

# HUD One Installation Guide

## Introduction

This guide will help you install the HUD One, the **only** device which can interface a Valentine One RADAR locator, a Passport 9500ci RADAR detector, *or both at the same time*, to the Head-Up Display (HUD) in a C6 Corvette. It can also interface a CarPC to these RADAR detectors as well as any GM vehicle with a Class 2 bus<sup>1</sup>. In short, the HUD One opens up a whole new world of integration possibilities for the hobbyist.

Installation of the HUD One is straightforward. If you have hardwired a Valentine One or installed a Passport 9500ci, then you will have no problems installing the HUD One. Or, if you prefer, any reputable car stereo installation shop in your local area should be able to install the HUD One for you.

The HUD One completely replaces the Valentine One Concealed Display and/or the Passport 9500ci Display Module. The information from your RADAR detectors is instead displayed on your HUD and/or your CarPC screen, eliminating these visible pieces of RADAR detection equipment from your cockpit.

## Before You Begin

Included with your HUD One package are:

- A HUD One circuit board,
- A wiring harness with 8-pin Molex plug on one end,
- This Quick Start Guide

Optional, but highly recommended, is the wiring diagram for your vehicle. This is especially helpful for locating a suitable connection point for the Class 2 bus wire. The factory service manuals are an excellent source for wiring diagrams and other information and are well worth the cost.

Other items that you may need:

- Serpac 051/151 enclosure (see next section)
- USB cable (Standard-A to Mini-B)
- SPST momentary contact switch (for the auxiliary mute button)
- Add-a-circuit fuse tap
- 6P4C (6 position, 4 conductor) and 4P4C (4 position, 4 conductor) modular crimp connectors and standard modular telephone wire
- Squeeze tap connectors, double-sided mounting tape, butt connectors, solder, electrical tape, zip ties, etc.

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<sup>1</sup> The Class 2 bus connects the various subsystems in the car (Engine Control Module, Transmission Control Module, Body Control Module, Car Stereo, etc.) together and allows these devices to communicate with one another. By tapping into this bus, the HUD One can not only display RADAR detector information on the Head-Up Display, it can also permit a CarPC to “talk” to any other node on the bus, collecting data and issuing commands.

The HUD One was designed specifically to fit inside either the Serpac<sup>2</sup> 051 or 151 enclosures (not included). These enclosures are readily available from electronics retailers such as Mouser and Digi-Key. The Serpac 051/151 comes from the factory with no access holes for the various connectors on the HUD One. You will need to create these access holes using a Dremel tool, saw, and/or file. All connectors, except for the USB port, are lined up along one side, so create one large rectangular hole for the main connectors and one smaller hole on the adjacent side for the USB port. See the illustrations for examples.

## Configuration

There are several jumpers (DIP shunts) on the HUD One board which are used to configure the various options. In general, the default jumper settings will be correct for most installations. The jumper settings are described below for reference; the default configuration is indicated by “(default).”

V1PWR: Controls +12V power to the Valentine One.

- Removed (default): If power to the Valentine One is to be provided by the Direct-wire Power Adapter, this jumper **must** be removed.
- Installed: When this jumper is installed, the HUD One will provide 12V power to the Valentine One through the RJ-14 jack.

V1GND: Controls the Valentine One ground connection.

- Removed (default): Removing this jumper entirely allows power to the Valentine One to be controlled by an external SPST toggle (“kill”) switch connected to pins 4 and 7 of the main HUD One wiring harness.
- Installed across pins 1 and 2: Use this configuration when power is externally controlled (i.e. When the HUD One is powered by a switched 12V circuit).
- Installed across pins 2 and 3: Using this configuration allows the HUD One to control power to the Valentine One. **WARNING:** this feature may not work correctly in some installations. If you enable this option and find that the main display of your Valentine One does not “go dark” after the power-on test sequence, reinstall the jumper onto pins 1 and 2.

CDEN: Configures the HUD One to work with a Valentine One Concealed Display.

