

**Instruction 51-1145  
4-1-15**

**S&S<sup>®</sup> Cycle, Inc.**

**14025 Cty Hwy G PO Box 215  
Viola, Wisconsin 54664**

Phone: 608-627-1497 • Fax: 608-627-1488  
Technical Service Phone: 608-627-TECH (8324)  
Technical Service Email: [sstech@sscyle.com](mailto:sstech@sscyle.com)  
Website: [www.sscyle.com](http://www.sscyle.com)



Copyright © 2007, 2015  
by S&S<sup>®</sup> Cycle, Inc.

All rights reserved.  
Printed in the U.S.A.

## **Installation Instructions for S&S<sup>®</sup> USB Delphi<sup>®</sup> Style VFI (Variable Fuel Injection) Module and Pro Tune II Software**

### **DISCLAIMER:**

S&S parts are designed for high performance, off road, racing applications and are intended for the very experienced rider only. The installation of S&S parts may void or adversely affect your factory warranty. In addition such installation and use may violate certain federal, state, and local laws, rules and ordinances as well as other laws when used on motor vehicles used on public highways, especially in states where pollution laws may apply. Always check federal, state, and local laws before modifying your motorcycle. It is the sole and exclusive responsibility of the user to determine the suitability of the product for his or her use, and the user shall assume all legal, personal injury risk and liability and all other obligations, duties, and risks associated therewith.

The words Harley<sup>®</sup>, Harley-Davidson<sup>®</sup>, H-D<sup>®</sup>, Sportster<sup>®</sup>, Evolution<sup>®</sup>, and all H-D part numbers and model designations are used in reference only. S&S Cycle is not associated with Harley-Davidson, Inc.

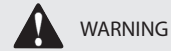
### **SAFE INSTALLATION AND OPERATION RULES:**

Before installing your new S&S part it is your responsibility to read and follow the installation and maintenance procedures in these instructions and follow the basic rules below for your personal safety.

- Gasoline is extremely flammable and explosive under certain conditions and toxic when breathed. Do not smoke. Perform installation in a well ventilated area away from open flames or sparks.
- If motorcycle has been running, wait until engine and exhaust pipes have cooled down to avoid getting burned before performing any installation steps.
- Before performing any installation steps disconnect battery to eliminate potential sparks and inadvertent engagement of starter while working on electrical components.
- Read instructions thoroughly and carefully so all procedures are completely understood before performing any installation steps. Contact S&S with any questions you may have if any steps are unclear or any abnormalities occur during installation or operation of motorcycle with an S&S part on it.
- Consult an appropriate service manual for your motorcycle for correct disassembly and reassembly procedures for any parts that need to be removed to facilitate installation.
- Use good judgment when performing installation and operating motorcycle. Good judgment begins with a clear head. Don't let alcohol, drugs or fatigue impair your judgment. Start installation when you are fresh.
- Be sure all federal, state and local laws are obeyed with the installation.
- For optimum performance and safety and to minimize potential damage to carb or other components, use all mounting hardware that is provided and follow all installation instructions.
- Motorcycle exhaust fumes are toxic and poisonous and must not be breathed. Run motorcycle in a well ventilated area where fumes can dissipate.

### **IMPORTANT NOTICE:**

Statements in this instruction sheet preceded by the following words are of special significance.



**WARNING**

Means there is the possibility of injury to yourself or others.



**CAUTION**

Means there is the possibility of damage to the part or motorcycle.

**NOTE**

Other information of particular importance has been placed in italic type.

S&S recommends you take special notice of these items.

### **WARRANTY:**

All S&S parts are guaranteed to the original purchaser to be free of manufacturing defects in materials and workmanship for a period of twelve (12) months from the date of purchase. Merchandise that fails to conform to these conditions will be repaired or replaced at S&S's option if the parts are returned to us by the purchaser within the 12 month warranty period or within 10 days thereafter.

In the event warranty service is required, the original purchaser must call or write S&S immediately with the problem. Some problems can be rectified by a telephone call and need no further course of action.

A part that is suspect of being defective must not be replaced by a Dealer without prior authorization from S&S. If it is deemed necessary for S&S to make an evaluation to determine whether the part was defective, a return authorization number must be obtained from S&S. The parts must be packaged properly so as to not cause further damage and be returned prepaid to S&S with a copy of the original invoice of purchase and a detailed letter outlining the nature of the problem, how the part was used and the circumstances at the time of failure. If after an evaluation has been made by S&S and the part was found to be defective, repair, replacement or refund will be granted.

### **ADDITIONAL WARRANTY PROVISIONS:**

- (1) S&S shall have no obligation in the event an S&S part is modified by any other person or organization.
- (2) S&S shall have no obligation if an S&S part becomes defective in whole or in part as a result of improper installation, improper maintenance, improper use, abnormal operation, or any other misuse or mistreatment of the S&S part.
- (3) S&S shall not be liable for any consequential or incidental damages resulting from the failure of an S&S part, the breach of any warranties, the failure to deliver, delay in delivery, delivery in non-conforming condition, or for any other breach of contract or duty between S&S and a customer.
- (4) S&S parts are designed exclusively for use in Harley-Davidson<sup>®</sup> and other American v-twin motorcycles. S&S shall have no warranty or liability obligation if an S&S part is used in any other application.

