SPLIT SECOND

Description:

The FTC1 Fuel/Timing Calibrator provides precise calibration of fuel and timing retard. It is most often used when naturally aspirated engines are converted to forced induction. The fuel calibration range supports conversion to larger injectors. The timing control section is used to map timing retard to avoid detonation under boost.

Through a serial interface, the FTC1 can be programmed by a laptop computer running the Split Second R4 software. The R4 software has two map tables. These tables provide three dimensional mapping of fuel mixture and timing retard. The active cell in each table is determined by absolute pressure measured by the internal sensor and RPM.

The FTC1 comes in many different versions. It must be ordered for a specific model of vehicle. Some versions have an internal 2.5 bar MAP sensor which can replace the stock one bar MAP sensor. Other versions operate in voltage mode and are driven off of the stock MAF sensor.

Some versions of the FTC1 control fuel through one or more additional injectors. These versions use map A for timing retard and map B for additional injection pulse width. Versions of the FTC1 that do not control additional injectors use map A for fuel control and map B for timing retard.

Features:

- Versions available for use with either larger injectors or additional injectors
- Can operate as a programmable MAP sensor for speed density applications
- Two three-dimensional map tables defined by absolute pressure and RPM
- Compatible with 2 and 4 stroke engines from 1 to 12 cylinders
- Laptop adjustable
- Can retard ignition timing by up to 20 degrees
- Some versions have built-in enrichment in closed loop
- Transient surge and battery reversal protection

Connection Information:

Because the FTC1 is offered in so many configurations, it is not possible to show a typical connection. Please refer to the installation instructions for a specific model for more information

Software:

The FTC1 is programmed with the R4 engine management software. When the software is launched an identification screen will appear that says Split Second. After four seconds, the main menu will appear. If this is a new application, select **File** then **New Customer** to create a new customer. Type in the customer name and save. The default location for customer names is My Documents.

When you return to the main screen, select **File** and **Open Customer** to open the customer file that you just created.   Once the customer is open, the **Maps**, **View**, **Options** and **Help** tabs become active.   You can fill in the various fields such as name, address etc. if you like.

Connections:

Connect the FTC1 to the computer using a USB to serial adapter cable. These cables require a software driver that must be properly installed on the computer. Select the proper com port for the serial adapter. The correct com port setting may be found under Ports in the Device Manager of the computer.

Once the serial cable is plugged in and the FTC1 is powered up, you may connect to the FTC1 by selecting the **Connect to ECU** icon.   Once communication has been established with the ECU, the **Real Time** pull down becomes active.

Programming:

Refer to the R4 data sheet for specific information on how to use the R4 software. Each version of the FTC1 has detailed installation instructions with specific information about how to configure the R4 calibration file.

Use the **Options** pull down and **Systems Settings** option to select either the Vacuum/Pressure, or Voltage mode. Select either Additional Injector Controller or Programmable Signal Calibrator depending on the version of the FTC1 you are using.

Most versions of the FTC1 have an internal 2-bar map sensor and are used with vacuum/pressure selected under System Settings. In this mode, the FTC1 is calibrated to read throughout the vacuum region and up to 16 PSI of boost. The vacuum and pressure readings are based on sea level conditions. As you move up in elevation and atmospheric pressure goes down, the ambient pressure reading will move down into the vacuum region.

Use the **Options** pull down and **Engine Settings** to select the number of cylinders of the engine. Pay close attention to the instructions for your specific version of the FTC1. There are times when the engine settings do not match the actual number of cylinders of your engine. This is due to the pulse rate of the signal used to measure engine RPM.

Use the **Maps** pull down to access the map tables. There are two map tables in the R4 program. Table A is normally used to program fuel and table B is used to program timing retard. If the FTC1 controls additional injectors, map A is used to control timing retard and map B is used for additional injector pulse width.

On versions of the FTC1 that control fuel through sensor calibration, the number entered into the cells on the map A represents the offset to the input load signal. The cell value can range from 0.0 to 20.0. The neutral value is 10.0. Cell values greater than 10 increase the load signal and make the fuel mixture richer. Cell values less than 10 decrease the load signal and make the mixture leaner.

Versions of the FTC1 that control additional injectors are programmed directly in milliseconds of injection on-time. The cell values in map B can range from 1 to 25.5 mS. As a practical matter, a minimum cell value of 1.0 mS is required to turn on an injector. Duty cycles greater than 80% should be avoided.

The number entered into the timing map indicates the timing retard in degrees. The value can range from zero to 20.0. The retard map can be thought of as an overlay map on top of the ignition timing map in the stock ECU. To retain smoothness, large jumps in value from one cell to the next should be avoided.

You can click and drag to highlight an area of cells. Once highlighted, you can use the icons across the top of the window to alter the selected cells in different ways. Use **Fill Selected** to enter the same cell value throughout the highlighted region.

