

# 590

HA467078U001

ISSUE 01

## DC590 Digital Drive

series  
digital



**Product Manual**

# 590 Series

# 590 Series DC Digital Drive

**HA467078U001 ISSUE 1**

Compatible with Version 9.x Software onwards

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**PRODUCT MANUAL**



# Safety Information



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# Safety Information



## Requirements

**IMPORTANT** Please read this information **BEFORE** installing the equipment.

### Intended Users

This manual is to be made available to all persons who are required to install, configure or service equipment described herein, or any other associated operation.

The information given is intended to highlight safety issues, and to enable the user to obtain maximum benefit from the equipment.

Complete the following table for future reference detailing how the unit is to be installed and used.

INSTALLATION DETAILS			
<b>Model Number</b> <i>(see product label)</i>		<b>Where installed</b> <i>(for your own information)</i>	
<b>Unit used as a:</b> <i>(refer to "Certification")</i>	Component	Relevant Apparatus	<input checked="" type="checkbox"/> Enclosure

### Application Area

The equipment described is intended for industrial motor speed control utilising DC motors, AC induction or AC synchronous machines

### Personnel

Installation, operation and maintenance of the equipment should be carried out by qualified personnel. A qualified person is someone who is technically competent and familiar with all safety information and established safety practices; with the installation process, operation and maintenance of this equipment; and with all the hazards involved.

# Safety Information



## Product Warnings

	<b>Caution</b> Risk of electric shock		<b>Caution</b> Refer to documentation		<b>Earth/Ground</b> Protective Conductor Terminal
--	--	--	--	--	--

## Hazards

### **DANGER! - Ignoring the following may result in injury**

1. This equipment can endanger life by exposure to rotating machinery and high voltages.
2. The equipment must be permanently earthed due to the high earth leakage current, and the drive motor must be connected to an appropriate safety earth.
3. Ensure all incoming supplies are isolated before working on the equipment. Be aware that there may be more than one supply connection to the drive.
4. There may still be dangerous voltages present at power terminals (motor output, supply input phases, DC bus and the brake, where fitted) when the motor is at standstill or is stopped.
5. For measurements use only a meter to IEC 61010 (CAT III or higher). Always begin using the highest range. CAT I and CAT II meters must not be used on this product.
6. Allow at least 10 minutes for the drive's capacitors to discharge to safe voltage levels (<50V). Use the specified meter capable of measuring up to 1000V dc & ac rms to confirm that less than 50V is present between all power terminals and between power terminals and earth.
7. Unless otherwise stated, this product must NOT be dismantled. In the event of a fault the drive must be returned. Refer to "Routine Maintenance and Repair".

# Safety Information



**WARNING! - Ignoring the following may result in injury or damage to equipment**

## **SAFETY**

**Where there is conflict between EMC and Safety requirements, personnel safety shall always take precedence.**

- Never perform high voltage resistance checks on the wiring without first disconnecting the drive from the circuit being tested.
- Whilst ensuring ventilation is sufficient, provide guarding and /or additional safety systems to prevent injury or damage to equipment.
- When replacing a drive in an application and before returning to use, it is essential that all user defined parameters for the product's operation are correctly installed.
- All control and signal terminals are SELV, i.e. protected by double insulation. Ensure all external wiring is rated for the highest system voltage.
- Thermal sensors contained within the motor must have at least basic insulation.
- All exposed metalwork in the Drive is protected by basic insulation and bonded to a safety earth.
- RCDs are not recommended for use with this product but, where their use is mandatory, only Type B RCDs should be used.

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## **EMC**

- In a domestic environment this product may cause radio interference in which case supplementary mitigation measures may be required.
- This is a product of the restricted sales distribution class according to IEC 61800-3.
- This equipment contains electrostatic discharge (ESD) sensitive parts. Observe static control precautions when handling, installing and servicing this product.
- It is designated as “professional equipment” as defined in EN61000-3-2. Permission of the supply authority shall be obtained before connection to the low voltage supply.

# Safety Information



## CAUTION!

### APPLICATION RISK

- The specifications, processes and circuitry described herein are for guidance only and may need to be adapted to the user's specific application. We can not guarantee the suitability of the equipment described in this Manual for individual applications.
- It is advised that motors with significantly lower voltage ratings than the supply voltage are **NOT** used with the drive.

---

### RISK ASSESSMENT

Under fault conditions, power loss or unintended operating conditions, the drive may not operate as intended. In particular:

- Stored energy might not discharge to safe levels as quickly as suggested, and can still be present even though the drive appears to be switched off
- The motor's direction of rotation might not be controlled
- The motor speed might not be controlled
- The motor might be energised

A drive is a component within a drive system that may influence its operation or effects under a fault condition. Consideration must be given to:

- Stored energy
- Supply disconnects
- Sequencing logic
- Unintended operation



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# Chapter 1

## Getting Started

A few things you should do when you first receive the unit.

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# About this Manual

This manual is intended for use by the installer, user and programmer of the 590 Series DC Digital Drive. It assumes a reasonable level of understanding in these three disciplines.

**NOTE** Please read all Safety Information before proceeding with the installation and operation of this unit.

Enter the “Model No” from the rating label into the "Installation Details" table at the front of this manual. It is important that you pass this manual on to any new user of this unit.

This manual is for the following models from the 590 Series DC Digital Drive:

- Three phase, regenerative, four quadrant armature controllers:
  - 590 - for currents up to 270A
  - 598 - external stack option
- Three phase non-regenerative, two quadrant armature controllers:
  - 591 - for currents up to 270A
  - 599 - external stack option
- 590H and 591H (further detail is provided in the separate Addendum manual)

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## How the Manual is Organised

This Engineering Reference manual is organised into chapters and appendices, indicated by the numbering on the edge of each page.

The manual is more detailed than the QuickStart manual, and so is of use to the unfamiliar as well as the high-end user.

### Application Block Diagram

You will find this at the rear of Appendix D: "Programming". These will become your programming tool as you become more familiar with the software.

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## Initial Steps

Use the manual to help you plan the following:

### *Installation*

Know your requirements:

- certification requirements, CE/UL/c-UL conformance
- conformance with local installation requirements
- supply and cabling requirements



### ***Operation***

Know your operator:

- how is it to be operated?
- what level of user is going to operate the unit?
- decide on the best menu level for the MMI

### ***Programming***

Know your application:

- plan your “block diagram programming”
- enter a password to guard against illicit or accidental changes
- learn how to back-up your application data

## **Equipment Inspection and Storage**

- Check for signs of transit damage
- Check the product code on the rating label conforms to your requirement

If the unit is not being installed immediately, store the unit in a well-ventilated place away from high temperatures, humidity, dust, or metal particles.

Refer to Chapter 2: “Product Overview” to check the rating label/product code.

Refer to Chapter 8: “Routine Maintenance and Repair” for information on returning damaged goods.

Refer to Appendix E: “Technical Specifications” - Environmental Details for the storage temperature.

## **Packaging and Lifting Details**

### **WARNING**

**The packaging is combustible. Igniting it may lead to the generation of lethal toxic fumes.**

- ◆ Save the packaging in case of return. Improper packaging can result in transit damage.
- ◆ Use a safe and suitable lifting procedure when moving the unit. Never lift the unit by its terminal connections.

Prepare a clear, flat surface to receive the drive before attempting to move it. Do not damage any terminal connections when putting the unit down.

# Chapter 2

## Product Overview

An introduction to the 590 range of products, and a quick look at the Keypad and available plug-in Options.

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# Product Range

The 590 Series DC Digital Drive is designed for use in a suitable enclosure, with associated control equipment. The unit accepts standard three-phase ac supply voltages in the range 110V to 660V, depending upon the model, and is suitable for the powering of DC shunt field and permanent magnet motors, providing controlled dc output voltage and current for armature and field.

All units are designed for simple and economical panel mounting using keyhole slots. Plug-in control connectors simplify the fitting and removal of the unit to the panel.

Where possible, standard parts are used throughout the range thereby reducing the variety of spare parts required to maintain a multi-drive system. For example, the same basic control boards are used in all types of three-phase armature controller regardless of horsepower or bridge configuration.

The control circuit is totally isolated from the power circuit thus simplifying the interconnection of controllers within a system and improving operator safety. The coding circuitry adjusts automatically to accept supply frequencies between 45-65Hz and possesses high immunity to supply-borne interference. The armature controllers are phase rotation insensitive.

## *Control and Communications*

The drive is controlled by a 32 bit Microcontroller providing advanced features such as:

- **Complex control algorithms** which are not achievable by simple analog techniques.
- **Software-configurable control circuitry** built around standard software blocks.
- **Serial link communications** with other drives or a PC for advanced process systems.

Integral MMI with a two-line 16 character display, is a powerful diagnostic tool. It provides access to all alarms, inputs and principal software blocks in the controller, whilst the front panel LED indicators give an immediate status display of the drive, key inputs and outputs.

## *Regenerative and Non-Regenerative Models*

The motor armature controllers include both regenerative and non-regenerative models:

- **Regenerative controllers** consist of two fully-controlled thyristor bridges and a field bridge with full transient and overload protection, together with sophisticated electronic control of acceleration and deceleration, speed and torque in both directions of rotation.
- **Non-regenerative controllers** consist of one fully-controlled thyristor bridge and a field bridge with full transient and overload protection, together with its associated electronic control circuitry, and provide accurate speed and/or torque control in one selected direction of rotation.

## *Field Regulator*

A field regulator is fitted as standard. The regulator consists of a full-wave half controlled single phase thyristor bridge with transient and overload protection. It provides either a fixed voltage or fixed current source, depending upon the selected mode of operation for constant torque applications. The field current mode of operation can be further enhanced to provide field weakening for drive control motors which require extended speed or constant horsepower control.

## Component Identification

- |    |   |
|----|---|
| 1  | Main converter assembly                   |
| 2  | Converter door assembly                   |
| 3  | Hinged MMI cover                          |
| 4  | Hinged terminal cover                     |
| 5  | Field wiring terminals                    |
| 6  | Control terminals                         |
| 7  | Control board                             |
| 8  | Tacho/Encoder/Microtach option board      |
| 9  | Main Serial Port COMMS option module (P1) |
| 10 | Calibration panel                         |
| 11 | Busbars - main power input and output     |
| 12 | System Port (P3)                          |
| 13 | Auxiliary Supply Terminal                 |
| 14 | Man-Machine Interface (MMI) keypad        |
| 15 | Status LEDs                               |
| 16 | MMI display                               |
| 17 | IP20 Top Cover                            |
| 18 | IP20 Fan Housing (where fitted)           |

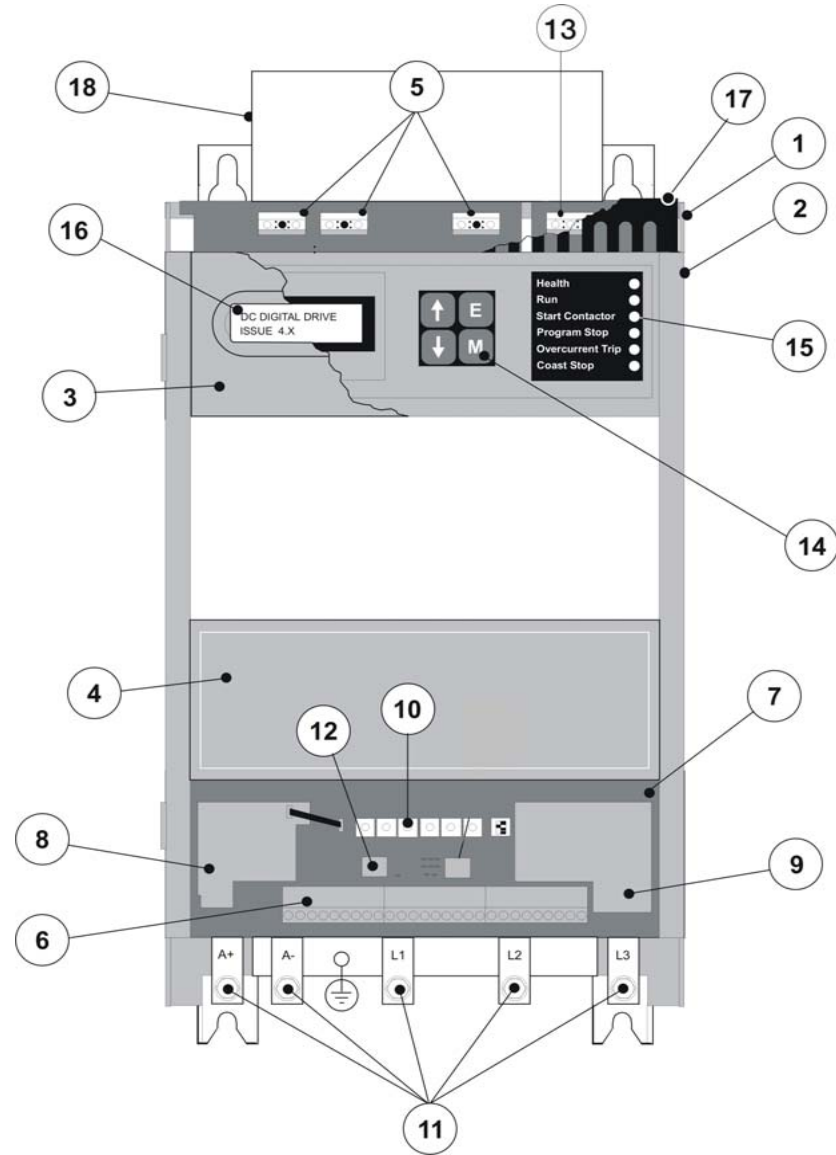


Figure 2-1 View of Component Parts (110A model illustrated)

# How it Works

**NOTE** Refer to Chapter 5: “Control Loops” for a more detailed explanation.

In *very* simple terms, the drive controls the dc motor with the use of *Control Loops* - an inner Current Loop and an outer Speed Loop. These control loops can be seen in the Application Block Diagram. The block diagram shows all the drive's software connections.

Using the Keypad, you can select the control loops to be used by the drive to provide either:

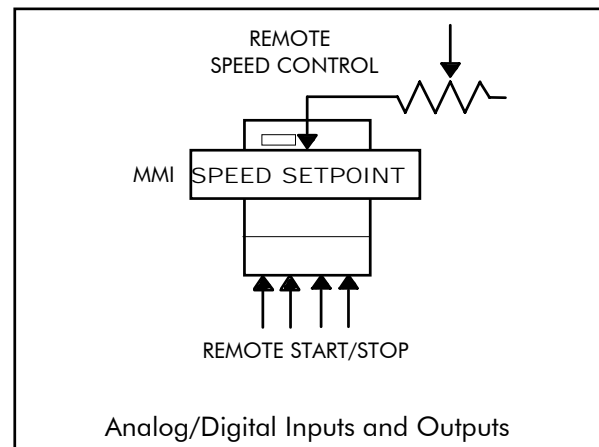
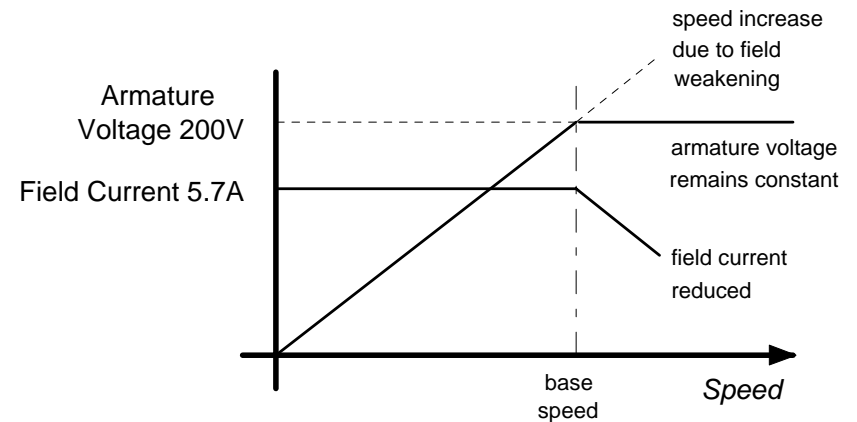
- Current Control
- Speed Control (default)

It is usual to supply a Current or Speed Feedback signal to the appropriate loop for more effective control of the drive. Current Feedback sensors are built-in, whereas Speed Feedback is provided directly from the armature sensing circuit (default), or by tachogenerator, encoder or Microtach connection to the relevant option board.

When in Speed Control, you can modify the performance of the drive further by controlling the motor field, i.e. Field Control. By weakening the field current, you can obtain an increase in motor speed beyond that normally achievable for the rated Armature Voltage of the dc motor.

The Drive is controlled remotely using digital/analog inputs and outputs. It cannot be directly *stopped* or *started* using the keypad.

By plugging in a COMMS Option Board, the Drive can be linked into a network and controlled by a PLC/SCADA or other intelligent device.



# Control Features

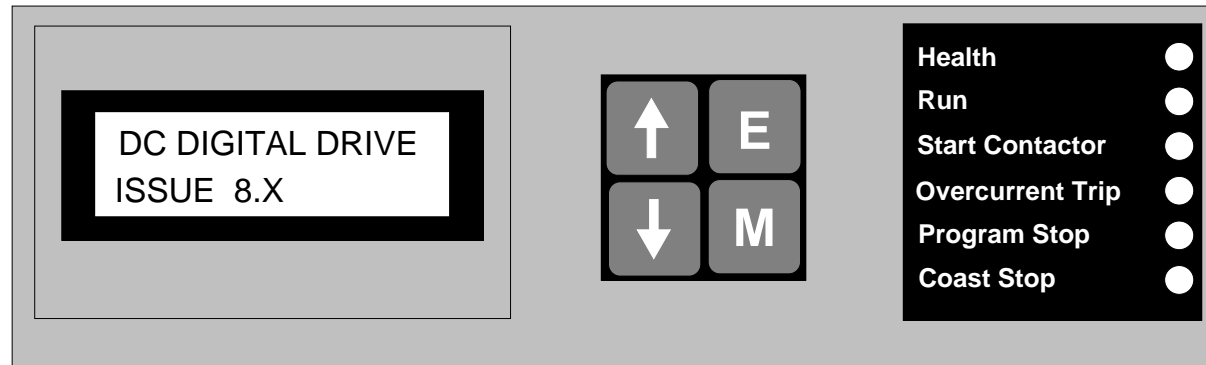
<b>Control</b>	Control Circuits	Fully isolated from power circuit (SELV)
	Output Control	<ul style="list-style-type: none"> <li>Fully controlled 3-phase thyristor bridge</li> <li>Microprocessor implemented phase control extended firing range</li> <li>For use on 50 or 60Hz supplies with a frequency compliance range of 45 to 65Hz</li> <li>Phase control circuits are phase rotation insensitive</li> </ul>
	Control Action	<ul style="list-style-type: none"> <li>Fully digital</li> <li>Advanced PI with fully adaptive current loops for optimum dynamic performance</li> <li>Self Tuning Current Loop utilising "Autotune" algorithm</li> <li>Adjustable speed PI with integral defeat</li> </ul>
	Speed Control	<ul style="list-style-type: none"> <li>By Armature Voltage feedback with IR compensation</li> <li>By Encoder feedback or analog tachogenerator</li> </ul>
	Speed Range	100 to 1 typical with tachogenerator feedback
	Typical Steady State Accuracy	<ul style="list-style-type: none"> <li>0.01 % Encoder Feedback with Digital setpoint (serial link or P3)</li> <li>0.1 % Analog Tach Feedback</li> <li>2 % Voltage Feedback</li> </ul> <p><b>NOTE</b> Long term analog accuracy is subject to tachogenerator temperature stability.</p>
	Adjustments	All adjustments in software can be altered by the MMI or via serial communications. The MMI provides monitoring and adjustment of parameters and levels, in addition to diagnostic facilities.
<b>Protection</b>	<ul style="list-style-type: none"> <li>High energy MOVs</li> <li>Overcurrent (instantaneous)</li> <li>Overcurrent (inverse time)</li> <li>Field failure</li> <li>Speed feedback failure</li> <li>Motor overtemperature</li> </ul>	<ul style="list-style-type: none"> <li>Thyristor Stack overtemperature (Force ventilated units)</li> <li>Thyristor "Trigger" failure</li> <li>Thyristor Snubber Network</li> <li>Zero-speed detection</li> <li>Standstill logic</li> <li>Stall protection</li> </ul>
<b>Diagnostics</b>	<ul style="list-style-type: none"> <li>Fully computerised with first fault latch and automatic display</li> <li>Digital LCD monitoring</li> <li>LED circuit state indication</li> </ul>	

**Table 2-1 Control Features**

# Keypad & Display

The Liquid crystal display can be seen through the hinged cover that protects the MMI. Lower the protective cover to see the control keys and status LEDs.

The MMI provides for application programming and monitoring of the Drive for remote control.



# Option Boards

A range of Option Boards are available for the 590 drive. The boards provide for Speed Feedback and Communications.

Refer to Chapter 3 : "Installing the Drive" - Speed Feedback and Technology Options.





# Chapter 3

## Installing the Drive

This chapter describes the mechanical and electrical installation of the 590 drive and associated equipment.

<b>Mechanical Installation</b> .....	<b>3-1</b>	<b>598/599 Power Board (AH385128U009)</b>	<b>3-30</b>
Unpacking the Drive	3-1	Heatsink Cooling Fan Connections	3-30
Lifting the Drive	3-1	Contactor Supply	3-30
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Ventilation and Cooling Requirements	3-4	Communications Option Boards	3-34
AC Line Choke	3-4	Comms Option Board (P1)	3-34
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<b>Electrical Installation</b> .....	<b>3-6</b>	Earth Fault Monitoring Systems	3-37
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DC Contactor - External VA Sensing	3-25		
Power Board Circuit Descriptions	3-26		
590/591 (AH385851U002, U003, U004, U005)	3-26		



# Mechanical Installation

**IMPORTANT** Read Appendix B: “Certification” before installing this unit. Refer to “Installation Drawings”, page 3-38 for further information.

---

## Unpacking the Drive

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### Caution

The packaging is combustible and this action may produce lethal toxic fumes.

---

Save the packaging in case of return. Improper packaging can result in transit damage.

---

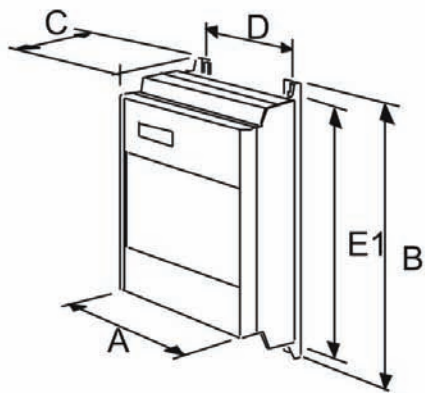
## Lifting the Drive

Use a safe and suitable lifting procedure when moving the drive. Never lift the drive by its terminal connections. Prepare a clear, flat surface to receive the drive before attempting to move it. Do not damage any terminal connections when putting the drive down.

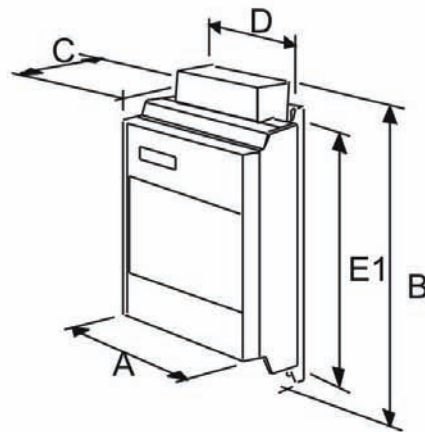
# Dimensions

Current Rating (A)	Model	Overall Dimensions			Fixing Centres		
		A	B	C	D	E1	E2
35 - 70	590C/591C	250	415	171	200	400	-
110 - 150	590C/591C	250	451	171	200	400	-
180	590C/591C	250	485	213	200	400	-
270	590C/591C	297	485	213	200	400	-

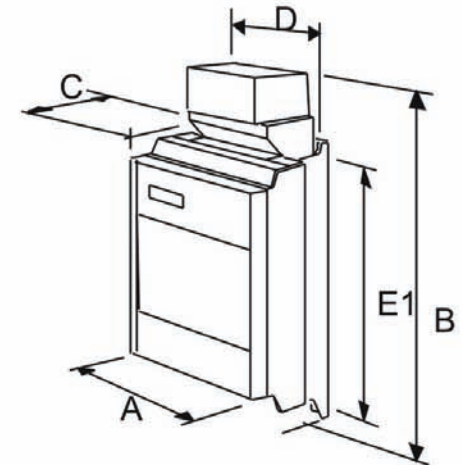
*Dimensions are in millimetres*



35A - 70A



110A - 150A



180A - 270A

---

## Mounting the Drive

**NOTE** General installation details are given below for mounting the Drive, however, if you are installing the unit with an EMC filter refer to “External AC Supply EMC Filter Installation, page 3-35.

Mount the unit vertically on a solid, flat, vertical surface. It is mounted using bolts or screws into four fixing points (keyhole slots). The design allows the use of 100mm grid fixing.

It must be mounted inside a suitable cubicle. To comply with the European safety standards VDE 0160 (1994)/EN50178 (1998), the cubicle must require a tool for opening.

**NOTE** Holes for the mounting bolts or screws must be placed accurately.

Cover any units already mounted to the panel to protect them from stray metal filings while drilling mounting holes.

### General Mounting Hints

Insert the mounting studs from the rear of the panel. Attach lock washers and nuts part way on to the lower mounting studs; these will help to keep the drive in place when mounting.

---

## Caution

Use proper lifting techniques when lifting and moving.

---

Lift the drive and engage the bottom slots safely on to the studs between the panel and lock washers/nuts you have just fitted. Engage the top slots with the remaining mounting studs and finger tighten the drive to the panel with lock washers and nuts. Finally, use the socket wrench to tighten all nuts securely.

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.

### Recommended Tools

Socket wrench	With a 6 Inch extension
Deep sockets	M6, M8
Screwdrivers	Phillips No.2, flat blade - 0.5 x 3.0mm, 0.8 x 4.0mm
Wire cutters	Small

---

## Ventilation and Cooling Requirements

Refer to Appendix E: “Technical Specifications” - Cooling Fans.

The Drive gives off heat in normal operation and must therefore be mounted to allow the free flow of air through the air entries and exits. Maintain the minimum air clearances given on the drawings to ensure that heat generated by other adjacent equipment is not transmitted to the Drive. Be aware that other equipment may have its own clearance requirements. When mounting two or more 590's together, these clearances are cumulative.

Ensure that the mounting surface is normally cool.

---

## AC Line Choke

**We recommend that you always use the specified ac line choke with the Drive** to provide a known supply impedance for effective operation of the thyristor transient suppression circuits. At least 1% line impedance should be provided in the supply side of the drive.

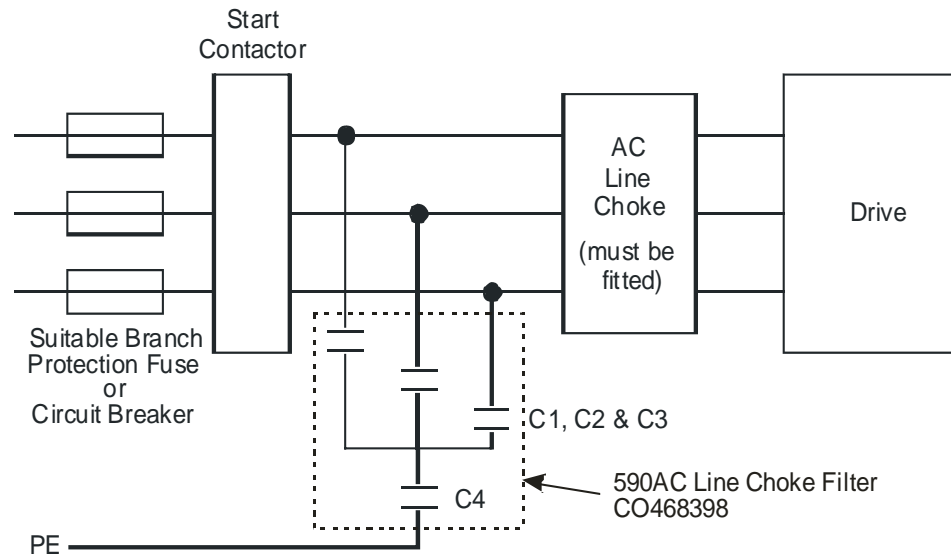
Refer to “Line Choke Installation Drawings”, page 3-53, for selection details.

# Filtering

**NOTE** Refer to Appendix B: "Certification" - EMC.

For compliance in Europe with EN61800-3 Table 11:

- The CE marking of drives whose armature current >100A is applicable without filtering.
- The CE marking of drives whose armature current <100A is **only** applicable with filtering. The drive requires one of the following:
  1. The specified filter given in Appendix B (also refer to External AC Supply EMC Filter Installation, page 3-35)
  2. Compliant filtering offered by the System
  3. Capacitors fitted between phase and earth (see Figure 3- 1 below)



Capacitor Reference Number	Capacitor Value/Type
C1, C2, C3	3.0 $\mu$ F 400V, EMI suppressor type Class X1
C4	1.0 $\mu$ F 400V, EMI suppressor type Class X1

**Figure 3- 1 AC Line Choke and Capacitors fitted to Frame 1 (15A & 35A) & Frame 2 (40A & 70A) Drives**



# Electrical Installation

## IMPORTANT

Please read the Safety Information on page Cont. 3 & 4 before proceeding.

## WARNING

Ensure that all wiring is electrically isolated and cannot be made “live” unintentionally by other personnel.

## NOTE

Refer to Appendix E: “Technical Specifications” for additional *Cabling Requirements for EMC Compliance and Termination Tightening Torque*.

Cables are considered to be electrically *sensitive, clean* or *noisy*. You should already have planned your cable routes with respect to segregating these cables for EMC compliance. If not, refer to Appendix B: “Certification”.

If the controller is to be operating in a regenerating mode for extended periods acting as a load generator for another machine, it is advisable to fit additional protection in the armature circuit. A dc fuse or high speed circuit breaker will provide this protection. If in doubt, contact Parker SSD Drives.

If fitted, the AC filter MUST be placed between the supply and the choke, on the mains side of the contactor.

Failure to do so will result in unreliable operation of the drive and reduced lifetime of the filter.

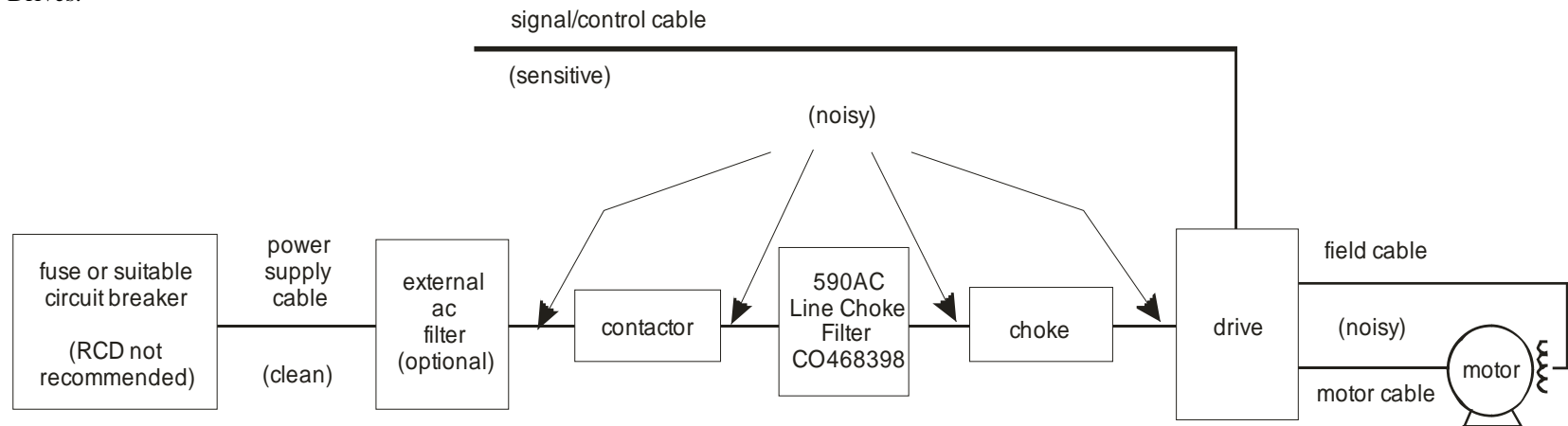


Figure 3- 2 Cabling Requirements

## Cable Gland Requirements

Use a metal gland to connect to the cubicle backplate, near the VSD (variable speed drive). It must be capable of securing a 360 degree screened connection to give EMC compliance. A 360 degree screened connection can be achieved as shown.

We suggest a rubber grommet is fitted on holes where a cable gland is not used.

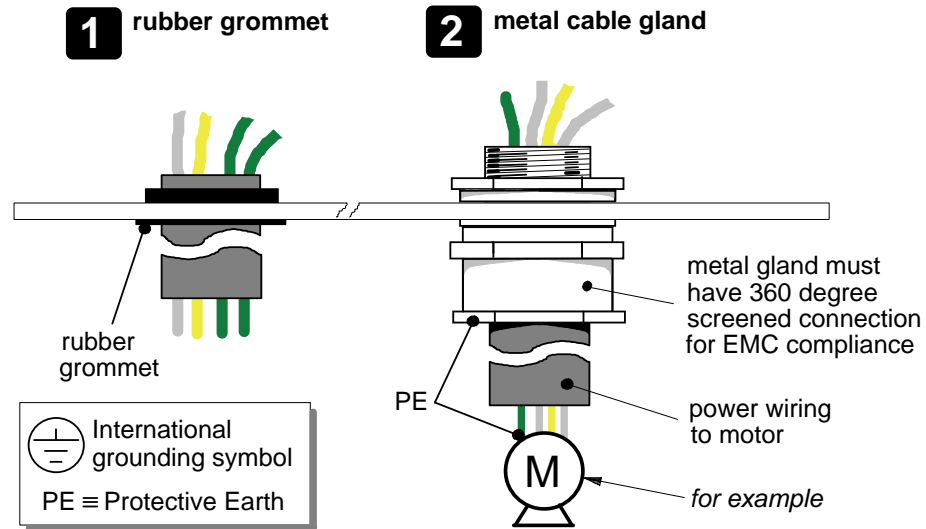


Figure 3- 3 Cable and Screen Fixings

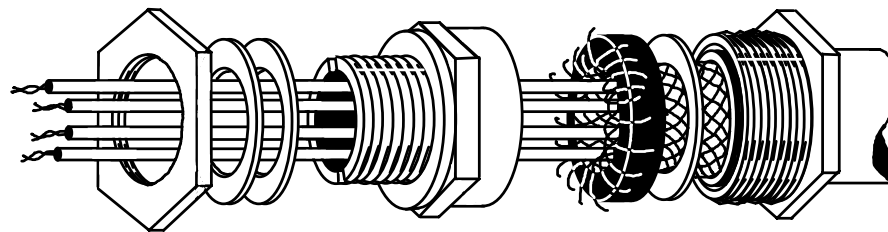


Figure 3- 4 360 Degree Screened Connection

---

# Minimum Connection Requirements

**IMPORTANT**

*If in doubt about the connection of the DC motor to the drive, contact Parker SSD Drives.*

**NOTE**

Because of the complexity of showing all possible configurations, this Chapter deals only with a 'general purpose' operation as a basic speed controller. Special wiring options usually form part of a customer-specific system and connection details will be provided separately.



Minimum connections to operate the drive safely are shown using bold lines in the following circuit diagrams. These connections are highlighted in text with the symbol opposite. The remaining connections are not necessary for a "quick start-up".

The Drive is using the default Armature Voltage feedback when following the 'minimum connection' instructions.

**WARNING**

**Power terminals carry electrical voltage which can be lethal. Never work on any control equipment or motors without first removing all power supplies from the equipment.**

---

**Caution**

Make sure all wiring connections meet or exceed applicable local and National Electrical Codes. Be sure to fit branch circuit and motor overload protection.

---

**IMPORTANT**

*If fitting your own "Power On" indicator lamp, annunciator, etc., this should be switched by an auxiliary contactor of the main contactor, not by the controller auxiliary relay.*

To avoid damaging the drive NEVER carry out high voltage resistance or dielectric strength tests without first completely disconnecting the drive from the circuit being tested.

## Power Cables

**NOTE** Refer to Appendix E: “Technical Specifications” - Wire Sizes and Termination Tightening Torques.

- minimum rating of 1.1 x full load current (Europe)
- minimum rating of 1.25 x full load current (UL)
- All incoming main AC power supply connections must be protected with high speed semiconductor fuses. Refer to Appendix E: “Technical Specifications” for fuse information.

## Control Wiring

**NOTE** Refer to Appendix E: “Technical Specifications” for Control Terminal information.

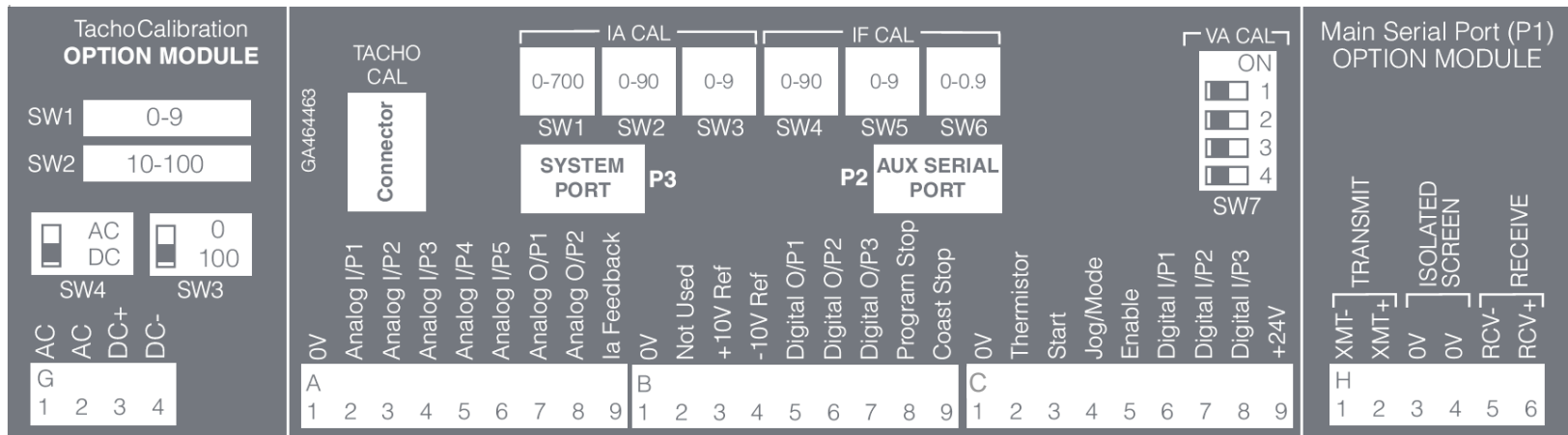
- Control wiring must have a minimum cross-section area of 0.75mm<sup>2</sup> (18AWG).
- Use screened control cables to comply with EMC requirements.
- Feed the control cables into the drive and connect to the control terminals. Refer to the connection label on the inside of the terminal cover. Close the terminal cover.

**IMPORTANT** All connections made to terminal blocks A, B and C must be isolated signal voltages.

## Important Connections

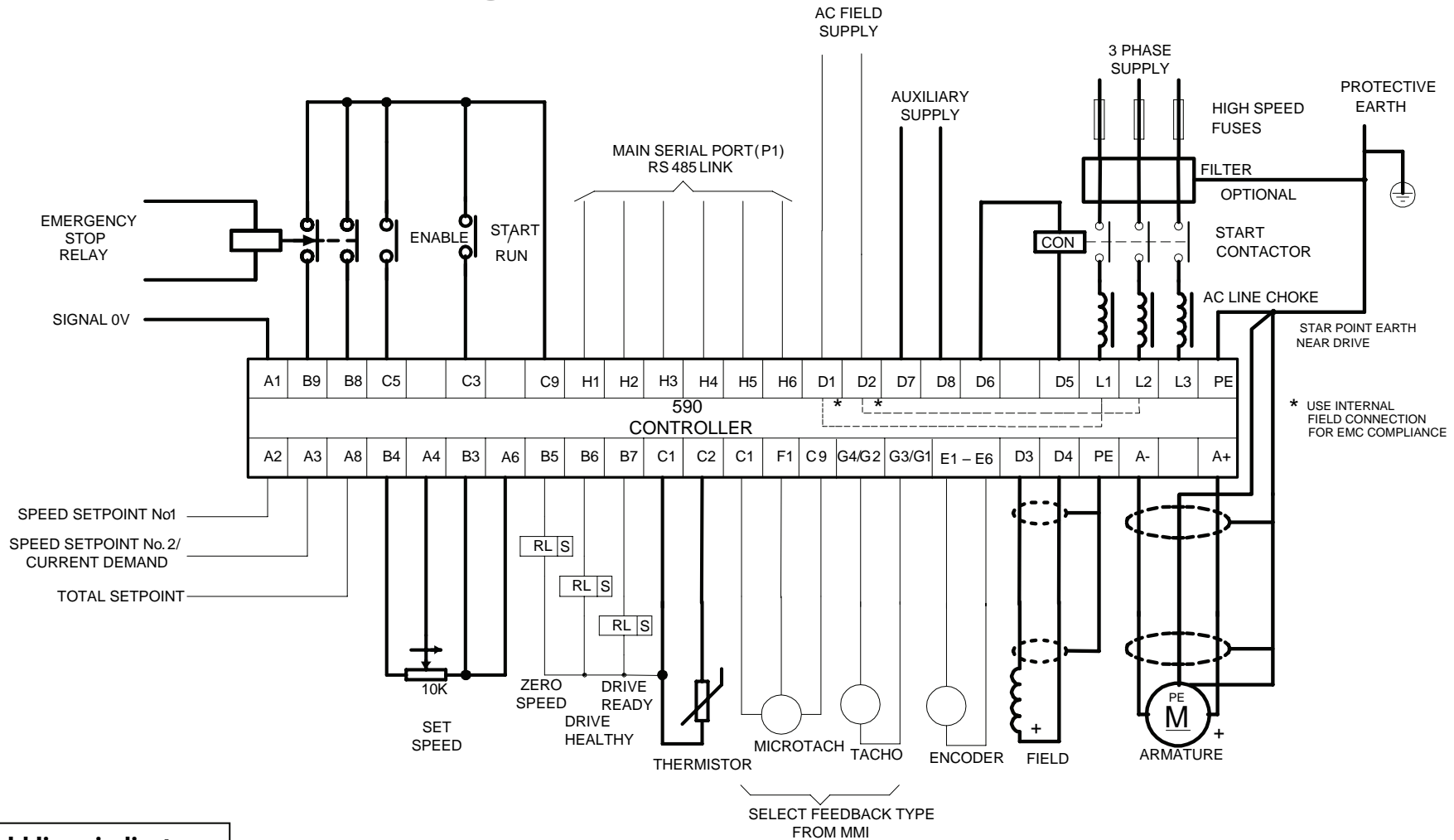
The following connections must be made for the drive to run:

- Terminals C1 and C2 must be linked if a thermostat is not fitted.



Terminal Connections Label

# Connection Diagrams



**Bold lines indicate "minimum connections"**

**Figure 3- 5 Minimum Connection Requirements (‘general purpose’ configuration)**

# Power Connections

## 3-Phase Contactor



D5

D6

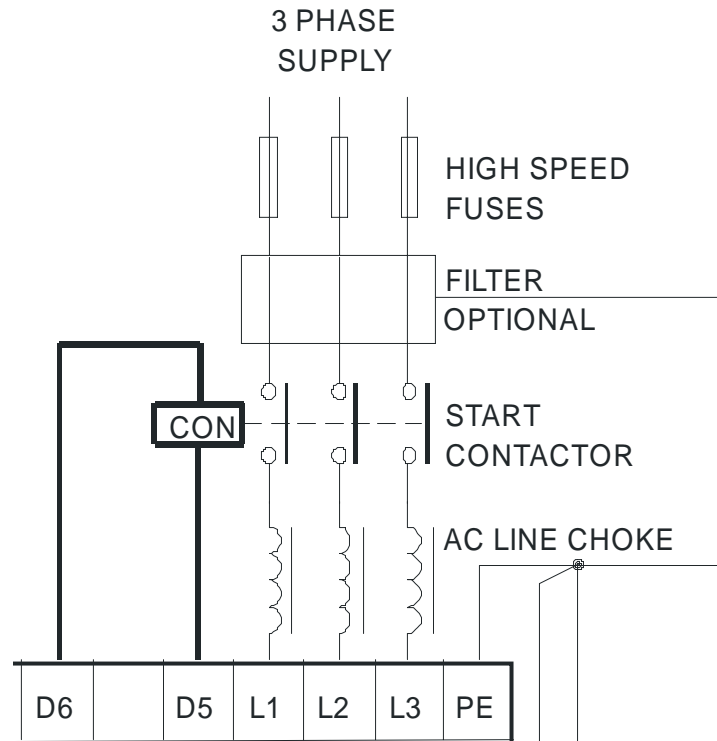
**Connect a 3-phase contactor in the main ac power supply connections, with a rating suitable (AC1) for the drive concerned.**

The contactor does not switch current and is primarily for disconnection and sequencing of the power bridge. The main contactor must be energised directly from the controller by connecting the coil to terminals D5 (Line) and D6 (Neutral). No additional series contacts or switches are permitted since they will interfere with the sequencing of the controller and cause unreliability and possible failure.

**Note:** If the 3-phase contactor has a coil with an inrush greater than 3A, a slave relay must be used to drive the contactor coil. The contactor and slave relay (if required) must have coil voltages compatible with the controller auxiliary supply voltage.

Do NOT use a slave relay with a coil current less than 25mA as it may be energised by the contact suppression network.

A dc contactor can be used but the sequencing must be adjusted to accommodate its use, an auxiliary normally open volt-free contact of the contactor must be connected in series with the "enable" input C5 to disable the drive until after the contactor is closed.



## Power Connections continued

### 3-Phase Supply, AC Line Choke



L1

L2

L3

Connect the main ac power to busbar terminals L1, L2 & L3 via the Branch Protection, AC Filter (optional), 3-Phase External Contactor, and AC Line Choke.

Connect the contactor coil to terminals D5 & D6.

#### Main AC Power

There is no specific phase connection to terminals L1, L2 and L3 as the controller is phase rotation independent

#### Branch Protection

$AC\ current = 0.83 \times DC\ Armature\ Current$

You must provide branch circuit protection using a suitable fuse to Type 2 circuit breaker (RCD, ELCB, GFCI circuit breakers are not recommended, refer to “Earth Fault Monitoring Systems”, page 3-43). Also refer to Appendix B: “Certification” – Conditions for Compliance with UL508C.

#### Semi-Conductor Protection

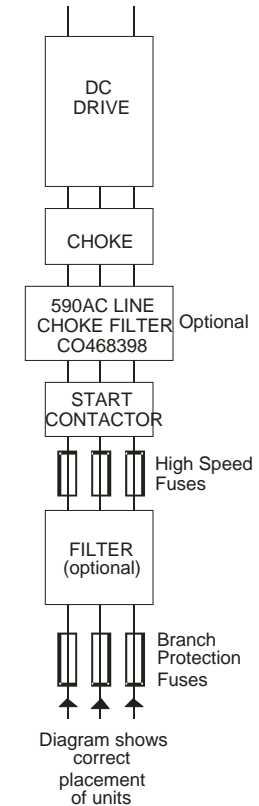
Always provide high-speed thyristor fusing to protect the thyristor stack in the case of direct output short circuits.

**IMPORTANT** *If a motor becomes completely short-circuited, the current trip (OVER I TRIP) will not protect the Drive.*

Refer to Appendix E: “Technical Specifications” – External Power Semiconductor Protection Fuses.

#### AC Filter (optional)

Refer to “External AC Supply EMC Filter Installation”, page 3-41.



**PE**

**Protective Earth Connections**



**Connect the drive's PE terminal to an independent earth/ground star point.**

**Connect this earth/ground star point to Protective Earth.**

**IMPORTANT** *The drive and filter (if fitted) must be permanently earthed. Each conductor used for permanent earthing must individually meet the requirements for a protective earth conductor*

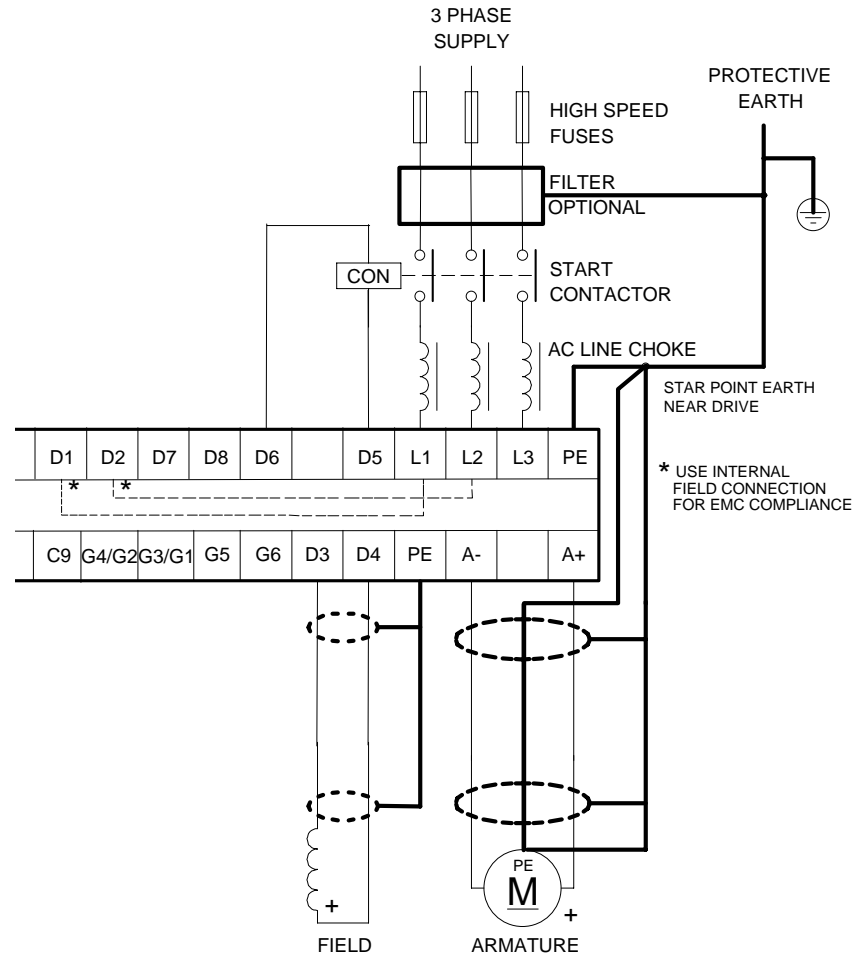
For installations to EN 60204 in Europe:

- For permanent earthing, the converter requires either two individual incoming protective earth conductors (<math><10\text{mm}^2</math> cross-section), or one conductor (>math>\geq 10\text{mm}^2</math> cross-section) connected to an independent protective earth/ground point near the drive.
- Run the motor protective earth/ground connection in parallel with the motor supply conductors, ideally in the same conduit/screen/ armour, and connect to an independent protective earth/ground point near the drive.
- Connect the drive to the independent earth/ground point.

Refer to Appendix B: "Certification" - EMC General Installation Considerations.

**NOTE** **The 720/800A chassis requires two individual incoming protective earth conductors to the filter using the two M8 terminals provided. BOTH MUST BE CONNECTED to protective earth.**

Protect the incoming mains supply, detailed in Appendix E: "Technical Specifications" - Power Details, using a suitable fuse or circuit breaker (a circuit breaker, e.g. RCD, ELCB, GFCI, is not recommended, refer to "Earth Fault Monitoring Systems", page 3-37.)





## Power Connections continued

**A+**

### Motor Armature

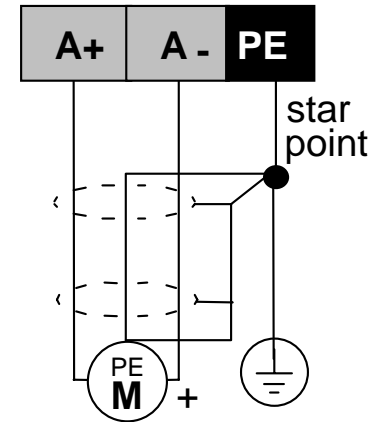


**A-**

**Connect the motor armature to terminals A+ and A-.**

The motor armature is connected to busbar terminals A+ and A-. If a DC contactor is used the poles should be interposed between the controller terminals and the motor terminals.

**Note:** When the controller is operating in a regenerating mode for extended periods acting as a load generator for another machine, it is advisable to fit additional protection in the armature circuit. A DC fuse or a high speed circuit breaker will provide this protection, if in doubt consult the Parker SSD Drives Engineering Department.



**D3**

### Motor Field



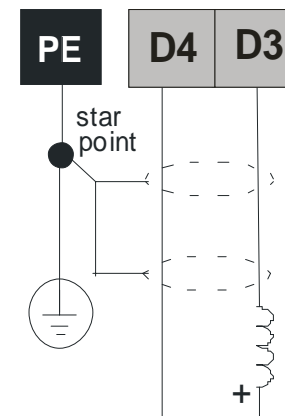
**D4**

**Connect the motor field (-) to terminal D3 and connect field (+) to terminal D4.**

Connect the motor field (-) to terminal D3 and field (+) to terminal D4. If the motor has no field connections, is a permanent magnet motor, or if the field is derived externally, you must inhibit the FIELD ENABLE parameter.

#### MMI Menu Map

- 1 SETUP PARAMETERS
- 2 FIELD CONTROL
- FIELD ENABLE



**Power Connections continued**

<b>D1</b>	<b>External AC Field</b>		<input type="checkbox"/> ✓
<b>D2</b>	<b>Connect the external field supply to terminals D1 and D2.</b>	<p>If an external field supply is required by the drive for application reasons, connect this supply to terminals D1 and D2. The magnitude of this voltage is determined by the desired field voltage. The supply must be protected externally with suitable fuses. Always derive the supply from the Red and Yellow phases of the main power supply, with the Red phase connected to terminal D1 and the Yellow phase to terminal D2.</p> <p>To change the drive from an internal to an external field type refer to "Motor Field Options", page 3-23.</p> <p><b>IMPORTANT</b>    <i>The connection of the controller and the external field supply must be consistent when using an externally supplied field regulator. Always derive the 1 phase, 50/60Hz supply from the L1 (Red) and L2 (Yellow) phases of the main power supply, directly or indirectly through a single-phase transformer, with the Red phase connected to terminal D1 and the Yellow phase to terminal D2.</i></p> <p><b>NOTE</b>    You must provide branch circuit and overload protection.</p>	
<b>D7</b>	<b>Auxiliary Supply</b>		<input type="checkbox"/> ✓
<b>D8</b>	<b>Connect the control supply to terminals D7 and D8.</b>	<p>Single phase, 110/240V ac, 50/60Hz.</p> <p><b>Note:</b> The auxiliary supply chosen must equate to the contactor coil voltage used.</p> <p><b>IMPORTANT</b>    <i>The auxiliary supply terminals must be connected directly to the incoming supply via a fuse or circuit breaker. No series sequencing switches or contacts are permitted without consultation from Parker SSD Drives.</i></p> <p>Use suitable external fuse protection: the steady state current absorbed by the controller is nominal, the external fuse is determined chiefly by considering the contactor holding VA and the controller cooling fans. (Frame H fans are powered separately).</p> <p>Refer to Appendix E: "Technical Specifications" - Power Supply Fuses.</p>	

# Control Connections

**A4**

## Setpoint Ramp Input



**A6**

**Connect a 10k potentiometer between terminals B3 and B4. Connect the wiper to A4.**

**B3**

**B4**

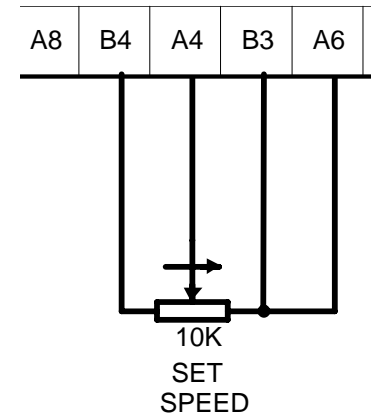
Controls the speed of the motor

For normal operation the speed demand signal is connected to the "Setpoint Ramp Input", terminal A4 (Analog I/P3). This input is scaled so that:

- +10V input = maximum forward speed demand (+100%)
- 10V input = maximum reverse speed demand (-100%)

The speed demand signal can be generated by connecting the two ends of an external 10K potentiometer to the +10V reference terminal B3 and -10V reference terminal B4, the wiper of the potentiometer being connected to the "Setpoint Ramp Input" as the speed reference.

The main current limit is adjustable by means of the MAIN CURR. LIMIT parameter [Tag No. 15]. For normal operation of the main current limit, Terminal A6 should be connected to the +10V reference, Terminal B3, and the CURR. LIMIT/SCALER should be set to 200%. This allows the MAIN CURR. LIMIT parameter to adjust the current limit between 0 and 200% full load current. If external control of the main current limit is required, a 10K potentiometer connected between Terminal B3 (+10V Ref) and Terminal B1(0V), with the wiper connected to Terminal A6 (Analog I/P5) gives 0 to 200% of full load current provided that MAIN CURR. LIMIT and CUR. LIMIT/SCALER are set to 200%.



### MMI Menu Map

- 1 SETUP PARAMETERS
  - CURR. LIMIT/SCALER
  - MAIN CURR. LIMIT
- 2 CURRENT LOOP

## Control Connections continued

**A1**

### Signal 0V, Speed Setpoint No. 1, Speed Setpoint No. 2/Current Demand

**A2**

**A3**

#### *Signal 0V (A1)*

This is the common reference point for all analog signals used in the drive.

For non-reversing applications and 2 quadrant controller (591 and 599), the speed demand only needs to operate between 0V and +10V, the anti-clockwise end of the potentiometer should then be connected to Terminal A1 (0V).

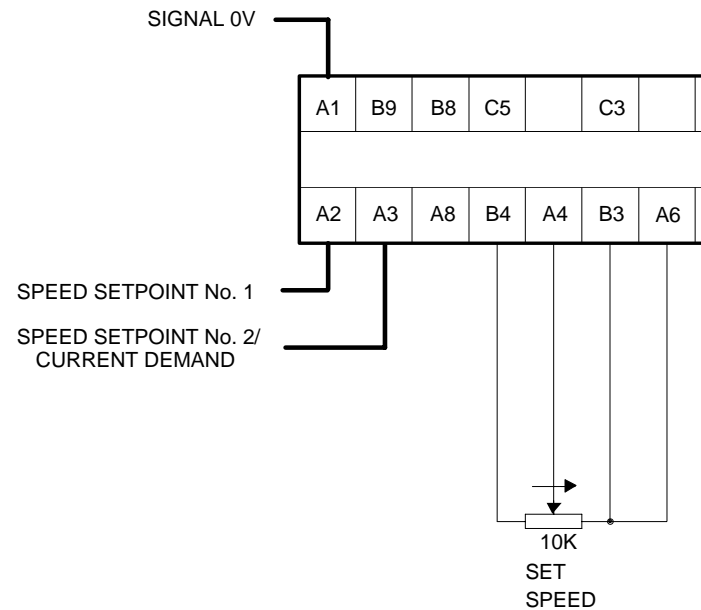
#### *Speed Setpoint No. 1 (A2)*

Terminal A2 (Analog Input 1) is a direct speed demand by-passing the "Setpoint Ramp Generator", and should be used if direct control is required.

#### *Speed Setpoint No. 2/ Current Demand (A3)*

Terminal A3 (Analog Input 2) is a dual function terminal (either "Speed Setpoint No. 2" or "Current Demand") as selected by mode switch control "Current Demand Isolate", Terminal C8. As a speed setpoint, it can be used in the same way as Terminal A2.

If more than one speed setpoint is used they are additive.



## Control Connections continued

**C1**

### Thermistor



**C2**

**Connect the motor thermistor to terminals C1 and C2.**

**or**

**link terminals C1 and C2 if sensors are not fitted**

**The motor temperature alarm (THERMISTOR) cannot be inhibited in software. Terminals C1 and C2 must be linked if sensors are not fitted.**

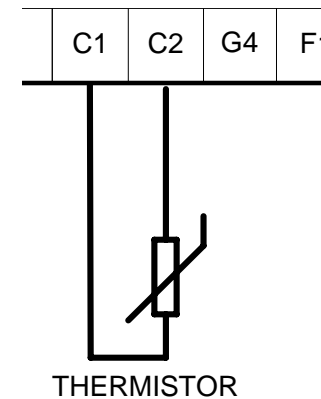
We recommend that you protect the dc motor against overtemperature by the use of temperature sensitive resistors or switches in the field and interpole windings of the machine.

If the motor is fitted with over-temperature sensing devices such as thermostats, microtherms or PTC thermistors, these should be connected (in series) between terminals C1 and C2. Thermistors must have a combined working resistance of 200 Ohms or less, rising to 2000 Ohms at over-temperature. These thermistors are classified by IEC34-II as Mark A.

**Such protection devices must be double insulated from the live windings of the machine.**

Temperature sensitive resistors have a low resistance (typically 100 Ohms) up to a reference temperature (typically 125°C), above this the resistance rises rapidly to greater than 2000 Ohms. The controller's thermistor alarm will activate at 1800 Ohms.

Temperature switches are usually normally closed, and open at approximately 105°C. The thermistor alarm is latched in software and must be reset by re-starting the Converter.



## Control Connections continued

**B8**

### Enable, Start/Run, Emergency Stop Relay



**B9**

**Connect Terminal C5 (Enable)**

**C3**

**to**

**C5**

**Terminal C9 (+24V)**

**C9**

**in order to allow the drive to run.**

**Connect terminals B8 & B9 to C9 via an Emergency Stop relay.**

**Connect terminal C3 to C9 to run/start the controller/motor.**

#### **Start**

The basic run/start sequence of the controller is provided by Terminal C3 (Start/Run), although other safeguards for extra protection are provided by Terminal B8 (Program Stop) and Terminal B9 (Coast Stop).

Assuming that the Program Stop and Coast Stop terminals are held TRUE, then a single contact connected between Terminal C9 (+24V) and Terminal C3 (Start/Run) when closed will cause the controller to energise the Main Contactor and, provided Terminal C5 (Enable) is also TRUE, will run the associated DC motor.

When the single contact to Terminal C3 (Start/Run) is opened, the controller will decelerate the motor to zero speed at a rate determined by the STOP TIME parameter's value and the MAIN CURR. LIMIT value.

Refer to Chapter 6: "Application Programming" - STOP RATES for further information.

**The Enable input is useful to inhibit the drive without opening the main contactor, however, it is not a safe mode of operation as the drive dc output is only reduced to zero. If the equipment controlled by the drive is to be serviced, then this method should be avoided and the drive disabled and isolated.**

**A regenerative drive can be stopped using a Normal Stop, a Program Stop, or an Emergency Stop, as described below. However, a non-regenerative drive can only be made to stop faster than friction and loading will allow by Dynamic Braking.**

#### **Normal Stop**

If the +24V is removed from Terminal C3 whilst the drive is controlling the motor under "Run" conditions, the controller will cause the motor to decelerate rapidly to rest at a rate determined by STOP LIMIT, STOP TIME and CURR. LIMIT.

#### **Program Stop**

If the +24V is removed from Terminal B8 whilst the drive is controlling the motor under "Run" conditions, the controller will cause the motor to decelerate rapidly to rest at a rate determined by PROG STOP I LIM, PROG STOP LIMIT and PROG STOP TIME. If the signal is re-applied to Terminal B8, the motor remains stationary until a new Start command is applied to Terminal C3 (Start/Run).

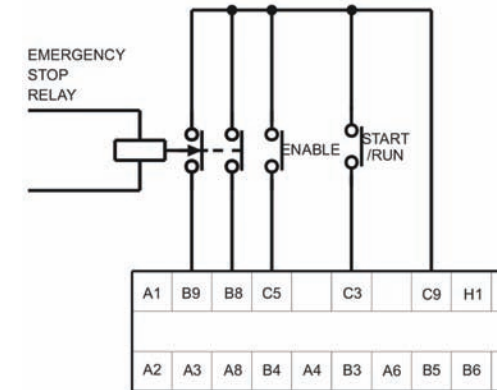
#### **Emergency Stop**

Additional terminals, Terminal B8 (Program Stop) and Terminal B9 (Coast Stop), provide extra facilities for the control of the regenerative controller:

Terminal B9 (Coast Stop) must be held at +24V to allow closure of the main contactor, the connection provides the power supply to allow the electronics to operate the auxiliary relay and hence the main contactor.

Connect Terminal B9 (Coast Stop) to Terminal C9 (+24V) via a normally open contact of an "emergency" stop relay. The emergency stop relay should not be part of the normal sequencing of the system, which is implemented via the Start contacts, but is a relay which can be operated in exceptional circumstances where human safety is of paramount importance.

Terminal B8 (Program Stop) provides a facility for regenerative braking on a 4 Quadrant drive (590 and 598).



## Control Connections continued

**B5**

### Zero Speed, Drive Healthy, Drive Ready

**B6**

#### User connection to external equipment.

**B7**

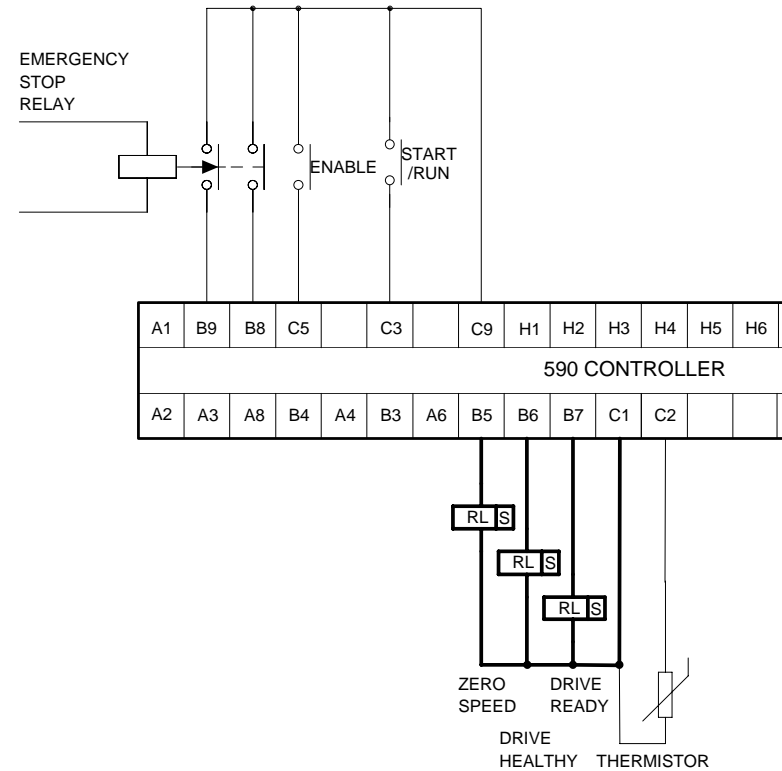
These digital output terminals provide a +24V dc output signal under certain conditions. This allows for the connection of relays which, in conjunction with the Enable, Start/Run and Emergency Stop relay, can be used to enhance the safe starting and stopping of the controller.

These are configurable outputs and can be used as required in the control system design, i.e. cubicle door lamps, connection to a suitable PLC.

The default actions are:

- B5 = Zero Speed Detected
- B6 = Drive Healthy
- B7 = Drive Ready

(The diagram shows a simple default configuration).



## Control Connections continued

**H1**

### RS485 Link

**H2**

**User connection to external equipment.**

**H3**

**Fit the COMMS Option Board to the Drive.**

**H4**

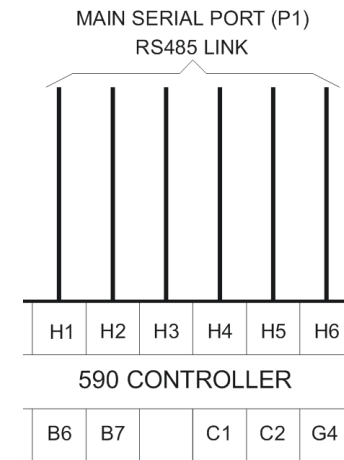
**H5**

**H6**

**This provides terminals H1 to H6.**

These terminals are found on the plug-in COMMS Option Board. The board, when fitted to each unit, allows converters to be linked together to form a network.

Refer to the RS485 Communications Interface Technical Manual supplied with the option board.



**G1**

### Analog Tachogenerator

**G2**

**User connection to external equipment.**

**G3**

**G4**

**Fit the Tacho Calibration Option Board to the Drive.**

**This provides terminals G1 to G4.**

Refer to Chapter 13: “Standard and Optional Equipment” - Optional Equipment for further information.

An Analog Tachogenerator is connected to the Drive using a screened twisted pair cable throughout its entire length to provide speed feedback via the Tacho Calibration Option Board. This provides facility for an AC or DC tachogenerator. The screen is grounded or earthed only at the drive end, any other grounding arrangement may cause problems.

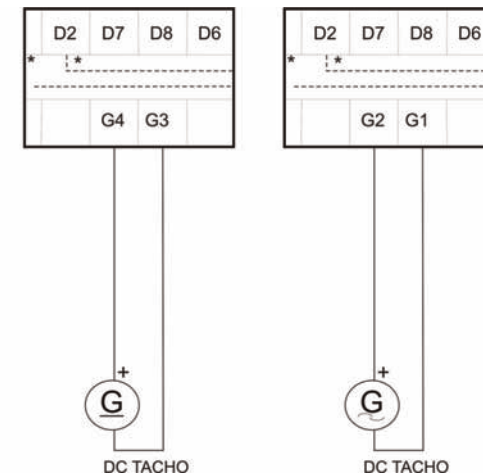
Terminals G1 and G2 are for AC tacho connections.

Terminals G3 and G4 are for DC tacho connections.

**Note:** The speed loop is set-up for an analog tacho by the **SPEED FBK SELECT** parameter in the **SPEED LOOP** function block. Select **ANALOG TACH** for this parameter.

*If an AC tachogenerator is used the output is rectified to produce the ac feedback to the speed loop. Consequently, the controller can only be used with a positive setpoint.*

Refer to Chapter 4: “Operating the Converter” for set-up information.





<b>F1</b>	<b>Microtach</b>	
<b>C1</b>	<b>User connection to external equipment.</b>	Refer to Chapter 3: “Installing the Drive” - Optional Equipment for further information. The Parker SSD Drives MICROTACH is available in two versions:
<b>C9</b>	<b>Fit the Microtach Option Board to the Drive.</b>	<ul style="list-style-type: none"> <li>● 5701 Plastic Fibre Microtach</li> <li>● 5901 Glass Fibre Microtach</li> </ul>
	<b>This provides the fibre optic terminal F1.</b>	<p>A Microtach can be connected to provide speed feedback via the Microtach Option Board using the international standard “ST” fibre optic system.</p> <p>F1 is the fibre optic receiver input socket. If fitted, terminals C9 (+24V dc) and C1 (0V) can be used to provide the supply and return respectively.</p> <p><b>NOTE</b> The speed loop is set-up for the Microtach by the SPEED FBK SELECT parameter in the SPEED LOOP function block. Select ENCODER for this parameter.</p> <p>The maximum Microtach frequency is 50kHz, thus with a standard 1000 lines per revolution Microtach the motor speed cannot exceed 3000 rpm.</p> <p>For specification and connection information refer to Parker SSD Drives or the appropriate Technical Manual.</p> <p><b>NOTE</b> This 590C product is not compatible with the older style of Microtach Speed Feedback option (AH058654U001, with 4-way terminals).</p>
<b>E1</b>	<b>Wire-Ended Encoder</b>	
<b>E2</b>	<b>User connection to external equipment.</b>	Refer to Chapter 3: “Installing the Drive” - Optional Equipment for further information. The wire-ended encoder is connected to the Drive using a screened cable throughout its entire length to provide speed feedback.
<b>E3</b>	<b>Fit the Encoder Option Board to the Drive.</b>	Terminals E1 (0V) and E2 (+24V dc) are the return and supply respectively.
<b>E4</b>	<b>Fit the Encoder Option Board to the Drive.</b>	<b>NOTE</b> The speed loop is set-up for the Encoder by the SPEED FBK SELECT parameter in the SPEED LOOP function block. Select ENCODER for this parameter.
<b>E5</b>	<b>Fit the Encoder Option Board to the Drive.</b>	The maximum allowable encoder frequency is 100kHz, thus with a standard 1000 lines per revolution encoder the motor speed cannot exceed 6000 rpm.
<b>E6</b>	<b>This provides terminals E1 to E6.</b>	For specification and connection information refer to Parker SSD Drives or the appropriate Technical Manual.

# Motor Field Options

## WARNING

Isolate the drive before converting to internal/external supply.

The FIELD CONTROL function block controls the motor field. The FLD CTRL MODE parameter allows you to select either Voltage or Current Control mode.

- In Voltage Control mode, the RATIO OUT/IN parameter is used to scale the motor field output voltage as a percentage of the input supply voltage.
- In Current Control mode, the SETPOINT parameter is used to set an absolute motor field output current, expressed as a percentage of the calibrated field current (IF CAL).

## Internal/External Supply

**NOTE** For information about the following terminal/power boards refer to Appendix E: “Technical Specifications” - Terminal Information (Power Board).

The internal motor field is more widely used, however, there is provision on the unit for an external motor field supply to be connected (perhaps for where the field voltage is greater than the input voltage and therefore not attainable, or where the motor field is switched separately for convenience).

## Power Board - PCB Reference 385851

This power board (printed with the above number) can be altered for use with either an internal or external motor field supply:

### Internal Motor Field (default for this board)

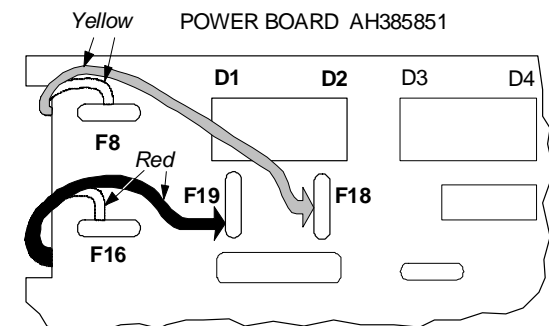
Terminals D3 and D4, the motor field outputs, are energised when the 3-phase supply to L1/L2/L3 is energised and the internal motor field is used. Terminals D1 and D2 are not energised. The internal motor field supply is fused by the 10A fuses, FS2 & FS3.

### External Motor Field Connections

Terminals D1 and D2 on the Power Board can be used for an external ac supply connection for the Motor Field Supply.

A simple re-wiring procedure disconnects the internal motor field supply and prepares terminals D1 and D2 for the external ac supply connection.

You should provide suitably rated external, fast-acting semi-conductor fusing, to a maximum of 10A.



## Re-Wiring Procedure

**WARNING**  
Isolate all power to the drive.

1. Loosen the control board fixing screws (2 off) and position the control board to allow access to the power board.
2. Remove the **red** link from the Faston connector “F16” on the left-hand side of the board and connect it to staging post “F19”, located below terminal D1.
3. Remove the **yellow** link wire from the Faston connector “F8” on the left-hand side of the board and connect it to staging post “F18”, located below terminal D2.

## Caution

When using an external ac input it is important to have the correct phase relationship on the terminals. The supply must be derived from L1 (Red) and L2 (Yellow) phases directly or indirectly through a transformer. L1 must be connected to D1, and L2 connected to D2.

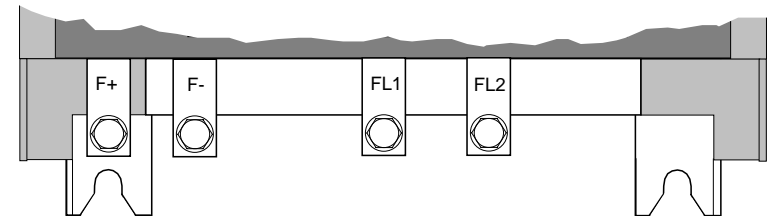
The external field supply can now be connected and power restored to the drive.

## Power Board - PCB Reference 385128

### External Motor Field (default for this board)

This power board (printed with the above number) is supplied in external stack options using an external motor field supply. Connect the external supply to busbars FL1 and FL2. The motor field output is taken from busbars F+ and F-.

You should provide suitably rated external, fast-acting semi-conductor fusing, to a maximum of 20A.



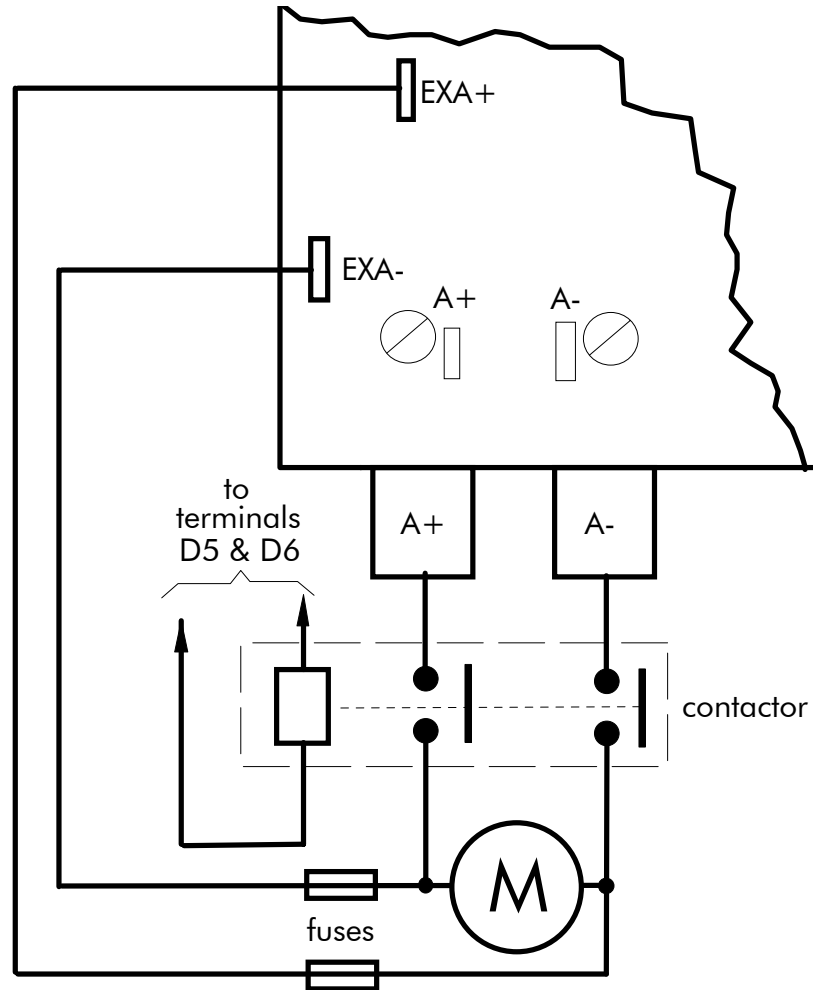
## Caution

When using an external ac input it is important to have the correct phase relationship on the terminals. The supply must be derived from L1 (Red) and L2 (Yellow) phases directly or indirectly through a transformer. L1 must be connected to D1, and L2 connected to D2.

# DC Contactor - External VA Sensing

Connections are provided for external armature voltage sensing (at the motor) for when a dc contactor is used between the drive and motor.

## Power Board - PCB Reference 385851



# Power Board Circuit Descriptions

## 590/591 (AH385851U002, U003, U004, U005)

All chassis sizes 35A to 270A  
(2 Quad and 4 Quad - Low and High Volt)

Power supplies for the controller are generated from the single phase auxiliary supply via a switched mode power supply.

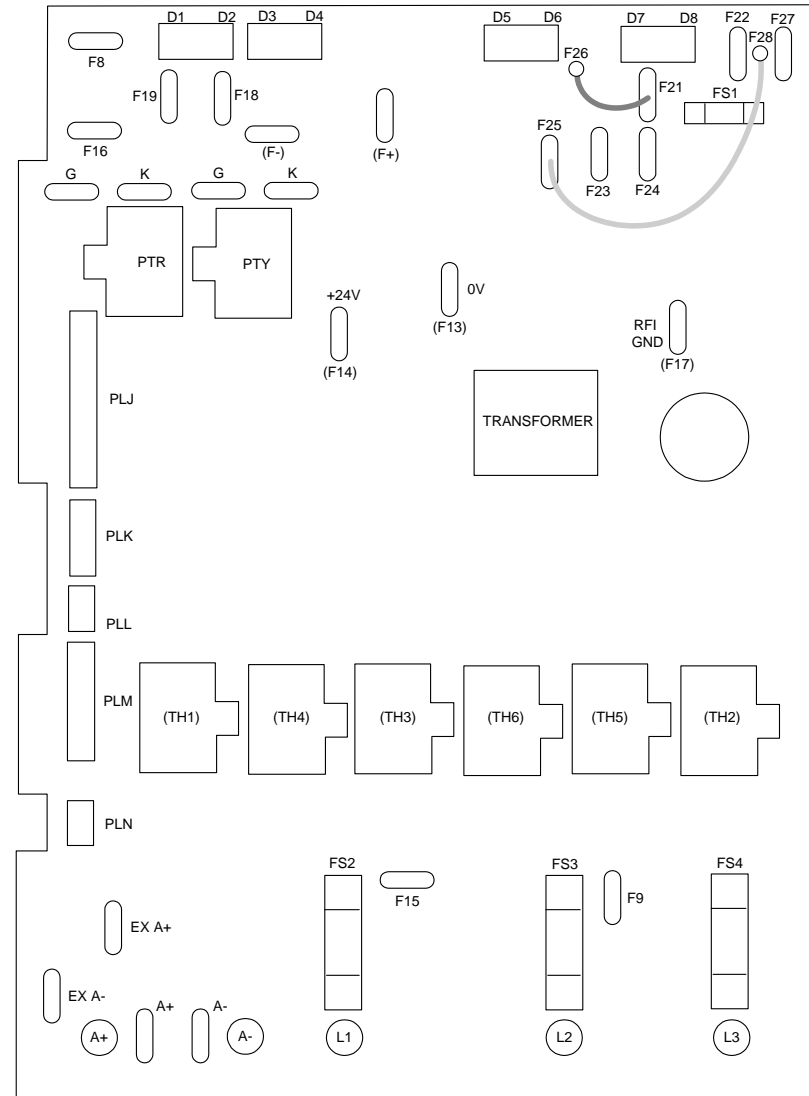
The incoming supply is directly rectified to provide a high voltage dc power rail. A high voltage transistor switches this rail on to the primary of a high frequency transformer, the output of which is rectified and smoothed to provide the dc power supply rails.

The +5V dc rail is monitored via a reference element and a control signal returned via an opto-isolator to the control element of the high voltage switching transistor.

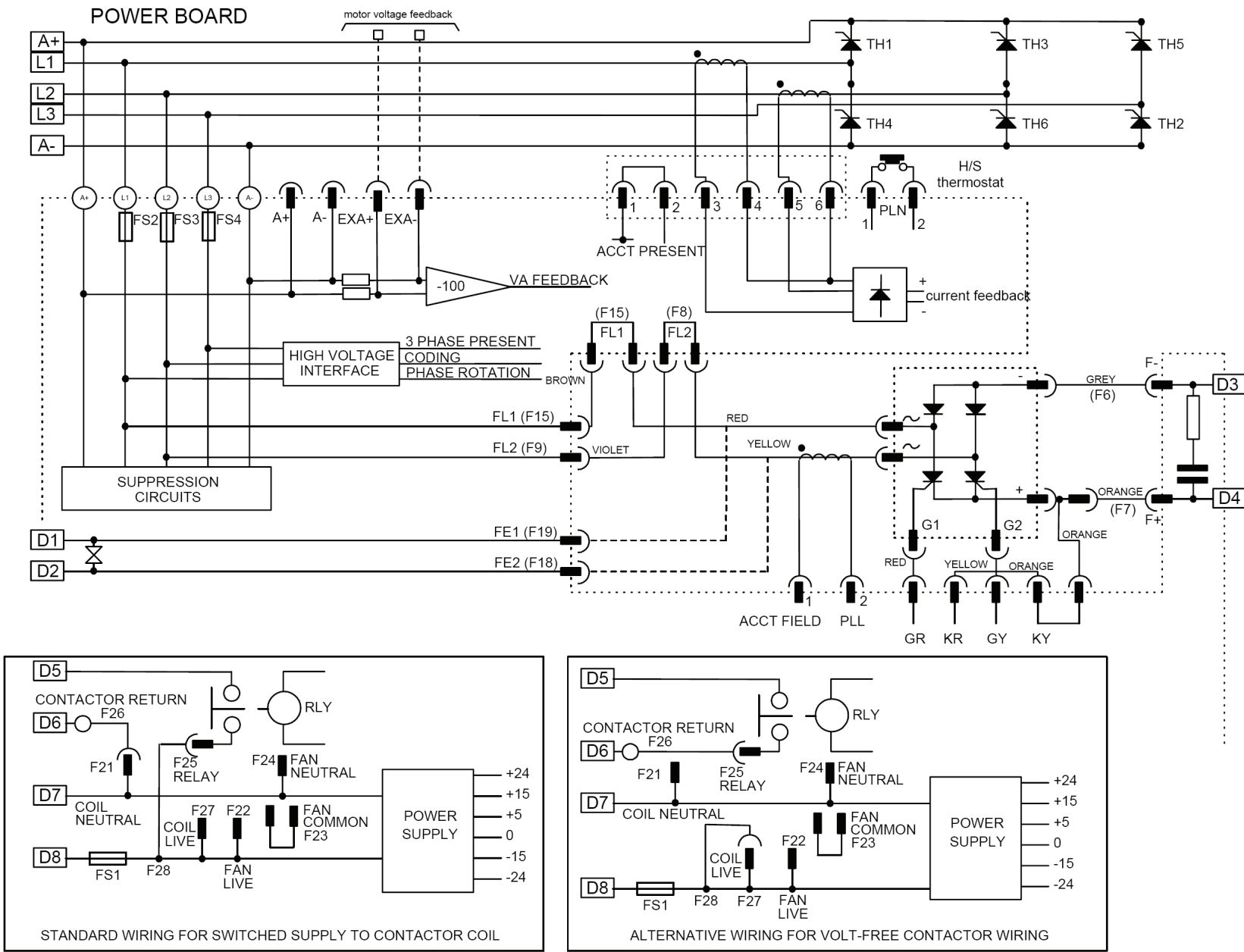
The ±15V dc rails are generated via separate secondary windings which are rectified, smoothed and stabilised by linear regulators.

The SMPS operates over an input voltage range of 110V to 240V ac ±10%, 50/60Hz.

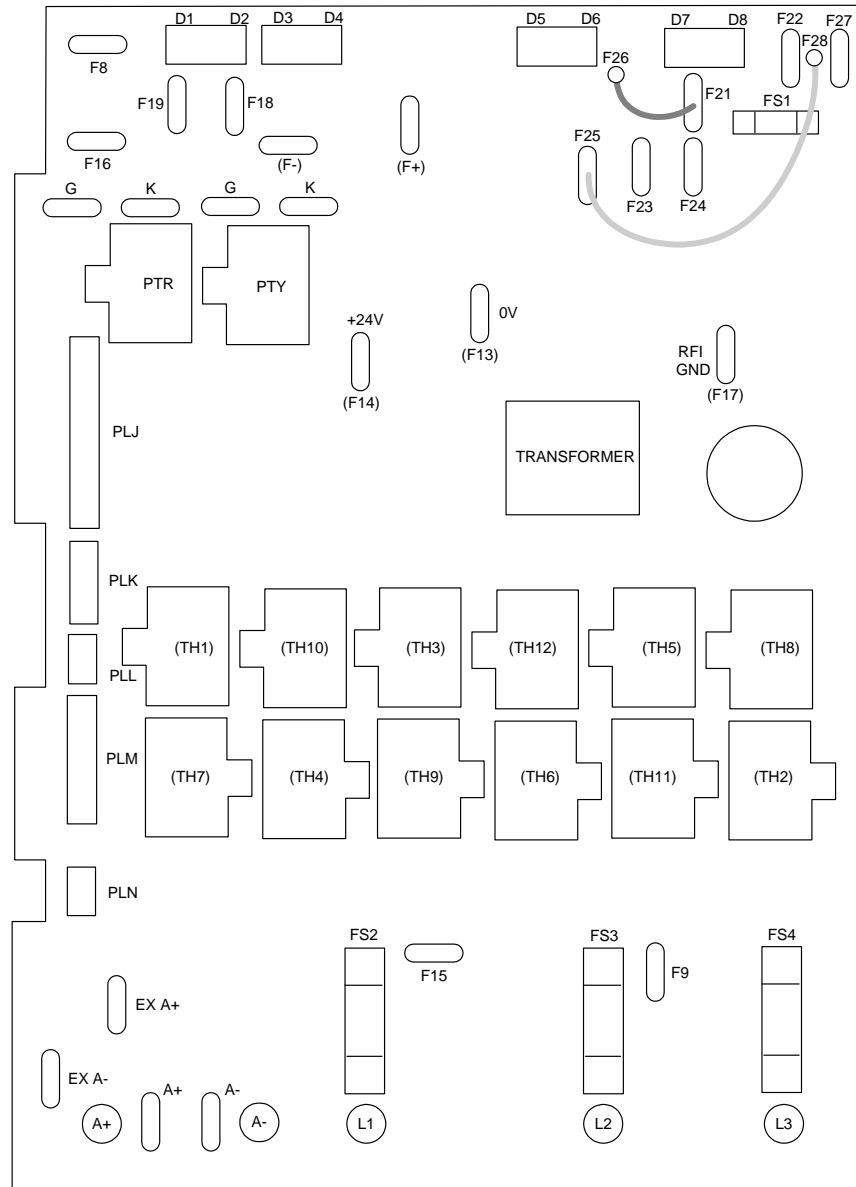
The auxiliary supply fuse FS1 provides protection of the high voltage elements.



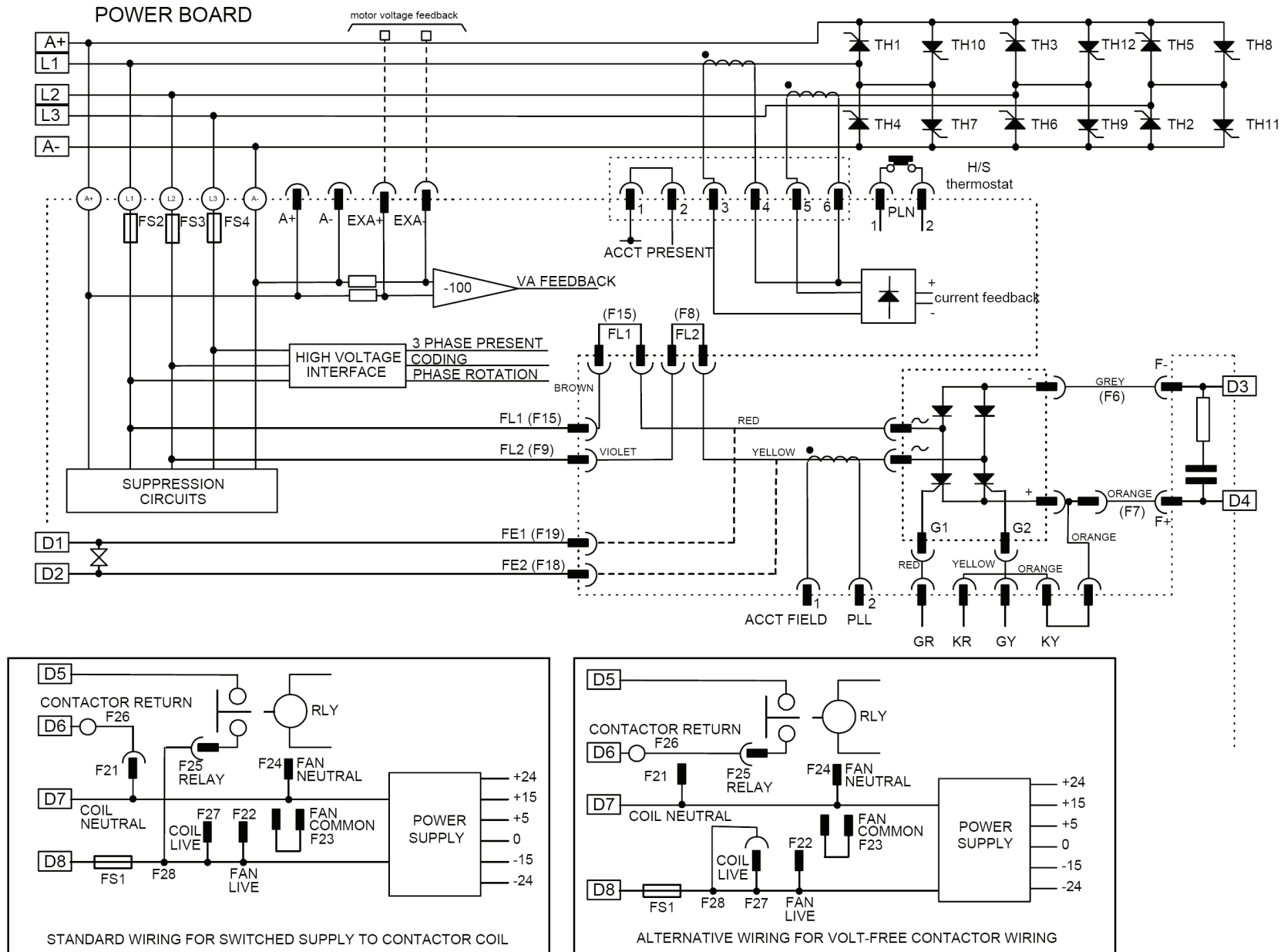
**Figure 3- 6 591 Power Board 2 Quad  
(AH385851U003, U004)**



**Figure 3-7 2 Quad Power Circuit - 35, 70, 110, 150, 180 & 270A using AH385851U003, U004**



**Figure 3- 8 590 Power Board 4 Quad (AH385851U002, U005)**



**Figure 3- 9 4 Quad Power Circuit - 35, 70, 110, 150, 180 & 270A using AH385851U002, U005**





# Optional Equipment

Contact your local Parker SSD Drives office to order optional equipment.

Item	Part Number
EMC Installation Guidelines for Modules and Systems <i>A Parker SSD Drives application manual detailing EMC requirements</i>	HA388879
590 Digital Section Control <i>A Parker SSD Drives application manual detailing the use of the block diagram to implement open and closed loop control of driven web section rolls</i>	HA388664
590 Digital Closed Loop Centre Winder <i>A Parker SSD Drives application manual detailing the use of the block diagram to implement closed loop centre winders</i>	HA388202
DSELite and ConfigEd Lite <i>Parker SSD Drives' Windows-based block programming tools</i>	Order by name
External AC Supply (RFI) Filter <i>For Drives without internal filters, on cable runs in excess of 25 metres</i>	Refer to Appendix E: "External AC Supply (RFI) Filters" for Part Numbers
Microtach Option Board <i>Two board types for connecting to a plastic or glass fibre Microtach encoder</i> <ul style="list-style-type: none"> <li>• Glass</li> <li>• Plastic</li> </ul>	AH386025U001 AH386025U002
Encoder Option Board <i>A board to interface to a wire-ended encoder</i>	AH387775U001 (universal)
Tacho Calibration Option Board <i>A switchable calibration board for interfacing to AC/DC analog tachogenerators</i>	AH385870U001
Comms Option Board (P1) Board <i>Two board types for supporting EI BYSYNCH or PROFIBUS communication protocols for connection to other equipment.</i> <ul style="list-style-type: none"> <li>• EI BYSYNCH (RS422, RS485)</li> <li>• PROFIBUS</li> </ul>	AH385826U001 AH389918U001

# Speed Feedback Option Boards

Each option board below is shown with the correct selection for the SPEED FBK SELECT parameter.

The selections are ARM VOLTS FBK, ANALOG TACH, ENCODER and ENCODER/ANALOG.

(ARM VOLTS FBK is default and requires no option board).

### MMI Menu Map

- 1  SETUP PARAMETERS
- 2  SPEED LOOP
- SPEED FBK SELECT

**WARNING**  
Isolate the drive before fitting or removing the options.

## Microtach Option Board

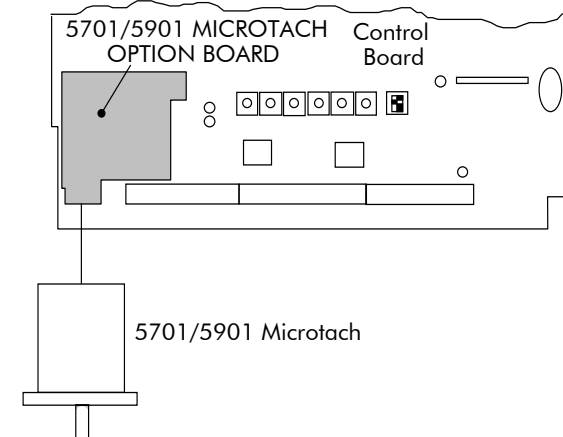
ENCODER

There are two kinds of Parker SSD Drives' Microtach, each requiring a different board:

5701 Microtach (plastic fibre)

5901 Microtach (glass fibre)

If fitted, refer to the Microtach Technical Manual for further information.

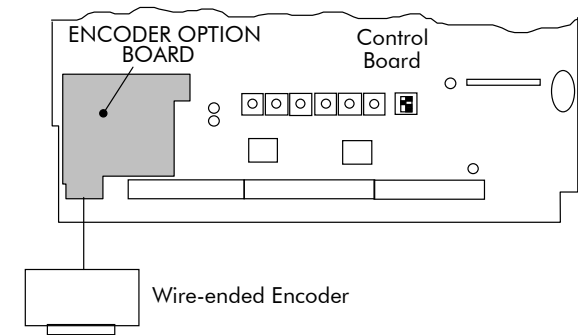


## Wire-Ended Encoder Option Board

The board accepts connection from a wire-ended encoder.

If fitted, refer to the Encoder Technical Manual for further information.

ENCODER

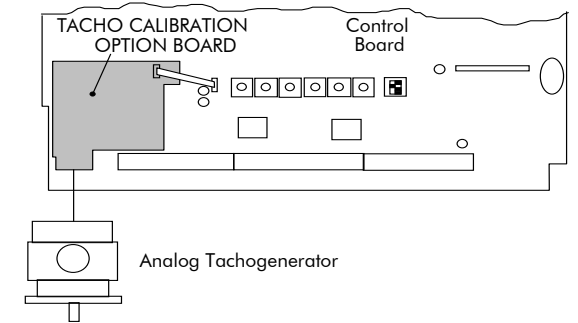


## Tacho Calibration Option Board

The board accepts connection from an analog tachogenerator.

If fitted, refer to Chapter 4: "Operating the Drive" - Speed Feedback Option Boards.

ANALOG TACH

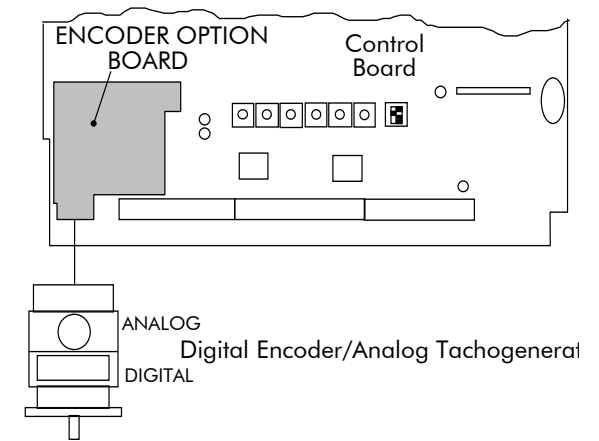


## Combined Tacho and Encoder Feedback

ENCODER/ANALOG

If an analog tachogenerator and digital encoder are to be used, the Encoder Option Board receives the digital signal, the analog signal is routed to Terminals B2 (Tacho) and B1 (0V).

Please refer to Parker SSD Drives Engineering Department for assistance with this feature.



## Communications Option Boards

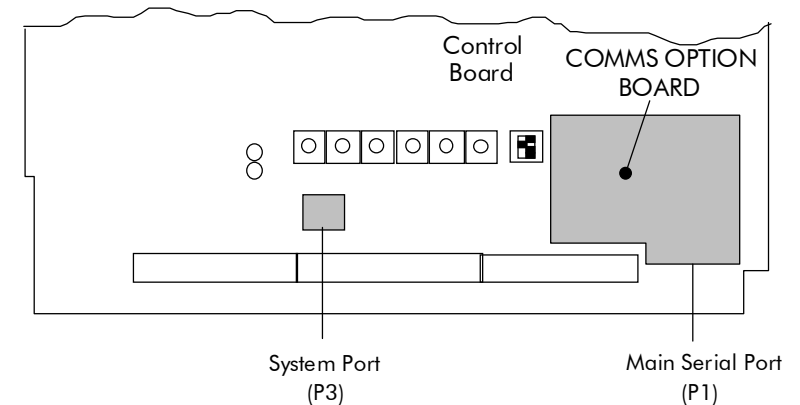
### Comms Option Board (P1)

Two protocols are supported, each requiring a different board:

- EI BYSINCH (EI BINARY or EI ASCII) ENCODER/ANALOG ENCODER/ANALOG
- PROFIBUS (OPTION) ENCODER/ANALOG

The board allows the 590 to be controlled as part of a system. The system can also comprise other Parker SSD Drives products such as the 605 and 584SV Inverters, or any other equipment using the same protocol.

**NOTE** The 5721 Operator Station is not supported by this product.



## External AC Supply EMC Filter Installation

Refer to Appendix E: “Technical Specifications” - Environmental Details, and External AC Supply (RFI) Filters and Line Choke for selection details.

A filter is used with the Drive to reduce the line conducted emissions produced by the Drive. Filters are used in parallel on the higher current Drives. When installed correctly and used with the specified 2% minimum line chokes, conformance with EN55011 Class A can be achieved (suitable for both generic environments: RF Emission and Immunity).

### Cubicle-Mounting the 590 Drive with Filter

#### **WARNING**

**Do not touch filter terminals or cabling for at least 5 minutes after removing the ac supply.**

**The CO389456 filter flying leads can reach 100°C under normal operating conditions. Leads should be separated to at least one cable diameter and adequately ventilated. Never bunch leads together.**

**Only use the ac supply filter with a permanent earth connection.**

**The filter should be fitted on the mains side of the contactor.**

The Drive must be mounted vertically on a solid, flat, vertical surface. It must be installed into a cubicle.

The recommended EMC filter is mounted to the left, right, above, below, or spaced behind the Drive. It can be mounted flat against the surface, or projecting out from the surface if the filter type has side fixings.

1. Mount the filter securely at the four fixing points (flat or on its side).
2. Mount the Drive next to the filter, allowing for the required air gap between the Drive, the filter and any adjacent equipment.

**NOTE** When filters CO389456 are mounted in parallel, they should be spaced 40mm apart for ventilation

### Connection Details

The connection between the Drive, choke and filter must always be as short as possible and **must be segregated from all other cables**. Ideally, mount the filter and choke onto the same metallic panel as the Drive. Take care not to obstruct any ventilation spacing.

If this cable/busbar exceeds 0.6m (2 feet) in length, it must be replaced with a screened/armoured cable. The screen/armour must be earthed at both the filter, choke and Drive ends with large-area contact surfaces, preferably with metal cable glands.

You should enhance the RF connection between the Drive, choke, filter and panel as follows:

1. Remove any paint/insulation between the mounting points of the EMC filter, choke, Drive and the panel. Liberally apply petroleum jelly over the mounting points and securing threads. This will prevent corrosion. Alternatively, conducting paint could be used on the panel.
2. If 1 above is not possible, then improve the RF earth bond between the filter and Drive by making an additional RF earth connection. Use wire braid of at least 10mm<sup>2</sup> cross-sectional area.

**NOTE**

**Metal surfaces, such as anodised or yellow chromed (with cable mounting or 35mm DIN rails, screws and bolts) have a high impedance which can be very detrimental to EMC performance.**

3. A low RF impedance path must be provided between the motor frame and back panel on which the drive, choke and EMC filters are mounted. This low impedance RF path should follow the path of the motor cables in order to minimise the loop area. **Failure to do so will result in increased conducted emissions.**

A low RF impedance path will normally be achieved by:

- Bonding the armour of the motor supply cables at one end to the motor frame, and at the other end to the cubicle back panel. Ideally 360° bonding is required, which can be achieved with cable glands, refer to Cable Gland Requirements, page 3-7.
- Ensuring that conduit containing the motor supply cables are bonded together using braid. The conduit should also be bonded to the motor frame and the cubicle back panel.

## Earthing Details

The protective earth (PE) conductor exiting the filter must be connected to the protective earth connection of the Drive. Any additional RF earth, such as a cable screen, **is not a protective earth**. The EMC filter must be **permanently earthed** to prevent the risk of electric shock under abnormal operating instances (such as the loss of one phase of the ac supply).

You can achieve permanent earthing by either:

- using a copper protective earth conductor of at least 10mm<sup>2</sup>
- installing a second conductor, in parallel connection with the protective conductor, to a separate protective earth terminal

Each conductor must independently meet the requirements for a protective earth conductor.

## Operating Conditions

The recommended EMC filters operate from normal three-phases supplies which are balanced with respect to earth (earth referenced supplies - TN). This minimises the earth leakage current due to the filter capacitors between phase and earth.

**IMPORTANT**

***We do not recommend the use of ac supply filters on non earth-referenced supplies - IT. The supplies cause earth leakage currents to increase, and interfere with the operation of earth fault monitoring equipment. In addition, EMC performance of the filter is degraded.***

As with all power electronic drives, conducted emissions increase with motor cable length. EMC conformance is only guaranteed up to a cable length of 50m. The cable length can be increased. Refer to Parker SSD Drives for more information.

# Earth Fault Monitoring Systems

## **WARNING**

**Circuit breakers used with VSDs and other similar equipment are not suitable for personnel protection. Use another means to provide personal safety. Refer to EN50178 (1998) / VDE0160 (1994) / EN60204-1 (1994)**

We do not recommend the use of circuit breakers (e.g. RCD, ELCB, GFCI), but where their use is mandatory, they should:

- Operate correctly with dc and ac protective earth currents (i.e. type B RCDs as in BS EN61009-1 : 2004).
- Have adjustable trip amplitude and time characteristics to prevent nuisance tripping on switch-on.

