DC590PR DC Digital Drive

HA860001C001 **ISSUE 1**

Compatible with Version 10.x Software onwards

WARRANTY

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PRODUCT MANUAL

Safety Information

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

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- The user, through its own analysis and testing, is solely responsible for making the final selection of the system and components and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application, follow applicable industry standards, and follow the information concerning the product in the current product catalog and in any other materials provided from Parker or its subsidiaries or authorized distributors.

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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			
Model Number ***(see product label)***		**Where installed** ***(for your own information)***	
Unit used as a: ***(refer to "Certification")***	o Component o Relevant Apparatus	**Unit fitted:**	☑ Enclosure

Application Area

The equipment described is intended for industrial (non-consumer) motor speed control utilising DC motors.

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

Caution Risk of electric shock	**Caution** Refer to documentation	**Earth/Ground** 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.

EMC

- In a domestic environment this product may cause radio interference in which case supplementary mitigation measures may be required.
- This equipment contains electrostatic discharge (ESD) sensitive parts. Observe static control precautions when handling, installing and servicing this product.
- This is a product of the restricted sales distribution class according to IEC 61800-3.
- 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

Contents

Chapter 1 # Getting Started

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

About this Manual

This manual is intended for use by the installer, user and programmer of the DC590PR 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 DC590PR Series DC Digital Drive:

- Three phase, regenerative, four quadrant armature controllers: 590PR
- Three phase non-regenerative, two quadrant armature controllers: 591PR

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".

This will become your programming tool as you become more familiar with the software.

Initial Steps

Use the manual to help you plan the following:

Installation

Know your requirements:

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

Operation
Know your operator:

- how is it to be operated, local and/or remote?
- what level of user is going to operate the unit?
- decide on the best menu level for the Keypad (where supplied)

Programming (Keypad or suitable PC programming tool only)
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
- customise the Keypad to the application

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 590PR range of products, and a quick look at the Keypads and available plug-in Options.

- **Product Range**
- **How it Works**
- **Control Features**
- **Keypads**
- **Option Boards**

Product Range

The DC590PR Series DC Digital Drive is designed for use in a suitable enclosure, with associated control equipment. The unit accepts a variety of standard three-phase ac supply voltages 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.

The Keypad gives access to parameters, diagnostic messages, trip settings and full application programming.

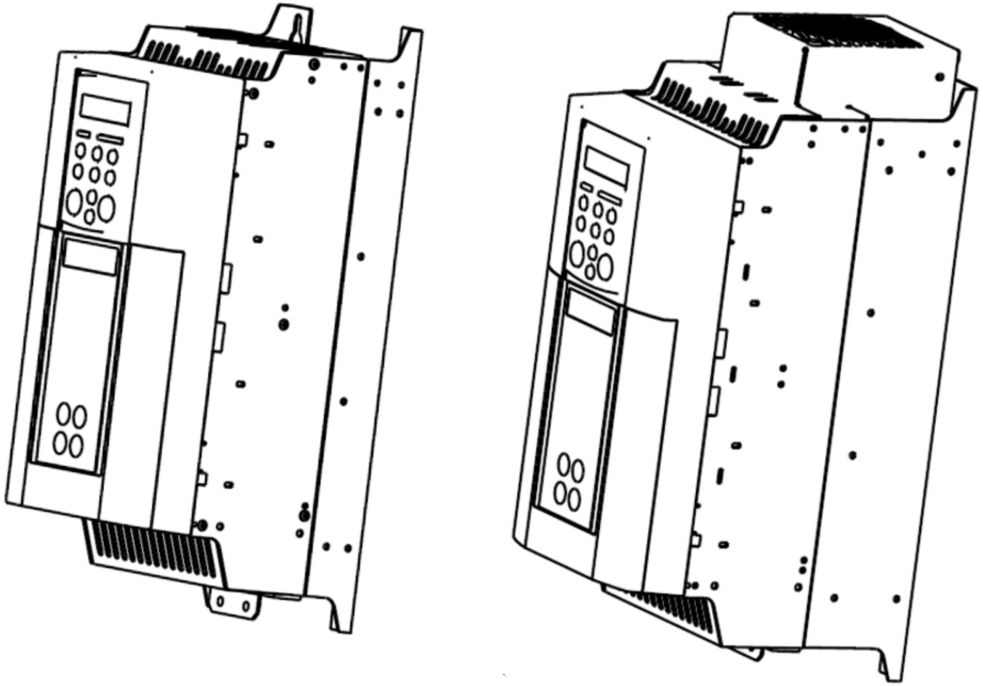
Regenerative and Non-Regenerative Models

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.



Output current(Armature)

Frame 1	Frame 2
20A	75A
35A	110A
45A	165A

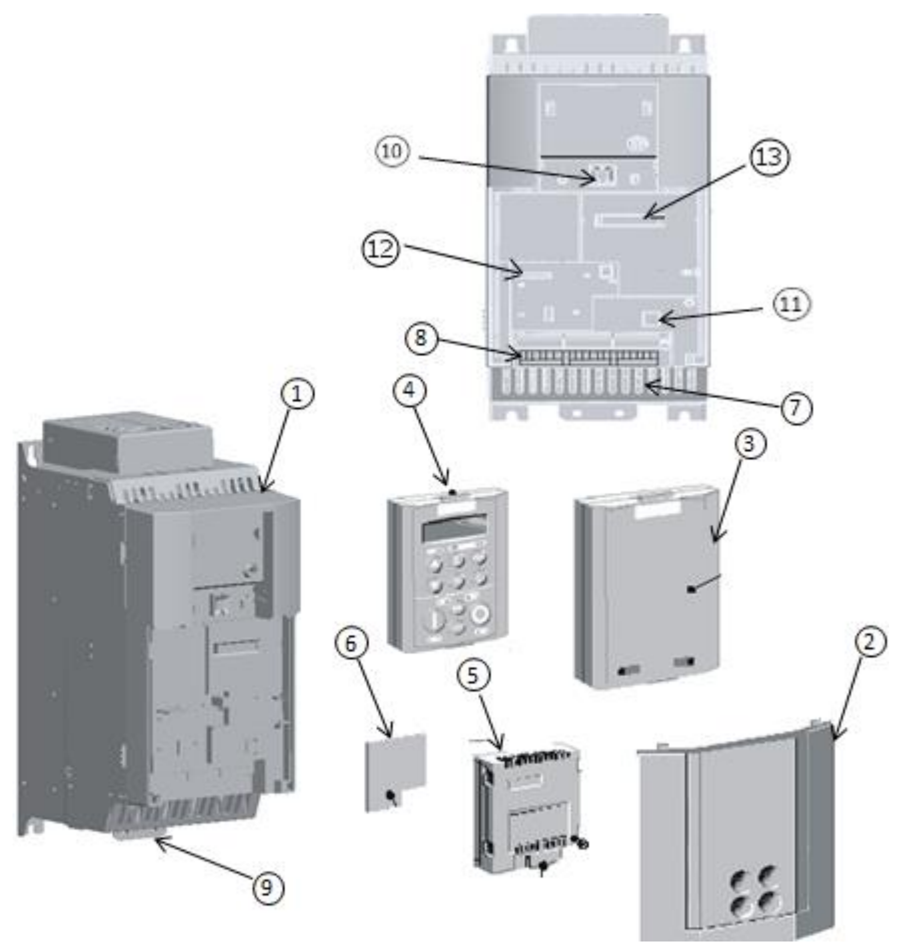
All units are available as a:

590PR: 4Q 3-phase, fully controlled, anti-paralled thyristor bridge configuration

591PR: 2Q 3-phase, fully controlled thyristor bridge configuration

590PR Controller (Frames 1 & 2)

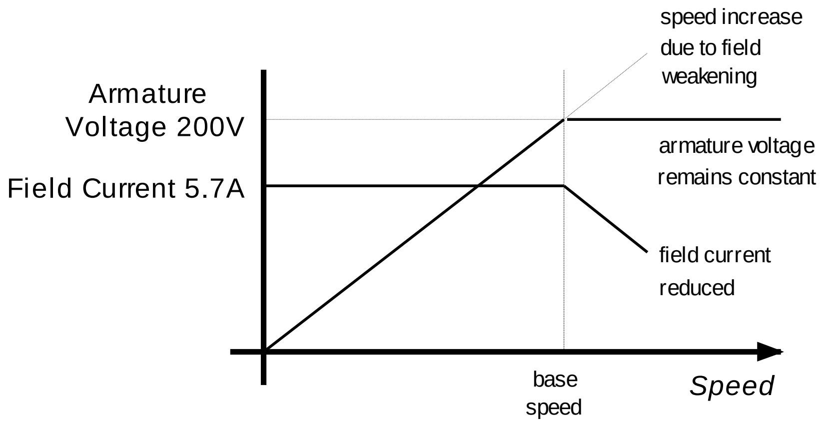
1	Main drive assembly
2	Terminal cover
3	Blank cover
4	6901 keypad (optional)
5	COMMS technology box (optional)
6	speed feedback option/card
7	Power terminals
8	Control terminals
9	Earthing points
10	Keypad port
11	System port (P3) (USB)
12	Analog input Terminal G
13	Analog input Terminal H
14	
15	



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.



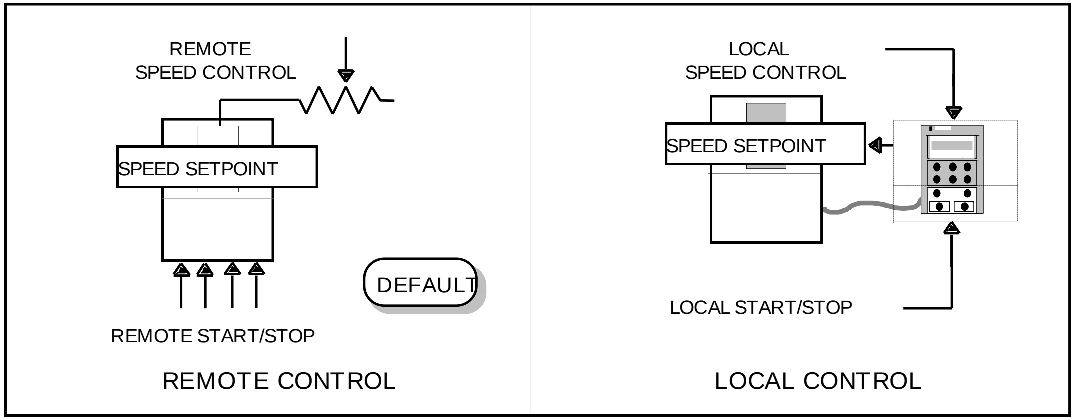
Using the Keypad, you can select the control loops to be used by the drive to provide either:

- 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 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, or locally using the Keypad. By plugging in a COMMS Option Technology Box, the drive can be linked into a network and controlled by a PLC/SCADA or other intelligent device.



Control Features

Control	Control Circuits	Fully isolated from power circuit (SELV)
	Output Control	• Fully controlled 3-phase thyristor bridge • Microprocessor implemented phase control extended firing range • For use on 50 or 60Hz supplies with a frequency compliance range of 45 to 65Hz • Phase control circuits are phase rotation insensitive
	Control Action	• Fully digital • Advanced PI with fully adaptive current loops for optimum dynamic performance • Self Tuning Current Loop utilising "Autotune" algorithm • Adjustable speed PI with integral defeat
	Speed Control	• By Armature Voltage feedback with IR compensation • By Encoder feedback or analog tachogenerator
	Speed Range	100 to 1 typical with tachogenerator feedback
	Steady State Accuracy	• 0.01 % Encoder Feedback with Digital setpoint (serial link or USB) • 0.1 % Analog Tach Feedback • 2 % Voltage Feedback NOTE **Long term analog accuracy is subject to tachogenerator temperature stability.**
	Adjustments	All adjustments in software can be altered by the Keypad or via serial communications. The Keypad provides monitoring and adjustment of parameters and levels, in addition to diagnostic facilities.
Protection		• High Energy MOVs • Over Current (instantaneous) • Over Load (inverse time) • Field Failure • Field Over I • ACCTs Failed • Speed Feedback Failure • Over Speed • Encoder Failed • Motor Overtemperature • Thyristor Stack Overtemperature • Thyristor "Trigger" Failure • Thyristor Snubber Network • Zero-speed Detection • Standstill Logic • Stall Protection • Over Volts Protection • 3 Phase Failed
Diagnostics		• Fully computerised with first fault latch and automatic display • Digital LCD monitoring • Full diagnostic information available on RS422/RS485

	• LED circuit state indication

Table 2-1 Control Features

Keypads

The drive is fitted with the 6901 Keypad.

It provides Local control of the drive, monitoring and complete access for application programming.

For example, you can start and stop the motor, check on diagnostic information, and change parameters values on the drive.

The keypad fits to the front of the drive, however, you can also remote-mount the keypad up to 3 metres away.

For remote-mounting, you'll need the correct Remote Mounting Kit. Refer to Chapter 6: "The Keypad".

Option Boards

A range of Option Boards are available for the DC590PR 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 installation of the DC590PR drive and associated equipment.

- **Mechanical Installation**
  - **Unpacking the Drive**
  - **Lifting the Drive**
  - **Mounting the Drive**
  - **Ventilation and Cooling Requirements**
  - **AC Line Choke**
  - **Filtering**
- **Electrical Installation**
  - **Minimum Connection Requirements**
  - **Motor Field Options**
  - **Power Board Circuit Descriptions**
- **Optional Equipment**
  - **Remote Mounting the Keypad**
- **Installation Drawings**
  - **Drive Installation Drawings**
  - **Filter Installation Drawings**
  - **Line Choke Installation Drawings**

Mechanical Installation

IMPORTANT	***Read Appendix B: "Certification" before installing this unit. Refer to "Installation Drawings", page 3-42 for further information.***

Unpacking the Drive

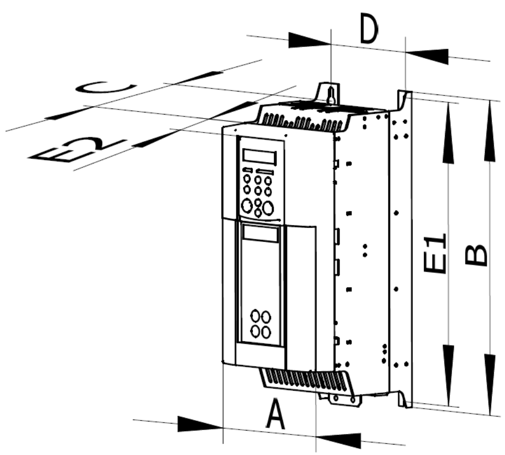
Caution

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

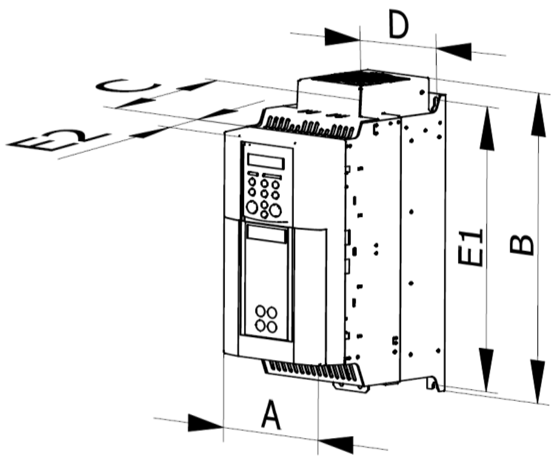
Save the packaging in case of return. Improper packaging can result in transit damage.

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.



20A-45A
Frame 1



75A-165A
Frame 2

Current Rating (A)	Weight in Kg (lbs)	Overall Dimensions			Fixing Centres		
		A	B	C	D	E1	E2
20	5.2 (11.4)	170 (6.7)	415 (16.4)	118 (4.7)	140 (5.5)	400 (15.8)	52(2.0)
35 - 45	7.2 (15.8)	170 (6.7)	415 (16.4)	145 (5.7)	140 (5.5)	400 (15.8)	52(2.0)
75	8.3 (18.2)	170 (6.7)	439 (17.3)	145 (5.7)	140 (5.5)	400 (15.8)	52(2.0)
110 - 165	10.4 (22.8)	170 (6.7)	439 (17.3)	183 (7.2)	130 (5.1)	400 (15.8)	52(2.0)

Dimensions are in millimetres (inches)
Refer to "Installation Drawings", page 3-40.

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 3-39.**

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 (2008)/EN61800-5-1(2007), the cubicle must require a tool for opening.

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

Caution

Use proper lifting techniques when lifting and moving.

Drill the mounting holes into the backplate. The holes must be positioned accurately. Fit the nut inserts. Fit bolts and washers into the top inserts so that the drive can be hung using the keyhole slots.

Hang the drive on the bolts, between the panel and washers you have just fitted. Fit bolts and washers to the lower nut inserts. 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, M10, M13, M17, 7/16”, 1/2”
Screwdrivers	Phillips No.2, flat blade - 0.5 x 3.0mm, 0.8 x 4.0mm
Wire cutters	Small

Ventilation and Cooling Requirements

NOTE **When fitting a drive into a sealed enclosure additional cooling MUST be provided, otherwise the internal air will overheat causing the drive to trip on "overtemperature".**

Refer to Appendix E: "Technical Specifications" - Cooling Fans.

The Drive gives off heat during 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 DC590PR'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 Appendix E: "Technical Specifications" - AC Line Choke for selection details.

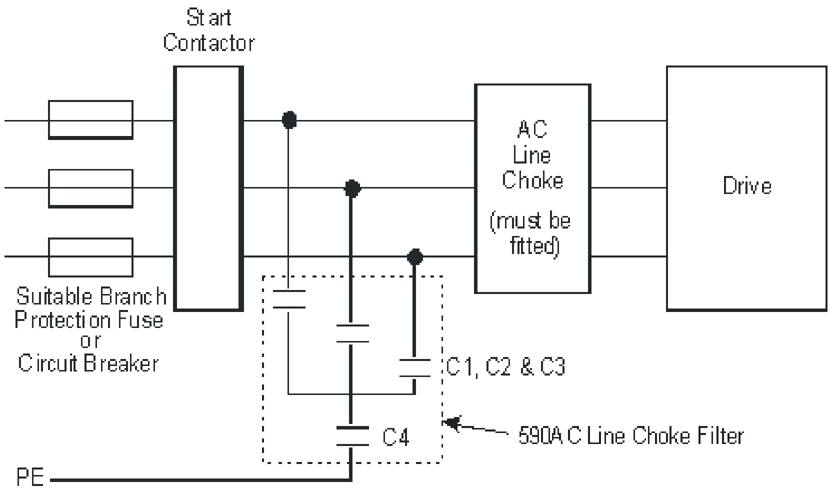
Filtering

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 3-39)
2. Compliant filtering offered by the System
3. Capacitors fitted between phase and earth (see Figure 3- below)



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

Figure 3-1 AC Line Choke and Capacitors fitted to Frame 1 (20A & 35A& 45A) & Frame 2 (75A) 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 *Wiring Requirements for EMC Compliance* and *Wire Sizes and Termination Tightening Torques*.**

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 Automation China.

If fitted, the AC filter MUST be placed between the supply and the choke.

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

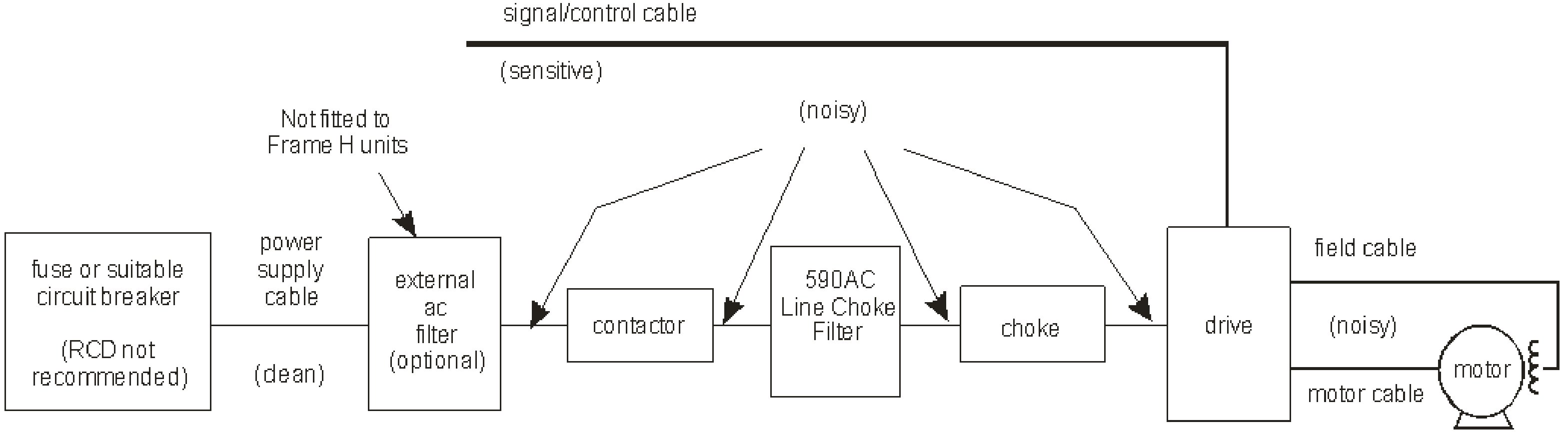


Figure 3-2 Cabling Requirements

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.

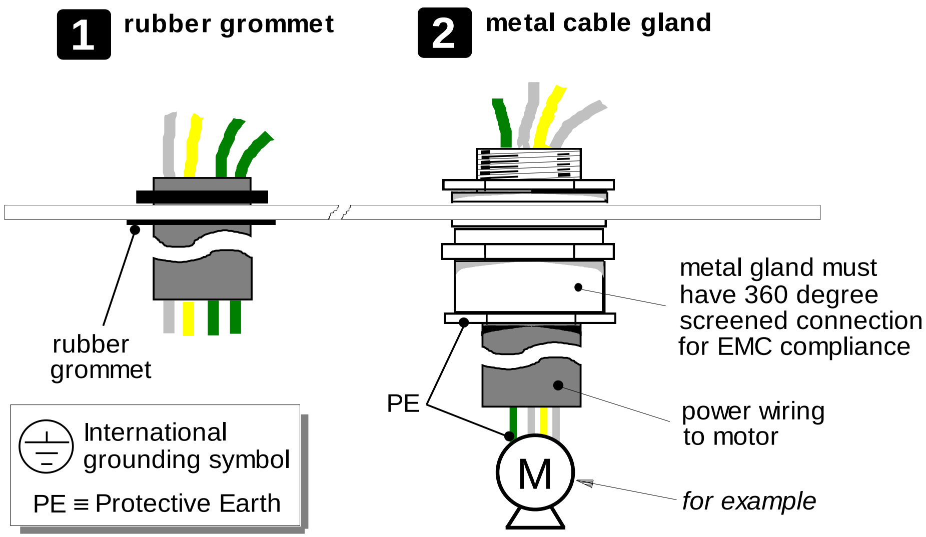


Figure 3-3 Cable and Screen Fixings

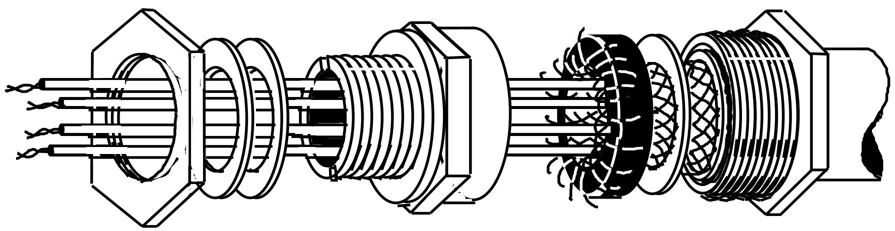


Figure 3-4 360 Degree Screened Connection

Minimum Connection Requirements

IMPORTANT ***If in doubt about the connection of the DC motor to the drive, contact Parker Automation China.***

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 an 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)

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^2 (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

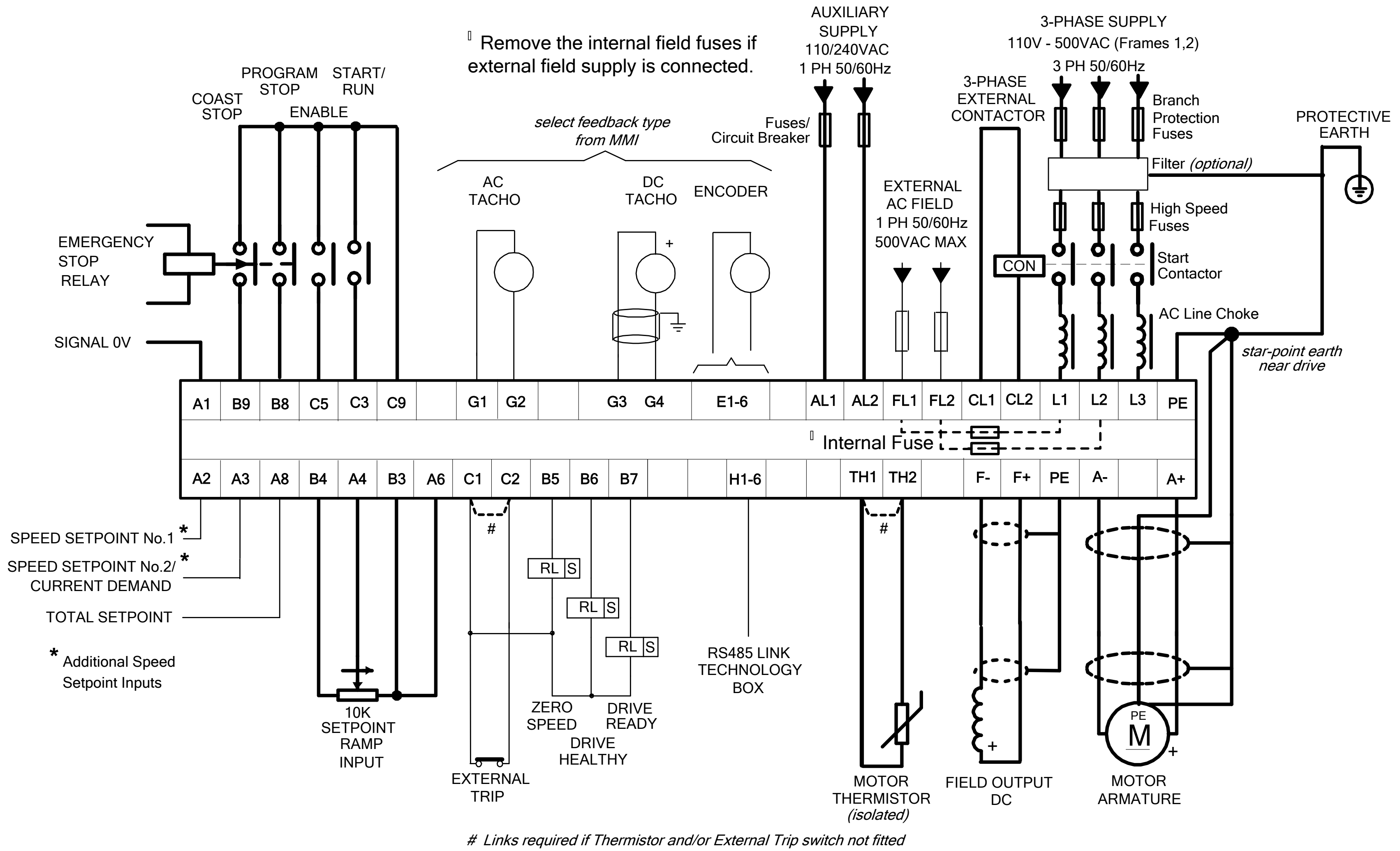
The following connections must be made for the drive to run:

- Terminals TH1 and TH2 must be linked if a motor thermostat is not fitted.
- Terminals C1 and C2 must be linked if an External Trip interlock is not required.

Connection Diagrams

FRAMES 1, 2,
Bold lines indicate "minimum connections"

Figure 3-5 Power Connections: Frames 1, 2 (`general purpose' configuration)



Power Connections

L1	**3-Phase Supply, 3-Phase External Contactor**	
L2	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.	Frame 1&2: Terminals 3 & 4 = TB16
L3	Connect the contactor coil to terminals 3 (Line) and 4 (Neutral).	
3		
4		

Frame 1&2: Terminals 3 & 4 = TB16

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 x DC Armature Current

You must provide branch circuit protection using a suitable fuse or Type 2 circuit breaker (RCD, ELCB, GFCI circuit breakers are not recommended, refer to "Earth Fault Monitoring Systems", page 3-41). Also refer to Appendix B: "Certification" - Conditions for Compliance with UL508c.

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 3-39.

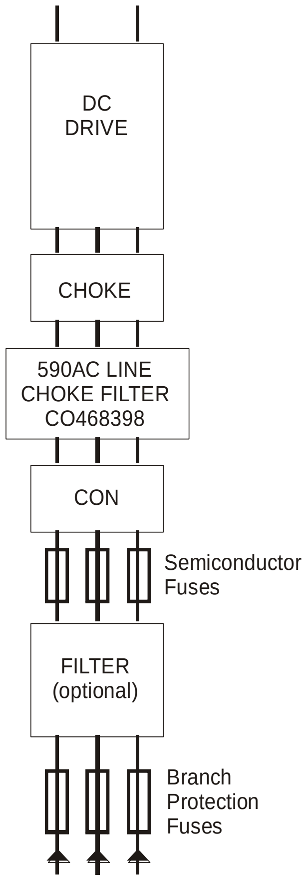


Diagram shows correct placement of units

Power Connections continued

3-Phase Supply, 3-Phase External Contactor continued

3-Phase External Contactor

The contactor does not switch current and is primarily for disconnection and sequencing of the power bridge. It must be energised directly from the controller by a coil with a rating suitable (AC1) for the controller concerned. No additional series contacts or switches are permitted since they will interfere with the sequencing of the controller and cause unreliability and possible failure.

Connect to main contactor terminals CL1 and CL2 only as described in Appendix E, otherwise unreliable or dangerous operation may occur - do not connect to a PLC input or sensitive relay.

Slave Relay : 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.

DC Contactor : A DC contactor can be used but the sequencing must be adjusted to accommodate its use: an auxilliary 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.

AC Line Choke

IMPORTANT ***Always fit the recommended choke. Refer to Appendix E: "Technical Specifications" - AC Line Choke.***

We can provide suitable chokes, designed to connect directly to the drive terminals. Refer to Appendix E: "Technical Specifications" - AC Line Choke.

Power Connections continued

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 drive requires either two individual incoming protective earth conductors (<10mm ² cross-section), or one conductor (≥10mm ²cross-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.

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

A+

A-

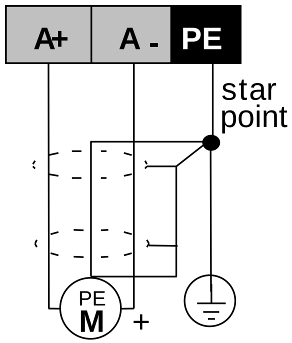
Motor Armature

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

Connect the cable screen to the motor's PE terminal and the earth/ground star point. Connect the motor's PE terminal to the earth/ground star point.

For cable information refer to Appendix B: "Certification" - Recommended Wire Sizes.

NOTE **If the drive is to operate in regenerating mode for long periods, it is advisable to fit a dc fuse or high speed circuit breaker in the armature circuit. If in doubt consult Parker Automation China**



Power Connections continued

Motor Field

F-
F+

Connect the motor field (-) to terminal F-, and connect field (+) to terminal F+ (TB1).

Connect the cable screen to the independent earth/ground point.
If the motor has no field connections, is a permanent magnet motor, or if the field is derived externally, you must either:

disable the FIELD ENABLE parameter (Tag No. 170) later during Set-up (disables the Field Fail alarm automatically)

or

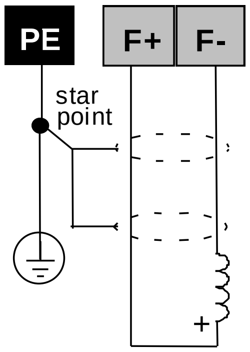
disable the Field Fail alarm

MMI Menu Map

1 SETUP PARAMETERS
2 FIELD CONTROL
FIELD ENABLE

MMI Menu Map

1 SETUP PARAMETERS
2 INHIBIT ALARMS
FIELD FAIL



Motor Thermistor

Th1
Th2

Connect the motor thermistor to terminals Th1 and Th2 or

link terminals if sensors are not fitted.

Terminals Th1 and Th2 must be linked if motor 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. When the motor is fitted with over-temperature sensing devices, such as thermostats or PTC thermistors, these should be connected (in series) between terminals TH1 and TH2.

- Thermistors must have a combined working resistance of 750Ω or less, rising to 4kΩ at over-temperature. These thermistors are classified by IEC34-II as Mark A.
- Temperature switches must be normally closed, and open at rated temperature.

The over temperature alarm will activate at 3kΩ. It is latched in software and must be reset by re-starting the Drive.

NOTE **The motor temperature alarm (THERMOSTAT) cannot be inhibited in software.**

Power Connections continued

FL1 FL2	**External AC Field**	☐ ✔
	Connect the external field supply to terminals FL1 and FL2 (TB2).	Used if an external field supply is required to the controller for application reasons. The magnitude of this voltage is determined by the desired field voltage. The supply must be protected externally with suitable fuses. *IMPORTANT* ***Need to remove internal field fuses when using external field supply.The connection of the controller and the external field supply must be consistent when using an externally supplied field regulator. Always derive the 1phase, 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 FL1 and the Yellow phase to terminal FL2.*** NOTE **You must provide branch circuit and overload protection.** To change the drive from an internal to an external field type refer to "Motor Field Options", page 3-24.
L N	**Auxiliary Supply**	☐ ✔
	Connect the control supply to terminals AL 1 and AL2.	Single phase, 110/240V ac, 50/60Hz. *Note:* **The auxiliary supply chosen must equate to the contactor coil voltage used.** *IMPORTANT* ***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 Automation China.*** 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. Refer to Appendix E: "Technical Specifications" - Power Supply Fuses.

Control Connections

A1

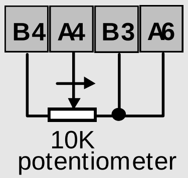
A4

B3

B4

Ramp Speed Setpoint

Connect a 10k potentiometer between terminals A1 and B3. Connect the wiper to A4.



Speed Demand

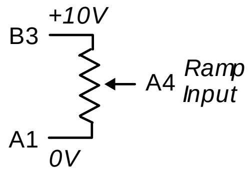
Controls the speed of the motor

Uni-directional Speed Setpoint

This connection provides a Uni-Directional Speed Setpoint for non-reversing applications and the 2 Quadrant controller (591PR):

Maximum forward speed setpoint (+100%)	=	Terminal B3, +10V input
Zero speed setpoint (0%)	=	Terminal B1, 0V input

Thus, zero speed is at the **left** (anti-clockwise) position on the potentiometer.

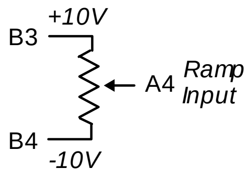


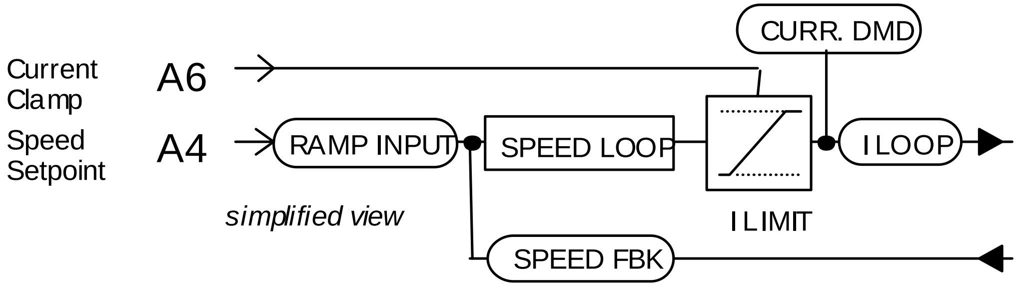
Bi-directional Speed Setpoint

Alternatively, substitute A1 for terminal B4 to scale the input such that:

Maximum forward speed setpoint (+100%)	=	Terminal B3, +10V input
Maximum reverse speed setpoint (-100%)	=	Terminal B4, -10V input

Thus, zero speed demand is at the **centre** position on the potentiometer.





In both cases, the Current Limit is controlled via terminal A6 (ANIN5).

NOTE **Terminals A1, B1 and C1 (Signal 0V) are the common reference points for all analog signals used in the drive.**

Control Connections continued

A6 **B3**

Current Limit

Connect terminal A6 to B3.

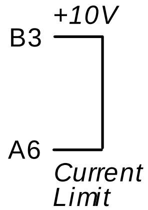
Current Limit
Controls the available motor torque

This connection provides control of the Positive and Negative Current Clamps and hence the Current Demand via terminal A6 (ANIN5). The "ANIN 5 (A6)" function block contains parameters to set up maximum/minimum values for the analog input, and a scaling ratio.

Adjust the main current limit using the MAIN CURR. LIMIT parameter [Tag No. 15]. Refer to Appendix D: "Programming" - CURRENT LOOP.

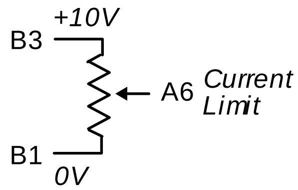
Fixed Current Limit

For normal operation of the main current limit, connect Terminal A6 (ANIN5) to Terminal B3 (+10V reference) and set the CURR.LIMIT/SCALER parameter to 200%. This allows the MAIN CURR.LIMIT parameter to adjust the current limit between 0 and 200% full load current.



Variable Current Limit

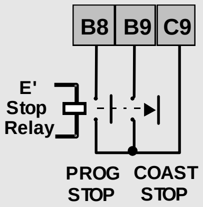
If external control of the current demand is required, an additional 10K potentiometer connected between Terminal B3 (+10V Ref) and Terminal B1(0V), with the wiper connected to Terminal A6 (Analog I/P5) gives 0 to 200% of full load current provided that the MAIN CURR. LIMIT and CUR. LIMIT/SCALER parameters are set to 200%.



B8 **B9** **C9**

Program Stop/Coast Stop

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



These connections provide a Program Stop (B8), and a Coast Stop (B9).
Refer to Chapter 4: "Operating the Drive" - Starting and Stopping Methods.

The "Emergency Stop" relay (normally-open, delay on de-energisation) should not be part of the normal sequencing 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.

- Removing 24V from B9 opens the main contactor via the relay
- Removing 24V from B8 provides regenerative braking for 4 Quadrant DC590PR drives

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

Control Connections continued

C5 / **C9**	**Enable**	☐ ✔
	Connect terminal C5 to C9.	Terminal C5 (Enable) must be connected to C9 (+24V) to allow the drive to run. **Connection via a switch 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.** **It is important that more than one stop input (ENABLE C5, START/RUN C3, COAST STOP B9, PROG STOP B8) is always used to ensure stopping of the drive under single fault conditions .**
C3 / **C9**	**Start/Run**	☐ ✔
	Connect terminal C3 to C9 via a switch.	When the single contact between C3 and C9 is closed the drive will run provided that: • B8 & B9 are TRUE (+24V) - see "Emergency Stop" above • C5 is TRUE (+24V) - see "Enable" above When the single contact between C3 and C9 is opened the drive 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 Appendix D: "Programming" - STOP RATES for further details. NOTE **If Enable C5 is opened during a Normal Stop sequence, the drive is disabled, the contactor opens, and the drive will Coast To Stop.**
C4 / **C9**	**Jog/Slack**	☐ ✔
	Connect terminal C4 to C9 via a switch or pushbutton.	• If the drive is stationary this switch provides a Jog facility. • If the drive is running, this switch provides a Take-Up Slack facility. For other user-definable operating modes, refer to Appendix D: "Programming" - JOG/SLACK for further details.

Control Connections continued

Terminals	Connection	Description
C1, C2	**External Trip**	
	Connect terminal C1 to C2, or link terminals if not required.	**Terminals C1 and C2 must be linked if an External Trip interlock is not required.** This input terminal provides an external trip facility to any normally-closed trip switch , e.g. for vent fan overload protection.
C1, B6	**Drive Healthy**	
	Connect terminal C1 to B6 via a lamp (for example).	This is one of three digital output terminals that provide a +24V dc output signal under certain conditions. They allow 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. The drive is "healthy" (TRUE) if there is no Start command. 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.
B5, B6, B7	**Digital Outputs**	
	User connection to external equipment.	There are three digital output terminals that provide a +24V dc output signal under certain conditions. They allow 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 Refer to Appendix E: "Technical Specifications" - Terminal Information - Control Board, also Chapter 6: "The Keypad" - DIAGNOSTICS.

Control Connections continued

A2 A3 C8	**Direct Speed Setpoints**	
	Connect your external setpoint(s) to terminal A2 and/or A3.	**Speed Setpoint No. 1 (A2)** This input is configurable 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)** This input is **not** configurable. 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. Also refer back to A4, Ramp Speed Setpoint, page 3-16.
A5 B4 C6 C9	**Auxiliary Current Clamp (-ve)**	
	Connect terminal A5 to B4 to provide -10V, or supply externally. Connect terminal C6 to C9 to enable bipolar current clamps.	Used to allow separate control of positive and negative Main Current Clamps, for example, in Winder applications. Enable bipolar current clamps by providing 24V at terminal C6. Terminal A5 (ANIN4) is an Auxiliary Current Clamp (-ve), 0 to -10V. NOTE **If driven positive, it will form a current demand.** The "ANIN 4 (A5)" function block contains parameters to set up maximum/minimum values for the analog input, and a scaling ratio. With 24V at terminal C6, Terminal A6 (ANIN 5) acts only as the Auxiliary Current Clamp (+ve), 0 to +10V.

Control Connections continued

A7 A8	**Analog Outputs**	
	User connection to external equipment.	These are configurable outputs and can be used as required in the control system design, i.e. connection to a meter, for cascading to another drive. • Terminal A7, Analog Output 1 provides a Speed Feedback value, -10V to +10V • Terminal A8, Analog Output 2 provides a Total Speed Setpoint value, -10V to +10V The "ANOUT1" and "ANOUT2" function blocks contain parameters to configure the values.
A9	**Current Meter Output**	
	User connection to external equipment.	This connection is for a Current Meter. The "ARMATURE I (A9)" parameter is used to select either unipolar or bipolar output. Refer to Appendix D: "Programming" - CALIBRATION. This ouput is **not** configurable. It is driven directly by hardware.
C6 C7 C8	**Digital Inputs**	
	User connections to the drive.	These configurable 24V dc digital inputs are used to control the drive. The default configurations are: • C6 : Current Clamp Select (see A5 and A6) • C7 : Ramp Hold • C8 : Current Demand Isolate (see A3) Refer to Appendix E: "Technical Specifications" - Terminal Information - Control Board, also Appendix D: "Programming" - DIGITAL INPUTS.

Control Connections continued

Terminals	Analog Tachometer	
G1 G2 G3 G4	**User connection to external equipment.** **Fit the Tacho Calibration Option Board to the Drive.** **This provides terminals G1 to G4.**	Refer to Optional Equipment, page 3-32, for further information. An Analog Tachometer 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 tachometer. The screen is grounded or earthed only at the drive end, any other grounding arrangement may cause problems. • Terminals G1 & G2 are for AC tacho connections. • Terminals G3 & 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 dc feedback to the speed loop. Consequently, the controller can only be used with a positive setpoint.* Refer to Chapter 4: “Operating the Drive” for set-up information.

Control Connections continued

E1	**Wire-Ended Encoder**	
E2 E3 E4 E5 E6	User connection to external equipment. Fit the Encoder Option Board to the Drive. This provides terminals E1 to E6.	Refer to Optional Equipment, page 3-32, for further information. The wire-ended encoder is connected to the Drive using a screened cable throughout its entire length to provide speed feedback. Terminals E1 (0V) and E2 (+24V dc) are the return and supply respectively. NOTE **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.** The maximum allowable encoder frequency is 100kHz, thus with a standard 1000 lines per revolution encoder the motor speed cannot exceed 6000 rpm. For specification and connection information refer to Parker Automation China or the appropriate Technical Manual.
H1	**Technology Box Option**	
H2 H3 H4 H5 H6	User connection to external equipment. Fit the Technology Box Option to the Drive. This provides terminals H1 to H6.	The Technology Box Option allows drives to be linked together to form a network. We can supply Options for most protocols. Refer to Appendix D: "Programming" - TEC OPTION for information about Technology Box Option types. For detailed information, refer to the appropriate Technical Manual supplied with the Technology Box.

Motor Field Options

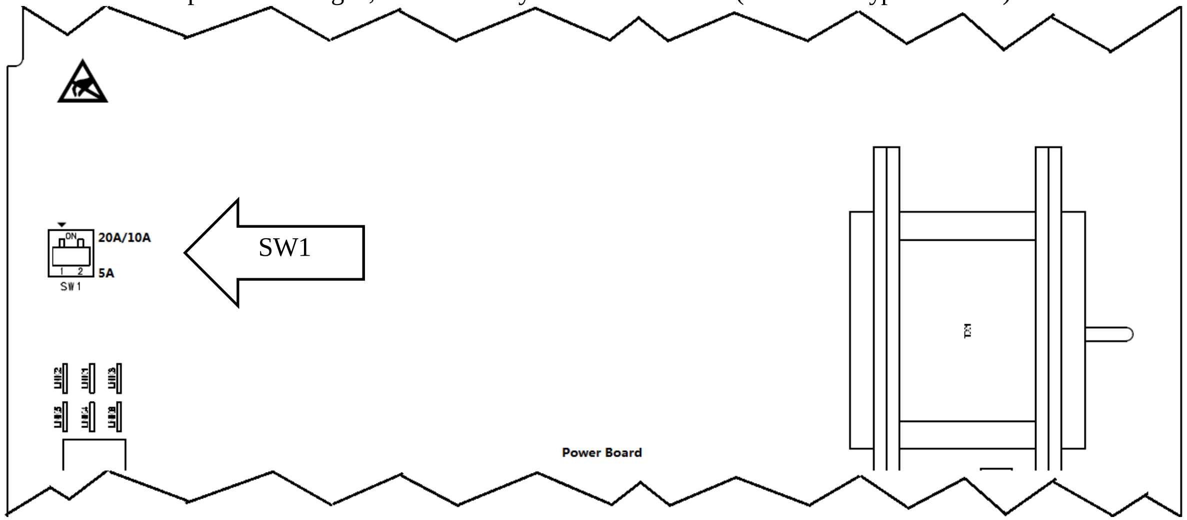
WARNING

Isolate the drive before converting to internal/external supply.
The setting of the field current range switch (SW1) must not be changed when the drive is powered on.

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 FLD. VOLTS RATIO 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).
- Field current range switch (SW1) has been provided on power board for improved resolution at low field current as shown below diagram. If it is intended to use the controller below 5A field current, then SW1 should be set to the 5A position.

Note: After the SW1 position changed, it is necessary to set the P-Code. (Refer to Keypad section)



Internal/External Supply (Frames 1&2)

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).

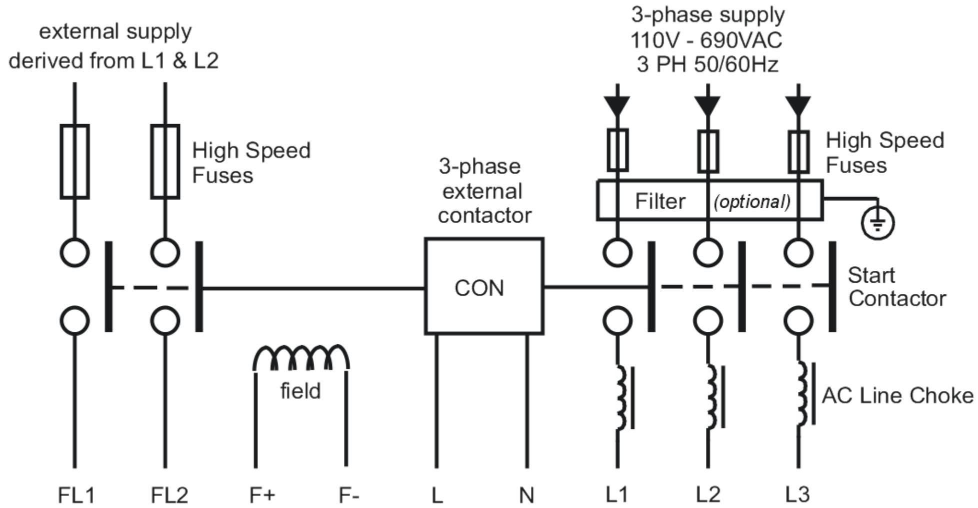
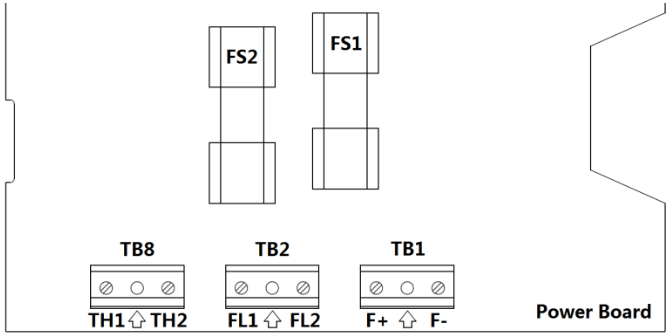


Figure 3-6 Typical connection diagram

Power Board - PCB Reference 860021 (Frame 1 & 2)



Internal Motor Field (default for this board)

Terminals F+ and F-, the motor field outputs, are energised when the 3-phase supply is connected to L1/L2/L3. Terminals FL1 and FL2 are not required. The internal motor field supply is fused by 10A fuses, FS1 & FS2 for Frame 1,20A for Frame 2.

Caution

The FL1 & FL2 terminals will be energised (live) when the internal field supply is used , and so these FL1 & FL2 terminals should not be connected to in this supply mode.

External Motor Field Connections

Terminals FL1 and FL2 can be used for external ac supply connection for the Motor Field Supply. You should remove the internal Fuse FS1 & FS2 and provide suitably rated external, fast acting semi-conductor fusing, to a maximum of 15A for Frame1 & 20A for Frame2.

Caution

External field currents above 10A up to the 15A for Frame1 require de-rating of the armature output current (amp for amp), and only apply for operation at or below 35°C ambient.

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 single-phase transformer.
L1 must be connected to FL1, and L2 connected to FL2.

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

Power Board Circuit Descriptions

AH860021T502, T504, T512, T514, (Frame 1 & 2)

(590PR - 4 Quad, 591+ - 2 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 FS4 provides protection of the high voltage elements in a fault condition.

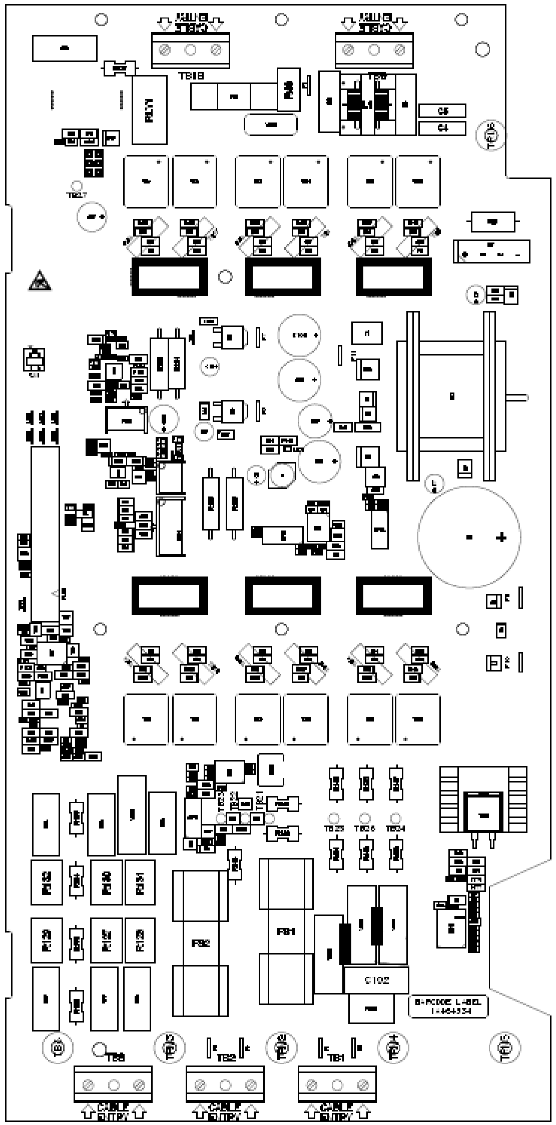
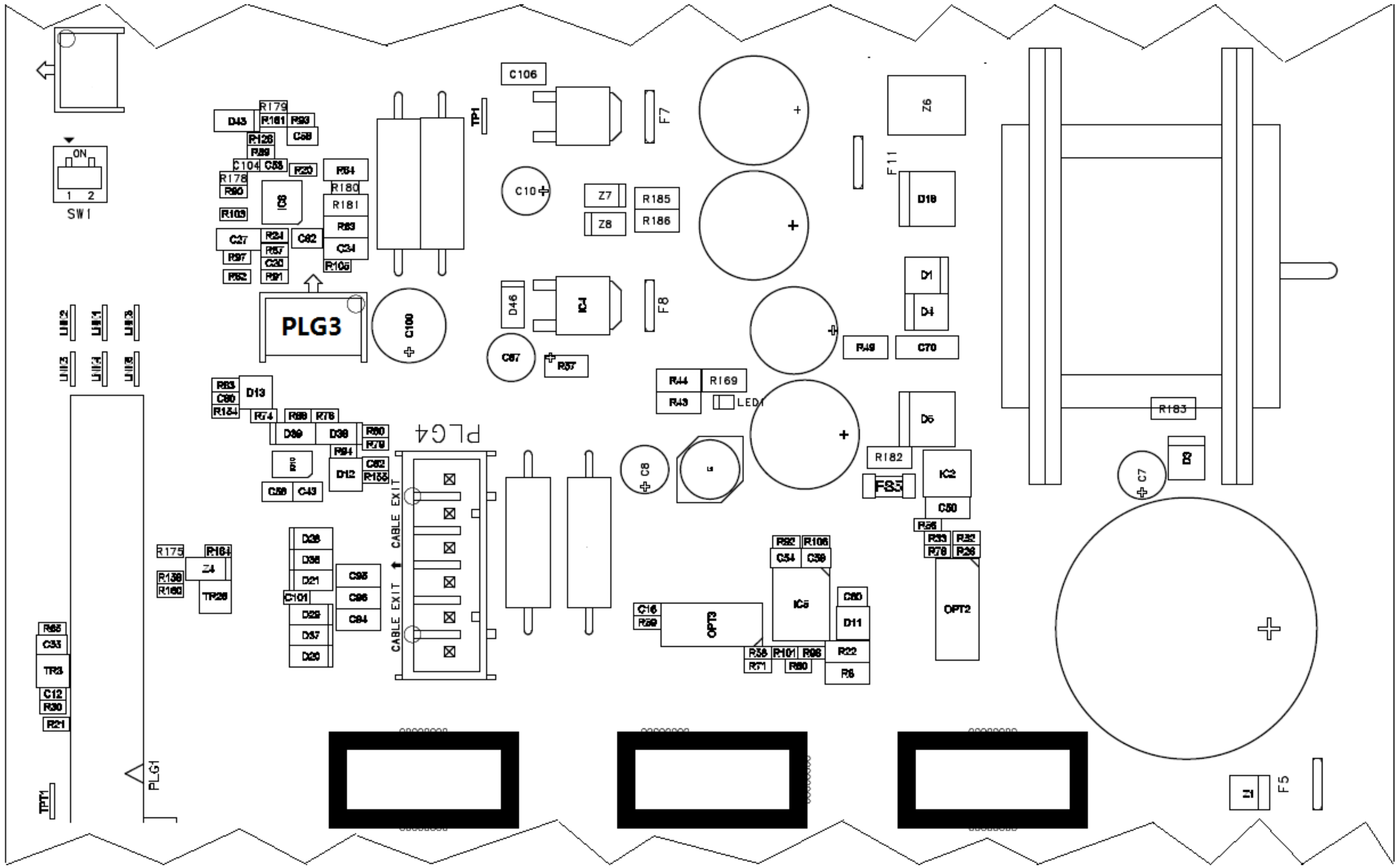


Figure 3-7 590PR Frame 1 & 2 4Q Power Board

Heatsink Cooling Fan Connections

When fitted, these fans are connected on the power board to PLG3 as below drawing:



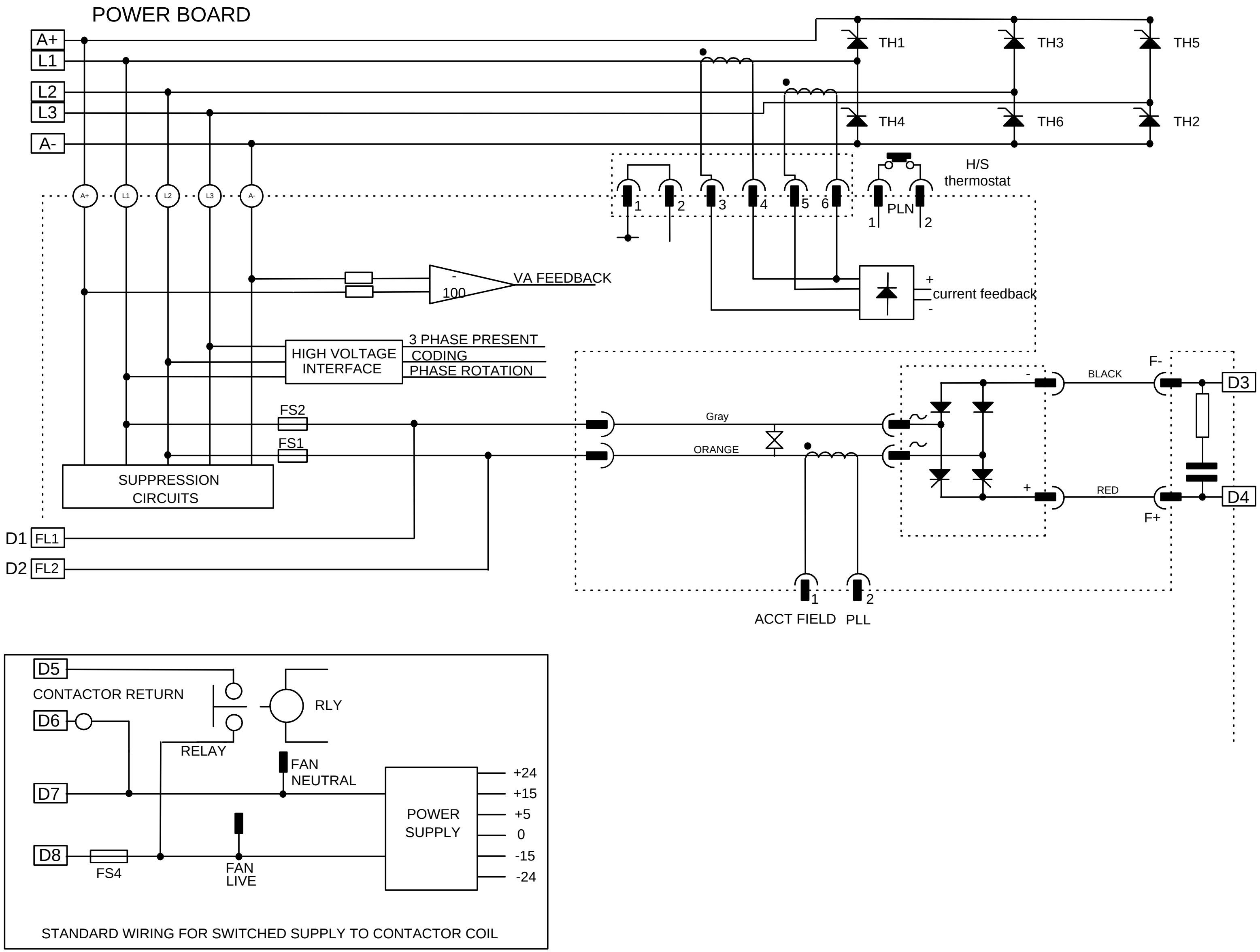


Figure 3- 8   2 Quad Power Circuit - using AH860021U003, U004 (Frame 1&2)

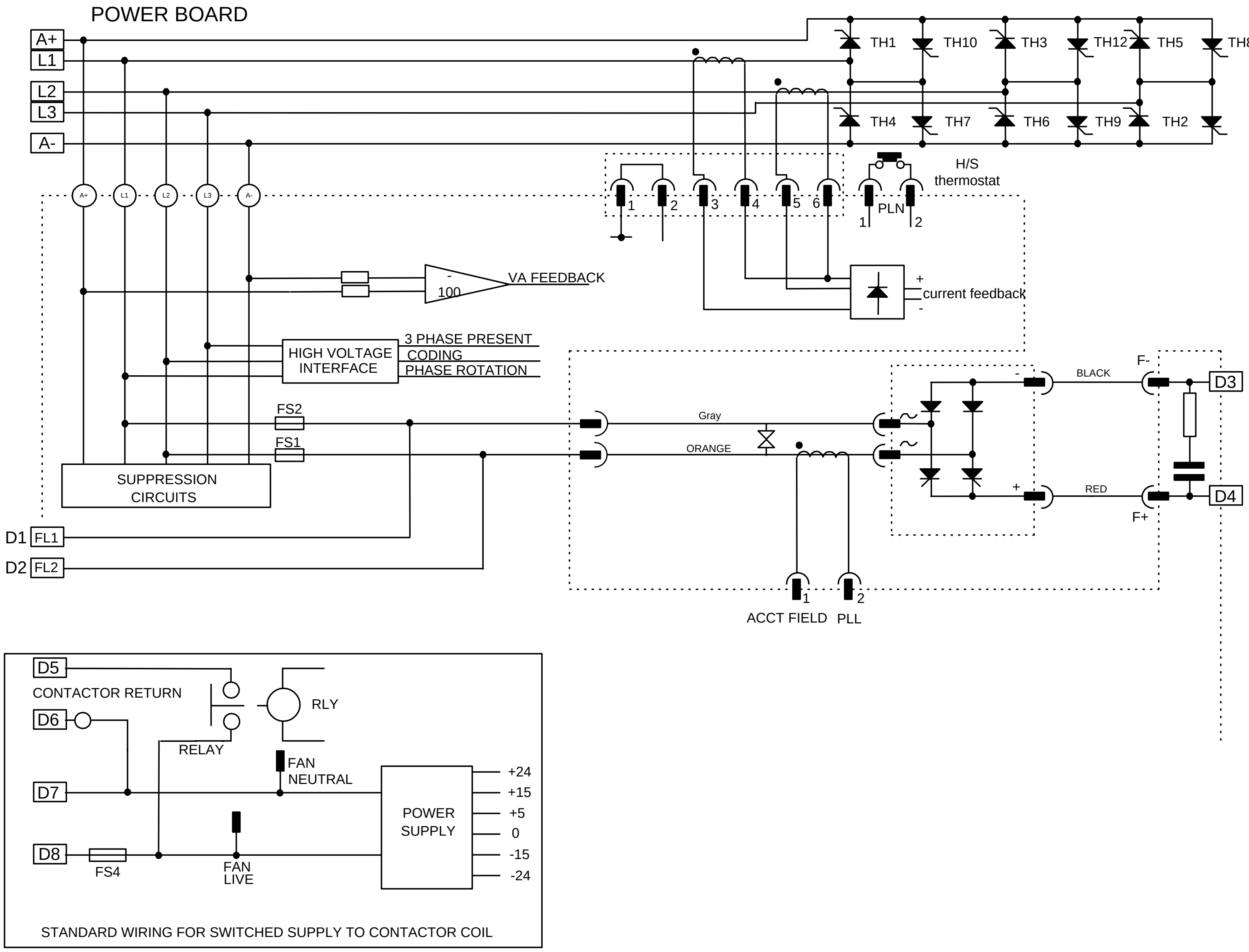


Figure 3- 9 4 Quad Power Circuit - using AH860021U002, U005 (Frame 1&2)

Optional Equipment

Contact your local Parker Automation China office to order optional equipment.

Item	Part Number
DSELite *Parker Automation China' Windows-based block programming software*	Go to www.parker.com
External AC Supply (RFI) Filter *For Drives without internal filters, on cable runs in excess of 25 metres*	Refer to Appendix E: "External AC Supply (RFI) Filters" for Part Numbers
Encoder Option Board *A board to interface to a wire-ended encoder*	AH387775U001 (universal)
Tacho Calibration Option Board *A switchable calibration board for interfacing to AC/DC analog tachogenerators*	AH385870U001
Comms Option Board (P1) Board *Two board types for supporting EI BYSYNCH or PROFIBUS communication protocols for connection to other equipment.* • *EI BYSYNCH (RS422, RS485)* • *PROFIBUS*	6055/EI00/00 6055/PROF/00

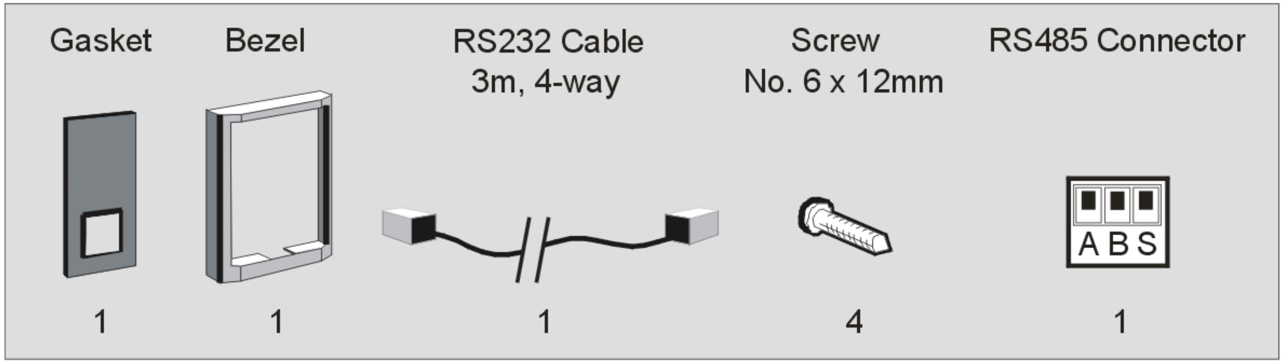
Remote Mounting the Keypad

The 6052 Mounting Kit is required to remote-mount a 6901 or 6911 Keypad. An enclosure rating of IP54 is achieved for the remote Keypad when correctly mounted using the 6052 Mounting Kit.

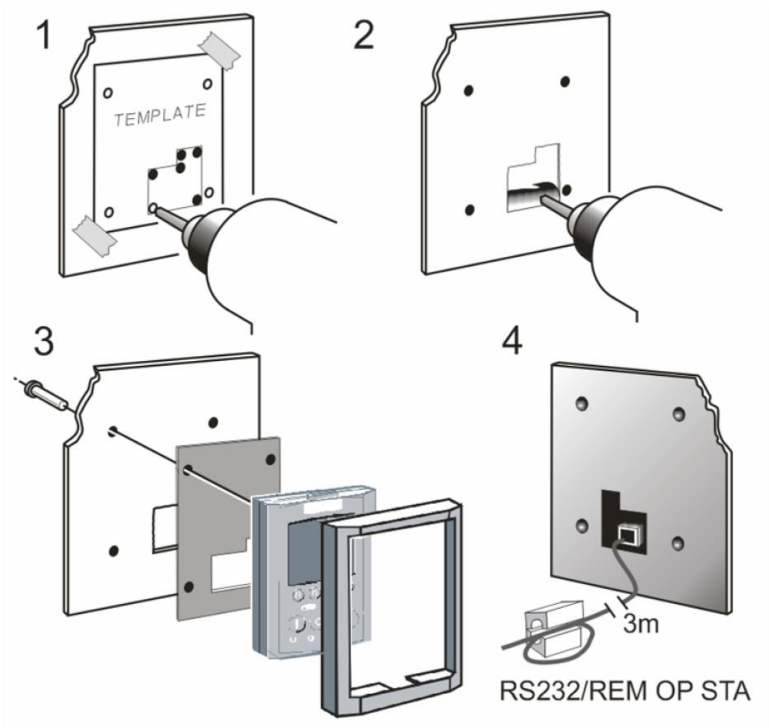
6052 Mounting Kit Parts for the Remote Keypad

Tools Required

No. 2 Posidrive screwdriver.



Assembly Procedure



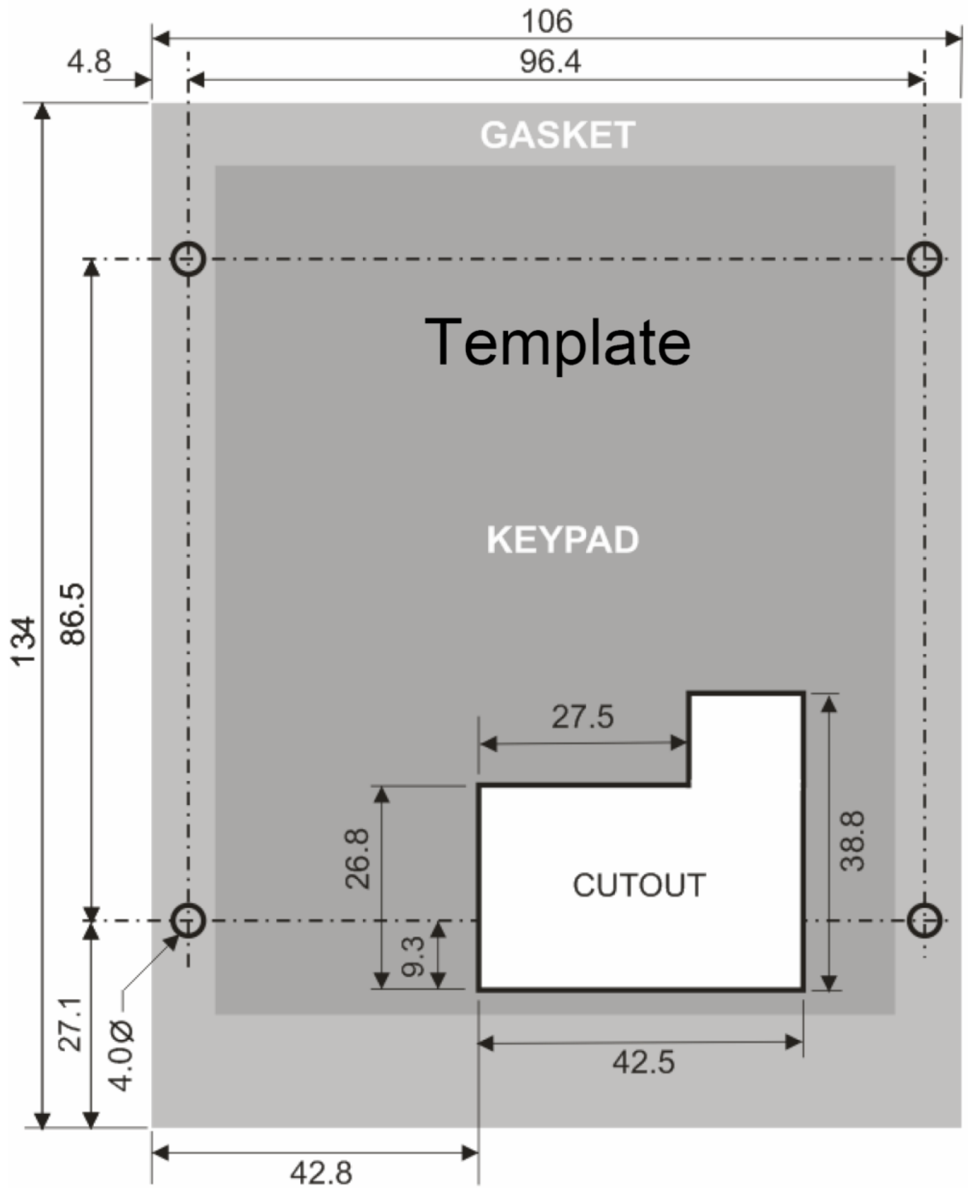


Figure 3-10 Mounting Dimensions for the Remote-Mounted Keypad

Speed Feedback and Technology Options

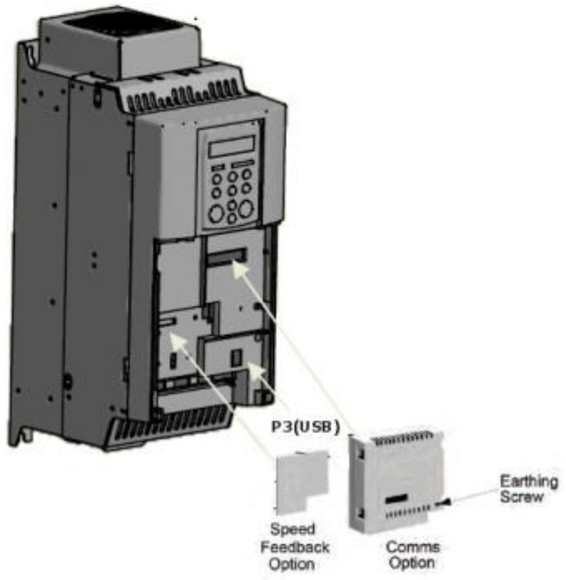
The Options are:

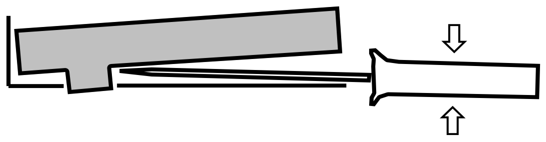
1. Speed Feedback (Analog Tacho Calibration Option Board/Encoder Feedback Option Card)
2. Communications Technology Box (6055 - LINK II, Profibus, DeviceNet, Serial RS485)

They are plugged into the two positions, as illustrated.

You can operate the Inverter with the Speed Feedback and/or Communications Technology Options.

Refer to the appropriate Technology Option Technical Manual for further information.





Removal

After removing the earthing screw, remove the COMMS option by carefully pushing a long screwdriver (for instance) under the option and gently levering it out. The pins are protected by the option moulding.

WARNING

Isolate the drive before fitting or removing the options.

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

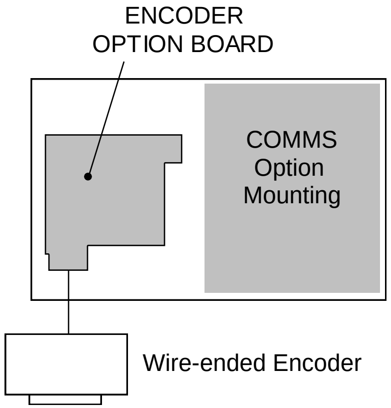
SPEED FBK SELECT

Wire-Ended Encoder Option Board

ENCODER

The board accepts connection from a wire-ended encoder.

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

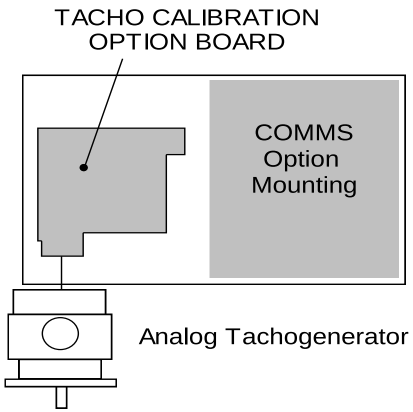


Tacho Calibration Option Board

ANALOG TACH

The board accepts connection from an analog tachogenerator.

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



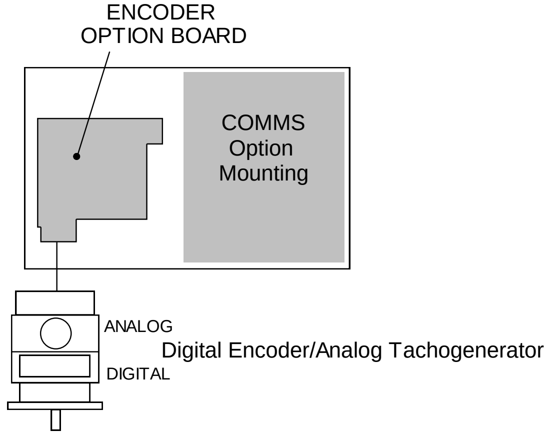
Combined Tacho and Encoder Feedback

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).

Note: External scaling resistors are required for the Analog Tacho Feedback and a shorting link inserted in the analog plug to directly connect terminal B2 to the analog speed feedback input.

Please refer to Parker Automation China Engineering Department for assistance with this feature (Special Build - Option 60).



Communications Technology Options

MMI Menu Map

1 SERIAL LINKS

2 TEC OPTION

TEC OPTION TYPE

Various protocols are supported, each requiring a different Technology Box. The type of Technology Box fitted is selected in the TYPE parameter:

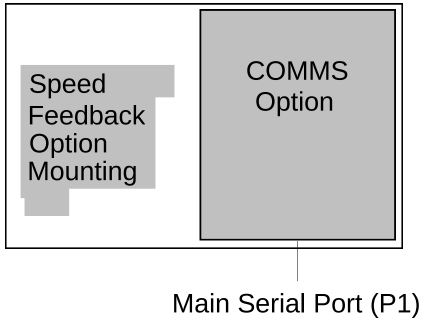
- RS485 (EI BINARY, EI ASCII or MODBUS RTU)
- PROFIBUS DP
- LINK
- DEVICENET
- CANOPEN
- LONWORKS

COMMS Option Technology Box

The option allows the DC590PR Drive to be controlled as part of a system.

The system can also comprise other Parker Automation China products such as the 690 and AC30 Inverters, or any other equipment using the same protocol.

IMPORTANT : The comms option should not be fitted or removed whilst the product is powered.



External AC Supply EMC Filter Installation

Refer to Appendix E: “Technical Specifications” - Environmental Details, and External AC Supply (RFI) Filters, and AC 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 A2 can be achieved (suitable for both generic environments: RF Emission and Immunity).

Cubicle-Mounting the DC590PR Drive with Filter

WARNING

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

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.

