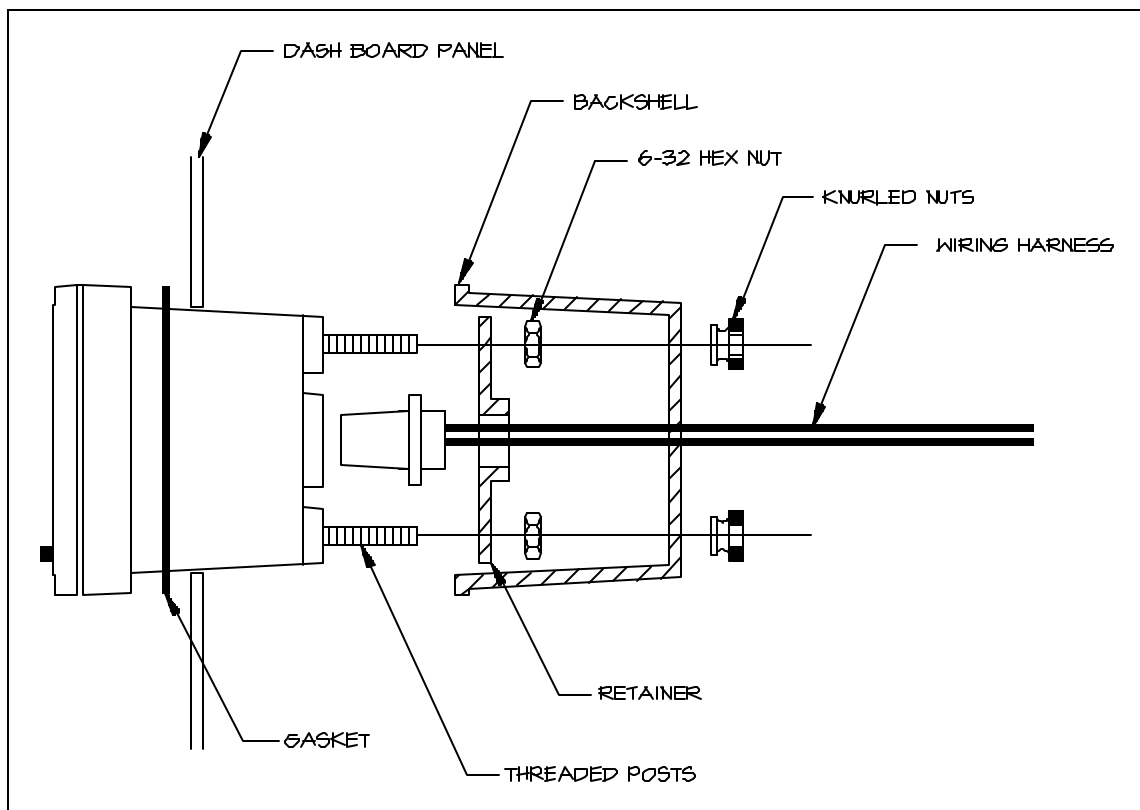# Avenger 1 Installation

Hardware Installation

The Avenger mounts in a standard 2 1/16" instrument bay as follows:

1) Remove the knurled nuts, backshell, and hex nuts from the threaded posts on the back of the unit.
2) Note the position of the clear plastic retainer. This piece must be installed correctly to maintain water seal.
3) Verify that the unit fits in the desired position in the dash.
4) Verify that the square gasket is in place at the front of the round part of the unit.
5) Holding the the Avenger right side up and looking at it from the back, remove the retainer and slide it over the wiring harness with the EGT 1 cable on the right, EGT 2 on the left, and the power/tach/remote switch connector through the center hole.
6) Plug the connectors into the back of the unit and slide the retainer down over the threaded posts so that the flat side of the retainer seats the connectors in their sockets.
7) Secure the retainer firmly with the two hex nuts supplied.
8) Run the wires through the dashboard hole.
9) Slide the wires, now behind the dash, through the backshell.
10) Slide the Avenger into position in the dash. The square gasket should be between the unit and the front of the dash.
11) Move the backshell up the wiring harness and slide it onto the back of the unit.
12) Finger tighten the knurled nuts provided on the rear threaded posts to secure the Avenger.
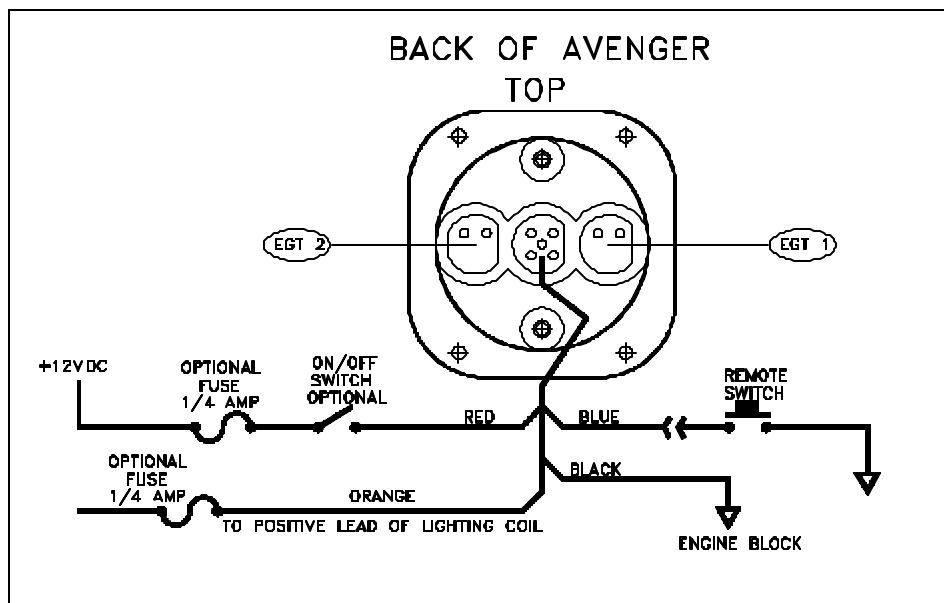
Routing Power and Sensor Cables

