TAT Messysteme

DynoMight II Series: Pro

TECHNOLOGY FROM MOTORSPORT for ALL DYNAMOMETERS

· ***DynoMight II*** is a New Generation of professional Data Acquisition for all Dynamometers, e.g. Engine Dynamometers, Chassis Dynamometer and also for Flow Benches, Cam and Valve Spring Checkers, etc.

· ***DynoMight II*** makes it possible to upgrade and enhance any dynamometer to a level which is capable of keeping up and even superceeding all but the most expensive of test systems available

· ***DynoMight II*** is very universal and due to its modular design it can be expanded into an extremely powerful tool capable of fulfilling many complex uses.

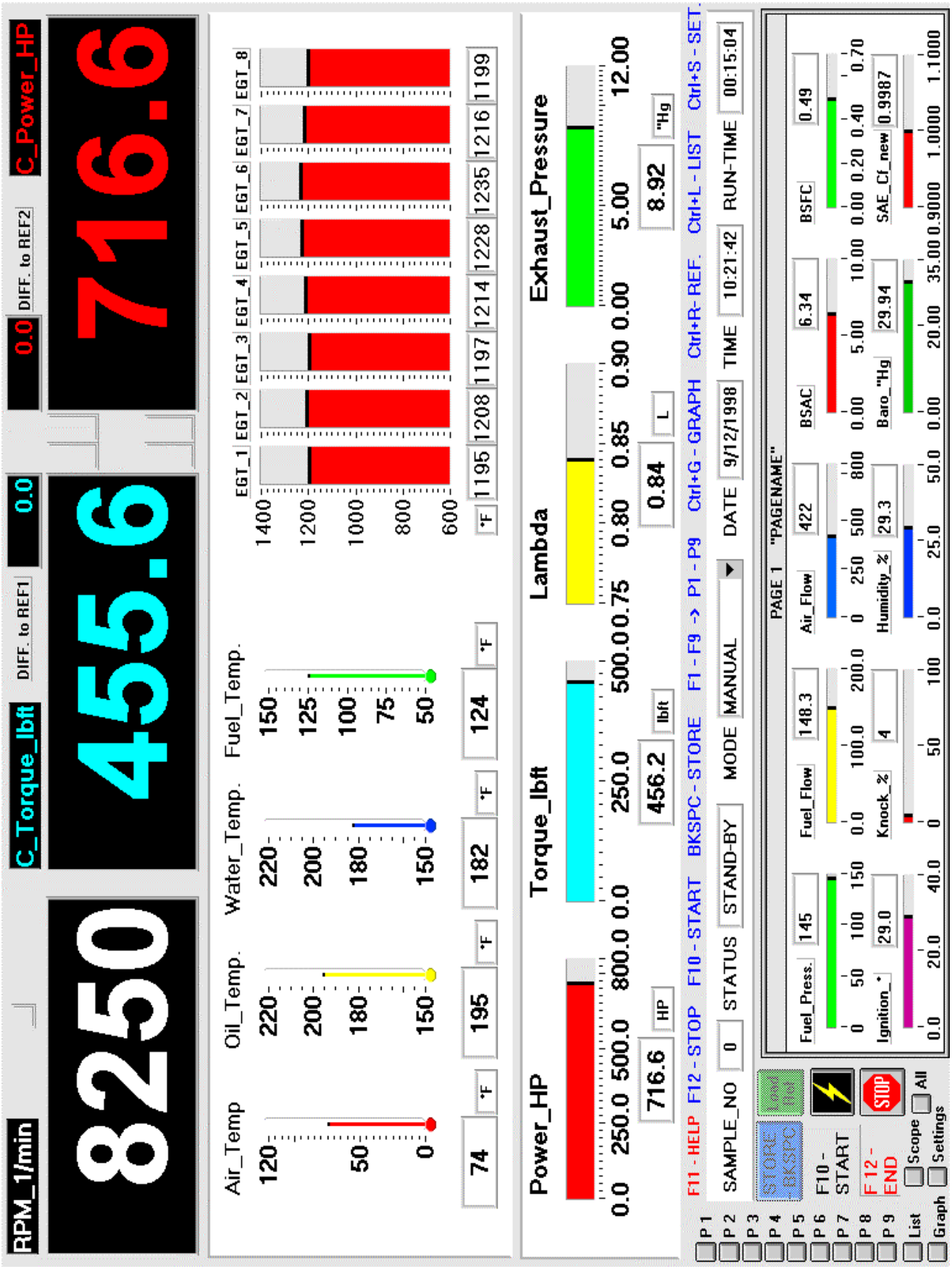
· ***DynoMight II*** is extremely easy to use and therefore requires no study of thick instruction manuals – get going very quickly and learn the system as you proceed.

