VCD 55

USER GUIDE

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1.0 KEY FEATURES

POWER OUTPUT

* 0.370 or 0.550 kW, selected by DIL switches for 220/240V 3 phase motors.

* Requires a single phase 220/240 V. ± 10% mains supply.

P.W.M. CHARACTERISTIC

* High P.W.M. switching frequencies, from 2.9 to 20.5 kHz.
* Motor is sinusoidally excited over the complete speed range, with no quasi square wave mode of operation.
* Current limiting by modification of P.W.M. waveforms.

FEATURES PROVIDED BY THE MICRO-CONTROLLER

* DC injection or dynamic braking is available.
* Precise digital control of all inverter operations, eg. motor speed, applied voltage, etc. Sophisticated control is achieved without the use of extensive analogue circuitry.
* Many protection features are included to ensure the drive does not trip under adverse operating conditions.

LED DIAGNOSTICS

* One LED indicates Power On.
* Two LED's indicate the reason for drive tripping.

POWER ELECTRONICS

* Insulated Gate Bipolar Transistors (IGBT), form the inverter bridge power circuit and give high power, high speed switching. but require only low drive power.
* Auto-protecting IGBT gate drive circuits. allow fast phase to phase, and phase to earth short circuit protection.

HARDWARE

* There is only one printed circuit board, giving minimal interconnections and a simple and reliable assembly.
* The control board is a double sided pcb, incorporating surface mount technology, used to miniaturise the circuits.

OPTIONS

* An external braking unit, IBD-2, is available as an option. This unit also requires the provision of external power resistors.

* Multi Speed Card
* Bidirectional speed control card
* Remote Control Card
* Remote Control Card with sense.

1.1 DESCRIPTION

The Inverter Drive is suitable for speed control of standard 3 phase induction motors, and special high frequency motors. The drive is suitable for control of motors with power ratings from 0.18 kW to 1.5 kW, with a 220 V (−10%) to 240 V (+10%) input voltage. The motor is sinusoidally excited over the complete speed range. Four voltage/frequency characteristics can be selected, with maximum frequencies of 100, 120, 220 or 440 Hz.

The block diagram shows the basic inverter drive configuration. The input AC supply is rectified to DC, and smoothed by the DC link capacitor. The IGBT output stage converts this DC voltage into a 3 phase P.W.M. output suitable for induction motors. The electronics power supply is derived from a line transformer and a switching regulator supply.

The control circuitry comprises a digital micro-controller, (a complete microprocessor and memory system on a chip), and a digital custom integrated circuit, (P.W.M. ASIC). The micro-controller allows accurate frequency and voltage control, without the problems of drift, offsets or noise. The custom I.C. generates the required output waveforms, and also controls the inverter protection circuits.

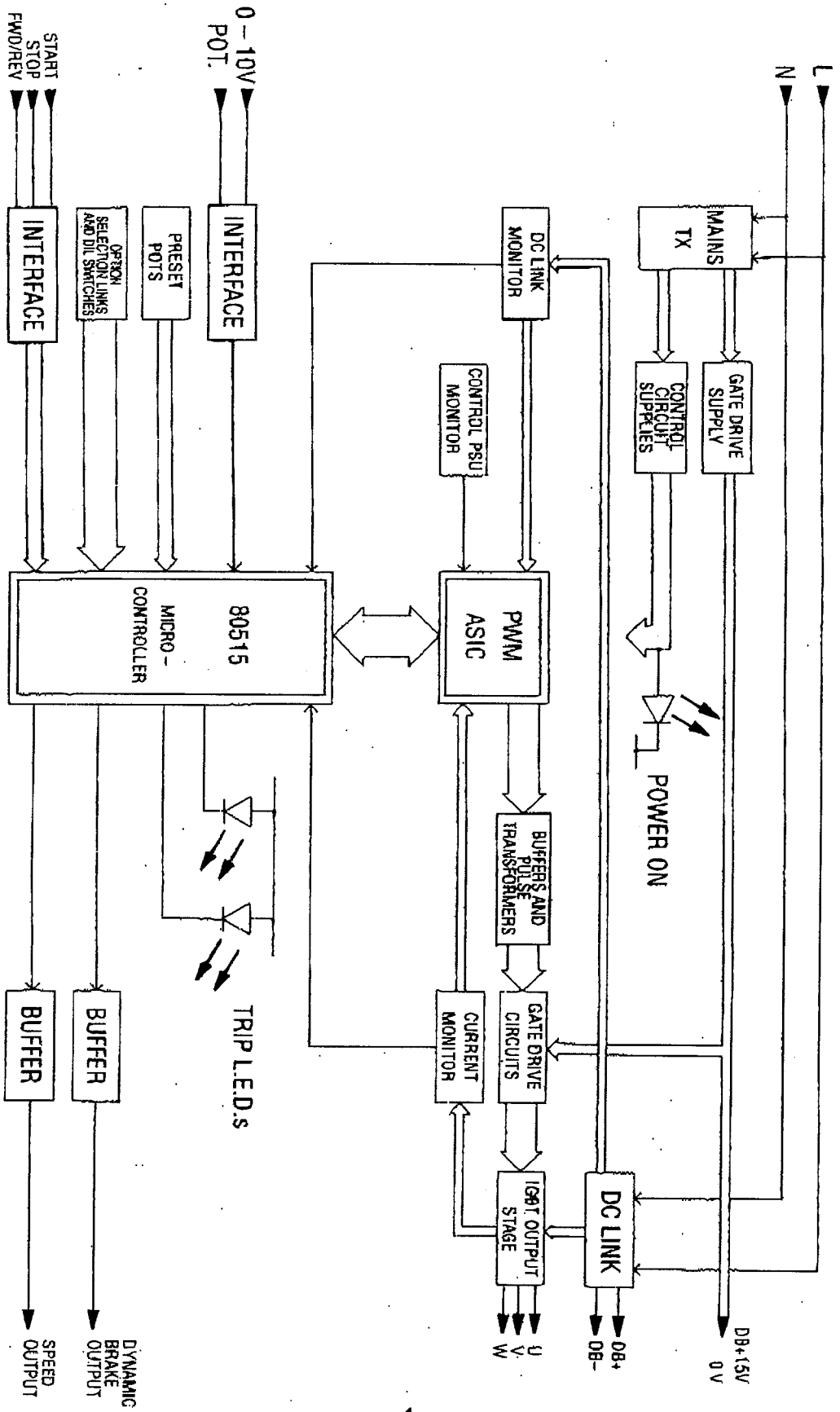
There are four levels of current protection which ensure the drive will not trip unnecessarily, but will protect itself under all abnormal working conditions.

1 Current limiting in the frequency control loop.
2 Current limiting by modifying the P.W.M. waveform.
3 Instantaneous current trip.
4 Individual power device protection.

DC injection braking is available, over the complete speed range. Alternatively, dynamic motor braking from set speed, down to zero speed, is possible by use of the optional external braking card, IBD-2 and power resistors.

The drive has a control system, which includes preset potentiometers, DIL Switch and jumper-link options to set-up. These can be used to set the motor speed and performance.

BLOCK DIAGRAM



1.2 SPECIFICATION

0.55 kW INVERTER		
Setting	370 W	550 W
Motor Rating kW	0.370	0.550
Max cont. output current amps.	2.0 A	3.0 A
Input Voltage	Single phase 220 Vac –10% to 240 Vac +10%, 50 or 60Hz	
Output Voltage	Three phase, voltage from zero to input level	
Cooling	Natural Ventilation	
Input rms current	4.7 A	7.0 A
Input p.f. lag	0.95	
Input kVA (230V)	1.1	1.6
Output kVA (230V)	0.8	1.2
Heat loss Watts (approx.)	50 Watts at 550 Watts Setting	
Weight	850g – (Chassis) 1.2 kg – (Module)	

Output Frequency Ranges 4 Upper Limit Frequencies (ULF) selectable: 0-100 Hz, 0-120 Hz, 0-220 Hz, 0-440 Hz

Maximum Output Current
550W Setting 4.5 A (150% of Full Load Current) for 30 s.
370W Setting 3 A for 30 s.

