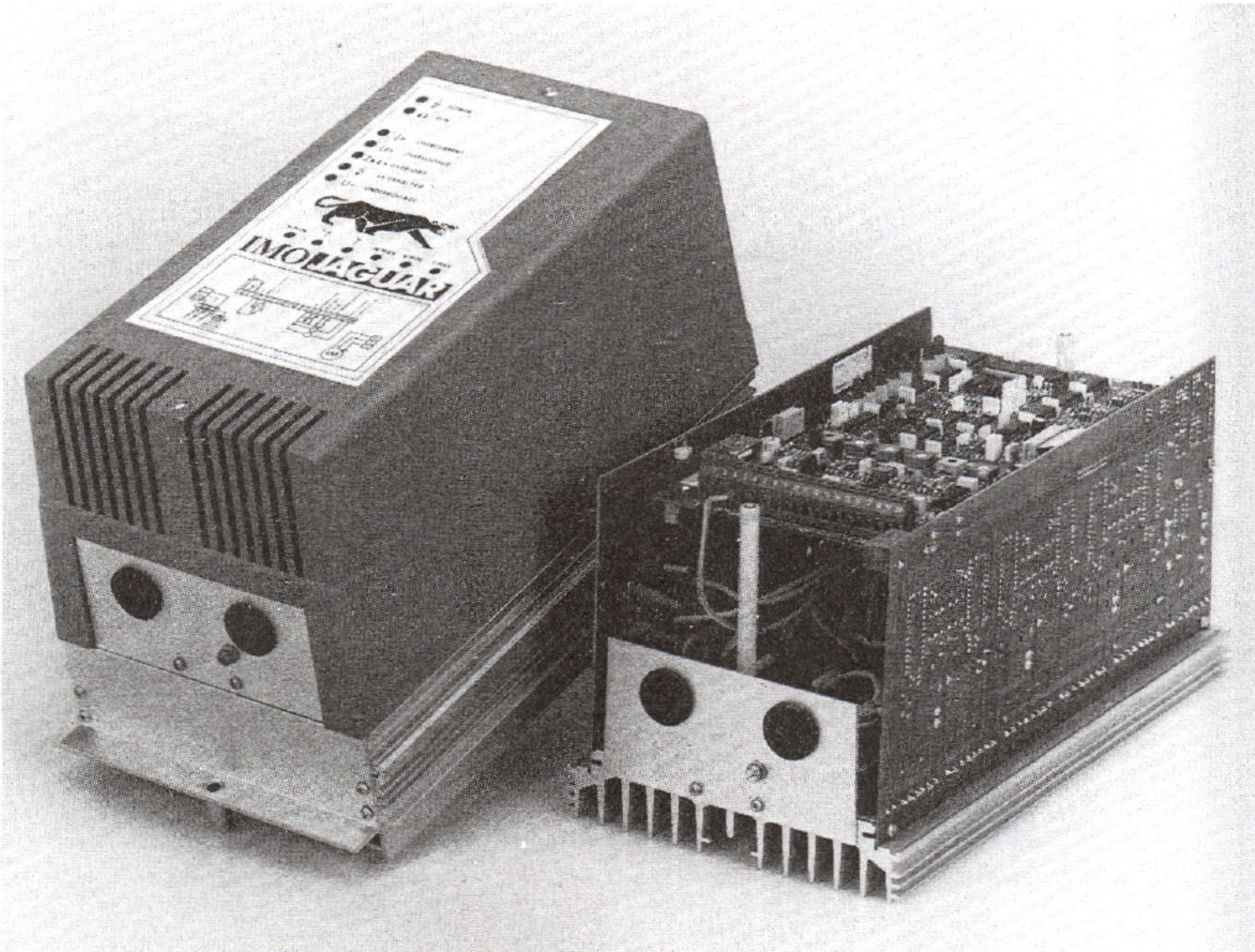
JAGUAR INSTRUCTION MANUAL



IMO JAGUAR

AC VARIABLE SPEED DRIVE
0.75 - 7.5kW

Please read these instructions before installation and use. Failure to do so may result in damage not covered by warranty. If in doubt contact your supplier.

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1. General

This series of PWM Sine Wave variable frequency inverters for the control of A.C. Motors covers the range 0.75-7.5kw. The 0.75kw to 1.5kw are available with single phase or three phase inputs. All units have isolated electronics, current limit, overload protection and a wide range of standard features. All units above 11A are fan cooled.

2. Specification

Standard Range

TYPE	VN75	VN110	VN150	VL75	VL110	VL150	VL220	VL370	VL550	VL750
Input	1PH 220/240V ±6% 50/60Hz			3PH 380/415V ±6% 50/60Hz						
Max. Output Line Voltage	3PH 220/240V			3PH 380/415V						
Motor Kw	0.75	1.10	1.50	0.75	1.10	1.5	2.20	3.70	5.50	7.50
Rated Current A	3.6	4.8	6.5	2.1	2.8	3.8	5.6	8.6	12.0	16.0
Cooling	Natural Ventilation								Fan	

Low Voltage Range

TYPE	VNO1	LVL02	LVL03	LVL05
Input	IPH 220/240V	3PH 220/240V ±6% 50/60Hz		
Max. Output Line Voltage	3PH 220/240V			
Motor H.P.	1	2	3	5
Rated Current A	5	8	11	17
Cooling	Natural Ventilation			Fan

High Voltage Range

TYPE	HVL03	HVL05	HVL075	HVL10
Input	3PH 440/460V ±6% 50/60Hz			
Max. Output Line Voltage	3PH 440/460V			
Motor H.P.	3	5	7.5	10
Rated Current A	4.8	7.6	11.5	15.0
Cooling	Natural Ventilation		Fan	

Frequency Range	2-100Hz ± 0.5% (2-120Hz for 60Hz motors)
Overcurrent	1.5 x F.L.C. for 20 sec.
I/P Power Factor	0.95 Lag. 0.86 Lag for VL550-750, LVL 05 HVL075/10
Temperature Range	–10 to + 40°C derate 1.5%/°C from 40-60°C max.
Humidity	85% R.H. at 40°C Non Condensing
Altitude	Above 1000 meters derate by 1%/100 meters
Control Method	PWM Sine Wave 2-48Hz merging Quasi-square 48-100Hz