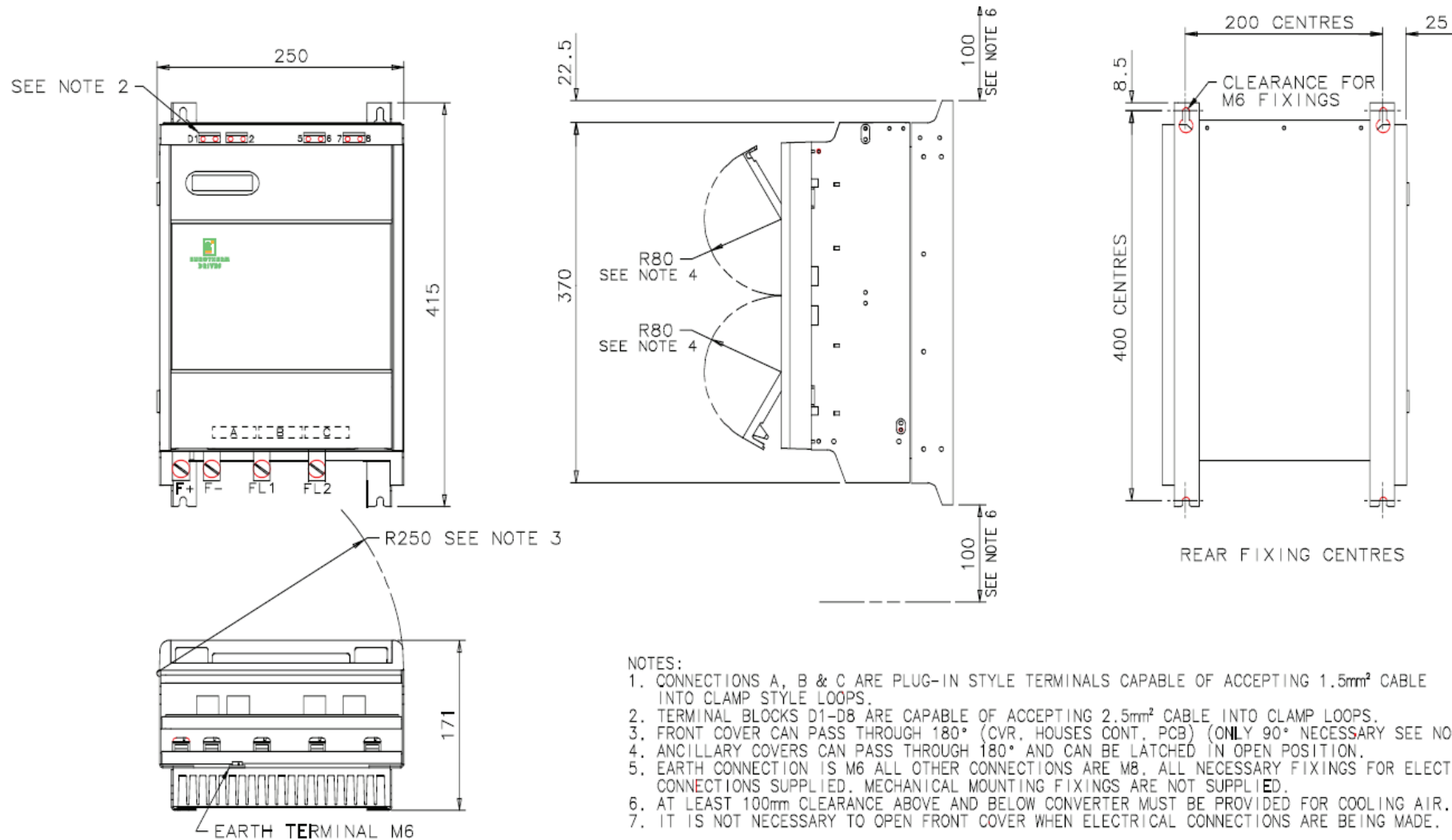
## **NOTE**

**When the ac supply is switched on, a pulse of current flows to earth to charge the EMC filter internal capacitors which are connected between phase and earth. This has been minimised in Parker SSD Drives filters, but may still trip out any circuit breaker in the earth system. In addition, high frequency and dc components of earth leakage currents will flow under normal operating conditions. Under certain fault conditions larger dc protective earth currents may flow. The protective function of some circuit breakers cannot be guaranteed under such operating conditions.**

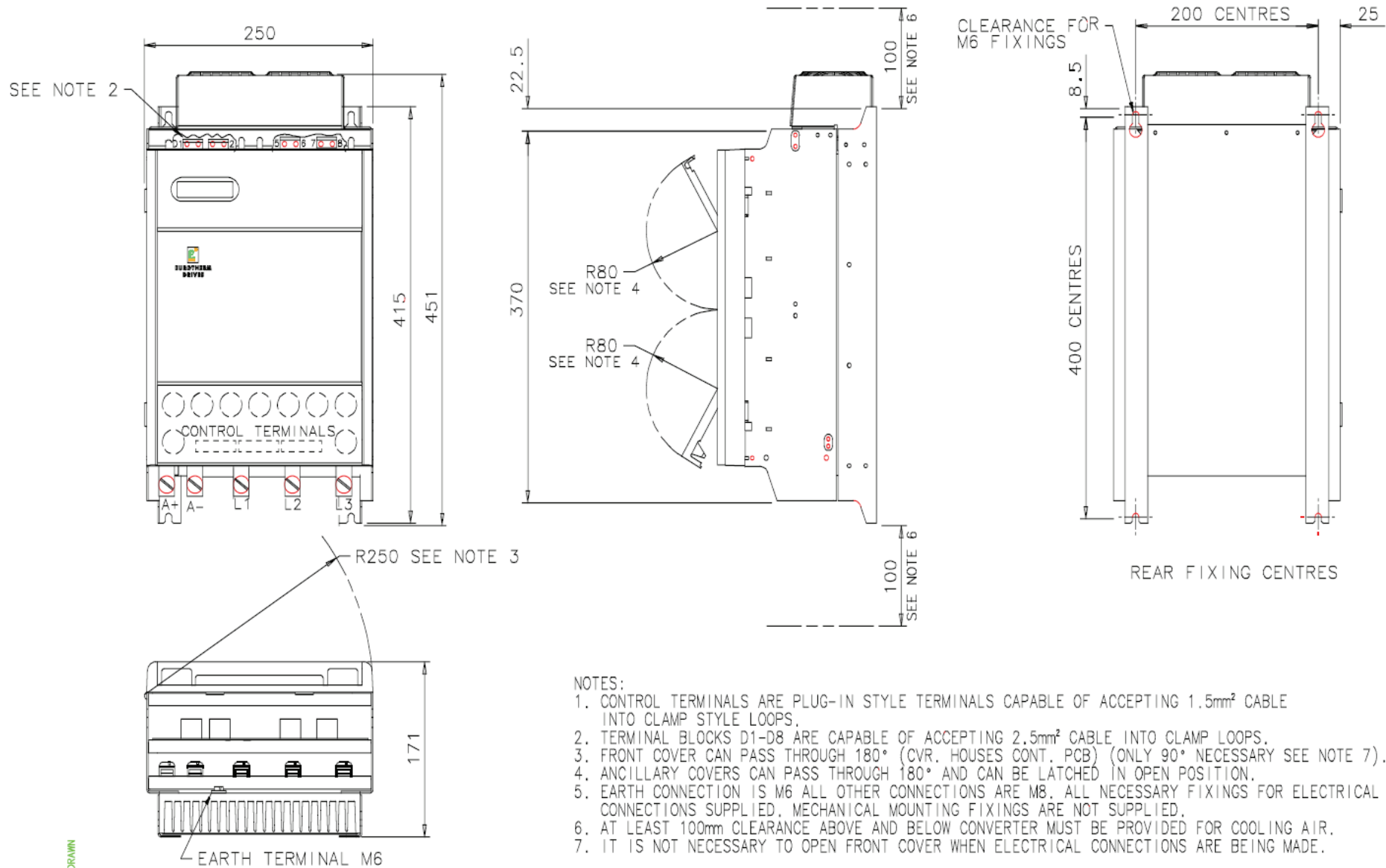


# Installation Drawings

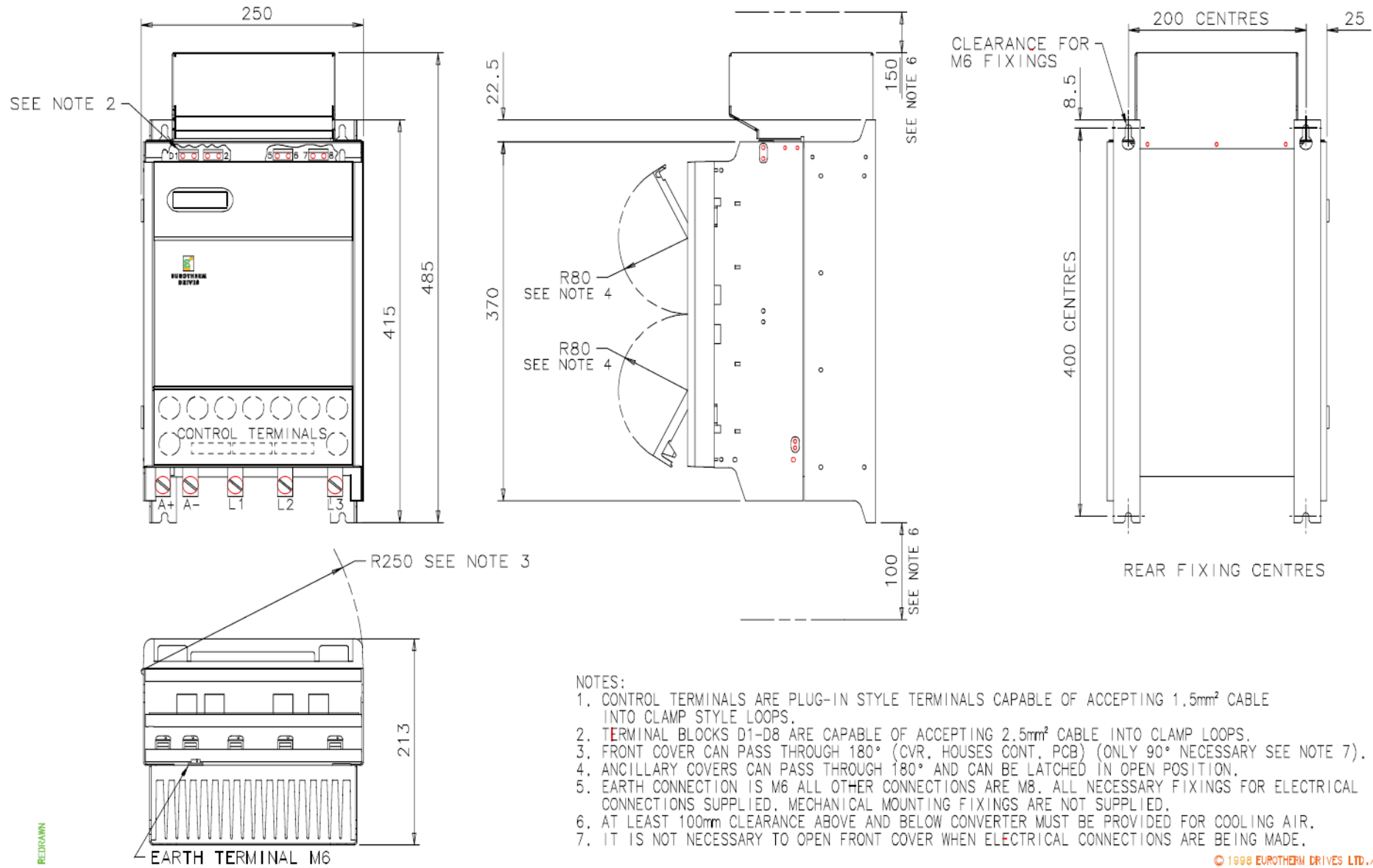
## Drive Installation Drawings



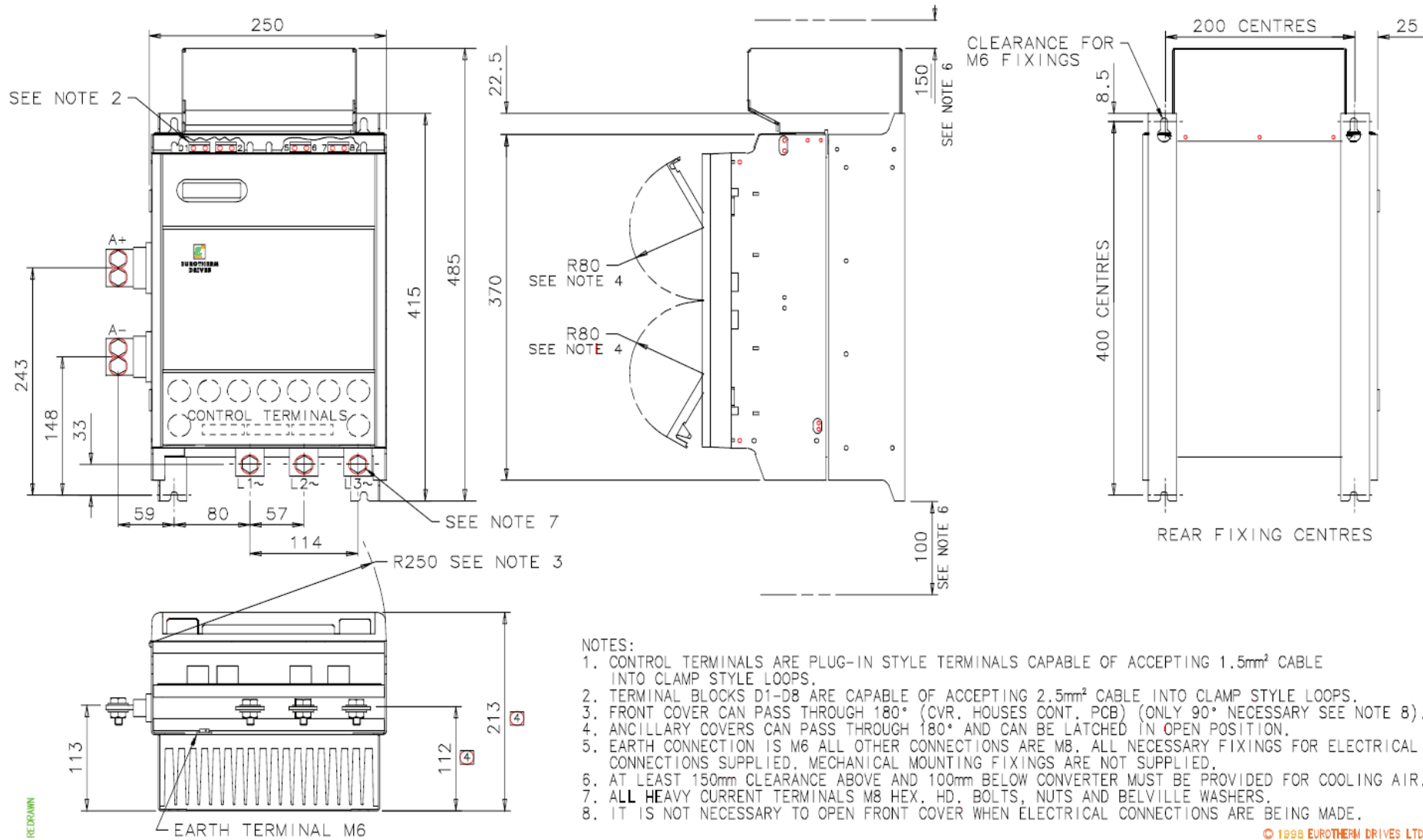
**Figure 3-10 35A & 70A Stack Assembly**



**Figure 3- 11 110A & 150A Stack Assembly**

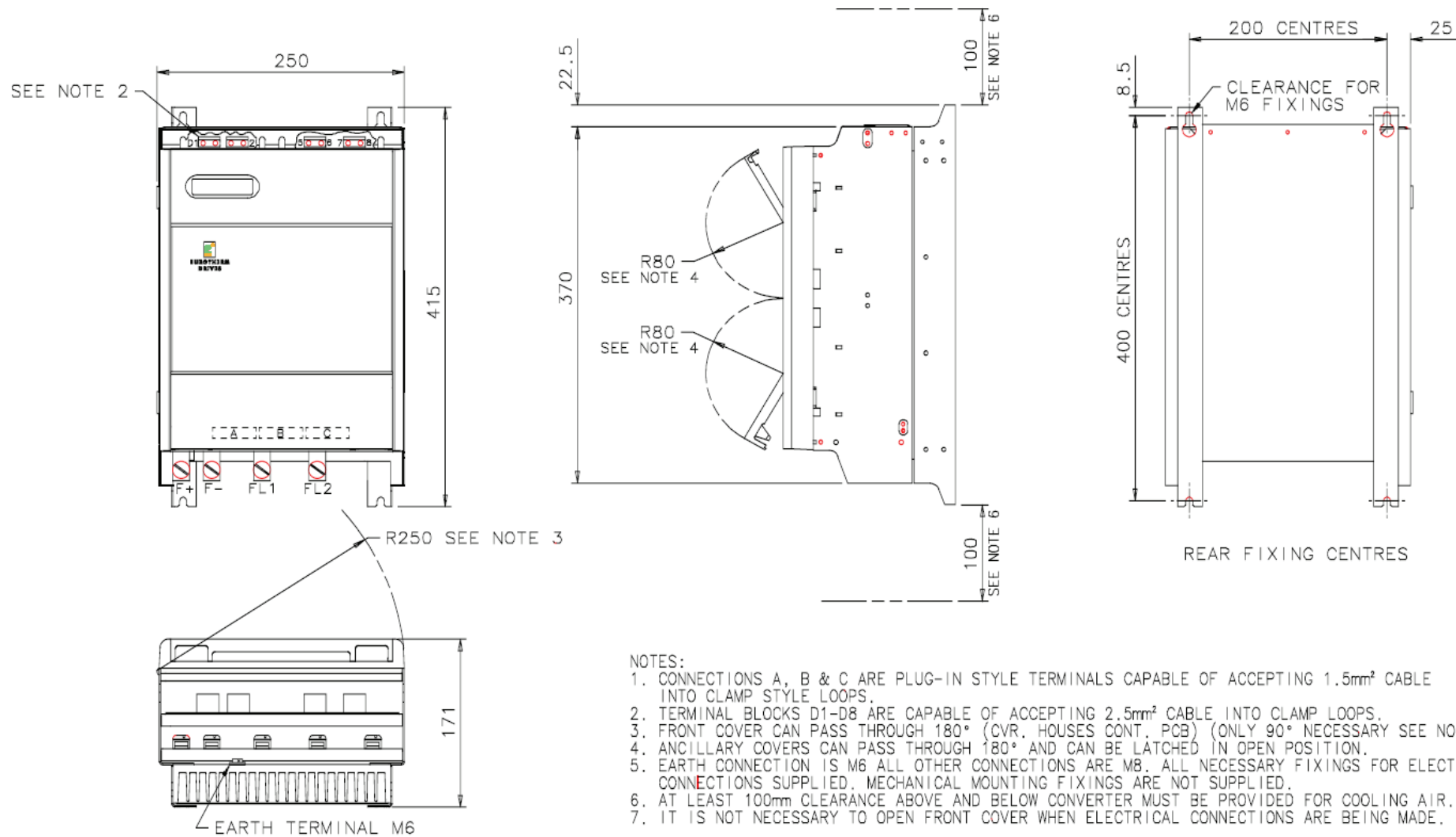


**Figure 3- 12 180A Stack Assembly**



**Figure 3- 13 270A Stack Assembly**

# External Stack Installation Drawings



**Figure 3-14 External Stack Assembly**

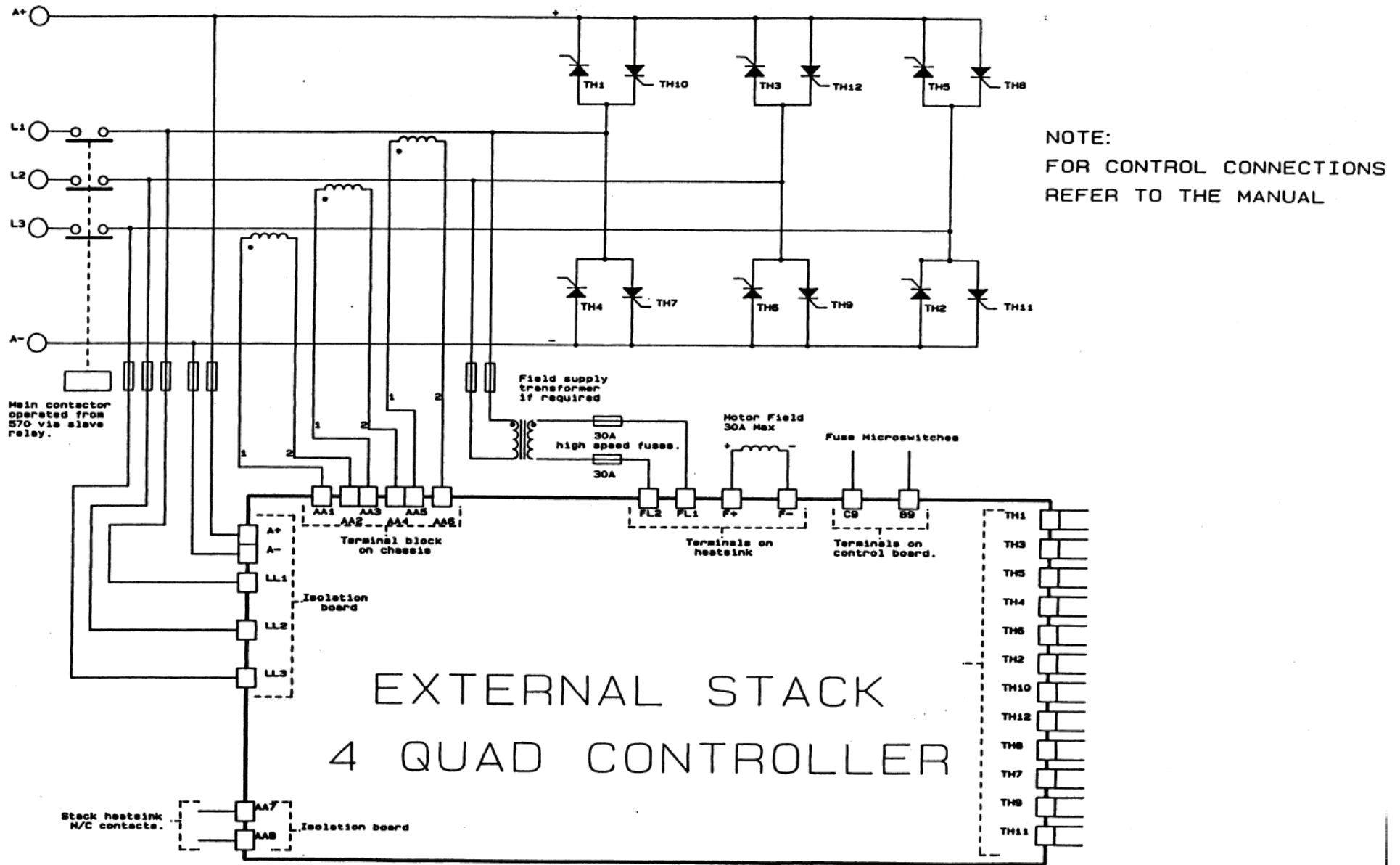


Figure 3- 15 Wiring Diagram for 4 Quad External Stack

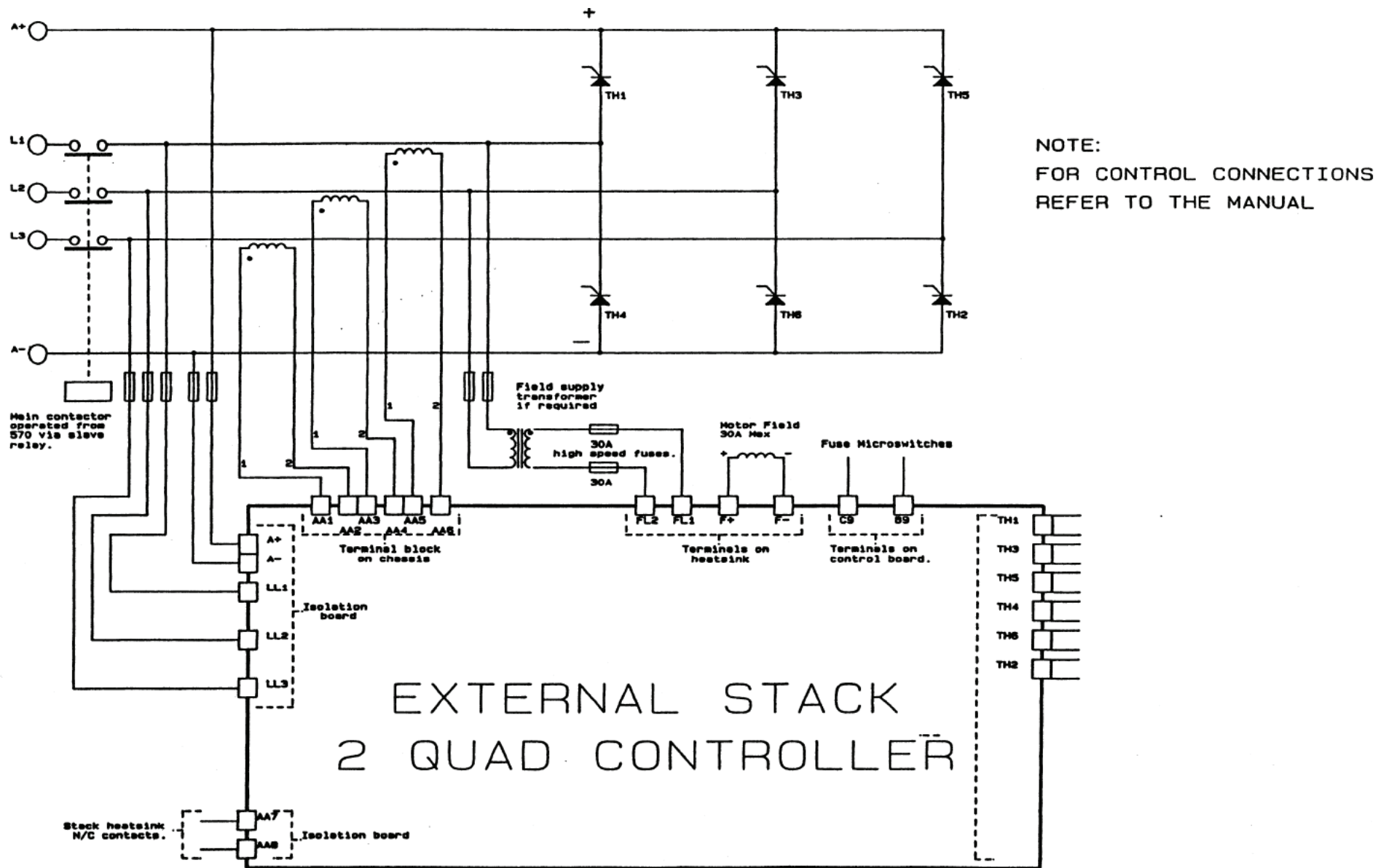
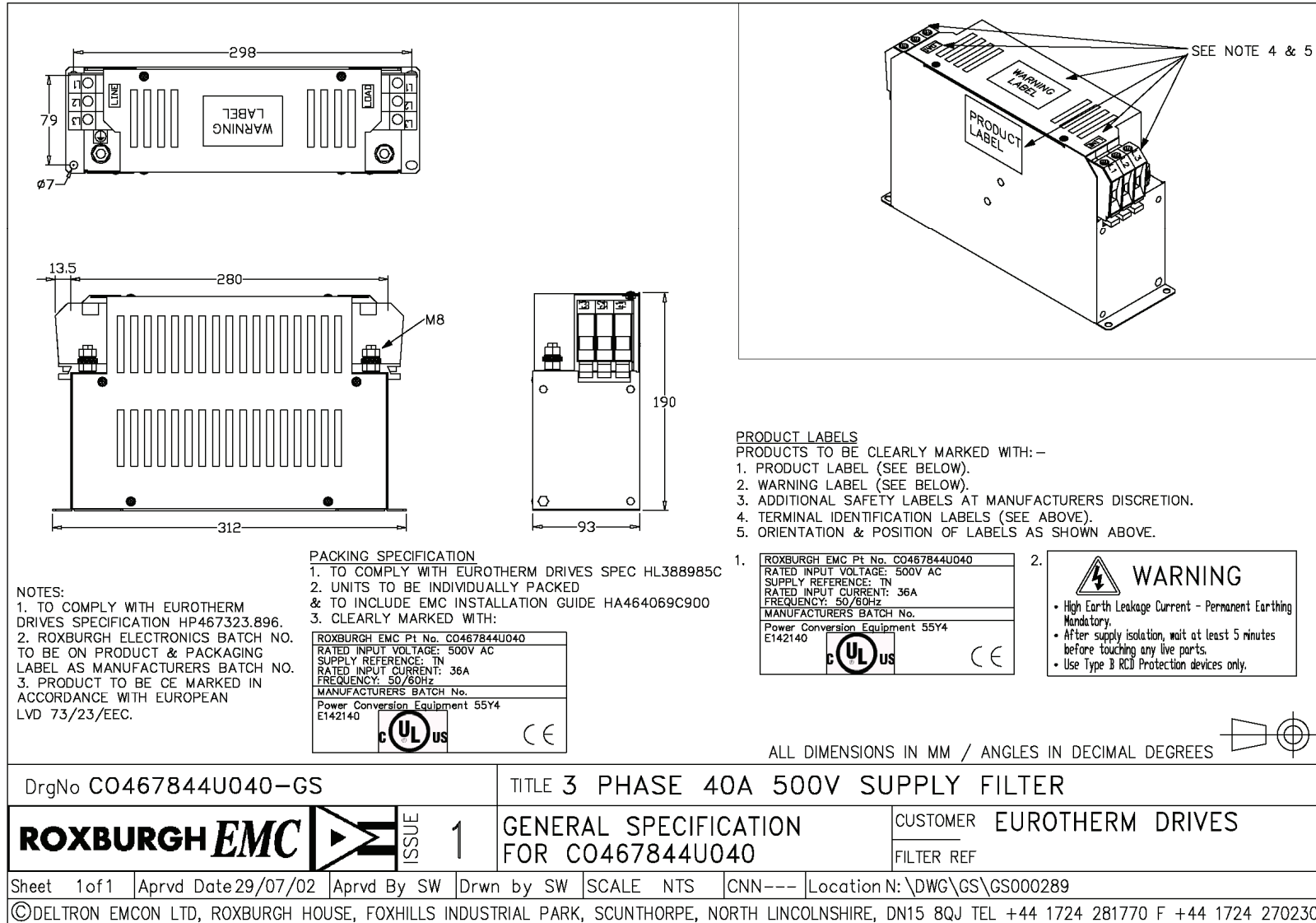


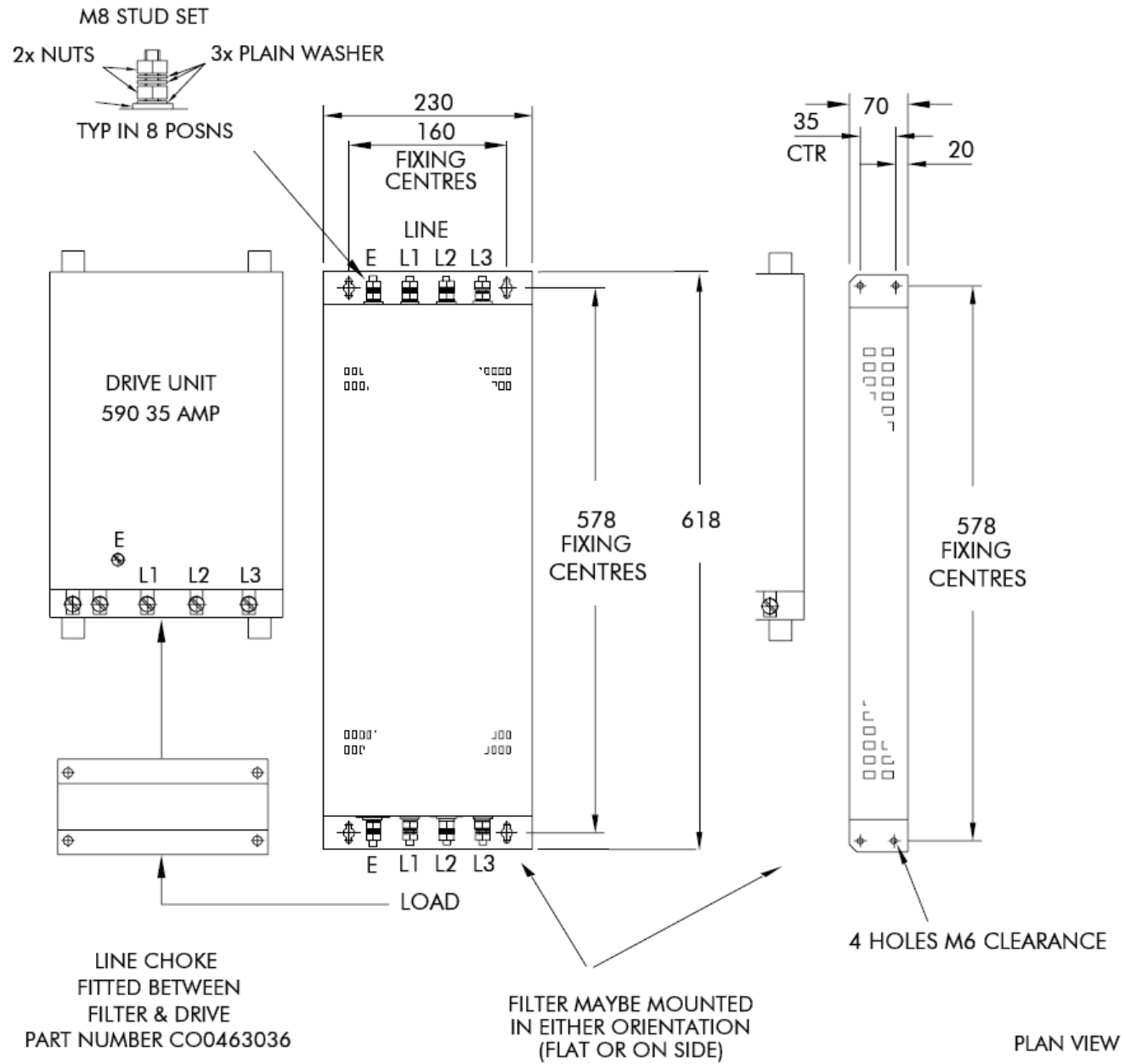
Figure 3-16 Wiring Diagram for 2 Quad External Stack

# Filter Installation Drawings

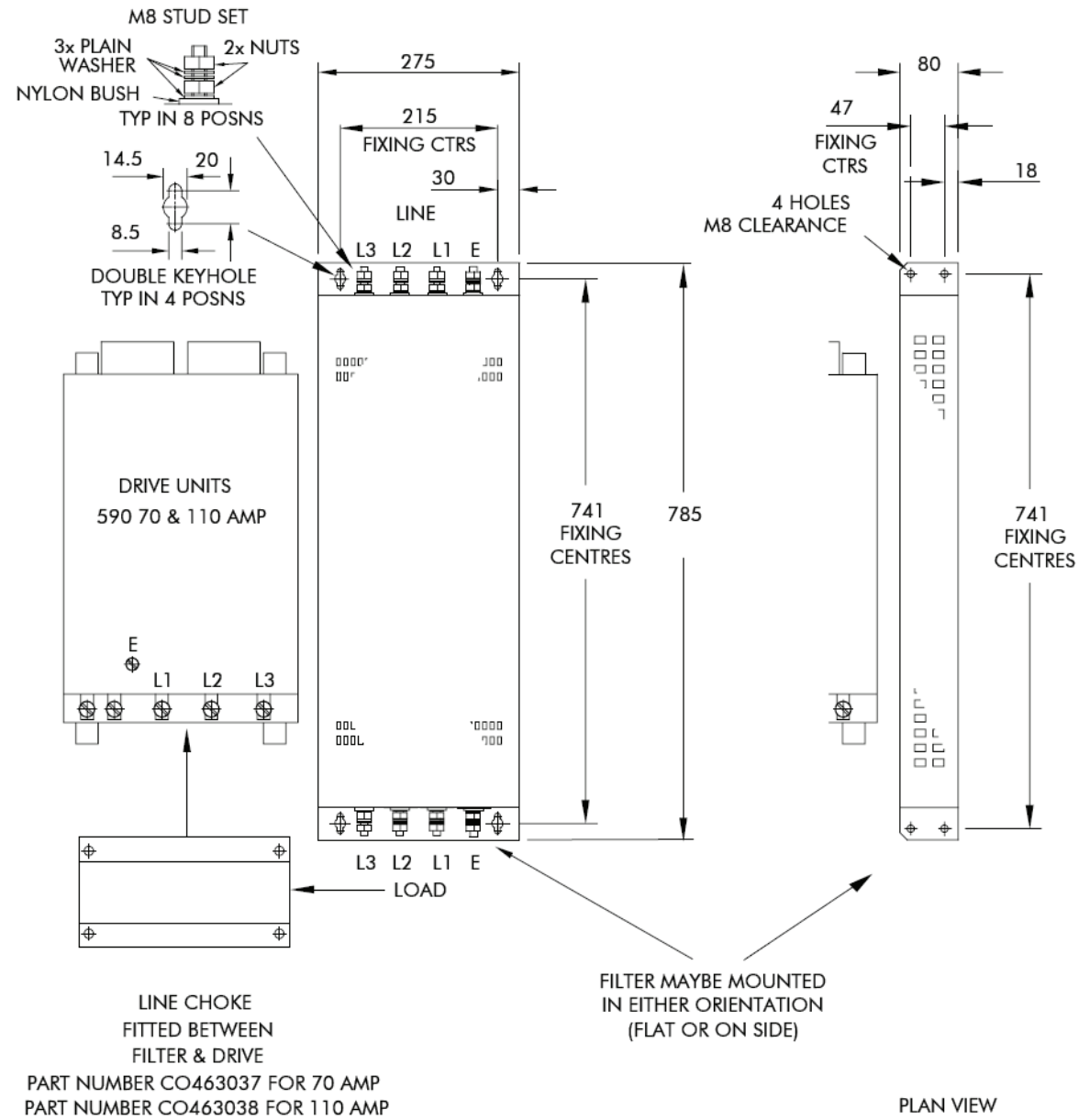


**Figure 3- 17 Filter Mounting Details, Part No. CO467844U040 for 590 35 Amp**

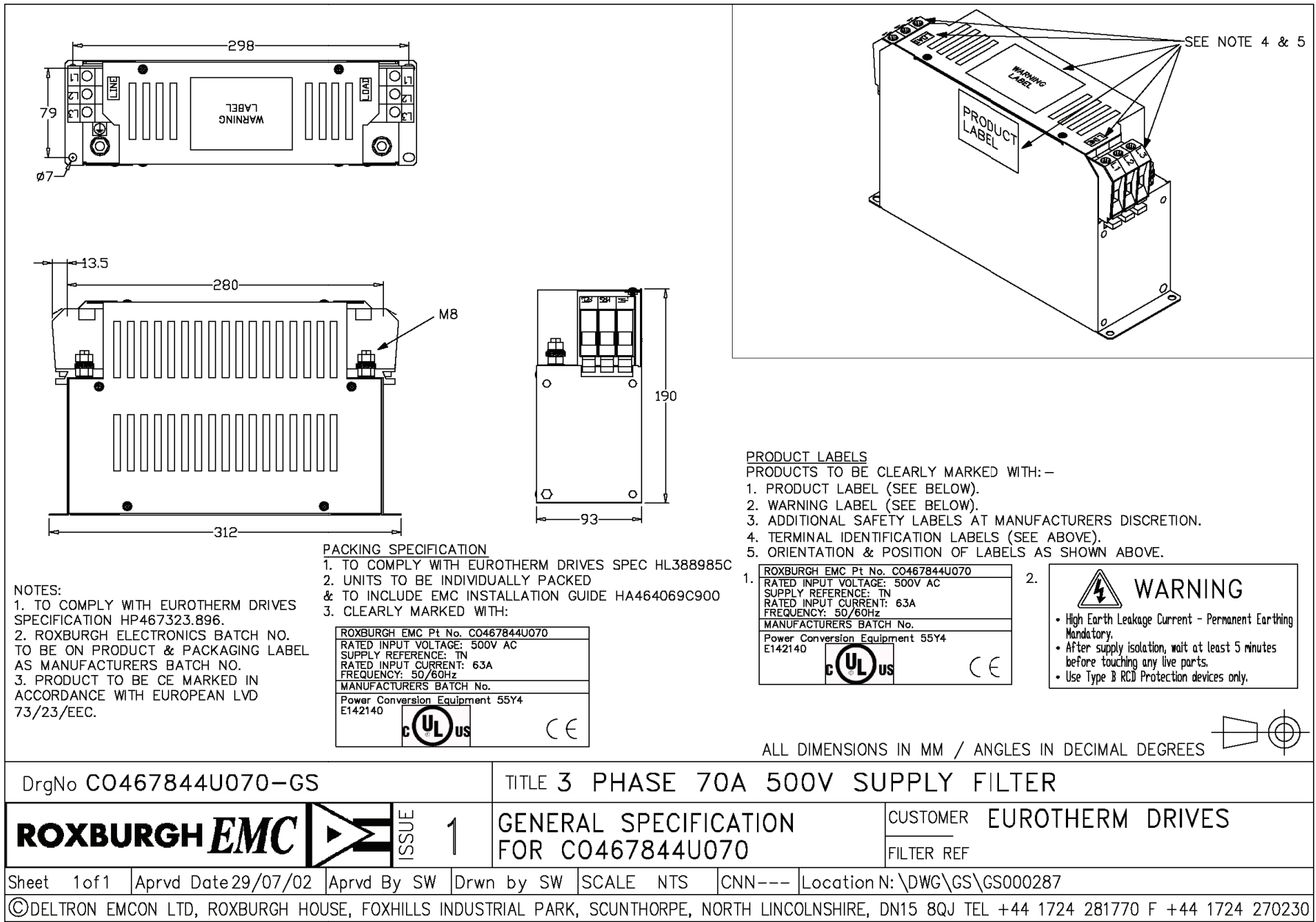




**Figure 3- 18 Filter Mounting Details, Part No. CO388965U035 for 590 35 Amp**



**Figure 3- 19 Filter Mounting Details, Part No. CO388965U110 for 590 70 & 110 Amp**



**Figure 3-20 Filter Mounting Details, Part No. C0467844U070 for 590 70 Amp**

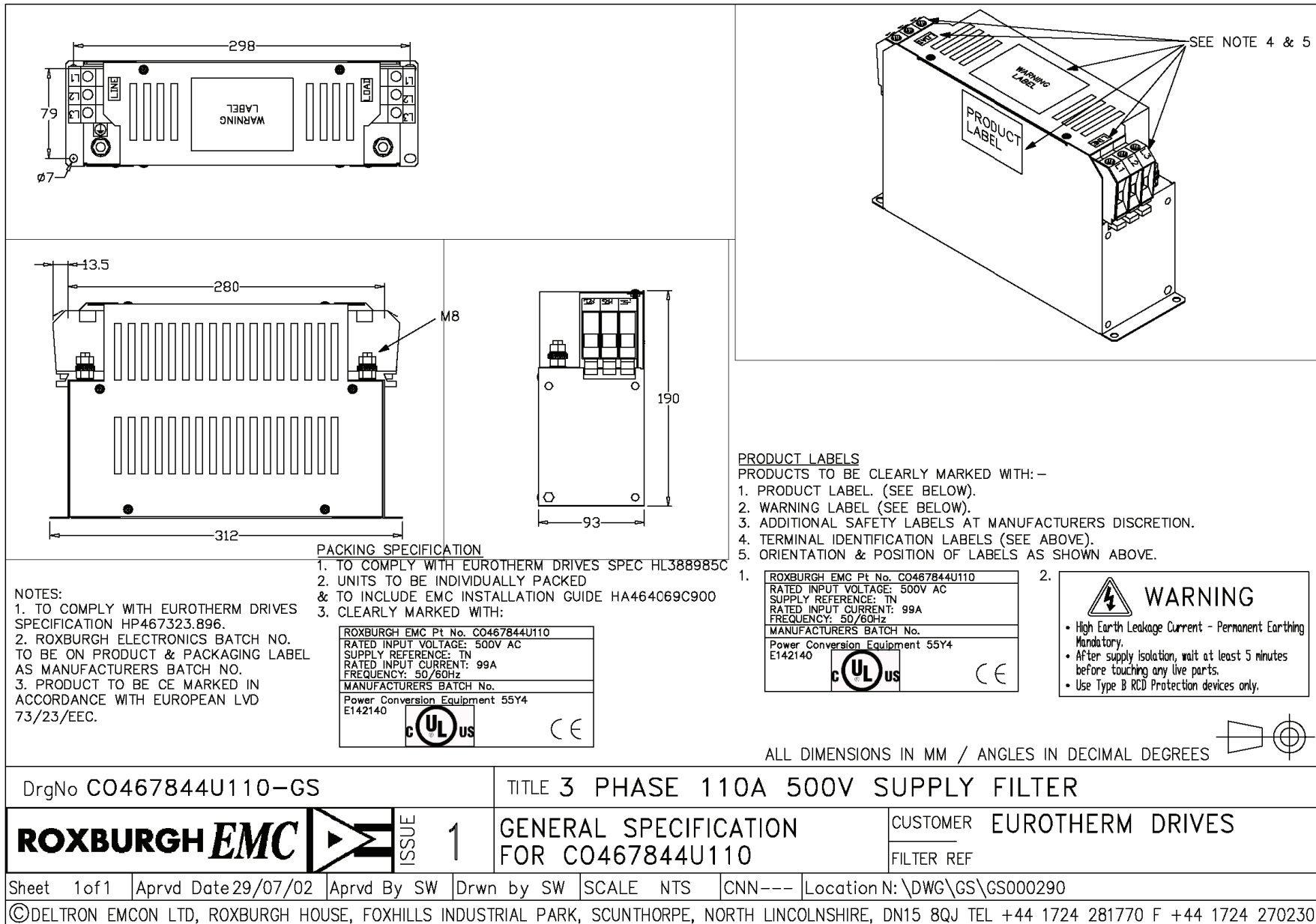
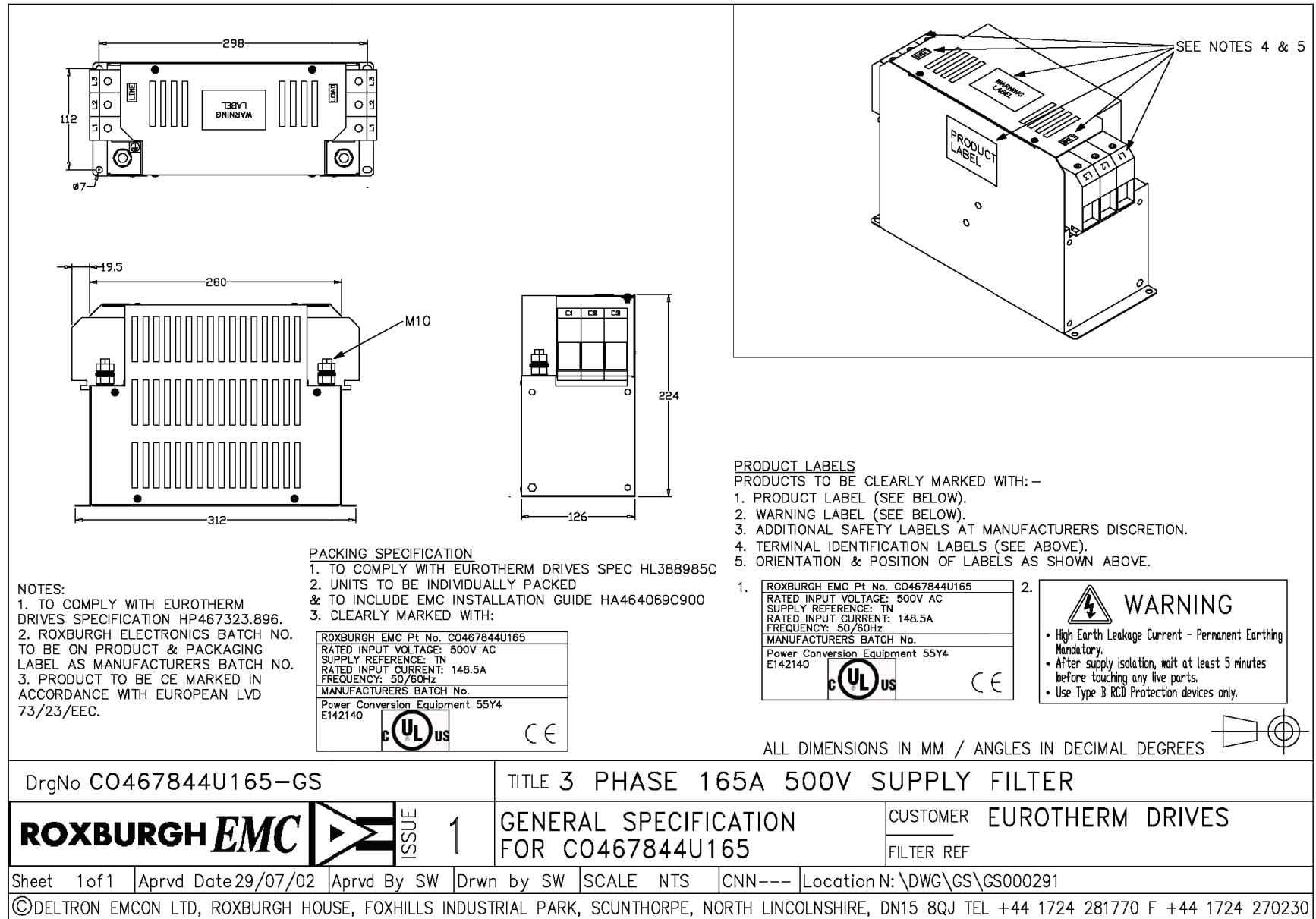


Figure 3- 21 Filter Mounting Details, Part No. CO467844U110 for 590 110 Amp



**Figure 3- 22 Filter Mounting Details, Part No. CO467844U165 for 590 150 Amp**

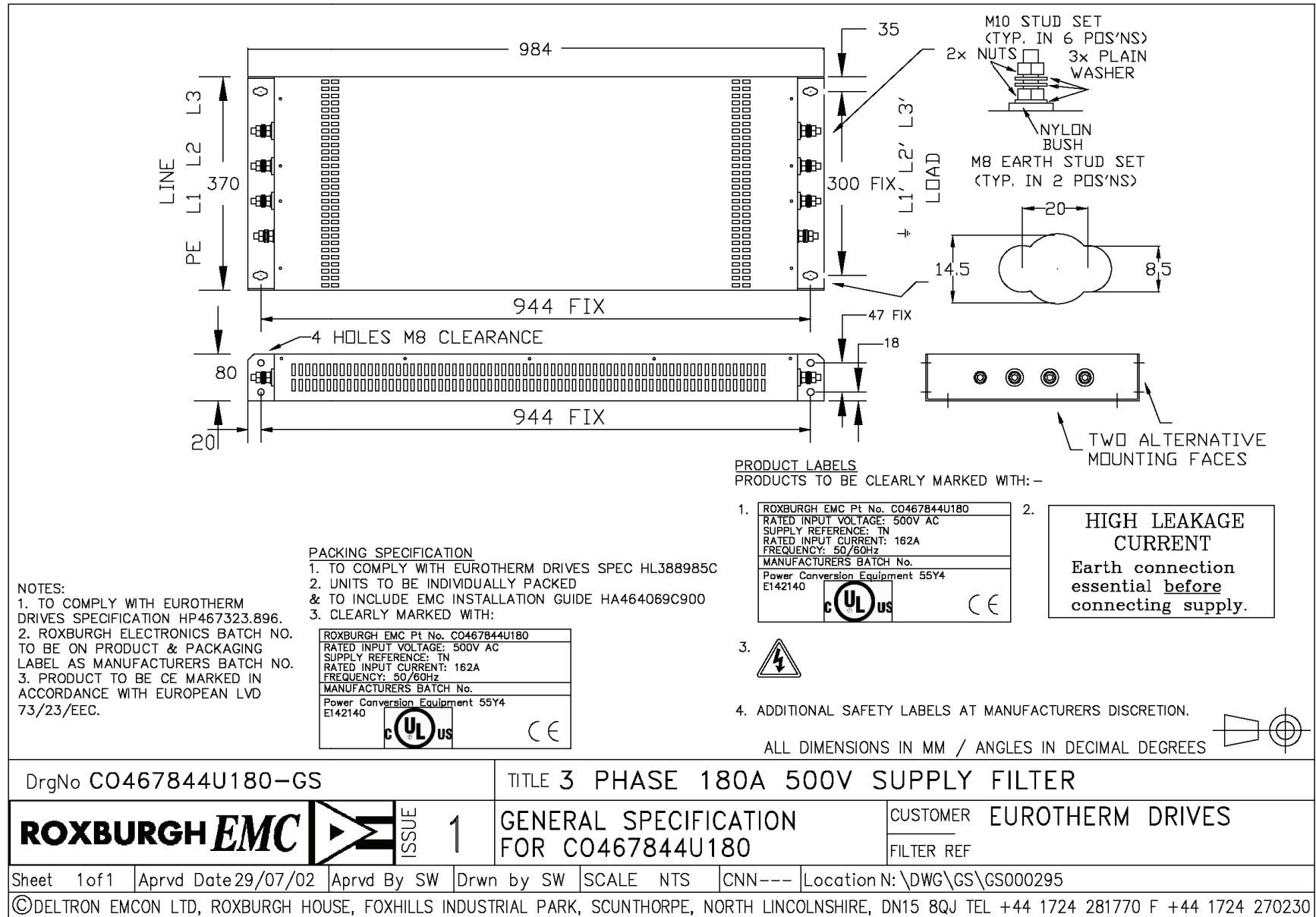
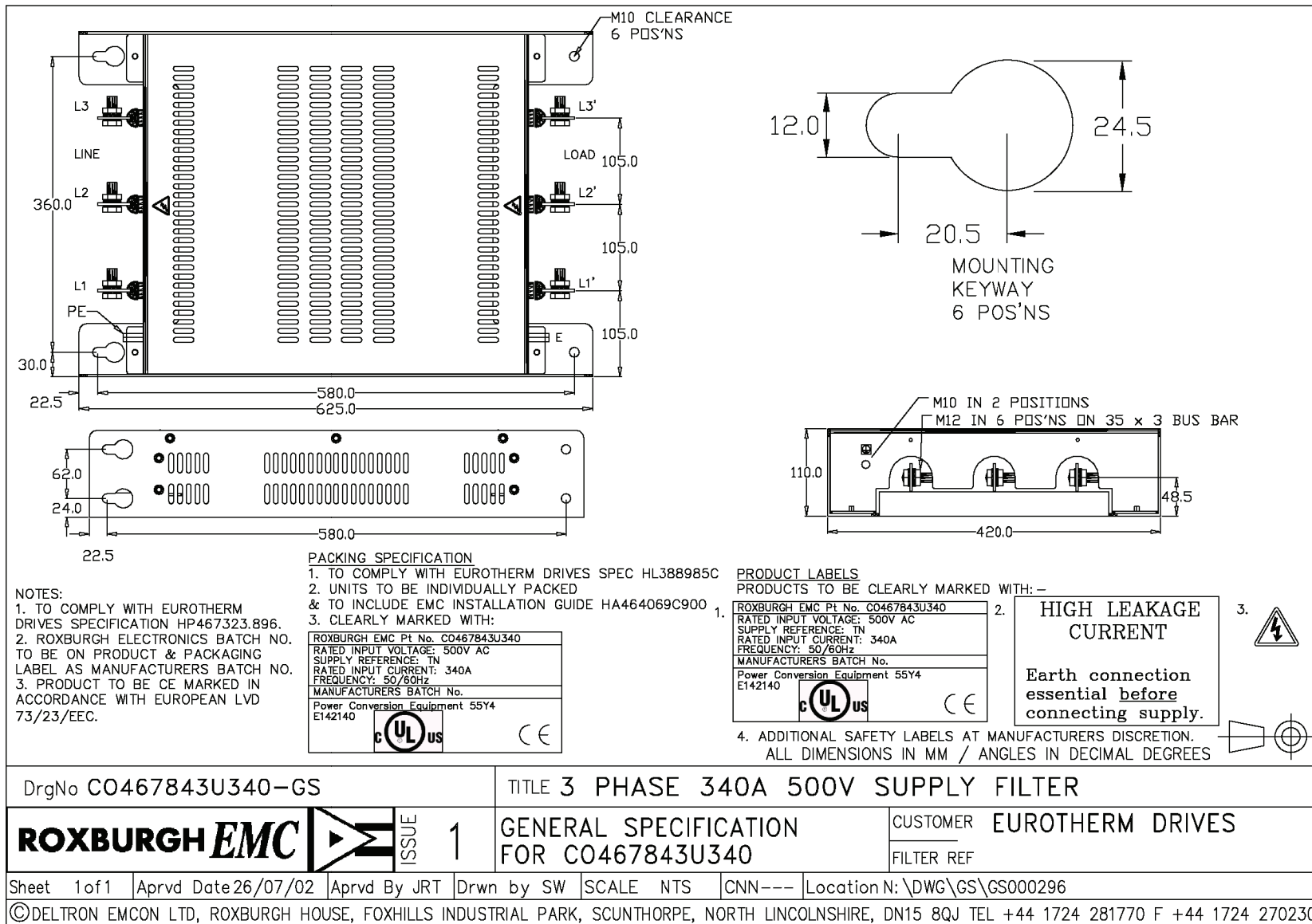


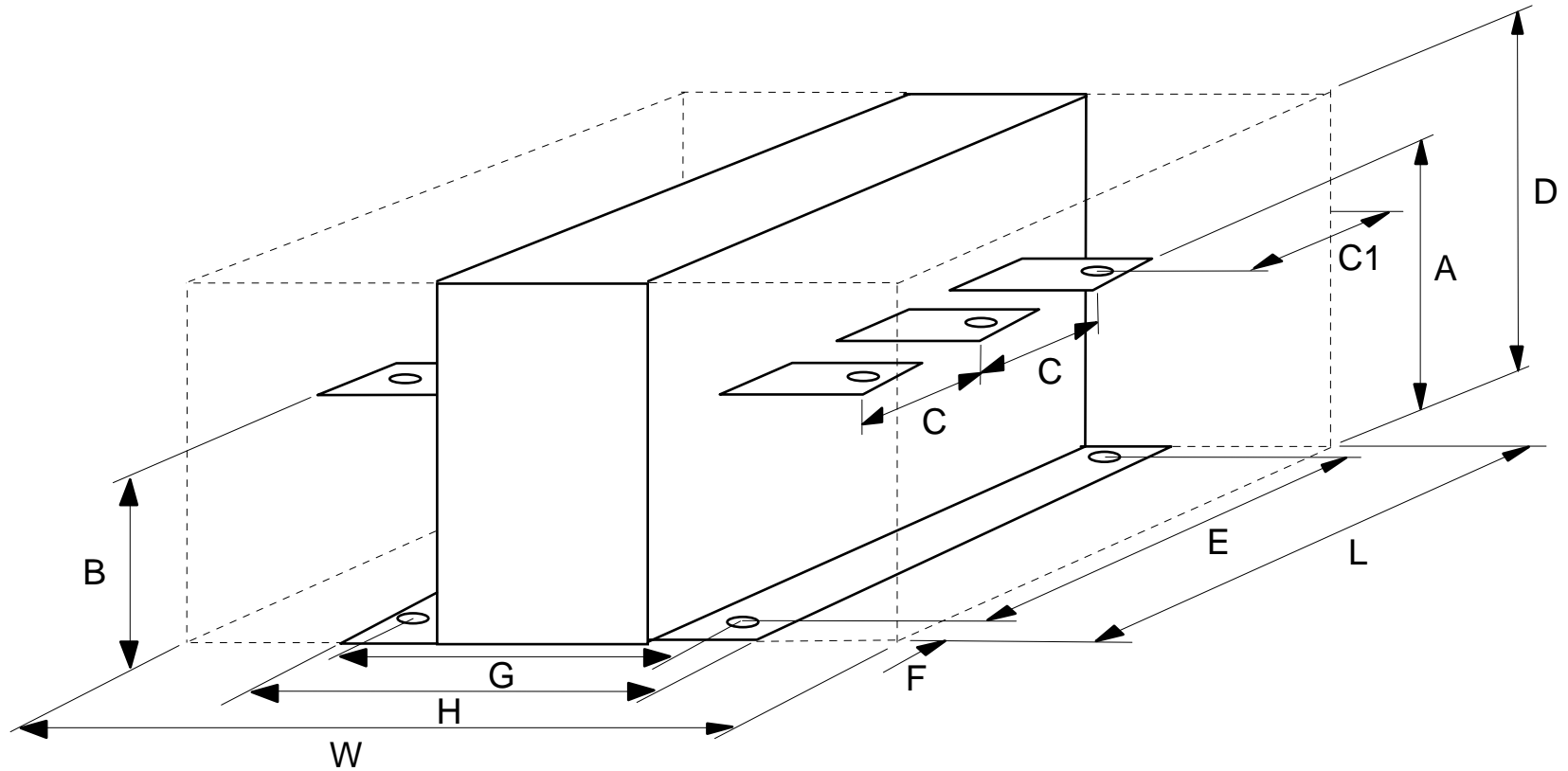
Figure 3- 23 Filter Mounting Details, Part No. CO467844U180 for 590 180 Amp



**Figure 3- 24 Filter Mounting Details, Part No. CO467843U340**  
**Frame 3 : 270 Amp (1 filter)**  
**(refer to Chapter 11: “Technical Specifications” - External AC Supply (RFI) Filters)**

# Line Choke Installation Drawings

**IMPORTANT** Always use the specified ac line choke with the Drive.





Parker Part Number	Drive Rating	Weight (kg)	Dimensions (mm)											Mtg Hole Ø	Terminal Ø
			A	B	C	C1	D	E	F	G	H	L	W		
CO055192	35A	50µH			50	27.5	130	140	7.5	50	70	155	260	Ø7	M8
CO055193	70A	50µH			50	27.5	130	140	7.5	72.5	92.5	155	302.5	Ø7	M8
CO055253	110A	50µH	108	85	60	35	160	170	10	76	101	190	341	Ø9	M6 I/P & M8 O/P
CO055255	180A	50µH	108	85	60	35	160	170	10	101	127	190	366	Ø9	M6 I/P & M8 O/P
CO057960	270A	50µH	110	110	80	60	255	200	40	170	200	280	380	Ø13	M8
<b>For use with EMC filters</b>															
CO463036	35A	485µH	108	85	60	35	160	170	10	76	101	190	341	Ø9	M8
CO463037	70A	242µH	108	85	60	35	160	170	10	90	116	190	355	Ø9	M8
CO463038	110A	154µH	108	85	60	35	160	170	10	102	128	190	367	Ø9	M8
CO463039	180A	113µH	108	85	57	37	255	200	40	170	200	280	380	Ø13	M6 I/P & M8 O/P

**Figure 3-25 Fitting details for the AC Line Choke**

# 590 Capacitor Box

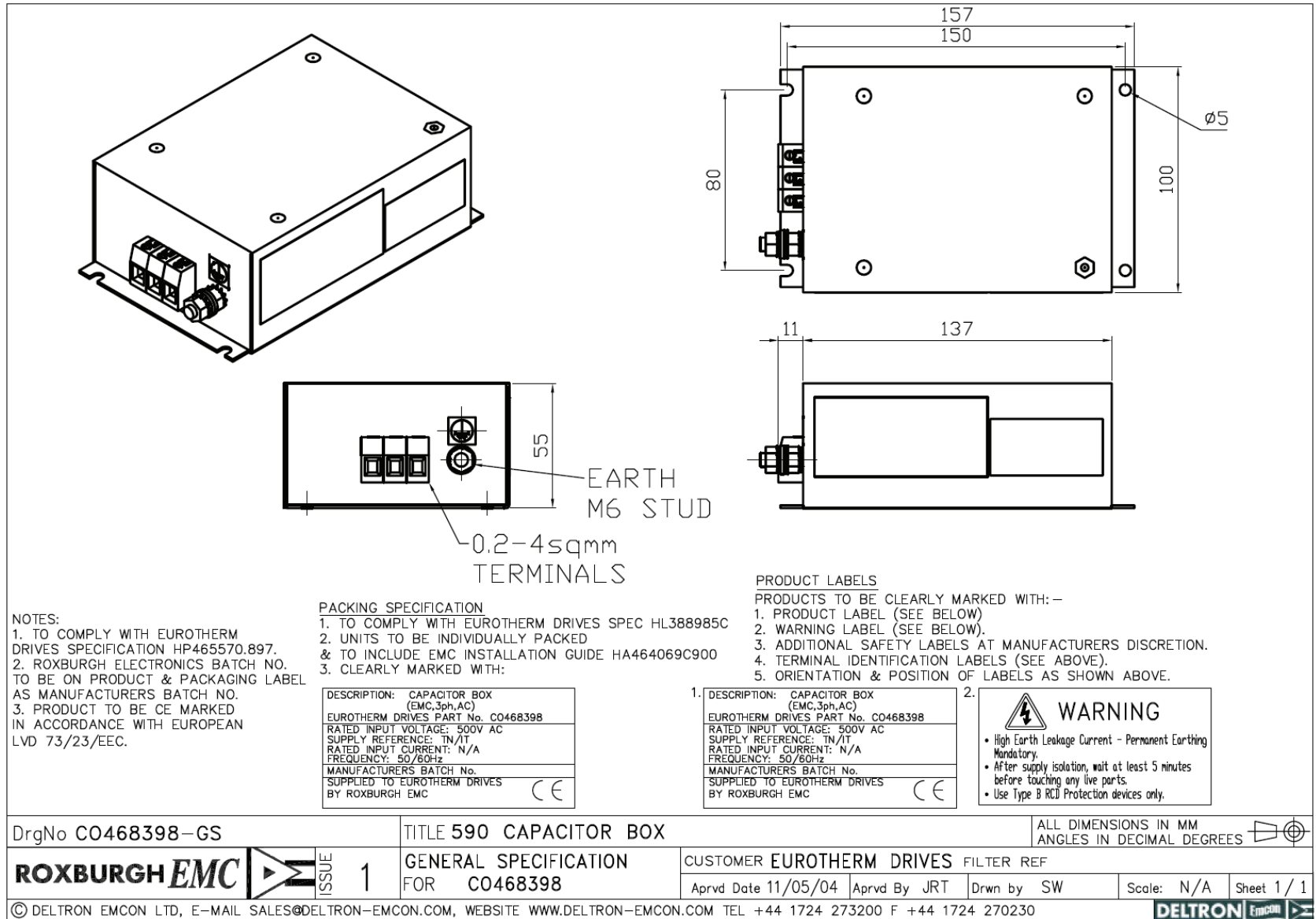


Figure 3- 26 Capacitor Box for 590 : C0468398



# Chapter 4

## Operating the Drive

Learn how to turn the motor for the first time, and about the various ways you can start and stop the drive. This chapter also offers some application advice.

<b>Pre-Operation Checks .....</b>	<b>4-1</b>	<b>Normal Stop (C3)</b>	<b>4-16</b>
<b>Setting-up the Drive .....</b>	<b>4-2</b>	<b>Program Stop (B8)</b>	<b>4-19</b>
<b>Calibration</b>	<b>4-2</b>	Coast Stop (B9)	4-21
Switchable Calibration Panel	4-3	Standstill	4-21
Analog Tacho Calibration Option Board	4-4	The Trip Condition	4-21
Microtach/Encoder Feedback Option Board	4-5	<b>Normal Starting Method</b>	<b>4-21</b>
Selecting Speed Feedback	4-5	<b>Advanced Starting Methods</b>	<b>4-22</b>
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<b>Performance Adjustment</b>	<b>4-13</b>	Jog	4-22
Current Loop - The Autotune Feature	4-13	Crawl	4-22
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<b>Stopping Methods</b>	<b>4-16</b>	Remote Sequencing Command	4-24



# Pre-Operation Checks

## Initial checks before applying power:

- Mains power supply voltage is correct.
- Auxiliary power supply voltage is correct.
- Motor is of correct armature voltage and current rating.
- Check all external wiring circuits - power, control, motor and earth connections.

### NOTE

**Completely disconnect the drive before point-to-point checking with a buzzer, or when checking insulation with a Megger.**

- Check for damage to equipment.
- Check for loose ends, clippings, drilling swarf etc. lodged in the Drive and system.
- If possible check that the motor can be turned freely, and that any cooling fans are intact and free from obstruction.

## Ensure the safety of the complete system before the drive is energised:

- Ensure that rotation of the motor in either direction will not cause damage.
- Ensure that nobody else is working on another part of the system which will be affected by powering up.
- Ensure that other equipment will not be adversely affected by powering up.

## Prepare to energise the drive and system as follows:

- Remove the main external HRC fuses to prevent the main 3-phase and single phase auxiliary supply from being connected.
- Disconnect the load from the motor shaft, if possible.
- If any of the Drive's control terminals are not being used, check whether these unused terminals need to be tied high or low. Refer to Appendix E: "Technical Specifications"- Terminal Information - Control Board.
- If there is any doubt about the integrity of a particular installation, insert a high wattage resistor, i.e. fire elements, in series with the motor armature.
- Check external run contacts are open.
- Check external speed setpoints are all zero.

# Setting-up the Drive

**IMPORTANT** You must not exceed the maximum drive and motor ratings. Refer to the Product Code or maximum rating label, and the motor rating plate.

**NOTE** Refer to Chapter 6: “The Man-Machine Interface (MMI)” to familiarise yourself with the MMI’s LED indications, and how to use the keys and menu structure.

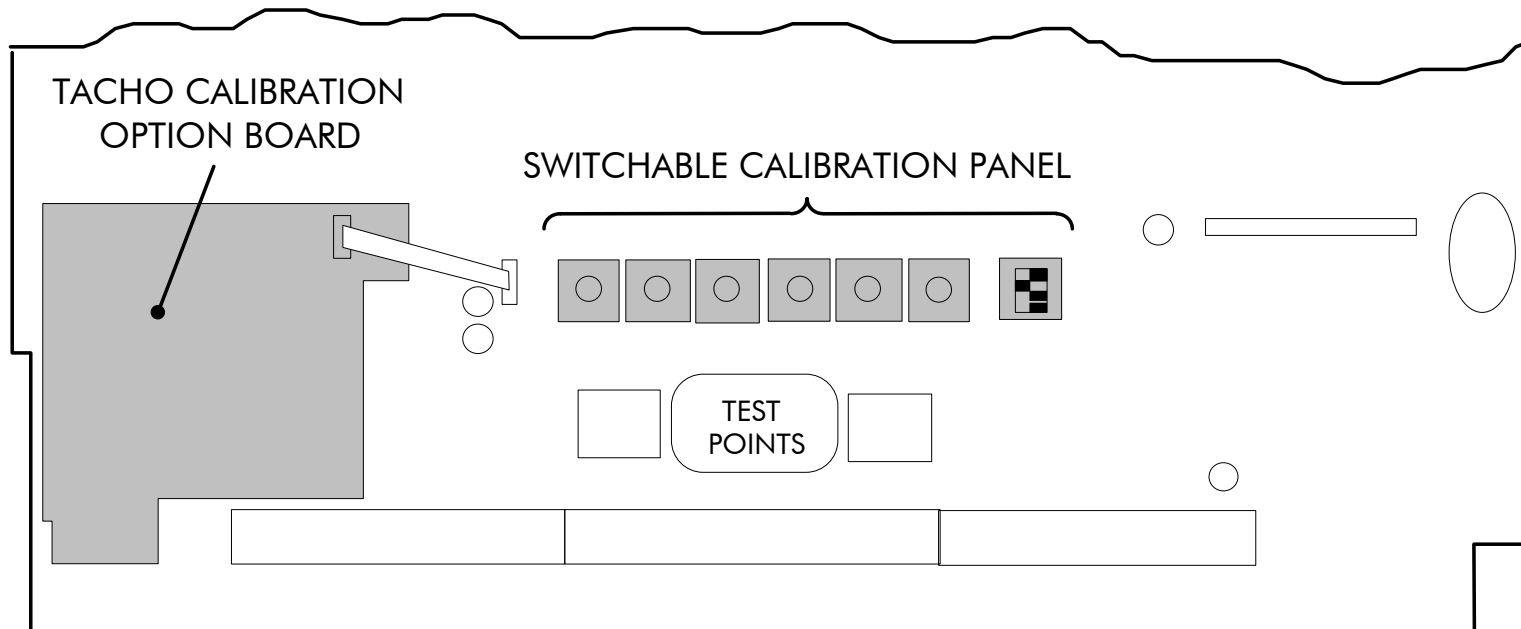
The following instructions are written in logical order. Complete each stage successfully before progressing to the next.

## Calibration

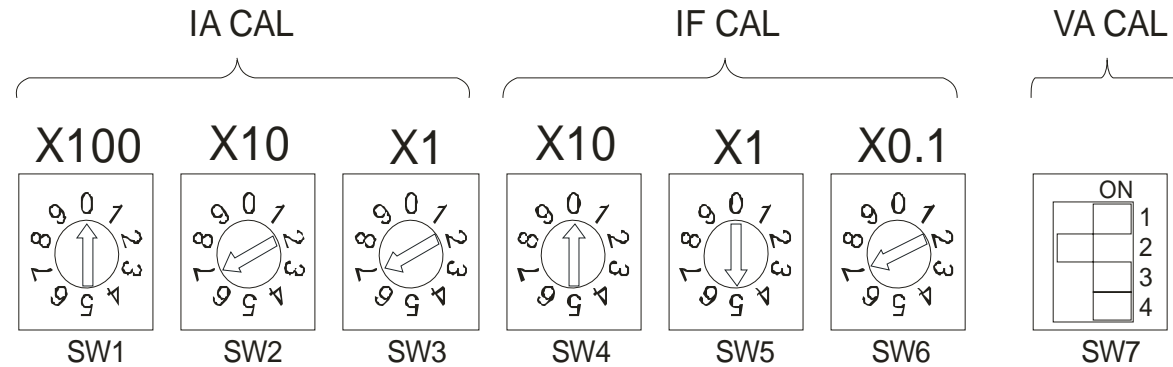
**NO POWER IS CONNECTED AT THIS STAGE**

You must first calibrate the Converter for use with the motor:

The settings for Armature Current, Field Current, Armature Voltage and the Tacho Calibration Option Board (if fitted) are selected on the control board. Lift the hinged terminal cover to reveal the switchable calibration panel and the switchable tacho calibration option board (if fitted).



# Switchable Calibration Panel



## Armature Current (IA CAL)

Note the maximum armature current from the motor rating plate and set this value using SW1, SW2 and SW3. The switches set Amps in hundreds, tens and units. The illustration above shows an IA CAL setting of 77A. (For increased accuracy, particularly with very low current motors, set the switches to 1A less than the motor rating plate value, since there is always a fixed, additive 1A calibration on the power stacks.)

## Field Current (IF CAL)

Note the nominal field current from the motor rating plate and set this value using SW4, SW5 and SW6. The switches set Amps in tens, units and tenths. The illustration shows an IF CAL setting of 5.7A. The maximum current is 19.9A, setting a higher value than this results in 0A.

**NOTE** If using an external stack controller, set the switches for one quarter less current than you require, i.e. if you want 12A of field current, set the switches to 9A. (This allows for a different turns ratio used in the current transformers of external stack modules).

## Armature Voltage (VA CAL)

Set this using the 4-way switch, SW7. The switch sets voltage according to the table below. The illustration above shows a VA CAL setting of 200V.

VA	Armature Volts VA (Volts)															
Switch	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525
1	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
2	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0
3	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0
4	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0

A "1" indicates that the switch is ON.

**NOTE** Calibration up to 700V is possible with external stacks. Refer to Parker SSD Drives.



# Analog Tacho Calibration Option Board

**NOTE** This option is not required if armature voltage or encoder feedback is to be used.

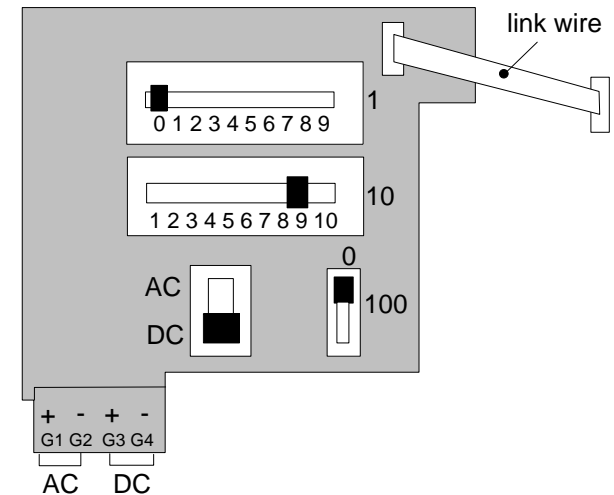
The board fits on to a 10-way connector. It also requires the connecting link wire to the control board. This link is inherent but must be connected for operation.

The board supports AC and DC analog tachos with a calibration range of 10 to 209V (see note):

- For AC tacho feedback, use terminals G1 and G2 with the selector switch in the AC position.
- For DC tacho feedback, use terminals G3 and G4 with the selector switch in the DC position.

Calculate the tacho voltage by multiplying the required maximum speed by the tacho calibration factor, e.g. motor speed 1500 rpm and tacho calibration factor 60V per 1000 rpm is 90V.

The tacho calibration volts are set using the 2 in-line switches (10-way). The switches set Volts in units and tens. The hundreds are set by the 1-way switch. The illustration above shows a setting of 90V.



**NOTE** Do not set the calibration volts to greater than 200V, the maximum terminal block rating.

## Calibration for Voltages greater than 200V

For full speed tacho voltages greater than 200V, an external resistor, value RE, is required in series with the tachogenerator connection to terminal G3.

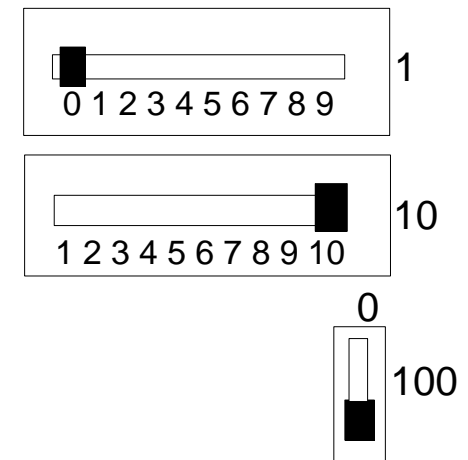
Set the switches on the Tacho Calibration Option Board to give a value of 200V, as shown opposite.

RE then is given by the formula:

$$RE = \frac{(\text{tachovolts} - 200)}{5} \text{ k}\Omega$$

The power dissipation of this resistor is given by the formula

$$W = (\text{tacho volts} - 200) \times 5 \text{ milliwatts}$$



## Microtach/Encoder Feedback Option Board

The option board assumes a 1000 lines per rev encoder is being used. Speed is set directly by the ENCODER RPM parameter. If you are using an alternative lines per rev encoder, you must set the ENCODER LINES parameter on the MMI later in the Operating Instructions.

### Selecting Speed Feedback

#### AUXILIARY POWER ONLY IS CONNECTED AT THIS STAGE

Connect the auxiliary power supply to power terminals D7 and D8 (but do not connect the main 3-phase power supply at this stage). Check that the correct voltage appears between terminals D7 and D8.

The MMI will now display the Welcome screen, and the Health and Overcurrent Trip MMI LEDs will be illuminated (assuming that the Converter's control terminals are wired as shown in Figure 3-5, Minimum Connection Requirements).

Use a digital voltmeter to check for the following:

*+24V rail at terminal C9, +10V rail at terminal B3, -10V rail at terminal B4*

Using the MMI, select the correct speed feedback option. The default is ARM VOLTS FBK.

The selections are ARM VOLTS FBK, ANALOG TACH, ENCODER and ENCODER/ANALOG.

**NOTE** Refer to Chapter 3: “Optional Equipment” - Speed Feedback Option Boards for further information.

#### MMI Menu Map

- 1 SETUP PARAMETERS
- 2 SPEED LOOP
- SPEED FBK SELECT

# Initial Start-Up Routine

Complete steps 1 to 18, including steps 16 and 17 as appropriate.

**NOTE** This routine assumes that the Converter’s control terminals are wired as shown in Figure 3-5, Minimum Connection Requirements. The field is “Enabled” and is in Voltage Control (default settings).

**IMPORTANT** Do not change any of the previously made calibration settings once the main contactor is energised.

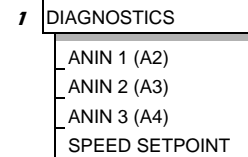
## Step 1: Check the Speed Setpoints operate correctly

- ANIN1 (terminal A2): an additional setpoint
- ANIN2 (terminal A3): an additional setpoint
- ANIN3 (terminal A4): this is the normal speed reference source

Use the MMI to display the value of the ANIN 3 (A4) (and the additional setpoints if present). Vary the setpoint potentiometer and observe the input voltage change.

The sum of all the setpoints is given by the value of the SPEED SETPOINT parameter. This is also output at terminal A8.

### MMI Menu Map

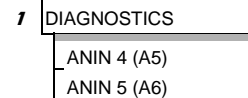


## Step 2: Check the External Current Clamps

Use the MMI to check the operation of the external current clamp settings (refer to Appendix D: “Programming” - ANALOG INPUTS for setting details).

- *If using a single external clamp (Unipolar), terminal C6 low (0V):*
  - Check that ANIN 5 (A6) is +10V or is adjustable up to +10V **Set to +10V**
- *If using dual external clamps (Bipolar), terminal C6 high (+24V):*
  - Check the ANIN 5 (A6) is at +10V or is adjustable up to +10V **Set to +10V**
  - Check that ANIN 4 (A5) is at -10V or is adjustable up to -10V **Set to -10V**

### MMI Menu Map



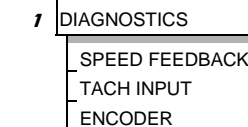
Setting the current clamps to 10V means that the current demand is controlled by the MAIN CURR. LIMIT parameter for the purposes of this initial Start routine.

## Step 3: Check the Speed Feedback signals

If possible, check the speed feedback by rotating the shaft manually in the forward direction.

- *Analog Tachogenerator:*
  - The Analog Tach Input should go positive.
- *MICROTACH/Encoder*
  - The ENCODER parameter should give a positive reading.

### MMI Menu Map



If there is no feedback signal from the Microtach, verify that both LEDs on the Microtach Option Board are illuminated. If either LED is extinguished, check that 24V is applied to the Microtach and all ancillary products, and that the fibre optic transmission length is not exceeded.

#### Step 4: Select the Speed Feedback method

Write down the MAIN CURR. LIMIT parameter's value here:

Set the MAIN CURR. LIMIT parameter to **0.00%**.

Select ARMATURE VOLTAGE initially for the speed feedback method in the SPEED FBK SELECT parameter.

**Perform a PARAMETER SAVE. Refer to Chapter 6: The Man-Machine Interface (MMI) - Saving Your Application.**

#### MMI Menu Map

- 1 SETUP PARAMETERS
- 2 CURRENT LOOP
  - MAIN CURR. LIMIT

#### MMI Menu Map

- 1 CONFIGURE DRIVE
  - SPEED FBK SELECT

#### MMI Menu Map

1 PARAMETER SAVE

PARAMETER SAVE

#### Step 5: Start the Drive using Auxiliary Power only

With +24V present at terminals B8 and B9 (Program Stop and Coast Stop):

- *Apply the "Start/Run" command to C3*

The main 3-phase contactor should pull-in and remain energised, (it may de-energise almost immediately due to the 3-phase fail alarm).
- *Remove the "Start/Run" command from C3*

The main 3-phase contactor should drop-out and remain de-energised.

If the above sequence does not function, remove the auxiliary power and check start/stop sequencing and contactor wiring.

If the contactor is left energised for an extended time during this check, the controller will detect that 3-phase is not connected and switch off the contactor, flagging the 3-phase alarm.

#### MMI Menu Map

- 1 DIAGNOSTICS
  - PROGRAM STOP
  - CONTACTOR CLOSED

### IMPORTANT

*The main contactor should never be operated by any means other than the drive internal controls, nor should any additional circuitry be placed around the contactor coil circuit.*

### WARNING

**Do not continue until the stop/start circuits and contactor operate correctly.**

#### Step 6: Power-down the drive and connect the 3-phase supply; power-up the Drive

Switch off all power supplies to the equipment and, when the whole system is totally isolated and safe, re-connect the main 3-phase power supply.

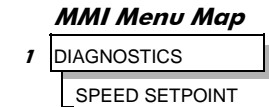
- Switch on the auxiliary supply.
- Switch on the main 3-phase supply.

**MAIN & AUXILIARY POWER ARE CONNECTED AT THIS STAGE**

---

**Step 7: Set the Speed Setpoint(s) to 5%**

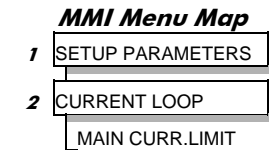
Set the Speed Setpoint(s) to 5% so that the value of the SPEED SETPOINT parameter is 5.0%. This is also output at Terminal A8.



---

**Step 8: Check the MAIN CURR LIMIT is zero**

Double-check that the MAIN CURR. LIMIT is set to 0.00%.



---

**Step 9: Start the Drive and check the field voltage**

Apply the Start/Run command and check that 3-phase mains is applied to Power Terminals L1, L2 and L3. Be ready to check that the correct field voltage appears between the auxiliary supply terminals F+ and F- Apply 24V to "Enable" (C5) and immediately check the field voltage. (Note that any external interlocks which affect the Enable input C5 will affect the operation of the drive.)

---

**Caution**

This is high voltage DC, proceed with caution. Do not continue if this is incorrect, switch off all supplies immediately and check connections. Refer to 9.1 or 9.2 on the next page.

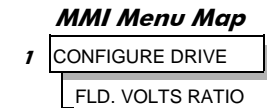
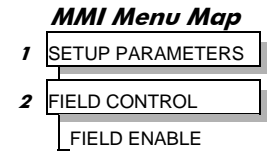
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**If the field voltage is incorrect, make the following checks:**

**Step 9.1 Internally Supplied Field:**

- Check that 3-phase is applied to terminals L1, L2 and L3 when the main contactor is closed.
- Check that the coding fuses on the power board or suppression board are healthy.
- The FIELD ENABLE parameter should be set to ENABLE.
- With the FIELD ENABLE parameter in view, press the ↓ (DOWN) key. The display changes to FLD CTRL MODE. Press the **M** key. Is this set to VOLTAGE CONTROL or CURRENT CONTROL?
  - If set to VOLTAGE CONTROL, check the value of the FLD. VOLTS RATIO parameter. Set this to 65% to obtain 300V fields from 460V supplies.
  - If set to CURRENT CONTROL, check the field current calibration set-up, refer back to “Calibration”.

If the field volts are at maximum, check the field continuity. (The field voltage may initially be lower than the rated value due to a cold field.)

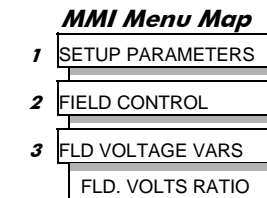
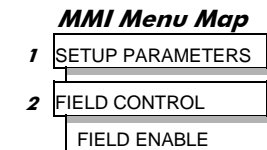


**Step 9.2 Externally Supplied Field:**

Refer to Chapter 3: “Installing the Drive” - Motor Field Options for conversion details.

- Check the voltage applied (externally fused) to terminals D1 and D2.
- Check the phasing of voltage applied to D1 and D2:
  - D1 must be connected directly or indirectly to the Red phase on main power terminal L1.
  - D2 must be connected directly or indirectly to the Yellow phase on main power terminal L2.
- The FIELD ENABLE should be set to ENABLE.
- With the FIELD ENABLE parameter in view, press the ↓ (DOWN) key. The display changes to FLD CTRL MODE. Press the **M** key. Is this set to VOLTAGE CONTROL or CURRENT CONTROL?
  - If set to VOLTAGE CONTROL, check the value of the FLD. VOLTS RATIO parameter. Set this to 65% to obtain 300V fields from 460V supplies.
  - If set to CURRENT CONTROL, check the field current calibration set-up, refer back to “Calibration”.

Check that 3-phase is applied to terminals L1, L2 and L3.



---

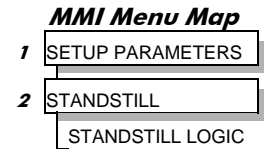
**Step 10: Check the MMI**

Check that all six MMI LED’s are now illuminated. Note that any external interlocks which affect the enable input C5 will affect the state of the RUN LED.

---

**Step 11: Check the STANDSTILL LOGIC parameter**

If the STANDSTILL LOGIC parameter in the STANDSTILL menu at level 2 is ENABLED, temporarily set it to DISABLED.



---

**Caution**

During the following set-up instructions, be ready to STOP the drive should the motor try to overspeed.

If 5% speed (approximately) is exceeded and the motor continues to accelerate a reversed connection is implied, decrease the MAIN CURR.LIMIT parameter to zero. Open the main contactor and disconnect all supplies. Reverse the motor connections.

---

**Step 12: Turn the motor and check direction of rotation**

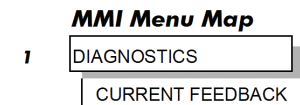
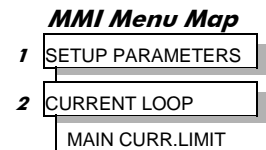
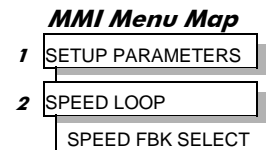
Perform the next operation with ARM VOLTS FBK selected for the SPEED FBK SELECT parameter (because it is hard-wired and therefore the sign will be correct). Select it now.

Slowly increase the MAIN CURR.LIMIT parameter towards a maximum of 20%. At some point the motor will begin to rotate as the parameter value is increased. The motor speed will settle at 5% of full speed. If the motor is loaded it may require more than 20% current limit to turn the motor.

- If the motor does not turn at all when the MAIN CURR.LIMIT is increased to 20%, check the CURRENT FEEDBACK parameter to verify that current is flowing into the armature. If no current is flowing, switch off and check the armature connections.
  - Is the motor connected to the drive?
  - Verify that Calibration has been carried out correctly.

Check the direction of rotation is suitable for your process:

- If the direction of rotation is correct, then the armature and field are wired correctly.
- If direction of rotation is incorrect then open the main contactor and disconnect all supplies. Reverse either the armature or field wiring.



**WARNING**  
**Do not continue until Step 12 is completed satisfactorily.**

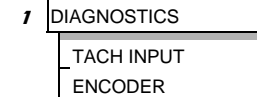
### Step 13: Check the Speed Feedback sign

With the motor rotating in the forward direction, check the sign of the feedback from the Tachometer or Encoder using the appropriate Diagnostic menu: TACH INPUT or ENCODER.

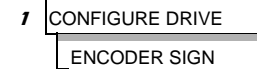
- If the diagnostic value is positive (correct), stop the drive. Re-instate your selection for the SPEED FBK SELECT parameter (if other than ARM VOLTS FBK) and run the drive to check operation. If the test is successful go to Step 14.
- If the diagnostic value is negative:
  - Analog Tach: reverse the connections of the analog tach on terminals G3 and G4
  - Encoder: change the sign of the encoder feedback ENCODER sign parameter.

Re-instate your selection for the SPEED FBK SELECT parameter (if other than ARM VOLTS FBK) and run the drive to check operation.

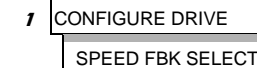
#### MMI Menu Map



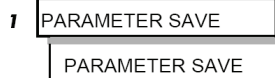
#### MMI Menu Map



#### MMI Menu Map



#### MMI Menu Map



**When satisfactory operation has been achieved, perform a PARAMETER SAVE. Refer to Chapter 6: “Man Machine Interface (MMI)” - Saving Your Application.**

### Step 14: Adjusting the Speed Setpoint

With the MAIN CURR.LIMIT parameter set to 20% or to the level required to achieve rotation, set the Speed Setpoints so that the value of the SPEED SETPOINT is about 10%, 1.0V at setpoint input (Terminal A8). The motor will accelerate to this speed setting.

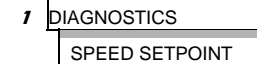
#### Step 14.1 4 Quadrant Drives which require reverse rotation:

Alter the Speed Setpoints so that the value of the SPEED SETPOINT parameter is about -10% and check that motor runs in the reverse direction.

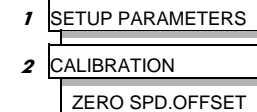
#### Step 14.2 Adjustment of ZERO SPEED OFFSET parameter (Ensure STANDSTILL is DISABLED as in Step 11):

- 4 Quadrant, non-reversing drives  
Set the Speed Setpoint potentiometer to zero and adjust the ZERO SPEED OFFSET parameter for minimum shaft rotation.
- 2 Quadrant, non-reversing drives  
Set the Speed Setpoint potentiometer to zero and adjust the ZERO SPEED OFFSET parameter until the shaft is just rotating then reduce level until the shaft stops.
- 4 Quadrant, reversing drives  
Set the ZERO SPEED OFFSET parameter to balance maximum speed in forward and reverse directions. You can also set STANDSTILL LOGIC parameter to ENABLE if a stationary shaft is required.

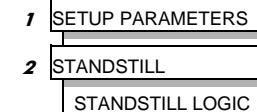
#### MMI Menu Map



#### MMI Menu Map



#### MMI Menu Map





### Step 15: Fine adjustments for Speed Feedback

Gradually increase the Speed Setpoints so that the value of the SPEED SETPOINT (DIAGNOSTIC menu) is at maximum. Check the shaft speed is correct.

If fine adjustment is required adjust the calibration as appropriate to the speed feedback selection:

- Armature Voltage feedback has a +2/-10% trim, greater changes outside this range require re-setting of the calibration switches.
- Analog Tachogenerator has a +2/-10% trim, greater changes outside this range require re-setting of the calibration switches.
- The MICROTACH/Encoder should give an absolute rotational speed for which adjustment is unnecessary however the motor speed may not be the relevant factor thus speed of rotation can be altered by simply adjusting the calibration.

### Step 16: Adjustment for Field Weakening

If the drive is to be run with a top speed greater than the base speed then 'field weakening' is used to achieve that top speed. (Refer to Chapter 5: "Control Loops" - Field Control for a more detailed explanation).

#### NOTE

**The drive must be operating in Field Current Control. Select CURRENT CONTROL on the FLD CTRL MODE parameter. Also, field weakening cannot be used if you have Armature Voltage feedback selected.**

IR COMPENSATION (CALIBRATION menu) is also used in field weakening applications to improve dynamic response and speed holding stability.

To set up IR COMPENSATION:

Set FIELD ENABLE to DISABLED (FIELD CONTROL menu) and set the MAIN I LIMIT to 50%. Start the drive with a 5% speed demand and ensure the ACTUAL POS I LIMIT is 50% (diagnostic). This should stall the drive at zero speed and cause it to pass 50% current.

Monitor the BACK EMF diagnostic and note the value (typically anything up to 9% is normal). Stop the drive and enter twice this value into IR COMPENSATION and repeat the test to ensure that BACK EMF then reads zero.

Run the drive up to base speed and check the motor volts scaling is correct. Note the scaled BEMF at base speed.

Tune the Field Current Controller and the Field Weakening Controller by reference to Chapter 5: "Control Loops".

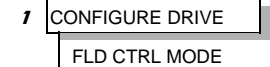
In the FLD WEAK VARS menu, verify that the MIN FLD CURRENT parameter is set appropriately. Adjust the base speed BEMF volts to the required scaled level by setting the MAX VOLTS parameter.

Increase the speed above the base speed, checking that the armature volts remain constant whilst the field current reduces.

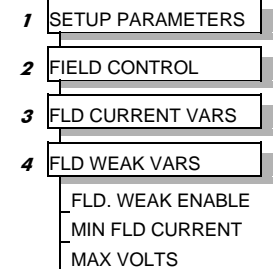
Gradually increase to maximum speed. Monitor the armature volts at maximum speed and trim the speed using the appropriate control as detailed in Step 15. *PROCEED WITH CARE - MAKE SMALL ADJUSTMENTS.*

Trim the MIN FLD CURRENT parameter to the appropriate setting (5% lower than the field current at full speed).

#### MMI Menu Map



#### MMI Menu Map



### Step 17: Adjustment for Reversing Drives

For reversing drives, check the maximum reverse speed.

Imbalance in reversing drives can only be corrected by adjusting the ZERO SPD OFFSET parameter, which may be to the detriment of operation at Zero Setpoint.

#### MMI Menu Map

1	SETUP PARAMETERS
2	CALIBRATION
	ZERO SPD.OFFSET

### Step 18: Re-setting the MAIN CURR. LIMIT parameter

Re-set the MAIN CURR. LIMIT parameter to the original setting that you previously noted in Step 4. If in doubt, set it to 100% to correspond to 100% full load current (FLC).

#### NOTE

**The controller cannot achieve 200% current unless the CUR. LIMIT/SCALER parameter is increased to 200% (from its default setting of 100%). Until this is done, the External Current Clamp will limit the current to 100%, refer to Appendix D: “Programming” - CURRENT LOOP.**

#### MMI Menu Map

1	SETUP PARAMETERS
2	CURRENT LOOP
	MAIN CURR.LIMIT

- If the current limit is set higher (maximum 200%) and the motor runs into an overload condition, the current is automatically reduced from the current limit level down to 110% FLC (continual rating).  
(If the motor continues to rotate it may overheat and thermal protection should be provided).
- If the motor is overloaded and the current provided by the controller is not enough to maintain rotation, i.e. the motor stalls, the controller will trip out showing STALL TRIP alarm, if enabled (default), after the time set by STALL TRIP DELAY.

## Performance Adjustment

### Current Loop - The Autotune Feature

Now perform an Autotune to identify and store the following Current Loop parameters:

PROP. GAIN    INT. GAIN    DISCONTINUOUS

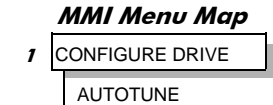
### Initial Conditions

1. Main contactor open, i.e. no Start/Run signal at terminal C3.
2. Set the AUTOTUNE parameter to OFF.
3. Program Stop (terminal B8) and Coast Stop (terminal B9) should be high, i.e. 24V.
4. If the field is being supplied by a third-party controller, remove the field manually. (If the field is internally regulated, the default Autotune automatically quenches the field).

**IMPORTANT** *The shaft may require clamping for certain motors to prevent rotation >20% during the Autotune sequence. If the motor is either a compound motor (series field), has some residual magnetism, or is a permanent magnet motor it WILL rotate and the shaft must be clamped. If in any doubt, CLAMP OR BE READY TO STOP THE MOTOR.*

## Performing an Autotune

- Set the AUTOTUNE parameter to ARMATURE.
- Close the main contactor, i.e. Start/Run signal to terminal C3.
- Energise the Enable terminal (C5).



The Autotune sequence is initiated. The Keypad displays “AUTOTUNING” during the process. When complete (after approximately 10 seconds), the main contactor is opened automatically signalling the end of the sequence and the AUTOTUNE parameter is reset to OFF.

- **Perform a PARAMETER SAVE now.** Refer to Chapter 6: “Man-Machine Interface (MMI)” - Saving Your Application.
- If necessary, restore field connections and remove the mechanical clamp.

## Autotune Failed?

- The MMI displays the message AUTOTUNE ABORTED.  
If any one of the Initial Conditions above are removed, or the Autotune sequence times out (after 2 minutes), then the Autotune sequence is aborted causing the main contactor to drop out.
- The MMI displays the message AUTOTUNE ERROR
  - The motor shaft was rotating, or was caused to rotate.
  - The field current was seen to exceed 6%, when a field-off (default) Autotune had been selected.
  - The drive to armature wiring was open-circuit.
  - The discontinuous current boundary was found to exceed 200% of the nominated motor armature current rating
  - Large imbalance in the three-phase voltages of the supply.
  - A hardware fault relating to current feedback was detected on the control board.

**NOTE** Refer to Chapter 5: “Control Loops” - Current Control for manual tuning instructions.

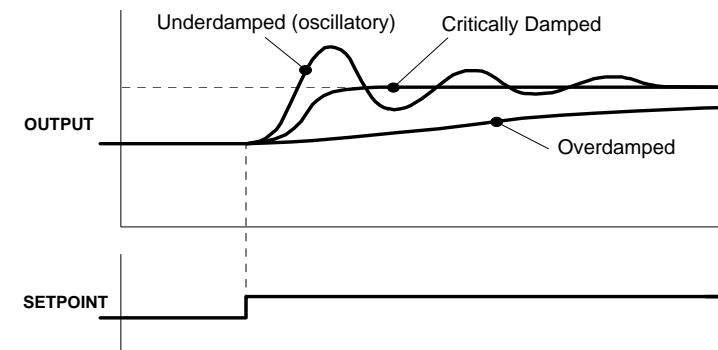
## Speed Loop Adjustment

You will need to adjust the Speed Loop for your particular application although in most cases the default settings are acceptable. The optimum Speed Loop performance is achieved by adjusting the PROP. GAIN and INT. TIME CONST. parameters.

A PI controller is used to control the response of any closed loop system. It is used specifically in system applications involving the control of drives to provide zero steady state error between Setpoint and Feedback, together with good transient performance.

### Proportional Gain (PROP. GAIN)

This is used to adjust the basic response of the closed loop control system. The speed error is multiplied by the Proportional Gain to produce a motor current demand.



### **Integral (INT.TIME CONST.)**

The Integral term is used to reduce steady state error between the setpoint and feedback values of the controller by accumulating current demand in proportion to the error input. If the integral is set to zero, then there will always be a steady state error.

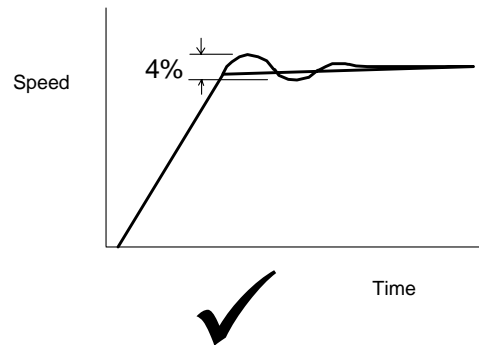
### ***A Method for Setting-up the PI Gains***

The gains should be set-up so that a critically damped response is achieved for a step change in setpoint. An under damped or oscillatory system can be thought of as having too much gain, and an over damped system has too little.

To set up the P gain, set the I gain low (large time set is INT. TIME CONST.). Apply a step change in setpoint that is typical for the System, and observe the speed feedback response on terminal A7. Increase the P gain and repeat the test until the system becomes oscillatory. At this point, reduce the P gain until the oscillations disappear. This is the maximum value of P gain achievable.

If the steady state error is significant, i.e. the feedback is not sufficiently close to the setpoint value, the I term needs to be used. As before, increase the I gain and apply the step change. Monitor the output. If the output becomes oscillatory, reduce the P gain slightly. This should reduce the steady state error. Increasing the I gain further may reduce the time to achieve zero steady state error.

### **Correct Response**



Critically Damped Response with no more than 4% of maximum speed from first overshoot to first undershoot

# Starting and Stopping Methods

## Stopping Methods

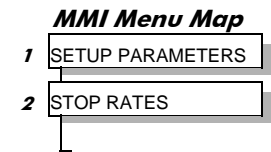
- If the Drive is “non-regenerative” (2-quad - 591) it effectively coasts to a stop once the current demand reverses.
- If the Drive is “regenerative” (4-quad - 590) then it can stop faster because it uses energy from the load, i.e. reverse current is allowed to flow.

*Normal Stop and Program Stop are only relevant for a “regenerative” controller.*

*The parameters STOP TIME and PROG STOP TIME have associated timers which initiate a Coast Stop after the timed period.*

*The Coast Stop has direct control of the Run relay with no intervening electronics.*

All associated parameters can be found in the STOP RATES menu.



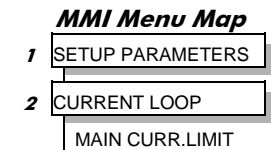
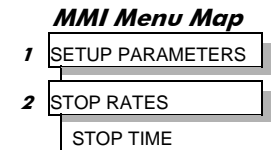
Terminal	Description	Function	Parameter	Priority
B9	Coast Stop	Motor coasts to rest	--	Overrides Program Stop and Normal Stop
B8	Program Stop	Motor decelerates at Program Stop rate	PROG STOP TIME	Overrides Normal Stop
C3	Start/Run (Normal Stop)	Motor decelerates at Normal Stop rate	STOP TIME	--

## Normal Stop (C3)

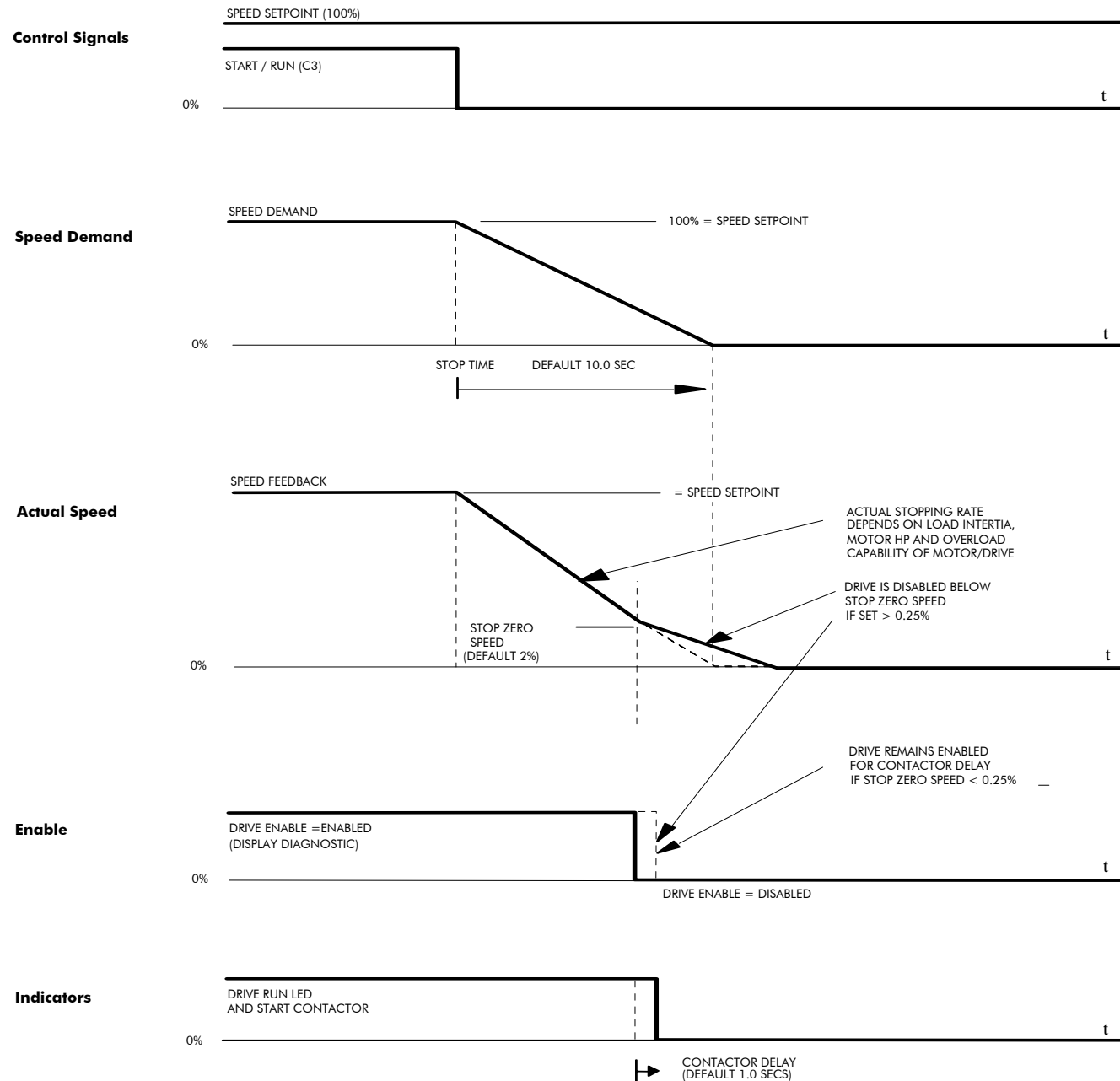
This is achieved by removing 24V from Terminal C3.

The motor speed is brought to zero in a time defined by the STOP TIME parameter.

