



# TRAX-5 Technical Manual

Document #9721, rev. 1.02



## CONTACT INFORMATION

Main Office: +1-303-430-1500  
Technical Support: +1-303-426-4521  
[support@octagonsystems.com](mailto:support@octagonsystems.com)  
[www.octagonsystems.com](http://www.octagonsystems.com)

Octagon Systems Corporation, 7403 Church Ranch Blvd., Westminster, CO 80021-5490

## Copyright Information

Octagon Systems®, and the Octagon logo are registered trademarks of Octagon Systems Corporation. Windows® is a registered trademark of Microsoft Corporation.

## Disclaimers

©2016 Octagon Systems Corporation. All rights reserved. However, small parts of this document may be reproduced for publication or reference, provided that Octagon Systems Corporation is cited as the source. The contents of this manual and the specifications herein may change without notice.

The information contained in this manual is believed to be correct. However, Octagon assumes no responsibility for any of the circuits described herein, conveys no license under any patent or other right, and makes no representations that the circuits are free from patent infringement. Octagon makes no representation or warranty that such applications will be suitable for the use specified without further testing or modification.

Octagon Systems Corporation's general policy does not recommend the use of its products in life support applications where the failure or malfunction of a component may directly threaten life or injury. It is a Condition of Sale that the use of Octagon products in life support applications assumes all the risk of such use and indemnifies Octagon against all damage.

The specifications at the end of the manual are subject to change without notice. Please go to [www.octagonystems.com](http://www.octagonystems.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@octagonystems.com](mailto:support@octagonystems.com)  
Applications Notes (via web): [www.octagonystems.com](http://www.octagonystems.com)

## Revision History

| Revision | Reason for Change                                 | Date     |
|----------|---|----------|
| A14      | Initial production release                        | 09/14    |
| 1.00     | Update 2GB RAM to 4GB.                            | 11/30/15 |
| 1.01     | Eliminated erroneous references to dual CAN bus   | 07/07/16 |
| 1.02     | Eliminated erroneous references to the TPM module | 01/13/17 |
|          |   |          |
|          |   |          |
|          |   |          |
|          |   |          |

**Table of Contents**

Technical Support ..... 2  
 Revision History ..... 2  
**Table of Contents** ..... **3**  
**List of Tables** ..... **3**  
**TRAX-5 Functional Overview** ..... **4**  
 Description ..... 4  
 TRAX-5 Major Hardware Features ..... 4  
     Internal Functional Expansion ..... 4  
     Robust Internal Power Supply ..... 4  
 TRAX-5 major software features ..... 5  
     AMIBIOS BIOS ..... 5  
     Boot Sequence ..... 5  
     Virtualization ..... 5  
**Baseboard Connectors** ..... **8**  
**Using the TRAX-5** ..... **9**  
 Power ..... 9  
 Ethernet ..... 9  
 Audio ..... 9  
 GPS ..... 9  
 ANT1, ANT2 ..... 9  
 USB ..... 9  
 Serial Communication ..... 9  
 VGA ..... 10  
 Power Management ..... 10  
 Digital I/O ..... 10  
 Status LEDs ..... 11  
 Mating Connectors ..... 12  
 External Connector Pin-outs ..... 12  
**Opening the TRAX-5** ..... **15**  
**Technical Specifications** ..... **16**  
**Warranty** ..... **18**  
 Limitations on Warranty ..... 18  
 Service Policy ..... 18  
 Returning a Product for Repair ..... 19  
 Product Return Policies ..... 19  
 Governing Law ..... 19

**List of Tables**

Table 1 - Internal Connectors and Sockets ..... 8  
 Table 2 – TRAX-5 Mating Connectors ..... 12  
 Table 3 - POWER Connector Pin-Out ..... 12  
 Table 4 - DISPLAY Connector Pin-Out ..... 13  
 Table 5 – ETHERNET Connector Pin-Out ..... 13  
 Table 6 – SERIAL/USB Connector Pin-Out ..... 13  
**Table 7 - PCI-104 signal deviations** ..... **15**  
 Table 8 - Accessories ..... 15

## **TRAX-5 Functional Overview**

### **Description**

The Octagon TRAX-5 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-5 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 I/O. External power range is from 9 VDC to 36 VDC.

Internally the TRAX-5 has a 32 GB (or larger) solid state drive, a PCI-104 interface, a Mini PCI socket, and Mini PCI Express sockets.

### **TRAX-5 Major Hardware Features**

The 3845 Intel processor has a clock speed of 1.91 GHz, integral graphics and memory controller supplied with 4 GB of DDR3 SDRAM soldered to the CPU board.

