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## Integrated Measurement Interface Box

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# Integrated Measurement Interface Box (IMIB)

**Model: All**

**Production: All**

# OBJECTIVES

After completion of this module you will be able to:

- Identify the controls/interface of the IMIB
- Demonstrate the use of the measuring devices
- Perform measures with the Multimeter and Oscilloscope
- Know how to set up the basic measurements in the IMIB

# Introduction

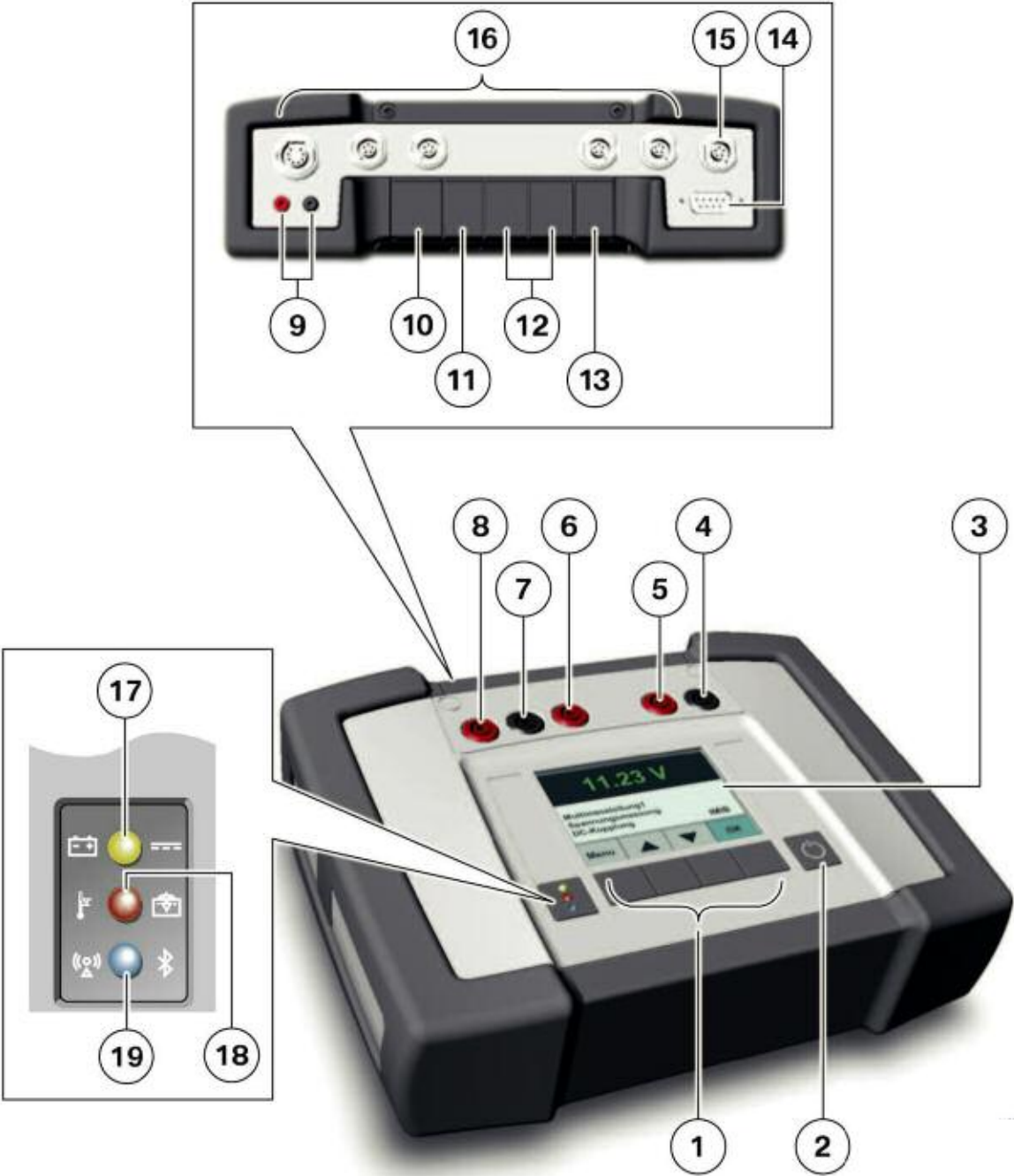
The Integrated Measurement Interface Box (IMIB) gives access to the measuring technology in the new workshop system. The compact shape of the Integrated Measurement Interface Box makes it a versatile tool for testing signal transmitters, data lines and electronic components of vehicles.

The Integrated Measurement Interface Box offers the following functions:

- Voltage measurement
- Current measurement with current clips up to 1,800 A
- Resistance measurement
- Pressure measurement:
  - Low-pressure measurement down to 2 bar onboard
  - Up to 100 bar with external sensor
- Temperature measurement with external sensor
- Use of:
  - RZV cable (static ignition voltage distribution)
  - kV clip (kilovolt clip)
  - Trigger clip
- Two-channel oscilloscope
- Stimuli function

**Note: For more information regarding IMIB, please refer to Dealernet and select: Menu>BMW>Aftersales Portal>Service>Workshop Technology and access the ISTA User Manual file. You can also type Workshop Technology in the search engine and that will prompt you to the correct web page.**

**Integrated Measurement Interface Box (IMIB)**



<b>Index</b>	<b>Explanation</b>	<b>Index</b>	<b>Explanation</b>
1	Button	11	USB Connection
2	ON / OFF Button	12	2.5 bar pressure sensor
3	3.5 inch LCD Display	13	Power Connection
4	Voltage measurement ground (-)	14	Trigger clip or temperature sensor connection
5	Voltage measurement connection	15	Connection of old Sensors: 25 bar pressure sensor, kV clip, RZV cable
6	2A current measurement connection	16	Connection of new sensors: e.g. 100 A current clip, 1,800 a current clip, 100 bar pressure sensor, temperature sensor
7	Voltage, current and resistance measurement ground (-)	17	Indicator for power supply source: external or battery
8	Connection for voltage, current, and resistance measurement	18	Indicator for battery charge and temperature warning
9	Stimuli connection	19	Indicator for WLAN mode
10	Workshop Network LAN connection		

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The measuring cables and sensors used with the Measurement Interface Box (MIB) to date, can for the most part, continue to be used. For oscilloscope measurements, standard measuring cables are used. These cables can also be used for voltage measurements.

If a measurement is carried out during a diagnostic procedure, the result determined by the Integrated Measurement Interface Box is automatically evaluated in the diagnostics program and therefore influences the next diagnostics stage. In addition to its use in diagnostic procedures, the Integrated Measurement Interface Box can also double as a stand-alone and portable digital multimeter.

The measured values are shown on the display screen. It is possible to measure voltage, current, pressure and resistance. Temperature and frequency, however, can only be measured as part of diagnostics, i.e. in the procedures of the Integrated Service Technical Application. Measured values are not displayed on the display screen if the Integrated Measurement Interface Box is being controlled by the Integrated Service Technical Application.

The results are displayed in the Integrated Service Technical Application under "Measuring equipment". Registration and configuration (e.g. of the display language) is carried out using the Workshop System Management. Software updates are similarly managed using the Workshop System Management and are implemented automatically when necessary.

Other important features include:

- Hard drive capacity: 20 GB
- RAM: 512 MB
- Rechargeable battery life: Up to 3 hours
- Connection to workshop network by:
  - Cable
  - Wireless

The Integrated Measurement Interface Box also has a USB interface, which will be used for vehicle diagnostics in the future.



**Using the Integrated Measurement Interface Box inside a vehicle**

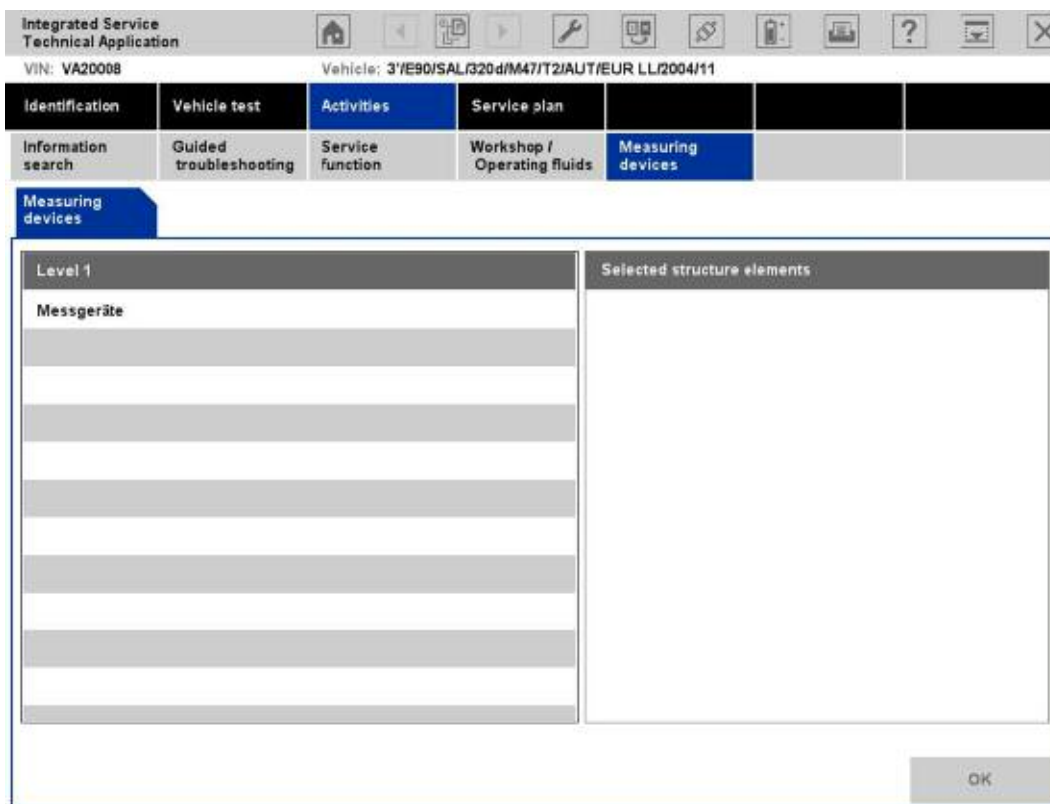
Index	Explanation
1	ICOM A
2	V adapter cable
3	Measurement box
4	Integrated Measurement Interface Box

# Measuring Devices

The measuring devices (Multimeter, Oscilloscope, Signals) are component parts of the ISTA workshop system. The corresponding measuring devices hardware, as well as the periodic measurement data logging, preparation of information, and provision of the results, are all performed by the IMIB connected via LAN.

