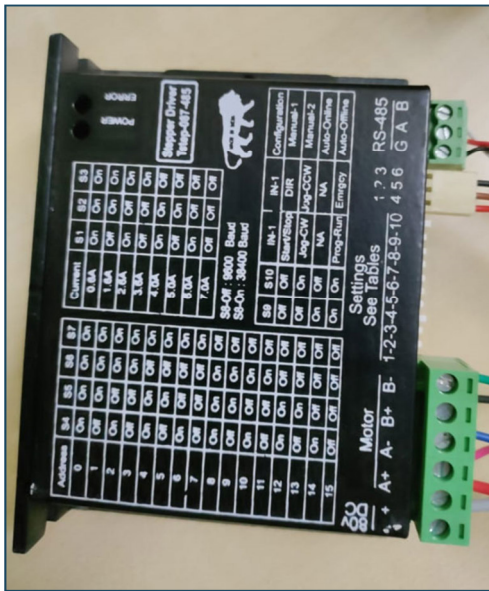




Tstep-087-485, Two Phase Bipolar Stepper Motor Driver with integrated motion controller



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THIS MANUAL CONTAINS INFORMATION FOR INSTALLING AND OPERATING THE FOLLOWING PRODUCT:

TSTEP-087-485, TWO PHASE BIPOLAR STEPPER MOTOR DRIVER WITH RS 485 INTERFACE

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GENERAL DESCRIPTION

The Tiny Controls TSTEP-087-485 is a high resolution stepper motor driver and is programmable with RS485 interface.

Tstep-087 operates on an unregulated positive supply voltage of +18 to +80V DC. Drive output current ranges from 1.2A to 7.0A per phase. The control interface for drive is opto-isolated Inputs, a potentiometer terminal and RS-485 interface for better noise immunity. Internally drive works as a micro-step driver with 2000 steps/revolution. The is programmed to provide excellent stability at all speeds overcoming limitations of other drives to perform in certain low speed conditions, full power operations at speed normally prohibited when use other drives.

Over current (windings short) and under voltage are automatically sensed by drive. When any of these conditions occur, driver shuts down and 'Fault LED' blinks to indicate the presence of fault condition.

The driver is small enough to be assembled with ease into compact control boxes or located near the motor itself.

PHYSICAL AND ELECTRICAL CHARACTERISTICS

Supply Voltages: 18 ~ 80 V DC

Phase Current: 1.2 ~ 7.0 A

Chopping Frequency: 20 KHz

Auto Current Reduction: 70% of set current after approx. 1 second of inactivity.

Inputs: IN1 and IN2 are opto- coupled (3.3 V or 5 V compatible).

Short Circuit Protection: Motor windings and motor outputs to ground.

Step Frequency: Internally operates up to 100 KHz.

Micro-steps: Internally operates as 2000 steps/rev

Potentiometer input: any value between 2k to 10k ohm

RS-485: For programming parameters or working in Online/Offline modes

Maximum operating Temperature: 70 degree Celsius (158 F).

TERMINAL DESCRIPTION

Power and Motor Connector: Connect Power (18-80VDC) and Stepper motor, for 6 and eight wire motors, refer to section at the end for various configurations.

DIP-Switch for configuration: Refer to below tables for configuring, current, device address, baud-rate and selecting different operation modes.

Motor Current Setting			
Current (Ampere)	S1	S2	S3
0.6	ON	ON	ON
1.6	OFF	ON	ON
2.6	ON	OFF	ON
3.6	OFF	OFF	ON
4.0	ON	ON	OFF
5.0	OFF	ON	OFF
6.0	ON	OFF	OFF
7.0	OFF	OFF	OFF

Device Address Setting				
Address	S4	S5	S6	S7
0	ON	ON	ON	ON
1	OFF	ON	ON	ON
2	ON	OFF	ON	ON
3	OFF	OFF	ON	ON
4	ON	ON	OFF	ON
5	OFF	ON	OFF	ON
6	ON	OFF	OFF	ON
7	OFF	OFF	OFF	ON
8	ON	ON	ON	OFF
9	OFF	ON	ON	OFF
10	ON	OFF	ON	OFF
11	OFF	OFF	ON	OFF
12	ON	ON	OFF	OFF
13	OFF	ON	OFF	OFF
14	ON	OFF	OFF	OFF
15	OFF	OFF	OFF	OFF

Baud Rate	S8
9600	OFF
38400	ON

Operation Mode Setting		
MODE	S9	S10
Manual Mode - 1	<i>OFF</i>	<i>OFF</i>
Manual Mode - 2	<i>OFF</i>	<i>ON</i>
Auto-Offline Mode	<i>ON</i>	<i>ON</i>
Auto-Online Mode	<i>ON</i>	<i>OFF</i>

Download Demo software for Auto-Offline and Auto-Online modes from our website, Refer to next section for RS-485 commands and protocol.

