Service Manual
2100Q (*is*)

DOC222.52.90214 Oct09
Version 0.90

Contents

1 General

The turbiditimeter 2100Q measures turbidity from 0 to 1000 NTU. Primarily for field use, the portable meter operates on four AA batteries. Data can be stored and transferred to a printer, computer or USB storage device.

1.1 Instrument versions

The following models of the DR 2800 Spectrophotometer are available:

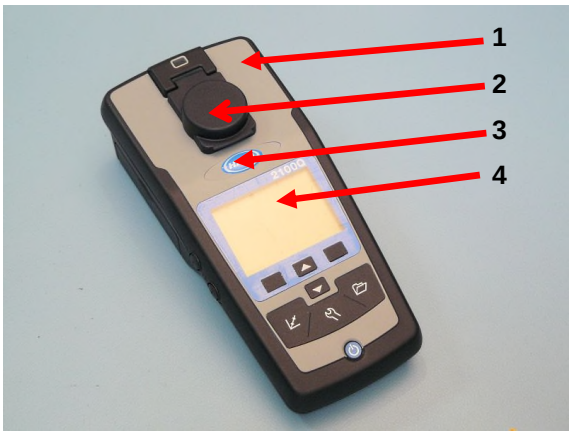
- LPG439.01.00002 2100Q
- LPG439.01.00012 2100Q is

1.2 Specifications

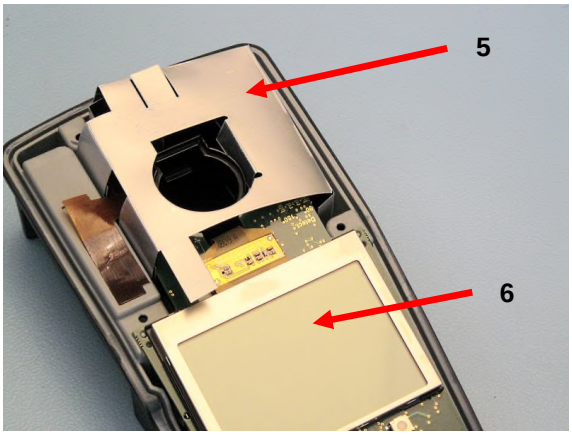
Specifications are subject to change without notice.

Specification	Details
Measurement method	Ratio turbidimetric determination using a primary nephelometric light scatter signal (90°) to the transmitted lightscatter signal.
Regulatory	**2100Q:** Meets EPA Method 180.1 **2100Q*is*:** Meets ISO 7027
Lamp source	**2100Q:** Tungsten filament lamp **2100Q*is*:** Light-emitting diode (LED) at 860 nm
Range	0–1000 NTU (FNU)
Accuracy	±2% of reading plus stray light from 0–1000 NTU (FNU)
Repeatability	±1% of reading or 0.01 NTU (FNU), whichever is greater
Resolution	0.01 NTU on lowest range
Stray light	≤ 0.02 NTU (FNU)
Signal averaging	Selectable on or off
Detector	Silicon Photodiode
Reading modes	Normal (Push to Read), Signal Averaging or Rapidly Settling Turbidity™
Calibration options	Single step RapidCal™ for Low-Level Regulatory Reporting from 0–40 NTU (FNU) Full range calibration from 0–1000 NTU (FNU) Calibration to degrees of turbidity
Calibration logger	Records the last 25 successful calibrations
Verification logger	Logs the last 250 successful verifications
Data logger	500 records
Power requirement	AC 100–240 V , 50/60 Hz (with power or USB/power module) 4 AA alkaline batteries Rechargeable NiMH (for use with USB/power module)
Operating conditions	Temperature: 0 to 50 °C (32 to 122 °F) Relative Humidity: 0–90% at 30 °C, 0–80% at 40 °C, 0–70% at 50 °C, noncondensing
Storage conditions	–40 to 60 °C (–40 to 140 °F), instrument only
Interface	Optional USB
Sample required	15 mL (0.5 oz.)
Sample cells	Round cells 60 x 25 mm (2.36 x 1 in.) borosilicate glass with screw caps
Dimensions	22.9 x 10.7 x 7.7 cm (9.0 x 4.2 x 3.0 in.)
Weight	530 g (1.17 lb) without batteries 620 g (1.37 lb) with four AA alkaline batteries
Meter enclosure rating	IP67 (closed lid, battery and module compartment excluded)
Protection class	Power supply: Class II
Certification	CE certified
Warranty	1 year

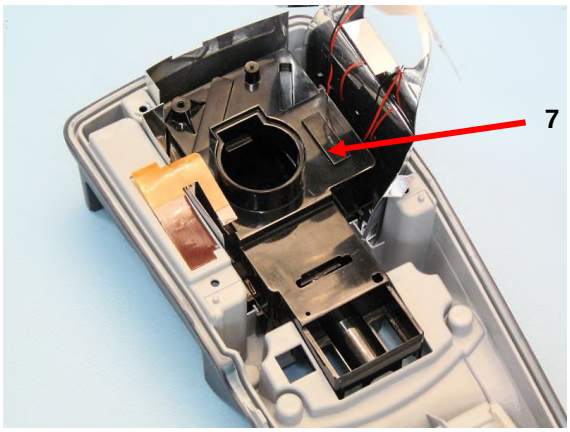
1.3 Location of components in the turbiditimeter



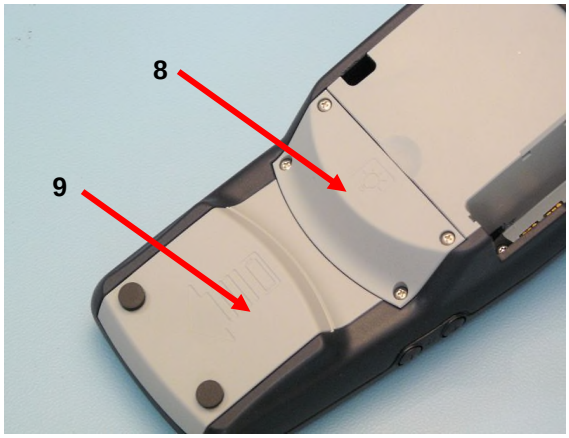
1 - Housing top
2 - Pick cap with magnet
3 - Label
4 - Display window