A 32 GB Flash drive is installed for fixed disk storage. Read and write speed far exceed the CompactFlash used in previous generation products.

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 card also incorporates a Mini PCI and a Mini PCI Express slot for radios or other communication devices.

### **Robust Internal Power Supply**

The TRAX-5 accepts a DC input voltage which can be powered from fixed supplies, vehicle batteries or train power systems. The internal power supply has a very robust front end, and is also reverse polarity protected. 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-5 major software features**

### **AMIBIOS BIOS**

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

### **Boot Sequence**

The TRAX-5 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.

-----

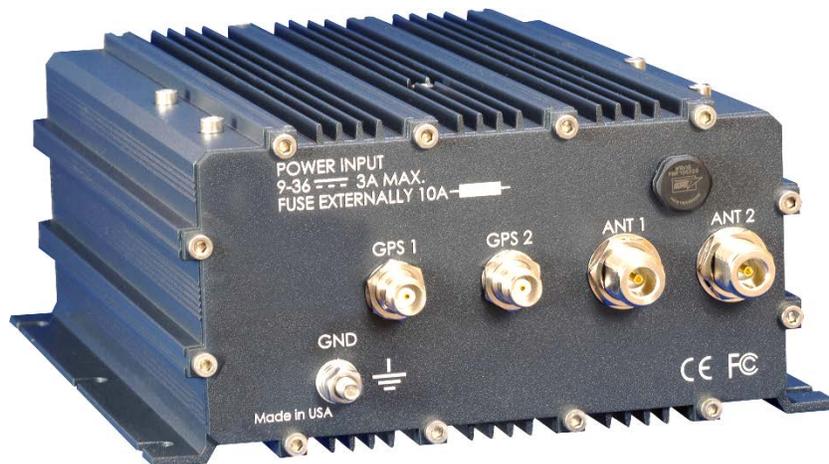
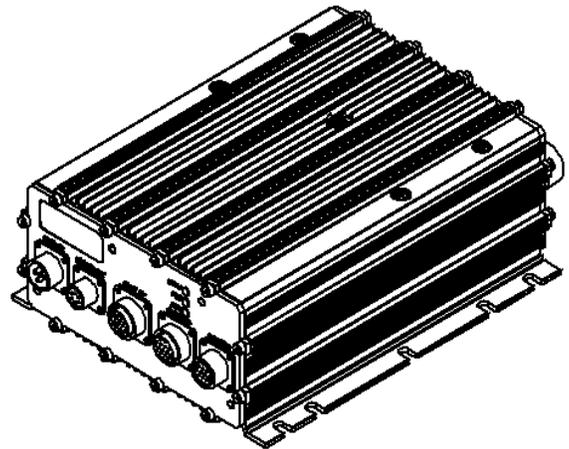
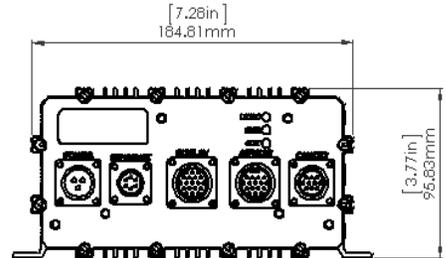
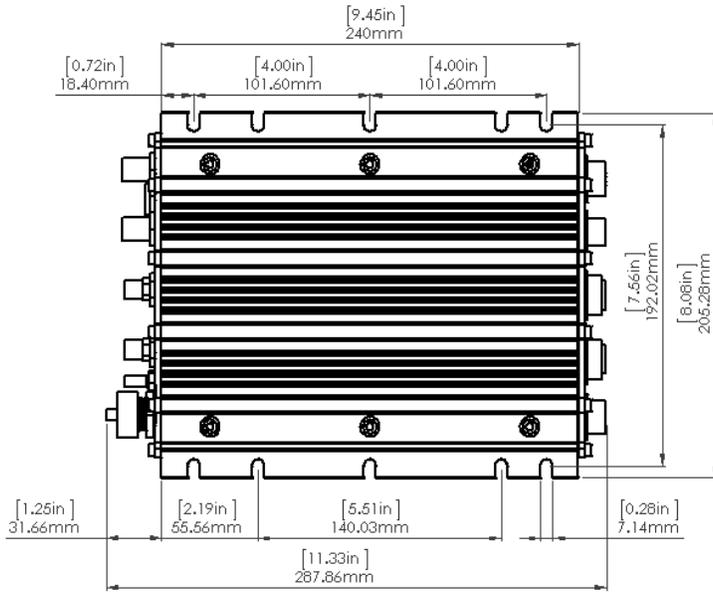
## **Recommended Installation Practices**

