ETM Conveyor Drive System

1/2HP (.37kW)

User Manual

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Drive Features

- Versatile input voltage range
- Fan-less design with mounting plate heat sink
- High efficiency
- Simple analog controls and RS-485 digital interface
- Compact integrated system with ETM NEMA100 Direct Drive Motor and controller
- Internal protection
  - Motor regeneration effects
  - Motor and controller over-temp
  - Locked rotor
- Sinusoidal current control for smooth quiet motor operation

Drive specifications

General Specifications	
Model	ETM-MD-.5
Input Power	
AC Input Range	120 - 240VAC, +/- 10%, 1Ø or 3Ø
AC Input Frequency	47Hz – 63Hz
Outputs	
Motor	U, V, W 3 phase motor drive
DC Bus Voltage	170V (115VAC mains), 340V (230VAC mains)
Motor Power Output	.5HP (.37kW) continuous
Output Current	$3A_{rms}$ continuous, $10A_{rms}$ peak (2 seconds)
Inputs/Outputs	
Front Panel	FWD/STOP/REV, Speed Control (UP/DOWN Arrows)
Analog/Digital Signals	See Table 1 below (Terminal Strip Signals)
Communications	
RS-485	ASCII serial commands, MODBUS
Motor Feedback	
Encoder	Absolute digital encoder, isolated
Motor Temp	Thermistor, isolated
Display	
LCD	16X2 character LCD display
Protections	
Motor Over Temperature	Current limit and LCD status enable >90°C, Drive disable >110°C
Drive Over Temperature	Current limiting when drive temp exceeds 90°C
Protective Earth	External ground connection marked per IEC60417
Safe Torque Off	See NOTE 1 below
Regeneration	Drive protected in overvoltage state
Mechanical and Environmental	
Size	8.0in (203mm) X 5.5in (140mm) X 2.4in (61mm)
Weight	8Lbs (3.6kg)
Ambient Temperature	0 to +45°C operating, -40 to +85°C storage
Agency Conformance	
	PENDING
	ROHS Compliant
Enclosure	
	NEMA 1, IP 20, Black ABS (UL 94 5VA Compliant)
Test Conditions	Wye connected load: Ambient temperature = 25°C, Power input = 115VAC, 60Hz, 1Ø

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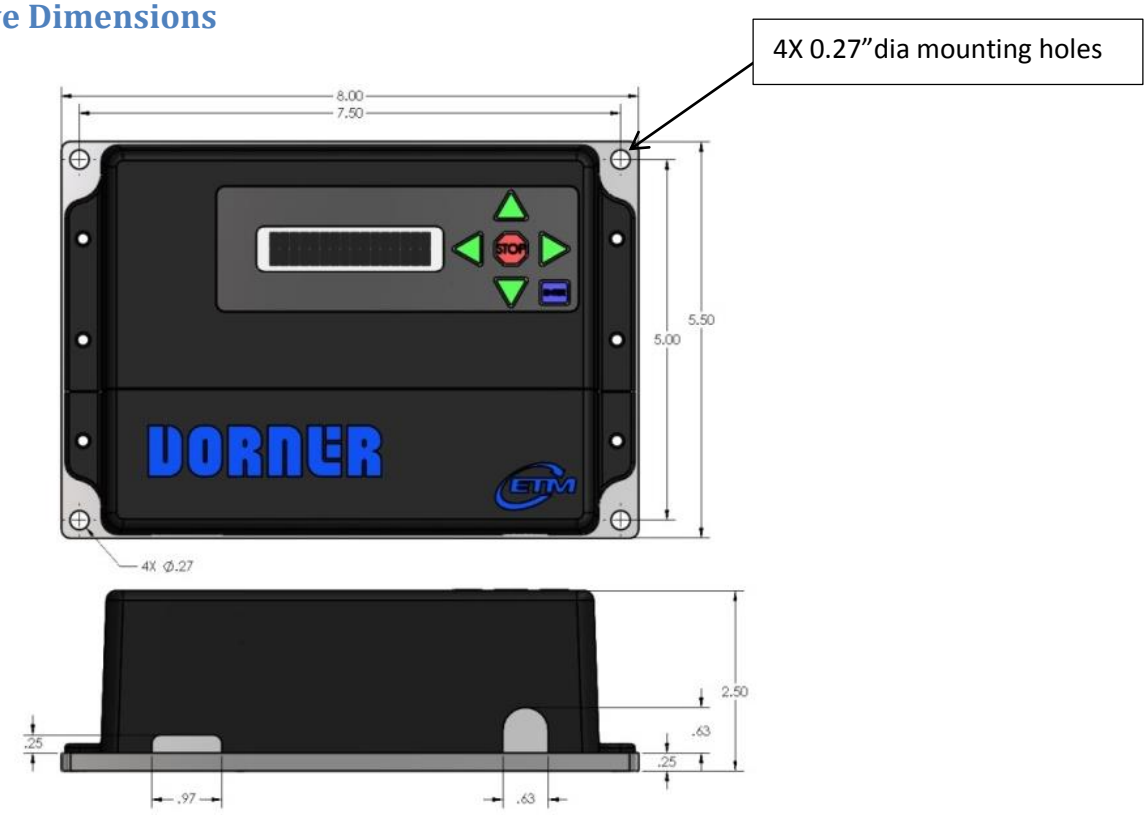
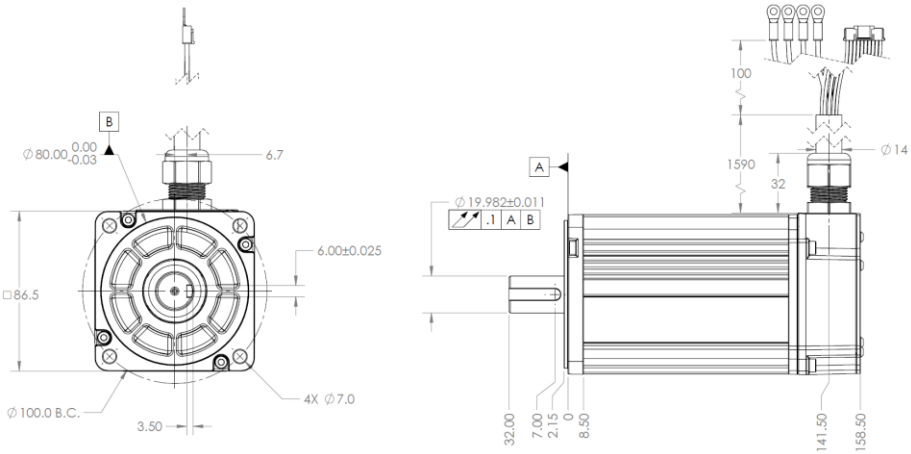
Installation