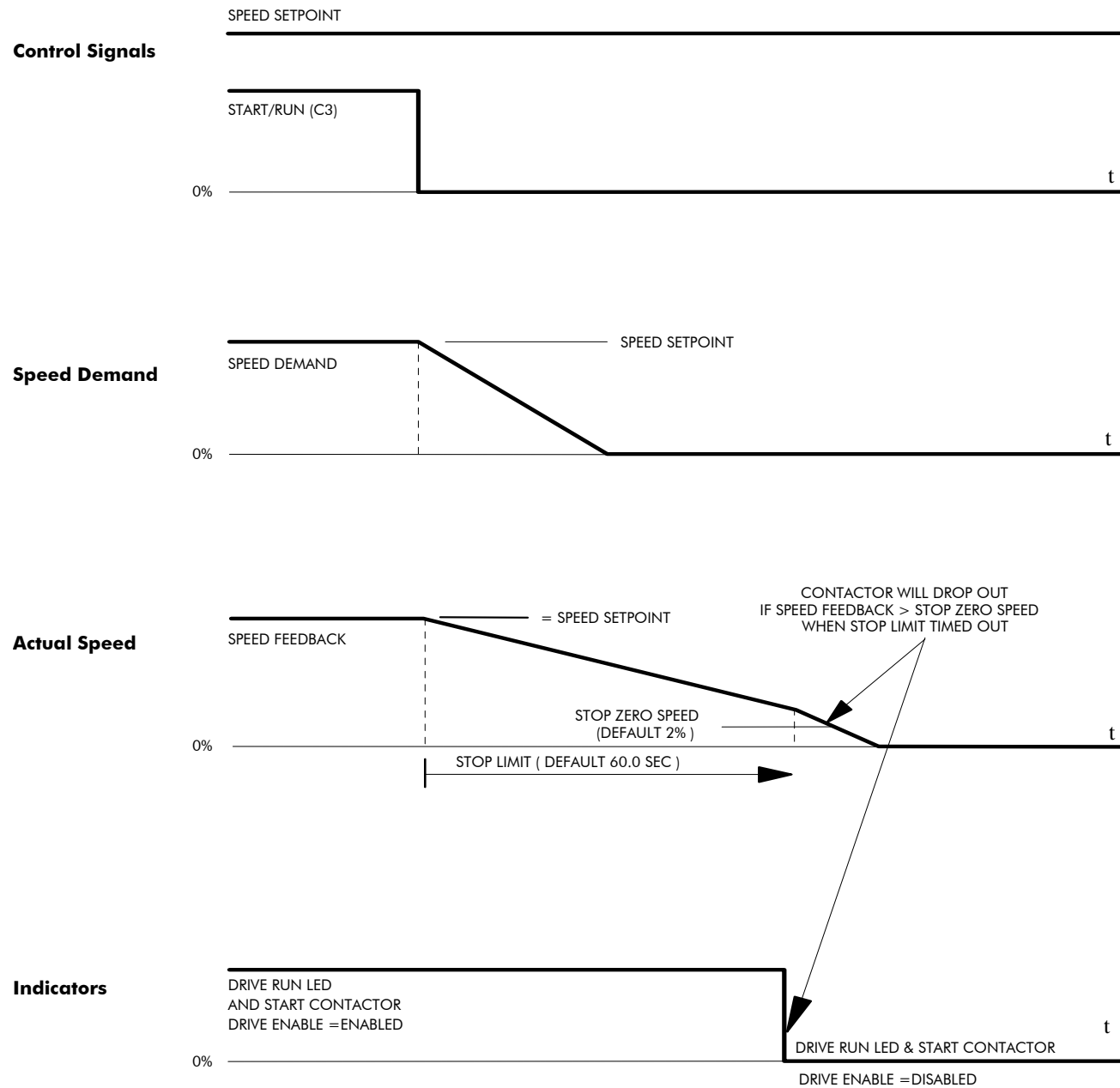
During Normal Stop, the current is limited by the MAIN CURR. LIMIT parameter



### NORMAL STOP



### TIME-OUT IN NORMAL STOP



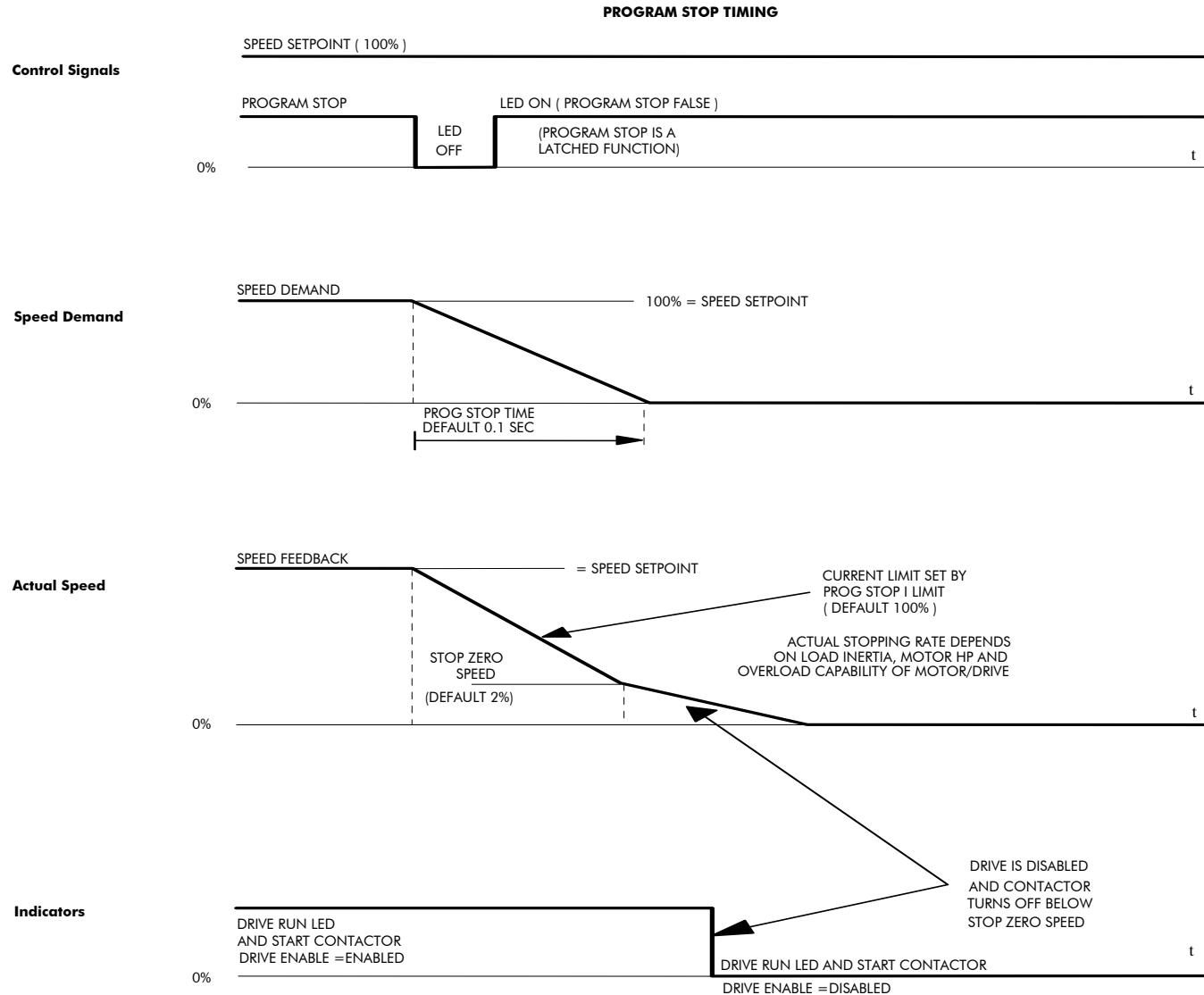
# Program Stop (B8)

This is achieved by removing 24V from Terminal B8.

The motor speed is brought to zero under conditions defined by the PROG. STOP TIME (ramp rate) and PROG. STOP I LIMIT parameters.

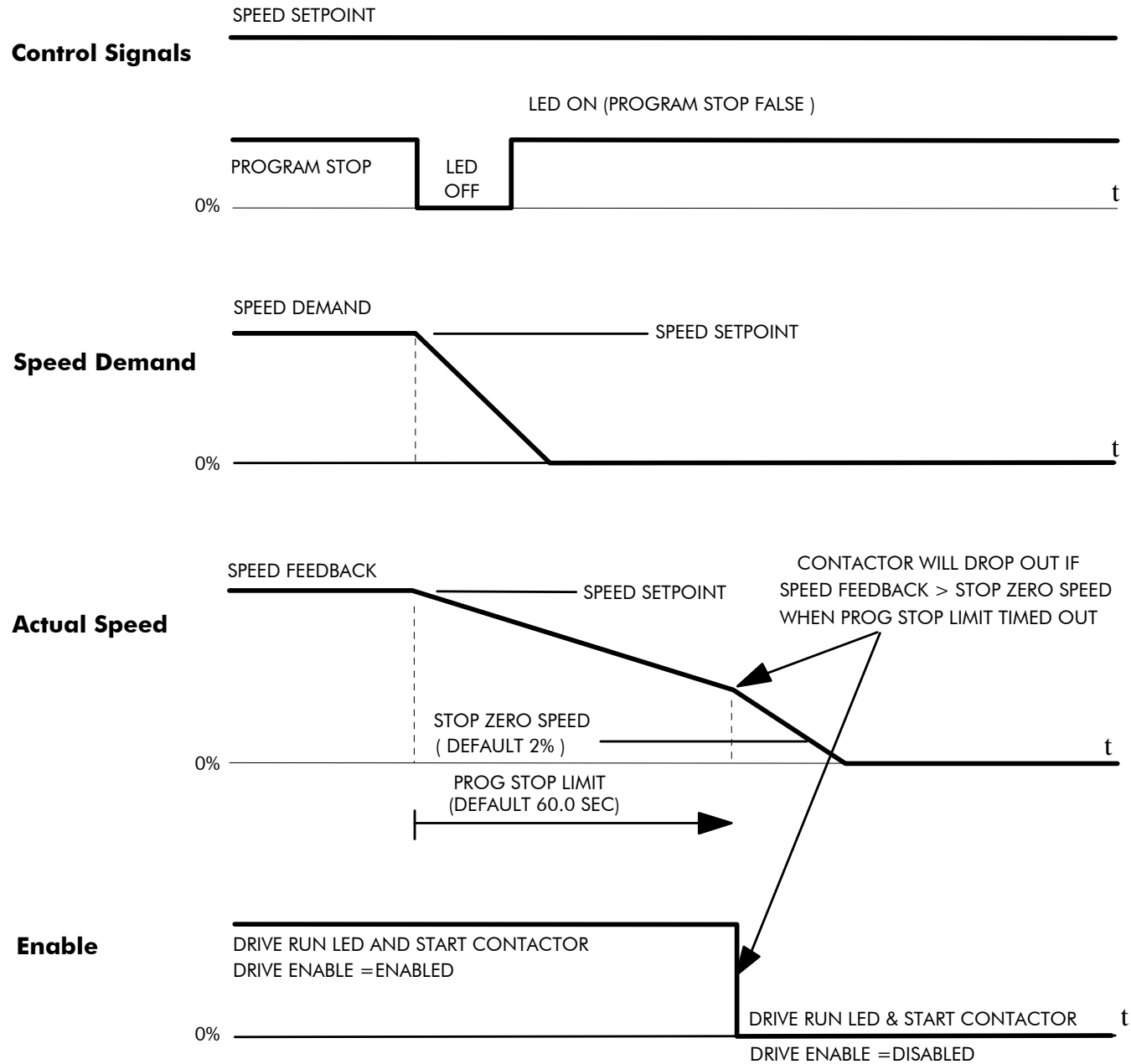
**MMI Menu Map**

1	SETUP PARAMETERS
2	STOP RATES
	PROG. STOP TIME
	PROG. STOP I LIMIT





**TIME-OUT IN PROGRAM STOP**



## Coast Stop (B9)

This is achieved by removing 24V from Terminal B9.

The stack is automatically quenched and the contactor is opened. The motor coasts to a stop.

**NOTE** The motor coast stop rate is dictated by the motor inertia - the drive does not control the motion.

## Standstill

Refer to Appendix D: “Programming” - STANDSTILL.

## The Trip Condition

When a trip condition is detected, a similar stopping method to Coast Stop is used. The power stack cannot be re-enabled until the trip condition has been cleared and successfully reset.

Refer to Chapter 7: “Trips and Fault Finding” for further details.

## Normal Starting Method

To achieve a normal start of the Drive:

1. Apply 24V to Terminal C5 (Enable)
2. Apply 24V to Terminal C3 (Start)

**NOTE** The Drive will not start if there are alarms present, or if Terminals B8 (Program Stop) or B9 (Coast Stop) are low, 0V.

*Ensure that Program Stop and Coast Stop are valid before Start/Run is applied.*

### MMI Menu Map

1	SETUP PARAMETERS
2	STANDSTILL
	STANDSTILL LOGIC
	ZERO THRESHOLD

# Advanced Starting Methods

## Starting Several Drives Simultaneously

1. Apply 24V to Terminal C3 (Start)
2. Use Terminal C5 (Enable) to synchronise the start-up of the Drives

## Jog

**NOTE** The Drive will not start if there are alarms present.

This facility provides two dedicated jog setpoints (or perhaps an Inch Forward/Inch Reverse). Activating Jog runs the motor at speeds set by JOG SPEED 1 or JOG SPEED 2. The JOG/SLACK::MODE parameter selects JOG SPEED 1 or 2.

1. Apply 24V to Terminal C5 (Enable)
2. Apply 24V to Terminal C4 (Jog Mode)

Refer to Appendix D: “Programming” - JOG/SLACK for further information. Also refer to the STOP RATES function block: the CONTACTOR DELAY parameter is used to prevent multiple operations of the main contactor from rapid use of the Jog switch.

## Crawl

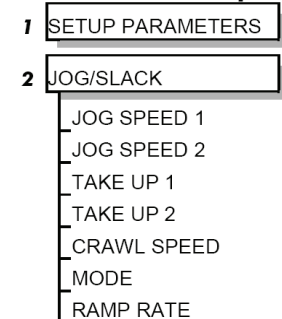
**NOTE** The Drive will not start if there are alarms present.

This facility provides a dedicated crawl setpoint. Activating Crawl runs the motor at the speed set by CRAWL SPEED.

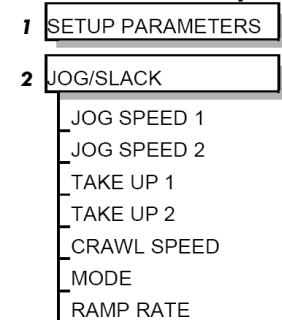
1. Apply 24V to Terminal C5 (Enable)
2. Set JOG/SLACK::MODE parameter (Tag No. 228) to **TRUE**.
3. Apply 24V to Terminal C3 (Start) and Terminal C4 (Jog Mode) simultaneously to start the Drive using the crawl speed, in Forward or Reverse.

When selecting CRAWL, apply Start (C3) and Jog (C4) simultaneously, otherwise you may experience Modes 3 or 6 momentarily. Refer to Appendix D: “Programming” - JOG/SLACK for further information (see the Setpoint Selection Table).

### MMI Menu Map



### MMI Menu Map



# Take Up Slack

**NOTE** The Drive will not start if there are alarms present.

This facility provides two additional Take Up Slack setpoints. Activating Take Up Slack runs the motor at the speed set by "speed setpoint + TAKE UP1" or "speed setpoint + TAKE UP 2".

## TAKE UP SLACK 1:

1. Apply 24V to Terminal C5 (Enable).
2. Apply 24V to Terminal C3 (Start) to accelerate to set speed.
3. Set JOG/SLACK::MODE parameter (Tag No. 228) to **FALSE**.
4. Apply 24V to Terminal C4 (Jog Mode) to run the motor at "speed setpoint + TAKE UP 1".
5. Remove 24V from Terminal C4 (Jog Mode) to run the motor at speed setpoint.

## TAKE UP SLACK 2:

6. Apply 24V to Terminal C5 (Enable).
7. Apply 24V to Terminal C3 (Start) to accelerate to set speed.
8. Set JOG/SLACK::MODE parameter (Tag No. 228) to **TRUE** to run the motor at "speed setpoint + TAKE UP 2".
9. Set JOG/SLACK::MODE parameter (Tag No. 228) to **FALSE** to run the motor at speed setpoint .

Refer to Appendix D: “Programming” - JOG/SLACK for further information (see the Setpoint Selection Table).

### MMI Menu Map

1	SETUP PARAMETERS
2	JOG/SLACK
	JOG SPEED 1
	JOG SPEED 2
	TAKE UP 1
	TAKE UP 2
	CRAWL SPEED
	MODE
	RAMP RATE

# COMMS Control of the Drive

## Remote Sequencing Command

REM. SEQUENCE : Tag 536, Mnemonic "ow", Default = 0x0000 ("0x" denotes a Hexadecimal value)

**NOTE** Refer to the RS485 Communications Interface Technical Manual, HA463560 on the website, for information about the EI Bisynch ASCII communications protocol.

Reserved bits are undefined when read and should be set Zero when written.

Bit Number	Mask	Name	Comment
0 (lsb)	0x0001	Remote Enable	
1	0x0002	Remote Start	
2	0x0004	Remote Jog	
3	0x0008	Remote Jog Mode	Selects Jog Speed
4	0x0010	Reserved	
5	0x0020	Reserved	
6	0x0040	Reserved	
7	0x0080	Reserved	
8	0x0100	Remote Alarm Ack	Alarm Acknowledge
9	0x0200	Remote/Remote Trip	Remote Trip (High for OK)
10	0x0400	Reserved	
11	0x0800	Reserved	
12	0x1000	Reserved	
13	0x2000	Reserved	
14 (msb)	0x4000	Reserved	
15 (msb)	0x8000	Reserved	

## Useful Commands using EI Bisynch ASCII - REM. SEQUENCE

Tag 536, Mnemonic "ow", for example:

	/Remote Trip	Alarm Ack	Jog Mode	Jog	Start	Enable	Command
Start Drive	1	0	X	0	1	1	ow>0203
Stop Drive	1	0	X	0	0	1	ow>0201
Disable Drive	1	0	X	X	X	0	ow>0200
Jog Setpoint 1	1	0	0	1	0	1	ow>0205
Jog Setpoint 2	1	0	1	1	0	1	ow>020D
Remote Trip	0	0	X	X	X	X	ow>0000
Reset Alarm a)	1	1	0	0	0	0	ow>0300
Reset Alarm b)	1	0	X	0	0	0	Healthy Output Bit 11 goes high ow>0200

## Sequence Status

SEQ STATUS : Tag 537, Mnemonic "ox" (Read Only)

Reserved bits are undefined when read.

Bit Number	Mask	Name	Comment
0 (lsb)	0x0001	Coast Stop	Coast Stop demanded
1	0x0002	Program Stop	Program (Fast) Stop demanded
2	0x0004	Disable	/Enable demanded
3	0x0008	Run	Drive Start demanded
4	0x0010	Jog	Drive Jog demanded
5	0x0020	Reserved	Undefined
6	0x0040	Alarm	Unacknowledged alarm, (Health Store != 0)
7	0x0080	Reserved	Undefined
8	0x0100	Running	Contactors in and drive ready to be enabled
9	0x0200	Enabled	Drive is enabled.
10	0x0400	Zero Speed	Zero speed Output TAG 17
11	0x0800	Healthy Output	Healthy Output TAG 12
12	0x1000	Ready	Ready Output TAG 559
13	0x2000	Reserved	Undefined
14	0x4000	Reserved	Undefined
15 (msb)	0x8000	Reserved	Undefined

## Useful Bit Patterns using SEQ STATUS

Tag 537, Mnemonic "ox" (Read Only) - for example:

Sequence Status	Comment
0x1B0B	Running
0x044B	Tripped, Run High
0x0447	Tripped, Run Low, Enable Low
0x0C47	Trip Acknowledged, Healthy output TRUE Alarm stays high until drive is restarted.

### Drive Enable

To Enable the drive in remote mode the following diagnostic must be TRUE:

REM.SEQ.ENABLE[535] and REM SEQUENCE [536] BIT 1.

### Drive Start

To Start the drive in remote mode the following diagnostic must be TRUE:

REM.SEQ.ENABLE[535] and REM SEQUENCE [536] BIT 0.

### Drive Jog

To Jog the drive in remote mode the following diagnostic must be TRUE:

REM.SEQ.ENABLE[535] and REM SEQUENCE [536] BIT 3.

### Jog Mode

To select the jog setpoint in remote mode the following diagnostic must be TRUE:

REM.SEQ.ENABLE[535] and REM SEQUENCE [536] BIT 4.

### ACK Alarm

Alarms are latched while ACK ALARM is FALSE.

To Acknowledge an alarm when in Remote Sequencing, use REM. SEQUENCE [536] BIT 8.

### Remote Trip Alarm

The Remote trip alarm is designed to signal a network fault to the drive. When using the Profibus interface, all outputs are set to zero on link fail. If one of the outputs is REM SEQUENCE [536 ] the drive will trip after a delay specified by REM TRIP DELAY (541). The Drive will then need a low -> high transition on ACK Alarm and Start before the drive may run again.

REM TRIP INHIBIT [540]	REM TRIP DELAY [541]	REMOTE TRIP [542]
Disable remote trip.	Delay before trip becomes active after bit being cleared.	Status of the Remote trip alarm, OK, Warning (Remote Seq Bit 9 FALSE and delay not expired), Active (Trip active, timer expired and remote not inhibited).

# Chapter **5**

## Control Loops

This chapter explains the principle of operation, and provides help on setting up the control loops correctly.

Control Loops - Principle of Operation .....	5-1	Set-Up Notes	5-5
Current Loop	5-1	Field Weakening	5-5
Speed Loop	5-4	Standby Field	5-6
Field Control	5-5		





# Control Loops - Principle of Operation

**NOTE** Selection between Current Control or Speed Control (default) is made by the I DMD ISOLATE (current demand isolate) parameter using Digital I/P3 (Terminal C8). If ENABLED the Drive operates as a current controller, and if DISABLED (the default) it operates as a speed controller.

## MMI Menu Map

1	SETUP PARAMETERS
2	CURRENT LOOP
	I DMD ISOLATE

---

## Current Loop

The current loop accepts a demand from either the speed loop, or directly from the plant, and forms an error signal which is the difference between demand and average value of feedback. The error signal is fed into a Proportional + Integral compensator which produces the output of the current loop, i.e. the firing angle signal.

In the Drive, the error signal is created in two different forms:

1. The *average* error is computed as the difference between demand and average value of feedback and fed into the Integral part of the P + I algorithm.
2. The *instantaneous* error is computed as the difference between demand and instantaneous value of feedback and is fed into the Proportional part of the P + I algorithm. This gives higher transient performance since it does not contain any time lag, unlike the average which has a built-in lag of 1/6 of mains cycle. However, the average is the true measurement of torque which is the objective of the current control and this is not affected by the small time lag in achieving zero steady-state error.

The firing angle signal is translated into a certain time delay from the mains zero cross point (obtained via a Phase-Lock-Loop) and this results in a firing command being issued to the thyristor stack every 1/6 of a mains cycle in steady-state.

Some special features of the current controller are discussed separately below.

### Adaptive Current Control

The gain of a thyristor 6-pulse converter (voltage-time area over firing angle) drops dramatically at discontinuous values of armature current. Therefore a gain boost is required in the current controller to compensate for that.

In the Drive, this is handled by an adaptive algorithm which allows the current to follow the demand in one step (firing) within the discontinuous region of operation.

### Back EMF (BEMF) Estimate

With the motor at standstill, the firing angle for zero current is 120 degrees. When the motor is rotating at different speeds the firing angle for zero current follows a cosine locus.

It is of paramount importance to track this locus as close as possible throughout the speed range if the current loop bandwidth is to be maintained at its highest possible level during current reversals from master to slave bridge and visa-versa.

There are two reasons for the loss of bandwidth at current reversals:

1. The loss of converter gain needs to be compensated in an accurate way which is the objective of the adaptive algorithm.
2. The above algorithm also relies on the right start-up value of firing angle in the incoming bridge in order to minimise both the "dead-time" (time interval of zero current referred to below) as well as the rise time to the required current demand.

In order to get the right start-up value of firing angle the knowledge of the operating BEMF is necessary. In the Drive, this is achieved by a combination of a hardware peak current detector and appropriate software algorithm.

## Bridge Changeover Delay

The bridge changeover "dead-time", i.e. time interval of zero current, is programmable from 1 to 1500 (via Reserved Menu) with a default value of 1.

*For values from 1 to 6:*

The delay can be set at multiples of 1/6 mains period, i.e. max.  $6 \times 3.33 = 20\text{ms}$  at 50Hz. This is relevant for use with large power converters where it is advisable to allow more time for snubber currents to subside before reversal is enabled. It is also relevant for motors with very large armature inductance where zero current detection is more sensitive and therefore a "factor of safety" in the bridge changeover delay is advisable.

*For values from 7 to 1500:*

The delay corresponds to  $7 \times 1.33\mu\text{s}$  up to  $1500 \times 1.33\mu\text{s} = 2\text{ms}$  maximum.

## Manual Tuning

**NOTE** This procedure is rarely used or required, if possible use Autotune.

If the motor is permanent magnet or (very rarely) wound-field of relatively high permanent magnetism, and the drive is a 4Q drive, then clamp the shaft prior to using the 4Q Autotune process (default). This mode of Autotune produces current pulses on alternate thyristor bridges, and thus the net rotational torque is very low.

There are two circumstances where a manual tuning process would be required:

1. The motor is permanent magnet or (very rarely) wound-field of relatively high permanent magnetism, and the drive is a 2Q drive.
2. The Autotune process has failed with AUTOTUNE ERROR message. The possible causes of an Autotune error are:
  - The motor shaft was rotating, or was caused to rotate.
  - The field current was seen to exceed 6%, when a field-off Autotune had been selected.
  - The drive to armature wiring was open-circuit.
  - The discontinuous current boundary was found to exceed 200% of the nominated motor armature current rating (see **A** below).
  - Large imbalance in the three-phase voltages of the supply (see **B** below).
  - A hardware fault relating to current feedback was detected on the control board.

If the cause of the Autotune failure can be determined and rectified then do so and simply repeat the Autotune process.

### MMI Menu Map

- 1 SETUP PARAMETERS
- 2 CURRENT LOOP
  - MAIN CURR.LIMIT
  - PROP. GAIN
  - INT. GAIN
  - DISCONTINUOUS
  - I DMD. ISOLATE

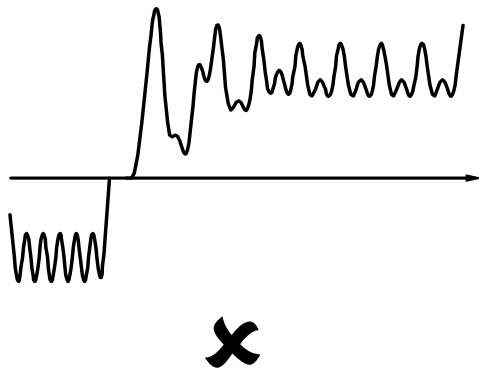
### MMI Menu Map

- 1 SETUP PARAMETERS
- 2 FIELD CONTROL
  - FIELD ENABLE

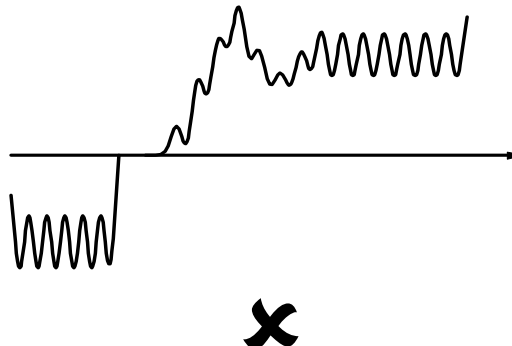
### MMI Menu Map

- 1 DIAGNOSTICS
  - CURRENT FEEDBACK

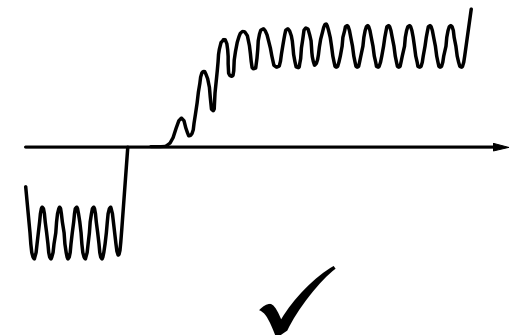
- A. If a very high motor discontinuous current boundary was the cause of failure, then the discontinuous-region manual tuning process needs to be applied as follows:
1. Set the DISCONTINUOUS parameter to 0, which selects adaptive current control off. When operating in this mode, disable the Missing Pulse alarm, since it is normally masked in the discontinuous region, and it will otherwise give spurious trips at low currents.
  2. Set PROP. GAIN to a low level (typically 1), since it is ineffectual in the discontinuous current operating region.
  3. Set the INT. GAIN to a moderate level (typically 10), sufficient to give fast response throughout the discontinuous current region.
- B. If imbalance in the three-phase voltages of the supply is the cause of failure then the PI-control manual tuning process needs to be applied as follows:
1. Set FIELD ENABLE to Disabled and clamp the motor shaft, to prevent rotation.
  2. Attach an oscilloscope to the control board armature current monitor test-point, (test point IA [see page-4 Diagnostics] scaled for 1.1V = 100% rated armature current, +ve = reverse bridge, -ve = forward bridge). The scaled armature current value can also be seen in the CURRENT FEEDBACK diagnostic.
  3. Run the drive with a positive speed demand, gradually increasing MAIN CURR. LIMIT until the armature current pulses are seen to just join up. At this point, enter the value of CURRENT FEEDBACK into the DISCONTINUOUS parameter.
  4. Enable the I DMD. ISOLATE parameter (or supply 24V to terminal C8). Use a toggling square-wave (< 20Hz) on the direct demand input (terminal A3) to generate current steps above the discontinuous region. Alternately increase PROP. GAIN and INT. GAIN, as far as possible, until the current loop response is correct (see Tuning Hints below).



Current Loop controls incorrectly set.  
Rapid alternating oscillation = P gain too high



Current Loop controls incorrectly set.  
Slower oscillatory response = I gain too high



Current Loop controls correctly set.

## Tuning Hints

If the P gain (PROP.GAIN) is too high then the response will exhibit a rapid oscillation, that alternates on consecutive current pulses.

If the I gain (INT. GAIN) is too high then the result will be a slower oscillatory response (under-damped), with a period of multiple pulses.

If the I gain (INT. GAIN) is too low then the response will exhibit a long settling tail.

## Diagnostics

The diagnostic point for "real" armature current is the first (left-hand side) test point below the armature current calibration switches. This will give 1.1V average for 100% current. It will also give the operating bridge, i.e. TP1 will be negative for the Master bridge (positive current demand) and positive for the Slave bridge (negative current demand).

## Current Demand Rate Limit (di/dt)

Access to the di/dt limit is currently reserved for Parker SSD Drives personnel only in the Reserved Menu.

This is a limit imposed on the rate of change of the current demand. It is to be used for motors with commutation limitations, mechanical systems that cannot absorb rapid torque transients and also as a means of limiting current overshoot for large current swings (e.g. 0 → 200%). The default value is set at 35% (i.e. maximum allowable change is 35% of FLC in 1/6 mains cycle) which has no practical effect on the current response between 0 and 100%.

---

# Speed Loop

The speed loop accepts a demand from either an outside loop (i.e. position loop) or directly from the plant and forms the error signal which is the difference between demand and feedback. The error signal is fed into a Proportional + Integral compensator which produces the output of the speed loop, i.e. the current demand signal.

The integral gain is translated into a Time Constant (secs) in the MMI which defines more clearly the function of the compensator against a certain load time constant.

## Speed Loop Synchronised with Current Loop

The proportional part of the P+I algorithm is executed immediately before each run of the current loop, thus ensuring minimum time lag and therefore maximum bandwidth.

## Combined Analog Tacho/Encoder Feedback

By using the analog tacho feedback on the Proportional part of the P + I algorithm and the encoder feedback on the Integral part (using similar principle as in the current loop), the Drive combines maximum transient response with the increased steady-state accuracy of the digital feedback. Please refer to Parker SSD Drives Engineering Department for assistance in the use of this feature.

# Field Control

## Set-Up Notes

The setting of the P + I gains for the current controller is done manually in much the same way as described in Chapter 4: “Current Loop - Manual Tuning”, and one convenient way is to switch several times from "quench" to "standby" mode and observe the current response 0 → 50% for rise time and overshoot.

## Current Control

The field current loop can accept a demand directly from the plant and/or an outside field weakening loop and forms the error signal which is the difference between demand and feedback. The error signal is fed into a P + I compensator which produces the output of the field loop, i.e. the field firing angle signal.

The firing angle signal is translated into a certain time delay from the mains zero cross point (obtained via the same Phase-Lock-Loop as for the armature) and this results into a firing command being issued to the field bridge every 1/2 of a mains cycle in steady-state.

## Voltage Control

This offers the facility of an open-loop voltage control for motors which do not provide in the nameplate the field current rating. The field voltage is controlled by the specified FLD. VOLTS RATIO which defaults to 90.0%. This is the maximum dc Volts that can be obtained for a given ac RMS input in a single-phase rectifier, i.e. 370V dc for 415V ac supply. The specified ratio determines directly the firing angle at which the controller operates and therefore the thermal effects on the field resistance as well as mains voltage variations are not compensated for. It is also worth noting that in this mode the field overcurrent alarm is not active (since there is no current scaling) and therefore this mode is not recommended for use with supplies much greater than the field voltage rating.

### MMI Menu Map

- 1 SETUP PARAMETERS
- 2 FIELD CONTROL
- 3 FLD.CURRENT VARS
- 4 FLD.WEAK VARS
  - FLD. WEAK ENABLE
  - EMF LEAD
  - EMF LAG
  - EMF GAIN
  - MIN FLD.CURRENT
  - MAX VOLTS
  - BEMF FBK LEAD
  - BEMF FBK LAG

## Field Weakening

Motor field weakening is used to extend the speed region of the motor above its base speed (the motor speed resulting at rated armature voltage, rated armature current and rated field current), in a constant power mode of operation (motor torque reducing with increasing speed).

*Note that the motor should be rated for field-weakened operation, in terms of rotational speed and reduced field current, before utilising this mode.*

The drive includes a field weakening loop that, above base speed, can control the field current demand to the correct level required to maintain motor back-EMF at a pre-defined level.

**NOTE** Field weakening is not possible when running with Armature Volts feedback. Although field weakening can be “Enabled” in this instance, a software interlock clamps the field demand at 100% and will not allow the field weakening to reduce it.

When the back-EMF measurement is higher than the MAX VOLTS setting (default 100%) the excess voltage is presented to the field weakening gain-limited PI controller as an error, and this controller reduces the field current demand accordingly.

The gain-limited controller is tuned as follows:

1. Ensure that the armature current, speed and field current loops are correctly tuned.

2. Enable field weakening control (FLD. WEAK ENABLE = ENABLE), with analogue tachogenerator, encoder or microtach speed feedback, correctly installed and configured for extended speed operation.
3. Run the drive and slowly increase the speed demand so that the field is being weakened by the gain-limited PI controller. Change the MAX VOLTS parameter down and up by 10% to generate field current transients.
4. Alternately increase the P gain (using the dc-gain parameter EMF GAIN) and reduce the integral time-constant (parameter EMF LEAD) until the loop is correctly tuned (see the Current Loop "Tuning Hints" above).

It is the over-voltage of the back-EMF that provides the error which drives this controller to weaken the field, and the over-voltage occurring during ramp through base speed is dependent on the rate of ramp. If the over-voltage is excessive, then provide advanced notice of the overvoltage (in order to reduce it) by employing the lag/lead filter applied to the back-emf measurement. This filter is disabled by default through its equal lag and lead time-constant settings, increase the lead time-constant to provide advance notice of weakening to the controller.

**Notes on field weakening controller usage:**

1. **The use of the back-EMF filter should be limited to 3:1 ratio of lag to lead time-constants, and the field current loop and field weakening controller may need to be de-tuned, in order to maintain overall loop stability.**
2. **The gain-limit of the PI controller may also be adjusted in order to optimise the balance between transient and static back-EMF over-voltage. Lower lag time-constants and lower dc-gains result in more static back-EMF over-voltage, but allow for more back-EMF filter advance during speed ramps. The ratio of lag to lead time-constants should be typically maintained above 10 to avoid significant dc over-voltage on the back-EMF.**

**MMI Menu Map**

- 1 SETUP PARAMETERS
- 2 FIELD CONTROL
  - FLD. QUENCH DELAY
  - FLD. QUENCH MODE

## Standby Field

When the armature current gets quenched, a timer starts timing-out and after a certain delay (FLD. QUENCH DELAY) it will either quench the field totally (FLD. QUENCH MODE = QUENCH) or will reduce it to 50% of the current or voltage setpoint (FIELD QUECH MODE = STANDBY). This applies to both current and voltage modes.

# Chapter 6

## The MAN - MACHINE INTERFACE (MMI)

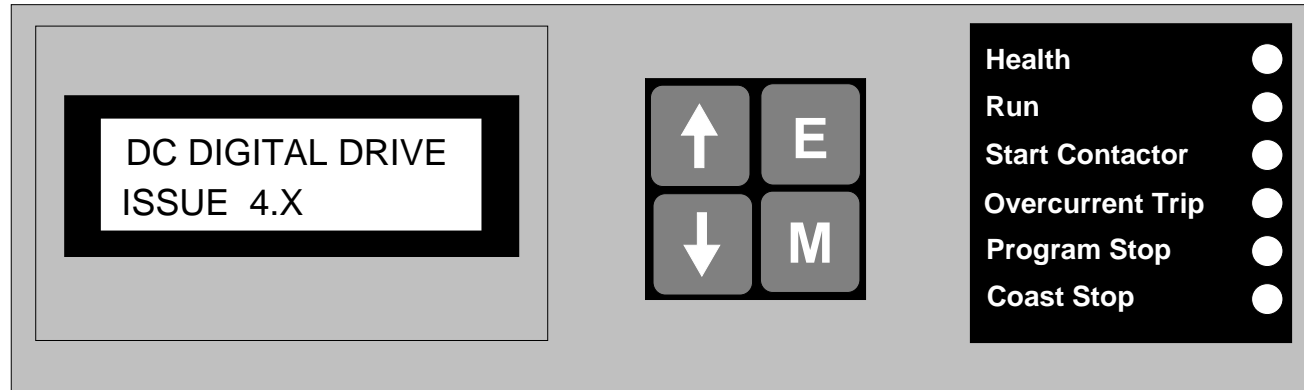
This chapter details the menus, control keys and keypad indications.

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Control Key Definitions	6-2	CONFIGURE DRIVE	6-16
Keys for Programming the Drive	6-2	FUNCTION BLOCKS	6-17
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# Introducing the MMI



**Figure 6-1 The Keypad**

The built-in Man-Machine Interface (MMI) consists of a liquid crystal display, control keys and LEDs that allow full use of the drive's features. The Liquid crystal display can be seen through the hinged cover that protects the MMI. Lower the protective cover to see the control keys and LEDs.

The MMI provides for application programming and monitoring of the Drive for remote control.

## Welcome Screen

On power-up, a self-calibration is displayed. This is quickly replaced by a default Welcome screen showing the product description and software version of the Drive.





The display then changes to MENU LEVEL after a further 15 seconds (you can press the **M** key to display this screen immediately). This screen is at the top of the MMI's menu system.

---

# Control Key Definitions

## Keys for Programming the Drive

**NOTE** Refer to “Navigating the Menu System”, page 6-6 for a quick-start to using the menu.

<b>UP</b> 	<i>Navigation</i> - Moves upwards through the list of parameters. <i>Parameter</i> - Increments the value of the displayed parameter. <i>Command Acknowledge</i> - Confirms action when in a command menu.
<b>DOWN</b> 	<i>Navigation</i> - Moves downwards through the list of parameters. <i>Parameter</i> - Decrements the value of the displayed parameter.
<b>ESCAPE</b> 	<i>Navigation</i> - Displays the previous level's Menu. <i>Parameter</i> - Returns to the parameter list. <i>Trip Acknowledge</i> - Acknowledges displayed Trip or Error message.
<b>MENU</b> 	<i>Navigation</i> - Displays the next Menu level, or the first parameter of the current Menu. <i>Parameter</i> - Allows a writable parameter to be modified.

## LED Indications

There are six LEDs that indicate the status of the Drive. Each LED is considered to operate in two different ways:

- OFF
- ON

The LEDs are labelled HEALTH, RUN, START CONTACTOR, PROGRAM STOP, OVER CURRENT TRIP, and COAST STOP. The status of the LEDs have the following meanings:

HEALTH	Drive State
○	Drive fault condition
●	Drive normal condition
RUN	Drive State
○	Drive not enabled: <ul style="list-style-type: none"> <li>• the thyristor bridge is disabled</li> <li>• the main contactor control relay is de-energised</li> <li>• an alarm is present</li> </ul>
●	Drive in run condition Drive is healthy (as indicated by the HEALTH LED) Ready (which requires a Start instruction) and enabled; indicates that the controller is in a normal run condition. The main contactor control relay is energised and the thyristor bridge is enabled.
START CONTACTOR	Drive State
○	Start contactor is Open
●	Start contactor is Closed (by a start instruction). The drive is healthy
PROGRAM STOP	Drive State
○	The program stop line is open and the program stop is carried out until main contactor drop-out occurs
●	No program stop (+24V is applied to terminal B8)
OVER CURRENT TRIP	Drive State
○	Armature current exceeded 280% full load. The drive has tripped, refer to Chapter 7: "Trips and Fault Finding" - Trip Messages (OVER I TRIP)
●	Armature current normal
COAST STOP	Drive State
○	Hardware stop by main contactor drop-out
●	Stop not active (+24V is applied to terminal B8)

In normal run condition, all LEDs on the MMI are illuminated. Any LED which is off indicates a condition which prevents operation of the controller.

**HINT:** The general rule for LED indications is "ON IS GOOD, OFF IS BAD"

# The Menu System

The menu system is divided into a 'tree' structure with 9 "MENU LEVEL" main menus.

Consider these main menus to be at Menu Level 1 (refer to the The Menu System Map, page 6-6). Parameters in Menu Level 1 are the most frequently used, as you descend the menu levels the parameters are less frequently used.

The Keypad has selectable "viewing levels" which can restrict the view of the Remote menu system, refer to "Selecting a Menu Viewing Level", page 6-14.

Below is a simple description of the main menus:

- **DIAGNOSTICS:** a view of important diagnostic parameters.
- **SETUP PARAMETERS:** contains all the function block parameters for setting-up the Drive.
- **PASSWORD:** contains all the Password parameters required for security.
- **ALARM STATUS:** a view of the alarm diagnostic parameters contained in the FUNCTION BLOCKS menu.
- **MENUS:** allows full or reduced menu displays on the Keypad, and selects the display language.
- **SERIAL LINKS:** contains all the parameters for external communications set-up and operation.
- **SYSTEM:** contains all the parameters for I/O configuration.
- **PARAMETER SAVE:** save the application/parameters.
- **CONFIGURE DRIVE:** a view of the important parameters used when setting-up the drive.
- **FUNCTION BLOCKS:** a view of all available function blocks, as seen in the Configuration Tool. (Only visible in ADVANCED menu view).

## The Menu System

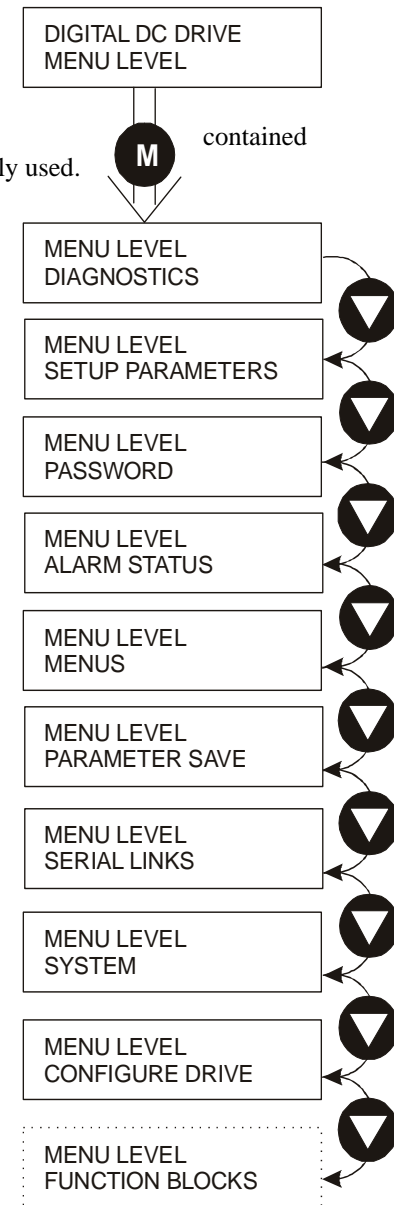


Figure 6-2 The Menu System showing Main Menus and Key Presses

## Navigating the Menu System

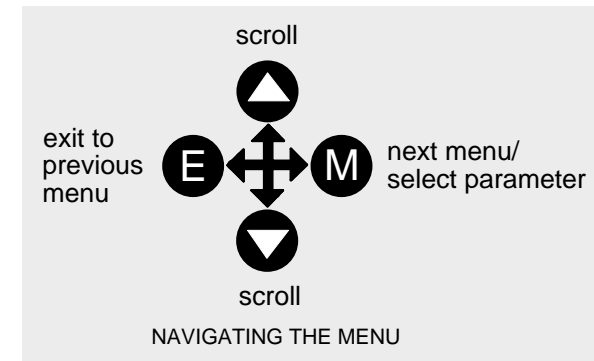
The Menu System can be thought of as a map which is navigated using the four keys shown opposite.

- Keys **E** and **M** navigate through the menu levels.
- The up (▲) and down (▼) keys scroll through the Menu and Parameter lists.

Menus can contain other menus at a lower level in the tree structure, parameters, or a mixture of both.

The keys are used as above to select a parameter (a parameter has a selection (i.e. ON/OFF) or a value displayed on the bottom line).

**HINT:** Remember that because the Menu and Parameter lists are looped, the ▲ key can quickly move you to the last Menu or Parameter in the loop. The keys will repeat if you hold them down. This is an easy way to step through and view a menu's contents.



## Changing a Parameter Value

With the Parameter you want on view, three of the keys now perform different functions:

- Change a selection (i.e. ON/OFF) using the up (▲) and down (▼) keys.
- Change a value as follows:

*The up (▲) and down (▼) keys increment/decrement the value at a rate determined by the right hand character of the value, indicated by the appearance of a cursor.*

- ◆ If the cursor is positioned as 100.0, then the value will change by tenths of a unit
- ◆ If the cursor is positioned as 100.0, then the value will change in whole units, etc.

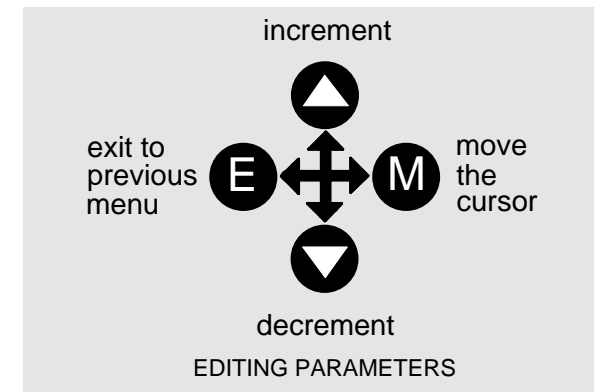
*The up (▲) and down (▼) keys will repeat if you hold them down and, at a preset point, the cursor will progressively move one character to the left and increment/decrement the value at an increased rate.*

*Alternatively, you can move the cursor manually by pressing the **M** key. Repeated pressing moves the cursor right to left along the value.*

*The cursor times-out after approximately half a second, so use the **M** key and up (▲) and down (▼) keys promptly once the cursor is in position.*

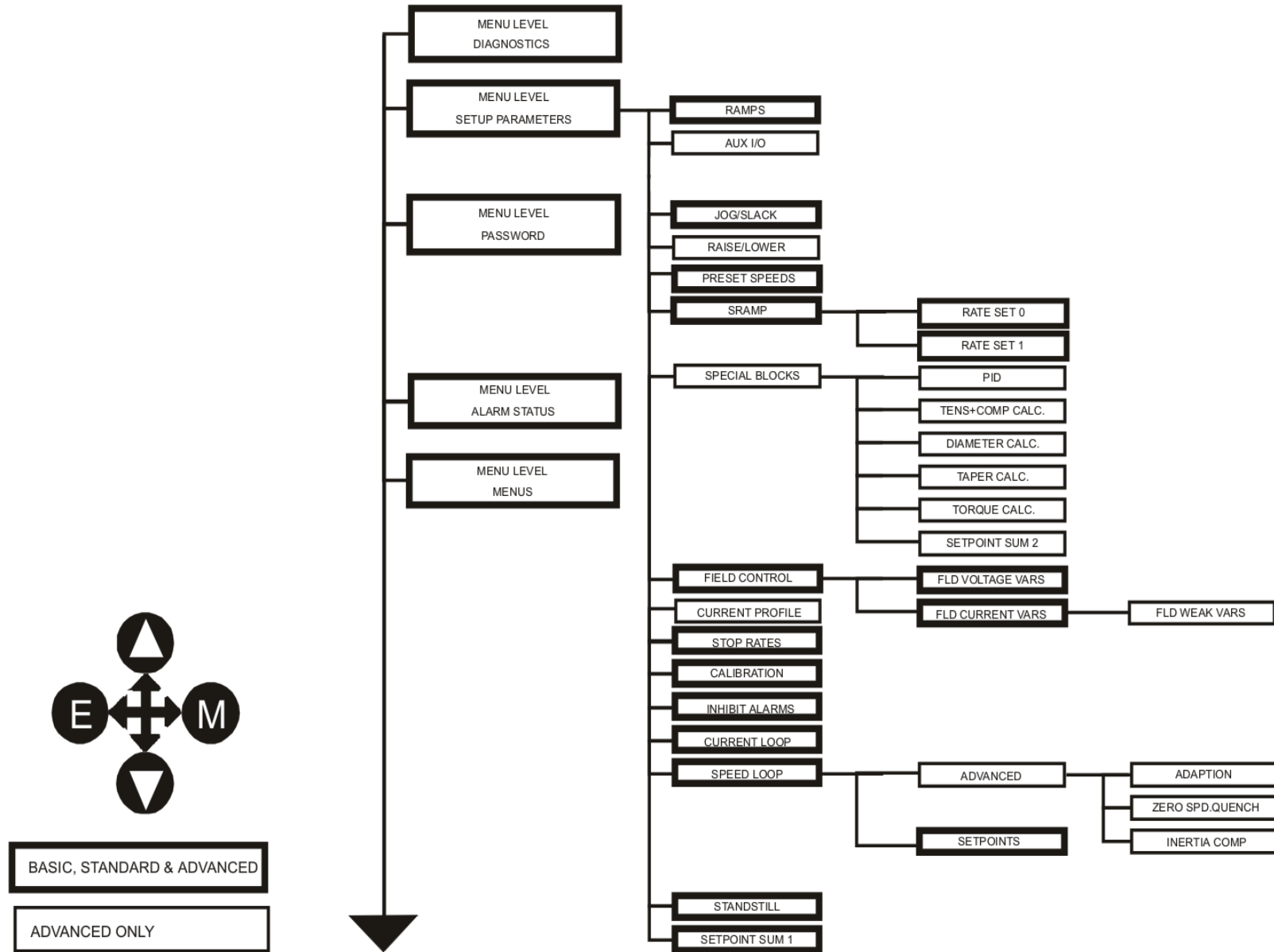
### NOTE

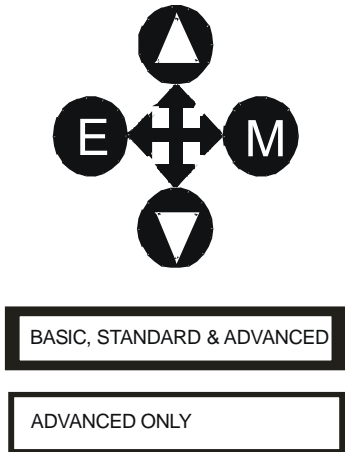
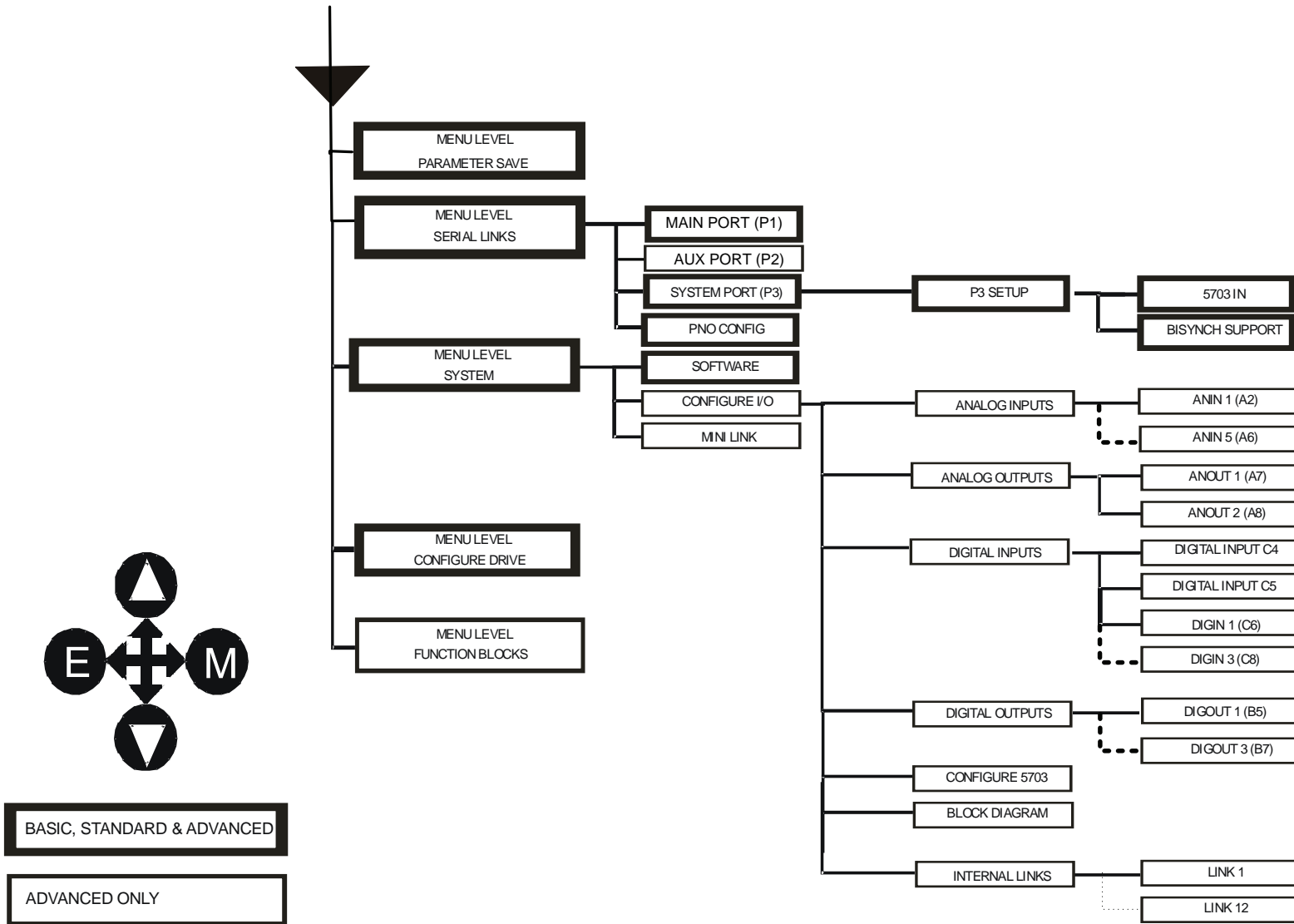
**A cursor appears under all numerical values except for parameters in the Diagnostics and Alarm Status menus whose values provide information only.**



A Parameter showing a cursor under the value

# The Menu System Map







# The Man-Machine Interface (MMI)

## MMI Menu Map

1

<b>DIAGNOSTICS</b>
SPEED DEMAND
SPEED FEEDBACK
SPEED ERROR
CURRENT DEMAND
CURRENT FEEDBACK
POS. I CLAMP
NEG. I CLAMP
ACTUAL POS I LIM
ACTUAL NEG I LIM
INVERSE TIME O/P
AT CURRENT LIMIT
AT ZERO SPEED
AT ZERO SETPOINT
AT STANDSTILL
STALL TRIP
PROGRAM STOP
DRIVE START
DRIVE ENABLE
OPERATING MODE
FIELD ENABLED
FIELD DEMAND
FIELD I FBK.
FLD.FIRING ANGLE
ANIN 1 (A2)
ANIN 2 (A3)
ANIN 3 (A4)
ANIN 4 (A5)
ANIN 5 (A6)

## DIAGNOSTICS

The DIAGNOSTICS Menu table describes all the parameters in the MMI's DIAGNOSTICS menu. These parameters are "read-only" and are very useful for tracing configuration problems. The list is shown in MMI order, and the parameter names are as displayed by the Keypad and the DSE Configuration Tool.

### DIAGNOSTICS (MMI only)

Parameter	Tag	Range	SETUP PARAMETERS Function Blocks
<b>SPEED DEMAND</b>	<b>89</b>	—.xx %	
Speed loop total setpoint after the ramp-to-zero block.			<i>Refer to SPEED LOOP</i>
<b>SPEED FEEDBACK</b>	<b>207</b>	—.xx %	
Speed loop feedback.			<i>Refer to FEEDBACKS</i>
<b>SPEED ERROR</b>	<b>297</b>	—.xx %	
Speed loop error.			<i>Refer to SPEED LOOP</i>
<b>CURRENT DEMAND</b>	<b>299</b>	—.xx %	
Current loop demand (speed error PI output or external current demand clamped by all the current limits).			<i>Refer to CURRENT LOOP</i>
<b>CURRENT FEEDBACK</b>	<b>298</b>	—.xx %	
Scaled and filtered current feedback.			<i>Refer to FEEDBACKS</i>
<b>POS. I CLAMP</b>	<b>87</b>	—x % (h)	
Positive current clamp.			<i>Refer to CURRENT LOOP</i>
<b>NEG. I CLAMP</b>	<b>88</b>	—x % (h)	
Negative current clamp.			<i>Refer to CURRENT LOOP</i>

MMI Menu Map cont.

- 1 **DIAGNOSTICS**
- ANOUT 1 (A7)
- ANOUT 2 (A8)
- START (C3)
- DIGITAL INPUT C4
- DIGITAL INPUT C5
- DIGIN 1 (C6)
- DIGIN 2 (C7)
- DIGIN 3 (C8)
- DIGOUT 1 (B5)
- DIGOUT 2 (B6)
- DIGOUT 3 (B7)
- RAISE/LOWER O/P
- PID OUTPUT
- PID CLAMPED
- PID ERROR
- SPT SUM OUTPUT
- RAMP OUTPUT
- SPEED SETPOINT
- TERMINAL VOLTS
- BACK EMF
- TACH INPUT
- ENCODER
- SYSTEM RESET

DIAGNOSTICS (MMI only)			
Parameter	Tag	Range	SETUP PARAMETERS Function Blocks
<b>ACTUAL POS I LIM</b> Overall positive current limit value.	<b>67</b>	—x % (h)	<i>Refer to CURRENT LOOP</i>
<b>ACTUAL NEG I LIM</b> Overall negative current limit value.	<b>61</b>	—x % (h)	<i>Refer to CURRENT LOOP</i>
<b>INVERSE TIME O/P</b> Inverse time clamp output level.	<b>203</b>	—xx %	<i>Refer to INVERSE TIME</i>
<b>AT CURRENT LIMIT</b> Current demand is being restrained by the overall current clamp.	<b>42</b>	<b>FALSE / TRUE</b>	<i>Refer to CURRENT LOOP</i>
<b>AT ZERO SPEED</b> At zero speed feedback.	<b>77</b>	<b>FALSE / TRUE</b>	<i>Refer to STANDSTILL</i>
<b>AT ZERO SETPOINT</b> At zero speed demand.	<b>78</b>	<b>FALSE / TRUE</b>	<i>Refer to STANDSTILL</i>
<b>AT STANDSTILL</b> AT ZERO SPEED and AT ZERO SETPOINT.	<b>79</b>	<b>FALSE / TRUE</b>	<i>Refer to STANDSTILL</i>
<b>STALL TRIP</b> Armature current is above STALL THRESHOLD, and AT ZERO SPEED is TRUE but <u>not</u> AT ZERO SETPOINT.	<b>112</b>	<b>FALSE / TRUE</b>	<i>Refer to ALARMS</i>
<b>RAMPING</b> The SETPOINT ramp function block is limiting the rate of change of Speed Setpoint.	<b>113</b>	<b>FALSE / TRUE</b>	<i>Refer to RAMPS</i>
<b>PROGRAM STOP</b> State of program stop (Terminal B8). When B8 is at 24V, then PROGRAM STOP is FALSE.	<b>80</b>	<b>FALSE / TRUE</b>	<i>Refer to SELECT</i>
<b>DRIVE START</b> Controller start/run command.	<b>82</b>	<b>ON / OFF</b>	<i>Refer to SELECT</i>
<b>DRIVE ENABLE</b> Drive speed and current loop are enabled/quenched.	<b>84</b>	<b>ENABLED / DISABLED</b>	<i>Refer to SELECT</i>

## DIAGNOSTICS (MMI only)

Parameter	Tag	Range	SETUP PARAMETERS Function Blocks
<b>OPERATING MODE</b>	<b>212</b>	<b>0 to 7</b>	
Indicates whether the drive is in RUN, JOG 1....STOP etc.			
0 : STOP			
1 : STOP			
2 : JOG SP. 1			
3 : JOG SP. 2			
4 : RUN			
5 : TAKE UP SP. 1			
6 : TAKE UP SP. 2			
7 : CRAWL			
			<i>Refer to JOG/SLACK</i>
<b>FIELD ENABLED</b>	<b>169</b>	<b>ENABLED / DISABLED</b>	
Drive field loop is enabled/quenched.			
			<i>Refer to FIELD CONTROL</i>
<b>FIELD DEMAND</b>	<b>183</b>	<b>—.xx %</b>	
The meaning of field demand depends upon which mode of field control is in force; in current control FIELD DEMAND is the current setpoint to the field loop, in voltage mode FIELD DEMAND is the voltage ratio to the field controller.			
			<i>Refer to FIELD CONTROL</i>
<b>FIELD I FBK.</b>	<b>300</b>	<b>—.xx %</b>	
Scaled and filtered field current feedback.			
			<i>Refer to FIELD CONTROL</i>
<b>FLD.FIRING ANGLE</b>	<b>184</b>	<b>—.xx DEG</b>	
Field firing angle in degrees: 155 degrees is the value for back stop (min field) and 5 degrees is the value for front stop (max field).			
			<i>Refer to FIELD CONTROL</i>
<b>ANIN 1 (A2)</b>	<b>50</b>	<b>—.xx VOLTS</b>	
Speed setpoint no. 1.			
			<i>Refer to ANALOG INPUTS</i>
<b>ANIN 2 (A3)</b>	<b>51</b>	<b>—.xx VOLTS</b>	
Hardwired. Speed setpoint no. 2 or current demand if C8 = ON.			
			<i>Refer to ANALOG INPUTS</i>
<b>ANIN 3 (A4)</b>	<b>52</b>	<b>—.xx VOLTS</b>	
Speed setpoint no. 3 (ramped).			
			<i>Refer to ANALOG INPUTS</i>
<b>ANIN 4 (A5)</b>	<b>53</b>	<b>—.xx VOLTS</b>	
Speed setpoint no. 4 or negative current clamp if C6 = ON.			
			<i>Refer to ANALOG INPUTS</i>
<b>ANIN 5 (A6)</b>	<b>54</b>	<b>—.xx VOLTS</b>	
Main current limit or positive current clamp if C6 = ON.			
			<i>Refer to ANALOG INPUTS</i>

## DIAGNOSTICS (MMI only)

Parameter	Tag	Range	SETUP PARAMETERS Function Blocks
<b>ANOUT 1 (A7)</b> Scaled speed feedback.	<b>55</b>	—. <b>xx</b> VOLTS	<i>Refer to ANALOG OUTPUTS</i>
<b>ANOUT 2 (A8)</b> Total speed setpoint.	<b>56</b>	—. <b>xx</b> VOLTS	<i>Refer to ANALOG OUTPUTS</i>
<b>START (C3)</b> Start/Run terminal.	<b>68</b>	ON / OFF	<i>Refer to SEQUENCING</i>
<b>DIGITAL INPUT C4</b> Jog/Take-up Slack terminal.	<b>69</b>	ON / OFF	<i>Refer to DIGITAL INPUTS</i>
<b>DIGITAL INPUT C5</b> Electronic enable/disable (quench) terminal (ON = Enabled).	<b>70</b>	ON / OFF	<i>Refer to DIGITAL INPUTS</i>
<b>DIGIN 1 (C6)</b> Symmetrical current clamps/Asymmetrical (bipolar) current clamps (ON = Bipolar).	<b>71</b>	ON / OFF	<i>Refer to DIGITAL INPUTS</i>
<b>DIGIN 2 (C7)</b> Ramp hold input (ON = Hold).	<b>72</b>	ON / OFF	<i>Refer to DIGITAL INPUTS</i>
<b>DIGIN 3 (C8)</b> Current demand isolate; giving speed or current mode of operation. (ON = Current mode).	<b>73</b>	ON / OFF	<i>Refer to DIGITAL INPUTS</i>
<b>DIGOUT 1 (B5)</b> At zero speed.	<b>74</b>	ON / OFF	<i>Refer to DIGITAL OUTPUTS</i>
<b>DIGOUT 2 (B6)</b> Drive healthy. Health is also displayed on the front panel LED, always ON when the start is low.	<b>75</b>	ON / OFF	<i>Refer to DIGITAL OUTPUTS</i>
<b>DIGOUT 3 (B7)</b> Drive ready to run (all alarms healthy and mains synchronisation achieved).	<b>76</b>	ON / OFF	<i>Refer to DIGITAL OUTPUTS</i>
<b>RAISE/LOWER O/P</b> Value of the raise/lower ramp function.	<b>264</b>	—. <b>xx</b> %	<i>Refer to RAISE/LOWER</i>
<b>PID OUTPUT</b> Output of the PID function block.	<b>417</b>	—. <b>xx</b> %	<i>Refer to PID</i>
<b>PID CLAMPED</b> Indicates the PID output has reached either the positive or negative limit.	<b>416</b>	FALSE / TRUE	<i>Refer to PID</i>

## DIAGNOSTICS (MMI only)

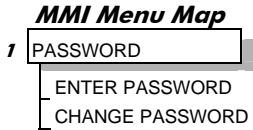
Parameter	Tag	Range	SETUP PARAMETERS Function Blocks
<b>PID ERROR</b> Displays the difference between the setpoint (INPUT 1) and the feedback signal (INPUT 2) in the PID function block.	<b>415</b>	—. <b>xx</b> %	<i>Refer to <b>PID</b></i>
<b>SPT SUM OUTPUT</b> Setpoint summation output.	<b>86</b>	—. <b>xx</b> %	<i>Refer to <b>SETPOINT SUM 1</b></i>
<b>RAMP OUTPUT</b> Setpoint ramp output.	<b>85</b>	—. <b>xx</b> %	<i>Refer to <b>RAMPS</b></i>
<b>SPEED SETPOINT</b> Speed loop total setpoint including the ramp output before the ramp-to-zero function.	<b>63</b>	—. <b>xx</b> %	<i>Refer to <b>SPEED LOOP</b></i>
<b>TERMINAL VOLTS</b> Scaled armature terminal volts.	<b>57</b>	—. <b>x</b> %	<i>Refer to <b>CALIBRATION</b></i>
<b>BACK EMF</b> Calculated motor back EMF including IR. compensation. (Armature Volts Feedback)	<b>60</b>	—. <b>x</b> %	<i>Refer to <b>CALIBRATION</b></i>
<b>TACH INPUT</b> Scaled analog tachogenerator feedback.	<b>308</b>	—. <b>x</b> %	<i>Refer to <b>FEEDBACKS</b></i>
<b>ENCODER</b> Encoder speed feedback in RPM.	<b>206</b>	—. <b>RPM</b>	<i>Refer to <b>ENCODER</b></i>

## SETUP PARAMETERS

Refer to Appendix D for parameter details. A parameter can be located by referring to the Parameter Specification Table: Tag Number Order.

The layout of this 590 menu is shown by The Menu System Map on page 6-6.

# PASSWORD



When in force, the password prevents unauthorised parameter modification by making all parameters “read-only”. If you attempt to modify a password protected parameter, it will cause “PASSWORD ??” to flash on the display.

The password protection is activated/deactivated using the ENTER PASSWORD and CHANGE PASSWORD parameters:

**Activated:** ENTER PASSWORD and CHANGE PASSWORD values are different

**Deactivated:** ENTER PASSWORD and CHANGE PASSWORD values are the same

## To Activate Password Protection

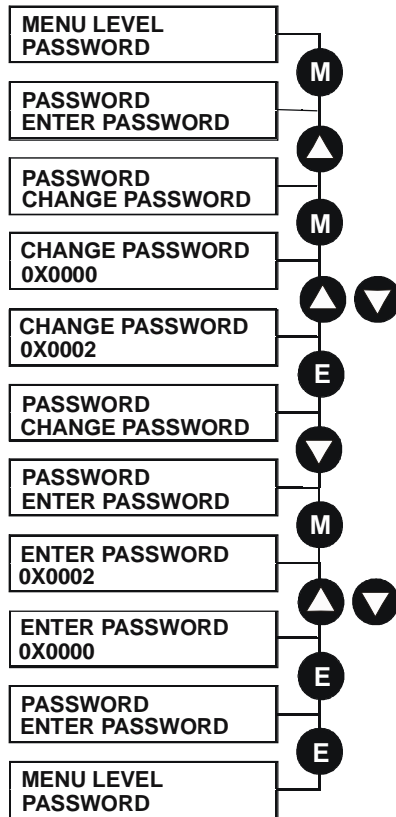
By default, the password feature is disabled, i.e. both the CHANGE PASSWORD and ENTER PASSWORD parameters have the same value: 0x0000.

*To activate a password:*

Enter any value other than the default value (0x0000) in the CHANGE PASSWORD parameter, for example 0x0002.

The ENTER PASSWORD parameter will now display this new password (e.g. 0x0002). Change the value in this parameter (to hide the password).

The password is now hidden, and CHANGE PASSWORD displays “\*\*\*\*”.



## To Deactivate Password Protection

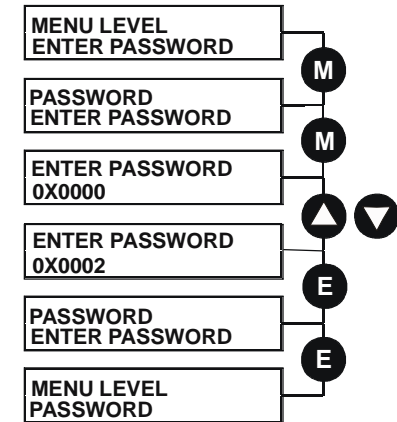
With password protection activated, you can no longer edit the CHANGE PASSWORD parameter until you deactivate the password protection (because the value is hidden by “\*\*\*\*”).

*To deactivate a password:*

Enter the current password (e.g. 0x0002) in the ENTER PASSWORD parameter.

CHANGE PASSWORD will now display the current password.

Because the ENTER PASSWORD parameter value is always reset to 0x0000 when powering-up the drive, 0x0000 is the default value for the CHANGE PASSWORD parameter, i.e. by default, the two parameter values are the same and so password protection is disabled.



# ALARM STATUS

Refer to Chapter 7: "Trips and Fault Finding" for a list of all the alarms.

# MENUS

## Selecting a Menu Viewing Level

For ease of operation the MMI has three `viewing levels`: BASIC, STANDARD and ADVANCED. The setting for the viewing level decides how much of the menu system will be displayed.

Refer to the The Menu System Map, page 6-6 to see how the viewing level changes the displayed menu.

To change the viewing level, go to the MENUS menu. The VIEW LEVEL parameter in this menu selects the viewing level.

- Select BASIC to see a reduced selection of parameters to operate the drive
- Select STANDARD to see the "standard" set of parameters
- Select ADVANCED to see the full menu system - useful when programming

## Selecting the Display Language

There is an option to select a different display language.

The choice of display language is selected by the LANGUAGE parameter in the MENUS menu (menu view must be set to ADVANCED).

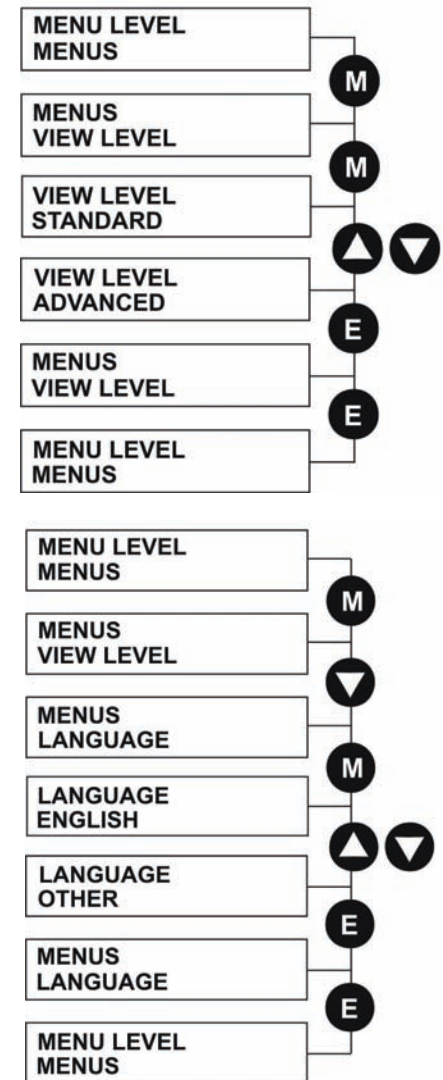
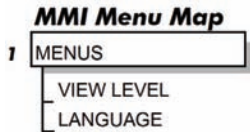
Remember to perform a PARAMETER SAVE if you need the new language to be saved on power-down.

ENGLISH is the default language and is permanently saved (in Read Only Memory).

A second language is loaded (typically French), however German, Italian and Spanish are available by contacting Parker SSD Drives. When a new language is downloaded it replaces the current second language.

# PARAMETER SAVE

Refer to "Saving Your Application", page 6-19.



## SERIAL LINKS

This menu contains 3 function blocks. These can be found in the SETUP PARAMETERS menu - refer to Appendix D: "Programming".

### SERIAL LINKS

- MAIN PORT (P1) refer to Appendix D:"Programming"
- SYSTEM PORT (P3) refer to Appendix D:"Programming"
- PNO CONFIG refer to Appendix D:"Programming"

## SYSTEM

This menu contains 2 parameters and 3 function blocks. The function blocks can be found in the SETUP PARAMETERS menu - refer to Appendix D: "Programming".

### SYSTEM

- SOFTWARE this parameter displays the software release of the firmware in the drive.
- CONFIGURE I/O refer to Appendix D: "Programming" – CONFIGURE I/O
- miniLINK refer to Appendix D:"Programming" - miniLINK



## MMI Menu Map

1	CONFIGURE DRIVE
	FLD. CTRL MODE
	FLD. VOLTS RATIO
	MAIN CURR. LIMIT
	AUTOTUNE
	SPEED FBK SELECT
	ENCODER LINES
	ENCODER RPM
	ENCODER SIGN
	SPD. INT. TIME
	SPD. PROP. GAIN

# CONFIGURE DRIVE

The CONFIGURE DRIVE menu contains many of the important parameters used during set-up when using the MMI.

**NOTE** The FUNCTION BLOCKS\MISCELLANEOUS\CONFIGURE DRIVE menu contains a different set of parameters, for set-up using the configuration tool.

Refer to Chapter 4: "Operating the Drive" - Setting-up the Drive to see the most important parameters being used.

## CONFIGURE DRIVE (MMI view)

Parameter	Tag	Range	SETUP PARAMETERS Function Blocks
<b>FLD. CTRL MODE</b> Selects between open-loop VOLTAGE CONTROL or closed-loop CURRENT CONTROL.	<b>209</b>	<b>See below</b>	<i>Refer to FIELD CONTROL</i>
<b>FLD. VOLTS RATIO</b> Sets the output dc field voltage as a ratio of the RMS FIELD supply voltage when FLD CTRL MODE is set to VOLTAGE CONTROL.	<b>210</b>	<b>0.0 to 100.0 % (h)</b>	<i>Refer to FIELD CONTROL</i>
<b>MAIN CURR. LIMIT</b> Independent symmetric current clamp. Sets symmetric clamps outside scaling from the CUR. LIMIT/SCALER parameter.	<b>421</b>	<b>0.00 to 200.00 %</b>	<i>Refer to CURRENT LOOP</i>
<b>AUTOTUNE</b> Turns the AUTOTUNE procedure on. Refer to Chapter 4: "Operating the Drive" - Performance Adjustment.	<b>18</b>	<b>OFF/ON</b>	<i>Refer to AUTOTUNE</i>

## CONFIGURE DRIVE (MMI view)

Parameter	Tag	Range	SETUP PARAMETERS Function Blocks
<b>SPEED FBK SELECT</b>	<b>47</b>	<b>See below</b>	
<p>Determines the source of the speed feedback signal. The default, ARM VOLTS FBK, uses internal circuitry to derive the speed feedback. The other selections require the appropriate external device to provide the feedback signal.</p> <p>0 : ARM VOLTS FBK            1 : ANALOG TACH            2 : ENCODER            3 : ENCODER/ANALOG - for Parker SSD Drives use            4 : ENCODER 2</p>			<i>Refer to SPEED LOOP</i>
<b>ENCODER LINES</b>	<b>24</b>	<b>10 to 5000</b>	
<p>The number of lines must be set to match the type of encoder being used. Incorrect setting of this parameter will result in an erroneous speed measurement. The 5901 Microtach has 1000 lines per revolution as standard. Proprietary encoders of other specifications can be normalised by setting this parameter as appropriate.</p>			<i>Refer to ENCODER</i>
<b>ENCODER RPM</b>	<b>22</b>	<b>0 to 6000</b>	
<p>Motor top speed setting (100%) when using encoder feedback.</p>			<i>Refer to ENCODER</i>
<b>ENCODER SIGN</b>	<b>49</b>	<b>NEGATIVE / POSITIVE</b>	
<p>Since the encoder feedback cannot be reversed electrically, the signal polarity can be reversed by the control software.</p> <p><i>It is necessary to set up this parameter when in CLOSED-LOOP VEC mode, as the encoder direction must be correct for this mode to operate.</i></p>			<i>Refer to ENCODER</i>
<b>SPD.INT.TIME</b>	<b>13</b>	<b>0.001 to 30.000 s</b>	
<p>Speed loop PI integral gain adjustment.</p>			<i>Refer to SPEED LOOP</i>
<b>SPD.PROP.GAIN</b>	<b>14</b>	<b>0.00 to 200.00</b>	
<p>Speed loop PI proportional gain adjustment.</p>			<i>Refer to SPEED LOOP</i>

## FUNCTION BLOCKS

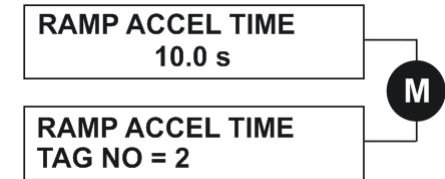
(Only visible in ADVANCED menu view). Refer to Appendix D where all the function blocks under this menu are listed in alphabetical order.

This menu repeats all the parameters provided by other menus. The structure of this programmers' menu is the same as the CELite Configuration Tool.

# Menu Shortcuts and Special Key Combinations

## Quick Tag Information

Hold down the **M** key for approximately ½ second in any Menu System parameter to display the Tag number for that parameter.



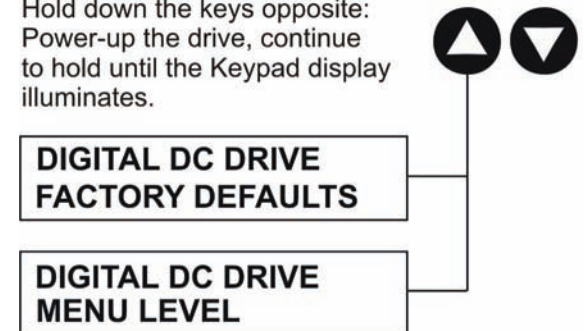
## Resetting to Factory Defaults (2-button reset)

Power-up the drive holding down the '▲' and '▼' keys (or all four keys).

The drive is now safely configured with the default settings detailed in this manual.

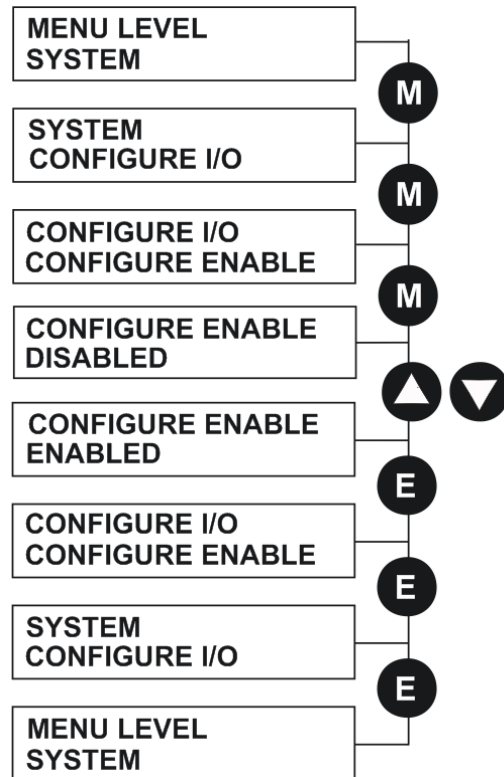
The default configuration is not automatically saved to non-volatile memory, so you must perform a PARAMETER SAVE (refer to "Saving Your Application", page 6-19).

Hold down the keys opposite:  
Power-up the drive, continue to hold until the Keypad display illuminates.



# How to Save, Restore and Copy your Settings

## Saving Your Application

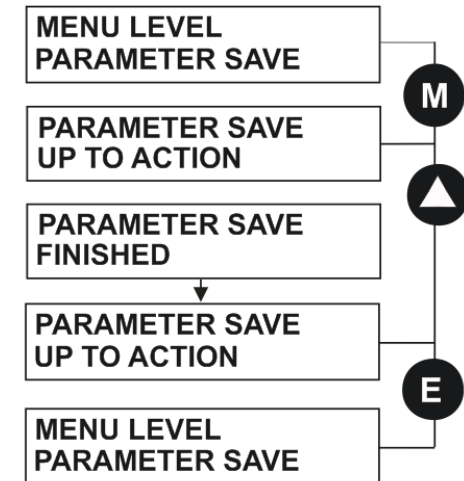


### **Operating Mode (CONFIGURE ENABLE = DISABLED)**

In Operating mode you can change parameter values. The Drive can be running or stopped. Note that some parameters can only be changed when the Drive is stopped. It is not possible to modify the internal links when the Drive is in Operating mode.

### **Configuration Mode (CONFIGURE ENABLE = ENABLED)**

In the configuration mode you can modify connections between the function blocks in the drive. You can also change parameter values, as above. The Drive cannot run in this mode. Output values are not updated.



The PARAMETER SAVE menu, available in both the full and reduced view levels, is used to save any changes you make to the MMI settings.

Pressing the ▲ (UP) key, as instructed, saves all parameter values (with one exception, see the note below) in non-volatile memory.

**NOTE** The local setpoint parameter value is not saved on power-down.

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## Restoring Saved Settings

If you are unsure about any changes you have made and you have not yet performed a PARAMETER SAVE, simply switch the Drive off, and power-up again. The “last saved” parameter settings will be restored.

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## Copying an Application

Copying an application requires a host computer connection to the Drive’s System Port (P3). Information can then be downloaded to the computer (and uploaded to the Drive).

Refer to Appendix A: “Serial Communications” for further information.

# Chapter

# 7

## Trips and Fault Finding

The drive may trip in order to protect itself. To restart the drive, you will need to clear the trip(s). This chapter provides a list of trips, as displayed by the keypad

<b>Trips and Fault Finding .....</b>	<b>7-1</b>	<i>Alarm Messages</i>	7-3
<b>Trips</b>	7-1	Hexadecimal Representation of Trips	7-4
What Happens when a Trip Occurs	7-1	Using the MMI to Manage Trips	7-5
Resetting a Trip Condition	7-1	Test Points	7-11
<b>Fault Finding</b>	<b>7-2</b>		



# Trips and Fault Finding

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## Trips

### What Happens when a Trip Occurs

When a trip occurs, the Drive's power stage is immediately disabled causing the motor and load to coast to a stop. The trip is latched until action is taken to reset it. This ensures that trips due to transient conditions are captured and the Drive is disabled, even when the original cause of the trip is no longer present.

### Drive Indications

If a trip condition is detected the unit displays and performs the following actions.

1. The HEALTH LED goes out indicating a Trip condition has occurred. (Investigate, find and remove the cause of the trip.)
2. Terminal B6 (Healthy) goes low (0V).
3. The MMI displays the activated alarm.
4. The alarm message(s) can be acknowledged by pressing the **E** key, however, the unit will not restart at this point.

### Resetting a Trip Condition

All trips must be reset before the Drive can be re-enabled. A trip can only be reset once the trip condition is no longer active, i.e. a trip due to a heatsink over-temperature will not reset until the temperature is below the trip level.

**NOTE** **More than one trip can be active at any time. For example, it is possible for both the HEATSINK TRIP and the OVERVOLTS (VA) trips to be active. Alternatively it is possible for the Drive to trip due to a FIELD OVER I error and then for the HEATSINK TRIP trip to become active after the Drive has stopped (this may occur due to the thermal time constant of the heatsink).**

You can reset the trip(s) in one of two ways:

1. Power-up, or remove and re-apply the auxiliary power supply.
2. Stop and start the drive, i.e. remove and re-apply the Start/Run signal (terminal C3 or C4, or the STOP and RUN keys on the MMI).

Success is indicated by the HEALTH LED (on the unit ) illuminating. The MMI will return to its original display.



## Fault Finding

Problem	Possible Cause	Remedy
Drive will not power-up	Fuse blown	Check supply details, replace with correct fuse. Check Product Code against Model No.
	Faulty cabling	Check all connections are correct and secure. Check cable continuity
Drive fuse keeps blowing	Faulty cabling or connections wrong	Check for problem and rectify before replacing with correct fuse
	Faulty Drive	Contact Parker SSD Drives
Cannot obtain HEALTH state	Incorrect or no supply available	Check supply details
Motor will not run at switch on	Motor jammed	Stop the Drive and clear the jam
Motor runs and stops	Motor becomes jammed	Stop the Drive and clear the jam
Motor runs at full speed only	Reversed tachogenerator or open circuit tachogenerator	Check tachogenerator connections
	Open circuit speed reference potentiometer	Check terminal

**Table 7-1 Fault Finding**

# Alarm Messages

When a trip occurs an alarm message is displayed on the MMI, and information about the trip is stored in the ALARM STATUS menu.

The alarm message and the LAST ALARM parameter are displayed in the selected language when viewed on the MMI.

The HEALTH STORE, HEALTH WORD and ALARM HISTORY parameters display information as hexadecimal values, or the sum of the hexadecimal values when more than one alarm is active. Thus the unique value can represent one or more alarms.

**NOTE** Hexadecimal refers to the common practice of counting to the base of 16 in computing rather than the base of 10. The sixteen `numbers' used being 0 to 9, A to F. Thus 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.

## LAST ALARM

(Tag 528). This display shows the last alarm message to have been displayed. To reset the parameter simply press the ▼ (DOWN) key to clear the alarm. Alternatively, you can switch the auxiliary supply off and on, causing NO ACTIVE ALARMS to be displayed.

**NOTE** The LAST ALARM value is presented in hexadecimal format when viewed in CELite or when used in the Block Diagram.

## HEALTH WORD

(Tag 115). This parameter is used to continuously monitor the status of the Drive. As alarms are added or removed, the display will immediately update to show the hexadecimal sum of these alarms.

The value reverts to 0x0000 when the Start (C3) input is raised (+24V), and when no trip condition is present.

## HEALTH STORE

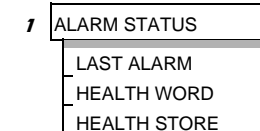
(Tag 116). This displays the hexadecimal value of the first (or only) alarm to occur causing the trip condition.

The display reverts to 0x0000 when the Start (C3) input is raised (+24V).

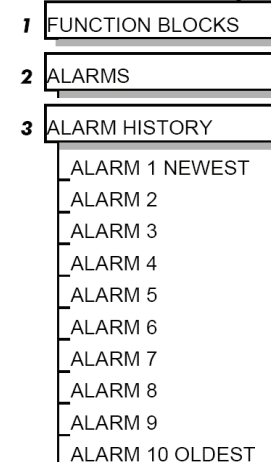
## ALARM HISTORY

The most recent 10 alarm events are stored in the ALARM HISTORY function block, with the oldest in parameter ALARM 10 (OLDEST), and most recent in ALARM 1 (NEWEST). As with the HEALTH STORE and HEALTH WORD parameters, the alarm history is stored as four character hexadecimal numbers.

### MMI Menu Map



### MMI Menu Map



## Hexadecimal Representation of Trips

The LAST ALARM, HEALTH WORD, HEALTH STORE and ALARM HISTORY parameters use a four digit hexadecimal number to identify individual trips. Each trip has a unique corresponding number as shown below.

LAST ALARM, HEALTH WORD and HEALTH STORE				
Trip		Trip Code		
		First Digit	Digit	Last Digit
	NO ACTIVE ALARMS			
0	OVERSPEED			1
1	MISSING PULSE			2
2	FIELD OVER I			4
3	HEATSINK TRIP			8
4	THERMISTOR		1	
5	OVER VOLTS (VA)		2	
6	SPD FEEDBACK		4	
7	ENCODER FAILED		8	
8	FIELD FAILED		1	
9	3 PHASE FAILED		2	
10	PHASE LOCK		4	
11	5703 RCV ERROR		8	
12	STALL TRIP	1		
13	OVER I TRIP	2		
14	OTHER •	4		
15	ACCTS FAILED	8		

• For the LAST ALARM parameter, replace OTHER with trip codes opposite.

Trip Codes : LAST ALARM only			
14	AUTOTUNE ERROR	F	0 0 1
14	AUTOTUNE ABORTED	F	0 0 2
14	SEQ PRE READY	F	0 0 3
14	REMOTE TRIP	F	0 0 6
14	SEQUENCING	F	0 0 9
14	COMMS TIMEOUT	F	0 1 0
14	CALIBRATION TRIP	F	3 0 0
14	AUX SUPPLY	F	F 0 3

When more than one trip is to be represented at the same time then the trip codes are simply added together to form the value displayed. Within each digit, values between 10 and 15 are displayed as letters A to F

For example, if the HEALTH WORD parameter is **01A8** then this represents a “1” in digit 3, an “8” and a “2” in digit 2, (8+2 = 10, displayed as A) and an 8 in digit 1. This in turn represents the active trips FIELD FAILED, ENCODER FAILED, OVER VOLTS (VA) and HEATSINK TRIP (an unlikely situation).

Decimal number	Display
10	A
11	B
12	C
13	D
14	E
15	F

## Using the MMI to Manage Trips

### Trip Messages

Most of the alarms have a delay timer so that the Drive only trips if the condition persists for the whole of the delay period.

If the Drive trips, then the display immediately shows a message indicating the reason for the trip. The possible trip messages are given in the table below.

Trip Message and Meaning	Possible Reason for Trip
<p><b>OVERSPEED</b></p> <p>Motor overspeed - the speed feedback signal has exceeded 125% of rated speed.</p>	<p>Badly adjusted speed loop (alarm only operates with encoder or armature volts feedback selected)</p> <p>Alarm time delay : 50 milliseconds</p>
<p><b>MISSING PULSE</b></p> <p>A missing pulse from the 6-pulse armature current waveform. This trip is only enabled when the motor loading exceeds 1.5 times the DISCONTINUOUS parameter value.</p> <p><b>Note that the MISSING PULSE trip is not intended or able to protect the drive if a thyristor fails to function during regenerative operation. This can result in damage to the drive.</b></p> <p>We recommend fusing the armature circuit if regenerative operation is intended. The MISSING PULSE trip is intended to detect firing circuit connector problems during motoring operation of the drive.</p>	<p>Firing plug failure</p> <p>Connection failure</p> <p>Alarm time delay : 60 seconds</p>

Trip Message and Meaning	Possible Reason for Trip
<p>FIELD OVER I The motor field current has exceeded 120% of the calibrated value</p>	<p>External field has incorrect supply phases applied (Alarm only operates with field current control mode selected) Alarm time delay : 10 seconds</p>
<p>HEATSINK TRIP The Drive heatsink temperature is too high</p>	<p>The ambient air temperature is too high Poor ventilation or spacing between Drives Fan failure, check fuse on power board, wrong rotation (models above 70A bridge rating) Blocked ventilation slots Clogged air filters Excessive armature current - nominal armature current on motor nameplate should be checked against the current calibration for the Drive. <b>Note: The stack must be allowed to cool in order to re-start the Drive.</b> Alarm time delay : 0.5 seconds</p>
<p>THERMISTOR The motor temperature is too high</p>	<p>Inadequate ventilation Blower failure -check for direction, clogged air filters (models above 70A bridge rating) Excessive armature current - check nominal armature current on nameplate against current calibration) <b>Note: The motor must be allowed to cool in order to re-start the Drive.</b> Alarm time delay : 5 seconds</p>
<p>OVER VOLTS (VA) Motor armature voltage has exceeded 120% of rated volts</p>	<p>Loose armature connection Badly adjusted field voltage setting Badly adjusted field current loop Badly adjusted field-weakening bemb loop Badly adjusted speed loop Alarm time delay : 1 second</p>

Trip Message and Meaning	Possible Reason for Trip
<p><b>SPEED FEEDBACK</b></p> <p>The difference between speed feedback and armature voltage feedback is greater than the SPDFBK ALM LEVEL parameter value</p> <p>The speed feedback and armature voltage feedback are of opposite polarity and both greater than 10%</p> <p>If FLD WEAK ENABLE parameter is enabled, speed feedback is less than 10% when in the field weakening region</p>	<p>Analog tacho feedback polarity incorrect (terminals G3 and G4)</p> <p>The ENCODER SIGN parameter's polarity is incorrect</p> <p>Disconnection of wiring, including fibre optics</p> <p>Armature voltage calibration has not been suitably reduced when running at reduced field currents</p> <p>Tachogenerator failure</p> <p>Tachogenerator coupling failure</p> <p>Alarm time delay : 0.125 seconds</p>
<p><b>ENCODER FAILED</b></p> <p>No speed feedback signal</p>	<p>The SPEED FBK SELECT parameter is set to ENCODER but an optional Encoder board is not fitted</p> <p>Where applicable, check fibre optic cable for damage, bend radius, operating length - refer to the Microtach handbook.</p> <p>Check cable and connections on wire-ended encoder</p>
<p><b>FIELD FAIL</b></p> <p>Field current is less than 6% of rated current when in Current Control mode</p> <p>Field current is less than 50mA when in Voltage Control mode (with field current scaling switches set to 0.2A)</p>	<p>Open circuit motor field - check connection and measure field resistance</p> <p>Faulty operation of field controller</p> <p>Where an ac supply feeds the onboard field regulator, check connections FL1 &amp; FL2 for line-to-line voltage (rather than line-to-neutral) - L1 into FL1, L2 into FL2. Note that the 3-phase supply must be present for mains synchronisation purposes. For loads where no field supply is required, e.g. a permanent magnet motor, set the FIELD ENABLE parameter to DISABLED to suspend this alarm.</p> <p>Alarm time delay : 1 second</p>
<p><b>3-PHASE FAILED</b></p> <p>3-phase supply failure</p>	<p>Total failure of supply, or missing phase of 3-phase supply (detected under most circumstances) - check supply to the controller, check high-speed thyristor stack protection fuses, check power chassis coding fuses.</p> <p>Check the mains voltage of the Drive (refer to the Product Code). This alarm may not operate properly with controller if the voltage is incorrect, i.e. wrong unit or controller.</p>
<p><b>PHASE LOCK</b></p> <p>Supply frequency is outside the frequency band limits 45 - 65Hz</p>	<p>Check supply frequency</p> <p>Synchronisation errors caused by distorted supply</p>

Trip Message and Meaning	Possible Reason for Trip
5703 RCV ERROR Invalid data received via P3 port from another Drive	(Alarm only operates when MODE parameter is set to 5703 SLAVE)
STALL TRIP With motor stationary (AT ZERO SPEED parameter shows TRUE), current has exceeded the STALL THRESHOLD parameter value for longer than the STALL TRIP DELAY parameter value	(Alarm only operates when the STALL TRIP parameter is enabled).
OVER I TRIP Current feedback value has exceeded 280% of rated current	(300% loading not exceeding 15ms or 325% not exceeding 6.6ms is acceptable) Motor armature windings failure - check insulation resistance. Badly tuned current loop Faulty Drive - refer to Parker SSD Drives
ACCTS FAILED AC current transformer plug connection to Drive power board missing	Check armature current transformer plug for correct installation. <b>Note: The trip prevents the contactor closing and the current loop activating without armature current feedback - important in the case of external stack controllers where the thyristor stack is remote from the control board.</b>
AUTOTUNE ERROR Error has been encountered during the Autotune process to include: Speed feedback has exceeded 20% of rated speed Field current feedback has exceeded 6% of rated field current	The motor shaft was rotating, or was caused to rotate. The field current was seen to exceed 6%, when a field-off Autotune had been selected, or the field current stopped during a field-on Autotune. The drive to armature wiring was open-circuit. The discontinuous current boundary was found to exceed 200% of the motor armature current rating (refer to Chapter 5: "Control Loops" - Manual Tuning) Large imbalance in the three-phase voltages of the supply (refer to Chapter 5: "Control Loops" - Manual Tuning) A hardware fault relating to current feedback was detected on the control board.
AUTOTUNE ABORT The Autotune sequence has been aborted.	Coast Stop, Program Stop, Enable or Start Run terminal(s) disabled during Autotune sequence The AUTOTUNE parameter reset during the Autotune sequence Autotune sequence has timed-out (approximately 2 minutes).
SEQ PRE READY Coding not present.	Replace power board or chassis.
REMOTE TRIP	REM. SEQUENCE parameter Remote Trip flag set to zero.

Trip Message and Meaning	Possible Reason for Trip
SEQUENCING Internal sequencing error	Contact Parker SSD Drives
COMMS TIMEOUT Remote comms timeout	See COMMS TIMEOUT parameter in the SEQUENCING function block
CONFIG ENABLED	The drive was requested to start whilst in Configuration mode
CALIBRATION FAIL	Signal calibration fault If powering the unit off and on does not remove the problem, a hardware failure is suspected. Refer to Parker SSD Drives.
AUX SUPPLY CRITICAL ERROR xxxx::xxxxxxx	Check auxiliary supply and/or mains input  0412::xxxxxxx – Unrecognised block type in configuration. Update product firmware to latest version. 0701::xxxxxxx – Unrecognised control board hardware. Update product firmware to latest version. For all other critical error codes contact Parker SSD Drives.

**Table 7-2 Trip Messages**

## Self Test Alarms

Self Test Alarm and Meaning	Possible Reason for Alarm
(EEPROM) CHECKSUM FAIL Parameters not saved, or are corrupted.	(The alarm appears at power-up or at the end of "Upload" UDP Transfer) Corrupted UDP file loaded - press the <b>E</b> key and perform a PARAMETER SAVE. The Drive will be returned to its factory default values.
LANGUAGE CHECKSUM FAIL Incorrect language selected, or corrupted	(The alarm appears at power-up or at the end of "Upload" UDP Transfer) Corrupted UDP file loaded - press the <b>E</b> key and reload the correct language or de-select the second language.



## Setting Trip Conditions

The following parameters in the CALIBRATION and ALARMS menus are used to set trip conditions:

- CALIBRATION :: OVER SPEED LEVEL
- ALARMS :: SPDFBK ALM LEVEL
- ALARMS :: STALL THRESHOLD
- ALARMS :: STALL TRIP DELAY
- ALARMS :: REMOTE TRIP DELAY

## Viewing Trip Conditions

The following parameters in the ALARMS menu can be viewed to investigate trip conditions:

- LAST ALARM
- HEALTH WORD
- HEALTH STORE
- THERMISTOR STATE
- SPEED FBK STATE
- STALL TRIP
- REMOTE TRIP

There are ten parameters in the ALARMS HISTORY function block that store the most recent alarm events.

## Inhibiting Alarms

The following alarms can be inhibited in the ALARMS menu.

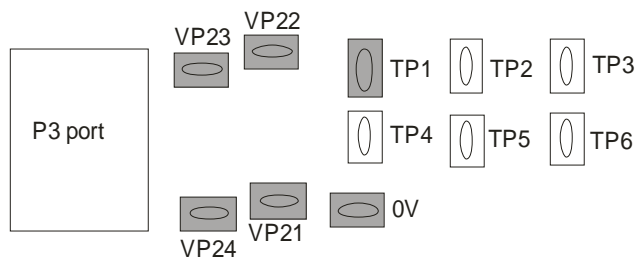
- SPEED FBK ALARM
- ENCODER ALARM
- FIELD FAIL
- 5703 RCV ERROR
- STALL TRIP
- TRIP RESET
- REM TRIP INHIBIT

The block diagram can be wired to reset a trip condition by using the TRIP RESET parameter in the ALARMS function block. A FALSE to TRUE transition of this parameter will cause the trip to reset.

**NOTE** The STALL TRIP parameter in the DIAGNOSTICS menu is set regardless of the state of STALL TRIP inhibit. The flag is set after the stall time-out expires. The relevant bit (bit 12) in the HEALTH WORD and HEALTH STORE parameters is only set when STALL TRIP is enabled.

## Test Points

The following test points are located on the control board and, used with a meter, will provide valuable information in the event of a fault. Refer to Parker SSD Drives for further information.



Test Point	Description
TP1	Armature current $\pm 2.2V \equiv \pm 200\%$ , (value of CURRENT FEEDBACK diagnostic, Tag No. 298)
TP2	Buffered analog tach $\pm 10V \equiv \pm 100\%$ , (value of SPEED FEEDBACK diagnostic, Tag No. 207)
TP3	Armature volts $5V = +100\%$ , $+2.5V = 0\%$ , $0V = -100\%$ (mean voltage, value of TERMINAL VOLTS diagnostic, Tag No. 57)
TP4	Field current $4V \equiv 100\%$ , (value of FIELD I FBK diagnostic, Tag No. 300)
TP5	<i>Not used</i>
TP6	Overcurrent trip $12V$ to $-15V$ transition on trip
0V	0V



# Chapter 8

## Routine Maintenance and Repair

This chapter contains preventive maintenance procedures, contact details for repairing the unit, and instructions for replacing fuses and fans.

<b>Maintenance</b> .....	<b>8-1</b>	<b>Saving Your Application Data</b>	<b>8-2</b>
Service Procedures	8-1	Returning the Unit to Parker SSD Drives	8-2
Preventive Maintenance	8-1	Disposal	8-3
<b>Repair</b> .....	<b>8-2</b>	Technical Support Checks	8-3



# Maintenance

Because of its solid state design, the 590 Digital drive has few items requiring service or maintenance. Service is typically a matter of replacing fuses, checking electrical contacts, and isolating problems in the overall system application.

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## 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.

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## Service Procedures

### Required Tools and Equipment

Tools needed for routine service operations include basic hand tools — screwdrivers, wrenches, etc.

### WARNING

**Only qualified service personnel should attempt to repair or replace parts in the 590.**

**Isolate the entire 590 drive from electrical power before attempting to work on it.**

## Preventive Maintenance

You should perform regular preventive maintenance every six months to ensure long life and continued usefulness of the 590. Keep the drive and its components clean, check auxiliary fans if fitted, and make sure connections and mounting bolts have not loosened from vibration.

The control and field wires can be checked by gently attempting pulling the wires out of the terminals. The terminals should hold the wires firmly in place.

All the remaining wires should be checked with a torque wrench. Refer to Appendix E: "Technical Specifications" - Termination Tightening Torque tables.

# Repair

There are no user-serviceable components.

**IMPORTANT** MAKE NO ATTEMPT TO REPAIR THE UNIT - RETURN IT TO PARKER SSD DRIVES.

## Saving Your Application Data

The Drive retains saved settings during power-down. You can download and upload this back into the repaired unit, if necessary. You may, depending upon your knowledge of the fault, attempt the back-up of your application data now, refer to Chapter 6: “The Keypad” - Copying an Application.

If the fault clearly lies within the MMI, then return the unit for repair.

## Returning the Unit to Parker SSD Drives

Before calling Parker SSD Drives Customer Service, make sure you have the following information available:

Information	Source
Model number and serial number	590 Digital drive rating label
Motor horsepower, armature current and voltage, field current and voltage, base and top speed ratings	Motor nameplate
Speed voltage feedback per 1000 RPM (analog device), or counts per revolution(digital device)	Speed feedback device nameplate
Applications information and operating environment	System drawings

Contact your nearest Parker SSD Drives Service Centre to arrange return of the item.

You will be given a *Returned Material Authorisation*. Use this as a reference on all paperwork you return with the faulty item.

Pack and despatch the item in the original packing materials; or at least an anti-static enclosure. Do not allow packaging chips to enter the unit.

## Warranty Information

Warranty information precedes the *Contents* at the front of this manual.

---

## Disposal

This product contains materials which are consignable waste under the Special Waste Regulations 1996 which complies with the EC Hazardous Waste Directive - Directive 91/689/EEC.

We recommend you dispose of the appropriate materials in accordance with the valid environmental control laws. The following table shows which materials can be recycled and which have to be disposed of in a special way.

Material	Recycle	Disposal
metal	yes	no
plastics material	yes	no
printed circuit board	no	yes

The printed circuit board should be disposed of in one of two ways:

1. High temperature incineration (minimum temperature 1200°C) by an incinerator authorised under parts A or B of the Environmental Protection Act
2. Disposal in an engineered land fill site that is licensed to take aluminium electrolytic capacitors. Do not dispose of in a land fill site set aside for domestic waste.

## Packaging

During transport our products are protected by suitable packaging. This is entirely environmentally compatible and should be taken for central disposal as secondary raw material.

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## Technical Support Checks

The results of the following checks will be very useful to Parker SSD Drives' Technical Support.

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### Caution

Please only attempt these checks if you are electrically competent.

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Miscellaneous Checks	✓ or ✗
Check 24V present at Terminals C1 to C9 (C1 is 0V) - dc	
Check ±10V present at Terminals B3 and B4 (B1 is 0V) - dc	
Check auxiliary supply present at Neutral & Line, 110/240V ac	
Check the fans rotate, where applicable	



### WARNING

**Now isolate the unit completely from all supplies. It may be necessary to remove an armature and field connection to carry out the following checks.**

<b>Continuity Test on Fuses Using a Meter</b>	✓ or ✗
Check the coding fuses on the power board Check the auxiliary fuses etc. (fan fuse, if applicable)	
<b>Diode Check on Power Terminals Using a Meter</b>	✓ or ✗
A+ to L1, L2, L3 and Earth Terminal = Open Circuit A- to L1, L2, L3 and Earth Terminal = Open Circuit	
<b>Internal Field Check Using a Meter</b>	✓ or ✗
All the coding fuses must be OK before continuing with the following checks since the fuses are in the circuit.	
+ve to L1 & -ve to F+ = Diode Drop (approximately 0.5V) +ve to L2 & -ve to F+ = Diode Drop (approximately 0.5V) +ve to F- & -ve to F+ = Diode Drop (approximately 0.5V) -ve to L1 & +ve to F- = Open Circuit -ve to L2 & +ve to F- = Open Circuit	
<b>External Field Check Using a Meter</b>	✓ or ✗
+ve to FL1 & -ve to F+ = Diode Drop (approximately 0.5V) +ve to FL2 & -ve to F+ = Diode Drop (approximately 0.5V) +ve to F- & -ve to F+ = Diode Drop (approximately 0.5V) -ve to FL1 & +ve to F- = Open Circuit -ve to FL2 & +ve to F- = Open Circuit	

Make a note of the Serial Number and Model Number.

<b>Serial Number</b>		<b>Model Number</b>	
----------------------	--	---------------------	--

**Re-establish all connections. All terminals should be secure and not over-torqued.**

# Appendix **A**

## Serial Communications

<b>Main Serial Port (P1)</b> .....	<b>A-1</b>		
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# Main Serial Port (P1)

The plug-in COMMS Option Board provides a serial data port, allowing Converters to be linked to form a network. Using a PLC/SCADA or other intelligent device, this network can be continuously controlled to provide supervision and monitoring for each Converter in the system.

Refer to the COMMS Option Board Technical Manual for further details.

# System Port (P3)

This port has several uses:

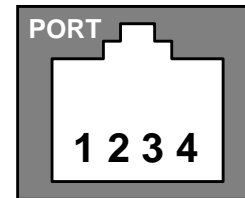
<b>UDP Support</b>	Upload information from a PC	Refer to page A-3
<b>ConfigEd Lite</b>	Parameters can be monitored and updated by ConfigEd Lite (or other suitable PC programming tool)	Refer to page A-5
<b>5703 Support</b>	Connection for a Parker SSD Dries' 5703 Setpoint Repeater Unit	Refer to page A-6
<b>EI ASCII</b>	Communications with other control/supervisory equipment	Refer to page A-9
<b>EI BINARY</b>	Communications with other control/supervisory equipment	Refer to page A-14

## Drive Connections

The port is an un-isolated RS232, 9600 Baud (default), supporting the standard EI BISYNCH ASCII or BINARY communications protocol. Contact Parker SSD Drives for further information.

Use a standard P3 lead to connect to the Drive.

P3 Port Pin	Lead	Signal
1	Black	0V
2	Red	24V
3	Green	TX
4	Yellow	RX



### 6-Way Lead to DB9/DB25 Connector

**IMPORTANT** There is 24V present on pin 2 of the P3 port. This may damage your PC or the Drive.

P3 Port Pin	Lead	Female DB9 Pin	Female DB25 Pin
1	Black	5	7
2	Red	not connected	not connected
3	Green	2	3
4	Yellow	3	2

---

## UDP Support

The Upload Download Protocol (UDP) can be used to transfer text files between the drive and a host computer using the P3 port. Files that can be transferred using UDP are configuration files, language files and text “dumps” of all the parameters shown on the MMI.

Configuration files and language files are formatted as Intel Hex files. The files contain a copy of the drive’s configuration and may be transferred either from the drive to the host computer, or from the host computer to the drive. **Transferring a configuration file to the drive will over-write all the drive’s settings.**

Language files contain information required to display parameters on the Display/Keypad in a language other than English. These may only be transferred from the host computer to the drive. Contact Parker for further information.

MMI dumps are human readable text files showing all the parameters in the drive in the order they are shown on the MMI. The files can only be transferred from a drive to the host computer.

## System Port (P3) Set-up

When transferring data using UDP the communications settings used are:

Baud rate selected via the P3 SET UP::BAUD RATE parameter, (Tag No 198).

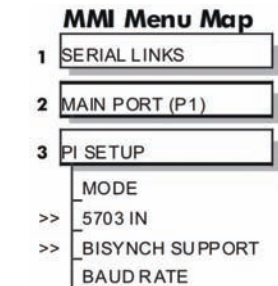
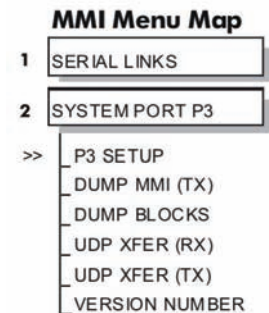
- 1 Stop bit, (fixed)
- No Parity, (fixed)
- 8 data bits, (fixed)
- No flow control, (fixed)

## UDP Transfer Procedure

### UDP XFER (RX)

This is the transfer of either a language or a configuration file from the host computer to the Drive. The drive automatically detects whether the file is a language file or a configuration file. **Transferring a configuration file to the drive will over-write all the drive’s settings.**

1. Connect the Drive to the host using the appropriate lead.
2. Using a standard communications package prepare the host to transfer an ASCII file. Remember to set-up the host's serial port first.
3. Start the transfer on the Drive by selecting UDP XFER (RX) on the MMI and pressing the UP (↑) key, as instructed.
4. When the Drive says RECEIVING, begin the file transmission.
5. The Drive automatically terminates the UDP transfer when it detects the end of the Intel Hex end-of-file record.



## **UDP XFER (TX)**

This is the transfer of the drive's settings as an Intel Hex file.

1. Connect the Drive to the host using the appropriate lead.
2. Using a standard communications package prepare the host to receive an ASCII file. Remember to set up the host's serial port first.
3. On the host computer, direct data received on the serial comms port to a file.
4. Start the transfer on the Drive by selecting UDP XFER (TX) on the MMI and pressing the UP (↑) key, as instructed. The drive says SENDING.
5. When the transfer is finished, terminate the capture of serial data on the host computer.

