

Chapter 4

SETTING-UP AND COMMISSIONING

Contents	Page
INTRODUCTION	4-1
PHYSICAL DESCRIPTION	4-1
MAN-MACHINE INTERFACE (MMI)	4-1
Display and Menu.....	4-1
Definition of terms	4-1
Function Keys	4-2
Command Keys	4-3
Summary of MMI Keys	4-4
Status LEDs.....	4-4
NAVIGATING THE MMI MENU STRUCTURE	4-4
Menu Structure	4-6
Configure Drive.....	4-6
Diagnostics.....	4-6
Set-up Parameters	4-6
Password	4-6
Alarms.....	4-6
Menus	4-6
Parameter Save	4-6
Serial Links	4-6
System.....	4-6
SETTING-UP PROCEDURE	4-7
Setup Step 1 Before You Start	4-7
Setup Step 2 Ensure The Safety Of The Complete System ...	4-7
Setup Step 3 Prepare To Energise	4-7
Setup Step 4 Power On.....	4-8
Initial Setup.	4-8
Setup Step 5 Run the drive	4-9
Setup Step 6 Autotuning the Drive.....	4-10
Reset To Factory Defaults	4-10
Change Stack Size.....	4-11

Chapter 4 SETTING-UP AND COMMISSIONING

INTRODUCTION

This chapter describes how to use the Man-Machine Interface (MMI), the necessary steps to set up and commission an installed 620 Vector Drive.

In order to commission the drive successfully it is necessary to understand the basic operation of the MMI.

PHYSICAL DESCRIPTION

The 620 Vector Drives feature an MMI panel, shown in Figure 4.1 Man-Machine Interface (MMI), comprising a 2x16 character liquid crystal display (LCD), four function keys six command keys and four status LEDs. Programming commands and data are entered into the drive by using the function keys to navigate the MMI menu structure and setting various parameters. 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.

The Command keys provide a means of locally operating the drive.



Figure 4.1 Man-Machine Interface (MMI)

MAN-MACHINE INTERFACE (MMI)

The physical parts of the MMI comprise the LCD display and function keys. The software element comprises an extensive menu system.

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.

NOTE:

There are two user views of the MMI, REDUCED and FULL. The reduced view significantly simplifies the MMI structure by removing the more advanced menu entries.

These views may be selected under

MENUS::FULL MENUS = TRUE/FALSE.

Definition of terms

Certain terms have specific meanings in the context of the MMI. The most common of these are defined as follows.

Default	A value which is pre-programmed into the 620 Vector drive during manufacture and which may be changed if required. Note that it is possible to completely reset all parameters to their default settings by following the procedure "Reset to Defaults" later in this chapter.
Diagnostic	A displayed status indicator which can be used to determine the health or operational mode of the drive. Diagnostics are Read Only.
Local Mode	A special operational mode of the drive where basic operations are controlled directly from the front panel (MMI) rather than by reference to external inputs. The opposite to this is Remote.

Operator station	The MMI, when it is being used in LOCAL MODE to control the motor speed setpoint directly. Can Also be used to describe the MMI and command buttons as a whole.
Parameter	Any variable (user input number) such as RAMP ACCEL TIME etc. Parameter names are shown in this chapter LIKE THIS . They are usually shown with their associated menu trail (i.e. how you get to them from the top level), such as DIAGNOSTICS::SPEED FEEDBACK , where the double colon indicates a progression through one menu level. (A complete menu map the appendix).
Setpoint	The speed at which a motor is set to run at (expressed as a percentage of the maximum speed which is programmed for the set-up).
Parameter Save	The PARAMETER SAVE option enables the user to store the setup parameters after adjustment. Unless the user carries out this operation the entered settings will be lost if the power is removed from the Drive.

Function Keys

The four 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. The following section identifies each key by its legend and describes its function.



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.

Pressing this key while in LOCAL MODE (LOCAL LED illuminated) shows the actual speed of the motor as a percentage of the maximum speed.

If FULL MENUS are enabled then pressing the 'M' key while displaying a tag value



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 previous point where you were working.



