



# TRAX-10 Standard Model Technical Manual

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**Superior Support – Relentless Reliability**

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The specifications at the end of the manual are subject to change without notice. Please go to [www.octagonsystems.com](http://www.octagonsystems.com) to get the current specifications.

## 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: [support@octagonsystems.com](mailto:support@octagonsystems.com)

Applications Notes (via web): [www.octagonsystems.com](http://www.octagonsystems.com)

## Revision History

| Revision | Reason for Change          | Date     |
|----------|----------------------------|----------|
| 1.00     | Initial production release | 09/19/17 |
|          |                            |          |
|          |                            |          |
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## ***TRAX-10 Functional Overview***

### **Description**

The Octagon TRAX-10 incorporates an Intel®, quad-core, 64-bit X86-class computer in a ruggedized enclosure. The high processing power couples with DirectX 11 video capability making the TRAX-10 a mobile workstation. The unit has considerable real-world I/O, rich in serial data pathways like Ethernet, USB, COM ports and CAN as well as wireless technologies.

Other I/O includes Concurrent GPS, high resolution video, and digital. External power range is from 9 VDC to 36 VDC.

Internally, the TRAX-10 has a 32 GB (or larger) solid state drive, a PCI-104 interface, a Mini PCI socket, and Mini PCI Express sockets.

### **TRAX-10 Major Hardware Features**

The quad-core, Intel 3845 processor has a clock speed of 1.91 GHz, integral graphics and memory controller supplied with 2 GB of DDR3 SDRAM soldered to the CPU board.

A solid state SATA Flash drive is installed for fixed disk storage. Read and write speed far exceed the CompactFlash used in previous generation products. Densities from 32GB to 512GB are available. Contact Octagon sales for pricing and information.

A 72- channel, concurrent, GPS receiver offers precision location and timing information. The receiver supports 3.3V powered as well as passive antennas. The system is GPS, GLONASS, Galileo, BeiDou QZSS and SBAS compatible.

### **Internal Functional Expansion**

The PCI-104 interface accepts industry-standard PCI-104 boards. The Baseboard also incorporates two Mini PCI Express slots for radios or other communication devices.

### **Robust Internal Power Supply**

The TRAX-10 accepts a DC input voltage which can be powered from fixed supplies, vehicle batteries or train power systems. It is protected against load dumps, reverse voltage and transients. It was designed for 24V systems, but operates over a range of 9 to 36 VDC. The power supply is fully isolated to minimize ground fault problems caused by multiple grounds.

## TRAX-10 major software features

### **AMIBIOS BIOS**

The TRAX-5 has an AMIBIOS BIOS optimized for the device and embedded installations.

### **Boot Sequence**

The TRAX-10 can be configured to boot from native SATA SSD, a network resource, or from a USB device such as a floppy drive, hard drive, flash device, or a CD-ROM. A USB or network boot allows software installation without opening the case.

### **Virtualization**

Hardware virtualization refers to the creation of a virtual machine that acts like a real computer with an operating system. Software executed on these virtual machines is separated from the underlying hardware resources. For example, a computer that is running Microsoft Windows may host a virtual machine that looks like a computer with the Linux Mint operating system; Linux Mint-based software can be run on the virtual machine.



