

Installation & Operating Manual

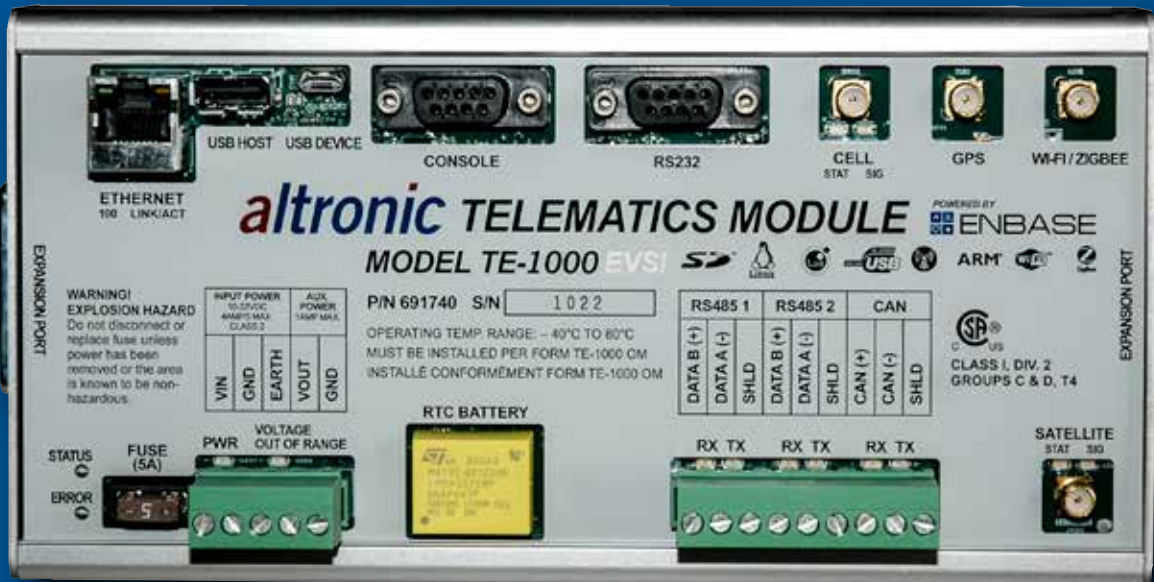
TE-1000 Telematics Module

Form TE-1000 IOM 12-18

altronic

HOERBIGER Engine Division

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1.0 OVERVIEW

1.1 The TE-1000 is an engine and compressor automation platform with built-in telematics for remote diagnostics and set point control. The TE-1000 includes a state-of-the-art mobile application and analytics dashboard driving engine and compressor optimization and uptime performance. The Telematics module is a general purpose, microprocessor-based, remote electronic device designed to monitor and control industrial equipment. The system contains the following features:

- Secure Digital (SD) nonvolatile memory card for storing monitored data and control logic
- Ethernet, USB, RS232, RS485, and CAN ports for connecting to external systems
- WiFi radio for local wireless communications with smartphones, tablets, PCs
- GPS radio for geo-location and asset tracking
- Zigbee radio for wireless communications with battery-powered sensors
- Selectable Cellular (AT&T, Verizon) and/or Satellite for remote locations and back-up configurations are available (See Ordering Section Below)
- Monitors DE-3000/DE-3000+ control and safety setpoints and reports alarms and shutdowns
- Custom programming logic via Lua open-source scripting language

1.2 Monitoring and configuring of the DE-3000/DE-3000+ is via the TE-1000's user interface. The built-in web-based application called the Web Hub Control Panel can be accessed by the following connection methods:

- WiFi (local)
- Ethernet (local)
- RS232 Serial (local)
- Satellite (remote)
- Cellular (remote)

The Web TE-1000 Control Panel provides a built-in HMI for monitoring and control, full configuration and programmability, local history log, and device status tracking.

2.0 HARDWARE SPECIFICATIONS

2.1 TELEMATICS MODULE (TE-1000)

- (1) Ethernet port
- (1) USB Host port
- (1) USB Device port
- (1) CAN bus port
- (2) RS 485 ports
- (1) RS232 DB9 port
- (1) Console DB9 port
- (1) Male DB25 expansion port (future expansion)
- (1) Female DB25 expansion port (future expansion)
- 4GB SD Card for local data storage (expandable to 32GB)
- Battery-backed Real-Time Clock
- WiFi + Zigbee Radio for wireless sensors
- GPS Module for Geo-location
- Cellular/GSM, Cellular/CDMA, or Satellite Remote Communications Modem
- Power Input 12-32VDC, 3.0A max.

WARNING: BEFORE INSTALLING OR SERVICING THE TE-1000:

- READ THIS GUIDE THOROUGHLY
- DISCONNECT POWER TO EQUIPMENT
- ENSURE THE PRODUCT IS BEING INSTALLED BY A QUALIFIED TECHNICIAN
- OBSERVE ALL LOCAL RESTRICTIONS, CODES AND ORDINANCES
- OBSERVE ALL WARNINGS AND CAUTIONS HIGHLIGHTED IN THIS DOCUMENT
- ENSURE AREA IS KNOWN TO BE NON-HAZARDOUS BEFORE PROCEEDING WITH INSTALLATION / SERVICE

NOTE: THIS EQUIPMENT IS SUITABLE FOR USE IN CLASS 1, DIV. 2 GROUPS C & D, T4 LOCATIONS

WARNING: EXPLOSION HAZARD — SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2.

AVERTISSEMENT: RISQUE D'EXPLOSION — LA SUBSTITUTION DE COMPOSANTS PEUT RENDRE CE MATERIEL INACCEPTABLE POUR LES EMPLACEMENTS DE CLASSE I, DIVISION 2.