UP

When in the menu structure, pressing the UP key steps through the options or settings for the currently displayed menu option. This will either result in displaying different menu options or stepping through available settings for the selected parameter.

Numerical values are incremented by the UP key.

Pressing this key while in LOCAL MODE (LOCAL LED illuminated) increases the speed reference. The speed of the motor is shown on the display (while the button is pressed) as a percentage of the maximum speed.

**DOWN**

When in the menu structure, pressing the DOWN key steps through the options or settings for the currently displayed menu option. When you are stepping through text displays (e.g. menu options), the DOWN key steps in the opposite direction from the UP key.

Numerical values are decremented by the DOWN key.

Pressing this key while in LOCAL MODE (LOCAL LED illuminated) decreases the speed reference. The speed of the motor is shown on the display (while the button is pressed) as a percentage of the maximum speed.

Command Keys

The six command keys allow the user to start / stop and jog the drive directly from the op station. The following section identifies each key by its legend and describes its function. The Up and Down Keys also take on command functions in Local mode.

**LOCAL/REMOTE**

This key toggles between the normal operating mode (REMOTE) and the LOCAL control mode. It only works when the motor is stopped.

When in LOCAL MODE the LOCAL LED is illuminated, and the MMI buttons START, STOP, JOG, REVERSE, UP and DOWN can be used to control the motor speed and direction.

Press the LOCAL button to return to REMOTE MODE, the MMI will return to the last accessed place in the main menu.

**PROG**

When in LOCAL MODE, pressing the PROG button switches back to the main MMI menu. At the point it was last accessed from REMOTE MODE, while still remaining in LOCAL MODE. This enables changes to be made to parameters not available in the LOCAL MODE menu.

This button has no function in REMOTE MODE.

**FORWARD/REVERSE**

When in LOCAL MODE, the FORWARD/REVERSE button changes the sign of the speed reference. When you press this button, the display changes to indicate the new direction of rotation.

When in JOG mode (see below), this key selects between the two jog speeds.

This button has no function in REMOTE MODE.

**JOG**

When in LOCAL MODE, pressing this button runs the motor at the speed set by the **JOG SPEED**¹ parameters. The motor only runs in jog mode while the button is pressed.

This button has no function in REMOTE MODE.

**START**

When in LOCAL MODE, pressing this button starts the motor running¹The motor will continue to run at the selected speed until the STOP button is pressed .

This button has no function in REMOTE MODE.

¹ JOG and START require the inputs COAST STOP, FAST STOP and ENABLE to be high before they will operate.

**STOP**

When in LOCAL MODE, pressing this button stops the motor if it is running. While stopped, the drive remembers the direction and speed at which the motor was running and will resume to those settings if the START button is pressed. This button has no function in REMOTE MODE.

Summary of MMI Keys



Goes down a level



Goes up a level.



EITHER Accesses other parameters in the same menu level







OR Modifies the selected parameter.


Status LEDs



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


HEALTH	<p>The drive is powered up and there are no alarms present (the drive is healthy).</p> <p>HEALTH is reset by RUN going high and the drive running.</p>
RUN	<p>The RUN digital input is active, the motor is running and there are no alarms present.</p> <p>If the LED is flashing fast, this indicates that the output current has exceeded the selected I*T threshold.</p> <p>The LED flashes slowly during Autotune (described later).</p>
BRAKE	<p>If this LED is on, it indicates that the DC link voltage inside the drive has risen above the dynamic braking threshold. Chapter 3 "DYNAMIC BRAKING" describes this in more detail.</p>
LOCAL	<p>This LED indicates the drive is in LOCAL MODE when illuminated.</p>

NAVIGATING THE MMI MENU STRUCTURE


The MMI comprises several hundred menu options (shown in Figure 4.3). The    and  buttons navigate through the menus.

When the 620 Vector drive is initially powered up, the MMI displays the start-up screen. Pressing  activates the menu structure.

The  and  buttons step between main menu options of the same level.

The  button selects the displayed menu option, which will either lead to a further sub-menu or to an adjustable parameter.

When an adjustable parameter is displayed, the  and  buttons adjust the value up and down.

