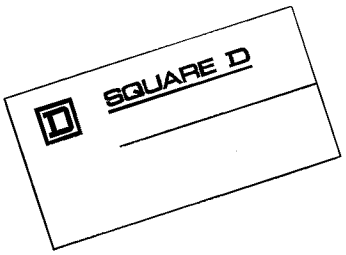
Adjustable Speed Drive Controllers for Asynchronous Motors VSD57 Series



User's Manual

Constant and Variable Torque:
1 to 200 HP - 200 to 575 VAC

Receiving, Installation, Configuration and Startup

GROUPE SCHNEIDER

■ Federal Pioneer ■ Merlin Gerin ■ Modicon ■ Square D ■ Telemecanique

⚠ DANGER

HAZARDOUS VOLTAGE

- **Read and understand this bulletin in its entirety before installing or operating VSD57 drive controllers. Installation, adjustment, repair and maintenance of these drive controllers must be performed by qualified personnel**
- **Disconnect all power before servicing drive controller. WAIT THREE MINUTED until DC bus capacitors discharge. The DC bus LED is not an accurate indication of the absence of DC bus voltage.**
- **DO NOT short across DC capacitors or touch unshielded components or terminal strip screw connections with voltage present. Install all covers and close the door before applying power or starting and stopping the drive controller.**
- **User is responsible for conforming to all applicable code requirements with respect to grounding all equipment. For drive controller grounding points, refer to terminal connection drawings.**
- **Many parts in this drive controller, including printed wire boards, operate at line voltage. DO NOT TOUCH. Use only electrically insulated tools.**

Before servicing this controller:

- **Disconnect all power.**
- **Place a "DO NOT TURN ON" label on drive controller disconnect.**
- **Lock diconnect in open position.**

Failure to observe these precautions will cause shock or burn, resulting in severe personal injury or death

PLEASE NOTE

Electrical equipment should be serviced only by qualified electrical maintenance personel, and this document should not be viewed as sufficient instruction for those who are not otherwise qualified to operate, service or maintain the equipment discussed. Although reasonable care has been taken to provide accurate and authoritative information in this document, no responsibility is assumed by Schneider Canada Inc. for any consequences arising out of the use of this material.

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1. GENERAL

1.1 PRODUCT CHANGES

Schneider Canada Inc. reserves the right to discontinue or make modifications to the design of its products without prior notice, and holds no obligation to make modifications to products sold previously. Schneider Canada Inc. also holds no liability for losses of any kind which may result from this action.

1.2 WARRANTY

Schneider Canada warrants the VSD 57 series AC motor control to be free of defects in material and workmanship for a period of twelve months from the date of shipment. Any control component, which under normal use, becomes defective, within the stated warranty time period, shall be returned to Schneider Canada Inc., freight prepaid, for examination. Schneider Canada Inc. reserves the right to make the final determination as to the validity of a warranty claim, and sole obligation is to repair or replace only components which have been rendered defective due to faulty material or workmanship. No warranty claim will be accepted for components which have been damaged due to mis-handling, improper installation, unauthorized repair and/or alteration of the product, operation in excess of design specifications or other misuse, or improper maintenance. Schneider Canada Inc. makes no warranty that its products are compatible with any other equipment, or to any specific application, to which they may be applied and shall not be held liable for any other consequential damage or injury arising from the use of its products.

This warranty is in lieu of all other warranties, expressed or implied. No other person, firm or corporation is authorized to assume, for Schneider Canada Inc., any other liability in connection with the demonstration or sale of its products.

1.3 RECEIVING

Inspect all cartons for damage which may have occurred during shipping. Carefully unpack equipment and inspect thoroughly for damage or shortage. Report any damage to carrier and/or shortages to supplier. All major components and connections should be examined for damage and tightness, with special attention given to PC boards, plugs, knobs and switches.

1.4 CUSTOMER MODIFICATION

Schneider Canada Inc., its sales representatives and distributors, welcome the opportunity to assist our customers in applying our products. Many customizing options are available to aid in this function. Schneider Canada Inc. cannot assume responsibility for any modifications not authorized by its engineering department.

2. THEORY

DESCRIPTION OF AC MOTOR OPERATION

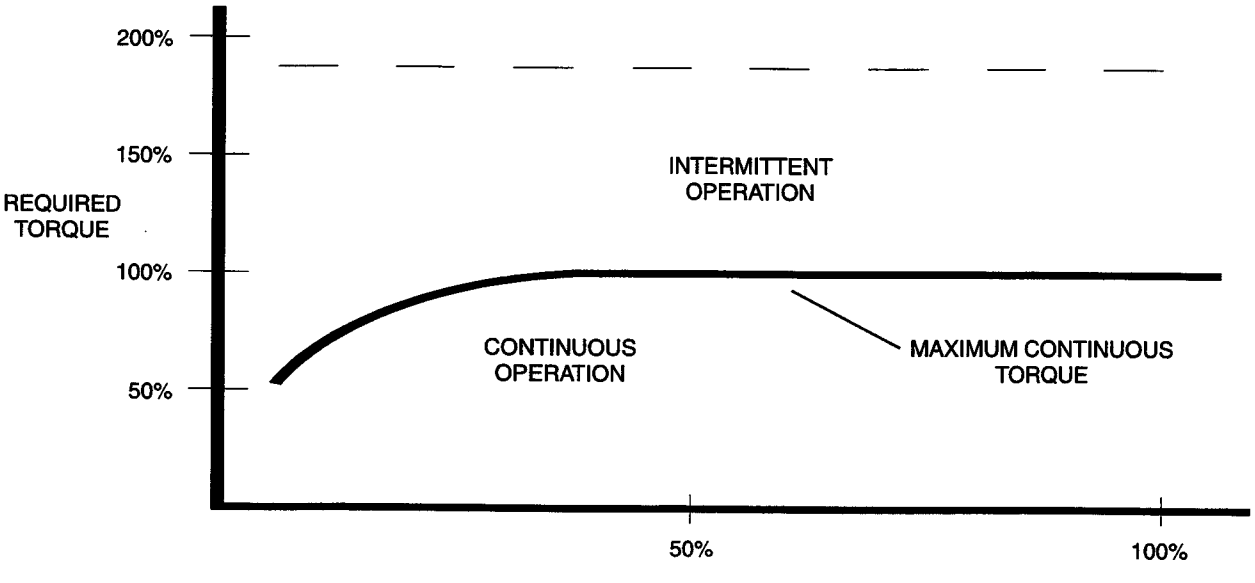
Three phase AC motors are comprised of two major components, the stator and the rotor. The stator is a set of three electrical windings held stationary in the motor housing. The rotor is a metal cylinder, fixed to the motor drive shaft, which rotates within the stator. The arrangement of the stator coils and the presence of three phase AC voltage give rise to a rotating magnetic field which drives the rotor. The speed at which the magnetic field rotates is known as the synchronous speed of the motor. Synchronous speed is a function of the frequency at which the voltage is alternating and the number of poles in the stator windings.

The following equation gives the relation between synchronous speed, frequency, and the number of poles:
$Ss = 120\ f/p$
Where: Ss = Synchronous speed (rpm), f = frequency (Hz), p = number of poles

In three phase induction motors the actual shaft speed differs from the synchronous speed as load is applied. This difference is known as "slip". Slip is commonly expressed as a percentage of synchronous speed. Typical values are three percent at full load.

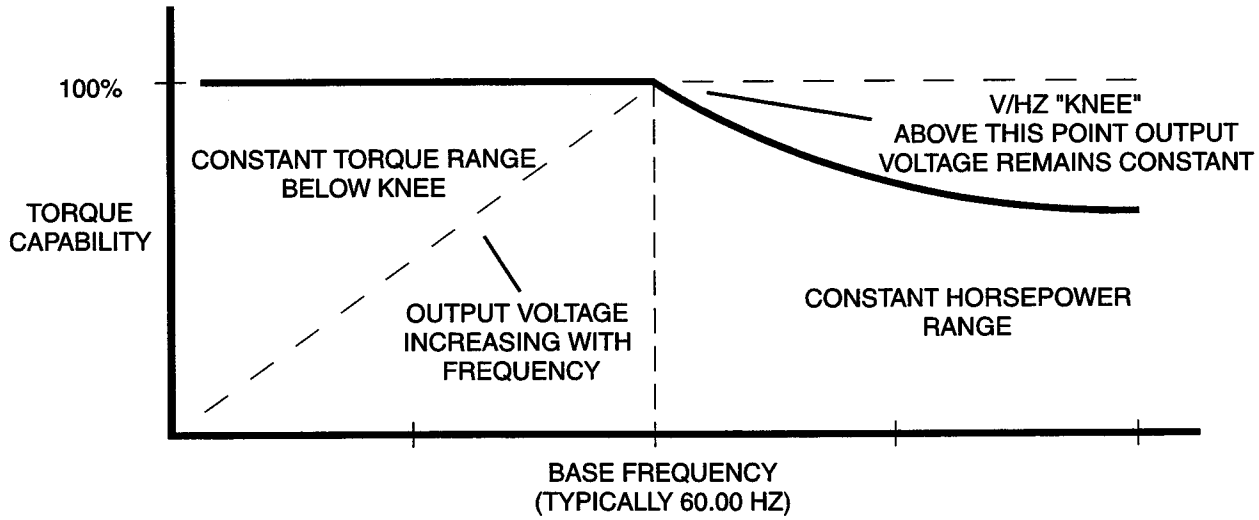
The strength of the magnetic field in the gap between the rotor and stator is proportional to the amplitude of the voltage at a given frequency. The output torque capability of the motor is, therefore, a function of the applied voltage amplitude at a given frequency. When operated below base (rated) speed, AC motors are commonly run in a mode known as "constant torque". Constant torque output is obtained by maintaining a constant ratio between voltage amplitude (volts) and frequency (hertz). For 60 hertz 230, 460, and 575 volt motors, common values for this volts to hertz ratio are 3.83, 7.66, and 9.58 respectively. Operating with these values of the volts to hertz ratio generally yields optimum torque capability. Operating at lower ratio values lowers torque and power capability, and is known as "Variable Torque" operation. Operating at higher ratio values will cause the motor to overheat.

TYPICAL DERATING CURVE
FOR CONTINUOUS LOW SPEED OPERATION



If the motor's applied frequency is increased while voltage remains constant, its torque capability will decrease as speed increases. This will cause horsepower capability of the motor to remain approximately constant. Motors are commonly run in this mode when operated above base speed, where drive output voltage is limited by the input line voltage. This operating range is known as the "constant horsepower" range. The typical maximum range for constant horsepower is about 2.0 to 1 (60 to 120 Hz).

AC MOTOR OPERATING RANGES



WARNING! Consult motor manufacturer before operating above base speed.

DRIVE FUNCTION DESCRIPTION

The drive is a 16 bit microprocessor based, keypad programmable, variable speed AC motor drive. There are four major sections; an input diode bridge and filter, a power board, a control board, and an output intelligent power module(s).

DRIVE OPERATION

Incoming AC line voltage is converted to a pulsating DC voltage by the input diode bridge. The DC voltage is supplied to the bus filter capacitors through a charge circuit which limits inrush current to the capacitors during power-up, and discharges the capacitors after power is removed . The pulsating DC voltage is filtered by the bus capacitors which reduces the ripple level. The filtered DC voltage enters the inverter section of the drive, composed of six output intelligent insulated gate bi-polar transistors (IGBT's) which make up the three output legs of the drive. Each leg has one intelligent IGBT connected to the positive voltage and one connected to the negative voltage. Alternately switching on each leg, the intelligent IGBT produces an alternating voltage on each of the corresponding motor windings. By switching each output intelligent IGBT at a very high frequency (known as the carrier frequency) for varying time intervals, the inverter is able to produce a smooth, three phase, sinusoidal current wave which optimizes motor performance.

CIRCUIT DESCRIPTION

The control section consists of a control board with a 16 bit microprocessor, keypad and display. Drive programming is accomplished via the keypad or the serial communications port. During operation the drive can be controlled via the keypad, by control devices wired to the control terminal strip, or by the the serial communications port. The Power Board has the control and protection circuits which supply the six or seven output IGBT's. The seventh output IGBT is used for the dynamic braking option, and is not available on all models. The Power Board also contains a charging and discharging circuit for the bus filter capacitors, a motor current feedback circuit, a voltage feedback circuit, and a fault signal circuit. The drive has several built in protection circuits. These include phase-to-phase and phase-to-ground short circuit protection, high and low line voltage protection, protection against excessive ambient temperature, and against continuous excessive output current. Activation of any of these circuits will cause the drive to shut down in a protection "trip".

INPUT SIGNALS

The drive allows for three speed reference signal types: a speed potentiometer (10,000 Ohm), 4-20 MA, or 0-10 VDC signals. For control by a speed pot., the wiper lead is connected to terminal 5A, and the high and low end leads are connected to terminals 6 and 2, respectively. For 4-20 MA control, wire the positive to terminal 5B and the negative to terminal 2. For 0-10 VDC control, wire the positive to terminal 5D and the negative to terminal 2.

The input impedance of terminal 5A, speed control potentiometer input is 100 K ohms, the 0-10 VDC input, terminal 5D, is 200 K ohms, and the 4-20 MA input, terminal 5B, is 100 ohms (0.4 to 2.0 VDC). Terminal 2 is circuit common (the minus connection).

The control voltage of the microprocessor control board is 24 VDC, (Isolated, referenced to circuit common - terminal 2).

OUTPUT SIGNALS

There are four terminals with output frequency and load indicating signals; Terminal 10B can be set to indicate speed or load via 0-10 VDC or 2-10 VDC. Terminal 10D can be set to indicate speed or load via 0-20 MA or 4-20 MA. Terminal 10C has a a 12 VDC pulse train (at 6 times the output frequency) proportional to speed. Terminal 10E can be set to indicate output frequency or load via either a 0-10 VDC or 2-10 VDC signal.

AUXILIARY RELAY CONTACTS / OPEN COLLECTOR OUTPUT

The control board has two sets of FORM C contacts at terminals 16 through 21. Contacts are rated 2 amps resistive at 28 VDC or 120 VAC. Each set of contacts can be programmed to indicate NO FUNCTION, RUN, FAULT, FAULT LOCKOUT, AT SPEED, CURRENT LIMIT, FOLLOWER PRESENT, AUTO SPEED MODE, START PENDING, OR ABOVE SET SPEED, OR MAINTENANCE TARGET.

The VSD57 Series general control wiring diagrams illustrate the relays in the de-energized state.

There is an open collector output at terminal 14 for status indication. This output can be programmed for any of the functions listed below for the auxiliary contacts. The circuit is a current sinking type, and is rated 24 VDC, 5 MA maximum.

The following choices are available with each relay or open collector output.

- The NO FUNCTION is not a true indicator, but rather a means of disabling the relay.
- A RUN relay energizes whenever a "START" is called for, and remains energized until a "STOP" is called for and the output frequency has decelerated to 0.5 HZ, until the drive has "tripped", or until the input voltage is removed. This is used to indicate that the drive is in the run mode, not necessarily that the motor is turning.
- A FAULT relay energizes when input voltage is applied to the drive and remains energized until the input voltage is removed, or the drive has "tripped" into a fault condition - see the PARAMETER DESCRIPTION section.
- A FAULT LOCKOUT relay is used when the drive is programmed to automatically restart after a "trip" condition. The relay energizes when input voltage is applied to the drive and remains energized until the input voltage is removed, or the drive has "tripped" into a fault condition, and unsuccessfully attempted the number of restarts set by the RESTART LIMIT (Parameter #72).
- An AT SPEED relay energizes when the drive reaches the commanded frequency. The frequency at which the relay energizes and de-energizes has a (+ / -) 3 HZ frequency band, from the commanded frequency.
- CURRENT LIMIT relay energizes when the drive is operating in current limit. Once the current limit relay is energized, it remains energized for a minimum of 500 mS. If the drive is operating in and out of current limit at a period of less than 500 mS, the relay will remain energized. Otherwise at the end of the 500 mS interval, if the drive is no longer in current limit, the relay will de-energize.
- A FOLLOWER PRESENT relay energizes when the 4-20 MA speed reference input wired to control board terminals 5B and 2 is greater than 2 MA, and de-energizes when the input signal falls below 2 MA.
- The AUTO SPEED MODE relay energizes when in the AUTO MODE. This relay function will only be active if Parameter #67 is set to AUTO / MANUAL SPEED, or AUTO / MANUAL LOCAL. This function will energize and remain energized if Parameter #67 is programmed for AUTO SPEED. This function will not be active if Parameter #67 is programmed for MANUAL SPEED.
- The START PENDING relay energizes when the FAULT RESTART (Parameter #72) is ENABLED, and a START PENDING condition exists. This relay will remain energized for the duration of the start pending message. The duration of the start pending message is controlled by the RESTART DELAY (Parameter #73). This relay will also energize when the DC BRAKE (Parameter #80) is set to either ON START, or START & STOP, and a start braking sequence is active. The time period the relay will remain energized is determined by the START BRAKE (Parameter #84).
- An ABOVE SET SPEED relay energizes when the output frequency of the drive exceeds the value corresponding to the RELAY SET SPEED (Parameter #123) value, and de-energizes when the output frequency returns to a value lower than the RELAY SET SPEED value.
- The MAINTENANCE TARGET relay energizes after the time period value set by the MAINTENANCE TARGET (Parameter #132) has elapsed. The relay will stay energized until a new (Higher) time period value has been set by Parameter #132.

  If Parameter #132 is set to 0, the MAINTENANCE TARGET relay function is disabled.

3. DESIGN SPECIFICATIONS

Storage Temperature	-20° to 70° C
Ambient Operating (All Voltages)	Temperature 0° - 40°C
Ambient Humidity	Less than 95% (non-condensing)
Maximum Altitude	3300 feet (1000 meters) above sea level
Input Line Voltages	200 / 240 Vac, 400 / 480 Vac, and 480 / 590 Vac
Input Voltage Tolerance	+10%, -15%
Input Frequency Tolerance	48 to 62 Hz
Displacement Power Factor	Approximately 0.96
Frequency Stability	+/- 0.00006% / °C
Input Power Device	Full Wave Bridge Rectifier
Output Power Device	IGBT Power Module
Wave Form	Sine Coded Pulse Width Modulated
Output Frequency	0-120 Hz Standard
Carrier Frequency	Factory default to constant 1.5 kHz, Adjustable to 12 kHz.
Service Factor	Typically greater than 96%
Overload Current Capacity	120% for one minute for Variable Torque (based on drive nominal output current rating) 150% for one minute, 180% for twenty seconds for Constant Torque (based on drive nominal output current rating)
Speed Reference Follower	0-10 VDC, or (10-0 VDC), 4-20 MA, or (20-4 MA) (Isolated, referenced to circuit common - terminal 2)
Control Voltage	24 VDC (Isolated, referenced to circuit common - terminal 2)
Ride Thru	400 mS
Output Signals	
0 - 10 VDC	Proportional to speed or load (terminal 10B)
12 VDC Pulse train (40 - 50% duty cycle)	Proportional to speed (terminal 10C)
4 - 20 MA	Proportional to speed or load (terminal 10D)
0 - 10, 2 - 10 VDC	Proportional to speed or load (terminal 10E)
Line Reactor	1) At 200V & 460V standard 25 HP and above 2) At 575 Volt standard 5 HP and above

4. VSD 57 SERIES MODEL DESIGNATION CODE

The model number of a VSD57 Series drive gives a full description of the basic drive unit (see example below). Options such as door interlocked disconnects, input line fuses, input line and load reactors, EMI / RFI filter, manual and automatic transfer bypass, additional door mounted operator controls, remote stations, etc can also be provided.

EXAMPLE: VSD57VU72S66

(VSD 57 Series, 575V AC, 5 HP, TYPE 1 ENCLOSURE) **VSD57 V U72 S6 6**

SERIES:

SERIES VSD 57

TORQUE CAPABILITY (only for VSD 57 SERIES):

C = Constant Torque & Variable Torque
V = Variable Torque only

POWER RATING:

U18 = 1HP	D16 = 15HP	D64 = 60HP
U29 = 2HP	D23 = 20 HP	D79 = 75 HP
U41 = 3 HP	D27 = 25 HP	C10 = 100 HP
U72 = 5 HP	D33 = 30 HP	C13 = 125 HP
U90 = 7 1/2 HP	D46 = 40 HP	C15 = 150 HP
D12 = 10 HP	D54 = 50 HP	C19 = 200 HP

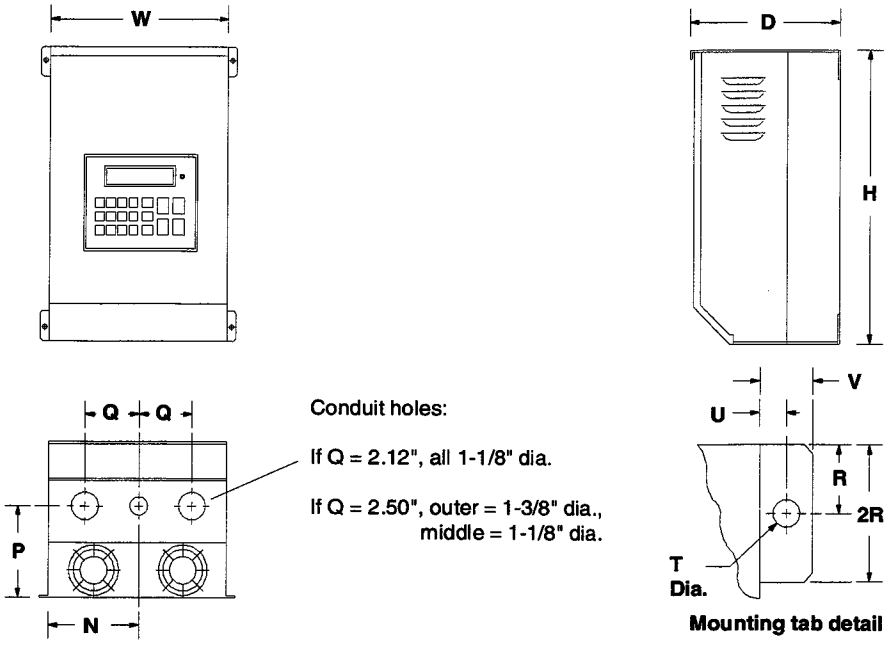
INPUT VOLTAGE:

M2 = 240 VAC 3 phase
N4 = 480 VAC 3 phase
S6 = 590 VAC 3 phase

ENCLOSURE TYPE:

6 = type 1 vented enclosure
8 = type 4/12 totally enclosed
9 = type 4X totally enclosed stainless steel and water-tight

VSD57 SERIES - VARIABLE TORQUE - CHASSIS AND TYPE 1 ENCLOSED



Conduit holes:

If Q = 2.12", all 1-1/8" dia.

