be +9 volts to allow 10 percent over range. When a dancer is used, the drive requires a minimum range of three volts.

Line Speed Reference

A line speed reference is required for the diameter calculator to work. It should be scaled to produce +10 volts at full speed and connected into terminal A4, LINE SPEED REF. If this signal comes from a source other than a Eurotherm Drives motor controller, it may need to be scaled and isolated. This signal is connected to parameter SETUP PARAMETERS::SPECIAL BLOCKS::DIAMETER CALC::LINE SPEED. If type 5703 Peer-to-Peer Communications Modules are used, digital line speed signal may be substituted for the 0 - 10 volt analog signal.

Tension Setpoint

The tension setpoint of 0 to +10 volts (scaled internally to 90 percent using parameter ANIN 4 (A5):: CALIBRATION) is connected to terminal A5, TENSION SP. Typically this signal could come from a potentiometer supplied from the drive's +10 volt terminal, B3. This signal is connected to parameter SETUP PARAMETERS::SPECIAL BLOCKS::TAPER CALC::TENSION SPT. If the serial communications option is installed, the tension setpoint could be generated by a PLC, supervisory computer, or 5721 operator station.

Taper Setpoint

A taper setpoint, if required, of 0 to +10 volts should be connected to A6, TAPER SETPOINT. The range of taper can be set by the MAX VALUE and MIN VALUE for the analog input in the CONFIGURE I/O menu. This signal is connected to parameter SETUP PARAMETERS:: SPECIAL BLOCKS:: TAPER CALC:: TAPER. If the serial communications option is installed, the taper setpoint could be generated by a PLC, supervisory computer, or 5721 operator station.

Overwind/Underwind

Digital input terminal C6, OVERWIND, selects the winding direction, ON for overwinding and OFF for underwinding. If only unidirectional winding is required, set the winding direction manually using parameter SETUP PARAMETERS:: SPECIAL BLOCKS::OVER WIND. Remember to disconnect terminal C6 by changing its DESTINATION TAG to 0 in the CONFIGURE I/O menu.

Preset Enable

24 VDC at digital input terminal C7, PRESET ENABLE, selects the PRESET ENABLE. When ON, the diameter memory is preset to the diameter preset input value or minimum diameter as described earlier.

For a simple rewind, the operator can use a pushbutton to reset to core when the full roll is removed and a new roll is started. For an unwind, the operator presets the new roll diameter using either a potentiometer, a 5570 Ranger ultrasonic transducer, or some other diameter input device.

Tension Enable

Digital input C8, TENSION ENABLE, switches the drive from strict speed control to closed-loop, tension regulation control. This input should be ON when the winder is started and OFF when it is jogged.

Jog

JOG is selected by digital input C4. The jog direction can be selected by terminal C6, OVERWIND.

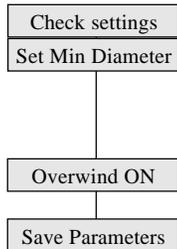
Startup Procedure

The following procedures describe the steps for starting up SPW winders.

Speed Mode

Initial Setup

These steps customize the drive for the calibration phase.

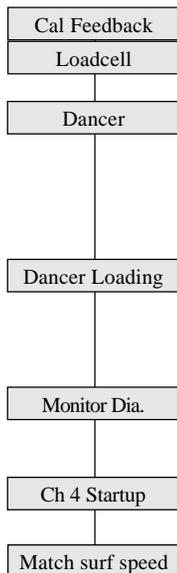


1. Check that all parameters are set to the default values described in the installation section.
2. Set the MIN DIAMETER to the core as a percentage of full roll. If there is more than one core size, it should be set to the smallest, for example if the smallest core is 3.5 inches and the maximum full roll is 42 inches then the MIN DIAMETER is:

$$3.5 / 42 * 100 = 8.33 \text{ percent}$$
3. Set OVERWIND to ON by connecting +24 volts to terminal C6 (or via the MMI if C6 is being used for some other function).
4. Save the parameters.

Calibration

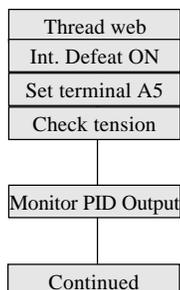
This section calibrates the drive in speed mode.



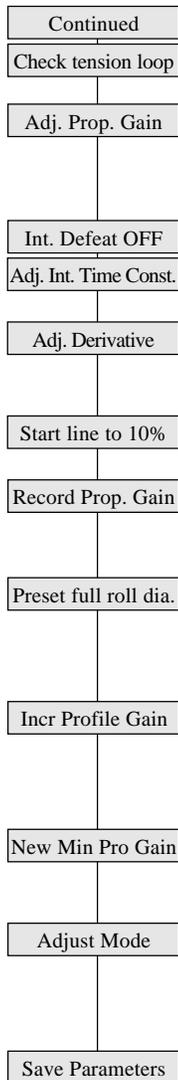
1. Calibrate the feedback device.
 - a. **Loadcells:** Follow the loadcell manufacturer's manual to calibrate the loadcells. Calibrate the loadcell amplifier output for +9 VDC = full tension to allow the tension loop to maintain control at 10 percent over full tension. The tension signal should be positive at terminal A3 with respect to terminal A1 (0 VDC).
 - b. **Dancers:** Check the dancer position feedback. Optimally it should vary from 0 VDC when the dancer is in the fully tight position to +10 VDC in the fully loose position. A smaller range is acceptable but may require resetting the dancer position setpoint. For example, if the swing is from +5 VDC to +9 VDC, then the setpoint should be set at 70 percent to control the dancer at mid-position.
 Dancer loading, if controlled from the drive, should be checked and calibrated at the voltage to pressure transducer. The drive dancer loading output is 9 VDC at full tension. This can be adjusted using the CONFIGURE I/O:: ANALOG OUTPUTS:: ANOUT 1:: % TO GET 10V value for analog output A7, DANCER LOADING.
2. Ensure terminal C8, TENSION ENABLE, is OFF and monitor SPECIAL BLOCKS:: DIAMETER CALC:: DIAMETER is preset to core. If the diameter does not equal the minimum diameter, momentarily jumper +24 volts to C7, DIAMETER PRESET ENABLE.
3. Start up the drive as described in Chapter 4, that is, AUTOTUNE the current loop, optimize the speed loop, etc. Use terminal A4, LINE SPEED REFERENCE, as the speed demand input.
4. Load an empty core into the winder and match the core surface speed to the line speed using the 590SP encoder or analog tachometer calibration as appropriate.

At this point the feedback device, drive, and winder should be functioning correctly. When starting up turret winders, repeat the above procedure for the second spindle.