5 - EMC cover
6 - Main board with Display



7 - Optical bench



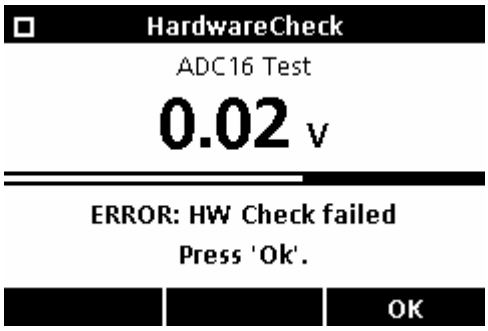
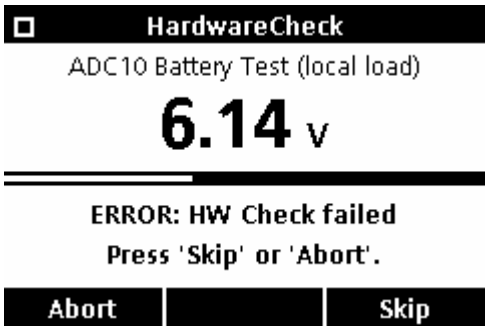
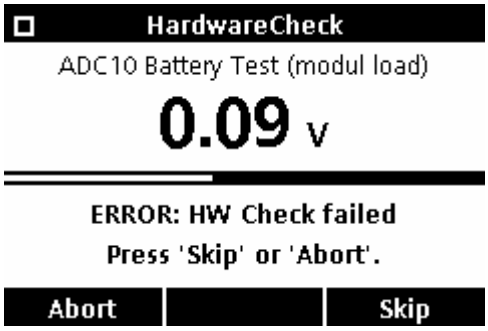
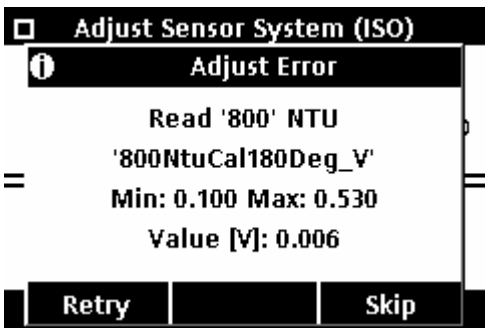
8 - Lamp cover (only 2100Q)
9 - Battery cover

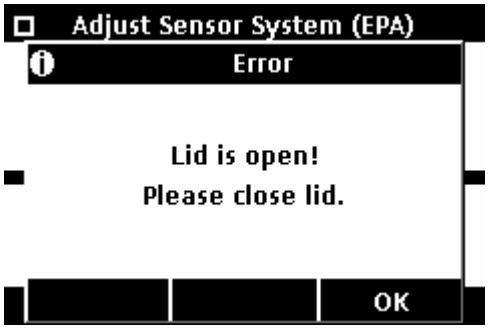
2 Error messages / Trouble shooting

The error messages listed here supplement the error messages in the User Manual.

2.1 Error messages during the service inspection

Hardware Check and Adjust Sensor System Errors.
For detailed description please refer to section 5.5 Service Inspection (after repair).

	ADC16 Test error occurred in cases of: - Lamp/IrLED is defect or not plugged. - 90° Detector is defect or not plugged. - 180° detector is defect or not plugged. - Blue filter in beam path is not assembled. - Optical lens in beam path is not correctly assembled. - Main board (YAB110/YAB111) is defect.
	Battery Test **(local load)** error occurred in cases of: - Bad battery contact. - Bad contact from battery package to main board. - Main board (YAB110/YAB111) is defect.
	Battery Test **(module load)** error occurred in cases of: - Bad battery contact. - Bad contact from battery package to main board. - Bad contact from main board to module board in USB OTG Adapter (Module #7) (LZV813) - Main board (YAB110/YAB111) is defect.
	Adjust Error (**different IDs**) occurred in cases of: - Wrong vial is plugged. - Lamp/IrLED is defect or not plugged. - 90° detector is defect or not plugged. - 180° detector is defect or not plugged. - Blue filter in beam path is not assembled. - Optical lens in beam path is not correctly assembled. - Main board (YAB110/YAB111) is defect.

	Lamp_Error occurred in cases of: - Lamp/IrLED is defect or not plugged. - 90° detector and 180° detector are defect or not plugged. - Beam path is darkened or cut off. - Main board (YAB110/YAB111) is defect.
	RefToLow_Error occurred in cases of: - Lamp/IrLED is defect or not plugged. - 180° detector is defect or not plugged. - Beam path is darkened. - Main board (YAB110/YAB111) is defect.
	Overrange_error occurred in cases of: - To much light at 90° detector. - To much light at 180° detector. - Main board (YAB110/YAB111) is defect.
	'Lid is open' error occurred in cases of: - Lid is open… - Lid has no magnet assembled. - Main board (YAB110/YAB111) is defect.

2.2 Error messages from user interface

Message			Close lid and push Read.
1	**Possible cause**		The lid is open or lid detection failed.
	Action		Check with Testprogram-Digital-Display/Keys the function of the read contact on the Main board. (see section 3.3.1 Display/Keys)

Message			Low Battery!
1	**Possible cause**		Battery is low. (Voltage < 4.1V in battery test)
	Action	1	Insert new batteries
		2	Check with Testprogram-Digital-Power/Battery menu (see section 3.3.6 Battery)

Message		ADC Failure!
1	**Possible cause**	Hardware error causing measurement to fail. ADC16 / Main board is defect.
	Action	Check with Testprogram-Analog-Read menu (see section 3.4.1 Read ADC) Change Main board (YAB110/YAB111)

Message			Detector signal too low!
1	**Possible cause**		Insufficient light on the 180° detector (< 0,010 V).
	Action	1	Check with Testprogram-Analog-Read menu (see section 3.4.1 Read ADC)
		2	Check for obstructed light path.

Message			Overrange!
1	**Possible cause**		Turbidity too high- caused probably by calibrating with QuickCal only.
	Action	1	Calibrate the upper range.
		2	Dilute the sample.

