



**CAUTION: CAREFULLY READ INSTRUCTIONS BEFORE PROCEEDING. NOT LEGAL FOR USE OR SALE ON POLLUTION CONTROLLED VEHICLES WHEN USED FOR NITROUS ACTIVATION.**

## OVERVIEW

The SL-1 is a combination shift light and vehicle data logger with the following features:

- Ultra high brightness red/green/blue LED display that can be panel mounted or attached to a tach with a supplied bracket. The LED display features full spectrum color capability including white with user selected colors for each function and automatic dimming under low light conditions.
- Launch and multi-stage shift light capability. A launch RPM and up to five shift RPM levels can be defined to support up to six gear transmissions.
- Gear detection is based on vehicle speed (if a vehicle speed sensor is available) or RPM drop during shift. Vehicle speed based gear detection allows use in applications other than drag racing as it allows correct gear sensing after downshifts.
- Launch detection is based on vehicle speed (if a vehicle speed sensor is available) or a signal from a line lock solenoid.
- Two independent programmable alarm functions for analog inputs. Additional programmable alarm and general purpose control output functions are described in the software section.
- Flexible RPM input compatible with high voltage coil drive (vehicles with coil packs or distributor ignition), standard 12 volt tach signal, or low level logic drive (newer vehicles with coil-on-plug).
- Built-in data logging. Ideal as basic vehicle data logger during dyno tuning or on the track. Logs data whenever system is armed. Stores last 5 minutes of data at 10 samples/second.
- Data logged includes throttle position, RPM, vehicle speed, status of all inputs and outputs, and two 0-5 volt analog inputs.
- Heavy duty industrial grade clamping terminal blocks allow easy and reliable hookup without soldering or crimping.

- Compact size: 3.3"L x 2.4"W x 1.1"H (not including mounting feet and terminal block).
- USB interface to laptop PC. Powerful Windows software for programming controller and downloading logged data.



Figure 1 – SL-1 Shift Light

## ADDITIONAL REQUIRED PARTS

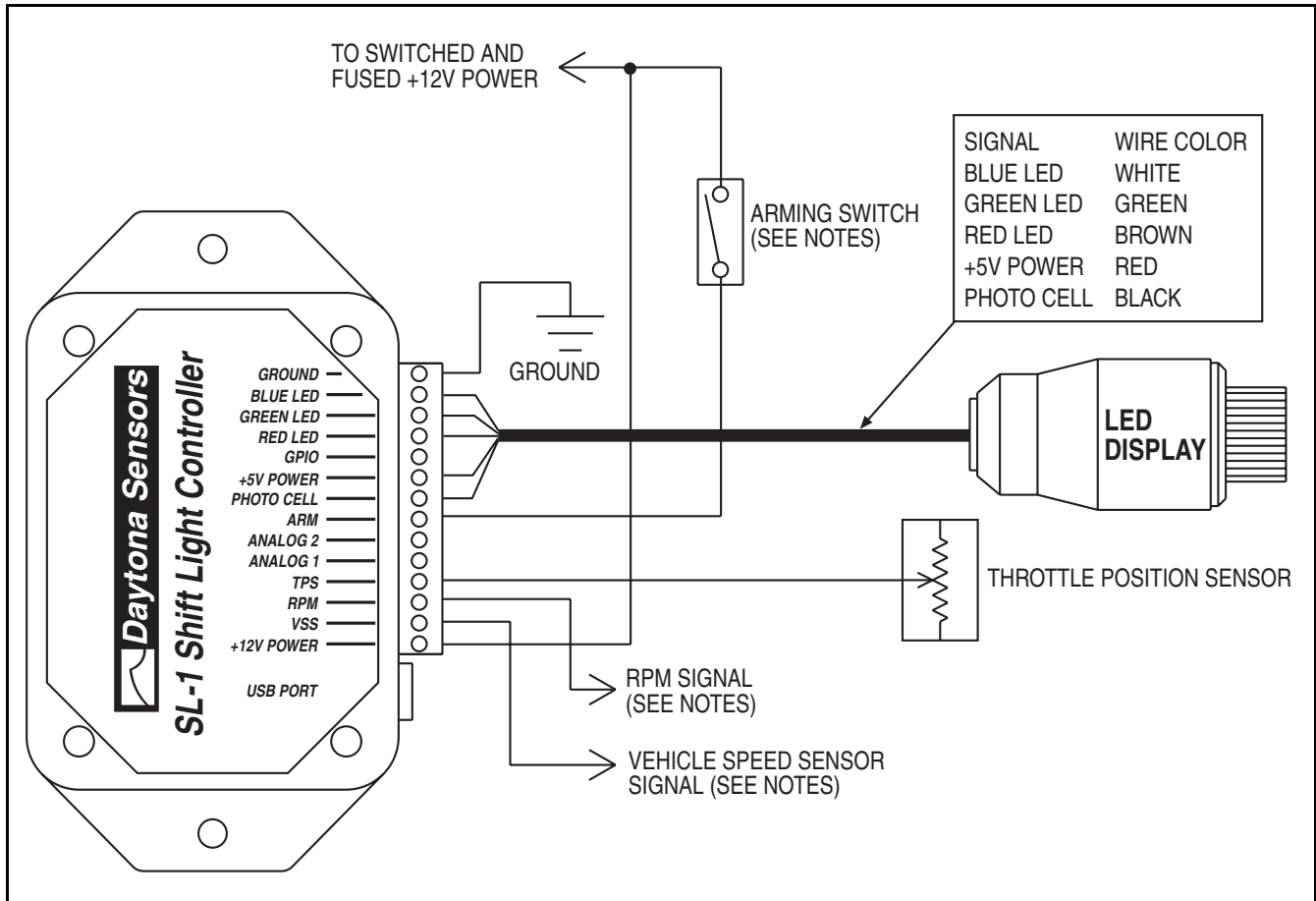
The SL-1 comes with a USB cable and software on CDROM. To complete the installation, you will require: wire, wire labels, and crimp terminals. Some applications may also require additional fuses, switches, and relays. The Appendix includes a list of recommended parts and suppliers.

Throttle position sensor (TPS), RPM, and vehicle speed sensor (VSS) signal connections are required to utilize all the capabilities of the SL-1. **You will require a vehicle wiring diagram to locate these signal connections.**

## INSTALLATION

1. Turn off the ignition switch and disconnect the battery ground cable before proceeding.
2. Select a convenient mounting location for the SL-1. The unit is not sealed and must be mounted in a dry location away from sources of heat. We recommend underdash mounting. The unit is not intended for underhood mounting. You can secure the SL-1 with two sheet metal screws or Velcro tape strips. Orient the unit so that you will have easy access to the terminal blocks and USB port.

Figure 2 – Basic Hookup



3. Refer to Figure 2 for basic hookup. All connections can be made with 18-20 AWG wire.
4. **Working with clamping terminal blocks.** All connections to the SL-1 terminal blocks must be clearly identified either by means of distinct wire colors or the use of wire labels. If you use distinct wires colors, mark up Figure 2 for future reference. Refer to the Appendix for recommended wire labels. Wire should be stripped back 3/16-1/4 inch. No bare wire should be visible outside the terminal block. Use a miniature Phillips or flat screwdriver to tighten the screws.
5. **LED display.** The LED display can be panel mounted in a 3/4" diameter hole using the supplied 3/4-24 panel nut. The LED display can also be attached to a tachometer using the supplied bracket and decorative back housing.
6. **Arming switch.** The use of an arming switch is optional and not required for basic shift light functions. The unit can be configured so that it only logs data when armed. Alarm and general purpose output (GPO) functions are only active when the unit is armed.
7. **Switched +12V power.** Most vehicles will have an accessory fuse that can be used as a source for the switched and fused +12V power connection. Refer to the Appendix for recommended fuse taps.
8. **Throttle position sensor (TPS) signal.** The use of a TPS signal is optional and not required for basic shift light functions. Most vehicles manufactured since 1981 will have a TPS with 0-5V output located on the throttle body or carburetor. Refer to the vehicle wiring diagram for details. You can check the TPS signal with a DVM. Some late model vehicles with drive-by-wire electronic throttle bodies will have a dual output accelerator pedal sensor. The signal voltage on one output will rise with increasing pedal position and the other output will drop. Connect the SL-1

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TPS input to the rising signal. Solder this signal connection and wrap with self vulcanizing electrical tape (refer to the Appendix).

9. **RPM signal.** Depending on your vehicle type and engine control, there are three possible sources for the RPM signal:

a. **High level signal on the Coil- terminal of most inductive discharge type ignitions.** This includes most original

equipment (OE) ignitions except coil-on-plug with integrated drive electronics. For distributorless systems with multiple coils or coil packs, you can use any one of the Coil- signals. Refer to the vehicle wiring diagram for details. The Coil- terminal will connect to an ignition module or engine control module (ECM). The Coil+ terminal will connect to switched +12V.

b. **Tach signal (preferred for best noise immunity).** The SL-1 is compatible with industry standard 12V square wave tach signals such as what would be used to drive an Autometer or similar aftermarket tach. Most aftermarket capacitive discharge (CD) ignitions including the MSD-6 and Crane HI-6 series have a tach output that you can use.

c. **Low level logic signal.** This type of signal is found on late model vehicles, including many imports, that use coil-on-plug with integrated drive electronics. Refer to the vehicle wiring diagram for details. You can use the signal that goes from the ECM to any one of the coil-on-plug units.

Unless you are using the tach terminal on an aftermarket ignition or a screw terminal on a coil, you should solder the RPM signal connection and wrap with self vulcanizing electrical tape (refer to the Appendix). During initial setup, you must configure an RPM signal level jumper inside the SL-1. Refer to the Initial Setup section on page 17 for details.

10. **Vehicle speed sensor (VSS) signal.** The use of a VSS signal is optional and not required for basic shift light functions. However, if you plan to use the launch and multi-stage shift light feature, you must connect either a VSS signal or a signal from a line lock solenoid (refer to step 11). Most vehicles manufactured since 1981 will have a VSS. Refer to the vehicle wiring diagram for details. Some late model vehicles with anti-skid braking (ABS) and electronic stability control (ECS) systems utilize

individual wheel sensors use to calculate an average vehicle speed. Accessing a discrete vehicle speed signal on these systems may not be possible. You may have to install a driveshaft sensor (contact tech support for details). For Nissan 350Z applications, you can access vehicle speed on the 8P/R signal (pin 26 on the unified meter and A/C amp module behind the center console).