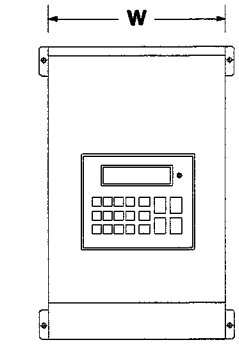
If Q = 2.50", outer = 1-3/8" dia., middle = 1-1/8" dia.

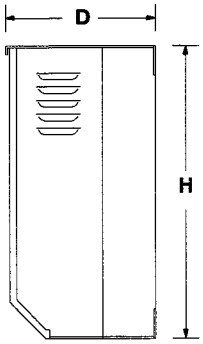
Mounting tab detail

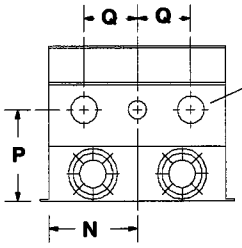
HP	Voltage	Model	H	W	D	N	P	Q	R	T	U	V	Wght
1 to 2	200/240	VSD57VU29M26	12.00	7.44	7.91	3.72	4.75	2.12	1.00	0.28	0.37	0.68	25
	400/480	VSD57VU29N46	12.00	7.44	7.91	3.72	4.75	2.12	1.00	0.28	0.37	0.68	25
	480/590	VSD57VU29S66	12.00	7.44	7.91	3.72	4.75	2.12	1.00	0.28	0.37	0.68	25
3	200/240	VSD57VU41M26	12.00	7.44	7.91	3.72	4.75	2.12	1.00	0.28	0.37	0.68	25
	400/480	VSD57VU41N46	12.00	7.44	7.91	3.72	4.75	2.12	1.00	0.28	0.37	0.68	25
	480/590	VSD57VU41S66	12.00	7.44	7.91	3.72	4.75	2.12	1.00	0.28	0.37	0.68	25
5	200/240	VSD57VU72M26	12.00	7.44	7.91	3.72	4.75	2.12	1.00	0.28	0.37	0.68	25
	400/480	VSD57VU72N46	12.00	7.44	7.91	3.72	4.75	2.12	1.00	0.28	0.37	0.68	25
	480/590	VSD57VU72S66	15.50	7.44	7.91	3.72	4.75	2.12	1.00	0.28	0.37	0.68	35
7.5	200/240	VSD57VU90M26	12.00	7.44	7.91	3.72	4.75	2.12	1.00	0.28	0.37	0.68	25
	400/480	VSD57VU90N46	12.00	7.44	7.91	3.72	4.75	2.12	1.00	0.28	0.37	0.68	25
	480/590	VSD57VU90S66	15.50	7.44	7.91	3.72	4.75	2.12	1.00	0.28	0.37	0.68	35
10	200/240	VSD57VD12M26	14.00	8.88	9.50	4.44	5.75	2.50	1.00	0.28	0.37	0.68	30
	400/480	VSD57VD12N46	12.00	7.44	7.91	3.72	4.75	2.12	1.00	0.28	0.37	0.68	25
	480/590	VSD57VD12S66	15.50	7.44	7.91	3.72	4.75	2.12	1.00	0.28	0.37	0.68	35
15	200/240	VSD57VD16M26	14.00	8.88	9.50	4.44	5.75	2.50	1.00	0.28	0.37	0.68	45
	400/480	VSD57VD16N46	14.00	8.88	9.50	4.44	5.75	2.50	1.00	0.28	0.37	0.68	30
	480/590	VSD57VD16S66	19.00	8.88	9.84	4.44	6.13	2.50	1.00	0.28	0.37	0.68	50
20	200/240	VSD57VD23M26	19.00	8.88	9.84	4.44	6.13	2.50	1.00	0.28	0.37	0.68	50
	400/480	VSD57VD23N46	19.00	8.88	9.84	4.44	6.13	2.50	1.00	0.28	0.37	0.68	35
	480/590	VSD57VD23S66	25.00	8.88	10.50	4.44	6.50	2.50	1.50	0.36	0.37	0.68	55

ALL DIMENSIONS SHOWN ARE IN INCHES - ALL WEIGHTS SHOWN ARE IN POUNDS

VSD57 SERIES -VARIABLE TORQUE- CHASSIS AND TYPE 1 ENCLOSED







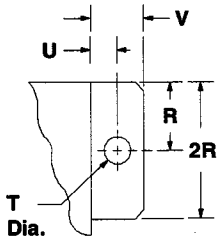
Conduit holes:

If Q = 2.50", outer = 1-3/8" dia.
middle = 1-1/8" dia.

If Q = 2.62", left = 1-1/8" dia.
middle & right = 1-3/8" dia.

If Q = 3.12", left = 1-1/8" dia.
middle & right = 1-3/4" dia.

If Q =4.50 ", left = 1-1/8" dia.
middle & right = 2-1/2" dia.



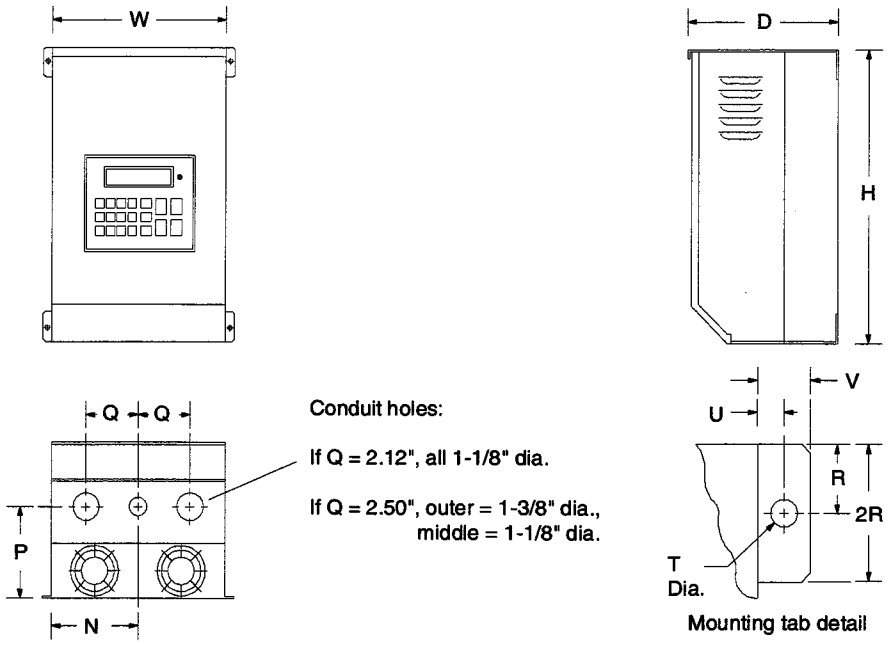
Mounting tab detail

HP	Voltage	Model	H	W	D	N	P	Q	R	T	U	V	Wght
25	200/240	VSD57VD27M26	25.00	8.88	10.50	4.44	6.50	2.50	1.50	0.36	0.37	0.68	80
	400/480	VSD57VD27N46	25.00	8.88	10.50	4.44	6.50	2.50	1.50	0.36	0.37	0.68	80
	480/590	VSD57VD27S66	25.00	8.88	10.50	4.44	6.50	2.50	1.50	0.36	0.37	0.68	80
30	200/240	VSD57VD33M26	25.00	8.88	10.50	4.44	6.50	2.50	1.50	0.36	0.37	0.68	80
	400/480	VSD57VD33N46	25.00	8.88	10.50	4.44	6.50	2.50	1.50	0.36	0.37	0.68	80
	480/590	VSD57VD33S66	25.00	8.88	10.50	4.44	6.50	2.50	1.50	0.36	0.37	0.68	80
40	200/240	VSD57VD46M26	25.00	13.00	10.50	5.56	6.50	2.62	1.50	0.36	0.37	0.68	125
	400/480	VSD57VD46N46	25.00	13.00	10.50	5.56	6.50	2.62	1.50	0.36	0.37	0.68	120
	480/590	VSD57VD46S66	25.00	13.00	10.50	5.56	6.50	2.62	1.50	0.36	0.37	0.68	85
50	200/240	VSD57VD54M26	25.00	13.00	10.50	5.56	6.50	2.62	1.50	0.36	0.37	0.68	130
	400/480	VSD57VD54N46	25.00	13.00	10.50	5.56	6.50	2.62	1.50	0.36	0.37	0.68	125
	480/590	VSD57VD54S66	25.00	13.00	10.50	5.56	6.50	2.62	1.50	0.36	0.37	0.68	120
60	200/240	VSD57VD64M26	29.00	16.64	11.85	7.14	6.88	3.12	1.50	0.44	0.49	0.92	175
	400/480	VSD57VD64N46	25.00	13.00	10.50	5.56	6.50	2.62	1.50	0.36	0.37	0.68	170
	480/590	VSD57VD64S66	25.00	13.00	10.50	5.56	6.50	2.62	1.50	0.36	0.37	0.68	130
75	400/480	VSD57VD79N46	29.00	16.64	11.85	7.14	6.88	3.12	1.50	0.44	0.49	0.92	175
	480/590	VSD57VD79S66	29.00	16.64	11.85	7.14	6.88	3.12	1.50	0.44	0.49	0.92	170
100	400/480	VSD57VC10N46	29.00	16.64	11.85	7.14	6.88	4.50	1.50	0.44	0.49	0.92	185
	480/590	VSD57VC10S66	29.00	16.64	11.85	7.14	6.88	4.50	1.50	0.44	0.49	0.92	175
125	400/480	VSD57VC13N46	29.00	24.42	11.85	11.12	6.50	4.50	1.50	0.44	0.49	0.92	255
	480/590	VSD57VC13S66	29.00	24.42	11.85	11.12	6.50	4.50	1.50	0.44	0.49	0.92	205
150	400/480	VSD57VC15N46	29.00	24.42	11.85	11.12	6.50	4.50	1.50	0.44	0.49	0.92	260
	480/590	VSD57VC15S66	29.00	24.42	11.85	11.12	6.50	4.50	1.50	0.44	0.49	0.92	255
200	400/480	VSD57vC19N46	29.00	37.00	11.85	11.12	6.50	4.50	1.50	0.44	0.49	0.92	360
	480/590	VSD57VC19S66	29.00	37.00	11.85	11.12	6.50	4.50	1.50	0.44	0.49	0.92	350

ALL DIMENSIONS SHOWN ARE IN INCHES - ALL WEIGHTS SHOWN ARE IN POUNDS

6. DIMENSIONAL DATA VSD57 CONSTANT TORQUE (VARIABLE TORQUE)

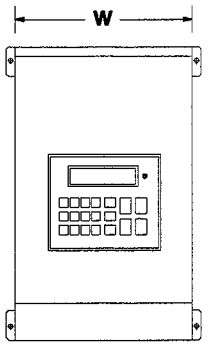
57 SERIES - CONSTANT TORQUE- CHASSIS AND TYPE 1 ENCLOSED

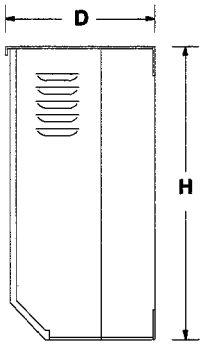


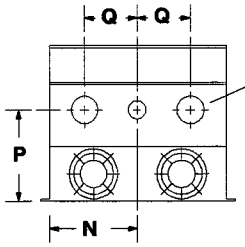
HP	Voltage	Model	H	W	D	N	P	Q	R	T	U	V	Wght
1/4	200/240	VSD57CU18M26	12.00	7.44	5.91	3.72	2.75	2.12	1.00	0.28	0.37	0.68	25
TO 1	400/480	VSD57CU18N46	12.00	7.44	5.91	3.72	2.75	2.12	1.00	0.28	0.37	0.68	25
	480/590	VSD57CU18S66	12.00	7.44	5.91	3.72	2.75	2.12	1.00	0.28	0.37	0.68	19
1.5	200/240	VSD57CU29M26	12.00	7.44	7.91	3.72	4.75	2.12	1.00	0.28	0.37	0.68	25
TO 2	400/480	VSD57CU29N46	12.00	7.44	7.91	3.72	4.75	2.12	1.00	0.28	0.37	0.68	25
	480/590	VSD57CU29S66	12.00	7.44	7.91	3.72	4.75	2.12	1.00	0.28	0.37	0.68	19
3	200/240	VSD57CU41M26	12.00	7.44	7.91	3.72	4.75	2.12	1.00	0.28	0.37	0.68	25
	400/480	VSD57CU41N46	12.00	7.44	7.91	3.72	4.75	2.12	1.00	0.28	0.37	0.68	25
	480/590	VSD57CU41S66	12.00	7.44	7.91	3.72	4.75	2.12	1.00	0.28	0.37	0.68	19
5	200/240	VSD57CU72M26	12.00	7.44	7.91	3.72	4.75	2.12	1.00	0.28	0.37	0.68	25
	400/480	VSD57CU72N46	12.00	7.44	7.91	3.72	4.75	2.12	1.00	0.28	0.37	0.68	25
	480/590	VSD57CU72S66	15.50	7.44	7.91	3.72	4.75	2.12	1.00	0.28	0.37	0.68	31
7.5	200/240	VSD57CU90M26	14.00	8.88	9.50	4.44	5.75	2.50	1.00	0.28	0.37	0.68	35
	400/480	VSD57CU90N46	12.00	7.44	7.91	3.72	4.75	2.12	1.00	0.28	0.37	0.68	35
	480/590	VSD57CU90S66	15.50	7.44	7.91	3.72	4.75	2.12	1.00	0.28	0.37	0.68	31
10	200/240	VSD57CD12M26	14.00	8.88	9.50	4.44	5.75	2.50	1.00	0.28	0.37	0.68	35
	400/480	VSD57CD12N46	14.00	8.88	9.50	4.44	5.75	2.50	1.00	0.28	0.37	0.68	35
	480/590	VSD57CD12S66	19.00	8.88	9.84	4.44	6.13	2.50	1.00	0.28	0.37	0.68	53
15	200/240	VSD57CD16M26	14.00	8.88	9.50	4.44	5.75	2.50	1.00	0.28	0.37	0.68	35
	400/480	VSD57CD16N46	14.00	8.88	9.50	4.44	5.75	2.50	1.00	0.28	0.37	0.68	35
	480/590	VSD57CD16S66	19.00	8.88	9.84	4.44	6.13	2.50	1.00	0.28	0.37	0.68	53
20	200/240	VSD57CD23M26	19.00	8.88	9.84	4.44	6.13	2.50	1.00	0.28	0.37	0.68	55
	400/480	VSD57CD23N46	19.00	8.88	9.84	4.44	6.13	2.50	1.00	0.28	0.37	0.68	55
	480/590	VSD57CD23S66	25.00	8.88	10.50	4.44	6.50	2.50	1.50	0.36	0.37	0.68	75

ALL DIMENSIONS SHOWN ARE IN INCHES - ALL WEIGHTS SHOWN ARE IN POUNDS

VSD57 SERIES - CONSTANT TORQUE - CHASSIS AND TYPE 1 ENCLOSED







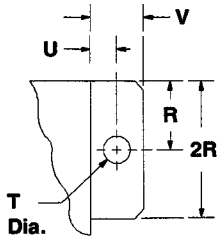
Conduit holes:

If Q = 2.50", outer = 1-3/8" dia.
middle = 1-1/8" dia.

If Q = 2.62", left = 1-1/8" dia.
middle & right = 1-3/8" dia.

If Q = 3.12", left = 1-1/8" dia.
middle & right = 1-3/4" dia.

If Q =4.50 ", left = 1-1/8" dia.
middle & right = 2-1/2" dia.

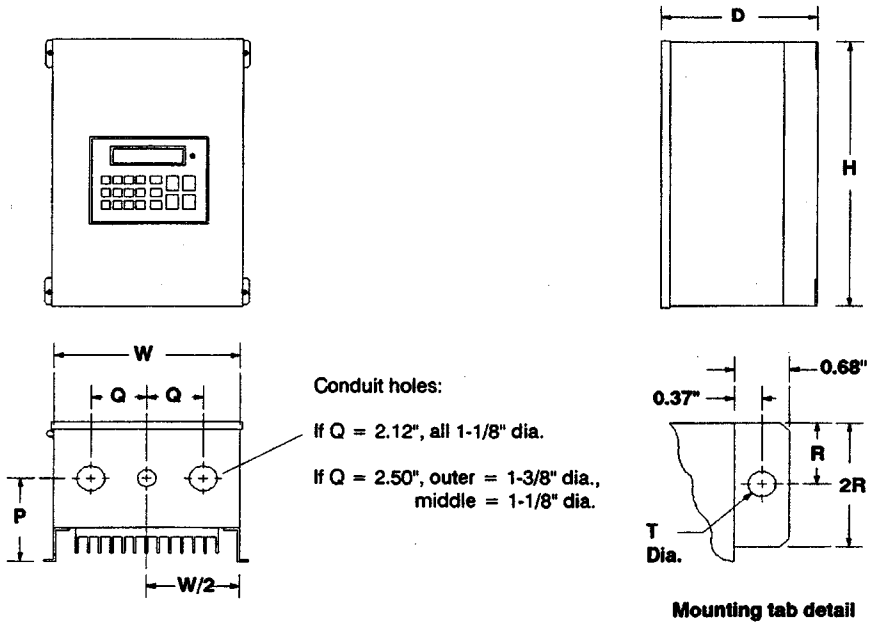


Mounting tab detail

HP	Voltage	Model	H	W	D	N	P	Q	R	T	U	V	Wght
25	200/240	VSD57CD27M26	25.00	8.88	10.50	4.44	6.50	2.50	1.50	0.36	0.37	0.68	80
	400/480	VSD57CD27N46	25.00	8.88	10.50	4.44	6.50	2.50	1.50	0.36	0.37	0.68	80
	480/590	VSD57CD27S66	25.00	8.88	10.50	4.44	6.50	2.50	1.50	0.36	0.37	0.68	75
30	200/240	VSD57CD33M26	25.00	13.00	10.50	5.56	6.50	2.50	1.50	0.36	0.37	0.68	125
	400/480	VSD57CD33N46	25.00	8.88	10.50	4.44	6.50	2.50	1.50	0.36	0.37	0.68	80
	480/590	VSD57CD33S66	25.00	8.88	10.50	4.44	6.50	2.50	1.50	0.36	0.37	0.68	75
40	200/240	VSD57CD46M26	25.00	13.00	10.50	5.56	6.50	2.62	1.50	0.36	0.37	0.68	130
	400/480	VSD57CD46N46	25.00	13.00	10.50	5.56	6.50	2.62	1.50	0.36	0.37	0.68	125
	480/590	VSD57CD46S66	25.00	13.00	10.50	5.56	6.50	2.62	1.50	0.36	0.37	0.68	-
50	400/480	VSD57CD54N46	25.00	13.00	10.50	5.56	6.50	2.62	1.50	0.36	0.37	0.68	130
	480/590	VSD57CD54S66	25.00	13.00	10.50	5.56	6.50	2.62	1.50	0.36	0.37	0.68	-
60	200/240	VSD57CD64M26	29.00	16.64	11.85	7.14	6.88	3.12	1.50	0.44	0.49	0.92	185
	400/480	VSD57CD64N46	29.00	16.64	11.85	7.14	6.88	3.12	1.50	0.44	0.49	0.92	180
	480/590	VSD57CD64S66	29.00	16.64	11.85	7.14	6.88	3.12	1.50	0.44	0.49	0.92	-
75	400/480	VSD57CD79N46	29.00	16.64	11.85	7.14	6.88	3.12	1.50	0.44	0.49	0.92	185
	480/590	VSD57CD79S66	29.00	16.64	11.85	7.14	6.88	3.12	1.50	0.44	0.49	0.92	-
100	400/480	VSD57CC10N46	29.00	24.42	11.85	11.12	6.50	4.50	1.50	0.44	0.49	0.92	250
	480/590	VSD57CC10S66	29.00	24.42	11.85	11.12	6.50	4.50	1.50	0.44	0.49	0.92	-
125	400/480	VSD57CC13N46	29.00	24.42	11.85	11.12	6.50	4.50	1.50	0.44	0.49	0.92	260
	480/590	VSD57CC13S66	29.00	24.42	11.85	11.12	6.50	4.50	1.50	0.44	0.49	0.92	-
150	400/480	VSD57CC15N46	29.00	37.00	11.85	11.12	6.50	4.50	1.50	0.44	0.49	0.92	360
	480/590	VSD57CC15S66	29.00	37.00	11.85	11.12	6.50	4.50	1.50	0.44	0.49	0.92	-

