NOTE:
INSTALL SHORTING JUMPER ON J3 FOR 12V-15V OPERATION.
JUMPER MUST BE REMOVED FOR VOLTAGES >15V

OPTO SENSOR #1 GROUND
OPTO SENSOR #1 PHOTO TRANSISTOR
OPTO SENSOR #1 LED

OPTO SENSOR #2 GROUND
OPTO SENSOR #2 PHOTO TRANSISTOR
OPTO SENSOR #2 LED

SWITCH #1 CLOSURE TO GROUND INPUT
SWITCH #2 CLOSURE TO GROUND INPUT

1 AMP ON/OFF DRIVER #1 -
SOLENOID, DC MOTOR ETC
1 AMP ON/OFF DRIVER #2 -
SOLENOID, DC MOTOR ETC

1 AMP ON/OFF DRIVER #1 +
1 AMP ON/OFF DRIVER #2 +

DO NOT UNPLUG LOADS WHILE POWER IS ON. BREAKING OF CURRENT IN THE INDUCTANCE OF THE MOTOR GENERATES A HIGH VOLTAGE ARC, WHICH DAMAGES THE DRIVE.

SEE PAGE 2 FOR BRUSH MOTOR WIRING
SEE PAGE 3 FOR MANUFACTURER SPECIFIC BLDC MOTOR WIRING EXAMPLES

NOTES:
1) INSTALL SHORTING JUMPER ON J3 FOR 12V-15V OPERATION.
JUMPER MUST BE REMOVED FOR VOLTAGES >15V

2) WHEN IN STEP AND DIRECTION MODE (/1n32R): SWITCH1 INPUT BECOMES THE STEP INPUT
SWITCH2 INPUT BECOMES THE DIRECTION INPUT.

3) IF MOTOR EXHIBITS POSITIVE FEEDBACK, SWITCH ENCODER A,B LINES

4) KEEP ENCODER / INPUTS AWAY FROM NOISY MOTOR POWER WIRES.

NOTE: ENCODER SIGNALS MUST BE >4.5V HIGH LEVEL.
THIS MAY REQUIRE EXTERNAL PULLUPS.
NOTE:
INSTALL SHORING JUMPER ON J3 FOR 12V-15V OPERATION. JUMPER MUST BE REMOVED FOR VOLTAGES >15V

SWITCH #1 CLOSURE TO GROUND INPUT
SWITCH #2 CLOSURE TO GROUND INPUT

OPTO SENSOR #1 GROUND
OPTO SENSOR #1 LED
OPTO SENSOR #1 PHOTO TRANSISTOR
OPTO SENSOR #2 GROUND
OPTO SENSOR #2 LED
OPTO SENSOR #2 PHOTO TRANSISTOR

1 AMP ON/OFF DRIVER #1 -
SOLENOID, DC MOTOR ETC
1 AMP ON/OFF DRIVER #1 +

NOTE:
1) IF MOTOR EXHIBITS POSITIVE FEEDBACK, SWITCH MOTOR POWER LEADS. OR SWITCH ENCODER A, B LINES

3) KEEP ENCODER / INPUTS AWAY FROM NOISEY MOTOR POWER WIRES.

SEE PAGE 1 FOR BRUSHLESS MOTOR WIRING
SEE PAGE 3 FOR MANUFACTURER SPECIFIC BLDC MOTOR WIRING EXAMPLES

DO NOT UNPLUG LOADS WHILE POWER IS ON. BREAKING OF CURRENT IN THE INDUCTANCE OF THE MOTOR GENERATES A HIGH VOLTAGE ARC, WHICH DAMAGES THE DRIVE.

NOTE: ENCODER SIGNALS MUST BE >4.5V HIGH LEVEL. THIS MAY REQUIRE EXTERNAL PULLUPS.
NOTE: MOTORS WITHOUT ENCODERS CAN BE RUN IN THE "N0" VELOCITY MODE. OR FOR FINE CONTROL THEY CAN BE RUN IN "N1" MODE WITH TWO OF THE HALL SENSOR LINES WIRED TO THE ENCODER CHANNELS A AND B TO ACT AS A ROUGH POSITION ENCODER. THIS WILL ALLOW FINE ACCELERATION CONTROL, OR ROUGH POSITION CONTROL THE VELOCITY WILL NEED TO BE SET LOW. TRY /1IL1V10000R, ENSURE THAT THE ENCODER IS HOOKED UP TO COUNT UP WHEN THE MOTOR MOVES IN THE POSITIVE DIRECTION.

NOTE: ENCODER SIGNALS MUST BE >4.5V HIGH LEVEL. THIS MAY REQUIRE EXTERNAL PULLUPS.

