Turnkey Instruments Ltd



BrakeSafe
Operating Instructions

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KEY-PRESS	FUNCTION
[RESET]	to switch on to quit current function to see battery condition
[ENTER]	to select an instrument function to select the **Editing Mode** to select an instrument setting to enter a character and move on to the next to enter an edited value press and hold
[PRINT]	to print results to insert a pause after a test
[S]	to measure slope gradient to manually start & stop a test to set the pedal force transducer to zero
[A]	to arm for test to print all results to reset Trailer & Vehicle ID to all dashes
[↑] or [+]	to increase a value to fast increase press and hold to choose **YES** for a setting
[↓] or [-]	to decrease a value to fast decrease press and hold to choose **NO** for a setting

GETTING STARTED

The **BrakeSafe** keypad has a tactile feel and the instrument beeps when a button is pressed. Holding a button for more than one second causes the instrument to beep rapidly. This is the ***hold-mode*** in which **[↑]** , **[↓]** and **[ENTER]** behave differently as described below.

SWITCHING ON: To turn the instrument on, press and release the switched marked **[RESET]**. After a short self test (see below) the display will show **"BrakeSafe *ready*"**, together with the time and date. If the battery needs re-charging, the display will flash **"*Charge battery*"**.

The battery must be fully re-charged as soon the **"*Charge battery*"** warning appears. The instrument will not let you print results with the **"*Charge battery*"** warning on.

SWITCHING OFF: Providing the instrument is not armed for a test or printing, it will switch itself off automatically if no buttons have been pressed for 4 minutes. To manually switch off the instrument press **[S]** and **[PRINT]** together.

DISPLAY CONTRAST: To adjust the contrast of the display press and hold **[RESET]** as the instrument is switched-on until the display goes its darkest after about 3 seconds. Then use the **[+]** or **[-]** buttons to darken or lighten the display respectively. Press **[ENTER]** when the required contrast is obtained. **BrakeSafe** will automatically remember this setting and use it each time it is switched-on. The contrast can only be adjusted as you switch the instrument on, and once set to suit you it should not normally need re-adjusting.

SELF TEST: As **BrakeSafe** is switched on it carries out certain self tests to make sure it is working correctly. At the end of the self test the display will show ***"Calibration date"***, this is the time and date when the instrument was last calibrated. If this is more than a year ago, the display will show ***"PLEASE HAVE ME RE CALIBRATED"*** instead.

If the instrument detects a fault with its memory during the self test the display will show "***MEMORY ERROR***".

If the instrument has lost its calibration information the display will show "***POOR CALIBRATION***".

In both of the above cases, the instrument will automatically revert to a default calibration and is therefore still usable - albeit with reduced accuracy. In this case, after the error message, the display will show "***PLEASE HAVE ME RE CALIBRATED***". If the "***Memory Error***" warning appears always check that the Trimmable Parameters (see Appendix B) have not been corrupted before using the instrument.

MEMORY: If you press **[RESET]** while the display shows **"BrakeSafe *ready"***, the display will switch to indicating the battery voltage and the percentage of memory used. Release **[RESET]** to revert to the normal display.

The fully charged battery voltage is about 6.4 volts. It is suggested that the battery is recharged if its voltage drops below 6 volts.

As the percentage of memory used approaches 100% you should reduce number of tests stored to free up more memory space (see **ARMING FOR A TEST** below). Doing this erases the tests from memory so remember to first print any stored tests you wish to keep.

If the battery charger is connected the second line of the display will show the recharge current being taken by the battery instead of the percentage memory used. When full charge is reached the current will drop below 30 milli-amperes (mA), and the battery voltage will eventually rise to about 7.25 volts while the charger is connected.