Drive Dimensions



Motor Dimensions (mm)



Wiring

Figure 2 shows the cable connections from the motor to the drive, as well as the I/O and signal connections.

Note: Motor must be wired to Drive before Supply Power is turned on.

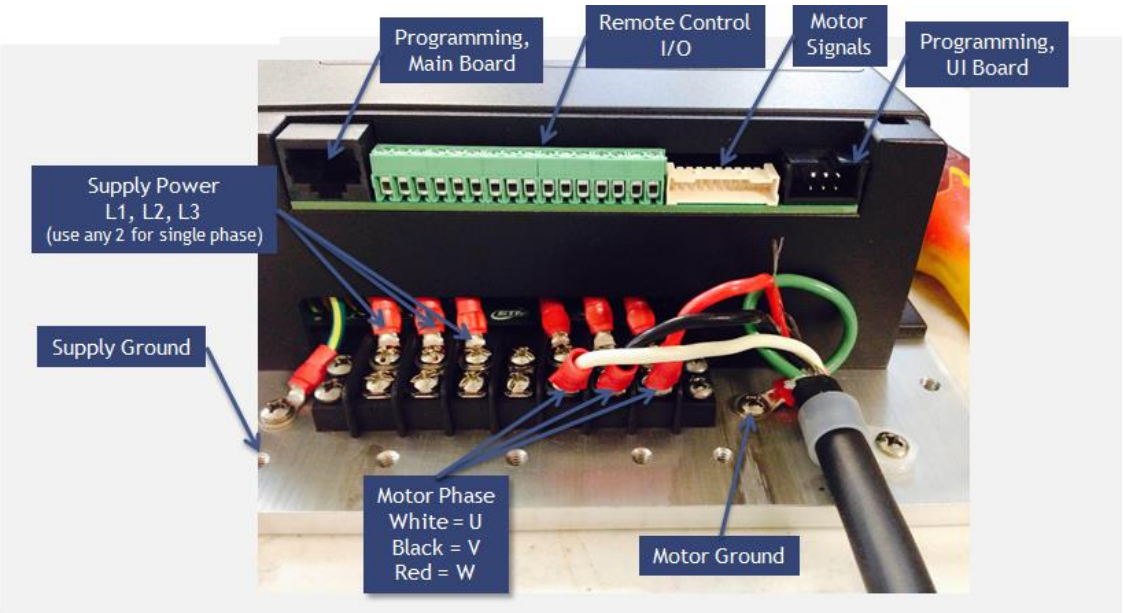


Figure 1: Cable connections

Terminal	Description	Notes
1	Start/Stop	
2	Analog Common	
3	Analog Input (Potentiometer)	Speed Control
4	DC Supply	5VDC, 10ma (Speed Control)
5	FWD/REV	
6	Digital Common	0VDC
7	Digital Output	Fault
8	Analog Output	0..5, max 20ma (Speed Reference)
9	TXA (RS485+)	
10	TXB (RS485-)	