TAT DynoMight systems are very easy to use and yet offer a myriad of essential and powerful features. These come with every one of our systems, even right down to the very smallest.
This type of system has quickly become a favourite amongst European Super-Touring Car works teams with 40% of them using such a system to develop and map their engines for optimum performance. For readers not familiar with the 2.0l Super-Touring Car series we would like to explain the significance of this: this is the largest saloon racing series in Europe with nearly all cars either built or commissioned by the car manufacturers themselves, Peugeot, Nissan, Honda, BMW, Ford, Renault, Audi, Vauxhall/Opel (=GM). Engines are not allowed to exceed 8,500 rpm in this series. Nonetheless, these engines produce over 300 Hp. Due to these all being only small 2.0l normally aspirated 4-cylinder engines they all have extremely explosive power and torque characteristics. To make matters even worse, their inertia is very low. This is a worst case scenario for any Engine Dynamometer and its Data Acquisition System. We are proud to say, that even under these unfavourable conditions our systems still attain unrivalled fast response and yet high consistency of all test results.

But these are not the only extreme conditions our test systems have been subjected to in the past. TAT systems are also used in the demanding GT racing

class, for homologation purposes, for Baja desert race cars, marine engines, and, and, and...the list is long. On behalf of a large car manufacturer our very versatile acquisition system was even successfully used as a mobile in-car data collection unit to perform safety checks of pressures and temperatures apparent in automotive fuel tanks in tests conducted the Arizona desert. Even under these extremely hostile conditions the TAT system performed flawlessly and gathered valuable information which has led to today's modified fuel system designs no longer requiring a fuel return path.

We are confident that the TAT system will also perform at its best in your specific application.



Pic. 1

DynoMight II Main Screen (see explanation on page 6)

The most significant advantages of **DynoMigh** *at a glance:*

1. Can be used for all Dynamometers, be they controlled manually or automatically

2. High level of accuracy and consistency of all test results.

3. Highest level of consistency and repeatability are ensured through a unique mathematical algorithm featuring engine cycle synchronous sampling, successive averaging and infinite impulse response filtering. Although instruments and displays respond very quickly outside sources of interference are rejected leading to remarkably consistent test results.

4. Great care has been taken to maintain easy-to-use and thus user-friendly software throughout. Although many powerful features have been included, even users with little or no previous computer experience will very quickly be able to use this system to their full benefit. Long study of thick instruction manuals will not be necessary.

5. Many time saving and automated features. The number of necessary keystrokes is reduced to a minimum.

6. Visual and acoustic Warning and Alarm Function alert the operator when readings exceed their permitted operating ranges. A number of emergency actions can be defined for the event of an Alarm condition.

7. Data Acquisition, data processing, and display of readings occurs with real-time characteristic. This means that all readings are displayed without significant time delay (merely fractions of a second, depending on setup).

8. All sensor values (temperatures, pressures, etc) and calculations (corrected power and torque, BSFC,etc.) are displayed utilizing so-called 'virtual instruments' on a PC monitor. These are similiar to 'real' physical analog instruments one would expect to find in a console. In contrast to these, however, virtual instruments have the advantage of being easily grouped, reset for different uses, and all being located on an easy to read off screen. Should you already have a 'real' physical console you can of course still use this and simply run it alongside the computer system. Simply 'tap' sensor outputs as appropriate and feed them into the Pro Data Acquisition electronics.

9. All instruments and channels can be configured freely by the user. Any sensor can be connected to any channel, only few limitations exist. This gives these systems their truly universal aspect, allowing them to be used for a myriad of applications, Engine Dynos, Flow Benches, Chassis Dynos (Rolling Roads), Cam and Valve Spring Checkers. Many more applications are possible. One was a mobile fuel cell test system which was successfully realized by a major car manufacturer testing under extreme conditions in the Arizona dessert.

10. All relevant parameters controlling the data acquisition cycle and data processing can be set to ideally suit the type of test. Other systems in this class do not usually allow this. The system response can be set exactly to your liking, i.e. the displayed sensor values can be displayed very dynamically (fast) or damped (slower but more stable). In this context we are often questioned why we do not employ round analog instruments as these would also be good for showing trends. Our response to this is, that in the past we also believed in 'fancy gizmos' of this nature. But we have since learned from the truly professional systems (we mean those costing hundreds of thousands of dollars as used by the car manufacturers themselves). These systems do not need and thus do not employ any of this, as they have the ability to maintain steady readings throughout the whole test. A test with wildly flickering readings is meaningless, no matter what type of display instrument is used. Even in a worst case scenario (small 4 cylinder engine with extremely low inertia and explosive power band = 2.0l Super-Touring Car engine) it is not unusual for our Pro systems to maintain stable readings for power and torque within a deviation of only 0.5 Hp which equates to less than
+/- 0.1 % of the full scale value - by any standards a very respectable achievement.

11. All tests can be fully commented. All engine info with specifications, modifications and customer name etc. can be added. There is no limit to the length of the possible entry. Tests without sufficient comments can quickly become meaningless if the exact engine spec. and test conditions are no longer known. All observations during a test can also be added to the comments after the test. Also, all previously stored comments can still be edited after the test.

12. Reference Tests: during a test the system will constantly compare current values and reference values from a previously recorded test run with regards to power, efficiency, emissions etc. and indicate whether improvements have been made or not. An essential tool for fast and optimized mapping of engine management systems.

