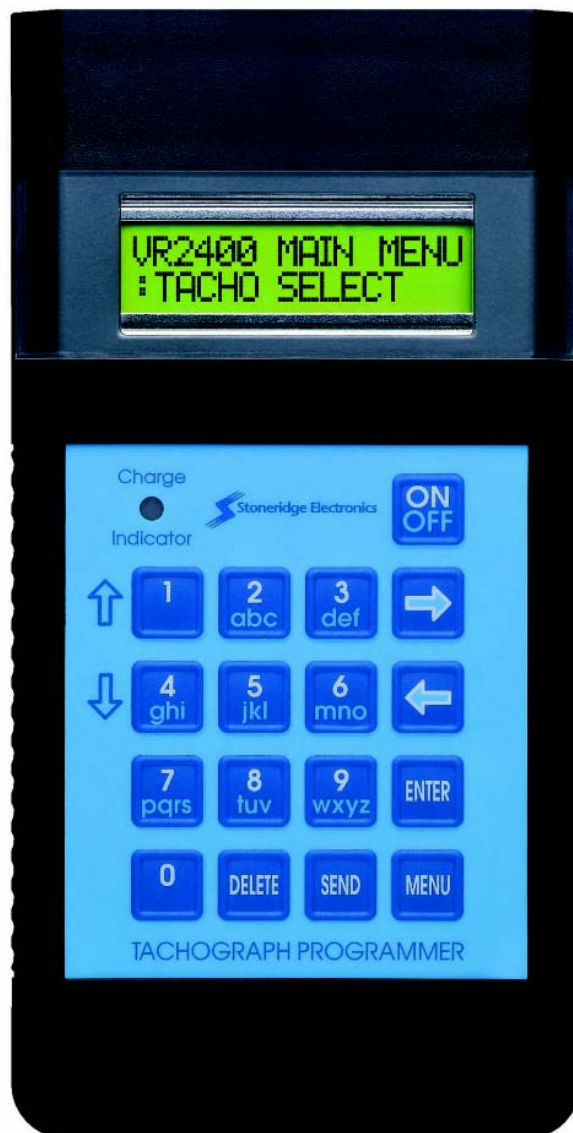




Stoneridge

Tachograph Programmer User Manual



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1. INTRODUCTION

1.1 *What does the Tachograph Programmer do?*

- Determines the characteristic coefficient ('W-factor') of a vehicle using a rolling road or either of two different fixed-distance methods;
- Carries out bench tests of Tachographs semi-automatically;
- Checks the K-factor setting of Tachographs;
- Calculates the DIL switch settings for any valid K-factor;
- Can be used as a Tachograph speed simulator;
- Determines the appropriate pulses per engine revolution (PPR) setting for a vehicle;
- Allows Tachograph internal parameters to be Read and Checked and Reprogrammed if required (Note: Stoneridge VR8400/2400/SE5000 Kienzle 1319/1324/DTCO, Motometer EGK100 and Actia Smartach tachographs only);
- Displays information in the serial data stream;
- Allows the initiation self-test modes;
- Allows the resetting of the memory to default values;
- Can carry-out a Tachograph Clock Test;
- Can check CANbus message output from the Stoneridge VR2400/SE5000 and the Kienzle 1324 Tachographs;
- Can analyse the Diagnostic Trouble Codes (DTC) stored internally in the Stoneridge VR2400/SE5000, Kienzle 1324/DTCO and Actia Smartach Tachographs (see Annex C for a full list of DTCs);
- Includes internal diagnostics routines to confirm that the Programmer is functioning correctly.

1.2 *With which Tachograph Types can the Programmer be used ?*

The Tachograph Programmer can be used with all available types of electronic tachographs, i.e. **Stoneridge VR1400/8300/8400/2400/SE5000, Kienzle 1314/1318/1319/1324/DTCO, MotoMeter EGK-100 and Actia Smartach.**

1.3 *How do I use This Manual?*

This manual describes, in detail, all the functions performed by the Tachograph Programmer. The Tachograph Programmer can be used with all electronic tachographs, many of which require slightly different procedures.

To make it easier to find the information you require, the manual is structured as follows:

Chapter 2: PREPARATION FOR USE

Basic instructions for starting to use the Programmer, including checking and charging the battery, and how to select the Tachograph type to be programmed.

Chapter 3: MAIN MENU PROGRAMMER FUNCTIONS

Briefly describes the functions performed by the Programmer. A quick-reference Table (Table 1) lists the functions available for each Tachograph type and the harnesses that are required for each Programmer function.

Chapter 4: FUNCTION DESCRIPTIONS AND DETAILS OF TEST PROCEDURES

This gives a more detailed description of the different functions available in the Tachograph Programmer and provides Step-by-step procedures for carrying out the various Tachograph tests and functions.

Chapter 5: PROGRAMMING A TACHOGRAPH

Once the various Tachograph parameters have been determined (using the Tests described previously), the values determined must be sent to the Tachograph so that it can be updated with the correct parameter values.

1.4 *What version of Tachograph Programmer Software does this Manual Support ?*

This manual covers the Tachograph Programmer functionality for Software version Rev2.01. The determination of the current Software Version in a Tachograph Programmer is described in section 2.6 (Diagnostics Menu – ROM Test).

A Tachograph Programmer with an older version of Software can be upgraded to the current version (i.e., version Rev2.01). For further information on programmer software upgrades, please contact Stoneridge via E-mail at "sales@elc.stoneridge.com".

A Programmer upgrade is done using a Standard PC running a dedicated installation Program which is available on a Programmer Upgrade CD.

The PC (Serial Communications Port) is connected to the Programmer (Socket D on Figure 1) via a Field Download Cable (Part Number: 7780-953).

2. PREPARATION FOR USE

2.1 Power Supply

The Tachograph Programmer is powered from an internal rechargeable nickel metal hydride battery pack. The voltage of the Battery Pack may be checked at any time by selecting Battery Detect from the Diagnostics Menu - see section 2.6 (Diagnostics Menu – Battery Detect) for details.

The 9.6V Battery Pack has a capacity of 600mA/hr. The idle current of the programmer is approximately 30mA, rising to a maximum of 78mA when in normal use. Standard use of the communications features results in a current consumption of around 45mA. The OFF state current consumption is around 35µA, which maintains the function of the Programmers internal temperature compensated real-time clock. Based on these figures, a fully charged battery pack should give a continuous power on time of approximately 13 hours. Assuming a badly degraded battery, the programmer should have an expected worst case power-ON time of around 7 hours before recharge is required.

2.1.1 Battery Charging

The battery is recharged using the AC charger supplied in the Programmer kit (illustrated as Harness I in ANNEX A -). When fully discharged, the battery will take approximately 14 hours to recharge. The unit will then operate for at least 8 hours before requiring recharging. To conserve battery charge, the unit will switch off automatically after 10 minutes of non-use (except when in a bench test mode) or if the Voltage drops below 8V - the Critical voltage - below which tests can become inaccurate.

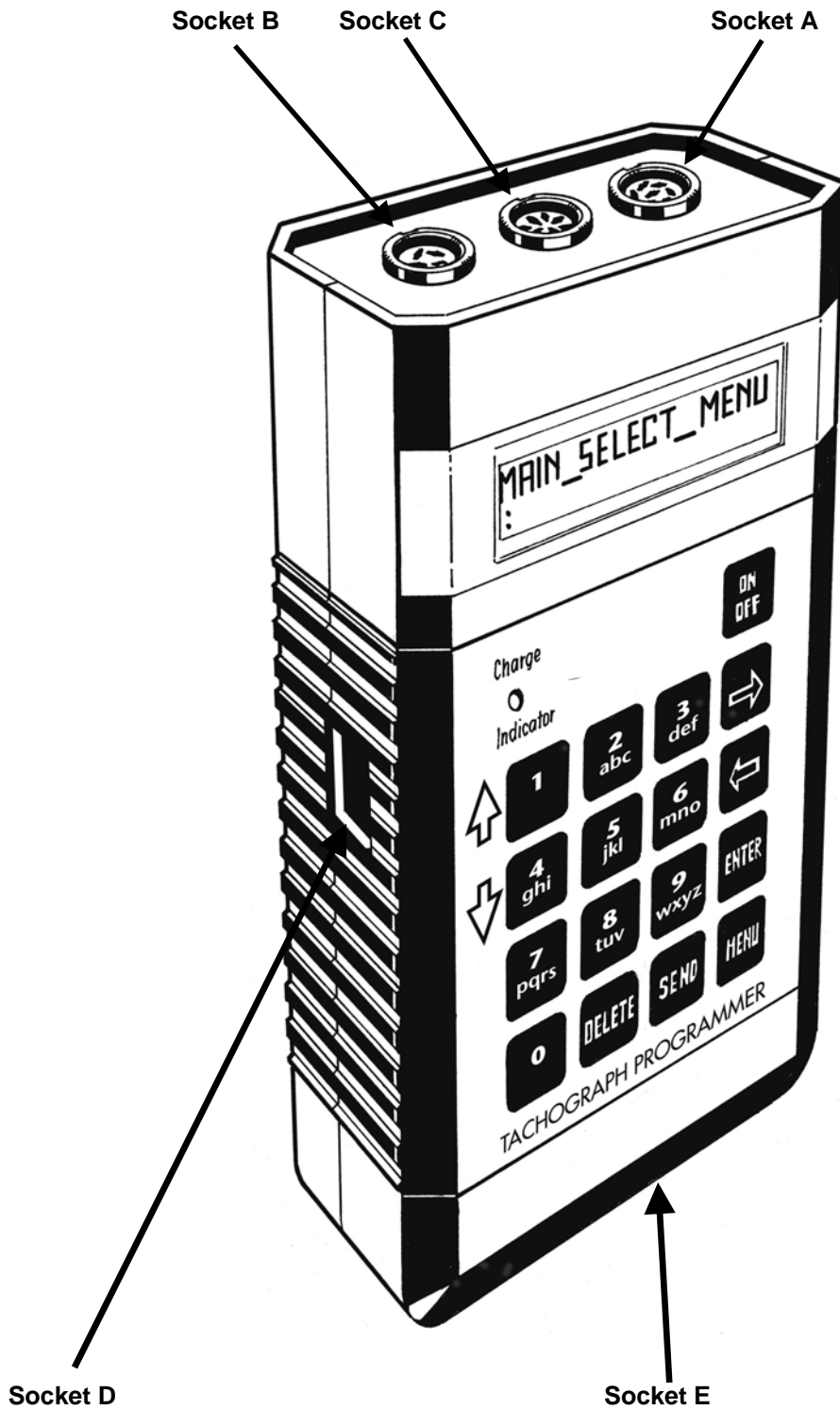
The Programmer should **NOT** be continuously connected to the charger after an overnight charge. This can greatly reduce the Batteries performance, and in extreme cases destroy the Battery.

2.2 Connectors

The Tachograph Programmer has three connectors on the end of the unit above the display and two others on the side and on the bottom, as shown on Figure 1 (see below).

- A. 6-pin DIN socket for connection of battery charging unit, bench test leads, pulser leads for rolling road or fixed distance calibration and Stoneridge VR8400 programming leads.
- B. 4-pin DIN socket for connection of flexi-switch and Stoneridge VR8300/8400/2400/SE5000 serial data lead.
- C. 8-pin DIN socket for connection of Stoneridge VR2400/SE5000, Kienzle 1319/ 1324/DTCO, MotoMeter and Actia Smartach tachographs.
- D. RJ11 Socket used for upgrading the Programmer Software version.
- E. Smartcard Connector. Smartcards are capable of storing digital information so that the data stored can be read by suitable electronic devices. The MKII Tachograph Programmer has a smartcard slot which may be utilised in the future for a variety of uses including security.

FIGURE 1: MKII TACHOGRAPH PROGRAMMER OUTLINE



2.3 Connection Harnesses

A range of different connection harnesses is supplied in the Programmer kit to allow many different connections to tachograph systems according to the functions required. These are illustrated and described in Annex A, and are referred to as appropriate throughout this manual.

2.4 Functions of the Keys

- | | | |
|---------|---|--|
| MENU | - | Press to return to the MAIN MENU |
| ENTER | - | Either selects a setting to be changed or terminates an entry. |
| ← → | - | Cycles through the options available for a particular setting. Press either of these keys as appropriate to move to the required function and then press ENTER to select. |
| SEND | - | Sends parameter information to the attached tachograph. |
| DELETE | - | Allows deletion of the entered value. |
| 0 ... 9 | - | Numeric keys for entry of numeric values. They also have the secondary function as shortcut keys (see below) and the tertiary function of inputting letters. |
| ↑ ↓ | - | The 1 and 4 keys have an additional function and are used to alter the speed in a speed test. |
| ON/OFF | - | Used for turning the instrument on and off. Note that if the unit is left for 10 minutes without any keys being pressed then the unit will turn off automatically (except in bench test mode). |

Shortcut keys- to facilitate faster and easier use of the Programmer, the number keys also have shortcut key functions (the shortcut keys are only active if the Tachograph type selected supports the function). The shortcuts are as follows:

- 1- Rolling Road test.
- 2- Fixed Distance #1 test.
- 3- Fixed Distance #2 test.
- 4- Clock test.
- 5- R.P.M. Pulse test.
- 6- K-Factor test.
- 7- Read All Data.
- 8- Modify Data.
- 9- Send All Data.

2.5 Switching On

To switch ON the Tachograph Programmer, press the ON/OFF button on the keyboard. The unit will first display a copyright message and the software version and then, after an audible beep, will display the MAIN MENU. From this menu the required functions may be selected.

If the ENTER key is held down while switching ON, the Programmer will request a Pass code – type “8642” and press “ENTER” – the Programmer will then enter the Diagnostics Menu. Please note that the use of the Pass code is only to prevent unwanted entry to the Diagnostics Menu. The Diagnostics functions are described in Section 2.6.

2.6 Diagnostics Menu

Within the Tachograph Programmer there are a number of additional functions provided which carry out various self-test functions and which allow setting of various default values.

To gain access to the internal utilities, first ensure that the Tachograph Programmer is turned off. **Press and hold** the ENTER key and then turn on the unit by pressing the ON key. As the unit turns on it will emit a beep as usual, but in this case will request a Pass code – type “8642” and press “ENTER” – the Programmer will then enter the DIAGNOSTICS MENU.

2.6.1 Diagnostics Menu - Function Descriptions

- | | |
|-----------------------|--|
| Language Select | - The MKII Tachograph Programmer may be operated in a number of different languages. The available languages are dependant on the Tachograph Programmer type. |
| Set Time and Date | - This is used to set the time (24 hour clock) and date (ddMMyyyy format) used by the Programmer. |
| Fixed Distance Length | - This allows the Length of the Fixed Distance Track (used in Programmer Fixed-Distance Tests) to be altered between 20 and 1000m (previously this was fixed at 20m permanently). |
| Backlight Select | - This is used to enable or disable the Programmer’s LCD Backlight. This feature is not available in Standard Programmer Types. |
| Hardware Test | - This function is used in conjunction with an external test jig for conformance testing. It is for use by SE personnel only. |
| Keyboard Test | - This enables the user to check that the keyboard is fully functional by pressing each key in turn. |
| Display Test | - This causes the unit to display a visual routine so that the user can check that the display is functioning correctly. |
| ROM Test | - This function can be used to check the Programmer’s internal read-only memory (ROM) and display the result. |
| Battery Detect | - This is used to check the Voltage of the Programmer’s internal battery pack. If within tolerance, message “Battery OK!” should be displayed. If not then the battery needs recharging. |
| Frequency Test | - Used during conformance testing to calibrate the accuracy of the clock within the Tachograph Programmer. This function is for use by SE personnel only. |
| Set calib no. | - This enables a user to enter a default identification string for a particular tachograph fitting station. Generally this is the identification issued by the approvals authority. |
| Bench test type | - This allows the selection of the appropriate bench test for any given country. Standard bench tests are pre-programmed for several countries; selecting the Custom bench test option allows a user to define a different test sequence. See Annex B for details of the Bench Tests available and instructions for programming a custom bench test. |

2.6.2 Diagnostics Menu - Operation of Functions

<p>With the Programmer OFF, press and hold the ENTER key and switch the device ON.</p> <p>To prevent unintentional use of the Diagnostic functions, a pass code will be requested. Type in 8642, and press ENTER. By pressing the ← or → keys the required function may then be displayed.</p>	<p>Enter PIN :8642</p>
<p>Language Select - Press ENTER and the current language and the characters ← → will be displayed (on the right of display). Press the required key (← or →) until the required language is shown and then press ENTER again to make the selection permanent.</p> <p>The language selected will then be used for all the operating menus until a different language is selected. Press MENU once to return to the DIAGNOSTICS MENU.</p>	<p>DIAGNOSTICS MENU :Language Select</p> <p>SELECT LANGUAGE :English ← →</p>
<p>Set time & date - Press ENTER and type in the time in the format shown on the screen.</p> <p>Press ENTER after setting the time to set the date in the format shown on the screen.</p> <p>When the time and date have been set, press ENTER to confirm the settings.</p> <p>Note : The time entered should be UTC time.</p>	<p>DIAGNOSTICS MENU :Set time & date</p> <p>Time: HHmm :09:45</p> <p>Date: ddMMyyyy :01/07/2003</p>
<p>Fixed Dist leng – Press ENTER to display the Fixed Distance Length.</p> <p>Press ENTER to change the distance (Note: Range is 20 to 1000m). Enter the distance required and press the ENTER key to accept.</p> <p>Press MENU to return to the Diagnostic Menu.</p>	<p>DIAGNOSTICS MENU :Fixed Dist leng</p> <p>Enter distance :20 m</p>
<p>BacklightSelect – Press ENTER to display whether backlight is selected On or Off.</p> <p>Press the ← or → key to change the selection.</p> <p>Press ENTER to confirm selection. Note: Backlight is only available in a</p>	<p>DIAGNOSTICS MENU :BacklightSelect</p> <p>BacklightSelect :On ← →</p>

programmer that has a backlight display fitted.	
Hardware Test – This test is to be applied by the manufacturer only.	DIAGNOSTICS MENU :Hardware Test
Keyboard Test - Press ENTER and then press the correct key when prompted. When the test is successfully completed the message: Keyboard OK! will appear briefly on the screen.	DIAGNOSTICS MENU :Keyboard Test
Display Test - Press ENTER to start the test procedure. The default contrast is 25% but this may be changed using keys 1 or 4 . Press ENTER and the test runs automatically.	DIAGNOSTICS MENU :Display Test Adjust contrast :25%
ROM Test - Press ENTER to start the test procedure. The Checksum will appear after a brief interval. Press the MENU key once to return to the Diagnostics Menu. Note that the actual checksum value will depend on the version of software in the Programmer.	DIAGNOSTICS MENU :ROM Test (c)2005 Rev 2.01 :Checksum = XXXX
Battery Detect - Press ENTER to start the test procedure. The battery voltage will appear after a brief interval. Press the MENU key once to return to the Diagnostics Menu.	DIAGNOSTICS MENU :Battery Detect Battery OK! :11.239V
Frequency Test – This test is to be applied by the manufacturer only.	DIAGNOSTICS MENU :Frequency Test
Set calib no. - Press ENTER to view the current calibration number. Press ENTER a second time to change the calibration number if necessary. Once the number has been changed, press	DIAGNOSTICS MENU :Set calib no. Set calib no. SE 1234

<p>ENTER a third time to confirm the new values.</p> <p>Press the MENU key to return to the DIAGNOSTICS MENU.</p>	
<p>Benchtest type - Press ENTER to display the current Benchtest type.</p> <p>Use the ← or → keys to select UK, French, German, Swedish, Dutch, Belgium or to Custom the bench test procedure.</p> <p>Press ENTER to select the required type.</p>	<p>DIAGNOSTICS MENU :Benchtest type</p> <p>Benchtest type :UK ← →</p>

2.7 Selection of tachograph type

Before using the Programmer, the model of tachograph being calibrated must be selected from the Main Menu. When the Programmer is switched on the first item displayed on the MAIN MENU is TACHO SELECT. From elsewhere in the MAIN MENU press the ← or → keys until TACHO SELECT is displayed.