Output Waveform Asynchronous sinewave P.W.M., with constant switching frequency, selectable from: 2.9, 5.9, 8.8, 11.7, 14.6, 17.6, 20.5 kHz.

Control Technology Micro-controller and custom designed ASIC.

Operating Temperature 0°C to +40°C, derate 1.5%/°C above 40°C, to 60°C max.

Humidity 5% to 95% RH at 40°C, non-condensing.

Altitude Above 1000 m, derate 1%/100 m, to 4000 m max.

Module Dimensions 165.0H x 105.0D x 233.0W mm. (Chassis)
183.5H x 115.0D x 250.0W mm. (Module)

Protection IP00 (Chassis)
IP10 (Module)

1.3 CONTROL INPUT & OUTPUT

** All inputs and outputs are isolated from the high voltage supplies **

DIGITAL INPUTS

Start terminal 1	Open Collector, 0--5V at 0.5mA or Normally open contact, impluse close to run.
Stop terminal 2	Open collector, 0--5V at 0.5mA or Normally closed contact, impulse open to stop
Fwd/Rev terminal 3	Open collector, 0--5V at 0.5mA or Normally open contact, close to reverse.
Com terminal 4/5	Digital common, for digital inputs.

ANALOGUE INPUTS

Pot pos terminal 6	+5V reference for set speed potentiometer.
Pot wiper terminal 9	Set speed signal from potentiometer.
Pot neg terminal 10	Common for speed reference input, potentiometer or voltage signal.
0--10V in terminal 7	0--10V speed reference input, 20K impedance.
0--5V out terminal 8	Link to pot wiper for 0--10V input operation.

ANALOGUE OUTPUTS

Speed + terminal 11	Speed indication from 0 to ULF. The following meters should be used for the desired analogue outputs, (i) 0-5V ; use high impedance voltmeter (>100 kohm). (ii) 0-1mA ; use milli-ammeter (<500 ohm).
Speed -- terminal 12	Common to speed indication

14 CONTROL ADJUSTMENTS

** All inputs and outputs are isolated from the high voltage supplies **

POTENTIOMETER ADJUSTMENTS

By use of five preset potentiometers drive parameters can be continuously adjusted whilst the drive is running. See section 3.2.

Boost Set maximum boost voltage, 0–25% of maximum voltage. Also influence the fixed low frequency and magnitude of the injected current when performing DC brake.

Up Sets acceleration time from 0–ULF Hz, either:– 0.2 – 2 seconds or 2 – 30 seconds (set by SW1.2)

Down Sets deceleration time from ULF–0 Hz, either:– 0.2 – 2 seconds or 2 – 30 seconds (set by SW1.1)

Max Spd Maximum frequency setting, from 0 to ULF setting.

Min Spd Minimum frequency setting, from 0 to 100% setting of maximum speed preset pot.

LINK SELECTIONS

There are 4 selector links, which define the configurations of the drive. These may only be adjusted when the drive is disconnected from the mains supply. See section 3.3.

LINK No.	FUNCTION
LKS1 **LKS2**	Method of stopping (Alt. Ramp/Ramp/Coast/DC Brake)
LKS3	Auto or manual boost.
LKS4	Auto or manual start.

1.4 CONTROL ADJUSTMENTS . . . . con't

DIL SWITCH SELECTIONS

There are 8 DIL SWITCHES, which define how the drive is to function. These may only be adjusted when the drive is disconnected from the main supply. See Section 3.3.

DIL SWITCH No.	FUNCTION
SW1.1	Ramp down range (0.2 – 2s)/(2 – 30s)
SW1.2	Ramp up range (0.2 – 2s)/(2 – 30s)
SW1.3	Ixt threshold level (370W/550W)
SW1.4 SW1.5	Upper limit frequency (100, 120, 220, 440Hz)
SW1.6 SW1.7 SW1.8	Switching frequency (2.9 to 20.5KHz)

TRIP INDICATION

Two L.E.D.s are provided to indicate the cause of any drive trip that occurs. Indication is maintained until the cause of the fault is removed and the drive reset.

The drive may be reset by either:– opening the stop contact (terminals 2 to 4/5), and then closing the run contact (terminals 1 to 4/5), or removing mains supply for 1-2 seconds.

L.E.D. STATUS CODES

1 = L.E.D. ON 0 = L.E.D. OFF F = L.E.D. FLASHING

L.E.D.A.	L.E.D. B	STATUS	POSSIBLE CAUSE
0	0	Drive O.K.	
0	1	Overvolt Trip	High mains or excessive deceleration rate.
1	0	Undervolt Trip	Low mains supply.
1	1	Power supply fault	Internal fault.
0	F	Overcurrent Trip	Excessive load current.
F	0	D.C. Link start up	Internal fault.
1	F	Frequency link error	Do not set 440Hz ULF at 2.9kHz.
F	1	Watchdog Timer Error	Recovery from software or hardware upset.
F Together	F	Ixt trip	Unit has timed to overload trip.
F Alternate	F	Ixt integration	Unit is timing towards over load trip.

2. Installation & Application Guide

2.0 MECHANICAL

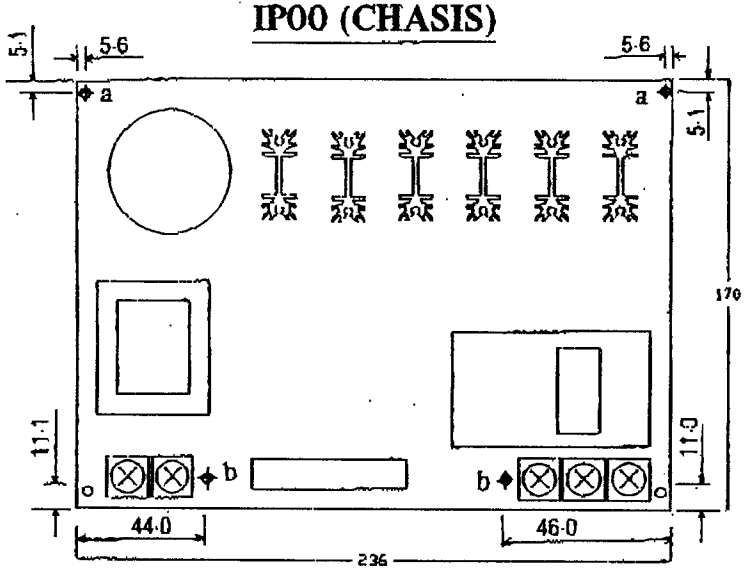
The drive is constructed to IP00 (Chassis) or IP10 (Module) and consequently is intended to be mounted inside a protected electrical control equipment enclosure. The installation should be free from harmful dust, corrosive gases, and any liquids. Care should be taken to avoid condensation of vaporised liquids.

