CDE

User Guide

CDE

VARIABLE SPEED DRIVE

for
STANDARD AC INDUCTION MOTORS
0.75kW to 11kW

www.controltechniques.com

Safety Information

Persons supervising and performing the electrical installation or maintenance of a CDE Drive must be suitably qualified and competent in these duties. They should be given the opportunity to study and if necessary to discuss this User Guide before work is started.

The voltages present in the CDE Drive are capable of inflicting a severe electric shock and may be lethal. The Stop function of the CDE Drive does not remove dangerous voltages from the CDE Drive terminals. Mains supplies should be removed before any servicing work is performed.

The installation instructions should be adhered to. Any questions or doubt should be referred to the supplier of the equipment. It is the responsibility of the owner or user to ensure that the installation of the CDE Drive and the way in which it is operated and maintained complies with the requirements of the Health and Safety at Work Act in the United Kingdom and applicable legislation and regulations and codes of practice in the UK or elsewhere.

The CDE Drive software incorporates an optional Auto-start facility. In order to prevent the risk of injury to personnel working on or near the motor or its driven equipment and to prevent potential damage to equipment, users and operators, all necessary precautions must be taken if operating the CDE Drive in this mode.

The Stop and Start inputs of the CDE Drive should not be relied upon to ensure safety of personnel. If a safety hazard could exist from unexpected starting of the CDE Drive, an interlock should be installed to prevent the motor being inadvertently started.

General Information

The manufacturer accepts no liability for any consequences resulting from inappropriate, negligent or incorrect installation or adjustment of the optional operating parameters of the equipment or from mismatching the CDE Drive with the motor.

The contents of this User Guide are believed to be correct at the time of printing. In the interests of a commitment to a policy of continuous development and improvement, the manufacturer reserves the right to change the specification of the product or its performance, or the contents of the User Guide, without notice.

Part Number **0427-0013**

CDE Issue 3 May 1998

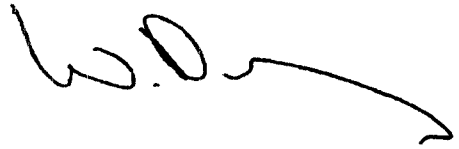
CONTROL TECHNIQUES DRIVES LTD
79 MOCHDRE INDUSTRIAL ESTATE
NEWTOWN, POWYS SY16 4LE

DECLARATION OF CONFORMITY

The AC variable speed drive product bookcase CDE power range 0.75kW-2.2kW, 4.0kW-7.5kW, and 11.0kW, has been designed and manufactured in accordance with the following European harmonised, national and international standards:

EN60249	Base materials for printed circuits
IEC326-1	Printed boards: General information for the specification writer
IEC326-5	Printed boards: Specification for single and double sided printed boards with plated through holes
IEC326-6	Printed boards: Specification for multilayer printed boards
IEC664-1	Insulation co-ordination for equipment within low-voltage systems: Principles, requirements and tests
EN60529	Degrees of protection provided by enclosures (IP code)
UL94	Flammability rating of plastic materials

This product complies with the Low Voltage Directive 73/23/EEC and the CE Marking Directive 93/68/EEC.



W. Drury
Technical Director

Newtown
Date: 13 January 1997

Note
This electronic drive product is intended to be used with an appropriate motor, controller, electrical protection components and other equipment to form a complete end product or system. It must only be installed by a professional assembler who is familiar with requirements for safety and electromagnetic compatibility ("EMC"). The assembler is responsible for ensuring that the end product or system complies with all the relevant laws in the country where it is to be used. Refer to the product manual or EMC data sheet for further information on EMC standards complied with by the product, and guidelines for installation.

Worked Example 1: Specify a thermal overload for use with a DB140 using its internal resistor. The application is working the resistor close to its maximum specification of 1.5kW for 10 seconds, with 90 seconds cooling time. The nominal resistance is 80Ω.

Data:

P_{max} = 1.5kW
t_{max} = 10 seconds
R = 80Ω
V_{dc} = 750V

Since the continuous rating of the resistor is 150W the average current must be limited to

$$\sqrt{\frac{150}{80}} = 1.369 \text{ Amps}$$

$$Ipk = \frac{750}{80} = 9.375 \text{ Amps}$$

$$Duty = \frac{1.369}{9.375} = 0.146$$

$$Irms = \sqrt{9.375^2 \cdot 0.146} = 3.582 \text{ Amps}$$

$$Iset = \frac{3.582}{4} = 0.895 \text{ Amps}$$

This is the current that must be set on the relay so relay type LR2-D1306 (1.0A to 1.6A) should be used.

The short circuit condition will overload the relay by a factor of 8.5, and this will cause the relay to trip out after approximately 4 seconds.

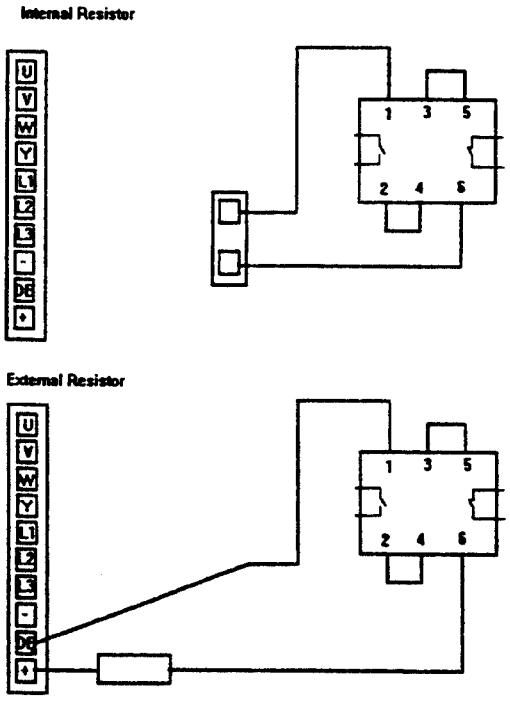
The diagrams below cover the following drives

Vector	CDE	Digitax	Spindax
VBE400	CDE400	DBE420	SA010
VBE550	CDE550	DBE600	SA016
VBE750	CDE750	DBE750	SA022
VBE1100S	CDE1100S	DBE1100S	

Electrical Installation

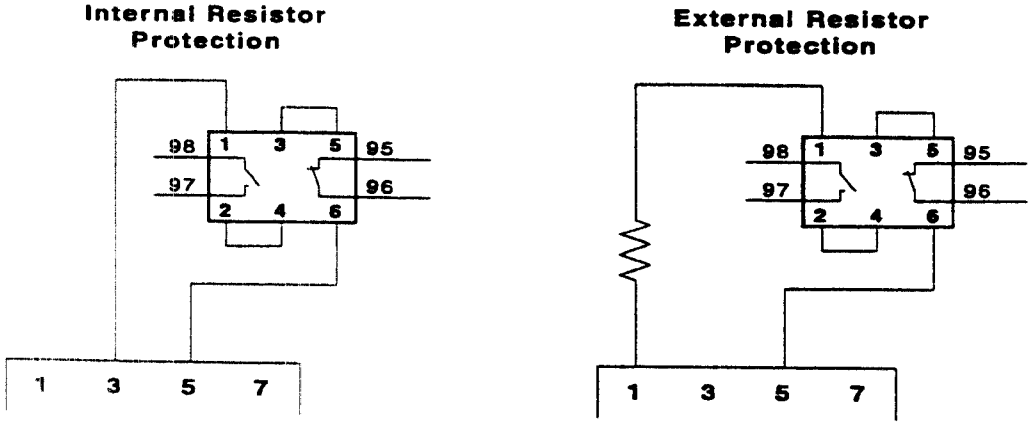
The following diagrams show how to connect the relay to protect the internal resistor for the drives stated, or external resistors if used.

Large bookcase package



The internal resistor must be disconnected if an external resistor is being used. The internal resistor is disconnected if there is no connection between the two way terminal block on the bottom of the unit.

Small Bookcase Package Only



NOTE: If external resistors are used, ensure that the internal resistor is disconnected by removing any wire link between terminals 3 and 5.

The previous diagrams refer to the following drives:

Vector	CDE	DigitAx	SpindAx
VBE75	CDE75	DBE140	SA005
VBE110	CDE110	DBE220	
VBE150	CDE150		
VBE220	CDE220		

The normally closed contacts 95 and 96 should be connected in series with the line contactor coil.

Data

Ingress Protection

IP20 including cooling fans when fitted

Power supply

380V - 480Vac ±10% at 60Hz ±2Hz

380V - 440Vac ±10% at 50Hz ±2Hz

Supply impedance: 0Ω min.

Maximum supply imbalance:
2% negative phase sequence equivalent to 3% phase voltage imbalance

Output Ratings

Output type

3-phase balanced asynchronous PWM synthesised sine wave

Output voltage

Variable from 0V to a maximum value that is nominally equal to the supply voltage

Output frequency

Fully variable from: 0Hz to 1kHz

Accuracy: 0.01% of O/P frequency signal

Resolution:

Keypad control

0.1Hz up to 100Hz
1Hz above 100Hz

High resolution mode

0.001Hz

Maximum output current

150% of full load current for 60 seconds

Environment

Operating ambient temperature

-10°C to +50°C

Storage temperature and time

-40°C to +50°C, 12 months maximum

Maximum Humidity

Non condensing

Derating

If the site is above 1000m, reduce the normal full-load current by 1% for each 100m above 1000m.

Local heat sources (such as other equipment) that raise the air temperature above +50°C must be removed.

Starts per hour

CDE Drive

By switching the supply: 20 starts per hour maximum

Electronic control only: unlimited

Motor

Refer to the motor manufacturer

PWM switching frequencies

The switching frequency can be selected from:

3kHz, 6kHz, 9kHz, 12kHz

The selected frequency remains constant for all drive frequencies, unless quasi square-wave is selected (using parameter **b6.24**).

Weight

Model	kg
CDE 75, 110, 150	5.0
CDE 220	5.5
CDE 400	7.5
CDE 550, 750	8.0
CDE 1100	9.0

Power ratings

Model CDE	Motor power		Maximum continuous output current	Input current	Maximum input power at 415V	Maximum output power at 415V
	HP	kW	A	A	kVA	kVA
75	1.0	0.75	2.1	3.4	2.4	1.5
110	1.5	1.1	2.8	4.5	3.2	2.0
150	2.0	1.5	3.8	5.5	4.0	2.7
220	3.0	2.2	5.6	8.7	6.3	4.0
400	5.0	4.0	9.5	13.2	9.5	6.8
550	7.5	5.5	12.0	13.5	9.7	8.6
750	10.0	7.5	16.0	16.7	12.0	11.5
1100	15.0	11.0	22.0	23.4	17.0	16.0

Fuses and power cables

Fuses

The use of a 'slow' fuse is recommended for handling current surge during power-up of the CDE Drive.

Cables

Sizes given are for 3-core and 4-core PVC-insulated armoured cable rated at 600Vac (1000Vdc) and laid in accordance with the manufacturer's instructions.

Model	Recommended fuse rating at 380V A	Typical cable size mm^2
CDE 75	6	1.0
CDE 110	6	1.0
CDE 150	10	1.5
CDE 220	10	1.5
CDE 400	16	2.5
CDE 550	16	2.5
CDE 750	20	2.5
CDE1100	35	4.0

Control signal wiring

Recommended size: 0.5mm^2 or 20AWG.

Overall screen required.

Connect screen only to the 0V terminal on the CDE Drive.