14. The system requires no special sensors and provisions have been made to enable the connection of nearly any sensor. The software even provides a facility to find characteristic formulae of non-linear sensors. This means that even OEM sensors can be connected directly to the system (together with a suitable series resistor). Also, lambda-probes can be connected without any interface circuitry. Lambda values can be calculated directly from any lamda-probe's voltage signal during a test.

15. The system calibration and setup can quickly be changed. This allows for employing engine specific configurations and simply changing these as appropriate. Graphing-templates for different engines can be defined. These are then automatically selected and ensure that you are always displayed exactly the curves you wish to see with the correct scaling for the correct test. This will save you a lot of time in the long run as it avoids unnecessarily repeating keystrokes.

16. All calculations for the power correction factor, corrected power, fuel consumption, piston speed, etc. are performed during test time and the results are instantly displayed throughout the whole test.

17. All calculations are mapped into a look-up table at startup of the system. This significantly reduces execution times for calculations which means that the system has no problem with keeping up in processing the incoming 50.000 samples per second from the highly integrated and miniaturized full SMT (Surface Mount Technology) electronics. In fact, operation of the optional 16-bit delta-sigma A/D module running at an even more respectable 360.000 samples per second is handled just as smoothly.

18. All readings are displayed in clear order and can appear on up to ten switchable screens (*depending on the number of input channels).

19. Digital and parallel high speed data transmission between sensor input box and PC. This does not only allow for 'neat' connections but more importantly provides the system with the essential high grade of rejection capability to outside sources of interference (from ignition, alternator, etc.).

20. Only a minimum of keystrokes are required to activate the most important and most commonly used functions.

21. All advantages of MS-Windows supported

22. All data and configuration information is stored in ASCII text format. This means that all files can be read and edited using any standard editor and also that all data can also be further processed in standard spreadsheet applications software. Of course, easy-to-use setup tools come as part of the Pro system, so changes to the system's setup can easily be performed.

23. Triple data security. Data points are immediately written to the non-volatile harddisk memory.
Therefore, no data can be lost in the event of an unexpected interruption of a test. After completion of each test, the actual data file is created. If necessary, all data points are automatically arranged in ascending order with respect to engine speed, or also any other specified parameter. A test run can be paused and restarted again at any time.

25. 'Shell'-Button allows a quick jump into the working directory of the software to copy or edit data or configuration files. Also, a batch file can be automatically started on activating a single button. This could for example be setup in such a way that the last test files are backed up to a floppy disk etc.

26. There is nearly no limit to the number of curves which can be overlayed and printed.

27. WYSIWYG print-outs in color or black and white to any inkjet or laser printer. What you see on the screen is exactly what is printed to your printer.

28. Zoom function allowing magnification of any desired screen section.

29. 'Magnetic' cursor which can be locked onto a desired curve and used to trace this for exact values and also to identify the curve..

30. All test data can be viewed and printed in tabular form.

31. Movable and sizeable Info Window in the graph to add further comments to print-outs.

32. Time saving templates including all information for curve selection, scaling, axis assignments, position, size, and additional comments text can be defined. These will be automatically applied to the corresponding test files.

33. Screens showing comparisons of different tests can easily be combined under a single name thus enabling the user to load these with only two keystrokes.

34. Five different modes for triggering data storage are available to suit any requirement
Data can be stored manually on activating a key on the keyboard, automatically by an automatic timer, by a timer which is only activated when a certain sensor or channel reaches a certain value (level triggering; the trigger could for example be if engine knock exceeds 20%)

35. Optional High Speed A/D module running at 360.000 samples per second available.
For very special applications 60.000.000 samples per second can be reached.

Specification may change at any time without notice - please ask for confirmation when placing your order.

Explaining the Main Screen (see Pic. 1)

The most important readings are constantly displayed on this screen. All channels can be assigned freely to any of the on-screen instruments. Usually, for an engine dynamometer one would choose to place the most important readings rpm, torque and power into the large top three instruments. One could however equally well assign completely different channels to these.

Please note that the on-screen display will be twice as large when using the recommended screen size of 17" (43cm). All readings can therefore be viewed easily, even from a distance !

Screen, upper middle and right: The two small numerical displays **DIFF to REF 1/2** show the difference of current values and a loaded reference test. It is possible to have a real-time graph appear in the main test screen during a test. A reference test can be loaded into this. During the whole test current values are constantly compared to the reference values. The difference is displayed in the DIFF to REF displays, the green and red annunciator lights showing whether current values are above (green lights) or below (red lights) the reference values. Furthermore curves for the actual test are automatically drawn and overlayed with the reference curves so you can immediately see the differences displayed graphically.

See also picture 4 on page 9 for more information on this feature.

The Reference Function is an essential tool for performing quick and optimized engine mapping.

Screen, bottom: the bottom 1/3 of the screen area is the switchable screen area - all sensor readings which are not located in the upper part of the main screen will be located in one of these windows.

The **Info Block** (directly above the switchable window area): shows system status, data storage mode, date, current time and run time of the test so far.

The **Help Line** located just above the Info Block provides a short form reminder of what functions are available and which keyboard keystrokes activate these.