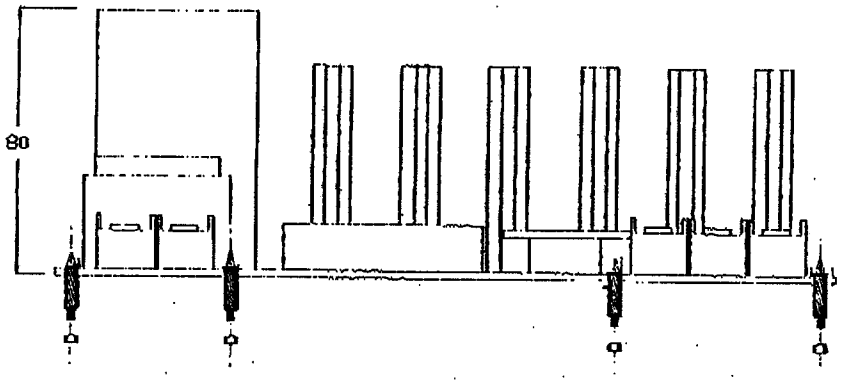
It is important that the heat dissipated by the drive, (see watts lost data, in section 1.2), plus that from any other heat source, does not raise the mounting enclosure's internal temperature to above the allowed operating ambient, of 0 to +40°C. Derate, or force cool if necessary.

It is essential that the unit is mounted vertically, and that there is sufficient clearance around the unit, to ensure correct air flow over the heatsink cooling fins. Allow 100mm clear space above and below the unit, and 50 mm clear space at the sides and from the front face.

The mounting detail, shown below, gives the overall dimensions, and mounting feet fixing centres.

IP00 (CHASIS)



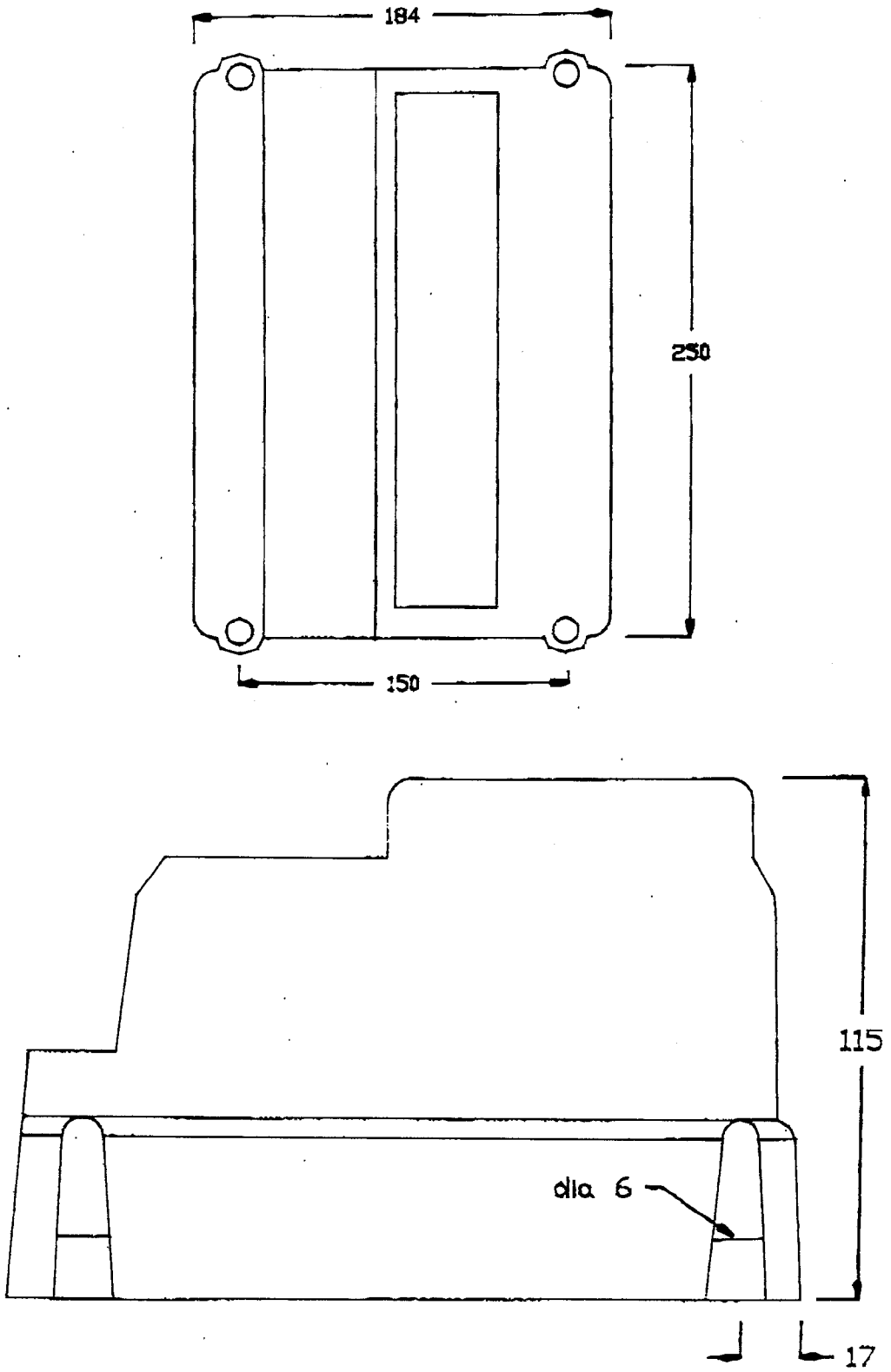


PCB FIXING HOLES

a - holes, 2 x Ø4.2
b - holes, 2 x Ø6.0

Dimensions in mm

IP10 (MODULE)



LID FIXING HOLES 4 x ϕ6-0

2.1 ELECTRICAL

!!! DANGER !!! **ELECTRIC SHOCK RISK** DISCONNECT THE MAINS SUPPLY TO THE DRIVE, AND LEAVE FOR 5 MINUTES, BEFORE WORKING ON THE EQUIPMENT.

Connect the single phase mains supply to the large terminals L–N. Connect the motor connections, to the large terminals, U–V–W. The mains supply should be fed via an isolator, contactor, or M.C.B. For up to 1 starts per hour, mains switching alone, may be used to stop/start the drive. Use the electronic stop/start control, if more frequent starts are required, to reduce contactor wear.

!!! **IMPORTANT !!! THE MAINS SUPPLY TO THE DRIVE MUST BE PROTECTED BY EITHER FUSES, OR AN M.C.B.**

Adhere to local regulations when choosing fuse and cable types and sizes, refer to section 1.2 for input currents, on full load. Typical sizes are:

FUSE	POWER CABLE
10A	1.5mm^2

The power cable should be rated 300 V/600 V (ac/dc). The same power cable can be used for the motor connections.