EDITING MODE: The editor allows some of the instrument settings and parameters to be changed. Editing can be password protected. To select the editor press **[ENTER]** while the display shows **"BrakeSafe ready"**, then use **[↑]** or **[↓]** to choose what to edit followed by **[ENTER]** to select:

TRAILER ID: allows the user to change the name identification of the trailer. Up to sixteen alphanumeric characters can be entered for each of the 32 ID's that can be stored. Press **[↑]** or **[↓]** to locate the ID to change and press **[ENTER]**. Pressing **[↑]** or **[↓]** changes the flashing character, then **[ENTER]** to move on to the next character position. Press and hold **[ENTER]** to save the whole name. Pressing [A] resets the ID to all dashes.

VEHICLE ID: allows the user to change the vehicle identification. The characters are edited in the same fashion as Trailer ID.

Change Settings: your instrument has various settings which can be turned ON or OFF by the user. The settings you can change are described in **Appendix A** of this manual. Press **[↑]** to turn a setting ON, **[↓]** to turn it OFF. Then press **[ENTER]** to select the choice and move on to the next.

Trim Parameters: your instrument is programmed with some adjustable parameters whose values can be changed. They are described in **Appendix B** of this manual. This editing option allows you to change their value. Press **[↑]** or **[↓]** to increase or decrease the value of the flashing digit, then **[ENTER]** to move on to the next digit. press and hold **[ENTER]** to save the whole parameter value and move on to the next.

Trim Zeros: allows the user to periodically check and trim the slope transducer zero levels. Zeroing can be done on any flat surface by following the prompts on the display. Properly trimmed zeros allow the instrument to be used to make accurate measurements of ground slope. Note that the zero trimming surface does not have to be exactly horizontal but it must be flat. Make the first measurement with the instrument handle nearest to you, then rotate the instrument through 180 degrees and make the second measurement with the handle away from you.

Adjust Clock: allows the time to be changed to compensate for daylight saving. On selection, the minutes value will flash to indicate it can be adjusted, use **[↑]** or **[↓]** to change then [ENTER] to save the new value, the hours value will then flash and can be adjusted likewise. The date can only be changed at the factory.

Re-calibrate: shows the latest calibration information and allows the factory/distributor to re-calibrate the instrument. Press **[P]** to print a Calibration Report.

USING BRAKESAFE

MEASURING SLOPE: To measure the slope gradient press the switch marked **[S]**. The instrument will now continuously measure and display the slope gradient in percent. A negative number means a downward gradient. If a very accurate measurement is required, first trim the instrument zeros as described in **Trim Zeros**.

If the **pedal force** or **line pressure** input option is switched-on, the second line of the display will show the force in Newtons being applied to the Pedal Force Transducer (or pressure in Bar applied to the pressure gauge). If not, the second line will show the gradient as **1 in n**.

Note that the instrument assumes that no pedal force is being applied as it enters this ***MEASURING SLOPE*** mode. It takes the value of pedal force it measures on entry as the zero point and uses this value to compensate for any zero drift of the pedal force transducer. This zero point is automatically saved in the instrument memory. Please make sure that no force is being applied to the transducer at the moment **[S]** is pressed.

Note that the **line pressure** is not zeroed on entry.

POSITIONING THE INSTRUMENT: If the **Trigger Pad** or **Pedal Force Transducer** (PFT) are to be used attach to the brake pedal and connect to the instrument using the cable provided.

Place **BrakeSafe** on the front passenger seat or in the passenger footwell. The Velcro on the underside of the instrument will adhere to fabric seats and carpeted footwells. When placing on the seat also restrain by passing the passenger seatbelt through the instrument carrying handle. If placing in the footwell make sure that Velcro holds sufficiently to prevent the instrument moving forward under braking. If in doubt restrain using the carrying handle and/or position against a forward bulkhead. The accuracy of the results depend on the instrument remaining secure while the vehicle decelerates.

The instrument should be positioned in the vehicle so that the large arrows on its lid are pointing in the direction of travel.

Although the tilt of the instrument relative to the ground surface is automatically recorded and used to compensate the results, the very best results will be obtained when the instrument base is parallel to the road surface.