The **Ranges** of all instruments can be configured freely so each instrument can be set to the optimum working range. For example, the Instrument for Oil Temperature can be set to 50°C - 150°C or of course just as well to 20°F - 300°F. Any desired range is possible.

The **Units** of all channels can be selected freely, be they °C, °F, °K, Hp, BHp, KW, Nm, lbft, m/s, ft/s, bar, Pa, psi, "Hg, etc. - it doesn't matter. Any units are possible !

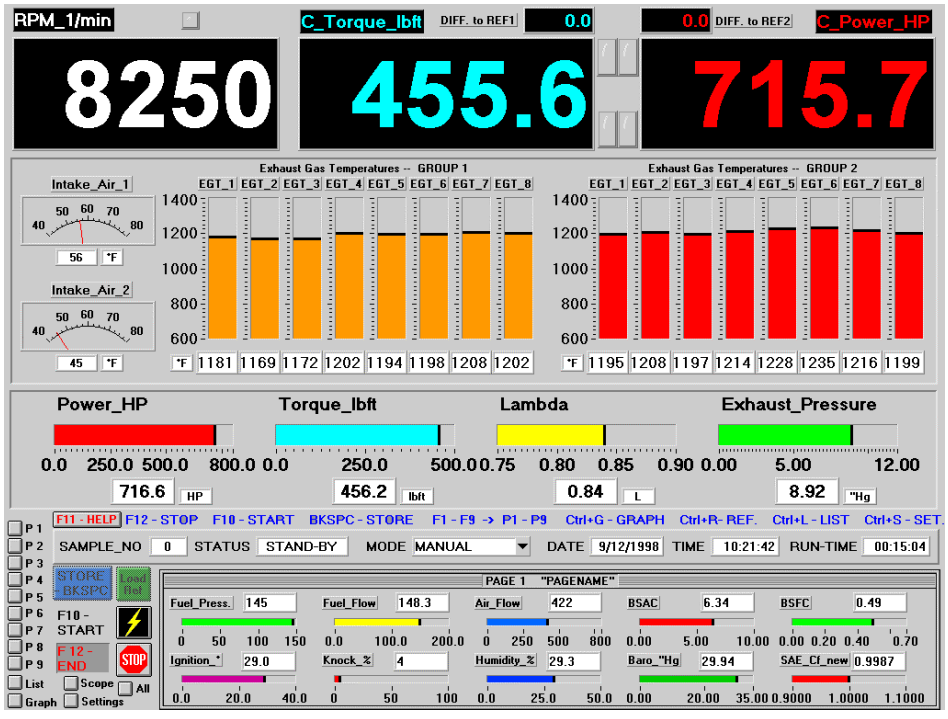
The **Colors** of all displays can also be changed freely to any desired color. Color coding will prove a big help during the test. All exhaust gas temperatures could

be colored red, all water temperatures blue, and so forth. Quick associations can thus be made simply on viewing the different colors.

All **Sensors** can be used (*some may require an interface)
Sensors providing an analog output in the 0V to 10V range can be connected directly to the system's inputs (-10V to 10V range available, soon). This will be the majority of sensors. Sensors which change their resistance can also be connected directly to the system by utilizing a suitable series resistor. Sensors providing a current output (usually 4..20mA) can also be connected directly by utilizing a suitable parallel resistor. Sensors providing a digital output pulse can be connected using our very precise frequency to voltage interfaces. Thermocouples can be connected using our special thermocouple amplifier connection box. Even Sensors with non-linear characteristics (thermistors etc.) can be connected directly and linearized automatically by our powerful software.
Likewise any Lambda-Probe (at least fourth order differential equation required)

