Race Electronics

Engine Management Systems

USER MANUAL VER 15.01

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MANUAL UPDATE NOTES V15.01 TO V22.0

V16.01

Rover flywheel mode added in option 17. Settings are

0 normal missing tooth wheel as per manual

1 Rover 2 gap wheel with distributor for original 1400 K series

2 Rover 4 gap wheel with 2 and 3 teeth between gaps (VVC)

3 Rover 4 gap wheel with 5 and 4 teeth between gaps (1600 non VVC)

V17.0

Y/N question on flash change light in option 34 to indicate launch control active. Setting this precludes the use of the change light output for general switching on RPM (say camshaft position on Honda VTEC)

V18.0

1 Initial injection pulse time added in option 17. In previous versions of the system this was fixed at 40ms. You can now vary this from 1 to 40ms. This pulse only occurs once as the engine is started and is there to clear air from injectors etc. Some engines are very sensitive to overfuelling at this time so this can now be reduced if required.

2 The start up teeth before TDC can be reduced to zero i.e. the engine will fire exactly at TDC below 1500 rpm. This improves the ability to start high compression engines with small flywheels.

3 Access to dyno mode can now be made with a simple serial cable. Press page up/page down to alter advance or fuelling depending on which map is shown on screen. Use knobs course/fine to alter the step.

V19.0

1 Allows uses of 12 - 3 crank wheel for Honda Blackbird engine (75 degrees BTDC)

V20.0

1 Allows extending coil on time to 9 milli seconds

V21.0

1 Allows switching of Aux2 output on water temperature

2 Implements idle speed control using injectors 2 output. Needs PWM idle valve.

V22.0

1) You can now switch between injectors 1 and 2 at a choice of rpm (option 17).
2) The Lambda control can be permanently engaged.
3) The idle speed control is now temperature sensitive (option 32)
4) The button on the launch control acn be used to provide a button only pressed rev. limit.

CONTENTS

GETTING STARTED

We hope any Customer already familiar with computers, their keyboards and codes, will bear with us and not be offended by the simplicity of this manual for the DTA Engine Management System(s).

As we cannot know the levels of computer expertise of users of DTA/EMS we have decided on a basic and simple approach, often choosing to interpret or re-phrase common computer terms or jargon.

What we are sure of is that any buyer will be anxious to get on and use the programme as soon as possible to begin engine setting and development with an absolute minimum of simple commands. When computer-speak is unavoidable, a translation will be found in brackets.

INSTALLATION

GETTING STARTED

a Begin by attaching all wires, contacts, sensors, power feed and loom to link to the ECU (engine "black box") as described in the physical installation section.

b Switch on the lap-top ("Pocket" computer incorporating its own keyboard screen, batteries etc.) or switch on the power to any full-size PC unit to be used.

c Enter your copy of the DTA programme onto computer's hard disc (a once only job) as follows:

1 Find the ENTER key. Most important. This is the one key that when pressed tells the computer to carry out any instructions you have given it with other keys.

2 Find the F4 key. This key will imprint any changes you make into the memory of the ECU permanently. Failing to press it at the correct time means you will lose all your alterations at switch-off.

3 Insert the DTA/floppy disc (thin plastic square 31/2 x 31/2ins.)into the letterbox-like slot (floppy drive). Note that "floppy discs" are in fact rigid.

4 If using Windows 95 put the system into MSDOS mode (Choose shutdpwn from the start menu and choose "restart the cpmputer in MSDOS mode").
Type into the keyboard A: and press ENTER.
" " " " INSTALL and press ENTER.

5 The installation program will install the system and its data to disc C: in subdirectory \DTA. If these are not suitable and you know what you are doing then make a suitable subdirectory of your choice and copy all the files on the distribution diskette to it.

5) Wait 20 secs until programme is installed.

6) You can now switch your computer off or on as you wish. The programme will always be ready and waiting.

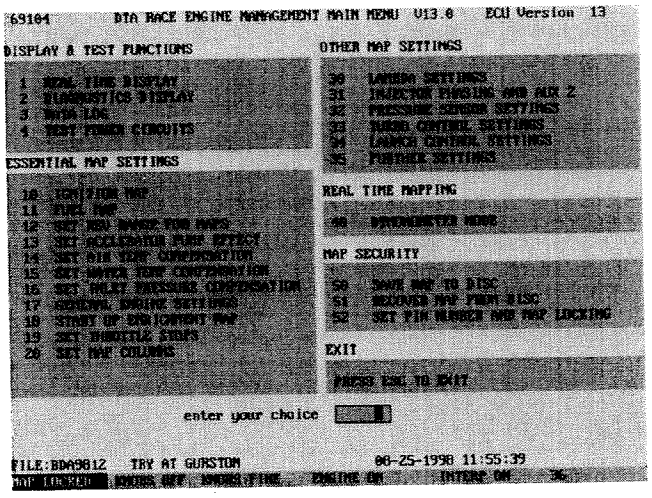
d To use the programme (these same instructions will be heeded every time you employ the DTA system). If you wish to work with the ECU first switch on the engine ignition (in car or on dyno) otherwise you will only be able to work with maps stored on the computers hard disc, for immediate instructions on progressing when using this mode see chapter 12. Type into the keyboard

CD\DTA (note that \ is called "backslash"). Press ENTER
DTA press ENTER.

A request for your PIN number will now appear. Ignore this and press ENTER except in one situation - where you have commissioned a professional engine builder to map your ECU. He may wish to protect his development information with his own private code. Be clear with him over whether he wishes to do this. If he does you will not have that PIN number which will have the effect of restricting access to certain parts of the system to avoid damaging changes that can be made by the inexperienced. You will ,however, still have access to the parts of the program which display data only.

Please note that only a limited number of attempts can be made to enter the PIN number correctly !

The menu will now appear (a directory or numbered list of what is in the programme).



e You can now see any section of the Menu (programme) by pressing the appropriate numbers (1,2,3 etc.) followed by ENTER. Use the ESC (escape) key to simply return to the menu.

NOTE THE SOFTWARE DEFAULTS TO ENGLISH AND COM1. THIS CAN BE CHANGED AS THE PROGRAM IS STARTED. SEE EXAMPLES BELOW.

DTA 2 44 (ENTER) CHANGES THE SYSTEM TO COM2 IN ENGLISH
DTA 1 33 (ENTER) CHANGES TO COM1 AND FRENCH

THESE CHANGES ARE STORED AND NEED ONLY BE ENTERED ONCE.

DEFINITION OF TERMS

CALIBRATION UNITS USED

Temperature	degrees Centigrade	(C)
Time (fuel flow)	pulse length in milli-seconds	(ms)
Engine speed	revs. per minute	(rpm)
Engine turns	rotations from starter engagement	(plain number)
Ignition	degrees before top dead centre	(degs. BTD)
Throttle opening	percentage of throttle opening	(%)
Dwell	percentage of time coil turned on (%)	
Exhaust	rich/weak indication	Lambda number
Pressure	kpa of inlet pressure	(kpa) 100kpa = 1 atm

MAP EDITING KEYS

FUNCTION KEYS

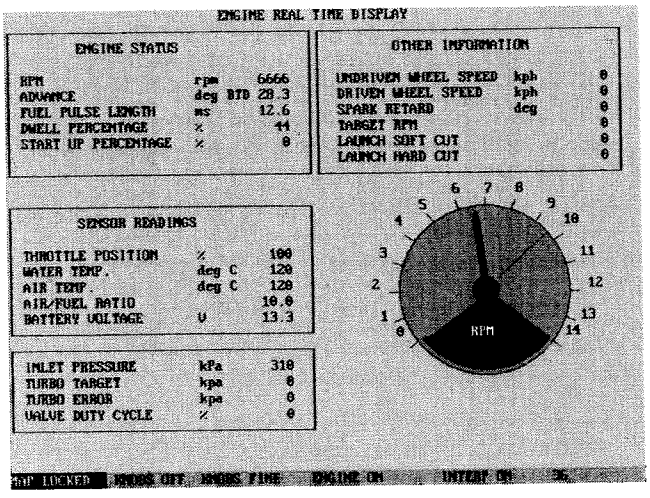
F1	Graph map
F2	Exit without saving
F3	Change 1 cell by a percentage
F4	Exit and store changes to engine
F5	Change column by a percentage
F6	Change row by a percentage
F7	Change whole map by a percentage
F8	Change an area of cells by a percentage
F9	Copy column
F10	Copy row

OTHER KEYS

ESC (escape)	Exit without saving
ENTER	Confirm change
CURSOR KEYS	Move about maps
Cntrl + right arrow	Move 1 column to right
Cntrl + left arrow	Move 1 column to left
M	Display pull down menu

The following numbered chapters apply to each part of the numbered Menu, giving enlarged detail on what is in the further explanations on what they do and how to use them, together with a full colour picture of what you will see on the screen with some helpful labels. You can go to them in numbered sequence, or pick any particular section you might wish to see or use. You must always return to this Menu to enter another section. Press the ESC (escape) key or F4 to leave any Menu option.

CHAPTER 1 REAL TIME DISPLAY



This display gives a continuous read out of the current engine settings. These are grouped into three sections.

ENGINE STATUS

This shows current RPM, instantaneous advance in use, instantaneous fuel pulse length in use, current dwell percentage of the coils and any start up enrichment in operation.

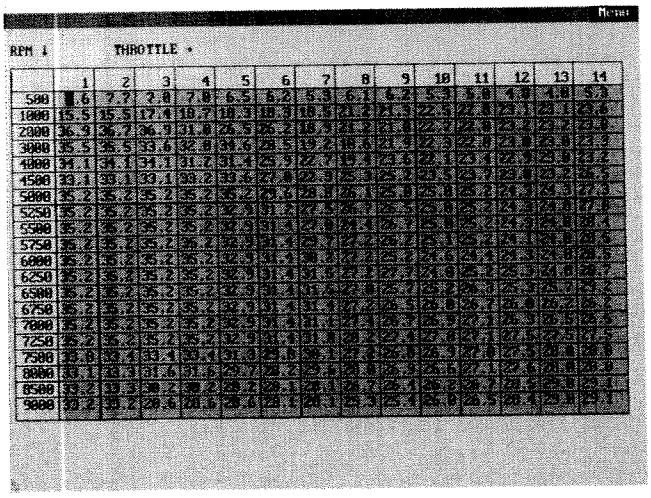
SENSOR READINGS

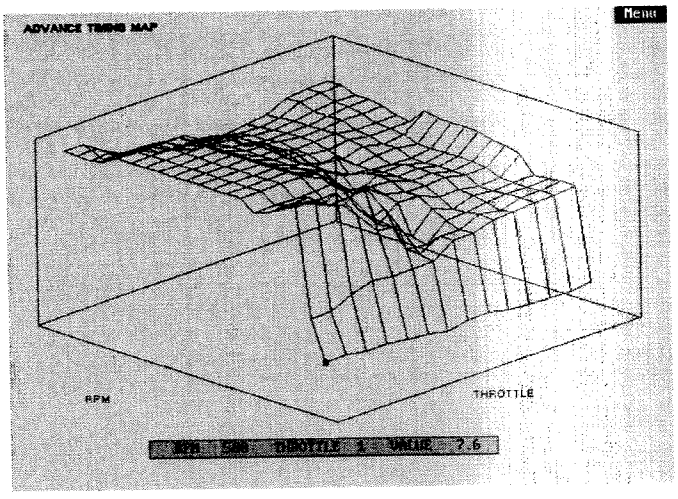
This section shows the current readings of the various engine sensors and the inlet pressure control parameters

OTHER INFORMATION

This shows the current status of the launch control system

CHAPTER 2 MAIN IGNITION MAP





Ignition map with default (basic) settings in RED of degs. BTDC. Default settings are a basic set of figures built into the programme as a starting point. Whatever alterations you may choose to make, you can always get these (default) figures back again. Alter timing by moving the cursor to the chosen place and type in the new figures.