- Installed (default): This jumper must be installed when using the HUD One as the only Concealed Display for the Valentine One.
- Removed: If a Valentine One Concealed Display unit is also installed in the vehicle, this jumper **must** be removed to allow the HUD One and the Concealed Display to operate simultaneously. **WARNING: failure to remove this jumper when connecting a Concealed Display can cause permanent damage to the HUD One, the Valentine One, and/or the Concealed Display. This damage will not be covered under any warranty!**

## Mounting

Note that some of the connections listed below are optional depending on your intended use for the HUD One. For example, owners of non-GM cars (or GM cars which do not have a

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2 <http://www.serpac.com/sx5x.aspx>

Class 2 bus) will not need to connect the Class 2 bus wire; similarly, connecting a cable to the USB port is only needed if you plan to interface to a CarPC.

Find a suitable mounting location for the HUD One. If you have a CarPC, the best location is inside your CarPC's case, using #4-40 nylon standoffs and screws. For standalone use, the HUD One has been designed to fit inside a Serpac 051 or 151 enclosure. In either case, the selected mounting location should be within easy reach of connection points for +12V, ground, and the Class 2 bus. If your Valentine One and/or Passport 9500ci is already installed, you'll want to mount the HUD One as close as possible to the Valentine One Direct-wire Power Adapter and/or the Passport 9500ci Interface Module to minimize wire lengths. The HUD One can be attached to a smooth surface with double-sided foam mounting tape, hung from a wiring bundle using zip ties, or any other suitable fastening method.

## Wiring

The following illustration shows the locations of the main connecting jacks on the HUD One. Not shown is the USB connector, which is located on the right-hand side of the circuit board as oriented in the photograph.



