HONDATA

ROM EDITOR

VERSION 2.5

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INSTALLATION OF ROM EDITOR

Hardware requirements

Programming and Datalogging
Pentium 133 32Mb Ram
Windows 95 or 98 (recommended)
Serial and Parallel port.

Datalogging only
Windows 95, 98, ME, NT, 2000, XP
Pentium 133 32Mb Ram
Keyspan usb serial adaptor *(newer laptops without serial ports)*
http://www.keyspan.com/products/usb/PDAadapter/

What is installed and where.

The disk supplied contains a compressed copy of the ROM
Editor program and a number of stock and tuned files.
Those files are detailed in a later chapter.

Double click on ROM Editor icon to begin the installation
process and follow the instructions. Contact Hondata for
the installation password if it has not been provided.

ROM Editor is installed in c:/Program Files/ROMEditor/
Into that folder is installed the ROMEditor software, and a
ROMs folder, which contains the tunes and a number of
stock files for returning the ECU to a stock configuration.
Note that the stock files cannot be edited by ROM Editor.

A Hondata folder is created in the programs folder accessi-
ble from the start menu.
A short-cut is also installed on the desktop.

Check *www.hondata.com/downloads.html* for software
updates and a color version of this manual in Adobe
Acrobat format.

Hondata Rom Editor supports drag and drop in which a
ROM file may be dropped onto the Hondata ROM editor
icon to open. Alternatively a ROM file may be dragged into
an open ROM Editor Window.
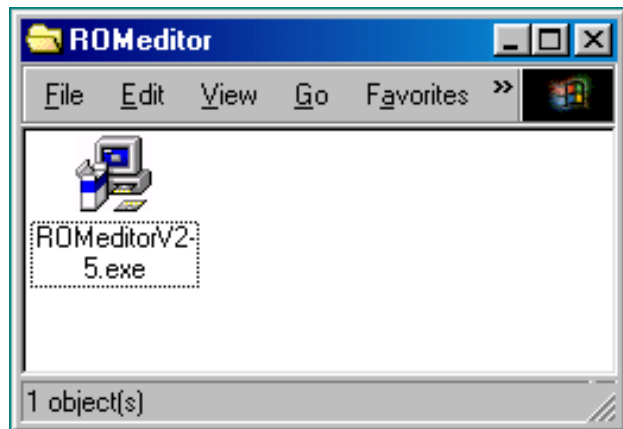
ROMeditor Installation disk
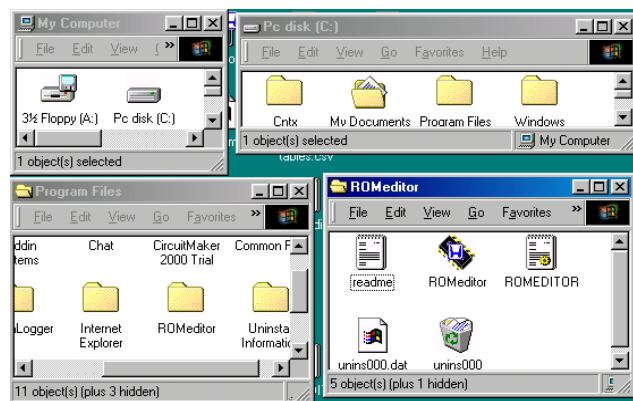
Default installation location for ROMeditor

Launching ROMeditor from the Start Menu

Opening a ROM file by Dragging

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INSTALLATION OF POCKET PROGRAMMER

Installing the Windows Pocket programmer software.

Current versions of thje software supplied with the Pocket Programmer work under Windows 95 and 98 and have been tested under 2000, NT, ME and XP. Windows ME is not recommended.Earlier versions of the software run only 95 and 98.

Always check http://xtronics.com/memory/eprom.htm#upgrades the latest version of the pocket programming software.
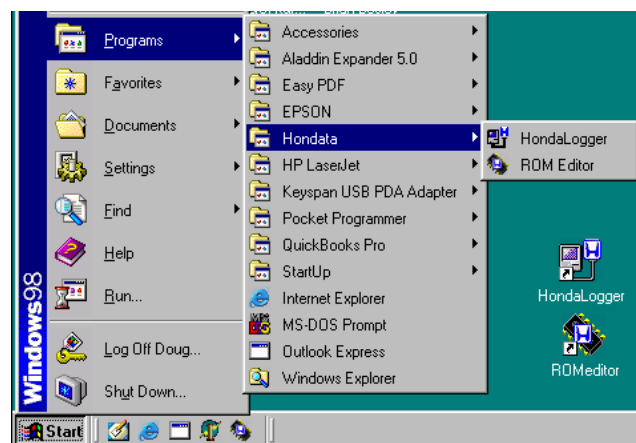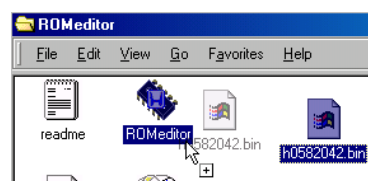
An version of the Pocket Programming software is available for download from http://www.hondata.com/pocketprogrammer.html with an install password of quiditch .

Launch the software from the floppy disk supplied or from the software downloaded from the internet.
Do not install the DOS software that ships with the emulator board (the two inch square circuit board with the ribbon cable) This is not needed as its functionality is built into ROM Editor.

Set the installation directory to ROM Editor
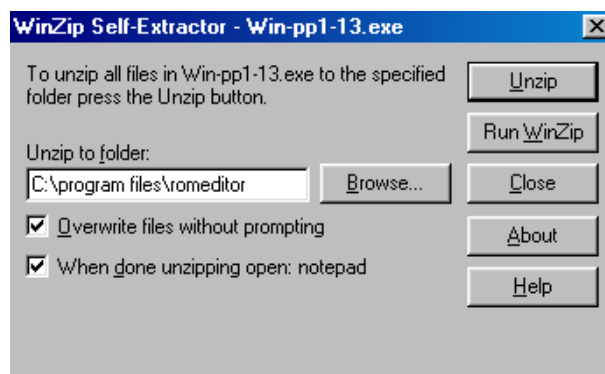
Windows Pocket Programmer Installer

The finished installation looks like this. ROM Editor and the Win_pp Windows pocket programming software are kept in the same directory for ease of access.

Drag ROM Editor and WinPP2 applications to the task bar for easy access.

Win_PP installed to the ROMeditor folder and dragged to the task bar

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CREATING A NEW ROM

Creating a New ROM

New ROM images can be created by selecting New from the File menu. You then select the ECU, tables and other options, and a ROM image is created. Table can be selected from other ECUs in the same family, or from a set of pre-existing tunes. Note that the tunes are a starting point only. Any vehicle onto which they are installed must be tested for air/fuel ratio and correct ignition advance.

Select the ECU for which you are making the new program.
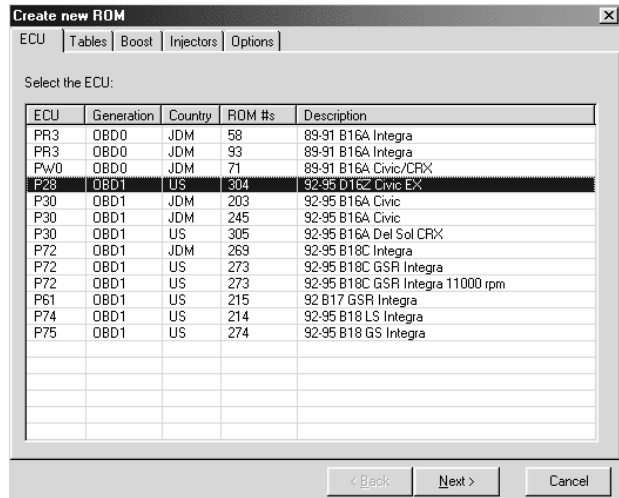
Ecu selection window

If the ECU you have selected is to be used with a different engine in a fairly standard state of tune then select the stock tables from a different ECU. This is ideal for motor swaps.
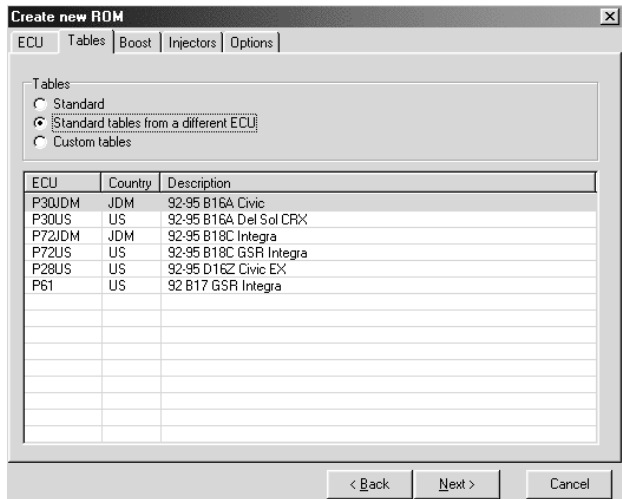
Stock Fuel and Ignition table selection

If the engine is highly modified, or boosted there may be a selection among the custom tables that better suits your requirements.
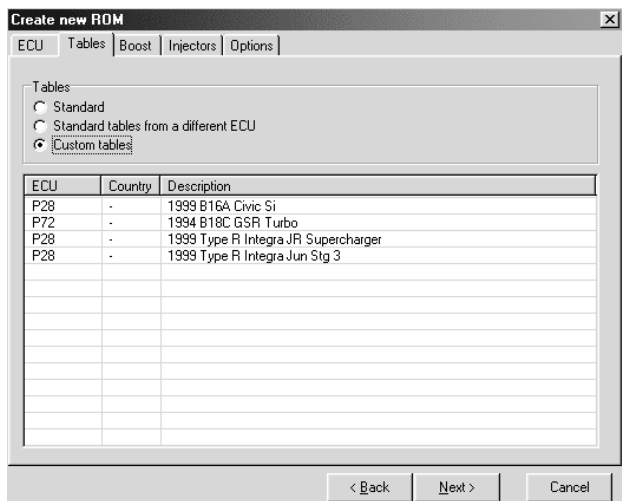
Custom Fuel and Ignition table selection

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CREATING A NEW ROM

Select whether you are running NA, Boost with the stock MAP sensor or with the GM 3 Bar MAP sensor. This also sets the display width of the ignition and fuel maps.
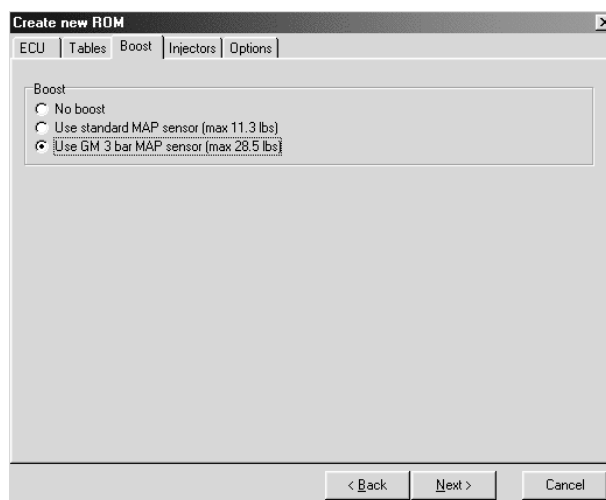
Boost selection

Set your replacement injector sizing and any alterations to stock fuel pressure. They can be altered later.
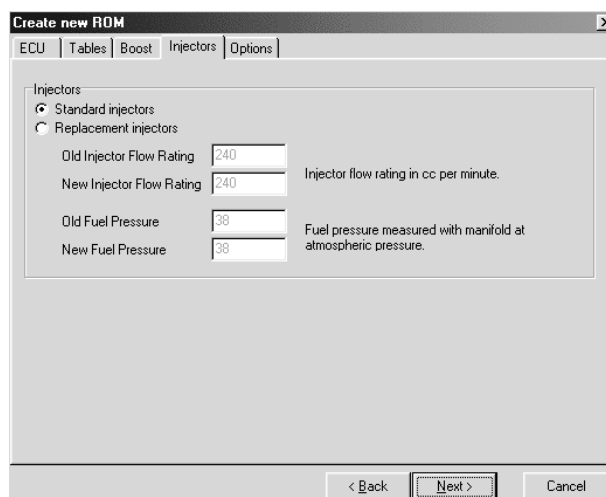
Injector sizing and fuel pressure

For tuning purposes switch the car to open loop and use a wide band lambda meter if you have one. Running the car in closed loop makes consistant power runs difficult as the ECU has a learning mode. See long and short term O2 trim later in the documentation.

Closed loop operation

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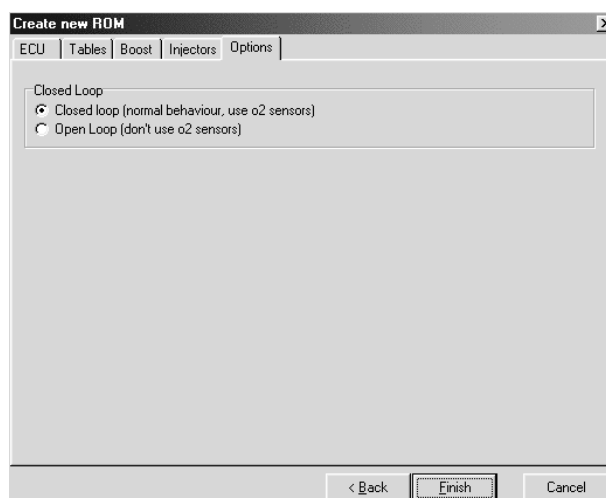
CREATING A NEW ROM

The ROM file you have created has axes of increasing RPM down from top to bottom and increasing load from left to right.

