

## Control Modes

- Indexer, Point-to-Point, PVT
- Camming, Gearing
- Position, Velocity, Torque [Servo Mode]
- Position (Microstepping)

## Command Interface

- CANopen/DeviceNet
- ASCII and discrete I/O
- Stepper commands
- PWM velocity/torque command
- Master encoder [Gearing/Camming]

## Communications

- CANopen/DeviceNet
- RS-232

## Feedback

- Digital Quad A/B encoder

## I/O - Digital

- 12 inputs, 4 outputs

## Dimensions: mm [in]

- 138 x 78 x 39 [5.4 x 3.1 x 1.5]



Model	Ip	Ic	Vdc
STP-075-07	7	5	75
STP-075-10	10	10	75

## DESCRIPTION

Stepnet is a stepping motor driver that combines CANopen networking with 100% digital control of stepping motors. When used with Copleys' Accelnet™ and Xenus™ digital servoamplifiers it makes possible brushless, brush, and stepping motor control over the same distributed network.

In Servo Mode, steppers fitted with encoders can be operated as DC brushless servo motors in current, velocity or position modes. This enables the motor to operate at higher RPM's without stalling which might occur in open-loop operation as a stepper.

Stepnet can operate as a stand-alone driver accepting incremental position commands from step-motor controllers in Step/Direction or CU/CD format, as well as A/B quadrature commands from a master-encoder. Pulse to motor position ratio is programmable for electronic gearing.

Set up is fast and simple using CME 2™ software operating under Windows® and communicating with Stepnet via an RS-232 link. CAN address selection is programmable in flash memory, by rotary switch on the unit or via programmable digital inputs.

Stepnet operates as a Motion Control Device under the DSP-402 protocol of the CANopen DS-301 V4.01 (EN 50325-4) application layer. DSP-402 modes supported include: Profile Position, Profile Velocity, Interpolated Position Mode (PVT), and Homing Modes. When operating in Servo Mode, Profile Torque mode is available. The CAN bus interface is optically isolated from the driver circuits.

Profile Position mode does a complete motion index on command with acceleration & deceleration, top speed, and distance pro-

grammable. In PVT (Position-Velocity-Time) mode, the controller sends out a sequence of points each of which is an increment of a larger, more complex move than that of a single index or profile. The driver then uses cubic polynomial interpolation to "connect the dots" such that the motor reaches each point (Position) at the specified velocity (Velocity) at the prescribed time (Time). Homing mode is configurable to work with a combination of limit and home switches such that the driver moves the motor into a position that has an absolute reference to some part of the machine. Profile Velocity mode controls velocity, acceleration, and deceleration with no target position defined.

There are twelve logic inputs. Input [IN1] is dedicated for driver Enable. Eleven are programmable as limit or home switches, stepper pulse inputs, A/B encoder, reset, CAN address, or motor overtemperature sensor. There are four programmable logic outputs for reporting a driver fault, operating a motor-mounted brake, or other status indications. When operating as a node on a CANopen network, the inputs and outputs can be read or controlled as independent I/O points that are not linked to driver operation.

An Aux HV input is provided for "keep alive" power that preserves the driver data (e.g. current position) and CANopen operation if +HV has been removed as in an emergency-stop situation. This enables the control system to monitor drive status and to enable an orderly recovery without a full system reset, and homing of all axes.

Operation from transformer-isolated DC power supplies saves cost in multi-axis systems.

## GENERAL SPECIFICATIONS

Test conditions: Load = 1mH per phase, ambient temperature = 25 °C. +HV = HV<sub>max</sub>

MODEL	STP-075-07	STP-075-10	
<b>OUTPUT POWER</b>			
Peak Current	7 (5)	10 (7)	Adc (Arms, sinusoidal)
Peak time	1	1	s
Continuous current	5 (3.54)	10 (7)	Adc (Arms, sinusoidal)
<b>INPUT POWER</b>			
HV <sub>min</sub> to HV <sub>max</sub>	+20 to +75	+20 to +75	Vdc, transformer-isolated
I <sub>peak</sub>	8	11	Adc (1 sec)
I <sub>cont</sub>	5.5	11	Adc
Aux HV	+20 to +75	+20 to +75	Vdc
<b>CURRENT CONTROL</b>			
Current loop update rate		15 kHz (66.7 μs)	
PWM outputs	Dual MOSFET H-bridges, 15 kHz center-weighted PWM, space-vector modulation		
PWM ripple frequency		30 kHz	
HV Compensation	Changes in HV do not affect current-loop bandwidth		
<b>REFERENCE INPUTS</b>			
CAN bus	Operating Modes	Profile Position, Profile Velocity, Interpolated Position, and Homing modes. Profile Torque when in Servo Mode	
Digital position reference	Step/Direction, CountUp/CountDown	Stepper command pulses ( 1 MHz maximum rate )	
Digital torque or velocity reference (Servo mode only)	Quad A/B Encoder	5 Mline/sec, 20 Mcount/sec (after quadrature)	
		PWM/polarity or 50% PWM format	
<b>DIGITAL INPUTS (NOTE 1)</b>			
Quantity	12		
Enable [IN1]	Dedicated input for driver enable, 33 μs RC filter, 10 kΩ pull-up/down to +5/ground		
GP [IN2,3,4,5]	General Purpose inputs with 33 μs RC filters (22 μs for [IN5]), programmable functions and active level select, 10 kΩ pull-up/down to +5/ground, Vin = 0 to +30 Vdc		
HS [IN6,7,8,9,10,11,12]	High-Speed Inputs inputs with 100 ns RC filters, programmable functions, and active level select 10 kΩ pull-up/down to +5/ground, Vin = 0 to +12 Vdc		
All inputs	74HC14 Schmitt trigger operating from +5.0 V with RC filter on input, 10 kΩ pull-up/down to +5/ground		
Logic levels	RC time-constants assume active drive on inputs and do not include 10 kΩ resistors Vin-LO < +1.35 Vdc, Vin-HI > +3.65 Vdc		
<b>DIGITAL OUTPUTS</b>			
Quantity	4		
Type	Current-sinking MOSFET open-drain outputs with 1 kΩ pullup to +5 Vdc through diode, 1 Adc sink max, +30 Vdc max.		
Functions	Programmable with CME 2™		
Active Level	Programmable to either HI (off, pull-up to +5 Vdc) or LO (on, current-sinking) when output is active		
<b>RS-232 COMMUNICATION PORT</b>			
Signals	RxD, TxD, Gnd	Full-duplex, serial communication port for driver setup and control, 9,600 to 115,200 Baud	
<b>CANopen COMMUNICATION PORTS</b>			
Number	Two, optically-isolated from driver circuits		
Signals	CANH, CANL, Ground, 1 Mbit/sec maximum		
Protocol	CANopen Application Layer DS-301 V4.01 DSP-402 Device Profile for Drives and Motion Control		
<b>MOTOR CONNECTIONS</b>			
Motor A+,A-,B+,B-	Outputs to 2-phase stepper motor, bipolar drive connected		
Motemp	Motor temperature sensor or switch. Any input [IN2~IN12] can be programmed for this function		
Encoder	Quadrature encoder for stall-detection or servo-mode operation		
<b>PROTECTIONS</b>			
HV Overvoltage	> +91 Vdc	Driver outputs turn off until +HV is < overvoltage	
HV Undervoltage	< +20 Vdc	Driver outputs turn off until +HV >= +20 Vdc	
Driver over temperature	PC Board > 70 °C.	Programmable actions	
Short circuits		Output to output, output to ground, internal PWM bridge faults	
I <sup>2</sup> T Current limiting		Programmable: continuous current, peak current, peak time	
Latching / Non-Latching		Programmable	
<b>AGENCY CONFORMANCE</b>			
EN 55011 : 1998	CISPR 11 (1997) Edition 2/Amendment 2: Limits and Methods of Measurement of Radio Disturbance Characteristics of Industrial, Scientific, and Medical (ISM) Radio Frequency Equipment		
EN 61000-6-1 : 2001	Electromagnetic Compatibility Generic Immunity Requirements <i>Following the provisions of EC Directive 89/336/EEC:</i>		
EN 60204-1: 1997	Safety of Machinery. Electrical Equipment of Machines <i>Following the provisions of EC Directive 98/37/EC:</i>		
UL 508C : 1996	UL Standard for Safety for Power Conversion Equipment		