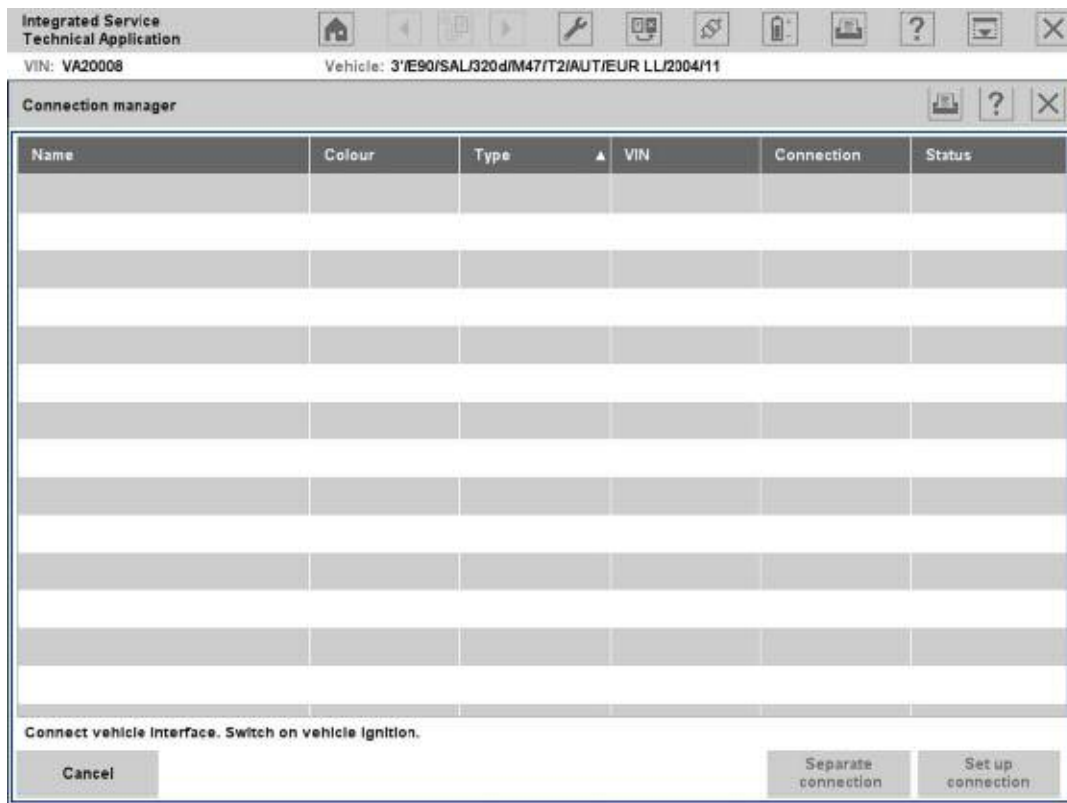
How to start the measuring devices:

- Call up the measuring devices via the "Activities" -> "Measuring devices" selection in the navigation area.
- Choose the "Measuring devices" tab. The "Connection manager" mask appears.
- Select the desired IMIB and click the "Set up connection" button. The "Measuring devices" tab will then appear with the preset "Multimeter" preset tab.



**"Measuring devices" tab**





**"Connection manager" mask**

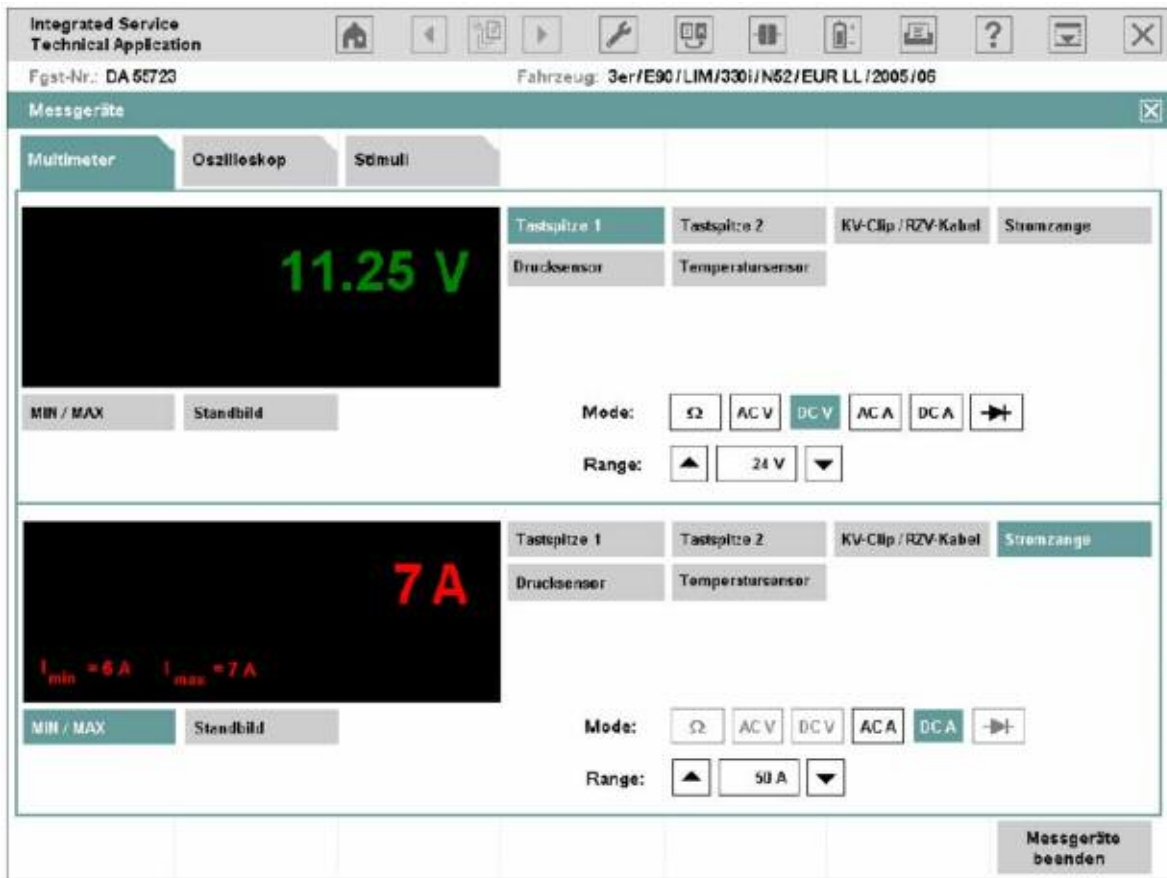
**Switching to Another Tab**

When switching between the measuring devices tabs, the most recently made setting will be retained.

# Multimeter

The "Multimeter" tab contains display and control elements for two multimeters that are separately displayed in the content range, divided by a green line. Besides individual measurements, the devices also support parallel measurement via Probe 1 and Probe 2 for resistance, direct/alternating voltage, direct/alternating current, as well as the diode test. Furthermore, parallel measurements with Probe 1 or 2, as well as a sensor (kV clip/RZV cable [resting voltage cable], clip-on ammeter, pressure sensor, or temperature sensor), are possible.

Each multimeter consists of a display area (left) and a settings area (right). With the "Quit measuring devices" button in the action line, you can return to the "Measuring devices" tab.



## "Multimeter" mask

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## Display Range

The display area shows the measured value with its physical unit of measurement highlighted in color. The measured values of Multimeter 1 (connected with Probe 1 by default) are displayed in green; Multimeter 2 (connected with probe 2 by default) displays measured values in red.

Under the display area, there are two buttons with the following functions:

- ◇ **MIN/MAX:** If you click this button, the two limit values are shown at the bottom left of the display window. "MIN" corresponds to the lowest value in the period of measurement, e.g. "I<sub>min</sub> = 6 A". "MAX" shows the highest value, e.g. "I<sub>max</sub> = 7 A".
- ◇ **Freeze-frame:** This function "freezes" the measurement; the last measurement is thus retained. You can also trigger the freeze-frame function at the probe and then read the value at the tester. If you click the button a second time, the measured values continue to be displayed.

## ■ Range

The setting range is located at the bottom right of the mask, divided into an area for Multimeter 1 (top) and Multimeter 2 (bottom). At the top, there are six buttons for selecting a measurement source (probes and sensors). Under these are the "Mode" zones for setting the measurement type and "Range" for setting the measurement range.

## Source (measurement source)

The following measurement sources are used:

- Probe 1: for resistors, direct/alternating voltage, direct/alternating current, diode tests.
- Probe 2: for resistors, direct/alternating voltage, direct/alternating current, diode tests.
- kV clip/RZV cable: for high voltage measurements in ignition systems.
- Clip-on ammeter: for direct and alternating current.
- Pressure sensor: for pressure measurements, e.g. cylinder 1 compression.
- Temperature sensor: for temperature measurements in liquids, e.g. oil temperature.


After the source has been selected, the button will be displayed in the color of the mask.

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## Mode

The possible settings change according to the selected source. After selection of a mode, e.g. "DC V", it is highlighted in the color of the mask.

The abbreviations are defined below:

- $\Omega$  : Resistor measurement
- AC V: Alternating voltage measurement
- DC V: Direct voltage measurement
- AC A: Alternating current measurement
- DC A: Direct current measurement
-  : Diode test

## ■ Range

The range changes according to the source. The measuring device will automatically be set to the highest measurement range by default; however, you can manually adjust it if required.

