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.

SOFTWARE INSTALLATION

DOS SOFTWARE

1   Begin by attaching all wires, contacts, sensors, power feed and loom to link to the ECU as described in the physical installation section and wiring diagram.
2   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 shutdown from the start menu and choose "restart the computer 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 sacs 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.

3   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 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 that 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).

4   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.

WINDOWS SOFTWARE

Insert the CD. Switch to the CD drive from Windows Explorer. Double click on Setup. Unless you know about PC's install the software in the default directory offered. With certain flavours of Windows you may have a problem with the programme locating certain files it needs. This is not us, it is Mr Gates boys. The default directories for all important information are as below.

Programme   C:\DTAwin
HELP FILE   C:\DTAwin   (This is the one most commonly lost by windows, annoying given that it is a bit important!)
Maps   C:\DTAwin\maps
Display Settings   C:\DTAwin\display

Set the Com Port (Menu:- File/Serial Port Options) to the COM port you are going to plug into. If your machine does not have a COM port contact us about an approved USB -> COM port adapter.

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 center	(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 DOS

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

Windows menu:- Display and Test Functions/Real Time Info

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

Windows menu:- Essential Map Settings/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 or green 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 WHEN USING DOS SOFTWARE

DOS

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.

WINDOWS

A 3D Graph is always on screen This shows a "3D" wire frame graph of the map to allow ready visualisation of any "holes" in the map and other irregularities. Any point can be dragged with a mouse.

To change any group of cells as a whole drag your mouse over the group and a pop up dialogue box will appear. Change by a percentage (+ or -) or set all cells to a specific value.

To copy a row, click on the column or row header. The row will be highlighted. Click on the column or row you wish to copy to (not its header!).

To exit press F4 or click on the close cross and a confirmation message will be issued.

EDITING THE MAP GRAPHICALLY USING DOS

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 MAIN MENU.

CHAPTER 3 MAIN FUEL MAP

Windows menu:- Essential Map Settings/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.

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.

See ignition map for group or graph features

CHAPTER 4 SET REV RANGE FOR MAPS

Windows menu:- Essential Map Settings/RPM Range

Setting a suitable RPM scale for the engine in use. Just type in new figures. Use enter rather than the cursor keys to confirm each change.

CHAPTER 5 ACCELERATOR PUMP EFFECT

Windows menu:- Essential Map Settings/Throttle Pump Effect

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.

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

Windows menu:- Essential Map Settings/Air Temp Compensation

There is only one set of correct fuel compensation figures for this shown below.

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

Windows menu:- Essential Map Settings/Water Temp 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 INLET PRESSURE COMPENSATION

Windows menu:- Essential Map Settings/Pressure 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

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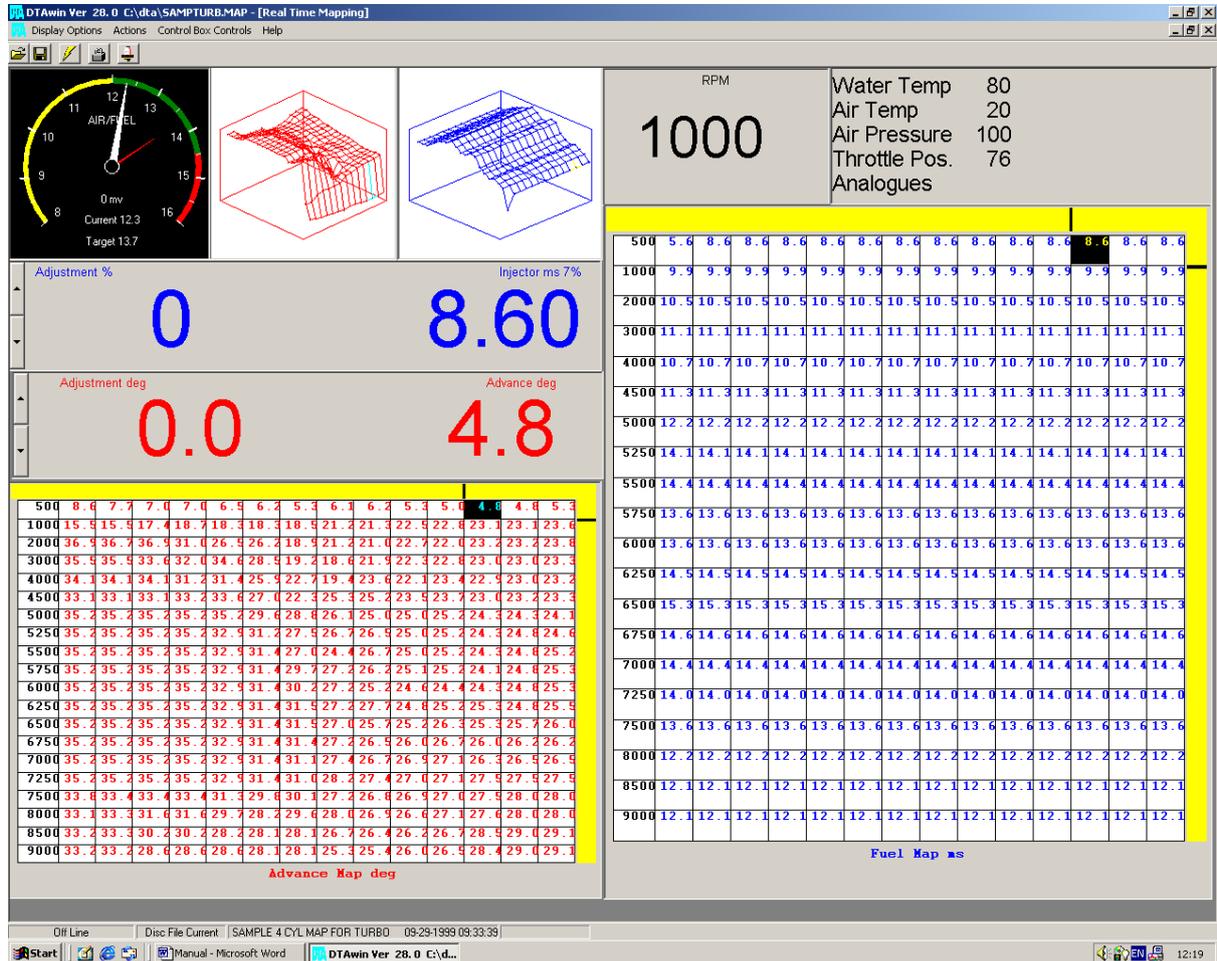
This section indicates exactly what the system is doing any moment in a graphic display. Moving needles constantly monitor RPM, fuel flow, ignition advance and exhaust gas content (rich or lean) while gauge values are simultaneously given in large, clear colour-coded figures.