### Notes

- [IN1] is not programmable and always works as driver Enable. Other digital inputs are programmable.

## FEATURES

Stepnet is a DSP based driver for two-phase step motors that operates as a node on a CAN bus or as a stand-alone driver that takes step motor pulses to command motor position. It operates from line-isolated DC power supplies.

As a CAN node it operates under the CANopen protocol DSP-402 for motion control devices. The functions supported include Profile Position, Profile Velocity, Interpolated Position, and Homing Modes. In Profile Position Mode a single PDO (Process Data Object) can command a position profile with programmable acceleration, deceleration, maximum speed, and target position. The acceleration can be trapezoidal or S-curve. Interpolated Position Mode works with multiple PDO's each of which specifies position, velocity, and time. For this reason this mode is sometimes called PVT (Position, Velocity, Time) mode. The driver uses a cubic-interpolation algorithm to connect the PVT points such that the motor satisfies the PVT parameters at each point while moving along a path that connects the points smoothly. In PVT mode long moves of complex shapes can be performed. Profile Velocity mode has controlled acceleration, deceleration, and maximum velocity for speed control application with no defined positions. Profile Torque mode is available when the stepper is operated in Servo Mode.

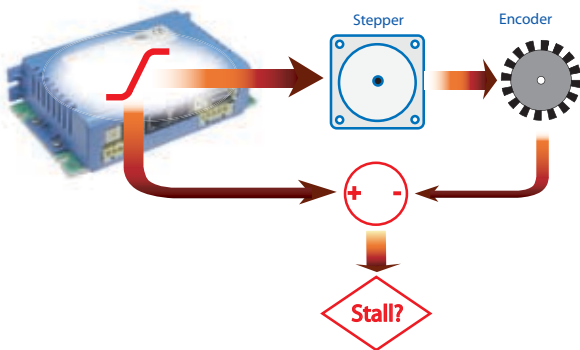
Multiple axes can be synchronized so that moves are coordinated. This emulates the functions normally performed by motion-controller cards or chips which can now be eliminated in many cases reducing cost and system complexity.

Stepnet also operates as a stand-alone driver taking pulses from controllers that output pulses in the Step/Direction or Count-Up/Count-Down mode. Electronic gearing is supported when the position commands come from a quadrature encoder. The ratio of encoder counts at the inputs to microsteps at the motor is programmable.



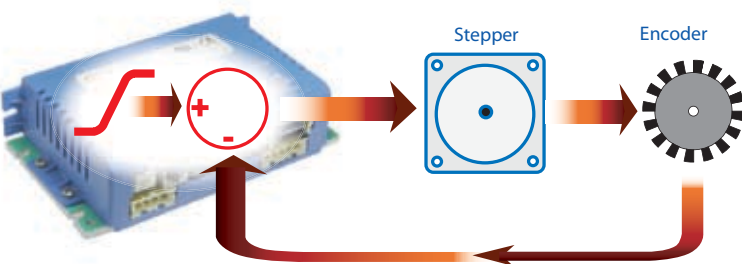
## MICROSTEPPING

Step motors can be viewed as brushless motors with a large number of poles, or electrical cycles per revolution. The two windings are spaced at 90 electrical degrees. Reversing the currents in each winding produces a 180 degree phase shift. The result is full-stepping. This kind of operation can be noisy and the large angular change per step excites the rotor to produce undesirable vibrations. In microstepping, the phase currents are sinusoidal and the change in electrical angle per step can be programmed such that the motor moves with less noise and vibration.



## STALL DETECTION

Adding an encoder to the motor gives position feedback to the driver. When the measured movement of the motor differs from the commanded position by an amount that is programmable a motor stall is indicated. The driver can then signal the control system that a motor stall has occurred, or can send a message over the CAN bus with the same effect. In this mode the stepper is operated in open-loop mode where the driver changes the phase currents based on the commanded position of the motor.



## SERVO MODE

The stepper motor is now operated as a brushless servo motor. Motor phase currents are adjusted dynamically in response to the difference between commanded position and motor position as fed back by the encoder. Field-oriented control (vector control) of the motor currents gives a wider range of motor speeds without the possibility of stalling. If the load exceeds motor's capability excess following error can be detected and driver programmed to take appropriate action.

### CME 2™ SOFTWARE

Driver setup is fast and easy using *CME 2™* software. All of the operations needed to configure the driver are accessible through this powerful and intuitive program.

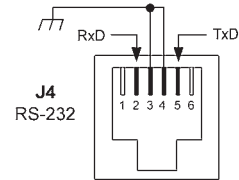
Motor data can be saved as .ccm files. Driver data is saved as .ccx files that contain all driver settings plus motor data. This eases system management as files can be cross-referenced to amplifiers.

Once an driver configuration has been completed systems can be replicated easily with the same setup and performance.

### RS-232 COMMUNICATION

*Stepnet* is configured via a three-wire, full-duplex RS-232 port that operates from 9,600 to 115,200 Baud. *CME 2™* software provides a graphic user interface (GUI) to set up all of *Stepnet* features via a computer serial port.

Once configured, *Stepnet* can be used in stand-alone mode, or as a networked driver on a CAN bus.