VR2400 MAIN MENU
:**TACHO SELECT**

Press ENTER and the TACHO TYPE menu will be displayed. Press ENTER again and then use the ← or → keys to select the appropriate tachograph type (Stoneridge VR2400/8400/8300/1400/SE5000 series, Kienzle 1324/1319/1318/ 1314/DTCO, Motometer EGK-100 and Actia Smartach). Press ENTER to make the selection and then MENU to return to the MAIN MENU.

TACHO TYPE
:**2400 Series**

then MENU to return to the MAIN MENU.

2.8 Selection of Pulser type (Stoneridge VR8300/1400)

For Stoneridge VR8300 or VR1400 series tachographs, the pulser type to be used must also be selected. This is to ensure that any calibration factor determined is correct.

VR1400 MAIN MENU
:**PULSER SELECT**

With the Programmer at the MAIN MENU and displaying PULSER SELECT, press ENTER and PULSER TYPE will be displayed. Use the ← or → keys to select the appropriate pulser type. Press ENTER to make the selection and then MENU to return to the MAIN MENU.

PULSER TYPE
:**8 Pulses/Rev** ← →

Note: The 2 pulse/rev option should only be selected when the tachograph is fitted with a Stoneridge Veeder-Root 2-pulse sender. The 8 pulse/rev option must be selected for all other pulsers regardless of the actual number of pulses per rev from the sender.

2.9 Selection of *SENDER TYPE* (Stoneridge VR2400)

For Stoneridge VR2400 series tachographs, the sender type may be selected.



VR2400 MAIN MENU
:PULSER SELECT



SENDER TYPE
: Encrypted ← →

With the Programmer at the VR2400 MAIN MENU and displaying PULSER SELECT, connect a Cable U between the Programmers' Socket 'C' and the 2400 Tachograph and then press ENTER.

Use the ← or → keys to scroll through the options until the preferred sender type is displayed. Press ENTER and again to confirm the selection. The four choices available for sender Type are: **Encrypted**, **4-Wire**, **3-Wire** and **Magnetic**.

Please note that for all other Tachograph types no sender type is selectable.

3. PROGRAMMER FUNCTIONS

This Chapter briefly describes all the MKII Programmer functions and lists the required harnesses in Table 1. A full description of each function is included in Chapter 4.

- **Tacho Select** - this function allows the operator to specify the tachograph type that is to be calibrated or tested by the Programmer (see section 2.7 for more details).
- **Pulser Select** (Stoneridge VR8300/1400 and Kienzle 1314) – this function allows the operator to specify the pulser type (or sender type for VR2400) that is being used with the current tachograph (see sections 2.8 and 2.9 for more details).
- **Rolling Road Test** (all) - this function finds the “W” factor of the vehicle using the Hartridge (or similar) Rolling Road (see section 4.1.1 for more details).
- **Fixed Distance #1 Test** (all) - this function finds the “W” factor of the vehicle using the Physical method 20m track (see section 4.1.2 for more details).
- **Fixed Distance #2 Test** (all) - this function finds the “W” factor of the vehicle using the Physical method 20m track with Flexi-Switch (see section 4.1.3 for more details).
- **Bench Test** (all) - this semi-automatic function assists the fitter to bench test the tachograph using a series of commands displayed on the screen (see section 4.2 for details of Bench Test connections and Annex B for full details of all Bench Test Routines).
- **Speed Simulator Test** - this function injects speed pulses into the tachograph for checking of tachograph speed pointer, overspeed warning, or stylus positions on chart (see section 4.3 for more details).
- **RPM Pulse Test** (Stoneridge VR2400/8400/8300, Kienzle1318, Motometer EGK100, 4-stylus tachographs only) - this function is used to find the “Pulse Per Engine Rev” from the “W” terminal on the alternator or a revs sender (see section 4.4 for more details).
- **Clock Test** - this function checks the accuracy of the tachograph clock. The function is automatic for Motometer EGK100 tachograph, Stoneridge VR2400/SE5000, Kienzle 1324/DTCO and Actia Smartach but uses an optional external clock-tester for other tachographs (see section 4.5 for more details).
- **Serial data** (Stoneridge VR8400/8300/2400/SE5000) - this function “reads” tachographs via the serial output and displays various settings within the tachograph (see section 4.6 for more details).
- **CANBus Data** (Stoneridge VR2400/SE5000 and Kienzle 1324) - allows data to be transferred between tachograph and programmer using the CANbus (see section 4.7 for more details).
- **Tacho Control** (Stoneridge VR8400/2400 and Kienzle 1324) - this function is used to put the tachograph into either the “Self Test” or the “Extended Test” mode, to Reset the tachograph memory to the “Default state” or to pair a tachograph with a sender (2400/1324 only) (see section 4.8 for more details).
- **Identify Tacho** (Stoneridge VR2400/SE5000, Kienzle 1324/DTCO and Actia Smartach) – this function interrogates the tachograph via the K-line and determines the System supplier, Manufacture date, Serial number, Hardware version, Software number, Software version and System name (see section 4.9 for more details).

- **Read/Erased DTCs** (Stoneridge VR2400/SE5000, Kienzle 1324/DTCO and Actia Smartach) - enables the Diagnostic Trouble Codes in the tachograph to be displayed on the Programmer and then erased if required (see section 4.10 for more details).
- **Read all data/ Modify data/ Send all data** (Stoneridge VR2400/SE5000, Kienzle 1319/1324/DTCO, EGK100 and Actia Smartach) - these functions interrogate the tachograph via the K-line or serial data line to allow the fitter to change the various settings on the tachograph and program all the data set-up in the Programmer in a single operation (see Chapter 5 for more details).
- **Program Tacho** (Stoneridge VR8400) - this function can be used to select various settings such as "Ignition Recording On" and "Overspeed Setting" (see section 5.1 for more details)..
- **K-factor Test** (Stoneridge VR8400 and Kienzle 1319, 1318, 1314) - this function measures the "K" factor currently set on the tachographs (see section 4.11 for more details).
- **DIL calculate** (Stoneridge VR8400/8300/1400, Kienzle1318) - this function eliminates the need to look up calibration tables (see section 4.12 for more details).
- **Time/Date** (Stoneridge SE5000, Kienzle DTCO, Actia Smartach) – this function allows the time/date, and time offset in the tachograph to be read and modified.
- **Pair/Test** (Stoneridge SE5000, Kienzle DTCO) – this function can be used to pair the sender, and allow a number of tests to be carried out on the tachograph.

Table 1: Available functions and required harnesses

Tachograph	VR2400	VR8400	VR8300	VR1400	K1324	K1319	K1318	K1314	Moto-Meter EGK100	SE5000	DTCO	Smartach
Function												
Rolling Road	U or D	G+J or D	G+J or D	K	W or D	G+O+J	G+J or D	G+J or L N	Z or D	Z or D	Z or D	Z or D
Fixed Dist #1	U or D	G+J or D	G+J or D	K	W or D	G+O+J	G+J or D	G+J or L N	Z or D	Z or D	Z or D	Z or D
Fixed Dist #2	U or D	G+J or D	G+J or D	K	W or D	G+O+J	G+J or D	G+J or L N	Z or D	Z or D	Z or D	Z or D
Bench Test	C	G+S+J or C	C	K	C or O	G+O+J or C	G+S+J or C	G+T+J or L C+M or N	Z	Z	Z	Z
Speed Simulator	U or C	G+S+J or C	C	K	W or C	G+O+J or C	G+S+J or C	G+T+J or L C+M or N	Z	Z	Z	Z
RPM Pulse Test	E	E	E	-	W	-	E	-	N	-	-	-
Clock Test	U	Clock Tester	Clock Tester	-	W	Clock Tester	Clock Tester	Clock Tester	N	Z	Z	Z
Serial Data	X	H+J+F or H+J	H+J+F	-	-	-	-	-	X	-	-	-
CanBus Data	V	-	-	-	V	-	-	-	V	-	-	-
Tacho Control	U	G+J	-	-	W or C	-	-	-	N	-	-	-
Identify Tacho	U	-	-	-	W	-	-	-	Z	Z	Z	Z
Read/Erased DTCs	U	-	-	-	W	-	-	-	Z	Z	Z	Z

Table 1: Available functions and required harnesses (continued)

Tachograph	VR2400	VR8400	VR8300	VR1400	K1324	K1319	K1318	K1314	Moto-Meter EGK100	SE5000	DTCO	Smartach
Function												
Send All Data	U	G+J	-	-	W	P	-	-	N	Z	Z	Z
Modify Data	U	-	-	-	W	P	-	-	N	Z	Z	Z
Read All Data	U	-	-	-	W	P	-	-	N	Z	Z	Z
Program Tacho	-	G+J	-	-	-	-	-	-	-	-	-	-
K-Factor Test	-	G+J	-	-	-	G+O+J	G+J	G+J	-	-	-	-
Pair / Test	-	-	-	-	-	-	-	-	-	Z	Z	-
Time / Date	-	-	-	-	-	-	-	-	-	Z	Z	Z
Enter PIN	-	-	-	-	-	-	-	-	-	Z	-	-

Notes:

- (1) Fixed Distance #2 also requires the Flexi Switch.
- (2) DIL Calculate and Tacho Select and Pulser Select do not require any connections.

4. FUNCTION DESCRIPTIONS

This chapter describes the application of the Tests available in the MKII Tachograph Programmer, gives details of the connections required for each and provides a step-by-step instruction guide for each function for the inexperienced user.

4.1 *Enter PIN Code.*

In order to read or inject pulses or to write data via the front programming connector of a digital tachograph, the tachograph must be put into calibration mode. Calibration mode consists of a valid workshop card being inserted into the tachograph, and a PIN code entered.

In the case of the SE5000 the PIN code can be entered either through the tachographs keypad, or via the programmer. A PIN code function is available through the Main Menu, but the programmer may also prompt for a PIN code if a function is attempted while the tachograph is not in calibration mode.

Entering a PIN through the programmer operates in a similar manner to SMS messaging. Continually pressing a key will cycle through a list of characters under that key. Pressing a new key or waiting for approx 5 seconds, will move to the next character. Pressing Enter will ask the tachograph to authenticate the PIN. If too many characters are entered, use the arrow and delete keys to correct.

The list of characters under each key is detailed in Annex D

In the case of the DTCO the PIN code can only be entered through the tachograph keypad.

Insert the workshop card into the tachograph, and insert the front connector from the programmer into the Tachograph.

From the MAIN MENU select ENTER PIN using the ← and → keys. Press ENTER.	SE5000 MAIN MENU :ENTER PIN
The programmer should request the code to be entered. Enter the correct Code for the workshop card and Press Return	Enter PIN :

4.2 *W-factor (Vehicle Characteristic Coefficient) Determination*

The MKII Tachograph Programmer can use three different methods of determining the W-factor for a vehicle, namely Rolling Road, Fixed Distance #1 and Fixed Distance #2. In each case the W-factor (revs/km for a 2-pulse sender or pulses/km for other senders) is determined and displayed. Where appropriate the correct setting of the tachograph DIL switches is indicated.

The choice of the method to be used will depend on the other facilities available. However, the connections between Programmer and tachograph or sender are the same for all three of the calibration methods used:

Table 2: W-factor Test connections

Tachograph	Harness	Connection
Stoneridge VR2400 Series	U or D	Connect to front of tachograph or directly to the vehicle sender.
Stoneridge VR8400/8300 Series,	G + clip J or D only	Jack plug of harness G to socket inside front of Tachograph DIN plug of harness G to Programmer socket A; Use Crocodile clip J to make required ground connection to a suitable point on the vehicle.
Stoneridge VR1400 Series	K	DIN plug of harness K to Programmer socket A; connect appropriate black plug into socket on back of tachograph; connect other black plug directly to vehicle sender.
Kienzle 1314	G+J or L only	As 8400 or DIN plug of harness L to Programmer socket A; Connect appropriate white plug into socket on back of tachograph; Connect other white plug directly to vehicle sender.
Kienzle 1318	C or G+J	Jack plug of harness G to socket inside tachograph DIN plug of harness G to Programmer socket A; Use Crocodile clip J to make required ground connection to a suitable point on the vehicle. Or DIN plug of harness C to socket A on Programmer and other end to socket B of tachograph.

Tachograph	Harness	Connection
Kienzle 1319	C or G+O+J	Jack plug of harness G to socket on harness O and 8 way connector of O to socket inside tachograph. DIN plug of harness G to Programmer socket A; Use Crocodile clip J to make required ground connection to a suitable point on the vehicle. Or DIN plug of harness C to socket A on Programmer and other end to socket B of tachograph.
Kienzle1324	W	DIN plug to Programmer socket C. Other end to D-shaped socket on front of tachograph.
MotoMeter EGK-100	N	One DIN plug of harness N to Programmer socket A; Other DIN plug to MotoMeter programming socket.
SE5000/DTCO/ Smartach	Z	DIN plug to Programmer socket C. Other end to D-shaped socket on front of tachograph.
All tachographs (Fixed Distance #2 test)	Flexi-switch	Connect to Programmer socket B, and mount flexi-switch on vehicle chassis.

Where a suitable connection is not available on the front of the tachograph to read pulses from the sender, it is necessary to make a connection direct to the sender, using Harnesses **D** (Stoneridge VR8300/8400/2400/SE5000 series, Kienzle 1319/1324/DTCO Series and Actia Smartach), **K** (Stoneridge VR1400 series) and **L** (Kienzle 1314). The tachograph is bypassed completely when using these harnesses, and a separate ground connection is not required.

4.2.1 Rolling Road (Hartridge or similar)

This method uses the Tachograph Programmer in conjunction with a rolling road. The vehicle to be calibrated is positioned with its driving wheels on the rollers of the rolling road and is then **driven at a constant speed of 50km/h**. The Tachograph Programmer will then determine the W-factor.

Procedure

Select ROLLING ROAD from the Main Menu, and follow the instructions as displayed below;

From the MAIN MENU select ROLLING ROAD (shortcut key 1) using the ← and → keys. Press ENTER.	VR2400 MAIN MENU :ROLLING ROAD
Increase the speed of the vehicle as indicated by the rolling road equipment until it is steady at 50km/h.	Hold at 50km/h ENTER to Start
Press ENTER and the Programmer will start counting pulses. The pulses will be audible as low-pitched clicks.	Hold at 50 km/h Reading pulses
After about 15 seconds it will emit an audible beep and the measured W-factor will be displayed. If appropriate for the selected tachograph type the measured K-factor and the required DIL switch setting will be displayed. For Stoneridge VR2400/SE5000, Kienzle 1319/DTCO, MotoMeter EGK-100 and Actia Smartach tachographs the required W-factor will be retained in the Programmer (until the Programmer is turned off) ready for later programming of the tachograph, as described in Chapter 5.	W=8000 K=8000 DIL= 23 9
Note: In the case of the message ERROR! CHECK CONNECTIONS being displayed, ensure that the ground connection is made correctly. Otherwise check the other connections.	ERROR! CHECK CONNECTIONS

4.2.2 Fixed Distance Method No. 1

This method typically uses the 20m measured distance often available at tachograph fitting stations, but it is possible to set to any distance from 20 to 1000m as required. The Fixed Distance Length can be adjusted via the Diagnostics Menu (see Section 2.6).

Care must be taken to ensure that the Fixed Distance Length set and the actual track length are the same, otherwise the W-Factor determined will be incorrect.

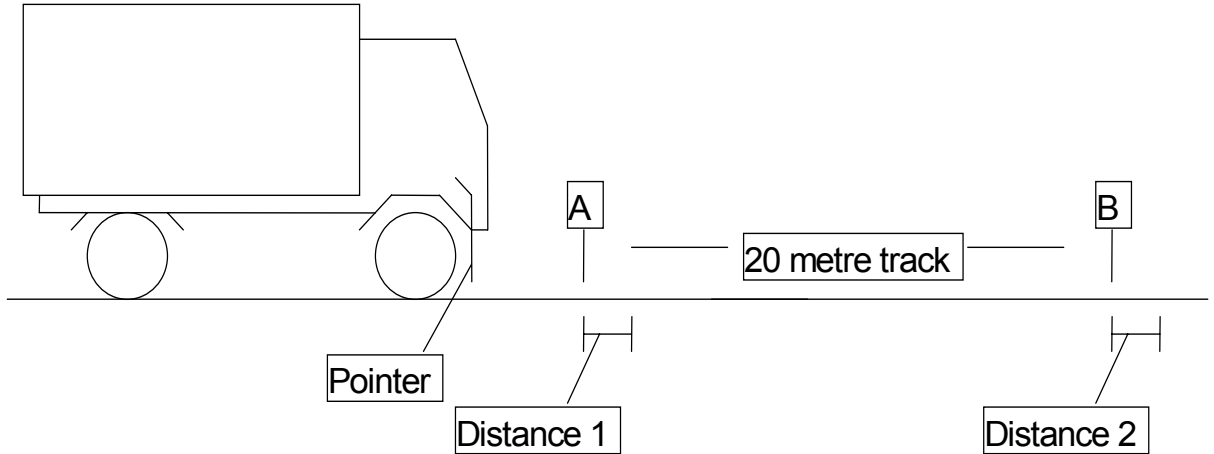
The vehicle is driven along the measured track and measurements made at either end of the track are fed into the Programmer, from which the W-factor is determined.

Notes:

1. This method is only suitable for use where the pulser on the vehicle continues to produce pulses even when the vehicle is moving very slowly.
2. It is not suitable for use with many proximity senders.

3. It is not suitable for use with 80mph scale tachographs.
4. If testing a Kienzle 1319 tachograph, ensure that the km/h scale is selected (see Section 5.4 for details).

Procedure



To use Fixed Distance Method No. 1 reliably, a method is needed of indicating accurately when the vehicle is at the beginning and end of the measured distance. For the duration of the test some form of pointer should be attached to the vehicle with its pointing end close to the ground. The vehicle is driven such that the pointer passes directly over the marks at either end of the measured distance. It is then much easier to measure the distance between each mark and the point at which the next pulse occurs.

When attaching the pointer to the vehicle it is preferable to fix it to a point rigidly attached to the chassis (e.g. the end of the front bumper) and not to the cab which is often sprung.

Select FIXED DISTANCE #1 from the Main Menu, and follow the instructions displayed in the step-by-step details of the procedure that follow;

Select FIXED DISTANCE #1 on the MAIN MENU (shortcut key 2) using the ← and → keys, and press ENTER.	VR8400 MAIN MENU :FIXED DIST #1
Move the vehicle to the beginning of the 20m track (position A) such that the pointer is over the marker at the beginning of the track and then press ENTER.	Drive to point A Press <ENTER>
Move the vehicle slowly forward until an audible beep is heard indicating that a pulse has been received. Stop the vehicle and press ENTER.	<ENTER> when new pulse received

Measure in mm the distance just moved by the vehicle from point A. Key this distance into the Programmer as Distance 1 and press ENTER to terminate the entry.	Enter Distance 1 : mm
Move the vehicle to the end of the 20m track (position B), again so that the pointer is over the marker, and press ENTER. Low-pitched clicks will be heard as the pulses are received.	<ENTER> when at position B
Move the vehicle slowly forward again until a louder audible beep is heard indicating that a pulse has been received. Stop the vehicle and press ENTER.	<ENTER> when new pulse received
Measure in mm the distance just moved by the vehicle from point B. Key this distance into the Programmer as Distance 2 and press ENTER to terminate the entry.	Enter Distance 2 : mm
The W-factor measured for run #1 will be displayed. Press ENTER.	End of run #1 W factor = 8005
Repeat steps 2 to 7, this time moving back from point B to point A.	
Repeat steps 2 to 7 once more in each direction giving a total of two runs in each direction. The measured W-factor will be displayed at the end of each run. After keying in the last distance and pressing ENTER, the W-factor for the last run will be displayed. Press ENTER again and the average of the measured W-factors for the four runs will be displayed, as well as the K-factor.	W=8000 K=8000 DIL=_23_ 9_

The required W-factor will be retained in the Programmer (until the Programmer is turned off) ready for later programming of the tachograph.