6 Pin Input Connector: Use supplied cable to connect to various Inputs according to the table below:

Pin Function				Operation Mode
(Pins 1-3 for Pot) 1:GND, 2: Analog-in 3 : 3.3V)	4 (IN2)	5 (IN1)	6 (+COMM for IN1, IN2)	
POT	<i>Start/Stop</i>	<i>Direction</i>	<i>+ve</i>	<i>Manual -1</i>
POT	<i>Jog-CW</i>	<i>Jog-CCW</i>	<i>+ve</i>	<i>Manual - 2</i>
POT	<i>IN2</i>	<i>IN1</i>	<i>+ve</i>	<i>Auto-Offline</i>
POT	<i>IN2</i>	<i>IN1</i>	<i>+ve</i>	<i>Auto-Online</i>

RS-485 Terminal: Connect to RS-485 bus, maximum 16 devices can be connected, make sure No two devices on the BUS are set to same address. Always terminate with proper BUS resistor (120 ohm) at the last device on the BUS.

RS-485 Frame format and command structure

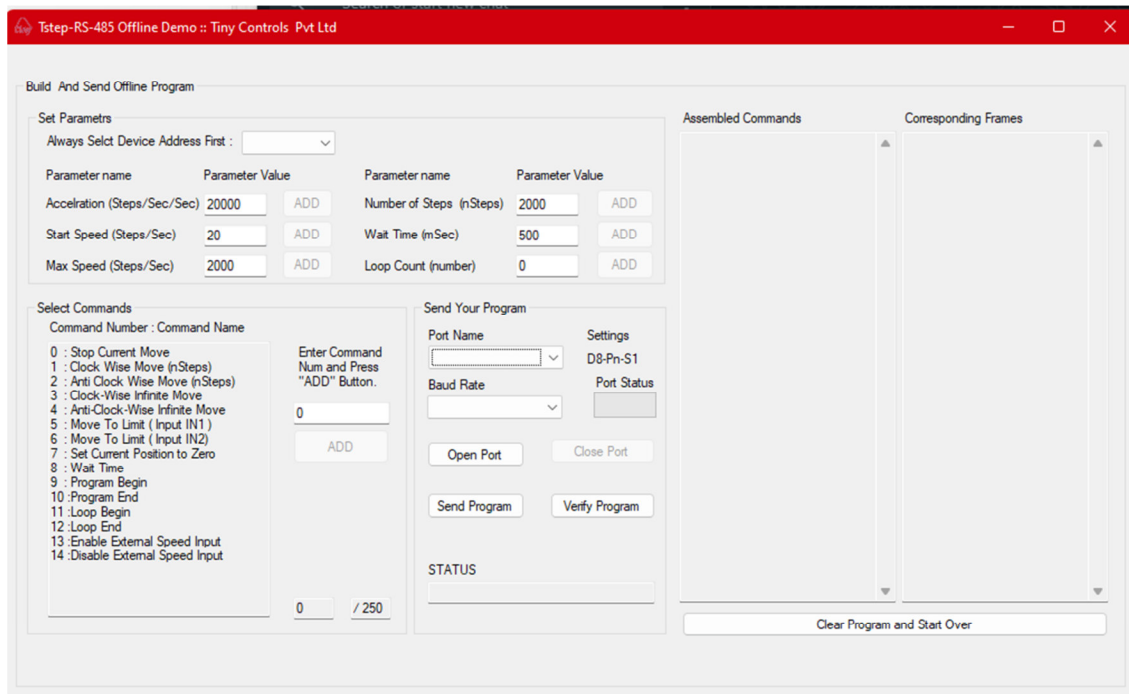
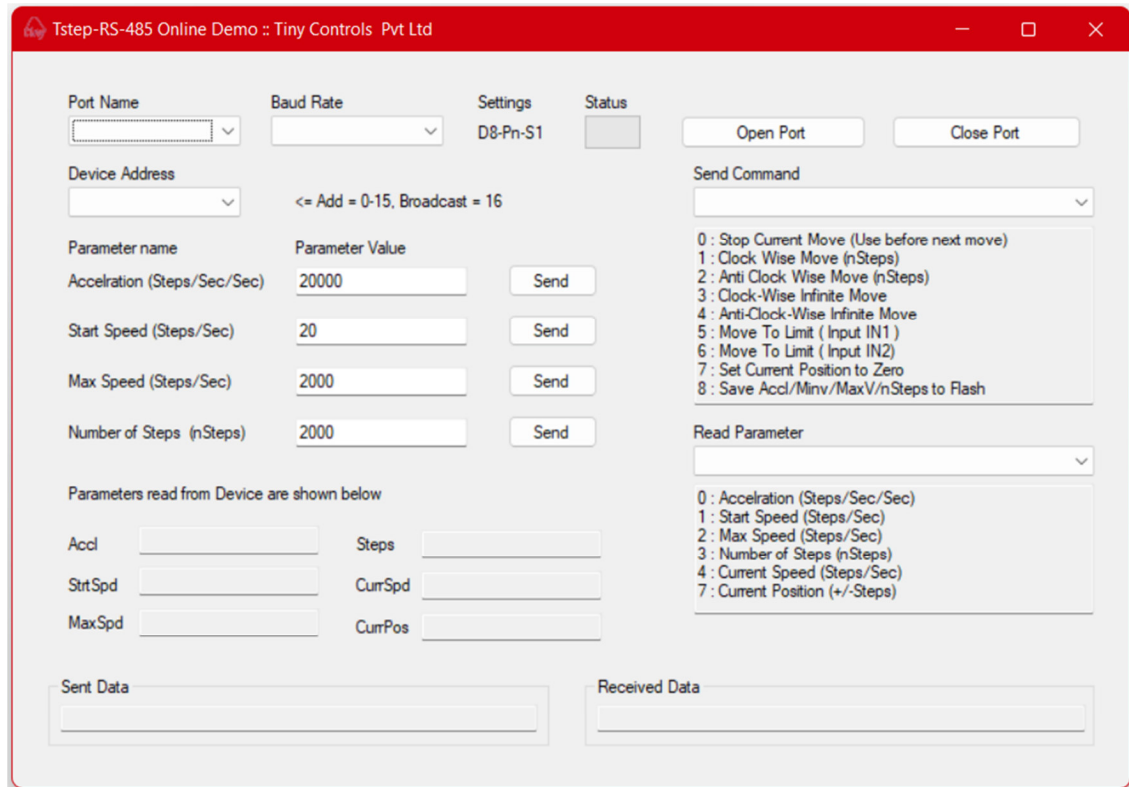
RS-485 frame consists of 8 bytes (0x denotes a hex number, but decimal equivalent number can be sent):