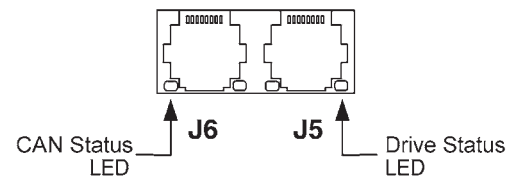
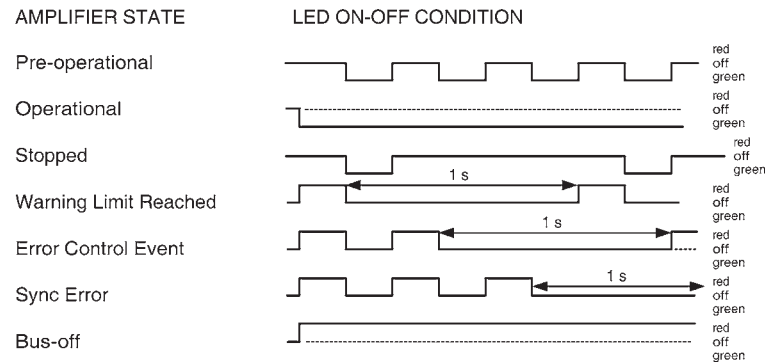


### CANOPEN COMMUNICATIONS

*Stepnet* drivers employ the CAN *physical* layer which defines the signals, voltage levels, and connections. Once connected as a node on a CAN (Controller Area Network) they communicate using the CANopen protocol which defines the format of the data flowing over the bus. The CAN transceiver circuit and local +5 Vdc supply are optically isolated from the driver circuits.

J5 & J6 pins 1,2,3, and 7 are wired to conform to CiA DR-303-1 section 6.4 “RJ45 connector”. Pin 4 designated “reserved” in DR-303-1 is not connected. Pin 8 of J5 & J6 are inter-connected for systems that carry CAN\_V+ power. This enables this power to pass through the driver to other equipment on the CAN. Pin 6, CAN\_SHLD connects between J5 & J6 to continue this connection through to other equipment.

### CAN STATUS LED



### DRIVER STATUS LED

A single bi-color LED gives the state of the driver by changing color, and either blinking or remaining solid. The possible color and blink combinations are:

- *Green/Solid*: Driver OK and enabled. Will run in response to reference inputs or CANopen commands.
- *Green/Slow-Blinking*: Driver OK but NOT-enabled. Will run when enabled.
- *Green/Fast-Blinking*: Positive or Negative limit switch active. Driver will only move in direction not inhibited by limit switch.
- *Red/Solid*: Transient fault condition. Driver will resume operation when fault is removed.
- *Red/Blinking*: Latching fault. Operation will not resume until amp is Reset

#### Drive Fault conditions:

- Over or under-voltage
- Motor over-temperature
- Encoder +5 Vdc fault
- Short-circuits from output to output
- Short-circuits from output to ground
- Internal short circuits
- Driver over-temperature
- Following error

Faults are programmable to be either transient or latching

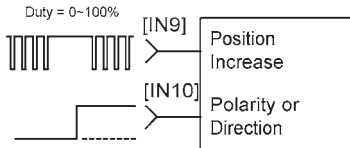
**STAND-ALONE MODE POSITION-CONTROL INPUTS**

Stepnet works with motion controllers that output pulses to command position. These formats are supported:

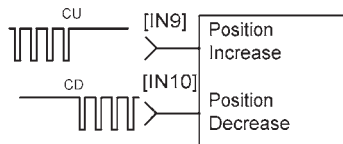
- Step/Direction
- CU/CD
- A/B Quadrature Encoder

In Step/Direction, a pulse-train controls motor position, and the direction is controlled by a DC level at the Direction input. CU/CD (Count-Up/Count-Down) turns the motor CW or CCW depending on which input the pulse-train is directed to. The motor can also be operated in an electronic gearing mode by connecting the inputs to an encoder on another motor. In all cases the ratio between input pulses and motor revolutions is programmable.

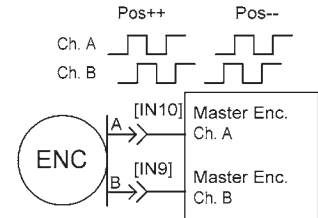
**STEP/DIRECTION INPUTS**



**COUNT-UP/COUNT-DOWN INPUTS**

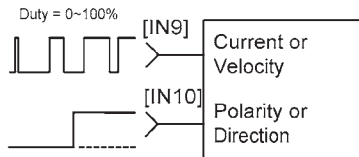


**QUAD A/B ENCODER INPUTS**



**STAND-ALONE MODE TORQUE & VELOCITY INPUTS (SERVO MODE ONLY)**

A digital PWM signal controls magnitude, and a DC signal controls polarity..

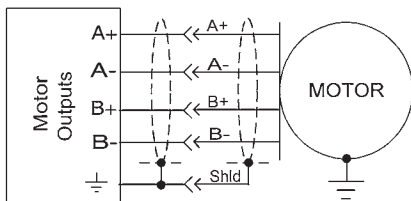


**MOTOR CONNECTIONS**

The only motor connections required for stepper operation are the motor phases. These carry the driver output currents that drive the motor to produce motion. The feedback encoder, brake, and motor over-temperature sensors are optional. If stall-detection is desired in stepper operation the encoder is required. When operating a stepper as a servo-motor the encoder is also required.

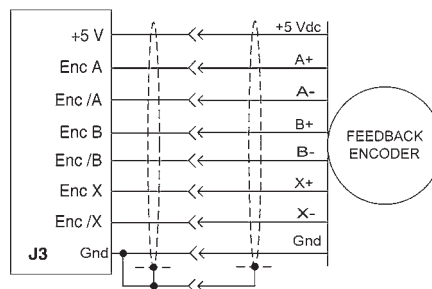
**MOTOR PHASE CONNECTIONS**

The driver output is a dual H-bridge that converts the DC buss voltage (+HV) into sinusoidal voltage waveforms that drive the motor phases. Cable should be sized for the continuous current rating of the driver. Motor cabling should use twisted, shielded conductors for CE compliance, and to minimize PWM noise coupling into other circuits.



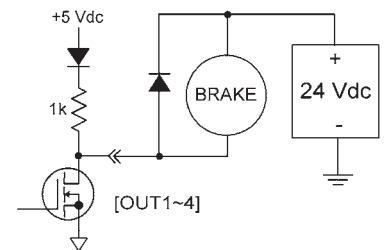
**MOTOR ENCODER**

Six dedicated inputs accept the encoder A, B, and X (index) signals. Encoders with differential line-driver outputs must be used.