Braking resistor

Model	Max regenerative power with internal braking resistor	Minimum external resistor value
CDE 75	1.5kW for 10 secs braking time with 90 secs minimum cooling time	80Ω
CDE 110		
CDE 150		
CDE 220		
CDE 400	3.0kW for 10 secs braking time with 90 secs minimum cooling time	40Ω
CDE 550		
CDE 750		
CDE1100		

Heat dissipation and cooling

Model	Drive Heat Dissipation		Cooling method
	at 3kHz PWM W	at 12kHz PWM W	
CDE 75	45	68	Natural
CDE 110	53	85	
CDE 150	62	95	
CDE 220	95	145	
CDE 400	140	248	Fan
CDE 550	175	300	
CDE 750	230	392	
CDE1100	260	470	

Serial Communications

RS485, RS422 – 4.8, 9.6, 19.2k Baud

Protocol: ANSI x3.28-2.5-A4-N, positive logic

Mechanical Installation

Mounting location

1 Choose a location that is free from excessive dust, corrosive vapours, gases and all liquids, including condensation of atmospheric moisture.

2 If condensation is likely to occur when the CDE Drive is not in use, install an anti-condensation heater. This heater must be switched off when the CDE is in use; automatic switching is recommended.

3 Do not locate the CDE Drive in a classified hazardous area, unless the CDE Drive is installed in an approved cubicle and the installation is certified.

4 Install the CDE Drive vertically for best flow of cooling air.

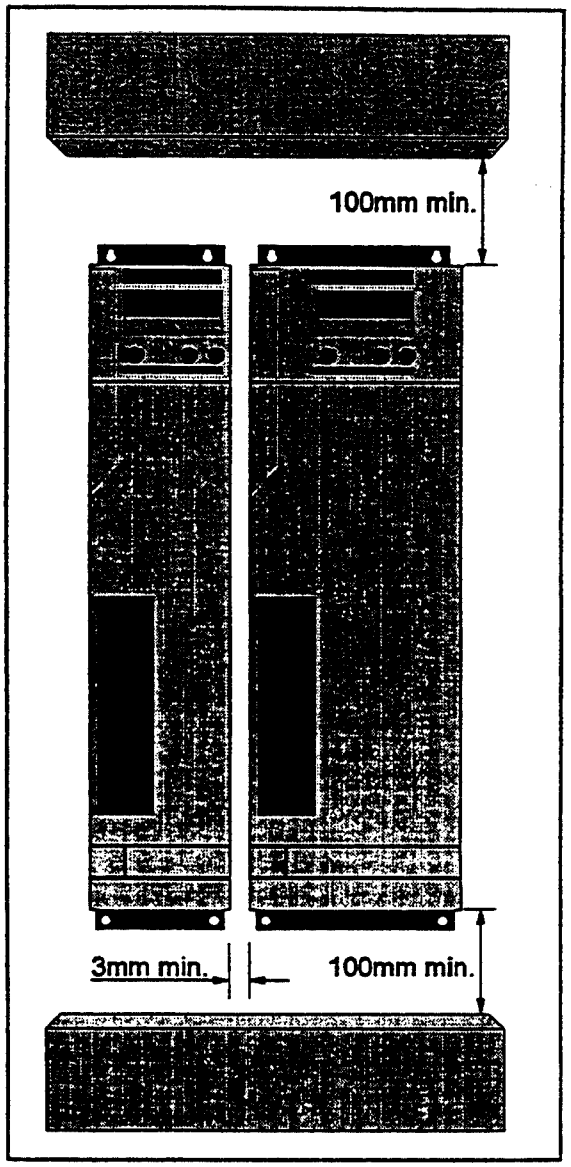
5 Observe the requirements for ambient temperature if the CDE Drive is to be mounted directly above any heat generating equipment (such as another CDE Drive). The CDE Drive has over-temperature protection which trips the Drive when the heatsink reaches 90°C.

6 If the CDE Drive is to be installed directly beneath other equipment (such as another variable speed drive), ensure the CDE Drive does not cause the ambient temperature requirements of the equipment to be exceeded.

7 Leave 3mm clearance to the side of the CDE Drive to allow removal of the terminal cover.

8 When mounting the CDE Drive close to other equipment, leave a minimum clearance of 100mm above and below.

9 The CDE Drive can be surface or through-mounted on a panel or in a sealed or ventilated cubicle.

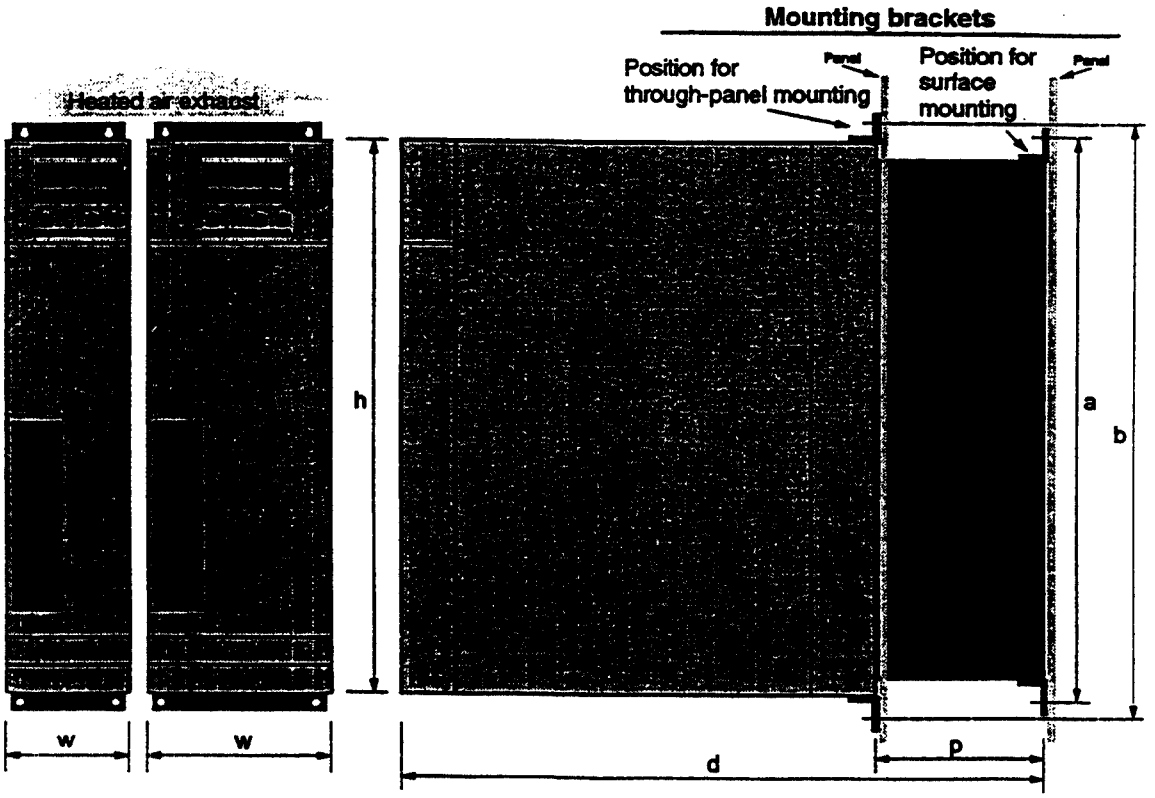


Installing the CDE Drive

The CDE Drive may be installed in either of these mounting arrangements:

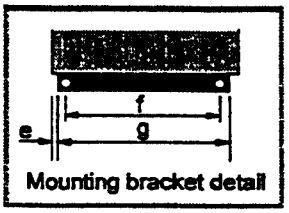
Surface mounted on a panel or in a cubicle

Through an aperture in a panel so that the heatsink of the CDE Drive projects from the rear of the panel. This arrangement can be used for mounting the CDE Drive through the rear panel of a cubicle to allow free circulation of air around the heatsink and to minimise temperature rise inside the cubicle. This can be beneficial if the cubicle is to house a number of CDE Drives.

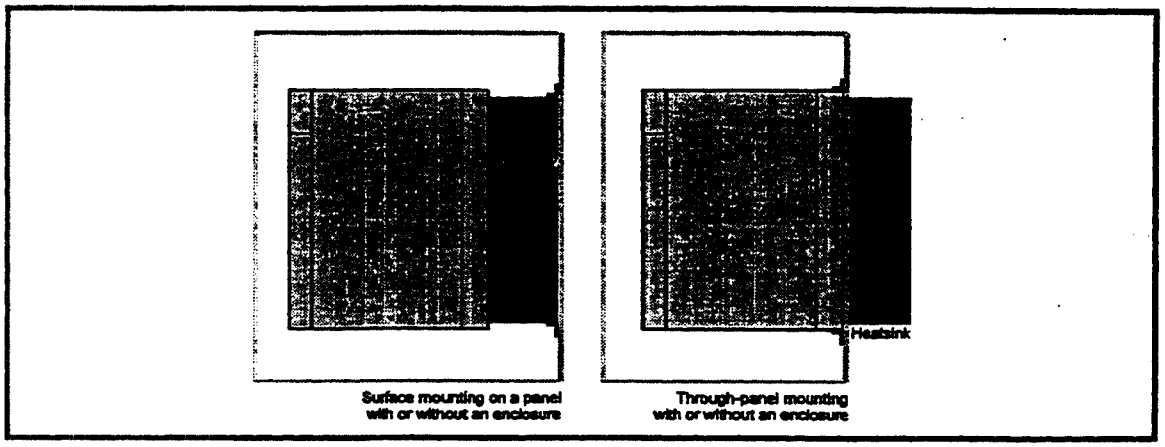


CDE 75
CDE 110
CDE 150
CDE 220

CDE 400
CDE 550
CDE 750
CDE 1100



Dimensions		CDE 75 CDE 110 CDE 150 CDE 220	CDE 400 CDE 550 CDE 750 CDE 1100
Height of case	h	352	352
Width	w	78.5	127
Overall Depth	d	323.5	328.5
Depth of heatsink	p	95	100
Surface mounting fixing centres top bracket to bottom bracket	a	359.4	359.4
Through-panel mounting fixing centres top bracket to bottom bracket	b	372	372
Width of mounting bracket	g	60	92
Fixing centres of mounting bracket	f	45	77
Inset of mounting bracket from side of case	e	9.25	17.5
Fixing hole diameter		4mm clear	



The CDE Drive is held in place by two brackets fixed with self-tap screws to the top and bottom of the unit. The brackets can be re-positioned to suit either mounting arrangement shown above. To re-position the brackets, remove their retaining screws and re-fit the brackets in the required location.

Installing in a sealed cubicle

To maintain sufficient cooling of the CDE Drive when it is installed inside a sealed cubicle, heat generated by all the equipment in the cubicle must be taken into account and the cubicle must be of adequate size. To calculate the minimum acceptable size of cubicle, use the following procedure.

Calculate the minimum required surface area A_e for the cubicle from:

$$A_e = \frac{P}{k\,(Ti - Tamb)}$$

where...

A_e	Unobstructed heat-conducting area in m^2
k	Heat Transmission coefficient of the cubicle material
Ti	Maximum permissible operating temperature in °C of the CDE Drive
Tamb	Maximum external ambient temperature in °C
P	Power in Watts dissipated by all heat sources in the cubicle.

Example

To calculate the size of a cubicle for one **CDE 750** (7.5kW). The following conditions are assumed:

The installation is to conform to IP54, the CDE Drive being surface-mounted within the cubicle.

Only the top, front and two sides of the cubicle are free to dissipate heat.

The cubicle is to be made of painted 2mm sheet steel.

