Chapter 4

SETTING-UP AND COMMISSIONING

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DESCRIPTION

The 584S Frequency Inverters feature a Man-Machine Interface (MMI) panel, shown in Figure 4.1, comprising a 2x16 character liquid crystal display (LCD), ten function keys and four status LEDs. The LCD and function keys provide a means of tailoring the drive for individual application requirements, monitoring performance and basic operation of the drive. The status LEDs show the condition of the drive.

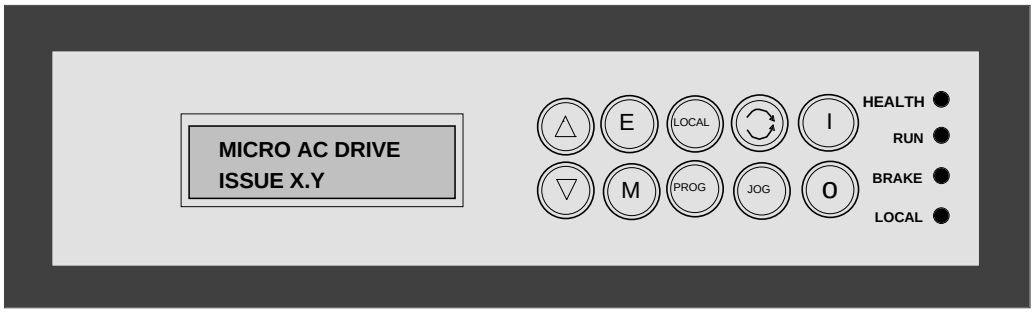


Figure 4.1 Man-Machine Interface

MAN-MACHINE INTERFACE

Since the setting up and commissioning procedures rely on the use of the MMI, its operation is described in the following sub-paragraphs. Users familiar with the MMI may proceed directly to "**SETTING-UP PROCEDURE**".

Display and Menu

The MMI display comprises two lines of plain text information to provide access to the various menu options and parameters. The top line contains the title of the current menu or parameter and the second contains either one of the options within the menu, or the value or status of the parameter. The basic operation of the MMI display and function keys is described in Figure 4.2.

Parameters and Diagnostics

In this chapter the names of parameters and diagnostics are presented in a different font to indicate that they appear on the MMI display, for example **`MOTOR I LIMIT`**.

User Reset

If during commissioning or at any time you wish to return the drive parameters to a known factory default, then follow this set sequence.

1. Remove power from the drive.
2 Wait till display disappears.
3 Reapply power with both the up arrow and down arrow key depressed.

Function Keys

The ten function keys allow the user to move around the menu structure on the display, alter parameters or manually control the drive. Each key is identified by a legend and is described in the following section:

MENU

The MENU select key allows the user to access the menu level or function indicated on the bottom line of the display. This key does not alter any of the stored drive parameters. This key will also allow the user to observe the actual frequency diagnostic while in LOCAL MODE. This diagnostic is only present while the key is depressed.

ESCAPE

The ESCAPE key allows the user to select the preceding menu level. It does not alter any of the stored drive parameters. The ESCAPE key always takes you back to the last point at which you were working.

UP

The UP key provides forward movement to explore the options available under any selected menu level. The selected menu is always given on the top line of the display. When a modifiable parameter is shown on the top line of the display the UP key will increment its value. In LOCAL MODE this key will increment the local setpoint unless its value is already MAX SPEED.

DOWN

The DOWN key provides backward movement to explore the options available under any selected menu level. The selected menu is always given on the top line of the display. When a modifiable parameter is shown on the top line of the display the DOWN key will decrement its value. In LOCAL MODE this key will decrement the local setpoint unless its value is already MIN SPEED.

LOCAL/REMOTE

This key will toggle between the normal operating mode (remote) and the local control mode (this can only happen when the drive is stopped). Control functionality is now with the operator station i.e. START, STOP, JOG and speed setpoint (REF) . Pressing the local button will place the LCD in a new separate MMI tree entry. Pressing the local/remote button to put the drive back into remote mode will place the LCD back at the original position in the standard tree (again only when the drive is stopped).

PROG

This button toggles between the local mode MMI display (if the local mode has been selected) and the normal MMI tree. This will allow the user to change parameters etc. while the drive is operating in this local mode. The toggle will always be between the last normal MMI entry and the new local MMI entry.

FORWARD/REVERSE

The FORWARD/REVERSE button will change the direction of motor rotation. The display will also change to indicate which direction is selected.

JOG

This button will run the drive at a speed determined by the JOG SPEED parameter and in the direction determined by the FORWARD/REVERSE selection. This function is only active while the button is depressed. After operating JOG the drive will be placed in a stopped mode.

START

This button will enable the drive in a similar manner to placing 24V on terminal 20 (note this action is latched). This button will only perform this function if the local mode has been selected.

STOP

This button will disable the drive in a similar manner to removing the 24V from terminal 20 (note this action is latched).This button will only perform this function if the local mode has been selected. Setpoint values will be maintained during stop.

Status LEDs

The status LEDs give instant diagnostic information on the condition of the drive. When the LEDs are lit they indicate:

HEALTH	The drive is powered up and there are no alarms present.
RUN	The run digital input is active and there are no alarms present. A flashing RUN LED indicates that the output current has exceeded the selected I*T threshold. The drive will trip if this condition persists. "**I*T ALARM**" in this chapter describes the I*T function in more detail.
BRAKE	The DC link voltage inside the drive has risen above the dynamic braking threshold. Chapter 3 "**DYNAMIC BRAKING**" describes this in more detail.
LOCAL	The drive is in local mode when illuminated.

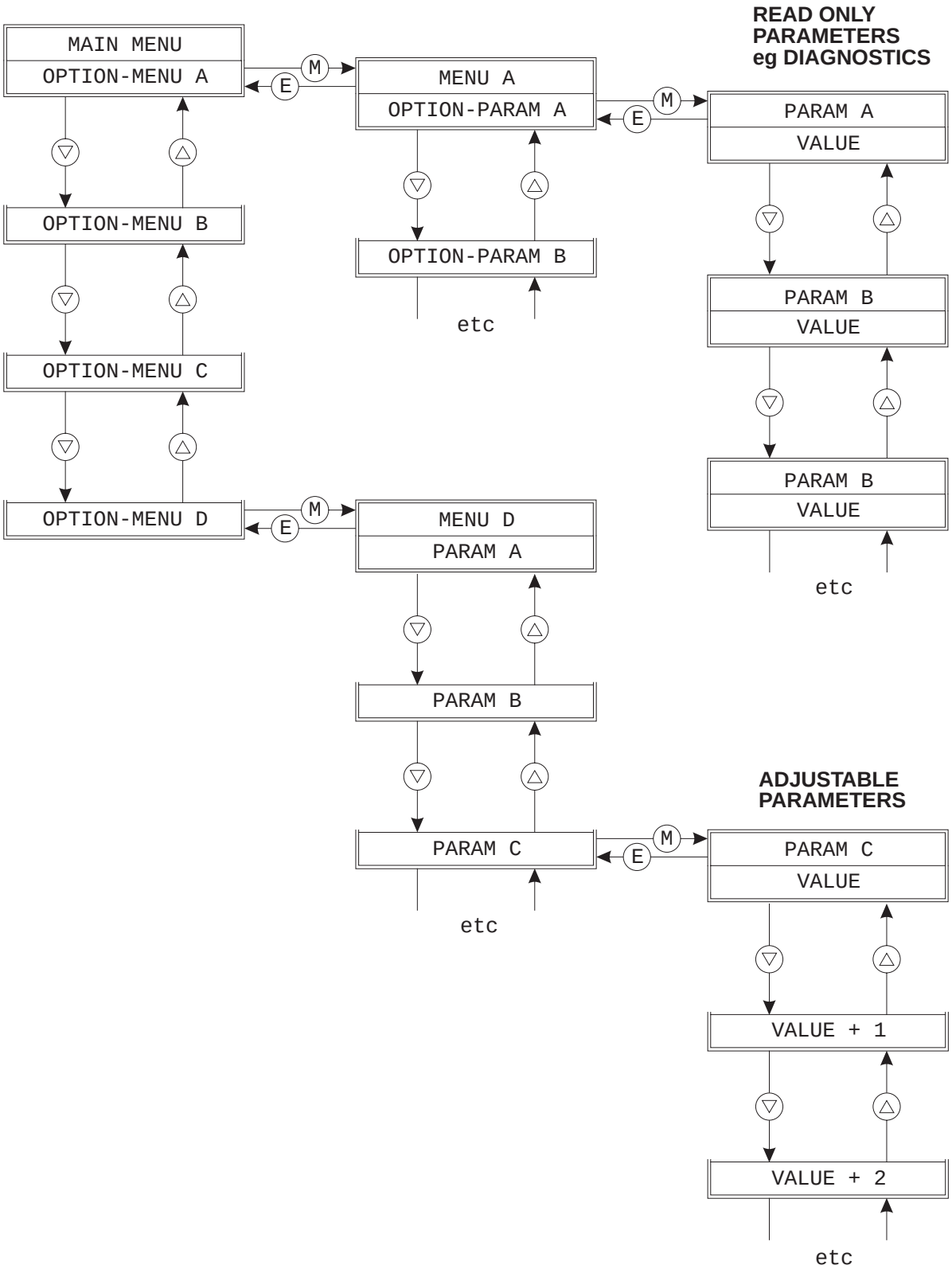


Figure 4.2 - Using the MMI

Menu Structure

The options available to the user from the main menu are given in Figure 4.3. These options are briefly described in the following paragraphs which include references for further details.

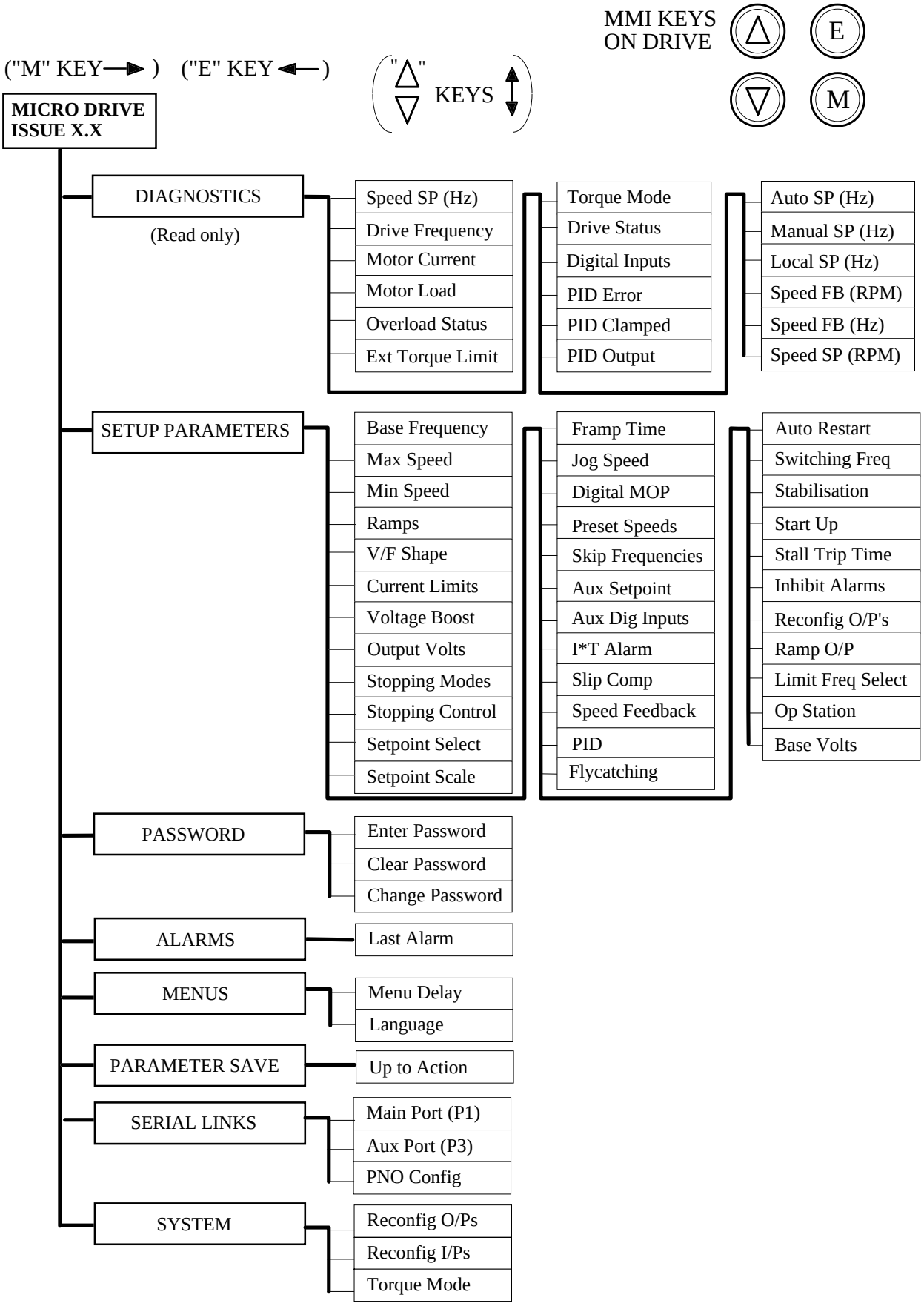


Figure 4.3 - Main Menu Options

Diagnostics

The DIAGNOSTIC option provides the user with access to read-only displays of various drive status parameters. Refer to Chapter 5 for further details.

