



# Hardware Installation Guide

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BBX



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## INTRODUCTION

This document provides instructions and guidelines that should be followed for the successful installation of a Mentor BBX.

### 1 Revision Tracking

Date	Description	Revision	Initials
February 5, 2004	Initial Release	1.0	DRP
July 6, 2004	Updated BBX Front View	1.1	JK
Sept 30, 2004	Added cabling caution in Installation section	1.2	JK
Nov 25, 2004	Updated System Diagram and FCC Statement	1.3	DRP/JK

### 2 General Precautions

Before using this product, be sure to carefully read all operating instructions. Save these instructions for future reference. Also be sure to heed all the warnings located throughout this document.

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#### NOTE

Mentor Engineering Inc. reserves the right to change specifications without notice. Please ensure you have the most recent revision of this Document

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#### CAUTION

Use only a damp cloth for cleaning. Never use any type of liquid or aerosol cleaner, or any type of organic solvent to clean this product.

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#### CAUTION

The BBX unit should be serviced by qualified trained personnel only. Attempting to remove the cover or disassemble the product could expose you to dangerous high voltage points.

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**WARNING**

To avoid the risk of electric shock, never expose this product to water or operate in a high humidity environment. Never use the product around water (near a bathtub, kitchen sink, swimming pool or in the rain).

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**WARNING**

Do not attempt to operate a damaged device. If the product has been exposed to water, shows evidence of physical damage or is not operating properly unplug it from the power source and refer servicing to qualified service personnel.

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## FCC COMPLIANCE STATEMENT (USA)

### 1 FCC Class B Part 15

This device complies with Part 15 of FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference
2. This device must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a **residential** environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. In which case the user will be required to correct the interference at their own expense.

The user of this equipment is cautioned that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

## REQUIRED ITEMS

For a typical installation in a vehicle, following items will be needed:

- BBX Unit
- BBX Power cable(s)
- In-line Cable Fuses
- Mounting Plate and Thumbscrews
- Mounting Plate Hardware (Not Supplied)

To assist with the installation, it is often necessary to have the following available:

- Laptop PC
- BBX Programming Cable
- Multimeter

## INSTALLATION

### 1 General

BBX is a wireless GPS unit with AVL (Automatic Vehicle Location) capability. The unit has been designed for use with a Computer Aided Dispatch system to monitor fleet vehicles on the road. It can be equipped with several different RF Modems, or connected to a conventional radio system. As well, the device has several vehicle inputs and can attach to several different peripheral devices via USB or RS232 communication.

The BBX is shipped pre-programmed with the appropriate communications and application software. In some cases, however, it is necessary to re-program the units with updated files prior to installation. Please refer to the BBX Programming application note for details on re-programming and configuring the units.