ALL DIMENSIONS SHOWN ARE IN INCHES - ALL WEIGHTS SHOWN ARE IN POUNDS

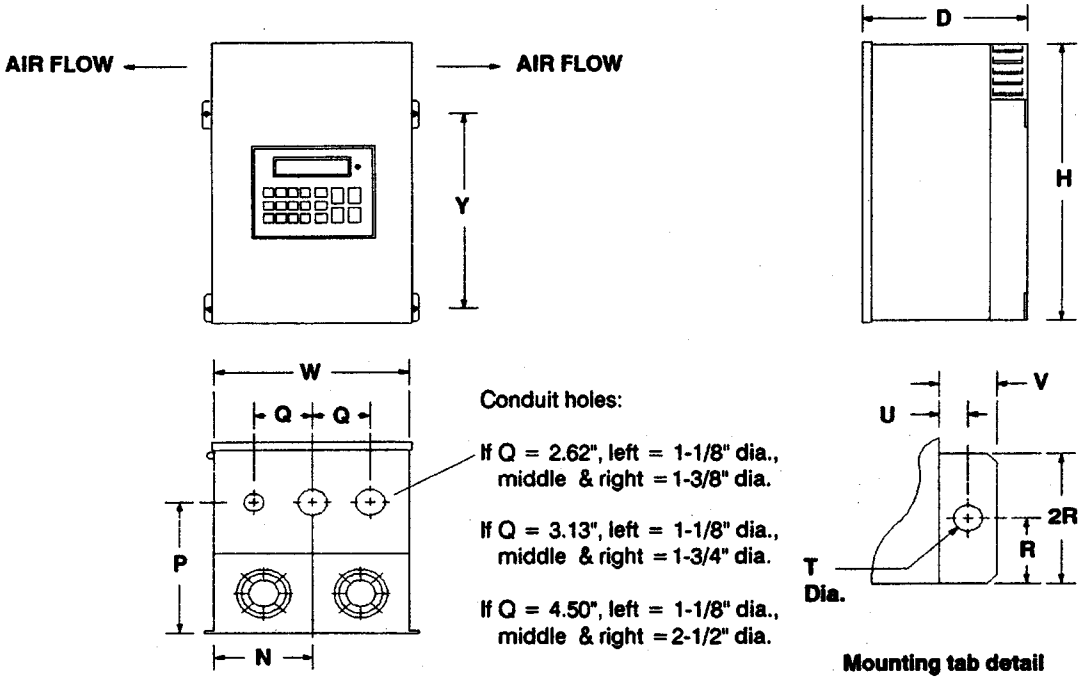
VSD57 SERIES - CONSTANT TORQUE- TYPE 4/12 AND 4X ENCLOSED



HP	Voltage	Model	H	W	D	P	Q	R	T	Wght
1/4 TO 1	200/240	VSD57CU18M28	13.00	7.88	6.19	3.50	2.12	1.00	0.28	25
	400/480	VSD57CU18N48	13.00	7.88	6.19	3.50	2.12	1.00	0.28	25
	480/590	VSD57CU18S68	13.00	7.88	6.19	3.50	2.12	1.00	0.28	21
1.5 TO 2	200/240	VSD57CU29M28	13.00	7.88	7.25	4.56	2.12	1.00	0.28	25
	400/480	VSD57CU29N48	13.00	7.88	6.19	3.50	2.12	1.00	0.28	25
	480/590	VSD57CU29S68	13.00	7.88	6.19	3.50	2.12	1.00	0.28	21
3	200/240	VSD57CU41M28	13.00	7.88	7.25	4.56	2.12	1.00	0.28	25
	400/480	VSD57CU41N48	13.00	7.88	7.25	4.56	2.12	1.00	0.28	25
	480/590	VSD57CU41S68	13.00	7.88	7.25	4.56	2.12	1.00	0.28	21
5	200/240	VSD57CU72M28	16.00	9.70	7.50	4.81	2.12	1.00	0.28	35
	400/480	VSD57CU72N48	16.00	9.70	7.50	4.81	2.12	1.00	0.28	35
	480/590	VSD57CU72S68	16.00	9.70	7.50	4.81	2.12	1.00	0.28	46
7.5	200/240	VSD57CU90M28	19.00	11.38	8.83	5.63	2.50	1.00	0.28	50
	400/480	VSD57CU90N48	16.00	9.70	7.50	4.81	2.12	1.00	0.28	35
	480/590	VSD57CU90S68	16.50	9.70	7.50	4.81	2.12	1.00	0.28	46
10	200/240	VSD57CD12M28	19.00	11.38	8.83	5.63	2.50	1.00	0.28	50
	400/480	VSD57CD12N48	19.00	11.38	8.83	5.63	2.50	1.00	0.28	50
	480/590	VSD57CD12S68	19.00	11.38	8.83	5.63	2.50	1.00	0.28	60
15	200/240	VSD57CD16M28	19.00	11.38	8.83	5.63	2.50	1.00	0.28	50
	400/480	VSD57CD16N48	19.00	11.38	8.83	5.63	2.50	1.00	0.28	50
	480/590	VSD57CD16S68	19.00	11.38	8.83	5.63	2.50	1.00	0.28	60
20	200/240	VSD57CD23M28	29.00	11.74	9.78	5.88	2.50	1.50	0.36	80
	400/480	VSD57CD23N48	29.00	11.74	9.78	5.88	2.50	1.50	0.36	80
	480/590	VSD57CD23S68	29.00	11.74	9.78	5.88	2.50	1.50	0.36	85
25	200/240	VSD57CD27M28	29.00	11.74	10.98	7.08	2.50	1.50	0.36	85
	400/480	VSD57CD27N48	29.00	11.74	9.78	5.88	2.50	1.50	0.36	85
	480/590	VSD57CD27S68	29.00	11.74	9.78	5.88	2.50	1.50	0.36	85
30	400/480	VSD57CD33N48	29.00	11.74	10.98	7.08	2.50	1.50	0.36	90
	480/590	VSD57CD33S68	29.00	11.74	10.98	7.08	2.50	1.50	0.36	90

ALL DIMENSIONS SHOWN ARE IN INCHES - ALL WEIGHTS SHOWN ARE IN POUNDS

VSD57 SERIES - CONSTANT TORQUE - TYPE 12 ENCLOSED



HP	Voltage	Model	H	W	D	N	P	Q	R	T	U	V	Y	Wght
30	200/240	VSD57CD33M28	31.00	14.00	11.86	6.00	7.50	2.62	1.50	0.36	0.37	0.68	22.50	150
40	200/240	VSD57CD46M28	31.00	14.00	11.86	6.00	7.50	2.62	1.50	0.36	0.37	0.68	22.50	150
	400/480	VSD57CD46N48	31.00	14.00	11.86	6.00	7.50	2.62	1.50	0.36	0.37	0.68	22.50	150
	480/590	VSD57CD46S68	31.00	14.00	11.86	6.00	7.50	2.62	1.50	0.36	0.37	0.68	22.50	-
50	400/480	VSD57CD54N48	31.00	14.00	11.86	6.00	7.50	2.62	1.50	0.36	0.37	0.68	22.50	150
	480/590	VSD57CD54S68	31.00	14.00	11.86	6.00	7.50	2.62	1.50	0.36	0.37	0.68	22.50	-
60	200/240	VSD57CD64M28	37.00	18.00	13.30	7.50	8.00	3.13	1.50	0.49	0.50	0.92	27.00	200
	400/480	VSD57CD64N48	37.00	18.00	13.30	7.50	8.00	3.13	1.50	0.49	0.50	0.92	27.00	195
	480/590	VSD57CD64S68	37.00	18.00	13.30	7.50	8.00	3.13	1.50	0.49	0.50	0.92	27.00	-
75	400/480	VSD57CD79N48	37.00	18.00	13.30	7.50	8.00	3.13	1.50	0.49	0.50	0.92	27.00	200
	480/590	VSD57CD79S68	37.00	18.00	13.30	7.50	8.00	3.13	1.50	0.49	0.50	0.92	27.00	-
100	400/480	VSD57CC10N48	39.00	26.00	13.30	11.50	8.00	4.50	1.50	0.49	0.50	0.92	27.00	300
	480/590	VSD57CC10S68	39.00	26.00	13.30	11.50	8.00	4.50	1.50	0.49	0.50	0.92	27.00	-
125	400/480	VSD57CC13N48	39.00	26.00	13.30	11.50	8.00	4.50	1.50	0.49	0.50	0.92	27.00	310
	480/590	VSD57CC13N68	39.00	26.00	13.30	11.50	8.00	4.50	1.50	0.49	0.50	0.92	27.00	-

ALL DIMENSIONS SHOWN ARE IN INCHES - ALL WEIGHTS SHOWN ARE IN POUNDS

7. DRIVE RATINGS - 208 / 240 V Model

VSD57 Series ratings - Variable Torque application only

Model Number	Motor Power		INPUT		OUTPUT	
	230 V HP	200 V HP	3 Phase input only Input Line Current 240/208V A	Power (240V/208V) KVA	Output Current (230/200V) A	Max Transient Current (60s) A
VSD57VU29M26	2	1.5	8.1	3.4/2.8	6.8	8.16
VSD57VU41M26	3	2	11.3	4.7/3.9	9.6	11.52
VSD57VU72M26	5	3	17.7	7.3/6.1	15.2	18.24
VSD57VU90M26	7.5	5	25.2	10.5/8.7	22	26.4
VSD57VD12M26	10	7.5	31.8	13.2/11.0	28	33.6
VSD57VD16M26	15	10	47.6	19.8/16.5	42	50.4
VSD57VD23M26	20	15	61	25.3/21.0	54	64.8
VSD57VD27M26	25	20	64	26.6/22.1	68	81.6
VSD57VD33M26	30	25	76	31.6/26.3	80	96
VSD57VD46M26	40	30	98.6	41/34.1	104	124.8
VSD57VD54M26	50	40	122	50.7/42.1	130	156
VSD57VD64M26	60	50	145	60.5/50.3	154	184.8
VSD57VD79M26	75	60	182	75.7/62.8	192	230.4

1) AC line reactor are included as standard equipment on 200/230 VAC models 25 HP through 75HP

2) Verify the nameplate current rating of the motor. It may be necessary to use a larger HP drive to meet the continous full load amp requirements.

3) See section 11, for recommended input fuse type.

VSD57 Series ratings - Constant Torque (& Variable Torque)

Model Number	Motor Power		INPUT		OUTPUT	
	230 V HP	200 V HP	3 Phase input only Input Line Current 240/208V A	Power (240V/208V) KVA	Output Current (230/200V) A	Max Transient Current (60s) A
VSD57CU18M2-	1	1	4.6 / 5.5	1.9	4.0 / 4.8	6.0/7.2
VSD57CU29M2-	2	2	8.1 / 9.7	3.4	6.8 / 8.1	10.2 / 12.2
VSD57CU41M2-	3	3	11.3 / 13.6	4.7	9.6 / 11.5	14.4 / 17.2
VSD57CU72M2-	5	5	17.7 / 21.3	7.3	15.2 / 18.0	22.8 / 27.0
VSD57CU90M2-	7.5	7.5	25.2 / 30.3	10.5	22.0 / 26.0	33.0 / 39.0
VSD57CD12M2-	10	10	31.8 / 38.2	13.2	28.0 / 33.0	42.0 / 49.5
VSD57CD16M2-	15	15	47.6 / 57.2	19.8	42.0 / 49.0	63.0 / 73.5
VSD57CD23M2-	20	20	61.0 / 73.2	25.3	54.0 / 64.0	81.0 / 96.0
VSD57CD27M2-	25	25	64.0 / 76.8	26.6	68.0 / 78.0	102.0 / 117.0
VSD57CD33M2-	30	30	76.0 / 91.2	31.6	80.0 / 92.0	120.0 / 138.0
VSD57CD46M2-	40	40	98.6 / 118.4	41	104.0 / 120.0	156.0 / 180.0
VSD57CD64M2-	60	60	145.0 / 174.0	60.5	154.0 / 185.0	231.0 / 277.5

1) AC line reactor are included as standard equipment on 200/230 VAC models 25 HP through 60HP

2) Verify the nameplate current rating of the motor. It may be necessary to use a larger HP drive to meet the continous full load amp requirements.

3) See section 11, for recommended input fuse type.

4) - Last number of model code designates enclosure type. See section 4.

8. DRIVE RATINGS - 480 V Model

VSD57 Series ratings - Variable Torque application only

Model Number	Motor Power		INPUT		OUTPUT	
	460 V HP	380 V KW	3 Phase input only Input Line Current 480/400 V A	Power (480V/400V) KVA	Output Current (460V/380V) A	Max Transient Current (60s) A
VSD57VU29N46	2	0.75	4	3.4/2.8	3.4	4.08
VSD57VU41N46	3	1.5	5.7	4.7/3.9	4.8	5.76
VSD57VU72N46	5	3	8.8	7.3/6.1	7.6	9.12
VSD57VU90N46	7.5	4	12.6	10.5/8.7	11	13.2
VSD57VD12N46	10	5.5	15.9	13.2/11.0	14	16.8
VSD57VD16N46	15	9	23.8	19.8/16.5	21	25.2
VSD57VD23N46	20	11	30.6	25.3/21.0	27	32.4
VSD57VD27N46	25	15	32.2	26.6/22.1	34	40.8
VSD57VD33N46	30	18.5	38.4	31.6/26.3	40	48
VSD57VD46N46	40	22	49.3	41/34.1	52	62.4
VSD57VD54N46	50	30	61	50.7/42.1	65	78
VSD57VD64N46	60	37	72.8	60.5/50.3	77	92.4
VSD57VD79N46	75	45	90.8	75.5/62.7	96	115.2
VSD57VC10N46	100	55	116	96.4/80.0	124	148.8
VSD57VC13N46	125	75	146	121.4/100.8	156	187.2
VSD57VC15N46	150	90	169	140/116.2	180	216
VSD57VC19N46	200	110	225	187.1/155.3	240	288

1) AC line reactor are included as standard equipment on 480 VAC models 25 HP and above.

2) Verify the nameplate current rating of the motor. It may be necessary to use a larger HP drive to meet the continous full load amp requirements.

3) See section 11, for recommended input fuse type.

4) For drive models VSD57VC13N46, VSD57VC15N46 and VSD57VC19N46 derate the input and ouput nominal current and power ratings by 0,90 for a 10 KHZ carrier frequency, and 0.80 for 12KHZ carrier frequency.

VSD57 Series ratings - Constant Torque (& Variable Torque)

Model Number	Motor Power		INPUT		OUTPUT	
	460 V HP	380 V KW	3 Phase input only Input Line Current 480/400V A	Power (480V/400V) KVA	Output Current (460/380V) A	Max Transient Current (60s) A
VSD57CU18N4-	1	0.75	2.3 / 2.8	1.9	2.0 / 2.4	3.0 / 3.6
VSD57CU29N4-	2	1.5	4.0 / 4.8	3.4	3.4 / 4.1	5.1 / 6.1
VSD57CU41N4-	3	2.2	5.7 / 6.8	4.7	4.8 / 5.7	7.2 / 8.5
VSD57CU72N4-	5	4	8.8 / 10.6	7.3	7.6 / 9.0	11.4 / 13.5
VSD57CU90N4-	7.5	5.5	12.6 / 15.2	10.5	11.0 / 13.0	16.5 / 19.5
VSD57CD12N4-	10	7.5	15.9 / 19.1	13.2	14.0 / 17.0	21.0 / 25.5
VSD57CD16N4-	15	11	23.8 / 28.6	19.8	21.0 / 25.0	31.5 / 37.5
VSD57CD23N4-	20	15	30.6 / 36.7	25.4	27.0 / 32.0	40.5 / 48.0
VSD57CD27N4-	25	18.5	32.2 / 38.6	26.7	34.0 / 40.0	51.0 / 60.0
VSD57CD33N4-	30	22	38.4 / 46.1	31.5	40.0 / 48.0	60.0 / 72.0
VSD57CD46N4-	40	30	49.3 / 59.2	41	52.0 / 62.0	78.0 / 93.0
VSD57CD54N4-	50	37	61.0 / 73.2	50.7	65.0 / 78.0	43.3 / 117.0
VSD57CD64N4-	60	45	72.8 / 87.4	60.5	77.0 / 92.0	115.5 / 138.0
VSD57CD79N4-	75	55	90.8 / 109.0	75.5	96.0 / 115.0	144.0 / 172.5
VSD57CC10N4-	100	75	116.0 / 139.2	96.4	124.0 / 148.0	186.0 / 222.0
VSD57CC13N4-	125	90	146.0 / 175.2	121.4	156.0 / 187.0	234.0 / 280.5
VSD57CC15N4-	150	110	169.0 / 203.0	140	180.0 / 216.0	270.0 / 324.0

1) AC line reactor are included as standard equipment on 480 VAC models 25 HP and above.

2) Verify the nameplate current rating of the motor. It may be necessary to use a larger HP drive to meet the continous full load amp requirements.

3) See section 11, for recommended input fuse type.

4) - Last number of model code designates enclosure type. See section 4.

9. DRIVE RATINGS - 575 V Model

VSD57 Series ratings - Variable Torque application only

Model Number	Motor Power		INPUT		OUTPUT	
	575 V HP	525 V KW	3 Phase input only Input Line Current 590/525V A	Power (590V/525V) KVA	Output Current (575/525V) A	Max Transient Current (60s) A
VSD57VU29S66	2	1.5	3.3	3.4/2.8	2.7	3.24
VSD57VU41S66	3	2.2	4.6	4.7/3.9	3.9	4.68
VSD57VU72S66	5	3	5.8	7.3/6.1	6.1	7.32
VSD57VU90S66	7.5	4	8.6	10.5/8.7	9	10.8
VSD57VD12S66	10	5.5	10.6	13.2/11.0	11	13.2
VSD57VD16S66	15	9	16.4	19.8/16.5	17	20.4
VSD57VD23S66	20	11	20.8	25.3/21.0	22	26.4
VSD57VD27S66	25	15	26.3	26.6/22.1	27	32.4
VSD57VD33S66	30	18.5	30.9	31.6/26.3	32	38.4
VSD57VD46S66	40	22	39.7	41/34.1	41	49.2
VSD57VD54S66	50	30	50	50.7/42.1	52	62.4
VSD57VD64S66	60	37	59.6	60.5/50.3	62	74.4
VSD57VD79S66	75	45	74.1	75.5/62.7	77	92.4
VSD57VC10S66	100	55	94.5	96.4/80.0	99	118.8
VSD57VC13S66	125	75	119	121.4/100.8	125	150
VSD57VC15S66	150	90	137	140/116.2	144	172.8
VSD57VC19S66	200	132	183	187/155	192	230.4

1) AC line reactor are included as standard equipment on 575 VAC models 5 HP and above.

2) Verify the nameplate current rating of the motor. It may be necessary to use a larger HP drive to meet the continous full load amp requirements.

3) See section 11, for recommended input fuse type.

4) For drive models VSD57VC13S66, VSD57VC15S66 and VSD57VC19S66 derate the input and ouput nominal current and power ratings by 0,90 for a 10 KHZ carrier frequency, and 0.80 for 12KHZ carrier frequency.

VSD57 Series ratings - Constant Torque (& Variable Torque)

Model Number	Motor Power		INPUT		OUTPUT	
	575 V HP	525 V KW	3 Phase input only Input Line Current 590/525V A	Power (590V/525V) KVA	Output Current (590/525V) A	Max Transient Current (60s) A
VSD57CU18S6-	1	0.75	1.8 / 1.7	1.9	1.6 / 1.5	2.4 / 2.25
VSD57CU29S6-	2	1.5	3.3 / 3.2	3.4	2.7 / 2.6	4.1 / 3.9
VSD57CU41S6-	3	2.2	4.6 / 4.6	4.7	3.9 / 3.8	5.8 / 5.7
VSD57CU72S6-	5	4	5.8 / 6.6	5.9	6.1 / 6.5	9.2 / 9.7
VSD57CU90S6-	7.5	5.5	8.6 / 8.6	8.8	9.0 / 9.0	13.5 / 13.5
VSD57CD12S6-	10	7.5	10.6 / 11.0	10.9	11.0 / 12.0	16.5 / 18.0
VSD57CD16S6-	15	11	16.4 / 18.0	16.7	17.0 / 18.4	25.5 / 27.6
VSD57CD23S6-	20	15	20.8 / 22.8	21.3	22.0 / 23.0	33.0 / 34.5
VSD57CD27S6-	25	18.5	26.3 / 28.9	26.9	27.0 / 28.5	40.5 / 42.7
VSD57CD33S6-	30	22	30.9 / 33.9	31.6	32.0 / 33.0	48.0 / 49.5
VSD57CD46S6-	40	30	39.7 / 43.7	40.5	41.0 / 45.0	61.5 / 67.5
VSD57CD54S6-	50	37	50.0 / 54.0	51.1	52.0 / 55.0	78.0 / 82.5
VSD57CD64S6-	60	45	59.6 / 64.0	60.9	62.0 / 65.0	93.0 / 97.5
VSD57CD79S6-	75	55	74.1 / 78.0	75.7	77.0 / 80.0	115.5 / 120.0
VSD57CC10S6-	100	75	94.5 / 100.0	96.6	99.0 / 105.0	148.5 / 157.5
VSD57CC13S6-	125	90	119.0 / 125.0	121.6	125.0 / 129.0	187.5 / 193.5
VSD57CC15S6-	150	110	137.0 / 150.0	140	144.0 / 156.0	216.0 / 234.0

1) AC line reactor are included as standard equipment on 575 VAC models 5 HP and above.

2) Verify the nameplate current rating of the motor. It may be necessary to use a larger HP drive to meet the continous full load amp requirements.

3) See section 11, for recommended input fuse type.

4) Last number of model code designates enclosure type. See section 4.

10. INSTALLATION

⚠ WARNING

DRIVES MUST NOT BE INSTALLED WHERE SUBJECTED TO ADVERSE ENVIRONMENTAL CONDITIONS! DRIVES MUST NOT BE INSTALLED WHERE SUBJECTED TO: COMBUSTIBLE, OILY, OR HAZARDOUS VAPORS OR DUST; EXCESSIVE MOISTURE OR DIRT; STRONG VIBRATION; EXCESSIVE AMBIENT TEMPERATURES. CONSULT SCHNEIDER CANADA FOR MORE INFORMATION ON THE SUITABILITY OF A DRIVE TO A PARTICULAR ENVIRONMENT.

The drive should be mounted on a smooth vertical surface capable of safely supporting the unit without vibrating. The LCD display has an optimum field of view, this should be considered when determining the mounting position.

Chassis models must be installed in an electrical enclosure which will provide complete mechanical protection and maintain uniform internal temperature within the drive's ambient operating temperature rating. All drive models **MUST be mounted** in a **vertical position** for proper heatsink cooling.

Maintain a minimum of **three to four inches above** and **below** the drive and a minimum of **three inches on either side** of units rated **below 20 HP**. Maintain a minimum of **six to eight inches above** and **below** the drive and a minimum of **four inches on either side** of of units rated **above 20 HP**. Fans or blowers should be used to insure proper cooling in tight quarters. Do not mount drives above other drives or heat producing equipment. Note the ambient operating temperature ratings for each drive model.

If it is necessary to drill or cut the enclosure or panel, extreme care must be taken to avoid damaging drive components or contaminating the drive with metal fragments (which cause shorting of electrical circuits). Cover drive components with a clean cloth to keep out metal chips and other debris. Use a vacuum cleaner to clean drive components after drilling, even if chips do not appear to be present. Do not attempt to use positive air pressure to blow chips out of drive, since this will lodge debris under electronic components. Contaminating the drive with metal chips can cause drive failure and will void the warranty.

11. INPUT AC LINE REQUIREMENTS

⚠ DANGER

HAZARDOUS VOLTAGE
Hazard of electrical shock. Disconnect incoming power and wait three minutes before servicing the drive. Capacitors retain charge after power removal.

