

TStep-087 MICROSTEP DRIVE



OPERATING MANUAL

Manual Rev: 01.1d , Product Revision: P01



B-17, Nishat Park, Kakrola Mor, New Delhi, India – 110078

Email: sales@tinycontrols.com

Web: www.tinycontrols.com

This manual contains information for installing and operating the following Tinycontrols Company products:

- Tstep-087 Microstep Drive

Tinycontrols and the Tinycontrols Company logo are trademarks of Tinycontrols Company. Other trademarks, trade names, and service marks owned or registered by any other company and used in this manual are the property of their respective companies.

Copyright © 2011 Tinycontrols Company

B-17, Nishat Park, Kakrola Mor, New Delhi, India – 110078

All Rights Reserved

CONTENTS

GENERAL DESCRIPTION.....	4
LOCATION OF COMPONENTS.....	5
INSTALLATION.....	6
TERMINALS.....	7
CURRENT SETTING.....	9
NOTES.....	10

GENERAL DESCRIPTION

The TINY CONTROLS Tstep-087 is a high resolution step motor drive operating on a fixed 10 micro stepping.

The Tstep-087 operates on an unregulated positive supply voltage of 24-80 VDC. Drive output current ranges from 0.5 to 7 amps per phase. The Tstep-087 operates hybrid PM step motors rated from .5 to 7 amps per phase. With suitably sized motors, over half kilowatt (560 watts - peak) can be delivered to the user's application.

The control interface for the drive is opto-isolated for maximum noise immunity. The inputs are compatible with TTL drivers and require no additional components.

The Tstep-087 is programmed to provide excellent stability at all speed overcoming a limitation of other drives to perform in certain low speed conditions. This allows continuous, full power operation at speeds normally prohibited when use other drives.

The 'H' bridge output utilizes MOSFET design to minimize heating due to switching losses. To improve motor efficiency, automatic current standby reduces phase current to a low level while the motor is at rest to keep heating of the drive and motor to a minimum.

Over-current (winding shorts etc.), and under-voltage are automatically sensed by the Tstep-087. When any of these conditions occur the Tstep-087 shuts down and turns on a 'fault' LED to indicate the presence of the fault condition.

The drive is compact, measuring approximately 3.5" x 3" x 1". It comes encased in an anodized / powder coated aluminum cover, small enough to be assembled with ease into compact control boxes.

Technical Specifications :

Supply Voltage: 20V to 80V DC

Phase Current: 0.5 to 7 Amps in steps of 0.5 Amps

Chopping Freq : 35 Khz approx

Auto Current Reduction: 50% of set current after approx 1 second of in-activity

Size: 85mm x 70mm x 22 mm

Mounting : See installation on page 6

Inputs : Step and Direction opto coupled, 10 mA input current

Output : Error opto coupled, open collector output must be pulled up externally

Short-circuit protection : yes

Step Frequency: 0 to 200 kHz

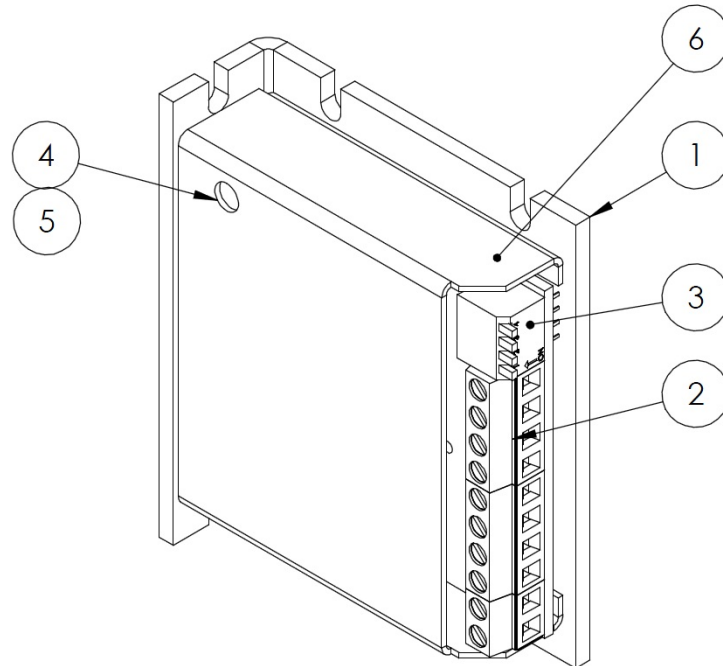
Step Pulse : Step on rising edge, minimum low/high time 3uS