Tension Mode



1. Thread the web through the machine and attach it to the core.
2. Initially, set INT. DEFEAT to ON to provide proportional control only.
3. Set terminal A5, TENSION SETPOINT, to a reasonable value for the web.
4. With the line stopped, start the winder with the TENSION ENABLE set ON. The winder should control tension, if not check the polarity of the feedback and trim.
5. The scaled PID OUTPUT can be monitored in DIAGNOSTICS in the MMI. Monitoring the PID trim output can be very useful for diagnosing problems because it shows the state of the PID. Two other diagnostic parameters are also available for monitoring the PID state, PID CLAMPED and PID ERROR. However, remember effects of the O/P SCALER(TRIM). For example, if O/P SCALER(TRIM) is set to 10 percent, then reading 10 percent on PID OUTPUT will indicate the PID has saturated.



6. Check the tension loop performance by making step changes to the tension demand and monitoring the tension feedback. Increasing the proportional gain gives faster response but at some point the winder will become unstable. If this occurs, reduce the gain until it regains stability. The proportional gain is controlled by a profiler using PROP. GAIN, MIN PROFILE GAIN, and MODE. The default for MODE is 0 causing PROFILED GAIN to equal PROP. GAIN. It keeps the gain at PROP. GAIN throughout the diameter range. As a result, adjust PROP. GAIN during initial tests at standstill with an empty core.
7. Once stable proportional control is achieved, set the INT. DEFEAT to OFF.
8. The integral action ensures a zero steady-state error at all line speeds. INT. TIME can be reduced to improve response; however, if the time is set too short, instability will occur.
9. Derivative action may be useful to increase the damping of the position loop; especially with large rolls. Adjust DERIVATIVE TC as necessary. For loadcell tension control, DERIVATIVE TC should not be required so leave it set to zero.
10. Start the line and increase the speed to about 10 percent of full speed. Monitor the tension control and adjust the tuning as required.
11. With the proportional gain optimized at core, record the PROP. GAIN value. Now it is necessary to check the performance at full roll. Either run the line until a full roll is wound or, stop the line and replace the empty core with a full roll and re-attach the web.
13. Before performing the stability tests with a full roll, the full roll diameter must be preset. Set the input to terminal A2, EXTERNAL DIAMETER PRESET, to 10 volts for full roll diameter. 24 volts at terminal C7, PRESET ENABLE, sets the diameter to 100 percent. The diameter can be monitored at SPECIAL BLOCKS:: DIAMETER CALC::: DIAMETER.
14. At this point, PROP. GAIN probably needs to be increased to produce optimum performance at full roll. If this is the case, adjust MIN PROFILE GAIN to give optimum performance throughout the roll. MIN PROFILE GAIN should be reduced by the amount the PROP. GAIN was increased as shown in the equation below.

$$\text{MIN PROFILE GAIN}_{\text{NEW}} = (\text{PROP. GAIN}_{\text{OLD}} / \text{PROP. GAIN}_{\text{NEW}}) * 100\%$$

For example, if the PROP. GAIN at core was 10 percent and it was increased to 20 percent at full roll, reduce MIN PROFILE GAIN from the default 100 percent to 50 percent.
15. MODE allows the change of proportional gain with diameter to be varied. The winder performance should be monitored throughout the buildup of the roll at various line speeds. MODE would be changed so the proportional gain at each diameter fits the required gain profile better. The higher the setting for MODE, the lower the gain at smaller diameters.
16. Save parameters

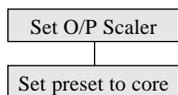
Winders with Dancer Feedback

The start-up procedure using dancer feedback is the same as for loadcell feedback except for the following changes:

Unwinds

Follow the same procedure used for rewinds except as follows.

Speed Mode



- 2a. Set O/P SCALER(TRIM) to -10 percent. This sets the correct loop polarity so that the loadcell or dancer feedback remain unchanged.
- 2b. Set terminal C7, PRESET ENABLE, to ON. Initially, set terminal A2, EXTERNAL DIAMETER PRESET to core.

Tension mode

An unwind cannot run at any speed with an empty core. As a result, after completing the test at standstill with an empty core, step 8, skip directly to full roll tests, step 13.



SECTION CONTROL (SC)

A typical process line contains a number of sections using one or more control modes. This configuration provides the standard features required by a line drive section to perform Draw, Ratio, Loadcell, Dancer position, or Torque control. It also includes Reverse, Anti-reverse, Agitate, Slack take-up/pay-out, Jog, Ramp, and Raise/Lower. Pull rolls, coaters, ovens, treaters, laminators, presses, and more can be controlled with the 590SP.

Figures M.18 and M.19 illustrate typical loadcell and dancer control applications, respectively.