## ***Recommended Installation Practices***

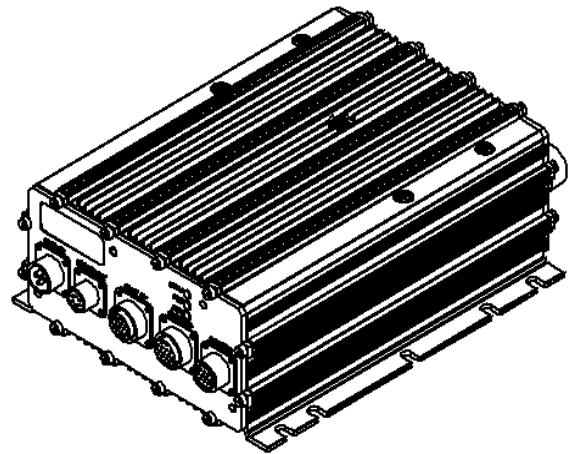
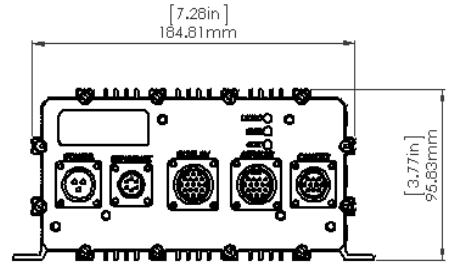
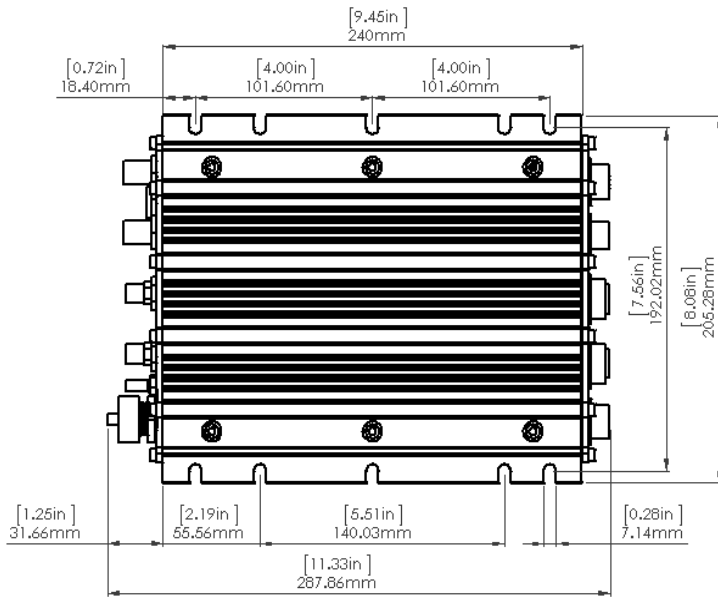
The TRAX-10 is designed to operate in difficult environments. Proper installation will help ensure product longevity and adherence to the product standards.

1. System should be connected to the vehicle frame via an earthing or grounding bolt on the rear of the enclosure. A 14AWG (3.31mm<sup>2</sup>) stranded wire should be used to connect this stud to a suitable chassis grounding point. This wire should be as short as possible. The inclusion of an internal star washer is recommended. This provides some ground-fault protection and reduces EMI to meet CE requirements.
2. For tracked vehicles, shock mounting would be prudent.
3. Opening the unit must not be done in the field, but at an approved antistatic workstation. The unit may be opened to replace/install wireless and/or SIM cards. Instructions for opening the case are available from Octagon Technical Support.
4. The unit should be mounted so as to not impede the convection cooling. 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 other 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.
5. The protective caps must be left on all unused connectors. Failure to do so may render those connectors unusable in the future due to corrosive liquids or conductive dust.
6. There are no internal repairable components. Customer field repair is in violation of Octagon's warranty.
7. Do not over-tighten the antenna cable connectors.
8. The TRAX-10 includes mounting flanges that must be secured to a surface with ¼ inch or 6 mm bolts or screws.
9. The power supply cable gauge should be as large and as short in as practicable.
10. The TRAX-10 is protected against transient voltages common in mobile applications. It is recommended that external in-line fuses be used on both input power lines. Octagon recommends standard, fast acting 10A fuses.
11. Proper ESD precautions and method must be followed when installing, servicing, or otherwise handling the TRAX-10.
12. The USB 2.0 has a maximum cable length of 5M. Cables with built-in repeaters to extend this length should not be used.
13. The TRAX-10 contains several switching regulators with an inrush requirement of 10A. The external supply must be capable of supplying this inrush current so as to not "starve" the startup of the internal supplies. If the power supply is mounted remotely to the TRAX-10, the wiring size must be increased to prevent excessive drop during startup.
14. Contact Octagon Technical Support for proper disassembly/ access to internal options & expansion. **Storage options must be factory installed.**
15. To power down the TRAX-10, turn the ignition switch off. Allow two minutes for the automatic shut-down sequence (saving data and configuration) to complete. The LED on the display will go off signaling the completion.
16. High pressure, power washing is prohibited

***Warning - During Arc welding/Electrical Resistance welding on the vehicle in which this product is installed, EVERY and ALL cables to the unit must be disconnected prior to welding. Otherwise the unit may be seriously damaged and the warranty is VOID.***