Max Operating Temperature : 65 deg C

Direction Input : Stay 500nS unchanged before and after a step pulse

LOCATION OF COMPONENTS

The major components of the Tstep-087 are shown below.



The following is a description of these components.

1. MOUNTING PLATE

This plate also serves as a heatsink for the drive. Primary heat generating components are attached to this plate. Secondary heat generators are thermally coupled to it by the heat conductive epoxy used to encapsulate the Tstep-087.

2. CONNECTOR

A 10 position terminal strip located on the front edge of the Tstep-087 provides the connections for power supply, motor windings and controller interface. The function of each contact is printed on the case adjacent to the terminal strip.

3. OPTION HEADER

This 4 pin DIP switch is used to select motor current.

4. FAULT LED - RED

This LED indicates that the Tstep-087 has triggered its protective shutdown circuit. Cycling the power supply after correcting the fault condition will reset the Tstep-087 and turn off the LED.

5. POWER LED – GREEN

This LED indicates the power is connected to the drive.

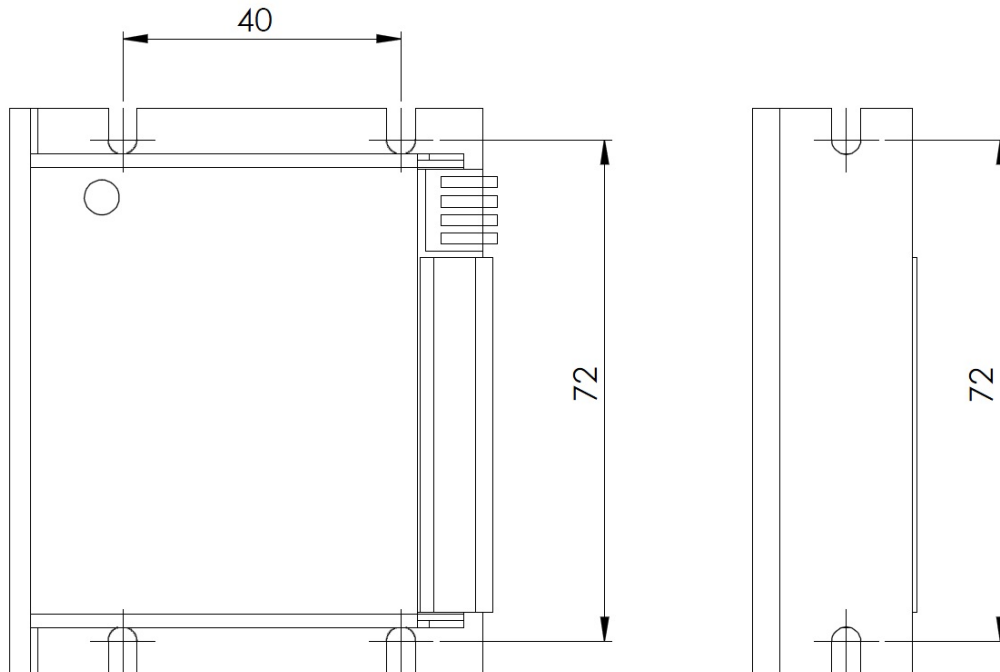
6. ALUMINIUM COVER

This powder coated or aluminum cover protects the drive from dust and other external

elements coming in contact with the drive electronics.