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 ^{2}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 360o 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 $10mm^2$
- 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 Automation China 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 EN61800-5-1(2007) / VDE0160 (2008)

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 : 2009).
- 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 Automation China 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

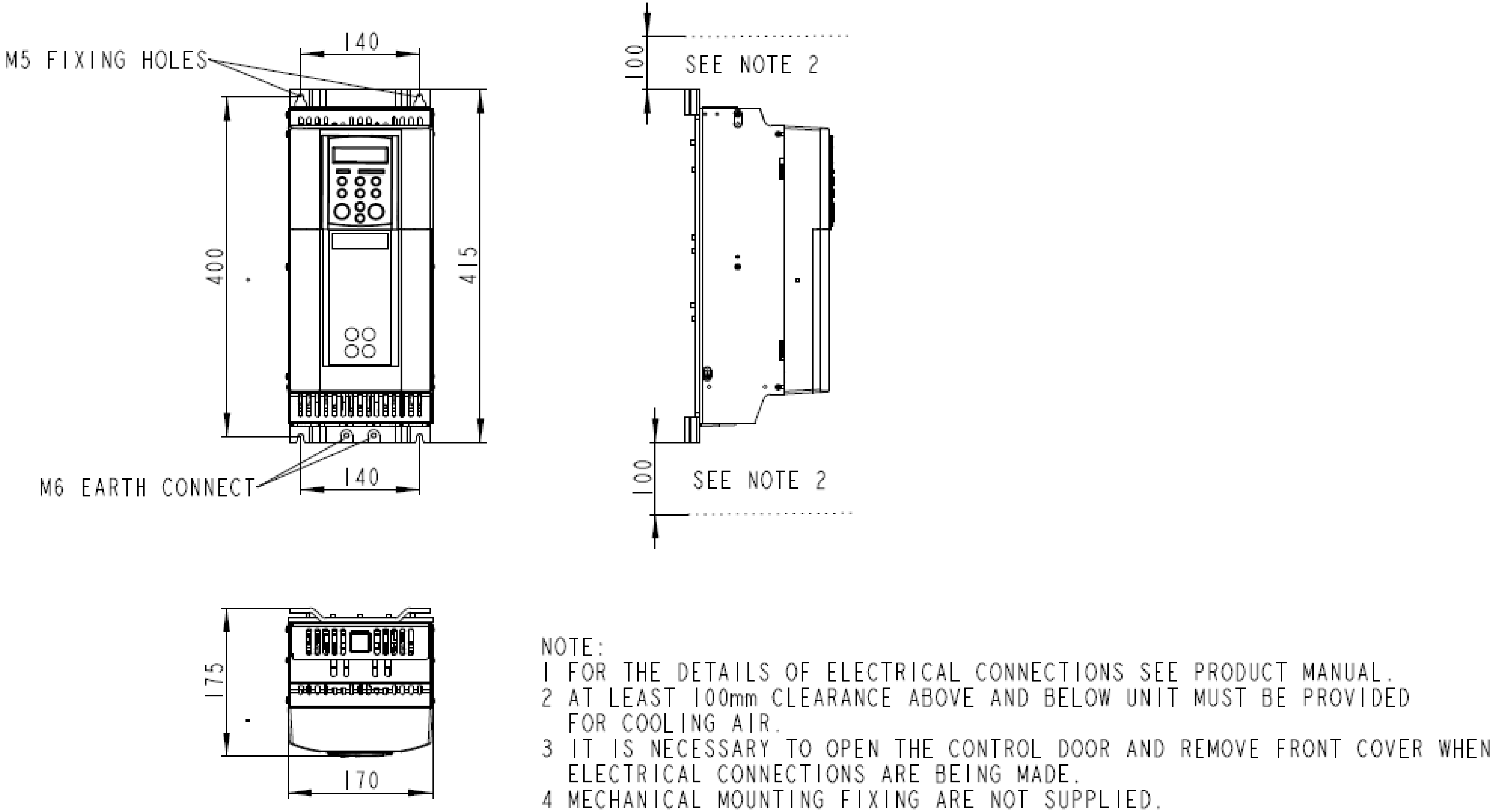


Figure 3- 11 Frame 1 : 20A Stack Assembly

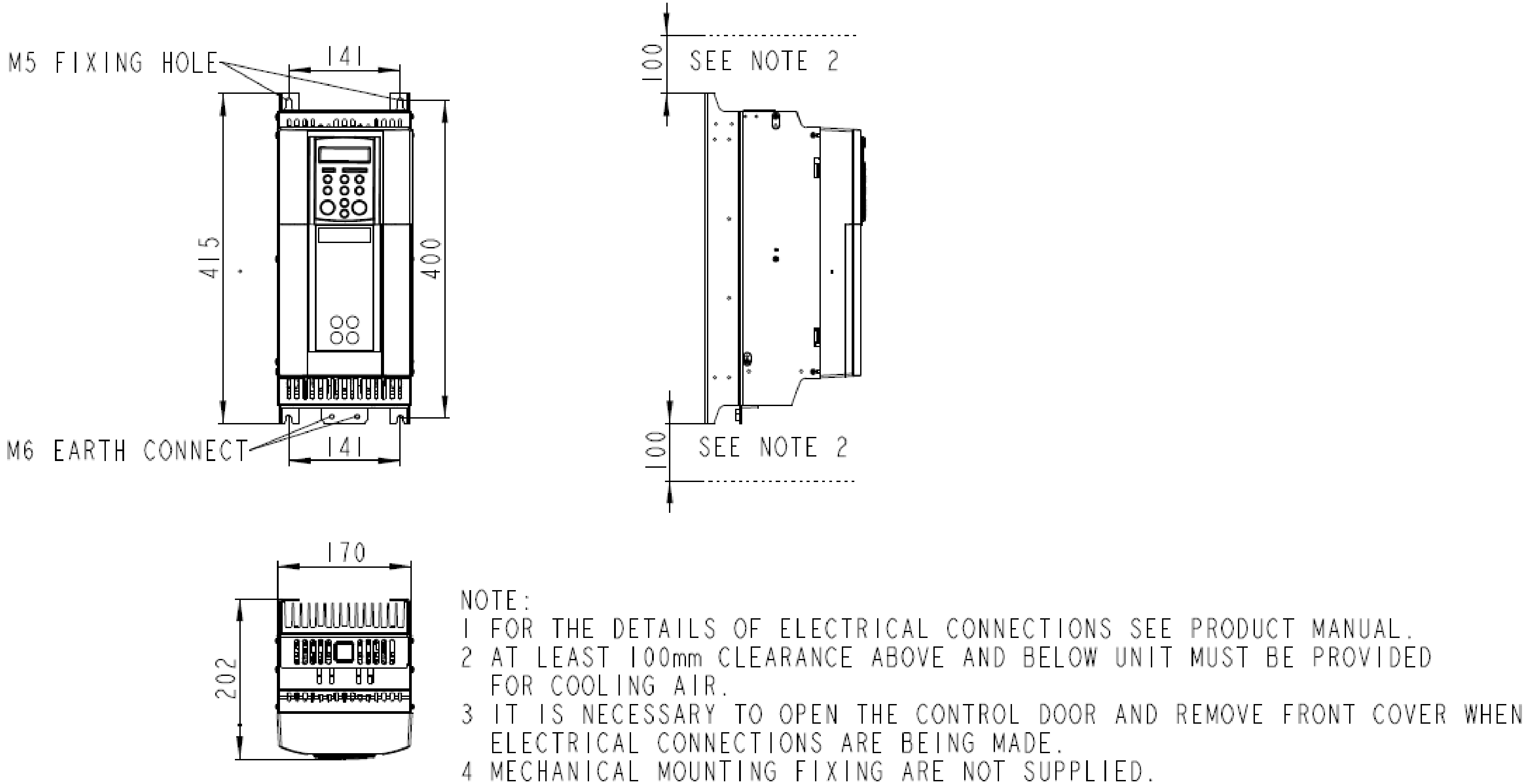
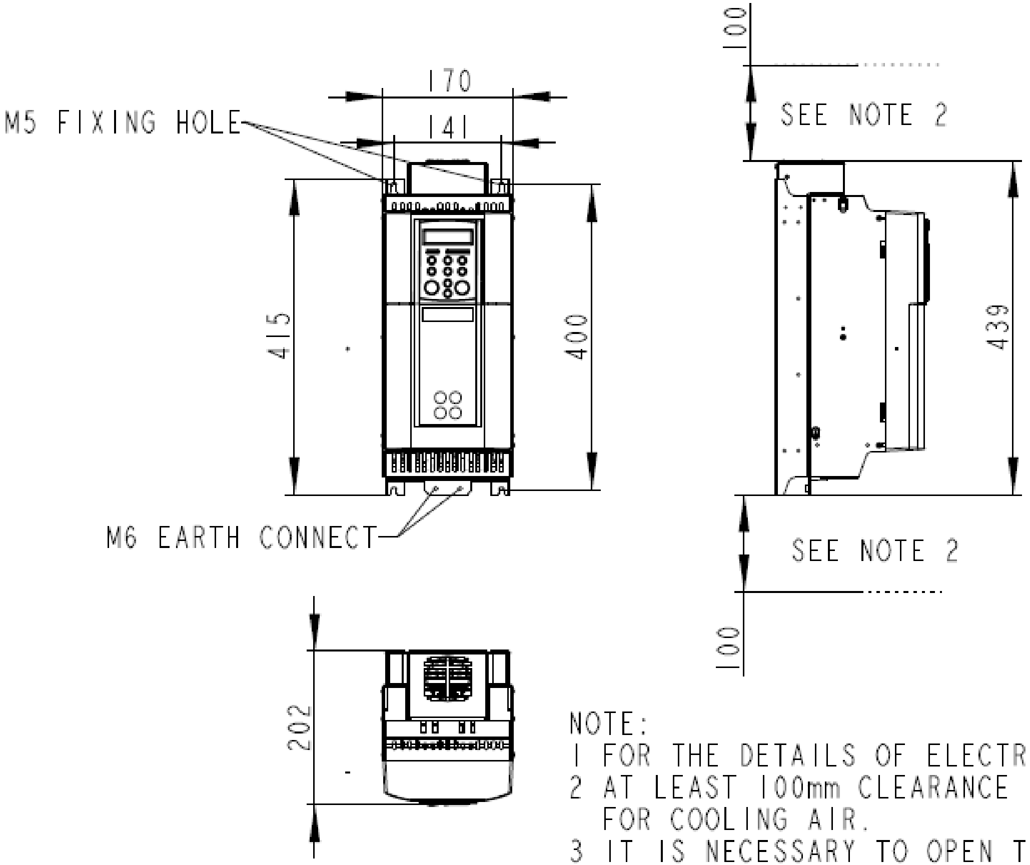


Figure 3- 12 Frame 1 : 35A & 45A Stack Assembly



NOTE:
1 FOR THE DETAILS OF ELECTRICAL CONNECTIONS SEE PRODUCT MANUAL.
2 AT LEAST 100mm CLEARANCE ABOVE AND BELOW UNIT MUST BE PROVIDED FOR COOLING AIR.
3 IT IS NECESSARY TO OPEN THE CONTROL DOOR AND REMOVE FRONT COVER WHEN ELECTRICAL CONNECTIONS ARE BEING MADE.
4 MECHANICAL MOUNTING FIXING ARE NOT SUPPLIED.

Figure 3- 13 Frame 2 : 75A Stack Assembly

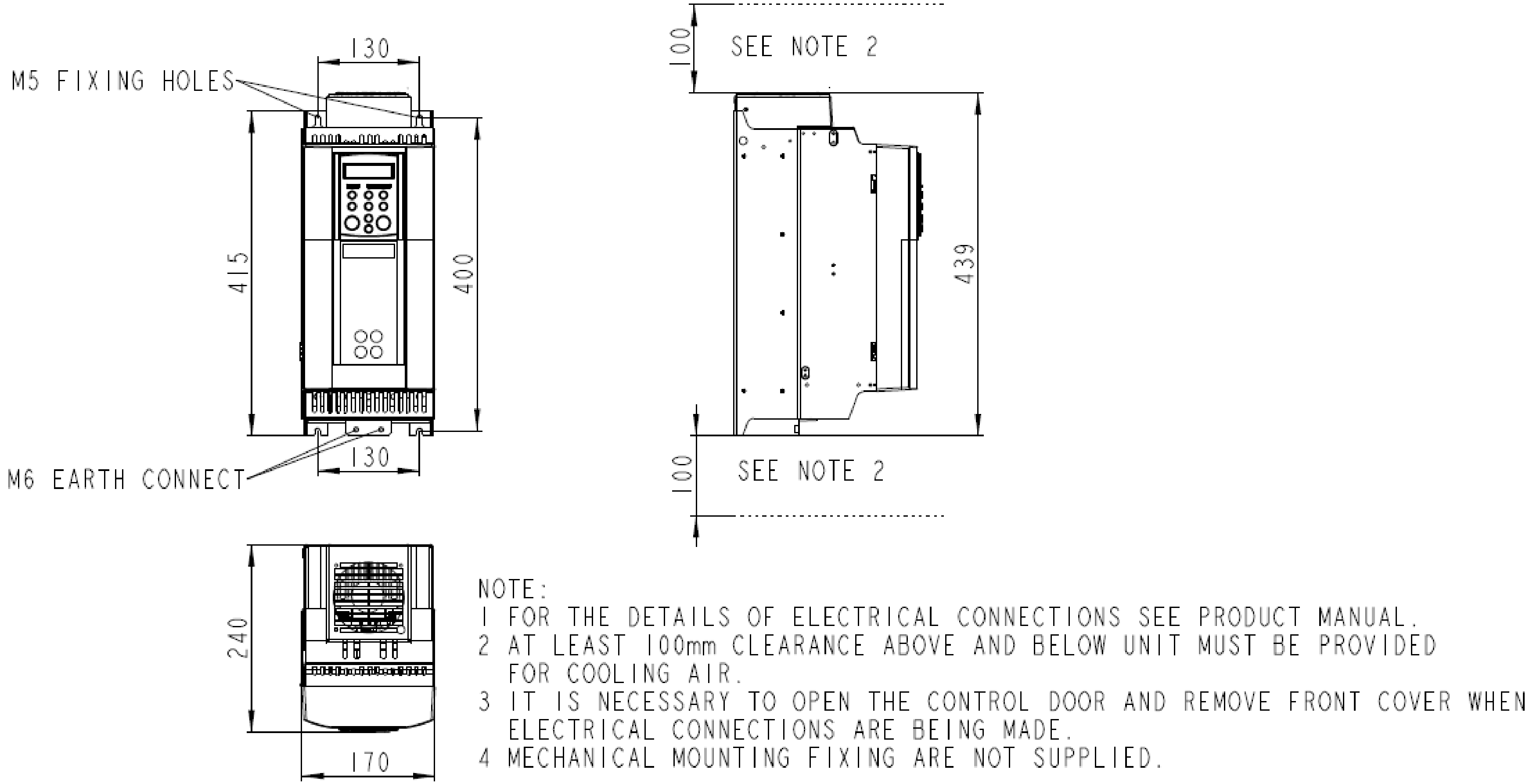


Figure 3- 14 Frame 2 : 110A/165A Stack Assembly

Filter Installation Drawings

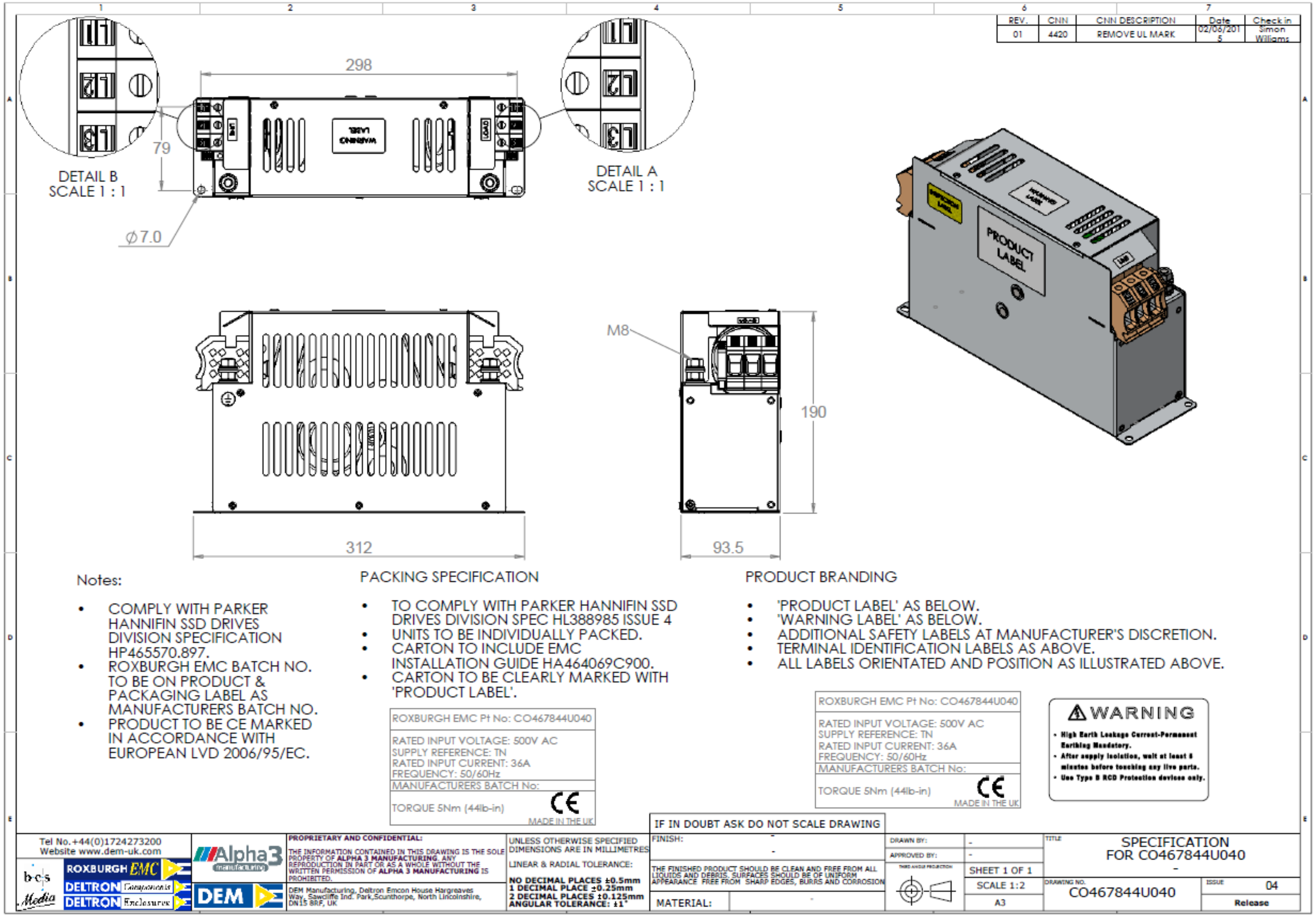


Figure 3- 15 Filter Mounting Details, Part No. CO467844U040 for Frame 1 : 20 &35 Amp

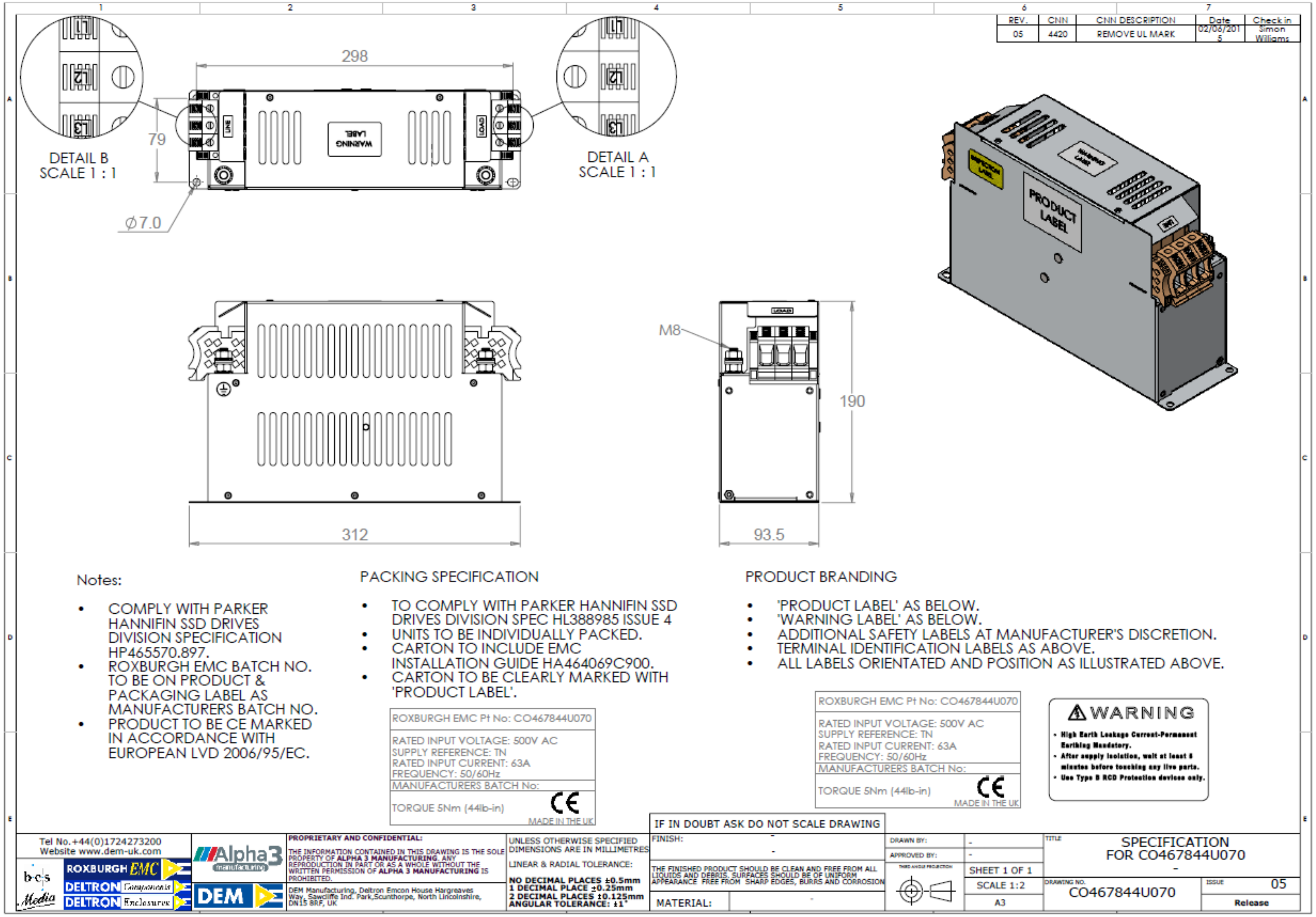


Figure 3- 17 Filter Mounting Details, Part No. CO467844U070 for Frame 1 : 45 Amp

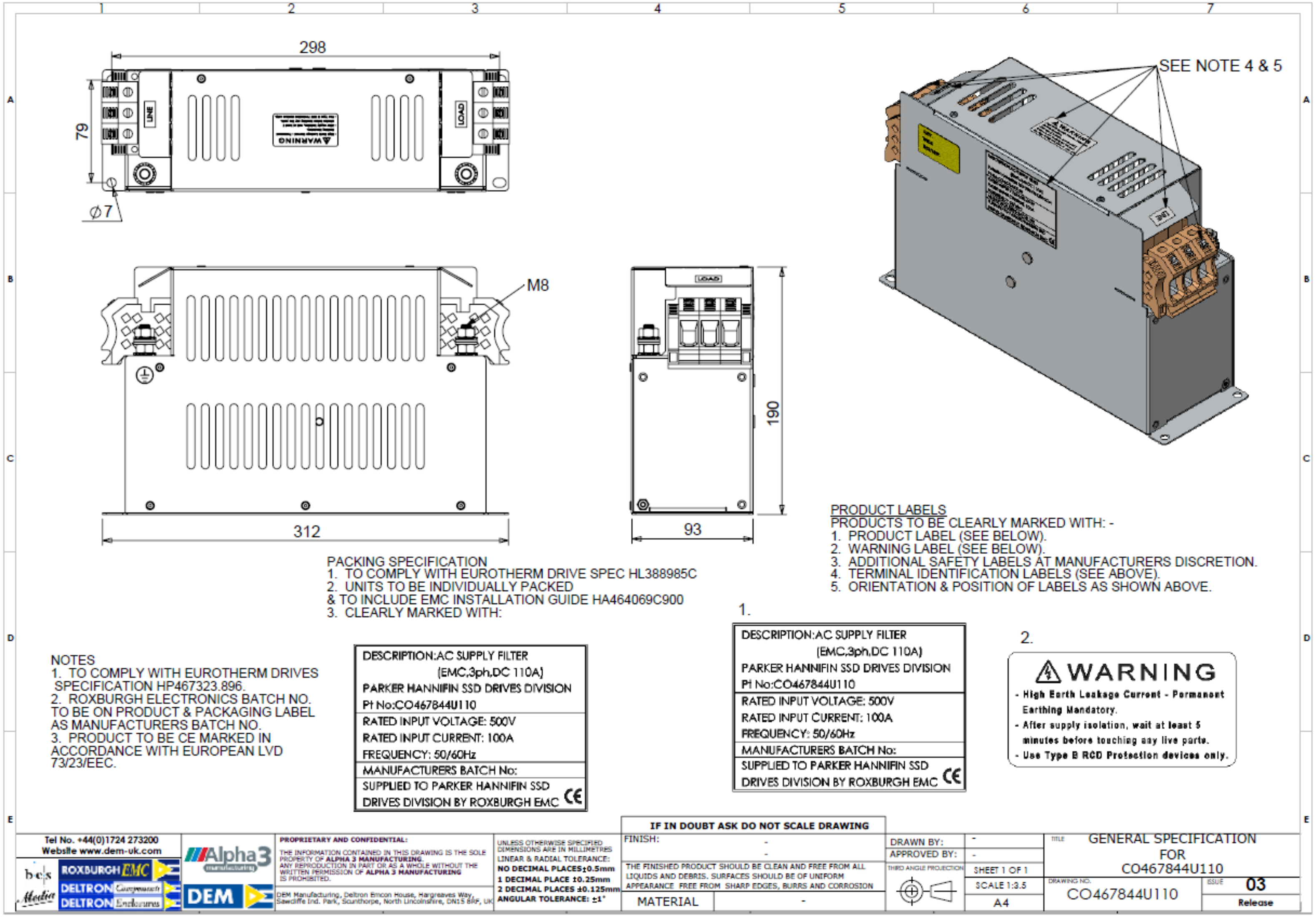


Figure 3- 18 Filter Mounting Details, Part No. CO467844U110 for Frame 2 : 75 &110 Amp

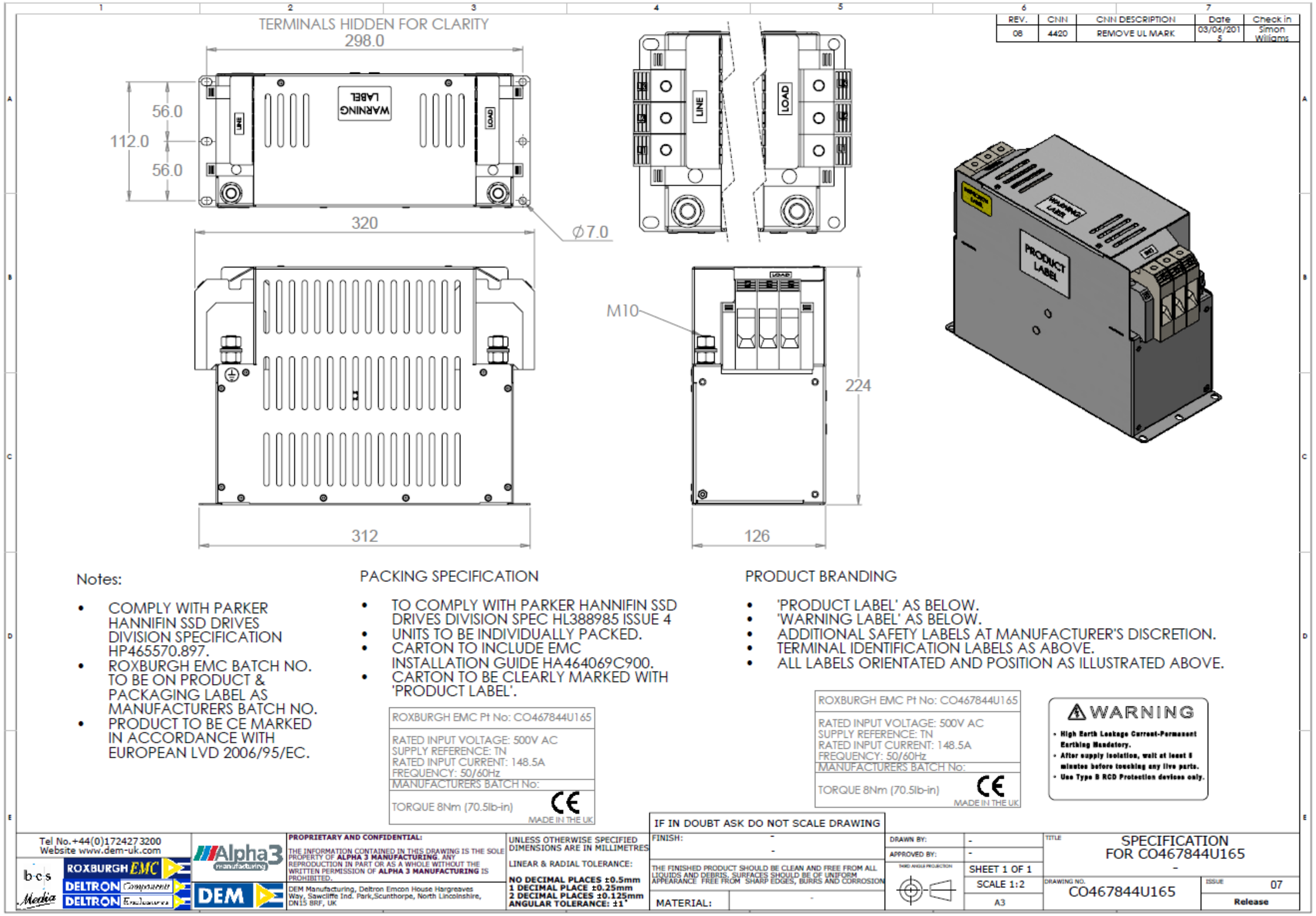
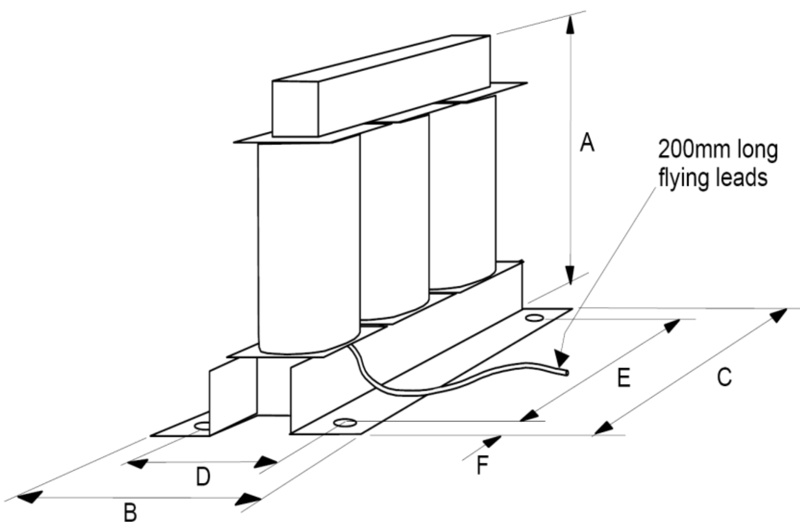


Figure 3- 19 Filter Mounting Details, Part No. CO467844U165 for Frame 2 : 165 Amp

Line Choke Installation Drawings

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



Parker Part Number	Drive Rating	Weight (kg)	Dimensions (mm) A	B	C	D	E	F	Mtg Hole Ø	Terminal Ø
For use without EMC Filters										
Frame 1										
CO466448U015	20A	1	67	60	80	40	64	8	7	M8
CO466448U040	35A & 45A	2.5	127	70	155	48	140	7.5	7	M8
Frame 2										
CO466448U070	75A	4.5	127	76	155	55	140	7.5	7	M8
CO466448U110	110A	7.5	160	100	190	75	170	10	9	M8
CO466448U165	165A	7.5	160	102	190	76	170	10	9	M8
For use with EMC filters										
Frame 1										
CO466449U015	20A	4.5	127	90	155	68	140	7.5	7	M8
CO466449U040	35A & 45A	8	160	100	190	75	170	10	9	M8
Frame 2										
CO466449U070	75A	10	160	105	190	83	170	10	9	M8
CO466449U110	110A	14	160	125	190	103	170	10	9	M8
CO466449U165	165A	28	225	200	240	176	150	45	15	M8

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.

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.
- Check the field current range selection switch has been set to the desired position

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.

Control Philosophy

There are four ways to control the Drive using Remote and Local control:

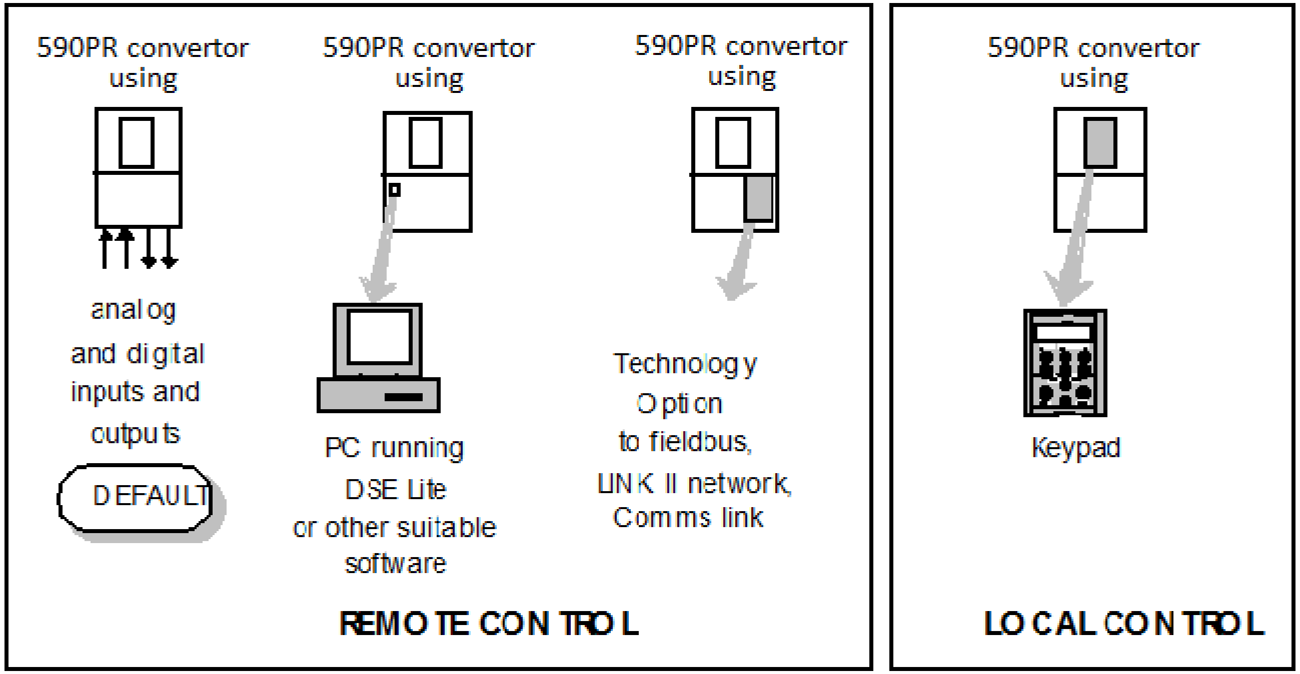


Figure 4-1 Remote and Local Control Modes

Start/Stop and Speed Control

There are two forms of control in operation at any time: *Start/Stop* and *Speed Control*. Each can be individually selected to be under either Local or Remote Control.

- **Local or Remote Start/Stop** decides how you will start and stop the Drive.
- **Local or Remote Speed Control** determines how you will control the motor speed.

In each case, Local and Remote control are offered by using the following:

Local: The Keypad

Remote: Analog and digital inputs and outputs, System Port P3 (USB)or the Technology Option

Thus the Drive can operate in two modes:

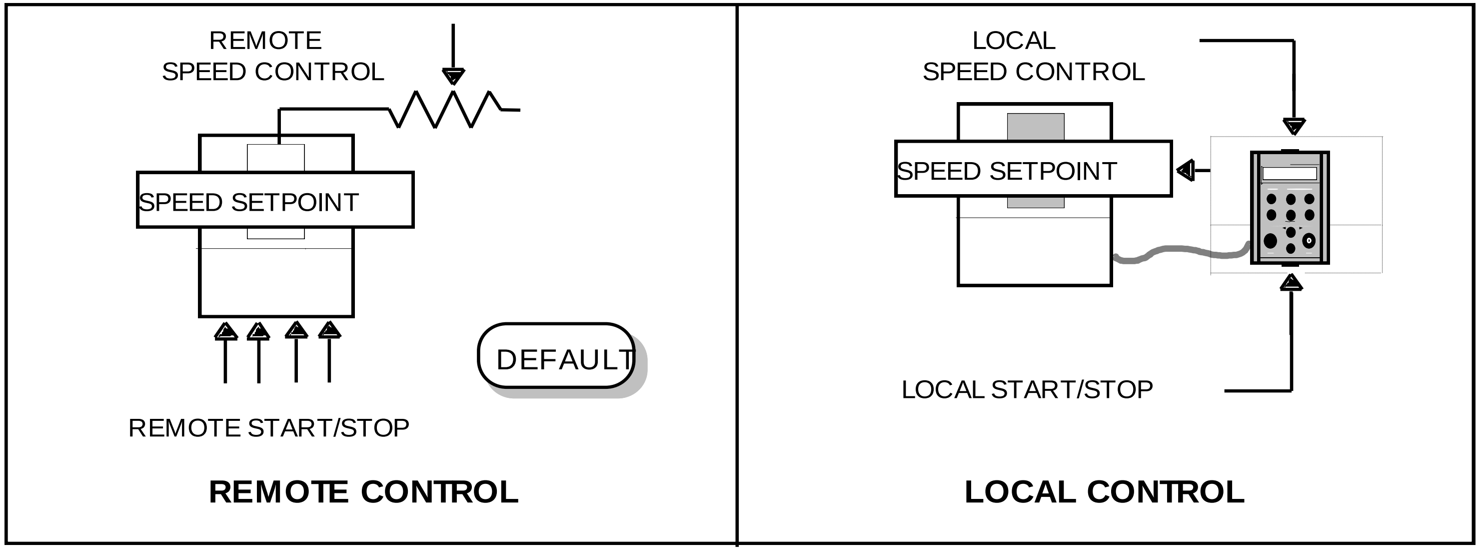


Figure 4-2 Local and Remote Control

NOTE **Start/Stop is also known as "Sequencing".**
Speed Control is also known as "Reference Generation".

Selecting Local or Remote Control

DEFAULT *The default is for the **L/R** key to be set for Remote control, i.e. both the SEQ and REF LEDs will be off.*

If the default Remote Start/Stop and Speed Control is not suitable for your application, follow the instructions below using the Keypad or a suitable PC programming tool to select Local Start/Stop and Speed Control.

NOTE **You can only change between Local and Remote control when the Drive is "stopped".**

The **L/R** key on the Keypad toggles between **Local** and **Remote** control, changing both Start/Stop and Speed Control modes at the same time.

LED Indications

The mode of control is indicated by the "LOCAL" LEDs on the Keypad:

SEQ = Start/Stop
REF = Speed Control

If the LED is illuminated (l), then LOCAL mode is in force.

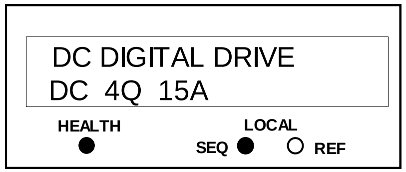


Figure 4-3 Control Mode LED Indications

Operation in Local Mode

The drive requires the following power terminals to be connected for operation in Local control.

3-phase supply via contactor
Auxiliary supply
3-phase contactor coil
Motor thermistor TH1 & TH2
Motor armature
Motor field

The drive requires the following control terminals to be active for operation in Local control.

Current Limit (jumper A6 to B3)
Program Stop - high (jumper B8 to C9)
Coast Stop - high (jumper B9 to C9)
External Trip - low (jumper C1 to C2)
External Enable - high (jumper C5 to C9)

To run in Local control:

Press the L/R key to enable Local control as detailed above
On the Keypad press the RUN key  to start the unit
Use the UP  and DOWN  keys to control the speed
On the Keypad press the STOP key  to stop the unit

Reading the Status LEDs

These LEDs are used when the blanking cover is fitted to the drive instead of the Keypad.

 OFF

 SHORT FLASH

 EQUALFLASH

 LONG FLASH

 ON

HEALTH	RUN	Drive State
		Re-Configuration, or corrupted non-volatile memory at power-up
		Tripped
		Auto Restarting
		Stopped
		Running with zero reference
		Running
		Stopping

Table 4-1 Status indications given by the Health and Run LEDs

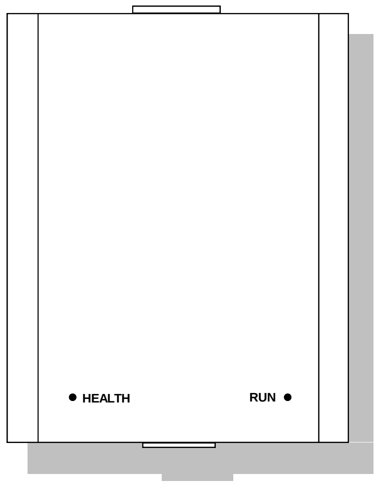


Figure 4-4 Blank Cover showing LEDs

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.***

The following start-up routine assumes that the Keypad is connected and is in default mode, and that the Drive's control terminals are wired as shown in the Minimum Connection diagrams in Chapter 3.

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

Calibrating the Control Board

AUXILIARY POWER ONLY IS CONNECTED AT THIS STAGE

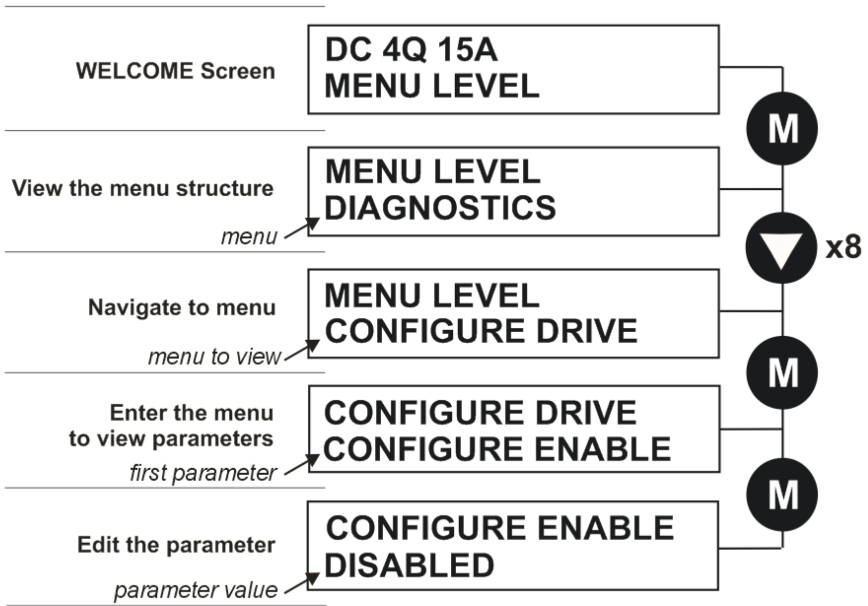
You must first calibrate the Drive for use with the motor.

Connect the auxiliary power supply to auxiliary supply terminals L & N (Frame 1&2: Terminals L & N = TB2), but do not connect the main 3-phase power supply at this stage. Check that the correct voltage appears between these terminals.

The Keypad will now display the Welcome screen, and the Health and Forward LEDs will be illuminated (assuming that the Drive's control terminals are wired as shown in Figure 3-4, Minimum Connection Requirements).

NOTE **The CONFIGURE DRIVE menu at the top of the menu tree contains many of the important parameters used during set-up.**

Refer to Chapter 6: "The Keypad" to familiarise yourself with the keypad's LED indications, and how to use the keys and menu structure.



MMI Menu Map

1 CONFIGURE DRIVE
- CONFIGURE ENABLE
- NOM MOTOR VOLTS
- ARMATURE CURRENT
- FIELD CURRENT
- 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

Set the following parameters:

CONFIGURE ENABLE

Set to TRUE. This allows you to change parameter values, but the drive cannot run.

NOM MOTOR VOLTS – Armature Voltage (VACAL)

If the drive is designed for use on a nominal 3-phase power supply of 220V and 500V, set the Armature Voltage value in the NOM MOTOR VOLTS parameter.

NOTE **Refer to the Product Code on the drive's Rating Label to confirm the drive's specification. Also refer to Appendix E: "Technical Specifications" - Understanding the Product Code.**

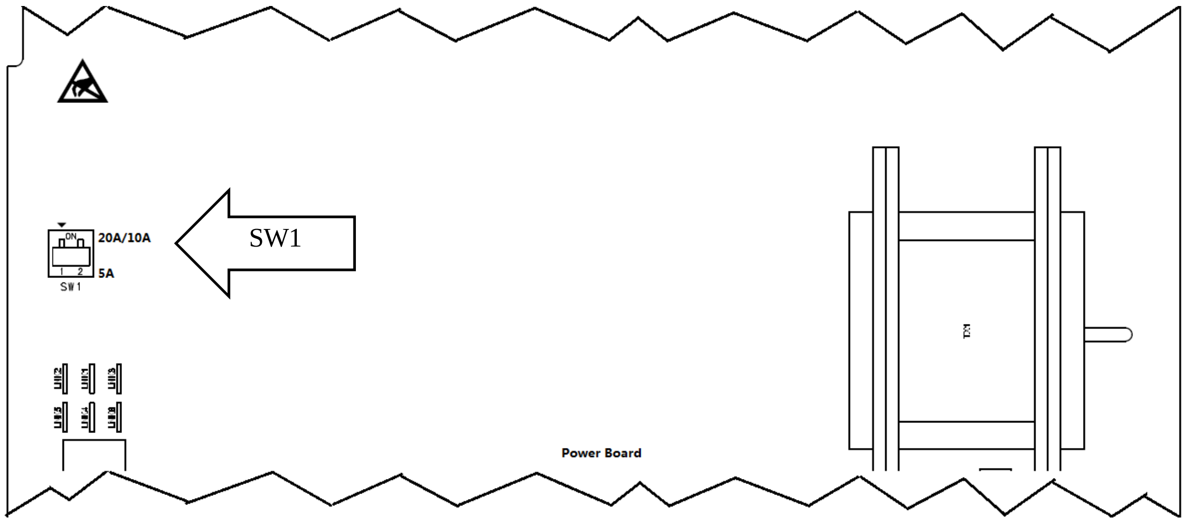
ARMATURE CURRENT (IA CAL)

Note the maximum armature current from the motor rating plate and set this value in the ARMATURE CURRENT parameter.

FIELD CURRENT (IF CAL)

Note the nominal field current from the motor rating plate and set this value in the FIELD CURRENT parameter.

Field current range switch (SW1) has been provided on power board for improved resolution at low field current as shown below diagram.
If it is intended to use the controller below 5A field current, then SW1 should be set to the 5A position.
Note: After the SW1 position changed, it is necessary to set the P-Code. (Refer to Keypad section)



IMPORTANT ***The setting of the field current range switch (SW1) must not be changed when the drive is powered on.***

FLD.CTRL MODE

Set the field control mode to Field Voltage or Field Current control. Refer to Appendix D: "Programming" - FIELD CONTROL for further information. By default, the drive is operating in Voltage Control mode.

FLD.VOLTS RATIO

Enter the calculated ratio into the parameter given by the equation:

$$100 \times \frac{\text{FIELD VOLTS}}{\text{RMS AC INPUT VOLTS}}$$

The maximum value obtainable is 90%, i.e. field output = 0.9 x Vac. Setting this parameter higher than the default 90% will not increase the field output.

Selecting Speed Feedback

AUXILIARY POWER ONLY IS CONNECTED AT THIS STAGE

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

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

MMI Menu Map

1 CONFIGURE DRIVE

SPEED FBK SELECT

NOTE **Refer to Chapter 3: "Installing the Drive" - Speed Feedback and Technology Options for further information.**

Speed Feedback Option Boards

Analog Tacho Calibration Option Board

WARNING

Do not fit this Option Board with the drive powered-up.

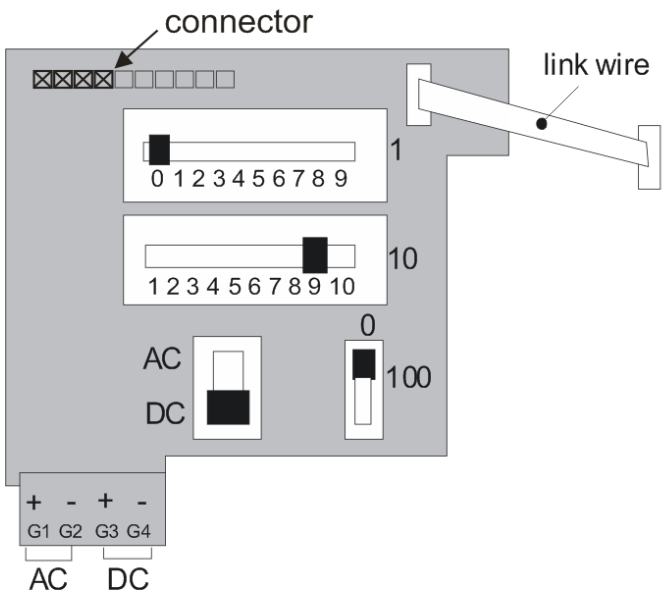
NOTE **This option is not required if armature voltage or encoder feedback is to be used.**

The board plugs into the front of the drive. Mount it on the 10-pin connector correctly using the 4 left-hand pins. This will allow the locating pegs to align with the mounting holes. 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 200V:

- 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.



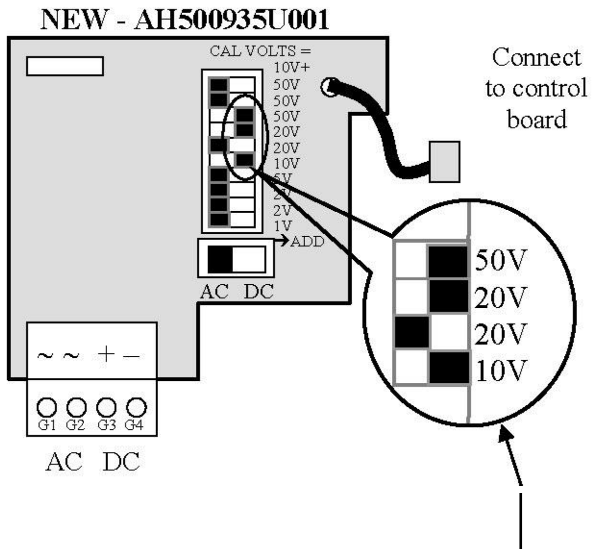
ORIGINAL – AH385870U001

This product may be fitted with a new version of the Analog Tacho Calibration Board:

ORIGINAL: The original option has part number AH385870U001 and 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 shows a setting of 90V. When setting switches for AC tachos, calibrate the switches for √2 x voltage feedback required, i.e. √2 x 90V = 127V. This adjusts the rms value received from an AC tacho into the required peak value.

NEW: The new option has part number AH500935U001 and is mounted in the same manner as the original. The connecting link wire to the control board is still required and must be connected for operation.

It is configured by setting its 10-way switch and single 2-position switch.



Calibration of the new AH500935U001 version

On this new version of the option the full-speed tachogenerator voltage is configured by adding

together the values from any number of the individual selection switches (on the 10-way switch).

CALIBRATED FULL-SPEED VOLTAGE = 10V + SUM OF SWITCHES SELECTED

NOTE **Individual switch values will be included if the switch is set to the right.**

In the example AH500935U001 shown above (with three right black switches selected):

Calibrated full-speed voltage = 10V + (50V + 20V + 10V) = 90V

IMPORTANT ***The calibrated full-speed voltage is 10V greater than the sum of switch values selected.***

This AH500935U001 board continues to support both AC and DC analog tachos with a calibration range of 10 to 200V.

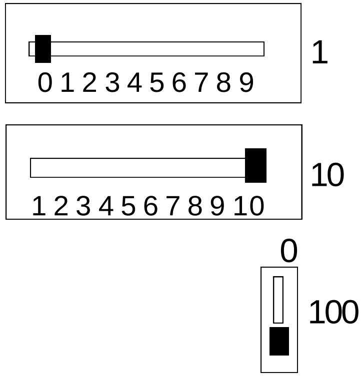
- For AC tacho feedback, use terminals G1 & G2, with selector switch in the AC position (left). Calibrate the switches for √2 x full-speed voltage required, i.e. √2 x 90V = 127V. This adjusts the r.m.s. value received from an AC tacho into the required peak value.
- For DC tacho feedback, use terminals G3 & G4, with selector switch in the DC position (right).

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:

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

The power dissipation of this resistor is given by the formula

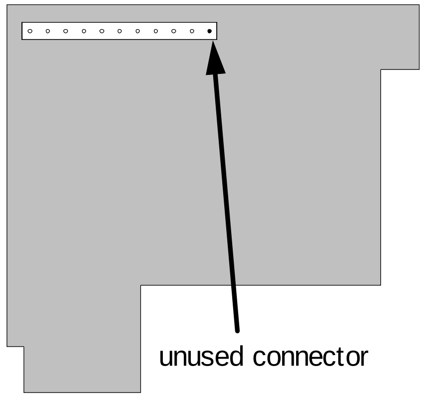
W = (tacho volts - 200) x 5 milliwatts

Encoder Feedback Option Boards

WARNING!
Do not fit this Option Board with the drive powered-up.

The board plugs into the front of the drive. Mount it on the 10-pin connector correctly. This will allow the locating pegs to align with the mounting holes.

These option boards assume 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 Keypad later in the Operating Instructions.



Save Your Settings

CONFIGURE ENABLE

Set to FALSE.

MMI Menu Map

1 CONFIGURE DRIVE
CONFIGURE ENABLE

PARAMETER SAVE

Perform a Parameter Save to save your settings. Press the ▲ (UP) key, as instructed.

MMI Menu Map

1 PARAMETER SAVE
PARAMETER SAVE

Initial Start-Up Routine

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

NOTE **This routine assumes that the Drive's control terminals are wired as shown in the Minimum Connection Requirements drawings in Chapter 3. 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 Keypad 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

1 DIAGNOSTICS
- ANIN 1 (A2)
- ANIN 2 (A3)
- ANIN 3 (A4)
- SPEED SETPOINT

Step 2: Check the External Current Clamps

Use the Keypad 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**

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.

MMI Menu Map

1 DIAGNOSTICS
- ANIN 4 (A5)
- ANIN 5 (A6)

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.

- *Encoder*

  The ENCODER parameter should give a positive reading.

MMI Menu Map

1 DIAGNOSTICS
- SPEED FEEDBACK
- TACH INPUT
- ENCODER

Step 4: Select the Speed Feedback method

MMI Menu Map

1 SETUP PARAMETERS

2 CURRENT LOOP

MAIN CURR. LIMIT

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

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

MMI Menu Map

1 CONFIGURE DRIVE

SPEED FBK SELECT

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

MMI Menu Map

1 PARAMETER SAVE

PARAMETER SAVE

Perform a PARAMETER SAVE. Refer to Chapter 6: "The Keypad" - Saving Your Application.

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.

MMI Menu Map

1 DIAGNOSTICS

PROGRAM STOP

CONTACTOR CLOSED

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.

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%

MMI Menu Map

1 DIAGNOSTICS

SPEED SETPOINT

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

MMI Menu Map

1 SETUP PARAMETERS

2 CURRENT LOOP

MAIN CURR.LIMIT

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.

Apply 24V to "Enable" (C5) and immediately check that the correct field voltage appears between the auxiliary supply terminals F+ and F-. (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 and check connections. Refer to 9.1 or 9.2 on the next page.

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

Step 9.1 Internally Supplied Field:

MMI Menu Map

1 SETUP PARAMETERS

2 FIELD CONTROL

FIELD ENABLE

- Check that 3-phase is applied to terminals L1, L2 and L3 when the main contactor is closed.
- Check that the coding fuses and should read the field fuse 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?

MMI Menu Map

1 CONFIGURE DRIVE

FLD. VOLTS RATIO

  - 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 current 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 FL1 and FL2.
- Check the phasing of voltage applied to FL1 and FL2:
  - ➢ FL1 must be connected directly or indirectly to the Red phase on main power terminal L1.
  - ➢ FL2 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.

MMI Menu Map

1 SETUP PARAMETERS
2 FIELD CONTROL
3 FLD VOLTAGE VARS
FLD. VOLTS RATIO

Step 10: Check the Keypad

Check that the HEALTH and RUN Keypad LEDs are now illuminated, also either the FWD or REV 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.

MMI Menu Map

1 SETUP PARAMETERS
2 CURRENT LOOP
MAIN CURR.LIMIT

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

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.

MMI Menu Map

1 SETUP PARAMETERS

2 STANDSTILL

STANDSTILL LOGIC

- 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.

MMI Menu Map

1 DIAGNOSTICS

CURRENT FEEDBACK

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 correct direction, check the sign of the feedback from the Tachometer or Encoder using the appropriate Diagnostic menu: TACH INPUT or ENCODER.

MMI Menu Map

1 DIAGNOSTICS
- TACH INPUT
- 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 parameter.

MMI Menu Map

1 CONFIGURE DRIVE
- ENCODER SIGN

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

1 CONFIGURE DRIVE
- SPEED FBK SELECT

MMI Menu Map

1 PARAMETER SAVE
- PARAMETER SAVE

When satisfactory operation has been achieved, perform a PARAMETER SAVE. Refer to Chapter 6: "The Keypad" - 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.

MMI Menu Map

1 DIAGNOSTICS
- SPEED SETPOINT

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.

MMI Menu Map

1 SETUP PARAMETERS

2 CALIBRATION
- ZERO SPD.OFFSET

- 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

1 SETUP PARAMETERS

2 STANDSTILL
- STANDSTILL LOGIC

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.

MMI Menu Map

1 SETUP PARAMETERS

2 CALIBRATION

ARMATURE V CAL.
ANALOG TACH CAL.
ENCODER RPM

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 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).

MMI Menu Map

1 CONFIGURE DRIVE

FLD CTRL MODE

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 function block) 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 function block). Start the drive with a 5% speed demand and ensure the ACTUAL POS I LIMIT is 100% (diagnostic). This should stall the drive at zero speed and cause it to pass 100% current. Monitor the BACK EMF diagnostic and note the value (typically anything up to 17% is normal). Stop the drive and enter 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 are correct.

In the FLD WEAK VARS menu, verify that field weakening is selected (FIELD WEAK ENABLE) and that the MIN FLD CURRENT parameter is set appropriately. Adjust the maximum BEMF volts to the required scaled level by setting the MAX VOLTS parameter.

MMI Menu Map

1 SETUP PARAMETERS

2 FIELD CONTROL

3 FLD CURRENT VARS

4 FLD WEAK VARS

FLD. WEAK ENABLE
MIN FLD CURRENT
MAX VOLTS

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).

Step17: 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).

MMI Menu Map

1 SETUP PARAMETERS

2 CURRENT LOOP

MAIN CURR.LIMIT

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.**

- 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 103% FLC (continual rating).
- If the motor is overloaded, the controller will reduce the current to 103% of the current calibration. (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. it stalls, the controller will trip out showing STALL TRIP alarm, if enabled.

Performance Adjustment

Current Loop - The ARMATURE 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, 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

MMI Menu Map

1 CONFIGURE DRIVE

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 (also the HEALTH led is lit and the RUN led flashes). 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: "The Keypad - Saving Your Application.
- If necessary, restore field connections and remove the mechanical clamp.

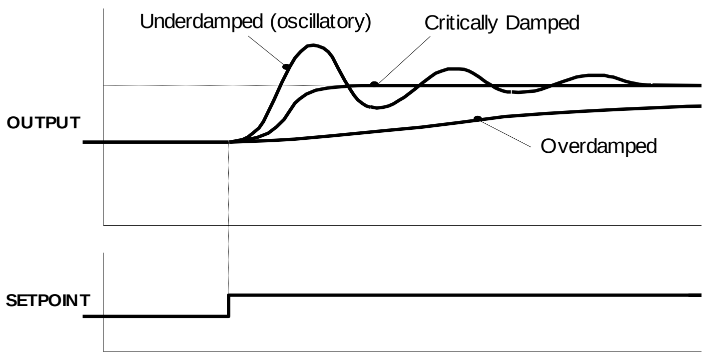
Autotune Failed

- The Keypad 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 Keypad 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 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 either the stack rating or 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.

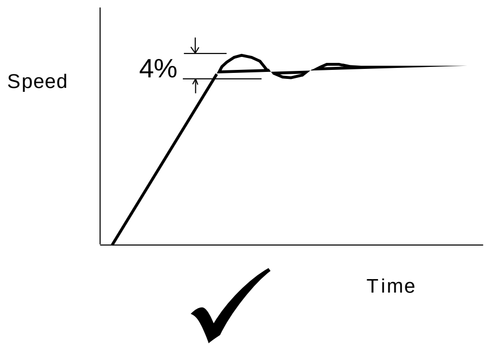
A Method for Setting-up the PI Gains

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

To set up the P gain, set the I gain to zero. Apply a step change in setpoint that is typical for the System, and observe the speed feedback response on terminal A7. Increase the 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 – 590PR) 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.

MMI Menu Map

1 SETUP PARAMETERS

2 STOP RATES

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.

MMI Menu Map

1 SETUP PARAMETERS

2 STOP RATES

STOP TIME

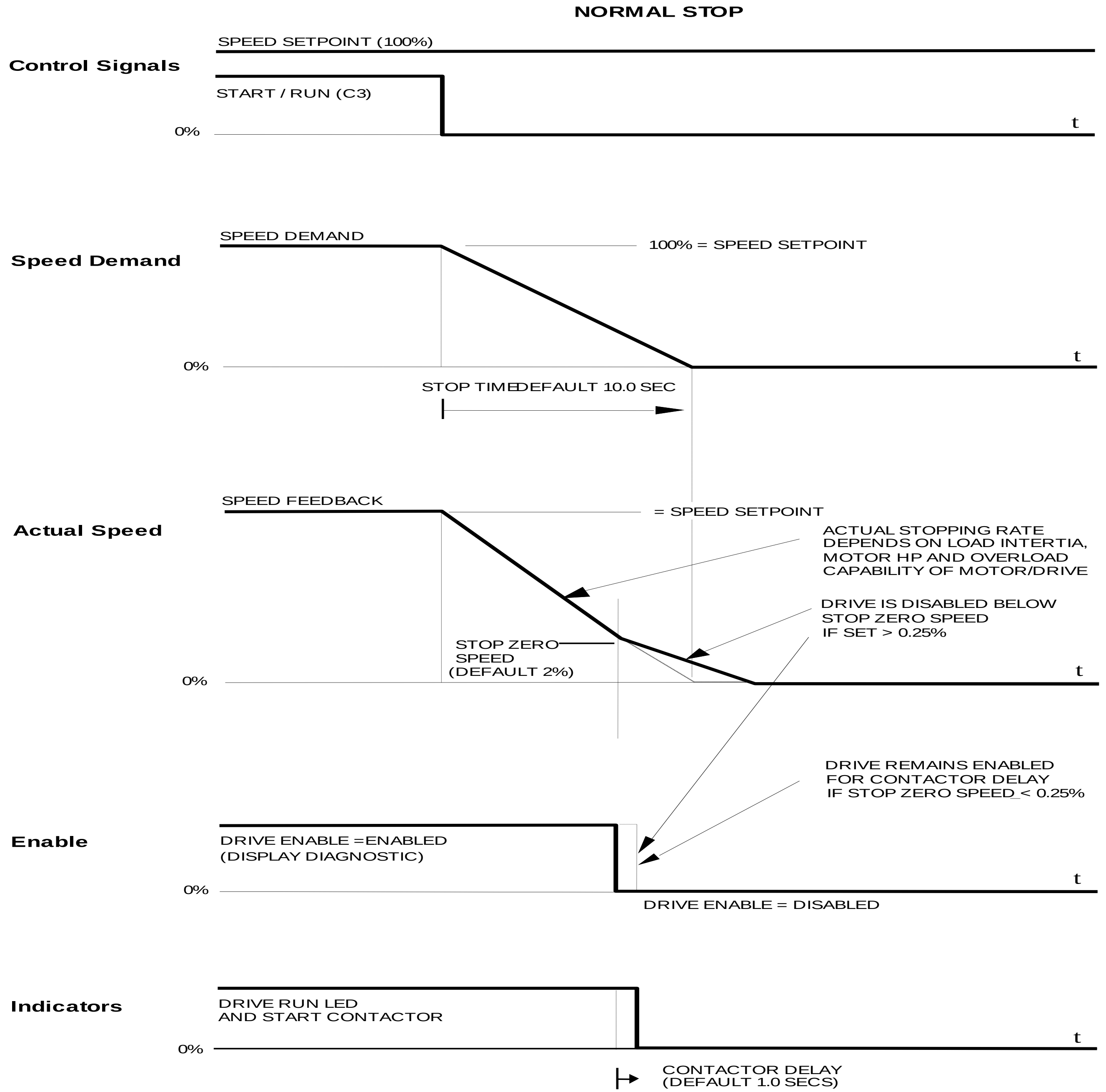
During Normal Stop, the current is limited by the MAIN CURR. LIMIT parameter

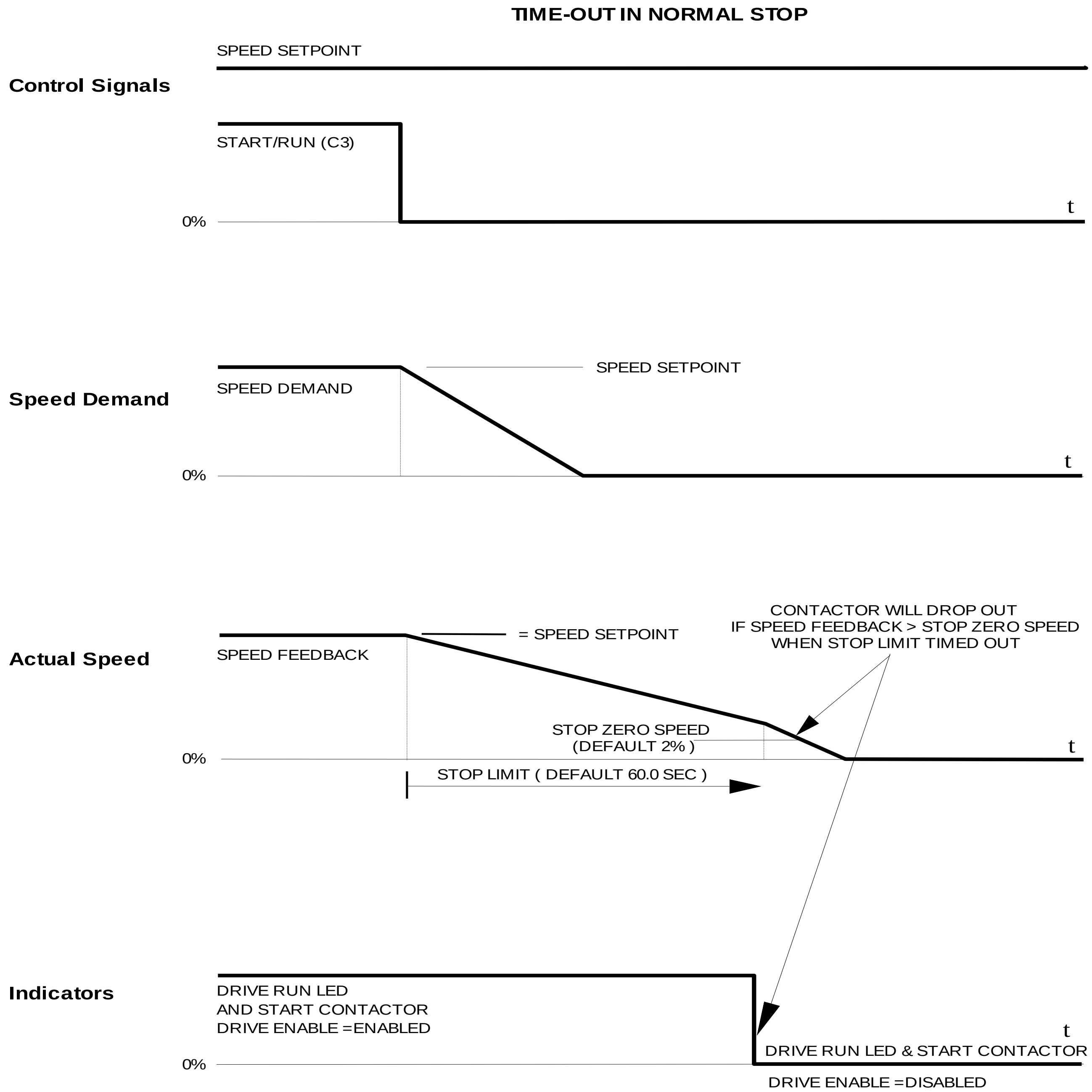
MMI Menu Map

1 SETUP PARAMETERS

2 CURRENT LOOP

MAIN CURR.LIMIT


NORMAL STOP
SPEED SETPOINT (100%)
Control Signals
START / RUN (C3)
0%
t
SPEED DEMAND
Speed Demand
100% = SPEED SETPOINT
0%
t
STOP TIME DEFAULT 10.0 SEC
SPEED FEEDBACK
Actual Speed
= SPEED SETPOINT
ACTUAL STOPPING RATE DEPENDS ON LOAD INTERTIA, MOTOR HP AND OVERLOAD CAPABILITY OF MOTOR/DRIVE
DRIVE IS DISABLED BELOW STOP ZERO SPEED IF SET > 0.25%
STOP ZERO SPEED (DEFAULT 2%)
0%
t
DRIVE REMAINS ENABLED FOR CONTACTOR DELAY IF STOP ZERO SPEED < 0.25%
Enable
DRIVE ENABLE =ENABLED (DISPLAY DIAGNOSTIC)
0%
t
DRIVE ENABLE = DISABLED
Indicators
DRIVE RUN LED AND START CONTACTOR
0%
t
CONTACTOR DELAY (DEFAULT 1.0 SECS)


TIME-OUT IN NORMAL STOP
Control Signals
SPEED SETPOINT
START/RUN (C3)
0%
t
Speed Demand
SPEED DEMAND
SPEED SETPOINT
0%
t
Actual Speed
SPEED FEEDBACK
= SPEED SETPOINT
CONTACTOR WILL DROP OUT
IF SPEED FEEDBACK > STOP ZERO SPEED
WHEN STOP LIMIT TIMED OUT
STOP ZERO SPEED
(DEFAULT 2%)
0%
t
STOP LIMIT (DEFAULT 60.0 SEC)
Indicators
DRIVE RUN LED
AND START CONTACTOR
DRIVE ENABLE =ENABLED
t
DRIVE RUN LED & START CONTACTOR
DRIVE ENABLE =DISABLED
0%

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.

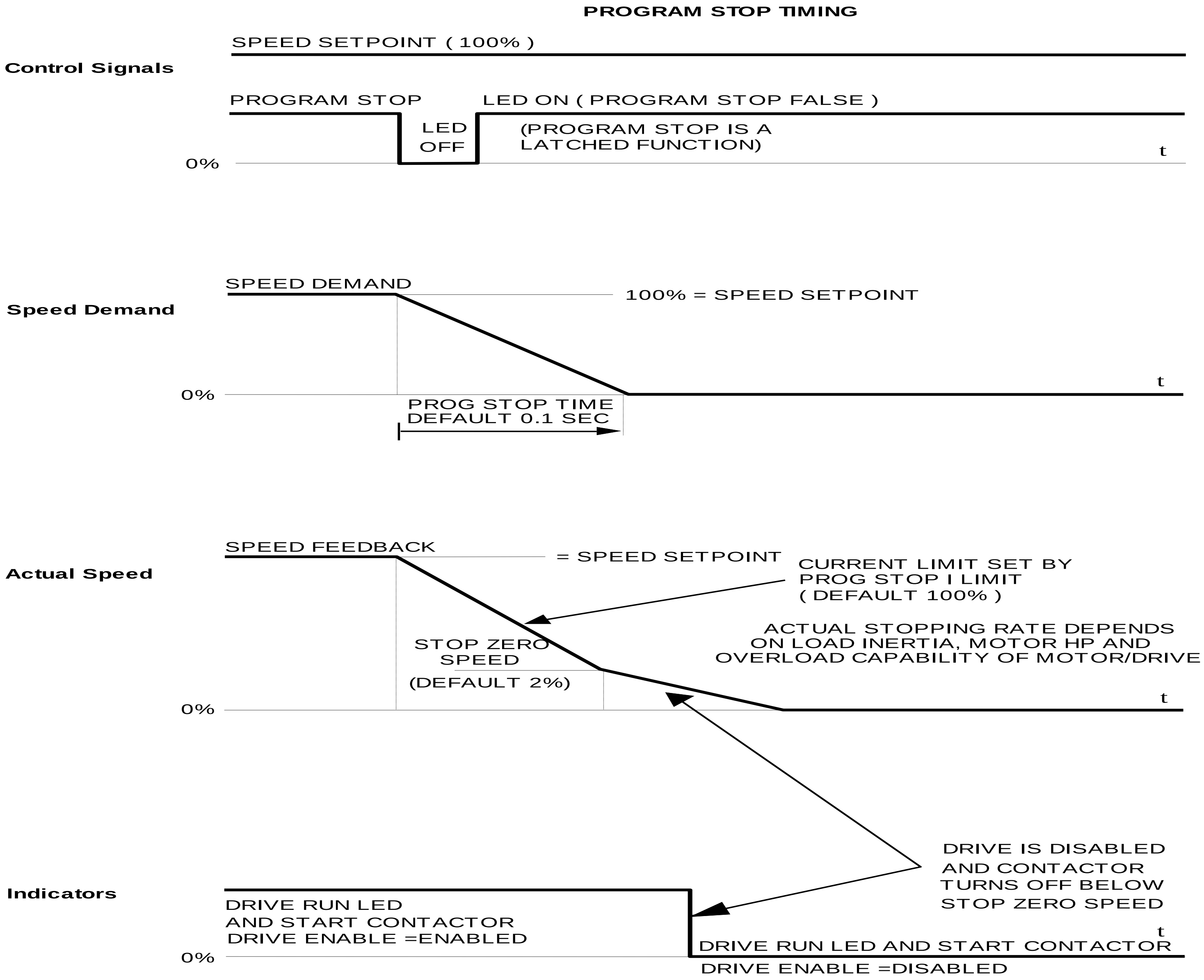
MMI Menu Map

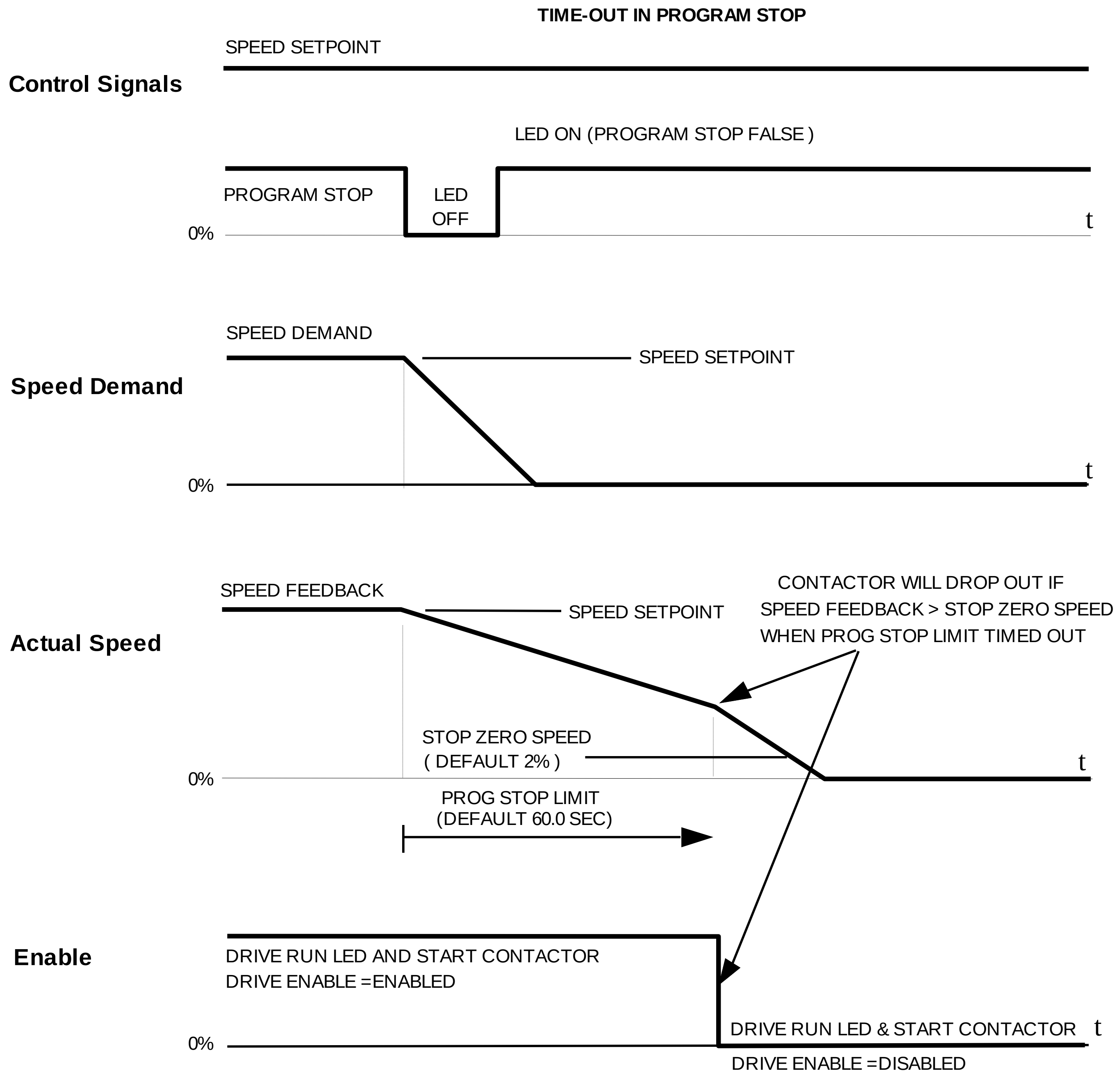
1 SETUP PARAMETERS

2 STOP RATES

PROG. STOP TIME

PROG. STOP I LIMIT


PROGRAM STOP TIMING
Control Signals
SPEED SETPOINT (100%)
PROGRAM STOP
LED OFF
LED ON (PROGRAM STOP FALSE)
(PROGRAM STOP IS A LATCHED FUNCTION)
0%
t
Speed Demand
SPEED DEMAND
100% = SPEED SETPOINT
0%
t
PROG STOP TIME DEFAULT 0.1 SEC
Actual Speed
SPEED FEEDBACK
= SPEED SETPOINT
CURRENT LIMIT SET BY PROG STOP I LIMIT (DEFAULT 100%)
ACTUAL STOPPING RATE DEPENDS ON LOAD INERTIA, MOTOR HP AND OVERLOAD CAPABILITY OF MOTOR/DRIVE
STOP ZERO SPEED
(DEFAULT 2%)
0%
t
DRIVE IS DISABLED AND CONTACTOR TURNS OFF BELOW STOP ZERO SPEED
Indicators
DRIVE RUN LED AND START CONTACTOR DRIVE ENABLE =ENABLED
0%
t
DRIVE RUN LED AND START CONTACTOR
DRIVE ENABLE =DISABLED


TIME-OUT IN PROGRAM STOP
Control Signals
SPEED SETPOINT
LED ON (PROGRAM STOP FALSE)
PROGRAM STOP
LED
OFF
0%
t
Speed Demand
SPEED DEMAND
SPEED SETPOINT
0%
t
Actual Speed
SPEED FEEDBACK
SPEED SETPOINT
CONTACTOR WILL DROP OUT IF
SPEED FEEDBACK > STOP ZERO SPEED
WHEN PROG STOP LIMIT TIMED OUT
STOP ZERO SPEED
(DEFAULT 2%)
0%
t
PROG STOP LIMIT
(DEFAULT 60.0 SEC)
Enable
DRIVE RUN LED AND START CONTACTOR
DRIVE ENABLE =ENABLED
0%
DRIVE RUN LED & START CONTACTOR
t
DRIVE ENABLE =DISABLED

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.**

MMI Menu Map

1 SETUP PARAMETERS

2 STANDSTILL

STANDSTILL LOGIC

ZERO THRESHOLD

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.