Message		Underrange!
1	**Possible cause**	The measured absorbance is below the calibration range.
	Action	Repeat calibration

Message			Please check the lamp!
1	**Possible cause**		Signals are too low on the 90° detector (< 0.005 V) **and** 180° detector (< 0,010 V).
	Action	1	The lamp is defective. Change the lamp (see section 4.1 Lamp removing (only 2100Q) and 4.2 Lamp installing (only 2100Q))
		2	The LED is defective. Change the LED (see section 4.4 Main board with Display)

Message			Temperature too high! Switch off instrument.
1	**Possible cause**		Temperature has exceeded the meter limits (>60°C or >140°F).
	Action	1	Check the value to plausibility (see section 3.3.6 Battery)

Message			RST: Average value!
1	Possible cause		Solids are settling too slowly. Reading Mode is not suitable for this sample.
	Action	1	Select a different Reading Mode.

Message			Confidence level is < 95%
1	Possible cause		The Reading Mode Rapidly Settling Turbidity did not meet the range of 95% confidence.
	Action	1	Shake the sample vigorously so that the solids allocate. Repeat the measurement again.
		2	If the sample is stable and does not have settlable solids switch to normal measurement mode.

Message			Standard value out of range. Insert standard and push Read
1	Possible cause		Used incorrect standard value for measurement.
	Action	1	Insert the appropriate standard and read again.

Message			ID already in use. Enter new ID
1	Possible cause		The Operator or Sample ID is unavailable as it is already assigned.
	Action	1	Create a new ID.

Message			Error - Security Please set password before activating security
1	Possible cause		No password is created.
	Action	1	Create a password.

Message			Please enter at least one character.
1	Possible cause		Password must contain minimum of one character.
	Action	1	Create a password of at least one character.

Message			Password incorrect. Please retry.
1	Possible cause		Incorrect password was entered.
	Action	1	Enter the appropriate password.
		2	Enter Universal password: "**HACH"** (see section 3.1.3 Password)

Message			Please disconnect the USB cable from your computer.
1	Possible cause		Data storage does not respond while connected to the meter and the computer.
	Action	1	Disconnect the USB cable from the meter and try sending data again.

Message			USB module memory full. Delete data and try again.
1	Possible cause		Data storage is full.
	Action	1	1. Connect USB modul to the computer. 2. Download the stored data to the computer. 3. Delete Data Log on the module.

3 Test program

3.1 General

The test program can be used to modify settings and test the correct functioning of the meter. Some of the test programs contain functions that are intended only for use by the development and production departments. Where this is the case, it is indicated in the program description.
The test program contains menus to guide the user to the individual program options. When the test program is running, the menu is shown on the left side of the display. The right side of the display is the output window, in which status information and/or messages are shown. The full menu path is always shown in the title line at the top of the display.

3.1.1 Selecting a language

The test program is available in English, only.

To change the language of the user interface, press and hold the power button for at least 4s.

The language menu appears.

Chose a language with the Up/Down Arrow Keys and press "**OK**"

3.1.2 Instrument update

The meter firmware can be updated. The files are provided via Internet download and transferred from the PC to the module.

Note:

- **All customer specific information (User-ID, Sample-ID), stored measuring results are still in place after the update!**
- **The update will work only, if there a newer firmware on the module as on the meter!**

To update the meter firmware:

- Download the update file to the computer from the internet.

- Connect the module to the computer via USB cable.

- Unzip the downloaded file to the module.

- Plug the module into the meter.

- Push and hold the power button for more than 4 seconds.

- The meter starts with the bootloader software and updates the firmware.

- If the f/w update is complete, the instrument will power up automatically and start the application software.

- The meter displays the language menu so that that the user can select a language.

3.1.3 Password

Access to any programs of the meter can be protected by a password (see the Password section of the 2100Q (is) User Manual).

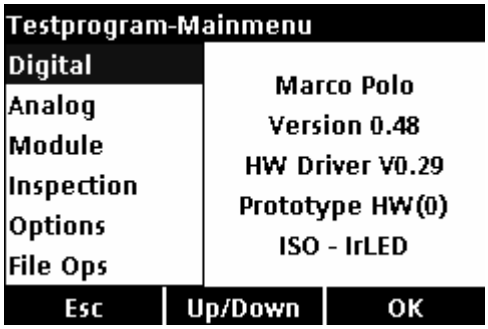
In an emergency (e.g. if you cannot remember the password) you can gain access with the help of a universal password:

Universal password: **HACH**

3.2 Testprogram-Mainmenu

Switch on the instrument with pressing continually the “setting” button and a short press on the “power” button.

Power Setting



You are in the **“Testprogram-Mainmenu”,** now.

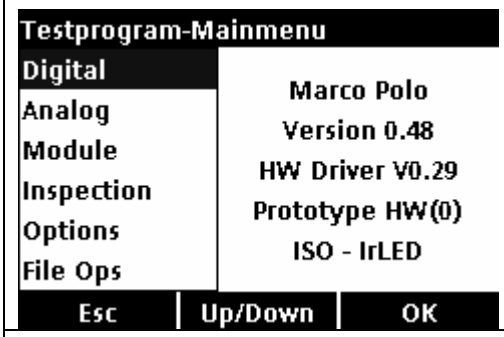
The table below contains the items shown in the main menu of the test program, with a brief description of their functions. A more detailed description is included in the following sections.

Menu item	Explanation
Digital	Calls the test programs for the digital, battery and power part of the 2100Q (is) (see section 3.3 Digital)
Analog	Calls the test programs for the analog part of the 2100Q (is) (see section 3.4 Analog)
Module	Calls the test programs for the modules and peripherals of the 2100Q (is) (see section 3.5 Module)
Inspection	Full Inspection, Service Inspection… (see section 3.6 Inspection)
Options	Various special test programs/settings. (see section 3.7 Options)
File Ops	Backup, Restore, Copy Logger (see section 3.8 File Ops)

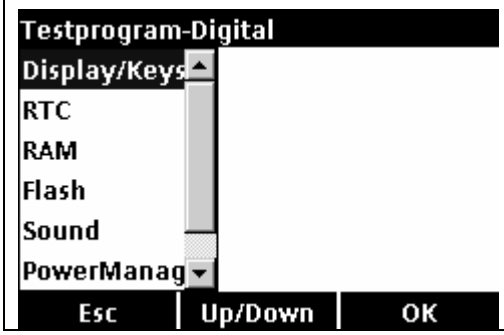
Explanation of the items in the window:

Display	Explanation
Marco Polo	Name of project
Version:	Shows the version number of the test program.
HW Driver:	Shows the version number of the Hardware driver.
Prototype HW(0)	Shows the hardware version of the photometer: “Prototype HW(0)”, “Pilotseries HW(1)” or “Series HW(2)”
ISO–IrLED / EPA–Lamp	Shows the instrument version: “ISO-IrLED” or “EPA-Lamp”

3.3 Digital



- Select “Digital” in the Testprogram-Mainmenu
- Confirm it with “OK”

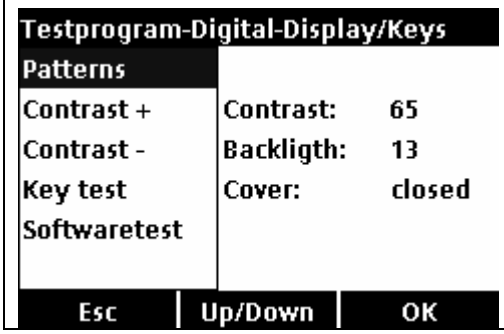


- “Testprogram-Digital” appears

Explanation of the menu items:

Menu item	Explanation
Display/Keys	Settings and tests for display and keys. (see section 3.3.1 Display/Keys)
RTC	Setting the date and time. (see section 3.3.2 RTC)
RAM	Calls the test program for the RAM. (see section 3.3.3 RAM)
Flash	Calls the test program for the Flash. (see section 3.3.4 Flash)
Sound	Settings and tests for the sound. (see section 3.3.5 Sound)
PowerManag	**CAUTION –** For use by the development department only!
Battery	Settings and tests for the batteries. (see section 3.3.6 Battery)

3.3.1 Display/Keys



- Select “Display/Keys” in the Testprogram-Digital menu
- Confirm it with “OK”
- “Testprogram-Digital-Display/Keys” appears

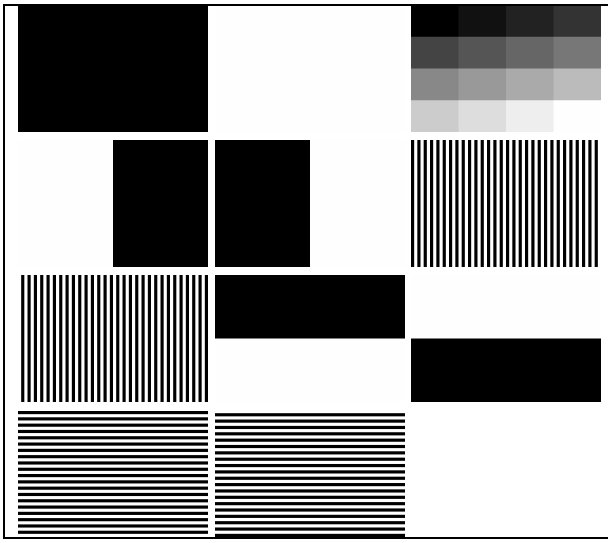
Explanation of the menu items:

Menu item	Explanation
Patterns	Different patterns for display tests (see section 3.3.1.1 Patterns
Contrast +	Increments the contrast
Contrast –	Decrements the contrast
Key test	Calls the test program for keys (see section 3.3.1.2 Key test)
Softwaretest	Calls more softwaretests. **CAUTION –** For use by the development department only!

Explanation of the items in the window:

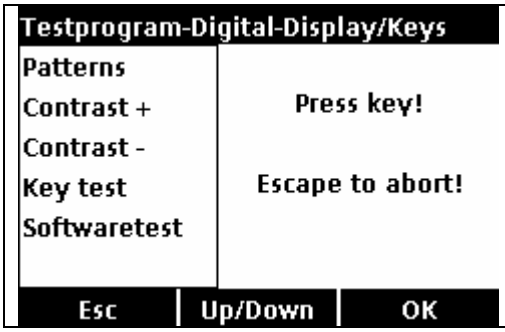
Display	Explanation
Contrast:	Shows the current status of the contrast
Backlight:	Shows the current status of the backlight
Cover:	Shows the current status of the lid: “open” or “closed”

3.3.1.1 Patterns



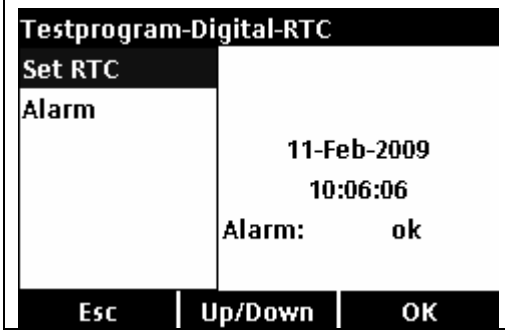
- Select “Patterns” in the Testprogram-Digital-Display/Keys menu
- Confirm it with “OK”
-  and  changes the pattern
-  lefts from  quit the pattern test

3.3.1.2 Key test



- Select “Key test” in the Testprogram-Digital-Display/Keys menu
- Confirm it with “OK”
- Keys test appears
- Press a key and in placed of “Press key!” the name of the pressed key appears.

3.3.2 RTC



- Select “RTC” in the Testprogram-Digital menu
- Confirm it with “OK”
- The Testprogram-Digital-RTC menu appears
- Chose “**Set RTC”** and press “**OK**” to set the date and time.

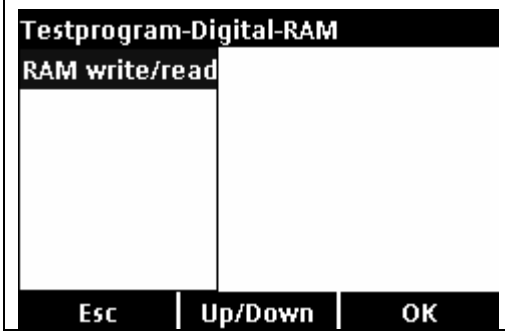
Explanation of the menu items:

Menu item	Explanation
Set RTC	Opens the input window for the date and time.
Alarm	RTC alarm timer at main board is been set to current time plus 2 seconds. It will be checked if the alarm interrupt has been occurred after 2 seconds.