WARNING: EXPLOSION HAZARD — DO NOT REPLACE FUSE/SHUNTS UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.

AVERTISSEMENT: RISQUE D'EXPLOSION — COUPER LE COURANT OU S'ASSURER QUE L'EMPLACEMENT EST DESIGNÉ NON DANGEREUX AVANT DE REPLACER LE FUSIBLE.

WARNING: DO NOT REMOVE OR REPLACE FUSE OR CONNECTORS WHILE CIRCUIT IS LIVE UNLESS THE AREA IS KNOWN TO BE FREE OF IGNITIBLE CONCENTRATIONS OF FLAMMABLE SUBSTANCES.

WARNING: EXPLOSION HAZARD — DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.

AVERTISSEMENT: RISQUE D'EXPLOSION — AVANT DE DECONNECTER L'EQUIPEMENT, COUPER LE COURANT OU S'ASSURER QUE L'EMPLACEMENT EST DESIGNÉ NON DANGEREUX.

- Operating Temp -40°C to 80°C
- Dimensions: 8 in x 4 in x 1¼ in
- Class I Division 2, Groups C & D; T4 hazardous locations

3.0 MOUNTING THE TE-1000 TELEMATICS MODULE

3.1 There are two options for mounting the TE-1000:

1. Mounting in a standalone NEMA Type 4X enclosure.
2. Mounting in a compressor control panel, using DIN rail or magnetic mount.

3.2 MOUNTING IN STANDALONE ENCLOSURE

The Altronic TE-1000 can ship with an optional NEMA Type 4X fiberglass enclosure with latching lid that screws down to provide ingress protection, impact protection and weather protection.

You must use the proper fittings and conduit that maintain the weather-proofing capabilities of the enclosure. The choice of flex or rigid conduit is up to the end user. All wiring and connections must be made in accordance with all local restrictions, codes and regulations.

3.3 MOUNTING IN EXISTING ENCLOSURE

The standard TE-1000 ships with two DIN rail mounting brackets on the back of the enclosure.

3.4 Alternative mounting options exist as follows (contact Altronic for details):

- Flanged end-plates for mounting to subpanels via self-tapping screws
- Magnetic mounting feet for non-invasive mounting on metallic surfaces

4.0 POWERING THE TE-1000 TELEMATICS MODULE

4.1 POWER REQUIREMENTS

Please carefully review the following recommendations and requirements

- The module requires 12-32VDC
- It is strongly recommended that power wiring be routed through a separate conduit from communications and sensor I/O wiring
- Use 16 AWG or larger gauge wire
- The input power and return terminal points are clearly labeled on the TE-1000 enclosure.

NOTE: THIS DEVICE IS OPEN TYPE EQUIPMENT THAT MUST BE USED WITHIN A SUITABLE END-USE SYSTEM ENCLOSURE, THE INTERIOR OF WHICH IS ACCESSIBLE ONLY THROUGH THE USE OF A TOOL. THE SUITABILITY OF THE ENCLOSURE IS SUBJECT TO INVESTIGATION BY THE LOCAL AUTHORITY HAVING JURISDICTION AT THE TIME OF INSTALLATION.

NOTE: WIRING TO OR FROM THIS DEVICE, WHICH ENTERS OR LEAVES THE SYSTEM ENCLOSURE, MUST UTILIZE WIRING METHODS SUITABLE FOR CLASS I, DIVISION 2 HAZARDOUS LOCATIONS, AS APPROPRIATE FOR THE INSTALLATION.

WARNING: IF YOU ARE PROVIDING YOUR OWN ENCLOSURE, YOU MUST MAKE SURE IT PROVIDES SUITABLE WEATHER, IMPACT, AND INGRESS PROTECTION. CONTACT ALTRONIC FOR RECOMMENDATIONS.

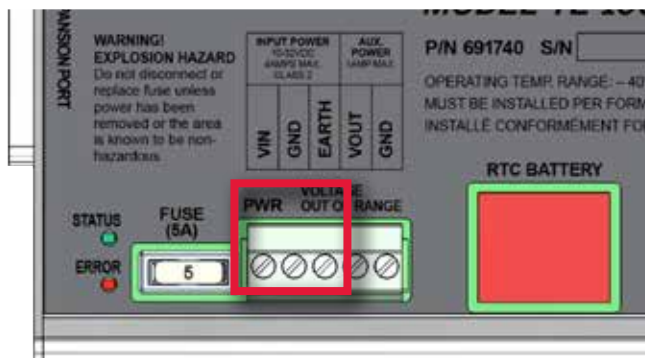


FIGURE 1 – MAIN POWER TERMINALS

For ease of wiring, a pluggable Power Terminal strip is located on the TE-1000. When operating in an environment with the potential for transient voltage spikes,

such as connecting to the batteries charged by an engine's alternator, installation recommendations are as follows:

- A power supply or voltage regulator should be used to ensure that the TE-1000 is not subjected to voltages outside of the operating range.
- The TE-1000 should be directly connected to the terminals of the battery and not to the alternator DC output. This allows the batteries to act as a buffer to filter out spikes and noise.
- The Earth terminal point on the Main Power Terminal should be connected to a grounding rod. AWG 14 or larger is recommended for the grounding wire.
- The negative terminal of the battery should be connected to a grounding rod.
- Do not start the equipment with weak or discharged batteries, as this prevents the batteries from acting as filters, allowing noise and voltage spikes to travel into the TE-1000.