11. **Optional general purpose input/output (GPIO) signal.** Refer to Figures 3-5 for GPIO hookup options. If you plan to use the launch and multi-stage shift light feature, you must connect either a VSS signal (refer to step 10) or a signal from a line lock solenoid as shown in Figure 3. If you use the GPIO to control a nitrous system or to retard an aftermarket ignition that requires a 12V (active high) signal, you must use a relay as shown. Refer to the Appendix for recommended relays.

***WARNING: If you connect a signal from a line lock solenoid to the GPIO terminal as shown in Figure 3, you must install the supplied diode. Failure to install the diode will damage the SL-1 and void the warranty.***

12. **Optional analog input signals.** The SL-1 will log 0-5V data on two analog inputs. Uses include logging air/fuel ratio from a wide-band sensor system such as a Delphi manifold absolute pressure (MAP) sensor as shown in Figure 6 or the Daytona Sensors WEGO IIID shown in Figure 7. If you are adding a MAP sensor to vehicle not originally equipped with one, you can use the +5V power from the SL-1 to power the sensor. The software is used to set the units and scaling for the analog inputs and configure optional alarm functions. Refer to the software section for details.

13. **Ground connection.** Use 18 AWG wire. Keep the ground connection as short as possible. The ground connection must go to a chassis ground stud (you can usually find one under the dash). If you are using the analog inputs, use the same ground point for any associated devices in order to avoid signals errors due to a ground loop.