TRIGGERING OPTIONS: Use the **Editing Mode** (Change Settings) to select the trigger mode and whether or not the pedal force is to be measured. When the **External Trigger is ON**, measurements will start (after arming) either when the force applied to the **Pedal Force Transducer** exceeds the **PFT Trig** threshold in Newtons or when the **Trigger Pad** is pressed. This triggering mode is useful for measuring the reaction or delay time of the braking system. When the **External Trigger** is **OFF**, measurements start when the deceleration exceeds the **Braking Threshold** (normally 10% g - see Appendix B). When the **Pedal Force/Line Pressure** setting is ON the instrument will also measure and record the applied pedal force/ pressure during the test, if **OFF** it will not.

When using the Pedal Force Transducer remember to zero it first by pressing **[S]** to measure slope before arming for the test.

When using the trigger pad, if it is held depressed when the instrument is being armed for the test the **DEADMAN BRAKE** trigger is automatically selected. In this mode a "***D***" will appear at the end of the top line of the display when the instrument is armed. In this case the **BrakeSafe** will start measuring when the trigger pad is **released**.

Alternatively you can operate the instrument with a manual start and stop using the **[S]** button.

ARMING FOR A TEST: Before brake performance can be measured the instrument must be armed. This is done by pressing the switch marked **[A]**.

The top line of the display will show "***ARM FOR TEST N***", where ***N*** is an identification number for the next brake test. This number, which will be between 1 and 50, is used to identify the test results on the printout and in the instrument memory. It automatically increases by 1 after each successful test.

To free memory you can reduce the test number using the **[↓]** button; if you go too far, use the **[↑]** button to increase again. Press **[ENTER]** to confirm you want to go ahead with that test.

If you do change the test number, remember to have printed or downloaded any results you want to keep because results from tests with higher test numbers will be erased from memory on arming.

If, when you press **[A]** to arm for a test, the test number exceeds 50 or if there is insufficient memory space left, the display will show "***Clear my Memory?***". In this case press **[A]** to start again at Test 1, or press **[R]** to quit so that the stored results can be printed. ***Print the results you want to keep before clearing the memory.*** Note that if your tests have long stopping times, you may not reach 50 tests before the memory is full.

The display then asks you to confirm the Vehicle ID, press **[A]** to accept, or change with **[↑]** or **[↓]**. To edit the ID press **[ENTER]** , use **[↑]** or **[↓]** to select characters, press **[ENTER]** to move to next character and press and hold **[ENTER]** to save.

The display then asks you to confirm the Trailer ID, use the same principal as the Vehicle ID to enter a Trailer ID. Once completed press **[A]**.

The display then asks you to ***"Get SLOPE offset"***, this is the typical ground slope on which the test is to be carried out. Drive to the stopping area and with the **vehicle stationary** at a representative point press **[ENTER]**. To give the most accurate results, **BrakeSafe** should be aligned to move parallel with the road surface.

The display will then show Don't Name Brake, use the **[↑]** or **[↓]** buttons to cycle through the brake options. Once completed press **[ENTER]**. This choice will be displayed on your printout.

You may now move the vehicle to the acceleration starting point for the test. If you know the road gradient is constant, you could ***"Get SLOPE Offset"*** here.

Just before accelerating off press **[A]** to start the brake test sequence.

After a short pause the display will show ***"ARMED TEST N"***, the second line will show the approximate speed increase since starting the test.

To disarm the instrument without carrying out a brake test, press **[RESET]**.

Normally **BrakeSafe** will automatically record suspension bounce for 1.5 seconds at the end of the test. If you press **[PRINT]** while **BrakeSafe** is armed, a **"P"** will appear at the end of the top line of the display. This indicates that **BrakeSafe** will pause at then end of the test until **[S]** is pressed. Press **[PRINT]** again to turn the pause facility off.