Control Inputs -(Isolated)	Set Speed (Frequency)	0 to +10V, 4-20MA 0-3000Hz (ramped)
	Set Torque	0 to +10V
	Forward/Reverse	N/O Contact or 0/15V Logic Signal @ 5mA
	Run/Inhibit	N/O Contact or 0/15V Logic Signal @ 5mA
	External Trip	N/C Momentary Contact or 0/15V Logic Signal @ 5mA
	External Reset	N/O Momentary Contact or 0/15V Logic Signal @ 5mA
	Tacho F.B.	20V/1000R.P.M. (Standard) 60V Max.
Control Outputs -(Isolated)	Speed (Frequency)	0 to +10V (100μA) ± 10% & 0-3000Hz
	Torque	0 to -10V (100μA) ± 20% from 10-50Hz
	Fault	C/O Contact 240V 3A AC
	Reference Voltage	+ 10V @ 2mA
	Ramp Output	0 to + 10V @ 5mA
Adjustments	Min Speed	2Hz-0.3 F Max
	Ramp Up	1-300 Sec. Linear

	Ramp Down	1-300 Sec. Linear
	Max Speed	40-100Hz (120Hz with 60Hz Motors)
	Low Freq Boost	0-0.15 x Max Motor Voltage
	Current Limit	0.75-1.5 x FLC
Diagnostic	Power On	ϟ
	Run	∩
	Over Current	>I
	Over Voltage	>V
	Overload	>I x t
	Under Voltage	<V
	Over Temperature	Models VL550-750, LVL03/05, HVL03-10

3. Principle of Operation

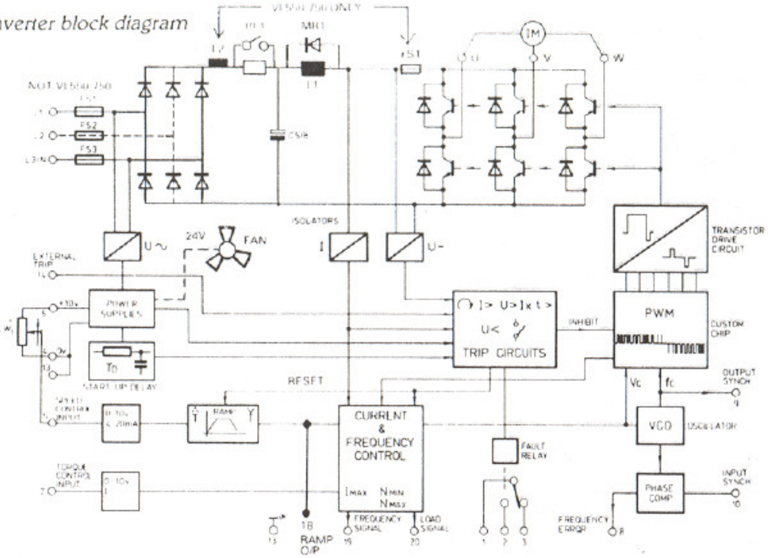
The synchronous speed (N) of a three phase induction motor is determined by the number of poles (P) and the frequency F of the applied voltage.

$$N = \frac{120F}{P}$$

To obtain true infinately variable speed it is necessary to change the frequency of the applied voltage. However when reducing frequency from 50Hz it is also necessary to reduce the applied voltage in proportion in order to maintain constant flux and avoid magnetic saturation of the motor. Similarly when increasing frequency above 50Hz the applied voltage should be increased, however, we are limited to the maximum voltage of the supply hence the torque speed characteristic 0/100Hz is approximately as shown in Fig 2. Fig 3 shows the relationship between frequency and applied voltage. Low frequency voltage boost is required to overcome the effect of motor resistance. Fig 1 shows the block diagram of the inverter. The input supply is rectified by a single or three phase rectifier the output of which is smoothed by C5/8. At switch on this capacitor is initally charged via R3 which is shorted out by RL1 after the start up delay (TD). The voltage across the capacitator is approximately 340 or 580V for single phase and three phase inputs respectively. This voltage is fed to the transistor inverter via current limiting inductance L. The D.C. current and voltage are monitored and isolated from the electronic control circuits.

The transistors are switched in such a way that each output line voltage is as shown in Fig 4. This results in a motor line current as shown in Fig 5 the ripple being limited by motor inductance. The flywheel diodes across each transistor provides a path for the inductive current, hence when the inverter is running at low power factor (light load) the current drawn by the D.C. link is low due to the current feed back from these diodes. Also when the frequency is reduced the motor will regenerate the reverse current flowing through the flywheel diodes into the D.C. link. If this is allowed to happen the D.C. link voltage will rise and the inverter will trip out on overvoltage. With this design, reverse current in, the D.C. link is carefully controlled thus avoiding tripping out with regenerative loads. The switching signals for the power transistors consist of ON and OFF pulses and are isolated from the electronic circuits by pulse transformers. The P.W.M. waveforms are generated in a custom I.C. which is in turn controlled by a frequency demand oscillator (VCO) and a voltage signal (VC). The trip circuits operate by inhibiting the inverter and generating OFF pulses to the appropriate transistors. The inverter is also inhibited at start up for 0.3 seconds after application of the supply voltage. Conventional analogue circuits control current speed acceleration and deceleration.