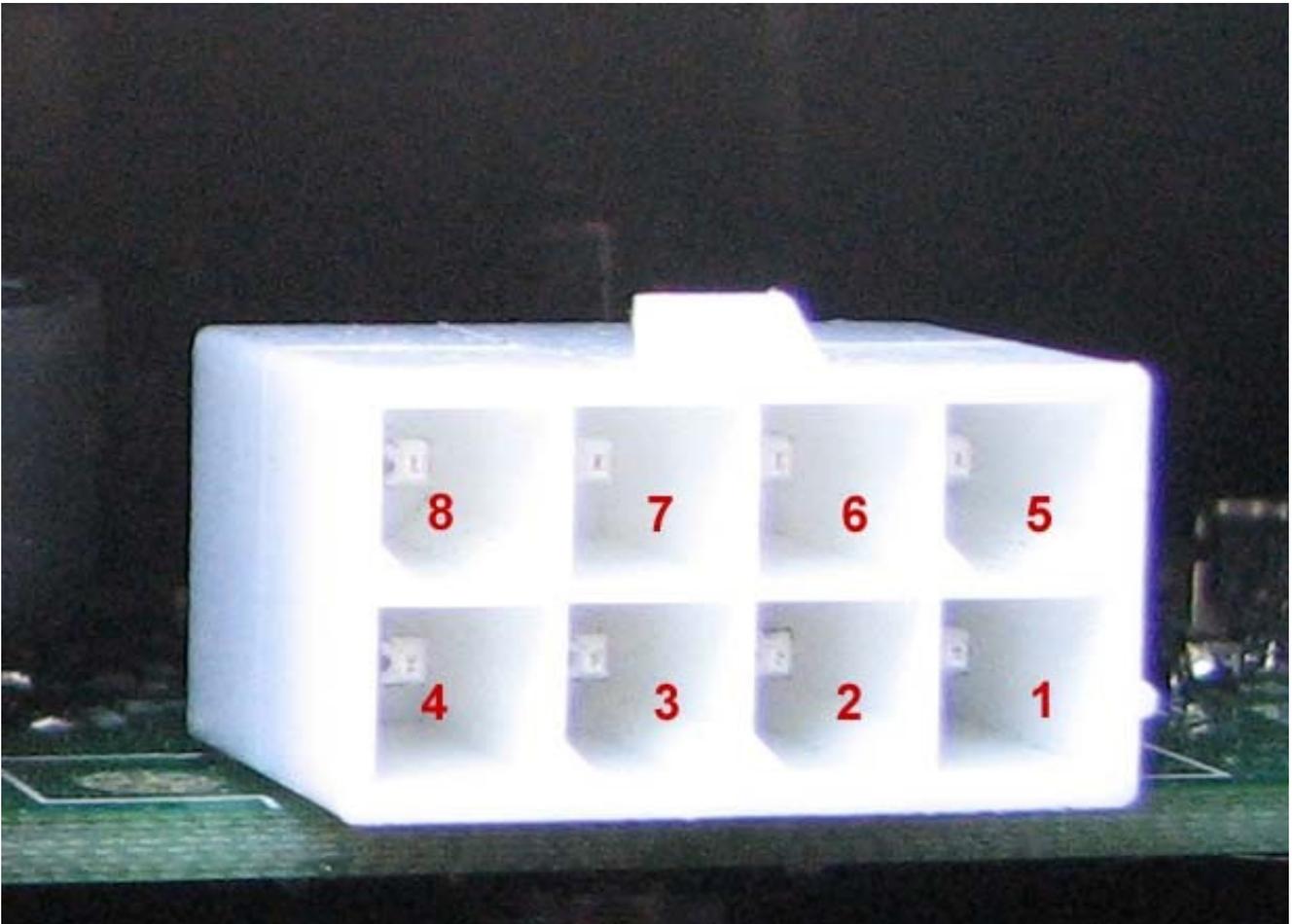
*Illustration 1: Connector Overview*

The jacks are identified as follows:

1. Valentine One main jack
2. Valentine One auxiliary jack
3. 9500ci Display Module connector
4. 9500ci Control Module input jack
5. 9500ci Control Module output jack
6. Main wiring harness connector

### **Main Connector**

The main wiring harness connector is an 8-pin Molex Mini-Fit Jr. (Molex part number 0039012085) The pinout of this connector is described below (pins are numbered from right to left, bottom to top). Refer to Illustration 2.



*Illustration 2: HUD One Main Connector*

- Pin 1: +12V
- Pin 2: HUD One Mute Button
- Pin 3: Not used
- Pin 4: External switch control of V1 power
- Pin 5: GND
- Pin 6: GND
- Pin 7: GND
- Pin 8: Class 2 data

## ***Power***

**IMPORTANT:** It is usually best if the HUD One and your RADAR detector(s) are connected to a **switched** +12V circuit, i.e. power is only supplied when the vehicle ignition is on. Connecting to a +12V circuit that is always on may lead to unwanted battery drain. Use care when connecting the HUD One, your RADAR detector, your CarPC, or any other electronic accessory to a continuous-power circuit.

A good place to find a source of 12V power is the vehicle's fuse panel. Using a fuse tap, such as the Add-a-Circuit by Littelfuse, allows you to safely tap power from an existing circuit to supply the HUD One (and the RADAR detectors, if desired). Good candidates for a switched source of +12V are a windshield wiper circuit, a heated seat circuit, or a cigarette lighter circuit. Whichever circuit you choose, it's always a good idea to verify that the circuit is switched using a multimeter or test light (the circuit should read ~12V when the ignition is on and 0V when the ignition is off). Also, select a fuse which will supply enough current for the HUD One and the RADAR detectors. A 1A fuse is sufficient for the HUD One alone, but a higher value will be required if RADAR detectors or other devices are also being powered by your new circuit. Consult the owner's manual for your Valentine One and/or Passport 9500ci to determine their current requirements.

Usually there is a grounding point somewhere near the fuse panel; the service manual for your vehicle will show its exact location. This is the best place to connect your HUD One's ground lead. Splicing into a ground wire from an existing wiring harness using a squeeze tap is also an option.

## ***Class 2 Bus***

The Class 2 bus connection is somewhat more involved. The first step is to locate one of the Class 2 bus wires running through your vehicle; a wiring diagram or service manual is indispensable here. In general, Class 2 wires run to every major component in the vehicle, including the engine control module, transmission control module, stereo, XM receiver, and the On\*Star unit. All of the individual Class 2 wires typically home-run into one or more splice packs which connect the various legs of the Class 2 bus together. For example, the C6 Corvette has splice packs in both the driver's side and the passenger's side footwells. These splice packs often have unused terminal slots into which a new connection can be made; the downside of this method is that a special type of terminal (and crimping tool) is required to make the connection.