If any of the cells are highlighted in brown this indicates that the value of this cell has been set in the Dyno Mode whilst the engine was running. Moving the cursor above one of these cells will reveal on the bottom row of the display the % adjustment that was made to this cell. These cells can be used as markers to adjust the map using the function key percentage adjustments as described below. Use of the function keys allows changes to be made to various parts of the map as a group to speed up changes.

PRESS THE M KEY FOR A MENU OF THE FOLLOWING ITEMS

F1 This shows a "3D" wire frame graph of the map to allow ready visualisation of any "holes" in the map and other irregularities. Press any key to return to the normal display.

F2 This will exit from the map WITHOUT SAVING ANY CHANGES. If any changes have been made a warning will be issued.

F3 This allows you to change a single map cell by a percentage figure. The cell you have chosen is highlighted in black and the percentage to change by is requested on the bottom row of the screen. Type in the figure you require (either + or -) and press ENTER. Press the escape key to make no changes.

F4 This will exit from the map and all changes will be stored in the management box. This is the normal way of exiting the map.

F5 This allows you to change a whole column by a percentage. The column will be highlighted in black and the percentage to change by is requested on the bottom row of the screen. Type in the figure you require (either + or -) and press ENTER. Press the escape key to make no changes.

F6 This allows you to change a whole row by a percentage. The row will be highlighted in black and the percentage to change by is requested on the bottom row of the screen. Type in the figure you require (either + or -) and press ENTER. Press the escape key to make no changes.

F7 This allows you to change the whole map by a percentage. The map will be highlighted in black and the percentage to change by is requested on the bottom row of the screen. Type in the figure you require (either + or -) and press ENTER. Press the escape key to make no changes.

F8 This allows you to change a group of cells by a percentage. Move the cursor to the cell you wish to change and leave the cell by pressing the Control key and the cursor key at the same time. Continue until all the cells required are highlighted in black. Press ENTER. The percentage to change by is requested on the bottom row of the screen. Type in the figure you require (either + or -) and press ENTER. Press the escape key to make no changes.

F9 Copy a column. Move the cursor to the column you wish to copy. Press ENTER. The column will be highlighted in black. Move the cursor to the column you wish to copy to. Press ENTER. The first column will then be copied to the second column. Press escape at any time to abort copying.

F10 Copy a row. Move the cursor to the row you wish to copy. Press ENTER. The row will be highlighted in black. Move the cursor to the row you wish to copy to. Press ENTER. The first row will then be copied to the second row. Press escape at any time to abort copying.

EDITING THE MAP GRAPHICALLY

When the map is displayed in its wire frame form full editing is available. Your current position in the map is indicated with a small flashing cursor. Move about the wire frame using the cursor keys as normal.

By pressing ctrl (or alt) + up arrow or ctrl (or alt) + down arrow you can adjust any individual value up or down as required. Cntrl and arrow is a fine adjustment and alt and arrow is a course adjustment. Black lines will connect the new position with the cells immediately surrounding the active cell. When you are happy with the new position press enter and the map will be redrawn to reflect the new cell position. The underlying numbers in the map will also change. At any time before pressing enter you can press escape to replace the point at its previous position.

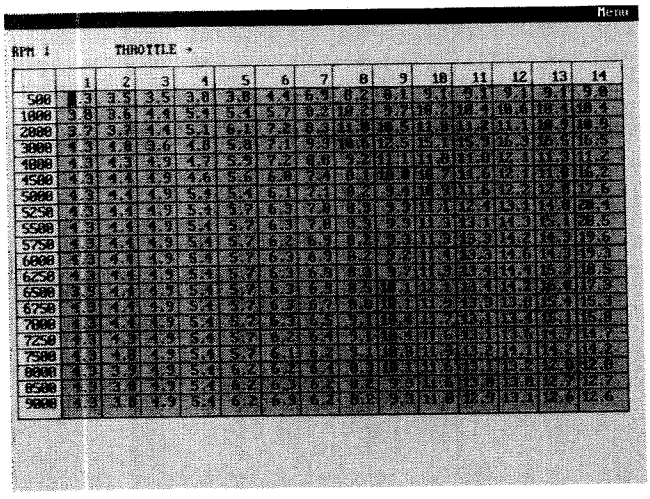
Most of the map editing function keys are active as in the number display. Press M for a menu of available keys.

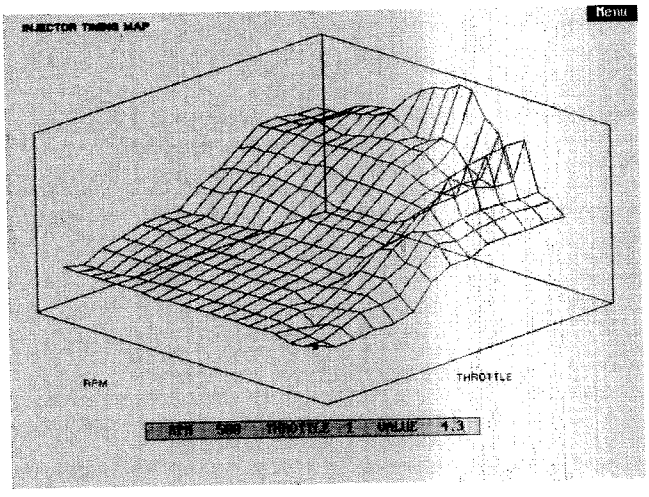
All adjustments when using one of the function key tools are made as above i.e. use ctrl (or alt) and either up or down arrow.

Press escape or F4 to return to the figure display.

CHAPTER 3 MAIN FUEL MAP

Fuel map with default (basic) settings in BLUE as the time any injector will remain open and flowing fuel, in milliseconds (0.001 sec). The injectors fire once every TWO revs i.e. once every engine cycle. Alter fuel flow with cursor and new figures exactly as in Chapter 2.





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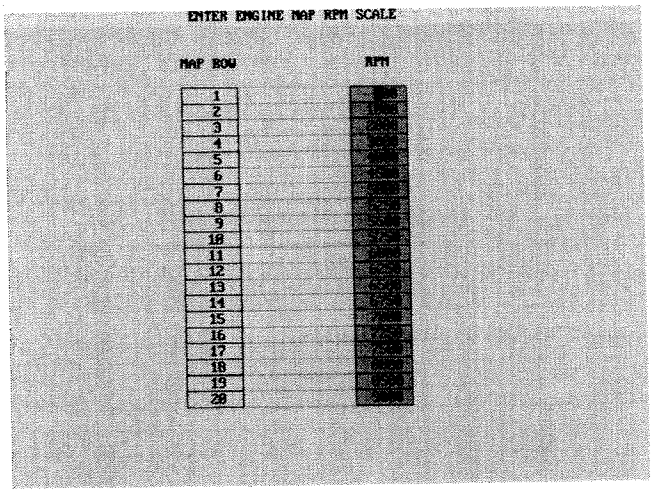
Press escape or F4 to return to the figure display.

CHAPTER 4 SET REV RANGE FOR MAPS

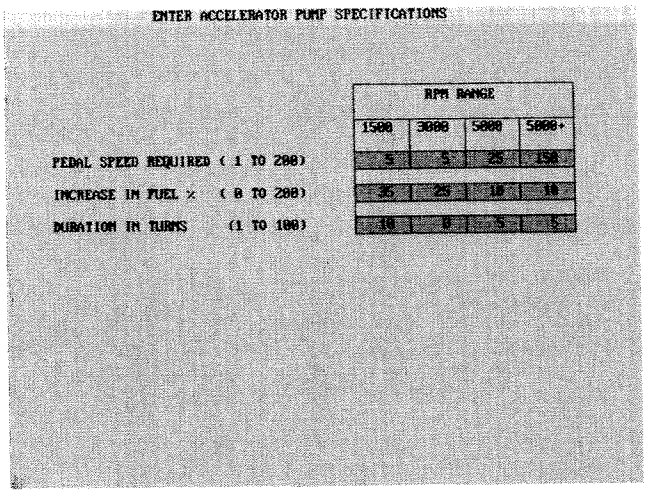


Setting a suitable RPM scale for the engine in use. Use the method from Chapter 2 (move cursor and type in new figures).

The scale must increase from top to bottom. The rpm bands can be of any size but we recommend a minimum spacing of 250 rpm. You can make the spacing closer then normal for any area of interest for your particular engine e.g. close together at low revs for a trials engine or close together at the high revs for a peaky race engine.

Do not forget to confirm these changes by pressing F4 key before leaving this section.

CHAPTER 5 ACCELERATOR PUMP EFFECT



As on a carburettor, this gives a shot of fuel for a limited time as the throttle is opened quickly. Very difficult to quantify, often varying between individual engines even of the same type and capacity. Normally needed if there is any hesitation or uncertainty when opening the throttle under load. Only experiment will yield the best results.

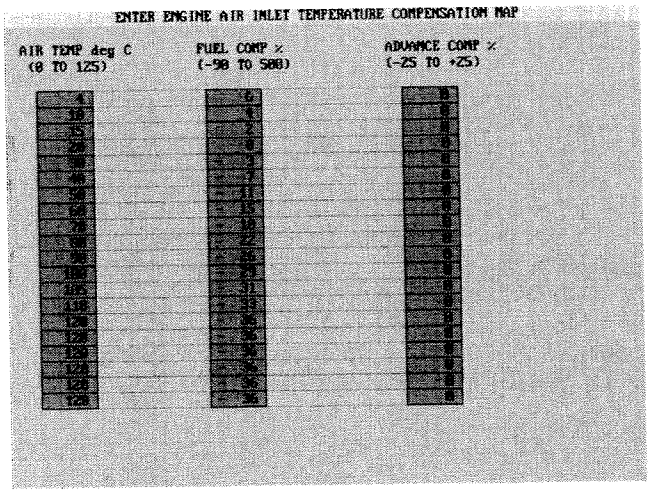
There are four different rpm bands to which it can be applied. Generally you will need a higher percentage of fuel uplift for a longer time at lower pedal speeds in the lower rpm bands and probably nothing at all in the higher bands.

The pedal speed row is an arbitrary number .If in doubt start at 25 for the lower bands increasing to 100 in the higher bands.

A very low figure will cause the throttle pump to work even with very slow movements of the pedal and values above 126 will mean it will probably never come into operation at all.

Press F4 to save the changes or ESCAPE to exit without saving.

CHAPTER 6 AIR TEMPERATURE COMPENSATION



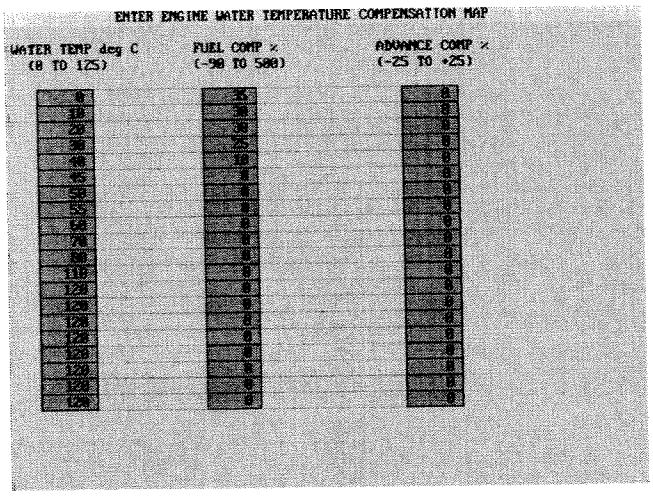
This section sets the correction to the basic map settings depending on the inlet air temperature. As an example you may wish to reduce the amount of fuel and retard the ignition slightly (say 10%) at high inlet temperatures.