Fig. 1 Inverter block diagram



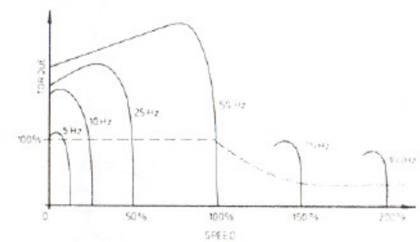


Fig. 2 Typical torque/speed characteristic with standard motor

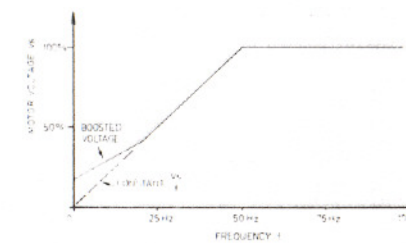


Fig. 3 Relationship between motor frequency and voltage

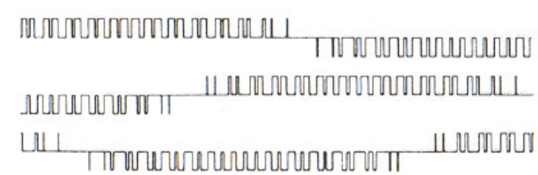


Fig. 4 Motor line to line voltage waveforms at 30Hz

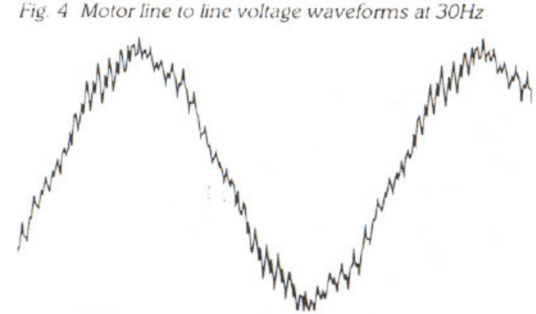


Fig. 5 Motor current waveform at 30Hz

4. Motor Rating

4.1 STANDARD MOTOR

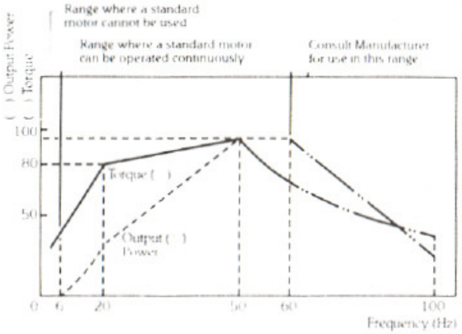


Fig. 6 — Motor derating at reduced speed

When the speed of a standard induction motor is reduced the speed of the cooling fan is also reduced and with it the amount of air necessary to ensure effective motor cooling. In addition because the inverter output voltage is not exactly sinusoidal the motor losses are also slightly increased. This increase in motor losses means that the motor cannot be continuously run at full load. Fig 6 shows typical continuous torques available when using a standard induction motor. To protect the motor at low speeds it should be equipped with thermal relays which can be arranged to trip the inverter via the external trip circuit (terminal 14). It is possible to use a motor of larger frame size than the rating of the inverter however it is important to check that the inverter current rating is not exceeded. Also due to the lower inductance of larger motors there is an increase in the ripple current and hence a de-rating may be necessary. As a general rule if the next frame size larger than the rated motor is used then a de-rating on inverter output current of 0.9 x nominal rating should be used. For more precise information on motor ratings please consult factory.

4.2 60Hz MOTORS

When using the inverter with 60Hz motors it is necessary to modify the V/Hz relationship. This is done by removing link J8 (50Hz) and inserting link J9 (60Hz). See figure 7.

5. Inverter Installation

5.1 LIST OF TERMINALS

Terminals	Description
L1, L2, L3	3 Phase Input (VL Models)
L1, N	1 Phase Input (VN Models)
U, V, W	Motor Connections (VL + HVL Models)
T1, T2, T3	Motor Connections (LVL — Models Only)

1. Common Contact ⎤ Fault
2. N/O Contact ⎥ Relay
3. N/C Contact ⎦ 240V 3A
4. Electronics Common OV
5. Speed Control Input
6. +10V Reference Voltage (2mA max load)
7. Torque Control Input
8. Frequency Error 0-14V D.C.
9. Output Synch. Frequency 30 x Motor Frequency
10. Input Synch. Frequency 30 x Motor Frequency
11. ⎤ Tacho Input -20V/1000 rpm
12. ⎦ 60V Max
13. Electronics Common OV
14. External Trip — Disconnect from OV to Trip
15. - EXTERNAL RESET - DISCONNECT FROM 0V TO RESET
16. INHIBIT - DISCONNECT FROM 0V TO INHIBIT
18. Ramp Output 0 to +10V
19. Frequency Indication 0 to 10V DC (100μA)
20. Torque Indication 0 to -10V DC (100μA)

