

Introduction

The Opel Test System

The Opel "TECHLINE" test system is based on a technical checking concept developed by Opel/Vauxhall for the detection and localization of faults in electronic vehicle systems.

Using the TECH 31 or TECH 32 hand oscilloscope, this test system was developed into a new mobile test instrument, which permits the diagnosis of, for example, elementary engine functions (alternator, ignition, etc.) and of engine system components (sensors).

Transferring the test data from the TIS2000 ensures that the hand oscilloscope is automatically correctly configured for the test. The data required for comparison of actual and nominal data in the form of a reference measurement curve is only available in the TECH 31. No reference curve is shown in TECH 32, just the instrument setup is downloaded here.

The TECH 31 or TECH 32 operating instructions, containing a detailed description of all functions, is enclosed in the instrument case.

Using the Test Pages

All of the test pages included in this brochure have the same format.

All of the test pre-conditions and the data which are required to perform the test are listed on the left of the test page, information regarding the evaluation of the measurements in the form of fault diagram are located to the right and on any subsequent pages.

The individual sections of the test sheets are explained in greater detail below.

The section "Connections" describes the assignment of the input channels for the TECH 31 and 32, the use of measurement leads or measurement sensors and the adaptation to the vehicle. The lead colour is indicated for connection plugs (which do not have pin designation entered). The designation "GRXX" for example indicates that the lead insulation has grey as its basic colour and which has a further colour designation ("XX") regardless of the measurement point.

The sequence of operations required for the recording of the signal plot are listed entered under the "Procedure".

The "Reference Curve" illustration shows the nominal signal plot display for one of the components to be checked.

The section "Possible Causes/Countermeasures" concludes by indicating various causes of faults and explains their rectification.

General Information/Safety Advice

The user must be familiar with the operating instructions enclosed with the instrument in order to set up the hand oscilloscope on the vehicle.

All operations on the vehicle electrical system (connection of test instruments, disconnection of plug connections, parts replacement) must only be performed with the ignition switched off.

Only use the extension and measurement leads with protective contacts enclosed in the instrument case. Check the connection lead for continuity and ensure the insulation is undamaged before starting the test.

In order to avoid short-circuits, only make test connections using suitable adapter leads (e.g., from the Electronic Kit **KM-609**) and at the same time ensure the connections are securely fixed.

Do not touch any live components or connection leads when testing with the ignition switched on or with the engine running.

Keep away from rotating components while the engine is running (fan, alternator). Likewise, keep connection leads away from hot or rotating components.

Introduction to Component Tests

The component tests are used to detect faults that can occur on electronic components (sensors and actuators).

Pre-condition for every test is: First the Tech2 should be used to read out Diagnostic Trouble Codes of the concerned system. In case of present Trouble Codes, the Checking Procedure should be used to diagnose the malfunction.

The technician must observe the instructions on the test sheets as closely as possible. To repeat the test procedure, the [REPEAT TEST] key on the TECH 31 must be depressed and the test restarted using the instructions listed under procedure.

After the test has been completed, restore the vehicle to its original condition (reconnect released plugs, re-insert relays or fuses).

The TECH 31 Hand Oscilloscope

The TECH 31 hand oscilloscope is a digital, battery-powered, multifunction, oscilloscope with two (2) input channels and an illuminated LCD screen. The integrated functions of the hand oscilloscope can be selected via a selection menu. The operation of the instrument is further simplified by programmed function keys.

The five blue Function keys F1 up to F5 are located directly below the LCD screen and permit the selection of functions, which can change during the test procedure. The designation for the selected function appears at the bottom of the LCD screen.

Various actions can be performed according to the selected function using the four arrow keys grouped in the centre of the keypad.

In the Menu:

- Selection of a menu option by moving the illuminated bar up or down.

In the measurement page:

- Changing the vertical or horizontal scaling factors.
- Moving the signal plot left, right, up or down.
- Setting the trigger level.
- Moving the cursor left or right.

Five further keys are located below the arrow keys, only two of which shall be described here in greater detail. The [SAVE - RECALL] key allows the operator to "freeze" the display as well as permitting the saving and recalling of measurement pages.

Up to 15 separate signal plots and sets of set-up data from measurements can be saved in the hand oscilloscope. The set-up data includes all of the information required to set up the hand oscilloscope for a test on a particular vehicle.

Pre-defined set-up data together with the signal plots from reference measurements can be loaded from the TIS via the optical interface. This loading procedure shall be described in a later section.

A further key can be used for the evaluation of measurements. Using the [CURSOR] key, two (2) vertical lines are faded in, which can be moved using the arrow keys over the signal plot, in order to read off the numerical values of the measurements.

Experienced users are also able to directly configure the hand oscilloscope for a test and to perform measurements without a reference curve, however the use of the data provided by the TIS is recommended

in order to avoid incorrect instrument configuration.