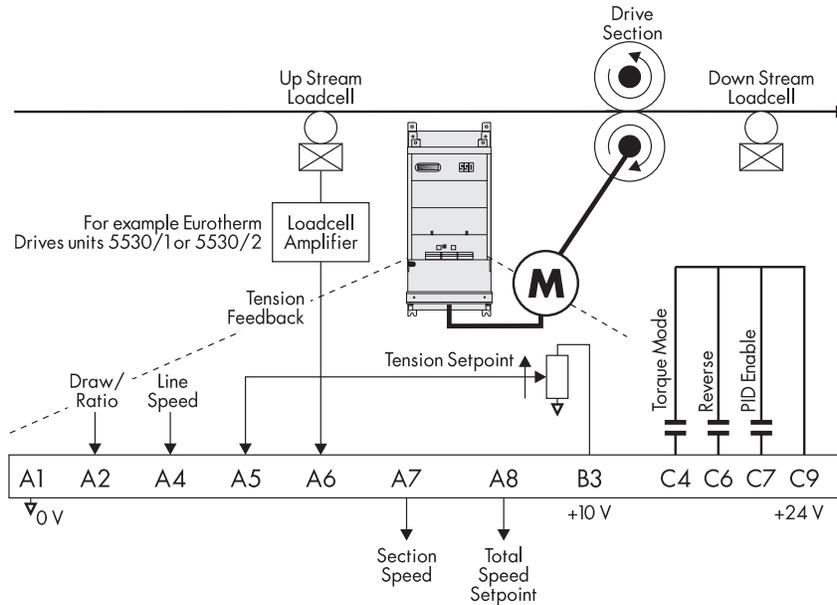


Figure M.17 - Loadcell Application

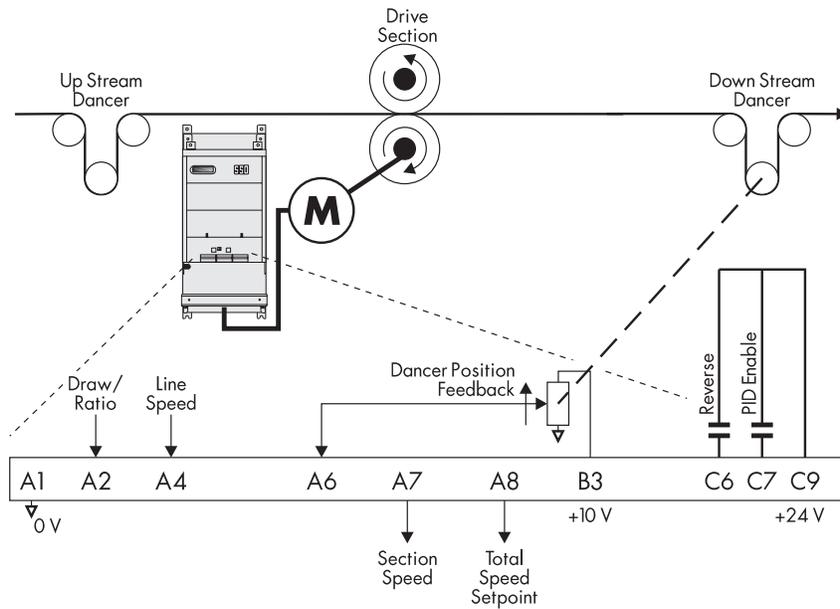


Figure M.18 - Dancer Position Application



Control Modes

SC provides the drive with control features required for a line drive section. SC uses drive terminals for all inputs and outputs, both analog and digital. These terminals may need to be re-configured depending on the functions required for the particular application.

A typical web process line will have a master or lead drive that sets the speed of the line and other slave drives which follow in a variety of ways. The primary control requirement is usually to maintain a reasonable tension between sections. Section control may be achieved in a number of ways.

Draw

Draw mode is the nearest approximation to an old fashioned line shaft with its mechanical variators. It works well even when the section has little or no grip on the web although in those applications it will not control tension. In draw mode, the slave drive is speed controlled with a percentage difference from the line speed reference. The speed difference or *draw*, which is usually small, stretches the web if it is extensible and the speed difference is positive, or permits the web to contract if the speed difference is negative.

When draw is used with non-extensible webs, very accurate speed control is required to provide acceptable tension control. With these materials, a very small speed difference either causes the web to be too loose or too tight. This application uses the Digital Draw feature discussed later in this chapter.

Ratio

Ratio control is speed control. It is similar to draw except that it is specified as a ratio of the line speed instead of a percentage difference. Ratio control generally varies over a much wider operating range than draw. Ratio is typically used by sections that have no effect on web tension but is required by the manufacturing process, for example on coater applicators and metering rolls.

Torque

Torque control is an open loop method of controlling tension because there is no direct tension measurement. It assumes that the process losses are small so the web tension will be proportional to torque at the motor shaft. The drive section torque is proportional to motor armature current and the speed is determined by the web speed assuming the drive section does not slip.

NOTE. To achieve constant tension throughout the speed range, use a constant torque motor. A motor with a field range will produce less torque as the speed increases above its base speed.

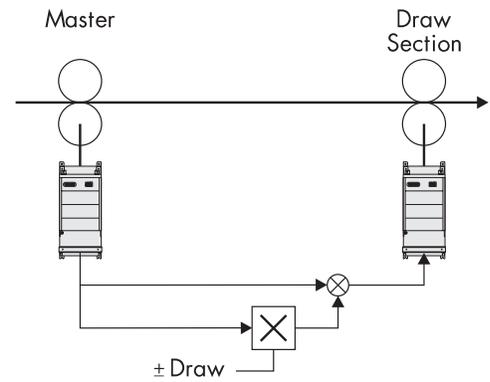


Figure M.19 - Draw

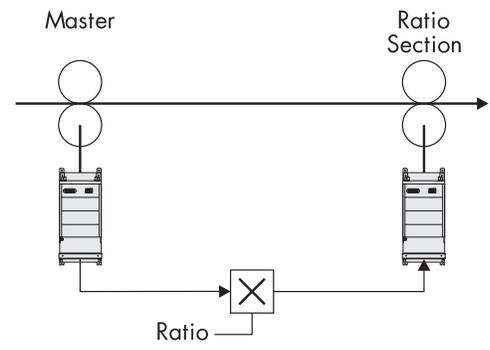


Figure M.20 - Ratio

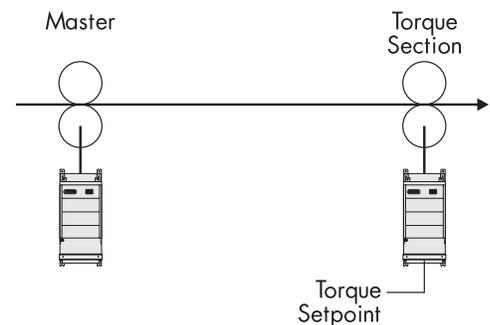


Figure M.21 - Torque

Tension

Draw controls speed but does not directly control tension. Tension control uses an outer control loop to adjust the section speed. The loadcell provides the feedback signal for the control loop. Speed is adjusted to keep the feedback signal from the loadcell at a fixed value, the tension setpoint.

Dancer Position

Dancer position control also uses an outer control loop to adjust the section speed. The dancer applies force to the web throughout its range of movement. Loading the dancer, usually by using pneumatics, determines the force and therefore the tension in the web. To keep the web tension constant, the drive section must control the web speed so that the dancer stays in a fixed position.

Additional Features

Line sections often require additional control features. The SC configuration has the following features built in. See the "Using Section Control" section for details on their use.

Reverse

Reversing allows sections such as coaters and laminators to reverse directions to accommodate a web path change to coat the other side of the web.

Anti-reverse

Anti-reverse is required where reversing a section may cause mechanical damage to the machine or may be hazardous to the operator.

Agitate

Agitate or *Sunday* drive is a feature used for coater and printer sections to keep the coater turning at a low speed when the line has stopped to prevent the coating material from solidifying.

Slack Take-up/pay-out

A line in draw control, such as a paper machine, can be difficult to get running. It often needs the ability to speed up or slow down one section relative to another to remove loops of slack web without disturbing the preset draw. Slack take-up offers this capability. Similarly, pay-out allows the operator to introduce slack in the web, for example when performing a splice.

Jog

Many sections need individual jog for positioning, clearing wrap-ups, or cleaning.

Ramp

A section ramp, independent from the main line ramp, allows an individual section to accelerate gradually. This permits it to speed up to match the main line and to decelerate smoothly as required by the process.

