



TRAX-4M

Technical Manual

Document # 9728 Rev. 1.00



CONTACT INFORMATION

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Technical Support

Carefully recheck your system before calling Technical Support. Run as many tests as possible; the more information you can provide, the easier it will be for Technical Support staff to help you solve the problem. For additional technical assistance, try the following:

Technical Support telephone: 1-303-426-4521

E-mail Technical Support: fasthelp@octagonsystems.com

Applications Notes (via web): www.octagonsystems.com

Revision History

Revision	Reason for Change	Date
1.00	Production release	8/14/2017

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TRAX-4M Functional Overview

Description

The TRAX-4M is an Intel Bay Trail mobile computer, in a rugged enclosure. The enclosure and all components are designed for maximum reliability in industrial environments with high shock, vibration and/or temperature. The connectors and interfaces are located on external panels for easy access. The system is designed for mobile applications where the initial cost must be low.

The TRAX-4M provides the following external interfaces:

- VGA video Interface for analog displays
- Two RS-232 Serial Ports
- Three USB 2.0 ports
- 10/100 Base-T Ethernet
- Digital I/O
- Audio Out (MONO)
- CAN bus (Optional)
- Two type "N" and one type TNC antenna connectors for GPS and optional wireless modules

Internally the TRAX-4M has:

- Two Mini PCIe-Card sockets (one is used for CAN Bus, if installed)
- 1 SIM socket
- M.2 (NGFF) 2242 Socket
- SODIMM socket for CPU memory

The BIOS is loaded on a flash device for easy updates. It is fully compatible with most popular operating systems.

The BIOS is preset for normal operation. Changes may not be required.
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Configuring and Ordering Your System

Octagon can build your TRAX-4M with your accessories so that the system is sealed at the factory. Contact your Octagon sales representative for assistance in ordering cellular or WiFi cards, or other options so that your system is fully configured from the factory.

Hard drive options

The TRAX-4M offers M.2 2242 SATA storage. The TRAX-4M also supports USB drives, which can be connected without opening the case.

M.2 (NGFF) socket

The standard TRAX-4M comes with a 32 GB, industrial grade, M.2 2242 MLC flash drive. The drive is fully SATA 2.0 compatible. The internal M.2 socket is B+M keyed. This socket accepts M.2 2242 drives up to 512 GB.

Operating Systems

Octagon can preinstall some operating systems, including drivers for the standard I/O features. Octagon has drivers for Windows 7, Windows 10, and Linux for the standard TRAX-4M features.

Cables

TRAX-4M is designed to use MIL 26482 style cables. A development cable set is available from Octagon. Wiring diagrams are also available for customers to design their own cables.