**NOTE:** All brand names, trademarks or registered trademarks mentioned in these instructions are the property of their respective holders and are used in a reference only capacity.

**CAUTION**

**S&S FUEL INJECTION IS NOT COMPATIBLE WITH E85 FUEL. USE OF E85 FUEL MAY CAUSE YOUR ENGINE TO RUN POORLY AND/OR DAMAGE TO SYSTEM COMPONENTS.**

**WARNING**

**UNRESTRICTED S&S VFI MODULES AND PROTUNE II SOFTWARE MUST NOT BE INSTALLED OR USED FOR TUNING OF POLLUTION CONTROLLED VEHICLES.**

**THESE VEHICLES HAVE SPECIFIC CALIBRATIONS TO MEET EMISSION REGULATIONS. MODIFYING OR INSTALLING AN UNAPPROVED CALIBRATION OR MODULE IS CONSIDERED TAMPERING AND IS PUNISHABLE BY LAW.**

**TABLE OF CONTENTS**

Introduction..... 2  
Kit Contents..... 2  
Additional Parts Required..... 3  
Optional Accessories ..... 3  
Installation..... 3  
    VFI Module Installation ..... 3  
    ProTune II Software Installation ..... 4  
    Installing USB Drivers ..... 8  
    USB Driver Installation - Windows® XP ..... 9  
    USB Driver Installation - Windows® Vista and Windows® 7/8 ..... 10  
    Loading a Calibration ..... 11  
Basic Troubleshooting..... 11  
ProTune II Diagnostics..... 12  
Check Engine Lamp Diagnostics..... 12  
Speedometer Diagnostics..... 13

**INTRODUCTION**

The S&S VFI (Variable Fuel Injection) module directly replaces the stock fuel injection module and works with the stock sensors and injectors. This Delphi® Style replacement module works with all 2001-'10 Harley-Davidson® EFI Softail®, 2002-'07 EFI touring, and 2004-'11 EFI Dyna® motorcycles.

This instruction sheet describes the installation of the S&S Delphi® Style replacement module with a USB computer interface.

**KIT CONTENTS**

- VFI Module
- USB Port Cover and Hardware Packet



Delphi® Replacement

**Kit Contents**

## ADDITIONAL PARTS REQUIRED

In most instances, the VFI module will be pre-programmed. If the VFI module included in this kit has not been programmed, this will be indicated by a label on the VFI module.

If programming is required, the following items are needed:

- A PC capable of running the ProTune II software (see minimum requirements in Installation section).
- A standard USB-A to 5-pin mini-B cable.

## OPTIONAL ACCESSORIES

All S&S VFI modules are capable of closed-loop fuel control. Optional Closed Loop Oxygen Sensor kits are available for S&S Magneti Marelli® Style and Delphi® Style VFI modules.

The S&S part number for the Closed Loop Oxygen Sensor kit to be used with the VFI module described in this instruction sheet is listed below:

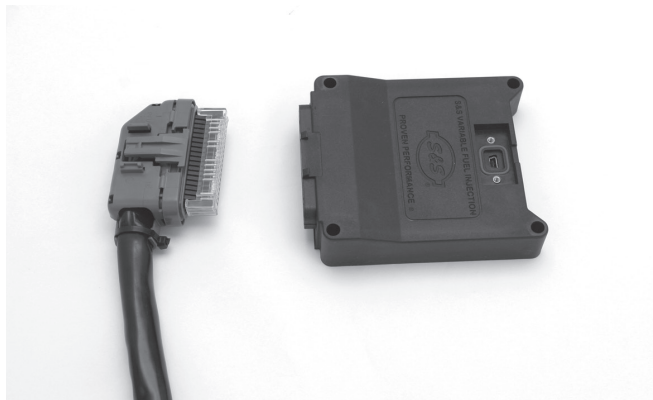
- 106-2066 – S&S Delphi® Style VFI Closed Loop Sensor Kit

## INSTALLATION

### VFI Module Installation

**NOTE:** *Included in this kit are components used to cover the USB port of the VFI module (o-ring, cover, and 2 screws). After the module is installed and any required work with the ProTune II software is complete, install these components before it is put into service. This is required to protect the module from the elements.*

- 1- Disconnect the negative battery cable.
- 2- Refer to the appropriate H-D® service manual to locate and remove the stock module. Save the mounting and installation hardware for reuse.
- 3- Push the 36-position connector straight into the end of the VFI module. Be sure that the connector seal is properly inserted and the connector lock clicks into place.