Setup Parameters

The SETUP PARAMETERS option provides the user with the facility to adjust and set a large number of drive parameters. Refer to "**SETUP PARAMETERS**" in this chapter for further details.

Password

The PASSWORD option allows the user to protect the setup parameters from being changed by an unauthorised user. Procedures for setting and changing passwords are included in "**PASSWORD**" in this chapter.

Alarms

The ALARMS option provides the user with access to the last alarm message. If the drive trips, the MMI display immediately shows an alarm message indicating the reason for the trip. This message can be cleared using the ESCAPE (E) key, but can be redisplayed via the ALARMS menu. Possible alarm messages are explained in Chapter 5.

Menus

The MENUS option allows the user to select the language in which the text appears.

Parameter Save

The PARAMETER SAVE option enables the user to store the setup parameters after adjustment.

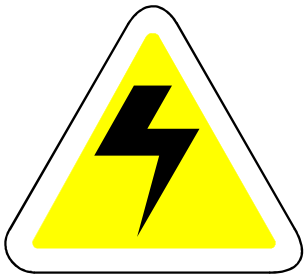
Serial Links

The SERIAL LINKS option allows access to the serial link setup parameters which are used to configure the RS232 port: AUX PORT P3 (fitted as standard), and the RS422/485 port: MAIN PORT P1 (fitted as an option). Further details are contained in Appendix B.

System

The SYSTEM option enables the user to set reconfigurable input and output control board connections as well as setting the torque mode. Refer to "**SYSTEM**" for further details.

SETTING-UP PROCEDURE



WARNING!

WAIT 5 MINUTES AFTER POWER IS DISCONNECTED BEFORE WORKING ON ANY PART OF THE SYSTEM OR REMOVING THE TERMINAL COVER FROM THE DRIVE

Before power is applied to the system the following items should be checked:

1) Mains power supply voltage is correct.

2) Motor is of correct voltage rating and is connected in either star or delta as appropriate.

3) All external wiring circuits; Power connections, Control connections, Motor connections, Earth connections.

   NOTE: Completely disconnect the drive before point to point checking with a buzzer or when checking insulation with a Meggar.

4) Check for damage to equipment.

5) Check for loose ends, clippings, drilling swarf, etc., lodged in the drive or ancillary equipment.

6) If possible check that the motor can be turned freely and that the cooling fan is intact and free of obstructions.

Next ensure the safety of the complete system when the drive is energised. In particular ensure:

1) That rotation of the motor in either direction will not cause damage.

2) That nobody else is working on another part of the equipment which will be affected by powering up.

3) That other equipment will not be adversely affected by powering up.

Prepare to energise the drive and system as follows:

1) Prevent application of the main power supply by removal of the supply fuses or isolate via supply circuit breaker.

2) Disconnect the load from the motor shaft, if possible.

3) If any of the drive control terminals are not being used then refer to Chapter 2, Table 2.5 to check whether these unused terminals need to be tied high or low.

4) Check external run contacts are open.

5) Check external speed setpoints are all zero.

6) The drive setup parameters, such as min/max speed, ramp times etc., all have factory default values. These values should be adequate for many applications, however it may be necessary to change some of the parameters to suit individual applications.

The most important parameters and their default values are listed in Table 4.1. Check that these are appropriate for your application before proceeding. If any changes are required to these parameters then this should be done when the drive has been powered up, but before the drive is enabled (ie. before the RUN input switch contacts are closed). Refer to "**SETUP PARAMETERS**" for a description of these parameters.

Table 4.1 - Important Setup Parameters and their Default Values

PARAMETER	DEFAULT	BRIEF DESCRIPTION
LIMIT FRQ SELECT	120Hz	Highest possible drive output frequency
BASE FREQUENCY	50Hz	Frequency at which drive gives max output volts
MIN SPEED	0Hz	Min motor speed
MAX SPEED	50Hz	Max motor speed
MOTOR I LIMIT	100%	Output current limit as % of drive rated current
OP CURRENT CAL	100%	Calibrates motor rated current to drive rated current
RAMP UP TIME 1	10.0s	Acceleration time from 0Hz to limit frequency
RAMP DOWN TIME 1	10.0s	Deceleration time from limit frequency to 0Hz
FIXED BOOST	0.0%	Boosts the starting torque by adding volts at low drive output frequencies
STOPPING MODE	RAMP	Ramp to standstill when RUN signal removed

POWER ON

Once all the preceding steps are completed and understood, the supply fuses or circuit breaker may be replaced and power applied to the drive. Although fairly general, the following assumes a single drive and motor configuration.

1) At switch on the diagnostic "HEALTH" LED should light. The remaining 3 LEDs should be off and the power-up message should appear on the MMI display as follows:

MICRO AC DRIVE
ISSUE X.YZ

2) If any of the basic drive parameters need to be changed then this should be done now. See "**MAN-MACHINE INTERFACE**" for a full explanation of how to use the MMI, and "**SET-UP PARAMETERS**" onwards for specific parameters.

3) Close the RUN contact and give the drive a small speed demand. The motor should rotate slowly.

4) If the motor rotates in the wrong direction either (a) swap two of the output phases M1/U, M2/V, M3/W or (b) operate the DIRECTION digital input terminal 22.

5) In applications where a high starting torque is required an increase in the **FIXED BOOST** parameter may be necessary. This parameter is described in "**SET-UP PARAMETERS**". Excessive boost may cause the drive to trip on overcurrent. Always use the minimum level of boost that allows the motor to start reliably.

6) If the motor current rating is smaller than the drive current rating then the **OP CURRENT CAL** parameter should be reduced to match the motor rating.

7) If several motors are connected to a single inverter then each motor should be protected with an appropriate overload device.

Caution

When power is removed from the product it must not be re-applied for a period of 30 seconds to allow the inrush limit circuit to operate correctly.

SETUP PARAMETERS

The **SETUP PARAMETERS** menu is entered in order to change default parameters and in order to make running performance adjustments. All the parameters are described in the following subparagraphs, although the order of presentation on the actual MMI may differ.

Caution

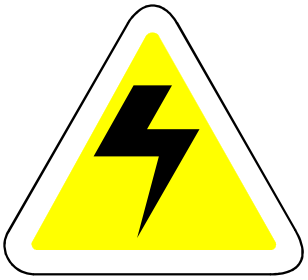
If your application requires operation above 120Hz with a special high speed motor then the **LIMIT FREQUENCY** parameter should be adjusted before any other parameters are changed. This is because **LIMIT FREQUENCY** affects the scaling of all frequency related parameters (**MIN SPEED, MAX SPEED, BASE FREQUENCY** etc). The default value for **LIMIT FREQUENCY** is 120Hz which covers the majority of applications for standard induction motors. This parameter is described in "**LIMIT FREQUENCY**".

Note: Users must remember to save parameters after any changes are made. See "**PARAMETER SAVE**" later in this chapter.

Base Frequency

The **BASE FREQUENCY** is the frequency at which the inverter produces maximum output voltage. This would be set at 50Hz or 60Hz for a standard motor. The range and default values are:

Range: **LIMIT FREQUENCY**/16 to **LIMIT FREQUENCY**
Default: 50Hz



WARNING!

The inverter output frequency can exceed the **MAX SPEED** parameter setting when using slip compensation feature or when using the PID output to trim the ramp output. This speed is clamped at 105% of the **MAX SPEED** parameter

Maximum and Minimum Speeds

MAX SPEED is the motor speed corresponding to maximum setpoint input. The maximum speed range and default values are:

Range: **MIN SPEED** to **LIMIT FREQUENCY**
Default: 50Hz

MIN SPEED is the motor speed corresponding to zero setpoint input. Range and default values are:

Range: 0Hz to **MAX SPEED**
Default: 0Hz

NOTE: The **MAX SPEED** and **MIN SPEED** parameters can affect the scaling of the analogue speed setpoint inputs (SPEED SETPOINT, + CURRENT LOOP and TRIM). Refer to Chapter 2, Table 2.5.

Ramps

The **RAMPS** option provides access to a number of ramp related parameters which control acceleration and deceleration characteristics. Ramp 2 times are only active if **FRAMP** parameter is configured as **2ND RAMP RATES (**see **RECONFIG I/Ps** parameter in the System menu) and terminal 21 is high. Parameter options include:

RAMP UP TIME 1

This is the time taken for the drive to ramp the frequency from 0Hz to **LIMIT FREQUENCY**.

Range: 0.1 to 3000 seconds.
Default: 10.0 seconds (up to 75kW) - 50.0 seconds (greater than 75kW).

RAMP DOWN TIME 1

This is the time taken for the drive to ramp the frequency from **LIMIT FREQUENCY** to 0Hz.

Range: 0.1 to 3000 seconds.
Default: 10.0 seconds (up to 75kW) - 50.0 seconds (greater than 75kW).

RAMP UP TIME 2

This is the time taken for the drive to ramp the frequency from 0Hz to **LIMIT FREQUENCY**.

Range: 0.1 to 3000 seconds.
Default: 10.0 seconds (up to 75kW) - 50.0 seconds (greater than 75kW).

RAMP DOWN TIME 2

This is the time taken for the drive to ramp the frequency from **LIMIT FREQUENCY** to 0Hz.

Range: 0.1 to 3000 seconds.
Default: 10.0 seconds(up to 75kW) - 50.0 seconds (greater than 75kW).

RAMP HOLD

This can prevent the drive from tripping on overvolts when decelerating large inertia loads without a dynamic braking unit. The deceleration ramp is stopped when the DC link volts rises above the braking level. It is only restarted when the link voltage falls below this threshold level. The effect is to increase the overall deceleration time.

Range: **DISABLED** or **ENABLED**
Default: **DISABLED**

NOTE: Do not enable the ramp hold feature when using injection braking. This will increase the risk of overvolt tripping on stopping.

RAMP TYPE

This option allows the user to choose between three types of ramp characteristics:

LINEAR RAMP provides a linear increase in motor speed with time.
PARABOLIC RAMP provides a soft start characteristic.
S RAMP provides both soft start at the beginning and soft finish at the end.

Default: **LINEAR RAMP**.