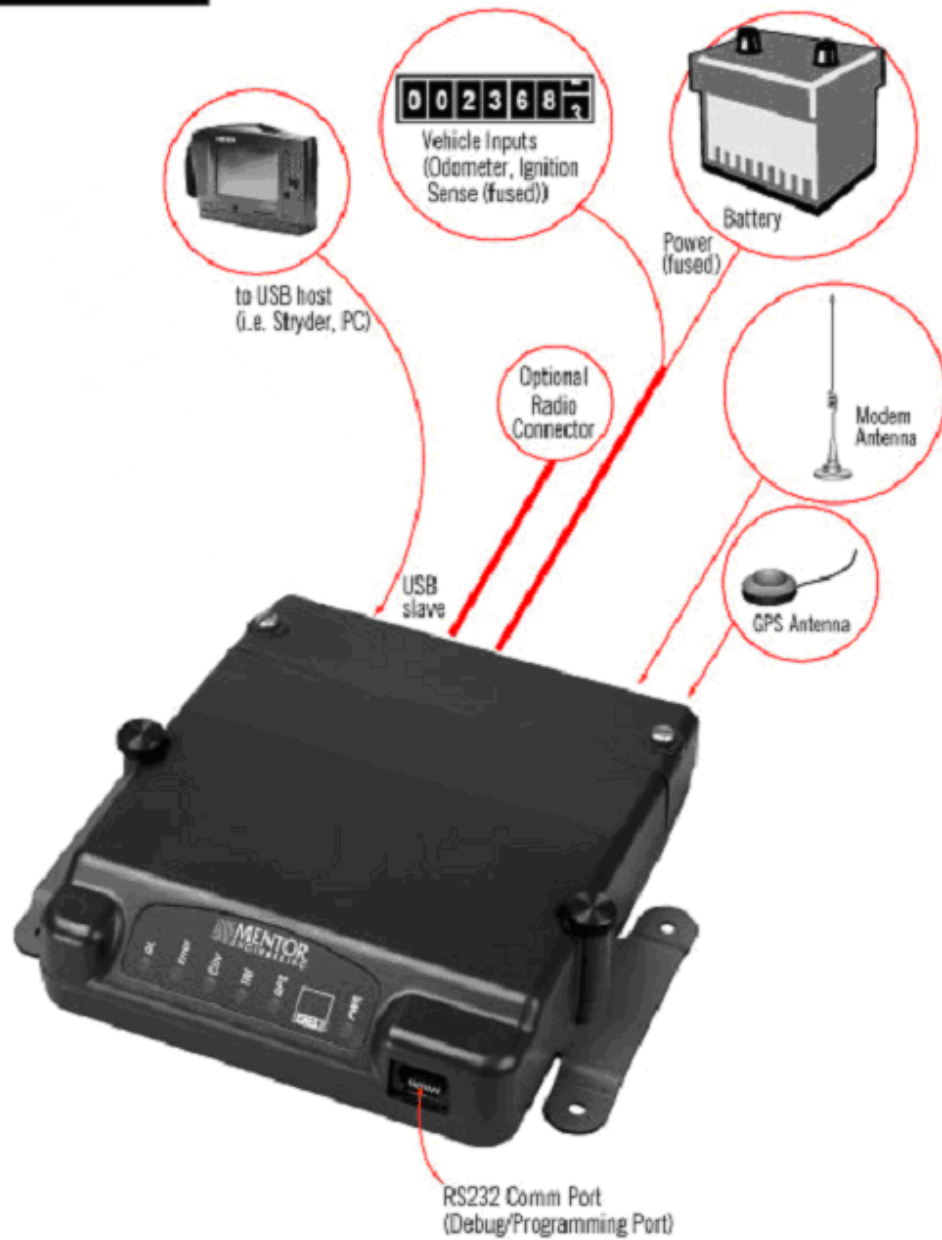
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### CAUTION

When installing the BBX, ensure that there is sufficient slack and/or strain relief in the cables that connect to the unit so that if the position of any of the attached devices changes, the cables will not cause any stress to occur on the connections to the BBX. Failure to do so may cause damage to the unit.