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.

Dyno Control Box

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 IN DOS

CONTROL KEYS IN DYNO MODE IN DOS

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

CONTROL KEYS IN DYNO MODE IN WIDOWS OR USE PULL DOWN MENUS

^A	DISPLAY ADVANCE MAP
^F	DISPLAY FUEL 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
^E   USE CURRENT SETTINGS TO MODIFY (TRACE) MAP CELL
F4   EXIT AND SAVE MODIFIED (TRACED) CELLS

SUGGESTED USE OF DYNO MODE

1   Press "I" or its to turn off the map interpolation and work to the nearest cell. Fire up the
        engine and set the dyno rpm to the rpm of interest.
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 repeat the 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 only available on PRO models) together with the
values set in menu Lambda Controls 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 continue 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

Windows menu:- Essential Map Settings/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.

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.

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.

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.

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.

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.

SWITCH INJECTORS AT RPM
> Above this RPM injectors 2 are used below it injectors 1. If fuel demand is high enough then both are used regardless of this setting.

AND ABOVE THROTTLE
> This is used in a twin injector setup. When the throttle is above this value and the rpm is above the rpm switching point then the ECU will use the second set of injectors. Note that if two sets of injectors are needed (decided by duty cycle) then they will be used regardless of this value.

DEFAULT VALUES ON SENSOR FAILURE
> if 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.

NUMBER OF TEETH ON SENSOR WHEEL
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.

36 – 1 Sensor Wheel and Sensor

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 90 degrees
Porsche 6 cylinder 90 degrees
BMW 6 cylinder 90 degrees

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

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.

ROVER MODE

The K series engines can have one of a number of flywheels, and which flywheel an engine is fitted with has an impact on the required programming for the DTA ECU.

All of the K series flywheels have trigger teeth set at 10° this means a total of 36 teeth. However a number of these trigger teeth will be missing and which teeth are missing defines the flywheel type. The diagrams below show the three types of flywheel.

Flywheel mode 1   Flywheel mode 2   Flywheel mode 3
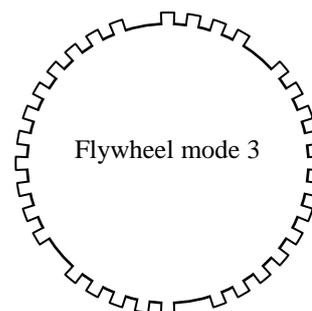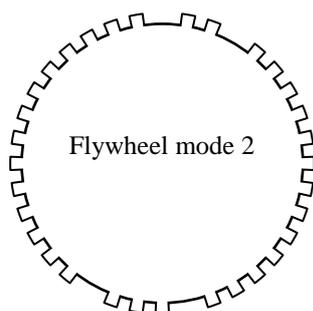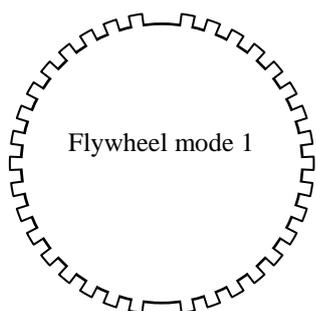
It is important that you check the flywheel configuration on your engine and make sure that the values in the General Engine Settings of your DTA ECU are correct. The

	Mode 1	Mode 2	Mode 3
No of teeth on gearwheel	36	36	36
No of missing teeth	1	1	1
Sensor position	167	96	158
Distributor fitted	Y	Can be Y or N	Can be Y or N

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 suit different coils. Most coils require 3 - 4000 micro seconds so unless you have specific information from the manufacturer of the coil leave this alone.