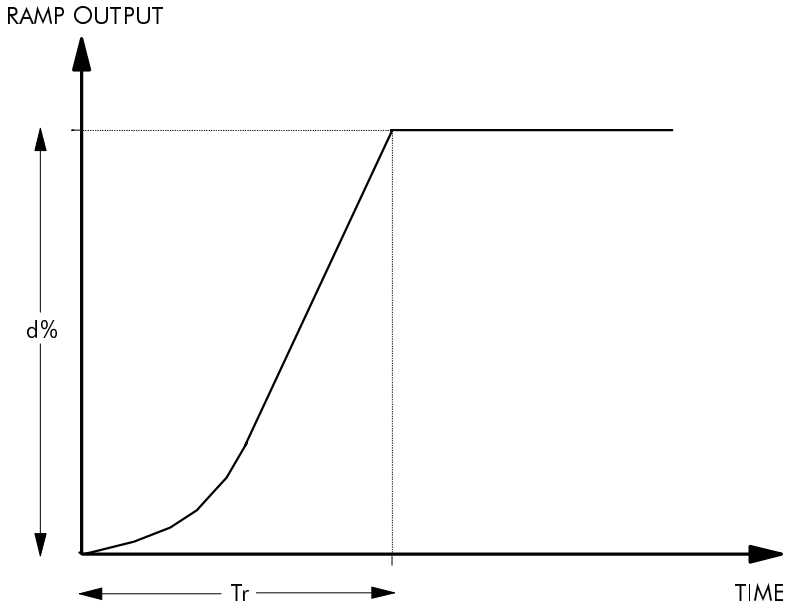
S RAMP %

This dictates the degree of soft start and soft finish experienced when using the **PARABOLIC RAMP** or **S RAMP**. **S RAMP %** has no effect when using **LINEAR RAMP**. An **S RAMP %** value of 0% causes the **PARABOLIC RAMP** or **S RAMP** to act as a **LINEAR RAMP**.

Range: 0 to 100%.
Default: 100%.

NOTE: When using PARABOLIC RAMP or S RAMP, the time taken for the motor speed to reach the speed setpoint will be dependent on the ramp time, the size of the speed setpoint and the value of the **S RAMP %** parameter. Refer to the following sub-paragraphs for further details regarding PARABOLIC RAMP or S RAMP characteristics.

PARABOLIC RAMP:



The PARABOLIC RAMP response time for a given setpoint step size, d%, and **S RAMP %** can be calculated as follows:

$$\text{If} \quad \sqrt{2 \times \frac{d\%}{100\%} \times \frac{SRAMP\%}{200\% - SRAMP\%}} \leq \frac{SRAMP\%}{200\% - SRAMP\%}$$

Then the PARABOLIC RAMP contains pure acceleration only. Thus, the response time, Tr, can be calculated using:

$$Tr = RAMPTIME \times \sqrt{2 \times \frac{d\%}{100\%} \times \frac{SRAMP\%}{200\% - SRAMP\%}}$$

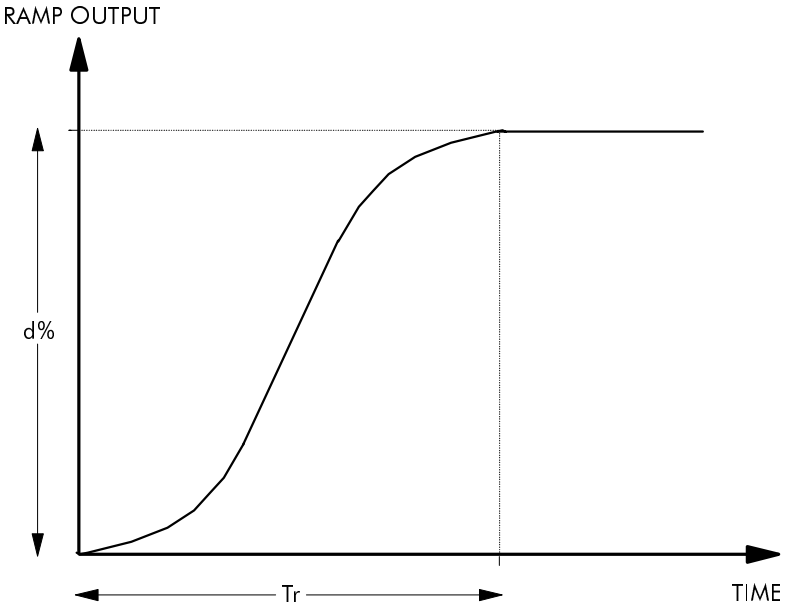
Else, the PARABOLIC RAMP contains acceleration and linear sections to its response. Thus, the response time, Tr, can be calculated using:

$$Tr = RAMPTIME \times \left[\frac{d\%}{100\%} + \frac{1}{2} \times \frac{SRAMP\%}{200\% - SRAMP\%} \right]$$

NOTE:- 100% is assumed to be equal to the **LIMIT FREQUENCY.**

The S applies to the start of the acceleration and the start of the deceleration

S RAMP:



The S RAMP response time for a given setpoint step size, d%, and **R RAMP %** can be calculated as follows:

If $$\sqrt{\frac{d\%}{100\%} \times \frac{SRAMP\%}{200\% - SRAMP\%}} \leq \frac{SRAMP\%}{200\% - SRAMP\%}$$

Then the S RAMP contains pure acceleration and deceleration only. Thus, the response time, Tr, can be calculated using:

$$Tr = RAMPTIME \times 2 \times \sqrt{\frac{d\%}{100\%} \times \frac{SRAMP\%}{200\% - SRAMP\%}}$$

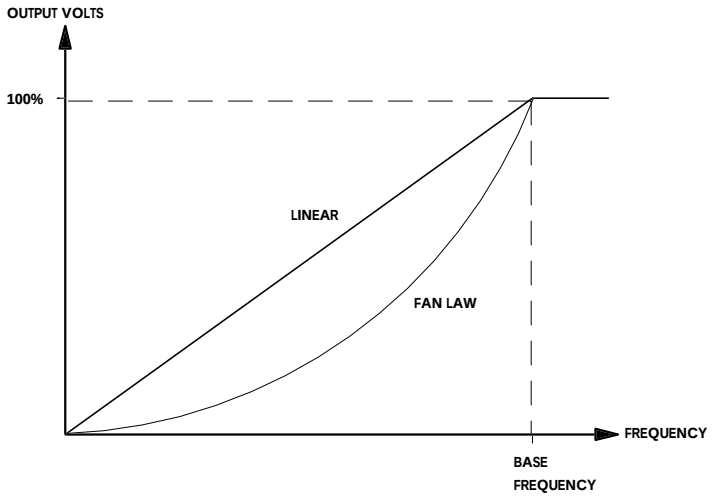
Else, the S RAMP contains acceleration, linear and deceleration sections to its response. Thus, the response time, Tr, can be calculated using:

$$Tr = RAMPTIME \times \frac{d\%}{100\%} \times \frac{200\%}{200\% - SRAMP\%}$$

NOTE:- 100% is assumed to be equal to the **LIMIT FREQUENCY.**

Voltage/Frequency Shape

The **V/F SHAPE** option enables of one of two voltage/frequency characteristics to be selected



LINEAR This gives a constant torque characteristic up to the **BASE FREQUENCY**

FAN LAW This gives a quadratic torque characteristic up to the **BASE FREQUENCY**. This matches the load requirement for fan and pump applications.
Range: **LINEAR**
FAN LAW
Default: **LINEAR**

Current Limits

This option provides access to a number of current limit parameters.

MOTOR I LIMIT This sets the maximum motoring current for the drive. If the drive output current exceeds this value then the drive will attempt to reduce the motoring load by reducing the motor frequency.
Range: 50 to 150%.
Default: 100%.

REGEN I LIMIT This sets the maximum regenerating current for the drive. If the drive output current exceeds this value then the drive will attempt to reduce the regenerating load by increasing the motor frequency.
Range: -50 to -150%.
Default -100%.

REGEN LIM SELECT This enables or disables the **REGEN I LIMIT** function.
Default: **ENABLED**.

EXT TORQUE LIM This parameter enables or disables the EXTERNAL TORQUE LIMIT analogue input on terminal 5. When enabled, the drive takes its load limit setting from terminal 5 rather than from the **MOTOR I LIMIT** parameter. In this mode, the drive will adjust the motor frequency to control the motor load rather than motor current.
Default: **DISABLED**.

OP CURRENT CAL This parameter can be used to scale the drive output current to match the actual motor current as follows:

$$\textbf{OP CURRENT CAL} = \frac{\text{MOTOR FLC}}{\text{DRIVE FLC}} \times 100\%$$

For example, if the drive full load current is 16A and the motor full load current is 14.8A then:

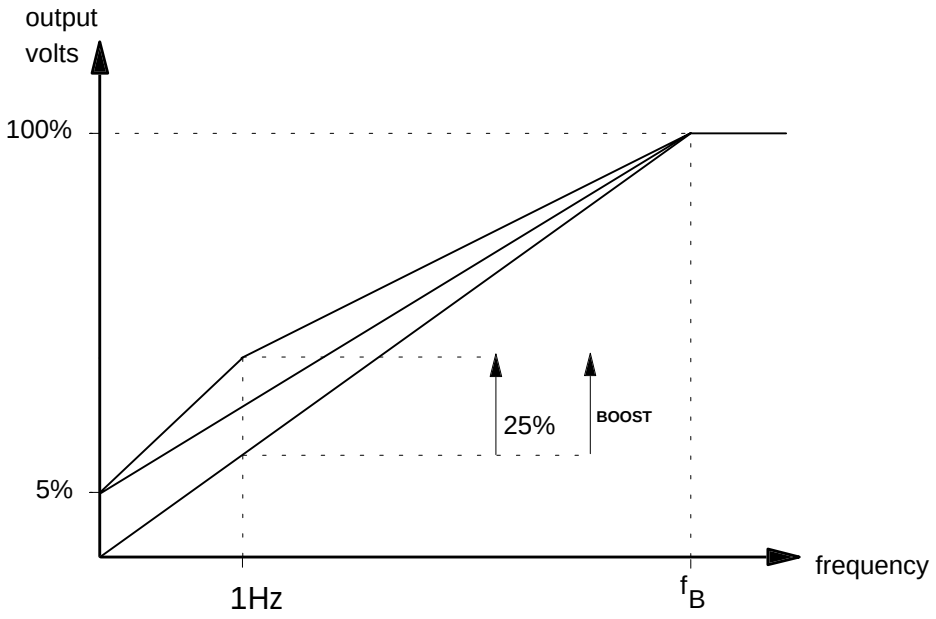
$$\textbf{OP CURRENT CAL} = \frac{14.8}{16} \times 100\% = 92.5\%$$

All current related diagnostics and parameters can now be read as a % of the motor rated current.
Range: 10 to 100%.
Default: 100%.

Voltage Boost

This is used to correctly flux the motor at low speeds. This allows the drive to produce greater starting torque for high friction loads. Voltage boost increases the motor volts above the selected V/F characteristic at the lower end of the speed range.

For applications requiring very high motor starting torque, consult Chapter 8 Appendix A for guidance on optimal settings for the voltage boost parameters.



f_B = BASE FREQUENCY

Two options are available:

FIXED BOOST This parameter determines the level of extra volts applied to the motor at low speeds .
Range 0 to 25% of the rated output voltage.
clamped internally to 5% in types 8, 9 and 10 inverters (greater than 75kW).
Default 0%.

Note:- 6% fixed boost is sufficient for most applications, excessive boost will cause the motor not to start as well as cause motor overheating.

AUTO BOOST The **AUTO BOOST** parameter determines whether the applied voltage boost is a fixed value or varies linearly with motor load. With the **AUTO BOOST** parameter enabled the applied boost is 0% at no load, but equal to the **FIXED BOOST** parameter at 100% load. **AUTO BOOST** is especially suited to applications where high motor torque is initially required to overcome stiction.