When powering the TE-1000 with a solar kit, the following recommendations should be followed:

- Connect the TE-1000 to the charge controller of the solar kit so as not to completely drain the batteries in the event of several consecutive days without sunlight.
- Use a system capable of providing at least 500mA on average and 2.5A for peak usage (e.g., transmit/receive over modem)

4.2 FUSE

The module is equipped with a fuse to protect from over-currents. If the TE-1000 fails to start after applying power, the first thing you should check is the fuse. Verify the integrity of the fuse by using a multi-meter to confirm continuity on the two leads. The fuse should fit securely into the socket.

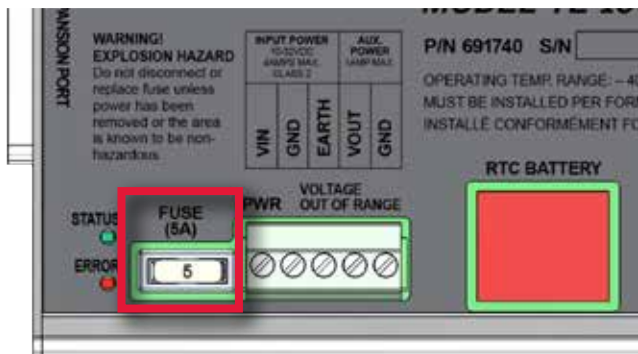


FIGURE 2 – FUSE

WARNING: WHEN REPLACING THE FUSE YOU MUST ENSURE YOU USE THE SAME TYPE AND RATING FUSE. A SPARE FUSE IS PROVIDED WITH EACH TE-1000 UNIT. PLEASE CONTACT ALTRONIC TO OBTAIN ADDITIONAL FUSES.

**WARNING: EXPLOSION HAZARD — DO NOT REPLACE FUSE/SHUNTS UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS;
AVERTISSEMENT: RISQUE D'EXPLOSION — COUPER LE COURANT OU S'ASSURER QUE L'EMPLACEMENT EST DESIGNÉ NON DANGEREUX AVANT DE REPLACER LE FUSIBLE.**

4.3 CONSOLE

The TE-1000 provides a DB9 serial connection to connect a PC for troubleshooting purposes. This port should not be used under normal circumstances.

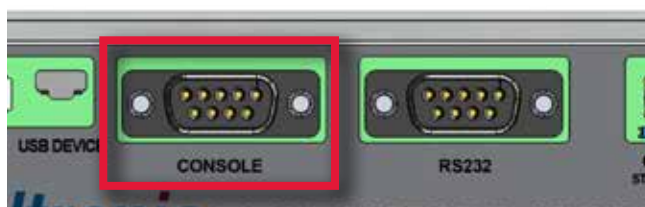


FIGURE 4 – CONSOLE

4.4 AUXILIARY POWER PORT

For powering additional devices, an Auxiliary Power Terminal is located on the Telematics Module. The Main and Auxiliary terminal points are electrically equivalent. The load on this terminal should not exceed 1A.

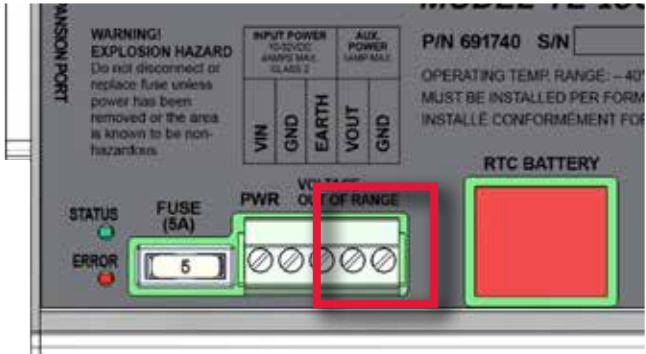


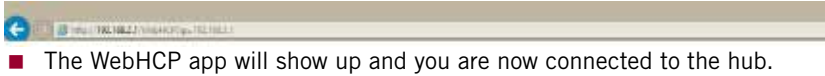
FIGURE 3 – AUXILIARY POWER TERMINAL

4.5 CONNECT TO THE HUB

There are 2 ways to connect to the hub: WIFI or using Ethernet cable.

WIFI

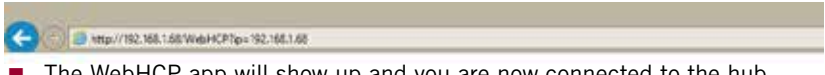
- On the WIFI network, look for the SSID named **EnbaseHub** and connect to it.
- Type in the password **thinkbig** when prompted to connect to the hub's WIFI.
- Open the browser and type in the hub IP address in the address bar: <http://192.168.2.1/WebHCP?ip=192.168.2.1>



- The WebHCP app will show up and you are now connected to the hub.

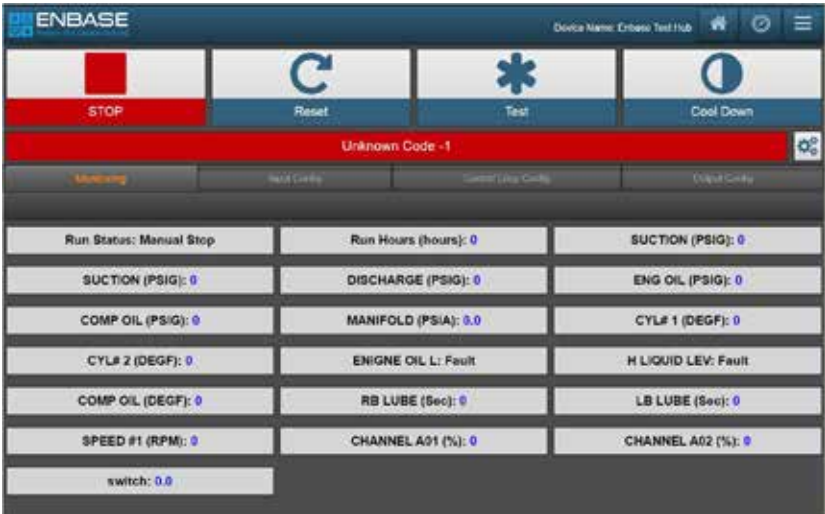
Ethernet

- Using an Ethernet cable, connect your laptop directly to the hub.
- Open the web browser and type in the hub IP address in the address bar: <http://192.168.1.68/WebHCP?ip=192.168.1.68>



- The WebHCP app will show up and you are now connected to the hub.