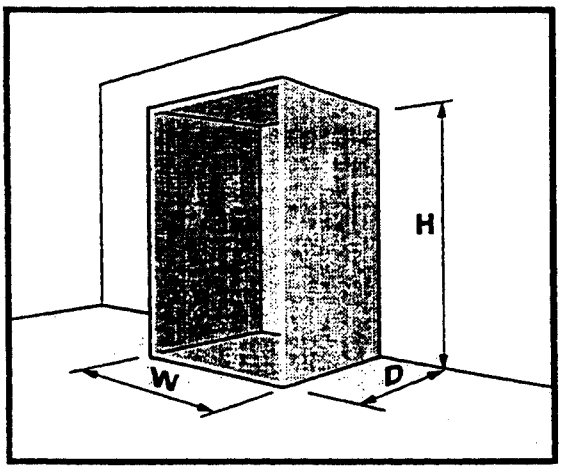
The maximum external ambient temperature is 30°C.

The CDE Drive PWM frequency is 3kHz.

Insert the following values:

P = 230W (from **Heat Dissipation and Cooling** table in *Data*)

Note It is essential to include any other heat sources in the value of P.



Ti = 50°C

Tamb = 30°C

k = 5.5 (typical value for painted 2mm sheet steel)

The minimum required heat conducting area is then:

$$A_e = \frac{230}{5.5(50-30)} = 2.09m^2$$

The unobstructed heat-conducting area of the cubicle is:

$$A_e = 2HD + HW + DW$$

Estimate two of the cubicle dimensions – the height and depth, for instance. Calculate the width from:

$$W = \frac{A_e - 2HD}{H + D}$$

Inserting **H = D = 0.7m**, obtain the minimum width:

$$W = \frac{2.09 - (2 \times 0.7 \times 0.7)}{0.7 + 0.7} = 0.8 \text{ metres}$$

If possible, locate heat-generating equipment in the lower part of the cubicle to encourage internal convection. Otherwise, increase the height of the cubicle or install 'stirrer' fans.

Installing in a ventilated cubicle

To calculate the volume of ventilating air, use the following procedure:

$$V = \frac{3.1\ P_l}{T_i - T_{amb}}$$

where **V** = Air-flow in m^3/hr

Example

To calculate the ventilation requirement for one CDE 750 Drive

Pl = 230W

Ti = 50°C

Tamb = 30°C

Then...

$$V = \frac{3.1 \times 230}{50 - 30} = 35.7 m^3/hr$$

Motor cooling

When a motor is driven at low speed, its internal cooling fan becomes less effective. If necessary, provide it with additional cooling (such as forced ventilation).

Electrical Installation

Warning **Electric Shock risk**

If the CDE Drive has been energised, the supply must be isolated *at least seven minutes* before work may continue. Refer to **Safety Information** on the inside front cover.

Hazardous areas

A variable speed drive may invalidate a hazardous area certification (Apparatus Group and/or Temperature Class) of Ex-protected motors. Obtain approval and certification for the complete installation of motor and drive.

Access to...

Terminals

Remove the terminal cover by gripping its lower edge and pulling forward.

Input Logic Polarity switch

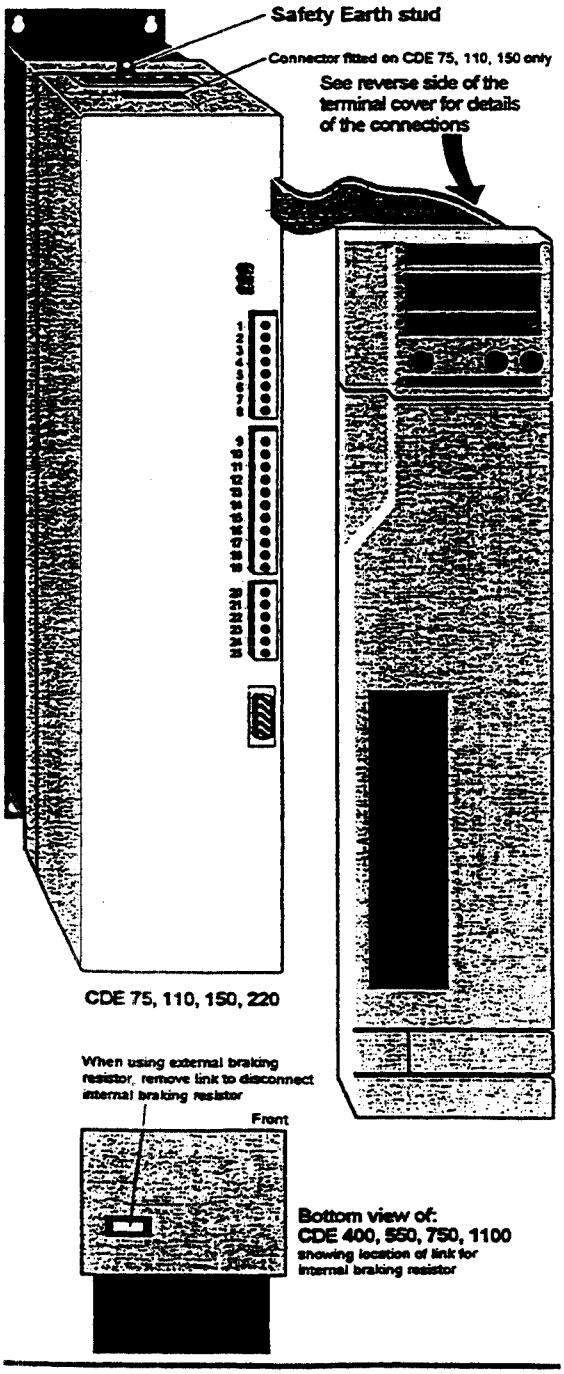
Remove the control pod by gripping its top edge and pulling forward.

Re-fitting is the reverse process.

Earthing

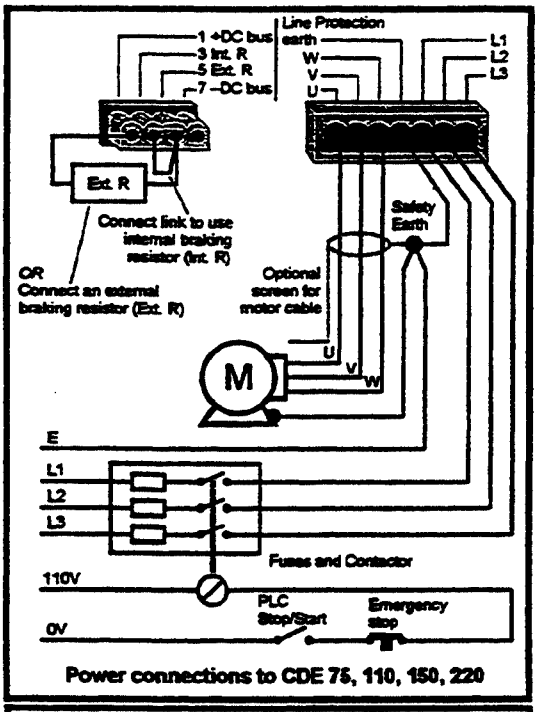
Connect the CDE Drive to system earth using the shortest possible wiring.

Earth impedance must conform to the requirements of industrial safety regulations. Earthing must be inspected and tested regularly.

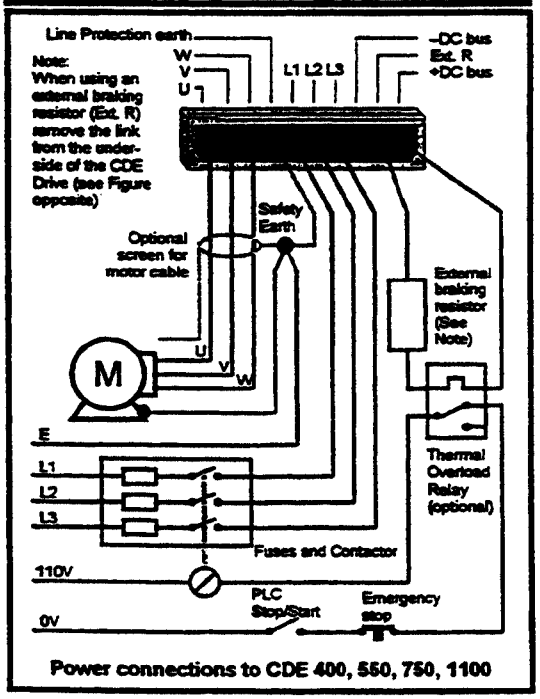


Link the **Line Protection Earth** on the power connector to the **Safety Earth** stud at the top of the CDE Drive.

Power connections



Power connections to CDE 75, 110, 150, 220



Power connections to CDE 400, 550, 750, 1100

Control connections

Terminal		I/O	Specification
Analogue Inputs and Outputs			
Status Relay Common	1	O	Volt-free contacts. Contact ratings: 250V, 7A ac resistive Relay can be programmed (using parameter b5.20) to be energised when the CDE Drive is healthy or 'at speed'.
Status Relay N/open	2		
Status Relay N/closed	3		
0V Common	4		0V common.
Voltage Speed Ref Input	5	I	Analogue voltage input, –10V to +10V. Zero speed at 0V. Input impedance 94kΩ. Alternatively, for unidirectional control, 0 to +10V. Resolution: 12 bit plus sign.
+10V Reference	6	O	+10V Supply, 10mA max, internally protected.
Torque Ref Input	7	I	Analogue voltage input –10V to +10V, zero torque at 0V. Input impedance 94kΩ. Resolution: 10 bit plus sign.
Current Speed Ref Input	8	I	Analogue current input. 4 to 20mA, 20 to 4mA or 0 to 20mA input referenced to 0V common. Input impedance 100Ω. Resolution 10 bit plus sign.
Digital Inputs and Outputs			Note: Connections are given for negative logic polarity. If appropriate, move the Input Logic Polarity link (under the Control Pod) for positive logic. The actions of the digital inputs are for Normal Mode. If Wireproof Mode is used, the alternative actions described on page 18 apply.
Motor Thermistor Input	9	I	CDE Drive trips when thermistor value exceeds 3kΩ, and resets when value reduces to 1.8kΩ.
Frequency Input	10	I	Frequency signal input for slaving or frequency control of the CDE Drive. 0 to +5V, 192kHz max.
0V Common	11		0V common.
External Trip Input	12	I	Connect to 0V common via N/C contacts or conducting open collector. Momentarily open contacts to trip CDE Drive. 0V to +24V.
$\overline{\text{Reset}}$ Input	13	I	Connect to 0V common via N/O contacts or open collector. Momentarily close contacts to reset CDE Drive; reset occurs on 'falling' edge. 0V to +24V.
Stop Input	14	I	Connect to 0V common via N/C contacts or conducting open collector. Momentarily open contacts to stop CDE Drive. 0V to +24V.
$\overline{\text{Run}}$ Input	15	I	Connect to 0V common via N/O contacts or open collector. Momentarily close contacts to start CDE Drive. 0V to +24V.
Local/$\overline{\text{Remote}}$ Input	16	I	Connect to 0V common via contacts or open collector. Close contacts for remote reference. 0V to +24V.
Forward/$\overline{\text{Reverse}}$ Input	17	I	Connect to 0V common via contacts or open collector. Close contacts to reverse motor. 0V to +24V.
Frequency Output Signal	18	O	Analogue signal. –10V to +10V at 10mA max. Resolution: 10 bit plus sign. 0V = 0Hz, 10V = max frequency set using parameter p0.01.
Load Output Signal	19	O	When b6.37 is set at 0: Analogue signal –10V to +10V at 10mA for 0 to 150% FLC. +ve for motoring forward and regenerating in reverse, –ve for regenerating forward and motoring in reverse. Resolution: 10 bit plus sign. Alternative function is selected with p6.28.
Preset Speeds & Status			
Preset Speed 1 Input	20	I	Connect to 0V by N/O contacts or open collector. To select a preset speed, see Preset Speed Selection table on page 17. 0V to +24V. Alternative function for terminal 22 is Jog Input, programmable using parameter b2.20.
Preset Speed 2 Input	21	I	
Preset Speed 3 Input	22	I	
Status Output	23	O	0V (250mA sink) to +24V (30mA source). Programmable using parameter p5.22 for Drive enabled, Load reached, Frequency reached, or x1 or x192 frequency output.
0V Common	24		0V common.
+24V Supply	25	O	+24V supply at 200mA max, internally protected.