Range ENABLED or DISABLED
Default DISABLED

NOTE: The **AUTO BOOST** feature requires a value of **FIXED BOOST** to be set by the user. Zero **FIXED BOOST** will result in zero **AUTO BOOST**.

$$BOOSTLEVEL = FIXEDBOOST \times \frac{MEASUREDLOAD}{100\%}$$

NOTE: Setting the **FIXED BOOST** parameter too high with **AUTO BOOST** enabled, can cause the drive to enter current limit. If this happens, the drive will be unable to ramp up in speed. Simply reducing the setting of the **FIXED BOOST** parameter will eliminate this problem.

Voltage Control

This option determines how the inverter output volts change as a result of variations of DC link volts.

VOLTAGE MODE Two control modes are available:-

FIXED The product of modulation depth and link volts is constant. The **OUTPUT VOLTS** at nominal supply voltage may be adjusted between 208.0 and 460.0 volts.

AUTOMATIC The product of modulation depth and link volts is initially kept constant following a change in link volts, but slowly reverts to the demanded level of modulation depth.

Default: Automatic.

OUTPUT VOLTS This parameter determines the desired level of maximum motor volts (i.e., the motor volts expected at base frequency).

Range: 208V to 460V.
Default: Either 230V or 400V dependent of drive nameplate voltage rating.

Stopping Mode

One of four stopping modes is available:

COAST The motor is allowed to freewheel to a standstill.

RAMP The motor speed is controlled down to zero at a rate set by the **RAMP DOWN TIME** parameter.

INJECTION On a stop command the motor volts are rapidly reduced at constant frequency to deflux the motor. If injection braking begins from a speed greater than 20% of **BASE FREQUENCY**,a low frequency braking current is applied until the motor speed is almost zero. This is followed by a timed 2.0s DC pulse to hold the motor shaft. The DC pulse amplitude is set by the voltage boost. Braking current during low frequency injection braking is controlled by the **MOTOR I LIMIT** parameter. If injection braking begins from a speed below 20% of **BASE FREQUENCY**, a d.c. pulse is applied to the motor. The duration of the d.c. holding pulse is governed by the active **RAMP DOWN TIME** parameter.

NOTE: **AUTO BOOST** should be disabled when using injection braking. Enabling the auto boost feature will make the DC holding pulse amplitude related to estimated motor load. Since load is small during injection braking, the DC holding pulse will also be small. **FIXED BOOST** only provides better motor holding performance.

RAMP + INJECTION The motor speed is controlled down to zero at a rate set by the **RAMP DOWN TIME** parameter. A timed DC pulse is then applied to hold the shaft. The DC pulse amplitude is set by the voltage boost.

Default **RAMP**

Stopping Control

The stopping control menu contains parameters associated with the stopping modes.

DC PULSE TIME. This parameter governs the duration of the d.c holding pulse applied to the motor at the end of a **RAMP + INJECTION** or **FRAMP** stopping sequence. The amplitude of the d.c. holding pulse is governed by **VOLTAGE BOOST** setting.

Range: 0.1s to 20.0s
Default: 2.0s

INJ TIMEOUT This parameter governs the maximum allowed duration of low frequency injection braking. If low frequency injection braking persists for longer than the **INJ TIMEOUT** duration, injection braking is terminated and a 2.0s d.c. holding pulse is forced.

Range: 0.1s to 600.0s
Default: 120.0s

Setpoint Select

This option enables the user to configure the manual and auto setpoints. The MANUAL/AUTO digital input (terminal 27) can be used to switch between manual and auto setpoints.

MANUAL SETPOINT There are 12 possible sources for the **MANUAL SETPOINT**

1. analogue input terminal 1, **0V TO +10V**
2. analogue input terminal 1, **-10V TO +10V**
3. **AUX SETPOINT** parameter
4. **PRESET SPEED 1** parameter
5. **PRESET SPEED 2** parameter
6. **PRESET SPEED 3** parameter
7. **PRESET SPEED 4** parameter
8. **PRESET SPEED 5** parameter
9. **PRESET SPEED 6** parameter
10. **PRESET SPEED 7** parameter
11. **PRESET SPEED 8** parameter
12. **DIGITAL MOP** parameter

Default **0V TO +10V**

AUTO SETPOINT There are 7 possible sources for the **AUTO SETPOINT**

1. analogue input terminal 3, **I LOOP 0-20mA**
2. analogue input terminal 3, **I LOOP 20-0mA**
3. analogue input terminal 3, **I LOOP 4-20mA**
4. analogue input terminal 3, **I LOOP 20-4mA**
5. **SERIAL LINK**, serial link setpoint parameter
6. **DIGITAL PRESET**, preset speed selected by digital input terminals 25, 26 and 24
7. **SPEED FEEDBACK**, measured speed of a different motor as a setpoint.

Default **I LOOP 0-20mA**

TRIM CHOICE The bipolar, -10V to +10V, speed trim, terminal 2, can be selected to operate with manual setpoints only, auto setpoints only or with manual and auto setpoints simultaneously. The Default is **MANUAL & AUTO**.

Setpoint Scale

This option provides setpoint ratio functions for the local operator station and both remote setpoints, manual and auto. The manual and auto setpoints are summed with the trim before being scaled by a **RATIO** and a **DIVIDER** and clamped between **MIN SPEED** and **MAX SPEED**.

LOCAL RATIO The local ratio is the factor which the local setpoint is multiplied by.
Range -3.0000 to +3.0000
Default 1.0000

LOCAL DIVIDER The local divider is the factor by which the local setpoint is divided by.
Range -3.0000 to +3.0000
Default 1.0000

MANUAL RATIO The manual ratio is the factor which the manual setpoint is multiplied by.
Range -3.0000 to +3.0000
Default 1.0000

MANUAL DIVIDER The manual divider is the factor by which the manual setpoint is divided by.
Range -3.0000 to +3.0000
Default 1.0000

AUTO RATIO The auto ratio is the factor which the auto setpoint is multiplied by.
Range -3.0000 to +3.0000
Default 1.0000

AUTO DIVIDER The auto divider is the factor by which the auto setpoint is divided by.
Range -3.0000 to +3.0000
Default 1.0000

Framp Time

This is the time taken for the drive to ramp the frequency from **LIMIT FREQUENCY** to 0Hz, when the **FRAMP** parameter is configured as **FRAMP (**see **RECONFIG I/Ps** parameter in the System menu) and terminal 21 is high, and the RUN signal is removed. The **FRAMP** is followed by a DC holding pulse with duration determined by the **DC PULSE TIME**. The range and default values are:

Range : 0 to 3000s
Default : 1.0s

NOTE: The FRAMP digital input is used only to select the **FRAMP TIME**. The RUN signal must always be removed to initiate the stop sequence.

Jog Speed

The **JOG SPEED** parameter determines the speed that the drive will run at when the JOG terminal, 24, is raised to +24V (terminal 18) or the JOG button to the MMI is depressed (depending which is active) The **JOG SPEED** parameter can only be altered when the **RECONFIG I/Ps** parameter in the "**SYSTEM**" menu is set to 4 PRESETS & JOG.

Range : **- LIMIT FREQUENCY** to **+LIMIT FREQUENCY**
Default : 5.0Hz

NOTE: JOG has priority over RUN

Digital MOP

The **DIGITAL MOP** provides the feature of an internal motorised potentiometer (MOP). The setpoint can be changed by an increase / decrease function. In order for the **DIGITAL MOP** to operate, the **RECONFIG I/Ps** parameter in the "**SYSTEM**" menu must be set to DIGITAL MOP & PRESET. Once configured, terminal 25, acts as setpoint RAISE, while terminal 26, acts as setpoint LOWER. The JOG, terminal 24, is reconfigured to provide a

MOP PRESET command. The **DIGITAL MOP** setpoint is not saved by the parameter save operation. Parameters accessed via the **DIGITAL MOP** menu are as follows:

MAX MOP SPEED This is the target **DIGITAL MOP** speed setpoint while RAISE is active.
Range : **-LIMIT FREQUENCY** to **+LIMIT FREQUENCY**
Default :+**LIMIT FREQUENCY**

MIN MOP SPEED This is the target **DIGITAL MOP** speed setpoint while LOWER is active.
Range : **-LIMIT FREQUENCY** to **+LIMIT FREQUENCY**
Default :-**LIMIT FREQUENCY**

MOP PRESET SPEED This is the **DIGITAL MOP** preset speed setpoint.
Range : **-LIMIT FREQUENCY** to **+LIMIT FREQUENCY**
Default :**0**

INCREASE RATE This is the time taken to ramp from 0 to **+LIMIT FREQUENCY** or from 0 to **-LIMIT FREQUENCY**.
Range : 0.1 to 3000.0s
Default :10.0s

DECREASE RATE This is the time taken to ramp from **+LIMIT FREQUENCY** to 0 or from **-LIMIT FREQUENCY** to 0.
Range : 0.1 to 3000.0s
Default :10.0s

NOTE: The **DIGITAL MOP** will fail to operate when **S RAMP** has been selected. This is because unlike linear or parabolic ramps, s-ramps cannot be instantly stopped without destroying the s characteristic.

Preset Speeds

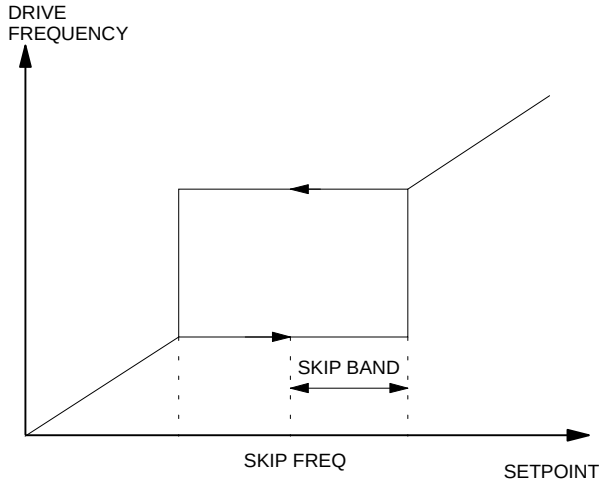
There are two banks of 4 preset speeds available to the user. All 8 presets can be selected locally using the **MANUAL SETPOINT** select parameter.

The first bank of 4 presets can be selected remotely using the two digital inputs, terminals 25 and 26, when the **RECONFIG I/Ps** parameter in the System menu (see "**SYSTEM**") is set to 4 PRESETS & JOG.

The second bank of 4 presets is only active when the **RECONFIG I/Ps** parameter in the "**SYSTEM**" menu is set to 8 PRESETS. Once the values have been programmed, this second bank of presets can be selected remotely via the two digital inputs, terminals 25 and 26, while the terminal 24, is held at +24V (terminal 18). The first bank of presets (preset speeds 1 to 4) can still be selected remotely using terminals 25 and 26, while terminal 24 is held at 0V (terminal 19).

Skip Frequencies

Four programmable skip frequencies are available to avoid resonances within the mechanical system. Enter the value of drive frequency that causes the resonance using the **SKP FRQ** parameter and then programme the width of the skip band using the **SKP FRQ BAND** parameter. The drive will then avoid sustained operation within the forbidden band as shown in the diagram.



SKP FQ SELECTION This option enables the user to enable or disable each of the 4 skip frequencies.
Default **DISABLED**.

SKP FRQ 1 to 4 These parameters contain the centre frequency of each skip band.
Range: 0Hz to **LIMIT FREQUENCY**
Default: 0Hz

SKP FRQ 1 to 4 BAND These parameters contain the width of each skip band.
Range: 0Hz to **LIMIT FREQUENCY**/12
Default: 0Hz

Aux Setpoint

This parameter allows a setpoint value to be entered directly via the MMI. The **MANUAL SETPOINT** select menu must first be used to enable the **AUX SETPOINT** to allow the motor speed to be controlled from the drive keypad.