All three columns are user settable. Move the cursor to the cell concerned and change the relevant figures.

NB The above shows a sample set of figures for automatic correction of fuelling for air inlet temperature.

Press F4 to save the figures or ESCAPE to exit without saving.

CHAPTER 7 WATER TEMPERATURE COMPENSATION

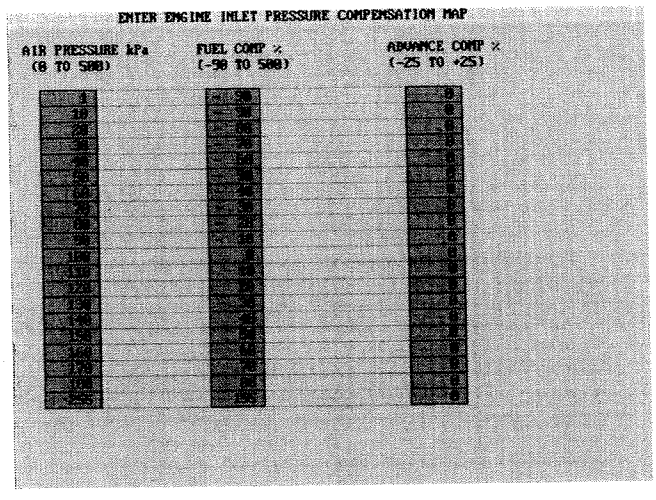


This section corrects the basic map settings depending on the engine water temperature. This provides the equivalent effect of a choke. As a general guide try gradually increasing the fuel increase percentage below 40 deg. C by about 20%. If the engine does not run cleanly on start up then either give it more or less fuel as required.

All three columns are user settable. Move the cursor to the cell of interest and change the relevant figures.

Press F4 to save the figures or ESCAPE to exit without saving.

CHAPTER 8 INLETPRESSURE COMPENSATION



This section corrects the basic map settings for the engine inlet pressure or barometric pressure depending on where the sensor is fitted. If a barometric sensor is fitted then normally the fuel would be reduced at low pressures (to keep the mixture strength the same) and possibly the ignition retarded.

If the engine is a forced induction (or "blown") then it would be normal to make the main map reflect the "on boost" requirement and use the compensation map to accommodate the off boost situation.

All three columns are user settable. Move the cursor to the cell of interest and change the relevant figures.

NB The above shows a sample set of figures for automatic correction of fuelling for air inlet pressure. Only use these figures if a pressure sensor is fitted if it is not set all fuel corrections to zero.

Press F4 to save the figures or ESCAPE to exit without saving.

CHAPTER 9 DYNO MODE

THIS SECTION CANNOT BE ENTERED UNLESS THE DTA CALIBRATION UNIT IS CONNECTED

This section indicates exactly what the system is doing any moment in a graphic display. Moving needles constantly monitor RPM, fuel flow, ignition advance and exhaust gas content (rich or lean) while gauge values are simultaneously given in large, clear colour-coded figures.

The **Dyno Calibration Unit** is a small box connected the to Engine Management Computer which allows the user to modify the ignition and advance settings remotely whilst the engine is running. There are two knobs and three buttons on this box. The two knobs will vary the calculated ignition advance and fuel pulse length from the standard map by + or - 50% on fuel and 25 degrees on advance and 10% on fuel and 6.5 degrees on advance in course or fine settings respectively.

The three buttons perform the same functions as the kill key ,the enter key and the knobs on/off key as described below. All are clearly marked.

The bottom line of the screen gives the current status of the calibration box controls.

Dyno mode was designed to make tuning the engine on a dynamometer as simple and fast as possible (see below for hints on methods of use).

There are three alternative displays in this section. The first display gives the gauge representation of all the current instantaneous engine settings. The other two displays are dynamic representations of the current position in the map that the system is using to calculate the instantaneous values.

NOTE :- WHEN YOU HAVE AN ENGINE ON THE DYNO DO NOT STOP IT BY TURNING OFF THE IGNITION. THE CONTROL PC AND THE ENGINE MANAGEMENT BOX BECOME ONE SYSTEM. TURNING OFF EITHER AT THE WRONG MOMENT CAN HAVE EXTREMELY BAD EFFECTS. IF YOU WANT TO STOP THE ENGINE USE THE KILL BUTTON ON THE DYNO CONTROL BOX.

PRESS THE M KEY FOR A MENU OF THE FOLLOWING ITEMS

CONTROL KEYS IN DYNO MODE

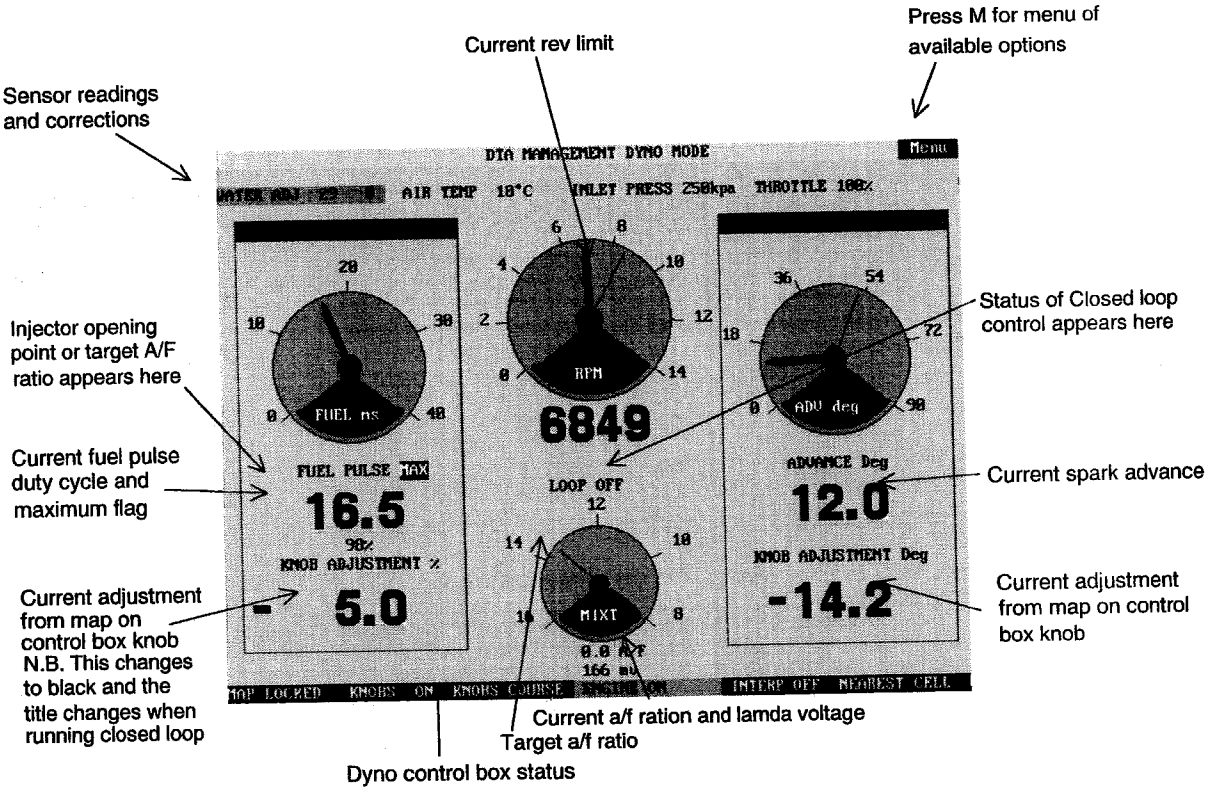
A	DISPLAY ADVANCE MAP
F	DISPLAY FUEL MAP
N	RETURN TO GAUGE DISPLAY (DISPLAY NEITHER MAP)
P	TURN ON OR OFF CONTROL KNOBS ON CALIBRATION UNIT
C	CHANGE CONTROL KNOBS TO COURSE OR FINE
K	STOP THE ENGINE ! (ALSO LOCKS THE DISPLAY)
	PRESS AGAIN TO ALLOW ENGINE START
T	CLEAR THE MODIFIED (TRACED) CELL LIST

I	TURN ON/OFF INTERPOLATION
L	TURN ON/OFF CLOSED LOOP CONTROL OF FUEL
O	TURN ON/OFF SET INJECTOR OPENING POINT
S	SET TARGET MIXTURE FOR CONTROL LOOP ON/OFF
U	UPDATE THE ENGINE MAP
ENTER	USE CURRENT SETTINGS TO MODIFY (TRACE) MAP CELL
ESC	EXIT WITHOUT SAVING MODIFIED (TRACED) CELLS
F4	EXIT AND SAVE MODIFIED (TRACED) CELLS

SUGGESTED USE OF DYNO MODE

1 Press "I" to turn off the map interpolation and work to the nearest cell. Fire up the engine and set the dyno rpm to the rpm ofinterest.

2 Use either the advance map mode or the fuel map mode and you will see the current cell position highlighted in black. Run the engine hard against the brake and adjust the knobs to give maximum power. When the fuel or advance map is displayed along the top and right hand edge of the map is a visual indication of the position within the cell. Always set the throttle position and rpm such that the small black markers line up with map grid lines. This will result in much more accurate maps. Press the enter key on the control box when you are happy power is optimised. The cell which has just been traced (marked) will be highlighted in brown (or blue if this



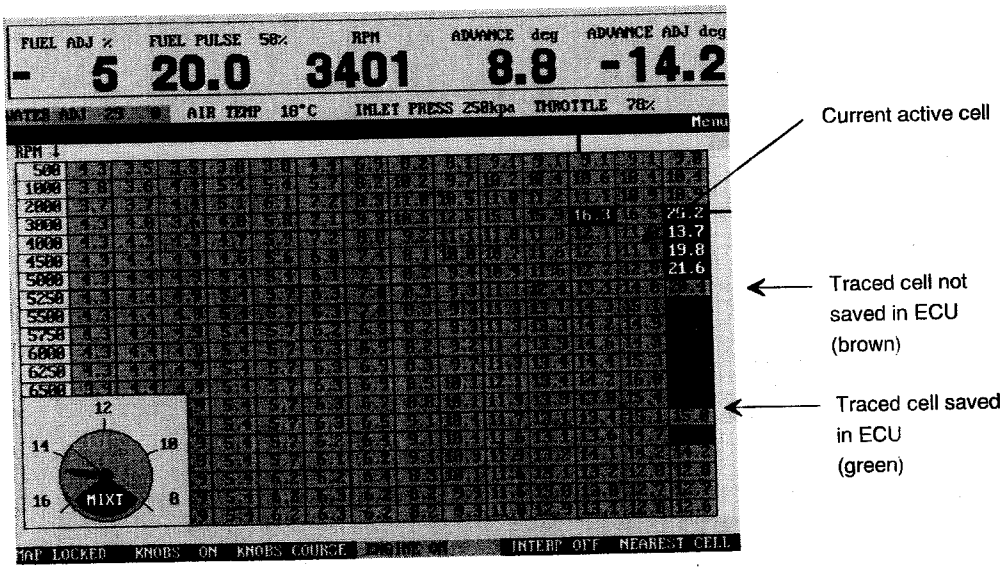
happens to be the current active cell). If very little adjustment has been used to achieve maximum power then continue for other cells you wish to trace. If a lot of adjustment has been used stop the engine with the kill button on the dyno control box and press F4 to exit and save the traced cells.