5.2 DIMENSION DETAIL (NATURALLY VENTILATED UNITS) VN75-150. VL75-370 ETC.

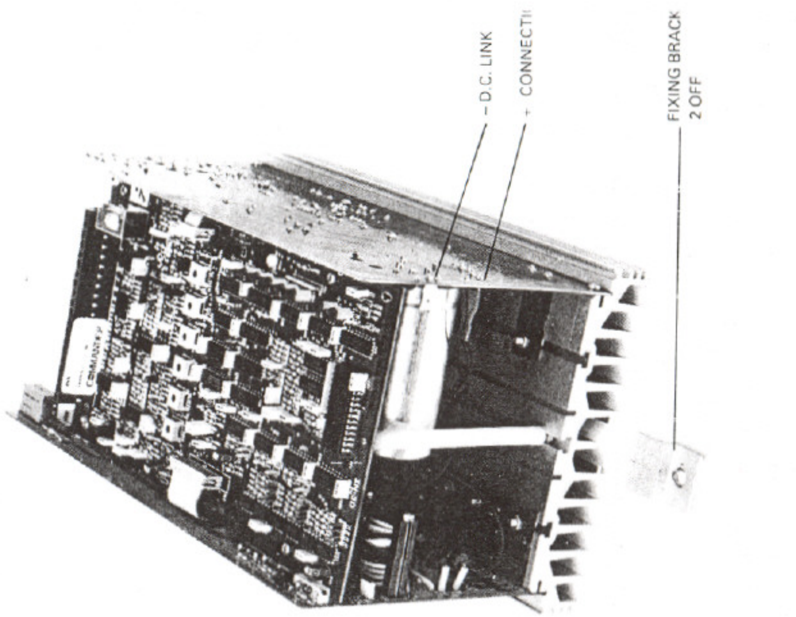


Fig. 8

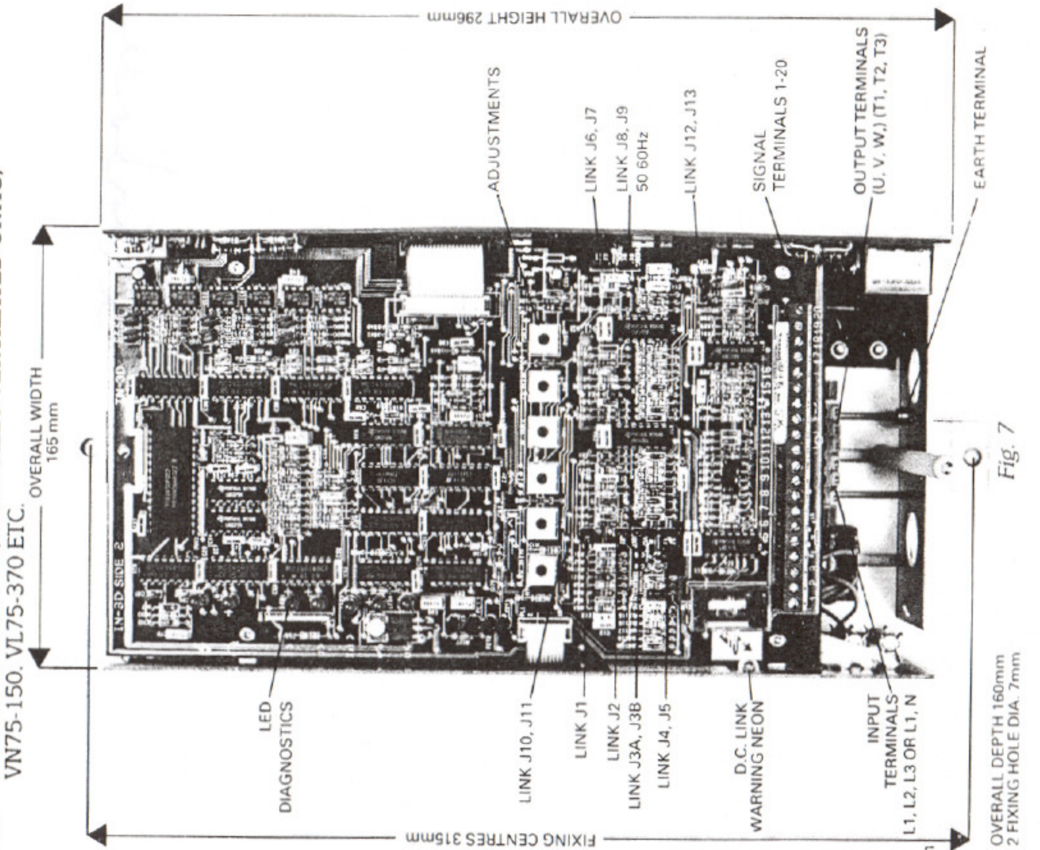


Fig. 7

5.3 DIMENSION DETAIL (FAN COOLED UNITS) VL550-750 ETC.

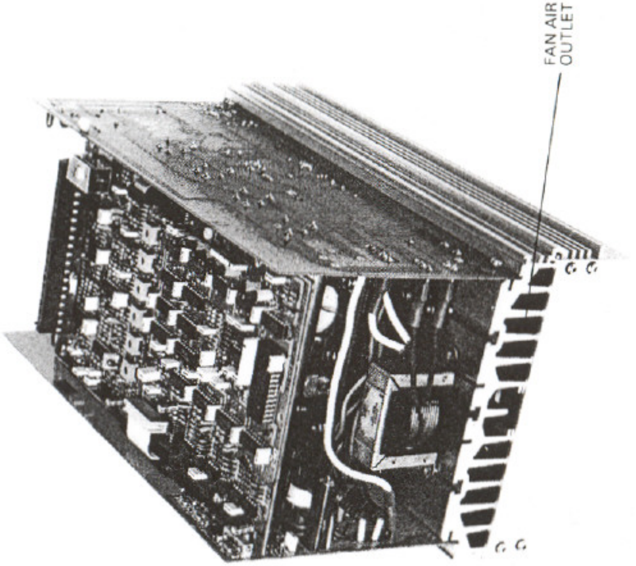


Fig. 10

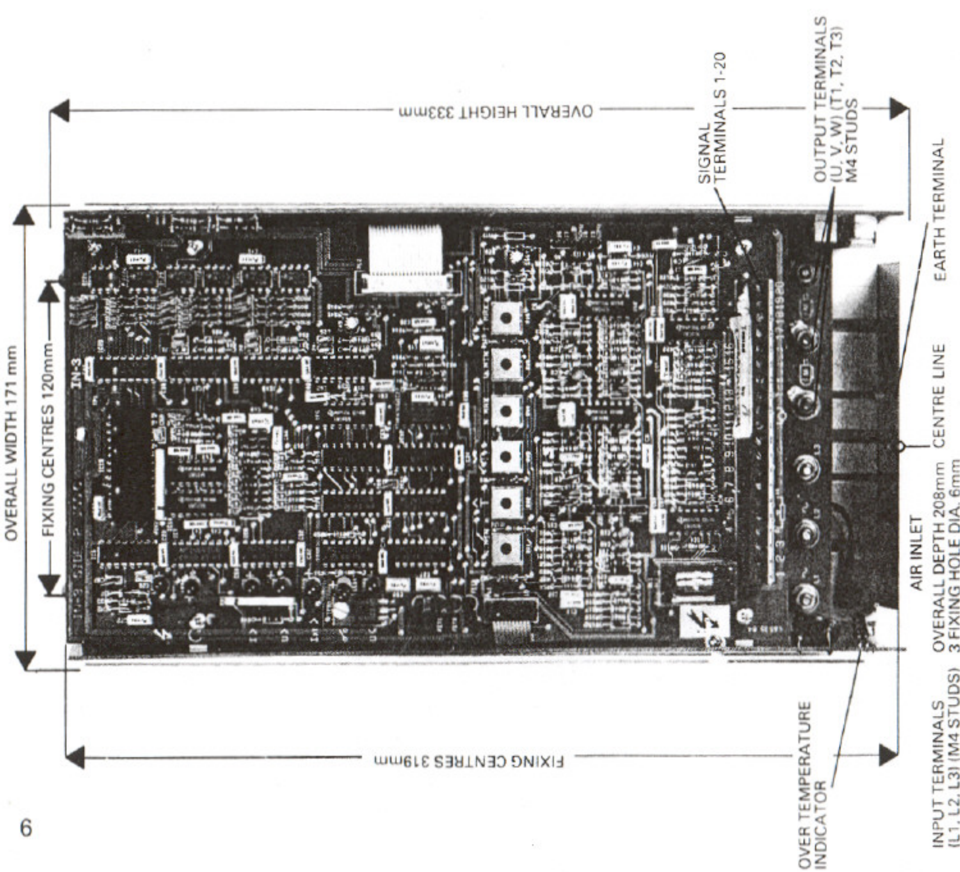


Fig. 9

5.4 CABLE & FUSE SIZES

Model	Motor Rating	O/P Current-Cable	mm²	I/P Current-Cable	mm²	Input Fuse C.B. Rating	Signal Wiring mm²	Voltage
VN75	0.75Kw	3.6	1.0	8.0	1.0	10A	0.75 Screen	220/ 240V
VN110	1.10Kw	4.8	1.0	11.0	1.5	15A	0.75 Screen	
VN150	1.50Kw	6.5	1.0	15.0	2.5	15A	0.75 Screen	
VL75	0.75Kw	2.1	1.0	3.0	1.0	5A	0.75 Screen	380/ 415V
VL110	1.10Kw	2.8	1.0	4.0	1.0	5A	0.75 Screen	
VL150	1.50Kw	3.8	1.0	5.5	1.0	10A	0.75 Screen	
VL220	2.20Kw	5.6	1.0	8.0	1.0	10A	0.75 Screen	
VL370	3.70Kw	8.6	1.5	12.0	2.5	15A	0.75 Screen	
VL550	5.50Kw	12.0	1.5	12.0	2.5	15A	0.75 Screen	
VL750	7.50Kw	16.0	2.5	15.0	2.5	15A	0.75 Screen	

ALL SIGNAL WIRING CONNECTED TO TERMINAL 1-20 SHOULD BE SCREENED WITH THE SCREEN CONNECTED TO EARTH AT ONE END ONLY.