After connecting to the Hub, the WebHCP app will show the home screen. If the Hub is configured for Altronic DE 3000, the Home Screen will be the DE 3000 screen.



4.6 CONNECTING TO EXTERNAL DEVICES

The TE-1000 is capable of connecting to third-party devices via the Serial or Ethernet ports. The following protocols are supported:

- Modbus RTU Master or Slave over RS232 (point-to-point)
- Modbus RTU Master or Slave over RS485 (multi-drop, single Master)
- Modbus RTU Master or Slave over TCP (multi-drop, multi-Master)

Along with the physical wiring and connections, you must also configure the Telematics Module to extract data from the external devices. This is done via the Web Hub Control Panel application.

4.7 CONNECTING TO DE-3000

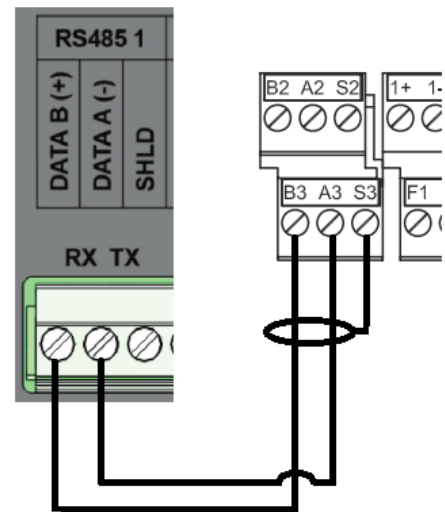
The TE-1000 connects to the DE-3000 (Com Port 3, 38.4K baud rate) via the RS232 and RS485 ports. The following protocols are supported:

- ASCII over RS232 (point-to-point)
- Modbus RTU Master over RS485 (point-to-point)
- A DB-9 male-female cable, 693115-X series or equivalent, is used to connect the TE-1000 to the DE-3000 Display Module and secured with the cable lock screws.
- A RS485 wire is used to connect the TE-1000 RS485 1 terminals to the DE-3000 Power Supply Module via the RS485 PORT 3 terminals marked B3, A3, and S3. The figure at right indicates proper wiring.

4.8 CONNECTING TO DE-3000+

The TE-1000 connects to the the DE-3000+ in the following way:

- Connect one end of a male-to-male null-modem DB9 serial cable to the Spare Serial Port DB9 connector of the TE-1000 and connect the other end to the Port 1 DB9 connector of the DE-3000 Display. Tighten the screws on the ends of the cable to ensure a tight and secure fit. The 9-pin port at the computer module needs a male connector.
- Connect one end of a shielded two-wire RS485 serial cable to RS485 Port 1 of the TE-1000 and connect the other end (which has RJ-45 connector) to the Graphite HMI's RS-485 port. Only connect the cable's Shield to the SHLD terminal of the TE-1000.



4.9 SERIAL CONNECTIONS – RS232

The Telematics Module provides a programmable DB9 serial connection. The following functions can be assigned to this port:

- Modbus RTU (point-to-point)
- TE-1000 Control Panel
- External Display
- External modem

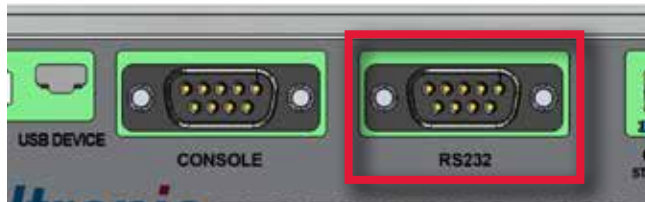


FIGURE 5 – RS232

4.10 SERIAL CONNECTIONS – RS485

The TE-1000 provides two ports for Modbus over RS485. Use the following method to connect a third party device via RS485:

- Connect the Data+/B line of the external device to the Module's Data +/B terminal point
- Connect the Data-/A line of the external device to the Module's Data -/A terminal point
- Connect the cable shield ONLY to the Module's SHLD terminal point. Do NOT connect the shield to any other device.

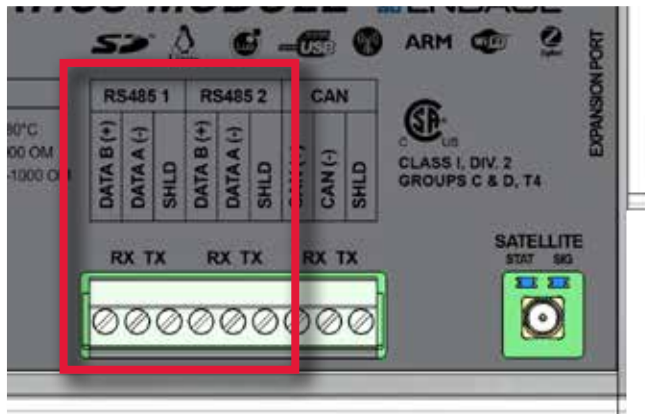


FIGURE 6 – RS485

Use the following best practices for RS485 network wiring:

- As stated above, DO NOT connect the shield to both ends of the network, as this will create a ground loop that will circulate noise and interfere with communications. The TE-1000 should be the last device on one end of the network and the shield should be landed on the Module.
- Use the proper cable optimized for RS485 networks, Belden 9841 or equivalent.
- When connecting multiple devices in a multi-drop network, you should keep the length of the drops to a minimum. Be sure to connect the Shield when connecting one drop to another so as to create a continuous connection (but do not connect the shield to any slave devices in the network). Also, take care to connect the TxD+/B of one device to the TxD+/B of another device, and TxD-/A to TxD-/A. For multi-drop networks a daisy-chain topology is recommended.