Recommended Installation Practices

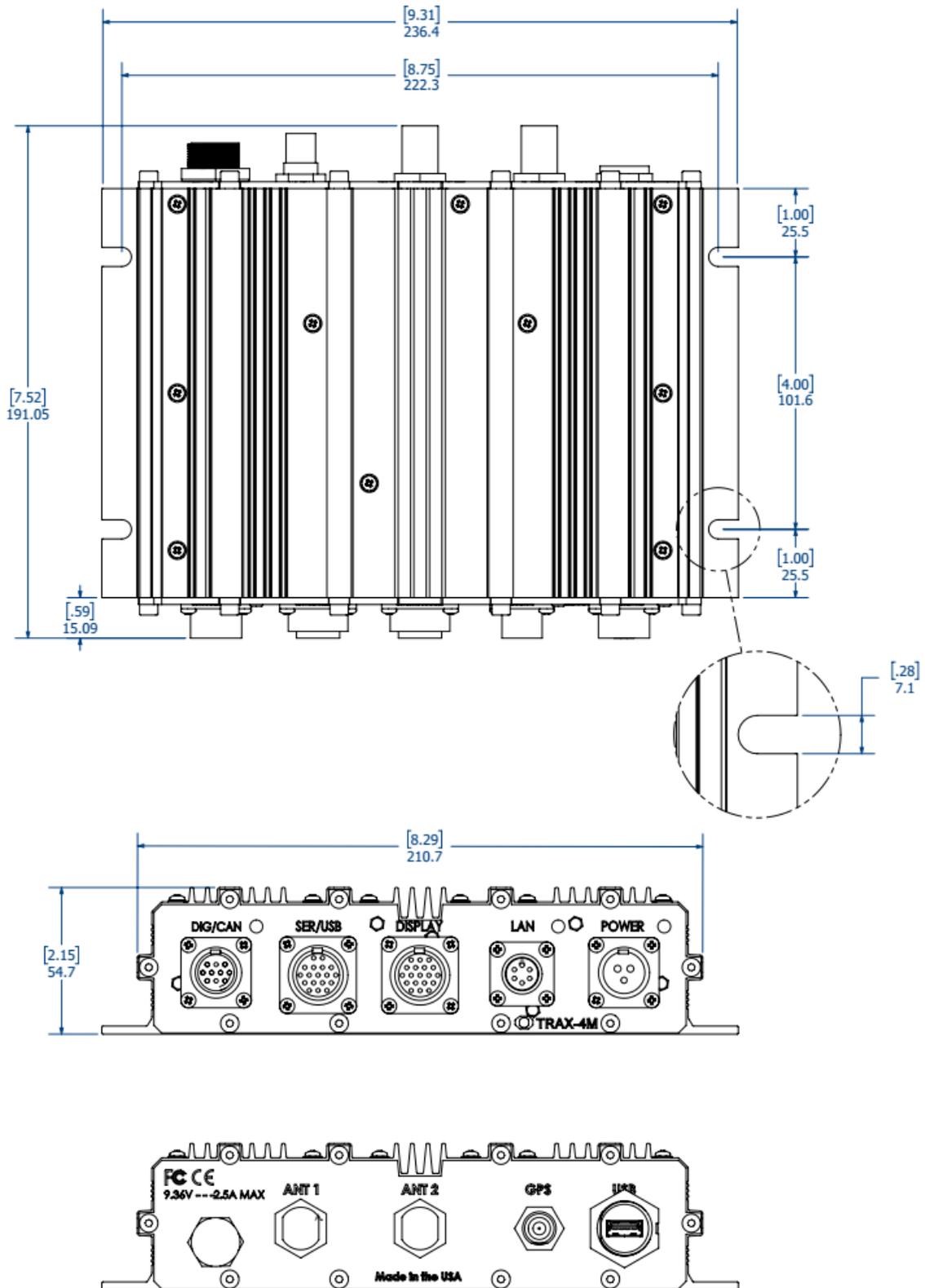
Proper installation will promote longevity and adherence to the product standards.

1. For tracked vehicles, shock mounting would be prudent.
2. Opening the unit must not be done in the field, but at an approved antistatic workstation. Instructions for opening the case are available from Octagon Technical Support.
3. The unit should be mounted in such a manner that the convection cooling is not impeded. Vertical mount is preferable. It is strongly recommended that the space between the heat fins and other objects exceed 100 mm (4") and there is at least 50 mm (2") of open space on the sides. Avoid "dead air" spaces such as under seats. The unit should not be bolted to any surface that is hotter than the ambient air surrounding the unit.
4. The protective caps must be left on all unused connectors. Failure to do so may render those connectors unusable in the future. While the connectors are water resistant, the caps help prevent conductive liquids and particles from invading the connector pins.
5. There are no internal repairable components. Customer field repair is in violation of Octagon's warranty.
6. Do not over-tighten the antenna cable connectors.
7. The TRAX-4M includes mounting flanges that must be secured to a surface with 0.25" or 6mm hardware.
8. The power supply cable gauge should be as large and as short as practicable.
9. The TRAX-4M is protected against transient voltages common in mobile applications. It is recommended that external in-line 5A fuses be used on both input power lines.
10. Proper ESD precautions and methods must be followed when installing, servicing, or otherwise handling the TRAX-4M.
11. The USB 2.0 ports have a maximum cable length of 5M. Cables with built-in repeaters are not recommended.
12. The inrush current on the TRAX-4M is 5A. The external supply must be capable of supplying this inrush current so as to not "starve" the startup. The power supply cable gauge should be as large and as short as practicable.
13. Contact Octagon Technical Support for proper disassembly / access to internal options & expansion.
14. To power down the TRAX-4M, turn the ignition switch off. Allow two minutes for the automatic shut-down sequence (saving data and configuration) to complete. The Front Panel power LED will go off, signaling the "Powered Off" condition.