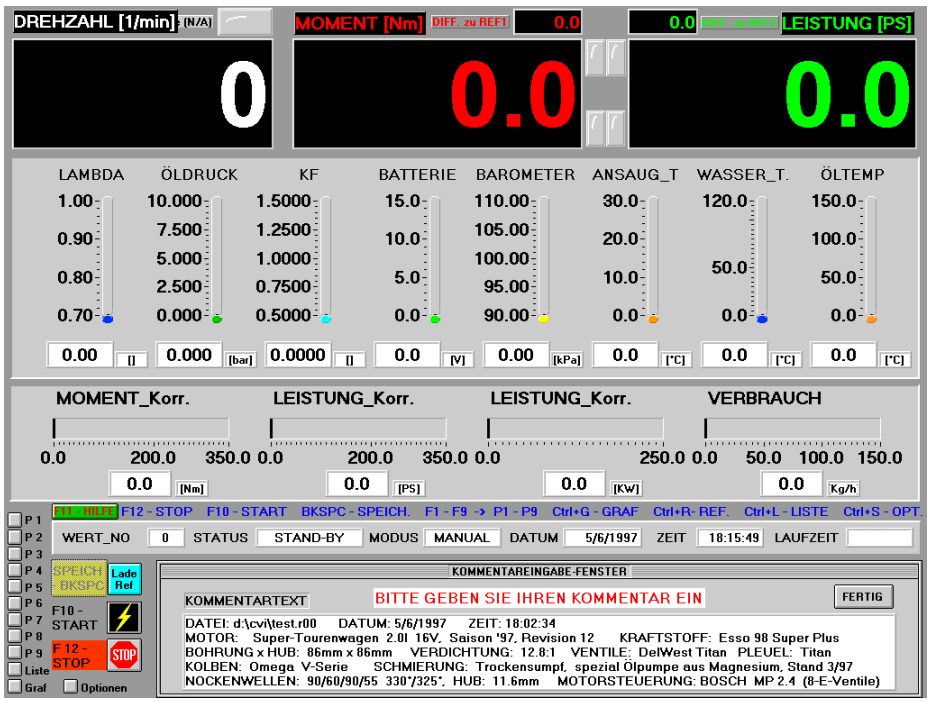
NEW -- NEW -- NEW -- NEW -- NEW

For tests (pulls) where a large number of Exhaust Gas Temperatures must be monitored we have designed a new main screen which allows display and data storage of 16 EGTs, more are of course also possible.



Pic. 1a
Showing the display possibility when a lot of EGT readings are required.
16 EGTs can be diplayed in the form of dedicated bar graphs (see orange and red bar graphs).

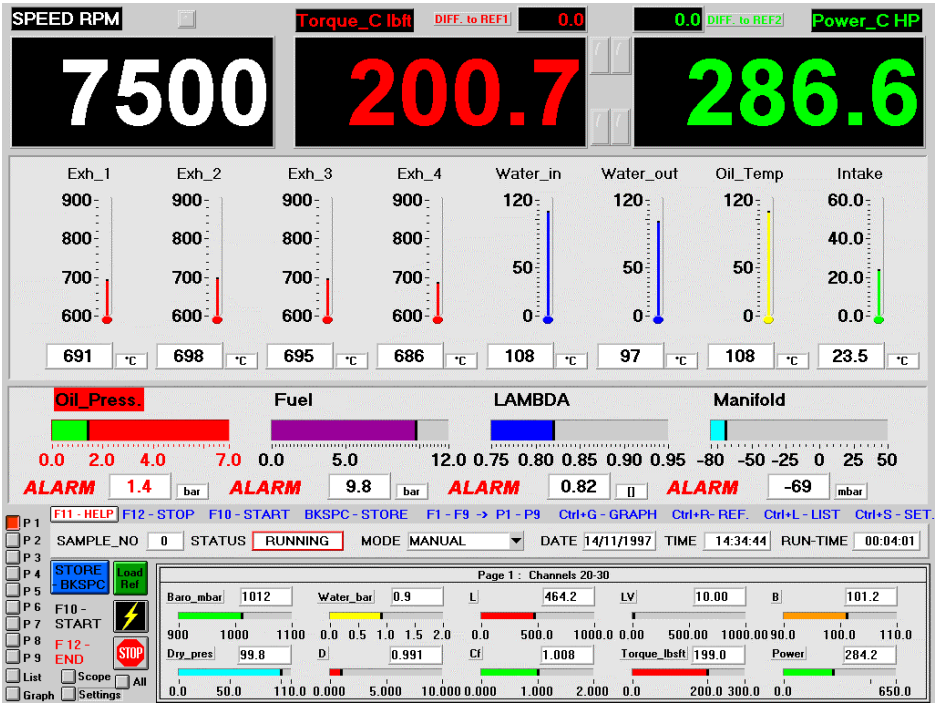
NEW -- NEW -- NEW -- NEW -- NEW



Pic. 2

All engine and test specific comments can be entered right at the start of every engine test. This ensures that even after long periods of time it will remain clear what the exact test entailed. The format of the comments text is completely open - simply type in as many details as possible such as Engine, Engine No., Specification, Modifications, Customer, etc. (above picture for an example)

Very practical is that after every test the previously made comments can be edited so that also findings during the test can be added, i.e. 'Lambda 0.95 - 1.0 below 4,000 rpm' etc.