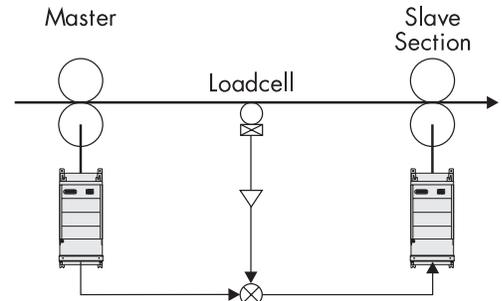


Figure M.22 - Tension

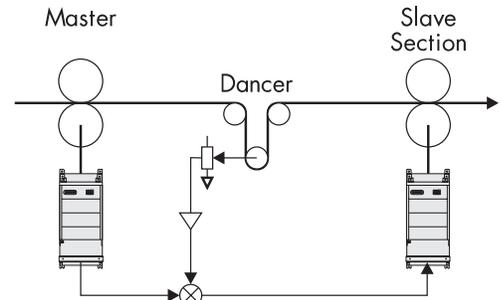


Figure M.23 - Dancer Position

Raise/Lower (Motor Operated Potentiometer Function)

The Raise/Lower function uses digital inputs to increase and decrease Draw, Ratio, or Tension. This permits gauge controls or other automatic systems with logic outputs to connect directly with the drive.

Installation

These parameters are located in the SYSTEM::CONFIGURE I/O menu.

Block Diagram Parameters

Parameter Name	Tag	Description
RAMP O/P DEST	= 309	SETPOINT SUM 1:: INPUT 0
SPT SUM 1 DEST	= 289	SPEED LOOP:: SETPOINTS:: SETPOINT 1
PID O/P DEST	= 423	SETPOINT SUM 1:: INPUT 2
SETPOINT SUM 2	= 432	TORQUE CALC.:: TORQUE DEMAND
POS. I CLAMP	= 301	CURRENT LOOP:: POS. I CLAMP
NEG. I CLAMP	= 48	CURRENT LOOP:: NEG. I CLAMP

Internal Links

LINK 1:: SOURCE TAG	= 8	SETPOINT SUM 1::SIGN 1
DESTINATION TAG	= 292	SETPOINT SUM 1::SIGN 0
LINK 2:: SOURCE TAG	= 62	Speed Feedback Unfiltered
DESTINATION TAG	= 443	SETPOINT SUM 2:: INPUT 1
LINK 3:: SOURCE TAG	= 69	Jog Input
DESTINATION TAG	= 433	TORQUE CALC.::TENSION ENABLE
LINK 4:: SOURCE TAG	= 85	RAMPS::RAMP OUTPUT
DESTINATION TAG	= 100	SETPOINT SUM 1:: INPUT 1
LINK 5:: SOURCE TAG	= 434	TORQUE CALC.::OVER WIND
DESTINATION TAG	= 8	SETPOINT SUM 1::SIGN 1
LINK 6:: SOURCE TAG	= 444	SETPOINT SUM 2:: INPUT 0
DESTINATION TAG	= 410	PID:: INPUT 1 (for loadcell tension control only)

Terminal I/O

ANIN 1:: DESTINATION TAG	= 6	SETPOINT SUM 1:: RATIO 1
ANIN 3:: DESTINATION TAG	= 5	RAMPS::RAMP INPUT
ANIN 4:: DESTINATION TAG	= 444	SETPOINT SUM 2:: INPUT 0
ANIN 5:: DESTINATION TAG	= 411	PID:: INPUT 2
DIGIN 1::DESTINATION TAG	= 434	TORQUE CALC.:: OVER WIND
DIGIN 2::DESTINATION TAG	= 408	PID:: ENABLE

Other Parameters

CURRENT LOOP::BIPOLAR CLAMPS	= ENABLED.
CURRENT LOOP::CUR. LIMIT/SCALER	= 200%.
SPEED LOOP::SETPOINTS::RATIO 2 (A3)	= 0.0000.