F1 and F2 display the low and high speed ignition tables.

F3 and F4 display the low and high speed fuel tables.

F7 displays the tables in 3D.

3 Bar Turbo GSR ROM VTEC ignition table

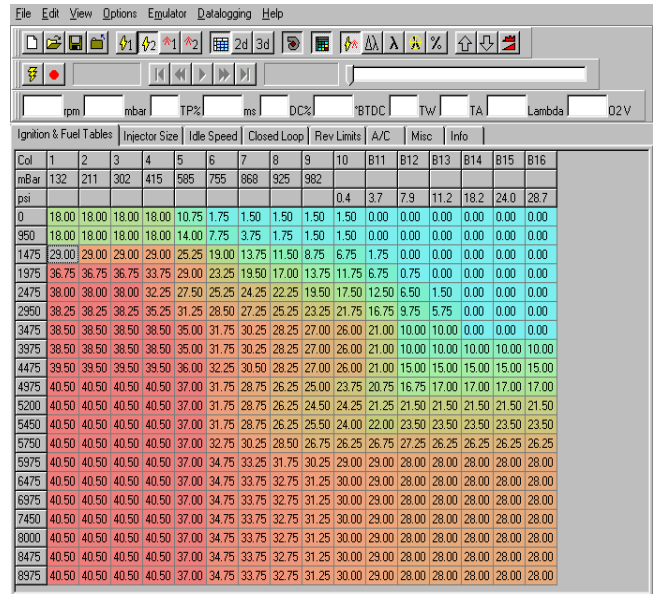| Col	1	2	3	4	5	6	7	8	9	10	B11	B12	B13	B14	B15	B16
mBar	132	211	302	415	585	755	868	925	982							
psi										0.4	3.7	7.9	11.2	18.2	24.0	28.7
0	18.00	18.00	18.00	18.00	10.75	1.75	1.50	1.50	1.50	1.50	0.00	0.00	0.00	0.00	0.00
950	18.00	18.00	18.00	18.00	14.00	7.75	3.75	1.75	1.50	1.50	0.00	0.00	0.00	0.00	0.00
1475	29.00	29.00	29.00	29.00	25.25	19.00	13.75	11.50	8.75	6.75	1.75	0.00	0.00	0.00	0.00
1975	36.75	36.75	36.75	33.75	29.00	23.25	19.50	17.00	13.75	11.75	6.75	0.75	0.00	0.00	0.00
2475	38.00	38.00	38.00	32.25	27.50	25.25	24.25	22.25	19.50	17.50	12.50	6.50	1.50	0.00	0.00
2950	38.25	38.25	38.25	35.25	31.25	28.50	27.25	25.25	23.25	21.75	16.75	9.75	5.75	0.00	0.00
3475	38.50	38.50	38.50	38.50	35.00	31.75	30.25	28.25	27.00	26.00	21.00	10.00	10.00	0.00	0.00
3975	38.50	38.50	38.50	38.50	35.00	31.75	30.25	28.25	27.00	26.00	21.00	10.00	10.00	10.00	10.00
4475	39.50	39.50	39.50	39.50	36.00	32.25	30.50	28.25	27.00	26.00	21.00	15.00	15.00	15.00	15.00
4975	40.50	40.50	40.50	40.50	37.00	31.75	28.75	26.25	25.00	23.75	20.75	16.75	17.00	17.00	17.00
5200	40.50	40.50	40.50	40.50	37.00	31.75	28.75	26.25	24.50	24.25	21.25	21.50	21.50	21.50	21.50
5450	40.50	40.50	40.50	40.50	37.00	31.75	28.75	26.25	25.50	24.00	22.00	23.50	23.50	23.50	23.50
5750	40.50	40.50	40.50	40.50	37.00	32.75	30.25	28.50	26.75	26.25	26.75	27.25	26.25	26.25	26.25
5975	40.50	40.50	40.50	40.50	37.00	34.75	33.25	31.75	30.25	29.00	29.00	28.00	28.00	28.00	28.00
6475	40.50	40.50	40.50	40.50	37.00	34.75	33.75	32.75	31.25	30.00	29.00	28.00	28.00	28.00	28.00
6975	40.50	40.50	40.50	40.50	37.00	34.75	33.75	32.75	31.25	30.00	29.00	28.00	28.00	28.00	28.00
7450	40.50	40.50	40.50	40.50	37.00	34.75	33.75	32.75	31.25	30.00	29.00	28.00	28.00	28.00	28.00
8000	40.50	40.50	40.50	40.50	37.00	34.75	33.75	32.75	31.25	30.00	29.00	28.00	28.00	28.00	28.00
8475	40.50	40.50	40.50	40.50	37.00	34.75	33.75	32.75	31.25	30.00	29.00	28.00	28.00	28.00	28.00
8975	40.50	40.50	40.50	40.50	37.00	34.75	33.75	32.75	31.25	30.00	29.00	28.00	28.00	28.00	28.00

If you position the mouse over a button a brief explanation will displayed after a few seconds.

All button functions will be covered in detail in a later chapter.

Save the ROM you have created. ROMeditor adds .bin as a default extension.

Pause to activate help

Hold down the ALT and press the TAB key until the ROMeditor folder appears. Launch the Win_PRG program
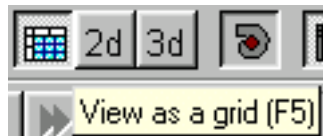
Pressing ALT TAB to switch programs

WRITING A CHIP

Programming the ATMEL AT29C256 Flash EEprom

INITIAL SETUP

Plug in and power up the Pocket programmer. Some PCs require the Pocket programmer to be plugged in before booting Windows.

Make sure no chip is plugged into the programmer. Some chips require 25V to program; the Atmel AT29C256 requires 5 V. If you have inserted the Atmel Chip before you are ready to program you risk overheating and damaging it with 25V.
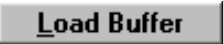
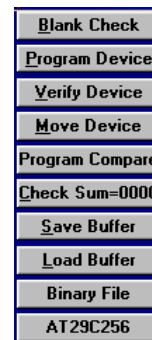Select the correct chip type from the list. If the list is not displayed.

Press the button below Binary File [Binary File / No Device] to bring cthe list up. The Atmel 27c256 PROM is proogrammed at 12.5 V using the selection of 27c256.

Click the button [**Load Buffer**] and select the file you just saved.

Eprom selection list

Programming buttons

Insert the Atmel chip into the pocket programmer. Note the notch on the chip is uppermost, and that the chip is placed at the bottom of the socket.

Click the button [**Program Device**]. Programming takes about 30 seconds on a 500 Mhz Pentium.

Remove the chip, place it in the ECU and turn the key on to verify the engine check light goes off. For problems, consult the installation manual for troubleshooting proceedure.
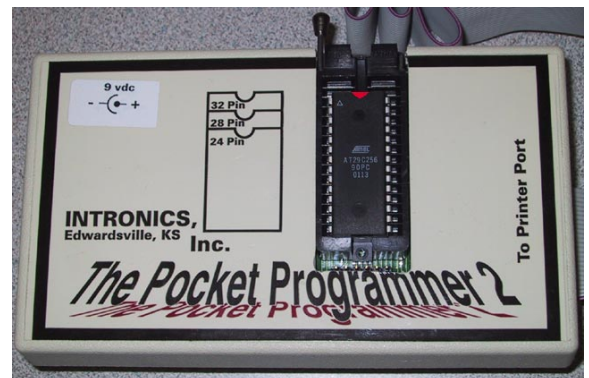
Programmer with Atmel flash chip in place

TROUBLESHOOTING

The engine check light is on

Plug in the Hondata interface (it must be plugged in at all times)
Read the error code (Appendix 2) and fix the error indicated by the blinking code.

The red LED on the Hondata interface is blinking, the engine check light is on, the car rev limits to 3000-3500 RPM and runs badly

Short the diagnostic connector and read the error code (Appendix 2) Code 0 is likely (solid check light)

The ECU is in limp home mode and probably running off its backup microprocessor. The ECU can run without a chip installed at all. In this mode the car runs with a fixed (rich) fueling and (retarded) ignition value.

Likely causes:	Fix
• No ROM is installed	Install one
• The ROM is blank, or has been incorrectly written	Rewrite a new Hondata ROM
• The ROM is installed backwards (it may get hot)	Reverse orientation (check notch)
• The ROM is faulty.	Rewrite a new Hondata ROM
• The external ROM soldering circuitry is faulty (cold weather exagerates this)	Cut J1 & test (OBD I Only)
• The ECU is faulty	Replace ECU with working unit

A good place to start is to write the stock ROM for the ECU as per Appendix 3. Switch the ignition on and off twice and observe if the engine check light extinguishes. If this works then the ECU, the programmer and the chip must be OK. If the car has injectors close to stock then start and run the car. Large injectors with the stock ROM will quickly flood the car. The red LED will flash with the stock ROM as it cannot communicate with it. Write another chip for the ECU using the supplied Atmel 29c256 Flash Eprom and stock settings.

If the stock ROM does not work, cut J1 (for OBD I only - see installation manual). If the engine check light stays on solidly (with the jumper shorted) then the ECU is likely faulty. Replace and test with another ECU. If the engine check light extinguishes, then the problem is likely faulty soldering or installation of the external ROM. Examine and repair the external ROM installation or substitute a known working ECU.

The red LED on the Hondata interface is blinking, the engine check light is off, the car runs normally, or rich for cars with bigger injectors

Likely causes:	Fix
• The stock ROM is installed (see Appendix 3)	Replace with a Hondata ROM
• J1 has not been installed (OBD I only)	Install it as per installation manual

The check light is on, the car rev limits 4000 rpm, will shut off under boost, but runs smoothly

In this instance the ROM is working OK, but cannot communicate with the Hondata interface.

Likely causes:	Fix
• The interface cable may be plugged in reverse	Check orientation
• Wires in the interface cable or connector may be broken	Check continuity in all 4 wires
• The Hondata interface is unplugged	Plug it in
• The Hondata interface is faulty	Replace with known working unit

Failing these suggestions, contact support@hondata.com, with a report on the problem.

CHIP BASICS

Definitions

ROM	Read Only Memory (This is what Honda supplies with their computer)
PROM	Programmable ROM. This chip can only be programmed once.
EPROM	Erasable Programmable Read Only Memory (Requires UV light to erase)
EEPROM	Electrically Erasable Programmable Read Only Memory (a.k.a. Flash)

In the early computers (most computers before '92 and some OBD I computers) the ROM is a 28 pin chip normally having the numbers 256 on it. The ROM contains data, like ignition timing values and fuel injector opening times. It also contains instructions on how to process that information for different throttle positions, temperatures, and revs, etc. Hondata ROMeditor software intelligently interprets that data, allowing changes to be easily and quickly made.

For most of OBD I (except Accord and Prelude) Honda combined their ROM with the microprocessor to reduce costs. The large two or three digit number on this processor is the Honda ROM number, the version of the software Honda uses for that car and engine computer.

OBD I computers have a blank space on the circuit board to install an external ROM. (Some very early Hondas may have instead a ROM already installed) This ROM becomes active when the jumper J1 is installed (see Hondata Installation manual). To return a computer to its stock operation remove J1.

What kind of blank ROM chip can I use?

The Hondata Stage 4 system is supplied with a flash EEPROM which allows rapid reprogramming by simply placing it back into the EPROM programmer.

Blank PROMs are supplied for stages 2 and 3. A PROM can only be used once and not erased. Hondata can also supply additional PROMs for under $3.00, or by request upgrade to flash eproms.

Once common, but now a little difficult to find are EPROMs with a quartz window in the center of the chip. The EPROM chips to use are 32K by 8 bit 27256. For example Shand Thomson makes the blank EPROM ST M27C256B 15F1. Anything compatible with this will do. EPROMs have a quartz window on the top of the chip. The inconvenience with EPROMs is the difficulty in erasing them, which requires they be placed under an ultraviolet light of the right frequency.

OBD II

96-98 Hondas mostly use an Oki 66507 based ECU. Blank OKI 66507 chips are like a PROM and can only be used once. They can be programmed from a standard EPROM programmer using an optional adaptor (worth about $500). At $200 each (they also contain a microprocessor), it becomes expensive to make a lot of changes, so an OBD I conversion may be quite economical if you plan a lot of re-tuning.

Hondata ROM contents

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Import and Export
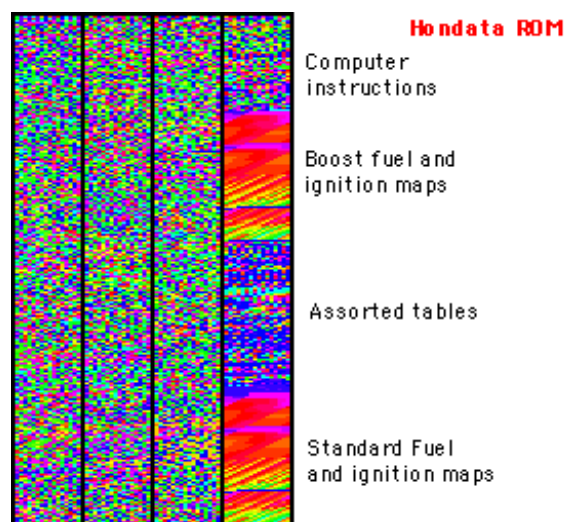
ECU BASICS

ECU swap table

ECUs may be easily swapped between models with similar wiring harnesses as ROM Editor can install any fuel and timing maps into any of the ECUs. Some features are wired into the ECU's circuitry, so if you want those features, use those ECUs.