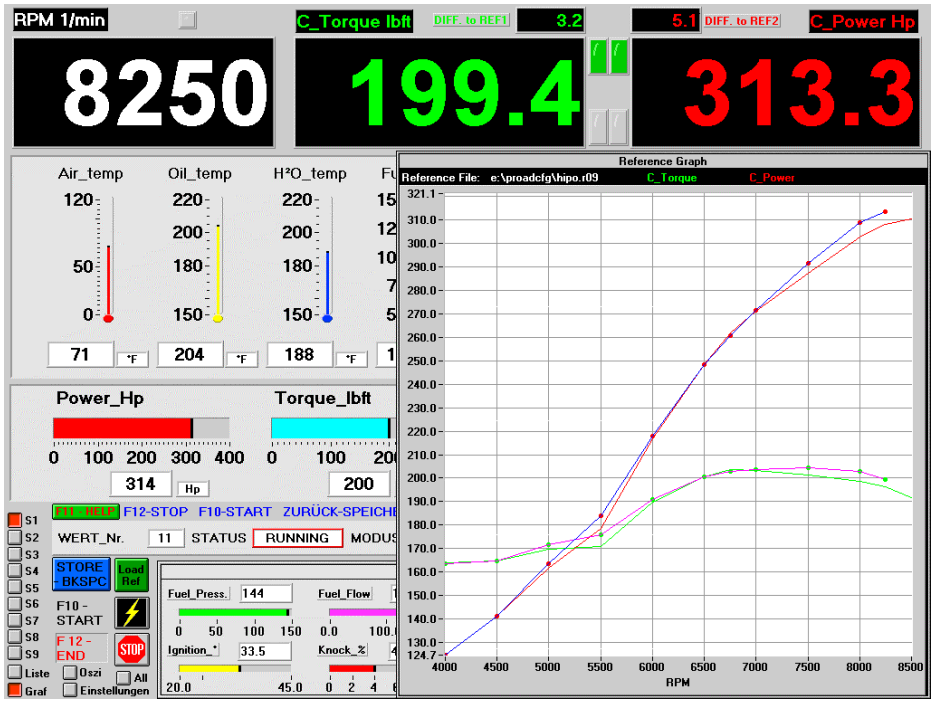
Pic 3

The system features an integrated two-level alarm function. The first level is a 'Warning' which commences when levels which are above normal but not yet critical are reached. The appropriate instrument(s) flashes yellow and a warning sound rings. The second level is an 'Alarm'. Alarm actions are that the appropriate instrument(s) flashes red, an alarm sound rings and an alarm action is taken. This means that the appropriate relais for this channel will be activated There are many possibilities for which such a relais can be used: - cut fuel and ignition, - switch on additional fans or auxiliary pumps , - bypass the throttle actuator and have the engine idle regardless of the throttle demand signal (this is advisable for turbocharged engines as you certainly do not want to have a hot turbo switched off before having it run through a cooling-down period first)

Possible Alarm/Warning programming could look like this:

if Oil Pressure is below 1.5 bar (22psi) --> Warning
Oil Pressure is below 1.0 bar (15psi) --> Alarm, cut fuel and ignition immediately

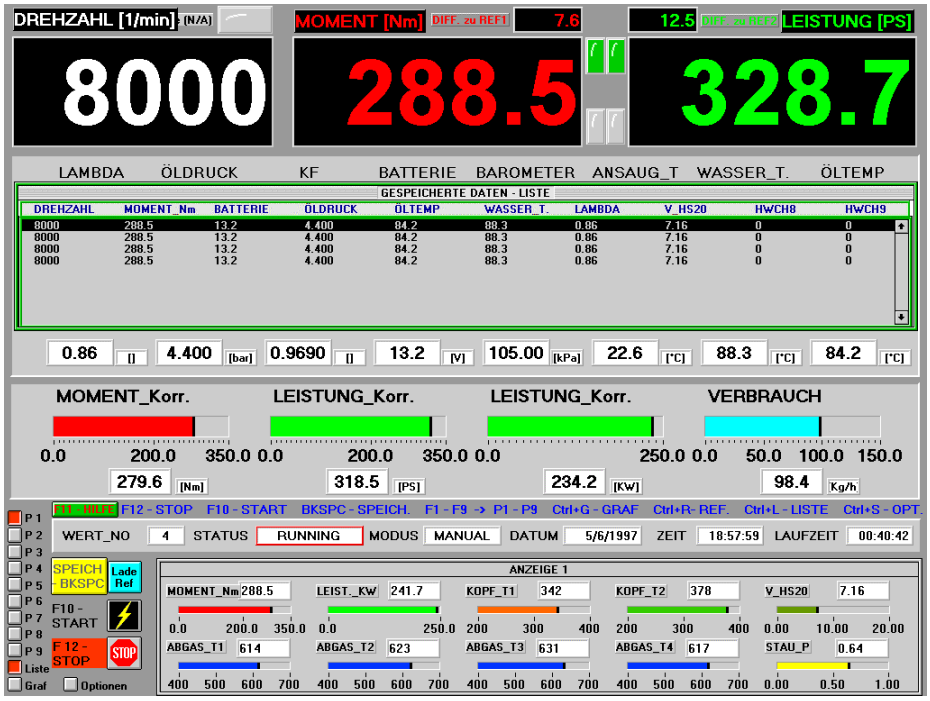
if Water Temp. above 100°C (212 °F) --> Warning
Water Temp. above 105°C (222 °F) --> Alarm, switch throttle to idling position to allow turbo to cool down or naturally aspirated engine → switch off immediately