Picture 1

- 4- Install the VFI module in the same location as the OEM module using the original mounting hardware.
- 5- Connect the negative battery cable.
- 6- Before starting the motorcycle, power must be cycled to allow the Idle Air Control (stepper) motor to recalibrate. To cycle the power, turn the ignition switch on with the run/stop switch in the "run" position then turn the ignition switch off and allow at least 15 seconds for the module to completely power down.
- 7- In most instances, the VFI module will be pre-programmed. If the VFI module included in this kit has not been programmed, this will be indicated by a label on the VFI module. If the VFI module has not been programmed, proceed with ProTune II Software Installation followed by Installing USB Drivers and Loading a Calibration sections of this instruction sheet. If the VFI module has been programmed, proceed with the next step.
- 8- Install the o-ring and port cover on the module using the 2 screws provided (tighten to 2-4 in-lbs). This is required to protect the VFI module from the elements.

### CAUTION

**Failure to install the provided USB port cover before use could result in damage to the VFI module not covered by warranty. Do not overtighten the retaining screws or you can damage the ECM. Torque retaining screws to 2-4 in-lbs.**

**CAUTION**

**S&S® recommends that you position the main connector of the VFI Module in its stock location for maximum protection against the elements.**

**ProTune II Software Installation**

The ProTune II Software allows the average performance enthusiast to install existing maps and modify them to optimize the performance of a particular engine. Customized maps can also be saved and reloaded allowing a switch between street and drag strip tuning quickly and easily. Maps for some of the most common engine and exhaust combinations are included with the installation of ProTune II. In addition, ProTune II is a great tool for diagnosing/troubleshooting issues if they arise.

The ProTune II software can be found in the Tech Info section of the S&S Website ([www.sscycle.com](http://www.sscycle.com)) or by going to the following address: <http://www.sscycle.com/tech-info/software/>

If you are unable to access the internet and need a copy of ProTune II mailed to you, please contact S&S Technical Services at 608-627-TECH (8324).

You must have the following minimum PC specifications to install and run ProTune II:

- Microsoft® Windows® XP Service Pack 2 or later, Microsoft Windows Vista™, Microsoft Windows 7, 8, or later operating system.
- 1.0 GHz or faster processor. Intel® Core™ Duo or faster/equivalent recommended.
- 128Mb System RAM, 256 Mb or more recommended
- 200Mb of free hard drive space.
- A desktop resolution of at least 1024x768 pixels. Higher desktop resolution is recommended for optimum use.
- A modern graphics system with 3D acceleration and 64 MB or greater on board RAM is required.

If you are new to the ProTune II program, you should load it on a computer and familiarize yourself with the screen and the controls before connecting to the VFI module. All required information for the installation is explained below. For additional information on ProTune II, see the User Manual installed with the software.

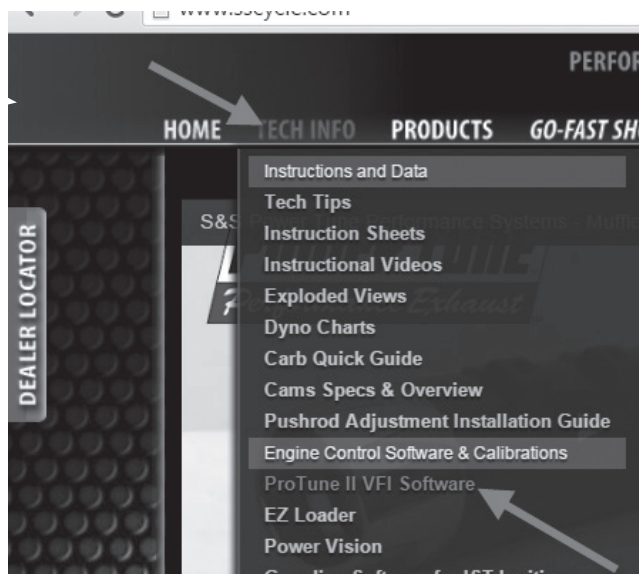
**1- Please use the following steps to locate and install the ProTune II software.**

**Note:** An instructional video covering the installation and initial connection of the ProTune II software with your ECM can also be found by clicking on the *Instructional Videos* section under **S&S Media** on our web-site:

<http://www.sscycle.com/media/instructional-videos/>

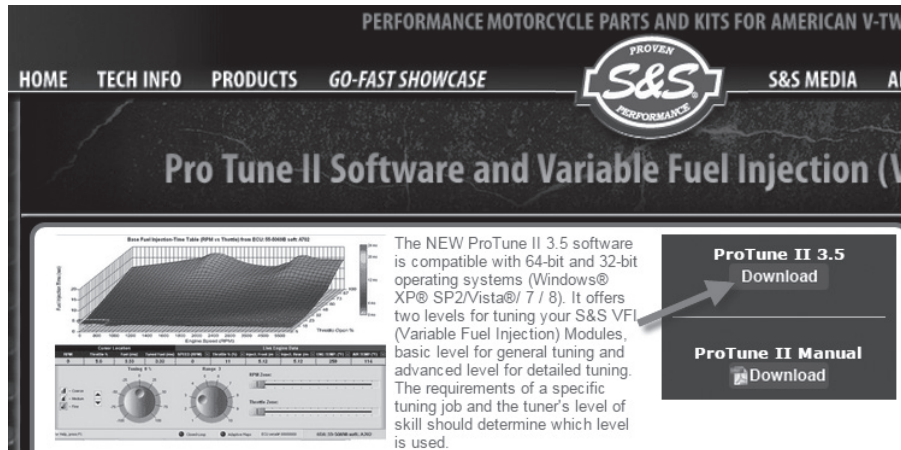
**a-** Close all applications other than your internet browser.