If appropriate for the selected tachograph type the required DIL switch setting will also be displayed. For Stoneridge VR2400/SE5000 Series, Kienzle 1319/DTCO, MotoMeter and Actia Smartach tachographs the required W-factor will be retained in the Programmer (until the Programmer is turned off) ready for later programming of the tachograph.

Note: For best accuracy two runs should be carried out in each direction rather than four in one direction since this will take account of any slight gradient of the track.

4.2.3 Fixed Distance Method No. 2

This method typically uses the 20m measured distance often available at tachograph fitting stations, but it is possible to set to any distance from 20 to 1000m as required. The Fixed Distance Length can be adjusted via the Diagnostics Menu (see Section 2.6).

Care must be taken to ensure that the Fixed Distance Length set and the actual track length are the same, otherwise the W-Factor determined will be incorrect.

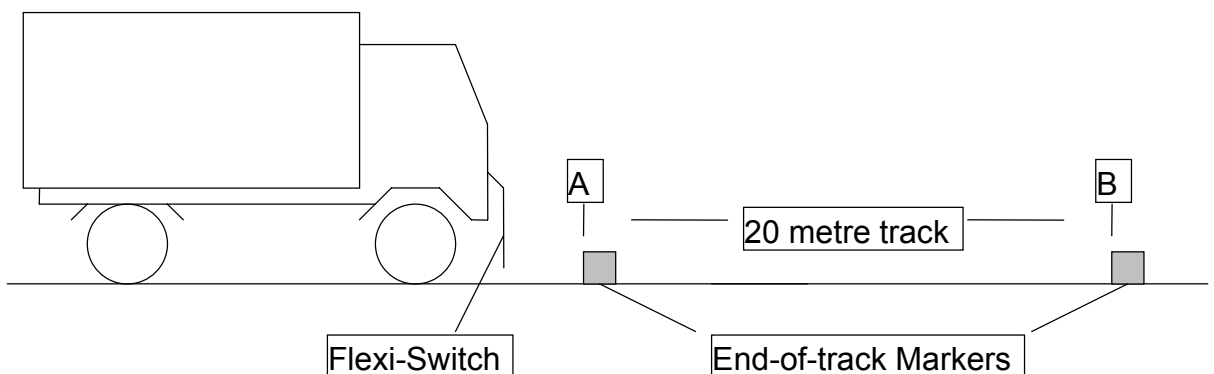
The vehicle is driven along the measured track but all measurements are automatically carried out by the Programmer, which then automatically determines the W-factor.

To simplify the measurements at each end of the measured distance a flexi-switch is used which makes contact with a marker at each end of the track. There is then no requirement for any operator intervention - the only requirement is to drive the vehicle the length of the track at a reasonably constant speed (roughly walking pace) such that the flexi-switch hits the markers at either end of the track.

Note: this method is not suitable for use with 80mph scale tachographs. If testing a Kienzle 1319 tachograph, ensure that the km/h scale is selected (see Section 5.4 for details).

Benefits of Fixed Distance Method No. 2

- Easy to use. No manual intervention required.
- Works with all types of pulser including those which stop generating pulses at low speeds.
- Cheap to use - avoids the need to invest in a rolling road
- Very accurate. The measurement accuracy is significantly greater than that of a rolling road. This method can thus be used to check the accuracy of a rolling road.



Procedure

Fixed Distance Method No. 2 requires the vehicle to be driven such that a flexi-switch attached to the vehicle strikes a marker at either end of the fixed track. To maintain the measurement accuracy the flexi switch should be attached to a part of the vehicle rigidly attached to the chassis such as the front bumper.

Ideally the flexi-switch should be mounted with its operating lever pointing vertically downwards and the markers should be placed on the ground. Alternatively, the flexi-switch may be mounted with its operating level pointing horizontally to strike against vertical posts.

The markers at either end of the track are best implemented using wooden or concrete blocks, ideally about 1m long with sides 100 to 150mm. Steel joist material is particularly suitable. The requirement is to have a marker which will have a well defined point of contact with the flexi-switch and which will not move during the test.

Although it is perfectly acceptable to mount the flexi-switch on the side of the vehicle with the markers to the side of the vehicle, some difficulty may be experienced in ensuring that the switch hits the markers repeatedly. A better arrangement is to mount the switch centrally on the front of the vehicle and arrange the markers such that the vehicle passes directly over them.

Select FIXED DISTANCE #2 from the Main Menu, and follow the instructions displayed in the step-by-step details of the procedure that follow;

Select FIXED DISTANCE #2 on the MAIN MENU (shortcut key 3) using the ← and → keys, and press ENTER.	KZ1319 MAIN MENU :FIXED DIST #2
Move the vehicle to a position a short distance before the beginning of the 20m track (position A) such that the flexi-switch lever is in line with the marker at the beginning of the track and then press ENTER.	Drive to point A Press <ENTER>
Drive the vehicle at a reasonably constant speed past markers at points A and B. A low pitched click will be heard as each pulse is received and, at the same frequency as the clicks, a visual indicator will be displayed as shown. When a marker is passed a louder audible beep will be heard.	Drive to point B Reading pulses . Drive to point B Reading pulses □ Drive to point B Reading pulses □
After the second marker has been passed the Programmer will display the measured W-factor for that run. Stop the vehicle and press ENTER.	End of run #1 W-factor = 8000
Repeat steps 2 and 3, this time moving back from position B to position A.	Drive to point B Press ENTER
Repeat steps 2 and 3 once more in each direction giving a total of two runs in each direction. After passing the last marker the W-factor for the last run will be displayed.	End of run #4 W-factor = 8000

Press ENTER again and the average of the measured W-factors for the four runs will be displayed as well as the K-Factor. If appropriate for the selected tachograph type the required DIL switch setting will also be displayed.	W=8000 K=8000 DIL= 23 9
--	--

Note: For best accuracy two runs should be carried out in each direction rather than four in one direction since this will take account of any slight gradient of the track. The repeatability of the Fixed Distance Calibration No 2 method is such that the effect of a slight gradient of the fixed track is easily measurable. By taking the average of runs in opposite directions the effect of the gradient is removed.

4.3 Bench Test (Connections)

Before installation and during recalibration it is necessary to carry out a bench test of the tachograph. This requires the unit to be run at different speeds for different periods of time and with different driver duty modes selected. The Tachograph Programmer provides a test signal simulating the pulser output which gives the required speed outputs for the required times. The only operator intervention is then to set the duty switches at the appropriate times as indicated by the Programmer.

Connections

During a bench test the Programmer simulates the output from a vehicle speed/distance sender. The harness suitable for connection to the sender input of the tachograph should therefore be selected:

Table 3 : Bench Test connections

Tachograph	Harness	Connection
Stoneridge VR2400, VR8300 Series	C	DIN plug to Socket A of Programmer; other end of harness to appropriate connector on rear of tachograph.
Stoneridge VR8400 Series and Kienzle 1318 Series	C or G+S+J	<p>As above or</p> <p>Jack plug of harness G to socket of harness S and jack plug of S to socket inside tachograph</p> <p>DIN plug of harness G to Programmer socket A;</p> <p>Use Crocodile clip J to make required ground connection to a suitable point on the vehicle.</p>

Tachograph	Harness	Connection
Kienzle 1319 Series	C or G+O+J	As above or Jack plug of harness G to socket of harness O and 8-way connector to socket on tachograph DIN plug of harness G to Programmer socket A; Use Crocodile clip J to make required ground connection to a suitable point on the vehicle.
Stoneridge VR1400 Series	K	DIN plug to Socket A of Programmer; other end of harness to appropriate connector on rear of tachograph and to vehicle sender.
Kienzle 1314 Series	L or G+T+J	DIN plug to Socket A of Programmer; other end of harness to appropriate connector on rear of tachograph and to vehicle sender. Or Jack plug of harness G to socket of harness Tand jack plug of S to socket inside tachograph DIN plug of harness G to Programmer socket A; Use J to make a suitable ground connection
Kienzle1324 Series	O or C	DIN plug to socket A of Programmer; other end of harness to appropriate connector on rear of tachograph and to vehicle sender. Or DIN plug to Socket A of Programmer; other end of harness to appropriate connector on rear of tachograph.
Motometer EGK100	C+ adapter M or N	DIN plug of harness C to Socket A of Programmer; other end to appropriate connector on rear of tachograph through adapter M. Or one end of N to socket C on Programmer and other end to Socket on Tachograph.
SE5000/DTCO/ Smartach	Z	DIN plug to programmer socket C. Other end to D-shaped socket on front of tachograph.

Procedure

The Bench Test routines in the MKII Tachograph Programmer are designed to lead the operator through the test without reference to other documents and wherever possible to automate the tasks. The Bench Test is carried out with the tachograph removed from or in the vehicle.

Standard UK, French, German, Swedish, Dutch, Belgian tests, or a Custom test are available. A Bench-Test Type can be selected via the Diagnostics Menu (see Section 2.6 for details). Note that the bench test procedure used for the digital tachographs varies from other tachograph types. For step-by-step details of the different Bench-test procedures see Annex B.

4.4 Distance Test

The Distance Test function is used to test the accuracy of the distance recording by injecting pulses simulating a distance travelled of 1000m.

The distance test is specific to the SE5000, DTCO and Smartach tachographs.

Select Distance Test from the MAIN MENU and press ENTER	SE5000 MAIN MENU :DISTANCE TEST
At the beginning of the test the odometer (High Resolution Total Vehicle Distance) of the tachograph is read and stored in the programmer.	Reading data
Find the K-factor that the tachograph is currently set to. Press the DELETE key, and key this value into the Programmer. Then press ENTER.	Select K-factor :8000 Pul/km?
The programmer sends a message to allow speed pulses to be output through the front of the tachograph. If the Tachograph is already in Calibration Mode (or if it is non-activated) the PIN will NOT be requested. If the Programmer is not in Calibration mode, the workshop card should be inserted into the tachograph and the PIN code entered.	Sending data
Speed pulses are output to simulate 50km/h for 72 seconds	Speed: 50 km/h Time: 72s
At the end of the test the odometer (High Resolution Total Vehicle Distance) of the tachograph is read and stored in the programmer.	Reading data
The total distance the tachograph has recorded is then calculated, and the accuracy displayed (to +/- 1%)	Distance = 1000m +0%

4.5 Speed Simulator

The speed simulator function is used to inject speed pulses into the tachograph. This can be used to check the accuracy of the tachograph speed pointer or speed stylus position. The final distance displayed also enables the tachograph odometer to be checked. When the tachograph is still fitted in the vehicle, the speed simulator function is also useful for verifying the operation of speed or distance related ancillaries such as the Road Speed Limiter.

Connections

These are the same as for the connections for the Bench test (see Table 3 in section 4.2). Additionally, the pulses can be injected into the front of tachographs still fitted in the vehicle but only if the engine is switched off (connections in this case are the same as for the K-factor Test - see Table 10 in section 4.14).

Procedure

Select SPEED SIMULATOR from the Main Menu, and follow the instructions displayed in the step-by-step details of the procedure that follow;

Select SPEED SIMULATOR from the MAIN MENU and press ENTER	VR2400 MAIN MENU :SPEED SIMULATOR
Find the K-factor that the tachograph is currently set to. Press the DELETE key, and key this value into the Programmer. Then press ENTER. Instructions for determining the K-factor are given in section 4.14	Select K-factor :8000 Pul/km?
Key in the speed required and press ENTER. Note that there is a minimum detectable speed for each tachograph type, which depends on the K-factor but may be up to 20km/h. Below this, the speed will reset to 0km/h.	Enter speed : km/h
The Programmer will now inject speed pulses into the tachograph.	K=8000 Pul/km Speed=50 km/h
Use the ↑ and ↓ (7 and 4) keys to increase or reduce speed.	K = 8000 Pul/km Speed=51 km/h
When done press ENTER. The unit will now display the total distance covered (in metres).	Distance=1090 m Press <ENTER>
Press ENTER to key in a new speed or MENU to return to the MAIN MENU.	VR2400 MAIN MENU :SPEED SIMULATOR

4.6 Revs per minute pulse test

When fitting a tachograph which records engine speed (i.e. 4-stylus or EVENT tachograph) it is necessary to determine the number of pulses received by the tachograph for each revolution of the engine. The tachograph can then be programmed accordingly.

Connections

Table 4 : RPM Pulse Test connections

Tachograph	Harness	Connection
Stoneridge and Kienzle 4-stylus models (remove the grey seal for VR8300 and VR8400 models)	E	DIN plug to Socket A of Programmer; remove the existing plug from socket C on the tachograph and connect it to the harness socket; Connect the red harness plug to socket C on rear of tachograph.
Kienzle 1324 Series	W	DIN plug to socket C on Programmer. D-shaped connector to socket on front of tachograph
Motometer EGK100	G+ adapter Q + clip J	DIN plug of harness G to Socket A of Programmer; jack to socket D on rear of tachograph through adapter Q. Note that the tachograph is not in the circuit. Use Crocodile clip J to make required ground connection to a suitable point on the vehicle.

Procedure

Select RPM PULSE TEST from the Main Menu, and follow the instructions displayed in the step-by-step details of the procedure that follow;

From the MAIN MENU select RPM PULSE TEST (shortcut key 5).	VR8400 MAIN MENU :RPM PULSE TEST
Start the vehicle engine and run it at 1000 rpm.	Hold 1000 RPM ENTER to start
Whilst holding 1000rpm press ENTER on the Programmer. The unit will indicate Reading pulses.	Hold 1000 RPM Reading pulses
At the end of the test the measured PPR value will be displayed.	End of RPM test PPR = 8.0
Press ENTER or MENU to return to the MAIN MENU.	VR8400 MAIN MENU :RPM PULSE TEST

4.7 Clock Test

Most Benchtest procedures include the requirement to check the accuracy of the internal clock. There are two different methods of determining the clock accuracy of Tachographs, and these two methods are described as follows.

4.7.1 Clock Test – Motometer, Stoneridge VR2400/SE5000, Kienzle 1324/DTCO and Actia Smartach

When checking one of the above tachograph types, the accuracy of the internal clock may be checked as described in this Section. It is also very important with the 2400 to check that the chart is in synch with the internal clock once the clock has been checked.

Connections

Table 5 : Clock Test Connections (2400, SE5000, 1324, DTCO, EGK100 and Smartach)

Tachograph	Harness	Connection
Stoneridge VR2400 Series	U	DIN plug to socket C on the Programmer and the D-shaped connector to the socket inside the front of the tachograph
Kienzle 1324	W	DIN plug to socket C on the Programmer and the D-shaped connector to the socket on the front of the tachograph
Motometer EGK-100	N	One end to socket C on Programmer and other end to Socket on tachograph
SE5000/DTCO/ Smartach	Z	DIN plug to programmer socket C. Other end to D-shaped socket on front of tachograph.

Procedure

Select CLOCK TEST from the Main Menu, and follow the instructions displayed in the step-by-step details of the procedure that follow;

From the MAIN MENU select CLOCK TEST (shortcut key 4) using the ← and → keys. Press ENTER to start the test.	EGK100 MAIN MENU :CLOCK TEST
The Programmer will display the message Testing clock.	Testing clock
After a few moments the clock accuracy in seconds per day will be displayed.	Clock Accuracy +0.2s/day

In the case of lack of signal from the tachograph (caused by such as a faulty connection to the tachograph), the Programmer will display an error message.	ERROR! No signal Press <ENTER>
--	---

4.7.2 Clock Test – Stoneridge VR8400/8300 Series and Kienzle 1314/1318/1319

Connections

Clock Tester to Programmer socket C. Set both duty knobs to Rest. Ensure that the tachograph is powered and the speed pointer is at rest. Hold the adapter against the tachograph face, and move it around until it makes a regular clicking sound - this is the correct location. Please note that the correct location is not necessarily near the clock face, as the Tester detects the clock motor (this is why the duty knobs must be at Rest and the pointer at zero - otherwise the Tester may detect the chart motor instead of the clock motor). Similarly, the Tester must not be within 12 inches of a mains transformer.

Procedure

Select CLOCK TEST from the Main Menu, and follow the instructions displayed in the step-by-step details of the procedure that follow;

From the MAIN MENU select CLOCK TEST (shortcut key 4) using the ← and → keys. Hold the Tester at the correct location on the Tachograph face (as described above). Press ENTER to start the test.	KZ1314 MAIN MENU :CLOCK TEST
The Programmer will display the message Testing clock, and will make a regular clicking sound.	Testing clock
After a short time the clock accuracy in seconds per day will be displayed.	Clock Accuracy +0.2s/day
In the case of loss of signal or inconsistent signal from the tachograph (usually caused by movement of the Tester away from the clock motor), the Programmer will display an error message.	ERROR! No signal Press <ENTER>

4.8 Serial Data

This feature provides monitoring of the serial output of Stoneridge VR8300, VR8400, VR2400 and SE5000 tachographs via the serial data output and displays settings within the tachograph.

Connections

Table 6 : Serial Data Test connections

Tachograph	Harness	Connection
Stoneridge VR2400/SE5000 Series	X + H + clip J	Use X to connect red plug of harness H to connect D on rear of tachograph; Use crocodile clip J to make required ground connection to a suitable point on the vehicle, or to negative connection of the tachograph.
Stoneridge VR8400 series models only	H + clip J	DIN plug to Socket B of Programmer; red plug to serial data socket (next to DIL switches); Use Crocodile clip J to make required ground connection to a suitable point on the vehicle, or to negative connection of the tachograph.
Stoneridge VR8300 or VR8400 series models	F+ H + clip J	Use F to connect red plug of harness H to connector D on rear of tachograph; Use Crocodile clip J to make required ground connection to a suitable point on the vehicle, or to negative connection of the tachograph.

Note: The serial data connections on the front and rear of the VR8400 tachograph are connected in parallel. If anything is connected to the rear socket this may affect the signal levels available to the Programmer at the socket next to the DIL switches.

Procedure

Select SERIAL DATA from the Main Menu, and follow the instructions displayed in the step-by-step details of the procedure that follow;

From the MAIN MENU select SERIAL DATA using the arrow keys ← → and press ENTER.	VR2400 MAIN MENU :SERIAL DATA
Press the ← or → key and observe the display after each press. Each display shows settings within the tachograph. If an error message is displayed, then check the connections.	SERIAL DATA MENU ERROR! No data
Press the MENU key to return to the MAIN MENU.	VR2400 MAIN MENU :SERIAL DATA

4.9 CANBus Data

This feature provides monitoring of the output of the Stoneridge VR2400/SE5000 and the Kienzle 1324 tachographs via the CANBus data output and displays the settings within the tachograph.

Table 7: CANBus data connections

Tachograph	Harness	Connection
Stoneridge VR2400/SE5000	V	Remove existing plug from socket A on the tachograph and connect it to the harness socket. Connect the white harness plug to socket A on tachograph.
Kienzle 1324	V	As above

Procedure

Select CANBus data from the MAIN MENU, press ENTER and follow the instructions displayed in the step-by-step details of the procedure that follow;

From the MAIN MENU select CANBUS DATA by using the ← and → keys. Press ENTER to get into the CANBUS DATA MENU.	VR2400 MAIN MENU :CANBUS DATA
Customer Type - Press ENTER and use the ← and → keys to select the CANBus type required. Press ENTER to confirm the selection. Options are: ISO, Renault, Scania, MAN, DC, VW, DAF, Volvo Bus and Volvo AH. Note the customer type will not be requested for the SE5000.	Customer type :ISO ← →
Press ENTER and use the ← and → keys to observe the displays. Each display shows the different settings in the tachograph.	CANBUS DATA MENU
If an error message is displayed then check the connections.	CANBUS DATA MENU ERROR! NO DATA
Press the menu key to return to the MAIN MENU.	VR2400 MAIN MENU :CANBUS DATA

4.10 Pair/Test Tacho.

This function allows several functions in the tachograph to be tested, such as; Display Test, LCD negative, Printer Test, Hardware Test, Card Reader, Button Test. This function also allows the Sender to be paired.