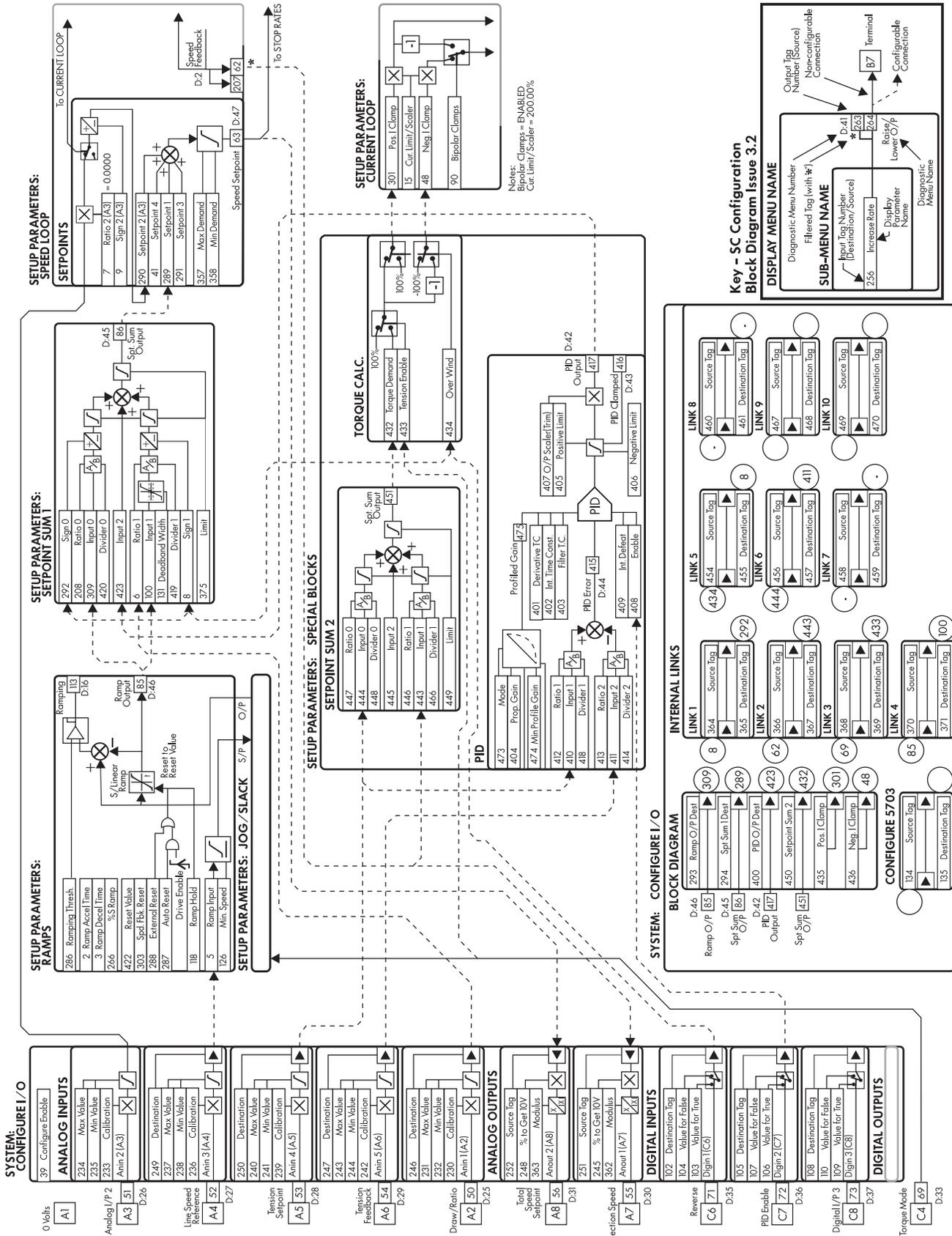


Figure M.24 - SC Configuration Block Diagram

Input Signal Descriptions

This section describes the functions of the terminals used in the SC configuration.

WARNING

The control terminals of the drive are fully isolated from all power circuits and should not be connected to other non-isolated circuits. In the interests of safety and to minimize electrical noise, it is recommended that the drive 0 volts common terminal be connected to ground either directly at the drive or at one point in the system.

Draw/Ratio

The draw/ratio signal is connected to terminal A2. It should read +10 volts for maximum draw or ratio. The CALIBRATION parameter for terminal analog input 2 can convert the input signal to the desired output range, 5 percent maximum draw for example.

Line Reference

A line speed reference is required because the feedback device provides only a speed trim signal. It should be scaled to +10 volts at full speed and connected into terminal A4, LINE SPEED REFERENCE. The 5703 Peer-to-Peer communications unit may alternatively be used for a digital line reference.

Tension Setpoint

The tension setpoint of 0 to +10 volts (scaled internally using CALIBRATION) connects to terminal A5, TENSION SETPOINT. Typically this signal comes from a potentiometer supplied from the drive's +10 volt terminal, B3.

For dancer position applications, this input is not required. The user can enter the setpoint directly in the MMI in parameter SPECIAL BLOCKS:: PID:: INPUT 1 if terminal A5 is connected to a DESTINATION TAG other than 410. The setpoint will normally be set at the same value as the feedback signal with the dancer positioned midway between stops, for example if the feedback range is 10 to 90 percent, the setpoint would be 50 percent.

Tension Feedback

The tension feedback signal from a loadcell must be scaled using a loadcell amplifier, such as the Eurotherm Drives 5530/1 or 5530/2, before connecting into terminal A6, TENSION FEEDBACK, on the 590SP. At full tension, the output should be adjusted to read +9 volts to allow 10 percent overrange.

The dancer position is the tension feedback in dancer applications. The dancer uses a position transducer with a signal range of 0 to +10 volts. The simplest type of transducer is a potentiometer coupled to the dancer shaft and supplied with +10 volts by the drive's terminal B3. The optimum mechanical arrangement provides nearly full potentiometer rotation for the full dancer travel. At the cost of resolution, less rotation is acceptable down to a minimum of about 30 percent or 3 volts change.

Reverse

Reverse, terminal C6, changes the direction of the line section. It is connected to OVER WIND and SETPOINT SUM 1:: SIGN 0 and SIGN 1 for changing directions in torque and speed modes. Other tension modes require configuration changes to assure the speed demand changes correctly.

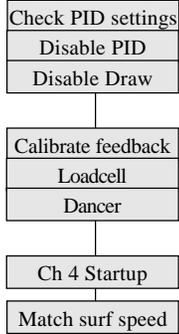
PID Enable

The PID needs to be enabled for the tension loop to operate. The enable input is at terminal C7, PID ENABLE. It cannot be permanently connected to +24 volts or the integral will saturate and cause poor initial performance. Usually the PID should be enabled when the drive is started, tension control is selected, and the section nip is closed.

Startup Procedures for Tension or Dancer Position Control

The following procedures describe a methodology for starting and tuning a tension control line drive section. The first steps assure the drive section parts are calibrated correctly. The PID setup steps tune the section for best performance.

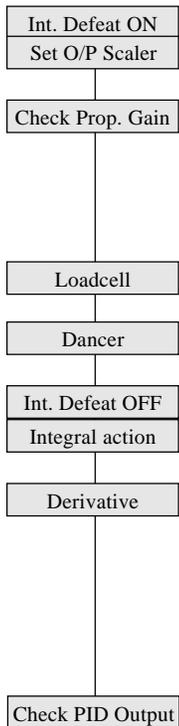
Initial Section Setup



1. Set all the PID parameters to the default values (see Appendix H).
2. Disable PID:: ENABLE at terminal C7.
3. Verify SETPOINT SUM 1:: RATIO 0 is set to 100.00 percent and set terminal A2, DRAW/RATIO, to 0 volts.
4. Calibrate the feedback device.
 - a. When using loadcell feedback, see the manufacturer's manual for calibration instructions.
 - b. When using dancer feedback, verify that the dancer polarity is correct and the dancer position setpoint is for mid-position.
5. Start up the drive as described in Chapter 4 (that is, AUTOTUNE the current loop, etc.).
6. Match the roll surface speed of the line drive section to the master drive surface speed using the 590 encoder or tachometer calibration as appropriate.

At this point, the loadcell or dancer, drive, and drive sections should be functioning properly.

PID Adjustment



1. Set INT. DEFEAT to ON to provide proportional control only.
2. Set O/P SCALER (TRIM) to suit the type of web. As a rough guide, use 2 to 5 percent for a non-extensible web and 5 to 10 percent for an extensible web.
3. With a web in the machine, run the line at a low speed with the PID enabled, terminal C7. Check the tension loop performance by making step changes in tension and monitoring the feedback. Increasing PROP. GAIN gives faster response but at some point the section will become unstable. When the section becomes unstable, reduce PROP. GAIN a little until it regains stability.
 - a. For loadcell feedback, check the performance by making step changes in the tension demand and monitoring the tension feedback.
 - b. For dancer feedback, check the performance by manually moving the dancer and watching it return to the center position.
4. After achieving stable proportional control, set INT. DEFEAT to OFF.
5. The integral action ensures a zero steady state error at all line speeds. Reduce INT. TIME CONST. to improve response; however, if the time is set too short, instability will occur.
6. Derivative gain can improve stability, particularly where the PID has a wide control range, or for tension systems using high inertia dancer rolls. If the position loop response is overdamped, increase DERIVATIVE TC slowly until the response is critically damping.

NOTE. PID tension controlled systems are highly sensitive to changes in derivative gain. Make changes in the DERIVATIVE TC in small increments *only*.

