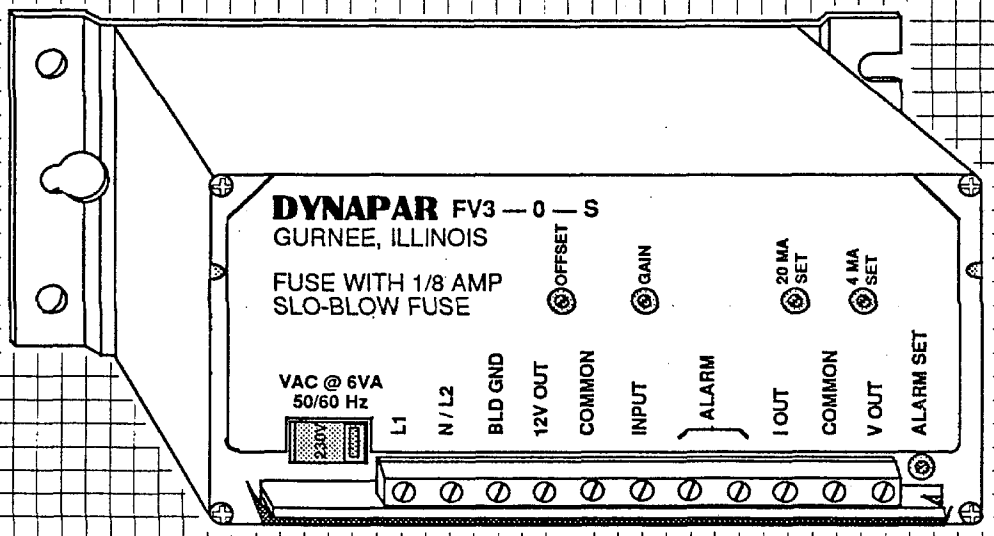
FV3

FREQUENCY – T O – VOLTAGE CONVERTER



FV3 FREQUENCY – TO – VOLTAGE CONVERTER

DESCRIPTION

The FV3 is a Frequency-to-Voltage Converter that accepts a variable frequency signal and provides both a DC voltage and a 4-20 mA current output proportional to input frequency. Its primary function is to replace DC and AC tachometer feedback on motors when used with a brushless encoder.

A wide range of input types and frequency ranges form 30 Hz to 50kHz full scale are jumper selectable along with alternate response times.

FEATURES

- DC Tachometer signal directly from Encoder
- Unidirectional Inputs
- 0-10 Volt and 4-20 mA outputs
- Switch Selectable 115 or 230 Volt AC 50/60 Hz power
- Wide Input Frequency Range
- Built in 12 VDC @ 75 mA Encoder Supply

SPECIFICATIONS...

Input Power	115/230 VAC ± 10 % 50/60Hz, .12/.06 Amp
Input Signal	
Frequency	Range Selectable 30 Hz to 60 kHz Full Scale
Input Signal	0 to 2.5 up to 0 to 15V
Magnetic	1.5 to 15V P-P
Output	
Voltage	
Range	0-10 Volts @ 25 mA
Linearity	±0.1% F.S. Max
Stability	±0.05% F.S /°F
Current	
Range	4-20 mA
Linearity	±0.2% max
Load Resistance	800 ohms max (includes wirings resistance)
Response Time	See Table 2, Page 5
Ripple	See Page 6
Vout/Iout tracking	± 0.3%
Transducer Power Output	12VDC±5%, 75 mA Max

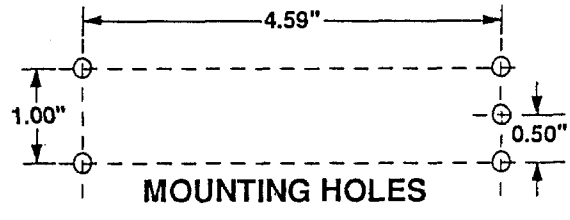
Mechanical Dimensions:	
Mounting Holes:	4.5 x 1.00 inches. 114 x 25.4 mm.
Overall:	5.00W by 1.74H by 3.95D inches. 127.W by 44.2H by 100.D mm.
Enclosure:	88.4W by 43.9H by 80.0D inches. 67W by 137H by 162D mm.
Footplate:	5.00W by 1.74H by .22D inches. 127.W by 44.2H by 5.59D mm.
Environmental	
Operating Temperature:	32 °F. to 140 °F. 0 °C. to 60 °C.
Storage Temperature:	0 °F. to 186 °F. -18 °C. to 85 °C.
Relative Humidity:	0% to 90% non-condensing
OPTIONAL SPEED DETECTION CIRCUIT	
Switching Threshold	5% to 100% of Full Scale
Output Type	Relay Contact, selectable normally open or normally closed
Contact Rating	1.25 Amp AC/DC, 125 Volts