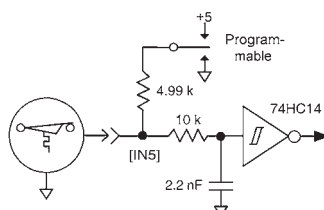
**MOTOR BRAKE**

Digital outputs [OUT1,2,3,4] can be programmed to power a motor-mounted brake. These brake the motor when they are in an unpowered state and must have power applied to release. This provides a fail-safe function that prevents motor motion if the system is in an unpowered (uncontrolled) state. Because brakes are inductive loads, an external flyback diode must be used to control the coil voltage when power is removed. The timing of the brake is programmable.



**MOTOR TEMPERATURE SENSOR**

Digital input [IN5] is programmable for use with a motor overtemperature switch. The input should be programmed as a pull-up to +5 Vdc if the motor switch is grounded.



## DIGITAL INPUTS

Stepnet has twelve digital inputs, eleven of which have programmable functions. Input [IN1] is not programmable and is dedicated to the driver Enable function. This is done to prevent accidental programming of the input in such a way that the controller could not shut it down.

Two types of RC filters are used: GP (general purpose) and HS (high speed). Input functions such as Step/Direction, CW/CCW, Quad A/B are wired to inputs having the HS filters, and inputs with the GP filters are used for general purpose logic functions, limit switches, and the motor temperature sensor. All inputs have programmable debounce time for reliable operation with electromechanical relays.

Programmable functions of the digital inputs are:

### GP inputs

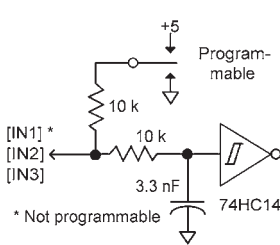
- Amp enable (dedicated function on [IN1])
- Positive Limit switch
- Negative Limit switch
- Home switch
- Driver Reset
- Motor over-temperature
- Motion abort
- CAN address bits (IN7~IN10 only)

### HS inputs

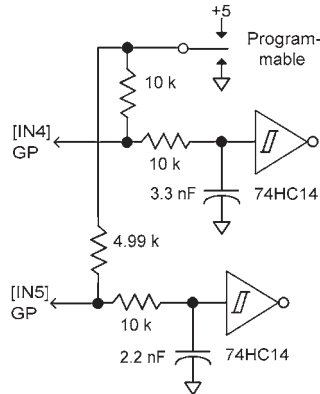
- Step & Direction, or CU/CD step motor position commands
- Quad A/B master encoder position commands
- PWM Sync input

In addition to the active level and function for each programmable input, the input resistors are programmable in four groups to either pull up to +5 Vdc, or down to ground. Grounded inputs with HI active levels interface to PLC's that have PNP outputs that source current from +24 Vdc sources. Inputs pulled up to +5 Vdc work with open-collector, or NPN drivers that sink current to ground.

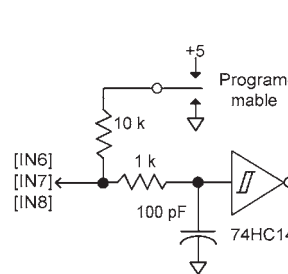
GP INPUTS 1,2,3



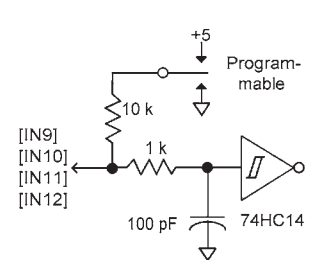
GP INPUTS 4,5



HS INPUTS 6,7,8



HS INPUTS 9,10,11,12

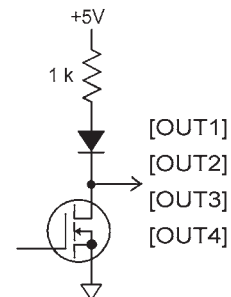


Note: 4.99 k input resistor on [IN5] is for compatibility with over-temperature sensors on Copley Motion Systems ThrustTube linear motors

## DIGITAL OUTPUTS

Digital outputs are open-drain MOSFETs with 1 kΩ pull-up resistors to +5 Vdc. These can sink up to 1 A dc from external loads operating from power supplies to +30 Vdc. When driving inductive loads such as a motor brake, an external fly-back diode is required. The diode in the output is for driving PLC inputs that are opto-isolated and connected to +24 Vdc. The diode prevents conduction from +24 Vdc through the 1 kΩ resistor to +5 Vdc in the driver. This could turn the input on, giving a false indication of the driver output state.

These outputs are programmable to be on or off when active. Typical functions are driver fault indication or motor brake operation. Other functions are programmable.



**GROUNDING CONSIDERATIONS**

Power and control circuits in *Stepnet* share a common circuit-ground (Gnd on J1-4, Signal Ground on J3-7 & 25 and J4-3 & 4). Input logic circuits are referenced to Signal Ground, as are power GND, digital outputs, and encoder. For this reason, driver Gnd terminals should connect to the users' common ground system so that signals between driver and controller are at the same common potential, and to minimize noise. The system ground should, in turn, connect to an earthing conductor at some point so that the whole system is referenced to "earth". The CAN ports are optically isolated from the driver circuits.

Because current flow through conductors produces voltage-drops across them, it is best to connect the driver HV GND to system earth, or circuit-common through the shortest path, and to leave the power-supply floating. In this way, the power supply (-) terminal connects to ground at the driver HV Return terminals, but the voltage drops across the cables will not appear at the driver ground, but at the power supply negative terminal where they will have less effect.

For CE compliance driver cables should be shielded. Motor phase currents are balanced, but currents can flow between the PWM outputs, and the motor cable shield.

To minimize the effects of these currents on nearby circuits, the cable shield should connect to Frame Gnd (J2-1). Power supply wiring should also be shielded and shield connected to J1-1, and pin 9 of J3 connects the control cable shield to frame ground. The driver case (Frame Ground, or F.G.) does not connect to any driver circuits. Connections to F.G. are provided on connectors J1-1, J2-1, and J3-9. When installed, the driver case should connect to the system chassis. This maximizes the shielding effect of the case, and provides a path to ground for noise currents that can occur in the cable shields.

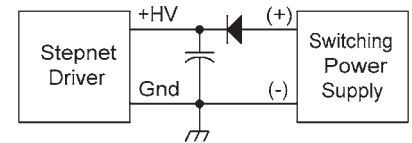
Signals from controller to driver are referenced to +5 Vdc, and other power supplies in user equipment. These power supplies should also connect to system ground and earth at some point so that they are at same potential as the driver circuits. The final configuration should embody three current-carrying loops. First, the power supply currents flowing into and out of the driver at the +HV and Gnd pins on J1. Second the driver outputs driving currents into and out of the motor phases, and motor shield currents circulating between the A+, A-, B+, & B- outputs and Gnd. And, lastly, logic and signal currents connected to the driver control inputs and outputs.

**POWER SUPPLIES**

*Stepnet* operates typically from transformer-isolated, unregulated DC power supplies. These should be sized such that the maximum output voltage under high-line and no-load conditions does not exceed the drivers maximum voltage rating. Power supply rating depends on the power delivered to the load by the driver. Unlike servo motors that consume little power at a standstill, steppers dissipate power continuously when in-position. This can vary from full rated current in both windings to something less based on programmed value of holding current.