- Start byte, always 0x5A followed by
- One Address byte (0x00 to 0x0f) followed by
- One byte Parameter Number (or Command Number) followed by
- Four bytes Parameter Value (Least significant byte first) followed by
- End byte, always 0xA5

Parameter / Command List			
Parameter	No	4 bytes of data	Available in Online/Offline/Both Modes
Accel (Steps/Sec²)	0	0xNNNNNNNN	Both
Start Speed (Steps/Sec)	1	0xNNNNNNNN	Both
Max Speed (Steps/Sec)	2	0xNNNNNNNN	Both
Move (No. of Steps)	3	0xNNNNNNNN	Both
Wait Time (mSec)	4	0xNNNNNNNN	Both
Loop Count (number)	5	0xNNNNNNNN	Both
Send Command	6	0x00 : Stop move (if running)	Both
Send Command	6	0x01 : CW move (nSteps)	Both
Send Command	6	0x02 : CCW move (nSteps)	Both
Send Command	6	0x03 : CW infinite move	Both
Send Command	6	0x04 : CCW infinite move	Offline
Send Command	6	0x05 : Move to IN1	Offline
Send Command	6	0x06 : Move to IN2	Both
Send Command	6	0x07 : Reset Current Position	Both
Send Command	6	0x08 : Wait Time / Save Data	Offline : Wait Time Online : Save parameters
Send Command	6	0x09 : Program Begin	Offline
Send Command	6	0x0A : Program End	Offline
Send Command	6	0x0B : Loop Begin	Offline
Send Command	6	0x0C : Loop End	Offline
Send Command	6	0x0D : Enable Ext Speed Control	Offline
Send Command	6	0x0E : Disable Ext Speed Control	Offline
Read Command	7	0x00 : Read Current Accel	Online
Read Command	7	0x01 : Read Start Speed	Online
Read Command	7	0x02 : Read Max Speed	Online
Read Command	7	0x03 : Read Move (steps)	Online
Read Command	7	0x04 : Read Current Speed	Online
Read Command	7	0x07 : Read Current Position	Online

Demonstration Software:

Visit our Website at <https://www.tinycontrols.com> to download demonstration software as shown and setup our product in minutes.