In most cases, derivative gain introduces oscillations and system instability and therefore should not be used. Loadcell feedback systems usually do not require derivative gain. For loadcell control, leave DERIVATIVE TC set to zero.
7. PID OUTPUT can be monitored in the DIAGNOSTICS menu of the MMI. This can be very useful when diagnosing problems. If the speed tracking is incorrect, PID OUTPUT will rise because the PID must provide an increasing trim as speed rises. If the web is slipping at the tension control section, PID OUTPUT will saturate at 100 percent since the trim cannot produce tension. If the trim polarity is incorrect, PID OUTPUT will saturate and the web will be either too tight or too loose.

Other Settings

Trim Range

O/P SCALER (TRIM) scales the PID output to produce the speed trim. It sets the amount of overspeed the PID trim produces and the polarity of the trim. The polarity should be positive when the feedback devices are upstream of the drive and negative when downstream of the drive.

For dancer applications, the feedback signal should be connected to be more positive when the web is tight and less positive when the web is slack. In this arrangement, dancer feedback will increase the speed when the web is slack.

The trim range value depends on the nature of the web. It needs to be greater for an extensible web than for a non-extensible web. In addition, the extensible web requires a higher control loop gain which comes with the greater trim range. If required, trim ranges for two different types of web can be selected by configuring an unused digital input to set two different values of trim range (see Extensible/Non-extensible Webs, page M-37).

Tension

The tension in dancer applications is determined by the air pressure or weight loading on the dancer. The drive only controls the dancer position.

Other Features

This section explains how to use the many features available in the SC configuration.

Draw

To select draw mode, set SETPOINT SUM 1:: RATIO 0 to 100 percent. The input at terminal A2, DRAW/RATIO, sets the amount of draw by adjusting SETPOINT SUM 1:: RATIO 1. It is multiplied by the line speed, terminal A4, and then added to the line speed to produce the speed demand.

Calibrating analog input 1 in CONFIGURE I/O sets the draw range. In draw mode, the draw range is normally set to about -5 to +5 percent. To set a 5 percent range, set CONFIGURE I/O:: ANALOG INPUTS:: ANIN 1 (A2):: CALIBRATION to 0.0500. Then, +10 volts on terminal A2 produces +5 percent draw and -10 volts produces -5 percent draw.

Terminal A2 can also be limited by MAX VALUE and MIN VALUE, *clamps*, with defaults of +100 and -100 percent. If a draw range of more than 100 percent is required, the clamps must be increased accordingly. The clamps can be set to lower values if asymmetric draw is required. For positive draw only, limit the input at A2 to 0 to +10 volts.

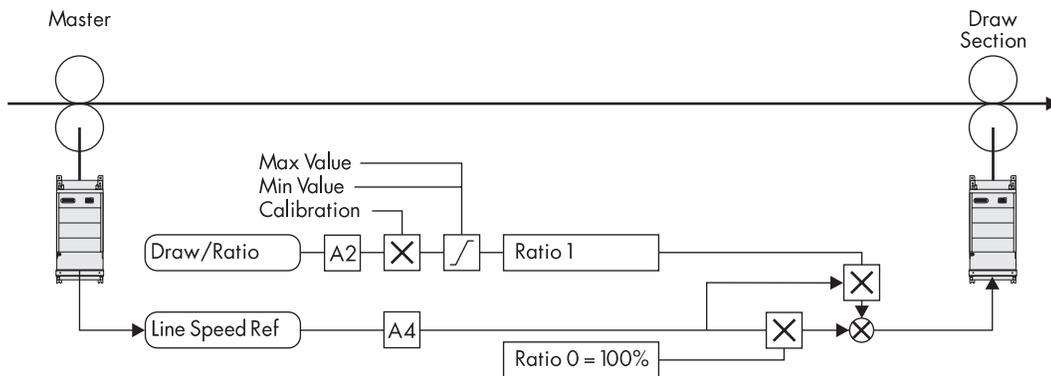


Figure M.25 - Draw

Cascade Draw

When two or more draw sections follow in line after a master drive section, cascading their line speed references instead of having each section following the master can be more useful. To cascade the speed references, connect the total speed setpoint signal, terminal A8, from the first section to the line speed reference input, terminal A4, of the second section. Similarly, take the second section's total speed setpoint into the line speed reference of the third section, etc. This allows a change to the draw setting of the first section to be passed to following sections while maintaining their relative speeds.



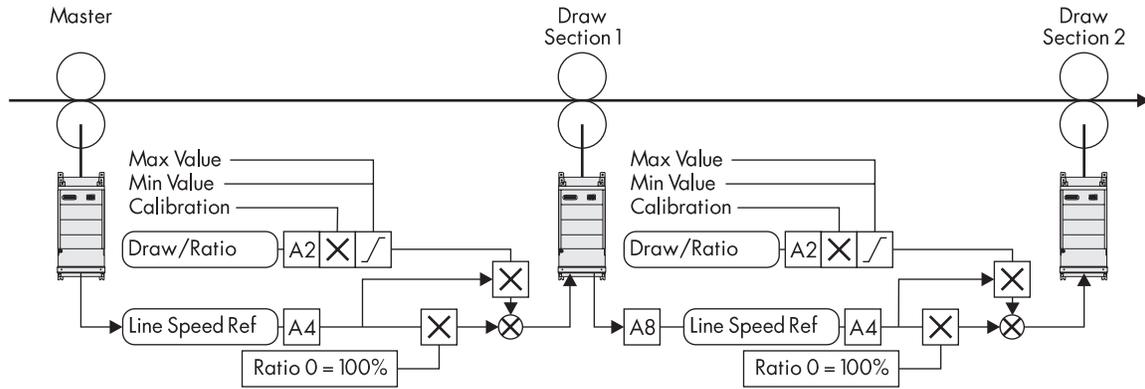


Figure M.26 - Cascade Draw

Digital Draw

Using draw with non-extensible materials requires very small speed differences between line drive sections which, in turn, requires very precise speed control. Analog inputs and outputs may not provide adequate precision or stability. The digital 590SP's speed accuracy can be greatly improved by direct, serial connection between drives using the 5703 Peer-to-Peer interface (catalog number 655-RS232). This interface should be used with digital speed feedback from an encoder or the 5701 optical encoder. Refer to Appendix E for use of the 5703.

To use draw with the 5703, re-configure the drive as follows:

Menu	Parameter	Setting
CONFIGURE I/O		
ANALOG INPUTS:: ANIN 3 (A4)::	DESTINATION TAG	0
CONFIGURE 5703::	SOURCE TAG	63
	DESTINATION TAG	5
SYSTEM PORT (P3):: 5703 SUPPORT::	SETPT. RATIO	1.0000
	SETPT. SIGN	POSITIVE
	5703 MODE	MASTER or SLAVE

Remember to save the changes with the PARAMETER SAVE menu in the drive.