INJECTOR START PULSE

When the engine first starts to turn on the starter motor this pulse is given to the injectors once. It is used to clear air from the fuel system. Use the minimum required to ensure good starting.

DISTRIBUTOR FITTED

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

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 recommended for two stroke engines and BMC 'A' Series.

TRANSITION FROM CRANKING

This is the speed when the engine is recognised as successfully running. Lightweight engines, for example motor bike engines, can "kick back" if this is too low. Once this transition has taken place the engine remains in running mode until the speed drops below 500 rpm when cranking mode is resumed.

INJECTOR DEAD TIME

Injectors take time to open and close. Setting this figure takes account of this and allows all the percentage changes that the ECU performs to the fuelling figure to be more accurate. Leave zero for compatibility with old maps. A normal switching figure would be approx. 0.75ms

TWIN SPARK?

P8PRO only. Only use this when the engine has 2 spark plugs per cylinder. Remember there are only eight coil drivers. First spark plug coil outputs coil 1 to coil 4, second plug outputs are coil 5 to coil 8, that is cylinder 1 first plug is on coil output 1, second spark plug on cylinder 1 is coil output 5.

TWIN SPARK OFFSET

P8PRO Only. Allows small delay (in degrees) between 2 sparks on the same cylinder. If 0 then both sparks are at the same time. If 10 then the second spark occurs ten degrees later. Note that all advance figures relate to the first spark.

EXTERNAL COIL AMPLIFIERS

Select this check box if you are using external coil amplifiers. Normally the coil signal is inverted for external amplifiers and this function does this. Certain amplifiers need a "pull up" resistor between 12 volts and the ECU coil output. Others have them fitted internally. If in doubt consult the coil manufacturer.

Do not check this box if you have an un-amplified coil connected to the system. Severe damage may result to the ECU.

CHAPTER 11 STORE MAP ON DISC

Windows menu:- File/Save

Note that in windows still use 8 character DOS legal file name!!

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 put them 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

Windows menu:- File/Open

Windows:- Normally maps are stored in C:/DTAwin/Maps

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

Windows menu:- Display and Test Functions/Real Time Info

ENGINE STATISTICS

Largely self explanatory but:-
LT is an internal timing only of use to DTAfast
Crank Period is the time between firing strokes on an equal firing 4 stroke engine.

LOWEST AND HIGHEST

Self explanatory

CRANK SENSOR ERRORS

Rejected crank pulses are signals received from the crank shaft sensor that the system has decided cannot possibly be correct. Either they represent over 16000 rpm, are from electrical interference (from the HT leads for example) or you have an eccentric crank wheel or loose or damaged crank sensor.

SYNC ERRORS

Because the system knows how many teeth you have on your crank wheel, it counts them every time the engine rotates. If the count is not correct then a sync error results. It is always possible to get these when the engine first rotates on the starter motor, this is not a problem. If this number moves upwards when the engine is running at over 1000 rpm then you have a problem. Possible causes are as above or just entering the wrong wheel specification will give you this problem.

Sync crank ratio error similar to above.

Cam/Crank errors

Only important when running unequal firing or coil on plug or sequential. Checks that the correct number of crank to camshaft pulses are received.

NOTE THAT ANY SMALL FIGURES IN ANY OF THESE ARE UNIMPORTANT. IF YOU HAVE A PROBLEM THEY WILL RAPIDLY REACH HUNDREDS WHEN THE ENGINE IS RUNNING.

CURRENT SENSORS AND SHORT TERM ERRORS

OK and failed are the current status of the sensor. The number to the left of this is the number of transient errors the system has seen when the engine is running. A missing sensor (say Pressure) will always show as failed.

RESET SOURCES

Only for PRO systems. Any numbers here imply severe electrical interference. Please consult DTAfast.

CHAPTER 14 STARTUP ENRICHMENT MAP

Windows menu:- Essential Map Settings/Start Fuelling Map
Windows menu:- Essential Map Settings/Start Map Turns
Windows menu:- Essential Map Settings/Start Map Temps

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.

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. In the windows software the turns and temperatures are separate maps.

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

On completion press F4 to save the data.

CHAPTER 15 DATA LOGGING MENU

Windows menu:-Display and Test Functions

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 and traction 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-recording new data on top of previous information which will be wiped out. If launch control is on the log will not record in automatic mode
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 for future use or reference. Use in the same way as chapter 11 save map to disc. Note that the data is saved in text format to be either read by Wordpad or imported to a spread sheet.

FLEXIBLE LOGGING

Only Applicable to Pro systems.

Applicable to V29 systems and later.

Auto and Launch control buttons produce exactly the same results as earlier systems.