**b-** Go to **Tech Info** section of the S&S Website ([www.sscycle.com](http://www.sscycle.com)) and click on **ProTune II VFI Software**:



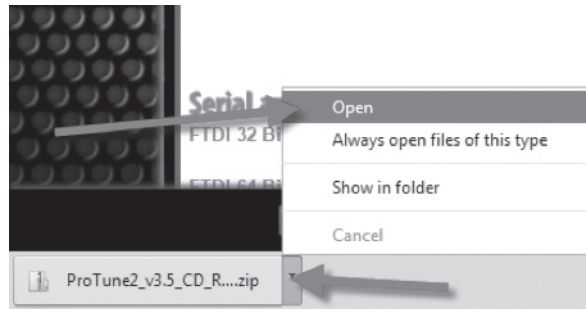
**Figure 1 Tech Info Menu**

c- When you arrive at the ProTune II Download page, click on the **“Download”** button by the current version of ProTune II:



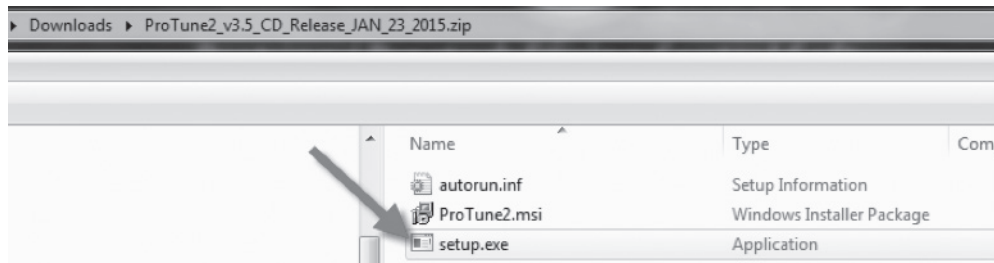
**Figure 2 ProTune II Download Screen**

d- If you are using Internet Explorer, please proceed to **Step f**. In Google Chrome, a small box will appear in the lower left of the screen that shows the progress of the download. After it is completed, click on the arrow to the right of that box, then click on **“Open”**



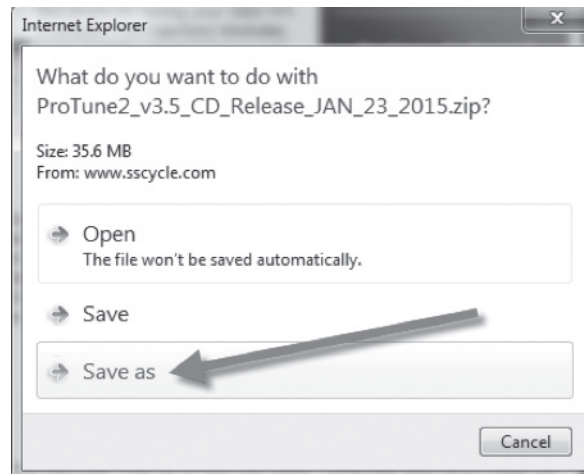
**Figure 3 File Download and Open in Google Chrome**

e- From there, Windows Explorer will open showing the contents of the downloaded file. Double-click on the **“setup”** file to proceed with the installation of ProTune II as described later.



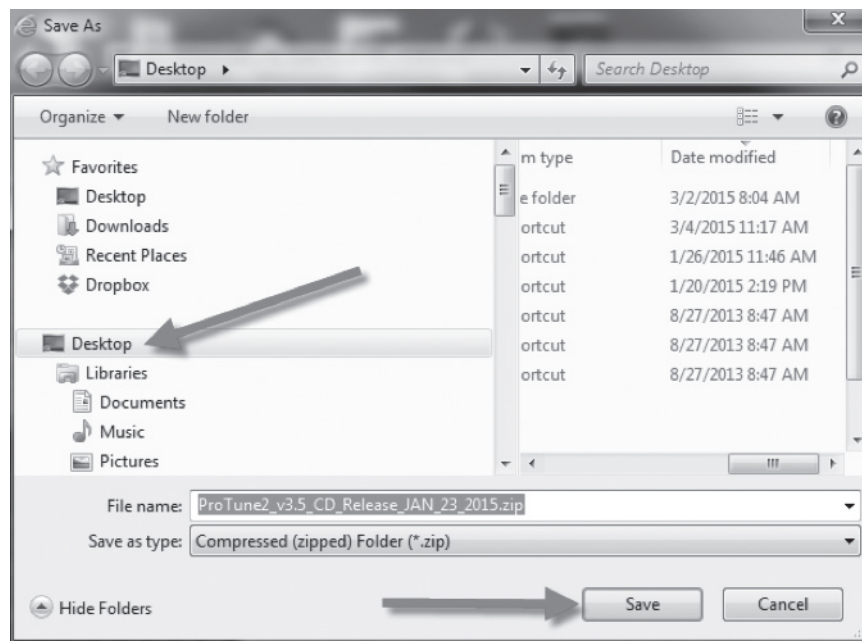
**Figure 4 Double click on the setup file to start in installation process**

f- In Internet Explorer, when you click on the “**Download**” button the following screen will appear. Click on the “**Save as**” button to proceed.