# TRAX-5, 10 Case Dimensions [inches] mm

Back panel shown without options



## Baseboard Connectors

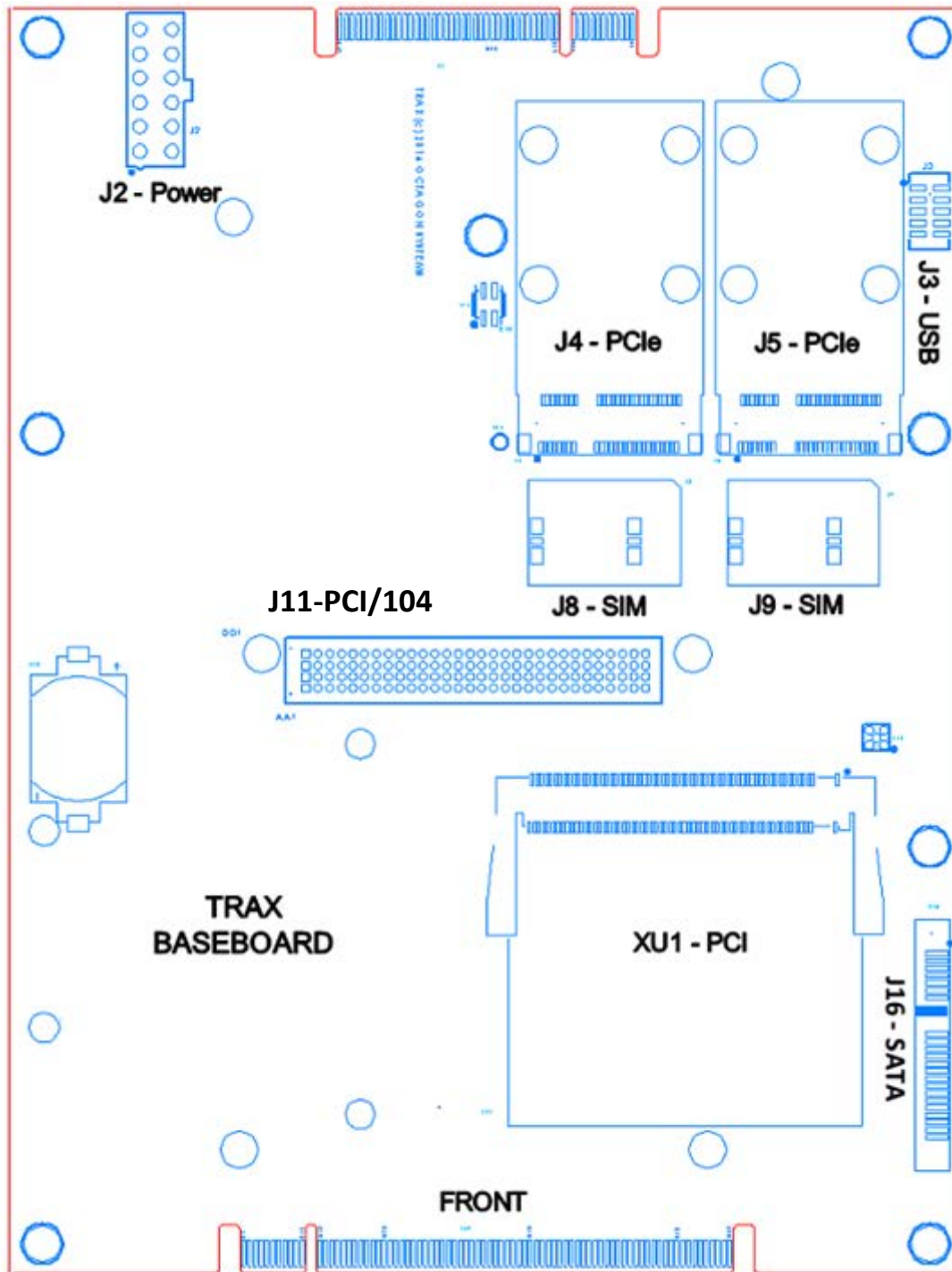


Table 1 - Internal Connectors and Sockets

|     |                     |    |                        |
|-----|---------------------|----|------------------------|
| J11 | PCI / 104 Connector | J8 | SIM card socket for J4 |
| J16 | SATA connector      | J9 | SIM card socket for J5 |
| XU1 | Mini PCI socket     | J2 | To power supply        |



## Using the TRAX-10

### Power

The TRAX-10 is rated for nominal 24V battery operation, but accepts 9V to 36V. The low end rating is for starting the vehicle. Sustained operation below 10V is not recommended. The external power cable negative and positive battery leads must be at least 16 AWG and should be stranded wire. The Ignition signal controls the power management Suspend and Resume functions; this signal should be connected to the vehicle ignition, or tied to +Battery, if unused. The wire may be 18AWG (~0.823 mm<sup>2</sup>).

NOTE: Reversing the battery leads will not damage the unit. It will not function and there is no indicator for reverse polarity.