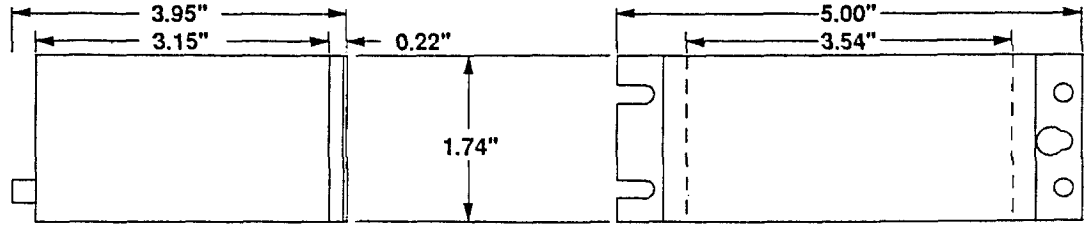
INSTALLATION

Unit may be mounted horizontally or vertically as required.

Drill (4) 0.20 in. DIA. holes as shown in diagram at right

Mount the unit using #10 hardware.





STEP ONE — ACCESS JUMPERS

Remove four front-panel screws and slide panel with circuit boards out of case.

Remove the two screws holding the upper(shorter) board.

The longer circuit board with the connectors protruding from the front pannel is the **MOTHER BOARD** and carries the power supply, input circuitry and the opotional overspeed/ underspeed circuit.

The shorter of the two boards which has several adjustable potentiometers along its edge that are accessable through holes in the front pannel is the **ANALOG BOARD** and carries the actual frequency-to-voltage conversion circuitry along with the voltage output and 4 to 20 ma current output circuit.

STEP TWO – JUMPER SETTINGS

Refering to Page 4, select the desired jumper configuration for for the input circuit and set the jumpers on the MOTHER BOARD.

If optional overspeed/underspeed circuit is used, refer to Page 9 for directions on configuring its associated jumpers.

STEP THREE — REASSEMBLE UNIT

Remount the **ANALOG BOARD**, on the front pannel. Replace the panel and circuit boards into the housing making sure the boards slide into the proper groves in the case. Attach the front pannel with the four Philips head screws.

STEP FOUR — SET AC VOLTAGE

Set the power selector switch to 115 or 230 volts as appropriate.

STEP FIVE — CALIBRATE

Connect power and a signal source that can be set to the desired full scale frequency.

With power applied and no input signal (input frequency = 0Hz) adjust the OFFSET control on the back panel to obtain a voltage output of 0. If the 4-20 ma output is to be used, measure the current output and adjust the 4 MA SET control to obtain a 4ma. output.

Apply a signal at the Full Scale input frequency and adjust the GAIN control on the back panel to obtain 10 volts at the voltage output. If the 4-20 ma output is to be used, adjust the control marked "20MA SET" until the output current is 20ma.

FACTORY SETTINGS

The FV3 comes from the factory in the following configuration

MOTHER BOARD

AC POWERLINE VOLTAGE SET TO 230 VOLTS

LINE DRIVER, TTL OR CMOS INPUT
JUMPERS 3, 4, 5 AND 6 OPEN

IF OPTIONAL OVERSPEED/UNDERSPEED CIRCUIT IS INSTALLED:

RELAY ENERGIZED **BELOW** SETPOINT
JUMPERS 1 AND 2 PARALLEL TO FRONT EDGE OF BOARD
NORMALLY OPEN RELAY CONTACT SELECTED
JUMPER 7 ON PINS 2 & 3.

ANALOG BOARD

10kHz FULL SCALE (SEE TABLE 2)
JUMPER 3 ENGAGED
JUMPER 6 INSTALLED ON PINS 2 & 3

SETUP...