For a quick re-arm press **[A]** this moves to a new test and gives the option to rename the brakes being tested.

BRAKE TESTING: With **BrakeSafe** armed as described above, two methods can be used for starting the brake test:

Trigger start-stop: This method uses either the internal or external trigger as described. When armed and the brake operated, **BrakeSafe** automatically starts to measure the deceleration experienced by the vehicle. The display will show "***AUTOMATIC STOP***". Measurements continue until **BrakeSafe** senses the vehicle has stopped decelerating, at which time the results are calculated and shown on the display.

Manual start-stop: This method can be used without any triggering. With the instrument armed as described above, momentarily press and release the **[S]** button as the brakes are applied to start the measurements. The display will show ***"MANUAL STOP"***. Press and release **[S]** again to stop the measurements as the vehicle comes to a halt.

PRINTING IMMEDIATE RESULTS: To print the results table of the test just carried out, press **[P]** while the results are still shown on the display.

With either method, at the end of a successful test the display will show the **Average Deceleration** (see Appendix A Show Peak g only? for alternatives), expressed as a fraction or % of g the acceleration due to gravity, g = 9.81 metres/sec/sec; the **Speed** at braking and the **Stopping Distance**. If the pedal force transducer has been used, the **peak pedal force** during braking, expressed in Newtons, is shown on the display.

If the test was not successful, the display will indicate the possible reason.

BrakeSafe will continue measuring for 1.5 seconds (or longer if the pause facility is used) after the vehicle comes to rest. This records the suspension bounce behaviour for inclusion on the graphical printout.

The display shows ***"Calculating..."*** whilst the results are calculated. Note that the calculated speed and distance assume the vehicle comes to rest and will be wrong if the vehicle is not brought to a halt during the brake test.

Do not allow the vehicle to move off until the results appear on the display.

After a successful brake test, the results are automatically stored in memory. Each set of test results is identified by the test number shown when the instrument was armed for that test.

If immediate printed results are not required press **[R]** in readiness for the next test.

The results table for the test will be printed. This will show the **Mean** and **Peak Deceleration**, the **Time to Stop, Brake Delay Time, Speed** at braking and **Stopping Distance**, the peak **Pedal Force** in Newtons, the time and date of the test, the test number, the date the next instrument calibration is due, and the instrument serial number. Also printed are the Examiner and Vehicle identifications.

The brake delay time can only be printed when the external triggering facility is used. The **Time to Stop** is the sum of the **Brake Delay Time** and the **Braking Time** (see Printing Graphs below).

Note that **BrakeSafe** will not allow you to print results if the low battery warning is on, or if the battery starts to fail during printing. However, since the results are automatically stored in memory, they can be printed out later on (or duplicate prints obtained) if this happens.

If at any time you wish to terminate a printout press **[RESET]**.

The printout will show "***I NEED CALIBRATING***" if your instrument is due for re-calibration.

The immediate printout automatically produces two copies of the results table.

PRINTING STORED RESULTS: The instrument will automatically store up to 50 sets of brake test results, each identified by its respective test number. On completion of each successful brake test, the test number will automatically increase by 1.

To print stored results press **[PRINT]** while the display shows "**BrakeSafe ready**". The display will show ***"Print Test N?"*** (where N is a test number between 1 and 50) and, on the second line, the Vehicle ID for that test.

Use **[↑]** or **[↓]** to change the test number if required, then press **[ENTER]** to start printing. Only one copy of the results table will be produced. **BrakeSafe** will remember which test number you reached in the print sequence and carry on printing from there even if a new test was printed in the immediate mode (see above). Changing the test number in this print mode will not erase any results.

You can also print all the stored results from the last test number printed up to the last test carried out. Do this by pressing **[A]** instead of **[P]** while the display shows ***"Print Test N"***. This does not apply to the immediate printouts described above.

Remember the print sequence number will be changed (and stored results erased) if the Test Number is changed during Arming.