The  button steps up a level (either from a parameter to a menu option or from a menu option to the next highest level menu).

The process of stepping through the menus and adjusting parameters is illustrated in Figure 4.2.

The image shows a screenshot of a menu screen, likely from a motor inverter, displaying file information. The text is as follows:

Title: 584F4- 2. EPS from Corel DRAW!
Creator: Corel DRAW!
CreationDate: Fri Mar 25 11:00:32 1994

The text is displayed in a bold, monospaced font. The background is white, and the text is black. The entire content is enclosed in a thin black rectangular border.

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.

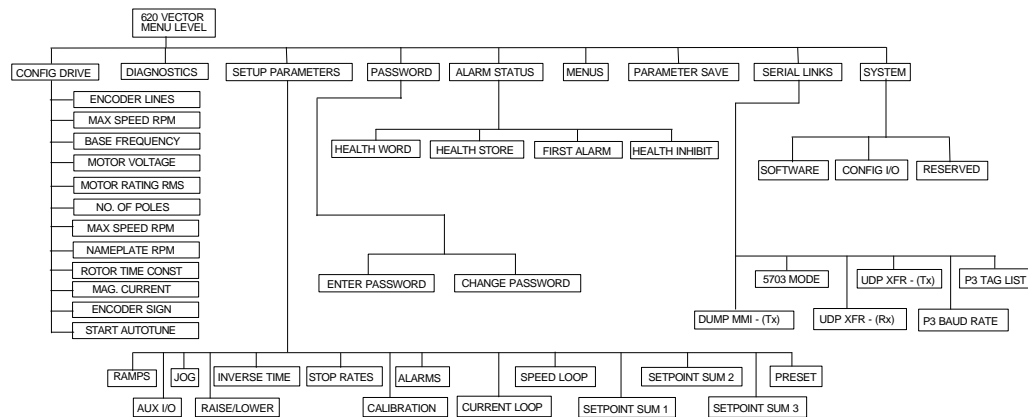


Figure 4.3 - Main Menu Options

Configure Drive

The CONFIGURE DRIVE option provides a fast track to commissioning a new 620 Vector drive. It contains all the parameters necessary for basic operation, grouped together under one menu. This will be described under 'Setup Step 4' later in this chapter.

Diagnostics

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

Set-up 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 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 key (E), but can be re displayed 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: P3 (fitted as standard).

System

The SYSTEM option enables the user to set re configurable input and output control board connections. Refer to "**SYSTEM**" for further details.

SETTING-UP PROCEDURE



Warning

ELECTRIC SHOCK HAZARD

WAIT 3 MINUTES AFTER POWER IS DISCONNECTED BEFORE WORKING ON ANY PART OF THE SYSTEM OR REMOVING THE TERMINAL COVER FROM THE DRIVE

Setup Step 1 Before You Start

1. Before power is applied to the system the following items should be checked:
2. Mains power supply voltage is correct for the drive type.
3. Motor is of correct voltage rating and is connected in either star or delta as appropriate.
4. An encoder of the correct type is fitted to the motor properly with no plug. A, Ä, B and B are connected to the drive. See Table 2.2.
5. All external wiring circuits such as Power connections, Control connections, Motor connections, Earth connections are properly connected and secure.
6. Check for damage to equipment. Do not attempt to operate the equipment if damage is found.
7. Check for loose ends, clippings, drilling swarf, etc., lodged in the drive or ancillary equipment. Do not attempt to operate the equipment until any such foreign objects have been completely removed.
8. If possible check that the motor can be turned freely and that the motor cooling fan is intact and free of obstructions.

Setup Step 2 Ensure The Safety Of The Complete System

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

1. That no personnel are at risk of injury or inconvenience when the drive system is energised.
2. That rotation of the motor in either direction will not cause damage.
3. That other equipment will not be adversely affected by powering up.



Caution

Before carrying out any high voltage insulation resistance checks with a Megger or similar device or performing point to point checking with a buzzer it is essential to completely disconnect the 620 Vector drive. Failure to comply may result in equipment damage and/or misleading results.