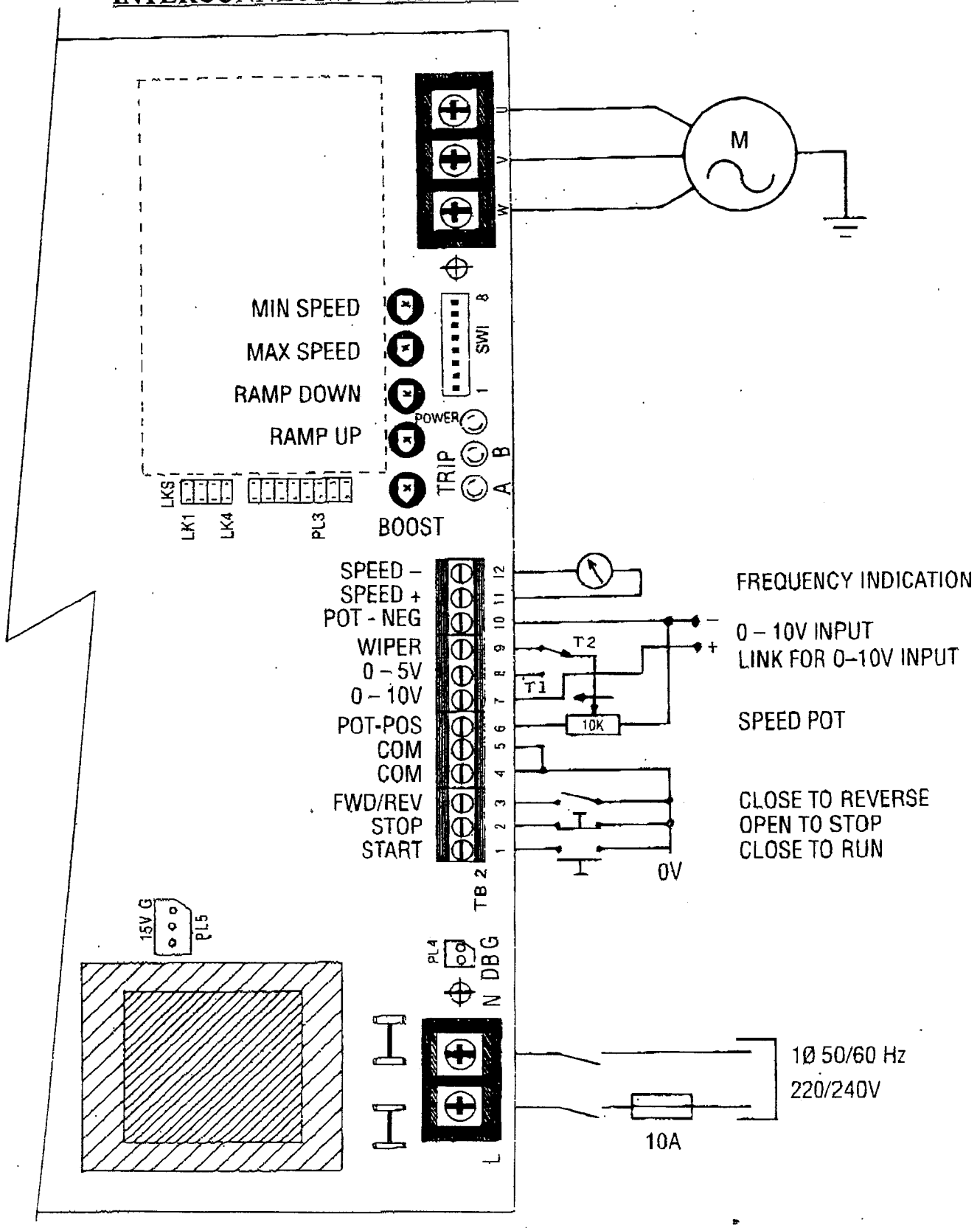
Physically segregate power cables from control cables. The power connections to the motor, from the drive output, may be switched, for isolation purposes, but not for control purposes, as the drive may trip.

All contractor coils, solenoid and brake coils should be suppressed, with an RC network, or equivalent.

Installations with long cable runs, to the motor, may need the addition of motor line chokes, to prevent nuisance tripping of the drive, LED B = flashing, caused by capacitative leakage effects. Refer to your supplier if cable runs exceed 20 metres.

For control interconnections, use cable of 0.5 mm^2, overall screened. Connect the screen to Earth at the drive end only. Segregate control cables from power cables.

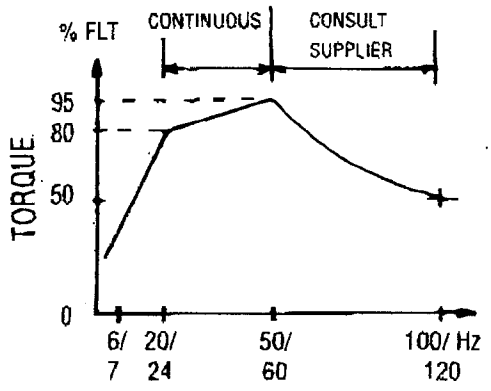
2.2 ELECTRONIC INTERCONNECTION DIAGRAM



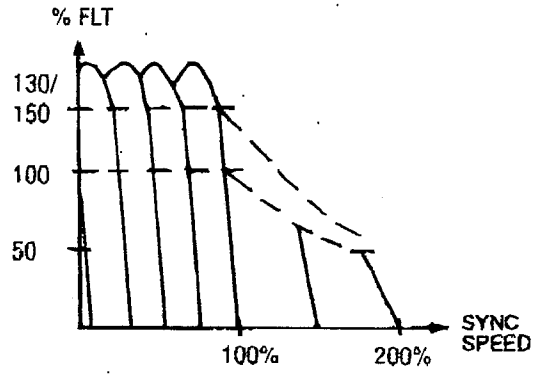
2.3 DRIVE AND MOTOR SELECTION

MOTOR RATING

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 is not exactly sinusoidal, the motor losses are slightly increased. Accordingly, the available motor output torque will be less than the rated value, ie de-rated. To protect the motor at low speeds, thermal relays should be used to trip the drive. If using a motor of next larger size than the drive, de-rate the drive by another 10%, to allow for the lower inductance. Consult your supplier, for further information.



DE-RATING



TORQUE/SPEED

DRIVE RATING

The ratings given in section 1.2, are for the 2.9 kHz switching frequency, at 40°C ambient. For constant torque applications, some de-rating of the drive output current may be required, if the higher switching frequencies are selected. Please consult your supplier for details. For fan type (square law) loads, no such de-rating should be required.

SPECIAL CONSIDERATIONS

RFI: In common with all inverter drives, the unit will produce a certain level of Radio Frequency Interference. It is the users' responsibility, to ensure compliance with local requirements for RFI control. Mains supply RFI filters can be installed with the drive, consult your supplier for details. Note that lowest levels of RFI emissions occur at the lowest switching frequencies.

MOTOR SPEED: *** **WARNING** *** Standard induction motors are not designed to operate at 220 or 440 Hz. Any attempt to run such a motor at above twice synchronous speed may result in catastrophic motor failure. Consult your motor supplier for advice and details of special high frequency motors.

2.4 OPTIONS

IBD--2

A dynamic braking unit, the IBD–2, is available as an option. External braking resistors should be wired to the IBD-2, as shown below.

*** **WARNING** *** It is most important that the thermal trip contact, should be wired into the mains supply contactor control circuit, such that it will open the contactor, when it trips.

Braking current : 9.0A dc for 20 seconds max.

Maximum duty cycle : 30% on, 70% off

Minimum brake resistor value : 47R

Protection : by external thermal trip; use Weber T12 series, type T12-221 SN

DB Resistor (ALT + STD) : 150R (150w)

TRIP VALUE : 0.7A (based on 15 sec nominal trip time), using a Weber type T12-221SN trip

Description of braking call ups (PCB Issue B)