The Flexible button allows you to choose what items to log. The maximum log time is 25 minutes and this reduces with more items logged. Note that the items are logged in groups of 8 so maximum time is still achieved with 8 items. With 9 - 16 items the time is halved, etc.

With the Continuous Loop button selected the oldest data in the log is continuously discarded and replaced with new data. When data is displayed or filed then the first data you see is the newest data, the oldest is at the end. Data is recorded all the time the engine is running.

With the Switched button selected data is only recorded when the switch is at 0 volts and the engine is running. When the log is full new data is discarded. When displayed or filed the first data is the oldest data. The last data is the newest.

NOTE:- The switched input is shared with the Analogue 2 input.

CHAPTER 16 SET THROTTLE STOPS

Windows menu:- Essential Map Settings/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 or the button on windows software.

b) Open throttle to maximum and again press ENTER or the Button on the windows software

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 COLUMNS

Windows menu:- Essential Map Settings/Set Map Columns

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.

Use MAP as Main Load V29 or later systems.

The check box allows the use of a manifold pressure sensor as the main load indicator, instead of throttle. This will apply throughout the system when checked. The scale will need to be rewritten to match whichever source is selected as load.

Save the changes by pressing F4 when complete.

CHAPTER 18 SET PIN NUMBER AND MAP LOCKING

Windows menu:- File/Map Locking and Pin Number

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 or press the appropriate windows button. 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

Windows menu:- Other Map Settings/Lambda Settings

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.

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 two sample 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.

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!

TARGET AIR/FUEL MIXTURE

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

MAXIMUM INCREASE IN FUEL

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

MAXIMUM REDUCTION IN FUEL

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

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.

TURN ON CLOSED LOOP

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

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.

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.

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.

MINIMUM WATER TEMERATURE FOR CONTROL

Below this water temperature closed loop will not engage

DELAY AFTER START

The system waits this length of time after every engine start before engaging closed loop.

ALLOWED RPM BAND FOR CORRECTION MAP

P8PRO Only

When the system is recording the corrections in the fuel correction table, this band is used to test whether the engine is in or close enough to a particular cell. If outside this band no corrections will be recorded.

ALLOWED THROTTLE BAND FOR CORRECTION

P8PRO Only

Same as the above put applied to throttle position

TURN OFF LAMBDA ABOVE RPM AND THROTTLE

Above this RPM AND Throttle the Lambda correction will be zeroed, effectively turning off the Lambda control and allowing the engine to run solely on the map. When the RPM or the Throttle % drops below this then the Lambda control is turned back on.

USE ANA3 OR LAMBDA INPUT

P8PRO Only

The input marked "lambda" on the wiring diagram is optimised for a 1 volt switching lambda sensor. A better device is an NGK sensor with amplifier. In this case use the Analogue 3 input, which is 5 volt optimised, and select this option.

USE 20 X 14 LAMBDA MAP

P8PRO Only

Instead of the two values in this table for target lambda use the 20 x 14 target map.

GENERATE FUEL CORRECTION MAP

P8PRO Only

When running closed loop the system constantly generates a percentage correction figure to the base fuel map. When this feature is turned on the percentages generated are stored in a 20 x 14 table for updating the main fuel map when the engine is stopped.

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

Windows menu:- Other Map Settings/Injector Phasing and Aux2

This section allows the setting of the values for injector phasing on sequential systems only. All angular values are referenced 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 amount 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 inlet 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.
4   SEQUENTIAL ACTIVE
         Self explanatory but note that a cam shaft sensor must be fitted and the wiring correctly implemented but it will work.
    5   END OR START
         Either the beginning or the end of the injection pulse can be fixed in degrees. Normally end is the best.

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 overrides 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 AND IDLE SPEED

Windows menu:- Other Map Settings/Pressure Sensor and Idle Speed

PRESSURE SENSOR SETTINGS

There are two values in this section. 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 the pressure at 5 volts until the reading is correct. If using a 3 bar Marelli sensor try 288 at 5 volts first.

IDLE VALVE FREQUENCY

This is the frequency at which the idle PWM valve operates. Initially try 20 Hertz.

PID FACTORS

These factors are used in controlling the amount of air going through the valve to keep the idle speed as you require it. PID control loops are a well established method of achieving this. Initial settings of 80, 10 and 0 should be tried. If the idle speed oscillates up and down initially reduce the proportional factor. If the idle speed does not respond quickly enough increase the proportional factor. The integral factor should not normally be above 20.

CONTROL LOOP DELAY

The value of this is very engine dependent. Manifold size, valve size, flywheel size are all influencing factors. Essentially this is the time delay between the PID loop making a change to airflow and looking again at the RPM to see what effect it had. If this time is too low then the engine speed will oscillate above and below the target speed. If it is too high then the idle speed will not respond quickly enough to small engine speed variations.

IDLE SPEED

Not used on later systems as the temperature dependant table is used.

IDLE THROTTLE OFF

Below this throttle position the idle control is turned on. Above it is turned off.

MAX DUTY CYCLE

V29 SYSTEMS OR LATER

This is the maximum allowed duty cycle of the valve. Setting a low value has the same effect as restricting the size of the valve.