- Be aware that there is very little consistency in the naming conventions of the wires in an RS485 network. What one vendor calls A is another vendor's B, and vice-versa. If you are having trouble communicating with a third party device you should try to reverse the A/B connections at the device's RS485 terminal points. Enbase follows the EIA-485 standard wherein A refers to the (-) inverting pin (TxD-/RxD-), also known as D-, and B refers to the non-inverting (+) pin (TxD+/RxD+), also known as D+. These are clearly labeled on the top panel of the Module for Serial Port 3 and 4.
- For very long networks you may need to terminate both ends of the RS485 network. By default, the RS485 connections on the Module are terminated with a built-in 120-ohm resistor (this can be disabled via programmatic settings in the Web Hub Control Panel). If communication issues are experienced, a 120 ohm resistor should be terminated at the opposite end of network run

4.11 CAN BUS

The TE-1000 provides a CAN bus port to support monitoring of engine data over J1939. Use the following method to connect a third party device via CAN:

- Connect the CAN HI (+) of the external device to the Module's CAN + terminal
- Connect the CAN LO (-) of the external device to the Module's CAN - terminal
- Connect the cable shield to the Module's SHLD terminal

The Module's CAN port has a built-in 120 ohm termination resistor. As such, the TE-1000 should be the last device on one end of the CAN network. The last device on the other end of the network should also be terminated with a 120 ohm resistor.

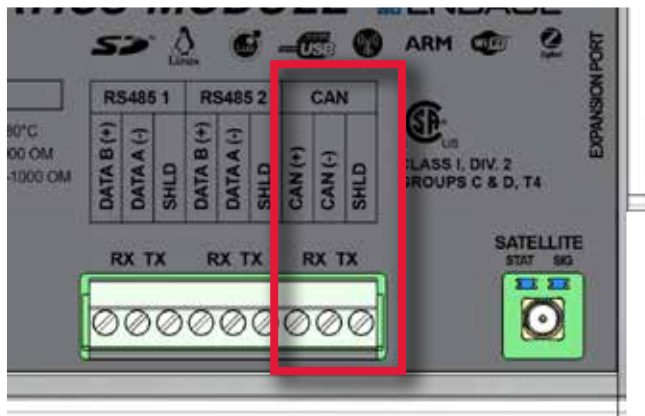


FIGURE 7 – CAN BUS

4.12 ETHERNET CONNECTION

Use the following method to connect to a third party device via Ethernet:

- Use an Ethernet cable to connect the Module's Ethernet port to a Module using a standard cable. If connecting directly to a device you may need to use a cross-over cable.
- The TE-1000's default IP address is 192.168.1.68.

The Ethernet port can be used for the following functions:

- Modbus TCP Master
- Modbus TCP Slave
- Connect to the Module's built-in Web Hub Control Panel web application

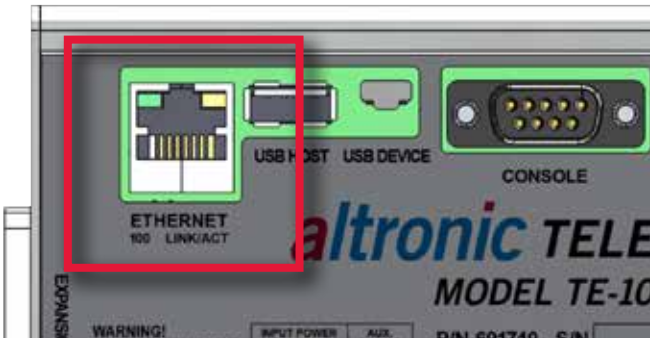


FIGURE 8 – ETHERNET

4.13 USB HOST

The Module provides a single USB Host port for future expansion.

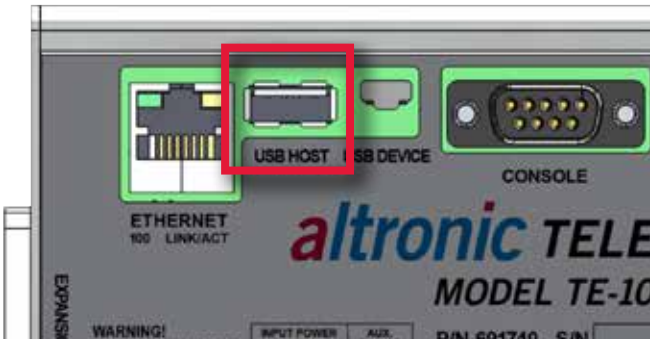


FIGURE 9 – USB HOST

4.14 USB DEVICE

The Module provides a single USB Device port for future expansion.