Range: **-LIMIT FREQUENCY** to **+LIMIT FREQUENCY**

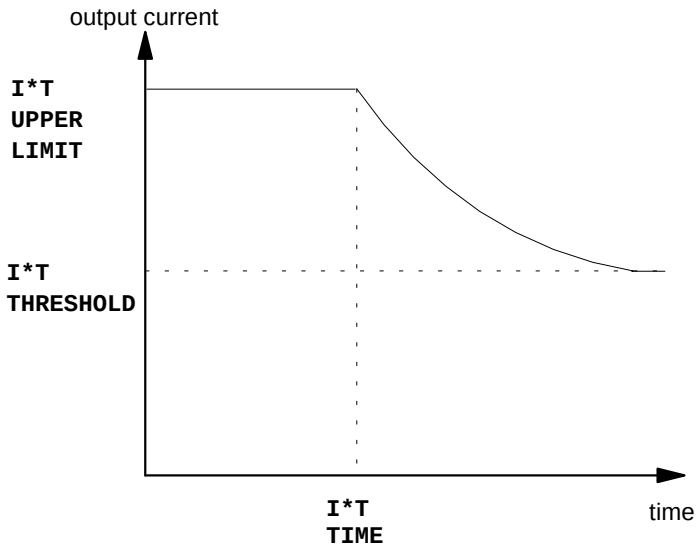
Default: 0Hz

Aux Digital Inputs

AUX DIG INPUTS are used by the serial link to control **AUX JOG**, **AUX RUN**, **AUX FRAMP** and **AUX DIRECTION** parameters. The functionality of the these inputs is shown in Chapter 2 Figure 2-2.

I*T Alarm

The **I*T ALARM** parameters allow the overload characteristics of the drive to be programmed to match the application.



If the drive output current exceeds the **I*T THRESHOLD** then the drive will trip after a certain time given by:

$$\text{I*T TRIP TIME} = \frac{(\textbf{I*T UPPER LIMIT} - \textbf{I*T THRESHOLD}) \times \textbf{I*T TIME}}{\text{OUTPUT CURRENT} - \textbf{I*T THRESHOLD}}$$

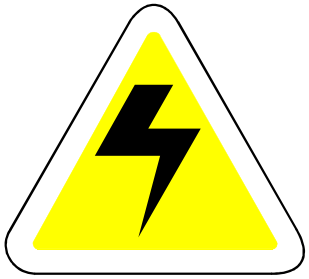
I*T THRESHOLD Adjustment of the long term continuous rating. This parameter should be set to match the current rating of the motor being used.
Range 50% to 105% of drive rating.
Default 105%

I*T UPPER LIMIT Adjustment of the maximum overload permissible
Range 50% to 150% of drive rating.
Default 150%.

I*T TIME — Adjustment of the maximum time the maximum overload can be sustained.
Range 5 to 60 seconds
Default 60 seconds

Slip Compensation

Slip compensation increases the inverter output frequency as a function of load. This is an open loop compensation for the slip characteristic of the induction motor.



WARNING!

The inverter output frequency can exceed the **MAX SPEED** parameter setting when using slip compensation feature by 5%.

COMP LEVEL — Gives the frequency value which will be added to the output frequency at 100% drive load.
Range 0 to **LIMIT FREQUENCY**/ 24 Hz
Default 0 Hz

The procedure for adjusting **SLIP COMP** is as follows:

1. Run the drive at the desired speed on no load.
2. Measure the actual motor speed using a hand tacho or other suitable device.
3. Run the drive at the desired speed on full load
4. Measure the actual motor speed and increase the **SLIP COMP** parameter until the no-load speed (synchronous speed) is attained.

REGEN SLIP COMP — This parameter determines whether slip compensation will be active during regenerative operation.

Range Enable / Disable
Default Disable

NOTE:- Slip compensation is disabled when the output frequency is below 0.5 Hz

Speed Feedback

The **SPEED FEEDBACK** parameters are used to calibrate the speed feedback measurement. The Speed Feedback Option Board needs to be fitted to the drive and connected to a suitable encoder before the speed feedback measurement will operate. Parameters accessed via the **SPEED FEEDBACK** menu are as follows:

FEEDBACK SOURCE — Used to enable the speed measurement function from an encoder.

ENCODER SIGN — Used to invert the sign of the measured speed where necessary.

ENCODER LINES — The resolution must be set to match the type of encoder being used. Incorrect setting of this parameter will result in an erroneous speed measurement.
Range 1 to 10000.
Default 1000.

POLE PAIRS This parameter must correspond to the number of pole-pairs for the AC motor being used. The most common form of AC motor has 4 poles or 2 pole-pairs. If you are in doubt as to the correct number of pole-pairs your motor possesses, please contact your motor supplier. Incorrect setting of this parameter will result in an erroneous speed measurement.

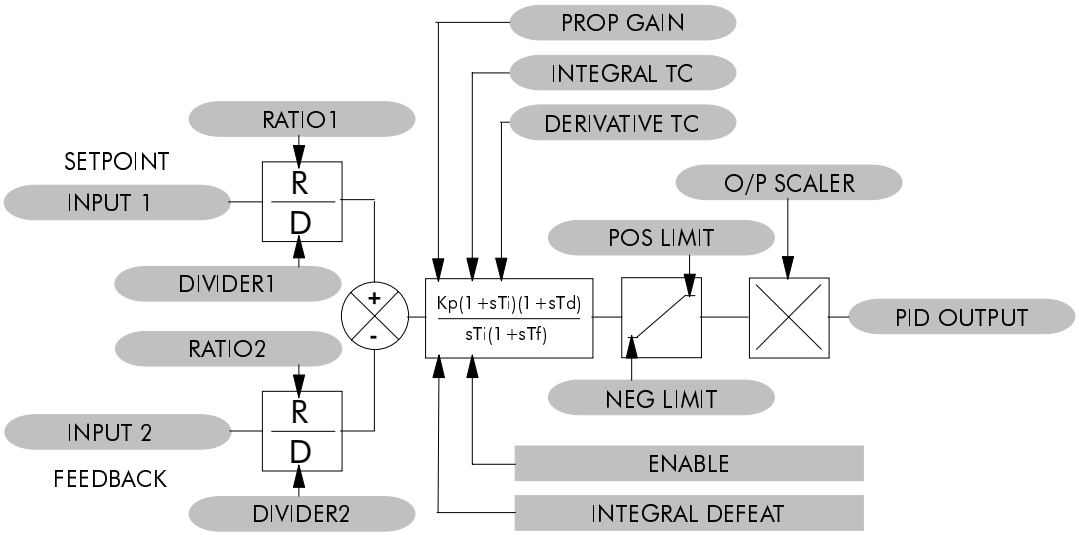
NOTE: The motor synchronous speed can be calculated from the motor supply frequency and the pole-pairs using the following :

$$\text{Nsync(rpm)} = 60 \times \frac{\text{Freq(Hz)}}{\text{pole} - \text{pairs}}$$

eg. a 4 pole motor (2 pole-pairs) with a base speed of 50Hz will have a synchronous speed of 1500rpm.

PID

Current software provides the user with a general purpose PID controller block internal to the drive. The PID can be used either in conjunction with speed feedback to provided closed-loop speed control, or with other external setpoints and feedbacks for closed-loop process control.



PROP GAIN This parameter is the true proportional gain of the PID controller. With a **PROP GAIN** of zero, the PID output would become zero. Range: 0.0 to 100.0. Default: 1.0.

INTEGRAL TC This parameter is the integral time constant of the PID controller. Range: 0.01 to 100.00s. Default: 1.00s.

DERIVATIVE TC This parameter is the derivative time constant of the PID controller. Range: 0.000 to 10.000s. Default: 0.000s. With the **DERIVATIVE TC** set to zero, the PID becomes a P+I controller.

FILTER TC In order to help attenuate high frequency noise on the PID output, a first order lag output filter has been provided. The **FILTER TC** parameter determines the output filter time constant. Range: 0.000 to 10.000s. Default: 2.000s.

POSITIVE LIMIT This parameter determines the maximum positive excursion of the PID output. Range: 0.00 to 105.00%. Default: 100%. PID output corresponds to the **LIMIT FREQUENCY**.

NEGATIVE LIMIT — This parameter determines the maximum negative excursion of the PID output. Range: -105.00 to 0.00%. Default: -100.00%. 100% PID output corresponds to the **LIMIT FREQUENCY**.

O/P SCALER (TRIM) — This parameter represents an overall PID output scaling function which is applied after the PID **POSITIVE LIMIT** and **NEGATIVE LIMIT** clamps. Range: -3.0000 to +3.0000. Default: 0.0417.

NOTE:-With 100% **POSITIVE LIMIT** and **NEGATIVE LIMIT** clamps, the default **O/P SCALER (TRIM)** value of 0.0417 represents a maximum PID output of 5Hz with a 120Hz **LIMIT FREQUENCY**.

ENABLE — This parameter globally resets the PID output and integral term when DISABLED. This parameter must be ENABLED in order for the PID to operate Default: DISABLED.

NOTE: The PID is automatically disabled when the drive is in the stopped state (not running), or the **FRAMP** parameter is configured to **PID RESET** and terminal 21 is active.

INTEGRAL DEFEAT — This parameter resets the PID integral term when ON. Range: ON or OFF. Default: OFF.

INPUT 1 — This parameter represents the value of the PID setpoint. 100% corresponds to the value of the **LIMIT FREQUENCY**. Range: -300.00 to +300.00%. Default: 0.00%.

RATIO 1 — This represents the PID setpoint ratio parameter. Range: -3.0000 to +3.0000. Default: 1.0000.

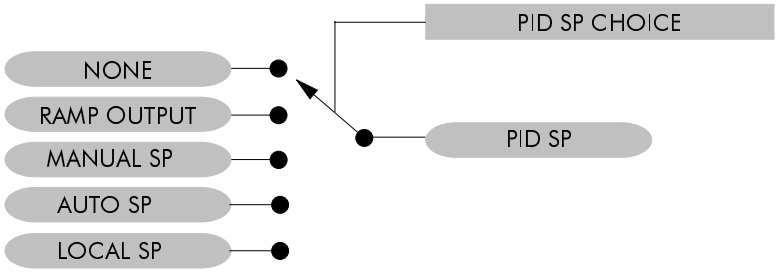
DIVIDER 1 — This represents the PID setpoint divider parameter. Range: -3.0000 to +3.0000. Default: 1.0000.

INPUT 2 — This parameter represents the value of the PID feedback. 100% corresponds to the value of the **LIMIT FREQUENCY**. Range: -300.00 to +300.00%. Default: 0.00%.

RATIO 2 — This represents the PID feedback ratio parameter. Range: -3.0000 to +3.0000. Default: 1.0000.

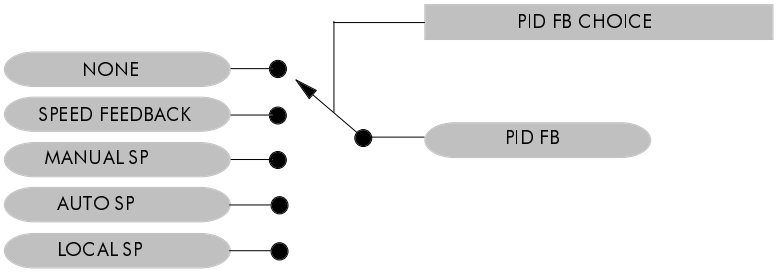
DIVIDER 2 — This represents the PID feedback divider parameter. Range: -3.0000 to +3.0000. Default: 1.0000.