Another option is to tap into an existing Class 2 bus wire using 3M Scotchlok or T-tap connectors. These connectors have a metal insert which, when squeezed down onto the wire with a pair of pliers, automatically pierces the insulation and makes electrical contact. Be sure to select the appropriate size tap connector for the size of the wire you're tapping onto. Locate the Class 2 bus wire running to a component such as the stereo system head unit, the On\*Star VCIM, or the XM Radio receiver. The service manual for your vehicle will show where these components are located, as well as which wire carries the Class 2 bus signals. Route the Class 2 bus wire from the HUD One wiring harness (pin 8 of the Molex connector) to your selected location, and squeeze a Scotchlok tap onto the existing Class 2 bus wire along with the Class 2 input wire to the HUD One.

## ***Auxiliary Mute Switch***

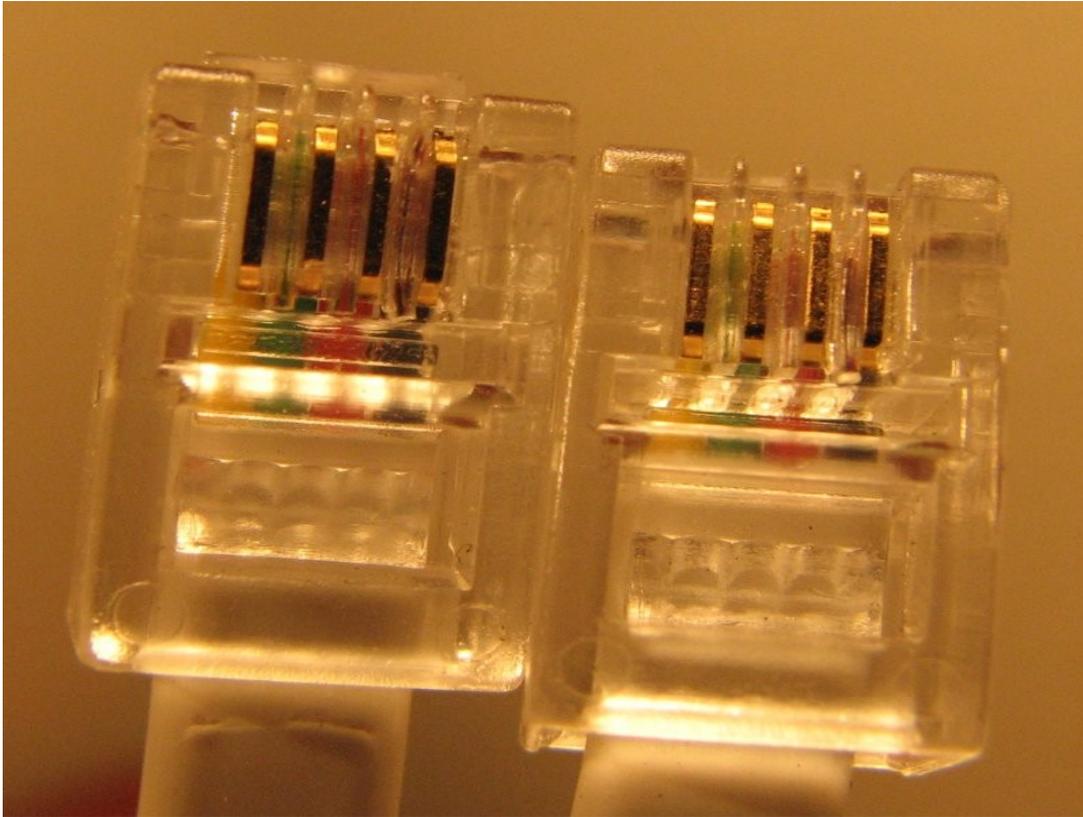
The HUD One supports an auxiliary mute switch (not included). This is a SPST momentary contact switch that you install in any convenient place, such as a center console near the armrest. When you press the button, the HUD One will close the Mute contact inputs on your RADAR detector(s). Having a remote mute switch decreases reaction time and increases stealthiness, as you will no longer have to make a highly visible reach (e.g. to your visor) to mute an alert or turn off the LIDAR shifters. After mounting the switch in your preferred location, run a pair of wires from the switch to the HUD One mounting location and connect them to pins 2 and 6 on the HUD One wiring harness.