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**BBX System Diagram**



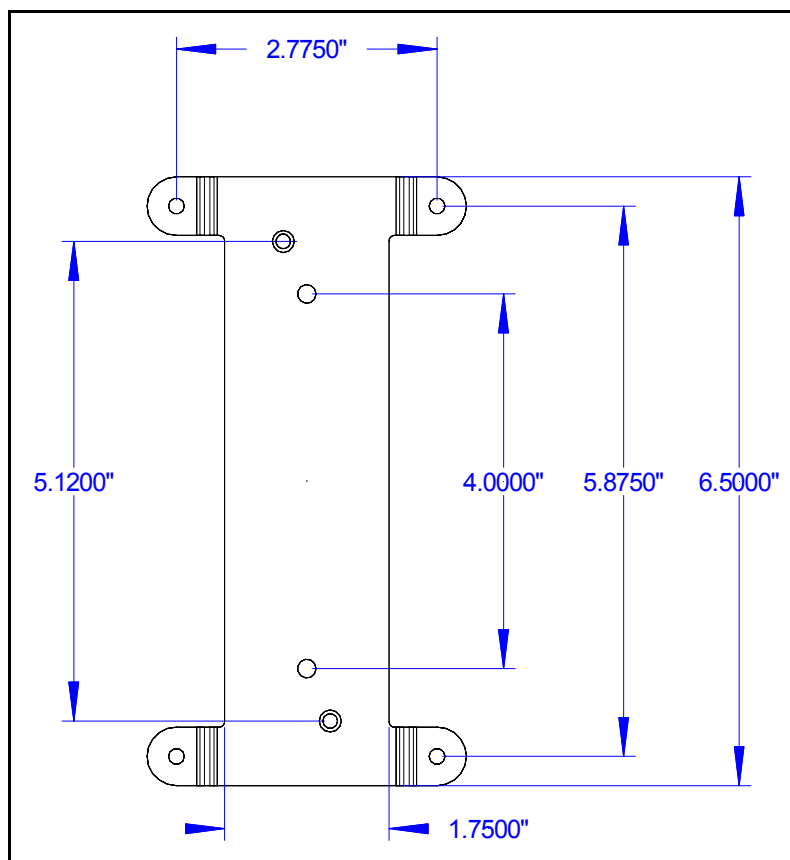
**Figure 1: Typical System Schematic**



## 2 BBX Mounting Plate

The Mounting Plate is supplied with each unit, and allows the BBX to be mounted in a variety of locations and orientations. The mounting location is application specific. The BBX does not have an interactive user interface and thus can be installed out of sight (i.e. under a car seat, or in the trunk). Installing the BBX out of sight not only increases the aesthetic properties of the installation but also limits the access by drivers and passengers to the cabling.

The Mounting plate is first fastened to the car interior using bolts or other appropriate means. Hardware has not been supplied for this step as it will vary depending on the thickness and type of material the mounting plate is attached to. The BBX unit can then be attached to the mounting plate using the supplied thumbscrews.



**Figure 1: Mounting Plate Dimensions**

### Mounting Hardware:

- Mounting Plate and Thumbscrews (supplied)
- Mounting Plate Hardware (not supplied)  
4 x 0.17" Mounting Holes (Fits most #8 fasteners)

### 3 BBX Connections

The cable cover on the BBX unit can be removed by hand or by using a flathead screwdriver to loosen the two screws. Removing the cable cover gives access to the BBX interface points, which are detailed below.

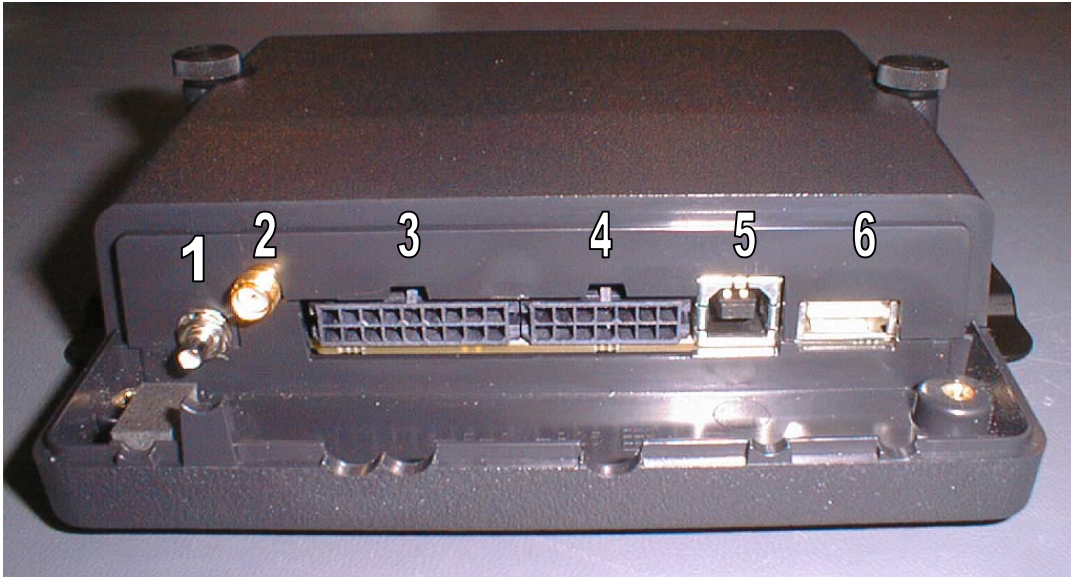


Figure 2: BBX Interface points (Rear View)



Figure 3: BBX Interface points (Front View)

#### 3.1 Interface Summary

1. Straight SMB Connector  
GPS Antenna
2. Straight SMA Connector  
Modem Antenna
3. 18pin Micro Fit Connector (MOLEX 43045-1806)

- Power, Ignition Sense, Odometer and Vehicle I/O
- 4. 14pin Micro Fit Connector: (MOLEX43045-1406)  
Radio I/O
- 5. USB-B Slave Port
- 6. Future Use
- 7. User Interface  
LEDs to indicate – USB Good link, Error, In Coverage, Transmit Indicate, GPS, Power (IGN on).
- 8. 8 position Modular Jack - RJ48 (AMP 406525-1)  
RS232 Comm/Debug Port

### 3.2 Communications Interface (2 Way Radio)

The installation cable provided will bring the appropriate interface pins from the communications connector to an appropriate adapter for the communications device (i.e. mobile radio). Details for specific interfaces are available as application notes from Mentor Engineering, Inc. See Interface Point #4 above.