INSTALLATION

When operating the Tstep-087 at high power (more than 2.5A) levels an **external heat sink must be attached to the mounting plate.**

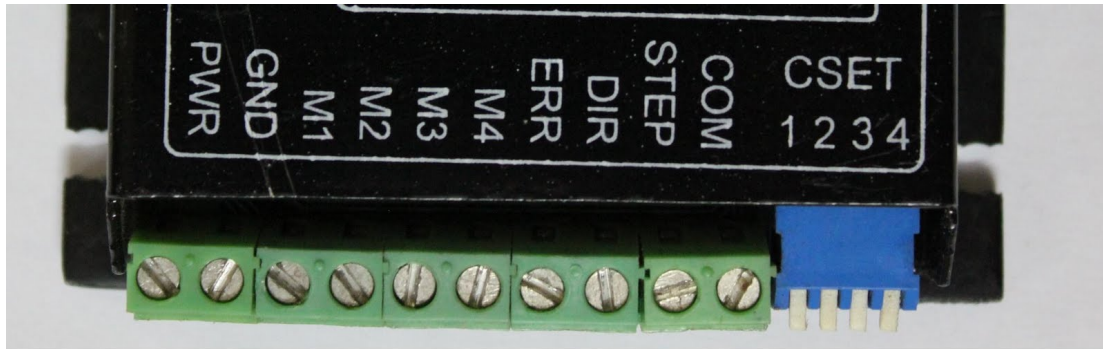


The mounting plate dimension are as given above, the dimensions are in millimeter.

No terminals or connectors are required on the wiring to the drive. A wire size of 16-22 gauge (around 1 sq mm) is recommended. Either stranded or solid conductor wire may be used. The insulation should be stripped back 5 mm (around quarter of an inch) and the wire left un-tinned.

The following section describes each connector terminal in detail.

TERMINALS (1 to 10)



POWER SUPPLY TERMINAL 1 & 2

Terminal 1 connects to the positive output from the power supply. The power supply voltage range is +20 to +80 VDC.

Terminal 2 is the ground connection for motor power supply.

The power supply may be unregulated. For unregulated supplies it is recommended that the ripple voltage be limited to a maximum of 10% of the DC output voltage.

The power supply should have a sufficient smoothing capacitor, if a Switch mode power supply is used a capacitor (470uf / 100V) connected across the power terminals is suggested, since SMPA usually have little output capacitance. This capacitor should be located as close as possible to the motor power terminals.

Because of the 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 the supply by the step motor drive. If the supply cannot absorb this power, the voltage generated may exceed the 80 volt limit of the Tstep-087 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 will not exceed 2/3 of the motor's rated per phase current. Low performance (series) operation requires a maximum of 2/3 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.

More than one Tstep-087 can be run from a common power supply if the filter capacitor is sized large enough to account for the combined load. Each Tstep-087 must have separate power supply leads back to the power supply.

PHASE OUTPUTS TERMINALS 3, 4, 5 & 6

These are the phase winding outputs to the step motor. One motor winding coil goes to PHASE M1, M2 and the other motor winding coil connects to PHASE M3, M4. No power is applied to the Phase outputs until the initial one second approx after power-up of the Tstep-087 (Power-On Reset).

The Tstep-087 will drive 4, 6 and 8 wire motors. With 6 wire and 8 wire motors, the user has the option of connecting the windings in a high or low performance configuration. Reference the relevant info to determine the best configuration for your application.

Motor wires not connected to the Tstep-087 should not be left exposed. Cut off the stripped ends and insulate them with electrical tape or heat-shrink tubing.

CONTROL SIGNAL TERMINALS 7 - 10

Terminal 7-10 are opto isolated from the power section of drive, terminal 10 being common Common GND and should not be connected to POWER GND for best performance.

Terminal 7 is an output ERROR signal and is open collector making it possible to connect multiple output error signals from all drives to be simply connected together. This signal must be pulled up externally and the drive (any of the drive in multiple drives system) will pull it down to common ground on fault condition. The red LED will light up on the drive and all the outputs to the motor power terminals are disabled.