PID SP CHOICE — This parameter determines the source of the PID setpoint. Range: NONE, RAMP OUTPUT, MANUAL SETPOINT, AUTO SETPOINT or LOCAL SETPOINT.
Default: NONE.



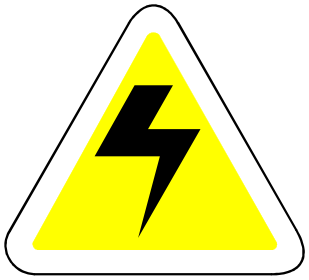
NOTE:-With the **PID SP CHOICE** parameter set to **NONE**, a fixed value of the PID setpoint can be set directly into the **INPUT 1** parameter.

PID FB CHOICE This parameter determines the source of the PID feedback. Range: NONE, SPEED FEEDBACK, MANUAL SETPOINT AUTO SETPOINT or LOCAL SETPOINT
Default: NONE.



NOTE:-With the **PID FB CHOICE** parameter set to **NONE**, a fixed value of the PID feedback can be set directly into the **INPUT 2** parameter.

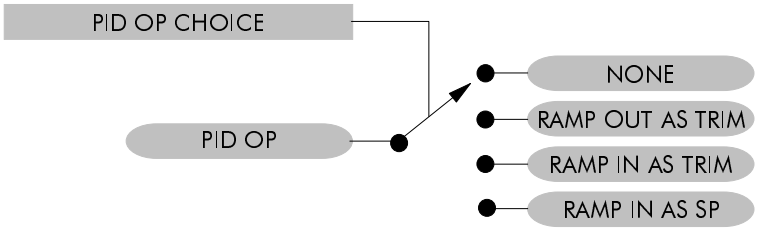
PID OP This option provides access to two further parameter options, **PID OP CHOICE** and **PID OP MODE**.



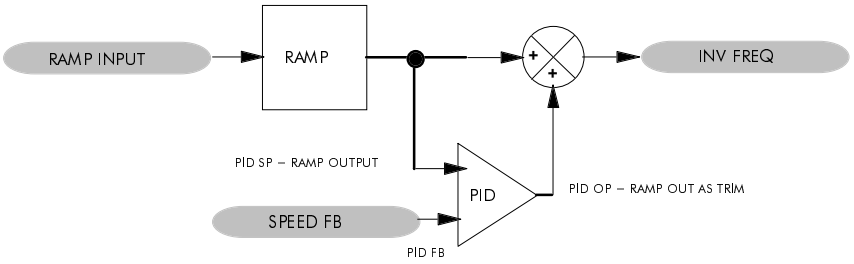
WARNING!

The inverter output frequency can exceed the **MAX SPEED** parameter setting when using the PID output to trim the ramp output by 5%.

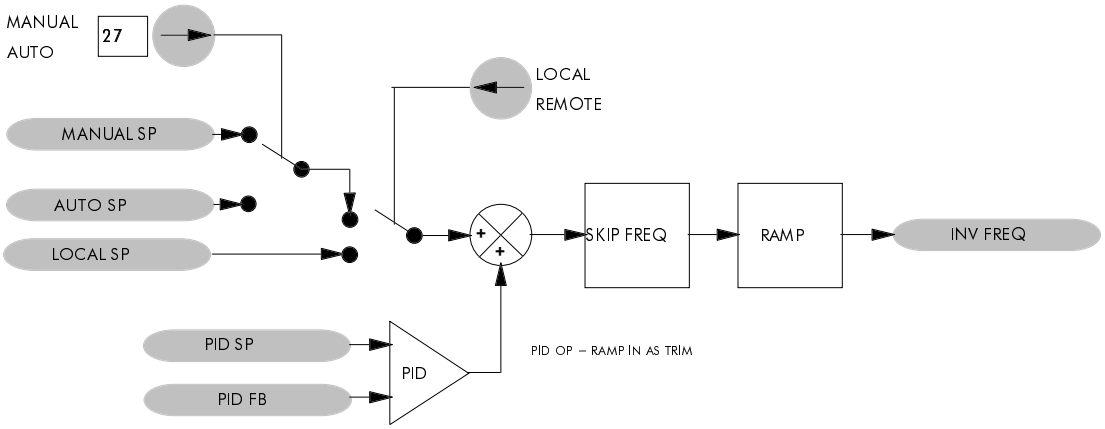
PID OP CHOICE This parameter determines the application of the PID output. Range: NONE, RAMP OUT AS TRIM, RAMP IN AS TRIM or RAMP IN AS SP. Default: NONE.

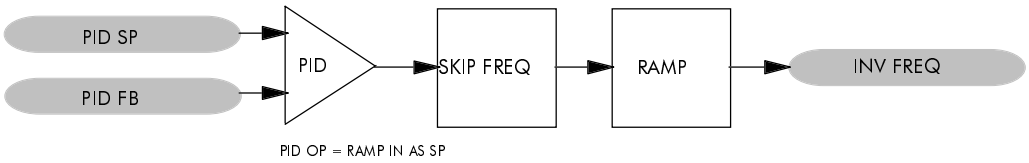


For closed-loop speed control, **PID OP CHOICE** should be set to RAMP OUT AS TRIM and **O/P SCALER (TRIM)** should be chosen such that maximum PID output corresponds to full load motor slip frequency. In this way, the ramp output can be trimmed by the PID to compensate for motor speed variations due to load.



For closed-loop process control applications, **PID OP CHOICE**, can be set either such that the PID output trims the ramp input, RAMPIN AS TRIM, or so that the PID output acts as the ramp input, RAMP IN AS SP





PID OP MODE This parameter determines the type of control the PID is allowed to exhibit for closed-loop process control applications (**PID OP CHOICE** set to either RAMP IN AS TRIM or RAMP IN AS SP). Range: UNIPOLAR or BIPOLAR. Default: UNIPOLAR.

In UNIPOLAR mode, the PID output cannot cause the inverter output frequency to be of an opposite sign to the setpoint.

In BIPOLAR mode, the PID output is allowed to cause the inverter output frequency to an opposite direction to the setpoint.

NOTE: In closed-loop speed control with **PID OP CHOICE** set to RAMP OUT AS TRIM, the PID is never allowed to drag the inverter output frequency in an opposite direction to the setpoint.

Flycatching

The **FLYCATCHING** function enables the drive to be restarted smoothly into an spinning motor.

ENABLE

The **ENABLE** parameter globally enables the flycatching feature. With the feature ENABLED when the drive is re-enabled from a stopped condition, the drive performs a speed search sequence. Once the motor speed has been identified, the drive begins to smoothly ramp to the speed setpoint from the discovered motor speed.
Default: Disabled

SEARCH MODE

The **SEARCH MODE** parameter determines which of the 3 types of speed search sequence performed by the drive when the flycatching mode is engaged.
Default: Bidirectional

The **UNIDIRECTIONAL** speed search sequence only searches for the motor speed in the direction of the speed setpoint.

The **BIDIRECTIONAL** speed search sequence, initially searches for the motor speed in the direction of the speed setpoint. If the drive fails to identify the motor speed in this direction, a second speed search is performed in the reverse direction.

The **REFLUX AT SP** sequence simply performs a soft-start at the speed setpoint. This mode can be used in situations where the motor speed is known not to have deviated much from the speed setpoint. In situations where this is not the case, **UNIDIRECTIONAL** or **BIDIRECTIONAL** flycatching is preferred. This mode is not available in types 8, 9 and 10 inverters (greater than 75kW).

REFLUX TIME

The **REFLUX TIME** parameter determines the time taken to ramp up the inverter output volts from the **SEARCH VOLTS** level to the normal operating level once the motor speed has been successfully identified.
Range: 0.1 to 10.0 seconds
Default: 2.0 seconds

Note:- Refluxing the motor too quickly can cause the drive to trip on either overvoltage or overcurrent. In either case increasing this parameter will reduce the risk of tripping.

SEARCH TIME

The **SEARCH TIME** parameter governs the rate at which the flycatching speed search is performed. Once flycatching is initiated, the spinning motor is refluxed to the **SEARCH VOLTS** level with the inverter output frequency fixed at the **MAX SPEED** parameter. The inverter output frequency is then ramped down towards the **MIN SEARCH SPEED** level at a ramp rate governed by the **SEARCH TIME** parameter.
Range: 0.1 to 60.0 seconds
Default: 15 seconds

Note:- Performing the flycatching speed search too quickly can cause the drive to inaccurately identify the motor speed. Refluxing at an inaccurate motor speed can cause the drive to trip on overvoltage. If this occurs, increasing this parameter will reduce the risk of tripping.

SEARCH VOLTS

The **SEARCH VOLTS** parameter determines the percentage of the full motor volts applied during the flycatching speed search sequence.
Range: 0.0% to 100.0%
Default: 15.0%

Note:- Increasing the **SEARCH VOLTS** level improves the accuracy of the discovered motor speed but increases the braking influence of the speed search on the rotating motor.

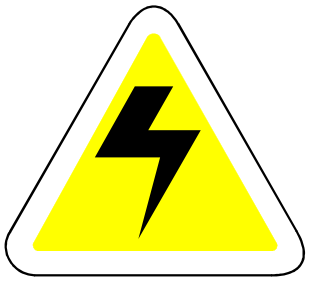
MIN SEARCH SPEED

The **MIN SEARCH SPEED** parameter determines the lower limit of the **UNIDIRECTIONAL** and **BIDIRECTIONAL** speed search sequences. If while

performing the speed search, the inverter frequency falls below this level, flycatching is deemed to have failed. The drive will then restart from zero speed.
Range: 0.0Hz to 120.0Hz
Default: 10.0Hz

Auto Restart

The **AUTO RESTART** function allows the drive a limited number of self restarts after a trip has occurred. **AUTO RESTART** is only recommended for remote drive applications where manual clearing of drive fault conditions is impractical.



WARNING!

When using **AUTO RESTART** the drive will restart automatically. It is the user's responsibility to ensure that unexpected drive restarts do not cause injury to people or damage to equipment.

The following **AUTO RESTART** parameters are provided:

ENABLE
This parameter globally enables the **AUTO RESTART** function.
Default: Disabled

ATTEMPT DELAY
This determines the delay between **AUTO RESTART** attempts.
Range: 0.5 to 600.0 seconds
Default: 10.0 seconds

ATTEMPTS
This parameter governs the number of restarts the drive will try before requiring a manual fault reset.
Range: 1 to 10
Default: 5

ATTEMPTS LEFT
This is a read-only diagnostic indicating the number of restart attempts left before a manual fault reset is required.

TRIP MASK
This parameter permits the user to perform **AUTO RESTART** only on selected trip conditions. The **TRIP MASK** is a 16 bit hexadecimal number each bit of which is logically ANDed with the corresponding bit of the 16 bit **DRIVE STATUS** diagnostic word (chapter 5). When the drive trips, a unique bit in the **DRIVE STATUS** diagnostic word is set. This bit identifies the type of trip that has occurred. If the corresponding bit in the **TRIP MASK** word is also set, and **AUTO RESTART** is ENABLED, an **AUTO RESTART** attempt will be made. If the corresponding bit in the **TRIP MASK** word is not set, no **AUTO RESTART** attempt is made (and the fault condition will require a manual reset).
Range: 0x0000 to 0xFFFF
Default: 0x1F00

NOTE: The default value for the **TRIP MASK** word is 0x1F00. Thus, with the **AUTO RESTART** feature ENABLED, the drive will only attempt to restart after the following trips:

DC Link Overvoltage Trip
DC Link Undervoltage Trip

Overcurrent Trip
I*T Trip
Stall Trip

AR CANCEL TIME This sets the required period of drive operation after a successful **AUTO RESTART** before the **ATTEMPTS LEFT** diagnostic is reset to the **ATTEMPTS** parameter.
Range: 0.1 to 600.0 seconds
Default: 300.0 seconds

Switching Frequency

This controls the drive switching frequency of the inverter

SWITCHING FREQ Higher switching frequencies produce lower audible noise from the motor, but increase overall inverter losses. Lower switching frequencies improve motor operation at low speed and result in lower overall inverter losses.
Range: 3kHz, 6kHz or 9kHz available in certain conditions (See Technical Specification)
Default: 3kHz

Stabilisation

This helps to stabilise larger motors running on light load

STABILISATION Larger motors can sometimes exhibit instability at certain speeds under light load. If oscillations are apparent in the motor speed or current, increase the **STABILISATION** parameter until stable operation is achieved. A typical setting for this parameter would be between 0.5Hz and 1.0Hz. Note that too high a value will tend to make the motor more unstable. The range and default values are:
Range: 0Hz to **LIMIT FREQUENCY**/24
Default: **LIMIT FREQUENCY**/200

Start up

Select default control mode and default MMI position on power-up.