14. Reconnect the battery ground cable.

Figure 3 – GPIO Hookup to Line Lock Solenoid

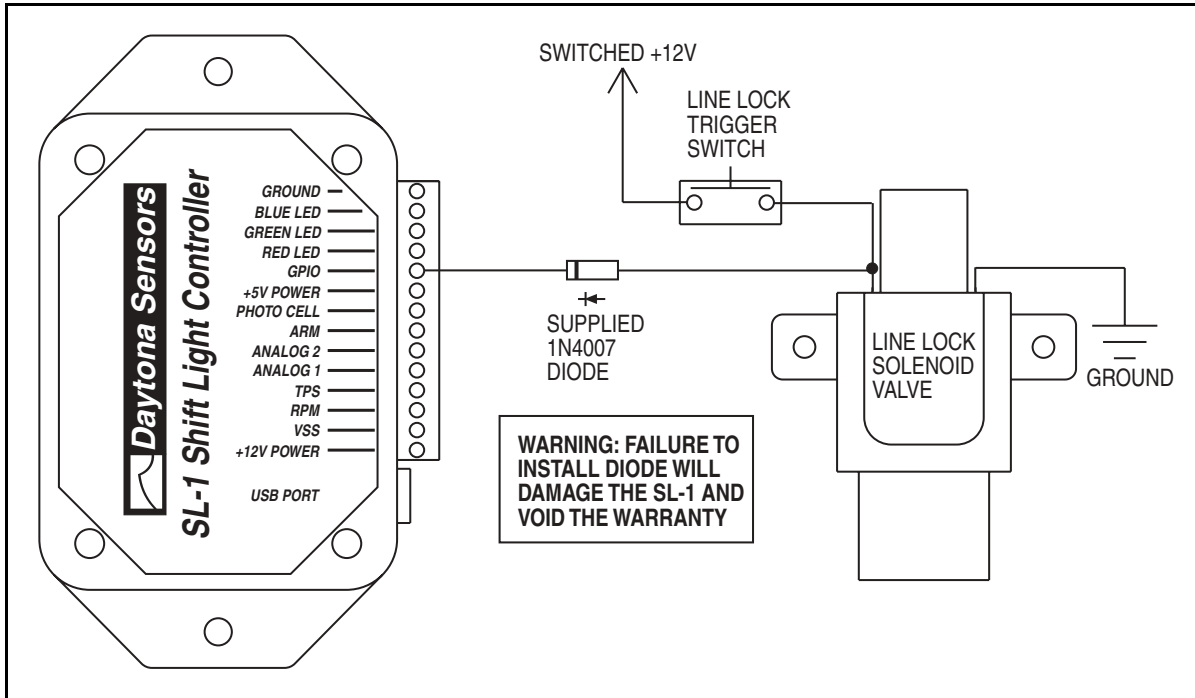


Figure 4 – GPIO Hookup for Nitrous System Control

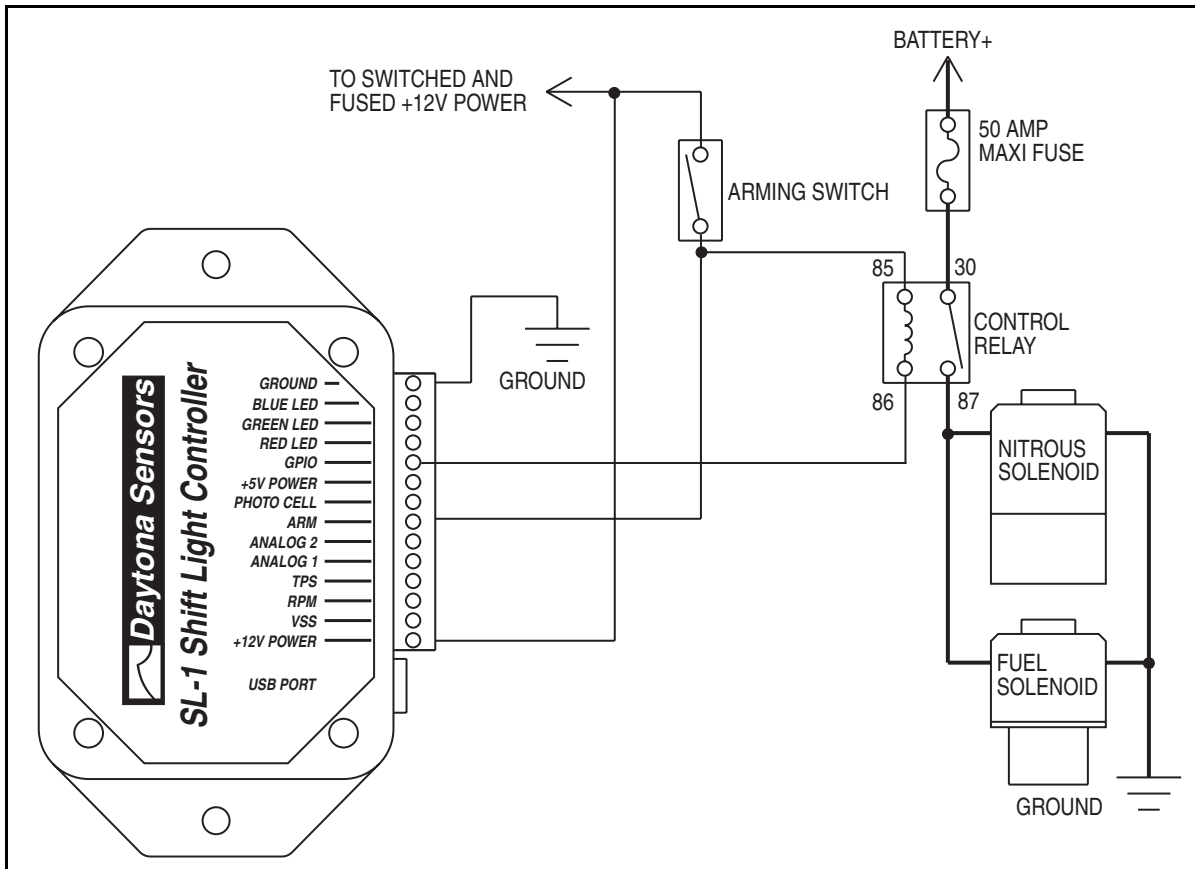


Figure 5 – GPIO Hookup for High Gear Retard

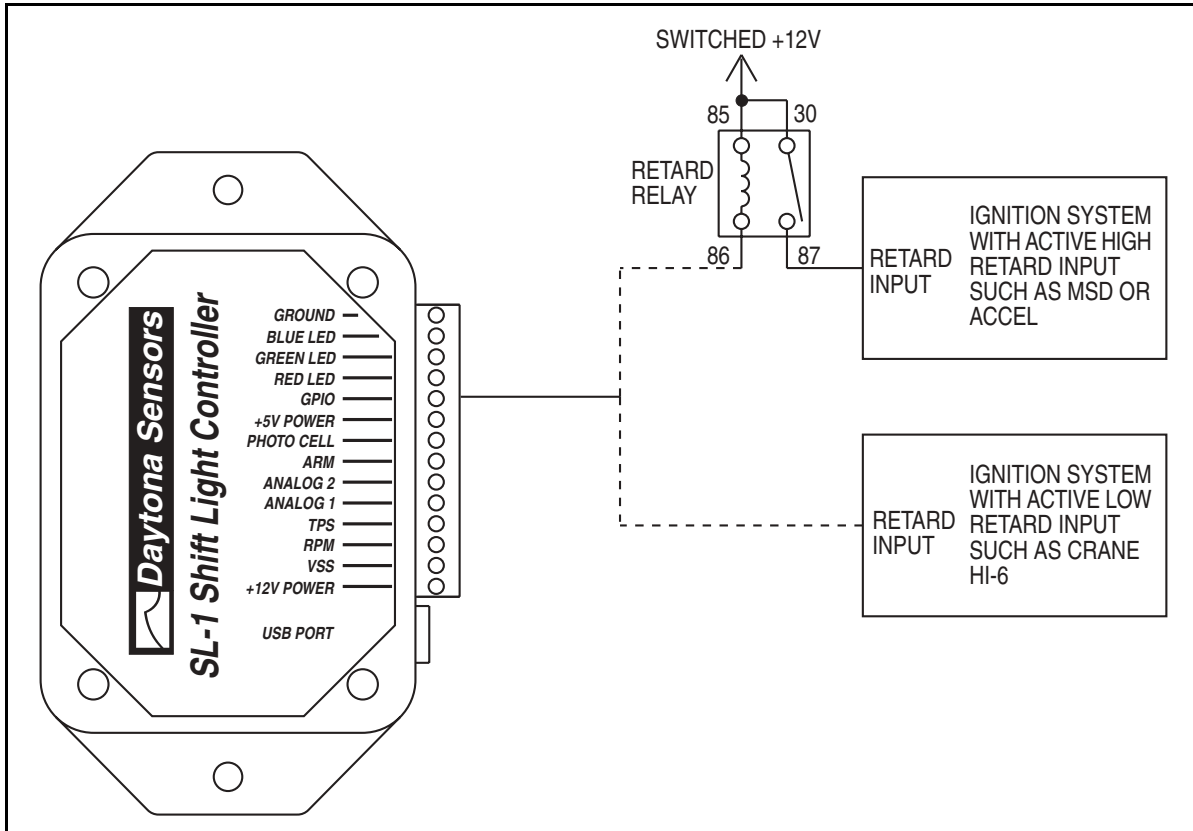


Figure 6 – Analog Input Hookup to Delphi MAP Sensor

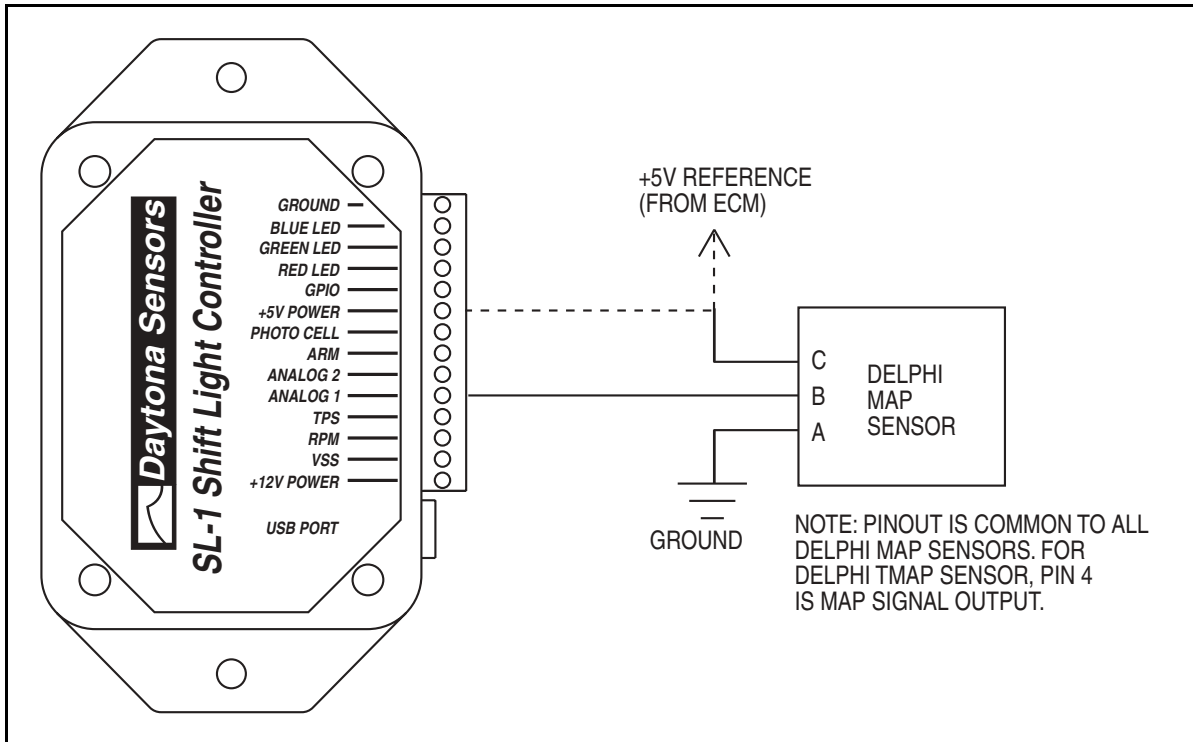
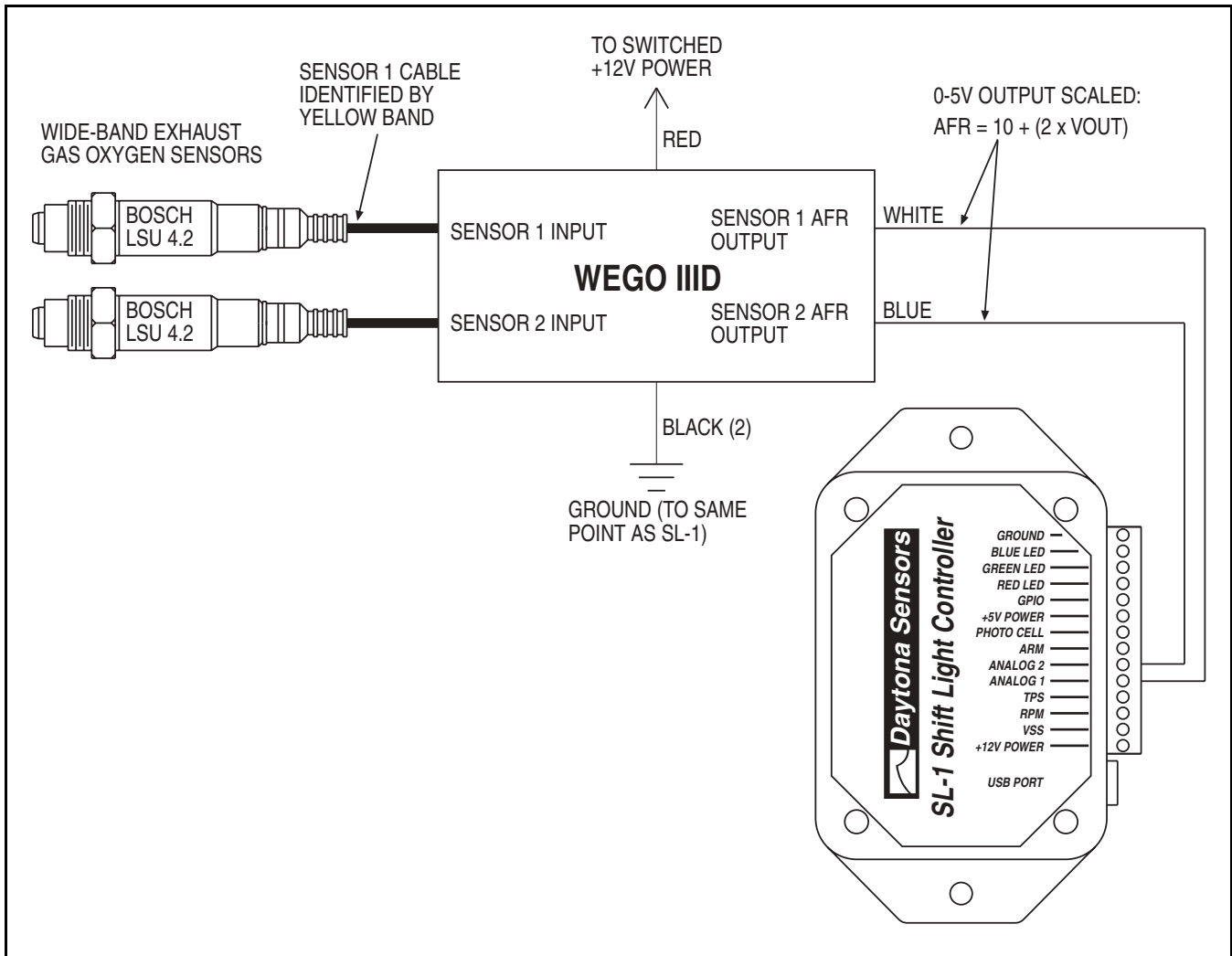


Figure 6 – Analog Input Hookup to Daytona Sensors WEGO IIID Wide-Band System



## OVERVIEW OF INITIAL SETUP

The SL-1 requires initial setup to establish nitrous system control parameters. PC Link Shift software is used for setup. In addition, the Shift Log data logging software is used to check for proper scaling of the throttle position, RPM, vehicle speed, and analog inputs. Complete the software installation and read the software sections of this instruction manual, then continue the initial setup steps on page 17.

## PC REQUIREMENTS

The SL-1 connects to your PC by means of a USB interface. A USB cable is supplied with the unit. The PC must have a free USB port. If you have an older PC without USB capability, you cannot use the SL-1.

We recommend a laptop PC with Pentium processor and super VGA display (SVGA with 1024 x 768 pixel resolution) running Windows 98/ME/XP/Vista. Data chart display is graphics intensive and a high speed Pentium processor is recommended. Processors slower than 300 MHz will exhibit sluggish program loading and response. The PC must have a CDROM drive for program loading.

PC Link Shift and Shift Log software include print commands to print downloaded data. The programs have been tested with Hewlett-Packard laser and inkjet printers and Epson inkjet printers. We recommend using a color inkjet printer.

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## USB INSTALLATION

The SL-1 USB interface is based on the FTDI FT232R chip and VCP (virtual COM port) drivers that allow the unit to emulate a standard Windows RS-232 COM port. Updated Windows drivers, installation instructions and troubleshooting tips are available on the FTDI website at [www.ftdichip.com](http://www.ftdichip.com).

You will require the Daytona Sensors CDROM for installation. For Windows 98 and ME, use the drivers in the VCP\_Drivers\_Win98ME folder on the CDROM. For Windows XP and Vista, use the drivers in the VCP\_Drivers\_Win2KXP folder. You can install directly from the CDROM or copy these files to a folder on your hard drive.

The standard Windows installation process is used, as with other USB devices. If you have never installed a USB device, you can refer to the appropriate FTDI Windows Installation Guide (in the USB\_Interface folder on the CDROM) for step-by-step details. Individual guides are provided for Windows 98, 2000 (2K), and XP/Vista. The Windows 98 guide is also applicable to Windows ME. Refer to the table of contents in the appropriate guide for Installing FT232R Devices/Installing VCP Drivers.

1. Insert the CDROM. Exit from the Daytona Sensors autorun menu if it appears.
2. Connect the SL-1 to the PC with the supplied USB cable.
3. The Windows Found New Hardware Wizard will appear. Do not click on the option to connect to Windows Update.
4. Click on the option to install from a specific location, click on the option to search for the best driver, and then browse to the VCP\_Drivers folder on the CDROM. Disregard any warnings about drivers that have not passed Windows Logo testing.
5. The wizard will complete installation of the USB serial converter (FTDI chip). This completes the first part of the installation.
6. The wizard will reappear to install the COM port driver. Repeat steps 3-4 above.

## COM Port Configuration

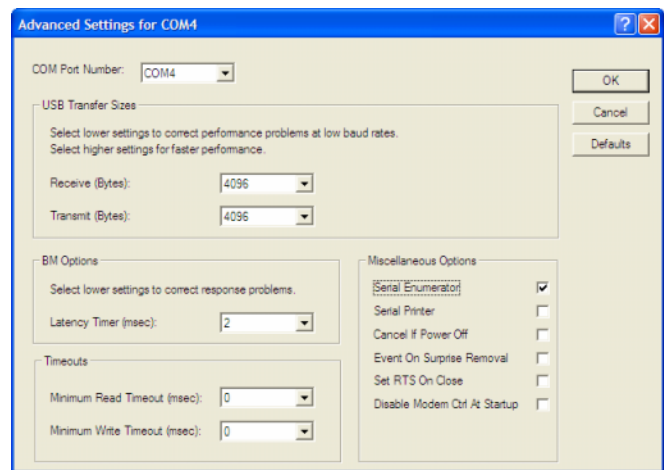
After completing the installation steps outlined above, you must configure the new COM port using Device Manager.