Pic. 4

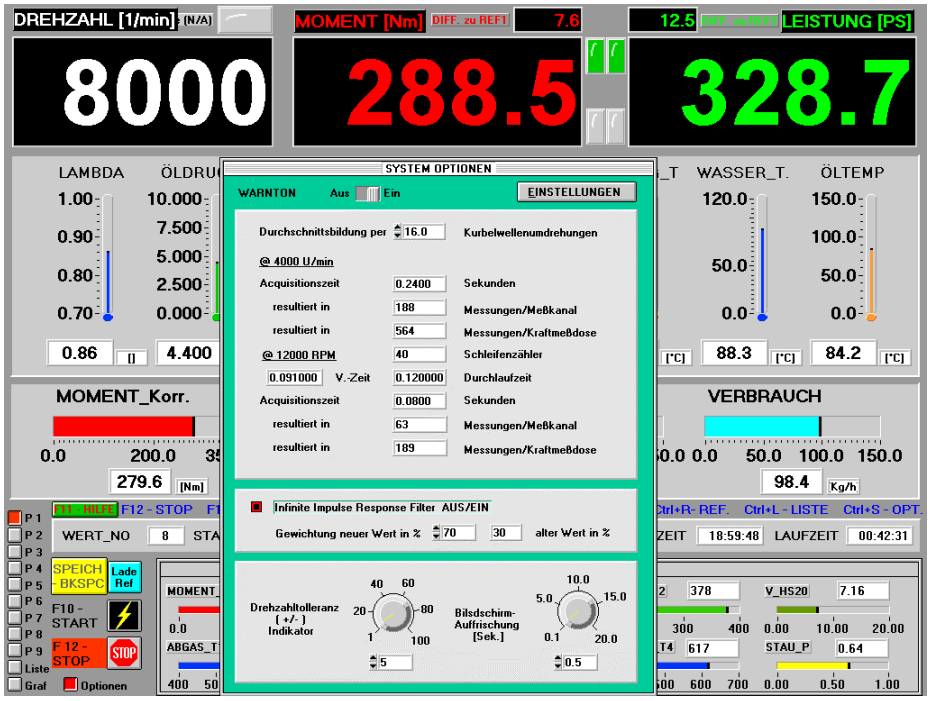
Reference-Curves Before or even during a test run one can load a previous test file into a real-time graph which will constantly be displayed during the whole test. Usually one would choose to load the best baseline test as a reference and then try to improve on this. Once the test is in progress current values (usually for Power and Torque, but also other readings such as Fuel Flow etc. are possible) will be compared to the reference values. If current readings are above the reference then the green annunciator lights will light up, if they are below the red lights will light up. The current position to the reference can also be seen in the graph. Furthermore the relative difference is constantly displayed in numerical terms. Also, curves for the actual test are automatically drawn and overlayed with the reference curves so you can immediately see the differences displayed graphically.

This feature is extremely useful for online mapping of engine management systems. As you are performing a step test and adjusting the engine management system's fuel and ignition map you can immediately see the effects on engine power as you are doing this. It is therefore an easy task to 'dial in' the optimum settings. Of course this function could also be used to optimize efficiency or emissions, etc. Imagine further refining this test possibility by adding knock sensors, cylinder pressure sensors, etc. Things really do not get much better than this...



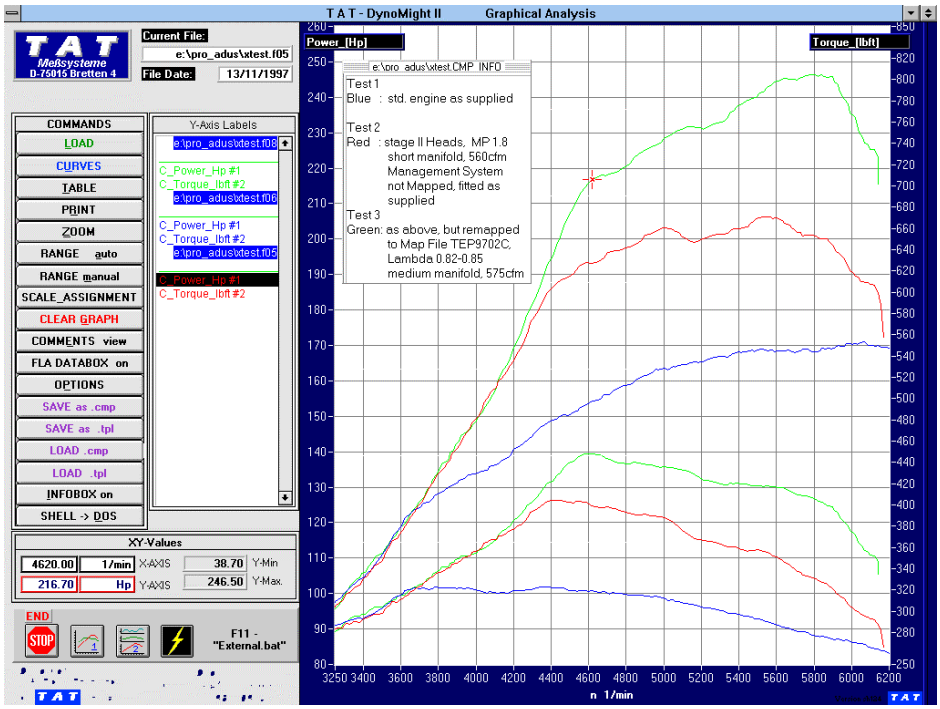
Pic. 5

A data list window can be displayed at any time. During the test all stored test points can be viewed to ensure that all required test points have been saved. Data is stored with triple security:
All data points are immediately written to the harddrive, so if someone happens to switch off the PC during the test by mistake you will not have lost any valuable information. After completion of every test the data is transferred to a further file which will automatically order all test points (if you have not stored your tests in strictly ascending order). Every file contains the exact time and thus duration for which each test point has been held for - helpful information in the event of an engine failing and it becoming essential to reconstruct the last readings.