ECU	VTEC control	Knock Sensor	Intake runner
JDM OBD 0 89-91			
PR3	Yes	Yes	No
PWO	Yes	Yes	No
(these ECUs need a 16 tooth distributor)			
JDM and USDM OBD I (grey plug)			
P72	Yes	Yes	Yes
P61	Yes	Yes	Yes
P30	Yes	Yes	No
P28	Yes	No	No
PR4	No	No	No
P06	No	No	No
P74/P75	No	No	No
(these ECUs need a 24 tooth distributor found in all later model Hondas)			

The intake runner refers to the ECU's ability to switch the length of the intake runner from long to short. Commonly found in the GSR, Prelude and some Accords. If you have swapped to a Type R manifold, then a P30 computer will work fine. The top two ECUs are interchangeable.

General rule of thumb is that in using ROM Editor, an ECU from our conversion table can be adapted to drive any other Honda up to the current models. For example a P28 ECU from a 94 SOHC Civic EX can be adapted to drive a '93 VTEC Accord, 99 Civic Si (B16A) 2000 Type R Integra or Prelude all up to 29Lb boost if necessary. See the conversion chart above for the major features offered by each Honda ECU.

1990-1995 Accord and 92-95 Prelude

These computers use an OKI 66911 processor which is different in function from the OKI 66207 processor used on the other OBD one computers. The wiring harnesses and ECU plugs are identical to the Civics and Integra. If you want a Hondata conversion for one of these cars, you will need to substitute the stock ECU with an ECU listed on the conversion table above.

Automatic to Manual conversion.

Hondata can convert any automatic ECU to a manual ECU by request.

MAIN TOOLBAR

F1 Displays the low speed ignition map from 0-7350 RPM
F2 Displays the high speed ignition map from 0-8975 RPM
F3 Displays the low speed fuel map from 0-7350 RPM
F4 Displays the high speed ignition map from 0-8975 RPM

Each of the maps above can be displayed in three ways:

F5 Table format (colorised or non colorised) Easiest for editing
F6 2D format.. Each load value (map sensor value) is shown as a line
F7 3D format.. Useful for determining overall trends and unusual values.

Shift F1 Shows the fuel and ignition tables

The next three functions are for use with a wide band lambda meter. If one is not present the stock oxygen sensor values are graphed. This is convered in detail in a later chapter.

Shift F2 Displays how rich or lean the car is, as compared to the values specified in settings
Shift F3 Shows the actual lambda values recorded from the wideband Lambda meter
Shift F4 Displays the user's preset and desired lambda values. (see settings under file menu)
Shift F5 Displays the estimated injector duty cycle. Helps determine when larger injectors or more fuel pressure is needed

The low speed maps run to 7350 RPM and the high speed maps 8975.

In a stock non VTEC Honda only the first maps are used. However when tuned it is desirable to have a higher rev limit and more tuning points above. Hondata programs the tables to switch at the VTEC point without generating a VTEC error..
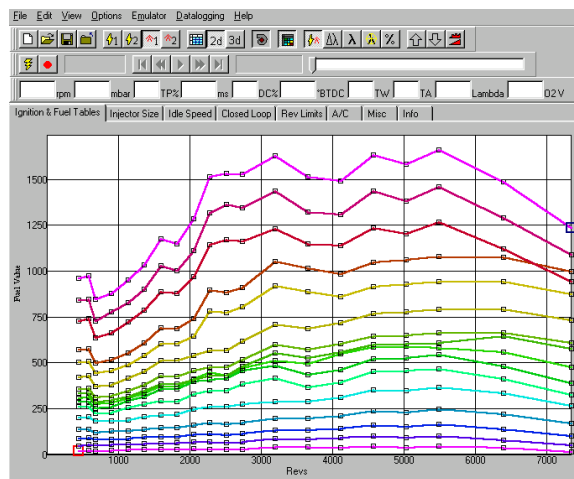
2D Low speed 3 Bar Turbo fuel map

EDITING TABLES

Select a cell with the mouse and type in a value.

Or, select a rectangular area you wish to change with the mouse then press I for increase or D for decrease.

⇧ Increase Selection   I
⇩ Decrease Selection   D

Ignition is changed in 0.25 degree increments and fuelling in 1 % increments. Due to the representation of fuel numbers numbers inside the ROM, a decrease followed by an increase may not always show the original number - but it will be very close.
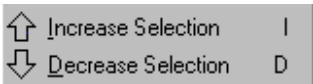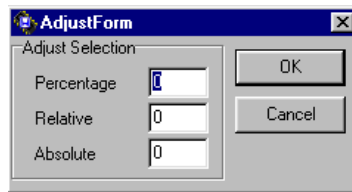
Larger amounts of increase or decrease can be specified in the settings (file menu)

The numbers in the fuel tables represent volume of fuel delivered. Double the number and double the fuel is delivered. Approximate injector pulse width in ms can be displayed on the 2D and 3D graphs if show injector duration is selected from the options menu. Doubling the fuel value will not always double the injector duration, especially at low injector openings due to the time taken for the injector to open and close.

If you rev your car past the last tabled RPM value - typically 8975 rpm, the Honda ECU continues to use the values on the last row of the table.

Col	1	2	3	4	5	6	7	8	9	10	B11	B12	B13	B14	B15	B16
mBar	132	211	302	415	585	755	868	925	982							
psi										0.4	3.7	7.9	11.2	18.2	24.0	28.7
0	18.00	18.00	18.00	18.00	10.75	1.75	1.50	1.50	1.50	1.50	0.00	0.00	0.00	0.00	0.00	0.00
950	18.00	18.00	18.00	18.00	14.00	7.75	3.75	1.75	1.50	1.50	0.00	0.00	0.00	0.00	0.00	0.00
1475	29.00	29.00	29.00	29.00	25.25	19.00	13.75	11.50	8.75	6.75	1.75	0.00	0.00	0.00	0.00	0.00
1975	36.75	36.75	36.75	33.75	29.00	23.25	19.50	17.00	13.75	11.75	6.75	0.75	0.00	0.00	0.00	0.00
2475	38.00	38.00	38.00	32.25	27.50	25.25	24.25	22.25	19.50	17.50	12.50	6.50	1.50	0.00	0.00	0.00
2950	38.25	38.25	38.25	35.25	31.25	28.50	27.25	25.25	23.25	21.75	16.75	9.75	5.75	0.00	0.00	0.00
3475	38.50	38.50	38.50	38.50	35.00	31.75	30.25	28.25	27.00	26.00	21.00	10.00	10.00	0.00	0.00	0.00
3975	38.50	38.50	38.50	38.50	35.00	31.75	30.25	28.25	27.00	26.00	21.00	10.00	10.00	10.00	10.00	10.00
4475	39.50	39.50	39.50	39.50	36.00	32.25	30.50	28.25	27.00	26.00	21.00	15.00	15.00	15.00	15.00	15.00
4975	40.50	40.50	40.50	40.50	37.00	31.75	28.75	26.25	25.00	23.75	20.75	16.75	17.00	17.00	17.00	17.00
5200	40.50	40.50	40.50	40.50	37.00	31.75	28.75	26.25	24.25	24.25	21.25	21.50	21.50	21.50	21.50	21.50
5450	40.50	40.50	40.50	40.50	37.00	31.75	28.75	26.25	25.50	24.00	22.00	23.50	23.50	23.50	23.50	23.50
5750	40.50	40.50	40.50	40.50	37.00	32.75	30.25	28.50	26.75	26.25	26.75	27.25	26.25	26.25	26.25	26.25
5975	40.50	40.50	40.50	40.50	37.00	34.75	33.25	31.75	30.25	29.00	29.00	28.00	28.00	28.00	28.00	28.00
6475	40.50	40.50	40.50	40.50	37.00	34.75	33.75	32.75	31.25	30.00	29.00	28.00	28.00	28.00	28.00	28.00
6975	40.50	40.50	40.50	40.50	37.00	34.75	33.75	32.75	31.25	30.00	29.00	28.00	28.00	28.00	28.00	28.00
7450	40.50	40.50	40.50	40.50	37.00	34.75	33.75	32.75	31.25	30.00	29.00	28.00	28.00	28.00	28.00	28.00
8000	40.50	40.50	40.50	40.50	37.00	34.75	33.75	32.75	31.25	30.00	29.00	28.00	28.00	28.00	28.00	28.00
8475	40.50	40.50	40.50	40.50	37.00	34.75	33.75	32.75	31.25	30.00	29.00	28.00	28.00	28.00	28.00	28.00
8975	40.50	40.50	40.50	40.50	37.00	34.75	33.75	32.75	31.25	30.00	29.00	28.00	28.00	28.00	28.00	28.00

3 Bar Turbo GSR ROM VTEC ignition table

AdjustForm

Adjust Selection

Percentage [0]   OK

Relative   [0]   Cancel

Absolute   [0]

Adjust options **J**

Adjust Adjust Selection J **(press J)**

For larger changes Adjust is used. For example:
   Percentage
      50 entered increases the values by 50%.
         -50 entered halves the selected values.
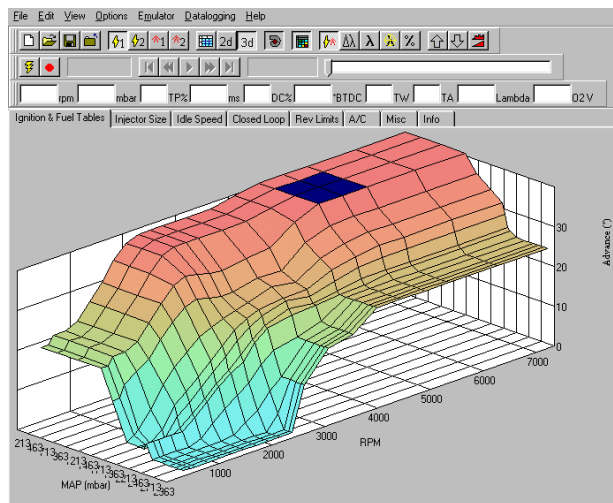   **Relative**
      50 entered adds 50 to the selected value
      -50 entered subtracts the selected values.
   Absolute
      20 entered makes all the values selected 20.

Extrapolate Extrapolate Selection E **(press E)**

This function smooths a selected area making it as flat as possible between the 4 corner most selected values.

3D Low speed 3 Bar Turbo timing map

EDITING TABLES

Cutting and Pasting

Taskbar showing two copies of ROM Editor running

Cutting and pasting is most useful between different ROM files. As Hondata Rom editor can only open one ROM file at a time, you will need to launch ROMeditor a second time.

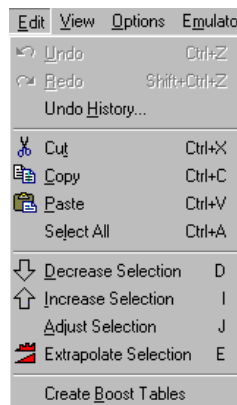Maximise both windows and use Alt and Tab Keys to switch between them.

Select an area from one map and copy. Use Alt and Tab Keys to switch (or click the inactive ROMe Editor icon on the menubar). Select the same sized area on your target map and them paste.

To compare two maps from different ROMs maximise both ROM Editor windows. Click between the two running applications to observe the differences.

Maps may also be printed for quick access and comparative purposes.

Edit Menu

Undo history

This shows a list of changes since the ROM file was opened for editing. When a file is saved the history is erased.


Undo History

SETTINGS

General

When the tables are viewed, Pressing I or D increases or decreases the values. By default these are set to 0.25 (the smallest available) for ignition and 1% for fuelling.

Rounding the Revs (in this case 25 rpm) affects the display of the RPM axes in the ignition and fuel maps.