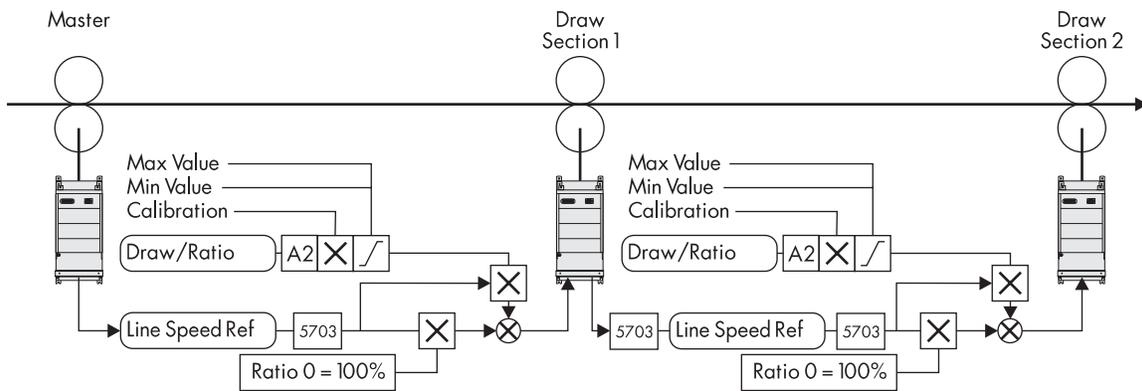


Figure M.27 - Digital Draw



Ratio

Ratio mode sets the section speed to the line speed multiplied by the ratio input. To select ratio mode, set SETPOINT SUM 1:: RATIO 0 to 0.00 percent. Terminal A4, LINE SPEED REFERENCE, supplies the line speed signal. Terminal A2, DRAW/RATIO, receives the ratio setpoint. It is multiplied by the line speed to produce the speed demand.

The maximum range of terminal A2 is -300 to +300 percent. To set a ratio range of 50 to 200 percent, set ANALOG INPUTS:: ANIN 1 (A2):: CALIBRATION to 2.0000, MAX VALUE to +200.00%, and MIN VALUE to +50.00%. Now 0 to 10 volts on input A2 produces a ratio of 50 to 200 percent. The overall speed demand is clamped to a maximum of 105 percent so ratios of more than 100 percent can only be used at less than full line speed.

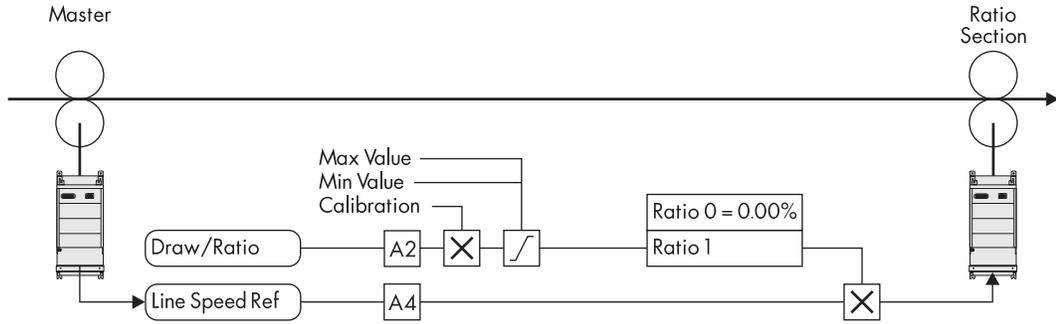


Figure M.28 - Ratio

Torque

Torque mode is armature current control. To achieve current control, an overspeed is added to the line speed demand. Since the actual section speed is held at line speed by the web, the speed loop saturates causing the current demand to equal the current limit. This function is similar to that discussed earlier in this chapter's CPW section.

24 VDC at terminal C4 selects torque mode. JOG/SLACK:: TAKE UP 1 sets the overspeed. It determines how much faster than line speed the section runs if it is not held back by the web, for example if the web breaks. Current loop parameter BIPOLAR CLAMPS must be set to ENABLED and CUR. LIMIT/SCALER set to 200 percent.

The signal at terminal A5, TENSION SETPOINT, sets the initial tension demand. It is combined with the loss compensations to produce the current limit. Follow the instructions in the CPW section, pages M-17 and M-18, for setting up the loss compensation parameters. Terminal C6, REVERSE, is connected to TORQUE CALC:: OVER WIND. 24 VDC at terminal C6 switches the current limits, permitting the section to run in reverse.

NOTE. Set PID:: ENABLE to OFF when running in torque mode.

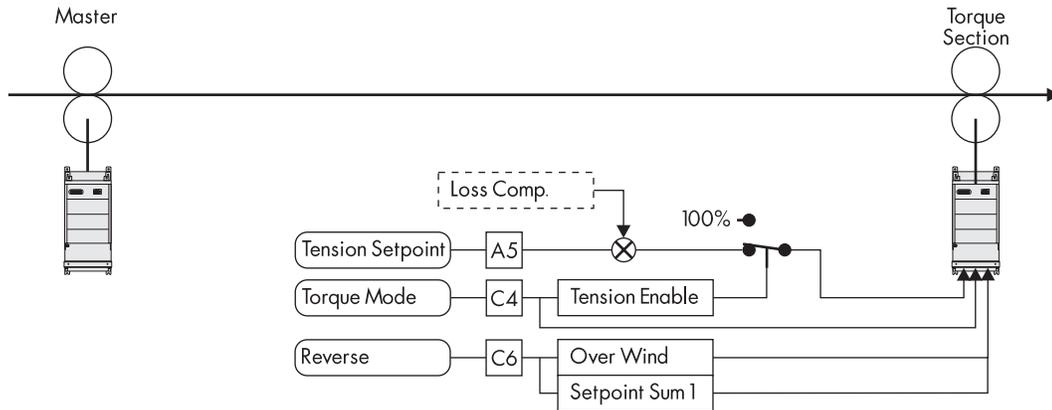


Figure M.29 - Torque



Reverse

The motor rotation can be reversed by terminal C8, REVERSE. This SC configuration only works when in torque, draw, or ratio mode. To provide a section reverse ability for tension feedback modes, change the configuration to route the line speed reference and trim signals through SETPOINT SUM 1 parameters INPUT 0 and INPUT 1.

Anti-reverse

If it is necessary to ensure that a section does not reverse, even if reversing would be required to maintain tension or dancer position, then use the Anti-reverse function. Set SPEED LOOP:: SETPOINTS:: MIN DEMAND to 0.00% to achieve anti-reverse.