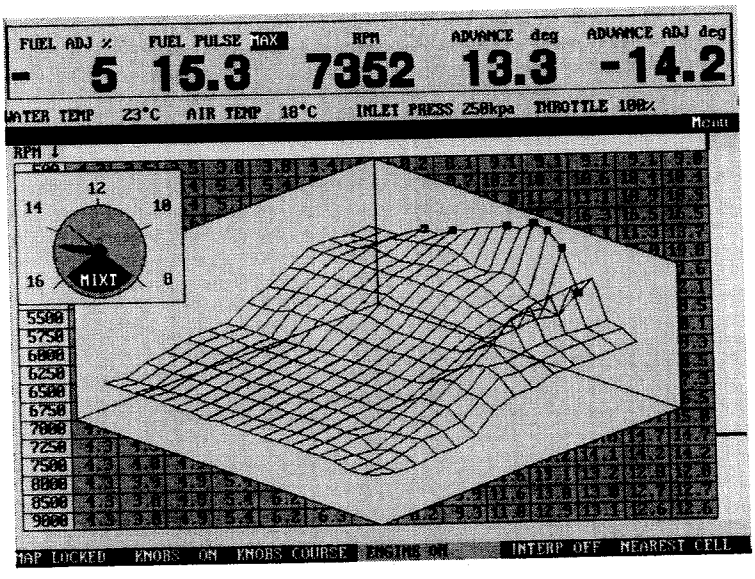
3 Enter the advance map edit mode (option 2 on the menu) and make sweeping adjustments to the map using the function keys. NOTE that now that you have traced cells on the map that when you do percentage adjustment using the function keys you will be given the option of leaving the traced cells unaffected. Normally this will be your requirement as these cells have already been set on the dyno. Check the map looks correct using the graph map key (F1). Save the changes using the F4 key.

4 Enter the fuel map and do the same as in 3 above.

5 Return to the dyno mode and start up the engine. The kill mode will be deselected automatically. Choose another cell and repeatthe operation. This cell will probably be much closer than the first and may be near enough i.e. require very little adjustment on the control unit knobs. If this is the case carry on and do as many cells as you wish to "map" the engine to your satisfaction. Save your adjustments by pressing F4. NOTE the traced cells list (i.e. the cells highlighted in brown) can be cleared at any time by pressing the "T" key but beware that the information will be lost so save any traced cells by pressing the F4 key before hand. An extra feature now added is that traced cells which have been used already to update the engine map are now highlighted in black on green. This allows you to keep track of which cells have been set and which have not.

6 Stop engine using the kill button and return to the advance and fuel map edit modes (option 2 and 3 respectively). Adjust the figures of the untraced cells until the map looks visually smooth using the F1 graph map key. Return to option 9 and try the engine again. As a last check turn the interpolation back on and see that the performance is as you expect. You will soon develop your own strategy for use of the tools we provide but the above provides very quick results for us (We map engines ourselves!)





CLOSED LOOP CONTROL

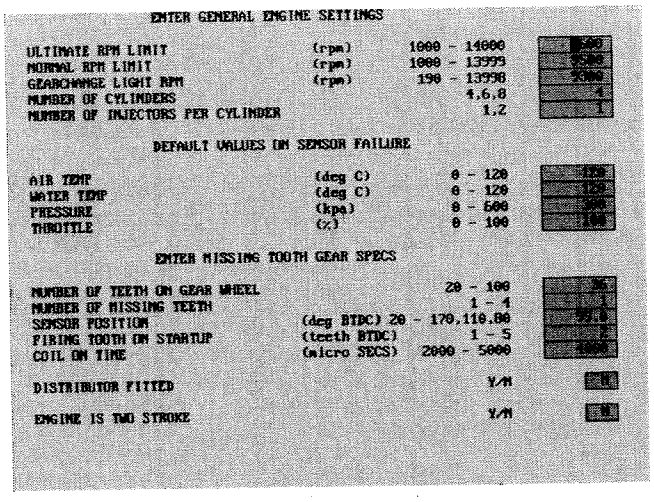
All systems are now equipped for closed loop control of the fuelling. This uses the output from a lambda sensor (or preferably an NGK UEGO sensor) together with the values set in menu option 19 to control the fuelling automatically. Sample values for these settings are given in this manual in the description of the lambda settings section.

Pressing "L" will turn on the closed loop control and attempt to adjust the fuelling until the measured mixture is the same as the target mixture requested. This will result in a change to the screen display. The knob adjustment percentage displayed in the bottom left of the screen will change to black and the title will be highlighted as "lambda adjust %". This is the figure by which the system is adjusting the fuelling to keep to the target mixture requested. To adjust the required target mixture either change the value directly in menu option 19 or press "S". This will change the fuel pulse display on the left of the screen to the required target mixture. This is adjustable on the left hand knob on the dyno calibration unit. Be careful when starting to adjust the target mixture as the knob becomes active the instant "S" is pressed. If the knob is at one of its extremes then violent changes will be made to the fuelling virtually instantaneously.

When a new cell is selected (i.e. the rpm changes or the throttle position is changed)
then the fuelling will adjust quickly to the new value. When this has settled to a stable figure then press enter as normal to trace the cell and record the value as normal.Before leaving the cell press "U" which will update the engine map and zero the advance adjustment. The fuelling adjustment controlled by the lambda sensor should now go to zero. NOTE even on a cell that has been previously set the lambda sensor system will continure to make small adjustments to the fuelling. This is normal and is caused by small fluctuations in fuel pressure ,air temperature etc. This is the reason that road cars use systems permanently controlled by a lambda sensor.

The most likely source of problems when using this feature is that the mixture adjustment varies wildly with major positive and negative adjustments of the fuelling adjustment. This is caused by either the lambda sensor being too slow for the required loop frequency of the other settings for the lambda sensor being incorrect. Stop the engine immediately and adjust the settings in option 19.

CHAPTER 10 GENERAL ENGINE SETTINGS



This option contains various general engine settings as listed below. These must be set to suit the engine you are working with.

1 ULTIMATE RPM LIMIT

The engine will not go through this limit no matter what the conditions i.e. off load and full throttle. It is ,however ,fairly brutal in operation and should be set slightly higher than the normal rpm limit below.

2 NORMAL RPM LIMIT

This limit introduces a cut on each cylinder in rotation which would be enough to constrain rpm rise in a driving situation. It has a fairly soft action and does not upset the car. Normally set to 250 rpm below the ultimate limit.

3 GEAR CHANGE LIGHT RPM

The rpm figure at which the change light switches on. Normally set to 250 to 500 rpm below the normal rpm limit.

4 NUMBER OF CYLINDERS

The number of cylinders the engine has. Allowed figures are 4,6 or 8. NOTE The model of management box has to be able to support the number of cylinders.

5 NUMBER OF INJECTORS PER CYLINDER

The number of injectors per cylinder. Allowed figures 1 or 2.

NOTE The model of management box has to be able to support the number injectors.

6 DEFAULT VALUES ON SENSOR FAILURE

il the system detects a failed sensor, these are the values that the system will assume for these sensors. Make sure that the map values at these points are what you wish the engine to receive.

7 NUMBER OF TEETH ON GEAR WHEEL

8 NUMBER OF MISSING TEETH

These two entries need some explanation. The usual Ford crankshaft timing wheel has 35 actual teeth. It is a 36 tooth wheel with one tooth missing. Similarly a Vauxhall or Peugeot wheel is 58 teeth, this being a sixty tooth wheel with 2 teeth missing. The figures for these two items are entered as below;

FORD number of teeth on wheel 36 number of missing teeth 1

VAUXHALL number of teeth on wheel 60 number of missing teeth 2

Other similar wheels must be entered in the same fashion.

9 SENSOR POSITION

Please refer to the hardware installation section to determine this figure. Known figures are as below.

Vauxhall/opel 4 cylinder	117 degrees
Ford Zetec	72 degrees
Porsche 6 cylinder	90 degrees
BMW 6 cylinder	90 degrees

All of these need checking with a stroboscope when the engine is running.

10 FIRING TOOTH ON STARTUP

This is the position that the engine will fire below 1000 rpm and while on the starter motor. It is measured in teeth before TDC. So for a 36 tooth wheel, which is ten degrees per tooth and this figure set to 1 the engine will start at 10 degrees before TDC. With this set to 2 the engine will fire at 20 degrees BTDC. With a 60 tooth wheel this changes to 6 and 12 degrees respectively. Normally with a racing engine set this to 1. With a road engine then 2 may be acceptable but look for backfiring when attempting to start.

11 COIL ON TIME

This is the length of time the coil is turned on before firing (also referred to as the dwell time). This allows changes to suitdifferent coils. Most coils require 4000 micro seconds so unless you have specific information from the manufacturer of the coil leave this alone.

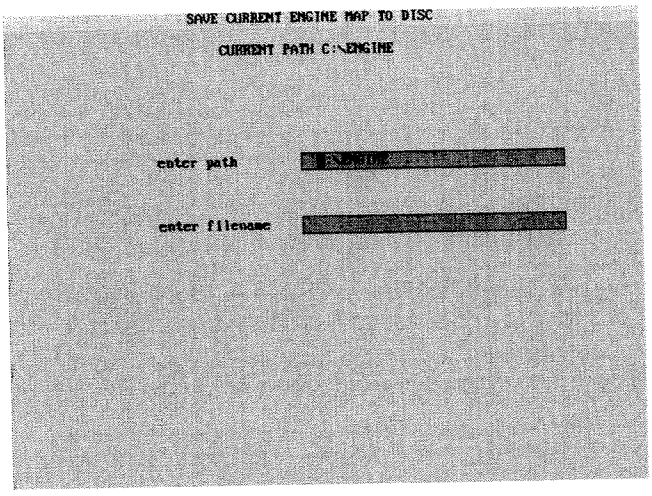
12 DISTRIBUTOR FITTED

Set to Y if engine is firing through a distributor N if distributorless

13 ENGINE IS TWO STROKE

Set two Y if you wish the injectors to fire once per rev rather than once per 4 stroke cycle. Only reccomended for two stroke engines.

CHAPTER 11 STORE MAP ON DISC



Store map on disc (saving new data and giving it a file name) The new figures/settings worked out during an engine test will normally be saved. They are kept on the computers hard disc (in the computer's memory) until you need them again, suitably labelled with a file name chosen by the tester.

a Most programmes (including this one) can only cope with eight characters whether letters, numbers or a mixture for a file name.As with all DOS filenames do not use "\","*","?" etc.

b One approach is to code your tests for example as below

AW17PRT1

Where AW = customer (Allan Warburton)
17 = capacity (1700cc)
PR = engine type (push rod)
T1 = test 1

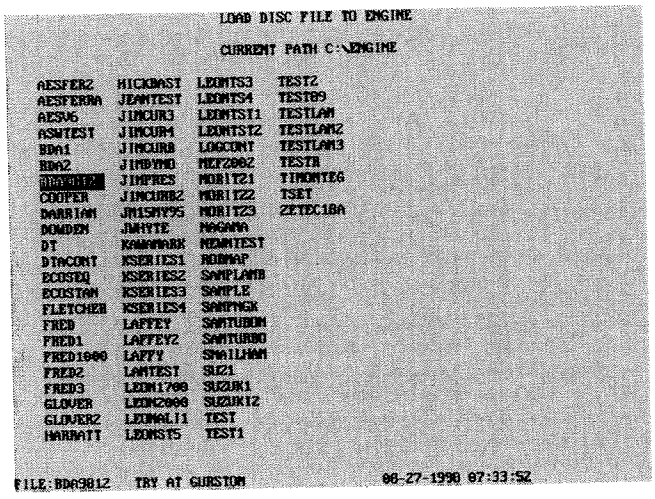
or any similar scheme you find suitable.

c finally you note the code with its full details into a small notebook. Or you can use AA - ZZ, but you will still have to puthem into that notebook...

Once you have decided on your code, and selected Sec.11, you will see C:\DTA on the screen (if you wish to store your engine maps in a different path enter what you require). Press ENTER. The screen will then ask you for your filename. Press ENTER. It may take up to 30 seconds to complete storing all the data onto the disc. See Sec.12 for getting back again and into the management box.

