Avenger II and III Installation and Operation Manual

Quick Check

Please turn your Avenger on and off before installation to ensure that the unit is operating properly.

RPM 1	MAX EGT 1
0.00	-99
	oFF

Press and release the ON button. The LCD displays should flash twice and then show the values at left. LCD 1 (on the left) shows 0.00 thousand engine RPM on RPM channel 1. LCD 2 shows that the highest EGT is channel 1 at -99° F. -99° is the normal reading when there is no thermocouple connected.

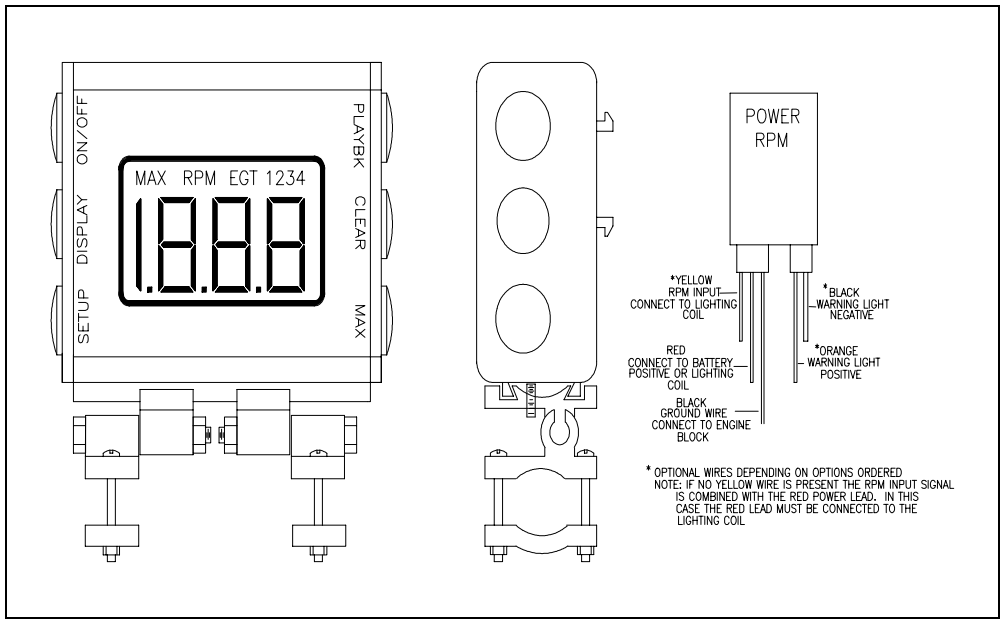
Press ON and release it while LCD 2 shows oFF. The unit will shut off. This may take a few tries. If you hold the button long enough for LCD 2 to change to rEc, release the button and try again.

If the unit does not operate, please contact your dealer for instructions.

Hardware Installation

Select a mounting position that does not interfere with operation of the sled and will not pose a hazard to the driver should an accident occur.

Mount the Avenger to the sled using the bracket supplied as shown in the illustration. Rotate the mounting brackets to the orientation which works best for your application.



Routing Power and Sensor Cables

Route the power and sensor cables to the Avenger, running all wires as far as practical from the ignition wires and heat sources. Take care that the wiring not interfere with operation of the sled. After the cabling is secure as described below, wrap the bundles with the spiral-wrap provided. Once the power cables are properly connected, the unit turns on automatically when power is supplied. See Auto-On below for additional information.

Connecting Power

The power, engine RPM, and optional warning light wires share a single connector. Plug the connector into the Avenger as shown on the back of the unit. Route the wires and connect as shown in the illustration. Please note that the basic Avenger connector has only the red and black wires. On these systems the red wire should be connected to the lighting coil and the black wire to engine ground.

Connecting Exhaust Probes

Install the EGT probes as detailed in the instruction sheet included with the probes. Plug the EGT connectors into the sockets marked EGT 1, 2, 3, and 4 on the back of the Avenger.

Initial Setup

Your Avenger was factory configured to display the engine RPM and EGTs. You must, however, tell the Avenger how many pulses are generated by the lighting coil during each revolution of the engine. Set this value as shown below:

RPM 1	MAX EGT 1
0.00	-99
RPM 1	
P1	1

Press and release the ON button. The display should flash twice and show the values at left.

Press and release SETUP to enter SETUP mode and display the number of pulses per engine revolution. Use the arrow buttons to adjust the number, if necessary. Press REPLAY to return the display to RUN mode.

In most cases P1 should be set to double the number of engine cylinders. If this does not work use the method below to determine the correct value,

1) Set P1 to 1, as described above, and start the engine.
2) Compare the reported RPM with the actual RPM. The Avenger will report either half the correct RPM or it will show that the RPM is some number of times higher than it actually is. Note this error factor. Often this factor will be the same as the number of cylinders. (Ex:. If the RPM reads 3300 when it is really 1100, note that it is 3 times too high.)
3) Set P1 to the error factor from line 2. (Ex: Set P1 to 3, in the example above.)

To customize your unit further see *Customizing the Avenger*.

Operating the Avenger

While your Avenger is acting as a dashboard instrument -- showing real-time data -- the buttons have the following effects:

ON RECORD	Turns the unit on. When pressed and released, ON turns the unit off. When pressed and held for more than a half second, starts recording data on release. (The R on LCD 1 flashes while the Avenger is recording.)
DISPLAY LIGHT	The Avenger stores 10 display sets. Each display set consists of a pair (or triplet, for the Avenger III) of channels to show on the LCDs. When this button is pressed and released the Avenger switches to the next display set. (See *Customizing the Avenger* for information on customizing the display sets.) When pressed and held, this button turns the backlight on or off. Note that external power must be present to run the backlight.
SETUP	Enters SETUP mode. (See *Customizing the Avenger* for details.)
REPLAY	Enters REPLAY mode. Press again to return to RUN mode. (See *Viewing Recorded Data* below.)
CLEAR	Acknowledges all overlimit sensor channels. If there are no channels in unacknowledged overlimit, CLEAR resets the MAX and snapshot memories. CLEAR does **not** erase the current recording.
MAX	Recalls and displays the MAX data for each channel. The next three presses display snapshot memory.
REMOTE SWITCH	Stores a single-frame snapshot to be viewed with MAX. Can be reprogrammed in SETUP mode to act as DISPLAY or RECORD button presses. Starts recording data if held for ½ second.

Alarms

Each channel has a user-specified alarm limit. If a channel exceeds its limit, the Avenger warns you by overriding the current display set with a flashing display of whichever channel is in overlimit. If the optional Warning Relay or Warning Light is installed it is also flashed to indicate the overlimit condition.

Memory Store

The optional Remote Switch allows the user to store up to 3 snapshots of data. These snapshots can be viewed using the MAX button.

Recording Data

To record a 25 seconds of data, press RECORD and release it when LCD 2 shows rEc. The Avenger flashes the R on LCD 1, but otherwise operates normally for 25 seconds while it records data.

Viewing Recorded Data

To replay the recorded run, press REPLAY. While the Avenger is in REPLAY, the P on LCD 1 flashes and the buttons have the following effects:

ON RECORD	Turns the unit off or begins recording new data..
DISPLAY	Switches to the next display set.
REWIND	Rewinds to the start of the stored run.
RUN	Exits REPLAY mode and reverts to displaying real-time data. (see *Operating the Avenger* above.)
PLAY ⇑	Steps one frame (1/5th second) forward in the stored run when pressed and released. To play the recording at full speed, hold this button down. The P on LCD 2 flashes to indicate full speed playback.
PLAY ⇓	Steps one frame backward in the stored run when pressed and released.
REMOTE SWITCH	Begins recording new data.

Customizing the Avenger

Press the SETUP button to customize your Avenger's behavior. Adjust the value on LCD 2 using the arrow buttons. Accept the current value and advance to the next entry by pressing SETUP. Except where otherwise noted, pressing REPLAY accepts the current entry and returns to RUN mode. The SETUP entries are:

RPM 1 P1	1	Number of engine pulses per revolution. See ***Initial Setup*** above for more information.
RPM 2 P2	1	Optional RPM 2 required. Number of RPM 2 (jack shaft) pulses per revolution. This should be the number of magnets in the jack shaft collar.
R 12 FAc	1.00	Optional RPM 2 required. Gearing ratio between transmission output shaft and jack shaft pickup. RPM1/RPM2 ratio is calculated by the formula RPM1 ÷ (RPM2 × factor).
RPM 1 Li	RPM 1 10.00	Alarm limit for engine RPM, in thousands of RPM. The Avenger warns you when engine RPM exceeds this value.
EGT 1 Li 1	EGT 1 1450	Alarm limit for EGT 1. The Avenger warns you when EGT 1 exceeds this value.
EGT 2 Li 2	EGT 2 1450	Alarm limit for EGT 2. The Avenger warns you when EGT 2 exceeds this value.
EGT 3 Li 3	EGT 3 1450	Alarm limit for EGT 3. The Avenger warns you when EGT 3 exceeds this value.
EGT 4 Li 4	EGT 4 1450	Avenger III required. Alarm limit for EGT 4. The Avenger warns you when EGT 4 exceeds this value.
1 LAn	1 0.00	Optional Analog channel required. Alarm limit for the analog channel. The Avenger warns you when the analog channel exceeds this value.
RPM 1 d. 1	MAX EGT 1 L 1	Allows customization of the ten display sets. LCD 1 shows d and the number of the display set to be modified. LCD 2 shows L and the number of the LCD within the display set. The display type indicators show the channel currently selected for each LCD. The flashing decimal point highlights the LCD to be modified. Use the arrow keys to select a channel to display on the current LCD during normal operation. See ***Display Types*** below for descriptions of the channel indicators and display types. Press SETUP to advance to the next LCD or display set. Press REPLAY to jump directly to MAX OFF and skip past the rest of the 10 display sets.
MAX OFF	10	**Auto-off feature.** Number of minutes that the Avenger will remain on with no engine RPM and no button presses.
inP	M 123 SAu	Action of the optional external switch. The options are: save a snapshot of data (SAu), start recording (rEc), or select next display set (dSP). A press and hold of the switch always starts a new recording.
M CAL	660	Optional RPM 2 required. Number of RPM2 pulses per 1/8th mile. This value must be correct for the Avenger to display MPH. You can enter this value in one of two ways: 1) Determine the number of jack shaft revolutions in 660' (1/8th mile) and use the arrow keys the enter the result. 2) Mark off a straight 660' run. Press RECORD and slowly drive the 660'. Press SETUP at the end of the 660' run to save the counted RPM pulses.

Display Types

The display types are represented by the following characters on the LCDs:

RPM 1	Engine RPM.
RPM 2	Optional RPM 2 required. Jack shaft RPM.
M	Optional RPM 2 required. MPH as calculated from RPM 2 and CAL.
MAX EGT	Temperature of hottest EGT.
EGT 1-4	Temperature of EGT 1-4.
1	Optional Analog channel required. Value from transducer on the analog channel.
R 12	Optional RPM 2 required. Ratio of RPM1 to RPM2. Formula is RPM1 ÷ (RPM2 × factor).
RP	Elapsed time into the recording, expressed in tenths of a second. (e.g. 108 represents 10.8 seconds into the recording.)
<blank>	No channel is displayed on this LCD. If all LCDs in a display set are blank, the whole set is skipped during operation.

Avenger Power-on Features

Auto-On

The Avenger turns on as soon as external power is supplied to it. If you do not want the Auto-On feature, please contact your dealer to arrange for a replacement unit before installing the Avenger.

Advanced Setup

Advanced setup mode allows you to change several infrequently changed options. To enter this mode, turn the unit on while holding the SETUP button. The Avenger steps through the entries below:

2 09	05A
M Lo	OFF
RPM 1 rEc	7.00
RPM 1 odd	1
1 OFF	1.00
1 SCA	600
1 dEc	6.00
MAX M En	On

Version number of the ROM software. The left-hand display also shows the number of LCDs.

Determines which 3 snapshots the Avenger stores. ON stores the first 3 snapshots. OFF stores the most recent snapshots.

RPM record threshold. The start of recording is delayed until engine RPM exceeds this value. While the recording is delayed LCD 2 shows a flashing R.

Odd-fire number. Number of actual pulses required for each software pulse. This value is used only for non-even-fire engines.

The next 3 entries configure the optional analog channel. See Programming the Optional Analog Input below for more detail. Offset is the voltage at a value of 0 for the optional analog transducer.

Scale is the engineering value of the optional analog transducer at 5 volts.

The arrow key toggles the decimal point on and off for display of the optional analog channel.

The arrow keys toggle the optional Extended Memory On and OFF. This control is only shown if the unit has the Extended Memory option.

Programming the Optional Analog Input

The Avenger's analog channel must be configured in Advanced Setup to read an attached transducer. There are 3 parameters used to describe a transducer to the Avenger:

1) The *offset* is the output voltage supplied by the transducer to indicate a value of 0. Example: RacePak's pressure transducers supply 1.0V at 0 PSI. Set the Avenger to 1.00.
2) The *scale* is the engineering value of the transducer when it has an output of 5 volts.
3) The *decimal* entry toggles the display's decimal point.

Master Clear

Holding the CLEAR and ON buttons while turning on the Avenger resets all options to the factory defaults. This feature erases all customizations you have made to your Avenger.

Charging the Internal Batteries

The Avenger recharges itself from the lighting coil or from external battery power, depending on the installation. It takes under ten hours for the batteries to charge fully and once charged the batteries will run the unit without external power for about 4-5 hours.

For trail sleds, normal use should be sufficient to keep the batteries charged. Sleds that are used for only short periods at a time (e.g. drag sleds) will require some other battery charging system. Contact your dealer for information about CSI/RacePak's battery charger.

If you power your Avenger with an external battery, please make sure that the unit's red wire is not supplied with power when the sled is not in use. The Avenger's recharge circuit will drain the external power source even when the unit is turned off.

IMPORTANT!!! Before storing your Avenger for long periods of time you should fully discharge the internal Ni-Cad batteries. To do this, enter advanced setup mode and disable the **auto-off** feature by changing the time off value to 0 and leaving the unit on until it quits.

The following information pertains to available options only. These features must be purchases separately. Contact your dealer for ordering information and pricing.

Second RPM

Overview

The second RPM option adds several new features to your Avenger 2 or 3. Each of these features is represented by a new display type described in the table below:

RPM	2	Jack shaft RPM.
R	12	Ratio of RPM1 to RPM2. The formula uses the ratio factor entered in Setup mode: Ratio = RPM1 ÷ (RPM2 × factor).
M		MPH as calculated from RPM 2 and the CAL value entered in Setup mode.
M	2	Distance traveled (in feet or miles) as calculated from RPM2 and CAL.

In order for the speed and odometer functions to operate properly, the CAL and P2 values in Setup must be set correctly. See **Customizing the Avenger** above.

Installation

Install the supplied collar onto the jack shaft. Make sure the collar fits snug and cannot slip. If the collar does not fit properly contact your dealer to obtain a correctly sized collar. Plug the RPM 2 cable into the Avenger port labeled **RPM 2**. Route the cable down to the jack shaft collar making sure you avoid any obstacles that may damage the cable. Mount the sensor so that it is directly over the collar and has 0.050" to 0.075" air gap.

Odometer

The M2 (odometer) display type behaves differently in Playback mode than it does in Run mode. In Playback mode the M2 display shows the number of feet the track has traveled since the start of the recording. In Run mode M2 reports the distance, in miles, since the odometer was reset. The following actions affect the odometer count:

- Performing a Master Clear resets the odometer count to 0.
- Changing the CAL value in Setup mode resets the odometer to 0.
- Exceeding about 4 million stored pulses resets the odometer to 0. (4 million turns is about 750 miles at 1 turn per foot.)
- Every turn of the jack shaft while the unit is in Run or Record modes adds to the odometer count. Jack shaft turns that happen while the unit is in Playback mode are ignored.

PC Download Option – Avenger III Only

Overview

The Download Option allows you to analyze run data on a PC. It includes:

- the Extended Memory Option, which increases record time to over 12 minutes
- Windows 95/98 data analysis software for your PC. See the back of this manual for minimum PC requirements
- a cable and adapter to transfer data from the Avenger to your PC's serial port.

Installing the PC software on a PC with Windows 95/98

1) Turn the computer on.
2) Insert the CD-ROM into your CD drive. If you have auto insertion notification enable, the installation program will run automatically. If this is the case skip to step 6.
3) If the installation program does not begin automatically, click the Start button and then select Run.
4) Type X:SETUP in the text box marked Open. X represents the drive letter of your CD-ROM drive.
5) Click OK.
6) Follow the on screen instructions to complete the software installation.
7) To start the software double-click the Racepak icon

8) The first time you start the DataLink software you will be prompted for a license disk. When prompted, insert the license disk in your floppy drive and select OK.

Configuring the software for your PC

Before the first download you must:

1) Determine which of your PC's COM ports you will use with your Avenger 3.
2) Start the Racepak program.
3) Select **Settings** from the menu bar.
4) Select **Preferences** from the drop-down box.
5) Under **Logger COM Port,** select the serial port you will be using under -- COM 1, COM 2, COM 3, COM 4 -- and press OK.
6) If you are not sure of the COM port you are using try COM 1 first.

The software is now ready to download data from your Avenger using the COM port you selected.

Recording and downloading data

Follow the steps below to record a run and download it into your PC:

1) Turn on the Avenger.
2) Press and hold the ON/RECORD button until the center display shows **rEc**.
3) Release the ON/RECORD button. The **R** in the leftmost window should now be flashing. This indicates that the unit is recording.
4) Allow the unit to record for at least 30 seconds, then press and release the Replay button. The **P** in the leftmost window should flash to indicate that the unit is in Playback Mode. Entering Playback Mode ends the recording.
5) Turn the Avenger off by holding the ON button and releasing it while the center display shows **oFF**.
6) Connect the provided serial cable and adapter between the COM port on your PC and the Avenger port marked **Serial Printer**.
7) Turn on the PC and start the RacePak program.
8) Turn on the Avenger.
9) Click the green page icon in the upper left corner of the tool bar.
10) Select the configuration to use. You should select the serial number of your Avenger in the left box and **Avenger** in the right box.
11) Press and hold the REPLAY button on the Avenger until the dialog box on your PC screen reports that it is receiving data.
12) When the Avenger has finished transferring data, follow the on screen instructions to complete the upload.
13) Turn off the Avenger and unplug the data cable.
14) Instructions on using the PC software is include the blue manual marked **DataLink Lite**.

Printer Output Option - Avenger III Only

Overview

The Avenger printer output option allows you to send recorded run data from your Avenger to a serial printer.

Hardware Installation

The printer's serial port must be set to 9600 baud, no parity, 8 data bits, and 1 stop bit. See your printer manual for details on configuring your printer.

Using the Printer Option

To send stored data to the printer, connect the printer cable and hold the REPLAY button until Snd Prn shows on the Avenger. When you release the REPLAY button the Avenger switches to playback mode and prints the data. Press any key to stop the printout.

If the Avenger detects a printer error it will stop and wait for you to correct the problem. Press any button to return to playback mode.

To print another copy of the recorded data, hold REPLAY and repeat the steps above.

Extended Memory Option – Avenger III Only

Overview

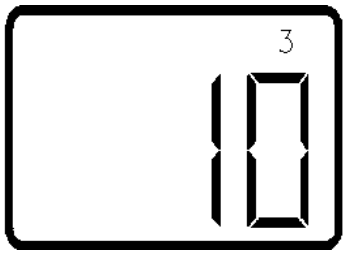
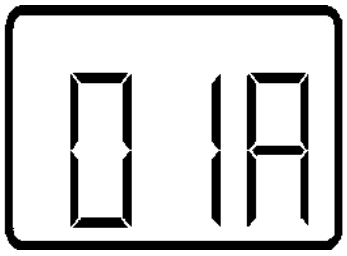
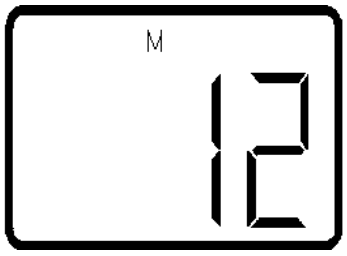
The Extended Memory Option allows much longer recordings at twice the data rate (10 samples per second) of the stock Avenger 3. It also includes several changes, which make it easier to deal with longer recordings.

1) The recording is retained, even when the unit is turned off.
2) The Playback Arrow keys (↑ and ↓) allow skipping through the recording.
3) The RP Display Type now includes an indication of minutes.
4) A new recording mode – Logging – has been added.

Quick Check

To verify that your Avenger 3 has the Extended Memory Option installed, please follow the steps below:

1) If the Avenger is on, turn it off by pressing the ON button and releasing it while the center LCD says oFF.
2) Press and hold the SETUP button.
3) Press and hold the ON button.
4) When the displays stop flashing, release both buttons. The display should look like the figure below:

		
The 3 indicates an Avenger 3. The 10 is an internal version code which may vary from unit to unit.	This is the rest of the internal version code begun in the left-hand LCD.	This window displays the number of minutes of record time the unit detects. Memory can be added in 6-minute increments to a maximum of 48 minutes.

If your Avenger 3 does not display an M and a number of minutes in the rightmost LCD, it does not have the Extended Memory Option installed.

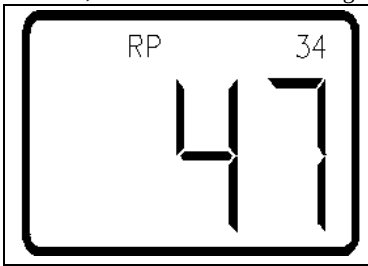
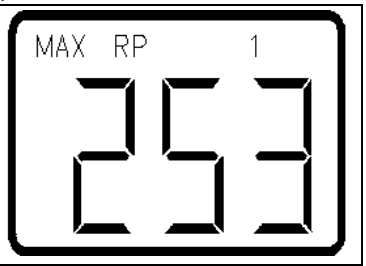
Playback Differences

When displaying a recorded run, a stock Avenger 3 stops full-speed playback when you release the ↑ key. With an Extended Memory Avenger you need only hold the ↑ key until the P starts flashing in the center window. In full speed playback mode (indicated by the flashing P in the center window) the buttons have the following effects:

ON RECORD	No change. Turns the unit on or starts a new recording as in a stock Avenger 3.
DISPLAY LIGHT	No change. Steps to the next display or turns the backlight on or off.
SETUP REWIND	Stops the playback.
REPLAY RUN	No change. Exits REPLAY mode.
CLEAR ↑	Jumps forward 30 seconds.
MAX ↓	Jumps back 30 seconds.

Display Type Differences

The RP Display Type has been expanded so that it can display more than 25 seconds. It still displays a number representing tenths of seconds, but it now shows the number of minutes in the small indicators at the top of the LCD. To determine the number of minutes into the run, add the small indicator digits together. If the MAX indicator appears, add 10 minutes.

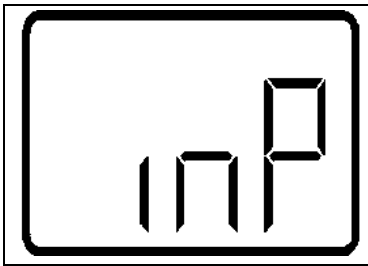
	The display on the left shows 7 minutes, 4.7 seconds. The display to the right shows 11 minutes, 25.3 seconds:	

Log Mode

Log Mode allows you to start and stop the recording with a toggle switch; the Avenger 3 records only when the switch is closed.

- The unit begins recording about a second after the switch is closed.
- Any recording in progress stops as soon as the switch is opened.
- The unit adds one second of zeroed data each time recording stops.
- The Record Threshold will delay the start of a new recording until the engine RPM exceeds the set point.
- Starting a new recording no longer erases the previous run.
- The CLEAR function now gives an opportunity to clear the current run. Using the ↑ key, select On to clear the run or oFF to leave it unchanged. Press SETUP to end clear mode.

To enable Log Mode (and disable the normal recording mode) use Setup as described in the Avenger3 manual and select inP rEc as shown below:

		
Press and release SETUP until this display indicates the remote switch input setting.	Use the ↑ key to step to rEc to enable Log Mode. The other choices, dSP and Sav, are described in the Avenger 3 manual.	This display is blank in Setup Mode.

Once the display shows the values above, press REPLAY to store the settings and exit Setup Mode.

Minimum PC System Requirements for Racepak DataLink Software:

- IBM PC or clone with 200 MHz Pentium Processor and 8 Mbytes Ram
- Windows 95/98/NT Operating System
- 100 Mbytes free disk space
- 3.5 inch 1.4 Mbytes floppy disk drive
- CD-ROM drive
- SVGA color video support with a minimum 800 x 600 resolution (1024 x 768 recommended)
- Keyboard and mouse
- One 9 pin serial communication port

IMPORTANT!!!!

If the electrical system of your vehicle has only DC voltage available you will need to obtain a special power/RPM harness from your dealer. Contact your dealer immediately if this is the case.

IMPORTANT!!!!

Do not replace the Ni-Cad batteries inside your Avenger with alkaline batteries. Doing so may cause severe damage to your Avenger unit. In addition, opening the Avenger may result in fogging and damage to the unit.

Six Month Limited Warranty on Parts and Workmanship

Purchaser's only remedy and seller's only liability shall be to repair or replace materials provided by the purchaser to be defective and returned to seller with a copy of purchaser's receipt. Seller shall not be liable for any injury, expenses, profits, loss or damage, direct, incidental, or consequential, or any other pecuniary loss arising out of the use or inability to use the product in question even if seller has been advised of the possibility of such damages. Because some states do not allow the exclusion or limitation of liability for consequential or incidental damages, the above limitation may not apply to you.

It is purchaser's responsibility to notify seller of suspected defects as soon as purchaser becomes aware of them, and to follow seller's instructions to minimize further damage. Seller is not responsible for damage resulting from purchaser's inaction.

Exhaust gas temperatures are intended only for use as a tuning tool. Due to differences in installation and airflow the reported temperature at the probe may be substantially different from the temperature inside the cylinder. The determination of such differences is the sole responsibility of the user of the equipment.

CSI assumes no liability for probes. Temperature probes are covered by 'Exhaust Gas Technologies' warranty.