**Figure 5 Internet Explorer Download Screen**

g- Save the downloaded file to your Desktop by clicking to highlight “**Desktop**” in the left part of the screen and clicking the “**Save**” button in the lower right.



**Figure 6 Saving file to Desktop**

h- On your Desktop, locate and double click on the downloaded file as shown below, then proceed with double clicking on the “**setup**” file contained within as shown in **step e**.



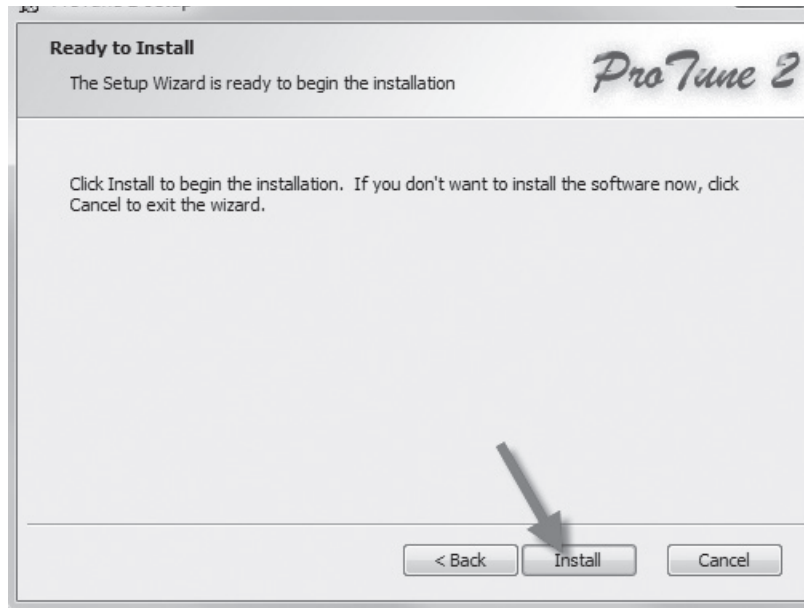
**Figure 7 Resulting file downloaded from S&S web-site**

- i- Depending on your system settings, a screen may appear asking if you want the program to make changes to your computer. Click on "Yes"  
Then, the Pro Tune II Setup Wizard will appear on your screen. From the ProTune II Setup Wizard click **Next**.



**Figure 8 ProTune II Setup Wizard Screen**

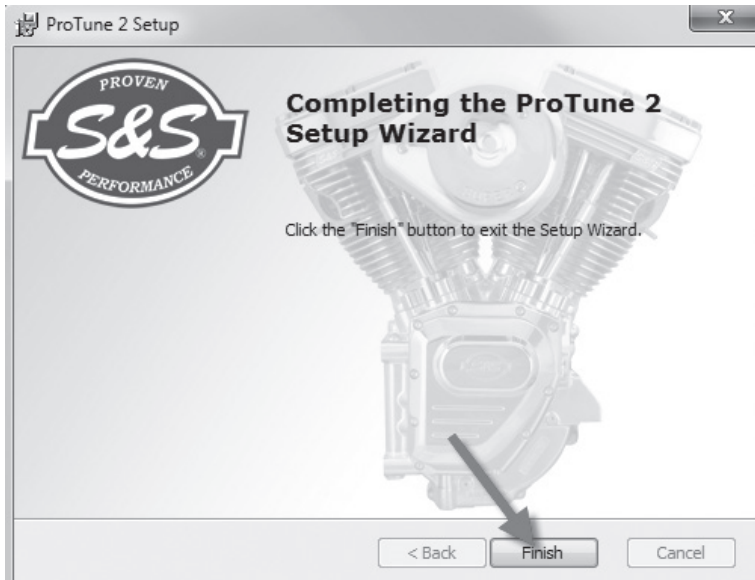
- j- The Ready to Install Screen will now appear. Click **Install**.



**Figure 9 ProTune II Ready to Install Screen**

- k- ProTune II will now install and copy files to your computer. If a Windows Security message appears during device driver installation click **Install**.

1- When the ProTune II installation is completed select **Finish** to exit the Setup Wizard.



**Figure 10 Completing ProTune II Setup**

2- **See Figure 11.** After the installation, the ProTune II program and user manual icons will appear on your desktop. ProTune II can be opened by double-clicking on the program icon.



**Figure 11 ProTune II Program and Manual Icons**

### Installing USB Drivers

**NOTE:** The first time the VFI module is connected to a PC, the USB drivers will need to be installed for ProTune II to communicate with the VFI module. If drivers have already been installed, you may skip this section.

1- Close all window applications including ProTune II.