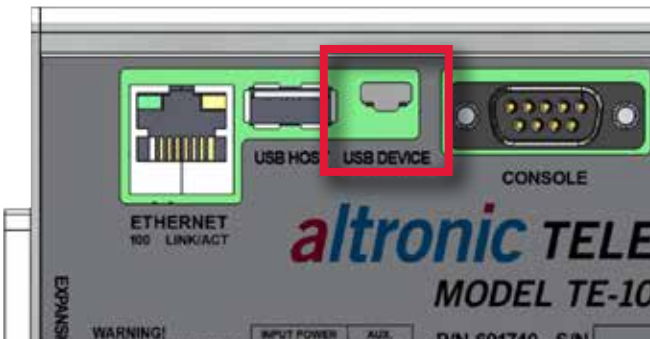


FIGURE 10 – USB HOST

4.15 ANTENNA CONNECTIONS AND PLACEMENT

The TE-1000 has the following antenna connections:

- WiFi + Zigbee (with provided stub antenna)
- GPS (with provided external antenna/extension cable)
- Modem (with provided external magnetic omni-directional antenna/extension cable for Cell, or external magnetic antenna/extension cable for Satellite)

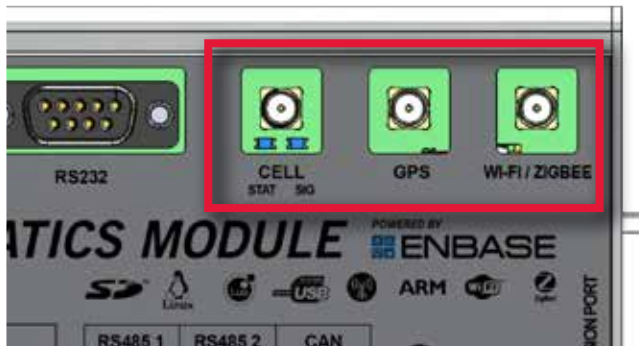


FIGURE 11 – CELLULAR, GPS, & WI-FI/ZIGBEE ANTENNA CONNECTIONS

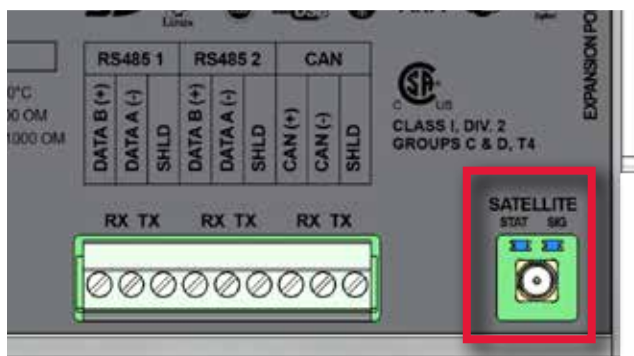


FIGURE 12 – SATELLITE ANTENNA CONNECTION

Optional antennas can be provided for each type of radio depending on the installation environment. External antennas should be placed as high as is practical with as few obstructions as possible. Magnetic antennas should be placed on a metal surface at least 4" x 4" in order to provide an adequate ground plane.

When troubleshooting remote connections, contact Enbase for guidance in optimizing antenna placement and modem type selection:

Phone: (713) 492-0008
 Email: support@enbasesolutions.com
 Web: www.enbasesolutions.com
 Enbase Energy Technology
 24 Greenway Plaza Ste 1050
 Houston, TX 77046

5.0 OPTIONS, ACCESSORIES, REPLACEMENT PARTS

Please contact Altronic to order any of the following options, accessories, and replacement parts.

5.1 TE-1000 Telematics Module

Part Number	Description	
	Cellular Modem	Satellite Modem
691740-1	—	—
691740-2	AT&T ¹	—
691740-3	VERIZON ²	—
691740-4	—	SATELLITE ³
691740-5	AT&T ¹	SATELLITE ³
691740-6	VERIZON ²	SATELLITE ³

NOTE: ALL TELEMATICS MODULES INCLUDE LOCAL BLUETOOTH AND WIFI + ZIGBEE CONNECTIVITY.

- 1 - Cellular GSM AT&T Certified Communication Card
 2 - Cellular CDMA/Verizon Certified Communication Card
 3 - Satellite Iridium Certified Communication Card

5.2 Antennas

Part Number	Description
691511-W	Antenna, Wi-Fi + Zigbee
52166	Null modem cable, TE to DE, 6' Cable
691511-C	Antenna, Cellular, Magnet base, 9.8' cable
691511-S	Antenna, Satellite, Magnet base, 15' cable
691511-G	Antenna, GPS, Magnet base, With cable

5.3 Modification Kits

Part Number	Description
KT-G	Modification Kit, AT&T modem
KT-EV	Modification Kit, Verizon modem
KT-SI	Modification Kit, Satellite modem

5.4 Spare Fuses — Contact Altronic (Controls)

6.0 TROUBLESHOOTING GUIDE

6.1 POWER-RELATED ISSUES

SYMPTOM	RECOMMENDED ACTIONS
Module will not start (power LED does not come on)	<ul style="list-style-type: none"> ■ Check fuse ■ Check voltage at power terminals – must be 12-32VDC ■ Ensure power source can provide sufficient current (250ma average at 24VDC) ■ Ensure power wiring is of sufficient gauge (16 AWG minimum recommended)
LEDs flicker, or TE-1000 LEDs are on but TE-1000 is unresponsive	<ul style="list-style-type: none"> ■ Possible noise issues. Ensure Earth terminal is connected to grounding rod and that negative terminal of battery is also connected to grounding rod. ■ If equipment has a magneto, make sure the magneto is properly grounded ■ If equipment has an engine you must ensure that resistive spark plugs are being used
Power LED comes on but other LEDs are off	<ul style="list-style-type: none"> ■ It is possible that voltage dropped below 9 volts during operation. Try cycling power to the TE-1000. ■ If problem persists contact Altronic – this is a possible indication of a damaged unit