% ENRICHMENT AT 100% DUTY CYCLE

This will increase the fuelling when the valve is working. Setting this to say 10% will enrich the mixture by 10% when the valve is at 100% duty cycle, at 50% duty cycle the enrichment will be 5%.

CHAPTER 22 TEST POWER CIRCUITS

Windows menu:- Display and Test Functions/Test Injectors and Coils

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

Windows menu:- Other Map Settings/Turbo Control

This section controls the manifold pressure via a small valve such as those made by AMAL or LOCTROL. The target 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 overrides 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 speed of response of the 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 whether 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 if the boost pressure is far to high.

8   USE OPEN LOOP

        V30 systems and higher

        Setting this check mark on allows you to avoid the difficulties of using a control loop for manifold pressure control. Set the RPM and throttle scales you need together with the valve frequency and over boost pressure.

        Fill in the table with a representative pulse percentage, say 50%. Run the engine and see what Pressure is being achieved. Adjust the percentages until your requirements are met.

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.

NOTE THAT IF YOU ARE USING MANIFOLD PRESSURE AS MAIN LOAD MAKE SURE ALL PRESSURE COMPENSATIONS ARE ZERO

CHAPTER 25 LAUNCH CONTROL & GEAR CHANGE CUT

Windows menu:- Other Map Settings/launch Control & Shift Cut

Launch control 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 un-driven 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 that the 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 initially 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 originally 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 will be invoked at this RPM above the target, secondly the hard limit will be invoked. The hard limit is very rarely hit in normal circumstances.
10   LIMIT RPM WHEN BUTTON PRESSED ONLY
         With this option no sensor is needed and the rpm is limited to the start line RPM as long as the launch button is pressed.
11   SET START RPM WHEN BUTTON FIRST PRESSED
         The engine start line RPM is set at whatever RPM the engine is doing the instant the launch activation button is pressed.

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 ends 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 or equal to this figure then no engine cutting takes place. Used
         to allow engagement of first gear on the start line without stopping the engine!
4)   DELAY ONLY
         This ignores the time the button is pressed and just uses the delay from first contact

CHAPTER 26 LAMBDA TARGET MAP

Windows menu:- Other Map Settings/Lambda Target Map

P8PRO Only

This table contains the target air/fuel ratio for any point in the operating point of the engine. Minimum
is 10/1 and maximum is 16/1. Manipulate as with any other 20 x 14 map. Its operation is governed by
a check box in Lambda settings.

CHAPTER 27 FUEL CORRECTION MAP

Windows menu:- Other Map Settings/Show Fuel Correction Map

P8PRO Only

When the engine is running in closed loop control the system constantly generates a percentage
correction figure to the main fuelling map. When this storage map is turned on in Lambda settings
then this percentage is stored in this table. Storage is made on increasing revs and or increasing
throttle.

After the vehicle has done some running, generating the figures in this map. Stop the engine and
inspect the results. If they look sensible you can use apply and zero. This will combine the stored
percentages with the main map and zero the percentage tables. If any individual figure looks suspect
you can edit this before combining. If you do not like any of the stored figures zero the percentage
figures and try again.

This system works best with a 2 cell Lambda such as an NTK with external electronics.

NOTE:- In order to apply corrections to the main fuelling map the main map must be unlocked.

CHAPTER 28 UNEQUAL FIRING ANGLES

Windows menu:- Other Map Settings/Unequal Firing Angles

P8PRO Only

Engine must have a cam sensor fitted.

Some modern multi cylinder engines do not have equally spaced cylinders in a rotational sense. For
example the Cosworth Opel V6 2.5 l ex DTM engine fires at 0, 75, 240, 315, 480, 535 degrees as
against a standard pattern for a six cylinder engine of 0, 120, 240, 360, 480, 600 degrees. The first
entry must always be zero, the others in order of firing the relevant cylinder spacing.

NUMBER OF TEETH COILS ON IN CRANKING

Pro systems only. Controls temperature build up in small coil over plug systems. Set to 1 or 2.
Increase only if the engine does not fire reliably at starter motor speeds.

One coil per plug is self explanatory.

CHAPTER 29 TRACTION CONTROL SETTINGS

Windows menu:- Other Map Settings/traction Control Settings

P8PRO Only

The traction control system, only available on PRO models, is a full 3 or 4 wheel implementation. It will limit the amount of driven wheel spin to any desired slip compared with the undriven wheels. Note that it is not applicable to 4 wheel drive vehicles. To complete sets of parameters are available to allow for differing conditions. These are controlled by a switch on the dash of the car. If no switch is used then the dry settings are used. Besides the wet/dry switch an on/off switch must be fitted on the dash. This switch is not optional as the default for this function is off.

A special data logging mode is available to help set up in single seater cars.

MINIMUM SPEED TO ACTIVATE

Below this undriven wheel speed the vehicle is considered to be stopped and the traction control will take no action.