## ***Valentine One***

The HUD One has a 6P4C modular jack for the Valentine One, identical to the “main” jack on the OEM Valentine One Direct-wire Power Adapter (DWPA) box. Your Valentine One should be plugged into the “Main” jack on the DWPA and a second modular phone cord should be run from the “Accessory” jack on the DWPA to the main input jack (#1) on the HUD One. When using this configuration, be sure to remove the “V1PWR” and “V1GND” jumpers on the HUD One circuit board, since in this configuration power is supplied to the Valentine One by the DWPA and not the HUD One. Refer to the Configuration section for more information on jumper settings.

## ***Passport 9500ci***

When used with a 9500ci, the HUD One completely replaces the 9500ci's Display Module. The Control Module is still used, but is wired “through” the HUD One so as to give access to the mute signal pins on the Control Module cable. The 9500ci cables use 4P4C modular connectors, identical to those used on telephone handsets. The HUD One uses two of these 4P4C cables: one goes from Jack #3 on the HUD One to the “Display Module” jack on the 9500ci interface module; the other goes from Jack #4 on the HUD One to the “Control Module” jack on the 9500ci. The 9500ci Control Module plugs into the remaining jack (#5) on the HUD One. Note that the HUD One does not supply or control power to the 9500ci; powering the 9500ci from a switched circuit is recommended. In addition, the 9500ci's Control Module remains fully functional, and can be used to turn the 9500ci on or off if desired. The 4P4C cables must be wired in a “crossover” fashion, so that the order of the conductor colors appears the same on both ends. Refer to Illustration 3.



*Illustration 3: 4P4C Modular Connectors for the 9500ci*

## **CarPC**

Connection to a CarPC is accomplished using a single USB cable with a standard size A connector on the CarPC end and a mini-B connector on the HUD One end. Drivers are included for Windows PCs; for other platforms, the standard FTDI USB and Virtual COM Port drivers may be used. Refer to the HUD One User's Guide for more information on using a CarPC with the HUD One.

## ***Updating the Firmware***

The HUDOne has been designed to be USB flash upgradable by the end user. This allows new features to be added without having to send the unit back to us for reprogramming. The USB port on the HUDOne is controlled by the common FTDI 232 chip. This chip makes it a breeze for developers to have a USB port on their devices as it acts as a traditional Com port when configured with the correct drivers. Furthermore, FTDI has a program that allows developers to program their devices with a unique VID/PID without going through the great expense and certifications otherwise required. This allows the end user to have the HUDOne on the USB port and not have it crash due to another FTDI driven device on the host computer. Many USB devices are FTDI driven and if you use FTDI's drivers, you get their generic VID/PID. Any other device you plug into the computer that was designed this way will cause a conflict and likely crash the system. The HUDOne will not do that.

The HUDOne uses the same WHQL certified drivers offered by FTDI just with a slight different configuration file during installation that allows you to locate the HUDOne by name within Windows device manager section.

You will need a laptop running Windows XP or newer. The first step in upgrading the HUDOne is to unzip the appropriate driver package:

HUDOne 2.08.14 32bit.zip  
HUDOne 2.08.14 64bit.zip

You can unzip to any folder or create a temp folder for now, just remember where you placed the. Next, place the ignition in the ACC or Run position as the HUDOne needs to be powered in order to apply the new firmware. Next, plug the HUDOne into a USB port and allow windows to recognize new hardware has been installed and search for the drivers. If you are presented with an option for driver installation then click on the option to manually search for the drivers and then locate the folder where you unzipped them. Click "next" and Windows will go through the motions of loading the drivers. When the window pops up stating these drivers are not certified, just click "continue anyway" and the installation will proceed. Once done with that windows will then install the com port driver and you will repeat the previous step. If you are running Windows 7 or Vista then you will get a driver failed to install window. Close that and navigate to the device manager and locate the HUDOne. Right click and choose update driver. As before, do a manual install and navigate to the folder where the drivers are located. Proceed through the device and com port drivers.

Once the drivers are installed, open device manager and find your HUDOne device under USB. That way you know it's installed. Next go to "Com Ports" and look for "HUDOne Serial Port". That is the virtual com port assigned to your HUDOne. Note the port number assigned.

Next, open the HUDOne update utility and assign the proper com port. Click connect and you should be connected to your unit. If that happens, then select the firmware file you were sent and then click update. Once finished, you may disconnect the USB cable and you are good to go.