1. Click Start, Settings, Control Panel, System, Hardware, and then Device Manager. Scroll down

to Ports (COM and LPT).

2. The SL-1 will appear as a USB Serial Port. Click on this new port.
3. Click on the Port Settings tab.
4. Click on Advanced. In most cases the wizard will have installed your new SL-1 as COM4 or COM5. For optimum performance, you should change the BM Options Latency Timer to 2 msec as shown in Figure 7.
5. Once you have configured a COM port number for your new SL-1 unit, make sure that you use this same COM port selection in the SL-1 software by using the Port Setup command from the Communications menu.

Figure 7 – COM Port Configuration



## SOFTWARE INSTALLATION

The software is supplied on CDROM media or in the form of a compressed file downloaded from our website. The installation process uses InstallShield. This industry standard installer is based on the new Microsoft Windows Installer service that greatly reduces potential problems such as version conflicts and allows for application self-repair. Since Windows 98 systems did not originally include the Windows Installer service, the required installer software is included in the distribution media.

There are two programs to install: PC Link Shift and Shift Log. Start by installing PC Link Shift. If you are downloading software from the web, only download and install one program at a time. Before proceeding with installation, shutdown any other applications that may be running. For Windows Vista, you must disable the User Account Control (UAC) during installation. If you are

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not familiar with the UAC, please refer to the Vista UAC Tech Note on our website's Tech FAQ for details.

Use the Windows Explorer or the Run command from the Windows Start Menu to launch setup.exe in the PC\_Link\_Shift folder on the CDROM or the setup.exe file downloaded from our website. InstallShield will install the software in an appropriate folder under Program Files.

Repeat the installation process for Shift Log. Use the Windows Explorer or the Run command from the Windows Start Menu to launch setup.exe in the Shift\_Log folder on the CDROM or the setup.exe file downloaded from our website. InstallShield will install the software in an appropriate folder under Program Files.

Once InstallShield has completed the installation, PC Link Shift and Shift Log will appear on the Windows Start Menu. You can then launch them just as you would any other Windows program.

The programs require the Monospace 821 BT fixed pitch printer font in order to properly align columns when printing. The Monospace 821 BT font is included in the distribution media and automatically copied to your Windows Fonts folder during installation. A backup copy is also placed in the program folder. If you accidentally delete this font, use the Install New Font command from the Fonts folder File menu. The filename associated with Monospace 821 BT is monos.ttf.

## **PC LINK SHIFT SOFTWARE**

Before the SL-1 is armed, you can download or upload data with PC Link Shift.

After PC Link Shift is launched, the main screen appears blank. When launched for the first time, the program uses COM1 as the default port. In most cases, you will have configured the SL-1 USB interface to use a different COM port, such as COM5. Use the Port Setup command on the Communications menu to select the correct COM port. The program will remember the new port setup.

You have two options for obtaining data for editing. You can open a previously saved setup file by using the Open File command on the File menu or you can download data from an attached SL-1 unit by using the Download Data From EEPROM command on the Communications menu. Note that SL-1 setup files use a .dat extension. You should create a separate folder to store these files. A sample setup file (Sample.dat) is included in the program folder.

Once you have SL-1 data, you can edit various shift light and alarm parameters, general setup options,

and scale factors. You can print the displayed setup data by using the Print Parameters command from the File menu. When you open a file or download data from a unit, the data is stored in a buffer memory. Once you have completed all your edits, you can save the data in buffer memory to a file or upload it back to the unit by using the appropriate command from the File or Communications menu.

## **SHIFT LIGHT SETUP**

Controller scale factors shown in Figure 8 are generally established during initial setup (see page 17) and with the exception of the data logging interval will probably remain unchanged for a particular vehicle. Scale factors that you can set include:

**RPM Pulses/Rev** – RPM pulses per revolution (PPR). Some general guidelines follow, based on the type of signal connected to the RPM input:

**Tach signal.** This includes aftermarket CD type ignitions with a tach output. In most cases  $PPR = N/2$  where N is the number of cylinders. For example a 4 cylinder engine would require  $PPR=2$  and a V8 engine would require  $PPR=4$

**Distributor type ignition** with connection to Coil- terminal. Same as for a tach signal. Use  $PPR = N/2$  where N is the number of cylinders.

**Wasted spark coil pack** (distributorless system) with connection to Coil- terminal. Use  $PPR=1$ .

**Coil on plug** (no wasted spark) with connection to Coil- terminal or logic level drive signal from the ECM. Use  $PPR=0.5$

**RPM Debounce** – RPM signal filtering in milliseconds (msec). Use the default value of 0.5 msec for most applications. Ford 4.6L modular V8 engines will require a value of 3.5 msec.

**VSS Frequency** – sets the correct scaling for vehicle speed based on the signal frequency at 60 MPH. Values vary widely between different vehicle applications. Unless you have a scopemeter to measure the actual signal frequency, some trial and error using the Shift Log software to display the vehicle speed will be required to establish the correct setting. If you are not using the VSS input, you can ignore this parameter.

**Zero TPS** – throttle position sensor voltage corresponding to zero percent (closed) throttle. You can use a DVM or the Shift Log software to establish the correct setting.



**100% TPS** – throttle position sensor voltage corresponding to wide open throttle. You can use a DVM or the Shift Log software to establish the correct setting. The unit requires a rising throttle voltage where the 100% value is higher than the zero value.

**Data Logging Interval** – you can set the interval from 0.1 to 1.0 seconds. Data logging capacity is 2700 samples. An interval of 0.1 seconds allows the unit to store the last 4.5 minutes of operation. An interval of 1.0 seconds corresponds to 45 minutes of data. Data is only logged when the unit is armed. For drag racing or dyno testing, we suggest that you set the interval to 0.1 seconds and select the Data Logging Only When Armed option. For general vehicle data logging, you can set a longer interval based on your requirements. If you change the data logging interval, you should also run the Shift Log program and clear the data buffer.

**Data Logging Only When Armed** – Data is only logged when +12 volts is applied to the ARM input. Please note that regardless of this option, other functions such as the general purpose output (GPO), and user defined alarms are only active when the system is armed. The shift light function, including multi-stage and launch functions, is always active.

**Minimum LED Brightness** - This parameter sets the minimum LED brightness under low light (night) conditions. A value of 5-10% is reasonable for most applications. 100% represents maximum brightness.

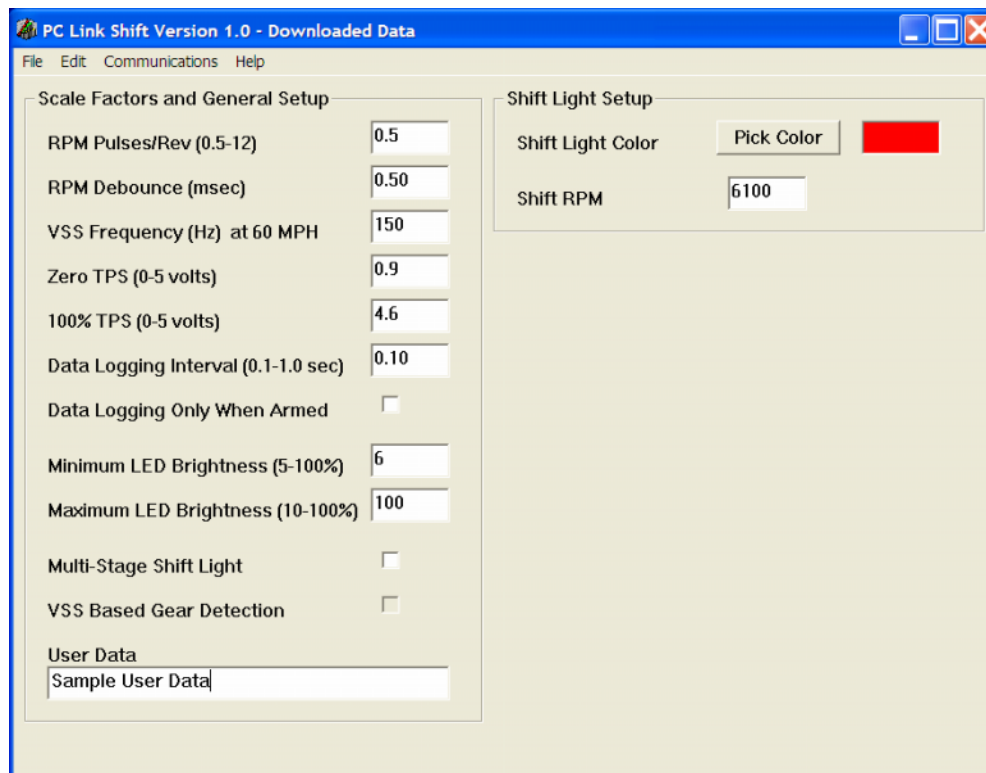
**Maximum LED Brightness** - This parameter sets the maximum LED brightness under bright daylight conditions. 100% represents maximum brightness.

**Multi-Stage Shift Light** - Enables launch and multi-stage shift light feature.

**VSS Based Gear Detection** - Enables gear detection based on vehicle speed sensor (VSS). If this option is not selected, gear detection is based on a signal from a line lock solenoid connected to the GPIO input and sensing RPM drop between gears. VSS based gear detection allows using the multi-stage shift light feature for road racing applications where downshifts occur.

**User Data** – you can enter up to 32 characters of user data such as comments that will be saved in EEPROM memory.

Figure 8 – Basic Shift Light Setup

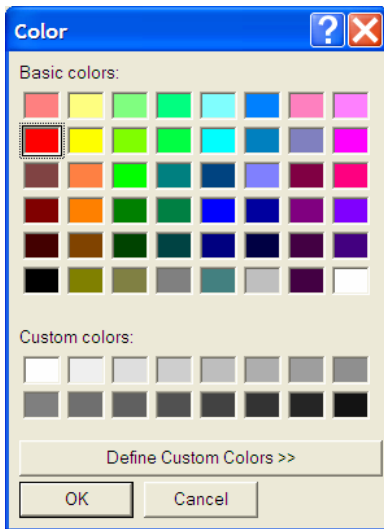


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## **BASIC SHIFT LIGHT SETUP**

If the multi-stage shift light option is not selected, basic shift light setup appears as shown in Figure 8. You can select the shift light color and RPM. If you click on the Pick Color command, a Windows color dialog box appears as in Figure 9. You can select the desired color and click on OK. We recommend that you only select saturated colors and white. Some intermediate color mixtures of red, green, and blue may not display accurately and gray shades will appear as less intense white illumination.