CONTROL MODE This parameter selects whether the terminals or the MMI controls the drive. **REMOTE** selects the terminal as the control source. **LOCAL** selects the operator station as the control source and places the display in the local mode.
Default: **REMOTE**

MENU POSITION This parameter selects which diagnostic menu to be displayed after power-up. These can be chosen from the following:
Range: **MICRO AC DRIVE, SPEED SP(Hz), DRIVE FREQUENCY, MOTOR CURRENT, MOTOR LOAD, EXT TORQUE LIMIT, DRIVE STATUS, DIGITAL INPUTS, TORQUE MODE, PID ERROR, PID CLAMPED, PID OUTPUT, SPEED FB(RPM), SPEED FB(HZ), SPEED SP(RPM), MANUAL SP(HZ), AUTO SP(HZ)**
Default: **MICRO AC DRIVE**

Stall Trip Time

A motor stall timer.

STALL TRIP TIME — If the drive operates continuously in current limit for longer than the **STALL TRIP TIME** then a MOTOR STALLED alarm will occur.
Range: 0.1 to 3000 seconds
Default: 600 seconds

Inhibit Alarms

This menu allows certain alarm conditions to be disabled. For example, the **STALL ALARM** must be disabled in applications where the drive operates continuously in current limit.

Reconfigure Outputs

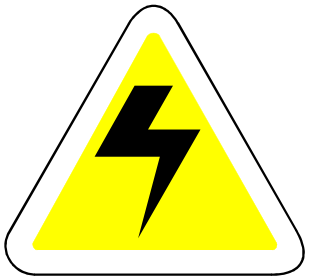
The Setup Parameters **RECONFIG O/Ps** menu contains parameters that govern the operation of the reconfigurable relay outputs RELAY1 and RELAY2. (These relays are configured using the **RECONFIG O/Ps** menu which is under **SYSTEM**) The following **RECONFIG O/Ps** parameters are provided:

AT SPEED THRESH — The relay contacts close when the drive output frequency falls within the speed setpoint ± the **AT SPEED THRESH** parameter. The relay contacts subsequently open when the drive output frequency differs from the speed setpoint by more than ± the **AT SPEED THRESH** parameter.
Range: 0 to **+LIMIT FREQUENCY**. Default: **LIMIT FREQUENCY**/120.

0 SPEED THRESH — The relay contacts close when the drive output frequency is within the ± **0 SPEED THRESH** parameter of 0Hz. The relay contacts subsequently open when the drive output frequency rises out of the ± **0 SPEED THRESH** parameter frequency band.
Range: 0 to **+LIMIT FREQUENCY**. Default: **LIMIT FREQUENCY**/120.

LOAD THRESH — This parameter determines the measured motor load at which the AT LOAD relay will operate (change state). Range: 0 to 150%. Default: 50%

FB SPEED THRESH — The relay contacts will close when the measured motor speed is greater than the **FB SPEED THRESH** parameter. The relay contacts close when the measured motor speed is below the **FB SPEED THRESH** parameter.
Range: 0 to **+LIMIT FREQUENCY**. Default: **LIMIT FREQUENCY/**12.



WARNING!

The **BRAKE CONTROL** logic will fail to operate correctly where there is a missing motor phase. In this situation the drive will incorrectly estimate the motor load. As a consequence the brake logic will release the motor brake while the motor is not producing torque. In this situation the motor has no control over the load. It is the responsibility of the user, by the use of external equipment, to detect missing motor phases and to prevent the **BRAKE CONTROL** logic from either releasing or maintaining open the motor brake in these circumstances.

BRAKE CONTROL — This mode is intended to control external electro-mechanical motor brakes in lift and hoist applications. There are 3 parameters associated with this mode. The relay contacts close when drive frequency > **ON FREQ LEVEL** AND motor load > **ON LOAD LEVEL.** The relay contacts open when drive frequency < **OFF FREQ LEVEL.**

ON LOAD LEVEL — Load level at which the external motor brake is to be released.
Range: 0 to 150%.
Default: 50%.

ON FREQ LEVEL — Frequency at which the external motor brake is to be released.
Range: 0Hz to **LIMIT FREQUENCY**.
Default: **LIMIT FREQUENCY**/24

OFF FREQ LEVEL — Frequency at which the external motor brake is to be applied.
Range: 0Hz to **LIMIT FREQUENCY**.
Default: **LIMIT FREQUENCY**/40.

Ramp Output

This parameter sets the scaling of the RAMP OUTPUT analogue output, terminal 7. Three ranges are possible:

MIN TO MAX — This gives 0V at **MIN SPEED** and +10V at **MAX SPEED.**

0 TO LIMIT FREQ — This gives 0V at 0Hz and +10V at the **LIMIT FREQUENCY**.

0 TO MAX — This gives 0V at 0Hz and +10V at **MAX SPEED**.
Default: **MIN TO MAX**

Limit Frequency

The limit frequency is the highest possible value of drive output frequency. There are 3 choices of limit frequency, 120Hz, 240Hz and 480Hz . This is determined by the **LIMIT FRQ SELECT** parameter. The default value for **LIMIT FRQ SELECT** is 120Hz. The setpoint frequency resolution of the drive is the **LIMIT FREQ SELECT**/10,000.

Op Station

These parameters are associated with the control and configuration of the operator station on the front of the drive.

INITIAL SETUP — **INITIAL SETUP** is the menu which contains the power-up parameters for the operator station.

DIRECTION — **DIRECTION** sets the preferred direction on power up and when **LOCAL** mode is selected..
Range: Forward / Reverse.
Default: Forward.

AUTO START — **AUTO START** sets whether the drive will run immediately on power-up if the **CONTROL MODE** is set to **LOCAL**. If the **CONTROL MODE** parameter is set to **REMOTE** then this parameter will have no effect.
Range: Enabled/Disabled.
Default: Disabled.

SPEED SETPOINT — **SPEED SETPOINT** sets the initial setpoint for the operator station which is invoked on power up and when **CONTROL MODE** is set to **LOCAL**.
Range: 0 to LIMIT FREQUENCY
Default: 0 Hz.

KEY INHIBITS — **KEY INHIBITS** provides the user with a means to disable any or all of the operator station keys.

START — **START** sets whether the start button on the operator station is enabled or disabled.
Default: Enabled.

STOP — **STOP** sets whether the stop button on the operator station is enabled or disabled.
Default: Enabled.

JOG — **JOG** sets whether the jog button on the operator station is enabled or disabled.
Default: Enabled.

SPEED SETPOINT — **SPEED SETPOINT** sets whether the up and down buttons on the operator station are enabled or disabled.
Default: Enabled.

DIRECTION — **DIRECTION** sets whether the direction button on the operator station is enabled or disabled.
Default: Enabled.

LOCAL/REMOTE — **LOCAL/REMOTE** sets whether the local button on the operator station is enabled or disabled.
Default: Enabled.

Base Volts

BASE VOLTS — **BASE VOLTS** is the output voltage produced at the **BASE FREQUENCY**, as a % of the input voltage. This is the maximum output voltage the drive will produce.
Range: 0% to 115.4%.
Default: 100%

NOTE: Setting the **BASE VOLTS** parameters greater than 100% increases the amplitude of the output voltage fundamental component, but only at the expense of increased high frequency harmonics.

PASSWORD

The 584S Frequency Inverters have a password system which can be used to prevent unauthorised access to the setup parameters. Once the user has programmed in a password then the setup parameters become read-only. In order to change the parameter values the correct password must first be entered.

All drives shipped from the factory have a default password value of 0000.

The **PASSWORD** submenu has 3 entries as follows:

ENTER PASSWORD	This option is used to enter the password to regain access to the setup parameters. The password value entered must match the value previously set up in the **CHANGE PASSWORD** menu.
CHANGE PASSWORD	This option is used to change the password or to initially programme a user password. When a password has been set up, the **PARAMETER SAVE** menu should be used to save the password in non-volatile memory.
CLEAR PASSWORD	This option is used to clear the password value displayed under the **ENTER PASSWORD** menu. When this menu is accessed the **ENTER PASSWORD** value is cleared to "**0000**". If the **CHANGE PASSWORD** value is non-zero then the setup parameters will be locked.

Example 1: Initial programming of password

1) Access the **CHANGE PASSWORD** menu. The display will show:

CHANGE PASSWORD
0X0000

2) Using the up and down arrow keys, set the password value required as a 4 digit hexadecimal number. The display will show, for example:

CHANGE PASSWORD
0X1234

When you are happy with the password make a note of the value and keep it in a safe place!

3) Press the 'E' key to take you out of the **CHANGE PASSWORD** menu. The display will show:

REMEMBER PASSWORD
0X1234

Press the 'E' key again and the display will show:

NOW SAVE PARAMS
0X1234

This is to remind you to save the password along with the other parameters before you remove power from the drive. Press the 'E' key again to exit the **CHANGE PASSWORD** menu.

4) Access the **CLEAR PASSWORD** menu and press the 'M' key. The display will show:

CLEAR PASSWORD
PASSWORD CLEARED

This indicates that the password value entered above has been locked into the system. Using **CLEAR PASSWORD** sets the value in the **ENTER PASSWORD** menu to **0x0000**, otherwise the password would still be displayed.

5) The setup parameters are now locked. Remember to use **PARAMETER SAVE** to put the password value in non-volatile memory. If you now go back to the **CHANGE PASSWORD** menu the password value is hidden and the display will show:

CHANGE PASSWORD
****

Example 2: Accessing setup parameters when the password is set.

1) Access the **ENTER PASSWORD** menu. The display will show:

ENTER PASSWORD
0X0000

2) Use the up and down arrow keys to select your password.

3) Press the 'E' key to exit the **ENTER PASSWORD** menu.

4) Access the **SETUP PARAMETERS** menu to make any necessary changes.

5) When all parameter changes have been made come back to the **CLEAR PASSWORD** menu to hide the password value and lock the setup parameters again.

Example 3: Changing a previously set password

1) Access the **ENTER PASSWORD** menu.

2) Use the up and down arrow keys to enter the existing password value.

3) Leave the **ENTER PASSWORD** menu and access the **CHANGE PASSWORD** menu.

4) Use the up and down arrow keys to select a new password value.

5) Leave the **CHANGE PASSWORD** menu and access the **CLEAR PASSWORD** menu.

6) Press the 'M' key to clear the password value and lock the setup parameters.

7) Remember to use **SAVE PARAMETERS** to save the new password value in non-volatile memory.

PARAMETERS SAVE

This menu is used to save all of the drive parameters in the non-volatile memory. Press the UP arrow as instructed on the second line of the MMI display (UP TO ACTION) to save the drive parameters.

NOTE:- Parameters cannot be saved when the drive is unhealthy or braking (stopping). Toggle run signal to clear alarm or wait for drive to stop before saving.