**Note: If the displayed measurement value lies outside the manually selected range, the display changes to "++++" or "----".**

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## Using the Multimeter

How to perform a resistor measurement with Multimeter 1:

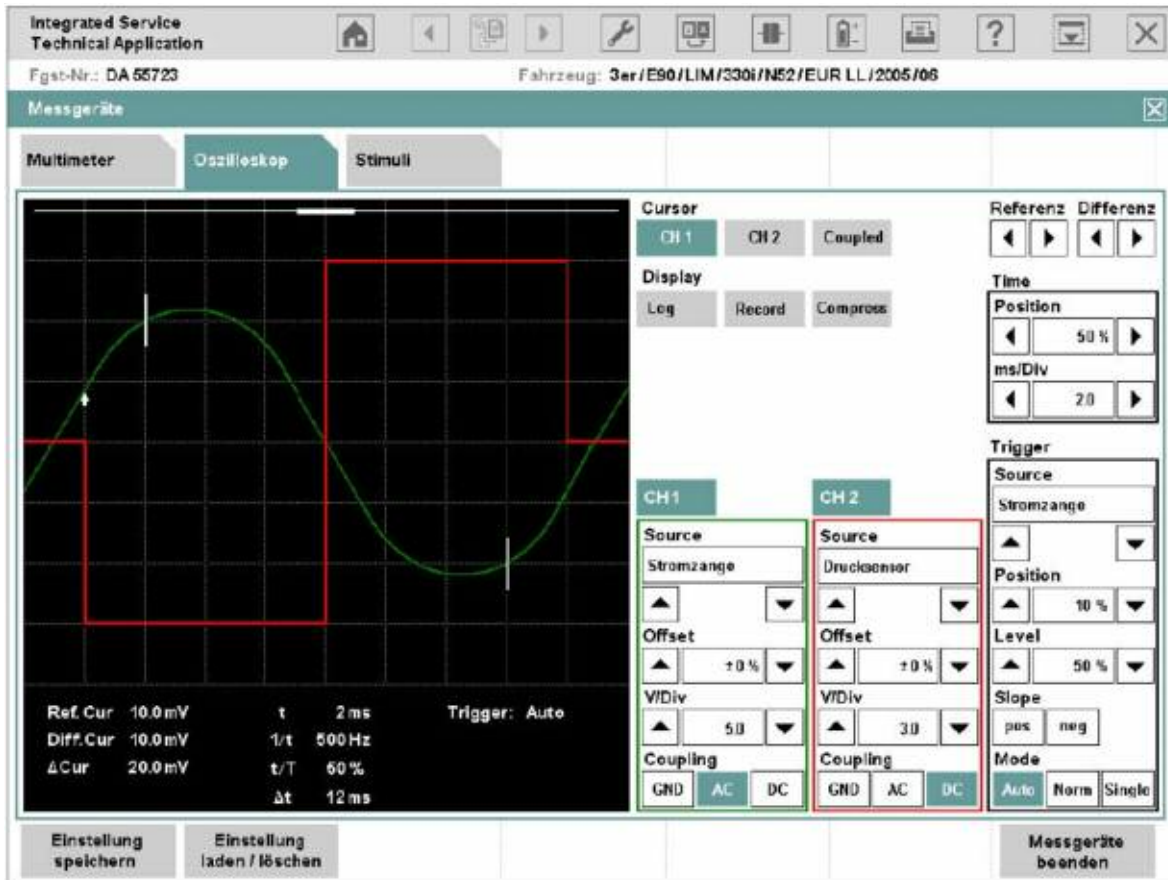
- Select the source "Probe 1".
- Select the " $\Omega$ " mode.
- Connect the DSO cable 1 to the IMIB.
- Connect the probes to the resistance.
- Perform the measurement.

How to perform measurements on two signals simultaneously, so that you can measure battery voltage and current, for example:

- Select the source "Clip-on ammeter" on Multimeter 2.
- Select the "DC A" mode on Multimeter 2.
- Select the range matching the selected clip-on ammeter on Multimeter 2.
- Select the source "Probe 1" on Multimeter 1.
- Select the "DC V" mode at Multimeter 1.
- Connect the clip-on ammeter to the IMIB.
- Connect the clip-on ammeter to the vehicle's minus lead.
- Connect the DSO cable 1 to the IMIB.
- Connect the probes to the battery poles.
- Click the button on the probe to freeze the measurement.
- Evaluate the measurement.

# Oscilloscope

Two time-dependent variables are measured with the dual channel oscilloscope. The screen displays measured and processed curves and results in the left (display) area. The IMIB settings can be adjusted in the right (setting) area.



## "Oscilloscope" tab

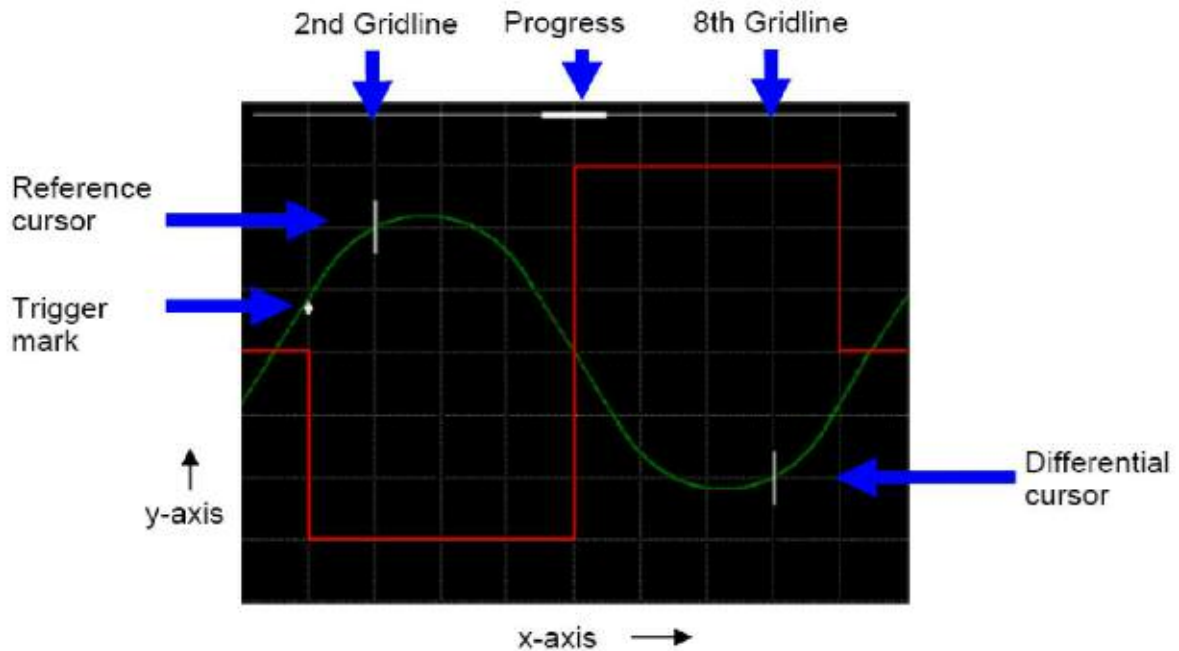
### Display Area

The display area is divided into the following:

- Graph display: for graphical plots of curves.
- Measured value display: for numerical display of voltage and time values.

## ■ Graph Display

With linear scaling, the graph display is divided into a 10 x 8 grid. With logarithmic scaling, the y-axis is divided into 4 groups of 10; the x-axis remains unchanged.



### Graph display

Depending on the application, a trigger mark, two cursors and a progress bar on the top edge will appear in the graph plot.

So that you can distinguish between curves and correctly assign their settings, the curve from Channel 1 (CH1) is green and the curve from Channel 2 (CH2) is red. Cursors, trigger marks and progress bars are white.

The frequency of graph updates depends on the sampling rate set on the oscilloscope.

The following presets apply for individual areas:

- Sampling rate < 100 s: Time interval 10 ms.
- $100 \text{ s} \leq \text{sampling rate} < 1 \text{ s}$ : Time interval 300 ms.
- Sampling rate  $\geq 1 \text{ s}$ : Record mode (Record). The curve progresses in linear steps of approx. 4 pixels from right to left and is recorded at the same time.

## Measured Value Display

Below the graph display, there is a display consisting of 3 columns for numerical values and status messages.

Ref. Cur	10.0 mV	t	2 ms	Trigger: Auto
Diff. Cur	10.0 mV	1/t	500 Hz	
$\Delta$ Cur	20.0 mV	t/T	50 %	
		$\Delta$ t	12 ms	

### Measured value display

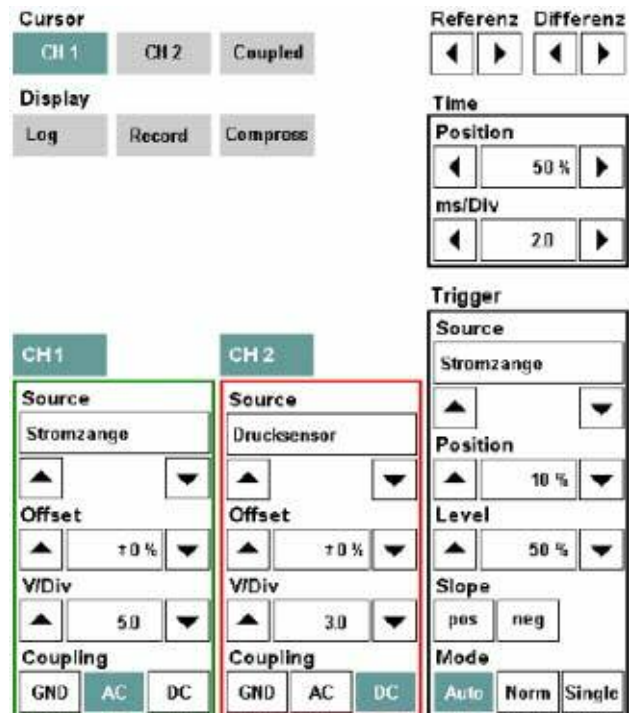
The meaning of the displays is described in the following chapter.

### Range

The controls for setting the oscilloscope are located on the right-hand side of the mask.