A highlighted area of cells can also be changed by a percentage by using the **Change By** button. To increase a highlighted area of cells by 10 percent for example, select the cells, click on the **Change By** button and enter 10. To reduce by 50 percent, enter –50.

You can also fill a range of cells with values that are interpolated from the end points. This works over a row, column or 2-dimensional area. To fill values over a two dimensional area, fill the four corners of the area with cell values. Then click and drag to select the area encompassed by those corner cells. Click on the **Auto Fill** button. The software will fill the highlighted cell with values interpolated from the corner values.

Once the maps are set up, you can write to the ECU in the FTC1. To write to the ECU, the ignition must be on so that the FTC1 is powered up. The engine must be off so that tach pulses are not present during programming. To write to the ECU press the **Write Data to ECU** button. You can also upload from the ECU using the **Read Data from ECU** button. You can then save or modify the data. When you close a file in R4 it will automatically be saved in its current state.

During the tuning process, it is a good idea to periodically close the file you are working in and start a new file. This will make it possible to go back to a previous tune. Create and open a new customer file. Set the correct system settings, connect and Read Data from ECU. You are now ready to continue tuning. Use the notes field on the main screen to record pertinent information about the file.


Operation:

Once the data is loaded into the FTC1, the engine can be started. From the main screen, the **Real Time** pull down can be used to observe a variety of operating parameters. The **All** option brings up a window that displays boost pressure and RPM as well as cell value and duty cycle for both A and B channels.

The All window can be enlarged to full screen size to make it easy to read while working on the engine. The **RPM** and **Pressure** options display analog gauges that show those parameters. The **All**, **RPM** and **Pressure** options can all be displayed simultaneously.

Electrical Characteristics:

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Supply Voltage	BATT+ to BATT-	12	13.5	15	V
Supply Current	Into BATT+ terminal		25		mA
Tach threshold	Normal operation		2.5		V
Tach Hysteresis	Normal operation		0.5		V
Vacuum/Boost	On vacuum/boost hose	0		2.5	Bar
MAP output	Steady state source current		0.1		mA
Direct Output	Steady state source current		10		mA
Modify Output	Steady state source current		10		mA

Mechanical Characteristics:

1.57

4.13

6.19

7.00

SPLIT SECOND
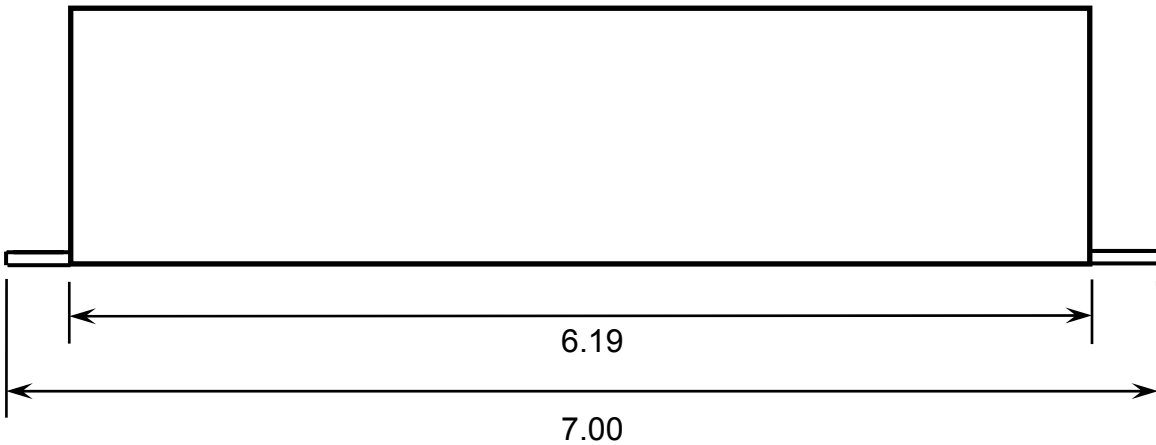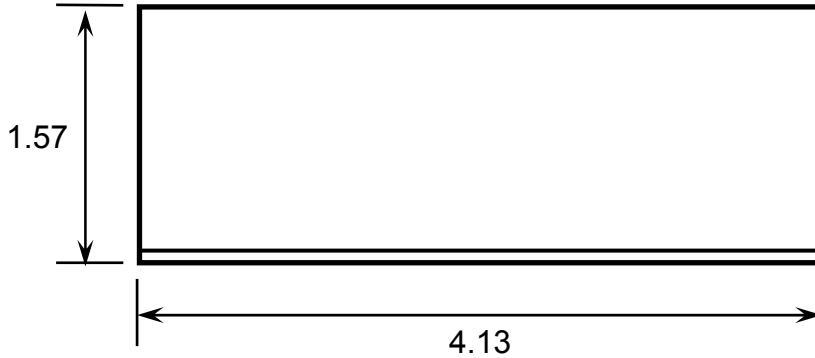
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