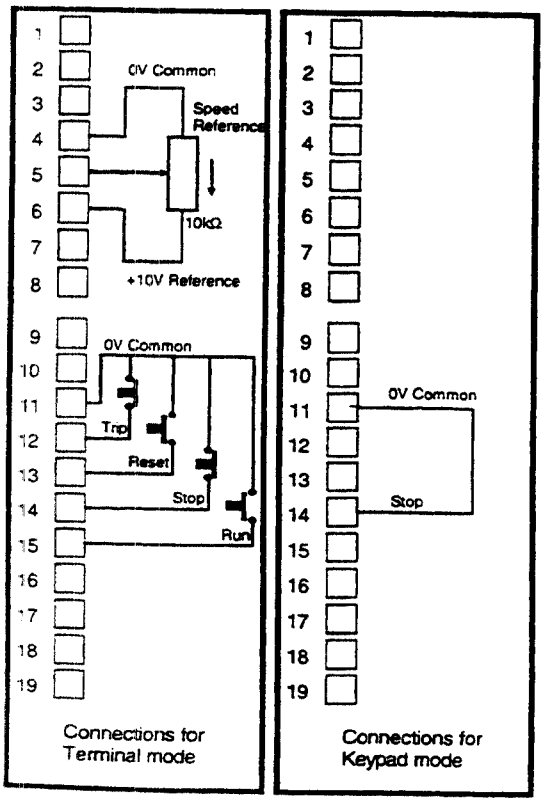
Setting up to run

Configure the CDE Drive for either *Terminal mode* or *Keypad mode* of operation. The diagrams below show basic connections that need to be made to allow the CDE Drive to operate in either mode.

To operate the CDE Drive, certain parameters need to be adjusted. There are two types of parameter: numerical (**p**) parameters and bit (**b**) parameters. Numerical parameters allow adjustment of variables (eg. frequency limits); bit parameters allow selection of states (eg. selection of keypad mode or terminal mode).

Parameters are in nine menus. The menu number precedes the decimal point in the parameter number. After power-up, when **Mode** is pressed, parameter **p0.00** is displayed.

Normally, a motor thermistor must be connected to the CDE Drive to prevent **th** trips (see page 17). This can be disabled by setting **b6.22** at 1



The following are basic instructions for using the CDE Drive.

Terminal mode

1 Ensure that the Speed Reference potentiometer is set at minimum.

2 Connect the CDE Drive to the supply.

3 Check the control pod display shows:

rdY

4 Close the **Run** switch.

5 Check the display shows the frequency.

6 Advance the Speed Reference potentiometer. Check the motor speed and displayed frequency change accordingly.

7 By default, the display shows frequency when the CDE Drive is running. To display Load (in Terminal mode only), press together the two keys:

▲ ▼

Keypad mode

1 Connect the CDE Drive to the supply.

2 Set parameter **b0.29** at 1 (See *List of Parameters*).

3 Check the display shows **rdY** alternating with the minimum frequency.

4 Press: ▲

to raise the frequency. Check the motor speed increases. Reduce the speed by pressing: ▼

When the minimum frequency (**p0.00**) is displayed, the CDE Drive stops.

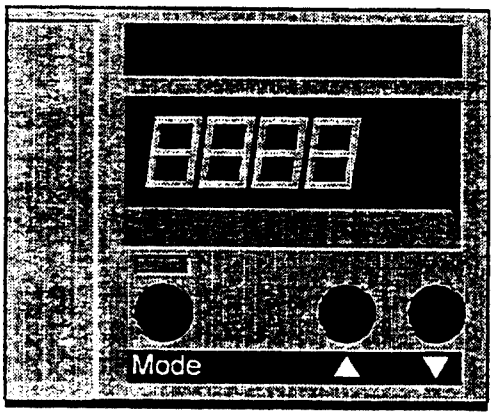
5 If keypad mode is required the next time the CDE Drive is to be powered up, save parameters using **p0.33**.

6 When the CDE Drive is stopped, **rdY** and the minimum frequency are displayed alternately. When the Drive is running, the demanded frequency is displayed continuously.

7 If the CDE Drive trips when in Keypad Mode, the frequency demand and the trip are displayed alternately. To reset a trip, press together the two keys:

▲ ▼

Control pod



The control pod (see above) has a four-digit display. This display normally shows the *current status* (eg. **rdY**) of the CDE Drive, frequency, load current or a trip code. It can display instead:

In View mode (display flashes)...

Menu and Parameter number

The value of a displayed parameter

You can scroll up or down to:

View the parameters in the selected menu

View menu number

In Edit mode (display constant)...

Parameter value

Menu number

You can scroll up or down to edit parameter values or select a different menu number.

The **Mode** key is used to:

Change from View to Edit mode

Change from Edit to View mode

The ▲ & ▼ keys are used to scroll up or down.

Parameters

Display a parameter

1 Press the **Mode** key once. The display no longer shows the current status (eg. **rdY**). It now shows for one second a parameter number in the form of **p0.01** or **b0.20**. (The display is now in View mode). The parameter value and the parameter number then alternate. After 8 seconds, the display returns to showing the current status.

2 To select a different parameter number, in Menu 0, press:

▲ or ▼

Either hold down or repeatedly press the key to scroll through the parameter set of Menu 0.

Display a parameter in a different menu

1 When the display is alternately showing a parameter number and value, press:

▲ or ▼

continuously until the display shows:

- - - 0

(for Menu 0).

2 Before 8 seconds elapse, again press **Mode**. The display now goes constant, showing

- - - 0

The display is now in Edit mode.

3 To scroll though the menu numbers, press:

▲ or ▼

4 The menu number changes and is shown constant:

- - - 6

5 Before 8 seconds elapse, press **Mode**. The display now flashes:

- - - 6

6 To scroll through the parameter numbers in the displayed menu, press:

▲ or ▼

Edit a parameter value

Note If security is set, parameter values cannot be edited unless the correct security code number is first entered. See *Security access* below.

The values of parameters may be changed when the CDE Drive is stopped or running.

1 Select the parameter to be edited by following the instructions in *Display a parameter*.

2 Press **Mode** once again. The display shows the parameter value constantly (without alternating with the parameter number).

3 Before 8 seconds elapse, press:

▲ or ▼

to increase or decrease the display reading. Pressing the key momentarily changes the value by plus or minus one least-significant digit. If the key is kept pressed, the displayed figure will increase or decrease rapidly. If a key is not pressed for 8 seconds, the display reverts to showing the current status of the CDE Drive.

Save parameters

Most parameters are not saved at power down. Save parameters as follows:

1 Display the value of parameter **p0.33**.

2 Scroll through the values and stop when the display shows:

1

3 Press Mode. The parameters are saved and the display changes to:

0

alternating with:

p0.33

Load default parameters

1 Display the value of parameter **p0.33**.

2 Scroll through the values and stop when the display shows:

255

3 Press **Mode**. The default parameters are loaded and the display shows the same as for saving parameters.

Set up a security code

The CDE Drive is supplied with no security set up, (ie. security code = 0). There is no protection against unauthorised editing of parameters. To set up a security code, proceed as follows:

1 Display the value of **p0.11**.

2 Change the value to the desired security number.

3 Now display the value of parameter **p0.33** and follow the procedure in *Save parameters* above.

4 Display the value of **p0.11**. Check that this reads:

0000

Security access

To edit parameters when security is set up, proceed as follows:

1 Display parameter **p0.11**.

2 Change the displayed value to the security code number.

3 Display the parameter to be edited. Its value can now be changed.

List of parameters

Parameters are saved according to the following letter:

- **s** At parameter save (using **p0.33**)
- **n** Never
- **p** At power down

Parameter			Default setting	Notes
Menu 0 — Standard Parameters				
p0.00	Minimum frequency	s	0.0	
p0.01	Maximum frequency	s	50.0	
p0.02	Acceleration time to 100Hz	s	5.0	Pro-rata to any other frequency.
p0.03	Deceleration time from 100Hz	s	10.0	Pro-rata from any other frequency.
p0.04	Motoring current limit	s	150	Set at 0 to 150% of rated Drive load current.
p0.05	Regenerating current limit	s	150	Set at 0 to 150% of rated Drive load current.
p0.06	Rated current	s	100	Set at rated load current of motor
p0.07	Voltage boost	s	3.0	
		Set maximum level of voltage boost for zero frequency at: 0 to 30% of rated voltage of motor (as entered in p0.12).		
p0.08	Slip compensation	s	0.0	
		Modifies output frequency of Drive to compensate for motor slip. Set at motor slip frequency for rated load current of motor (as entered in p0.06).		
p0.09	DC injection brake current	s	50.0	
		Set at 0 to 150% of rated load current of Drive. If this is set too low, the motor may not stop.		
p0.10	Serial address	s	11	Enter an identification number for serial communications.
p0.11	Security code		0	See *Set up security* and *Security access* above.

Note
The two types of standard ramp are:
Discontinuous — deceleration occurs in stages and so is not smooth; no setting up is required.
PID controlled — deceleration is continuous and smooth; setting up is required.

Parameter			Default setting	Notes
p0.12	Rated voltage	s	415	Enter rated voltage of motor.
p0.13	Rated frequency	s	50.0	Enter rated frequency of motor.
b0.20	Torque control	s	0	
		Set at 0 for frequency control. Set at 1 for torque control. If the Torque Control input is enabled (b6.27 = 1), the torque level is defined by the input voltage. −10V to +10V corresponds to −150% to +150% rated Drive torque. If b6.27 = 0, p6.12 defines the torque level.		
b0.21	Autostart	s	0	Set at 1 for Drive to start automatically when power is applied.
b0.22	Coast stop enable	s	0	Set at 1 to enable (over-rides DC injection brake)
b0.23	DC injection mode stop enable	s	0	Set at 1 to enable
b0.24	Fast ramp select (up and down)	s	0	
		Set at 0 for either type of standard ramp (see Note below left). The deceleration ramp rate is controlled to limit the DC bus voltage to the level set in p6.09. Discontinuous or PID controlled standard ramp is selected using b6.33. Set at 1 for fast ramp. The ramp rates are defined by the values of the acceleration and deceleration parameters, except when the Drive is stopping and b0.22 or b0.23 are set at 1.		
p0.25	Voltage control mode selector (See page 18)	s	0	Select:
		Auto-boost AUTO, where the boost is proportional to the load. Fixed boost Fd. Vector mode Vr_I : Rs test at initialisation. Vector mode Vr_S : Rs test at every start. Vector mode Vr : no Rs test.		
b0.26	Bipolar Speed Reference control	s	0	Set at 0 for unipolar control where speed control input is 0 to +10V. To reverse motor, close Forward/ Reverse switch.
b0.28	Load display	s	0	Set at 0 to display frequency.
b0.29	Keypad mode	s	0	Set at 0 for terminal mode.

