



TRAX-5 Standard Model Technical Manual

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The specifications at the end of the manual are subject to change without notice. Please go to 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
Applications Notes (via web): www.octagonystems.com

Revision History

Revision	Reason for Change	Date
1.00	Production Release	09/19/17

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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 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 card also incorporates two Mini PC slots 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. 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

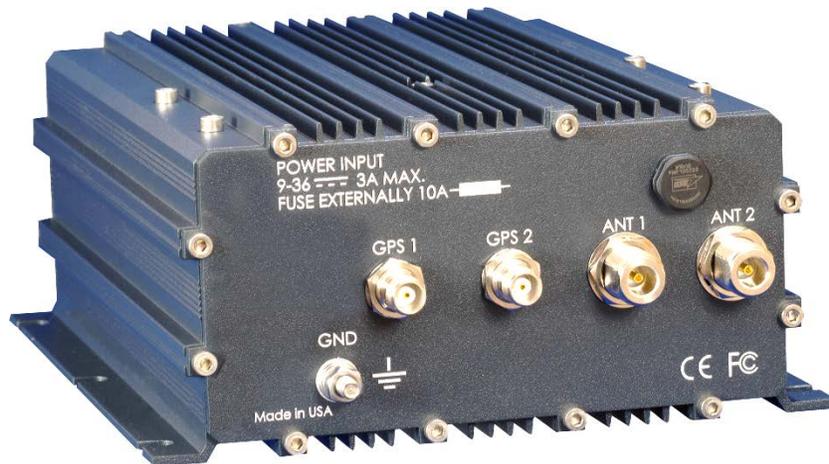
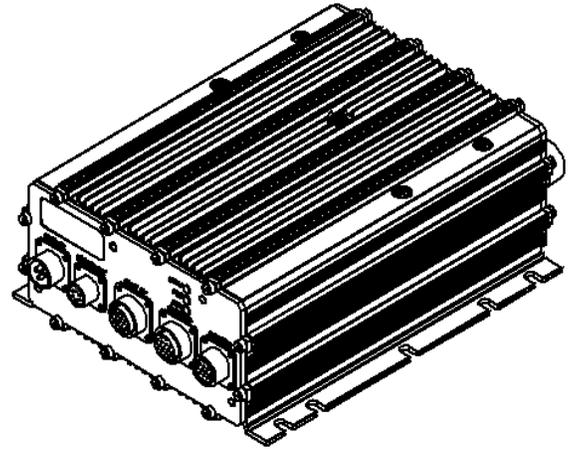
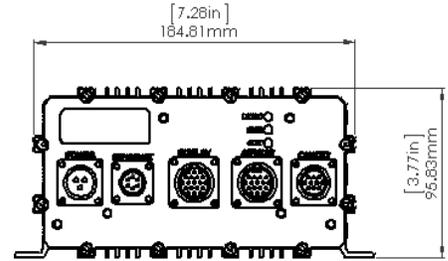
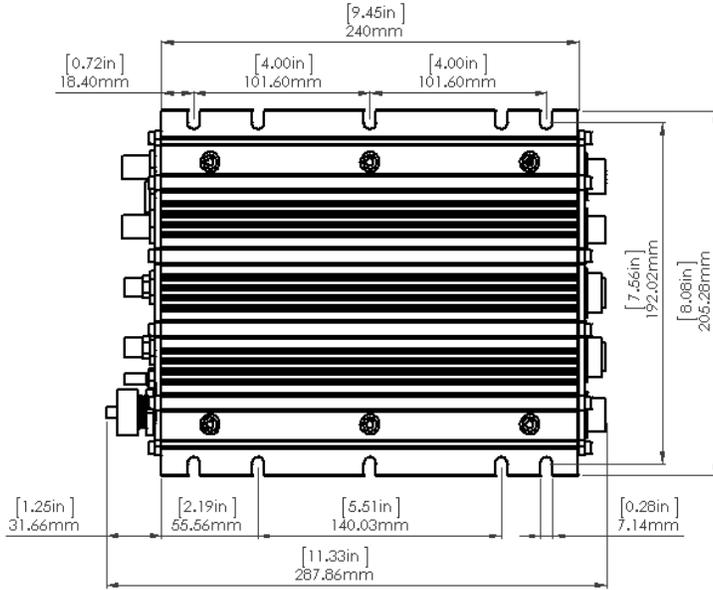
The TRAX-5 is designed to operate in difficult environments. Proper installation will help ensure product longevity and adherence to the product standards.