Explanation of the items in the window:

Display	Explanation
	Shows the current date
	Shows the current time
Alarm:	Shows the current status of Alarm

3.3.3 RAM



- Select “RAM” in the Testprogram-Digital menu
- Confirm it with “OK”
- Testprogram-Digital-RAM menu appears

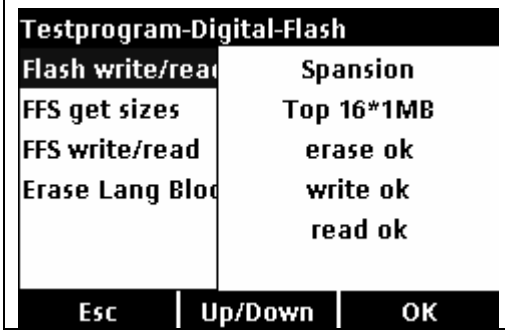
Explanation of the menu items:

Menu item	Explanation
RAM write/read	Perform the write/read test program for the RAM

Explanation of the items in the window:

Display	Explanation
RAM test OK	Shows the result of the performed RAM test

3.3.4 Flash



- Select “Flash” in the Testprogram-Digital menu
- Confirm it with “OK”
- Testprogram-Digital-Flash menu appears

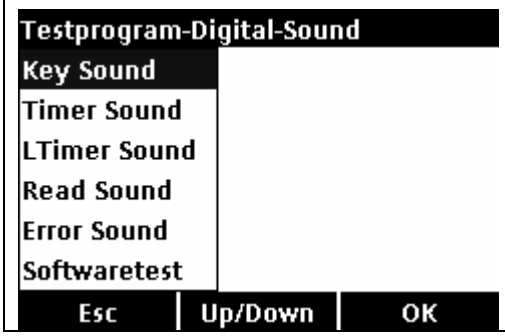
Explanation of the menu items:

Menu item	Explanation
Flash write/read	Test internal Flash File System
FFS get sizes	Shows sizes of the FFS
FFS write/read	**CAUTION –** For use by the development and production departments only!
Erase Lang Block	**CAUTION –** For use by the development and production departments only!

Explanation of the items in the window:

Display (example)	Explanation
Spansion	Type
Top 16*1MB	Size
erase ok	Erase OK/NOK
write ok	Write OK/NOK
read ok	Read OK/NOK

3.3.5 Sound

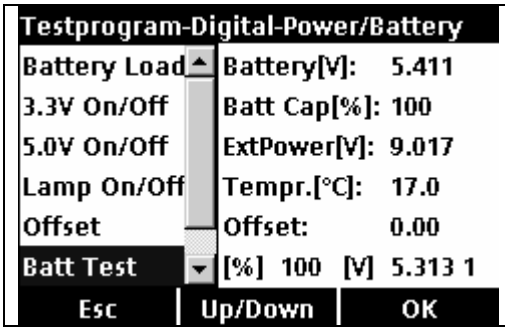


- Select “Sound” in the Testprogram-Digital menu
- Confirm it with “OK”
- Testprogram-Digital-Sound menu appears

Explanation of the menu items:

Menu item	Explanation
Key Sound	Plays the key sound
Timer sound	Plays the timer sound
LTimer Sound	Plays the long timer sound
Read Sound	Plays the read sound
Error Sound	Plays the error sound
Softwaretest	**CAUTION –** For use by the development department only!

3.3.6 Battery



- Select “Battery” in the Testprogram-Digital menu
- Confirm it with “OK”
- Testprogram-Digital-Power/Battery menu appears

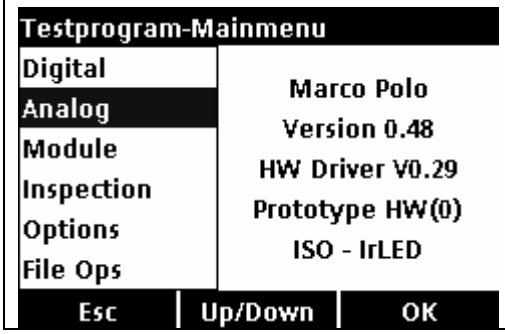
Explanation of the menu items:

Menu item	Explanation
Battery Load	Switch On/Off Load for battery
3.3V On/Off	Switch On/Off 3.3V peripheral (sound/lid)
5.0V On/Off	Switch On/Off analog power
Lamp On/Off	Switch On/Off Lamp/IrLED
Offset	**CAUTION –** For use by the development department only!
Batt Test	Performs battery capacitance test. • Set load to battery • Read voltage (load voltage) • Calculate capacitance with load voltage. • shows the results
Force Charge	**CAUTION –** For use by the development department only!

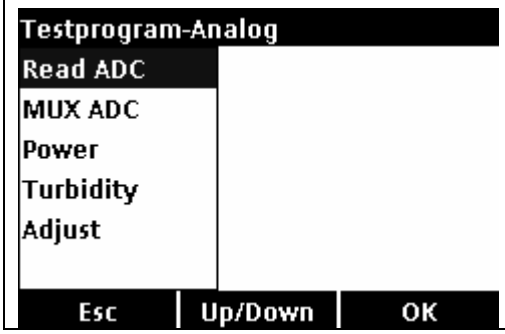
Explanation of the items in the window:

Display	Explanation
Battery[V]:	current battery voltage (Load value < 4.1 V shows “low battery!” message)
Batt Cap[%]:	Capacitance calculated from current battery voltage
ExtPower[V]:	External power from power adapter (9V Min:8.25V Max: 9.35V)
Tempr.[°C]:	Value of internal temperature sensor (it should be <60°C or <140°F)
Offset:	CAUTION – For use by the development department only!
[%] [V]	Result of “Batt Test” (Voltage < 4.1 V shows “low battery!” message)

3.4 Analog



- Select “Analog” in the Testprogram-Mainmenu
- Confirm it with “OK”

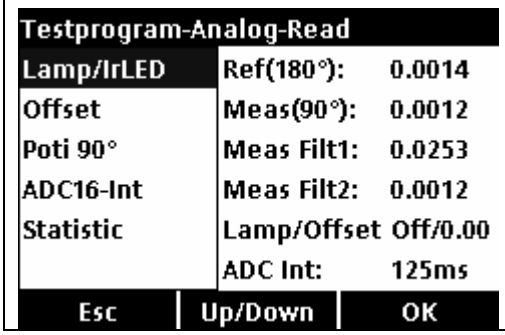


- "Testprogram-Analog" appears

Explanation of the menu items:

Menu item	Explanation
Read ADC	Calls the Read menu for ADC (see section 3.4.1 Read ADC)
MUX ADC	**CAUTION –** For use by the development department only!
Power	Calls the Power menu for analog power (see section 3.4.2 Power)
Turbidity	Calls the turbidity menu (see section 3.4.3 Turbidity)
Adjust	**CAUTION –** For use by the development department only!