The controls are arranged in five settings:

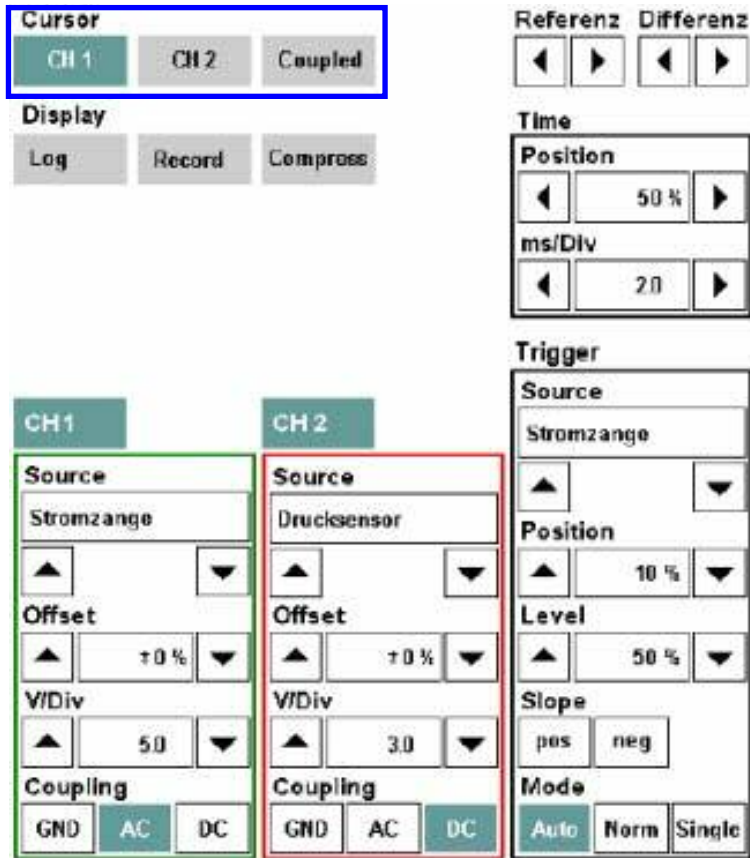
- Cursor (exclusively arrow keys for reference and difference)
- Display
- Time
- Channel (channels CH1 and CH2)
- Trigger



### Range



## Cursor and Display Settings



The "Cursor" settings group contains the following buttons:

◇ **CH1, CH2:** When clicking and locking a button, the two cursors will appear in the second and eighth grid line of the graph display for the respective curve (reference and difference). The cursors can only be displayed for one channel respectively: For example, if you lock the "CH2" button, then the "CH1" button will be simultaneously unlocked. If you click the same button once more, the measuring cursors will be faded out again. You can move the reference cursor along the x-axis with the two reference arrow keys and the differential cursor by using the differential arrow keys. The cursors move pixel by pixel; their speed increases the longer you hold the arrow key down. As soon as a cursor reaches the edge of a measurement curve, the respective arrow key can no longer be operated.

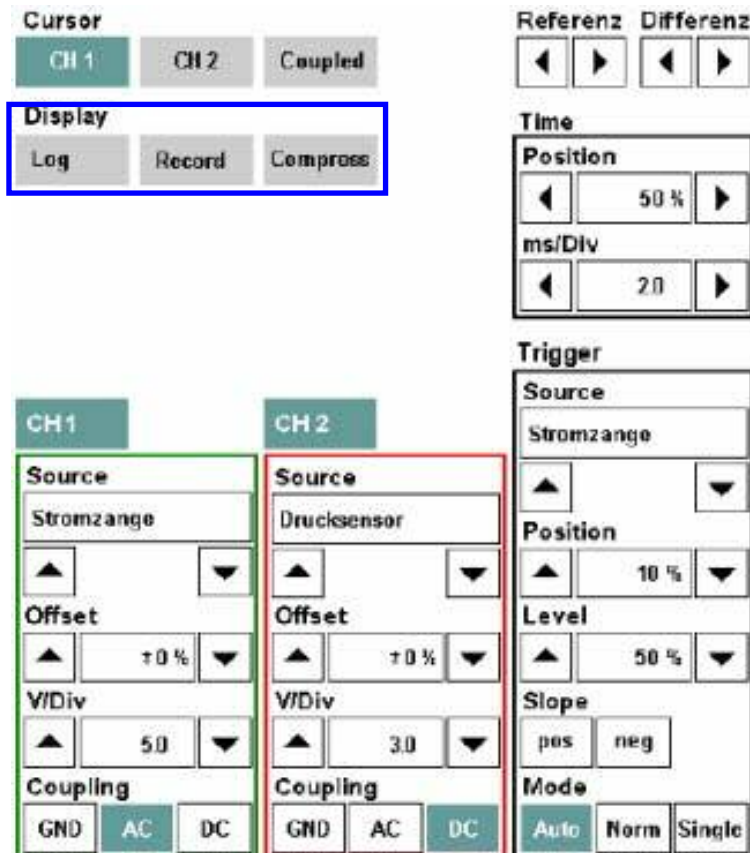
◇ **Coupled:** is activated only if one of the "CH1" or "CH2" buttons, is active. If the "Coupled" button is locked, then the differential cursor moves when the differential cursor is displaced, maintaining constant spacing. With the differential arrow keys, you can continue to displace the differential cursor separately. If you hide the cursor for one channel and later show it again (cursor key locked), the "Coupled" button adopts the most recently displayed state.

The following applications are linked with the cursor function:

- Measuring curves: The oscilloscope determines the following points and shows the values in the measured value display:
- Intersection of reference cursor with the curve ("Ref.Cur")
- Interface of differential cursor with the curve ("Diff.Cur")
- Voltage difference between the reference and differential cursor ("Cur")
- Output of Set values: When you select the "CH1" or "CH2" button in the cursor settings group

The following counter values are entered into the measured value display:

- Period ("t")
- Frequency ("1/t")
- Sample ratio of selected channel ("t/T")
- Time lag between reference and differential cursor ("t").
- Zooming compresses the curves. In compressed mode, you can select and zoom in on a curve section.

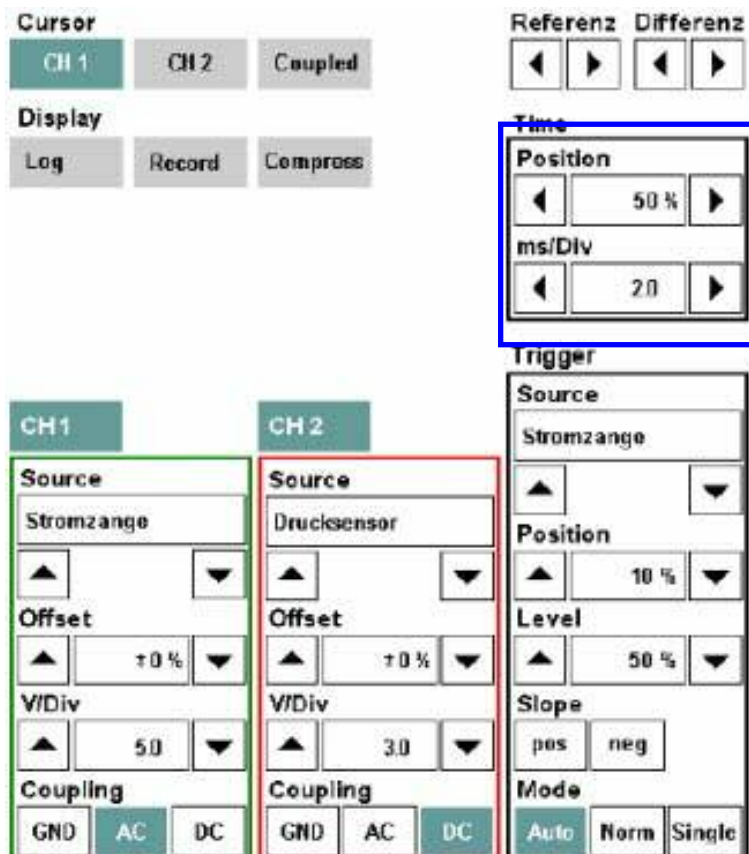


The "Display" settings group contains the following buttons:

◊ **Log:** logarithmic scaling on/off, as default y-values are presented in linear fashion. When clicking and locking the "Log" button, the y-axis switches to logarithmic scaling in value ranges up to 4 groups of 10. Negative measurements are zeroed in the logarithmic display. Clicking the button a second time switches back to linear scaling.

◊ **Record:** record mode on/off. When clicking and locking the "Record" button, the record mode will be started. The process can be interrupted by once again clicking on the "Record" button. The record mode is automatically stopped in the "Single" trigger mode if a trigger event occurs (trigger level, ramp). All settings for the "Channel", "Time" and "Trigger" groups are locked. The record mode is only accessible if the "Compress" button is not locked.

◊ **Compress:** scales the x-axis over the entire curve. When clicking and locking the "Compress" button, the x-axis is scaled so that the entire and most recently recorded curve can be shown in the measured graph display. The "Record" button and those for the trigger mode (Auto, Normal, Single) are deactivated. The "Compress" button can only be clicked after a curve has been recorded. Mark a section of the compressed curve (either Channel 1 or 2) with the reference and differential cursor. Click the "Compress" button. The oscilloscope zooms in on the marked curve section to the normal scaling of the x-axis.

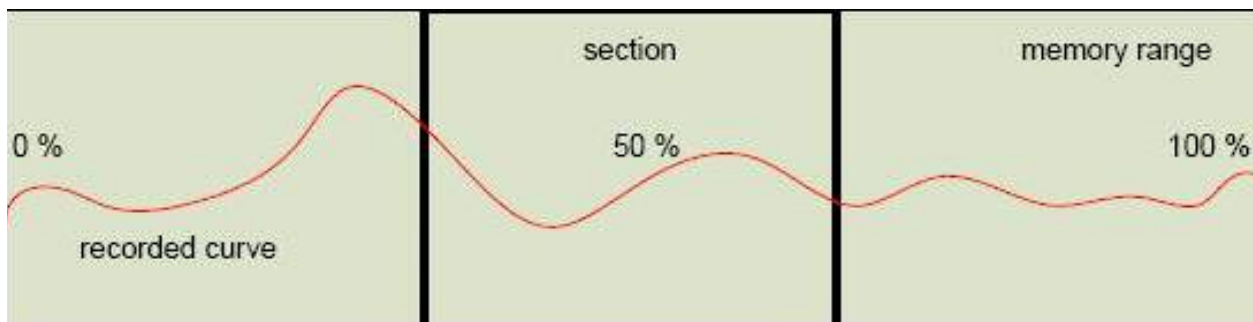


By increasing the sampling rate with the "<Time>/Div" arrow keys, you can zoom in further into a curve section until the curve is completely expanded.

With the "<Range>/Div" arrow keys, you can extend the curve in the vertical direction. This does not enhance the resolution, however.

The settings group contains display ranges for the set values and two arrow keys which can be used to adjust the set values.