### 3.3 Vehicle Interface

Details regarding the cabling interface for external BBX peripheral devices, odometers, and additional I/O are available as application notes specific to these functions. These notes are provided as required by Mentor Engineering, Inc. See Interface Point #3 above.

## 4 Cabling

The BBX receives power via the Mentor supplied power cable (4-CAS-BBXVEHC075-00). Power and Ignition Sense lines need to be installed with the in-line fuses provided. See cable pin out for details.

The BBX has a USB Slave Port located under the BBX cable cover. In order to fit the USB cable under the BBX cable cover, a short over-mold USB cable must be used. This cable is available in several lengths from Mentor.

It is common practice to route the cabling through the vehicle so it is not visible to the driver and is protected from the environment. Mentor Engineering recommends that this practice be followed in all installations.

If an external device (i.e. mobile radio) is being used with the BBX the installation must ensure that there is a common ground between the devices. BBX Power leads can be crimped onto the power leads at the power input to the communications device. Installing the power leads in this way will avoid the possibility of the ground potential at BBX differing from the ground potential of the communications device (due to current draw during a transmit cycle).

The BBX should be installed to unswitched power. The unit will use the ignition line to power on and off automatically.

The in-line power fuse is a 3-amp MINI blade fuse (2-FUS-MINI003A-00). The power fuse must be installed within 4" of the Vehicle Battery. The in-line ignition fuse is a 2-amp MINI blade fuse (2-FUS-MINI002A-00). The Vehicle ignition line must be fused with the in-line fuse provided or through the vehicle fuse box.

Note, a blown fuse will often indicate that there is either a problem with a connection to the BBX or with BBX itself. Check all connections before replacing a fuse.

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**CAUTION**

For continued protection against risk of fire and equipment damage, replace only with the correct type and rating of fuse.

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Please refer to the Technical Data section of this manual for details on the voltage and current requirements of BBX.

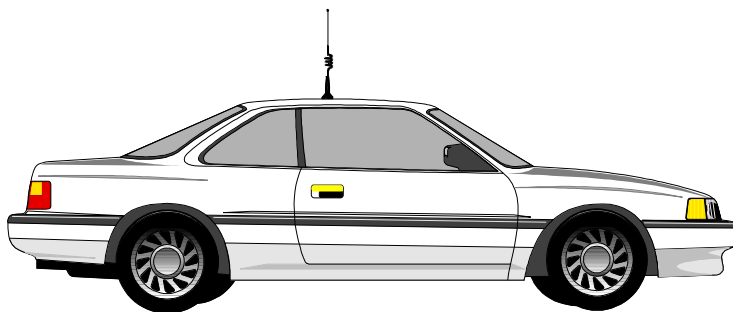
**5 Communications Device**

The BBX can use a variety of communication devices. In radio systems, this will be an external mobile radio with its accompanying antenna. If a data system such as GPRS, iDEN, CDPD, etc. is being used, then the communications device will be a modem (which may be internal in the BBX). The size and location of the communications device should be taken into account during the installation process to ensure that there is enough space to mount and install all components of the system in the vehicle.

**6 Antenna Installation**

Antenna location has an extremely significant impact on the performance of a wireless modem. Mentor Engineering recommends using a roof top antenna installed in the center of the vehicle roof for best coverage and to meet SAR/MPE radiation specifications (See Following section: RF Radiation Specifications).

Antenna installation requirements vary between different antennas. Contact Mentor for specific Antenna information for your application. The following Figure shows the preferred location of a rooftop antenna.



cntrant.cdr

**Figure 4: Location of Roof Mount Antenna**

**6.1 General Antenna Guidelines**

- Position the antenna as high as possible on the body of the vehicle.

- Keep the RF cable as short as possible. Cut the excess cable during an installation. Do not wrap it up. Excess cable adds unnecessary loss to the signal.
- Ensure the antenna is in a vertical position during operation.
- Use proper RF connectors. Use a straight SMA connector when using a BBX with an internal wireless modem. (Refer to the SMA Connector Assembly documentation provided)

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**WARNING**

Improper installation of the SMA connector can cause damage to the mating SMA connector on the BBX unit.