3.4.1 Read ADC



- Select "Read ADC" in the Testprogram-Analog menu
- Confirm it with "OK"
- Testprogram-Analog-Read menu appears

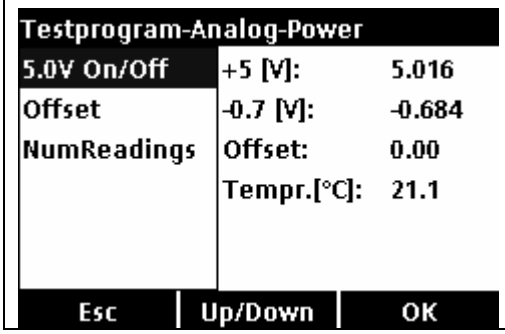
Explanation of the menu items:

Menu item	Explanation
Lamp/IrLED	Switch On/Off Lamp/IrLED
Offset	**CAUTION –** For use by the development department only!
Poti 90°	Sets gain potentiometer for 90° detector (0-99) To test if read value changed by potentiometer change.
ADC16-Int	**CAUTION –** For use by the development department only!
Statistic	**CAUTION –** For use by the development department only!

Explanation of the items in the window:

Display	Explanation
Ref(180°)	180° detector value [V]
Meas(90°)	90° detector value [V]
Meas Filt1	Second stage filter amplifier 90° detector value [V]
Meas Filt2	90° detector value [V]
Lamp/Offset	Status of Lamp/ status of Offset
ADC Int	Sample time of analog / digital converter

3.4.2 Power



- Select “Power” in the Testprogram-Analog menu
- Confirm it with “OK”
- Testprogram-Analog-Power menu appears

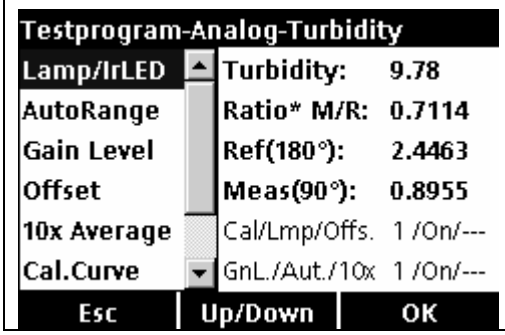
Explanation of the menu items:

Menu item	Explanation
5.0V On/Off	Switch on/off analog power
Offset	**CAUTION –** For use by the development department only!
NumReadings	**CAUTION –** For use by the development department only!

Explanation of the items in the window:

Display	Explanation
+5 [V]	Value of positive analog power voltage (+5V Min: 4.9V Max: 5.2V)
-0.7 [V]	Value of negative analog power voltage (-0.7V Min: -0.8V Max: -0.5V)
Offset	CAUTION – For use by the development department only!
Tempr.[°C]	Value of internal temperature sensor (the same sensor as section 3.3.6 Battery)

3.4.3 Turbidity



- Select “Turbidity” in the Testprogram-Analog menu
- Confirm it with “OK”
- Testprogram-Analog-Turbidity menu appears

Note: *Typical values for 10 NTU vial (Turbidity, Ratio, Ref, Meas) are shown in picture left side*

Explanation of the menu items:

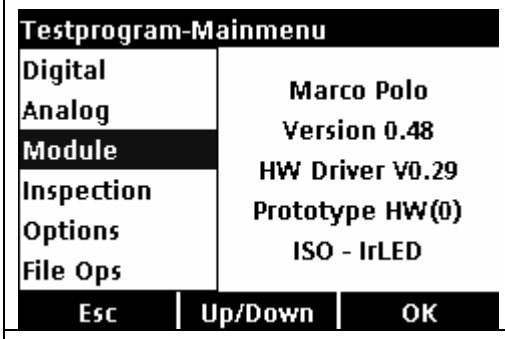
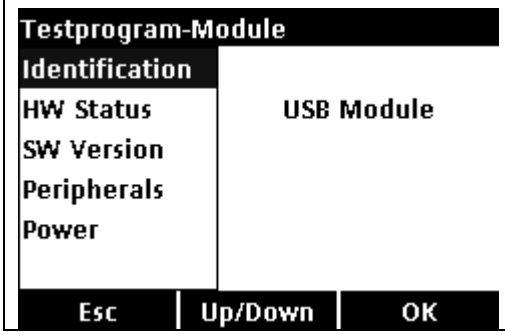
Menu item	Explanation
Lamp/IrLED	Switch On/Off Lamp/IrLED
AutoRange	**CAUTION –** For use by the development departments only!
Gain Level	**CAUTION –** For use by the development departments only!
Offset	**CAUTION –** For use by the development departments only!
10x Average	**CAUTION –** For use by the development departments only!
Cal.Curve	**CAUTION –** For use by the development departments only!
Dark Adj.	**CAUTION –** For use by the development departments only!

Edit Poti	**CAUTION –** For use by the development departments only!

