ORION ELECTRONICS

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OPERATION MANUAL
MODEL NO.: BPD-6A-S

Sr. No. _____

Batch No. _____

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ORION

STEPPER MOTOR DRIVE : BPD-6A-S

INDEX INDEX INDEX

GENERAL INTRODUCTION

Stepper motors are characterized by their unique ability to stop instantly and accurately at a given point. Not only that, it can instantly reverse its direction of rotation. ORION range of stepper motor drives and controllers make things look simpler for otherwise difficult applications.

Following features of the stepper motors are worth noting:

- Instant start / stop up to at least 60 RPM.
- Instant reversal up to at least 60 RPM.
- No effect of voltage fluctuation on speed.
- Can provide holding torque in stopped condition.

ORION products further accentuate these advantages, by their features:

- Speeds up to 2000 RPM (or more) possible within specific framework of application.
- Current chopping techniques.
- State of the art devices.
- Power efficient design.
- Versatile interface to suit different controllers.

ORION CONTROLLERS

ORION controllers is an impressive range to choose from. We offer a good mix of economic and higher end solutions, to make your application technically successful and commercially viable. An appropriate combination of following features can be chosen:

- Programmable acceleration pattern to suit specific motor.
- Versatile interface compatible with various control output methods.
- Sensor inputs for start / stop / slow down.
- Thumb wheel switch or key pad setting for stop / slow down.
- Limit switch inputs.
- Inching.

ABOUT THE SUPPLIED SYSTEM

The system is a stepper motor drive, controlled by signals from your external controller. The transformers are housed in a separate enclosure of same size. There are three signal inputs to drive from controller. They are-

- Start
- Direction
- Clock

The acceleration and retardation, of course has to be taken care by the controller. The motor starts when current flows through the input LED of the optocoupler. The default setting is ENABLE, which means that the motor will be energized and will have holding torque, when stopped.

SPECIFICATIONS

Control supply		230 vac, 1 ph, 50 Hz
		(195 to 255 vac)
Drive type		Bipolar, Half Step
Drive current capacity		6.5 Amp max
Controls		NPN 24 V signals (external)
Protection		Fuse for mains supply
		3 Amp (5 X 20), glass
		Fuse for motor supply
		4 Amp. (5 X 20), glass
Size :	Drive box	290 (L) X 150 (W) X 115 (H) 40 mm Cooling fan on top.
	Transformer box	170 (L) X 130 (W) X 115 (H)

ORION drives are a result of continuous improvisations, so that, the system becomes rugged and durable, while serving the need. **However, heavy voltage fluctuations beyond those specified can damage the drives. Therefore, if the electrical environment is not healthy, a servo stabilizer is strongly recommended.** It should be rated for 1 KVA per drive. The current capacity of the drives is up to 6.5 Amps, but the current has to be adjusted as per the rating of the motor as specified by the motor manufacturer. The procedure is explained in the section "Settings of the Drives"

CONTROLS AND INDICATORS

There are three LED's, two toggle switches and a set of test points.
The LED marked "POWER" indicates the presence of motor power supply. If this LED is off, the motor will neither energize nor move, even if start and clock signals are present.
The LED marked "START" is a dual color LED. The color will change when the start signal goes on and off. Whether it will be green or red when it is active will depend on internal setting. Basically it is meant to indicate proper receipt of start signal. Similarly, the LED marked "DIR" is a dual color LED and indicates change in direction.
The FWD-REV toggle switch provides ease of setting the direction of motion, at the time of installation. Later on, care should be taken to see that the setting is not tampered. The direction change can be implemented by exchanging the connections A1 and A2, of motor.
The DIS-ENA switch decides whether in stopped condition the motor will provide holding torque (ENA) or will be free (DIS)
The test points are provided to connect a voltmeter, to check the set current value. The procedure is explained in the section SETTINGS OF THE DRIVE.

SETTINGS OF THE DRIVE

Current setting

The current has to be adjusted to the appropriate value for the chosen motor. Connect a digital voltmeter to the test points provided on the front plate of the drive box. Ensure that the drive is in enabled, by activating the start signal. This is extremely important; because after the start signal de-activates, the current setting is automatically reduced to half, and if current setting is carried out during this state, the actual current in start state will be double. The formula is-

I = V-ref ÷ R-sns, where

I = per phase current of motor.