Figure 9 – Color Dialog Box



## **MULTI-STAGE SHIFT LIGHT SETUP WITH RPM DROP GEAR DETECTION**

If the multi-stage shift light option is selected, the setup appears as shown in Figure 10. Gear detection is based on a signal from a line lock solenoid connected to the GPIO input and sensing RPM drop between gears. This mode of operation is only suitable for drag racing. Refer to the installation instructions for wiring hookup details. You can select the launch and shift light colors using the Pick Color commands same as explained above. You can set individual RPM values for launch and the shift point for up to five gears. If your transmission has less than six gears, just set the unused shift points to the same value as used

for your upper gear. The Short Shift Window value provides protection in case you shift before the shift point is reached. For the sample data shown, the unit would correctly sense a short shift from 1st into 2nd gear as low as 5,600 RPM. The Minimum Shift Drop value is the minimum RPM drop that must occur between gears for the unit to sense a shift.

The launch RPM value and color is active while the line lock solenoid is energized and +12 volts is applied to the GPIO input. The LED display will illuminate at the launch RPM and start rapidly blinking 100 RPM higher. Energizing the line lock solenoid also resets the gear counter. When the line lock solenoid is released, the launch function is disabled and the multi-stage shift light function becomes active.

## **MULTI-STAGE SHIFT LIGHT SETUP WITH VSS BASED GEAR DETECTION**

If the multi-stage shift light and VSS based gear detection options are selected, the setup appears as shown in Figure 11. Gear detection is based the minimum VSS values entered for each gear. Refer to the installation instructions for VSS wiring hookup details. This mode of operation is required for road racing where downshifts will occur. You can select the launch and shift light colors using the Pick Color commands same as explained above. You can set individual RPM values for launch and the shift point for up to five gears. The minimum VSS value for 1st gear is generally set to zero. At zero speed, the launch RPM value and color is active. The LED display will illuminate at the launch RPM and start rapidly blinking 100 RPM higher. If the launch feature is not desired, just set the launch RPM to a value above the engine redline. The minimum VSS for each gear should be set to a speed just below the shift point. Precise values are not required. If your transmission has less than six gears, just set the unused shift RPM points to the same value as used for your upper gear and set the corresponding minimum VSS to values above the normal vehicle top speed.

Figure 10 – Multi-Stage Shift Light Setup with RPM Drop Gear Detection

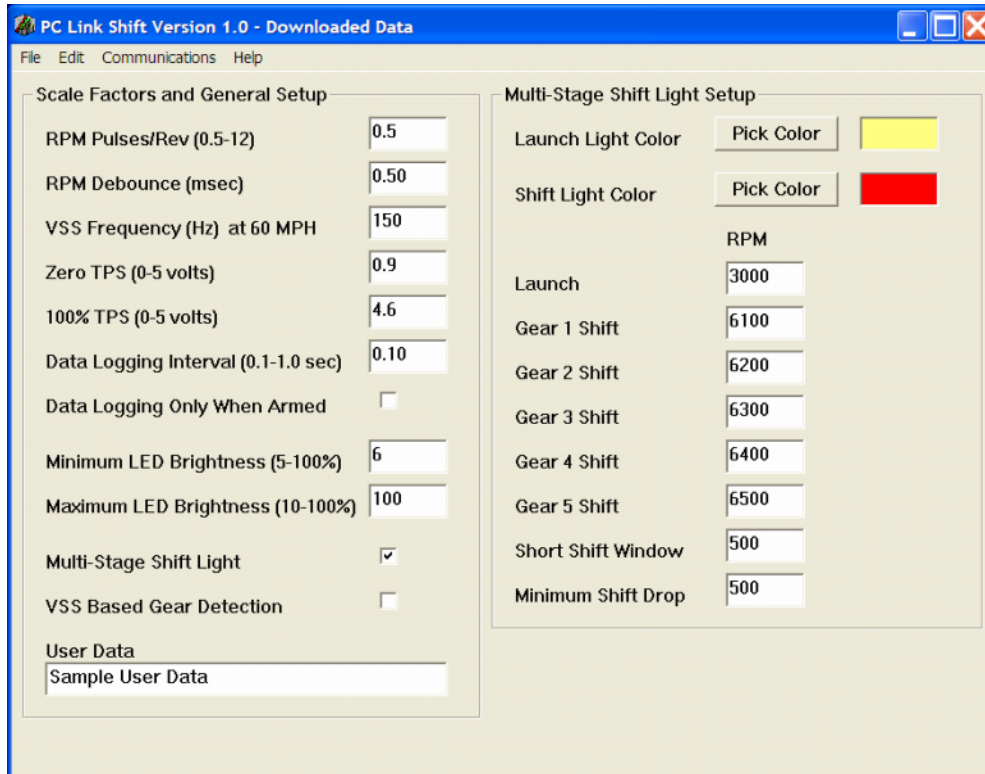
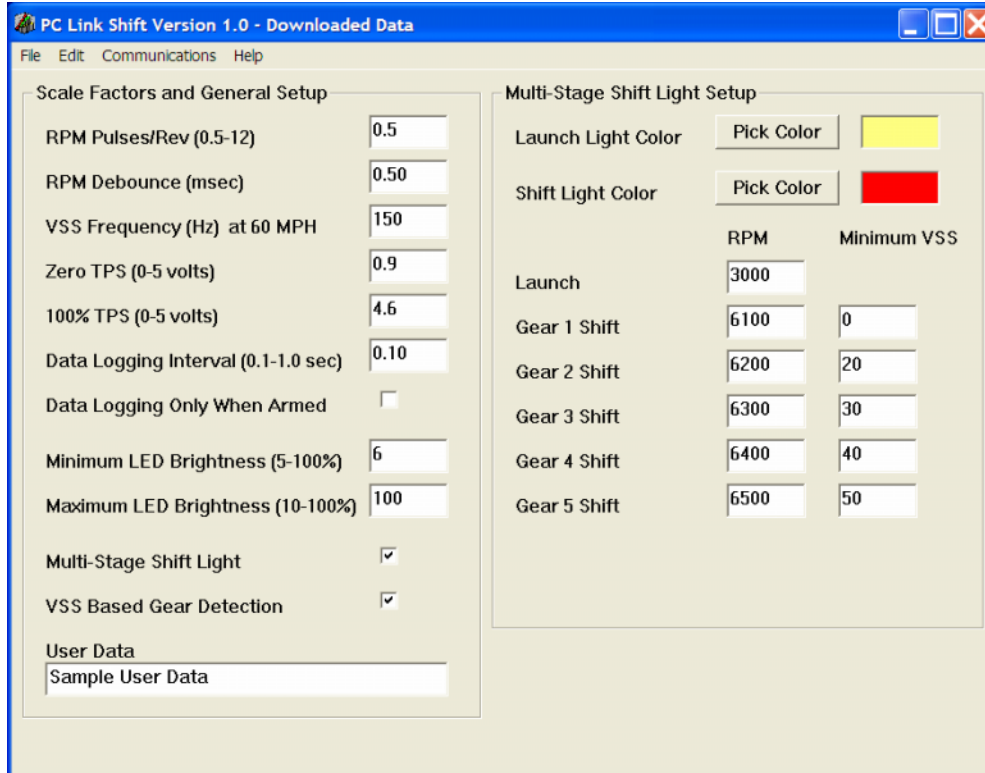


Figure 11 – Multi-Stage Shift Light Setup with VSS Based Gear Detection



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## GENERAL PURPOSE OUTPUT (GPO) SETUP

Use the Edit GPO Parameters command from the Edit menu to display the GPO parameters dialog box as shown in Figure 12. Please note that the GPO function on the GPIO terminal is not available if the unit is configured as a multi-stage shift light with RPM drop based gear detection. In this mode, the GPIO terminal is used as an input for the signal from a line lock solenoid. Typical applications include using the GPO function as a window switch to control a nitrous system, high gear retard, or other accessory.

Please note that the GPO function is only active when the system is armed (+12 volts applied to ARM input).

**Enable GPO** – select this option to enable the GPO function.

**Minimum RPM and Maximum RPM** – RPM window within which the GPO is on.

**TPS Off** – percent value below which the GPO will be turned off. We recommend using a value that is 5-10% less than the TPS On setting for best noise immunity.

**TPS On** – percent value above which the GPO is on.

**Minimum RPM and Maximum VSS** – vehicle speed window within which the GPO is on.

**Delay** – time delay (in seconds) from the point where all the above conditions are met to the point where the GPO is on.

Figure 12 – GPO Parameters Dialog Box

Enable GPO	<input checked="" type="checkbox"/>
Minimum RPM (100 RPM steps)	3000
Maximum RPM (100 RPM steps)	6000
TPS Off (%)	89
TPS On (%)	94
Minimum VSS (MPH)	30
Maximum VSS (MPH)	160
Delay (sec)	0.00
One-Shot Delay	<input type="checkbox"/>