Power supplies should be chosen with continuous power ratings that are sufficient for the motor in use.

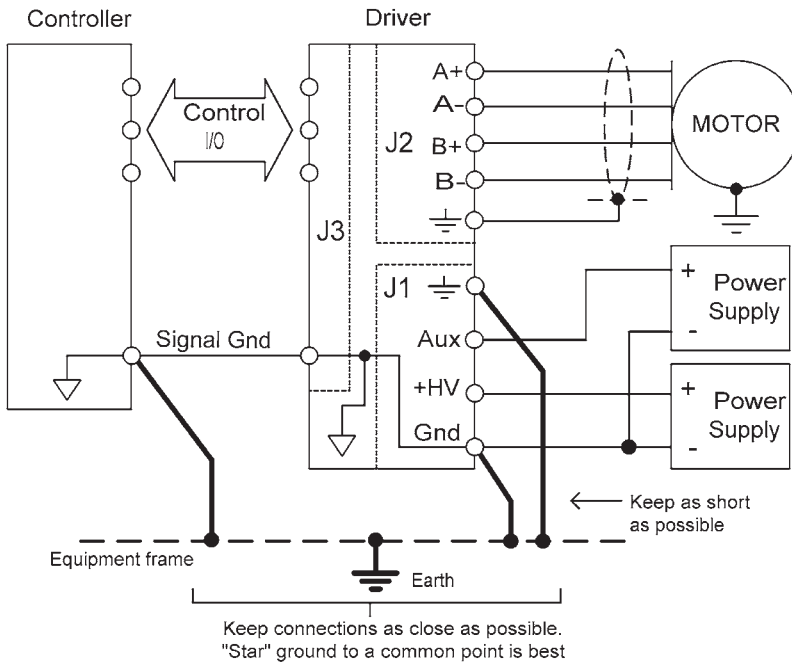
Operation from regulated switching power supplies is possible if a diode is placed between the power supply and driver to prevent regenerative energy from reaching the output of the supply. If this is done, there must be external capacitance between the diode and driver.



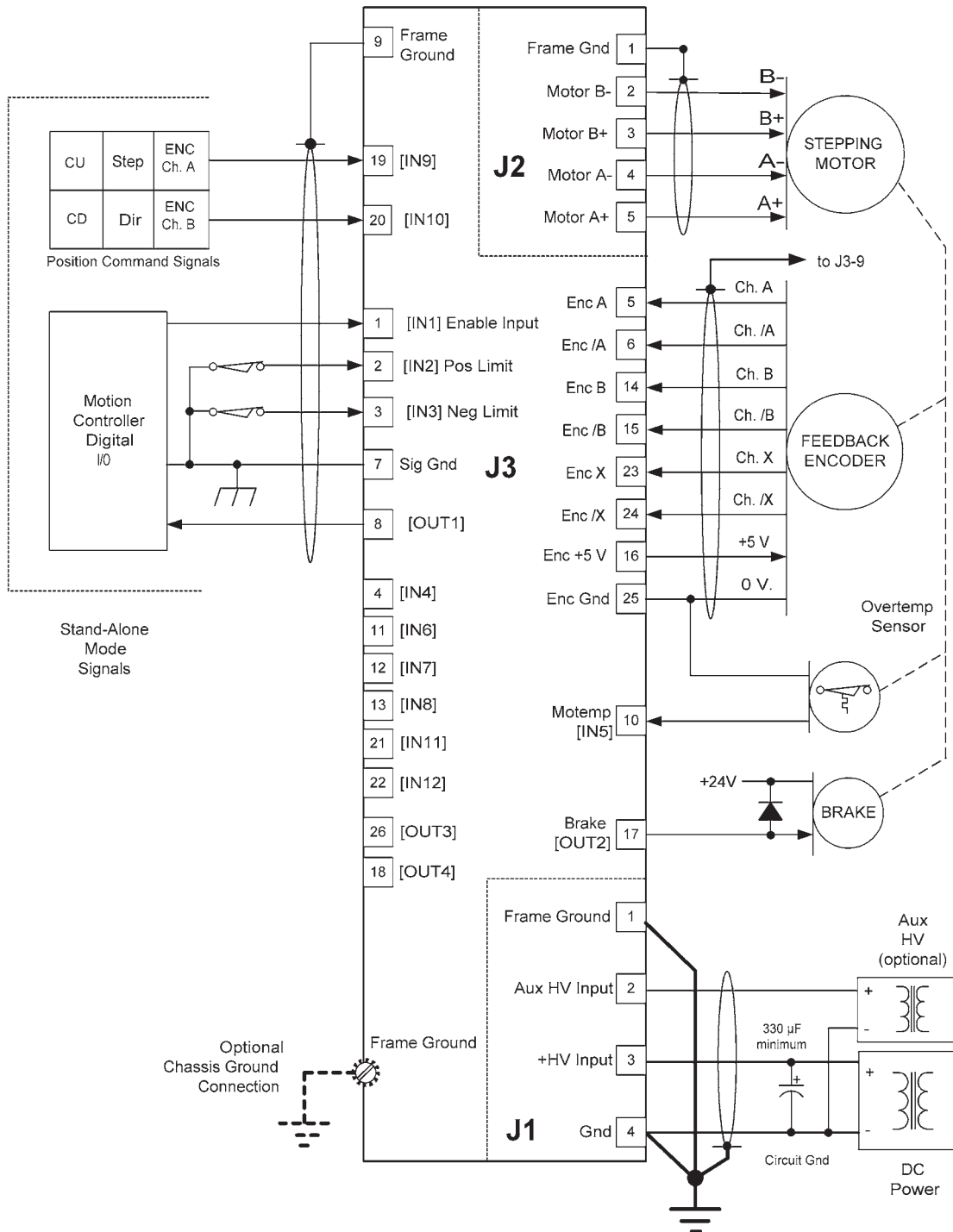
**AUXILIARY HV POWER**

*Stepnet* has an input for AUX HV. This is a voltage that can keep the driver communications and feedback circuits active when the PWM output stage has been disabled by removing the main +HV supply. This can occur during EMO (Emergency Off) conditions where the +HV supply must be removed from the driver and powered-down to ensure operator safety. The AUX HV input operates from any DC voltage that is within the operating voltage range of the driver and powers the DC/DC converter that supplies operating voltages to the driver DSP and control circuits.

When the driver +HV voltage is greater than the AUX-HV voltage it will power the DC/DC converter. Under these conditions the AUX-HV input will draw no current.