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

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

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

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

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).

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".

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

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).

External Control of the Drive

Remote Sequencing Command

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

This is 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.

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	Validation	This bit must be zero for the command word to be accepted

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
							Healthy Output Bit 11 goes high
Reset Alarm b)	1	0	X	0	0	0	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	Contactor 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

Typical Bit Patterns reported via 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.

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

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 x 3.33 = 20ms 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 x 1.33µs up to 1500 x 1.33µs = 2ms 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, 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 either the stack rating or 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

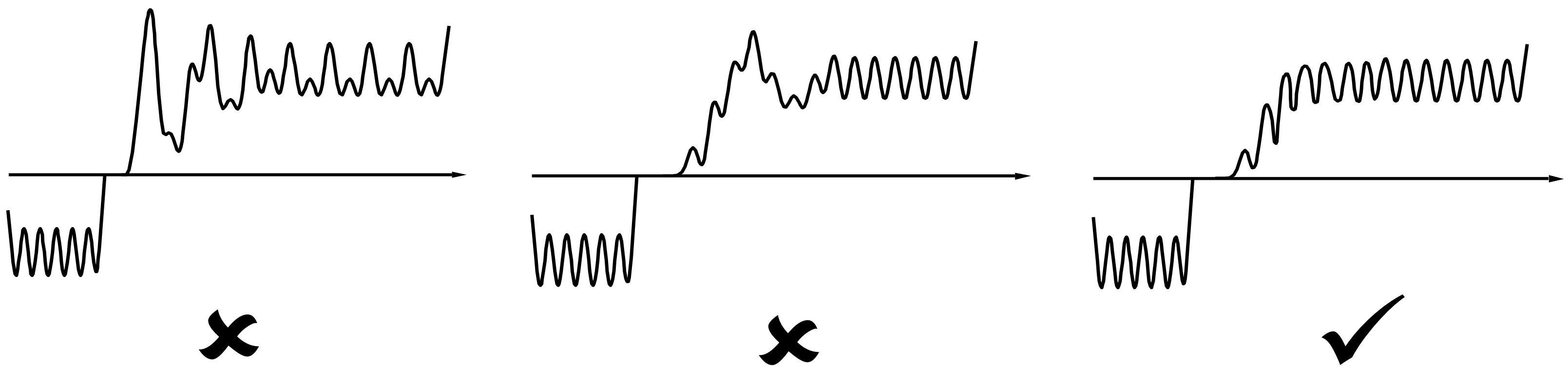
- CURRENT FEEDBACK

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 5-5], 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 se

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 calibration panel. This will give 1.1V average for 100% current. It will also give the operating bridge, i.e. it 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 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 à 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 Engineering Department for assistance in the use of this feature.

Field Control

Set-Up Notes

MMI Menu Map

1 CONFIGURE DRIVE
AUTOTUNE

Use the field AUTOTUNE facility to tune the field current control loop.

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. The motor should be stationary.

Caution

Never perform a field autotune if the motor is turning above base speed, since this will generate armature voltages that can overvoltage the armature circuit.

Performing an Autotune

1. Set the AUTOTUNE parameter to FIELD.
2. Close the main contactor, i.e. Start/run signal to terminal C3.
3. Energise the Enable terminal (C5).

The Autotune sequence is initiated. When complete (after approximately 5 seconds), the main contactor is opened signalling the end of the sequence and the AUTOTUNE parameter is reset to OFF.

4. Perform a PARAMETER SAVE now. Refer to Chapter 6: "The Keypad - Saving Your Application".

MMI Menu Map

1 SETUP PARAMETERS
2 FIELD CONTROL
3 FLD.CURRENT VARS
SETPOINT
PROP. GAIN
INT. GAIN
>> FLD.WEAK VARS

Autotune Failed?

The AUTOTUNE ERROR message may result if:

- The field terminals are open-circuit or short-circuit.
- More than 180% or less than 20% field voltage is required to drive the current configured in the FIELD CURRENT parameter.
- The natural field time-constant is greater than 5 seconds.

In these cases, a manual tuning process will be required, much like the manual tuning of the armature current loop. With manual tuning, one convenient method of producing field current demand steps is to set the field demand (SETPOINT) to 50% and then use the drive enable to move to and from the 'quench' and 'standby' modes to create transients. Monitor the field current at control board test-point IF, scaled 4V = 100% rated field current.

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.

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.

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

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 it can be reduced most simply by switching to the ADVANCED field weakening mode. In the STANDARD mode, 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.**

ADVANCED Mode

The ADVANCED mode of the field weakener offers the following advantages over the STANDARD mode.

1. **A feedforward control is applied in addition to the gain-capped PI controller.** This term, which compares the actual speed feedback to the calculated base speed, estimates the required field weakening. The use of this control term significantly reduces the overvoltage on transition through base speed, prior to the application of any lead-lag compensation. Transistions through base speed can be more rapid without overvoltage as a result. In addition, false weakening of the field is eliminated for speed transients just below base speed, if the lead-lag back-emf filter is left disabled.
2. **The back-emf control loop is gain compensated for reducing field level.** Motor back-emf is related directly to the motor speed, and to the motor flux level. As a result the transfer gain from field current to back-emf is directly related to motor speed. An adaptive gain element is included in the ADVANCED mode that increases back-emf loop gain below full speed, and this allows improved control performance at the field weakening boundary whilst maintaining stability at full speed.
3. **The speed control loop is gain compensated for reducing field level.** Motor torque is related directly to both armature current and motor flux level. An adaptive gain element is included in the ADVANCED mode that increases speed loop gain below full field, and this maintains speed control performance into the field weakened operating region. Note that the lag-lead back-emf filter can still be applied in the ADVANCED mode to further improve voltage control during rapid excursions into field weakening.

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 Keypad

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

Connecting the 6911 Keypad

The Keypad is a plug-in MMI (Man-Machine Interface) option that allows full use of the drive's features.

It provides local control of the drive, monitoring, and complete access for application programming.

Insert the Keypad into the front of the drive (replacing the blank cover and plugging into the RS232 programming port); or mount it up to 3 metres away using the optional panel mounting kit with connecting lead.

Refer to Chapter 3: "Installing the Drive" - Remote Mounting the Keypad.

On power-up, a calibration message is displayed. This is quickly replaced by a default Welcome screen showing the product description and Product Code.

The Welcome screen is at the top of the menu system.

The drive can operate in one of two modes:

Remote Control Mode: Allowing complete access for application programming

Local Control Mode: Providing local control and monitoring of the drive

Local control keys are inactive when Remote control mode is selected and vice versa, with one exception; the **L/R** key toggles Local or Remote control modes and so is always operative.

The drive always initialises in Remote control mode, and with the Local control keys inactive, it is unlikely that the motor could be started accidentally.

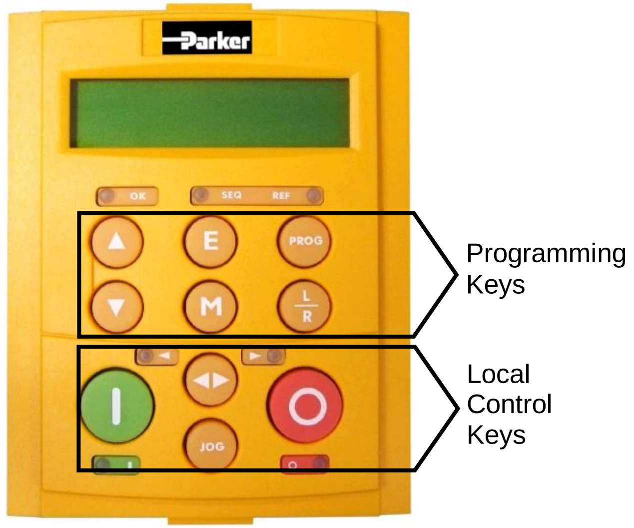


Figure 6-1 6911 Keypad

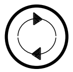
Control Key Definitions

Keys for Programming the Drive

NOTE **Refer to “Navigating the Menu System”, page 6-7 for a quick-start to using the menu.**

UP	*Navigation* - Moves upwards through the list of parameters. *Parameter* - Increments the value of the displayed parameter. *Command Acknowledge* - Confirms action when in a command menu.
DOWN	*Navigation* - Moves downwards through the list of parameters. *Parameter* - Decrements the value of the displayed parameter.
ESCAPE	*Navigation* - Displays the previous level’s Menu. *Parameter* - Returns to the parameter list. *Trip Acknowledge* - Acknowledges displayed Trip or Error message.
MENU	*Navigation* - Displays the next Menu level, or the first parameter of the current Menu. *Parameter* - Holding **M** down when a parameter is displayed shows that parameter’s Tag No. Repeated pressing at a writable parameter moves a cursor across the value to allow rapid increment/decrement of the parameter value.
PROG	*Navigation* - When in Local mode, displays the previous MMI menu whilst remaining in Local mode enabling changes to be made to parameters not available in Local menu. The key has no function in Remote mode.
LOCAL/ REMOTE	*Control* - Toggles between Remote and Local Control Modes for both Start/Stop (Seq) and Speed Control (Ref). When toggling, the display automatically goes to the relevant SETPOINT screen, and the SETPOINT (LOCAL) screen will have the and keys enabled to alter the setpoint.

Keys for Operating the Drive Locally

FORWARD/ REVERSE 	*Control* - Changes the direction of motor rotation when in Local mode, indicated by the display. Selects between two jog speeds when in Jog mode. This key has no function in Remote mode.
JOG 	*Control* - Runs the motor at a speed determined by the JOG SPEED 1 parameter. When the key is released, the Drive returns to “stopped”. Only operates when the Drive is “stopped” and in Local mode. This key has no function in Remote mode.
RUN 	*Control* - Runs the motor at a speed determined by the LOCAL SETPOINT. *Trip Reset* - Resets any trips and then runs the motor as above. Only operates when the Drive is in Local mode.
STOP/RESET 	*Control* - Stops the motor. Only operates when the Drive is in Local mode. *Trip Reset* - Resets any trips and clears displayed message if trip is no longer active.

Indications

Keypad Alarm Messages

An alarm message will be displayed on the MMI when the unit is tripped.

- The Drive has tripped.
  The top line indicates a trip has occurred while the bottom line gives the reason for the trip. See example opposite.

```
* * *  ALARM  * * *
3 PHASE FAILED
```

Acknowledge the trip message by pressing the E key. Press the STOP/RESET key to restore the Health LED.

Refer to Chapter 7: “Trips and Fault Finding” for trip messages and reasons.

Keypad LEDs

OFF

FLASH

ON

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

The LEDs are labelled HEALTH, RUN, STOP, FWD, REV, and LOCAL (as SEQ and REF). Combinations of these LEDs have the following meanings:

HEALTH (OK)	RUN	STOP	Drive State
FLASH	FLASH	FLASH	Re-Configuration
FLASH	OFF	ON	Tripped
ON	OFF	ON	Stopped
ON	OFF	FLASH	Stopping
ON	FLASH	OFF	Running with zero reference
ON	ON	OFF	Running
ON	FLASH	FLASH	Autotuning

FWD	REV	Forward / Reverse State
ON	OFF	Requested direction and actual direction are forward
OFF	ON	Requested direction and actual direction are reverse
FLASH	OFF	Requested direction is forward but actual direction is reverse
OFF	FLASH	Requested direction is reverse but actual direction is forward

LOCAL SEQ	LOCAL REF	Local / Remote Mode
OFF	OFF	Start/Stop (Seq) and Speed Control (Ref) are controlled from the terminals
ON	ON	Start/Stop (Seq) and Speed Control (Ref) are controlled using the Keypad keys

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 6-8). Parameters contained 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 6-17.

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.

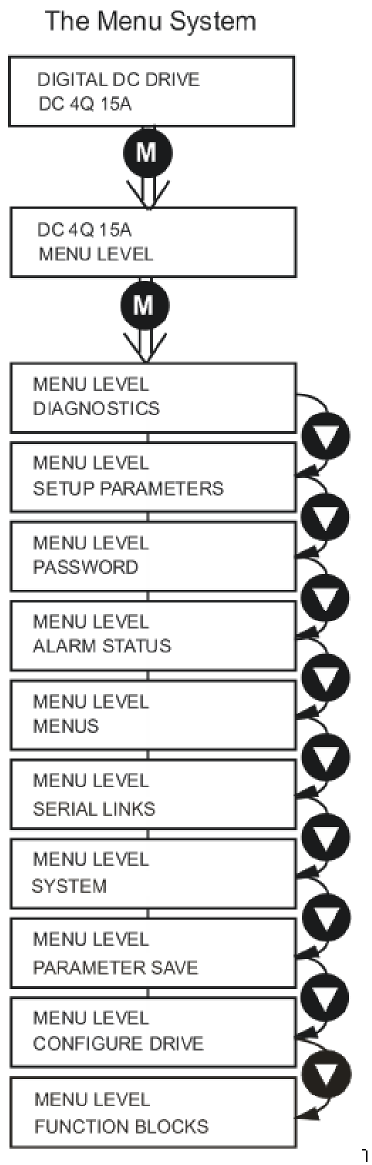


Figure 6-2 The Menu System showing Main Menus and Key Presses

The Local Menu

There is also a separate Local menu which provides Local Setpoint information. This menu can be accessed from anywhere in the Menu System by pressing the **L/R** key. Holding the **M** key down in the Local menu will display additional Feedback information. A toggle to the Local menu displays whichever is in force, Forward or Reverse, previously selected by the **FWD/REV** key.

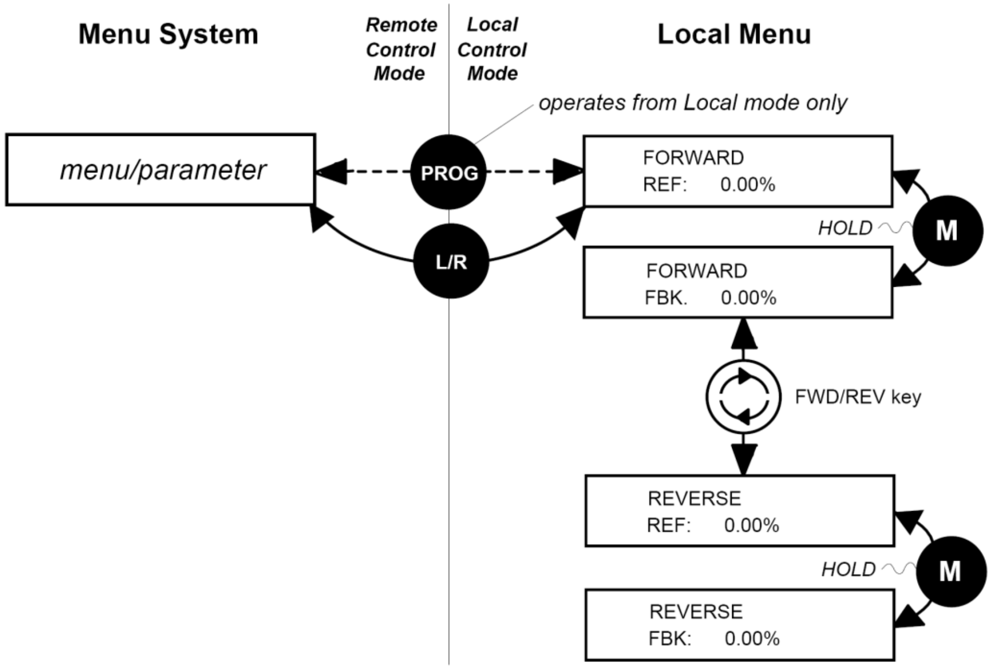


Figure 6-3
Viewing the Local Menu

The L/R Key

The **L/R** key (Local/Remote) only operates when the motor is stopped. It toggles the drive between Local or Remote control and an appropriate menu on the Keypad is displayed; either a Local menu when in Local control, or a main programming menu from the Menu System when in Remote control.

When in Local control, the Local LEDs, SEQ and REF, are illuminated and the RUN, STOP, JOG, FORWARD/REVERSE, UP and DOWN local control keys can be used to control the motor speed and direction.

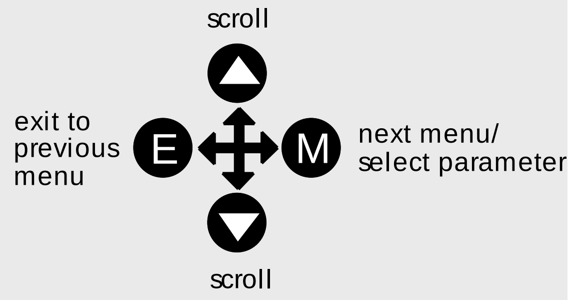
Pressing the **L/R** key when in Local control mode selects Remote control mode and returns you to your previous menu in the Menu System.

The PROG Key

The **PROG** key only operates when in Local control mode. It toggles the display between the Local menu and the main Menu System but the drive remains in Local control. Thus, the **PROG** key allows you to make changes to parameters normally available in Remote control mode whilst remaining in Local mode operation.

HINT: When operating the drive locally, it is quite useful to have a relevant parameter selected in the main Menu System for easy access.

Navigating the Menu System



NAVIGATING THE MENU

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

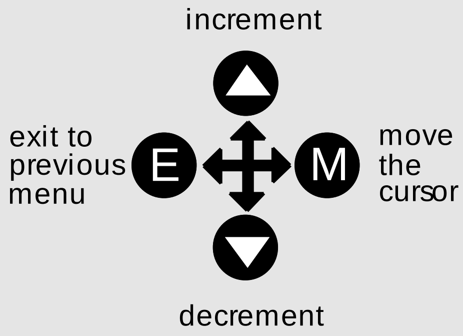
- *Keys **E** and **M** navigate through the menu levels.*
- *The up (▲) and down (▼) keys scroll through the Menu and Parameter lists.*

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 s 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



EDITING PARAMETERS

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 10**0**.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.

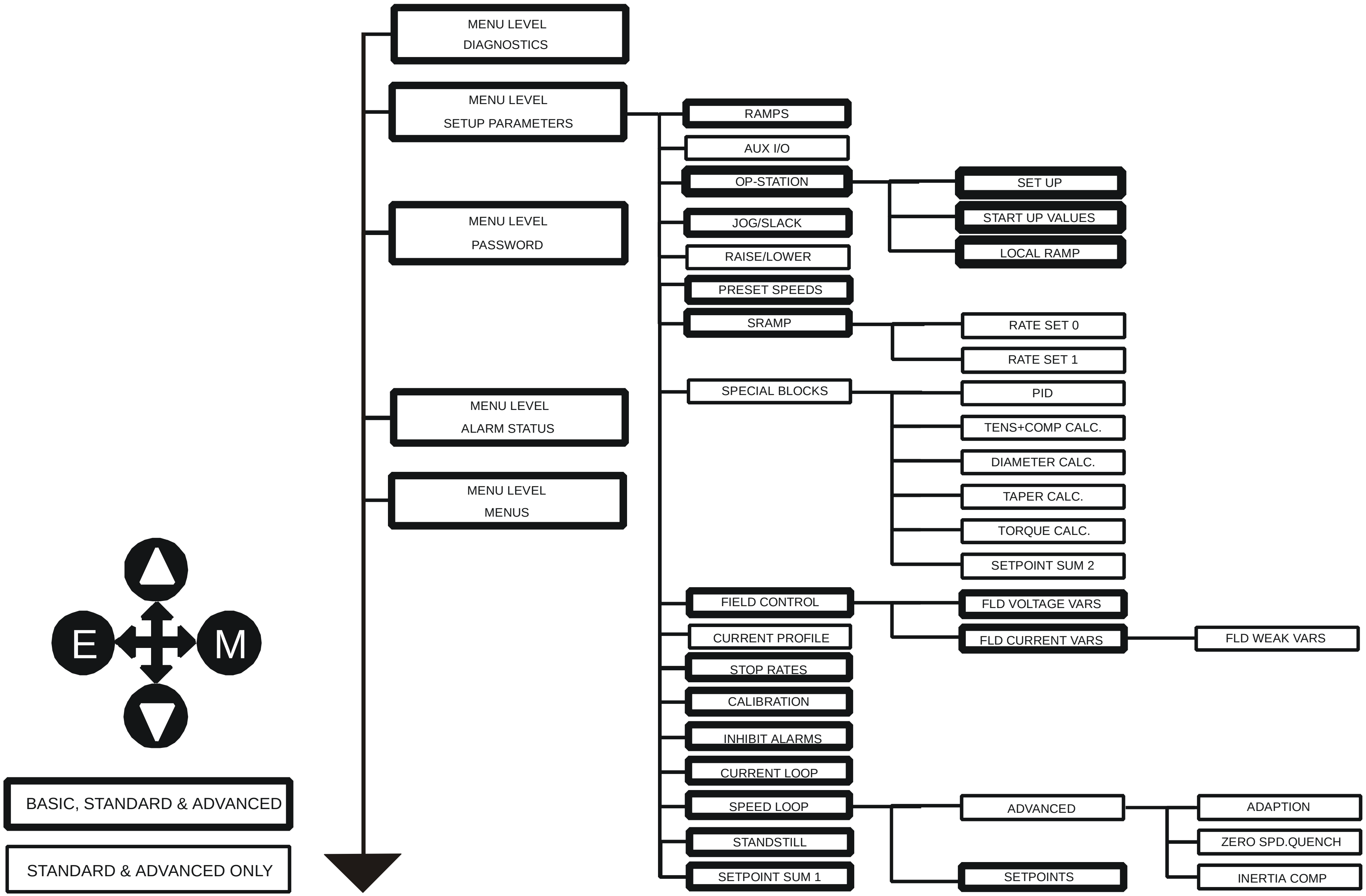
*Alternatively, you can move the cursor manually by pressing the **M** key. Repeated pressing moves the cursor right to left along the value.*

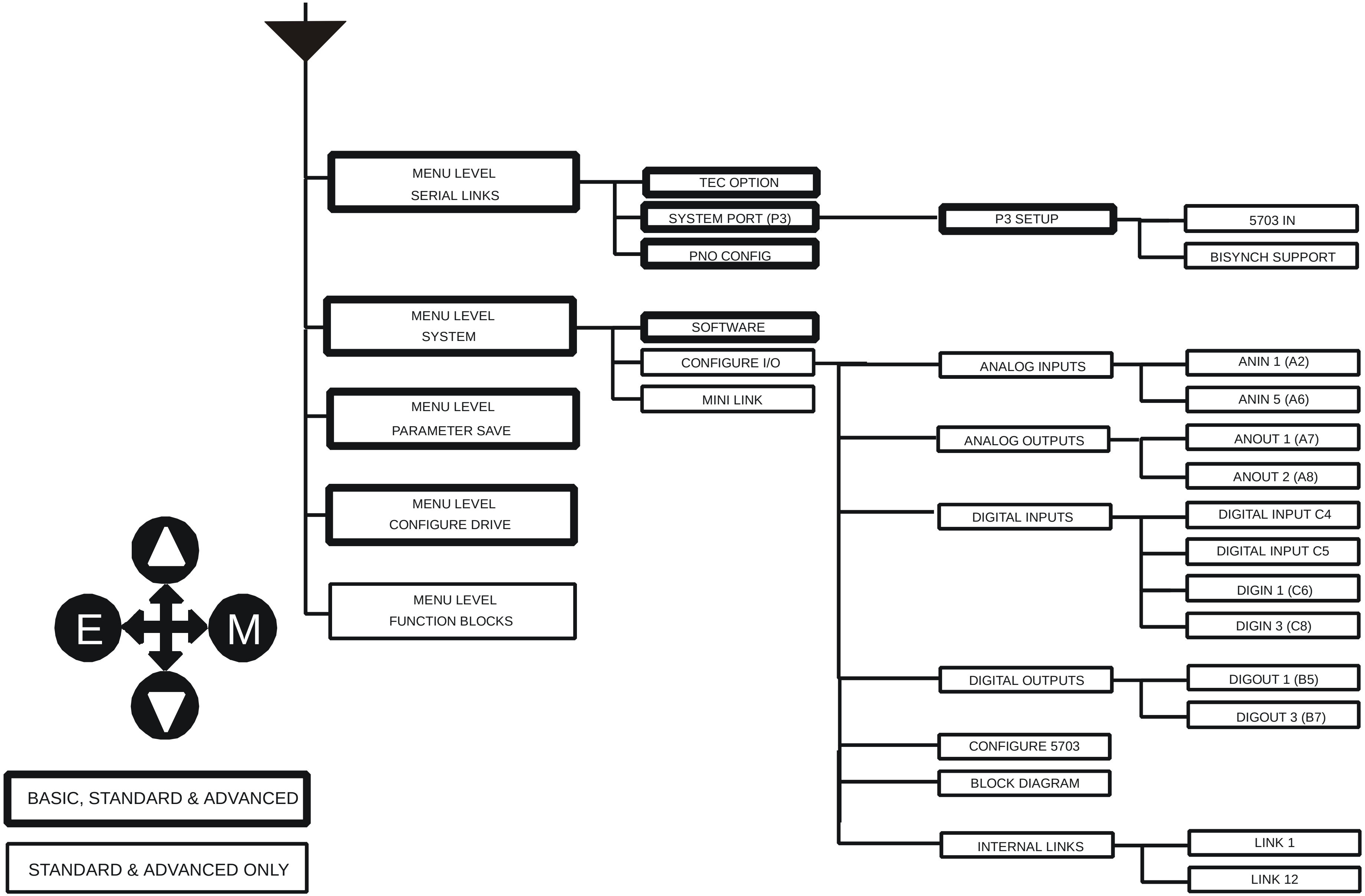
*The cursor times-out after approximately half a second, so use the **M** key and up (▲) and down (▼) keys promptly once the cursor is in position.*

A Parameter showing a cursor under the value

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

The Menu System Map




MENU LEVEL
SERIAL LINKS
TEC OPTION
SYSTEM PORT (P3)
PNO CONFIG
P3 SETUP
5703 IN
BISYNCH SUPPORT
MENU LEVEL
SYSTEM
SOFTWARE
CONFIGURE I/O
MINI LINK
ANALOG INPUTS
ANIN 1 (A2)
ANIN 5 (A6)
ANALOG OUTPUTS
ANOUT 1 (A7)
ANOUT 2 (A8)
DIGITAL INPUTS
DIGITAL INPUT C4
DIGITAL INPUT C5
DIGIN 1 (C6)
DIGIN 3 (C8)
DIGITAL OUTPUTS
DIGOUT 1 (B5)
DIGOUT 3 (B7)
CONFIGURE 5703
BLOCK DIAGRAM
INTERNAL LINKS
LINK 1
LINK 12
MENU LEVEL
PARAMETER SAVE
MENU LEVEL
CONFIGURE DRIVE
MENU LEVEL
FUNCTION BLOCKS
E
M
BASIC, STANDARD & ADVANCED
STANDARD & ADVANCED ONLY

The Keypad Menus

MMI Menu Map

1 DIAGNOSTICS

- SPEED DEMAND
- SPEED FEEDBACK
- SPEED ERROR FILT
- SPEED LOOP O/P
- CURRENT DEMAND
- CURRENT FEEDBACK
- CURRENT FBK.AMPS
- IaFbk UNFILTERED
- IaDmd UNFILTERED
- 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
- RAMPING
- PROGRAM STOP
- COAST STOP
- DRIVE START
- DRIVE ENABLE
- OPERATING MODE
- FIELD ENABLED
- FIELD DEMAND
- FIELD I FBK.
- FIELD I FBK.AMPS
- UNFIL.FIELD 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 6901 Keypad and the DSE Configuration Tool.

DIAGNOSTICS (MMI only)

Parameter	Tag	Range	SETUP PARAMETERS Function Blocks
SPEED DEMAND	**89**	**—.xx %**	
Speed loop total setpoint after the ramp-to-zero block.			*Refer to **SPEED LOOP***
SPEED FEEDBACK	**207**	**—.xx %**	
Speed loop feedback.			*Refer to **FEEDBACKS***
SPEED ERROR FILT	**297**	**—.xx %**	
Speed loop error.			*Refer to **SPEED LOOP***
SPEED LOOP O/P	**356**	**—.xx %**	
Output from speed loop PI.			*Refer to **SPEED LOOP***
CURRENT DEMAND	**299**	**—.xx %**	
Current loop demand (speed error PI output or external current demand clamped by all the current limits).			*Refer to **CURRENT LOOP***
CURRENT FEEDBACK	**298**	**—.xx %**	
Scaled and filtered current feedback.			*Refer to **FEEDBACKS***
CURRENT FBK. AMPS	**538**	**—.xx AMPS**	
Scaled and filtered armature current in Amps.			*Refer to **CURRENT LOOP***
IaFbk UNFILTERED	**65**	**—.xx %**	
Scaled current feedback (unfiltered).			*Refer to **CURRENT LOOP***
IaDmd UNFILTERED	**66**	**—.xx %**	
Scaled current demand (unfiltered).			*Refer to **CURRENT LOOP***
POS. I CLAMP	**87**	**—.x % (h)**	
Positive current clamp.			*Refer to **CURRENT LOOP***
NEG. I CLAMP	**88**	**—.x % (h)**	
Negative current clamp.			*Refer to **CURRENT LOOP***

DIAGNOSTICS (MMI only)

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
- PRESET O/P
- SRAMP OUTPUT
- OUTPUT FPM
- SPEED SETPOINT
- TERMINAL VOLTS
- BACK EMF
- ARM VOLTS FBK
- TACH INPUT
- UNFIL.TACH INPUT
- ENCODER
- UNFIL.ENCODER
- UNFIL.SPD.FBK
- UNFIL.SPD.ERROR
- CONTACTOR CLOSED
- HEALTH LED
- READY
- DRIVE RUNNING
- SYSTEM RESET

Parameter	Tag	Range	SETUP PARAMETERS Function Blocks
ACTUAL POS I LIM	**67**	**—.x % (h)**	
Overall positive current limit value.			*Refer to* ***CURRENT LOOP***
ACTUAL NEG I LIM	**61**	**—.x % (h)**	
Overall negative current limit value.			*Refer to* ***CURRENT LOOP***
INVERSE TIME O/P	**203**	**—.xx %**	
Inverse time clamp output level.			*Refer to* ***INVERSE TIME***
AT CURRENT LIMIT	**42**	**FALSE / TRUE**	
Current demand is being restrained by the overall current clamp.			*Refer to* ***CURRENT LOOP***
AT ZERO SPEED	**77**	**FALSE / TRUE**	
At zero speed feedback.			*Refer to* ***STANDSTILL***
AT ZERO SETPOINT	**78**	**FALSE / TRUE**	
At zero speed demand.			*Refer to* ***STANDSTILL***
AT STANDSTILL	**79**	**FALSE / TRUE**	
AT ZERO SPEED and AT ZERO SETPOINT.			*Refer to* ***STANDSTILL***
RAMPING	**113**	**FALSE / TRUE**	
The SETPOINT ramp function block is limiting the rate of change of Speed Setpoint.			*Refer to* ***RAMPS***
PROGRAM STOP	**80**	**FALSE / TRUE**	
State of program stop (Terminal B8). When B8 is at 24V, then PROGRAM STOP is FALSE.			*Refer to* ***SELECT***
COAST STOP	**525**	**FALSE / TRUE**	
State of coast stop (Terminal B9). When B9 is at 24V, then COAST STOP is FALSE.			*Refer to* ***SELECT***
DRIVE START	**82**	**ON / OFF**	
Controller start/run command.			*Refer to* ***SELECT***
DRIVE ENABLE	**84**	**ENABLED / DISABLED**	
Drive speed and current loop are enabled/quenched.			*Refer to* ***SELECT***

DIAGNOSTICS (MMI only)

Parameter	Tag	Range	SETUP PARAMETERS Function Blocks
OPERATING MODE	**212**	**0 to 7**	
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			*Refer to **JOG/SLACK***
FIELD ENABLED	**169**	**ENABLED / DISABLED**	
Drive field loop is enabled/quenched.			*Refer to **FIELD CONTROL***
FIELD DEMAND	**183**	**—.xx %**	
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.			*Refer to **FIELD CONTROL***
FIELD I FBK.	**300**	**—.xx %**	
Scaled and filtered field current feedback.			*Refer to **FIELD CONTROL***
FIELD I FBK.AMPS	**539**	**—.x AMPS**	
Scaled and filtered field current feedback in Amps.			*Refer to **FIELD CONTROL***
UNFIL.FIELD FBK	**181**	**—.xx %**	
Scaled field current (unfiltered).			*Refer to **FEEDBACKS***
FLD.FIRING ANGLE	**184**	**—.xx DEG**	
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).			*Refer to **FIELD CONTROL***
ANIN 1 (A2)	**50**	**—.xx VOLTS**	
Speed setpoint no. 1.			*Refer to **ANALOG INPUTS***
ANIN 2 (A3)	**51**	**—.xx VOLTS**	
Hardwired. Speed setpoint no. 2 or current demand if C8 = ON.			*Refer to **ANALOG INPUTS***
ANIN 3 (A4)	**52**	**—.xx VOLTS**	
Speed setpoint no. 3 (ramped).			*Refer to **ANALOG INPUTS***

DIAGNOSTICS (MMI only)

Parameter	Tag	Range	SETUP PARAMETERS Function Blocks
ANIN 4 (A5)	**53**	**—.xx VOLTS**	
Speed setpoint no. 4 or negative current clamp if C6 = ON.			*Refer to **ANALOG INPUTS***
ANIN 5 (A6)	**54**	**—.xx VOLTS**	
Main current limit or positive current clamp if C6 = ON.			*Refer to **ANALOG INPUTS***
ANOUT 1 (A7)	**55**	**—.xx VOLTS**	
Scaled speed feedback.			*Refer to **ANALOG OUTPUTS***
ANOUT 2 (A8)	**56**	**—.xx VOLTS**	
Total speed setpoint.			*Refer to **ANALOG OUTPUTS***
START (C3)	**68**	**ON / OFF**	
Start/Run terminal.			*Refer to **SEQUENCING***
DIGITAL INPUT C4	**69**	**ON / OFF**	
Jog/Take-up Slack terminal.			*Refer to **DIGITAL INPUTS***
DIGITAL INPUT C5	**70**	**ON / OFF**	
Electronic enable/disable (quench) terminal (ON = Enabled).			*Refer to **DIGITAL INPUTS***
DIGIN 1 (C6)	**71**	**ON / OFF**	
Symmetrical current clamps/Asymmetrical (bipolar) current clamps (ON = Bipolar).			*Refer to **DIGITAL INPUTS***
DIGIN 2 (C7)	**72**	**ON / OFF**	
Ramp hold input (ON = Hold).			*Refer to **DIGITAL INPUTS***
DIGIN 3 (C8)	**73**	**ON / OFF**	
Current demand isolate; giving speed or current mode of operation. (ON = Current mode).			*Refer to **DIGITAL INPUTS***
DIGOUT 1 (B5)	**74**	**ON / OFF**	
At zero speed.			*Refer to **DIGITAL OUTPUTS***
DIGOUT 2 (B6)	**75**	**ON / OFF**	
Drive healthy. Health is also displayed on the front panel LED, always ON when the start is low.			*Refer to **DIGITAL OUTPUTS***
DIGOUT 3 (B7)	**76**	**ON / OFF**	
Drive ready to run (all alarms healthy and mains synchronisation achieved).			*Refer to **DIGITAL OUTPUTS***
RAISE/LOWER O/P	**264**	**—.xx %**	
Value of the raise/lower ramp function.			*Refer to **RAISE/LOWER***

DIAGNOSTICS (MMI only)

Parameter	Tag	Range	SETUP PARAMETERS Function Blocks
PID OUTPUT	**417**	**—.xx %**	
Output of the PID function block.			*Refer to* ***PID***
PID CLAMPED	**416**	**FALSE / TRUE**	
Indicates the PID output has reached either the positive or negative limit.			*Refer to* ***PID***
PID ERROR	**415**	**—.xx %**	
Displays the difference between the setpoint (INPUT 1) and the feedback signal (INPUT 2) in the PID function block.			*Refer to* ***PID***
SPT SUM OUTPUT	**86**	**—.xx %**	
Setpoint summation output.			*Refer to* ***SETPOINT SUM 1***
RAMP OUTPUT	**85**	**—.xx %**	
Setpoint ramp output.			*Refer to* ***RAMPS***
PRESET O/P	**572**	**—.x %**	
Scales the selected preset input by MAX SPEED.			*Refer to* ***PRESET SPEEDS***
SRAMP OUTPUT	**589**	**—.x %**	
Diagnostic, ramp output.			*Refer to* ***SRAMP***
OUTPUT FPM	**593**	**—.x**	
Outputs the selected INPUT value.			*Refer to* ***PRESET SPEEDS***
SPEED SETPOINT	**63**	**—.xx %**	
Speed loop total setpoint including the ramp output before the ramp-to-zero function.			*Refer to* ***SPEED LOOP***
TERMINAL VOLTS	**57**	**—.x %**	
Scaled armature terminal volts.			*Refer to* ***CALIBRATION***
BACK EMF	**60**	**—.x %**	
Calculated motor back EMF including IR compensation. (Armature Volts Feedback)			*Refer to* ***CALIBRATION***
ARM VOLTS FBK	**605**	**—. V**	
Back EMF scaled by NOM MOTOR VOLTS (CONFIGURE DRIVE function block).			*Refer to* ***FEEDBACKS***
TACH INPUT	**308**	**—.x %**	
Scaled analog tachogenerator feedback.			*Refer to* ***FEEDBACKS***
UNFIL.TACH INPUT	**58**	**—.x %**	
Analog tachogenerator feedback (unfiltered).			*Refer to* ***CALIBRATION***

DIAGNOSTICS (MMI only)

Parameter	Tag	Range	SETUP PARAMETERS Function Blocks
ENCODER	**206**	**—. RPM**	
Encoder speed feedback in RPM.			*Refer to* ***ENCODER***
UNFIL.ENCODER	**59**	**—. RPM**	
Encoder speed feedback in RPM (unfiltered).			*Refer to* ***ENCODER***
UNFIL.SPD.FBK	**62**	**—.xx %**	
Unfiltered speed feedback.			*Refer to* ***SPEED LOOP***
UNFIL.SPD.ERROR	**64**	**—.xx %**	
Unfiltered speed error.			*Refer to* ***SPEED LOOP***
CONTACTOR CLOSED	**83**	**FALSE / TRUE**	
Main contactor control signal.			*Refer to* ***SEQUENCING***
HEALTH LED	**122**	**FALSE / TRUE**	
State of Health LED on Keypad.			*Refer to* ***ALARMS***
READY	**125**	**FALSE / TRUE**	
The drive is ready to accept an enable signal.			*Refer to* ***SEQUENCING***
DRIVE RUNNING	**376**	**FALSE / TRUE**	
Drive is enabled and may make current when TRUE. A diagnostic for those parameters that can only be written to when the drive is stopped (parameters marked with Note 2 in the Parameter Specification Table).			*Refer to* ***SEQUENCING***
SYSTEM RESET	**374**	**FALSE / TRUE**	
Set for one cycle as the drive is enabled.			*Refer to* ***SEQUENCING***

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 590PR menu is shown by The Menu System Map on page 6-8.

MMI Menu Map

1 PASSWORD
- ENTER PASSWORD
- CHANGE PASSWORD

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

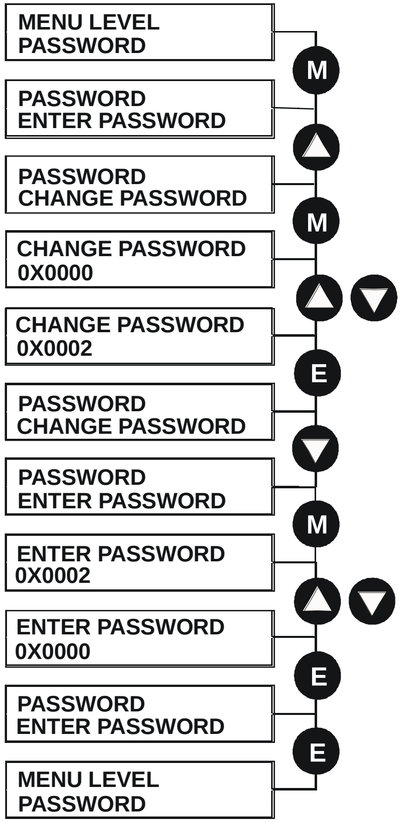
By default, the password feature is disabled, i.e. both the CHANGE PASSWORD and ENTER PASSWORD parameters have the same value: 0x0000.

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 "****".



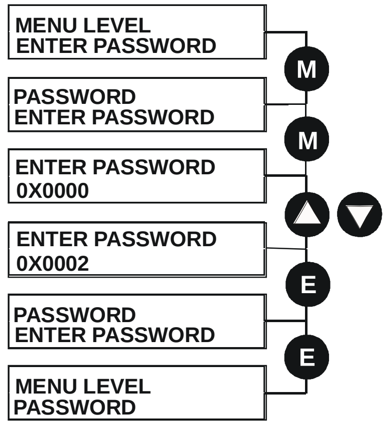
To Deactivate Password Protection

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

MMI Menu Map

1 MENUS
- VIEW LEVEL
- LANGUAGE

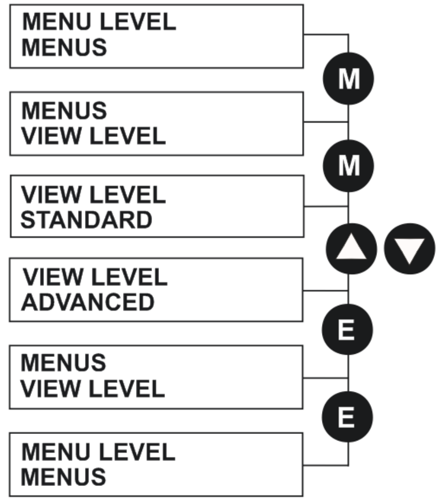
Selecting a Menu Viewing Level

For ease of operation the Keypad 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 Menu System Map, page 6-8 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



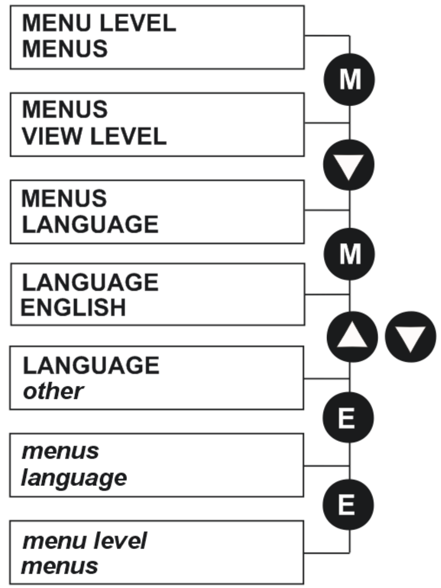
Selecting the Display Language

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. 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).

Alterative languages (French, German, Spanish and Italian) can be selected.



SERIAL LINKS

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

```
SERIAL LINKS
|_ TEC OPTION              refer to Appendix D:"Programming"
|_ SYSTEM PORT P3 (USB)    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                see below
|_ CONFIGURE I/O           see below
|_ miniLINK                refer to Appendix D:"Programming" - miniLINK
|_ SAVE TO OP              refer to Appendix D:"Programming" - CONFIGURE DRIVE
|_ LOAD FROM OP            refer to Appendix D:"Programming" - CONFIGURE DRIVE
```

SOFTWARE Parameter

This parameter displays the software release of the firmware in the drive.

CONFIGURE I/O Parameter

This parameter is repeated in several menus. It is used whenever you want to save any changes that are made to a parameter.

Refer to Appendix D: "Programming" - Modifying a Block Diagram.

PARAMETER SAVE

Refer to "Saving Your Application", page 6-23.

CONFIGURE DRIVE

MMI Menu Map

1 CONFIGURE DRIVE
- CONFIGURE ENABLE
- NOM MOTOR VOLTS
- ARMATURE CURRENT
- FIELD CURRENT
- 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

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

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
CONFIGURE ENABLE	**39**	**FALSE / TRUE**	
Selects Setup Mode (FALSE) or Configuration Mode (TRUE). Refer to Appendix D "Programming" - Modifying a Block Diagram.			
NOM MOTOR VOLTS	**521**	**100 to 875 VOLTS**	
Sets the 100% value for Armature Volts VA. Set this value to match the motor in use. (Refer to ARMATURE V CAL in the CALIBRATION function block).			
ARMATURE CURRENT	**523**	**drive dependent AMPS**	
Sets the 100% value for Armature Current IA. Set this value to match the motor in use.			
FIELD CURRENT	**524**	**drive dependent AMPS**	
Sets the 100% value for Field Current IF. Set this value to match the motor in use. Note: this should be set to a minimum value if in Field Voltage control - see FLD. CTRL MODE.			
FLD. CTRL MODE	**209**	**See below**	
Selects between open-loop VOLTAGE CONTROL or closed-loop CURRENT CONTROL.			*Refer to* ***FIELD CONTROL***
FLD. VOLTS RATIO	**210**	**0.0 to 100.0 % (h)**	
Sets the output dc field voltage as a ratio of the RMS FIELD supply voltage when FLD CTRL MODE is set to VOLTAGE CONTROL.			*Refer to* ***FIELD CONTROL***
MAIN CURR. LIMIT	**421**	**0.00 to 200.00 %**	
Independent symmetric current clamp. Sets symmetric clamps outside scaling from the CUR. LIMIT/SCALER parameter.			*Refer to* ***CURRENT LOOP***
AUTOTUNE	**18**	**OFF/ON**	
Turns the AUTOTUNE procedure on. Refer to Chapter 4: "Operating the Drive" - Performance Adjustment.			*Refer to* ***AUTOTUNE***

CONFIGURE DRIVE (MMI view)

Parameter	Tag	Range	SETUP PARAMETERS Function Blocks
SPEED FBK SELECT	**47**	**See below**	
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 use 4 : ENCODER 2			*Refer to* ***SPEED LOOP***
ENCODER LINES	**24**	**10 to 5000**	
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.			*Refer to* ***ENCODER***
ENCODER RPM	**22**	**0 to 6000**	
Motor top speed setting (100%) when using encoder feedback.			*Refer to* ***ENCODER***
ENCODER SIGN	**49**	**NEGATIVE / POSITIVE**	
Since the encoder feedback cannot be reversed electrically, the signal polarity can be reversed by the control software. *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.*			*Refer to* ***ENCODER***
SPD.INT.TIME	**13**	**0.001 to 30.000 s**	
Speed loop PI integral gain adjustment.			*Refer to* ***SPEED LOOP***
SPD.PROP.GAIN	**14**	**0.00 to 200.00**	
Speed loop PI proportional gain adjustment.			*Refer to* ***SPEED LOOP***

FUNCTION BLOCKS

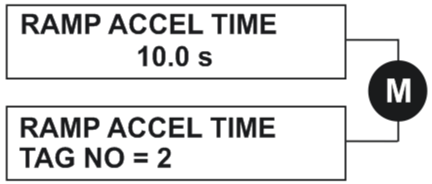
Refer to Appendix D where all the function blocks under this menu are listed in alphabetical order.

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

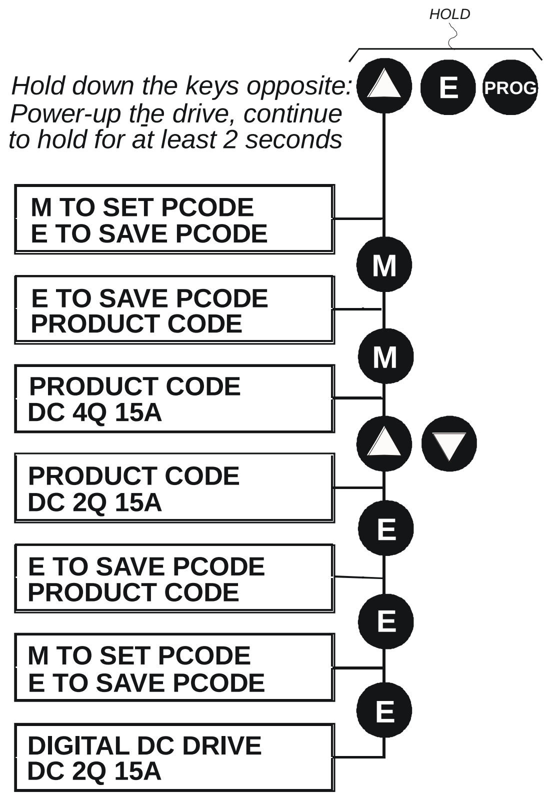


Changing the P-code (3-button reset)

NOTE **The MMI will go to this state directly when the field current range switch (SW1) has been changed and the drive has then been re-powered.**

NOTE **The MMI will go to this state directly if a new control board is fitted.**

Power-up the drive holding three keys as described in the chart.



Caution

At this point, the 590PR may not be correctly configured. It is vitally important that it is configured for the correct power rating or irreparable damage may occur to the drive when it attempts to run the motor.

Continue to select the correct Product Code rating. Perform a PARAMETER SAVE now (refer to "Saving Your Application", page 6-23).

This is the preferred way of selecting a new product code. The available product codes are restricted to the set of codes that match the stack that the control board is fitted to.

If the product code is changed during the 3-button reset, the following parameters are set to their default value for the new product code:

Tag 523	ARMATURE CURRENT
Tag 524	FIELD CURRENT
Tag 201	REGEN ENABLE

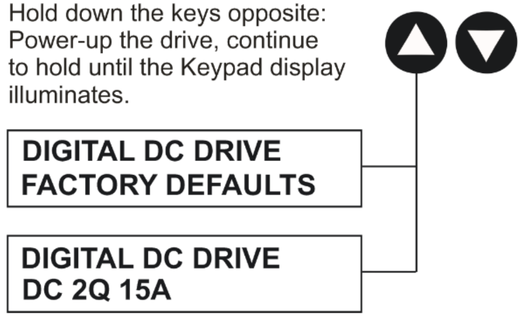
NOTE **The 3-button reset does not cause the default configuration to be loaded.**

Resetting to Factory Defaults (2-button reset)

Power-up the drive holding two keys as described below.

The drive is now safely configured with the default settings detailed in this manual for the existing product code.

The default configuration is not automatically saved to non-volatile memory, so you must perform a PARAMETER SAVE (refer to "Saving Your Application", page 6-23).

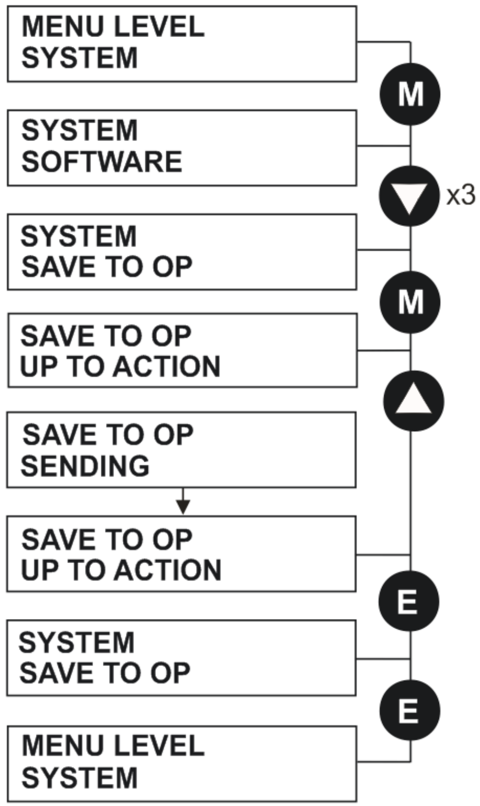


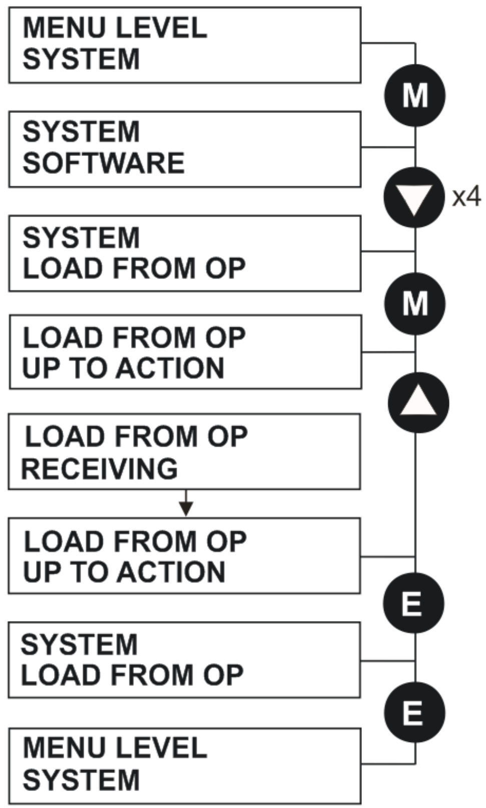
Cloning Feature

The Keypad can be used to transfer all parameters from a drive to another of the same rating. You can also use the Keypad to store a back-up of the drive's parameter settings.

SAVE TO OP will upload all parameter settings from the drive to the Keypad.

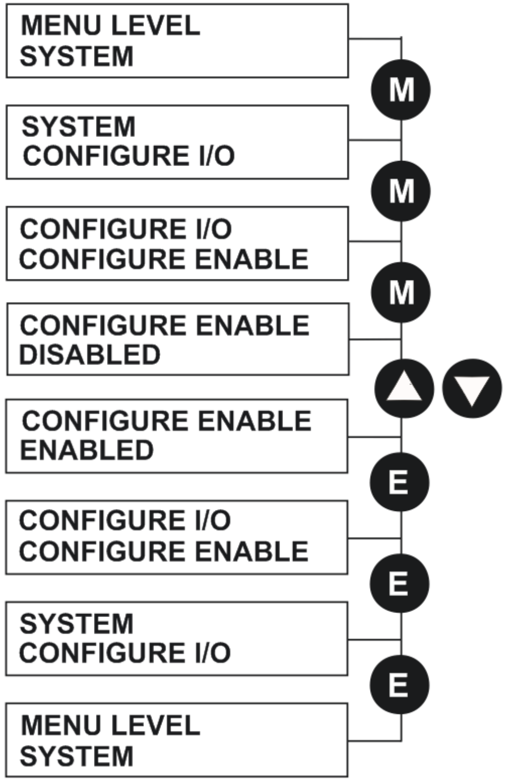
LOAD FROM OP will download all parameter settings from the Keypad to the drive.

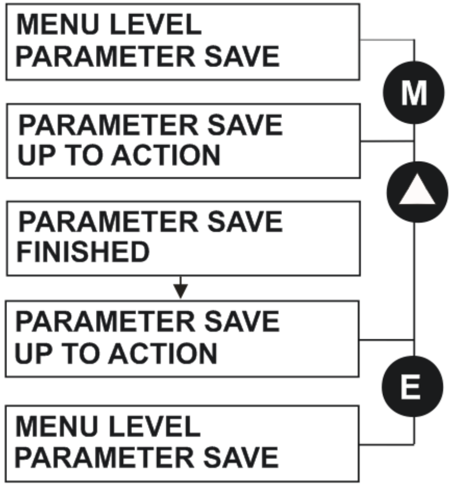




How to Save, Restore and Copy your Settings

Saving Your Application





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 s (UP) key, as instructed, saves all parameter values (with one exception, see the note below) in non-volatile memory, i.e. values are stored during power-down.

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

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.

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.

Copying an Application

Copying an application requires a host computer connection to the Drive’s System Port P3 (USB). 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

Trips and Fault Finding

- **Trips**
- **Fault Finding**

Trips and Fault Finding

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).

Keypad Indications

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

1. The HEALTH LED goes out indicating a Trip condition has occurred. The MMI displays the activated alarm. (Investigate, find and remove the cause of the trip.)
2. 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 or MMI) 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
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 7-2 Fault Finding

Critical Error

The 590PR has a security feature. When the power board is not recognized by the control board, all the lights in the MMI will flash and the MMI will display: "CRITICAL ERROR:: 0x0F01:: 00000001". In this case please contact Parker.

If the MMI displays any other Critical Error Code, please contact Parker.

Alarm Messages

MMI Menu Map

1 ALARM STATUS
- LAST ALARM
- HEALTH WORD
- HEALTH STORE

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 **t** (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 DSELite 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 funtion 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

1 FUNCTION BLOCKS

2 ALARMS

3 ALARM HISTORY

- ALARM 1 NEWEST
- ALARM 2
- ALARM 3
- ALARM 4
- ALARM 5
- ALARM 6
- ALARM 7
- ALARM 8
- ALARM 9
- ALARM 10 OLDEST

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**	**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			
** Refer to "**Error! Reference source not found.**" below*					
• 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	CONTACTOR DELAY	F	0	0	4
14	EXTERNAL TRIP	F	0	0	5
14	REMOTE TRIP	F	0	0	6
14	ENABLE LOW	F	0	0	7
14	SEQUENCING	F	0	0	9
14	COMMS TIMEOUT	F	0	1	0
14	CONFIG ENABLED	F	2	0	0
14	CALIBRATION TRIP	F	3	0	0
14	NO OP-STATION	F	4	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
OVERSPEED Motor overspeed - the speed feedback signal has exceeded 125% of rated speed.	Badly adjusted speed loop (alarm only operates with encoder or armature volts feedback selected) Alarm time delay : 50 milliseconds

Trip Message and Meaning	Possible Reason for Trip
MISSING PULSE 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. **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.** 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.	Firing plug failure Connection failure Alarm time delay : 60 seconds
FIELD OVER I The motor field current has exceeded 120% of the calibrated value	External field has incorrect supply phases applied (Alarm only operates with field current control mode selected) Alarm time delay : 10 seconds
HEATSINK TRIP The Drive heatsink temperature is too high	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. *Note:* **The stack must be allowed to cool in order to re-start the Drive.** Alarm time delay : 0.5 seconds

Trip Message and Meaning	Possible Reason for Trip
THERMISTOR The motor temperature is too high	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) *Note:* **The motor must be allowed to cool in order to re-start the Drive.** Alarm time delay : 5 seconds
OVER VOLTS (VA) Motor armature voltage has exceeded 120% of rated volts	Loose armature connection Badly adjusted field voltage setting Badly adjusted field current loop Badly adjusted field-weakening bemf loop Badly adjusted speed loop Alarm time delay : 1 second
SPEED FEEDBACK The difference between speed feedback and armature voltage feedback is greater than the SPDFBK ALM LEVEL parameter value If FLD WEAK ENABLE parameter is enabled, speed feedback is less than 10% when in the field weakening region	Analog tacho feedback polarity incorrect (terminals G3 and G4) The ENCODER SIGN parameter's polarity is incorrect Disconnection of wiring, including fibre optics Armature voltage calibration has not been suitably reduced when running at reduced field currents Tachogenerator failure Tachogenerator coupling failure Alarm time delay : 0.125 seconds
ENCODER FAILED No speed feedback signal	The SPEED FBK SELECT parameter is set to ENCODER but an optional Encoder board is not fitted Where applicable, check fibre optic cable for damage, bend radius, operating length - refer to the Microtach handbook. Check cable and connections on wire-ended encoder

Trip Message and Meaning	Possible Reason for Trip
FIELD FAIL	
Field current is less than 6% of rated current when in Current Control mode Field current is less than 50mA when in Voltage Control mode (with default current burden of 15K)	Open circuit motor field - check connection and measure field resistance Faulty operation of field controller Where an ac supply feeds the onboard field regulator, check connections FL1 & 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. Alarm time delay : 1 second
3-PHASE FAILED	
3-phase supply failure	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. 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.
PHASE LOCK	
Supply frequency is outside the frequency band limits 45 - 65Hz	Check supply frequency Synchronisation errors caused by distorted supply
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

Trip Message and Meaning	Possible Reason for Trip
ACCTS FAILED	
AC current transformer plug connection to Drive power board missing	Check armature current transformer plug for correct installation. Frame 5 only : Load imbalance between the two parallel power stacks *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.**
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 either the stack rating or the nominated 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.
CONTACTOR DELAY	
The internal auxiliary 3-phase contactor failed to close.	Check the position of the Calibration Scaling Switch - refer to **Error! Reference source not found.**, page **Error! Bookmark not defined.**.
EXTERNAL TRIP	Customer alarm! Trip operates if input open or high impedance. Alarm time delay : 0.2 seconds Device not wired to drive or device open circuited : check C1 to C2 connections to drive - connect C1 to C2 if customer device not fitted.

Trip Message and Meaning	Possible Reason for Trip
REMOTE TRIP	REM. SEQUENCE parameter Remote Trip flag set to zero.
ENABLE LOW	Local Mode run with Enable input low
SEQUENCING Internal sequencing error	Contact Parker
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.
NO OP STATION	Keypad has been disconnected from Drive whilst Drive is running in local control.
AUX SUPPLY	Check auxilliary supply and/or mains input
COMMS FAULT CODE x	Keypad faulty Remote cable to keypad faulty Drive firmware not running
CRITICAL ERROR xxxx::xxxxxxxx	Contact Parker

Table 7-2 Trip Messages

Self Test Alarms

Self Test Alarm and Meaning	Possible Reason for Alarm

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 **E** 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 **E** 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.

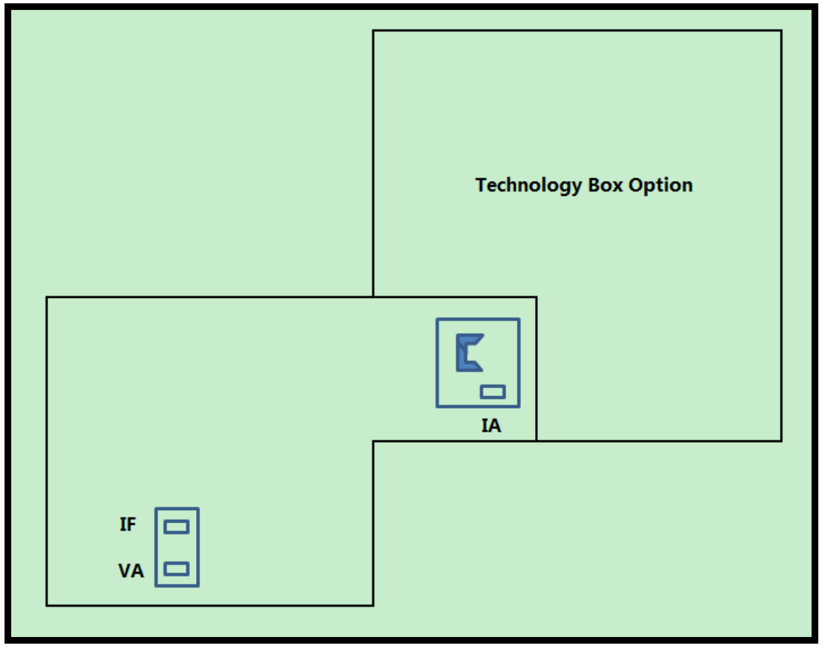
SPEED FBK ALARM
ENCODER ALARM
FIELD FAIL
5703 RCV ERROR
STALL TRIP
TRIP RESET
REM TRIP INHIBIT

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 can be accessed through the Technology Option housing. When used with a meter, they will provide valuable information in the event of a fault. Refer to Parker for further information.



Test Points viewed through the front of the drive.

Test Point	Description
IF	Field current feedback 0.0V = 0% 4.0V =100% (mean voltage), *value of FIELD I FBK diagnostic, Tag No. 300*
IA	Armature current feedback ± 1.1V ≡ ±100% (mean current), *value of CURRENT FEEDBACK diagnostic, Tag No. 298*
VA	Armature volts feedback +5V ≡ +100%, +2.5V ≡ 0%, 0V ≡ -100% calculated VA (mean voltage), *value of TERMINAL VOLTS diagnostic, Tag No. 57*

Chapter 8 Routine Maintenance and Repair

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

Maintenance

Because of its solid state design, the DC590PR 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.

WARNING

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.

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 590PR.

Isolate the entire 590PR 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 590PR. 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. This section contains information for repair work that may be undertaken.

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 service

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

Information	**Source**
Model number and serial number	DC590PR 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 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.

Technical Support Checks

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

WARNING

Please only attempt these checks if you are electrically competent.

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.

Continuity Test on Fuses Using a Meter	✓or ×
Check the coding fuses on the power board Check the auxiliary fuses etc. (fan fuse, if applicable)	
Diode Check on Power Terminals Using a Meter	✓or ×
A+ to L1, L2, L3 and Earth Terminal = Open Circuit A- to L1, L2, L3 and Earth Terminal = Open Circuit	
Internal Field Check Using a Meter All the coding fuses must be OK before continuing with the following checks since the fuses are in the circuit.	✓or ×
-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	
External Field Check Using a Meter	✓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.

Serial Number		**Model Number**	

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

Repairs for Frame 2

Replacing the Fan (Frame 2)

> **WARNING!**
> **Ensure that all wiring is electrically isolated and cannot be made "live" unintentionally by other personnel.**

Step1: Loosen the two screws of the baffle and remove.

Step2: Slide down the baffle.

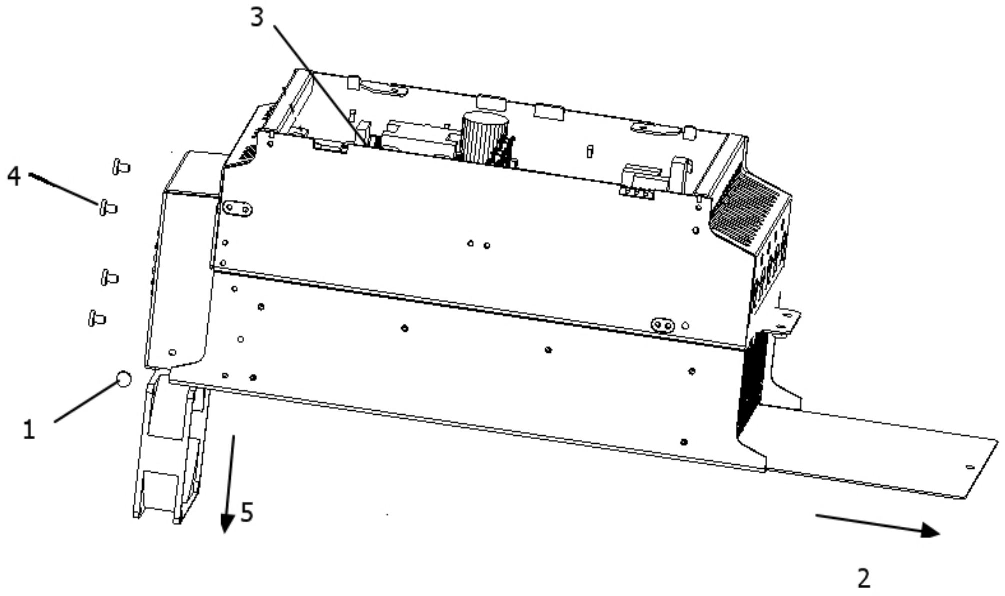
Step3: Remove fan electrical connector from power board.

Step4: Remove the fan snap fixings.

Step5: Bring the fan out.

Notes: There is no need to remove the fan cover.

Reverse the procedure for refitting the fan assembly – refer to the refitting note in the diagram above. The replacement fan assembly includes the fan, cover and capacitor, requiring just a simple connection of the supply cable.



Appendix A

Serial Communications

System Port (P3)

- UDP Support
- DSELite Support
- EI Bisynch ASCII Support
- EI Binary Support
- Error Codes

System Port (P3)

This port has several uses:

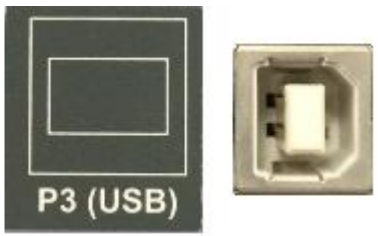
UDP Support	Upload information from a PC	Refer to page 1
DSE Lite	Parameters can be monitored and updated by DSE Lite (or other suitable PC programming tool)	Refer to page 4
EI ASCII	Communications with other control/supervisory equipment	Refer to page 5
EI BINARY	Communications with other control/supervisory equipment	Refer to page 10

Drive Connections

The port is an isolated USB, 9600 Baud (default), supporting the standard EI BISYNCH ASCII communications protocol. You can find and install the USB driver --"PL2303_Prolific_DriverInstaller_v1_10_0" in 590PR CD.

Use a standard USB lead to connect to the Drive.

P3



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.

MMI Menu Map

1 SERIAL LINKS

2 SYSTEM PORT P3

>> P3 SETUP
DUMP CHANGED
DUMP MMI (TX)
UDP XFER (RX)
UDP XFER (T)
VERSION NUMBER

System Port (P3) Set-up

When transferring data using UDP the communications settings used are:

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

1 Stop bit, (fixed)

No Parity, (fixed)

8 data bits, (fixed)

No flow control, (fixed)

MMI Menu Map

1 SERIAL LINKS

2 SYSTEM PORT (P3)

3 P3 SETUP

MODE
5703 IN
>> BISYNCH SUPPORT
BAUD RATE

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 or just those that have been changed from the default values. The format of the data is human readable and may be used as documentation of the drive’s configuration.

DUMP CHANGED

This parameter is used in conjunction with DUMP MMI (TX). When TRUE, only those parameters that have been modified from their default value are included in the dump.

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.

DSELite 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. Go to www.Parker.com/ssd for updates.

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

1 SERIAL LINKS

2 SYSTEM PORT (P3)

3 P3 SETUP

- MODE
- 5703 IN
- BISYNCH SUPPORT >>
- BAUD RATE

EI Bisynch ASCII Support

The drive can communicate using the EI Bisynch ASCII protocol without the need for a Technology Option board to be fitted.

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

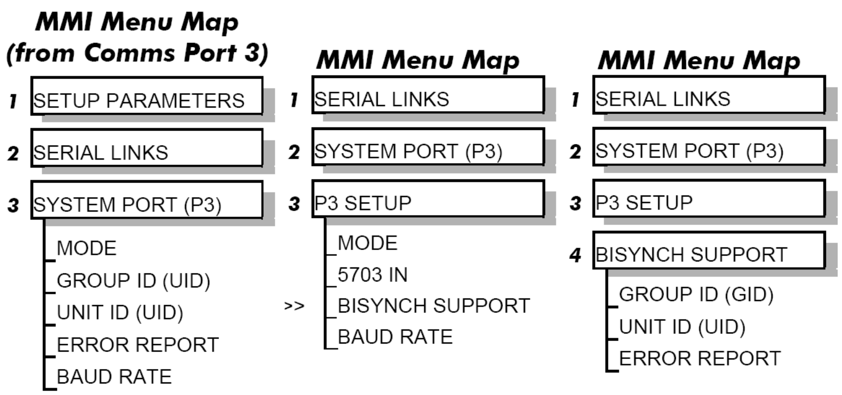
Set MODE parameter (Tag No. 130) to **EIACSII** using the MMI

Set BAUD RATE parameter (Tag No. 198)

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

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

For details of the EI Bisync Protocol refer to the RS485 Communications Interface Technical Manual, HA463560U002. This is available for download on the Parker Drives website, www.parker.com/ssd.



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

!1 : Command 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 (590PR 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

!2 : State 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

!3 : Save Command 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.

!4 : Save State 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 166. 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	-XXXXX. to XXXXX. -XXXXX.X to XXXXX.X -XXXXX.XX to XXXXX.XX -XXXXX.XXX to XXXXX.XXX -XXXXX.XXXX to XXXXX.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 adapting 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 12.

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.

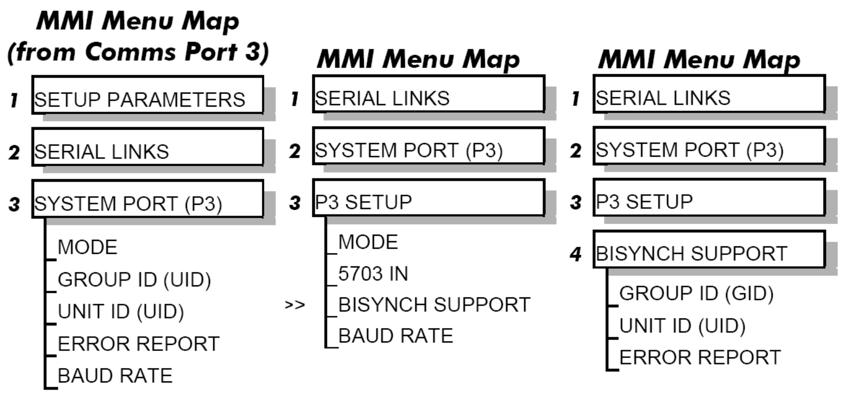
System Port (P3) Set-up

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 Drives protocol group identity address) to match the drive being communicated with.

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



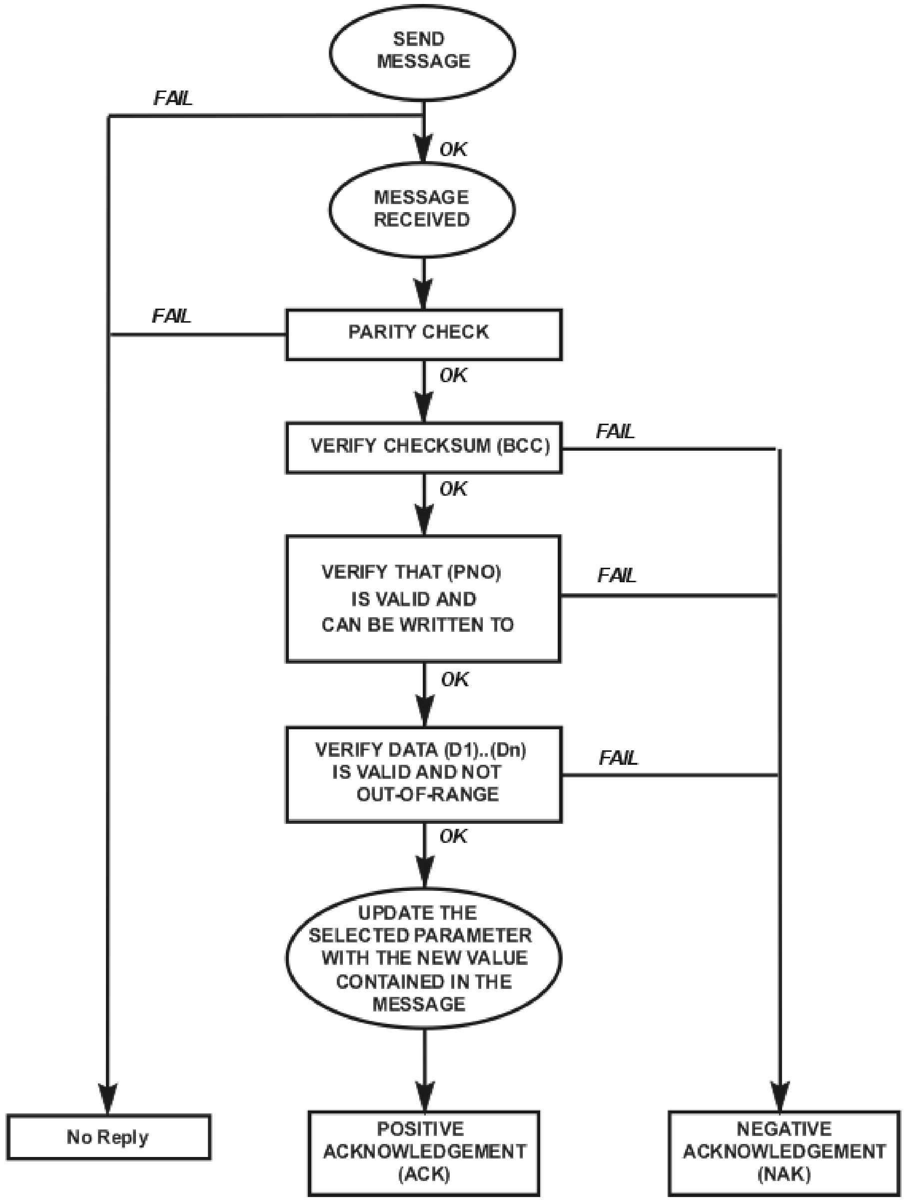


Figure A-3 Converter Response Sequence to a Binary Selection Message

EI Bisynch Binary Message Protocol

Transmission Standard	:	RS485 (RS422 bi-directional)
Protocol	:	ANSI-X3.28-2.5-B1
Data Rates	:	300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600 or 115200 Baud
Character Format	:	1 start + 8 bit ASCII data + 1 parity + 1 stop bit (11 bits)
Parity	:	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)	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: D1 :bits 2 [→] 6 mode number *Number format is:* 0 = XXXX 1 = XXX.X 2 = XX.XX 3 = X.XXX 4 = .XXXX bits 0 and 1 bits 14 and 15 of the value. D2 :bits 0 [→] 6 bits 7 to 13 of the value. D3 :bits 0 [→] 6 bits 0 to 6 of the value.
(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.

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

590PR and 590PRDRV

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 pointers associated with PNO's 112 to 127.

For example:

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

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

Enquiry Polling

In Enquiry Polling mode, block 1 is polled.

