



# TRAX-2

## Technical Manual

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**Superior Support – Relentless Reliability**

#### CONTACT INFORMATION

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[www.octagonsystems.com](http://www.octagonsystems.com)

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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](mailto:fasthelp@octagonsystems.com)

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

## Revision History

Revision	Reason for Change	Date
1.00	Production release	02 May 2016
1.01	Minor correction	16 May 2016
1.02	Remove references to CFast and TPM Corrections to CAN option	22 Feb 2017

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## TRAX-2 Functional Overview

### Description

The TRAX-2 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-2 provides the following external interfaces:

- DVI-I video Interface for analog and digital displays
- Two RS-232 Serial Ports
- Two USB 2.0 ports
- 10/100/1000 Base-T Ethernet
- Digital I/O
- Audio In and Out
- Dual CAN bus (with optional CAN bus card)
- Five SMA antenna connectors for GPS and optional wireless modules

Internally the TRAX-2 has:

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

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.**

## ***Configuring and Ordering Your System***

Octagon can build your TRAX-2 with your accessories so that the system is sealed at the factory. Contact your Octagon sales representative for assistance in ordering cellular, WiFi cards, or other options so that your system is fully configured from the factory.

### **Hard drive options**

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

### **M.2 (NGFF) socket**

The standard TRAX-2 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 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-2 features.

### **Cables**

TRAX-2 is designed to use off the shelf, PC style cables. This enables the end user to deploy the TRAX-2 easily without designing custom cables.

## ***Recommended Installation Practices***

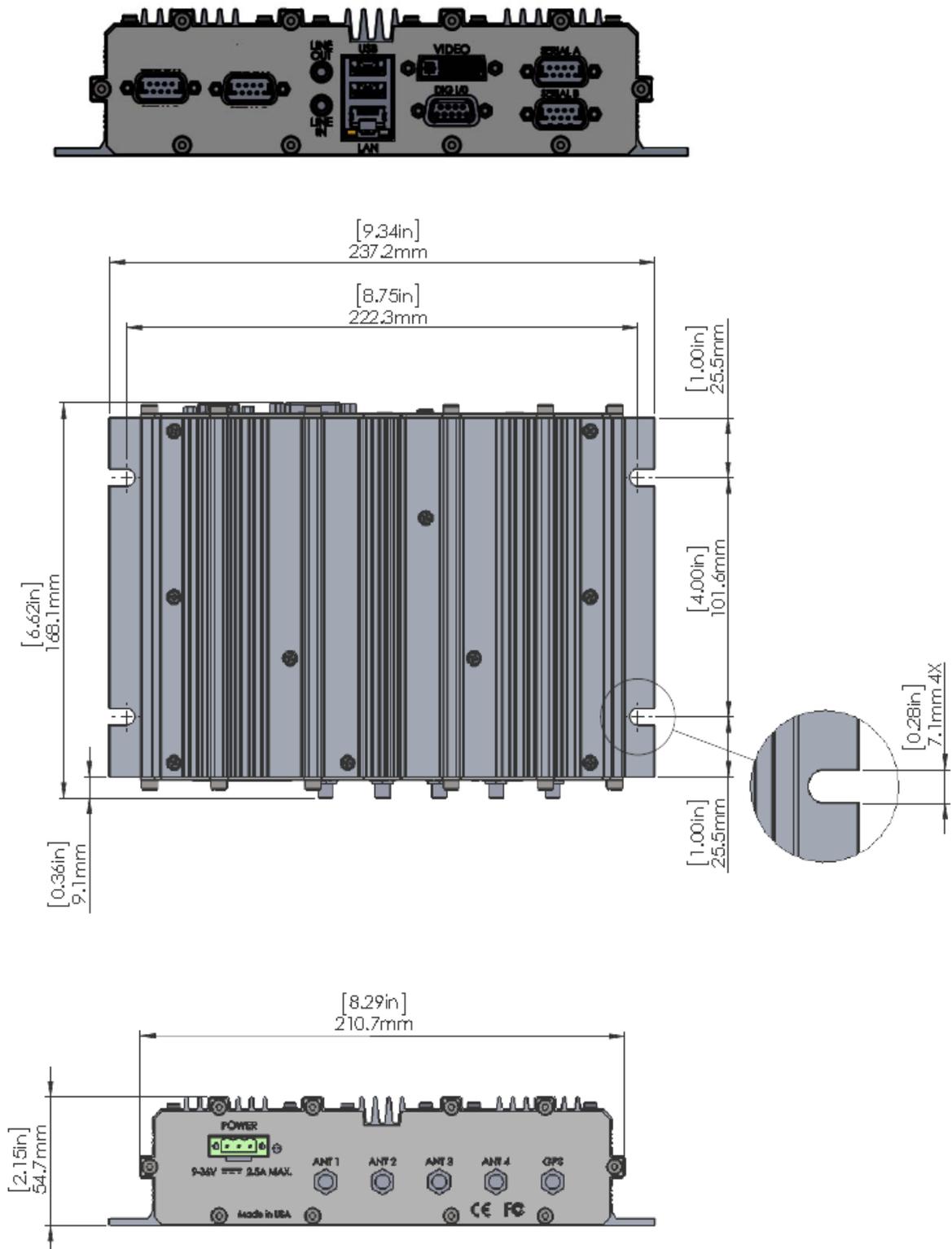
Proper installation will promote longevity and adherence to the product standards.