Parameter			Default setting	Notes
p0.30	Remote mode selector	s	4-20	Select: 4-20mA 20-4mA 0-20mA, Fr s (frequency slaving) Fr (frequency ratio input to define frequency demand) or HrES (high resolution frequency control)
p0.31	Baud rate	s	4800	Select: 4800, 9600 or 19200
p0.32	Switching frequency	s	3	Select: 3, 6, 9 ,12kHz
p0.33	Store parameters and load defaults	n		See *Save parameters* and *Load default parameters* above
Menu 1 — Skip Frequencies				
p1.00	Skip frequency 1	s	0	Must be lower than p1.01
p1.01	Skip frequency 2	s	0	Must be higher than p1.00 and lower than p1.02
p1.02	Skip frequency 3	s	0	Must be higher than p1.01
p1.03	Skip band 1	s	0	Select width of frequency band either side of related skip frequency through which the output frequency is required to pass but not stabilise.
p1.04	Skip band 2	s	0	
p1.05	Skip band 3	s	0	
Menu 2 — Preset Speeds				
p2.00	Preset frequency 1	s	0	Enter frequency in Hz. Negative values reverse the motor (The frequencies are selected using terminals 20, 21, 22.) See *Preset speed selection* table below).
p2.01	Preset frequency 2	s	0	
p2.02	Preset frequency 3	s	0	
p2.03	Preset frequency 4	s	0	
p2.04	Preset frequency 5	s	0	
p2.05	Preset frequency 6	s	0	
p2.06	Preset frequency 7	s	0	
p2.07	Jog Frequency	s	1.5	Enter frequency.
p2.08	Jog Boost Level	s	3.0	Enter boost level.
p2.09	High resolution frequency control	n	0	Enter frequency digits: XXX.X
p2.10	High resolution frequency control	n	0	Enter frequency digits: 0.0XX

Parameter			Default setting	Notes
b2.20	Jog select	s	0	Set at 0 to use terminal 22 as Preset Speed Input 3. Set at 1 to use terminal 22 as Jog Input.
b2.21	Preset acceleration/ deceleration select	s	0	Set at 0 for ramps set in p0.02 and p0.03. Set at 1 for preset ramps set in Menus 3 and 4.
b2.22	Enable jog boost level	s	0	Set at 0 for normal boost. Set at 1 for boost set in p2.08.
Menu 3 — Preset Acceleration Rates				
p3.00	Preset acceleration 1	s	5.0	For each preset speed, enter value for preset acceleration to the preset speed.
p3.01	Preset acceleration 2	s	5.0	
p3.02	Preset acceleration 3	s	5.0	
p3.03	Preset acceleration 4	s	5.0	
p3.04	Preset acceleration 5	s	5.0	
p3.05	Preset acceleration 6	s	5.0	
p3.06	Preset acceleration 7	s	5.0	
p3.07	Jog acceleration	s	0.2	Enter value for acceleration to jog speed.
Menu 4 — Preset Deceleration Rates				
p4.00	Preset deceleration 1	s	10.0	For each preset speed, enter value for preset deceleration to the preset speed.
p4.01	Preset deceleration 2	s	10.0	
p4.02	Preset deceleration 3	s	10.0	
p4.03	Preset deceleration 4	s	10.0	
p4.04	Preset deceleration 5	s	10.0	
p4.05	Preset deceleration 6	s	10.0	
p4.06	Preset deceleration 7	s	10.0	
p4.07	Jog deceleration	s	0.2	Enter value for deceleration to jog speed.
Menu 5 — Miscellaneous functions Auto-reset, threshold detectors, PI controller digital outputs, sequencing				
p5.00	Number of automatic reset attempts	s	0	Default: 0 = disabled Set the number of auto-reset attempts from 1 to 5 after a trip.
p5.01	Reset delay	s	1.0	Set delay between auto-reset attempts from 1 sec to 5 secs.

Parameter			Default setting	Notes
p5.02	Load reached level	s	100	See p5.22
p5.03	Frequency reached level	s	50.0	See p5.22
p5.04	PI ramp	s	0.0	Set acceleration time to 100Hz and deceleration time from 100Hz — pro-rata for other frequencies
p5.05	PI proportional gain	s	0	Actual gain = p5.05 / 1000
p5.06	PI integral gain	s	0	Actual gain = p5.06 / 100
b5.20	Status Relay	s	0	Relay to be energised when: Set at 0 for Drive healthy. Set at 1 for Drive 'at speed'.
b5.21	Spinning motor enable	s	0	Set at 1 for Drive to 'catch' a spinning motor.
p5.22	Status Output selector	s	Enbl	
		To select output function of terminal 23: Enbl — Drive enabled Frrd — Frequency reached Lrrd — Load reached Fout — Output frequency at: Drive frequency x1 or x192 (selected by b6.31).		
b5.23	Dynamic V/f enable	s	0	Set at 1 to enable load-responsive Volts/Hz mode.
b5.24	Ramp down on trips cL, It, Oh, th, thS	s	0	Set at 1 for Drive to ramp down when tripped.
p5.25	Wireproof sequencing select	s	0	
		Set at 0 for Standard mode (edge-triggered operation) Set at 1 for Wireproof mode (See page 17)		
p5.26	PI enable	s	0	Set at 0 to by-pass the PI controller. Set at 1 to enable the PI controller.
p5.27	PI feedback selector	s	4-20	Select:
		4-20 : 4-20mA from current speed ref I/P. Volt : −10V to +10V from torque ref I/P. Fr : 0 to 15497Hz from frequency input		
b5.28	PI feedback invert	s	0	Set at 1 to invert the PI controller feedback signal

Parameter			Default setting	Notes
Menu 6 — Advanced Parameters				
p6.00	Vdc proportional gain	s	100	Use for mains loss control and for PID control of standard ramp braking.
p6.01	Vdc integral gain	s	400	
p6.02	Vdc differential gain	s	0	
p6.04	Current limit proportional gain	s	40	Use to set up frequency controlling current limit.
p6.05	Current limit integral gain	s	0	
p6.06	Frequency slaving numerator	s	1000	
p6.07	Frequency slaving denominator	s	1000	
p6.08	Stator resistance	p	0	Set: Stator resistance / Per Unit resistance
		Per Unit resistance values: CDE75 0.1289Ω CDE110 0.0966Ω CDE150 0.0713Ω CDE220 0.0489Ω CDE400 0.0285Ω CDE550 0.0225Ω CDE750 0.0168Ω CDE1100 0.0129Ω		
p6.09	Standard ramp voltage control level	s	700	
		Use to set the DC bus voltage level during standard ramp deceleration. Caution: When in PID control mode, do not set p6.09 below the likely level of DC bus voltage produced by the supply, since this may cause the motor to be accelerated to maximum speed instead of decelerated.		
p6.10	S-ramp frequency band	s	0.0	
p6.11	Stop detection frequency	s	0.0	
		Stop is normally detected when the ramp output reaches zero. Use p6.11 to increase this level. When detected, the 1 sec stop period is initiated.		
p6.12	Torque demand	s	0	Set torque level (only when b6.27 is set at 0)
p6.13	Magnetising current	p	55.0	
		Enter motor magnetising current as a percentage of the rated Load current of the CDE Drive.		
b6.20	Mains loss detection disable	s	0	

Parameter			Default setting	Notes
b6.21	Mains loss forced stop select	s	0	
		Default: 0 for 'ride through' of short supply interruptions. Set at 1 for Drive to ramp down to stop when supply is interrupted.		
b6.22	Motor thermistor trip disable	s	0	
b6.23	High stability space vector modulation select	s	0	
		Set at 0 for conventional space vector modulation. Set at 1 to improve motor stability particularly on light loads.		
b6.24	Quasi-square mode enable	s	0	Set at 0 for PWM at all times. Set at 1 to disable PWM at full output voltage.
b6.25	Forward rotation disable	s	0	
b6.26	Reverse rotation disable	s	0	
b6.27	Torque Control Input enable	s	0	Set at 0 for control of torque using p6.12. Set at 1 for control of torque using terminal 7.
p6.28	Selector for analogue output on Terminal 19	s	Load	Set at: LoAd: Load Vdc: dc link voltage, fullscale = 830V USEr: Level defined by p8.34.
b6.29	DC current injection when stopped for 1 sec.	s	0	Set at 0 for voltage control. Set at 1 for current control set in p0.09.
b6.30	High stability space vector modulation disable at stop	s	0	High stability space vector modulation can be noisy at low speeds. To disable at stop, set at 1.
b6.31	Master frequency x1 or x192 select	s	0	Set at 0 for x1. Set at 1 for x192.
p6.32	Automatic measurement of motor magnetising current enable	n	0	
b6.33	Standard ramp select	s	0	Set at 0 for discontinuous deceleration. Set at 1 for PID controlled deceleration. (See b0.20).
b6.34	Serial Comms two-wire mode enable	s	0	Set at 0 for 4-wire mode.

Parameter			Default setting	Notes
p6.35	Serial Comms mode select	s	A	Set at A for ANSI serial comms.
p6.36	Serial Comms continuous transmit enable	s	0	
		Set at 0 for multi-drop systems where the transmitter is enabled only when the Drive sends data.		
b6.37	Load signal always positive for motoring	s	0	Set at:
		Set at 0 for output to be as described for Terminal 18 on page 8. Set at 1 for load signal to be always positive when motoring and always negative when regenerating.		
Menu 7 — Fault log				
p7.00	Last fault	p		Read only
p7.01	Previous fault	p		
p7.02	Previous fault	p		
p7.03	Previous fault	p		
p7.04	Previous fault	p		
p7.05	Previous fault	p		
p7.06	Previous fault	p		
p7.07	Previous fault	p		
p7.08	Previous fault	p		
p7.09	Previous fault	p		
Menu 8 — Control/Status Parameters				
b8.00	Drive disable	s	0	Set at 0 for Drive enabled. Set at 1 for Drive cannot be enabled.
b8.01	Display stop state	n	0	Read only — 0 = Run possible 1 = Run not possible
b8.02	Run control / status	n	0	
		When b8.10 is set at 0, b8.02 shows state of terminal 15 (Run Input). 1 = low for negative logic. When b8.10 is set at 1, terminal 15 has no effect and the Run function is controlled by b8.02		
b8.03	Reverse control / status	n	0	
		When b8.11 is set at 0, b8.03 shows state of terminal 17 (Reverse Input) 1 = low for negative logic. When b8.11 is set at 1, terminal 17 has no effect and the Reverse function is controlled by b8.03		

Parameter			Default setting	Notes
b8.04	Remote control / status	n	0	
		When b8.12 is set at 0, b8.04 shows state of terminal 16 (Remote Input) 1 = low for negative logic. When b8.12 is set at 1, terminal 16 has no effect and the Remote function is controlled by b8.04		
b8.05	External trip control / status	n	0	
		When b8.13 is set at 0, b8.05 shows state of terminal 12 (Trip Input) 1 = low for negative logic. When b8.13 is set at 1, terminal 12 has no effect and the external trip function is controlled by b8.05		
b8.06	Reset control / status	n	0	
		When b8.14 is set at 0, b8.06 shows state of terminal 13 (Reset Input) 1 = low for negative logic. When b8.14 is set at 1, terminal 13 has no effect and the Reset function is controlled by b8.06		
b8.07	Preset frequency 1 control / status	n	0	
		When b8.15 is set at 0, b8.07 shows state of terminal 20 (Preset Speed 1 Input) 1 = low for negative logic. When b8.15 is set at 1, terminal 20 has no effect and the Preset freq. 1 function is controlled by b8.07		
b8.08	Preset frequency 2 control / status	n	0	
		When b8.16 is set at 0, b8.08 shows state of terminal 21 (Preset Speed 2 Input) 1 = low for negative logic. When b8.16 is set at 1, terminal 21 has no effect and the Preset freq. 2 function is controlled by b8.08		
b8.09	Preset frequency 3 control / status	n	0	
		When b8.17 is set at 0, b8.09 shows state of terminal 22 (Preset Speed 3 Input) 1 = low for negative logic. When b8.17 is set at 1, terminal 22 has no effect and the Preset freq. 3 function is controlled by b8.09		
b8.10	Run parameter control select	s	0	
		Set at 0 for b8.02 to act as Run status (read only). Set at 1 for b8.02 to act as Run control.		
b8.11	Reverse parameter control select	s	0	
		Set at 0 for b8.03 to act as Reverse status (read only). Set at 1 for b8.03 to act as Reverse control.		