Warning – If Arc welding or Electrical Resistance welding is being done on the vehicle in which this product is installed ALL and EVERY cable to the unit must be disconnected prior to welding.

Otherwise the unit may be seriously damaged and the warranty VOIDED.

Figure 1 TRAX-4M dimensions mm (in)



Using the TRAX-4M

Installing an operating system

You can install an operating system onto the M.2 SATA drive.

The preferred method of installing an OS is using a USB installation media, such as a USB CD ROM, USB hard drive, or USB flash drive. This avoids having to open the case. The two installation methods below assume a USB media.

The TRAX-4M can be ordered with Windows 7 Embedded Std.™ , WIN 10 IoT Enterprise™, or Linux pre-installed.

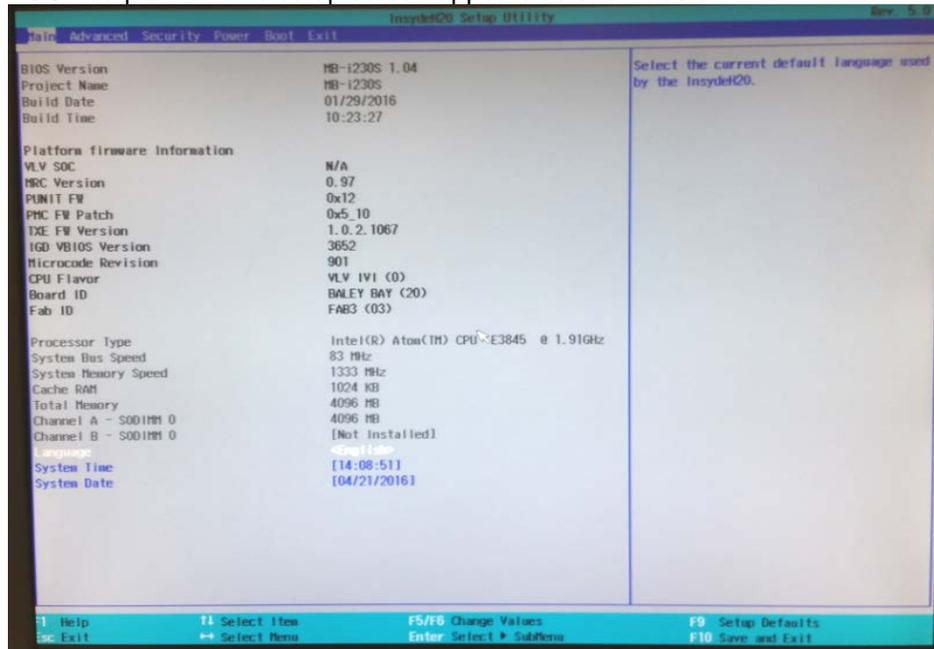
Installing an OS onto the M.2 drive

If you have not made any changes to the TRAX-4M BIOS Setup, you can install the OS onto the M.2 drive by connecting the USB installation media and powering on the system. The TRAX-4M will first look for the USB device for booting, and will automatically start the installation process.

Note: Some operating systems may require a mouse. For best results, connect a USB mouse before starting the installation.

To install the OS onto the M.2 drive, you may have to change some of the parameters in BIOS Setup. Use the following procedure:

- 1 Attach the USB CD-ROM drive, keyboard and mouse to the USB connectors, and a monitor to Display.
- 2 Apply power to the TRAX-4M. Enter Setup by pressing the Del key during BIOS POST sequence. The setup screen appears as shown below.