MOTHER BOARD

FIGURE 1
MOTHER BOARD

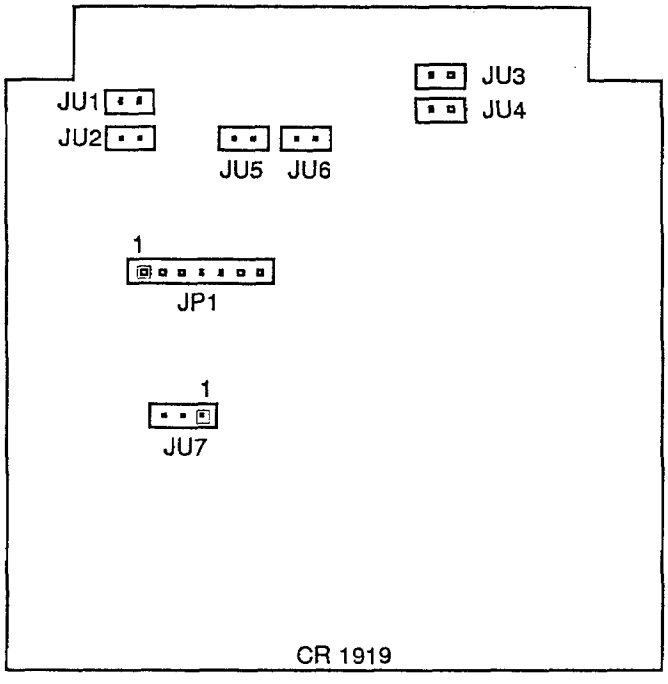


FIGURE 2
INPUT CIRCUIT

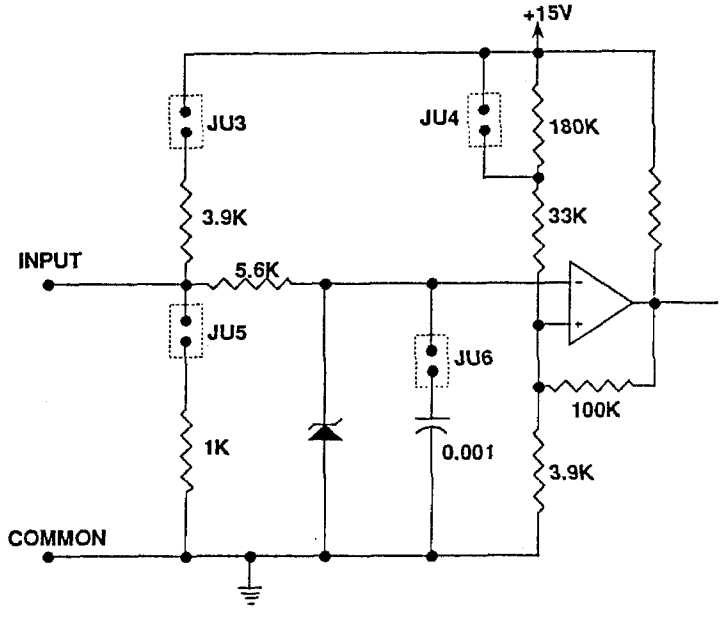


TABLE 1
MOTHER BOARD

RECOMMENDED INPUT CONFIGURATION

	JUMPER 3	4	5	6
MAGNETIC PICKUP	-	-	-	-
OPEN COLLECTOR OUTPUT				
NPN	X	X	-	-
PNP	-	X	X	-
LINE DRIVER, TTL OR CMOS	-	X	-	-
SWITCH CONTACT TO (+)	-	X	X	X
SWITCH CONTACT TO (–)	X	X	-	X

X - INDICATES JUMPER INSTALLED

JUMPER FUNCTIONS — MOTHER BOARD

FIGURE 2 is a partial schematic of the input circuit of the FV3 MOTHER BOARD showing the JUMPERS JU3 thru JU6.

JU3 is used to select a 3.9Kohm pull-up resistor to 15volts.

JU4 selects input trip points of either 1.5/2.0volts (JU4 connected) or .26/.76volts (JU4 removed).

JU5 selects a 1.0K pull-down resistor to common when installed.

JU6 adds a 0.001ufd capacitor to the input for additional noise filtering when installed. Frequency response is then limited to 20kHz.

THE FOLLOWING JUMPERS ARE USED ONLY WITH THE OPTIONAL OVERSPEED/UNDERSPEED CIRCUIT

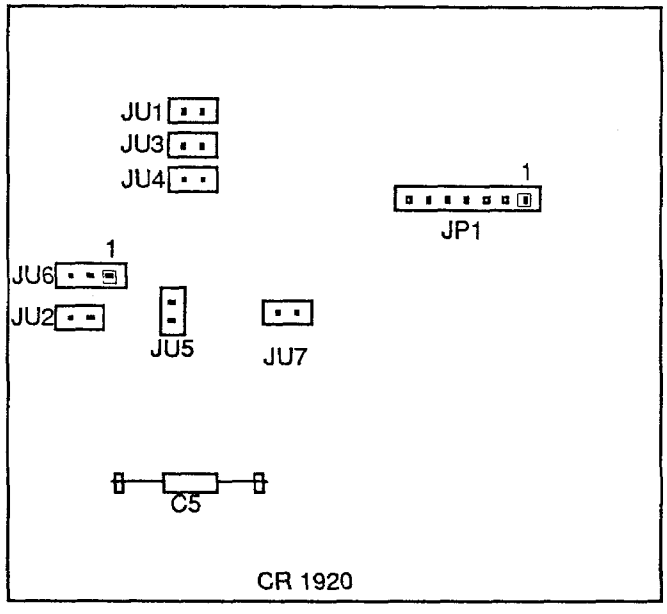
JU1 and JU2 select if over/under-speed relay is pulled up when speed is above or below set point.