The TRAX-5 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 12AWG (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 bolt size is 6 mm. The inclusion of an internal star washer is recommended. This provides some ground-fault protection and reduces EMI. NOTE: This connection is mandatory to meet CE EMI 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 in such a manner that the convection cooling is not impeded. Vertical mount is preferable in hot climates. 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.
5. The protective caps must be left on all unused connectors. Failure to do so may render those connectors unusable in the future.
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-5 includes mounting flanges that must be secured to a surface with ¼ inch or 6mm bolts or screws.
9. The power supply cable gauge should be as large and as short in as practicable.
10. The TRAX-5 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 fuses with of 10A.
11. Proper ESD precautions and method must be followed when installing, servicing, or otherwise handling the TRAX-5.
12. The USB 2.0 have a maximum cable length of 5M. Cables with built-in repeaters are available but the end devices may not be properly recognized by the operating system software and are not recommended.
13. The TRAX-5 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-5, 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.
15. To power down the TRAX-5, 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.

# TRAX-5 Case Dimensions [inches] mm

Back panel shown without options



## Baseboard Connectors

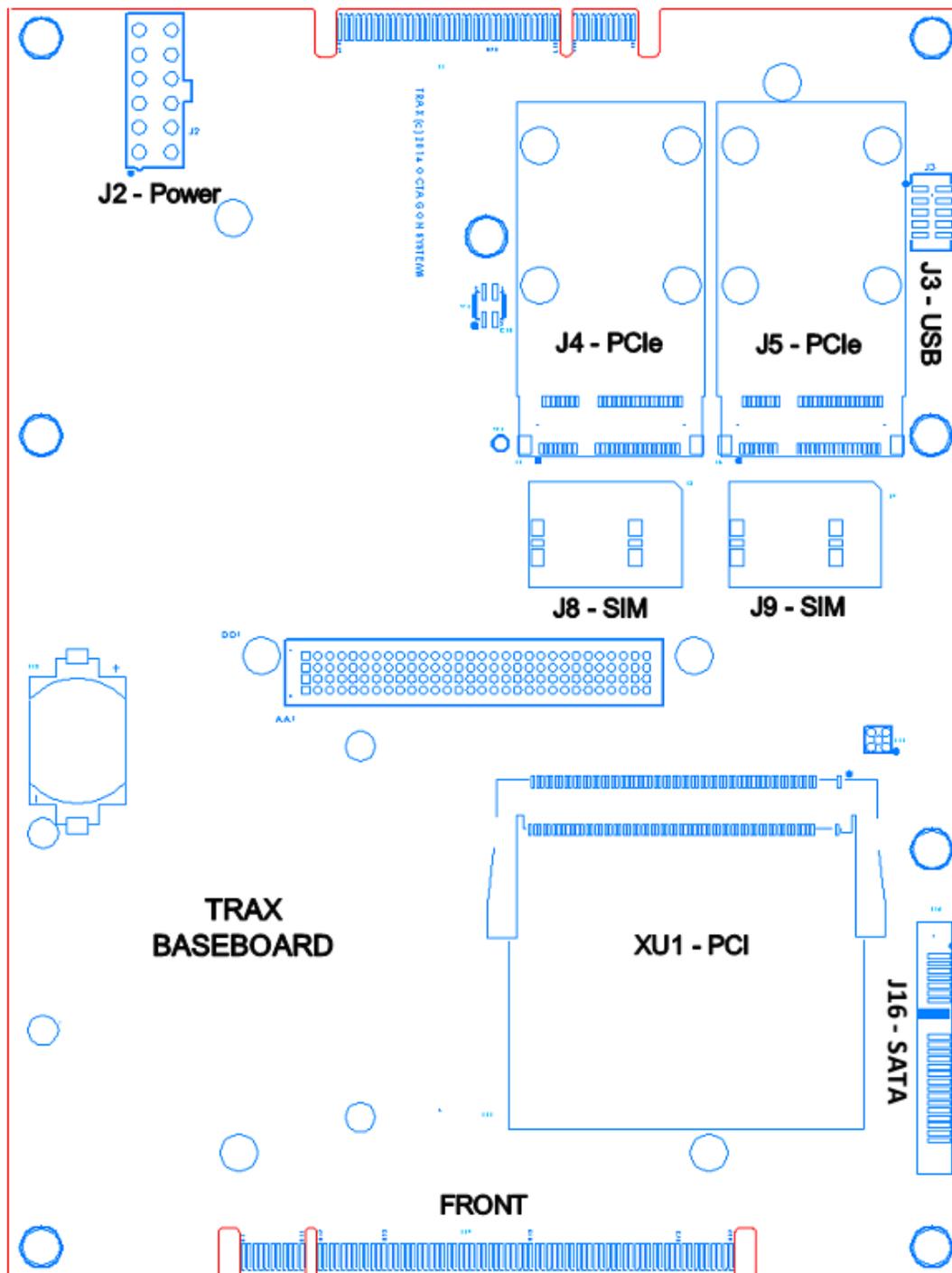


Table 1 - Internal Connectors and Sockets

|            |                        |           |                               |
|------------|------------------------|-----------|-------------------------------|
|            |                        | <b>J8</b> | <b>SIM card socket for J4</b> |
| <b>J16</b> | <b>SATA connector</b>  | <b>J9</b> | <b>SIM card socket for J5</b> |
| <b>XU1</b> | <b>Mini PCI socket</b> | <b>J2</b> | <b>To power supply</b>        |

## Using the TRAX-5

### Power

The TRAX-5 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 gauge (~1.29 mm<sup>2</sup>). It must 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-5 provides one 10/100Base-T Ethernet port. The port supports 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-5 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 a TNC, GPS connector. The high performance GPS receiver is a standard feature of the TRAX-5 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 “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 PCI-104 and Mini PCI. An internal cable connects the card to the appropriate external connector.

### USB

The TRAX-5 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-5 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