## **MMI Dump Procedure**

The MMI dump can be used to transfer all of the drive's parameters to a host computer. The format of the data is human readable and may be used as documentation of the drive's configuration.

## **DUMP MMI (TX)**

This is the transfer of all parameters.

1. Connect the Drive to the host using the appropriate lead.
2. Using a standard communications package prepare the host to receive an ASCII file. Remember to set up the host's serial port first.
3. On the host computer, direct data received on the serial comms port to a file.
4. Start the transfer on the Drive by selecting DUMP MMI (TX) on the MMI and pressing the UP (↑) key, as instructed. The drive says REQUESTED..
5. When the transfer is finished, terminate the capture of serial data on the host computer.

---

## ConfigEd Lite Support

This is Parker's Windows-based block programming software. It has a graphical user interface and drawing tools to allow you to create block programming diagrams quickly and easily. Contact your local Parker SSD Drives sales office.

### System Port (P3) Set-up

Set MODE parameter (Tag No. 130) to EIASCII using the MMI

Set the BAUD RATE parameter to match the baud rate selected on the host computer.

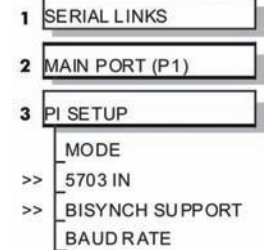
1 Stop bit (fixed)

Even Parity (fixed)

7 bits (fixed)

No flow control, (fixed)

#### MMI Menu Map





## 5703 Support

The 5703 Setpoint Repeater Unit provides the facility to run a line of drives in speed-lock without the use of a 5720 Quadraloc controller; for accurate speed-holding, encoder feedback is required. Ratioed speed-locking is supported, although the unit is not intended to replace the Quadraloc in applications requiring high accuracy.

A 16-bit speed signal is passed between drives via the P3 port on each Drive (a port otherwise used only off-line for the upload and download of EEPROM data). The port operates RS232 compatible signal levels. The 5703/1 converts these signal levels to fibre optic signals for transmission, and from fibre optics to RS232 for reception. Alternatively an external converter may be used to provide galvanic isolation and to convert the signals to RS485 for transmission over longer distances than is recommended for RS232.

### Hardware Description

The 5703 is housed in a DIN rail mounted box and is provided with a cable to connect into the P3 port. The cable is 400mm long to limit transmission errors, the primary unit-to-unit interconnection is intended to be achieved by a fibre optic cable.

The 5703 unit itself is simply an electric signal-to-light converter and does not alter the signal in any way, this is achieved within the software data of the Drive.

It is fitted with one fibre optic receiver and two fibre optic transmitters, the fibre optic receiver has a fixed function to receive data from the preceding unit while the transmitter sends data to the following unit. The additional transmitter can be used either to re-transmit the incoming signal or provide a second transmission of the output signal, this gives the unit wide functionality. When the link is in the normal right hand position, assuming the board is mounted with the fibre optics downward, the second transmitter repeats the output signal. In the left hand position it repeats the input signal.

The 5703/1 can be configured to point to any relevant parameter in the block diagram, the default connections are such that the scaled input is connected to the "additional speed demand" and the output to the "speed demand".

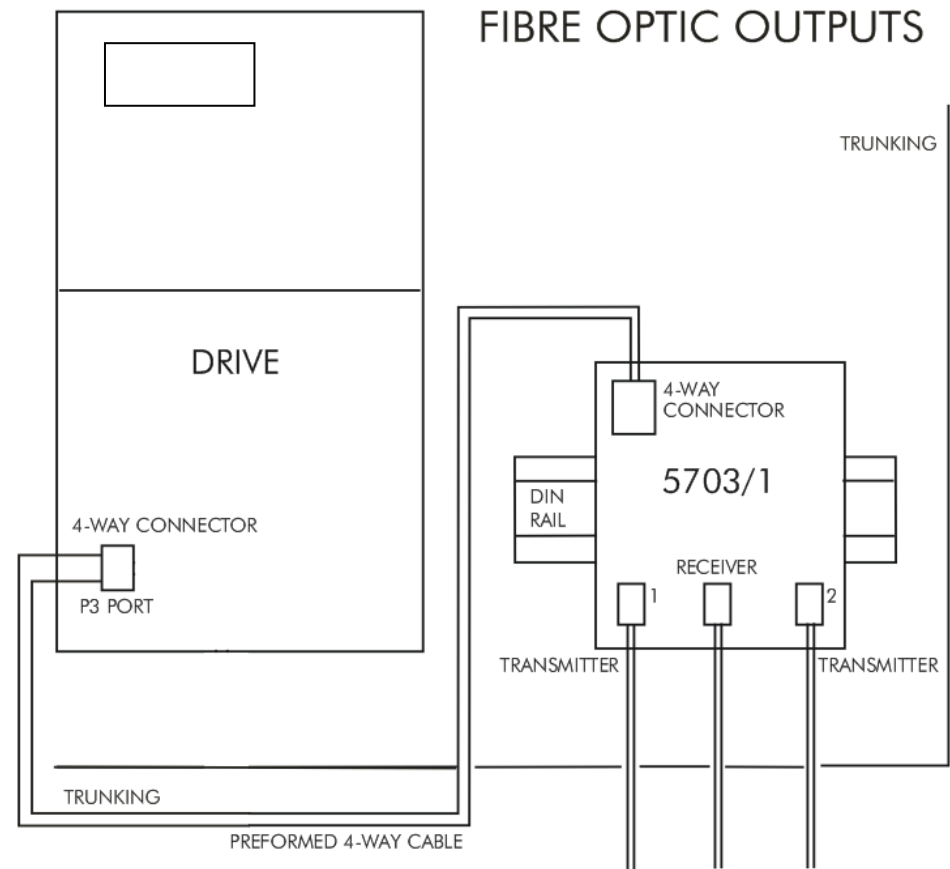
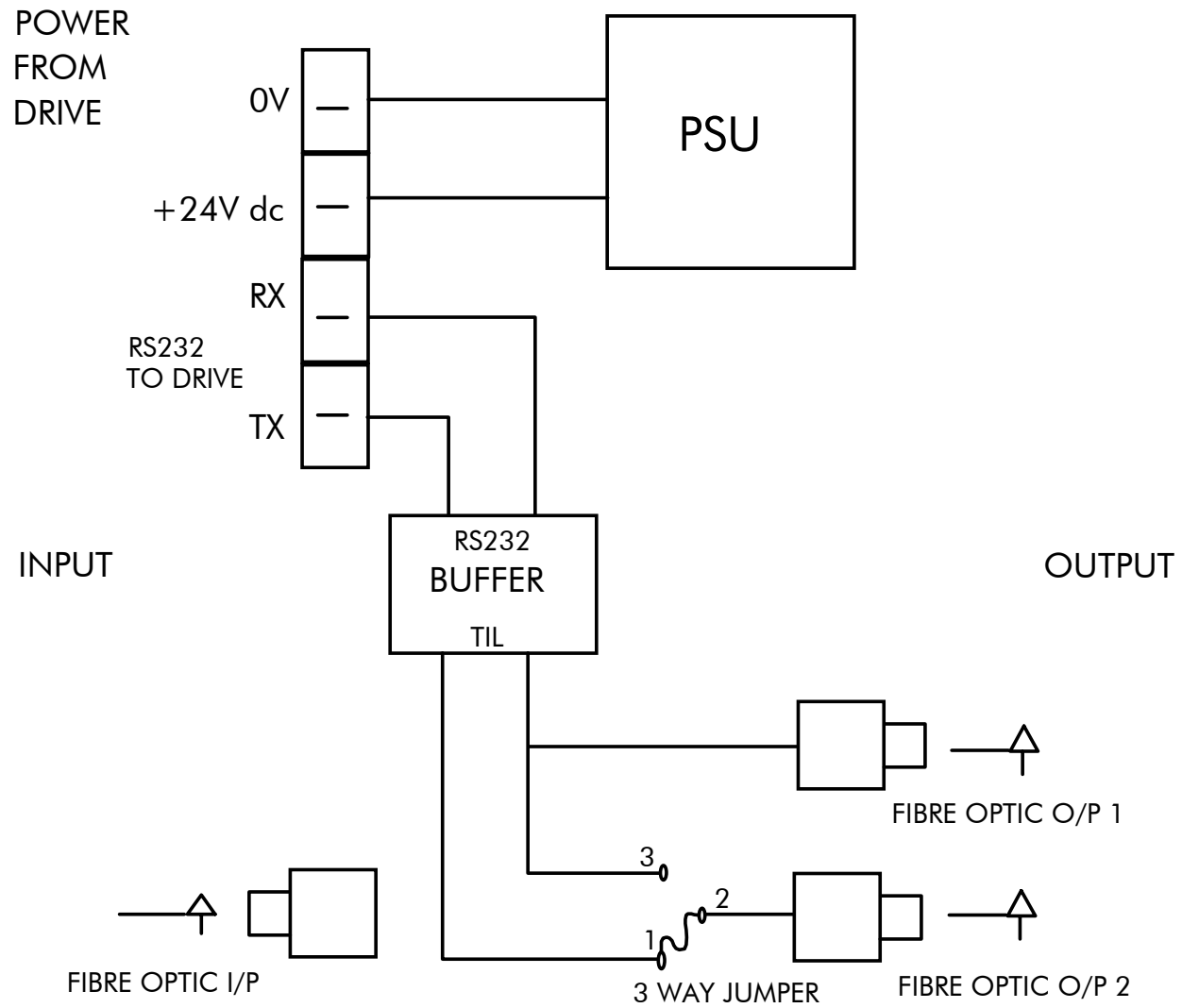


Figure A- 1 5703/1 Product Outline Drawing



**Figure A- 2 Internal Wiring Diagram of 5703/1 Speed Repeater**

## System Port (P3) Set-up

Set MODE parameter (Tag No. 130) to 5703 SLAVE or 5703 MASTER using the MMI

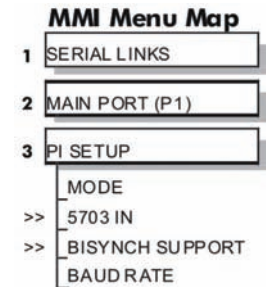
Set BAUD RATE parameter (Tag No. 198) to the required baud rate using the MMI. The baud rate must be the same on both the transmitting and the receiving drives.

1 Stop bit (fixed)

NO Parity (fixed)

8 bits (fixed)

No flow control, (fixed)

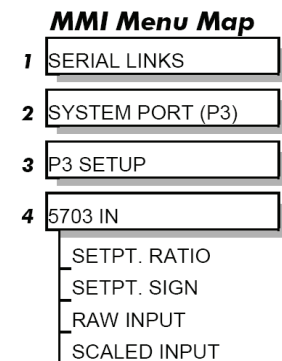


## Commissioning the 5703/1

### Input to the Drive

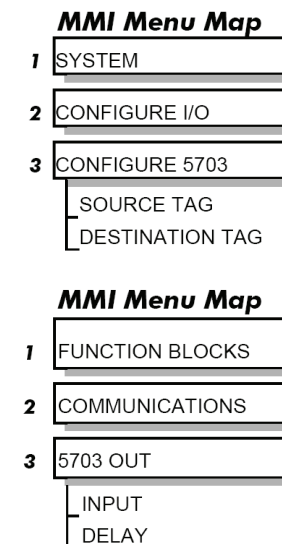
The speed setpoint from the 5703/1 enters the drive via the P3 port and, after scaling, is presented to the application as the parameter 5703 IN::SCALED INPUT. In the default application, this is added to analogue inputs 1, 2 and 3, (ramped), to form the setpoint. IN BASIC TACHO-FOLLOWER MODE, ALL THE ANALOG INPUTS MUST BE DISABLED TO PREVENT LOSS OF ACCURACY, yet it may be necessary in some applications to provide analog inputs for trim signals or inch setpoints:

1. The ramp input may be disabled by taking terminal C7 (Ramp Hold) permanently high; the ramp is automatically cleared when the drive is quenched, and its output will never move from (exactly) zero. The ramp input may often be of use in line master drives; but the ramp should be disabled in slave drives. Note that the P3 setpoint may be passed through the ramp function; in such a case, the analog input to the ramp (terminal A4) is automatically disconnected.
2. Analog input 1 (terminal A2) is used for inch setpoints. During normal running, the terminal is shorted to 0V and the deadband function is used so that no signal at all passes to the summing junction. The analog inch setpoints are set a little above the threshold of the deadband so as to give the required inching speeds, forward or backward. Selection between analog inching and absolutely zero analog input is thus accomplished automatically.
3. Analog input 2 (terminal A3) may be disabled by writing zero to its scaling block; this will normally be done through the MMI at commissioning, but may be overridden by the serial link. Alternatively, this input may be used for a local analog trim.



### Output from the Drive

By default, the value transmitted from the drive is the SPEED DEMAND parameter.



# EI Bisynch ASCII Support

The drive can communicate using the EI Bisynch ASCII protocol.

**NOTE** The P3 port is not physically compatible with a multi-point network.

This communications protocol comes under the heading of Binary Synchronous Communications Data Link Control (BSCDLC). This is all part of an internationally recognised ANSI standard protocol called BISYNCH (Binary Synchronous) and is known by the abbreviation x3.28. It is widely used by manufacturers of computers, computer peripherals, and communications equipment.

EI BISYNCH, the specific form of communication used, corresponds with the following full American National Standard definition:

- ANSI Standard: x3.28, Revision: 1976
- Establishment and Termination Control Procedures Sub-category 2.5:  
*Two-way Alternate, Non-switched Multi-point with Centralised Operation & Fast Select*
- Message Transfer Control Procedure Sub-category B1:  
*Message Associated Blocking with Longitudinal Checking & Single Acknowledgement*

This is known by the abbreviation ANSI - x3.28 - 2.5 - B1.

## Features

- Configured using Function Block inputs
- Diagnostics using Function Block outputs
- Software-selectable Baud Rate
- Software-selectable Slave Address
- Direct tag access for all parameters

## System Port (P3) Set-up

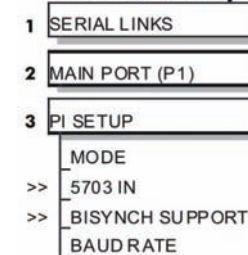
Set MODE parameter (Tag No. 130) to **EIACSII** using the MMI

Set BAUD RATE parameter (Tag No. 198)

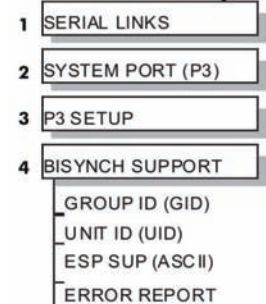
Set the GROUP ID parameter (the Parker SSD Drives protocol group identity address) to match the drive being communicated with.

Set the UNIT ID parameter (the Parker SSD Drives protocol unit identity address) to match the drive being communicated with.

### MMI Menu Map



### MMI Menu Map



For details of the EI Bisynch Protocol refer to the RS485 Communications Interface Technical Manual, HA463560U002. This is available for download on the Parker SSD Drives website, [www.ssddrives.com](http://www.ssddrives.com).

## EI Bisynch ASCII Parameter Mapping

### 1. EI Bisynch ASCII Prime Set

The following prime set parameters are supported:

Mnemonic	Description	Range (HEX encoding)	Access
II	Instrument Identity	>0690, >0605 or >5900	Read Only
V0	Main Software Version	>0000 to >FFFF	Read Only
V1	Keypad Software Version	>0000 to >FFFF (>0000 if not fitted)	Read Only
V2	Technology Box Software Version	>0000 to >FFFF	Read Only
EE	Last Error Code	>0000 to >FFFF (Writing any value resets this to >00C0)	Read/Write

### 2. Command/Status

The following Command/Status parameters are supported:

Mnemonic	Description	Range (Hex encoding)	Access
!1	Command	see below	Write Only
!2	State	see below	Read Only
!3	Save Command	see below	Write Only
!4	Save State	see below	Read Only

<b><i>!1 : Command</i></b>	
Write-only: used to modify the state of the Inverter and to load configuration data from non-volatile memory.	
HEX Value	Description
>7777	Reset Command. Acknowledges failed restore. Loads and saves (590 does not save) default Product Code and default Configuration (Macro 1).
>0101	Restores Saved Configuration from drive's non-volatile memory.
>0111	Restores Default Configuration
>4444	Exit Configuration Mode
>5555	Enter Configuration Mode
<b><i>!2 : State</i></b>	
Read-only: used to determine the major state of the Inverter.	
HEX Value	Description
>0000	Initialising. (Powering up )
>0001	Corrupted Product Code and Configuration
>0002	Corrupted Configuration
>0003	Restoring Configuration
>0004	Re-Configuring Mode
>0005	Normal Operation Mode
<b><i>!3 : Save Command</i></b>	
Write-only: used to save the configuration and product code in non-volatile memory.	
HEX Value	Description
>0000	Reset Command. Acknowledges (clears) any previous save error.
>0001	Saves Configuration to drive's non-volatile memory.
<b><i>!4 : Save State</i></b>	
Read only: used to determine the progress of a non-volatile saving operation.	
HEX Value	Description
>0000	Idle
>0001	Saving
>0002	Failed

### 3. Tag Access

Each parameter in the Inverter's menu system is identified by a unique Tag Number. Information is exchanged across the system by use of a two character Mnemonic that is derived from the Tag Number.

**NOTE** Refer to the Parameter Specification Table in Appendix D for a full list of tag mnemonics - see the MN column. Refer to the Notes column which gives access information about each parameter.

#### *Parameter Mapping*

The algorithm to convert between tag number and 2 character mnemonics is:

```
if (TagNo < 936) then
  m = INT ((TagNo + 360)/36) (INT: the integer part)
  n = (TagNo + 360) MOD 36 (MOD: the remainder)
  if m > 9 then
    char_1 = 'a' + (m - 10)
  else
    char_1 = '0' + m
  end_if
  if n > 9 then
    char_2 = 'a' + (n - 10)
  else
    char_2 = '0' + n
  end_if
else
  m = INT ((TagNo - 936)/26) (INT: the integer part)
  n = (TagNo - 936) MOD 26 (MOD: the remainder)
  char_1 = 'a' + m
  char_2 = 'A' + n
end_if
```

The algorithm generates mnemonics containing only the characters '0' to '9', 'A' to 'Z' and 'a' to 'z'.

### 4. PNO Access

For compatibility with the earlier 590 product, parameters may also be accessed using the ASCII PNO listed in the "EI Bisynch Binary Parameter Specification Tables", page A-20. For example, PNO 39 can be accessed with the mnemonic "27".

## 5. Encoding

Type	Description	Encoding	Comments
BOOL	Boolean	FALSE >00 TRUE >01	Will accept >0 and >1
WORD	16-bit Bitstring	>0000 to >FFFF	Will accept leading zero suppression, except >0
INT	32-bit Signed Integer	-XXXX. to XXXX. -XXXX.X to XXXX.X -XXXX.XX to XXXX.XX -XXXX.XXX to XXXX.XXX -XXXX.XXXX to XXXX.XXXX	Leading zeroes suppressed up to digit before decimal point. Trailing zeroes suppressed after decimal point.
ENUM	Enumerated Value ( 0 to 99)	>00 to >FF	Leading zeroes suppressed, except >0.
TAG	Tag No.	-XXXX. to XXXX. or 0. to XXXX.	As INT above. Source tag numbers may be set negative to indicate a feedback link, used to break a loop of function blocks.

*Note: The “.” in the above formats is not optional. It **must** be sent to conform to the EI-BISYNCH standard.*



# EI Binary Support

This mode has many similarities with the ASCII mode, and so what follows is a summary of the differences to the ASCII mode.

## Character Format

Each byte is transmitted as 11 bits rather than adopting the 10-bit format used by the ASCII mode. 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)	* 0 = Control character, 1 = Data character

## How is the Information Transferred?

During serial communications, Drive acts as a slave and responds to messages sent from the Supervisor. Messages received from the Supervisor are categorised into Main Messages and Continuation Messages.

The Binary mode introduces several different Control and Data Characters. Refer to “EI Bisynch Binary Message Protocol”, page 16.

## Response to a ‘Selection’ Message

The response is very similar to the ASCII mode but differs in that the ASCII (GID)/(UID) address is replaced by the Binary (INO), Instrument Number. Also, the ASCII parameter mnemonic (C1)(C2) is replaced by the Binary (PNO) character.

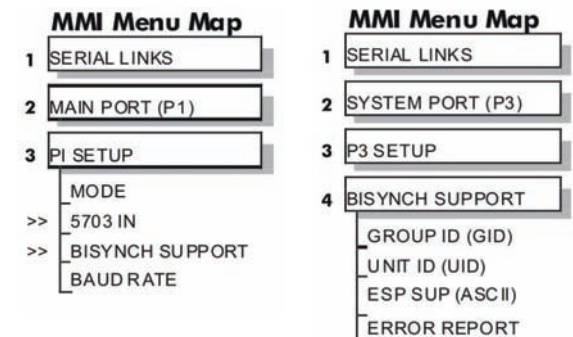
## System Port (P3) Set-up

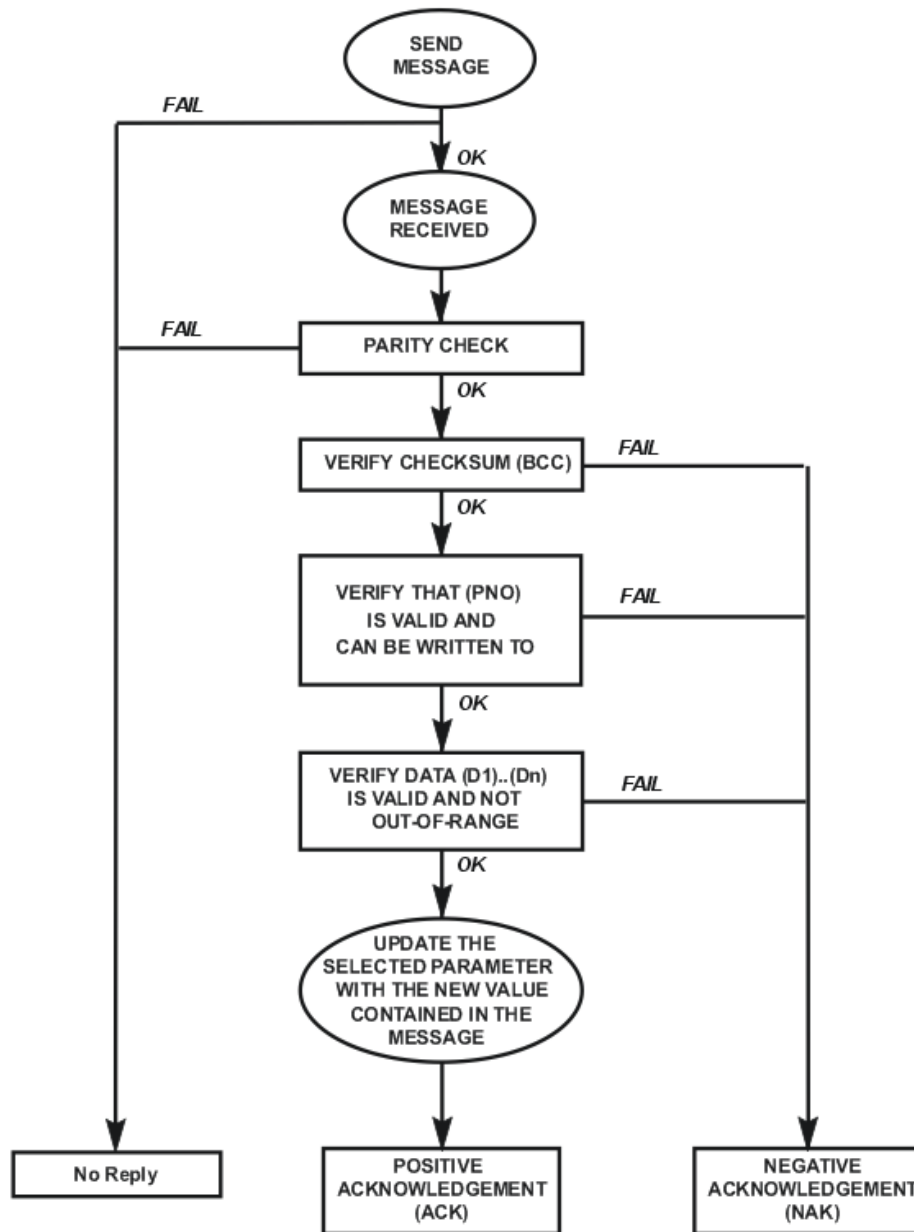
Set MODE parameter (Tag No. 130) to **EIBINARY** using the MMI

Set BAUD RATE parameter (Tag No. 198)

Set the GROUP ID parameter (the Parker SSD Drives protocol group identity address) to match the drive being communicated with.

Set the UNIT ID parameter (the Parker SSD Drives protocol unit identity address) to match the drive being communicated with.





**Figure A-3 Converter Response Sequence to a Binary Selection Message**

# EI Bisynch Binary Message Protocol

<b>Protocol</b>	:	ANSI-X3.28-2.5-B1
<b>Data Rates</b>	:	300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600 or 115200 Baud
<b>Character Format</b>	:	1 start + 8 bit ASCII data + 1 parity + 1 stop bit (11 bits)
<b>Parity</b>	:	Even

## Transferring Data - Binary Example Messages

There are two message types:

1. Main Messages
2. Continuation Messages

### Main Messages

The main messages are in four types:

#### SELECTION

The Supervisor writes to one parameter. The (BCC) character contains the checksum of all characters following the (STX).

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

#### POLLING

The Supervisor requests to read the value of one parameter.

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

#### ENQUIRY POLLING

The Supervisor requests to read all parameters in block 1.

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

#### MULTI-PARAMETER 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 and the reply will be sent by the drive, in blocks of up to 8 parameters.

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

**NOTE**

The (CCC) is the checksum of the characters following an (EOT) and is therefore equal to (INO) in Selection and Enquiry Polling messages.

## Continuation Messages

There are two types of continuation messages sent by the Supervisor:

### **NEXT (send next item from a list)**

Only valid if sent following a multi-parameter poll.

(ACK)

### **REPEAT (repeat last response)**

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

(NAK)

## Serial Transmission Responses

### **SELECTION MESSAGE RESPONSE (one character)**

Sent after the correct reception of a Selection message.

(ACK)

### **FAULT DETECTION RESPONSE (one character)**

Sent in the case of detecting a fault.

(NAK) or (EOT)

### **POLLING MESSAGE RESPONSE (more than one character)**

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

### **MULTI-POLLING MESSAGE RESPONSE (more than one character)**

The response can consist of a group of messages (blocks). The (ETX) character is only sent at the end of the last block (as for Polling Message Response above).

For other blocks, the (ETX) is replaced by an (ETB) to indicate an end of a block rather than the end of the response.

## Control Character Definitions

Standard Control Character Definitions	
(EOT)	End of Transmission (commands the slave to stop transmitting and wait to be addressed)
(STX)	Start of Text.
(ENQ)	Enquiry (sent by the master as the last character of any type of polling message)
(ETX)	End of Text (is followed by the checksum)
(ETB)	End of Block (sent instead of (ETX) when replying to a multi parameter enquiry). It indicates the end of a block, but not the end of a message.
(ACK)	Positive Acknowledgement
(NAK)	Negative Acknowledgement

## Data Character Definitions

Standard Data Character Definitions	
(INO)	Instrument Number (contains the address of the slave drive and is equivalent to the combination of the GID, UID characters of the ASCII mode)
(PNO)	Parameter Number (equivalent to the combination of 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)	<p>These characters include the mode name and value read from, or to be 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:</p> <p style="margin-left: 40px;">D1 :            bits 2 [→]            6            mode number</p> <p style="margin-left: 80px;"><i>Number format is:</i></p> <p style="margin-left: 80px;">0 = XXXX</p> <p style="margin-left: 80px;">1 = XXX.X</p> <p style="margin-left: 80px;">2 = XX.XX</p> <p style="margin-left: 80px;">3 = X.XXX</p> <p style="margin-left: 80px;">4 = .XXXX</p> <p style="margin-left: 80px;">bits 0 and 1            bits 14 and 15 of the value.</p> <p style="margin-left: 40px;">D2 :            bits 0 [→] 6            bits 7 to 13 of the value.</p> <p style="margin-left: 40px;">D3 :            bits 0 [→] 6            bits 0 to 6 of the value.</p>
(CCC)	Connection Check Control (contains the checksum of all the characters following the (EOT) character in the message)
(BCC)	Block Check Character (checksum value generated by taking the exclusive OR (XOR) of the ASCII values of all characters transmitted after and excluding (STX) up to and including (ETX).

## List of PNO Assignments

The serial link parameter numbers (PNO) include dedicated parameters, and also 16 configurable parameters. These vary with each Drive type.

### **590**

The 16 configurable parameters have PNO's 112 to 127. These can be made to point to any TAG number, either via the MMI (PNO CONFIG), or via the serial link.

PNO's 96 to 111 are actually the pointers associated with PNO's 112 to 127.

For example:

By MMI, if PNO112 = 123, then PNO 112 will access TAG number 123.

Over serial link, if PNO96 = 123, then PNO 112 will again access TAG number 123

### **Enquiry Polling**

In Enquiry Polling mode, block 1 is polled.

### **MMI Menu Map**

1 SERIAL LINKS

2 PNO CONFIG

PNO 112  
PNO 113  
PNO 114  
PNO 115  
PNO 116  
PNO 117  
PNO 118  
PNO 119  
PNO 120  
PNO 121  
PNO 122  
PNO 123  
PNO 124  
PNO 125  
PNO 126  
PNO 127

## EI Bisynch Binary Parameter Specification Tables

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
2	R/O	Drive Software Version Number.

Block 1								
PNO (ID) BINARY	(MN) ASCII	TAG	DATA FORMAT			LIMITS MIN TO MAX	ACCESS	DESCRIPTION
			BIT	ASCII	BINARY			
8	08	063	-	21	xxx.xx		R/O	Speed Setpoint
9	09	089	-	21	xxx.xx		R/O	Speed Demand
10	0A	062	-	21	xxx.xx		R/O	Speed Feedback
11	0B	066	-	21	xxx.xx		R/O	Current Demand
12	0C	065	-	21	xxx.xx		R/O	Current Feedback
13	0D	183	-	21	xxx.xx		R/O	Field Demand
14	0E	181	-	21	xxx.xx		R/O	Field Feedback
15	0F	115	-	23	xxxxx		R/O	Health Word
			0			0/1		OVERSPEED
			1			0/1		MISSING PULSE
			2			0/1		FIELD OVER I
			3			0/1		Heatsink Over Temperature
			4			0/1		Motor Over Temperature
			5			0/1		OVER VOLTS (VA)
			6			0/1		Speed Feedback
			7			0/1		Encoder Failed
			8			0/1		Field Failed
			9			0/1		Three Phase Failed
			10			0/1		Phase Lock Loop
			11			0/1		5703 Receive Error
			12			0/1		Stall Trip
			13			0/1		Over Current Trip
			14			0/1		Other Trip
			15			0/1		ACCTS Failed

Block 2								
PNO (ID) BINARY	(MN) ASCII	TAG	DATA FORMAT			LIMITS MIN TO MAX	ACCESS	DESCRIPTION
			BIT	ASCII	BINARY			
16	10	050	-	21	xxx.xx		R/O	Anin 1 (A2)
17	11	051	-	21	xxx.xx		R/O	Anin 2 (A3)
18	12	052	-	21	xxx.xx		R/O	Anin 3 (A4)
19	13	053	-	21	xxx.xx		R/O	Anin 4 (A5)
20	14	054	-	21	xxx.xx		R/O	Anin 5 (A6)
21	15	067	-	21	xxx.xx		R/O	Actual Pos I Lim
22	16	061	-	21	xxx.xx		R/O	Actual Neg I Lim
23	17	040	-	23	xxxxx		R/O	
-		068	0			0/1		Start Input
-		069	1			0/1		Jog Input
-		070	2			0/1		Enable Input
-		071	3			0/1		Digital Input 1
-		072	4			0/1		Digital Input 2
-		073	5			0/1		Digital Input 3
-		-	6			0/1		Program Stop Input
-		-	7			0/1		Coast Stop Input
-		074	8			0/1		Digital Output 1
-		075	9			0/1		Digital Output 2
-		076	10			0/1		Digital Output 3
-		-	11-15			0/1		Reserved



Block 3								
PNO (ID) BINARY	(MN) ASCII	TAG	DATA FORMAT			LIMITS MIN TO MAX	ACCESS	DESCRIPTION
			BIT	ASCII	BINARY			
24	18	030	21		xxx.xx	-200.00/200.00	R/W	Additional Current Demand
25	19	015	21		xxx.xx	0/200.00	R/W	Main Current Limit
26	1A	087	21		xxx.xx	0/200.00	R/O	+ve Current Clamp
27	1B	088	21		xxx.xx	0/200.00	R/O	-ve Current Clamp
28	1C	016	21		xxx.xx	0/200.00	R/W	Current Loop P Gain
29	1D	017	21		xxx.xx	0/200.00	R/W	Current Loop I Gain
30	1E	171	21		xxx.xx	0/100.00	R/W	Field Current Setpoint
31	1F	116	23		xxxxx		R/O	Health Store
			0			0/1		Over Speed
			1			0/1		Missing Pulse
			2			0/1		Field Over Current
			3			0/1		Fin Over Temperature
			4			0/1		Motor Over Temperature
			5			0/1		Field Over Volts
			6			0/1		Speed Feedback
			7			0/1		Encoder Fail
			8			0/1		Field Fail
			9			0/1		Three Phase
			10			0/1		Phase Lock Loop
			11			0/1		5703 Receive Error
			12			0/1		Stall Trip
			13			0/1		Over Current Trip
			14			0/1		Other Trip
			15			0/1		ACCTS Failed.

Block 4								
PNO (ID) BINARY	(MN) ASCII	TAG	DATA FORMAT			LIMITS MIN TO MAX	ACCESS	DESCRIPTION
			BIT	ASCII	BINARY			
32	20	060	21		xxx.xx		R/O	Back EMF
33	21	058	21		xxx.xx		R/O	Analogue Tach
34	22	059	21		xxxxx		R/O	Encoder
35	23	064	21		xxx.xx		R/O	Speed Error
36	24	132	21		x.xxxx	-3.0000/3.0000	R/W	P3 Setpoint Ratio
37	25	014	21		xxx.xx	0/200.00	R/W	Speed Loop P Gain
38	26	013	21		xx.xxx	0.001/ 30.000	R/W	Speed Loop Time Constant (SEC)
39 *	27		23		xxxxx			
		161	0			0/1	R/W	Aux. Start
		168	1			0/1	R/W	Aux. Enable
			2-7				-	Reserved
		288	8			0/1	R/W	External Ramp Reset
		287	9			0/1	R/W	Auto Reset
		113	10				R/O	Ramping
		303	11			0/1	R/W	Reset Ramp to Speed Feedback

Block 5								
PNO (ID) BINARY	(MN) ASCII	TAG	DATA FORMAT			LIMITS MIN TO MAX	ACCESS	DESCRIPTION
			BIT	ASCII	BINARY			
40	28	006	21		x.xxxx	-3.0000/3.0000	R/W	Ratio 1
41	29	007	21		x.xxxx	-3.0000/3.0000	R/W	Ratio 2
42	2A	086	21		xxx.xx		R/O	Set Point Sum Output
43	2B	002	21		xxx.x	0.1/600.0	R/W	Ramp Accel. Time
44	2C	003	21		xxx.x	0.1/600.0	R/W	Ramp Decel. Time
45	2D	085	21		xxx.xx	-	R/O	Ramp Output
46	2E	041	21		xxx.xx	-100.00/100.00	R/W	Speed Setpoint 4
47	2F		23		xxxxx			
		082	0				R/O	Drive Start
		084	1				R/O	Drive Enable
		122	2				R/O	Health Flag
		125	3				R/O	Ready
			4 - 7					Reserved
		079	8				R/O	At Standstill
		112	9				R/O	Stall Trip Warning
			10 - 15					Reserved

Block 6								
PNO (ID) BINARY	(MN) ASCII	TAG	DATA FORMAT			LIMITS MIN TO MAX	ACCESS	DESCRIPTION
			BIT	ASCII	BINARY			
48	30	027	21		xxx.x	0.1/600.0	R/W	Stop time
49	31	026	21		xxx.x	0.1/600.0	R/W	P-Stop time
50	32	091	21		xxx.xx	0/200.00	R/W	P-Stop Current Limit
51	33	029	21		xxx.xx	0/100.00	R/W	Stop Zero Speed Threshold
52	34	005	21		xxx.xx	-100.00/100.00	R/W	Ramp Input
53	35	100	21		xxx.xx	-200.00/200.00	R/O	Setpoint Sum Input 1
54	36	309	21		xxx.xx	-200.00/200.00	R/W	Setpoint Sum Input 0
55	37		23		xxxxx			
		94	0			0/1	R/W	Aux. Digital Output 1
		95	1			0/1	R/W	Aux. Digital Output 2
		96	2			0/1	R/W	Aux. Digital Output 3
		-	3 - 7					Reserved
		292	8			0/1	R/W	Sign 0
		8	9			0/1	R/W	Sign 1
		9	10			0/1	R/W	Sign 2
			11 - 15					Reserved

Block 7								
PNO (ID) BINARY	(MN) ASCII	TAG	DATA FORMAT			LIMITS MIN TO MAX	ACCESS	DESCRIPTION
			BIT	ASCII	BINARY			
56	38	055	21		xxx.xx		R/O	Analogue Output 1
57	39	056	21		xxx.xx		R/O	Analogue Output 2
58	3A	128	21		xxx.xx	-100.00/100.00	R/W	Aux. Analogue Output 1
59	3B	129	21		xxx.xx	-100.00/100.00	R/W	Aux. Analogue Output 2
60	3C	266	21		xxx.xx	0/100.00	R/W	% S-Ramp
61	3D	264	21		xxx.xx		R/O	Raise / Lower Output
62	3E	255	21		xxx.xx	-300.00/300.00	R/W	Raise / Lower Reset Value
63	3F	-	23		xxxxx			
-		261	0			0 1	R/W	Raise / Lower Raise Input
-		262	1			0 1	R/W	Raise/Lower Lower Input
-		307	2			0 1	R/W	Raise / Lower Reset

Block 8								
PNO (ID) BINARY	(MN) ASCII	TAG	DATA FORMAT			LIMITS MIN TO MAX	ACCESS	DESCRIPTION
			BIT	ASCII	BINARY			
64	40	218	21		xxx.xx	-100.00/100.00	R/W	Jog Speed 1
65	41	219	21		xxx.xx	-100.00/100.00	R/W	Jog Speed 2
66	42	253	21		xxx.xx	-100.00/100.00	R/W	Take Up 1
67	43	254	21		xxx.xx	-100.00/100.00	R/W	Take Up 2
68	44	225	21		xxx.xx	-100.00/100.00	R/W	Crawl Speed
71	47	-	23		xxxxx			
-		228	0			0 1	R/W	Jog Mode
-		227	1			0 1	R/W	Auxiliary Jog

Block 9								
PNO (ID) BINARY	(MN) ASCII	TAG	DATA FORMAT			LIMITS MIN TO MAX	ACCESS	DESCRIPTION
			BIT	ASCII	BINARY			
72	48	208	21		x.xxxx	-3.0000/+3.0000 0	R/W	Ratio 0
73	49	309	21		xxx.xx	-100.00/+100.0 0	R/W	Input 0
74	4A	48	21		xxx.xx	-100.00/+100.0 0	R/W	Pre-set -ve Current Limit
75	4B	301	21		xxx.xx	-100.00/+100.0 0	R/W	Pre-set +ve Current Limit

Block 10								
PNO (ID) BINARY	(MN) ASCII	TAG	DATA FORMAT			LIMITS MIN TO MAX	ACCESS	DESCRIPTION
			BIT	ASCII	BINARY			
80	50	103	21		xxx.xx	-300.00 /+300.00	R/W	Value for TRUE Digital Input 1
81	51	104	21		xxx.xx	-300.00 /+300.00	R/W	Value for FALSE Digital Input 1
82	52	106	21		xxx.xx	-300.00 /+300.00	R/W	Value for TRUE Digital Input 2
83	53	107	21		xxx.xx	-300.00 /+300.00	R/W	Value for FALSE Digital Input 2
84	54	109	21		xxx.xx	-300.00 /+300.00	R/W	Value for TRUE Digital Input 3
85	55	110	21		xxx.xx	-300.00/+300.00	R/W	Value for FALSE Digital Input 3

Block 11							
PNO (ID) BINARY	(MN) ASCII	TAG	DATA FORMAT		LIMITS MIN TO MAX	ACCESS	DESCRIPTION
			BIT	ASCII   BINARY			
88	58	339	21	xxx.xx	-300.00/+300.00	R/W	Value 1
89	59	340	21	xxx.xx	-300.00/+300.00	R/W	Value 2
90	5A	341	21	xxx.xx	-300.00/+300.00	R/W	Value 3
91	5B	342	21	xxx.xx	-300.00/+300.00	R/W	Value 4
92	5C	343	21	xxx.xx	-300.00/+300.00	R/W	Value 5
93	5D	344	21	xxx.xx	-300.00/+300.00	R/W	Value 6
94	5E	345	21	xxx.xx	-300.00/+300.00	R/W	Value 7
95	5F	-	23	xxxxx			
-		346	0		0 1	R/W	Logic 1
-		347	1		0 1	R/W	Logic 2
-		348	2		0 1	R/W	Logic 3
-		349	3		0 1	R/W	Logic 4
-		350	4		0 1	R/W	Logic 5
-		351	5		0 1	R/W	Logic 6
-		352	6		0 1	R/W	Logic 7
-		353	7		0 1	R/W	Logic 8

Block 12							
PNO (ID) BINARY	(MN) ASCII	TAG	DATA FORMAT		LIMITS MIN TO MAX	ACCESS	DESCRIPTION
			BIT	ASCII   BINARY			
96	60	312	21	xxxxx		R/W	Pointer for PNO 112
97	61	313	21	xxxxx		R/W	Pointer for PNO 113
98	62	314	21	xxxxx		R/W	Pointer for PNO 114
99	63	315	21	xxxxx		R/W	Pointer for PNO 115
100	64	316	21	xxxxx		R/W	Pointer for PNO 116
101	65	317	21	xxxxx		R/W	Pointer for PNO 117
102	66	318	21	xxxxx		R/W	Pointer for PNO 118
103	67	319	21	xxxxx		R/W	Pointer for PNO 119

Block 13								
PNO (ID) BINARY	(MN) ASCII	TAG	DATA FORMAT			LIMITS MIN TO MAX	ACCESS	DESCRIPTION
			BIT	ASCII	BINARY			
104	68	320	21	xxxxx			R/W	Pointer for PNO 120
105	69	321	21	xxxxx			R/W	Pointer for PNO 121
106	6A	322	21	xxxxx			R/W	Pointer for PNO 122
107	6B	323	21	xxxxx			R/W	Pointer for PNO 123
108	6C	324	21	xxxxx			R/W	Pointer for PNO 124
109	6D	325	21	xxxxx			R/W	Pointer for PNO 125
110	6E	326	21	xxxxx			R/W	Pointer for PNO 126
111	6F	327	21	xxxxx			R/W	Pointer for PNO 127

Block 14								
PNO (ID) BINARY	(MN) ASCII	TAG	DATA FORMAT			LIMITS MIN TO MAX	ACCESS	DESCRIPTION
			BIT	ASCII	BINARY			
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 (ID) BINARY	(MN) ASCII	TAG	DATA FORMAT			LIMITS MIN TO MAX	ACCESS	DESCRIPTION
			BIT	ASCII	BINARY			
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 upon the destination TAG number

# Error Codes

## ERROR REPORT (EE)

The EI-BISYNCH Prime Set contains the EE mnemonic. This is also an output parameter in the MAIN PORT (P1), and SYSTEM PORT (P3) function blocks, where the parameter value can be read and reset. Refer to the COMMS Option Technical Manual for further details.

The parameter displays the last error as a hexadecimal code. The following values are returned if an enquiry (reading information from the Drive) is performed on this Read/Write parameter.

Value	Description
>00C0	No error
>01C7	Invalid mnemonic
>02C2	Checksum (BCC) error
>03C2	Framing or overrun error
>04C8	Attempt to read from a write-only parameter
>05C8	Attempt to write to a read-only parameter
>07C7	Invalid message format
>07C8	Invalid data (encoding error)
>08C8	Data out of range

Writing any value to this parameter will set the value to >00C0 (No Error). Clearing the last error value may be useful in seeing a repetitive error re-occurring.

### MMI Menu Map

- 1 SERIAL LINKS
- 2 SYSTEM PORT (P3)
- 3 P3 SETUP
- 4 BISYNCH SUPPORT
  - ERROR REPORT





# Appendix **B**

## Certification

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# Introduction

Our Drives are certified as being compliant with the regulated market requirements in:

## *Europe*

Drives are CE certified as being compliant with

- The Low Voltage Directive 2006/95/EC
- The EMC Directive 2004/108/EC

## *USA*

- Underwriters Laboratory Standard UL508c for Power Conversion Equipment

## *Canada*

- Canadian Standards Association C22.2 No.14 for Industrial Control Equipment

## *Australia & New Zealand*

- CTick mark indicating EMC compliance is validated by compliance with the European Harmonised Standards for EMC

## *Rest of the world*

- Compliance may be certified for any countries where certification is based on CISPR (IEC) standards

## Europe

---

### What are the European Directives?

The Directives are created to allow manufacturers to trade freely within the EEC territory through technical harmonisation of entire product sectors, and by guaranteeing a high level of protection of public interest objectives. This is done by creating a CE marking **CE**, a "trade symbol" showing that the technical requirements and those for safety and health are met.

Business and industry are given a wide choice of how to meet their obligations. The European standards bodies have the task of drawing up technical specifications. Compliance with harmonised standards, of which the reference numbers have been published in the Official Journal and which have been transposed into national standards, provides presumption of conformity to the corresponding essential requirements of the EC directives.

Manufacturers are free to choose any other technical solution that provides compliance with the essential requirements. Compliance with harmonised standards remains voluntary and offers one route to complying with these essential requirements.

The Declaration of Conformity signed by the companies nominated Compliance Officer is certification that the apparatus to which it refers meets the requirements of **all** the relevant European directives.

Compliance with harmonised standards provides a "presumption of conformity" and is the route which has been adopted by Parker SSD Drives.

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## CE Marking for the Low Voltage Directive (LVD) 2006/95/EC

The Low Voltage Directive (LVD) 2006/95/EC<sup>1</sup> seeks to ensure that electrical equipment within certain voltage limits provides both a high level of protection for European citizens and enjoys a Single Market in the European Union. The Directive covers electrical equipment designed for use with a voltage rating of between 50 and 1000V for alternating current and between 75 and 1500V for direct current. For most electrical equipment, the health aspects of emissions of Electromagnetic Fields are also under the domain of the Low Voltage Directive.

The LVD is one of the oldest Single Market Directives which, in broad terms, provides both a conformity assessment procedure to be applied to equipment before being placed on the Market, and Essential Health Safety Requirements (EHSRs) which such equipment must meet either directly or by means of compliance with harmonized standards.

For electrical equipment within its scope, the Directive provides 'The Requirements' with respect to health and safety covering all risks, thus ensuring that electrical equipment is safe in its intended use.

In respect of conformity assessment, there is no third party intervention, as the manufacturer undertakes the conformity assessment. However, there are so-called "Notified Bodies" under the Directive, which may be used to provide reports in response to a challenge by a national authority as to the conformity of the equipment.

When installed in accordance with this manual, the product is CE marked by Parker SSD Drives in accordance with the Low Voltage Directive

Parker SSD Drives' certification (DoC) is supported by tests undertaken in accordance with harmonised standard BS EN61800-5-1

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## CE Marking for the EMC Directive 2004/108/EC

The aim of the EMC Directive 2004/108/EC<sup>2</sup> is to ensure that any electric or electronic device will create no more than a limited amount of RF interference such that other apparatus are not prevented from functioning correctly, also to ensure that an electric or electronic device will withstand a certain amount of Electro Magnetic interference from within its working environment.

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<sup>1</sup> *Directive 73/23/EEC has recently been the subject of a codification, requiring a new number 2006/95/EC. Readers should note that the text itself is identical.*

<sup>2</sup> *Directive 89/336/EEC has been superseded by Directive 2004/108/EC which came into effect on 15th December 2004.*

Provisions have been put in place so that:

- Equipment (apparatus<sup>3</sup> and fixed installations<sup>4</sup>) needs to comply with the requirements of the EMC Directive when it is placed on the market and/or taken into service.
- The application of good engineering practice is required for fixed installations, with the possibility for the competent authorities of Member States to impose measures if non-compliances are established.

The directive text makes a clear distinction between the requirements and assessment procedures for apparatus and for fixed installations respectively (fixed installations can include networks and large machines).

- Fixed installations, although they must comply with the protection requirements, require neither an EC Declaration of Conformity (DoC) nor CE marking;
- Mobile installations are considered apparatus.

The conformity assessment procedure for apparatus has been simplified to a single procedure. There is no compulsory involvement of a third party, but the manufacturer has the option of presenting his technical documentation to a Notified Body for assessment.

When deviating from the European harmonized standards or not applying them fully, the manufacturer has to perform an EMC assessment and provide detailed documentary evidence that the apparatus complies with the protection requirements of the EMC Directive.

Apparatus intended for a given fixed installation and not otherwise commercially available may be exempt from the requirements and procedures for apparatus (e.g. EC Declaration of Conformity and CE marking), provided that certain

documentation requirements are met, including precautions to be taken in order not to compromise the EMC characteristics of the fixed installation.

BS EN 61800-3 defines the emissions and immunity levels for Power drive systems (PDS) and the main component parts of such a system (Basic drive module and Complete drive module).

The standard defines specific categories of PDS:

**PDS of Category C1**

PDS of rated voltage less than 1000V, intended for use in the first environment

**PDS of Category C2**

PDS of rated voltage less than 1000V, which is neither a plug in device nor a movable device and, when used in the first environment, is intended to be installed and commissioned only by a professional.

NOTE a professional is a person or organisation having necessary skills in installing and/or commissioning power drive systems, including their EMC aspects.

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<sup>3</sup> *‘Apparatus’ means any finished appliance or combination thereof made commercially available as a single functional unit, intended for the end user and liable to generate electromagnetic disturbance, or the performance of which is liable to be affected by such disturbance.*

<sup>4</sup> *‘Fixed installation’ means a particular combination of several types of apparatus and where applicable other devices, which are assembled, installed and intended to be used permanently at a predefined location.*

**PDS of Category C3**

PDS of rated voltage less than 1000V, intended for use in the second environment and not intended for use in the first environment

**PDS of Category C4**

PDS of rated voltage equal to or above 1000V, or rated current equal to or above 400A, or intended for use in complex systems in the second environment

The drive is generally a category C3 apparatus. Some of the equipments with higher ratings might be classified in Category C4; but for certification, and as an aid to builders of complex system, the emission limits and immunity levels associated with category C3 have been applied.

Parker SSD Drives' certification (DoC) is supported by tests undertaken in accordance with harmonised standard BS EN61800-3

## United States of America & Canada

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### Compliance

The US have many municipalities that have laws, codes or regulations which require a product to be tested by a nationally recognized testing laboratory before it can be sold in their area. Parker SSD Drives adopt the nationally recognised Underwriters Laboratories (UL) mark to demonstrate compliance.

Products are also certified for the Canadian market obtained through UL and their memorandum of understanding with the Canadian Standards Agency (CSA).

Parker SSD Drives obtain product certification to UL508C “Power Conversion Equipment” for the US market, and C22.2 No.14 “Industrial Control Equipment” for the Canadian market.

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### Conditions for Compliance with UL508c

#### Solid-State Motor Overload Protection

**NOTE** An external motor overload protective device must be provided by the installer.

The maximum internal overload protection level (current limit) is 150% for 30 seconds and 200% for 10 seconds.

Motor overload protection is provided by means of the thermal device in the motor winding. This protection cannot be evaluated by UL, hence it is the responsibility of the installer and/or the local inspector to determine whether the overload protection is in compliance with the National Electrical Code or Local Code requirements.

## Branch Circuit/Short Circuit Protection Requirements

The controller requires branch circuit protection. Branch circuit protection requirements must be in accordance with the latest addition of the National Electrical Code, NEC/NFPA-70.

UL Recognized Component (JFHR2) semiconductor fuses with current ratings and maximum  $I^2t$  ratings as specified below must be used in the controller. Refer to the table below for the recommended fuse manufacturer and part number.

(HP)	Controller Rating (A)	Semiconductor Fuses			
		Ratings			Part No. Littelfuse (or equivalent*)
		(V)	(A)	$I^2t$ (A <sup>2</sup> s)	
20	35	500Vac	40	1,000	L50S 40
40	70	500Vac	80	5,000	L50S 80
60	110	500Vac	125	10,000	L50S 125
80	150	500Vac	175	20,000	L50S 175
100	180	500Vac	175	20,000	L50S 175
150	270	500Vac	300	60,000	L50S 300

\* Other UL Recognized Component (JFHR2) semiconductor fuses may be installed upstream of the controller provided that the voltage, ampere and  $I^2t$  ratings shown above are not exceeded.

**Note:** Semiconductor fuses are acceptable as branch circuit short-circuit protection for the solid-state motor controllers only.

**Table B- 1 Branch Circuit/Short Circuit Protection Requirements**



## Short Circuit Rating

These products are suitable for use on a circuit capable of delivering not more than (the value shown in Table 12-2) RMS Symmetrical Amperes, 500V maximum.

Output Ratings			Short Circuit Rating
A	kW	Hp	RMS Symmetrical Amperes
35	15	20	5,000
70	30	40	5,000
110	45	60	10,000
150	60	80	10,000
180	75	100	10,000
270	110	150	10,000

**Table B- 2 Short Circuit Ratings**

## Field Wiring Temperature Rating

Use 75°C copper conductors only.

## Operating Ambient Temperature

For the operating ambient temperature range, refer to Appendix E: “Technical Specifications”.


## Field Wiring Terminal Markings

For the correct field wiring connections that are to be made to each terminal, refer to Chapter 3: “Installing the Drive” - Electrical Installation.

## Power and Control Field Wiring Terminals

For the correct tightening torque value, refer to Appendix E: “Technical Specifications”.

## Field Grounding Terminals

The field grounding terminal(s) is identified with the International Grounding Symbol (IEC) Publication 417, Symbol 5019. 

## Field Terminal Kits

UL compliant terminal kits are available for the connection of power wiring for the following Drive ratings. These terminals must be applied with the correct tooling as described in the Installation Instructions provided with each terminal kit.

Kit Part Number	Controller Rating (A)	Number of Lugs	Purpose	Wire Size
LA386000U035	35	5	AC/DC	8 AWG (8.4 mm <sup>2</sup> )
LA386000U070	70	5	AC/DC	4 AWG (21.2 mm <sup>2</sup> )
LA386000U110	110	3	AC	2 AWG (33.6 mm <sup>2</sup> )
		2	DC	1/0 AWG (53.5 mm <sup>2</sup> )
LA386000U150	150	3	AC	1/0 AWG (53.5 mm <sup>2</sup> )
		2	DC	3/0 AWG (85 mm <sup>2</sup> )
LA386000U180	180	3	AC	3/0 AWG (85 mm <sup>2</sup> )
		2	DC	4/0 AWG (107.5 mm <sup>2</sup> )
LA386000U240	240	10 *	AC/DC	1/0 AWG (53.5 mm <sup>2</sup> )
LA386000U270	270	6 *	AC	1/0 AWG (53.5 mm <sup>2</sup> )
		4 *	DC	2/0 AWG (67.5 mm <sup>2</sup> )

\* 2 cables and lugs are required per terminal.

## Fuse Replacement Information

For fuse replacement information, refer to Appendix E: “Technical Specifications”.

# Australia & New Zealand

A Mutual Recognition Agreement in relation to conformity assessment, certificates and markings between Australia and the European Community was signed on June 1, 1998 and entered into force on January 1, 1999. Sectoral Annexes of the MRA cover: medicinal products, medical devices, telecommunications terminal equipment, low voltage equipment (i.e. electrical safety), electromagnetic compatibility (EMC), machinery, pressure equipment and automotive products.

## EMC Standards

Extract from Mandatory Australian Communications Authority standards.

Product	European	International	AS/NZS
Industrial, scientific, and medical (ISM) equipment	EN 55011	CISPR 11	2064 Note 3
Information technology equipment	EN 55022	CISPR 22	3548 Note 2
Generic (residential, commercial, and light industry)	EN 50081.1	IEC 61000-6-3	4251.1
Generic (industrial environments)	EN 50081-2	IEC 61000-6-4	4251.2
Adjustable speed electrical power drive systems	EN 61800-3	IEC 61800-3	0

Parker SSD certification (DoC) is supported by tests undertaken in accordance with harmonised standard BS EN61800-3

# EMC

## Emissions Limits

### Conducted

Frequency (MHz)	DB ( $\mu$ V)		Product Specific EN 61800-3
	Quasi Peak	Average	
where $I \leq 100A$			Category C3 Table 17
0.15 - 0.5	100	90	
0.5 - 5.0	86	76	
5.0 - 30.0	90	80	
<i>decreasing with log of frequency to:</i>	70	60	
where $I \geq 100A$			
0.15 - 0.5	130	120	
0.5 - 5.0	125	115	
5.0 - 30.0	115	105	

### Harmonics (Low Frequency Emissions)

$I < 75A$  61000-3-12

$I > 75A$  61000-3-4

Harmonic emissions for DC drive installations cannot be predicted here as they are determined by motor parameters that are installation dependent. For help in determining the harmonics contact Parker SSD.

Where these levels are too high and to ensure compatibility with other equipment, EMC filters are available from Parker SSD Drives.

### Radiated

Frequency (MHz)	DB ( $\mu$ V)	Product Specific
	Quasi Peak	EN 61800-3
$30 \leq f < 230$	50	Category C3 (Table 18) Measured at 10m
$230 \leq f < 1000$	60	

Where these levels are too high and to ensure compatibility with other equipment, Parker SSD Drives can advise on suitable counter-measures.

## EMC Immunity Levels

Port	Phenomenon	Basic standard for test method	Level	Performance (acceptance criterion)
Enclosure port	ESD	IEC 61000-4-2	4 kV CD or 8 kV AD if CD impossible	B
	Radio-frequency electromagnetic field, amplitude modulated.	IEC 61000-4-3 see also 5.3.4	80 MHz to 1000 Mhz 10 V/m 80% AM (1 kHz)	A
Power ports	Fast transient-burst	IEC 61000-4-4	2 kV/5 kHz <sup>a</sup>	B
	Surge <sup>b</sup> 1,2/50 μs, 8/20 μs	IEC 61000-4-5	1 kV <sup>c</sup> 2 kV <sup>d</sup>	B
	Conducted radio-frequency common mode <sup>e</sup>	IEC 61000-4-6 see also 5.3.4	0,15 MHz to 80 MHz 10 V 80 % AM (1 kHz)	A
Power interfaces	Fast transient-burst <sup>e</sup>	IEC 61000-4-4	2 kV/5 kHz Capacitive clamp	B
Signal interfaces	Fast transient-burst <sup>e</sup>	IEC 61000-4-4	1 kV/5 kHz Capacitive clamp	B
	Conducted radio-frequency common mode <sup>e</sup>	IEC 61000-4-6 see also 5.3.4	0,15 MHz to 80 MHz 10 V 80 % AM (1 kHz)	A
Ports for process measurement control lines	Fast transient-burst <sup>e</sup>	IEC 61000-4-4	2 kV/5 kHz Capacitive clamp	B
	Surge <sup>f</sup> 1,2/50 μs, 8/20 μs	IEC 61000-4-5	1 kV <sup>d,f</sup>	N/A All control connections must be <30m (excludes fieldbus).
	Conducted radio-frequency common mode <sup>e</sup>	IEC 61000-4-6 see also 5.3.4	0,15 MHz to 80 MHz 10 V 80 % AM (1 kHz)	A
CD : contact discharge      AD : air discharge      AM : amplitude modulation				
<sup>a</sup> Power ports with current rating < 100A: direct coupling using the coupling and decoupling network. Power ports with current rating ≥ 100A: direct coupling or capacitive clamp without decoupling network. If the capacitive clamp is used, the test level shall be 4kV/2,5kHz. <sup>b</sup> Applicable only to power ports with current consumption , 63 A during light load test conditions as specified in 5.1.3. The rated impulse voltage of the basic insulation shall not be exceeded (see IEC 60664-1). <sup>c</sup> Coupling line-to-line. <sup>d</sup> Coupling line-to-earth. <sup>e</sup> Applicable only to ports or interfaces with cables whose total length according to the manufacturer's functional specification may exceed 3 m. <sup>f</sup> Applicable only to ports with cables whose total length according to the manufacturer's functional specification may exceed 30 m. In the case of a shielded cable, a direct coupling to the shield is applied. This immunity requirement does not apply to fieldbus or other signal interfaces where the use of surge protection devices is not practical for technical reasons. The test is not required where normal functioning cannot be achieved because of the impact of the coupling/decoupling network on the equipment under test (EUT).				

**Table B- 3 Minimum immunity requirements for PDSs intended for use in the second environment**

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# EMC General Installation Considerations

## Earthing Requirements

**IMPORTANT** *Protective earthing always takes precedence over EMC screening.*

### Protective Earth (PE) Connections

**NOTE** In accordance with installations to EN60204, only one protective earth conductor is permitted at each protective earth terminal contacting point.

Local wiring regulations take precedence and may require the protective earth connection of the motor to be connected locally, i.e. not as specified in these instructions. This will not cause shielding problems because of the relatively high RF impedance of the local earth connection.

### EMC Earth Connections

For compliance with EMC requirements, we recommend that the “0V/signal ground” be separately earthed. When a number of units are used in a system, these terminals should be connected together at a single, local earthing point.

Control and signal cables for the encoder, all analogue inputs, and communications require screening with the screen connected only at the VSD (Variable Speed Drive) end. However, if high frequency noise is still a problem, earth the screen at the non-VSD end via a 0.1µF capacitor.

**NOTE** Connect the screen (at the VSD end) to the VSD protective earth point, and not to the control board terminals.

## Cabling Requirements

### *Planning Cable Runs*

- Use the shortest possible motor cable lengths.
- Use a single length of cable to a star junction point to feed multiple motors.
- Keep electrically noisy and sensitive cables apart.
- Keep electrically noisy and sensitive parallel cable runs to a minimum. Separate parallel cable runs by at least 0.25 metres. For runs longer than 10 metres, separation should be increased proportionally. For example if the parallel runs were 50m, then the separation would be  $(50/10) \times 0.25\text{m} = 1.25\text{m}$ .
- Sensitive cables should cross noisy cables at 90°.
- Never run sensitive cables close or parallel to the motor, dc link and braking chopper circuit for any distance.
- Never run supply, dc link or motor cables in the same bundle as the signal/control and feedback cables, even if they are screened.
- Ensure EMC filter input and output cables are separately routed and do not couple across the filter.

## Increasing Motor Cable Length

Because cable capacitance and hence conducted emissions increase with motor cable length, conformance to EMC limits is only guaranteed with the specified ac supply filter option up to a maximum cable length as specified in Appendix E: "Technical Specifications".

This maximum cable length can be improved using the specified external input or output filters.

Screened/armoured cable has significant capacitance between the conductors and screen, which increases linearly with cable length (typically 200pF/m but varies with cable type and current rating).

Long cable lengths may have the following undesirable effects:



- Producing increased conducted emissions that degrade the performance of the EMC filter due to saturation.
- Causing RCDs (Residual Current Devices) to trip due to increased high frequency earth current.
- Producing increased heating inside the EMC ac supply filter from the increased conducted emissions.

These effects can be overcome by adding chokes or output filters at the output of the VSD.

# Certificates

Issued for compliance with the EMC Directive when the unit is used as *relevant apparatus*.

This is provided to aid your justification for EMC compliance when the unit is used as a *component*.

<b>590A/C/D/L (35 - 800 AMPS)</b>	
 <b>EC DECLARATIONS OF CONFORMITY</b> Date CE marked first applied: 01.04.2001	
<b>EMC Directive</b> In accordance with the EEC Directive 2004/108/EC We Parker SSD Drives, address as below, declare under our sole responsibility that the above Electronic Products when installed and operated with reference to the instructions in the Product Manual (provided with each piece of equipment) is in accordance with the relevant clauses from the following standard:- * BSEN61800-3 (2004)	<b>Low Voltage Directive</b> In accordance with the EEC Directive 2006/95/EC We Parker SSD Drives, address as below, declare under our sole responsibility that the above Electronic Products when installed and operated with reference to the instructions in the Product Manual (provided with each piece of equipment), is in accordance with the relevant clauses from the following standard :- EN50178 (1998)
<b>MANUFACTURERS DECLARATIONS</b>	
<b>EMC Declaration</b> We Parker SSD Drives, address as below, declare under our sole responsibility that the above Electronic Products when installed and operated with reference to the instructions in the Product Manual (provided with each piece of equipment) is in accordance with the relevant clauses from the following standard:- * BSEN61800-3 (1997)	<b>Machinery Directive</b> The above Electronic Products are components to be incorporated into machinery and may not be operated alone. The complete machinery or installation using this equipment may only be put into service when the safety considerations of the Directive 89/392/EEC are fully adhered to. Particular reference should be made to EN60204-1 (Safety of Machinery - Electrical Equipment of Machines). All instructions, warnings and safety information of the Product Manual must be adhered to.
 _____ Dr Martin Payn (Conformance Officer)	
* Compliant with the immunity requirements of the Standard without specified EMC filters.	
<b>PARKER SSD DRIVES</b> NEW COURTWICK LANE, LITTLEHAMPTON, WEST SUSSEX BN17 7RZ TELEPHONE: +44(0)1903 737000 FAX: +44(0)1903 737100 Registered Number: 4806503 England. Registered Office: 55 Maylands Avenue, Hemel Hempstead, Herts HP2 4SJ	

The drive is CE marked in accordance with the low voltage directive for electrical equipment and appliances in the voltage range when installed correctly.

Since the potential hazards are mainly electrical rather than mechanical, the drive does not fall under the machinery directive. However, we do supply a manufacturer's declaration for when the drive is used (as a *component*) in machinery.





# Appendix

## Parameter Specification Tables

Details for all parameters provided on the Keypad.

Parameter Tables ..... C-1  
Specification Table: Tag Number Order ..... C-2

Parameter Table: MMI Menu Order ..... C-25



# Parameter Tables

The headings for the Tag No. table are described below.

<b>Tag</b>	A numeric identification of the parameter. It is used to identify the source and destinations of internal links.												
<b>Mn</b>	Serial Communications Mnemonic: Refer to Appendix A: "Serial Communications"												
<b>MMI Block Name</b>	The menu page under which the parameter is stored on the MMI.												
<b>MMI Parameter Name</b>	The parameter name as it appears on the MMI.												
<b>Minimum/Maximum/Default/Units/Range</b>	<p>The Range varies with parameter type:</p> <p>INT    The upper and lower limits of the parameter, indicating the parameter's true, internally-held, number of decimal.</p> <p style="text-align: center;"><b>Note:</b> Decimal Places - some internally held parameters with two decimal places are only displayed with one decimal place. These parameters are indicated in the Parameter Description tables. The Range parameter highlights these with "(h)".</p> <p>BOOL    0 = FALSE, 1 = TRUE</p> <p>WORD    0x0000 to 0xFFFF (hexadecimal)</p>												
<b>Notes</b>	<p>Output parameters are not saved in non-vol memory unless noted otherwise. Input parameters are saved in non-vol memory unless noted otherwise.</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"><b>View levels:</b></td> <td style="width: 50%; vertical-align: top;"><b>Write qualifiers:</b></td> </tr> <tr> <td>V0 Normal</td> <td>W0 Always</td> </tr> <tr> <td>V1 Advanced</td> <td>W1 Only when stopped</td> </tr> <tr> <td></td> <td>W2 Only when in configuration mode</td> </tr> <tr> <td></td> <td>W3 Only in thee-button reset mode</td> </tr> <tr> <td></td> <td>W4 Read only, (output parameters)</td> </tr> </table>	<b>View levels:</b>	<b>Write qualifiers:</b>	V0 Normal	W0 Always	V1 Advanced	W1 Only when stopped		W2 Only when in configuration mode		W3 Only in thee-button reset mode		W4 Read only, (output parameters)
<b>View levels:</b>	<b>Write qualifiers:</b>												
V0 Normal	W0 Always												
V1 Advanced	W1 Only when stopped												
	W2 Only when in configuration mode												
	W3 Only in thee-button reset mode												
	W4 Read only, (output parameters)												

## *Parameter Types:*

Parameters that look like 0x0000 are WORDS

Parameters that have text are BOOLS if they have a range of 0,1

Parameters that have text are WORDS if their range is 0 to greater than 1

All other parameters are INT (integers)

If a parameter can only be written to in Config mode, this implies that the drive is stopped.

# Specification Table: Tag Number Order

\* Parameter has a display resolution of 1 decimal place but a comms resolution of 2 decimal places.

Tag	Mn	Function Block Name	Parameter Name	Minimum	Maximum	Default	Units	Range	Notes
2	a2	RAMPS	RAMP ACCEL TIME	0.1	600.0	10.0	s		V0 W0
3	a3	RAMPS	RAMP DECEL TIME	0.1	600.0	10.0	s		V0 W0
5	a5	MIN SPEED	RAMP INPUT	-105.00	105.00	0.00	%		V1 W0
6	a6	SETPOINT SUM 1	RATIO 1	-3.0000	3.0000	1.0000			V0 W0
7	a7	SPEED LOOP	RATIO 2 (A3)	-3.0000	3.0000	1.0000			V0 W0
8	a8	SETPOINT SUM 1	SIGN 1	0	1	1		0: NEGATIVE 1: POSITIVE	V1 W0
9	a9	SPEED LOOP	SIGN 2 (A3)	0	1	1		0: NEGATIVE 1: POSITIVE	V0 W0
10	aa	CALIBRATION	ZERO SPD. OFFSET	-5.00	5.00	0.00	%		V0 W0
11	ab	STANDSTILL	STANDSTILL LOGIC	0	1	0		0: DISABLED 1: ENABLED	V0 W0
12	ac	STANDSTILL	ZERO THRESHOLD	0.00	100.00	2.00	%		V0 W0
13	ad	SPEED LOOP	SPD.INT.TIME	0.001	30.000	0.500	s		V0 W0
14	ae	SPEED LOOP	SPD.PROP.GAIN	0.00	200.00	10.00			V0 W0
15	af	CURRENT LOOP	CUR.LIMIT/SCALER	0.00	200.00	100.00	%		V0 W0
16	ag	CURRENT LOOP	PROP. GAIN	0.00	200.00	45.00			V0 W0
17	ah	CURRENT LOOP	INT. GAIN	0.00	200.00	3.50			V0 W0
18	ai	AUTOTUNE	AUTOTUNE	0	1	0		0: OFF 1: ARMATURE	V0 W0
19	aj	ALARMS	FIELD FAIL	0	1	0		0: ENABLED 1: INHIBITED	V0 W0
20	ak	CALIBRATION	ARMATURE V CAL.	0.9800	1.1000	1.0000			V0 W0
21	al	CALIBRATION	IR COMPENSATION	0.00	100.00	0.00	%		V0 W0
22	am	ENCODER 1	ENCODER RPM	0	6000	1000	RPM		V0 W1
23	an	CALIBRATION	ANALOG TACH CAL	0.9800	1.1000	1.0000			V0 W0
24	ao	ENCODER 1	ENCODER LINES	10	5000	1000			V0 W1
25	ap	CALIBRATION	ARMATURE I (A9)	0	1	1		0: UNIPOLAR 1: BIPOLAR	V0 W0
26	aq	STOP RATES	PROG STOP TIME	0.1	600.0	0.1	s		V0 W0
27	ar	STOP RATES	STOP TIME	0.1	600.0	10.0	s		V0 W0
28	as	ALARMS	STALL TRIP	0	1	0		0: ENABLED 1: INHIBITED	V1 W0
29	at	STOP RATES	STOP ZERO SPEED	0.00	100.00	2.00	%		V0 W0
30	au	CURRENT LOOP	ADDITIONAL DEM	-200.00	200.00	0.00	%		V1 W0

Tag	Mn	Function Block Name	Parameter Name	Minimum	Maximum	Default	Units	Range	Notes
31	av	CURRENT PROFILE	SPD BRK2 (HIGH)	0.0	100.0	100.0	%		V0 W1
32	aw	CURRENT PROFILE	SPD BRK1 (LOW)	0.0	100.0	100.0	%		V0 W1
33	ax	CURRENT PROFILE	IMAX BRK2 (SPD2)	0.0	200.0	200.0	%		V0 W1
37	b1	MENUS	VIEW LEVEL	0	2	1		0: BASIC 1: STANDARD 2: ADVANCED	V0 W0
39	b3	CONFIGURE DRIVE	CONFIGURE ENABLE	0	1	0		0: DISABLED 1: ENABLED	V0 W1
41	b5	SPEED LOOP	SETPOINT 4	-105.00	105.00	0.00	%		V0 W0
42	b6	CURRENT LOOP	AT CURRENT LIMIT	0	1	0			V1 W4
43	b7	DIGITAL OUTPUT 1	MODULUS	0	1	1			V0 W0
44	b8	DIGITAL OUTPUT 2	MODULUS	0	1	1			V0 W0
45	b9	DIGITAL OUTPUT 3	MODULUS	0	1	1			V0 W0
47	bb	SPEED LOOP	SPEED FBK SELECT	0	3	0		0: ARM VOLTS FBK 1: ANALOG TACH 2: ENCODER 3: ENCODER/ANALOG	V0 W1
48	bc	CURRENT LOOP	NEG. I CLAMP IN	-100.00	100.00	-100.00	%		V1 W0
49	bd	ENCODER 1	ENCODER SIGN	0	1	1		0: NEGATIVE 1: POSITIVE	V0 W1
50	be	ANALOG INPUT 1	ANIN 1 (A2)	0.00	0.00	0.00	V		V1 W4
51	bf	ANALOG INPUT 2	ANIN 2 (A3)	0.00	0.00	0.00	V		V1 W4
52	bg	ANALOG INPUT 3	ANIN 3 (A4)	0.00	0.00	0.00	V		V1 W4
53	bh	ANALOG INPUT 4	ANIN 4 (A5)	0.00	0.00	0.00	V		V1 W4
54	bi	ANALOG INPUT 5	ANIN 5 (A6)	0.00	0.00	0.00	V		V1 W4
55	bj	ANALOG OUTPUT 1	ANOUT 1 (A7)	0.0	0.0	0.0	V		V1 W4
56	bk	ANALOG OUTPUT 2	ANOUT 2 (A8)	0.0	0.0	0.0	V		V1 W4
57	bl	CALIBRATION	TERMINAL VOLTS	0.0	0.0	0.0	%		V1 W4
58	bm	CALIBRATION	UNFIL.TACH INPUT	0.0	0.0	0.0	%		V0 W4
59	bn	ENCODER 1	UNFIL.ENCODER	0	0	0	RPM		V0 W4
60	bo	CALIBRATION	BACK EMF	0.0	0.0	0.0	%		V0 W4
61	bp	CURRENT LOOP	ACTUAL NEG I LIM	0.0	0.0	0.0	%		V0 W4
62	bq	SPEED LOOP	UNFIL.SPD.FBK	0.00	0.00	0.00	%		V0 W4
63	br	SPEED LOOP	SPEED SETPOINT	0.00	0.00	0.00	%		V0 W4
64	bs	SPEED LOOP	UNFIL.SPD.ERROR	0.00	0.00	0.00	%		V0 W4
65	bt	CURRENT LOOP	IaFbk UNFILTERED	0.0	0.0	0.0	%		V0 W4
66	bu	CURRENT LOOP	IaDmd UNFILTERED	0.0	0.0	0.0	%		V0 W4
67	bv	CURRENT LOOP	ACTUAL POS I LIM	0.0	0.0	0.0	%		V0 W4
68	bw	SEQUENCING	START (C3)	0	1	0		0: OFF 1: ON	V1 W4

Tag	Mn	Function Block Name	Parameter Name	Minimum	Maximum	Default	Units	Range	Notes
69	bx	DIGITAL INPUT 4	DIGITAL INPUT C4	0	1	0		0: OFF 1: ON	V1 W4
70	by	DIGITAL INPUT 5	DIGITAL INPUT C5	0	1	0		0: OFF 1: ON	V1 W4
71	bz	DIGITAL INPUT 1	DIGIN 1 (C6)	0	1	0		0: OFF 1: ON	V1 W4
72	c0	DIGITAL INPUT 2	DIGIN 2 (C7)	0	1	0		0: OFF 1: ON	V1 W4
73	c1	DIGITAL INPUT 3	DIGIN 3 (C8)	0	1	0		0: OFF 1: ON	V1 W4
74	c2	DIGITAL OUTPUT 1	DIGOUT 1 (B5)	0	1	0		0: OFF 1: ON	V1 W4
75	c3	DIGITAL OUTPUT 2	DIGOUT 2 (B6)	0	1	0		0: OFF 1: ON	V1 W4
76	c4	DIGITAL OUTPUT 3	DIGOUT 3 (B7)	0	1	0		0: OFF 1: ON	V1 W4
77	c5	STANDSTILL	AT ZERO SPEED	0	1	0			V0 W4
78	c6	STANDSTILL	AT ZERO SETPOINT	0	1	0			V1 W4
79	c7	STANDSTILL	AT STANDSTILL	0	1	0			V1 W4
80	c8	SEQUENCING	PROGRAM STOP	0	1	0			V1 W4
81	c9	ALARMS	SPEED FBK ALARM	0	2	0		0: ENABLED 1: INHIBITED 2: ARM V FALLBACK	V0 W0
82	ca	SEQUENCING	DRIVE START	0	1	0		0: OFF 1: ON	V0 W4
83	cb	SEQUENCING	CONTACTOR CLOSED	0	1	0			V0 W4
84	cc	SEQUENCING	DRIVE ENABLE	0	1	0			V0 W4
85	cd	RAMPS	RAMP OUTPUT	0.00	0.00	0.00	%		V1 W4
86	ce	SETPOINT SUM 1	SPT SUM OUTPUT	0.00	0.00	0.00	%		V1 W4
87	cf	CURRENT LOOP	POS. I CLAMP	0.0	0.0	0.0	%		V1 W4
88	cg	CURRENT LOOP	NEG. I CLAMP	0.0	0.0	0.0	%		V1 W4
89	ch	SPEED LOOP	SPEED DEMAND	0.00	0.00	0.00	%		V0 W4
90	ci	CURRENT LOOP	BIPOLAR CLAMPS	0	1	0		0: DISABLED 1: ENABLED	V1 W0
91	cj	STOP RATES	PROG STOP I LIM	0.00	200.00	100.00	%		V0 W0
92	ck	ALARMS	ENCODER ALARM	0	1	0		0: ENABLED 1: INHIBITED	V0 W0
93	cl	CURRENT PROFILE	IMAX BRK1(SPD1)	0.0	200.0	200.0	%		V0 W1
94	cm	AUX I/O	AUX DIGOUT 1	0	1	0		0: OFF 1: ON	V0 W0

Tag	Mn	Function Block Name	Parameter Name	Minimum	Maximum	Default	Units	Range	Notes
95	cn	AUX I/O	AUX DIGOUT 2	0	1	0		0: OFF 1: ON	V0 W0
96	co	AUX I/O	AUX DIGOUT 3	0	1	0		0: OFF 1: ON	V0 W0
97	cp	LINK	13 SOURCE TAG	-1298	1298	77			V0 W2
98	cq	LINK	14 SOURCE TAG	-1298	1298	122			V0 W2
99	cr	LINK	15 SOURCE TAG	-1298	1298	125			V0 W2
100	cs	DEADBAND	INPUT 1	-200.00	200.00	0.00	%		V1 W0
102	cu	LINK	20 DESTINATION TAG	0	1298	90			V0 W2
103	cv	DIGITAL INPUT	1 VALUE FOR TRUE	-300.00	300.00	0.01	%		V0 W0
104	cw	DIGITAL INPUT	1 VALUE FOR FALSE	-300.00	300.00	0.00	%		V0 W0
105	cx	LINK	21 DESTINATION TAG	0	1298	118			V0 W2
106	cy	DIGITAL INPUT	2 VALUE FOR TRUE	-300.00	300.00	0.01	%		V0 W0
107	cz	DIGITAL INPUT	2 VALUE FOR FALSE	-300.00	300.00	0.00	%		V0 W0
108	d0	LINK	22 DESTINATION TAG	0	1298	119			V0 W2
109	d1	DIGITAL INPUT	3 VALUE FOR TRUE	-300.00	300.00	0.01	%		V0 W0
110	d2	DIGITAL INPUT	3 VALUE FOR FALSE	-300.00	300.00	0.00	%		V0 W0
111	d3	ALARMS	5703 RCV ERROR	0	1	0		0: ENABLED 1: INHIBITED	V0 W0
112	d4	ALARMS	STALL TRIP	0	1	0		0: OK 1: FAILED	V1 W4
113	d5	RAMPS	RAMPING	0	1	0			V1 W4
114	d6	SEQUENCING	SEQ STATE	0	15	0		0: SEQ INIT 1: SEQ INIT 2: SEQ HOLD 3: SEQ STANDBY 4: SEQ PRE READY 5: SEQ READY 6: SEQ AUTOTUNING 7: SEQ RUN 8: SEQ AT ZERO SPD. 9: SEQ QUENCH 10: SEQ PROGRAM STOP 11: SEQ STOP 12: SEQ DELAY STOP 13: SEQ COAST STOP 14: SEQ ERROR 15: CURRENT DECAY	V0 W4
115	d7	ALARMS	HEALTH WORD	0x0000	0xFFFF	0x0000			V1 W4



Tag	Mn	Function Block Name	Parameter Name	Minimum	Maximum	Default	Units	Range	Notes
116	d8	ALARMS	HEALTH STORE	0x0000	0xFFFF	0x0000			V1 W4
118	da	RAMPS	RAMP HOLD	0	1	0		0: OFF 1: ON	V1 W0
119	db	CURRENT LOOP	I DMD. ISOLATE	0	1	0		0: DISABLED 1: ENABLED	V1 W0
120	dc	MENUS	ENTER PASSWORD	0x0000	0xFFFF	0x04D2			V0 W0
121	dd	MENUS	CHANGE PASSWORD	0x0000	0xFFFF	0x0000			V1 W0
122	de	ALARMS	HEALTH LED	0	1	0			V0 W4
125	dh	SEQUENCING	READY	0	1	0			V0 W4
126	di	MIN SPEED	MIN SPEED	0.00	100.00	0.00	%		V1 W0
127	dj	CONFIGURE DRIVE	DUMP ENABLED	0	1	0			V0 W4
128	dk	AUX I/O	ANOUT 1	-100.00	100.00	0.00	%		V0 W0
129	dl	AUX I/O	ANOUT 2	-100.00	100.00	0.00	%		V0 W0
130	dm	SYSTEM PORT (P3)	MODE	0	4	3		0: DISABLED 1: 5703 MASTER 2: 5703 SLAVE 3: EIASCII 4: EIBINARY	V0 W0
131	dn	DEADBAND	DEADBAND WIDTH	0.0	100.0	0.0	%		V0 W0
132	do	5703 IN	SETPT. RATIO	-3.0000	3.0000	0.0000			V0 W0
133	dp	5703 IN	SETPT. SIGN	0	1	1		0: NEGATIVE 1: POSITIVE	V0 W0
134	dq	LINK	16 SOURCE TAG	-1298	1298	89			V0 W2
135	dr	LINK	45 DESTINATION TAG	0	1298	41			V0 W2
137	dt	CURRENT LOOP	DISCONTINUOUS	0.00	200.00	12.00	%		V0 W0
138	du	MAIN PORT (P1)	GROUP ID (GID)	0	7	0			V0 W0
139	dv	MAIN PORT (P1)	UNIT ID (UID)	0	15	0			V0 W0
140	dw	AUX PORT (P2)	GROUP ID (GID)	0	7	0			V0 W0
141	dx	AUX PORT (P2)	UNIT ID (UID)	0	15	0			V0 W0
142	dy	MAIN PORT (P1)	PNO.7	0x0000	0xFFFF	0xFFFF			V0 W0
143	dz	AUX PORT (P2)	PNO.7	0x0000	0xFFFF	0xFFFF			V0 W0
144	e0	MAIN PORT (P1)	CHANGEBAND (BIN)	0.00	100.00	0.00	%		V0 W0
145	e1	AUX PORT (P2)	CHANGEBAND (BIN)	0.00	327.67	0.00	%		V0 W0
146	e2	MAIN PORT (P1)	ENABLED	0	1	1			V0 W0
147	e3	AUX PORT (P2)	ENABLE	0	1	1			V0 W0
148	e4	MAIN PORT (P1)	MODE	0	2	0		0: EIASCII 1: EIBINARY 2: OPTION	V0 W0
149	e5	AUX PORT (P2)	MODE	0	1	0		0: EIASCII 1: EIBINARY	V0 W0

Tag	Mn	Function Block Name	Parameter Name	Minimum	Maximum	Default	Units	Range	Notes
150	e6	MAIN PORT (P1)	BAUD RATE	0	9	5		0: 300 1: 600 2: 1200 3: 2400 4: 4800 5: 9600 6: 19200 7: 38400 8: 57600 9: 115200	V0 W0
151	e7	AUX PORT (P2)	BAUD RATE	0	9	6		0: 300 1: 600 2: 1200 3: 2400 4: 4800 5: 9600 6: 19200 7: 38400 8: 57600 9: 115200	V0 W0
152	e8	MAIN PORT (P1)	ESP SUP.(ASCII)	0	1	0		0: DISABLED 1: ENABLED	V0 W0
153	e9	AUX PORT (P2)	ESP SUP.(ASCII)	0	1	0		0: DISABLED 1: ENABLED	V0 W0
155	eb	DRIVE INFO	VERSION NUMBER	0x0000	0xFFFF	0x0000			V0 W4
158	ee	MAIN PORT (P1)	ERROR REPORT	0x0000	0xFFFF	0x00C0			V0 W0
159	ef	AUX PORT (P2)	ERROR REPORT	0x0000	0xFFFF	0x00C0			V0 W0
161	eh	SEQUENCING	AUX START	0	1	1		0: OFF 1: ON	V0 W0
162	ei	CONFIGURE DRIVE	LEGACY MODE	0x0000	0xFFFF	0x0001			V1 W2
168	eo	SEQUENCING	AUX ENABLE	0	1	1		0: OFF 1: ON	V0 W0
169	ep	FIELD CONTROL	FIELD ENABLED	0	1	0		0: DISABLED 1: ENABLED	V0 W4
170	eq	FIELD CONTROL	FIELD ENABLE	0	1	1		0: DISABLED 1: ENABLED	V0 W1
171	er	FIELD CONTROL	SETPOINT	0.00	100.00	100.00	%		V1 W0
172	es	FIELD CONTROL	INT. GAIN	0.00	100.00	1.28			V0 W0
173	et	FIELD CONTROL	PROP. GAIN	0.00	100.00	0.10			V0 W0
174	eu	FIELD CONTROL	FLD. WEAK ENABLE	0	1	0		0: DISABLED 1: STANDARD	V0 W1

Tag	Mn	Function Block Name	Parameter Name	Minimum	Maximum	Default	Units	Range	Notes
175	ev	FIELD CONTROL	EMF LEAD	0.10	50.00	2.00			V0 W0
176	ew	FIELD CONTROL	EMF LAG	0.00	200.00	40.00			V0 W0
177	ex	FIELD CONTROL	EMF GAIN	0.00	100.00	0.30			V0 W0
178	ey	FIELD CONTROL	MAX VOLTS	0.00	100.00	100.00	%		V0 W0
179	ez	FIELD CONTROL	MIN FLD.CURRENT	0.00	100.00	90.00	%		V0 W1
180	f0	ALARMS	SPDFBK ALM LEVEL	0.0	100.0	50.0	%		V1 W0
181	f1	FEEDBACKS	UNFIL.FIELD FBK	0.00	0.00	0.00	%		V0 W4
182	f2	CALIBRATION	FIELD I CAL.	0.9800	1.1000	1.0000			V0 W0
183	f3	FIELD CONTROL	FIELD DEMAND	0.00	0.00	0.00	%		V1 W4
184	f4	FIELD CONTROL	FLD.FIRING ANGLE	0.00	0.00	0.00	DEG		V1 W4
185	f5	FIELD CONTROL	FLD.QUENCH DELAY	0.0	600.0	0.0	s		V1 W0
186	f6	FIELD CONTROL	FLD. QUENCH MODE	0	1	0		0: QUENCH 1: STANDBY	V1 W0
187	f7	5703 IN	RAW INPUT	0.00	0.00	0.00	%		V0 W4
189	f9	5703 IN	SCALED INPUT	0.00	0.00	0.00	%		V0 W4
191	fb	FIELD CONTROL	BEMF FBK LEAD	10	5000	100			V0 W0
192	fc	FIELD CONTROL	BEMF FBK LAG	10	5000	100			V0 W0
195	ff	DIGITAL OUTPUT 1	THRESHOLD (>)	-300.00	300.00	0.00	%		V0 W0
196	fg	DIGITAL OUTPUT 2	THRESHOLD (>)	-300.00	300.00	0.00	%		V0 W0
197	fh	DIGITAL OUTPUT 3	THRESHOLD (>)	-300.00	300.00	0.00	%		V0 W0
198	fi	SYSTEM PORT (P3)	BAUD RATE	0	9	5		0: 300 1: 600 2: 1200 3: 2400 4: 4800 5: 9600 6: 19200 7: 38400 8: 57600 9: 115200	V0 W0
201	fl	CURRENT LOOP	REGEN ENABLE	0	1	1		0: 2Q (NON-REGEN) 1: 4Q (REGEN)	V0 W1
202	fm	SPEED LOOP	INT. DEFEAT	0	1	0		0: OFF 1: ON	V1 W0
203	fn	INVERSE TIME	INVERSE TIME O/P	0.00	0.00	0.00	%		V1 W4
206	fq	ENCODER 1	ENCODER	0	0	0	RPM		V0 W4
207	fr	FEEDBACKS	SPEED FEEDBACK	0.00	0.00	0.00	%		V0 W4
208	fs	SETPOINT SUM 1	RATIO 0	-3.0000	3.0000	1.0000			V0 W0
209	ft	FIELD CONTROL	FLD.CTRL MODE	0	1	0		0: VOLTAGE CONTROL 1: CURRENT CONTROL	V0 W1

Tag	Mn	Function Block Name	Parameter Name	Minimum	Maximum	Default	Units	Range	Notes
210	fu	FIELD CONTROL	FLD.VOLTS RATIO	0.0	100.0	90.0	%		V0 W0
212	fw	JOG/SLACK	OPERATING MODE	0	7	0		0: STOP 1: STOP 2: JOG SP. 1 3: JOG SP. 2 4: RUN 5: TAKE UP SP. 1 6: TAKE UP SP. 2 7: CRAWL	V1 W4
216	g0	STOP RATES	PROG STOP LIMIT	0.0	600.0	60.0	s		V1 W0
217	g1	STOP RATES	STOP LIMIT	0.0	600.0	60.0	s		V1 W0
218	g2	JOG/SLACK	JOG SPEED 1	-100.00	100.00	5.00	%		V0 W0
219	g3	JOG/SLACK	JOG SPEED 2	-100.00	100.00	-5.00	%		V0 W0
224	g8	ALARMS	STALL TRIP DELAY	0.1	600.0	30.0	s		V1 W0
225	g9	JOG/SLACK	CRAWL SPEED	-100.00	100.00	10.00	%		V0 W0
227	gb	SEQUENCING	AUX JOG	0	1	1		0: OFF 1: ON	V0 W0
228	gc	JOG/SLACK	MODE	0	1	0			V0 W0
230	ge	ANALOG INPUT	1 CALIBRATION	-3.0000	3.0000	1.0000			V0 W0
231	gf	ANALOG INPUT	1 MAX VALUE	-300.00	300.00	100.00	%		V0 W0
232	gg	ANALOG INPUT	1 MIN VALUE	-300.00	300.00	-100.00	%		V0 W0
233	gh	ANALOG INPUT	2 CALIBRATION	-3.0000	3.0000	1.0000			V0 W0
234	gi	ANALOG INPUT	2 MAX VALUE	-300.00	300.00	100.00	%		V0 W0
235	gj	ANALOG INPUT	2 MIN VALUE	-300.00	300.00	-100.00	%		V0 W0
236	gk	ANALOG INPUT	3 CALIBRATION	-3.0000	3.0000	1.0000			V0 W0
237	gl	ANALOG INPUT	3 MAX VALUE	-300.00	300.00	100.00	%		V0 W0
238	gm	ANALOG INPUT	3 MIN VALUE	-300.00	300.00	-100.00	%		V0 W0
239	gn	ANALOG INPUT	4 CALIBRATION	-3.0000	3.0000	1.0000			V0 W0
240	go	ANALOG INPUT	4 MAX VALUE	-300.00	300.00	200.00	%		V0 W0
241	gp	ANALOG INPUT	4 MIN VALUE	-300.00	300.00	-200.00	%		V0 W0
242	gq	ANALOG INPUT	5 CALIBRATION	-3.0000	3.0000	1.0000			V0 W0
243	gr	ANALOG INPUT	5 MAX VALUE	-300.00	300.00	200.00	%		V0 W0
244	gs	ANALOG INPUT	5 MIN VALUE	-300.00	300.00	-200.00	%		V0 W0
245	gt	ANALOG OUTPUT	1 % TO GET 10V	-300.00	300.00	100.00	%		V0 W0
246	gu	LINK	23 DESTINATION TAG	0	1298	100			V0 W2
247	gv	LINK	26 DESTINATION TAG	0	1298	301			V0 W2
248	gw	ANALOG OUTPUT	2 % TO GET 10V	-300.00	300.00	100.00	%		V0 W0
249	gx	LINK	24 DESTINATION TAG	0	1298	5			V0 W2
250	gy	LINK	25 DESTINATION TAG	0	1298	48			V0 W2
251	gz	LINK	17 SOURCE TAG	-1298	1298	62			V0 W2

Tag	Mn	Function Block Name	Parameter Name	Minimum	Maximum	Default	Units	Range	Notes
252	h0	LINK 18	SOURCE TAG	-1298	1298	63			V0 W2
253	h1	JOG/SLACK	TAKE UP 1	-100.00	100.00	5.00	%		V0 W0
254	h2	JOG/SLACK	TAKE UP 2	-100.00	100.00	-5.00	%		V0 W0
255	h3	RAISE/LOWER	RESET VALUE	-300.00	300.00	0.00	%		V0 W0
256	h4	RAISE/LOWER	INCREASE RATE	0.1	600.0	10.0	s		V0 W0
257	h5	RAISE/LOWER	DECREASE RATE	0.1	600.0	10.0	s		V0 W0
258	h6	RAISE/LOWER	MIN VALUE	-300.00	300.00	-100.00	%		V0 W0
259	h7	RAISE/LOWER	MAX VALUE	-300.00	300.00	100.00	%		V0 W0
260	h8	LINK 27	RAISE/LOWER DEST	0	1298	0			V0 W2
261	h9	RAISE/LOWER	RAISE INPUT	0	1	0			V0 W0
262	ha	RAISE/LOWER	LOWER INPUT	0	1	0			V0 W0
263	hb	ALARMS	STALL THRESHOLD	0.00	200.00	95.00	%		V1 W0
264	hc	RAISE/LOWER	RAISE/LOWER O/P	0.00	0.00	0.00	%		V0 W4
266	he	RAMPS	% S-RAMP	0.00	100.00	2.50	%		V1 W0
268	hg	SPEED LOOP	MODE	0	3	0		0: DISABLED 1: SPD FBK DEP 2: SPD ERR DEP 3: CUR DMD DEP	V0 W0
269	hh	SPEED LOOP	SPD BRK1 (LOW)	0.00	100.00	1.00	%		V0 W0
270	hi	SPEED LOOP	SPD BRK2 (HIGH)	0.00	100.00	5.00	%		V0 W0
271	hj	SPEED LOOP	PROP. GAIN	0.00	200.00	5.00			V0 W0
272	hk	SPEED LOOP	INT.TIME.CONST	0.001	30.000	0.500	s		V0 W0
274	hm	SPEED LOOP	I GAIN IN RAMP	0.0000	2.0000	1.0000			V0 W0
284	hw	SPEED LOOP	ZERO SPD. LEVEL	0.00	200.00	0.50	%		V0 W0
285	hx	SPEED LOOP	ZERO IAD LEVEL	0.00	200.00	1.50	%		V0 W0
286	hy	RAMPS	RAMPING THRESH.	0.00	100.00	0.50	%		V1 W0
287	hz	RAMPS	AUTO RESET	0	1	1		0: DISABLED 1: ENABLED	V1 W0
288	i0	RAMPS	EXTERNAL RESET	0	1	0		0: DISABLED 1: ENABLED	V1 W0
289	i1	SPEED LOOP	SETPOINT 1	-105.00	105.00	0.00	%		V0 W0
290	i2	SPEED LOOP	SETPOINT 2 (A3)	0.00	0.00	0.00	%		V0 W4
291	i3	SPEED LOOP	SETPOINT 3	-105.00	105.00	0.00	%		V0 W0
292	i4	SETPOINT SUM 1	SIGN 0	0	1	1		0: NEGATIVE 1: POSITIVE	V1 W0
293	i5	LINK 28	RAMP O/P DEST	0	1298	291			V0 W2
294	i6	LINK 29	SPT SUM 1 DEST	0	1298	289			V0 W2
297	i9	SPEED LOOP	SPEED ERROR	0.00	0.00	0.00	%		V0 W4
298	ia	FEEDBACKS	CURRENT FEEDBACK	0.00	0.00	0.00	%		V0 W4
299	ib	CURRENT LOOP	CURRENT DEMAND	0.00	0.00	0.00	%		V0 W4

Tag	Mn	Function Block Name	Parameter Name	Minimum	Maximum	Default	Units	Range	Notes
300	ic	FIELD CONTROL	FIELD I FBK.	0.00	0.00	0.00	%		V0 W4
301	id	CURRENT LOOP	POS. I CLAMP IN	-100.00	100.00	100.00	%		V0 W0
302	ie	STOP RATES	CONTACTOR DELAY	0.1	600.0	1.0	s		V1 W0
303	if	MAIN PORT (P1)	OPTION VERSION	0.00	9999.99	0.00			V0 W0
304	ig	MENUS	LANGUAGE	0	1	0		0: ENGLISH 1: ENGLISH	V1 W1
305	ih	ALARMS	TRIP RESET	0	1	1			V1 W0
306	ii	LINK	19 SOURCE TAG	-1298	1298	89			V0 W2
307	ij	RAISE/LOWER	EXTERNAL RESET	0	1	0		0: FALSE 1: TRUE	V1 W0
308	ik	FEEDBACKS	TACH INPUT	0.0	0.0	0.0	%		V0 W4
309	il	SETPOINT SUM	1 INPUT 0	-200.00	200.00	0.00	%		V1 W0
312	io	PNO CONFIG	PNO 112	-1298	1298	0			V0 W0
313	ip	PNO CONFIG	PNO 113	-1298	1298	0			V0 W0
314	iq	PNO CONFIG	PNO 114	-1298	1298	0			V0 W0
315	ir	PNO CONFIG	PNO 115	-1298	1298	0			V0 W0
316	is	PNO CONFIG	PNO 116	-1298	1298	0			V0 W0
317	it	PNO CONFIG	PNO 117	-1298	1298	0			V0 W0
318	iu	PNO CONFIG	PNO 118	-1298	1298	0			V0 W0
319	iv	PNO CONFIG	PNO 119	-1298	1298	0			V0 W0
320	iw	PNO CONFIG	PNO 120	-1298	1298	379			V0 W0
321	ix	PNO CONFIG	PNO 121	-1298	1298	380			V0 W0
322	iy	PNO CONFIG	PNO 122	-1298	1298	381			V0 W0
323	iz	PNO CONFIG	PNO 123	-1298	1298	382			V0 W0
324	j0	PNO CONFIG	PNO 124	-1298	1298	383			V0 W0
325	j1	PNO CONFIG	PNO 125	-1298	1298	384			V0 W0
326	j2	PNO CONFIG	PNO 126	-1298	1298	385			V0 W0
327	j3	PNO CONFIG	PNO 127	-1298	1298	0			V0 W0
328	j4	SYSTEM PORT (P3)	ESP SUP.(ASCII)	0	1	0		0: DISABLED 1: ENABLED	V0 W0
329	j5	SYSTEM PORT (P3)	GROUP ID (GID)	0	7	0			V0 W0
330	j6	SYSTEM PORT (P3)	UNIT ID (UID)	0	15	0			V0 W0
331	j7	SYSTEM PORT (P3)	CHANGEBAND (BIN)	0.00	100.00	0.00	%		V0 W0
332	j8	SYSTEM PORT (P3)	ERROR REPORT	0x0000	0xFFFF	0x00C0			V0 W0
333	j9	SYSTEM PORT (P3)	PNO.7	0x0000	0xFFFF	0xFFFF			V0 W0
334	ja	MAIN PORT (P1)	PARITY	0	1	0		0: EVEN 1: ODD	V0 W0
337	jd	ALARMS	THERMISTOR STATE	0	1	0			V0 W4
338	je	ALARMS	P3 RX TIMEOUT	0	1	0			V0 W4
339	jf	miniLINK	VALUE 1	-300.00	300.00	0.00	%		V1 W0

Tag	Mn	Function Block Name	Parameter Name	Minimum	Maximum	Default	Units	Range	Notes
340	jg	miniLINK	VALUE 2	-300.00	300.00	0.00	%		V1 W0
341	jh	miniLINK	VALUE 3	-300.00	300.00	0.00	%		V1 W0
342	ji	miniLINK	VALUE 4	-300.00	300.00	0.00	%		V1 W0
343	jj	miniLINK	VALUE 5	-300.00	300.00	0.00	%		V1 W0
344	jk	miniLINK	VALUE 6	-300.00	300.00	0.00	%		V1 W0
345	jl	miniLINK	VALUE 7	-300.00	300.00	0.00	%		V1 W0
346	jm	miniLINK	LOGIC 1	0	1	0		0: OFF 1: ON	V1 W0
347	jn	miniLINK	LOGIC 2	0	1	0		0: OFF 1: ON	V1 W0
348	jo	miniLINK	LOGIC 3	0	1	0		0: OFF 1: ON	V1 W0
349	jp	miniLINK	LOGIC 4	0	1	0		0: OFF 1: ON	V1 W0
350	jq	miniLINK	LOGIC 5	0	1	0		0: OFF 1: ON	V1 W0
351	jr	miniLINK	LOGIC 6	0	1	0		0: OFF 1: ON	V1 W0
352	js	miniLINK	LOGIC 7	0	1	0		0: OFF 1: ON	V1 W0
353	jt	miniLINK	LOGIC 8	0	1	0		0: OFF 1: ON	V1 W0
355	jv	JOG/SLACK	RAMP RATE	0.1	600.0	1.0	s		V0 W0
357	jx	SPEED LOOP	MAX DEMAND	0.00	105.00	105.00	%		V0 W0
358	yy	SPEED LOOP	MIN DEMAND	-105.00	0.00	-105.00	%		V0 W0
359	jz	DIGITAL OUTPUT	1 INVERTED	0	1	0			V0 W0
360	k0	DIGITAL OUTPUT	2 INVERTED	0	1	0			V0 W0
361	k1	DIGITAL OUTPUT	3 INVERTED	0	1	0			V0 W0
362	k2	ANALOG OUTPUT	1 MODULUS	0	1	0			V0 W0
363	k3	ANALOG OUTPUT	2 MODULUS	0	1	0			V0 W0
364	k4	LINK	1 SOURCE TAG	-1298	1298	0			V0 W2
365	k5	LINK	1 DESTINATION TAG	0	1298	0			V0 W2
366	k6	LINK	2 SOURCE TAG	-1298	1298	0			V0 W2
367	k7	LINK	2 DESTINATION TAG	0	1298	0			V0 W2
368	k8	LINK	3 SOURCE TAG	-1298	1298	0			V0 W2
369	k9	LINK	3 DESTINATION TAG	0	1298	0			V0 W2
370	ka	LINK	4 SOURCE TAG	-1298	1298	0			V0 W2
371	kb	LINK	4 DESTINATION TAG	0	1298	0			V0 W2
374	ke	SEQUENCING	SYSTEM RESET	0	1	0			V0 W4
375	kf	SETPOINT SUM	1 LIMIT	0.00	200.00	105.00	%		V0 W0

Tag	Mn	Function Block Name	Parameter Name	Minimum	Maximum	Default	Units	Range	Notes
376	kg	SEQUENCING	DRIVE RUNNING	0	1	0			V0 W4
379	kj	miniLINK	VALUE 8	-300.00	300.00	0.00	%		V1 W0
380	kk	miniLINK	VALUE 9	-300.00	300.00	0.00	%		V1 W0
381	kl	miniLINK	VALUE 10	-300.00	300.00	0.00	%		V1 W0
382	km	miniLINK	VALUE 11	-300.00	300.00	0.00	%		V1 W0
383	kn	miniLINK	VALUE 12	-300.00	300.00	0.00	%		V1 W0
384	ko	miniLINK	VALUE 13	-300.00	300.00	0.00	%		V1 W0
385	kp	miniLINK	VALUE 14	-300.00	300.00	0.00	%		V1 W0
390	ku	LINK	11 SOURCE TAG	-1298	1298	0			V0 W2
391	LINK	43 DESTINATION TAG	0	1298	0			V0 W2	
392	kw	ADVANCED	1 ADVANCED	0	1	0		0: OFF 1: ON	V0 W0
393	kx	ADVANCED	1 MODE	0	6	0		0: SWITCH 1: INVERT 2: AND 3: OR 4: SIGN CHANGER 5: MODULUS 6: COMPARATOR	V0 W0
394	ky	LINK	41 AUX.SOURCE	-1298	1298	0			V0 W2
395	kz	LINK	12 SOURCE TAG	-1298	1298	0			V0 W2
396	l0	LINK	44 DESTINATION TAG	0	1298	0			V0 W2
397	l1	ADVANCED	2 ADVANCED	0	1	0		0: OFF 1: ON	V0 W0
398	l2	ADVANCED	2 MODE	0	6	0		0: SWITCH 1: INVERT 2: AND 3: OR 4: SIGN CHANGER 5: MODULUS 6: COMPARATOR	V0 W0
399	l3	LINK	42 AUX.SOURCE	-1298	1298	0			V0 W2
400	l4	LINK	30 PID O/P DEST	0	1298	0			V0 W2
401	l5	PID	DERIVATIVE TC	0.000	10.000	0.000	s		V1 W0
402	l6	PID	INT.TIME.CONST	0.01	100.00	5.00	s		V1 W0
403	l7	PID	FILTER T.C.	0.000	10.000	0.100	s		V1 W0
404	l8	PROFILED GAIN	PROFILE P GAIN	0.0	100.0	1.0			V1 W0
405	l9	PID	POSITIVE LIMIT	0.00	105.00	100.00	%		V1 W0
406	la	PID	NEGATIVE LIMIT	-105.00	0.00	-100.00	%		V1 W0
407	lb	PID	O/P SCALER(TRIM)	-3.0000	3.0000	0.2000			V1 W0



Tag	Mn	Function Block Name	Parameter Name	Minimum	Maximum	Default	Units	Range	Notes
408	lc	PID	ENABLE	0	1	1		0: DISABLED 1: ENABLED	V1 W0
409	ld	PID	INT. DEFEAT	0	1	0		0: OFF 1: ON	V1 W0
410	le	PID	INPUT 1	-300.00	300.00	0.00	%		V1 W0
411	lf	PID	INPUT 2	-300.00	300.00	0.00	%		V1 W0
412	lg	PID	RATIO 1	-3.0000	3.0000	1.0000			V1 W0
413	lh	PID	RATIO 2	-3.0000	3.0000	1.0000			V1 W0
414	li	PID	DIVIDER 2	-3.0000	3.0000	1.0000			V1 W0
415	lj	PID	PID ERROR	0.00	0.00	0.00	%		V1 W4
416	lk	PID	PID CLAMPED	0	1	0			V1 W4
417	ll	PID	PID OUTPUT	0.00	0.00	0.00	%		V1 W4
418	lm	PID	DIVIDER 1	-3.0000	3.0000	1.0000			V1 W0
419	ln	SETPOINT SUM	1 DIVIDER 1	-3.0000	3.0000	1.0000			V1 W0
420	lo	SETPOINT SUM	1 DIVIDER 0	-3.0000	3.0000	1.0000			V0 W0
421	lp	CURRENT LOOP	MAIN CURR. LIMIT	0.00	200.00	110.00	%		V0 W0
422	lq	RAMPS	RESET VALUE	-300.00	300.00	0.00	%		V1 W0
423	lr	SETPOINT SUM	1 INPUT 2	-200.00	200.00	0.00	%		V1 W0
424	ls	DIAMETER CALC.	LINE SPEED	-105.00	105.00	0.00	%		V1 W0
425	lt	DIAMETER CALC.	MIN DIAMETER	0.00	100.00	10.00	%		V1 W0
426	lu	DIAMETER CALC.	MIN SPEED	0.00	100.00	5.00	%		V1 W0
427	lv	DIAMETER CALC.	DIAMETER	0.00	0.00	0.00	%		V1 W4
428	lw	DIAMETER CALC.	MOD OF LINE SPD	0.00	0.00	0.00	%		V0 W4
429	lx	DIAMETER CALC.	MOD OF REEL SPD	0.00	0.00	0.00	%		V0 W4
430	ly	DIAMETER CALC.	UNFILT DIAMETER	0.00	0.00	0.00	%		V0 W4
431	lz	LINK	31 DIAMETER	0	1298	0			V0 W2
432	m0	TORQUE CALC.	TORQUE DEMAND	-200.00	200.00	0.00	%		V1 W0
433	m1	TORQUE CALC.	TENSION ENABLE	0	1	1		0: DISABLED 1: ENABLED	V1 W0
434	m2	TORQUE CALC.	OVER WIND	0	1	1		0: DISABLED 1: ENABLED	V1 W0
435	m3	LINK	32 POS. I CLAMP	0	1298	0			V0 W2
436	m4	LINK	33 NEG. I CLAMP	0	1298	0			V0 W2
437	m5	DIAMETER CALC.	REEL SPEED	-105.00	105.00	0.00	%		V1 W0
438	m6	DIAMETER CALC.	TAPER	-100.00	100.00	0.00	%		V1 W0
439	m7	DIAMETER CALC.	TENSION SPT.	0.00	100.00	0.00	%		V1 W0
440	m8	DIAMETER CALC.	TENSION TRIM	-100.00	100.00	0.00	%		V1 W0
441	m9	DIAMETER CALC.	TOT.TENS.DEMAND	0.00	0.00	0.00	%		V1 W4
442	ma	LINK	34 TAPER	0	1298	0			V0 W2
443	mb	SETPOINT SUM	2 INPUT 1	-300.00	300.00	0.00	%		V1 W0

Tag	Mn	Function Block Name	Parameter Name	Minimum	Maximum	Default	Units	Range	Notes
444	mc	SETPOINT SUM	2 INPUT 0	-300.00	300.00	0.00	%		V1 W0
445	md	SETPOINT SUM	2 INPUT 2	-300.00	300.00	0.00	%		V1 W0
446	me	SETPOINT SUM	2 RATIO 1	-3.0000	3.0000	1.0000			V0 W0
447	mf	SETPOINT SUM	2 RATIO 0	-3.0000	3.0000	1.0000			V0 W0
448	mg	SETPOINT SUM	2 DIVIDER 0	-3.0000	3.0000	1.0000			V0 W0
449	mh	SETPOINT SUM	2 LIMIT	0.00	200.00	105.00	%		V0 W0
450	mi	LINK	35 SETPOINT SUM 2	0	1298	0			V0 W2
451	mj	SETPOINT SUM	2 SPT SUM OUTPUT	0.00	0.00	0.00	%		V1 W4
452	mk	DIAMETER CALC.	TAPERED DEMAND	0.00	0.00	0.00	%		V1 W4
453	ml	DIAMETER CALC.	RAMP RATE	0.1	600.0	5.0	s		V1 W0
454	mm	LINK	5 SOURCE TAG	-1298	1298	0			V0 W2
455	mn	LINK	5 DESTINATION TAG	0	1298	0			V0 W2
456	mo	LINK	6 SOURCE TAG	-1298	1298	0			V0 W2
457	mp	LINK	6 DESTINATION TAG	0	1298	0			V0 W2
458	mq	LINK	7 SOURCE TAG	-1298	1298	0			V0 W2
459	mr	LINK	7 DESTINATION TAG	0	1298	0			V0 W2
460	ms	LINK	8 SOURCE TAG	-1298	1298	0			V0 W2
461	mt	LINK	8 DESTINATION TAG	0	1298	0			V0 W2
462	mu	DIAMETER CALC.	RESET VALUE	0.00	100.00	10.00	%		V1 W0
463	mv	DIAMETER CALC.	EXTERNAL RESET	0	1	0		0: DISABLED 1: ENABLED	V1 W0
464	mw	ANALOG OUTPUT	1 OFFSET	-100.00	100.00	0.00	%		V0 W0
465	mx	ANALOG OUTPUT	2 OFFSET	-100.00	100.00	0.00	%		V0 W0
466	my	SETPOINT SUM	2 DIVIDER 1	-3.0000	3.0000	1.0000			V1 W0
467	mz	LINK	9 SOURCE TAG	-1298	1298	0			V0 W2
468	n0	LINK	9 DESTINATION TAG	0	1298	0			V0 W2
469	n1	LINK	10 SOURCE TAG	-1298	1298	0			V0 W2
470	n2	LINK	10 DESTINATION TAG	0	1298	0			V0 W2
472	n4	ALARMS	SPEED FBK STATE	0	1	0			V0 W4
473	n5	PROFIED GAIN	MODE	0	4	0			V1 W0
474	n6	PROFIED GAIN	MIN PROFILE GAIN	0.00	100.00	20.00	%		V1 W0
475	n7	PROFIED GAIN	PROFIED GAIN	0.0	0.0	0.0			V1 W4
478	na	LINK	36 TENS+COMP CALC.	0	1298	0			V0 W2
479	nb	DIAMETER CALC.	FIX.INERTIA COMP	-300.00	300.00	0.00	%		V1 W0
480	nc	DIAMETER CALC.	VAR.INERTIA COMP	-300.00	300.00	0.00	%		V1 W0
481	nd	DIAMETER CALC.	ROLL WIDTH/MASS	0.00	100.00	100.00	%		V1 W0
482	ne	DIAMETER CALC.	FILTER T.C.	0	20000	10			V1 W0
483	nf	DIAMETER CALC.	RATE CAL	-100.00	100.00	10.00			V1 W0
484	ng	DIAMETER CALC.	NORMALISED dv/dt	-300.00	300.00	0.00	%		V1 W0
485	nh	DIAMETER CALC.	INERTIA COMP O/P	0.00	0.00	0.00	%		V1 W4

Tag	Mn	Function Block Name	Parameter Name	Minimum	Maximum	Default	Units	Range	Notes
486	ni	DIAMETER CALC.	TENSION SCALER	-3.0000	3.0000	1.0000			V1 W0
487	nj	DIAMETER CALC.	STATIC COMP	-300.00	300.00	0.00	%		V0 W0
488	nk	DIAMETER CALC.	DYNAMIC COMP	-300.00	300.00	0.00	%		V0 W0
489	nl	DIAMETER CALC.	REWIND	0	1	1		0: DISABLED 1: ENABLED	V0 W0
491	nn	SETPOINT SUM 2	STPT SUM 2 OUT 0	0.00	0.00	0.00	%		V0 W4
492	no	SETPOINT SUM 2	STPT SUM 2 OUT 1	0.00	0.00	0.00	%		V0 W4
493	np	ANALOG INPUT 2	OUTPUT	0.00	0.00	0.00	%		V0 W4
494	nq	LINK 37	DESTINATION TAG	0	1298	496			V0 W2
495	nr	LINK 38	DESTINATION TAG	0	1298	497			V0 W2
496	ns	SEQUENCING	JOG/SLACK	0	1	0		0: OFF 1: ON	V0 W0
497	nt	SEQUENCING	ENABLE	0	1	0		0: OFF 1: ON	V0 W0
498	nu	DIAMETER CALC.	LINE SPEED SPT	-105.00	105.00	0.00	%		V0 W0
499	nv	MAIN PORT (P1)	OPTION ADDRESS	0	32767	0			V0 W0
525	ol	SEQUENCING	COAST STOP	0	1	0			V0 W4
527	on	CURRENT LOOP	MASTER BRIDGE	0	1	0			V0 W4
528	oo	ALARMS	LAST ALARM	0x0000	0xFFFF	0x0000			V0 W4
535	ov	SEQUENCING	REM.SEQ.ENABLE	0	1	0			V0 W1
536	ow	SEQUENCING	REM.SEQUENCE	0x0000	0xFFFF	0x8000			V1 W0
537	ox	SEQUENCING	SEQ STATUS	0x0000	0xFFFF	0x0000			V0 W4
540	p0	ALARMS	REM TRIP INHIBIT	0	1	0		0: ENABLED 1: INHIBITED	V0 W0
541	p1	ALARMS	REM TRIP DELAY	0.1	600.0	10.0	s		V0 W0
542	p2	ALARMS	REMOTE TRIP	0	1	0			V0 W4
547	p7	SPEED LOOP	SPD.FBK.FILTER	0.000	1.000	0.000			V0 W0
549	p9	SPEED LOOP	SPEED LOOP O/P	0.00	0.00	0.00	%		V0 W4
556	pg	INERTIA COMP	INERTIA	0.00	200.00	0.00			V0 W0
557	ph	INERTIA COMP	FILTER	0	20000	0			V0 W0
558	pi	INERTIA COMP	RATE CAL	0.00	200.00	100.00			V0 W0
559	pj	PRESET SPEEDS	MAX SPEED	0.1	3000.0	100.0	%		V0 W0
560	pk	PRESET SPEEDS	SELECT 1	0	1	0			V0 W0
561	pl	PRESET SPEEDS	SELECT 2	0	1	0			V0 W0
562	pm	PRESET SPEEDS	SELECT 3	0	1	0			V0 W0
563	pn	PRESET SPEEDS	INVERT O/P	0	1	0			V0 W0
564	po	PRESET SPEEDS	INPUT 0	-3000.0	3000.0	0.0			V0 W0
565	pp	PRESET SPEEDS	INPUT 1	-3000.0	3000.0	0.0			V0 W0
566	pq	PRESET SPEEDS	INPUT 2	-3000.0	3000.0	0.0			V0 W0
567	pr	PRESET SPEEDS	INPUT 3	-3000.0	3000.0	0.0			V0 W0

Tag	Mn	Function Block Name	Parameter Name	Minimum	Maximum	Default	Units	Range	Notes
568	ps	PRESET SPEEDS	INPUT 4	-3000.0	3000.0	0.0			V0 W0
569	pt	PRESET SPEEDS	INPUT 5	-3000.0	3000.0	0.0			V0 W0
570	pu	PRESET SPEEDS	INPUT 6	-3000.0	3000.0	0.0			V0 W0
571	pv	PRESET SPEEDS	INPUT 7	-3000.0	3000.0	0.0			V0 W0
572	pw	PRESET SPEEDS	PRESET O/P	0.00	0.00	0.00	%		V0 W4
573	px	LINK 39	PRESET DEST	0	1298	0			V0 W2
574	py	SRAMP	INPUT	-100.00	100.00	0.00	%		V0 W0
575	pz	SRAMP	RATE SELECT	0	1	0			V0 W0
576	q0	SRAMP	ACCEL 0	0.00	100.00	60.00	%		V0 W0
577	q1	SRAMP	DECEL 0	0.00	100.00	60.00	%		V0 W0
578	q2	SRAMP	ACCEL 0 JERK 1	0.00	100.00	20.00	%		V0 W0
579	q3	SRAMP	ACCEL 1	0.00	100.00	30.00	%		V0 W0
580	q4	SRAMP	DECEL 1	0.00	100.00	30.00	%		V0 W0
581	q5	SRAMP	ACCEL 1 JERK 1	0.00	100.00	20.00	%		V0 W0
582	q6	SRAMP	AUTO RESET	0	1	1			V0 W0
583	q7	SRAMP	EXTERNAL RESET	0	1	0			V0 W0
584	q8	SRAMP	RESET VALUE	-100.00	100.00	0.00	%		V0 W0
585	q9	SRAMP	QUENCH	0	1	0			V0 W0
586	qa	SRAMP	AT SPEED LEVEL	0.00	100.00	1.00	%		V0 W0
587	qb	SRAMP	AT SPEED	0	1	0			V0 W4
588	qc	SRAMP	ACCEL OUTPUT	0.00	0.00	0.00	%		V0 W4
589	qd	SRAMP	SRAMP OUTPUT	0.00	0.00	0.00	%		V0 W4
590	qe	LINK 40	SRAMP DEST	0	1298	0			V0 W2
593	qh	PRESET SPEEDS	OUTPUT FPM	0.0	0.0	0.0			V0 W4
594	qi	STOP RATES	CURR DECAY RATE	0.00	200.00	0.00			V0 W0
595	qj	SPEED LOOP	PRESET TORQUE	-250.00	250.00	0.00	%		V0 W0
596	qk	SRAMP	DECEL 0 JERK 1	0.00	100.00	20.00	%		V0 W0
597	ql	SRAMP	DECEL 1 JERK 1	0.00	100.00	20.00	%		V0 W0
600	qo	PRESET SPEEDS	LIMIT	0	1	0			V0 W0
601	qp	INERTIA COMP	DELTA	0.00	0.00	0.00	%		V0 W4
602	qq	INERTIA COMP	INERTIA COMP O/P	0.00	0.00	0.00	%		V0 W4
603	qr	INERTIA COMP	UNSCALED OUTPUT	0.00	0.00	0.00	%		V0 W4
604	qs	SPEED LOOP	PRESET T SCALE	-200.00	200.00	100.00	%		V0 W0
609	qx	AUTOTUNE	METHOD	0	1	0		0: 4Q MULTI 1: 2Q MULTI	V1 W1
610	qy	PRESET SPEEDS	GRAY SCALE	0	1	0			V0 W0
611	qz	SRAMP	ACCEL 0 JERK 2	0.00	100.00	20.00	%		V0 W0
612	r0	SRAMP	ACCEL 1 JERK 2	0.00	100.00	20.00	%		V0 W0
613	r1	SRAMP	DECEL 0 JERK 2	0.00	100.00	20.00	%		V0 W0
614	r2	SRAMP	DECEL 1 JERK 2	0.00	100.00	20.00	%		V0 W0

Tag	Mn	Function Block Name	Parameter Name	Minimum	Maximum	Default	Units	Range	Notes
617	r5	FIELD CONTROL	FIELD I THRESH	0.00	100.00	80.00	%		V0 W0
618	r6	FIELD CONTROL	UP TO FIELD	0	1	0			V0 W4
620	r8	RAMPS	INVERT	0	1	0			V0 W0
629	rh	LINK	13 DESTINATION TAG	0	1298	683			V0 W2
630	ri	LINK	14 DESTINATION TAG	0	1298	684			V0 W2
631	rj	LINK	15 DESTINATION TAG	0	1298	685			V0 W2
632	rk	LINK	17 DESTINATION TAG	0	1298	678			V0 W2
633	rl	LINK	18 DESTINATION TAG	0	1298	679			V0 W2
634	rm	LINK	19 DESTINATION TAG	0	1298	699			V0 W2
635	rn	LINK	20 SOURCE TAG	-1298	1298	680			V0 W2
636	ro	LINK	21 SOURCE TAG	-1298	1298	681			V0 W2
637	rp	LINK	22 SOURCE TAG	-1298	1298	682			V0 W2
638	rq	LINK	23 SOURCE TAG	-1298	1298	674			V0 W2
639	rr	LINK	24 SOURCE TAG	-1298	1298	675			V0 W2
640	rs	LINK	25 SOURCE TAG	-1298	1298	676			V0 W2
641	rt	LINK	26 SOURCE TAG	-1298	1298	677			V0 W2
642	ru	LINK	27 SOURCE TAG	-1298	1298	264			V0 W2
643	rv	LINK	28 SOURCE TAG	-1298	1298	85			V0 W2
644	rw	LINK	29 SOURCE TAG	-1298	1298	86			V0 W2
645	rx	LINK	30 SOURCE TAG	-1298	1298	417			V0 W2
646	ry	LINK	31 SOURCE TAG	-1298	1298	427			V0 W2
647	rz	LINK	32 SOURCE TAG	-1298	1298	707			V0 W2
648	s0	LINK	33 SOURCE TAG	-1298	1298	708			V0 W2
649	s1	LINK	34 SOURCE TAG	-1298	1298	441			V0 W2
650	s2	LINK	35 SOURCE TAG	-1298	1298	451			V0 W2
651	s3	LINK	36 SOURCE TAG	-1298	1298	706			V0 W2
652	s4	LINK	37 SOURCE TAG	-1298	1298	69			V0 W2
653	s5	LINK	38 SOURCE TAG	-1298	1298	70			V0 W2
654	s6	LINK	39 SOURCE TAG	-1298	1298	572			V0 W2
655	s7	LINK	40 SOURCE TAG	-1298	1298	589			V0 W2
656	s8	LINK	41 DESTINATION TAG	0	1298	687			V0 W2
657	s9	LINK	42 DESTINATION TAG	0	1298	689			V0 W2
658	sa	LINK	43 SOURCE TAG	-1298	1298	712			V0 W2
660	sc	LINK	44 SOURCE TAG	-1298	1298	713			V0 W2
662	se	LINK	45 SOURCE TAG	-1298	1298	189			V0 W2
664	sg	LINK	46 SOURCE TAG	-1298	1298	700			V0 W2
665	sh	LINK	46 DESTINATION TAG	0	1298	701			V0 W2
666	si	LINK	47 SOURCE TAG	-1298	1298	427			V0 W2
667	sj	LINK	47 DESTINATION TAG	0	1298	709			V0 W2
668	sk	LINK	48 SOURCE TAG	-1298	1298	425			V0 W2

Tag	Mn	Function Block Name	Parameter Name	Minimum	Maximum	Default	Units	Range	Notes
669	sl	LINK 48	DESTINATION TAG	0	1298	710			V0 W2
670	sm	LINK 49	SOURCE TAG	-1298	1298	691			V0 W2
671	sn	LINK 49	DESTINATION TAG	0	1298	697			V0 W2
672	so	LINK 50	SOURCE TAG	-1298	1298	475			V0 W2
673	sp	LINK 50	DESTINATION TAG	0	1298	711			V0 W2
674	sq	ANALOG INPUT 1	OUTPUT	0.00	0.00	0.00	%		V0 W4
675	sr	ANALOG INPUT 3	OUTPUT	0.00	0.00	0.00	%		V0 W4
676	ss	ANALOG INPUT 4	OUTPUT	0.00	0.00	0.00	%		V0 W4
677	st	ANALOG INPUT 5	OUTPUT	0.00	0.00	0.00	%		V0 W4
678	su	ANALOG OUTPUT 1	INPUT	-300.00	300.00	0.00	%		V0 W0
679	sv	ANALOG OUTPUT 2	INPUT	-300.00	300.00	0.00	%		V0 W0
680	sw	DIGITAL INPUT 1	OUTPUT	0.00	0.00	0.00	%		V0 W4
681	sx	DIGITAL INPUT 2	OUTPUT	0.00	0.00	0.00	%		V0 W4
682	sy	DIGITAL INPUT 3	OUTPUT	0.00	0.00	0.00	%		V0 W4
683	sz	DIGITAL OUTPUT 1	INPUT	-300.00	300.00	0.00	%		V0 W0
684	t0	DIGITAL OUTPUT 2	INPUT	-300.00	300.00	0.00	%		V0 W0
685	t1	DIGITAL OUTPUT 3	INPUT	-300.00	300.00	0.00	%		V0 W0
686	t2	ADVANCED 1	INPUT 1	-32768.00	32768.00	0.00			V0 W0
687	t3	ADVANCED 1	INPUT 2	-32768.00	32768.00	0.00			V0 W0
688	t4	ADVANCED 2	INPUT 1	-32768.00	32768.00	0.00			V0 W0
689	t5	ADVANCED 2	INPUT 2	-32768.00	32768.00	0.00			V0 W0
691	t7	MIN SPEED	OUTPUT	0.00	0.00	0.00	%		V1 W4
695	tb	MAIN PORT (P1)	REPLY DELAY	0	255	1	ms		V0 W0
696	tc	AUX PORT (P2)	REPLY DELAY	0	255	2	ms		V0 W0
697	td	RAMPS	RAMP INPUT	-105.00	105.00	0.00	%		V1 W0
698	te	JOG/SLACK	JOG/SLACK	0.00	0.00	0.00	%		V1 W4
699	tf	STANDSTILL	INPUT	-300.00	300.00	0.00	%		V0 W0
700	tg	DEADBAND	OUTPUT	0.00	0.00	0.00	%		V1 W4
701	th	SETPOINT SUM 1	INPUT 1	-300.00	300.00	0.00	%		V1 W0
702	ti	SETPOINT SUM 1	OUTPUT 1	0.00	0.00	0.00	%		V0 W4
703	tj	SETPOINT SUM 1	OUTPUT 0	0.00	0.00	0.00	%		V0 W4
704	tk	SETPOINT SUM 2	SIGN 1	0	1	1		0: NEGATIVE 1: POSITIVE	V1 W0
705	tl	SETPOINT SUM 2	SIGN 0	0	1	1		0: NEGATIVE 1: POSITIVE	V1 W0
706	tm	DIAMETER CALC.	OUTPUT	0.00	0.00	0.00	%		V1 W4
707	tn	TORQUE CALC.	POS. I CLAMP	0.00	0.00	0.00	%		V0 W4
708	to	TORQUE CALC.	NEG. I CLAMP	0.00	0.00	0.00	%		V0 W4
709	tp	PROFILED GAIN	DIAMETER	0.00	100.00	10.00	%		V1 W0
710	tq	PROFILED GAIN	MIN DIAMETER	0.00	100.00	10.00	%		V1 W0

Tag	Mn	Function Block Name	Parameter Name	Minimum	Maximum	Default	Units	Range	Notes
711	tr	PID	PID PROP GAIN	0.0	100.0	1.0			V1 W0
712	ts	ADVANCED 1	OUTPUT	0.00	0.00	0.00			V0 W4
713	tt	ADVANCED 2	OUTPUT	0.00	0.00	0.00			V0 W4
714	tu	5703 OUT	INPUT	-300.00	300.00	0.00	%		V0 W0
720	u0	LINK 51	SOURCE TAG	-1298	1298	0			V0 W2
721	u1	LINK 51	DESTINATION TAG	0	1298	0			V0 W2
722	u2	LINK 52	SOURCE TAG	-1298	1298	0			V0 W2
723	u3	LINK 52	DESTINATION TAG	0	1298	0			V0 W2
724	u4	LINK 53	SOURCE TAG	-1298	1298	0			V0 W2
725	u5	LINK 53	DESTINATION TAG	0	1298	0			V0 W2
726	u6	LINK 54	SOURCE TAG	-1298	1298	0			V0 W2
727	u7	LINK 54	DESTINATION TAG	0	1298	0			V0 W2
728	u8	LINK 55	SOURCE TAG	-1298	1298	0			V0 W2
729	u9	LINK 55	DESTINATION TAG	0	1298	0			V0 W2
730	ua	LINK 56	SOURCE TAG	-1298	1298	0			V0 W2
731	ub	LINK 56	DESTINATION TAG	0	1298	0			V0 W2
732	uc	LINK 57	SOURCE TAG	-1298	1298	0			V0 W2
733	ud	LINK 57	DESTINATION TAG	0	1298	0			V0 W2
734	ue	LINK 58	SOURCE TAG	-1298	1298	0			V0 W2
735	uf	LINK 58	DESTINATION TAG	0	1298	0			V0 W2
736	ug	LINK 59	SOURCE TAG	-1298	1298	0			V0 W2
737	uh	LINK 59	DESTINATION TAG	0	1298	0			V0 W2
738	ui	LINK 60	SOURCE TAG	-1298	1298	0			V0 W2
739	uj	LINK 60	DESTINATION TAG	0	1298	0			V0 W2
740	uk	LINK 61	SOURCE TAG	-1298	1298	0			V0 W2
741	ul	LINK 61	DESTINATION TAG	0	1298	0			V0 W2
742	um	LINK 62	SOURCE TAG	-1298	1298	0			V0 W2
743	un	LINK 62	DESTINATION TAG	0	1298	0			V0 W2
744	uo	LINK 63	SOURCE TAG	-1298	1298	0			V0 W2
745	up	LINK 63	DESTINATION TAG	0	1298	0			V0 W2
746	uq	LINK 64	SOURCE TAG	-1298	1298	0			V0 W2
747	ur	LINK 64	DESTINATION TAG	0	1298	0			V0 W2
748	us	LINK 65	SOURCE TAG	-1298	1298	0			V0 W2
749	ut	LINK 65	DESTINATION TAG	0	1298	0			V0 W2
750	uu	LINK 66	SOURCE TAG	-1298	1298	0			V0 W2
751	uv	LINK 66	DESTINATION TAG	0	1298	0			V0 W2
752	uw	LINK 67	SOURCE TAG	-1298	1298	0			V0 W2
753	ux	LINK 67	DESTINATION TAG	0	1298	0			V0 W2
754	uy	LINK 68	SOURCE TAG	-1298	1298	0			V0 W2
755	uz	LINK 68	DESTINATION TAG	0	1298	0			V0 W2

Tag	Mn	Function Block Name	Parameter Name	Minimum	Maximum	Default	Units	Range	Notes
756	v0	LINK	69 SOURCE TAG	-1298	1298	0			V0 W2
757	v1	LINK	69 DESTINATION TAG	0	1298	0			V0 W2
758	v2	LINK	70 SOURCE TAG	-1298	1298	0			V0 W2
759	v3	LINK	70 DESTINATION TAG	0	1298	0			V0 W2
760	v4	LINK	71 SOURCE TAG	-1298	1298	0			V0 W2
761	v5	LINK	71 DESTINATION TAG	0	1298	0			V0 W2
762	v6	LINK	72 SOURCE TAG	-1298	1298	0			V0 W2
763	v7	LINK	72 DESTINATION TAG	0	1298	0			V0 W2
764	v8	LINK	73 SOURCE TAG	-1298	1298	0			V0 W2
765	v9	LINK	73 DESTINATION TAG	0	1298	0			V0 W2
766	va	LINK	74 SOURCE TAG	-1298	1298	0			V0 W2
767	vb	LINK	74 DESTINATION TAG	0	1298	0			V0 W2
768	vc	LINK	75 SOURCE TAG	-1298	1298	0			V0 W2
769	vd	LINK	75 DESTINATION TAG	0	1298	0			V0 W2
770	ve	LINK	76 SOURCE TAG	-1298	1298	0			V0 W2
771	vf	LINK	76 DESTINATION TAG	0	1298	0			V0 W2
772	vg	LINK	77 SOURCE TAG	-1298	1298	0			V0 W2
773	vh	LINK	77 DESTINATION TAG	0	1298	0			V0 W2
774	vi	LINK	78 SOURCE TAG	-1298	1298	0			V0 W2
775	vj	LINK	78 DESTINATION TAG	0	1298	0			V0 W2
776	vk	LINK	79 SOURCE TAG	-1298	1298	0			V0 W2
777	vl	LINK	79 DESTINATION TAG	0	1298	0			V0 W2
778	vm	LINK	80 SOURCE TAG	-1298	1298	0			V0 W2
779	vn	LINK	80 DESTINATION TAG	0	1298	0			V0 W2
880	yg	DEMULTIPLEXER	OUTPUT 0	0	1	0			V0 W4
881	yh	DEMULTIPLEXER	OUTPUT 1	0	1	0			V0 W4
882	yi	DEMULTIPLEXER	OUTPUT 2	0	1	0			V0 W4
883	yj	DEMULTIPLEXER	OUTPUT 3	0	1	0			V0 W4
884	yk	DEMULTIPLEXER	OUTPUT 4	0	1	0			V0 W4
885	yl	DEMULTIPLEXER	OUTPUT 5	0	1	0			V0 W4
886	ym	DEMULTIPLEXER	OUTPUT 6	0	1	0			V0 W4
887	yn	DEMULTIPLEXER	OUTPUT 7	0	1	0			V0 W4
888	yo	DEMULTIPLEXER	OUTPUT 8	0	1	0			V0 W4
889	yp	DEMULTIPLEXER	OUTPUT 9	0	1	0			V0 W4
890	yq	DEMULTIPLEXER	OUTPUT 10	0	1	0			V0 W4
891	yr	DEMULTIPLEXER	OUTPUT 11	0	1	0			V0 W4
892	ys	DEMULTIPLEXER	OUTPUT 12	0	1	0			V0 W4
893	yt	DEMULTIPLEXER	OUTPUT 13	0	1	0			V0 W4
894	yu	DEMULTIPLEXER	OUTPUT 14	0	1	0			V0 W4
895	yv	DEMULTIPLEXER	OUTPUT 15	0	1	0			V0 W4



Tag	Mn	Function Block Name	Parameter Name	Minimum	Maximum	Default	Units	Range	Notes
896	yw	DEMULPLEXER	INPUT	0x0000	0xFFFF	0x0000			V0 W0
897	yx	5703 OUT	DELAY	0	1000	0	ms		V0 W0
1128	hK	MULTIPLEXER	OUTPUT	0x0000	0xFFFF	0x0000			V0 W4
1129	hL	MULTIPLEXER	INPUT 0	0	1	0			V0 W0
1130	hM	MULTIPLEXER	INPUT 1	0	1	0			V0 W0
1131	hN	MULTIPLEXER	INPUT 2	0	1	0			V0 W0
1132	hO	MULTIPLEXER	INPUT 3	0	1	0			V0 W0
1133	hP	MULTIPLEXER	INPUT 4	0	1	0			V0 W0
1134	hQ	MULTIPLEXER	INPUT 5	0	1	0			V0 W0
1135	hR	MULTIPLEXER	INPUT 6	0	1	0			V0 W0
1136	hS	MULTIPLEXER	INPUT 7	0	1	0			V0 W0
1137	hT	MULTIPLEXER	INPUT 8	0	1	0			V0 W0
1138	hU	MULTIPLEXER	INPUT 9	0	1	0			V0 W0
1139	hV	MULTIPLEXER	INPUT 10	0	1	0			V0 W0
1140	hW	MULTIPLEXER	INPUT 11	0	1	0			V0 W0
1141	hX	MULTIPLEXER	INPUT 12	0	1	0			V0 W0
1142	hY	MULTIPLEXER	INPUT 13	0	1	0			V0 W0
1143	hZ	MULTIPLEXER	INPUT 14	0	1	0			V0 W0
1144	iA	MULTIPLEXER	INPUT 15	0	1	0			V0 W0
1169	iZ	CONFIGURE DRIVE	DUMP CHANGED	0	1	0			V1 W1
1172	jC	CONFIGURE DRIVE	DEBOUNCE DIGIN	0	1	1			V0 W0
1174	jE	CURRENT LOOP	PHASE ANGLE @ E	0.00	0.00	0.00	DEG		V0 W4
1175	jF	SYSTEM PORT (P3)	REPLY DELAY	0	255	2	ms		V0 W0
1185	jP	FIELD CONTROL	WEAK PID ERROR	0.00	0.00	0.00	%		V1 W4
1186	jQ	FIELD CONTROL	WEAK PID OUT	0.00	0.00	0.00	%		V1 W4
1187	jR	FIELD CONTROL	FIELD STATE	0	6	0		0: FIELD INIT 1: FIELD QUENCH 2: FIELD STANDBY 3: FIELD FULL FLD 4: FIELD TIMER 5: FIELD ERROR 6: LOCAL BEMF	V0 W4
1188	jS	LINK	11 DESTINATION TAG	0	1298	686			V0 W2
1189	jT	LINK	12 DESTINATION TAG	0	1298	688			V0 W2
1190	jU	LINK	16 DESTINATION TAG	0	1298	714			V0 W2
1198	kC	PLL	PLL STATE	0	6	0		0: STOPPED 1: 1ST CODING EDGE 2: READ EDGES 3: MAINS PERIOD 4: LOCKED	V0 W4

Tag	Mn	Function Block Name	Parameter Name	Minimum	Maximum	Default	Units	Range	Notes
								5: UNLOCKED 6: FAIL	
1199	kD	PLL	PHASE ERROR	0.00	0.00	0.00			V0 W4
1201	kF	PLL	PLL MAINS FREQ	0.00	0.00	0.00			V0 W4
1204	kl	SEQUENCING	COMMS TIMEOUT	0.0	60.0	0.0	s		V0 W0
1220	kY	CONFIGURE DRIVE	AUTOMATIC SAVE	0	1	0			V0 W0
1226	IE	AUTOTUNE	STATE	0	3	0		0: IDLE 1: RUNNING 2: SUCCESS 3: FAILED	V1 W4
1227	IF	ENCODER 1	SPEED FEEDBACK	0.0	0.0	0.0	%		V0 W4
1238	IQ	DIGITAL INPUT 4	OUTPUT	0.00	0.00	0.00	%		V0 W4
1239	IR	DIGITAL INPUT 4	VALUE FOR TRUE	-300.00	300.00	0.01	%		V0 W0
1240	IS	DIGITAL INPUT 4	VALUE FOR FALSE	-300.00	300.00	0.00	%		V0 W0
1241	IT	DIGITAL INPUT 5	OUTPUT	0.00	0.00	0.00	%		V0 W4
1242	IU	DIGITAL INPUT 5	VALUE FOR TRUE	-300.00	300.00	0.01	%		V0 W0
1243	IV	DIGITAL INPUT 5	VALUE FOR FALSE	-300.00	300.00	0.00	%		V0 W0
1246	IY	ALARM HISTORY	ALARM 1 NEWEST	0x0000	0xFFFF	0x0000			V0 W4
1247	IZ	ALARM HISTORY	ALARM 2	0x0000	0xFFFF	0x0000			V0 W4
1248	mA	ALARM HISTORY	ALARM 3	0x0000	0xFFFF	0x0000			V0 W4
1249	mB	ALARM HISTORY	ALARM 4	0x0000	0xFFFF	0x0000			V0 W4
1250	mC	ALARM HISTORY	ALARM 5	0x0000	0xFFFF	0x0000			V0 W4
1251	mD	ALARM HISTORY	ALARM 6	0x0000	0xFFFF	0x0000			V0 W4
1252	mE	ALARM HISTORY	ALARM 7	0x0000	0xFFFF	0x0000			V0 W4
1253	mF	ALARM HISTORY	ALARM 8	0x0000	0xFFFF	0x0000			V0 W4
1254	mG	ALARM HISTORY	ALARM 9	0x0000	0xFFFF	0x0000			V0 W4
1255	mH	ALARM HISTORY	ALARM 10 OLDEST	0x0000	0xFFFF	0x0000			V0 W4
1267	mT	ENCODER 1	ENCODER TYPE	0	1	1		0: CLOCK/DIRECTION 1: QUADRATURE	V0 W1
1276	nC	AUTOTUNE	ERROR TYPE	0	12	0		0: NO ERROR 1: OVER SPEED 2: FIELD ERROR 3: PULSE WIDTH 4: OVER CURRENT 5: TIMEOUT 6: AUTOTUNE ABORTED 7: FIRING ANGLE 8: PEAK/AVER. RATIO 9: UNBALANCED BRID.	V1 W4

Tag	Mn	Function Block Name	Parameter Name	Minimum	Maximum	Default	Units	Range	Notes	
								10: NULL AVERAGE CUR 11: THYRISTOR OFF 12: HIGH SAT LEVEL		
1277	nD	ALARMS	ARM V FALLBACK	0	1	0		0: FALSE 1: TRUE	V0	W4
1279	nF	ALARMS	INVERSE TIME	0	1	1		0: ENABLED 1: INHIBITED	V0	W0
1295	nV	SEQUENCING	OPERATING MODE	0	2	0		0: TERMINALS 1: COMMUNICATIONS 2: LOCAL	V0	W4
1296	nW	ALARMS	SPDFBK ALM DELAY	0.000	5.000	0.250	s		V0	W0
1297	nX	MENUS	DISABLE FILTER	0	1	0			V0	W0
1298	nY	DRIVE INFO	DRIVE TYPE	0	1	0		0: 590P 1: 590	V0	W4

# Parameter Table: MMI Menu Order

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DIGITAL DC DRIVE

ISSUE: 9.1b

..PRODUCT CODE

....MENU LEVEL

.....DIAGNOSTICS

.....SPEED DEMAND	[0089]	Speed Loop
.....SPEED FEEDBACK	[0207]	Feedbacks
.....SPEED ERROR	[0297]	Speed Loop
.....CURRENT DEMAND	[0299]	Current Loop
.....CURRENT FEEDBACK	[0298]	Feedbacks
a.....POS. I CLAMP	[0087]	Current Loop
a.....NEG. I CLAMP	[0088]	Current Loop
.....ACTUAL POS I LIM	[0067]	Current Loop
.....ACTUAL NEG I LIM	[0061]	Current Loop
a.....INVERSE TIME O/P	[0203]	Inverse Time
a.....AT CURRENT LIMIT	[0042]	Current Loop
.....AT ZERO SPEED	[0077]	Standstill
a.....AT ZERO SETPOINT	[0078]	Standstill
a.....AT STANDSTILL	[0079]	Standstill
a.....STALL TRIP	[0112]	Alarms
a.....RAMPING	[0113]	Ramps
a.....PROGRAM STOP	[0080]	Sequencing
.....DRIVE START	[0082]	Sequencing
.....DRIVE ENABLE	[0084]	Sequencing
a.....OPERATING MODE	[0212]	Jog/Slack
.....FIELD ENABLED	[0169]	Field Control
a.....FIELD DEMAND	[0183]	Field Control
.....FIELD I FBK.	[0300]	Field Control
a.....FLD.FIRING ANGLE	[0184]	Field Control
a.....ANIN 1 (A2)	[0050]	Analog Input
a.....ANIN 2 (A3)	[0051]	Analog Input
a.....ANIN 3 (A4)	[0052]	Analog Input
a.....ANIN 4 (A5)	[0053]	Analog Input
a.....ANIN 5 (A6)	[0054]	Analog Input
a.....ANOUT 1 (A7)	[0055]	Analog Output
a.....ANOUT 2 (A8)	[0056]	Analog Output
a.....START (C3)	[0068]	Sequencing
a.....DIGITAL INPUT C4	[0069]	Digital Input
a.....DIGITAL INPUT C5	[0070]	Digital Input
a.....DIGIN 1 (C6)	[0071]	Digital Input
a.....DIGIN 2 (C7)	[0072]	Digital Input
a.....DIGIN 3 (C8)	[0073]	Digital Input
a.....DIGOUT 1 (B5)	[0074]	Digital Output

a.....DIGOUT 2 (B6)	[0075]	Digital Output
a.....DIGOUT 3 (B7)	[0076]	Digital Output
.....RAISE/LOWER O/P	[0264]	Raise/Lower
a.....PID OUTPUT	[0417]	PID
a.....PID CLAMPED	[0416]	PID
a.....PID ERROR	[0415]	PID
a.....SPT SUM OUTPUT	[0086]	Setpoint Sum
a.....RAMP OUTPUT	[0085]	Ramps
.....SPEED SETPOINT	[0063]	Speed Loop
a.....TERMINAL VOLTS	[0057]	Calibration
.....BACK EMF	[0060]	Calibration
.....TACH INPUT	[0308]	Feedbacks
.....ENCODER	[0206]	Encoder
.....SETUP PARAMETERS		
.....RAMPS		
.....RAMP ACCEL TIME	[0002]	Ramps
.....RAMP DECEL TIME	[0003]	Ramps
a.....RAMP HOLD	[0118]	Ramps
.....INVERT	[0620]	Ramps
a.....RAMP INPUT	[0005]	Min Speed
a.....% S-RAMP	[0266]	Ramps
a.....RAMPING THRESH.	[0286]	Ramps
a.....AUTO RESET	[0287]	Ramps
a.....EXTERNAL RESET	[0288]	Ramps
a.....RESET VALUE	[0422]	Ramps
a.....MIN SPEED	[0126]	Min Speed
a.....AUX I/O		
.....AUX START	[0161]	Sequencing
.....AUX JOG	[0227]	Sequencing
.....AUX ENABLE	[0168]	Sequencing
.....AUX DIGOUT 1	[0094]	Aux I/O
.....AUX DIGOUT 2	[0095]	Aux I/O
.....AUX DIGOUT 3	[0096]	Aux I/O
.....ANOUT 1	[0128]	Aux I/O
.....ANOUT 2	[0129]	Aux I/O
.....JOG/SLACK	[0496]	Sequencing
.....ENABLE	[0497]	Sequencing
.....JOG/SLACK		
.....JOG SPEED 1	[0218]	Jog/Slack
.....JOG SPEED 2	[0219]	Jog/Slack
.....TAKE UP 1	[0253]	Jog/Slack
.....TAKE UP 2	[0254]	Jog/Slack
.....CRAWL SPEED	[0225]	Jog/Slack
.....MODE	[0228]	Jog/Slack
.....RAMP RATE	[0355]	Jog/Slack
a.....RAISE/LOWER		
.....RESET VALUE	[0255]	Raise/Lower
.....INCREASE RATE	[0256]	Raise/Lower
.....DECREASE RATE	[0257]	Raise/Lower

.....	RAISE INPUT	[0261]	Raise/Lower
.....	LOWER INPUT	[0262]	Raise/Lower
.....	MIN VALUE	[0258]	Raise/Lower
.....	MAX VALUE	[0259]	Raise/Lower
a.....	EXTERNAL RESET	[0307]	Raise/Lower
.....	PRESET SPEEDS		
.....	SELECT 1	[0560]	Preset Speeds
.....	SELECT 2	[0561]	Preset Speeds
.....	SELECT 3	[0562]	Preset Speeds
.....	INVERT O/P	[0563]	Preset Speeds
.....	MAX SPEED	[0559]	Preset Speeds
.....	LIMIT	[0600]	Preset Speeds
.....	GRAY SCALE	[0610]	Preset Speeds
.....	INPUT 0	[0564]	Preset Speeds
.....	INPUT 1	[0565]	Preset Speeds
.....	INPUT 2	[0566]	Preset Speeds
.....	INPUT 3	[0567]	Preset Speeds
.....	INPUT 4	[0568]	Preset Speeds
.....	INPUT 5	[0569]	Preset Speeds
.....	INPUT 6	[0570]	Preset Speeds
.....	INPUT 7	[0571]	Preset Speeds
.....	PRESET O/P	[0572]	Preset Speeds
.....	OUTPUT FPM	[0593]	Preset Speeds
.....	SRAMP		
.....	INPUT	[0574]	Scramp
.....	RATE SELECT	[0575]	Scramp
.....	RATE SET 0		
.....	ACCEL 0	[0576]	Scramp
.....	DECEL 0	[0577]	Scramp
.....	ACCEL 0 JERK 1	[0578]	Scramp
.....	ACCEL 0 JERK 2	[0611]	Scramp
.....	DECEL 0 JERK 1	[0596]	Scramp
.....	DECEL 0 JERK 2	[0613]	Scramp
.....	RATE SET 1		
.....	ACCEL 1	[0579]	Scramp
.....	DECEL 1	[0580]	Scramp
.....	ACCEL 1 JERK 1	[0581]	Scramp
.....	ACCEL 1 JERK 2	[0612]	Scramp
.....	DECEL 1 JERK 1	[0597]	Scramp
.....	DECEL 1 JERK 2	[0614]	Scramp
.....	AUTO RESET	[0582]	Scramp
.....	EXTERNAL RESET	[0583]	Scramp
.....	RESET VALUE	[0584]	Scramp
.....	QUENCH	[0585]	Scramp
.....	AT SPEED LEVEL	[0586]	Scramp
.....	AT SPEED	[0587]	Scramp
.....	ACCEL OUTPUT	[0588]	Scramp
.....	SRAMP OUTPUT	[0589]	Scramp
a.....	SPECIAL BLOCKS		

a.....	PID		
a.....	PROFILE P GAIN	[0404]	Profiled Gain
a.....	INT.TIME.CONST	[0402]	PID
a.....	DERIVATIVE TC	[0401]	PID
a.....	POSITIVE LIMIT	[0405]	PID
a.....	NEGATIVE LIMIT	[0406]	PID
a.....	O/P SCALER (TRIM)	[0407]	PID
a.....	INPUT 1	[0410]	PID
a.....	INPUT 2	[0411]	PID
a.....	RATIO 1	[0412]	PID
a.....	RATIO 2	[0413]	PID
a.....	DIVIDER 1	[0418]	PID
a.....	DIVIDER 2	[0414]	PID
a.....	ENABLE	[0408]	PID
a.....	INT. DEFEAT	[0409]	PID
a.....	FILTER T.C.	[0403]	PID
a.....	MODE	[0473]	Profiled Gain
a.....	MIN PROFILE GAIN	[0474]	Profiled Gain
a.....	PROFILED GAIN	[0475]	Profiled Gain
a.....	TENS+COMP CALC.		
.....	STATIC COMP	[0487]	Diameter Calc
.....	DYNAMIC COMP	[0488]	Diameter Calc
.....	REWIND	[0489]	Diameter Calc
a.....	FIX.INERTIA COMP	[0479]	Diameter Calc
a.....	VAR.INERTIA COMP	[0480]	Diameter Calc
a.....	ROLL WIDTH/MASS	[0481]	Diameter Calc
.....	LINE SPEED SPT	[0498]	Diameter Calc
a.....	FILTER T.C.	[0482]	Diameter Calc
a.....	RATE CAL	[0483]	Diameter Calc
a.....	NORMALISED dv/dt	[0484]	Diameter Calc
a.....	INERTIA COMP O/P	[0485]	Diameter Calc
a.....	TENSION SCALER	[0486]	Diameter Calc
a.....	DIAMETER CALC.		
a.....	LINE SPEED	[0424]	Diameter Calc
a.....	REEL SPEED	[0437]	Diameter Calc
a.....	MIN DIAMETER	[0425]	Diameter Calc
a.....	MIN SPEED	[0426]	Diameter Calc
a.....	RESET VALUE	[0462]	Diameter Calc
a.....	EXTERNAL RESET	[0463]	Diameter Calc
a.....	RAMP RATE	[0453]	Diameter Calc
a.....	DIAMETER	[0427]	Diameter Calc
a.....	TAPER CALC.		
a.....	TAPER	[0438]	Diameter Calc
a.....	TENSION SPT.	[0439]	Diameter Calc
a.....	TAPERED DEMAND	[0452]	Diameter Calc
a.....	TENSION TRIM	[0440]	Diameter Calc
a.....	TOT.TENS.DEMAND	[0441]	Diameter Calc
a.....	TORQUE CALC.		
a.....	TORQUE DEMAND	[0432]	Torque Calc.

a.....	TENSION ENABLE	[0433]	Torque Calc.
a.....	OVER WIND	[0434]	Torque Calc.
a.....	SETPOINT SUM 2		
a.....	INPUT 2	[0445]	Setpoint Sum
a.....	INPUT 1	[0443]	Setpoint Sum
a.....	INPUT 0	[0444]	Setpoint Sum
.....	RATIO 1	[0446]	Setpoint Sum
.....	RATIO 0	[0447]	Setpoint Sum
a.....	DIVIDER 1	[0466]	Setpoint Sum
.....	DIVIDER 0	[0448]	Setpoint Sum
.....	LIMIT	[0449]	Setpoint Sum
a.....	SPT SUM OUTPUT	[0451]	Setpoint Sum
.....	FIELD CONTROL		
.....	FIELD ENABLE	[0170]	Field Control
.....	FLD.CTRL MODE	[0209]	Field Control
.....	FLD.VOLTAGE VARS		
.....	FLD.VOLTS RATIO	[0210]	Field Control
.....	FLD.CURRENT VARS		
a.....	SETPOINT	[0171]	Field Control
.....	PROP. GAIN	[0173]	Field Control
.....	INT. GAIN	[0172]	Field Control
a.....	FLD.WEAK VARS		
.....	FLD. WEAK ENABLE	[0174]	Field Control
.....	EMF LEAD	[0175]	Field Control
.....	EMF LAG	[0176]	Field Control
.....	EMF GAIN	[0177]	Field Control
.....	MIN FLD.CURRENT	[0179]	Field Control
.....	MAX VOLTS	[0178]	Field Control
.....	BEMF FBK LEAD	[0191]	Field Control
.....	BEMF FBK LAG	[0192]	Field Control
a.....	FLD.QUENCH DELAY	[0185]	Field Control
a.....	FLD. QUENCH MODE	[0186]	Field Control
a.....	CURRENT PROFILE		
.....	SPD BRK1 (LOW)	[0032]	Current Profile
.....	SPD BRK2 (HIGH)	[0031]	Current Profile
.....	IMAX BRK1 (SPD1)	[0093]	Current Profile
.....	IMAX BRK2 (SPD2)	[0033]	Current Profile
.....	STOP RATES		
.....	STOP TIME	[0027]	Stop Rates
a.....	STOP LIMIT	[0217]	Stop Rates
a.....	CONTACTOR DELAY	[0302]	Stop Rates
.....	PROG STOP TIME	[0026]	Stop Rates
a.....	PROG STOP LIMIT	[0216]	Stop Rates
.....	PROG STOP I LIM	[0091]	Stop Rates
.....	STOP ZERO SPEED	[0029]	Stop Rates
.....	CALIBRATION		
.....	ARMATURE V CAL.	[0020]	Calibration
.....	IR COMPENSATION	[0021]	Calibration
.....	ENCODER RPM	[0022]	Encoder



.....	ENCODER LINES	[0024]	Encoder
.....	ANALOG TACH CAL	[0023]	Calibration
.....	ZERO SPD. OFFSET	[0010]	Calibration
.....	ARMATURE I (A9)	[0025]	Calibration
a.....	SPDFBK ALM LEVEL	[0180]	Alarms
a.....	STALL THRESHOLD	[0263]	Alarms
a.....	STALL TRIP DELAY	[0224]	Alarms
.....	FIELD I CAL.	[0182]	Calibration
.....	INHIBIT ALARMS		
.....	FIELD FAIL	[0019]	Alarms
.....	5703 RCV ERROR	[0111]	Alarms
a.....	STALL TRIP	[0028]	Alarms
a.....	TRIP RESET	[0305]	Alarms
.....	SPEED FBK ALARM	[0081]	Alarms
.....	ENCODER ALARM	[0092]	Alarms
.....	CURRENT LOOP		
.....	MAIN CURR. LIMIT	[0421]	Current Loop
.....	PROP. GAIN	[0016]	Current Loop
.....	INT. GAIN	[0017]	Current Loop
.....	AUTOTUNE	[0018]	Auto-Tune
.....	DISCONTINUOUS	[0137]	Current Loop
a.....	ADDITIONAL DEM	[0030]	Current Loop
a.....	BIPOLAR CLAMPS	[0090]	Current Loop
.....	REGEN ENABLE	[0201]	Current Loop
.....	POS. I CLAMP IN	[0301]	Current Loop
a.....	NEG. I CLAMP IN	[0048]	Current Loop
a.....	I DMD. ISOLATE	[0119]	Current Loop
.....	CUR.LIMIT/SCALER	[0015]	Current Loop
.....	SPEED LOOP		
.....	SPD.PROP.GAIN	[0014]	Speed Loop
.....	SPD.INT.TIME	[0013]	Speed Loop
a.....	INT. DEFEAT	[0202]	Speed Loop
.....	ENCODER SIGN	[0049]	Encoder
.....	SPEED FBK SELECT	[0047]	Speed Loop
a.....	ADVANCED		
.....	ADAPTION		
.....	MODE	[0268]	Speed Loop
.....	SPD BRK1 (LOW)	[0269]	Speed Loop
.....	SPD BRK2 (HIGH)	[0270]	Speed Loop
.....	PROP. GAIN	[0271]	Speed Loop
.....	INT.TIME.CONST	[0272]	Speed Loop
.....	I GAIN IN RAMP	[0274]	Speed Loop
.....	ZERO SPD. QUENCH		
.....	ZERO SPD. LEVEL	[0284]	Speed Loop
.....	ZERO IAD LEVEL	[0285]	Speed Loop
.....	INERTIA COMP		
.....	INERTIA	[0556]	Inertia Comp
.....	FILTER	[0557]	Inertia Comp
.....	RATE CAL	[0558]	Inertia Comp

.....DELTA	[0601]	Inertia Comp
.....UNSCALED OUTPUT	[0603]	Inertia Comp
.....INERTIA COMP O/P	[0602]	Inertia Comp
.....SETPOINTS		
.....SETPOINT 1	[0289]	Speed Loop
.....SIGN 2 (A3)	[0009]	Speed Loop
.....RATIO 2 (A3)	[0007]	Speed Loop
.....SETPOINT 2 (A3)	[0290]	Speed Loop
.....SETPOINT 3	[0291]	Speed Loop
.....SETPOINT 4	[0041]	Speed Loop
.....MAX DEMAND	[0357]	Speed Loop
.....MIN DEMAND	[0358]	Speed Loop
.....STANDSTILL		
.....STANDSTILL LOGIC	[0011]	Standstill
.....ZERO THRESHOLD	[0012]	Standstill
.....SOURCE TAG	[0306]	Link
.....SETPOINT SUM 1		
.....RATIO 1	[0006]	Setpoint Sum
.....RATIO 0	[0208]	Setpoint Sum
a.....SIGN 1	[0008]	Setpoint Sum
a.....SIGN 0	[0292]	Setpoint Sum
a.....DIVIDER 1	[0419]	Setpoint Sum
.....DIVIDER 0	[0420]	Setpoint Sum
.....DEADBAND WIDTH	[0131]	Deadband
.....LIMIT	[0375]	Setpoint Sum
a.....INPUT 2	[0423]	Setpoint Sum
a.....INPUT 1	[0100]	Deadband
a.....INPUT 0	[0309]	Setpoint Sum
.....PASSWORD		
.....ENTER PASSWORD	[0120]	Menus
a.....CHANGE PASSWORD	[0121]	Menus
.....ALARM STATUS		
.....LAST ALARM	[0528]	Alarms
a.....HEALTH WORD	[0115]	Alarms
a.....HEALTH STORE	[0116]	Alarms
.....THERMISTOR STATE	[0337]	Alarms
.....SPEED FBK STATE	[0472]	Alarms
a.....STALL TRIP	[0112]	Alarms
.....MENUS		
.....VIEW LEVEL	[0037]	Menus
a.....LANGUAGE	[0304]	Menus
.....PARAMETER SAVE	[0354]	Configure Drive
.....SERIAL LINKS		
.....MAIN PORT (P1)		
.....ENABLED	[0146]	No Name
.....GROUP ID (GID)	[0138]	No Name
.....UNIT ID (UID)	[0139]	No Name
.....MODE	[0148]	No Name
.....BAUD RATE	[0150]	No Name

.....ESP SUP. (ASCII)	[0152]	No Name
.....CHANGEBAND (BIN)	[0144]	No Name
.....ERROR REPORT	[0158]	No Name
.....PNO.7	[0142]	No Name
.....OPTION ADDRESS	[0499]	No Name
.....OPTION VERSION	[0303]	No Name
.....PARITY	[0334]	No Name
.....SYSTEM PORT (P3)		
.....P3 SETUP		
.....MODE	[0130]	P3 Comms Port
.....5703 IN		
.....SETPT. RATIO	[0132]	5703 In
.....SETPT. SIGN	[0133]	5703 In
.....RAW INPUT	[0187]	5703 In
.....SCALED INPUT	[0189]	5703 In
.....BISYNCH SUPPORT		
.....GROUP ID (GID)	[0329]	P3 Comms Port
.....UNIT ID (UID)	[0330]	P3 Comms Port
.....ESP SUP. (ASCII)	[0328]	P3 Comms Port
.....CHANGEBAND (BIN)	[0331]	P3 Comms Port
.....ERROR REPORT	[0332]	P3 Comms Port
.....PNO.7	[0333]	P3 Comms Port
.....BAUD RATE	[0198]	P3 Comms Port
.....DUMP MMI (TX)	[1167]	Configure Drive
a.....DUMP BLOCKS	[1168]	Configure Drive
.....UDP XFER (RX)	[1171]	Configure Drive
.....UDP XFER (TX)	[1170]	Configure Drive
.....VERSION NUMBER	[0155]	Drive Info
.....PNO CONFIG		
.....PNO 112	[0312]	PNO Config
.....PNO 113	[0313]	PNO Config
.....PNO 114	[0314]	PNO Config
.....PNO 115	[0315]	PNO Config
.....PNO 116	[0316]	PNO Config
.....PNO 117	[0317]	PNO Config
.....PNO 118	[0318]	PNO Config
.....PNO 119	[0319]	PNO Config
.....PNO 120	[0320]	PNO Config
.....PNO 121	[0321]	PNO Config
.....PNO 122	[0322]	PNO Config
.....PNO 123	[0323]	PNO Config
.....PNO 124	[0324]	PNO Config
.....PNO 125	[0325]	PNO Config
.....PNO 126	[0326]	PNO Config
.....PNO 127	[0327]	PNO Config
.....SYSTEM		
.....SOFTWARE		
.....ISSUE: 9.1b		
a.....CONFIGURE I/O		

.....CONFIGURE ENABLE	[0039]	Configure Drive
.....ANALOG INPUTS		
.....ANIN 1 (A2)		
.....CALIBRATION	[0230]	Analog Input
.....MAX VALUE	[0231]	Analog Input
.....MIN VALUE	[0232]	Analog Input
.....DESTINATION TAG	[0246]	Link
.....ANIN 2 (A3)		
.....CALIBRATION	[0233]	Analog Input
.....MAX VALUE	[0234]	Analog Input
.....MIN VALUE	[0235]	Analog Input
.....OUTPUT	[0493]	Analog Input
.....ANIN 3 (A4)		
.....CALIBRATION	[0236]	Analog Input
.....MAX VALUE	[0237]	Analog Input
.....MIN VALUE	[0238]	Analog Input
.....DESTINATION TAG	[0249]	Link
.....ANIN 4 (A5)		
.....CALIBRATION	[0239]	Analog Input
.....MAX VALUE	[0240]	Analog Input
.....MIN VALUE	[0241]	Analog Input
.....DESTINATION TAG	[0250]	Link
.....ANIN 5 (A6)		
.....CALIBRATION	[0242]	Analog Input
.....MAX VALUE	[0243]	Analog Input
.....MIN VALUE	[0244]	Analog Input
.....DESTINATION TAG	[0247]	Link
.....ANALOG OUTPUTS		
.....ANOUT 1 (A7)		
.....% TO GET 10V	[0245]	Analog Output
.....MODULUS	[0362]	Analog Output
.....OFFSET	[0464]	Analog Output
.....SOURCE TAG	[0251]	Link
.....ANOUT 2 (A8)		
.....% TO GET 10V	[0248]	Analog Output
.....MODULUS	[0363]	Analog Output
.....OFFSET	[0465]	Analog Output
.....SOURCE TAG	[0252]	Link
.....DIGITAL INPUTS		
a.....DIGITAL INPUT C4		
.....DESTINATION TAG	[0494]	Link
a.....DIGITAL INPUT C5		
.....DESTINATION TAG	[0495]	Link
.....DIGIN 1 (C6)		
.....VALUE FOR TRUE	[0103]	Digital Input
.....VALUE FOR FALSE	[0104]	Digital Input
.....DESTINATION TAG	[0102]	Link
.....DIGIN 2 (C7)		
.....VALUE FOR TRUE	[0106]	Digital Input

.....VALUE FOR FALSE	[0107]	Digital Input
.....DESTINATION TAG	[0105]	Link
.....DIGIN 3 (C8)		
.....VALUE FOR TRUE	[0109]	Digital Input
.....VALUE FOR FALSE	[0110]	Digital Input
.....DESTINATION TAG	[0108]	Link
.....DIGITAL OUTPUTS		
.....DIGOUT 1 (B5)		
.....THRESHOLD (>)	[0195]	Digital Output
.....MODULUS	[0043]	Digital Output
.....SOURCE TAG	[0097]	Link
.....INVERTED	[0359]	Digital Output
.....DIGOUT 2 (B6)		
.....THRESHOLD (>)	[0196]	Digital Output
.....MODULUS	[0044]	Digital Output
.....SOURCE TAG	[0098]	Link
.....INVERTED	[0360]	Digital Output
.....DIGOUT 3 (B7)		
.....THRESHOLD (>)	[0197]	Digital Output
.....MODULUS	[0045]	Digital Output
.....SOURCE TAG	[0099]	Link
.....INVERTED	[0361]	Digital Output
.....CONFIGURE 5703		
.....SOURCE TAG	[0134]	Link
.....DESTINATION TAG	[0135]	Link
.....BLOCK DIAGRAM		
.....RAMP O/P DEST	[0293]	Link
.....SPT SUM 1 DEST	[0294]	Link
.....PID O/P DEST	[0400]	Link
.....DIAMETER	[0431]	Link
.....TAPER	[0442]	Link
.....SETPOINT SUM 2	[0450]	Link
.....POS. I CLAMP	[0435]	Link
.....NEG. I CLAMP	[0436]	Link
.....TENS+COMP CALC.	[0478]	Link
.....RAISE/LOWER DEST	[0260]	Link
.....PRESET DEST	[0573]	Link
.....SRAMP DEST	[0590]	Link
a.....INTERNAL LINKS		
a.....LINK 1		
.....SOURCE TAG	[0364]	Link
.....DESTINATION TAG	[0365]	Link
a.....LINK 2		
.....SOURCE TAG	[0366]	Link
.....DESTINATION TAG	[0367]	Link
a.....LINK 3		
.....SOURCE TAG	[0368]	Link
.....DESTINATION TAG	[0369]	Link
a.....LINK 4		

.....SOURCE TAG	[0370]	Link
.....DESTINATION TAG	[0371]	Link
a.....LINK 5		
.....SOURCE TAG	[0454]	Link
.....DESTINATION TAG	[0455]	Link
a.....LINK 6		
.....SOURCE TAG	[0456]	Link
.....DESTINATION TAG	[0457]	Link
a.....LINK 7		
.....SOURCE TAG	[0458]	Link
.....DESTINATION TAG	[0459]	Link
a.....LINK 8		
.....SOURCE TAG	[0460]	Link
.....DESTINATION TAG	[0461]	Link
a.....LINK 9		
.....SOURCE TAG	[0467]	Link
.....DESTINATION TAG	[0468]	Link
a.....LINK 10		
.....SOURCE TAG	[0469]	Link
.....DESTINATION TAG	[0470]	Link
a.....LINK 11		
.....SOURCE TAG	[0390]	Link
.....DESTINATION TAG	[0391]	Link
.....ADVANCED	[0392]	Advanced
.....MODE	[0393]	Advanced
.....AUX.SOURCE	[0394]	Link
a.....LINK 12		
.....SOURCE TAG	[0395]	Link
.....DESTINATION TAG	[0396]	Link
.....ADVANCED	[0397]	Advanced
.....MODE	[0398]	Advanced
.....AUX.SOURCE	[0399]	Link
a.....miniLINK		
a.....VALUE 1	[0339]	Minilink
a.....VALUE 2	[0340]	Minilink
a.....VALUE 3	[0341]	Minilink
a.....VALUE 4	[0342]	Minilink
a.....VALUE 5	[0343]	Minilink
a.....VALUE 6	[0344]	Minilink
a.....VALUE 7	[0345]	Minilink
a.....VALUE 8	[0379]	Minilink
a.....VALUE 9	[0380]	Minilink
a.....VALUE 10	[0381]	Minilink
a.....VALUE 11	[0382]	Minilink
a.....VALUE 12	[0383]	Minilink
a.....VALUE 13	[0384]	Minilink
a.....VALUE 14	[0385]	Minilink
a.....LOGIC 1	[0346]	Minilink
a.....LOGIC 2	[0347]	Minilink

a.....LOGIC 3	[0348]	Minilink
a.....LOGIC 4	[0349]	Minilink
a.....LOGIC 5	[0350]	Minilink
a.....LOGIC 6	[0351]	Minilink
a.....LOGIC 7	[0352]	Minilink
a.....LOGIC 8	[0353]	Minilink
.....CONFIGURE DRIVE		
.....FLD.CTRL MODE	[0209]	Field Control
.....FLD.VOLTS RATIO	[0210]	Field Control
.....MAIN CURR. LIMIT	[0421]	Current Loop
.....AUTOTUNE	[0018]	Auto-Tune
.....SPEED FBK SELECT	[0047]	Speed Loop
.....ENCODER LINES	[0024]	Encoder
.....ENCODER RPM	[0022]	Encoder
.....ENCODER SIGN	[0049]	Encoder
.....SPD.INT.TIME	[0013]	Speed Loop
.....SPD.PROP.GAIN	[0014]	Speed Loop

.....CONFIGURE ENABLE	[0039]	Configure Drive
.....ANALOG INPUTS		
.....ANIN 1 (A2)		
.....CALIBRATION	[0230]	Analog Input
.....MAX VALUE	[0231]	Analog Input
.....MIN VALUE	[0232]	Analog Input
.....DESTINATION TAG	[0246]	Link
.....ANIN 2 (A3)		
.....CALIBRATION	[0233]	Analog Input
.....MAX VALUE	[0234]	Analog Input
.....MIN VALUE	[0235]	Analog Input
.....OUTPUT	[0493]	Analog Input
.....ANIN 3 (A4)		
.....CALIBRATION	[0236]	Analog Input
.....MAX VALUE	[0237]	Analog Input
.....MIN VALUE	[0238]	Analog Input
.....DESTINATION TAG	[0249]	Link
.....ANIN 4 (A5)		
.....CALIBRATION	[0239]	Analog Input
.....MAX VALUE	[0240]	Analog Input
.....MIN VALUE	[0241]	Analog Input
.....DESTINATION TAG	[0250]	Link
.....ANIN 5 (A6)		
.....CALIBRATION	[0242]	Analog Input
.....MAX VALUE	[0243]	Analog Input
.....MIN VALUE	[0244]	Analog Input
.....DESTINATION TAG	[0247]	Link
.....ANALOG OUTPUTS		
.....ANOUT 1 (A7)		
.....% TO GET 10V	[0245]	Analog Output
.....MODULUS	[0362]	Analog Output
.....OFFSET	[0464]	Analog Output
.....SOURCE TAG	[0251]	Link
.....ANOUT 2 (A8)		
.....% TO GET 10V	[0248]	Analog Output
.....MODULUS	[0363]	Analog Output
.....OFFSET	[0465]	Analog Output
.....SOURCE TAG	[0252]	Link
.....DIGITAL INPUTS		
a.....DIGITAL INPUT C4		
.....DESTINATION TAG	[0494]	Link
a.....DIGITAL INPUT C5		
.....DESTINATION TAG	[0495]	Link
.....DIGIN 1 (C6)		
.....VALUE FOR TRUE	[0103]	Digital Input
.....VALUE FOR FALSE	[0104]	Digital Input
.....DESTINATION TAG	[0102]	Link
.....DIGIN 2 (C7)		
.....VALUE FOR TRUE	[0106]	Digital Input



.....VALUE FOR FALSE	[0107]	Digital Input
.....DESTINATION TAG	[0105]	Link
.....DIGIN 3 (C8)		
.....VALUE FOR TRUE	[0109]	Digital Input
.....VALUE FOR FALSE	[0110]	Digital Input
.....DESTINATION TAG	[0108]	Link
.....DIGITAL OUTPUTS		
.....DIGOUT 1 (B5)		
.....THRESHOLD (>)	[0195]	Digital Output
.....MODULUS	[0043]	Digital Output
.....SOURCE TAG	[0097]	Link
.....INVERTED	[0359]	Digital Output
.....DIGOUT 2 (B6)		
.....THRESHOLD (>)	[0196]	Digital Output
.....MODULUS	[0044]	Digital Output
.....SOURCE TAG	[0098]	Link
.....INVERTED	[0360]	Digital Output
.....DIGOUT 3 (B7)		
.....THRESHOLD (>)	[0197]	Digital Output
.....MODULUS	[0045]	Digital Output
.....SOURCE TAG	[0099]	Link
.....INVERTED	[0361]	Digital Output
.....CONFIGURE 5703		
.....SOURCE TAG	[0134]	Link
.....DESTINATION TAG	[0135]	Link
.....BLOCK DIAGRAM		
.....RAMP O/P DEST	[0293]	Link
.....SPT SUM 1 DEST	[0294]	Link
.....PID O/P DEST	[0400]	Link
.....DIAMETER	[0431]	Link
.....TAPER	[0442]	Link
.....SETPOINT SUM 2	[0450]	Link
.....POS. I CLAMP	[0435]	Link
.....NEG. I CLAMP	[0436]	Link
.....TENS+COMP CALC.	[0478]	Link
.....RAISE/LOWER DEST	[0260]	Link
.....PRESET DEST	[0573]	Link
.....SRAMP DEST	[0590]	Link
a.....INTERNAL LINKS		
a.....LINK 1		
.....SOURCE TAG	[0364]	Link
.....DESTINATION TAG	[0365]	Link
a.....LINK 2		
.....SOURCE TAG	[0366]	Link
.....DESTINATION TAG	[0367]	Link
a.....LINK 3		
.....SOURCE TAG	[0368]	Link
.....DESTINATION TAG	[0369]	Link
a.....LINK 4		

.....SOURCE TAG	[0370]	Link
.....DESTINATION TAG	[0371]	Link
a.....LINK 5		
.....SOURCE TAG	[0454]	Link
.....DESTINATION TAG	[0455]	Link
a.....LINK 6		
.....SOURCE TAG	[0456]	Link
.....DESTINATION TAG	[0457]	Link
a.....LINK 7		
.....SOURCE TAG	[0458]	Link
.....DESTINATION TAG	[0459]	Link
a.....LINK 8		
.....SOURCE TAG	[0460]	Link
.....DESTINATION TAG	[0461]	Link
a.....LINK 9		
.....SOURCE TAG	[0467]	Link
.....DESTINATION TAG	[0468]	Link
a.....LINK 10		
.....SOURCE TAG	[0469]	Link
.....DESTINATION TAG	[0470]	Link
a.....LINK 11		
.....SOURCE TAG	[0390]	Link
.....DESTINATION TAG	[0391]	Link
.....ADVANCED	[0392]	Advanced
.....MODE	[0393]	Advanced
.....AUX.SOURCE	[0394]	Link
a.....LINK 12		
.....SOURCE TAG	[0395]	Link
.....DESTINATION TAG	[0396]	Link
.....ADVANCED	[0397]	Advanced
.....MODE	[0398]	Advanced
.....AUX.SOURCE	[0399]	Link
a.....miniLINK		
a.....VALUE 1	[0339]	Minilink
a.....VALUE 2	[0340]	Minilink
a.....VALUE 3	[0341]	Minilink
a.....VALUE 4	[0342]	Minilink
a.....VALUE 5	[0343]	Minilink
a.....VALUE 6	[0344]	Minilink
a.....VALUE 7	[0345]	Minilink
a.....VALUE 8	[0379]	Minilink
a.....VALUE 9	[0380]	Minilink
a.....VALUE 10	[0381]	Minilink
a.....VALUE 11	[0382]	Minilink
a.....VALUE 12	[0383]	Minilink
a.....VALUE 13	[0384]	Minilink
a.....VALUE 14	[0385]	Minilink
a.....LOGIC 1	[0346]	Minilink
a.....LOGIC 2	[0347]	Minilink

a.....LOGIC 3	[0348]	Minilink
a.....LOGIC 4	[0349]	Minilink
a.....LOGIC 5	[0350]	Minilink
a.....LOGIC 6	[0351]	Minilink
a.....LOGIC 7	[0352]	Minilink
a.....LOGIC 8	[0353]	Minilink
.....CONFIGURE DRIVE		
.....FLD.CTRL MODE	[0209]	Field Control
.....FLD.VOLTS RATIO	[0210]	Field Control
.....MAIN CURR. LIMIT	[0421]	Current Loop
.....AUTOTUNE	[0018]	Auto-Tune
.....SPEED FBK SELECT	[0047]	Speed Loop
.....ENCODER LINES	[0024]	Encoder
.....ENCODER RPM	[0022]	Encoder
.....ENCODER SIGN	[0049]	Encoder
.....SPD.INT.TIME	[0013]	Speed Loop
.....SPD.PROP.GAIN	[0014]	Speed Loop

# Appendix **D**

## Programming

This Appendix provides an introduction to programming the drive. It describes the function blocks and parameters available in DSElite. The FUNCTION BLOCKS menu on the MMI provides access to these programming tool menu structures.

<b>Programming Your Application.....</b>	<b>D-1</b>	AUTOTUNE	D-24
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Saving Your Modifications	D-4	CONFIGURE DRIVE	D-30
Understanding the Function Block Description	D-4	CURRENT LOOP	D-31
MMI Menu Maps	D-5	CURRENT PROFILE	D-36
Function Blocks By Category	D-6	DEADBAND	D-37
Compatibility with Earlier Versions of Firmware	D-7	DEMULTIPLEXER	D-38
<b>Function Block Descriptions .....</b>	<b>D-10</b>	DIAMETER CALC.	D-39
5703 IN	D-10	DIGITAL INPUTS	D-47
5703 OUT	D-11	DIGITAL OUTPUTS	D-50
ADVANCED	D-12	DRIVE INFO	D-53
ALARM HISTORY	D-15	ENCODER	D-54
ALARMS	D-16	Functional Description	D-55
ANALOG INPUTS	D-21	FEEDBACKS	D-56
ANALOG OUTPUTS	D-23	FIELD CONTROL	D-57

INERTIA COMP	D-64	SETPOINT SUM	D-100
LINK	D-65	SPEED LOOP	D-103
INVERSE TIME	D-66	SRAMP	D-110
JOG/SLACK	D-67	STANDSTILL	D-113
MAIN PORT (P1)	D-70	STOP RATES	D-115
MENUS	D-72	SYSTEM PORT (P3)	D-118
MIN SPEED	D-73	TORQUE CALC.	D-120
miniLINK	D-74	<b>The Default Application .....</b>	<b>D-121</b>
MULTIPLEXER	D-75	<b>Block Diagrams</b>	<b>D-121</b>
PID	D-76	Programming Block Diagram - Sheet 1	D-122
PLL (PHASE LOCKED LOOP)	D-81	Programming Block Diagram - Sheet 2	D-123
PNO CONFIG	D-82	Programming Block Diagram - Sheet 3	D-124
PRESET SPEEDS	D-83	Main Block Diagram	D-125
PROFILED GAIN	D-86	Field Control Block Diagram	D-126
RAISE/LOWER	D-88	Start/Healthy Logic Block Diagram	D-127
RAMPS	D-91	Functional Block Diagram	D-128
SEQUENCING	D-97		

# Programming Your Application

## Programming with Block Diagrams

We recommend that you use a suitable programming tool (such as “ConfigEd Lite” which is Parker SSD Drives’ block programming software) to program the Drive for specific applications. It is however possible to use the MMI.

**NOTE** The Menus on the MMI contain parameters that don't necessarily reside in similarly-named function blocks in our Configuration Tool. To locate the function block for a parameter when using the MMI, hold the "M" key down when editing the parameter. This will display the Tag number. You can find the details for every Tag in this Appendix: Parameter Specification Tables. Alternatively, the Parameter Table in Appendix C: "Parameter Specifications" provides a quick reference from the MMI list to the associated function block.

The Drive is supplied with a basic set-up which can be used as a starting point for application-specific programming. This programming could simply involve the inputting of parameter values, or it may require the making or breaking of programmable links, which is a feature of this unit.

Block diagram programming provides a visual method of planning the software to suit your application. The basic block diagram is provided at the end of this Appendix and shows the software connections consisting of *function blocks* and *links*:

- Each function block contains the parameters required for setting-up a particular processing feature. Sometimes more than one function block is provided for a feature, i.e. for multiple digital inputs.
- Software links are used to connect the function blocks. Each link transfers the value of an output parameter to an input parameter of another (or the same) function block.

Each individual block is a processing feature: it takes the input parameter, processes the information, and makes the result available as one or more output parameters.

## Modifying a Block Diagram

### Operating and Configuration Modes

There are two modes of operation used while modifying a block diagram: *Operating* and *Configuration* modes.

The CONFIGURE ENABLE command is used to toggle between these two modes of operation.

DEFAULT

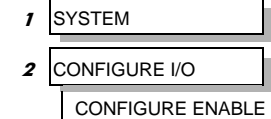
#### ***Operating Mode (CONFIGURE ENABLE = DISABLED)***

In Operating mode you can change parameter values. The Drive can be running or stopped. Note that some parameters can only be changed when the Drive is stopped. It is not possible to modify the internal links when the Drive is in Operating mode.

#### ***Configuration Mode (CONFIGURE ENABLE = ENABLED)***

In the configuration mode you can modify connections between the function blocks in the drive. You can also change parameter values, as above. The Drive cannot run in this mode. Output values are not updated.

#### ***MMI Menu Map***



## Making and Breaking Function Block Connections

Links can be changed, added or deleted from a block diagram whilst in the Configuration mode. There are 80 general-purpose links available, each has its own identification number (“link” number). You make a link by setting the link’s “source” and “destination” tags to be the two parameter tag numbers to be linked. The outputs of function blocks are not updated whilst in this mode.

**NOTE** Links 1 to 50 are pre-connected between certain blocks and form the connections shown in the Default Block Diagram. Any of these links can be re-used elsewhere in the block diagram.

The functions of the special links in previous software versions, (LINK 11 and LINK 12), are replaced by the ADVANCED 1 AND ADVANCED 2 function blocks.

In previous software versions, certain links were single-ended "special links". This is no longer the case. All links can now be re-used anywhere in the block diagram.

## Programming Rules

The following rules apply when programming:

### *Operating Mode (CONFIGURE ENABLE = DISABLED)*

- Function block output parameter values cannot be changed (because they are a result of the function block’s processing)
- Function block input parameter values that receive their values from a link cannot be changed (as the link will overwrite the value when the Drive is running).

### *Configuration Mode (CONFIGURE ENABLE = ENABLED)*

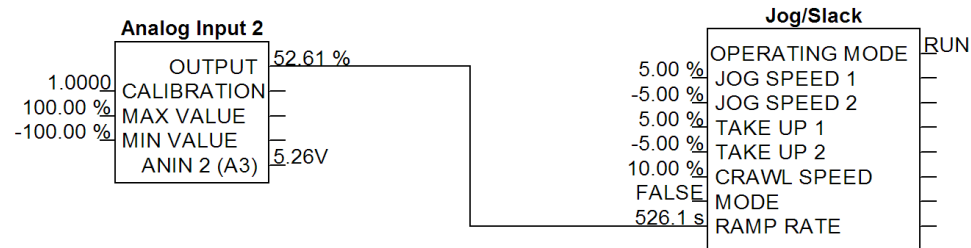
- A link’s destination tag must be set to an input parameter (only one link per input parameter).
- A link’s source tag may be set to any parameter. Both input and output parameters can be used as a source.
- Disable a link/function block by setting the “destination” and “source” tag to zero.
- Where a loop exists in the block diagram, mark one link in the loop as a feedback link, by setting its source to the negative value of the tag to be connected. This link will be the last to pass its value in the execution of the function blocks in the loop. Feedback links are ignored when the overall function block execution order is determined on exit from Configuration Mode.

## Execution Rules

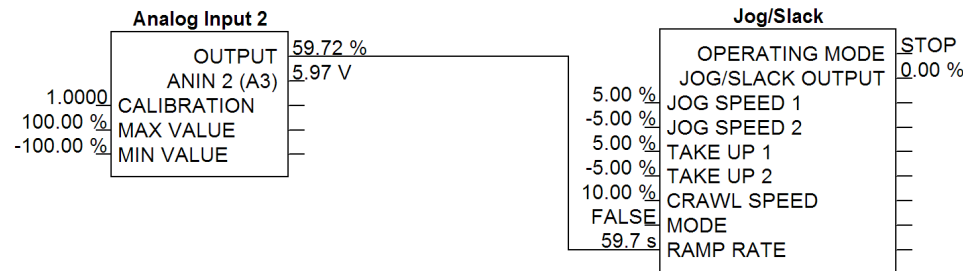
The complete block diagram is executed every 5ms, with individual control blocks executing within 1ms. Just before a function block is executed, all the links that have that block as their destination are executed, thereby copying new values in to the block’s parameter inputs. The input parameters are then processed to produce a new set of output parameters. The execution order of the blocks is automatically arranged for minimal delay.

The output value transferred by a link on execution is clamped to be between the maximum and minimum value for its destination input parameter.

To maintain compatibility, the new firmware emulates the functionality and behavior of links in earlier firmware versions by defaulting the LEGACY MODE parameter in function block CONFIGURE DRIVE to 0x0001 (non-zero).



**Figure 1 Operation of links (LEGACY MODE = non-zero : firmware Versions 4.x and 9.x)**



**Figure 2 Operation of links (LEGACY MODE = zero : firmware Version 9.x)**

The operation of a link is determined by the number of decimal places of each parameter. Previous firmware versions ignored the decimal place when linking two parameters. For example, linking Analog Input 2 to the Jog Ramp rate gave a Ramp Rate of 526.1s for an input value of 52.61%. Compare the Figure above.

An additional enhancement is that all values are now held to over 4 decimal places of precision. This is also true of values transferred via links. In the above example, although the Jog Ramp Rate is shown as 59.7s, internally the value will match that of the output of Analog Input 2, to over 4 decimal places.



## Saving Your Modifications

Ensure that CONFIGURE ENABLE = DISABLED before performing a PARAMETER SAVE.

If AUTOMATIC SAVE is set TRUE then changes made via the Operator Station are automatically saved.

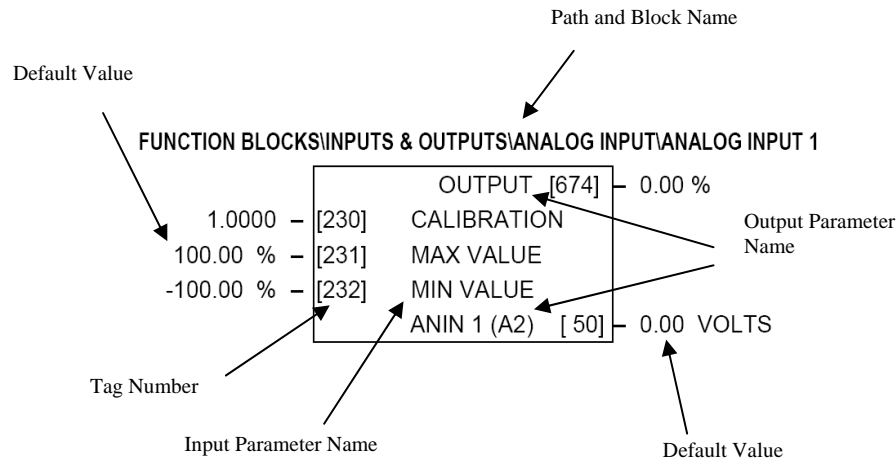
If parameter values or links have been modified, the new settings must be saved. The Drive will then retain the new settings during power-down. Refer to Chapter 6: "MMI – Man Machine Interface" - Saving Your Application.

## Understanding the Function Block Description

The following function block descriptions show the parameter information necessary for programming the Drive. Input parameters are shown on the left hand side, and output parameters are shown on the right hand side of the block.

<b>Default Value</b>	The default value of the unmodified factory set-up
<b>Input/Output Parameter Name</b>	The name shown on ConfigEd Lite
<b>Tag Number</b>	Unique identification used for linking and communications

Decimal Places - some parameters are held in memory with two decimal places but are displayed with one decimal place. These parameters are indicated in the Parameter Description tables. The Range parameter highlights these with a " (h) " suffix.



**Figure D-3 Function Block Parameter Information**

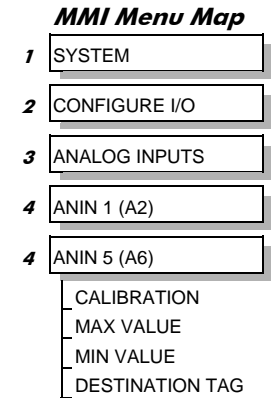
## MMI Menu Maps

The function block descriptions include an easy-find menu showing the menu levels and titles encountered to find the appropriate menu title, and the parameters contained in the menu(s).

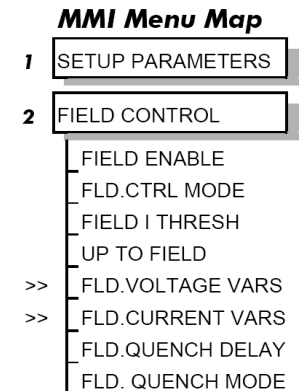
The Menu Maps are shown as if the view level is STANDARD.

Where there is more than one sub-menu, i.e. ANALOG INPUTS as illustrated, the parameters shown will be for the last sub-menu. In many cases, these parameters will reflect the name and number of the last sub-menu.

MMI parameters are named intuitively to make the MMI easier to use, however, they may vary slightly from function block names.

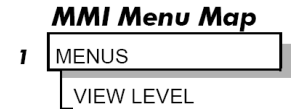


A function block may contain parameters that are contained within more than one MMI menu level, for example FIELD CONTROL. In this case, the extra menu levels are indicated by >> in the MMI Menu Map.



# Function Blocks By Category

The function blocks described in this Appendix are arranged in alphabetical order, however, they are listed below by Category. They each appear as a Menu in the FUNCTION BLOCKS menu. To view the FUNCTION BLOCKS Menu, ADVANCED view level must be selected



<b>Alarms</b>					
ALARM HISTORY	D-15	ALARMS	D-16		
<b>Communications</b>					
5703 IN	D-10	MAIN PORT (P1)	D-10	PNO CONFIG	D-82
5703 OUT	D-11	miniLINK	D-74	SYSTEM PORT (P3)	D-120
<b>Inputs &amp; Outputs</b>					
ANALOG INPUTS	D-21	AUX I/O	D-26	DIGITAL OUTPUTS	D-50
ANALOG OUTPUTS	D-23	DIGITAL INPUT	D-47		
<b>Menus</b>					
MENUS	D-70				
<b>Miscellaneous</b>					
ADVANCED	D-12	DRIVE INFO	D-53		
CONFIGURE DRIVE	D-30	LINKS	D-65		
DEMULTIPLER	D-38	MULTIPLEXER	D-75		
<b>Motor Control</b>					
AUTOTUNE	D-24	ENCODER	D-54	INVERSE TIME	D-66
CALIBRATION	D-27	FEEDBACKS	D-56	PLL	D-81
CURRENT LOOP	D-31	FIELD CONTROL	D-58	SPEED LOOP	D-103
CURRENT PROFILE	D-36	INERTIA COMP	D-64		
<b>Seq &amp; Ref</b>					
JOG/SLACK	D-67	SEQUENCING	D-97	STOP RATES	D-115
RAMPS	D-91	STANDSTILL	D-113		
<b>Setpoint Funcs</b>					
DEADBAND	D-37	PRESET SPEEDS	D-83	SETPOINT SUM	D-100
MIN SPEED	D-73	RAISE/LOWER	D-88	SRAMP	D-110
PID	D-76				
<b>Winder</b>					
DIAMETER CALC	D-39	PROFILED GAIN	D-86	TORQUE CALC	D-120

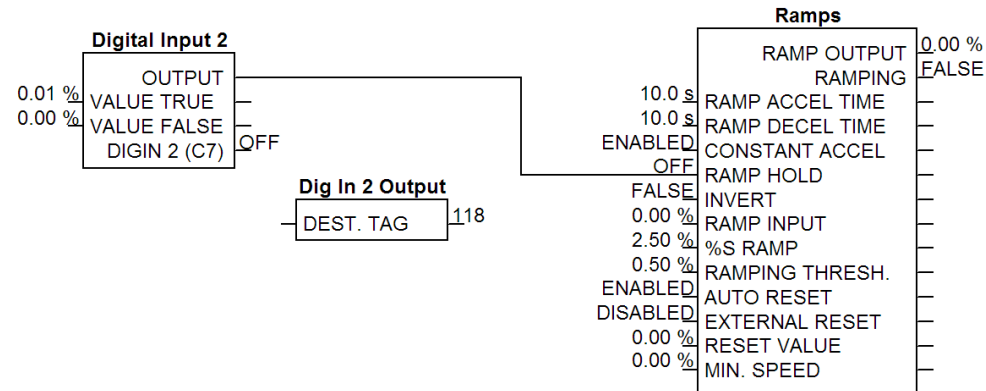
# Compatibility with Earlier Versions of Firmware

Version 9.x and onwards of the 590 is upwardly compatible with earlier firmware versions of the 590. It will accept and run existing configurations when downloaded via UDP, from DSElite. These earlier versions of firmware will not however accept a configuration designed for use with Version 9.x firmware and onwards.

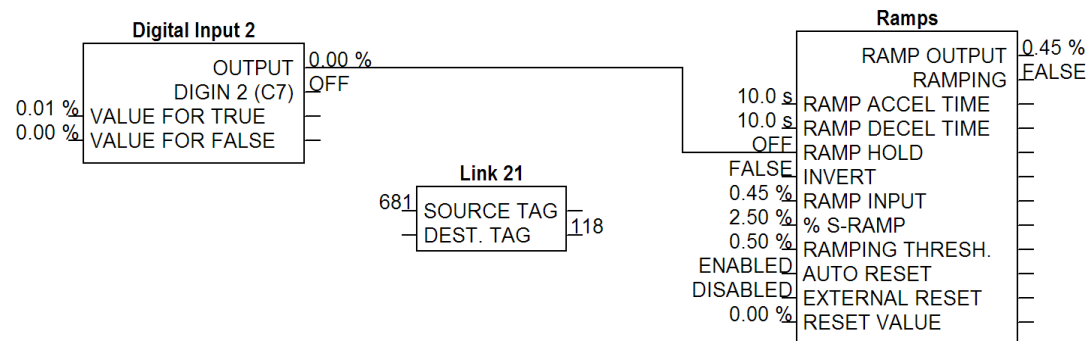
The implementation of the function block diagram destination links and source links is subtly different in version 9.x and onwards. All links have been rationalised to allow connection of any parameter to any input parameter. These enhancements will not interfere with operation of earlier configurations. The enhancements are designed to further improve the flexibility of the function block diagram.

In general, all “output” links have been replaced with the combination of a new output parameter and a new general purpose link. Similarly, all “input” links have been replaced with the combination of a new input parameter and a new general purpose link. Where a suitable output or input parameter already existed there was no need to create a new one, (for example, Configure 5703::Scaled Input already existed as a parameter).

As an illustration, consider the operation of Digital Input 2. Prior to Version 9.1 the output value was not available as an accessible parameter. It could be wired to an input parameter using its dedicated destination tag. By default it was connected to tag 118, RAMP HOLD.



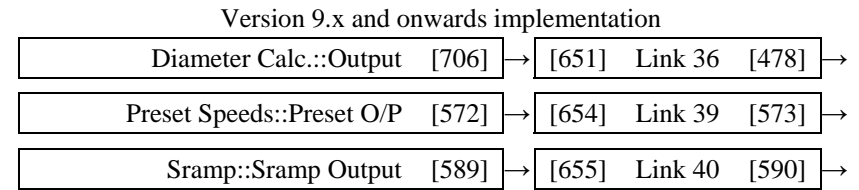
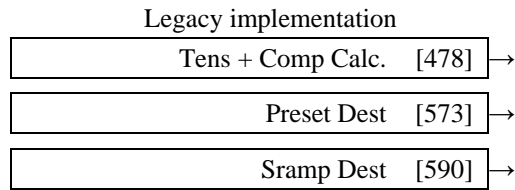
In the revised implementation, the output value is available as a new parameter, OUTPUT. This may be connected to any input parameter using any general purpose link. By default, Link 21 is used to connect OUTPUT (tag 681) to RAMP HOLD (tag 118).



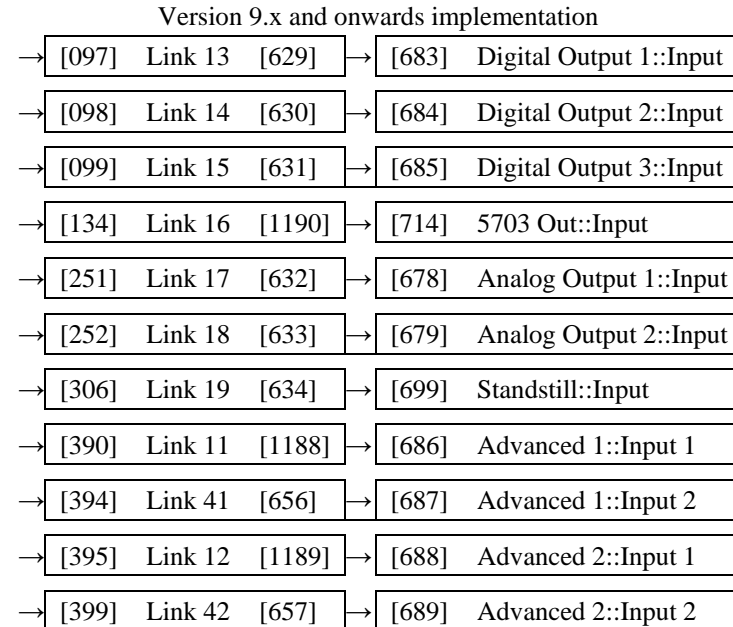
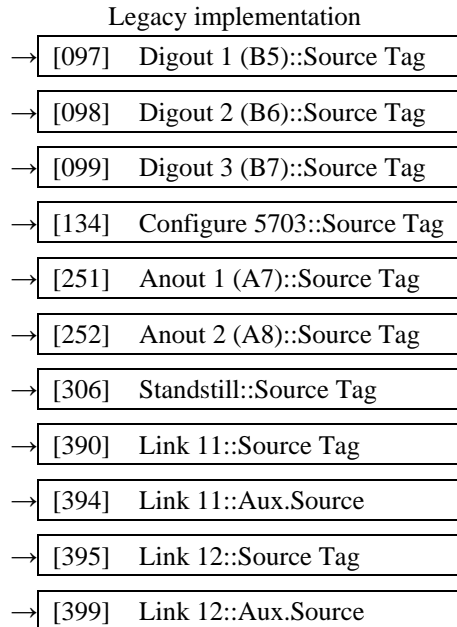
The following tables show the new input and output parameters available, and the allocation of links in the default configuration to emulate the behaviour of previous versions of firmware.

### **Enhancements to output links**

Legacy implementation	Version 9.x and onwards implementation
Digin1 (C6)::Destination Tag [102] →	Digital Input 1::Output [680] → [635] Link 20 [102] →
Digin2 (C7)::Destination Tag [105] →	Digital Input 2::Output [681] → [636] Link 21 [105] →
Digin3 (C8)::Destination Tag [108] →	Digital Input 3::Output [682] → [637] Link 22 [108] →
Digital Input C4::Destination Tag [494] →	Digital Input 4::Digital Input C4 [69] → [652] Link 37 [494] →
Digital Input C5::Destination Tag [495] →	Digital Input 5::Digital Input C5 [70] → [653] Link 38 [495] →
Configure 5703::Scaled Input [135] →	5703 In::Scaled Input [189] → [662] Link 45 [135] →
Anin 1 (A2)::Destination Tag [246] →	Analog Input 1::Output [674] → [638] Link 23 [246] →
Anin 3 (A4)::Destination Tag [249] →	Analog Input 3::Output [675] → [639] Link 24 [249] →
Anin 4 (A5)::Destination Tag [250] →	Analog Input 4::Output [676] → [640] Link 25 [250] →
Anin 5 (A6)::Destination Tag [247] →	Analog Input 5::Output [677] → [641] Link 26 [247] →
Raise/Lower Dest [260] →	Raise/Lower::Output [264] → [642] Link 27 [260] →
Ramp O/P Dest [293] →	Ramps::Ramp Output [85] → [643] Link 28 [293] →
SPT Sum 1 Dest [294] →	Setpoint Sum 1::Spt Sum Output [86] → [644] Link 29 [294] →
Link 11::Destination Tag [391] →	Advanced 1::Output [712] → [658] Link 43 [391] →
Link 12::Destination Tag [396] →	Advanced 2::Output [713] → [660] Link 44 [396] →
PID O/P Dest [400] →	PID::PID Output [417] → [645] Link 30 [400] →
Diameter [431] →	Diameter Calc::Diameter [427] → [646] Link 31 [431] →
Pos I Clamp [435] →	Torque Calc::Pos. I Clamp [707] → [647] Link 32 [435] →
Neg. I Clamp [436] →	Torque Calc::Neg. I Clamp [708] → [648] Link 33 [436] →
Taper [442] →	Diameter Calc::Tot.Tens Demand [441] → [649] Link 34 [442] →
Setpoint Sum 2 [450] →	Setpoint Sum 2::Spt Sum Output [451] → [650] Link 35 [450] →



### ***Enhancements to input links***



### ***Simplification of function blocks***

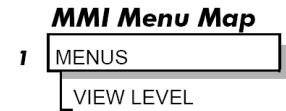
Some function blocks from previous versions of firmware have been re-arranged to clarify the functionality of each block. The changes are:

- SETPOINT SUM 1:      The Deadband function has been extracted into a new DEADBAND function block.
- 5703:                    This has been split into function blocks 5703 IN and 5703 OUT to improve function block execution order.
- AUX IO:                 This has been split into a new SEQUENCING function block and a smaller AUX I/O block.
- PID:                     The Gain Profile function has been extracted into a new PROFILED GAIN function block.
- RAMPS:                 The Minimum Speed function has been extracted into a new MIN SPEED function block.

In addition, the old Diameter Calc, Taper Calc and Tension & Comp blocks have been combined into a single block called Diameter Calc due to the close ties between these blocks.

# Function Block Descriptions

**NOTE** Remember to select the correct mode, Setup or Configuration, whilst editing. Refer to “Modifying a Block Diagram”, page D-1. To view the FUNCTION BLOCKS Menu, ADVANCED view level must be selected.



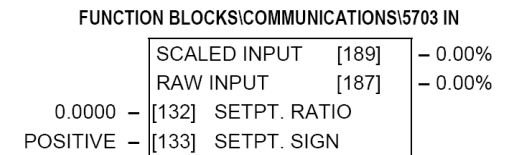
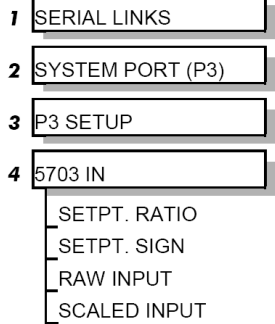
These Function Block descriptions relate to V9.x product firmware.

## 5703 IN

This function block contains the parameters for scaling the setpoint that are received via the P3 comms port using the 5703 setpoint repeater protocol.

In the default configuration, the output of this block (SCALED INPUT) is added to analog inputs 1, 2 and 3 to form the setpoint.

### MMI Menu Map



## 5703 IN

Parameter	Tag	Range
<b>SETPT. RATIO</b> Input scaler.	<b>132</b>	<b>-3.0000 to 3.0000</b>
<b>SETPT. SIGN</b> Input sign.	<b>133</b>	<b>NEGATIVE/ POSITIVE</b>
<b>SCALED INPUT</b> The scaled value received by the 5703 unit. This value is updated upon reception of a new message. If the drive is in Slave mode and no new messages have arrived, a 5703 RCV ERROR will occur. Note: in software versions prior to 5.17, this input is not updated when in Master mode.	<b>189</b>	<b>— .xx %</b>
<b>RAW INPUT</b> The unscaled value received via the P3 port.	<b>187</b>	<b>— .xx %</b>

### MMI Menu Map

- 1 FUNCTION BLOCKS
- 2 COMMUNICATIONS
- 3 5703 OUT
  - INPUT
  - DELAY

## 5703 OUT

This function block is used to define the value that is sent via the P3 port when the selected protocol is “5703 MASTER” or “5703 SLAVE”.

- In 5703 MASTER mode, the INPUT value is transmitted with a minimum period of 5ms. This period may be increased using the DELAY parameter. Note that the delay is the time from the start of one transmission to the start of the next transmission. If the selected baud rate is low then the time to transmit the data may be greater than the delay time, in which case the delay parameter has no effect.
- In 5703 SLAVE mode, the INPUT value is transmitted every time a value is received. The DELAY parameter is ignored in this mode.

FUNCTION BLOCKS\COMMUNICATIONS\5703 OUT

0.00 % - [714] INPUT  
0 ms - [897] DELAY

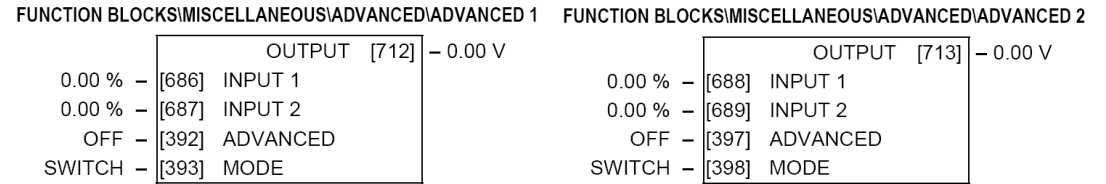
### 5703 OUT

Parameter	Tag	Range
<b>INPUT</b>	<b>714</b>	<b>-300.00 to 300.00 %</b>
The value that will be sent via the P3 port when the P3 MODE is either “5703 MASTER” or “5703 SLAVE”.		
<b>DELAY</b>	<b>897</b>	<b>0 to 1000 ms</b>
A delay parameter that may be used when in 5703 MASTER mode to increase the time between successive transmissions of the 5703 setpoint value.		



# ADVANCED

These two blocks perform some simple functions. They are compatible with the special Link 11 and Link12 used in earlier versions of this product.



### MMI Menu Map

- 1 SYSTEM
- 2 CONFIGURE I/O
- 3 INTERNAL LINKS
- 4 LINK 11
- 4 LINK 12
  - SOURCE TAG
  - DESTINATION TAG
  - ADVANCED
  - MODE
  - AUX. SOURCE

## ADVANCED

Parameter	Tag	Range
<b>INPUT 1</b> General purpose input.	<b>686, 688</b>	<b>-32768.00 to 32768.00 %</b>
<b>INPUT 2</b> General purpose input.	<b>687, 689</b>	<b>-32768.00 to 32768.00 %</b>
<b>ADVANCED</b> Controls the OUTPUT parameter. When OFF, OUTPUT is the same as INPUT 1. When ON, OUTPUT is the result of the function selected by MODE.	<b>392, 397</b>	<b>OFF/ON</b>
<b>MODE</b> This determines which operation is performed on the INPUT 1 and INPUT 2. It can be combined with ADVANCED to dynamically switch the OUTPUT between INPUT 1 and the result of the selected function. The functionality of the various MODE selections are shown in the table.	<b>393, 398</b>	<b>See below</b>
0 : SWITCH 1 : INVERTER 2 : AND (logic) 3 : OR (boolean) 4 : SIGN CHANGER 5 : MODULUS 6 : COMPARATOR		
<b>OUTPUT</b> Result of the selected function on the inputs.	<b>712, 713</b>	<b>— .xx V</b>

### MMI Menu Map

- 1 FUNCTION BLOCKS
- 2 MISCELLANEOUS
- 3 ADVANCED
- 4 ADVANCED 1
- 4 ADVANCED 2
  - INPUT 1
  - INPUT 2
  - OUTPUT

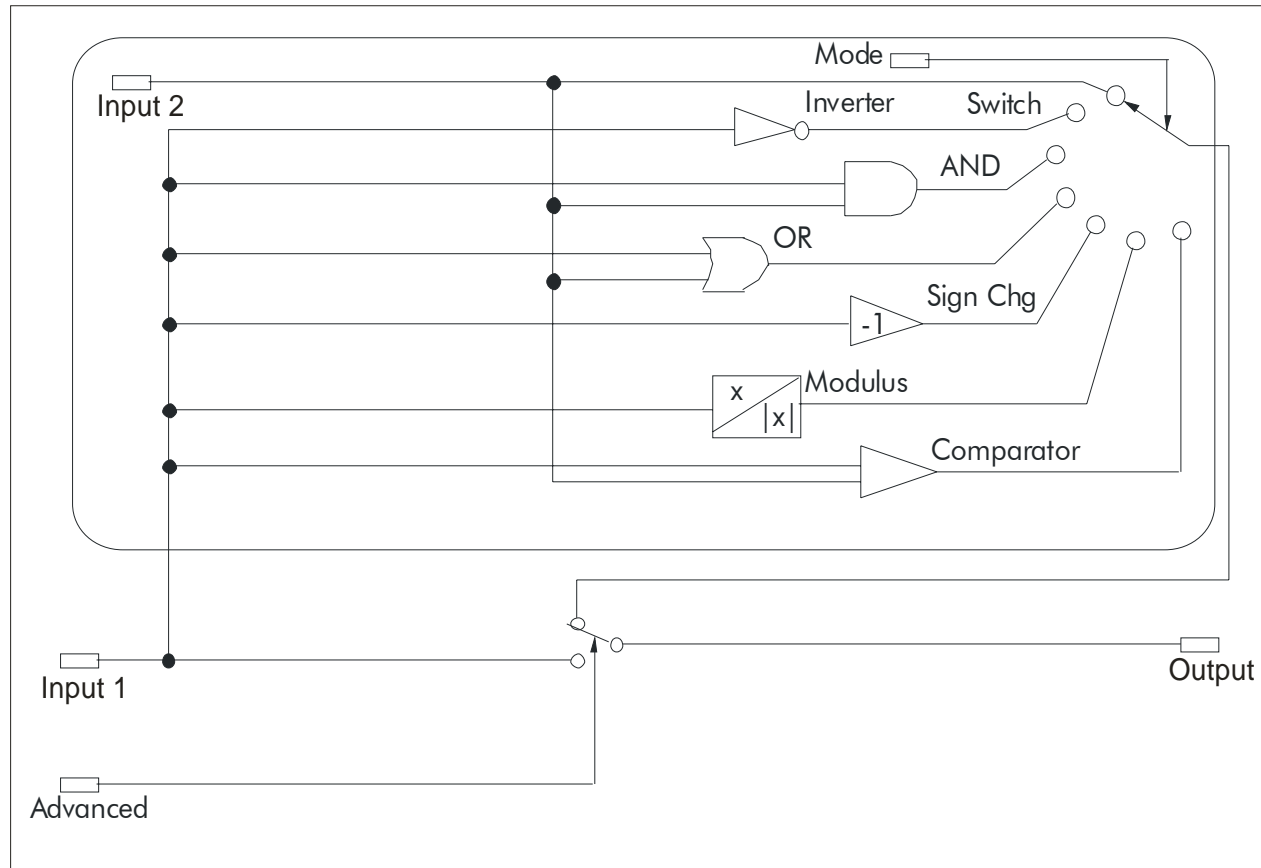
## Functional Description

MODE	Description
<b>SWITCH</b> - switches the signal source between auxiliary and source analog or logic tags	If ADVANCED = OFF OUTPUT = INPUT 1 If ADVANCED = ON OUTPUT = INPUT 2
<b>INVERTER</b> - inverts the source logic signal	If ADVANCED = OFF OUTPUT = INPUT 1 If ADVANCED = ON OUTPUT = Logic Inversion of INPUT 1
<b>AND</b> - gives AND-ed result of source logic signal and an auxiliary source logic signal	If ADVANCED = OFF OUTPUT = INPUT 1 If ADVANCED = ON OUTPUT = INPUT 1 AND INPUT 2
<b>OR</b> - gives OR-ed result of source logic signal and an auxiliary source logic signal	If ADVANCED = OFF OUTPUT = INPUT 1 If ADVANCED = ON OUTPUT = INPUT 1 OR INPUT 2
<b>SIGN CHANGER</b> - reverses the sign of the source logic signal	If ADVANCED = OFF OUTPUT = INPUT 1 If ADVANCED = ON OUTPUT = Value sign change of INPUT 1
<b>MODULUS</b> - produces the modulus of the source logic signal	If ADVANCED = OFF OUTPUT = INPUT 1 If ADVANCED = ON OUTPUT = Modulus of INPUT 1
<b>COMPARATOR</b> - changes destination logic signal to TRUE when source analog signal is greater than auxiliary analog signal	If ADVANCED = OFF OUTPUT = INPUT 1 If ADVANCED = ON If INPUT 1 ≤ INPUT 2 OUTPUT = 0 If INPUT 1 > INPUT 2 OUTPUT = 1

## Functional Description

The following diagram shows the internal schematic for a special link.

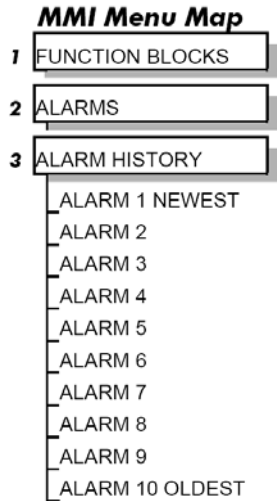
ADVANCED 1 & ADVANCED 2 (Link 11 & Link 12)



# ALARM HISTORY

This function block records the last ten alarms. ALARM 1 NEWEST is the most recent alarm and will be the same as the ALARMS::LAST ALARM parameter when an alarm is active.

## FUNCTION BLOCKS\ALARMS\ALARM HISTORY



ALARM 1 NEWEST	[1246]	0x0000
ALARM 2	[1247]	0x0000
ALARM 3	[1248]	0x0000
ALARM 4	[1249]	0x0000
ALARM 5	[1250]	0x0000
ALARM 6	[1251]	0x0000
ALARM 7	[1252]	0x0000
ALARM 8	[1253]	0x0000
ALARM 9	[1254]	0x0000
ALARM 10 OLDEST	[1255]	0x0000

## ALARM HISTORY

Parameter	Tag	Range
<b>ALARM 1 NEWEST</b>	<b>1246</b>	<b>0x0000 to 0xFFFF</b>
The hexadecimal value of the most recent alarm. Refer to Chapter 7: "Trips and Fault Finding" - Alarm Messages.		
<b>ALARM 2 - ALARM 9</b>	<b>1247 to 1254</b>	<b>0x0000 to 0xFFFF</b>
The second to ninth most recent alarms.		
<b>ALARM 10 OLDEST</b>	<b>1255</b>	<b>0x0000 to 0xFFFF</b>
The tenth most recent alarm.		

# ALARMS

This block allows you to disable certain alarms and leave drive operation un-interrupted if the related fault occurs.

## Caution

Do NOT inhibit any alarms if this might result in danger to personnel or equipment.

### MMI Menu Map

- 1 ALARM STATUS
  - LAST ALARM
  - HEALTH WORD
  - HEALTH STORE
  - THERMISTOR STATE
  - SPEED FBK STATE
  - STALL TRIP

### MMI Menu Map

- 1 SETUP PARAMETERS
- 2 INHIBIT ALARMS
  - FIELD FAIL
  - 5703 RCV ERROR
  - STALL TRIP
  - TRIP RESET
  - SPEED FBK ALARM
  - ENCODER ALARM

### MMI Menu Map

- 1 SETUP PARAMETERS
- 2 CALIBRATION
  - SPDFBK ALM LEVEL
  - STALL THRESHOLD
  - STALL TRIP DELAY

### FUNCTION BLOCKSALARMSALARMS

THERMISTOR STATE	[337]	FALSE
SPEED FBK STATE	[472]	FALSE
HEALTH LED	[122]	FALSE
HEALTH WORD	[115]	0x0000
HEALTH STORE	[116]	0x0000
REMOTE TRIP	[542]	FALSE
STALL TRIP	[112]	FALSE
LAST ALARM	[528]	0x0000
ARM V FALLBACK	[1277]	FALSE
ENABLED	[ 19]	FIELD FAIL
ENABLED	[111]	5703 RCV ERROR
ENABLED	[ 28]	STALL TRIP
TRUE	[305]	TRIP RESET
ENABLED	[ 81]	SPEED FBK ALARM
ENABLED	[ 92]	ENCODER ALARM
ENABLED	[540]	REM TRIP INHIBIT
10.0 s	[541]	REM TRIP DELAY
95.00 %	[263]	STALL THRESHOLD
30.0 s	[224]	STALL TRIP DELAY
50.0 %	[180]	SPDFBK ALM LEVEL
0.25s	[1296]	SPDFBK ALM DELAY

## ALARMS

Parameter	Tag	Range
<b>FIELD FAIL</b> Inhibits the field fail alarm.	<b>19</b>	<b>ENABLED / INHIBITED</b>
<b>5703 RCV ERROR</b> Inhibits 5703 serial communications receive error. Only active in Slave Mode.	<b>111</b>	<b>ENABLED / INHIBITED</b>
<b>STALL TRIP</b> Inhibits the stall trip alarm from tripping out the contactor. This is useful in applications requiring extended operation at zero speed.	<b>28</b>	<b>ENABLED / INHIBITED</b>
<b>TRIP RESET</b> When FALSE: faults are latched permanently and the HEALTHY output remains inactive, even when toggling the Start/Run input (C3) off/on. Once the drive is stopped the sequencing state remains in the SEQ HOLD state if any fault has been stored. Changing from FALSE to TRUE clears any stored faults. Also, when TRUE: stored faults are cleared whenever a Run signal is given to terminal C3. This feature can be used in applications where you want to reset the faults under your own control, rather than automatically with the Start/Run command.	<b>305</b>	<b>FALSE / TRUE</b>

## ALARMS

Parameter	Tag	Range
<b>SPEED FBK ALARM</b>	<b>81</b>	<b>ENABLED / INHIBITED/ARM V FALLBACK</b>
Provides facility to inhibit the speed feedback alarm, or to elect that (in place of the alarm) armature voltage is used as the fallback speed feedback if the armature voltage exceeds the normal speed feedback by SPDFBK ALM LEVEL for longer than SPDFBK ALM DELAY. The fallback control condition is latched, cleared only by stop/start, disable/re-enable or power down. (Note that speed feedback alarms caused by feedback inversion, by feedback exceeding armature voltage, or when the field weakening mode is selected, all prevent the fallback action, instead causing a normal drive trip.)		
<b>ENCODER ALARM</b>	<b>92</b>	<b>ENABLED / INHIBITED</b>
Inhibits the encoder option board alarm.		
<b>REM TRIP INHIBIT</b>	<b>540</b>	<b>ENABLED / INHIBITED</b>
Inhibits the remote trip.		
<b>REM TRIP DELAY</b>	<b>541</b>	<b>0.1 to 600.0 s</b>
The delay between the remote trip alarm being activated and the drive tripping.		
<b>STALL THRESHOLD</b>	<b>263</b>	<b>0.00 to 200.00 %</b>
Stall comparator current feedback threshold level.		
<b>STALL TRIP DELAY</b>	<b>224</b>	<b>0.1 to 600.0 s</b>
Stall comparator time-out delay before stall output becomes true.		
<b>SPDFBK ALM LEVEL</b>	<b>180</b>	<b>0.0 to 100.0 % (h)</b>
The speed feedback alarm compares speed feedback to armature voltage. The alarm level is the threshold which the difference between the two signals should exceed for the alarm to activate.		
<b>SPDFBK ALM DELAY</b>	<b>1296</b>	<b>0.000 to 5.000s</b>
The speed feedback alarm time-out delay before the alarm is activated, applies only to alarms caused by armature voltage exceeding speed feedback. Alarms caused by speed feedback exceeding armature voltage have fixed 5 second delay. Alarms caused by speed feedback of opposite polarity to armature voltage are instantaneous.		
<b>THERMISTOR STATE</b>	<b>337</b>	<b>FALSE / TRUE</b>
TRUE if the thermistor input is active, FALSE otherwise.		
<b>SPEED FBK STATE</b>	<b>472</b>	<b>FALSE / TRUE</b>
A Boolean output that shows the state of the speed feedback alarm. This output is updated even when the alarm is disabled.		

### MMI Menu Map

- 1 FUNCTION BLOCKS
- 2 ALARMS
- 3 ALARMS
  - REM TRIP INHIBIT
  - REM TRIP DELAY
  - SPDFBK ALM DELAY
  - REMOTE TRIP
  - ARM V FALLBACK
  - INVERSE TIME
  - P3 RX TIMEOUT

## ALARMS

Parameter	Tag	Range
<b>HEALTH LED</b> State of Health LED on Keypad.	<b>122</b>	<b>FALSE / TRUE</b>
<b>HEALTH WORD</b> The hexadecimal sum of any alarms present. Refer to Chapter 7: “Trips and Fault Finding” - Alarm Messages.	<b>115</b>	<b>0x0000 to 0xFFFF</b>
<b>HEALTH STORE</b> The hexadecimal value of the first (or only) alarm. Refer to Chapter 7: “Trips and Fault Finding” - Alarm Messages.	<b>116</b>	<b>0x0000 to 0xFFFF</b>
<b>REMOTE TRIP</b> The state of Remote Trip.	<b>542</b>	<b>FALSE / TRUE</b>
<b>STALL TRIP</b> Armature current is above STALL THRESHOLD and AT ZERO SPEED but <u>not</u> AT ZERO SETPOINT.	<b>112</b>	<b>FALSE / TRUE</b>

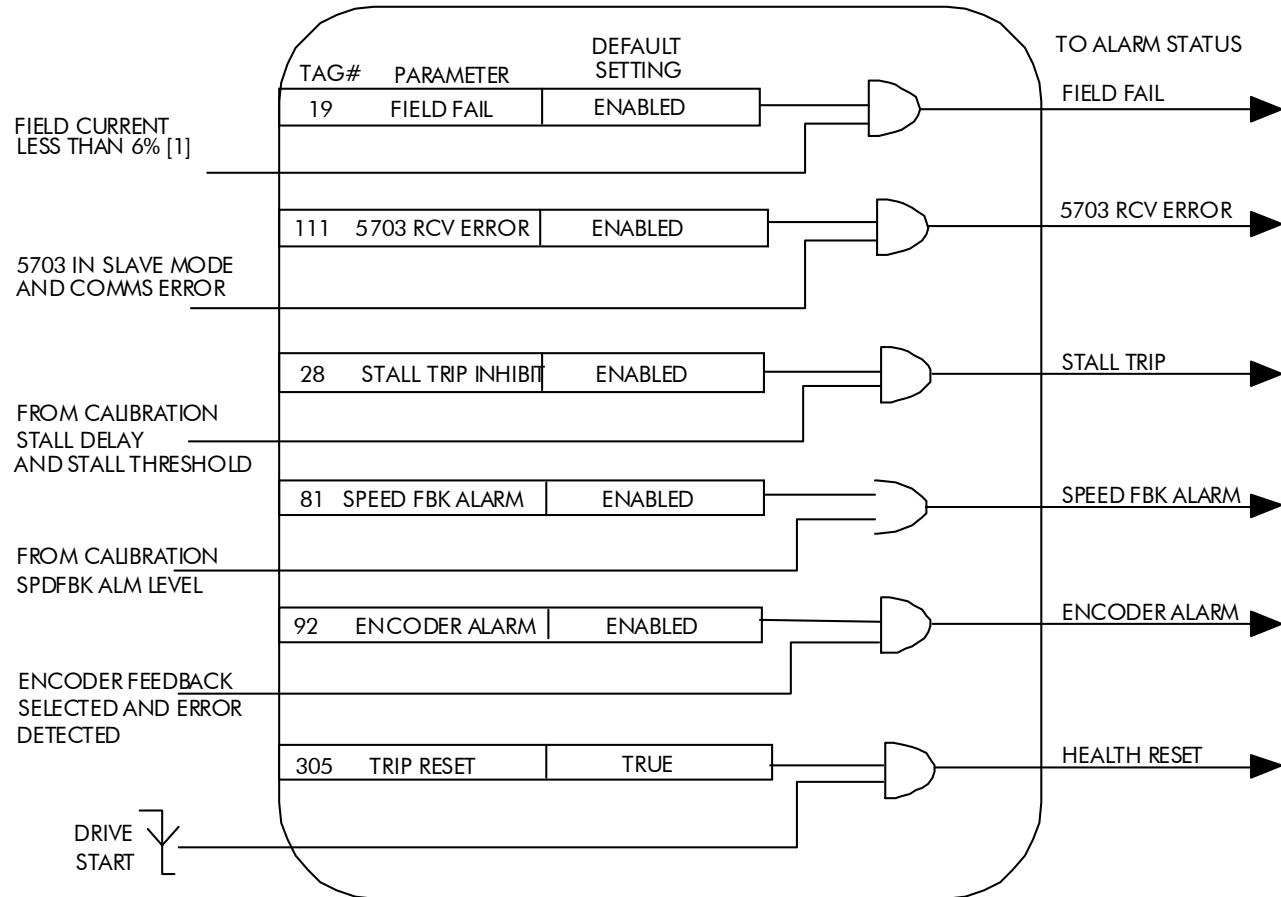
## ALARMS

Parameter	Tag	Range
<b>LAST ALARM</b>	<b>528</b>	<b>0x0000 to 0xFFFF</b>
The hexadecimal value of the last (or only) alarm. Refer to Chapter 7: “Trips and Fault Finding” - Alarm Messages.		
0x0000 : NO ACTIVE ALARMS		
0x0001 : OVER SPEED		
0x0002 : MISSING PULSE		
0x0004 : FIELD OVER I		
0x0008 : HEATSINK TRIP		
0x0010 : THERMISTOR		
0x0020 : OVER VOLTS (VA)		
0x0040 : SPD FEEDBACK		
0x0080 : ENCODER FAILED		
0x0100 : FIELD FAILED		
0x0200 : 3 PHASE FAILED		
0x0400 : PHASE LOCK		
0x0800 : 5703 RCV ERROR		
0x1000 : STALL TRIP		
0x2000 : OVER I TRIP		
0x8000 : ACCTS FAILED		
0xF001 : AUTOTUNE ERROR		
0xF002 : AUTOTUNE ABORTED		
0xF003 : SEQ PRE READY		
0xF004 : CONTACTOR DELAY		
0xF005 : EXTERNAL TRIP		
0xF006 : REMOTE TRIP		
0xF009 : SEQUENCING		
0xF010 : COMMS TIMEOUT		
0xF300 : CALIBRATION		
0xFF03 : AUX SUPPLY		
<b>ARM V FALLBACK</b>	<b>1277</b>	<b>FALSE / TRUE</b>
True if the armature voltage has been switched in as the speed feedback, in the ARM V FALLBACK mode.		
<b>INVERSE TIME</b>	<b>1279</b>	<b>ENABLED / INHIBITED</b>
Enables or inhibits an alarm which occurs in place of the inverse time current limit action when the moment of first reduction in current limit is reached.		
<b>P3 RX TIMEOUT</b>	<b>338</b>	<b>FALSE / TRUE</b>
Indicates that a valid message has not been received in the last 1 second. Operates only when the P3 port is in the 5703 SLAVE mode and is non latching (it clears to FALSE when a new message is received)		



# Functional Description

## INHIBIT ALARMS

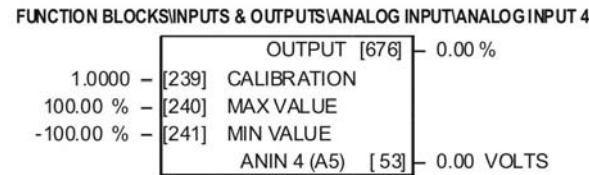
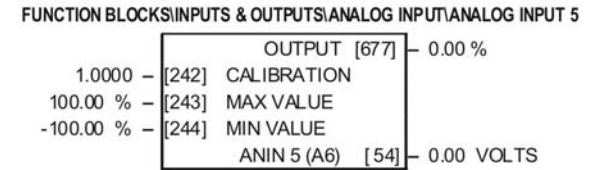
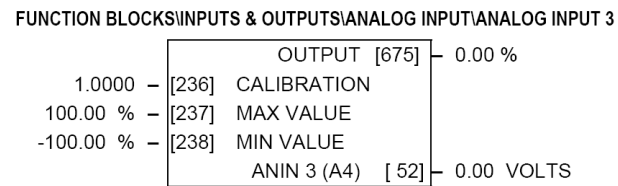
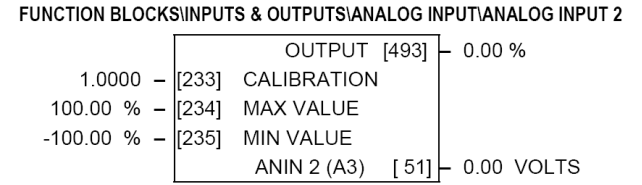
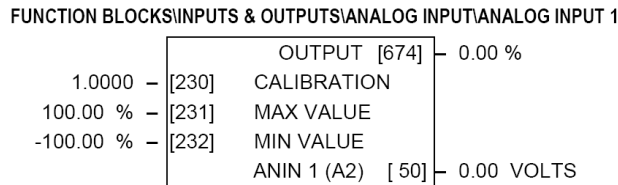
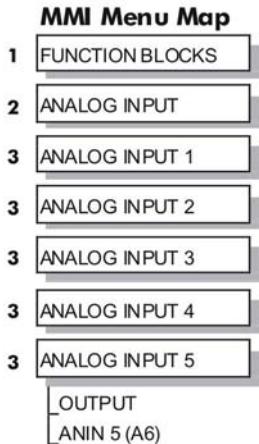
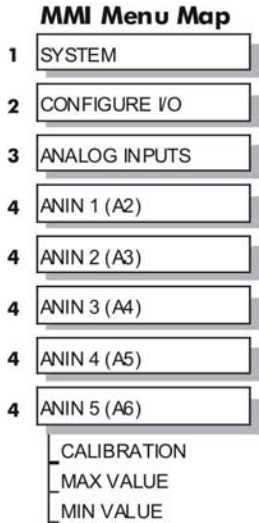


NOTE [1]:

FIELD FAIL THRESHOLD IS 6% IN CURRENT CONTROL  
25% IN VOLTAGE CONTROL

# ANALOG INPUTS

The analog input block is used to scale and clamp the inputs for terminals A2 to A6.



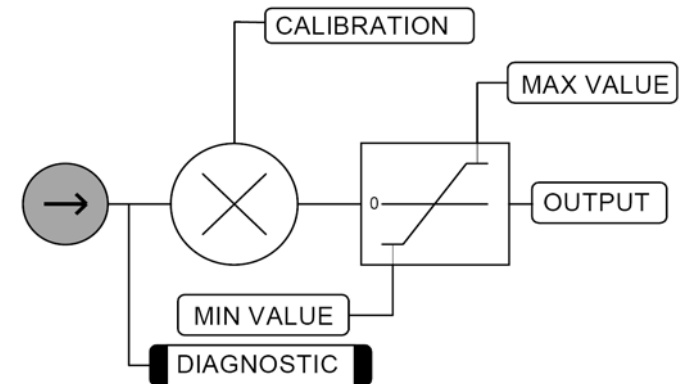
## NOTE

Terminal ANIN 2 (A3) is permanently connected to SETPOINT 2 (A3) in the SPEED LOOP function block and to the Current Demand via I DEMAND ISOLATE (the current demand isolate switch) in the CURRENT LOOP function block.

To avoid interference with other drive functions when not required: the parameter RATIO 2 (A3) (Tag 7 in the SPEED LOOP function block) must be set to zero; and the I DMD. ISOLATE parameter (Tag 119 in the CURRENT LOOP function block) must be set to DISABLED, i.e. selecting the Speed Loop as shown in the Main Block Diagram.

Because ANIN 2 (A3) is scanned synchronously with the current loop (typically every 3.3/2.6ms, 50/60Hz), it should be used for any signal whose response is critical e.g. a trim input from an external positioning system or load share.

Configurable Analog Inputs



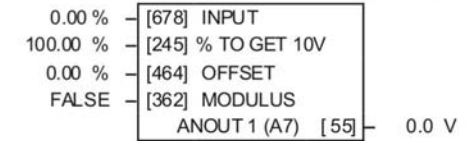
## ANALOG INPUTS

Parameter	Tag	Range
<b>CALIBRATION</b>	<b>230, 233, 236, 239, 242</b>	<b>-3.0000 to 3.0000</b>
The analog input scaling ratio. For a value of 1.0, 10V = 100%.		
<b>MAX VALUE</b>	<b>231, 234, 237, 240, 243</b>	<b>-300.00 to 300.00 %</b>
The maximum value of the scaled analog input.		
<b>MIN VALUE</b>	<b>232, 235, 238, 241, 244</b>	<b>-300.00 to 300.00 %</b>
The minimum value of the scaled analog input.		
<b>OUTPUT</b>	<b>674, 493, 675, 676, 677</b>	<b>—.xx %</b>
These parameters are the output diagnostics ANALOG INPUT 1 to ANALOG INPUT 5. Note by default 10V = 100%. To obtain a different range, adjust the CALIBRATION, MAX VALUE and MIN VALUE parameters.		
<b>ANIN 1 (A2) to ANIN 5 (A6)</b>	<b>50, 51, 52, 53, 54</b>	<b>—.xx VOLTS</b>
Actual volts measured on the analog input.		

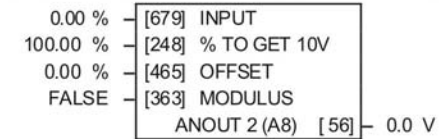
# ANALOG OUTPUTS

This function block converts the demand percentage into 0-10V, suitable for driving the analog output electronics of the drive.

FUNCTION BLOCKS: INPUTS & OUTPUTS: ANALOG OUTPUT: ANALOG OUTPUT 1

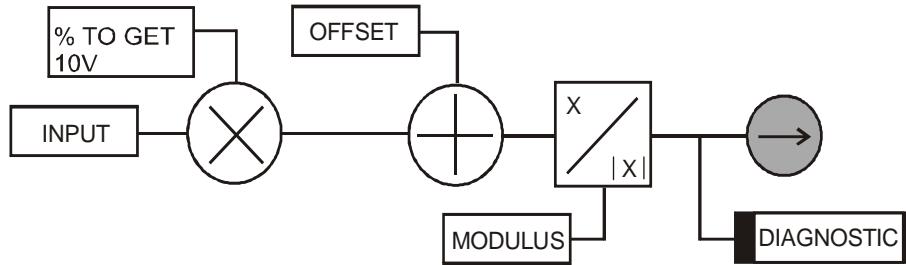


FUNCTION BLOCKS: INPUTS & OUTPUTS: ANALOG OUTPUT: ANALOG OUTPUT 2



## MMI Menu Map

- 1 SYSTEM
- 2 CONFIGURE I/O
- 3 ANALOG OUTPUTS
- 4 ANOUT 1 (A7)
- 4 ANOUT 2 (A8)
  - % TO GET 10V
  - MODULUS
  - OFFSET



## ANALOG OUTPUTS

## MMI Menu Map

- 1 FUNCTION BLOCKS
- 2 ANALOG OUTPUT
- 3 ANALOG OUTPUT 1
- 3 ANALOG OUTPUT 2
  - INPUT
  - ANOUT 2 (A8)

Parameter	Tag	Range
<b>INPUT</b>	<b>678, 679</b>	<b>-300.00 to 300.00 %</b>
Analog output value as a percentage of range.		
<b>% TO GET 10V</b>	<b>245, 248</b>	<b>-300.00 to 300.00 %</b>
Scaler value which produces 10V output. Set % to get 10V to 50% to get ±10V out for ±50% in.		
<b>OFFSET</b>	<b>464, 465</b>	<b>-100.00 to 100.00 %</b>
Offset value added to the normal output value after the scaler and before the modulus.		
<b>MODULUS</b>	<b>362, 363</b>	<b>FALSE / TRUE</b>
Unipolar analog output enable. If TRUE, then -10% gives +1V out.		
<b>ANOUT 1 (A7) to ANOUT 2 (A8)</b>	<b>55, 56</b>	<b>—.xx V (h)</b>
Actual voltage output to the terminal.		

# AUTOTUNE

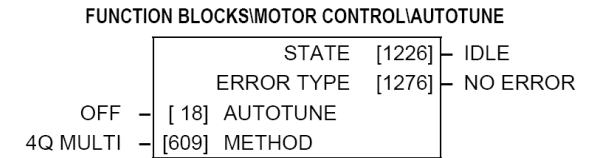
The Autotune feature is used to correctly set up the current loop controller parameters for the motor load.

The process consists of the drive generating a series of current pulses in the armature in order to determine:

1. The optimal proportional term and integral terms gains in the current controller, and storing these values as PROP. GAIN and INT. GAIN.
2. The average value at which the normal running pulses would just join up (stop being discontinuous), and storing this value as the DISCONTINUOUS parameter.

The Autotune is by default performed with the motor field off, and so the final proportional term gain is reduced by 30% to allow for some armature inductance fall-off when the field is re-applied.

Refer to Chapter 4: Performance Adjustment for details of how to perform an Autotune.



## MMI Menu Map

- 1 SETUP PARAMETERS
  - AUTOTUNE
- 2 CURRENT LOOP

## MMI Menu Map

- 1 FUNCTION BLOCKS
  - AUTOTUNE
- 2 MOTOR CONTROL
  - STATE
  - METHOD
  - ERROR TYPE
- 3 AUTOTUNE

## AUTOTUNE

Parameter	Tag	Range
<b>AUTOTUNE</b>	<b>18</b>	<b>OFF / ARMATURE</b>
Turns the AUTOTUNE procedure on Refer to Chapter 4: Performance Adjustment.		
<b>STATE</b>	<b>1226</b>	<b>See below</b>
Indicates the current operating state of the Autotune function block. The FAILED state indicates failure or abort of the Autotune process (for causes refer to Chapter 4: Performance Adjustment).		
0 : IDLE 1 : RUNNING 2 : SUCCESS 3 : FAILED		

## AUTOTUNE

Parameter	Tag	Range
-----------	-----	-------

<b>METHOD</b>	<b>609</b>	<b>See below</b>
---------------	------------	------------------

Controls the method of operation of the Autotune process.

- The default method 4QMULTI uses both thyristor bridges to generate balanced forward and reverse armature current pulses.
- The 2QMULTI method only uses the forward thyristor bridge.

Note that only the 2Q MULTI method is valid on a 2Q drive (591) and use of the 4Q MULTI setting will result in an autotune failure, with THYRISTOR OFF as the ERROR TYPE.

0 : 4Q MULTI  
1 : 2Q MULTI

---

<b>ERROR TYPE</b>	<b>1276</b>	<b>See below</b>
-------------------	-------------	------------------

Indicates the cause of an autotune error condition.

0 : NO ERROR  
1 : OVER SPEED  
2 : FIELD ERROR  
3 : PULSE WIDTH  
4 : OVER CURRENT  
5 : TIMEOUT  
6 : AUTOTUNE ABORTED  
7 : FIRING ANGLE  
8 : PEAK/AVER. RATIO  
9 : UNBALANCED BRID.  
10 : NULL AVERAGE CUR  
11 : THYRISTOR OFF (missing pulse)

---

# AUX I/O

## MMI Menu Map

- 1 SETUP PARAMETERS
- 2 AUX I/O
  - AUX DIGOUT 1
  - AUX DIGOUT 2
  - AUX DIGOUT 3
  - ANOUT 1
  - ANOUT 2

The auxiliary I/O parameters are primarily intended to extend the functionality of the serial links by allowing them access to the drive analog and digital terminals.

FUNCTION BLOCKS\INPUTS & OUTPUTS\AUX I/O

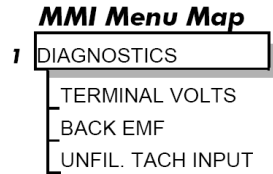
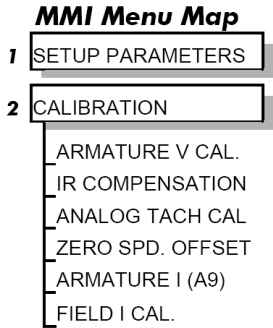
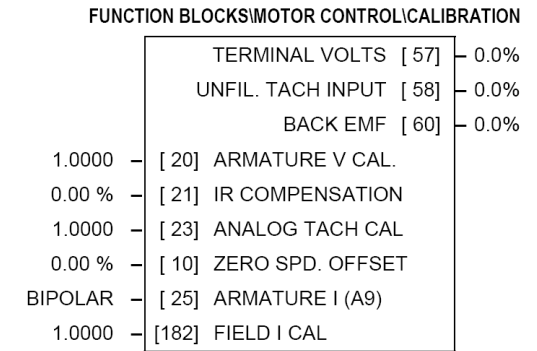
FALSE	[ 94] AUX DIGOUT 1
FALSE	[ 95] AUX DIGOUT 2
FALSE	[ 96] AUX DIGOUT 3
0.00 %	[128] ANOUT 1
0.00 %	[129] ANOUT 2

AUX I/O		
Parameter	Tag	Range
<b>AUX DIGOUT 1</b>	<b>94</b>	<b>FALSE / TRUE</b>
Software digital output 1. For example, to directly drive the configurable digital output DIGOUT1, connect the Source of DIGOUT1 to this parameter, Tag 94.		
<b>AUX DIGOUT 2</b>	<b>95</b>	<b>FALSE / TRUE</b>
Software digital output 2. For example, to directly drive the configurable digital output DIGOUT2, connect the Source of DIGOUT2 to this parameter, Tag 95.		
<b>AUX DIGOUT 3</b>	<b>96</b>	<b>FALSE / TRUE</b>
Software digital output 3. For example, to directly drive the configurable digital output DIGOUT3, connect the Source of DIGOUT3 to this parameter, Tag 96.		
<b>ANOUT 1</b>	<b>128</b>	<b>-100.00 to 100.00 %</b>
Software analog output 1. For example, to directly drive the configurable analog output ANOUT1, connect the Source of ANOUT1 to this parameter, Tag 128. ANOUT 1 can also be used as a general "staging post" for connecting inputs to outputs. For example, connect Analog Input 1 (A2) directly to Analog Output 1 (A7)		
<b>ANOUT 2</b>	<b>129</b>	<b>-100.00 to 100.00 %</b>
Software analog output 2. For example, to directly drive the configurable analog output ANOUT2, connect the Source of ANOUT2 to this parameter, Tag 129. ANOUT 2 can also be used as a general "staging post" for connecting inputs to outputs. For example, connect Analog Input 1 (A2) directly to Analog Output 2 (A8)		

# CALIBRATION

This function block contains motor-specific parameters.

When CONFIGURE ENABLE = TRUE, the operation of the Block Diagram is suspended and all Keypad LEDs will flash.



## CALIBRATION

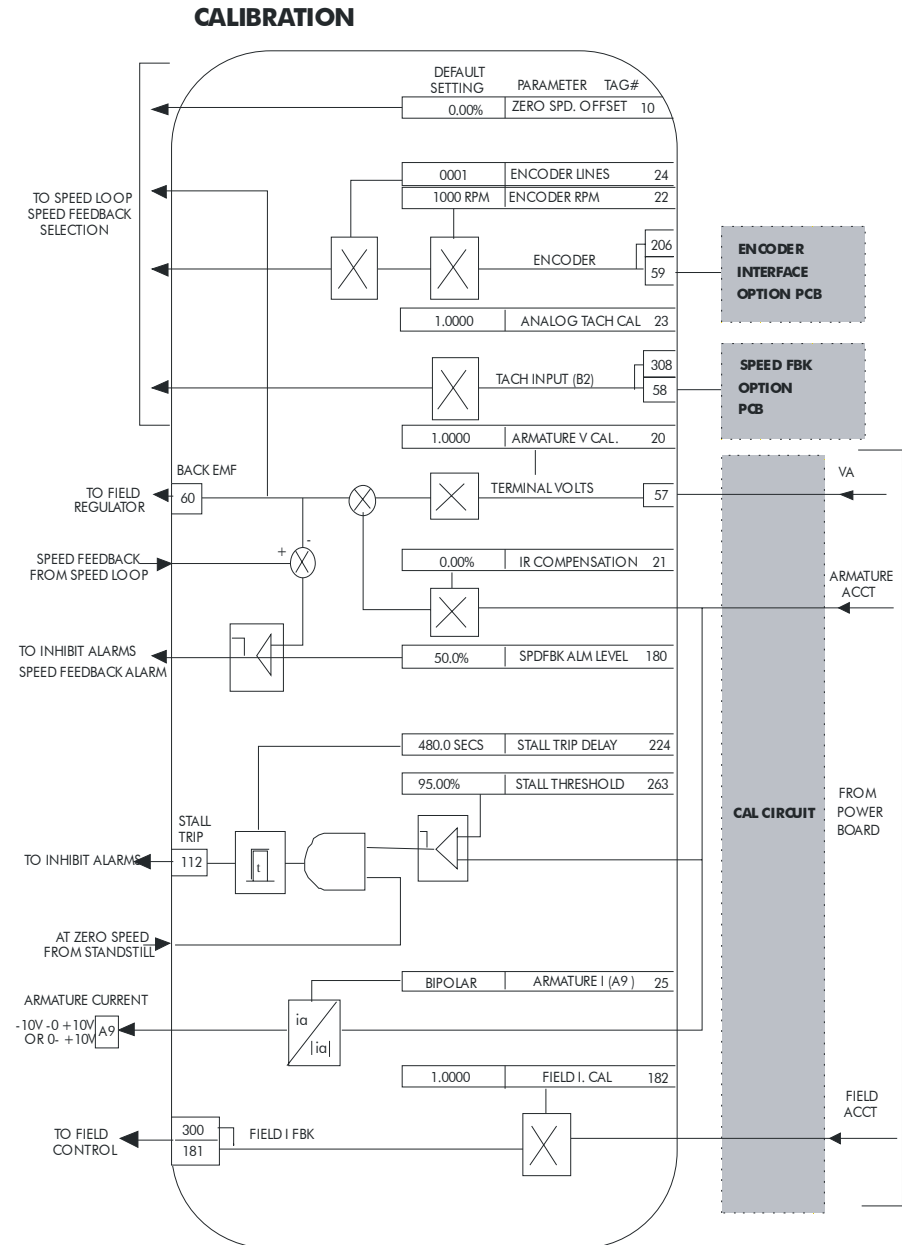
Parameter	Tag	Range
<b>ARMATURE V CAL.</b>	<b>20</b>	<b>0.9800 to 1.1000</b>
Trim adjustment of the motor armature volts to give exactly 100% at the required actual voltage value (e.g. 460V etc.).		
<i>Note: - Primary voltage calibration is achieved by adjusting SW7.</i>		
<b>IR COMPENSATION</b>	<b>21</b>	<b>0.00 to 100.00 %</b>
Compensation for motor IR drop to improve regulation when using armature voltage feedback as the speed feedback. This is also used in field weakening applications to improve dynamic response and speed holding stability, refer to “Initial Start-up Routine” in Chapter 4, Item 16.		
In armature voltage feedback control at non-zero armature currents, the terminal voltage will be elevated by the amount CURRENT FEEDBACK X IR COMPENSATION.		
<b>ANALOG TACH CAL</b>	<b>23</b>	<b>0.9800 to 1.1000</b>
Trim adjustment of the motor speed to give exactly 100% at the required actual speed value (e.g. 1500 RPM etc). <i>Note: Primary tach calibration is achieved by adjusting SW1 - 3 on the tach calibration board.</i>		
<b>ZERO SPD. OFFSET</b>	<b>10</b>	<b>-5.00 to 5.00 %</b>
If the speed feedback is not zero when the motor is stationary (possibly due to hardware offsets etc.) the setting of this parameter to the value of the offset will result in a zero reading from the speed feedback.		
<b>ARMATURE I (A9)</b>	<b>25</b>	<b>UNIPOLAR / BIPOLAR</b>
Selects operation of the current meter output (terminal A9), either bipolar or unipolar.		
Bipolar mode : +10V = 200% output current forward, -10V = 200% output current reverse		
Unipolar mode : +10V = 200% output current (forward or reverse).		



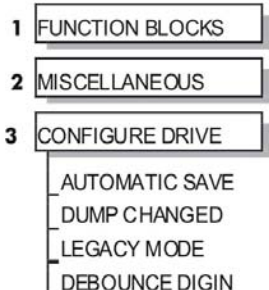
## CALIBRATION

Parameter	Tag	Range
<b>FIELD I CAL.</b>	<b>182</b>	<b>0.9800 to 1.1000</b>
Trim adjustment of the motor field current to give exactly 100% at the required actual current value (e.g. 1.5A etc.).		
<i>Note:- Primary field calibration is achieved by adjusting SW4 – 6.</i>		
<b>TERMINAL VOLTS</b>	<b>57</b>	<b>—x % (h)</b>
<i>Refer to Chapter 6: "The MMI - Man Machine Interface" - The MMI Menus (DIAGNOSTICS).</i>		
<b>UNFIL. TACH INPUT</b>	<b>58</b>	<b>—x % (h)</b>
<i>Refer to Chapter 6: "The MMI - Man Machine Interface" - The MMI Menus (DIAGNOSTICS).</i>		
<b>BACK EMF</b>	<b>60</b>	<b>—x % (h)</b>
<i>Refer to Chapter 6: "The MMI - Man Machine Interface" - The MMI Menus (DIAGNOSTICS).</i>		

# Functional Description



### MMI Menu Map



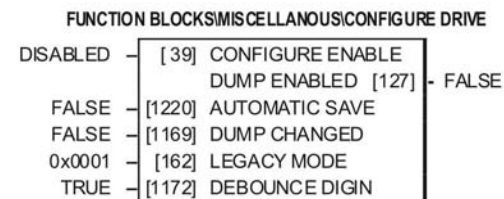
## CONFIGURE DRIVE

This block contains many of the parameters required for configuring the drive.

**NOTE** The CONFIGURE DRIVE menu on the MMI contains a different set of parameters, for set-up using the keypad.

CONFIGURE ENABLE: The operation of the Block Diagram is suspended and all Keypad LEDs will flash whilst CONFIGURE ENABLE = TRUE.

**NOTE** The CONFIGURE ENABLE parameter is also available in the following MMI menus for ease of use: CALIBRATION, CONFIGURE I/O



### CONFIGURE DRIVE

Parameter	Tag	Range
<b>CONFIGURE ENABLE</b>	<b>39</b>	<b>FALSE / TRUE</b>
Selects Operating Mode (FALSE) or Configuration Mode (TRUE). Refer to "Modifying a Block Diagram", page D-1.		
<b>AUTOMATIC SAVE</b>	<b>1220</b>	<b>FALSE/TRUE</b>
When TRUE, changes made to parameters using the operator station are automatically saved to the drive's non-volatile memory.		
<b>DUMP CHANGED</b>	<b>1169</b>	<b>FALSE /TRUE</b>
This parameter is used in conjunction with DUMP MMI (TX) and DUMP BLOCKS. When TRUE, only those parameters that have been modified from their default value are included in the dump.		
<b>LEGACY MODE</b>	<b>162</b>	<b>0x0000 to 0xFFFF</b>
When non-zero the drive emulates some behaviour of earlier firmware versions of the 590, (firmware version 4.x) In particular this behaviour affects linking of parameters in the function block diagram (refer to "Compatibility with Earlier Versions of Firmware". page D-7).		
<b>DEBOUNCE DIGIN</b>	<b>1172</b>	<b>FALSE/TRUE</b>
When TRUE the drive adds a 3ms debounce filter to the digital inputs. This affects terminals C3 to C8, B8 and B9. The hardware connection between terminal B9, (COAST STOP) and the control of the external contactor is not affected.		

# CURRENT LOOP

Use this to setup the drive's conventional current/torque loop.

It takes the current demand, imposes limits through four clamps, and then uses a PI loop to control the output.

The four separate clamps - current profile, inverse time overload, bipolar clamps and main current clamp - the clamps are in series and lowest clamp takes effect. The resultant clamp value can be seen in the diagnostics ACTUAL POS I LIM and ACTUAL NEG I LIM.

The internal inputs to this block are:

- the current demand from the speed loop or terminal A3 (selected via I DMD. ISOLATE)
- the current limit clamps from CURRENT PROFILE and INVERSE TIME (note that the bipolar clamps and main current clamp are resident in the CURRENT LOOP block)
- current feedback from CALIBRATION.

The default configuration uses DIGIN 1 and DIGIN 3 for switching modes (BIPOLAR CLAMPS and I DMD. ISOLATE respectively), ANIN 5 for setting the symmetrical positive and negative current clamps.

FUNCTION BLOCKS			MOTOR CONTROL			CURRENT LOOP		
	AT CURRENT LIMIT	[ 42]		FALSE				
	IaDmd UNFILTERED	[ 66]		0.00 %				
	CURRENT DEMAND	[299]		0.00 %				
	IaFbk UNFILTERED	[ 65]		0.0 %				
	MASTER BRIDGE	[527]		TRUE				
	PHASE ANGLE @ E	[1174]		0.00 DEG				
	POS. I CLAMP	[ 87]		0.0 %				
	NEG. I CLAMP	[ 88]		0.0 %				
	ACTUAL POS I LIM	[ 67]		0.0 %				
	ACTUAL NEG I LIM	[ 61]		0.0 %				
100.00 %	[ 15] CUR. LIMIT/SCALER							
110.00 %	[421] MAIN CURR. LIMIT							
45.00	[ 16] PROP. GAIN							
3.50	[ 17] INT. GAIN							
12.00 %	[137] DISCONTINUOUS							
0.00 %	[ 30] ADDITIONAL DEM							
DISABLED	[ 90] BIPOLAR CLAMPS							
4Q (REGEN)	[201] REGEN ENABLE							
100.00 %	[301] POS. I CLAMP IN							
-100.00 %	[ 48] NEG. I CLAMP IN							
DISABLED	[119] I DMD. ISOLATE							

**MMI Menu Map**

- 1 SETUP PARAMETERS
  - CURRENT LOOP
    - MAIN CURR. LIMIT
    - PROP. GAIN
    - INT. GAIN
    - DISCONTINUOUS
    - ADDITIONAL DEM
    - BIPOLAR CLAMPS
    - REGEN ENABLE
    - POS. I CLAMP IN
    - NEG. I CLAMP IN
    - I DMD. ISOLATE
    - CUR. LIMIT/SCALER

**MMI Menu Map**

- 1 DIAGNOSTICS
  - CURRENT DEMAND
  - POS. I CLAMP
  - NEG. I CLAMP
  - ACTUAL POS I LIM
  - ACTUAL NEG I LIM
  - AT CURRENT LIMIT

**MMI Menu Map**

- 1 FUNCTION BLOCKS
  - MOTOR CONTROL
    - CURRENT LOOP
      - Ia Dmd UNFILTERED
      - IaFbk UNFILTERED
      - MASTER BRIDGE
      - PHASE ANGLE @ E

CURRENT LOOP		
Parameter	Tag	Range
<b>CUR. LIMIT/SCALER</b>	<b>15</b>	<b>0.00 to 200.00 %</b>
Current limit scaler. It scales bipolar/unipolar clamps. To achieve 200% current limit, the current limit scaler should be set to 200%.		
<b>MAIN CURR. LIMIT</b>	<b>421</b>	<b>0.00 to 200.00 %</b>
Independent symmetric current clamp. Sets symmetric clamps outside scaling from the CUR. LIMIT/SCALER parameter.		
<b>PROP GAIN</b>	<b>16</b>	<b>0.00 to 200.00</b>
Proportional gain control for armature current PI loop. This parameter is set during the autotune function.		
<b>INT. GAIN</b>	<b>17</b>	<b>0.00 to 200.00</b>
Integral gain control for armature current PI loop, set during the autotune function.		

## CURRENT LOOP

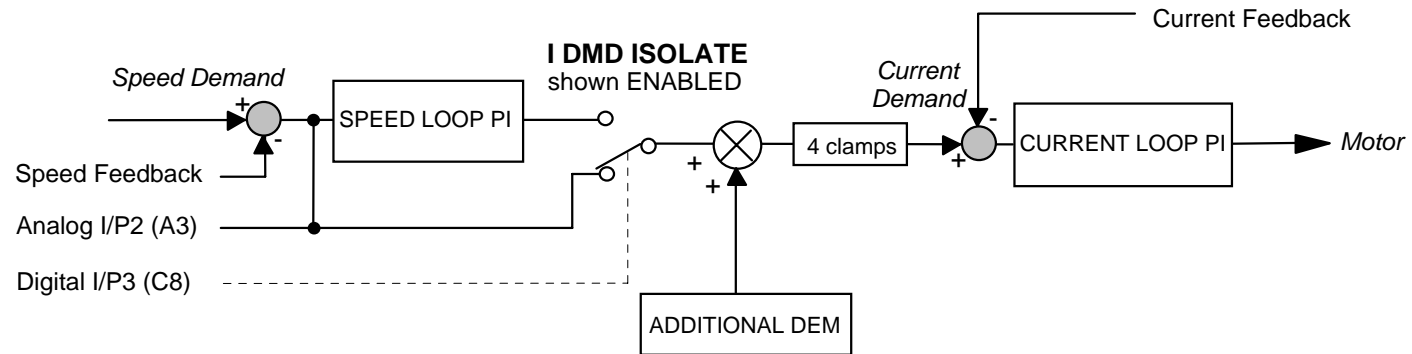
Parameter	Tag	Range
<b>DISCONTINUOUS</b>	<b>137</b>	<b>0.00 to 200.00 %</b>
Sets the boundary current between the discontinuous and continuous regions of operation. This is set during the autotune function and affects the performance of the adaptive algorithm.		
<b>ADDITIONAL DEM</b>	<b>30</b>	<b>-200.00 to 200.00 %</b>
Additional current demand input.		
<b>BIPOLAR CLAMPS</b>	<b>90</b>	<b>DISABLED / ENABLED</b>
Selects between bipolar (asymmetric) or unipolar (symmetric) current clamps for the 4 quadrants of operation. Default setting of DISABLED means UNIPOLAR clamps selected.		
<p style="text-align: center;">DISABLED - unipolar (symmetric) ENABLED - bipolar (asymmetric)</p> <p>With BIPOLAR CLAMPS disabled, the clamps are symmetrical and are set by POS. I CLAMP IN. With BIPOLAR CLAMPS enabled, the clamps are asymmetrical, bipolar. In bipolar mode, POS. I CLAMP IN sets the maximum positive current and NEG. I CLAMP IN sets the maximum negative current. Both clamps can be positive or negative, however, the POS I CLAMP IN value is internally prevented from going numerically below the NEG I CLAMP IN. CUR. LIMIT/SCALER scales both POS. I CLAMP IN and NEG. I CLAMP IN.</p>		
<b>REGEN ENABLE</b>	<b>201</b>	<b>See below</b>
When REGEN ENABLE is 2Q (NON-REGEN), 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.		
<p style="text-align: center;">2Q (NON-REGEN) - non-regenerative (2-quadrant) 4Q (REGEN) - regenerative (4-quadrant)</p> <p>If the product is 2-Quadrant (591) this parameter should be set to 2Q (non-regenerative).</p>		
<b>POS. I CLAMP IN</b>	<b>301</b>	<b>-100.00 to 100.00 %</b>
Positive current clamp when BIPOLAR CLAMPS is ENABLED.		
<b>NEG. I CLAMP IN</b>	<b>48</b>	<b>-100.00 to 100.00 %</b>
<p>Negative current clamp when BIPOLAR CLAMPS is ENABLED.</p> <p><i>Note on bipolar current clamps: these clamps in bipolar mode can cross-over onto the same quadrant. The POS. I CLAMP IN value is internally prevented from going numerically below the NEG. I CLAMP IN.</i></p>		

## CURRENT LOOP

Parameter	Tag	Range
<b>I DMD. ISOLATE</b>	<b>119</b>	<b>DISABLED / ENABLED</b>

Speed loop bypass; the current demand is taken from ANIN 2 (A3).

With I DMD. ISOLATE disabled, the current loop uses the current demand from the speed loop. With I DMD. ISOLATE enabled, ANALOG I/P 2, terminal A3, supplies the current demand. With default scaling, 10V dc on terminal A3 is 100% current demand. An additional current input, ADDITIONAL DEM, can be added to the current demand. The simplified diagram below, with reference to the default Block Diagram, shows how the I DMD ISOLATE parameter selects the controlling loop.



<b>AT CURRENT LIMIT</b>	<b>42</b>	<b>FALSE / TRUE</b>
<i>Refer to Chapter 6: "The MMI - Man Machine Interface" - The MMI Menus (DIAGNOSTICS).</i>		
<b>laDmd UNFILTERED</b>	<b>66</b>	<b>—x % (h)</b>
<i>Refer to Chapter 6: "The MMI - Man Machine Interface" - The MMI Menus (DIAGNOSTICS).</i>		
<b>CURRENT DEMAND</b>	<b>299</b>	<b>—xx %</b>
<i>Refer to Chapter 6: "The MMI - Man Machine Interface" - The MMI Menus (DIAGNOSTICS).</i>		
<b>laFbk UNFILTERED</b>	<b>65</b>	<b>—x % (h)</b>
<i>Refer to Chapter 6: "The MMI - Man Machine Interface" - The MMI Menus (DIAGNOSTICS).</i>		
<b>MASTER BRIDGE</b>	<b>527</b>	<b>FALSE/TRUE</b>
A diagnostic indicating currently active bridge; master = TRUE, slave = FALSE.		
<b>PHASE ANGLE @ E</b>	<b>1174</b>	<b>—x DEG</b>
The motor back EMF, presented as the angle at which the supply volts matches it. This is the instantaneous angle above which firing the thyristor would just start to make armature current.		

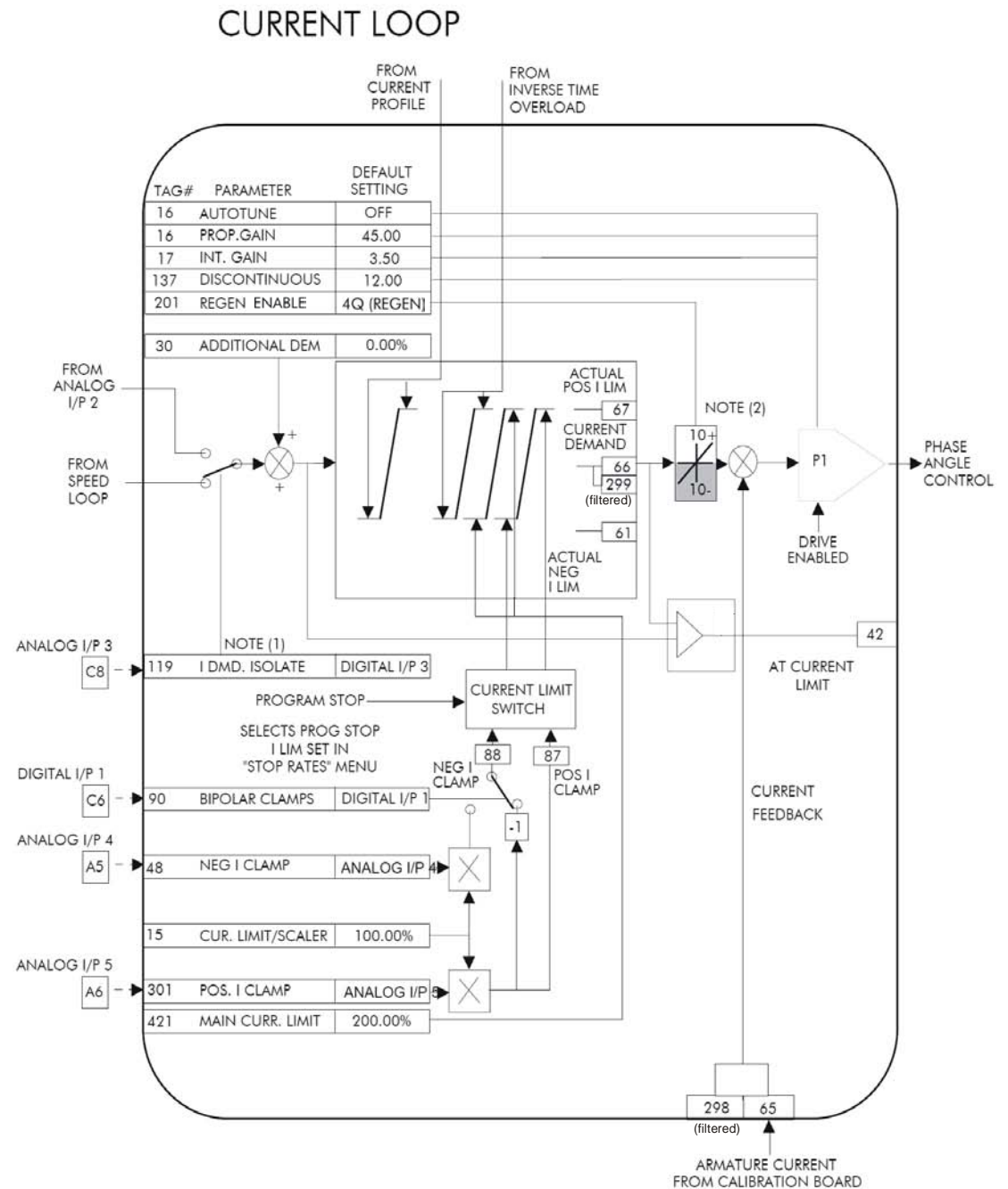
## CURRENT LOOP

Parameter	Tag	Range
<b>POS. I CLAMP</b>	<b>87</b>	— <b>x</b> %
<i>Refer to Chapter 6: "The MMI - Man Machine Interface" - The MMI Menus (DIAGNOSTICS).</i>		
<b>NEG. I CLAMP</b>	<b>88</b>	— <b>x</b> %
<i>Refer to Chapter 6: "The MMI - Man Machine Interface" - The MMI Menus (DIAGNOSTICS).</i>		
<b>ACTUAL POS I LIM</b>	<b>67</b>	— <b>x</b> %
<i>Refer to Chapter 6: "The MMI - Man Machine Interface" - The MMI Menus (DIAGNOSTICS).</i>		
<b>ACTUAL NEG I LIM</b>	<b>61</b>	— <b>x</b> %
<i>Refer to Chapter 6: "The MMI - Man Machine Interface" - The MMI Menus (DIAGNOSTICS).</i>		

## Functional Description

Note 1: I DMD. ISOLATE removes speed loop demand and selects analog I/P 2 as current regulator demand.  
I DMD. ISOLATE is overridden by program stop and stop to return drive to speed regulation.

Note 2: REGEN ENABLE = 2Q (NON-REGEN) prevents negative current demand and should be selected for 2Q stacks (591).





### MMI Menu Map

- 1 SETUP PARAMETERS
- 2 CURRENT PROFILE
  - SPD BRK1 (LOW)
  - SPD BRK2 (HIGH)
  - IMAX BRK1 (SPD1)
  - IMAX BRK2 (SPD2)

## CURRENT PROFILE

Use this to clamp the current limit for applications where motors have a reduced ability to commutate armature current at low field currents.

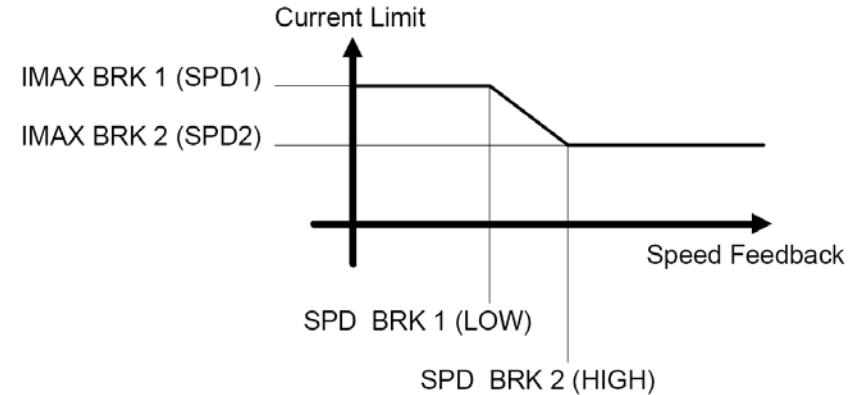
Normally this is required when using Field Weakening, although some motors exhibit commutation limitations at higher speeds even with rated field current.

The input to the block is SPEED FEEDBACK from the SPEED LOOP function block. The output of the block changes the current limit clamp in the current loop.

- When SPEED FEEDBACK exceeds SPD BRK 1 (LOW), the current profile begins scaling the current limit as set by IMAX BRK 1 (SPD1).
- As the SPEED FEEDBACK increases toward SPD BRK 2 (HIGH), the current limit is reduced linearly toward IMAX BRK 2 (SPD2).
- When the speed exceeds SPD BRK 2 (HIGH), the current limit remains at the IMAX BRK 2 (SPD2) setting.

FUNCTION BLOCKS MOTOR CONTROL CURRENT PROFILE

100.0 %	-	[ 32]	SPD BRK 1 (LOW)
100.0 %	-	[ 31]	SPD BRK 2 (HIGH)
200.0 %	-	[ 93]	IMAX BRK 1 (SPD1)
200.0 %	-	[ 33]	IMAX BRK 2 (SPD2)

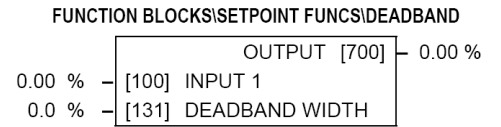
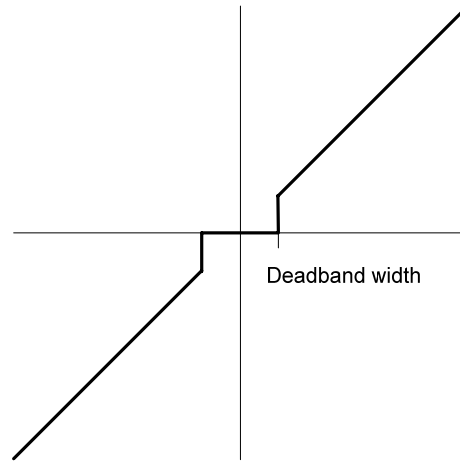


### CURRENT PROFILE

Parameter	Tag	Range
<b>SPD BRK 1 (LOW)</b>	<b>32</b>	<b>0.0 to 100.0 % (h)</b>
This is the motor speed at which current limit profiling begins.		
<b>SPD BRK 2 (HIGH)</b>	<b>31</b>	<b>0.0 to 100.0 % (h)</b>
This is the upper speed limit at which current limit profiling ends.		
<b>IMAX BRK 1 (SPD1)</b>	<b>93</b>	<b>0.0 to 200.0 % (h)</b>
This sets the current limit value at or below speed break-point 1, provided the other current limit clamps (inverse time overload, bipolar clamps and main current clamps) are greater than this setting.		
<b>IMAX BRK 2 (SPD2)</b>	<b>33</b>	<b>0.0 to 200.0 % (h)</b>
This sets the current limit value at or above speed break-point 2, provided the other current limit clamps setting (inverse time overload, bipolar clamps and main current clamps) are greater than this.		

# DEADBAND

When the input is within the deadband, the output is clamped to zero to ignore any noise. The limits are symmetrical around zero. The limits are set by the DEADBAND parameter.



## MMI Menu Map

- 1 SETUP PARAMETERS
- 2 SETPOINT SUM 1
  - DEADBAND WIDTH
  - INPUT 1

## MMI Menu Map

- 1 FUNCTION BLOCKS
- 2 SETPOINT FUNCS
- 3 DEADBAND
  - OUTPUT

## DEADBAND

Parameter	Tag	Range
<b>INPUT 1</b>	<b>100</b>	<b>-200.00 to 200.00 %</b>
Input 1 value. By default this is connected to Analog Input 1 (terminal A2).		
<b>DEADBAND</b>	<b>131</b>	<b>0.0 to 100.0 %</b>
Range within which the output is clamped at zero.		
<b>OUTPUT</b>	<b>700</b>	<b>—.xx %</b>
Modified value of input.		

### MMI Menu Map

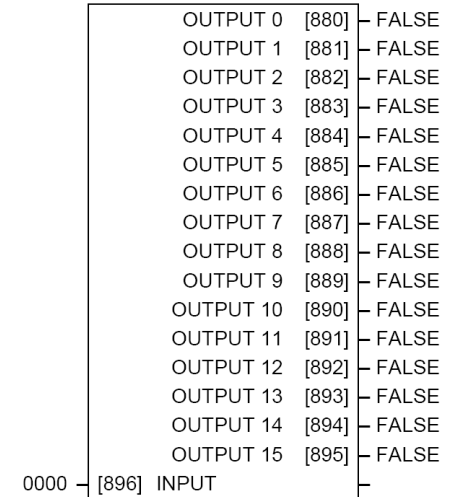
- 1 **FUNCTION BLOCKS**
- 2 **MISCELLANEOUS**
- 3 **DEMULTIPLEXER**
  - INPUT
  - OUTPUT 0
  - OUTPUT 1
  - OUTPUT 2
  - OUTPUT 3
  - OUTPUT 4
  - OUTPUT 5
  - OUTPUT 6
  - OUTPUT 7
  - OUTPUT 8
  - OUTPUT 9
  - OUTPUT 10
  - OUTPUT 11
  - OUTPUT 12
  - OUTPUT 13
  - OUTPUT 14
  - OUTPUT 15

## DEMULTIPLEXER

The demultiplexer function block splits the input word into 16 individual bits.

This may be used to extract the individual trip bits from the ACTIVE TRIPS parameter, for example.

### FUNCTION BLOCKS\MISCELLANEOUS\DEMULTIPLEXER



## DEMULTIPLEXER

Parameter	Tag	Range
<b>INPUT</b>	<b>896</b>	<b>0x0000 to 0xFFFF</b>
The input to be split into its component bits.		
<b>OUTPUT 0 to OUTPUT 15</b>	<b>880 to 895</b>	<b>FALSE / TRUE</b>
Each output returns the corresponding bit of the 16 bit input word.		

### MMI Menu Map

1	SETUP PARAMETERS
2	SPECIAL BLOCKS
3	DIAMETER CALC.
	LINE SPEED
	REEL SPEED
	MIN DIAMETER
	MIN SPEED
	RESET VALUE
	EXTERNAL RESET
	RAMP RATE
	DIAMETER

## DIAMETER CALC.

This block performs three functions.

**DIAMETER CALC:** Used to calculate roll diameters in winder applications.

**TAPER CALC:** Used to profile the tension demand with diameter.

**TENS+COMP CALC:** Used to provide additional torque to compensate for static and dynamic friction, as well as load inertia.

These three functions are combined into one function block as they are functionally closely coupled.

DIAMETER CALC calculates the diameter of a reel as a function of the reel speed and the line 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.

The ratio of the minimum core diameter to the maximum roll diameter determines the operating range of the diameter calculator. Set MIN DIAMETER 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
- When LINE SPEED is below MIN SPEED, DIAMETER is held at the last calculated diameter

When EXTERNAL RESET is ENABLED, 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 ENABLED 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% change in DIAMETER. For example, at the default setting of 5.0 seconds, a 50% step change in diameter would take 2.5 seconds for the output diameter output to display the change.

### FUNCTION BLOCKS/WINDER/DIAMETER CALC.

	DIAMETER	[427]	0.00 %
	MOD OF LINE SPD	[428]	0.00 %
	MOD OF REEL SPD	[429]	0.00 %
	UNFILT DIAMETER	[430]	0.00 %
	TAPERED DEMAND	[452]	0.00 %
	TOT. TENS. DEMAND	[441]	0.00 %
	INERTIA COMP O/P	[485]	0.00 %
	OUTPUT	[706]	0.00 %
0.00 %	[424]	LINE SPEED	
0.00 %	[437]	REEL SPEED	
10.00 %	[425]	MIN DIAMETER	
5.00 %	[426]	MIN SPEED	
10.00 %	[462]	RESET VALUE	
FALSE	[463]	EXTERNAL RESET	
5.0 s	[453]	RAMP RATE	
0.00 %	[438]	TAPER	
0.00 %	[439]	TENSION SPT.	
0.00 %	[440]	TENSION TRIM	
0.00 %	[487]	STATIC COMP	
0.00 %	[488]	DYNAMIC COMP	
TRUE	[489]	REWIND	
0.00 %	[479]	FIX. INERTIA COMP	
0.00 %	[480]	VAR. INERTIA COMP	
100.00 %	[481]	ROLL WIDTH/MASS	
0.00 %	[498]	LINE SPEED SPT	
10	[482]	FILTER T.C.	
10.00	[483]	RATE CAL	
0.00 %	[484]	NORMALISED dv/dt	
1.0000	[486]	TENSION SCALER	

### MMI Menu Map

1	SETUP PARAMETERS
2	SPECIAL BLOCKS
3	TAPER CALC.
	TAPER
	TENSION SPT
	TAPERED DEMAND
	TENSION TRIM
	TOT. TENS. DEMAND

## DIAMETER CALC.

Parameter	Tag	Range
<b>LINE SPEED</b>	<b>424</b>	<b>-105.00 to 105.00 %</b>
This will usually be configured to be the analog tacho input and scaled appropriately during calibration.		
<b>REEL SPEED</b>	<b>437</b>	<b>-105.00 to 105.00 %</b>
This will usually be configured to be the drive's own speed feedback, i.e. encoder or armature volts feedback.		
<b>MIN DIAMETER</b>	<b>425</b>	<b>0.00 to 100.00 %</b>
Set to the minimum core diameter (normally the empty core diameter) as a percentage of the maximum roll diameter.		
<b>MIN SPEED</b>	<b>426</b>	<b>0.00 to 100.00 %</b>
This is the minimum LINE SPEED level below which the diameter calculation is frozen.		
<b>RESET VALUE</b>	<b>462</b>	<b>0.00 to 100.00 %</b>
Normally for winders this will be set to the MIN DIAMETER value. It is the diameter preset used when changing rolls. This value will be preloaded into the ramp (filter) output when EXTERNAL RESET is enabled.		
<b>EXTERNAL RESET</b>	<b>463</b>	<b>DISABLED / ENABLED</b>
Sets and holds the diameter to the RESET VALUE when ENABLED.		
<b>RAMP RATE</b>	<b>453</b>	<b>0.1 to 600.0 s</b>
This is used to smooth the output of the diameter calculator.		
<b>TAPER</b>	<b>438</b>	<b>-100.00 to 100.00 %</b>
This defines the amount of tapering in the tension demand with diameter variation. When TAPER is positive, the tension demand is hyperbolically decreased as diameter increases.		
<b>TENSION SPT.</b>	<b>439</b>	<b>0.00 to 100.00 %</b>
This is the required tension setpoint.		
<b>TENSION TRIM</b>	<b>440</b>	<b>-100.00 to 100.00 %</b>
This is the additional tension demand in the form of a trim.		
<b>STATIC COMP</b>	<b>487</b>	<b>-300.00 to 300.00 %</b>
Static friction compensation set-up parameter.		
<b>DYNAMIC COMP</b>	<b>488</b>	<b>-300.00 to 300.00 %</b>
Dynamic friction compensation set-up parameter.		
<b>REWIND</b>	<b>489</b>	<b>DISABLED / ENABLED</b>
Switches the sign of the friction compensations when the motor changes direction. Set to DISABLED only when the winder reverses.		

### MMI Menu Map

1 SETUP PARAMETERS

2 SPECIAL BLOCKS

3 TENS+COMP CALC.

STATIC COMP

DYNAMIC COMP

REWIND

FIX. INERTIA COMP

VAR. INERTIA COMP

ROLL WIDTH/MASS

LINE SPEED SPT

FILTER T.C.

RATE CAL

NORMALISED dv/dt

INERTIA COMP O/P

TENSION SCALER

### MMI Menu Map

1 FUNCTION BLOCKS

2 WINDER

3 DIAMETER CALC

MOD OF LINE SPD

MOD OF REEL SPD

UNFILT DIAMETER

OUTPUT

## DIAMETER CALC.

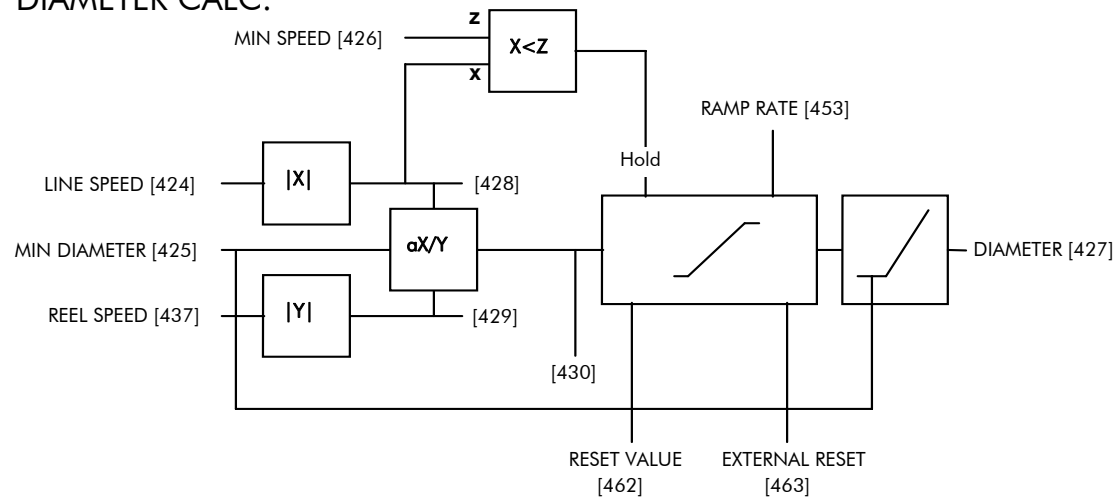
Parameter	Tag	Range
<b>FIX. INERTIA COMP</b>	<b>479</b>	<b>-300.00 to 300.00 %</b>
Fixed inertia compensation set-up parameter.		
<b>VAR. INERTIA COMP</b>	<b>480</b>	<b>-300.00 to 300.00 %</b>
Variable inertia compensation set-up parameter.		
<b>ROLL WIDTH/MASS</b>	<b>481</b>	<b>0.00 to 100.00 %</b>
Scales the inertia fixed and variable compensations based on roll width. 100% = maximum roll width.		
<b>LINE SPEED SPT</b>	<b>498</b>	<b>-105.00 to 105.00 %</b>
Used to calculate the line speed acceleration rate value for the fixed and variable inertia compensations.		
<b>FILTER T.C.</b>	<b>482</b>	<b>0 to 20000</b>
The line speed acceleration rate value is calculated from the line speed input. The calculated rate value may have a large ripple content that can disturb the motor torque. The rate signal is therefore filtered, and this filter has a time constant set by this parameter.		
<b>RATE CAL</b>	<b>483</b>	<b>-100.00 to 100.00</b>
Scales the inertia compensation acceleration/deceleration rate value to 100% of the maximum line ramp rate. This parameter should be set to the maximum time required to ramp from zero to full speed in seconds. If RATE CAL = 0.00, then this parameter is set externally through NORMALISED dv/dt, otherwise, RATE CAL sets the inertia compensation acceleration/deceleration rate.		
<i>Note - Inertia compensation does not work well for line ramp rates above 100 seconds and therefore this parameter is limited to 100.00.</i>		
<b>NORMALISED dv/dt</b>	<b>484</b>	<b>-300.00 to 300.00 %</b>
Useful for large line ramp rates (>100 Secs). Tag an external signal to NORMALISED dv/dt to set the inertia compensation acceleration/deceleration rate externally from the drive. Useful for ramp rates exceeding 100 seconds. The external signal must be normalised to 100% = the maximum line ramp rate. Active <i>only</i> when RATE CAL = 0.00.		
<b>TENSION SCALER</b>	<b>486</b>	<b>-3.0000 to 3.0000</b>
Scales the TENSION DEMAND which is directly connected from the TAPER CALC. function block.		
<b>DIAMETER</b>	<b>427</b>	<b>—.xx %</b>
This is the output of the block.		
<b>MOD OF LINE SPEED</b>	<b>428</b>	<b>—.xx %</b>
Modulus of line speed.		
<b>MOD OF REEL SPEED</b>	<b>429</b>	<b>—.xx %</b>
Modulus of reel speed.		
<b>UNFILT DIAMETER</b>	<b>430</b>	<b>—.xx %</b>
Unfiltered value of “diameter” (before RAMP RATE filter).		
<b>TAPERED DEMAND</b>	<b>452</b>	<b>—.xx %</b>
This is the output of the TAPER calculation on the TENSION SPT (before adding TENSION TRIM).		

## DIAMETER CALC.

Parameter	Tag	Range
<b>TOT. TENS. DEMAND</b>	<b>441</b>	—. <b>xx</b> %
This is the final output of this block (total tension demand) which can be connected to the appropriate points in the block diagram.		
<b>INERTIA COMP O/P</b>	<b>485</b>	—. <b>xx</b> %
Monitors the sum of all inertia compensations.		
<b>OUTPUT</b>	<b>706</b>	—. <b>xx</b> %
The sum of the diameter-scaled TENSION DEMAND after the TENSION SCALER scaling and the compensation losses. For open loop winder applications, connect this output to the TORQUE DEMAND (Tag 432) in the TORQUE CALC. function block. (This output is located in the SYSTEM::CONFIGURE I/O::BLOCK DIAGRAM menu).		

## Functional Description

### DIAMETER CALC.

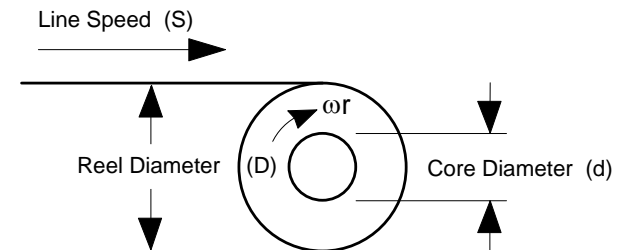


Circumference =  $\pi D$  or Line Speed (S) = Reel Speed ( $\omega r$ ) x D

$$\text{Thus } D = \frac{S}{\omega r}$$

$$\text{i.e. } D \propto \frac{\text{Line Speed (S)}}{\text{Reel Speed } (\omega r)}$$

Therefore with the web intact we can calculate the diameter from the two speeds.



## TAPER CALC

Use this to profile the tension demand with diameter.

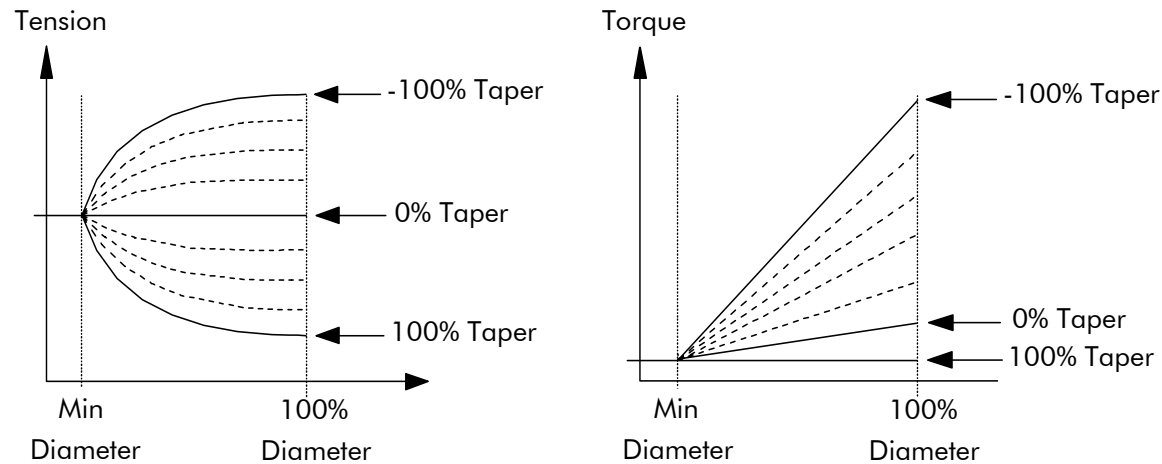
The function uses two inputs, tension setpoint and taper setpoint, to create the tension demand. The operator usually controls these setpoints.

Taper is a common requirement for winders. It reduces the tension as the roll diameter increases.

A profiler adjusts the tension using the equation:

$$\text{Tapered Demand} = \text{Tension Spt} \times \left\{ 100\% - \frac{\text{Taper}}{\text{Diameter}} \times (\text{Diameter} - \text{Min Diameter}) \right\}$$

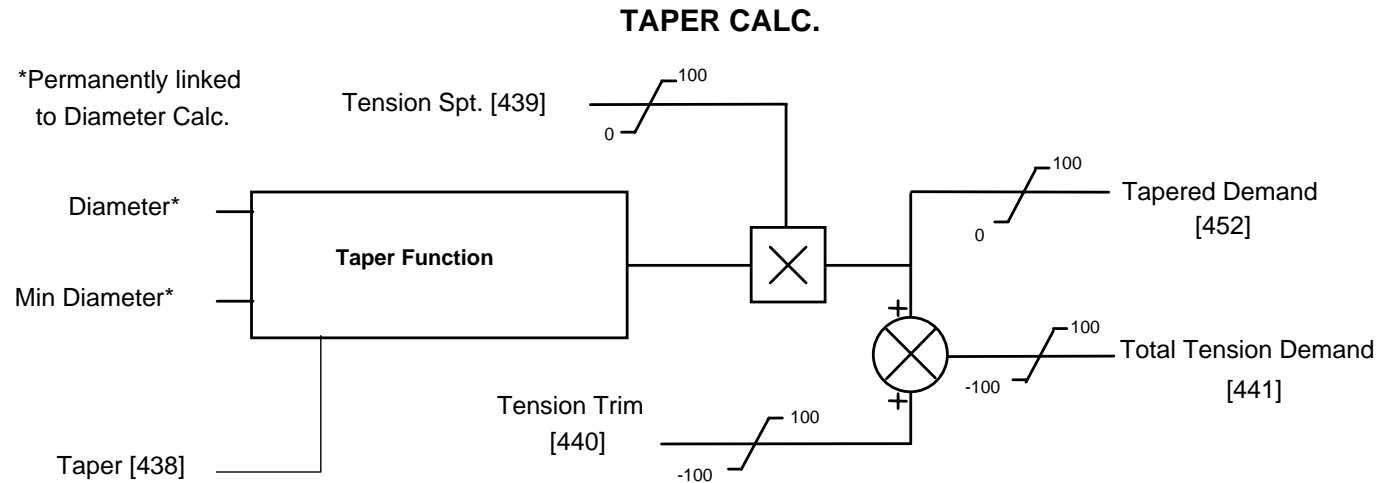
to yield a hyperbolic taper output. The taper tension characteristics are shown below:



The result is multiplied by TENSION SPT. to get TAPER DEMAND. When the taper setpoint is at 100%, the motor produces constant torque. That is, a constant torque 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.





## TENS+COMP CALC

**This provides additional torque to compensate for static and dynamic friction, as well as the load inertia.**

Add these losses to the diameter-scaled tension demand to produce a compensated torque demand for open loop winder applications.

The inputs to this function are DIAMETER, TOT. TENS. DEMAND, and SPEED FEEDBACK from the SPEED LOOP function block.

For open loop winder applications, connect OUTPUT to TORQUE DEMAND (Tag 432) in the TORQUE CALC. function block.

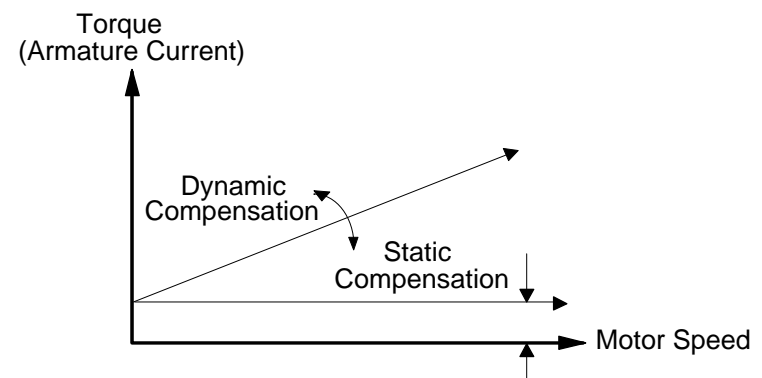
## Static and Dynamic Frictional Losses

Static and dynamic friction are due to gearbox resistance and mechanical binding in the winder spindle and motor bearings. Both absorb motor output torque and require compensation to maintain accurate winder tension.

Static friction, or "stiction", is a constant offset most noticeable at or near zero speed. The compensation torque required to overcome static friction is fixed over an entire operating speed range. You can ignore "stiction" for winders which do not normally operate at zero speeds.

Dynamic friction results from friction losses within the drive train, which includes gearboxes and chain belting linkages. The oil viscosity in gearboxes and windage losses in the motor armature fans also contribute to dynamic frictional losses.

The effects of static and dynamic friction are shown opposite.



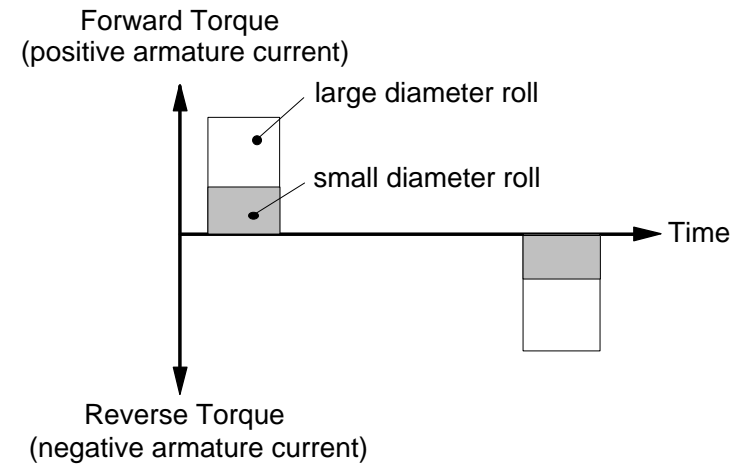
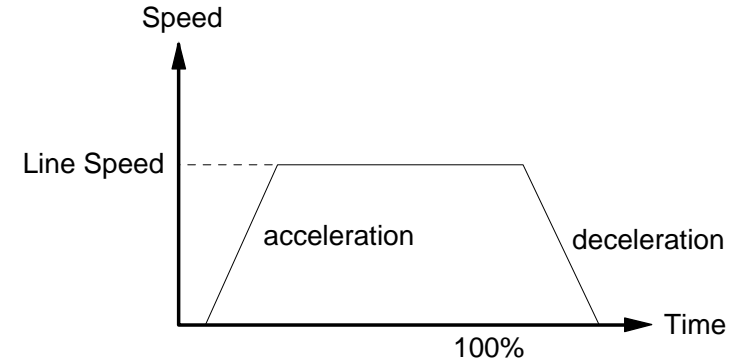
## Inertia Compensation

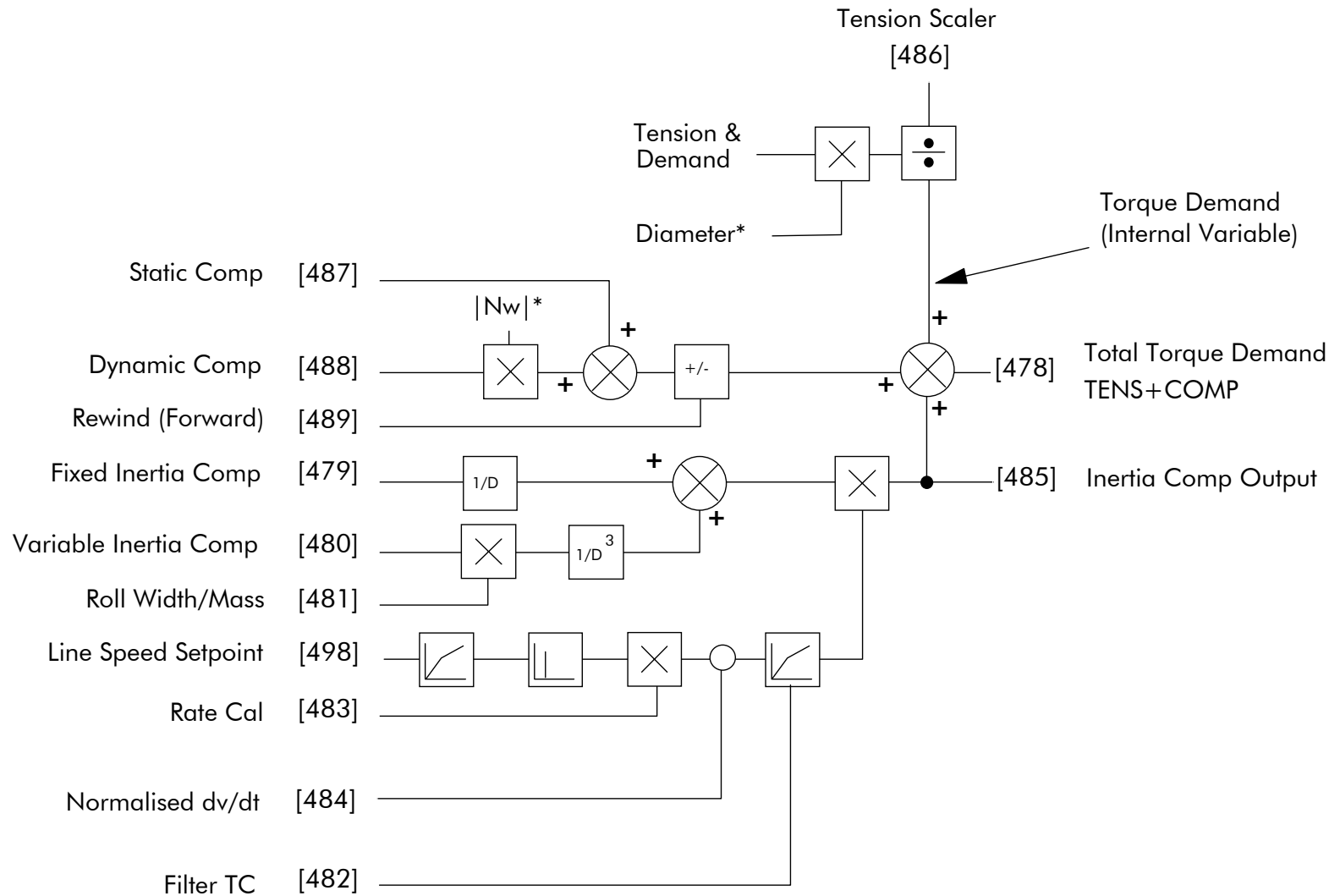
Many winders need inertia compensation to add or subtract torque during acceleration and deceleration to maintain constant tension, especially at large roll diameters. Without compensation, the tension holding capability of open loop winders diminishes during speed changes causing tension sag.

The inertia compensation characteristics is shown opposite.

For winder applications, inertia compensation is split into two components:

1. Fixed inertia compensation for the fixed motor, transmission and load components.
2. Variable inertia compensation for the changing roll inertia. This is especially necessary for high diameter build unwinds and winders.



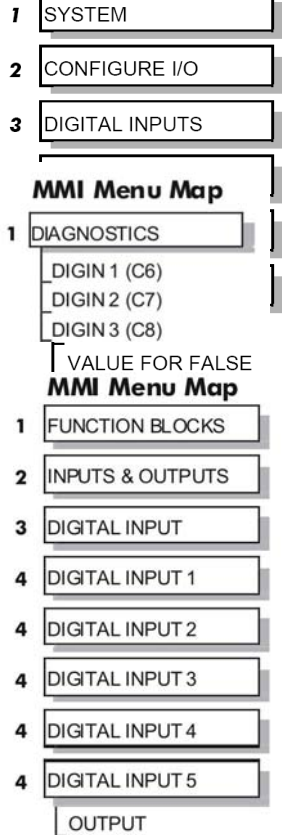


& - Internally connected to Taper Calculator

\* - Internally connected to Diameter Calculator

**TENS + COMP Block Diagram**

### MMI Menu Map

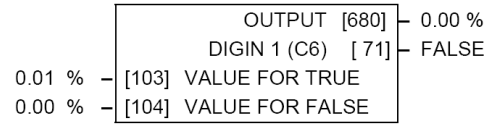


## DIGITAL INPUTS

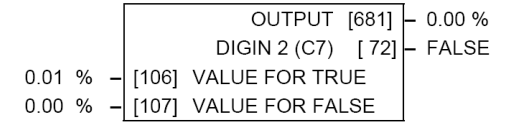
Use this block to control the digital operating parameters of the software.

The digital input can be configured to link to a destination location, and to set that destination TRUE or FALSE depending upon programmable values.

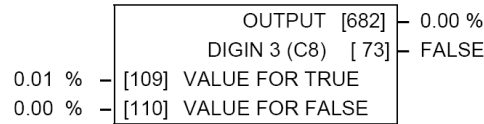
FUNCTION BLOCKS\INPUTS & OUTPUTS\DIGITAL INPUT\DIGITAL INPUT 1



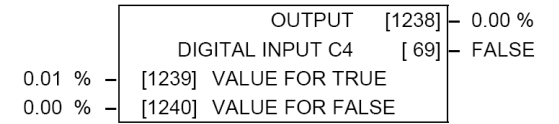
FUNCTION BLOCKS\INPUTS & OUTPUTS\DIGITAL INPUT\DIGITAL INPUT 2



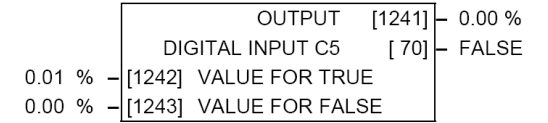
FUNCTION BLOCKS\INPUTS & OUTPUTS\DIGITAL INPUT\DIGITAL INPUT 3



FUNCTION BLOCKS\INPUTS & OUTPUTS\DIGITAL INPUT\DIGITAL INPUT 4



FUNCTION BLOCKS\INPUTS & OUTPUTS\DIGITAL INPUT\DIGITAL INPUT 5



## DIGITAL INPUTS

Parameter	Tag	Range
<b>VALUE FOR TRUE</b>	<b>103, 106, 109, 1239, 1242</b>	<b>-300.00 to 300.00 %</b>
The output value when input is TRUE, that is:		
Digital Input 1, terminal C6 = 24V (True)		
Digital Input 2, terminal C7 = 24V (True)		
Digital Input 3, terminal C8 = 24V (True)		
<b>VALUE FOR FALSE</b>	<b>104, 107, 110, 1240, 1243</b>	<b>-300.00 to 300.00 %</b>
The output value when input is FALSE, that is:		
Digital Input 1, terminal C6 = 0V (False)		
Digital Input 2, terminal C7 = 0V (False)		
Digital Input 3, terminal C8 = 0V (False)		
<b>OUTPUT</b>	<b>680, 681, 682, 1238, 1241</b>	<b>—.xx %</b>
The output value, this is either VALUE FOR TRUE or VALUE FOR FALSE.		
<b>DIGIN 1 (C6) to DIGITAL INPUT C5</b>	<b>71, 72, 73, 69, 70</b>	<b>OFF / ON</b>
The Boolean representation of the actual voltage applied to the terminal.		

## Digital Input Examples

### Using Digital Inputs with LOGIC Parameters

Logic parameters have values of 1/0: TRUE/FALSE, ON/OFF, ENABLED/DISABLED etc.

For example, the default connections in the drive allow the Digital Inputs to switch LOGIC parameters. These are the connections from:

- Terminal C6 to Tag 90 (BIPOLAR CLAMPS)
- Terminal C7 to Tag 118 (RAMP HOLD)
- Terminal C8 to Tag 119 (I DMD. ISOLATE)

In each case, the state of the terminal (24V or 0V) switches the destination parameter by sending a 1 or 0.

The format for the VALUE FOR TRUE and VALUE FOR FALSE parameters is in percent, thus 0.00% = 0 and 0.01% (or any other non-zero positive number) = 1.

#### *Inverting the Input Signal*

The default setting is for VALUE FOR TRUE to be 0.01% and VALUE FOR FALSE to be 0.00%. Inverting the digital input is therefore simple; set VALUE FOR TRUE to 0.00% and VALUE FOR FALSE to 0.01% (or any other non-zero number).

To do this:

1. Set CONFIGURE I/O::CONFIGURE ENABLE to TRUE
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 FALSE

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

### Using Digital Inputs with VALUE Parameters

Value parameters have values such as 100.00, or with units like 50.00%, 10.0 SECS etc.

You can use a Digital Input to send two fixed values to a VALUE parameter depending upon the state of the input terminal, 24V or 0V. You set the two fixed values you require in the VALUE FOR TRUE and VALUE FOR FALSE parameters.

For example, to connect Digital Input 1 to SPEED LOOP::SPD.PROP.GAIN :

1. Set CONFIGURE I/O::CONFIGURE ENABLE to TRUE
2. Find the tag number for SPD.PROP.GAIN either from the function block detail in this chapter, or from the Parameter Table: MMI Order - refer to Appendix C. (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 FALSE

Digital Input 1 will now set SPD.PROP.GAIN to two values depending upon the state of the input signal:

- When the input terminal is at 24V, SPD.PROP.GAIN is set to 10.00
- When the input terminal is at 0V, SPD.PROP.GAIN is set to 30.00

## DIGITAL INPUT C5

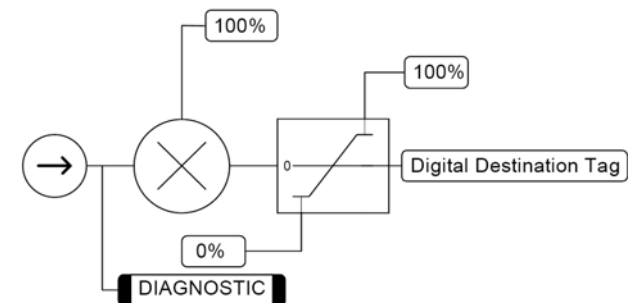
### Caution

If you are isolating power on the drive output using a DC contactor, you must use an auxiliary, normally-open contact connected to terminal C5 to immediately disable the drive's current loop when the contactor coil de-energises. Free-up terminal C5 for other uses **only** when isolating main power on the input side of the drive using an AC contactor.

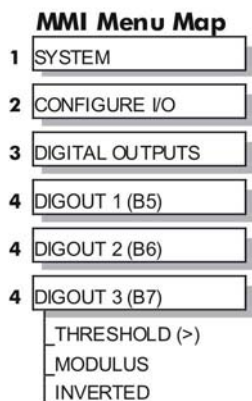
## Additional Digital Inputs

It is possible to use an Analog Input as a Digital Input to extend the number of Digital Inputs available. Again, 0.00% is regarded as Logic 0 and 0.01% (or any other non-zero positive value) is regarded as Logic 1.

### Using Analog I/P as Digital I/P



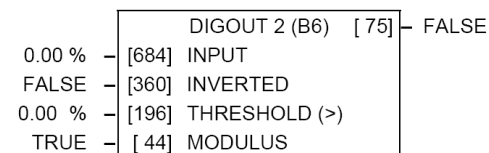
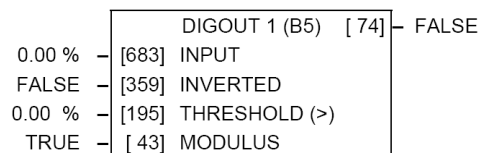
# DIGITAL OUTPUTS



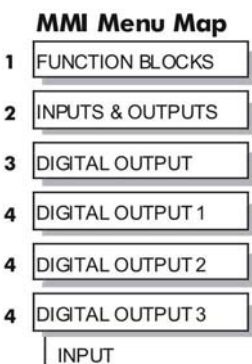
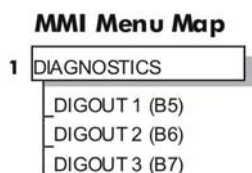
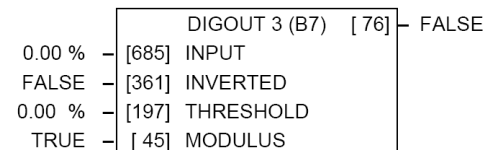
These function block allows you to output digital parameters within the software to other equipment.

A digital output can be configured to link to any digital value within the software system and to output information depending upon the status of that value.

FUNCTION BLOCKS\INPUTS & OUTPUTS\DIGITAL OUTPUT\DIGITAL OUTPUT 1      FUNCTION BLOCKS\INPUTS & OUTPUTS\DIGITAL OUTPUT\DIGITAL OUTPUT 2



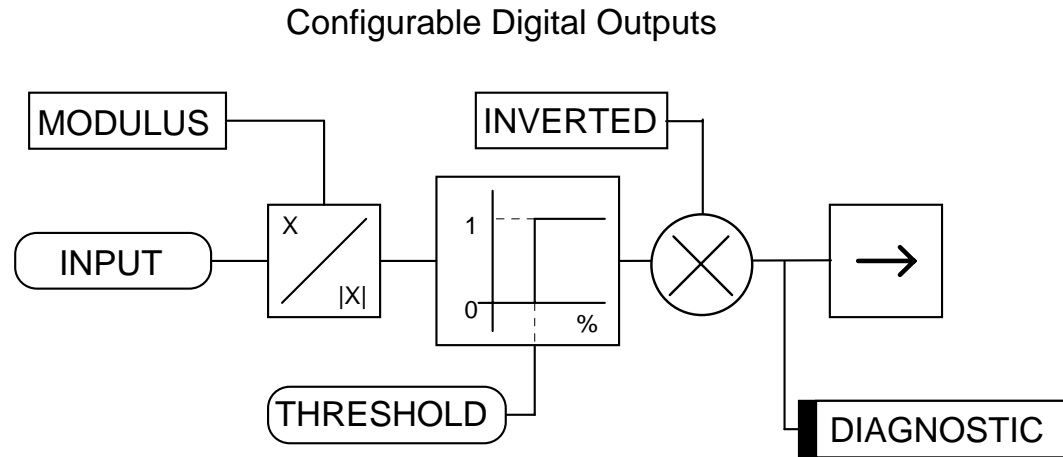
FUNCTION BLOCKS\INPUTS & OUTPUTS\DIGITAL OUTPUT\DIGITAL OUTPUT 3



## DIGITAL OUTPUTS

Parameter	Tag	Range
<b>INPUT</b>	<b>683, 684, 685</b>	<b>—.xx %</b>
The unprocessed value to output.		
<b>INVERTED</b>	<b>359, 360, 361</b>	<b>FALSE / TRUE</b>
Selects to invert the output when TRUE.		
<b>THRESHOLD (&gt;)</b>	<b>195, 196, 197</b>	<b>-300.00 to 300.00 %</b>
The threshold which the input value must exceed to set the output to TRUE.		
<b>MODULUS</b>	<b>43, 44, 45</b>	<b>FALSE / TRUE</b>
When TRUE, the absolute value of INPUT is used for the threshold test.		
<b>DIGOUT 1 (B5) to DIGOUT 3 (B7)</b>	<b>74, 75, 76</b>	<b>OFF / ON</b>
The actual Boolean value sent to the output terminal.		

## Functional Description



## Digital Output Examples

### Using Digital Outputs with LOGIC Parameters

Logic parameters have values of 1/0: TRUE/FALSE, ON/OFF, ENABLED/DISABLED etc.

For example, the (logic) default connections in the drive allow the Digital Outputs to provide (source) 24V or 0V dc depending upon the state of following tag connections:

- Terminal B5, Digital Output 1 is linked to Tag Number 77 (AT ZERO SPEED)
- Terminal B6, Digital Output 2 is linked to Tag Number 122 (HEALTH LED)
- Terminal B7, Digital Output 3 is linked to Tag Number 125 (READY)

In each case, the state of the source parameter defines the voltage available at the terminal (TRUE = 24V, FALSE = 0V when INVERTED = FALSE). Inverting the digital output is simple; set INVERTED to TRUE.



## Using Digital Outputs with VALUE Parameters (Up-to-speed Detector)

Value parameters have values such as 100.00, or with units like 50.00%, 10.0 SECS etc.

For example, to connect Digital Output 1 to read UNFIL.SPD.FBK:

1. Set CONFIGURE I/O::CONFIGURE ENABLE to TRUE
2. Find the tag number for UNFIL.SPD.FBK either from the function block detail in this chapter, or from the Parameter Table: MMI Order - refer to Appendix C. (It is 62).
3. Set DIGITAL OUTPUTS::DIGOUT 1 (B5)::SOURCE TAG to 62
4. Set DIGITAL OUTPUTS::DIGOUT 1 (B5)::THRESHOLD(>) to 50.00%
5. Set DIGITAL OUTPUTS::DIGOUT 1 (B5)::MODULUS to TRUE
6. Set DIGITAL OUTPUTS::DIGOUT 1 (B5)::INVERTED to FALSE
7. Set CONFIGURE I/O::CONFIGURE ENABLE to FALSE

This option is useful for generating an "up-to-speed" output. The MODULUS removes the sign from the value (so -100 becomes 100). The THRESHOLD(>) parameter determines when the output is 24V or 0V dc (the input signal must exceed this setting for the output to go high). Set INVERTED to TRUE to invert the result of the output.

# DRIVE INFO

This block provides information to identify the drive hardware and firmware version.

FUNCTION BLOCKS\MISCELLANEOUS\DRIVE INFO

DRIVE TYPE	[1298]	-590
VERSION NUMBER	[155]	-0x0000

- MMI Menu Map**
- 1 SERIAL LINKS
  - 2 SYSTEM PORT (P3)
    - VERSION NUMBER

- MMI Menu Map**
- 1 FUNCTION BLOCKS
  - 2 MISCELLANEOUS
  - 3 DRIVE INFO
    - DRIVE TYPE

DRIVE INFO		
Parameter	Tag	Range
<b>VERSION NUMBER</b>	<b>155</b>	<b>0x0901</b>
The drive's version number as seen via communications. Version 9.01 is represented as 0x0901. Serial communications mnemonic = V0. The version number cannot be changed, and is software version dependent.		
<b>DRIVE TYPE</b>	<b>1298</b>	<b>590P/590</b>
This output parameter indicates the type of control board detected in the drive (should read 590 on a 590 or 591 product).		

### MMI Menu Map

- 1 CONFIGURE DRIVE
  - ENCODER LINES
  - ENCODER RPM
  - ENCODER SIGN

### MMI Menu Map

- 1 DIAGNOSTICS
  - ENCODER
  - SPEED FEEDBACK

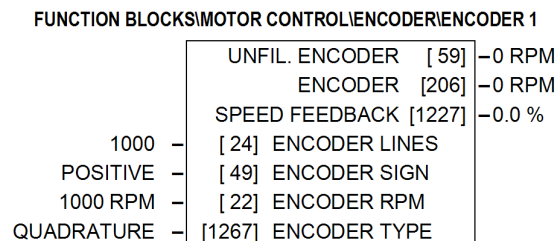
### MMI Menu Map

- 1 FUNCTION BLOCKS
- 2 MOTOR CONTROL
- 3 ENCODER
- 4 ENCODER 1
  - UNFIL. ENCODER

## ENCODER

This block allows the Speed Feedback to be measured using a quadrature encoder when a Speed Feedback Option is fitted - refer to Chapter 3: Speed Feedback and Technology Options.

The ENCODER 1 function block is associated with the speed feedback option.



## ENCODER

Parameter	Tag	Range
<b>ENCODER LINES</b>	<b>24</b>	<b>10 to 5000</b>
The number of lines must be set to match the type of encoder being used. Incorrect setting of this parameter will result in an erroneous speed measurement. The 5901 Microtach has 1000 lines per revolution as standard. Proprietary encoders of other specifications can be normalised by setting this parameter as appropriate.		
<b>ENCODER SIGN</b>	<b>49</b>	<b>NEGATIVE / POSITIVE</b>
Since the encoder feedback cannot be reversed electrically, the signal polarity can be reversed by the control software. <i>It is necessary to set up this parameter when in CLOSED-LOOP VEC mode, as the encoder direction must be correct for this mode to operate.</i>		
<b>ENCODER RPM</b>	<b>22</b>	<b>0 to 6000</b>
Motor top speed setting (100%) when using encoder feedback.		
<b>UNFIL. ENCODER</b>	<b>59</b>	<b>— RPM</b>
Unfiltered encoder speed in RPM		
<b>ENCODER</b>	<b>206</b>	<b>— RPM</b>
Encoder speed in RPM		
<b>SPEED FEEDBACK</b>	<b>1227</b>	<b>—x %</b>
Encoder speed in %. A speed of 100% indicates that the encoder is rotating at the value set in the ENCODER RPM parameter.		
<b>ENCODER TYPE</b>	<b>1267</b>	<b>See below</b>
Selects the operating mode of the encoder input. Set only to QUADRATURE for the 590 encoder speed feedback option. 0:CLOCK/DIRECTION 1:QUADRATURE		

## Functional Description

### *ENCODER TYPE = QUADRATURE*

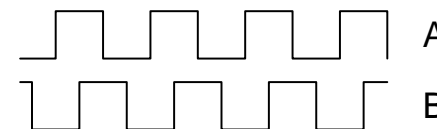
A quadrature encoder uses 2 input signals (A and B), phase shifted by a quarter of a cycle (90°).

Direction is obtained by looking at the combined state of A and B.

Each edge received from the encoder increments the encoder count. There are 4 counts per line.

Speed is calculated using the following function:

$$\text{SPEED HZ} = \text{filter} \left[ \frac{\text{CountsPerSecond}}{\text{Lines} \times 4}, \text{FilterTime} \right]$$



# FEEDBACKS

Diagnostics for the motor feedbacks.

## FUNCTION BLOCKS\MOTOR CONTROL\FEEDBACKS

UNFIL.FIELD FBK	[181]	0.00 %
SPEED FEEDBACK	[207]	0.00 %
CURRENT FEEDBACK	[298]	0.00 %
TACH INPUT	[308]	0.0 %

### MMI Menu Map

- 1 DIAGNOSTICS
  - SPEED FEEDBACK
  - CURRENT FEEDBACK
  - UNFIL.FIELD FBK
  - TACH INPUT

### MMI Menu Map

- 1 FUNCTION BLOCKS
- 2 MOTOR CONTROL
- 3 FEEDBACKS
  - UNFIL.FIELD FBK

## FEEDBACKS

Parameter	Tag	Range
<b>UNFIL.FIELD FBK</b> Scaled field current feedback	<b>181</b>	—. <b>xx</b> %
<b>SPEED FEEDBACK</b> Speed feedback.	<b>207</b>	—. <b>xx</b> %
<b>CURRENT FEEDBACK</b> Scaled and filtered armature current feedback.	<b>298</b>	—. <b>xx</b> %
<b>TACH INPUT</b> Scaled analog tachogenerator feedback.	<b>308</b>	—. <b>x</b> %

# FIELD CONTROL

This function block contains all the parameters for the field operating mode.

It controls the drive's full wave, single phase, motor field thyristor bridge circuit.

The FIELD CONTROL function block is viewed in three sub-menus on the MMI: FLD VOLTAGE VARS, FLD CURRENT VARS and FLD WEAK VARS.

In the FIELD CONTROL menu, you select the field operating mode: open loop voltage control or closed loop current control.

The inputs to the FIELD CONTROL block come from FLD VOLTAGE VARS and FLD CURRENT VARS.

FIELD ENABLE controls the field thyristor bridge and is set to DISABLED in permanent field motor applications. Disabling the field automatically overrides the field fail alarm. If FIELD ENABLE is enabled, you can select between voltage and current control using the FLD CTRL MODE parameter. The default is VOLTAGE CONTROL.

The diagnostic DRIVE ENABLE (Tag 84) is also used by the FLD. QUENCH DELAY to delay disabling the field when Run is removed.

## FLD VOLTAGE VARS : MMI Sub-Menu

Contains the parameter for the open loop VOLTAGE CONTROL mode.

In VOLTAGE CONTROL mode, set the value of FLD.VOLTS RATIO to provide the correct field voltage. This control mode provides open-loop phase angle control of the thyristor bridge. To calculate FLD.VOLTS RATIO, divide the desired DC field voltage by the line-to-line RMS AC input voltage and multiply by 100. Note that supply voltage variations are not compensated for in the field supply when in this mode of operation.

## FLD CURRENT VARS : MMI Sub-Menu

Contains the parameters for the closed loop current control mode.

CURRENT CONTROL mode uses actual field current feedback for closed-loop control giving accurate motor field control independent of motor temperature. This mode makes use of a simple PI controller and is a pre-requisite for field weakening.

FUNCTION BLOCKS		MOTOR CONTROL		FIELD CONTROL	
		FIELD ENABLE	[169]	DISABLED	
		FIELD DEMAND	[183]	0.00 %	
		FLD.FIRING ANGLE	[184]	0.00 DEG	
		FIELD I FBK	[300]	0.00 %	
		UP TO FIELD	[618]	FALSE	
		WEAK PID ERROR	[1185]	0.00 %	
		WEAK PID OUT	[1186]	0.00 %	
		FIELD STATE	[1187]	FIELD INIT	
100.00 %	-	[171]	SETPOINT		
0.10	-	[173]	PROP. GAIN		
1.28	-	[172]	INT. GAIN		
DISABLED	-	[174]	FLD. WEAK ENABLE		
2.00	-	[175]	EMF LEAD		
40.00	-	[176]	EMF LAG		
0.30	-	[177]	EMF GAIN		
90.00 %	-	[179]	MIN.FLD.CURRENT		
100.00 %	-	[178]	MAX VOLTS		
100	-	[191]	BEMF FBK LEAD		
100	-	[192]	BEMF FBK LAG		
0.0 s	-	[185]	FLD.QUENCH DELAY		
QUENCH	-	[186]	FLD.QUENCH MODE		
80.00 %	-	[617]	FIELD I THRESH		
VOLTAGE CONTROL	-	[209]	FLD. CTRL MODE		
90.0%	-	[210]	FLD. VOLTS RATIO		

### MMI Menu Map

- 1 SETUP PARAMETERS
- 2 FIELD CONTROL
  - FIELD ENABLE
  - FLD.CTRL MODE
  - >> FLD.VOLTAGE VARS
  - >> FLD.CURRENT VARS
  - FLD.QUENCH DELAY
  - FLD. QUENCH MODE

### MMI Menu Map

- 1 SETUP PARAMETERS
- 2 FIELD CONTROL
- 3 FLD.VOLTAGE VARS
  - FLD.VOLTS RATIO

### MMI Menu Map

- 1 SETUP PARAMETERS
- 2 FIELD CONTROL
- 3 FLD.CURRENT VARS
  - SETPOINT
  - PROP. GAIN
  - INT. GAIN
  - >> FLD.WEAK VARS

## FLD WEAK VARS : MMI Sub-Menu

In certain applications of a DC motor controller, high speeds can only be achieved by reducing the field current and therefore the resultant torque. This is termed as the Constant-Horsepower region or Field-Weakening region, and the speed at which it begins is known as the Base Speed.