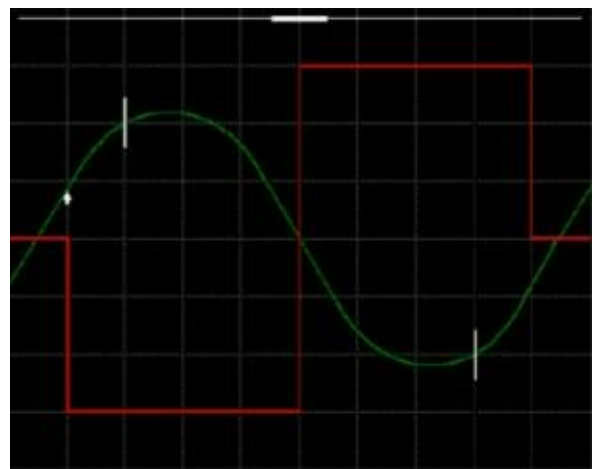
◇ **Position:** You can move the section along the x-axis if the recorded curve can no longer be completely displayed in the measurement value display. With the arrow keys, you can zoom in/zoom out the section from 0 to 100% along the saved curve. The longer you hold the arrow key down, the faster the section moves. The percentage value indicates in which section of the saved area the section is located.



As long as the reference and differential cursors are displayed (with channel CH1 or CH2 in the "Cursor" settings group selected), the section can only be displaced between the two cursors. To scroll through the entire memory, you have to deselect both channels in the "Cursor" settings group

The visible section is displayed in the graph display by the size and position of the status bar at the top of the display.

◇ **<Time>/Div:** This is where you define the sampling rate, in other words, it determines the horizontal scale of the graph which appears on the oscilloscope screen. The associated unit, e.g. "ms/Div", is displayed via the left arrow key.



## Channel

This channel settings group has two buttons, "CH1" and "CH2". Each channel has a Source, Offset, <Range>/Div (Range/Unit) and Coupling display range selection.

Source: The group of sensors. A signal is transmitted to the oscilloscope via a sensor.

Select from the possible sensors:

- Probe 1 and/or 2
- kV clip/RVZ cable
- 50 A or 1000 A clip-on ammeters
- 3.5 bar or 100 bar pressure sensors
- Trigger clamp
- Temperature sensor

The image shows a screenshot of an oscilloscope's channel settings menu. It is divided into several sections:

- Cursor:** CH1 (selected), CH2, Coupled.
- Display:** Log, Record, Compress.
- Referenz:** Left arrow, Right arrow.
- Differenz:** Left arrow, Right arrow.
- Time:** Position (50%), ms/Div (2.0).
- CH1 (highlighted with a blue border):** Source: Stromzange; Offset: ±0%; V/Div: 5.0; Coupling: GND, AC (selected), DC.
- CH2 (highlighted with a red border):** Source: Drucksensor; Offset: ±0%; V/Div: 3.0; Coupling: GND, AC, DC (selected).
- Trigger (highlighted with a blue border):** Source: Stromzange; Position: 10%; Level: 50%; Slope: pos, neg; Mode: Auto, Norm, Single.

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Select a sensor with the arrow keys. If the sensor is not yet connected, a corresponding message appears.

- ◇ **Offset:** The signal displayed on Channel 1 or 2 can be respectively overlaid with a constant component or a DC voltage (offset). The offset value is preset to 0%; you can change the range  $\pm 100\%$  of the y-axis.
- ◇ **<Measurement range>/Div:** This setting designates the group of measurement ranges and depends on the sensor selected. Set the range with the arrow keys; it will be displayed in the associated display range. The physical unit is above the left-hand arrow key.

The set range is transferred to the y-axis.

- ◇ **Coupling:** Signal coupling for the corresponding channel.

The following settings are possible:

- ◇ **GND (Ground):** The input is decoupled from the sensor and is grounded.
- ◇ **AC (Alternating Current):** Only alternating current components are represent in the curve.
- ◇ **DC (Direct Current):** Alternating and direct current components are represented in the curve.

The buttons for the non-available coupling types are gray.

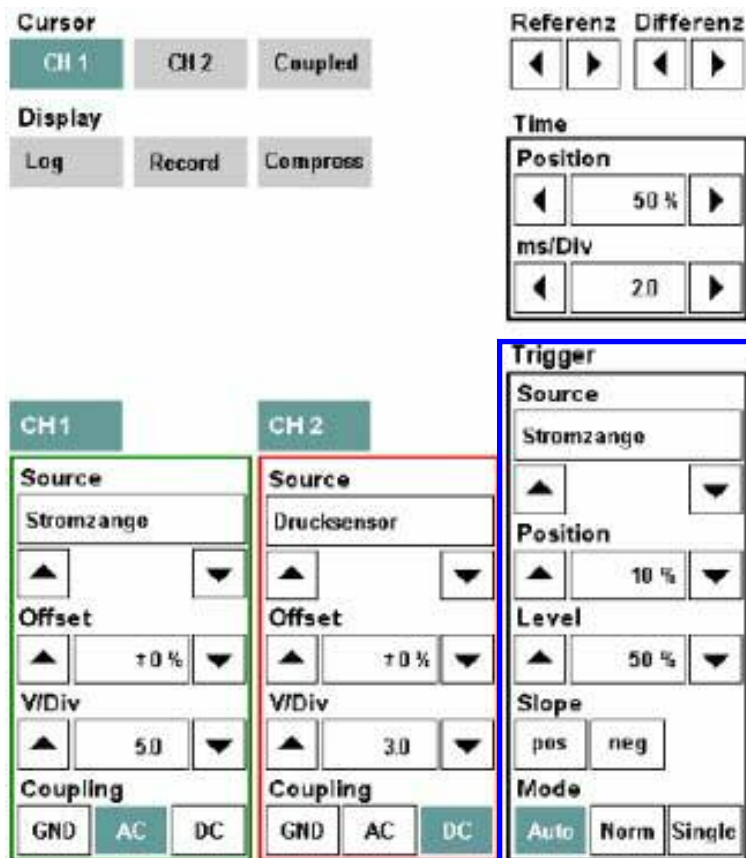
## Trigger

In the "Trigger" area, you can set the source, the (trigger) position, the trigger value (level), the slope and the mode. The current trigger position and trigger value are indicated by an arrow, with the arrow direction indicating slope.

- ◇ **Source:** The group of sensors. A trigger signal is transmitted to the oscilloscope via a sensor.

Select from the possible sensors:

- Probe 1 and/or 2
- kV clip/RVZ cable
- 50 A or 1000 A clip-on ammeters



Select a sensor using the arrow keys. If the sensor is not yet connected, a corresponding message will appear.

- ◇ **Position:** With the arrow keys, you can displace the trigger time along the x-axis between 10% and 90% along the graph display. The default setting is 50%; the signal in this case is triggered in the middle of the graph display.
- ◇ **Level:** With the arrow keys, you set the amplitude at which triggering should occur as a percentage of the y-axis.
- ◇ **Slope:** Defines whether triggering should occur on the positive or negative slope, whereby only one switch ("pos" or "neg") can be activated at one time. If both buttons are inactive, the trigger is activated whenever the set trigger value is reached, regardless of whether this occurs on the rising or falling slope.
- ◇ **Mode:** Except in record mode, a trigger mode is always active. The default setting is "Auto".
- ◇ **Auto:** If no trigger is set, then an untriggered image will be shown.
- ◇ **Norm:** Prerequisite for a display is the availability of a trigger.
- ◇ **Single:** Stops the oscilloscope measurement after the first valid trigger signal. If you click the "Single" button again, the mode is reactivated and recording of another measuring signal can begin.

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## Record Mode

In record mode, the measurements are recorded without being triggered continuously and temporarily stored.

Recording begins when you click the "Record" button. During recording, the latest measurements are presented in the graph display. The remaining memory capacity is continuously displayed as a percentage in the measurement display.

The trigger mode cannot be reactivated until the record mode has been stopped by clicking the "Record" button.

Recording may be stopped by the following events:

- Repeated clicking of the Record button
- Reaching of the preset trigger level (depending on the trigger mode)
- Memory full

After completion (manual or automatic) of data recording, the "Compress" button is activated and the entire curve along the x-axis is compressed to the width of the graph.

Various tools are available for closer examination of the curve, using cursor settings and the adjustment of values under "Time".



## Action Line

The action line contains the following buttons:

- ◇ **Save settings:** You can save oscilloscope settings. Saved settings are stored on the ISIS workshop server and are thus available on every ISIS that is linked to the respective ISIS in online mode. You start the operation by selecting the "Save settings" button in the action line. The "Save oscilloscope settings" mask appears. Enter a name in the "Save under" field under which the settings should be saved. The workshop system checks whether the name has already been assigned.



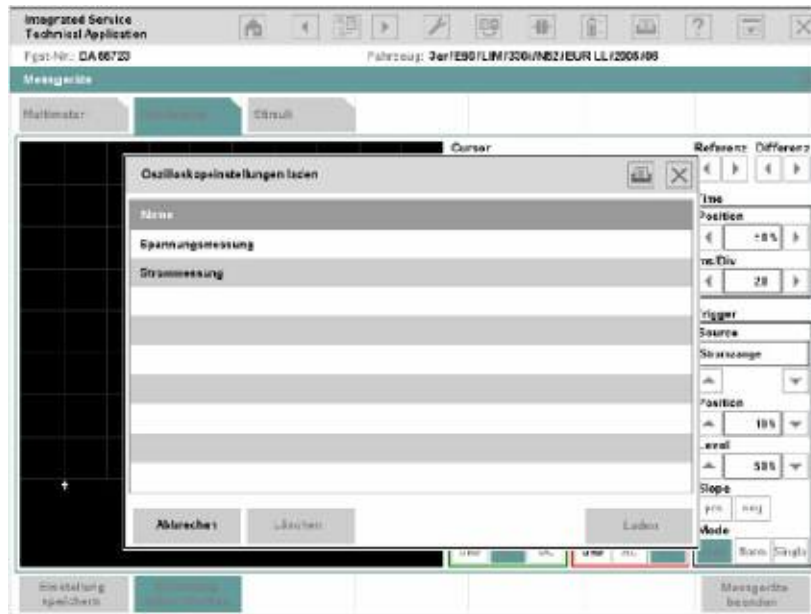
### "Save oscilloscope settings" mask (no current screenshot)

- ◇ **Load/delete settings:** The button is only active if oscilloscope settings have been saved. You can load or delete saved oscilloscope settings after you have clicked this button. The "Load oscilloscope settings" window opens with a list of saved oscilloscope settings.