SYSTEM

Options within the System menu are described in the following paragraphs:

Reconfig O/Ps

This menu controls the function of the two user-configurable relay outputs, RELAY 1, and RELAY 2. For each relay the following options are available:

ZERO SPEED The relay contacts close when the drive output frequency is at 0Hz ± **0 SPEED THRESH** parameter.

AT SPEED — The relay contacts close when the drive output frequency reaches the speed setpoint ± **AT SPEED THRESH**.

RUN CONFIRM — Relay contacts are closed when the drive is running. Relay contacts are open when the drive is not running.

BRAKE CONTROL — This mode is intended to control external electro-mechanical motor brakes in lift and hoist applications. There are 3 parameters associated with this mode. These are under the **BRAKE CONTROL** parameter. The relay contacts close when drive frequency > **ON FREQ LEVEL** and motor load > **ON LOAD LEVEL**. The relay contacts open when drive frequency < **OFF FREQ LEVEL.**

AT LOAD — The relay contacts close when the measured motor load exceeds the **LOAD THRESH** parameter. The relay contacts will open when the measured motor load falls below the **LOAD THRESH** parameter.

AT FB SPEED — The relay contacts will close when the measured motor speed is greater than the **FB SPEED THRESH** parameter. The relay contacts close when the measured motor speed is below the **FB SPEED THRESH** parameter.

NOTE: For the **AT FB SPEED** relay to operate correctly the drive requires speed feedback information from an encoder via the speed feedback option board. In addition the data concerning the number of encoder lines and motor pole-pairs needs to have been correctly entered in the set up parameters menu.

Reconfig I/Ps

This parameter determines the functionality of the FRAMP, JOG, PRESET1 & PRESET2 control terminals (terminals 21, 24, 25 and 26 respectively). The following options are provided:

PRESETS & JOG — Within this menu we can choose from the options:-

4 PRESETS & JOG With this option selected, raising the JOG terminal to +24V causes the drive to run at the jog speed setpoint. The digital inputs PRESET1 and PRESET2 remotely select 1 of 4 preset speed setpoints.

8 PRESETS With this option selected, the JOG digital input is now re-configured to select a second bank of preset speed (preset speeds 5 to 8).

DIGITAL MOP & PRESET With this selected, the functionality of the JOG, PRESET1 & PRESET 2 terminals are again reconfigured to act as a digital motorised potentiometer. PRESET1 becomes RAISE, PRESET 2 becomes LOWER and JOG becomes MOP PRESET.

FRAMP — Within this menu we can choose the function of the FRAMP terminal from the options:-

FRAMP with this option selected, raising the FRAMP terminal to +24V and removing the RUN signal causes the drive to ramp down with the FRAMP TIME selected.

PID RESET with this option selected, raising the FRAMP terminal to +24V causes the internal PID to be held in a reset state.

2ND RAMP RATES with this option selected, raising the FRAMP terminal to +24V causes the **RAMP UP TIME2** and **RAMP DOWN TIME2** to be selected as the main ramp times.

TRIP RESET with this option selected, raising the **FRAMP** terminal to +24V, and the RUN is input inactive, the drive will attempt to reset any trips.

Torque Mode

This parameter selects the power mode of the product. The following options are provided.

CONSTANT TORQUE This mode allows a 50% overload for 60 seconds, (see ELECTRICAL RATINGS CONSTANT TORQUE). This mode would be used in general industrial application.

QUADRATIC TORQUE This mode allows a 10% overload for 10 seconds, (see ELECTRICAL RATINGS QUADRATIC TORQUE) but has a higher continuous current rating than . **CONSTANT TORQUE.** This mode would be used for most pump and fan applications where the torque required is a square of speed.

SERIAL LINK

The 584 Series Drives support 2 serial links. Fitted as standard is an RS232 port, called the AUX PORT, P3. This is intended for connection to a personal computer to allow drive configuration and storing of parameters. The second serial port, called MAIN PORT P1, is fitted as an option. It is an opto-isolated RS422/485 port allowing full remote control of the drive from a host supervisory computer. This port also acts as an interface to Field Bus options (currently only PROFIBUS DP). Both serial ports use the industry standard EI BISYNC protocol. Each port has a number of setup parameters which are described below. Further information regarding the Serial Communications Option is included in Appendix B.

Main Port P1

Parameters available from the Main Port P1 menu are as follows:

SRL LINK ENABLE Enables serial port operation. Note that this parameter must be enabled before serial communications can take place.

PROTOCOL There are three types of message format (protocol), **EI ASCII**, **EI INARY** or **OPTION** (used for FIELD BUS options). This parameter selects which format is to be used. Default: **EI ASCII** .

GROUP ID (GID) Eurotherm protocol group identity address. Range: 0 to 7. Default: 0.

UNIT ID (UID) Eurotherm protocol unit identity address. Rang e: 0 to 15. Default: 0.

OPTION ADDRESS This parameter is used to set a "network" address to the option card.
Range: 0 to 32767
Default: 0.

BAUD RATE Baud rate is the serial communications bit rate. Range: 300 to 9600. Default: 9600.

ESP SUP(ASCII) See Appendix B for a description of ESP support.

CHANGEBAND(BIN) Enquiry poll changeband. See Appendix B Block 0, PNO.4 for a description of Changeband.
Range: 0.0% to 327.6%.
Default: 0.0%.

ERROR REPORT This is a read only diagnostic showing communication errors as follows:

ERROR REPORT	MEANING
00C0	No errors
01C7	Unknown mnemonic
02C2	Block check character fail
03C1	Parity error on received data
03C2	Framing or overrun error
05C8	Attempt to write to a read-only mnemonic
07C7	Invalid message format
08C8	Value in selection message out of range

PNO.7 Control word for multi-parameter polling. See Appendix B Block 0, PNO.7 for a description. Range: 0x0000 to 0xFFFF.
Default: 0xFFFF.

PARITY Select odd or even parity (Main Port P1 only). Eurotherm BISYNC protocol requires even parity, however odd parity may be selected for other applications. Default: EVEN.

OPTION VERSION The **OPTION VERSION** diagnostic indicates the software/firmware version of the field bus options.

AUX Port P3

Parameters available from the AUX Port P3 menu are as follows:

SRL LINK ENABLE Enables serial port operation. Note that this parameter must be enabled before serial communications can take place.

GROUP ID (GID) Eurotherm protocol group identity address. Range: 0 to 7. Default: 0.

UNIT ID (UID) Eurotherm protocol unit identity address. Rang e: 0 to 15. Default: 0.

PROTOCOL There are two types of message format (protocol), **EI ASCII** and **EI BINARY**. This parameter selects which format is to be used. Default: **EI ASCII** .

BAUD RATE Baud rate is the serial communications bit rate. Range: 300 to 9600. Default: 9600.

ESP SUP(ASCII) See Appendix B for a description of ESP support.

CHANGEBAND(BIN) Enquiry poll changeband. See Appendix B Block 0, PNO.4 for a description of Changeband.
Range: 0.0% to 327.6%.
Default: 0.0%.

ERROR REPORT This is a read only diagnostic showing communication errors as follows:

ERROR REPORT	MEANING
00C0	No errors
01C7	Unknown mnemonic
02C2	Block check character fail
03C1	Parity error on received data
03C2	Framing or overrun error
05C8	Attempt to write to a read-only mnemonic
07C7	Invalid message format
08C8	Value in selection message out of range

PNO.7 Control word for multi-parameter polling. See Appendix B Block 0, PNO.7 for a description. Range: 0x0000 to 0xFFFF.
Default: 0xFFFF.

PNO Config

The parameter number (PNO) configuration menu allows the serial link to be set up to access drive parameters and diagnostics indirectly. This is achieved using the configurable serial link mnemonic parameters as described in Appendix B Blocks 14 & 15. The configurable mnemonics are parameter numbers (PNOs) 112 to 127. These correspond to ASCII comms mnemonics 70 to 7F. Simply entering a drive parameter tag number into the MMI parameter associated with a configurable mnemonic, allows that parameter to be accessed indirectly by reading or writing to the configurable mnemonic via the serial link. A full list of drive parameters and their associated tag numbers is given in Appendix B.

For example, the tag number for the **RAMP UP TIME** parameter is 14. Setting the **PNO 112** parameter to 14, will allow the **RAMP UP TIME** parameter to be accessed when reading or writing to PNO 112 (ASCII mnemonic 70) via the serial link.

PNO 112 Contains the tag number of the drive parameter which will be accessed when reading or writing to parameter number 112 (PNO 112) via the serial link.
Range 0 to 255
Default 0

PNO 113 Contains the tag number of the drive parameter which will be accessed when reading or writing to parameter number 113 (PNO 113) via the serial link.
Range 0 to 255
Default 0

PNO 114 Contains the tag number of the drive parameter which will be accessed when reading or writing to parameter number 114 (PNO 114) via the serial link.
Range 0 to 255
Default 0

PNO 115 Contains the tag number of the drive parameter which will be accessed when reading or writing to parameter number 115 (PNO 115) via the serial link.
Range 0 to 255
Default 0

PNO 116 Contains the tag number of the drive parameter which will be accessed when reading or writing to parameter number 116 (PNO 116) via the serial link.
Range 0 to 255
Default 0

PNO 117 Contains the tag number of the drive parameter which will be accessed when reading or writing to parameter number 117 (PNO 117) via the serial link.
Range 0 to 255
Default 0

PNO 118 Contains the tag number of the drive parameter which will be accessed when reading or writing to parameter number 118 (PNO 118) via the serial link.
Range 0 to 255
Default 0

PNO 119 Contains the tag number of the drive parameter which will be accessed when reading or writing to parameter number 119 (PNO 119) via the serial link.
Range 0 to 255
Default 0

PNO 120 Contains the tag number of the drive parameter which will be accessed when reading or writing to parameter number 120 (PNO 120) via the serial link.
Range 0 to 255
Default 0

PNO 121 Contains the tag number of the drive parameter which will be accessed when reading or writing to parameter number 121 (PNO 121) via the serial link.
Range 0 to 255
Default 0

PNO 122 Contains the tag number of the drive parameter which will be accessed when reading or writing to parameter number 122 (PNO 122) via the serial link.
Range 0 to 255
Default 0

PNO 123 Contains the tag number of the drive parameter which will be accessed when reading or writing to parameter number 123 (PNO 123) via the serial link.
Range 0 to 255
Default 0

PNO 124 Contains the tag number of the drive parameter which will be accessed when reading or writing to parameter number 124 (PNO 124) via the serial link.
Range 0 to 255
Default 0

PNO 125 Contains the tag number of the drive parameter which will be accessed when reading or writing to parameter number 125 (PNO 125) via the serial link.
Range 0 to 255
Default 0

PNO 126 Contains the tag number of the drive parameter which will be accessed when reading or writing to parameter number 126 (PNO 126) via the serial link.
Range 0 to 255
Default 0

PNO 127 Contains the tag number of the drive parameter which will be accessed when reading or writing to parameter number 127 (PNO 127) via the serial link.
Range 0 to 255
Default 0

MENUS

MENU DELAY

This parameter controls the speed of response of the display to key presses. Increasing the **MENU DELAY** slows down the display.

Range: 10 to 200
Default: 20

LANGUAGE

This menu changes the displayed text to the selected language. Use the 'UP' and 'DOWN' keys to select the appropriate language. The language name will be displayed in the appropriate language chosen. i.e. English - **ENGLISH**, German - **DEUTSCH**, Parameter - **P LANGUAGE**. or French **FRANCAIS.** Selecting Parameter will display menu options as parameter codes. This is to be used in conjunction with the translation table in Appendix C, where the code is given with the English language equivalent, with space for translation to an otherwise unsupported language.
Note: When selecting a different language, the language will automatically be set to the language name selected. After changing the language parameter, it is important to perform a parameter save. In this way, the desired language setting will not be lost when power is removed from the product.

Range: English/German/Parameter/French
Default: English