V-ref = Voltage at test points on PCB

R-sns = 0.11, (the value of sense resistor)

For example, for a current setting of 4 Amps, the Vref should be set at 0.4 to 0.44 V. The clockwise motion of preset will decrease the setting.

The value is adjusted to 6 Amp / ph, by default. (if not specified in your P.O.)

Direction Setting

It is seen that the forward and reverse motion conventions differ from place to place and also due to gearing or coupling of the mechanism etc. A switch is provided on the drive fascia, by which you can change or set the direction of motion, when your external signal is active.

Holding Torque Setting

In case of stepper motor, in stopped state, the drive setting can be chosen, so that, the system provides holding torque. Generally, the drive should be set to possess holding torque. We refer to this as ENABLE mode. On the mother board, you will find a 4 pin header adjacent to the edge connector. If a shorting cap is inserted on the two pins near to the edge of the pcb, the ENA-DIS will be controlled by the toggle switch. If the shorting cap is inserted on the other two pins, the drive will automatically get disabled after set time. This timing is 10 sec from the last start signal received.

INSTALLATION

The location and mounting of the drives is very important. The drives get heated during continuous operation. So, cooling fan is mounted on the top cover of the drive enclosure. So choose a suitable location for free air flow. Make all the electrical connections as per connection details in this manual. Take extra care to make **firm and proper** connections. **Proper motor connections are most important. If wrong pairs are connected, the motor will not move.**

A fairly good mains power supply will help the drive to give a long service. Please ensure that the supply is proper and is properly connected. If the supply conditions are not good, servo stabilizer must be used.

CONNECTION DETAILS

To Transformers

4 Pin connector for motor supply

Pin no 1 & 2 } 90 VAC
Pin no 3 & 4 }

5 Pin connector for control supply

Pin no 1 } 16 VAC
Pin no 2 }
Pin no 3 . . . . No connection
Pin no 4 } 12 VAC
Pin no 5 }

2 Pin connector for service supply

Pin no 1 } 18 VAC
Pin no 2 }

To Motor

4 Pin connector to motor

Pin no 1 . . . . A1 } One winding
Pin no 2 . . . . A2 }
Pin no 3 . . . . B1 } Other winding
Pin no 4 . . . . B2 }

9 pin D type connector for signals

Pin no 1 . . . . Clock +
Pin no 2 . . . . Direction +
Pin no 3 . . . . Start +
Pin no 4 . . . . No connection
Pin no 5 . . . . Clock -
Pin no 6 . . . . Viso+ (approx 24 V)
Pin no 7 . . . . Direction -
Pin no 8 . . . . Start -
Pin no 9 . . . . 0 V (Viso ground)

FAULT FINDING

Motor is neither moving nor getting energized. None of the LED's glows.

Check mains power.

Motor does not move, although energized.

Check whether all 4 connections of motor are proper.

Check "start" signal from PLC.

Ensure that there is no blockage in the mechanical system.

The motor moves in forward only.

Check "Direction" signal from PLC.

The LED's glow but motor does not energize.

Check Fuse- Motor (6 Amp)

The fuse blows repeatedly after few minutes operation.

Check current setting.

Use slightly higher rating fuse or slow blow fuse.

(Never use rating more than 6 Amps)

The fuse blows immediately after power on.

Try using higher rating fuse once or twice, but if problem persists, call **ORION**