Select a line and click one of the following buttons:

- ◇ **Load:** The settings are loaded into the oscilloscope. The window closes.
- ◇ **Delete:** Deletes the selected settings. The window stays open.
- ◇ **Cancel:** Closes the window after opening.

## "Load oscilloscope settings" mask (no current screenshot)



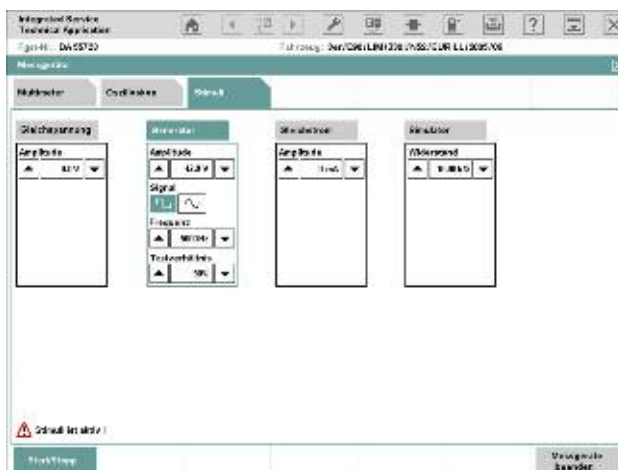
◇ **Quit measuring device:** The IMIB is reset, any activated signals are switched off, and the workshop system returns to the "Measuring devices" mask.

## Signals

The signals feed defined direct currents as well as direct and alternating voltages to the sensors and leads or simulate resistances. You can observe the effects with measuring instruments.

With the "Signals" tab, you parameterize the signal functions of the IMIB.

## "Signals" tab (no current screenshot)



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The content range contains a settings group for each of the signal sources, i.e. direct voltage, generator, direct current and simulator.

The settings for "Amplitude", "Frequency", "Sample ratio" and "Resistor" consist respectively of a display range for the set value and two arrow keys left and right, with which you can adjust the signal. The longer you hold the arrow key down, the faster the signal value changes.

The setting "Signal" provides a separate button for the "Rectangular" and "Sinusoidal" signal types.

Select a signal by clicking its heading. It is not possible to make a multiple selection.

If you switch to Multimeter or Oscilloscope and then return to Signals, then the most recent setting is retained. However, if you quit the Measuring instruments and then call up Signals again, then the settings will be reset to the default values.

The buttons in the action line have the following functions:

- **Start/Stop:** Transmits the set signals to the IMIB. In the message line, a message appears, indicating that the signals are active. When you click the button a second time, you switch the signals off again.
- **Exit measuring devices:** Switches active signals off, sets the measuring instruments back to the IMIB, and returns to the "Measuring instruments" tab.

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## Using the Oscilloscope

How to set direct voltage or direct current:

- Click the name of the signal source: "Direct voltage" or "Direct current".
- Select a value in the appropriate signal source with the arrow keys.
- Click the "Start/Stop" button.
- Click the "Start/Stop" again when you wish to terminate the signal feed.

How to adjust the alternating current generator:

- Click the name of the signal source: "Generator".
- Select the signal form: "Rectangular" or "Sinusoidal".
- Set the amplitude and frequency with the respective arrow keys.
- If you have selected the "Rectangular" signal form: Set the sampling rate with the corresponding arrow keys.
- Click the "Start/Stop" button.
- Click the "Start/Stop" again when you wish to terminate the signal feed.

How to simulate a resistance:

- Click the name of the signal source: "Simulator".
- Set the desired resistance with the corresponding arrow keys. The permissible resistance values are displayed in the window.
- Click the "Start/Stop" button.
- Click the "Start/Stop" again when you wish to terminate the signal feed.

# Workshop Trolley



**Workshop trolley with Integrated Service Information Display and Integrated Measurement Interface Box**

Index	Explanation
1	Integrated Service Information Display (ISID)
2	Integrated Measurement Interface Box (IMIB)

The workshop trolley used for Group Tester One, or GT1, can continue to be used for the new workshop system. It is simply a case of having to exchange the brackets for GT1 with the brackets for the Integrated Service Information Display. The brackets were delivered with the Integrated Service Information Display (ISID).



**Top view of ISID mounting brackets**



**Bottom view of ISID mounting brackets**

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# Basic Measurements

## Wire Test

Cables needed:

- Stimulus Cables
- Measurement Input 1 Cables

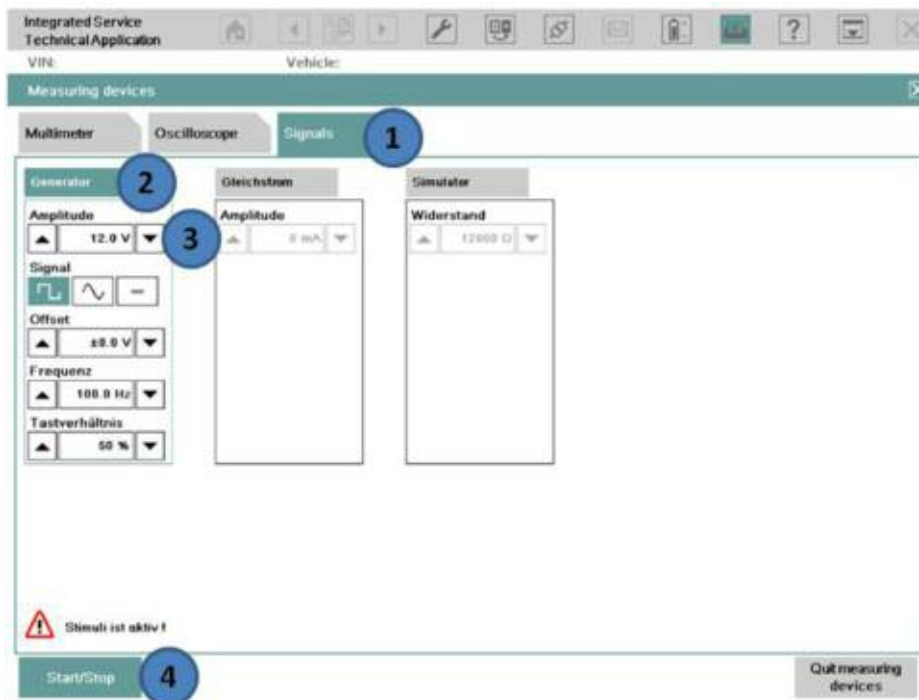
Procedure:

Connect B- from Stimulus Cable to B- of Measurement Input 1.

Connect B- from Measurement Input 1 to a ground on the vehicle.

Connect B+ from Stimulus Cable to one end of wire being tested.

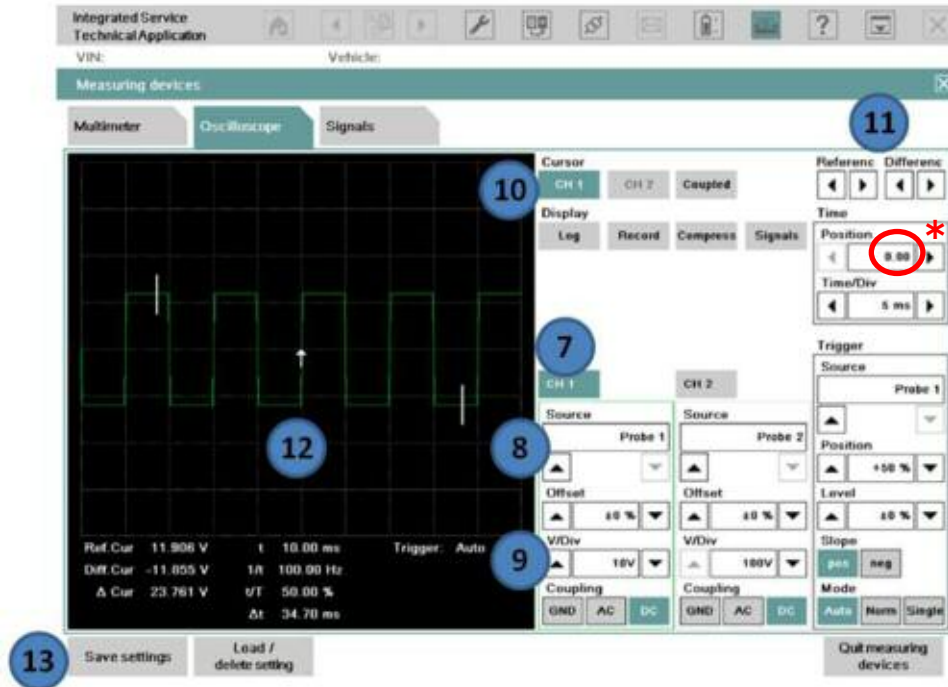
Connect B+ from Measurement Input 1 to other end of wire being tested.



- (1) Select the “Signals” tab.
- (2) Select the “Generator” column.
- (3) Set the voltage for the “Amplitude” setting using the 2 arrows, to the voltage of the circuit tested (for example 5V or 12V).
- (4) Select the “Start/Stop” button to start generating the voltage signal.
- (5) A warning message is shown indicating “Stimuli ist Aktiv!”
- (6) Switch to the “Oscilloscope” tab.