Table 1: Remote Control Signals (Isolated)

Menu

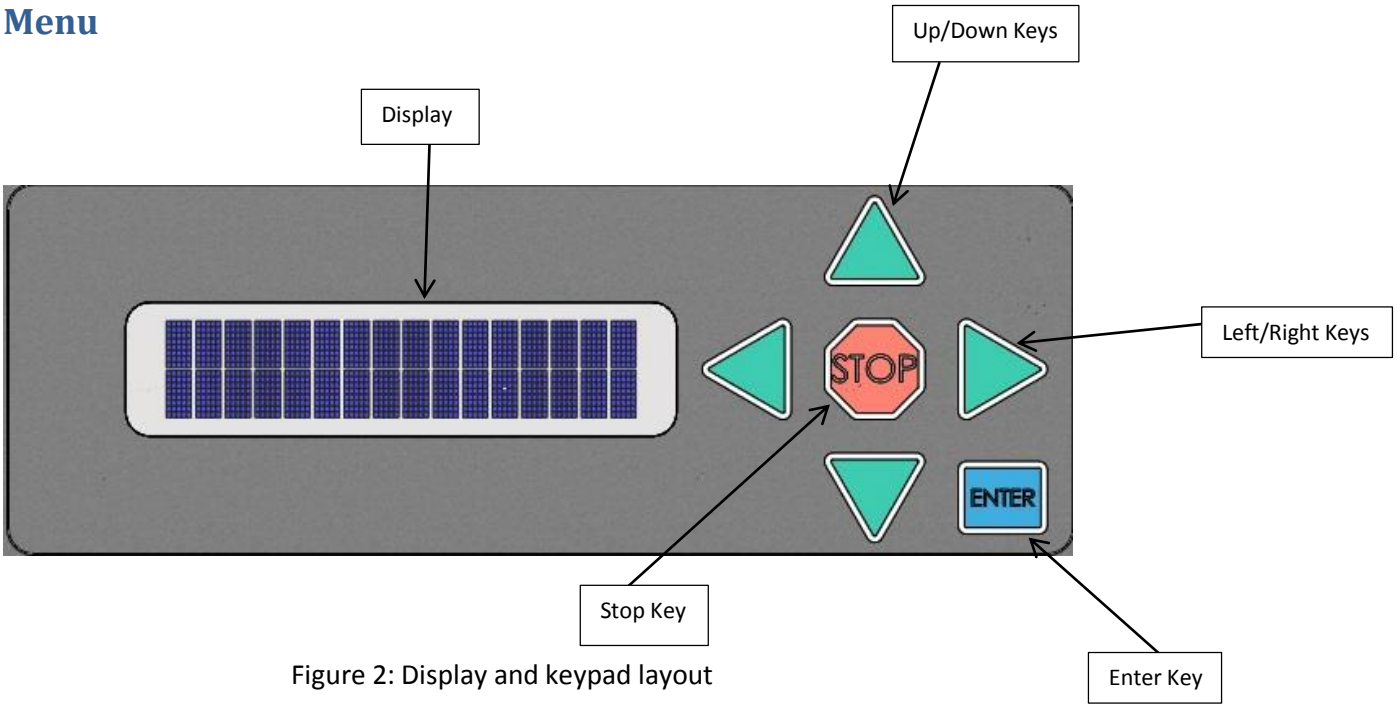


Figure 2: Display and keypad layout

On startup, the display shows the following text:

```
STOP              10 RPM
Speed Adj Up/Dwn
```

- The speed of the motor in RPM can be adjusted by pressing the UP/DOWN arrows on the keypad.
- Press the ENTER key to confirm the selected speed. Speed is limited by the min/max speed determined by the user.
- Once the correct speed has been selected, pressing the RIGHT arrow key will start the motor in the forward/reverse direction. (Determined by Start Key menu option)
- Pressing the STOP key will stop the motor.
- Holding the LEFT arrow key and then holding the ENTER key for 2 seconds (while still holding the LEFT key) will lock out the direction and speed controls on the keypad. STOP and Menu access will still be available. Remote direction and speed controls will still be available. Hold LEFT and ENTER again to unlock keypad. A locked display is indicated with the symbol Ω.