Select PAIR/TEST from the main menu and press ENTER.	SE5000 MAIN MENU :PAIR/TEST
--	--

Use the ← and → to select the test you wish to perform, and press ENTER to start the test. Note : The tachograph has to be in calibration mode (or non-activated). If the tachograph is unable to perform a test for some reason, the programmer will respond with 'Transfer FAIL'.	PAIR/TEST :Display Test
The programmer will monitor the progress of the test.	Sending Data ...
At the end of the test the 'Data Transfer OK' message should be displayed.	Sending Data Data Transfer OK

4.11 Tacho Control

For the Stoneridge VR8400 series, this menu option can be used to initiate the Self Test or Extended Test modes of the tachograph. It can also be used to reset the tachograph memory to the default state.

For the Stoneridge VR2400, this can be used to reset the tachograph or pair the sender.

For the Kienzle 1324 Series, this can be used to pair the sender.

Connections

Table 8 : Tacho control Connections

Tachograph	Harness	Connection
Stoneridge VR2400 Series	U	8-pin DIN to socket C on the programmer and the D-shaped connector to the socket inside the front of the tachograph.
Stoneridge VR8400 Series	G	5-pin DIN plug to socket A on the Programmer. Connect the jack plug to the jack socket inside the front of the tachograph. A ground connection is also needed to the harness black wire. Clip J may be used to aid connection to a suitable vehicle ground point.
Kienzle 1324	W	The 8-pin DIN plug to socket C on the Programmer and the D-shaped connector to the socket on the front of the tachograph

Procedure

Select TACHO CONTROL from the Main Menu, and follow the instructions displayed in the step-by-step details of the procedure that follow;

Select TACHO CONTROL on the MAIN MENU by using the ←and → keys, and	VR 2400 MAIN MENU :CONTROL MENU
---	--

press ENTER.	
From the CONTROL MENU make the required selection - using the arrow keys ← and → to select Reset Tacho or PAIR SENDER . Press ENTER to send the instruction to the tachograph.	CONTROL MENU : Pair Sender
In the case of Reset Defaults, the programmer will cause the tachograph to simulate a Power Off/On Condition.	CONTROL MENU :Reset Defaults
In the case of pair sender, press ENTER and the sender will pair automatically within 60 seconds. Note: When paired to the encrypted sender, the tachograph recognises only that sender. The signal from the sender becomes unique to that tachograph.	Sending data Data transfer OK

4.12 Identify Tacho – Stoneridge VR2400/SE5000 Series, Kienzle 1324/DTCO and Actia Smartach

This function interrogates Stoneridge VR2400/SE5000, Kienzle 1324/DTCO or Actia Smartach tachographs via the K-line. Parameters that can be determined are the System supplier, Manufacture date, Serial number and Hardware version (all tachograph types) and Software number, Software version and System name (all VR2400/SE5000 only).

Connections

Connect either Cable U between the Programmer and VR2400 Tachograph front connector, or Cable W between the Programmer and the 1324 Tachograph front connector, or Cable Z between the Programmer and the SE5000/DTCO/Smartach Tachograph front connector.

Procedure

Select IDENTIFY TACHO from the Main Menu, and follow the instructions displayed that follow;

From the VR2400 MAIN MENU use the ← and → keys to select IDENTIFY TACHO. Press ENTER and the Programmer interrogates the VR2400 tachograph. Use the ← and → keys to scroll through the available options.	VR2400 MAIN MENU :IDENTIFY TACHO
--	---

4.13 Read/Eraser DTCs – Stoneridge VR2400/SE5000 Series, Kienzle 1324/DTCO and Actia Smartach

This function enables the Diagnostic Trouble Codes in the tachograph to be displayed on the Programmer and then erased from the Tachographs memory if required. For a full list of VR2400 Tachograph DTCs please see Annex C.

Connections

Table 9 : Read/Erased DTCs Connections

Tachograph	Harness	Connection
Stoneridge VR2400 Series	U	8-pin DIN to socket C on the programmer and the D-shaped connector to the socket inside the front of the tachograph.
Kienzle 1324	W	The 8-pin DIN plug to socket C on the Programmer and the D-shaped connector to the socket on the front of the tachograph
SE5000/DTCO/Smartach	Z	The 8-pin DIN plug to socket C on the Programmer and the D-shaped connector to the socket on the front of the tachograph

Procedure

Select Read/Erased DTCs from the Main Menu, and follow the instructions displayed in the step-by-step details of the procedure that follow;

Select READ/ERASE DTCS on the MAIN MENU by using the ← and → keys, and press ENTER. If no connection is made, an error Message will be displayed, before returning to the Main Menu.	VR 2400 MAIN MENU :READ/ERASE DTCS TRANSFER FAILURE
If the connections are made, the programmer will read the DTCs data from the Tacho and messages will be displayed to indicate this.	Reading Data Please Wait
(2400 and 1324 tachographs) A typical DTC screen will then be displayed. Use the ↑ and ↓ (7 and 4) keys to check all the other DTCs stored. Press the DELETE key to delete individual DTCs stored (Note: this function VR2400 only)	DTC=A423 Cnt=1 14:42 10/07/2003

<p>(SE5000/DTCO tachograph)</p> <p>A typical DTC screen will then be displayed.</p> <p>Use the ↑ and ↓ (7 and 4) keys to check all the other DTCs stored.</p> <p>Press the DELETE key to delete individual DTCs stored.</p>	<p>002004 Cnt=1 14:42 03/02/2005</p>
<p>(Smartach tachograph)</p> <p>A typical DTC screen will then be displayed.</p> <p>Use the ↑ and ↓ (7 and 4) keys to check all the other DTCs stored.</p>	<p>DTC= 00200708</p>
<p>Press the MENU key to display the message shown.</p> <p>Press the ENTER key to delete all stored DTCs or the MENU key to return to the Main Menu without deleting any of the DTCs.</p>	<p>Press <ENTER> to clear DTCs</p>

4.14 K-Factor Test

This provides a simple way of determining the K-factor currently set on a tachograph. The test is applicable to Stoneridge VR8400 and Kienzle 1314, 1318 and 1319 ranges of tachograph. Note: with VR2400, SE5000, DTCO, 1324 and Smartach tachographs the K-factor can be read directly using Read All Data (see Section 5 for details).

Connections

Table 10 : K-factor Test Connections

Tachograph	Harness	Connection
Stoneridge VR8400 Series, Kienzle 1318	G+ clip J	<p>Jack plug of harness G to socket inside front of Tachograph.</p> <p>DIN plug of harness G to Programmer socket A;</p> <p>Use Crocodile clip J to make required ground connection to a suitable point on the vehicle</p>
Kienzle 1314	G+ clip J	<p>Jack plug of harness G to socket inside front of Tachograph;</p> <p>DIN plug of harness G to Programmer socket A;</p> <p>Use Crocodile clip J to make required ground connection to a suitable point on the vehicle</p>

Tachograph	Harness	Connection
Kienzle 1319	O+ G+ clip J	4-pin rectangular connector of harness O to socket inside front of Tachograph; other end to harness G. The 4-pin connector will fit either way up, but only one orientation is correct - this is indicated as a small cross marked on the connector. When inserting the adapter, the cross should face upwards; DIN plug of harness G to Programmer socket A; Use Crocodile clip J to make required ground connection

Procedure

Select K-FACTOR TEST from the Main Menu, and follow the instructions displayed in the step-by-step details of the procedure that follow;

From the MAIN MENU select K-FACTOR TEST (shortcut key 6) using the ← and → keys.	VR 8400 MAIN MENU :K-FACTOR TEST
Press ENTER. The Programmer will first display Sending pulses, please wait.	Sending pulses Please wait
After a few moments the Programmer will beep, and then display the K-factor setting of the tachograph. If the K-factor is different from the previous test, then the Programmer will beep and display "<>".	Sending pulses K = 8000
Step 3 will then repeat until the MENU or ENTER button is pressed. Three repetitions are recommended. If a significantly different K-factor (>10 pulses/km difference) is displayed, this usually indicates a cable fault or bad connection. It may also be due to a faulty tachograph.	Sending pulses K = 8000
Note: In the case of the message ERROR! CHECK CONNECTIONS being displayed, ensure that the ground connection is made correctly. Otherwise check the other connections.	ERROR! CHECK CONNECTIONS

4.15 DIL Calculate

For the Stoneridge VR8400/8300/1400 and Kienzle 1318 tachographs the K-factor is set using a bank of 10 DIL switches (except the VR1400, which has 8). The DIL Calculate function determines the appropriate combination of switches for any K-factor, thus avoiding the need to use calibration tables.

If a tachograph type has been selected which does not use DIL switches for calibration then this menu option is not available.

Connections

No connections are required whilst calculating the appropriate DIL switch settings.

Procedure

Select DIL CALCULATE from the Main Menu, and follow the instructions displayed in the step-by-step details of the procedure that follow;

From the MAIN MENU select DIL CALCULATE using arrow keys ← → and press ENTER.	VR8400 MAIN MENU :DIL CALCULATE
With the unit display as shown, press ENTER.	W=8000 K=8000 DIL = _23__ _9_
The W-factor of the vehicle may then be entered using the numeric keys; terminate the entry by pressing ENTER again. Note: W-factor determination functions are described in section 4.1.	Enter W-factor :
The exact K-factor setting will be displayed, together with the required settings of the DIL switches.	W=5000 K=5002 DIL = 12__ _6_89_

4.16 Time / Date.

This function allows the time and date to be set in the tachograph, but outside the normal calibration procedure. This test is applicable for the SE5000, DTCO and Smartach tachographs only.

Select TIME/DATE from the main menu and press ENTER.	SE5000 MAIN MENU :TIME/DATE
Current time - Press ENTER and a cursor will flash. Key in the current time and press ENTER.	Current time :10:35
Current date - Press ENTER and a cursor	Current date

will flash. Key in the current date and press ENTER.	:19/10/2003
Time offset - Press ENTER and use the up/down arrow keys to choose a time offset between +23:00 and -23:00 hours and +59 and -59 minutes.	Time offset :+1: +00
Press the Send key to send the data to the tachograph.	Sending data

5. PROGRAMMING A TACHOGRAPH

The method of programming a tachograph varies according to the type of tachograph. For earlier types of electronic tachograph, programming is generally carried out using internal DIL switches. Later types require an external Programmer to set some or all of the required parameters.

Of the types requiring an external Programmer, the MKII Tachograph Programmer supports programming of the Stoneridge VR8400/2400/SE5000 series, Kienzle 1319/1324/DTCO series, MotoMeter EGK-100 and Actia Smartach tachographs.

Note that in all cases the instructions suggest that, once settings have been altered, the SEND ALL DATA (shortcut key 9) command be used to transfer all the information at the end. It is, however, possible to send each individual setting after alteration by pressing the SEND key (except Kienzle 1319, EGK-100 and Smartach).

5.1 Programming Stoneridge VR8400 Series tachographs

Parameters which may be programmed

- Pulses Per engine Revolution (PPR) setting
- Low power Band
- Economy band
- Poor Economy
- Ignition-on recording
- Overspeed

Connections

Table 11: VR8400 series Programming connections

Tachograph	Harness	Connection
Stoneridge VR8400 Series	G+J	DIN plug to Programmer socket A; Jack plug to socket inside front of tachograph Crocodile clip to make required ground connection to a

Tachograph	Harness	Connection
		suitable point on the vehicle, or to the negative connection of the tachograph power supply.

Procedure for Standard and Engine Speed (RPM) Recording Versions

From the MAIN MENU select PROGRAM TACHO and press ENTER.	VR8400 MAIN MENU :PROGRAM TACHO
Pulses per Rev - Press ENTER and the cursor will appear on the display. Use the numeric keys to enter the required value. This is usually 8 pulses per rev.	Pulses per Rev :8
Engine Speed Recording - Select each of the engine speed recording bands (Low Power, Economy and Poor Economy) in turn. Press ENTER and characters ← → will appear. Use the ← and → keys to select the required value and terminate by pressing ENTER. Note: that the Programmer will not allow entry of inconsistent engine speed bands. For example, the user may not set a minimum speed for the Economy band which is lower than the speed defined for the Low Power band.	Low Power band :700 Revs/min Economy band :900 Revs/min Poor Economy :1100 Revs/min
Ignition On Record - Press ENTER and ← → will appear on the display. Use the ← or → keys to select ON or OFF and press ENTER to terminate the selection.	Ign On Record :OFF
Overspeed - Press ENTER and a cursor will flash. Key in the required overspeed value and terminate the entry by pressing ENTER.	Overspeed :80 km/h
Select SEND ALL DATA (shortcut key 9) from the main menu and press ENTER.	VR8400 MAIN MENU :SEND ALL DATA

Send All Data

When programming the tachograph, the values may be entered in turn, and then all sent to the tachograph at once.

From the MAIN MENU select SEND ALL DATA (shortcut key 9) and press ENTER.	VR8400 MAIN MENU SEND ALL DATA
Press ENTER to confirm that you wish to	Are you sure?

reprogram the tachograph, or MENU to cancel.	ENTER to program
Select the required scale type and press Enter. Options are: 125km/h,140km/h, 80mph, 160km/h.	Select the scale :125 km/h ← →
On completion of the data transfer the Programmer will emit an audible beep and will indicate Data Transfer OK.	Sending data Data transfer OK

5.2 Programming Stoneridge VR2400 Series tachographs

Parameters which may be programmed

Please note to select the SENDER TYPE option in the VR2400 MAIN MENU select the **PULSER SELECT** option (see section 2.9 for details).

- K-factor
- Odometer reading
- Pulses per engine Revolution
- Engine Speed Recording
- CANBus RPM
- RPM display
- Odo leading 0s
- Overspeed flash
- DTCs enabled
- Overspeed
- Current time
- Current date
- Time Offset
- Output shaft factor
- 4th chart trace
- CANBus enabled
- Customer type
- Dual axle
- Dual axle ratio
- Speedo OP factor
- D6 pin function
- Serial comms
- Ign On Record
- Crew auto duty
- 7 day eject PIN
- VIN
- Service Delay
- Install date
- Reset Heartbeat
- Analogue Revs
- Pin D4 Function
- Low Speed Limit
- Kline Speedo

2400 Programming Connections

Table 12: 2400 series Programming connections

Tachograph	Harness	Connection
2400	U	Connect DIN plug to socket C on the Programmer and the D-shaped connector to the socket inside the front of the tachograph

Procedure

Select READ ALL DATA (shortcut key 7) from the main menu and press ENTER.	VR2400 MAIN MENU :READ ALL DATA
Select MODIFY DATA (shortcut key 8) from the main menu and press ENTER. Use the ← and → to select the parameter you wish to alter.	VR2400 MAIN MENU :MODIFY DATA
K-factor - Press ENTER and type in the new value. Press enter again to confirm the value.	K-factor :8000
Odometer reading - Press ENTER and key in the required new odometer reading. Bear in mind that the last digit entered is the tenths digit, thus a required reading of 100.0km should be entered as 1000.	Odometer :0001235.0
Pulses Per engine Revolution - Press ENTER and a cursor will flash. Key in the required PPR value and press ENTER. Bear in mind that the last three digits are thousandths and the number 19.000 must be typed in as 19000.	Pulses per Rev :19.000
Engine Speed Recording - Select each of the engine speed recording bands (Low Power, Economy and Poor Economy) in turn. Press ENTER and characters ← → will appear. Use the ← and → keys to select the required value and terminate by pressing ENTER. Note: that the Programmer will not allow entry of inconsistent engine speed bands. For example, the user may not set a minimum speed for the Economy band which is lower than the speed defined for the Low Power band.	Low Power band :700 Revs/min Economy band :900 Revs/min Poor Economy :1100 Revs/min

CANBus RPM - Press ENTER and use the ← and → keys to select ON or OFF. Press ENTER to confirm the selection.	CANBus RPM :Off ← →
RPM display - Press ENTER and use the ← and → keys to select ON or OFF. Press ENTER to confirm the selection	RPM display :Off ← →
Odo leading 0s - Press ENTER and use the ← and → keys to select ON or OFF. Press ENTER to confirm the selection	Odo leading 0s :Off ← →
Overspeed flash - Press ENTER and use the ← and → keys to select ON or OFF. Press ENTER to confirm the selection	Overspeed flash :Off ← →
DTCs enabled - Press ENTER and use the ← and → keys to select ON or OFF. Press ENTER to confirm the selection	DTCs enabled :Off ← →
Overspeed - Press ENTER and a cursor will flash. Key in the required over speed value and press ENTER.	Overspeed :100 km/h
Current time - Press ENTER and a cursor will flash. Key in the current time and press ENTER. The time can also be set via the keys on the fascia of the 2400 tachograph.	Current time :10:35
Current date - Press ENTER and a cursor will flash. Key in the current date and press ENTER. The date can also be set via the keys on the fascia of the 2400 tachograph.	Current date :19/10/2000
Time offset - Press ENTER and use the up/down arrow keys to choose a time offset between +23:00 and -23:00 hours.	Time offset :+1:00
Output shaft factor - It is not necessary to change this value.	O/P shaft factor :8.140
4th Chart Trace - Press ENTER and use the ← and → keys to select ON or OFF. Press ENTER to confirm the selection	4th chart trace :Off ← →
CANBus enabled - Press ENTER and use the ← and → keys to select ON or OFF. Press ENTER to confirm the selection	CANBus enabled :Off ← →
Customer Type - Press ENTER and use the ← and → keys to select the CANBus type required. Press ENTER to confirm the selection. Options are: ISO, Renault, Scania, MAN, DC, Ford, VW, DAF, Volvo Bus and	Customer type :ISO ← →

Volvo AH.	
Dual axle - Press ENTER and use the the ← and → keys to select ON or OFF. Press ENTER to confirm the selection.	Dual axle :Off
Dual Axle Ratio - Press ENTER and type the value of the Dual Axle Ratio required. Press ENTER to confirm the selection	Dual axle ratio :1.3750
Speedo OP factor - Press ENTER and a cursor will flash. Key in the required value and press ENTER.	Speedo OP factor :4971
D6 pin function - Press ENTER and use the ← and → keys to select OFF, Revs warning or Speedometer.	D6 pin function :OFF
Serial comms - Press ENTER and use the ← and → keys to select Standard data or Extended data.	Serial comms :Standard data ← →
Ignition on Record - Press ENTER and use the the ← and → keys to select ON or OFF. Press ENTER to confirm the selection.	Ign On Record :Off ← →
Crew auto duty - Press ENTER and use the the ← and → keys to select ON or OFF. Press ENTER to confirm the selection.	Crew auto duty :Off ← →
7 day eject PIN - Press ENTER and type the PIN. This must be 4 digits long. Press ENTER to confirm the selection, (for non EU use only).	7 day eject PIN :0000
VIN - Press ENTER and type the Vehicle Identification Number. This can be up to 17 characters long. Press ENTER to confirm the selection.	VIN :1234567890ABCDEFG
Service delay - Press ENTER and a cursor will flash. Key in the number of WEEKS left until compulsory recalibration of the tachograph and press ENTER.	Service delay :104 weeks
Install date - Press ENTER and a cursor will flash. Key in the date of installation of the tachograph and press ENTER.	Install date :25/09/2001
Reset Heartbeat - Press ENTER and use the ← and → keys to select ON or OFF. Press ENTER to confirm the selection. Note: when set to ON the vehicle cluster presence is confirmed by the tachograph.	Reset Heartbeat :Off ← →
Analogue Revs - Press ENTER and use the	Analogue Revs

← and → keys to select ON or OFF. Press ENTER to confirm the selection.	:On ← →
Pin D4 Function - Press ENTER and use the ← and → keys to select the Pin D4 function required. Press ENTER to confirm the selection from: Off, Dynafleet, Low Speed, Functions, DTC Warning and Chart Change.	Pin D4 Function :Off ← →
Low Speed Limit - Press ENTER and a cursor will flash. Key in the required low speed value and press ENTER.	Low Speed Limit :5 km/h
Kline Speedo - Press ENTER and use the ← and → keys to select the Kline Speedo function required. Press ENTER to confirm the selection. Options are: Off or On.	Kline Speedo :Off ← →

Send all data

Once the new information has been entered into the programmer, it must be sent to the tachograph to replace the old settings.