Selecting file association changes all files with a .bin and .hex to one with a ROM Editor icon so that they may be opened by double clicking.
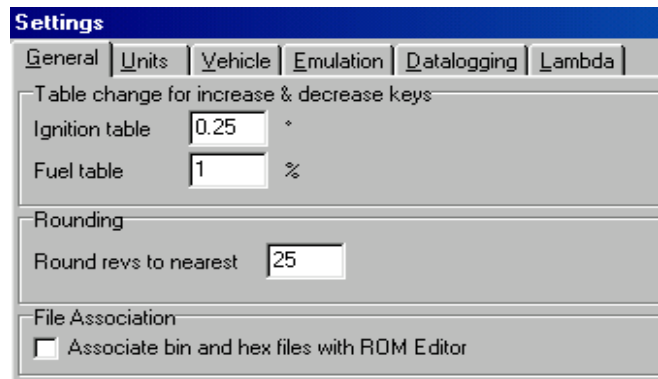
Units

This allows choice of air pressure units as measured by the MAP sensor. With the datalogging features of ROMeditor, air-fuel ratios can now be measured and displayed when using the appropriate wide band Lambda meter. See the datalogging section for more information.
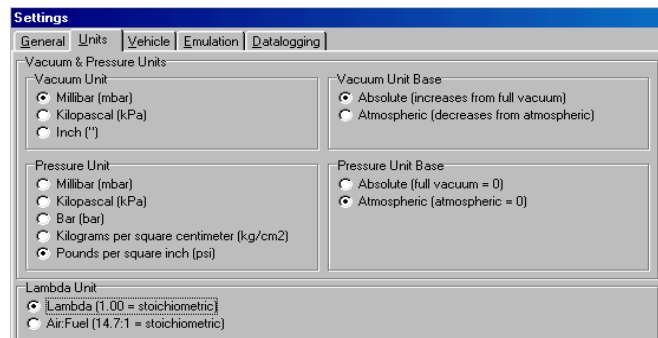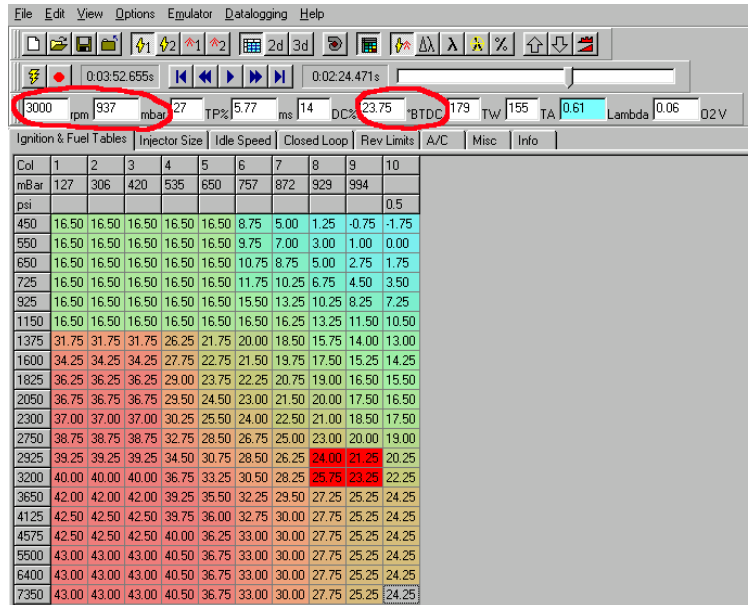

Units settings

INTERPOLATION

Interpolation

What if the revs of the engine or the MAP sensor value is in between the fixed points the Honda computer has fixed values for? How does the computer determine the correct fuelling or advance?

The technique used is called interpolation. The computer draws a straight line between the lower value and the higher value. A similar calculation is done for the MAP value.

The ECU takes the 4 fuel (or ignition) values that border this particular RPM and MAP value and apply a weighted average to arrive at the most appropriate value.

In this example the actual RPM of the engine is 3000 rpm with a MAP value of 937 (values are on the datalogging menubar). The weighted average of the four highlighted values in the map come to 23.75º, (also on the datalogging menubar)
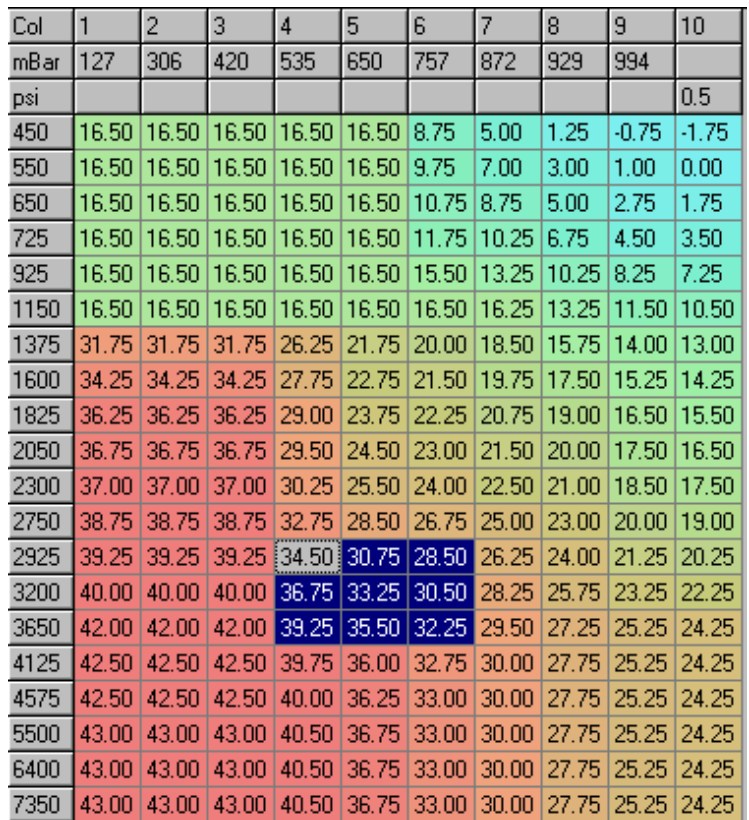
When you adjust a single fuel or ignition value, all surrounding fuel or ignition values up to the next closest RPM and Map values are affected.

In this example if the value of ignition 33.25º at 3200 rpm and 650 mBar is changed, then all ignition values between the:
REV ranges 2925-3650 and
MAP values of 535-757 mBar
are altered by the ECUs interpolation routines.

Interpolation output values are very smooth in between tabled load and RPM points. There are 65536 stepped values, compared to as little as 8 or 16 found in many other standalone computers.


Ignition map showing example of an interpolated ignition value.

Col	1	2	3	4	5	6	7	8	9	10
mBar	127	306	420	535	650	757	872	929	994	
psi										0.5
450	16.50	16.50	16.50	16.50	16.50	8.75	5.00	1.25	-0.75	-1.75
550	16.50	16.50	16.50	16.50	16.50	9.75	7.00	3.00	1.00	0.00
650	16.50	16.50	16.50	16.50	16.50	10.75	8.75	5.00	2.75	1.75
725	16.50	16.50	16.50	16.50	16.50	11.75	10.25	6.75	4.50	3.50
925	16.50	16.50	16.50	16.50	16.50	15.50	13.25	10.25	8.25	7.25
1150	16.50	16.50	16.50	16.50	16.50	16.50	16.25	13.25	11.50	10.50
1375	31.75	31.75	31.75	26.25	21.75	20.00	18.50	15.75	14.00	13.00
1600	34.25	34.25	34.25	27.75	22.75	21.50	19.75	17.50	15.25	14.25
1825	36.25	36.25	36.25	29.00	23.75	22.25	20.75	19.00	16.50	15.50
2050	36.75	36.75	36.75	29.50	24.50	23.00	21.50	20.00	17.50	16.50
2300	37.00	37.00	37.00	30.25	25.50	24.00	22.50	21.00	18.50	17.50
2750	38.75	38.75	38.75	32.75	28.50	26.75	25.00	23.00	20.00	19.00
2925	39.25	39.25	39.25	34.50	30.75	28.50	26.25	24.00	21.25	20.25
3200	40.00	40.00	40.00	36.75	33.25	30.50	28.25	25.75	23.25	22.25
3650	42.00	42.00	42.00	39.25	35.50	32.25	29.50	27.25	25.25	24.25
4125	42.50	42.50	42.50	39.75	36.00	32.75	30.00	27.75	25.25	24.25
4575	42.50	42.50	42.50	40.00	36.25	33.00	30.00	27.75	25.25	24.25
5500	43.00	43.00	43.00	40.50	36.75	33.00	30.00	27.75	25.25	24.25
6400	43.00	43.00	43.00	40.50	36.75	33.00	30.00	27.75	25.25	24.25
7350	43.00	43.00	43.00	40.50	36.75	33.00	30.00	27.75	25.25	24.25

Ignition values affected by a change @ 3200 rpm and 650 mBar

IGNITION TIMING

Ignition Base Timing

Because there is no fixed reference point in the Honda engine to provide timing information to the ECU, the actual timing will vary depending on the position of the distributor. For continuity between different tunes we recommend setting the timing to stock. The standard base timing setting for US models is 14-16 degrees; for JDM models 10-16 degrees.
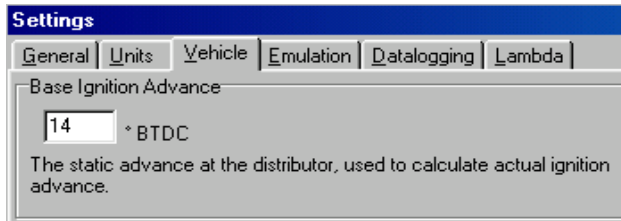
Static Ignition Timing setting

You can either retime the distributor to match the timing typed into the base ignition advance, or, calculate the base timing and type that figure into the base ignition advance settings.

Here is how to measure the static timing.

Make sure your ROM is saved.

- Select the entire low speed ignition map and set the timing to 20 degrees using the *J* Adjust command.
- In this example the base timing is estimated at 14 degrees (stock)
- Connect the timing light.
- If the timing light reads 22 ° for example, then add two degrees to the base timing setting to make it 16 °
- This is the actual static ignition timing.
- Alternatively, rotate the distributor by two degrees until the timing light reads 20 degrees.
- In this situation you are changing the static timing to 14 degrees.

Load your old ROM and start the car. The timing light value should match the datalogged value with the car at a constant RPM. This is because while accelerating or decelerating the engine the ECU may add or subtract several degrees of ignition timing

Making changes to the ignition base setting only changes the displayed values and not the actual timing. Actual timing changes can only be made by rotating the distributor or changing the map values.

Ignition Tuning Tips

If you are running a high octane pump gas with a relatively stock engine, try advancing the ignition up to 5 degrees for part and full throttle on the low speed cam map from 1200-3500 rpm. With fuelling changes, a 10 % power increases has been dynoed on some Hondas. Listen for knock though and retard as necessary.

Col	1	2	3	4	5	6	7	8	9	10
mBar	127	306	420	535	650	757	872	929	994	
psi										0.5
550	16.50	16.50	16.50	16.50	16.50	9.75	7.00	3.00	1.00	0.00
650	16.50	16.50	16.50	16.50	16.50	10.75	8.75	5.00	2.75	1.75
725	16.50	16.50	16.50	16.50	16.50	11.75	10.25	6.75	4.50	3.50
925	16.50	16.50	16.50	16.50	16.50	15.50	13.25	10.25	8.25	7.25
1150	16.50	16.50	16.50	16.50	16.50	16.50	16.25	13.25	11.50	10.50
1375	31.75	31.75	31.75	26.25	21.75	20.00	18.50	15.75	14.00	13.00
1600	34.25	34.25	34.25	27.75	22.75	21.50	19.75	17.50	15.25	14.25
1825	36.25	36.25	36.25	29.00	23.75	22.25	20.75	19.00	16.50	15.50
2050	36.75	36.75	36.75	29.50	24.50	23.00	21.50	20.00	17.50	16.50
2300	37.00	37.00	37.00	30.25	25.50	24.00	22.50	21.00	18.50	17.50
2750	38.75	38.75	38.75	32.75	28.50	26.75	25.00	23.00	20.00	19.00
2925	39.25	39.25	39.25	34.50	30.75	28.50	26.25	24.00	21.25	20.25
3200	40.00	40.00	40.00	36.75	33.25	30.50	28.25	25.75	23.25	22.25
3650	42.00	42.00	42.00	39.25	35.50	32.25	29.50	27.25	25.25	24.25
4125	42.50	42.50	42.50	39.75	36.00	32.75	30.00	27.75	25.25	24.25
4575	42.50	42.50	42.50	40.00	36.25	33.00	30.00	27.75	25.25	24.25
5500	43.00	43.00	43.00	40.50	36.75	33.00	30.00	27.75	25.25	24.25
6400	43.00	43.00	43.00	40.50	36.75	33.00	30.00	27.75	25.25	24.25
7350	43.00	43.00	43.00	40.50	36.75	33.00	30.00	27.75	25.25	24.25

Datalogging on. Car idling at 578 rpm with 16.5 ° timing

The same does not usually apply at high RPM. 1-2 degrees retard can be beneficial.

FUELING

Bigger injectors

Injectors are rated to flow at a certain pressure. For example at 43 psi Prelude injectors flow 310cc per minute. 620cc injectors will flow double that. In the car, however, injectors need time to open and close. For example a 40ms (millisecond) injector pulse can flow more than double that of a 20ms pulse when opening and closing times are taken into consideration. Running very large injectors on a highly boosted car could cause idling overfuelling problems because the injectors cannot be opened for a short enough time. Good idle speed and quality has been seen with injectors as large as 720-950 cc.

Global Fuel settings

More fuel pressure

Increasing your fuel pressure will also help increase the fuel flow. For example if injectors flow 310cc/minute at 40 psi, increasing the fuel pressure to 60 psi will make them flow 380 cc. Measure the fuel pressure with the ignition on but without the car running as some cars have a regulator that reduces fuel pressure at part throttle. Honda uses a variety of pressures on their engines ranging from 35 - 54 psi. Consider fixing the fuel pressure a little higher if you boost your car. If your fuel pressure is 20 psi and your boost pressure is 20 psi you are not going to inject any fuel.

When you do install larger injectors or increase fuel pressure you need to tell the engine computer of the changes so it can reduce the injector pulse width to allow idle without overfuelling.

For stock the injector multiplier is 1. If, in this example you double the injector size to 480cc and press calculate, the injector multiplier will change to 0.5. The 2D and 3D map values will not change, as the computer multiplies each value on the map by the injector multiplier after it has read the map value.