To access the settings menu, hold down the ENTER key for 2+ seconds. Use the UP/DOWN keys to cycle through the menu options. Use the LEFT/RIGHT keys to adjust each setting. Press the ENTER key to confirm a setting change. Table 2 shows the structure of the menu options.

Menu	Parameters	Description
Control Source	Keypad*	Speed/Start/Stop from Front Keypad
	Remote	Start/Stop Control from Terminal Strip
	Modbus	Modbus Interface (RS485) TBD
Reference Source	Keypad *	Speed Reference from Keypad
	0-5V Analog In	0-5VDC (Speed Control) from Terminal Strip
Start Key	Forward*, Reverse	Start Key direction
Minimum Speed	10 RPM	10-500 RPM (10 RPM Default)
Maximum Speed	500 RPM	10-500 RPM (500 RPM Default)
Acceleration Time	500 msec	20-3600 mseconds (500 mseconds default)
Deceleration Time	500 msec	20-3600 mseconds (500 mseconds default)
Input Polarity	Active High*	Start/FWD inputs on Terminal Strip
	Active Low	Start/FWD inputs on Terminal Strip
Test Mode	Spin Test	Initiates Spin Test
Belt Speed Ratio	476/1000 RPM/Ft/min	1:1 Ratio to motor speed, 1-1000
Monitor	See Table 3	Status monitors
Encoder Pos	2500	Positive Encoder calibration
Encoder Neg	-2500	Negative Encoder calibration
Backlight Adjust	0-100%	Display Backlight Control
Contrast Adjust	0-100%	Display Contrast Control
Firmware	Drive	Current Drive firmware version
	Display	Current Display firmware version
	Update	Allows firmware update
Phase Alignment	Press Enter	Initiates automatic encoder alignment

Table 2: Front Panel Menu Options *indicates default selection

To Exit the menu, navigate to the “To Exit Menu Press ENTER” option, and press the ENTER key.

Status Monitor

To access the status monitors of the drive and motor, hold the ENTER key for 3+ seconds to open the menu. Then use the UP/DOWN keys to navigate to the Monitor subsection. Use the LEFT/RIGHT keys to cycle through the different monitor options.

Monitor	Description
Status1	Fault code display
Status2	Fault code display
Speed	Motor speed in RPM
MCU Temp	Drive MCU temp
Enclosure Temp	Drive enclosure temp
Drive Temp	Drive heatsink temp
Motor Temp	Motor temp
ExtSpdInp	0-5V value of external speed input
Phase	Current in A_{rms}

Table 3: Status Monitor Menu Options

Fault Codes

Status1 and Status2 indicate possible fault codes from the drive or motor. Each status is a hexadecimal representation of a 16 bit binary word. Each bit represents a different fault. Table 4 describes the fault codes associated with each bit.

Status2 bit	Description	Status1 bit	Description
0x0001	Supply voltage high warning	**0x0001**	Vibration Limit Exceeded
0x0002	Supply voltage low warning	**0x0002**	Keep-Alive timeout
0x0004	Supply voltage high fault	**0x0004**	Fire Disconnect
0x0008	Supply voltage low fault	**0x0008**	Overspeed fault
0x0010	Phase Current A high fault	**0x0010**	Underspeed fault
0x0020	Phase Current B high fault	**0x0020**	Display interface frame error
0x0040	Phase Current C high fault	**0x0040**	Overload fault
0x0080	Motor temp high warning	**0x0080**	Not Used
0x0100	Motor Temp high fault	**0x0100**	Not Used
0x0200	Heatsink temp high warning	**0x0200**	Encoder Stuck
0x0400	Heatsink temp high fault	**0x0400**	Error reading EEPROM
0x0800	Ambient temp high warning	**0x0800**	Error writing EEPROM
0x1000	Ambient temp high fault	**0x1000**	Encoder error
0x2000	Phase current following error	**0x2000**	Receive frame errors
0x4000	Sudden change of speed	**0x4000**	MCU high temp fault
0x8000	Not Used	**0x8000**	Remote Interface

Table 4: Status1 and Status2 fault codes

Initial Start-up Procedure

When a Drive and Motor are first connected, the Drive must perform a one-time setup procedure to align the encoder on the Motor. It is very important that the Motor is wired to the Drive before supply power is turned on the first time. When the drive is powered on, the display will show a “Please wait, performing setup” message. The Motor will slowly turn one revolution forward. Once complete, the display will return to the home screen and normal operation can resume.

The Phase alignment can also be accessed through the Menu. Navigate to the Phase Alignment option and press ENTER to perform the alignment.