1. System should be connected to the vehicle frame via an earthing or grounding bolt on the rear of the enclosure. A 14AWG (3.31mm²) 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-5 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-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 10A fuses.
11. Proper ESD precautions and method must be followed when installing, servicing, or otherwise handling the TRAX-5.
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-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. **Storage options must be factory installed.**
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.
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 Case Dimensions [inches] mm

Back panel shown without options



Baseboard Connectors

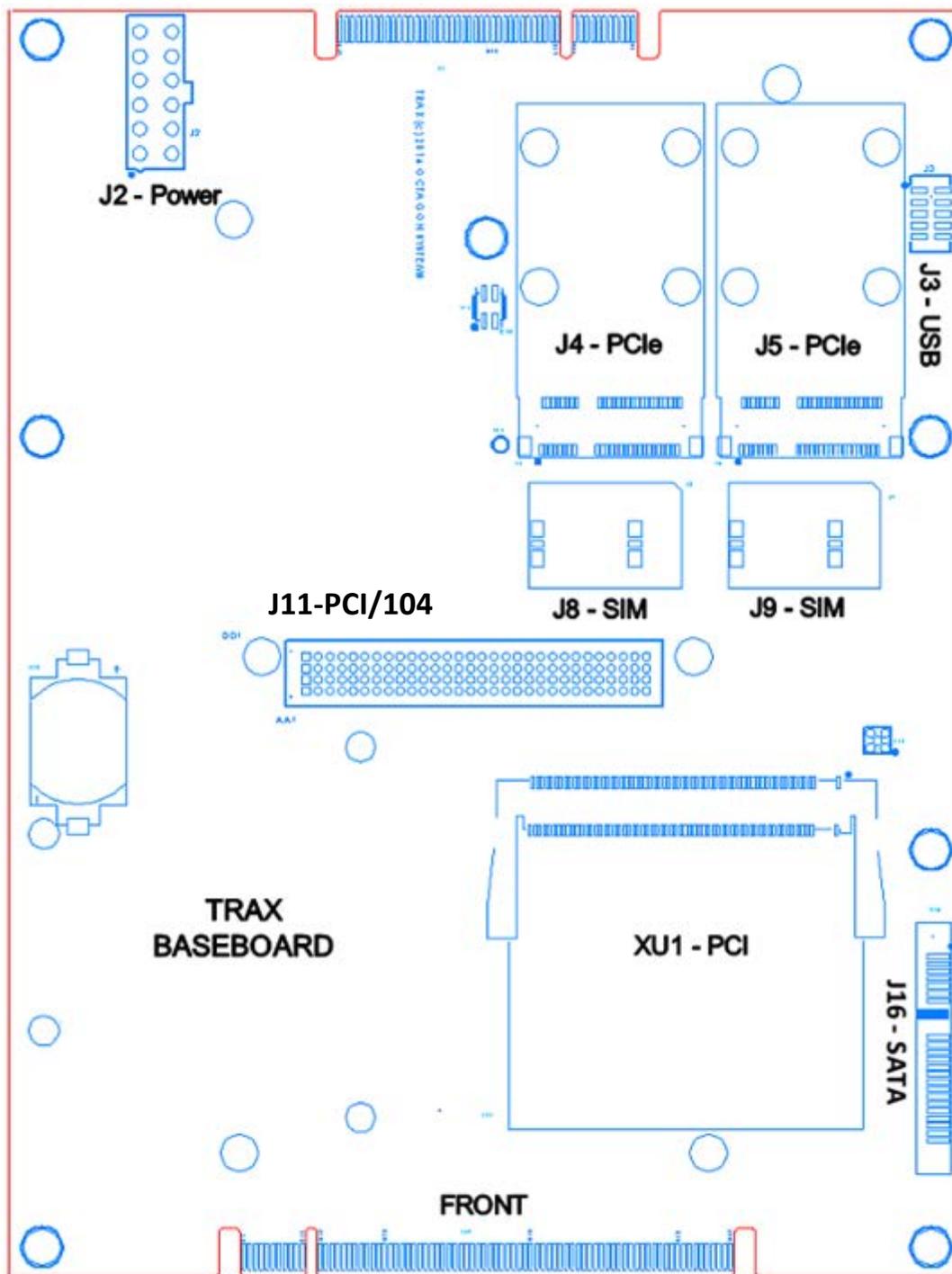


Table 1 - Internal Connectors and Sockets

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-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 mm²). 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 mm²).