When the map is finished being stored to disc you will be given the option of printing the map. If you answer yes be sure that a printer is connected to the parallel printer port (LPT1). A full hardcopy of all engine parameters will be printed.

CHAPTER 12 RECOVER MAP FROM DISC



This section will recover from disc previously saved engine maps. First you will be offered a default path as below

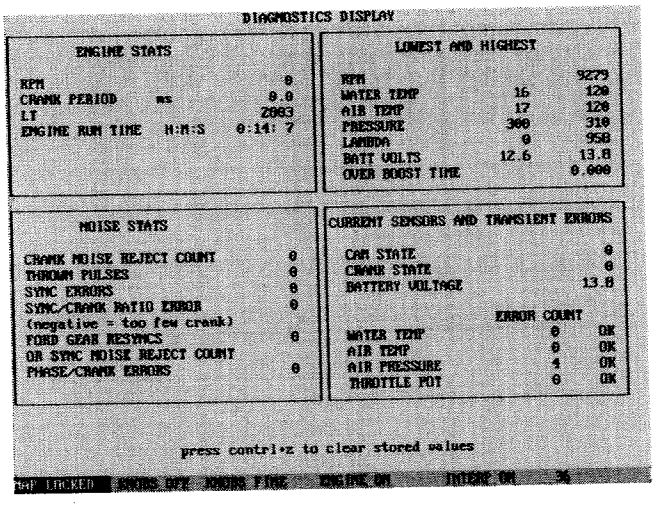
c:\dta

If you have not changed the system default path or do not understand what one is just press ENTER otherwise change the path to where your maps are stored.

The list of available engine maps will then be displayed on the screen. The current chosen map is highlighted in black. Move the highlighted square using the cursor until the required map is highlighted. A comment and date and time associated with the map appear on the bottom of the screen. Press ENTER to transfer the map to the engine box. This may take about 30 seconds.

You may delete unwanted files by pressing the del key when a map is highlighted.

CHAPTER 13 DIAGNOSTICS DISPLAY



This section contains information that may be helpful in the case of problems. There are four sections of information on the screen. These are as follows.

ENGINE STATS

This section amongst other things records the total engine running time.

LOWEST AND HIGHEST

This section contains the lowest and highest sensor values seen by the system when the engine is running. as well as the time the engine has been subjected to an over manifold pressure situation.

NOISE STATS

If the engine will not start or it exhibits peculiar miss fires then a look at these figures can be enlightening. If any of these figures are moving rapidly when the engine is running or you are attempting to start it go through the following check list.

1 Check that the Ford/Vauxhall gear specs are correct. If these are wrong the engine certainly will not start.
2 Check that the number of cylinders is correct.
3 Make sure all crank sensor connections are correct .
4 If all else fails ring us!

CURRENT SENSORS

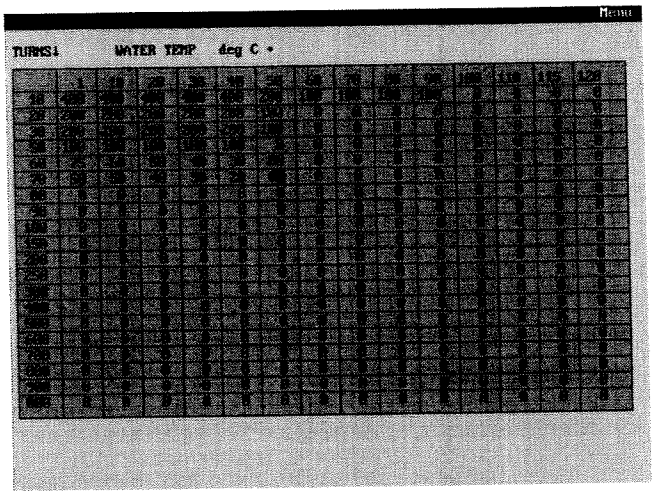
1 Cam state shows current signal level from a hall effect cam sensor. Can be used for timing purposes. The relevant transition isthe 1 to 0 transition. Refer to hardware installation section for exact position required. This is also where the signal from th e wheel speed sensor is recorded.

2 Crank State
Shows current signal level from a hall effect crank sensor. Can be used for timing purposes. The relevant transition is the 1 to 0 transition. Refer to hardware installation section for exact position required.

3 Battery Voltage
Shows current supply voltage in volts

4 Temp sensors etc.
Shows current status of water ,air ,pressure and throttle sensors. If they have failed it will say failed by the relevant sensor. Transient errors seen while the engine is running are counted and stored here.

CHAPTER 14 STARTUP ENRICHMENT MAP



The start-up enrichment map is an electronic equivalent of a plastic squirty bottle as used for starting recalcitrant race engines. It uses the water temperature and the number of engine turns (NOTE not rpm) from first starting to crank. It has an auto-cutoff the moment the engine catches and runs to above 1200 rpm.

You can alter both the enrichment percentage figures (blue), the water temperature scale (black) and the engine turns count figures (black) by moving the cursor to the appropriate cell and typing in the new figure.

You can also use the full range of map manipulation function numbers as below.

On completion press F4 to save the data.

F1 Not active

F2 This will exit from the map WITHOUT SAVING ANY CHANGES. If any changes have been made a warning will be issued.

F3 This allows you to change a single map cell by a percentage figure. The cell you have chosen is highlighted in black and the percentage to change by is requested on the bottom row of the screen. Type in the figure you require (either + or -) and press ENTER. Press the escape key to make no changes.

F4 This will exit from the map and all changes will be stored in the management box. This is the normal way of exiting the map.

F5 This allows you to change a whole column by a percentage. The column will be highlighted in black and the percentage to change by is requested on the bottom row of the screen. Type in the figure you require (either + or -) and press ENTER. Press the escape key to make no changes.

F6 This allows you to change a whole row by a percentage. The row will be highlighted in black and the percentage to change by is requested on the bottom row of the screen. Type in the figure you require (either + or -) and press ENTER. Press the escape key to make no changes.

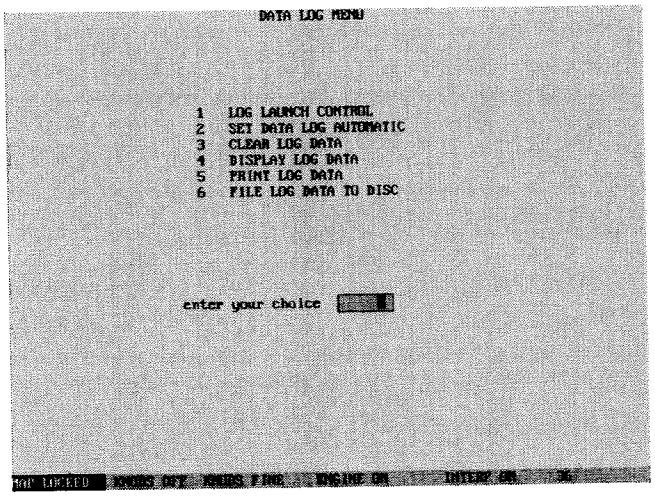
F7 This allows you to change the whole map by a percentage. The map will be highlighted in black and the percentage to change by is requested on the bottom row of the screen. Type in the figure you require (either + or -) and press ENTER. Press the escape key to make no changes.

F8 This allows you to change a group of cells by a percentage. Move the cursor to the cell you wish to change and leave the cell by pressing the Control key and the cursor key at the same time. Continue until all the cells required are highlighted in black. Press ENTER. The percentage to change by is requested on the bottom row of the screen. Type in the figure you require (either + or -) and press ENTER. Press the escape key to make no changes.

F9 Copy a column. Move the cursor to the column you wish to copy. Press ENTER. The column will be highlighted in black. Move the cursor to the column you wish to copy to. Press ENTER. The first column will then be copied to the second column. Press escape at any time to abort copying.

F10 Copy a row. Move the cursor to the row you wish to copy. Press ENTER. The row will be highlighted in black. Move the cursor to the row you wish to copy to. Press ENTER. The first row will then be copied to the second row. Press escape at any time to abort copying.

CHAPTER 15 DATA LOGGING MENU



A sub-menu or list of six special sections connected with saving/data continuously while the engine is running. It will do this automatically or only so long as it is switched on manually. It can also display results on the screen, print them out, and save them into the computer memory.

15/1 Special mode used for optimising the launch control.

15/2 Set data long automatic. With this setting the DTA will run to the limit of its capacity (3 mins) and then begin re-recordingnew data on top of previous information which will be wiped out.

15/3 Clear log data; clear log of any existing information to give a clean, empty start.

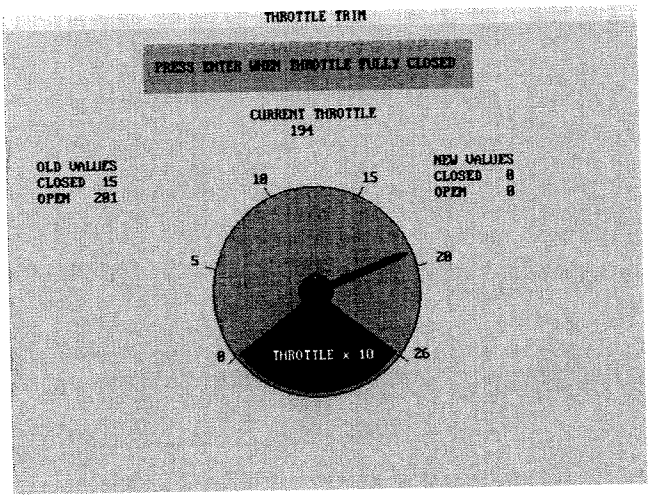
15/4 Display log data; puts all the information gathered onto screen. If the log is automatic mode the data is displayed backwards in time from when the engine last stopped. If the log is in switched mode the data is presented forwards in time from when the log switch was turned on.

If the system is turned on whilst in switched mode with the log switch in the on position then the log is automatically cleared.

15/5 Print log data; prints out a permanent record of the data.

15/6 File log data to disc; saving the data in the computer's memory for future use or reference. Use in the same way as chapter 11save map to disc.

CHAPTER 16 SET THROTTLE STOPS



Set throttle stops; locates the precise open and shut points of the throttle or slide mechanism to enable the programme to sense accurately, and match the amount of opening to the 14 columns on ignition, fuel and other tables.

TO SET

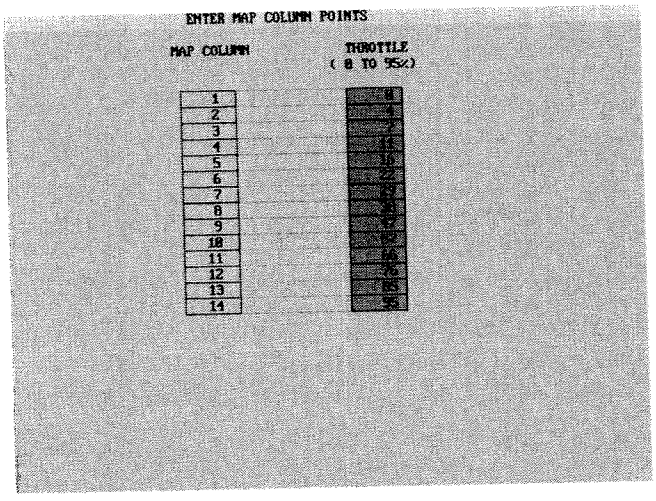
a First make sure the throttles are completely closed, then press ENTER.

b Open throttle to maximum and again press ENTER.

If the values are correct then answer Y when asked to confirm ,if you answer N then start again from a).

NOTE There are limits on throttle values available for use. The closed (idle) position must be higher than 10 (we recommend about 15) as lower values are used by the system to recognise that the throttle potentiometer (sensor) has failed.