- 2- Using a standard USB A to 5-pin Mini b cable, connect the mini-USB port on the case of the VFI module to an available USB port on the PC.
- 3- Turn on the ignition switch of the motorcycle and set the run/stop switch to “run”. Do not start the motorcycle at this time.
- 4- The PC will now recognize it has been connected to a VFI module and will start the process for installing the USB drivers. To complete the process follow the steps below for the operating system used on your PC.

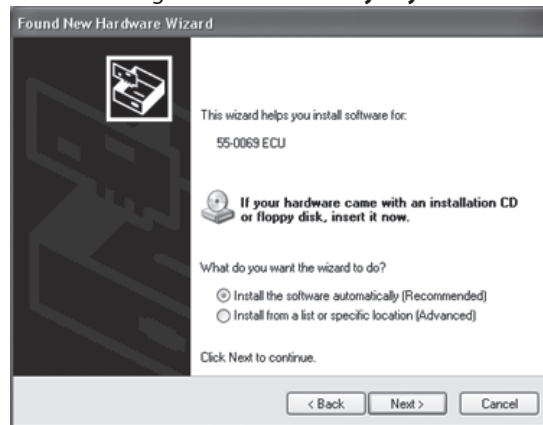
USB Driver Installation - Windows® XP

- a- After a few moments the **Found New Hardware Wizard** will appear and ask if Windows can connect to the internet to search for driver. Select **No, not this time** and click **Next**.



**Figure 12 Found New Hardware Wizard**

- b- Select Install the software automatically (Recommended) from the list of options and click **Next**.  
 III. You may get a “Hardware Installation” warning. Click **Continue Anyway**. The window below to the right will appear.



**Figure 13**

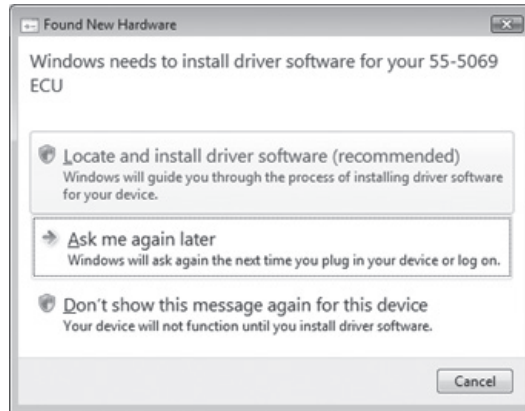
- c- Windows will locate the correct driver file and copy the required files. Wait for this to complete.
- d- Depending on your security settings, a Windows Security warning may appear. Click **Install** to continue.
- e- When the driver installation is complete click **Finish**. You can now use ProTune II to communicate with the VFI module.



**Figure 14**

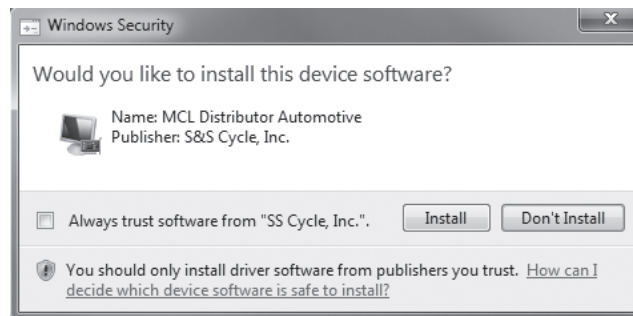
USB Driver Installation - Windows® Vista and Windows® 7 and 8

- a- After a few moments Windows will detect the presence of the new device. A small balloon window in the lower-right corner should indicate this. Windows should automatically install the USB driver and you can skip to step d. If this does not occur, proceed with step b.
- b- When the **Found New Hardware** dialog box appears, double-click the **Locate and install driver software (recommended)** option.



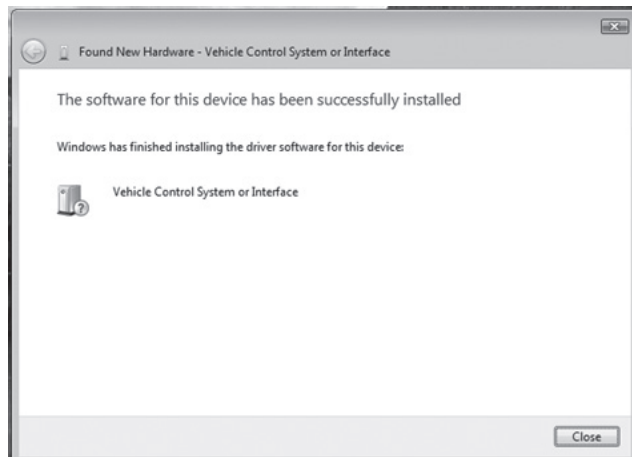
**Figure 15 Locate and install driver software (recommended)**

- c- Depending on your user account settings a security warning message may appear asking you to confirm the device installation. Allow the installation to continue.
- d- Depending on your security settings, the Windows Security message shown below may appear. Click **Install** to continue.



**Figure 16 Click Install**

- e- When the installation is complete click **Close**. You can now use ProTune II to communicate with the VFI module.