5.5 MOUNTING THE INVERTER

The inverter is designed for mounting in a control panel. The mounting brackets and fixing centres are shown in figs 7, 8, 9, and 10. The bottom bracket can be fixed and the inverter positioned before fixing in position the top bracket. Check the following before commissioning.

a) Unit is mounted vertically
b) Installation is free from dust, corrosive gas, and grinding fluid
c) Installation is free from vibration
d) The ambient temperature will not exceed –10 to +40°C
e) That there is at least 100mm clear space above and below the unit.

It should be rembered about the inverter heat sink will run at temperatures up to 100°C and contact should be avoided with anything that might be harmed by these temperatures.

When mounting in an enclosure it is important to take into account the watts dissapated by the inverter to avoid an excessive rise in ambient temperature.

Table shows maximum watts dissapated by various models of inverter.

Model	VN75	VN110	VN150	VL75	VL110	VL150	VL220	VL370	VL550	VL750
Watts	42	65	100	25	35	45	85	130	160	200

An adaptor kit is available that allows the heatsink to be mounted outside the cubicle. Order Code CFK-1.

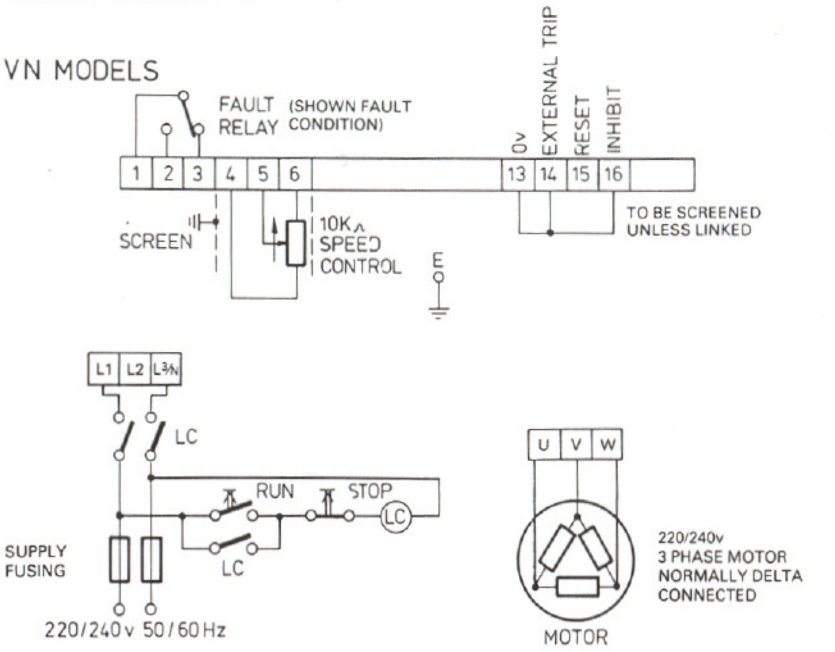
5.6 MOTOR LINE CHOKES — MOTOR CABLE LENGTH

Refer to your supplier for motor line choke recommendation when motor cable length in excess of 10 metres may be involved.

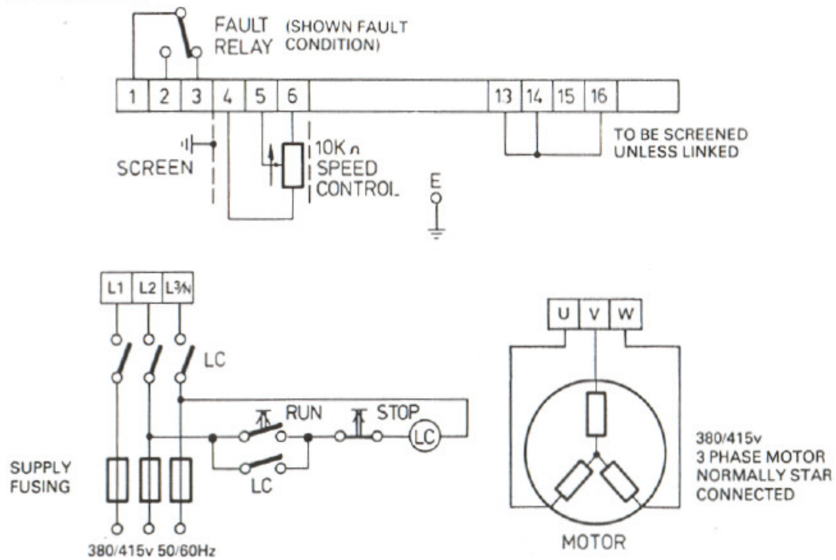
5.7 STANDARD CONNECTION DIAGRAM

The basic connections are shown below. Additional operational facilities are described in sections 7-18.

VN MODELS



VL MODELS



6. Commissioning

WARNING

AFTER SWITCHING OFF THE INVERTER CAPACITORS REMAIN CHARGED TO A HIGH VOLTAGE FOR APPROXIMATELY 5 MINUTES. THE NEON FIGURE (FIG 7) REMAINS ILLUMINATED UNTIL THE VOLTAGE DROPS TO 100V.

6.1 STARTING A DRIVE

Set the speed control to zero, switch on A.C. supply and press RUN button. The power on L.E.D. should light immediately followed by the RUN L.E.D. after a delay of approximately 0.3 seconds. Increase speed control to maximum which is factory set to approximately 40Hz.
If the motor rotation is incorrect switch off and reverse motor phases or reverse electronically (see section 7). If problems arise refer to the fault-finding chart in section 19.
The following adjustments are available to set the drive for a particular application.

6.2 ADJUSTMENTS

6.2.1 Minimum Frequency/Speed (N min)

Clockwise rotation increases frequency up to a level of 30% of the frequency set by N max.

6.2.2 Ramp Up (T̂)

This controls the linear rate of rise of speed/frequency control voltage. Clockwise rotation increases the rate (reduced time).
The range of control is approximately 1-300 seconds for maximum speed change.

6.2.3 Ramp Down (Ť)

This controls the linear rate of fall of the speed/frequency control voltage. Clockwise rotation increases the rate (reduced time).
The range of control being approximately 1-300 seconds for maximum speed change.
The actual deceleration may be determined by the load inertia in which case the RAMP DOWN control will not be effective until it is turned further anti-clockwise. If fast deceleration is required the COMMANDER braking unit (IB1) should be used. See Sec. 20.

6.2.4 Maximum Speed/Frequency (N max)

This controls the maximum frequency available with the speed control set to maximum. It is adjustable between 40-100Hz. Clockwise rotation increases frequency.

6.2.5 Low Frequency Boost (V min)

As explained in section 3 in order to maintain constant flux at low frequencies (less than <20Hz) it is necessary to increase the motor voltage. This control varies the amount of boost. Clockwise rotation increases the voltage at 2Hz to a maximum of 15% of a nominal motor voltage rating. It is only necessary to increase this control if insufficient torque is available at low speed. It should only be increased by the amount required, too much boost can prevent the inverter from being able to start the motor, or make the motor excessively noisy.