Route the power and sensor cables to the Avenger, keeping all wires as far as practical from heat sources and ignition wires. Connect the wires in the order listed below:

- Black - The black wire is ground and must be connected directly to the engine.

- Orange - The orange wire provides both tach signal and power. Connect this wire to the positive lead from the lighting coil.

Warning: Failure of the sled's voltage regulator may damage the Avenger. The use of fuses as shown below may help prevent such damage.

- Blue - This wire connects to the blue wire on the optional Remote Switch. If you do not have a remote switch, coil this wire out of the way.

- Remote Switch Black - If you have the optional Remote Switch, connect its black wire to the engine or to an instrument ground wire.

- Red - The red wire optionally supplies +12V DC to the unit. Note that the unit is on whenever +12V DC is supplied. The Avenger requires very little power, but will eventually drain the battery if stored with the power on.

Warning: Do not connec the red wire to the lighting coil. Connecting the Red wire to the lighting coil will damage the Avenger.

Connecting Power

Connect and secure all other wires before attaching the red wire. Failure to connect the power wire last may result in damage to the unit or the vehicle.
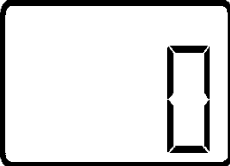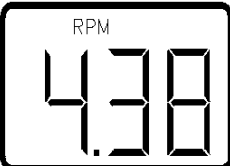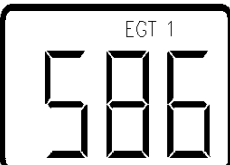
Connecting Exhaust Sensors

Install the EGT sensors as close as convenient to the header flange.

Avenger I Operation Manual

Getting Started

Follow the enclosed installation guide to mount the RacePak Avenger 1 or Hot Tach on your vehicle.

Your RacePak turns on automatically when power is applied and turns off when power is removed. Verify all connections and apply power to your RacePak. The unit's display should flash and enter Run Mode:
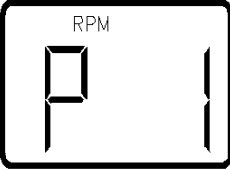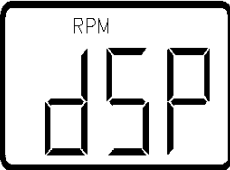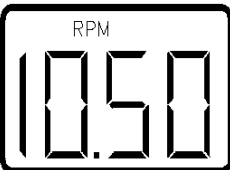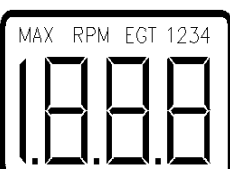
0	The first time you turn on your RacePak it may show only a 0. This display indicates that the unit has never been set up. Once you follow the procedure in Initial Setup the instrument will skip directly to the next step. Press & **Hold** the Display button and release it when the display blanks.
RPM **4.38**	The unit should display the current engine RPM. The figure at left shows 4380 RPM. Don't worry if your RPM looks wrong or reads 0; we'll correct it during Initial Setup below. Press the Display button and release it when the display blanks.
EGT 1 **586**	The unit should now show you the current temperature of EGT1 in degrees Fahrenheit. Press Display again to show EGT2.
EGT 2 **1207**	The display should now show you the current temperature of EGT 2. Press Display again to show the MAX EGT
MAX EGT 2 **1207**	The display should now show the temperature of the hottest EGT. In the example on the left, the unit shows EGT2 at 1207 since it is hotter than EGT1 at 586 degrees. Press Display again to return to RPM
RPM **4.38**	Your RacePak is back to showing engine RPM. Hold the Display button to turn off the backlight. The backlight should turn off when you release the button after about 3 seconds of holding it. Hold Display to turn the backlight on again.