PRINTING GRAPHS: BrakeSafe can also print graphs of the vehicle deceleration as a function of time. After printing a results table, the display will show **"PRINT GRAPH N ?"**. If a graph of deceleration is required press **[ENTER]**, if not press **[RESET]**.

The printer will feed paper as before until **[ENTER]** is released. The graph will be automatically scaled to suit the results. The deceleration axis is scaled to give either 0.125 g, 0.25 g, 0.5 g, 1.0 g or 1.5 g full scale, and the time axis scaled to match the time between the brakes being applied and the vehicle coming to a stop. At the end of the graph, the time axis scale will be printed.

Solid lines appear on the graph at the points in time when the deceleration first and last crosses the **Braking Threshold** (for the required start and stop window time respectively - see Appendix B). These are the brake start and brake end times. The time between these lines is the **Braking Time**. Some pre-braking measurements will be plotted on the graph prior to the brake start time.

Beyond the brake end time the graph records the suspension bounce for a further 1.5 seconds (or longer if Pause was used). In this portion of the graph negative values are plotted as shaded. Suspension bounce is not recorded in manual start/stop nor are the brake start end end times recorded on the graph.

If the **External Trigger** was used, a third solid line will appear on the graph prior to the brake start time. This is the external trigger time and it indicates the external trigger event and the time from it to the brake start time is the **Brake Delay Time**. Some pre-triggering measurements will also be plotted on the graph.

The average or **Mean Deceleration** is calculated over the **Braking Time** unless you set the instrument to include the **Brake Delay Time** in the average. In the latter case the average will be calculated over the whole **Time to Stop**. The **Time to Stop** is the **Braking Time** plus the **Brake Delay Time**.

If at any time you wish to terminate a graph printout press **[RESET]**.

If you have recorded pedal force or line pressure during a brake test these will also be plotted on the graph.

MEASURING ACCELERATION RATES

You can use the instrument to measure acceleration profiles for the vehicle. Do this by selecting YES for "***Acceleration Rate?***" in **Change Settings**. Position the instrument as for brake testing and if you are using the Trigger Pad attach it to the accelerator pedal.

Arm the instrument by pressing **[A]**. Then press the Trigger Pad or **[S]** to start measuring. The display will show the incremental speed increase since triggering and the time duration. To stop the measurements press **[S]** again. The display will then indicate the peak speed and the time it occured.

Press **[PRINT]** to print a graph of the acceleration profile

EXTERNAL INPUTS

With appropriate transducers you can also use your **BrakeSafe** to record and plot the brake pedal force or the brake line hydralic/air pressure during a brake test. The PFT1 pedal force transducer has been specifically designed for for use with **BrakeSafe** and will withstand pedal forces of up to 1500 Newtons. Consult Turnkey Instruments for suitable pressure transducers to measure line pressure.

PC-LINK

Test results recorded by your BrakeSafe can be downloaded to an IBM compatible computer for more detailed analysis and archive purposes. Information scanned in with the bar code wand is also downloaded. Thus a full database can be automatically maintained.

A PC-Link interface and software disk are required to download from the instrument. The operation of the PC Link software is described in a separate instruction booklet.

Brake for Windows is software for MicroSoft Windows with which you can download from your instrument to your PC and maintain an interactive database of your brake tests results. You can interrogate the database by Vehicle Registration, Examiner, test date, or brake performance. You get on screen graphs of the brake performance, which can be manipulated and analysed with the help of “on screen” buttons, and you can produce a full test report on your Windows printer. Call the factory for more information.

MAINTENANCE

The are no user serviceable parts inside the **BrakeSafe** instrument case. The manufacturer's warranty is invalidated if the case seal is broken.

CHARGING THE BATTERY: To re-charge the **BrakeSafe** battery, connect the charger supplied with the instrument to the DIN connector on the rear panel. Switch on the mains power to the charger. A full charge takes about 12 hours.