JU7 selects normally open or normally closed relay contacts for over/under-speed output.

SETUP...

ANALOG BOARD

FIGURE 3
ANALOG BOARD



JUMPER FUNCTIONS — ANALOG BOARD

JU1 , JU3 and JU4 see TABLE 2

JU2 and JU7 are used to select lowest range.

JU5 selects 4.7ufd filter capacitor.

JU6 selects either x1 or x2 input frequency multiplier.

C5 — 0.01 ufd capacitor that is mounted so it can be replaced to customize ripple/response time

FREQUENCY RANGE

Optimum performance can be obtained by proper selection of the frequency range. The input frequency can be internally multiplied by 1 or 2 (JU6 on ANALOG BOARD). TABLE 2 shows the optimum jumper settings for the various frequency ranges.

Refering to TABLE 2, determine the recommended jumper configuration for the frequency range to be used. Note: the listed frequency ranges assume that a 10 volt output (or 20ma) is desired at the "Full Scale" input frequency.

If the desired Full Scale frequency is near the end of a frequency range, it is normally better to use the lower range if reduced ripple is more important than response time. If fast response time is more important than ripple, use the higher frequency range. For instance, with a 300 Hz Full Scale frequency, the 100-300Hz range will proved a response time of 1.7 sec and a maximum ripple of .042 volts. The 300-1000 Hz range will give a response time of 0.52 sec and a maximum ripple of 0.14 volts.

Capacitor C5 on the ANALOG BOARD is mounted so that it can be changed with a minimum of difficulty. Tailoring of ripple and response time can be done by changing this capacitor. Please consult the factory if changes must be made.

TABLE 2
ANALOG BOARD

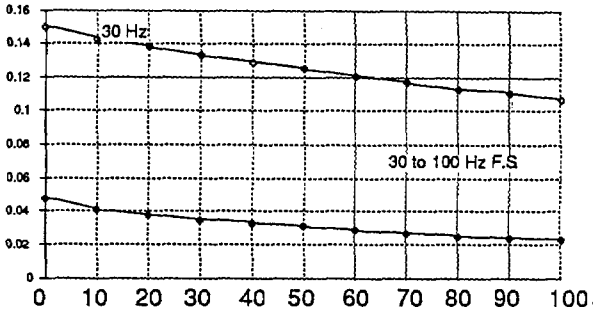
MAX FREQUENCY	JU1	JU3	JU4	JU2	JU6	JU7	JU5	*RESPONSE TIME
30HZ – 100HZ			X	X	2-3	X	X	5.1sec
100HZ – 300HZ		X		X	2-3	X	X	1.7sec
300HZ – 1KHZ	X				2-3	X	X	0.52 sec
1kHz – 3kHz			X		2-3			13msec
3kHz – 10kHz**		X			2-3			10msec
10kHz – 30kHz	X				2-3			6msec
20kHz – 60kHz	X				1-2			6msec

* RESPONSE TIME IS TIME TO REACH 99% OF FINAL VALUE
** FACTORY SETTINGS

SETUP...

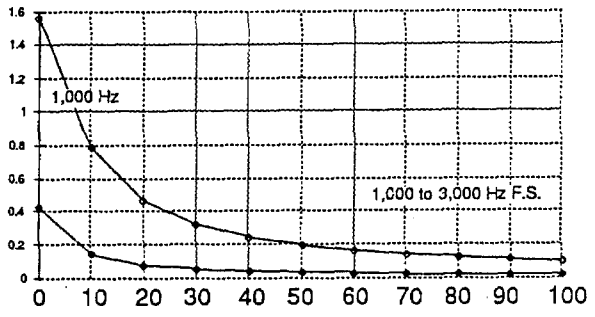
RIPPLE CHARTS

PEAK TO-PEAK RIPPLE (VOLTS)