CHAPTER 17 SET MAP COLUMN POINTS

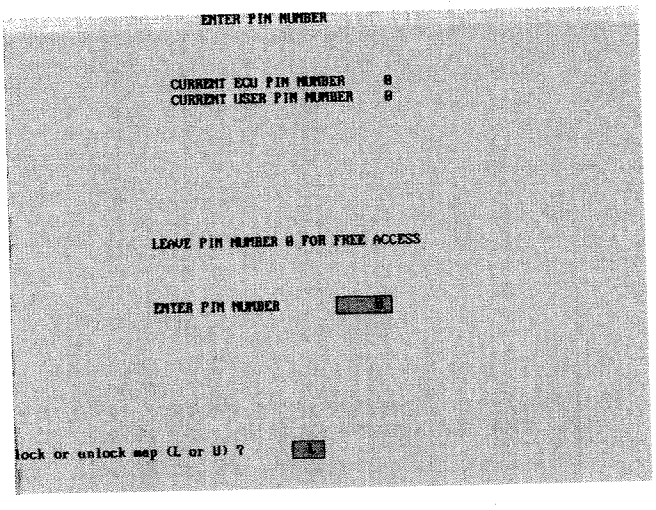


Because the response of a butterfly or slide system is inherently non-linear this option is included to match the movement across the map when the accelerator is pressed to the amount of air entering the engine. The default map includes a set of points which will work well in most situations. If ,however, you find after testing on the dyno that a portion of the fuel map becomes very steep across the map, that is an indication that the column positions need closing up at that point.

To change use the cursor to get to the figure of interest and change as required. NOTE the figures must increase from top to bottom of the screen.

Save the changes by pressing F4 when complete.

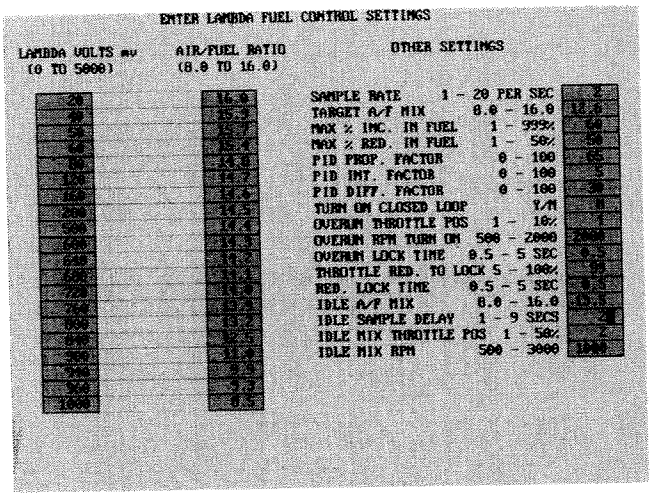
CHAPTER 18 SET PIN NUMBER AND MAP LOCK



This section allows the setting of a PIN number to restrict access to the system.

To set a pin number if the map is locked then enter the pin number and when asked to lock or unlock the map press "U" and then enter. Go back into option 18 and set the required pin number and then either leave the map unlocked or lock it as required. Remember to set or change a PIN number then the map must first be unlocked.

CHAPTER 19 LAMBDA SETTINGS



SETTINGS FOR BOSCH LAMBDA SENSOR

This section is probably the most difficult for us to explain to you because most of the settings you need to adjust have nothing whatever to do with engines as such.

The settings vary greatly between a Lambda sensor and an NGK UEGO sensor. Sample settings for each unit are given either on the facing page or overleaf. We advise that for serious work on the Dyno that better results are achieved using an NGK sensor than a standard Lambda. The NGK sensor is a much more linear device in the area of Air/Fuel ratio 14.5 to 10 to 1 i.e. the area where you will be running race engines for maximum power. Lambda sensors are essentially uncalibrated in this region and the results can vary greatly from one sensor to another. At the very least use a heated Lambda sensor for best results especially at low engine speeds and light throttle positions where the exhaust gas temperature can be very low.

1) LAMBDA VOLTS/AIR FUEL RATIO

This is a set of 20 values which equate the voltage seen from the lambda sensor with the air/fuel ratio this represents. The twosample sets of values given are for a Bosch heated lambda sensor and an NGK UEGO sensor. Unless you have specific information use the values given.

2) SAMPLE RATE

This is the frequency at which the sensor is checked to measure the air/fuel mixture when the engine is running hard. This is set at 3 times per second on the sample settings. This is fast enough to provide adequate setting speed on the dyno and is about as fast as a standard lambda sensor will respond. If when the closed loop is active the fuelling adjustment figure on the dyno display oscillates positive and negative wildly then set this figure lower. If the oscillation stops then you have a very slow sensor - buy a new one!

3) TARGET AIR/FUEL MIXTURE

This is the mixture at which the fuelling will be adjusted to when the engine is running hard.

4) MAXIMUM INCREASE IN FUEL

This is the limit on fuelling increase you wish to allow.

5) MAXIMUM REDUCTION IN FUEL

This is the limit on the fuelling reduction you wish to allow.

6) PID FACTORS

These three values alter the mathematics of the closed loop control. They should always add up to a total of 100. Only adjust the sample figures if you have problems. If the fuelling oscillates as described above and reducing the sample rate does not stop the oscillation then reduce the PID prop factor by 10 and increase the PID diff factor by 10 and try again. If it still oscillates do it again. If the system still oscillates when the PID prop factor has been reduced to 50 then contact us for further advice.

7) TURN ON CLOSED LOOP

This setting can be ignored as this is controlled usually from dyno mode

9) OVER RUN SETTINGS

These settings control what happens when the engine goes into an overrun condition. You will have noticed from the visual lambda indication on your dyno that when the engine is on the over run it appears to be very lean until it reaches idle or the throttle is opened again. This is an apparent leanness only and the closed loop should be turned off when this happens or it will try to fuel the engine to remove the leanness which is incorrect.

The overrun throttle position should be set at about 2/3% above the throttle reading at idle. The overrun rpm turn on should be set say 200 rpm above the idle rpm and the overrun lock time to about 1 second. Now when the engine is in an overrun condition the control loop will be turned off until either the rpm has dropped to idle or the throttle is reopened. This lock condition will be displayed on the dyno mode screen display.

10) THROTTLE REDUCTION TO LOCK

When the throttle is quickly closed from a wide open condition (but not so much as to cause an engine over run) a similar condition happens to the overrun. This is very much engine dependant and might not happen at all. Leave the settings as per the sample settings and all should be well.

11) IDLE SETTINGS

This group of settings allow you to run a different mixture strength at idle than under higher load. Normally you will run the engine leaner at idle and light loads or low speeds.

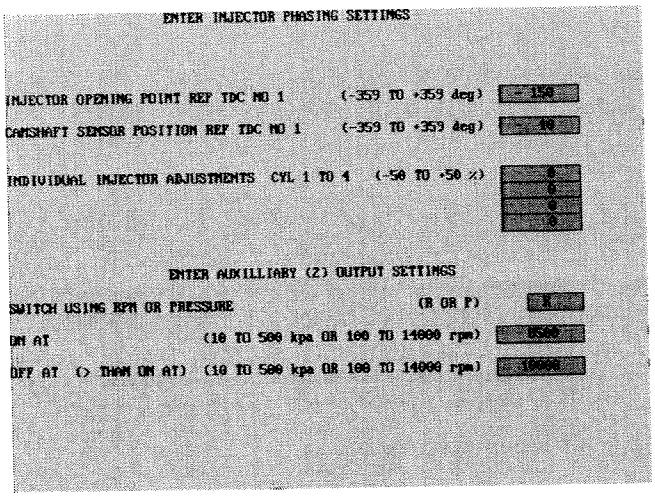
Idle air/fuel mixture is self explanatory and can either be set here or in dyno mode using the left hand calibration unit knob.

Idle sample rate is analogous to the main sample rate but needs to be very much slower. This is because the exhaust sensor does not respond as quickly when the exhaust gas temperature is low. Usually a figure of 1 sample per second is correct.

Idle mixture throttle position/rpm define the point in the map at which the system switches fuelling requirement. Essentially you are creating an "L" shaped area across the top of the map and down the left hand side ,inside which the system will use the idle mixture strength instead of the power mixture strength.

PLEASE NOTE THAT WHEN FIRST USING CLOSED LOOP CONTROL SET THE MAXIMUM AND MINIMUM FUELLING LIMITS LOW TO CHECK THAT THE SYSTEM IS WORKING CORRECTLY.

CHAPTER 20 INJECTOR PHASING



This section allows the setting of the values for injector phasing on sequential systems only. All angular values are refenced to TDC number 1 cylinder **firing stroke.**

1 INJECTOR OPENING POINT

The point at which the injector starts to open i.e. if you want the injectors to open 90 degrees before TDC firing stroke then enter -90. If you want them to open 90 degrees after TDC firing stroke then enter 90.

2 CAMSHAFT SENSOR POSITION

The position at which the camshaft sensor switches. Refer to DTA for confirmation of positions for different engine/sensor combinations.

3 INJECTOR BALANCE

This allows the amont of fuel to be allocated to each individual cylinder to be varied + or - 50% from the map value. You can use this to correct for mechanical differences in the inlect tract. Normally they should all be zero. N.B. they are listed in the order the injectors fire, not the cylinder order. If the firing order of the engine is 1342 and you want +10% fuel on cylinder number 3 then the second entry box down should be set to 10.

AUXILLIARY 2 SETTINGS

4 SWITCH ON MANIFOLD PRESSURE OR RPM

This allows the system to switch on RPM or manifold pressure. Uses for this output could be water injection, two stage shift light etc.

Note that this output is also used for turbo valve control and this use overides any setting here.

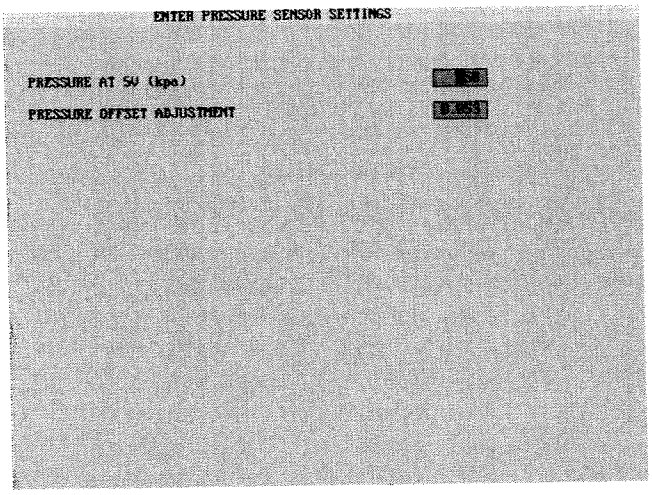
5 SWITCH ON AT

Pressure or RPM to turn on.

6 SWITCH OFF AT

Pressure or RPM to turn off at. If you do not wish the switch to turn off again set this outside the normal operating range of the engine. Say 14000 rpm.

CHAPTER 21 PRESSURE SENSOR SETTINGS



There are two values in this section. If you are using one of our internal pressure sensors then they will be factory set. If not then the sensor must be a 5 volt linear type and the first entry just reflects the full scale five volt pressure. The second entry is the zero offset. Check the sensor reading against an accurate barometer and adjust this figure until the two agree.

CHAPTER 22 TEST POWER CIRCUITS

This section allows the testing of the coil,spark plugs,injectors wiring etc.