MINIMUM RPM TO ACTIVATE

Below this RPM the traction control will take no action. Setting depends on engine performance and the desired car dynamics.

MINIMUM THROTTLE TO ACTIVATE

Below this throttle position the traction control system will take no action.

TARGET SLIP PERCENTAGE

The system constantly calculates the difference in wheel speed between driven and undriven wheels. Some slip is beneficial to maximum acceleration, say about 20%. Start line situations are different and require the use of Launch Control. If launch control is active then the traction control will take no action until this has relinquished control over the system.

BALANCE TO FASTER DRIVEN WHEEL

This setting is used to allow some speed averaging across the two driven wheels. For instance in the case of a free differential it should be set to nearly 100%. In a car with a very stiff limited slip differential it should be set to say 25%.

DELAY AFTER START

After the system detects that a car has stated to move it waits this length of time before engaging traction control (unless launch is active see above). There is also a delay before the system considers a car is stopped. This is to allow for the locked brake situation. See General Traction Settings.

EXCESS SLIP TO HARD CUT

This effectively decides how aggressive the cylinder cutting is when slip is detected. If it is too aggressive the car is unstable. Only testing can determine at what level this should be set.

PID FACTORS

These are used if the PID/Servo button is set to PID. Try at 80% Prop and 10% Int.

NOTE That if launch control is activated then traction control will not engage until this has finished operating.

CHAPTER 30 ALS/MAP2 CONTROL SETTINGS

Windows menu:- Other Map Settings/ALS Control Settings

P8PRO Only

This section controls the function of the turbo anti lag system.

WARNING:- TURBO ANTI LAG WILL RAISE THE EXHAUST VALVE, MANIFOLD AND TURBINE TEMPERATURES TO VERY HIGH VALUES. THIS MAY BE DETRIMENTAL TO THEIR LIFE. USE WITH CARE AND REMEMBER THAT TO RUN A LOT OF ANTI-LAG YOU NEED A BIG RACING BUDGET.

This anti lag system works in conjunction with an on/off switch on the dash and a solenoid controlled air valve. The bigger the valve the more retard will be needed and the more turbo pressure will be achieved. When in the anti-lag condition the valve is opened and the ignition map is switched to the ALS Ignition Map which will have large negative values to reduce the engine power even though air is entering the engine and it is firing. Because the engine is firing the turbo keeps spinning generating manifold pressure. This will also be associated with loud "popping" in the exhaust.

ALS THROTTLE LOW

Currently inactive.

ALS THROTTLE HIGH

Below this value the ALS is active. Above it switches off.

ALS RPM LOW

Below this RPM the ALS system remains inactive.

This map is used instead of the main ignition map when the ALS system is active. Normally large negative values are used here to limit engine power output when the ALS valve is activated.

WARNING SETTING THESE TO LARGE NEGATIVE VALUES WITH RAISE THE EXHAUST VALVE, MANIFOLD AND TURBINE TEMPERATURES TO VERY HIGH VALUES. THIS MAY BE DETRIMENTAL TO THEIR LIFE. USE WITH CARE AND REMEMBER THAT TO RUN A LOT OF ANTI-LAG YOU NEED A BIG RACING BUDGET.

Alter timing by moving the cursor to the chosen place and type in the new figures. Figures are degrees of advance before (negative values after) top dead centre.

If you wish to manipulate a group of cells by a percentage or set to a value, drag the mouse over the group and a pop up will ask you for your requirements.

If you wish to copy a row or column click on the header box on either row or column, move mouse pointer to destination and click. The row or column will be copied.

Version 35 and above

A Fuel map has been added as well as the ignition map. This allows for a separate switchable main map pair. This can be used for many things including a separate map when NOS is used.

CHAPTER 31 FLEXIBLE ANALOGUES

Windows menu:- Other Map Settings/Analougue1 and Aux3 ETC

P8PRO Only

These functions are designed to be the ultimate in meeting user defined auxiliary requirements. For instance they can be configured to provide multi stage NOS control, multi-stage water injection, speed related power reduction or even just a straightforward multi stage shift light.

The object is to provide an input, either a dedicated analogue voltage value or any input available to the ECU, to modify fuelling and ignition based on this value and link it to a pulse width valve connected to the output.

FIRST SELECT YOUR INPUT AND SET SCALE

Select your input from the options on the lower right of the screen. These are self explanatory but the analogue input is an uncommitted 0 - 5 Volt signal from wherever you wish to derive it.
Next fill in the scale values (left column) to the range you expect to see.

FUEL AND ADVANCE CORRECTIONS

Put in any fuel and advance percentage corrections you wish to see for the given input value.

ANALOGUE VALUE

These numbers represent the true physical value of what the input voltage means if the input is an uncommitted analogue value. This is only there for your convenience in remembering the function (i.e. if the voltage represents oil temperature put the correct values in here).

PWM DUTY CYCLE

This is the on/off percentage of the linked output switch. 0% means the valve is off, 100% means the valve is on. Anywhere in between regulates the flow through the PWM valve (for instance a water injection valve).