**CAUTION:** It is mandatory that the low resistance, electrical connection be made between the earthing or grounding bolt on the rear of the unit and the vehicle frame. This will insure that the CE and UL limits with regards to radiation emission are met, as well as safety considerations.

### Ethernet

The TRAX-10 provides one 100Base-T Ethernet and four 10/100/1000Base-T Ethernet ports. These ports support the IEEE 802.3 Ethernet standard. Note that you must have the correct Ethernet driver installed to be able to use the Ethernet port. The Ethernet driver is available on the Octagon Systems web site.

### Audio

The TRAX-10 provides a monaural line output, included in the display connector. The default configuration is a line level (1V P-P) output.

### GPS

The rear panel contains two TNC type GPS connectors. The high performance GPS receiver is a standard feature of the TRAX-10 system. The GPS is connected to the CPU through an internal USB interface. The receiver supports industry standard NMEA messages, as well as the UBX packet protocol

### ANT1, ANT2

There are two type "N" antenna connectors on the rear panel that provide connection to optional internal wireless communication modules. Numerous communication formats are implemented with add-on cards such as Mini PCI Express and Mini PCI. An internal cable connects the card to the appropriate external connector.

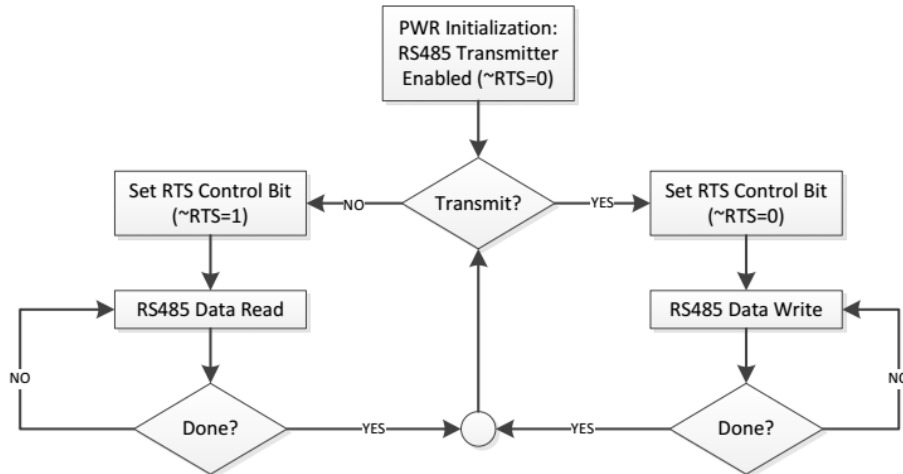
### USB

The TRAX-10 provides two USB 2.0 ports on the front panel- one in the Display connector, and one in the Serial/USB connector. The system is capable of booting from external USB storage devices and CD/DVD drives.

## Serial Communication

The TRAX-10 has four serial ports. One port supports RxD, TxD, RTS and CTS. Two of the ports implement RxD and TxD. The fourth port supports RxD/TxD, RS-232 and RS-485

### RS 485 operation flow chart



Be aware that operating systems may assign port numbers in a different order, such as 1, 2, and 3. Identification of the hardware ports can be done by checking the address of the I/O resource associated with each COM port by the OS.

## VGA

The VIDEO connector has standard VGA signals. Display resolution up to 1920x1200 is supported.

## Power Management

The TRAX-10 system hardware and BIOS support ACPI power management functions.

The Ignition Detect signal on the Power connector controls the power management Power on and Shutdown functions; this signal should be connected to the vehicle ignition. If not used, the Ignition Detect signal must be tied to +Battery to allow the system to start.

Operation when the ignition terminal is connected to vehicle ignition, or a "switched" power source is as follows: The system will remain in "soft off" - a very low power state as long as Ignition remains low. When Ignition is raised to +Battery level, system startup is initiated, after a short delay to ensure Power and Ignition are stable. Disconnecting Ignition, or connecting to ground will signal the operating system to shut down - however the system remains on, drawing power from the +Battery terminal until shutdown occurs and the system returns to soft off. Failure of the operating system to shut down in a reasonable time will result in a forced soft off state.

Shutting down the operating system while ignition is connected to power levels (high state) will cause the system to shut down and re-start. In order to shut the system off, the ignition switch must be opened.

## Digital I/O

The TRAX-10 provides one digital output. When activated, it provides a ground for external devices connected to the vehicle voltage. When inactive it appears as an open. The line can withstand voltages up to 100V when in the off state and can sink 100 mA when active.