Fuel trim calculator

Duty Cycle

Duty cycle is measured as percentage. It is the percentage of time the injector is held open between successive injector pulses. As engine revs rise, there is less time to deliver the correct amount of fuel to the cylinder - and the duty cycle rises. 100% duty cycle is where the injector is held open all the time. You cannot accurately deliver fuel at 100% duty cycle. 80% is a commonly regarded maximum. When you get close to or pass this number consider upgrading your fuel injectors or increasing your fuel pressure. Honda drives their injectors hard and at high RPM on mildly worked motors over 90% duty cycle is commonly seen with the stock injectors.
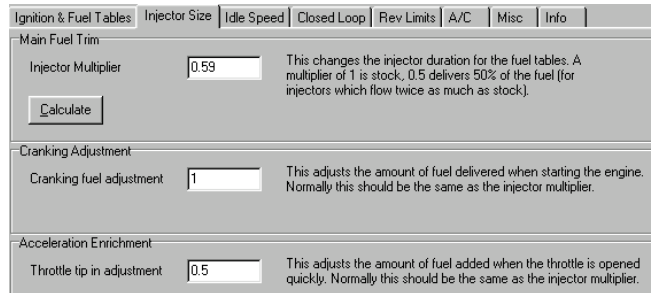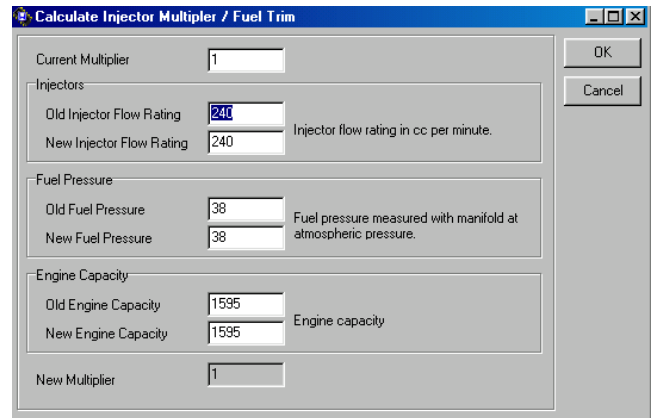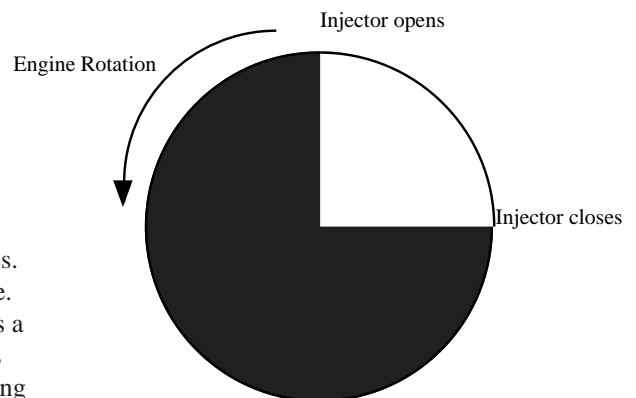
Injector open for 75% of one engine revolution

© 2001 Hondata

FUELING

Honda injector sizing and fuel pressure

This information is only provided as a guide and has not been verified. If you are not sure measure your injectors with a multimeter. Most Hondas that run low impedance injectors also run a resistor pack, so that the ECU sees a total of about 12 ohms impedance.If you run peak and hold injectors without a Honda resistor pack you will eventually burn out your ECU's injector driver transistors. Specific model fuel pressure information is not available, but in general most Hondas run 37-45 PSI with the Type R at 52 psi.

Peak and hold injectors have a resistance 2 ohms
Saturated injectors have a resistance of 10 - 14 ohms

Hondas using peak and hold injectors

Honda VTEC JDM B16A	240cc
Honda Accord 2.2l VTEC & non VTEC 92-95	240cc
Honda Prelude 2.2 DOHC VTEC- 92-96	310 or 340cc
Honda Prelude 2.2 DOHC VTEC- 97+	280cc/min,
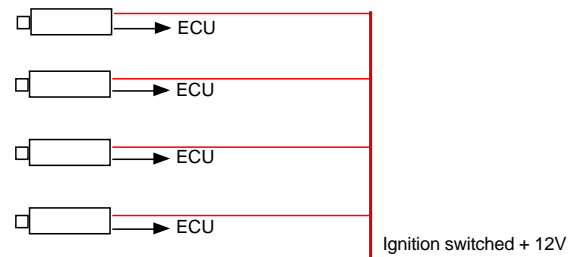
Hondas using saturated injectors

Honda Civic EX	240cc/min,
Honda Civic Si coupe	240cc/min,
Honda CRX Del sol (B16A engine)	240cc/min,
Integra GSR B18b, B18C and Type R engines	240cc/min,

Converting to Peak and Hold injectors

Near the brake master cylinder is a connector that distributes power to the injectors and a number of sensors. Verify with a multimeter which wires go to the injectors. Cut all 4 and connect the wires coming from the injectors to the resistor pack. Connect the power wire from the resistor pack to one if the 4 unused wires coming from the power connector.

Resistor Pack wiring for Peak and hold injectors
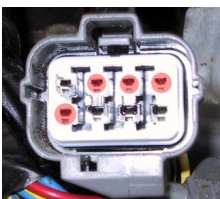
Injector connections

12V power distribution connector
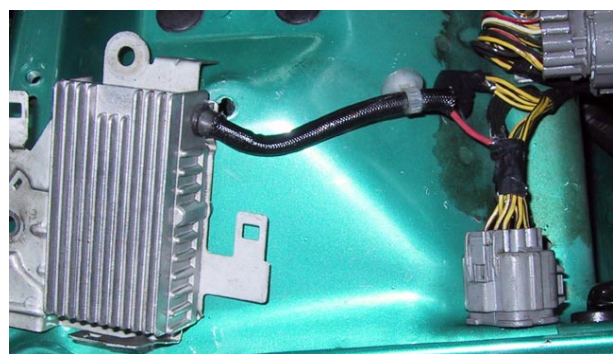
Resistor box in place

BOOST

Boosted cars need less ignition advance because the charge burns faster. If you do not reduce your ignition advance the faster burning flame front meets the top of the piston while it is still rising. The result is tremendous cylinder pressure, lifting the head and loading the conrods and bearings. Retarding the ignition by resetting the distributor's base timing may give you the correct ignition advance when under boost in some parts of the rev range, Everywhere else in the rev and load range you will be losing power. With the Hondata Boost ROM option, timing is left at stock for good off-boost throttle response. When on boost the Hondata modified ROM just supplies the correct advance value for the amount of boost from the table columns B11 and above. (See editing fuel and ignition tables)

Create boost tables

The Boost tables are the additional columns Hondata added to the stock fuel and ignition maps. (See boost tables from the main menu.) You may need to contact your turbocharger/supercharger supplier for the efficiency rating. This makes a good starting point for further tuning.

Getting ignition table values correct is critical for maximum power. There is also quite a variation between different turbo setups. In this example the ignition is set to retard by 1.5 ° per lb of boost. In practice retard of 1/2 a degree per lb of boost seems to work well.

Boost tables are created in columns 11 and above and are viewed by pressing the show/hide boost tables button.

Hondata ROMS are supplied with starter boost tables.
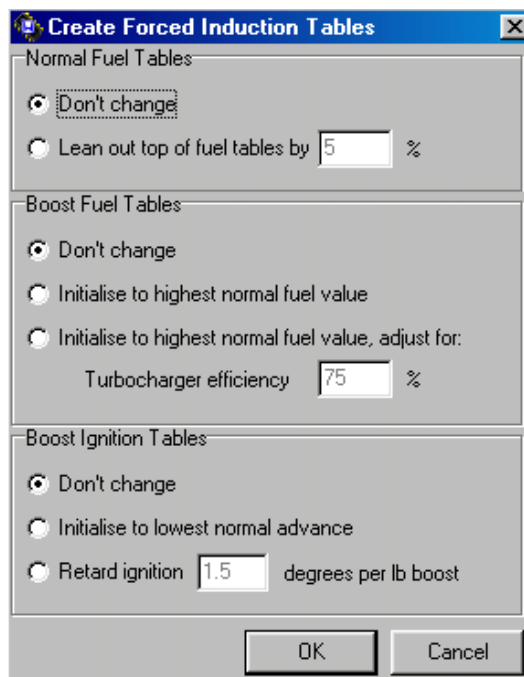
Forced induction tables

OTHER ADJUSTMENTS

Idle control

The IAC (Idle Air Control) valve is controlled from the ECU by widening or shortening a pulse. Increasing the duty cycle allows more air to pass.

Modifications like lumpy cams, bored throttle bodies, and retarded ignition can affect the idle speed. With this value the computer will try and maintain the idle speed, all other factors (such as temperature and cam profiles) permitting.

Make sure your throttle plate closes fully. Adjust the TPS so that the closed throttle voltage reads close to 0.45v and not exceeding 0.5v. The car must be running for this adjustment, which can be made with a hammer and punch where the TPS is riveted.
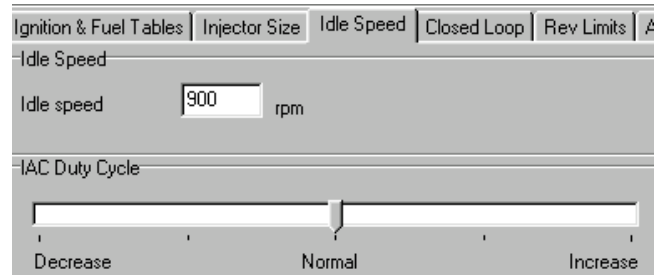
Idle Controls

Closed and Open Loop

Closed loop operation is when the ECU reads the oxygen sensor to determine the fuel content of the exhaust gases. Too much or too little fuel, and the computer will override the values in the fuel maps by as much as 30% - all in the name of economy. This is why external add-on devices that adjust fuelling do not work effectively at part throttle. The computer overrides them.

For example, if you replace 240cc injectors with 310cc injectors (29 % larger) using a stock ECU, you are just on the limit of the ability of the computer to control fuelling in closed loop. Any increase in fuel pressure and you are likely to get engine check lights from overfuelling.

A stock ECU will switch to open loop after about 25% throttle. This causes a problem occurs with boosted cars. When a stock Honda develops boost under 25% throttle it is still in closed loop trying to maintain 14.7:1 air fuel ratio. Boost requirements are closer to 12:1 air fuel ratio. This causes stumbling and rough running. The switch to open loop can now be made based on manifold pressure.

Closed Loop settings

Short term and long term O2 adjustment.

Under closed loop the ECU adjusts the fuelling to 14:7:1. The amount it must modify the fuel tables to achieve this is called *Short Term* adjustment. Over time this value is averaged out and stored in the ECU as a *Long Term* adjustment. The long term adjustment is zeroed by removing power from the computer. These values can be graphed with Hondalogger. When you go wide open throttle the ECU switches to open loop and applies the long term fuel trim to the fuel table values. This is why you must tune your part throttle maps accurately. Tuning must be done with closed loop disabled.
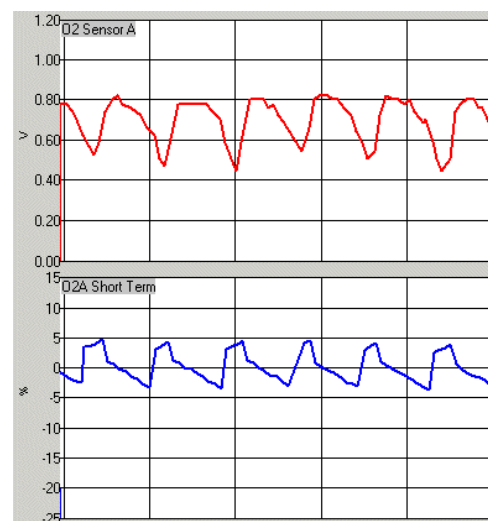
Short Term O2 adjustment

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OTHER ADJUSTMENTS

Rev Limits

Rev limits can be set in two ways.
As shown here they can be fixed in the ROM, overriding any settings made by the static or dynamic methods as described in the installation manual. Hondalogger will continue to display the last dynamic or static value that is stored in the interface box. This is useful for fixing a rev limit you know is safe for a particular engine, that you would not like the customer to override.

The VTEC revs can be overridden in the same way.

Rev limit values

Boost cut

As a safety feature, Hondata ECUs can cut the fuel when the boost exceeds a certain level. This is useful in the case where boost may spike past your preset level and lean out your mixture. When the boost cut is activated the ECU activates the check engine light and cuts the fuel until the boost drops below 400 mBar or the revs drop below 2000 rpm.

Air Conditioning

In these vehicles, air conditioning can be switched off when the throttle position or revs exceed a certain value.

Air Conditioning cutoff

Miscellaneous

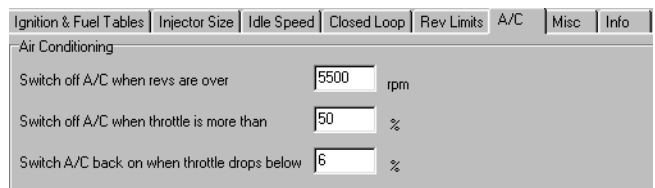When a 3 bar map sensor is installed this option must be checked.

It is recommended the knock sensor be disabled while dyno tuning. Engines with forged pistons can rattle, triggering the knock sensor into retarding falsely.
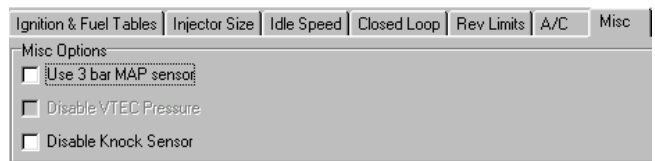

Miscellaneous settings

ROM identification

This is the ECU the ROM is intended for. In some instances a ROM will work in different ECUs.