## USER DEFINED ALARMS SETUP

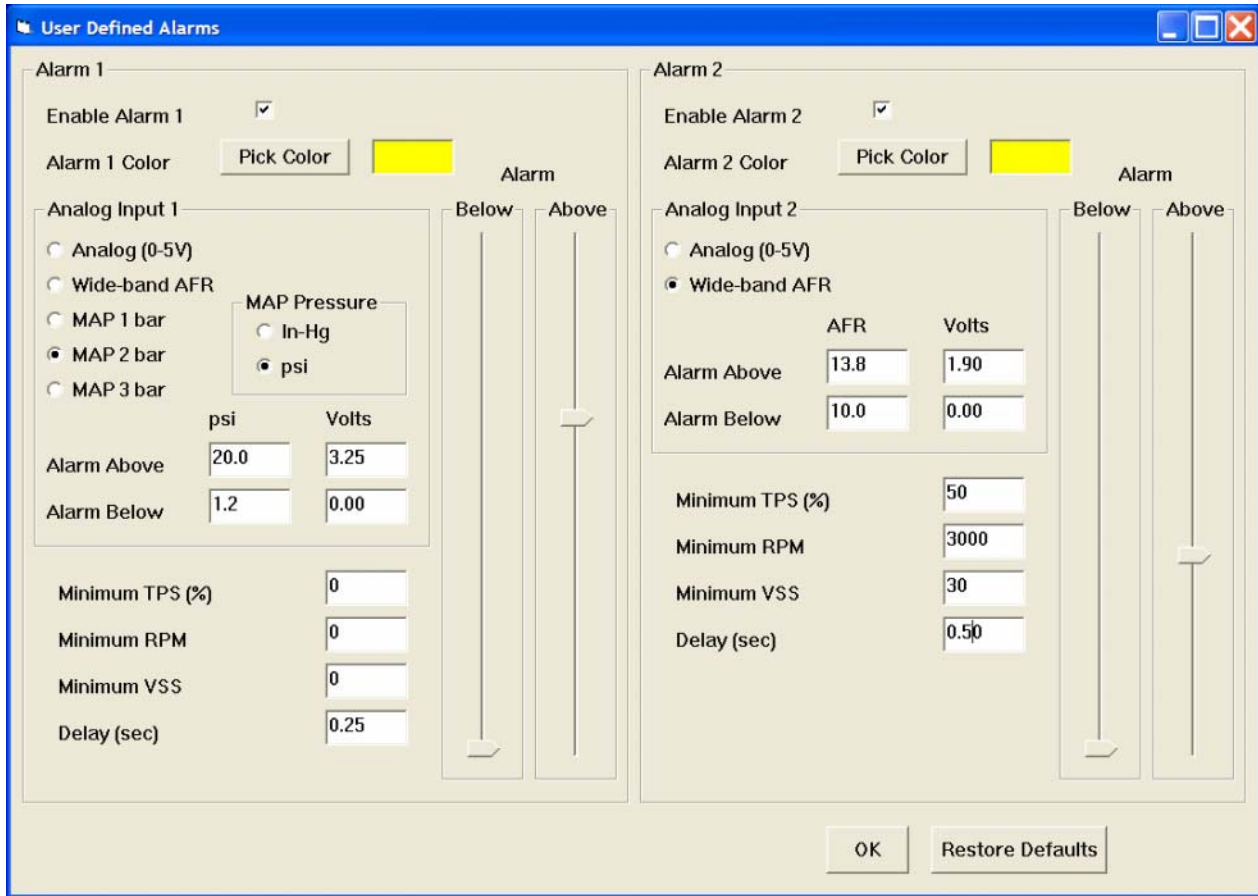
Use the Edit User Defined Alarms command from the Edit menu to display the User Defined Alarms dialog box as shown in Figure 13. The user defined alarms are based on signal levels at the two analog inputs. Each alarm can be independently enabled. You can also select the alarm color. If you click on the Pick Color command, a Windows color dialog box appears. You can select the desired color and click on OK. We recommend that you only select saturated colors and white. Some intermediate color mixtures of red, green, and blue may not display accurately and gray shades will appear as less intense white illumination.

An alarm is triggered when the corresponding analog input signal level drops below or rises above set voltage levels. Sliders are used to set the voltage levels. To disable low signal level alarm, set the Alarm Below slider to zero volts. To disable high signal level alarm, set the Alarm Above slider to 5.0 volts. You can set minimum TPS, RPM, and VSS conditions that must be exceeded before the alarm is triggered. You can also set a time delay (in seconds) from the point where all the alarm trigger conditions are met to the point where the alarm is on. Setting a short delay helps avoid spurious alarms for situations such as momentary lean air/fuel ratio (AFR) or overboost transients on acceleration.

Analog input 1 can be configured for general purpose 0-5 volt signal levels, use with a wide-band air/fuel ratio (AFR) system such as the Daytona Sensors WEGO series, or common Delphi manifold absolute pressure (MAP) sensors. Alarm signal levels are displayed in appropriate units corresponding to the options you have selected. Analog input 2 can be configured for general purpose 0-5 volt signal levels or use with a wide-band AFR system.

Please note that the user defined alarms are only active when the system is armed (+12 volts applied to ARM input).

Figure 13 – User Defined Alarms Dialog Box

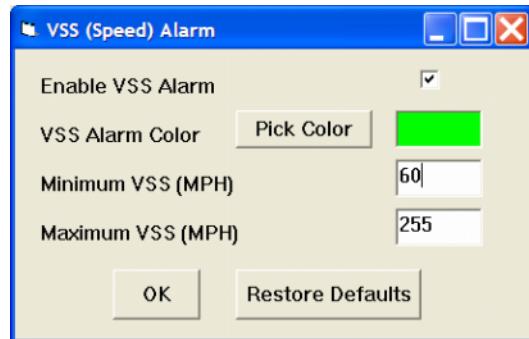


### VSS (SPEED) ALARM SETUP

Use the Edit VSS (Speed) Alarm command from the Edit menu to display the VSS (Speed) Alarm dialog box as shown in Figure 14. You can select the VSS alarm color. If you click on the Pick Color command, a Windows color dialog box appears. You can select the desired color and click on OK. We recommend that you only select saturated colors and white. Some intermediate color mixtures of red, green, and blue may not display accurately and gray shades will appear as less intense white illumination. You can also set the minimum and maximum VSS values. The alarm is active below and above these values. To disable minimum VSS alarm, enter a zero value. To disable maximum VSS alarm, enter the value 255. A typical application is a pit row speed limit alarm. For the sample data shown, the LED would illuminate below 60 MPH.

Please note that the VSS alarm is only active when the system is armed (+12 volts applied to ARM input).

Figure 14 – VSS (Speed) Alarm Dialog Box



## SHIFT LOG SOFTWARE

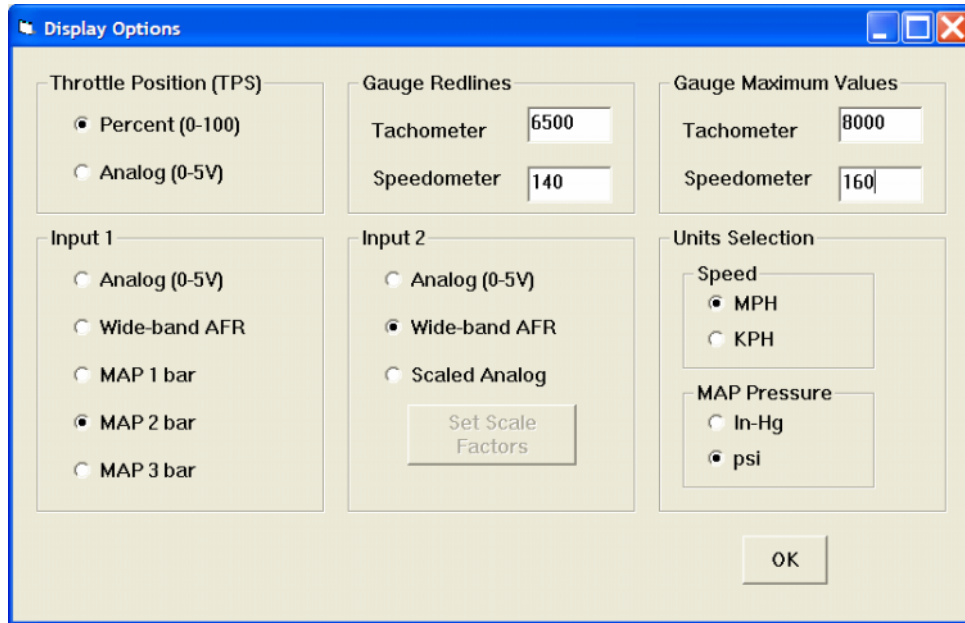
After Shift Log is launched, the display options screen appears as shown in Figure 15. You can select display units and limits. The program will remember your selections. You can also bring up the screen by using the Display Options command from the Edit menu. When you save downloaded data to a file, the display option settings are saved along with the data. If you later open the file, the same display options will reappear.

Analog input 1 can be configured for general purpose 0-5 volt signal levels, use with a wide-band air/fuel ratio (AFR) system such as the Daytona Sensors WEGO series, or common Delphi manifold

absolute pressure (MAP) sensors. Signal levels are displayed in appropriate units corresponding to the options you have selected. Analog input 2 can be configured for general purpose 0-5 volt signal levels, use with a wide-band AFR system, or as a scaled analog input with custom scaling for other types of sensors.

When launched for the first time, the program uses COM1 as the default port. In most cases, you will have configured the SL-1 USB interface to use a different COM port, such as COM5. Use the Port Setup command on the Communications menu to select the correct COM port. The program will remember the new port setup.

Figure 15 – Display Options

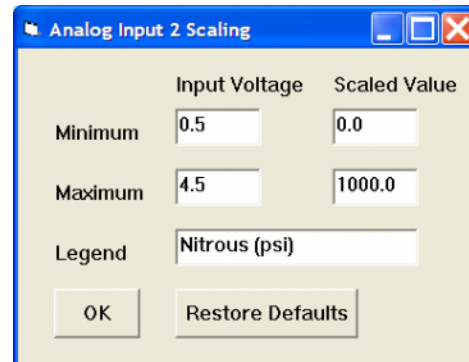


When the scaled analog option is selected for analog input 2, you can setup custom scaling by clicking on Set Scale Factors. The analog input 2 scaling dialog box will appear. In general, you will enter the minimum and maximum input voltages and corresponding scaled values displayed on the chart along with the desired chart legend. The minimum and maximum voltages must be in the range of 0.0-5.0 volts. The scaled values must be in the range of 0-10,000. Once entered, analog input scaling values are saved with the data.

Figure 16 shows settings for a typical industrial pressure sensor with 0.5-4.5 volt output range, such as the SSI Technologies P51 series. In this case, 0.5 volts

corresponds to 0 psi and 4.5 volts corresponds to 1000 psi.

Figure 16 – Analog Input 2 Scaling Example



## REAL TIME ENGINE DATA DISPLAY

When the engine is running, you can display real time engine data on an instrument panel type screen by using the View Real Time Data command on the View menu. Please note that real time engine data cannot be directly saved by means of the Shift Log program. However, this data is constantly being logged and can be downloaded (for example at the end of series of dyno runs).

Real time engine data is displayed on an instrument panel type layout with round tach and speedometer gauges and bar graph type gauges for all most other parameters. Status messages are displayed in a separate window. If the engine is not running most values will appear as zero.

Displayed parameters include (depending on display option settings):

**RPM** – engine crankshaft RPM (numeric value displayed beneath gauge)

**VSS** – vehicle speed in MPH or KPH (numeric value displayed beneath gauge)

**TPS** – throttle position (0 to 100% or 0 to 5V)

**MAP** – manifold pressure in In-Hg or psi (29.92 In-Hg or 14.7 psi corresponds to sea level atmospheric pressure)

**AFR 1, AFR 2** – if you have connected a single or dual channel wide-band system to the analog inputs, the software can display the air/fuel ratio

**INPUT 1, INPUT 2** – analog voltage (0 to 5V) on the analog inputs. Input 2 can also display custom scaled values (refer to Display Options on page 14).