Select SEND ALL DATA (shortcut key 9) from the main menu and press ENTER.	VR2400 MAIN MENU SEND ALL DATA
---	---

5.3 Programming Kienzle 1324 Series tachographs

Parameters which may be programmed

- Odometer reading
- Time offset
- VIN
- Install date
- Output shaft factor
- CANBus Type
- Current time
- W-factor
- Service delay
- Current date
- K-factor
- L-Factor

Connections

Table 13: Kienzle 1324 Programming connections

Tachograph	Harness	Connection
KZ1324 Series	W	DIN plug to socket C on Programmer and D-shaped connector to socket on front of tachograph.

Procedure

Select READ ALL DATA (shortcut key 7) from the main menu and press ENTER.	KZ1324 MAINMENU :READ ALL DATA
Select MODIFY DATA (shortcut key 8) from the main menu and press ENTER. Use the ← and → keys to select the parameter you wish to alter.	KZ1324 MAIN MENU :MODIFY DATA
Odometer reading - Press ENTER and key in the required new odometer reading. Bear in mind that the last digit entered is the tenths digit, thus a required reading of 100.0km should be entered as 1000.	Odometer :100.0
Install date - Press ENTER and a cursor will flash. Key in the date of installation of the tachograph and press ENTER.	Install date :19/09/2001
Current time - Press ENTER and type in the time in the format shown. Press ENTER to confirm	Current time: :13:45
Current date - Press ENTER and type in the date in the format shown. Press ENTER to confirm	Current date :25/09/2001
Time offset - Press ENTER and use arrow keys to set the time offset. The range is +23 to -23 hours. Press ENTER to confirm.	Time offset :+1:00
Output shaft factor - Press ENTER and type in the required number. Bear in mind that the last three digits are thousandths and that the number 65.500 must be typed in as 65500. Press ENTER to confirm.	O/P shaft factor :65.525
W-factor - Press ENTER and type in the number. Press ENTER to confirm.	W-factor :8345
K-factor - This is Read Only and cannot be modified with the MKII Programmer.	K-factor :8000 Pul/km
VIN - Press ENTER and type the Vehicle Identification Number. This can be up to 17 characters long. Press ENTER to confirm the selection	VIN :1234567890ABCDEFG
CANBus Type - Press ENTER. Enter the 2 digit code that corresponds to the tachograph type. 00 - OFF, 01 - 50ms, 02 -10ms or 03 -	CANBus Type :01

20ms. Press ENTER to confirm the selection.	
Service delay - Press ENTER and a cursor will flash. Key in the number of WEEKS left until compulsory recalibration of the tachograph and press ENTER.	Service delay :104 weeks
L-Factor - Press ENTER and a cursor will flash. Key in the circumference of the vehicle wheel in mm and press ENTER.	L-Factor :3000 mm

Send all data

Once the new information has been entered into the programmer, it must be sent to the tachograph to replace the old settings.

Select SEND ALL DATA (shortcut key 9) from the main menu and press ENTER.	KZ1324 MAINMENU SEND ALL DATA
---	--

5.4 Programming Kienzle 1319 Series tachographs

Parameters which may be programmed

- K-factor
- Odometer reading
- Over speed limit
- Speed units (km/h or mph)
- Calibration station Identifier
- Calibration date
- Installation date
- Tachograph clock speed

Connections

Select harness P. Connect the 8-pin DIN plug to the Programmer socket C. Remove the seal and the cover over the connector on the front of the tachograph. Connect the other end of the harness to the pair of connectors on the front of the tachograph.

Procedure

<p>Read the current tachograph setting prior to making changes. From the MAIN MENU select using arrow keys READ ALL DATA (shortcut key 7) and then press ENTER to read data from the tachograph.</p>	<p>KZ1319 MAIN MENU :READ ALL DATA</p>
<p>When the Programmer indicates that the data has been received return to the MAIN MENU and this time select MODIFY DATA (shortcut key 8) using the ← → arrow keys. Press ENTER.</p> <p>Select the parameters to be changed. Press the ← or → keys to move between the parameters to be entered.</p>	<p>KZ1319 MAIN MENU :MODIFY DATA</p>
<p>K-factor - Again press ENTER to change the current value and enter the new value which was stored during the W-factor measurement (described in Section 4.1). For Kienzle 1319 tachographs, the K-factor is remembered until the Programmer is switched off or the K-factor is changed.</p>	<p>K-Factor :52356</p>
<p>Odometer reading - Press ENTER and key in the required new odometer reading. Bear in mind that the last digit entered is the tenths digit, thus a required reading of 100.0km should be entered as 1000.</p>	<p>Odometer :0001234.5</p>
<p>Over speed - Press ENTER and key in the required new overspeed limit.</p>	<p>Over Speed :100km/h</p>
<p>Speed Units - Press ENTER and the characters <> will appear. Select km/h or mph using the ← and → keys and then press ENTER.</p>	<p>Speed units :km/h</p>
<p>Calibration station Identifier - This is an alphanumeric string identifying the station carrying out the calibration. Press ENTER and a cursor will flash indicating which character is being changed. Press the key with the required letter a number of times to get the character. Use the arrow keys to move between characters. Terminate the entry by pressing ENTER.</p> <p>Note: that a default Calib. Ident. string may be programmed into the Programmer. After selecting Calib. Ident. and pressing ENTER thus causing the cursor to flash, pressing DELETE will enter the default string and terminate the entry.</p>	<p>Calib. Ident. :SE #1234</p>

Calibration Date - key in the calibration date in numeric format, e.g. for 25 September 2001 enter 250901.	Calib. Date :25/09/01
Installation Date - key in the calibration date in numeric format, e.g. for 24 September 2001 enter 240901.	Install Date :24/09/01
Tachograph Clock Speed - Press ENTER and <> will appear on the display. Using the ← and → keys select either Normal or Fast clock speed. Fast clock speed increases the rate of rotation of the chart for test purposes. Note: Ensure that the clock speed is returned to normal at the end of the test and before sealing the tachograph.	Clock speed :Normal
Having entered the values to be programmed into the tachograph, return to the MAIN MENU by pressing menu button and now select SEND ALL DATA (shortcut key 9).	KZ1319 MAIN MENU :SEND ALL DATA

5.5 Programming MotoMeter EGK-100 tachographs

a) Parameters which may be programmed

- K-factor
- Engine speed recording bands
- Pulses per engine revolution

(b) Connections

Select harness N. Connect one end of the harness to socket C on the Programmer. Connect the other end to the 8-pin connector on the front of the tachograph.

c) Procedure

If appropriate read the current tachograph setting prior to making changes. From the MAIN MENU select READ ALL DATA (shortcut key 7) using the arrow keys ← →, and then press ENTER to read data from the tachograph.	EGK100 MAIN MENU :READ ALL DATA
When the Programmer indicates that the data has been received return to the MAIN MENU and this time select MODIFY DATA (shortcut key 8) the arrow keys, and press ENTER.	EGK100 MAIN MENU :MODIFY DATA
Select the parameters to be changed. Press	EGK100 MAIN MENU

the ← or → keys to move between the parameters to be entered.	:READ ALL DATA
K-factor - Again press ENTER to change the current value and enter the new value that was stored during the W-factor measurement.	K-factor :8000
Pulses per engine revolution - Press ENTER and key in the new value. For the MotoMeter tachograph values between 20.0 and 30.0 are valid. A 3-digit number should be entered, and on completion of the entry (press ENTER) the Programmer will insert a decimal point between the last two digits.	Pulses per Rev :20.8
Engine speed recording bands - In each case press ENTER to change the current value and enter the new value. Note: the Programmer will not allow the user to enter inconsistent engine speed bands. For example, the minimum speed for the Economy band must be higher than the speed defined for the Low Power band.	Low Power band :900 Economy band :1400 Poor Economy :1600
Having entered the values to be programmed into the tachograph, return to the MAIN MENU by pressing Menu button and now select SEND ALL DATA (shortcut key 9) by pressing the arrow keys.	EGK100 MAIN MENU :SEND ALL DATA
As instructed on the display, press ENTER to send the data. On completion of the data transfer the Programmer will indicate Data Transfer OK.	Sending Data Data Transfer OK
In the event of a problem, the message Transfer FAILURE will be displayed. In that event check the harness connection.	Transfer FAILURE

5.6 Programming SE5000 Series tachographs

Parameters which may be programmed

- K-Factor
- Odometer
- Current time
- Current date
- Tyre Size
- W-Factor
- Canbus Enable
- Preferred Language
- Time Offset
- Output Shaft Factor
- D6 Pin Function
- Speedo O/P Factor
- Next Calibration Date
- VRN
- Install Date
- Revs Input C3/CAN
- VIN
- Service delay
- Reset Heartbeat
- L-Factor
- Vehicle Reg. Nation
- Speed Authorised
- Illumination Inupt

Connections

Table 13: Stoneridge SE5000 Programming connections

Tachograph	Harness	Connection
SE5000 Series	Z	DIN plug to socket C on Programmer and D-shaped connector to socket on front of tachograph.

Procedure

Select READ ALL DATA from the main menu and press ENTER.	SE5000 MAIN MENU :READ ALL DATA
Select MODIFY DATA from the main menu and press ENTER. Use the ← and → to select the parameter you wish to alter.	SE5000 MAIN MENU :MODIFY DATA
K-factor - Press ENTER and type in the new value. Press enter again to confirm the value.	K-factor :8000
Odometer reading - Press ENTER and key in the required new odometer reading. Bear in mind that the last digit entered is the tenths digit, thus a required reading of 100.0km should be entered as 1000.	Odometer : 21 055 406.0

<p>Current time - Press ENTER and a cursor will flash. Key in the current time and press ENTER.</p> <p>Note the time should be set to UTC time.</p>	<p>Current time :10:35</p>
<p>Current date - Press ENTER and a cursor will flash. Key in the current date and press ENTER.</p> <p>Note the time should be set to UTC time.</p>	<p>Current date :19/10/2003</p>
<p>Time offset - Press ENTER and use the up/down arrow keys to choose a time offset between +23:00 and -23:00 hours and +59 and -59 minutes.</p>	<p>Time offset :+1: +00</p>
<p>Output shaft factor - It is not necessary to change this value.</p>	<p>O/P shaft factor :8.140</p>
<p>CANBus enabled - Press ENTER and use the ← and → keys to select ON or OFF. Press ENTER to confirm the selection</p>	<p>CANBus enabled :Off ← →</p>
<p>D6 pin function - Press ENTER and use the ← and → keys to select OFF, Revs warning or Speedometer.</p>	<p>D6 pin function :OFF</p>
<p>Speedo OP factor - Press ENTER and a cursor will flash. Key in the required value and press ENTER.</p>	<p>Speedo OP factor :4971</p>
<p>VIN - Press ENTER and type the Vehicle Identification Number. This can be up to 17 characters long. Press ENTER to confirm the selection.</p>	<p>VIN :1234567890ABCDEFG</p>
<p>Service delay – Read Only.</p>	<p>Service delay :104 weeks</p>
<p>Install date - Press ENTER and a cursor will flash. Key in the date of installation of the tachograph and press ENTER.</p>	<p>Install date :19/09/2001</p>
<p>Reset Heartbeat - Press ENTER and use the ← and → keys to select ON or OFF. Press ENTER to confirm the selection.</p> <p>Note: when set to ON the vehicle cluster presence is confirmed by the tachograph.</p>	<p>Reset Heartbeat :Off ← →</p>
<p>L-Factor – Press ENTER and a cursor will flash. Key in the L-Factor value.</p>	<p>L-Factor :1234 mm</p>
<p>Tyre Size - Press ENTER and type the Tyre Size. This can be up to 15 characters long.</p>	<p>Tyre Size</p>

Press ENTER to confirm the selection.	:1234567890ABCDE
Next Calib Date - Press ENTER and a cursor will flash. Key in the next calibration date and press ENTER.	Next Calib Date :19/10/2005
Vehicle Registration Nation - Press ENTER and type the Vehicle Registration Nation. This can be up to 3 characters long. Press ENTER to confirm the selection. The Vehicle Registration Nation can also be referred to as Registering Member State.	Veh. Reg. Nation :123
VRN - Press ENTER and type the VRN. This can be up to 13 characters long. Press ENTER to confirm the selection.	VRN :1234567890ABC
Speed Authorised - Press ENTER and a cursor will flash. Key in the Speed authorised value.	Speed Authorised :125 km/h
Illumination Input - Press ENTER and use the ← and → keys keys to select one of the following options. OFF, CAN ONLY, A2 ONLY.	Illum. Input :OFF
Revs Input C3/CAN - Press ENTER and use the ← and → keys to choos between the following options. CAN ENABLED, C3 ENABLED.	Revs Inp. C3/CAN :CAN ENABLED
Preferred Language - Press ENTER and the cursor will flash. Enter the correct code for the required language and press ENTER to accept it.	Pref. Language :en
W-Factor - Press ENTER and a cursor will flash. Key in the W-Factor value.	W-Factor :8000
Having entered the values to be programmed into the tachograph, return to the MAIN MENU by pressing Menu button and now select SEND ALL DATA (shortcut key 9) by pressing the arrow keys.	SE5000 MAIN MENU :SEND ALL DATA
As instructed on the display, press ENTER to send the data. On completion of the data transfer the Programmer will indicate Data Transfer OK.	Sending Data Data Transfer OK
In the event of a problem, the message Transfer FAILURE will be displayed. In that event check the harness connection.	Transfer FAILURE

5.7 Programming DTCO Series tachographs

Parameters which may be programmed

- K-Factor
- Odometer
- Current time
- Current date
- VRN
- Pulses Per Rev
- Time Offset
- Output shaft factor
- VIN
- L-Factor
- Speed Authorised
- CANBus type
- Tyre Size
- Next Calibration Date
- Vehicle Reg. Nation
- W-Factor
- Install Date

Connections

Table 13: DTCO Programming connections

Tachograph	Harness	Connection
DTCO Series	Z	DIN plug to socket C on Programmer and D-shaped connector to socket on front of tachograph.

Procedure

Select READ ALL DATA from the main menu and press ENTER.	DTCO MAIN MENU :READ ALL DATA
Select MODIFY DATA from the main menu and press ENTER. Use the ← and → to select the parameter you wish to alter.	DTCO MAIN MENU :MODIFY DATA
K-factor - Press ENTER and type in the new value. Press enter again to confirm the value.	K-factor :8000
Odometer reading - Press ENTER and key in the required new odometer reading. Bear in mind that the last digit entered is the tenths digit, thus a required reading of 100.0km should be entered as 1000.	Odometer : 21 055 406.0
Current time - Press ENTER and a cursor will flash. Key in the current time and press ENTER.	Current time :10:35

Note the time should be set to UTC time.	
Current date - Press ENTER and a cursor will flash. Key in the current date and press ENTER. Note the time should be set to UTC time.	Current date :19/10/2003
Time offset - Press ENTER and use the up/down arrow keys to choose a time offset between +23:00 and -23:00 hours and +59 and -59 minutes.	Time offset :+1: +00
Output shaft factor - It is not necessary to change this value.	O/P shaft factor :8.140
VIN - Press ENTER and type the Vehicle Identification Number. This can be up to 17 characters long. Press ENTER to confirm the selection.	VIN :1234567890ABCDEFG
L-Factor - Press ENTER and a cursor will flash. Key in the L-Factor value.	L-Factor :1234 mm
Tyre Size - Press ENTER and type the Tyre Size. This can be up to 15 characters long. Press ENTER to confirm the selection.	Tyre Size :1234567890ABCDE
Next Calib Date - Press ENTER and a cursor will flash. Key in the next calibration date and press ENTER.	Next Calib Date :19/10/2005
Vehicle Registration Nation - Press ENTER and type the Vehicle Registration Nation. This can be up to 3 characters long. Press ENTER to confirm the selection. The Vehicle Registration Nation can also be referred to as Registering Member State.	Veh. Reg. Nation :123
VRN - Press ENTER and type the VRN. This can be up to 13 characters long. Press ENTER to confirm the selection.	VRN :1234567890ABC
Speed Authorised - Press ENTER and a cursor will flash. Key in the Speed authorised value.	Speed Authorised :125 km/h
W-Factor - Press ENTER and a cursor will flash. Key in the W-Factor value.	W-Factor :8000
Install date - Press ENTER and a cursor will flash. Key in the date of installation of the tachograph and press ENTER.	Install date :19/09/2001
Pulses per Rev - Press ENTER and a cursor will flash. Enter the number required and press ENTER again to accept.	Pulses per Rev :4.000

CANBus Type - Press the ENTER key. This will cause a flashing cursor to appear. Enter the required number(0 – 99), and press ENTER to confirm.	CANBus type :01
Having entered the values to be programmed into the tachograph, return to the MAIN MENU by pressing Menu button and now select SEND ALL DATA (shortcut key 9) by pressing the arrow keys.	DTCO MAIN MENU :SEND ALL DATA
As instructed on the display, press ENTER to send the data. On completion of the data transfer the Programmer will indicate Data Transfer OK.	Sending Data Data Transfer OK
In the event of a problem, the message Transfer FAILURE will be displayed. In that event check the harness connection.	Transfer FAILURE

5.8 Programming Smartach Series tachographs

Parameters which may be programmed

- VIN
- Time Offset
- L-factor
- Next Calibration date
- VRN
- Current time
- Odometer
- W-factor
- Speed Authorised
- Current date
- K-factor
- Tyre Size
- Vehicle Reg. Nation

Connections

Table 13: Smartach Programming connections

Tachograph	Harness	Connection
Smartach Series	Z	DIN plug to socket C on Programmer and D-shaped connector to socket on front of tachograph.

Procedure

Select READ ALL DATA from the main menu and press ENTER.	S.TACH MAIN MENU :READ ALL DATA
Select MODIFY DATA from the main menu and press ENTER. Use the ← and → to select the parameter you wish to alter.	S.TACH MAIN MENU :MODIFY DATA
K-factor - Press ENTER and type in the new value. Press enter again to confirm the value.	K-factor :8000
Odometer reading - Press ENTER and key in the required new odometer reading. Bear in mind that the last digit entered is the tenths digit, thus a required reading of 100.0km should be entered as 1000.	Odometer : 21 055 406.0
Current time - Press ENTER and a cursor will flash. Key in the current time and press ENTER. Note the time should be set to UTC time.	Current time :10:35
Current date - Press ENTER and a cursor will flash. Key in the current date and press ENTER. Note the time should be set to UTC time.	Current date :19/10/2003
Time offset - Press ENTER and use the up/down arrow keys to choose a time offset between +23:00 and -23:00 hours and +59 and -59 minutes.	Time offset :+1: +00
VIN - Press ENTER and type the Vehicle Identification Number. This can be up to 17 characters long. Press ENTER to confirm the selection.	VIN :1234567890ABCDEFG
L-Factor - Press ENTER and a cursor will flash. Key in the L-Factor value.	L-Factor :1234 mm
Tyre Size - Press ENTER and type the Tyre Size. This can be up to 15 characters long. Press ENTER to confirm the selection.	Tyre Size :1234567890ABCDE
Next Calib Date - Press ENTER and a cursor will flash. Key in the next calibration date and	Next Calib Date :19/10/2005

press ENTER.	
Vehicle Registration Nation - Press ENTER and type the Vehicle Registration Nation. This can be up to 3 characters long. Press ENTER to confirm the selection. The Vehicle Registration Nation can also be referred to as Registering Member State.	Veh. Reg. Nation :123
VRN - Press ENTER and type the VRN. This can be up to 13 characters long. Press ENTER to confirm the selection.	VRN :1234567890ABC
Speed Authorised - Press ENTER and a cursor will flash. Key in the Speed authorised value.	Speed Authorised :125 km/h
W-Factor - Press ENTER and a cursor will flash. Key in the W-Factor value.	W-Factor :8000
Having entered the values to be programmed into the tachograph, return to the MAIN MENU by pressing Menu button and now select SEND ALL DATA (shortcut key 9) by pressing the arrow keys.	S.TACH MAIN MENU :SEND ALL DATA
As instructed on the display, press ENTER to send the data. On completion of the data transfer the Programmer will indicate Data Transfer OK.	Sending Data Data Transfer OK
In the event of a problem, the message Transfer FAILURE will be displayed. In that event check the harness connection.	Transfer FAILURE

5.8 **Reading of speed pulses from the front of Kienzle 1314, 1318 and 1319**

When using a Tachograph Programmer with 1314, 1318 and 1319 tachographs, a minor inconsistency occurs when using the front sockets. This has some effect when carrying out either the K-Factor test, Bench test or the Speed simulator test using a jack plug.