With a fully charged battery, **BrakeSafe** can be operated for up to 20 hours, depending on how much the printer is used.

Always recharge the battery as soon as possible after the ***"Charge Battery"*** warning appears on the display.

To get the best performance and battery life out of your **BrakeSafe** it is important that the battery is kept in good condition.

To keep the battery in optimum condition and the instrument ready for use we recommend the following charging schedules:

1 If ***BrakeSafe*** is in regular use, re-connect the battery charger after every testing session and leave the instrument permanently on charge.
2 If **BrakeSafe** is not to be used for a month or so, fully recharge the battery and then disconnect the charger. Then at monthly intervals give **BrakeSafe** a 24 hour top up charge. In this way, the instrument will always be ready for use.
3 If the battery has gone into deep discharge through neglect or miss-use, it may take up to 72 hours of re-charging to fully recover its capacity.

CHANGING PAPER ROLL AND RIBBON: Remove the printer cover. This is held in place by the two Allen key screws on the top of the instrument. Lift out the paper roll and carrier and tear through the remaining paper strip to leave a short length feeding into the printer.

Remove this strip of paper by carefully pulling it upwards through the printer.

Remove the printer ribbon by pressing on the right hand side near the PUSH marker.

Fit a new roll of paper onto the roll carrier so that the paper will feed upwards into the printer mechanism from the bottom of the roll. Make sure the leading edge of the paper strip is square.

Replace the paper carrier. Feed the leading edge of the paper strip into the bottom of the printer and wind through by turning the knurled plastic screw on the left hand side of the mechanism. Once the paper appears out of the top of the printer, pull through a short length to align it properly.

Pass the ribbon over the leading edge of the paper and then gently press it down onto the printer mechanism until it clicks into position. Tension the ribbon by turning the adjuster on the left hand side in the direction of the arrow.

Replace the printer cover.

CALIBRATION: The **BrakeSafe** instrument is supplied with a self-printed **Calibration Report** with the instrument identified by its serial number. Additional copies of the Calibration Report can be printed by the instrument.

It is recommended that **BrakeSafe** be re-calibrated once per year or earlier if the instrument self test warns of a calibration fault.

Turnkey Instruments Ltd and its distributors can offer a full Re-calibration and Maintenance Contract for your **BrakeSafe**.

NOTES

For help and information, call.....

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APPENDIX A - CHANGING SETTINGS

Use **[↑]** to choose YES to turn a setting on, or **[↓]** to choose NO to turn it off. Then press **[ENTER]** to select and save the setting choice and move on to the next one.

PASSWORD PROTECT? Choose YES to protect the settings and parameters with the password ***. The password must be entered via the keypad before the **Editing Mode** can be used.

ACCELERATION RATE? Choose YES to determine the acceleration rate of the vehicle. Position and arm the instrument as for brake testing. Attach the trigger pad to the accelerator pedal or press **[S]** to start measuring. Press **[S]** again to stop. Press **[P]** to print the ***Acceleration Profile***.

SKIDMAN mode? Choose YES for the SkidMan accident reconstruction mode. Speed is not calculated and just the average and peak decelerations are printed. Speed can be inferred from skid length and average deceleration.

LINE PRESSURE? Choose YES to record the brake line air or hydraulic pressure during the brake test. An external pressure transducer must be connected to the DIN socket. This should give an output of 0.4 volt at 0 bar pressure and 2.0 volt at 100 bar. Consult the wiring diagram in Appendix C for DIN socket pin connections.

PEDAL FORCE? Choose YES to record the force applied to the brake pedal during the brake test. Fix the optional **Pedal Force Transducer** to the brake pedal and connect to the DIN socket.

SHOW PEAK g ONLY? Choose YES to record peak rather than average deceleration on the display and printout.