ANA NAME

Another item for your convenience. A reminder of what the function does!

FUNCTION ACTIVE

Exactly what it says. If this is checked things happen, if not they don't.

AUX ACTIVE

If this checked then the linked auxiliary is working otherwise it does nothing or has its alternate function (for instance coil 8). Note that function active must be checked as well.

AUX FREQUENCY

The operating frequency of the linked output.

Version 35 and greater

TURN ON USING MAP2/ALS SWITCH

This puts the analogue function under control of the external switch. When the switch is turned on the function will work, otherwise no action is taken. This is useful for control of an external valve for controlling, say, NOS or water injection.

CHAPTER 32 FLEXIBLE LOGGING

Windows menu:- Display and Test Functions/Flexible Logging

Only Applicable to Pro systems V29 systems and later.

Auto and Launch control buttons produce exactly the same results as earlier systems.

The Flexible button allows you to choose what items to log. The maximum log time is 25 minutes and this reduces with more items logged. Note that the items are logged in groups of 8 so maximum time is still achieved with 8 items. With 9 - 16 items the time is halved, etc.

With the Continuous Loop button selected the oldest data in the log is continuously discarded and replaced with new data. When data is displayed or filed then the first data you see is the newest data, the oldest is at the end. Data is recorded all the time the engine is running.

With the Switched button selected data is only recorded when the switch is at 0 volts and the engine is running. When the log is full new data is discarded. When displayed or filed the first data is the oldest data. The last data is the newest.

NOTE:- The switched input is shared with the Analogue 2 input.

CHAPTER 33 SERIAL DATA STREAM

Windows menu:- Other Map Settings/ Data Stream

Available on V29 Pro systems.

On a P8 the following data is transmitted on pin 2 of the serial connection port at a frequency of 10Hz.

Header Bytes

Data (all 16 bits, binary, LSB first)

RPM
Throttle %
Water Temp C
Air Temp C
Manifold Pressure Kpa
Lambda mV
Battery V (X10)
Undriven Wheel Speed Kph (x10)

On V30 systems the following information is also sent

Ana1 mV
Ana2 mV
Ana3 mV

Check Sum

16 bit subtractive Check Sum, including header bytes.

all RS232 levels at

9600 baud, 8 bits, 1 stop bit, no parity

At 10Hz frequency.

CHAPTER 34 ELECTRONIC PEDAL SETTINGS

These settings act as a safety feature for an external throttle actuator. It works by having two potentiometers, one on the pedal and one on the butterfly. These are constantly compared and if they differ by more than the allowed amount for more than the specified time then the engine will shut down. This should only occur when either of the sensors fails or the actuator is stuck.

CHAPTER 35 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 the values 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 17 from the menu)

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

6   Change the maximum advance to suit this engine (option 11 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 which is 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 36 CABLES

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. Because of the varying qualities of wire currently available we just give suitable current limits.

ALL SENSOR CONNECTIONS	250 milliAmp
ALL POWER CONNECTIONS	10 Amp
BATTERY NEGATIVE CONNECTIONS	30 Amp
CRANK & CAM SENSORS	SCREENED TWISTED PAIR
WHEEL SPEED SENSORS	SCREENED MULTI CONDUCTOR

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 minitimer 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.

CHAPTER 37 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.**

CHAPTER 38 COMPATIBLE PART NUMBERS

ECU COMPATIBLE PART NUMBERS

This list is not exhaustive and other parts will work. If in doubt follow the general rules i.e. so long as a temperature sensor is 2.4 K Ohms at approximately 20 Deg C then it will be fine. If you do not have a sensor then either buy one from us or choose a part off the list.

Throttle Pot

Almost any linear pot is fine preferable approx. 5KOhms
Bosch   0280 122 001   (3 pin VX/Opel)
                      Connections
                      1) Gnd
                      2) 5V
                      3) Signal
0280 122 201
Colvern or Jenvey pot
Ford   88WF9B989
Rover   JZX3491

Air Temp Sensor **(any NTC reading approx. 2.4 KOhms at 20 deg C)**

Lucas   SNB802
Bosch   0280 130 039

Water Temp Sensor (any NTC reading approx. 2.4 KOhms at 20 deg C)

Lucas   SNB801
Bosch   0280 013 026

Crank Sensor (almost any VR (Magnetic) type)

Ford   6859702
                  6181945
Vx/Opel   904 514 41
Bosch   0261 210 036
                  0261 210 104
                  0261 210 001
                  0261 210 081 (VW)
Rover   NSC100390

Lambda Sensor the following are recommended others will work

Bosch   0258 104 002
                  0258 006 127 (EU3)

NTK   TL-7111-W1 (with amplifier TC600) P8 only

Ignition Coils

Ford   6503280 (4 Cyl 4 ms coil on time)
Valeo   V245041 (4 Cyl 3 ms coil on time)
Bosch   0221 503 407 (3 ms coil on time)
Bosch   0221 503 001 (3 ms coil on time)
Bosch   0221 503 002 (6 Cyl, 3ms coil on time)
Bosch   0221 503 468 (4 coils in line, 3 ms coil on time)
                          Connections
Earth
12V
cyl 4 (nearest to connector)
cyl 3
cyl 2
cyl 1
Distributor Coil 0221 118 322 (2 ms coil on time)

Single Ignition Coils

A word of warning about these. They are generally not chosen by manufacturers for performance reasons but usually some other. Just because they are fashionable, do not assume that they are better!