ECU Identification
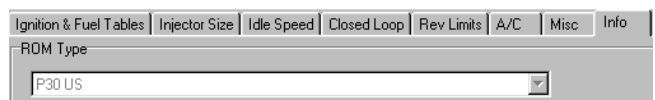
DATALOGGING

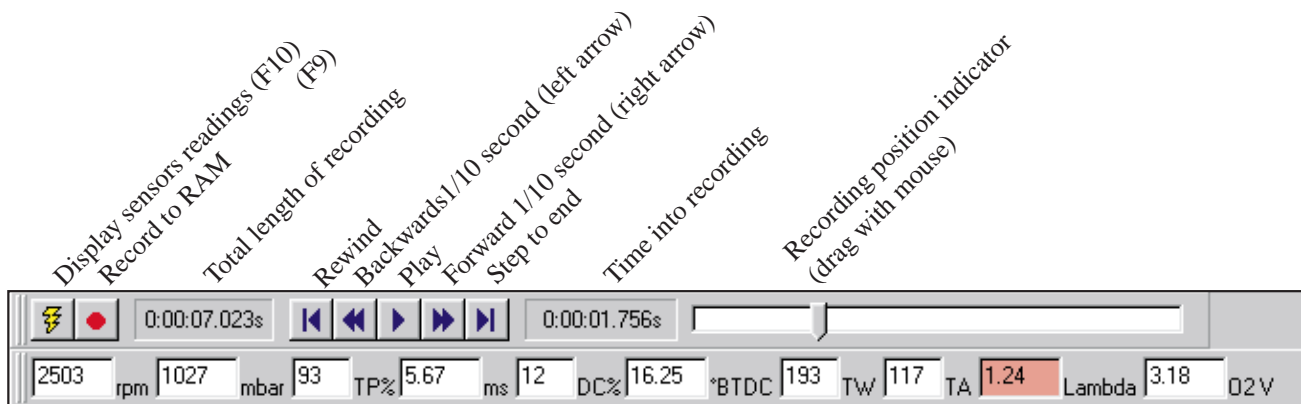Display sensors readings (F10)

Record to RAM (F9)

Total length of recording

Rewind

Backwards1/10 second (left arrow)

Play

Forward 1/10 second (right arrow)

Step to end

Time into recording

Recording position indicator (drag with mouse)

| 2503 rpm | 1027 mbar | 93 TP% | 5.67 ms | 12 DC% | 16.25 °BTDC | 193 TW | 117 TA | 1.24 Lambda | 3.18 O2 V |

Datalogging

Version 2.5 of ROM Editor incorporates some basic Datalogging functions listed at the bottom of this screen shot. While the car is running, ROM Editor displays fuelling, timing and RPM information. In addition ROM Editor displays the two by two area on the MAP in which the car is running. In this example columns 2 and 3, and rows 4 and 5 - a typical idle position. This is known as map tracing.

Choose *Show activity* from the Emulator menu. Rev the car and the highlighted area moves to the right and down. This display feature is very useful in conjunction with a constant load dyno to accurately see what fuel and ignition values the car is using.

Over 80 % the DC% (duty cycle) display is colored yellow as a warning you are reaching peak injector capacity.

## Recording and saving a map tracing session
Press F10 to get a live display of sensor values and F9 to begin recording these values. Press F9 again so stop recording.

Navigating a recording
Click on the position indicator and drag the pointer to the point of interest - (start of dyno run). If you have trouble locating this, open the same file under Hondalogger and using F3 (graphs) locate the time index of interest eg 2.45 (2 minutes 24 seconds into the recording). Use the left and right arrow keys to navigate forwards and backwards 1/10 of a second per key press.

Transferring datalogs from Hondalogger to ROM Editor.
Files recorded and saved from Hondalogger & ROM Editor can be read by either program. The datalogging features of ROM Editor are a subset of those in Hondalogger. Only one recording can be made at a time before saving, and only about 10 sensors can be recorded. These recordings are loaded and saved from the datalogging menu.
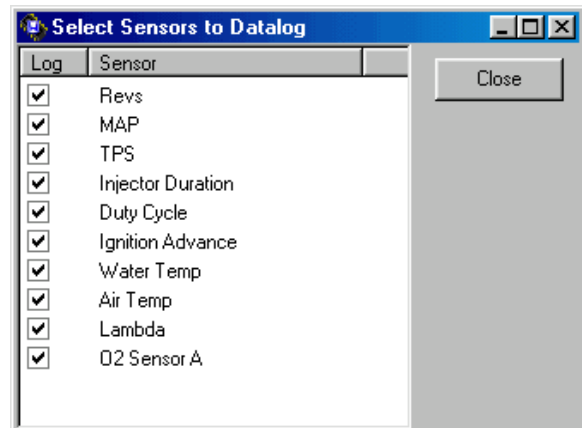
Channels Datalogged
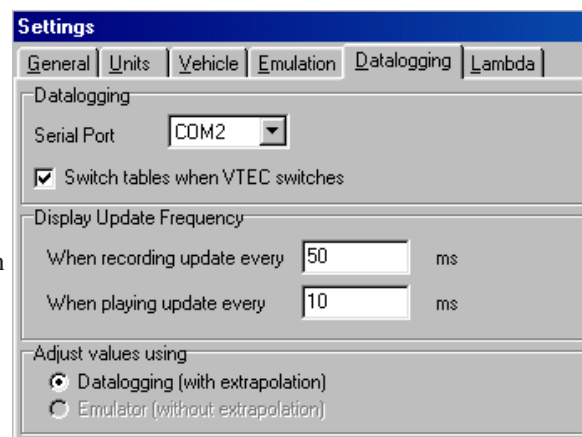
DATALOGGING

VTEC map switching

As the car passes the VTEC point as defined in the REV limits tab (or set by the driver using the in car button) the tables automatically switch, displaying the correct ignition and fuelling values.

When the red Record button (F9) is pressed the data is recorded to RAM, over the top of the previous recording, until the button (F9) is pressed again. If you do not wish to lose this data, save the recording immediately


Datalogging active with car idling

datalogging menu

IMPORTING AND EXPORTING TABLES

How to upgrade your old ROMs

From time to time Hondata will upgrade the functionality of its ROMS. For example if your old ROMs do not have a feature such as idle control:

1) Open the old ROM
2) Export the tables
3) Make a new ROM based on the ECU you are using
4) Import the tables from the old ROM
5) Save the ROM file and write the chip
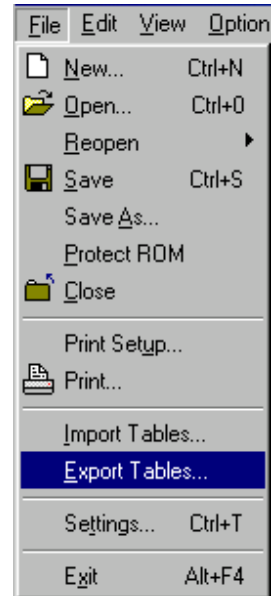
Export and import Tables

What is exported.

Files are exported in a csv format which can then be read and altered in a spreadsheet or similar program.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	[Honda ROM Editor]																
2	Boosted=0																
3	Multiplier=0.545																
4	StartMultiplier=0.700																
5	TPSMultiplier=1.000																
6	Column	1	2	3	4	5	6	7	8	9	10	B11	B12	B13	B14	B15	B16
7	Millibar	127	306	420	535	650	757	872	929	994	1044	1266	1546	1775	2249	2645	2963
8	Hg	26.17	20.88	17.49	14.1	10.72	7.54	4.16	2.46	0.56	-0.92	-7.49	-15.7	-22.5	-36.5	-48.2	-57.6
9	Kg/cm2	-0.9	-0.72	-0.6	-0.48	-0.36	-0.25	-0.13	-0.07	-0.01	0.05	0.28	0.56	0.8	1.29	1.7	2.03
10	lbs/in2	-12.8	-10.2	-8.51	-6.82	-5.14	-3.56	-1.87	-1.03	-0.08	0.65	3.92	8.03	11.4	18.36	24.19	28.85
11																	
12	[Ignition1]																
13	16	20															
14	457	16.5	16.5	16.5	16.5	16.5	8.75	5	1.25	-0.75	-1.75	-4	-4	-4	-4	-4	-4
15	549	16.5	16.5	16.5	16.5	9.75	7	3	1	0	-4	-4	-4	-4	-4	-4	-4
16	642	16.5	16.5	16.5	16.5	16.5	10.75	8.75	5	2.75	1.75	-3.25	-4	-4	-4	-4	-4
17	728	16.5	16.5	16.5	16.5	16.5	11.75	10.25	6.75	4.5	3.5	-1.5	-4	-4	-4	-4	-4
18	915	16.5	16.5	16.5	16.5	16.5	15.5	13.25	10.25	8.25	7.25	2.25	-3.75	-4	-4	-4	-4
19	1143	16.5	16.5	16.5	16.5	16.5	16.5	16.25	13.25	11.5	10.5	5.5	-0.5	-4	-4	-4	-4
20	1372	31.75	31.75	31.75	26.25	21.75	20	18.5	15.75	14	13	8	2	-3	-4	-4	-4
21	1601	34.25	34.25	34.25	27.75	22.75	21.5	19.75	17.5	15.25	14.25	9.25	3.25	-1.75	-4	-4	-4
22	1831	36.25	36.25	36.25	29	23.75	22.25	20.75	19	16.5	15.5	10.5	4.5	-0.5	-4	-4	-4
23	2059	36.75	36.75	36.75	29.5	24.5	23	21.5	20	17.5	16.5	11.5	5.5	0.5	-4	-4	-4
24	2288	37	37	37	30.25	25.5	24	22.5	21	18.5	17.5	12.5	6.5	1.5	-4	-4	-4
25	2746	38.75	38.75	38.75	32.75	28.5	26.75	25	23	20	19	14	8	3	-4	-4	-4
26	2918	39.25	39.25	39.25	34.5	30.75	28.5	26.25	24	21.25	20.25	15.25	9.25	4.25	-4	-4	-4
27	3204	40	40	40	36.75	33.25	30.5	28.25	25.75	23.25	22.25	17.25	11.25	6.25	-3.75	-4	-4
28	3662	42	42	42	39.25	35.5	32.25	29.5	27.25	25.25	24.25	19.25	13.25	8.25	-1.75	-4	-4
29	4119	42.5	42.5	42.5	39.75	36	32.75	30	27.75	25.25	24.25	19.25	13.25	8.25	-1.75	-4	-4
30	4577	42.5	42.5	42.5	40	36.25	33	30	27.75	25.25	24.25	19.25	13.25	8.25	-1.75	-4	-4
31	5493	43	43	43	40.5	36.75	33	30	27.75	25.25	24.25	19.25	13.25	8.25	-1.75	-4	-4
32	6408	43	43	43	40.5	36.75	33	30	27.75	25.25	24.25	19.25	13.25	8.25	-1.75	-4	-4
33	7350	43	43	43	40.5	36.75	33	30	27.75	25.25	24.25	19.25	13.25	8.25	-1.75	-4	-4
34																	
35	[Ignition2]																
36	16	20															
37	0	16.5	16.5	16.5	16.5	6.25	0.5	-3	-6	-6	-6	-4	-4	-4	-4	-4	-4
38	598	16.5	16.5	16.5	16.5	8.25	2.75	-0.75	-4.5	-6	-6	-4	-4	-4	-4	-4	-4

ROM Editor tables exported then imported into Excel

TUNING FOR ALTITUDE

Naturally Aspirated

As the Honda uses a MAP sensor, the higher the altitude you run your Honda, the lower the MAP value will be at full throttle. This means that wide open throttle may not correspond to column 10 but column 9, or lower. To find out what the map sensor value will be at wide open throttle, switch on, but do not start the car. Press F10 to datalog with ROM Editor from the ECU and read the MAP value.

This is an approximate guide, as air pressure can vary daily by as much as 10%.

Ignition & Fuel Tables	Rev Limits	A/C	Injector Size	Idle Speed	Mis

Col	1	2	3	4	5	6	7	8	9	10
mBar	134	306	420	535	650	764	879	936	994	
mBar										1044

8665m (28400 ft)   6414m (21000ft)   4713m (15500 ft)   3346m (11000 ft)   2200m (7200 ft)   1220m (4000 ft)   737m (2400 ft)   360m (1200 ft)   Sea Level

Map values and approximate equivalent altitudes

Boost

Running a boosted car at altitude will lower the boost level compared to sea level. The amount of boost drop will depend on the efficiency of the compressor. Some observed effects have also included a slight leaning of in mixture.

If you examine the stock fuel maps you will find them to be reasonably linear in fuel reduction as altitude increases. However, we highly recommend you dyno at the altitude you intend to run.

WIDE BAND TUNING

Introduction

Most wideband lambda meters have a 0-5 V output that is proportional to the air fuel ratio. If that 0-5V signal is fed into the existing O2 sensor wiring, ROM Editor can convert the voltage and graph it as an A/F value. Those values can then be overlaid overlay onto the fuel tables and be used to make corrections.

The most accurate wide band lambda meter we have found to date is the MoTeC. The stock O2 sensor is accurate only for 14.7:1 (economy) air fuel ratio and should not be used for tuning.

ROM Editor Setup

Choose settings from the file menu and edit the voltage conversion table to match the specifications of your wide band lambda meter. Go to the closed loop panel and set the ROM file to run in open loop. After tuning the engine the ROM can be reset to run on closed loop again.

MoTeC PLM Setup

The MoTeC PLM can be programmed for different voltage outputs. Install the PLM software from the floppy disk and upload the file hondata.pl1 to the MoTeC PLM.