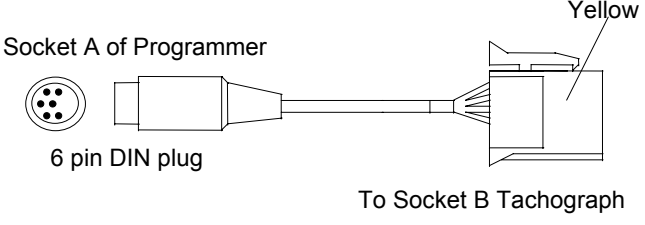
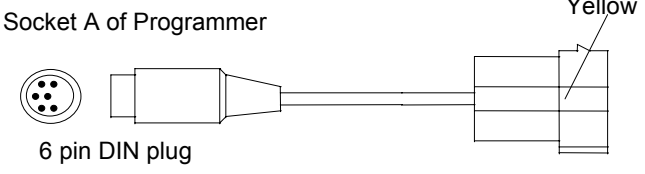
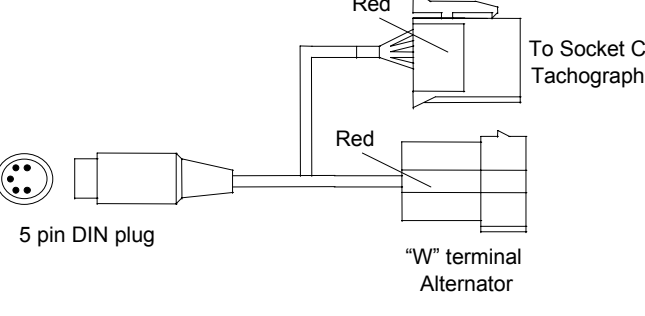
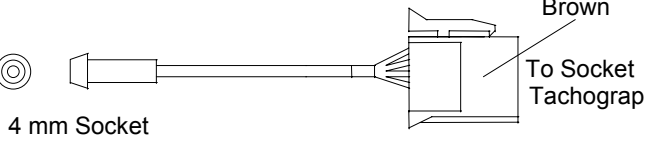
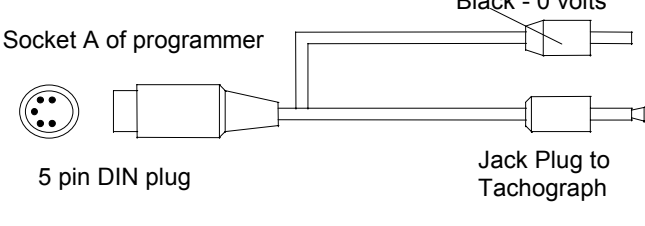
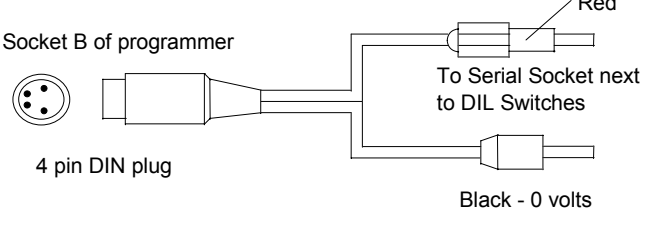
The signal coming through the sender cable is a square waveform and therefore oscillates between two states 'high' and 'low', If, at the time of performing a Bench test, the sender signal is in its low state, then this 'grounds' the circuitry in the tachograph and gives the appearance that the tachograph is inactive. There are two ways in which this can be overcome. Either disconnect the sender or move the vehicle slightly forward. The table below recommends which method to apply with which test:

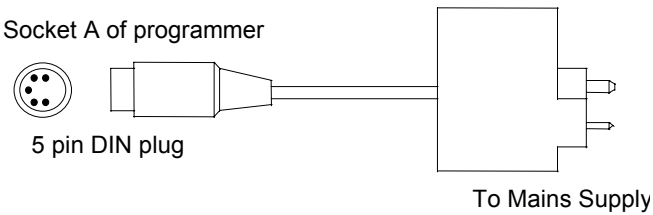

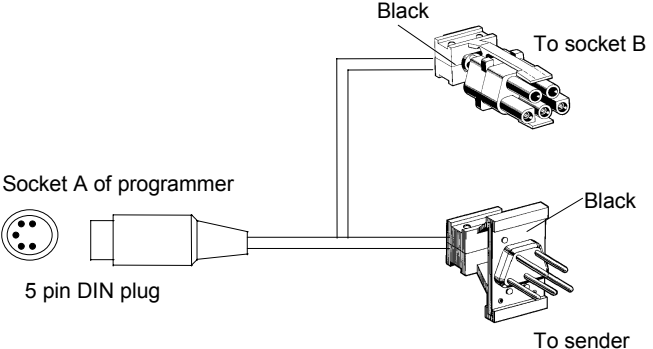
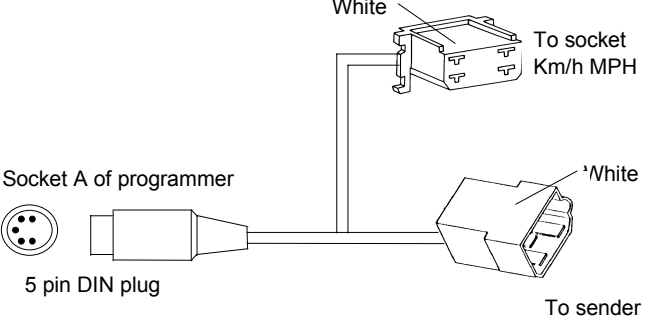
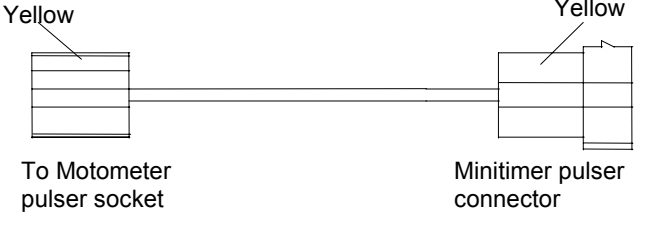
Table 14: Kienzle 1314,1318, 1319 Speed Pulse Method

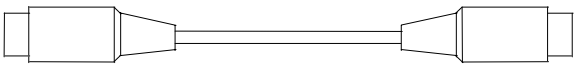

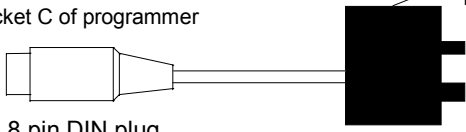
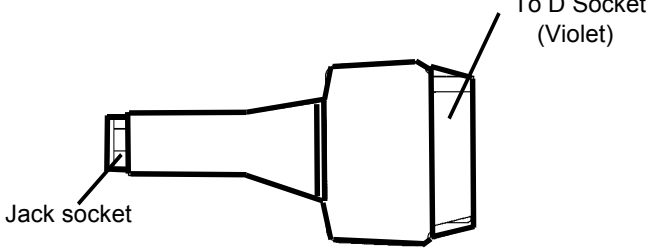
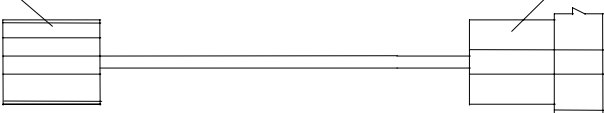


	Bench Test	K-Factor Test	Speed Test
Disconnect Sender	Yes	Yes	No
*Move Vehicle slightly forward	No	Yes	Yes

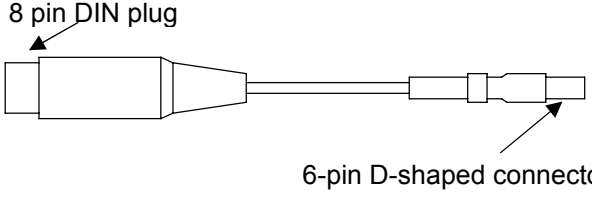
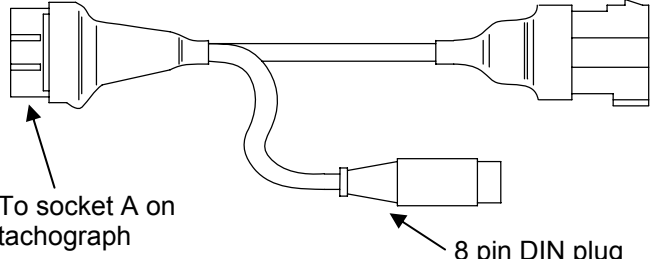
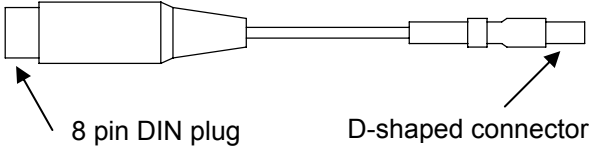
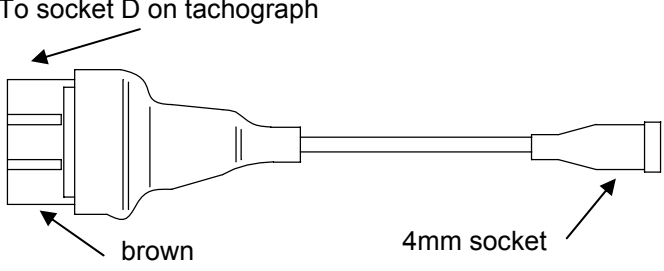
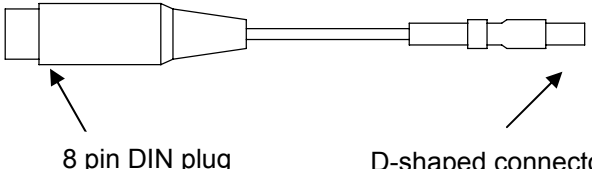

- When carrying out either the K-factor test or the Speed test with the tachograph still mounted in the cab of the vehicle, the more practical solution would be to roll the vehicle slightly forward (until the tachograph speed pointer moves up to the correct speed being sent by the Programmer), then **stop** the vehicle.


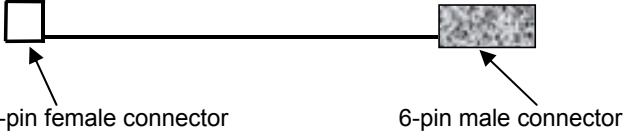

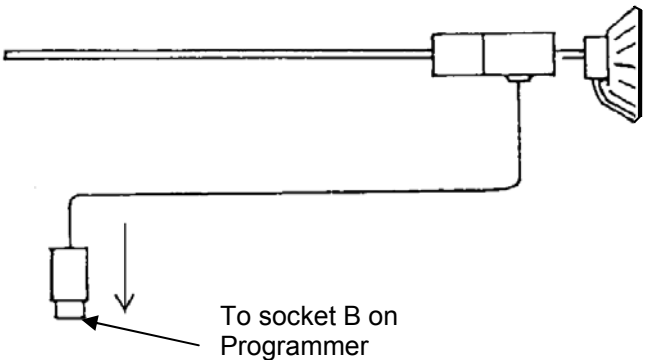
ANNEX A - TEST HARNESSES FOR USE WITH THE TACHOGRAPH PROGRAMMER

Part Number	Harness Diagrams	Application
<p>(C) 7780-981</p>	 <p>Socket A of Programmer 6 pin DIN plug Yellow To Socket B Tachograph</p>	<p>Tachograph Drive Lead</p>
<p>(D) 7780-982</p>	 <p>Socket A of Programmer 6 pin DIN plug Yellow Vehicle Sender Connection Lead</p>	<p>Vehicle Sender Connection Lead</p>
<p>(E) 7780-983</p>	 <p>5 pin DIN plug Red Red To Socket C Tachograph "W" terminal Alternator</p>	<p>PPR/Engine rev Calibration Lead</p>
<p>(F) 7780-986</p>	 <p>4 mm Socket Brown To Socket Tachograph</p>	<p>Serial Data Out Adapter Lead</p>
<p>(G) 7780-984</p>	 <p>Socket A of programmer 5 pin DIN plug Black - 0 volts Jack Plug to Tachograph Jack Socket Connection Lead</p>	<p>Jack Socket Connection Lead</p>
<p>(H) 7780-989</p>	 <p>Socket B of programmer 4 pin DIN plug Red To Serial Socket next to DIL Switches Black - 0 volts Serial Data Connection Lead</p>	<p>Serial Data Connection Lead</p>

Part Number	Harness Diagrams	Application
<p>(I)</p> <p>UK 7955-778 EURO -779</p>	 <p>Socket A of programmer</p> <p>5 pin DIN plug</p> <p>To Mains Supply</p>	<p>Battery Charger</p>
<p>(J)</p> <p>2714-377</p>	 <p>"Crocodile Clip"</p>	<p>To be pushed on Black plugs on harnesses G or H</p>
<p>(K)</p> <p>7780-987</p>	 <p>Socket A of programmer</p> <p>5 pin DIN plug</p> <p>Black</p> <p>To socket B</p> <p>Black</p> <p>To sender</p>	<p>VR1400 Drive Lead W factor lead</p>
<p>(L)</p> <p>7780-988</p>	 <p>Socket A of programmer</p> <p>5 pin DIN plug</p> <p>White</p> <p>To socket Km/h MPH</p> <p>White</p> <p>To sender</p> <p>"Note : 3 wire plug"</p>	<p>KZ1314 Drive Lead W factor Lead</p>
<p>(M)</p> <p>7780-974</p>	 <p>Yellow</p> <p>To Motometer pulser socket</p> <p>Yellow</p> <p>Minitimer pulser connector</p>	<p>MotoMeter bench test lead adapter</p>

Part Number	Harness Diagrams	Application
<p>(N)</p> <p>7780-980</p>	<p>Socket C of programmer</p>  <p>8 pin DIN plug 8 pin DIN plug</p>	<p>MotoMeter programming lead</p>
<p>(O)</p> <p>7780-979</p>	<p>4mm Jack socket</p>  <p>8 way connector to Tacho</p>	<p>Kienzle 1319 K-factor lead</p>
<p>(P)</p> <p>7780-973</p>	<p>Socket C of programmer</p>  <p>8 pin DIN plug Connector to Tacho</p>	<p>Kienzle 1319 programming lead</p>
<p>(Q)</p> <p>7780-975</p>	 <p>Jack socket To D Socket (Violet)</p>	<p>MotoMeter Revs Adapter Lead</p>
<p>(R)</p> <p>7780-976</p>	<p>White</p>  <p>To Motometer power socket Minitimer Power connector</p>	<p>MotoMeter Power Adapter Lead</p>
<p>(S)</p> <p>7780-978</p>	 <p>4mm Jack 4mm socket</p>	<p>Flexible extension for use with harness G (KZ1318, VR8400)</p>
<p>(T)</p> <p>7780-977</p>	 <p>4mm Jack 4mm socket</p>	<p>Flexible extension for use with harness G (KZ1314 only)</p>

Part Number	Harness Diagrams	Application
(U) 7780-954	 <p>8 pin DIN plug</p> <p>6-pin D-shaped connector</p>	VR2400 Calibration/ programming
(V) 7780-956	 <p>To socket A on tachograph</p> <p>8 pin DIN plug</p>	VR2400/ VR8900/ K1324/ SE5000 Canbus
(W) 7780-952	 <p>8 pin DIN plug</p> <p>D-shaped connector</p>	1324 Calibration/ programming
(X) 7780-955	 <p>To socket D on tachograph</p> <p>brown</p> <p>4mm socket</p>	2400 serial data lead
(Z) 7945-013	 <p>8 pin DIN plug</p> <p>D-shaped connector</p>	Digital tachograph interface cable
7955-938	 <p>Socket C of programmer</p> <p>8 pin DIN plug</p> <p>SE Clock Tester</p>	SE Clock Adapter

Part Number	Harness Diagrams	Application
7780-946	<p style="text-align: center;">Socket A of programmer</p>  <p style="text-align: center;">5 pin DIN plug</p>	Battery Discharge Device
7780-949	 <p style="text-align: center;">6-pin female connector 6-pin male connector</p>	Flat Cable Assembly for Bench Test (VR2400 only)
7780-953	 <p style="text-align: center;">To Socket D of programmer To PC Serial Port</p> <p style="text-align: center;">RJ11 6-WAY 9-Way D-Type Socket</p>	Field Download Cable Assy (Note: Used for Programmer Software Upgrades Only. See section 1.4 for more details).
7955-777	 <p style="text-align: center;">To socket B on Programmer</p>	Flexi-switch is used with the "Fixed Distance #2" feature, providing a very simple accurate method of vehicle calibration.

Please note that all of the cables listed in Annex A are supplied as part of a standard Hand-held programmer Kit EXCEPT the Flexi-Switch (7955-777) which must be purchased separately.

ANNEX B - DETAILS OF BENCH TEST ROUTINES

(a) UK Bench Test

Before performing the Bench Test, go to the Diagnostics menu and check that the UK Bench Test is selected (see Section 2.6). At the end of the Benchtest perform the Clock Test (see section 4.7 for details).