- 3 Select the "BOOT" tab.
- 4 Select "USB BOOT"
- 5 Save the BIOS changes and exit. When you reboot, the TRAX-4M will boot from the

USB device. Follow the on-screen dialog to load the operating system. Refer to the OS documentation for further information.

Boot sequence

The TRAX-4M can be configured to boot from a USB device such as a floppy drive, hard drive, flash device, or a CD-ROM. A USB boot allows software installation externally.

Configuring your operating system

The operating system must be configured for Power Management. The TRAX-4M system does not have a power switch to power the system On and Off. The system uses the Ignition switch as the system power switch. The operating system must be configured to shut down the system when the ignition switch is opened.

LEDs

The TRAX-4M has a Green (PWR) LED on the front panel. The PWR LED will illuminate to indicate that the unit is running. The TRAX-4M also has Ethernet status LEDs on the front panel. The Ethernet LEDs provide the link and activity status of the Ethernet port, and the connection speed.

DISPLAY

The display connector offers Analog RGB video. The interface is compatible with VGA monitors. The TRAX-4M will support Analog resolutions up to 2560 x 1600 @ 60Hz.

Keyboard/Mouse

The TRAX-4M will support a USB keyboard and mouse. See USB below. Wake-on keyboard and Wake-on mouse are supported for power management.

USB

Three external USB 2.0 ports are available. USB0 & USB1 are available on the front panel, USB2 is located on the rear panel. The TRAX-4M will automatically detect USB peripherals such as keyboards, flash drives, CD ROMs; USB floppy drives and USB hard drives.

Ethernet

10/100base T Ethernet is available from the Ethernet connector on the front panel. Status lights on the connector show Link and activity status, and speed. Note that you must have the Ethernet drivers installed to be able to use the Ethernet port.

Serial communication

The TRAX-4M has two RS232 serial ports, and an optional fourth port. Signals are RxD, and TxD, COM drivers for Windows and Linux are available on the Octagon web site.

Digital I/O

The digital I/O comprises four inputs and one output. The digital I/O is accessed through an API that is available for Windows or Linux. Please contact Octagon customer support for additional information.

Digital I/O resides on a USB UART (Future Technology Device) Location Id 0x0113

Digital input bit #1 mask:	0x01
Digital input bit #2 mask:	0x02
Digital input bit #3 mask:	0x04
Digital input bit #4 mask:	0x80
Digital status LED bit #1 mask:	0x10
Digital status LED bit #2 mask:	0x20
Digital output bit #1 mask:	0x40

Output lines

One digital output
Optically isolated, 100mA current sink

Input lines

Four digital inputs
3-36 VDC

Software drivers

Application programs for the TRAX-4M digital I/O are available on the Octagon website for Windows and Linux.

Audio

The MONO audio output is HD compatible, and uses a standard Codec driver. The TRAX-4M has one line level audio output. Audio is accessed through the front panel display connector. The audio driver is available on the Octagon website.

CAN Bus

The CAN Bus is implemented through an add-in PCIe Mini-Card and is galvanically isolated to 500 VDC. The drivers for the TRAX-4M CAN Bus card are on the Octagon website. The CAN Bus signals are available on the CAN connector. Per the CAN specification, the maximum cable length is reduced to 20 meters at 1Mbps.

SERIAL Ports

The TRAX-4M has 2 native RS-232 2 wire (TXD, RXD) ports. Up to two, optional, 2 wire ports are available through an add-in card.

Temperature sensor

The TRAX-4M has an onboard temperature sensor. The temperature sensor is part of the 9-axis sensor.

GPS

The TRAX-4M is equipped with a Ublox 72 channel GPS which is capable of concurrent operation in GPS, GLONASS, Beidou, and QZSS. The GPS is connected to an SMA connector on the back panel. An active antenna is required for proper operation. The antenna must be capable of 3 volt operation. A driver is required. Please visit the Octagon website for driver download.