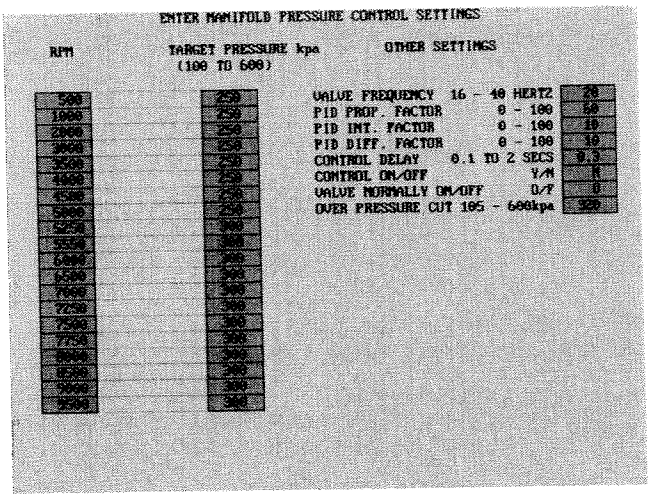
Just follow the instructions on screen.

BEWARE THAT IF THE FUEL PUMP IS TURNED ON THE ENGINE WILL RAPIDLY FILL WITH PETROL WHICH CAN BE EXTREMELY DANGEROUS. DO NOT HOLD ANY OF THE SPARK PLUGS AS WITH A MODERN COIL THE VOLTAGES PRODUCED CAN BE LETHAL.

CHAPTER 24 TURBO CONTROL SETTINGS

This section controls the manifold pressure via a small valve such as those made by AMAL or LOCTROL. The taget pressure is set for any RPM position and the system will ensure this is achieved (if possible given the engine/turbo combination). The valve is controlled using the AUX 2

output and its use for this purpose overides other uses of AUX 2.



1 TARGET PRESSURE
This is the absolute pressure required at the rev band.

2 VALVE FREQUENCY
This is the frequency of switching of the control valve. Most small valves are happy with about 20 hertz.

3 PID PROP, PID INT, PID DIFF FACTORS
These relate to the control system mathematics. Normally set to 60,10,10. Varying these values alters the spped of response ofthe closed loop control system. If these figures do not work please feel free to contact us for advice concerning your particular installation.

4 CONTROL DELAY
This is the delay between the system making a change to the valve and checking to see the result in manifold pressure. It depends on the size of the plenum, turbo and engine. A good starting point would be 0.3 secs.

5 CONTROL ON/OFF
Exactly what it says. If set to N then no control is used and the other functions of AUX2 are available. When set to Y the system regulates the manifold pressure.

6 VALVE NORMALLY ON/OFF
This determines wether the switch is on or off when the pressure is below the target. When set to O then when the pressure is low AUX2 is switched off. The opposite is true when set to F.

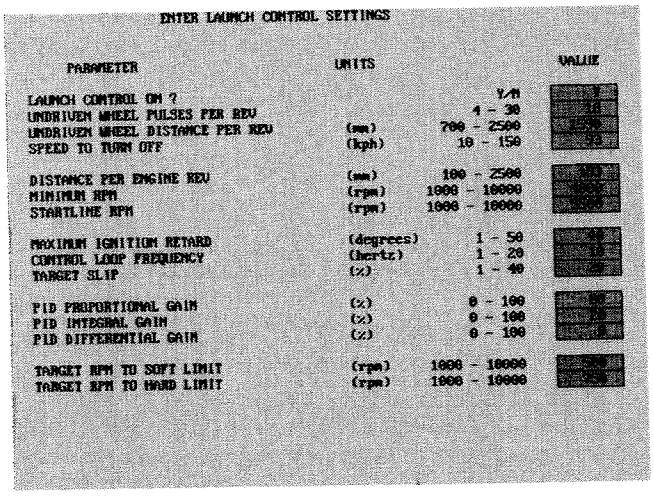
7 OVERPRESSURE CUT OFF
This turns off the injectors and sparks when the manifold pressure is above this limit. This protects the engine from damage ifthe boost pressure is far to high.

MAPPING A TURBO ENGINE

FIRST SET THE PRESSURE COMPENSATION TO THE FIGURES GIVEN IN CHAPTER 8. SET THE AIR TEMPERATURE COMPENSATION TO THE FIGURES GIVEN IN CHAPTER 6. ENSURE THAT THE PRESSURE SENSOR SETTINGS ARE SET FOR THE SENSOR YOU ARE USING. THE ENGINE CAN THEN BE MAPPED IN THE NORMAL WAY.

CHAPTER 25 LAUNCH CONTROL & GEAR CHANGE CUT

Launch controil is a means of allowing the ECU control of the engine power output during the race start phase to provide the best possible traction from the start line. The driver maintains full throttle at all times, even when stationary with the clutch depressed. As soon as the car begins to move the ECU reduces power output by first retarding the ignition advance and if this still does not control the rpm it will cut one or all cylinders as required to keep the engine RPM to the limits set in this section. An undriven wheel speed sensor is required (hall effect wired as the wiring diagram) and a push button switch on the dashboard to activate the system. The driver comes to the start line, depresses the clutch and engages gear. The launch control button is pressed (the gear change light will flash repeatedly to signal that all is working) and presses the throttle fully open. The engine will be held at the start line rev limit as set below. This requires the use of the hard cut limit (done automatically by the system) so the engine sounds very peculiar. When the clutch is released the ECU will control the engine revs to maintain the target slip percentage until the turn off speed is reached. After this time it will allow the engine to run free until the button is pressed again..



1 LAUNCH CONTROL ON

This is main engagement switch. When set to N nothing will happen. When set to Y when the button is pressed the system is armed and the gear change light will flash. It will continue to flash until either the turn off speed is reached or the button is pressed again.

2 UNDRIVEN WHEEL PULSES PER ROTATION

This is the number of pulses the hall effect sensor sees i.e. if using the brake disc the number of holes in the disc.

3 UNDRIVEN WHEEL DISTANCE PER ROTATION (in mm)

Self explanatory either measure it or use 3.142 x diameter.

4 SPEED TO TURN OFF (in kph)

Undriven wheel speed to turn off the system. Normally set to the maximum speed in first gear.

5 DISTANCE PER ENGINE ROTATION (in mm)

Distance the car travels in the start gear per rotation of the engine.

formula :- distance = (wheel diameter x 3.142)/(fist gear ratio x final drive ratio)

example (584 x 3.142)/(2.57 x 3.89) = 184 mm

NB. if you change the tyre diameter or the first gear or final drive ratio this needs changing!

6 MINIMUM RPM

This is the absolute minimum rpm allowed by the control. At this point all retard etc. is removed.as quickly as possible so thatthe engine does not bog down.

7 STARTLINE RPM

This is the RPM that the engine is held at while using full throttle on the start line. It is also the rpm that is targeted initally immediately the car starts to move. As the speed increases to the point that the target RPM is above this figure the engine is allowed to go faster.

8 PID GAINS

These figures control the mathematics of this function. Leave as originaly set i.e. 80,20,0 unless you have problems, in which case contact us.

9 TARGET RPM TO SOFT LIMIT/HARD LIMIT

The system will initially try to control the engine using ignition retard. If this is not enough then first the soft limit willbe invoked at this RPM above the target, secondly the hard limit will be invoked. The hard limit is very rarely hit in normal cicumstances.

Please remember that the settings for wet and dry situations are unlikely to be the same. Also in the wet some modulation of the throttle pedal will improve the performance.

The gear shift cut section allows the ignition to be turned off when a gear change is in progress with a sequential gear box. The signal is provided by a switch, usually mounted on the gear lever.

1 GEAR SHIFT CUT ON ?
Yes no answer, is this function active.

2 SHIFT CUT DELAY TIME
Time in milli seconds after the shift signal iends to continue to stop the ignition sparks. Used to allow mechanical settling of the gearbox after engagement. Consult gearbox manufacturer for a suitable figure.

3 NO SHIFT CUT BELOW THROTTLE
If the throttle position is below this figure then no engine cutting takes place. Used to allow engagement of first gear on the startline without stopping the engine!

CHAPTER 26 INITIAL SET UP AND MAPPING STRATEGY

The system when you receive it will already have a map installed. This map is a genuine map which has been used on an engine. It may not, however ,bear any resemblance to the map you will need for any particular engine. This section deals with what you must do to make use of this map to speed the production of engines of any kind.

NOTE WHEN YOU HAVE AN ENGINE ON THE DYNO DO NOT STOP IT BY TURNING OFF THE IGNITION. THE CONTROL PC AND THE ENGINE MANAGEMENT BOX BECOME ONE SYSTEM. TURNING OFF EITHER AT THE WRONG MOMENT CAN HAVE EXTREMELY BAD EFFECTS. IF YOU WANT TO STOP THE ENGINE USE THE STOP BUTTON ON THE DYNO CONTROL BOX.

1 Connect up the system and provide all the sensor inputs you wish to use as per the hardware installation section.

2 Check all sensors are performing correctly i.e. you have no indications of failed sensors (option 13 from the menu) and that thevalues given are reasonable (option 1 from the menu). Pay particular attention to the throttle sensor as it is easy to get this reading the wrong way round!

3 Set the throttle stops correctly (option 16 from the menu)

4 Adjust the general engine settings to the correct values (option 10 from the menu)

5 Change the map rev range to suit the current engine.

6 Change the maximum advance to suit this engine (option 2 on the menu) using F7 map percentage change. We cannot advise you on a figure for this you will have to use your experience.

7 Alter the fuel map to give a peak of fuel delivery at the expected maximum BMEP of the engine and an injector pulse time whichs suitable for the engine ,the fuel pressure used and the flow rate of the injector used. Use the function key map changes to achieve this. It is difficult to give you an exact figure for this but if you need some advice informally we will ,by telephone, give you a place to start from (we do not accept any liability for this information but it will enable you to get a new type of engine started). Remember the injectors open only once every two engine revs.

8 Start the engine on the dyno and use the advice given in SECTION 2 CHAPTER 9 to optimise the engine map.

9 When the engine is in the car you can finalise items like the accelerator pump effect, water temperature compensation etc.

10 Save the map to disc. This will enable you next time you do a similar engine to start with a map which is probably exactly right

11 IF THE ENGINE IS A TURBO FOLLOW THE INSTRUCTIONS GIVEN IN TURBO CONTROL SETTINGS FIRST!

HARDWARE INSTALLATION

The installation of the system is quite simple and problem free so long as the instructions in this section of the manual are followed. All the wiring and timings diagrams for this section can be found from appendix A onwards. Please be sure that you use the diagrams relevant to the model of system that you have purchased. The mounting instructions given should be followed as closely as possible. Whilst the unit will work in almost any position in the car the more closely you follow the instructions the more trouble free will the unit will be and its life will be considerably extended.

CHAPTER 27 CABLING SPECIFICATIONS

CONNECTING THE ECU

The main wiring schematics are given at the end of this manual in the appendix. Please ensure that you use the correct diagram for your model of system.

It is essential for proper operation that this diagram is followed exactly. We can recommend a variety of loom makers for bespoke looms fitted to the car or we can supply all the connectors you need to make one yourself. We will also make a loom to specification on receipt of a dimensioned diagram.

If you wish us to make a loom a sample diagram is given to follow for the dimensions we require.

WIRE SPECIFICATIONS

Different parts of the installation have different requirements regarding the type of wire used. With the exception of the wire used for the rotational sensors these are minimum requirements to handle the currents generated.

ALL SENSOR CONNECTIONS	0.5MM ^{2}
ALL POWER CONNECTIONS	1.0MM ^{2}
BATTERY NEGATIVE CONNECTIONS	1.5MM ^{2}
CRANK & CAM SENSORS	SCREENED TWISTED PAIR

CONNECTORS

a Injector Connectors.