From the MAIN MENU select BENCH TEST using the ← and → keys, and press ENTER.	VR2400 MAINMENU :BENCH TEST
Select the Tachograph scale (125 km/h, 140 km/h, 180 km/h, 100 km/h or 160 km/h) using the ← and → keys, and press ENTER.	Select the scale : 125 km/h ← →
Set the tachograph to a K-factor of 8000 (remember to note the original setting first), or press delete and enter K factor required. The display and the setting method will vary according to the type of tachograph selected. Press ENTER. For a VR2400 tachograph benchtest, it is easier to read-in the K factor first and use this value in the benchtest.	Select K-factor :8000 Pul/km?
Select whether the change of Duty is to be automatically changed or manually changed. Press ENTER to accept current settings or the ← and → keys to change. Note: Auto Duty can only be programmed via the front connector.	Auto Duty : Off < - - >
Perform the task displayed. Press ENTER on completion. N.B. Some VR2400 tachographs may not have a display in which case this check can be omitted.	Check backlight illuminated
Perform the task displayed. Press ENTER on completion. Note: For dual driver, 2 charts have to be inserted. For a single driver, only 1 chart has to be inserted.	Prepare and insert chart(s)
Perform the task displayed. Press ENTER on completion.	Driver=Active Crew=Active
The speed will now be maximum speed for the selected scale for 10 seconds, e.g. 125km/h, and the time will count down to zero and then an audible beep will be heard.	Speed: 125 km/h Time: 10 s
The speed displayed will then go to 0km/h for 10 seconds (the time will count down to zero)	Speed: 0 km/h Time: 10 s

and an audible beep will be heard again.	
Note the current odometer reading on the tachograph. This will be required later to check the accuracy of the odometer. Press ENTER.	Note odometer reading
The speed will now go to 40km/h and will be held for 2½ minutes (150 seconds – the time will count down to zero). To move on to the next test before the end of the normal time press ENTER. At the end of the 2½ minute test there will be an audible beep.	Speed: 40 km/h Time: 150 s
The speed will then go up to 80 km/h. After a further 2½ minutes (the time will count down to zero) there will again be an audible beep indicating the end of that test.	Speed: 80 km/h Time: 150 s
The speed will move up to 100 km/h for a further 3 minutes (time will count down to zero). At the end of the time there will be a further beep and the speed will return to zero.	Speed: 100 km/h Time: 180 s
Perform the task displayed. Press ENTER on completion.	Driver=Active Crew=Active
The unit will record Active 4 duty for 2 minutes (the time will count down to zero). After that time an audible beep will be heard.	Recording duty Time: 120 s
Perform the task displayed. Press ENTER on completion.	Driver=Passive Crew=Passive
The unit will record Passive 1 duty for 2 minutes (the time will count down to zero) and then beep.	Recording duty Time: 120 s
Perform the task displayed. Press ENTER on completion.	Driver=Rest Crew=Rest
The unit will record Rest 2 for 2 minutes (the time will count down to zero) and then beep	Recording duty Time: 120 s
Compare the new odometer reading with that noted above - a difference of 10km is expected.	Check odometer added 10 km
The display will then show as opposite. Check that the time on the chart corresponds with the time indicated on the clock, then press ENTER.	Check clock to chart time
Remove the two chart(s) and check the trace(s) (speed, duty and distance on chart 1,	Check chart rec. for veh. Set K

duty on chart 2). Press ENTER.	
Press the ENTER or MENU key to return to the MAIN MENU.	VR2400 MAINMENU :BENCH TEST

(b) French Bench Test

Before performing the Bench Test, check that the French Bench Test is selected from the Diagnostics menu (see Section 2.6). The speeds registered during the test will depend on the Tachograph scale selected at Step 2. The relevant speeds for each scale, and the total distance covered, are listed below:

Table 15: Speeds for French Bench Test

Scale	125 km/h	140 km/h	180 km/h
Step 13	125 km/h	140 km/h	180 km/h
Step 20	125 km/h	140 km/h	180 km/h
Step 22	40 km/h	40 km/h	40 km/h
Step 23	70 km/h	80 km/h	100 km/h
Step 24	100 km/h	120 km/h	160 km/h
Step 29	+16.75km	+19 km	+24 km

From the MAIN MENU select BENCH TEST using the ← and → keys, and press ENTER.	VR2400 MAINMENU :BENCH TEST
Select the scale of the tachograph (125 km/h, 140 km/h, 180 km/h only in France) using the ← and → keys, and press ENTER.	Select scale :125 km/h ← →
Set the tachograph to a K-factor of 8000, (remember to make a note of the original setting), or press delete and enter K factor required. The display and the setting method will vary according to the type of tachograph selected. Press ENTER.	Set K factor :8000 Pul/km?
Select whether the change of Duty is to be automatically changed or manually changed. Press ENTER to accept current settings or the ← and → keys to change. Note: Auto Duty can only be programmed via the front connector.	Auto Duty : Off < - - >

Check the tachograph settings. Press ENTER.	Check tacho settings
Connect the drive lead. The precise lead required will vary according to the type of tachograph. After connection press ENTER.	Connect drive lead to tacho
Set the power supply to 12 or 24V to match the tachograph and turn on the supply. Press ENTER.	Switch on at correct voltage
For tachographs with a second hand or a clock tell-tale check that the clock is stepping.	Check clock is stepping OK
Perform the task displayed. Press ENTER on completion.	Check bulbs are illuminated
Perform the task displayed. Press ENTER on completion.	Prepare and insert 2 charts
Close the tachograph as appropriate for the type of tachograph and press ENTER.	Close the tachograph
Set both Driver 1 duty and Driver 2 duty to Rest, 2 then press ENTER.	Driver=Rest Crew=Rest
The speed will now be maximum speed for the selected scale for 10 seconds, e.g. 125km/h, and the time will count down to zero and then an audible beep will be heard.	Speed: 125km/h Time: 10s
The speed displayed will then go to 0km/h for 10 seconds (the time will count down to zero) and an audible beep will be heard again.	Speed : 0km/h Time : 10s
The display will then show as opposite. Check that the time on the chart corresponds with the time indicated on the clock, then press ENTER.	Check clock to chart time
Close the tachograph as appropriate for the type of tachograph and press ENTER.	Close the tachograph
Note the odometer reading.	Note odometer reading
Set Driver 2 to Active 4, then press ENTER.	Driver=Rest Crew=Active
Note the time displayed on the Tachograph clock.	Record time on Tacho

The speed will go to maximum and will be held for 3 minutes (180 seconds – the time will count down to zero). At the end of the 3 minute test there will be an audible beep.	Speed: 125km/h Time: 180s
The speed will return to 0km/h for a further 3 minutes (180 seconds – the time will count down to zero), after which there will be an audible beep.	Speed: 0km/h Time: 180s
The speed will increase to the value shown in Table 15. After 180 seconds (the time will count down to zero) there will again be an audible beep.	Speed: 40km/h Time: 180s
The speed will increase to the value shown in Table 15. After 180 seconds (the time will count down to zero) there will again be an audible beep.	Speed: 70km/h Time: 180s
The speed will then will increase to the value shown in Table 15. After 180 seconds (the time will count down to zero) there will again be an audible beep.	Speed: 100km/h Time: 180s
Set both duty knobs to the passive position (both 1), then press ENTER.	Driver=Passive Crew=Passive
The unit will time 180s (the time will count down to zero) of the duty, after which there will again be an audible beep	Speed: 0km/h Time: 180s
Set Driver 1 duty Active, 4, Driver 2 duty Rest, 2, then press ENTER.	Driver=Active Crew=Rest
The unit will time another 180s (the time will count down to zero) . After 180 seconds there will again be an audible beep indicating completion of the test.	Speed: 0km/h Time: 180s
Check that the odometer reading has increased over that noted previously, by 16.75km for 125 km/h scale, or 19km for 140km/h scale, or 24km for 180km/h scale selected.	Check odometer :+16.75km
Remove the two charts and check the traces (speed, duty and distance on chart 1, duty on chart 2). Press ENTER.	Check chart recordings
Reset the K-factor of the tachograph to the correct value for the vehicle (as noted at Step 3). Press ENTER.	Set K-exact for vehicle

Switch off the power and disconnect the tachograph.

**SWITCH OFF
POWER SUPPLY**

Press the ENTER or MENU key to return to the MAIN MENU.

(c) German Bench Test

Before performing the Bench Test, check that the German Bench Test is selected in the Diagnostics menu (see section 2.6). The speeds registered during the test will depend on the Tachograph scale selected at Step 2. The relevant speeds for each scale are listed below:

Table 16: Speeds for German Bench Test

Scale	100 km/h	125 km/h	140 km/h	160 km/h	180 km/h
Speeds:	170 km/h	170 km/h	170 km/h	170 km/h	170 km/h
2	180 km/h	180 km/h	180 km/h	180 km/h	180 km/h
3	0 km/h	0 km/h	0 km/h	0 km/h	0 km/h
4	90 km/h	115 km/h	130 km/h	150 km/h	170 km/h
5	100 km/h	125 km/h	140 km/h	160 km/h	180 km/h
6	30 km/h	40 km/h	40 km/h	60 km/h	40 km/h
7	60 km/h	80 km/h	80 km/h	100 km/h	100 km/h
8	90 km/h	120 km/h	120 km/h	140 km/h	160 km/h
9	100 km/h	125 km/h	140 km/h	160 km/h	180 km/h
10	90 km/h	120 km/h	120 km/h	140 km/h	160 km/h
11	60 km/h	80 km/h	80 km/h	100 km/h	100 km/h
12	30 km/h	40 km/h	40 km/h	60 km/h	40 km/h
13	30 km/h	40 km/h	40 km/h	60 km/h	40 km/h
14	60 km/h	80 km/h	80 km/h	100 km/h	100 km/h
15	80 km/h	110 km/h	110 km/h	110 km/h	150 km/h
16	90 km/h	120 km/h	120 km/h	140 km/h	160 km/h
17	90 km/h	115 km/h	130 km/h	150 km/h	170 km/h
18	100 km/h	125 km/h	140 km/h	160 km/h	180 km/h
19	90 km/h	120 km/h	120 km/h	140 km/h	160 km/h
20	60 km/h	80 km/h	80 km/h	100 km/h	100 km/h
21	30 km/h	40 km/h	40 km/h	60 km/h	40 km/h

From the MAIN MENU select BENCH TEST using the ← and → keys, and press ENTER.	VR2400 MAINMENU :BENCH TEST
Select the Tachograph scale (125 km/h, 140 km/h, 180 km/h, 100 km/h or 160 km/h).	Select the scale : 125 km/h ← →
Set the tachograph to a K-factor of 8000 (remember to note the original setting first), or press delete and enter K factor required. The display and the setting method will vary according to the type of tachograph selected. Press ENTER.	Select K-factor :8000 Pul/km?
Select whether the change of Duty is to be automatically changed or manually changed. Press ENTER to accept current settings or the ← and → keys to change. Note: Auto Duty can only be programmed via the front connector.	Auto Duty : Off < - - >
Perform the task displayed. Press ENTER on completion.	Check tachometer settings
Connect the drive lead. The precise lead required will vary according to the type of tachograph. After connection press ENTER.	Connect drive lead to tachometer
Set the power supply to 12 or 24V to match the tachograph and turn on the supply. Press ENTER.	Switch on at correct voltage
For tachographs with a second hand or a clock tell-tale check that the clock is stepping. Press ENTER on completion.	Check clock is stepping OK
Perform the task displayed. Press ENTER on completion.	Check bulbs are illuminated
The Programmer provides a specific clock check facility incorporating a clock tester for the VR2400, K1324 and MotoMeter EGK-100 tachographs. The clock test should be carried out at the end of the benchtest for these tachographs. For other tachographs a separate clock tester will be required. Press ENTER to confirm that the accuracy has been tested, or exit the Benchtest (Press MENU) to perform the clock test procedure.	Check clock for accuracy

Perform the task displayed. Press ENTER on completion.	Prepare and charts	insert 2
Close the tachograph as appropriate for the type of tachograph and press ENTER.	Close the	tachograph
The speed will now be 170 km/h (speed '1' in Table 16) for 5 seconds, the time will count down to zero and then an audible beep will be heard.	Speed : 170 km/h	Time : 5 s
The speed will now increase to 180 km/h (speed '2' in Table 16) for 10 seconds, the time will count down to zero and then an audible beep will be heard.	Speed : 180 km/h	Time : 10 s
The speed will drop to 0 km/h (Speed '3' in Table 16). An audible beep will be heard after 10 seconds (the time will count down to zero).	Speed : 0 km/h	Time : 10 s
Check that the time on the chart corresponds with the time indicated on the clock, then press ENTER on completion.	Check clock to chart time	
Move the chart on 3 minutes by advancing the clock. Press ENTER. For the VR2400, K1319 & K1324 the clock cannot be advanced manually, and the instruction is WAIT for the time to count down to zero.	Advance chart	Time: 180 s
Close the tachograph as appropriate for the type of tachograph and press ENTER. (Note: This screen does not appear for the K1319).	Close the	tachograph
The speed will now be speed '4' (as shown in Table 16) for 5 seconds, the time will count down to zero and then a beep will be heard.	Speed : 115 km/h	Time : 5 s
The speed will now go to the maximum for the selected scale (speed '5' as shown in Table 16) and will be held for 120 seconds (the time will count down to zero). To move on to the next test before the end of the normal time press ENTER. At the end of the 2 minute test there will be an audible beep.	Speed: 125 km/h	Time: 120 s
Open the tachograph and move the chart on 3 minutes by advancing the clock. Close the tachograph again and press ENTER. If no keys are pressed the time count down to zero and then move on to the next stage automatically.	Advance chart	Time: 180 s
The speed will then go to the speed shown in Table 16 (speed '6'). After 15 seconds (the time will count down to zero) there will be an	Speed: 40 km/h	Time: 15 s

audible beep.	
The speed will then go up to the speed shown in Table 16 (speed '7'). After 15 seconds (the time will count down to zero) there will again be an audible beep.	Speed: 80 km/h Time: 15 s
The speed will then go up to the speed shown in Table 16 (speed '8'). After 15 seconds (the time will count down to zero) there will again be an audible beep.	Speed: 120 km/h Time: 15 s
The speed will then go up to maximum (speed '9' as shown in Table 16). After 5 seconds (the time will count down to zero) there will again be an audible beep.	Speed: 125 km/h Time: 5 s
The speed will then go down to the speed shown in Table 16 (speed '10'). After 15 seconds (the time will count down to zero) there will again be an audible beep.	Speed: 120 km/h Time: 15 s
The speed will then go down to the speed shown in Table 16 (speed '11'). After 15 seconds (the time will count down to zero) there will again be an audible beep.	Speed: 80 km/h Time: 15 s
The speed will then go down to the speed shown in Table 16 (speed '12'). After 15 seconds (the time will count down to zero) there will again be an audible beep and the speed will return to 0 km/h.	Speed: 40 km/h Time: 15 s
Open the tachograph and move the chart on 3 minutes by advancing the clock. Close the tachograph again and press ENTER. If no keys are pressed the time count down to zero and then move on to the next stage automatically.	Advance chart Time: 180 s
The speed will then go up to the speed shown in Table 16 (speed '13'). After 5 seconds (the time will count down to zero) there will again be a beep and the speed will return to 0 km/h.	Speed: 40 km/h Time: 5 s
Open the tachograph and move the chart on 3 minutes by advancing the clock. Close the tachograph again and press ENTER. If no keys are pressed the time will count down to zero and then move on to the next stage automatically.	Advance chart Time: 180 s
The speed will then go up to the speed shown in Table 16 (speed '14'). After 10 seconds (the time will count down to zero) there will again be a beep and the speed will return to 0 km/h.	Speed: 80 km/h Time: 10 s

Open the tachograph and move the chart on 3 minutes by advancing the clock. Close the tachograph again and press ENTER. If no keys are pressed the time will count down to zero and then go to the next stage automatically.	Advance chart Time: 180 s
The speed will then go up to the speed shown in Table 16 (speed '15'). After 10 seconds (the time will count down to zero) there will again be a beep and the speed will return to 0 km/h.	Speed: 110 km/h Time: 5 s
The speed will then go up to the speed shown in Table 16 (speed '16'). After 10 seconds (the time will count down to zero) there will again be a beep.	Speed: 120 km/h Time: 10 s
Open the tachograph and move the chart on 3 minutes by advancing the clock. Close the tachograph again and press ENTER. If no keys are pressed the time will count down to zero and then move on to the next stage automatically.	Advance chart Time: 180 s
The speed will move down to the speed shown in Table 16 (speed '17') for a further 2 minutes (the time will count down to zero). At the end of the time there will be a further beep.	Speed: 115 km/h Time: 5 s
The speed will then go up to the maximum speed (as shown in Table 16 - speed '18'). After 10 seconds (the time will count down to zero) there will again be a beep.	Speed: 125 km/h Time: 10 s
The speed will move down to the speed shown in Table 16 (speed '19') for a further 2 minutes (the time will count down to zero). At the end of this time there will be a beep.	Speed: 120 km/h Time: 120 s
The speed will move down to the speed shown in Table 16 (speed '20') for a further 2 minutes (the time will count down to zero). At the end of this time there will again be a beep.	Speed: 80 km/h Time: 120 s
The speed will move down to the speed shown in Table 16 (speed '21') for a further 2 minutes (the time will count down to zero). At the end of the time there will be a further beep and the speed will return to 0 km/h.	Speed: 40 km/h Time: 120 s
Perform the task displayed. Press ENTER on completion.	Driver=Active Crew=Active

The unit will record active 4 duty time for 180 seconds, after which time a beep will be heard.	Recording duty Time: 180 s
Perform the task displayed. Press ENTER on completion.	Driver=Passive Crew=Passive
The unit will record passive 1 duty time for 180 seconds, after which time a beep will be heard.	Recording duty Time: 180 s
Perform the task displayed. Press ENTER on completion.	Driver=Rest Crew=Rest
The unit will record rest 2 for 180 seconds, after which time a beep will be heard.	Recording duty Time: 180 s
Remove the two charts and check the traces (speed, duty and distance on chart 1, duty on chart 2). Press ENTER.	Check chart recordings
Reset the K-factor of the tachograph to the correct value for the vehicle (as noted at Step 3). Press ENTER.	Set K-exact for vehicle
Switch off the power and disconnect the tachograph.	SWITCH OFF POWER SUPPLY
Press the ENTER or MENU key to return to the MAIN MENU.	VR2400 MAINMENU :BENCH TEST

(d) Swedish Bench Test

Before performing the Bench Test, check that the Swedish Bench Test is selected in the Diagnostics menu (see section 2.6).

From the MAIN MENU select BENCH TEST using the ← and → keys, and press ENTER.	VR2400 MAIN MENU :BENCH TEST
Select the required Tachograph scale (i.e., 125 km/h, 140 km/h, 180 km/h or 100 km/h).	Select the scale : 125 km/h ← →
Set the tachograph to a K-factor of 8000 (remember to note the original setting first), or press delete and enter K factor required. The display and the setting method will vary according to the type of tachograph selected. Press ENTER.	Select K factor :8000 Pul/km?
Select whether the change of Duty is to be automatically changed or manually changed.	Auto Duty Off < - - > :

<p>Press ENTER to accept current settings or the ← and → keys to change.</p> <p>Note: Auto Duty can only be programmed via the front connector.</p>	
<p>Perform the task displayed. Press ENTER on completion.</p>	<p>Check bulbs are illuminated</p>
<p>The Programmer provides a specific clock check facility incorporating a clock tester for the VR2400, K1324 and MotoMeter EGK-100 tachographs. The clock test should be carried out at the end of the benchtest for these tachographs. For other tachographs a separate clock tester will be required. Press ENTER to confirm that the accuracy has been tested, or exit the Benchtest (Press MENU) to perform the clock test procedure.</p>	<p>Check clock for accuracy</p>
<p>Perform the task displayed. Press ENTER on completion.</p>	<p>Prepare and insert 2 charts</p>
<p>Note the current odometer reading on the tachograph. This will be required later to check the accuracy of the odometer. Press ENTER.</p>	<p>Note odometer reading</p>
<p>Set both duty knobs to Active 4 and press ENTER on completion. Note: when testing VR1400 tachographs the driver knob should be set to Drive.</p>	<p>Driver=Active Crew=Active</p>
<p>The speed will now be maximum speed for the selected scale for 10 seconds, e.g. 125km/h, and the time will count down to zero and then an audible beep will be heard.</p>	<p>Speed: 125 km/h Time: 10 s</p>
<p>The speed displayed will then go to 0km/h for 10 seconds (the time will count down to zero) and an audible beep will be heard again.</p>	<p>Speed: 0 km/h Time: 10 s</p>
<p>Close the tachograph as appropriate for the type of tachograph and press ENTER.</p>	<p>Close the tachograph</p>
<p>The speed displayed will then go to 125km/h for 10 seconds (the time will count down to zero) and a beep will be heard.</p>	<p>Speed: 125 km/h Time: 10 s</p>
<p>The speed will then go to 50km/h for 490 seconds (the time will count down to zero) and a beep will be heard.</p>	<p>Speed: 50 km/h Time: 490 s</p>
<p>The speed will go up to 100 km/h for 90 seconds (the time will count down to zero) and a beep will be heard.</p>	<p>Speed: 100 km/h Time: 90 s</p>

The speed will go up to 125km/h for 10 seconds (the time will count down to zero) and a beep will be heard.	Speed: 125 km/h Time: 10 s
Set both duty knobs to Rest, 2, and press ENTER on completion.	Driver=Rest Crew=Rest
The unit will record duty time for 120 seconds (the time will count down to zero). After that time a beep is heard.	Recording duty Time: 120s
Set both duty knobs to Passive, 1, and press ENTER on completion.	Driver=Passive Crew=Passive
The unit will record duty for 120 seconds (the time will count down to zero). After that time a beep is heard.	Recording duty Time: 120s
Set both duty knobs to active, 4, and press ENTER on completion.	Driver=Active Crew=Active
The unit will record duty time for 120 seconds (the time will count down to zero). After that time a beep is heard.	Recording duty Time: 120s
Look at the odometer reading and compare it to the start to check that it has increased by 10km.	Check odometer added 10 km
Open the tachograph, remove the charts and check the recordings are as they should be.	Check chart recordings
Switch off the tachograph.	SWITCH OFF POWER SUPPLY
Program now returns automatically to the MAIN MENU.	VR2400 MAIN MENU :BENCH TEST