A FEW POINTS WORTH NOTING

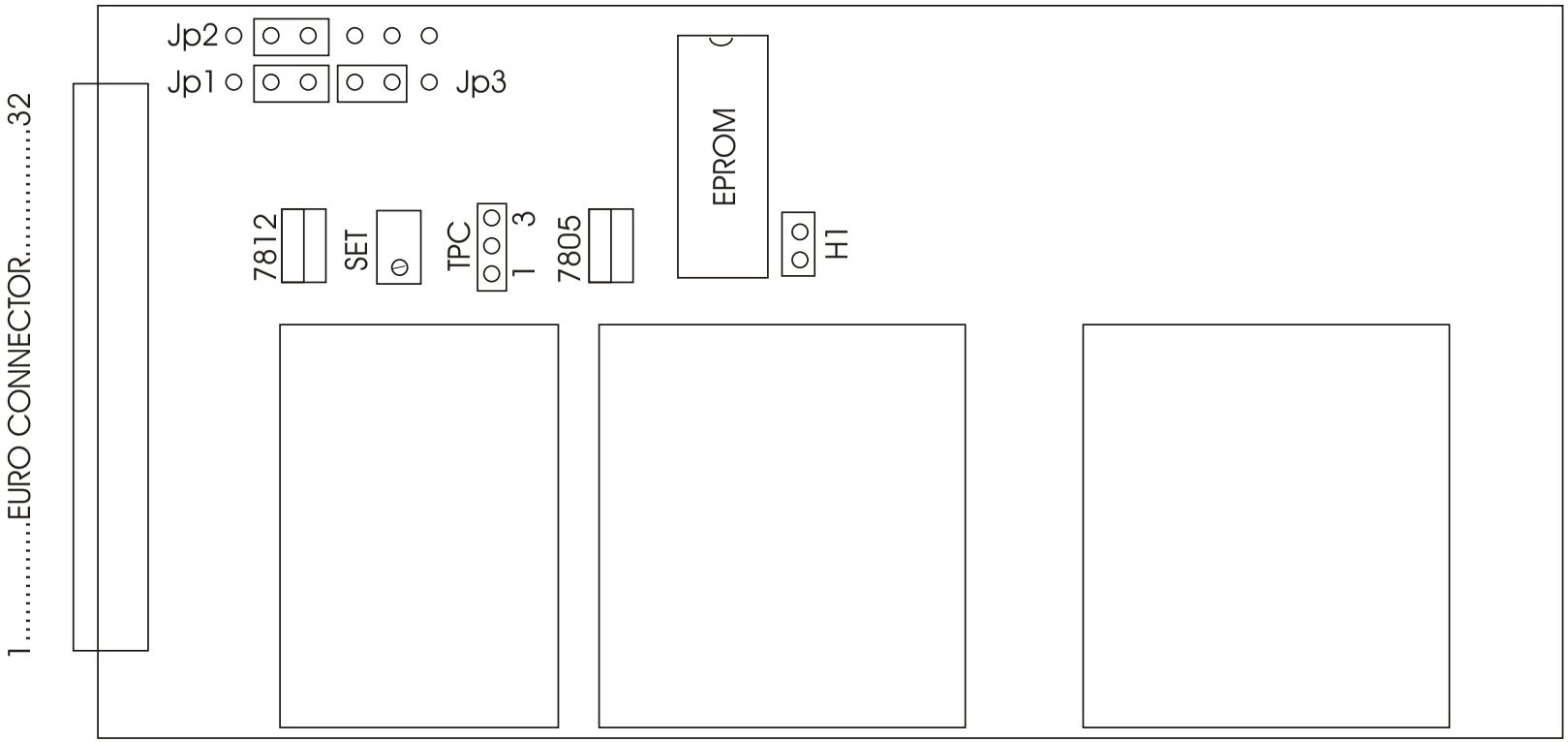
- Generally, the stepper motors get heated up, to about 75°C. It is a good practice to provide heat sinking by way of a well-machined mounting plate, made of good conducting material. Providing good air flow with a cooling fan is necessary for machine with long working cycles.
- The cables running from the drive to the motor, should be of proper size. Unnecessary lengths of this cable should be avoided. While designing the panel cabling layout, make it a point, not to bunch the signal and motor cables together.
- Use shielded cable for signals, especially when you are using higher lengths.
- It is critically important that the stepper motor shafts are not machined at customer's end. The motor may get permanently damaged. Similarly, in case there is some problem with the motor, **do not try to open the motor and do not put oil.** Instead, the manufacturer should be informed and motor should be sent for repairs.
- Do not attempt component level servicing on drive or other pcb's without instructions from ORION.