The TECH 32 Hand Oscilloscope

The TECH 32 hand oscilloscope is a digital, battery-powered, multifunction, oscilloscope with two (2) input channels and an illuminated LCD screen.

The four blue Function keys F1 up to F4 are located directly below the LCD screen and permit the selection of functions, which can change during the test procedure. The designation for the selected function appears at the bottom of the LCD screen.

Various actions can be performed according to the selected function using the four arrow keys grouped in the center of the keypad.

In the Menu:

- Selection of a menu option by moving the illuminated bar up or down.

In the measurement page:

- Moving the signal plot left, right, up or down.
- Setting the trigger level.
- Moving the cursor left or right.

Up to 15 separate sets of set-up data from measurements and 2 signal curves can be saved in the hand oscilloscope. The set-up data includes all of the information required to set up the hand oscilloscope for a test on a particular vehicle.

Pre-defined set-up data can be loaded from the TIS2000 via the optical interface. This loading procedure shall be described in a later section.

Experienced users are also able to directly configure the hand oscilloscope for a test and to perform measurements without a reference curve, however the use of the data provided by the TIS2000 is recommended in order to avoid incorrect instrument configuration.

Load Test Program from TIS

The diagnosis documentation for the hand oscilloscope includes a reference curve for each specific measurement. A special button is located to the left of the reference curve. The TECH 31/32 download menu opens if this is clicked.

The TECH 31/32 must be connected by now to the PC using the optical RS 232 included in the case. Ensure the connection port entered in the top of the download menu is correct. This connection port can be altered in the TIS2000 configuration menu.

Once the download menu is opened, a selection list is displayed showing the optional memory locations in the TECH 31/32. The default value of number 1 is used if no memory location is selected. Any curve located in the selected memory location is automatically overwritten.

Clicking the data transfer button starts the download procedure. The set-up data and, for TECH 31, the screen contents of the reference curve are thus transferred. The process takes approx. 10 seconds. The measurement parameters for the TECH 31/32 are correctly set up and for TECH 31 the expected nominal curve is displayed in grey.

The TECH 31/32 can now be disconnected from the TIS2000 in order to perform measurements upon the vehicle. If the setting parameters are altered in the course of the measurement procedure, the nominal curve is deleted. After an actual value curve is recorded using the Save/Recall key, then a comparison can be made between actual and nominal value curves. Minor differences between the two are to be expected. If there are considerable dissimilarities in the progression of the curves, the diagnostic information with the optional fault curve display should be noted.

The measurements stored in the memory following the measurement only remain stored until they are overwritten. Each memory can be called up using the Save/Recall key. The result is then the same as for downloading.

Adaptation and Connection to the Vehicle

The proper and correct diagnosis of electronic components in the vehicle can only be as good as the adaptation of the test instrument to the vehicle.

Methods which damage the wiring harness (such as: puncturing the lead insulation with the test probe) are not permitted, because damage (corrosion) will inevitably result.

The appropriate adapter plug from the Electronic Kit **KM-609** (Kent Moore) must be used for all measurements on vehicle auxiliaries and components.

The flexible pin adapters enclosed with the instrument case may only be used to make connections to vehicle plug connection crimped contacts in special cases where it is not possible to connect the adapter leads (e.g., where access is difficult).

To do this, the pin adapters are inserted into the plug connection parallel to the lead from the rear between the lead insulation and the spray water seal. When inserting the adapter, particular care must be taken to ensure the spray water seal is not damaged. Older vehicles are particularly prone to heating of the rubber seal and making it porous and thus preventing the seal from returning to its original position.

The COM input of the hand oscilloscope must be connected to the engine ground connection before any ignition system measurements are taken.

Abbreviations and Definitions

INPUT A	1. Measurement input for the hand oscilloscope (standard connection).
INPUT B	2. Measurement input (only used in conjunction with INPUT A).
COM/TRIGGER	Used to trigger the measurement signal from INPUT A.
Synchronised	During a compression test on vehicles with STD ignition systems, it is possible to use the trigger tab on cylinder 1 to determine a faulty cylinder.
Not Synchronised	It is not possible to allocate a fault for vehicles with STD ignition systems and twin ignition coils because of the doubled sparking rate.
Function Keys	These are the five blue keys located below the display window. Their function is determined by the current test and appears in the lower margin of the display.
Invert	Folds the display of the signal plot about the horizontal axis.
Optical Interface	Volt-free connection for connecting external equipment (PC).
Horizontal Scale Factor	Time units per division on the horizontal axis (time base).
Vertical Scale Factor	The amplification units (volt, ampere, ohm) per division on the vertical axis.
Signal Plot	The voltage plot resulting from the measurement of an input signal.
Voltage Spike	Very brief and usually very high voltage impulse.
Triggering Level	The voltage level at which the unit starts to display the signal plot.