This will set the display to air fuel ratio instead of lambda and set the reference voltage output for the lambda logging function of ROM Editor.
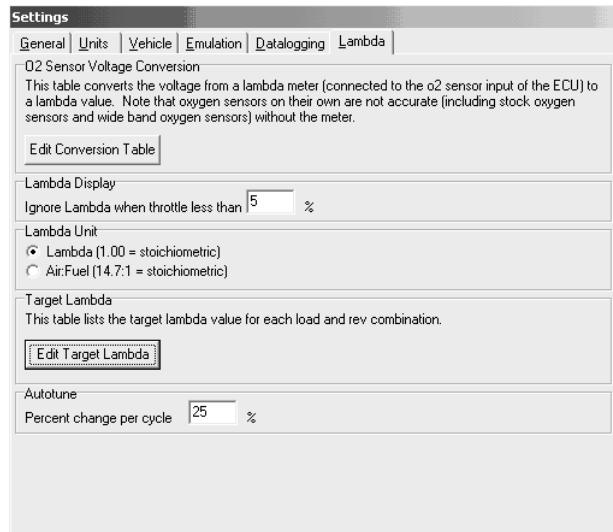
Check http://www.hondata.com/motecplm.html to download any updates of the configuration file and MoTeC software.
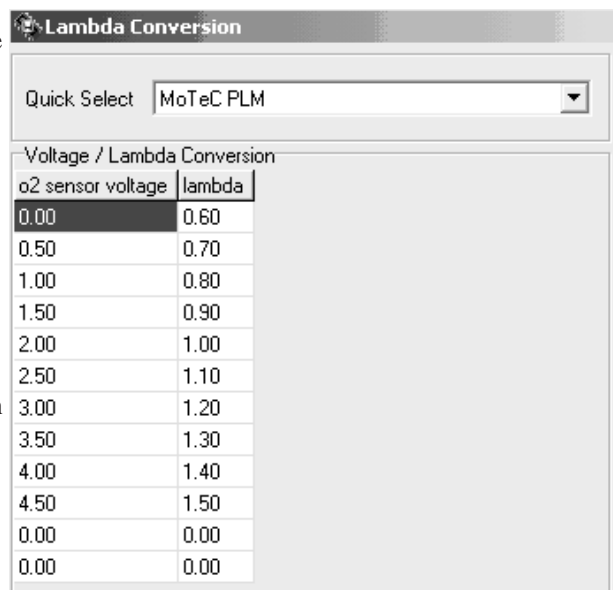
Target Lambda

Target Lambda is the air/fuel ratio best for the engine being tuned. A default table is provided, but can be changed to suit requirements.
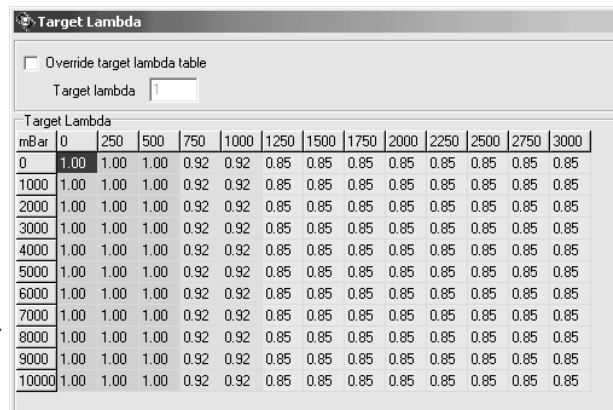
Datalogging the MoTeC Wide band Lambda meter.

In practice this works very well. Delta lambda (*Shift F2*) indicates the percentage difference between the actual lambda value recorded, and the target lambda table values you wish to achieve. If this same percentage change is applied to the fuel tables the results are very close to target (usually within 1-2 %). As a result relatively few dyno runs are needed to achieve the desired air / fuel ratio.

Lambda settings


Wide band lambda voltage conversion table

o2 sensor voltage	lambda
0.00	0.60
0.50	0.70
1.00	0.80
1.50	0.90
2.00	1.00
2.50	1.10
3.00	1.20
3.50	1.30
4.00	1.40
4.50	1.50
0.00	0.00
0.00	0.00

Target lambda table

mBar	0	250	500	750	1000	1250	1500	1750	2000	2250	2500	2750	3000
0	1.00	1.00	1.00	0.92	0.92	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
1000	1.00	1.00	1.00	0.92	0.92	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
2000	1.00	1.00	1.00	0.92	0.92	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
3000	1.00	1.00	1.00	0.92	0.92	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
4000	1.00	1.00	1.00	0.92	0.92	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
5000	1.00	1.00	1.00	0.92	0.92	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
6000	1.00	1.00	1.00	0.92	0.92	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
7000	1.00	1.00	1.00	0.92	0.92	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
8000	1.00	1.00	1.00	0.92	0.92	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
9000	1.00	1.00	1.00	0.92	0.92	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
10000	1.00	1.00	1.00	0.92	0.92	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85

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WIDE BAND TUNING

Positioning the wideband sensor.

Note that the airfuel ratio for the MoTeC will be richer before the catalytic converter than after - which is where most dyno operators place their wideband sensors. There will also be a greater time delay between the reading of the tailpipe based sensor and the O2 based sensor at the front of the engine.
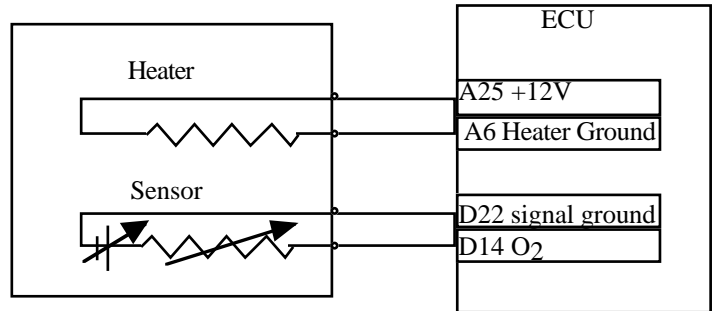
Stock O2 sensor wiring

Connecting to the O2 sensor plug

Remove the stock O2 sensor.
The O2 sensor plug has 4 wires. Two for the heater, one for ground and one for the O2 sensor voltage. Install a 1K resistor across the heater wiring. This stops the computer from generating an heater error while tuning. Connect to the 0-5V output from the wideband to the signal ground and signal wires. The easiest way to do this is to canabilise a plug from a dead O2 sensor and wire it up permanently to your wide band.
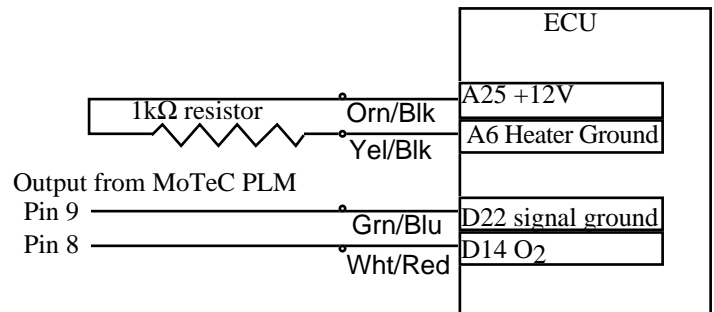
The wire color coding illustrated here will vary from car to car.

MoTeC PLM wiring

Testing

Connect the datalogging cable to the Hondata interface box, start the car and press (F10) in ROM Editor. The reading displayed within ROM Editor should match the air/fuel ratio reading displayed on the wide band lambda meter.

WIDE BAND TUNING

Show ign & fuel tables Shift F1
Show % rich or lean Shift F2
Show recorded lambda Shift F3
Show target lambda Shift F4
Show Estimated duty cycle Shift F5

Estimated duty cycle based on fuel pressure and injectors

Shift F5

Displays the estimated injector duty cycle based on some simple calculations. Helps determine when larger injectors or more fuel pressure is needed. Is accurate to about 10-15%. Use datalogging to determine the actual duty cycle.

Shift F4

Displays the user's preset and desired lambda values. (see settings under file menu) This overlays the fuel tables to provide a base to compare with the recorded lambda or air / fuel ratio numbers.

Preset Lambda or Air Fuel ratio values

Shift F3

Shows the actual lambda (or air fuel ratio) values recorded from the wideband lambda meter. Values will be stored on both the low speed cam, and high speed cam fuel maps if you have a VTEC car. The resultant map is refered to as a lambda trace. Every time a power run is made, the lambda value is averaged with the values previously recorded. For this reason the lambda values must be cleared before a dyno run is made after making fueling and ignition changes. Clear lambda highlighting (*Ctrl L*) is under the view menu.


Air Fuel Ratios on the VTEC cam at 11.3 lb boost

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WIDE BAND TUNING

Shift F2

Displays what percentage rich or lean the car is, as compared to the values specified in settings (*Shift F4*). In this example (colored orange - red) the engine is running 7-11% lean from 5775 - 8500 rpm in the 11.3 lb boost column.

Only one datalogging run is recorded. If you want to retain this air / fuel ratio recording it must be saved after each dyno run.
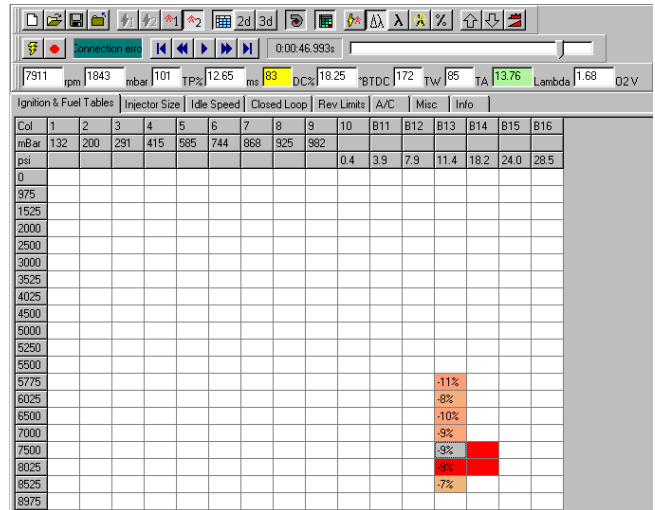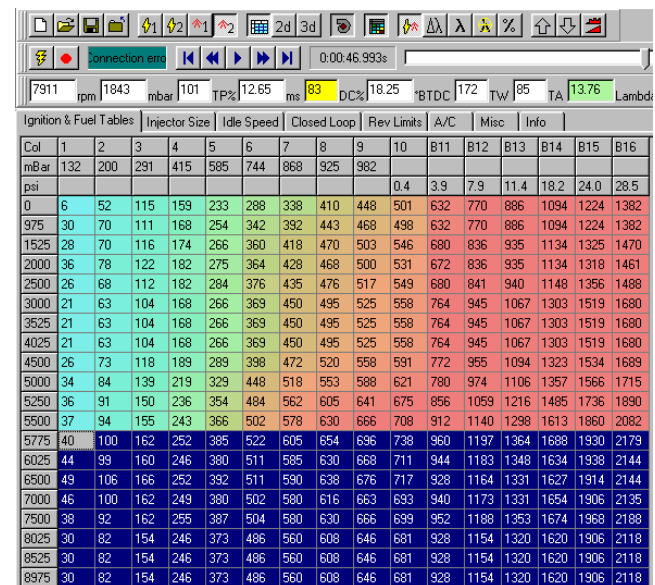
Delta Lambda screen showing lean at 11.3 lb boost

Shift F1

Displays the standard fuel and ignition tables. From the percentage rich value recorded (7-11%) it is suggested that the entire area selected to the right be richened by say 10%.

A point to note here is that fueling changes made low in the rev range can affect air fuel ratios higher in the rev range. For example if 10 % extra fuel is added just at 5775 rpm, this can change the air / fuel ratio all the way to 8500 rpm. This becomes very obvious if a dyno run is started by rolling on the accelerator instead of depressing it rapidly. The accelerator pump effect can easily reduce the air fuel ratio by a few percent. The throttle tip in adjustment value can be adjusted under the **injector size** panel.

With this in mind fueling changes should start at low RPM and progress to higher RPM, rolling gently on the throttle to start the run.

Fuel table with values above 5775 rpm selected

Tuning Proceedure:

• Do not start dyno runs under 170F water temperature as the computer is adding cold enrichment fuel

• Start the dyno runs at the same air intake temperature for consistancy

• Tune the fuel tables before the ignition.

• Set the VTEC point to 8000 RPM and tune the low speed cam first

• Set the VTEC point to 3000 RPM and tune the high speed cam next.

• Fix the VTEC point where the torque curves cross.

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USING THE TRANSTRONICS EMULATOR

Setting up the Transtronic Pocket programmer and emulator adaptor

Plug the parallel cable into the PC and emulator adaptor into the top of the Pocket Programmer. Note that the position of the red stripe goes to pin 1 on the socket in the ECU. You must have a constant 9V supply to the emulator before switching on the PC.

Power Supply

The car lighter adapter must be rewired for a constant 12V if using the 12-9v adapter. This is because cranking the car cuts power to the lighter adaptor which erases the emulator memory (RAM). The result is an engine check light and the car running in limp mode.

Early pocket programmers used a negative center electrode. Later ones used a positive centre electrode. If the programmer does not work check the voltage level and polarity of your power supply.