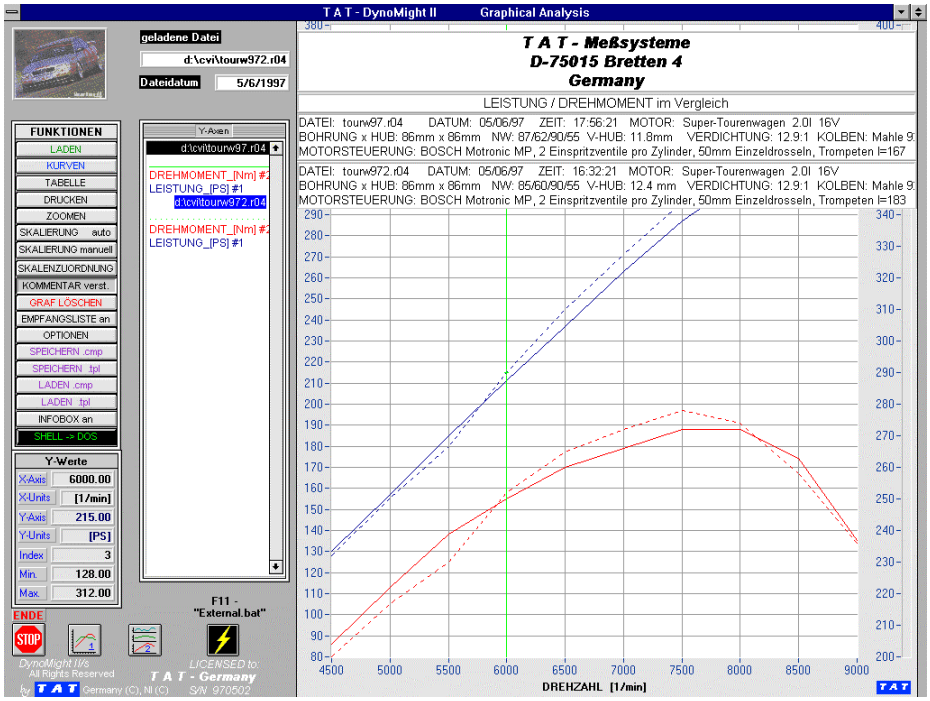
Pic. 6

Shows the configuration setup window
All settings can easily be changed.



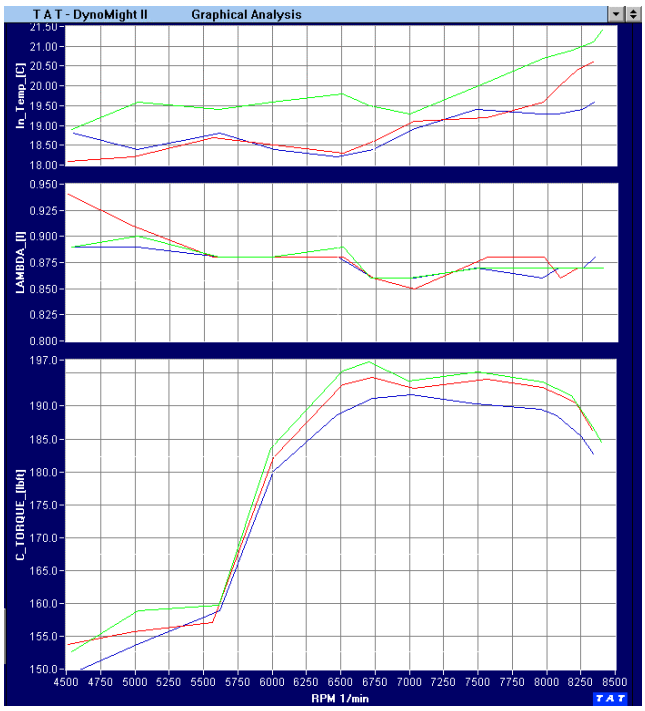
Pic. 7

One of the many specialities of the Graphical Analysis program is it's unrivalled ease-of-use. All functions are easily selected via virtual push buttons. We have avoided utilizing cumbersome pull-down menus throughout.



Pic. 9

Shows the company name and test comments which will be printed above every graph. This can be viewed and modified on-screen at any time.



Pic. 10

It is possible to display any test data in three independent graphs, individually or together.
All graphs can be scaled freely with regards to their screen size and also regarding their scaling. As an example the top graph could be set to 30% of total screen size, the middle one to 20% and the bottom one to 50% - any configuration is possible. As you can imagine, using this screen enables superior analysis of test data while incurring a minimum of curve intersections. This is absolutely desirable as it tends to make a visual analysis so much easier and clearer, e.g. place all curves for ignition timing into the first graph, all lambda curves into the second, and all torque curves into the third to instantly see the whole 'picture' of how the particular engine responded to different configurations.

Striving to provide you with the finest Data Acquisition Systems...

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