Anti-reverse causes the tension control loop integral to saturate if the control loop asks for reverse speed. Anti-reverse only operates with a unidirectional section. If terminal C8, REVERSE, is selected, the setpoint will be clamped to zero.

Agitate

Use parameter RAMPS:: MIN SPEED to set the agitate speed.

MIN SPEED should be set to about 5 percent. When the drive section is started, the speed ramps up to MIN SPEED. When the line speed exceeds this agitate speed, the section will follow the line. MIN SPEED will only have an effect if the line speed is reduced again below the agitate value.

NOTE. The nip must be opened and the PID must be disabled when the line speed is below the agitate speed.

Ramp

The line reference signal sent to the drive goes through a ramp. This ramp controls the acceleration to agitate speed, if used, and allows the section to be started and stopped while the line is running. The ramp parameters are located in SETUP PARAMETERS:: RAMPS.

NOTE. The ramp accelerate and decelerate times should be set significantly faster than the line ramp so that the section can always keep up with the line.

Jog

The jog function is not provided in this SC configuration.

Slack Take-up/pay-out

Slack Take-up/pay-out is a speed increase while running to take up slack web. It can only be used in draw or ratio mode. If the drive is running and the jog terminal, C4, is energized, the drive speed increases by an amount set in parameter TAKE-UP 1. This configuration uses this feature to provide the overspeed in torque mode. The parameters are found in SETUP PARAMETERS:: JOG/SLACK:: TAKE-UP 1 or TAKE-UP 2 or MODE.

The speed increase is ramped to provide smooth control of the section and any cascaded sections. TAKE-UP SLACK 2 can be set negative to pay-out slack and is selected by MODE in the JOG/SLACK menu. This function can be controlled by an unused terminal by re-configuring a digital input to tag 228. See Chapter 5 for full details of the jog / slack functions.

Raise/Lower

The Raise/Lower block provides a MOP function. It can be used to set draw or tension setpoints by using digital inputs. Two digital input terminals need to be re-configured, one to RAISE INPUT, tag 261, and the other to LOWER

INPUT, tag 262. The output of the Raise/Lower function is connected to SETPOINT SUM 1:: RATIO 1, tag 6, or SETPOINT SUM 2:: INPUT 0, tag 444. The analog input that is replaced, either A2, DRAW/RATIO or A5, TENSION SETPOINT, must have its destination tag set to zero.

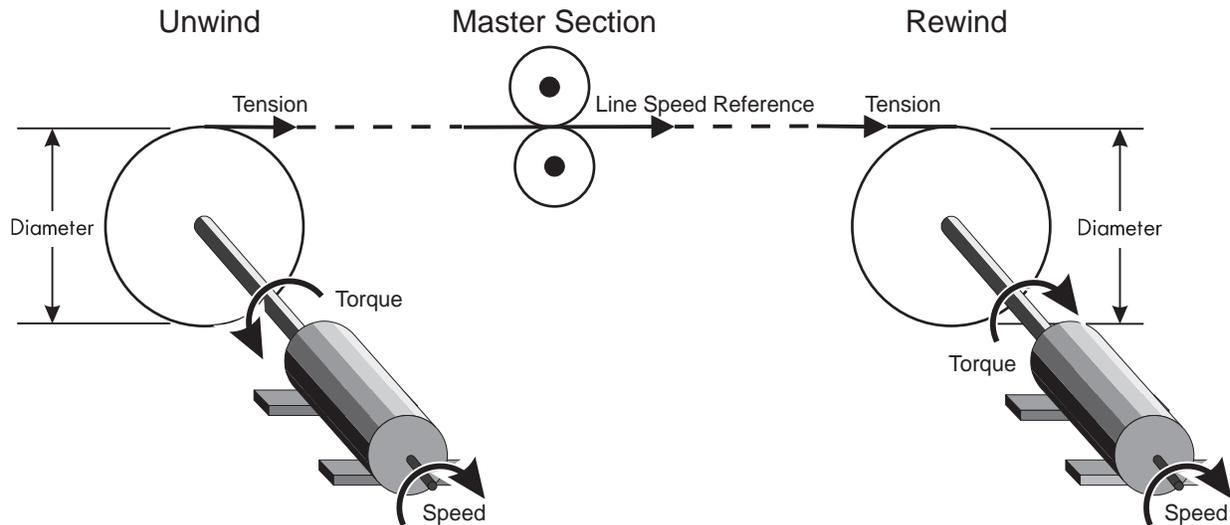
Extensible/Non-extensible Webs

When using loadcell tension control, the PID trim loop O/P SCALER (TRIM) needs to be higher for extensible web than for non-extensible web. For machines running a variety of materials, it may be necessary to be able to select different gains.

A digital input can be used to select two values of trim range. In the CONFIGURE I/O menu, select an unused digital input, set VALUE FOR TRUE to 10 percent, for example, and VALUE FOR FALSE to 5 percent, and DESTINATION TAG to 407, O/P SCALER (TRIM). Now the operator can select the extensible trim range by setting the digital input high. VALUE FOR TRUE and VALUE FOR FALSE must be adjusted to give the best trim ranges for extensible and non-extensible webs.

SIMPLE WINDER EQUATIONS

Below are equations used to determine winder torque and horsepower requirements.



$$\text{Diameter (ft)} = \frac{1}{\pi} \times \left[\frac{\text{Line Speed (ft/min)}}{\text{Winder Speed (rpm)}} \right]$$

$$\text{Torque}_{\text{Tension}} \text{ (lbf)} = \text{Tension (lbf)} \times \frac{\text{Diameter (ft)}}{2}$$

$$\text{Torque}_{\text{Total}} \text{ (lbf)} = \text{Torque}_{\text{Tension}} \text{ (lbf)} + \text{Torque}_{\text{Friction}} \text{ (lbf)} + \text{Torque}_{\text{Inertia}} \text{ (lbf)}$$

$$\text{Horsepower}_{\text{Web}} = \left[\frac{\text{Line Speed (ft/min)} \times \text{Tension (lbf)}}{33000} \right]$$

$$\text{Horsepower}_{\text{Winder}} = \left[\text{Horsepower}_{\text{Web}} \times \frac{\text{Diameter Build-up}}{\text{Constant Hp Range}} \right] + \text{Horsepower}_{\text{Friction}} + \text{Horsepower}_{\text{Inertia}}$$

$$\text{Horsepower} = \left[\frac{2\pi \times \text{Motor Speed (rpm)} \times \text{Motor Torque (lbf)}}{33000} \right]$$

Figure M.30 - Winder Equations