**Figure 17 Click Close**

## Loading a Calibration

In most instances, the VFI module will be pre-programmed. If the module included in this kit has not been programmed, this will be indicated by a label on the VFI module. If there is a need to program the VFI module, proceed with the following steps:

- 1- Connect to the VFI module.
  - a- Using a standard USB A to 5-pin Mini b cable, connect the mini-USB port on the case of the VFI module to the USB port on the PC.
  - b- Open ProTune II by double-clicking the ProTune II icon on the desktop. The lower-right corner of the ProTune II window contains a communication status box. When there is no ECM (Electronic Control Module referring to the VFI module) communication this box will flash between blue and black and alternate between messages No ECM on USB and Checking USB.

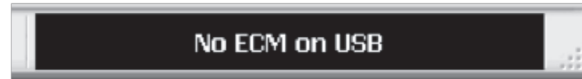


Figure 18

- c- Turn the ignition switch of the motorcycle to on and set the run/stop switch to "run". Do not start the motorcycle at this time.
    - d- The communication status box in the lower-right corner of ProTune II will illuminate green to show that ProTune II is communicating with the VFI module. If it does not illuminate green see the **Basic Troubleshooting** section below.

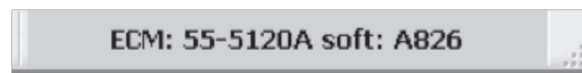


Figure 19

- 2- Sending a Calibration file to the VFI module.
  - a- From the File menu of ProTune II, select Send all data to ECM... or click on the motorcycle icon in the upper-left corner of the screen.



Figure 20

- b- A window will open showing the list of calibration folders for each type of ECM. Open the folder "USB Port Delphi® Style ECM" to view the available files for this ECM. Select the calibration from the list that most closely matches the vehicle setup and click **Open** to start the calibration download process. Do not switch off power to the ECM at this time.
      - c- After the calibration has loaded a message will appear advising you to cycle power on the ECM for at least 15 seconds. Select OK on the message and turn the key off on the motorcycle for at least 15 seconds.
- 3- The VFI module calibration is now complete. Install the o-ring and port cover on the VFI module using the 2 screws provided. This is required to protect the VFI module from the elements.

## BASIC TROUBLESHOOTING

- 1- Problem: ProTune II is not communicating with the VFI module.
  - a- Check that the VFI module is powered. The VFI module must be supplied with vehicle power in order to operate. Your motorcycle ignition and run/stop switch should be set to the ON and RUN positions. Make sure that the battery voltage is normal. Try cycling power to the VFI module (switch off the ignition for 15 seconds and then switch on).
  - b- Check that the cable is connected firmly to the VFI module and the PC.
  - c- Try disconnecting and reconnecting the USB connection to the VFI module. This will reset the module connection and allow Windows to relocate the device.
  - d- Was the USB driver installed correctly? Please review the **Installing USB Drivers** section of this instruction sheet. Additional troubleshooting information can be found in the ProTune II Manual installed with the software on your PC.
- 2- Problem: I have the correct calibration loaded into the VFI module for my motorcycle, but it won't start or idle properly.
  - a- If the motorcycle has an S&S or other aftermarket throttle body, please review setup instructions for those components. Typical S&S throttle body closed throttle voltage setting is 0.50 V. Variation of +/- 0.02 V is typical.
  - b- Perform **Test Outputs** function using the ProTune II software (see ProTune II manual or help files installed with the software for additional information). Specifically, check to ensure that both injectors and ignition coils are working correctly and installed on the correct cylinder. Also verify that the stepper motor (Idle Air Control) is functioning properly.

- c- Verify that the VFI module is powering down properly. When the VFI module is powering down (ignition on then off) the stepper motor will move through a recalibration process and the VFI module will remain in communication with the ProTune II software for approximately 10 – 15 seconds after the ignition switch is turned off. If this does not happen, verify components and wiring for the constant or ECM power system of the motorcycle.
- d- If performing the above tasks does not correct the problem, please contact S&S Tech Services. Be prepared to list details about your motorcycle and engine configuration. Model year, displacement, compression ratio, camshaft, intake, and exhaust are typical items needed to determine if the calibration is correct. Also, be prepared to provide the part number or details about the calibration you are using. This information can be found in the Comment Field portion of the calibration. This is accessed through the View menu of ProTune II. You may also be asked to send your current calibration to S&S via e-mail.

### ProTune II Diagnostics

The recommended method for checking the VFI module for Diagnostic Trouble Codes (DTCs) is by using the ProTune II software. DTCs can be read and cleared by clicking on the DTCs button found on the upper left of the ProTune II screen when connected to a powered module. Please, refer to the ProTune II manual or help files for more information on DTCs.

### Check Engine Lamp Diagnostics

The S&S Cycle ECU has a feature which can report engine faults by flashing a code via the Check Engine lamp on the motorcycle.