ORION

The standard header settings
are shown. Jp1 for direction
Jp2 for start and Jp3 for Enable / Disable

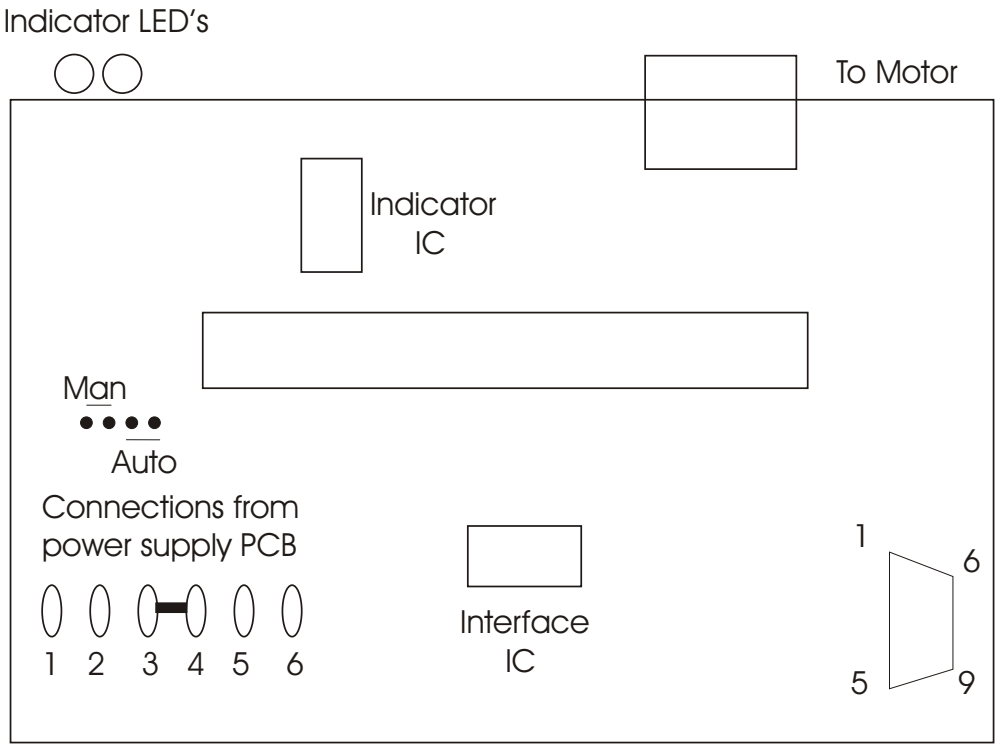
For checking or setting current,
connect multimeter on voltage range 2 V,
at points 1 and 3on TPC test points,
confirm that start signal is active,
Adjust SET potentiometer to get desired setting.
Anticlockwise motion increases setting