INPUT AC POWER REQUIREMENTS

VOLTAGE:

The input voltage must match the drive's nameplate voltage rating. Voltage fluctuation must not vary by greater than 10% overvoltage or 15% undervoltage. Note: Drives with dual rated voltage input and must be set for the proper supply voltage - see VOLTAGE SELECTION section.

The drive is suitable for use on a circuit capable of delivering not more than 18,000 rms symmetrical amperes, at the drive's rated voltage. This is applicable only when a 3% impedance reactor and current limiting fuses are installed at the input power of VSD57 drive.

Phase to phase voltage imbalance must be less than 2.0%. Excessive phase to phase imbalance can cause severe damage to the drive's power components.

Motor voltage should match line voltage in normal applications. The drive's maximum output voltage will equal the input voltage. Use extreme caution when using a motor with a voltage rating which is different from the input line voltage - see BASE FREQUENCY (Parameter #100) in the DESCRIPTION OF PARAMETERS section.

kVA RATINGS:

If the kVA rating of the AC supply transformer is greater than ten times the input kVA rating of the drive, a drive isolation transformer, or a 2 to 3% input line inductor (also known as a choke or reactor) must be added. This applies only to 200 / 240 VAC and 400 / 480 VAC models 20 hp and below, and 480 / 590 VAC models 3 hp and below, since larger units have built in line reactors.

Line Reactor	1) At 200V & 460V standard 25 HP and above 2) At 575 Volt standard 5 HP and above

INPUT FUSING AND DISCONNECT REQUIREMENTS

A circuit breaker or a disconnect switch with fuses must be provided in accordance with the National Electric Code (NEC) or Canadian Electrical Code (CEC) and all local codes.

The VSD57 Variable Torque is capable of withstanding a 120% overload for 60 seconds. The VSD57 Constant Torque is capable of withstanding a 150% overload for 60 seconds. Select a fast actingfuse or magnetic trip circuit breaker rated at a maximum of 1.2 times the input amperage rating of the Variable Torque Drive or select a fast acting fuse or magnetic trip circuit breaker rated at a maximum of 1.5 times the input rating of the Constant Torque Drive. Note: See the Drive Ratings Section.

Minimum voltage rating of the protection device should be; 250 VAC for 200 / 240 VAC rated drives, and 600 VAC for 400 / 480 VAC and 480 / 590 VAC drives.

All VSD57 drives require fuse protection, current limiting fuses must be used. Select fuses with low I^2T values, rated at 200,000 AIC. Recommended fuses are Bussman type KTK-R and JJN for 200 / 240 VAC installations and KTK-R and JJS for 400 / 480 and 480 / 590 VAC drives. Similar fuses with equivalent ratings by other manufacturers may also be acceptable.

12. VOLTAGE SELECTION

⚠ CAUTION

BEFORE APPLYING INCOMING AC VOLTAGE, VERIFY THAT THE PROPER VOLTAGE SELECTION AT (PL1, OR PL2), AND PARAMETER #94 HAS BEEN MADE. FAILURE TO PROPERLY SELECT THE INPUT VOLTAGE MAY RESULT IN DRIVE DAMAGE.

INPUT RATINGS

VSD57 Series drives rated for 200/240 VAC, 50-60 HZ input: with the proper voltage selection, the drives will function with input power of 208 VAC (+ 10%, - 15%) or with input power of 240 VAC (+ 10%, - 15%), at 48 to 62 HZ.

VSD57 Series drives rated for 400/480 VAC, 50-60 HZ input: with the proper voltage selection, the drives will function with input power of 400 VAC (+ 10%, - 15%) or with input power of 480 VAC (+ 10%, - 15%), at 48 to 62 HZ.

VSD57 Series drives rated for 480/590 VAC, 50-60 HZ input: with the proper voltage selection, the drives will function with input power of 480 VAC (+ 10%, - 15%) or with input power of 590 VAC (+ 10%, - 15%), at 48 to 62 HZ.

VOLTAGE SELECTION

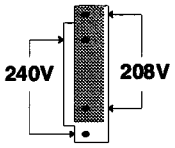
To select the proper voltage on 1, 2, and 3 horsepower 200 / 240 VAC drives position the plug on pin header PL1, located in the lower right corner of the power board. See figure a and figure b, below.

For all other units select the proper voltage by moving the jumper plug on pin header PL2 to the position on pin header PL2 which corresponds to the desired input voltage - middle and lower pin for 200, VAC input (on 590V product) (figure c), and middle and upper pin for 240, 400V or 480 (on 480V product), or 590 VAC input (figure d).

NOTE: In addition to the voltage jumper selection, Parameter # 94 must also be selected for the proper voltage - see the PARAMETER DESCRIPT ION section.

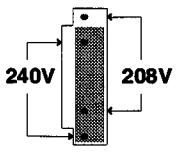
2 - 3 HP, 200 / 240 VAC MODELS

PL1



208 VAC INPUT SETTING
figure a.

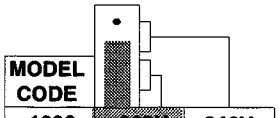
PL1



240 VAC INPUT SETTING
figure b.

ALL OTHER UNITS

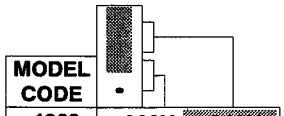
PL2



MODEL CODE		
1200	200V	240V
1400	400V	480V
1500	480V	590V

208, 400, 480 VAC INPUT SETTING
figure c.

PL2



MODEL CODE		
1200	200V	240V
1400	400V	480V
1500	480V	590V

240, 480, 590 VAC INPUT SETTING
figure d.

13. WIRING

Note drive input and output current ratings and check applicable electrical codes for required wire type and size, grounding requirements, over-current protection, and incoming power disconnect, before wiring the drive. Size conservatively to minimize the voltage drop.

GENERAL WIRING PRACTICES

Good wiring practices requires the seperation of controlcircuit wiring from all power (line and load) wiring. Power wiring to the motor must have the maximum possible seperation from all other power wiring, whether from the same drive or other drives; **do not run in the same conduit**. This seperation reduces the possibility of coupling electircal noise between cicuits.

When wiring VSD57 Drives, follow the wiring practices required by national and local electrical codes in addition to the practices below:

- Use metallic conduit for all drive controller wiring. Do not run control and power wiring in the same conduit. All three power output wires, from terminals T1, T2 and T3 to the motor, must be kept tightly bundled and run in a seperate conduit away from all other wiring.
- Metallic conduits carrying power wiring or low-level control wiring must be separated by at least 4 in (10cm)
- Non-metallic conduits or cable trays used to carry power wiring must be separated from metallic conduit carrying low-level control wiring by at least 12 in (30.5cm).
- Whenever power and control wiring cross, the metallic conduits and non-metallic conduits or trays must cross at right angles.
- In some installations, conducted emissions to the line from the drive controller must be attenuated to prevent interference with telecommunication, radio and sensitive electronic equipment. In these instances, attenuating filters may be required.

INPUT WIRING PRECAUTIONS

⚠ DANGER

HAZARDOUS VOLTAGE

Hazard of electrical shock. Disconnect incoming power and wait three minutes before servicing the drive. Capacitors retain charge after power removal.

Input fusing and a power disconnect switch or contactor MUST be wired in series with terminals L1, L2, and L3. These may be supplied by Schneider Canada Inc., as an option. If one has not been supplied by Schneider Canada Inc., a disconnect means must be wired during installation. This disconnect must be used to power down the drive when servicing, or when drive is not to be operated for a long period of time, but should not be used to start and stop the motor. Start and stop the motor with the drive run/stop circuit. Repetitive cycling of a disconnect or input contactor (more than once every two minutes) may cause damage to the drive.

The drive is nameplated for three phase input only, wire input to terminals L1, L2, and L3.

OUTPUT WIRING PRECAUTIONS

> **⚠ WARNING**
>
> **DRIVE CONTOLLER DAMAGE**
>
> **Drive controller will be damaged if input line voltage is applied to output terminals (U/T1, V/T2, W/T3). Check power connections before energizing drive controller.**
>
> Failure to observe this precaution can result in equipment damage, severe personal injury or death.

The drive controller is sensitive to the amount of capacitance (either phase-to-phase or phase-to-ground) present on the output power conductors. If excessive capacitance is present, the drive controller may trip.

Follow the guidlines below when selecting output cable:

- Cable type: the cable selected must have a low capacitance phase-to phase and to ground. Do not use mineral impregnated cable because it has a very high capacitance. Immersion of cables in water increases capacitance.
- Cable length: the longer the cable, the greater the capacitance. Cable lengths greater than 320 ft (100m) may cause problems.
- Proximity to output cables from other drive controllers: because of the high frequency switching and increased capacitance, the drive may fault under some conditions.
- Do not use lightning arrestors or power factor correction capacitors on output of drive controller.

For installations where cable capacitances may be a problem, an inductor can be installed between the drive controller and the motor.

All three power output wires, from terminals T1, T2, and T3 to the motor, must be kept tightly bundled and run in a separate conduit away from all other wiring.

Do not install contactors between drive and motor without consulting Schneider Canada Inc. Representative, for more information.

GROUNDING

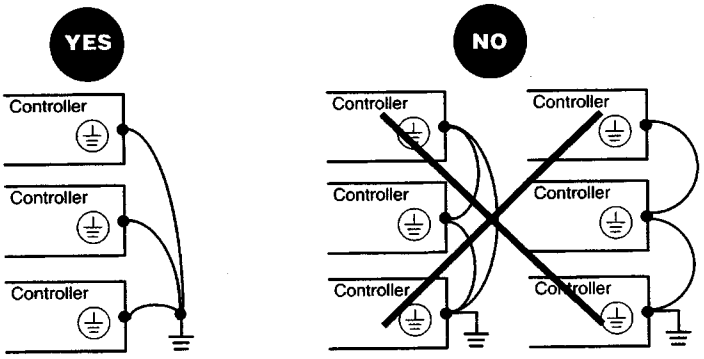
For safe , dependable operation, drive controllers must be grounded according to national and all local codes. To ground the drive controller:

- Connect a copper wire from the grounding terminal to the power system ground conductor. Wire size is determined by the drive controller size and by national and local codes
- Verify resistance to ground is one ohm or less. Improper grounding causes intermittent and unreliable operation.

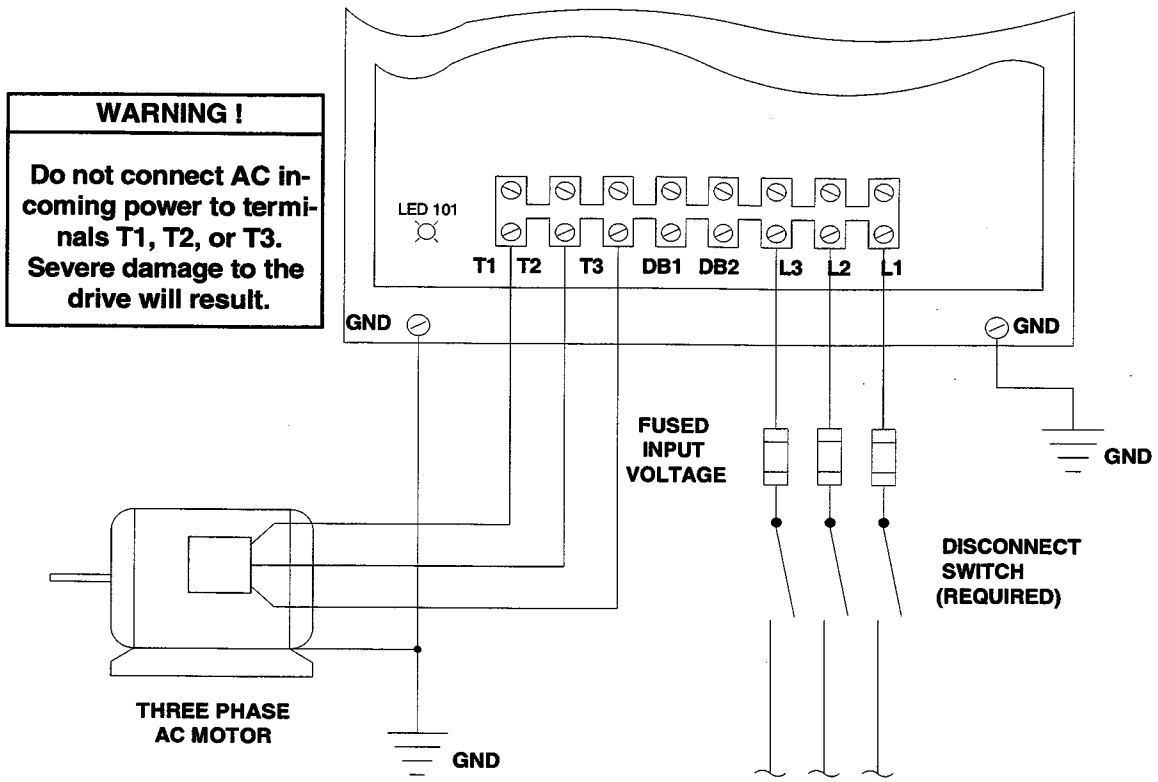
⚠ DANGER

- **Ground equipment using screw provided.**
- **Drive controller must be grounded before applying power.**
- **Do not use metallic conduits or shields as a ground conductor.**

Failure to observe these precautions will cause shock or burn, resulting in severe personal injury or death



VSD 57 SERIES POWER WIRING DIAGRAM



INSTALL, WIRE AND GROUND IN ACCORDANCE WITH ALL APPLICABLE CODES.

NOTES:

1.) WIRE THE MOTOR FOR THE PROPER VOLTAGE PER THE OUTPUT RATING OF THE DRIVE. MOTOR WIRES MUST BE RUN IN A SEPARATE STEEL CONDUIT AWAY FROM CONTROL WIRING AND INCOMING AC POWER WIRES.

2.) DO NOT INSTALL CONTACTORS BETWEEN DRIVE AND MOTOR, WITHOUT FIRST CONSULTING SCHNEIDER CANADA FOR MORE INFORMATION. OPERATING CONTACTORS BETWEEN DRIVE AND MOTOR MAY RESULT IN DRIVE DAMAGE.

3.) REMOVE ANY EXISTING, AND DO NOT INSTALL, POWER FACTOR CORRECTION CAPACITORS BETWEEN DRIVE AND MOTOR. **FAILURE TO DO SO WILL RESULT IN DRIVE DAMAGE.**

4.) USE ONLY UL AND CSA LISTED AND APPROVED WIRE.

5.) WIRE MINIMUM VOLTAGE RATINGS: 300 V FOR 200 / 240 VAC SYSTEMS AND 600 V FOR 400 / 480 AND 480 / 590 VAC SYSTEMS.

6.) SELECT WIRE GAUGE BASED ON A MINIMUM OF 120% OF THE VARIABLE TORQUE DRIVE'S AND 150% OF THE CONSTANT TORQUE DRIVE'S CONTINUOUS INPUT CURRENT RATING, AND MINIMUM 75°C INSULATION RATING. USE COPPPER WIRE ONLY. SEE DRIVE RATINGS FOR CURRENT RATING.

7.) WIRE AND GROUND IN ACCORDANCE WITH NEC OR CEC, AND ALL APPLICABLE LOCAL CODES.

14. CONTROL WIRING

⚠ CAUTION

INSTALL, WIRE, AND GROUND IN ACCORDANCE WITH NEC OR CEC, AND ALL APPLICABLE LOCAL CODES.
ALL CONTROL WIRING MUST BE WIRED WITH CLASS I WIRING OR EQUIVALENT. USE COPPER WIRE RATED FOR A MINIMUM OF 75° C.

The drive can be controlled by the keypad or by operators wired to the control terminal strip. To run the drive from the keypad, wire the control per the instructions in the OPERATING BY KEYPAD CONTROL section.

Control wiring, when run external to the drive, MUST be in a separate conduit and away from all input and output power wiring. Use twisted wires or shielded cable grounded at drive panel ONLY.

Terminals marked 2 are the circuit common used for the start, stop, jog, fwd / rev, input select, local / remote, analog input, analog output, and E-stop functions. If necessary terminal 2 may be connected to chassis ground.

SURGE PROTECTION

Current and voltage surges and spikes in the coils of contactors, relays, and solenoids, near or connected to the drive can lead to faulty drive operation. A snubber circuit should be used on relay and contactor coils associated with the inverter. For AC loads snubbers should consist of a resistor and a capacitor in series across the coil. For DC loads a free-wheeling or flyback diode should be placed across the coil.

RUN COMMAND

Start-stop control can be accomplished by either a two wire or a three wire circuit. For two wire control, terminal 2 is connected to terminal 12A and the run contact is wired to terminals 1 and 2. For three wire control, a normally closed pushbutton is wired to terminals 1 and 2 (stop signal) and a normally open pushbutton is wired to terminals 2 and 12A (start signal).

SPEED REFERENCE SIGNAL

The drive allows for three speed reference signal types: a speed potentiometer (2.5 to 10 k Ohm), 4-20 MA, or 0-10 VDC signals. For control by a speed pot., the wiper lead is connected to terminal 5A, and the high and low end leads are connected to terminals 6 and 2, respectively. For 4-20 MA control, wire the positive to terminal 5B and the negative to terminal 2. For 0-10 VDC control, wire the positive to terminal 5D and the negative to terminal 2.

The input impedance of terminal 5A, speed control potentiometer input is 100 K ohms, the 0-10 VDC input, terminal 5D, is 200 K ohms, and the 4-20 MA input, terminal 5B, is 100 ohms (0.4 to 2.0 VDC). Terminal 2 is circuit common (the minus connection).

OUTPUT FREQUENCY / LOAD SIGNAL

The drive is equipped with output signals that are proportional to output frequency (speed) or load. These signals can be used to interface with other equipment or to operate speed or load meters. Three signals proportional to frequency are available: a 0-10 VDC voltage signal between terminals 10B and 2 (capable of sourcing 20 MA @ 10 VDC); a frequency output (40 to 50% duty cycle pulse train) between terminals 10C and 2 (12 VDC open circuit, 2200 ohm source impedance). The frequency is six times the drive output frequency; A 4-20 MA DC current signal between terminals 10D and 2; and a 0 - 10 VDC, or 2 - 10 VDC voltage signal between terminals 10E and 2, (capable of sourcing 20 MA @ 10 VDC).

Note: The output type must be selected in the case of the analog outputs - see the PARAMETER DESCRIPTION section.

AUXILIARY OUTPUT CONTACTS SERIES MODELS

The control board has two auxiliary relays with form "C" contacts, and an open collector (transistor) output which can be used to indicate several different drive functions - see the PARAMETER DESCRIPTION section, (Parameters 121, 122, and 124).

The terminals for relay number one are 16, 17, and 18. The terminals for relay number two are 19, 20, and 21. Terminals 17 and 20 are the respective commons. Contacts between 16 and 17, and 19 and 20 are normally open (N.O.). Contacts between 17 and 18, and 20 and 21 are normally closed (N.C.). Contacts are rated 2 amps at 28 VDC or 120 VAC.

The open collector output is at terminal 14. It is a current sinking type output and is rated at 24 VDC, 5 MA maximum. Control wiring diagrams show relays in the rest state (coils NOT energized)

FORWARD-REVERSE

Terminals 12B and 12C are used to select direction of motor rotation in the remote mode. Terminal 12B must be maintained closed to terminal 2 to select forward or terminal 12C must be maintained closed to terminal 2 to select reverse for the drive to start when in the remote mode.

JOG

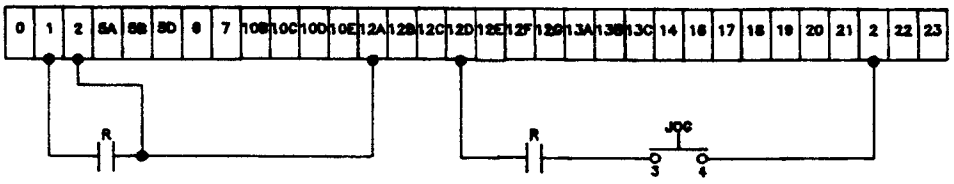
Closing the remote jog circuit, terminal 2 to terminal 12D, will activate the remote jog mode. When the jog mode is activated, the drive will start (or continue to run if already started), ramp to the jog speed at the jog accel (or decel) rate and run at the jog speed until the jog circuit is opened.

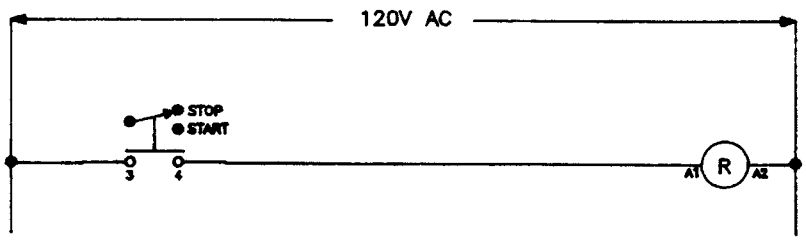
⚠ WARNING

THE JOG FUNCTION OVERRIDES THE KEYPAD & REMOTE STOP COMMANDS.

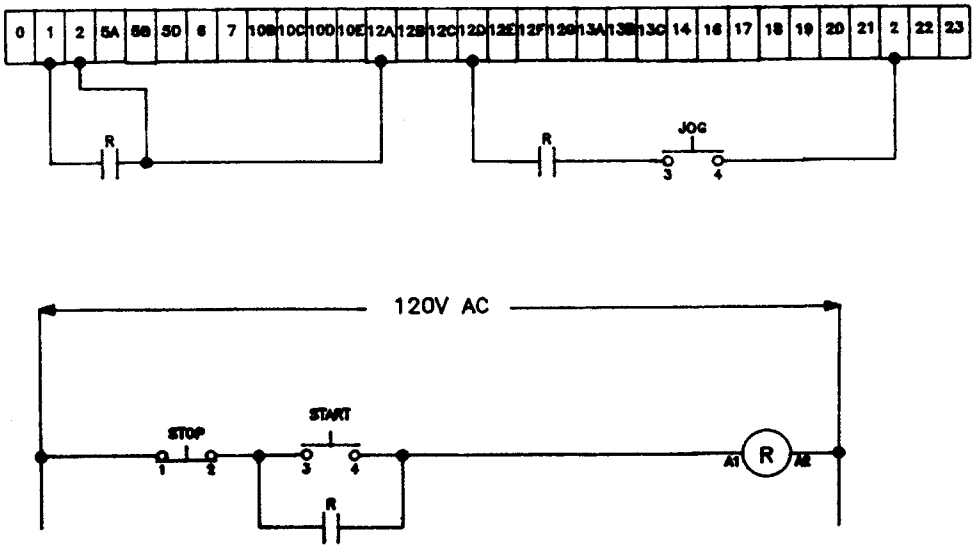
To disable the JOG function in the REMOTE mode while the STOP command is active, wire the control terminal strip per the following diagrams:

Two Wire Start/Stop





Three Wire Start/Stop



SPEED REFERENCE SELECTION

A speed reference is selected by closing one of the terminals 12E through 13C to terminal 2.