LINK FITTED = 1 LINK REMOVED = 0 DON'T CARE = X

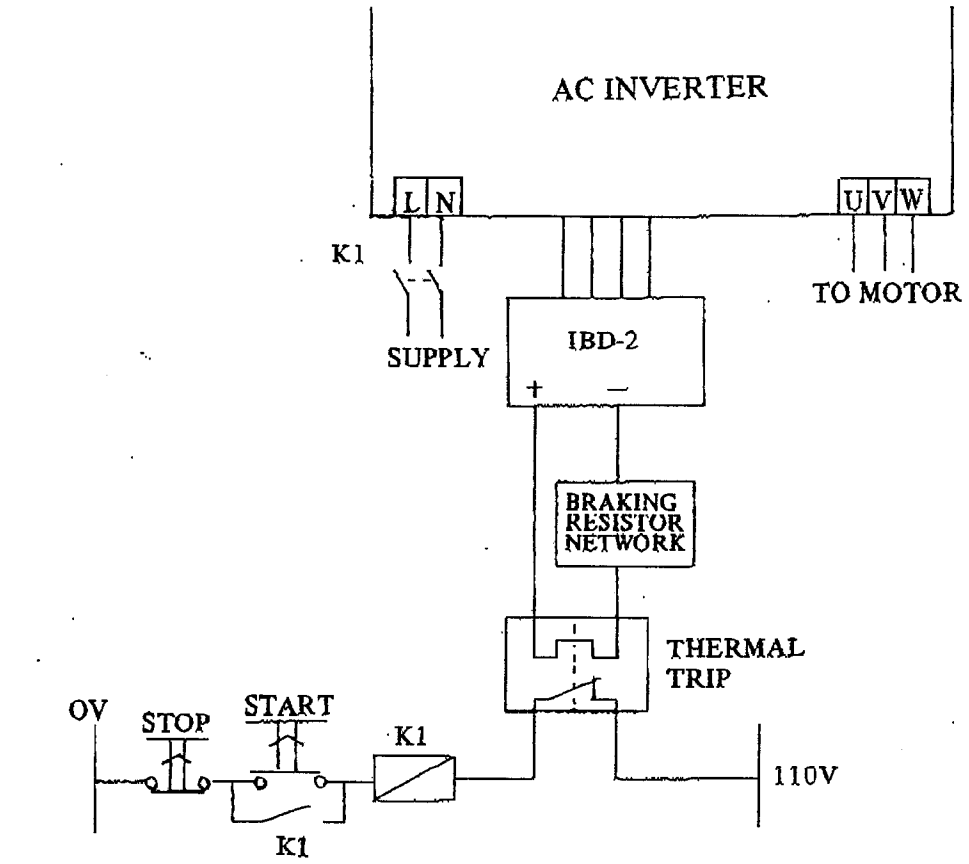
Function	LKS	Link Position + Drive Setting			
STOP	LKS.1	1	0	1	0
	LKS.2	1	1	0	0
		Ramp	Ramp	Coast	DC Brake
DB		ALT	Standard		N/A

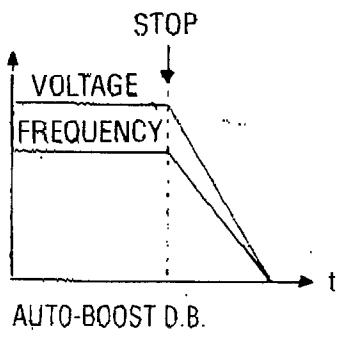
Standard DB braking can be selected by removing LKS.1 and inserting LKS.2 links. Alternative DB braking can be selected by inserting LKS.1 and LKS.2 links. Braking is initiated by a STOP command. Both voltage and frequency is reduced to zero under control. DB braking also operates when reversing, and when reducing the speed reference (decelerating).

2.4 OPTIONS . . . . con't

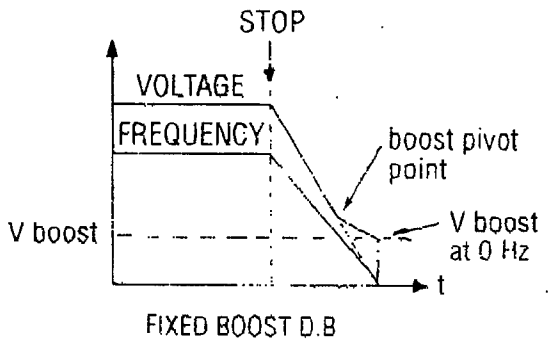
Alternative DB braking requires the optional DB brake card (IBD-2) and braking resistor to be fitted. Otherwise, the drive can trip on overvoltage very readily when ramping down. Using the alternative DB brake, the motor can be brought to rest at a much shorter time than with standard DB braking when it is loaded. With alternative DB braking, the motor can be brought to rest according to the set ramp down time, provided the DC link voltage does not build sufficiently high to trip the drive on overvoltage.

TYPICAL BRAKING CARD CONFIGURATION





AUTO-BOOST D.B.



FIXED BOOST D.B

MULTI-SPEED CARD

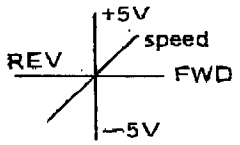
The 0.55 kW inverter can be modified to provide 3-preset speeds (each speed setting is user selectable), with fourth option for variable speed control by the simple fitting of a Multi-Speed Card to the unit. The four options can be selected by setting two reference switches on the Multi-Speed Card. The table is as follow:

Ref 1	1	0	1	0
Ref 2	1	1	0	0
Active	Variable speed	Pre-set speed-1	Pre-set speed-2	Pre-set speed-3

Note: 1 = Ref connector open circuit
0 = Ref connector connected to 0V

BI-DIRECTIONAL SPEED CONTROL CARD

The 0.55 kW range of inverters require a uni-polar, or positive only going 0 to 5 volts speed reference input. The motor director is reversed, at any time, by operating the forward/reverse digital switch. Certain applications require a bi-polar, or positive and negative going 5 volt speed reference inputs. The motor direction in reversed automatically as the speed control voltage passes through zero volts.



The inverter can be converted to accept bi-polar input voltages by incorporating a bi-polar speed reference card.

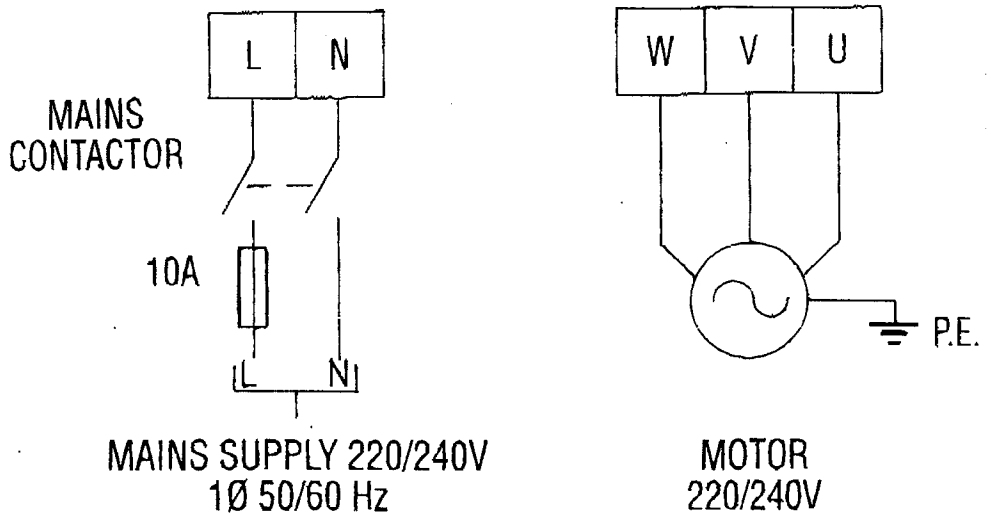
REMOTE CONTROL CARD

The remote control card accepts a 4—20mA current input and converts it to a 0—5V speed reference signal, which controls the speed of the inverter. A selection link is also available to select the inverse polarity which takes in a 20—4mA current to provide a 0—5V speed reference for the wiper terminal.