WiFi

The TRAX-4M supports WiFi cards in PCIe Mini-card form factor. These are available as an ordering option. TRAX-4M can support a single WiFi card, or two WiFi cards, if the CAN bus option is not selected. SMA antenna connectors are provided on the rear panel for two WiFi cards.

Nine-Axis Sensor

The TRAX-4M has an on-board nine axis MEMS sensor composed of a 3D accelerometer, 3D Gyroscope, and a 3D magnetometer. A few possible uses are: recognize, monitor and record complex vehicle movements, tremor analysis, tilt and shock measurement, and motion control for cameras or vehicles.

Expansion

Two Mini PCIe expansion sockets are available on the TRAX-4M motherboard. These can be used to add WiFi cards, Modem cards, CAN bus cards, or Serial cards. One SIM socket is also available.

Power

The TRAX-4M has internal power supply circuitry that filters the incoming D.C. voltage. It provides power to the system from the vehicle input power. The recommended range for external power is 10V to 36V for normal operation; temporary drops to 9V or surges to 40V will not affect operation.

The power supply has advanced brownout protection, ensuring proper supply restart sequencing. This is particularly critical in mobile applications where the engine might be started at low temperatures.

Warning

Vehicular wiring typically experiences large voltage drops, especially during engine starting conditions. In 12V systems this is especially important as voltage drops below 8V are common. External wiring to the TRAX-4M should be of appropriate gauge as to mitigate voltage drops on the power input cable.

Power input

The Power Input connector has three pins. Refer to the *User connector pin-outs* section.

Ignition switch

The IGNITION switch signal comes from the vehicle and is at battery voltage when active. The IGNITION signal is part of the power management subsystem. When the IGNITION signal transitions from high to low it asserts “power fail.” This signal can be used to turn the system On and Off via power management software configuration in your operating system. If the ignition switch is not used in your system, connect this line to the vehicle battery voltage. Refer to Power Management for further information.

Power management

The TRAX-4M supports ACPI v5.0 and power states S0, S3, S4, and S5. Please refer to the specifications for information on how to use these functions. The TRAX-4M supports Wake-on LAN, USB, and RTC. For additional information refer to the TRAX-4M on the Octagon web site.

TRAX-4M Technical Data

Processor

- Intel E3845 Quad-Core CPU, 1.91 GHz
- 2MB L2 Cache
- 64-bit Capable
- Virtualization Support
- ACPI 5.0 Support

Memory

- 4 GB DDR3-1333 (socketed), up to 8GB supported

Graphics

- DirectX 11, OpenGL 3.0, OpenCL 1.2
- Up to 2560 x 1600 (WUXGA) resolution

Storage

- Internal 32GB Solid State Disk in M.2 2242 form factor with ECC. Up to 512 GB supported.

GPS

- 72-Channel Engine
- Concurrent GNSS, GPS, GLONASS, Galileo, QZSS, SBAS, Beidou
- Fast Acquisition and High Accuracy

External I/O

- Three USB 2.0 Ports
- Two RS-232 COM Ports (two additional ports optional)
- MONO Audio Line Out
- One 10/100 Base-T Ethernet Port
- Five Digital I/O
 - Four Inputs – 3-36V operation range
 - One Output - 100ma current sink
- VGA video
- 1x TNC for GPS, 2x Type “N” for wireless radios
- Status LEDs

CAN bus

- CAN bus 2.0 A,B compatible (optional)
- Drivers for Windows and Linux
- 500V galvanic isolation

Wireless Options

- 802.11b/g/n, Dual band, Long Range WiFi
- GSM/GPRS/LTE Cellular

Display Option

Compatible with Octagon K Series displays
2M cable, video, touchscreen & audio

Power Supply

9-36 VDC input voltage (10-36 VDC continuous), 28V nominal
Protection for Load Dump, Reverse Voltage, Brown Out, and Transients
Ignition input for power control