**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 1920x1280 is supported.

## **Power Management**

The TRAX-5 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 enter a standby low power state indicated by a yellow power LED on the front panel, and will remain as long as ignition is applied. Removal and reapplication of voltage to the ignition lead will restart the system.

## **Digital I/O**

The TRAX-5 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 with the cathode connected to the supply voltage. Failure to do so can damage the output.

The TRAX-5 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.

## Status LEDs

The TRAX-5 has 3 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.
-

## Mating Connectors

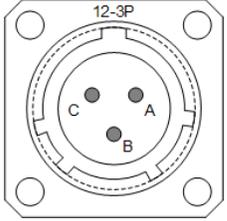
Table 2 – TRAX-5 Mating Connectors

| External Connectors |                               |                          |
|---------------------|-------------------------------|--------------------------|
| Connector           | Function                      | Mating Connector         |
| GPS                 | GPS antenna                   | TNC-F, 50 Ω              |
| ANT1                | Wireless Accessory (optional) | N-F, 50 Ω                |
| Cellular            | Wireless WAN (optional)       | N-F, 50 Ω                |
| 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 |
| DIG/CAN             | Digital I/O & CAN Bus         | PT06E12-10PSR or similar |

## 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     |   |

**Mating Connector PT06E12-3SSR**

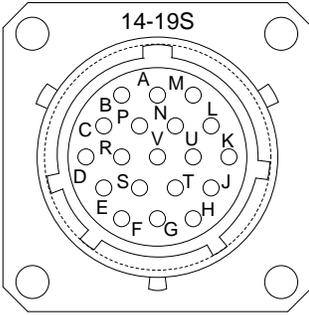
The external power cable must be at least 18AWG (0.823mm<sup>2</sup>) for cables of 0.75M or shorter. For longer cables, use 16AWG (3.31 mm<sup>2</sup>) up 2M and 12AWG (3.31mm<sup>2</sup>) for longer cables. The Ignition Detect signal controls the power management Suspend and Resume functions; this signal should be connected to the vehicle ignition.

-----

**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)

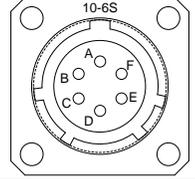


**Mating Connector PT06E14-19PSR**

**Table 5 – ETHERNET Connector Pin-Out**

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

**PT02E106S**

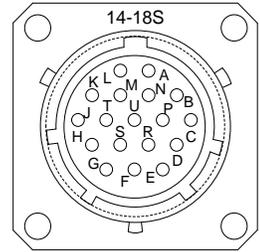


**Mating Connector PT06E10-6PSR**

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

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

**PT02E1418S**  
(rear view)

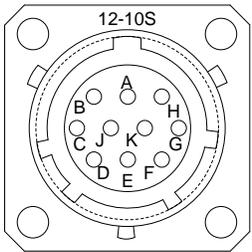


**Mating Connector PT06E14-18PSR**

**Table 7 – CAN/DIG 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     | Dig common   |
| Digital IN 4  | D     | J     | Digital IN 2 |
| Digital OUT 0 | E     | K     | Digital IN 3 |

**PT02E1210SW**  
**(rear view)**



**Mating Connector PT06E12-10PSR**

## Opening the TRAX-5

**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. Contact Octagon Technical Support for complete instructions prior to disassembling the unit. Failure to properly reassemble the environmental protection (gaskets) will void the warranty.