Explanation of the items in the window:

Display	Explanation
Turbidity	Value of current calculated turbidity
Ratio M/R	Value of 180°/90° detector ratio
Ref(180°)	180° detector value [V]
Meas(90°)	90° detector value [V] regarding selected gain level
Cal/Lmp/Offs	Index selected cal. curve / status of lamp/IrLED / status of offset
GnL./Aut./10x	Status of gain level / status of automatic level selection / 10 times measurement

3.5 Module

	• Select “Module” in the Testprogram-Mainmenu • Confirm it with “OK”
	• “Testprogram-Module” appears

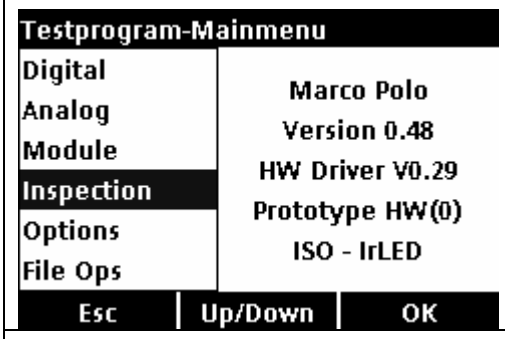
Explanation of the menu items:

Menu item	Explanation
Identification	Performs the identification of Modules
HW Status	**CAUTION –** For use by the development departments only!
SW Version	Reads SW version of Module firmware and shows the result
Peripherals	**CAUTION –** For use by the development departments only!
Power	**CAUTION –** For use by the development departments only!

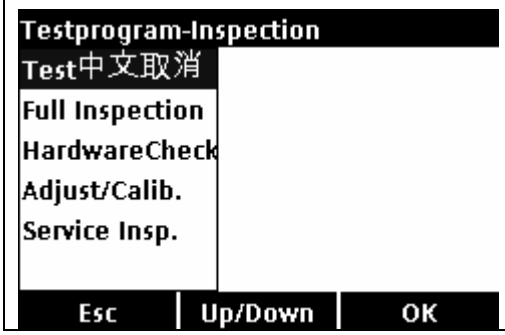
Explanation of the items in the window:

Display	Explanation
USB Module / Module not found	When USB Module is detected, then “USB Module” is been shown
SW Version (x.yyy)	x: bootloaderversion yyy: firmwareversion

3.6 Inspection



- Select “Inspection” in the Testprogram-Mainmenu
- Confirm it with “OK”

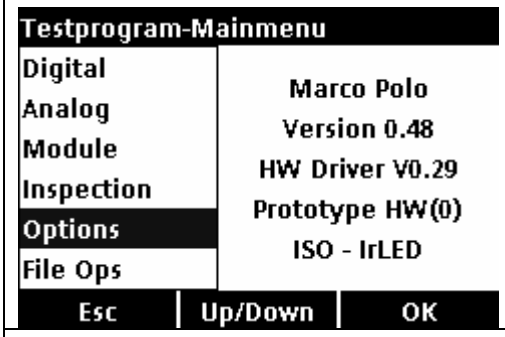


- “Testprogram-Inspection” appears

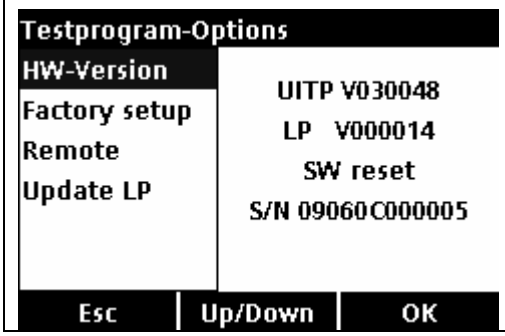
Explanation of the menu items:

Menu item	Explanation
FI-Chinese	**CAUTION –** For use by the development and production departments only!
Full Inspection	**CAUTION –** For use by the development and production departments only!
HardwareCheck	This is the Hardware Check part from the Service Inspection, only.
Adjust/Calib	This is the Adjust-Calibration part from the Service Inspection, only.
Service Insp	This is the Service Inspection, included the Hardware Check and the Adjust/Calibration (see section 5.5 Service Inspection (after repair))

3.7 Options



- Select “Options” in the Testprogram-Mainmenu
- Confirm it with “OK”



- “Testprogram-Options” appears

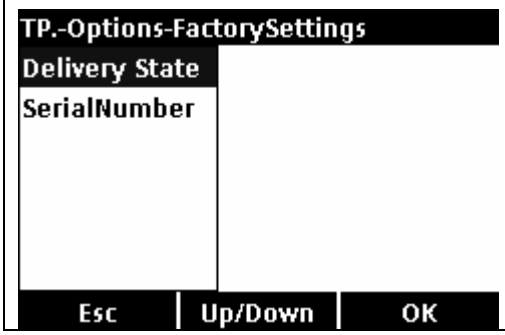
Explanation of the menu items:

Menu item	Explanation
HW-Version	**CAUTION –** For use by the development departments only!
Factory setup	Delivery State, Serial Number
Remote	**CAUTION –** For use by the development departments only!
Update LP	Update the bootloader program

Explanation of the items in the window:

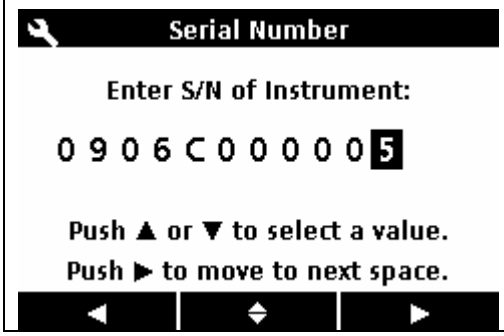
Display	Explanation
UITP Vxxxxxx	Firmware version
LP Vxxxxxx	Bootloader version
SW/HW reset	Last executed reset type
S/N YYMM0C0xxxxx	Xxxxx: counted number of instrument for YYMM

3.7.1 Factory setup

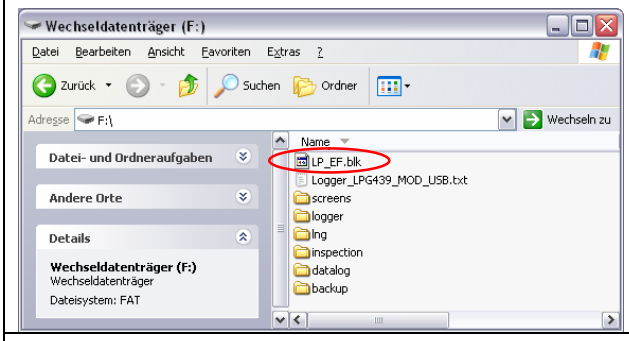
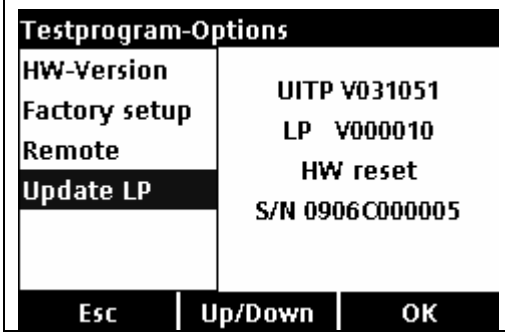