3. Starting & Adjusting

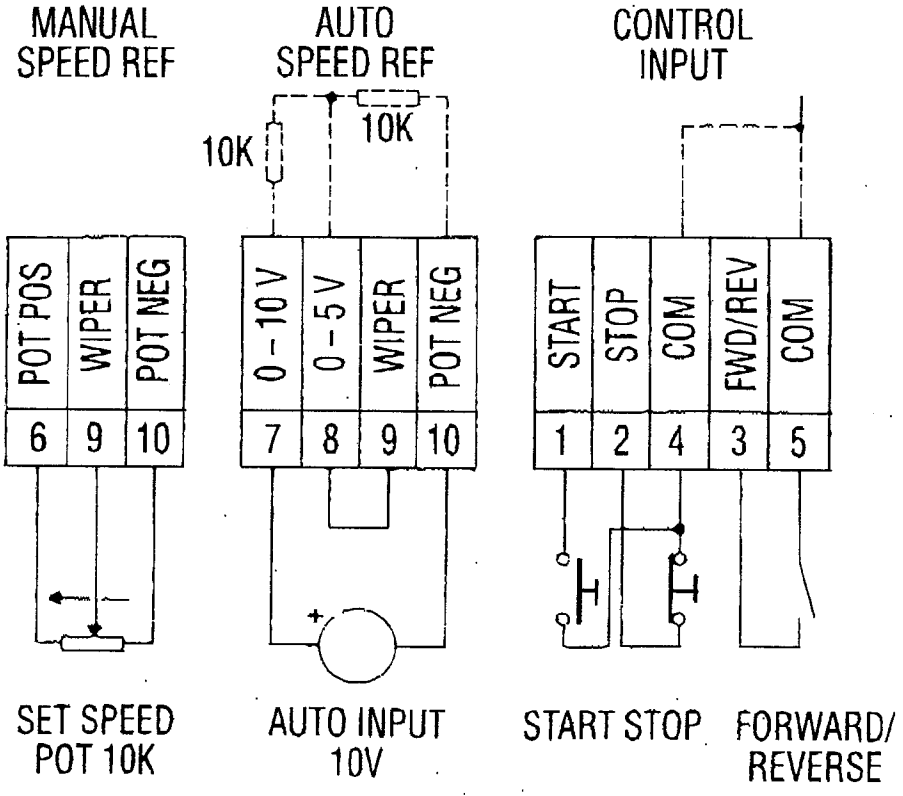
3.0 POWER CONNECTIONS

Connect the single phase mains supply, and motor connections to the power terminals. A typical circuit is shown below.



CONTROL CONNECTIONS

Connect the control operators to the 12 way control terminal. A basic set-up is shown below. Note that a system only requires use of manual or auto input.



3.1 POWER UP THE DRIVE

Before switching on the drive, set the preset potentiometers as follows:–
Boost, and Min Speed to fully counter clockwise.
Max Speed, Up, and Down to midway.
The speed demand input should be set for minimum.
The drive, as supplied, is set for Auto start, link LKS.4 fitted.

Switch on the A.C. supply. The power LED will light. Varying the speed demand input will cause the motor to accelerate. To stop the drive, momentarily open the stop switch, opening terminals 2 and 5.

If motor fails to accelerate load, adjust Boost potentiometer clockwise to increase starting torque. Adjust for minimum boost requirements to avoid motor overheating. Alternatively, auto boost can be selected.

Adjust Maximum and Minimum Speed potentiometers to required levels. **Note** the inverter will run at ULF (100, 120, 220, or 440 Hz) when Max Speed potentiometer set fully clockwise consequently caution must be exercised. The speed output, terminals 11 and 12, can help with these adjustments.

Adjust Ramp Up potentiometer for required acceleration time. The range of the potentiometer is set by DIL Switch SW1.2. Clockwise rotation increases acceleration time. Too short an acceleration time may cause the inverter to trip on Overcurrent, indicated by Trip LED B flashing, and Trip LED A not illuminated.

Adjust Ramp Down potentiometer for required deceleration time. The range is set by DIL Switch SW1.1. Clockwise rotations increases deceleration time. Too short a deceleration time may cause the inverter to trip on Overvoltage, indicated by Trip LED B only being illuminated.

To Reset after a trip condition, either switch the mains supply Off/On, or momentarily open the stop contact.

To Reverse the direction of rotation, connect terminal 3 to 4/5, the drive will ramp down to zero speed, and then ramp up to set speed in the opposite direction.

3.2 POTENTIOMETER DEFINITIONS

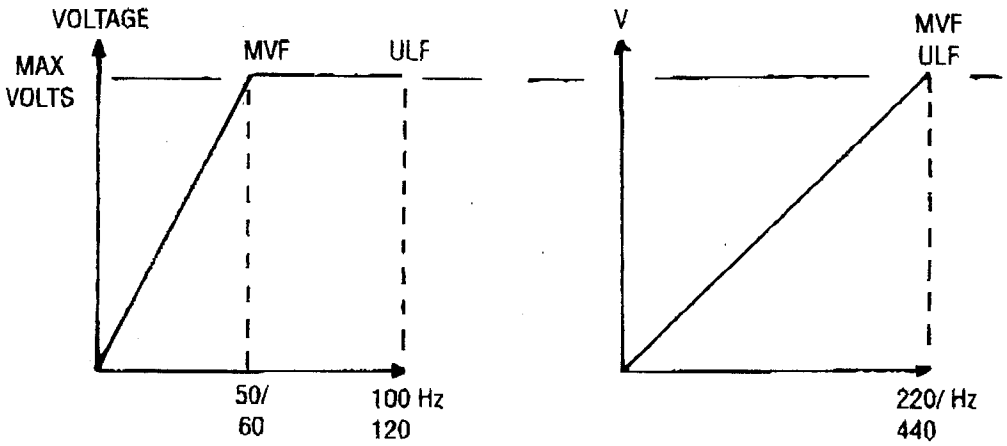
Voltage/frequency characteristics

ULF = upper limit frequency. This is the maximum attainable frequency. It can only be changed via the DIL Switch Options, see section 3.3.

MVF = maximum voltage frequency. This is the frequency at which output voltage stops increasing, and is a function of the ULF selected. Possible combinations are:

	ULF	MVF	
(a)	100 Hz	50 Hz	(Initial setting)
(b)	120 Hz	60 Hz	
(c)	220 Hz	220 Hz	
(d)	440 Hz	440 Hz	

V/f CHARACTERISTICS



(i) RV1 VOLTAGE (TORQUE) BOOST/DC BRAKING LEVEL

(Boost)

Function: sets the level of maximum voltage (torque) boost allowable. RV1 is used to overcome motor losses at low speed, and so increase the available starting torque. The level of boost is set at a frequency equal to 6.25% of MVF Hz. The maximum boost is 25.5% of supply voltage, tapering to zero at 50% of MVF Hz (point P). For frequencies below 6.25% of MVF Hz, boost either reduces along the set gradient (see graph) or tapers to 5.1% of supply voltage, whichever is lower. Boost is either AUTOMATIC or FIXED, depending on Link selection LKS.3 (see section 3.3).

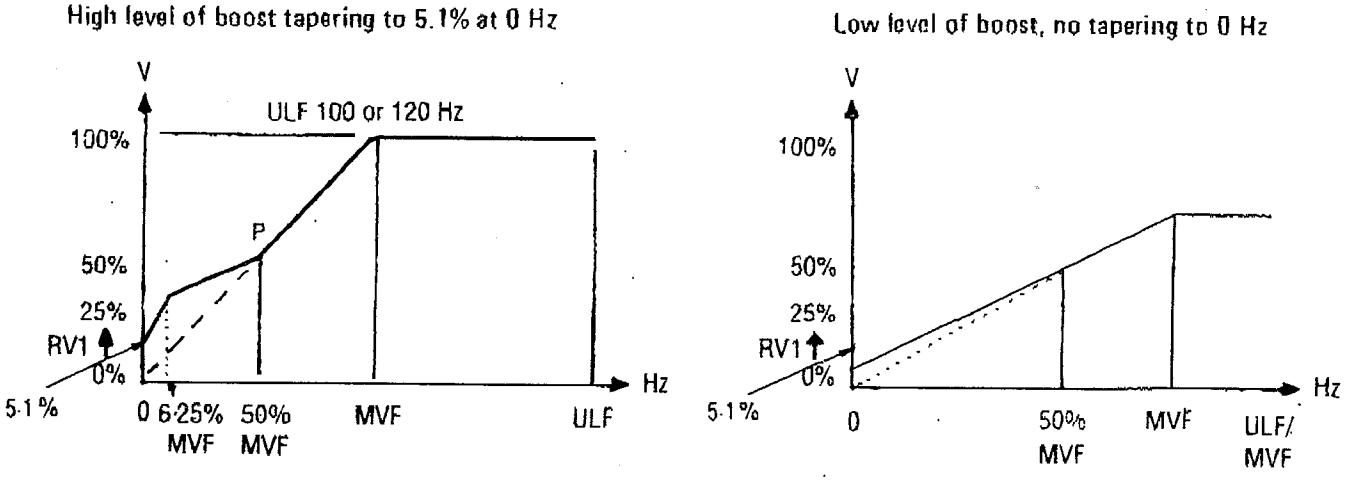
Automatic Boost varies linearly with load current, i.e. 0% boost at 0% current, to RV1 % boost, at 100% full load current.

Fixed boost should be set just sufficient to accelerate the motor and load. Setting a value too high, will increase losses in the motor, and will reduce it's life.

Range: 0.0 to 25% of nominal supply volts

Factory Set: 0%

RV1 VOLTAGE (TORQUE) BOOST



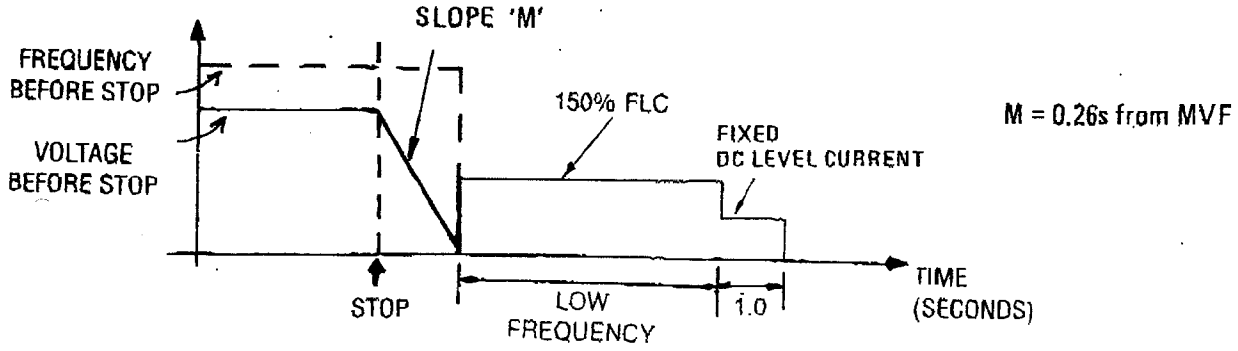
RV1 GIVES EXTRA TORQUE AT LOW SPEED

(DC Brake)

Function: DC injection braking is controlled at 150% FLC. For DC braking to be available, remove LKS.1 and LKS.2 links. DC braking is initiated by a STOP command. Braking is effected by rapidly reducing the current applied to the motor and then supplying a low frequency waveform current until the motor is almost at standstill. The low frequency of the injected current is influenced by the RV1 setting. The inverter then applies a fixed DC output current for about 1 second. The drive cannot be restarted until this 1 second delay has elapsed. So, if STOP is pressed whilst at zero speed, ther will be a 1 second period of DC injection (holding torque) before RUN is allowed. DC braking does not operate whilst reversing.

Factory set: DC BRAKE OFF.

D.C. BRAKING



3.2 POTENTIOMETER DEFINITIONS . . . . con't

(ii) **RV2** RAMP UP

Function: Sets time taken to increase frequency from 0 Hz to ULF for a 100% change in input speed reference.
Clockwise rotation increases ramp time.
Setting of SW1.2 allows choice of potentiometer range.

Range: 0.2 to 2 seconds (SW1.2 ON) or
2 to 30 seconds (SW1.2 OFF)

Factory Set: 2 seconds (SW1.2 OFF)

(iii) **RV3** RAMP DOWN

Function: Sets time taken to decrease frequency from ULF to 0 Hz for a 100% change in input speed reference.
Clockwise rotation increases ramp time.
Setting of SW1.1 allows choice of potentiometer range.

Range: 0.2 to 2 seconds (SW1.1 ON) or
2 to 30 seconds (SW1.1 OFF)

Factory Set: 2 seconds (SW1.1 OFF)

(iv) **RV4** MAX SPEED

Function: Sets maximum frequency equivalent to maximum speed reference input.
Clockwise rotation increases frequency.

Range: 0 Hz – ULF (dependant on setting of links SW1.4 and SW1.5)

Factory Set: 100 Hz (SW1.4 and SW1.5 ON)

(v) **RV5** MIN SPEED

Function: Sets minimum frequency equivalent to minimum speed reference input.
Clockwise rotation increases frequency.

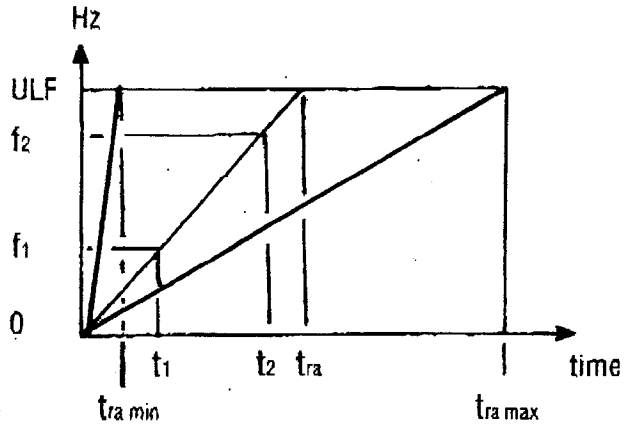
Range: 0 Hz – Max speed pot (RV4) setting.

Factory Set: 0 Hz.

RV2 RAMP UP TIME

t_{ra} min = 2 sec
t_{ra} max = 30 sec
(see SW1 Sec. 3.3)
TIME TO ACCELERATE
f_1 to f_2 = $t_2 - t_1$
t_{ra} set by RV2 (+SW1.2)

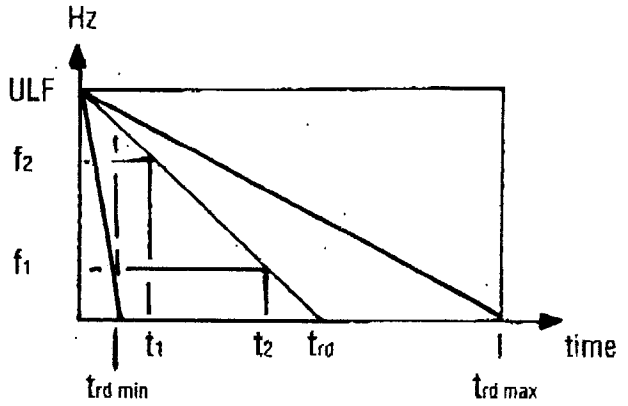
$$t_{1-2} = \frac{(f_2 - f_1)}{U.L.F.} \times t_{ra}$$