Parameter			Default setting	Notes
b8.12	Remote parameter control select	s	0	
		Set at 0 for b8.04 to act as Remote status (read only). Set at 1 for b8.04 to act as Remote control.		
b8.13	External trip parameter control select	s	0	
		Set at 0 for b8.05 to act as External trip status (read only). Set at 1 for b8.05 to act as External trip control.		
b8.14	Reset parameter control select	s	0	
		Set at 0 for b8.06 to act as Reset status (read only). Set at 1 for b8.06 to act as Reset control.		
b8.15	Preset frequency 1 parameter control select	s	0	
		Set at 0 for b8.07 to act as Preset freq. 1 status (read only). Set at 1 for b8.07 to act as Preset freq. 1 control.		
b8.16	Preset frequency 2 parameter control select	s	0	
		Set at 0 for b8.08 to act as Preset freq. 2 status (read only). Set at 1 for b8.08 to act as Preset freq. 2 control.		
b8.17	Preset frequency 3 parameter control select	s	0	
		Set at 0 for b8.09 to act as Preset freq. 3 status (read only). Set at 1 for b8.09 to act as Preset freq. 3 control.		
b8.18	Drive healthy	n	0	Read only
b8.19	Drive running	n	0	
b8.20	Ixt active	n	0	
p8.22	Actual frequency	n		Read only
p8.23	Load level	n		
p8.24	DC link Volts	n		
p8.25	Heatsink temperature in °C	n		
p8.26	Number of reset attempts left for auto reset	n		
p8.27	User software version number digits 1 & 2	n		
p8.28	User software version number digit 3	n		
p8.29	Machine control software version number digits 1 & 2	n		
p8.30	Machine control software version number digit 3	n		

Parameter			Default setting	Notes
p8.31	Level of voltage speed ref input	n		Read only -10V to +10V = -999 to +999
p8.32	Level of torque input	n		Read only -10V to +10V = -999 to +999
p8.33	Level of current speed ref input	n		Read only 0 to 20mA = 0 to +999
p8.34	User analogue output level	n		If p6.28 is set at User, p8.34 defines the output level on Terminal 19: -10V to +10V = -999 to +999
p8.35	User trip	n		If p8.35 is set at less than 40, the trip associated with the number is displayed and the CDE Drive trips. If p8.35 is set at 40 to 69, trip is displayed and the CDE Drive trips. If p8.35 is set at 70, the CDE Drive resets if a trip has occurred.
p8.36	MD29 software version number	n		Read only Digits 1 & 2

Parameter		Notes
Menu 9 — MD29 parameters		
p9.00 to p9.04	s	Parameters with range: -999 to +999
p9.05 to p9.09	n	
p9.10 to p9.19	s	Parameters with range: 0 to 255
p9.20 to p9.39	s	Bit parameters

Preset speed selection

Preset Speed			Terminal 22	Terminal 21	Terminal 20
b20 = 0	b20 = 1				
	When stopped	When running			
NSR	Stop	NSR	X	X	X
1	Stop	1	X	X	0
2	Stop	2	X	0	X
3	Stop	3	X	0	0
4	Jog	NSR	0	X	X
5	Jog	1	0	X	0
6	Jog	2	0	0	X
7	Jog	3	0	0	0

where: X = open circuit, 0 = connected to 0V (for negative logic polarity).
NSR = Normal speed reference.

Display messages

Display messages shown below in black are constant. Messages shown in grey are flashing.

Healthy messages

rdY	Standby (in Terminal mode)
rdY	Standby (in Keypad mode)
AcUU	Mains loss
dc	Injection brake
SCAN	Spin start
....	100% Current exceeded

Trip messages

The number given against each trip description is the value seen by Serial Comms in the trip log.

____	0 No trip
cL	1—Loss of current loop on Current Speed Ref I/P
Et	2—External trip has operated
It	3—Integrating overload (I xt)
Oh	4—Heatsink over-temperature
OIAC	5—Instantaneous AC trip
OV	6—DC Bus over-voltage
Ph	7—Supply phase loss
PS	8—Internal supply failure
th	9—Motor thermistor trip
OIdC	10—Instantaneous DC trip
EPS	11—External 24V power supply fault

UU	13—DC Bus under-voltage
Prc2	19—Watchdog failure on MD29 or other application board
rS	21—Drive outputs are open circuit during stator resistance measurement
trip	40-69—Trip activated by setting **p8.35** at 40-69. These appear in the trip log as tr40 to tr69
HF	Consult supplier if a code of this type appears

Wireproof mode

When **p5.25** is set at **1**, the CDE Drive will run only when the **Stop** and **Reset** inputs are active, and either the **Run** or **Reverse** input is active. (An input is active when the switch is closed).

The CDE Drive continues running for 70ms after the **Run** or **Reverse** switch is opened to allow direction reversal without stopping.

The CDE Drive stops when either the **Stop** or **Reset** switch is opened, or the **Run** and **Reverse** switches are both open for at least 70ms.

Voltage control

The voltage applied to the motor can be controlled in one of three ways:

Fixed boost

Fixed V/f characteristic with fixed boost at 0Hz

Auto-boost

Similar to fixed boost, except the amount of boost is load dependent

Vector mode

The CDE Drive compensates for stator resistance by analysing the motor currents into vectors. To implement this type of control, the CDE Drive requires the values of the stator resistance and magnetising current. These values can either be entered manually or measured automatically by the CDE Drive.

Stator resistance

The value is stored in **p6.08**.

Set **p0.25 = Vr_I** to automatically measure the resistance at power-up only.

Set **p0.25 = Vr_S** to automatically measure the resistance at power-up and each time the CDE Drive starts.

Set **p0.25 = Vr** to enter a value manually into **p0.68** or to use the last automatically measured value.

Since stator resistance changes with operating temperature, it is advisable to set **p0.25 at Vr_S** if possible.

Magnetising current

Either manually enter the value into **p6.13** or use the following procedure to set up the CDE Drive to automatically measure the magnetising current during commissioning. The magnetising current can be measured with the machine loaded or unloaded.

1. Set up the CDE Drive for the application (eg. ramp rates correctly set, etc).
2. Close the **Stop** switch.
3. Set **p6.32** at **255**. The CDE drive will run at half the rated frequency, measure the magnetising current, then stop. The value in **p6.32** returns to **0**. The measured value of the magnetising current is stored in **p6.13** and saved at power-down.
4. If the motor speed is not stable during the measurement, repeat the test since the result may be incorrect.

Since the magnetising current remains constant, it is not necessary to make further measurements.

Serial Communications

Serial communications can be used by a host computer or PLC to:

Read and edit the values of parameters

Control the CDE Drive

One host system may interface with up to 81 Drives when line buffers are used or 32 Drives without line buffers. The protocol is industry standard ANSI x 3.28—2.5—A4. The data format is 7 data bits, 1 start bit, 1 stop bit, and even parity.

Connecting the CDE Drive

Serial Comms connector	
Pin	Function
1	0V isolated common
2	Tx non-inverted output
3	Rx non-inverted input
4	NC
5	NC
6	Tx inverted output
7	Rx inverted input
8	NC
9	NC

Message structure

Messages consist of:

Control characters

Serial address code

Parameter identifier

Data field

Block checksum (BCC)

The message structure is shown below.

Control Characters

If a message is initiated from a keyboard, control characters may be entered by holding down the **Ctrl** key while pressing the key given in the last column of the table below.

Char-acter	Purpose	ASCII code (HEX)	Key
EOT	Reset Message begins End of transmission	04	D
ENQ	Enquiry Interrogating the Drive	05	E
STX	Start of text	02	B
ETX	End of text	03	C
ACK	Acknowledge (Message accepted)	06	F
BS	Backspace (Go to previous parameter)	08	H
NAK	Negative acknowledge (Message not understood)	15	U

Serial address code

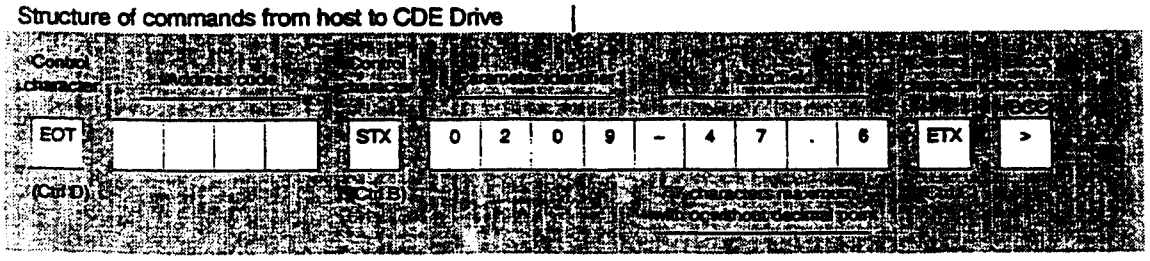
Each CDE Drive on a serial communications link, must have an individual address code. The required serial address code should be entered in **p0.10**. The code must have two digits, and the number 0 must *not* be used. The first digit defines the *group* (1 to 9); the second digit defines the *Drive number* in the group (1 to 9).

The code for an individual CDE Drive should be sent by the host as in this example:

CDE Drive address code: 28

Address code to be sent by host: 2288

Structure of commands from host to CDE Drive



To address all the Drives in Group 2, the host would need to send:

2200

To address all CDE Drives on the serial comms link, the host would need to send:

0000

Parameter identifier

To address an individual parameter, the host needs to send a code that relates to the parameter number. For example:

To address - **p0.01**

Send - **0001**

(Replace the **b** or **p** identifier by the number **0**, and omit the decimal point).

Data field

Data are sent as numerical values with a negative polarity sign and decimal point when appropriate. The data field is of variable length, with a maximum of seven characters including the decimal point. The state of bit parameters is sent as numerical value **1** or **0**. For variable (**p**) parameters, having a series of options defined by character strings on the display (eg. **p0.30**), the first option (**4-20**) is set by sending **0**, the second option (**20-4**) by sending **1**, etc.

Block checksum

The block checksum character (BCC) is used to check that each message has not been corrupted when being sent. The BCC is a value that is calculated from the ASCII codes of the characters in the parameter and data fields.

The following example shows how the BCC is calculated.

A message for parameter **p2.09** contains the value **–47.6**. The parameter identifier is **0209** and the data field contains **–47.6**.