1. 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.
2. 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 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.
3. There are no internal repairable components. Customer field repair is in violation of Octagon's warranty.
4. Do not over-tighten the antenna cable connectors.
5. The TRAX-2 includes mounting flanges that must be secured to a surface with 0.25" or 6mm hardware.
6. The power supply cable gauge should be as large and as short as practicable. NOTE: The power connector is supplied (plugged into the TRAX-2)
7. The TRAX-2 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.
8. Proper ESD precautions and methods must be followed when installing, servicing, or otherwise handling the TRAX-2.
9. The USB 2.0 ports have a maximum cable length of 5M. Cables with built-in repeaters to extend this length should not be used.
10. The inrush current on the TRAX-2 is 10A. 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.
11. Contact Octagon Technical Support for proper disassembly/ access to internal options & expansion.
12. To power down the TRAX-2, 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 "Powered Off" condition.
13. Washing the unit will void the warranty.

**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 is VOID.**

Figure 1 TRAX-2 dimensions mm (in)



## Using the TRAX-2

### 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-2 can be ordered with Windows Embedded Standard™, Windows 10 or Linux pre-installed.

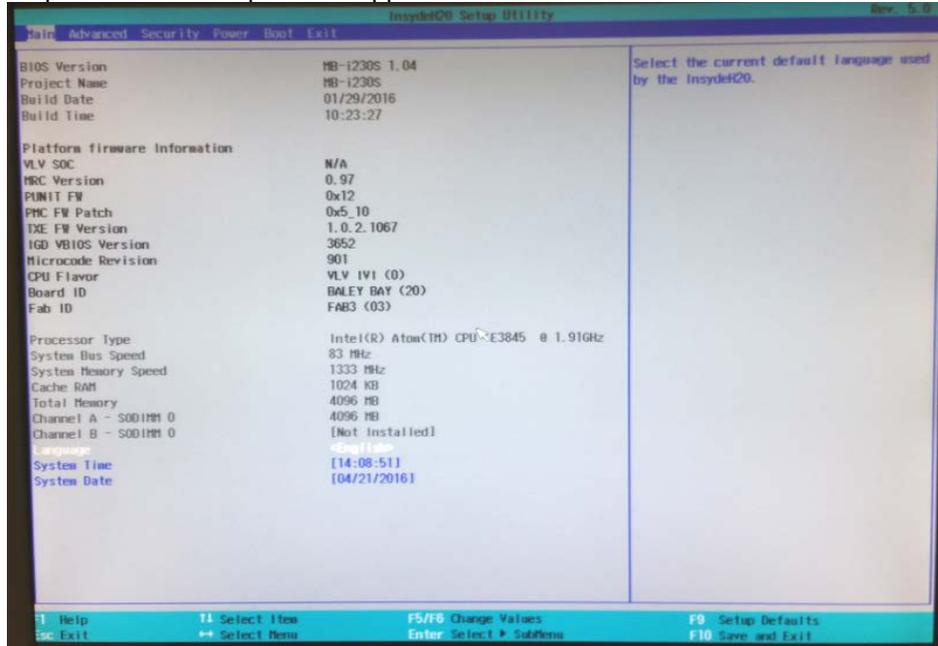
### Installing an OS onto the M.2 drive

If you have not made any changes to the TRAX-2 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-2 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 also before starting the installation. A USB hub is needed to install any operating system, as the two provided will be used for keyboard and mouse.**

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-2. 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-2 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-2 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-2 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-2 has a dual color (PWR / STBY) LED on the rear panel. The PWR / STBY LED will display different colors to indicate whether the unit is running or in standby mode. The TRAX-2 also has Ethernet status LEDs in the front panel Ethernet connector. The Ethernet LEDs provide the link and activity status of the Ethernet port, and the connection speed.

## **DVI-I**

The DVI-I connector offers both DVI digital video and Analog RGB video. The interface is compatible with both DVI and VGA monitors. The TRAX-2 supports digital resolutions up to 1920 x 1080 @ 60Hz and Analog resolutions up to 2560 x 1600 @ 60Hz.

## **Keyboard/Mouse**

The TRAX-2 supports a USB keyboard and mouse. See USB below. Wake-on keyboard and Wake-on mouse are supported for power management.