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 two TNC type GPS connectors. 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 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 and Mini PCI Express. An internal cable connects the card to the appropriate external connector.

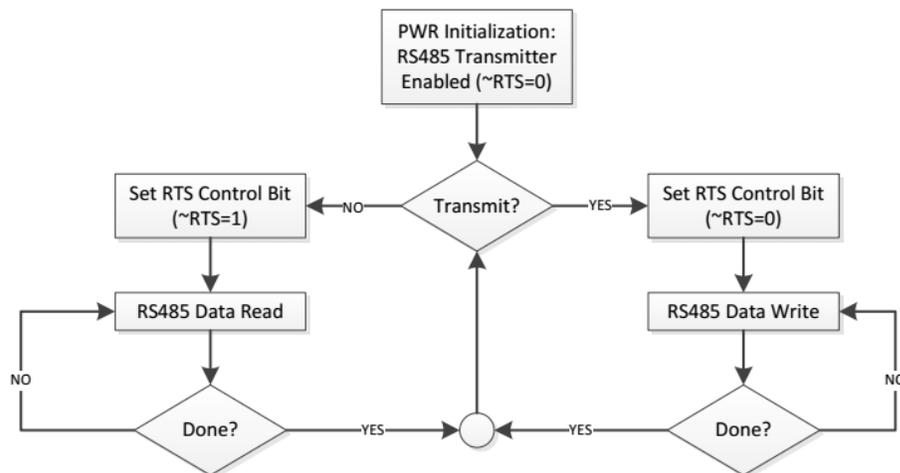
USB

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.

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-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 shut down and then restart. In order to shut the system off, the ignition switch must be opened.

Digital I/O

The TRAX-5 provides one digital output. When activated, it provides a ground return 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.

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.

Storage

The TRAX-5 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-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

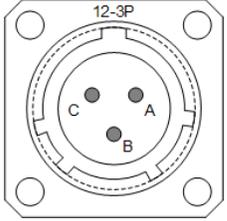
Table 2 – TRAX-5 Mating Connectors

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	

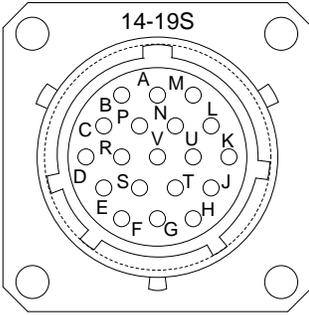
Mating Connector PT06E12-3SSR

The external power cable must be at least 18AWG (0.823mm²) for cables of 0.75M or shorter. For longer cables, use 16AWG (3.31 mm²) up 2M and 12AWG (3.31mm²) 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)

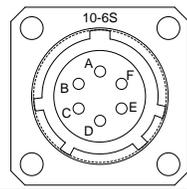


Mating Connector PT06E14-19PSR

Table 5 – ETHERNET Connector Pin-Out (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

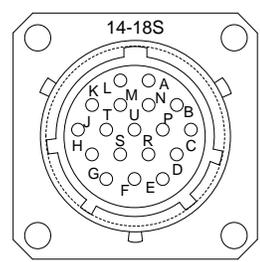


Mating Connector PT06E10-6PSR

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)

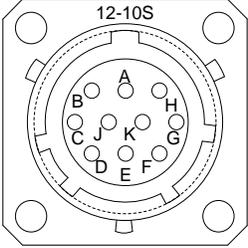


Mating Connector PT06E14-18PSR

Table 7 – CAN/DIG Pin-Out

Signal Name	Pin #	Pin #	Signal Name
CAN H	A	F	Digital IN 1
CAN L	B	G	Digital IN 0
CAN GND	C	H	Dig common
Digital Out 0	D	J	Digital IN 3
Digital IN 4	E	K	Digital IN 2

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. **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.

Table 7 - PCI-104 signal deviations

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

Table 8 - Accessories

Product	Description	Octagon p/n
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

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.

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.

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