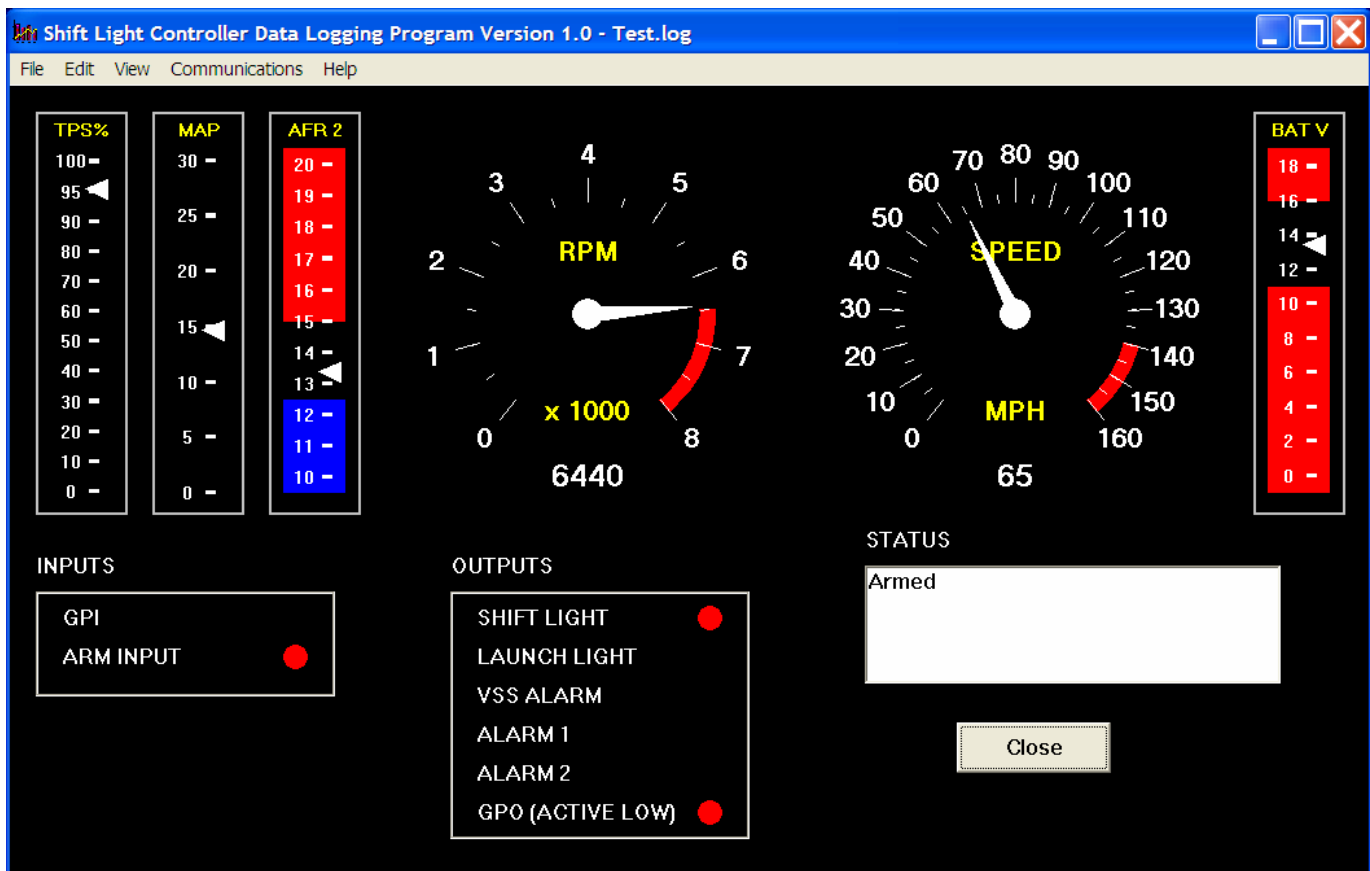
**BAT** – battery voltage

**INPUTS** – status of the inputs.

**OUTPUTS** – status of the outputs. Note that the general purpose output (GPO) is active low (switched to ground when on)

**STATUS** – general SL-1 status messages

Figure 17 – Shift Log Real Time Display



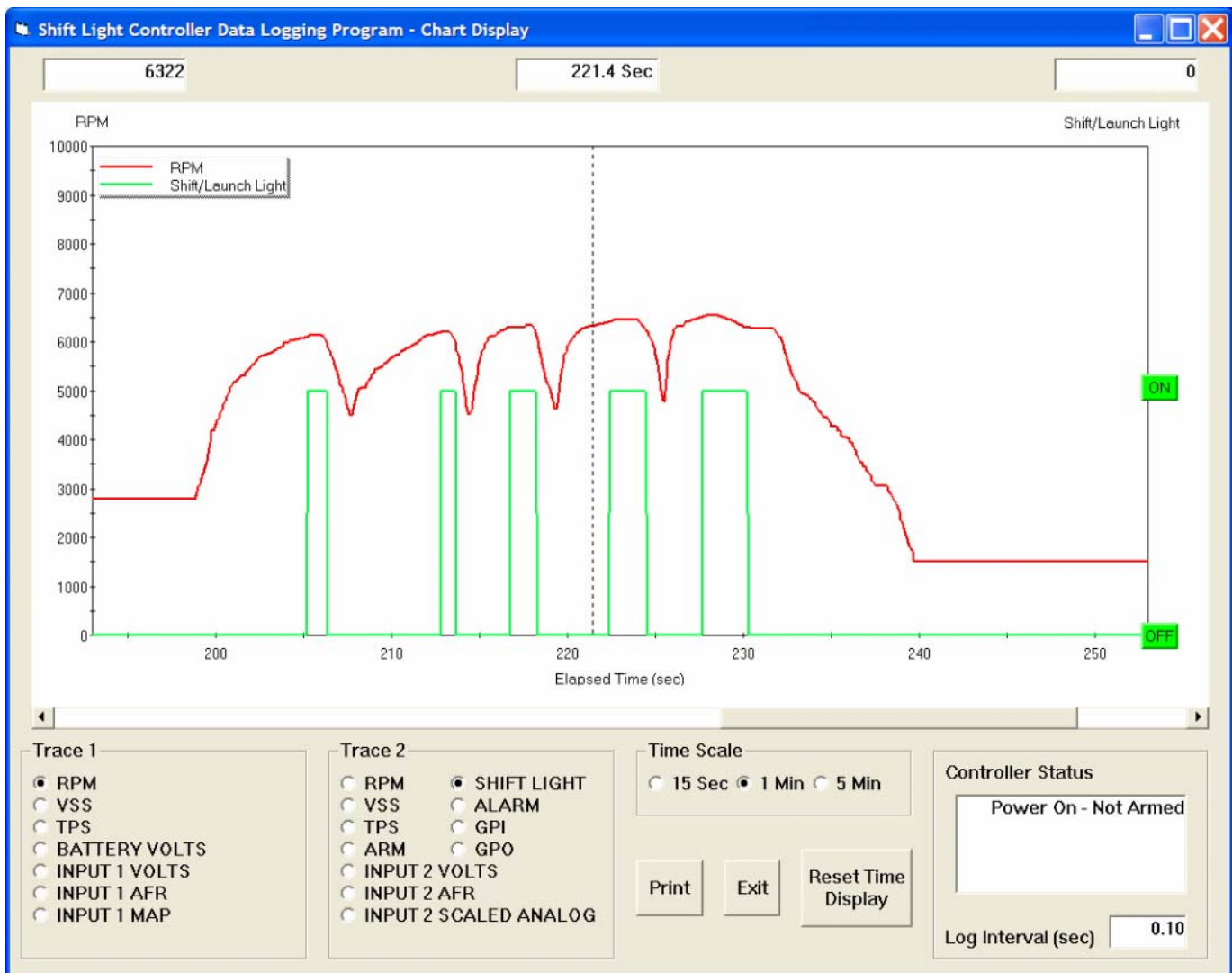
## DATA LOGGING CHART DISPLAY

You can also display data logged by the SL-1 on a chart recorder type screen. Data logged by the SL-1 must be downloaded before it can be displayed, by using the Download Data command on the Communications menu. Once data has been downloaded, it is automatically displayed. **The last data logged will appear at the right end of the chart.** You can save the data by using the Save File command from the File menu. You can display a previously saved data file by first using the Open File command on the File menu and then using the View Chart command on the View menu.

Note that SL-1 data files use a .log extension. You should create a separate folder to store these files. A sample data file (Sample.log) is included in the program folder.

You have a range of capabilities for analyzing downloaded data displayed in the chart recorder format. You can select two parameters for display. Trace 1 is displayed in red with its Y axis legends on the left side of the chart. Trace 2 is displayed in green with its Y axis legends on the right side of the chart.

Figure 18 – Data Logging Chart Display





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The X axis is always elapsed time. You can select from one of three time scales. You can use the scroll bar to move the chart display window in terms of elapsed time. If you hold the left mouse button down within the chart area, a cursor line appears. The exact values of the parameters displayed on trace 1 and trace 2 and the elapsed time appear in windows above the chart. If you want to analyze the elapsed time between two events (for example the time required to accelerate from 0 to 60 MPH), you can move the cursor to the first event and then click on the Reset Time Display button. You can print the displayed chart to any Windows printer by clicking on the Print button (a color inkjet printer is recommended for best results).

Data parameters include:

**RPM** – engine crankshaft RPM

**VSS** – vehicle speed in MPH or KPH

**TPS** – throttle position (0 to 100%)

**BATTERY VOLTS** – battery voltage

**INPUT 1 VOLTS, INPUT 2 VOLTS** – analog input voltage

**INPUT 1 AFR, INPUT 2 AFR** – air/fuel ratio based on the exhaust gas oxygen sensor reading (10:1 to 20:1). Only applicable if a wide-band system has been connected to the analog inputs

**INPUT 1 MAP** – manifold pressure in In-Hg or psi (29.92 In-Hg or 14.7 psi corresponds to sea level atmospheric pressure). Only applicable if a MAP sensor has been connected.