DRIVER CONNECTIONS



NOTES

1. The functions of input signals [IN2~IN12] are programmable. Default functions are shown.
2. The function of [IN1] on J3-3 is always Driver Enable and is not programmable.  
The active level of [IN1] is programmable, and resetting the driver with changes on the enable input is programmable.
3. The functions of [OUT1~OUT4] are programmable. The functions shown are typical.



## CONNECTORS & SIGNALS

### J3 CABLE CONNECTOR:

26-Position, Sub-D, three-row

Solder-Cup:

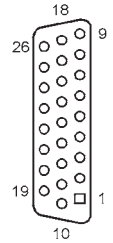
*Connector:* Norcomp, Inc. PN: 180-026-102-001 (or equivalent), *Backshell:* Century Interconnect PN: CHS15B (or equivalent)

Poke &amp; crimp:

*Connector:* Norcomp, Inc. PN: 180-026-172-000 (or equivalent), *Contacts:* Norcomp, Inc. PN: 180-001-170-001 (or equivalent)  
*Backshell:* Century Interconnect PN: CHS15B (or equivalent)

Cable: 26 conductor, shielded

J3 SIGNALS	PIN	J3 SIGNALS	PIN	PIN	J3 SIGNALS
		Output 4 [OUT4]	18	9	Frame ground
Output 3 [OUT3]	26	Output 2 [OUT2]	17	8	[OUT1] Output 1
Signal ground	25	Encoder +5 Vdc	16	7	Signal ground
Encoder input /X	24	Encoder input /B	15	6	Encoder input /A
Encoder input X	23	Encoder input B	14	5	Encoder input A
Programmable input [IN12]	22	Programmable input [IN8]	13	4	[IN4] Programmable Input
Programmable input [IN11]	21	Programmable input [IN7]	12	3	[IN3] Programmable Input
Programmable input [IN10]	20	Programmable input [IN6]	11	2	[IN2] Programmable Input
Programmable input [IN9]	19	Programmable input [IN5]	10	1	[IN1] Enable



### J4 CABLE CONNECTOR:

RJ-11 style, male, 6 position

Cable: 6-conductor modular type

J4 SIGNALS	Pin
No connect	1
RxD Input	2
Signal Ground	3
Signal Ground	4
TxD Output	5
No connect	6

J5,J6 SIGNALS	Pin
(CAN_V+) <sup>1</sup>	8
CAN_GND	7
(CAN_SHLD) <sup>1</sup>	6
Reserved <sup>1</sup>	5
No connection	4
CAN_GND	3
CAN_L	2
CAN_H	1

CAN signals within dashed line are isolated from amplifier  
See J4-J5 Notes

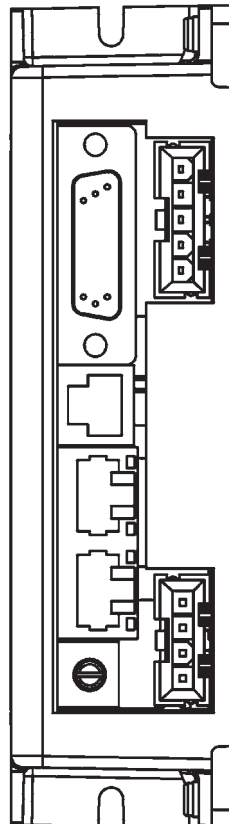
### J4, J5 CABLE CONNECTOR:

RJ-45 style, male, 8 position

Cable: 8-conductor modular type

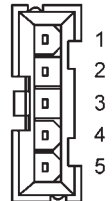
### J4-J5 NOTES

1. These signals interconnect between J4 & J5 but have no internal connections to the driver
2. CAN circuits are optically-isolated from driver circuits


**F.G.**

Frame ground via tapped hole in heatplate

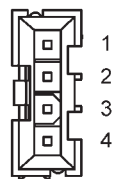
PIN	J2 SIGNALS
1	Frame Ground
2	Motor B-
3	Motor B+
4	Motor A-
5	Motor A+



### J2 CABLE CONNECTOR:

 Molex: 39-01-4051 backshell  
 Molex: 39-00-0039 contact (5)  
 Cable: AWG 18

PIN	J1 SIGNALS
1	Frame Ground
2	Aux HV
3	+HV Input
4	GND



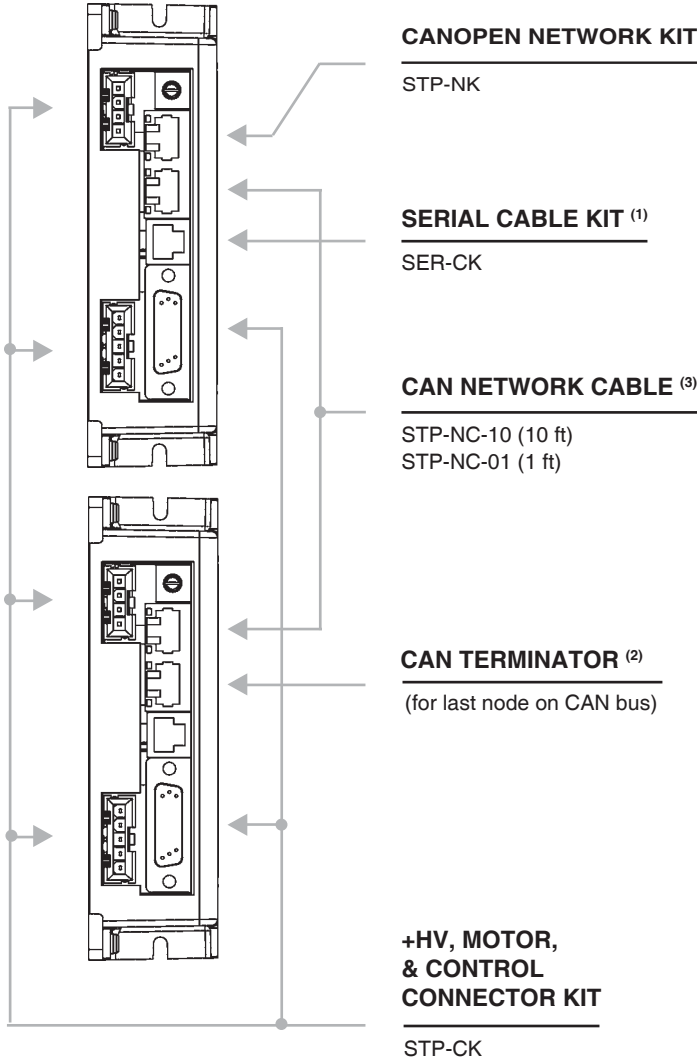
### J1 CABLE CONNECTOR:

 Molex: 39-01-4041 backshell  
 Molex: 39-00-0039 contact (4)  
 Cable: AWG 18

**CANOPEN CONFIGURATION**

Multiple drivers are connected as nodes on a CAN bus

Individual drivers are configured using an RS-232 connection and *CME 2™* software