ROM Editor Setup

Open Hondata ROM editor and under *File* go to settings. Select Transtronics as the emulator type. If an error message says cannot open emulator, then remove the emulator adaptor from the top of the Pocket programmer and try again. Once the connection is established, then re-insert the emulator adaptor. This only needs to be done once.
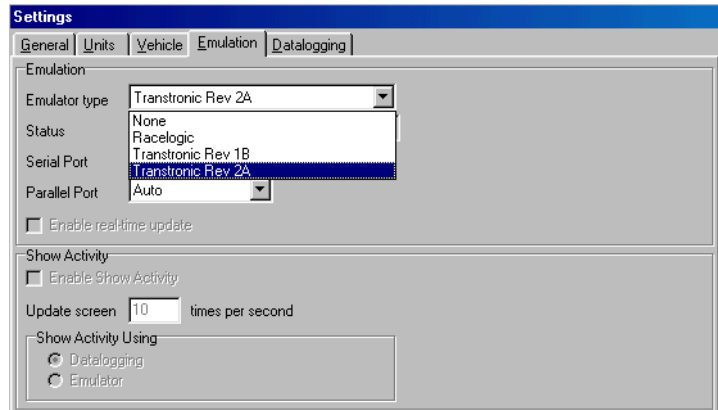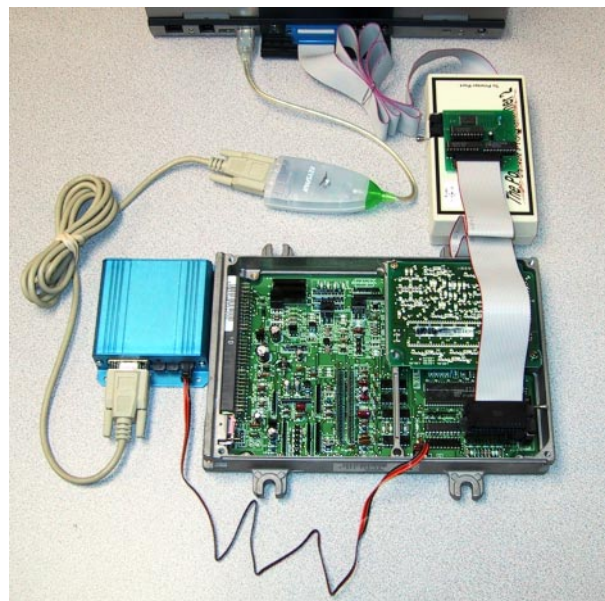

Emulation Settings
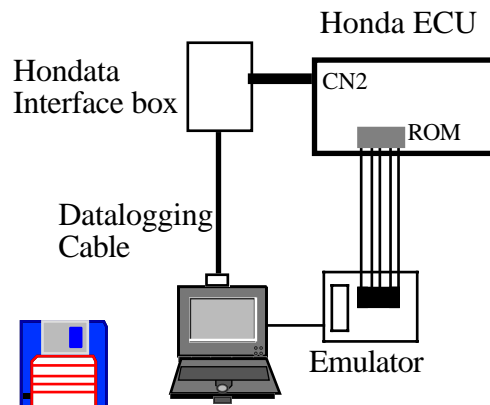
Emulator setup

Pocket programmer and emulator connected to the ECU using the optional keyspan USB to serial adapter

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USING THE TRANSTRONICS EMULATOR

Early models are Rev 1B; all later versions of the emulator are Rev 2A. Selecting the wrong version means the car will only operate in limp home mode with a constant engine check light.

Operation from within ROM Editor

The Transtronic emulator adaptor is RAM based and allows you to make very quick changes to the ignition and fuelling values between dyno runs.

First you must download the entire ROM *Ctrl+R* which takes about 3 seconds under Windows 98. This must be done while the car is switched off. ROM Editor cannot verify if a download is successful, but verification is simple. Switch the ignition on. If the engine check light extinguishes and the light on the Hondata interface box is solid and non blinking, the download is successful.

If you are making changes to a particular fuel or ignition table *Ctrl+E* will download the changes in about 1/10th of a second from the table currently displayed. Any other changes will require the download of the entire ROM.

This emulator adaptor is not designed to accept changes while the car is running. Doing so will cause the engine to hesitate and sometimes trigger a check light. A fast laptop can sometimes download the current table without any problems, but this is not supported by Hondata. Once all your tuning changes have been made, remove the emulator adaptor and use the Pocket programming software to write a PROM or EPROM. (See Writing a Chip Page 9)

Racelogic

The Racelogic Emulator operates off a serial port. If you want to datalog at the same time you will need two serial ports.

The Racelogic emulator is a realtime emulator, where changes made on the screen are instantly made in the computer. It is not able to program EPROMs.

APPENDIX 1 KEYBOARD SHORTCUTS

F1 Displays the low speed ignition map from 0-7350 RPM
F2 Displays the high speed ignition map from 0-8975 RPM
F3 Displays the low speed fuel map from 0-7350 RPM
F4 Displays the high speed ignition map from 0-8975 RPM

F5 Table format (colorised or non colorised) Easiest for editing
F6 2D format.. Each load value (map sensor value) is shown as a line
F7 3D format.. Useful for determining overall trends and unusual values.

Shift F1 Shows the fuel and ignition tables

Shift F2 Displays how rich or lean the car is, as compared to the values specified in settings
Shift F3 Shows the actual lambda values recorded from the wideband Lambda meter
Shift F4 Displays the user's preset and desired lambda values. (see settings under file menu)
Shift F5 Displays the estimated injector duty cycle. Helps determine when larger injectors or more fuel pressure is needed

Navigation (When the Datalogging progress bar is clicked)
Right Arrow   Forward one tenth second
Left Arrow   Backwards one tenth second

APPENDIX 2 ERROR CODES

Error Codes

What are ECU problem codes?

ECU problems codes are diagnostic outputs from the ECU, used to indicate in what area a problem lies. Usually the check engine warning light (on the dash) will come on for a serious problem, but will not necessarily come on for a minor problem. The ECU will remember problem codes with the ignition off; the only way to clear the codes is to disconnect the battery or remove the hazard fuse for half a minute or so.

How to read ECU codes.
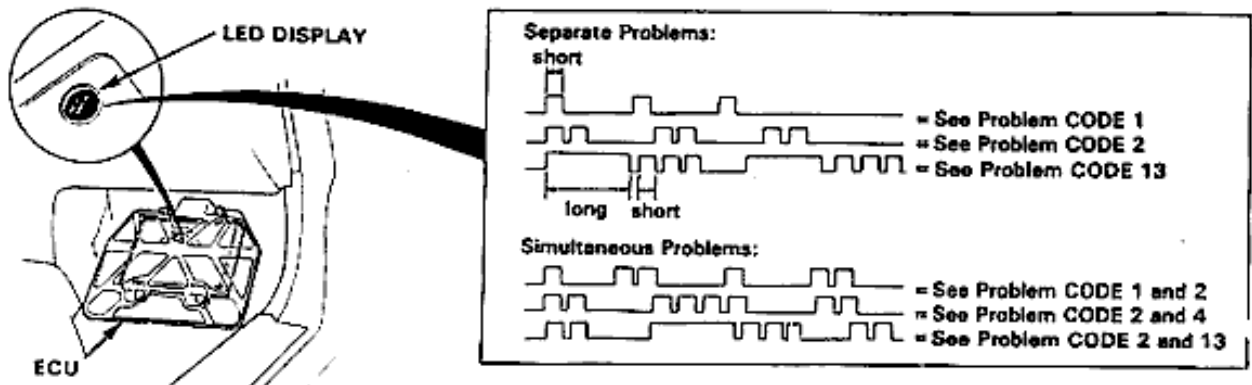
Pre OBDI ECUs
To read the codes, turn the ignition on and look at the LED inside the ECU. The LED is visible through a small plastic window in the top of the ECU. The ECU can signal simultaneous problems by blinking separate codes, one after the other. Problem codes 1 - 9 are indicated by 1 - 9 flashes, problem codes over 9 use one long flash as ten short flashes.

OBDI and later ECUs
Find the diagnostic connector, which is a two wire blue connector found near the passengers feet, or in the centre console.
Short out the diagnostic connector with a piece of wire. The check engine light on the dash will flash the problem codes.

1	O2A - Oxygen sensor #1
2	O2B - Oxygen sensor #2
3	MAP - manifold absolute pressure sensor
4	CKP - crank position sensor
5	MAP - manifold absolute pressure sensor
6	ECT - water temperature sensor
7	TPS - throttle position sensor
8	TDC - top dead centre sensor
9	CYP - cylinder sensor
10	IAT - intake air temperature sensor
12	EGR - exhaust gas recirculation lift valve
13	BARO - atmospheric pressure sensor

APPENDIX 2

Error Codes

14	IAC (EACV) - idle air control valve
15	Ignition output signal
16	Fuel injectors
17	VSS - speed sensor
19	Automatic transmission lockup control valve
20	Electrical load detector
21	VTEC spool solenoid valve
22	VTEC pressure valve
23	Knock sensor
30	Automatic transmission A signal
31	Automatic transmission B signal
41	Primary oxygen sensor heater
43	Fuel supply system
45	Fuel system too rich or lean
48	LAF - lean air fuel sensor
54	CKF - crank fluctuation sensor
58	TDC sensor #2
61	Primary oxygen sensor
63	Secondary oxygen sensor
65	Secondary oxygen sensor heater

OBD II specific errors

67	Catalyst system Efficiency Below Threshold malfunctioning or defective catalyst system
70	Automatic Transmission malfunction with the automatic transmission controls
71	Cylinder 1 Misfire or a Random Misfire a condition is present that is creating a cylinder misfire
72	Cylinder 2 Misfire or a Random Misfire a condition is present that is creating a cylinder misfire
73	Cylinder 3 Misfire or a Random Misfire a condition is present that is creating a cylinder misfire
74	Cylinder 4 Misfire or a Random Misfire a condition is present that is creating a cylinder misfire
75	Cylinder 5 Misfire or a Random Misfire a condition is present that is creating a cylinder misfire
76	Cylinder 6 Misfire or a Random Misfire a condition is present that is creating a cylinder misfire
80	Exhaust Gas Recirculation insufficient flow detected
86	ECT Sensor (Engine Coolant Temperature) circuit range / performance problem
90	Evaporative Emission Control System leak detected in the fuel tank area
91	Fuel Tank Pressure Sensor low input
92	Evaporative Emission Control System insufficient purge flow

APPENDIX 3 ROM FILES

Files stored in the ROM Editor folder
ROMS\Tunes
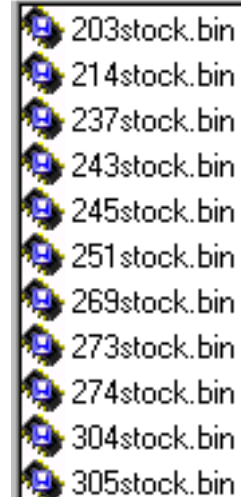A set of exported tables for:
99 B16A Civic Si. 240 inj + 40 psi fuel
95 Drag turbo 440 inj 60 psi
00 JRSC Type R 440 inj 50 psi
99 Type R Jun 3 Cams 240 inj 60 psi fuel
Dyno plots for these are on http://
www.hondata.com/dyno.html

Hondata ROMs
These have been modified for Hondata features (datalogging, launch control, boost etc).

h058	PR3 JDM B16A OBD0 89-91
h058ol	PR3 JDM B16A OBD0 89-91 open loop
h058m3	PR3 JDM B16A OBD0 89-91 3 bar sensor
h058m3o	PR3 JDM B16A OBD0 89-91 3 bar sensor & open loop
h071	PW0 JDM B16A OBD0 89-91
h071m3	PW0 JDM B16A OBD0 89-91 open loop
h071m3	PW0 JDM B16A OBD0 89-91 3 bar sensor
h071m3ol	PW0 JDM B16A OBD0 89-91 3 bar sensor & open loop
h245	P30 JDM DOHC VTEC B16A OBDI
h269	P72 JDM DOHC VTEC B18C OBDI
h273	P72 US DOHC VTEC B18C OBDI
h273e	P72 US DOHC VTEC B18C OBDI
h274	P74/P75 US DOHC B18A OBDI
h304	P28 US SOHC VTEC OBDI
h305	P30 US DOHC VTEC B16A OBDI

Stock ROMs
These are stock ROMs and do not offer any of the Hondata features like datalogging or boost.

203	P30-001 JDM DOHC VTEC B16A OBDI
214	P74 US B18
237	P08-001 JDM SOHC VTEC
243	P08-010 JDM SOHC VTEC
245	P30-010 JDM DOHC VTEC B16A OBDI
251	P06
269	P72 JDM DOHC VTEC B18C
273	P72 US DOHC VTEC B18C GSR
274	P75 US B18
304	P28 US SOHC VTEC OBDI
305	P30 US DOHC VTEC B16A OBDI

r\ROMs\Tunes
- civicsi.csv
- gsrt.csv
- typerjrsc.csv
- typerjun.csv

r\ROMs\Stock
- 203stock.bin
- 214stock.bin
- 237stock.bin
- 243stock.bin
- 245stock.bin
- 251stock.bin
- 269stock.bin
- 273stock.bin
- 274stock.bin
- 304stock.bin
- 305stock.bin

\ROMs\Hondata
- h058.bin
- h058.csv
- h058m3.bin
- h058m3ol.bin
- h058ol.bin
- h071.bin
- h071.csv
- h071m3.bin
- h071m3ol.bin
- h071ol.bin
- h215.csv
- h245.bin
- h245.csv
- h269.bin
- h269.csv
- h273.bin
- h273.csv
- h273e.bin
- h273e.csv
- h274.bin
- h274.csv
- h304.bin
- h304.csv
- h305.bin
- h305.csv
- roms.txt