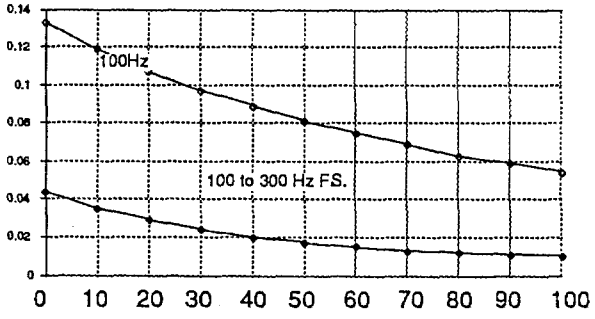
PERCENT OF FULL SCALE INPUT

PEAK TO-PEAK RIPPLE (VOLTS)



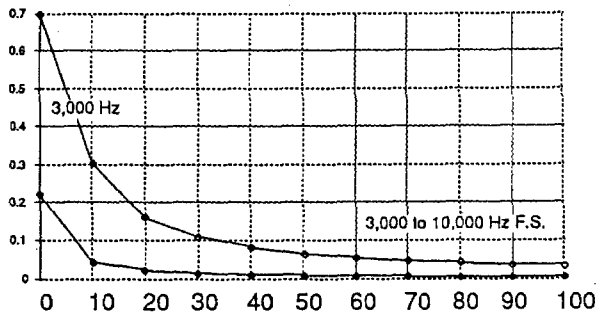
PERCENT OF FULL SCALE INPUT

PEAK TO-PEAK RIPPLE (VOLTS)



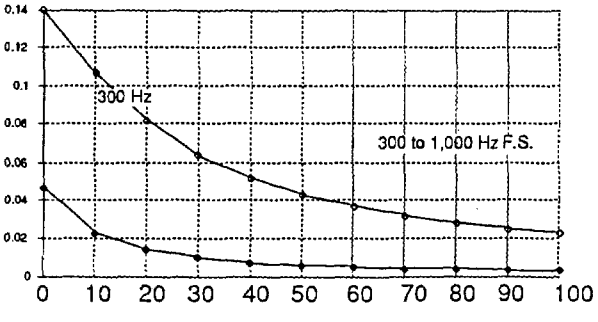
PERCENT OF FULL SCALE INPUT

PEAK TO-PEAK RIPPLE (VOLTS)



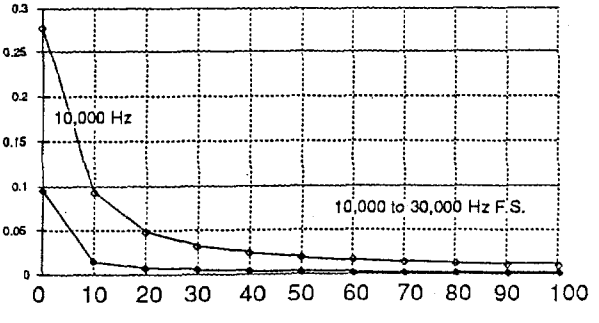
PERCENT OF FULL SCALE INPUT

PEAK TO-PEAK RIPPLE (VOLTS)



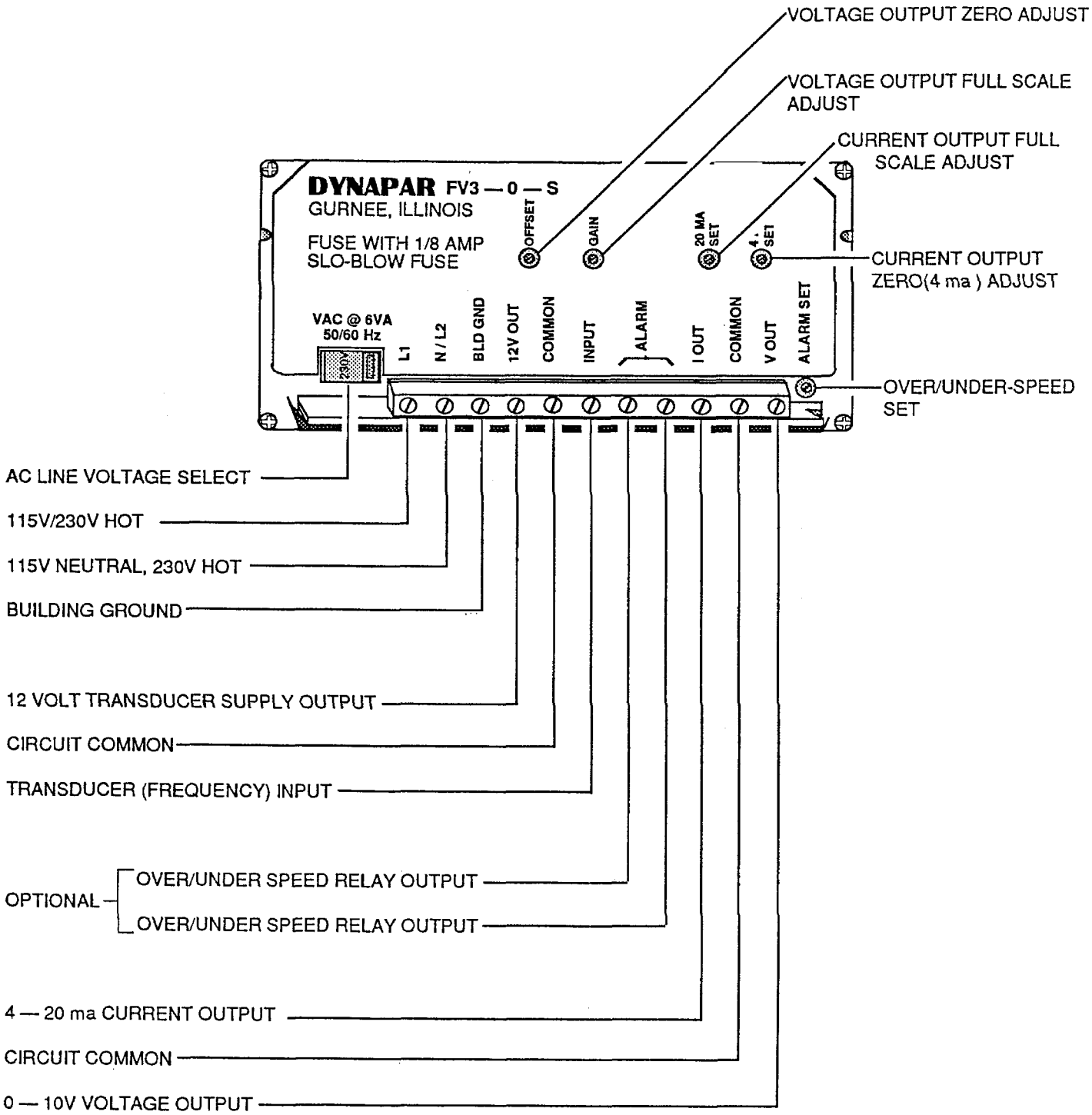
PERCENT OF FULL SCALE INPUT

PEAK TO-PEAK RIPPLE (VOLTS)



PERCENT OF FULL SCALE INPUT

CONNECTIONS...



AC POWER

Set the AC line voltage selector switch to 115 or 230 volts bysliding the selector with a screwdriver or similar object. Connect AC power as indicated. The FV3 requires an external fuse (1/8A. for 115 VAC; 1/16 A. for 230 VAC; SLO-BLO type). Be sure to connect the terminal marked "BLD GND" to the green saftey wire of the AC power cord.

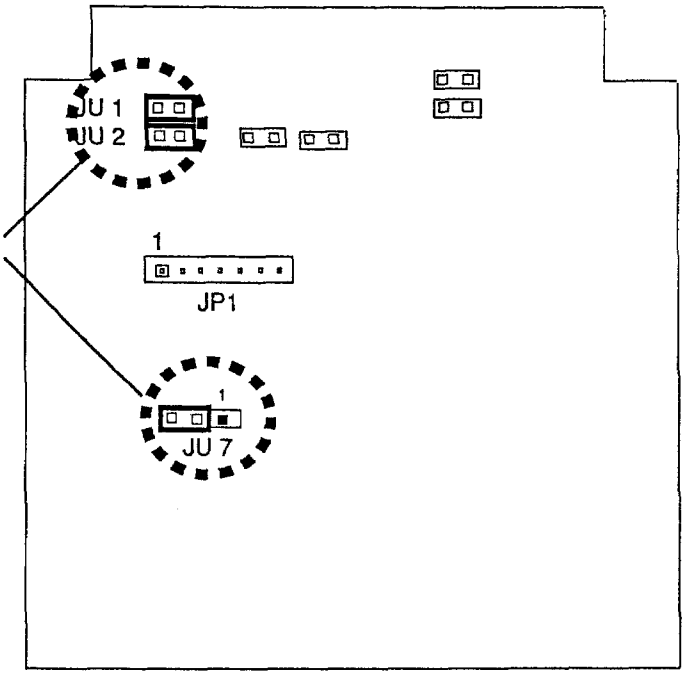
INPUT SHIELDS

The use of a shielded cable is highly recommended. For best results, the shield should be connected only on the end attached to the FV3. Connect it to the signal input common terminal, not to building ground.

CALIBRATION...

OPTIONAL OVERSPEED/UNDERSPEED DETECTOR

FIGURE 6
MOTHER BOARD



JUMPERS FOR OVERSPEED/ UNDERSPEED CIRCUIT (JUMPERS SET IN RECOMMENDED CONFIGURATION FOR OVERSPEED DETECTION)

If this option is used, the jumpers JU1, JU2 AND JU7 on the **MOTHER BOARD** must be set for the desired mode of operation.

The first part of the setup is to set JU1 and JU2 so that the output relay is in the desired state when the speed is below the set point. For instance, it is usually desirable to have the relay energized when conditions are "NORMAL" so that a power failure or other fault will cause the relay to release and indicate a failure condition. If this is to be the case, then arrange jumpers JU1 and JU2 as shown below.

FIGURE 4

RELAY **ENERGIZED** BELOW SET POINT

RELAY **DE-ENERGIZED** BELOW SET POINT

FIGURE 4-A is recommended for OVERSPEED detection and FIGURE 4-B is recommended for UNDERSPEED detection.

Jumper JU7 selects the nomally open or the normally closed contacts of the relay. In a safety circuit, a NOMRAL condition is usually indicated by closed contacts so that opening of the contacts or breaking of the circuit by some fault will indicate a fault condition. Remember that the NORMALLY OPEN contacts of the relay are closed when the relay is energized (this is usually the NORMAL operating condition). See diagram below.

FIGURE 5
(de-energized)

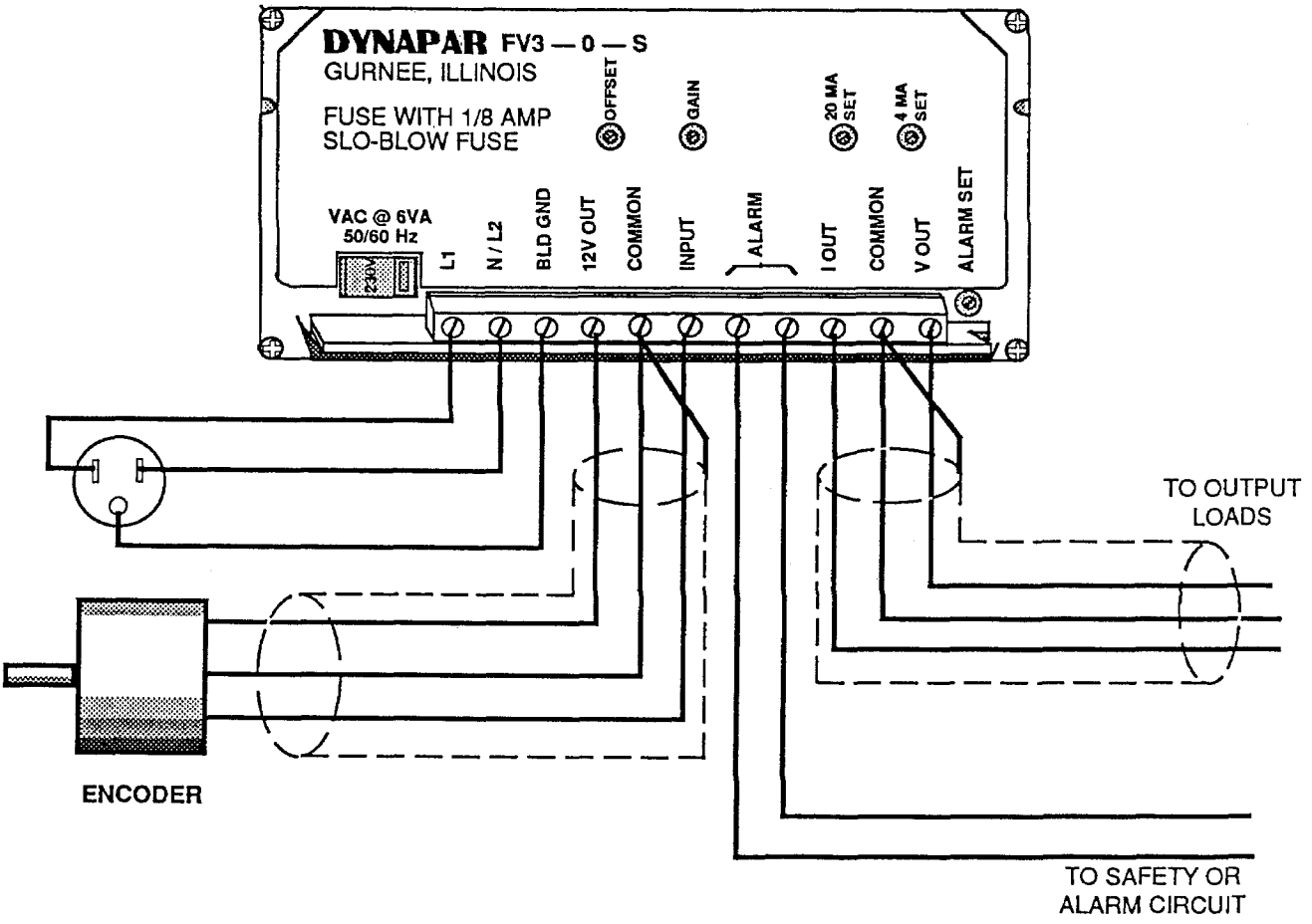
NORMALLY CLOSED SELECTED

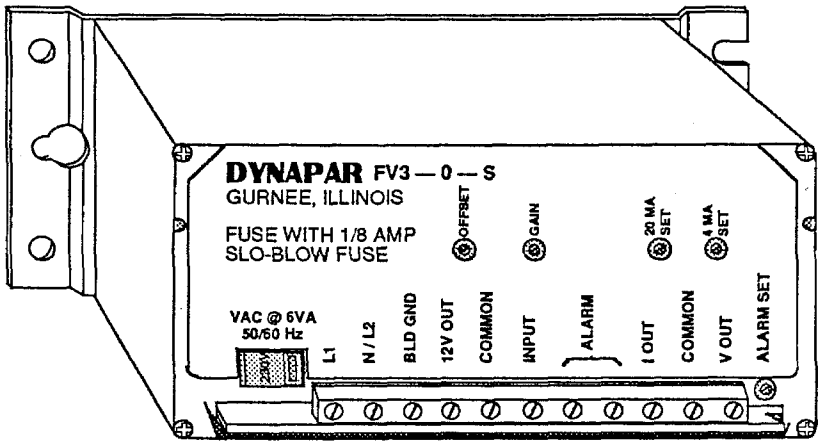
NORMALLY OPEN SELECTED

Thus if the unit is is used to protect against an overspeed condition, jumpers JU1 and JU2 would be set so that the relay would be pulled up when the speed is BELOW the trip point (see FIGURE 4-A) and jumper JU7 would be set to select the normally open contact (see FIGURE 5-A).

APPLICATIONS...

For best linearity, fast response time and low ripple, it is recommended that the system is arranged to operate in a frequency range corresponding to a full scale frequency of 3000 to 10,000 Hz.. This would involve selecting an encoder with a line count (pulses per revolution) so that a normal operating RPM would provided an output frequency in the range of 2000 to 7000 Hz. For instance .....





ORDERING INFORMATION

Model Numbers	FV3 - 0 - S - 00	FREQUENCY - TO - VOLTAGE CONVERTER
	FV3 - 1 - S - 00	FREQUENCY - TO - VOLTAGE CONVERTER with SPEED DETECTOR RELAY

WARRANTY

Standard products manufactured by the Company are warranted to be free from defects in workmanship and material for a period of one year from the date of shipment, and products which are defective in workmanship or material will be repaired or replaced, at the option of the Company, at no charge to the Buyer. Final determination as to whether a product is actually defective rests with the Company. The obligation of the Company hereunder shall be limited solely to repair and replacement of products that fall within the foregoing limitations, and shall be conditioned upon receipt by the Company of written notice of any alleged defects or deficiency promptly after discovery within the warranty period, and in the case of components or units purchased by the Company, the obligation of the Company shall not exceed the settlement that the Company is able to obtain from the supplier thereof. No products shall be returned to the Company without its prior consent. Products which the Company consents to have returned shall be shipped F.O.B. the Company's factory. The Company cannot assume responsibility or accept invoices for unauthorized repairs to its components, even though defective. The life of the products of the Company depends, to a large extent, upon the type of usage thereof, and THE COMPANY MAKES NO WARRANTY AS TO FITNESS OF ITS PRODUCTS FOR SPECIFIC APPLICATIONS BY THE BUYER NOR AS TO PERIOD OF SERVICE UNLESS THE COMPANY SPECIFICALLY AGREES OTHERWISE IN WRITING AFTER THE PROPOSED USAGE HAS BEEN MADE KNOWN TO IT.

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO ANY WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE.

SERVICE: If this product requires service, call Dynapar for an RMA (Return Material Authorization) number, pack it in a sturdy carton and ship prepaid to: Service Dept. at address below.

Include:
1. Description of problem
2. Name of responsible person
3. Purchase order number
4. Return shipping instructions