Connection Diagram:

POWER SUPPLY:

Power supply may be unregulated. For unregulated supplies, it is recommended that ripple voltage should be limited to a maximum of 10% of the DC output voltage. The power supply should have a sufficient smoothing capacitance. If a Switch mode power supply is used a capacitor (470uf / 100V) connected across the power terminal is suggested, since SMPS usually have little output capacitance. This capacitor should be located as close as possible to motor power terminals.

Because of an electrical noise generated by these drives, it is not recommended that the supply be shared with low level logic circuitry. During rapid deceleration of large inertial loads from high speeds, step motors become generators of considerable electrical power. This is returned to supply by the step motor drive. If the supply cannot absorb this power, voltage generated may exceed the limit of the Tstep-087 i.e. 80 volts and damage the drive and power supply. To prevent this problem, make sure the ripple voltage does not exceed the rated supply voltage of drive.

Power supply current requirements depend on the motor being used and whether it is wired for high performance (parallel) or low performance (series) operation. If the motor is wired for high performance (parallel) the current required from the supply should not exceed 2/3 rated per phase current of motor. Low performance (series) operation requires a maximum of 1/3 the motor's rated current.

Use the manufacturer's phase current rating of the motor in conjunction with the motor wiring option to estimate the size of power supply required. See explanation on following pages for more details related to the various connection configurations.

More than one drive can be run from a common power supply if the filter capacitor is sized large enough to account for the combined load. Each drive must have separate power supply leads back to the power supply.

When operating Tstep-087-485 at high power (more than 3.0 A) levels, make suitable arrangements to keep the drive cool. All connections are available on the front side of the drive for easy access and clean routing of wire harness.

Note: *Don't run Signal and motor/Power cables parallel in the same conduit as the high frequency power switching generated noise can get into signal interfering the working of the driver. Use shielded cables for Signal lines for better noise immunity. A wire size of 16-22 AWG (around 1 sq. mm) is recommended. Either stranded or solid conductor wire can be used. The insulation should be stripped back 5 mm (around quarter of an inch) and the wire left un-tinned.*

NOTES:

The Tstep-087 is a high frequency switching type drive. Because of rapid rate of voltage and current change inherent with this type of drive, considerable RFI is generated. The following precautions should be taken to prevent noise from coupling back to the inputs and causing erratic operation.

Never run the motor leads in the same cable or wiring harness as the STEP, DIR or COM (GND or 5 V) lines.

Keep power supply leads as short as possible. If the power supply lead length exceeds 12 inches, use a 100 μ F / 100V capacitor across Power terminals.

Never wire capacitors, inductors or any other components to the motor output terminals.

Ground the Tstep-087-485 driver case.

The metal casing of the driver acts as an electrical noise filter and it is recommended not to run the drive without the cover (casing).

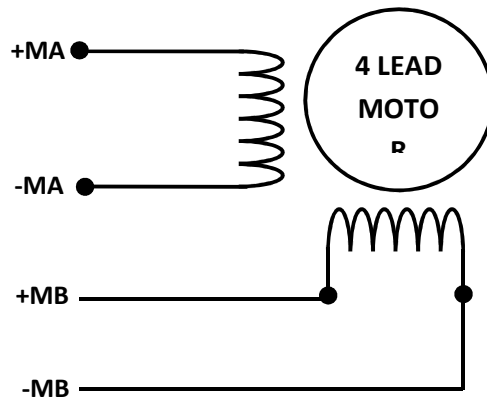
*Drive is protected from over current and short circuits but **not** from reverse polarity on POWER Terminals and doing so blows the internal fuse and may destroy the driver.*

Never put a switch on the DC side of the Drive power supply, always the switch should be located on the AC side of the power supply. Loose power wires to the Drive also equivalent to a switch on DC side and can trigger the error inside drive; in worst case it may blow the internal fuse.