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 BIT**	**ASCII**	**BINARY**	**LIMITS MIN TO MAX**	**ACCESS**	**DESCRIPTION**
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		Cal. Card
			15			0/1		ACCTS Failed

Block 2								
PNO (ID) BINARY	**(MN) ASCII**	**TAG**	**DATA FORMAT BIT**	**ASCII**	**BINARY**	**LIMITS MIN TO MAX**	**ACCESS**	**DESCRIPTION**
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 BIT	ASCII	BINARY	LIMITS MIN TO MAX	ACCESS	DESCRIPTION
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		Cal. Card
			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 BIT**	**ASCII**	**BINARY**	**LIMITS MIN TO MAX**	**ACCESS**	**DESCRIPTION**
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 BIT	ASCII	BINARY	LIMITS MIN TO MAX	ACCESS	DESCRIPTION
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 BIT	ASCII	BINARY	LIMITS MIN TO MAX	ACCESS	DESCRIPTION
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 BIT**	**ASCII**	**BINARY**	**LIMITS MIN TO MAX**	**ACCESS**	**DESCRIPTION**
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 BIT**	**ASCII**	**BINARY**	**LIMITS MIN TO MAX**	**ACCESS**	**DESCRIPTION**
72	48	208		21	x.xxxx	-3.0000/+3.0000	R/W	Ratio 0
73	49	309		21	xxx.xx	-100.00/+100.00	R/W	Input 0
74	4A	48		21	xxx.xx	-100.00/+100.00	R/W	Pre-set -ve Current Limit
75	4B	301		21	xxx.xx	-100.00/+100.00	R/W	Pre-set +ve Current Limit

Block 10								
PNO (ID) BINARY	**(MN) ASCII**	**TAG**	**DATA FORMAT BIT**	**ASCII**	**BINARY**	**LIMITS MIN TO MAX**	**ACCESS**	**DESCRIPTION**
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 BIT	ASCII	BINARY	LIMITS MIN TO MAX	ACCESS	DESCRIPTION
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 BIT	ASCII	BINARY	LIMITS MIN TO MAX	ACCESS	DESCRIPTION
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 BIT**	**ASCII**	**BINARY**	**LIMITS MIN TO MAX**	**ACCESS**	**DESCRIPTION**
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 BIT**	**ASCII**	**BINARY**	**LIMITS MIN TO MAX**	**ACCESS**	**DESCRIPTION**
112	70	PNO 96		*	*	*	*	Configurable PNO 0
113	71	PNO 97		*	*	*	*	Configurable PNO 1
114	72	PNO 98		*	*	*	*	Configurable PNO 2
115	73	PNO 99		*	*	*	*	Configurable PNO 3
116	74	PNO 100		*	*	*	*	Configurable PNO 4
117	75	PNO 101		*	*	*	*	Configurable PNO 5
118	76	PNO 102		*	*	*	*	Configurable PNO 6
119	77	PNO 103		*	*	*	*	Configurable PNO 7

Block 15								
PNO (ID) BINARY	**(MN) ASCII**	**TAG**	**DATA FORMAT BIT**	**ASCII**	**BINARY**	**LIMITS MIN TO MAX**	**ACCESS**	**DESCRIPTION**
120	78	PNO 104		*	*	*	*	Configurable PNO 8
121	79	PNO 105		*	*	*	*	Configurable PNO 9
122	7A	PNO 106		*	*	*	*	Configurable PNO 10
123	7B	PNO 107		*	*	*	*	Configurable PNO 11
124	7C	PNO 108		*	*	*	*	Configurable PNO 12
125	7D	PNO 109		*	*	*	*	Configurable PNO 13
126	7E	PNO 110		*	*	*	*	Configurable PNO 14
127	7F	PNO 111		*	*	*	*	Configurable PNO 15

* = These fields depend 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), AUX PORT (P2) 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.

MMI Menu Map
(from Comms Port 3)

1 SETUP PARAMETERS
2 SERIAL LINKS
3 SYSTEM PORT (P3)
- MODE
- GROUP ID (UID)
- UNIT ID (UID)
- ERROR REPORT
- BAUD RATE

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.

Appendix B

Certification

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 2014/35/EU
- The EMC Directive 2014/30/EC
- The RoHS Directive 2011/65/EU

USA

- Underwriters Laboratory Standard UL508c for Power Conversion Equipment

Canada

- Canadian Standards Association C22.2 No.14 for Industrial Control Equipment

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.

CE Marking for the Low Voltage Directive (LVD) 2014/35/EU

The Low Voltage Directive (LVD) 2014/35/EU[1] 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 in accordance with the Low Voltage Directive

Parker'S certification (DoC) is supported by tests undertaken in accordance with harmonised standard BS EN61800-5-1

CE Marking for the EMC Directive 2014/30/EU

[1] ***Directive 2006/95/CE has recently been the subject of a codification, requiring a new number 2014/35/EU. Readers should note that the text itself is identical.***

The aim of the EMC Directive 2014/30/EU[2] 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. Provisions have been put in place so that:

- Equipment (apparatus [3] and fixed installations[4]) 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.

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2 ***Directive 2004/108/EC has been superseded by Directive 2014/30/EU which came into effect on April 2016.***

3 ***'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.***

4 ***'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.***

NOTE a professional is a person or organisation having necessary skills in installing and/or commissioning power drive systems, including their EMC aspects.

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'S certification (DoC) is supported by tests undertaken in accordance with harmonised standard BS EN61800-3

CE Marking for the RESTRICTION OF HAZARDOUS SUBSTANCES (RoHS) 2011/65/EU

This product is in full compliance with RoHS Directive 2011/65/EU, with respect to the following substances:

1) Lead (Pb),

2) Mercury (Hg),

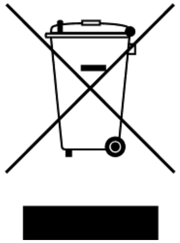
3) Cadmium (Cd),

4) Hexavalent chromium (Cr (VI)),

5) Polybrominated biphenyls (PBB),

6) Polybrominated diphenyl ethers (PBDE).

Waste Electrical and Electronic Equipment (WEEE)



Waste Electrical and Electronic Equipment - must not be disposed of with domestic waste.

It must be separately collected according to local legislation and applicable laws.

Parker Hannifin Company, together with local distributors and in accordance with EU directive 2002/96/EC, undertakes to withdraw and dispose of its products, fully respecting environmental considerations.

For more information about how to recycle your Parker supplied waste equipment, please contact your local Parker Service Centre.

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.

United States of America & Canada

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 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 obtain product certification to UL508C “Power Conversion Equipment” for the US market, and C22.2 No.14 “Industrial Control Equipment” for the Canadian market.

Conditions for Compliance with UL508C

Solid-State Motor Overload Protection

NOTE **An external motor overload protective device must be provided by the installer.**

As the motor current exceeds an internal threshold of 103%, the excess current is integrated. As below picture, the inverse time output remains unchanged until the integrated value (Prevailing Load) is no less than 150% current or equivalent to “Overload Level current” for 10s or the integrated value (Prevailing Load) is less than 150% current for 30s. Once this limit is reached the integral value is clamped, and the inverse time output is decreased towards 103% at 10% per second.

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.

Motor over temperature sensing is required. Motors used in conjunction with the drive controller shall be provided with PTC sensor(s) or relays suitable for use with the variable speed drive. Technical details can be found in Chapter 3 Installing the Drive.

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.

Motor HP @ 500V dc	Controller Rating (A)	Input Line Semiconductor Fuses: Ratings (Vac)	(A)	I^2t (A^2s) (cold)	Mersen / Bussmann Part No. or equivalent*	UL Tested Fuses Model
7.5	20	500	35	0.47	A7OQS35-4 /170M1562D	3NE4101
10	20	500	35	0.47	A7OQS35-4 /170M1562D	
15	35	500	40	0.58	A7OQS40-4/ 170M1563D	3NE4102
20	35	500	40	0.58	A7OQS40-4/ 170M1563D	
25	45	500	50	0.86	A7OQS50-4/ 170M1564D	3NE4117
30	75	500	80	2.7	A7OQS80-4/ 170M1566D	170M1566
40	75	500	80	2.7	A7OQS80-4/ 170M1566D	
50	110	500	125	6.9	A7OQS125-4/ 170M3813D	170M1568
60	110	500	125	6.9	A7OQS125-4/ 170M3813D	
75	165	500	175	16.5	A7OQS175-4/ 170M1569D	170M1570
100	165	500	175	16.5	A7OQS175-4/ 170M1569D	

* Other UL Recognized Component (JFHR2) semiconductor fuses may be used with the controller provided that the voltage, ampere and I^2t ratings shown above are not exceeded.

● Semiconductor fuses are acceptable as branch circuit short-circuit protection for the solid-state motor controllers only.

Table B- 1 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 B-2) RMS Symmetrical Amperes, 500V maximum.

Output Ratings		Short Circuit Rating
(A)		RMS Symmetrical Amperes
20		5,000
35		5,000
45		5,000
75		5,000
110		10,000
165		10,000

Table B- 2 Short Circuit Ratings

Field Wiring Temperature Rating

Use 75°C copper conductors only.

Surrounding Air Temperature

For the operating ambient temperature range, refer to Appendix E: “Technical Specifications” - Environmental Details.

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

M8 screw fixing points are provided for the power field wiring using insulated crimp lugs.

These M8 screw fixing points are not suitable for use with un-insulated crimp lugs or Panduit style screw lugs.

For the correct tightening torque value, refer to Appendix E: “Technical Specifications”.

Field Grounding Terminals

M6 screw fixing points are provided for the field grounding using insulated crimp lugs.

These M6 screw fixing points are not suitable for use with un-insulated crimp lugs or Panduit style screw lugs.

The field grounding terminal(s) is identified with the International Grounding Symbol (IEC) Publication 417, Symbol 5019. ⏚

Recommended Wire Sizes

North American wire sizes (AWG) are based on NEC/NFPA-70 Table 310.15(B)(16) for ampacities of thermoplastic-insulated (75 ℃) copper conductors assuming not more than three current-carrying conductors in raceway or cable, based on ambient temperature of 40 ℃. The wire sizes allow for an ampacity of 125% of the rated input and output amperes for motor branch-circuit conductors as specified in NEC/NFPA-70.

The table below gives the wire sizes for the input (supply) and output (motor) wiring. The table includes the rated input and output amperes for each model at 460V or 575V operation.

Recommended Wire Sizes (Frames 1, 2)

Main power wiring. Local wiring regulations always take precedence.

	Input			Output		
Drive Size (A)	**Input Current (A)**	**Number of Conductors**	**North American Wire Size**	**Output Current (A)**	**Number of Conductors**	**North American Wire Size**
Frame 1						
20	23.5	1	10 AWG	20	1	10 AWG
35	36.5	1	8 AWG	35	1	8 AWG
45	45.0	1	6 AWG	45	1	6 AWG
Frame 2						
75	76.5	1	3 AWG	75	1	3 AWG
110	107.5	1	1/0 AWG	110	1	1/0 AWG
165	156.5	1	3/0 AWG	165	1	4/0 AWG

The wire size for the motor field supply wiring is recommended to be 12AWG.

Surrounding Air Temperature

0 ℃ to 45 ℃ for 20A,35A,45A, 0 ℃ to 40 ℃ for 75A,110A,165A, 1.5% per degC ambient increase above 40degC for frame 2 (fan blown) product. 3% per degC ambient increase above 45degC for frame 1 (convection cooled) product

For details on these input fuses, refer to Appendix E: "Technical Specifications".

External Power Semiconductor Protection Fuses

For Details on these input fuses, refer to Appendix E: ‘Technical Specifications’.

EMC Standards

Extract from Mandatory Australian Communications Authority standards.

Product	European	International
Industrial, scientific, and medical (ISM) equipment	EN 55011	CISPR 11
Information technology equipment	EN 55022	CISPR 22
Generic (residential, commercial, and light industry)	EN 50081.1	IEC 61000-6-3
Generic (industrial environments)	EN 50081-2	IEC 61000-6-4
Adjustable speed electrical power drive systems	EN 61800-3	IEC 61800-3

Parker certification (DoC) is supported by tests undertaken in accordance with harmonised standard BS EN61800-3

EMC

Emissions Limits

Conducted

Frequency (MHz)	DB (µV)		Product Specific
	Quasi Peak	Average	EN 61800-3
where I ≤100A 0.15 - 0.5 0.5 - 5.0 5.0 - 30.0 *decreasing with log of frequency to:*	100 86 90 70	90 76 80 60	Category C3 Table 17
where I ≥100A 0.15 - 0.5 0.5 - 5.0 5.0 - 30.0	130 125 115	120 115 105	

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.

Where these levels are too high and to ensure compatibility with other equipment, EMC filters are available from Parker.

Radiated

Frequency (MHz)	DB (µV)	Product Specific
	Quasi Peak	EN 61800-3
30≤ f- ≤230 230≤ f- ≤1000	50 60	Category C3 (Table 18) Measured at 10m

Where these levels are too high and to ensure compatibility with other equipment, Parker 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 [a]	B
	Surge [b] 1,2/50 µs, 8/20 µs	IEC 61000-4-5	1 kV [c] 2 kV [d]	B
	Conducted radio-frequency common mode [e]	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 [e]	IEC 61000-4-4	2 kV/5 kHz Capacitive clamp	B
Signal interfaces	Fast transient-burst [e]	IEC 61000-4-4	1 kV/5 kHz Capacitive clamp	B
	Conducted radio-frequency common mode [e]	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 [e]	IEC 61000-4-4	2 kV/5 kHz Capacitive clamp	B
	Surge [f] 1,2/50 µs, 8/20 µs	IEC 61000-4-5	1 kV [d,f]	B
	Conducted radio-frequency common mode [e]	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

[a] Power ports with current rating < 100 A: direct coupling using the coupling and decoupling network. Power ports with current rating ≥ 100 A: direct coupling or capacitive clamp without decoupling network. If the capacitive clamp is used, the test level shall be 4 kV/2,5kHz.

[b] 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).

[c] Coupling line-to-line.

[d] Coupling line-to-earth.

[e] Applicable only to ports or interfaces with cables whose total length according to the manufacturer's functional specification may exceed 3 m.

[f] 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

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) x 0.25m = 1.25m.
- 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 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:

- Tripping on `overcurrent' as the cable capacitance is charged and discharged at the switching frequency.
- 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

590PR/591PR (RANGE)

EC DECLARATIONS OF CONFORMITY

Date CE marked first applied: 21/03/2016

Issued for compliance with the EMC Directive when the unit is used as *relevant apparatus.*

EMC Directive

In accordance with the EEC Directive 2014/30/EU

We Parker , 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+A1:2012

Low Voltage Directive

In accordance with the EEC Directive 2014/35/EU

We Parker , 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 :-

*BSEN61800-5-1:2007

The drive is CE marked in accordance with the low voltage directive for electrical equipment and appliances in the voltage range when installed correctly.

MANUFACTURERS DECLARATIONS

This is provided to aid your justification for EMC compliance when the unit is used as a *component.*

EMC Declaration

We Parker , 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+A1:2012

Machinery Directive

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 2006/42/EC 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.

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.

Martin Payn (**EM Compliance Manager**)

590PR/591PR (RANGE)

MANUFACTURERS EC DECLARATIONS OF CONFORMITY

Date CE marked first applied: 21/03/2016

Restriction of Hazardous Substances (RoHS)

We Parker Hannifin Manufacturing Limited, address as below, declare under our sole responsibility that the above Electronic Products comply with the RoHS substance restrictions in EC Directive 2011/65/EU.

Products are produced in accordance with the relevant clauses of the harmonized standard EN50581:2012

"*Technical documentation for the evaluation of electrical and electronic products with respect to restriction of hazardous substances*".

M. Payn

Dr. Martin Payn

(EM Compliance Manager)

Parker Hannifin Manufacturing Limited, Electromechanical & Drives Division,

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Appendix C Parameter Specification Tables

Details for all parameters provided on the Keypad.

Parameter Tables

The headings for the Tag No. table are described below.

Tag	A numeric identification of the parameter. It is used to identify the source and destinations of internal links.
Mn	Serial Communications Mnemonic: Refer to Appendix A: "Serial Communications"
MMI Block Name	The menu page under which the parameter is stored on the MMI.
MMI Parameter Name	The parameter name as it appears on the MMI.
Minimum/Maximum / Default/Units/Range	The Range varies with parameter type: INT The upper and lower limits of the parameter, indicating the parameter's true, internally-held, number of decimal. *Note:* 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)".** BOOL 0 = FALSE, 1 = TRUE WORD 0x0000 to 0xFFFF (hexadecimal)
Notes	Output parameters are not saved in non-vol memory unless noted otherwise. Input parameters are saved in non-vol memory unless noted otherwise. **View levels:** V0 Normal V1 Advanced **Write qualifiers:** W0 Always 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)

C-2 Parameter Specification Tables

If a parameter can only be written to in Config mode, this implies that the drive is stopped.

Specification Table: Tag Number Order

Tag	Mn	MMI Block Name	MMI 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	2	0		0: OFF 1: ARMATURE 2: FIELD	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

Tag	Mn	MMI Block Name	MMI Parameter Name	Minimum	Maximum	Default	Units	Range	Notes	
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
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	4	0		0: ARM VOLTS FBK 1: ANALOG TACH 2: ENCODER 3: ENCODER/ANALOG 4: ENCODER 2	V0	W1
48	bc	CURRENT LOOP	NEG. I CLAMP IN	-200.00	200.00	-200.00	%		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

Tag	Mn	MMI Block Name	MMI Parameter Name	Minimum	Maximum	Default	Units	Range	Notes	
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
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	1	0		0: ENABLED 1: INHIBITED	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

Tag	Mn	MMI Block Name		MMI Parameter Name	Minimum	Maximum	Default	Units	Range	Notes	
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
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	-1276	1276	77			V0	W2
98	cq	LINK	14	SOURCE TAG	-1276	1276	122			V0	W2
99	cr	LINK	15	SOURCE TAG	-1276	1276	125			V0	W2
100	cs	DEADBAND		INPUT 1	-200.00	200.00	0.00	%		V1	W0
102	cu	LINK	20	DESTINATION TAG	0	1276	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	1276	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	1276	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

Tag	Mn	MMI Block Name	MMI Parameter Name	Minimum	Maximum	Default	Units	Range	Notes	
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
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
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	COMMS PORT 3	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

Tag	Mn	MMI Block Name		MMI Parameter Name	Minimum	Maximum	Default	Units	Range	Notes	
134	dq	LINK	16	SOURCE TAG	-1276	1276	89			V0	W2
135	dr	LINK	45	DESTINATION TAG	0	1276	41			V0	W2
137	dt	CURRENT LOOP		DISCONTINUOUS	0.00	200.00	12.00	%		V0	W0
155	eb	DRIVE INFO		VERSION NUMBER	0x0000	0xFFFF	0x0000			V0	W4
158	ee	COMMS PORT	2	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		EMULATE 590P	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	2	0		0: DISABLED 1: STANDARD 2: ADVANCED	V0	W1
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

Tag	Mn	MMI Block Name	MMI Parameter Name	Minimum	Maximum	Default	Units	Range	Notes	
191	fb	FIELD CONTROL	BEMF FBK LEAD	20	5000	100			V0	W0
192	fc	FIELD CONTROL	BEMF FBK LAG	20	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	COMMS PORT 3	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
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

Tag	Mn	MMI Block Name	MMI Parameter Name	Minimum	Maximum	Default	Units	Range	Notes	
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	1276	100			V0	W2
247	gv	LINK 26	DESTINATION TAG	0	1276	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	1276	5			V0	W2
250	gy	LINK 25	DESTINATION TAG	0	1276	48			V0	W2
251	gz	LINK 17	SOURCE TAG	-1276	1276	62			V0	W2
252	h0	LINK 18	SOURCE TAG	-1276	1276	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

Tag	Mn	MMI Block Name	MMI Parameter Name	Minimum	Maximum	Default	Units	Range	Notes	
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	1276	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	1276	291			V0	W2
294	i6	LINK 29	SPT SUM 1 DEST	0	1276	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
300	ic	FIELD CONTROL	FIELD I FBK.	0.00	0.00	0.00	%		V0	W4

Tag	Mn	MMI Block Name	MMI Parameter Name	Minimum	Maximum	Default	Units	Range	Notes	
301	id	CURRENT LOOP	POS. I CLAMP IN	-200.00	200.00	200.00	%		V0	W0
302	ie	STOP RATES	CONTACTOR DELAY	0.1	600.0	1.0	s		V1	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	-1276	1276	89			V0	W2
307	ij	RAISE/LOWER	EXTERNAL RESET	0	1	0			V1	W0
308	ik	FEEDBACKS	TACH INPUT	0.0	0.0	0.0	%		V0	W4
309	il	SETPOINT SUM 1	INPUT 0	-300.00	300.00	0.00	%		V1	W0
312	io	PNO CONFIG	PNO 112	-1276	1276	0			V0	W0
313	ip	PNO CONFIG	PNO 113	-1276	1276	0			V0	W0
314	iq	PNO CONFIG	PNO 114	-1276	1276	0			V0	W0
315	ir	PNO CONFIG	PNO 115	-1276	1276	0			V0	W0
316	is	PNO CONFIG	PNO 116	-1276	1276	0			V0	W0
317	it	PNO CONFIG	PNO 117	-1276	1276	0			V0	W0
318	iu	PNO CONFIG	PNO 118	-1276	1276	0			V0	W0
319	iv	PNO CONFIG	PNO 119	-1276	1276	0			V0	W0
320	iw	PNO CONFIG	PNO 120	-1276	1276	379			V0	W0
321	ix	PNO CONFIG	PNO 121	-1276	1276	380			V0	W0
322	iy	PNO CONFIG	PNO 122	-1276	1276	381			V0	W0
323	iz	PNO CONFIG	PNO 123	-1276	1276	382			V0	W0
324	j0	PNO CONFIG	PNO 124	-1276	1276	383			V0	W0
325	j1	PNO CONFIG	PNO 125	-1276	1276	384			V0	W0
326	j2	PNO CONFIG	PNO 126	-1276	1276	385			V0	W0
327	j3	PNO CONFIG	PNO 127	-1276	1276	0			V0	W0
328	j4	COMMS PORT 3	ESP SUP.(ASCII)	0	1	1			V0	W0
329	j5	COMMS PORT 3	GROUP ID (GID)	0	7	0			V0	W0
330	j6	COMMS PORT 3	UNIT ID (UID)	0	255	0			V0	W0
331	j7	COMMS PORT 3	CHANGEBAND (BIN)	0.00	100.00	0.00	%		V0	W0
332	j8	COMMS PORT 3	ERROR REPORT	0x0000	0xFFFF	0x00C0			V0	W0
333	j9	COMMS PORT 3	PNO.7	0x0000	0xFFFF	0xFFFF			V0	W0
337	jd	ALARMS	THERMISTOR STATE	0	1	0			V0	W4
339	jf	miniLINK	VALUE 1	-300.00	300.00	0.00	%		V1	W0
340	jg	miniLINK	VALUE 2	-300.00	300.00	0.00	%		V1	W0

Tag	Mn	MMI Block Name	MMI Parameter Name	Minimum	Maximum	Default	Units	Range	Notes	
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	jy	SPEED LOOP	MIN DEMAND	-105.00	105.00	-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	-1276	1276	0			V0	W2
365	k5	LINK 1	DESTINATION TAG	0	1276	0			V0	W2
366	k6	LINK 2	SOURCE TAG	-1276	1276	0			V0	W2
367	k7	LINK 2	DESTINATION TAG	0	1276	0			V0	W2
368	k8	LINK 3	SOURCE TAG	-1276	1276	0			V0	W2
369	k9	LINK 3	DESTINATION TAG	0	1276	0			V0	W2

Tag	Mn	MMI Block Name		MMI Parameter Name	Minimum	Maximum	Default	Units	Range	Notes	
370	ka	LINK	4	SOURCE TAG	-1276	1276	0			V0	W2
371	kb	LINK	4	DESTINATION TAG	0	1276	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
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	-1276	1276	0			V0	W2
391	kv	LINK	43	DESTINATION TAG	0	1276	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	-1276	1276	0			V0	W2
395	kz	LINK	12	SOURCE TAG	-1276	1276	0			V0	W2
396	l0	LINK	44	DESTINATION TAG	0	1276	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		See Tag 393	V0	W0
399	l3	LINK	42	AUX.SOURCE	-1276	1276	0			V0	W2
400	l4	LINK	30	PID O/P DEST	0	1276	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		PROP. GAIN	0.0	100.0	1.0			V1	W0

Tag	Mn	MMI Block Name	MMI Parameter Name	Minimum	Maximum	Default	Units	Range	Notes	
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
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	-300.00	300.00	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	1276	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

Tag	Mn	MMI Block Name		MMI Parameter Name	Minimum	Maximum	Default	Units	Range	Notes	
435	m3	LINK	32	POS. I CLAMP	0	1276	0			V0	W2
436	m4	LINK	33	NEG. I CLAMP	0	1276	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	1276	0			V0	W2
443	mb	SETPOINT SUM	2	INPUT 1	-300.00	300.00	0.00	%		V1	W0
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	1276	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	-1276	1276	0			V0	W2
455	mn	LINK	5	DESTINATION TAG	0	1276	0			V0	W2
456	mo	LINK	6	SOURCE TAG	-1276	1276	0			V0	W2
457	mp	LINK	6	DESTINATION TAG	0	1276	0			V0	W2
458	mq	LINK	7	SOURCE TAG	-1276	1276	0			V0	W2
459	mr	LINK	7	DESTINATION TAG	0	1276	0			V0	W2
460	ms	LINK	8	SOURCE TAG	-1276	1276	0			V0	W2
461	mt	LINK	8	DESTINATION TAG	0	1276	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	-1276	1276	0			V0	W2

Tag	Mn	MMI Block Name	MMI Parameter Name	Minimum	Maximum	Default	Units	Range	Notes	
468	n0	LINK 9	DESTINATION TAG	0	1276	0			V0	W2
469	n1	LINK 10	SOURCE TAG	-1276	1276	0			V0	W2
470	n2	LINK 10	DESTINATION TAG	0	1276	0			V0	W2
472	n4	ALARMS	SPEED FBK STATE	0	1	0			V0	W4
473	n5	PROFILED GAIN	MODE	0	4	0			V1	W0
474	n6	PROFILED GAIN	MIN PROFILE GAIN	0.00	100.00	20.00	%		V1	W0
475	n7	PROFILED GAIN	PROFILED GAIN	0.0	0.0	0.0			V1	W4
478	na	LINK 36	TENS+COMP CALC.	0	1276	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
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	1276	496			V0	W2
495	nr	LINK 38	DESTINATION TAG	0	1276	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

Tag	Mn	MMI Block Name	MMI Parameter Name	Minimum	Maximum	Default	Units	Range	Notes	
500	nw	TEC OPTION	TEC OPTION TYPE	0	15	0		0: NONE 1: RS485 2: PROFIBUS DP 3: LINK 4: DEVICE NET 5: CAN OPEN 6: LONWORKS 7: CONTROLNET 8: MODBUS PLUS 9: ETHERNET 10: TYPE 10 11: TYPE 11 12: TYPE 12 13: TYPE 13 14: TYPE 14 15: TYPE 15	V0	W0
501	nx	TEC OPTION	TEC OPTION IN 1	-32768	32767	0			V0	W0
502	ny	TEC OPTION	TEC OPTION IN 2	-32768	32767	0			V0	W0
503	nz	TEC OPTION	TEC OPTION IN 3	-32768	32767	0			V0	W0
504	o0	TEC OPTION	TEC OPTION IN 4	-32768	32767	0			V0	W0
505	o1	TEC OPTION	TEC OPTION IN 5	-32768	32767	0			V0	W0
506	o2	TEC OPTION	TEC OPTION FAULT	0	5	0		0: NONE 1: PARAMETER 2: TYPE MISMATCH 3: SELF TEST 4: HARDWARE 5: MISSING	V0	W4
507	o3	TEC OPTION	TEC OPTION VER	0x0000	0xFFFF	0x0000			V0	W4
508	o4	TEC OPTION	TEC OPTION OUT 1	0	0	0			V0	W4
509	o5	TEC OPTION	TEC OPTION OUT 2	0	0	0			V0	W4
510	o6	DRIVE INFO	PRODUCT CODE	0	154	3		0-106: INVALID 107: 500V4Q 20Ia 5If R 108: 500V2Q 20Ia 5If R 109: 500V4Q 35Ia 5If R 110: 500V2Q 35Ia 5If R 111: 500V4Q 45Ia 5If R 112: 500V2Q 45Ia 5If R 113: 500V4Q 75Ia 5If R	V0	W3

Tag	Mn	MMI Block Name	MMI Parameter Name	Minimum	Maximum	Default	Units	Range	Notes
								114: 500V2Q 75Ia 5If R 115: 500V4Q 110Ia5If R 116: 500V2Q 110Ia5If R 117: 500V4Q 165Ia 5If R 118: 500V2Q 165Ia 5If R 119: 500V4Q 20Ia 10If R 120: 500V2Q 20Ia 10If R 121: 500V4Q 35Ia 20If R 122: 500V2Q 35Ia 20Ia R 123: 500V4Q 45Ia 20If R 124: 500V2Q 45Ia 20If R 125: 500V4Q 75Ia 20If R 126: 500V2Q 75Ia 20If R 127: 500V4Q 110Ia 20If R 128: 500V2Q 110Ia 20If R 129: 500V4Q 165Ia20If R 130: 500V2Q 165Ia20If R 131: 200V4Q 20Ia 5If R 132: 200V2Q 20Ia 5If R 133: 200V4Q 35Ia 5If R 134: 200V2Q 35Ia 5If R 135: 200V4Q 45Ia 5If R 136: 200V2Q 45Ia 5If R 137: 200V4Q 75Ia 5If R 138: 200V2Q 75Ia 5If R 139: 200V4Q 110Ia 5If R 140: 200V2Q 110Ia 5If R 141: 200V4Q 165Ia 5If R 142: 200V2Q 165Ia 5If R 143: 200V4Q 20Ia 20If R 144: 200V2Q 20Ia 20If R 145: 200V4Q 35Ia 20If R 146: 200V2Q 35Ia 20If R 147: 200V4Q 45Ia 20If R 148: 200V2Q 45Ia 20If R	

Tag	Mn	MMI Block Name	MMI Parameter Name	Minimum	Maximum	Default	Units	Range	Notes	
								149: 200V4Q 75Ia 20If R 150: 200V2Q 75Ia 20If R 151: 200V4Q 110Ia20If R 152: 200V2Q 110Ia20If R 153: 200V4Q 165Ia20If R 154: 200V2Q 165Ia20If R		
511	o7	OP-STATION	LOCAL KEY ENABLE	0	1	1			V0	W0
512	o8	OP-STATION	SETPOINT	0.00	100.00	0.00	%		V0	W0
513	o9	OP-STATION	JOG SETPOINT	0.00	100.00	5.00	%		V0	W0
514	oa	OP-STATION	RAMP ACCEL TIME	0.1	600.0	10.0	s		V0	W0
515	ob	OP-STATION	RAMP DECEL TIME	0.1	600.0	10.0	s		V0	W0
516	oc	OP-STATION	INITIAL DIR	0	1	1		0: REVERSE 1: FORWARD	V0	W0
517	od	OP-STATION	INITIAL MODE	0	1	0		0: REMOTE 1: LOCAL	V0	W0
518	oe	OP-STATION	INITIAL VIEW	0	1	0		0: LOCAL 1: PROGRAM	V0	W0
519	of	OP-STATION	INITIAL SETPOINT	0.00	100.00	0.00	%		V0	W0
520	og	OP-STATION	INITIAL JOG	0.00	100.00	5.00	%		V0	W0
521	oh	CONFIGURE DRIVE	NOM MOTOR VOLTS	100	875	100	V		V0	W2
523	oj	CONFIGURE DRIVE	ARMATURE CURRENT	1.0	35.0	1.0	A		V0	W2
524	ok	CONFIGURE DRIVE	FIELD CURRENT	0.2	4.0	0.2	A		V0	W2
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
538	oy	CURRENT LOOP	CURRENT FBK.AMPS	0.0	0.0	0.0	A		V0	W4
539	oz	FIELD CONTROL	FIELD I FBK.AMPS	0.0	0.0	0.0	A		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
545	p5	DRIVE INFO	PCODE ID	0	255	3			V0	W2

Tag	Mn	MMI Block Name		MMI Parameter Name	Minimum	Maximum	Default	Units	Range	Notes	
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
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	1276	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

Tag	Mn	MMI Block Name		MMI Parameter Name	Minimum	Maximum	Default	Units	Range	Notes	
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	1276	0			V0	W2
593	qh	PRESET SP		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
605	qt	FEEDBACKS		ARM VOLTS FBK	0	0	0	V		V0	W4
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
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
626	re	DRIVE INFO		FRAME ID	0	0	0			V0	W4
628	rg	CONFIGURE DRIVE		UDP USE OP PORT	0	1	0			V0	W0
629	rh	LINK	13	DESTINATION TAG	0	1276	683			V0	W2
630	ri	LINK	14	DESTINATION TAG	0	1276	684			V0	W2
631	rj	LINK	15	DESTINATION TAG	0	1276	685			V0	W2
632	rk	LINK	17	DESTINATION TAG	0	1276	678			V0	W2
633	rl	LINK	18	DESTINATION TAG	0	1276	679			V0	W2
634	rm	LINK	19	DESTINATION TAG	0	1276	699			V0	W2
635	rn	LINK	20	SOURCE TAG	-1276	1276	680			V0	W2
636	ro	LINK	21	SOURCE TAG	-1276	1276	681			V0	W2

Tag	Mn	MMI Block Name	MMI Parameter Name	Minimum	Maximum	Default	Units	Range	Notes	
637	rp	LINK 22	SOURCE TAG	-1276	1276	682			V0	W2
638	rq	LINK 23	SOURCE TAG	-1276	1276	674			V0	W2
639	rr	LINK 24	SOURCE TAG	-1276	1276	675			V0	W2
640	rs	LINK 25	SOURCE TAG	-1276	1276	676			V0	W2
641	rt	LINK 26	SOURCE TAG	-1276	1276	677			V0	W2
642	ru	LINK 27	SOURCE TAG	-1276	1276	264			V0	W2
643	rv	LINK 28	SOURCE TAG	-1276	1276	85			V0	W2
644	rw	LINK 29	SOURCE TAG	-1276	1276	86			V0	W2
645	rx	LINK 30	SOURCE TAG	-1276	1276	417			V0	W2
646	ry	LINK 31	SOURCE TAG	-1276	1276	427			V0	W2
647	rz	LINK 32	SOURCE TAG	-1276	1276	707			V0	W2
648	s0	LINK 33	SOURCE TAG	-1276	1276	708			V0	W2
649	s1	LINK 34	SOURCE TAG	-1276	1276	441			V0	W2
650	s2	LINK 35	SOURCE TAG	-1276	1276	451			V0	W2
651	s3	LINK 36	SOURCE TAG	-1276	1276	706			V0	W2
652	s4	LINK 37	SOURCE TAG	-1276	1276	69			V0	W2
653	s5	LINK 38	SOURCE TAG	-1276	1276	70			V0	W2
654	s6	LINK 39	SOURCE TAG	-1276	1276	572			V0	W2
655	s7	LINK 40	SOURCE TAG	-1276	1276	589			V0	W2
656	s8	LINK 41	DESTINATION TAG	0	1276	687			V0	W2
657	s9	LINK 42	DESTINATION TAG	0	1276	689			V0	W2
658	sa	LINK 43	SOURCE TAG	-1276	1276	712			V0	W2
660	sc	LINK 44	SOURCE TAG	-1276	1276	713			V0	W2
662	se	LINK 45	SOURCE TAG	-1276	1276	189			V0	W2
664	sg	LINK 46	SOURCE TAG	-1276	1276	700			V0	W2
665	sh	LINK 46	DESTINATION TAG	0	1276	701			V0	W2
666	si	LINK 47	SOURCE TAG	-1276	1276	427			V0	W2
667	sj	LINK 47	DESTINATION TAG	0	1276	709			V0	W2
668	sk	LINK 48	SOURCE TAG	-1276	1276	425			V0	W2
669	sl	LINK 48	DESTINATION TAG	0	1276	710			V0	W2
670	sm	LINK 49	SOURCE TAG	-1276	1276	691			V0	W2
671	sn	LINK 49	DESTINATION TAG	0	1276	697			V0	W2
672	so	LINK 50	SOURCE TAG	-1276	1276	475			V0	W2
673	sp	LINK 50	DESTINATION TAG	0	1276	711			V0	W2

Tag	Mn	MMI Block Name	MMI Parameter Name	Minimum	Maximum	Default	Units	Range	Notes	
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
693	t9	COMMS PORT 1	ERROR REPORT	0x0000	0xFFFF	0x00C0			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	V		V0	W4
708	to	TORQUE CALC.	NEG. I CLAMP	0.00	0.00	0.00	V		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	MMI Block Name		MMI Parameter Name	Minimum	Maximum	Default	Units	Range	Notes	
711	tr	PID		PROP. GAIN	0.0	100.0	1.0			V1	W0
712	ts	ADVANCED	1	OUTPUT	0.00	0.00	0.00	V		V0	W4
713	tt	ADVANCED	2	OUTPUT	0.00	0.00	0.00	V		V0	W4
714	tu	5703 OUT		INPUT	-300.00	300.00	0.00	%		V0	W0
720	u0	LINK	51	SOURCE TAG	-1276	1276	0			V0	W2
721	u1	LINK	51	DESTINATION TAG	0	1276	0			V0	W2
722	u2	LINK	52	SOURCE TAG	-1276	1276	0			V0	W2
723	u3	LINK	52	DESTINATION TAG	0	1276	0			V0	W2
724	u4	LINK	53	SOURCE TAG	-1276	1276	0			V0	W2
725	u5	LINK	53	DESTINATION TAG	0	1276	0			V0	W2
726	u6	LINK	54	SOURCE TAG	-1276	1276	0			V0	W2
727	u7	LINK	54	DESTINATION TAG	0	1276	0			V0	W2
728	u8	LINK	55	SOURCE TAG	-1276	1276	0			V0	W2
729	u9	LINK	55	DESTINATION TAG	0	1276	0			V0	W2
730	ua	LINK	56	SOURCE TAG	-1276	1276	0			V0	W2
731	ub	LINK	56	DESTINATION TAG	0	1276	0			V0	W2
732	uc	LINK	57	SOURCE TAG	-1276	1276	0			V0	W2
733	ud	LINK	57	DESTINATION TAG	0	1276	0			V0	W2
734	ue	LINK	58	SOURCE TAG	-1276	1276	0			V0	W2
735	uf	LINK	58	DESTINATION TAG	0	1276	0			V0	W2
736	ug	LINK	59	SOURCE TAG	-1276	1276	0			V0	W2
737	uh	LINK	59	DESTINATION TAG	0	1276	0			V0	W2
738	ui	LINK	60	SOURCE TAG	-1276	1276	0			V0	W2
739	uj	LINK	60	DESTINATION TAG	0	1276	0			V0	W2
740	uk	LINK	61	SOURCE TAG	-1276	1276	0			V0	W2
741	ul	LINK	61	DESTINATION TAG	0	1276	0			V0	W2
742	um	LINK	62	SOURCE TAG	-1276	1276	0			V0	W2
743	un	LINK	62	DESTINATION TAG	0	1276	0			V0	W2
744	uo	LINK	63	SOURCE TAG	-1276	1276	0			V0	W2
745	up	LINK	63	DESTINATION TAG	0	1276	0			V0	W2
746	uq	LINK	64	SOURCE TAG	-1276	1276	0			V0	W2
747	ur	LINK	64	DESTINATION TAG	0	1276	0			V0	W2
748	us	LINK	65	SOURCE TAG	-1276	1276	0			V0	W2
749	ut	LINK	65	DESTINATION TAG	0	1276	0			V0	W2

Tag	Mn	MMI Block Name		MMI Parameter Name	Minimum	Maximum	Default	Units	Range	Notes	
750	uu	LINK	66	SOURCE TAG	-1276	1276	0			V0	W2
751	uv	LINK	66	DESTINATION TAG	0	1276	0			V0	W2
752	uw	LINK	67	SOURCE TAG	-1276	1276	0			V0	W2
753	ux	LINK	67	DESTINATION TAG	0	1276	0			V0	W2
754	uy	LINK	68	SOURCE TAG	-1276	1276	0			V0	W2
755	uz	LINK	68	DESTINATION TAG	0	1276	0			V0	W2
756	v0	LINK	69	SOURCE TAG	-1276	1276	0			V0	W2
757	v1	LINK	69	DESTINATION TAG	0	1276	0			V0	W2
758	v2	LINK	70	SOURCE TAG	-1276	1276	0			V0	W2
759	v3	LINK	70	DESTINATION TAG	0	1276	0			V0	W2
760	v4	LINK	71	SOURCE TAG	-1276	1276	0			V0	W2
761	v5	LINK	71	DESTINATION TAG	0	1276	0			V0	W2
762	v6	LINK	72	SOURCE TAG	-1276	1276	0			V0	W2
763	v7	LINK	72	DESTINATION TAG	0	1276	0			V0	W2
764	v8	LINK	73	SOURCE TAG	-1276	1276	0			V0	W2
765	v9	LINK	73	DESTINATION TAG	0	1276	0			V0	W2
766	va	LINK	74	SOURCE TAG	-1276	1276	0			V0	W2
767	vb	LINK	74	DESTINATION TAG	0	1276	0			V0	W2
768	vc	LINK	75	SOURCE TAG	-1276	1276	0			V0	W2
769	vd	LINK	75	DESTINATION TAG	0	1276	0			V0	W2
770	ve	LINK	76	SOURCE TAG	-1276	1276	0			V0	W2
771	vf	LINK	76	DESTINATION TAG	0	1276	0			V0	W2
772	vg	LINK	77	SOURCE TAG	-1276	1276	0			V0	W2
773	vh	LINK	77	DESTINATION TAG	0	1276	0			V0	W2
774	vi	LINK	78	SOURCE TAG	-1276	1276	0			V0	W2
775	vj	LINK	78	DESTINATION TAG	0	1276	0			V0	W2
776	vk	LINK	79	SOURCE TAG	-1276	1276	0			V0	W2
777	vl	LINK	79	DESTINATION TAG	0	1276	0			V0	W2
778	vm	LINK	80	SOURCE TAG	-1276	1276	0			V0	W2
779	vn	LINK	80	DESTINATION TAG	0	1276	0			V0	W2
780	vo	LOGIC FUNC	1	INPUT A	0	1	0			V0	W0
781	vp	LOGIC FUNC	1	INPUT B	0	1	0			V0	W0
782	vq	LOGIC FUNC	1	INPUT C	0	1	0			V0	W0

Tag	Mn	MMI Block Name		MMI Parameter Name	Minimum	Maximum	Default	Units	Range	Notes	
783	vr	LOGIC FUNC	1	TYPE	0	15	0		0: NOT(A) 1: AND(A,B,C) 2: NAND(A,B,C) 3: OR(A,B,C) 4: NOR(A,B,C) 5: XOR(A,B) 6: 0-1 EDGE(A) 7: 1-0 EDGE(A) 8: AND(A,B,!C) 9: OR(A,B,!C) 10: S FLIP-FLOP 11: R FLIP-FLOP 12: LATCH 13: SWITCH 14: (A AND B) OR C 15: (A OR B) AND C	V0	W0
784	vs	LOGIC FUNC	1	OUTPUT	0	1	0			V0	W4
785	vt	LOGIC FUNC	2	INPUT A	0	1	0			V0	W0
786	vu	LOGIC FUNC	2	INPUT B	0	1	0			V0	W0
787	vv	LOGIC FUNC	2	INPUT C	0	1	0			V0	W0
788	vw	LOGIC FUNC	2	TYPE	0	15	0		See Tag 783	V0	W0
789	vx	LOGIC FUNC	2	OUTPUT	0	1	0			V0	W4
790	vy	LOGIC FUNC	3	INPUT A	0	1	0			V0	W0
791	vz	LOGIC FUNC	3	INPUT B	0	1	0			V0	W0
792	w0	LOGIC FUNC	3	INPUT C	0	1	0			V0	W0
793	w1	LOGIC FUNC	3	TYPE	0	15	0		See Tag 783	V0	W0
794	w2	LOGIC FUNC	3	OUTPUT	0	1	0			V0	W4
795	w3	LOGIC FUNC	4	INPUT A	0	1	0			V0	W0
796	w4	LOGIC FUNC	4	INPUT B	0	1	0			V0	W0
797	w5	LOGIC FUNC	4	INPUT C	0	1	0			V0	W0
798	w6	LOGIC FUNC	4	TYPE	0	15	0		See Tag 783	V0	W0
799	w7	LOGIC FUNC	4	OUTPUT	0	1	0			V0	W4
800	w8	LOGIC FUNC	5	INPUT A	0	1	0			V0	W0
801	w9	LOGIC FUNC	5	INPUT B	0	1	0			V0	W0
802	wa	LOGIC FUNC	5	INPUT C	0	1	0			V0	W0
803	wb	LOGIC FUNC	5	TYPE	0	15	0		See Tag 783	V0	W0

Tag	Mn	MMI Block Name	MMI Parameter Name	Minimum	Maximum	Default	Units	Range	Notes	
804	wc	LOGIC FUNC 5	OUTPUT	0	1	0			V0	W4
805	wd	LOGIC FUNC 6	INPUT A	0	1	0			V0	W0
806	we	LOGIC FUNC 6	INPUT B	0	1	0			V0	W0
807	wf	LOGIC FUNC 6	INPUT C	0	1	0			V0	W0
808	wg	LOGIC FUNC 6	TYPE	0	15	0		See Tag 783	V0	W0
809	wh	LOGIC FUNC 6	OUTPUT	0	1	0			V0	W4
810	wi	LOGIC FUNC 7	INPUT A	0	1	0			V0	W0
811	wj	LOGIC FUNC 7	INPUT B	0	1	0			V0	W0
812	wk	LOGIC FUNC 7	INPUT C	0	1	0			V0	W0
813	wl	LOGIC FUNC 7	TYPE	0	15	0		See Tag 783	V0	W0
814	wm	LOGIC FUNC 7	OUTPUT	0	1	0			V0	W4
815	wn	LOGIC FUNC 8	INPUT A	0	1	0			V0	W0
816	wo	LOGIC FUNC 8	INPUT B	0	1	0			V0	W0
817	wp	LOGIC FUNC 8	INPUT C	0	1	0			V0	W0
818	wq	LOGIC FUNC 8	TYPE	0	15	0		See Tag 783	V0	W0
819	wr	LOGIC FUNC 8	OUTPUT	0	1	0			V0	W4
820	ws	LOGIC FUNC 9	INPUT A	0	1	0			V0	W0
821	wt	LOGIC FUNC 9	INPUT B	0	1	0			V0	W0
822	wu	LOGIC FUNC 9	INPUT C	0	1	0			V0	W0
823	wv	LOGIC FUNC 9	TYPE	0	15	0		See Tag 783	V0	W0
824	ww	LOGIC FUNC 9	OUTPUT	0	1	0			V0	W4
825	wx	LOGIC FUNC 10	INPUT A	0	1	0			V0	W0
826	wy	LOGIC FUNC 10	INPUT B	0	1	0			V0	W0
827	wz	LOGIC FUNC 10	INPUT C	0	1	0			V0	W0
828	x0	LOGIC FUNC 10	TYPE	0	15	0		See Tag 783	V0	W0
829	x1	LOGIC FUNC 10	OUTPUT	0	1	0			V0	W4
830	x2	VALUE FUNC 1	INPUT A	-32768.00	32768.00	0.00			V0	W0
831	x3	VALUE FUNC 1	INPUT B	-32768.00	32768.00	0.00			V0	W0
832	x4	VALUE FUNC 1	INPUT C	-32768.00	32768.00	0.00			V0	W0
833	x5	VALUE FUNC 1	TYPE	0	46	0		0: IF(C) -A 1: ABS(A+B+C) 2: SWITCH(A,B) 3: (A*B)/C 4: A+B+C 5: A-B-C	V0	W0

Tag	Mn	MMI Block Name	MMI Parameter Name	Minimum	Maximum	Default	Units	Range	Notes
								6: B<=A<=C 7: A>B+/-C 8: A>=B 9: ABS(A)>B+/-C 10: ABS(A)>=B 11: A(1+B) 12: IF(C) HOLD(A) 13: BINARY DECODE 14: ON DELAY 15: OFF DELAY 16: TIMER 17: MINIMUM PULSE 18: PULSE TRAIN 19: WINDOW 20: UP/DWN COUNTER 21: (A*B)/C ROUND 22: WINDOW NO HYST 23: WIND A>=B,A<=C 24: A<=B 25: ((A*B)/100)+C 26: MIN(A,B,C) 27: MAX(A,B,C) 28: PROFILE SQRT 29: PROFILE LINEAR 30: PROFILE x^2 31: PROFILE x^3 32: PROFILE x^4 33: ON A>B, OFF A<C 34: (A+B) CLAMPED C 35: (A-B) CLAMPED C 36: (A*B) CLAMPED C 37: (A/B) CLAMPED C 38: A>=B:A, A<=C:0 39: (A * B) + C 40: A * (B + C) 41: A * (B - C) 42: A * (1+B/C) 43: A * (1+(B * C)) 44: MONOSTABLE HIGH 45: MONOSTABLE LOW 46: FILTER	

Tag	Mn	MMI Block Name		MMI Parameter Name	Minimum	Maximum	Default	Units	Range	Notes	
834	x6	VALUE FUNC	1	OUTPUT	0.00	0.00	0.00			V0	W4
835	x7	VALUE FUNC	2	INPUT A	-32768.00	32768.00	0.00			V0	W0
836	x8	VALUE FUNC	2	INPUT B	-32768.00	32768.00	0.00			V0	W0
837	x9	VALUE FUNC	2	INPUT C	-32768.00	32768.00	0.00			V0	W0
838	xa	VALUE FUNC	2	TYPE	0	46	0		See Tag 833	V0	W0
839	xb	VALUE FUNC	2	OUTPUT	0.00	0.00	0.00			V0	W4
840	xc	VALUE FUNC	3	INPUT A	-32768.00	32768.00	0.00			V0	W0
841	xd	VALUE FUNC	3	INPUT B	-32768.00	32768.00	0.00			V0	W0
842	xe	VALUE FUNC	3	INPUT C	-32768.00	32768.00	0.00			V0	W0
843	xf	VALUE FUNC	3	TYPE	0	46	0		See Tag 833	V0	W0
844	xg	VALUE FUNC	3	OUTPUT	0.00	0.00	0.00			V0	W4
845	xh	VALUE FUNC	4	INPUT A	-32768.00	32768.00	0.00			V0	W0
846	xi	VALUE FUNC	4	INPUT B	-32768.00	32768.00	0.00			V0	W0
847	xj	VALUE FUNC	4	INPUT C	-32768.00	32768.00	0.00			V0	W0
848	xk	VALUE FUNC	4	TYPE	0	46	0		See Tag 833	V0	W0
849	xl	VALUE FUNC	4	OUTPUT	0.00	0.00	0.00			V0	W4
850	xm	VALUE FUNC	5	INPUT A	-32768.00	32768.00	0.00			V0	W0
851	xn	VALUE FUNC	5	INPUT B	-32768.00	32768.00	0.00			V0	W0
852	xo	VALUE FUNC	5	INPUT C	-32768.00	32768.00	0.00			V0	W0
853	xp	VALUE FUNC	5	TYPE	0	46	0		See Tag 833	V0	W0
854	xq	VALUE FUNC	5	OUTPUT	0.00	0.00	0.00			V0	W4
855	xr	VALUE FUNC	6	INPUT A	-32768.00	32768.00	0.00			V0	W0
856	xs	VALUE FUNC	6	INPUT B	-32768.00	32768.00	0.00			V0	W0
857	xt	VALUE FUNC	6	INPUT C	-32768.00	32768.00	0.00			V0	W0
858	xu	VALUE FUNC	6	TYPE	0	46	0		See Tag 833	V0	W0
859	xv	VALUE FUNC	6	OUTPUT	0.00	0.00	0.00			V0	W4
860	xw	VALUE FUNC	7	INPUT A	-32768.00	32768.00	0.00			V0	W0
861	xx	VALUE FUNC	7	INPUT B	-32768.00	32768.00	0.00			V0	W0
862	xy	VALUE FUNC	7	INPUT C	-32768.00	32768.00	0.00			V0	W0
863	xz	VALUE FUNC	7	TYPE	0	46	0		See Tag 833	V0	W0
864	y0	VALUE FUNC	7	OUTPUT	0.00	0.00	0.00			V0	W4
865	y1	VALUE FUNC	8	INPUT A	-32768.00	32768.00	0.00			V0	W0
866	y2	VALUE FUNC	8	INPUT B	-32768.00	32768.00	0.00			V0	W0
867	y3	VALUE FUNC	8	INPUT C	-32768.00	32768.00	0.00			V0	W0

Tag	Mn	MMI Block Name		MMI Parameter Name	Minimum	Maximum	Default	Units	Range	Notes	
868	y4	VALUE FUNC	8	TYPE	0	46	0		See Tag 833	V0	W0
869	y5	VALUE FUNC	8	OUTPUT	0.00	0.00	0.00			V0	W4
870	y6	VALUE FUNC	9	INPUT A	-32768.00	32768.00	0.00			V0	W0
871	y7	VALUE FUNC	9	INPUT B	-32768.00	32768.00	0.00			V0	W0
872	y8	VALUE FUNC	9	INPUT C	-32768.00	32768.00	0.00			V0	W0
873	y9	VALUE FUNC	9	TYPE	0	46	0		See Tag 833	V0	W0
874	ya	VALUE FUNC	9	OUTPUT	0.00	0.00	0.00			V0	W4
875	yb	VALUE FUNC	10	INPUT A	-32768.00	32768.00	0.00			V0	W0
876	yc	VALUE FUNC	10	INPUT B	-32768.00	32768.00	0.00			V0	W0
877	yd	VALUE FUNC	10	INPUT C	-32768.00	32768.00	0.00			V0	W0
878	ye	VALUE FUNC	10	TYPE	0	46	0		See Tag 833	V0	W0
879	yf	VALUE FUNC	10	OUTPUT	0.00	0.00	0.00			V0	W4
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
896	yw	DEMULTIPLEXER		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

Tag	Mn	MMI Block Name	MMI Parameter Name	Minimum	Maximum	Default	Units	Range	Notes	
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
1145	iB	SELECT 1	INPUT 0	-32768.00	32768.00	0.00			V0	W0
1146	iC	SELECT 1	INPUT 1	-32768.00	32768.00	0.00			V0	W0
1147	iD	SELECT 1	INPUT 2	-32768.00	32768.00	0.00			V0	W0
1148	iE	SELECT 1	INPUT 3	-32768.00	32768.00	0.00			V0	W0
1149	iF	SELECT 1	INPUT 4	-32768.00	32768.00	0.00			V0	W0
1150	iG	SELECT 1	INPUT 5	-32768.00	32768.00	0.00			V0	W0
1151	iH	SELECT 1	INPUT 6	-32768.00	32768.00	0.00			V0	W0
1152	iI	SELECT 1	INPUT 7	-32768.00	32768.00	0.00			V0	W0
1153	iJ	SELECT 1	SELECT	0	7	0			V0	W0
1154	iK	SELECT 1	OUTPUT 0	0.00	0.00	0.00			V0	W4
1155	iL	SELECT 1	OUTPUT 1	0.00	0.00	0.00			V0	W4
1156	iM	SELECT 2	INPUT 0	-32768.00	32768.00	0.00			V0	W0
1157	iN	SELECT 2	INPUT 1	-32768.00	32768.00	0.00			V0	W0
1158	iO	SELECT 2	INPUT 2	-32768.00	32768.00	0.00			V0	W0
1159	iP	SELECT 2	INPUT 3	-32768.00	32768.00	0.00			V0	W0
1160	iQ	SELECT 2	INPUT 4	-32768.00	32768.00	0.00			V0	W0
1161	iR	SELECT 2	INPUT 5	-32768.00	32768.00	0.00			V0	W0
1162	iS	SELECT 2	INPUT 6	-32768.00	32768.00	0.00			V0	W0
1163	iT	SELECT 2	INPUT 7	-32768.00	32768.00	0.00			V0	W0
1164	iU	SELECT 2	SELECT	0	7	0			V0	W0
1165	iV	SELECT 2	OUTPUT 0	0.00	0.00	0.00			V0	W4

Tag	Mn	MMI Block Name		MMI Parameter Name	Minimum	Maximum	Default	Units	Range	Notes	
1166	iW	SELECT	2	OUTPUT 1	0.00	0.00	0.00			V0	W4
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	COMMS PORT	3	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	1276	686			V0	W2
1189	jT	LINK	12	DESTINATION TAG	0	1276	688			V0	W2
1190	jU	LINK	16	DESTINATION TAG	0	1276	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 5: UNLOCKED 6: FAIL	V0	W4
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	kI	SEQUENCING		COMMS TIMEOUT	0.0	60.0	0.0	s		V0	W0
1220	kY	CONFIGURE DRIVE		AUTOMATIC SAVE	0	1	0			V0	W0
1226	lE	AUTOTUNE		STATE	0	3	0		0: IDLE 1: RUNNING 2: SUCCESS 3: FAILED	V1	W4
1227	lF	ENCODER	1	SPEED FEEDBACK	0.0	0.0	0.0	%		V0	W4
1230	lI	ENCODER	2	ENCODER LINES	10	5000	1000			V0	W1
1231	lJ	ENCODER	2	ENCODER SIGN	0	1	1		0: NEGATIVE 1: POSITIVE	V0	W1
1232	lK	ENCODER	2	ENCODER RPM	0	6000	1000	RPM		V0	W1

Tag	Mn	MMI Block Name		MMI Parameter Name	Minimum	Maximum	Default	Units	Range	Notes	
1235	lN	ENCODER	2	UNFIL.ENCODER	0	0	0	RPM		V0	W4
1236	lO	ENCODER	2	ENCODER	0	0	0	RPM		V0	W4
1237	lP	ENCODER	2	SPEED FEEDBACK	0.0	0.0	0.0	%		V0	W4
1238	lQ	DIGITAL INPUT	4	OUTPUT	0.00	0.00	0.00	%		V0	W4
1239	lR	DIGITAL INPUT	4	VALUE FOR TRUE	-300.00	300.00	0.01	%		V0	W0
1240	lS	DIGITAL INPUT	4	VALUE FOR FALSE	-300.00	300.00	0.00	%		V0	W0
1241	lT	DIGITAL INPUT	5	OUTPUT	0.00	0.00	0.00	%		V0	W4
1242	lU	DIGITAL INPUT	5	VALUE FOR TRUE	-300.00	300.00	0.01	%		V0	W0
1243	lV	DIGITAL INPUT	5	VALUE FOR FALSE	-300.00	300.00	0.00	%		V0	W0
1246	lY	ALARM HISTORY		ALARM 1 NEWEST	0x0000	0xFFFF	0x0000			V0	W4
1247	lZ	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
1259	mL	PID		HI RES PROP GAIN	0.000	100.000	0.000			V1	W0
1265	mR	?		POSITIVE LIMIT	0.00	250.00	250.00			?	?
1266	mS	?		NEGATIVE LIMIT	-250.00	0.00	-250.00			?	?
1267	mT	ENCODER	1	ENCODER TYPE	0	1	1		0: CLOCK/DIRECTION 1: QUADRATURE	V0	W1
1268	mU	ENCODER	2	ENCODER TYPE	0	1	1		0: CLOCK/DIRECTION 1: QUADRATURE	V0	W1
1273	mZ	FIELD CONTROL		BEMF SOURCE	0	1	0		0: LOCAL BEMF 1: BEMF INPUT	V1	W1
1274	nA	FIELD CONTROL		BEMF INPUT	-200.00	200.00	0.00	%		V1	W0
1275	nB	CURRENT LOOP		ISOL DMD SOURCE	0	1	0		0: ANIN 2 (A3) 1: FIELD I DEMAND	V1	W1

Tag	Mn	MMI Block Name	MMI Parameter Name	Minimum	Maximum	Default	Units	Range	Notes	
1276	nC	AUTOTUNE	ERROR TYPE	0	11	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. 10: NULL AVERAGE CUR 11: THYRISTOR OFF	V1	W4

Parameter Table: MMI Menu Order

```
......DIAGNOSTICS
........SPEED DEMAND    [0089]      Speed Loop
........SPEED FEEDBACK  [0207]      Feedbacks
........SPEED ERROR     [0297]      Speed Loop
........SPEED LOOP O/P  [0549]      Speed Loop
........CURRENT DEMAND  [0299]      Current Loop
........CURRENT FEEDBACK      [0298]      Feedbacks
........CURRENT FBK.AMPS      [0538]      Current Loop
........IaFbk UNFILTERED      [0065]      Current Loop
........IaDmd UNFILTERED      [0066]      Current Loop
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.......RAMPING         [0113]      Ramps
a.......PROGRAM STOP    [0080]      Sequencing
........COAST STOP      [0525]      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
........FIELD I FBK.AMPS      [0539]      Field Control
........UNFIL.FIELD FBK       [0181]      Feedbacks
a.......FLD.FIRING ANGLE      [0184]      Field Control
a.......ANIN 1 (A2)     [0050]      Analog Input
a.......ANIN 2 (A3)     [0051]      Analog Input
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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
........PRESET O/P       [0572]      Preset Speeds
........SRAMP OUTPUT     [0589]      Sramp
........OUTPUT FPM       [0593]      Preset Speeds
........SPEED SETPOINT   [0063]      Speed Loop
a.......TERMINAL VOLTS   [0057]      Calibration
........BACK EMF  [0060]      Calibration
........ARM VOLTS FBK    [0605]      Feedbacks
........TACH INPUT       [0308]      Feedbacks
........UNFIL.TACH INPUT       [0058]      Calibration
........ENCODER          [0206]      Encoder
........UNFIL.ENCODER    [0059]      Encoder
........UNFIL.SPD.FBK    [0062]      Speed Loop
........UNFIL.SPD.ERROR        [0064]      Speed Loop
........CONTACTOR CLOSED       [0083]      Sequencing
........HEALTH LED       [0122]      Alarms
........READY            [0125]      Sequencing
........DRIVE RUNNING    [0376]      Sequencing
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........SYSTEM RESET    [0374]      Sequencing
......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
..........REM.SEQ.ENABLE      [0535]      Sequencing
a.........REM.SEQUENCE  [0536]      Sequencing
..........SEQ STATUS    [0537]      Sequencing
........OP-STATION
..........SET UP
............SETPOINT    [0512]      Op-Station
............JOG SETPOINT      [0513]      Op-Station
............LOCAL KEY ENABLE  [0511]      Op-Station
..........START UP VALUES
............INITIAL SETPOINT  [0519]      Op-Station
............INITIAL JOG       [0520]      Op-Station
............INITIAL DIR       [0516]      Op-Station
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............INITIAL VIEW      [0518]      Op-Station
............INITIAL MODE      [0517]      Op-Station
..........LOCAL RAMP
............RAMP ACCEL TIME   [0514]      Op-Station
............RAMP DECEL TIME   [0515]      Op-Station
........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
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..........INPUT 7        [0571]      Preset Speeds
..........PRESET O/P     [0572]      Preset Speeds
..........OUTPUT FPM     [0593]      Preset Speeds
........SRAMP
..........INPUT          [0574]      Sramp
..........RATE SELECT    [0575]      Sramp
..........RATE SET 0
............ACCEL 0      [0576]      Sramp
............DECEL 0      [0577]      Sramp
............ACCEL 0 JERK 1     [0578]      Sramp
............ACCEL 0 JERK 2     [0611]      Sramp
............DECEL 0 JERK 1     [0596]      Sramp
............DECEL 0 JERK 2     [0613]      Sramp
..........RATE SET 1
............ACCEL 1      [0579]      Sramp
............DECEL 1      [0580]      Sramp
............ACCEL 1 JERK 1     [0581]      Sramp
............ACCEL 1 JERK 2     [0612]      Sramp
............DECEL 1 JERK 1     [0597]      Sramp
............DECEL 1 JERK 2     [0614]      Sramp
..........AUTO RESET     [0582]      Sramp
..........EXTERNAL RESET       [0583]      Sramp
..........RESET VALUE    [0584]      Sramp
..........QUENCH  [0585]      Sramp
..........AT SPEED LEVEL       [0586]      Sramp
..........AT SPEED       [0587]      Sramp
..........ACCEL OUTPUT   [0588]      Sramp
..........SRAMP OUTPUT   [0589]      Sramp
a.......SPECIAL BLOCKS
a.........PID
a...........PROP. 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
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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
............MOD OF LINE SPD   [0428]      Diameter Calc
............MOD OF REEL SPD   [0429]      Diameter Calc
............UNFILT DIAMETER   [0430]      Diameter Calc
a.........TAPER CALC.
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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
............STPT SUM 2 OUT 0  [0491]      Setpoint Sum
............STPT SUM 2 OUT 1  [0492]      Setpoint Sum
........FIELD CONTROL
..........FIELD ENABLE  [0170]      Field Control
..........FLD.CTRL MODE       [0209]      Field Control
..........FIELD I THRESH      [0617]      Field Control
..........UP TO FIELD   [0618]      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
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..............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
..........CURR DECAY RATE     [0594]      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
..........CONFIGURE ENABLE    [0039]      Configure Drive
..........NOM MOTOR VOLTS     [0521]      Configure Drive
..........ARMATURE CURRENT    [0523]      Configure Drive
..........FIELD CURRENT       [0524]      Configure Drive
..........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
..........REM TRIP DELAY      [0541]      Alarms
..........FIELD I CAL.  [0182]      Calibration
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........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
..........REM TRIP INHIBIT    [0540]      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
..........MASTER BRIDGE       [0527]      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
..........PRESET TORQUE       [0595]      Speed Loop
..........PRESET T SCALE      [0604]      Speed Loop
..........ENCODER SIGN  [0049]      Encoder
..........SPEED FBK SELECT    [0047]      Speed Loop
..........SPD.FBK.FILTER      [0547]      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
........REMOTE TRIP     [0542]      Alarms
......MENUS
........VIEW LEVEL      [0037]      Menus
a.......LANGUAGE  [0304]      Menus
......SERIAL LINKS
........TEC OPTION
..........TEC OPTION TYPE     [0500]      Tec Option
..........TEC OPTION IN 1     [0501]      Tec Option
..........TEC OPTION IN 2     [0502]      Tec Option
..........TEC OPTION IN 3     [0503]      Tec Option
..........TEC OPTION IN 4     [0504]      Tec Option
..........TEC OPTION IN 5     [0505]      Tec Option
..........TEC OPTION FAULT    [0506]      Tec Option
..........TEC OPTION VER      [0507]      Tec Option
..........TEC OPTION OUT 1    [0508]      Tec Option
..........TEC OPTION OUT 2    [0509]      Tec Option
........SYSTEM PORT (P3)
..........P3 SETUP
............MODE  [0130]      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]      Comms Port
..............UNIT ID (UID)   [0330]      Comms Port
```

```
..............ERROR REPORT    [0332]      Comms Port
............BAUD RATE   [0198]      Comms Port
a.........DUMP CHANGED  [1169]      Configure Drive
..........DUMP MMI (TX)       [1167]      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
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
........SAVE TO OP      [0624]      Configure Drive
........LOAD FROM OP    [0625]      Configure Drive
..........SPEED DEMAND  [0089]      Speed Loop
..........SPEED FEEDBACK      [0207]      Feedbacks
..........CURRENT DEMAND      [0299]      Current Loop
..........CURRENT FEEDBACK    [0298]      Feedbacks
```

```
..........PHASE ANGLE @ E     [1174]      Current Loop
a.........ADDITIONAL DEM      [0030]      Current Loop
```

......PARAMETER SAVE   [0354]   Configure Drive

......CONFIGURE DRIVE

```
........CONFIGURE ENABLE      [0039]      Configure Drive
........NOM MOTOR VOLTS       [0521]      Configure Drive
........ARMATURE CURRENT      [0523]      Configure Drive
........FIELD CURRENT   [0524]      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 Programing

This Appendix provides an introduction to programming the drive. It describes the function blocks and parameters available in DSE Lite. The FUNCTION BLOCKS menu on the MMI provides access to these programming tool menu structures.

Programming Your Application

Programming with Block Diagrams

We recommend that you use a suitable programming tool (such as “DSELite” which is Parker’ block programming software) to program the Drive for specific applications. It is however possible to use the Keypad.

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

MMI Menu Map

1 SYSTEM

2 CONFIGURE I/O

CONFIGURE ENABLE

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.

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.
- To mark a link as a feedback link, set the source to the negative value of the tag to be connected. Feedback links are ignored when the function block execution order is determined.

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.

The setting of the EMULATE 590P parameter (tag 162) in the CONFIGURE DRIVE function block affects the time constants of the PID block and the linking of parameters in the function block diagram:

- **When non-zero** the drive emulates the functionality of links in earlier firmware versions of the 590P, (firmware Versions 5.x and 7.x)
- **When zero (0x0000)** the behaviour changes so that the value is transferred, preserving the decimal place, (firmware Version 8.x and onwards).

Refer to "Compatibility with Earlier Versions of Firmware", page 9, for more information.

To maintain compatibility, the new firmware emulates the functionality and behavior of links in earlier firmware versions by defaulting the EMULATE 590P parameter to 0x0001 (non-zero).

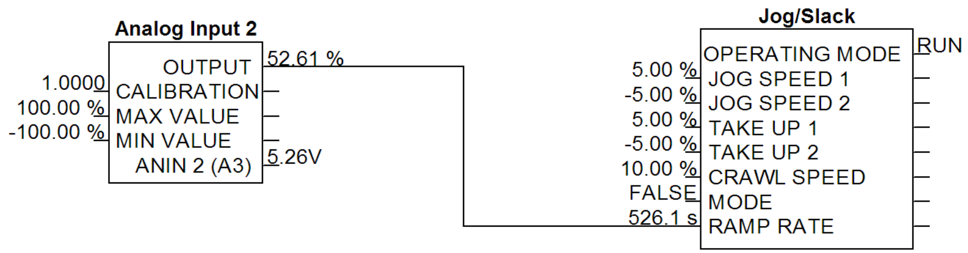


Figure 4 Operation of links (EMULATE 590P = non-zero : firmware Versions 5.x, 7.x, 8.x and onwards)

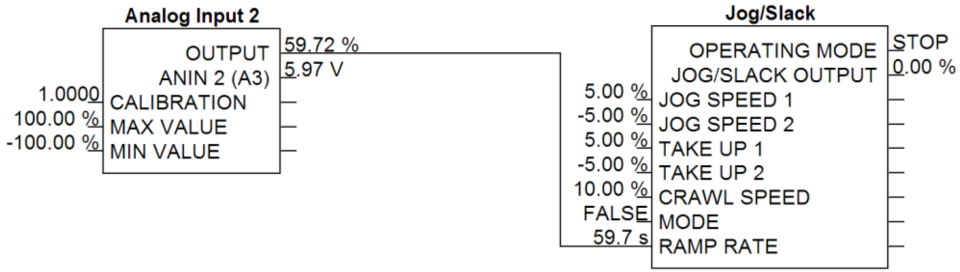


Figure 5 Operation of links (EMULATE 590P = zero : firmware Version 8.x and onwards)

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: “The Keypad” - Saving Your Application.

Understanding the Function Block Description

The following function blocks 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.

Default Value	The default value of the unmodified factory set-up
Input/Output Parameter Name	The name shown on DSE Lite
Tag Number	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.

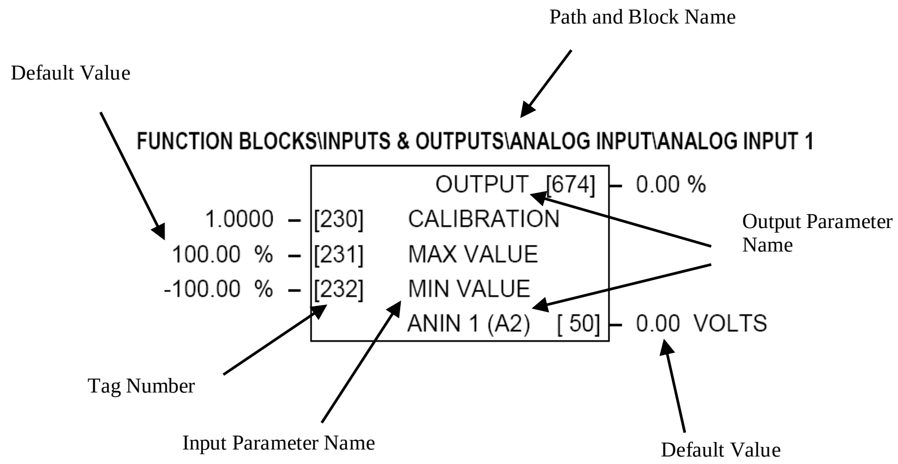


Figure D-6 Function Block Parameter Information

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 keypad easier to use, however, they may vary slightly from function block names.

MMI Menu Map

1 SYSTEM

2 CONFIGURE I/O

3 ANALOG INPUTS

4 ANIN 1 (A2)

4 ANIN 5 (A6)

- CALIBRATION
- MAX VALUE
- MIN VALUE
- DESTINATION TAG

A function block may contain parameters that are contained within more than one MMI menu, for example FIELD CONTROL. In this case, the extra menus are indicated by >> in the MMI Menu Map.

MMI Menu Map

1 SETUP PARAMETERS

2 FIELD CONTROL

- FIELD ENABLE
- FLD.CTRL MODE
- FIELD I THRESH
- UP TO FIELD
- >> FLD.VOLTAGE VARS
- >> FLD.CURRENT VARS
- FLD.QUENCH DELAY
- FLD. QUENCH MODE

Function Blocks By Category

MMI Menu Map

1 MENUS

VIEW LEVEL

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

Alarms					
ALARM HISTORY	14	ALARMS	15		
Communications					
5703 IN	**Error! Bookmark not defined.**	COMMS PORT	30	TEC OPTION	133
5705 OUT	**Error! Bookmark not defined.**	miniLINK	84		
Inputs & Outputs					
ANALOG INPUTS	19	AUX I/O	25	DIGITAL OUTPUTS	52
ANALOG OUTPUTS	21	DIGITAL INPUTS	49		
Menus					
MENUS	82	OP STATION	86		
Miscellaneous					
ADVANCED	10	DRIVE INFO	55	MULTIPLEXER	85
CONFIGURE DRIVE	32	LINKS	70	VALUE FUNC	136
DEMULITPLEXER	40	LOGIC FUNC	76		
Motor Control					
AUTOTUNE	22	ENCODER	57	INVERSE TIME	71
CALIBRATION	26	FEEDBACKS	60	PLL	93
CURRENT LOOP	33	FIELD CONTROL	62	SPEED LOOP	117
CURRENT PROFILE	38	INERTIA COMP	69		
Seq & Ref					
JOG/SLACK	72	SEQUENCING	111	STOP RATES	130
RAMPS	104	STANDSTILL	127		
Setpoint Funcs					
DEADBAND	39	PRESET SPEEDS	95	SETPOINT SUM	114
MIN SPEED	83	RAISE/LOWER	101	SRAMP	124

PID	88	SELECT	110		
Winder					
DIAMETER CALC	41	PROFILED GAIN	99	TORQUE CALC	135

Compatibility with Earlier Versions of Firmware

Version 10.x and onwards is the only version available for use with 590PR. The functionality of 590PR includes functions of earlier version of 590+ products.

As an example, the 5703 is no longer available but its functionality is still available in the firmware.

Function Block Descriptions

NOTE **Remember to select the correct mode, Setup or Configuration, whilst editing. Refer to "Modifying a Block Diagram", page 6-18. To view the FUNCTION BLOCKS Menu, ADVANCED view level must be selected.**

MMI Menu Map

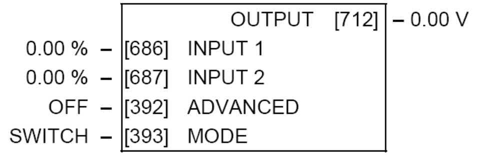
1 MENUS
- VIEW LEVEL

ADVANCED

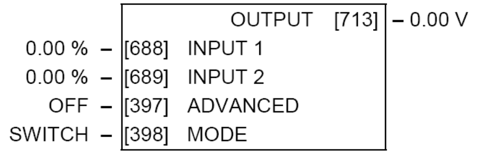
These two blocks perform some simple functions. They are compatible with the special Link 11 and Link12 used in earlier versions of 590 range.

For new configurations, consider using the new VALUE and LOGIC function blocks.

FUNCTION BLOCKS\MISCELLANEOUS\ADVANCED\ADVANCED 1



FUNCTION BLOCKS\MISCELLANEOUS\ADVANCED\ADVANCED 2



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
INPUT 1	**686, 688**	**-32768.00 to 32768.00 %**
General purpose input.		
INPUT 2	**687, 689**	**-32768.00 to 32768.00 %**
General purpose input.		
ADVANCED	**392, 397**	**OFF/ON**
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.		
MODE	**393, 398**	**See below**

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.

0 : SWITCH	
1 : INVERTER	
2 : AND	(logic)
3 : OR	(boolean)
4 : SIGN CHANGER	
5 : MODULUS	
6 : COMPARATOR	

OUTPUT	**712, 713**	**— .xx V**

Result of the selected function on the inputs.

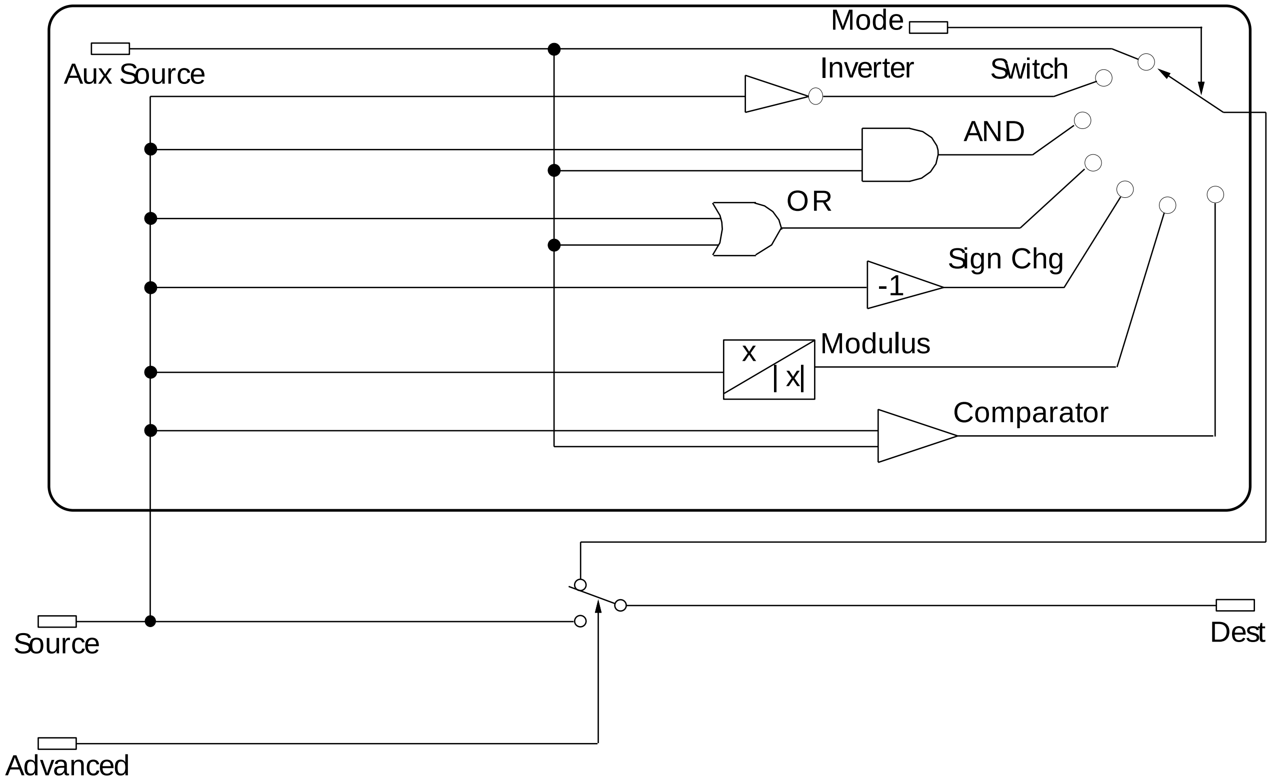
Functional Description

MODE	Description
SWITCH - switches the signal source between auxilliary and source analog or logic tags	If ADVANCED = OFF OUTPUT = SOURCE If ADVANCED = ON OUTPUT = INPUT 2
INVERTER - inverts the source logic signal	If ADVANCED = OFF OUTPUT = INPUT 1 If ADVANCED = ON OUTPUT = Logic Inversion of INPUT 1
AND - gives AND-ed result of source logic signal and an auxilliary source logic signal	If ADVANCED = OFF OUTPUT = INPUT 1 If ADVANCED = ON OUTPUT = INPUT 1 AND INPUT 2
OR - gives OR-ed result of source logic signal and an auxilliary source logic signal	If ADVANCED = OFF OUTPUT = INPUT 1 If ADVANCED = ON OUTPUT = INPUT 1 OR INPUT 2
SIGN CHANGER - reverses the sign of the source logic signal	If ADVANCED = OFF OUTPUT = INPUT 1 If ADVANCED = ON OUTPUT = Value sign change of INPUT 1
MODULUS - produces the modulus of the source logic signal	If ADVANCED = OFF OUTPUT = INPUT 1 If ADVANCED = ON OUTPUT = Modulus of INPUT 1
COMPARATOR - changes destination logic signal to TRUE when source analog signal is greater than auxilliary 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

MMI Menu Map

1 FUNCTION BLOCKS
2 ALARMS
3 ALARM HISTORY
- ALARM 1 NEWEST
- ALARM 2
- ALARM 3
- ALARM 4
- ALARM 5
- ALARM 6
- ALARM 7
- ALARM 8
- ALARM 9
- ALARM 10 OLDEST

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
ALARM 1 NEWEST	**1246**	**0x0000 to 0xFFFF**
The hexadecimal value of the most recent alarm. Refer to Chapter 7: “Trips and Fault Finding” - Alarm Messages.		
ALARM 2 - ALARM 9	**1247, 1248, 1249, 1250, 1251, 1252, 1253, 1254**	**0x0000 to 0xFFFF**
The second to ninth most recent alarms.		
ALARM 10 OLDEST	**1255**	**0x0000 to 0xFFFF**
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
- REMOTE TRIP

MMI Menu Map

1 SETUP PARAMETERS

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

MMI Menu Map

1 SETUP PARAMETERS

2 CALIBRATION
- SPDFBK ALM LEVEL
- STALL THRESHOLD
- STALL TRIP DELAY
- REM TRIP DELAY

MMI Menu Map

1 DIAGNOSTICS
- HEALTH LED

FUNCTION BLOCKS\ALARMS\ALARMS

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

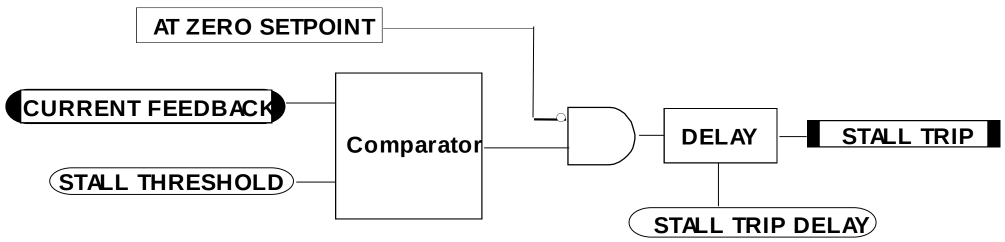
ENABLED	[19]	FIELD FAIL
ENABLED	[111]	5703 RCV ERROR
ENABLED	[28]	STALL TRIP
TRUE	[305]	TRIP RESET
ENABLED	[81]	SPEED FBK ALARM
ENABLED	[92]	ENCODER ALARM
ENABLED	[540]	REM TRIP INHIBIT
10.0 s	[541]	REM TRIP DELAY
95.00 %	[263]	STALL THRESHOLD
30.0 s	[224]	STALL TRIP DELAY
50.0 %	[180]	SPDFBK ALM LEVEL

ALARMS

Parameter	Tag	Range
FIELD FAIL	**19**	**ENABLED / INHIBITED**
Inhibits the field fail alarm.		
5703 RCV ERROR	**111**	**ENABLED / INHIBITED**
Inhibits 5703 serial communications receive error. Only active in Slave Mode.		
STALL TRIP	**28**	**ENABLED / INHIBITED**
Inhibits the stall trip alarm from tripping out the contactor. This is useful in applications requiring extended operation at zero speed.		
TRIP RESET	**305**	**FALSE / TRUE**
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.		
SPEED FBK ALARM	**81**	**ENABLED / INHIBITED**

ALARMS

Parameter	Tag	Range
Inhibits the speed feedback alarm.		
ENCODER ALARM	**92**	**ENABLED / INHIBITED**
Inhibits the encoder option board alarm.		
REM TRIP INHIBIT	**540**	**ENABLED / INHIBITED**
Inhibits the remote trip.		
REM TRIP DELAY	**541**	**0.1 to 600.0 s**
The delay between the remote trip alarm being activated and the drive tripping.		
STALL THRESHOLD	**263**	**0.00 to 200.00 %**
Stall comparator current feedback threshold level.		
STALL TRIP DELAY	**224**	**0.1 to 600.0 s**
Stall comparator time-out delay before stall output becomes true.		

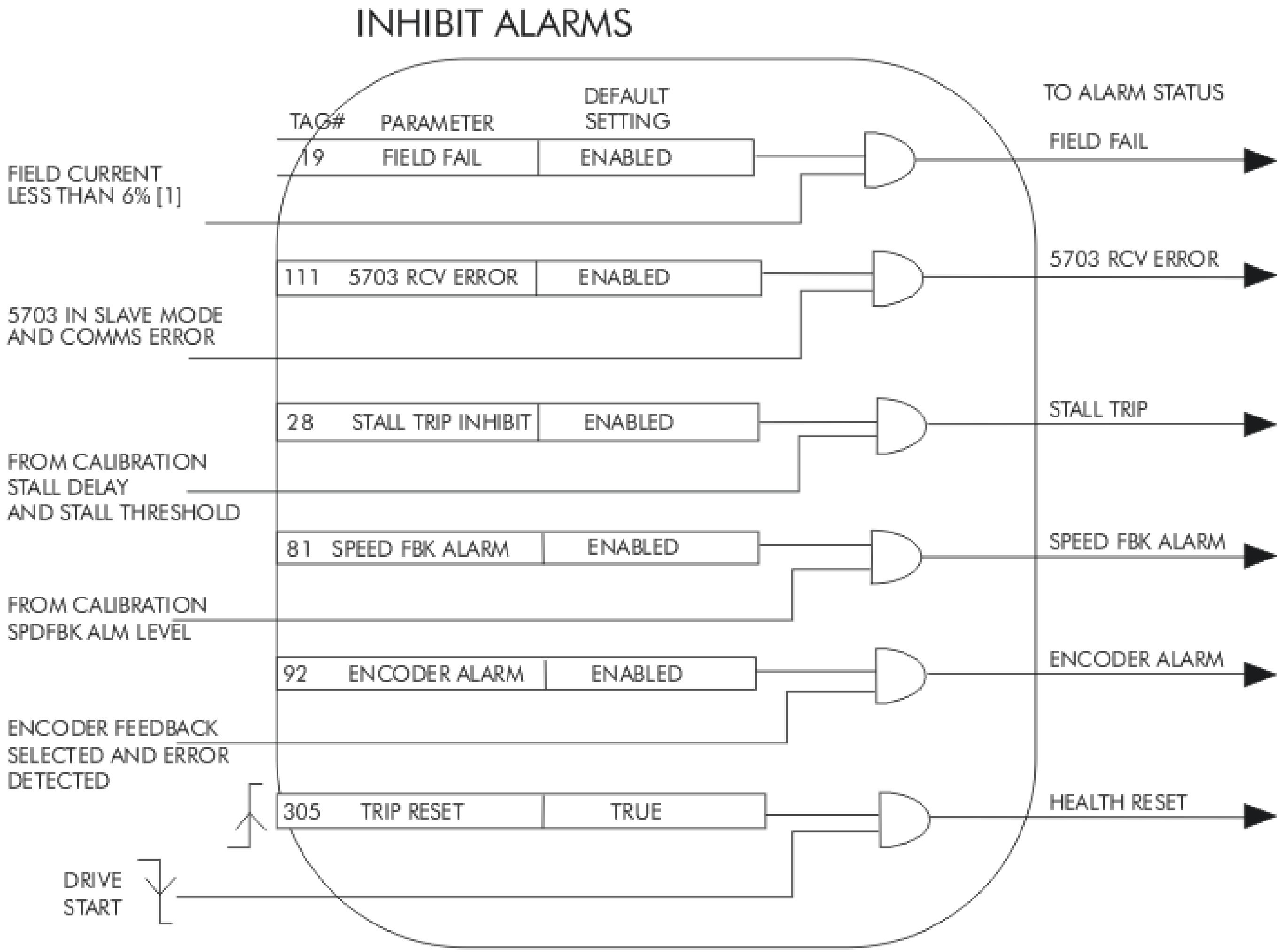


Parameter	Tag	Range
SPDFBK ALM LEVEL	**180**	**0.0 to 100.0 % (h)**
The speed feedback alarm compares speed feedback to armature voltage. The alarm level is the threshold which the difference between the two signals should exceed for the alarm to activate.		
THERMISTOR STATE	**337**	**FALSE / TRUE**
TRUE if the thermistor input is active, FALSE otherwise.		
SPEED FBK STATE	**472**	**FALSE / TRUE**
A Boolean output that shows the state of the speed feedback alarm. This output is updated even when the alarm is disabled.		
HEALTH LED	**122**	**FALSE / TRUE**
State of Health LED on Keypad.		
HEALTH WORD	**115**	**0x0000 to 0xFFFF**
The hexadecimal sum of any alarms present. Refer to Chapter 7: “Trips and Fault Finding” - Alarm Messages.		
HEALTH STORE	**116**	**0x0000 to 0xFFFF**
The hexadecimal value of the first (or only) alarm. Refer to Chapter 7: “Trips and Fault Finding” - Alarm Messages.		
REMOTE TRIP	**542**	**FALSE / TRUE**

ALARMS

Parameter	Tag	Range
The state of Remote Trip.		
STALL TRIP	**112**	**FALSE / TRUE**
Armature current is above STALL THRESHOLD and AT ZERO SPEED but not AT ZERO SETPOINT.		
LAST ALARM	**528**	**0x0000 to 0xFFFF**
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 0xF007 : ENABLE LOW 0xF009 : SEQUENCING 0xF010 : COMMS TIMEOUT 0xF200 : CONFIG ENABLED 0xF300 : CALIBRATION 0xF400 : NO OP-STATION 0xFF03 : AUX SUPPLY 0xFF05 : PCB VERSION 0xFF06 : PRODUCT CODE		

Functional Description



NOTE [1]:

FIELD FAIL THRESHOLD IS 6% IN CURRENT CONTROL
12% IN VOLTAGE CONTROL

ANALOG INPUTS

MMI Menu Map

1 SYSTEM
2 CONFIGURE I/O
3 ANALOG INPUTS
4 ANIN 1 (A2)
4 ANIN 2 (A3)
4 ANIN 3 (A4)
4 ANIN 4 (A5)
4 ANIN 5 (A6)
- CALIBRATION
- MAX VALUE
- MIN VALUE
- DESTINATION

The analog input block is used to scale and clamp the inputs for terminals A2 to A6.

FUNCTION BLOCKS\INPUTS & OUTPUTS\ANALOG INPUT\ANALOG INPUT 1

Value	Tag	Parameter	Tag	Value
		OUTPUT	[674]	0.00 %
1.0000	[230]	CALIBRATION		
100.00 %	[231]	MAX VALUE		
-100.00 %	[232]	MIN VALUE		
		ANIN 1 (A2)	[50]	0.00 VOLTS

FUNCTION BLOCKS\INPUTS & OUTPUTS\ANALOG INPUT\ANALOG INPUT 2

Value	Tag	Parameter	Tag	Value
		OUTPUT	[493]	0.00 %
1.0000	[233]	CALIBRATION		
100.00 %	[234]	MAX VALUE		
-100.00 %	[235]	MIN VALUE		
		ANIN 2 (A3)	[51]	0.00 VOLTS

FUNCTION BLOCKS\INPUTS & OUTPUTS\ANALOG INPUT\ANALOG INPUT 3

Value	Tag	Parameter	Tag	Value
		OUTPUT	[675]	0.00 %
1.0000	[236]	CALIBRATION		
100.00 %	[237]	MAX VALUE		
-100.00 %	[238]	MIN VALUE		
		ANIN 3 (A4)	[52]	0.00 VOLTS

FUNCTION BLOCKS\INPUTS & OUTPUTS\ANALOG INPUT\ANALOG INPUT 4

Value	Tag	Parameter	Tag	Value
		OUTPUT	[676]	0.00 %
1.0000	[239]	CALIBRATION		
200.00 %	[240]	MAX VALUE		
-200.00 %	[241]	MIN VALUE		
		ANIN 4 (A5)	[53]	0.00 VOLTS

FUNCTION BLOCKS\INPUTS & OUTPUTS\ANALOG INPUT\ANALOG INPUT 5

Value	Tag	Parameter	Tag	Value
		OUTPUT	[677]	0.00 %
1.0000	[242]	CALIBRATION		
200.00 %	[243]	MAX VALUE		
-200.00 %	[244]	MIN VALUE		
		ANIN 5 (A6)	[54]	0.00 VOLTS

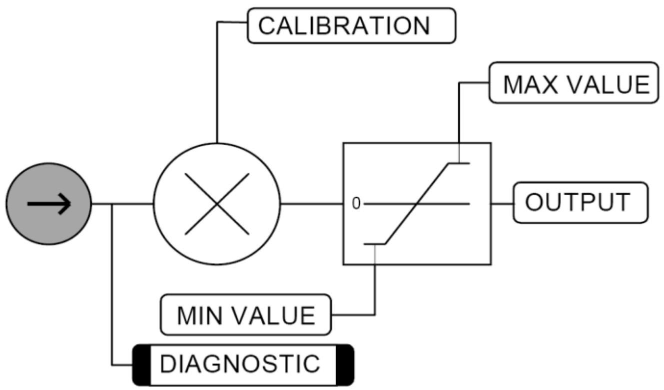
NOTE

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

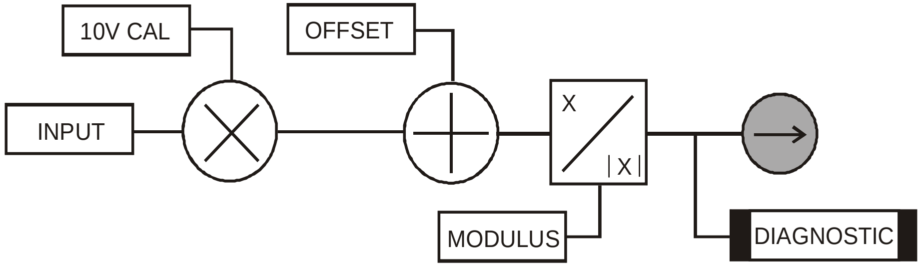
Parameter	Tag	Range
CALIBRATION	**230, 233, 236, 239, 242**	**-3.0000 to 3.0000**
The analog input scaling ratio. For a value of 1.0, 10V = 100%.		
MAX VALUE	**231, 234, 237, 240, 243**	**-300.00 to 300.00 %**
The maximum value of the scaled analog input.		
MIN VALUE	**232, 235, 238, 241, 244**	**-300.00 to 300.00 %**
The minimum value of the scaled analog input.		
OUTPUT	**674, 493, 675, 676, 677**	**— .xx %**
These parameters is the output diagnostic 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.		
ANIN 1 (A2) to ANIN 5 (A6)	**50, 51, 52, 53, 54**	**—.xx VOLTS**
Actual volts measured on the analog input.		

ANALOG OUTPUTS

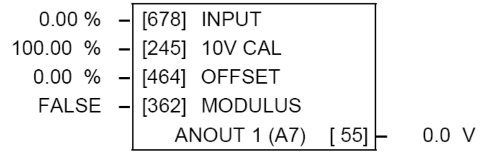
MMI Menu Map

1 SYSTEM
2 CONFIGURE I/O
3 ANALOG OUTPUTS
4 ANOUT 1 (A7)
4 ANOUT 2 (A8)
- % TO GET 10V
- MODULUS
- OFFSET
- SOURCE TAG

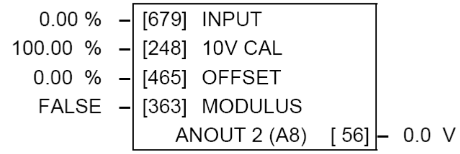
This function block converts the demand percentage into 0-10V, suitable for driving the analog output electronics of the drive.



FUNCTION BLOCKS\INPUTS & OUTPUTS\ANALOG OUTPUT\ANALOG OUTPUT 1



FUNCTION BLOCKS\INPUTS & OUTPUTS\ANALOG OUTPUT\ANALOG OUTPUT 2



ANALOG OUTPUTS

Parameter	Tag	Range
INPUT	**678, 679**	**-300.00 to 300.00 %**
Analog output value as a percentage of range.		
10V CAL	**245, 248**	**-300.00 to 300.00 %**
(% TO GET 10V)		
Scaler value which produces 10V output. Set 10V CAL to be 50% to get ±10V out for ±50% in.		
OFFSET	**464, 465**	**-100.00 to 100.00 %**
Offset value added to the normal output value after the scaler and before the modulus.		
MODULUS	**362, 363**	**FALSE / TRUE**
Unipolar analog output enable. If TRUE, then -10% gives +1V out.		
ANOUT 1 (A7) to ANOUT 2 (A8)	**55, 56**	**—.xx V (h)**
Actual voltage output to the terminal.		

MMI Menu Map

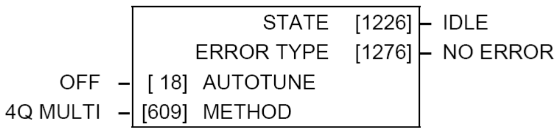
1 SETUP PARAMETERS
2 CURRENT LOOP
  AUTOTUNE

MMI Menu Map

1 FUNCTION BLOCKS
2 MOTOR CONTROL
3 AUTOTUNE
  STATE
  METHOD
  ERROR TYPE

AUTOTUNE

FUNCTION BLOCKS\MOTOR CONTROL\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.

AUTOTUNE

Parameter	Tag	Range
AUTOTUNE	**18**	**OFF / ARMATURE / FIELD**

Turns the AUTOTUNE procedure on, and selects if field or armature tuning is required. Refer to Chapter 4: Performance Adjustment.

Parameter	Tag	Range
STATE	**1226**	**See below**

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

Parameter	Tag	Range
METHOD	**609**	**See below**

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 the 2Q MULTI method is always used on a 2Q drive (591) irrespective of the setting of this parameter.

0 : 4Q MULTI
1 : 2Q MULTI

AUTOTUNE

Parameter	Tag	Range
ERROR TYPE	**1276**	**See below**

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)

Functional Description

OVER SPEED	Motor speed detected at greater than 20% during autotune.
FIELD ERROR	Armature Autotune: For a field-off armature autotune, it means that the field current was measured at greater than 6% of the calibration value (which, if the field is calibrated to a low current, can be a very low threshold). For a field-on armature autotune, it means that the field was not up to current when expected during the autotune process. Field Autotune: Field volts found to be less than 10% for 50% of rated field current flowing, or Field current measured at > 105% of rated during autotune.
PULSE WIDTH	Less than 12 pulses have been measured during the autotune that meeting the pulse width angle tolerance requirements – likely unstable/unbalanced supply or motor shaft moving.
OVER CURRENT	Equivalent discontinuous armature current level measured at greater than 200% of either the stack rating or ARMATURE CURRENT setting;
TIMEOUT	Various timeouts.

AUTOTUNE ABORTED	User abort of the process.
FIRING ANGLE	Firing angle has reached 60deg. before zero voltage crossing, in an attempt to derive a 60deg. wide pulse – likely absent armature or severely resistive load.
PEAK/AVER.RATIO	Badly shaped current pulse, where the pk/average current ratio is more than 30% away from expected 1.5.
UNBALANCED BRID.	Pulse size imbalance greater than that from a motor BEMF equivalent to 5deg. from zero voltage crossing – likely poorly balanced supply phases or motor shaft turning.
NULL AVERAGE CUR	No current pulses detected.
THYRISTOR OFF	Missing pulse detected – likely missing firing pulses from one or more thyristors.

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

Default	Tag	Parameter
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
AUX DIGOUT 1	**94**	**FALSE / TRUE**
Software digital output 1. For example, to directly drive the configurable digital output DIGOUT1, connect the Source of DIGOUT1 to this parameter, Tag 94.		
AUX DIGOUT 2	**95**	**FALSE / TRUE**
Software digital output 2. For example, to directly drive the configurable digital output DIGOUT2, connect the Source of DIGOUT2 to this parameter, Tag 95.		
AUX DIGOUT 3	**96**	**FALSE / TRUE**
Software digital output 3. For example, to directly drive the configurable digital output DIGOUT3, connect the Source of DIGOUT3 to this parameter, Tag 96.		
ANOUT 1	**128**	**-100.00 to 100.00 %**
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)		
ANOUT 2	**129**	**-100.00 to 100.00 %**
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

MMI Menu Map

1 SETUP PARAMETERS

2 CALIBRATION

- ARMATURE V CAL.
- IR COMPENSATION
- ANALOG TACH CAL
- ZERO SPD. OFFSET
- ARMATURE I (A9)
- FIELD I CAL.

MMI Menu Map

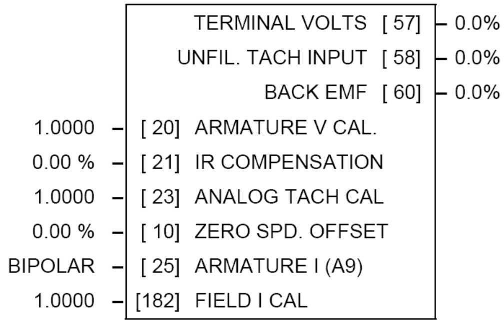
1 DIAGNOSTICS

- TERMINAL VOLTS
- BACK EMF
- UNFIL. TACH INPUT

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.

FUNCTION BLOCKS\MOTOR CONTROL\CALIBRATION



CALIBRATION

Parameter	Tag	Range
ARMATURE V CAL.	**20**	**0.9800 to 1.1000**

Trim adjustment of the motor armature volts to give exactly 100% at the required actual voltage value (e.g. 460V etc.).

Note: - Primary voltage calibration is achieved by adjusting the NOM MOTOR VOLTS parameter (CONFIGURE DRIVE function block).

IR COMPENSATION	**21**	**0.00 to 100.00 %**

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.

ANALOG TACH CAL	**23**	**0.9800 to 1.1000**

Trim adjustment of the motor speed to give exactly 100% at the required actual speed value (e.g. 1500 RPM etc). *Note: Primary tacho calibration is achieved by adjusting SW1 - 3 on the tacho calibration board.*

ZERO SPD. OFFSET	**10**	**-5.00 to 5.00 %**

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.

ARMATURE I (A9)	**25**	**UNIPOLAR / BIPOLAR**

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

FIELD I CAL.	**182**	**0.9800 to 1.1000**

CALIBRATION

Parameter	Tag	Range

Trim adjustment of the motor field current to give exactly 100% at the required actual current value (e.g. 1.5A etc.). Note:- Primary field calibration is achieved by adjusting the FIELD CURRENT parameter (CONFIGURE DRIVE function block).

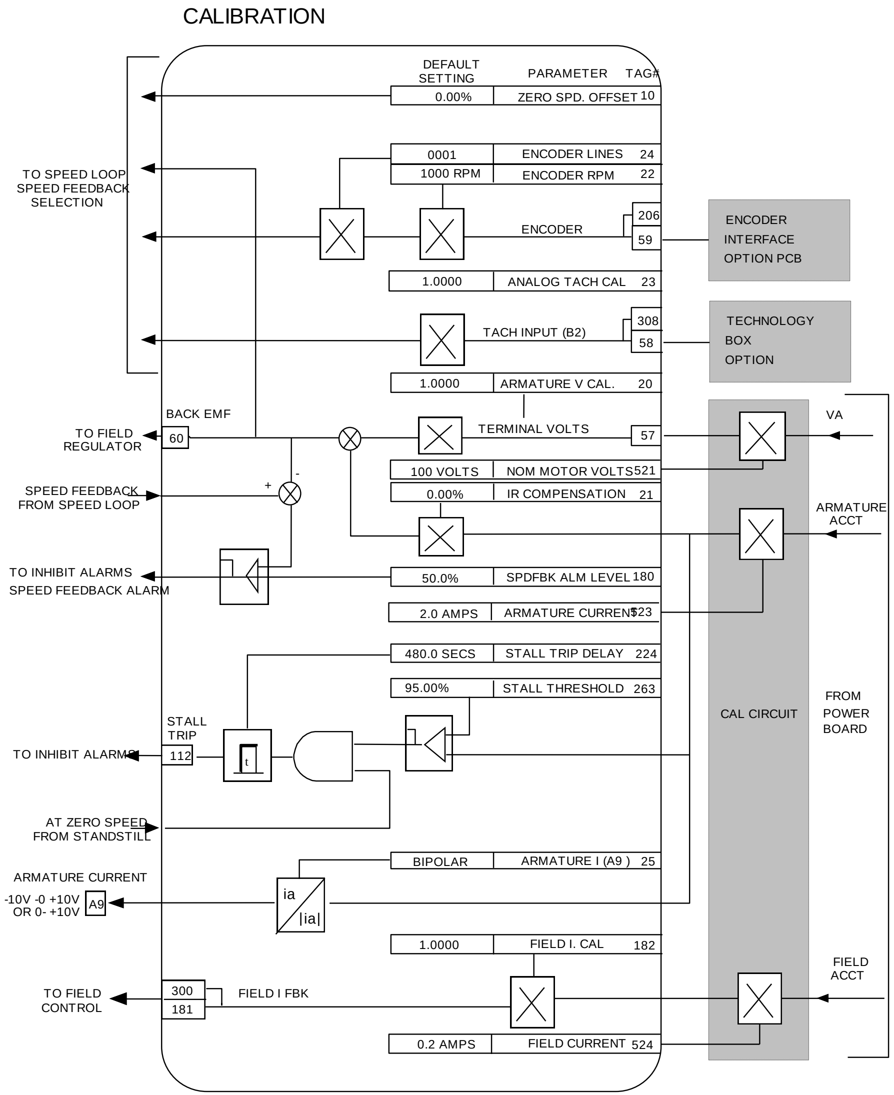
Frame 1					Frame 2				
SW1 Position	**MIN_IF**	**MAX_IF**	**CAL_IF**	**FIELD CURRENT Parameter (Tag524)**	**SW1 Position**	**MIN_IF**	**MAX_IF**	**CAL_IF**	**FIELD CURRENT Parameter (Tag524)**
20A/10A	0.8A	15A	20A	0.8-15A*	20A/10A	0.8A	20A	20A	0.8-20A
5A	0.2A	5A	5A	0.2-5A	5A	0.2A	5A	5A	0.2-5A

* External field currents above 10A up to the 15A for Frame1 require de-rating of the armature output current (amp for amp), and only apply for operation at or below 35°C ambient.

CALIBRATION

Parameter	Tag	Range
TERMINAL VOLTS	**57**	**—.x % (h)**
Refer to Chapter 6: "The Keypad" - The Keypad Menus (DIAGNOSTICS).		
UNFIL. TACH INPUT	**58**	**—.x % (h)**
Refer to Chapter 6: "The Keypad" - The Keypad Menus (DIAGNOSTICS).		
BACK EMF	**60**	**—.x % (h)**
Refer to Chapter 6: "The Keypad" - The Keypad Menus (DIAGNOSTICS).		

Functional Description



COMMS PORT

MMI Menu Map

1 SETUP PARAMETERS
2 SERIAL LINKS
3 SYSTEM PORT (P3)
- MODE
- GROUP ID (UID)
- UNIT ID (UID)
- ERROR REPORT
- BAUD RATE

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 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 "DSELite". Refer to the DSELite manual HA471486.

FUNCTION BLOCKS\COMMUNICATIONS\COMMS PORT\COMMS PORT 3

Value	Tag	Parameter
EIASCII	[130]	MODE
19200	[198]	BAUD RATE
0	[329]	GROUP ID (GID)
0	[330]	UNIT ID (UID)
TRUE	[328]	ESP SUP. (ASCII)
0.00 %	[331]	CHANGEBAND (BIN)
0xFFFF	[333]	PNO.7
0x00C0	[332]	ERROR REPORT
2 ms	[1175]	REPLY DELAY

MMI Menu Map

1 FUNCTION BLOCKS
2 COMMUNICATIONS
3 COMMS PORT
4 COMMS PORT 3
- MODE
- BAUD RATE
- GROUP ID (GID)
- UNIT ID (UID)
- ESP SUP. (ASCII)
- CHANGEBAND (BIN)
- PNO.7
- ERROR REPORT
- REPLY DELAY

COMMS PORT

Parameter	Tag	Range
MODE	**130**	**See below**
Used the set the protocol on this port. 0 : DISABLED 1 : 5703 MASTER 2 : 5703 SLAVE 3 : EIASCII 4 : EIBINARY		
BAUD RATE	**198**	**See below**
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		
GROUP ID (GID)	**329**	**0 to 7**
The Parker protocol group identity address.		

COMMS PORT

Parameter	Tag	Range
UNIT ID (UID)	**330**	**0 to 255**
The Parker protocol unit identity address.		
ESP SUP. (ASCII)	**328**	**FALSE/TRUE**
Reserved for future use.		
CHANGEBAND (BIN)	**331**	**0.00 to 100.00 %**
Reserved for future use.		
PNO.7	**333**	**0x0000 to 0xFFFF**
Reserved for future use.		
ERROR REPORT	**332**	**0x0000 to 0xFFFF**
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.		
DELAY	**1175**	**0 to 255 ms**
A programmable delay inserted by the drive before replying to a request.		

CONFIGURE DRIVE

MMI Menu Map

1 CONFIGURE DRIVE
- CONFIGURE ENABLE
- NOM MOTOR VOLTS
- ARMATURE CURRENT
- FIELD CURRENT

MMI Menu Map

1 SERIAL LINKS

2 SYSTEM PORT (P3)
- DUMP CHANGED

MMI Menu Map

1 FUNCTION BLOCKS

2 MISCELLANEOUS

3 CONFIGURE DRIVE
- AUTOMATIC SAVE
- UDP USE OP PORT
- EMULATE 590P
- DEBOUNCE DIGIN

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**

FUNCTION BLOCKS\MISCELLANOUS\CONFIGURE DRIVE

DISABLED –	[39]	CONFIGURE ENABLE
100 V –	[521]	NOM MOTOR VOLTS
1.0 A –	[523]	ARMATURE CURRENT
0.2 A –	[524]	FIELD CURRENT
FALSE –	[1220]	AUTOMATIC SAVE
FALSE –	[1169]	DUMP CHANGED
FALSE –	[628]	UDP USE OP PORT
0x0001 –	[162]	EMULATE 590P
TRUE –	[1172]	DEBOUNCE DIGIN

CONFIGURE DRIVE

Parameter	Tag	Range
CONFIGURE ENABLE	**39**	**FALSE / TRUE**
Selects Operating Mode (FALSE) or Configuration Mode (TRUE). Refer to "Modifying a Block Diagram", page 6-18.		
NOM MOTOR VOLTS	**521**	**100 to 875 VOLTS**
Sets the 100% value for Armature Volts VA. Set this value to match the motor in use. (Refer to ARMATURE V CAL in the CALIBRATION function block).		
ARMATURE CURRENT	**523**	**Product code dependent AMPS**
Sets the 100% value for Armature Current IA. Set this value to match the motor in use.		
FIELD CURRENT	**524**	**Product code dependent AMPS**
Sets the 100% value for Field Current IF. Set this value to match the motor in use. Note: this should be set to a minimum value if in Field Voltage control **-** see FLD. CTRL MODE in the FIELD CONTROL function block.		
AUTOMATIC SAVE	**1220**	**FALSE/TRUE**
When TRUE, changes made to parameters using the operator station are automatically saved to the drive's non-volatile memory.		
DUMP CHANGED	**1169**	**FALSE /TRUE**
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.		
UDP USE OP PORT	**628**	**FALSE/TRUE**
When TRUE the UDP transfer will be re-directed to the operator station port.		
EMULATE 590P	**162**	**0x0000 to 0xFFFF**
When non-zero the drive emulates some behaviour of earlier firmware versions of the 590P, (firmware versions 5.x and 7.x). This behaviour affects the time constants of the PID block, a number of parameters in the Field Control block, speed loop, and the linking of parameters in the function block diagram (refer to "**Error! Reference source not found.**". page **Error! Bookmark not defined.**).		
DEBOUNCE DIGIN	**1172**	**FALSE/TRUE**
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.

MMI Menu Map

1 SETUP PARAMETERS

2 CURRENT LOOP

- MAIN CURR. LIMIT
- PROP. GAIN
- INT. GAIN
- DISCONTINUOUS
- ADDITIONAL DEM
- BIPOLAR CLAMPS
- REGEN ENABLE
- MASTER BRIDGE
- POS. I CLAMP IN
- NEG. I CLAMP IN
- I DMD. ISOLATE
- CUR. LIMIT/SCALER

MMI Menu Map

1 DIAGNOSTICS

- CURRENT DEMAND
- CURRENT FBK. AMPS
- IaFbk UNFILTERED
- IaDmd UNFILTERED
- POS. I CLAMP
- NEG. I CLAMP
- ACTUAL POS I LIM
- ACTUAL NEG I LIM
- AT CURRENT LIMIT
- BACK EMF

MMI Menu Map

1 FUNCTION BLOCKS

2 MOTOR CONTROL

3 CURRENT LOOP

- PHASE ANGLE @ E
- ISOL DMD SOURCE

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 %
CURRENT FBK.AMPS	[538]	0.0 A
MASTER BRIDGE	[527]	TRUE
BACK EMF	[1173]	0.00 V
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
250.00 %	[301]	POS. I CLAMP IN
-250.00 %	[48]	NEG. I CLAMP IN
DISABLED	[119]	I DMD. ISOLATE
ANIN 2 (A3)	[1275]	ISOL DMD SOURCE

CURRENT LOOP

Parameter	Tag	Range
CUR. LIMIT/SCALER	**15**	**0.00 to 200.00 %**
Current limit scaler. It scales bipolar/unipolar clamps. To achieve 200% current limit, the current limit scaler should be set to 200%.		
MAIN CURR. LIMIT	**421**	**0.00 to 200.00 %**
Independent symmetric current clamp. Sets symmetric clamps outside scaling from the CUR. LIMIT/SCALER parameter.		
PROP GAIN	**16**	**0.00 to 200.00**
Proportional gain control for armature current PI loop. This parameter is set during the autotune function.		
INT. GAIN	**17**	**0.00 to 200.00**
Integral gain control for armature current PI loop, set during the autotune function.		

CURRENT LOOP

Parameter	Tag	Range
DISCONTINUOUS	**137**	**0.00 to 200.00 %**

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.

ADDITIONAL DEM	**30**	**-200.00 to 200.00 %**

Additional current demand input.

BIPOLAR CLAMPS	**90**	**DISABLED / ENABLED**

Selects between bipolar (asymmetric) or unipolar (symmetric) current clamps for the 4 quadrants of operation. Default setting of DISABLED means UNIPOLAR clamps selected.

DISABLED **-** unipolar (symmetric)
ENABLED **-** bipolar (asymmetric)

With BIPOLAR CLAMPS disabled, the clamps are symmetrical and are set by POS. I CLAMP IN. With BIPOLAR CLAMPS enabled, the clamps are assymmetrical, 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.

REGEN ENABLE	**201**	**See below**

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.

2Q (NON-REGEN) **-** non-regenerative (2-quadrant)
4Q (REGEN) **-** regenerative (4-quadrant)

POS. I CLAMP IN	**301**	**-200.00 to 200.00 %**

Positive current clamp when BIPOLAR CLAMPS is ENABLED.

NEG. I CLAMP IN	**48**	**-200.00 to 200.00 %**

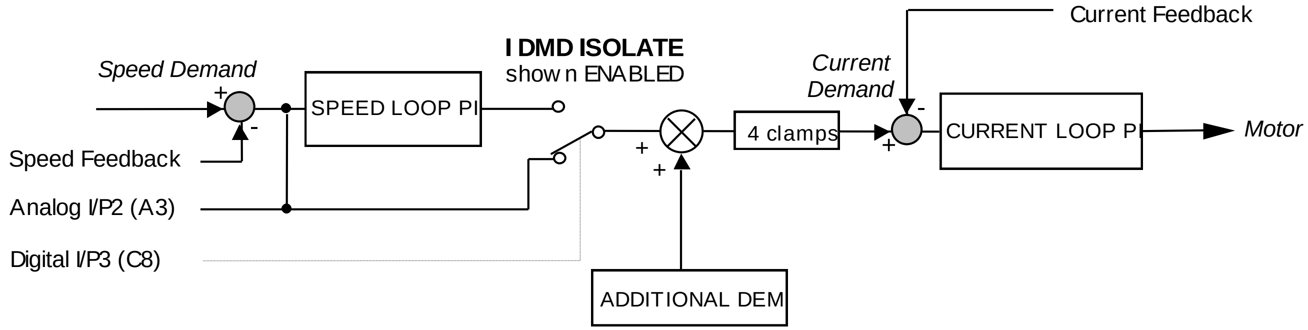
Negative current clamp when BIPOLAR CLAMPS is ENABLED.
Note on bipolar current clamps: these clamps in bipolar mode can cross-over onto the same quadrant. The POS. I CLAMP IN value is internally prevented from going numerically below the NEG. I CLAMP IN.

CURRENT LOOP

Parameter	Tag	Range
I DMD. ISOLATE	**119**	**DISABLED / ENABLED**

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.



Parameter	Tag	Range
AT CURRENT LIMIT	**42**	**FALSE / TRUE**

Refer to Chapter 6: "The Keypad" - The Keypad Menus (DIAGNOSTICS).

Parameter	Tag	Range
IaDmd UNFILTERED	**66**	**—.x % (h)**

Refer to Chapter 6: "The Keypad" - The Keypad Menus (DIAGNOSTICS).

Parameter	Tag	Range
CURRENT DEMAND	**299**	**—.xx %**

Refer to Chapter 6: "The Keypad" - The Keypad Menus (DIAGNOSTICS).

Parameter	Tag	Range
IaFbk UNFILTERED	**65**	**—.x % (h)**

Refer to Chapter 6: "The Keypad" - The Keypad Menus (DIAGNOSTICS).

Parameter	Tag	Range
CURRENT FBK. AMPS	**538**	**—.x AMPS**

Refer to Chapter 6: "The Keypad" - The Keypad Menus (DIAGNOSTICS).

Parameter	Tag	Range
MASTER BRIDGE	**527**	**FALSE/TRUE**

A diagnostic indicating currently active bridge; master = TRUE, slave = FALSE.

Parameter	Tag	Range
BACK EMF	**1173**	**—.x V**

Refer to Chapter 6: "The Keypad" - The Keypad Menus (DIAGNOSTICS).

Parameter	Tag	Range
PHASE ANGLE @ E	**1174**	**—.x DEG**

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

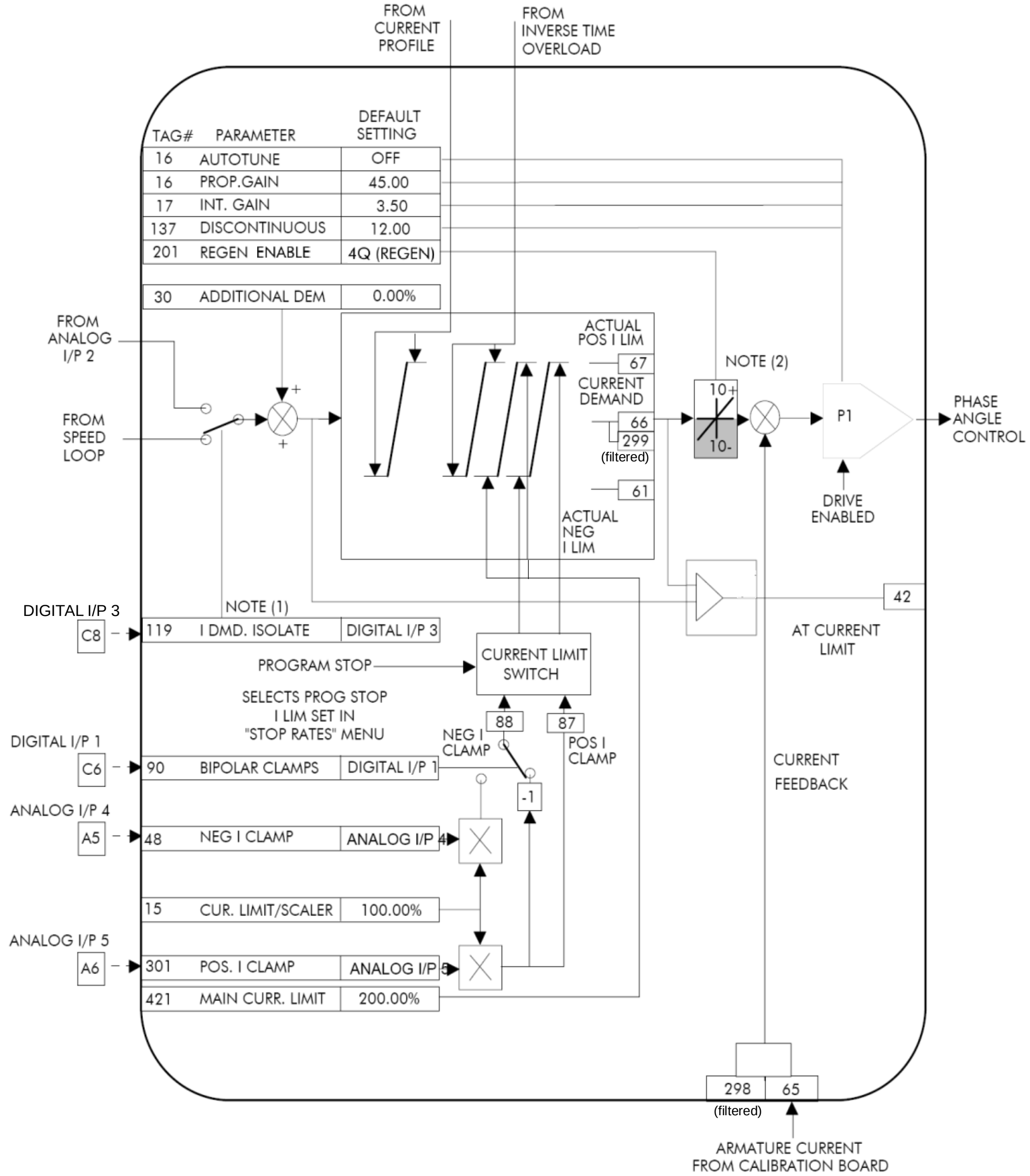
Parameter	Tag	Range
POS. I CLAMP	**87**	**—.x %**
Refer to Chapter 6: "The Keypad" - The Keypad Menus (DIAGNOSTICS).		
NEG. I CLAMP	**88**	**—.x %**
Refer to Chapter 6: "The Keypad" - The Keypad Menus (DIAGNOSTICS).		
ACTUAL POS I LIM	**67**	**—.x %**
Refer to Chapter 6: "The Keypad" - The Keypad Menus (DIAGNOSTICS).		
ACTUAL NEG I LIM	**61**	**—.x %**
Refer to Chapter 6: "The Keypad" - The Keypad Menus (DIAGNOSTICS).		
ISOL DMD SOURCE	**1275**	**ANIN 2 (A3) / FIELD I DEMAND**
Selects the source of the isolated current demand. ➢ Setting ANIN 2 (A3) makes use of the A3 analogue input terminal as the current demand. ➢ Setting FIELD I DEMAND makes use of the current demand (%) at the field current controller, as the percentage armature current demand. The use of this parameter is typically combined with parameters BEMF SOURCE, BEMF INPUT and 3-PHASE FIELD to apply the drive to field weakening control of a motor field.		

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. Non-regenerative drives use non-regen mode irrespective of the REGEN ENABLE parameter setting.

CURRENT LOOP



CURRENT PROFILE

MMI Menu Map

1 SETUP PARAMETERS

2 CURRENT PROFILE

- SPD BRK1 (LOW)
- SPD BRK2 (HIGH)
- IMAX BRK1(SPD1)
- IMAX BRK2(SPD2)

Use this to clamp the current limit for applications where motors have a reduced ability to commutate armature current at low field currents.

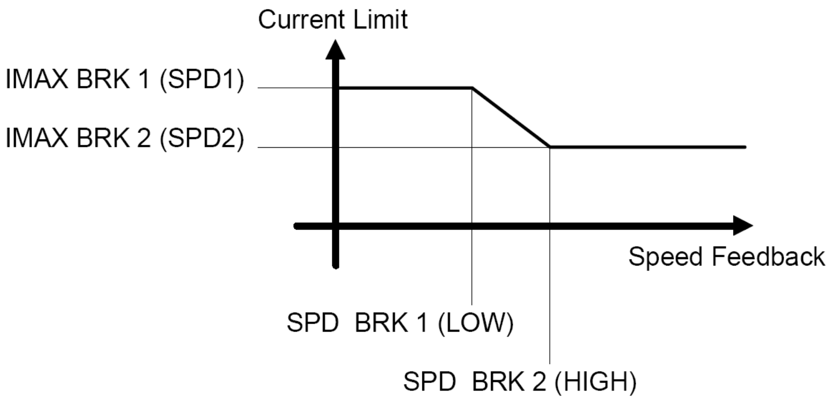
Normally this is required when using Field Weakening, although some motors exhibit commutation limitations at higher speeds even with rated field current.

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)

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 BRK2 (HIGH), the current limit is reduced linearly toward IMAX BRK2 (SPD2).
- When the speed exceeds SPD BRK2 (HIGH), the current limit remains at the IMAX BRK2 (SPD2) setting.



CURRENT PROFILE

Parameter	Tag	Range
SPD BRK 1 (LOW)	**32**	**0.0 to 100.0 % (h)**
This is the motor speed at which current limit profiling begins.		
SPD BRK 2 (HIGH)	**31**	**0.0 to 100.0 % (h)**
This is the upper speed limit at which current limit profiling ends.		
IMAX BRK 1 (SPD1)	**93**	**0.0 to 200.0 % (h)**
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.		
IMAX BRK 2 (SPD2)	**33**	**0.0 to 200.0 % (h)**
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

MMI Menu Map

1 SETUP PARAMETERS
2 SETPOINT SUM 1
- DEADBAND WIDTH
- INPUT 1

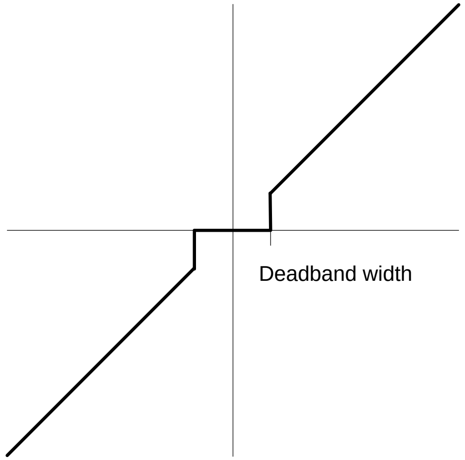
MMI Menu Map

1 FUNCTION BLOCKS
2 SETPOINT FUNCS
3 DEADBAND
- OUTPUT

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.

FUNCTION BLOCKS\SETPOINT FUNCS\DEADBAND

OUTPUT [700] – 0.00 %
0.00 % – [100] INPUT 1
0.0 % – [131] DEADBAND WIDTH



DEADBAND

Parameter	Tag	Range
INPUT 1	**100**	**-200.00 to 200.00 %**
Input 1 value. By default this is connected to Analog Input 1 (terminal A2).		
DEADBAND	**131**	**0.0 to 100.0 %**
Range within which the output is clamped at zero.		
OUTPUT	**700**	**—.xx %**
Modified value of input.		

DEMULTIPLEXER

MMI Menu Map

1 FUNCTION BLOCKS

2 MISCELLANEOUS

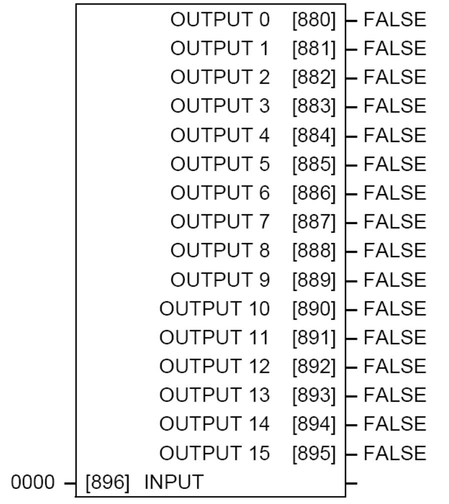
3 DEMULTIPLEXER

- 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

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
INPUT	**896**	**0x0000 to 0xFFFF**
The input to be split into its component bits.		
OUTPUT 0 to OUTPUT 15	**880 to 895**	**FALSE / TRUE**
Each output returns the corresponding bit of the 16 bit input word.		

DIAMETER CALC.

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
- MOD OF LINE SPD
- MOD OF REEL SPD
- UNFILT DIAMETER

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:

Minimum Core Outside Diameter ÷ Maximum Full Roll Diameter x 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.

MMI Menu Map

1 SETUP PARAMETERS

2 SPECIAL BLOCKS

3 TAPER CALC.

- TAPER
- TENSION SPT
- TAPERED DEMAND
- TENSION TRIM
- TOT. TENS. DEMAND

FUNCTION BLOCKS\WINDER\DIAMETER CALC.

Default	Tag	Parameter	Value
	[427]	DIAMETER	0.00 %