EXTERNAL TRIGGER? Choose YES to trigger the instrument when the applied **Pedal Force** reaches the PFT Trig in Newtons or when the **Trigger Pad** is depressed. Otherwise the instrument will triggered when the deceleration exceeds **Brake Threshold** (see Appendix B). Fix the **Pedal Force Transducer** or **Trigger Pad** to the brake pedal.

FAST SAMPLING? Choose YES to record at 400 samples per second instead of the normal 40 per second. Will use up memory 10 times as fast but useful for studying high speed ABS oscillations.

LCD BACKLIGHTING? Choose YES to illuminate the LCD for use at night. The extra current drain will shorten time between battery re-charges.

FINE SLOPE? Choose YES to display the slope gradient to 0.1% in the **SLOPE MEASURING** mode. Otherwise measures to 1%

MILES PER HOUR? Choose YES to show, print and download results in mph and feet, NO for kilometres per hour and metres.

RESULTS IN % g? Choose YES for the results to be displayed and printed as a percentage of g, NO to display and print as fraction of g. (where g=9.81 m s-2 the acceleration due to gravity)

DELAY IN AVERAGE? Choose YES to include the measurements during **Brake Delay Time** period in the average g result (tends to give a lower average reading), NO to start the average after the brake delay. Has no effect unless the **External Trigger** is used (no brake delay without the external trigger).

APPENDIX B - TRIMMABLE PARAMETERS

Tilt 2.5 degrees/g - this compensates for the tilt of the vehicle, caused by the movement of its suspension, as it decelerates. The default value of 2.5 degrees per g is suitable for typical saloon cars. Vehicles with softer suspension require a larger tilt compensation.

Brake at 10.00% - this is the deceleration in %g of the **Braking Threshold** which determines the start and end of braking. If the **External Trigger** is being used it is also the threshold for the end of the **Brake Delay Time** period. It can be adjusted between 00.00% and 99.99% g. The default value is 10.00% g.

PFT Trig 20.00 N - this is the brake pedal force in Newtons required to trigger the instrument when using the pedal force transducer.

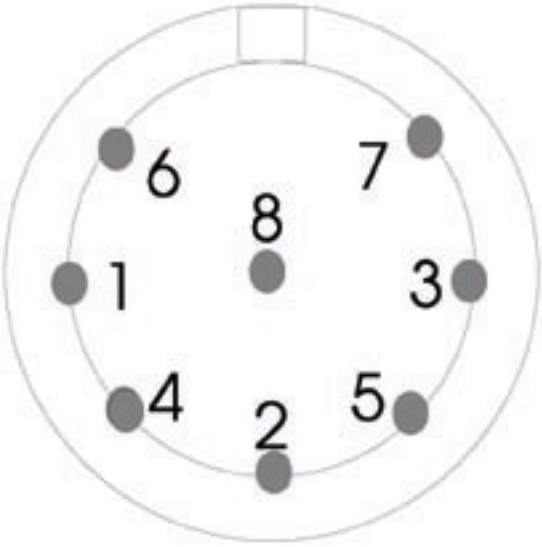
Starting 00.50 secs - the time window the deceleration must be sustained at more than **braking threshold** for the braking to be determined to have started (and the Brake Delay to have ended). The brake start time is then taken as the beginning of this time window. The time from the **External Trigger** to the brake start time is the **Brake Delay Time**. The Starting Time Window can be adjusted between 00.00 sec and 02.55 sec, the default value is 00.50 secs.

Stopping 00.10 secs - the time window (after a valid start) the deceleration must be sustained at less than **braking threshold** for the braking to be determined to have ended (and the vehicle to have stopped). The brake end time is then taken as the beginning of this time window. The time between the brake start and brake end times is the **Braking Time**. The average deceleration will be calculated over this interval unless you have specifically included in the average the deceleration during the Brake Delay Time as well. The Stopping Time Window can be adjusted between 00.00 sec and 02.55 sec, the default value is 00.10 secs.