6.2 REMOTE COMMUNICATIONS

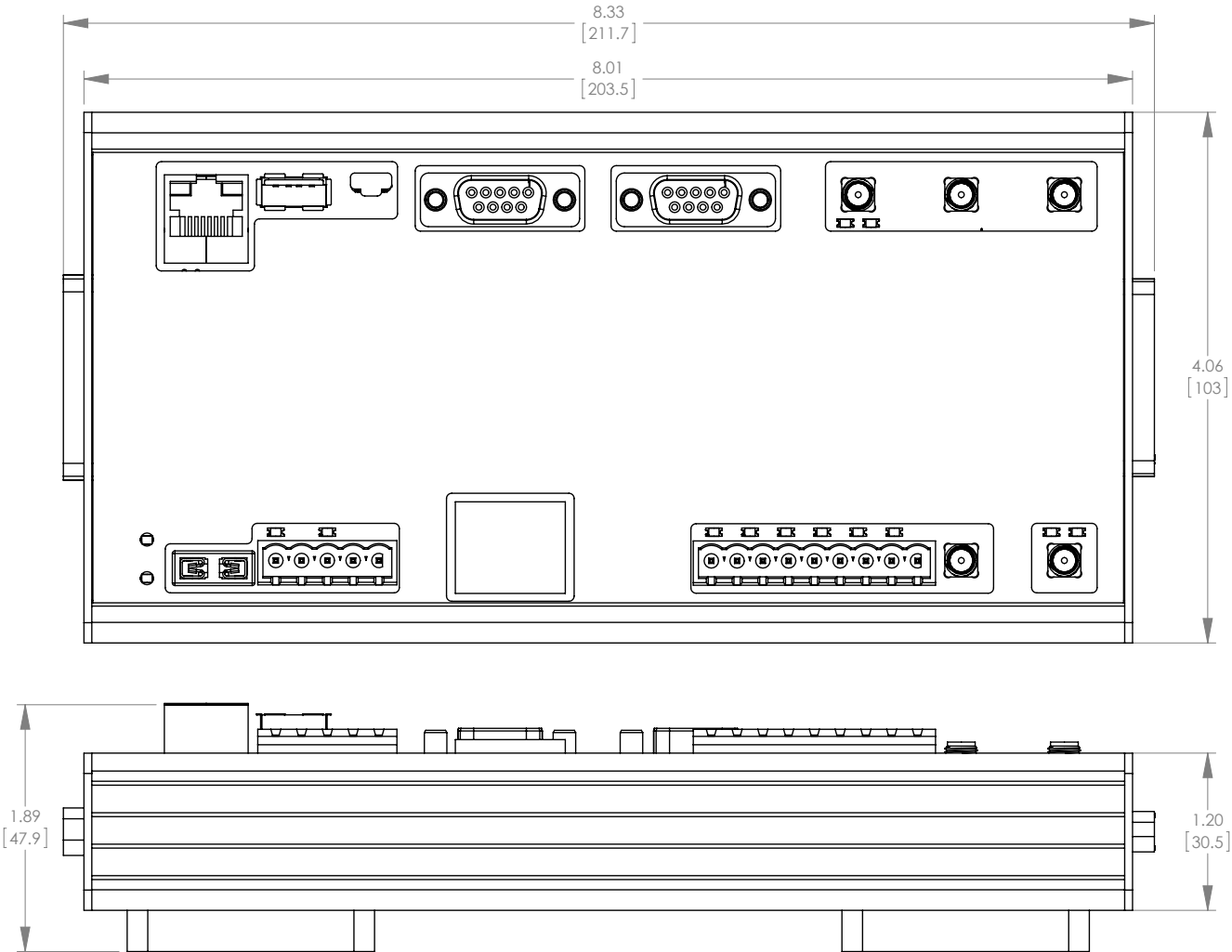
SYMPTOM	RECOMMENDED ACTIONS
MODEM STAT indicator flashes (Telematics Module unable to connect to network)	<ul style="list-style-type: none"> ■ Check that the proper antenna is securely connected to the MODEM coaxial antenna connector on the TE-1000 ■ Confirm with Altronic that unit is activated ■ For cellular applications, contact Altronic to confirm cell carrier has coverage in area ■ See recommendations above related to power/noise issues ■ See recommendations below related to signal strength
Modem SIG LED is off or only blinks once (little or no network signal)	<ul style="list-style-type: none"> ■ Try different antenna position or a different antenna: <ul style="list-style-type: none"> • If needed, use an extension cable to place the antenna in a higher location with fewer obstructions • If using a magnetic antenna, be sure to place it on a metallic surface to provide a proper grounding plane • For cellular modem, consider using a direction antenna aimed at the closest tower. Contact Altronic for assistance on antenna orientation ■ Satellite communications can be affected by weather (clouds, rain, etc.). Try waiting until the weather clears