## Wire Test (continued)



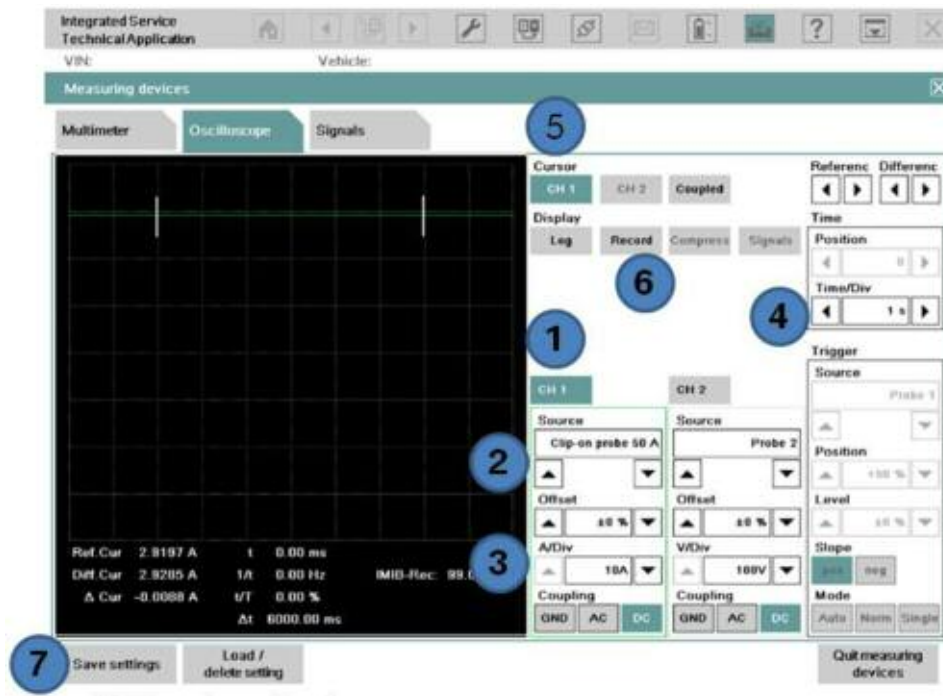
- (7) Select one of the 2 channels (in this example, channel 1 is selected).
- (8) Select "Probe 1"(Measurement Input 1) from the "Source" setting under channel 1.
- (9) Select "10V" from the "V/Div" setting under channel 1.
- (10) Select the channel 1 cursor "CH 1".
- (11) The cursors can be moved to a different part of the signal with the "Referenc/Differenc" arrows.
- (12) The signal above indicates a good wire. Any other signal indicates an open or shorted wire.
- (13) Select "Save settings" to save the configuration setup (can be loaded back up at a later time).

\* Also try setting the Time/Div to 200 ms.

## Closed Circuit Current Monitoring

Cables needed:

- IMIB and the “Clip-on probe 50A or 100A”



Procedure:

- (1) Select channel 1 or 2.
- (2) Change the “Source” to “Clip-on probe 50A or 100A” (confirm calibration prompt).
- (3) Set “A/DIV” to “10A”.
- (4) Change the “Time/DIV” in the “Time” box to “1 s” to start (the value can be changed if longer recording time is needed).
- (5) Select the “Cursor” for the channel selected, 1 or 2.
- (6) Once the measurement is started, press the “Record” button to start monitoring.
- (7) Select “Save settings” to save the configuration setup (can be loaded back up at a later time).

## Closed Circuit Current Monitoring (continued)



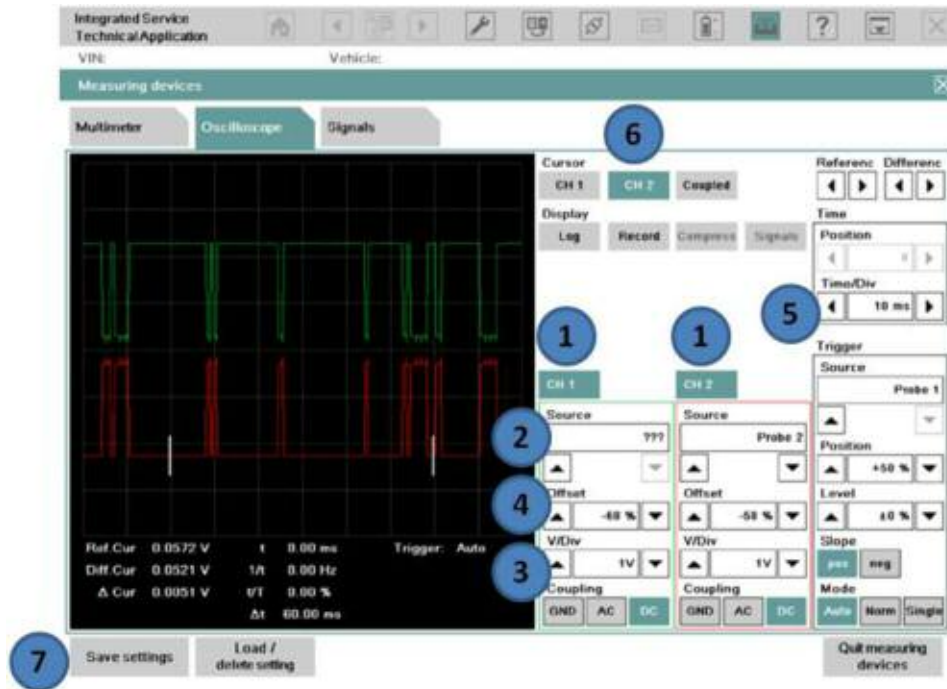
*Procedure:*

- (8) Select the “Record” button to stop recording.*
- (9) Select the “Compress” button to start analyzing the recorded signal.*
- (10) Change the “Time/DIV” in the “Time” box to the value which makes the signal easier to view glitches.*
- (11) Change the “Position” in the “Time” box to scroll through the signal.*
- (12) The white bar along the top of the display indicates the part of the entire signal being viewed.*
- (13) The cursor(s) may be moved to display the value of different parts of the display.*

## Checking K-CAN

Cables needed:

- Probe 1 (Measurement Input 1)
- Probe 2 (Measurement Input 2)



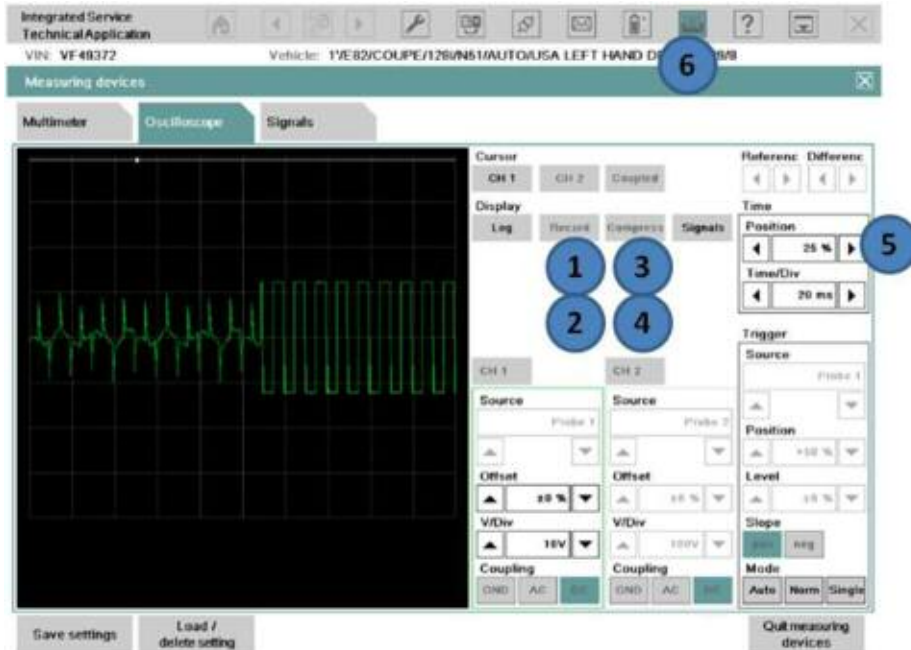
Procedure:

Connect B+ of Probe 1 and Probe 2 to K-CAN\_L and K-CAN\_H at vehicle harness.

Connect B- of Probe 1 and Probe 2 to vehicle ground point.

- (1) Select both channels in order to view both the K-CAN\_H and K-CAN\_L.
- (2) The “Source” under each channel should be set to Probe 1 and Probe 2.
- (3) Set the “V/DIV” for each channel to “1V”.
- (4) Once the scope signals are displayed, use the “Offset” arrows to move the signals apart on the display (this makes it easier for viewing).
- (5) Set the “Time/DIV” in the “Time” box to “10 ms”.
- (6) Select the cursor for channel 1 or 2 (only 1 channel can display cursors at a time).
- (7) Select “Save settings” to save the configuration setup (can be loaded back up at a later time).

## Recording and Analyzing Measurements



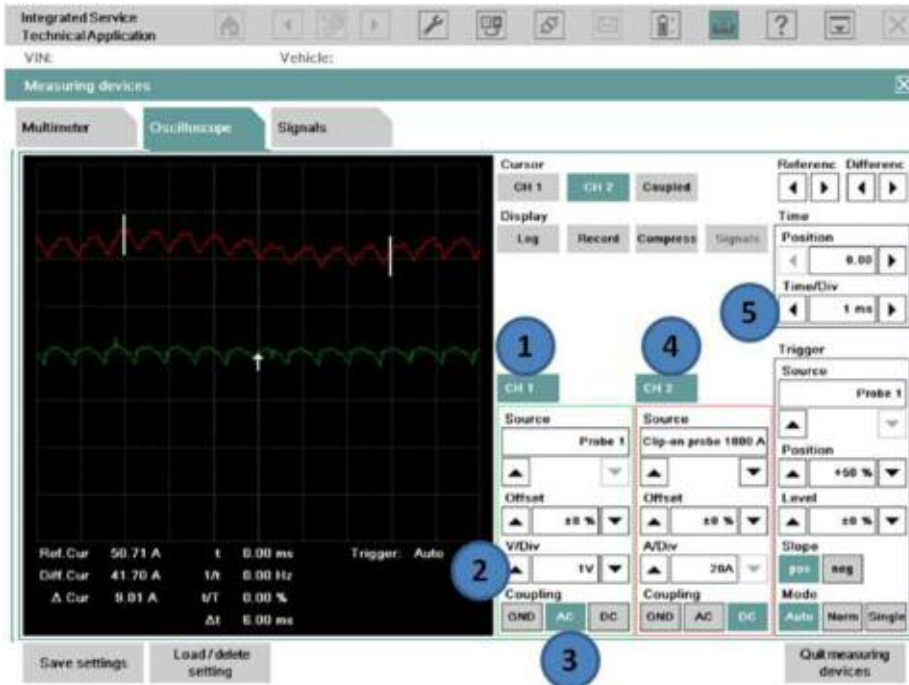
### Procedure:

- (1) Start recording the signal by pressing the “Record” button.
- (2) Stop recording the signal by pressing the “Record” button again.
- (3) The “Compress” button is then highlighted and the entire signal is compressed on the display.
- (4) Press the “Compress” button to enter the analysis mode.
- (5) In the “Time” box, scroll backward or forward to scan the recorded signal (a white status bar is displayed at the top of the display, which shows the part of the signal being analyzed).
- (6) The screen may be printed at any time using the print button.