Drive pcb as seen from component side



H1 INSERTED = FULL STEP
H1 OPEN = HALF STEP

Mother Board as seen from solder side



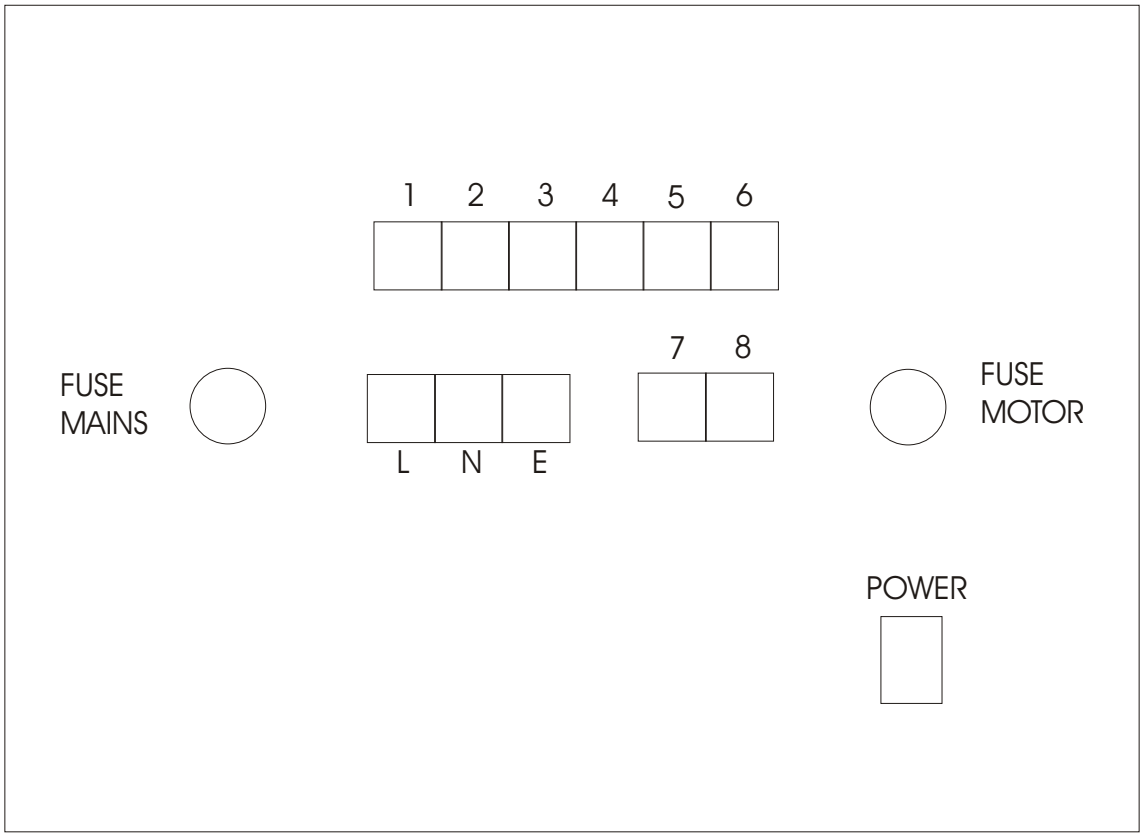
Voltages at various pins with respect to pin no 3 or 4 (gnd) when mains voltage is 230 VAC in normal condition

Pin no 1	0 V
Pin no 2	20 to 22 VDC
Pin no 5	135 VDC (V-motor + 15 VDC approx)
Pin no 6	120 to 125 VDC

9 Pin connector

Pin no 1	Clock+
Pin no 2	Direction +
Pin no 3	Start +
Pin no 4	No connection
Pin no 5	Clock -
Pin no 6	Viso +
Pin no 7	Direction -
Pin no 8	Start -
Pin no 9	Gnd iso

CONNECTIONS ON THE TRANSFORMER BOX



CONNECT MAINS POWER TO TERMINALS MARKED 'L', 'N', 'E'.
CHECK AC VOLTAGE AT TERMINALS 1 AND 2....16 V
CHECK AC VOLTAGE AT TERMINALS 3 AND 4....18 V
CHECK AC VOLTAGE AT TERMINALS 5 AND 6....12 V
CHECK AC VOLTAGE AT TERMINALS 7 AND 9....95 V

OTHER ORION PRODUCTS

STEPPER MOTOR DRIVES (BIPOLAR)-

BPD-3A3-C = 230 VAC CONTROL SUPPLY, EXTERNAL SIGNALS & TEST MODE

BPD-3A3-E = 230 VAC CONTROL SUPPLY, ONLY EXTERNAL SIGNALS

BPD-3A3-S = 24 VDC CONTROL SUPPLY OR 36 VDC & 12 VC DUAL SUPPLY

BPD-6A+ = ANALOG INPUT FOR SPEED, START, DIRECTION & SLOW SIGNALS FROM EXTERNAL CONTROLLER

BPD-9A-S = 230 VAC CONTROL SUPPLY, MOTOR CURRENTS UP TO 10 AMPS

MSD-3A-8 = 230 VAC CONTROL SUPPLY, MOTOR CURRENTS UP TO 3 AMPS 800 OR 1600 STEPS / REV, TEST MODE

MSD-3A-64 = 230 VAC CONTROL SUPPLY, MOTOR CURRENTS UP TO 3 AMPS 3200 OR 6400 OR 12800 STEPS / REV, TEST MODE

CONTROLLERS-

PLASTIC BAG MAKING MACHINE

CUT TO LENGTH SYSTEMS

FOIL STAMPIMG

2 & 3 AXIS ENGRAVING / MILLING MACHINES

TUBE FILLING & SEALING MACHINES

VISIT www.orionele.com to find out more....

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