We recommend AMP mini timer connectors with a release clip. These are available from us for people who wish to make their own looms.

b Crank/Cam Sensor Connectors

For Ford crank sensors a 2 pin AMP mini timer is required and for Vauxhall sensors a 3 pin mini timer is required.

c Other Sensors

The air and water temperature sensors are normally connected with a 2 pin AMP microtimer plug. The connections to the barometric sensor vary with the type.

d Coil

A distributor can be connected in the time honoured fashion of lucar connectors or rings as required. Our preferred distributorless coil, which is the Valeo coil ,uses a 4 pin mini timer.

e **DAMAGE MAY BE CAUSED TO THE UNIT BY REVERSE BATTERY CONNECTION OR TOUCHING THE CASE WITH A LIVE 12 VOLT SUPPLY**

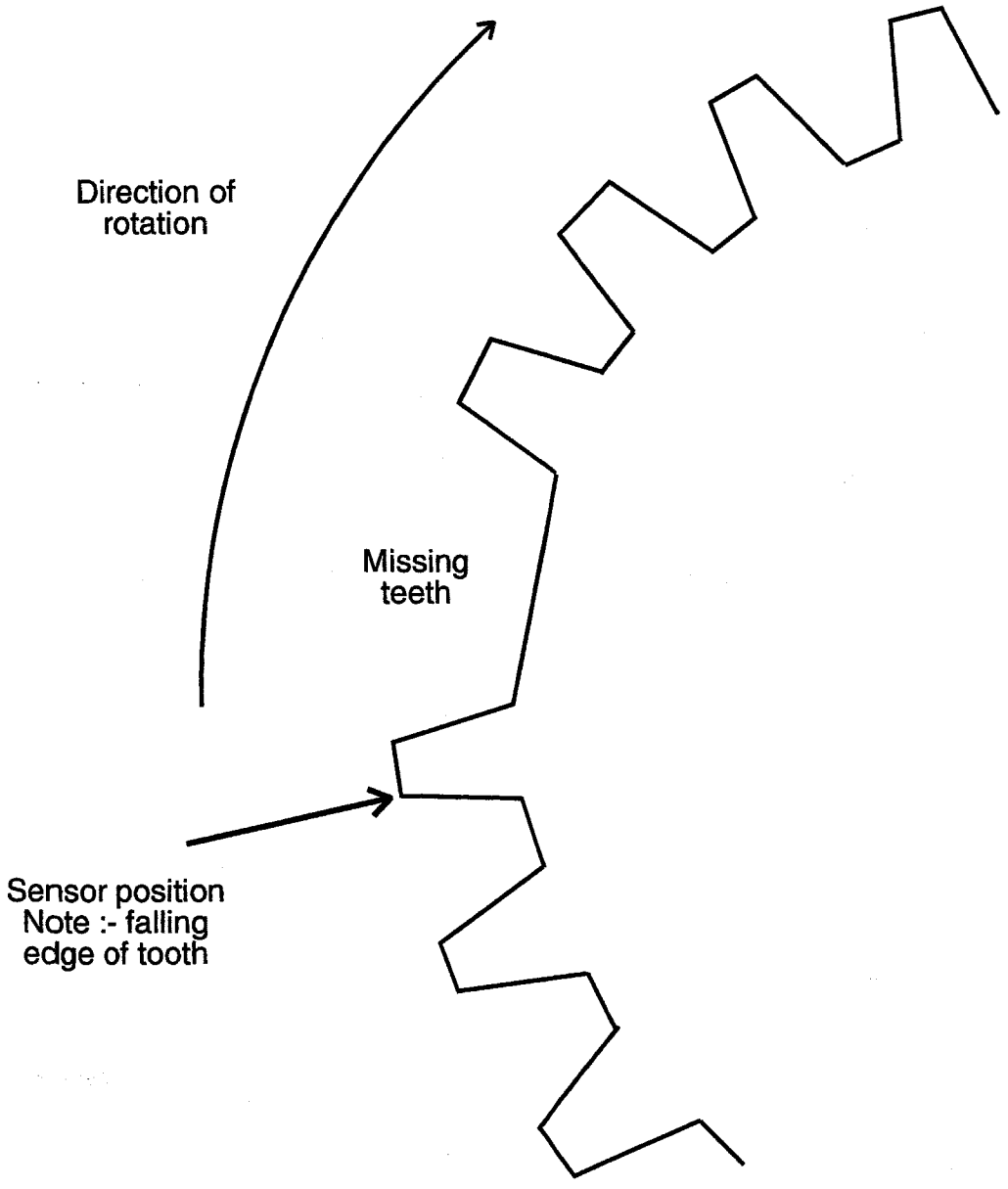
f Route all cables in as direct a manner as possible. Pay particular attention to the crank and cam sensor wires. Keep these as far away as possible from any HT leads. Do not under any circumstances route the sensor connections in the same loom as the power connections. We have gone to some trouble to provide you with separate power and sensor connectors on the ECU please keep the loom that way.

CHAPTER 28 MOUNTING INSTRUCTIONS

Mount the ECU in as cool a position as you have available i.e. not in the immediate proximity of the exhaust pipes etc. It should be mounted on a layer of foam rubber to minimise the transmission of vibration and use an 'O' ring or strong elastic bands to secure it.

The unit should be mounted as closely as possible to the engine ideally in the engine bay taking note ,however, of the temperature requirements as above. **The mounting position needs to protect the ECU from contamination with water,oil,petrol etc.**

MULTI TOOTH CRANK WHEEL SENSOR POSITION



To measure the correct angle for menu option 10 position the engine with the sensor opposite the first falling edge of the tooth following the missing tooth (as illustrated above). Mark the position. Turn the engine to exactly TDC number 1 cylinder. The number of degrees you have to turn the engine is the correct figure. Remember that this angle must be at least 10 degrees more than the highest advance you wish to run and has a maximum of 160,110,80 degrees for 4,6 and 8 cylinder engines respectively.

When the engine is running use a digital strobe light to measure the advance. Check this against the figure the system thinks it is using (say from dyno mode). If they do not agree make adjustments to the sensor position in option 10 until they do agree. This can be done whilst the engine is running.

Note also that unless you are using a specially modified strobe then the light will read twice the real advance when running distributor less i.e. if the strobe light says 50 degrees the real advance is 25 degrees!

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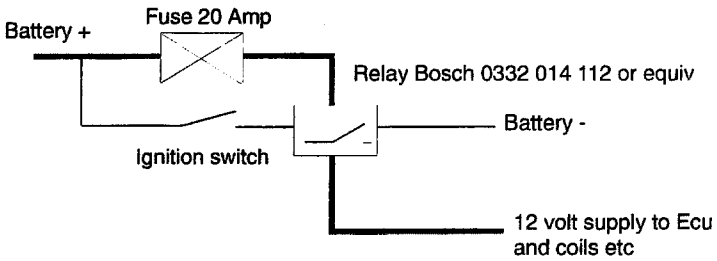
4 CYLINDER WIRING SCHEMATIC

FOR
4 CYLINDER IGNITION ONLY
4 CYLINDER SINGLE INJECTOR
4 CYLINDER TWIN INJECTOR

LAST UPDATED 31/1/2000

Typical 12v supply circuit



12 volt supply

ECU supply

Crank sensor connections

Use twisted pair wire with overall screen for crank sensor

VR sensor pin outs (magnetic)

Ford
Pin 1 to pin 18
Pin 2 to pin 20
Shield to pin 20 at ECU

Vauxhall/Opel/BMW/Volvo/Saab/ etc. (Bosch & Siemens)
Pin 1 to pin 18
Pin 2 to pin 20
Pin 3 to shield to pin 20 at ECU

Marelli
Pin 2 to pin 18
Pin 1 to pin 20
Shield to pin 20 at ECU

Throttle pot

Connect 5 v to side to which throttle wiper goes at full open

any value 500 Ohm to 20 K Ohm

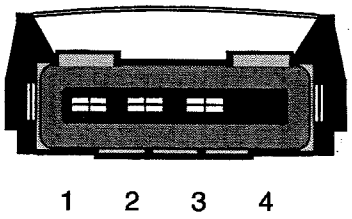
Colvern (Jenvey) pot

red = wiper
green = 5v
yellow = Sensor GND

Connectors

Sagem/Valeo Coil (C)

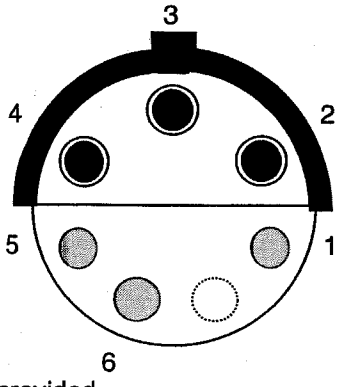
Pin 1- Ignition 1
Pin 2- Ignition 2
Pin 3- 12 V
Pin 4- Unused



Connects directly to 4 pin connector on coil

Chassis Interface Connector

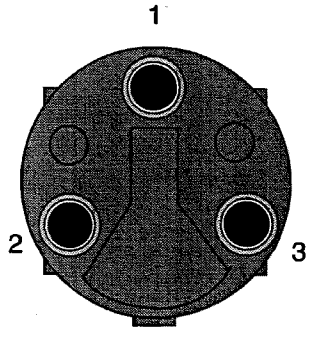
Pin 1- ECU and Injector power supply
Pin 2- Coil power supply
Pin 3- Shift Light
Pin 4- Tacho
Pin 5- Auxiliary Output
Pin 6- Fuel pump relay



Connects to the sub loom provided

Colvern Throttle Pot (T)

Pin 1- Throttle Reference
Pin 2- Throttle Signal
Pin 3- Electronics Ground

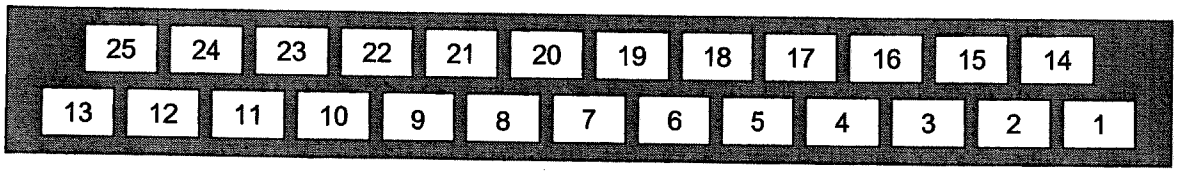


Connects to the throttle pot mounted on the throttle bodies

Other Connections

Earth Eye - connects to the negative terminal of the battery
2 pin mini timer (W) - connects to the water temp sensor
2 pin mini timer (A) - connects to the air temp sensor
2 pin mini timer (S) - connects to the crank sensor
Group of 4 x 2pin mini timers - connects to injectors
Lambda wire, black - connects to grey wire on Bosch sensors
Lambda wire, white - connects to black wire on Bosch sensors

Injection Loom
Sagem/Valeo Coil
Ford Crank Sensor
Colvern Throttle Pot.
Lambda



PIN #	Connection	Comment
1	Lambda signal	White wire
2	Lambda ground	Black wire
3		
4		
5	+5V sensor feed	Colvern TP (2)
6	+5V sensor feed	Air temp (2), Water temp (2)
7	Sensor ground	Colvern TP (3)
8	Auxiliary Output	Chassis interface connector (5)
9	Tacho	Chassis interface connector (4)
10	Fuel pump relay	Chassis interface connector (6)
11	Shift light	Chassis interface connector (3)
12	Earth	Earth strap connects to -ve side of battery
13	Earth	Earth strap connects to -ve side of battery
14	Throttle pot	Colvern TP (1)
15	Water temp sensor	Water temp (1)
16	Air temp sensor	Air temp (1)
17		
18	Crank sensor	Crank sensor (1)
19		
20	Sensor ground	Crank sensor (2)
21		
22	Injectors	Injectors (2)
23	Coil ignition 2	Coil (2)
24	Coil ignition 1	Coil (1)
25	ECU supply	Chassis interface connector (1)