The output line will provide 1A peak repetitive for 50mS for driving incandescent lamps switching on at a rate of one per second, at a 50% duty cycle with a 50mA lamp. The output line has inductive load protection with a 1A, 100V diode across the load, and the cathode connected to the supply voltage.

The TRAX-10 also provides five digital inputs. The inputs detect a positive voltage with an input range of 0V to +Battery. The input is inactive when open (less than 100mA) and active when connected to a positive voltage of 4-36VDC.

**Note that drivers written by Octagon indicate a binary value of 0 when the input is open/inactive, and 1 when active.**

## Storage

The TRAX10 uses a (SATA) solid state storage device to act as the system hard disk drive. Storage options are available from 32 GB to 512 GB. All storage options must be factory installed.

## Status LEDs

The TRAX-10 has 3 front panel status LEDs:

- LAN indicates LAN link (green) and activity (yellow).
- STAT is a user controlled bi-color status LED. Accessing the LED registers is accomplished through operating system drivers. Contact Octagon for driver availability and/or a Board Support Package for your Operating System.
- PWR is a Power indicator, indicating On (Green) or Standby (Yellow) state of the power supply.

The TRAX 10 has 4 rear panel Ethernet status LEDs, one for each Ethernet port. Each bi-color LED indicates:

- GREEN ON /GREEN BLINKING = 100Mb operation + Activity
- GREEN BLINKING / YELLOW ON = 1Gb operation + Activity



## Mating Connectors

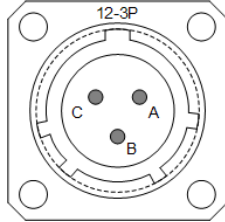
Table 2 - TRAX-10 Mating Connectors

| External Connectors |                               |                                    |
|---------------------|-------------------------------|------------------------------------|
| Connector           | Function                      | Mating Connector                   |
| GPS                 | GPS antenna                   | TNC-F, 50 <input type="checkbox"/> |
| ANT1                | Wireless Accessory (optional) | N-F, 50 <input type="checkbox"/>   |
| Cellular            | Wireless WAN (optional)       | N-F, 50 <input type="checkbox"/>   |
| Power               | Power Input                   | PT06E12-3SSR or similar            |
| Display             | Video, Audio, USB             | PT06E14-19PSR or similar           |
| Ethernet            | LAN                           | PT06E10-6PSR or similar            |
| Serial/USB          | COM ports, USB                | PT06E14-18PSR or similar           |
| Option              | Digital I/O & Option          | PT06E12-10PSR or similar           |
| Dual CAN Bus        | CAN Bus                       | PT06E10-6SSR or similar            |
| Ethernet (rear)     | Gb Ethernet x 4               | M12-x coded                        |

### External Connector Pin-outs

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

Table 3 - POWER Connector Pin-Out

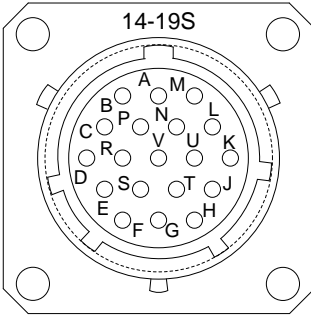
| Signal Name                          | Pin # |  |
|--------------------------------------|-------|--|
| V_IN (Voltage IN)                    | A     |  |
| GND_EXT (Ext Gnd)                    | B     |  |
| IGNITION                             | C     |  |
| <b>Mating Connector PT06E12-3SSR</b> |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

The external power cable must be at least 16AWG for cables of 2M or shorter. For longer cables, use 14AWG. The Ignition Detect signal controls the power management Suspend and Resume functions; this signal should be connected to the vehicle ignition. This wire may be as small as 18AWG.

**Table 4 - DISPLAY Connector Pin-Out**

| Signal Name     | Pin # | Pin # | Signal Name |
|-----------------|-------|-------|-------------|
| Display Power – | A     | L     | BLUE shield |
| Display Power + | B     | M     | H Sync      |
| VGA-SCL         | C     | N     | VGA-SDA     |
| 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     | USB0 Shield |
| BLUE            | K     |       |             |