Pressing and Holding Buttons

The RacePak recognizes two types of button action: **Press** and **Hold**. **Press** means press the button and release it after about half a second. **Hold** means press and hold the button for about 3 seconds. The RacePak acknowledges that a button has been pressed by blanking the display. When the the unit recognizes a **Hold,** it restores the display.
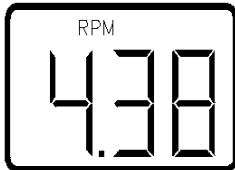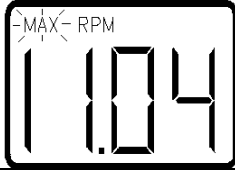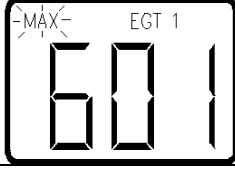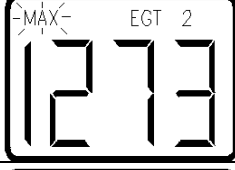
Initial Setup

In order to compute RPM your RacePak must know how many ignition pulses are generated during each revolution of the engine. Follow the steps below to set the RacePak to work on your vehicle.

RPM **4.38**	Apply power to the unit. It should show engine RPM. (If the RacePak has never been set up it will show only a 0. Follow this procedure as though it showed RPM.) Hold the Mode button until the display blanks and comes back on, about 3 seconds. Release the Mode button to enter Setup Mode.
RPM **P 1**	When you release the Mode button, the display should show the number of ignition pulses your RacePak expects to see each engine revolution. Press or hold Display to step to the next pulse number. Select 0 if your ignition system generates 1 pulse per two revolutions. One pulse per revolution is a good first guess. See Troubleshooting for more detail. Press Mode to step to the next Setup option.
RPM **dSP**	This option lets you select RPM, EGT1, EGT2, or MAX EGT as the channel to view when the RacePak is first turned on. Press Display. Repeat until the desired channel appears. Press Mode to step to the next Setup option.
☼ RPM **10.50**	The warning LED tells you that you are setting an overlimit warning level -- RPM in this case. If Engine RPM exceeds this value, the unit will switch to display RPM and flash the warning light. Press or hold Display to change the warning level. Select 18.00 to disable the RPM limit. Press Mode to step to the next Setup option.
☼ EGT 1 **1225**	This is the warning limit for EGT1. Press or hold Display to change the warning level. Select 1600 to disable the EGT1 limit. Press Mode to step to the next Setup option.
☼ EGT 2 **600**	This is the warning limit for EGT2. Press or hold Display to change the warning level. Select 1600 to disable the EGT2 limit. Press Mode to save any changes and end Setup. To exit Setup Mode without saving the changes, disconnect power from the gage.
☼ MAX RPM EGT 1234 **1.8.8.8.**	The RacePak flashes the display and the warning light to acknowledge the new Setup.

Repeat these steps to change any setup option.

Viewing Max Readings

Your RacePak constantly keeps track of the highest reading on each channel. Follow the steps below to view these peak values.

RPM 4.38	With the unit in Run Mode showing RPM, press the Mode button to enter MAX Mode. Note: You can enter MAX Mode while displaying any channel. RPM is chosen here only as an example.
-MAX- RPM 1.04	The unit now flashes MAX in the display to indicate that the readings are MAX, not current, values. The display now shows the highest RPM it has recorded since it was turned on. Press the Display button to show MAX EGT1.
-MAX- EGT 1 601	The display now shows EGT1's highest value. Press the Display button to show MAX EGT2.
-MAX- EGT 2 1273	The display now shows EGT2's highest value. Press the Display button to show the highest MAX EGT.
-MAX- EGT 2 1273	The display now shows the highest value either EGT has reached since the unit was turned on. The 1 or 2 indicates which channel recorded the peak value. Press the Mode button to return to Run Mode. Hold Mode to clear the MAX readings before returning to Run Mode..
MAX EGT 2 1207	MAX stops flashing and the display now shows the current temperature of the hottest EGT. **Note**: If there is a recorded run, the RacePak will enter Playback Mode instead of Run Mode. See Viewing Recorded Data below for details.