6.2.6 Torque Limit (I max)

This control sets the maximum potential torque that can be delivered by the motor. Clockwise rotation increases the available torque and it is adjustable between 75-150% FLT. The actual torque available at low frequencies may in fact be less than 150% FLT due to the motor characteristics. See fig 2. It also sets the maximum continuous current that the controller may deliver. Too low a setting may cause the motor to trip out on I x t overload during starting or running.

7. Reversing

The motor can be reversed electronically by connecting terminal 17 to OV (terminals 13 or 4). With terminal 17 open the phase sequence of the output terminal is U, V, W

The motor can be reversed electronically whilst running the sequence of events on reversing is as follows: On reversal the motor decelerates under ramp control to zero speed when the phase sequence is electronically reversed and the motor then accelerates in the reverse direction to the set speed.

8. Speed Control Input Variations

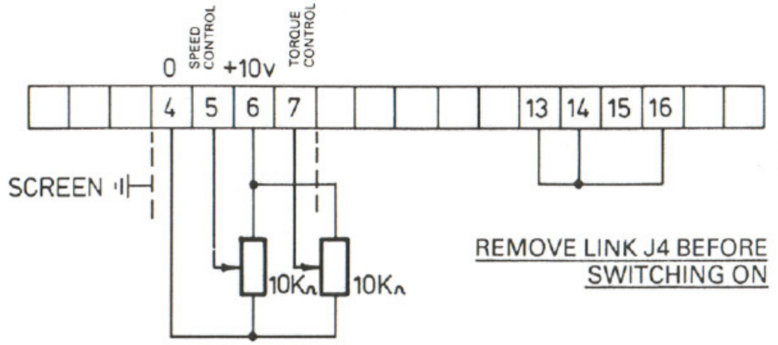
Links J1 and J2 set input speed control parameters as follows (see fig. 7).

0 to +10v — J1 Linked, J2 Open
4-20MA — J1 Open, J2 Linked

For speed potentiometer control use a potentiometer value of 10 kOhm (minimum)

9. Torque Control

The drive can be run in the torque control mode by making the following connections and removing link J4 **before switching** the Inverter on.



10. External Speed Signal

A voltage proportional to frequency is available between 13(OV) and 19 as follows:

0 to +10v±10% = 0-100Hz
Output impedance = 4.7k

The sync. frequency of 0-3000Hz is available between terminal 9 and 13 (OV).
Output impedance = 1 kohm

11. External Torque Signal

An external signal approximately proportional to torque is available between terminals 13(OV) and 20 as follows:

0 to −10V ± 20% = 0-Max Torque (150% FLT)
Output impedance = 4.7k. Maximum load 100μA

This signal is not valid when operating in torque control mode.
Above 50Hz the max torque is reduced due to the under fluxing of the motor.

12. Tacho Generator Feedback

The speed regulation of the drive is determined by the slip of the motor typically 4%. To achieve better regulation tachogenerator feedback can be employed. The D.C. tachogenerator should be connected between terminals 11 and 12. The voltage range that can be accepted is between 30-60v D.C. (at Max speed). Typically 20V/1000 rpm. It is not necessary to observe polarity.
The following adjustment should be made to the inverter.

NO TACHOGENERATOR FEEDBACK
J6 LINKED, J7 OPEN,
R15 REMOVED
(AS DELIVERED)

TACHOGENERATOR FEEDBACK
J6 OPEN, J7 LINKED
R15 4.7K

R15 sets the stability of the drive reducing its value increases the damping. The N MAX control still adjusts the maximum speed.

13. External Inhibit

To enable the drive to run, terminal 16 must be connected to OV (terminal 13 or 4). When this connection is open the drive is inhibited and the RUN LED is de-energised, reconnecting 16 to OV removes the inhibit.

14.External Trip

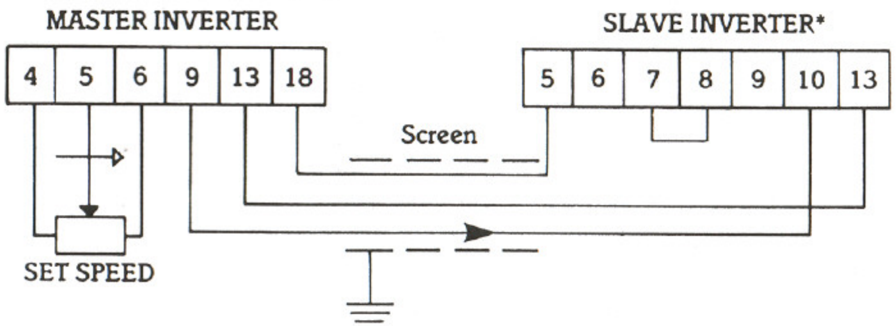
To enable the drive to run, terminal 14 must be connected to OV (terminals 13 or 4). When this connection is opened momentarily the drive will trip and the RUN LED is de-energised and the external trip LED energised. To reset the power must be removed or the external reset terminal used.

15.External Reset

Any of the five trip conditions indicated by the LED's can be reset by removing the input power from the inverter or by momentarily connecting terminal 15 to OV (terminals 13 or 4). The drive will reset after start up delay TD (0.3 seconds).

16.Frequency Synchronisation

The inverter may be synchronised to an external frequency applied to terminal 10. Terminal 8 must be linked to terminal 7 and Link J4 removed. The external frequency must be at a frequency of 30 x MOTOR FREQUENCY and at LOGIC LEVEL OF 15v. Two or more inverters may be synchronised together by using the frequency signal on terminal 9 as a frequency synchronising waveform for another inverter (terminal 10). The slave inverter requires a speed reference ≥ to the speed of the master, this is achieved by linking terminal 18 (ramp output) of the master to terminal 5 (speed reference) of the slave and adjusting the max. speed (N max) potentiometer of the slave.



*Remove Link J4 on Slave Inverter **before** switching Inverter on.

17.Economy Mode

With LINKJ3A (fig 7) fitted the inverter operates with a constant V/F ratio modified at low frequencies by the boost control (fig 3).

To operate in the ECONOMY MODE LINKJ3A is removed and J3B inserted. Now the V/F ratio will be dependent on the load as shown in Figure 11. At NO LOAD the motor voltage being approx 50% of the nominal maximum value. This means the efficiency will be improved and the accoustic noise of the motor substantially reduced. Change link position only with the inverter switched off.

This mode of operation is recommended for fans and pumps or any load where rapid changes of torque do not occur.