Drive can be reset back to normal operation (after removing the fault condition like short at output) by recycling the POWER.

Terminal 8 is DIR signal, Motor will step clockwise on high signal and counter clockwise on low signal on each step pulse. If the motor is stepping in opposite direction to what is desired, it can be corrected by just reversing the phase wires of one phase keeping the other phase coil connection same.

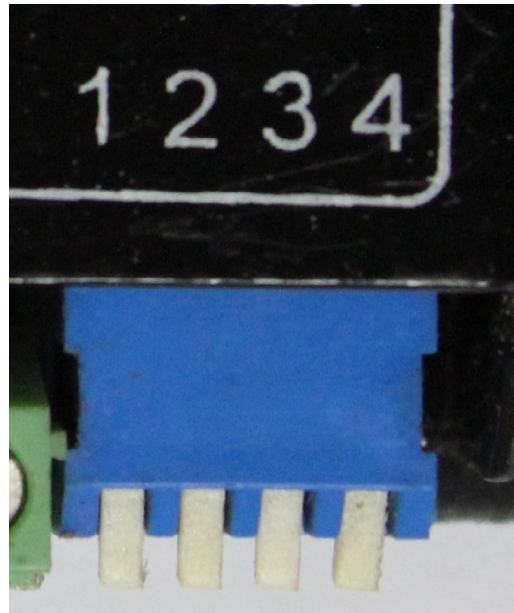
Terminal 9 is the STEP pulse (active high) signal input, the motor will rotate one step on each low to high going edge. Though there are no minimum requirements for timing it is suggested to keep the signal high for a minimum of 5 microsecond to fully saturate the output transistor inside the opto coupler.

Terminal 10 is the common (negative) GND terminal for the 3 signals STEP, DIR and ERROR.

STEP and DIR signal are to be driven with 5V signals without needing any external

resistor, the driver must be able to supply a minimum of 10 mA to the opto coupled STEP/DIR signal for best performance. IF the driver is not capable of sourcing full current it is advisable to buffer these signals with TTL buffers like 74244 type of drivers.

CURRENT SETTING USING DIP SWITCHES.



The base current on the drive is preset to 0.5A, The drive can be set to supply current up to 7A using the provide piano type DIP switches.

There are four DIP switches 1 to 4 and they are assigned current as below :

switch 1 - 0.5 Amp

switch 2 - 1.0 Amp

switch 3 - 2.0 Amp

switch 4 - 3.0 Amp

And the base (minimum) current that drive can be set to is 0.5 Amp.

When any (one or more) switch is OFF position the respective current gets added to the base current to make up a total current to the motor.

Example :

all switches ON = total current is base+ 0amp = 0.5Amp

sw 1 OFF, all other ON = the current is base + 0.5Amp = 1.0 Amp

sw 1 and 2 OFF, 3,4 ON = the current is base + 0.5 +1 = 2.0Amp

All OFF current is base + 0.5 + 1.0 + 2.0 + 3.0 = 7 Amp

Note : Switch in down position is ON position and disable the current for the respective switch.

NOTES :

The Tstep-087 is a high frequency switching type drive. Because of the 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.

1. Never run the motor leads in the same cable or wiring harness as the STEP, DIRECTION or +5 VDC input lines.
2. Keep power supply leads as short as possible. If the power supply lead length exceeds 12 inches, use a 100 μ f capacitor across Terminals 1 & 2 at the drive.
3. Never wire capacitors, inductors or any other components to the motor output terminals.
4. Ground the Tstep-087 case.
5. The aluminum casing of Tstep-087 acts as an electrical noise filter and it is advisable not to run the drive without the cover (casing).
6. Drive is protected from over current and short circuits but not from reverse polarity on POWER Terminals and connecting the power wrongly will destroy the drive.
7. The current set piano type dip switches are ON when they are in the bottom position and OFF when they are at the TOP.
8. 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.
9. Note that the extreme left terminal is POWER and the next one is GND, its printed on drive cover but just making sure by mistake the power is not connected wrong way.