	[428]	MOD OF LINE SPD	0.00 %
	[429]	MOD OF REEL SPD	0.00 %
	[430]	UNFILT DIAMETER	0.00 %
	[452]	TAPERED DEMAND	0.00 %
	[441]	TOT. TENS. DEMAND	0.00 %
	[485]	INERTIA COMP O/P	0.00 %
	[706]	OUTPUT	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 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

- OUTPUT

DIAMETER CALC.

Parameter	Tag	Range
LINE SPEED	**424**	**-105.00 to 105.00 %**
This will usually be configured to be the analog tacho input and scaled appropriately during calibration.		
REEL SPEED	**437**	**-105.00 to 105.00 %**
This will usually be configured to be the drive's own speed feedback, i.e. encoder or armature volts feedback.		
MIN DIAMETER	**425**	**0.00 to 100.00 %**
Set to the minimum core diameter (normally the empty core diameter) as a percentage of the maximum roll diameter.		
MIN SPEED	**426**	**0.00 to 100.00 %**
This is the minimum LINE SPEED level below which the diameter calculation is frozen.		
RESET VALUE	**462**	**0.00 to 100.00 %**
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.		
EXTERNAL RESET	**463**	**DISABLED / ENABLED**
Sets and holds the diameter to the RESET VALUE when ENABLED.		
RAMP RATE	**453**	**0.1 to 600.0 s**
This is used to smooth the output of the diameter calculator.		
TAPER	**438**	**-100.00 to 100.00 %**
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.		
TENSION SPT.	**439**	**0.00 to 100.00 %**
This is the required tension setpoint.		
TENSION TRIM	**440**	**-100.00 to 100.00 %**
This is the additional tension demand in the form of a trim.		
STATIC COMP	**487**	**-300.00 to 300.00 %**
Static friction compensation set-up parameter.		
DYNAMIC COMP	**488**	**-300.00 to 300.00 %**
Dynamic friction compensation set-up parameter.		
REWIND	**489**	**DISABLED / ENABLED**
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

DIAMETER CALC.

Parameter	Tag	Range
FIX. INERTIA COMP	**479**	**-300.00 to 300.00 %**
Fixed inertia compensation set-up parameter.		
VAR. INERTIA COMP	**480**	**-300.00 to 300.00 %**
Variable inertia compensation set-up parameter.		
ROLL WIDTH/MASS	**481**	**0.00 to 100.00 %**
Scales the inertia fixed and variable compensations based on roll width. 100% = maximum roll width.		
LINE SPEED SPT	**498**	**-105.00 to 105.00 %**
Used to calculate the line speed acceleration rate value for the fixed and variable inertia compensations.		
FILTER T.C.	**482**	**0 to 20000**
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.		
RATE CAL	**483**	**-100.00 to 100.00**
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. *Note - Inertia compensation does not work well for line ramp rates above 100 seconds and therefore this parameter is limited to 100.00.*		
NORMALISED dv/dt	**484**	**-300.00 to 300.00 %**
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 *only* when RATE CAL = 0.00.		
TENSION SCALER	**486**	**-3.0000 to 3.0000**
Scales the TENSION DEMAND which is directly connected from the TAPER CALC. function block.		
DIAMETER	**427**	**—.xx %**
This is the output of the block.		
MOD OF LINE SPEED	**428**	**—.xx %**
Modulus of line speed.		
MOD OF REEL SPEED	**429**	**—.xx %**
Modulus of reel speed.		
UNFILTERED DIAMETER	**430**	**—.xx %**
Unfiltered value of "diameter" (before RAMP RATE filter).		
TAPERED DEMAND	**452**	**—.xx %**
This is the output of the TAPER calculation on the TENSION SPT (before adding TENSION TRIM).		

MMI Menu Map

1 SETUP PARAMETERS

2 SPECIAL BLOCKS

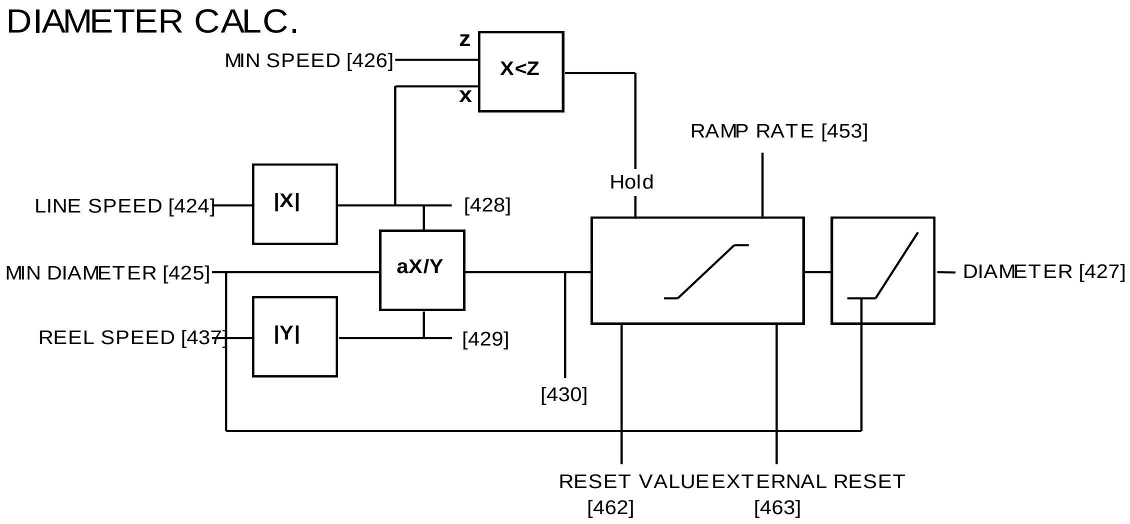
3 TENS+COMP CALC.

- 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

DIAMETER CALC.

Parameter	Tag	Range
TOT. TENS. DEMAND	**441**	**—.xx %**
This is the final output of this block (total tension demand) which can be connected to the appropriate points in the block diagram.		
INERTIA COMP O/P	**485**	**—.xx %**
Monitors the sum of all inertia compensations.		
OUTPUT	**706**	**—.xx %**
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

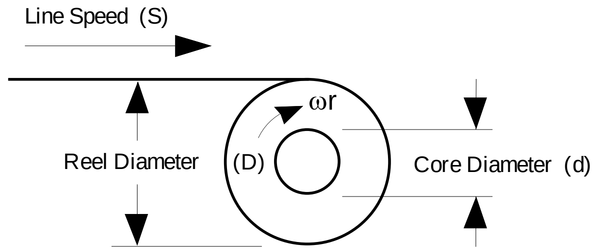


Circumference = πD or Line Speed (S) = Reel Speed (ωr) x D

Thus D = $\dfrac{S}{\omega r}$

i.e. D $\propto$ $\dfrac{\text{Line Speed (S)}}{\text{Reel Speed } (\omega r)}$

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.

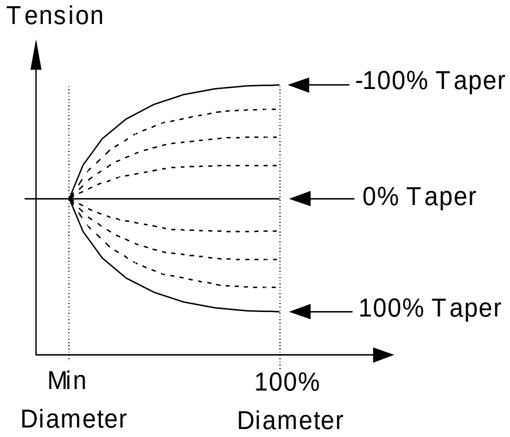
The function uses two inputs, tension setpoint and taper setpoint, to create the tension demand. The operator usually controls these setpoints.

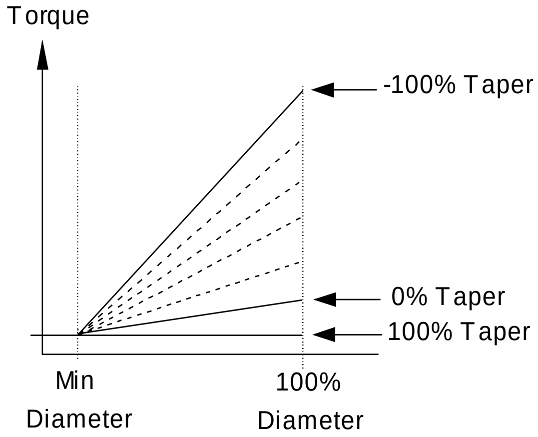
Taper is a common requirement for winders. It reduces the tension as the roll diameter increases.

A profiler adjusts the tension using the equation:

$$\text{Tapered Demand} = \text{Tension Spt} \times \left\{ 100\% - \frac{\text{Taper}}{\text{Diameter}} \times (\text{Diameter} - \text{Min Diameter}) \right\}$$

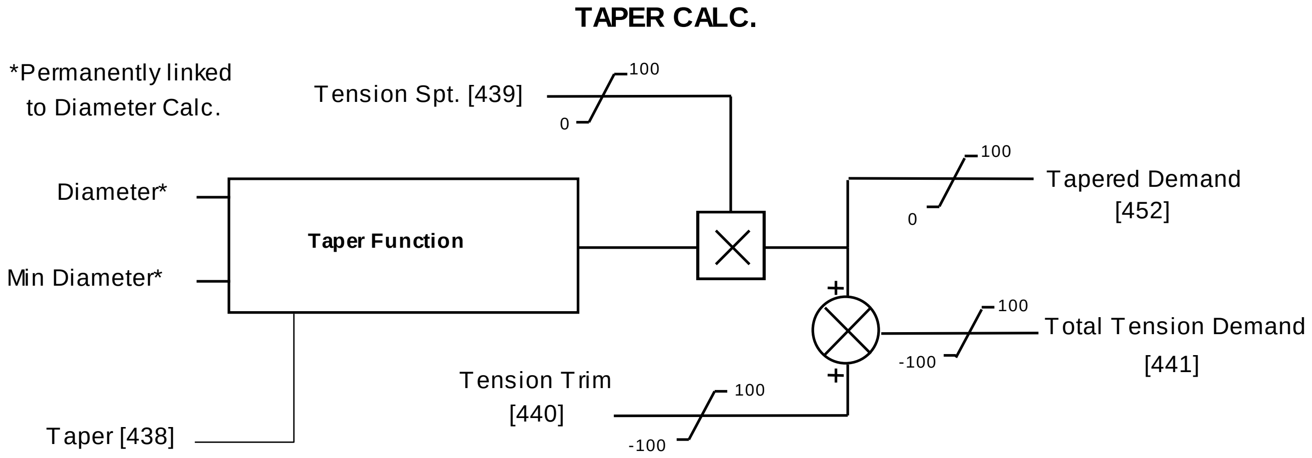
to yield a hyperbolic taper output. The taper tension characteristics are shown below:





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.

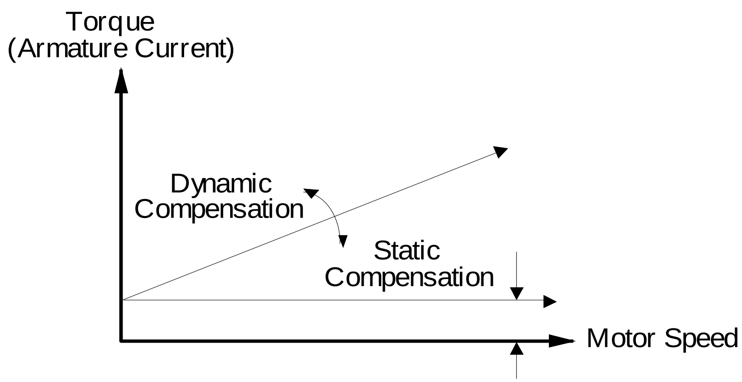
Static and Dynamic Frictional Losses

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.



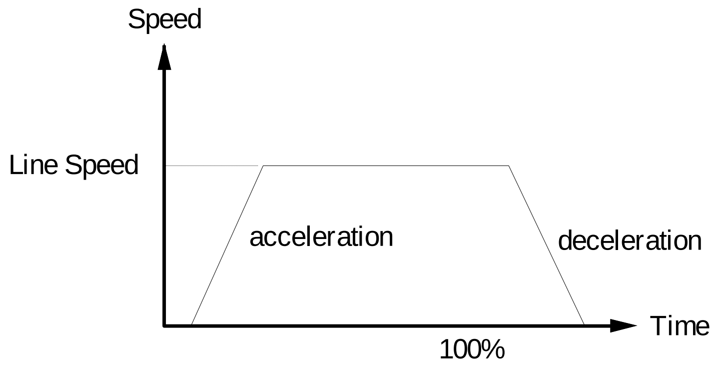
Inertia Compensation

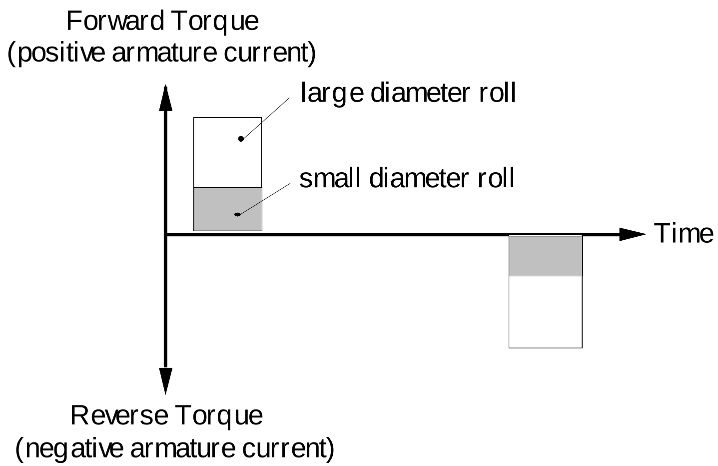
Many winders need inertia compensation to add or subtract torque during acceleration and deceleration to maintain constant tension, especially at large roll diameters. Without compensation, the tension holding capability of open loop winders diminishes during speed changes causing tension sag.

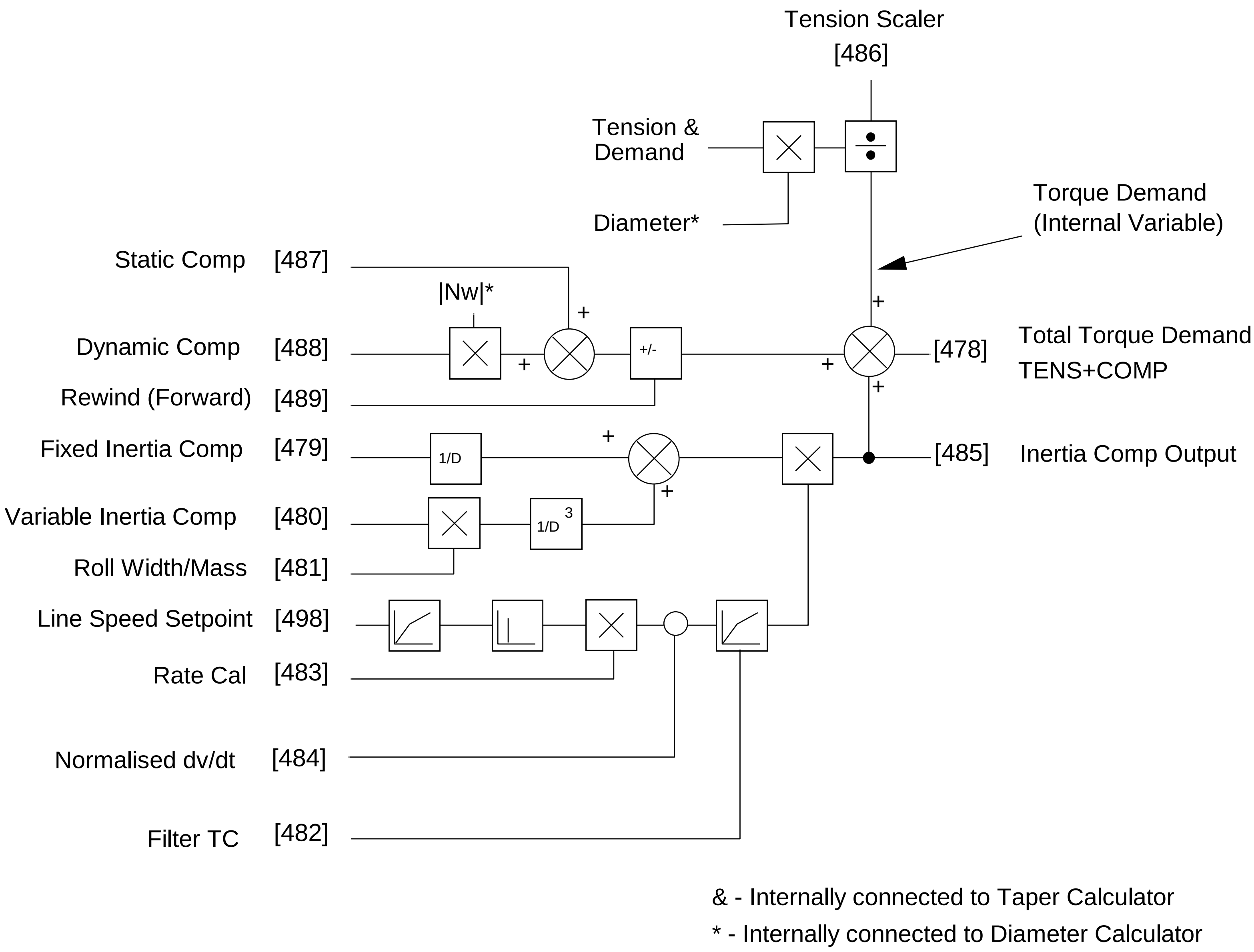
The inertia compensation characteristics is shown opposite.

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.







TENS + COMP Block Diagram

DIGITAL INPUTS

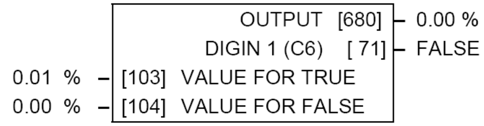
MMI Menu Map

1 SYSTEM
2 CONFIGURE I/O
3 DIGITAL INPUTS
4 DIGIN 1 (C6)
4 DIGIN 2 (C7)
4 DIGIN 3 (C8)
VALUE FOR TRUE
VALUE FOR FALSE

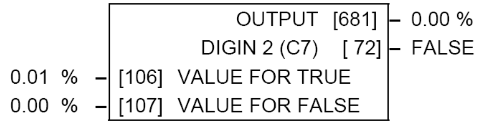
Use this block to control the digital operating parameters of the software.

The digital input can be configured to point to a destination location, and to set that destination TRUE or FALSE depending upon programmable values.

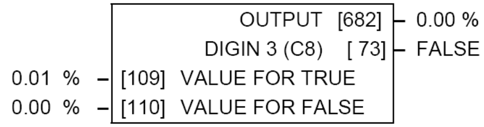
FUNCTION BLOCKS\INPUTS & OUTPUTS\DIGITAL INPUT\DIGITAL INPUT 1



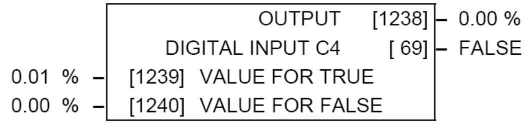
FUNCTION BLOCKS\INPUTS & OUTPUTS\DIGITAL INPUT\DIGITAL INPUT 2



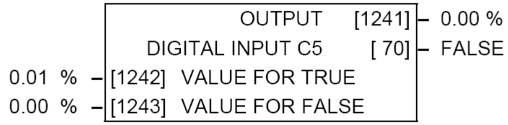
FUNCTION BLOCKS\INPUTS & OUTPUTS\DIGITAL INPUT\DIGITAL INPUT 3



FUNCTION BLOCKS\INPUTS & OUTPUTS\DIGITAL INPUT\DIGITAL INPUT 4



FUNCTION BLOCKS\INPUTS & OUTPUTS\DIGITAL INPUT\DIGITAL INPUT 5



DIGITAL INPUTS

Parameter	Tag	Range
VALUE FOR TRUE	**103, 106, 109, 1239**	**-300.00 to 300.00 %**

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)

VALUE FOR FALSE	**104, 107, 110, 1240**	**-300.00 to 300.00 %**

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)

OUTPUT	**680, 681, 682, 1238**	**—.xx %**

The output value, this is either VALUE FOR TRUE or VALUE FOR FALSE.

DIGIN 1 (C6) to DIGITAL INPUT C5	**71, 72, 73, 69**	**OFF / ON**

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

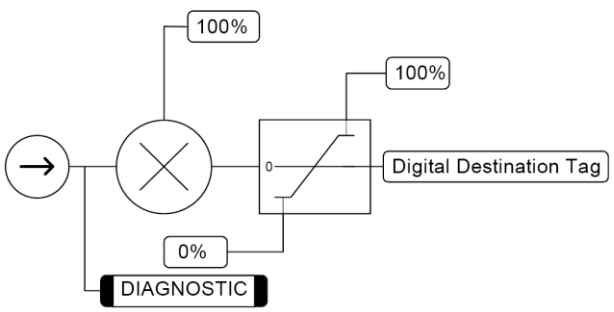
If you are isolating power on the drive output using a DC contactor, you must use an auxiliary, normally-open contact connected to terminal C5 to immediately disable the drive's current loop when the contactor coil de-energises. Free-up terminal C5 for other uses **only** when isolating main power on the input side of the drive using an AC contactor.

NOTE **Some 590 DRV models isolate power on the 590 drive output using a DC contactor, so you cannot use terminal C5 as an additional digital input.**

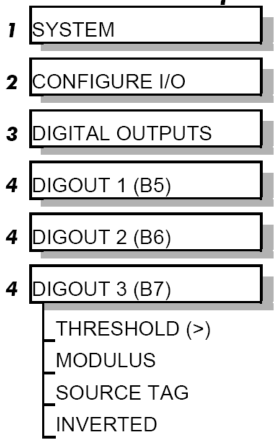
Additional Digital Inputs

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



MMI Menu Map

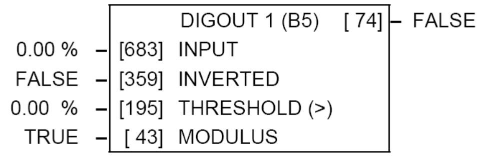


DIGITAL OUTPUTS

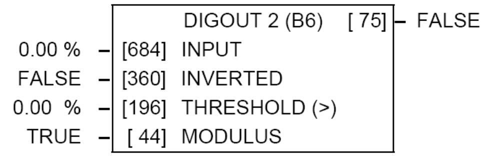
These function block allows you to output digital parameters within the software to other equipment.

A digital output can be configured to point to any digital value within the software system and to output information depending upon the status of that value.

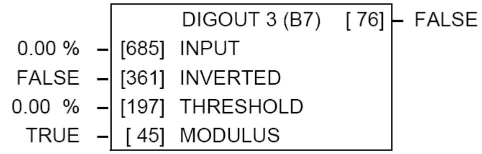
FUNCTION BLOCKS\INPUTS & OUTPUTS\DIGITAL OUTPUT\DIGITAL OUTPUT 1



FUNCTION BLOCKS\INPUTS & OUTPUTS\DIGITAL OUTPUT\DIGITAL OUTPUT 2



FUNCTION BLOCKS\INPUTS & OUTPUTS\DIGITAL OUTPUT\DIGITAL OUTPUT 3

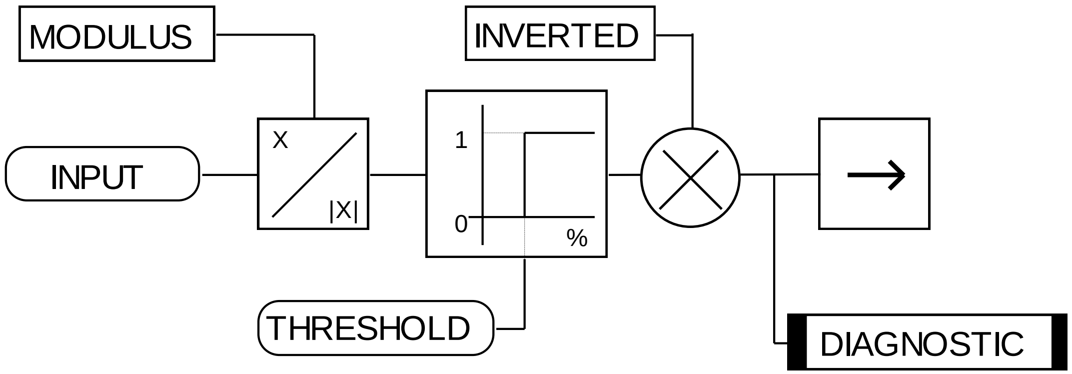


DIGITAL OUTPUTS

Parameter	Tag	Range
INPUT	**683, 684, 685**	**—.xx %**
The unprocessed value to output.		
INVERTED	**359, 360, 361**	**FALSE / TRUE**
Selects to invert the output when TRUE.		
THRESHOLD	**195, 196, 197**	**-300.00 to 300.00 %**
(THRESHOLD (>))		
The threshold which the input value must exceed to set the output to TRUE.		
MODULUS	**43, 44, 45**	**FALSE / TRUE**
When TRUE, the absolute value of INPUT is used for the threshold test.		
DIGOUT 1 (B5) to DIGOUT 3 (B7)	**74, 75, 76**	**OFF / ON**
The actual Boolean value sent to the output terminal.		

Functional Description

Configurable Digital Outputs



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.

MMI Menu Map

1 SERIAL LINKS

2 SYSTEM PORT (P3)

VERSION NUMBER

FUNCTION BLOCKS\MISCELLANEOUS\DRIVE INFO

PRODUCT CODE [510] – 1

FRAME ID [626] – 0

VERSION NUMBER [155] – 0x0000

1 – [545] PCODE ID

MMI Menu Map

1 FUNCTION BLOCKS

2 MISCELLANEOUS

3 DRIVE INFO

PCODE ID

PRODUCT CODE

FRAME ID

DRIVE INFO

Parameter	Tag	Range
PCODE ID	**545**	**0 to 100**

The product code. This representation is guaranteed to be unchanged between different software versions.
0-255 Details as Tag 510

DRIVE INFO

Parameter	Tag	Range
PRODUCT CODE	**510**	**0 to 96**

An internal representation of the product code. This representation may change between software versions.

0-106: INVALID
107: 500V4Q 20Ia 5If R
108: 500V2Q 20Ia 5If R
109: 500V4Q 35IIa 5If R
110: 500V2Q 35IIa 5If R
111: 500V4Q 45IIa 5If R
112: 500V2Q 45IIa 5If R
113: 500V4Q 75IIa 5If R
114: 500V2Q 75IIa 5If R
115: 500V4Q 110Ia5If R
116: 500V2Q 110Ia5If R
117: 500V4Q 165Ia 5If R
118: 500V2Q 165Ia 5If R
119: 500V4Q 20Ia 10If R
120: 500V2Q 20Ia 10If R
121:500V4Q 35Ia 20If R
122: 500V2Q 35Ia 20Ia R
123: 500V4Q 45Ia 20If R
124: 500V2Q 45Ia 20If R
125: 500V4Q 75Ia 20If R
126: 500V2Q 75Ia 20If R
127: 500V4Q 110Ia 20If R
128: 500V2Q 110Ia 20If R
129: 500V4Q 165Ia20If R
130: 500V2Q 165Ia20If R
131: 200V4Q 20Ia 5If R
132: 200V2Q 20Ia 5If R
133: 200V4Q 35Ia 5If R
134: 200V2Q 35Ia 5If R
135: 200V4Q 45Ia 5If R
136: 200V2Q 45Ia 5If R
137: 200V4Q 75Ia 5If R
138: 200V2Q 75Ia 5If R
139: 200V4Q 110Ia 5If R
140: 200V2Q 110Ia 5If R
141: 200V4Q 165Ia 5If R
142: 200V2Q 165Ia 5If R
143: 200V4Q 20Ia 20If R
144: 200V2Q 20Ia 20If R
145: 200V4Q 35Ia 20If R
146: 200V2Q 35Ia 20If R
147: 200V4Q 45Ia 20If R
148: 200V2Q 45Ia 20If R
149: 200V4Q 75Ia 20If R
150: 200V2Q 75Ia 20If R
151: 200V4Q 110Ia20If R
152: 200V2Q 110Ia20If R
153: 200V4Q 165Ia20If R
154: 200V2Q 165Ia20If R

FRAME ID	**626**	—.

An internal representation of the frame size.

VERSION NUMBER	**155**	0x0A01

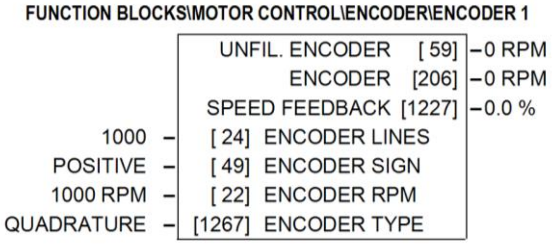
The drive's version number as seen via communications. Version 10.1 is represented as 0x0A01
Serial communications mnemonic = V0. The version number cannot be changed, and is software version dependent.

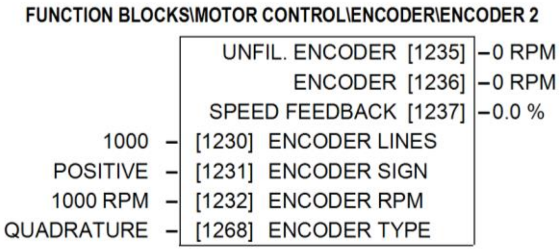
ENCODER

MMI Menu Map (from ENCODER 1)

1 CONFIGURE DRIVE
- ENCODER LINES
- ENCODER RPM
- ENCODER SIGN

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.





MMI Menu Map (from ENCODER 1)

1 DIAGNOSTICS
- ENCODER
- UNFIL. ENCODER

The ENCODER 1 function block is associated with the speed feedback option.

The ENCODER 2 function block is associated with Digital Input 2 (terminal C7) and Digital Input 3 (terminal C8) where:

- Digital Input 2 provides the clock.
- Digital Input 3 is used as a direction input.

MMI Menu Map

1 FUNCTION BLOCKS
2 MOTOR CONTROL
3 ENCODER
4 ENCODER 1
4 ENCODER 2
- SPEED FEEDBACK
- ENCODER TYPE

ENCODER

Parameter	Tag	Range
ENCODER LINES	**24, 1230**	**10 to 5000**

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.

Parameter	Tag	Range
ENCODER SIGN	**49, 1231**	**NEGATIVE / POSITIVE**

Since the encoder feedback cannot be reversed electrically, the signal polarity can be reversed by the control software.

It is necessary to set up this parameter when in closed-loop speed control mode, as the encoder direction must be correct for this mode to operate.

Parameter	Tag	Range
ENCODER RPM	**22, 1232**	**0 to 6000**

Motor top speed setting (100%) when using encoder feedback.

Parameter	Tag	Range
UNFIL. ENCODER	**59, 1235**	**—. RPM**

Unfiltered encoder speed in RPM

Parameter	Tag	Range
ENCODER	**206, 1236**	**—. RPM**

Encoder speed in RPM

Parameter	Tag	Range
SPEED FEEDBACK	**1227, 1237**	**—.x %**

Encoder speed in %. A speed of 100% indicates that the encoder is rotating at the value set in the ENCODER RPM parameter.

ENCODER

Parameter	Tag	Range
ENCODER TYPE	**1267, 1268**	**See below**

Selects the operating mode of the encoder input. Both of these encoder function blocks can be used in either QUADRATURE or CLOCK/DIRECTION modes of operation. When in CLOCK/DIRECTION mode, the CLOCK input is applied to terminal A on the speed feedback option (for ENCODER 1) or to Digital Input 2 (for ENCODER 2), and every rising edge of the CLOCK is counted.

0 : CLOCK/DIRECTION
1 : QUADRATURE

Functional Description

You must configure Digital Input 2 and 3 which, by default, provide "Ramp Hold" and "Current Demand Isolate" functionality. In the default configuration they are linked using LINK 21 and LINK 22 respectively. The Encoder blocks are connected to terminals C7 and C8 internally and thus don't require these links. Use the Configurator Tool to delete the links.

Alternatively when the default configuration is loaded, this can be done using the Keypad as shown below:

Navigate to the SYSTEM::CONFIGURE I/O menu. Select the CONFIGURE ENABLE parameter and set to ENABLED. All LEDS on the Keypad will flash. Press the E key. Use the ▽ key to navigate to the DIGITAL INPUTS menu.

In this menu, select the DIGIN 2 (C7) menu. Navigate to the DESTINATION TAG parameter and set this value to 0 (zero). Repeat this operation for the DIGIN 3 (C8) parameter.

Remember to perform a Parameter Save.

ENCODER TYPE = CLOCK/DIRECTION

This (pulse-counting mode) Encoder Type can be set in the ENCODER 2 function block only.

Digital Input 2 (terminal C7) is used to provide the clock - the pulses are applied on C7

Digital Input 3 (terminal C8) is used as a direction input:

- When C8 is high, (24V), the count is incremented
- When C8 is low, (0V), the count is decremented

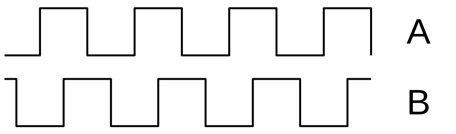
Each full pulse received increments the encoder count.
A full pulse is the pulse input going from low to high, and then back to low.

Speed is calculated using the following function:

$$\text{SPEED HZ} = \text{filter}\left[\frac{\text{CountsPerSecond}}{\text{Lines}}, \text{FilterTime}\right]$$

ENCODER TYPE = QUADRATURE

A quadrature encoder uses 2 input signals (A and B), phase shifted by a quarter of a cycle (90°).



Digital input 2, (C7) = Encoder A phase

Digital input 3, (C8) = Encoder B phase

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:

$$\text{SPEED HZ} = \text{filter}\left[\frac{\text{CountsPerSecond}}{\text{Lines x 4}}, \text{FilterTime}\right]$$

FEEDBACKS

MMI Menu Map

1 DIAGNOSTICS
- SPEED FEEDBACK
- CURRENT FEEDBACK
- UNFIL.FIELD FBK
- ARM VOLTS FBK
- TACH INPUT

Diagnostics for the motor feedbacks.

FUNCTION BLOCKS\MOTOR CONTROL\FEEDBACKS

ARM VOLTS FBK	[605]	0 V
UNFIL.FIELD FBK	[181]	0.00 %
SPEED FEEDBACK	[207]	0.00 %
CURRENT FEEDBACK	[298]	0.00 %
TACH INPUT	[308]	0.0 %

FEEDBACKS

Parameter	Tag	Range
ARM VOLTS FBK	**605**	**—.x V**
Back EMF scaled by NOM MOTOR VOLTS.		
UNFIL.FIELD FBK	**181**	**—.xx %**
Scaled field current feedback		
SPEED FEEDBACK	**207**	**—.xx %**
Speed feedback.		
CURRENT FEEDBACK	**298**	**—.xx %**
Scaled and filtered armature current feedback.		
TACH INPUT	**308**	**—.x %**
Scaled analog tachogenerator feedback.		

FIELD CONTROL

MMI Menu Map

1 SETUP PARAMETERS

2 FIELD CONTROL

- FIELD ENABLE
- FLD.CTRL MODE
- FIELD I THRESH
- UP TO FIELD
- >> FLD.VOLTAGE VARS
- >> FLD.CURRENT VARS
- FLD.QUENCH DELAY
- FLD. QUENCH MODE

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.

FUNCTION BLOCKS\MOTOR CONTROL\FIELD CONTROL

Default	Tag	Parameter	Tag	Output
		FIELD ENABLED	[169]	DISABLED
		FIELD DEMAND	[183]	0.00 %
		FLD.FIRING ANGLE	[184]	0.00 DEG
		FIELD I FBK	[300]	0.00 %
		FIELD I FBK.AMPS	[539]	0.0 A
		UP TO FIELD	[618]	FALSE
		WEAK PID ERROR	[1185]	0.00 %
		WEAK PID OUT	[1186]	0.00 %
		FIELD STATE	[1187]	FIELD INIT
		BEMF INPUT	[1274]	0.00 %
ENABLED	[170]	FIELD ENABLE		
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		
LOCAL BEMF	[1273]	BEMF SOURCE		

MMI Menu Map

1 SETUP PARAMETERS

2 FIELD CONTROL

3 FLD.VOLTAGE VARS

- FLD.VOLTS RATIO

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.

MMI Menu Map

1 SETUP PARAMETERS

2 FIELD CONTROL

3 FLD.CURRENT VARS

- SETPOINT
- PROP. GAIN
- INT. GAIN
- >> FLD.WEAK VARS

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.

FLD WEAK VARS : MMI Sub-Menu

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
- FIELD I FBK.AMPS
- FLD.FIRING ANGLE

MMI Menu Map

1 FUNCTION BLOCKS

2 MOTOR CONTROL

3 FIELD CONTROL

- WEAK PID ERROR
- WEAK PID OUT
- FIELD STATE
- BEMF SOURCE
- BEMF INPUT

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.

FIELD CONTROL

Parameter	Tag	Range
FIELD ENABLE	**170**	**DISABLED / ENABLED**
Enables and disables the drive motor Field Control.		
SETPOINT	**171**	**0.00 to 100.00 %**
Field current setpoint as percentage of calibrated value.		
PROP. GAIN	**173**	**0.00 to 100.00**
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.		
INT. GAIN	**172**	**0.00 to 100.00**
This is the integral gain adjustment of the field current PI loop.		
FLD. WEAK ENABLE	**174**	**DISABLED/STANDARD/ADVANCED**
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. ADVANCED mode also adds in a feedforward control term, based on a comparison of the speed feedback to the calculated base speed, and uses adaptive gain, in both the back-emf and speed control loops, to compensate for the gain effects of reduced field operation.		
EMF LEAD	**175**	**0.10 to 50.00**
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.		
EMF LAG	**176**	**0.00 to 200.00**
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.		
EMF GAIN	**177**	**0.00 to 100.00**
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.		

FIELD CONTROL

Parameter	Tag	Range
MIN FLD. CURRENT	**179**	**0.00 to 100.00 %**

Protects against motor overspeeding due to unintended excessive field weakening.

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.

MAX VOLTS	**178**	**0.00 to 100.00 %**

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.

BEMF FBK LEAD	**191**	**20 to 5000**

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).
Refer to Chapter 5: "Control Loops" for details of Tuning.

BEMF FBK LAG	**192**	**20 to 5000**

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).
Refer to Chapter 5: "Control Loops" for details of Tuning.

FLD. QUENCH DELAY	**185**	**0.0 to 600.0 s**

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.

FLD. QUENCH MODE	**186**	**QUENCH / STANDBY**

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.)

FIELD I THRESH	**617**	**0.00 to 100.00 %**

Threshold for UP TO FIELD diagnostic as a percentage of calibrated field current (see below).

FLD. CTRL MODE	**209**	**See below**

Selects between open-loop VOLTAGE CONTROL or closed-loop CURRENT CONTROL.

FLD. VOLTS RATIO	**210**	**0.0 to 100.0 %**

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.

FIELD ENABLED	**169**	**DISABLED / ENABLED**

Refer to Chapter 6: "The Keypad" - The Keypad Menus (DIAGNOSTICS).

FIELD CONTROL

Parameter	Tag	Range
FIELD DEMAND	**183**	**—.xx %**
Refer to Chapter 6: "The Keypad" - The Keypad Menus (DIAGNOSTICS).		
FLD. FIRING ANGLE	**184**	**—.xx DEG**
Refer to Chapter 6: "The Keypad" - The Keypad Menus (DIAGNOSTICS).		
FIELD I FBK.	**300**	**—.xx %**
Field current feedback, as a percentage of the calibrated level.		
FIELD I FBK.AMPS	**539**	**—.x A**
FIELD I FBK calibrated in Amps.		
UP TO FIELD	**618**	**FALSE / TRUE**
Field current feedback is above FIELD I THRESHOLD when TRUE. This may be used as part of a mechanical brake release strategy.		
WEAK PID ERROR	**1185**	**—.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.		
WEAK PID OUT	**1186**	**—.xx %**
Output field reduction demand, as a percentage of calibrated field current, from the field weakening controller.		
FIELD STATE	**1187**	**See below**
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		
BEMF SOURCE	**1273**	**LOCAL BEMF / BEMF INPUT**
Selects the source of the back-emf feedback into the field weakening control loop. Setting LOCAL BEMF makes use of the back-emf measured at the armature terminals. Setting BEMF INPUT uses the value in the parameter BEMF INPUT as the feedback for the field weakening control.		

FIELD CONTROL

Parameter	Tag	Range
BEMF INPUT	**1274**	**—.xx %**

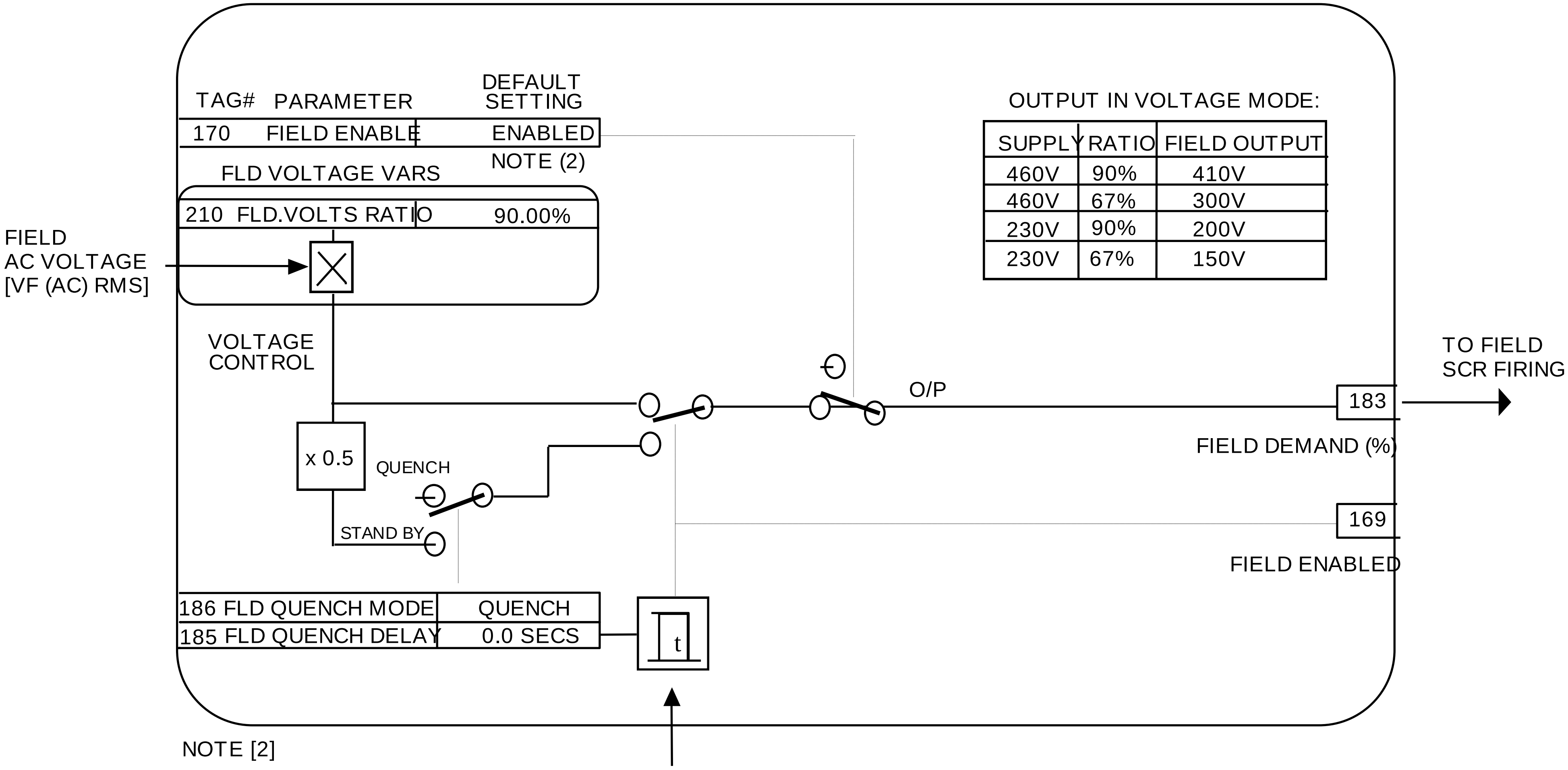
The feedback value of back-emf used for the field weakening control, when BEMF SOURCE is set to BEMF INPUT. It allows for the use of the field weakening control structure on motors not directly connected to the armature terminals. It can be wired within the block diagram to an analogue input or a communications path.

The use of this parameter is typically combined with parameters ISOL DMD SOURCE and 3-PHASE FIELD (CURRENT LOOP function block) to apply the drive to field weakening control of a motor field.

Note: If the ADVANCED field weakening mode is being used with an external back-emf feedback, ensure to apply the speed feedback so that the base speed calculator can function correctly.

Functional Description

FIELD CONTROL MODE : VOLTAGE



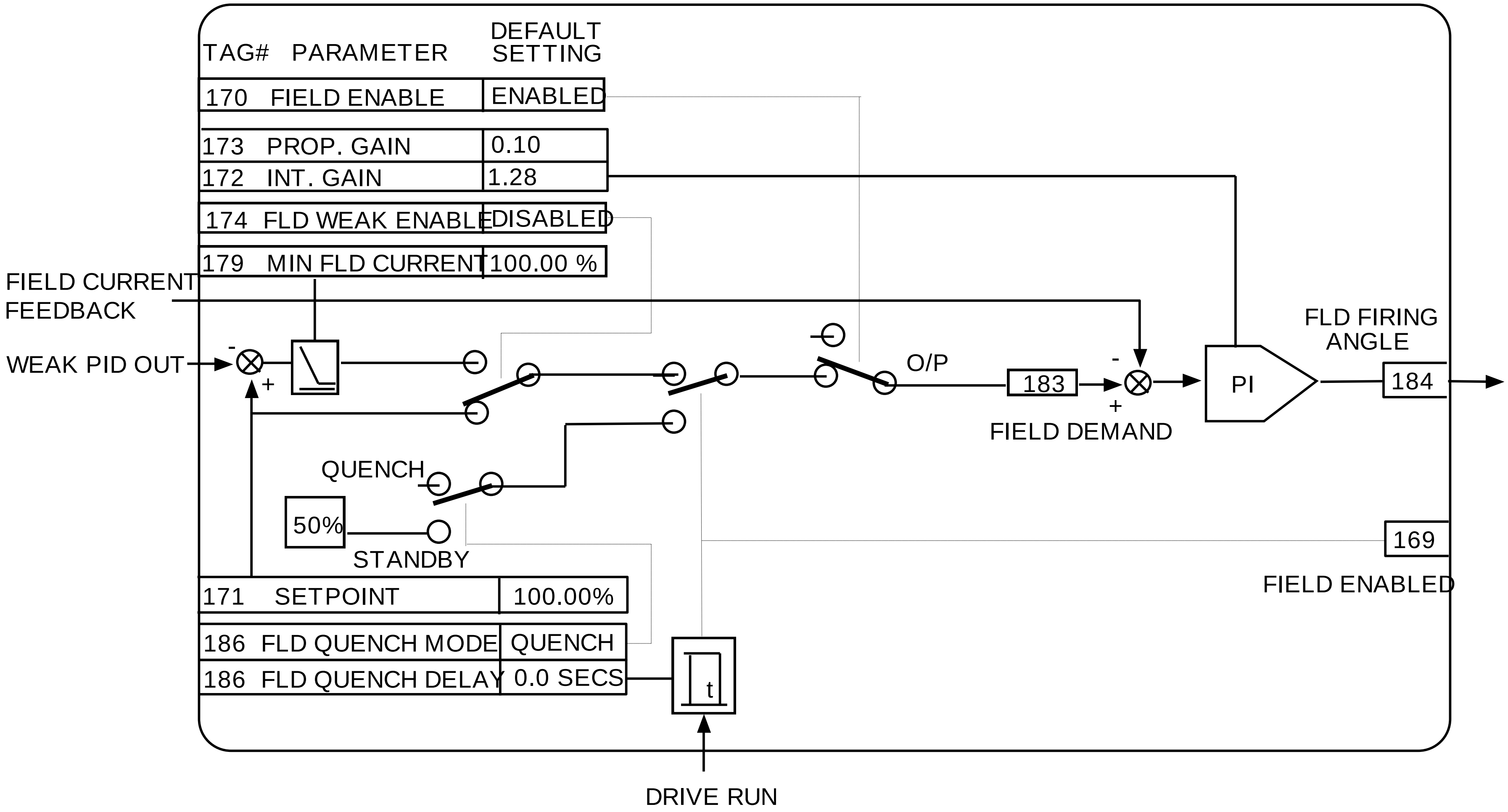
OUTPUT IN VOLTAGE MODE:

SUPPLY	RATIO	FIELD OUTPUT
460V	90%	410V
460V	67%	300V
230V	90%	200V
230V	67%	150V

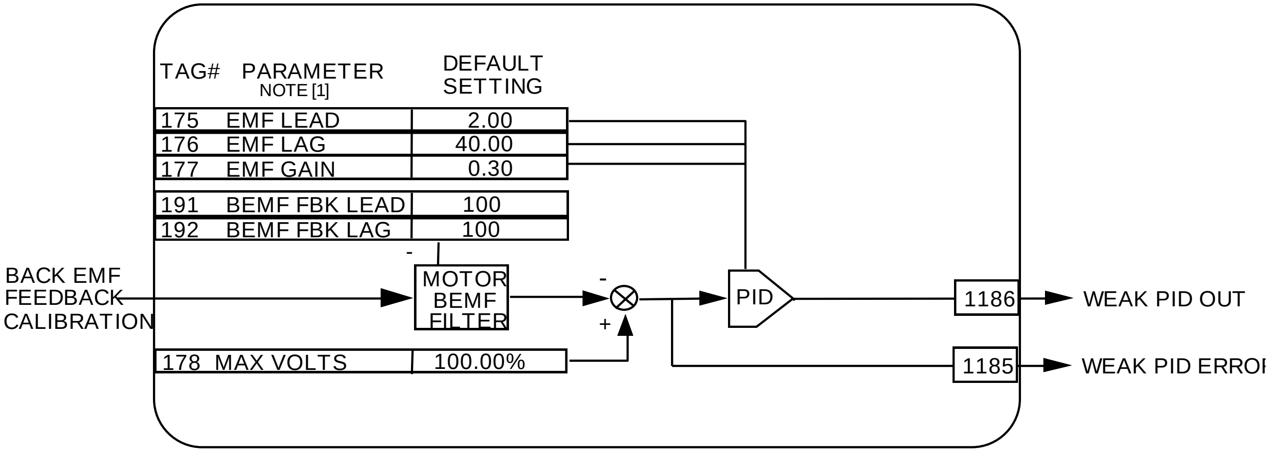
NOTE [2]

DISABLING FIELD ENABLE PARAMETER WILL AUTOMATICALLY OVERRIDE FIELD FAILURE ALARM.

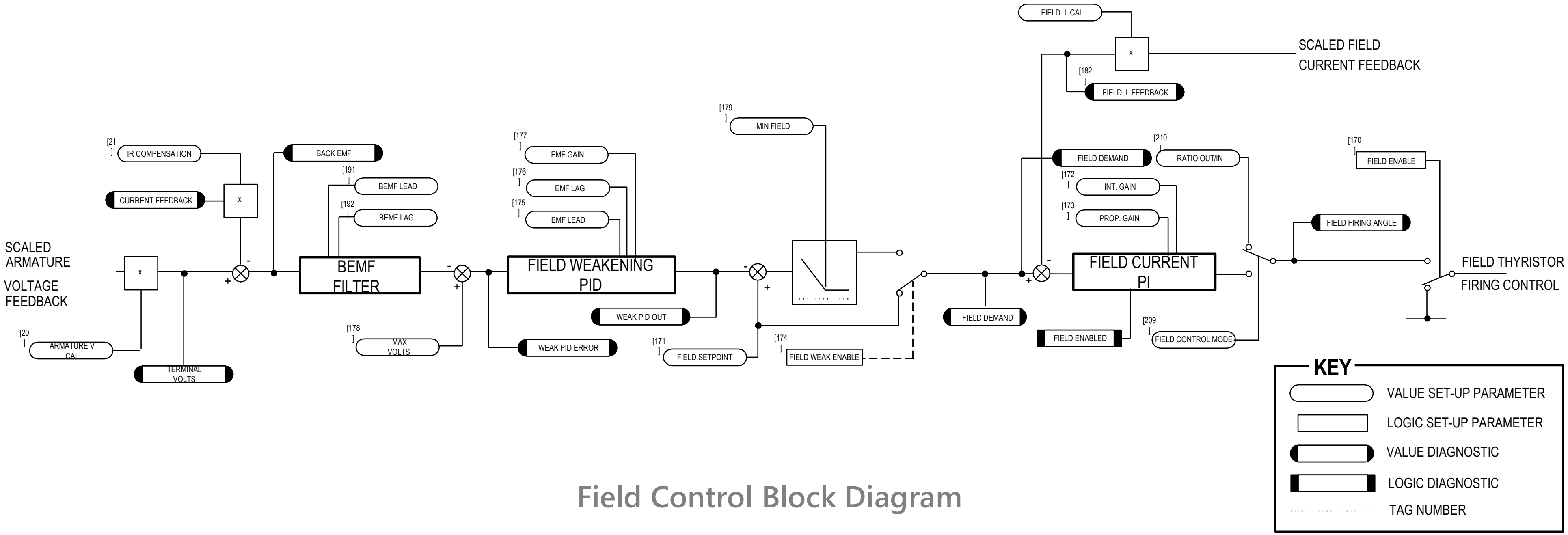
FIELD CONTROL MODE : CURRENT



FLD WEAK VARS



NOTE [1]
FIELD WEAKENING OPERATION REQUIRES ENCODER OR ANALOG TACH FEEDBACK



Field Control Block Diagram

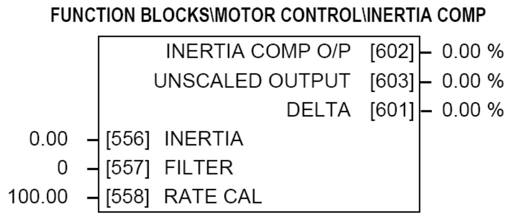
INERTIA COMP

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.

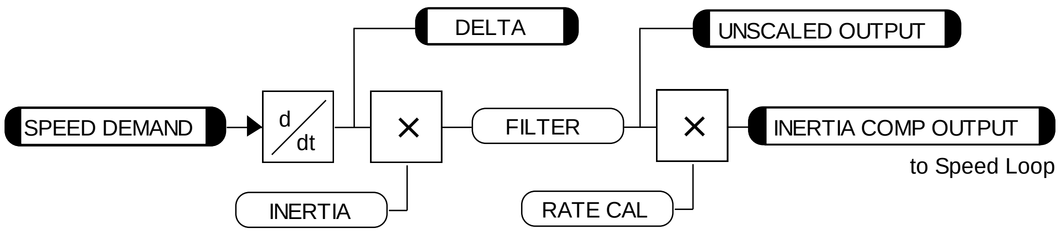
This is particularly useful in high accuracy applications such as positioning systems and elevators. The block calculates its output at the same rate as the current loop for maximum performance.



INERTIA COMP

Parameter	Tag	Range
INERTIA	**556**	**0.00 to 200.00**
The value of current necessary to accelerate load to 100% speed in 1 second.		
FILTER	**557**	**0 to 20000**
Low pass filter acting on the DELTA parameter.		
RATE CAL	**558**	**0.00 to 200.00**
Inertia compensation scaling factor.		
INERTIA COMP O/P	**602**	**—.xx %**
Inertia compensation directly added to the speed loop output.		
UNSCALED OUTPUT	**603**	**—.xx %**
Unscaled inertia compensation.		
DELTA	**601**	**—.xx %**
Rate of change of speed demand in %/s^2.		

Functional Description



MMI Menu Map

1 FUNCTION BLOCKS
2 MISCELLANEOUS
3 LINK
4 LINK 1
4 LINK 80
SOURCE TAG
DESTINATION TAG

LINK

Use internal links to connect between function block parameters.

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
LINK 1 - 80		
SOURCE TAG	**Refer to Parameter Table**	**-1276 to 1276**
Enter the tag number of the source input value. Refer to "Making and Breaking Function Block Connections", page 2.		
DESTINATION TAG	**Refer to Parameter Table**	**0 to 1276**
Enter the tag number for the destination output value. Refer to "Making and Breaking Function Block Connections", page 2.		

MMI Menu Map

1 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.

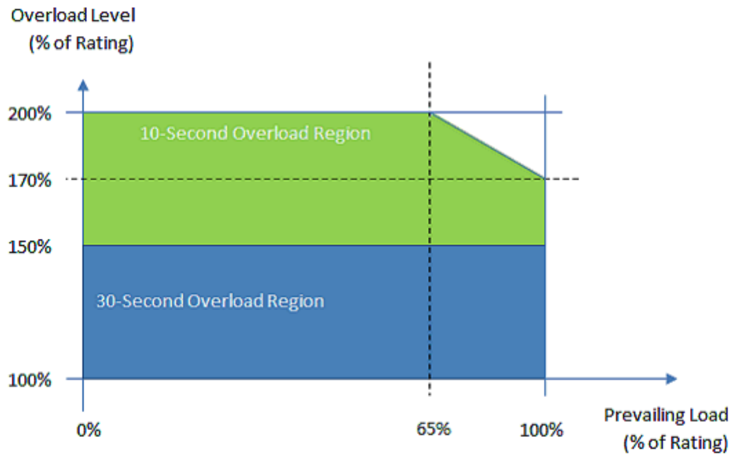
FUNCTION BLOCKS\MOTOR CONTROL\INVERSE TIME

INVERSE TIME [203] – 0.00 %

As the motor current exceeds an internal threshold of 103%, the excess current is integrated. As in the diagram below, the inverse time output remains unchanged until the integrated value (Prevailing Load) is no less than 150% current or equivalent to "Overload Level current" for 10s or the integrated value (Prevailing Load) is less than 150% current for 30s. Once this limit is reached the integral value is clamped, and the inverse time output is decreased towards 103% at 10% per second.

Should the current drop below the 103% threshold the integrator value starts to discharge. As soon as the integrated value is less than the maximum "overload level current", the inverse time output is allowed to ramp back up to "Overload Level current" at a rate of 10% per second.

The inverse time output parameter is internally used by the current loop.



INVERSE TIME

Parameter	Tag	Range
INVERSE TIME	**203**	**—.xx %**

Inverse time clamp output level.

JOG/SLACK

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

MMI Menu Map

1 FUNCTION BLOCKS

2 SEQ & REF

3 JOG/SLACK

- JOG/SLACK OUTPUT

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 OUTPUT 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.

FUNCTION BLOCKS\SEQ & REF\JOG/SLACK

Default	Parameter	Output
	OPERATING MODE [212]	STOP
	JOG/SLACK OUTPUT [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:*** 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.

JOG/SLACK

Parameter	Tag	Range
JOG SPEED 1	**218**	**-100.00 to 100.00 %**
Jog speed setpoint 1.		
JOG SPEED 2	**219**	**-100.00 to 100.00 %**
Jog speed setpoint 2.		
TAKE UP 1	**253**	**-100.00 to 100.00 %**
Take-up slack speed setpoint 1.		
TAKE UP 2	**254**	**-100.00 to 100.00 %**
Take-up slack speed setpoint 2.		
CRAWL SPEED	**225**	**-100.00 to 100.00 %**
Crawl speed setpoint.		
MODE	**228**	**FALSE / TRUE**
Selects jog speed setpoints, take up setpoints, and the crawl setpoint. To achieve full functionality, connect MODE to a spare digital input.		

JOG/SLACK

Parameter	Tag	Range
RAMP RATE	**355**	**0.1 to 600.0 s**

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.

Parameter	Tag	Range
OPERATING MODE	**212**	**See below**

Refer to Chapter 6: "The Keypad" - The Keypad 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

Parameter	Tag	Range
JOG/SLACK OUTPUT	**698**	**___.00 %**

The setpoint combined with the JOG / SLACK function.

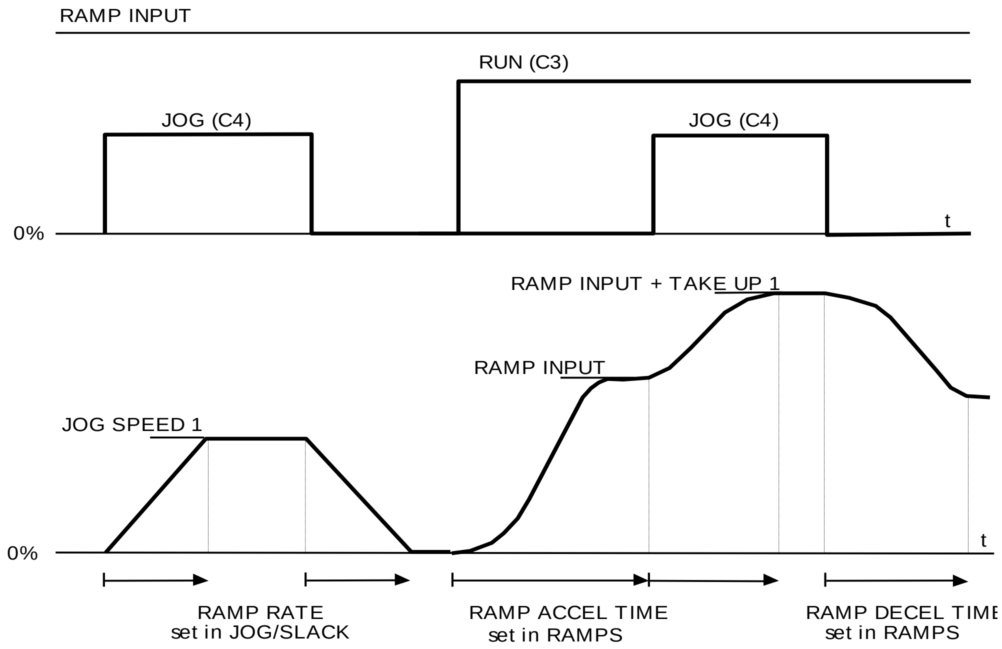
Functional Description

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.**

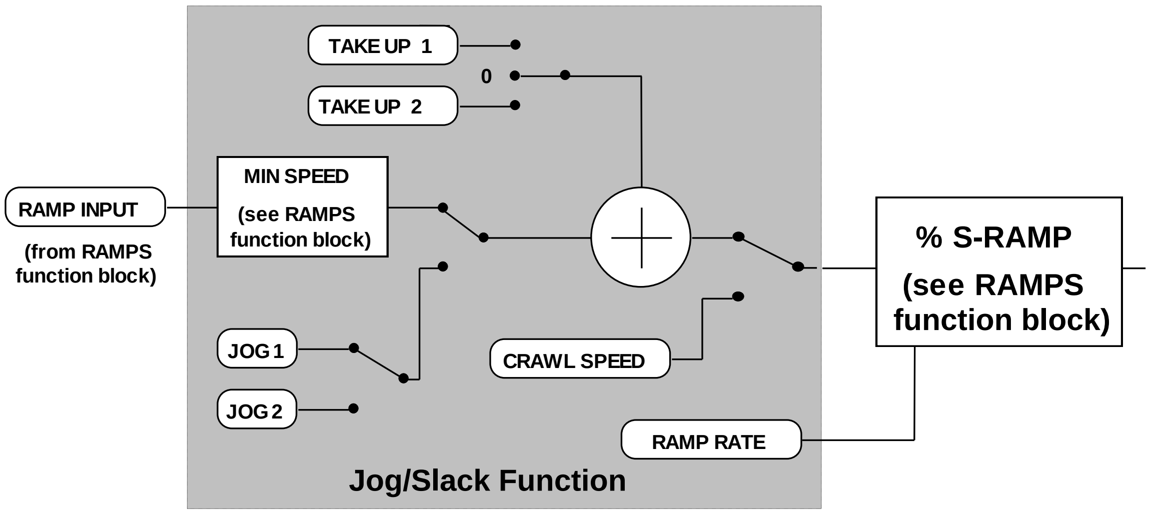
Setpoint Selection Table

OPERATING MODE [212] - diagnostic		Start C3	Jog C4	MODE [228]	Ramp Input	Ramp Time	Contactor
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



LOGIC FUNC

MMI Menu Map

1 FUNCTION BLOCKS
2 MISCELLANEOUS
3 LOGIC FUNC
4 LOGIC FUNC 1
4 LOGIC FUNC 2
4 LOGIC FUNC 3
4 LOGIC FUNC 4
4 LOGIC FUNC 5
4 LOGIC FUNC 6
4 LOGIC FUNC 7
4 LOGIC FUNC 8
4 LOGIC FUNC 9
4 LOGIC FUNC 10
- INPUT A
- INPUT B
- INPUT C
- TYPE
- OUTPUT

These generic function blocks can be configured to perform one of a number of simple functions upon a fixed number of inputs.

FUNCTION BLOCKS\MISCELLANEOUS\LOGIC FUNC\LOGIC FUNC 1

Default	Tag	Parameter	Value
	[784]	OUTPUT	FALSE
FALSE	[780]	INPUT A	
FALSE	[781]	INPUT B	
FALSE	[782]	INPUT C	
NOT(A)	[783]	TYPE	

FUNCTION BLOCKS\MISCELLANEOUS\LOGIC FUNC\LOGIC FUNC 2

Default	Tag	Parameter	Value
	[789]	OUTPUT	FALSE
FALSE	[785]	INPUT A	
FALSE	[786]	INPUT B	
FALSE	[787]	INPUT C	
NOT(A)	[788]	TYPE	

FUNCTION BLOCKS\MISCELLANEOUS\LOGIC FUNC\LOGIC FUNC 3

Default	Tag	Parameter	Value
	[794]	OUTPUT	FALSE
FALSE	[790]	INPUT A	
FALSE	[791]	INPUT B	
FALSE	[792]	INPUT C	
NOT(A)	[793]	TYPE	

FUNCTION BLOCKS\MISCELLANEOUS\LOGIC FUNC\LOGIC FUNC 4

Default	Tag	Parameter	Value
	[799]	OUTPUT	FALSE
FALSE	[795]	INPUT A	
FALSE	[796]	INPUT B	
FALSE	[797]	INPUT C	
NOT(A)	[798]	TYPE	

FUNCTION BLOCKS\MISCELLANEOUS\LOGIC FUNC\LOGIC FUNC 5

Default	Tag	Parameter	Value
	[804]	OUTPUT	FALSE
FALSE	[800]	INPUT A	
FALSE	[801]	INPUT B	
FALSE	[802]	INPUT C	
NOT(A)	[803]	TYPE	

FUNCTION BLOCKS\MISCELLANEOUS\LOGIC FUNC\LOGIC FUNC 6

Default	Tag	Parameter	Value
	[809]	OUTPUT	FALSE
FALSE	[805]	INPUT A	
FALSE	[806]	INPUT B	
FALSE	[807]	INPUT C	
NOT(A)	[808]	TYPE	

FUNCTION BLOCKS\MISCELLANEOUS\LOGIC FUNC\LOGIC FUNC 7

Default	Tag	Parameter	Value
	[814]	OUTPUT	FALSE
FALSE	[810]	INPUT A	
FALSE	[811]	INPUT B	
FALSE	[812]	INPUT C	
NOT(A)	[813]	TYPE	

FUNCTION BLOCKS\MISCELLANEOUS\LOGIC FUNC\LOGIC FUNC 8

Default	Tag	Parameter	Value
	[819]	OUTPUT	FALSE
FALSE	[815]	INPUT A	
FALSE	[816]	INPUT B	
FALSE	[817]	INPUT C	
NOT(A)	[818]	TYPE	

FUNCTION BLOCKS\MISCELLANEOUS\LOGIC FUNC\LOGIC FUNC 9

Default	Tag	Parameter	Value
	[824]	OUTPUT	FALSE
FALSE	[820]	INPUT A	
FALSE	[821]	INPUT B	
FALSE	[822]	INPUT C	
NOT(A)	[823]	TYPE	

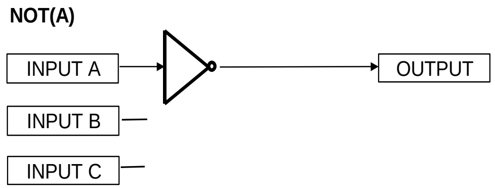
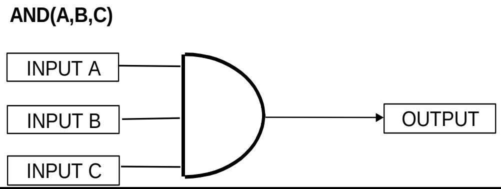
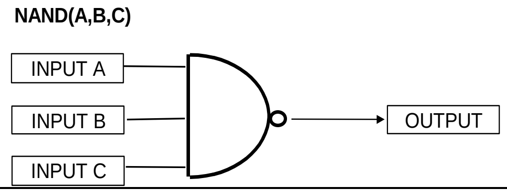
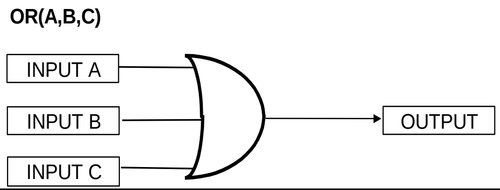
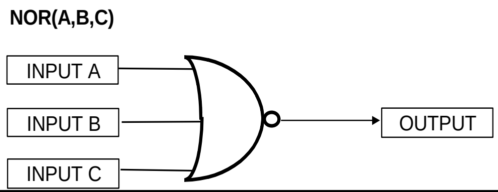
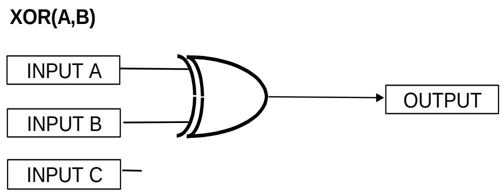
FUNCTION BLOCKS\MISCELLANEOUS\LOGIC FUNC\LOGIC FUNC 10

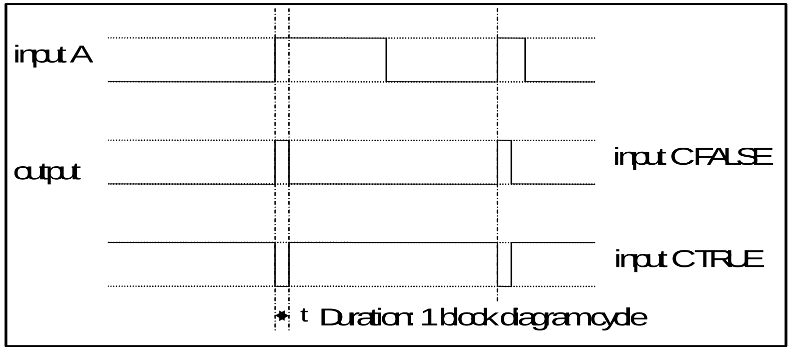
Default	Tag	Parameter	Value
	[829]	OUTPUT	FALSE
FALSE	[825]	INPUT A	
FALSE	[826]	INPUT B	
FALSE	[827]	INPUT C	
NOT(A)	[828]	TYPE	

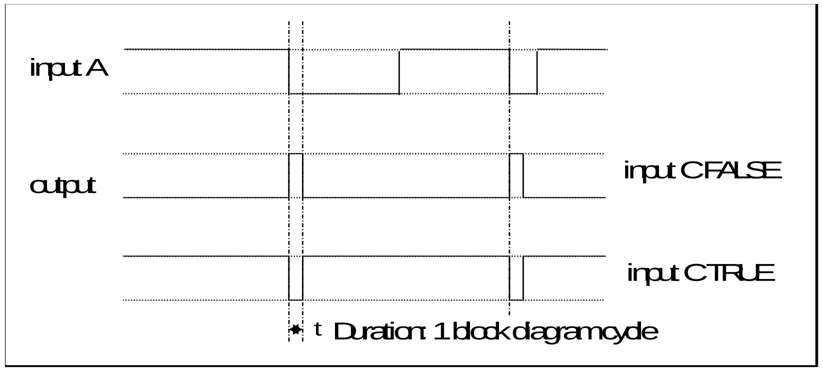
LOGIC FUNC

Parameter	Tag	Range
INPUT A	**780, 785, 790, 795, 800, 805, 810, 815, 820, 825**	**FALSE / TRUE**
General purpose logic input.		
INPUT B	**781, 786, 791, 796, 801, 806, 811, 816, 821, 826**	**FALSE / TRUE**
General purpose logic input.		
INPUT C	**782, 787, 792, 797, 802, 807, 812, 817, 822, 827**	**FALSE / TRUE**
General purpose logic input.		
TYPE	**783, 788, 793, 798, 803, 808, 813, 818, 823, 828**	**See below**
The operation to be performed on the three inputs to produce the output value. The operations that can be selected are: 0: NOT(A) 1: AND(A,B,C) 2: NAND(A,B,C) 3: OR(A,B,C) 4: NOR(A,B,C) 5: XOR(A,B) 6: 0-1 EDGE(A) 7: 1-0 EDGE(A) 8: AND(A,B,!C) 9: OR(A,B,!C) 10: S FLIP-FLOP 11: R FLIP-FLOP 12: LATCH 13: SWITCH 14: (A AND B) OR C 15: (A OR B) AND C		
OUTPUT	**784, 789, 794, 799, 804, 809, 814, 819, 824, 829**	**FALSE / TRUE**
The result of performing the selected operation on the inputs.		

Functional Description

Operation	Description	
NOT(A)		If INPUT A is TRUE the OUTPUT is FALSE, otherwise the OUTPUT is TRUE.
AND(A,B,C)		If A and B and C are all TRUE then the OUTPUT is TRUE, otherwise the OUTPUT is FALSE.
NAND(A,B,C)		If A and B and C are all TRUE then the OUTPUT is FALSE, otherwise the OUTPUT is TRUE.
OR(A,B,C)		If at least one of A or B or C is TRUE then the OUTPUT is TRUE, otherwise the OUTPUT is FALSE.
NOR(A,B,C)		If at least one of A or B or C is TRUE then the OUTPUT is FALSE, otherwise the OUTPUT is TRUE.
XOR(A,B)		If A and B are the same, (both TRUE or both FALSE), then the output is FALSE, otherwise the output is TRUE.

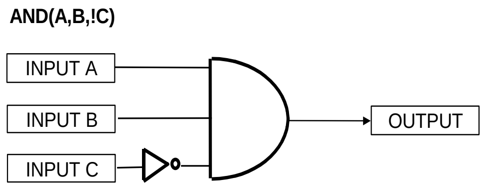
<table>
<tr><th>Operation</th><th>Description</th></tr>
<tr><td>0-1 EDGE(A)</td><td>


Rising Edge Trigger
Input B is not used.
This function outputs a pulse of 5ms duration when INPUT A to the block becomes TRUE. When INPUT C is TRUE, the output is inverted.
The output is held TRUE for one execution of the function block diagram.
</td></tr>
<tr><td>1-0 EDGE(A)</td><td>


Falling Edge Trigger
Input B is not used.
This function outputs a pulse of 20ms duration when INPUT A to the block becomes FALSE. When INPUT C is TRUE, the output is inverted.
The output is held TRUE for one execution of the function block diagram.
</td></tr>
</table>

Operation	Description
AND(A,B,!C)	See diagram and truth table below

AND(A,B,!C)



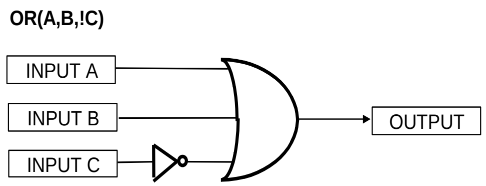
Refer to the Truth Table.

FALSE = 0, TRUE = 1.

Input State

A	B	C	Output State
0	0	0	**0**
0	0	1	**0**
0	1	0	**0**
0	1	1	**0**
1	0	0	**0**
1	0	1	**0**
1	1	0	**1**
1	1	1	**0**

OR(A,B,!C)



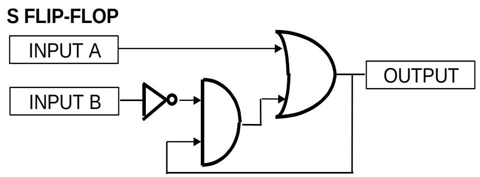
Refer to the Truth Table.

FALSE = 0, TRUE = 1.

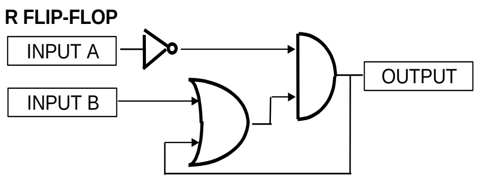
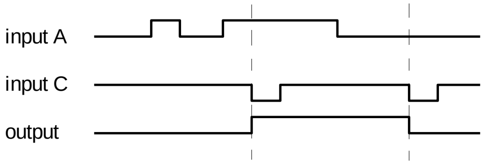
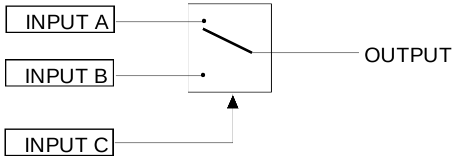
Input State

A	B	C	Output State
0	0	0	**1**
0	0	1	**0**
0	1	0	**1**
0	1	1	**1**
1	0	0	**1**
1	0	1	**1**
1	1	0	**1**
1	1	1	**1**

S FLIP-FLOP



This is a set dominant flip-flop. INPUT A functions as *set,* and INPUT B as *reset* .

Operation	Description	
R FLIP-FLOP		This is a reset dominant flip-flop. INPUT A functions as *reset*, and INPUT B as *set* .
LATCH		When INPUT C is low, the output is the value of INPUT A. This output value is then latched until INPUT C is low again. INPUT B is not used.
SWITCH		When INPUT C is FALSE, the output is equal to INPUT A. When INPUT C is TRUE, the output is equal to INPUT B.

MENUS

MMI Menu Map

1 MENUS
- VIEW LEVEL
- LANGUAGE
- ENTER PASSWORD
- CHANGE PASSWORD

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

Default	Tag	Parameter
STANDARD	[37]	VIEW LEVEL
ENGLISH	[304]	LANGUAGE
0x0000	[120]	ENTER PASSWORD
0x0000	[121]	CHANGE PASSWORD

MENUS

Parameter	Tag	Range
VIEW LEVEL	**37**	**BASIC / STANDARD / ADVANCED**
This parameter controls which parameters and menus are visible on the MMI. Refer to Chapter 6: "The Keypad" -The Menu System Map to see the effects of these selections.		
LANGUAGE	**304**	**ENGLISH / OTHER**
Selects the MMI display language. Other languages are available, please contact Parker. Refer also to Chapter 6: “The Keypad” - Selecting the Display Language.		
ENTER PASSWORD	**120**	**0x0000 to 0xFFFF**
Refer to Chapter 6: “The Keypad” - Password Protection for further instruction.		
CHANGE PASSWORD	**121**	**0x0000 to 0xFFFF**
Refer to Chapter 6: “The Keypad” - Password Protection for further instruction.		

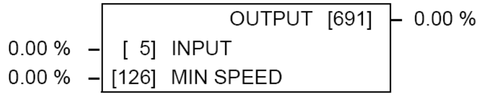
MIN SPEED

The Min Speed function block may be used to prevent the drive running with a zero setpoint.

MMI Menu Map

1 FUNCTION BLOCKS
2 SETPOINT FUNCTIONS
3 MIN SPEED
OUTPUT

FUNCTION BLOCKS\SETPOINT FUNCS\MIN SPEED



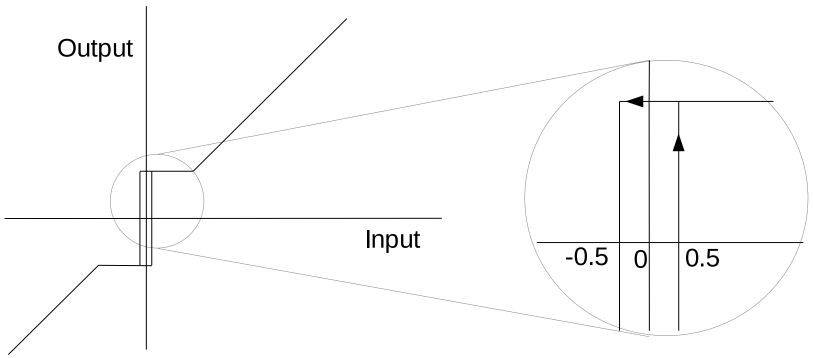
MMI Menu Map

1 SETUP PARAMETERS
2 RAMPS
INPUT
MIN SPEED

MIN SPEED

Parameter	Tag	Range
INPUT	**5**	**-105.00 to 105.00 %**
Input value.		
MIN SPEED	**126**	**0.00 to 100.00 %**
The minimum speed clamp is fully bi-directional and operates with a 0.5% hysterisis. If this parameter is less than 0.5% it is ignored and OUTPUT = INPUT.		

Minimum Speed



Parameter	Tag	Range
OUTPUT	**691**	**—.xx %**
Clamped value of input.		

miniLINK

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

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.

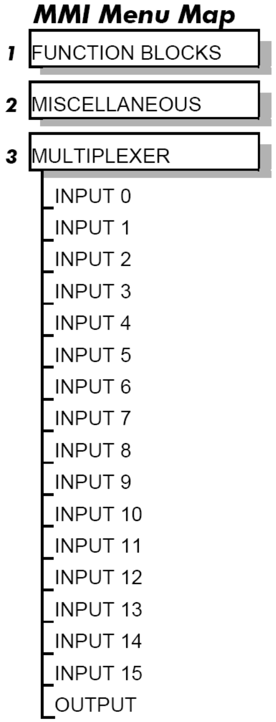
FUNCTION BLOCKS\COMMUNICATIONS\miniLINK

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

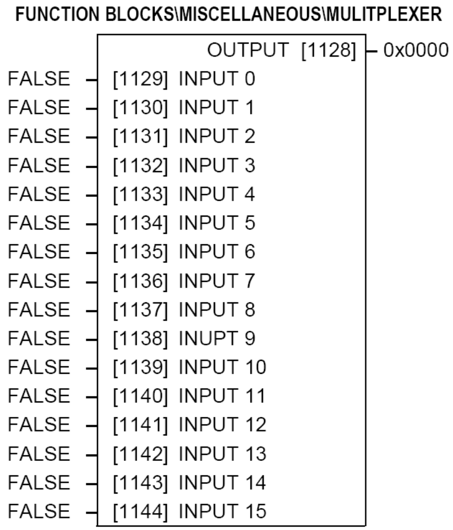
Parameter	Tag	Range
VALUE 1 to VALUE 14	**339 to 385**	**-300.00 to 300.00 %**
General purpose inputs.		
LOGIC 1 to LOGIC 8	**346 to 353**	**OFF / ON**
General purpose logic inputs.		

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.



MULTIPLEXER

Parameter	Tag	Range
INPUT 0 to INPUT 15	**1129 to 1144**	**FALSE / TRUE**
The Boolean inputs to be assembled into a single word.		
OUTPUT	**1128**	**0x0000 to 0xFFFF**
The resulting word.		

OP STATION

MMI Set-up options and Local setpoint information.

MMI Menu Map

1 SETUP PARAMETERS
2 OP-STATION
3 SET UP
- SETPOINT
- JOG SETPOINT
- LOCAL KEY ENABLE

FUNCTION BLOCKS\MENUS\OP-STATION

TRUE	[511] LOCAL KEY ENABLE
0.00 %	[512] SETPOINT
5.00 %	[513] JOG SETPOINT
10.0 s	[514] RAMP ACCEL TIME
10.0 s	[515] RAMP DECEL TIME
FORWARD	[516] INITIAL DIR
REMOTE	[517] INITIAL MODE
LOCAL	[518] INITIAL VIEW
0.00 %	[519] INITIAL SETPOINT
5.00 %	[520] INITIAL JOG

MMI Menu Map

1 SETUP PARAMETERS
2 OP-STATION
3 START UP VALUES
- INITIAL SETPOINT
- INITIAL JOG
- INITIAL DIRECTION
- INITIAL VIEW
- INITIAL MODE

MMI Menu Map

1 SETUP PARAMETERS
2 OP-STATION
3 LOCAL RAMP
- RAMP ACCEL TIME
- RAMP DECEL TIME

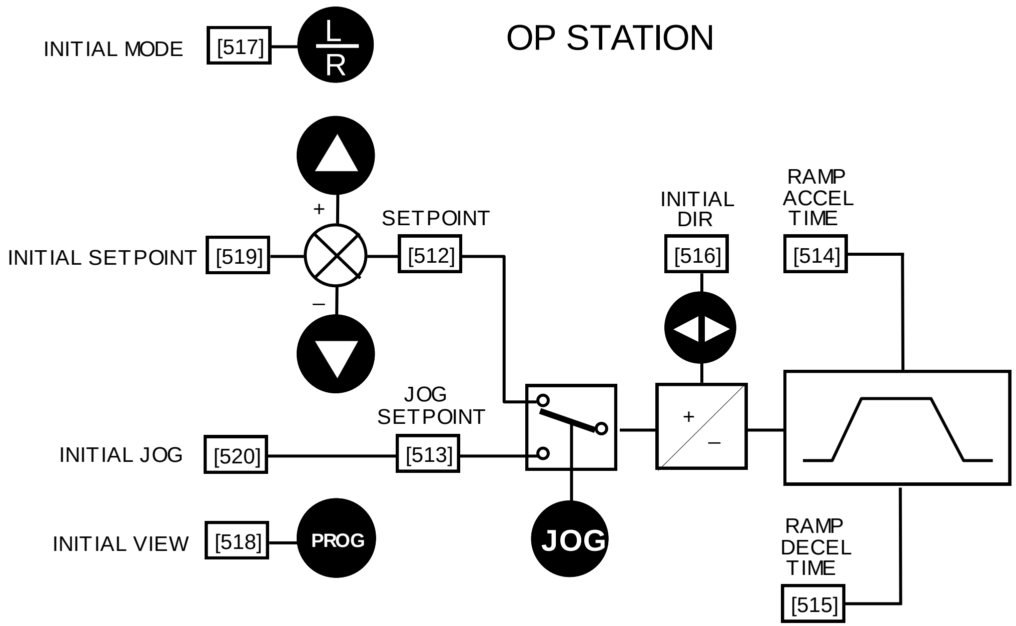
OP STATION

Parameter	Tag	Range
LOCAL KEY ENABLE	**511**	**FALSE / TRUE**
Enables the LOCAL/REMOTE control key on the op-station. Set to TRUE to allow the operator to toggle between local and remote modes.		
SETPOINT	**512**	**0.00 to 100.00 %**
SET UP menu - Actual value of local setpoint. This value is not persistent.		
JOG SETPOINT	**513**	**0.00 to 100.00 %**
SET UP menu - Actual value of local jog setpoint. This value is not persistent.		
RAMP ACCEL TIME	**514**	**0.1 to 600.0 s**
Acceleration time used while in Local mode.		
RAMP DECEL TIME	**515**	**0.1 to 600.0 s**
Deceleration time used while in Local mode.		
INITIAL DIR	**516**	**REVERSE / FORWARD**
START UP VALUES menu - Start-up mode of local direction on power-up. Set to TRUE for Forward.		
INITIAL MODE	**517**	**REMOTE / LOCAL**
START UP VALUES menu - Start-up mode of Keypad LOCAL/REMOTE control key on power-up. Set to TRUE for Local mode.		
INITIAL VIEW	**518**	**LOCAL / PROGRAM**
START UP VALUES menu - Start-up mode of Keypad PROG key on power-up. Set to TRUE for Program mode to see the local setpoint.		

OP STATION

Parameter	Tag	Range
INITIAL SETPOINT	**519**	**0.00 to 100.00 %**
START UP VALUES menu - Default value of local setpoint on power-up.		
INITIAL JOG	**520**	**0.00 to 100.00 %**
START UP VALUES menu - Default Value of local jog setpoint on power up.		

Functional Description



Local Setpoint (only active when the drive is in Local mode)

PID

MMI Menu Map

1 SETUP PARAMETERS

2 SPECIAL BLOCKS

3 PID

- PROP. GAIN
- 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.

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

Value	Tag	Parameter
0.00 %	[417]	PID OUTPUT
FALSE	[416]	PID CLAMPED
0.00 %	[415]	PID ERROR
1.0	[711]	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
0.000	[1259]	HI RES PROP GAIN

MMI Menu Map

1 DIAGNOSTICS

- PID OUTPUT
- PID CLAMPED
- PID ERROR

MMI Menu Map

1 FUNCTION BLOCKS

- HI RES PROP GAIN

PID

Parameter	Tag	Range
PROP. GAIN	**711**	**0.0 to 100.0**
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 x [1 + (Td/Ti)] x 5 %, i.e. approx. 50% for Td << Ti. Also refer to HI RES PROP GAIN below.		
INT. TIME CONST.	**402**	**0.01 to 100.00 s**
The integral time constant (Ti)		
DERIVATIVE TC	**401**	**0.000 to 10.000 s**
The derivative time constant (Td). Set this value to 0.000 to remove the derivative term.		
FILTER T.C.	**403**	**0.000 to 10.000 s**
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

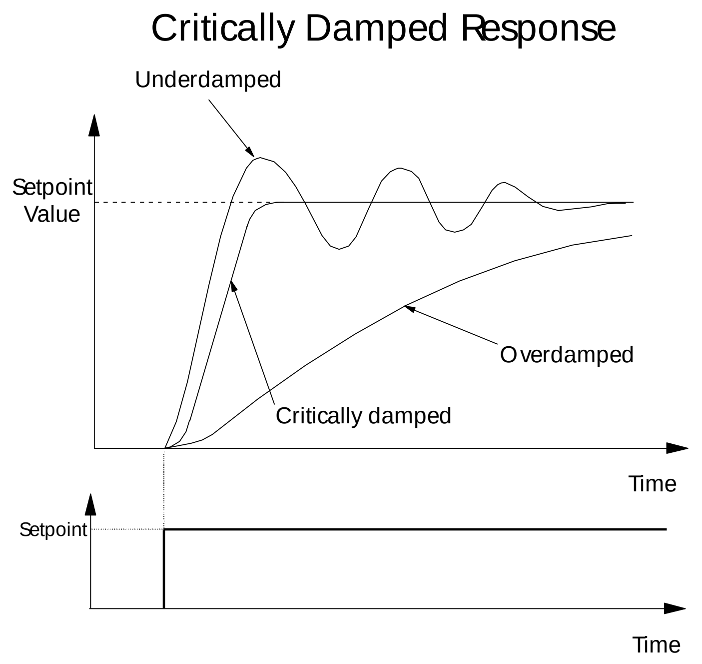
Parameter	Tag	Range
POSITIVE LIMIT	**405**	**0.00 to 105.00 %**
The upper limit of the PID algorithm.		
NEGATIVE LIMIT	**406**	**-105.00 to 0.00 %**
The lower limit of the PID algorithm.		
O/P SCALER (TRIM)	**407**	**-3.0000 to 3.0000**
The ratio that the limited PID output is multiplied by in order to give the final PID Output. Normally this ratio would be between 0 and 1.		
INPUT 1	**410**	**-300.00 to 300.00 %**
PID setpoint input. This can be either a position/tension feedback or a reference/offset.		
INPUT 2	**411**	**-300.00 to 300.00 %**
PID feedback input. This can be either a position/tension feedback or a reference/offset		
RATIO 1	**412**	**-3.0000 to 3.0000**
This multiplies Input 1 by a factor (Ratio 1).		
RATIO 2	**413**	**-3.0000 to 3.0000**
This multiplies Input 2 by a factor (Ratio 2).		
DIVIDER 1	**418**	**-3.0000 to 3.0000**
This divides Input 1 by a factor (Divider 1).		
DIVIDER 2	**414**	**-3.0000 to 3.0000**
This divides Input 2 by a factor (Divider 2).		
ENABLE	**408**	**DISABLED / ENABLED**
Enables or disables the PID output.		
INT. DEFEAT	**409**	**OFF / ON**
When ON, the Integral term is disabled. The block transfer function then becomes P+D only.		
HI RES PROP GAIN	**1259**	**0.000 to 100.000**
Additive, high resolution, proportional term gain. This value is added to PROP GAIN to form the total proportional term gain. Its default value is 0.000 (unused).		
PID OUTPUT	**417**	**—.xx %**
Refer to Chapter 6: "The Keypad" - The Keypad Menus (DIAGNOSTICS).		
PID CLAMPED	**416**	**FALSE / TRUE**
Refer to Chapter 6: "The Keypad" - The Keypad Menus (DIAGNOSTICS).		
PID ERROR	**415**	**—.xx %**
Refer to Chapter 6: "The Keypad" - The Keypad Menus (DIAGNOSTICS).		

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 ±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.

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

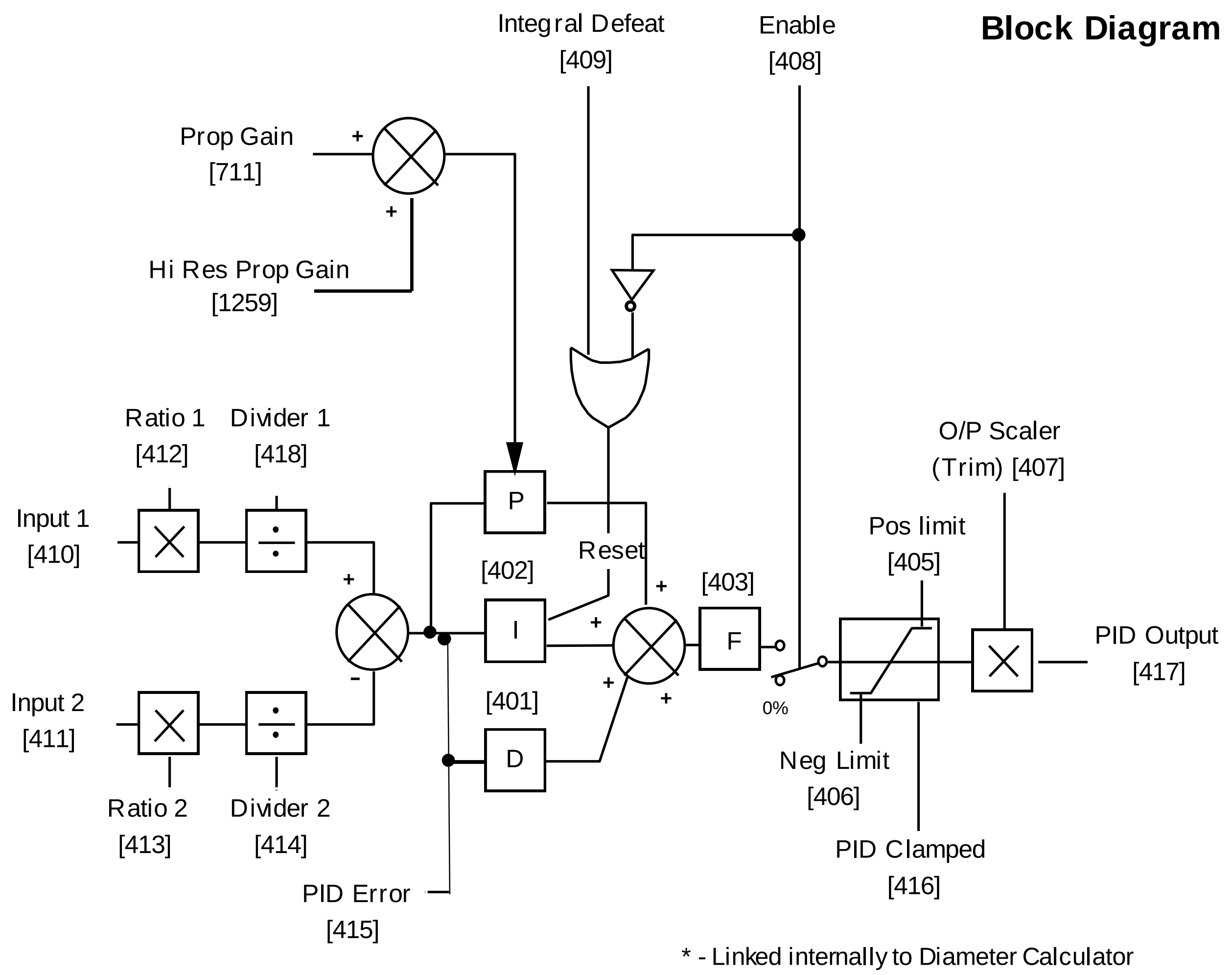
Derivative gain instantaneously boosts the PID output signal. Increasing DERIVATIVE TC decreases the damping, which in most cases causes overshoot and oscillations resulting in an unacceptable system response.

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.

NOTE **The EMULATE 590P parameter in the CONFIGURE DRIVE function block affects the time constants used in the PID. If this parameter is non-zero, the filter, integral and derivative time constants used within the PID are four times greater than those shown on the input parameters. This emulates the behaviour of earlier versions of the 590P. Refer to "Execution Rules", 2.**



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

PLL (PHASE LOCKED LOOP)

MMI Menu Map

1 FUNCTION BLOCKS
2 MOTOR CONTROL
3 PLL
- PLL STATE
- PHASE ERROR
- PLL MAINS FREQ

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
PLL STATE	**1198**	**See below**

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.

0 : STOPPED
1 : 1ST CODING EDGE
2 : READ EDGES
3 : MAINS PERIOD
4 : LOCKED
5 : UNLOCKED
6 : FAIL

Parameter	Tag	Range
PHASE ERROR	**1199**	**—.xx**

The instantaneous angle error between the zero-crossing detection of the line supply and the reference output from the PLL function block.

Parameter	Tag	Range
PLL MAINS FREQ	**1201**	**—.xx**

The measured 3-phase line supply frequency at the output of the PLL function block.

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**	**-1276 to 1276**
Indirect access parameters.		

PRESET SPEEDS

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

The Preset Speeds block allows you to select one of eight preset inputs, which in turn may be connected to other blocks of inputs.

FUNCTION BLOCKS\SETPOINT FUNCS\PRESET SPEEDS

Default	Tag	Parameter	Tag	Default
		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		

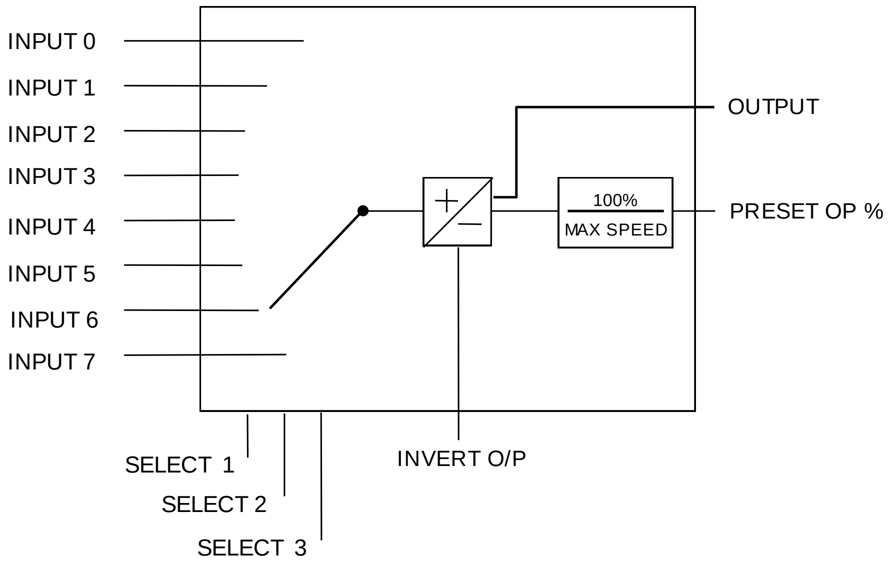
PRESET SPEEDS

Parameter	Tag	Range
SELECT 1	**560**	**FALSE / TRUE**
Select inputs 1.		
SELECT 2	**561**	**FALSE / TRUE**
Select inputs 2.		
SELECT 3	**562**	**FALSE / TRUE**
Select inputs 3.		
INVERT O/P	**563**	**FALSE / TRUE**
Changes the sign of the output. If TRUE, the output is of the opposite sign to the selected input.		
MAX SPEED	**559**	**0.1 to 3000.0 RPM**
Scaler for PRESET OP (%).		

PRESET SPEEDS

Parameter	Tag	Range
LIMIT	**600**	**FALSE / TRUE**
Clamp output to MAX SPEED if TRUE.		
GRAY SCALE	**610**	**FALSE / TRUE**
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.		
INPUT 0 to INPUT 7	**564, 565, 566, 567, 568, 569, 570, 571**	**-3000.0 to 3000.0**
Pre-set input variables.		
PRESET O/P	**572**	**—.xx %**
Scales the selected preset input by MAX SPEED.		
OUTPUT FPM	**593**	**—.x**
Outputs the selected INPUT value.		

Functional Description


INPUT 0
INPUT 1
INPUT 2
INPUT 3
INPUT 4
INPUT 5
INPUT 6
INPUT 7
OUTPUT
100%
MAX SPEED
PRESET OP %
SELECT 1
SELECT 2
SELECT 3
INVERT O/P

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

- PROP. GAIN
- MODE
- MIN PROFILE GAIN
- PROFILED GAIN

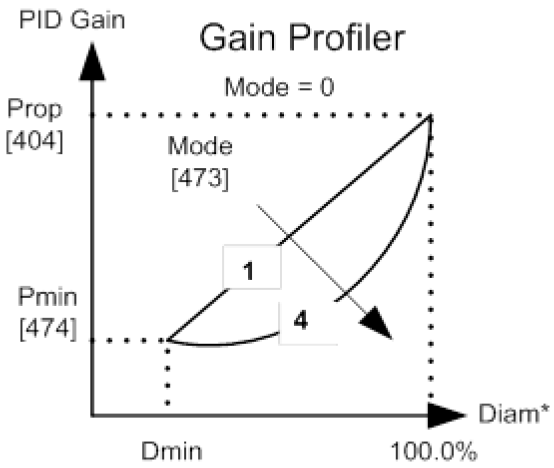
MMI Menu Map

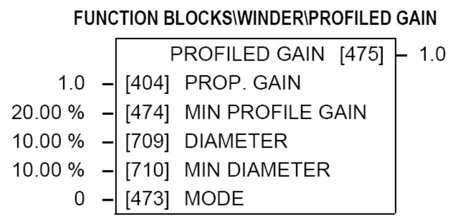
1 FUNCTION BLOCKS

2 WINDER

3 PROFILED GAIN

- DIAMETER
- MIN DIAMETER





PROFILED GAIN

Parameter	Tag	Range
PROP. GAIN	**404**	**0.0 to 100.0**
The nominal gain prior to profiling.		
MIN PROFILE GAIN	**474**	**0.00 to 100.00 %**
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.		
DIAMETER	**709**	**0.00 to 100.00 %**
The actual measured diameter. If appropriate, this may be connected to the DIAMETER output parameter in the DIAMETER CALC function block.		
MIN DIAMETER	**710**	**0.00 to 100.00 %**
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
MODE	**473**	**0 to 4**

This determines the shape of the proportional gain profile. The higher the setting, the steeper the curve of the profiled gain.
For Mode = 0, Profiled Gain = constant = P.
For Mode = 1, Profiled Gain = A * (diameter - min diameter) + B.
For Mode = 2, Profiled Gain = A * (diameter - min diameter)^2 + B.
For Mode = 3, Profiled Gain = A * (diameter - min diameter)^3 + B.
For Mode = 4, Profiled Gain = A * (diameter - min diameter)^4 + B.

Parameter	Tag	Range
PROFILED GAIN	**475**	**—.x**

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.

- When MODE is not ZERO (see above) this overrides the P gain above.
- When MODE = 0, then PROFILED GAIN = PROP. GAIN.

RAISE/LOWER

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

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

Default	Tag	Parameter	Output
	[264]	RAISE/LOWER O/P	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	

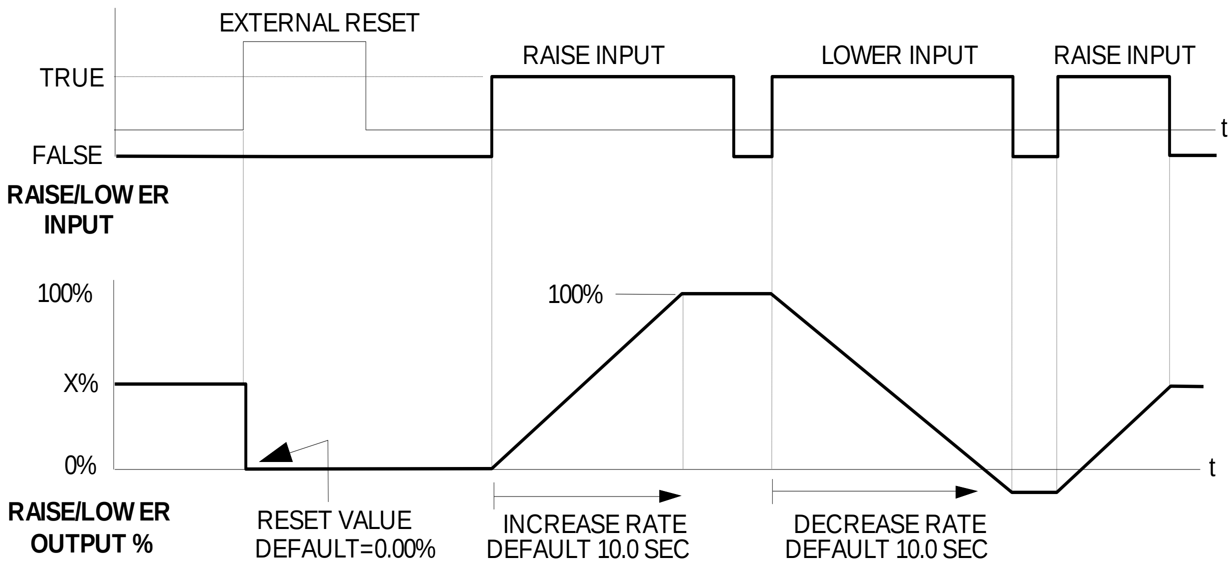
RAISE/LOWER

Parameter	Tag	Range
RAISE/LOWER O/P	**264**	**—.xx %**
The output value.		
RESET VALUE	**255**	**-300.00 to 300.00 %**
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.		
INCREASE RATE	**256**	**0.1 to 600.0 s**
Rate of change of an increasing output value. An increasing value is defined as the output ramping away from zero.		
DECREASE RATE	**257**	**0.1 to 600.0 s**
Rate of change of a decreasing output value. A decreasing value is defined as the output ramping towards zero.		
RAISE INPUT	**261**	**FALSE / TRUE**
Command to raise the output value. When TRUE, increases the output at the rate determined by INCREASE RATE.		
LOWER INPUT	**262**	**FALSE / TRUE**
Command to lower the output value. When TRUE, decreases the output at the rate determined by DECREASE RATE.		

RAISE/LOWER

Parameter	Tag	Range
MIN VALUE	**258**	**-300.00 to 300.00 %**
Minimum ramp output clamp. This is a plain clamp, not a ramped "min speed" setting.		
MAX VALUE	**259**	**-300.00 to 300.00 %**
Maximum ramp output clamp.		
EXTERNAL RESET	**307**	**FALSE / TRUE**
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%).

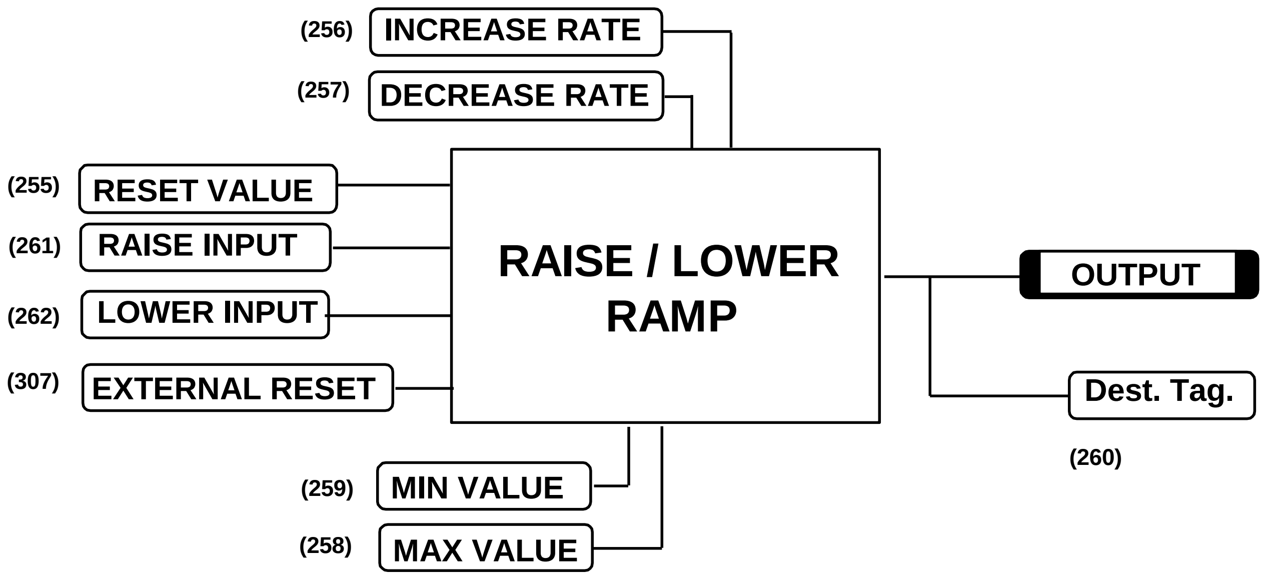
When RAISE INPUT is TRUE, the output increases at INCREASE RATE. The output cannot exceed MAX VALUE.

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

MMI Menu Map

1 SETUP PARAMETERS

2 RAMPS

- RAMP ACCEL TIME
- RAMP DECEL TIME
- RAMP HOLD
- INVERT
- % S-RAMP
- RAMPING THRESH.
- AUTO RESET
- EXTERNAL RESET
- RESET VALUE

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.**

FUNCTION BLOCKS\SEQ & REF\RAMPS

Default	Tag	Parameter	Output
	[85]	RAMP OUTPUT	0.00 %
	[113]	RAMPING	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	

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.

MMI Menu Map

1 FUNCTION BLOCKS

2 SEQ & REF

3 RAMPS

- RAMP INPUT

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.

Actual Ramp Time = RAMP TIME x (3.5 x % 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.

MMI Menu Map

1 DIAGNOSTICS

- RAMPING
- RAMP OUTPUT

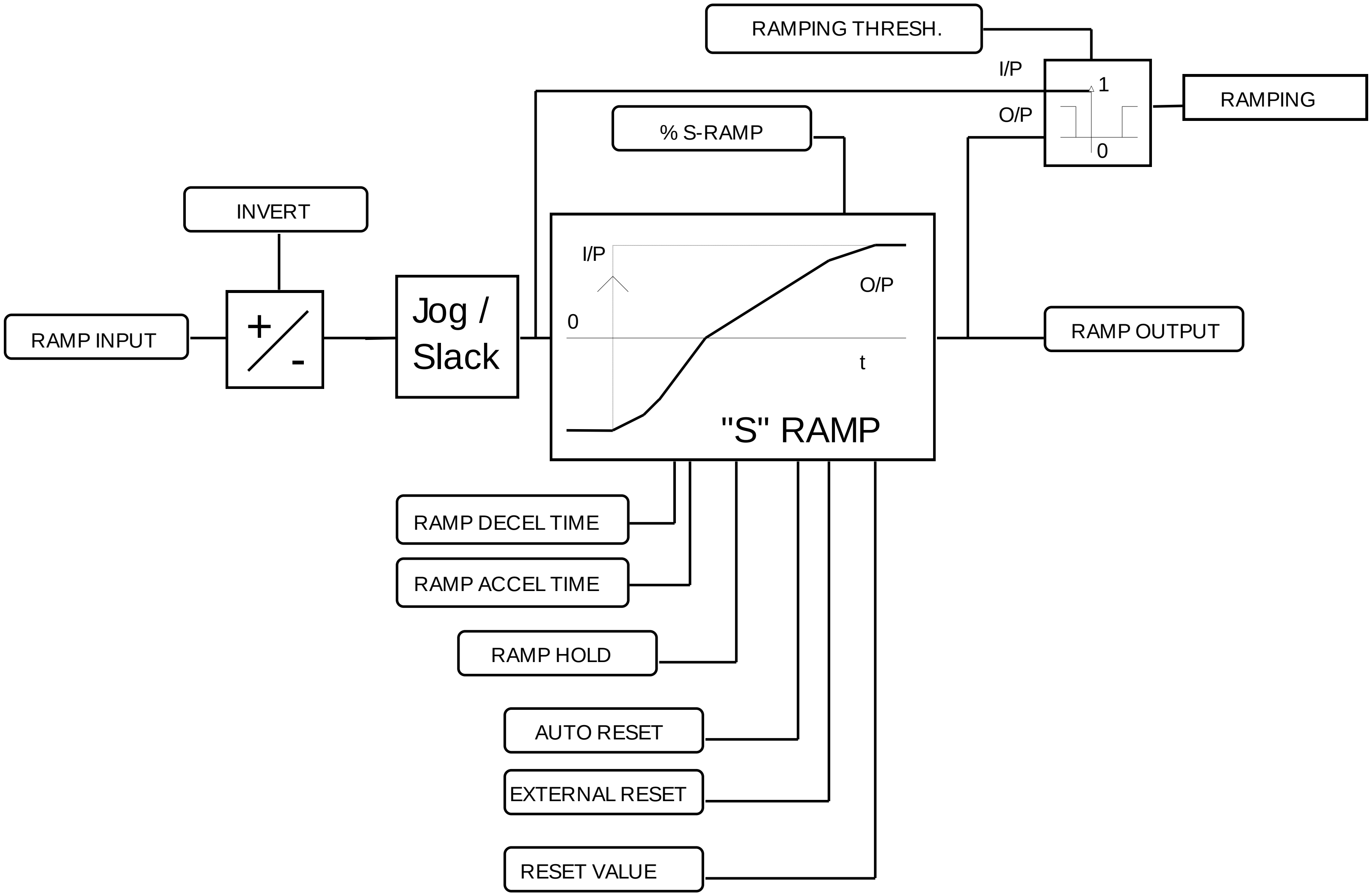
RAMPS

Parameter	Tag	Range
RAMP ACCEL TIME	**2**	**0.1 to 600.0 s**
The acceleration time for 100% change.		
RAMP DECEL TIME	**3**	**0.1 to 600.0 s**
The deceleration time for 100% change.		

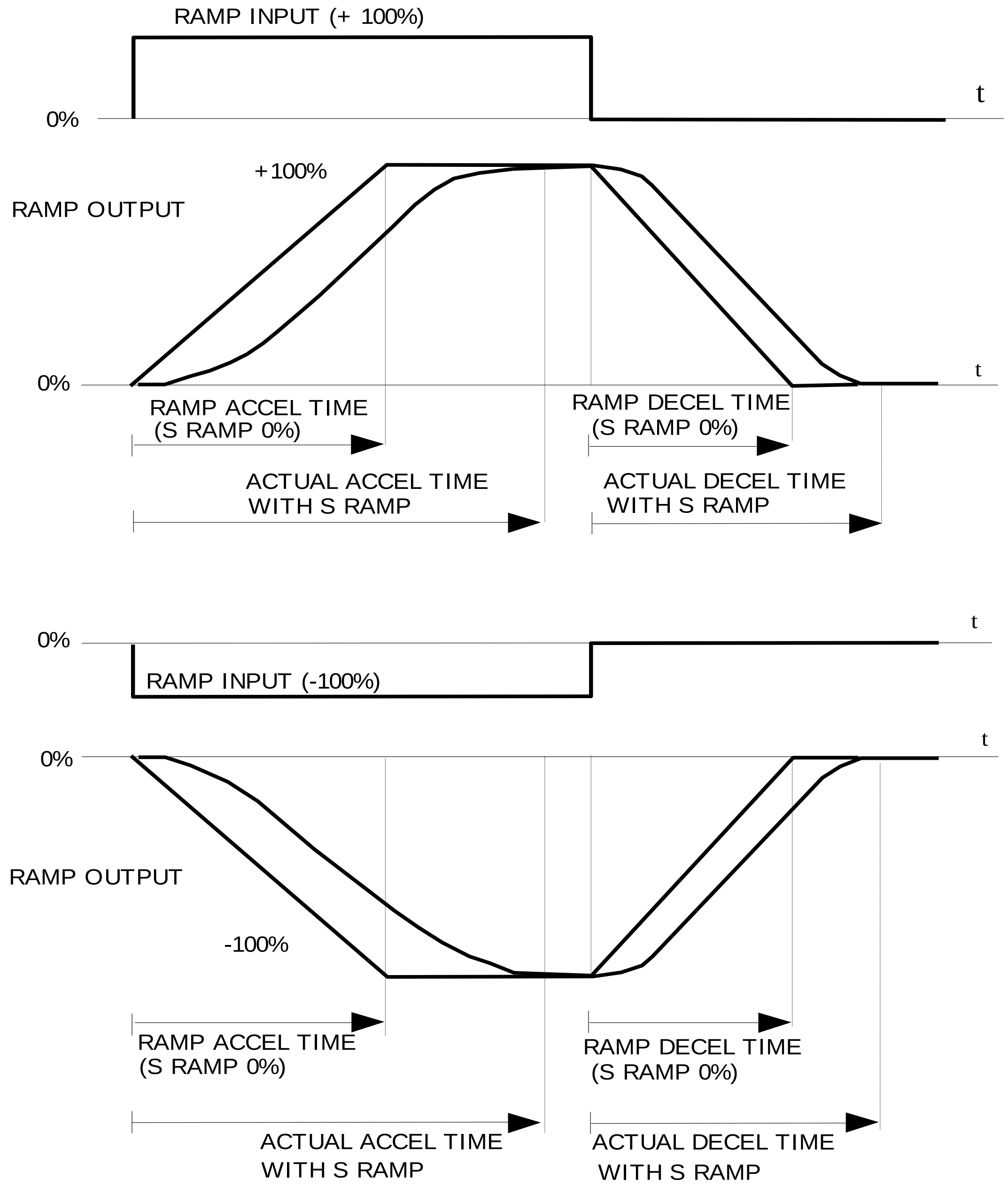
RAMPS

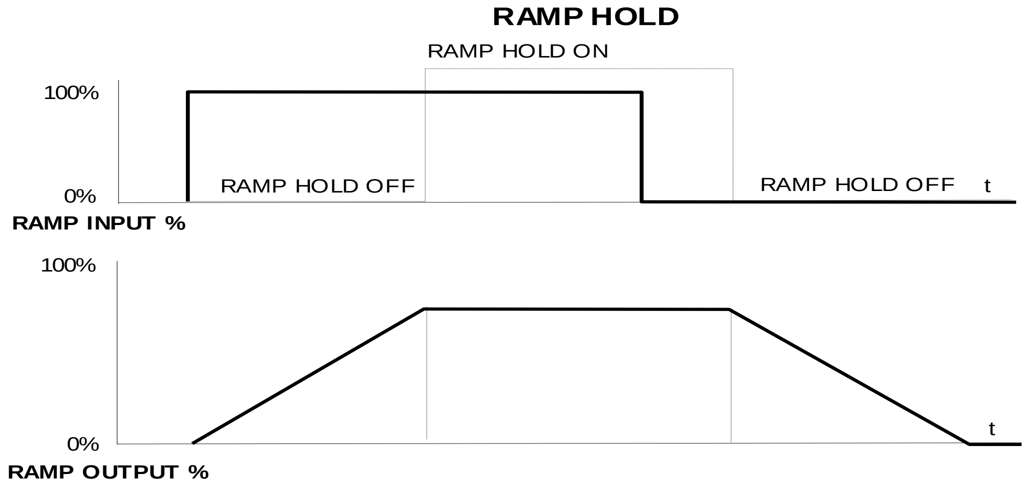
Parameter	Tag	Range
RAMP HOLD	**118**	**OFF / ON**
When ON, the ramp output is held at its last value. This is overridden by a ramp reset.		
INVERT	**620**	**FALSE / TRUE**
Inverts the RAMP INPUT signal.		
RAMP INPUT	**5**	**-105.00 to 105.00 %**
Input value.		
% S-RAMP	**266**	**0.00 to 100.00 %**
Percentage 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.		
RAMPING THRESH.	**286**	**0.00 to 100.00 %**
Ramping flag threshold level. The threshold is used to detect whether the ramp is active.		
AUTO RESET	**287**	**DISABLED / ENABLED**
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).		
EXTERNAL RESET	**288**	**DISABLED / ENABLED**
When ENABLED, the ramp is reset to RESET VALUE. EXTERNAL RESET does not depend on AUTO RESET for its operation.		
RESET VALUE	**422**	**-300.00 to 300.00 %**
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).		
RAMP OUTPUT	**85**	**—.xx %**
Setpoint ramp output.		
RAMPING	**113**	**FALSE / TRUE**
The SETPOINT ramp function block is limiting the rate of change of Speed Setpoint.		

Functional Description

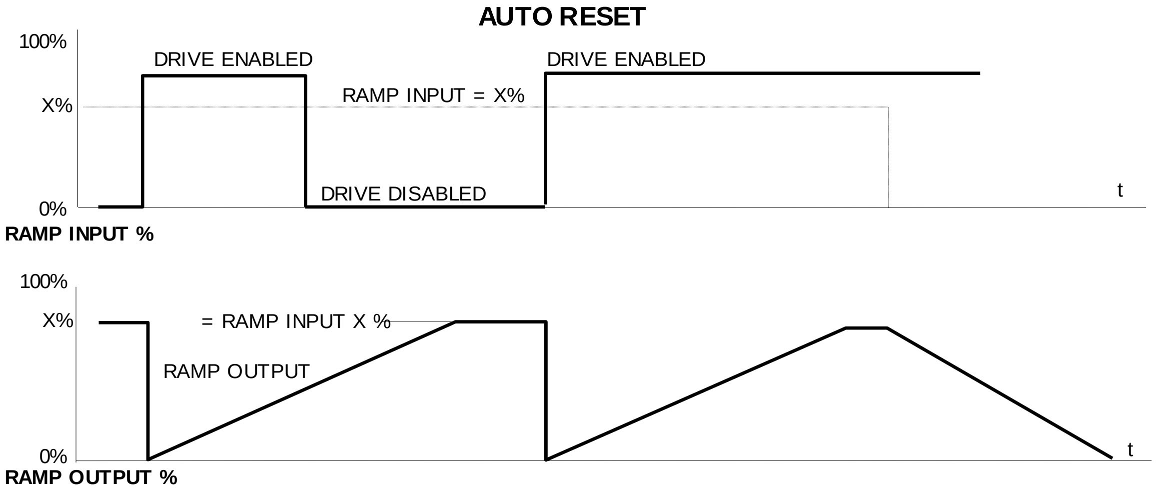


ACCELERATION/DECELERATION RATES

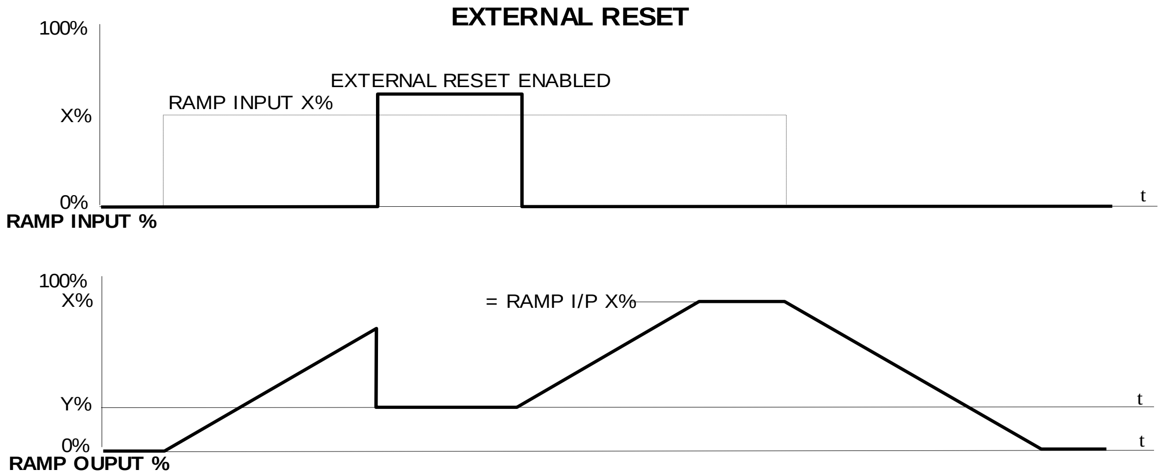




The ramp will function when a ramp input is present. When DIGIN 2 (C7) is ON, RAMP HOLD stops the ramp from changing. Even when the ramp input signal is removed, RAMP HOLD keeps the ramp output from changing. Once RAMP HOLD is OFF, the ramp resumes.



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.



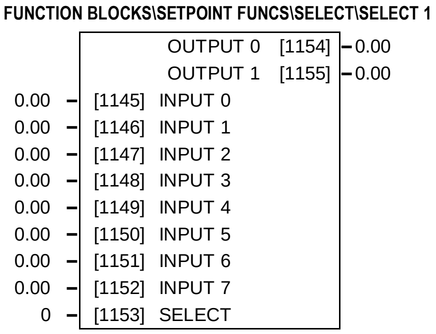
The ramp input is set to X% at time t_0. The ramp output will increase at the ramp rate.
While EXTERNAL RESET is ENABLED, the ramp output resets to RESET VALUE (Y%). When EXTERNAL RESET is DISABLED, the ramp output continues to follow the input signal.

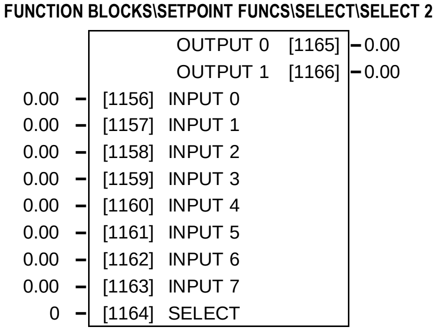
MMI Menu Map

1 FUNCTION BLOCKS
2 SETPOINT FUNCS
3 SELECT
4 SELECT 1
4 SELECT 2
- INPUT 0
- INPUT 1
- INPUT 2
- INPUT 3
- INPUT 4
- INPUT 5
- INPUT 6
- INPUT 7
- SELECT
- OUTPUT 0
- OUTPUT 1

SELECT

Used to select a value from one of eight inputs, depending on the value of the select input. A second output is provided to allow the block to be used as two banks of four inputs.





SELECT

Parameter	Tag	Range
INPUT 0 to INPUT 7	**1156 to 1163**	**-32768.00 to 32768.00**
Inputs to the select block		
SELECT	**1164**	**0 to 7**
Determines which of the inputs is routed to OUTPUT 1 . In addition, if SELECT INPUT is in the range 0 to 3, INPUT 4 to INPUT 7 respectively is routed to OUTPUT 2, otherwise OUTPUT 2 is unchanged.		
OUTPUT 0	**1165**	**—.xx**
Selected output		
OUTPUT 1	**1166**	**—.xx**
Alternative selected output from INPUT 4 to INPUT 7 if SELECT is less than 4.		

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
- REM.SEQ.ENABLE
- REM. SEQUENCE
- SEQ STATUS

MMI Menu Map

1 DIAGNOSTICS

- PROGRAM STOP
- COAST STOP
- DRIVE START
- DRIVE ENABLE
- START (C3)
- CONTACTOR CLOSED
- READY
- DRIVE RUNNING
- SYSTEM RESET

MMI Menu Map

1 FUNCTION BLOCKS

2 SEQ & REF

3 SEQUENCING

- COMMS TIMEOUT
- SEQ STATE

FUNCTION BLOCKS\SEQ & REF\SEQUENCING

Output	Tag	Default
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

Default	Tag	Input
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
AUX START	**161**	**OFF / ON**
Software Start/Run command. Auxiliary Start is ANDed with the Start input, C3, to generate Drive Start. This should normally be left ON.		
AUX JOG	**227**	**OFF / ON**
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.		
AUX ENABLE	**168**	**OFF / ON**
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
JOG/SLACK	**496**	**OFF / ON**
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.		
ENABLE	**497**	**OFF / ON**
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.		
REM.SEQ.ENABLE	**535**	**FALSE / TRUE**
(Refer to Chapter 4: "External 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		
REM.SEQUENCE	**536**	**0x0000 to 0xFFFF**
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: "External Control of the Drive")		
COMMS TIMEOUT	**1204**	**0.0 to 60.0 s**
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.		
SEQ STATUS	**537**	**0x0000 to 0xFFFF**
An data word that reports the status of the important system flags that can be read over a field bus. (Refer to Chapter 4: "External Control of the Drive")		
DRIVE START	**82**	**OFF / ON**
Logical OR of the START and JOG inputs.		
CONTACTOR CLOSED	**83**	**FALSE / TRUE**
When ON, the main contactor coil is energised. Refer to Terminal Information for D5 & D6 in Appendix E: "Technical Specifications" - Terminal Information.		
DRIVE ENABLE	**84**	**FALSE / TRUE**
Drive speed and current loop are enabled/quenched.		
DRIVE RUNNING	**376**	**FALSE / TRUE**
When TRUE, the stack is switched on and enabled.		

SEQUENCING

Parameter	Tag	Range
SYSTEM RESET	**374**	**FALSE / TRUE**
Set for one cycle as the drive is enabled.		
READY	**125**	**FALSE / TRUE**
The drive is ready to accept an enable signal.		
SEQ STATE	**114**	**See below**
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		
START (C3)	**68**	**OFF / ON**
State of the Start/Run terminal.		
PROGRAM STOP	**80**	**FALSE / TRUE**
State of program stop (Terminal B8). When B8 is at 24V, then PROGRAM STOP is FALSE.		
COAST STOP	**525**	**FALSE / TRUE**
State of coast stop (Terminal B9). When B9 is at 24V, then COAST STOP is FALSE.		

SETPOINT SUM

MMI Menu Map

1 SETUP PARAMETERS

2 SETPOINT SUM 1

- RATIO 1
- RATIO 0
- SIGN 1
- SIGN 0
- DIVIDER 1
- DIVIDER 0
- LIMIT
- INPUT 2
- INPUT 1
- INPUT 0

Use this menu to sum and scale up to three analog inputs to produce the SPT. SUM output.

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

	SPT SUM OUTPUT	[86]	0.00 %
	STPT SUM 1 OUT 1	[702]	0.00 %
	STPT SUM 1 OUT 0	[703]	0.00 %
0.00 %	[309]	INPUT 0	
0.00 %	[701]	INPUT 1	
0.00 %	[423]	INPUT 2	
1.0000	[6]	RATIO 1	
1.0000	[208]	RATIO 0	
1.0000	[419]	DIVIDER 1	
1.0000	[420]	DIVIDER 0	
POSITIVE	[8]	SIGN 1	
POSITIVE	[292]	SIGN 0	
105.00 %	[375]	LIMIT	

FUNCTION BLOCKS\SETPOINT FUNCS\SETPOINT SUM\SETPOINT SUM 2

	SPT SUM OUTPUT	[451]	0.00 %
	STPT SUM 2 OUT 1	[492]	0.00 %
	STPT SUM 2 OUT 0	[491]	0.00 %
0.00 %	[444]	INPUT 0	
0.00 %	[443]	INPUT 1	
0.00 %	[445]	INPUT 2	
1.0000	[446]	RATIO 1	
1.0000	[447]	RATIO 0	
1.0000	[466]	DIVIDER 1	
1.0000	[448]	DIVIDER 0	
POSITIVE	[704]	SIGN 1	
POSITIVE	[705]	SIGN 0	
105.00 %	[449]	LIMIT	

MMI Menu Map

1 FUNCTION BLOCKS

2 SETPOINT FUNCS

3 SETPOINT SUM

4 SETPOINT SUM 1

- SPT SUM OUTPUT
- STPT SUM 1 OUT 1
- STPT SUM 1 OUT 0

SETPOINT SUM

Parameter	Tag	Range
INPUT 0 Input 0 value.	**309**	**-300.00 to 300.00 %**
INPUT 1 Input 1 value.	**701**	**-300.00 to 300.00 %**
INPUT 2 Input 2 value.	**423**	**-300.00 to 300.00 %**
RATIO 1 Multiplier term for INPUT 1.	**6**	**-3.0000 to 3.0000**
RATIO 0 Multiplier term for INPUT 0.	**208**	**-3.0000 to 3.0000**
DIVIDER 1 Divider scaling for INPUT 1. Dividing by 0 (zero) results in a zero output.	**419**	**-3.0000 to 3.0000**
DIVIDER 0 Divider scaling for INPUT 0. Dividing by 0 (zero) results in a zero output.	**420**	**-3.0000 to 3.0000**
SIGN 1 Polarity for INPUT 1.	**8**	**NEGATIVE / POSITIVE**
SIGN 0 Polarity for INPUT 0.	**292**	**NEGATIVE / POSITIVE**

SETPOINT SUM

MMI Menu Map

1 FUNCTION BLOCKS

2 SETPOINT FUNCS

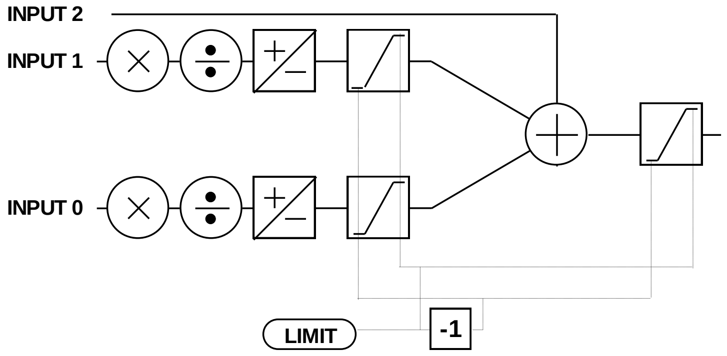
3 SETPOINT SUM

4 SETPOINT SUM 2

- INPUT 0
- INPUT 1
- INPUT 2
- RATIO 1
- RATIO 0
- DIVIDER 1
- DIVIDER 0
- SIGN 1
- SIGN 0
- LIMIT
- SPT SUM OUTPUT
- STPT SUM 2 OUT 1
- STPT SUM 2 OUT 0

Parameter	Tag	Range
LIMIT	**375**	**0.00 to 200.00 %**

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.



SPT SUM OUTPUT	**86**	**—.xx %**

The sum of input 0, 1 and 2 after the limit clamp.

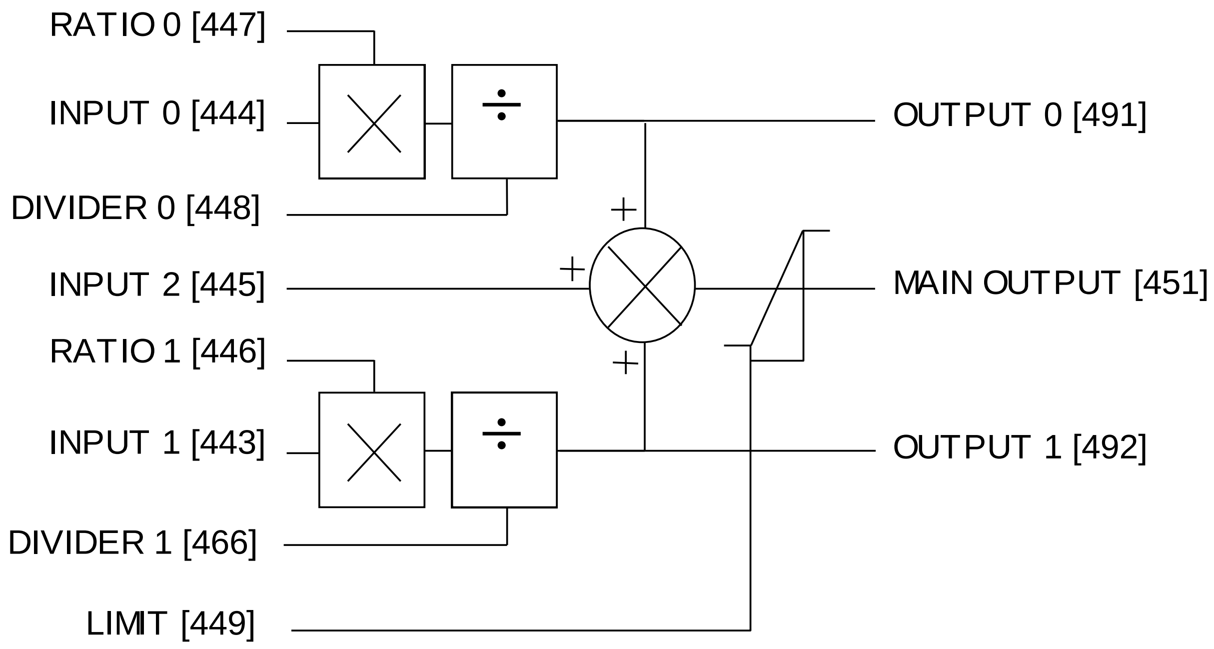
STPT SUM 1 OUT 1	**702**	**—.xx %**

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.

STPT SUM 1 OUT 0	**703**	**—.xx %**

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.

Functional Description



SPEED LOOP

MMI Menu Map

1 SETUP PARAMETERS

2 SPEED LOOP

- SPD.PROP.GAIN
- SPD.INT.TIME
- INT. DEFEAT
- PRESET TORQUE
- PRESET T SCALE
- SPEED FBK SELECT
- ENCODER SIGN
- SPD.FBK.FILTER
- >> ADVANCED
- >> SETPOINTS

MMI Menu Map

1 SETUP PARAMETERS

2 SPEED LOOP

3 SETPOINTS

- SETPOINT 1
- SIGN 2 (A3)
- RATIO 2 (A3)
- SETPOINT 2 (A3)
- SETPOINT 3
- SETPOINT 4
- MAX DEMAND
- MIN DEMAND

Use this block to tune the speed loop PI to produce a current demand.

This function block has five main functions:

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

Default	Tag	Parameter	Tag	Output
		SPEED ERROR FILTERED	[297]	0.00 %
		SPEED LOOP O/P	[549]	0.00 %
		SPEED DEMAND	[89]	0.00 %
		UNFIL.SPD.FBK	[62]	0.00 %
		SPEED SETPOINT	[63]	0.00 %
		UNFIL.SPD.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

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.

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

SPEED LOOP

Parameter	Tag	Range
SPD PROP GAIN	**14**	**0.00 to 200.00**
Speed loop PI proportional gain adjustment.		
SPD INT TIME	**13**	**0.001 to 30.000 s**
Speed loop PI integral gain adjustment.		
INT. DEFEAT	**202**	**OFF / ON**
When ON it inhibits the integral part of the speed loop PI control to give proportional only control.		
SPEED FBK FILTER	**547**	**0.000 to 1.000**
(SPD.FBK.FILTER) 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 τ in milliseconds can be calculated from the following equation: $\tau = \frac{3.3}{Log_e\left(\frac{1}{\alpha}\right)}$ Where α 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.		
SETPOINT 1	**289**	**-105.00 to 105.00 %**
Speed Setpoint 1 (Default Setpoint Sum 1 O/P).		
SIGN 2 (A3)	**9**	**NEGATIVE / POSITIVE**
Speed Setpoint 2 Sign.		

SPEED LOOP

Parameter	Tag	Range
RATIO 2 (A3)	**7**	**-3.0000 to 3.0000**
Speed Setpoint 2 Ratio.		
SETPOINT 3	**291**	**-105.00 to 105.00 %**
Speed Setpoint 3 (Default Ramp O/P).		
SETPOINT 4	**41**	**-105.00 to 105.00 %**
Speed Setpoint 4 (Default 5703 I/P).		
MAX DEMAND	**357**	**0.00 to 105.00 %**
Sets the maximum input to the speed loop. It is clamped at 105% to allow for overshoot in the external loops.		
MIN DEMAND	**358**	**-105.00 to 105.00 %**
Sets the minimum input to the speed loop.		
PRESET TORQUE	**595**	**-200.00 to 200.00 %**
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.		
PRESET T SCALE	**604**	**-200.00 to 200.00 %**
Scaler for PRESET TORQUE.		
MODE	**268**	**See below**
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		
SPD BRK 1 (LOW)	**269**	**0.00 to 100.00 %**
Speed breakpoint 1 to start gain profiling.		
SPD BRK 2 (HIGH)	**270**	**0.00 to 100.00 %**
Speed breakpoint 2 to stop gain profiling.		

SPEED LOOP

Parameter	Tag	Range
PROP. GAIN	**271**	**0.00 to 200.00**
Proportional gain used below SPD BRK 1 (LOW)		
INT. TIME CONST.	**272**	**0.001 to 30.000 s**
Integral time constant used below SPD BRK 1 (LOW)		
I GAIN IN RAMP	**274**	**0.0000 to 2.0000**
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).		
ZERO SPD. LEVEL	**284**	**0.00 to 200.00 %**
Sets the threshold of SPEED DEMAND and SPEED FEEDBACK for suspending the current output.		
ZERO IAD LEVEL	**285**	**0.00 to 200.00 %**
Sets the current demand threshold for suspending the current output.		
SPEED ERROR FILTERED	**297**	**—.xx %**
Refer to Chapter 6: "The Keypad" - The Keypad Menus (DIAGNOSTICS).		
SPEED LOOP O/P	**549**	**—.xx %**
Refer to Chapter 6: "The Keypad" - The Keypad Menus (DIAGNOSTICS).		
SPEED DEMAND	**89**	**—.xx %**
Refer to Chapter 6: "The Keypad" - The Keypad Menus (DIAGNOSTICS).		
UNFIL.SPD.FBK	**62**	**—.xx %**
Refer to Chapter 6: "The Keypad" - The Keypad Menus (DIAGNOSTICS).		
SPEED SETPOINT	**63**	**—.xx %**
Refer to Chapter 6: "The Keypad" - The Keypad Menus (DIAGNOSTICS).		
UNFIL.SPD.ERROR	**64**	**—.xx %**
Refer to Chapter 6: "The Keypad" - The Keypad Menus (DIAGNOSTICS).		
SETPOINT 2 (A3)	**290**	**—.xx %**
Speed Setpoint 2 - Fixed (non-configurable) setpoint scanned synchronously with the current loop		

SPEED LOOP

Parameter	Tag	Range
SPEED FBK SELECT	**47**	**See below**

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 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

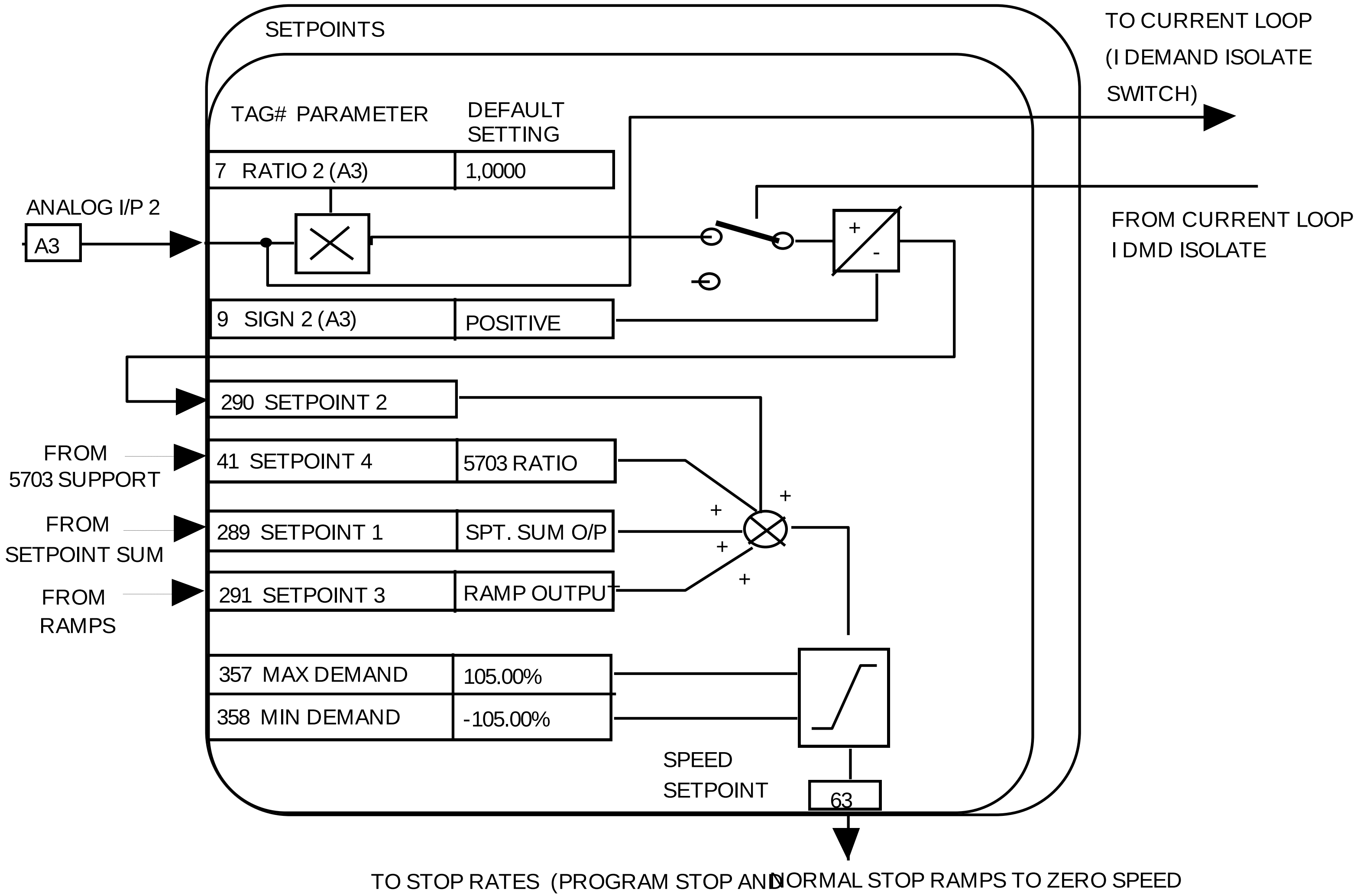
1 **The speed loop is reset by unquenching the speed loop/current loop.**

2 **I DMD. ISOLATE is overridden by Program Stop (B8) or Normal Stop (C3)**.

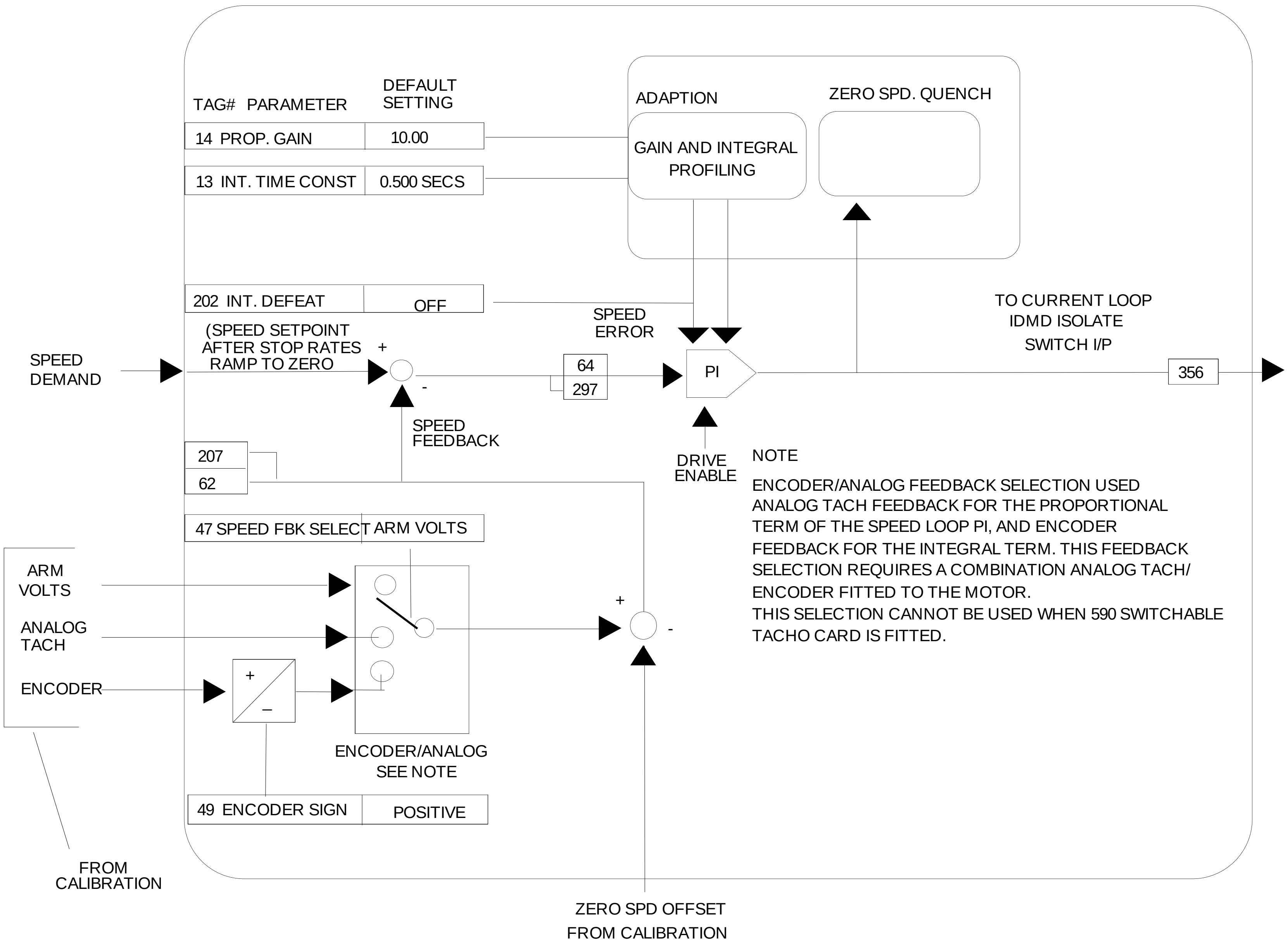
3 **The speed loop PI holds the integral term as soon as the PI output reaches current limit. This is true even in Current Demand Isolate mode where it may interfere depending on the way the speed PI is used. This feature is currently not suppressible.**

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


TAG# PARAMETER
DEFAULT SETTING
14 PROP. GAIN
10.00
13 INT. TIME CONST
0.500 SECS
202 INT. DEFEAT
OFF
ADAPTION
GAIN AND INTEGRAL PROFILING
ZERO SPD. QUENCH
SPEED DEMAND
(SPEED SETPOINT AFTER STOP RATES RAMP TO ZERO
SPEED ERROR
64
297
PI
TO CURRENT LOOP IDMD ISOLATE SWITCH I/P
356
DRIVE ENABLE
SPEED FEEDBACK
207
62
47 SPEED FBK SELECT
ARM VOLTS
ARM VOLTS
ANALOG TACH
ENCODER
ENCODER/ANALOG SEE NOTE
49 ENCODER SIGN
POSITIVE
FROM CALIBRATION
ZERO SPD OFFSET FROM CALIBRATION
NOTE
ENCODER/ANALOG FEEDBACK SELECTION USED ANALOG TACH FEEDBACK FOR THE PROPORTIONAL TERM OF THE SPEED LOOP PI, AND ENCODER FEEDBACK FOR THE INTEGRAL TERM. THIS FEEDBACK SELECTION REQUIRES A COMBINATION ANALOG TACH/ ENCODER FITTED TO THE MOTOR.
THIS SELECTION CANNOT BE USED WHEN 590 SWITCHABLE TACHO CARD IS FITTED.

SRAMP

This function block limits the rate of change of an input by limiting the acceleration and the jerk (rate of change of acceleration).

MMI Menu Map

1 SETUP PARAMETERS

2 SRAMP

- INPUT
- RATE SELECT
- >> RATE SET 0
- >> RATE SET 1
- AUTO RESET
- EXTERNAL RESET
- RESET VALUE
- QUENCH
- AT SPEED LEVEL
- AT SPEED
- ACCEL OUTPUT
- SRAMP OUTPUT

MMI Menu Map

1 SETUP PARAMETERS

2 SRAMP

3 RATE SET 0

- ACCEL 0
- DECEL 0
- ACCEL 0 JERK 1
- ACCEL 0 JERK 2
- DECEL 0 JERK 1
- DECEL 0 JERK 2

MMI Menu Map

1 SETUP PARAMETERS

2 SRAMP

3 RATE SET 1

- ACCEL 1
- DECEL 1
- ACCEL 1 JERK 1
- ACCEL 1 JERK 2
- DECEL 1 JERK 1
- DECEL 1 JERK 2

FUNCTION BLOCKS\SETPOINT FUNCS\SRAMP

Default	Tag	Parameter	Output
	[589]	SRAMP OUTPUT	0.00 %
	[588]	ACCEL OUTPUT	0.00 %
	[587]	AT SPEED	FALSE
0.00 %	[574]	INPUT	
0	[575]	RATE SELECT	
TRUE	[582]	AUTO RESET	
FALSE	[583]	EXTERNAL RESET	
0.00 %	[584]	RESET VALUE	
FALSE	[585]	QUENCH	
1.00 %	[586]	AT SPEED LEVEL	
60.00 %	[576]	ACCEL 0	
60.00 %	[577]	DECEL 0	
20.00 %	[578]	ACCEL 0 JERK 1	
20.00 %	[611]	ACCEL 0 JERK 2	
20.00 %	[596]	DECEL 0 JERK 1	
20.00 %	[613]	DECEL 0 JERK 2	
30.00 %	[579]	ACCEL 1	
30.00 %	[580]	DECEL 1	
20.00 %	[581]	ACCEL 1 JERK 1	
20.00 %	[612]	ACCEL 1 JERK 2	
20.00 %	[597]	DECEL 1 JERK 1	
20.00 %	[614]	DECEL 1 JERK 2	

SRAMP

Parameter	Tag	Range
INPUT	**574**	**-100.00 to 100.00 %**
Input value.		
RATE SELECT	**575**	**0 to 1**
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.		
AUTO RESET	**582**	**FALSE / TRUE**
The ramp is reset automatically when the drive is enabled if set to TRUE.		
EXTERNAL RESET	**583**	**FALSE / TRUE**
Resets the ramp output.		

SRAMP

Parameter	Tag	Range
RESET VALUE	**584**	**-100.00 to 100.00 %**
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.		
QUENCH	**585**	**FALSE / TRUE**
If TRUE forces the ramp input to zero.		
AT SPEED LEVEL	**586**	**0.00 to 100.00 %**
Threshold for AT SPEED diagnostic output.		
ACCEL 0	**576**	**0.00 to 100.00 %**
Acceleration rate, in units of percent per second^2. i.e. 75.00 % means that the maximum acceleration will be 75.00% per second^2 if the full speed of the machine is 1.25ms then the acceleration will be 1.25 * 75.0% = 0.9375ms^2 .		
DECEL 0	**577**	**0.00 to 100.00 %**
Deceleration rate, only active if SYMMETRIC = TRUE.		
ACCEL 0 JERK 1	**578**	**0.00 to 100.00 %**
Rate of change of acceleration, in units of percent per second^3. For example: 75.00 % means that the maximum acceleration will be 50.00% per second^3 if the full speed of the machine is 1.25ms then the acceleration will be 1.25 * 50.0% = 0.625ms3. 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.		
ACCEL 0 JERK 2	**611**	**0.00 to 100.00 %**
Rate of change of acceleration in units of percent per second^3 for segment 2. Only applicable if SYMMETRIC = FALSE.		
DECEL 0 JERK 1	**596**	**0.00 to 100.00 %**
Rate of change of acceleration in units of percent per second^3 for segment 3. Only applicable if SYMMETRIC = FALSE.		
DECEL 0 JERK 2	**613**	**0.00 to 100.00 %**
Rate of change of acceleration in units of percent per second^3 for segment 4. Only applicable if SYMMETRIC = FALSE.		
ACCEL 1	**579**	**0.00 to 100.00 %**
Refer to ACCEL 0.		
DECEL 1	**580**	**0.00 to 100.00 %**
Refer to DECEL 0.		
ACCEL 1 JERK 1	**581**	**0.00 to 100.00 %**
Refer to ACCEL 0 JERK 1.		

SRAMP

Parameter	Tag	Range
ACCEL 1 JERK 2	**612**	**0.00 to 100.00 %**
Refer to ACCEL 0 JERK 2.		
DECEL 1 JERK 1	**597**	**0.00 to 100.00 %**
Refer to DECEL 0 JERK 1.		
DECEL 1 JERK 2	**614**	**0.00 to 100.00 %**
Refer to DECEL 0 JERK 2.		
SRAMP OUTPUT	**589**	**— .xx %**
Diagnostic, ramp output.		
ACCEL OUTPUT	**588**	**— .xx %**
Acceleration diagnostic.		
AT SPEED	**587**	**FALSE / TRUE**
Diagnostic output indicating the Abs (input - output) is less than AT SPEED LEVEL.		

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^2

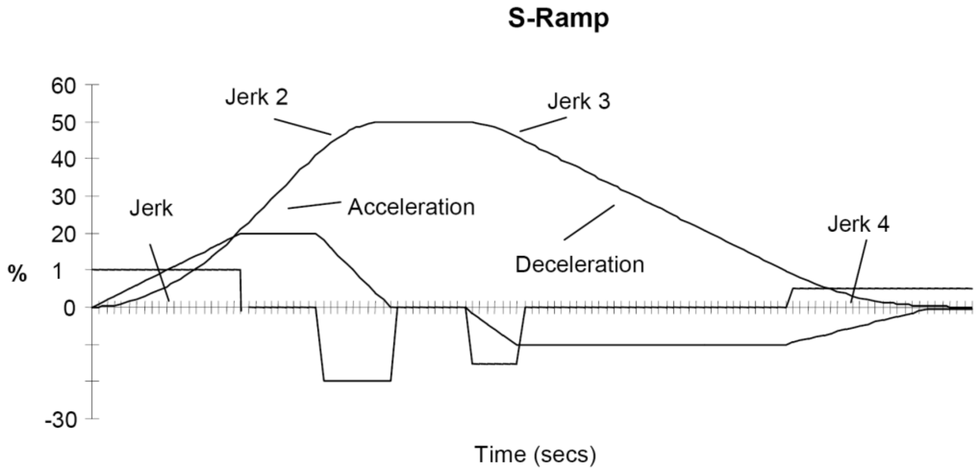
J is the maximum allowable value for jerk, in %/sec^3

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^2 and a jerk of 10 %/s^3

MMI Menu Map

1 SETUP PARAMETERS

2 STANDSTILL

- STANDSTILL LOGIC
- ZERO THRESHOLD

MMI Menu Map

1 FUNCTION BLOCKS

2 SEQ & REF

3 STANDSTILL

- ZERO SETPOINT

MMI Menu Map

1 DIAGNOSTICS

- AT ZERO SPEED
- AT ZERO SETPOINT
- AT STANDSTILL

STANDSTILL

Set a ZERO THRESHOLD defining when the speed setpoint is at zero to inhibit motor rotation.

FUNCTION BLOCKS\SEQ & REF\STANDSTILL