Setup Step 3 Prepare To Energise

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 the external run contacts are open.
5. Check the external speed setpoint controls are all set to zero.

Setup Step 4 Power On

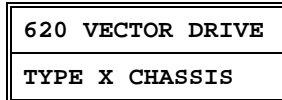
Once all the preceding steps are completed and understood, the supply fuses or circuit breaker may be replaced and power applied to the drive.

Setting up the drive consists of:

- Setting up basic motor parameters via the MMI.
- Running Autotune to set up magnetising current and slip.
- Tuning the speed loop for the particular application.

Initial Setup.

When the 620 Vector drive is switched on, the HEALTH LED should light. The remaining 3 LEDs should be off and the power-up message should appear on the MMI display as follows:



1. Press **(M)** **(M)**. The display will show '**MENU LEVEL / DIAGNOSTICS**'. Pressing the **(Δ)** and **(▽)** buttons will enable you to move around the top level menu. Press **(Δ)** until the display shows **CONFIGURE DRIVE** (if you miss **CONFIGURE DRIVE** or any other menu item, either use the **(▽)** button to get back or keep pressing **(Δ)** until **CONFIGURE DRIVE** is displayed again). You will be navigating the Initial Setup menus shown at the extreme left of Fig 4.3.
2. Ensure that the '**CONFIGURE DRIVE**' menu is selected on the display. Press **(M)** to enter this menu. When you enter the menu, the first parameter to appear on the display will be **ENCODER LINES**. Other parameters may be selected by means of the **(Δ)** and **(▽)** buttons. Locate **ENCODER LINES** and press **(M)** to select this parameter. Use the **(Δ)** and **(▽)** buttons to enter the number of lines on the encoder. When you have entered the correct number of encoder lines, press **(E)** to return to the previous level where the remaining parameters may be accessed.
3. Press **(▽)** to select **MAX SPEED RPM** and then press **(M)**. This entry sets the maximum rotation speed for the process, and can be up to 9 times the motor base speed printed on the nameplate if required. (This speed will be the 100% speed referred to elsewhere in the MMI). Use the **(Δ)** and **(▽)** buttons to set the **MAX SPEED RPM** parameter to the required figure. Press **(E)**.
It is important at this stage to set **MAX SPEED RPM** to the highest value that you are likely to be using. This is because the autotune will only set up the magnetising current values up to this speed. If at a later stage you wish to run the motor faster then it will be necessary to re-run the autotune. To avoid this inconvenience, set up **MAX SPEED RPM** to a high value now, and reduce it after autotune if required. The maximum motor speed should not of course be exceeded.
4. Press **(▽)** to select **BASE FREQUENCY** and then press **(M)**. Read the motor power supply frequency from the motor nameplate (typically 50Hz or 60 Hz) and use the **(Δ)** and **(▽)** buttons to set the **BASE FREQUENCY** parameter to the same figure. Press **(E)**.
5. Press **(▽)** to select **MOTOR VOLTAGE** and then press **(M)**. Read the motor power supply voltage from the motor nameplate and use the **(Δ)** and **(▽)** buttons to set the **MOTOR VOLTAGE** parameter to the same figure. Press **(E)**.
6. Press **(▽)** to select **MOTOR RATING RMS** and then press **(M)**. Read the motor full-load current from the motor nameplate and use the **(Δ)** and **(▽)** buttons to set the **MOTOR RATING RMS** parameter to the same figure. Press **(E)**.
7. Press **(▽)** to select **NO.OF POLES** and then press **(M)**. Read the number of poles from the motor nameplate. This number must be divisible by 2, e.g. 2, 4, 6, 8 etc. or an error will be generated later. Use the **(Δ)** and **(▽)** buttons to set the **NO.OF POLES** parameter. Press **(E)**.
8. Press **(▽)** to select **NAMEPLATE RPM** and then press **(M)**. Read the base speed from the motor nameplate, and use the **(Δ)** and **(▽)** buttons to set the **NAMEPLATE RPM** parameter to the specified figure. Press **(E)**. It is important to enter this value exactly as it appears on the nameplate. For example, if it appears on the nameplate as 1450rpm, DO NOT round it up to 1500rpm.