MAX over 00.20 s - the time window interval in seconds over which the developed or sustained peak reading is determined. The default interval is 0.2 seconds. It follows that the value determined will be greatest lowest value seen as the window is scanned across the data.

APPENDIX C - DIN CONNECTOR

PIN CONNECTIONS VIEWED ONTO DIN PLUG MATING FACE



Pin 1 external trigger input, serial data out, barcode input
Pin 2 battery charger -ve and case
Pin 3 digital status input, serial data input
Pin 4 pulse input
Pin 5 signal common
Pin 6 voltage output (5.5 volt approx)
Pin 7 analogue input 0.4 volt to 2.0 volt (pressure)
Pin 8 battery charger +ve

APPENDIX D - TECHNICAL SPECIFICATION

Measurement Accuracy	better than ±2% over full scale, better than ±1.5% from 15% g to 90% g
Measurement Range	0 to 140% g (g=9.81 metre/sec/sec). Resolution 0.1 % g., 40 or 400 measurements per second
BrakeSafe Printer	40 column dot matrix type with graphics
BrakeSafe Display	2 line alphanumeric LCD with backlight
Internal Memory	32k bytes, battery backed CMOS RAM
Real Time Clock	months and leap years adjust automatically
Bar Code Input	scans vehicle and examiner identification (uses code 39 bar codes)
Start Trigger	Automatic 10% g or from brake pedal

Computer Link	serial RS232. Memory saves results of up to 50 brake tests for transfer into PC database or spreadsheet or **Brake for Windows**
Battery	6 volt rechargeable, operates for over 16 hours from full charge. Display shows battery voltage and warns when re-charge required
Battery Charger	unregulated 12 volt DC 600mA from AC mains or car cigarette lighter. Re-charge current shown on display
Keypad	tactile feel with audio feedback. Full alphanumeric entry for examiner and vehicle identification
Pedal Force Transducer	Detachable type PFT1 with auto zero, 1200 Newtons FSD, accuracy better than ±2%
Size and Weight	140 x 220 x 78 mm, 2.75 kg nett

APPENDIX E – MOT SPECIFICATION

The following instructions are reproduced for your convenience from the MOT Inspection Manual, Issue Date: Mar 1992. When in any doubt, always refer to the latest edition of this Manual.

Information
Roads used for decelerometer brake testing

The requirement for a steady road speed during a brake test by decelerometer means that the vehicle must always be driven on a road which.

- Has a good surface
- Is suitable for brake tests when wet or dry
- Has a minimum of traffic

A particular public road should not be used for tests so much that it would cause complaints from residents.

Testing transmission handbrakes
When using a decelerometer to test a transmission handbrake, keep the ratchet disengaged for as long as the brake is applied. Take the efficiency reading without the occurrence of transmission snatch or judder.

Vehicles which just pass
With some vehicles the required brake efficiency is just obtained or just exceeded, but the tester knows that a higher performance figure is normally obtained for the type of vehicle. Although the vehicle has passed the brake performance test, the tester should advise the vehicle presenter that the braking system appears to need adjustment.

Method of Inspection Decelerometer Test

If the vehicle is of a type which cannot be tested on a roller brake tester,

- Set up the decelerometer in the vehicle in accordance with the equipment manufacturer's instructions
- Drive the vehicle on a level road at a steady speed of approximately 20 mph (32 kph) and note the brake efficiency recorded when applying only
    a. the service brake, minimum 50 %
    b. the parking brake, minimum 25 %
    c. while the vehicle is decelerating under the action of the service brake, note if the steering wheel tends to pull or the vehicle tends to swerve.

Reasons for Rejection

d. the service brake efficiency recorded on the decelerometer does not meet the requirements specified in the Brake Efficiency Table

e. the parking brake efficiency recorded on the decelerometer does not meet the requirements specified in the Brake Efficiency Table

f. when the service brake is applied

- there is severe grab or judder, or
- there is severe pull one way on the steering wheel, and/or the vehicle swerves appreciably

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