RV3 RAMP DOWN TIME

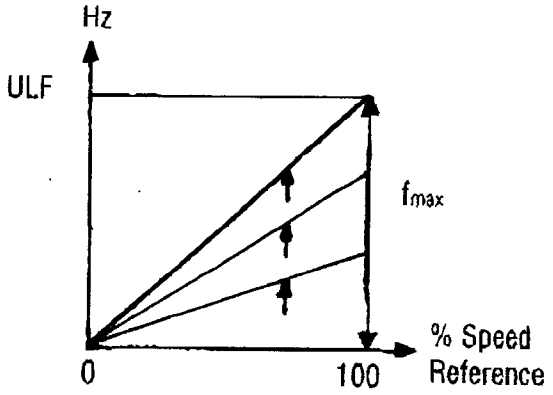
t_{rd} min = 2 sec
t_{rd} max = 30 sec
(see SW1 Sec. 3.3)
TIME TO DECELERATE
f_2 to f_1 = $t_2 - t_1$
t_{rd} set by RV3 (+SW1.1)

$$t_2 - t_1 = \frac{(f_2 - f_1)}{U.L.F.} \times t_{rd}$$



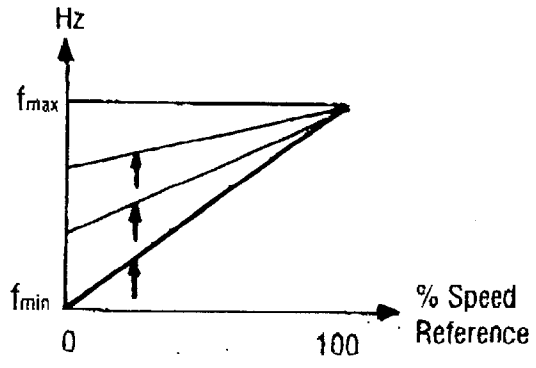
RV4 MAX SPEED

f_{max} set by RV4
(see SW1 Sec. 3.3)
ULF $\geq f_{max} \geq 0$



RV5 MIN SPEED

f_{min} set by RV5
$f_{max} \geq f_{min} \geq 0$
at fmin = 0



3.3 CONTROL SELECTOR

** WARNING **
Sections of the inverter circuitry are not isolated from the A.C. supply and are therefore LIVE. Ensure that unit is disconnected and the D.C. Link discharged before reselecting control links.

Selector Links and DIL Switches can only be adjusted with power disconnected.

LINK DEFINITIONS

LINK – IN = 1 LINK – OUT = 0 DON'T CARE = X

(i) LKS.1/2 STOP

Selects the method of stopping the motor, either ramp, coast or DC braking. If ramp is selected, the motor speed decelerates to zero, in a time proportional to the setting of ramp down potentiometer (RV3). Ramp is used if times longer or shorter than natural coast times are required. Ramp also provides a controlled linear deceleration rate.
If coast is selected the time taken to stop will depend on frictional and windage losses, and load inertia.
DC braking injects dc into the motor, and dissipates the energy there, as heat. The level of dc braking is controlled at 150% FLC. See section 3.2.
See Section 2.4 on dynamic braking option.

LK. 1 status	1	0	1	0
LK. 2 status	1	1	0	0
Drive setting	RAMP	RAMP	COAST	DC BRAKE
DB	ALT	STANDARD		N/A

Factory setting: Coast

(ii) LKS.3 AUTO BOOST OR FIXED BOOST

Selects the low speed voltage (torque) boost method. Boost is either fixed or will automatically increase with load demand. Refer to section 3.2

LK. 3 status	1	0
Drive setting	Auto	Fixed

Factory Setting: Auto

(iii) LKS.4 AUTO START OR MANUAL START MODE

Selects the start up method. Manual start requires a RUN command to start after applying power. Auto start will start the motor just after power is applied, by carrying out a RUN command automatically, unless a stop command occurs. This mode is useful for auto restarting after a temporary loss of supply.

LKS. 4 status	1	0
Drive setting	Auto	Manual

Factory Setting: Auto

SWITCH DEFINITIONS

SWITCH ON = 1 SWITCH OFF = 0 DON'T CARE = X

(i) SW1.1 RAMP DOWN

Selects range of ramp down potentiometer (RV3).

SW1.1 position	1	0
Drive setting (sec)	0.2 – 2	2 – 30

Factory setting : 2–30 seconds.

(ii) SW1.2 RAMP UP

Selects range of ramp up potentiometer (RV2).

SW1.2 position	1	0
Drive setting (sec)	0.2 – 2	2 – 30

Factory setting: 2 – 30 seconds.

3.3 CONTROL SELECTOR . . . . con't

(iii) SW1.3 Ixt

Sets the level of current at which the drive will start to time towards an overload trip condition, Ixt.
On either setting, the drive will trip after 30 seconds of 150% of selected rating.
For lesser overload conditions the time is proportionally longer.
During Ixt time out the two LEDs will alternatively flash on and off.

SW1.3 position	1	0
Drive setting (W)	550	370

Factory Setting: 550W.

(iv) SW1.4/5 UPPER LIMIT FREQUENCY

Any of four upper limit frequencies may be selected. Note that 440Hz can not be selected when a switching frequency of 2.9KHz is selected (SW1.6/7/8)

SW1.4 position	1	0	1	0
SW1.5 position	1	1	0	0
Drive setting (Hz)	100	120	220	440

Factory Setting: 100Hz.

(v) SW1.6/7/8

SWITCHING FREQUENCY

Any one of seven switching rates may be selected.

SW1.6 position	X	1	0
SW1.7 position	1	0	0
SW1.8 position	1	1	1
Drive setting (kHz)	2.9	5.9	8.8

SW1.6 position	1	0	1	0
SW1.7 position	1	1	0	0
SW1.8 position	0	0	0	0
Drive setting (kHz)	11.7	14.6	17.6	20.5

Factory setting: 2.9 kHz.

4. Problem Solving

4.0 FAULT FINDING

Power on LED does not light does not run . . . .

. . . Check mains supply fuse to drive. Replace fuse if failed, but only do this once. Change drive if fuse blows again.

Motor fails to run, Power On LED illuminated . . .

. . . Check control wiring and stop/start contacts operate correctly. Check wiring of speed reference.

Trip LEDs shows a fault . . .

. . . Refer to Trip Indication under section 1.4, for possible cause. Overcurrent trips can be caused by shock loads, short circuits, too long a cable to the motor, or trying to accelerate too large a motor. Overvoltage trips are sometimes caused by decelerating too fast. Increase the setting of ramp down potentiometer and check LKS.1/2 are set for ramp to stop. If Power supply fault is shown, try powering down the drive, wait 2 minutes, then power up again. If the trip conditions still exists, replace the drive.

Motor fails to turn the load, and is noisy . . .

. . . Too high fixed boost setting, reduce setting of boost potentiometer.

5. Summary

5.0 SWITCH/LINK OPTIONS SUMMARY

WARNING Standard induction motors are not designed to operate at 220 or 440 Hz. Any attempt to run such a motor at above twice synchronous speed may result in catastrophic motor failure. Consult your motor supplier for advice and details of special high frequency motors.

SWITCH SELECTION

SWITCH ON = 1 SWITCH OFF = 0 DON'T CARE = X

– indicate factory setting

FUNCTION	SW1	SWITCH POSITION						
RAMP DOWN	SW1.1	1			0			
		0.2 – 2 sec			2 – 30 sec			
RAMP UP	SW1.2	1			0			
		0.2 – 2 sec			2 – 30 sec			
Ixt	SW1.3	1			0			
		550 WATTS			370 WATTS			
UPPER	SW1.4	1	0	1	0			
LIMIT	SW1.5	1	1	0	0			
DRIVE SETTING		100	120	220	440 Hz			
SWITCHING	SW1.6	X	1	0	1	0	1	0
FREQUENCY	SW1.7	1	0	0	1	1	0	0
	SW1.8	1	1	1	0	0	0	0
DRIVE SETTING		2.9	5.9	8.8	11.7	14.6	17.6	20.5 KHz.

LINKS SELECTION

LINK FITTED = 1 LINK REMOVED = 0

FUNCTION	LKS	LINK POSITION			
STOP	LKS.1	1	0	1	0
	LKS.2	1	1	0	0
DRIVE SETTING		RAMP	RAMP	COAST	DC BRAKE
DB		ALT	STANDARD		N/A
BOOST	LKS.3	1	0		
		AUTO	FIXED		
START	LKS.4	1	0		
		AUTO	MANUAL		