Clearing MAX readings

The RacePak automatically clears all MAX values to zero when it is turned on. To reset the peak values without turning off the unit, enter MAX Mode as outlined above. If you hold the Mode button to return to Run Mode, instead of simply pressing it, the unit resets the MAX values.

Overlimit Warnings

The RacePak compares each reading of each channel to the alarm limit programmed in Initial Setup above. If any channel exceeds its limit the unit flashes the warning light and displays that channel. If more than one channel is in alarm, the unit shows each in turn.

Temporarily Disabling Alarms

Press the Mode button to temporarily clear all active alarms. The RacePak disables the alarm for any channel that is over its limit when you press the Mode button. Note that to enter MAX Mode while a channel is in alarm requires pressing the Mode button twice: once to clear the alarm and once to enter MAX Mode.

Re-enabling Temporarily Disabled Alarms

All alarms are enabled when the unit is turned on or when you leave MAX Mode. See Viewing Max Readings above for details on MAX Mode.

The Optional External Switch

The external switch allows you to switch the display and to record a 356 second run.
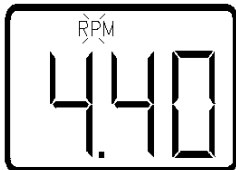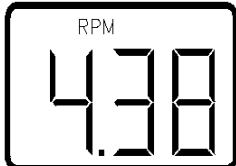
Changing the Display

In Run and MAX Modes, pressing the external switch steps the unit to the next display just as pressing the Display button would.

Recording a Run

RPM 4.38	With the unit in Run Mode, hold the external switch until the R starts flashing. When you release the switch your RacePak will begin recording data.
RPM 4.38	The flashing R indicates that your gage is currently recording data. The unit records for 356 seconds or until you press the Mode button and enter MAX Mode. Note: See Viewing Max Readings and Temporarily Disabling Alarms for details on entering MAX Mode.
RPM 4.38	When the R stops flashing, the recording is complete. Your RacePak stores the recorded run until you either record a new run or modify the unit's setup (See Initial Setup above). **Turning the unit off does not clear the recorded run.**

Viewing Recorded Data

RPM 4.38	With the unit in Run Mode showing RPM, press the Mode button to enter MAX Mode. If any alarms are active you must press Mode a second time to enter MAX Mode. See Temporarily Disabling Alarms. **Note**: You can enter MAX Mode while displaying any channel. RPM is chosen here only as an example.
MAX RPM 11.04	The unit now flashes MAX in the display. Press Mode. If the unit has a recorded run it enters Playback Mode to display it. The unit returns to Run Mode, as in Viewing Max Readings above, if there is no recording.
RPM 4.38	The display now shows the RPM recorded in the first frame of data. The flashing P indicates that the unit is in Playback Mode showing recorded data. Press the Display button to show the EGT1 recorded in the first data frame.
P EGT 1 586	This is the EGT1 reading recorded during the first frame. Press Display to show EGT2. Press again for MAX EGT. Press Display again to show RPM.
RPM 4.38	The display again shows the RPM recorded in the first frame of data. Press the external switch to step to the second recorded frame.

RPM 4.40	The display now shows the RPM recorded during the second frame. To replay the run at full speed, hold the external switch. Release the switch to pause playback. To exit to Run Mode, press Mode.
RPM 4.38	When the recording is over, the P stops flashing and the unit returns to Run Mode. To view the run again, re-enter Playback Mode as above.

Troubleshooting

The following table lists some common problems and likely solutions:

Unit will not turn on.	Make sure power is getting to the unit. Check the fuse.
RPM or EGT is unstable.	Check that the ground wire goes directly to a good engine ground. Check that the cables are routed as far from ignition or kill wires as possible. If EGT readings are stable and correct when the engine is not running, the problem is almost certainly one of the above.
RPM is stable, but too high or too low.	The value for P in Initial Setup does not match your ignition. Follow this procedure to determine the correct setting: 1) Set P to 1. (See Initial Setup above to change P.) 2) Briefly run the engine at about 2000 RPM and note the RPM reported by the gage. 3) If the gage read too high, round the reported RPM to the nearest 2000 and skip to step 5. Example: If the gage read 5.60, round to 6.00. 4) If the gage reads low, the value to use for P should be 0. 5) Set P to **half** the value from step 3 or to 0. Example: If the rounded RPM was 6.00, set P to 3. 6) Run the engine and check the RPM. If it still seems wrong, contact your dealer for assistance.
RPM is 0.	Make sure that the RPM pickup wire is connected correctly.
Display button will not change display.	If the Alarm light is flashing, the unit has overridden the Display button to show an over limit channel. Press Mode to temporarily clear the alarm. See Overlimit Warnings for details.