```
                    AT ZERO SETPOINT   [ 78] – FALSE
                       AT ZERO SPEED   [ 77] – FALSE
                      AT STANDSTILL    [ 79] – FALSE
   0.00 %  – [699]  INPUT
 DISABLED  – [ 11]  STANDSTILL LOGIC
   2.00 %  – [ 12]  ZERO THRESHOLD
```

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".

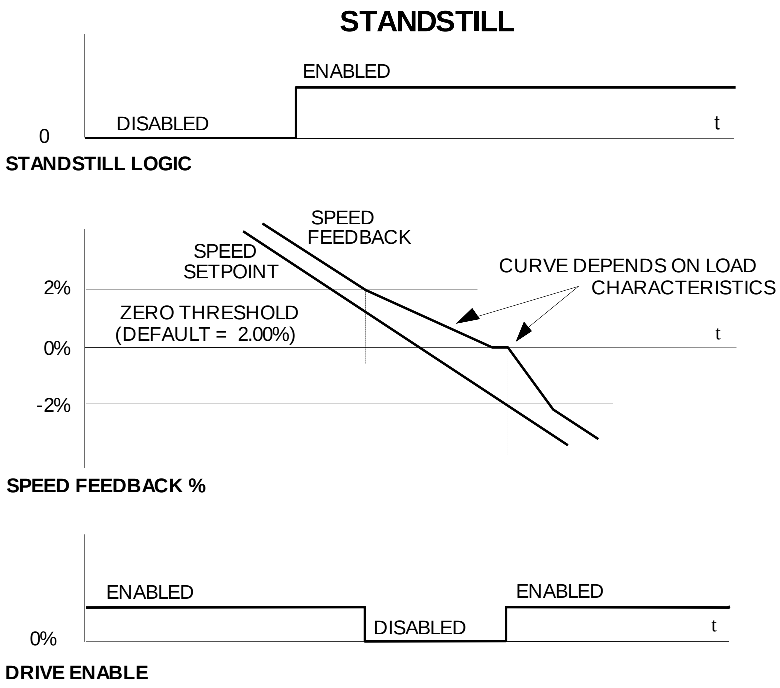
However, it can cause problems in web handling applications using tension feedback: at zero speed, the SCR/thyristors turn off allowing the web tension to pull the driven roll in reverse. When the drive no longer senses it is at zero speed, the SCR/thyristors turn back on causing the motor to move forward and regulate tension. An oscillation condition can result as the drives SCR/thyristors turn on and off trying to maintain a fixed position.

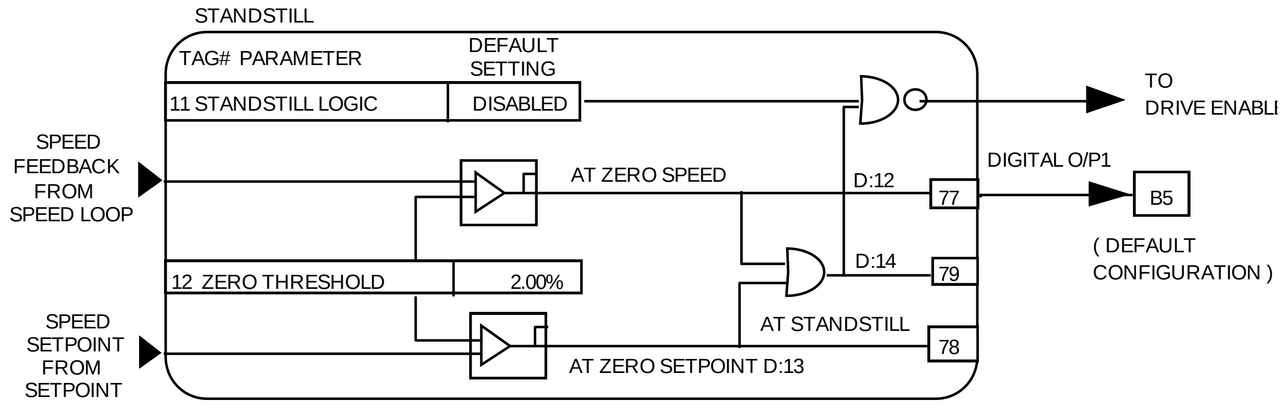
STANDSTILL

Parameter	Tag	Range
ZERO SETPOINT	**699**	**-300.00 to 300.00 %**
The input to the standstill function. By default this is connected to the speed demand parameter from the speed loop function block.		
STANDSTILL LOGIC	**11**	**DISABLED / ENABLED**
If ENABLED, the Drive is quenched (although the contactor remains in) when the Speed Feedback and Speed Setpoint values are less than ZERO THRESHOLD.		
ZERO THRESHOLD	**12**	**0.00 to 100.00 %**
Threshold level which defines zero setpoint and zero speed diagnostic outputs and also controls the zero speed relay output.		
AT ZERO SETPOINT	**78**	**FALSE / TRUE**
Logic output, TRUE when INPUT is below ZERO THRESHOLD. There is hysteresis of 0.5% on this test.		
AT ZERO SPEED	**77**	**FALSE / TRUE**

STANDSTILL

Parameter	Tag	Range
Logic output, TRUE when speed feedback is below ZERO THRESHOLD. There is hysteresis of 0.5% on this test. The speed feedback parameter is internally connected to the PERCENT RPM parameter in the FEEDBACKS block.		
AT STANDSTILL	**79**	**FALSE / TRUE**
Logic output that is TRUE when standstill is detected.		




STANDSTILL
TAG# PARAMETER
DEFAULT SETTING
11 STANDSTILL LOGIC
DISABLED
12 ZERO THRESHOLD
2.00%
SPEED FEEDBACK FROM SPEED LOOP
SPEED SETPOINT FROM SETPOINT
AT ZERO SPEED
D:12
77
D:14
79
AT STANDSTILL
78
AT ZERO SETPOINT D:13
TO DRIVE ENABLE
DIGITAL O/P1
B5
(DEFAULT CONFIGURATION)

STOP RATES

MMI Menu Map

1 SETUP PARAMETERS

2 STOP RATES

- STOP TIME
- STOP LIMIT
- CONTACTOR DELAY
- CURR DECAY RATE
- PROG STOP TIME
- PROG STOP LIMIT
- PROG STOP I LIM
- STOP ZERO SPEED

These parameters are used by a regenerative drive when stopping with Normal Stop or Program Stop.

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.

FUNCTION BLOCKS\SEQ & REF\STOP RATES

10.0 s	[27]	STOP TIME
60.0 s	[217]	STOP LIMIT
1.0 s	[302]	CONTACTOR DELAY
0.00	[594]	CURR DECAY RATE
0.1 s	[26]	PROG STOP TIME
60.0 s	[216]	PROG STOP LIMIT
100.00 %	[91]	PROG STOP I LIM
2.00 %	[29]	STOP ZERO SPEED

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. When STOP ZERO SPEED is set above 0.25% and the CURRENT DECAY RATE is not zero, the drive disables during the contactor delay. Otherwise the drive disables after the contactor delay. This is useful when using the Jog function to prevent multiple operations of the contactor. CONTACTOR DELAY is overridden when terminal C5 (Enable Input) is at 0V.

Program Stop

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.

STOP RATES

Parameter	Tag	Range
STOP TIME	**27**	**0.1 to 600.0 s**
Time to reach zero speed from 100% set speed in normal stop mode (terminal C3 = 0V).		
STOP LIMIT	**217**	**0.0 to 600.0 s**
The maximum time a controlled stop can take in a Normal Stop (regenerative breaking) before the drive will coast to stop. The timer is triggered when terminal C3 = 0V.		
CONTACTOR DELAY	**302**	**0.1 to 600.0 s**
This defines the time the contactor stays energised for after the STOP ZERO SPEED limit is reached. **Maintain zero speed during contactor delay.**		
CURR DECAY RATE	**594**	**0.00 to 200.00 %/s**
This is the rate at which the current is quenched when the current loop is disabled. 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% is 2s.		
PROG STOP TIME	**26**	**0.1 to 600.0 s**
Time to reach zero speed from 100% set speed in Program Stop mode (B8 = 0V).		
PROG STOP LIMIT	**216**	**0.0 to 600.0 s**
The maximum time a Program Stop (regenerative breaking) can take before the contactor is de-energised and the drive is disabled. The timer is triggered when terminal B8 = 0V.		
PROG STOP I LIM	**91**	**0.00 to 200.00 %**
Main current limit level (assuming current limit not overridden by I Profile or Inverse Time limits) when performing a Program Stop.		
STOP ZERO SPEED	**29**	**0.00 to 100.00 %**
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

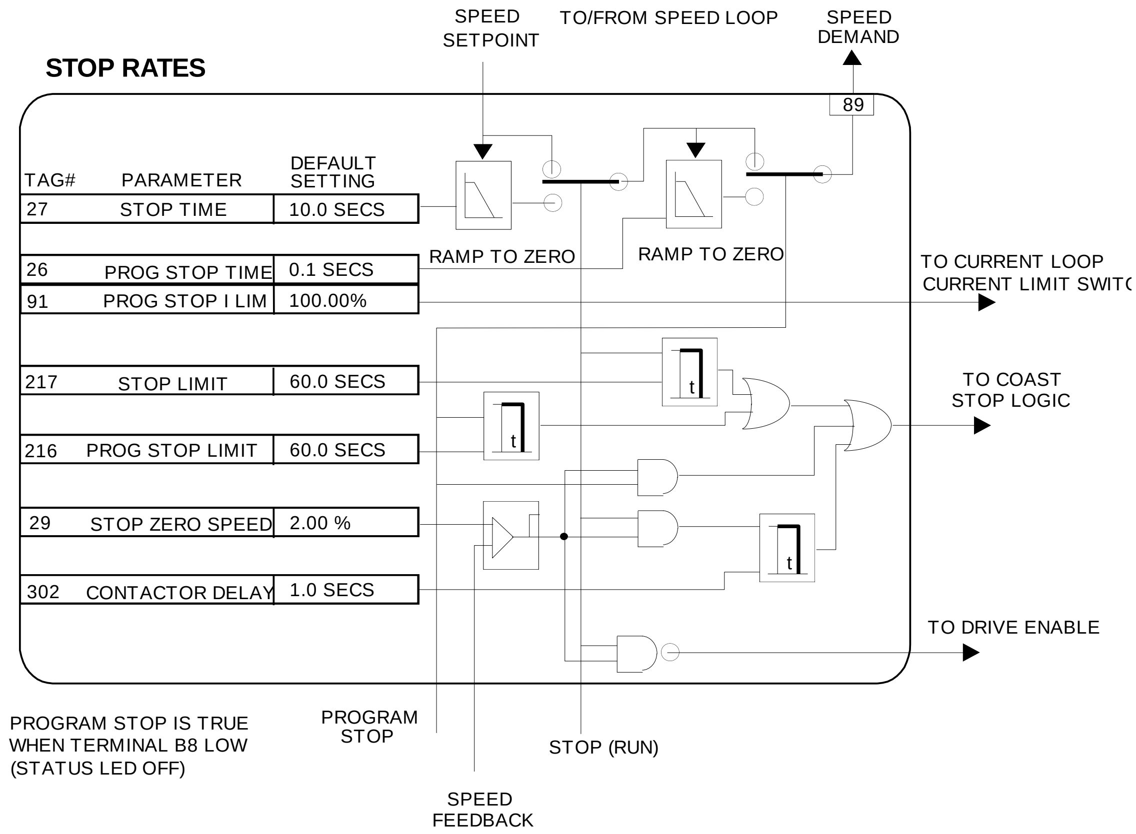
Program Stop - Terminal B8

- Independent ramp time
- Stop Timer
- Independent Current Limit that may be higher than normal Current Limit
- Independent zero speed

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.



TEC OPTION

MMI Menu Map

1 SERIAL LINKS

2 TEC OPTION

- TEC OPTION TYPE
- TEC OPTION IN 1
- TEC OPTION IN 2
- TEC OPTION IN 3
- TEC OPTION IN 4
- TEC OPTION IN 5
- TEC OPTION FAULT
- TEC OPTION VER
- TEC OPTION OUT 1
- TEC OPTION OUT 2

This function block is used to configure the inputs and outputs of the various Technology Options that can be fitted.

The Technology Option provides a communications interface for external control of the Drive.

Refer to the appropriate Technology Option Technical Manual supplied with the option for further details.

FUNCTION BLOCKS\COMMUNICATIONS\TEC OPTION

TEC OPTION FAULT [506] – NONE
TEC OPTION VER [507] – 0x0000
TEC OPTION OUT 1 [508] – 0
TEC OPTION OUT 2 [509] – 0
NONE – [500] TEC OPTION TYPE
0 – [501] TEC OPTION IN 1
0 – [502] TEC OPTION IN 2
0 – [503] TEC OPTION IN 3
0 – [504] TEC OPTION IN 4
0 – [505] TEC OPTION IN 5

TEC OPTION

Parameter	Tag	Range
TEC OPTION TYPE	**500**	**See below**

Selects the type of Technology Option.

0 : NONE	10 : TYPE 10
1 : RS485	11 : TYPE 11
2 : PROFIBUS	12 : TYPE 12
3 : LINK	13 : TYPE 13
4 : DEVICE NET	14 : TYPE 14
5 : CAN OPEN	15 : TYPE 15
6 : LONWORKS	
7 : CONTROLNET	
8 : MODBUS PLUS	
9 : ETHERNET	

Parameter	Tag	Range
TEC OPTION IN 1 to TEC OPTION IN 5	**501, 502, 503, 504, 505**	**-32768 to 32767**

The use of these input parameters depends upon the type of Technology Option fitted. Refer to the Technology Option Technical Manual.

TEC OPTION

Parameter	Tag	Range
TEC OPTION FAULT	**506**	**See below**

The fault state of the Technology Option.

0 : NONE	no faults
1 : PARAMETER	parameter out-of-range
2 : TYPE MISMATCH	TYPE parameter mismatch
3 : SELF TEST	hardware fault - internal
4 : HARDWARE	hardware fault - external
5 : MISSING	no option fitted

If the VERSION NUMBER error message is displayed, the Technology Option is using software that doesn’t fully support the drive; refer to Parker .

Parameter	Tag	Range
TEC OPTION VER	**507**	**0x0000 to 0xFFFF**

The version of the Technology Option. If no option is fitted then the version is reset to zero.

Parameter	Tag	Range
TEC OPTION OUT 1 to TEC OPTION OUT 2	**508, 509**	**— .**

The use of these output parameters depends upon the type of Technology Option fitted. Refer to the Technology Option Technical Manual.

MMI Menu Map

1 SETUP PARAMETERS

2 SPECIAL BLOCKS

3 TORQUE CALC.

- TORQUE DEMAND
- TENSION ENABLE
- OVER WIND

MMI Menu Map

1 SYSTEM

2 CONFIGURE I/O

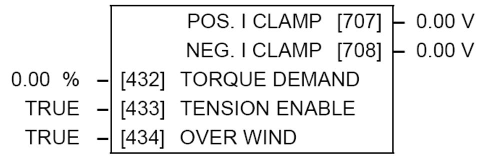
3 BLOCK DIAGRAM

- POS. I CLAMP
- NEG. I CLAMP

TORQUE CALC.

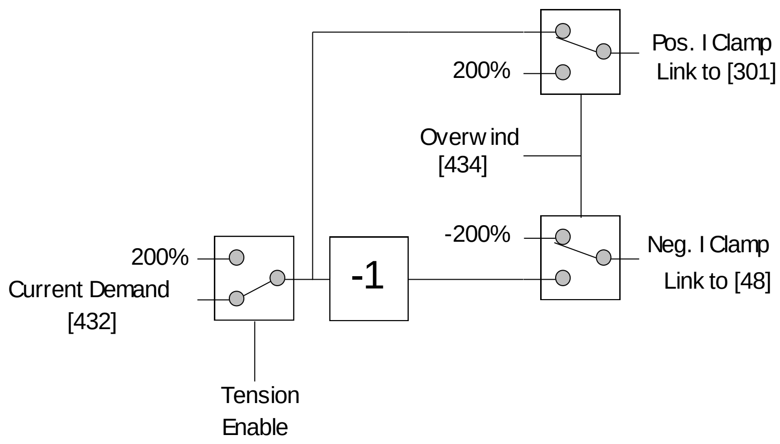
This block switches the drive between Speed and Tension mode. It also switches the current limits as required for over and under winding.

FUNCTION BLOCKS\WINDER\TORQUE CALC.



TORQUE CALC.

Parameter	Tag	Range
TORQUE DEMAND	**432**	**-200.00 to 200.00 %**
This is the TORQUE CALC function block input.		
TENSION ENABLE	**433**	**DISABLED / ENABLED**
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.		
OVER WIND	**434**	**DISABLED / ENABLED**
Reverses the sign of the output clamps for over/under winding. Switch using a free digital input.		
POS. I CLAMP	**707**	**— .xx V**
Positive current clamp.		
NEG. I CLAMP	**708**	**— .xx V**
Negative current clamp		



VALUE FUNC

MMI Menu Map

1 FUNCTION BLOCKS
2 MISCELLANEOUS
3 VALUE FUNC
4 VALUE FUNC 1
4 VALUE FUNC 2
4 VALUE FUNC 3
4 VALUE FUNC 4
4 VALUE FUNC 5
4 VALUE FUNC 6
4 VALUE FUNC 7
4 VALUE FUNC 8
4 VALUE FUNC 9
4 VALUE FUNC 10
- INPUT A
- INPUT B
- INPUT C
- TYPE
- OUTPUT

The value function blocks can be configured to perform one of a number of functions upon a fixed number of inputs.

Boolean inputs and outputs are

Outputs:

FALSE = 0.00
TRUE = 0.01

Inputs:

-0.005 < x < 0.005 = FALSE,
Else TRUE

FUNCTION BLOCKS\MISCELLANEOUS\VALUE FUNC\VALUE FUNC 1

OUTPUT [834] – 0.00
0.00 – [830] INPUT A
0.00 – [831] INPUT B
0.00 – [832] INPUT C
IF(C) -A – [833] TYPE

FUNCTION BLOCKS\MISCELLANEOUS\VALUE FUNC\VALUE FUNC 2

OUTPUT [839] – 0.00
0.00 – [835] INPUT A
0.00 – [836] INPUT B
0.00 – [837] INPUT C
IF(C) -A – [838] TYPE

FUNCTION BLOCKS\MISCELLANEOUS\VALUE FUNC\VALUE FUNC 3

OUTPUT [844] – 0.00
0.00 – [840] INPUT A
0.00 – [841] INPUT B
0.00 – [842] INPUT C
IF(C) -A – [843] TYPE

FUNCTION BLOCKS\MISCELLANEOUS\VALUE FUNC\VALUE FUNC 4

OUTPUT [849] – 0.00
0.00 – [845] INPUT A
0.00 – [846] INPUT B
0.00 – [847] INPUT C
IF(C) -A – [848] TYPE

FUNCTION BLOCKS\MISCELLANEOUS\VALUE FUNC\VALUE FUNC 5

OUTPUT [854] – 0.00
0.00 – [850] INPUT A
0.00 – [851] INPUT B
0.00 – [852] INPUT C
IF(C) -A – [853] TYPE

FUNCTION BLOCKS\MISCELLANEOUS\VALUE FUNC\VALUE FUNC 6

OUTPUT [859] – 0.00
0.00 – [855] INPUT A
0.00 – [856] INPUT B
0.00 – [857] INPUT C
IF(C) -A – [858] TYPE

FUNCTION BLOCKS\MISCELLANEOUS\VALUE FUNC\VALUE FUNC 7

OUTPUT [864] – 0.00
0.00 – [860] INPUT A
0.00 – [861] INPUT B
0.00 – [862] INPUT C
IF(C) -A – [863] TYPE

FUNCTION BLOCKS\MISCELLANEOUS\VALUE FUNC\VALUE FUNC 8

OUTPUT [869] – 0.00
0.00 – [865] INPUT A
0.00 – [866] INPUT B
0.00 – [867] INPUT C
IF(C) -A – [868] TYPE

FUNCTION BLOCKS\MISCELLANEOUS\VALUE FUNC\VALUE FUNC 9

OUTPUT [874] – 0.00
0.00 – [870] INPUT A
0.00 – [871] INPUT B
0.00 – [872] INPUT C
IF(C) -A – [873] TYPE

FUNCTION BLOCKS\MISCELLANEOUS\VALUE FUNC\VALUE FUNC 10

OUTPUT [879] – 0.00
0.00 – [875] INPUT A
0.00 – [876] INPUT B
0.00 – [877] INPUT C
IF(C) -A – [878] TYPE

VALUE FUNCTION

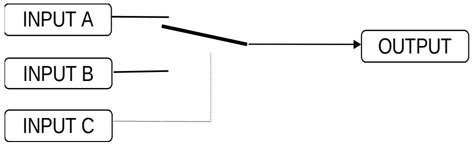
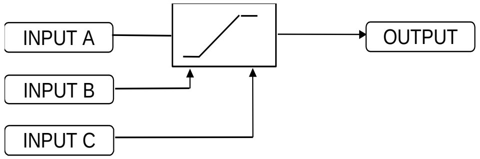
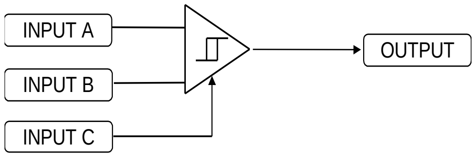
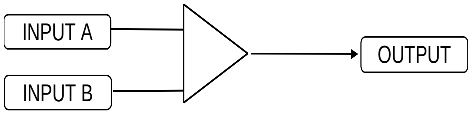
Parameter	Tag	Range
INPUT A	**830, 835, 840, 845, 850, 855, 860, 865, 870, 875**	**-32768 to 32768**
General purpose input.		
INPUT B	**831, 836, 841, 846, 851, 856, 861, 866, 871, 876**	**-32768 to 32768**
General purpose input.		
INPUT C	**832, 837, 842, 847, 852, 857, 862, 867, 872, 877**	**-32768 to 32768**
General purpose input.		
TYPE	**833, 838, 843, 848, 853, 858, 863, 868, 873, 878**	**See below**
The operation to be performed on the three inputs to produce the output value.		

0: IF(C) -A
1: ABS(A+B+C)
2: SWITCH(A,B)
3: (A*B)/C
4: A+B+C
5: A-B-C
6: B<=A<=C
7: A>B+/-C
8: A>=B
9: ABS(A)>B+/-C
10: ABS(A)>=B
11: A(1+B)
12: IF(C) HOLD(A)
13: BINARY DECODE
14: ON DELAY
15: OFF DELAY
16: TIMER
17: MINIMUM PULSE
18: PULSE TRAIN
19: WINDOW
20: UP/DWN COUNTER
21: (A*B)/C ROUND
22: WINDOW NO HYST
23: WIND A>=B,A<=C
24: A<=B
25: ((A*B)/100)+C
26: MIN(A,B,C)
27: MAX(A,B,C)
28: PROFILE SQRT
29: PROFILE LINEAR
30: PROFILE x^2
31: PROFILE x^3
32: PROFILE x^4
33: ON A>B, OFF A<C
34: (A+B) CLAMPED C
35: (A-B) CLAMPED C
36: (A*B) CLAMPED C
37: (A/B) CLAMPED C
38: A>=B:A, A<=C:0
39: (A * B) + C
40: A * (B + C)
41: A * (B - C)
42: A * (1+B/C)
43: A * (1+(B * C))
44: MONOSTABLE HIGH
45: MONOSTABLE LOW
46: FILTER

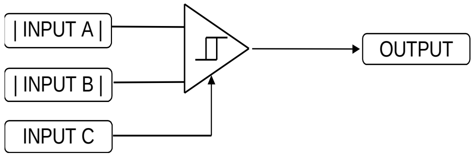
Parameter	Tag	Range
OUTPUT	**834, 839, 844, 849, 854, 859, 864, 869, 874, 879**	**— .xx**
The result of performing the selected operation on the inputs.		

Functional Description

OUTPUT is generated from the inputs according to the operation type selected. The output is always limited to be within the range -32768.00 to +32767.00.

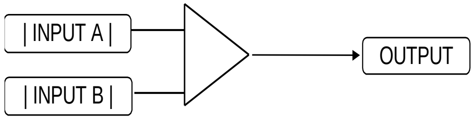
Operation	Description
IF(C) -A	If INPUT C is not zero the OUTPUT is minus INPUT A, otherwise the OUTPUT is the same as INPUT A.
ABS(A+B+C)	The OUTPUT is set to the absolute value of INPUT A + INPUT B + INPUT C.
SWITCH(A,B)	 If INPUT C is zero the OUTPUT is set to INPUT A, otherwise the output is set to INPUT B
(A*B)/C	The OUTPUT is set to (INPUT A * INPUT B) / (INPUT C). The algorithm compensates for the remainder term.
A+B+C	The OUTPUT is set to (INPUT A + INPUT B + INPUT C).
A-B-C	The OUTPUT is set to (INPUT A - INPUT B - INPUT C).
B <= A <= C	 The OUTPUT is set to the value of INPUT A, limited to between a maximum value of INPUT C and a minimum value of INPUT B. If INPUT B is greater than INPUT C the output is undefined.
A>B+/-C	 The OUTPUT is TRUE if INPUT A is greater than INPUT B + INPUT C. The OUTPUT is FALSE if INPUT A is less than INPUT B - INPUT C. Otherwise the OUTPUT is unchanged. In this way the block acts as a simple comparator with a comparison level of INPUT B and a hysteresis band equal to +/- INPUT C.
A>=B	 The OUTPUT is TRUE if INPUT A is greater than or equal to INPUT B, otherwise the OUTPUT is FALSE.

<table>
<tr><th>Operation</th><th>Description</th></tr>
<tr><td>ABS(A)>
ABS(B)+/-C</td><td>



The OUTPUT is TRUE if the magnitude of INPUT A is greater than or equal to the magnitude of INPUT B - INPUT C.

The OUTPUT is FALSE if the magnitude of INPUT A is less than the magnitude of INPUT B - INPUT C. Otherwise the OUTPUT is unchanged. In this way the block acts as a magnitude comparator with a comparison level of INPUT B and a hysteresis band equal to +/- INPUT C.</td></tr>
<tr><td>ABS(A)>
=ABS(B)</td><td>

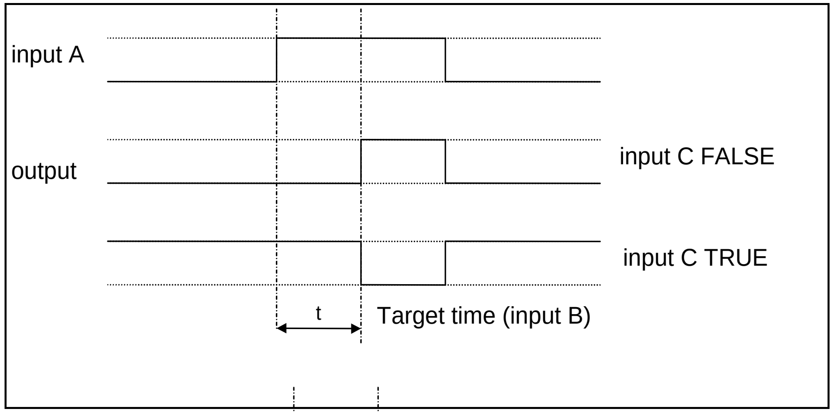
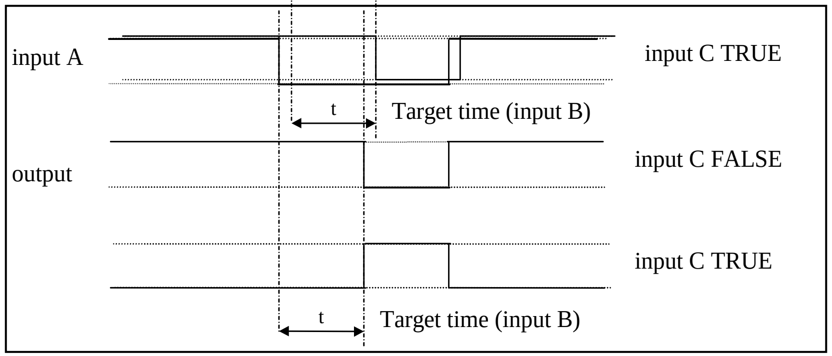


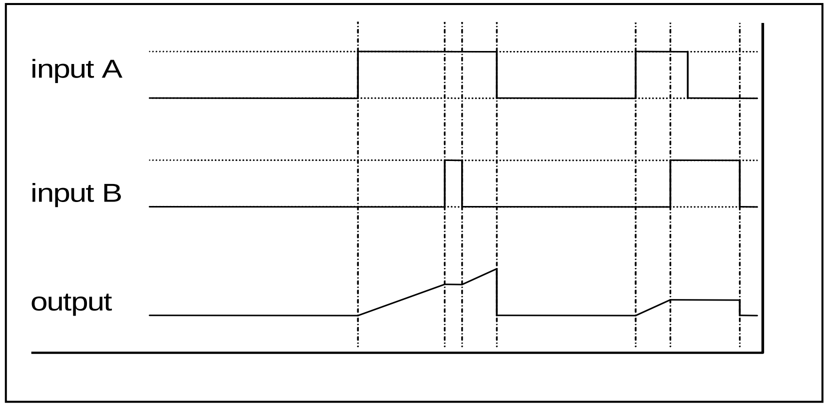
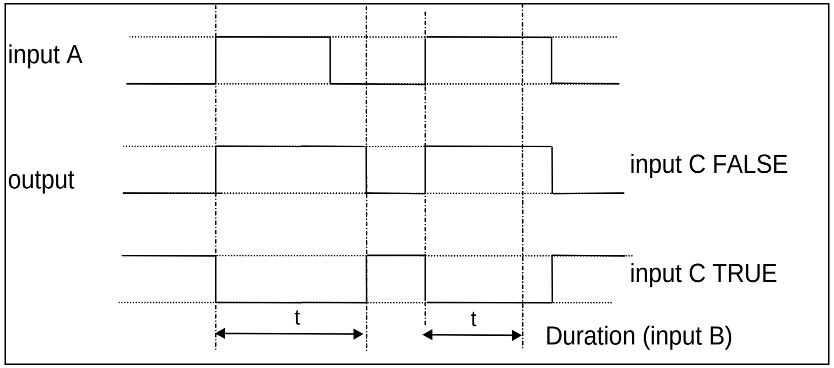
The OUTPUT is TRUE if the magnitude of INPUT A is greater than or equal to the magnitude of INPUT B, otherwise the OUTPUT is FALSE.</td></tr>
<tr><td>A(1+B)</td><td>The OUTPUT is set to INPUT A + (INPUT A * INPUT B / 100.00).</td></tr>
<tr><td>IF(C) HOLD A</td><td>If INPUT C is zero, the OUTPUT is set to INPUT A, otherwise the OUTPUT is unchanged.

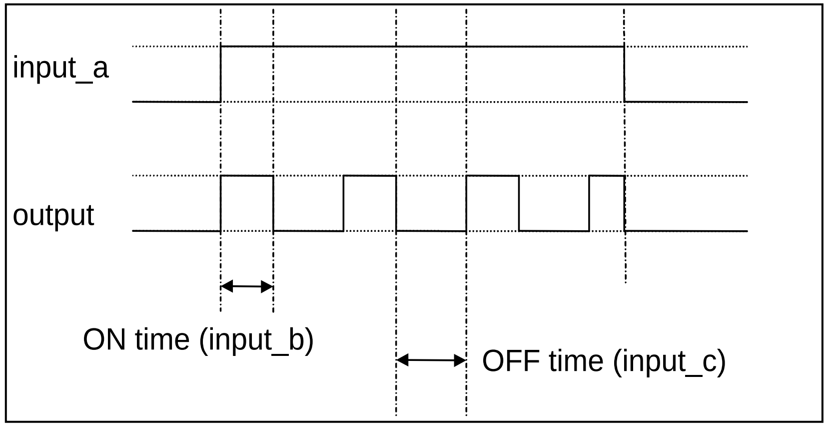
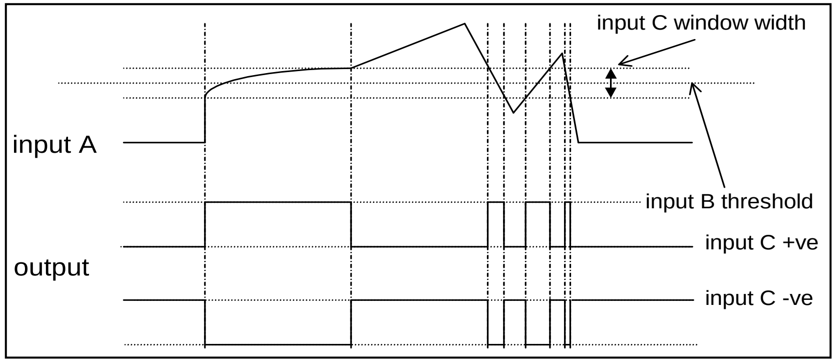
On powering up the drive, the output will be pre-loaded with the last saved value of input B.</td></tr>
<tr><td>BINARY DECODE</td><td>The OUTPUT is set according to which of the INPUTs are non-zero.

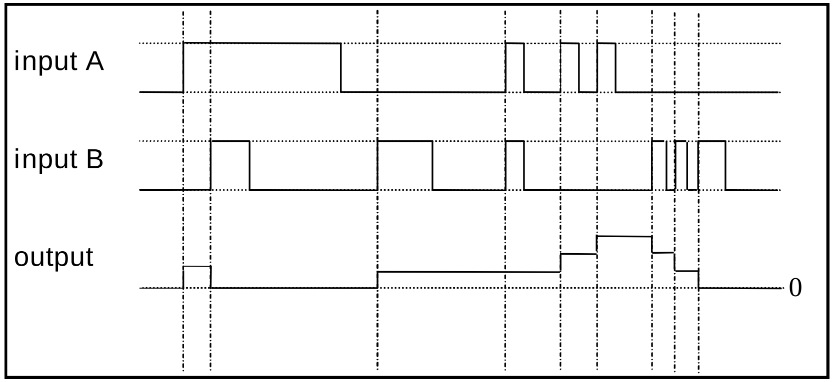
<table>
<tr><th>INPUT C</th><th>INPUT B</th><th>INPUT A</th><th>OUTPUT</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>0.00</td></tr>
<tr><td>0</td><td>0</td><td>≠0</td><td>1.00</td></tr>
<tr><td>0</td><td>≠0</td><td>0</td><td>2.00</td></tr>
<tr><td>0</td><td>≠0</td><td>≠0</td><td>3.00</td></tr>
<tr><td>≠0</td><td>0</td><td>0</td><td>4.00</td></tr>
<tr><td>≠0</td><td>0</td><td>≠0</td><td>5.00</td></tr>
<tr><td>≠0</td><td>≠0</td><td>0</td><td>6.00</td></tr>
<tr><td>≠0</td><td>≠0</td><td>≠0</td><td>7.00</td></tr>
</table>

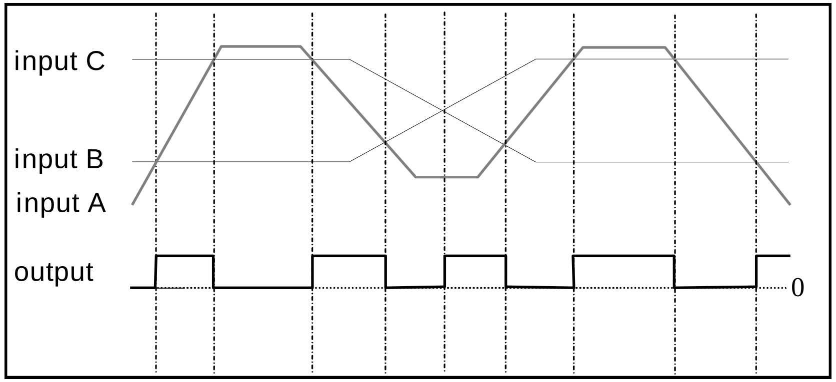
In the above table, ≠0 indicates that the corresponding input is not zero.</td></tr>
</table>

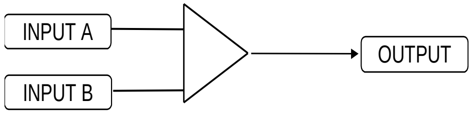
Operation	Description
ON DELAY	 A programmable delay between receiving and outputting a Boolean TRUE signal. INPUT A becoming TRUE starts the delay timer. INPUT B sets the duration of the delay in seconds (1 = 1 second). At the end of the duration, OUTPUT becomes TRUE unless INPUT A has reverted to FALSE. Setting INPUT C to TRUE (≠0) inverts the output.
OFF DELAY	 A programmable delay between receiving and outputting a Boolean FALSE signal. INPUT A becoming FALSE starts the delay timer. INPUT B sets the duration of the delay in seconds (1 = 1 second). Setting INPUT C to TRUE (≠0) inverts the output. At the end of the duration, OUTPUT becomes FALSE unless INPUT A has reverted to TRUE.

Operation	Description
TIMER	 Times the period elapsed from when INPUT A is set TRUE and held TRUE, to when INPUT B becomes TRUE. OUTPUT is the duration of the timer in seconds (1 = 1 second), starting from zero. If INPUT B is TRUE, the value for OUTPUT is held until INPUT B is released. If on release INPUT A is still TRUE, the timer will continue from the held value. Setting INPUT A and INPUT B to FALSE resets the timer. INPUT C is not used.
MINIMUM PULSE	 Creates an output of adjustable minimum time when INPUT A is TRUE. (INPUT A is assumed to be a sequence of TRUE pulses and FALSE off periods.) INPUT B sets the length of the minimum pulse required in seconds (1 = 1 second). INPUT C inverts the output when TRUE. The duration of the pulse is *at least* the period set by INPUT B.

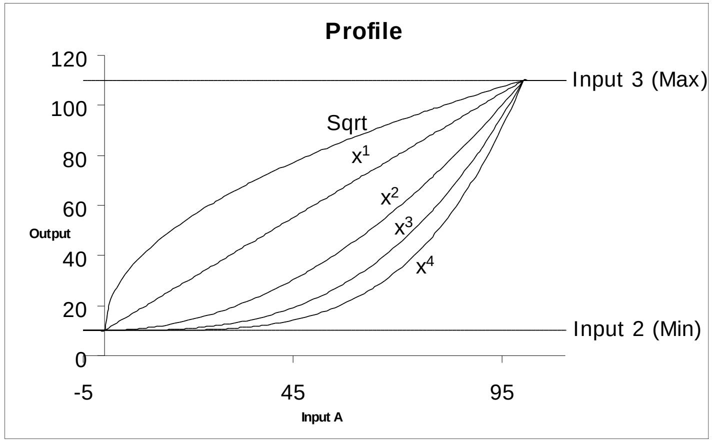
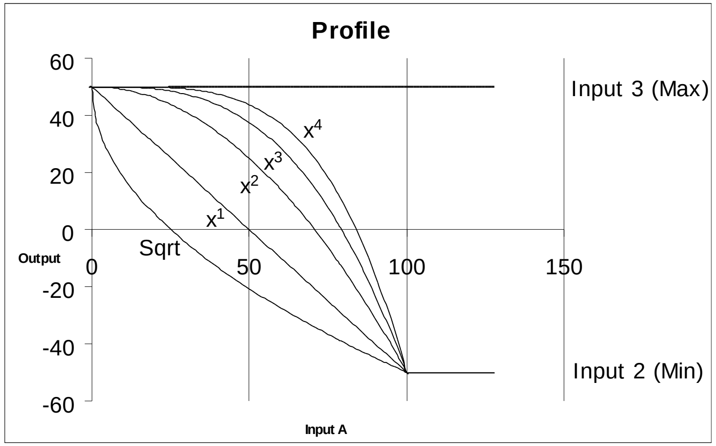
Operation	Description
PULSE TRAIN	 Creates a pulsed FALSE / TRUE output of programmable frequency. INPUT A enables the pulse train when TRUE, disables when FALSE. INPUT B sets the length of the *on* part of the pulse in seconds (1 = 1 second). INPUT C sets the length of the *off* part of the pulse in seconds (1 = 1 second).
WINDOW	 This function outputs TRUE when INPUT A is within a programmable range, and FALSE otherwise. INPUT B sets the threshold of the window to be monitored. INPUT C defines the range of the window around the threshold. When the value of INPUT A is inside the window, the window expands by 0.01 to avoid flutter on output if noisy, i.e. if INPUT B = 5 and INPUT C = 4 then the range is 3 to 7, expanded to 2.5 to 7.5 when the value if INPUT A is inside the window. If INPUT C is set to zero, the output will only be TRUE if INPUT A is exactly equal to INPUT B (this is fulfilled in the default condition when inputs A, B & C are all zero) If INPUT C is set to a negative value, its absolute value defines the window range, and the output is inverted.

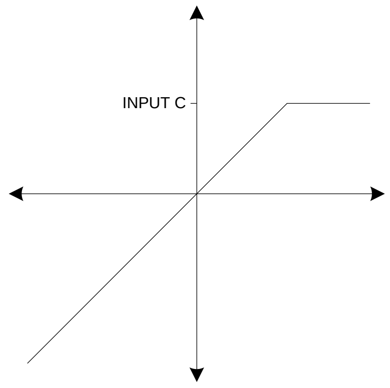
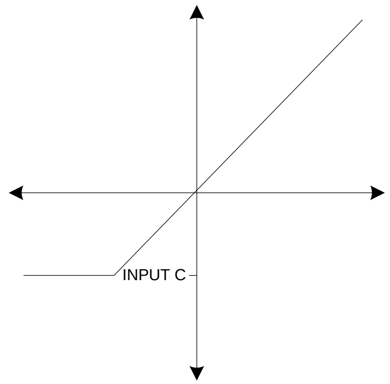
Operation	Description
UP/DOWN COUNTER	 INPUT A provides a rising edge trigger to increment the output count by one. INPUT B provides a rising edge trigger to decrement the output count by one. INPUT C holds the output at zero. The output starts at zero. The output is limited at ±300.00.
(A*B)/C ROUND	The OUTPUT is set to (INPUT A * INPUT B) / (INPUT C). This is the same as (A*B)/C (enumerated value 3) except that the result is rounded.
WINDOW NO HYST	This is the same as WINDOW (enumerated value 19) except that there is no hysteresis when inside the `window'. Thus, from the diagram given in WINDOW, if INPUT B = 5 and INPUT C = 4 then the range is 3 to 7.

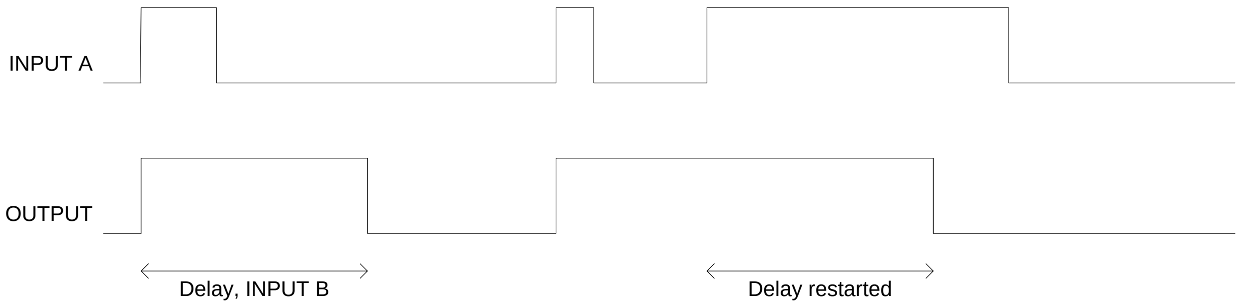
<table>
<tr><th>Operation</th><th>Description</th></tr>
<tr><td>WINDOW
B<=A<=C</td><td>

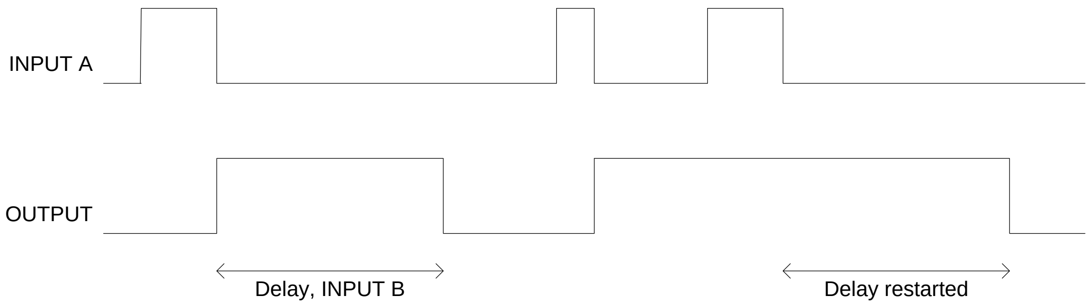
INPUT B and INPUT C are the upper and lower levels of the band.
If B<= C and A is in the band then the OUTPUT is TRUE, else OUTPUT is FALSE
If C<B and A is in the band then the OUTPUT is FALSE, else OUTPUT is TRUE (i.e. output is inverted)
Note: OUTPUT is set to FALSE if the TYPE is changed or is in initialisation. </td></tr>
<tr><td>A<=B</td><td>

The OUTPUT is TRUE if INPUT A is less than or equal to INPUT B, otherwise the OUTPUT is FALSE.</td></tr>
<tr><td>((A*B)/100)+C</td><td>The OUPUT is set to ((INPUT A * INPUT B)/100)+C.</td></tr>
<tr><td>MIN (A,B,C)</td><td>The OUTPUT is set to the smallest of INPUT A, INPUT B and INPUT C.</td></tr>
<tr><td>MAX (A,B,C)</td><td>The OUTPUT is set to the largest of INPUT A, INPUT B and INPUT C.</td></tr>
</table>

Operation	Description
PROFILE SQRT PROFILE X^1 PROFILE X^2 PROFILE X^3 PROFILE X^4	 Example : Profile Min = 10, Max = 110
	 Example : Profile Min = 50, Max = -50
	Profile functions convert an input (0-1) to an output with (min) +((max-min) * fn(input)) where fn() is Sqrt (square root), Linear (X^1), X^2, X^3 or X^4. The output is clamped between Min and Max. The input is clamped 0-100.
	The profiles are calculated from 100 point tables and linearly interpreted between the points.
	PROFILE SQRT $y = \min + (\max - \min) x^{0.5}$ PROFILE X^1 $y = \min + (\max - \min) x$
	PROFILE X^2 $y = \min + (\max - \min) x^2$ PROFILE X^3 $y = \min + (\max - \min) x^3$
	PROFILE X^4 $y = \min + (\max - \min) x^4$
	where INPUT A : Input x INPUT B : Min INPUT C : Max

Operation	Description
ON A>B, OFF A<C	If INPUT A is greater than INPUT B then the OUTPUT is ON, (0.01). Otherwise if INPUT A is less than INPUT C then the OUTPUT is OFF, (0.00). If neither of these conditions is met then the OUTPUT is unchanged.
(A+B) CLAMPED C (A-B) CLAMPED C (A*B) CLAMPED C (A/B) CLAMPED C	The OUTPUT is the result of INPUT A +, -, * or / INPUT B, clamped by INPUT C.  **Action of clamp for when INPUT C is greater than zero** If INPUT C is greater than 0 then the OUTPUT is clamped to INPUT C if it is greater than INPUT C.  **Action of clamp when INPUT C is negative or zero** If INPUT C is negative or zero then the OUTPUT is clamped to INPUT C if it is less than INPUT C.
A>=B:A, A<=C:0	If INPUT A is greater than or equal to INPUT B then the OUTPUT is set to INPUT A. Otherwise if INPUT A is less than or equal to INPUT C then the OUTPUT is set to 0. If neither of these conditions is met then the OUTPUT is unchanged.

<table>
<tr><th>Operation</th><th>Description</th></tr>
<tr><td>(A * B) + C</td><td>The OUTPUT is set to the result of (INPUT A * INPUT B) + INPUT C.</td></tr>
<tr><td>A * (B + C)</td><td>The OUTPUT is set to the result of INPUT A * (INPUT B + INPUT C).</td></tr>
<tr><td>A * (B - C)</td><td>The OUTPUT is set to the result of INPUT A * (INPUT B - INPUT C).</td></tr>
<tr><td>A * (1+B/C)</td><td>The OUTPUT is set to the result of INPUT A * (1.0 + (INPUT B / INPUT C)). If INPUT C is zero then the result if (INPUT B/INPUT C) will be 32768.0 for positive values of INPUT B, and -32768.0 for negative values of INPUT B.</td></tr>
<tr><td>A * (1+(B * C))</td><td>The OUTPUT is set to the result of INPUT A * (1.0 + (INPUT B * INPUT C)).</td></tr>
<tr><td>MONOSTABLE HIGH</td><td>The OUTPUT is set HIGH, (0.01), on the rising edge of INPUT A. The OUTPUT remains high for a delay set by INPUT B, (in seconds). If a second rising edge reaches INPUT A while OUTPUT is high, the delay is restarted.


The OUTPUT is inverted if INPUT C is not zero.</td></tr>
<tr><td>MONOSTABLE LOW</td><td>The OUTPUT is set HIGH, (0.01), on the falling edge of INPUT A. The OUTPUT remains high for a delay set by INPUT B, (in seconds). If a second falling edge reaches INPUT A while OUTPUT is high, the delay is restarted.


The OUTPUT is inverted if INPUT C is not zero.</td></tr>
</table>

Operation	Description
FILTER	The OUTPUT is the result of INPUT A passed through a first order low pass infinite impulse response filter with time constant set by INPUT B, (in seconds). If INPUT C is not zero then the OUTPUT is set to INPUT A.

The Default Application

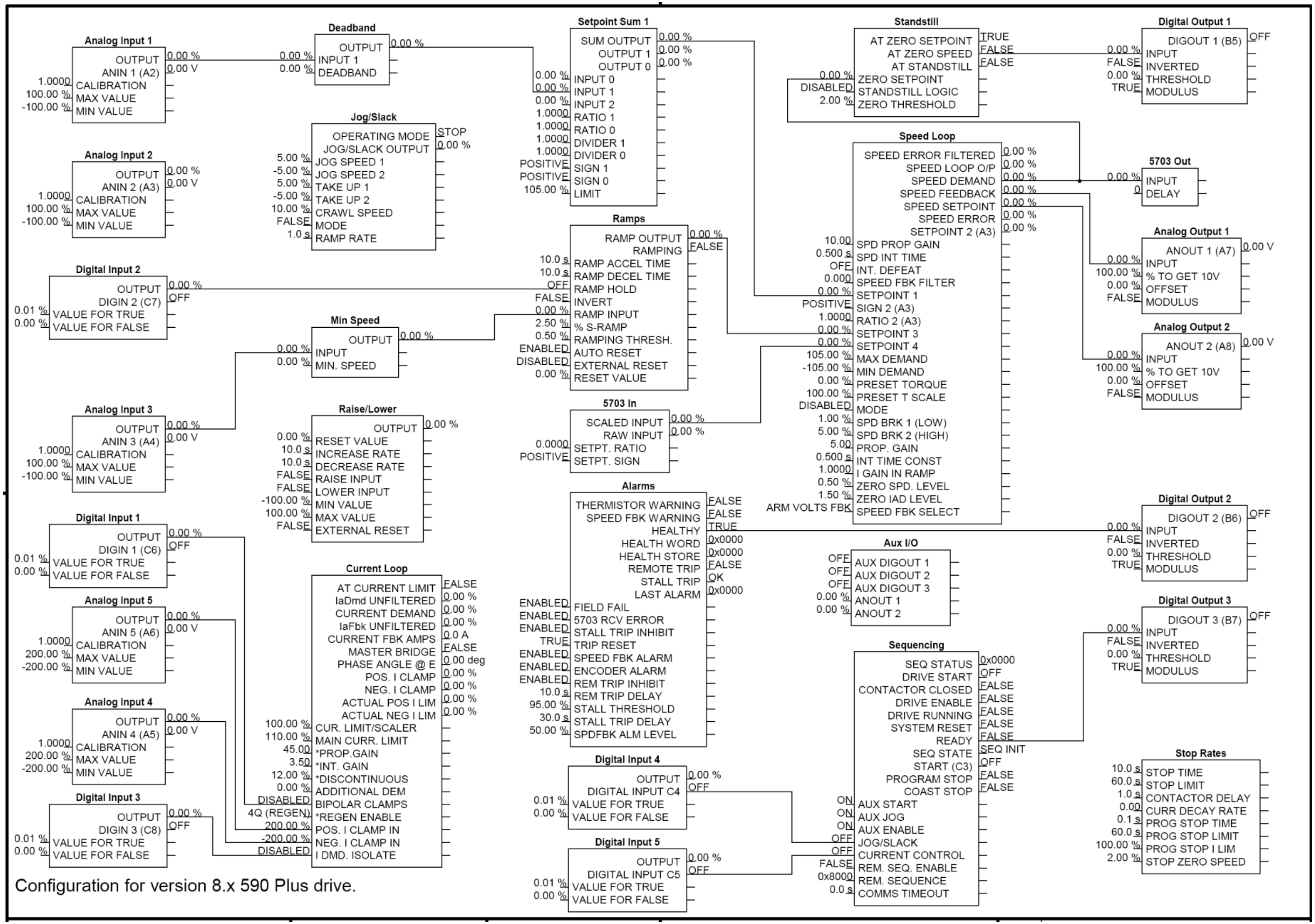
Block Diagrams

The Drive is supplied with a pre-programmed set of parameters providing for basic speed control.

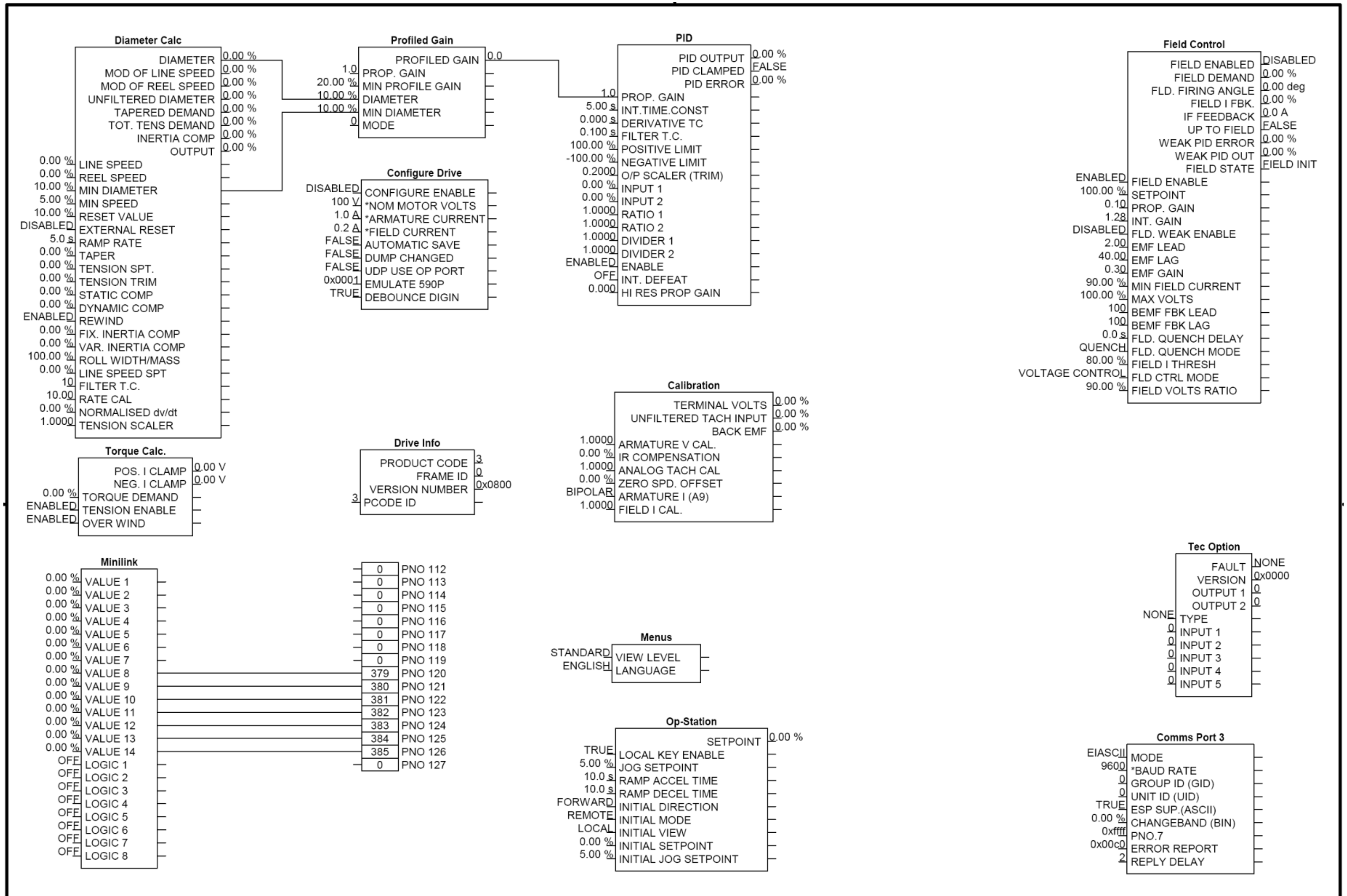
The following block diagrams show this factory set-up.

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 Keypad” - Saving Your Application.

To return to the default application, refer to Chapter 6: “The Keypad” - Resetting to Factory Defaults (2-button reset).

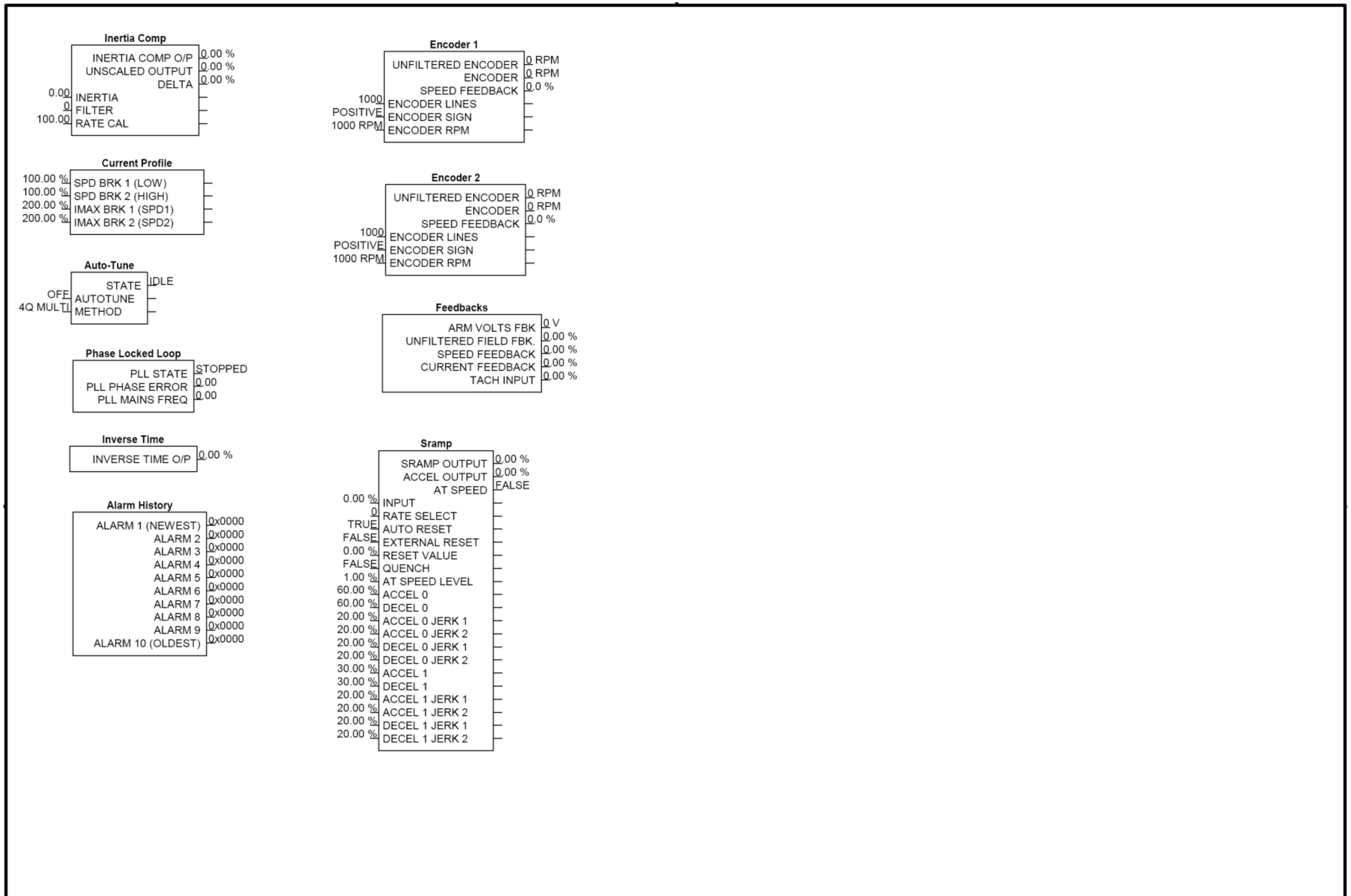


Programming Block Diagram - Sheet 1



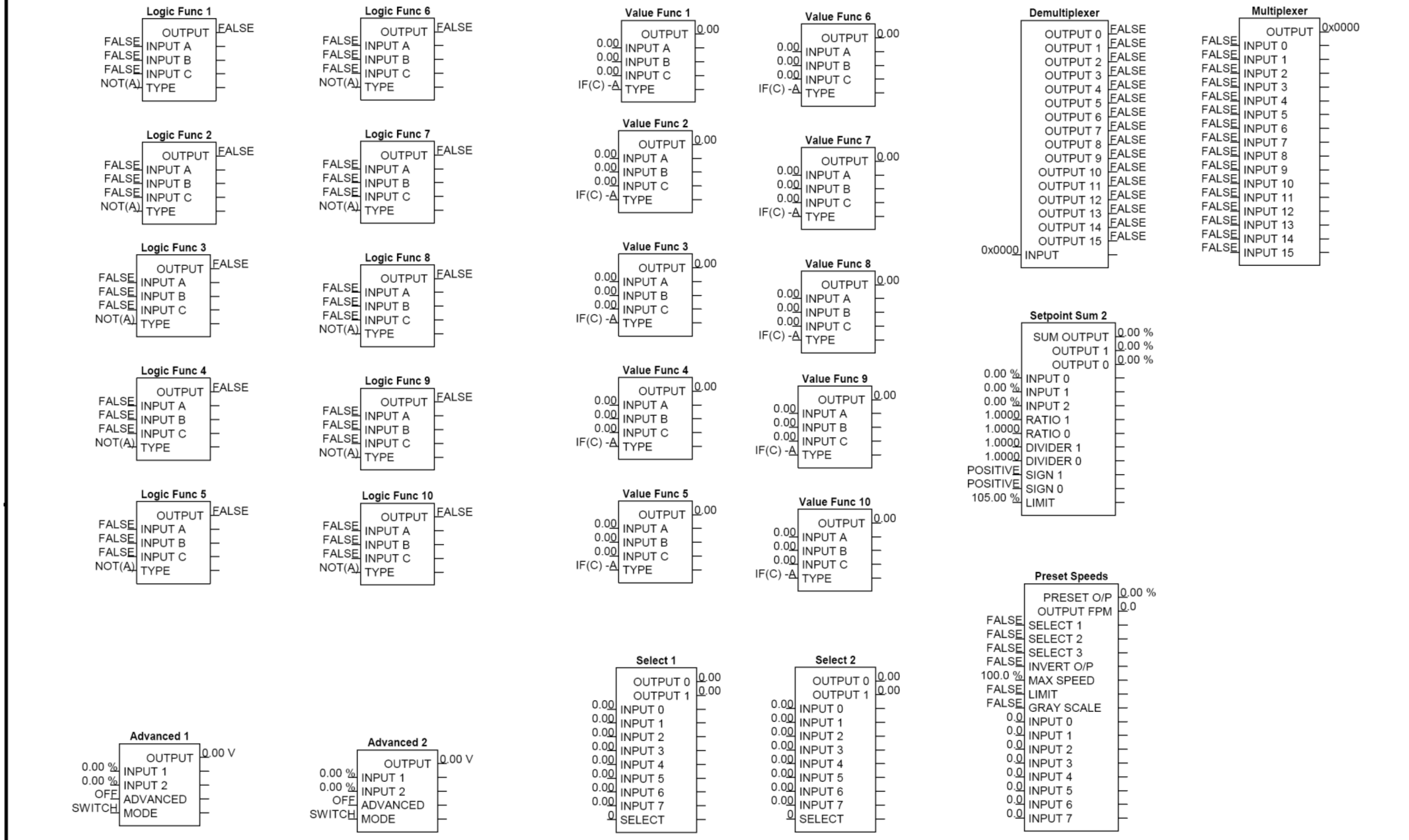
Configuration for version 8.x 590 Plus drive.

Programming Block Diagram - Sheet 2



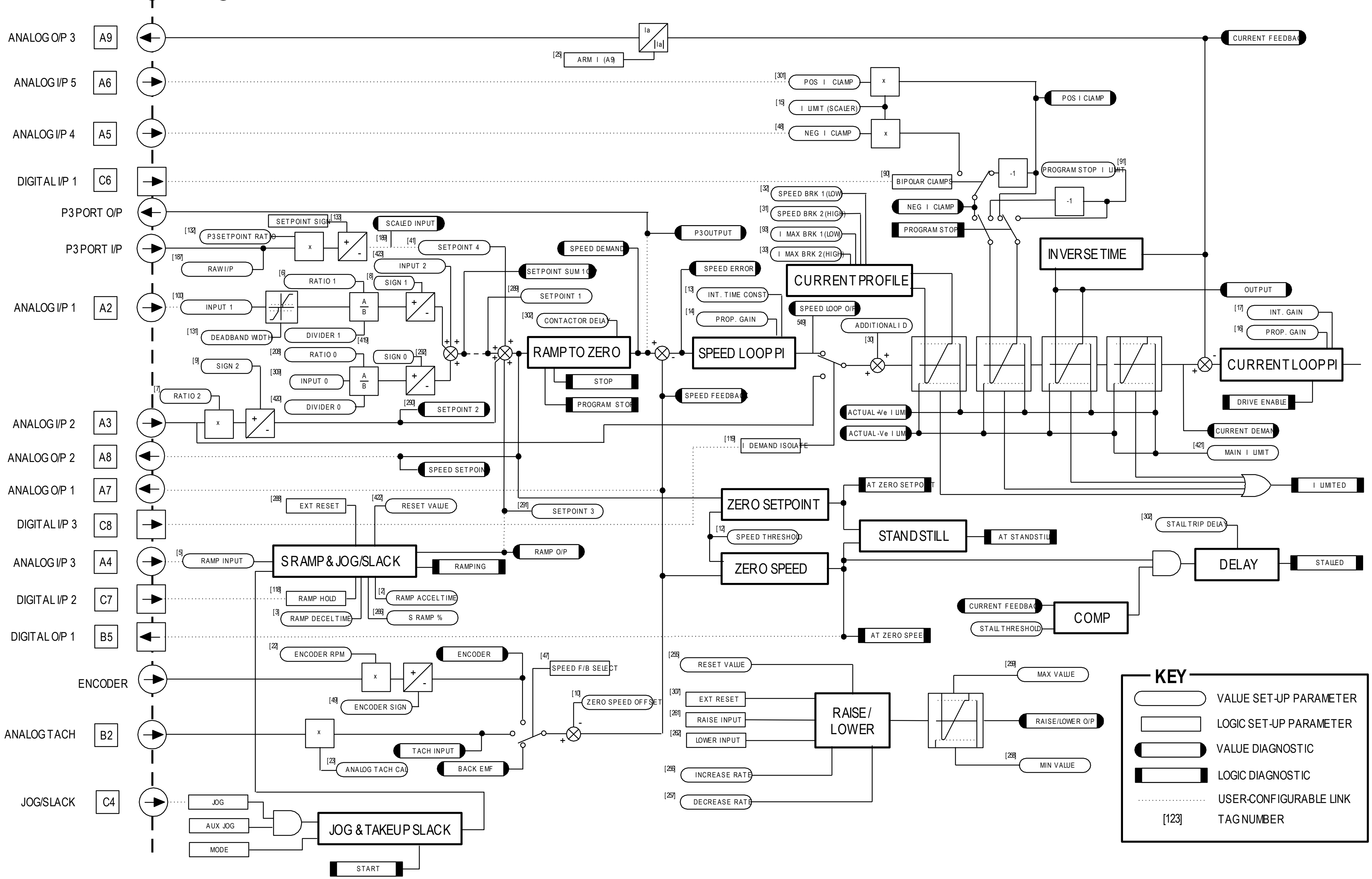
Configuration for version 8.x 590 Plus drive.

Programming Block Diagram - Sheet 3

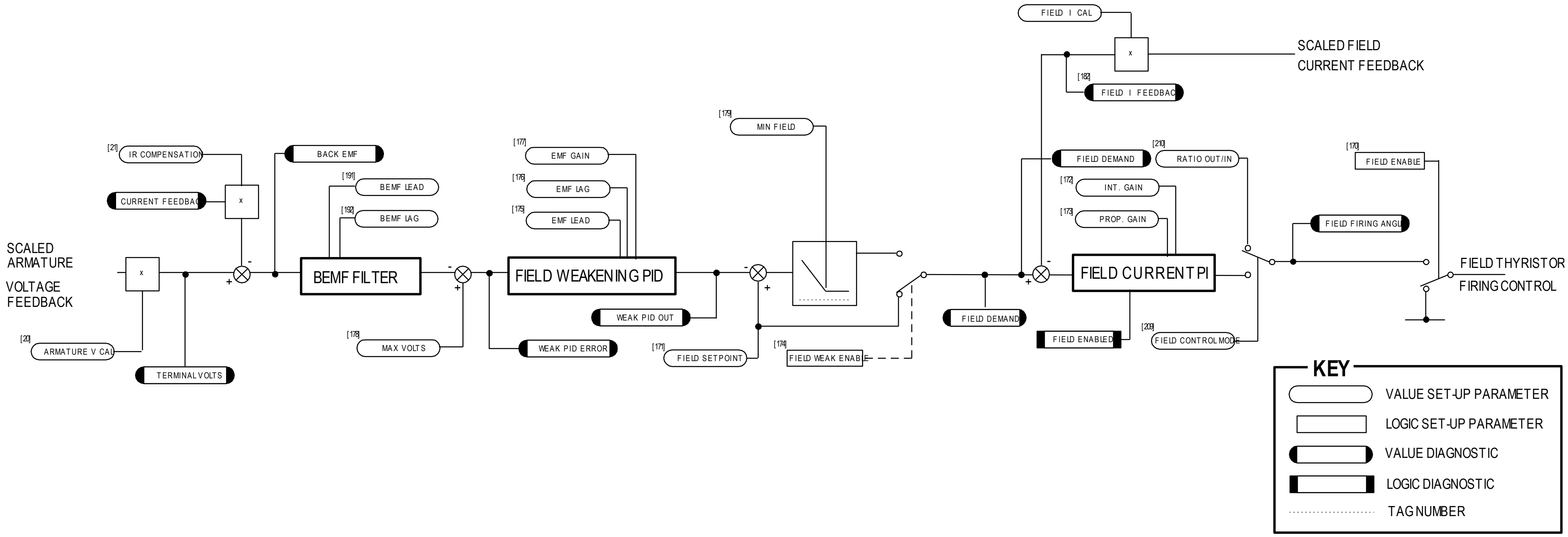


Configuration for version 8.x 590 Plus drive.

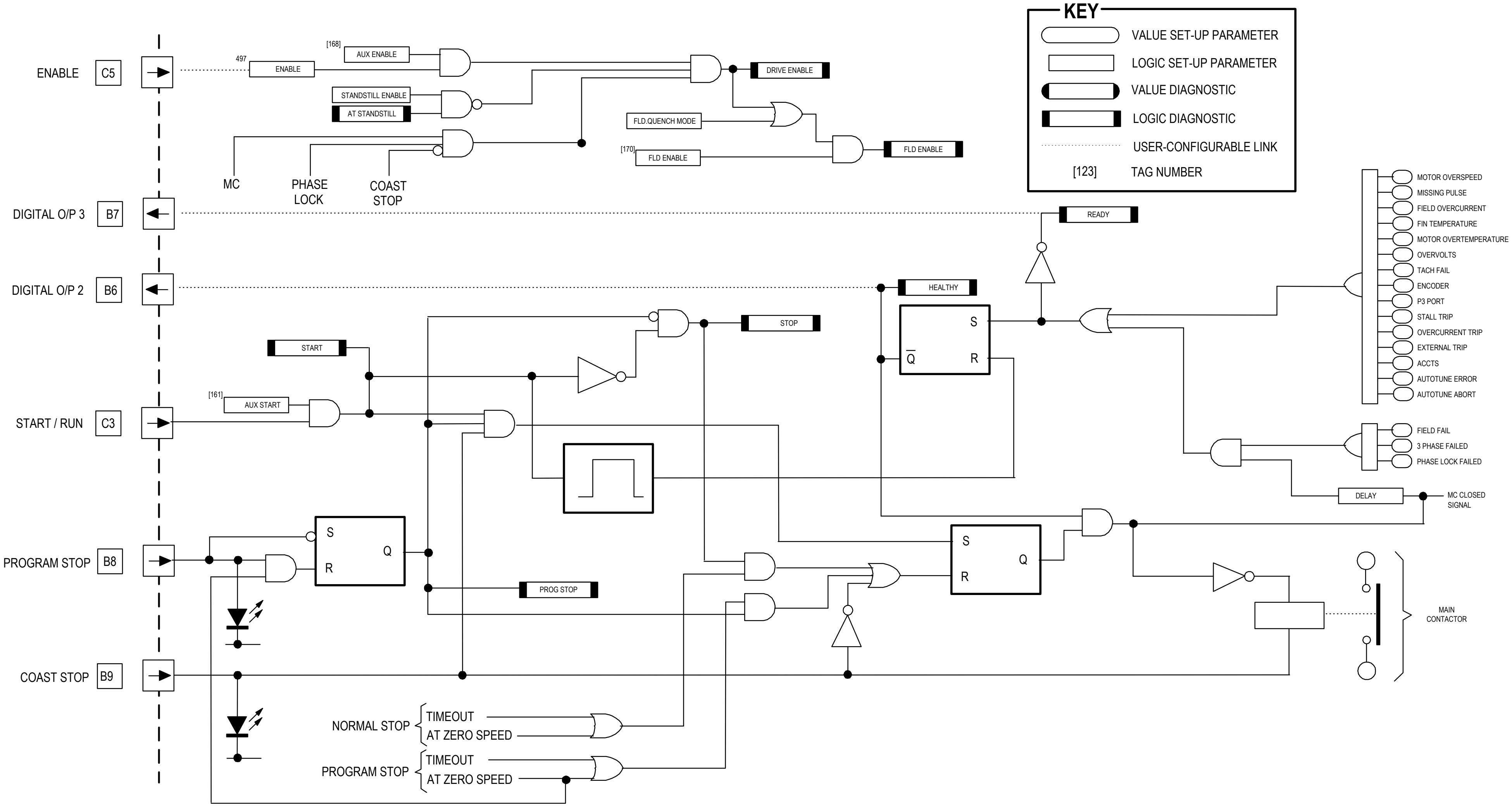
Programming Block Diagram - Sheet 4



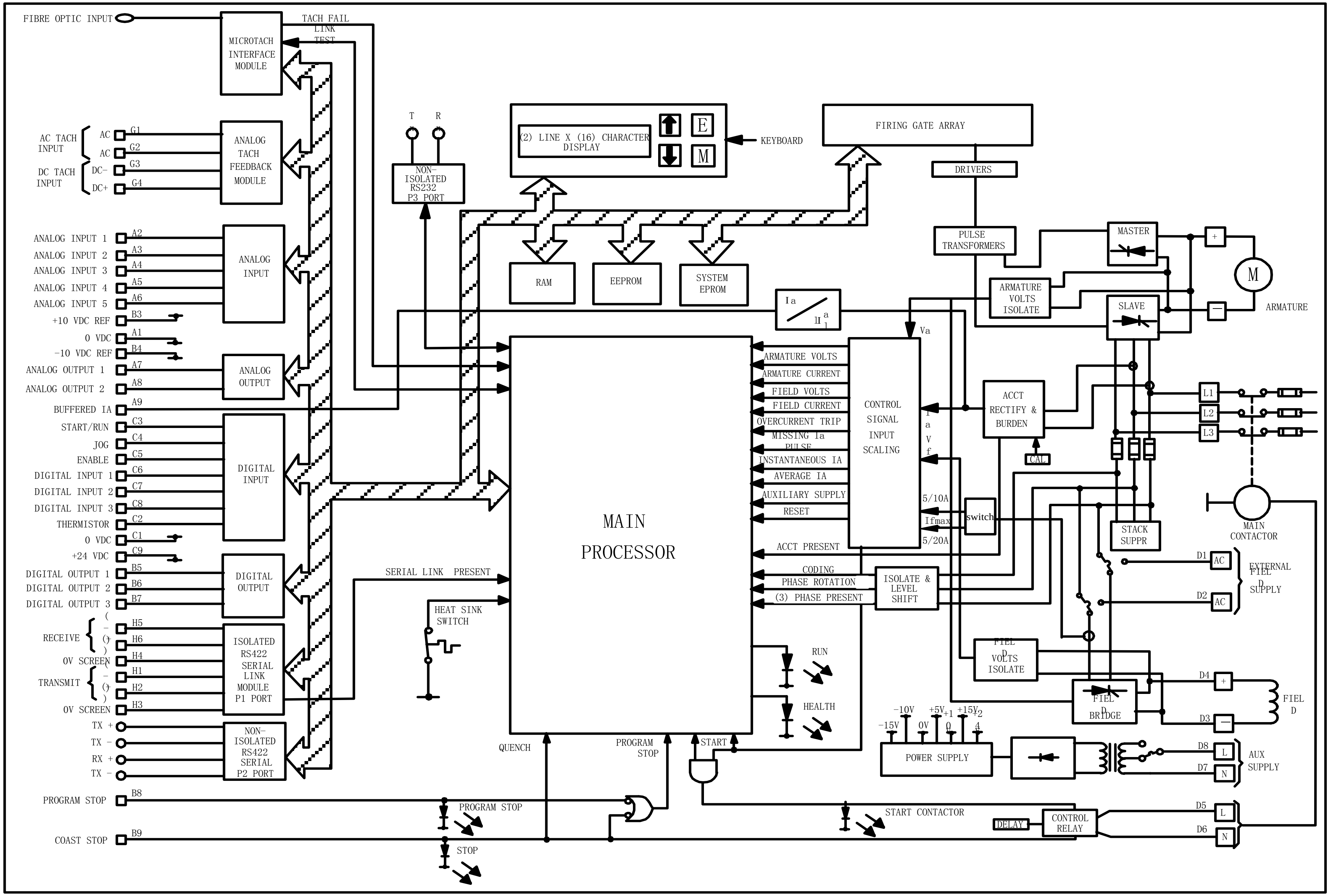
Main Block Diagram



Field Control Block Diagram



Start/Healthy Logic Block Diagram



Functional Block Diagram

Appendix E

Technical Specifications

Understanding the Product Code

- **Model Number**

Technical Specifications

Understanding the Product Code

Model Number

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.

Product Coding Scheme

590PR Series 110V-500V 3 phase

	Block 1		Block 2					Block 3			Block4	
Example	590PR	-	23	2200	1	0	-	P	00	-	U	0

Family		Code
	590PR Series DC Digital Drive-regen	590PR
	591PR Series DC Digital Drive-non-regen	591PR

	Supply Voltage	Output Current(A)	Frame Size	Code		
Current/Power Ratings	110-220V 3ph	20	1	23	2200	1
		35	1		2350	1
		45	1		2450	1
		75	2		2750	2
		110	2		3110	2
		165	2		3165	2
	220-500V 3ph	20	1	53	2200	1
		35	1		2350	1
		45	1		2450	1
		75	2		2750	2
		110	2		3110	2
		165	2		3165	2
Auxiliary supply	Universal 110V-240V 50-60Hz 1ph					0

		Code
Mechanical Type	Panel Mounting	P
Special Options	None	00
Language	Universal	U
Keypad	None	0
	6901 keypad fitted	4

Technical Specifications

Environmental Details

Operating Temperature	Frame 1 : 0°C to +45°C Frame 2 : 0°C to +40°C Operating temperature is defined as the ambient temperature to the immediate surround of the Drive, when the Drive and other equipment adjacent to it is operating at worst case conditions. Output current values should be derated at 1% per degree Centigrade above rated temperature up to a maximum of 55°C.
Storage Temperature	-25°C to +55°C
Shipping Temperature	-25°C to +70 °C
Product Enclosure Rating	IP20 UL Open Type (North America/Canada) If the product enclosure is totally enclosed, the exposed metal surface dissipates approximately 50W/m² for a 10°C temperature rise of internal air above ambient.
Vibration	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
Altitude	If >500 metres (1650 feet) above sea level, derate Motor Power rating by 1% per 200 metres (660 feet) to a maximum of 2,000 metres (6,561 feet),3000m for products operating on supplies ≤240VAC
Humidity	Maximum 85% relative humidity at 40°C non-condensing
Atmosphere	Non flammable, non corrosive and dust free
Climatic Conditions	Class 3C3, as defined by EN60721-3-3 (1995)
Safety	
Europe	EN61800-5-1 : 2007, 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

Electrical Ratings - Power Circuit

Refer to Chapter 3: "Earth Fault Monitoring Systems" for circuit breaker details.
Motor HP ratings as NEC Table 430-247: "Full Load Current in Amperes, DC Motors
The ratings assume that the armature discontinuous current level is at or below the armature average current rating.

Surrounding Air Temp.	Output Current @ 150% and 200% * (A)	Output Current @ 100% Continuous * (A)F	Motor HP @ 500V dc (HP)	Internal Field Current supply (A)[1]	Total Losses @ Full Load (W)	Symmetrical Fault Current rms (kA)
45℃	20	20	7.5	5/10[2]	57	5
45℃	20	20	10	5/10[2]	57	5
45℃	35	35	15	5/10[2]	57	5
45℃	35	35	20	5/10[2]	117	5
45℃	45	45	25	5/10[2]	132	5
40℃	75	75	30	5/20[3]	234	5
40℃	75	75	40	5/20[3]	234	5
40℃	110	110	50	5/20[3]	354	10
40℃	110	110	60	5/20[3]	354	10
40℃	165	165	75	5/20[3]	519	10
40℃	165	165	100	5/20[3]	519	10

See section 4 for the internal field / external field current setting

- **The output current is given at 100% continuous(no overload), and with overload 150% for 30s or 200% for 10s.**

1. Field current range switch (SW1) has been provided on power board for improved resolution at low field current
2. The maximum externally supplied field current is 15A for Frame1 but requires de-rating of the armature output current (amp for amp) above 10A, and only apply for operation at or below 35°C ambient.
3. The maximum externally supplied field current is 20A for Frame2.

EMC Compliance

All models	European Community Directive 2014/30/EU
All models	EN61800-3 (2004+A1:2012) Table 17: conducted emissions when installed in accordance with the instructions in Chapter 3. Refer to "Mounting the Drive". EN61800-3 (2004+A1:2012) 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+A1:2012) Table 18 Radiated emissions
If fitted with specified external filters	EN61800-3 (2004+A1:2012) Table 14 C2: conducted emissions

Power Supply Details

3-Phase Supply	**LV Build**	All Frames	110-220V ac ±10%, 50/60Hz ± 5%, line-to-line, ground referenced (TN) and non-ground referenced (IT)
	MV Build(standard)	All Frames	220-500V ac ±10%, 50/60Hz ± 5%, line-to-line, ground referenced (TN) and non-ground referenced (IT)
Supply Current		Supply current due to armature = (0.9 x Idc) A ac rms. Total ac rms current including motor field current is listed below.	
Frame 1		20A unit: 23.5A; 35A unit: 36.5A; 45A unit: 45.0A	
Frame 2		75A unit: 76.5A; 110A unit: 107.5A; 165A unit: 156.5A	
Field Supply Current		(1 x Idc) Amps ac rms (build related)	
Field Supply Voltage		Build-related, Internally derived from L1 and L2 phases. When externally supplied - Max. 1-phase 500V line-to-line, phase aligned to the armature L1-L2 supply.	
3 Phase Input		3-phase rotation insensitive, no adjustment necessary for frequency change	

Auxiliary Power Supply Details

Auxiliary Supply	110-240V ±10%, 50-60Hz ±10%, single phase, Overvoltage Category II
Auxiliary Supply Current	3A ac rms maximum. Nominal current used for power supplies: 0.5A at 110V ac, 0.25A at 240V ac The remainder is available for driving the AC Contactor.
Contactor Output	3A maximum at the auxiliary voltage

AC Line Choke (Frames 1-2)

To correctly isolate the DC590PR drive from the ac power system, and to protect other equipment from transients on the power system, always use the recommended external ac line choke (or alternatively a transformer may achieve the necessary isolation).

Drives below 100A Armature Current rating cannot achieve conformance with EN61800-3 Table 17 using only a 50µH line choke. Capacitors must be fitted between phase and earth to achieve conformance. Refer to Chapter 3: "Installing the Drive" - Filtering.

Armature Current Rating (A)	AC Rating (A)	Inductance (µH)	Parker Part No.	
		500Vac	**500Vac**	
For use without filters (use with capacitors for armature currents <100A, refer to Chapter 3: "AC Line Choke")				
Frame 1				
20	23.5	50 µH	CO466448U040	-
35	36.5		CO466448U040	-
45	45		CO466448U070	-
Frame 2				
75	76.5	50 µH	CO466448U110	-
110	107.5		CO466448U110	-
165	156.5		CO466448U165	-
AC Line Chokes @ 2% line impedance for conformance with EN61800-3 (2004) +A1:2012 Table 14 Category C2 when used with specified filters.				
Frame 1				
20	23.5	424 µH	CO466449U040	-
35	36.5		CO466449U040	
45	45	242 µH	CO466449U070	-
Frame 2				
75	76.5	154 µH	CO466449U110	-
110	107.5		CO466449U110	-
165	156.5	113 µH	CO466449U165	-

External AC Supply (RFI) Filters

Filters must only be fitted on the mains side of the contactor.

AC supply filter part numbers for conformance with EN61800-3 (2004) Table 14 Category C2.

Armature Current Rating (A)	Total Filter Watt Loss (W)	Parker Filter Part No.
Frame 1		
20	11	1 off CO467844U040
35	16	1 off CO467844U040
45	16	1 off CO467844U070
Frame 2		
75	16	1 off CO467844U110
110	18	1 off CO467844U110
165	25	1 off CO467844U165

External Power Semiconductor Protection Fuses (Frames 1-2)

For fuses where compliance to UL Standards are required, refer to Appendix B: "Certification" – Branch Circuit/Short Circuit Protection Requirements.

Controller Rating (A)	Line Fuse Rating (A)	Mersen / Bussmann Part No. or equivalent*	Fuse I^2t @ 500V I^2t (A^2s) (cold)	Thyristor I^2t (kA^2s)
Frame 1				
20	35	A7OQS35-4 /170M1562D	0.47	0.94
35	40	A7OQS40-4/ 170M1563D	0.58	0.94
45	60	A7OQS50-4/ 170M1564D	0.86	7.87
Frame 2				
75	80	A7OQS80-4/ 170M1566D	2.7	7.87
110	125	A7OQS125-4/170M3813D	6.9	7.87
165	175	A7OQS175-4/170M1569D	16.5	17.7

* Other semiconductor fuses may be used with the controller provided that the voltage, ampere and I^2t ratings shown above are not exceeded

Earthing/Safety Details

Protective Earth	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 made in two ways: 1. By using a copper conductor of at least 10mm² cross-sectional area. 2. By using a second conductor, through separate terminals electrically parallel to the protective conductor. Note: **Each conductor itself must meet the local requirements for a protective earth conductor.**
Input Supply Details (TN) and (IT)	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.
Earth Leakage Current	>10mA (all models)

Power Supply Fuses

Power Board	Identification	Fuse Rating	Parker Part No.
Frame 1			
AH860021	FS1, 5x20mm glass slow-blow (for auxiliary supply, contactor)	3A	CH540033
Frame 2			
AH860021	FS1, 5x20mm glass slow-blow (for auxiliary supply, contactor, fan supply)	3A	CH540033

Motor Field Fuses

Identification	Fuse Rating	Parker Part No.
Frames 1		
10x38mm	10A	CS470407U010
Frames 2		
10x38mm	20A	CS470407U020

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.

Digital Input	Rated Voltage: • Off Region • Transition Region • On Region Input Impedance Sample Interval Debounce Period Encoder Mode (Digital Input 1 & 2): • SPACE Region • Transition Region • MARK Region Maximum Clock Frequency	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 5V logic -3V to +0.5V +0.5V to +3V +3V to +30V 100kHz
Digital Output 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.	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	Nominally +24V dc 5ms Negligible up to 50mA load Source +100mA maximum source None Indefinite short circuit protection provided Automatic Protected against current-limited reverse voltage sources (<100mA) <30V dc <0.4mA sourcing
Analog Input	Input Resolution Input Impedance Input Impedance Limit Sample Interval Hardware Latency Overload Capability	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 Calibration Option Card only.

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.

Analog Output	Output Resolution Output Drive Capacity Update Interval Settling Time Output Overdrive Capability Overload Protection	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

Terminal Information - Power Board (Frames 1-2)

Terminal Description	Terminal Function	Signal Level	Terminal Number
Mains Supply L1	Three phase mains power input, phase reference Line 1	Refer to Power Supply Details, page 56.	L1
Mains Supply L2	Three phase mains power input, phase reference Line 2	Refer to Power Supply Details, page 56.	L2
Mains Supply L3	Three phase mains power input, phase reference Line 3	Refer to Power Supply Details, page 56.	L3
Armature connection positive A+	Drive dc power output, reference Armature Positive connection to dc motor	Maximum voltage dependent upon the supply voltage, the ratio being: Vout is approximately equal to 1.15Vac supply	A+

Terminal Information - Power Board (Frames 1-2)

Terminal Description	Terminal Function	Signal Level	Terminal Number
Armature connection negative A-	Drive dc power output, reference Armature Negative connection to dc motor	Maximum voltage dependent upon the supply voltage, the ratio being: Vout is approximately equal to 1.15Vac supply	A-
External field supply FL1	External single phase ac Line 1 input to field bridge.	500V ac maximum, 50-60Hz line-to-line	FL1
External field supply FL2	External single phase ac Line 2 input to field bridge. Required AC Input Voltage = 1.11 x Nominal DC Output. The field regulator will control the field current provided that the Nominal DC Output voltage exceeds the field voltage by at least 10%. i.e. $V_{AC} = 1.11 \times V_{DC}$ and $V_{DC} = 1.1 \times V_{FIELD}$ therefore $V_{AC} = 1.22 \times V_{FIELD}$ The external AC supply must be fitted with high speed fuses to protect the field regulator. For controllers with 10A (Frame 1) or 20A (Frame 2) field capability 10A or 20A fuses should be used. *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 FL1, and L2 to FL2.*	500V ac maximum, 50-60Hz line-to-line	FL2

Terminal Information - Power Board (Frames 1-2)

Terminal Description	Terminal Function	Signal Level	Terminal Number
Field Output F-	DC supply for motor field connections. The DC output voltage at these terminals will depend upon the AC supply voltage and the mode of field control. ***Voltage Control*** 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:- $\mathrm{Vdc} = \frac{\mathrm{Vratio\ x\ VAC}}{100}$ 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.	0.9 x Vac	F–
Field Output F+	DC supply for motor field connections.	0.9 x Vac	F+
Auxiliary supply AL1	Line	110-240V 50-60Hz line-to-line	AL1
Auxiliary supply AL2	Neutral These terminals are the mains input connections for the switch mode power supply and contactor control relay supply. Refer to the Product Code (Block 8) for the specified auxiliary voltage.	110-240V 50-60Hz line-to-line	AL2

Terminal Information - Power Board (Frames 1-2)

Terminal Description	Terminal Function	Signal Level	Terminal Number
Main contactor coil CL1	Line 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. *Note: When using a Slave Relay, the contacts of the Contactor Control Relay are internally suppressed by a series connected resistor (680 Ohms) and capacitor (33µF) to protect the relay contacts. Users should be aware that when the Contactor Control Relay is "De-energised", a leakage current of approximately 2mA @ 220V can be expected and this should be considered when interfacing to these terminals. Typically, there could be the energisation of very sensitive relays.*	Auxiliary Supply Voltage	CL1
Main contactor coil CL2	Neutral This terminal is internally connected to the auxiliary supply neutral and provides a convenient connection point for the contactor coil neutral connection.	Auxiliary Supply Voltage	CL2

Terminal Information - Power Board (Frames 1-2)

Terminal Description	Terminal Function	Signal Level	Terminal Number
Thermistor TH1	Isolated Thermistor Input - positive 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. The controller complies with the requirements of IEC 34-11-2-2 and is suitable for use with Mark A detectors. 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 4kΩ. The preferred installation is for three detectors to be connected in series between terminals Th1 and Th2. The 590+ will indicate a motor overtemperature alarm if the external resistance between Th1 and Th2 exceeds 3kΩ. The alarm can be reset when the resistance falls below 750Ω. Terminals Th1 and Th2 must be jumped if overtemperature sensors are not used.	See description	MOTOR THERMISTOR TH1
Thermistor TH2	Isolated Thermistor Input - negative See description above	See description	TH2
PE	Protective ground – incoming ground	-	THREADED INSERT
PE	Protective ground – motor ground	-	THREADED INSERT

Terminal Information – Control Board

This Control Board is common to all 590PR units.

Terminal Description	Terminal Function	Signal Level	Configurable	Terminal Number
TERMINAL BLOCK A				
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 = 200% Positive current demand -10V = 200% Reverse current clamp	YES	A5

Terminal Information – Control Board

This Control Board is common to all 590PR 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.	Bipolar Mode +10V = 200% output current forward. -10V = 200% output current reverse. Unipolar Mode +10V = 200% output current.	NO	A9
TERMINAL BLOCK 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

Terminal Information – Control Board

This Control Board is common to all 590PR units.

Terminal Description	Terminal Function	Signal Level	Configurable	Terminal Number
-10V DC Reference	User -10V Reference	-10V at 10mA short circuit protected	YES	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 (100mA maximum)	YES	B5
Digital Output 2	Drive Healthy (Drive Operational) This output is true when the controller is Healthy.	+24V when Healthy (100mA maximum)	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 (100mA maximum)	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 BLOCK C				
0V (Signal)	Zero Volt Reference	0V	N/A	C1

Terminal Information – Control Board

This Control Board is common to all 590PR units.

Terminal Description	Terminal Function	Signal Level	Configurable	Terminal Number
External Trip Input	An external interlock or permissive.	External permissive element should be connected to C1 to run. If not using this feature, connect a jumper between C1 and C2. May be used as an unisolated motor thermal input	NO	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 Threshold + 16V	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 Threshold +16V	YES	C4
Enable Input	Enable 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.	+24V = True/Enable 0V = False/Inhibit Threshold +16V	YES	C5

Terminal Information – Control Board

This Control Board is common to all 590PR units.

Terminal Description	Terminal Function	Signal Level	Configurable	Terminal Number
Digital Input 1	Current Clamp Select 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.	+24V = True/Bipolar Clamp 0V = False/Unipolar Clamp Threshold +16V	YES	C6
Digital Input 2	Ramp Hold 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. Access encoder mode set-up & output parameters via the ENCODER 2 function block.	+24V = True/Hold 0V = False/Ramp Threshold + 16V Encoder CLK/DIRECTION Mode: CLOCK INPUT +5V to +24V = MARK 0V = SPACE	YES	C7
Digital Input 3	Current Demand Isolate 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. Access encoder mode set-up & output parameters via the ENCODER 2 function block.	+24V = True/Current 0V = False/Speed Threshold + 16V Encoder CLK/DIRECTION Mode: DIRECTION INPUT +5V to +24V, or 0V	YES	C8

Terminal Information – Control Board

This Control Board is common to all 590PR units.

Terminal Description	Terminal Function	Signal Level	Configurable	Terminal Number
+24V Supply	+24V	Maximum output current: 200mA Note that the maximum combined consumption for digital outputs 1, 2 & 3 and C9 should not exceed 300mA. Some typical loads are given below: Relays : 50mA each DeviceNetTechnology Box : 50mA	N/A	C9

Terminal Information – Option Boards

Terminal Description	Terminal Function	Signal Level	Terminal Number
TERMINAL BLOCK G (SWITCHABLE TACHO CALIBRATION OPTION)			
AC Tacho input	AC		G1
AC Tacho input	AC		G2
+ DC Tacho input	+DC		G3
- DC Tacho input	-DC		G4
Tacho Out	Calibrated Tacho Output		P3
TERMINAL BLOCK G (ENCODER OPTION)			
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.			
TECHNOLOGY BOX OPTION (SERIAL COMMUNICATIONS)			

Terminal Information – Option Boards

Terminal Description	Terminal Function	Signal Level	Terminal Number
Refer to the Technical Manual supplied with the option for details.			

Wiring Requirements for EMC Compliance

Where shielded/armoured cables are specified, use "SY" or "CY" type cables for better performance.

	Power Supply Wire	Motor Wire	External Filter to Drive Wire	Signal/Control Wire
Wire Type (for EMC Compliance)	Unshielded	Unscreened	Replace flying leads with shielded/armoured when >0.6m	Shielded
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
Shield to Ground Connection		Both ends	Both ends	Drive end only

Wire Sizes and Termination Tightening Torques (Frames 1-2)

- Power cables must have a minimum rating of 1.1 x full load current - EUROPE
- Control wiring must have a minimum cross-section area of 0.75mm^2 (18AWG)

Terminations	Maximum Tightening Torque	UL		EUROPE
		Recommended Wire Size	Maximum Terminal Aperture Size (AWG)	Maximum Terminal Aperture Size (mm^2)
All Units				
A1 – A9, B1 – B9, C1 – C9	0.22Nm (1.95 lb-in.)	14 AWG	14	1.5
AL1,AL2,CL1,CL2, TH1, TH2	0.5Nm (4.4 lb-in)	14 AWG	12	2.5
Frame 1				
20A UNITS				
A+, A-	15 Nm (11 lb-ft)	10 AWG	N/A	N/A
L1, L2, L3	15 Nm (11 lb-ft)	10 AWG	N/A	N/A
Grounding Point	8 Nm (6 lb-ft)	10 AWG	N/A	N/A
F+, F-	0.5Nm (4.4 lb-in)	12 AWG	12	2.5
35A UNITS				
A+, A-	15 Nm (11 lb-ft)	8 AWG	N/A	N/A
L1, L2, L3	15 Nm (11 lb-ft)	8 AWG	N/A	N/A
Grounding Point	8 Nm (6 lb-ft)	10 AWG	N/A	N/A
F+, F-	0.5Nm (4.4 lb-in)	12 AWG	12	2.5
45A UNITS				
A+, A-	15 Nm (11 lb-ft)	6 AWG	N/A	N/A
L1, L2, L3	15 Nm (11 lb-ft)	6 AWG	N/A	N/A
Grounding terminal	8 Nm (6 lb-ft)	10 AWG	N/A	N/A
F+, F-	0.5Nm (4.4 lb-in)	12 AWG	12	2.5
Frame 2				
75A UNITS				
A+, A-	15 Nm (11 lb-ft)	3 AWG	N/A	N/A
L1, L2, L3	15 Nm (11 lb-ft)	3 AWG	N/A	N/A
Grounding terminal	8 Nm (6 lb-ft)	8 AWG	N/A	N/A
F+, F-	0.5Nm (4.4 lb-in)	12 AWG	12	2.5
110A UNITS				

Wire Sizes and Termination Tightening Torques (Frames 1-2)

- Power cables must have a minimum rating of 1.1 x full load current - EUROPE
- Control wiring must have a minimum cross-section area of 0.75mm^2 (18AWG)

Terminations	Maximum Tightening Torque	UL		EUROPE
		Recommended Wire Size	Maximum Terminal Aperture Size (AWG)	Maximum Terminal Aperture Size (mm^2)
A+, A-	15 Nm (11 lb-ft)	1/0 AWG	N/A	N/A
L1, L2, L3	15 Nm (11 lb-ft)	1/0 AWG	N/A	N/A
Grounding terminal	8 Nm (6 lb-ft)	6 AWG	N/A	N/A
F+, F-	0.5Nm (4.4 lb-in)	12 AWG	12	2.5

Wire Sizes and Termination Tightening Torques (Frames 1-2)

- Power cables must have a minimum rating of 1.1 x full load current - EUROPE
- Control wiring must have a minimum cross-section area of 0.75mm^2 (18AWG)

Terminations	Maximum Tightening Torque	UL		EUROPE
		Recommended Wire Size	**Maximum Terminal Aperture Size (AWG)**	**Maximum Terminal Aperture Size (mm^2)**
165A UNITS				
A+, A-	15 Nm (11 lb-ft)	4/0 AWG	N/A	N/A
L1, L2, L3	15 Nm (11 lb-ft)	3/0 AWG	N/A	N/A
Grounding terminal	8 Nm (6 lb-ft)	6 AWG	N/A	N/A
F+, F-	0.5Nm (4.4 lb-in)	12 AWG	12	2.5

Cooling Fans

Output Current (armature) (A)	Maximum Rating Ambient (°C)	Cooling Method	Number of Fans	Fan Power Rating 110/120V ac	Fan Power Rating 220/240V ac
Frame 1					
20	45	no fan	N/A	N/A	N/A
35	45	no fan	N/A	N/A	N/A
45	45	no fan	N/A	N/A	N/A
Frame 2					
75	40	Integral Fan (24V dc)	1 (internal)	N/A	N/A
110	40	Integral Fan (24V dc)	1 (internal)	N/A	N/A
165	40	Integral Fan (24V dc)	1 (internal)	N/A	N/A

Spares List (Frames 1-2)

Common Spares

Control Board			LED Board	Ribbon Cable
Software Version	Part Number	Status *		
10.x	AH860023U001	CURRENT	-	-

** Do not attempt to upgrade by fitting a later software version Control Board. You may experience hardware compatibility problems. If in doubt, contact Parker.*

Frame 1-2

Product	Power Board	Terminal Board	*Armature Thyristor*	Field Bridge	Fan	Fan Assy
591PR/0020/500/	AH860021U512	-	CF385522U016	LA860077	-	-
590PR/0020/500/	AH860021U514	-	CF385522U016	LA860077	-	-
591PR/0035/500/	AH860021U512	-	CF385522U016	LA860077	-	-
590PR/0035/500/	AH860021U514	-	CF385522U016	LA860077	-	-
591PR/0045/500/	AH860021U512	-	CF385524U016	LA860077	-	-
590PR/0045/500/	AH860021U514	-	CF385524U016	LA860077	-	-
591P/0075/500/	AH860021U512	-	CF385524U016	LA860077	DL860001	LA860042
590P/0075/500/	AH860021U514	-	CF385524U016	LA860077	DL860001	LA860042
591P/0110/500/	AH860021U512	-	CF385524U016	LA860077	DL860002	LA860041
590P/0110/500/	AH860021U514	-	CF385524U016	LA860077	DL860002	LA860041
591P/0165/500/	AH860021U512	-	CF385525U016	LA860077	DL860002	LA860041
590P/0165/500/	AH860021U514	-	CF485525U016	LA860077	DL860002	LA860041
591PR/0020/220/	AH860021U512	-	CF385522U016	LA860077	-	-
590PR/0020/220/	AH860021U514	-	CF385522U016	LA860077	-	-
591PR/0035/220/	AH860021U512	-	CF385522U016	LA860077	-	-
590PR/0035/220/	AH860021U514	-	CF385522U016	LA860077	-	-
591PR/0045/220/	AH860021U512	-	CF385524U016	LA860077	-	-
590PR/0045/220/	AH860021U514	-	CF385524U016	LA860077	-	-

Spares List (Frames 1-2)

591P/0075/220/	AH860021U512	-	CF385524U016	LA860077	DL860001	LA860042
590P/0075/220/	AH860021U514	-	CF385524U016	LA860077	DL860001	LA860042
591P/0110/220/	AH860021U512	-	CF385524U016	LA860077	DL860002	LA860041
590P/0110/220/	AH860021U514	-	CF385524U016	LA860077	DL860002	LA860041
591P/0165/220/	AH860021U512	-	CF385525U016	LA860077	DL860002	LA860041
590P/0165/220/	AH860021U514	-	CF485525U016	LA860077	DL860002	LA860041