## Alternator Test

Cables needed:

- Probe 1 (Measurement Input 1)
- 1000 A Clip-on probe



Procedure:

Connect B+ of Probe 1 to the engine compartment battery post.

Connect B- of Probe 1 to the engine compartment ground post.

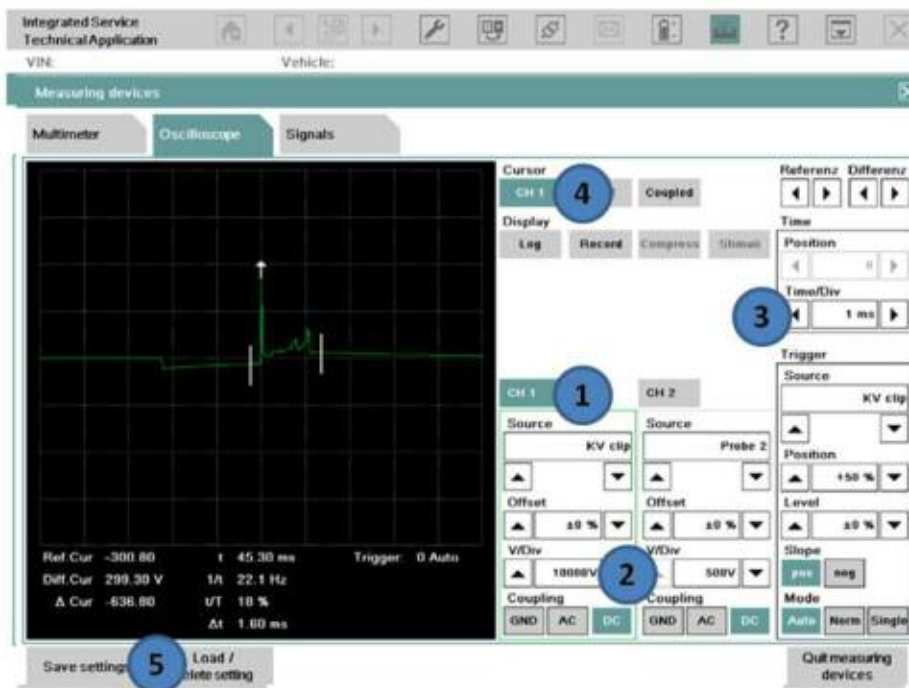
Connect the 1000 A Clip-on probe to the B+ cable at the engine compartment jump point.

- (1) Select channel 1 and set the "Source" as "Probe 1".
- (2) Set the "V/DIV" to "1V".
- (3) Set the "Coupling" to "AC".
- (4) Select channel 2 and set the "Source" as "Clip-on probe 1000 A". A pop-up message prompts to calibrate the clamp first before connecting to the B+ cable.
- (5) Set the "Time/DIV" under the "Time" box to "1 ms".
- (6) Select "Save settings" to save the configuration setup (can be loaded back up at a later time).

## Secondary Ignition Test

Cables needed:

- KV Trigger Clip
- Adapter Cable 12 7 050



Procedure:

Remove the coil to test, and install the adapter lead between the coil and spark plug.

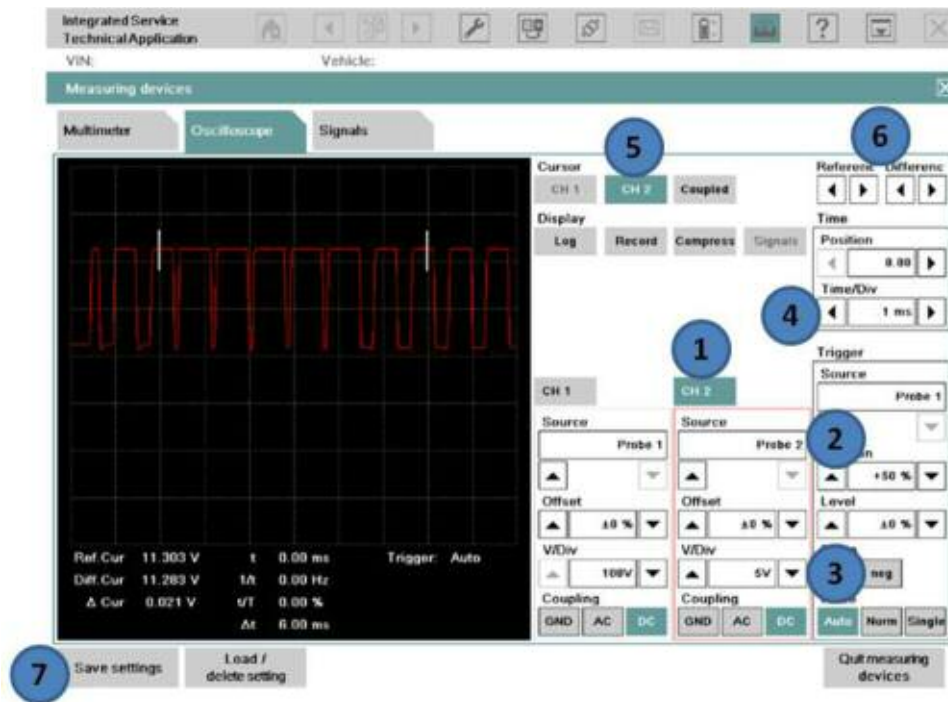
Clip the KV trigger onto the adapter lead.

- (1) Select channel 1 and set the "Source" as "KV clip".
- (2) Set the "V/DIV" to "10000V".
- (3) Set the "Time/DIV" under the "Time" box to "1 ms".
- (4) Set the "Cursor" to "CH 1".
- (5) Select "Save settings" to save the configuration setup (can be loaded back up at a later time).
- (6) Repeat the test for all the cylinders.

## Checking the BSD Line

Cables needed:

- Probe 1 (Measurement Input 1) or
- Probe 2 (Measurement Input 2)



Procedure:

Connect B+ of Probe 1 or Probe 2 to the BSD Line at the vehicle harness.

Connect B- of Probe 1 or Probe 2 to the vehicle ground point.

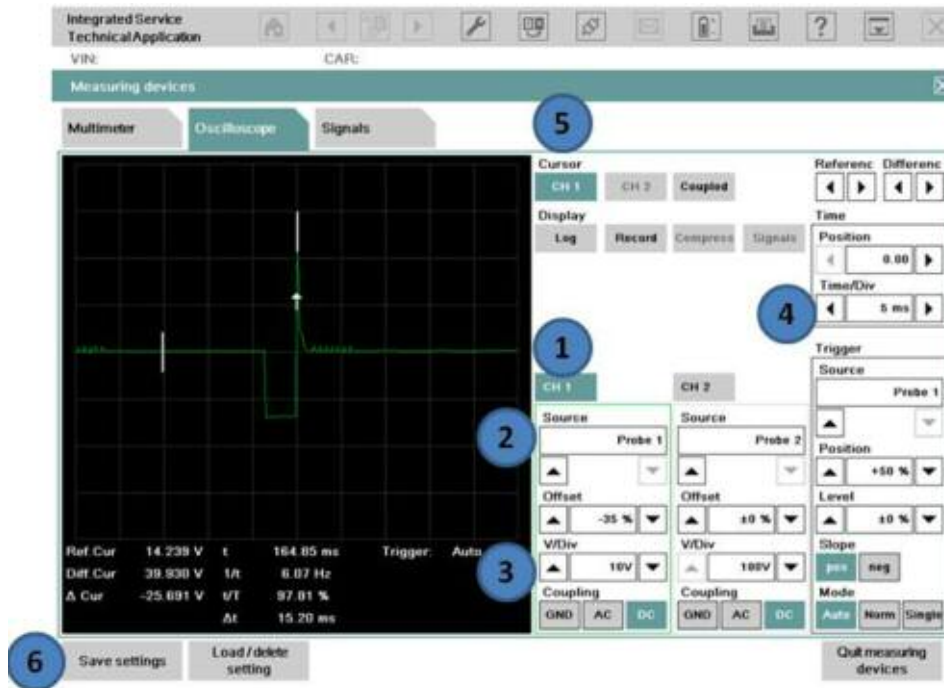
- (1) Select one of the 2 channels (in this example, channel 2 is selected).
- (2) Select "Probe 2"(Measurement Input 2) from the "Source" setting under channel 2.
- (3) Select "5V" from the "V/Div" setting under channel 2.
- (4) Set the "Time/DIV" under the "Time" box to "1 ms".
- (5) Select the channel 2 cursor "CH 2".
- (6) The cursors can be moved to a different part of the signal with the "Referenc/Differenc" arrows.
- (7) Select "Save settings" to save the configuration setup (can be loaded back up at a later time).



## Checking Injector Signal

Cables needed:

- Probe 1 (Measurement Input 1) or
- Probe 2 (Measurement Input 2).



Procedure:

Connect B+ of Probe 1 or Probe 2 to the P\_EVZ signal line at the DME.

Connect B- of Probe 1 or Probe 2 to the vehicle ground point.

- (1) Select either channel 1 or channel 2.
- (2) This is the "Source" for the channel to Probe 1 and Probe 2 (depending on the channel selected).
- (3) Set the "V/DIV" for each channel to "10V".
- (4) Set the "Time/DIV" in the "Time" box to "5ms".
- (5) Select the cursor for channel 1 or 2 (depending on the channel selected).
- (6) Select "Save settings" to save the configuration setup (can be loaded back up at a later time).

## Checking PT-CAN

Cables needed:

- Probe 1 (Measurement Input 1)
- Probe 2 (Measurement Input 2)



Procedure:

Connect B+ of Probe 1 and Probe 2 to PT-CAN\_L and PT-CAN\_H at the vehicle harness.

Connect B- of Probe 1 and Probe 2 to the vehicle ground point.

- (1) Select both channels in order to view both the PT-CAN\_H and PT-CAN\_L.
- (2) The “Source” under each channel should be set to Probe 1 and Probe 2.
- (3) Set the “V/DIV” for each channel to “1V”. If .5V is selected, this may cause a flat line of the signal.
- (4) Once the scope signals are displayed, use the “Offset” arrows to move the signals apart on the display (this makes it easier for viewing).
- (5) Set the “Time/DIV” in the “Time” box to “2 ms – 5ms”.
- (6) Select the cursor for channel 1 or 2 (only 1 channel can display cursors at a time).
- (7) Select “Save settings” to save the configuration setup (can be loaded back up at a later time).