- Notes:
1. Only one SER-CK is needed per installation
  2. CANopen Network Kit STP-NK includes Sub-D 9 to RJ-45 adapter, 10 ft. modular cable, and CAN bus terminator
  3. Order one cable (1 or 10 ft) for each additional driver

PART NUMBER	DESCRIPTION
STP-075-07	Stepnet CANopen Stepper Driver 5/7 Adc @ 75 Vdc
STP-075-10	Stepnet CANopen Stepper Driver 10/10 Adc @ 75 Vdc
STP-CK	Connector Kit for Stepnet (J1 & J2 connector shells & crimp contacts ,and plug with soldercups & backshells for J3)
STP-NK	CANopen Network Kit
STP-HK	Heatsink Kit (for field installation)
STP-CV	DB-9 Female to RJ45 Adapter Assembly
STP-NC-10	CAN network cable, 10 ft (3 m)
STP-NC-01	CAN network cable, 1 ft (0.3 m)
STP-NT	CAN Network Terminator
CME 2	CME 2™ CD (CME 2™, Manual)
SER-CK	Serial Cable Kit

**+HV**

**POWER SUPPLY**  
Mains-isolated DC  
Required for all systems  
User-supplied

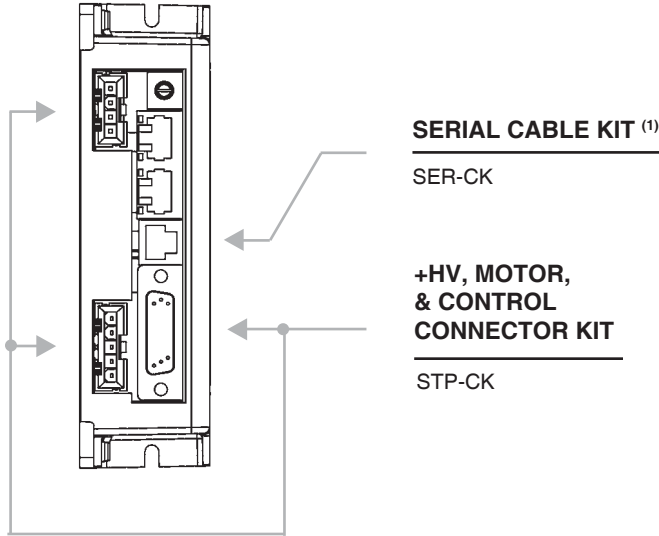
**AUX HV**

**AUX HV POWER SUPPLY**  
(Optional)

**STP-HK**

**HEATSINK**  
(Optional)

**STAND-ALONE CONFIGURATION**



Stepper Motor Control Signals:  
Step/Direction  
CU/CD

Electronic Gearing Signals:  
A/B Quadrature encoder

*CME 2™* is used for setup and configuration.

Notes:

1. Only one SER-CK is needed per installation

PART NUMBER	DESCRIPTION
STP-075-07	Stepnet CANopen Stepper Driver 5/7 Adc @ 75 Vdc
STP-075-10	Stepnet CANopen Stepper Driver 10/10 Adc @ 75 Vdc
STP-CK	Connector Kit for Stepnet (J1 & J2 connector shells & crimp contacts ,and plug with soldercups & backshells for J3)
CME 2	CME 2™ CD (CME 2™, Manual)
SER-CK	Serial Cable Kit
STP-HK	Heatsink Kit (for field installation)



**POWER SUPPLY**

Mains-isolated DC  
Required for all systems  
User-supplied



**AUX HV POWER SUPPLY**

(Optional)



**HEATSINK**

(Optional)

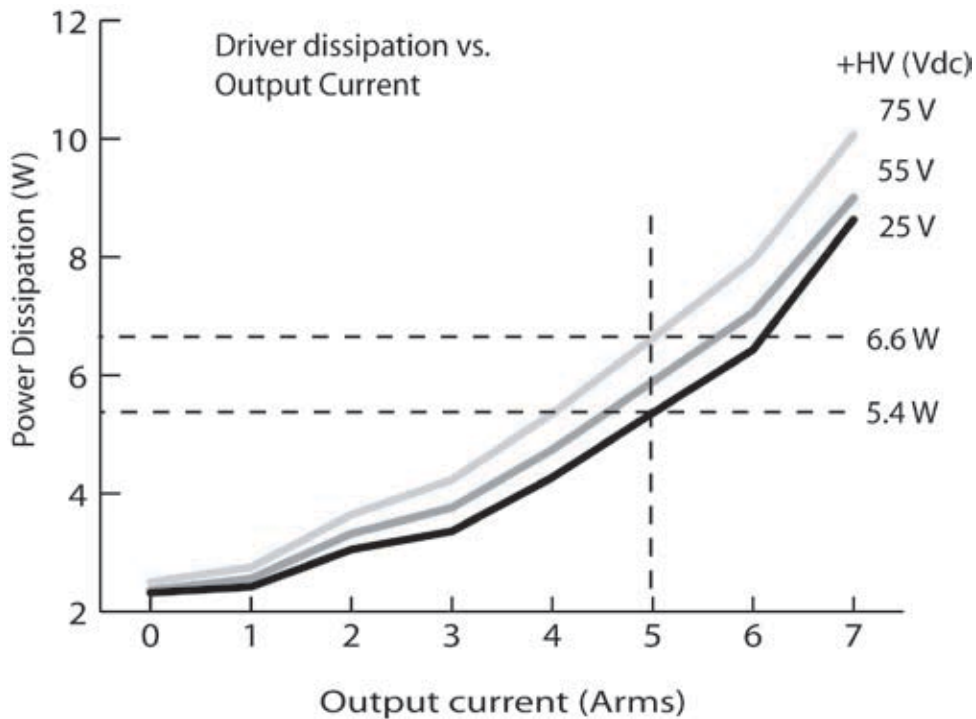
**POWER DISSIPATION**

The chart on this page shows the internal power dissipation for *Stepnet* under differing power supply and output current conditions. The output current is calculated from the motion profile, motor, and load conditions. The values on the chart represent the rms (root-mean-square) current that the amplifier would provide during operation. The +HV values are for the average DC voltage of the power supply.

When +HV and driver output current are known, the amplifier power dissipation can be found from the charts. The next step is to determine the temperature rise the driver will experience when it's installed. For example, if the ambient temperature in the enclosure is 40 °C, and the heatplate temperature is to be limited to 65 °C to avoid shutdown, the rise would be 25 °C *above ambient*.

Divide the temperature rise by the power dissipation will yield a result in units of °C/W. For a *Stepnet* operating at 75 Vdc and outputting 5 Arms, the dissipation would be about 6.6 W. This would give 25 °C/6.6W, or 3.8 °C/W as the maximum thermal resistance ( $R_{th}$ ) of a heatsink.

From the tables on the opposite page it can be seen that *Stepnet* will work in this application without heatsink or forced-air cooling.