Closing terminal 12E to 2 activates a pot. wired to terminals 2, 5A, and 6. Closing terminal 12F to 2 activates a 4 - 20 MA speed reference wired to terminals 2 and 5B. Closing terminal 12G to 2 activates a 0 - 10 VDC speed reference wired to terminals 2 and 5D. Closing different combinations of terminals 13A, 13B, and/or 13C to terminal 2 will activate one of the seven preset speeds. See "Parameters # 11 - 17 PRESET SPEEDS" in the DESCRIPTIONS OF PARAMETERS section.

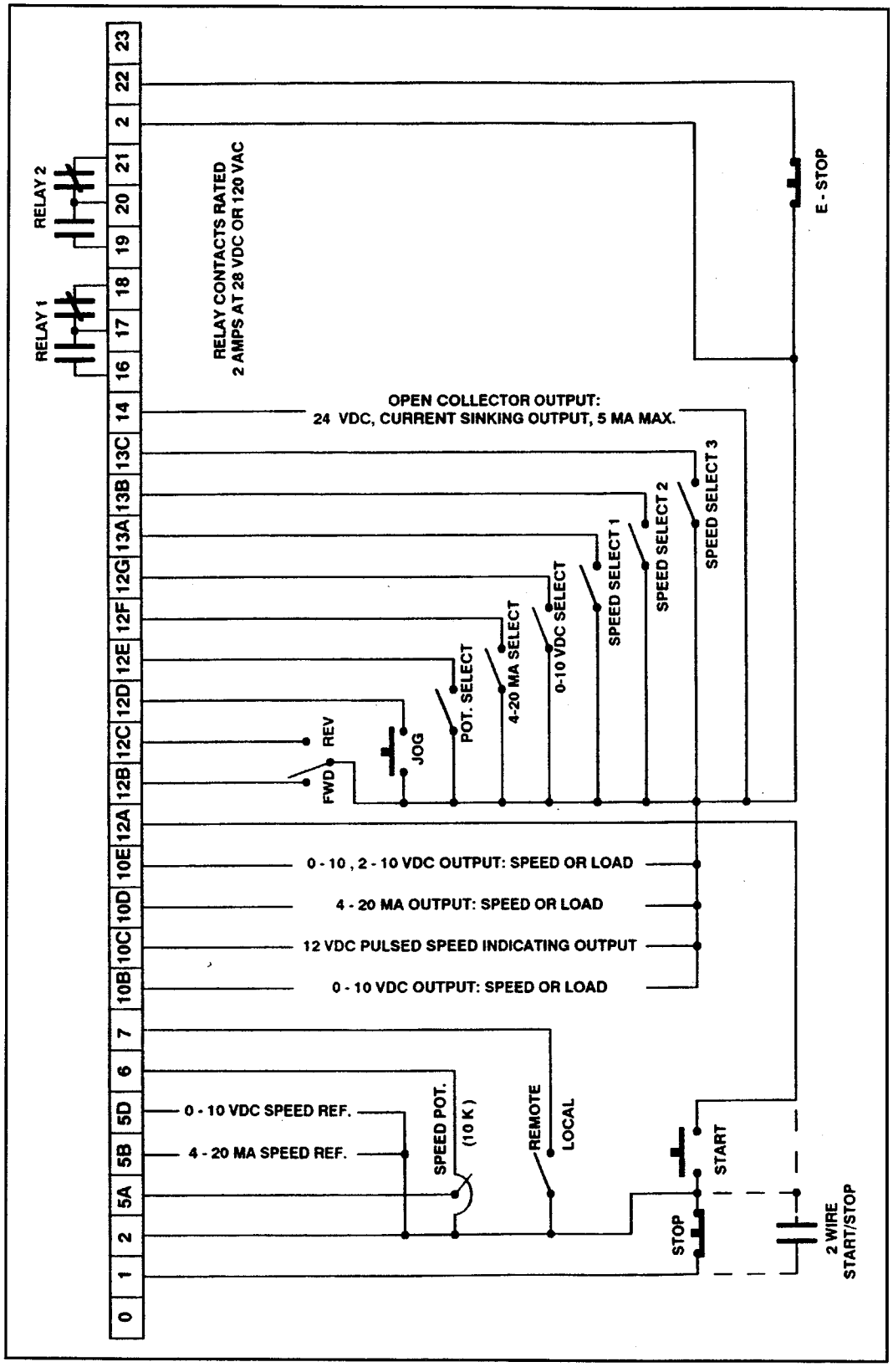
EMERGENCY STOP (E-Stop)

The control board has terminals to facilitate safety interlocks, and protective devices, (e.g. E-Stop pushbutton).

Opening terminals 22 to 2, will cause the drive to trip into the EMERGENCY STOP function. When the EMERGENCY STOP condition exists, the drive will COAST TO STOP, it will not follow the NORMAL DECEL ramp. (See the following parameters, NORMAL DECEL, (Parameter #30), COAST TO STOP, (Parameter #65), and DYNAMIC BRAKING, Parameter #86).

The drive will not start unless there is Emergency Stop protective devices, or a wire jumper closing terminals 22 to 2.

15. VSD57 SERIES CONTROL WIRING DIAGRAM



16. INITIAL POWER UP

⚠ DANGER

HAZARDOUS VOLTAGE

- **Hazard of electrical shock. Disconnect incoming power and wait three minutes before servicing drive. Capacitors retain charge after power is removed.**
- **DC bus LED is not an accurate indication of abscence of DC bus voltage.**
- **DO NOT short across capacitors or touch unsheilded components or terminal strip screw connections with voltage present**
- **Many parts in this drive controller, including printed wiring boards, operate at line voltage. DO NOT TOUCH. Use only electrically insulated tools.**
- **Failure to observe these precautions will cause shock or burn, resulting in severe personal injury or death.**

Before attempting to operate drive, motor, and driven equipment be sure all procedures pertaining to installation and wiring have been properly followed. Before powering up the drive for the first time, wire the drive for operation via the keypad (see OPERATING BY KEYPAD CONTROL), then follow the procedures below.

Disconnect the driven load from the motor. Verify that the drive input terminals L1, L2, and L3 are wired to the proper input voltage (per the nameplate rating of the drive). Verify the voltage selection has been properly selected per the "VOLTAGE SELECTION" section.

⚠ DANGER

INCOMING AC POWER MUST NOT BE WIRED TO T1, T2, OR T3!

DO NOT CYCLE INCOMING AC MORE THAN ONCE PER TWO MINUTES!

Failure to observe these precautions will cause shock or burn, resulting in severe personal injury or death.

Energize the incoming power line. The LCD display should light and indicate the standby mode. If the display does not appear, remove the incoming power, wait three minutes, check to be sure the bus capacitors have discharged, and verify correct installation of wiring. If wiring is correct, re-apply incoming power, note display for drive status. Next follow the procedures in the "PROGRAMMING" section to properly configure the parameter values.

Power down the drive and wait for the bus capacitors to discharge, then wire the proper (correct voltage) leads of the motor to T1, T2, and T3. Reapply incoming power and then press start. If the motor rotates in the wrong direction, remove the incoming power, wait three minutes, check to be sure the bus capacitors have discharged and swap motor wires connected to T1and T2.

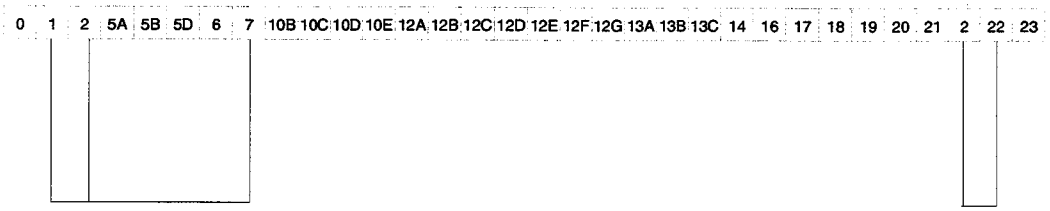
Rewire control wiring per directions in the CONTROL WIRING section, if required.

17. OPERATING BY KEYPAD CONTROL

The drive can be operated by keypad (local mode), by control devices wired to the control terminal strip (remote mode), by serial communications (serial mode), or by a combination of the terminal strip and either the keypad or serial communications control source. Units should first be run in the keypad control mode during initial start up. For information on wiring remote operators see the CONTROL WIRING section and the DESCRIPTION OF PROGRAMMABLE PARAMETERS sections.

SETTING UP FOR CONTROL BY THE KEYPAD

To operate by keypad control first wire the control terminal strip per the diagram depicted below:



WIRING FOR BASIC KEYPAD CONTROL

1.) 2 to 1 de-activates the remote stop. (NOTE: The remote stop function is always operational, even in the local mode).

2.) 2 to 7 to activate local (keypad) mode.

3.) 2 to 22 to de-activate E-stop.

Note : To Run in the remote mode, in addition to opening terminals 2 to 7, several terminal closures must be made: A contact closure needs to be made by closing terminal 1 to 2, and terminal 12A to 2. A direction must be selected by closing terminal 12B or 12C to 2. A speed reference type must be selected by closing terminal 12E, 12F, 12G, 13A, 13B, or 13C to terminal 2, Terminal 12D to 2, JOG, activates the jog function.

THIS CIRCUIT OVERRIDES THE START/STOP FUNCTION AND CAUSES THE DRIVE TO RUN AT THE SPEED DETERMINED BY THE JOG SPEED PARAMETER.

KEYPAD FUNCTIONS IN LOCAL OPERATING MODE

START, STOP - Note: The keypad STOP key is always active in both the LOCAL or REMOTE modes.

SPEED CONTROL - To change the speed via the keypad press the UP ARROW and DOWN ARROW keys to scroll to the desired speed, or input the desired speed with the numerical keys, and press ENTER.

JOG - To enter the keypad jog mode, press the JOG key while holding down the STOP key, and then release both keys. "JOG" will appear in the speed reference portion of the display. The drive will now jog whenever the JOG button is pressed. Press any other key than JOG to exit the jog mode.

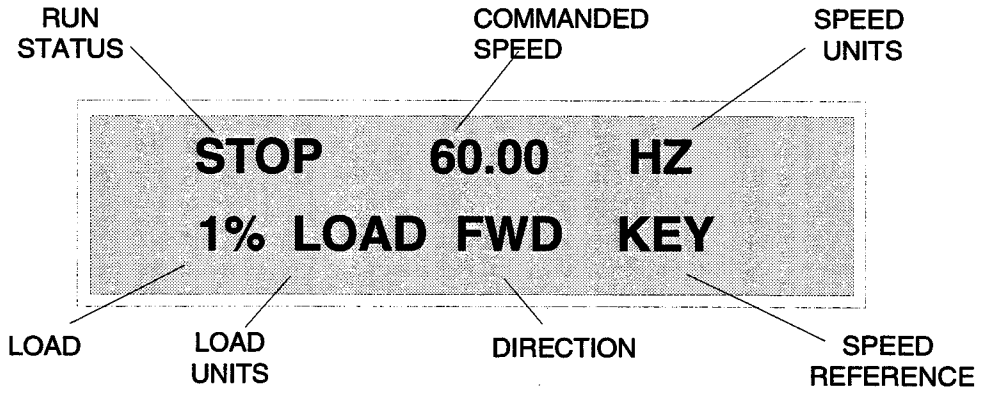
FORWARD/REVERSE - To change the direction of rotation press the FWD/REV key, and then press the ENTER key. Note: Parameter #66 must be set to FWD + REV for this key to be active. (NOTE: FORWARD ONLY is the factory default).

SPEED REFERENCE SELECTION (AUTO/MANUAL) - To change between keypad speed control (MAN) and some other speed reference type (AUTO) press the AUTO/MAN key, and then press ENTER. To activate a speed reference type other than keypad control, the corresponding terminal (12E, 12F, 12G, 13A, 13B, or 13C) on the control strip must be connected to terminal 2. See the control wiring section. Note: Parameter #67 must be set to AUTO/MANUAL SPEED, or AUTO/MANUAL LOCAL for this key to be active, - see the DESCRIPTION OF PARAMETERS section.

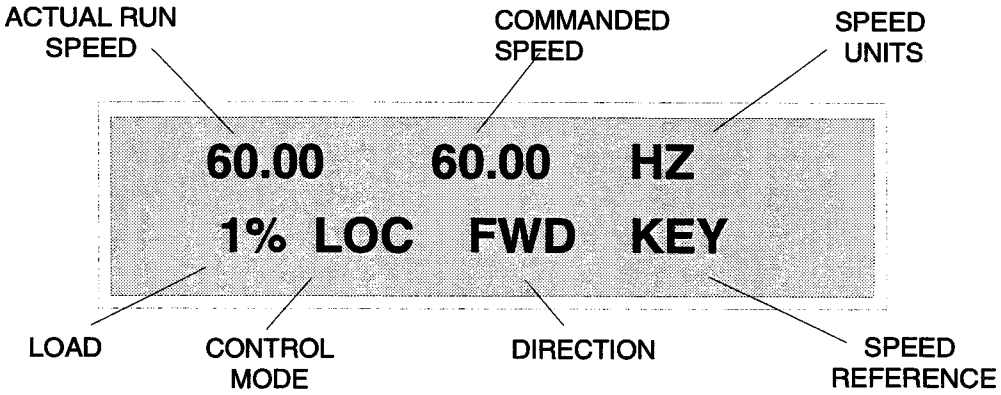
CLEARING MIS-KEYED INPUTS - Use the CLEAR key to clear errors made while entering data.

VIEWING A FAULT - To view the present fault condition press ENTER while in the operating mode. To view previous faults press Prog/Run and then ENTER. (Previous faults are stored in Parameter #200, see the DESCRIPTION OF PARAMETERS section).

THE VSD57 SERIES KEYPAD DISPLAY IN THE OPERATING MODE (NORMAL)



THE VSD57 SERIES KEYPAD DISPLAY IN THE OPERATING MODE - ACTUAL SPEED (ALTERNATE), PARAMETER #133.



18. MONITOR MODE

The Monitor Mode has four display functions: Time Since Start, Total Run Time, Total KiloWatt Hours, and Hours Until Maintenance Required.

Time Since Start displays the time since the drive was started. This value resets each time the START button is pressed or if power is removed from the drive.

Total Run Time displays the total elapsed run time. The value is displayed in hours and minutes. For memory purposes the value is rounded to the nearest hour and stored in non-volatile memory. This value is non-resettable.

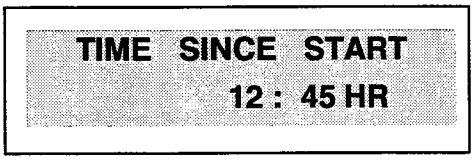
Total Kilowatt-Hours displays the total elapsed kilowatt-hours as calculated from the total elapsed run time, motor current and voltage. This value is non-resettable.

Hours Until Maintenance Required displays the time remaining until the Maintenance Target (Parameter #132) is reached. This parameter is usually used to indicate a time when maintenance needs to be completed on driven equipment (e.g. motor or gear box lubrication) Parameter #132 must be set to a value higher than zero for this function to be enabled.

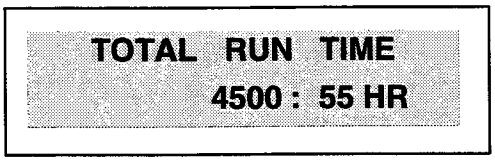
To enter the Monitor Mode press the ENTER button while in the Operating Mode. Pressing the ENTER button once will display the Time Since Start function. Pressing the ENTER button a second time will display the Total Run Time function. Pressing the ENTER button a third time will display the Total KiloWatt-Hour function. Pressing the ENTER button a fourth time will display the Hours Until Maintenance Required function if Parameter #132 is set to a value higher than zero. Pressing the ENTER button a fifth time will return the display to the Operating Mode.

Examples of the four Monitor Mode Functions:

Time Since Start Display

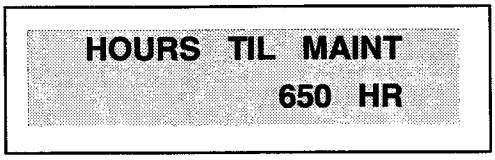


Total Run Time Display



Total Kilowatt-Hour Display

Hours until Maintenance Display

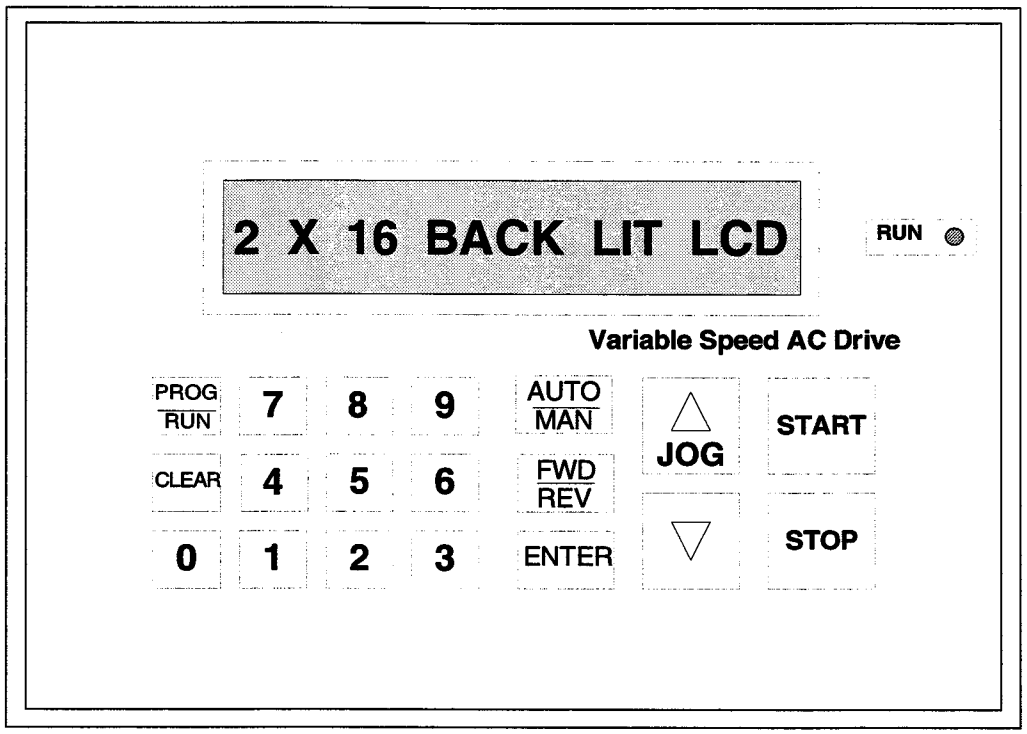


Parameter #132 -

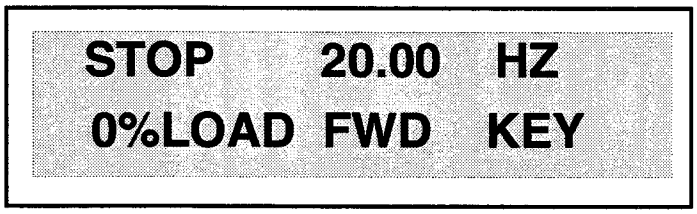
19. PROGRAMMING - CONFIGURATION

THE VSD57 SERIES KEYPAD

The drive is programmed using the keypad to enter the program parameter menu and change parameter values. The keypad may also be used to operate the drive when in the local mode (terminal 7 closed to terminal 2). An LED to the right of the LCD display indicates when the drive is running (power is applied to the motor).



When the drive is first powered up it will be in the operating mode in standby. The display will appear as follows:

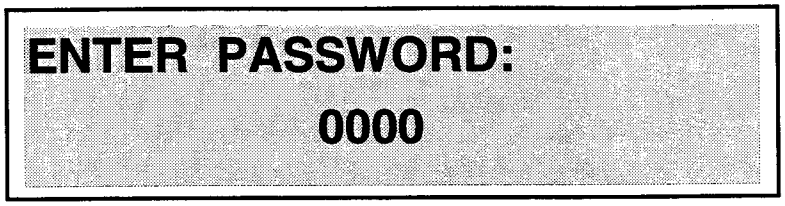


To program the drive, first access the program mode by pressing the PROG/RUN button. This will result in either direct entry into the program mode if password protection is disabled or the ENTER PASSWORD prompt will be displayed if password protection is enabled. If the ENTER PASSWORD: prompt is displayed (see diagram below) input the appropriate password and press the ENTER key.

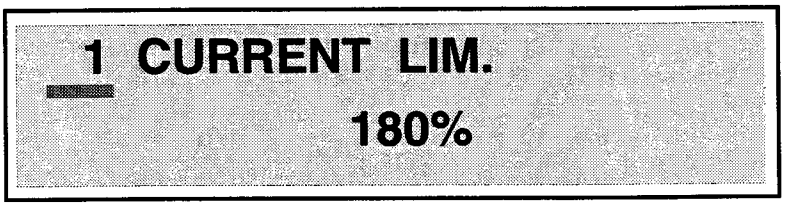
Pressing the ENTER key, prior to entering a password, upon initially entering the program mode will access Parameter #200 PREVIOUS FAULTS. This parameter retains a historical log of ten previous drive protection trip conditions.

If an asterisk is showing in the upper right hand corner of the display, it is not necessary to input the password before pressing ENTER. The asterisk will appear for approximately three minutes after initial entry into the drive menu. Pressing the ENTER button when the asterisk is showing, places the drive in programming mode, at the last parameter viewed.

Upon entering the program mode the first item in the parameter list will be displayed (see below).



To change the displayed parameter, scroll through the menu using the UP and DOWN keys, or move directly



to the desired point by keying in a new parameter number with the numerical keys and then pressing ENTER.