Operating System Support

Windows Embedded Standard 7™, Windows 10 IoT Enterprise™, Linux

Environmental

Operating temperature	–40° to +71°C operating
Non-operating temperature	–40° to 71°C, non-operating
Relative humidity	5% to 95% non-condensing
Shock	MIL-STD 810F, 20g, 3 axis
Vibration	MIL-STD 810F, Composite wheeled vehicle
EMI Emissions	CE Class A, Radiated and Conducted

Mechanical

Extruded, marine grade aluminum, passivated	
Size:	237 L x 157 W x 55 H mm (9.3" x 6.4" x 2.2")
Weight:	1.3 kg (3.3 lbs)

* These specifications are for the standard TRAX-4M system as shipped from the factory. The specifications assume a gap of at least 50 mm on five of the six sides between the unit and any structure and 100 mm on the top. Additional expansion cards will lower the maximum operating temperature. Derate the maximum temperature by at least 2°/watt for additional components. External airflow around the TRAX-4M improves the maximum temperature rating, but is not required

Avoid “stale” air areas where natural convection is restricted.

Warning – If Arc welding or Electrical Resistance welding is being done on the vehicle in which this product is installed ALL and EVERY cable to the unit must be disconnected prior to welding.

Otherwise the unit may be seriously damaged and the warranty VOIDED.

TRAX 4M USER CONNECTORS

Table 1 – TRAX-4M Mating Connectors

External Connectors		
Connector	Function	Mating Connector
GPS	GPS antenna	TNC-F, 50 Ω
ANT1-2	Wireless Accessory (optional)	N-F, 50 Ω
Power	Power Input	PT06E12-3SSR or similar
Display	Video, Audio, USB, Power	PT06E14-19PSR or similar
Ethernet	LAN	PT06E10-6PSR or similar
Serial/USB	COM ports, USB	PT06E14-18PSR or similar
DIG / CAN	Digital I/O & CAN Bus	PT06E12-10PSR or similar

The following descriptions are as seen from the outside of the faceplate.

Table 2 - Power Connector Pin-Out

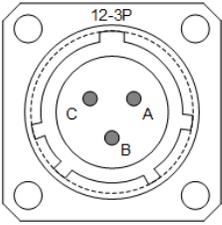
Signal Name	Pin #	
V_IN (Voltage IN)	A	
GND_EXT (Ext Gnd)	B	
IGNITION	C	
Mating Connector PT06E12-3SSR		

Table 3 - Display Connector Pin-Out

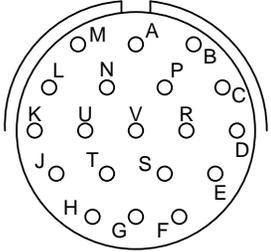
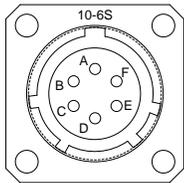
Signal Name	Pin #	Pin #	Signal Name	
Display Power —	A	L	BLUE shield	
Display Power +	B	M	H Sync	
DDC_Clock	C	N	DDC_Data	
Audio LINE out	D	P	V Sync	
GND Audio	E	R	GND USB0	
RED	F	S	USB0 +5V	
RED shield	G	T	USB0 D —	
GREEN	H	U	USB0 D +	
GREEN shield	J	V	SHIELD	
BLUE	K			
Mating Connector PT06E14-19PSR				

Table 4 – Ethernet Connector Pin-Out

Signal Name	Pin #	Pin #	Signal Name
LAN Rx+	A	D	LAN Tx —
LAN Rx-	B	E	LAN Tx+
Shield ground	C	F	Reserved

PT02E106S

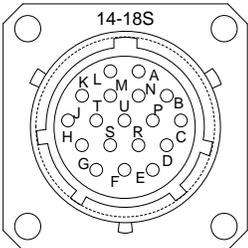


Mating Connector PT06E10-6PSR

Table 5 – Serial/USB Connector Pin-Out

Signal Name	Pin #	Pin #	Signal Name
COM2 RXD	A	K	OPTION
COM2TXD	B	L	COM1 RXD
COM GND	C	M	COM1 TXD
USB1 +5V	D	N	OPTION
USB1 Data+	E	P	OPTION
USB1 Data-	F	R	GND
USB1 GND	G	S	OPTION
OPTION	H	T	OPTION
OPTION	J	U	GND