**PT02E1419S**  
(rear view)

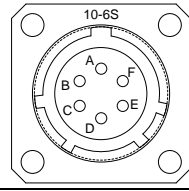


**Mating Connector PT06E14-19PSR**

**Table 5 - ETHERNET Connector Pin-Out (Front Panel)**

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

**PT02E106S**

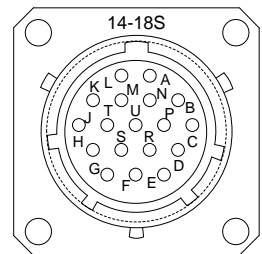


**Mating Connector PT06E10-6PSR**

**Table 6 - SERIAL/USB Connector Pin-Out**

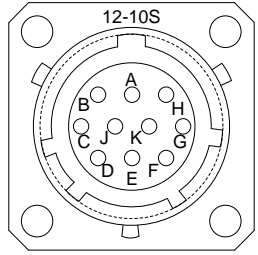
| Signal Name | Pin # | Pin # | Signal Name |
|-------------|-------|-------|-------------|
| COM3 TXD    | A     | K     | COM1 GND    |
| COM3 RXD    | B     | L     | COM1 TXD    |
| COM3 GND    | C     | M     | COM1 RXD    |
| USB1 +5V    | D     | N     | COM2 TXD    |
| USB1 Data+  | E     | P     | COM2 RXD    |
| USB1 Data-  | F     | R     | COM2 GND    |
| USB1 GND    | G     | S     | COM4 D-/TXD |
| COM1 CTS    | H     | T     | COM4 D+/RXD |
| COM1 RTS    | J     | U     | COM4 GND    |

**PT02E1418S**  
(rear view)



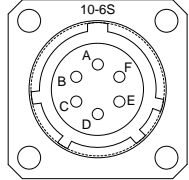
**Mating Connector PT06E14-18PSR**

Table 7 - OPTION Pin-Out

| Signal Name   | Pin # | Pin # | Signal Name  | <b>PT02E1210SW</b><br>(rear view)<br> |
|---------------|-------|-------|--------------|--|
| Option        | A     | F     | Digital IN 1 |  |
| Option        | B     | G     | Digital IN 0 |  |
| Option        | C     | H     | Dig common   |  |
| Digital Out 0 | D     | J     | Digital IN 3 |  |
| Digital IN 4  | E     | K     | Digital IN 2 |  |

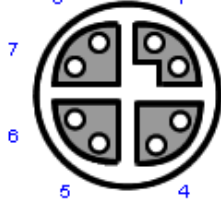
**Mating Connector PT06E12-10PSR**

Table 8 - DUAL CAN Pin-Out (CAN1 is an option)

| Signal Name | Pin # | Pin # | Signal Name | <b>PT02E106P</b><br> |
|-------------|-------|-------|-------------|---|
| CAN0 L      | A     | D     | CAN1 L      |   |
| CAN0 GND    | B     | E     | CAN1 GND    |   |
| CAN0 H      | C     | F     | CAN1 H      |   |

**Mating Connector PT06E10-6SSR**

Table 9 - ETHERNET Connector Pin-Out - rear panel

| Pin # | Signal |  |
|-------|--------|--|
| 1     | MDX0+  |  |
| 2     | MDX0-  |  |
| 3     | MDX1+  |  |
| 4     | MDX1-  |  |
| 5     | MDX3+  |  |
| 6     | MDX3-  |  |
| 7     | MDX2-  |  |
| 8     | MDx2+  |  |



## *Opening the TRAX-10*

*This is not recommended.* Access to the SIM card and wireless module sockets requires the enclosure be opened. This must be done in accordance with safe and approved methods in an approved anti-static environment. **Larger storage devices can only be installed as factory options.** Contact Octagon Technical Support for complete instructions prior to disassembling the unit. Failure to properly reassemble the environmental protection (gaskets) will void the warranty.



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

**Otherwise the unit may be seriously damaged and the warranty is VOID.**

## **Warranty**

Octagon Systems Corporation (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. If a product returned for repairs is found to be free of defect, customer may be liable for the minimum current repair charge.



## **Returning a Product for Repair**

1. The customer must call Tech Support at 1-303-426-4521 to determine if the problem can be resolved without a return.
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 all warranties. Then package in a safe container for shipping.
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. Expedited shipping may incur costs 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.

## **Product Return Policies**

Custom and semi-custom orders are non-cancelable and the product is non-returnable unless otherwise provided by contract.

Standard products may, at Octagon's option, be returned according to the standard restocking policy at the time of return.

## **Governing Law**

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

The information in this manual is provided for reference only. Octagon does not assume any liability arising out of the application or use of the information or products described in this manual. This manual may contain or reference information and products protected by copyrights or patents. No license is conveyed under the rights of Octagon or others.