The ASCII codes (for the parameter identifier) are:

0	011 0000
1	011 0001
0	011 0000
9	011 10001

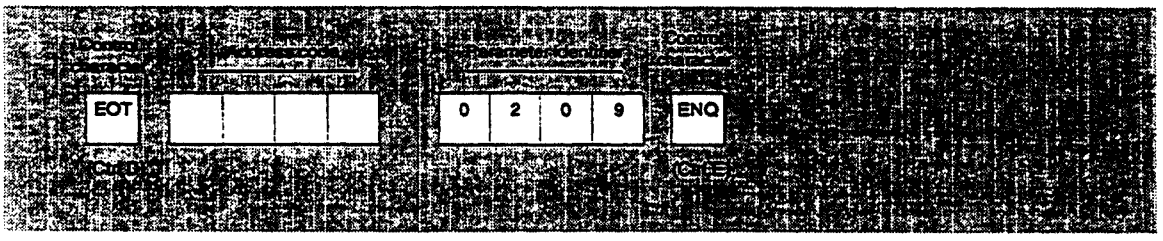
The first and second ASCII codes are compared in an **XOR** function. The result is **000 0010**.

This result is compared with the third ASCII code (011 0000) which produces the result **011 0010**. This number is then compared with the next ASCII code. The process is repeated until the final digit in the data field is reached, as shown below:

Character	ASCII code	XOR
0	0011 0000	
2	0011 0010	0000 0010
0	0011 0000	0011 0010
9	0011 1001	0000 0011
–	0010 1101	0010 0110
4	0011 1100	0001 0010
7	0011 0111	0010 0101
.	0010 1110	0000 1011
6	0011 0110	0011 1101
ETX	0000 0011	0011 1110
>	0011 1110	

Note If the decimal value is less than **32**, then **32** must be added. The resulting code is then used to derive the BCC.

Messages from host to interrogate the CDE Drive



Messages from host to CDE Drive

Messages from the host to the CDE Drive are used to:

Interrogate the CDE Drive for values or states of parameters

Send a command to the CDE Drive

Interrogating the CDE Drive

To find the value of a parameter, the host should send a message that is structured as shown at the foot of the previous page.

The data field is not used

The final control character should be:

ENQ (Ctrl E)

Sending a command to the CDE Drive

To send a command, the message structure given at the foot of page 19 should be used.

Commands are used to:

Change the value of a parameter

Control operation of the CDE Drive

Change a parameter value

To change a parameter, the message should contain the relevant parameter identifier. The data field should contain the required value.

For example, to set parameter **p2.09** at **–47.6Hz**, send:

Parameter identifier **0209**

Data field **–47.6**

To set **b0.21** at **1**, send:

Parameter identifier **0021**

Data field **1**

Control the CDE Drive

To control operation of the CDE Drive, the message should contain the relevant control parameter identifier. The data field should contain the value relating to the required control state. For example, to start the CDE Drive, **b8.02** must be set at **1**. Send:

Parameter identifier **0802**

Data field **1**

To stop the CDE Drive, send:

Parameter identifier **0802**

Data field **0**

The control parameters are **b8.02** to **b8.09**. These parameters are active only when the relevant *control select parameter* is set at **1**. (See **b8.10** to **b8.17** in the *List of Parameters*).

Messages from CDE Drive to host

Messages from the CDE Drive to the host are used to:

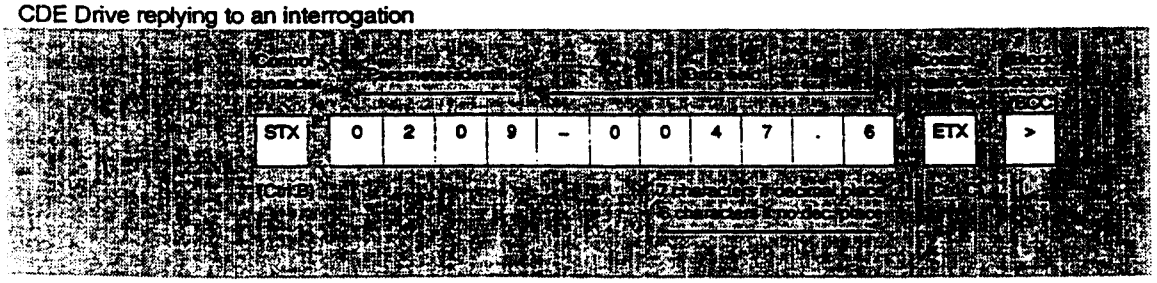
Reply to an interrogation (send a message containing the value of the parameter specified by the host)

Acknowledge a command from the host

Replying to an interrogation

When the CDE Drive is interrogated for the value of a parameter, the CDE Drive sends a message in reply that contains the parameter

CDE Drive replying to an interrogation



identifier and, in the data field, the value of the parameter.

The structure of reply messages is shown in *CDE Drive replying to an interrogation* below.

Acknowledging a command

When a message has been sent by the host, the CDE Drive responds by sending an acknowledgement.

If the message was a command, the CDE Drive sends the reply message: **ACK**

If a command from the host is not understood, the CDE Drive sends the reply message: **NAK**

A message can be misunderstood because:

Transmission was corrupted

Message was incorrectly structured

Requested value was out of range

If the specified parameter number is not recognised by the CDE Drive, the CDE Drive sends the reply message: **EOT**

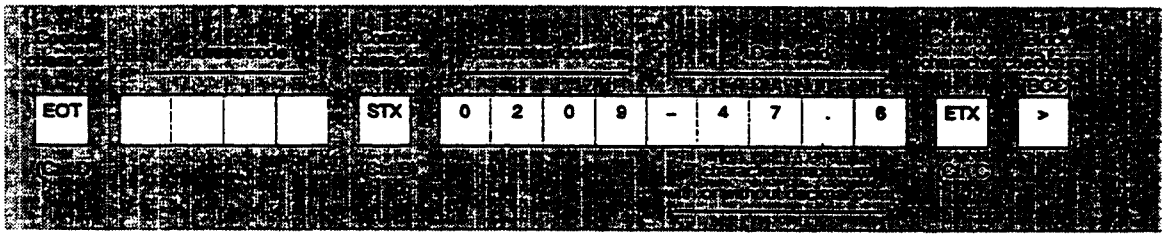
Other messages from host to CDE Drive

Time can be saved by sending the control codes given below:

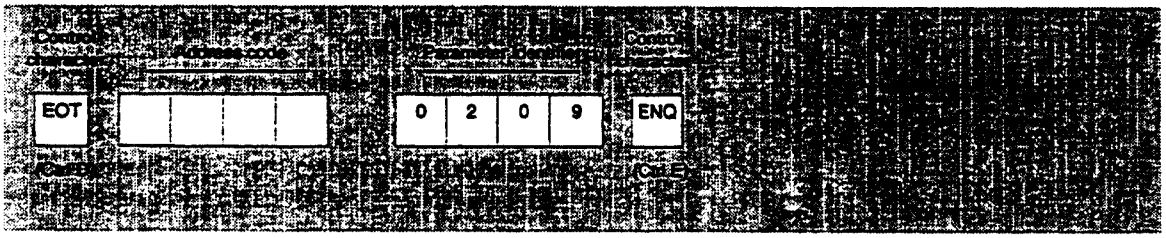
NAK (Ctrl U)	Repeat enquiry	Interrogate the CDE Drive repeatedly for the current value of the last specified parameter.
ACK (Ctrl F)	Next parameter	Interrogate the CDE Drive for the value of the next parameter in the list.
BS (Ctrl H)	Previous parameter	Interrogate the CDE Drive for the value of the previous parameter in the list.

To ensure that the correct Drive answers, a valid full-length read or write must occur before these codes will work.

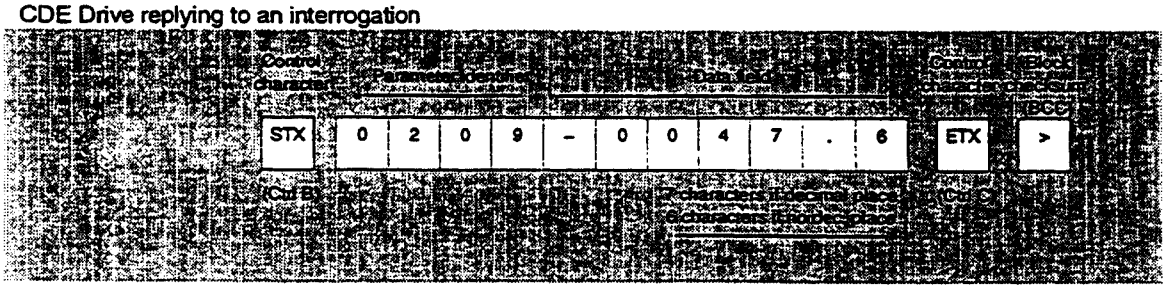
Structure of commands from host to CDE Drive