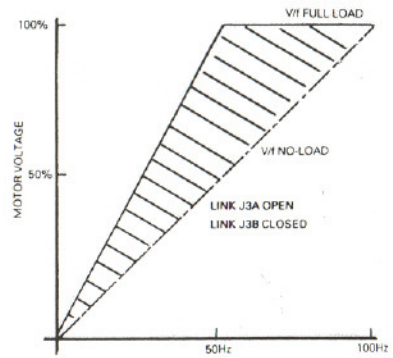
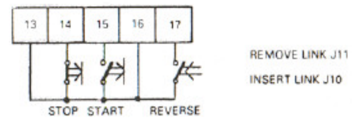


Fig 11 Economy Mode V/f Characteristics

18.Electronic Pushbutton Control

The external trip & reset facility can be used for pushbutton control of the inverter. Thus avoiding the need for an input contactor. However to achieve this the under voltage detector must be made to latch and this is done by removing link J11 and inserting link J10 (see fig 7).



19.LED Diagnostic Indicators

19.1 **POWER ON** Indicates voltage has been applied to terminals L1, L2 and L3 or L1 & N. Failure to light indicates supply loss or blown control fuse.

19.2 **RUN** Indicates drive healthy and ready to run. Lights 0.3 seconds after application of power to the inverter.

19.3 **OVERCURRENT** Indicates that the inverter peak current has been exceeded.

19.4 **OVER VOLTAGE** Indicates that the D.C. Link Voltage of the inverter has exceeded its maximum rating, indicating excessive motor regeneration or supply voltage.

19.5 **OVERLOAD** Indicates operation of inverse time overload trip. Typically the trip will operate in approximately 20 seconds for 1.5 x FLT. Reducing the I MAX control reduces the trip level.

19.6 **EXTERNAL TRIP** Indicates that terminal 14 has been disconnected from OV.

19.7 **UNDER VOLTAGE** Indicates power supply voltage is low. This indicator flashes ON and OFF during the start up delay. With Link J11 inserted this trip does not latch. It can be made to latch by inserting Link J10. With fan cooled models this trip also indicates overtemperature (see below).

19.8 **OVERTEMPERATURE (see fig 9)** Indicates that the heatsink or ambient temperature is too high. In the overtemperature condition the undervoltage L.E.D. also lights. This indicator applies to VL550/750 and all LVL/HVL models. This trip latches and must be reset after a suitable cool-down period

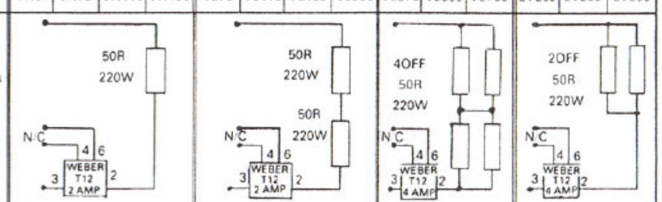
20.Braking Unit (IB-1)

20.1 **GENERAL** The IB1 provides controlled motor braking for all models of inverter units except HVL series (440/460v supply). Braking torque is determined by remotely mounted power resistors — supplied. Protection against excessive braking load is by thermal trip — also supplied. The thermal trip **must** be fitted.

20.2 **SPECIFICATION** AC supply. 220-415 volt ± 6% 50/60Hz, self adjusting reference.
DC supply. 2 wire +HT, -HT connection to Inverter — not protected.
Braking Current. 15Amp DC for 20 seconds max.
Braking Point. Factory preset. Suits LVL, VN & VL Inverters — not HVL series.
Braking Torque. Set by remote power resistors — supplied.
Braking Duty. Normally 5 seconds every 2 minutes. Expandable.
Protection. AC supply fusing. Not protected on DC lines.
Temp Range. -10°C to +40°C.

20.3 **APPLICATION** For controlled braking of motor and load. The IB-1 braking system should be specified. By using power resistors of known value a defined braking torque is developed, braking time being dictated by total load inertia. The IB-1 will work correctly from an AC supply anywhere between 220-415 ±6% without further adjustment It should not be used with HVL series inverters where the supply is 440/460V. The table in fig 12 shows the correct power resistor combination for all models along with resulting braking torques. Figures are quoted against a 5 second braking period every 2 minutes. This may be increased — refer to supplier. For convenience provision is made on the IB-1 for connecting the thermal trip. See fig 13.

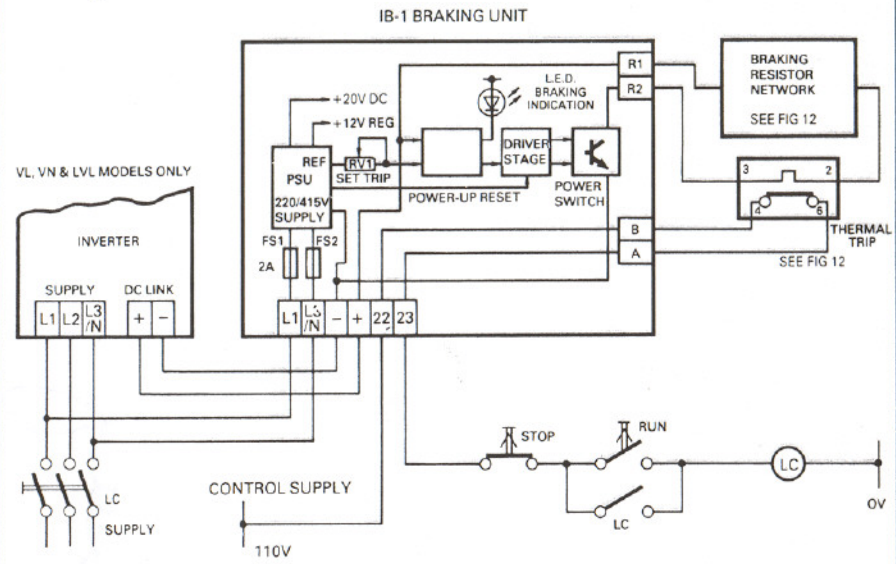
Fig 12 Braking Resistor/Trip — Data & Connections

MODEL	VN01	VN75	VN110	VN150	VL75	VL110	VL150	VL220	VL370	VL550	VL750	LVL02	LVL03	LVL05
RESISTOR NETWORK CONFIGURATION AND WEBER TRIP VALUE T12 SERIES TYPE T12 — 221SN														
% MOTOR F.L.T. BRAKING - APPRX.	85	110	85	62	165	125	92	70	79	58	43	100	73	50
BRAKING DUTY — APPRX.	5 SECONDS BRAKING IN EVERY 2 MINUTES — MAXIMUM													
THERMAL TRIP TIME	15 SECONDS — NOMINAL													

NOTE: FOR EXTENDED BRAKING PERFORMANCE REFER TO SUPPLIER

The IB1 is also recommended for applications involving overhauling loads, high speed/inertial load and systems using synchronous motors.