## **USB**

Two external USB 2.0 ports are available. USB0 & USB1 are available on the front panel. The TRAX-2 will automatically detect USB peripherals such as keyboards, flash drives, CD ROMs; USB floppy drives and USB hard drives.

## **Ethernet**

10/100/1000 base 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-2 has two serial ports. Signals are RxD, TxD, RTS and CTS. COM drivers for Windows and Linux are available on the Octagon web site.

## Digital I/O

The digital I/O comprises two 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.

### Base address

The digital I/O resides on the	SMBus
The specific I2C chip address	0x4E.
The digital input register address	0x22.
The digital output register address	0x21.
The digital input bit #1 mask	0x01.
The digital input bit #2 mask	0x02.
The digital output bit mask	0x04.

### Output lines

One digital output  
Optically isolated, 100mA current sink

### Input lines

Two digital inputs  
3-36 VDC

### Software drivers

Application programs for the TRAX-2 digital I/O are available on the Octagon website for Windows and Linux.

#### Cable

The TRAX-2 digital I/O requires a unique cable. Please see the table on page 16 for connector type and pinout.

#### Audio

The audio is HD compatible, and uses a standard Codec driver. The TRAX-2 audio has one line level input, and one line level output. Audio is accessed through the front panel connectors. Standard PC color coding is used. The audio driver is available on the Octagon website.

#### Dual CAN Bus

The CAN Bus is implemented through an optional, add-in, two channel, PCIe Mini-Card. Both channels are galvanically isolated to 300 VDC. The drivers for the TRAX-2 CAN Bus card are on the Octagon website. The CAN Bus signals are available on the CAN A, CAN B connectors. The termination on the CAN BUS is 120 ohms and must be added to the CAN network. The maximum cable length is reduced to 40 meters at 1Mbps.

#### Temperature sensor

The TRAX-2 has an onboard temperature sensor. The temperature sensor is part of the 9 axis sensor.

## GPS

The TRAX-2 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-2 supports WiFi cards in PCIe Mini-card form factor. These are available as an ordering option. TRAX-2 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-2 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.

## Power

The TRAX-2 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-2 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 *External 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-2 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-2 supports Wake-on LAN, USB, and RTC. For additional information refer to the TRAX-2 on the Octagon web site.

## **TRAX-2 Technical Data**

### **Processor**

- Intel E3825 Dual-Core CPU, 1.33 GHz
- 2MB L2 Cache
- 64-bit Capable
- Virtualization Support
- ACPI 5.0 Support

### **Memory**

- 4 GB DDR3-1066

### **Graphics**

- DirectX 11, OpenGL 3.0, OpenCL 1.2
- Up to 1920 x 1200 (WUXGA) resolution

### **Storage**

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

### **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
- Two RS-232 COM Ports
- Audio Line In & Line Out
- One 10/100/1000 Base-T Ethernet Port
- Three Digital I/O
  - Two Inputs – 3-36V operation range
  - One Output - 100ma current sink
- DVI-I for Analog and Digital displays
- SMA for GPS, 4x RP-SMA for wireless radios
- Status LEDs

### **Dual CANbus**

- CANbus 2.0 A,B compatible
- Drivers for Windows and Linux
- 300V galvanic isolation

### **Wireless Options**

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

### **Display Option**

- Compatible with K Series displays

5M cable, video, touchscreen & audio

### **Power Supply**

9-36 VDC input voltage (10-36 VDC continuous)

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 Mint

### **Environmental**

Operating temperature	-20° to +62°C per MIL-STD 810G
Non-operating temperature	-30° 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 56 H mm (9.3" x 6.4" x 2.2")

Weight: 1.3 kg (3.3 lbs)

\* These specifications are for the standard TRAX-2 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-2 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 is VOID.**

## External connector pin-outs

**Table 1 - Digital I/O**

Mating Connector type (cable end): DB9-M

Signal Name	Pin #
Digital In 0	1
Digital In 1	2
Digital Out 0	3
VCC5	4
GND	5
No Connect	6
No Connect	7
No Connect	8
No Connect	9

**Table 2 - CANbus A, B**

Mating Connector type (cable end): DB9-F

Signal Name	Pin #
No Connect	1
CAN_L-	2
CAN_GND	3
No Connect	4
No Connect	5
No Connect	6
CAN_H	7
No Connect	8
CAN V+	9

**Table 3 - Power Connector I/O**

Mating Connector type (cable end): DECA MC101-50003 (supplied)

Signal Name	Pin #
VEH_POWER +	1
VEH_GND -	2
IGNITION	3

**Pin 1 is on right**

**Table 4 - Serial A,B**

Mating Connector type (cable end): DB9-F

Signal Name	Pin #
No Connect	1
RxD	2
TxD	3
No Connect	4
GND	5
No Connect	6
RTS	7
CTS	8
No Connect	9

**NOTE: DVI-I, USB, audio & LAN are PC compatible, industry standard connectors**

## **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-2 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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