9. Press ∇ to select **MAG CURRENT %** and then press \textcircled{M} . Read the “no load current” from the motor nameplate, and use the Δ and ∇ buttons to set the **MAG CURRENT %** parameter to the specified figure $((\text{No Load Current} / \text{Motor Rating RMS}) * 100\%)$. Press \textcircled{E} .
If the “no load current” is not available, set the **MAG CURRENT %** to 30-40% for motors less than 30kw and 20-30% for motors > 30kw.
10. Press ∇ to select **ROTOR TIME CONST** and then press \textcircled{M} . This parameter sets up an initial estimate of the rotor time constant which Autotune will later optimise. For motors up to 2.2kW use 100.0ms, between 2.2kW and 7.5kW use 200.0ms, between 7.5kW and 22kW use 400.0ms and for larger motors use 800.0ms. Use the Δ and ∇ buttons to set the **ROTOR TIME CONST** parameter to the required figure. Press \textcircled{E} .
11. At this point almost all of the required basic parameters have been entered and further parameters can only be determined by running the drive. All the parameters should now be saved. To save the parameters, press \textcircled{E} \textcircled{M} which will select **SAVE PARAMETERS** option, and then press \textcircled{M} . Press Δ to save the parameters. The display will say **FINISHED** after a second or so when the process is complete. Press \textcircled{E} ∇ \textcircled{M} to return to the Configure Drive menu.

Setup Step 5 Run the drive

The next step is to run the drive.



Warning

- **UNPREDICTABLE MOTION, ESPECIALLY IF MOTOR PARAMETERS ARE INCORRECT.**
 - **ENSURE NO PERSONNEL ARE IN THE VICINITY OF THE MOTOR OR ANY CONNECTED MACHINERY.**
 - **ENSURE THAT THE EMERGENCY STOP CIRCUITS FUNCTION CORRECTLY BEFORE RUNNING THE MOTOR FOR THE FIRST TIME.**
 - **WHEN THE DRIVE IS RUN FOR THE FIRST TIME ROTATION WILL BE OF UNKNOWN DIRECTION, MAY BE JERKY AND SPEED CONTROL MAY NOT OPERATE CORRECTLY.**
 - **ENSURE THAT NO MACHINERY CONNECTED TO THE MOTOR WILL BE DAMAGED BY UNPREDICTABLE MOTION.**
-

1. Press $\textcircled{\text{LOCAL}}$ to put the drive into LOCAL MODE. The LOCAL LED should light.
2. Use the Δ and ∇ buttons to set a speed demand of between 5% and 10% of full speed (the actual value is not critical).
3. Press \textcircled{I} to start the motor. The RUN LED should illuminate. (If any error messages occur on the MMI, refer to Chapter 6, "**Diagnostics**").
4. Listen to and look at the motion of the motor. If the encoder sign is correct the motor will rotate smoothly and respond to changes in speed demand or direction. To check this, use the Δ and ∇ buttons to increase the speed to about double the first figure, and then use the \textcircled{X} button to change the direction of rotation. If it accelerates and changes direction smoothly, this confirms that the encoder sign is set correctly.
5. If the ENCODER SIGN is incorrect, the motor will rotate in a jerky and/or noisy manner. Alternatively, it may rotate smoothly at a very low speed but not respond to changes in speed demand or direction. In either case the encoder sign must be changed. Paragraph 7 describes how to change the encoder sign.
6. If the motor rotates in the wrong direction, press $\textcircled{0}$ to stop the motor then power down the entire drive assembly, wait 3 minutes for the DC Link capacitors to discharge then swap motor drive cables M1 and M2. Re-start the Initial Setup procedure from step 1. The encoder sign will have been changed by the change in motor direction as described in step 4.
7. Press $\textcircled{0}$ to stop the motor, then press $\textcircled{\text{LOCAL}}$ to put the drive back into REMOTE MODE.
8. If the **ENCODER SIGN** needs changing, go into the '**CONFIGURE DRIVE**' menu and select **ENCODER SIGN**, then press \textcircled{M} . Use the Δ and ∇ buttons to set the **ENCODER SIGN** parameter to the other setting. Press \textcircled{E} .
9. This completes the initial part of the setting up phase. At this point the motor is running under control, but it is not optimised for smooth, efficient running. The next step is to Autotune the drive to automatically set up the remaining basic parameters.