### MMI Menu Map

- 1 SETUP PARAMETERS
- 2 FIELD CONTROL
- 3 FLD.CURRENT VARS
- 4 FLD.WEAK VARS
  - FLD. WEAK ENABLE
  - EMF LEAD
  - EMF LAG
  - EMF GAIN
  - MIN FLD.CURRENT
  - MAX VOLTS
  - BEMF FBK LEAD
  - BEMF FBK LAG

### MMI Menu Map

- 1 DIAGNOSTICS
  - FIELD ENABLED
  - FIELD DEMAND
  - FIELD I FBK
  - FLD.FIRING ANGLE

### MMI Menu Map

- 1 FUNCTION BLOCKS
- 2 MOTOR CONTROL
- 3 FIELD CONTROL
  - WEAK PID ERROR
  - WEAK PID OUT
  - FIELD STATE
  - FIELD I THRESH
  - UP TO FIELD

## FIELD CONTROL

Parameter	Tag	Range
<b>FIELD ENABLE</b> Enables and disables the drive motor Field Control.	<b>170</b>	<b>DISABLED / ENABLED</b>
<b>SETPOINT</b> Field current setpoint as percentage of calibrated value.	<b>171</b>	<b>0.00 to 100.00 %</b>
<b>PROP. GAIN</b> This is the proportional gain adjustment of the field current PI loop. The default of 0.10 is equivalent to a real gain of 10.	<b>173</b>	<b>0.00 to 100.00</b>
<b>INT. GAIN</b> This is the integral gain adjustment of the field current PI loop.	<b>172</b>	<b>0.00 to 100.00</b>
<b>FLD. WEAK ENABLE</b> Activates the additional motor back-emf, gain-limited PI loop for field weakening (field spillover) control. STANDARD mode uses the control loop to convert the back-emf in excess of the MAX VOLTS setting, into a reduction of the demanded field current.	<b>174</b>	<b>DISABLED/STANDARD</b>
<b>EMF LEAD</b> With field weakening control enabled, a gain-limited PI loop is brought into operation. This is the lead time constant adjustment of the field weakening PI loop. With a default of 2.00, real time constant = 200ms. Refer to Chapter 5: "Control Loops" for details of Tuning.	<b>175</b>	<b>0.10 to 50.00</b>
<b>EMF LAG</b> This is the lag time constant adjustment of the field weakening PI loop. With a default of 40.00, real time constant = 4000ms. Refer to Chapter 5: "Control Loops" for details of Tuning.	<b>176</b>	<b>0.00 to 200.00</b>
<b>EMF GAIN</b> This is the steady-state gain adjustment of the field weakening PI loop. With a default of 0.30, real gain = 30. Refer to Chapter 5: "Control Loops" for details of Tuning.	<b>177</b>	<b>0.00 to 100.00</b>

## FIELD CONTROL

Parameter	Tag	Range
<b>MIN FLD. CURRENT</b>	<b>179</b>	<b>0.00 to 100.00 %</b>
<p>Protects against motor overspeeding due to unintended excessive field weakening.</p> <p>The field weakening loop reduces the field current to achieve speed control above base speed. At top speed the field reaches a minimum value. MIN FIELD CURRENT should be set below this minimum value to allow reasonable margin for transient control near the top speed but not lower than 6% as this could then cause the "Field Fail" alarm to operate.</p>		
<b>MAX VOLTS</b>	<b>178</b>	<b>0.00 to 100.00 %</b>
<p>Maximum volts is the back-emf voltage level at which field weakening begins. It is also known as "Spillover Bias". The default value is 100% of the nominal value as set by the armature voltage calibration value. This value might be reduced due to the known IR drop included in the armature voltage calibration value. Additionally for commissioning purposes, this value may be set to another (lower) desirable level, and subsequently returned to the original value.</p>		
<b>BEMF FBK LEAD</b>	<b>191</b>	<b>20 to 5000</b>
<p>This is the lead time constant of the back emf feedback filter which is used for reducing armature voltage overshoots when accelerating fast through base speed with a default of 100 (ms).</p> <p>Refer to Chapter 5: "Control Loops" for details of Tuning.</p>		
<b>BEMF FBK LAG</b>	<b>192</b>	<b>20 to 5000</b>
<p>This is the lag time constant of the above feedback filter. If the filter is active, the ratio of lead / lag should always be greater than 1 to give an overall lead action which reduces the voltage overshoot and less than, typically, 3 for stable control. The default values cancel each other and make the filter inactive with a default of 100 (ms).</p> <p>Refer to Chapter 5: "Control Loops" for details of Tuning.</p>		
<b>FLD. QUENCH DELAY</b>	<b>185</b>	<b>0.0 to 600.0 s</b>
<p>If dynamic breaking is used the field must be maintained for a period after the drive is disabled until the motor reaches zero speed. The field quench delay is the period of time that the field is maintained for when the drive is disabled.</p>		
<b>FLD. QUENCH MODE</b>	<b>186</b>	<b>QUENCH / STANDBY</b>
<p>After the field quench delay has expired, the field can be entirely quenched or put into a standby mode at 50% of rated current or volts depending whether in current or voltage control mode respectively. (The default standby value of 50% can be modified through the "SYSTEM / Reserved" Menu which is primarily for factory use only and requires the "super" password.)</p>		
<b>FIELD I THRESH</b>	<b>617</b>	<b>0.00 to 100.00 %</b>
<p>Threshold for UP TO FIELD diagnostic as a percentage of calibrated field current (see below).</p>		
<b>FLD. CTRL MODE</b>	<b>209</b>	<b>See below</b>
<p>Selects between open-loop VOLTAGE CONTROL or closed-loop CURRENT CONTROL.</p>		
<b>FLD. VOLTS RATIO</b>	<b>210</b>	<b>0.0 to 100.0 %</b>
<p>Sets the output dc field voltage as a percentage of the RMS FIELD supply voltage (line-to-line) when FLD CTRL MODE is set to VOLTAGE CONTROL.</p>		
<b>FIELD ENABLED</b>	<b>169</b>	<b>DISABLED / ENABLED</b>
<p>Refer to Chapter 6: "The MMI - Man Machine Interface" - The MMI Menus (DIAGNOSTICS).</p>		

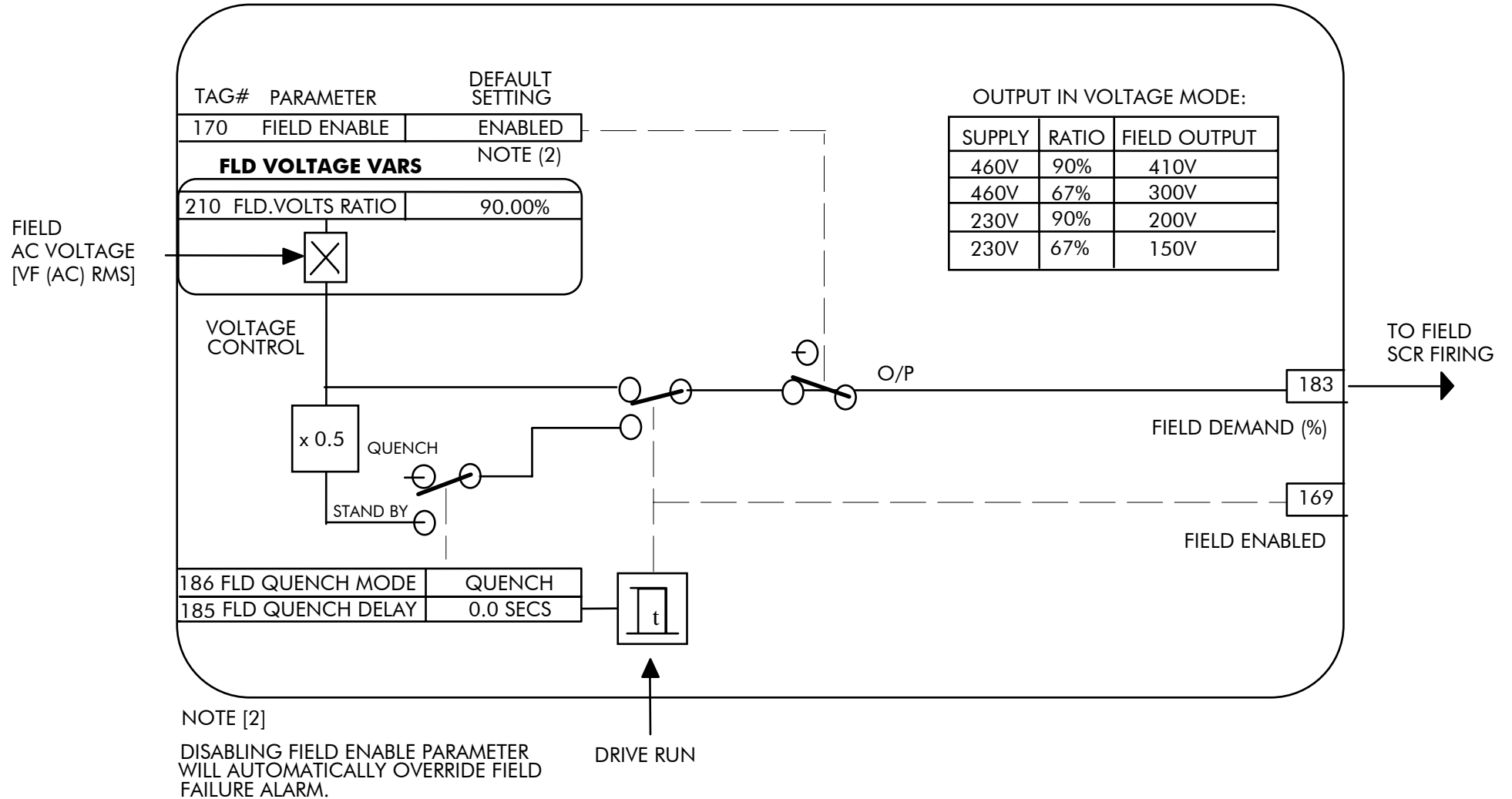


## FIELD CONTROL

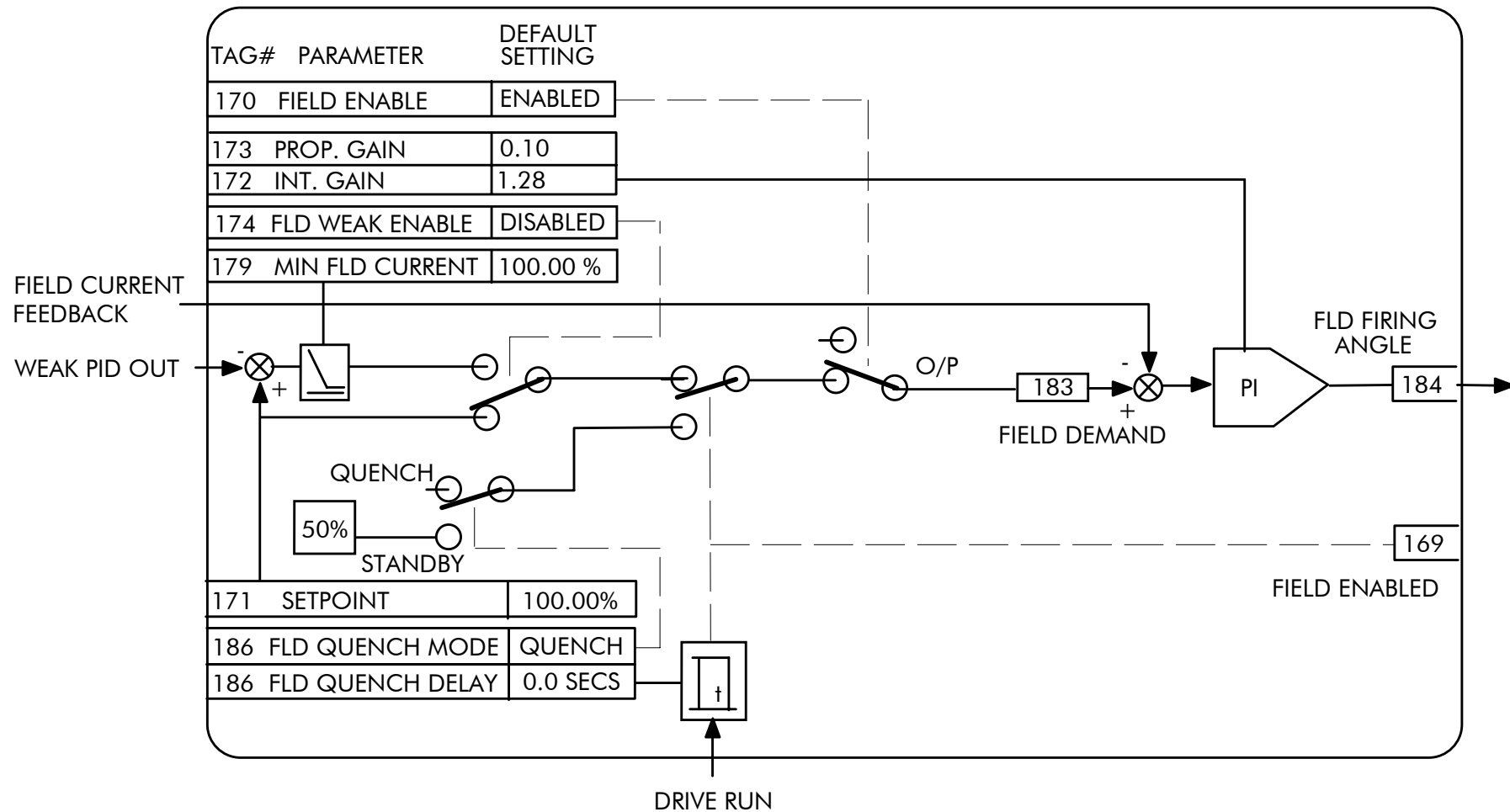
Parameter	Tag	Range
<b>FIELD DEMAND</b>	<b>183</b>	—.xx %
<i>Refer to Chapter 6: "The MMI - Man Machine Interface" - The MMI Menus (DIAGNOSTICS).</i>		
<b>FLD. FIRING ANGLE</b>	<b>184</b>	—.xx DEG
<i>Refer to Chapter 6: "The MMI - Man Machine Interface" - The MMI Menus (DIAGNOSTICS).</i>		
<b>FIELD I FBK.</b>	<b>300</b>	—.xx %
Field current feedback, as a percentage of the calibrated level.		
<b>UP TO FIELD</b>	<b>618</b>	<b>FALSE / TRUE</b>
Field current feedback is above FIELD I THRESHOLD when TRUE. This may be used as part of a mechanical brake release strategy.		
<b>WEAK PID ERROR</b>	<b>1185</b>	—.xx %
Input error, as a percentage of calibrated Volts, to the field weakening controller. This is formed from the spill-over of filtered BEMF above the MAX VOLTS setting.		
<b>WEAK PID OUT</b>	<b>1186</b>	—.xx %
Output field reduction demand, as a percentage of calibrated field current, from the field weakening controller.		
<b>FIELD STATE</b>	<b>1187</b>	<b>See below</b>
State of the field controller.		
0 : FIELD INIT		
1 : FIELD QUENCH		
2 : FIELD STANDBY		
3 : FIELD FULL FLD		
4 : FIELD TIMER            indicates that the FLD.QUENCH DELAY timer is counting down		
5 : FIELD ERROR		
6 : LOCAL BEMF		

# Functional Description

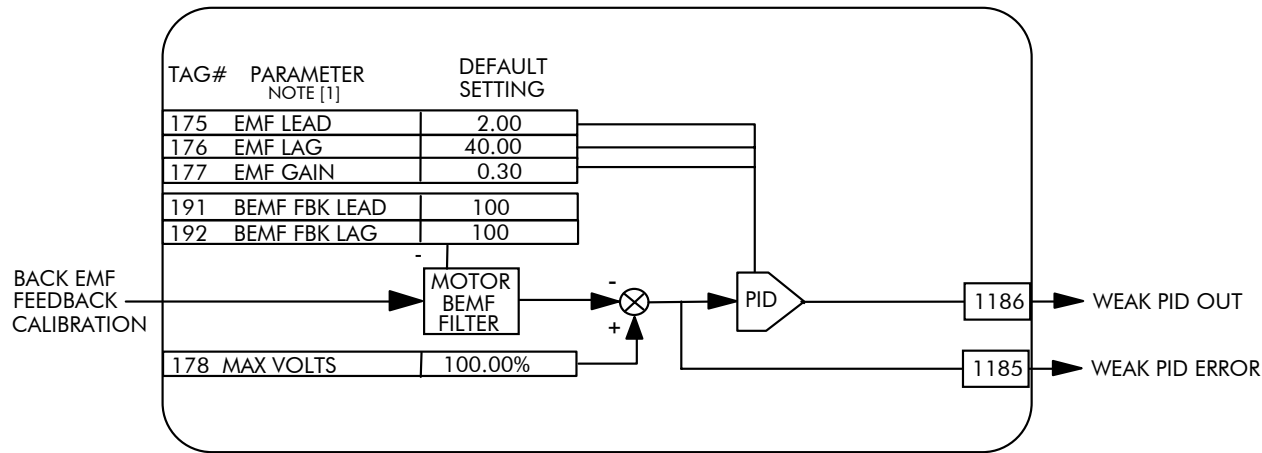
## FIELD CONTROL MODE : VOLTAGE



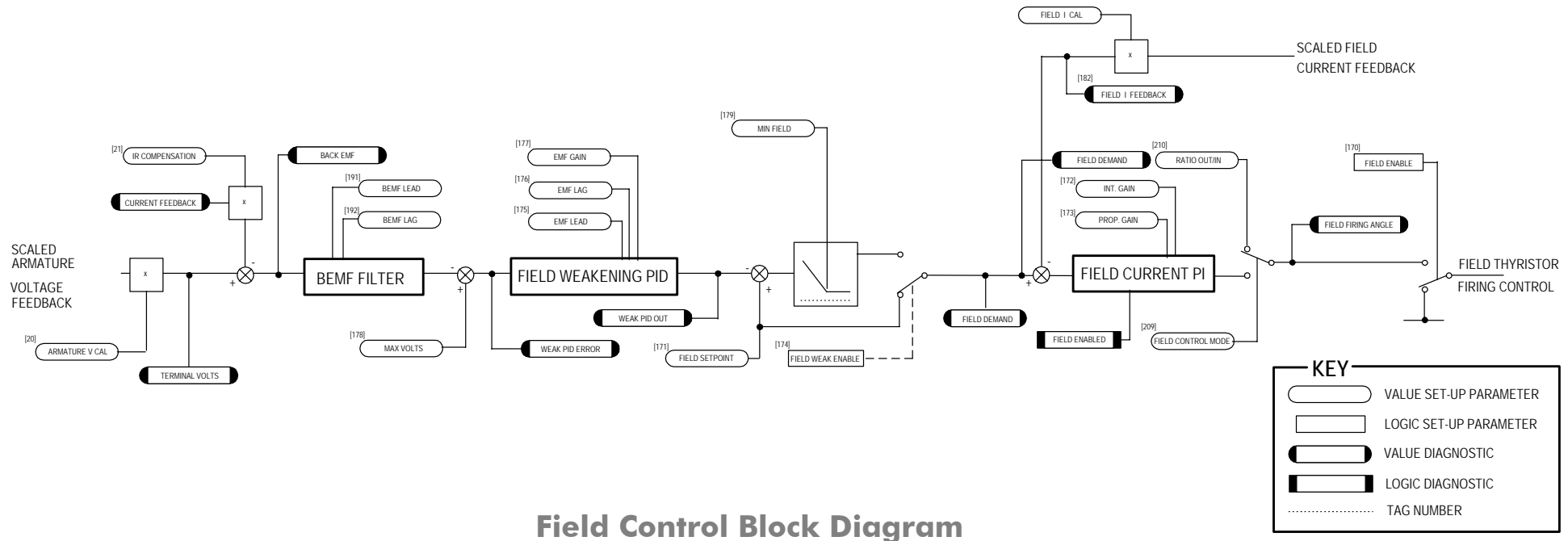
## FIELD CONTROL MODE : CURRENT



# FLD WEAK VARS



NOTE [1]  
FIELD WEAKENING OPERATION REQUIRES ENCODER OR ANALOG TACH FEEDBACK



**KEY**

- VALUE SET-UP PARAMETER
- LOGIC SET-UP PARAMETER
- VALUE DIAGNOSTIC
- LOGIC DIAGNOSTIC
- TAG NUMBER

**Field Control Block Diagram**

# INERTIA COMP

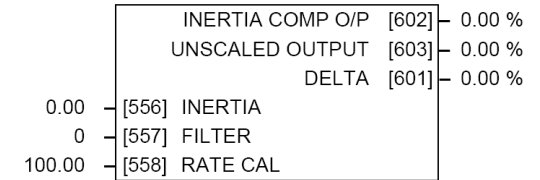
## MMI Menu Map

- 1 SETUP PARAMETERS
- 2 SPEED LOOP
- 3 ADVANCED
- 4 INERTIA COMP
  - INERTIA
  - FILTER
  - RATE CAL
  - DELTA
  - UNSCALED OUTPUT
  - INERTIA COMP O/P

This function block directly compensates for load inertia during acceleration.

This is particularly useful in high accuracy applications such as positioning systems and elevators. The block calculates its output at the same rate as the current loop for maximum performance.

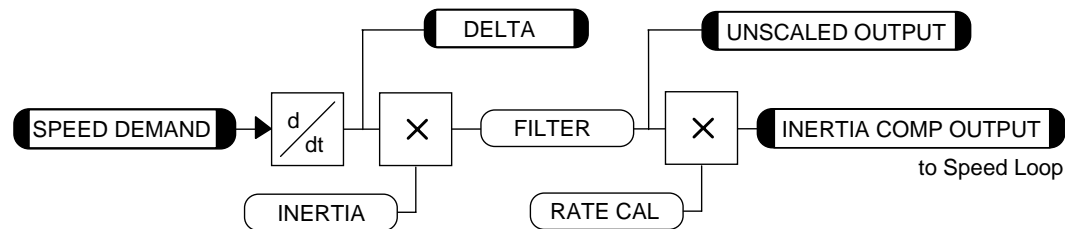
FUNCTION BLOCKS\MOTOR CONTROL\INERTIA COMP



## INERTIA COMP

Parameter	Tag	Range
<b>INERTIA</b>	<b>556</b>	<b>0.00 to 200.00</b>
The value of current necessary to accelerate load to 100% speed in 1 second.		
<b>FILTER</b>	<b>557</b>	<b>0 to 20000</b>
Low pass filter acting on the DELTA parameter.		
<b>RATE CAL</b>	<b>558</b>	<b>0.00 to 200.00</b>
Inertia compensation scaling factor.		
<b>INERTIA COMP O/P</b>	<b>602</b>	<b>—.xx %</b>
Inertia compensation directly added to the speed loop output.		
<b>UNSCALED OUTPUT</b>	<b>603</b>	<b>—.xx %</b>
Unscaled inertia compensation.		
<b>DELTA</b>	<b>601</b>	<b>—.xx %</b>
Rate of change of speed demand in %/s <sup>2</sup> .		

## Functional Description



# LINK

Use internal links to connect between function block parameters.

## MMI Menu Map

- 1 FUNCTION BLOCKS
- 2 MISCELLANEOUS
- 3 LINK
- 4 LINK 1
- 4 LINK 80
  - SOURCE TAG
  - DESTINATION TAG

FUNCTION BLOCKS\MISCELLANEOUS\LINK\LINK1

- 0 - [364] SOURCE TAG
- 0 - [365] DESTINATION TAG

FUNCTION BLOCKS\MISCELLANEOUS\LINK\LINK80

- 0 - [778] SOURCE TAG
- 0 - [779] DESTINATION TAG

## LINK

Parameter	Tag	Range
<b>LINK 1 - 80</b>		
<b>SOURCE TAG</b>	Refer to Parameter Table	<b>-1298 to 1298</b>
Enter the tag number of the source input value. Refer to “Making and Breaking Function Block Connections”, page D-2.		
<b>DESTINATION TAG</b>	Refer to Parameter Table	<b>0 to 1298</b>
Enter the tag number for the destination output value. Refer to “Making and Breaking Function Block Connections”, page D-2.		

**MMI Menu Map**

DIAGNOSTICS

INVERSE TIME O/P

# INVERSE TIME

The purpose of the inverse time is to automatically reduce the current limit in response to prolonged overload conditions.

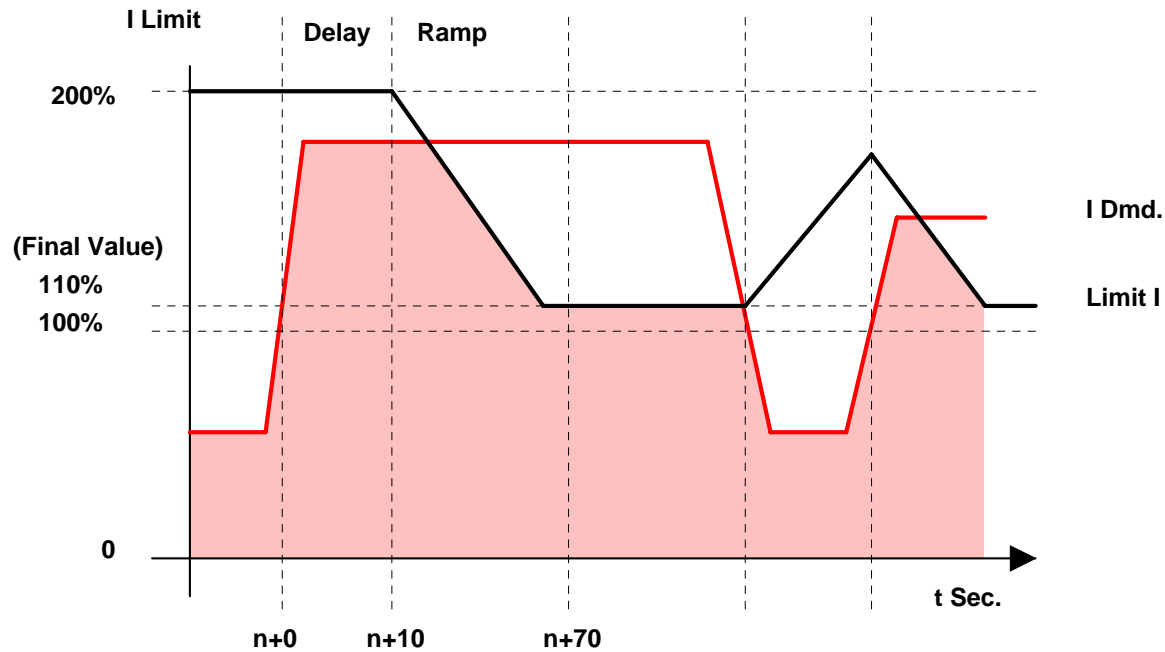
FUNCTION BLOCKS/MOTOR CONTROL/INVERSE TIME

INVERSE TIME O/P [203] 0.00 %

## INVERSE TIME

Parameter	Tag	Range
INVERSE TIME O/P	203	—XX %

Inverse time clamp output level.



If the motor current exceeds an internal threshold of 110%, for greater than 10s, then the internal overload current limit begins to reduce linearly from 200% down toward 100% over a period of 60s.

If the motor current falls below 110% at any time during this process then the overload limit ramps up again at the same fixed rate.

This overload current limit is applied in addition to all other current limits and its value can be seen in the output parameter INVERSE TIME O/P.

# JOG/SLACK

This block can be used to provide jog, take up slack and crawl speed functions.

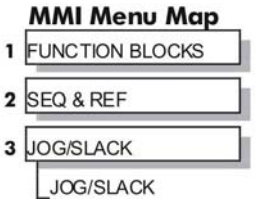
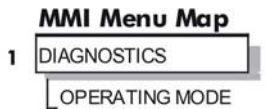
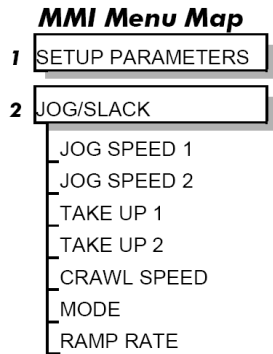
The inputs to this block are the Start and Jog signals via the SEQUENCING function block, and the speed demand from the RAMPS function block. The output of this block is connected to the RAMPS function block.

The JOG/SLACK parameters modify or replace the ramp input speed demand. You should use a spare digital input to switch between modes to achieve full functionality.

The JOG/SLACK parameter is internally connected to the RAMPS function block. This output is the modified value of the speed demand as required by MODE, Start, and Jog. These settings are shown in the Setpoint Selection table.

- **Jog:** With the Start signal OFF, the jog speed demand replaces the ramp input speed demand. MODE selects between jog setpoints 1 and 2. The jog RAMP RATE replaces the RAMP ACCEL TIME and RAMP DECEL TIME in the RAMPS function block. % S-RAMP is also set to 0.00%.
- **Take Up Slack:** With the Start signal ON, 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 speed demand. MODE and Jog settings, from the table, select between the two take-up slack setpoints.
- **Crawl:** CRAWL SPEED replaces the ramp input speed demand as the output signal when both Start and Jog signals are ON, and MODE is TRUE.

OPERATING MODE [212]	STOP
JOG/SLACK [698]	0.00 %
5.00 % - [218]	JOG SPEED 1
-5.00 % - [219]	JOG SPEED 2
5.00 % - [253]	TAKE UP 1
-5.00 % - [254]	TAKE UP 2
10.00 % - [225]	CRAWL SPEED
FALSE - [228]	MODE
1.0 s - [355]	RAMP RATE



## JOG/SLACK

Parameter	Tag	Range
<b>JOG SPEED 1</b> Jog speed setpoint 1.	<b>218</b>	<b>-100.00 to 100.00 %</b>
<b>JOG SPEED 2</b> Jog speed setpoint 2.	<b>219</b>	<b>-100.00 to 100.00 %</b>
<b>TAKE UP 1</b> Take-up slack speed setpoint 1.	<b>253</b>	<b>-100.00 to 100.00 %</b>
<b>TAKE UP 2</b> Take-up slack speed setpoint 2.	<b>254</b>	<b>-100.00 to 100.00 %</b>
<b>CRAWL SPEED</b> Crawl speed setpoint.	<b>225</b>	<b>-100.00 to 100.00 %</b>
<b>MODE</b> Selects jog speed setpoints, take up setpoints, and the crawl setpoint. To achieve full functionality, connect MODE to a spare digital input.	<b>228</b>	<b>FALSE / TRUE</b>



## JOG/SLACK

Parameter	Tag	Range
<b>RAMP RATE</b>	<b>355</b>	<b>0.1 to 600.0 s</b>
The ramp rate used while jogging. This is independent of the main ramp rate during normal running. The acceleration and deceleration times in jog are always equal.		
<b>OPERATING MODE</b>	<b>212</b>	<b>See below</b>
Refer to Chapter 6: "The MMI Man Machine Interface" - The MMI Menus (DIAGNOSTICS).		
0 : STOP		
1 : STOP		
2 : JOG SP. 1		
3 : JOG SP. 2		
4 : RUN		
5 : TAKE UP SP. 1		
6 : TAKE UP SP. 2		
7 : CRAWL		
<b>JOG/SLACK</b>	<b>698</b>	<b>____.00 %</b>
The setpoint combined with the JOG / SLACK function.		

## Functional Description

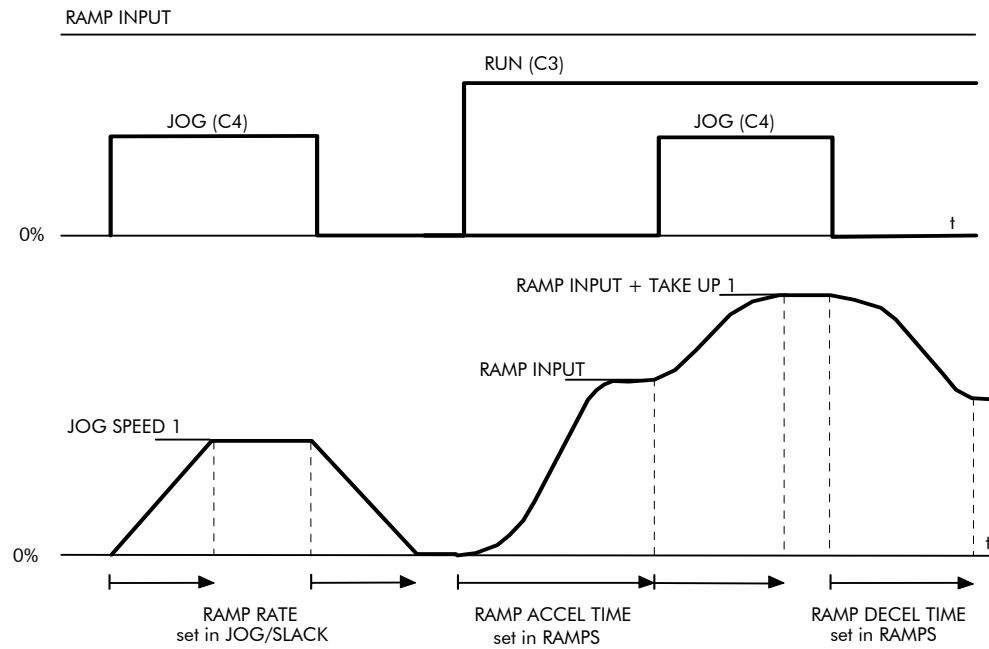
### NOTE

The setpoint column in the table below refers to the Ramp Input ONLY, as indicated in the table. Any "direct" setpoints present will also add to this setpoint to make the total speed setpoint. If you don't want this to happen, for example during jogging, then disconnect the direct setpoint(s) during the appropriate conditions.

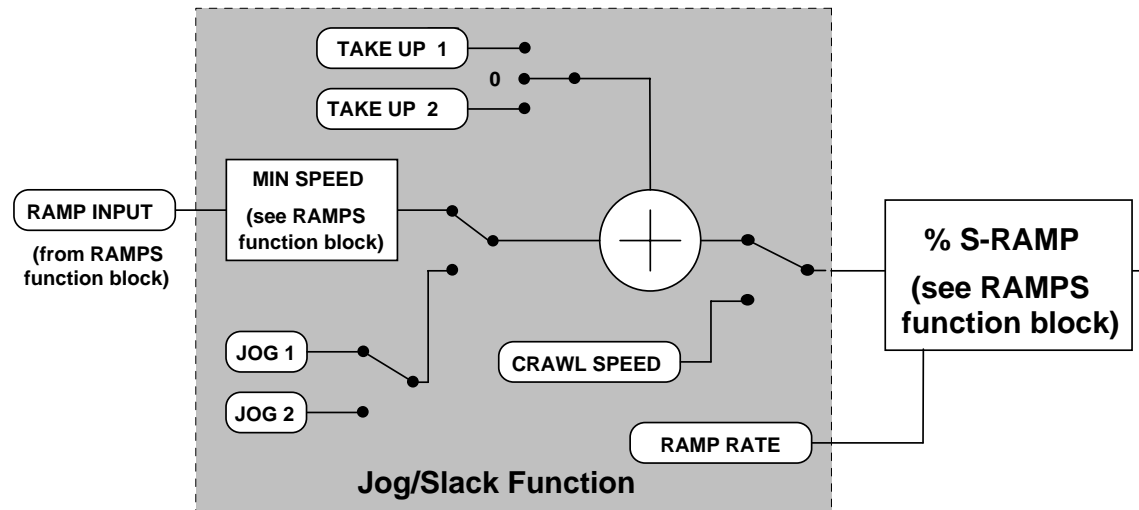
## Setpoint Selection Table

OPERATING MODE [212] - diagnostic	Start C3	Jog C4	MODE [228]	Ramp Input	Ramp Time	Contact
0 : STOP	OFF	OFF	False	Setpoint	Default	OFF
1 : STOP	OFF	OFF	True	Setpoint	Default	OFF
2 : JOG SP. 1 (inch/jog 1)	OFF	ON	False	JOG SPEED 1	RAMP RATE	ON
3 : JOG SP. 2 (inch/jog 2)	OFF	ON	True	JOG SPEED 2	RAMP RATE	ON
4 : RUN	ON	OFF	False	Setpoint	Default	ON
5 : TAKE UP SP. 1 (take-up slack 1)	ON *	ON *	False	Setpoint + TAKE UP 1	Default	ON
6 : TAKE UP SP. 2 (take-up slack 2)	ON	OFF	True	Setpoint + TAKE UP 2	Default	ON
7 : CRAWL	ON *	ON *	True	CRAWL SPEED	Default	ON

\* Start (C3) and Jog (C4) must be applied (ON) simultaneously in the cases of TAKE UP SP.1 and CRAWL.



### Block Diagram



### MMI Menu Map

- 1 SERIAL LINKS
- 2 MAIN PORT (P1)
  - ENABLED
  - GROUP ID (GID)
  - UNIT ID (UID)
  - MODE
  - BAUD RATE
  - ESP SUP. (ASCII)
  - CHANGEBAND (BIN)
  - ERROR REPORT
  - PNO.7
  - OPTION ADDRESS
  - OPTION VERSION
  - PARITY

### MMI Menu Map

- 1 FUNCTION BLOCKS
- 2 COMMUNICATION
- 3 MAIN PORT (P1)
  - REPLY DELAY

## MAIN PORT (P1)

Use this block to configure the drive's P1 port.

Refer to Appendix A: "Serial Communications" – Main Port P1 for further information.

This function block configures the drive to use the plug-in communication Option Board.

The P1 port is a non-isolated serial communications port built in to the drive's Control Board.

It is used off-line (while the drive is stopped) for transferring and saving drive configuration files using a personal computer (PC) running a serial communications program, or on-line (while the drive is running) when using the Parker SSD Drives 5703 Setpoint Repeater Unit.

You can also use the P1 port to transfer configuration files by connecting to a PC running the Windows™ compatible software package "ConfigEd Lite". Refer to the ConfigEd Lite manual RG352747.

### FUNCTION BLOCKS\COMMUNICATIONS\COMMS PORT\COMMS PORT 1

EIASCII	[148]	MODE
9600	[150]	BAUD RATE
0	[138]	GROUP ID (GID)
0	[139]	UNIT ID (UID)
TRUE	[152]	ESP SUP. (ASCII)
0.00 %	[144]	CHANGEBAND (BIN)
0xFFFF	[142]	PNO.7
0x00C0	[693]	ERROR REPORT
2 ms	[695]	REPLY DELAY
ENABLED	[146]	ENABLED
EVEN	[334]	PARITY
0	[499]	OPTION ADDRESS
0.00	[303]	OPTION VERSION

## MAIN PORT (P1)

Parameter	Tag	Range
<b>MODE</b>	<b>148</b>	<b>See below</b>
Used to set the protocol on this port.		
	0 : DISABLED	
	1 : 5703 MASTER	
	2 : 5703 SLAVE	
	3 : EIASCII	
	4 : EIBINARY	
<b>BAUD RATE</b>	<b>150</b>	<b>See below</b>
Transmission rate. Options available are:		
	0 : 300	
	1 : 600	
	2 : 1200	
	3 : 2400	
	4 : 4800	
	5 : 9600 (default)	
	6 : 19200	
	7 : 38400 (reserved for future use)	
	8 : 57600 (reserved for future use)	
	9 : 115200 (reserved for future use)	
<b>GROUP ID (GID)</b>	<b>138</b>	<b>0 to 7</b>
The Parker SSD Drives protocol group identity address.		

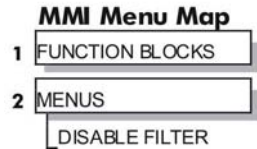
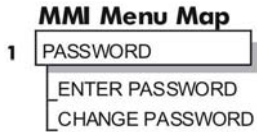
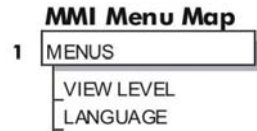
## MAIN PORT (P1)

Parameter	Tag	Range
<b>UNIT ID (UID)</b>	<b>139</b>	<b>0 to 15</b>
The Parker SSD Drives protocol unit identity address.		
<b>ESP SUP. (ASCII)</b>	<b>152</b>	<b>ENABLED / DISABLED</b>
<i>Reserved for future use.</i>		
<b>CHANGE BAND (BIN)</b>	<b>144</b>	<b>0.00 to 100.00 %</b>
<i>Reserved for future use.</i>		
<b>PNO.7</b>	<b>142</b>	<b>0x0000 to 0xFFFF</b>
<i>Reserved for future use.</i>		
<b>ERROR REPORT</b>	<b>158</b>	<b>0x0000 to 0xFFFF</b>
Displays the last error as a hexadecimal code. Writing any value to this parameter will set the value to >00C0 (No Error). Refer to Appendix A: "Serial Communications" - Reference for a list of codes.		
<b>REPLY DELAY</b>	<b>695</b>	<b>0 to 255 ms</b>
A programmable delay inserted by the drive before replying to a request.		
<b>ENABLED</b>	<b>146</b>	<b>ENABLED / DISABLED</b>
Enables Main Port (P1) operation.		
<b>PARITY</b>	<b>334</b>	<b>ODD / EVEN</b>
Selects odd or even parity.		
<b>OPTION ADDRESS</b>	<b>499</b>	<b>0 to 32767</b>
Refer to Profibus Communications Option board Technical Manual for further details.		
<b>OPTION VERSION</b>	<b>303</b>	<b>-.XX</b>
Refer to Profibus Communications Option board Technical Manual for further details.		

# MENUS

Use this block to select one of three MMI menu structures, to set a display language, and to protect the Keypad with a password.

	FUNCTION BLOCKS	MENUS	MENUS
STANDARD	[ 37]	VIEW LEVEL	
ENGLISH	[304]	LANGUAGE	
0x0000	[120]	ENTER PASSWORD	
0x0000	[121]	CHANGE PASSWORD	



## MENUS

Parameter	Tag	Range
<b>VIEW LEVEL</b>	<b>37</b>	<b>BASIC / STANDARD / ADVANCED</b>
This parameter controls which parameters and menus are visible on the MMI. Refer to Chapter 6: "The MMI - Man Machine Interface" -The Menu System Map to see the effects of these selections.		
<b>LANGUAGE</b>	<b>304</b>	<b>ENGLISH / OTHER</b>
Selects the MMI display language. Other languages are available, please contact Parker SSD Drives. Refer also to Chapter 6: "The MMI - Man Machine Interface" - Selecting the Display Language.		
<b>ENTER PASSWORD</b>	<b>120</b>	<b>0x0000 to 0xFFFF</b>
Refer to Chapter 6: "The MMI - Man Machine Interface" - Password Protection for further instruction.		
<b>CHANGE PASSWORD</b>	<b>121</b>	<b>0x0000 to 0xFFFF</b>
Refer to Chapter 6: "The MMI - Man Machine Interface" - Password Protection for further instruction.		
<b>DISABLE FILTER</b>	<b>1297</b>	<b>FALSE / TRUE</b>
Disables filter on MMI value display. Does not affect how parameters are updated internally.		



### MMI Menu Map

- 1 SYSTEM
- 2 miniLINK
  - VALUE 1
  - VALUE 2
  - VALUE 3
  - VALUE 4
  - VALUE 5
  - VALUE 6
  - VALUE 7
  - VALUE 8
  - VALUE 9
  - VALUE 10
  - VALUE 11
  - VALUE 12
  - VALUE 13
  - VALUE 14
  - LOGIC 1
  - LOGIC 2
  - LOGIC 3
  - LOGIC 4
  - LOGIC 5
  - LOGIC 6
  - LOGIC 7
  - LOGIC 8

## miniLINK

These parameters are general purpose tags.

These parameters are used extensively in conjunction with communications masters in order to map the field bus parameters into the drive. Refer to the appropriate Tech Box manual.

### FUNCTION BLOCKS\COMMUNICATIONS\miniLINK

- 0.00 % - [339] VALUE 1
- 0.00 % - [340] VALUE 2
- 0.00 % - [341] VALUE 3
- 0.00 % - [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
- OFF - [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

### miniLINK

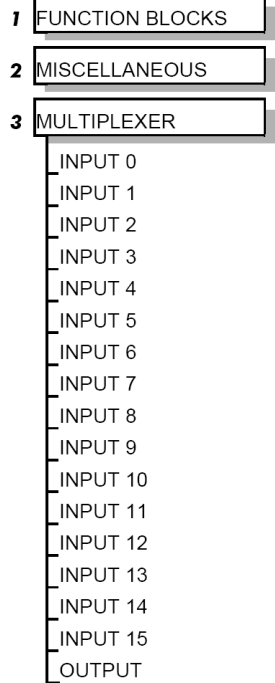
Parameter	Tag	Range
VALUE 1 to VALUE 14 General purpose inputs.	339 to 345, 379 to 385	-300.00 to 300.00 %
LOGIC 1 to LOGIC 8 General purpose logic inputs.	346 to 353	OFF / ON

# MULTIPLEXER

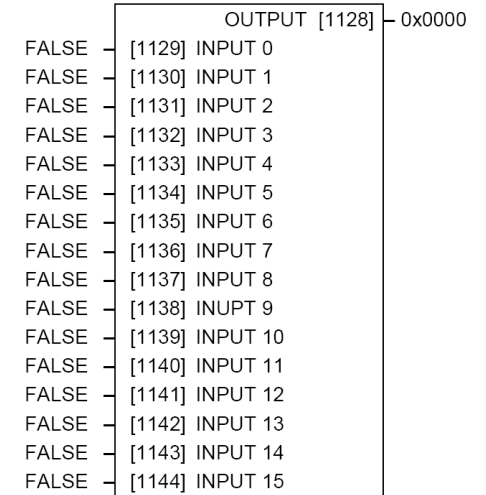
Each block collects together 16 Boolean input values into a single word.

For example, one may be used to collect individual bits within a word for efficient access from a communications master.

## MMI Menu Map



## FUNCTION BLOCKS MISCELLANEOUS MULTIPLEXER



## MULTIPLEXER

Parameter	Tag	Range
<b>INPUT 0 to INPUT 15</b> The Boolean inputs to be assembled into a single word.	<b>1129 to 1144</b>	<b>FALSE / TRUE</b>
<b>OUTPUT</b> The resulting word.	<b>1128</b>	<b>0x0000 to 0xFFFF</b>



**MMI Menu Map**

1	SETUP PARAMETERS
2	SPECIAL BLOCKS
3	PID
	INT.TIME.CONST
	DERIVATIVE TC
	POSITIVE LIMIT
	NEGATIVE LIMIT
	O/P SCALER(TRIM)
	INPUT 1
	INPUT 2
	RATIO 1
	RATIO 2
	DIVIDER 1
	DIVIDER 2
	ENABLE
	INT. DEFEAT
	FILTER T.C.

# PID

This is a general purpose PID block which can be used for many different closed loop control applications.

The PID feedback can be loadcell tension, dancer position or any other transducer feedback such as pressure, flow etc.

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

**Features:**

- Independent adjustment of gain and time constants.
- Additional first-order filter (F).
- Functions P, PI, PD, PID with/without F individually selected.
- Ratio and divider for scaling each input.
- Independent positive and negative limits.
- Output scaler (Trim).
- Gain profiled by diameter for centre-driven winder control.

FUNCTION BLOCKS:SETPOINT FUNCS:PID

	PID OUTPUT	[417]	0.00 %
	PID CLAMPED	[416]	FALSE
	PID ERROR	[415]	0.00 %
1.0	[711] PID PROP. GAIN		
5.00 s	[402] INT. TIME CONST.		
0.000 s	[401] DERIVATIVE TC		
0.100 s	[403] FILTER T.C.		
100.00 %	[405] POSITIVE LIMIT		
-100.00 %	[406] NEGATIVE LIMIT		
0.2000	[407] O/P SCALER (TRIM)		
0.00 %	[410] INPUT 1		
0.00 %	[411] INPUT 2		
1.0000	[412] RATIO 1		
1.0000	[413] RATIO 2		
1.0000	[418] DIVIDER 1		
1.0000	[414] DIVIDER 2		
ENABLED	[408] ENABLE		
OFF	[409] INT. DEFEAT		

**MMI Menu Map**

1	DIAGNOSTICS
	PID OUTPUT
	PID CLAMPED
	PID ERROR

**MMI Menu Map**

1	DIAGNOSTICS
	PID OUTPUT
	PID CLAMPED
	PID ERROR

## PID

Parameter	Tag	Range
<b>PID PROP. GAIN</b>	<b>711</b>	<b>0.0 to 100.0</b>
The maximum limit of the proportional gain. This is a pure gain factor which shifts up or down the whole Bode PID transfer function leaving the time constants unaffected. A value of P = 10.0 means that, for an error of 5%, the proportional part (initial step) of the PID output will be: $10 \times [1 + (Td/Ti)] \times 5\%$ , i.e. approx. 50% for $Td \ll Ti$ . In the default configuration this gain is derived from the PROFILED GAIN function block output.		
<b>INT. TIME CONST.</b>	<b>402</b>	<b>0.01 to 100.00 s</b>
The integral time constant (Ti)		
<b>DERIVATIVE TC</b>	<b>401</b>	<b>0.000 to 10.000 s</b>
The derivative time constant (Td). Set this value to 0.000 to remove the derivative term.		
<b>FILTER T.C.</b>	<b>403</b>	<b>0.000 to 10.000 s</b>
A first-order filter for removing high frequency noise from the PID output. When set to 0.000 the filter is removed. The high frequency lift of the transfer function is determined by the ratio k of the Derivative Time Const (Td) over the Filter Time Constant (Tf) - typically 4 of 5.		

**PID**

Parameter	Tag	Range
<b>POSITIVE LIMIT</b> The upper limit of the PID algorithm.	<b>405</b>	<b>0.00 to 105.00 %</b>
<b>NEGATIVE LIMIT</b> The lower limit of the PID algorithm.	<b>406</b>	<b>-105.00 to 0.00 %</b>
<b>O/P SCALER (TRIM)</b> The ratio that the limited PID output is multiplied by in order to give the final PID Output. Normally this ratio would be between 0 and 1.	<b>407</b>	<b>-3.0000 to 3.0000</b>
<b>INPUT 1</b> PID setpoint input. This can be either a position/tension feedback or a reference/offset.	<b>410</b>	<b>-300.00 to 300.00 %</b>
<b>INPUT 2</b> PID feedback input. This can be either a position/tension feedback or a reference/offset	<b>411</b>	<b>-300.00 to 300.00 %</b>
<b>RATIO 1</b> This multiplies Input 1 by a factor (Ratio 1).	<b>412</b>	<b>-3.0000 to 3.0000</b>
<b>RATIO 2</b> This multiplies Input 2 by a factor (Ratio 2).	<b>413</b>	<b>-3.0000 to 3.0000</b>
<b>DIVIDER 1</b> This divides Input 1 by a factor (Divider 1).	<b>418</b>	<b>-3.0000 to 3.0000</b>
<b>DIVIDER 2</b> This divides Input 2 by a factor (Divider 2).	<b>414</b>	<b>-3.0000 to 3.0000</b>
<b>ENABLE</b> Enables or disables the PID output.	<b>408</b>	<b>DISABLED / ENABLED</b>
<b>INT. DEFEAT</b> When ON, the Integral term is disabled. The block transfer function then becomes P+D only.	<b>409</b>	<b>OFF / ON</b>
<b>PID OUTPUT</b> <i>Refer to Chapter 6: "MMI – Main Machine Interface – The MMI Menus (DIAGNOSTICS).</i>	<b>417</b>	<b>—.xx %</b>
<b>PID CLAMPED</b> <i>Refer to Chapter 6: "MMI – Main Machine Interface – The MMI Menus (DIAGNOSTICS).</i>	<b>416</b>	<b>FALSE / TRUE</b>
<b>PID ERROR</b> <i>Refer to Chapter 6: "MMI – Main Machine Interface – The MMI Menus (DIAGNOSTICS).</i>	<b>415</b>	<b>—.xx %</b>

## Functional Description

The following block diagram shows the internal structure of the PID block.

PID is used to control the response of any closed loop system. It is used specifically in system applications involving the control of drives to allow zero steady state error between Reference and Feedback, together with good transient performance.

The block executes a Proportional Gain + Integral + Derivative control algorithm, with an added filter to attenuate high-frequency noise. You can select P, PD, PI or PID as required.

### Proportional Gain (PROP. GAIN)

This is used to adjust the basic response of the closed loop control system. It is defined as the portion of the loop gain fed back to make the complete control loop stable. The PID error is multiplied by the Proportional Gain to produce an output.

### Integral (INT. TIME CONST.)

The Integral term is used to give zero steady state error between the setpoint and feedback values of the PID. If the integral is set to a small value, this will cause an underdamped or unstable control system.

### Derivative (DERIVATIVE TC)

This is used to correct for certain types of control loop instability, and therefore improve response. It is sometimes used when heavy or large inertia rolls are being controlled. The derivative term has an associated filter to suppress high frequency signals.

The algorithm modifies the error between the setpoint and the feedback with the proportional, integral, and derivative terms. The error is clamped internally to  $\pm 105\%$  maximum.

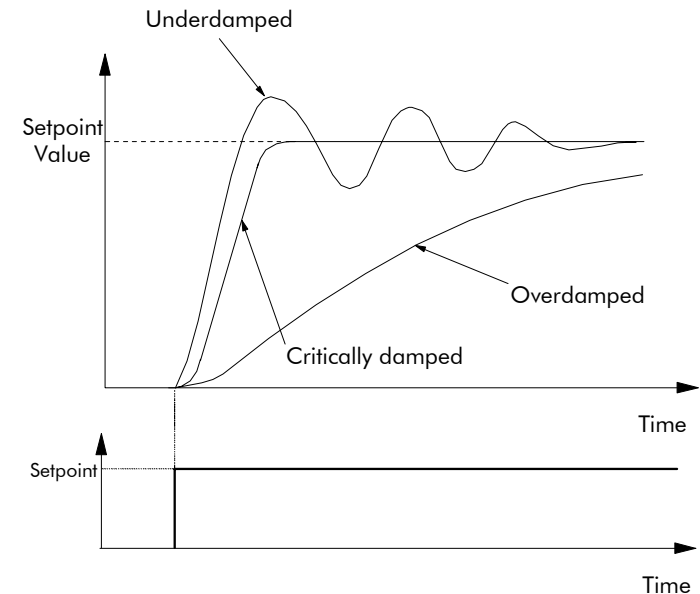
The proportional, integral, and derivative terms are scaled by PROP. GAIN, INT. TIME CONST., and DERIVATIVE TC respectively. An additional gain profiler can modify the proportional gain as the roll diameter changes. The block diagram shows how the proportional gain changes when using the profiler.

## Proportional Gain

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 opposite.

You should try to achieve a critically damped response which allows the mechanics to track as precisely as possible a step change on the setpoint.

## Critically Damped Response



## Integral Gain

Integral eliminates steady-state error. Reducing INT. TIME CONST. improves the 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 INT. DEFEAT to ON will disable the integral gain term.

## Derivative Gain

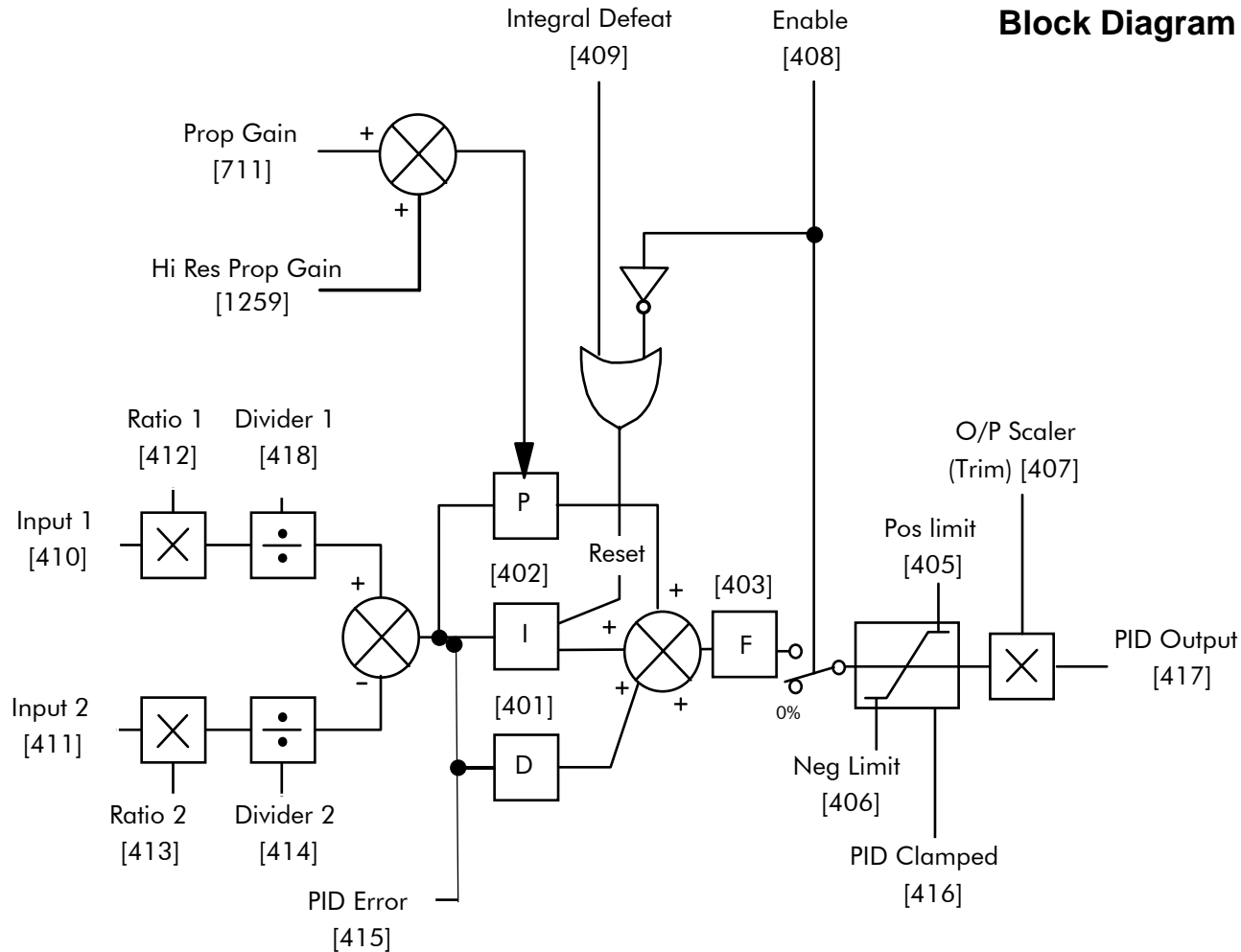
Derivative gain instantaneously boosts the PID output signal. Increasing DERIVATIVE TC decreases the damping, which in most cases causes overshoot and oscillations resulting in an unacceptable system response.

**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.

- 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.

## Block Diagram



\* - Linked internally to Diameter Calculator

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

- PID ERROR : displayed in the DIAGNOSTICS menu
- PID OUTPUT : displayed in the DIAGNOSTICS menu
- SETPOINT : monitored at SETUP PARAMETERS::SPECIAL BLOCKS::PID::INPUT 1
- FEEDBACK : monitored at SETUP PARAMETERS::SPECIAL BLOCKS::PID::INPUT 2

**MMI Menu Map**

- 1 FUNCTION BLOCKS
- 2 MOTOR CONTROL
- 3 PLL
  - PLL STATE
  - PHASE ERROR
  - PLL MAINS FREQ

## PLL (PHASE LOCKED LOOP)

The phase locked loop function block allows the drive to ride through short disturbances to the supply voltage, frequency or phase and provides immunity to waveform distortion.

FUNCTION BLOCKS MOTOR CONTROL \ PLL

PLL STATE	[1198]	STOPPED
PHASE ERROR	[1199]	0.00
PLL MAINS FREQ	[1201]	0.00

### PLL (PHASE LOCKED LOOP)

Parameter	Tag	Range
<b>PLL STATE</b>	<b>1198</b>	<b>See below</b>
<p>Indicates the current operating state of the phase locked loop function block. Normally the PLL will reside in the LOCKED state after close of the 3-phase line contactor. The FAIL state results if the supply frequency moves beyond the acceptable operating range.</p> <ul style="list-style-type: none"> <li>0 : STOPPED</li> <li>1 : 1ST CODING EDGE</li> <li>2 : READ EDGES</li> <li>3 : MAINS PERIOD</li> <li>4 : LOCKED</li> <li>5 : UNLOCKED</li> <li>6 : FAIL</li> </ul>		
<b>PHASE ERROR</b>	<b>1199</b>	<b>—,xx</b>
<p>The instantaneous angle error between the zero-crossing detection of the line supply and the reference output from the PLL function block.</p>		
<b>PLL MAINS FREQ</b>	<b>1201</b>	<b>—,xx</b>
<p>The measured 3-phase line supply frequency at the output of the PLL function block.</p>		

# PNO CONFIG

## MMI Menu Map

- 1 SERIAL LINKS
- 2 PNO CONFIG
  - PNO 112
  - PNO 113
  - PNO 114
  - PNO 115
  - PNO 116
  - PNO 117
  - PNO 118
  - PNO 119
  - PNO 120
  - PNO 121
  - PNO 122
  - PNO 123
  - PNO 124
  - PNO 125
  - PNO 126
  - PNO 127

The PNO parameters are used in conjunction with the EI ASCII and EI BINARY communications protocols.

Refer to Appendix A: "Serial Communications".

## FUNCTION BLOCKS\COMMUNICATIONS\PNO CONFIG

0	[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
379	[320]	PNO 120
380	[321]	PNO 121
381	[322]	PNO 122
382	[323]	PNO 123
383	[324]	PNO 124
384	[325]	PNO 125
385	[326]	PNO 126
0	[327]	PNO 127

PNO CONFIG		
Parameter	Tag	Range
PNO 112 - 127	312 to 327	-1298 to 1298
Indirect access parameters.		

## PRESET SPEEDS

The Preset Speeds block allows you to select one of eight preset inputs, which in turn may be connected to other blocks of inputs.

### MMI Menu Map

- 1 SETUP PARAMETERS
- 2 PRESET SPEEDS
  - SELECT 1
  - SELECT 2
  - SELECT 3
  - INVERT O/P
  - MAX SPEED
  - LIMIT
  - GRAY SCALE
  - INPUT 0
  - INPUT 1
  - INPUT 2
  - INPUT 3
  - INPUT 4
  - INPUT 5
  - INPUT 6
  - INPUT 7
  - PRESET O/P
  - OUTPUT

### FUNCTION BLOCKS\SETPOINT FUNC\PRESET SPEEDS

	PRESET O/P	[572]	0.00 %
	OUTPUT FPM	[593]	0.0
FALSE	-	[560]	SELECT 1
FALSE	-	[561]	SELECT 2
FALSE	-	[562]	SELECT 3
FALSE	-	[563]	INVERT O/P
100.0 RPM	-	[559]	MAX SPEED
FALSE	-	[600]	LIMIT
FALSE	-	[610]	GRAY SCALE
0.0	-	[564]	INPUT 0
0.0	-	[565]	INPUT 1
0.0	-	[566]	INPUT 2
0.0	-	[567]	INPUT 3
0.0	-	[568]	INPUT 4
0.0	-	[569]	INPUT 5
0.0	-	[570]	INPUT 6
0.0	-	[571]	INPUT 7

### PRESET SPEEDS

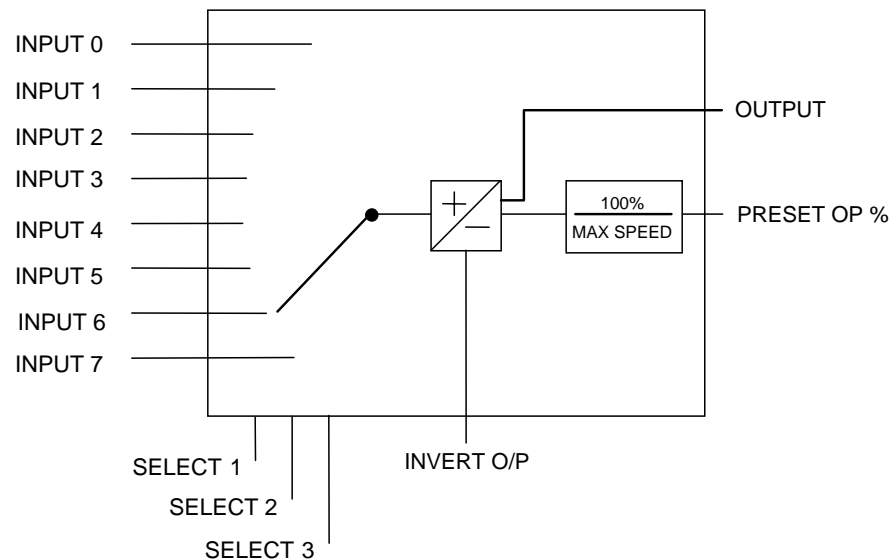
Parameter	Tag	Range
<b>SELECT 1</b>	<b>560</b>	<b>FALSE / TRUE</b>
Select input 1.		
<b>SELECT 2</b>	<b>561</b>	<b>FALSE / TRUE</b>
Select input 2.		
<b>SELECT 3</b>	<b>562</b>	<b>FALSE / TRUE</b>
Select input 3.		
<b>INVERT O/P</b>	<b>563</b>	<b>FALSE / TRUE</b>
Changes the sign of the output. If TRUE, the output is of the opposite sign to the selected input.		
<b>MAX SPEED</b>	<b>559</b>	<b>0.1 to 3000.0 RPM</b>
Scaler for PRESET OP (%).		



## PRESET SPEEDS

Parameter	Tag	Range
<b>LIMIT</b>	<b>600</b>	<b>FALSE / TRUE</b>
Clamp output to MAX SPEED if TRUE.		
<b>GRAY SCALE</b>	<b>610</b>	<b>FALSE / TRUE</b>
Selects Gray Scale encoding when TRUE, Binary encoding when FALSE. When gray scale is selected, only one input changes between state preventing the mis-selection of intermediate states.		
<b>INPUT 0 to INPUT 7</b>	<b>564 to 571</b>	<b>-3000.0 to 3000.0</b>
Pre-set input variables.		
<b>PRESET O/P</b>	<b>572</b>	<b>—.xx %</b>
Scales the selected preset input by MAX SPEED.		
<b>OUTPUT FPM</b>	<b>593</b>	<b>—.x</b>
Outputs the selected INPUT value.		

## Functional Description



## Selection Table

Three Boolean variables used to select between one of the 8 preset values.

BINARY ENCODING			
Select 3	Select 2	Select 1	Input
FALSE	FALSE	FALSE	0
FALSE	FALSE	TRUE	1
FALSE	TRUE	FALSE	2
FALSE	TRUE	TRUE	3
TRUE	FALSE	FALSE	4
TRUE	FALSE	TRUE	5
TRUE	TRUE	FALSE	6
TRUE	TRUE	TRUE	7

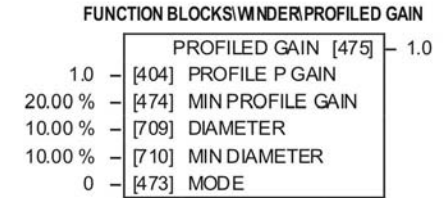
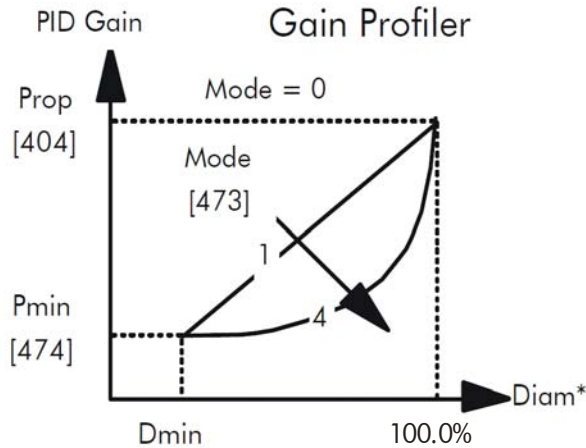
GRAY SCALE ENCODING			
Select 3	Select 2	Select 1	Input
FALSE	FALSE	FALSE	0
FALSE	FALSE	TRUE	1
FALSE	TRUE	TRUE	2
FALSE	TRUE	FALSE	3
TRUE	TRUE	FALSE	4
TRUE	TRUE	TRUE	5
TRUE	FALSE	TRUE	6
TRUE	FALSE	FALSE	7

# PROFILED GAIN

This function block may be used to profile the proportional gain input to the PID block.

- MMI Menu Map**
- 1 SETUP PARAMETERS
  - 2 SPECIAL BLOCKS
  - 3 PID
    - PROFILE P GAIN
    - MODE
    - MIN PROFILE GAIN
    - PROFILED GAIN

- MMI Menu Map**
- 1 FUNCTION BLOCKS
  - 2 WINDER
  - 3 PROFILED GAIN
    - DIAMETER
    - MIN DIAMETER



## PROFILED GAIN

Parameter	Tag	Range
<b>PROFILE P GAIN</b>	<b>404</b>	<b>0.0 to 100.0</b>
The nominal gain prior to profiling.		
<b>MIN PROFILE GAIN</b>	<b>474</b>	<b>0.00 to 100.00 %</b>
This expresses the minimum gain required at minimum diameter (core) as a percentage of the (maximum) P gain at full diameter (100%), when MODE > 0.		
<b>DIAMETER</b>	<b>709</b>	<b>0.00 to 100.00 %</b>
The actual measured diameter. If appropriate, this may be connected to the DIAMETER output parameter in the DIAMETER CALC function block.		
<b>MIN DIAMETER</b>	<b>710</b>	<b>0.00 to 100.00 %</b>
Set to the minimum core diameter (normally the empty core diameter) as a percentage of the maximum roll diameter. If appropriate, this may be connected to the MIN DIAMETER parameter in the DIAMETER CALC function block.		

## PROFILED GAIN

Parameter	Tag	Range
<b>MODE</b>	<b>473</b>	<b>0 to 4</b>
<p>This determines the shape of the proportional gain profile. The higher the setting, the steeper the curve of the profiled gain.</p> <p>For Mode = 0, Profiled Gain = constant = P.</p> <p>For Mode = 1, Profiled Gain = A * (diameter - min diameter) + B.</p> <p>For Mode = 2, Profiled Gain = A * (diameter - min diameter)<sup>2</sup> + B.</p> <p>For Mode = 3, Profiled Gain = A * (diameter - min diameter)<sup>3</sup> + B.</p> <p>For Mode = 4, Profiled Gain = A * (diameter - min diameter)<sup>4</sup> + B.</p>		
<b>PROFILED GAIN</b>	<b>475</b>	<b>—x</b>
<p>The proportional gain after profiling by a profiler block which varies the gain versus diameter. This is primarily to be used with Speed Profiled Winders for compensation against varying diameter and therefore inertia.</p> <ul style="list-style-type: none"><li>• When MODE is not ZERO (see above) this overrides the P gain above.</li><li>• When MODE = 0, then PROFILED GAIN = PROP. GAIN.</li></ul>		

# RAISE/LOWER

This function block acts as an internal motorised potentiometer (MOP).

The OUTPUT is not preserved when the drive is powered-down.

FUNCTION BLOCKS	SETPOINT FUNCS	RAISE/LOWER
		RAISE/LOWER O/P [264] — 0.00 %
0.00 %	[255]	RESET VALUE
10.0 s	[256]	INCREASE RATE
10.0 s	[257]	DECREASE RATE
FALSE	[261]	RAISE INPUT
FALSE	[262]	LOWER INPUT
-100.00 %	[258]	MIN VALUE
100.00 %	[259]	MAX VALUE
FALSE	[307]	EXTERNAL RESET

**MMI Menu Map**

- 1 SETUP PARAMETERS
- 2 RAISE/LOWER
  - RESET VALUE
  - INCREASE RATE
  - DECREASE RATE
  - RAISE INPUT
  - LOWER INPUT
  - MIN VALUE
  - MAX VALUE
  - EXTERNAL RESET

**MMI Menu Map**

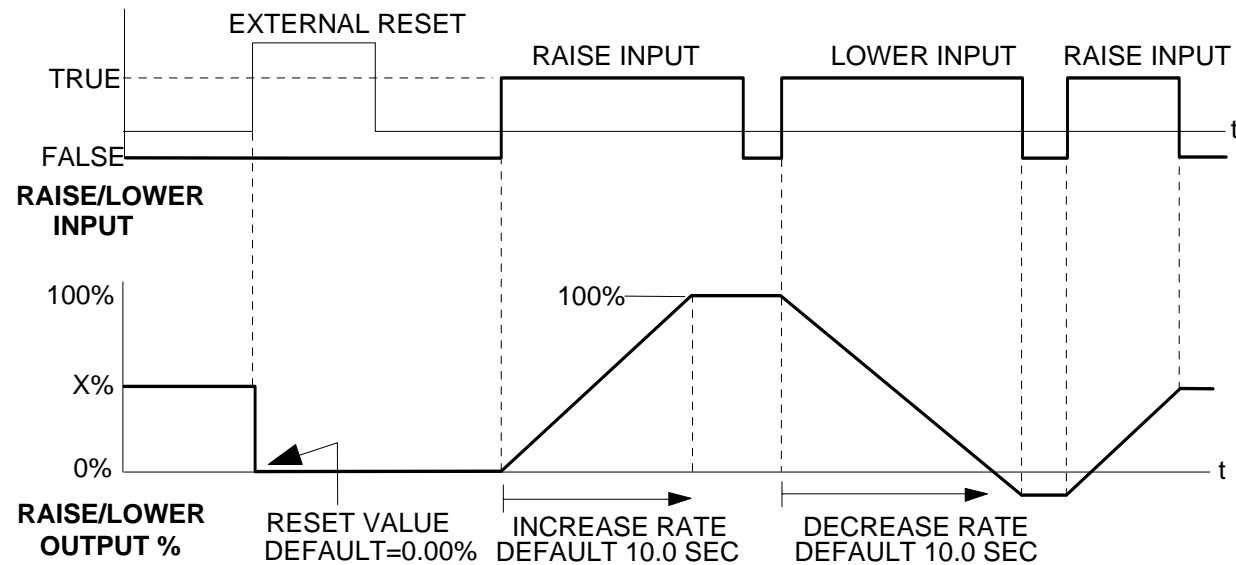
- 1 FUNCTION BLOCKS
- 2 SETPOINT FUNCS
- 3 RAISE/LOWER
  - RAISE/LOWER O/P

RAISE/LOWER		
Parameter	Tag	Range
<b>RAISE/LOWER O/P</b>	<b>264</b>	<b>— .xx %</b>
The output value.		
<b>RESET VALUE</b>	<b>255</b>	<b>-300.00 to 300.00 %</b>
This reset value is pre-loaded directly into the output when EXTERNAL RESET is TRUE, or at power-up. It is clamped by MIN VALUE and MAX VALUE.		
<b>INCREASE RATE</b>	<b>256</b>	<b>0.1 to 600.0 s</b>
Rate of change of an increasing output value. An increasing value is defined as the output ramping away from zero.		
<b>DECREASE RATE</b>	<b>257</b>	<b>0.1 to 600.0 s</b>
Rate of change of a decreasing output value. A decreasing value is defined as the output ramping towards zero.		
<b>RAISE INPUT</b>	<b>261</b>	<b>FALSE / TRUE</b>
Command to raise the output value. When TRUE, increases the output at the rate determined by INCREASE RATE.		
<b>LOWER INPUT</b>	<b>262</b>	<b>FALSE / TRUE</b>
Command to lower the output value. When TRUE, decreases the output at the rate determined by DECREASE RATE.		

## RAISE/LOWER

Parameter	Tag	Range
<b>MIN VALUE</b>	<b>258</b>	<b>-300.00 to 300.00 %</b>
Minimum ramp output clamp. This is a plain clamp, not a ramped "min speed" setting.		
<b>MAX VALUE</b>	<b>259</b>	<b>-300.00 to 300.00 %</b>
Maximum ramp output clamp.		
<b>EXTERNAL RESET</b>	<b>307</b>	<b>FALSE / TRUE</b>
When TRUE, sets the output of the Raise/Lower block to the RESET VALUE.		

## Functional Description



The diagram above illustrates the raise/lower functionality.

When EXTERNAL RESET is set TRUE, the raise/lower output resets to RESET VALUE (default = 0.00%).

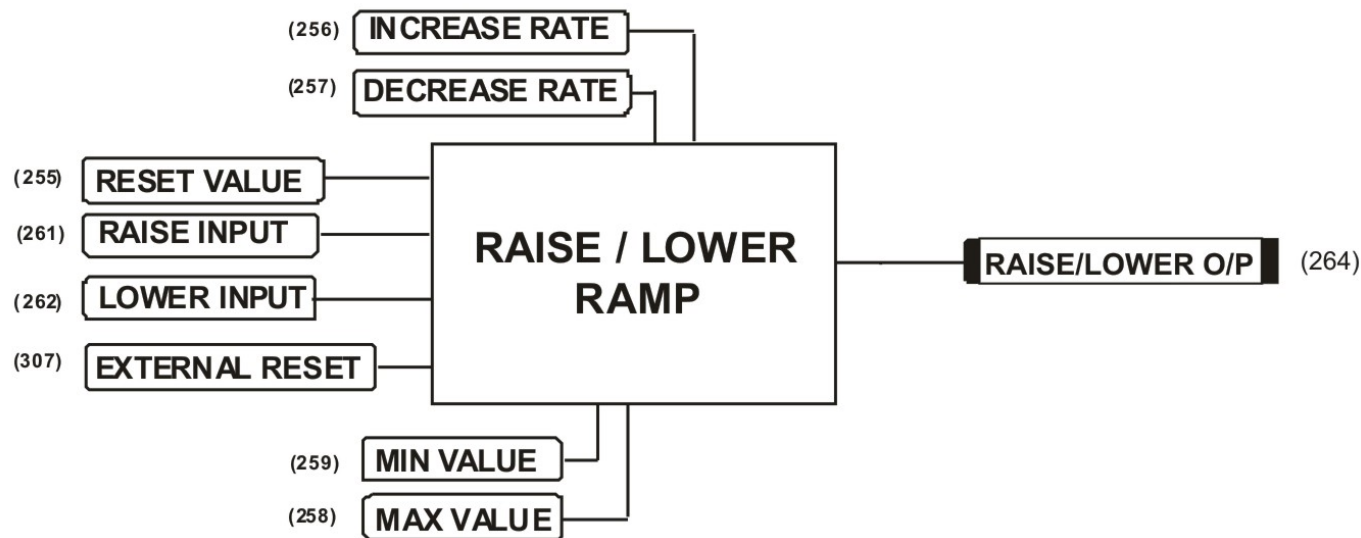
When RAISE INPUT is TRUE, the output increases at INCREASE RATE. The output cannot exceed MAX VALUE.

The reverse is true when LOWER INPUT is TRUE: LOWER INPUT reduces the output at DECREASE RATE. The output cannot drop below MIN VALUE.

The ramp is held at its last value when the RAISE and LOWER INPUT are removed.

Setting both RAISE INPUT and LOWER INPUT to TRUE at the same time creates a ramp hold condition.

If MIN VALUE is greater than MAX VALUE the output is forced to zero.



If Reset, Output = Reset Value (Clamped)

# RAMPS

The RAMPS parameters set the shape and duration of the ramp used for starting and changing speeds.

**NOTE** The STOP RATES function block contains a separate deceleration rate for controlled stopping of the drive.

By default the inputs are ANIN 3 (A4) for a ramped speed input, and DIGIN 2 (C7) to switch RAMP HOLD. The input signal to the block is clamped by MIN SPEED, which sets the minimum ramp input speed when the drive is enabled. The default output connection is to SPEED LOOP:: SETPOINT 3.

RAMP INPUT is internally routed to the JOG/SLACK function block to be modified as determined by the JOG inputs. The RAMPS block then 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 function 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 percentage is increased, 350% of the S-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.

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

RAMP HOLD stops the ramp from changing. When DIGIN 2 (C7) 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.

## FUNCTION BLOCKS: SEQ & REF: RAMPS

	RAMP OUTPUT	[ 85]	0.00 %
	RAMPING	[113]	FALSE
10.0 s	[ 2]	RAMP ACCEL TIME	
10.0 s	[ 3]	RAMP DECEL TIME	
OFF	[118]	RAMP HOLD	
FALSE	[620]	INVERT	
0.00 %	[697]	RAMP INPUT	
2.50 %	[266]	% S-RAMP	
0.50 %	[286]	RAMPING THRESH.	
ENABLED	[287]	AUTO RESET	
DISABLED	[288]	EXTERNAL RESET	
0.00 %	[422]	RESET VALUE	

**MMI Menu Map**

- 1 SETUP PARAMETERS
  - RAMPS
    - RAMP ACCEL TIME
    - RAMP DECEL TIME
    - RAMP HOLD
    - INVERT
    - % S-RAMP
    - RAMPING THRESH.
    - AUTO RESET
    - EXTERNAL RESET
    - RESET VALUE

**MMI Menu Map**

- 1 FUNCTION BLOCKS
- 2 SEQ & REF
  - RAMPS
    - RAMP INPUT

**MMI Menu Map**

- 1 DIAGNOSTICS
  - RAMPING
  - RAMP OUTPUT

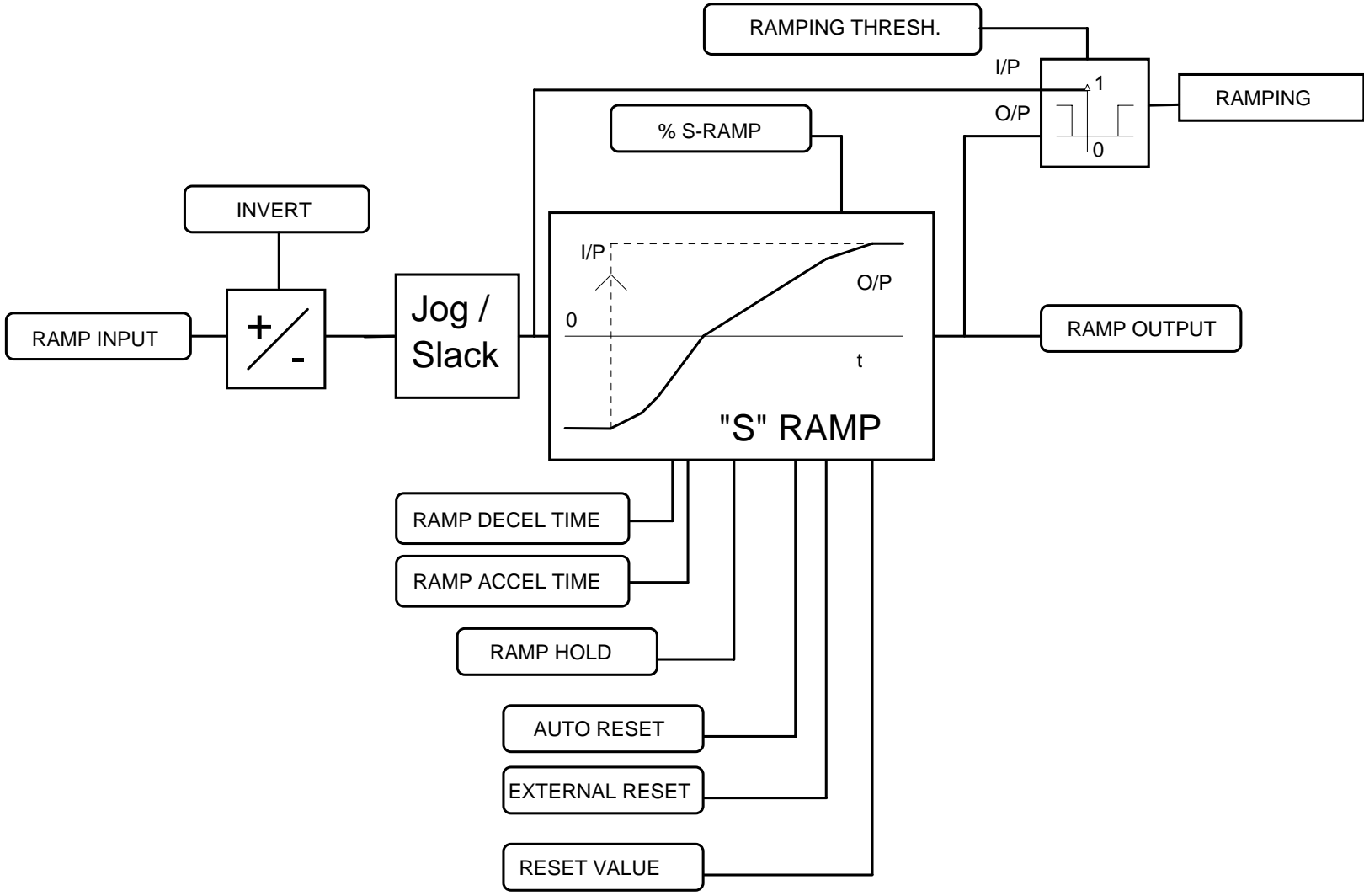
RAMPS		
Parameter	Tag	Range
<b>RAMP ACCEL TIME</b>	<b>2</b>	<b>0.1 to 600.0 s</b>
The acceleration time for 100% change.		
<b>RAMP DECEL TIME</b>	<b>3</b>	<b>0.1 to 600.0 s</b>
The deceleration time for 100% change.		



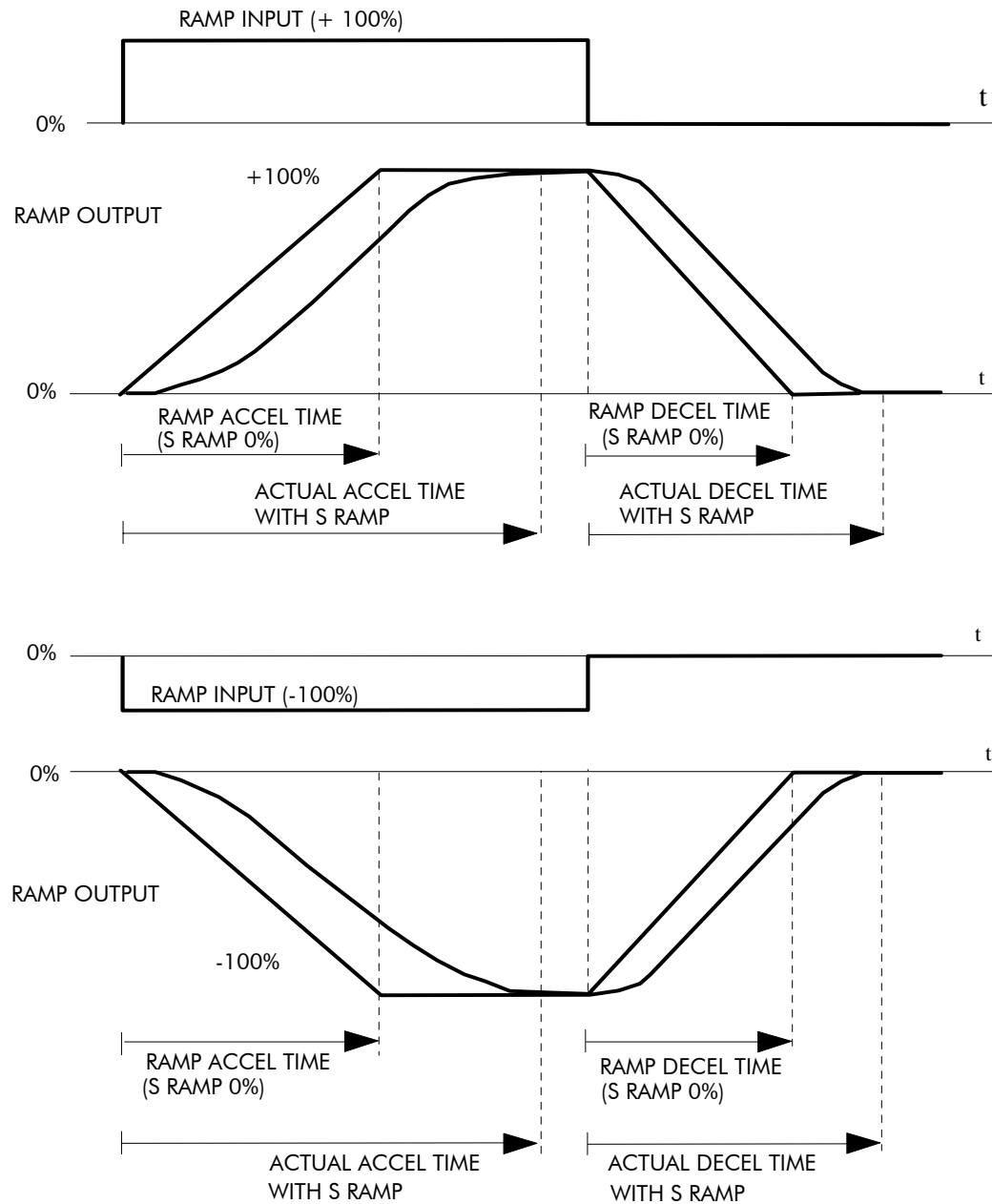
## RAMPS

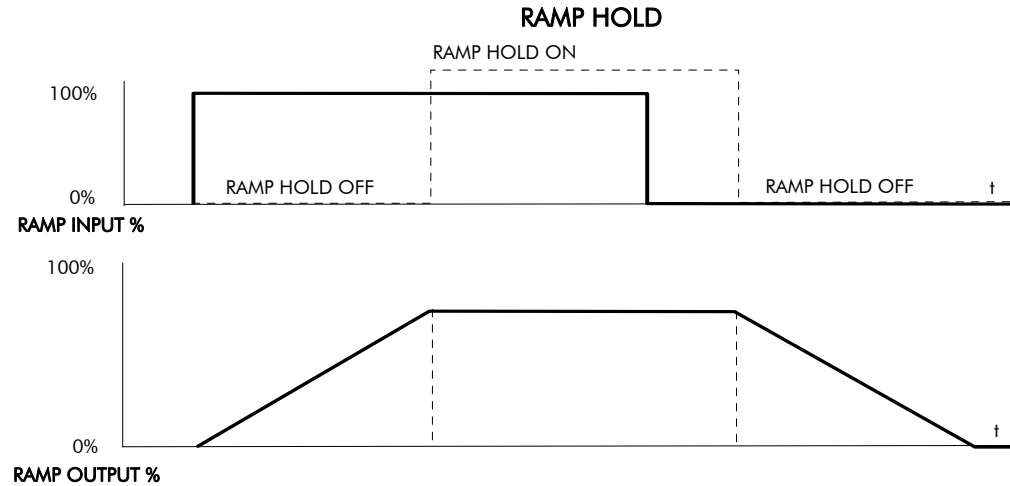
Parameter	Tag	Range
<b>RAMP HOLD</b>	<b>118</b>	<b>OFF / ON</b>
When ON, the ramp output is held at its last value. This is overridden by a ramp reset.		
<b>INVERT</b>	<b>620</b>	<b>FALSE / TRUE</b>
Inverts the RAMP INPUT signal.		
<b>RAMP INPUT</b>	<b>5</b>	<b>-105.00 to 105.00 %</b>
Input value.		
<b>% S-RAMP</b>	<b>266</b>	<b>0.00 to 100.00 %</b>
Percentage of ramp with S-shaped rate of change. A value of zero is equivalent to a linear ramp. Changing this value affects the ramp times.		
<b>RAMPING THRESH.</b>	<b>286</b>	<b>0.00 to 100.00 %</b>
Ramping flag threshold level. The threshold is used to detect whether the ramp is active.		
<b>AUTO RESET</b>	<b>287</b>	<b>DISABLED / ENABLED</b>
When ENABLED, the ramp is reset whenever SYSTEM RESET is TRUE. (SYSTEM RESET Tag 374 is an internal flag that is set TRUE for one cycle after the Speed/Current loop is enabled, i.e. every time the drive is started).		
<b>EXTERNAL RESET</b>	<b>288</b>	<b>DISABLED / ENABLED</b>
When ENABLED, the ramp is reset to RESET VALUE. EXTERNAL RESET does not depend on AUTO RESET for its operation.		
<b>RESET VALUE</b>	<b>422</b>	<b>-300.00 to 300.00 %</b>
The ramp output value at power-up, or when the ramp is reset. In order to catch a spinning load smoothly ('bumpless transfer') connect SPEED FEEDBACK Tag No. 62 (source) to RESET VALUE Tag No. 422 (destination).		
<b>RAMP OUTPUT</b>	<b>85</b>	<b>—.xx %</b>
Setpoint ramp output.		
<b>RAMPING</b>	<b>113</b>	<b>FALSE / TRUE</b>
The SETPOINT ramp function block is limiting the rate of change of Speed Setpoint.		

# Functional Description

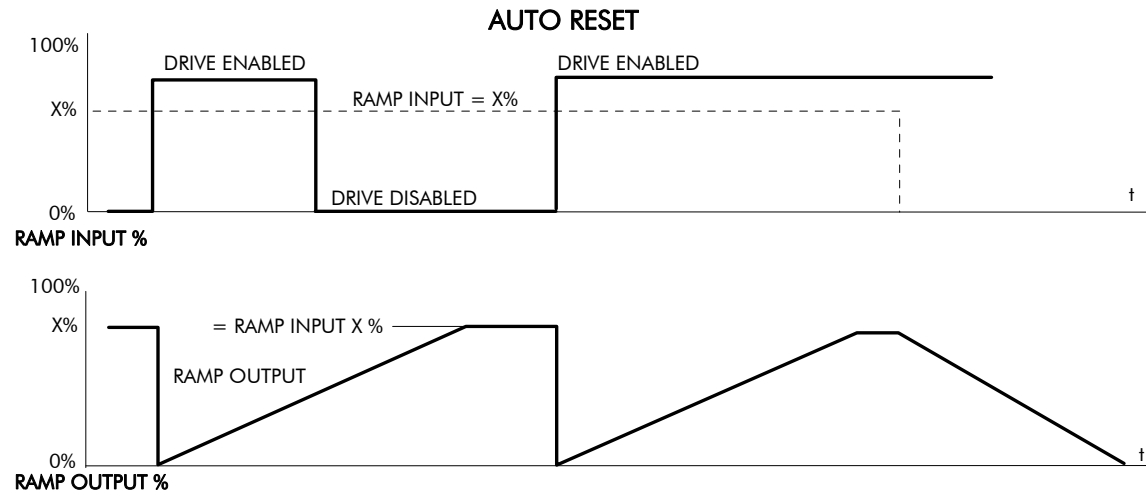


## ACCELERATION/DECELERATION RATES

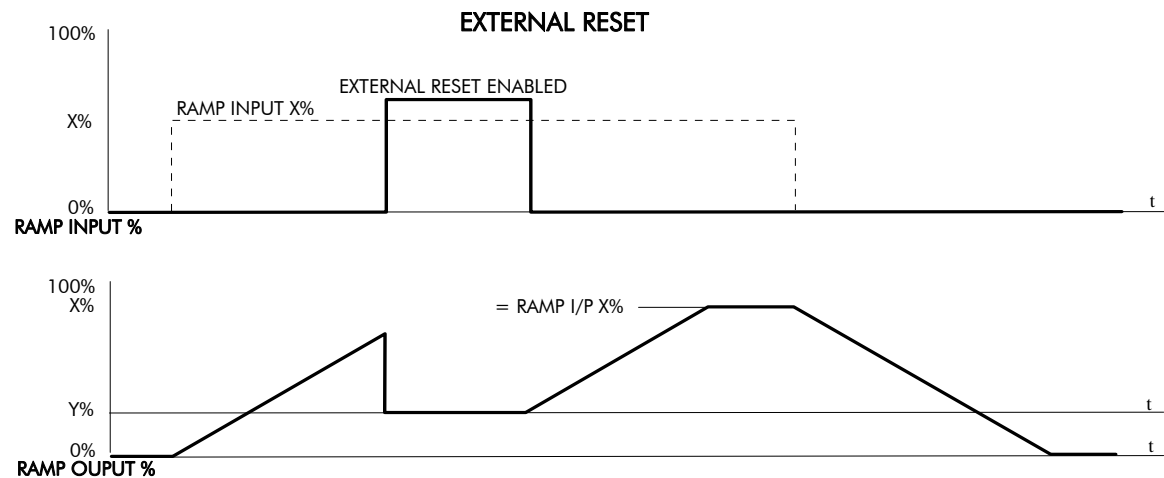




The ramp will function when a ramp input is present. When DIGIN 2 (C7) is ON, RAMP HOLD stops the ramp from changing. Even when the ramp input signal is removed, RAMP HOLD keeps the ramp output from changing. Once RAMP HOLD is OFF, the ramp resumes.



When AUTO RESET is ENABLED, 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.



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 (Y%). When EXTERNAL RESET is DISABLED, the ramp output continues to follow the input signal.

# SEQUENCING

This function block contains all the parameters relating to the sequencing (start and stop) of the drive.

**MMI Menu Map**

- 1 SETUP PARAMETERS
- 2 AUX I/O
  - AUX START
  - AUX JOG
  - AUX ENABLE
  - JOG SLACK
  - ENABLE

**MMI Menu Map**

- 1 DIAGNOSTICS
  - PROGRAM STOP
  - DRIVE START
  - DRIVE ENABLE
  - START (C3)

**MMI Menu Map**

- 1 FUNCTION BLOCKS
- 2 SEQ & REF
- 3 SEQUENCING
  - REM. SEQ. ENABLE
  - REM. SEQUENCE
  - COMMS TIMEOUT
  - SEQ STATUS
  - CONTACTOR CLOSED
  - DRIVE RUNNING
  - SYSTEM RESET
  - READY
  - SEQ STATE
  - COAST STOP
  - OPERATING MODE

FUNCTION BLOCKS SEQ & REF SEQUENCING		
	SEQ STATUS [537]	- 0x0000
	DRIVE START [82]	- OFF
	CONTACTOR CLOSED [83]	- FALSE
	DRIVE ENABLE [84]	- FALSE
	DRIVE RUNNING [376]	- FALSE
	SYSTEM RESET [374]	- FALSE
	READY [125]	- FALSE
	SEQ STATE [114]	- SEQ INIT
	START (C3) [68]	- OFF
	PROGRAM STOP [80]	- FALSE
	COAST STOP [525]	- FALSE
	OPERATING MODE [1295]	- TERMINALS
ON -	[161] AUX START	
ON -	[227] AUX JOG	
ON -	[168] AUX ENABLE	
OFF -	[496] JOG/SLACK	
OFF -	[497] ENABLE	
OFF -	[535] REM.SEQ.ENABLE	
0x8000 -	[536] REM.SEQUENCE	
0.0 s -	[1204] COMMS TIMEOUT	

## SEQUENCING

Parameter	Tag	Range
<b>AUX START</b>	<b>161</b>	<b>OFF / ON</b>
Software Start/Run command. Auxiliary Start is ANDed with the Start input, C3, to generate Drive Start. This should normally be left ON.		
<b>AUX JOG</b>	<b>227</b>	<b>OFF / ON</b>
Software Jog command. Auxiliary Jog is ANDed with the Jog input, Tag 496 (by default C4), to generate Drive Jog. This should normally be left ON.		
<b>AUX ENABLE</b>	<b>168</b>	<b>OFF / ON</b>
Software Enable command. Auxiliary Enable is ANDed with the Enable input, Tag 497 (by default C5), to generate Drive Enable. This should normally be left ON.		

## SEQUENCING

Parameter	Tag	Range
<b>JOG/SLACK</b>	<b>496</b>	<b>OFF / ON</b>
Main jog input which is connected to DIGITAL INPUT C4 by default. The Jog input is ANDed with Auxiliary Jog input, Tag 227, to generate Drive Jog.		
<b>ENABLE</b>	<b>497</b>	<b>OFF / ON</b>
Enable input which is connected to DIGITAL INPUT C5 by default. The Enable input is ANDed with Auxiliary Enable input, Tag 168, to generate Drive Enable.		
<b>REM.SEQ.ENABLE</b>	<b>535</b>	<b>FALSE / TRUE</b>
(Refer to Chapter 4: "COMMS Control of the Drive"). When enabled, the drive will accept Sequencing commands exclusively from the REM. SEQUENCE parameter, Tag 536.		
FALSE - disables REM. SEQUENCE TRUE - enables REM. SEQUENCE		
<b>REM.SEQUENCE</b>	<b>536</b>	<b>0x0000 to 0xFFFF</b>
A control word that allows the device to be operated remotely over a field bus. REM. SEQ. ENABLE must be TRUE to enable this function. (Refer to Chapter 4: "COMMS Control of the Drive").		
<b>COMMS TIMEOUT</b>	<b>1204</b>	<b>0.0 to 60.0 s</b>
A watchdog timeout that may be used when the drive is in remote sequencing mode. The watchdog feature is enabled by selecting a non-zero time in this parameter. The watchdog is reset every time the REM.SEQUENCE word, (Tag 536), is written.		
<b>SEQ STATUS</b>	<b>537</b>	<b>0x0000 to 0xFFFF</b>
An data word that reports the status of the important system flags that can be read over a field bus. (Refer to Chapter 4: "COMMS Control of the Drive").		
<b>DRIVE START</b>	<b>82</b>	<b>OFF / ON</b>
Logical OR of the START and JOG inputs.		
<b>CONTACTOR CLOSED</b>	<b>83</b>	<b>FALSE / TRUE</b>
When ON, the main contactor coil is energised. Refer to Terminal Information for D5 & D6 in Appendix E: "Technical Specifications" - Terminal Information.		
<b>DRIVE ENABLE</b>	<b>84</b>	<b>FALSE / TRUE</b>
Drive speed and current loop are enabled/quenched.		
<b>DRIVE RUNNING</b>	<b>376</b>	<b>FALSE / TRUE</b>
When TRUE, the stack is switched on and enabled.		

## SEQUENCING

Parameter	Tag	Range
<b>SYSTEM RESET</b>	<b>374</b>	<b>FALSE / TRUE</b>
Set for one cycle as the drive is enabled.		
<b>READY</b>	<b>125</b>	<b>FALSE / TRUE</b>
The drive is ready to accept an enable signal.		
<b>SEQ STATE</b>	<b>114</b>	<b>See below</b>
0: SEQ INIT 1: SEQ INIT 2: SEQ HOLD 3: SEQ STANDBY 4: SEQ PRE READY 5: SEQ READY 6: SEQ AUTOTUNING 7: SEQ RUN 8: SEQ AT ZERO SPD. 9: SEQ QUENCH 10: SEQ PROGRAM STOP 11: SEQ STOP 12: SEQ DELAY STOP 13: CURRENT DECAY 14: SEQ COAST STOP 15: SEQ ERROR		
<b>START (C3)</b>	<b>68</b>	<b>OFF / ON</b>
State of the Start/Run terminal.		
<b>PROGRAM STOP</b>	<b>80</b>	<b>FALSE / TRUE</b>
State of program stop (Terminal B8). When B8 is at 24V, then PROGRAM STOP is FALSE.		
<b>COAST STOP</b>	<b>525</b>	<b>FALSE / TRUE</b>
State of coast stop (Terminal B9). When B9 is at 24V, then COAST STOP is FALSE.		
<b>OPERATING MODE</b>	<b>1295</b>	<b>TERMINALS / COMMUNICATIONS</b>
Output parameter that indicates the current sequencing control source.		



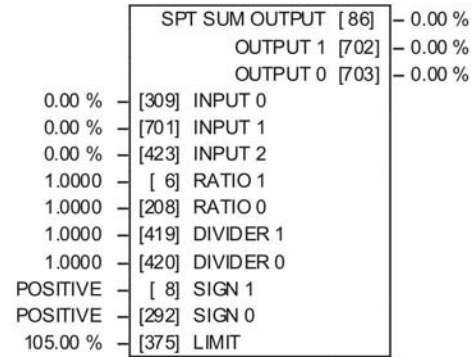
# SETPOINT SUM

Use these function blocks to sum and scale up to three analog inputs to produce the SPT. SUM outputs.

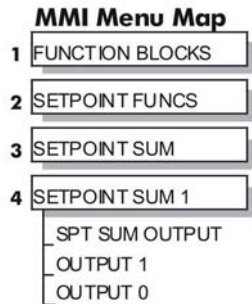
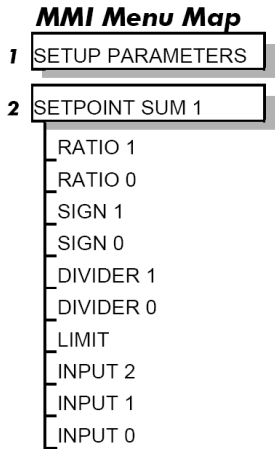
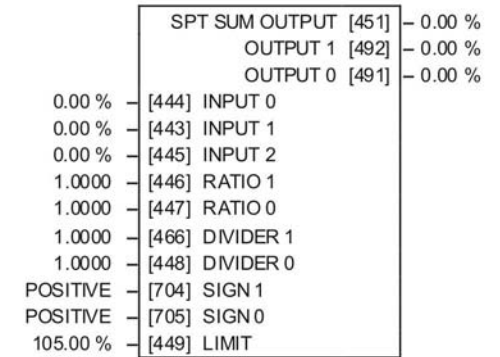
INPUT 0 and INPUT 1 have individual ratio and divider scalers, and signs. The inputs have symmetrical limits set by LIMIT. INPUT 2 has no scaling or limits.

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

FUNCTION BLOCKS | SETPOINT FUNCS | SETPOINT SUM | SETPOINT SUM 1



FUNCTION BLOCKS | SETPOINT FUNCS | SETPOINT SUM | SETPOINT SUM 2



## SETPOINT SUM

Parameter	Tag	Range
<b>INPUT 0</b> Input 0 value.	<b>309, 444</b>	<b>-300.00 TO 300.00 %</b> <b>(-200.00 to 200.00 % IN SETPOINT SUM 1)</b>
<b>INPUT 1</b> Input 1 value.	<b>701, 443</b>	<b>-300.00 TO 300.00 %</b> <b>(-200.00 to 200.00 % IN SETPOINT SUM 1)</b>
<b>INPUT 2</b> Input 2 value.	<b>423, 445</b>	<b>-300.00 to 300.00 %</b>
<b>RATIO 1</b> Multiplier term for INPUT 1.	<b>6, 446</b>	<b>-3.0000 to 3.0000</b>
<b>RATIO 0</b> Multiplier term for INPUT 0.	<b>208, 447</b>	<b>-3.0000 to 3.0000</b>
<b>DIVIDER 1</b> Divider scaling for INPUT 1. Dividing by 0 (zero) results in a zero output.	<b>419, 466</b>	<b>-3.0000 to 3.0000</b>
<b>DIVIDER 0</b> Divider scaling for INPUT 0. Dividing by 0 (zero) results in a zero output.	<b>420, 448</b>	<b>-3.0000 to 3.0000</b>
<b>SIGN 1</b> Polarity for INPUT 1.	<b>8, 704</b>	<b>NEGATIVE / POSITIVE</b>

**MMI Menu Map**

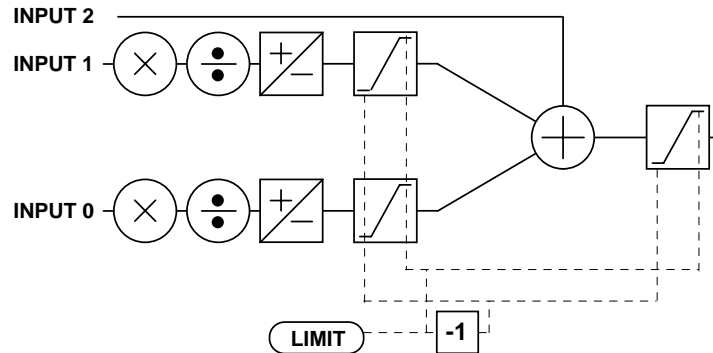
- 1 SETUP PARAMETERS
- 2 SPECIAL BLOCKS
- 3 SETPOINT SUM 2
  - RATIO 1
  - RATIO 0
  - DIVIDER 1
  - DIVISER 0
  - LIMIT
  - INPUT 2
  - INPUT 1
  - INPUT 0
  - SPT SUM OUTPUT

**MMI Menu Map**

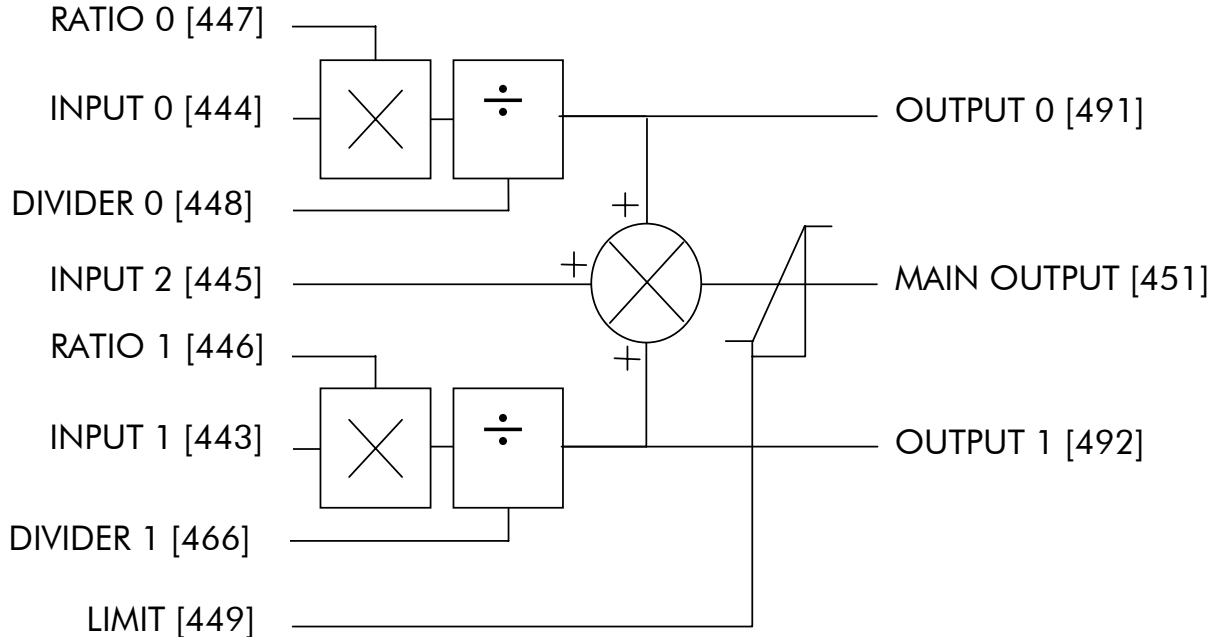
- 1 FUNCTION BLOCKS
- 2 SETPOINT FUNCS
- 3 SETPOINT SUM
- 4 SETPOINT SUM 2
  - SIGN 1
  - SIGN 0
  - OUTPUT 1
  - OUTPUT 0

**SETPOINT SUM**

Parameter	Tag	Range
<b>SIGN 0</b> Polarity for INPUT 0.	<b>292, 705</b>	<b>NEGATIVE / POSITIVE</b>
<b>LIMIT</b> The Setpoint Sum programmable limit is symmetrical and has the range 0.00% to 200.00%. The limit is applied both to the intermediate results of the RATIO calculation and the total output.	<b>375, 449</b>	<b>0.00 to 200.00 %</b>
<b>SPT SUM OUTPUT</b> The sum of input 0, 1 and 2 after the limit clamp.	<b>86, 451</b>	<b>—.xx %</b>
<b>OUTPUT 1 (in SETPOINT SUM 1)</b> <b>STPT SUM 2 OUT 1 (in SETPOINT SUM2)</b> An additional output provided to gain access to Input 1 channel sub-calculations. The result of (INPUT 1 x RATIO 1) / DIVIDER 1 clamped to within ± LIMIT.	<b>702, 492</b>	<b>—.xx %</b>
<b>OUTPUT 0 (in SETPOINT SUM 1)</b> <b>STPT SUM 2 OUT 0 (in SETPOINT SUM 2)</b> An additional output provided to gain access to Input 0 channel sub-calculations. The result of (INPUT 0 x RATIO 0) / DIVIDER 0 clamped to within ± LIMIT.	<b>703, 491</b>	<b>—.xx %</b>



# Functional Description



# SPEED LOOP

Use this block to tune the speed loop PI to produce a current demand.