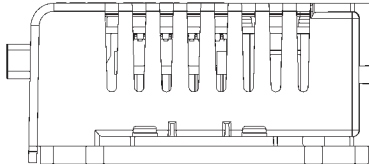
## MOUNTING & COOLING

Stepnet has slots for mounting to panels at 0° or 90°. Cooling is by conduction from driver heatplate to mounting surface, or by convection to ambient. A heatsink (optional) is required for the driver to deliver the rated continuous output current. Depending on the driver mounting and cooling means this may not be required.

## HEATSINK OPTIONS

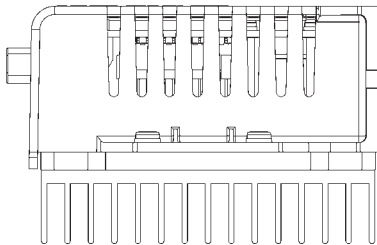
$R_{th}$  expresses the rise in temperature of the amplifier per Watt of internal power loss. The units of  $R_{th}$  are °C/W, where the °C represent the rise above ambient in degrees Celsius. The data below show thermal resistances under convection, or fan-cooled conditions for the no-heatsink and heatsink.

### NO HEATSINK



NO HEATSINK	°C/W
CONVECTION	2.8
FORCE AIR (100 LFM)	1.3

### STANDARD HEATSINK (STP-HS)



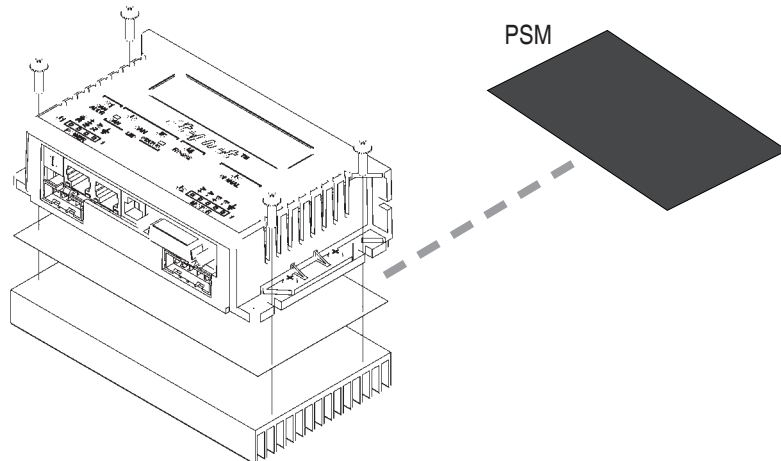
STP-HS HEATSINK	°C/W
CONVECTION	<td>
FORCE AIR (100 LFM)	0.8
FORCE AIR (200 LFM)	0.6

## HEATSINK INSTALLATION

The heatsink is mounted using the same type of screws used to mount the driver to a panel. Phase change material (PSM) is used in place of thermal grease. This material comes in sheet form and changes from solid to liquid form as the driver warms up. This forms an excellent thermal path from driver heatplate to heatsink for optimum heat transfer.

### STEPS TO INSTALL

1. Place the PSM on the Stepnet aluminum heatplate taking care to center the PSM holes over the holes in the driver body.
2. Mount the heatsink onto the PSM again taking care to see that the holes in the heatsink, PSM, and driver all line up.
3. Torque the #6-32 mounting screws to 8~10 lb-in (0.9~1.13 N·m).



## MASTER ORDERING GUIDE

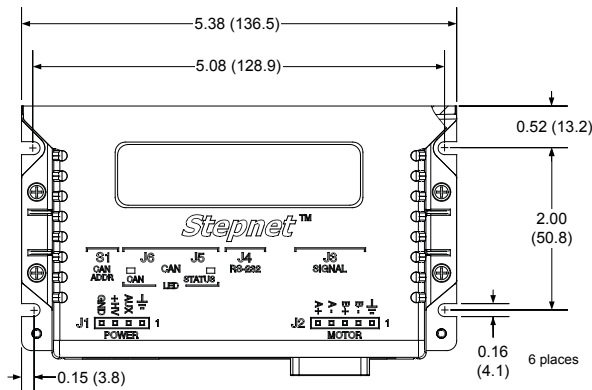
Part Number	Description
STP-075-07	Stepnet CANopen Stepper Drive 5/7 Adc @ 75 Vdc
STP-075-10	Stepnet CANopen Stepper Drive 10/10 Adc @ 75 Vdc
STP-CK	Connector kit: J1 & J2 connector shells and crimp contacts, and J3 plug with soldercups and backshell
STP-NK	CANopen Network Kit: D-Sub 9F to RJ-45 adapter, 10 ft (3 m) CANopen RJ-45 (Ethernet) cable and CAN network terminator
STP-NC-10	CANopen RS-45 (Ethernet) cable, 10 ft (3 m)
STP-NC-01	CANopen RS-45 (Ethernet) cable, 1 ft (0.3 m)
STP-CV	CANopen D-Sub 9F to RJ-45 adapter
STP-NT	CANopen Network Terminator
SER-CK	Serial Cable Kit (1 per computer) for CME2
CME2	CME2 CD-ROM
STP-HK	Heatsink kit for field installation (add "-H" to driver part number to have heatsink mounted to driver at factory)

## ORDERING INSTRUCTIONS

Example: Order 1 STP-075-07 driver with heatsink installed at factory and associated components for operation as a CANopen driver:

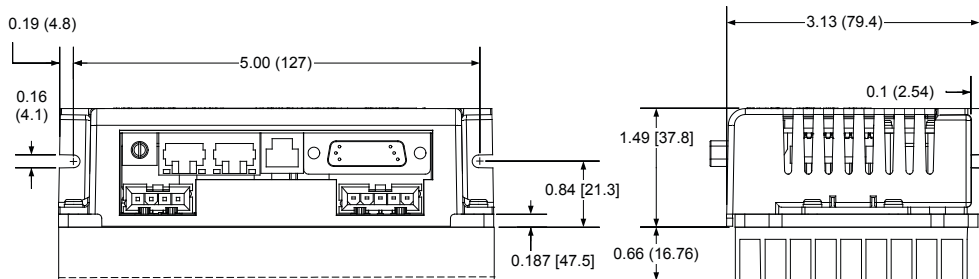
Qty	Item	Remarks
1	STP-075-07-H	Stepnet™ stepper driver with heatsink
1	STP-CK	Connector Kit
1	STP-NK	CANopen network kit
1	SER-CK	Serial Cable Kit
1	CME2	CME 2™ CD

## DIMENSIONS



Dimensions shown in inches (mm).

Weights: Amplifier 0.94 lb (0.43 kg)  
Heatsink 0.4 lb (0.15 kg)



## ROHS COMPLIANCE



Models with the green leaf symbol on the label are RoHS compliant.