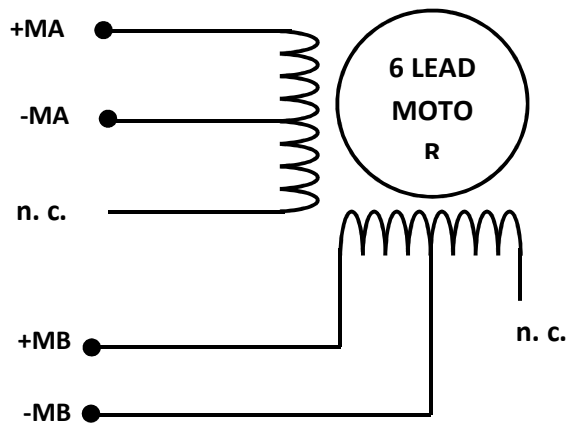
Make sure power is not connected wrong way, before switching on the power to driver.

CONNECTING: 4, 6 AND 8 WIRE MOTOR

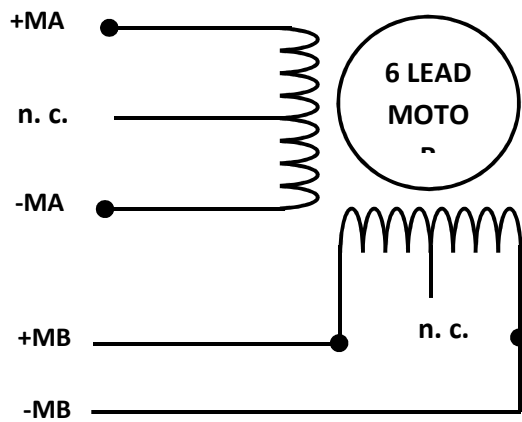
4 Lead: Only One Way (Set rated Current)



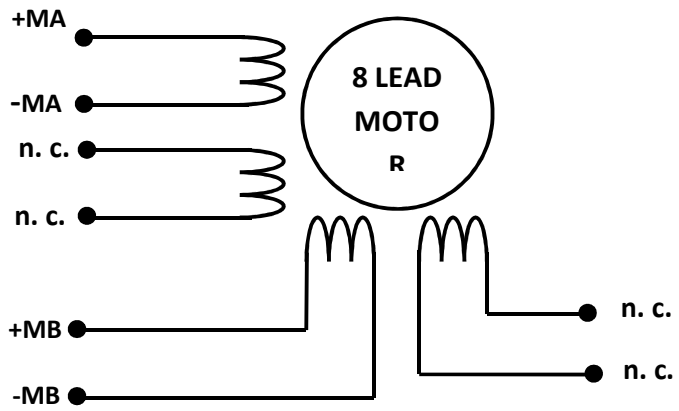
6 Lead: Half Coil (Set 2/3 rated Current)



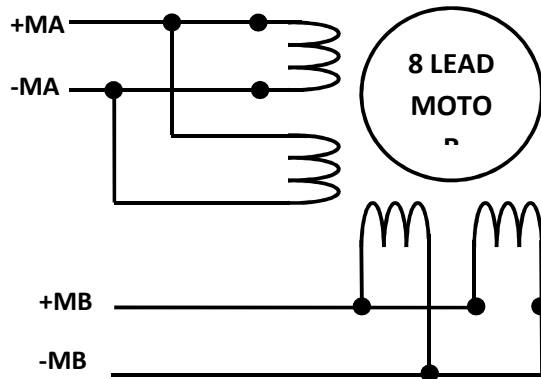
6 Lead: Series Coil (Set 1/3 rated Current)



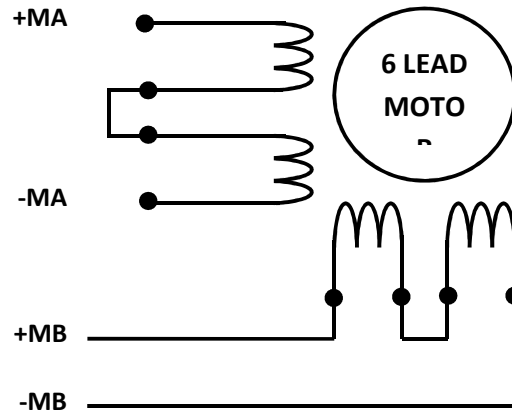
8 Lead: Half Coil (Set 2/3 rated Current)



8 Lead: Parallel Coil (Set 2/3 rated Current)



8 Lead: Series Coil (Set 1/3 rated Current)



NOTE: It is recommended to set the drive output current equal to above value, this results heating from motor.

USER NOTES: