



## Hot Tach Pro Operation Manual

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# **SECTION 1:**

# **INSTALLATION**

# **NOTES:**

## **I. Before You Begin**

The RacePak Hot Tach Pro System contained in this shipment has been configured to meet your specific requirements. Before you begin the installation of the system please step through the following checklist to insure no errors have occurred in the order process and that all materials have been shipped correctly.

### **STEP 1: Unit Input Configuration and Setup Verification:**

The Hot Tach Pro has analog channel inputs. Each analog channel is factory configured to measure either thermocouple type temperature transducers or voltage output type transducers with a range of 0 to 5 volts. This configuration is set during manufacture and cannot be modified in the field.

- ***Thermocouple type input***—If a thermocouple type input is selected the system is automatically configured to readout in degrees F and no further software setup is required. Several type of thermocouples are available. Be sure to check the thermocouple description to be sure it is configured correctly for your application.
- ***Voltage output type transducer***—If a voltage type input is selected the system is capable of measuring a variety of different types of transducers. Each type of transducer requires different setup options to be programmed in the software setup of the system to read out correctly in engineering units on the LCD display. The appropriate setup information for the selected transducer will be preset at the factory. Be sure to check the transducer information to be sure it is configured correctly for your application.

There is a label on the side of each Hot Tach Pro describing how the analog channels are configured. If your unit is label 4 TEMPS then all four channels of your unit are configured for thermocouple inputs. If your unit is labeled 3 TEMPS / 1 ANALOG then channels 1 – 3 are configured for thermocouples and channel 4 is configured for a 0-5 volt input. If your unit is labeled 2 TEMPS / 2 ANALOG then channels 1-2 are configured for a thermocouple and channels 3-4 are configured for a 0-5 volt input.

### **STEP 2: Main System Unit:**

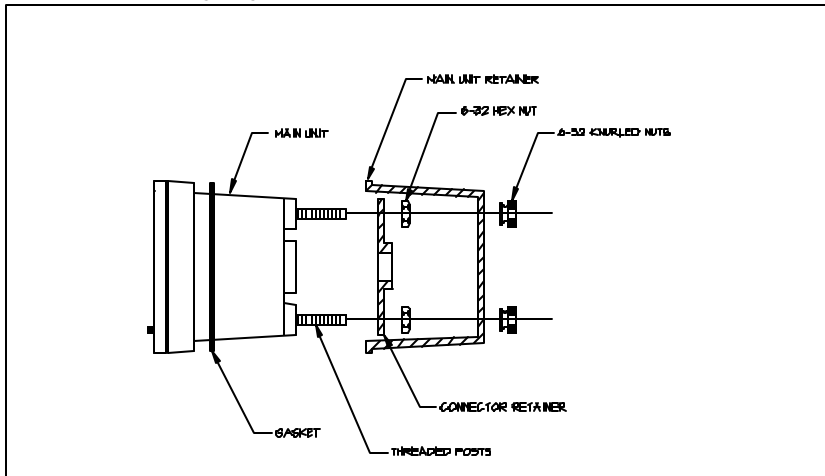
Locate the main system unit package. The label on the outside of the box will also describe the configuration of the 4 analog inputs. Be sure the this configuration matches the configuration label on the side of the Hot Tach Pro.

Next verify all of the components of the main system have been properly shipped.

The components are:

- Main Unit
- Rubber Mounting Gasket
- Connector Retainer
- 2 each 6-32 hex nuts
- Main Unit Retainer
- 2 each 6-32 knurled nuts

Refer to the following diagram for details:



### STEP 3: System Inter-Connect Cable Verification:

The Hot Tach Pro System requires three separate wiring harnesses to connect the various sensors to the main system unit. These are one power and rpm input harness assembly and two analog/temperature input harness assemblies. Each harness assembly will be packaged separately with the appropriate label indicating where it should plug into the Hot Tach Pro.

The RPM/POWER wiring harness assembly is common to all Hot Tach Pro Systems and is identified by the red connector. Verify an assembly has been shipped with your unit.

The ANALOG INPUT harness assemblies are customized to match the configuration of the Analog Inputs as described on the Hot Tach Pro configuration label. The ANALOG 1-2 INPUT harness assembly should match the configuration of analog channels 1 and 2 and is identified by the black connector. The ANALOG 3-4 INPUT harness assembly should match the configuration of the analog channels 3 and 4 and is identified by the tan connector.

Verify all assemblies match the system configuration and all thermocouples are of the appropriate type for your application.

## **STEP 4: Analog Transducer Verification:**

If any of the analog inputs have been configured for voltage output type transducers such as pressure transducers and you have purchased the transducers from RacePak, the transducers will be shipped with the main unit. Each transducers will be individually packaged with a label describing which analog input to connect the transducer, the type of the transducer, and the appropriate software settings required by the Hot Tach Pro unit. Verify that the pressure you plan to measure is within the transducers pressure range. For instance, do not use a 0-15 PSI transducer to measure a fuel injection pressure of 70 PSI. Likewise, do not use a 0-250 PSI transducer to measure a carburetor fuel pressure of 7 PSI.

## **STEP 5: DataLink Data Analysis Software:**

If you have purchased the DataLink data analysis software you will have received a separate package containing the following:

- DataLink Data Analysis Software Manual
- DataLink Data Analysis Software CD
- DataLink License Disk
- Serial Download Cable with Hot Tach Pro Adapter

Please verify all materials have been included.

If all materials have been properly configured and shipped you are now ready to begin the installation of the Hot Tach Pro System. If any materials are missing and/or improperly configured please contact your dealer for instructions.

# **NOTES:**

## II. Installing the Hot Tach Pro Unit

This section will guide you step by step through the installation of the Hot Tach Pro Unit into the racing vehicle.

### STEP 1: Selecting the Mounting Location:

The first step in installing the RacePak Hot Tach unit is to determine the best location to mount the main unit. There are several important issues that should be carefully considered when selecting the location. Some of these issues are:

- **Safety**—Extreme care should be taken in selecting a mounting location that will not restrict the driver's ability to control the vehicle and/or that might cause injury to the driver in case of an accident. At no time should sensors used to measure the condition of hot or flammable liquids, such as fuel and/or oil, be located inside the driver compartment. In addition, care should be taken to insure wiring harnesses do not become pinched between frame members in the vehicle causing potential short circuit conditions that might result in a fire.
- **Visibility**—If the LCD display or warning light is to be used during actual driving conditions, position the unit in a location where the driver can see the unit without distracting his attention from the race track.
- **High Voltage Sources**—All electronics are susceptible to improper operation when exposed to high voltage electrical fields such as the ignition system on your vehicle. Mount the main unit and route all cables as far from the high voltage components (coil, coil wire, and spark plug wires) as possible.
- **High Temperature Heat Sources**—Thermocouple type sensors actually measure the difference in temperature between two points. In our case, the temperature at the tip of the sensor and the temperature at the connector into the main system. In order, to obtain the actual temperature, the Hot Tach unit must also measure the temperature at the connector and add it to the temperature obtained from the thermocouple. Rapid changes in temperature to the main unit can cause errors in the actual temperature readings.
- **Environmental Conditions**—The RacePak Hot Tach system has been designed for the racing environment, however, a little common sense will go a long way in providing trouble free operation and in extending the life of the unit. Avoid mounting the unit in areas of high vibration. If the unit vibrates and then impacts a solid object severe damage will occur. Avoid mounting the unit where it will be exposed to high pressure water spray. The unit is water resistant, however, the unit is not designed to withstand constant and/or high pressure water.
- **Clearance behind unit**—Be sure to check for sufficient clearance behind the main system to allow the wiring harnesses to exit the unit without tight bends.

## **STEP 2: Preparing a Mounting Hole:**

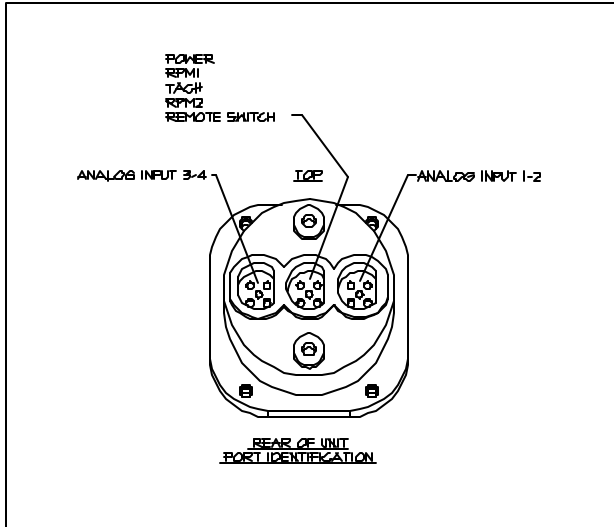
The RacePak Hot Tach Pro is designed to install in a 2 1/16 inch diameter cutout. Once the mounting location has been determined use an appropriate tool to make the cut out.

## **STEP 3: Installing the Wiring Harnesses into the Main Unit:**

Before the main unit can be mounted on the vehicle the three wiring harness assemblies must be installed into the connectors on the rear of the main unit. To install the wiring harness perform the following procedures.

- Remove the knurled nuts, back shell, and hex nuts from the threaded posts on the back of the main unit.
- Verify the unit will fit into the cutout in the dash made in step 2.
- Note the position of the clear plastic retainer still attached to the back of the main unit. The retainer must be installed in the same manner to maintain proper water seal. Next remove the two hex nuts securing the retainer and remove the retainer from the main unit.
- Take the RPM/POWER wiring harness assembly out of the package and thread the wires through the center hole in the retainer as shown below.
- Verify the rubber mounting gasket is in place on the rear of the main unit.
- Open the two packages containing the Analog 1-2 input harness and the Analog3-4 input harness.
- Holding the Hot Tach right side up and looking at it from the back, insert the RPM/POWER wiring harness connector into the center connector opening on the Hot Tach Unit. The flat side on the harness connector should align with the flat side of the connector cavity on the Hot Tach unit. Next insert the ANALOG 1-2 INPUT harness into the connector on the right hand side of the unit and the ANALOG 3-4 INPUT harness into the connector on the left hand side of the unit.
- Slide the connector retainer on the RPM/POWER harness down over the threaded posts on the back of the main unit. You will need to insert the ANALOG 1-2 and ANALOG 3-4 harnesses into the side cavities in the connector retainer as you slide the retained down onto the unit.
- Secure the connector retainer with the two hex nuts supplied.

Hot Tach Pro connector diagram



#### **STEP 4: Installing the Main Unit in the Dash Cut out:**

We are now ready to install the main unit in the dash cutout. To install the main unit, perform the following steps.

- Route the wire harness assemblies and thermocouple sensors through the mounting hole in the dash until the main unit is inserted in the mounting hole.
- Slide the wires and any thermocouple sensors, now behind the dash, through the center opening in the main unit retainer.
- Hold the Hot Tach in position in the dash and move the main unit retainer up the wiring harnesses and onto the back of the main unit. Make sure the mounting studs on the main unit go through the two mounting holes on the main unit retainer.
- Finger tighten the knurled nuts provided on the mounting studs to secure the Hot Tach main unit.

## **STEP 5: Routing and Connecting the RPM/POWER Harness.**

We are now ready to route and connect the individual wires in the RPM/POWER harness assembly. Route and install each wire as discussed below.

### **BLACK WIRE--POWER GROUND**

The black wire provides the power ground for the system. This wire should be connected directly to the chassis ground or the vehicle. If you are using a battery separate from the vehicle battery you will need to connect this black wire to both the ground terminal of the battery and to the vehicle chassis ground for the unit to function properly.

### **BLUE WIRE—REMOTE SWITCH INPUT**

The blue wire connects to one side of the remote switch as shown below. The second side of the remote switch connects to the vehicles chassis ground.

### **YELLOW WIRE—TACH INPUT**

The yellow wire provides the engine rpm tach signal to the Hot Tach unit. This wire can be connected in several different methods depending on the type of ignition system used by the vehicle. Find the description of the ignition system below that best fits your vehicle's ignition system and connect the wire accordingly.

#### **Ignition System with Tach Output – Recommended Method**

Connect the yellow wire directly to the Tach output terminal of the ignition system.

#### **Standard Ignition System – Single Coil—No Tach Output**

Wrap the yellow wire around the coil wire. Start with approximately 10 wraps around the wire. If the rpm reading is erratic and reads low add additional wraps.

Using this method may cause erratic rpm readings if the engine reaches your rev limiter setting.

#### **Standard Ignition System – Multiple Coils No Tach Output**

Wrap the yellow wire around one of the spark plug wires on each coil by daisy chaining the wire from one plug wire to the next. Approximately 10 turns on each plug wire. Using this method may cause erratic rpm readings if the engine reaches your rev limiter setting.

### High Energy Magneto with External Coil

Wrap the yellow wire around the coil wire. Start with 2 to 3 wraps. If the rpm reading is erratic add additional wraps.

### High Energy Magneto with Internal Coil

Wrap the yellow wire around each of the spark plug wire. Start with 2 to 3 wraps per wire daisy chaining the wire from one plug wire to the next.

### ORANGE WIRE—SECOND RPM INPUT

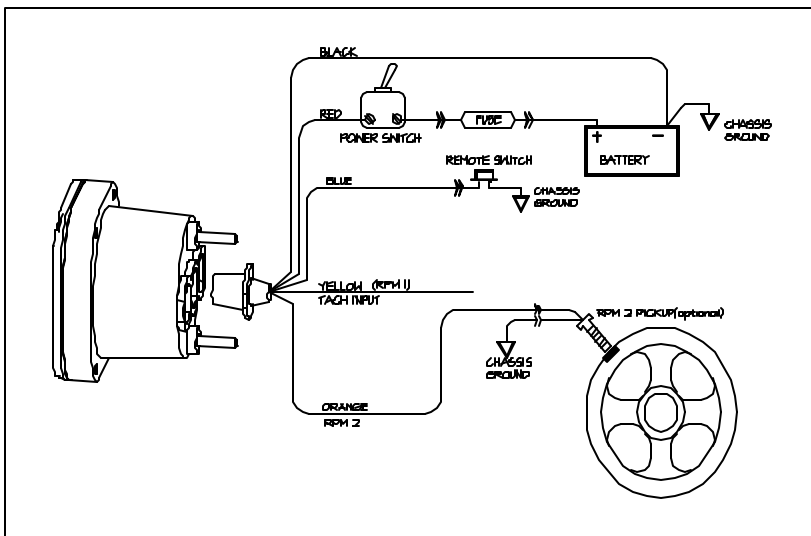
The orange wire connects the sending unit for the optional second rpm pickup. Route the wire to the pickup and follow the instructions contained in the second rpm kit for connection instructions.

### RED WIRE—12 VOLT DC INPUT

The red wire is used to provide 12 Volt DC power to the Hot Tach unit. Connect this wire to a source of switched power on your vehicle, leaving the unit on continuously will discharge the battery on your vehicle. Remember the unit must be turned on to download the data from the unit into your PC or to replay the data on the LCD display. Select a source of power that will remain on when the engine is not running.

An inline fuse holder and connection wire assembly has been included with the power harness. If the source of power you are using is not fused, use this assembly between the power source and on/off switch to provide protection against short circuits.

### Hot Tach Pro wiring diagram



## **STEP 6: Routing and Installing the Thermocouple Sensors :**

If your system includes analog channels that utilize thermocouple type temperature sensors, the next step will be to route the thermocouple sensors and install the sensing element of the thermocouple in the proper location to measure the desired temperatures. When routing the thermocouple cables be sure to avoid routing the cables next to high temperature heat sources such as the exhaust manifold.

Although the thermocouple tips are designed for high temperatures, the thermocouple cable can be damaged by high temperatures. Also avoid high voltage wires such as spark plug and coil wires. The output from thermocouple sensors is only a milli-volt signal compared to tens of thousands of volts on the spark plug wires. Once you have routed the cables secure them with tie-wraps or other suitable means to insure the cables are not damaged.

Several different types of thermocouples are available depending on the measurement being made. Refer to the types of measurements and thermocouples below and install the thermocouple accordingly.

### **Exhaust Gas Temperature Measurement**

The first step in installing the exhaust gas temperature probe is to determine the location to mount the thermocouple probe. In general the probe should be located as close to the exhaust port as practical, normally 3 to 7 inches from the piston skirt. Of more importance than the actual distance, however, is insuring that all of the thermocouple probes are mounted at the same distance from the piston skirt. If they are not, they will not read the same temperature given the same actual exhaust gas temperature. If you have multiple vehicles and/or you are comparing data with other individuals, try to position the thermocouples the same distance from the piston skirt to allow your data to be directly compared.

If you are measuring more than one cylinder such as a bank of cylinders, locate the thermocouple in the collector pipe 6 to 12 inches from the entrance of the individual pipes.

### **IMPORTANT!!**

**If you are installing the thermocouples through a water cooled manifold such as those on a watercraft or boat be sure to select a location where there is no water jacket. You may need to contact the manufacturer to determine the proper location to mount the sensor.**

Once you have selected a mounting position and marked the mounting position on the exhaust pipe or manifold, you are ready install the thermocouple sensor. You may need to remove the exhaust pipe and/or manifold from the engine to avoid getting metal chips in the engine during the installation process.

#### **Clamp Type Thermocouple Assembly.**

Drill a hole through the outer wall of the exhaust pipe that is just slightly larger than the outer diameter of the exhaust temperature probe. Open the clamp on the thermocouple assembly and insert the thermocouple probe into the exhaust pipe. Next wrap the clamp assembly around the exhaust pipe and close the clamp and tighten.

#### **Thermocouple with Weld On Fitting**

Remove the weld on fitting from the thermocouple probe and remove the nut and ferrule from the weld on fitting. Position the fitting directly over the position on the exhaust pipe the probe is to be installed and clamp the fitting into place. Weld the fitting in place. Be careful not to overheat or damage the threaded portion of the fitting. Next select a drill slightly smaller than the hole in the fitting but larger than the diameter of the thermocouple probe. Drill a hole through the exhaust pipe through the hole in the fitting.

Insert the nut and then the ferrule back on the thermocouple probe and insert the probe into the welded fitting. Adjust the depth of the probe such that the tip of the probe is in the center of the exhaust pipe. Tighten the nut on the compression fitting.

#### **Thermocouples with 1/8 Inch Pipe Compression Fitting**

Drill an tap an eighth inch pipe thread into the location the thermocouple probe is to be inserted. Remove the pipe fitting from the thermocouple, apply a proper sealing compound on the threads of the fitting and thread and tighten the fitting into the exhaust manifold or pipe.

Next insert the thermocouple back into the compression fitting and adjust the depth of the probe such that the tip of the probe is in the center of the exhaust pipe. Tighten the nut on the compression fitting.

## **Fluid Temperature Measurement**

Thermocouples for use in the measurement of fluids such as cooling water temperature will be supplied with 1/8<sup>th</sup> inch pipe compression fitting for mounting the thermocouple. In addition, these thermocouples will be manufactured with a closed tip. (Exhaust gas thermocouples will have an exposed tip) Be sure the thermocouple you are installing has a closed tip as the exposed tip type will not function properly and may leak fluid.

In most cases you will be able to install the thermocouple in an existing predrilled and taped location. If no existing locations are available you will need to drill and tap an 1/8<sup>th</sup> pipe fitting into the fluid cavity.

Remove the pipe fitting from the thermocouple, apply proper sealing compounds on the threads of the fitting and thread and tighten the fitting into the fluid cavity. Next insert the thermocouple back in the compression fitting and adjust the depth of the tip of the thermocouple probe to insure the probe is immersed in the fluid. Tighten the nut on the compression fitting.

## **STEP 7: Installing Voltage Type Analog Transducers**

The last step in installing your Hot Tach Pro system is to install any of the voltage type analog transducers, such as pressure sensors, and to route and connect the transducer cables to the ANALOG 1-2 or ANALOG 3-4 cable. Each transducer will be packaged individually. The label on the package will describe the transducer and which connector on the Hot Tach unit to connect the transducer.

Each transducer package will contain detailed instruction on installing that transducer. Follow the enclosed direction and install the transducer. Next route the transducer cable back to the Hot Tach unit and plug in the transducer cable to the Hot Tach connector indicated by the label on the transducer package. Remember to avoid routing the transducer cable near any high voltage and/or high temperature areas on the vehicle.

After you have installed all of the transducers you have completed the system installation and are ready to apply power to the unit and complete the software setup on the unit.

### III. Powering Your Unit for the First Time

You are now ready to power the Hot Tach unit for the first time and verify the operation of the unit. Apply power to the Hot Tach unit. Your Hot Tach unit turns on automatically whenever power is applied. The unit's display and warning LED will flash three times and then the unit will enter the **RUN** mode of operation with RPM 1 being displayed on the display screen.

If the unit turned on correctly, you are ready to go through the following exercises.

#### **Pressing and Holding Buttons**


In performing the following exercises and during the normal use of the Hot Tach you will be required to control the operation of the Hot Tach unit via the two front panel control buttons. The Hot Tach recognizes two types of button actions: **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 2 seconds. The terms Press and Hold will be used through the remainder of this manual to refer to these two type of button presses.

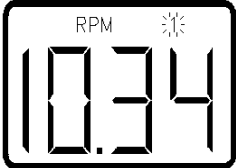
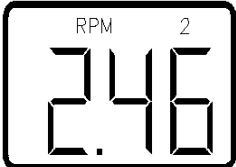
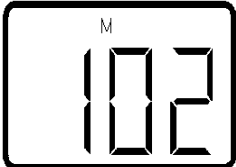
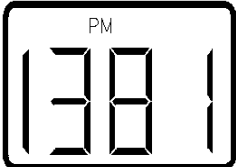
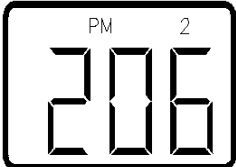


#### **Tour of the Channel Displays**

The Hot Tach Pro can display a variety of information on the front panel LCD display including the 6 measured input channels as well as a variety of calculated channels such as MPH. The following exercise will walk you through a list of all of the possible displays that can be programmed to display on your unit. **Some of the displays in the list may not appear on your Hot Tach unit.** These displays have been disabled at the factory as they may not be appropriate for your particular hardware configuration. Displays that are commonly disabled when the unit is shipped from the factory are shaded in the table below.

You can customize your Hot Tach to display only those channels that interest you. As you go through the exercise below mark the channels you wish to add or delete. Later in the section on the Advanced Setup we will walk you through enabling and disabling display channels.

The values contained in the following illustrations are for example purposes only. Your Hot Tach unit will display the current values measured by the unit.

	<p>The Hot Tach should display the current engine RPM in thousands. The figure at left shows 10,340 RPM. Your unit will be reading 0 as the engine is not running.</p> <p>Press the <b>DISPLAY</b> button to display the filtered RPM1.</p>
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	<p>This display mode shows the engine RPM, filtered for stability. The flashing 1 distinguishes the filtered from the unfiltered RPM. This display type is disabled when the unit is shipped from the factory.</p>
	<p>The display should now show the second rpm channel (normally the drive shaft or front wheel rpm) The figure shows 2,460 RPM.</p> <p>Press the <b>DISPLAY</b> button to show miles per hour.</p>
	<p>This value is the speed in miles per hour. The speed is calculated from RPM2 using the number of pulses in 660 feet. This display type is disabled when the unit is shipped from the factory.</p> <p>Press the <b>DISPLAY</b> button again to show the odometer.</p>
	<p>This display mode shows total miles traveled. Like speed, it is calculated using the input from the second rpm channel and the number of pulses per 660'. This display type is disabled when the unit is shipped from the factory.</p> <p>Press the <b>DISPLAY</b> button again to show the trip odometer.</p>
	<p>The trip odometer shows miles traveled since the unit was last zeroed. See the section on Basic Setup to reset the trip odometer. This display type is disabled when the unit is shipped from the factory.</p> <p>Press the <b>DISPLAY</b> button again to show the rpm1/rpm2 ratio.</p>
	<p>This display mode shows the rpm1/rpm2 ratio. It is calculated as <math>RPM\ 1 \div (RPM\ 2 \times \text{Ratio Factor})</math>. This display type is disabled when the unit is shipped from the factory.</p> <p>Press the <b>DISPLAY</b> button again to show EGT 1 or Analog 1.</p>
	<p>The unit should now show you either the current temperature of EGT 1 in degrees Fahrenheit or the value of the voltage type sensor connected to input 1 depending on the hardware configuration of your unit. If the channel is configured for a voltage type sensor the "EGT" label will not appear.</p> <p>Press the <b>DISPLAY</b> button again to show EGT 2 or Analog 2.</p>



The display should now show you either the current temperature of EGT 2 or the value of the voltage type sensor connected to input 2 depending on the hardware configuration of your unit. If the channel is configured for a voltage type sensor the “EGT” label will not appear.

Press the **DISPLAY** button again to show EGT 3 or Analog 3.



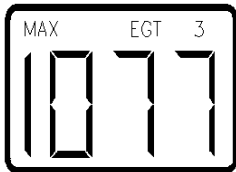
The display should now show you either the current temperature of EGT 3 or the value of the voltage type sensor connected to input 3 depending on the hardware configuration of your unit. If the channel is configured for a voltage type sensor the “EGT” label will not appear.

Press the **DISPLAY** button again to show EGT 4 or Analog 4.



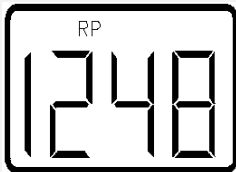
The display should now show you either the current temperature of EGT 4 or the value of the voltage type sensor connected to input 2 depending on the hardware configuration of your unit. If the channel is configured for a voltage type sensor the “EGT” label will not appear.

Press the **DISPLAY** button again to show the MAX EGT



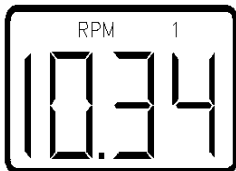
The display should now show the temperature of the hottest EGT. In the example on the left, the unit shows EGT 3 at 1077°F.

Press the **DISPLAY** button again to show the Record/Playback counter.



The Record/Playback display is like the counter on a VCR; it shows the seconds (or minutes if the ‘M’ is flashing) recorded since the start of the run. This display type is disabled when the unit is shipped from the factory.

Press the **DIS PLAY** button again to show engine RPM.



Your RacePak is back to showing engine RPM.

## **Turning on the Back Light**

The Hot Tach unit contains a back light used to illuminate the LCD display for night time operation. The back light is factory programmed to be on when the Hot Tach unit is turned on. To turn the back light off, Hold the **DISPLAY** Button in until the back light turns off then release the Display Button. To turn the back light on, Hold the **DISPLAY** button until the back light turns on.

# **SECTION II**

## **Setup**

# **NOTES:**

# **I. Programming the Options in the Hot Tach Pro**

The Hot Tach Pro has a number of user programmable options which can be used to tailor the unit to match the needs of the individual user. Many of these options have been factory configured to our 'best guess' as to the description of the target vehicle and as to how you will be using the instrument. If our guesses were incorrect you may need to reprogram some of the preset options. Other options, such as the alarm set points, must be programmed by the end user before they can be utilized.

To simplify the programming the user programmable options have been divided into two groups, 1) the Basic Setup Options and 2) the Advanced Setup Options. The Basic Setup Options are those options that are programmed on a regular basis, such as clearing the trip odometer and or changing the alarm set points. The Advanced Setup Options are those options that are programmed one time or when significant changes such as adding a new transducer are made to the Hot Tach unit. We will begin by reviewing the Basic Setup Options.

## **II. Basic Setup Options**

**CAUTION:** Entering basic or advanced setup will cause the permanent loss of all recorded data currently stored in the Hot Tach Pro unit.

The Basic Setup Mode is used to program the following user programmable options;

- Number of Tach Pulses per Revolution of the engine
- Number of Pulses per Revolution generated by the second RPM Pickup
- The RPM Ratio Factor used to correct for any constant gearing changes between the engine rpm and the output shaft from the engine.
- Trip Odometer Zero
- The default channel display to view when the Hot Tach unit is first turned on.
- The Over Limit Warning Levels for each of the measured channels.
- Number of revolutions per 1/8<sup>th</sup> mile(660 feet) generated by the second rpm pickup used to calibrate the mph and odometer readings.

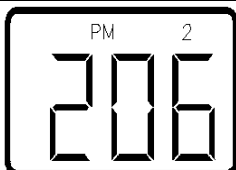
Before you enter the Basic Setup Mode you should review the options and determine what values will be assigned to each of the options. If you are not using the over limit warning level for a channel be sure to program the level to 0 to disable the alarm as an incorrectly programmed warning level will cause the display to act erratically.

To enter the Basic Setup Mode make sure the unit is on and in the Run Mode. Hold the **MODE** button until the display blanks and comes back on (about 3 seconds). Release the **MODE** button to enter the Setup Mode. You can exit the set up mode at any time by holding the **MODE** Button. All modifications made to that point will be saved. To exit the Setup Mode without saving the changes remove power to the unit.

## Changing Values

Pressing the **DISPLAY** button in basic or advanced setup mode will increment the currently displayed value. Pressing the **REMOTE SWITCH** button while in basic or advanced setup mode will decrement the currently displayed value.

	<p>Make sure the unit is on and in Run mode. Hold the <b>MODE</b> button until the display blanks and comes back on, about 3 seconds. Release the <b>MODE</b> button to enter Setup Mode.</p>
	<p>When you release the <b>MODE</b> button, the display shows the number of ignition pulses your Hot Tach Pro expects to see each engine revolution. Press or hold the <b>DISPLAY</b> button to step to the next pulse number. The pulse number will wrap to 0 after a maximum pulse number of 20 is reached. Select 0 if your ignition system generates one pulse per two revolutions.</p> <p>Press the <b>MODE</b> button to accept the value displayed and step to the next setting.</p>
	<p>Select the number of pulses generated during each rotation of the jack shaft or drive shaft. For the standard sensor configuration, this number should be the number of magnets in the collar. Press or hold the <b>DISPLAY</b> button to step to the next pulse number. The pulse number will wrap to 0 after a maximum pulse number of 20 is reached. Select 0 if your ignition system generates one pulse per two revolutions.</p> <p>Press the <b>MODE</b> button to step to the next setting.</p>
	<p>The RacePak uses the RPM Ratio Factor to adjust the RPM Ratio for any constant gearing between the engine and the drive shaft sensor. The RPM Ratio is calculated as <math>RPM1 \div (RPM2 \times \text{Ratio Factor})</math>. If you are uncertain what this setting should be, leave it at 1.00. Press or hold the <b>DISPLAY</b> button to step to the next higher factor. The factor will wrap to 0 after a maximum factor of 9.99 is reached.</p> <p>Press the <b>MODE</b> button to step to the next setting.</p>



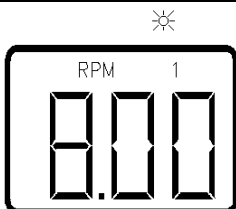
This setting allows you to zero the trip odometer. Press the **DISPLAY** button to reset the miles to 0. Press it again to restore the trip odometer's current reading.

Press the **MODE** button to step to the next Setup option.



This option lets you select which of the display modes to view when the RacePak is first turned on. Press the **DISPLAY** button repeatedly until the desired channel appears in the display to select the channel.

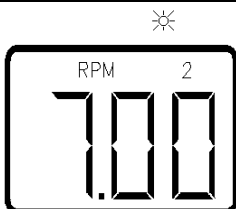
Press the **MODE** button to step to the next Setup option.



The active warning LED tells you that you are setting an over limit warning level – RPM 1 in this case. If Engine RPM exceeds this value, the unit will switch to display RPM 1 and flash the warning LED. (Setting a channel's warning level to 0 disables warnings for that channel.)

Press or hold the **DISPLAY** button to change the warning level. The warning level will wrap back to 0 rpm after the maximum rpm of 19,990 rpm is reached.

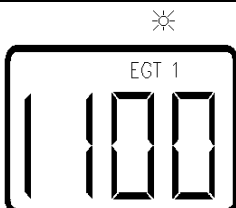
Press the **MODE** button to step to the next Setup option.



Set RPM the warning level for RPM 2.

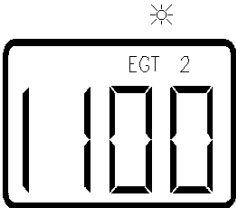
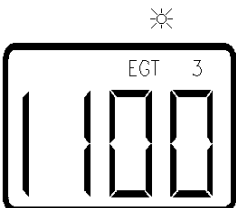


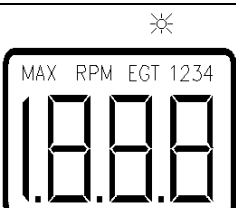
Press or hold the **DISPLAY** button to change the warning level. The warning level will wrap back to 0 rpm after the maximum rpm of 19,990 rpm is reached.

Press the **MODE** button to step to the next Setup option.



This is the warning limit for EGT 1 or for Analog Sensor 1. Press or hold the **DISPLAY** button to change the warning level.

Press the **MODE** button to step to the next Setup option.

	<p>This is the warning limit for EGT 2 or for Analog Sensor 2. Press or hold the <b>DISPLAY</b> button to change the warning level.</p> <p>Press the <b>MODE</b> button to step to the next Setup option.</p>
	<p>This is the warning limit for EGT 3 or for Analog Sensor 3. Press or hold the <b>DISPLAY</b> button to change the warning level.</p> <p>Press the <b>MODE</b> button to step to the next Setup option.</p>
	<p>This is the warning limit for EGT 4 or for Analog Sensor 4. Press or hold the <b>DISPLAY</b> button to change the warning level.</p> <p>Press the <b>MODE</b> button to step to the next Setup option.</p>
	<p>The Hot Tach Pro uses this value to calculate speed and distance from RPM 2. Enter the number revolutions in 660' (1/8<sup>th</sup> mile) of vehicle travel by pressing or holding the <b>DISPLAY</b> button. Any inaccuracy in this setting directly affects miles per hour, trip odometer, and total odometer.</p> <p>Press the <b>MODE</b> button to exit the Setup Mode and save the programmed values.</p>
	<p>The RacePak flashes the display and the warning light to acknowledge the new Setup.</p> <p>The unit will now return to the Run Mode and will display the channel programmed to display on power up.</p>

You have completed the programming of the Basic Setup Options.

### **III. Verifying the Engine RPM Pulse Setting**

Setting the Engine RPM 1 pulses can be tricky with all the different types of ignition systems available on the market. The following procedure will verify the setting of the engine pulses completed in the setup mode and will explain how to correct the settings if the engine rpm is incorrect.

To verify the setting perform the following procedure.

1. Turn the Hot Tach unit on and using the DISPLAY button display the "RPM 1" on the LCD display.
2. Start the engine on the vehicle and run the engine at a steady known rpm. You can either use a second tachometer or a known rpm point, such as idle, to set the speed of the engine.
3. With the engine at a steady known rpm read the rpm displayed on the hot tach unit.
4. Shut the engine on the vehicle off.

If the rpm of the engine and the rpm displayed on the Hot Tach are the same you have programmed the pulses correctly. If the rpm reading on the Hot Tach is higher you will need to increase the rpm 1 pulse setting. For instance, if the Hot Tach reading was 4000 rpm and the engine was actually running 2000 rpm you will need to double the Rpm 1 pulse setting. If the Hot Tach reading was lower than the actual reading you will need to decrease the pulse setting. For instance if the Hot Tach was reading 1000 and the engine was actually running 2000 divide the current pulse setting by 2. You can either use trial and error to set the new pulse setting or calculate the new setting for the pulses by the following formula;

$$\text{(Hot Tach Rpm Reading / Actual Rpm) * Current Programmed Pulse Setting. = New Setting}$$

Round the calculated value to the nearest whole number.

Once you have determined the new setting to try, repeat the Setup Procedure detailed above and then verify the new setting.

## IV. Advanced Setup Options

**CAUTION:** Entering basic or advanced setup will cause the permanent loss of all recorded data currently stored in the Hot Tach Pro unit.

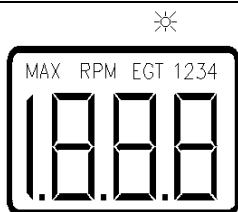
The Advanced Setup Mode allows you to access settings that you would seldom, if ever, change. These options include;

- Rpm 1 Record Threshold
- Rpm 1 Pause Threshold
- The Display Update Rate
- The Sampling Rate of the Record Mode
- Options to enable/disable each of the channel displays.
- Turn back light on or off at power up
- Define the Transducer types for each of the Analog Inputs configured for voltage type transducers

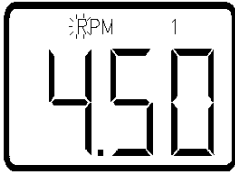
In most cases you will not need to enter the Advanced Setup Mode to Program the Advanced setup options. If you are happy with the current setup of the Hot Tach unit proceed to Section III on the Operation of the Hot Tach Pro.

To enter the Advanced Setup Mode, turn the Hot Tach Unit off and hold the **MODE** button. While holding the **MODE** button apply power to the Hot Tach Unit. After the display stops flashing and goes blank, release the **MODE** button to enter the Advanced Setup Mode. To exit the Advanced Setup Mode either complete the entire programming sequence or hold the **MODE** button until the display begins to flash.. All changes made up until that point in the programming will be saved. To exit the Advance Setup Mode without saving the changes simply remove power from the unit.

The details on the Advanced Setup Mode are given below:

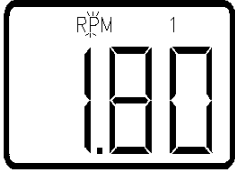


With the unit turned off, press and hold the **MODE** button. While holding the **MODE** button, apply power to the RacePak. After the display stops flashing and goes blank, release the **MODE** button to enter Advanced Setup.



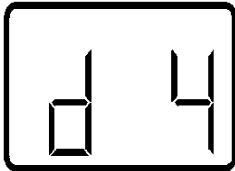
The first option is the RPM 1 Record Threshold. When you start a recording with the remote switch, the Hot Tach Pro does not begin to save data until RPM 1 reaches or exceeds this value. Set the Record Threshold to 0 to record regardless of engine RPM. Press or hold the **DISPLAY** button to increment the RPM 1 Record Threshold to the next higher level.

Press the **MODE** button to step to the next Setup option.



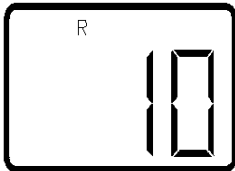
If you have enabled the RPM 1 Record Threshold, the next setting will be the RPM 1 Pause Threshold. This feature is used to pause recording when RPM 1 falls below the value for at least 1 second. Record will remain paused until RPM 1 reaches or exceeds the RPM 1 Record Threshold value set above. Set the Pause Threshold to 0 to continue recording regardless of engine RPM. Press or hold the **DISPLAY** button to increment the RPM 1 pause threshold to the next higher level.

Press the **MODE** button to step to the next Setup option.



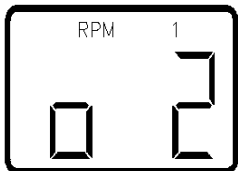
The RacePak reads each sensor 40 times per second. This setting – called DispSkip – slows the display rate down enough to be readable. The unit updates the value displayed once every DispSkip readings. Divide 40 by the number displayed to determine the number of readings per second. A DispSkip of 4 results in  $40 \div 4 = 10$  updates per second. Press or hold the **DISPLAY** button to increment the DispSkip to the next higher value. When the value reaches 40 it will wrap to 0.

Press the **MODE** button to step to the next Setup option.



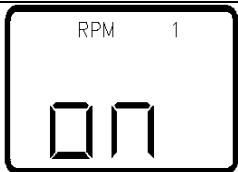
This setting -- called RecSkip – determines the number of sensor readings to be averaged into a frame of recorded data. The unit can record from 40 frames per second with RecSkip set to 1 to 1 frame every 5 seconds with RecSkip set to 200. Divide 40 by the number displayed to determine the number of samples recorded each second. A RecSkip of 10 stores  $40 \div 10 = 4$  frames per second. Press or hold the **DISPLAY** button to increment the RecSkip to the next higher value. When the value reaches 200 it will wrap to 0.

Press the **MODE** button to step to the next Setup option.



The Odd Fire setting lets you tell the unit to combine several actual spark signals to account for jitter or asymmetry in the ignition system. This is mostly useful for Harley-Davidsons, which may require an Odd Fire setting of 2. For even or symmetrical firing ignitions set this value to 1. Press or hold the **DISPLAY** button to increment the setting to the next higher value.

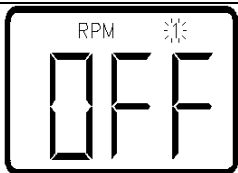
Press the **MODE** button to step to the next Setup option.



Your Hot Tach Pro can be configured to display only those channels that you want to see. Press the **DISPLAY** button to toggle between turning the channel ON or OFF.

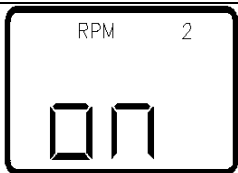
The Hot Tach Pro is shipped with engine RPM 1 turned ON.

Press the **MODE** button to step to the next Setup option.



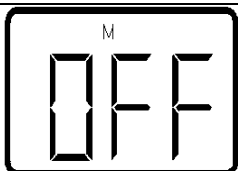
Any channel that is turned OFF is skipped in normal operation of the gauge displays. The RacePak does record (and download) the data; it simply doesn't show it on the LCD. The filtered engine RPM is turned OFF when the Hot Tach Pro leaves the factory. Press the **DISPLAY** button to toggle between turning the channel ON or OFF.

Press the **MODE** button to step to the next Setup option.



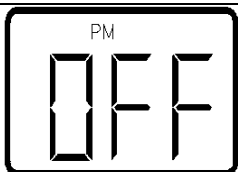
The Hot Tach Pro is shipped with RPM 2 turned ON. Press the **DISPLAY** button to toggle between turning the channel ON or OFF.

Press the **MODE** button to step to the next Setup option.



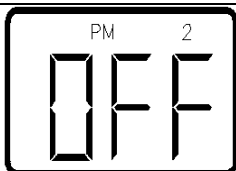
Speed in miles per hour is turned OFF when the Hot Tach Pro leaves the factory. Press the **DISPLAY** button to toggle between turning the channel ON or OFF.

Press the **MODE** button to step to the next Setup option.



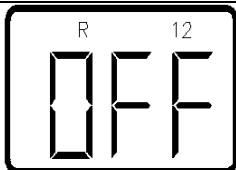
The odometer is turned OFF when the Hot Tach Pro leaves the factory. Press the **DISPLAY** button to toggle between turning the channel ON or OFF.

Press the **MODE** button to step to the next Setup option.



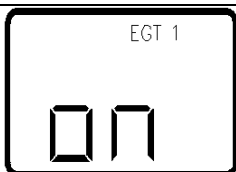
The trip odometer is turned **OFF** when the Hot Tach Pro leaves the factory. Press the **DIS PLAY** button to toggle between turning the channel **ON** or **OFF**.

Press the **MODE** button to step to the next Setup option.



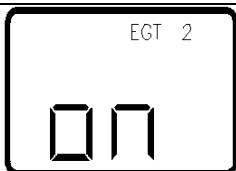
The rpm1/rpm2 ratio is turned **OFF** when the Hot Tach Pro leaves the factory. Press the **DISPLAY** button to toggle between turning the channel **ON** or **OFF**.

Press the **MODE** button to step to the next Setup option.



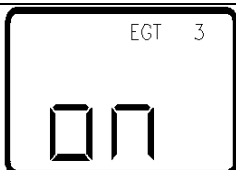
The Hot Tach Pro is shipped with EGT 1 temperature or Analog 1 Voltage input turned **ON**. Press the **DISPLAY** button to toggle between turning the channel **ON** or **OFF**.

Press the **MODE** button to step to the next Setup option.



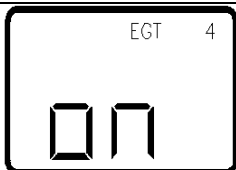
The Hot Tach Pro is shipped with EGT 2 temperature or Analog 2 Voltage input turned **ON**. Press the **DISPLAY** button to toggle between turning the channel **ON** or **OFF**.

Press the **MODE** button to step to the next Setup option.



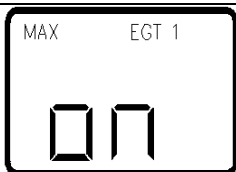
The Hot Tach Pro is shipped with EGT 3 temperature or Analog 3 Voltage input turned **ON**. Press the **DISPLAY** button to toggle between turning the channel **ON** or **OFF**.

Press the **MODE** button to step to the next Setup option.



The Hot Tach Pro is shipped with EGT 4 temperature or Analog 4 Voltage input turned **ON**. Press the **DISPLAY** button to toggle between turning the channel **ON** or **OFF**.

Press the **MODE** button to step to the next Setup option.



The Hot Tach Pro is shipped with MAX EGT temperature turned **ON**. Press the **DISPLAY** button to toggle between turning the channel **ON** or **OFF**.

Press the **MODE** button to step to the next Setup option.



The Record/Playback time is turned **OFF** when the Hot Tach Pro leaves the factory. Press the **DISPLAY** button to toggle between turning the channel **ON** or **OFF**.

Press the **MODE** button to step to the next Setup option.



This setting determines whether the back light turns **ON** or **OFF** when you apply power to the unit. (The back light flashes while the unit shows this setting.) Press the **DISPLAY** button to toggle between turning the back light **ON** or **OFF**.

Press the **MODE** button to step to the next Setup option.

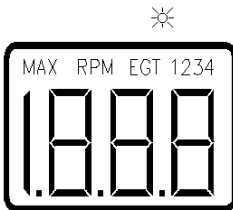
## Optional Analog

If your RacePak has analog channels configured for voltage type sensors the section below on Optional Analog Channel Setup will be repeated one time for each analog input configured as for voltage type sensors.



The final advanced setup option clears all user settings to the factory defaults. Select **'run'** to leave your settings intact. **Select 'clr' only if you want to return the RacePak to the state it was in when it left the factory.** Press the **DISPLAY** button to toggle between **'clr'** and **'run'**

Press the **MODE** button to exit the Advanced Setup Mode.



Flashes the display and the warning light to acknowledge the new Setup.

## **V. Optional Analog Channel Setup**

Each of the Hot Tach Pro's four analog channels can be factory-configured either as an EGT channel or as a more general purpose analog channel for use with voltage type transducers. An EGT channel monitors a type K thermocouple sensor. General analog channels are used to monitor all other transducers. The RacePak displays EGT channels in degrees Fahrenheit, with the letters 'EGT' in the display before the channel number. (All examples so far have assumed that all four analog channels were configured as EGTs.) General analog channels are displayed without the 'EGT' prefix.

Since the Hot Tach Pro has no way to determine what sensor is attached to a general analog channel, each channel must be configured to match the sensor it is reading. After enabling the individual display channels in Advanced Setup the Hot Tach allows you to configure each non-EGT analog channel. (If the unit has no general analog channels, these setup screens will not be presented.)

Each channel may require up to four selections:

- 1) Choose the Sensor Type.
- 2) Choose the Sensor Offset (Scaled channels only).
- 3) Choose the Sensor Full Scale Value (Scaled and PSI channels only).
- 4) Choose the location of the decimal point (Scaled and PSI channels only).



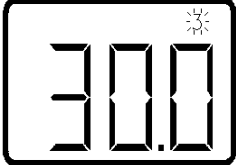

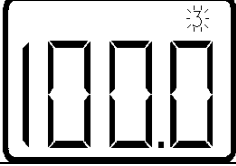

### **IMPORTANT NOTE:**


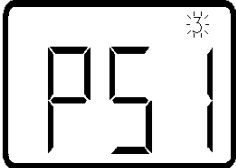

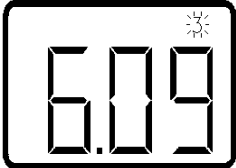

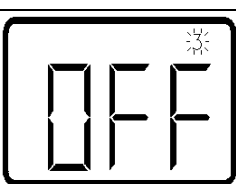
**The analog channels will not read correctly if the settings entered in the RacePak do not match the actual sensors being used. If the sensor you have does not match your needs, get a new transducer; giving the Hot Tach Pro incorrect sensor information will not compensate for having the wrong transducer.**

**When selecting a transducer, be aware that the Hot Tach Pro reads from 0-4V. This works out to 75% of full scale on a RacePak pressure transducer. Make sure that the highest values you expect from the sensor are within this range.**

## Analog Sensor Types





Refer to the shipping label for the Voltage Type transducer connected to the indicated input. Use the **DISPLAY** button to scroll through the sensor types listed below until the sensor type matches the transducer type specified on the shipping label. Press Mode to accept the selection and continue to the next step. The images illustrate setting channel 3.

	<p>Thermistor Temperature Sensor The thermistor temperature sensor reads from -10°F To 230°F.</p>
	<p>Volts This display shows the output of the transducer from 0-4 Volts.</p>
	<p>Pressure: Vacuum The vacuum transducer reads from 0-22.5 inches of mercury.</p>
	<p>Pressure: 60 PSI Full Scale The 60 PSI pressure transducer reads from 0-45 PSI.</p>
	<p>Pressure: 100 PSI Full Scale The 100 PSI transducer reads from 0 to 75 PSI.</p>
	<p>Pressure: 300 PSI Full Scale The 300 PSI transducer reads from 0-225 PSI.</p>

	<p>Pressure: 1500 PSI Full Scale The 1500 PSI transducer reads from 0-1125 PSI.</p>
	<p>Pressure: User Scaled Select this setting if your RacePak pressure transducer is not listed in this table.  See Setting PSI Analog Channels below.</p>
	<p>G Meter: 3g Full Scale This G Meter reads from -2 to +2 Gs.</p>
	<p>G Meter: 6g Full Scale This G Meter reads from -4 to +4 Gs.</p>
	<p>Custom Transducer This advanced feature allows you to enter scaling values for any linear transducer not listed above. It requires detailed technical knowledge of your transducer.  See Setting Scaled Analog Channel below for further details.</p>
	<p>Disabled The RacePak does not display channels that have been disabled.</p>

## Setting PSI Analog Channels

If you selected the PSI transducer type above, enter the full-scale pressure here. The full scale value will be specified on the shipping label on the transducer shipping package. As with Analog Sensor Types above, the images illustrate setting channel 3.

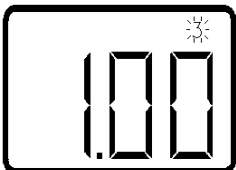





	<p>Set full-scale pressure in PSI using the Display button.</p>
	<p>Press the <b>MODE</b> button to set location of decimal point.</p>
	<p>Press Display to select the decimal point to display. The example at left shows a 150 PSI transducer, which will read from 0-120 PSI.</p>
	<p>Press the <b>MODE</b> button to continue with next channel.</p>

## Setting Scaled Analog Channels

If you selected the Scaled Analog channel type above, you will need to tell the RacePak about an unlisted sensor. You must know the following things about your sensor:

- 1) The voltage output by the sensor at 0 engineering units. For a pressure transducer, this would be the voltage at ambient pressure.
- 2) The engineering units represented by 5V of output. For a RacePak pressure transducer, this would be the full scale value.

The example below shows the values appropriate for a 150 PSI RacePak pressure transducer on analog channel 3.

	<p>Set volts at 0 engineering units.</p>
	<p>Press the <b>MODE</b> button to enter sensor's full scale reading.</p>
	<p>Set engineering units at 5V using the Display button.</p>
	<p>Press the <b>MODE</b> button to set location of decimal point.</p>
	<p>Press Display to select the decimal point to display. The example at left shows a 150 PSI transducer, which will read from 0-120 PSI.</p>
	<p>Press the <b>MODE</b> button to continue with next channel.</p>

## **SECTION III**

### **Operation of the Hot Tach Pro**

# **NOTES:**

# **I. General Operation–‘RUN’ Mode**

When the Hot Tach unit is turned on the unit will flash the warning LED and the display LCD three times to provide a self test for the unit. When the self test is complete the Hot Tach enters the RUN mode of operation and displays the channel that was selected during setup to display at power up (normally RPM 1). The RUN mode is the normal operating mode of the Hot Tach and is the mode where you will use the Hot Tach most of the time.

In the run mode you can view the real time values of any of the measured or calculated channels, monitor the over limit warnings, and turn on or off the display back light.

## **Changing the Current Channel Display**

At any time, while in the RUN mode, the channel currently being displayed on the LCD display can be advanced to the next channel in the in the enabled displays by pressing the **DISPLAY** button on the front of the Hot Tach Unit.

In addition, if you have installed a remote switch (connected to the blue wire in the POWER/RPM harness) you can also advance the channel currently being displayed on the LCD display to the next channel by pressing the remote switch.

## **Over Limit Warnings**

During normal operation, the Hot Tach compares each reading of each channel to the alarm limit programmed in the SETUP mode above. If any channel exceeds its limit, the unit flashes the warning light and displays that channel on the LCD display. If more than one channel is in alarm, the unit flashes the warning light and displays each of the channels in alarm in sequence on the LCD display.

## **Temporarily Disabling Alarms**

After you have identified the channel in alarm, press the **MODE** button to temporarily clear all active alarms. The Hot Tach will disable alarms for any channel that is over its limit when you pressed 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**

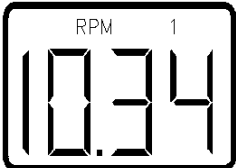
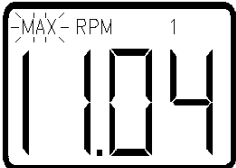
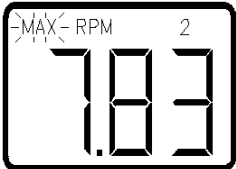


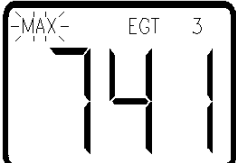
All alarms are enabled when the unit is turned on or when you leave MAX Mode. See ‘Viewing Max Reading’ below for details on MAX Mode.

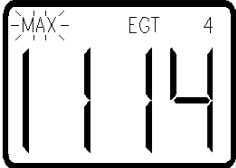


## **Back Lighting the Display**

The Hot Tach Pro can light the LCD display for improved visibility. To turn the back light on or off, hold the **DISPLAY** button until the back light turns on or off. The back light cannot be turned on or off while in **SETUP** or **ADVANCED SETUP** mode. See Advanced Setup to program whether the back light is on or off when the unit is turned on.

## II. Viewing Max Readings—‘MAX’ Mode

Your Hot Tach keeps track of the highest reading on each channel measured since the unit was turned on. These maximum readings can be displayed on the LCD display of the unit by entering the MAX mode. Follow the steps below to enter the MAX mode and to view these peak values. (Only the displays that are enabled when the unit leaves the factory are shown in the example below. If you have enabled or disabled channels in Advanced Setup your Hot Tach may not show the same display modes.)

	With the unit in Run Mode showing RPM 1, press and release the <b>MODE</b> button to enter MAX Mode.
	Note: You can enter MAX Mode while displaying any channel. RPM is chosen here only as an example.  The unit now flashes 'MAX' in the display to indicate that the readings are MAX, not current, values. The display now shows the highest engine RPM the unit has recorded since it was turned on.
	Press the <b>DISPLAY</b> button to show MAX RPM 2.  The display shows the highest RPM 2 the unit has recorded since it was turned on.
	Press the <b>DISPLAY</b> button to show MAX EGT 1.  The display now shows EGT 1's or Analog Input 1's highest value.
	Press the <b>DISPLAY</b> button to show MAX EGT 2.  The display now shows EGT 2's or Analog Input 2's highest value.
	Press the <b>DISPLAY</b> button to show MAX EGT 3.  The display now shows EGT 3's or Analog Input 3's highest value.
	Press the <b>DISPLAY</b> button to show MAX EGT 4.

	<p>The display now shows EGT 4's or Analog Input 4's highest value.</p>
	<p>The display now shows the highest value any EGT has reached since the unit was turned on. The 2 indicates that channel 2 recorded the peak value.</p>
	<p>Press the <b>DISPLAY</b> button to show the highest MAX EGT.</p> <p>Press the <b>MODE</b> button to return to Run mode. Hold the <b>MODE</b> button to clear the MAX readings before returning to Run Mode.</p> <p>'MAX' stops flashing and the display now shows the current temperature of the hottest EGT.</p> <p><b>Note:</b> If there is a recorded run, the RacePak will enter Playback Mode instead of Run Mode. See Viewing Recorded Data below for details.</p>

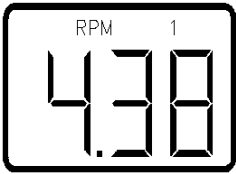


## Clearing MAX readings

The Hot Tach 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, instead of simply pressing it, to return to RUN Mode the unit will reset the maximum values to zero and will begin to record the new maximums.

### III. Recording a Run —‘RECORD’ Mode

The Hot Tach Pro can record and store the real time channel data for playback and/or download to a computer at a later time. Unlike the maximum values above, the recorded data stored in the Hot Tach unit is not erased until the next run is recorded over the top of the previous run or the BASIC SETUP or ADVANCED SETUP Mode is entered.

You must have a remote switch connected to the blue wire of the POWER/RPM HARNESS as discussed in the section on INSTALLATION if you plan to use the recording feature. The remote switch is used to start the recording and to playback the recording as discussed below.

	<p>With the unit in Run Mode, hold the external switch until the ‘R’ starts flashing. When you release the switch, your Hot Tach will begin recording data.</p>
	<p>Note: If you have set the RPM threshold in the Advanced Setup the recording does not start until the RPM exceeds the threshold.</p> <p>The flashing ‘R’ indicates that your gauge is currently recording data. The unit records until its memory fills or until you press the <b>MODE</b> button and enter MAX Mode. While recording the unit functions the same as in RUN mode.</p>
	<p>Note: See Viewing Max Readings for details on entering MAX Mode.</p> <p>When the ‘R’ stops flashing, the recording is complete</p> <p>Your Hot Tach stores the recorded run until you record a new run. <b>Turning the unit off does not clear the recorded run.</b></p>

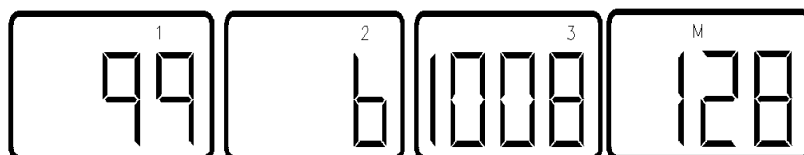
## Length of Recorded Data

The duration of your Hot Tach Pro's recording is determined by the amount of memory inside the Hot Tach Pro and the sample rate you have selected – the number of frames of data that it records each second. The sample rate can vary from 40 samples per second to one sample every five seconds. Use Advanced Setup's RecSkip entry to set the sample rate. The table below shows the approximate record time for each setting:

RecSkip	Samples Per Second	Record Length with 32K of memory	Record Length with 128K of memory
1	40	81 seconds	5.4 min (324s)
2	20	162 seconds	10.8 min (648s)
4	10	325 seconds	21.7 min (1300s)
5	8	406 seconds	27.0 min (1624s)
8	5	10 min (650s)	43.3 min (2600s)
10	4	13 min (812s)	54.1 min (3248s)
20	2	27 min (1625s)	1.8 hours (6500s)
40	1	54 min (3251s)	3.6 hours (13004s)
80	1 per 2 seconds	1.8 hours (6502s)	7.2 hours (26008s)
120	1 per 3 seconds	2.7 hours (9753s)	10.8 hours (39012s)
160	1 per 4 seconds	3.6 hours (13004s)	14.4 hours (52016s)
200	1 per 5 seconds	4.5 hours (16256s)	18.0 hours (65024s)

## Determining the Serial Number and amount of memory To

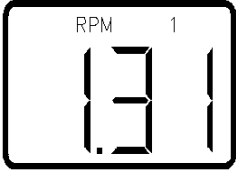
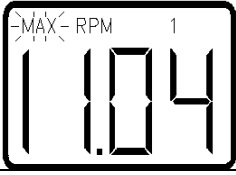
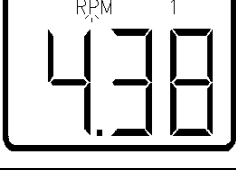


display the amount of onboard memory and the serial number of your Hot Tach Pro press and hold the **DISPLAY** button while turning on the power. After the unit has powered up and the display is blank release the **DISPLAY** button. The unit will now begin to flash the serial number and amount of onboard memory. The example below shows a Hot Tach Pro with 128k of memory and the serial number 99061008.

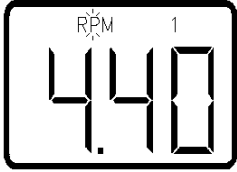


<b>99</b>	<b>06</b>	<b>1008</b>	<b>128K bytes</b>
First two digits of the serial number.	Second two digits of the serial number	Last four digits of the serial number	Amount of memory in kilobytes

## IV. Viewing Recorded Data – ‘PLAYBACK’ Mode

Once a run has been recorded by the Hot Tach Unit, the data can be played back on the LCD display of the Unit. This process requires the use of the remote switch connected to the blue wire of the POWER/RPM harness as detailed in the INSTALLATION section. Follow the steps below to replay the recorded run. (Only the displays that are enabled when the unit leaves the factory are shown in the example below. If you have enabled or disabled channels in Advanced Setup, your Hot Tach may not show the same displays.)

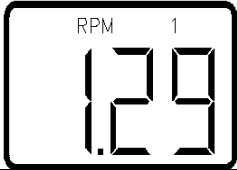
	<p>With the unit in Run Mode showing RPM 1, press and release the <b>MODE</b> button to enter MAX Mode. If any alarms are active, you must press <b>MODE</b> button a second time to enter MAX Mode.</p> <p><b>Note:</b> You can enter MAX Mode while displaying any channel. RPM is chosen here only as an example.</p>
	<p>The unit now flashes 'MAX' in the display.</p> <p>Press and release <b>MODE</b> button. If the unit has a recorded run, it enters <b>PLAYBACK</b> Mode to display it. (The unit returns to <b>RUN</b> Mode if there is no recording.)</p>
	<p>The display now shows the engine RPM recorded in the first frame of data. The flashing 'P' indicates that the unit is in <b>Playback</b> Mode showing recorded data.</p> <p>Press the <b>DISPLAY</b> button to show the EGT 1 or Analog 1 recorded in the first data frame.</p>
	<p>This is the EGT 1 or Analog 1 reading recorded during the first frame.</p> <p>Press and release the <b>DISPLAY</b> button to show EGT 2. Press again for EGT 3, then again for EGT 4, and again to display MAX EGT. Press the <b>DISPLAY</b> button again to show RPM 1.</p>
	<p>The display again shows the engine RPM recorded in the first frame of data.</p> <p>Press and release the remote switch to step to the second recorded frame.</p>



The display now shows the engine RPM recorded during the second frame.

To replay the run at full speed, hold the remote switch.

To exit Playback Mode, press the **MODE** or hold the remote switch until the recording is over..



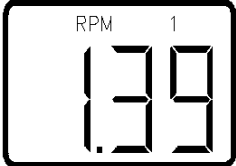
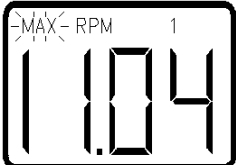
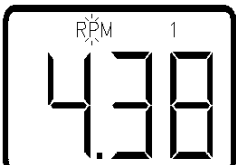
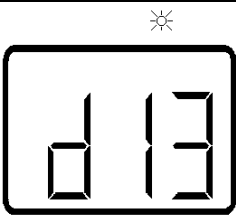
When the recording is over, the P stops flashing and the unit returns to RUN Mode.

To view the run again, re-enter Playback Mode.

## VI. Sending Recorded Data to a PC

### Step 1: Preparing the Hot Tach Pro for Downloading:

If you have purchased the RacePak DATALINK Data Analysis package, the data recorded by the Hot Tach unit can be downloaded from the Hot Tach Unit to a PC type computer. Follow the steps below to send the recorded run to a PC.

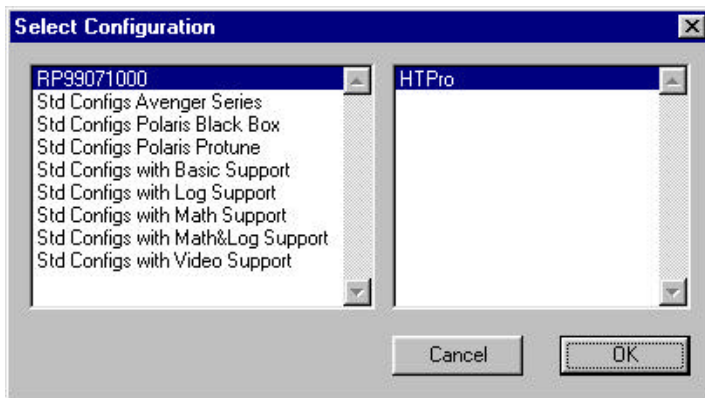
	<p>With the unit in Run Mode showing RPM, press and release the <b>M</b> <b>ODE</b> button to enter MAX Mode. If any alarms are active, you must press the <b>MODE</b> button a second time to enter MAX Mode. <b>Note:</b> You can enter MAX Mode while displaying any channel. RPM is chosen here only as an example.</p>
	<p>The unit now flashes 'MAX' in the display.</p> <p>Press and release the <b>MODE</b> button. If the unit has a recorded run, it enters Playback Mode to display it. (The unit returns to Run Mode if there is no recording.)</p>
	<p>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.</p> <p>Press and hold the <b>MODE</b> button to enter the download mode.</p>
	<p>The Hot Tach displays a 'd' followed by the current block number to indicate that it is downloading data through the warning light.</p>

## Step 2: Uploading Data to Your PC:

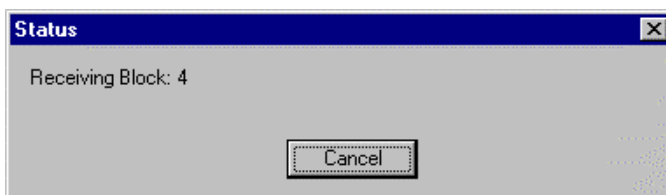
- With your computer turned off, plug the 9 pin connector of the download puck into an available serial communication port located at the back of your computer. Turn on your computer and start the Racepak DataLink software by double clicking on the Racepak icon located on your desktop.
- Place the download receiver over the face of the Hot Tach unit with the cord exiting the bottom of the unit.
- Click the **NEW** icon in the toolbar (pictured below) to initiate the upload of a new data file.



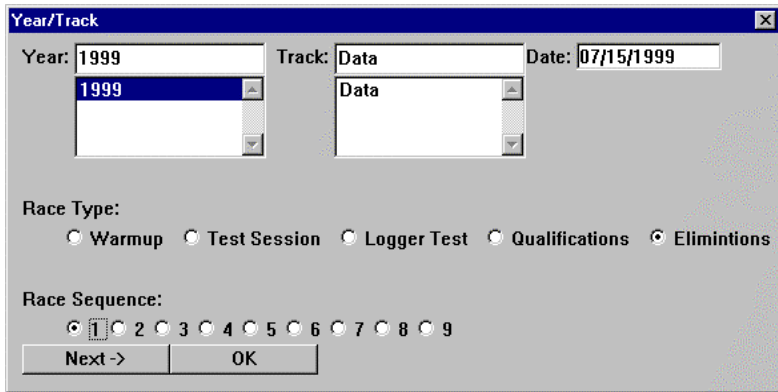
- The Select Configuration dialog box will be displayed. On the left side of the box highlight the serial number of the Hot Tach Pro you are uploading from.



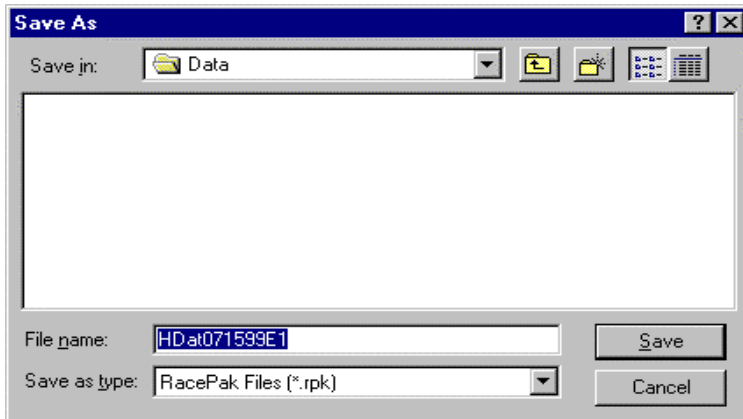
- The Status dialog box will appear indicating the upload status and which data block is currently being received. If you receive an error message, see section II-step #5 of the DataLink manual “Setting the default Serial Communication Port for Uploading Data” and then repeat the above steps.



- Select the year, track, race type and sequence. If the track name does not appear in the list, type it in the text box and it will automatically be created for you. Click on **OK**.



- The Save dialog box will now appear. A default file name will automatically be created for you based on the information entered above. We recommend using the default file name since the track, date and race information are embedded and make it easy to identify the data in the future. However, if you prefer not to use the default filename you may enter your own filename here. Click **Save** to complete the upload and save



the data to disk.

- When the download transfer is complete hold the Remote Switch until the Hot Tach unit returns to the RUN mode or turn the Hot Tach off to exit the download process.

## **NOTES:**

## 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 the unit is mounted on a Harley-Davidson, verify that the Odd Fire setting described in Advanced Setup is set to 2.
RPM 1 is stable, but too high.	Check the value for P1 in programmed in the BASIC SETUP. Try setting P1 to 1. Run the engine and note how many times too high the tach reads. Use that number for P1. Example: If RPM 1 reads 3000 at 1000 RPM, set P1 to 3.
RPM 1 is stable, but too low.	If the RPM 1 reads half what it should, set P1 to half its current value. If P1 is already 1, set it to 0.
RPM 1 is 0.	Make sure that the RPM 1 pickup wire is installed (either wrapped or 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 the section of general operation for details.
“R” begins to flash immediately after turn the unit on.	Make sure the blue wire in the power harness is not shorted to ground. Check the remote switch for a short to ground.
Get an error message when trying to upload or the block numbers loop forever.	Make sure the battery is in good condition. If using a 9 volt battery try a 12 volt battery.

## **NOTES:**

## **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 dated 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 sensors and/or probes supplied with the Hot Tach Pro system manufactured by companies other than CSI. Exhaust Gas Technologies, Inc cover temperature probes under separate warranty. Please contact Exhaust Gas Technologies, Inc directly at 714-997-5224

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