(e) Dutch Bench Test

Before performing the Bench Test, check that the Dutch Bench Test is selected in the Diagnostics menu (see section 2.6). The speeds registered during the test will depend on the Tachograph scale selected at Step 2. The relevant speeds for each scale are listed below:

Table 17: Speeds for Dutch Bench Test

Scale	100 km/h	125 km/h	140 km/h	160 km/h	180 km/h
Speeds:	90 km/h	120 km/h	120 km/h	140 km/h	160 km/h
2	0 km/h	0 km/h	0 km/h	0 km/h	0 km/h
3	0 km/h	0 km/h	0 km/h	0 km/h	0 km/h
4	30 km/h	40 km/h	40 km/h	60 km/h	40 km/h
5	60 km/h	80 km/h	80 km/h	100 km/h	100 km/h
6	90 km/h	120 km/h	120 km/h	140 km/h	160 km/h
7	100 km/h	125 km/h	140 km/h	160 km/h	180 km/h
8	90 km/h	120 km/h	120 km/h	140 km/h	160 km/h
9	60 km/h	80 km/h	80 km/h	100 km/h	100 km/h
10	30 km/h	40 km/h	40 km/h	60 km/h	140 km/h
11	90 km/h	120 km/h	120 km/h	140 km/h	160 km/h
12	0 km/h	0 km/h	0 km/h	0 km/h	0 km/h

From the MAIN MENU select BENCH TEST using the ← and → keys, and press ENTER.	VR2400 MAINMENU :BENCH TEST
Select the Tachograph scale required (i.e., 125 km/h, 140 km/h, 180 km/h, 100 km/h or 160 km/h).	Select the scale :125 km/h ← →
Set the tachograph to a K-factor of 8000 (remember to note the original setting first), or press delete and enter the K factor required. The display and the setting method will vary according to the type of tachograph selected. Press ENTER on completion.	Select K-factor :8000 Pul/km?
Select whether the change of Duty is to be automatically changed or manually changed. Press ENTER to accept current settings or the ← and → keys to change. Note: Auto Duty can only be programmed via the front connector.	Auto Duty :Off < - - >
Perform the task displayed. Press ENTER on completion.	Check tachometer settings
Connect the drive lead. The precise lead required will vary according to the type of tachograph. After connection press ENTER.	Connect drive lead to tachometer

Set the power supply to 12 or 24V to match the tachograph and turn on the supply. Press ENTER on completion.	Switch on at correct voltage
Only for tachographs with a second hand or a clock tell-tale, check that the clock is stepping. Press ENTER on completion.	Check clock is stepping OK
Perform the task displayed. Press ENTER on completion.	Check bulbs are illuminated
The Programmer provides a specific clock check facility incorporating a clock tester for the VR2400, K1324 and MotoMeter EGK-100 tachographs. The clock test should be carried out at the end of the benchtest for these tachographs. For other tachographs a separate clock tester will be required. Press ENTER to confirm that the accuracy has been tested, or exit the Benchtest (Press MENU) to perform the clock test procedure.	Check clock for accuracy
Perform the task displayed. Press ENTER on completion.	Prepare and insert 2 charts
Close the tachograph as appropriate for the type of tachograph and press ENTER.	Close the tachograph
Set both duty knobs to Rest, 2, and press ENTER on completion.	Driver=Rest Crew=Rest
The speed will now be speed '1' (as shown in Table 17) for 10 seconds, the time will count down to zero and then an audible beep will be heard.	Speed: 120 km/h Time: 10 s
The speed displayed will then go to 0km/h for 10 seconds (the time will count down to zero) and an audible beep will be heard again.	Speed: 0 km/h Time: 10 s
The display will then show as opposite. Check that the time on the chart corresponds with the time indicated on the clock, then press ENTER.	Check clock to chart time
The speed will remain at 0 km/h for 2 minutes (120 seconds - the time will count down to zero) and then an audible beep will be heard. To move on to the next test before the end of the normal time press ENTER.	Speed: 0 km/h Time: 120 s

The speed will then go up to speed '4' shown in Table 17. After 120 seconds (the time will count down to zero) there will again be an audible beep. To move on to the next test before the end of the normal time press ENTER.	Speed: 40 km/h Time: 120 s
The speed will then go up to speed '5' shown in Table 17. After 120 seconds (the time will count down to zero) there will again be an audible beep. To move on to the next test before the end of the normal time press ENTER.	Speed: 80 km/h Time: 120 s
The speed will then go up to speed '6' shown in Table 17. After 120 seconds (the time will count down to zero) there will again be an audible beep. To move on to the next test before the end of the normal time press ENTER.	Speed: 120 km/h Time: 120 s
The speed will then go up to speed '7' shown in Table 17. After 120 seconds (the time will count down to zero) there will again be an audible beep. To move on to the next test before the end of the normal time press ENTER.	Speed: 125 km/h Time: 120 s
The speed will then go down to speed '8' shown in Table 17. After 120 seconds (the time will count down to zero) there will again be an audible beep. To move on to the next test before the end of the normal time press ENTER.	Speed: 120 km/h Time: 120 s
The speed will then go down to speed '9' shown in Table 17. After 120 seconds (the time will count down to zero) there will again be an audible beep. To move on to the next test before the end of the normal time press ENTER.	Speed: 80 km/h Time: 120 s
The speed will then go down to speed '10' shown in Table 17. After 120 seconds (the time will count down to zero) there will again be an audible beep. To move on to the next test before the end of the normal time press ENTER.	Speed: 40 km/h Time: 120 s
The speed will then go up to speed '11' shown in Table 17. After 120 seconds (the time will count down to zero) there will again be an audible beep. To move on to the next test before the end of the normal time press ENTER.	Speed: 120 km/h Time: 120 s
The speed will now go to 0 km/h and will be	Speed: 0 km/h

held for 2 minutes (120 seconds - the time will count down to zero). To move on to the next test before the end of the normal time press ENTER. At the end of the 2 minute test there will be an audible beep.	Time: 120 s
Set both duty knobs to active, 4, and press ENTER on completion.	Driver=Active Crew=Active
The unit will record duty time for 120 seconds (the time will count down to zero). After that time a beep is heard.	Recording duty Time: 120 s
Remove the two charts and check the traces (speed, duty and distance on chart 1, duty on chart 2). Press ENTER.	Check chart recordings
Reset the K-factor of the tachograph to the correct value for the vehicle (as noted at Step 3). Press ENTER.	Set K-exact for vehicle
Switch off the power and disconnect the tachograph.	SWITCH OFF POWER SUPPLY
Press the ENTER or MENU key to return to the MAIN MENU.	VR2400 MAINMENU :BENCH TEST

(f) Belgian Bench Test

Before performing the Bench Test, check that the Belgian Bench Test is selected in the Diagnostics menu (see section 2.6). The maximum speed registered during the test will depend on the Tachograph scale selected at Step 2 below.

From the MAIN MENU select BENCH TEST using the ← and → keys, and press ENTER.	VR2400 MAINMENU :BENCH TEST
Select the Tachograph scale required (i.e., 125 km/h, 140 km/h, 180 km/h, 100 km/h or 160 km/h).	Select the scale : 125 km/h ← →
Set the tachograph to a K-factor of 8000 (remember to note the original setting first), or press delete and enter the K factor required. The display and the setting method will vary according to the type of tachograph selected. Press ENTER on completion.	Select K-factor :8000 Pul/km?
Select whether the change of Duty is to be automatically changed or manually changed. Press ENTER to accept current settings or the ← and → keys to change.	Auto Duty : Off < - - >
Note: Auto Duty can only be programmed	

via the front connector.	
Perform the task displayed. Press ENTER on completion.	Check tacho settings
Connect the drive lead. The precise lead required will vary according to the type of tachograph. After connection press ENTER.	Connect drive lead to tacho
Set the power supply to 12 or 24V to match the tachograph and turn on the supply. Press ENTER on completion.	Switch on at correct voltage
Only for tachographs with a second hand or a clock tell-tale, check that the clock is stepping. Press ENTER on completion.	Check clock is stepping OK
Perform the task displayed. Press ENTER on completion.	Check bulbs are illuminated
Perform the task displayed. Press ENTER on completion.	Prepare and insert 2 charts
Close the tachograph as appropriate for the type of tachograph and press ENTER.	Close the tachograph
Set both duty knobs to active, 4, and press ENTER on completion.	Driver=Active Crew=Active
The speed displayed will then go to 60km/h for 10 seconds (the time will count down to zero) and then an audible beep will be again.	Speed: 60 km/h Time: 10 s
The speed displayed will then go to 0km/h for 10 seconds (the time will count down to zero) and an audible beep will be heard again.	Speed: 0 km/h Time: 10 s
Open the tachograph as appropriate for the type of tachograph and press ENTER.	Open the tachograph
The display will then show as opposite. Check that the time on the chart corresponds with the time indicated on the clock, then press ENTER.	Check clock to chart time
Close the tachograph as appropriate for the type of tachograph and press ENTER.	Close the tachograph
Note the current odometer reading on the tachograph. This will be required later to check the accuracy of the odometer. Press ENTER.	Note odometer reading

Set both duty knobs to active, 4, and press ENTER on completion.	Driver=Active Crew=Active
Note the time displayed on the Tachograph clock.	Record time on Tacho
The speed '39,0km/h' will then be displayed on the Programmer. Press ENTER to continue.	Speed39,0km/h Press <ENTER>
Use the ↑ and ↓ (7 and 4) keys to increase or reduce the speed indicated by the speed pointer on the cluster until it is exactly 40km/h. Press ENTER to continue.	↑↓Pointer to 40 39,0 km/h
The final speed selected will be shown and after 120 seconds (the time will count down to zero) there will be an audible beep. To move on to the next test before the end of the normal time press ENTER.	Speed40,0km/h Time: 120 s
The speed '79,0km/h' will then be displayed on the Programmer. Press ENTER to continue.	Speed79,0km/h Press <ENTER>
Use the ↑ and ↓ (7 and 4) keys to increase or reduce the speed indicated by the speed pointer on the cluster until it is exactly 80km/h. Press ENTER to continue.	↑↓Pointer to 80 79,0 km/h
The final speed selected will be shown and after 120 seconds (the time will count down to zero) there will be an audible beep. To move on to the next test before the end of the normal time press ENTER.	Speed80,0km/h Time: 120 s
The maximum speed (minus 1 km/h) for the currently selected scale e.g. '124,0km/h' will then be displayed on the Programmer. Press ENTER to continue.	Speed124,0km/h Press <ENTER>
Use the ↑ and ↓ (7 and 4) keys to increase or reduce the speed indicated by the speed pointer on the cluster until it is exactly maximum speed (e.g. 125km/h). Press ENTER to continue.	↑↓Pointer to 125 124,0 km/h
The final speed selected will be shown and after 120 seconds (the time will count down to zero) there will be an audible beep. To move on to the next test before the end of the normal time press ENTER.	Speed125,0km/h Time: 120 s
The speed '101.0km/h' will then be displayed on the Programmer. Press ENTER to	Speed101,0km/h Press <ENTER>

continue.	
Use the ↑ and ↓ (7 and 4) keys to increase or reduce the speed indicated by the speed pointer on the cluster until it is exactly 100km/h. Press ENTER to continue.	↑↓Pointer to 100 101,0 km/h
The final speed selected will be shown and after 120 seconds (the time will count down to zero) there will be an audible beep. To move on to the next test before the end of the normal time press ENTER.	Speed100,0km/h Time: 120 s
The speed '61.0km/h' will then be displayed on the Programmer. Press ENTER to continue.	Speed61,0km/h Press <ENTER>
Use the ↑ and ↓ (7 and 4) keys to increase or reduce the speed indicated by the speed pointer on the cluster until it is exactly 60km/h. Press ENTER to continue.	↑↓Pointer to 60 61,0 km/h
The final speed selected will be shown and after 120 seconds (the time will count down to zero) there will be an audible beep. To move on to the next test before the end of the normal time press ENTER.	Speed60,0km/h Time: 120 s
Set both duty knobs to active, 4, and press ENTER on completion.	Driver=Active Crew=Active
The unit will record duty time for 120 seconds (the time will count down to zero). After that time a beep is heard. To move on to the next test before the end of the normal time press ENTER.	Active Time: 120 s
Set both duty knobs to Passive, 1, and press ENTER on completion.	Driver=Passive Crew=Passive
The unit will record duty for 120 seconds (the time will count down to zero). After that time a beep is heard. To move on to the next test before the end of the normal time press ENTER.	Passive Time: 120s
Set both duty knobs to Rest, 2, and press ENTER on completion.	Driver=Rest Crew=Rest
The unit will record duty time for 120 seconds (the time will count down to zero). After that time a beep is heard.	Rest Time: 120s
Check that the odometer reading has increased over that noted previously, by the amount shown. (Note: this will vary for each	Check odometer +26.705km

scale type selected and also depending on how long it takes to adjust each speed setting up or down).	
Remove the two charts and check the traces (speed, duty and distance on chart 1, duty on chart 2). Press ENTER.	Check chart recordings
Press the ENTER or MENU key to return to the MAIN MENU.	VR2400 MAINMENU :BENCH TEST

(g) Programming of a Custom Bench Test

Custom Bench Tests may be programmed from the DIAGNOSTICS MENU. To access the Diagnostics menu, hold down the ENTER key while switching the Programmer on.

To prevent unintentional use of the Diagnostic functions, a pass code will be requested. Type in 8642, and press ENTER.	Enter Code :8642
Select Benchtest Type, using the arrow keys (← →) and press ENTER.	DIAGNOSTICS MENU :Benchtest type
Select bench-test type Custom using the arrow keys (← →) then press ENTER.	Benchtest Type :Custom ← →
A series of 15 screens similar to that shown opposite are then presented in turn. Each defines one stage of the speed test. To move to the definition of the next stage press →; to move to the previous stage press ←; to change the definition of that stage press ENTER.	1 Time = 250 s Speed 80 km/h
Having pressed ENTER, enter the required speed for that stage of the test. If the entered speed is lower than the 10km/h, then it will automatically reset to 0km/h. Terminate the entry by pressing ENTER.	Enter speed : km/h
Then enter the required time for the stage (in seconds) again terminating the entry with ENTER. Thereafter press → to move on to the next stage. Setting the test time to zero will cause the unit to skip on to the next stage having a time greater than zero.	Enter time : s
Stages 16 to 20 allow definition of test stages where different duty modes are recorded - this must be carried out without speed since automatic tachographs would otherwise	16 Time= 120 s Duty=Active

record Drive. To move to the definition of the next stage press →; to move to the previous stage press ←; to change the definition of that stage press ENTER.	
The Programmer will then display a screen similar to the one shown. Use the ← and → arrow keys to select the required duty mode for both Driver 1 and Driver 2 then press ENTER.	Select duty : Active ← →
Again enter the required test time and terminate the entry by pressing ENTER. As before enter zero time to cause that stage to be skipped.	Enter time : s
After stage 20 has been completed, stage 1 appears on the screen again.	1 Time = 250 s Speed 80 km/h
Press the MENU key once to return to the DIAGNOSTICS MENU.	DIAGNOSTICS MENU :Benchtest type

On completion of the required bench test definition press MENU twice to return to the MAIN MENU. The test sequence just entered will be memorised until it is next changed and will be the selected Bench Test type. If a pre-programmed bench test type is subsequently selected the details of the entered Custom test sequence will remain in the Programmer memory.

(h) Digital Tachograph Bench Test

From the MAIN MENU select BENCH TEST using the ← and → keys, and press ENTER.	SE5000 MAINMENU :BENCH TEST
Set the tachograph to a K-factor of 8000 (remember to note the original setting first), or press delete and enter K factor required. The display and the setting method will vary according to the type of tachograph selected.	Select K-factor :8000 Pul/km?
The speed will then go up to 40km/h. After 10 seconds (the time will count down to zero) there will again be an audible beep. To move on to the next test before the end of the normal time press ENTER.	Speed: 40km/h Time: 10 s
The speed will then go up to 80km/h. After 10 seconds (the time will count down to zero) there will again be an audible beep. To move on to the next test before the end of the normal time press ENTER.	Speed: 80km/h Time: 10 s
The speed will then go up to 180km/h. After	Speed: 180km/h

60 seconds (the time will count down to zero) there will again be an audible beep. To move on to the next test before the end of the normal time press ENTER.	Time: 60 s
Set both duty knobs to Work, and press ENTER on completion.	Driver=Work Crew=Work
The unit will record duty time for 120 seconds (the time will count down to zero). After that time a beep is heard.	Recording duty Time: 120 s
Set both duty knobs to Rest, and press ENTER on completion.	Driver=Rest Crew=Rest
The unit will record duty time for 120 seconds (the time will count down to zero). After that time a beep is heard.	Recording duty Time: 120 s
Set both duty knobs to Passive, and press ENTER on completion.	Driver=Passive Crew=Passive
The unit will record duty time for 120 seconds (the time will count down to zero). After that time a beep is heard.	Recording duty Time: 120 s

ANNEX C - VR2400 SERIES TACHOGRAPH – DIAGNOSTIC TROUBLE CODES (DTC)

DTC	Description	Stored (Y/N)	Remarks	Suggested Action
A00C	Internal Error	Y	Internal device error.	Reset tachograph and re-test.
9010	LCD Error	Y	Fascia communications.	Check fascia functions (keypress, display, etc.)
A400	Tachograph Power Supply	Y	Power interruption.	Check power supply and connections.
9060	Drawer Error	Y	Drawer catch failure.	Check drawer function.
9061	Speed Rack Error	Y	Speed rack motor or opto failure.	Check charts inserted correctly. Reset tachograph and re-test.
9062	Duty Rack Error	Y	Duty rack motor or opto failure.	Check charts inserted correctly. Reset tachograph and retest
9063	Cam Error	Y	Cam motor or opto failure.	Check charts inserted correctly. Reset tachograph and retest.
9064	Chart Table Error	Y	Chart table motor or opto failure.	Check charts inserted correctly. Reset tachograph and retest.
A822	Sender-Tachograph Key/Serial Number Mismatch	Y	Encrypted data errors.	Re-pair tachograph to Sender. Check wiring to B-socket.
A423	Sender-Tachograph Communications Problem	Y	Encrypted communications errors (encrypted sender) or complimentary signal failure (4 wire sender) or sender disconnection.	Check tachograph settings – Sender Type. Re-pair sender if necessary. Check wiring to B-socket.
A411	CAN Bus Communication Error With Instrument Cluster	Y	“Cluster present” message not being received.	Check if instrument cluster matches tachograph display. Check wiring.
900B	CAN Bus Off	Y	CANBus error.	Check tachograph settings – CANBus enabled and Customer Type. Possibly no CANBus present in vehicle
900A	CAN Bus Error	Y	CANBus in passive error mode.	Check tachograph settings - possibly no CANBus present in vehicle.
9430	V-pulse Output Error	Y	Monitoring of V-Pulse output.	Disconnect all V-pulse supported equipment. Retest tachograph. If DTC does not reappear, suspect V-pulse driven equipment.
900F	Keyboard Error	Y	Key jammed or held for excessive period.	Check all keys/buttons on tachograph. Retest tachograph.
A00E	Calibration Error	Y	Requires configuration	Check tachograph settings – Install Date and Service Delay. Retest tachograph. The service delay applies to tachographs fitted with battery backed clock only – DC, Renault, MAN.
A050	Driving without Chart	N	Speed pulses detected with drawer open, driver chart missing or chart recording complete.	Ensure driver chart present and drawer properly closed.
9051	No Driver Chart Present	N	Drawer closed with no driver chart present.	Insert driver chart
9052	No Crew Chart Present	N	Drawer closed with no crew chart present.	Insert crew chart if required.

ANNEX D - Character Map.

Under certain functions, various characters can be entered by continually pressing the numeric keys on the programmer. The mapping for the characters against each key is listed below;

0 ! " # \$ % & ' ()
1 * + , - . / : ;
2 A B C a b c = > ?
3 D E F d e f @ [\\
4 G H I g h i] ^ _
5 J K L j k l ` { |
6 M N O m n o } ~
7 P Q R S p q r s
8 T U V t u v
9 W X Y Z w x y z <