**Table 7 - PCI-104 signal deviations**

| <b>PC-104-Plus</b> |               |               |
|--------------------|---------------|---------------|
| <b>Pin</b>         | <b>Signal</b> | <b>TRAX-5</b> |
| A30                | -12V          | no connect    |
| B30                | REQ3          | not used      |
| C30                | GRNT3         | not used      |
| D6                 | M66EN         | GND           |

**Table 8 - Accessories**

| <b>Product</b>              | <b>Description</b>              | <b>Octagon p/n</b>    |
|-----------------------------|---------------------------------|-----------------------|
| Lab Cable Kit               | Power supply & I/O cable kit    | 9780                  |
| Cable, Power Input          | 3 lead cable - unterminated     | 8339                  |
| Cable, Display              | VGA / USB display cable         | 7509733               |
| Cable, Serial/USB           | I/O Breakout cable              | 7509730               |
| Cable, LAN                  | RJ-45 to MOBL-D LAN cable       | 7508944               |
| Cable, CAN/DIG              | I/O Breakout cable              | 7509732               |
| Cable, Ethernet             | I/O Breakout cable.             | 7508944               |
| Extended Range Wireless LAN | Mini-PCI Wireless LAN interface | Contact Octagon Sales |

-----

## **Technical Specifications**

### **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 with ECC

### **Graphics**

- DirectX 11, OpenGL 3.0, OpenCL 1.2
- 542 MHz Graphics Core, 792 MHz Burst with Four Execution Units
- Hardware Accelerated Media Encode and Decode
- Up to 1920 x 1200 (WUXGA) resolution

### **Storage**

- Integrated 32GB Solid State Disk with ECC
  - Power Interrupt Data Protection
  - SMART Command-based Alerts
  - Wear leveling
- Optional Solid state drive module to 512 GB)

### **GPS**

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

### **External I/O**

- Two USB 2.0 Ports
- Four RS-232 COM Ports, One Port RS-485 Configurable
- One 10/100 Base-T Ethernet Port
- Six Digital I/O
  - Five Inputs - 0-36V operation range
  - One Output - 100ma current sink
- VGA with Touch Screen Interface plus Audio
- Two TNC for GPS
- Status LEDs
- Single CAN Bus

## Internal Expansion

- Two PCI-104 Slots
- One Mini PCI Slot
- Two Mini PCIe Slots

## Wireless Options

- 802.11b/g/n Long Range WiFi
- GSM/GPRS/LTE Cellular
- Mesh Network
- High Precision GPS
- Two "N" connectors for Wifi/Cellular
- Two "TNC" connectors for GPS

## Power Supply

- Isolated topology to 500V
- 9-36 VDC input voltage (10-36 VDC continuous)
- Protection for Load Dump, Reverse Voltage, Brown Out, and Transients
- Supports and Powers Octagon "K" Series Displays

## Manageability

Real-time monitoring of system health including power supplies, temperature, vibration and acceleration, watchdog events and system faults

## Operating System Support

- Windows Embedded Standard 7
- Windows 10 IoT Enterprise
- Linux

## Mechanical

- Extruded, marine grade aluminum, passivated
- Size: 240 L x 206 W x 96 H mm (9.5" x 8.1" x 3.8")
- Weight: 3.4 kg (7.5 lbs)
- Grounding Stud

**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 FCC limits with regards to radiation emission are met, as well as safety considerations.

## Environmental

|                           |   |
|---------------------------|---|
| Operating temperature     | -40° to +71°C   |
| Non-operating temperature | -50° to 95°C, non-operating   |
| Relative humidity         | 5% to 95% non-condensing  |
| Shock                     | 20g, 3 axis per MIL-STD 810F, Test Method 516.5, Functional shock test (4.5.2) 20g peak |
| Vibration                 | Per MIL-STD 810F, Test Method 514.5, Annex A, Category 20 for ground vehicles           |
| EMI                       | CE Class A Radiated and Conducted Emissions   |

---

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

## 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.

-----