To change the parameter value, press ENTER to move the "cursor" (highlighted character) from the parameter number ("1" in the above example) to the parameter value ("180%" in the above example). Then while the cursor is on the parameter value change the parameter value by scrolling to the desired value using the UP arrow and DOWN arrow keys and pressing the ENTER key. Numeric parameter values may also be changed by keying in the desired value via the numerical keys and then pressing ENTER.

See the PARAMETER MENU and PARAMETER DESCRIPTION sections for more information on programming.

20. PROGRAMMABLE PARAMETER MENU

PARAMETER MENU				
ITEM NUMBER	**PARAMETER NAME**	**VALUE LIMIT OR MENU CHOICE**	**DEFAULT SETTING**	**PASSWORD LEVEL**
1	CURRENT LIMIT	5 - 120 % (for VT) - 180% (for CT)	120 % (for VT) - 180% (for CT)	1
2	THERMAL OVERLOAD	50 - 120 % (for VT) - 150% (for CT)	120 % (for VT) - 150% (for CT)	1
3	SLIP COMPENSATION	0 - 5.0 %	0.0 %	1
4	SPEED @ 4 MA / 0 VDC	0.00 - 360.00 HZ	0.00 HZ	1
5	SPEED @ 20 MA / 10 VDC	0.00 - 360.00 HZ	60.00 HZ	1
9	PRESET ACC / DEC	DISABLED, ENABLED	DISABLED	1
11-13	SPEED PRESETS #1- #3	0.00 - 120.00 HZ	10.00 HZ	1
14-17	SPEED PRESETS #4- #7	0.00 - 120.00 HZ	10.00 HZ	1
19	JOG SPEED	0.00 - 120.00 HZ	10.00 HZ	1
20	NORMAL ACCEL	SEE TABLE 1	30.0 SEC	1
21-27	PRESET #1 - #7 ACCEL	SEE TABLE 1	30.0 SEC	1
29	JOG ACCEL	SEE TABLE 1	30.0 SEC	1
30	NORMAL DECEL	SEE TABLE 2	30.0 SEC	1
31-37	PRESET #1 - #7 DECEL	SEE TABLE 2	30.0 SEC	1
38	TAPER DECEL	DISABLED, ENABLED	DISABLED	1
39	JOG DECEL	SEE TABLE 2	30.0 SEC	1
41	SKIP SPEED #1	0.00 - 120.00 HZ	0.00 HZ	2
42	SKIP SPEED #2	0.00 - 120.00 HZ	0.00 HZ	2
43	SKIP SPEED #3	0.00 - 120.00 HZ	0.00 HZ	2
44	SKIP BANDWIDTH	0.00 - 10.00 HZ	2.00 HZ	2
50	TB-10B / D FUNCTION	0 -10 V FREQ, 0 -10 V LOAD, 4 - 20 MA FREQ, 4 - 20 MA LOAD	0 - 10V FREQ	2
51	FREQUENCY OUT @ MAXIMUM	1.00 - 360.00 HZ	60.00 HZ	2
52	TB-10D RESISTANCE OHM	0 - 250	250	2
53	TB-10E FUNCTION	0 - 10V FREQ, 0 -10 V LOAD, 2 -10 V FREQ, 2 -10 V LOAD, DISABLED	0 - 10V LOAD	2
54	LOAD OUT AT MAXIMUM	10 - 200 %	125 %	2
61	MINIMUM FREQUENCY	0.00 - 120.00 HZ	0.50 HZ	2
62	MAXIMUM FREQUENCY	0.00 - 120.00 HZ	60.00 HZ	2
64	STABILITY	NORMAL, LOW, MED, HIGH	NORMAL	2
65	COAST TO STOP	ENABLED, DISABLED	ENABLED (for VT) DISABLED (for CT)	2
66	FORWARD / REVERSE	FWD ONLY, REV ONLY, FWD + REV	FWD ONLY	2
67	AUTO / MANUAL SEL	AUTO SPEED, MANUAL SPEED, AUTO / MANUAL SPEED AUTO / MANUAL LOCAL	AUTO / MANUAL SPEED	2
70	AUTO START	DISABLED, ENABLED	DISABLED	2
71	RESTART ON FAULT	DISABLED, ENABLED	DISABLED	2
72	RESTART LIMIT	1 - 5	3	2
73	RESTART DELAY	1.0 - 180.0 SEC	5.0 SEC	2

PARAMETER MENU				
ITEM NUMBER	**PARAMETER NAME**	**VALUE LIMIT OR MENU CHOICE**	**DEFAULT SETTING**	**PASSWORD LEVEL**
75	RESTART DECEL	0.1 - 999.9 SEC	10.0 SEC	2
76	RESTART CURRENT LIMIT	10 - 180 %	100 %	2
80	DC BRAKE	DISABLED, CONTINUOUS, ON START, ON STOP, @ ZERO SPEED, START & STOP, ZERO SPEED & STOP	DISABLED	2
82	DC BRAKE LOAD	20 - 180 %	0 %	2
83	STOP BRAKE	0.1 - 60.0 SEC	5.0 SEC	2
84	START BRAKE	0.1 - 20.0 SEC	5.0 SEC	2
86	DYNAMIC BRAKING	DISABLED, ENABLED	DISABLED	2
90	SPEED UNITS	HZ, RPM, % RPM, /S, /M, /H, #/S, #/M, #/H	HZ	2
91	SPEED MULTIPLIER	0.10 - 400.00	30.00	2
92	LOAD UNITS	% LOAD, AMPS	% LOAD	2
93	LOAD MULTIPLIER	0.01 - 300.00	1.00	2
94	AC INPUT	240 / 480 / 590 200 / 400 / 480	240 / 480 / 590	2
95	SPEED DP	XXXXX, XXXX.X, XXX.XX, XX.XXX, X.XXXX, .XXXXX	XXXXX	2
100	BASE FREQUENCY	10.00 - 360.00 HZ	60.00 HZ	2
101	V/HZ CURVE TYPE	LINEAR - 1.0, VAR TORQUE - 1.3, VAR TORQUE - 1.6, VAR TORQUE - 2.0	VAR TORQUE - 1.6 (for VT) LINEAR - 1.0 (for CT)	2
104	AUTO V BOOST	0.0 - 20.0 %	0.0 %	2
105	MANUAL V BOOST	0.0 - 30.0 %	SEE TABLE 3	2
121	RELAY #1 FUNCTION	NO FUNCTION, RUN, FAULT, FAULT LOCKOUT, AT SPEED, CURRENT LIMIT, FOLLOWER PRESENT, AUTO SPEED MODE, START PENDING, ABOVE SET SPEED, MAINTENANCE TARGET	RUN	2
122	RELAY #2 FUNCTION	NO FUNCTION, RUN, FAULT, FAULT LOCKOUT, AT SPEED, CURRENT LIMIT, FOLLOWER PRESENT, AUTO SPEED MODE, START PENDING, ABOVE SET SPEED, MAINTENANCE TARGET	FAULT	2
123	RELAY SET SPEED	0.00 - 120.00 HZ	0.50 HZ	2
124	TB-14 FUNCTION	NO FUNCTION, RUN, FAULT, FAULT LOCKOUT, AT SPEED, CURRENT LIMIT, FOLLOWER PRESENT, AUTO SPEED MODE, START PENDING, ABOVE SET SPEED, MAINTENANCE TARGET	NO FUNCTION	2
130	DRIVE POWER	0 - 150 (for CT), 0 - 200 (FOR VT)	0	2
132	MAINTENANCE TARGET	0 - 65,000 HR	0 HR	2
133	DISPLAY FUNCTION	NORMAL, ACTUAL SPEED	NORMAL	2

PARAMETER MENU				
ITEM NUMBER	**PARAMETER NAME**	**VALUE LIMIT OR MENU CHOICE**	**DEFAULT SETTING**	**PASSWORD LEVEL**
137	CARRIER FREQUENCY SELECTION	1.5 kHZ, 8 kHZ, 10 kHZ, 12 kHZ (NOTE: DERATING INFORMATION IN SECTION 5.1)	1.5 kHZ	2
141	FACTORY PARAMETERS	DISABLED, ENABLED	DISABLED	2
142	CLEAR HISTORY	DISABLED, ENABLED	DISABLED	2
144	SOFTWARE VERSION	213-020X	213-020X	2
145	SERIAL COMMUNICATIONS	DISABLED, DETECT, MONITOR ONLY, PROGRAM, CONTROL, PROGRAM & CONTROL	PROGRAM	2
146	SERIAL TIMEOUT	0 - 30 SEC	8 SEC	2
147	SERIAL ADDRESS	1 - 30	1	2
148	ENABLE PASSWORDS	DISABLED, ENABLED	ENABLED	2
149	LEVEL 1 PASSWORD	0000 - 9999	9100	2
150	LEVEL 2 PASSWORD	0000 - 9999	0019	2
198	LANGUAGE	ENGLISH, SPANISH	ENGLISH	2
200	PREVIOUS FAULT	THIS "PARAMETER" IS FOR VIEWING ONLY	N/A	0

21. DESCRIPTION OF PARAMETERS

1 - CURRENT LIMIT

The current limit setting determines the maximum value of the output current. This is usually done to limit motor torque capability. For most applications the current limit is maintained at the maximum setting.

2 - THERMAL OVERLOAD

The THERMAL OVERLOAD setting is used to protect the motor from overheating due to excess current. The trip time for the THERMAL OVERLOAD setting is based on what is known as an "inverse I squared t" function. This circuit emulates the function of a mechanical thermal overload relay (commonly referred to as "heaters").

Set the THERMAL OVERLOAD to a value which is equal to the ratio of the motor amp rating to the drive amp rating X 120% for V.T. or X 150% for C.T. . This will result in a trip at 120% for V.T. or 150% for C.T. of the motor rating in one minute and allow for the continuous operation at a 1.0 service factor.

Example: For a 10 Hp, 480 VAC drive operating a 7.5 Hp motor with a full load current rating of 11 amps. Divide the motor current rating by the drive output current rating and then multiply by 120% for V.T. or 150% for C.T..
For V.T. (11.0/14.0) x 120% = 94% approx. (for one minute), and (11.0/14.0) x 100% = 79% approx. (continuous)
For C.T. (11.0/14.0) x 150% = 118% approx. (for one minute), and (11.0/14.0) X 100% = 79% approx. (continuous).

3 - SLIP COMPENSATION

SLIP COMPENSATION is used to compensate for changes in motor speed ("slip") which occur due to changes in load. In a standard AC induction motor, as the load on the motor increases, the motor current increases and the motor shaft speed decreases. By increasing the output frequency in response to the increased motor current, the reduction in the motor speed due to increased load is greatly reduced. Speed regulation with no load to full load fluctuations of less than 1% of base speed are attainable in most applications. SLIP COMPENSATION is often set to 3% since that is the standard slip rating of most AC induction motors. 0 Value means slip compensation is disabled.

4 - SPEED @ 4MA / 0V
5 - SPEED @ 20MA / 10V

These two parameters determine the gain in the 4 - 20 MA (or 20 - 4 MA) and 0 -10 VDC (or 10 - 0 VDC) follower circuit. The follower circuit is set to be either proportional (4 - 20 MA) or inversely proportional (20 - 4 MA) depending on which value is larger. The speed follower extremes can be set to any value at or between 0 - 360 HZ.

Example: To follow the speed of a 4 - 20 MA input signal where it is desired to have a minimum speed of 0 HZ at 4 MA and a maximum speed of 60 HZ at 12 MA; set Parameter #4 to 0 HZ, Parameter #5 to 120 HZ, and MAXIMUM FREQUENCY (Parameter #62) to 60 HZ.

Parameter #5 is set to 120 HZ since a line which passes through the points (0 HZ, 4 MA) and (120 HZ, 20 MA) also passes through point (60 HZ, 12 MA). Setting the MAXIMUM FREQUENCY to 60 HZ prevents the output frequency from rising above 60 HZ as the follower signal rises above 12 MA.

9 - PRESET ACC / DEC

This parameter is used to ENABLE or DISABLE the individual acceleration and deceleration rates for each of the seven speed presets. When disabled the NORMAL ACCEL (Parameter #20) and NORMAL DECEL (Parameter #30) control the rate of acceleration and deceleration of all the presets.

11-17 - SPEED PRESETS #1- #7

Speed presets are pre-programmed speeds which are activated via contact closures between terminal 2 and terminal 13A, 13B, and/or 13C. The presets can be set to any value between the MINIMUM FREQUENCY and MAXIMUM FREQUENCY. The speed presets are activated by the multiplex scheme shown in the following tables:

PRESET SPEED ACTIVATION			
PRESET NUMBER	**TB-13A TO TB-2**	**TB-13B TO TB-2**	**TB-13C TO TB-2**
ONE	CLOSED	OPEN	OPEN
TWO	OPEN	CLOSED	OPEN
THREE	OPEN	OPEN	CLOSED
FOUR	CLOSED	CLOSED	OPEN
FIVE	CLOSED	OPEN	CLOSED
SIX	OPEN	CLOSED	CLOSED
SEVEN	CLOSED	CLOSED	CLOSED

19 - JOG SPEED

The JOG SPEED determines the speed when a JOG is called for from the keypad (local JOG mode) or from a contact closure between terminals 2 and 12D (remote Jog mode). The JOG SPEED can be set to any value between the MINIMUM FREQUENCY and the MAXIMUM FREQUENCY.

JOG SPEED is usually set to a low value (5-10 HZ). For information on activating the JOG function see the OPERATING FROM THE KEYPAD and CONTROL WIRING sections.

20 - NORMAL ACCEL

This parameter sets the acceleration rate when the speed is commanded from the keypad, a potentiometer, 4-20 MA, 0-5 VDC, or 0-10 VDC. It also determines the acceleration for the preset speeds if the PRESET ACC/DEC is DISABLED. The NORMAL ACCEL does not have any effect when the speed is commanded by JOG. Minimum acceleration times vary with horsepower, SEE TABLE 1 for the NORMAL ACCEL value limit.

The ability to accelerate a given load at a particular rate will be limited by the output power capabilities of the drive/motor combination.

NOTE: All acceleration and deceleration times are based on the time to increase or decrease speed from 0 HZ to the BASE FREQUENCY (Parameter #100) value.

21-27 - PRESET #1 ACCEL - PRESET #7 ACCEL

These parameters set each individual acceleration rate when the speed is commanded by the corresponding preset speed (Parameters #1- #7) and PRESET ACC/DEC (Parameter #9) is set to ENABLED. Minimum acceleration times vary with horsepower, SEE TABLE 1 for the PRESET ACCEL value limit.

29 - JOG ACCEL

This parameter sets the acceleration rate for the Jog speed. Minimum acceleration times vary with horsepower, SEE TABLE 1 for the JOG ACCEL value limit.

TABLE 1
ACCELERATION TIMES

NORMAL ACCEL, (PRESET SPEEDS #1 THRU #7 ACCEL, AND JOG ACCEL)
VALUE LIMIT OR MENU CHOICE AND FACTORY DEFAULT

MODELS	VSD57 230 TO 460V		MODEL	VSD57 575V	
HORSEPOWER	VALUE LIMIT OR MENU CHOICE	FACTORY DEFAULT	HORSEPOWER	VALUE LIMIT OR MENU CHOICE	FACTORY DEFAULT
1 - 15 HP	0.1 - 3600.0 SEC	30.0 SEC	1 - 15 HP	0.1 - 3600.0 SEC	30.0 SEC
20 - 200 HP	1.0 - 3600.0 SEC	30.0 SEC	20 - 200 HP	1.0 - 3600.0 SEC	30.0 SEC

30 - NORMAL DECEL

This parameter sets the deceleration rate when the speed is commanded by the keypad, potentiometer, 4 -20 MA, 0-5 VDC, 0-10 VDC, or speed presets when PRESET ACC/DEC is in the DISABLED mode. Dynamic braking may be needed to provide enough decelerating capacity to slow large inertia loads from higher speeds. See OPTIONS-DYNAMIC BRAKING. Minimum deceleration times vary with horsepower, SEE TABLE 2 for the NORMAL DECEL value limit.

31-37 - PRESET #1 DECEL - PRESET #7 DECEL

These parameters set each individual deceleration rate when the speed is commanded by the corresponding preset speed (Parameter #1- #7) and PRESET ACC/DEC is set to ENABLED. Minimum deceleration times vary with horsepower, SEE TABLE 2 for the PRESET DECEL value limit.

38 - TAPER DECEL

Taper decel varies the decel "ramp" in order to increase stopping capacity on high inertia loads.

When this parameter is enabled, the decel ramp is altered from a linear relation to the "top half of an S-curve". During the first part of the decel period, when rotational kinetic energy is high, the rate of decel is low. During the later part of the decel period the rate of decel increases.

39 - JOG DECEL

Jog Decel sets the deceleration rate for the Jog speed. Minimum deceleration times vary with horsepower, SEE TABLE 2 for the JOG DECEL value limit.

TABLE 2
DECELERATION TIMES

NORMAL DECEL, (PRESET SPEEDS #1 THRU #7 DECEL, AND JOG DECEL)
VALUE LIMIT OR MENU CHOICE AND FACTORY DEFAULT

MODELS	VSD57 230 TO 480V		MODEL	VSD57 575V	
HORSEPOWER	VALUE LIMIT OR MENU CHOICE	FACTORY DEFAULT	HORSEPOWER	VALUE LIMIT OR MENU CHOICE	FACTORY DEFAULT
1 - 7.5 HP	0.1 - 3600.0 SEC	30.0 SEC	1 - 5 HP	0.1 - 3600.0 SEC	30.0 SEC
10 - 15 HP	0.5 - 3600.0 SEC	30.0 SEC	7.5 - 10 HP	0.5 - 3600.0 SEC	30.0 SEC
20 - 40 HP	2.5 - 3600.0 SEC	30.0 SEC	15 - 20 HP	2.5 - 3600.0 SEC	30.0 SEC
50 - 75 HP	7.5 - 3600.0 SEC	30.0 SEC	25 - 40 HP	7.5 - 3600.0 SEC	30.0 SEC
100 -200 HP	15.0 - 3600.0 SEC	30.0 SEC	50 - 75 HP	15.0 - 3600.0 SEC	30.0 SEC
			100 - 200 HP	25.0 - 3600.0 SEC	30.0 SEC

41 - 44 - SKIP SPEEDS

Parameters #41 through #44 are used to prevent continued operation at critical speeds. Critical speeds are speeds which cause mechanical resonance, usually causing excessive vibration in the driven equipment. The SKIP SPEEDS (Parameters #41 - #43) and SKIP BANDWIDTH (Parameter #44) are used to define up to three speed ranges which correspond to critical speeds (speed avoidance ranges). The SKIP SPEEDS are the mid-points of each of the speed avoidance ranges. The SKIP BANDWIDTH is the width of the speed avoidance ranges.

If the commanded speed lies within the speed avoidance range, the drive output speed will not enter the range, it will settle at the boundary determined by the skip frequency and skip bandwidth parameter settings. If the commanded speed lies on the opposite side of the speed avoidance range the output frequency will ramp thru the speed avoidance range to the value of the commanded frequency.

50 - TB-10B & TB-10D FUNCTION

This parameter selects the analog output signal at terminals 10B and 10D to be either frequency or load indicating and either 0-10VDC or 4-20 MA. This parameter determines the function of both 10B and 10D - they are not independent. Set the parameter to the desired setting and wire to terminal 10B if a 0-10 VDC signal is desired or wire to 10D if a 4-20 MA signal is desired. The parameter can be set to one of four values: 0-10 V FREQ, 0-10 V LOAD, 4-20 MA FREQ, 4-20 MA LOAD.

The load at terminal 10D should be exactly 250 ohms. If the load cannot be set to 250 ohms, adding a series resistor or changing Parameter #52 (TB-10D Resistance Ohms) to the actual load resistance. Any load less than 250 ohms decreases the output signal resolution. This signal may not be used to drive signal powered 4 - 20 MA devices.

51 - FREQUENCY OUT AT MAXIMUM

This parameter scales the analog frequency indicating output signals at terminals 10B, 10D, or 10E (see Parameters #50 and #53). Set the parameter value to the drive output frequency which is to correspond to maximum output level of the speed indicating signal (10VDC or 20 MA).

52 - TB-10D RESISTANCE OHMS

This parameter is used to select the output impedance of the 4-20 MA signal output from terminal 10D. The total resistance that is connected between terminal 2 and terminal 10D should equal 250 ohms. A series resistor can be added to accomplish this.When the resistance of the 4 - 20 MA device is less than 250 ohms, and a series resistor cannot be added, the actual measured resistance value needs to be entered to Parameter #52, in order to have the proper scaling with the 4 - 20 MA output signal on terminal 10D.

53 - TB-10E FUNCTION

This parameter selects the analog output signal at terminal 10E to be either frequency indicating or load indicating and either 0-10VDC or 2-10VDC. The parameter can be set to one of five values: 0-10 V FREQ, 0-10 V LOAD, 2-10 V FREQ, 2-10 V LOAD, DISABLED.

A 4 - 20 MA signal can be derived from these signals by programming this parameter for 2 - 10 VDC, and adding a series resistor so that the total load resistance equals 500 ohms.

54 - LOAD OUT AT MAXIMUM

This parameter scales the analog load indicating output signals at terminals 10B, 10D, or 10E (see Parameters #50 and #53). Set the parameter value to the load (%) output value which is to correspond to maximum output level of the load indicating signal (10VDC or 20 MA).

61 - MINIMUM FREQUENCY

The Minimum frequency determines the lowest output frequency (in Hertz) at which the drive will operate continuously. Note that the lowest speed at which a standard AC induction motor can produce torque is limited by the slip range, usually 3% of full speed. This means a standard motor will not produce full rated torque below 2 Hz. Note: units are always in HERTZ. The minimum frequency range is 0.0 Hz up to the MAXIMUM FREQUENCY.

When the Minimum frequency is set to 0.0 HZ, the drive may be run in ZERO SPEED MODE (no frequency or voltage is outputted from the drive). ZERO SPEED operation is used with applications requiring the ability to start and stop the drive using only the selected speed control source.

NOTE: The drive must be initially started using any of the normal start commands.

62 - MAXIMUM FREQUENCY

The Maximum frequency determines the highest output frequency (in Hertz).

⚠ CAUTION

THE MAXIMUM FREQUENCY MUST BE SET LOW ENOUGH TO AVOID OVER SPEEDING THE MOTOR AND OR DRIVEN EQUIPMENT. OVER SPEEDING THE MOTOR AND/OR DRIVEN EQUIPMENT MAY RESULT IN DAMAGE TO EQUIPMENT AND INJURY TO PERSONNEL! CONSULT MOTOR MANUFACTURER BEFORE OPERATING THE MOTOR ABOVE ITS RATED SPEED!

64 - STABILITY

The STABILITY adjustment alters the drive output to compensate for differences in motor inductance, capacitance, and impedance. Certain motors may operate erratically under lightly loaded conditions. If motor operation is erratic at low load levels, adjusting the STABILITY setting to LOW COMP, MED COMP, or HIGH COMP may give smoother operation.

65 - COAST TO STOP

VSD57 Series drives are shipped with the COAST TO STOP parameter in the ENABLED mode. When ENABLED and a drive "STOP" command is given, the motor will behave as though the drive was instantaneously disconnected. If RAMP TO STOP operation is required (COAST TO STOP parameter DISABLED).

Note: Dynamic braking may be needed to provide enough decelerating capacity to slow large inertia loads from higher speeds.

66 - FORWARD / REVERSE

This parameter is used to limit the motor rotation direction to forward or reverse, or to allow rotation in both directions. The parameter can be set to one of three values: FWD ONLY, REV ONLY, FWD + REV. FWD ONLY and REV ONLY disable the FWD/REV key and corresponding drive terminals Forward (terminal 12B) / Reverse (terminal 12C), in the REMOTE mode. FWD + REV enables the FWD/REV key allowing the motor direction to be changed from the keypad (local mode) or terminals 12B and 12C (remote mode).

When FWD + REV is selected and the opposite direction is activated by the keypad (local mode) or the terminal strip (remote mode) to change the motor direction, the frequency will ramp down to zero speed at the decel rate and then ramp up to the set speed in the opposite direction.

Activate the forward direction in the remote mode by closing terminal 2 to 12B. Activate the reverse direction in the remote mode by closing terminal. In the local mode, activate different motor directions by first pressing the FWD/REV key and then pressing the ENTER key.

When placing the VSD57 Series models in the REMOTE mode, the appropriate direction contact must be closed in order for the drive to run.If neither or both contacts are closed, the drive will STOP if running, or will not START if stopped.

67 - AUTO / MANUAL SELECT

This parameter is used to limit function of AUTO/MAN key on the keypad. Possible settings are, AUTO SPEED, MANUAL SPEED, AUTO / MANUAL LOCAL, or AUTO / MANUAL SPEED.

If set to MANUAL SPEED the drive's speed reference will default to keypad control, when in the LOCAL MODE, and the AUTO/MAN key is disabled.

If set to AUTO SPEED, the drive's speed reference will default to whichever speed control method is activated by the terminal strip (see the Control Wiring Section), and the AUTO/MAN key is disabled.

Note: If no speed control method is activated by a terminal strip connection, the speed reference will default to keypad control even if this parameter is set AUTO SPEED.

If set to AUTO / MANUAL LOCAL, the AUTO/MAN key is active and control may be switched between the drive keypad, and the drive terminal strip, when in the LOCAL MODE only.

If set to AUTO / MANUAL SPEED, the AUTO/MAN key is active and control may be switched between the drive keypad, and the drive terminal strip in either the local or remote mode.

Note: If no speed control method is activated by a terminal strip connection, the speed reference will default to keypad control.

70 - AUTO START

This parameter is used to automatically start the drive upon application of input power. The drive must be wired for two wire start/stop control with a maintained start contact which is in the closed position. NOTE:

The drive output frequency will ramp up from zero (no speed search will be conducted) whenever this parameter is enabled.

In the local (keypad) or remote mode, terminal 1 and 12A must be closed to terminal 2 for this function to be active.

⚠ WARNING

UNINTENDED EQUIPMENT ACTION

- **Automatic start can only be used for machines or installations that present no danger for personnel or equipment in the event of automatic restarting**
- **Equipment operation must conform with national and local safety regulations**
- **Failure to observe this precaution can result in equipment damage, severe personal injury, or death.**

71 - RESTART ON FAULT

This parameter sets the drive to either restart after a fault or to remain tripped until it is reset by calling for a stop.

If restart is ENABLED and the drive trips, the drive will attempt to restart after a time delay set by RESTART DELAY. If the drive is unable to restart, the drive will attempt additional restarts, each after a time delay. The number of attempted restarts is determined by the RESTART LIMIT.

The RESTART ON FAULT function is designed to restart into a coasting motor by conducting a speed search to catch the motor while it is still spinning, and then accelerate to the commanded speed.

Note: The drive can be set to conduct a speed search upon power up by setting Parameter #70 to DISABLED and Parameter #71 to ENABLED.

The speed search is conducted by first restarting the drive at MAXIMUM FREQUENCY at a reduced voltage. The voltage is then increased and the motor current rises to a high level causing the drive to go into current limit (based on the RESTART CURRENT LIMIT setting). The motor current rises to the current limit level because of the differential between the output frequency of the drive and the speed at which the motor is coasting. The drive output frequency then decelerates, at the RESTART DECEL rate, until the motor current drops below the current limit level (this occurs when the drive output frequency is matched to the motor speed). Once output frequency and motor speed are matched, the drive output frequency is accelerated returning the motor to the commanded speed. NOTE: The drive output frequency will ramp up from zero in the event of restart after a power outage (no speed search will be conducted) if Parameter #70, AUTO START, is enabled.

In the local (keypad) or remote mode, terminal 1 and 12A must be closed to terminal 2 for this function to be active.

⚠ WARNING

UNINTENDED EQUIPMENT ACTION

- **Automatic restart can only be used for machines or installations that present no danger for personnel or equipment in the event of automatic restarting**
- **Equipment operation must conform with national and local safety regulations**
- **Failure to observe this precaution can result in equipment damage, severe personal injury, or death.**

72 - RESTART LIMIT

The RESTART LIMIT determines the number of times the drive will attempt to restart after a trip. If unable to restart (fault condition persists) within the set number of attempts, the drive will display FAULT LOCKOUT and cease attempting to restart. The drive will not attempt to restart in the event of an E-stop trip or into a shorted motor without first being reset by opening the stop circuit (terminal 1 to terminal 2), or pressing the keypad stop key. This setting must be higher than the normal operating limit.

73 - RESTART DELAY

The RESTART DELAY is the time delay in between restart attempts. During this time delay the operator screen will display a warning, "WARNING! START PENDING". This parameter also determines the time period which must pass, after a fault, before the drive can be reset.

75 - RESTART DECEL

The RESTART DECEL sets the rate at which the drive lowers the output frequency during a restart speed search.

This parameter and the RESTART CURRENT LIMIT are set for a particular system by trial. The RESTART DECEL time should be minimized to limit speed transients during the speed search. However, setting the value too low can result in high bus voltage tripping.

76 - RESTART CURRENT LIMIT

The RESTART CURRENT LIMIT determines the current limit value used during the auto restart on trip sequence.

The RESTART CURRENT LIMIT should be minimized to limit speed transients during the speed search. However, setting the value too low can result in high bus voltage tripping. This setting must be higher than the operating current.

80 - DC BRAKE

DC injection braking provides shaft stopping torque by supplying low level DC voltage to the motor's stator coils. DC braking can provide up to the motor's full rated torque for short periods of time.

⚠ WARNING

NO HOLDING TORQUE

- **DC injection braking does not provide holding torque at zero speed**
- **DC injection braking does not function during loss of power or drive controller fault**
- **When required, use separate brake function for holding torque**
- **Failure to observe this precaution can result in equipment damage, severe personal injury, or death.**

⚠ CAUTION

MOTOR OVERHEATING AND DAMAGE

- **Application of DC injection braking for long periods of time can cause motor overheating and damage. Protect motor from extended periods of DC injection braking.**

This parameter sets the DC braking function to be either DISABLED or operational in a CONTINUOUS mode.

In the DISABLED mode, DC braking is not functional.

In the CONTINUOUS mode, DC braking energizes either when the output frequency decelerates to 0 HZ if COAST TO STOP (Parameter #65) is DISABLED, after a short delay when a stop command is given if COAST TO STOP (Parameter #65) is ENABLED, and remains energized until a start command is given.

In the ON START mode, DC braking energizes when a start is called for, and will remain energized until the time period determined by the START BRAKE setting (Parameter #84) has elapsed. The drive will automatically start once the START BRAKE setting time period elapses. During the START BRAKE time delay the operator screen will display START in the run status location on the drive keypad. Also, during this time, the START PENDING relay, or open collector output will energize if it has been selected.

In the ON STOP mode, DC braking energizes either when the output frequency reaches 0 HZ (COAST TO STOP (Parameter #65) is DISABLED) or when a stop command is given (COAST TO STOP (Parameter #65) is ENABLED), and remains energized until the time period determined by the STOP BRAKE (Parameter #83) elapses, or until a start command is given. Executing a start command while the STOP BRAKE (Parameter #83) is active, aborts the remaining stop time, and allows the drive to start immediately.

In the @ ZERO SPEED mode, DC braking energizes when the drive reaches zero speed (0.1HZ or less) and will remain energized until the time period determined by the STOP BRAKE (Parameter #83) has elapsed. To avoid brake cycling due to noise, there is hysteresis incorporated to enable and disable the ZERO SPEED BRAKE. Once active the ZERO SPEED brake will not re-enable until the command speed reaches 0.51HZ or greater, or if the command speed goes above 0.50 HZ during an active brake, the brake time will be aborted, and the drive will start.

NOTE: ZERO SPEED operation requires MINIMUM FREQUENCY (Parameter #61) be set to 0 HZ, or the ZERO SPEED function will not work. (See Parameter #61 for description of ZERO SPEED MODE).

In the START & STOP mode, DC braking energizes when a start or stop command is called for as described above for the individual ON START, and ON STOP modes.

In the @ ZERO & STOP mode, DC braking energizes when the drive reaches zero speed, or a stop is called for, and the drive has reached a stop condition as described under the individual ON STOP, and @ZERO SPEED modes.

82 - DC BRAKE LOAD

This parameter sets the magnitude of the current applied to the motor by the DC braking circuit. This parameter is based on the drive's nameplate current rating. DC BRAKE LOAD should be set to the lowest possible value which gives satisfactory operation in order to minimize motor heating.

83 - STOP BRAKE

This parameter determines the duration of time DC is applied to the motor when first coming to a stop, or with COAST TO STOP (Parameter # 65) ENABLED, shortly after the stop command. The STOP BRAKE TIME should be set to the lowest possible value which gives satisfactory operation in order to minimize motor heating.

84 - START BRAKE

This parameter determines the duration of time DC is applied to the motor before a start operation, but after a start command. The START BRAKE TIME should be set to the lowest possible value which gives satisfactory operation in order to minimize motor heating.

86 - DYNAMIC BRAKING

This parameter enables the dynamic braking circuit. Set the parameter to enable only when the optional dynamic braking resistors are installed. See OPTIONS-DYNAMIC BRAKING.

90 - SPEED UNITS

SPEED UNITS sets the units of the output speed indication on the keypad display. This parameter can be set for a variety of different keypad display functions; HZ, RPM, %, /S, /M, /H, #/S, #/M, and #/H. NOTE: The intended use of "/S", "/M", "/H"; are units per second, units per minute, and units per hour.

91 - SPEED MULTIPLIER

The SPEED MULTIPLIER is a calibration constant for the output speed indication on the keypad display. The speed multiplier is the constant which when multiplied by the frequency in Hertz, will give the desired displayed value. This parameter is used in conjunction with the SPEED UNITS (Parameter # 90) settings of RPM, /S, /M, /H, #/S, #/M, and #/H. This parameter has no effect when the SPEED UNITS (Parameter #90), is set to HZ, or %.

92 - LOAD UNITS

LOAD UNITS sets the units of the output load indication on the keypad display.This parameter can be set to display %LOAD, or AMPS. When set to %LOAD, the load indication is configured to be a load percentage meter (this is the factory default).

93 - LOAD MULTIPLIER

The LOAD MULTIPLIER is a calibration constant for the output load indication on the keypad display. This parameter has no effect when the LOAD UNITS (Parameter #92) are set to %LOAD. Setting the LOAD UNITS to AMPS and the LOAD MULTIPLIER to the nameplate amp rating of the drive configures the load indicator as an ammeter.

94 - AC INPUT

This parameter is used to select the correct AC incoming voltage to the drive. With system input line voltages of either 200 / 208 VAC, set Parameter #94 to the 200 / 400 / 480 VAC selection. With system input line voltages of 230 / 240 VAC, 460 / 480 VAC (on 480 VAC rated drives), or 575 / 600 VAC, set Parameter #94 to the 240 / 480 / 590 setting.

95 - SPEED DECIMAL POINT

This parameter is used to move the decimal point location in the speed units display. Speed Units are selected by Parameter #90. This parameter is only active if the speed unit display functions in Parameter #90 are set to of the following values; /S, /M, /H, #/S, #/M, and #/H. This parameter will have no effect with the speed unit display if Parameter #90 is set to HZ, RPM, or %RPM.

100 - BASE FREQUENCY

The BASE FREQUENCY is the frequency at which the drive output reaches full voltage. For most applications the base frequency should be set to the motor's rated frequency.

The BASE FREQUENCY determines the volts to hertz ratio. For example, if the drive is rated for 460 VAC and the BASE FREQUENCY is set to 60 HZ, and the V/HZ Curve Type (Parameter #101) is set to LINEAR-1.0, the drive will maintain a constant ratio of 7.66 V/HZ (except when AUTO V BOOST or MANUAL V BOOST are active).

101 - V/HZ CURVE TYPE

This parameter is used to change the relationship between the output voltage and frequency. Choices are; LINEAR-1.0, VAR-TORQUE-1.3, VAR TORQUE-1.6, and VAR-TORQUE-2.0.

LINEAR-1.0 gives a linear relationship between voltage and frequency, V/HZ is a constant, yielding constant motor torque capability. The three VARIABLE TORQUE values (1.3, 1.6, 2.0) are used to gain optimum energy savings and reduce acoustical noise in variable torque applications such as pumps and fans. An infinite array of V/HZ patterns are available by adjusting the BASE FREQUENCY, V/HZ CURVE TYPE, and MAXIMUM FREQUENCY.

104 - AUTO V BOOST

AUTO V BOOST supersedes the V/HZ setting determined by the BASE FREQUENCY and V/HZ CURVE TYPE to increase output voltage during acceleration. In order to boost motor torque, the output voltage is increased in the amount of the AUTO V BOOST setting whenever the drive is accelerating. AUTO V BOOST is usually used in applications with high inertia loads where quick accelerations are desired.

105 - MANUAL V BOOST

The MANUAL V BOOST supersedes the V/HZ setting determined by the BASE FREQUENCY and V/HZ CURVE TYPE and maintains a minimum voltage at lower frequency levels. MANUAL V BOOST is used in applications which require high starting torque. (e.g. conveyors, lifts and other loads which have high static friction or high inertia). MANUAL V BOOST varies with horsepower, SEE TABLE 3 for the MANUAL V BOOST value limit.

TABLE 3

MANUAL VOLTAGE BOOST FACTORY DEFAULT SETTINGS

HORSEPOWER	FACTORY DEFAULT	HORSEPOWER	FACTORY DEFAULT
1 HP	5.3 %	30 HP	2.4 %
2 HP	4.4 %	40 HP	2.3 %
3 HP	4.0 %	50 HP	2.2 %
5 HP	3.5 %	60 HP	2.1 %
7.5 HP	3.2 %	75 HP	2.0 %
10 HP	3.0 %	100 HP	1.9 %
15 HP	2.7 %	125 HP	1.9 %
20 HP	2.6 %	150 HP	1.8 %
25 HP	2.5 %	200 HP	1.8 %

121, 122 - RELAY #1 FUNCTION, RELAY #2 FUNCTION

The control board has two auxiliary relays which can be programmed for a variety of functions; NO FUNCTION, RUN, FAULT, FAULT LOCKOUT, AT SPEED, FOLLOWER PRESENT, START PENDING, AUTO SPEED MODE, ABOVE SET SPEED, OR MAINTENANCE TARGET. - See the THEORY SECTION for relay descriptions.

Each relay has a set of FORM C contacts rated 2 amps at 28 VDC or 120 VAC. Control wiring diagrams show relays in the rest state (coils NOT energized).

123 - RELAY SET SPEED

This parameter sets the speed at which Relay #1 or #2 (above) will change state if either or both are programmed for the ABOVE SET SPEED function. If set in the ABOVE SET SPEED MODE, the relay energizes when the output frequency of the drive exceeds the value corresponding to the RELAY SET SPEED value and de-energizes when the output frequency returns to a value lower than the RELAY SET SPEED value. - See the THEORY SECTION for relay descriptions.

124 - TB - 14 FUNCTION

This parameter sets the function of the open collector output at terminal 14. This function can be set to a variety of functions; NO FUNCTION, RUN, FAULT, FAULT LOCKOUT, AT SPEED, CURRENT LIMIT, FOLLOWER PRESENT, START PENDING, AUTO SPEED MODE. ABOVE SET SPEED, OR MAINTENANCE TARGET. - See the THEORY SECTION for relay descriptions.

The open collector output at terminal 14 is a current sinking type, and is rated 24 VDC, 5 MA maximum. NOTE - See the THEORY SECTION for relay descriptions.

130 - DRIVE POWER

This parameter is used to scale the kilwatt hour display. Enter the horsepower rating odf the drive (not the motor horsepower) as it appears on the drive data plate.

When this parameter is set to 0 the kilowatt hour display (see the Monitor Mode section) is disabled.

132 - MAINTENANCE TARGET

This parameter sets the time period, in hours, for the maintenance target alarm. The maintenance target alarm alerts the operator that a given amount of accumulated run time has passed. This can be used to indicate the need for maintenance on the driven equipment, or to time any other period dependent on motor run time.

After the time period set by this parameter has elapsed, a message is displayed indicating that the maintenance target has been reached. The message can be cleared by pressing any key to the keypad, but will be re-displayed each hour until a new maintenance target is set.

When this parameter is set to 0 the maintenance target display (see the MONITOR MODE SECTION) is disabled.

133 - DISPLAY FUNCTION

This parameter is used to set the drive keypad display to either a NORMAL display, or the ACTUAL SPEED (alternate) display. See the OPERATING BY KEYPAD CONTROL section for pictorial view of both the NORMAL and ACTUAL SPEED keypad displays.

The NORMAL display in the operating mode will display RUN STATUS, COMMANDED SPEED, SPEED UNITS, LOAD %, LOAD UNITS, DIRECTION, and SPEED REFERENCE.

The ACTUAL SPEED display in the operating mode will display ACTUAL RUN SPEED, COMMANDED SPEED, SPEED UNIT, LOAD %, CONTROL MODE, DIRECTION, and SPEED REFERENCE.

137 - CARRIER FREQUENCY SELECTION

This parameter determines permissible values of the carrier frequency. The carrier frequency is the switching rate of the output transistors. Higher switching rates causes less aubible noise to be emitted from the motor, but may cause the drive to run warmer. Set this parameter to the lowest value which gives acceptable sound levels, available carrier frequencies are: 1.5 kHZ, 8 kHZ, 10 kHZ, and 12 kHZ.

NOTE:The low carrier frequency is 1.5 kHZ up 25 HZ output frequency, and synchronized above 25 HZ. This carrier frequency is a fixed multiple of the drive output frequency.

Example: If the output frequency of the drive is set to 30 HZ, then the carrier frequency the drive is operating is 1800 HZ, (30 HZ x 60 = 1800 HZ).

The ability to operate a drive in the quiet (high carrier frequency) mode is dependent on the drive horsepower rating, driven load, drive enclosure, and the ambient temperature. Note the derating information in Section 7.

141 - FACTORY PARAMETERS

This parameter is used to reset the inverters customers usable parameters back to the factory default settings. Setting the value to ENABLE will reset the inverter - the parameter value will immediately revert back to the DISABLED setting.

142 - CLEAR HISTORY

This parameter is used to clear the PREVIOUS FAULTS (Parameter #200) history log. Setting the value to ENABLE will clear the fault history log - the parameter value will immediately revert back to the DISABLED setting.

144 - SOFTWARE VERSION

This parameter displays the version number of the drive's software. This information is useful if referring to the factory for programming or trouble shooting assistance. Since this value is a "view only" parameter, its value cannot be changed.

145 - SERIAL COMMUNICATIONS

This parameter is used with the serial communications feature. When using this feature, the inverter can communicate with a personal computer (PC), programmable logic controller (PLC), or other external device that utilizes RS-232, or RS-485 serial communications for control. The serial interface may be used to read present parameter settings (uploading to the control device), write new parameter settings (downloading from the control device), monitor present drive activity, and control current drive activity. These settings also allow use of the serial interface as a diagnostic tool.

This parameter selects the drive operations that are valid from an external control device over the serial link. This parameter can be set to the following access levels: DISABLED, DETECT, MONITOR ONLY, PROGRAM, CONTROL, PROGRAM & CONTROL. If the serial communications feature is not being used, leave this parameter set to the default setting of PROGRAM.

DISABLED -The serial port is inactive and will not respond to any requests from the external control device.

DETECT -The drive will only respond to requests for drive type identification, and software version level. This is provided to allow building a network map in an RS-485 network, and will allow the drive to be in an "OFF-LINE" mode, as far as serial communication is concerned.

MONITOR ONLY -In addition to drive type identification and software version, present drive status and the present drive parameter settings can be read. This function only allows reading information from the drive.

PROGRAM -The drive will accept updated parameter values from the external device. Additionally, all MONITOR functions are available.

CONTROL -The drive will accept control commands from the external control device, and will not accept PROGRAM functions. Additionally, all MONITOR functions are available.

PROGRAM & CONTROL -All PROGRAM, CONTROL, and MONITOR functions are operable with this access level.

146 - SERIAL TIMEOUT

This parameter is used with the serial communications feature. The drive has an internal "Watchdog Timer" that is active when an external device has control of the drive via the serial interface, Parameter #145 is set to either CONTROL or PROGRAM & CONTROL, and an active control link is established. During an active control link there is control and handshake information that is passed back and forth between the control device and the drive. If the serial link is broken, for a time period exceeding the SERIAL TIMEOUT, the drive will automatically stop and return to local operation.

This parameter has an adjustable range from 0 to 30 Seconds. Setting this parameter to 0, disables the "Watchdog Timer".

If the serial communications option is not being used, leave this parameter set to the default setting of 8 Seconds.

⚠ WARNING

Though setting this parameter to 0 may be appropriate during setup, CAUTION should be used, since a setting of 0 will allow the drive to operate via the serial link without a failsafe mechanism.

The SERIAL TIMEOUT function should always be enabled for normal serial link operation.

147 - SERIAL ADDRESS

This parameter is used with the serial communications feature, and is intended for use in a multiple drive network (RS-485). The serial link will support from 1 to 30 drives, each drive having an address in the range of 1 to 30. If the serial communications option is not being used, leave this parameter set to the default setting of 1.

148 - ENABLE PASSWORDS

This parameter sets the programming mode to be password protected when set to the ENABLED mode. Password protection is based on a two level system. See the PARAMETER MENU for a listing of the password level for each parameter. Level one allows access to "low end" parameters which are changed more frequently. Level two allows access to all parameters which are user adjustable.

149 - LEVEL 1 PASSWORD

Level 1 - factory default value - 9100.

150 - LEVEL 2 PASSWORD

Level 2 - factory default value - 0019

198 - LANGUAGE

This parameter allows the language that is displayed on the drive keypad to be changed between ENGLISH and SPANISH. When the language is changed, the effect is immediate. French will be available in the near future.

The ability to change the language is also available to the operator without having to be in the program mode. Pressing the STOP key and 0 key simultaneously, will bring up a message screen in opposite of the current default language. The selected language is the retained until changed through either Parameter #198, or by the STOP and 0 key combination.

200 - PREVIOUS FAULTS

This "parameter" stores a fault history of ten previous fault conditions. If any fault trips have occurred, the fault number and name will be stored here. View the previous faults by pressing ENTER and then scrolling through the previous faults with the UP and DOWN arrow keys. Possible values are shown in the table below.

FAULT HISTORY DISPLAYS

DISPLAY	DESCRIPTION (POSSIBLE CAUSE)
OUTPUT TRANSISTOR FAULT (1)	FAULT DETECTED AT OUTPUT TRANSISTOR - PHASE TO PHASE OR PHASE TO GROUND SHORT. DURING OPERATION
EMERGENCY STOP *	E-STOP CONNECTION (TERMINAL 2 TO TERMINAL 22 OPEN)
HIGH DC BUS VOLTAGE	HIGH INPUT LINE VOLTAGE OR REGENERATING MOTOR
HIGH CONTROL TEMPERATURE	HIGH AMBIENT TEMPERATURE OR HIGH HEATSINK TEMPERATURE
CURRENT OVERLOAD	HIGH MOTOR AMPERAGE DRAW (OVERLOADED MOTOR)
OUTPUT TRANSISTOR FAULT (2)	FAULT DETECTED AT OUTPUT TRANSISTOR - PHASE TO PHASE OR PHASE TO GROUND SHORT. AT START
LOW DC BUS VOLTAGE	LOW INPUT LINE VOLTAGE
START ERROR *	INPUT POWER APPLIED WITH START CIRCUIT CLOSED
DC BRAKE FAULT	NO MOTOR CONNECTED WHEN DC BRAKE IS ACTIVATED

* Not in fault history - run time fault display only.

This parameter may be accessed without entering the password, from the operating mode, by pressing the PROG/RUN key and then pressing ENTER.

22. Option - Dynamic braking

Dynamic braking principles:

When the frequency produced by the controller decreases rapidly, the motor behaves like an asynchronous generator and produces a braking torque. The motor feeds energy back to the drive controller. The amount of energey depends on the rate of deceleration, the inertia of the moving mass and the resistive torque.

Since the controller cannot feed the energy back into the supply, this causes an increase in the voltage of the filter capacitors, which limits the braking effect, potentially causing the controller to fault on overvoltage "High CD Bus Voltage". Part of the braking energy is dissipated as losses in the motor, the corresponding corresponding braking torque varying from 10% to 35% of the rated motor torque.

Dynamic braking allows a higher braking torque to be obtained and ensures dissipation of part of the braking energy in an external resistor. Dynamic braking consists of the following major components:

- Power transistor that switches the braking resistor across the filter capacitor terminals (Included in the controller)
- Control electronics (Included in the controller)
- Separately-mounted braking resistor.

The braking resistor is available from 3 HP up to 15 HP at 208 & 460 V and 20 HP at 575 V. There is no dynamic braking available as a standard for the 1 HP, 2 HP and above 20 HP models.

⚠ DANGER

HAZARDOUS VOLTAGE

- **DB module power and control terminals are at line potential.**
- **Ground equipment using screw provided.**
- **Disconnect all power before servicing DB module.**
- **Highvoltage remains after power is removed.**
- **Bus capacitors do not discharge immediately**

Before servicing:

- **WAIT TEN MINUTES.**
- **Measure bus capacitor voltage between + and - terminals of controller to verify DC voltage is zero.**
- **DO NOT short across capacitor terminals with voltage present.**
- **Install all covers before applying power to DB module.**
- **Use insulating tool.**
- **External devices connected to DB module must be insulated for line voltage with respect to ground.**

Falure to observe these precautions will cause shock or burn, resulting in severe personal injury or death!

Available braking torque:

Continuous braking (hold back) of 100% 9OR RATED MOTOR TORQUE) AT OUTPUT FREQUENCIES UP TO 15 hz (25% OF THE MOTOR BASE SPEED), OR 50% AT OUTPUT FREQUENCIES UP TO 30hz (50% OF THE MOTOR BASE SPEED), OR 25% OF OUTPUT FREQUENCIES UP YO ^0 hz (100% MOTOR BASE SPEED) IS POSSIBLE.

Intermittent (once per minute) braking (hold back) at 180% of the motor torque rated torque is possible for thirty seconds at the output frequencies up to 15 HZ (25% of motor base speed), fifteen seconds at output frequencies up to 30 HZ (50% of the motor base speed), or seven seconds at output frequencies up to 60HZ (100% of the motor base speed).

The braking resistor value is not recommended for continuous cycling applications which require stopping loads greater than twice that of the motor or from 1800 rpm, more than eight (8) times, from 2500 rpm more than four (4) times, or from 3600 rpm mre than (2) times, within a one minute period.

The braking resistor is available for use with the VSD 57 series variable speed drive as a separately mounted option. The braking resistor option should be located as close to the drive as possible. Care should be taken to insure adequate ventilation.

⚠ WARNING

OVERSPEED HAZARD.

- Generation of braking torque throughout the operating speed range of the controller rquires dynamic braking be present and operating.
- Dynamic braking resistor must be selected to generate required torque.

Failure to observe these precautions can result in severe personal injury, product damage

⚠ WARNING

NO HOLDING TORQUE.

- Dynamic braking does not provide torque at zero speed.
- Dynamic braking does not function during loss of power or controller fault.
- When required, use separate braking function for holding torque.

Failure to observe these precautions can result in severe personal injury, product damage or property dam or property damage

Installing a braking resistor kit:

> **⚠ WARNING**
>
> **HAZARDOUS VOLTAGE AND HOT COMPONENTS**
>
> **Avoid accidental contact with braking resistor. Resistor operating voltage may reach 1000 VDC between terminals and its temperature may reach 752 °F (400 °C).**
>
> - **Install resistors in appropriate enclosures or restricted area.**
> - **Provide sufficient coling air clearance**
> - **Do not mount on or enclose with combustible materials.**
> - **Use conductors rated for expected voltage and temperature.**
>
> Failure to observe these precautions may cause shock or burn, resulting in severe personal injury or death!

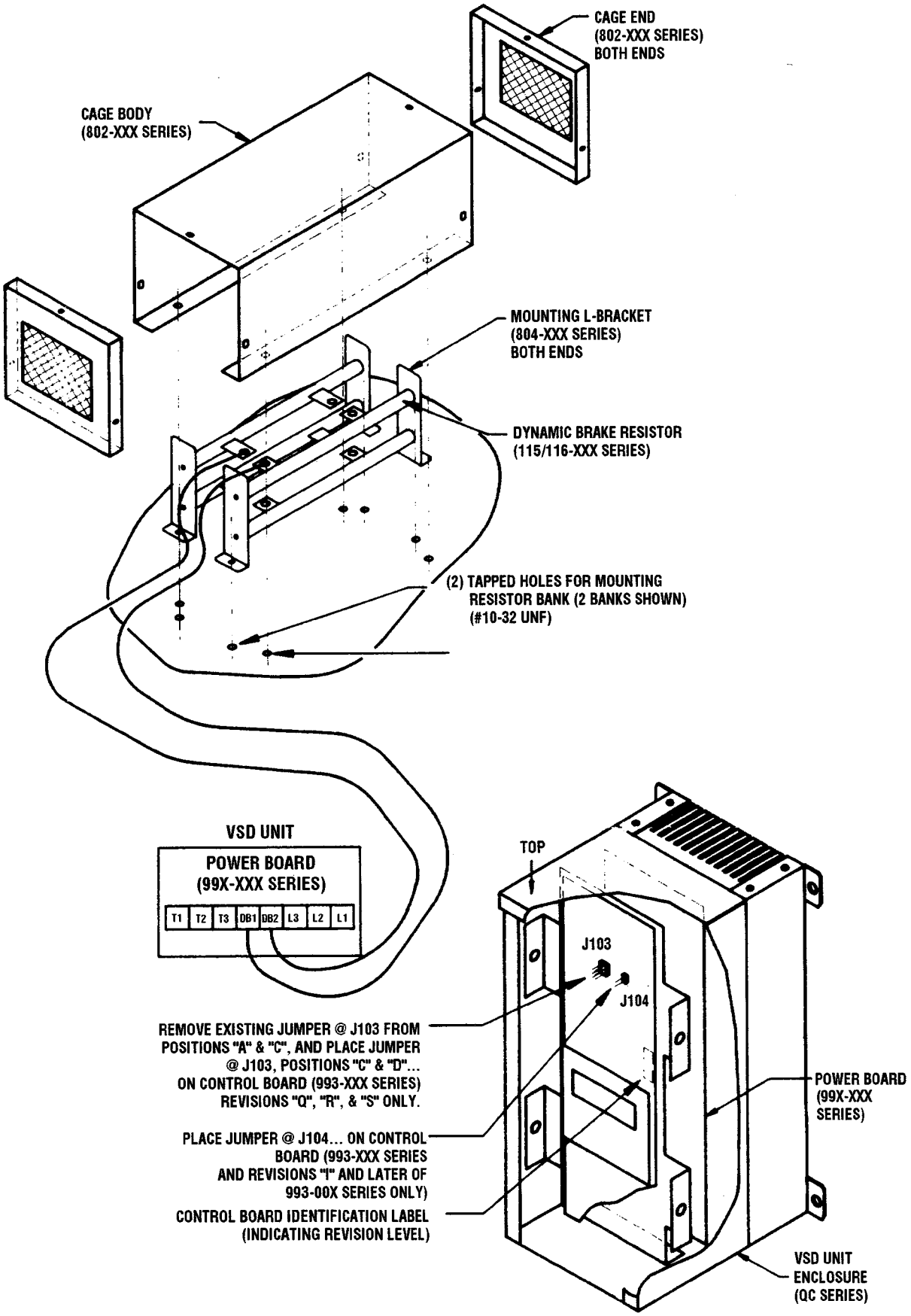
When mounting the resistor and associated cables, observe the following precautions:

- Braking Resistors must be sized and supplied by Schneider Canada.
- Two conductors from he breaking resistor need to be connected to the drive board. These two (2) wires should be run through a piece of rigid metal conduit, and connect to terminas DB1 and DB2 on the power board (see connecrtion diagram).
- When connecting the braking resistor to the drive controller, use conductors whose temperature and voltage ratings are suitable for the application. The conductor insiulation voltage rating must meet or excede the input line voltage rating. The conductor insulation temperature rating must be 194 °F (90 °C) or greater
- Parameter # 86 (Dynamic Brake) needs to be programmed to ENABLED if the dynamic brake assembly is installed
- Sufficient space and air pflow must be provided to allow for dissipation of heat produced by braking action, maintain at leat 2 inches between the resistor element and any surface. Do not mount the resistor to the combustible surfaces or house the resistor in a combustible enclosure.

Braking Resistor:

For VSD57	Total Wattage	Total Ohmic Value	Catalog Nbr	Dimensions H*W*D	Cabling: recommended section
At 230 V					
VSD57CU41M2-	350	60	C.F.	C.F.	AWG 14
VSD57CU72M2-	700	30	C.F.	C.F.	AWG 12
VSD57CU90M2-	1050	20	C.F.	C.F.	AWG12
VSD57CD12M2-	1600	14	C.F.	C.F.	AWG12
VSD57CD16M2-	2400	9.33	C.F.	C.F.	AWG10
At 460 V					
VSD57CU41N4-	350	240	C.F.	C.F.	AWG14
VSD57CU72N4-	700	120	C.F.	C.F.	AWG12
VSD57CU90N4-	1050	80	C.F.	C.F.	AWG12
VSD57CD12N4-	1600	56	C.F.	C.F.	AWG12
VSD57CD16N4-	2400	37.33	C.F.	C.F.	AWG10
At 575 V					
VSD57CU41S6-	350	360	C.F.	C.F.	AWG14
VSD57CU72S6-	700	180	C.F.	C.F.	AWG12
VSD57CU90S6-	1050	120	C.F.	C.F.	AWG12
VSD57CD12S6-	1200	90	C.F.	C.F.	AWG12
VSD57CD16S6	1800	60	C.F.	C.F.	AWG10
VSD57CD23S6	1800	56	C.F.	C.F.	AWG10

Customer connection diagram for external resistor:



23. PARAMETER MENU INDEX / USER SETTINGS

PARAMETER MENU NOTE: STANDARD DRIVES ARE SHIPPED AT DEFAULT SETTINGS						
ITEM NO.	**PARAMETER NAME**	**VALUE LIMIT OR MENU CHOICE**	**DEFAULT SETTING**	**PASSWORD LEVEL**	**SEE PAGE**	**USER SETTING**
1	CURRENT LIMIT	5 - 120 % (for V.T.) - 180% (for C.T.)	120 %(for V.T.) - 180% (for C.T.)	1	37	
2	THERMAL OVERLOAD	50 - 120 % (for V.T.) - 180% (for C.T.)	120 % (for V.T.) - 180% (for C.T.)	1	37	
3	SLIP COMPENSATION	0 - 5.0 %	0.0 %	1	37	
4	SPEED @ 4 MA / 0 VDC	0.00 - 360.00 HZ	0.00 HZ	1	37	
5	SPEED @ 20 MA / 10 VDC	0.00 - 360.00 HZ	60.00 HZ	1	37	
9	PRESET ACC / DEC	DISABLED, ENABLED	DISABLED	1	37	
11-13	SPEED PRESETS #1- #3	0.00 - 120.00 HZ	10.00 HZ	1	38	
14-17	SPEED PRESETS #4- #7	0.00 - 120.00 HZ	10.00 HZ	1	38	
19	JOG SPEED	0.00 - 120.00 HZ	10.00 HZ	1	38	
20	NORMAL ACCEL	SEE TABLE 19-1	30.0 SEC	1	38	
21-27	PRESET #1 - #7 ACCEL	SEE TABLE 19-1	30.0 SEC	1	38	
29	JOG ACCEL	SEE TABLE 19-1	30.0 SEC	1	38	
30	NORMAL DECEL	SEE TABLE 19-2	30.0 SEC	1	39	
31-37	PRESET #1 - #7 DECEL	SEE TABLE 19-2	30.0 SEC	1	39	
38	TAPER DECEL	DISABLED, ENABLED	DISABLED	1	39	
39	JOG DECEL	SEE TABLE 19-2	30.0 SEC	1	39	
41	SKIP SPEED #1	0.00 - 120.00 HZ	0.00 HZ	2	40	
42	SKIP SPEED #2	0.00 - 120.00 HZ	0.00 HZ	2	40	
43	SKIP SPEED #3	0.00 - 120.00 HZ	0.00 HZ	2	40	
44	SKIP BANDWIDTH	0.00 - 10.00 HZ	2.00 HZ	2	40	
50	TB-10B / D FUNCTION	0-10 V FREQ, 0-10 V LOAD, 4-20 MA FREQ, 4-20 MA LOAD	0-10V FREQ	2	40	
51	FREQUENCY OUT @ MAXIMUM	1.00 - 360.00 HZ	60.00 HZ	2	40	
52	TB-10D RESISTANCE OHM	0 - 250	250	2	40	
53	TB-10E FUNCTION	0 -10 V FREQ, 0-10 V LOAD, 2-10 V FREQ, 2-10 V LOAD	0-10V LOAD	2	40	
54	LOAD OUT AT MAXIMUM	10 - 200 %	125 %	2	40	
61	MINIMUM FREQUENCY	0.00 - 120.00 HZ	0.50 HZ	2	41	
62	MAXIMUM FREQUENCY	0.00 - 120.00 HZ	60.00 HZ	2		
64	STABILITY	NORMAL, LOW, MED, HIGH	NORMAL	2	41	
65	COAST TO STOP	ENABLED, DISABLED	ENABLED (for V.T.) DISABLED (for C.T.)	2	41	
66	FORWARD / REVERSE	FWD ONLY, REV ONLY, FWD + REV	FWD ONLY	2	41	
67	AUTO / MANUAL SEL	AUTO SPEED, MANUAL SPEED, AUTO / MANUAL SPEED, AUTO / MANUAL LOCAL	AUTO / MANUAL SPEED	2	42	

PARAMETER MENU
NOTE: STANDARD DRIVES ARE SHIPPED AT DEFAULT SETTINGS

ITEM NO.	PARAMETER NAME	VALUE LIMIT OR MENU CHOICE	DEFAULT SETTING	PASSWORD LEVEL	SEE PAGE	USER SETTING
70	AUTO START	DISABLED, ENABLED	DISABLED	2	42	
71	RESTART ON FAULT	DISABLED, ENABLED	DISABLED	2	43	
72	RESTART LIMIT	1 - 5	3	2	43	
73	RESTART DELAY	1.0 - 180.0 SEC	5.0 SEC	2	43	
75	RESTART DECEL	0.1 - 999.9 SEC	10.0 SEC	2	44	
76	RESTART CURRENT LIMIT	10 - 180 %	100 %	2	44	
80	DC BRAKE	DISABLED, CONTINUOUS ON START, ON STOP, @ ZERO SPEED, START & STOP, ZERO SPEED & STOP	DISABLED	2	44	
82	DC BRAKE LOAD	20 - 180 %	30 %	2	45	
83	STOP BRAKE	0.1 - 60.0 SEC	5.0 SEC	2	45	
84	START BRAKE	0.1 - 20.0 SEC	5.0 SEC	2	45	
86	DYNAMIC BRAKING	DISABLED, ENABLED	DISABLED	2	45	
90	SPEED UNITS	HZ, RPM, % RPM, /S, /M, /H, #/S, #/M, #/H	HZ	2	46	
91	SPEED MULTIPLIER	0.10 - 400.00	30.00	2	46	
92	LOAD UNITS	% LOAD, AMPS	% LOAD	2	46	
93	LOAD MULTIPLIER	0.01 - 300.00	1.00	2	46	
94	AC INPUT	240 / 480 / 590 200 / 400 / 480	240 / 480 / 590	2	46	
95	SPEED DP	XXXXX, XXXX.X, XXX.XX, XX.XXX, X.XXXX, .XXXXX	XXXXX	2	46	
100	BASE FREQUENCY	10.00 - 360.00 HZ	60.00 HZ	2	46	
101	V/HZ CURVE TYPE	LINEAR - 1.0, VAR TORQUE - 1.3, VAR TORQUE - 1.6, VAR TORQUE - 2.0	VAR TORQUE -1.6 LINEAR 1.0 (for C.T.)	2	47	
104	AUTO V BOOST	0.0 - 20.0 %	0.0 %	2	47	
105	MANUAL V BOOST	0.0 - 30.0 %	SEE TABLE 19-3	2	47	
121	RELAY #1 FUNCTION	NO FUNCTION, RUN, FAULT, FAULT LOCKOUT, AT SPEED, CURRENT LIMIT, FOLLOWER PRESENT, AUTO SPEED MODE, START PENDING, ABOVE SET SPEED, MAINTENANCE TARGET	RUN	2	47	
122	RELAY #2 FUNCTION	SAME AS RELAY #1	FAULT	2	47	
123	RELAY SET SPEED	0.00 - 120.00 HZ	0.50 HZ	2	48	
124	TB-14 FUNCTION	SAME AS RELAY #1	NO FUNCTION	2	48	
130	DRIVE POWER	0 - 200 (for V.T.) - 0 - 150 (for C.T.)	0	2		
132	MAINTENANCE TARGET	0 - 65,000 HR	0 HR	2	48	

PARAMETER MENU NOTE: STANDARD DRIVES ARE SHIPPED AT DEFAULT SETTINGS						
ITEM NO.	**PARAMETER NAME**	**VALUE LIMIT OR MENU CHOICE**	**DEFAULT SETTING**	**PASSWORD LEVEL**	**SEE PAGE**	**USER SETTING**
133	DISPLAY FUNCTION	NORMAL, ACTUAL SPEED	NORMAL	2	48	
137	CARRIER FREQUENCY SELECTION	1.5 kHZ, 8 kHZ, 10 kHZ, 12 kHZ,	1.5 kHZ	2	49	
141	FACTORY PARAMETERS	DISABLED, ENABLED	DISABLED	2	49	
142	CLEAR HISTORY	DISABLED, ENABLED	DISABLED	2	49	
144	SOFTWARE VERSION	213-020X	213-020X	2	49	
145	SERIAL COMMUNICATIONS	DISABLED, DETECT, MONITOR ONLY, PROGRAM, CONTROL, PROGRAM & CONTROL	PROGRAM	2	49	
146	SERIAL TIMEOUT	0 - 30 SEC	8 SEC	2	50	
147	SERIAL ADDRESS	1 - 30	1	2	50	
148	ENABLE PASSWORDS	DISABLED, ENABLED	ENABLED	2	50	
149	LEVEL 1 PASSWORD	0000 - 9999	9100	2	50	
150	LEVEL 2 PASSWORD	0000 - 9999	0019	2	50	
198	LANGUAGE	ENGLISH, SPANISH	ENGLISH	2	51	
200	PREVIOUS FAULT	THIS "PARAMETER" IS FOR VIEWING ONLY	N/A	0	51	

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VSD57IM9602

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