**NOTE:** If you have set your motorcycle to use the check engine lamp as a shift-light, this function will be disabled.

The procedures to activate and read the check engine lamp are as follows:

1. Turn the ignition switch to the **ON** position for three seconds (one second pause after the fuel pump stops), and then switch back to the **OFF** position for three seconds. Repeat this procedure one more time and then turn the ignition to the **ON** position and wait for eight seconds for the check engine lamp to start flashing.
2. The transmission of a code is always preceded by a series of rapid flashes (about 3 per second). This “intermission” is followed by a 2 second pause in which the lamp is off. The lamp will then flash one or more times to indicate the first digit of the trouble code. The length of time the lamp is illuminated and the length of time in which it is off are each about 1 second in duration. The number of times the lamp flashes indicated the first digit of the trouble code.
3. Following the transmission of the first digit, there is another 2 second pause in which the lamp is off. The lamp will then flash one or more times to indicate the second digit of the trouble code. The number of times the lamp flashes indicates the second digit of the trouble code.
4. Following the transmission of the second digit, there is a third 2 second pause in which the lamp is off. After the pause comes an “intermission”, followed by transmission of the next recorded trouble code. All subsequent codes are sent in the same manner, each separated from the next by an “intermission”. Once all the trouble codes have been sent the data string is repeated. See the table at the end of this instruction sheet for a list of the trouble codes supported.
5. Turn the Ignition Key switch to **OFF**. Wait about 15 seconds for the ECM to completely power down. The vehicle can now be started normally.

### **Speedometer Diagnostics for 2004 and Newer Stock Motorcycles (only available for modules using ECU code a702 or later)**

When the 55-5069 USB ECU is installed on a 2004 or newer motorcycle, diagnostic fault codes are available through the vehicle odometer. A computer cable is not required for these diagnostics.

1. With the Ignition switch **OFF** and the Run/Stop switch set to **Run**, press and hold the odometer reset button. The odometer will light up and display the total mileage.
2. While pressing the odometer reset button, turn the Ignition switch to the **Ign** position. Then release the odometer reset button. The speedometer and tachometer, if equipped, will do full range sweeps and light all indicator lights. The odometer will display "diAG".
3. Press and release the odometer reset button again. The odometer will display "PSSPt", with the first P blinking. The blinking letter indicates which module is selected to send diagnostic information.
  - a. The first "P" is the Engine Control Unit (ECU).
  - b. The first "S" is the Turn Signal Module (TSM).
  - c. The "SP" is the Speedometer.
  - d. The "t" is the Tachometer.
4. Press and release the odometer reset button to select the desired module from the list above. As you cycle through the P, S, SP, and t, the selected digits will blink.
5. To view the diagnostic fault codes in the selected module, press and hold the odometer reset button for about 4 seconds. The odometer will display a 5 digit code for any fault codes that are present. Record the fault codes. If there are not any trouble codes set on the selected module, the odometer will display "nonE".
6. Press and release the odometer reset button to toggle through the remaining fault codes, if any are present. The odometer will display "End" when all the fault codes present have been displayed.
7. To clear the diagnostic fault codes on the selected module, press and hold the reset button for about 4 seconds. The odometer will display "CLEAR" after clearing the trouble codes.
8. If you do not want to clear the trouble codes, press and release the reset button. The part number of the selected module will scroll across the odometer.
9. Press and release the reset button again. The odometer will now be back to step 3. You may now retrieve diagnostic trouble codes from a different module. Turning the Ignition switch to **OFF** at any point will exit the speedometer diagnostics procedure.

*See page 14 for Fault Flashing Codes and Speedometer Diagnostic Codes.*

**Check Engine Lamp – Fault Flashing Codes and Speedometer Diagnostic Codes**

Check Engine Lamp Flash Code	Speedometer Diagnostic Code	Fault Condition
11	P0122	Throttle Position Sensor Low/Short Circuit
11	P0123	Throttle Position Sensor High/Open Circuit
	P0105	Barometric Pressure Sensor Malfunction
12	P0108	MAP/Baro Sensor Low/Open Circuit
14	P0117	Engine Temperature Sensor Low/Short Circuit
14	P0118	Engine Temperature Sensor High/Open Circuit
15	P0113	Intake Air Temperature High/Open Circuit
15	P0112	Intake Air Temperature Low/Short Circuit
16	P0562	System Voltage (Battery) Low
16	P0563	System Voltage (Battery) High
23	P0261	Front Injector Open Circuit
23	P0262	Front Injector Short Circuit
32	P0264	Rear Injector Open/Low
32	P0265	Rear Injector High/Short
34	P0505	Stepper Motor Malfunction
52	P0604	ECU RAM Error
53	P0605	ECU Flash Error
54	P0603	ECU EEPROM Error
55	P0606	Microprocessor Malfunction (ECM Processor)
	P0217	Overheat Protection Stage 1
	P0217	Overheat Protection Stage 2
	P0217	Overheat Protection Stage 3
71	P0327	Knock Sensor 1 Circuit Low Input
72	P0328	Knock Sensor 1 Circuit High Input
	P0132	Front O2 Sensor High Voltage
	P0134	Front O2 Sensor Open/Not Responding
	P0170	Front Adaptive Maxed Out
	P0152	Rear O2 Sensor High Voltage
	P0154	Rear O2 Sensor Open/Not Responding
	P0173	Rear Adaptive Maxed Out