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- Avoid sharp bends and moving objects in the coaxial cable path.
- Position the antenna away from fuel caps.
- Position the antenna such that there is separation from other antennas (e.g. AM/FM Radio, cellular etc.).
- Follow the antenna manufacturer's guidelines exactly when installing antennas.

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**WARNING**

The BBX, when equipped with an internal modem, must be used with a Mentor authorized antenna in order to comply with FCC regulations. Improper antenna selection or positioning may result in excessive RF exposure which can harm the user.

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## RF RADIATION SPECS

### 1 FCC Radio Frequency Exposure Rules

Based on FCC rules 2.1091 and 2.1093 and FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields, OET Bulletin 65 and its Supplement C, all radio units are subject to routine environmental evaluation for radio-frequency (RF) exposure prior to equipment authorization or use.

For mobile devices, defined as a transmitting device designed to be generally used such that a separation distance of at least 25 cm is maintained between the body of the user and the transmitting radiated structure, the human exposure to RF radiation can be evaluated in terms of Maximum Permissible Exposure (MPE) limits for field strength or power density in  $\text{mW}/\text{cm}^2$ .

### 2 How to Comply with FCC SAR/MPE Guidelines

In order to comply with FCC SAR/MPE Guidelines the antenna must be placed a minimum of 25 cm from the vehicles edge. To accomplish this, and to ensure optimum antenna performance Mentor Engineering recommends that antenna be installed in the center of the vehicle rooftop.

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#### WARNING

The user should be instructed to maintain the minimum distance from the antenna.

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### 3 SAR and MPE Limits

SAR limits for General Population/Uncontrolled exposure is 1.6W/kg for partial body exposure, averaged over 1 g of tissue and 4 W/kg for hands, wrists and feet averaged over 10 g of tissue. The limits for Occupational/Controlled exposure are more relaxed, i.e. 8 W/kg for partial body and 20 W/kg for hands, wrists and feet. The 1.6 W/kg limit applies for most BBX applications.

The limit for MPE is  $0.6\text{mW}/\text{cm}^2$  at 900 MHz.

RF exposure distance is based on normal operating proximity to the user's or nearby persons' body. This distance is measured from any part of a radiating structure, generally the antenna, to the closest part of the body.

### 4 Labelling

If the antenna is installed at least 25 cm from the vehicle's edge no warning label is required.

If the antenna is not at least 25 cm from any vehicle edge, an additional RF radiation hazard label that warns the user or nearby persons to keep away from the antenna by the specified distance is required. This is because the minimum separation distance of the

final device configuration cannot be met due to occasional non-essential operating conditions or requirements.

An example statement is shown below.

“Warning: To meet the FCC RF exposure requirement for mobile transmitter end products, ensure that the antenna is at least 25 cm (10”) away from the user, or nearby persons, when transmitting.”

## BASIC OPERATION

### 1 Turning BBX On

Unit behaviour is dependant on installed software and typical operation will vary. However, the unit generally turns on when the vehicle ignition line is active or when the Programming Cable is inserted.

### 2 General Handling and Maintenance

Care should be taken in handling BBX to prolong product life. Caution should be used to prevent liquids from entering any openings on the unit. Liquid spills could seriously damage the internal contents of the unit.

#### 2.1 Cleaning Tips

Use a soft lint free cloth moistened with water or mild detergent to clean the exterior of the unit. Do not apply cleaner directly to any unit opening.



**BBX TECHNICAL DATA****1 Voltage**

Supply voltage 9 - 32 volts

**2 Current Consumption**

Input Voltage (V)	Current Draw <sup>†</sup> (mA)		
	Standby	No DSP	DSP Equipped
9	2.5	108	165
18	5	57	90
32	10	36	60

Peak<sup>‡</sup> 2A**3 Temperature Range**Operating -30 to +65°C  
-22 to +149°F**WARNING**

Operation at temperatures outside this range is not recommended.

Storage -40 to +80°C  
-40 to +176°F**4 Dimensions and Weight**Approximate Size (L x W x H) 4.75" x 5.0" x 1.0"  
121 x 127 x 25 mm

Weight (with typical modem) 0.77 lbs / 0.35 kg

**5 Compliance**

- FCC Class B Part 15

<sup>†</sup> Typical Current Draw measured with device powered without a modem and peripheral devices

<sup>‡</sup> Peak Current draw will vary depending on Modem type and peripheral devices used.

**NOTE**

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