**PT02E1418S
(rear view)**

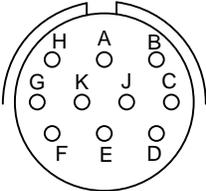


Mating Connector PT06E14-18PSR

Table 6 – DIG /CAN Pin-Out

Signal Name	Pin #	Pin #	Signal Name
CAN H	A	F	Digital IN 0
CAN L	B	G	Digital IN 1
CAN GND	C	H	Chassis GND
FUSED_CAN_PWR	D	J	Digital IN 2
Digital Out 0	E	K	Digital IN 3

**PT02E1210S
(rear view)**



Mating Connector PT06E12-10PSR

Accessories

Table 7- Accessories

Product	Description	Octagon P/N
Cable, Power Input	3 lead cable with un-terminated end	8339
Quickstart AC/DC Power Supply	Provides power from AC line	7509101
Cable, Display	VGA / USB display cable	7508943
Cable, LAN	RJ-45 to MOBL-D LAN cable	7508944
Cable, CAN /DIG		
CAN option card module	Mini PCIE CAN option card	Contact Octagon Sales
Wireless LAN card module	Mini-PCie Wireless LAN option card	Contact Octagon Sales

Warranty

Octagon warrants that its standard hardware products will be free from defects in materials and workmanship under normal use and service for the current established warranty period. Octagon's obligation under this warranty shall not arise until Buyer returns the defective product, freight prepaid to Octagon's facility or another specified location. Octagon's only responsibility under this warranty is, at its option, to replace or repair, free of charge, any defective component part of such products.

Limitations on warranty

The warranty set forth above does not extend to and shall not apply to:

1. Products, including software, which have been repaired or altered by other than Octagon personnel, unless Buyer has properly altered or repaired the products in accordance with procedures previously approved in writing by Octagon.
2. Products which have been subject to power supply reversal, misuse, neglect, accident, or improper installation.
3. The design, capability, capacity, or suitability for use of the Software. Software is licensed on an "AS IS" basis without warranty.

The warranty and remedies set forth above are in lieu of all other warranties expressed or implied, oral or written, either in fact or by operation of law, statutory or otherwise, including warranties of merchantability and fitness for a particular purpose, which Octagon specifically disclaims. Octagon neither assumes nor authorizes any other liability in connection with the sale, installation or use of its products. Octagon shall have no liability for incidental or consequential damages of any kind arising out of the sale, delay in delivery, installation, or use of its products.

Service policy

1. If a product should fail during the warranty period, it will be repaired free of charge. For out of warranty repairs, the customer will be invoiced for repair charges at current standard labor and materials rates.
2. Customers that return products for repairs, within the warranty period, and the product is found to be free of defect, may be liable for the minimum current repair charge.

Returning a product for repair

1. The customer must call Tech Support at 303-426-4521 to determine if repair service is necessary.
2. If repair service is required, Tech Support will require the customer's name, address, telephone number, email address and a list of problems found.
3. Tech Support will forward this information to the RMA Administrator who will contact the customer to issue the RMA number.
4. The customer must carefully package the product in an antistatic container. Failure to package in antistatic packaging will VOID the warranty. Ship the product back in a non-crushable container.
5. Write the RMA number on the outside of the shipping container.
6. The customer pays for shipping to Octagon. Octagon pays for shipping back to the customer.
7. Other conditions and limitations may apply to international shipments.

Note: Products returned to Octagon freight collect or without an RMA number cannot be accepted and will be returned freight collect.

Maintenance and Troubleshooting

Maintenance

There are no serviceable parts in the TRAX-4M system. Contact Octagon Technical Support if additional assistance is required.

Governing law

This agreement is made in, governed by and shall be construed in accordance with the laws of the State of Colorado.

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