6.3 MODBUS COMMUNICATIONS

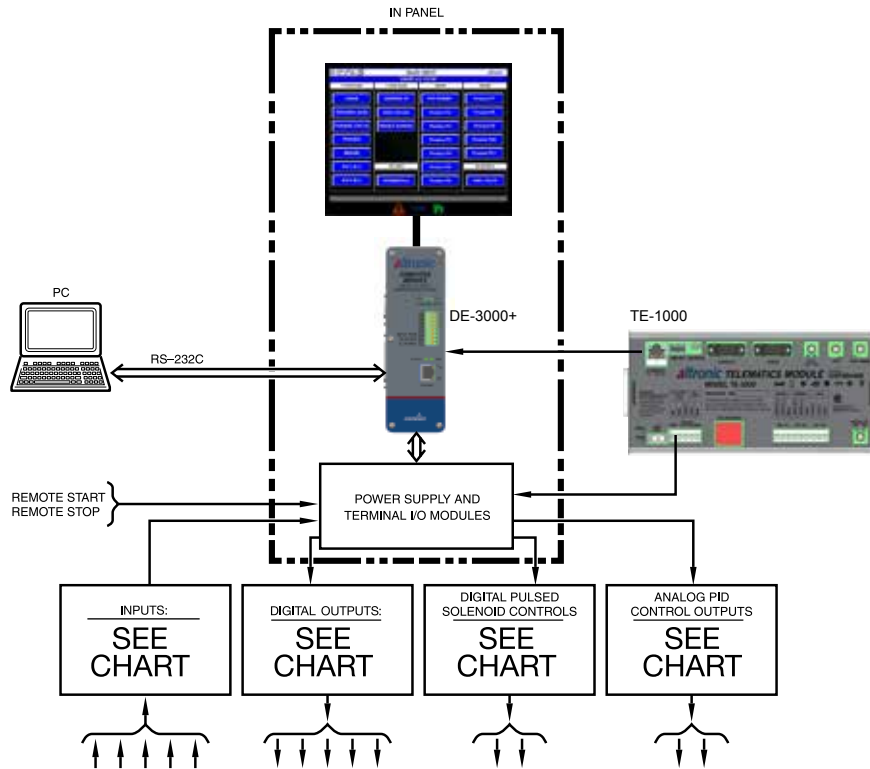
SYMPTOM	RECOMMENDED ACTIONS
No devices on network are communicating	<ul style="list-style-type: none"> ■ Check the RS485 wires on the corresponding TE-1000 serial port – you may need to reverse them
Specific device is not communicating	<ul style="list-style-type: none"> ■ Check the RS485 wires on the device's serial port – you may need to reverse them ■ Confirm the RTU Slave address of the device. Each slave device needs a unique Slave address. ■ Confirm the corresponding Tag is properly configured as a Modbus tag with the proper RTU Slave ID and register number. ■ Confirm that the device is responding to Modbus request by using a Modbus tool or Modbus software on a laptop. (Some third party devices are prone to comm failure and need to be confirmed as working correctly when isolated.)

SYMPTOM	RECOMMENDED ACTIONS
Frequent CRC errors	<ul style="list-style-type: none"> ■ Check integrity of the shield connection on the Telematics Module ■ Check continuity of shield throughout the network ■ Ensure shield is landed only on TE-1000 ■ See recommendations above related to power/noise issues.
Incorrect data values	<ul style="list-style-type: none"> ■ Confirm the corresponding Tag is properly configured: <ul style="list-style-type: none"> • Check register number • Check source data type • Check gain/offset scaling
General	<ul style="list-style-type: none"> ■ Make sure all devices are adequately powered per the device's operating range. ■ Use suitable cable optimized for serial communications ■ Some devices will not communicate when powered only by internal battery or by ignition power

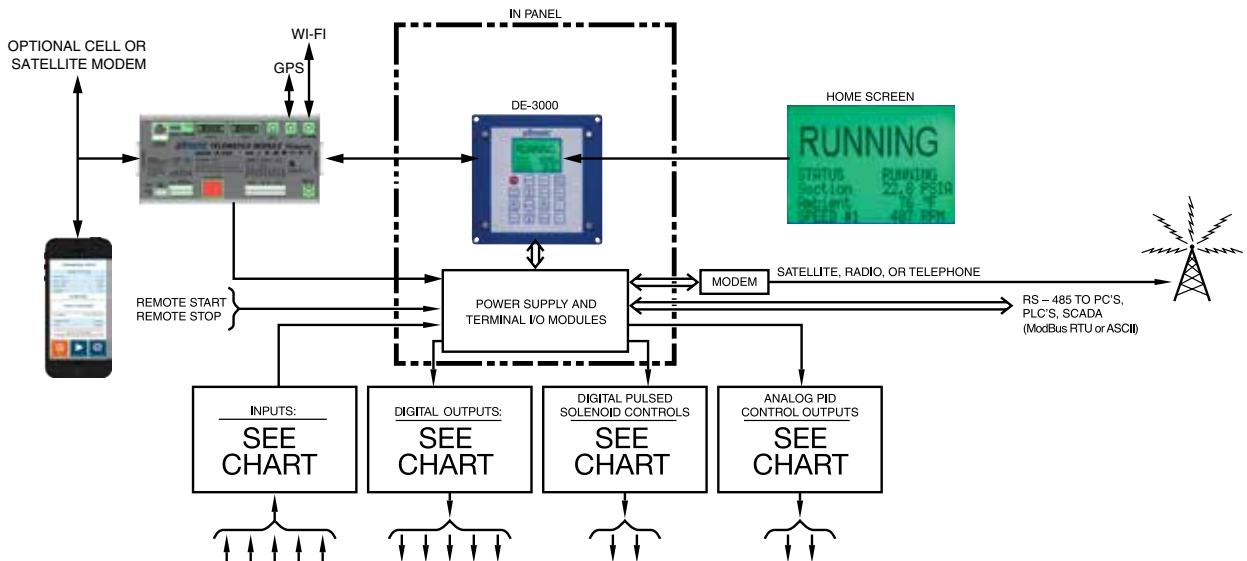
DIMENSIONS



SYSTEM DIAGRAM TE-1000 TO DE-3000+



SYSTEM DIAGRAM TE-1000 TO DE-3000



DISPLAY MODULE	1ST TERMINAL BOARD PART NO.	2ND TERMINAL BOARD PART NO.	DISCRETE INPUTS	ANALOG INPUTS	FREQUENCY (SPEED) INPUTS	DIGITAL OUTPUTS	ANALOG P.I.D. OUTPUTS
DE-3000/3000+	691171-1	—	30 configurable		1	12	2
DE-3000/3000+	691171-1	691175-2	45 configurable		2	16	4
DE-3000/3000+	691171-1	691171-2	60 configurable		2	20	4

NOTE: All inputs are configurable for discrete, analog or thermocouple input.