NOTE: MOTES WITHOUT ENCODERS CAN BE RUN IN THE "N0" VELOCITY MODE. OR FOR FINE CONTROL THEY CAN BE RUN IN "N1" MODE WITH TWO OF THE HALL SENSOR LINES WIRED TO THE ENCODER CHANNELS A AND B TO ACT AS A ROUGH POSITION ENCODER. THIS WILL ALLOW FINE ACCELERATION CONTROL, OR ROUGH POSITION CONTROL THE VELOCITY WILL NEED TO BE SET LOW. TRY /1IL1V10000R, ENSURE THAT THE ENCODER IS HOOKED UP TO COUNT UP WHEN THE MOTOR MOVES IN THE POSITIVE DIRECTION.

NOTE: ENCODER SIGNALS MUST BE >4.5V HIGH LEVEL. THIS MAY REQUIRE EXTERNAL PULLUPS.
ENCODERLESS OPERATION:
1) THE EZSERVO CAN PERFORM VELOCITY MODE CONTROL OF A MOTOR THAT DOES NOT HAVE AN ENCODER BY USING THE HALL SENSORS AS A GAGE OF SPEED. (N=0 MODE)

2) IT IS POSSIBLE TO USE THE N=1 POSITION CONTROL MODE BY WIRING TWO OF THE HALL SENSOR LINES TO THE ENCODER A AND B INPUTS IN ADDITION. THIS ALLOWS A CRUDE POSITION CONTROL MODE. IN THIS MODE THE VELOCITY CONTROL IS SUPERIOR TO THE N=0 MODE. USE SMALL ACCELERATIONS AND VELOCITIES IN THIS MODE. Eg TRY /1L1V10000P0R

3) THE RESPONSE CAN ALSO BE "STIFFENED" BY INCREASING THE PID GAIN CONSTANTS eg /1L1w3000y3000V10000P0R

4) IF WIRING HALL SENSORS AS ENCODERS, USE THE ENCODER 5 V TO POWER THE HALL SENSORS.

MOTORS:
1) THE EZ SERVO WILL DRIVE MOST SERVO MOTORS
2) FOR BEST PERFORMANCE SELECT A MOTOR THAT HAS A BACK EMF OF ABOUT 1/2 OF THE SUPPLY VOLTAGE, AT THE MAX SPEED DESIRED TO RUN AT. (Eg USE A 12V MOTOR WITH A 24V SUPPLY).

3) TYPICALLY A MOTOR THAT HAS AN INDUCTANCE OF AROUND 1mH AND A RESISTANCE OF AROUND 1 OHM WORKS WELL. BUT OTHER VALUES ARE ALSO OK. (0.1mH MINIMUM)

ON/OFF DRIVERS ALTERNATE WIRING DIAGRAM
1) ON/OFF DRIVERS RATED AT 2 AMPS PEAK, 1 AMP CONTINUOUS.

2) THE NEGATIVE PIN OF THESE DRIVERS IS ACTUALLY AN OPEN COLLECTOR TYPE OUTPUT THAT PULLS DOWN TO GROUND. IT IS POSSIBLE TO DRIVE LOADS THAT ARE OF A DIFFERENT VOLTAGE THAN THE SUPPLY VOLTAGE, BY CONNECTING THE POSITIVE SIDE OF THE LOAD TO AN EXTERNAL SUPPLY, AND THE NEGATIVE SIDE TO THE -VE OUTPUT PIN. HOWEVER, IN CASE THIS IS DONE IT IS NECESSARY TO PLACE AN EXTERNAL "FREE WHEELING" DIODE ACROSS ANY INDUCTIVE LOADS. EXTERNAL SUPPLY VOLTAGE MUST BE LESS THAN SUPPLY VOLTAGE TO EZ STEPPER

3) EXTERNAL DIODE IS NOT NECESSARY IF BOTH SIDES OF LOAD ARE WIRE BACK TO THE EZ STEPPER.
NOTES:
1) ALL 4 INPUTS ARE ANALOG INPUTS
2) ADC's VALUES RANGE FROM 0-16368. THE ACCURACY AS SHIPPED IS 7 BIT BUT CAN BE IMPROVED TO >10BIT WITH THE REMOVAL OF THE INPUT PROTECTION CIRCUITRY, CONTACT FACTORY FOR DETAILS
3) POTS IN THE RANGE OF 500 OHM - 10K ARE SUGGESTED, LOWER VALUES ARE LESS AFFECTED BY INTERNAL 10K PULLUP. 500 OHM RECOMMENDED.
4) IF USING POT FOR POSITION FEED BACK WITH 1/N3R MODE, IF MOTOR EXHIBITS POSITIVE FEEDBACK, SWITCH ENDS OF POT
5) 10K INTERNAL PULLUP WILL INTERFERE WITH LINEARITY OF POT VOLTAGE, AND MAY NEED TO BE REMOVED - CONTACT FACTORY.
6) INPUT OVERVOLTAGE PROTECTION CIRCUITRY MAY NEED TO BE REMOVED FOR >7BIT ACCURACY - CONTACT FACTORY.