Audi   06B 905 115 S3(amplified, pin 4 secondary earth, 3 signal, 2 primary earth, 1 12V, needs 2.2K pull up, coil on time ?)

ALS and Idle Valve

Bosch   0280 140 512   (note this is very large for an idle valve and benefits from restriction)

Manifold and Barometric pressure (any 5 volt linear sensor will be fine)

Marelli   APS05/01   (3.0 Bar)
Marelli   PRT03/01   (1.15 Bar)

Turbo Control Valve

VW   0589 062 83F

Injectors (any resistance greater than 5 Ohms or described as direct switching, subject to the current rating of the ECU outputs)

Bosch   0280 150 803
Bosch   0280 150 744
Weber Pico   Pico330/Pico440

etc.etc.

CHAPTER 40 WINDOWS SOFTWARE AND COM ERRORS

Unfortunately there are two problems with trying to run a real time RS232 communications program on a modern PC. Firstly a COM port might not exist at all and if it does it is not necessarily a hardware chip as in the past but a software version that steals cycles from the main processor. In the first case this can be overcome with a USB to RS232 adaptor, the second can be more problematic as it depends on how good the people were who wrote the software, the machine itself and what flavour of Windows is being run.

Errors that crop up include the following:-

!) Random ECU switched off messages
2) Overrun error true
3) Error 9 script out of range
4) Run-time error "6": overflow

These are all symptoms of the same problem.

HOW TO MITIGATE THESE PROBLEMS

Firstly the recommended machine specification for our Windows software is, 1+ Ghz Processor, 256 Meg Ram, 1024 x 768 screen, Windows XP.

Windows XP is the closest MS have come to a proper multi-tasking operating system yet. On most machines we have found it superior even to Win2K. Also ensure that you have the latest downloads from MS web-site (note that these can be huge and a dial-up connection will take days to complete). Just because you bought the machine yesterday does not mean that there are not 30Mbyte or more of downloads to bring it to as close to bug free as possible.

1) Set the serial port FIFO's

These are to be found in My Computer/Control Panel/System/Device Manager/Ports COM and LPT/Communications Port/Port Settings/Advanced what you should see when you get there is as below.
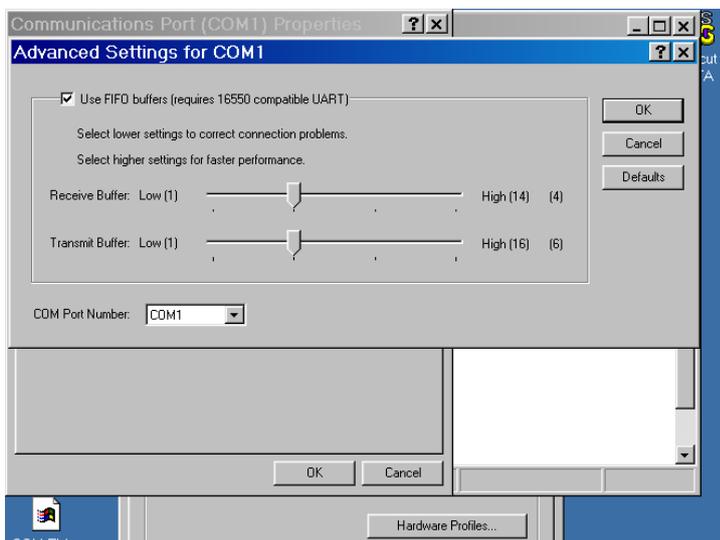
If the settings are different from the above, make them the same as this. The route to this page varies slightly with each flavour of Windows but is basically the same.

The settings above have a major influence on how your serial link performs.

2) Always use the latest version of our software

35

We are constantly inventing work-arounds of Windows basic limitations and so if you are having problems then download the Windows upgrade package from our web-site. This is only a relatively small file and is only the DTAwin.exe execution file. Unzip this into your DTAwin directory.

3) If you still have a lot of problems then try using a USB to COM port adaptor instead of the actual COM port. Because these have a higher priority than a real COM port and may be a considerable improvement. Remember to set the FIFO's as above.

CHAPTER 41 CRANK SENSOR CONNECTIONS

A common source of starting problems is connection of a VR (Magnetic) crank sensor. It is important that this is connected the correct way round. There are two alternatives:-

1) Try it both ways and see which way it works best
2) Put an oscilloscope on the crank input to the ECU. Below is what you should see.

In the middle of the trace is the gap. Note how the voltage rises through this gap. If it falls your sensor is connected the wrong way round and the engine will be difficult to start (if at all) and may not run as expected.

Also on the trace is the output from a hall effect cam trigger