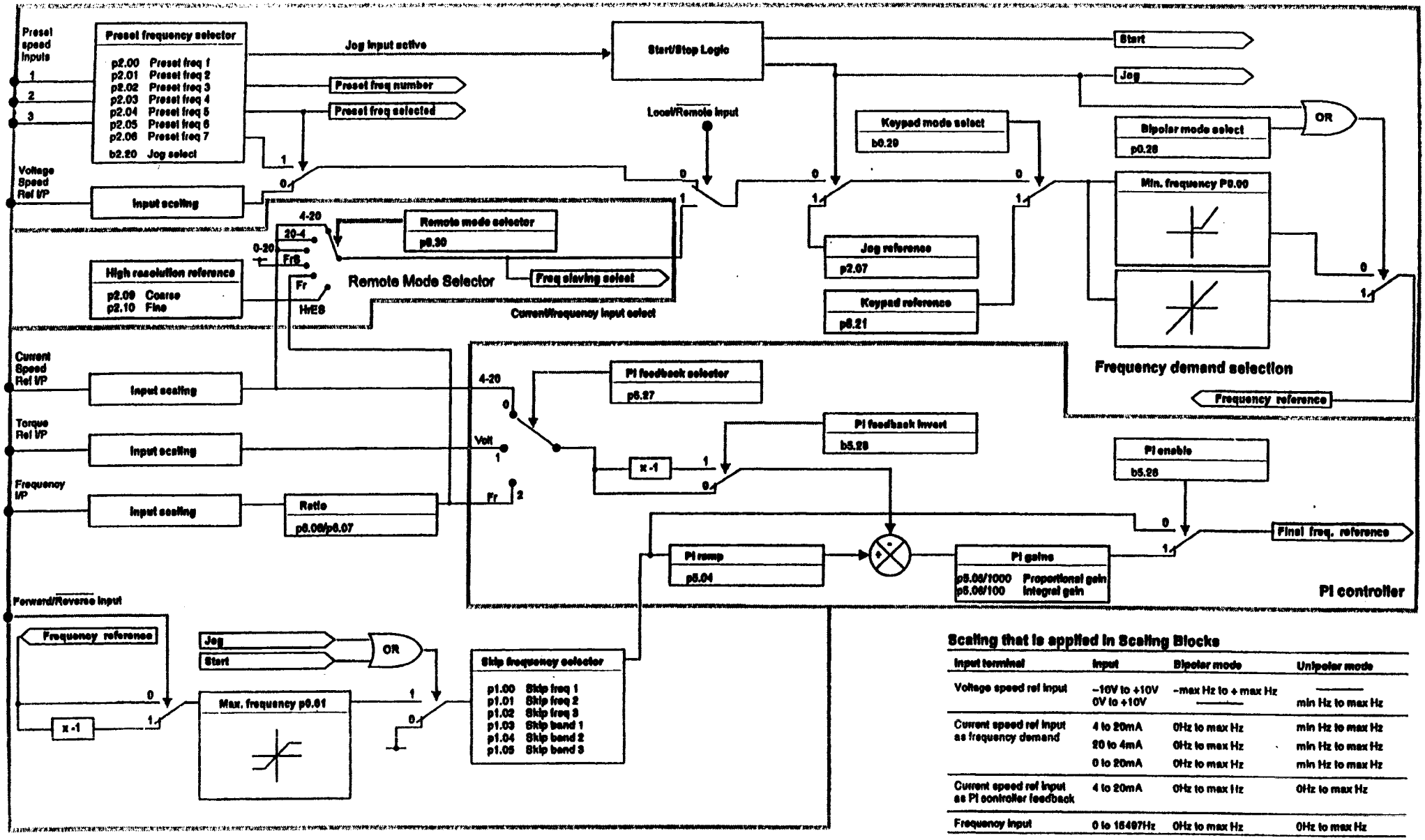


Messages from host to interrogate the CDE Drive



CDE Drive replying to an interrogation

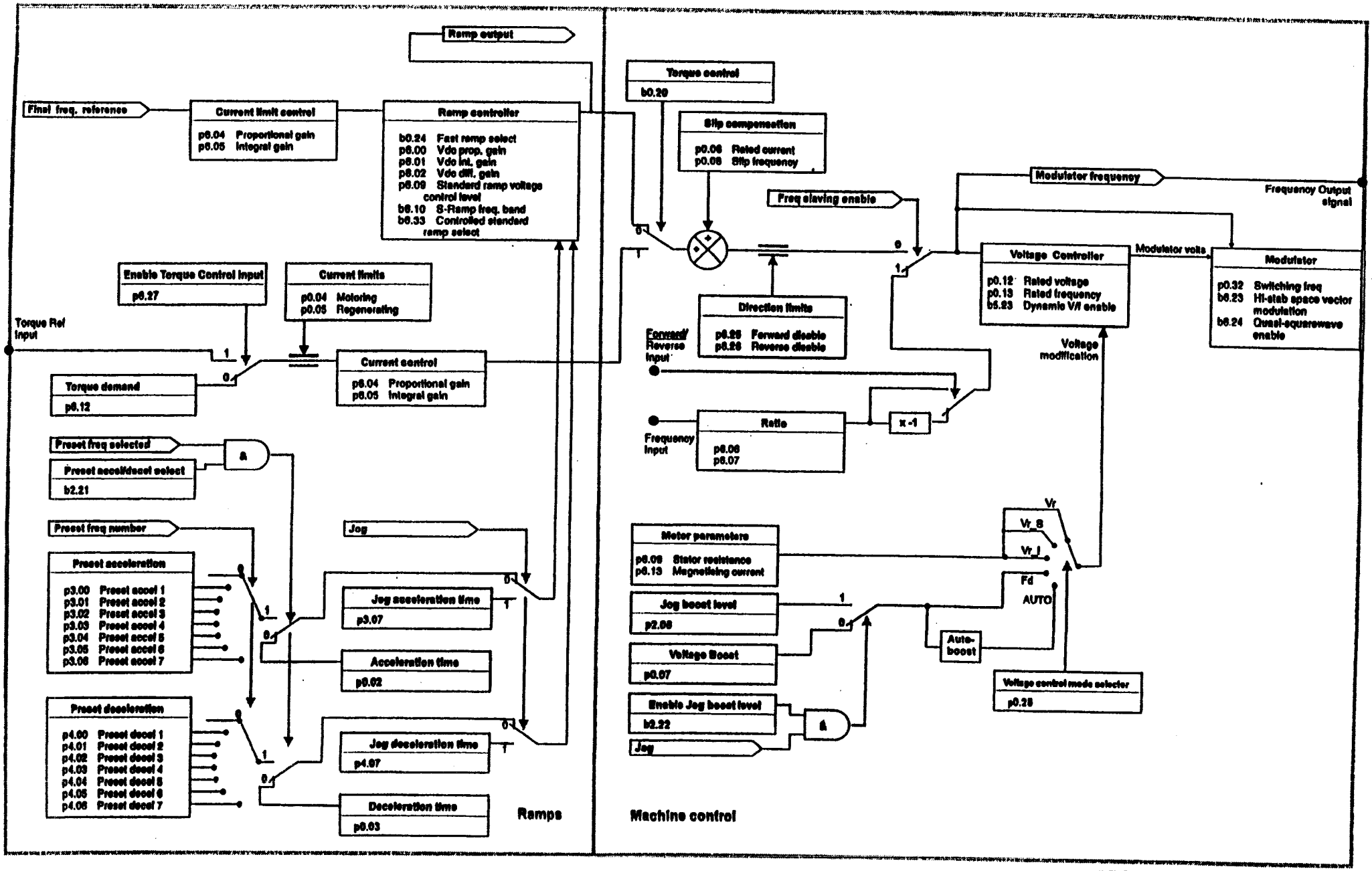




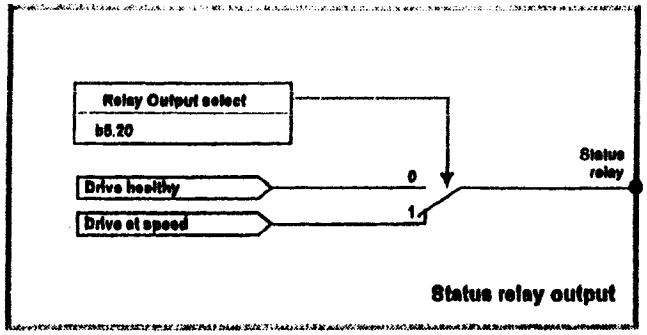
Scaling that is applied in Scaling Blocks

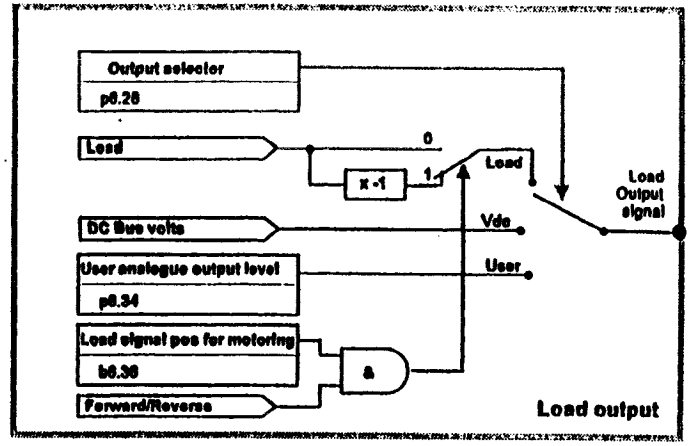
Input terminal	Input	Bipolar mode	Unipolar mode
Voltage speed ref input	-10V to +10V 0V to +10V	-max Hz to + max Hz ———	——— min Hz to max Hz
Current speed ref input as frequency demand	4 to 20mA 20 to 4mA 0 to 20mA	0Hz to max Hz 0Hz to max Hz 0Hz to max Hz	min Hz to max Hz min Hz to max Hz min Hz to max Hz
Current speed ref input as PI controller feedback	4 to 20mA	0Hz to max Hz	0Hz to max Hz
Frequency input	0 to 16497Hz	0Hz to max Hz	0Hz to max Hz
Torque input as PI controller feedback	-10V to +10V	-max Hz to +max Hz	-max Hz to +max Hz

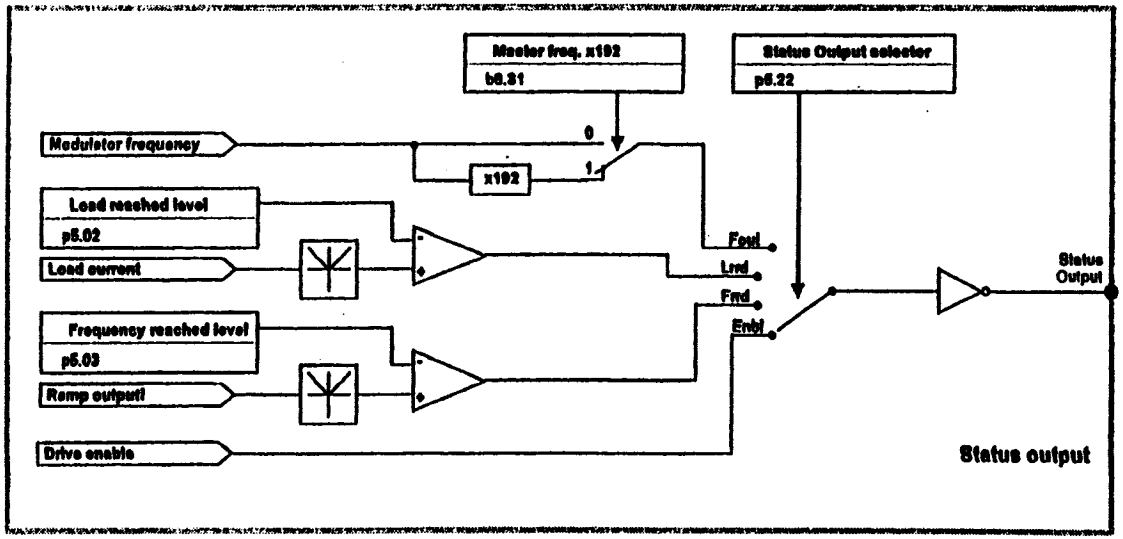
CDE logic diagram (part 1)



CDE logic diagram (part 2)







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Sundon Business Park
Dencora Way, Luton
Beds LU3 3HP

Tel: [44] 1582 567700
Fax: [44] 1582 567703
After Hours: [44] 1582 567700

U.K. - Warrington Application Centre

Control Techniques
224 Europa Boulevard
Gemini Business Park
Warrington
Cheshire
WA5 5TN

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Fax: [44] 1925 242808
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URUGUAY - Montevideo — Distributor

Secoin S.A.
Gral Aguilar 1270 Bis
C.P. 11800
Montevideo

Tel: [5982] 2093815/2030850
Fax: [5982] 209 2584

U.S.A. - Charlotte Application Centre

Control Techniques Drives Inc.
2716 Interstate Street
Charlotte
North Carolina 28208

Tel: [1] 704 393 3366
Fax: [1] 704 393 0900
After Hours: [1] 716 692 2442

U.S.A. - Chicago Drive Centre

Control Techniques Drives Inc.
95 Brandon Court
Glendale Heights
Illinois 60139

Tel: [1] 630 893 5249
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U.S.A. - Cleveland Drive Centre

Control Techniques Drives Inc.
6900 Southpointe Parkway
Brecksville
Cleveland,
Ohio 44141

Tel: [1] 440 717 0123
Fax: [1] 440 717 0133

U.S.A. - Dallas Drive Centre

Control Techniques Drives Inc.
1226 Exchange Drive
Richardson
Texas 75081

Tel: [1] 972 783 1831
Fax: [1] 972 783 9978
After Hours: [1] 800 759 0664

U.S.A. - Providence Drive Centre

Control Techniques Drives Inc.
4 Blackstone Valley Place
Lincoln
Rhode Island 02865

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After Hours: [1] 401 333 0080

VENEZUELA — Distributor

Emerson Electric CA
Avenida Don Diego Cisneros
(ppA1 De Los Ruices)-Edificio Stemo
Piso 1, Aptdo 75748
Caracas 1071-A

Tel: [58] 2 237 7522
Fax: [58] 2 238 9023

VIETNAM - Ho Chi Minh Application Centre

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Vietnam Co Ltd
(Ho Chi Minh)
70A Truong Cong Dinh St, Ward 13
Tan Binh District, Ho Chi Minh City

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