**INPUT 2 SCALED ANALOG** – only applicable if input 2 has been configured for a custom scaled value (refer to Display Options on page 14)

**ARM** – input displayed as a digital (on/off) signal

**SHIFT LIGHT** – status of launch and shift lights displayed as a digital (on/off) signal

**ALARM** – status of any alarm displayed as a digital (on/off) signal. When an alarm is active, a description of the alarm will appear in the controller status box

**GPI** – input level on the GPIO terminal displayed as a digital (on/off) signal. On means that the GPIO is terminal is at +12 volts

**GPO** – output status on the GPIO terminal displayed as a digital (on/off) signal. On means that the GPIO terminal is switched to ground

The maximum RPM and VSS values displayed on the chart depend on the display options settings (refer to the Display Options topic). **Caution: If these maximum values are set lower than the actual logged data, the chart cursor function will not update the display correctly.**

Additional data is displayed at the lower right side of the screen. This data includes:

**Controller Status** – general SL-1 status

**Log Interval** – the actual data logging interval in seconds

The SL-1 data buffer stores the **last** 2700 data points. With a nominal data logging interval of 0.10 seconds, this corresponds to 4.5 minutes of data. You can set the data logging interval by means of the PC Link Shift software.

You can clear the data within the SL-1 by using the Clear Data Buffer command from the Communications menu. If you change the data logging interval, you should also clear the SL-1 data buffer.

## INITIAL SETUP

1. Connect the USB cable, start PC Link Shift software, and open the sample.dat setup file.
2. Refer to page 8 for RPM Pulses/Rev setting. Enter the setting corresponding to your application and upload to the SL-1.
3. Start the engine. Start Shift Log software and use the View Real Time Data command from the View menu. Verify correct engine RPM display (should display idle RPM value same as vehicle tachometer).
4. If the RPM display is incorrect (too high or too low) but not zero, you will need to change the RPM Pulses/Rev setting. Turn off the ignition switch in between tests. If the RPM display is too low, use a lower RPM Pulses/Rev setting. If the RPM display is too high, use a higher RPM Pulses/Rev Setting. Change the setting as required in PC Link Shift and upload to the SL-1.
5. If the RPM display is zero, you may need to change the RPM signal level jumper on the SL-1 printed circuit board (PCB). Turn off the ignition switch in between tests. Remove the top cover of the SL-1 housing and refer to Figure 19. The jumper has three positions labeled 5V, TACH, and

COIL. The default factory setting is in the COIL position (for a high voltage coil signal). Move the jumper to the TACH position (for a 12V tach signal) and repeat the test. If the RPM display is still zero and your engine has coil-on-plug ignition, move the jumper to the 5V position (for a logic level signal). **Do not attempt to use the 5V position for any other type of ignition system.** If the RPM display is still zero, call tech support. Reinstall the cover. If required, go back to step 4 to establish the correct RPM Pulses/Rev setting.

Figure 19 – RPM Signal Level Jumper



- Skip this step if you are not using the VSS connection. Establishing the correct VSS scale factor in PC Link Shift will require some trial and error. Start with the default setting. Arm the SL-1 to log speed data while operating the vehicle at a known speed. Use Shift Log software and download data from the SL-1 to read the logged speed data. An alternate approach is to have a passenger monitor real time data with Shift Log. Use the following formula to calculate the correct scale factor:

$$\text{New VSS Freq} = \frac{\text{Original VSS Freq} \times \text{Speed Reading}}{\text{Actual Vehicle Speed}}$$

For example, if the original VSS frequency parameter was 145 Hz, the speed reading is 40 MPH and the actual vehicle speed is 50 MPH, then the new VSS frequency parameter should be:

$$116 \text{ Hz} = \frac{145 \text{ Hz} \times 40 \text{ MPH}}{50 \text{ MPH}}$$

You may have repeat this process several times for maximum accuracy.

- Turn on the ignition key, but **do not** start the engine. In the Shift Log software, use the Real Time Display Options command from the Edit menu and select Analog (0-5V) Throttle Position (TPS) display. Then go back to View Real Time Data. Write down the voltage levels for zero (closed) and 100% (wide open) TPS. If you want very accurate values, you can use a DVM to measure the voltage by probing between the TPS and ground terminals on the SL-1. Enter the zero and 100% TPS values in the PC Link Shift software and upload to the SL-1.
- Cycle the ignition key off/on. In the Shift Log software Real Time Display Options, change Throttle Position (TPS) to Percent (0-100). Then go back to View Real Time Data and verify that the TPS gauge goes between zero and 100% as the throttle is opened.
- Enter reasonable values for PC Link Shift controller parameters and general setup and upload to the SL-1. Additional information including setup tips for common applications is provided on our website at [www.daytona-sensors.com](http://www.daytona-sensors.com). If you can't find the information you are looking for, please contact our tech support.

## APPENDIX – RECOMMENDED PARTS AND SUPPLIERS

### WIRE

Wire supplied with most automotive accessories is usually un-tinned copper with a low number of strands. The unprotected copper in this inexpensive wire quickly oxidizes, especially when in contact with dissimilar metals on terminals. The low number of strands limits life in applications where flexing occurs. We recommend the use of high quality industrial grade wire with tinned copper strands and a high strand count.

18-20 AWG sizes can be used for all signal and low current applications. 16-18 AWG is adequate for purge solenoid wiring. 14 AWG should be used for high current fuel and nitrous solenoid wiring. Carol UL grade 1007/1015 wire is available from Digi-Key.

P/N	Description
C2040X-100	20 AWG wire (100 foot spool)
C2064X-100	18 AWG wire (100 foot spool)
C2104X-100	16 AWG wire (100 foot spool)
C2105X-100	14 AWG wire (100 foot spool)

Note: replace X with color code B=Black, W=White, R=Red, G=Green, A=Orange, Y=Yellow, L=Blue, N=Brown, S=Gray, V=Violet

### WIRE LABELS

To avoid confusion and possible serious problems, all wires going into terminal blocks must be uniquely identified, either by wire color or wire labels (also called markers). Using a single wire color (white is preferred) along with wire labels is the most cost effective solution. A Panduit write-on type label dispenser is available from Digi-Key. Use a fine point permanent marker to write on these labels.

P/N	Description
298-1295	Panduit PLDR-1 label dispenser with 1.00" x 0.38" write-on area

You can also use Avery P/N 15510 weatherproof white labels (1" x 2-5/8") available at Office Depot and other office supply stores. Cut these in half and fold over the wire to make a flag style label.

### CRIMP TERMINALS

High quality crimp terminals and a proper crimping tool are required to make reliable electrical

connections. Crimp terminals commonly sold in automotive and hardware stores have brittle vinyl insulation that easily cracks. We recommend the use of high quality industrial grade nylon insulated crimp terminals. The following parts are available from Digi-Key.

P/N	Description
A27241	16-20 AWG #10 ring tongue terminal
A27246	16-20 AWG 1/4" ring tongue terminal
A27248	16-20 AWG 3/8" ring tongue terminal
A27262	14-16 AWG 1/4" ring tongue terminal
A27264	14-16 AWG 3/8" ring tongue terminal
A0911	18-22 AWG .110" female quick disconnect terminal
MNU18-187DFIK	18-22 AWG .187" female quick disconnect terminal
MNU18-250DFIK	18-22 AWG 1/4" female quick disconnect terminal
MNU14-250DFIK	14-16 AWG 1/4" female quick disconnect terminal
A1069	16-22 AWG butt splice
A1080	14-16 AWG butt splice
A1086	10-12 AWG butt splice

### SWITCHES

Safety and reliability concerns dictate the use of rugged industrial quality switches. Low profile rocker switches are preferred for automotive applications. We recommend the C&K DM series miniature rocker switches available from Mouser Electronics. The DPST version is ideal for use as an arming switch.



P/N	Description
DM62J12S205PQ	DPST
D105J12S205QA	SPDT momentary

Use the A0911 .110" female terminals for the DPST switch and the MNU18-187DFIK .187" female terminals for the SPDT momentary switch. Mouser Electronics sells a wide range of high quality switches.

If you require a different style switch, we suggest that you order their catalog.

## RELAYS

The typical import brand 30-40 amp relays leave little safety margin. When used to switch heavy inductive solenoid loads, arcing can result in the contacts welding together – a potentially catastrophic failure mode. We recommend using Tyco/P&B automotive OE grade relays available from Newark Electronics and Digi-Key. Use the 40 amp version for most applications and the 70 amp version for fuel/nitrous solenoid activation. We recommend that you use the relay sockets and crimp terminals listed along with the relays.

P/N	Description
1432791-1	40 amp VF4 series relay
VCF4-1001	Socket for VF4 series relay
60249-1	12-16 AWG terminal for VF4
VF7-41F11	70 amp VF7 series relay
VCF7-1000	Socket for VF7 series relay
42281-1	14-18 AWG terminal for VF4 coil connections (2 required)
280756-4	10-14 AWG terminal for VF7 contact connections (2 required)

## FUSES AND FUSE TAPS

ATC series fuses and fuse holders commonly used for automotive applications are only available in 40 amp and lower ratings. For high current applications, we recommend the heavy duty 50 amp Littlefuse Maxi Fuse series available from Digi-Key.

P/N	Description
F1085	Maxi fuse block
F1038	50 amp Maxi fuse

Fuse taps are a convenient means of accessing switched +12V power. Solder the tap onto the fuse and use a female quick disconnect terminal for the new connection. Fuse taps are available from State Wire and Terminal.

P/N	Description
ATC-TAP	Fuse tap for ATC standard size fuses
ATM-TAP	Fuse tap for ATM mini fuses

## RELIABLE CONNECTIONS TO EXISTING SIGNALS

To connect the SL-1, you will have to tap into some existing signal wires on the vehicle. We caution against using any of the so called “vampire clips” that make an insulation displacement connection. These have proven very unreliable in racing applications. They may even cause the original wire to fray and break. We suggest a soldering any connections to existing signals. Use a stripping tool to cut through and push back about 1/4” of insulation at the spot on the original wire where you plan to make the connection. Wrap several turns of the new wire around, solder, insulate with self vulcanizing electrical tape, and use two cable ties to secure the splice as shown. Regular electrical tape will tend to unravel. Self vulcanizing electrical tape is available from Digi-Key as their P/N W213.



## SUPPLIERS

Suppliers referenced in the Appendix are listed in the table below. Additional suppliers for connectors, electronic tools, mechanical hardware, and test equipment are listed on our website at [www.daytona-sensors.com/tech\\_tools.htm](http://www.daytona-sensors.com/tech_tools.htm).

Supplier	Phone	Website
Digi-Key	1-800-344-4539	<a href="http://www.digi-key.com">www.digi-key.com</a>
Mouser	1-800-346-6873	<a href="http://www.mouser.com">www.mouser.com</a>
Newark	1-800-463-9275	<a href="http://www.newarkinone.com">www.newarkinone.com</a>
State Wire & Terminal	1-800-922-6527	<a href="http://www.statewire.com">www.statewire.com</a>