This function block has five main functions:

**MMI Menu Map**

1	SETUP PARAMETERS
2	SPEED LOOP
	SPD.PROP.GAIN
	SPD.INT.TIME
	INT. DEFEAT
	SPEED FBK SELECT
>>	ADVANCED
>>	SETPOINTS

**1. Combining the 4 speed setpoints into a single speed setpoint.**

Note that the speed demand is created from the combined speed setpoints and modified by any prevailing stop condition according to the STOP RATES function block settings.

**2. Selection of the speed feedback method.**

ZERO SPD OFFSET from the CALIBRATION function block is applied to the selected speed feedback to null out any remaining feedback at zero actual speed.

**3. Implementation of the PI speed controller.**

SPEED DEMAND is summed algebraically with SPEED FEEDBACK to produce SPEED ERROR. When the drive is enabled, SPEED ERROR is controlled by the PI loop. The resulting current demand signal is routed to the CURRENT LOOP function block and to the ADVANCED::ZERO SPD. QUENCH sub-menu.

The PI output is accessible via Tag No. 356, TOTAL I DMD. This point is before the I Limit clamps and the summing of the additional current demand. (This tag is not visible on the MMI).

**4. Speed controller gain and integral time constant profiling with speed.**

The gains change when the motor speed feedback reaches the thresholds set by SPD BRK 1 (LOW) and SPD BRK 2 (HIGH).

- At or below SPD BRK 1 (LOW), the speed loop uses the PROP. GAIN and INT. TIME CONST. values as its PI loop gains.
- Between SPD BRK 1 (LOW) and SPD BRK 2 (HIGH), profiling occurs and the speed loop gains are determined by another parameter value (according to the selection of the MODE parameter).
- Above SPD BRK 2 (HIGH), the SPD. PROP. GAIN and SPD. INT. TIME settings are used.

MODE selects the parameter for profiling the speed loop PI gains when the motor speed is between the two speed breakpoints.

FUNCTION BLOCKS MOTOR CONTROL SPEED LOOP

	SPEED ERROR	[297]	0.00 %
	SPEED LOOP O/P	[549]	0.00 %
	SPEED DEMAND	[ 89]	0.00 %
	UNFIL.SP.D.FBK	[ 62]	0.00 %
	SPEED SETPOINT	[ 63]	0.00 %
	UNFIL.SP.D.ERROR	[ 64]	0.00 %
	SETPOINT 2 (A3)	[290]	0.00 %
10.00	[ 14] SPD PROP GAIN		
0.500 s	[ 13] SPD INT TIME		
OFF	[202] INT. DEFEAT		
0.000	[547] SPD.FBK.FILTER		
0.00 %	[289] SETPOINT 1		
POSITIVE	[ 9] SIGN 2 (A3)		
1.0000	[ 7] RATIO 2 (A3)		
0.00 %	[291] SETPOINT 3		
0.00 %	[ 41] SETPOINT 4		
105.00 %	[357] MAX DEMAND		
-105.00 %	[358] MIN DEMAND		
0.00 %	[595] PRESET TORQUE		
100.00 %	[604] PRESET T SCALE		
DISABLED	[268] MODE		
1.00 %	[269] SPD BRK1 (LOW)		
5.00 %	[270] SPD BRK2 (HIGH)		
5.00	[271] PROP. GAIN		
0.500 s	[272] INT TIME CONST		
1.0000	[274] I GAIN IN RAMP		
0.50 %	[284] ZERO SPD. LEVEL		
1.50 %	[285] ZERO IAD LEVEL		
ARM VOLTS FBK	[ 47] SPEED FBK SELECT		

**MMI Menu Map**

1	SETUP PARAMETERS
2	SPEED LOOP
3	ADVANCED
>>	ADAPTION
>>	I GAIN IN RAMP
>>	ZERO SPD. QUENCH

**MMI Menu Map**

1	SETUP PARAMETERS
2	SPEED LOOP
3	ADVANCED
4	ADAPTION
	MODE
	SPD BRK 1 (LOW)
	SPD BRK 2 (HIGH)
	PROP. GAIN
	INT.TIME. CONST

**MMI Menu Map**

1	SETUP PARAMETERS
2	SPEED LOOP
3	ADVANCED
4	ZERO SPD. QUENCH
	ZERO SPD. LEVEL
	ZERO IAD LEVEL

**MMI Menu Map**

1	DIAGNOSTICS
	SPEED DEMAND
	SPEED SETPOINT

### 5. Zero speed/current disabling of thyristor firing

The current loop is disabled when SPEED DEMAND, SPEED FEEDBACK and CURRENT DEMAND have all dropped to the threshold levels set by ZERO SPD. LEVEL and ZERO IAD LEVEL.

This is similar to Standstill logic (it stops making current but the contactor stays energised) except that the speed loop remains enabled and this will cause the current loop to unquench very quickly.

## SPEED LOOP

Parameter	Tag	Range
<b>SPD PROP GAIN</b>	<b>14</b>	<b>0.00 to 200.00</b>
Speed loop PI proportional gain adjustment.		
<b>SPD INT TIME</b>	<b>13</b>	<b>0.001 to 30.000 s</b>
Speed loop PI integral gain adjustment.		
<b>INT. DEFEAT</b>	<b>202</b>	<b>OFF / ON</b>
When ON it inhibits the integral part of the speed loop PI control to give proportional only control.		
<b>SPD FBK FILTER</b>	<b>547</b>	<b>0.000 to 1.000</b>
A simple filter function that is applied to speed feedback to reduce ripple caused by low line count encoders and noisy tachos. A value of 0 disables the filter action ,and 1.00 is the maximum value. A typical value would be between 0.5 and 0.75.		
INCREASING THE FILTER VALUE MAY MAKE THE SPEED LOOP UNSTABLE.		
The filter time constant $\tau$ in milliseconds can be calculated from the following equation:		
$\tau = \frac{3.3}{\text{Log}_e\left(\frac{1}{\alpha}\right)}$		
Where $\alpha$ is the value of SPD FBK FILTER. A value of 0.5 equates to a filter time of 4.8ms, 0.8 to 14.7ms, and 0.9 to 31.2ms.		
<b>SETPOINT 1</b>	<b>289</b>	<b>-105.00 to 105.00 %</b>
Speed Setpoint 1 (Default Setpoint Sum 1 O/P).		
<b>SIGN 2 (A3)</b>	<b>9</b>	<b>NEGATIVE / POSITIVE</b>
Speed Setpoint 2 Sign.		

## SPEED LOOP

Parameter	Tag	Range
<b>RATIO 2 (A3)</b> Speed Setpoint 2 Ratio.	<b>7</b>	<b>-3.0000 to 3.0000</b>
<b>SETPOINT 3</b> Speed Setpoint 3 (Default Ramp O/P).	<b>291</b>	<b>-105.00 to 105.00 %</b>
<b>SETPOINT 4</b> Speed Setpoint 4 (Default 5703 I/P).	<b>41</b>	<b>-105.00 to 105.00 %</b>
<b>MAX DEMAND</b> Sets the maximum input to the speed loop. It is clamped at 105% to allow for overshoot in the external loops.	<b>357</b>	<b>0.00 to 105.00 %</b>
<b>MIN DEMAND</b> Sets the minimum input to the speed loop.	<b>358</b>	<b>-105.00 to 0.00 %</b>
<b>PRESET TORQUE</b> The PRESET TORQUE is pre-loaded into the speed loop integral store as the speed loop in enabled. This is scaled by PRESET T SCALE. This may be used to pre-load the output of the speed loop in elevator/hoist applications to prevent the load from falling back when the brake is released. PRESET T SCALE may be used in situations where the load may vary.	<b>595</b>	<b>-200.00 to 200.00 %</b>
<b>PRESET T SCALE</b> Scaler for PRESET TORQUE.	<b>604</b>	<b>-200.00 to 200.00 %</b>
<b>MODE</b> Selects the speed breakpoint input signal. 0 : DISABLED 1 : SPD FBK DEP      Speed Feedback Dependent 2 : SPD ERR DEP      Speed Error Dependent 3 : CUR DMD DEP      Current Demand Dependent	<b>268</b>	<b>See below</b>
<b>SPD BRK 1 (LOW)</b> Speed breakpoint 1 to start gain profiling.	<b>269</b>	<b>0.00 to 100.00 %</b>
<b>SPD BRK 2 (HIGH)</b> Speed breakpoint 2 to stop gain profiling.	<b>270</b>	<b>0.00 to 100.00 %</b>

### MMI Menu Map

1	FUNCTION BLOCKS
2	SPEED LOOP
	SPD. FBK FILTER
	PRESET TORQUE
	PRESET T SCALE
	SPEED ERROR
	SPEED LOOP O/P
	UNFIL. SPD. FBK
	UNFIL. SPD. ERROR

## SPEED LOOP

Parameter	Tag	Range
<b>PROP. GAIN</b>	<b>271</b>	<b>0.00 to 200.00</b>
Proportional gain used below SPD BRK 1 (LOW)		
<b>INT. TIME CONST.</b>	<b>272</b>	<b>0.001 to 30.000 s</b>
Integral time constant used below SPD BRK 1 (LOW)		
<b>I GAIN IN RAMP</b>	<b>274</b>	<b>0.0000 to 2.0000</b>
This scales the integral gain when the drive is ramping. When RAMPING (Tag No. 113) is TRUE, the integral gain from ADAPTION is switched through the I GAIN IN RAMP scaler. This can be used to help prevent integral wind-up while the drive is ramping (particularly high inertia loads).		
<b>ZERO SPD. LEVEL</b>	<b>284</b>	<b>0.00 to 200.00 %</b>
Sets the threshold of SPEED DEMAND and SPEED FEEDBACK for suspending the current output.		
<b>ZERO IAD LEVEL</b>	<b>285</b>	<b>0.00 to 200.00 %</b>
Sets the current demand threshold for suspending the current output.		
<b>SPEED ERROR</b>	<b>297</b>	<b>— .xx %</b>
<i>Refer to Chapter 6: "The MMI - Man Machine Interface" - The MMI Menus (DIAGNOSTICS).</i>		
<b>SPEED LOOP O/P</b>	<b>549</b>	<b>— .xx %</b>
<i>Refer to Chapter 6: "The MMI - Man Machine Interface" - The MMI Menus (DIAGNOSTICS).</i>		
<b>SPEED DEMAND</b>	<b>89</b>	<b>— .xx %</b>
<i>Refer to Chapter 6: "The MMI - Man Machine Interface" - The MMI Menus (DIAGNOSTICS).</i>		
<b>UNFIL.SP.D.FBK</b>	<b>62</b>	<b>— .xx %</b>
<i>Refer to Chapter 6: "The MMI - Man Machine Interface" - The MMI Menus (DIAGNOSTICS).</i>		
<b>SPEED SETPOINT</b>	<b>63</b>	<b>— .xx %</b>
<i>Refer to Chapter 6: "The MMI - Man Machine Interface" - The MMI Menus (DIAGNOSTICS).</i>		
<b>UNFIL.SP.D.ERROR</b>	<b>64</b>	<b>— .xx %</b>
<i>Refer to Chapter 6: "The MMI - Man Machine Interface" - The MMI Menus (DIAGNOSTICS).</i>		
<b>SETPOINT 2 (A3)</b>	<b>290</b>	<b>— .xx %</b>
Speed Setpoint 2 - Fixed (non-configurable) setpoint scanned synchronously with the current loop		

## SPEED LOOP

Parameter	Tag	Range
<b>SPEED FBK SELECT</b>	<b>47</b>	<b>See below</b>
Determines the source of the speed feedback signal. The default, ARM VOLTS FBK, uses internal circuitry to derive the speed feedback. The other selections require the appropriate external device to provide the feedback signal.		
0 : ARM VOLTS FBK		
1 : ANALOG TACH		
2 : ENCODER		
3 : ENCODER/ANALOG - for Parker SSD Drives use		

## Functional Description

### Speed Loop PI with Current Demand Isolate

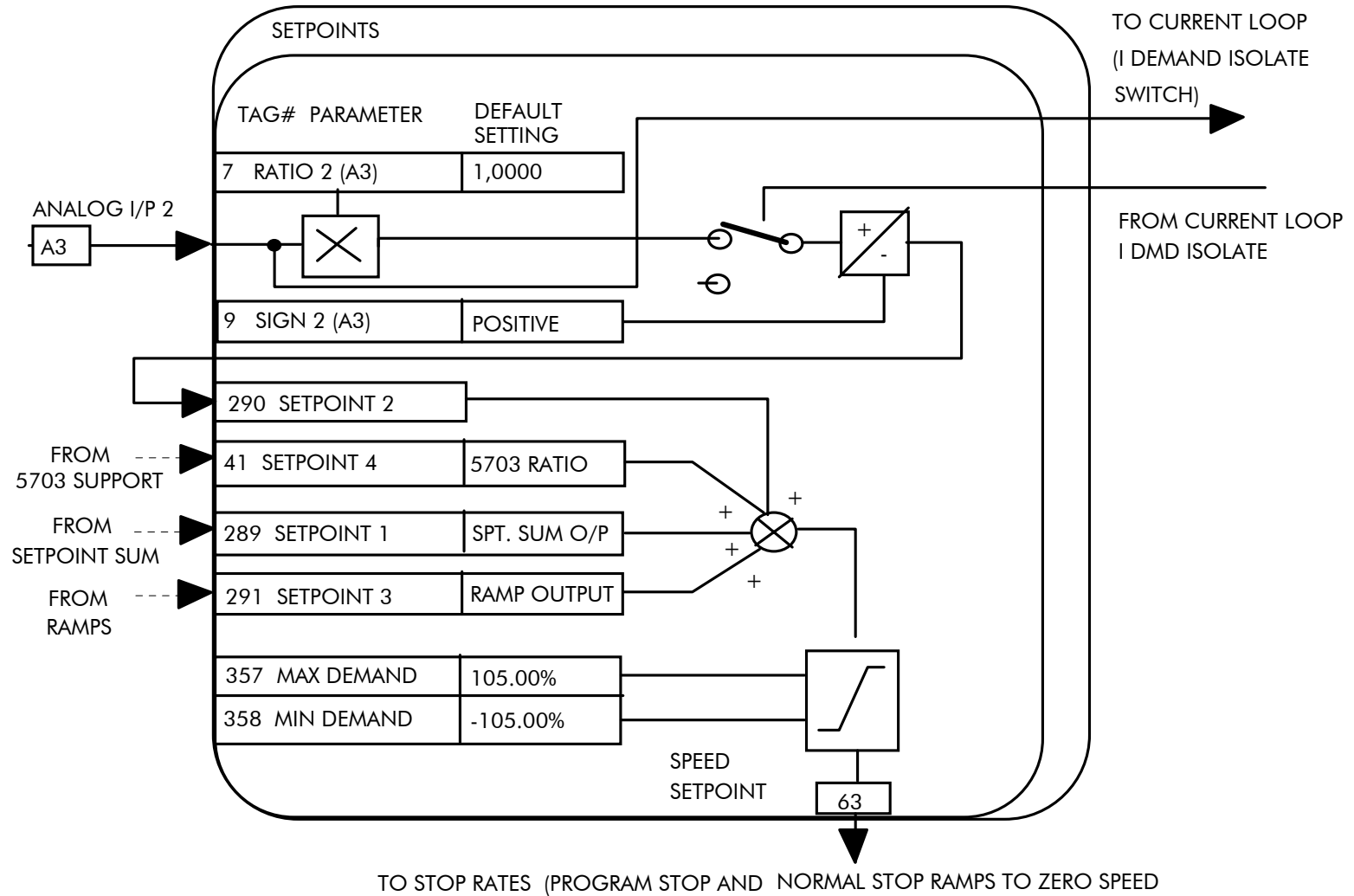
The speed loop output is still valid (active) with the I DMD. ISOLATE parameter enabled.

- NOTE**
- 1** The speed loop is reset by unquenching the speed loop/current loop.
  - 2** I DMD. ISOLATE is overridden by Program Stop (B8) or Normal Stop (C3).
  - 3** The speed loop PI holds the integral term as soon as the PI output reaches current limit. This is true even in Current Demand Isolate mode where it may interfere depending on the way the speed PI is used.

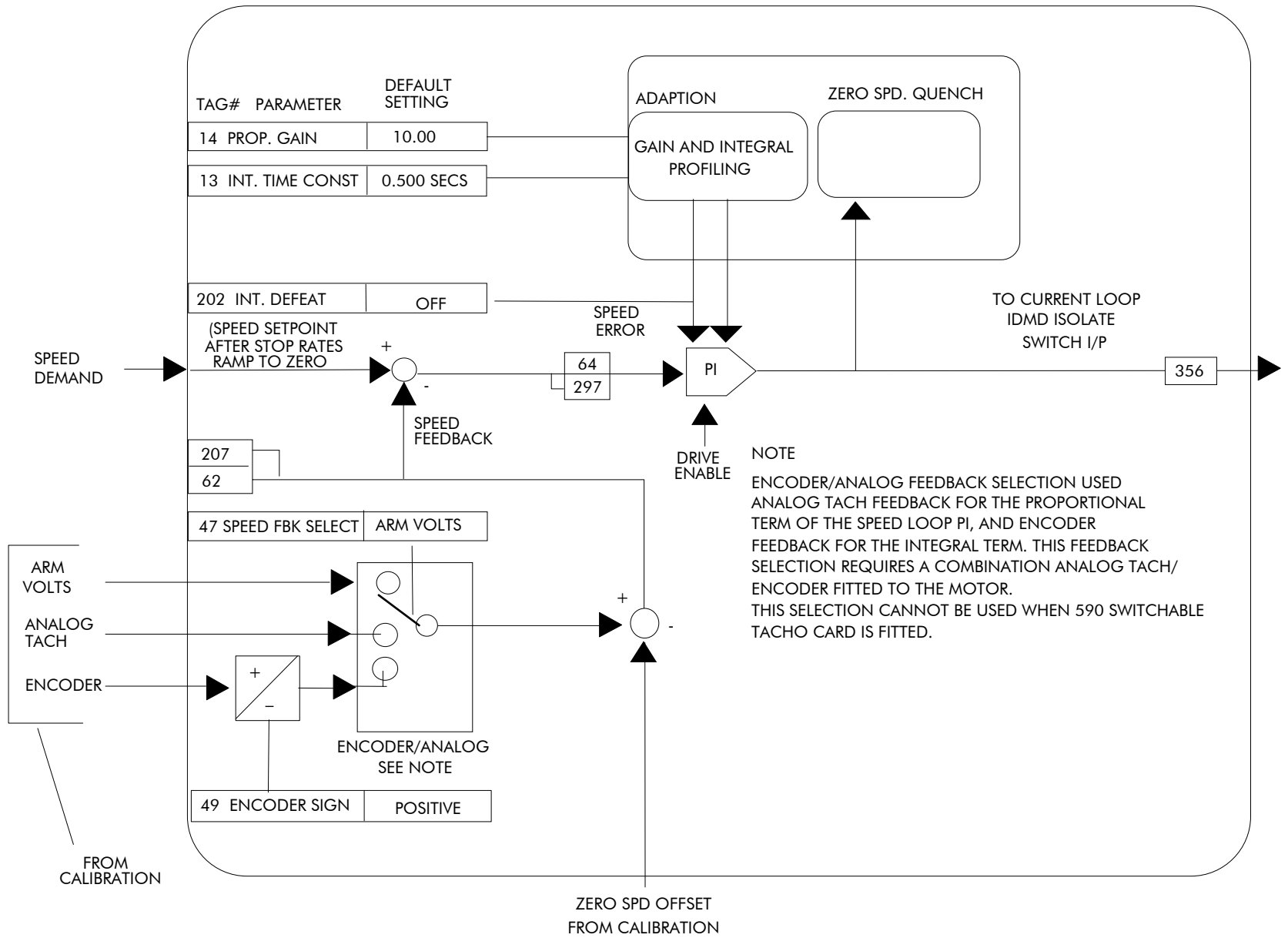


## 105% Speed Demands

The speed demand clamping allows the speed setpoint to reach 105%. This applies only to the final summing junction immediately before the speed loop and also to the Setpoint Sum 1 output. Individual speed setpoints are still clamped to 100%.

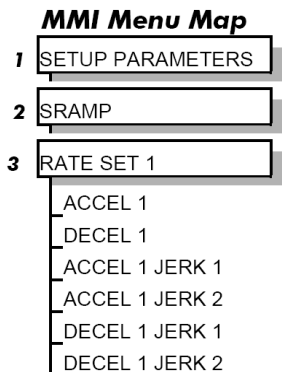
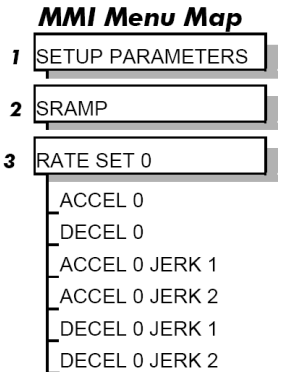
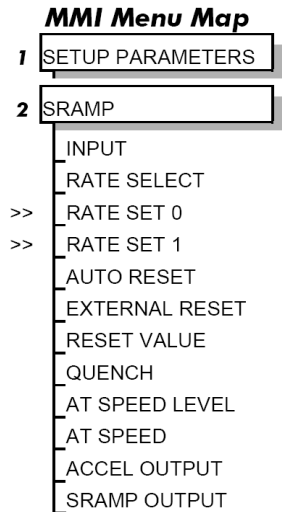
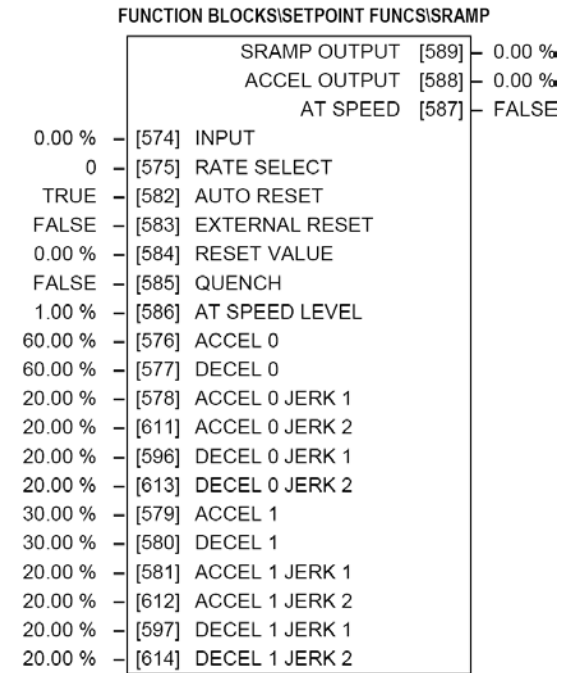


# SPEED LOOP



# SRAMP

This function block limits the rate of change of an input by limiting the acceleration and the jerk (rate of change of acceleration).



SRAMP		
Parameter	Tag	Range
<b>INPUT</b>	<b>574</b>	<b>-100.00 to 100.00 %</b>
Input value.		
<b>RATE SELECT</b>	<b>575</b>	<b>0 to 1</b>
Selects between one of two parameter sets. This allows you to have two operating modes (RATE SET 0 or RATE SET 1) with independent ramp parameters.		
<b>AUTO RESET</b>	<b>582</b>	<b>FALSE / TRUE</b>
The ramp is reset automatically when the drive is enabled if set to TRUE.		
<b>EXTERNAL RESET</b>	<b>583</b>	<b>FALSE / TRUE</b>
Resets the ramp output.		

## SRAMP

Parameter	Tag	Range
<b>RESET VALUE</b>	<b>584</b>	<b>-100.00 to 100.00 %</b>
The output value while RESET is TRUE also used as initial value on start up. If this is linked to speed feedback, the initial ramp output will be set to the current value of speed feedback.		
<b>QUENCH</b>	<b>585</b>	<b>FALSE / TRUE</b>
If TRUE forces the ramp input to zero.		
<b>AT SPEED LEVEL</b>	<b>586</b>	<b>0.00 to 100.00 %</b>
Threshold for AT SPEED diagnostic output.		
<b>ACCEL 0</b>	<b>576</b>	<b>0.00 to 100.00 %</b>
Acceleration rate, in units of percent per second <sup>2</sup> . i.e. 75.00 % means that the maximum acceleration will be 75.00% per second <sup>2</sup> if the full speed of the machine is 1.25ms then the acceleration will be $1.25 * 75.0\% = 0.9375\text{ms}^2$ .		
<b>DECEL 0</b>	<b>577</b>	<b>0.00 to 100.00 %</b>
Deceleration rate, only active if SYMMETRIC = TRUE.		
<b>ACCEL 0 JERK 1</b>	<b>578</b>	<b>0.00 to 100.00 %</b>
Rate of change of acceleration, in units of percent per second <sup>3</sup> . For example: 75.00 % means that the maximum acceleration will be 50.00% per second <sup>3</sup> if the full speed of the machine is 1.25ms then the acceleration will be $1.25 * 50.0\% = 0.625\text{ms}^3$ . If SYMMETRIC = TRUE then this value will be used for each of the four segments of the profile. If SYMMETRIC = TRUE then this value will be used only for the first acceleration segment.		
<b>ACCEL 0 JERK 2</b>	<b>611</b>	<b>0.00 to 100.00 %</b>
Rate of change of acceleration in units of percent per second <sup>3</sup> for segment 2. Only applicable if SYMMETRIC = FALSE.		
<b>DECEL 0 JERK 1</b>	<b>596</b>	<b>0.00 to 100.00 %</b>
Rate of change of acceleration in units of percent per second <sup>3</sup> for segment 3. Only applicable if SYMMETRIC = FALSE.		
<b>DECEL 0 JERK 2</b>	<b>613</b>	<b>0.00 to 100.00 %</b>
Rate of change of acceleration in units of percent per second <sup>3</sup> for segment 4. Only applicable if SYMMETRIC = FALSE.		
<b>ACCEL 1</b>	<b>579</b>	<b>0.00 to 100.00 %</b>
Refer to ACCEL 0.		
<b>DECEL 1</b>	<b>580</b>	<b>0.00 to 100.00 %</b>
Refer to DECEL 0.		
<b>ACCEL 1 JERK 1</b>	<b>581</b>	<b>0.00 to 100.00 %</b>
Refer to ACCEL 0 JERK 1.		

## SRAMP

Parameter	Tag	Range
<b>ACCEL 1 JERK 2</b> Refer to ACCEL 0 JERK 2.	<b>612</b>	<b>0.00 to 100.00 %</b>
<b>DECEL 1 JERK 1</b> Refer to DECEL 0 JERK 1.	<b>597</b>	<b>0.00 to 100.00 %</b>
<b>DECEL 1 JERK 2</b> Refer to DECEL 0 JERK 2.	<b>614</b>	<b>0.00 to 100.00 %</b>
<b>SRAMP OUTPUT</b> Diagnostic, ramp output.	<b>589</b>	<b>— .xx %</b>
<b>ACCEL OUTPUT</b> Acceleration diagnostic.	<b>588</b>	<b>— .xx %</b>
<b>AT SPEED</b> Diagnostic output indicating the Abs (input - output) is less than AT SPEED LEVEL.	<b>587</b>	<b>FALSE / TRUE</b>

## Useful Equations

**NOTE** These only hold true if Jerk = Jerk2 for acceleration or Jerk 3 = Jerk 4 for deceleration.

V is the maximum speed the drive must reach.

In % / sec

A is the maximum allowable acceleration in %/sec<sup>2</sup>

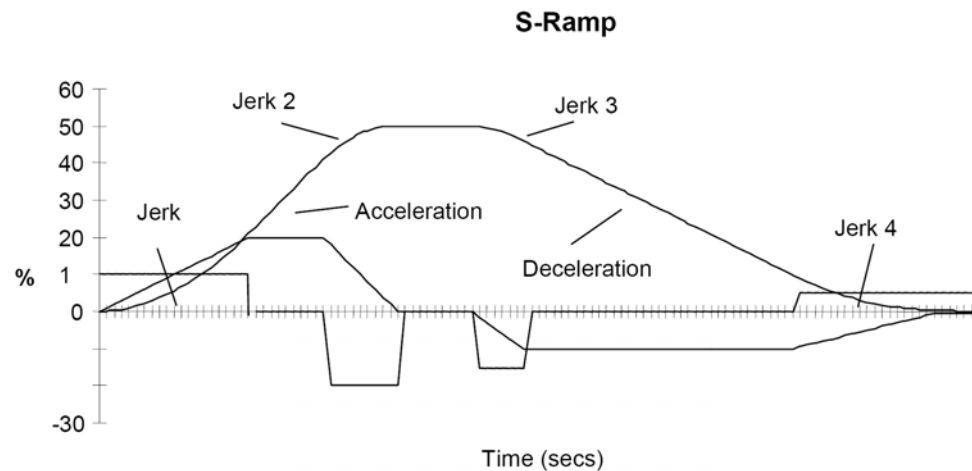
J is the maximum allowable value for jerk, in %/sec<sup>3</sup>

The time needed to stop or accelerate is:

$$t = \frac{V}{A} + \frac{A}{J} \text{ [Seconds]}$$

as the speed is symmetrical the average speed is V/2, therefore the stopping / acceleration distance can be calculated.

$$s = \frac{V}{2} \left( \frac{V}{A} + \frac{A}{J} \right) \text{ [Meters]}$$



**Example acceleration graph for a velocity 60 %/s maximum Acceleration of 20 %/s<sup>2</sup> and a jerk of 10 %/s<sup>3</sup>**

# STANDSTILL

Set a **ZERO THRESHOLD** defining when the speed setpoint is at zero to inhibit motor rotation.

The inputs to this block are **SPEED FEEDBACK** from the **SPEED LOOP** function block and **SPEED SETPOINT** from setpoints.

The outputs are **AT ZERO SPEED**, **AT STANDSTILL**, and **AT ZERO SETPOINT**. **AT ZERO SPEED** is connected to **DIGOUT 1 (B5)** in the default configuration. A "not at standstill" signal is sent to the drive enable logic.

When **SPEED FEEDBACK** is less than **ZERO THRESHOLD**, **AT ZERO SPEED** is **TRUE**.

When **SPEED SETPOINT** is less than **ZERO THRESHOLD**, **AT ZERO SETPOINT** is **TRUE**.

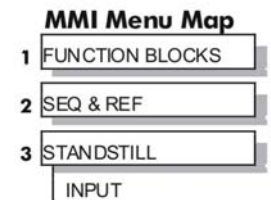
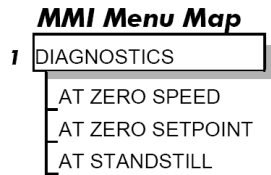
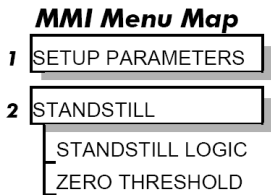
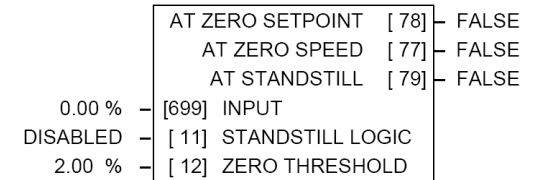
When both **AT ZERO SPEED** and **AT ZERO SETPOINT** are **TRUE**, **AT STANDSTILL** is **TRUE** signalling the motor has stopped.

If **AT STANDSTILL** is **TRUE** and **STANDSTILL LOGIC** is **ENABLED**, then the speed and current loops are quenched. The **SCR (Silicon Controlled Rectifier)/thyristor firing circuits** are disabled, the main contactor remains energised 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 and aids in preventing gearbox wear due to "chattering".

However, it can cause problems in web handling applications using tension feedback: at zero speed, the **SCR/thyristors** turn off allowing the web tension to pull the driven roll in reverse. When the drive no longer senses it is at zero speed, the **SCR/thyristors** turn back on causing the motor to move forward and regulate tension. An oscillation condition can result as the drives **SCR/thyristors** turn on and off trying to maintain a fixed position.

## FUNCTION BLOCKS\SEQ & REF\STANDSTILL

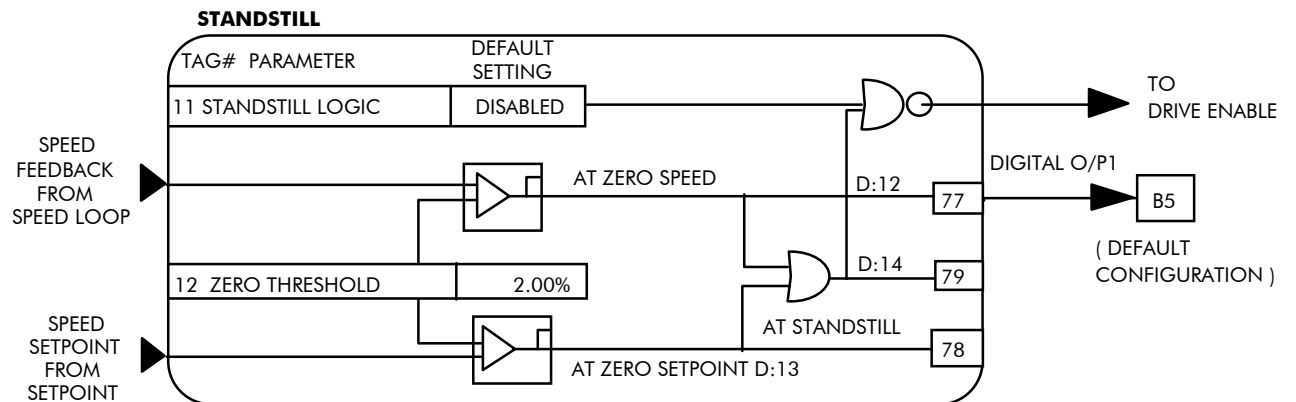
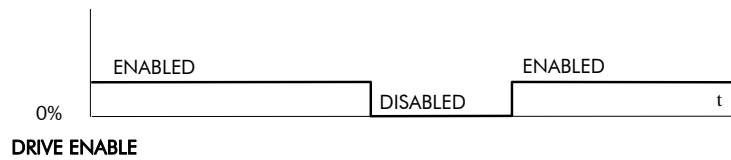
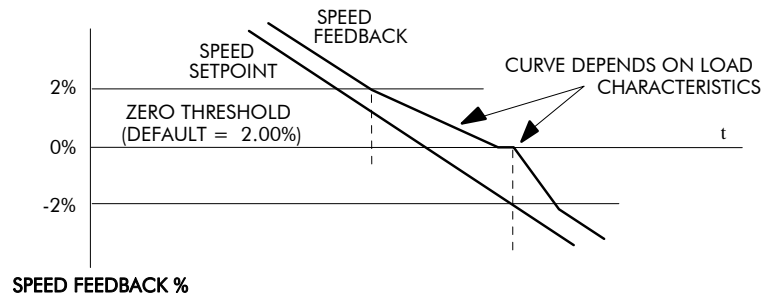
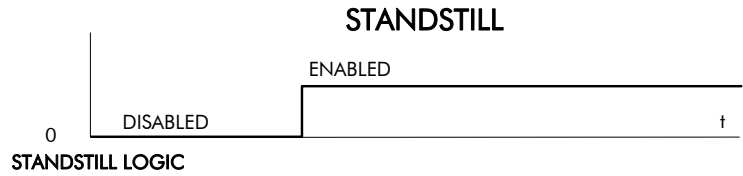


STANDSTILL		
Parameter	Tag	Range
<b>INPUT</b>	<b>699</b>	<b>-300.00 to 300.00 %</b>
The input to the standstill function. By default this is connected to the speed demand parameter from the speed loop function block.		
<b>STANDSTILL LOGIC</b>	<b>11</b>	<b>DISABLED / ENABLED</b>
If <b>ENABLED</b> , the Drive is quenched (although the contactor remains in) when the Speed Feedback and Speed Setpoint values are less than <b>ZERO THRESHOLD</b> .		
<b>ZERO THRESHOLD</b>	<b>12</b>	<b>0.00 to 100.00 %</b>
Threshold level which defines zero setpoint and zero speed diagnostic outputs and also controls the zero speed relay output.		
<b>AT ZERO SETPOINT</b>	<b>78</b>	<b>FALSE / TRUE</b>
Logic output, <b>TRUE</b> when <b>INPUT</b> is below <b>ZERO THRESHOLD</b> . There is hysteresis of 0.5% on this test.		
<b>AT ZERO SPEED</b>	<b>77</b>	<b>FALSE / TRUE</b>
Logic output, <b>TRUE</b> when speed feedback is below <b>ZERO THRESHOLD</b> . There is hysteresis of 0.5% on this test. The speed feedback parameter is internally connected to the <b>PERCENT RPM</b> parameter in the <b>FEEDBACKS</b> block.		

# STANDSTILL

Parameter	Tag	Range
<b>AT STANDSTILL</b>	<b>79</b>	<b>FALSE / TRUE</b>

Logic output that is TRUE when standstill is detected.



# STOP RATES

These parameters are used by a regenerative drive when stopping with Normal Stop or Program Stop.

FUNCTION BLOCKS | COMMUNICATIONS | COMMS PORT | COMMS PORT 2

**MMI Menu Map**

- 1 SETUP PARAMETERS
- 2 STOP RATES
  - STOP TIME
  - STOP LIMIT
  - CONTACTOR DELAY
  - PROG STOP TIME
  - PROG STOP LIMIT
  - PROG STOP I LIM
  - STOP ZERO SPEED

The stopping methods of the drive are described in more detail in Chapter 4: “Operating the Drive” - Starting and Stopping Methods.

The internal inputs to this block are SPEED SETPOINT and SPEED FEEDBACK from the SPEED LOOP function block, the Run signal from terminal C3, and PROGRAM STOP from terminal B8.

The internal outputs are SPEED DEMAND to the speed loop, PROG STOP I LIM to the current loop, and signals to the coast stop and drive enable logic.

EI ASCII	[130]	MODE
19200	[198]	BAUD RATE
0	[329]	GROUP ID (GID)
0	[330]	UNIT ID (UID)
TRUE	[328]	ESP SUP. (ASC II)
0.00 %	[331]	CHANGEBAND (BIN)
0xFFFF	[333]	PNO.7
0x00C0	[332]	ERROR REPORT
2 ms	[1175]	REPLY DELAY

## Normal Stop

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 can 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-energises and the drive disables.

The STOP LIMIT timer starts when C3 goes to 0V (the Run signal is removed). If the drive speed has not reached STOP ZERO SPEED within the STOP LIMIT time, the contactor de-energises and the drive disables.

During Normal Stops, after the motor reaches zero speed, CONTACTOR DELAY delays the de-energising of the contactor. This is useful when using the JOG function to prevent multiple operations of the contactor.

When STOP ZERO SPEED is set above 0.25% (or IDEMAND ISOLATE is TRUE) and the CURRENT DECAY RATE is zero, the drive disables during the contactor delay. Otherwise the drive disables after the contactor delay, thus maintaining zero speed during the contactor delay period.

## Program Stop (or IDEMAND ISOLATE is TRUE)

PROGRAM STOP provides a controlled fast stop for regenerative drives. The stop time is set by PROG STOP TIME. This timer starts once terminal B8 (Program Stop) goes to 0V. When the drive reaches STOP ZERO SPEED, the contactor de-energises and the drive disables. PROG STOP LIMIT sets the maximum time the Program Stop can take before the contactor de-energises 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.

**MMI Menu Map**

- 1 FUNCTION BLOCKS
- 2 SEQ & REF
- 3 STOP RATES
  - CURR DECAY RATE



## STOP RATES

Parameter	Tag	Range
<b>STOP TIME</b>	<b>27</b>	<b>0.1 to 600.0 s</b>
Time to reach zero speed from 100% set speed in normal stop mode (terminal C3 = 0V).		
<b>STOP LIMIT</b>	<b>217</b>	<b>0.0 to 600.0 s</b>
The maximum time a controlled stop can take in a Normal Stop (regenerative braking) before the drive will coast to stop. The timer is triggered when terminal C3 = 0V.		
<b>CONTACTOR DELAY</b>	<b>302</b>	<b>0.1 to 600.0 s</b>
This defines the time the contactor stays energised for after the STOP ZERO SPEED limit is reached.		
<b>CURR DECAY RATE</b>	<b>594</b>	<b>0.00 to 200.00 %/s</b>
This is the rate at which the current is quenched when the current loop is disabled at the end of the contactor delay period.		
A value of 100% will ramp the current from 100% to 0% in 1s.		
A value of 50% will ramp the current from 100% to 0% in 2s.		
A value of 0% (default) removes the ramp, and allows quench of the current loop during the contactor delay period (if STOP ZERO SPEED is >0.25% or IDEMAND ISOLATE is TRUE).		
<b>PROG STOP TIME</b>	<b>26</b>	<b>0.1 to 600.0 s</b>
Time to reach zero speed from 100% set speed in Program Stop mode (B8 = 0V).		
<b>PROG STOP LIMIT</b>	<b>216</b>	<b>0.0 to 600.0 s</b>
The maximum time a Program Stop (regenerative braking) can take before the contactor is de-energised and the drive is disabled. The timer is triggered when terminal B8 = 0V.		
<b>PROG STOP I LIM</b>	<b>91</b>	<b>0.00 to 200.00 %</b>
Main current limit level (assuming current limit not overridden by I Profile or Inverse Time limits) when performing a Program Stop.		
<b>STOP ZERO SPEED</b>	<b>29</b>	<b>0.00 to 100.00 %</b>
The threshold at which the CONTACTOR DELAY timer starts in Program Stop and Normal Stop modes. See also CONTACTOR DELAY above.		

# Functional Description

## Stop Hierarchy

### Coast Stop - Terminal B9

- Disables the drive and opens the contactor via the pilot output

### Enable - Terminal C5

- Suspends and resets the Control Loops

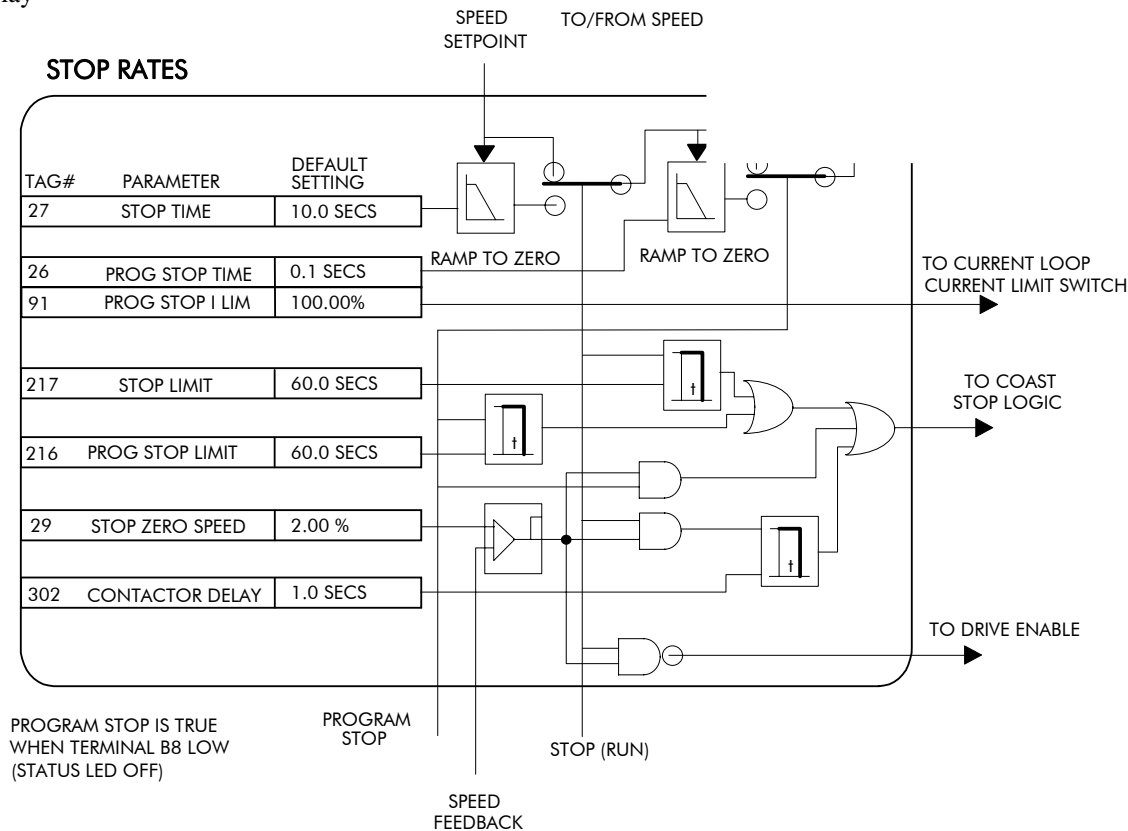
### Program Stop - Terminal B8

- Independent ramp time
- Stop Timer
- Independent Current Limit that may be higher than normal Current Limit

### Normal Run/Stop - Terminal C3

- Independent ramp time
- Contactor Delay

The Drive's reaction to commands is defined by a state machine. This determines which commands provide the demanded action, and in which sequence. Consequently, **COAST STOP** and **PROGRAM STOP** must be **FALSE**, i.e. the drive is not in Coast or Program mode, before a **Run** signal is applied otherwise the controller assumes a **Stop** mode and remains disabled. Refer to Chapter 4: "Operating the Drive" - Stopping Methods for descriptions of Coast Stop and Program Stop.



### MMI Menu Map

- 1 SERIAL LINKS
- 2 SYSTEM PORT (P3)
- 3 P3 SETUP
  - MODE
  - >> BISYNC SUPPORT
  - BAUD RATE

### MMI Menu Map

- 1 SERIAL LINKS
- 2 SYSTEM PORT (P3)
- 3 P3 SETUP
- 4 BISYNC SUPPORT
  - GROUP ID (GID)
  - UNITID (UID)
  - ESP SUP. (ASCII)
  - CHANGE BAND (BIN)
  - ERROR REPORT
  - PNO.7

### MMI Menu Map

- 1 FUNCTION BLOCKS
- 2 COMMUNICATIONS
- 3 SYSTEM PORT (P3)
  - REPLY DELAY

## SYSTEM PORT (P3)

Use this block to configure the drive's P3 port.

Refer to Appendix A: "Serial Communications" - System Port P3 for further information.

The P3 port is a non-isolated serial communications port built in to the drive's Control Board.

It is used off-line (while the drive is stopped) for transferring and saving drive configuration files using a personal computer (PC) running a serial communications program, or on-line (while the drive is running) when using the Parker SSD Drives 5703 Setpoint Repeater Unit.

You can also use the P3 port to transfer configuration files by connecting to a PC running the Windows™ compatible software package "ConfigEd Lite". Refer to the ConfigEd Lite manual RG352747.

### FUNCTION BLOCKS\COMMUNICATIONS\COMMS PORT\COMMS PORT 3

EIASCII	-	[130]	MODE
2600	-	[198]	BAUD RATE
0	-	[329]	GROUP ID (GID)
0	-	[330]	UNIT ID (UID)
TRUE	-	[328]	ESP SUP. (ASCII)
0.00 %	-	[331]	CHANGE BAND (BIN)
0xFFFF	-	[333]	PNO.7
0x00C0	-	[332]	ERROR REPORT
2 ms	-	[1175]	REPLY DELAY

## SYSTEM PORT (P3)

Parameter	Tag
<b>MODE</b>	<b>130</b>
Used to set the protocol on this port.	
0	: DISABLED
1	: 5703 MASTER
2	: 5703 SLAVE
3	: EIASCII
4	: EIBINARY
<b>BAUD RATE</b>	<b>198</b>
Transmission rate. Options available are:	
0	: 300
1	: 600
2	: 1200
3	: 2400
4	: 4800
5	: 9600 (default)
6	: 19200
7	: 38400
8	: 57600
9	: 115200 (reserved for future use)
<b>GROUP ID (GID)</b>	<b>329</b>
The Parker SSD Drives protocol group identity address.	
<b>UNIT ID (UID)</b>	<b>330</b>
The Parker SSD Drives protocol unit identity address.	

## SYSTEM PORT (P3)

Parameter	Tag
<b>ESP SUP. (ASCII)</b> <i>Reserved for future use.</i>	<b>328</b>
<b>CHANGEBAND (BIN)</b> <i>Reserved for future use.</i>	<b>331</b>
<b>PNO.7</b> <i>Reserved for future use.</i>	<b>333</b>
<b>ERROR REPORT</b> Displays the last error as a hexadecimal code. Writing any value to this parameter will set the value to >00C0 (No Error). Refer to Appendix A: "Serial Communications" - Reference for a list of codes.	<b>332</b>
<b>REPLY DELAY</b> A programmable delay inserted by the drive before replying to a request.	<b>1175</b>

**MMI Menu Map**

- 1 SETUP PARAMETERS
- 2 SPECIAL BLOCKS
- 3 TORQUE CALC.
  - TORQUE DEMAND
  - TENSION ENABLE
  - OVER WIND

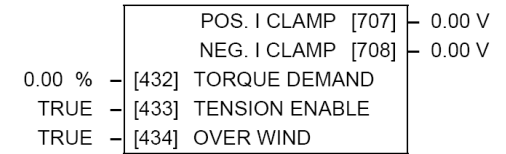
**MMI Menu Map**

- 1 FUNCTION BLOCKS
- 2 WINDER
- 3 TORQUE CALC
  - POS. I CLAMP
  - NEG. I CLAMP

# TORQUE CALC.

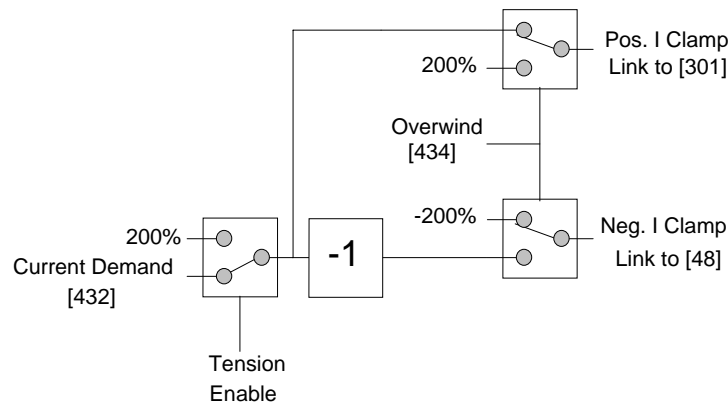
This block switches the current limits as required for over and under winding.

FUNCTION BLOCKS: WINDER, TORQUE CALC.



## TORQUE CALC.

Parameter	Tag	Range
<b>TORQUE DEMAND</b>	<b>432</b>	<b>-200.00 to 200.00 %</b>
This is the TORQUE CALC function block input.		
<b>TENSION ENABLE</b>	<b>433</b>	<b>DISABLED / ENABLED</b>
When TENSION ENABLE is ENABLED , the tension demand is set by the TORQUE DEMAND signal , tag 432. When DISABLED, it is set by the default current limit. Switch using a free digital input.		
<b>OVER WIND</b>	<b>434</b>	<b>DISABLED / ENABLED</b>
Reverses the sign of the output clamps for over/under winding. Switch using a free digital input. When ENABLED, the TORQUE DEMAND is applied to the positive quadrant current clamp. When DISABLED, the TORQUE DEMAND is applied to the negative quadrant current clamp.		
<b>POS. I CLAMP</b>	<b>707</b>	<b>— .xx V</b>
Positive current clamp output – link to tag 301 to use.		
<b>NEG. I CLAMP</b>	<b>708</b>	<b>— .xx V</b>
Negative current clamp output – link to tag 48 to use.		



# The Default Application

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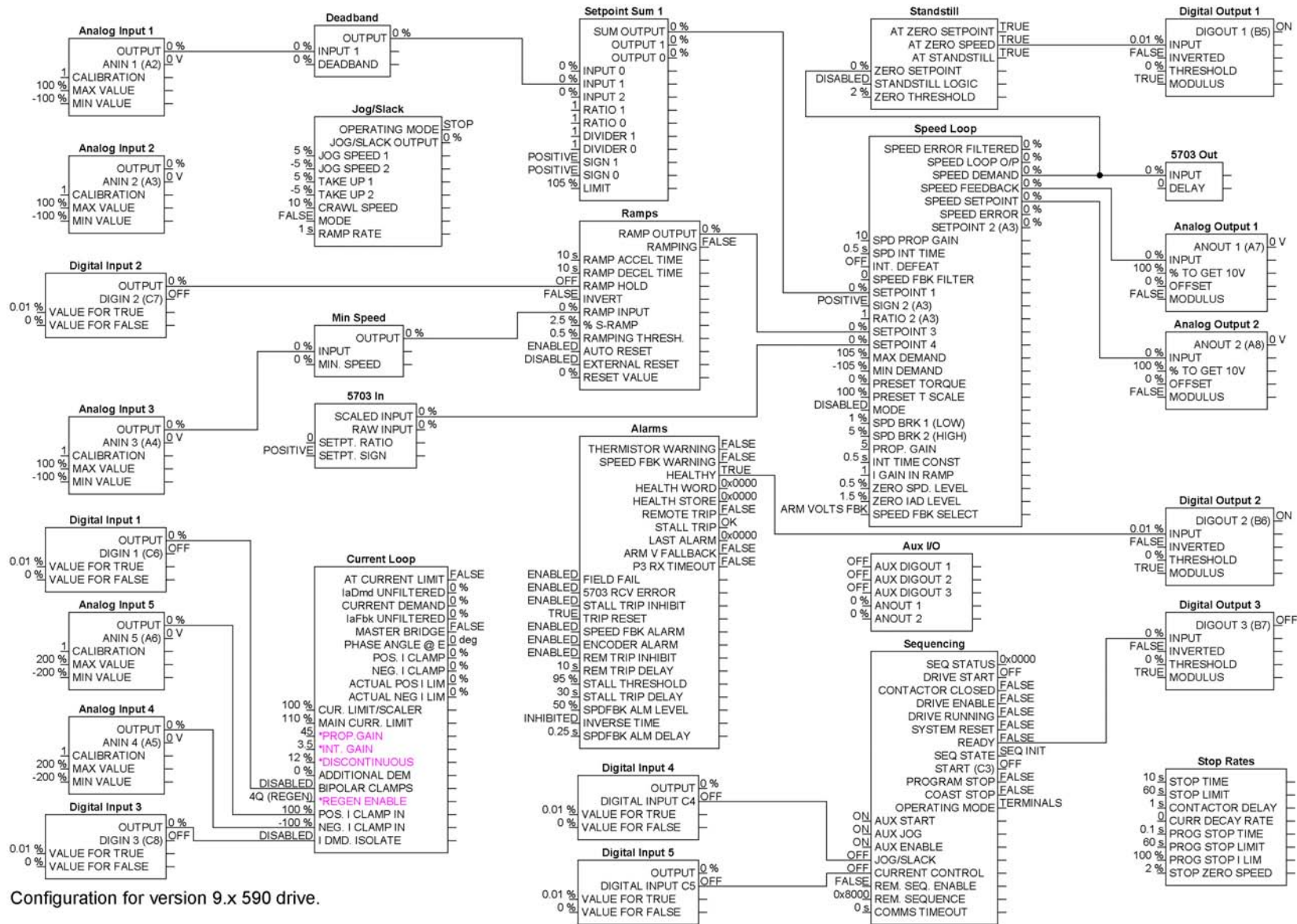
## Block Diagrams

The Drive is supplied with a pre-programmed set of parameters providing for basic speed control.

The following block diagrams show this factory set-up.

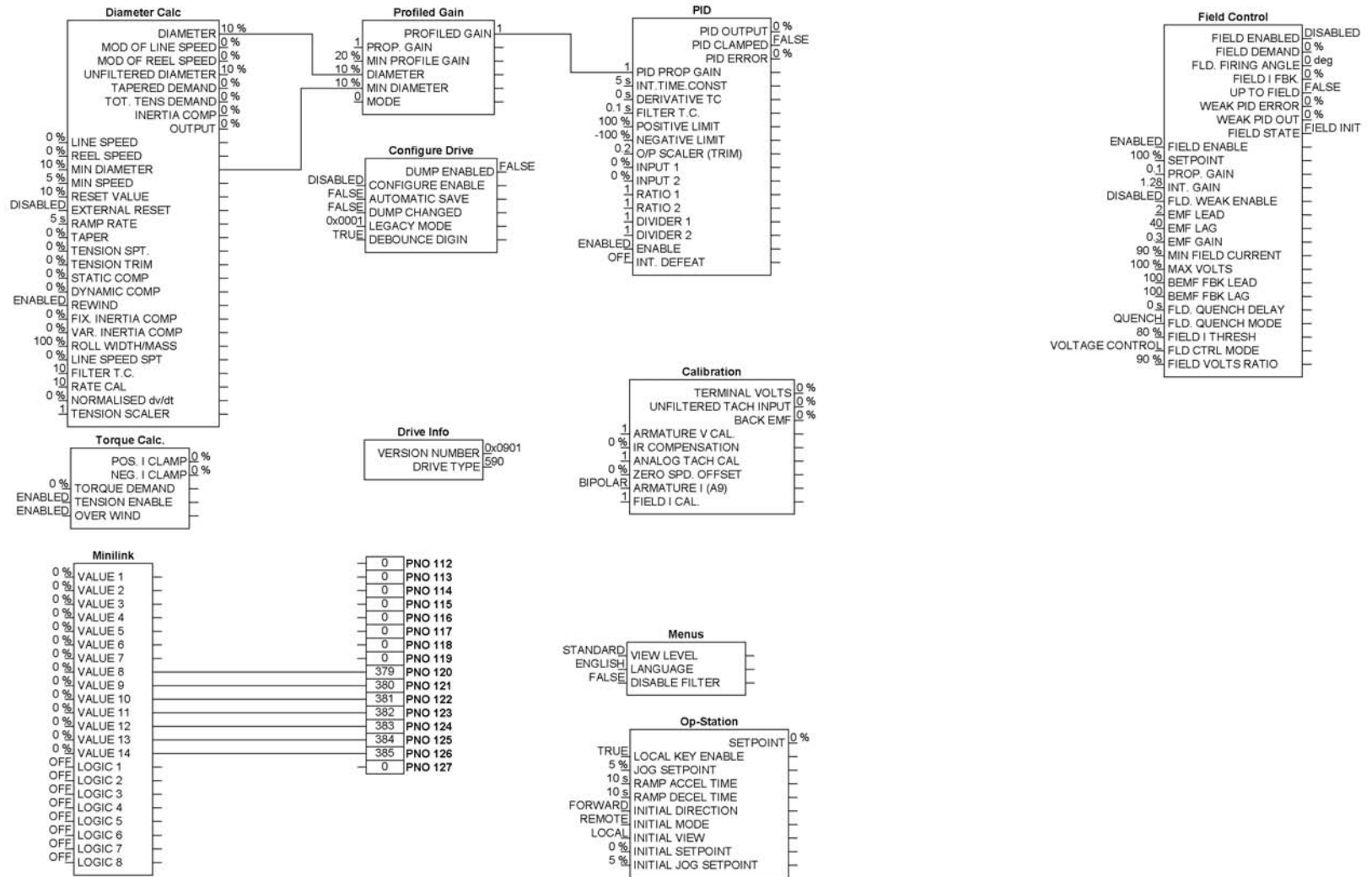
If you make any permanent changes to the block diagram, remember to update the non-volatile memory within the Drive by performing a PARAMETER SAVE. Refer to Chapter 6: “The MMI – Man Machine Interface” - Saving Your Application.

To return to the default application, refer to Chapter 6: “MMI – Man Machine Interface” - Resetting to Factory Defaults (2-button reset).



Configuration for version 9.x 590 drive.

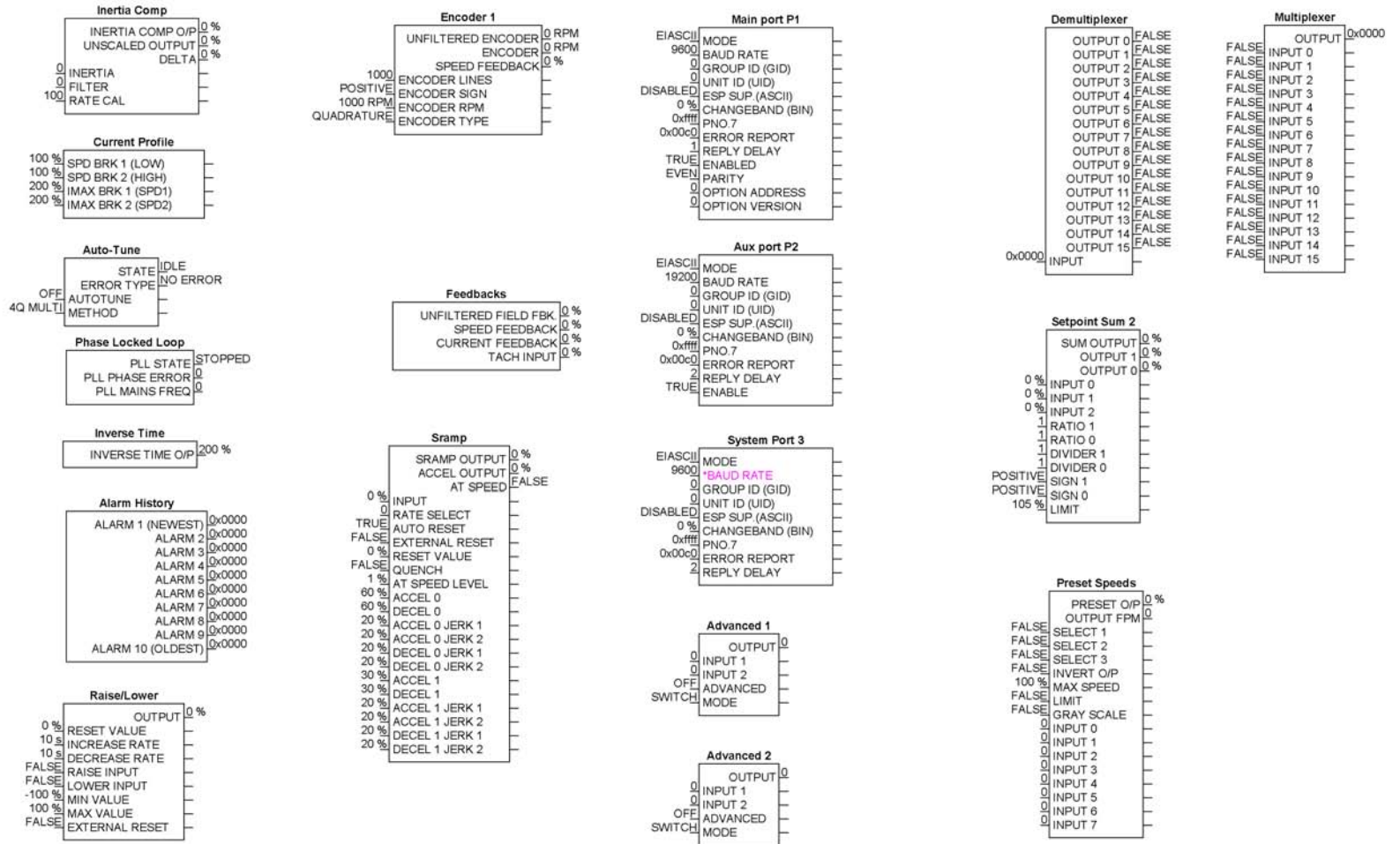
## Programming Block Diagram - Sheet 1



Configuration for version 9.x 590 drive.

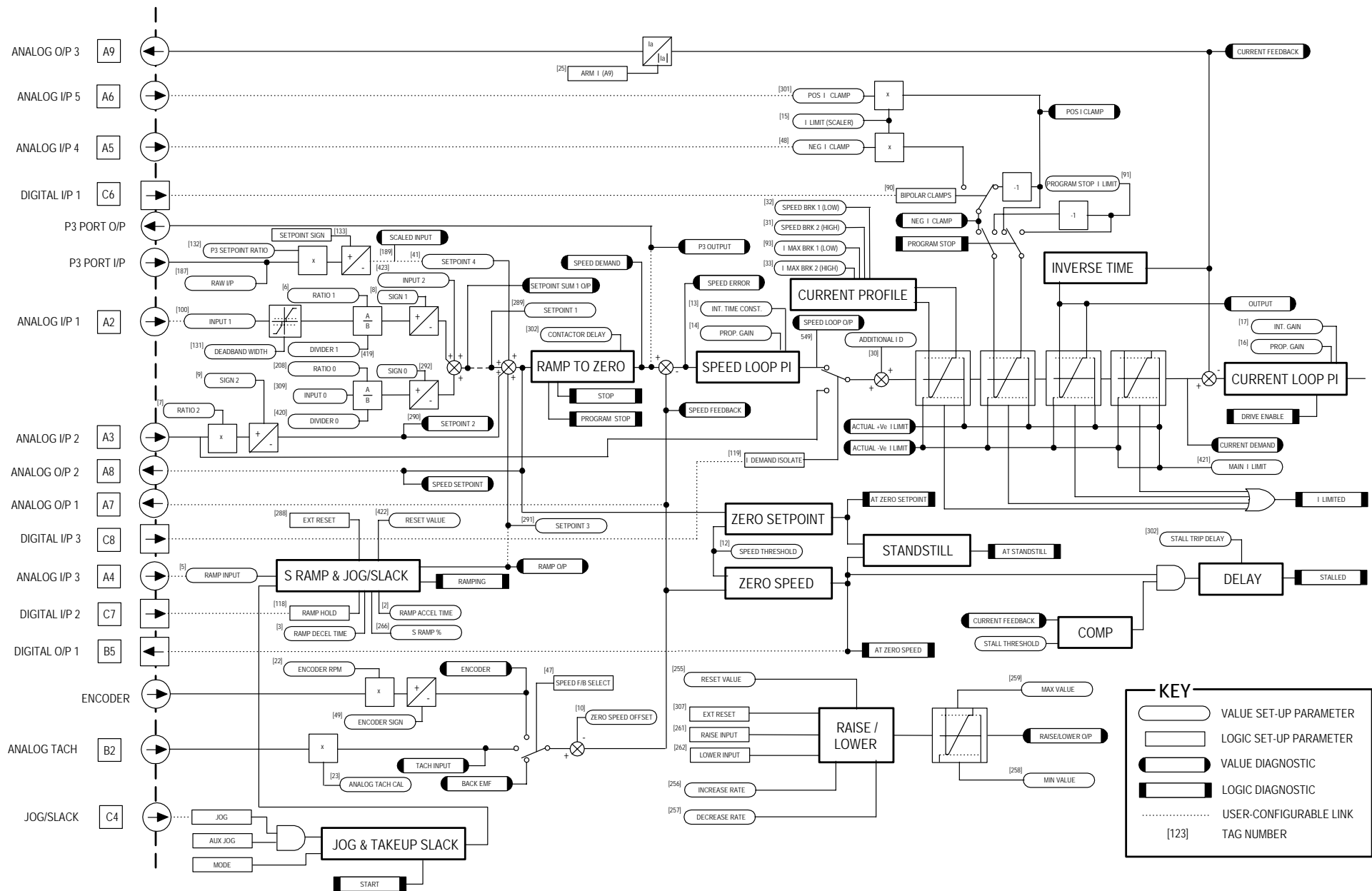
## Programming Block Diagram - Sheet 2



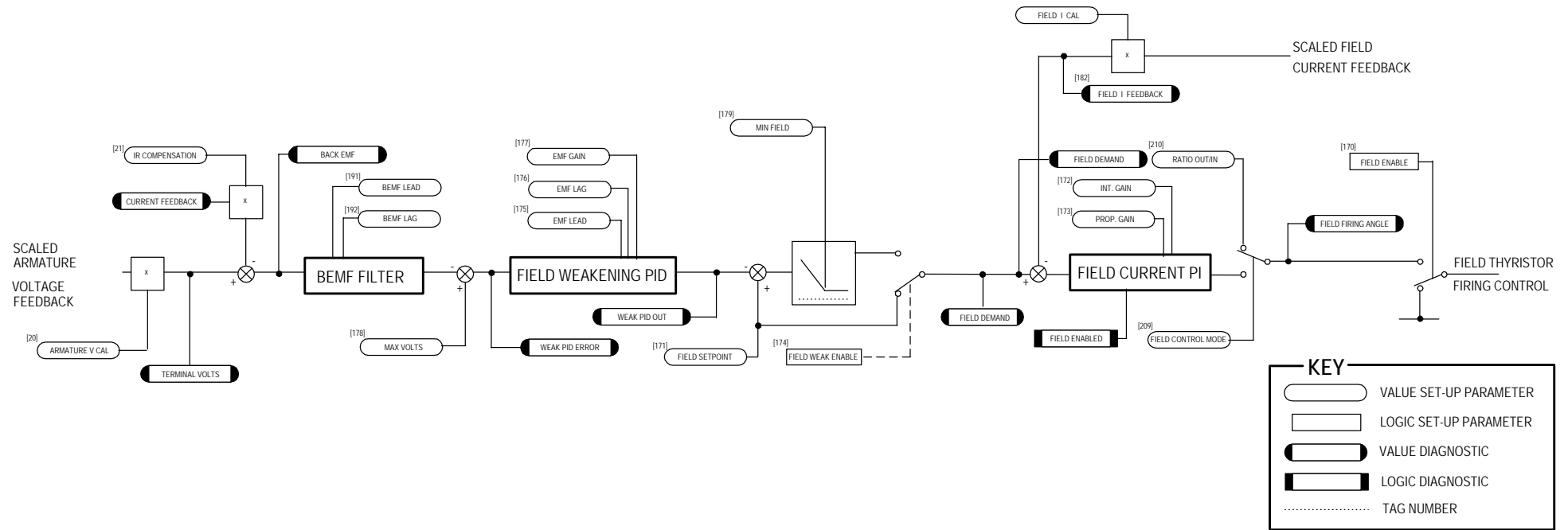


Configuration for version 9.x 590 drive.

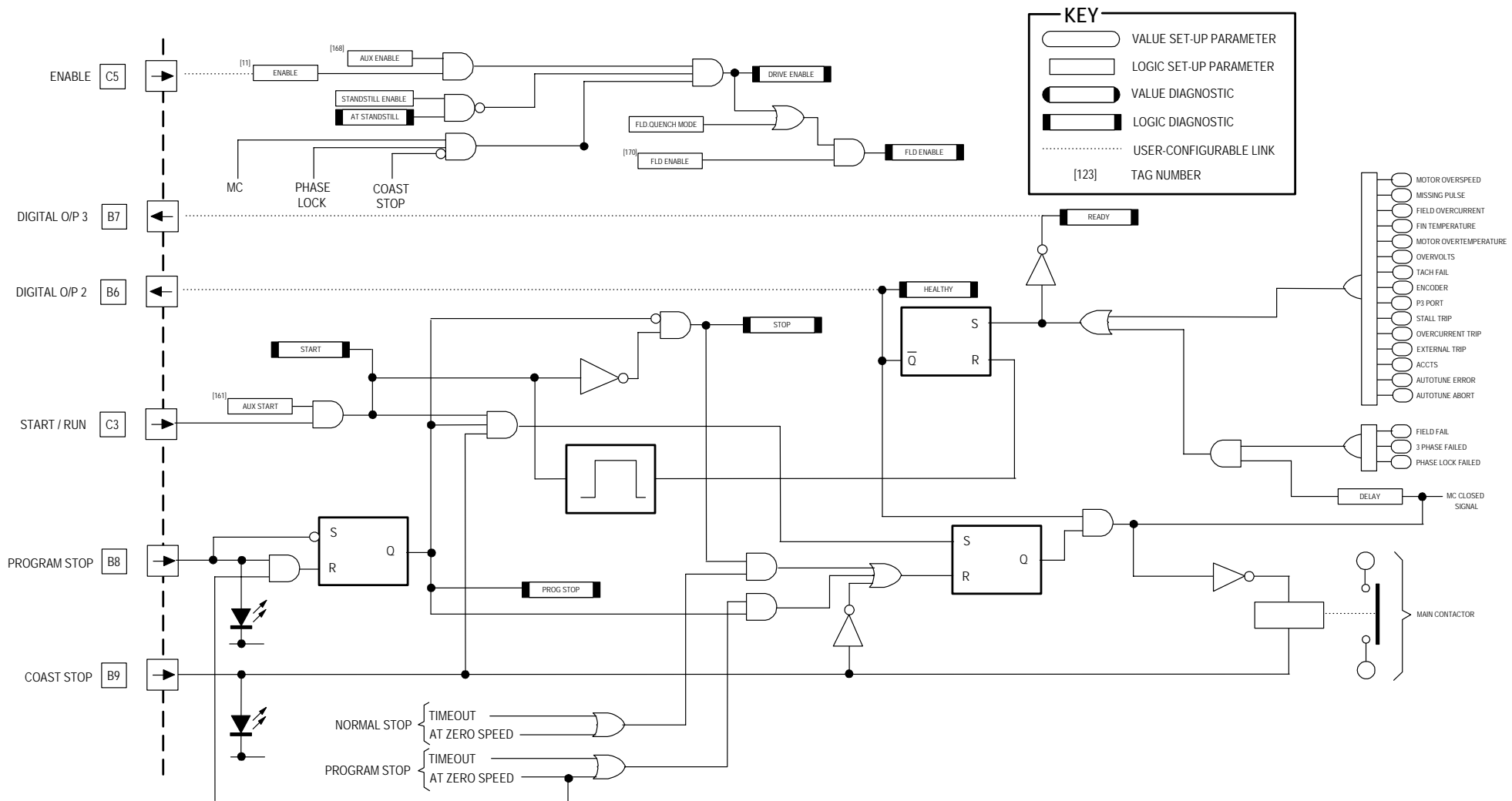
## Programming Block Diagram - Sheet 3



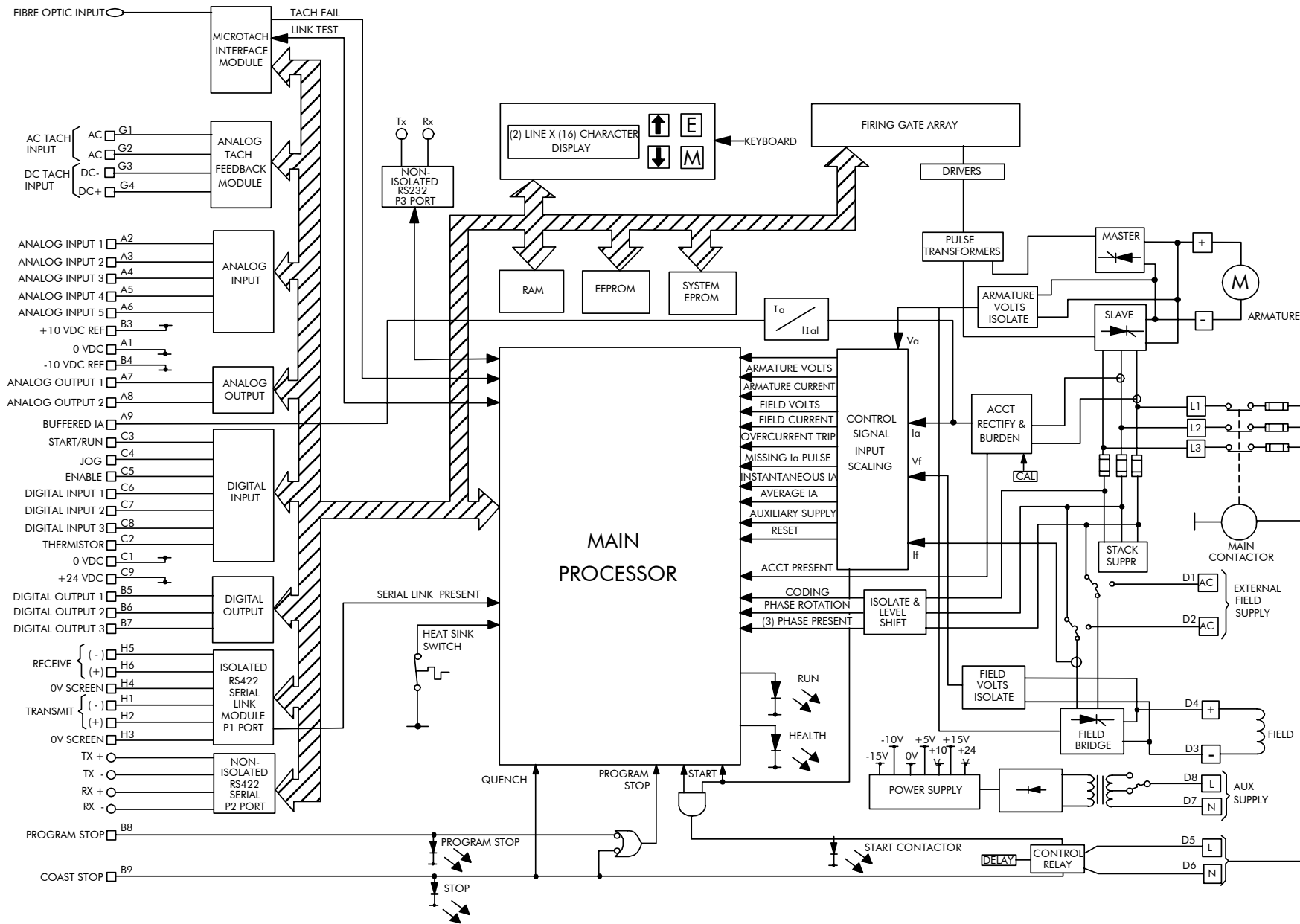
**Main Block Diagram**



**Field Control Block Diagram**



**Start/Healthy Logic Block Diagram**



**Functional Block Diagram**

# Appendix

## Technical Specifications

<b>Technical Specifications .....</b>	<b>E-1</b>	Auxiliary Power Supply Details	E-8
<b>Understanding the Product Code</b>	<b>E-1</b>	Terminal Definitions (Digital/Analog Inputs & Outputs)	E-9
Environmental Details	E-3	Printed Circuit Board Types	E-10
EMC Compliance	E-3	Power Terminals	E-10
External AC Supply (RFI) Filters and Line Choke	E-4	Terminal Information (Power Board)	E-11
Cabling Requirements for EMC Compliance	E-4	Terminal Information – Control Board	E-13
Internal Fuses	E-5	Terminal Information (Option Boards)	E-18
External Fuses (European)	E-5	Termination Tightening Torque	E-20
Earthing/Safety Details	E-6	Mechanical Details	E-20
Electrical Ratings - Power Circuit	E-7	Cooling	E-21
3-Phase Power Supply Details	E-7		



# Technical Specifications

## Caution

Always use an external ac line choke. Refer to “External AC Supply (RFI) Filters and Line Choke”.

## Understanding the Product Code

The unit is fully identified using an alphanumeric code which records how the Drive was calibrated, its various settings when despatched from the factory, and the country of origin.

The Product Code appears as the “Model No”. Each block of the Product Code is identified as below:

Model Number (Europe)		
Block No.	Variable	Description
1	XXXX	Generic product 590C : 3 phase 4 quadrant (regenerative) converter up to 720A 591C : 3 phase 2 quadrant (non-regenerative) converter up to 720A
2	XXXX	Four digits identifying the maximum dc output current rating that may be calibrated for each size of product: 0350 = 35A                      1800 = 180A                      4500 = 450A 0700 = 70A                      2700 = 270A                      7200 = 720A 1100 = 110A                      3600 = 360A
3	X	One digit identifying the nominal 3 phase ac power, supply voltage: 0 = 110V                      4 = 240V                      8 = 460V 1 = 115V                      5 = 380V                      9 = 480V 2 = 208V                      6 = 415V                      A = 500V 3 = 220V                      7 = 440V
4	X	One digit identifying the auxiliary ac control supply voltage: 0 = 110V 1 = 115V 3 = 220V 4 = 240V



Model Number (Europe)		
Block No.	Variable	Description
5	X	One digit specifying the user interface language. 0 = English 1 = (reserved) 2 = French 3 = German (refer to Customer Services) 4 = Italian (refer to Customer Services) 5 = Spanish (refer to Customer Services)
6	X	One character specifying any feedback option installed over and above the standard features of the product: 0 = Armature Voltage 1 = DC Tacho 2 = 5701 Plastic Fibre Microtach 3 = Wire-ended Encoder 4 = 5901 Glass Fibre Microtach
7	X	One character specifying the communications protocol and its hardware implementation method: 0 = No serial link 1 = Fitted RS485 serial link 2 = PROFIBUS (Version 1) - compatible with existing products 3 = PROFIBUS (Version 2) - preferred version
8	XX	Two characters specifying special options (hardware): 00 = No special options 01 to 99 = Documented special options

<b>Environmental Details</b>	
<b>Operating Temperature</b>	0°C to +55°C (see the "Cooling" table) Operating temperature is defined as the ambient temperature to the immediate surround of the Converter, when the Converter and other equipment adjacent to it is operating at worst case conditions.
<b>Storage Temperature</b>	-25°C to +55°C
<b>Shipping Temperature</b>	-25°C to +70 °C
<b>Product Enclosure Rating</b>	Cubicle Mounted      IP00 (Europe) UL Open Type (North America/Canada)
<b>Altitude</b>	If > 500 metres above sea level, derate Motor Power rating by 1% per 200 metres to a maximum of 5,000 metres
<b>Humidity</b>	Maximum 85% relative humidity at 40°C non-condensing
<b>Atmosphere</b>	Non flammable, non corrosive and dust free
<b>Vibration</b>	Test Fc of EN60068-2-6 10Hz<=f<=57Hz sinusoidal 0.075mm amplitude 57Hz<=f<=150Hz sinusoidal 1g 10 sweep cycles per axis on each of three mutually perpendicular axis
<b>Climatic Conditions</b>	Class 3k3, as defined by EN60721-3-3 (1995)
<b>Safety</b>	
Europe	EN61800-5 : 2003, when fitted inside a cubicle
North America/Canada	UL508C
Overvoltage Category	Overvoltage Category III (3-phase supply), Overvoltage Category II (auxiliary supply)
Pollution Degree	Pollution Degree 2

<b>EMC Compliance</b>	
<b>All models</b>	European Community Directive 2004/108/EC
<b>All models</b>	EN61800-3 (2004) Table 17 : conducted emissions when installed in accordance with the instructions in Chapter 3. Refer to "Mounting the Drive". EN61800-3 (2004) Immunity requirements: Maximum controlled speed (with feedback option) deviation = ±1% Maximum controlled armature current deviation = ±1% Maximum controlled field current deviation = ±10% Maximum line impedance 3% for compliance (defined as percentage drop in line-to-neutral voltage when rated dc current flows in armature output) EN61800-3 (2004) Table 18 Radiated emissions
<b>If fitted with external filters</b>	EN61800-3 (2004) restricted distribution: conducted emissions

## External AC Supply (RFI) Filters and Line Choke

Filters must only be fitted on the mains side of the contactor.  
Always use the recommended external AC Line Choke.

AC supply filter and line choke part numbers for conformance with EN55011 Class A.

Armature Current Rating (A)	Total Filter Watt Loss (W)	Parker SSD Filter Part No.	SSD EMC Line Choke
35	25	1 off CO388965U035	CO463036
70	75	1 off CO388965U110	CO463037
110	75	1 off CO388965U110	CO463038
150, 180	158	1 off CO388965U180	CO463039
270	50	1 off CO467843U340	CO057960

## Cabling Requirements for EMC Compliance

Where shielded/armoured cables are specified, use "SY" or "CY" type cables for better performance.

	Model	Power Supply Cable	Motor Cable	External Filter to Converter Cable	Signal/Control Cable
Cable Type (for EMC Compliance)		Unscreened	Screened/ armoured	Replace flying leads with screened/armoured when >0.6m	Screened
Segregation		From all other wiring (clean)	From all other wiring (noisy)		From all other wiring (sensitive)
Length Limitations With External Filter		Unlimited	50 metres	As short as possible	25 metres
Screen to Earth Connection			Both ends	Both ends	Converter end only

## Internal Fuses

### PCB Fuses

Board	Identification	Fuse Rating	Parker SSD Drives Part Number
AH385851	FS1, 5x20mm glass slow-blow (for auxiliary supply, contactor, fan supply)	3A	CH540033
AH385128	FS1, 5x20mm glass (fan supply)	1A	CH460013
	FS2, 5x20mm glass (contactor)	3A	CH460033
	FS3, 5x20mm glass slow-blow (auxiliary supply)	400mA	CH540042
Field Fuses			
Identification		Fuse Rating	Parker SSD Drives Part Number
10x38mm (all units up to 270A output current)		10A	CH430014

## External Fuses (European)

For fuses where compliance to UL Standards are required, refer to Appendix B: "Certification" - Branch Circuit/Short Circuit Protection Requirements.

Product Code	BS88 Type Fuse		DIN Type Fuse		Thyristor A <sup>2</sup> t
Block 2	Fuse Rating	Parker SSD Drives Part Number	Fuse Rating	Part Number	@ 125°C Junction Temperature
0010 to 0350	35A	CH110353	40A	CH570044	800 A <sup>2</sup> t
0351 to 0700	75A	CH120753	80A	CH570084	8,000 A <sup>2</sup> t
0701 to 1100	110A	CH120114	160A	CH580164	8,000 A <sup>2</sup> t
1101 to 1800	150A	CH120154	200A	CH580025	15,000 A <sup>2</sup> t
1801 to 2700	300A	CH130035	550A	CH590554	125,000 A <sup>2</sup> t

## Earthing/Safety Details

<b>Earthing</b>	Permanent earthing is mandatory on all units because the earth leakage current exceeds 3.5mA ac/10mA dc under normal operating conditions. Permanent earthing can be laid in two ways:: <ol style="list-style-type: none"><li>1. By using a copper conductor of at least 10mm<sup>2</sup> cross-sectional area.</li><li>2. By using a second conductor, through separate terminals electrically parallel to the protective conductor.</li></ol> <b>Note:</b> Each conductor itself must meet the local requirements for a protective earth conductor.
<b>Input Supply Details (TN) and (IT)</b>	Units with or without external filters are suitable for use on earth referenced (TN) supplies, but units used with a filter are not recommended for non-earth referenced (IT) supplies..
<b>Earth Leakage Current</b>	>50mA (all models)

## Electrical Ratings - Power Circuit

Refer to Chapter 3: "Installing the Drive" - Earth Fault Monitoring Systems for circuit breaker details.

Configuration: 590, \*598 - Two anti-parallel 3-phase thyristor bridges  
 591, \*599 - One 3-phase fully controlled thyristor bridge  
 \* *External stack options*

Short circuit protection semiconductor fuses should be installed in the 3-phase supply to the 590 products. These fuses are suitable for branch circuit short-circuit protection of the solid-state motor controllers only.

Please refer to Parker SSD Drives for the selection of suitable stack assemblies.

The standard overload capacity available is 200% for 10 seconds, 150% for 30 seconds.

Model	Voltage Ranges (V) ±10% 45/65Hz	Output Current (armature) (A)	Approximate Power Loss (W)	Motor Power @ 460V dc assuming 95% motor efficiency (kW)	Max Supply Fault Rating (A) rms Symmetrical	Field Current Rating (A)
590/1	110-500	35	105	15	5000	10
590/1	110-500	70	210	30	5000	10
590/1	110-500	110	330	45	10000	10
590/1	110-500	150	450	60	10000	10
590/1	110-500	180	540	75	10000	10
590/1	110-500	270	710	110	10000	10
598/9	220-660	--	--	--	--	30

## 3-Phase Power Supply Details

<b>Mains Supply</b>	3-phase, 50/60Hz, earth referenced (TN) and non-earth referenced (IT).		
<b>Operating Supply Tolerance</b>	±10%		
<b>Voltage Ranges</b>	220 to 500V ac - Standard Product	110 to 220V ac - Special Option	220 to 660V ac - External Stack Module (598/599)
<b>Supply Current</b>	(0.9 x Idc) Amps ac rms		
<b>Field Supply</b>	500V maximum		
<b>Phase</b>	3-phase rotation insensitive, no adjustment necessary for frequency change		

## Auxiliary Power Supply Details

\* AC fans are used , thus the input voltage must be suitable for the fans supplied, either 110-120V  $\pm 10\%$  or 220-240V  $\pm 10\%$ .

<b>Control and Fan*</b>	Single phase, 50-60Hz, $\pm 10\%$
<b>Supply Voltage</b>	110 - 120V $\pm 10\%$ 220 - 240V $\pm 10\%$
<b>DC Supply:</b> <b>Power Board AH385851</b>	+24V nominal internally regulated Maximum output capability: 17W or 750mA
<b>Power Board AH385128</b>	+24V nominal internally regulated Maximum output capability: 6W or 250mA

## Terminal Definitions (Digital/Analog Inputs & Outputs)

User inputs are IEC1131 compliant. Terminal blocks A, B, and C are located on the control board each block being a 9 way plug-in connector. In addition to terminal blocks A, B and C, terminal blocks G and H provide connections when the two option modules are fitted on the control board.

<p>Digital Input</p>	<p>Rated Voltage:</p> <ul style="list-style-type: none"> <li>• Off Region</li> <li>• Transition Region</li> <li>• On Region</li> </ul> <p>Input Impedance Sample Interval Debounce Period</p>	<p>24V dc -3V to +5V, min.current not defined, max. 15mA +5V to +15V, min.0.5mA, max. 15mA +15V to +30V, min. 2mA, max. 15mA Nominally 3.3kΩ 5ms 3ms</p>
<p>Digital Output</p> <p>These outputs are active high and source current from the terminal to the load. Thus 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.</p>	<p>Digital Output Voltage Output Update Interval Output Impedance Source/Sink Rated Current Temporary Overload Overload Protection Overload Recover Reverse Voltage Protection Operating Voltage Off state leakage current</p>	<p>Nominally +24V dc 5ms Negligible up to 50mA load Source +50mA maximum source None Indefinite short circuit protection provided Automatic Protected against current-limited reverse voltage sources (&lt;100mA) &lt;30V dc &lt;0.4mA sourcing</p>
<p>Analog Input</p>	<p>Input Resolution Input Impedance Input Impedance Limit Sample Interval Hardware Latency Overload Capability</p>	<p>12 Bit plus sign, i.e. 2.5mV resolution, equals 0.025% of full scale deflection 112kΩ ≥10kΩ (signal range -10V to +10V) 5ms, and just-in-time for control loops on Analog I/P 2 (A3), min. 5ms 1.3ms filter for Analog I/P (A3) and 2.5ms for others. +10%, i.e. maximum recognisable voltage +/-11V. Analog Tachogenerator input should be applied to Terminal G3 on Speed Feedback Option Card only.</p>
<p>Analog Output</p>	<p>Output Resolution Output Drive Capacity Update Interval Settling Time Output Overdrive Capability Overload Protection</p>	<p>11 Bit plus sign, i.e. 5mV resolution, equals 0.05% of full scale deflection 10V at 5mA max. 5ms 5ms, for 0% to 90% +10%, i.e. maximum output +/-11V at 2.5mA max. Indefinite short circuit protection provided</p>



## Printed Circuit Board Types

Power Board Part No.	Product Used On	Power Range	Input Voltage (3 phase)	Input Frequency	Aux Supply (single phase)
AH385851U002	590, 4 quad, high voltage option	35A to 270A	220 to 500V	50/60Hz	110V/240V ac
AH385851U005	590, 4 quad, low voltage option	35A to 270A	110 to 220V	50/60Hz	110V/240V ac
AH385851U003	591, 2 quad, high voltage option	35A to 270A	220 to 500V	50/60Hz	110V/240V ac
AH385851U004	591, 2 quad, low voltage option	35A to 270A	110 to 220V	50/60Hz	110V/240V ac
AH385128U009	598, external stack	--	--	50/60Hz	110V/240V ac
AH385128U009	599, external stack	--	--	50/60Hz	110V/240V ac
Power Board AH385128U009 operates with Trigger Board AH055036U003 and Suppression Board AI386001					
<b>Auxiliary Amps</b>					
AH385851 Internal PSU/Fans/Contactor : 4A fused at FS2					

## Power Terminals

Terminal Description	Terminal Function	Signal Level	Terminal Number
Mains Supply L1	Three phase mains power input, phase reference Line 1	500Vac maximum 50-60Hz line-to-line	L1
Mains Supply L2	Three phase mains power input, phase reference Line 2	500Vac maximum 50-60Hz line-to-line	L2
Mains Supply L3	Three phase mains power input, phase reference Line 3	500Vac maximum 50-60Hz line-to-line	L3
Armature connection positive	Converter dc power output, reference Armature Positive connection to dc motor	600Vdc maximum with respect to A- (maximum voltage dependent upon the supply voltage, the ratio being: Vout is approximately equal to 1.2Vac supply)	A+
Armature connection negative	Converter dc power output, reference Armature Negative connection to dc motor	600Vdc maximum with respect to A+ (maximum voltage dependent upon the supply voltage, the ratio being: Vout is approximately equal to 1.2Vac supply)	A-

## Terminal Information (Power Board)

Terminal Description	Terminal Function	Signal Level	Terminal Number
<p>External field supply FL1</p> <p>External field supply FL2</p>	<p>External single phase ac Line 1 input to field bridge.</p> <p>External single phase ac Line 2 input to field bridge.</p> <p>Required AC Input Voltage = 1.11 x Nominal DC Output.</p> <p>The field regulator will control the field current provided that the Nominal DC Output voltage exceeds the field voltage by at least 10%.</p> <p>i.e. <math>V_{AC} = 1.11 \times V_{DC}</math>  and <math>V_{DC} = 1.1 \times V_{FIELD}</math>  therefore <math>V_{AC} = 1.22 \times V_{FIELD}</math></p> <p>The external AC supply must be fitted with high speed fuses to protect the field regulator. For controllers with 10A field capability 10A fuses should be used, those with 20A field capability 20A fuses.</p> <p><i>Note: When using an external ac input it is important to have the correct phase relationship on the terminals. The supply must be derived from L1 (Red) and L2 (Yellow) phases directly or indirectly through a transformer. L1 must be connected to D1, and L2 to D2.</i></p>	<p>500V ac maximum, 50-60Hz line-to-line</p> <p>500V ac maximum, 50-60Hz line-to-line</p>	<p>D1</p> <p>D2</p>

## Terminal Information (Power Board)

Terminal Description	Terminal Function	Signal Level	Terminal Number
Field Output F+	DC supply for motor field connections.	0.9 x Vac	D4
Field Output F-	<p>DC supply for motor field connections.</p> <p>The DC output voltage at these terminals will depend upon the AC supply voltage and the mode of field control.</p> <p><b>Voltage Control</b></p> <p>The output voltage will be determined by the ratio parameter in the field variables. The relationship between the dc output voltage and AC input voltage is determined by the equation:-</p> $V_{dc} = \frac{V_{ratio} \times V_{AC}}{100}$ <p>The default value of Vratio is 90% hence the DC output voltage will be the same as for a full wave diode rectifier i.e., 90% is maximum output.</p>	0.9 x Vac	D3
Main contactor coil	<p>Line</p> <p>This terminal is the switched output from the contactor control relay and is derived from the auxiliary supply at terminal D8. The output is internally fused at 3A hence contactor coils having a high pick-up current must be operated via a slave relay.</p> <p><i>Note: The contacts of the Contactor Control Relay are suppressed by a series connected resistor (680 Ohms) and capacitor (22nF) to protect the relay contacts. Users should be aware that when the contactor Control Relay is "De-energised", a leakage current of approximately 2mA can be expected and this should be considered when interfacing to these terminals. Typically, there could be the energisation of very sensitive relays.</i></p>	110/240V 50-60Hz line-to-line	D5
Main contactor coil	<p>Neutral</p> <p>This terminal is internally connected to the auxiliary supply neutral and provides a convenient connection point for the contactor coil neutral connection.</p>	110/240V 50-60Hz line-to-line	D6

## Terminal Information (Power Board)

Terminal Description	Terminal Function	Signal Level	Terminal Number
Auxiliary supply	Neutral	110/240V 50-60Hz line-to-line	D7
Auxiliary supply	Line	110/240V 50-60Hz line-to-line	D8
<p>These terminals are the mains input connections for the switch mode power supply, contactor control relay supply and cooling fan supply (when force cooled - refer to Chapter 3: "Installing the Drive" - Heatsink Cooling Fan Connections). The voltage applied to these terminals is Product Code dependent</p>			

## Terminal Information – Control Board

This Control Board is common to all 590 units.

Terminal Description	Terminal Function	Signal Level	Configurable	Terminal Number
<b>TERMINAL BLOCK A</b>				
0V (Signal)	Zero Volt Reference	0V	N/A	A1
Analog Input 1	Speed Setpoint No. 1	+10V = Full speed setpoint forward -10V = Full speed setpoint reverse	YES	A2
Analog Input 2	Aux. Speed Setpoint/ Current Demand  The function of this input is determined by Digital Input No. 3 at terminal C8. C8 open circuit = Speed Setpoint C8 at +24V = Current Demand	+10V = Full speed setpoint forward -10V = Full speed setpoint reverse in speed setpoint mode. +10V = 100% Positive current demand. -10V = 100% Reverse current demand.	NO	A3
Analog Input 3	Ramped Speed Setpoint	+10V = Full speed setpoint -10V = Full speed setpoint reverse	YES	A4
Analog Input 4	Aux. Current Clamp -ve	+10V = 100% Positive current <b>demand</b> -10V = 100% Reverse current clamp	YES	A5

## Terminal Information – Control Board

This Control Board is common to all 590 units.

Terminal Description	Terminal Function	Signal Level	Configurable	Terminal Number
Analog Input 5  Note that unused analog inputs should be connected to 0V (Signal), or disconnected from the block diagram, in order to reduce signal noise.	Main Current Limit/ Aux. Current Clamp +ve  The function of analog inputs 4 and 5 is determined by digital Input No.1 on terminal C6. C6 open circuit: Analog inputs No.5 = Main Current Limit. C6 at +24V: Analog input No. 5 = Auxiliary Current Clamp Positive. Analog Input No. 4 = Auxiliary Current Clamp Negative.		YES	A6
Analog Output 1	Speed Feedback	+10V = Full speed feedback forward. -10V = Full speed feedback reverse.	YES	A7
Analog Output 2	Total Speed Setpoint	+10V = Full speed feedback forward. -10V = Full speed feedback reverse.	YES	A8
Current Meter Output	Buffered Armature Current Output  The output can be selected as either Bipolar or Unipolar by the Armature I parameter.	<u>Bipolar Mode</u> +10V = 200% output current forward. -10V = 200% output current reverse.  <u>Unipolar Mode</u> +10V = 200% output current.	NO	A9

## Terminal Information – Control Board

This Control Board is common to all 590 units.

Terminal Description	Terminal Function	Signal Level	Configurable	Terminal Number
<b>TERMINAL BLOCK B</b>				
0V (Signal)	Zero Volt Reference	0V	N/A	B1
Not Connected	Not Connected			B2
+10V DC Reference	User +10V Reference	+10V at 10mA short circuit protected	N/A	B3
-10V DC Reference	User -10V Reference	-10V at 10mA short circuit protected	N/A	B4
Digital Output 1	Zero Speed Detected The operating level of this output can be modified by the standstill zero threshold parameter to give the desired accuracy of operation	+24V at zero speed	YES	B5
Digital Output 2	Drive Healthy (Drive Operational) This output is true when the controller is Healthy.	+24V when Healthy	YES	B6
Digital Output 3	Drive Ready This output is true when the controller is ready to function, i.e., "locked" into the mains.	+24V when Ready	YES	B7
Program Stop Input	Program Stop When the Program Stop input is held at +24V, the drive operates as required by the inputs. When the Program Stop is open circuit or at zero volts, the controller provides a controlled or program stop as defined by the Program Stop parameters.	+24V drive run 0V (o/c) drive program stop Threshold +16V	NO	B8
Coast Stop Input	Coast Stop When the Coast Stop input is at +24V, the controller operates normally. When the Coast Stop is at zero volts or open circuit, the main contactor is open and the drive no longer operates. The motor coasts to rest.	+24V drive run 0V (o/c) drive coasts to rest. Threshold +16V	NO	B9

## Terminal Information – Control Board

This Control Board is common to all 590 units.

Terminal Description	Terminal Function	Signal Level	Configurable	Terminal Number
<b>TERMINAL BLOCK C</b>				
0V (Signal)	Zero Volt Reference	0V	N/A	C1
Thermistor/Microtherm Input	Motor overtemperature protection element input (must be double insulated sensor).	It is good practice to protect DC motors against sustained thermal overloads by fitting temperature sensitive resistors or switches in the field and interpole windings of the machine. These devices have a low resistance (typically 200Ω) up to a reference temperature 125°C. Above this temperature, their resistance rises rapidly to greater than 2000Ω. Motor overtemperature sensors should be connected in series between terminals C1 and C2. A motor overtemperature alarm will be indicated if the external resistance between C1 and C2 exceeds 1.8kΩ $\pm$ 200Ω.  Terminals C1 and C2 must be linked if overtemperature sensors are not used.	N/A	C2
Start/Run Input	Start/Run  When an input is applied to this terminal, the main contactor will close and the controller will operate provided there are no alarms, program stop/coast stop signals are high and the controller is enabled. When the input is removed the controller will perform a regenerative stop to zero speed. A regenerative stop can only be achieved by a 4 quad regenerative controller; the 2 quad non-regenerative controller will coast to zero speed.	+24V = True/Run 0V (o/c) = False/Normal Stop +5V to +15V Transition region	NO	C3
Jog Input	Jog  When the Jog Input is held at +24V, the drive jogs provided input C3 is low. When the Jog Input is removed the drive will ramp down to zero obeying the Jog Ramp Rate.	+24V = True/Jog 0V = False/Stop +5V to +15V Transition region	YES	C4

## Terminal Information – Control Board

This Control Board is common to all 590 units.

Terminal Description	Terminal Function	Signal Level	Configurable	Terminal Number
Enable Input	<p>Enable</p> <p>The Enable Input provides a means of electronically inhibiting controller operation. If the enable input is not true all control loops will be inhibited and the controller will not function.</p>	<p>+24V = True/Enable</p> <p>+5V to +15V Transition region</p>	YES	C5
Digital Input 1	<p>Current Clamp Select</p> <p>This input alters the configuration of the current clamps. With no connection, i.e., false, Analog I/P 5 provides a unipolar current limit. When true, Analog I/P5 is the positive current clamp, Analog I/P 4 is the negative current clamp.</p>	<p>+24V = True/Bipolar Clamp</p> <p>+5V to +15V Transition region</p>	YES	C6
Digital Input 2	<p>Ramp Hold</p> <p>If the input is held true the S-Ramp output is frozen at the last value irrespective of the Ramped Setpoint Input. When false the S-Ramp Output follows the Ramped Setpoint Input with a delay determined by the Acceleration and Deceleration Ramped time parameters.</p>	<p>+24V = True/Hold</p> <p>0V = False/Ramp</p> <p>+5V to +15V Transition region</p>	YES	C7
Digital Input 3	<p>Current Demand Isolate</p> <p>This input alters the drive operation from Speed Control to Current Control. When digital input No. 3 is true, analog input No. 2 provides the current demand and the speed loop is disconnected. When false the speed loop is in control and analog input No. 2 is an auxiliary speed setpoint.</p>	<p>+24V = True/Current</p> <p>0V = False/Speed</p> <p>+5V to +15V Transition region</p>	YES	C8



## Terminal Information – Control Board

This Control Board is common to all 590 units.

Terminal Description	Terminal Function	Signal Level	Configurable	Terminal Number
+24V Supply	+24V	<p>Maximum output current: 250mA</p> <p>Short circuit protected.</p> <p>Up to 750mA only with AH385851 power board, and only if LINK 24 is applied (shorting VP25 to VP26, located above SW4 – 6 in the control terminal area).</p> <p>Applying LINK 24 disables short circuit protection.</p> <p>Some typical loads are given below:</p> <p>Microtach : 75mA Relays : 50mA each Fibre Optic ancillaries : 50mA each</p>	N/A	C9

## Terminal Information (Option Boards)

Terminal Description	Terminal Function	Signal Level	Terminal Number
<b>TERMINAL BLOCK G (SWITCHABLE TACHO CALIBRATION OPTION)</b>			
+ AC Tacho input	+AC		G1
- AC Tacho input	- AC		G2
+ DC Tacho input	+DC		G3
- DC Tacho input	- DC		G4
<b>(5701 MICROTACH RECEIVE OPTION - PLASTIC)</b>			
Signal Input	Microtach fibre optic input	There are no other connections to this option module. (The 5701 Microtach should be powered by an external 24V DC at 60mA, 1.4W.)	F1

## Terminal Information (Option Boards)

Terminal Description	Terminal Function	Signal Level	Terminal Number
<b>(5901 MICROTACH OPTION MODULE - GLASS)</b>			
Signal Input	Microtach fibre optic input	There are no other connections to this option module. (The 5901 Microtach should be powered by an external 24V DC at 125mA, 3W.)	F1
<b>TERMINAL BLOCK G (ENCODER OPTION)</b>			
Terminal Block G pinouts will change function depending upon which option board is fitted to the control board. The configuration supplied as standard is with the Switchable Tacho Calibration Option fitted. Further information on the other options may be obtained from the relevant Technical Manual.			
<b>TERMINAL BLOCK H (SERIAL COMMUNICATIONS)</b>			
<i>Note: Where more than 8 serial communications option boards are interconnected on one system, the line termination resistor fitted to the option board causes excessive loading on the system. The resistor should be removed on boards daisy chained in the serial wiring, not those at the beginning or end of the system. Refer to Parker SSD Drives if in doubt.</i>			
<b>RS485</b>			
XMT- XMT +	Serial Communications Port P1 Transmit Terminals Balanced Line Driver outputs compatible with RS422 signal levels		H1 H2
0V Isolated 0V Isolated	Serial Communications Port Signal ground with galvanic isolation from controller signal ground or power ground (note that the signal screen must also be grounded at the host)		H3 H4
RCV- RCV+	Serial Communications Port P1 Receive Terminals Balance Line Receiver input compatible with RS422 signal levels		H5 H6
<b>PROFIBUS</b>			
0Vext +5VDCext	Signal reference for Profibus +5VDCext/50mA supply for Profibus		H1 H2
B-B` A-A`	Receive/Transmit-Data-P Receive/Transmit-Data-N		H3 H4
RTS 0Vext	For connecting repeater As pin 1		H5 H6

## Termination Tightening Torque

Product	Terminations	Maximum Tightening Torque		
ALL	A1 - A9	M2.5	5-7lb.in.	0.56-0.79Nm
	B1 - B9	M2.5	5-7lb.in.	0.56-0.79Nm
	C1 - C9	M2.5	5-7lb.in.	0.56-0.79Nm
35 - 270 Amps	D1 - D8	M3	4lb.in.	0.45Nm
35 - 180 Amps	A+, A-, L1, L2, L3	M8	8.1lb.ft.	11.0Nm
	Ground	M6	5.0lb.ft.	6.8Nm
270 Amps	A+, A-, L1, L2, L3	M8	12.2lb.ft.	16.5Nm
	Ground	M6	5.0lb.ft.	6.8Nm

## Mechanical Details


<b>Mounting Orientation</b>	Vertical. Refer to Chapter 3: "Installing the Drive" - Mechanical installation for dimensions and air clearances.			
<b>590/591</b>				
	Up to 70A	Up to 150A	Up to 180A	270A
<b>Nominal Blower Throughput (m<sup>3</sup>/hour)</b>	-	100	300	350
<b>Weight (kg (lbs))</b>	10-14 (22-30)	15 (33.2)	17 (37.5)	20 (44)
<b>Power Terminations</b>	Bus bars with M8 screws and captive nuts			AC terminals:: bus bars with M8 screws and captive nuts DC terminals:: M8 bolts with nuts and washers
<b>Control Terminations</b>	Plug-on connectors with retaining catches			
<b>598/599</b>				
<b>Weight (kg (lbs))</b>	10-14 (22-30)			
<b>Power Terminations</b>	Bus bars with M8 screws and captive nuts			
<b>Control Terminations</b>	<i>Control Board:</i> Plug on connectors with retaining catches. <i>Current Feedback/Coding Low Volts:</i> Screw in with wire protectors. <i>Coding High Volts/Armature Feedback:</i> M5 studs with nuts and washers			

## Cooling

<sup>1</sup>Derate linearly at 1% per degree centigrade for temperature exceeding the maximum rating ambient (55°C).

If the enclosure is totally enclosed, the exposed metal surface dissipates approximately 50W/m<sup>2</sup> for a 10°C temperature rise of internal air above ambient.

Model	Output Current (armature) (A)	Maximum Rating Ambient <sup>1</sup> (°C)	Cooling Method	Number of Fans	Fan Current Rating 110/120V ac	Fan Current Rating 220/240V ac
590/1	35	45	Natural	-	-	-
590/1	70	45	Natural	-	-	-
590/1	110	35	Integral Fan	2	100mA	-
590/1	150	35	Integral Fan	2	100mA	-
590/1	180	35	Integral Fan	1	0.36A	0.21A
590/1	270	35	Integral Fan	1	0.36A	0.21A
598/9	--	35	Separate Fan	--	--	--

ISS.	MODIFICATION	ECN No.	DATE	DRAWN	CHK'D
1	Initial Issue (HA467078U001)	19659	20 May 09	FEP	MH
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		DRAWING NUMBER ZZ467078U001		SHT. 1 OF 1	

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