20.4 CONNECTIONS
Fig 13



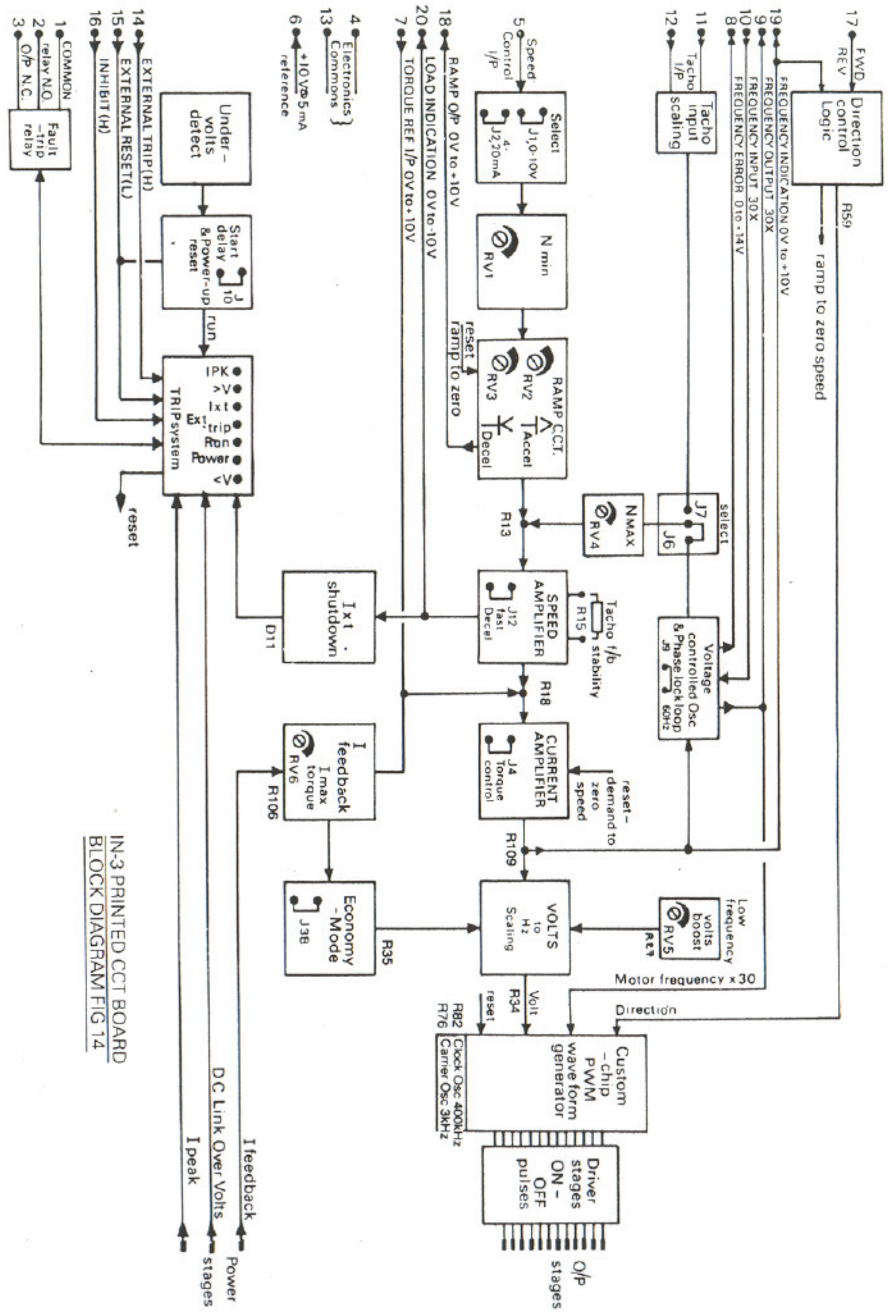
NOTE Inverter & IB1 are powered up simultaneously.

The supply to the IB-1 must be of the same value as that of the inverter.

20.5 **ADJUSTMENT** The Inverter must be adjusted for fast ramp-down where the IB-1 is used. The Inverter's main control p.c.b. ref IN-3, incorporates a link system, link J13 must be removed and J12 inserted for braking operation. Earlier models may not have link J12/J13, in this case add a shorting link across resistor R122 on the IN-3 p.c.b. for fast deceleration.

20.6 **PRINCIPLE OF OPERATION** The decelerating AC motor regenerates energy to the Inverter. Without the IB-1 system the inverter automatically extends the braking time, but in severe cases may tripout on 'over volts'. The IB-1 gives faster motor deceleration by continuously monitoring the inverter's internal D.C. link condition detecting the motor's regenerative energy as an increased D.C. link voltage. During braking the IB-1 connects the power resistor bank across the D.C. link dissipating the motor's braking energy. An on-board L.E.D. indicates the braking event. On completion of braking the IB-1 switches off. Variations in the mains supply between 220-415 volt ±6% are automatically compensated to maintain the correct braking point. To guard against excessive braking or fault conditions the thermal trip must always be used as shown in fig 12/13 . When first connecting the IB-1 to the Inverter ensure that all internal supplies have discharged. Wiring should be of a high standard and carefully checked before switching-on since the short circuit and earth-fault protection of the inverter is not effective on the IB-1 system interconnections.

21. IN3 Block Diagram



IN-3 PRINTED CCT BOARD BLOCK DIAGRAM FIG 14

22. Fault Finding Chart

Fault	Possible Cause	Action
Power on LED fails to light	Supply loss. Internal fuses blown	Replaces fuse. If they blow again replace Inverter
Motor will not run. Run LED fails to light	External interlock open LED lights	Terminals 14 & 16 must be connected to OV (4 or 13) Motor chokes required
	Overcurrent fault I> LED lights	Check motor connections for short circuit or earth fault. Reset if overcurrent trip operates again. Open circuit motor terminals. Reset. If fault remains replace inverter.
Motor will not accelerate Overload (I x t) lights after a time	Incorrect I max setting	Check & adjust setting
	Insufficient low frequency boost	Increase V min control until motor accelerates
	Too much low frequency boost	Reduce V min until motor accelerates
	Insufficient starting torque or motor overload	Consider using larger motor and inverter.
	Missing input phase. Internal fuse blown	Replace
Motor will not accelerate above 50Hz	N max control set too low	Increase N max control
	Constant or rising torque load. Overload (I x t) LED lights after a time	Lower N max control
Over voltage U> LED lights	Very high supply voltage surge	Reset
	Very high inertia load LED lights only on deceleration	Increase ramp down time on control T̄ Ensure Link J12 not fitted
Over temperature LED lights (see fig 9)	Faulty fan Obstructed air outlet or inlet (see fig 10) High Ambient °C	Rectify