Setup Step 6 Autotuning the Drive

The purpose of the Autotune function is to set up the magnetising current and rotor time constant for this motor.





This is a two-stage process. The first stage runs the drive up to various speeds to tune the magnetisation current. The second stage calculates the rotor time constant from the **MAG CURRENT** and motor nameplate details which you entered.



Caution

When the Autotune is carried out, the motor will run at base speed for several minutes.

It is essential that no load is applied to the output shaft for the Autotune to function correctly. A gearbox may be permissible provided it does not significantly load the motor, but it should be disconnected where possible.

Ensure that you are in the '**CONFIGURE DRIVE**' menu. Scroll around the menu with the  or  buttons until you locate **AUTOTUNE**. Press . Press  to set the **AUTOTUNE** flag **TRUE**. Then restart the drive.

The drive will now accelerate first to base speed, and then to a number of other speeds, up to the value set in **MAX SPEED RPM**. At each speed it will set up the magnetising current for this motor. When it has finished, it will then calculate the rotor time constant. If any error messages occur on the MMI, refer to Chapter 6, "Alarms".



If the autotune fails to run, but no error message appears on the MMI, this may be due to a wrong configuration in the autotune menu. This menu contains 2 flags which control the autotune action. 'Mag I Autotune' must be set true to ensure that the mag current autotune is carried out, and 'Set Tr < Rtd Spd' must be true for the rotor time constant calculation to be done. Go into the autotune menu, under 'Setup Parameters (see 'Menu Structure' on page 4-6) and ensure these flags are set to be true.

When Autotune has finished, the 620 Vector drive is set up with all the information required for basic operation as a speed controller. It is now necessary to save this information in non volatile memory, so that it will be retained when power is removed. This is done via the **PARAMETER SAVE** menu. See 'Parameter Save' under 'Menu Structure' on page 4-6.

At the end of the autotune process, the drive will calculate a new value of rotor time constant. If it is significantly different from the old value, it may be advisable to run the autotune again. The values of magnetising current obtained on the second pass will then be slightly more accurate, as the drive will now be using a more accurate value of rotor time constant.

Reset To Factory Defaults

Disconnect the power to the drive.

Hold down the  and  buttons while re-applying power and keep both buttons depressed for at least two seconds after power-up

Note: The start input must also be low [B7].

The MMI display will read

SELF TEST
EEPROM NOT READ

Press .

The drive is now safely configured to the factory defaults. On the 620L and 620Adv these factory defaults are saved automatically, on the 620Std the factory defaults must be saved using "Parameter Save" if wished.

NOTE:

Although it is not advised the 620L and 620Adv also support this function but they display the message

SELF TEST
EEPROM FAILED

And there configurations need to be restored by ConfigEd.




Change Stack Size

This is only be necessary if you are installing a new control board on an existing stack.



SELECTING A DIFFERENT STACK SIZE FROM THAT INDICATED ON THE STACK
RATING LABEL WILL DAMAGE THE STACK AND OR MOTOR



Disconnect the power to the drive.


Hold down the ,  and  (prog) buttons while re-applying power and keep both buttons depressed for at least two seconds after power-up.

Note: The start input must also be low [B7].

The MMI display will read

DRIVE RATING
75 kW 380-460v

At this stage the 620 Vector drive thinks that it is a 75kW model. **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.** Press the  and  buttons to step through the range of power ratings until the displayed value is the same as the rating on the identification label on the side of the drive.

Press the  to exit. This saves the new settings in EEprom (non volatile memory)

Note: The drives setup parameters are unchanged.

Note: The 620L / 620Adv need to have the power cycled to reinitialise the co-processor after this procedure.

Should it ever be necessary to reset all the parameters to their factory defaults (e.g. when swapping out a drive), use the following procedure.