- Select “Factory setup” in the Testprogram-Options menu
- Confirm it with “OK”
- “TP.-Options-FactorySettings” appears

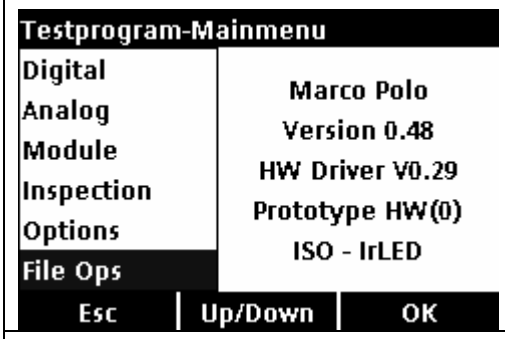
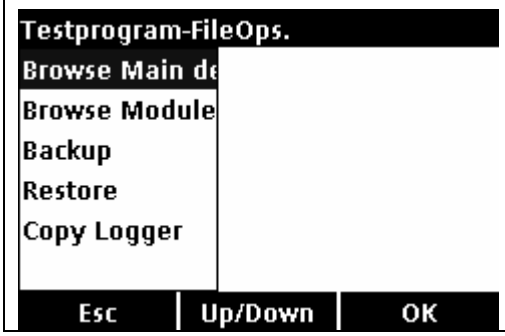
Explanation of the menu items:

Menu item	Explanation
Delivery State 	Touching the ‘OK’ key causes all instrument settings that have been changed by the customer to be reset to the default values (factory settings). All measurement data are deleted.
SerialNumber 	A window opens, in which the serial number of the photometer can be entered / changed.

3.7.2 Update LP

	• If it necessary to update the loader program, copies the “LP_EF.blk” file from PC to the Module. • Plug in the module in the meter
	• Select Update LP in the “Testprogram-Options” menu.

3.8 File Ops

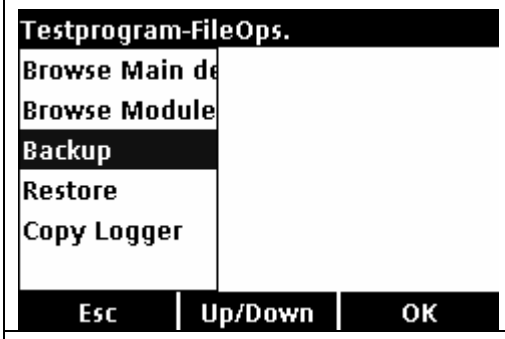
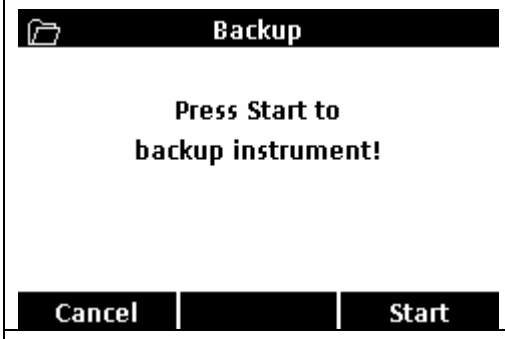
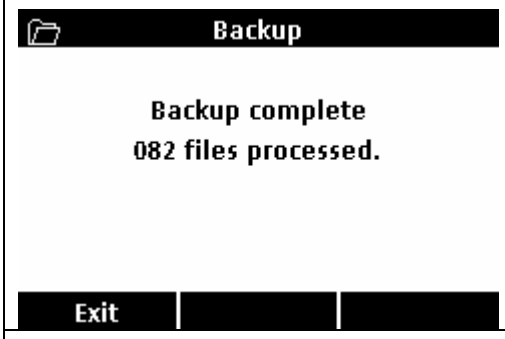
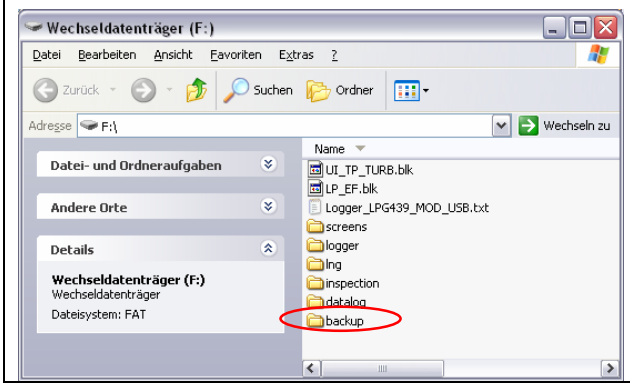
	• Select “File Ops” in the Testprogram-Mainmenu • Confirm it with “OK”
	• “Testprogram-File Ops” appears

Explanation of the menu items:

Menu item	Explanation
Browse Main	**CAUTION –** For use by the development department only!
Browse Module	**CAUTION –** For use by the development department only!
Backup	Makes a backup from the 2100Q (is) (see section 3.8.1 Backup)
Restore	Restores a saved backup from the 2100Q (is) (see section 3.8.2 Restore)
Copy Logger	Copies the logger file to the USB module (see section 3.8.3 Copy Logger)

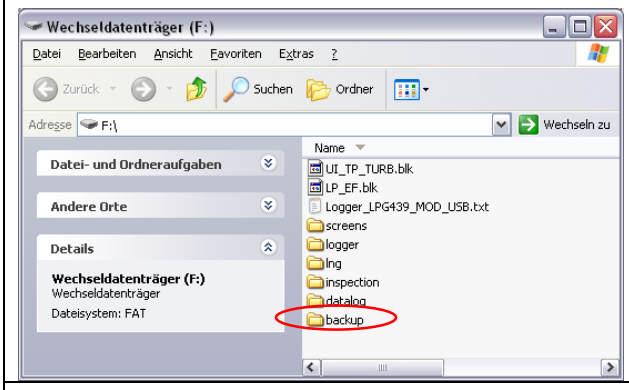
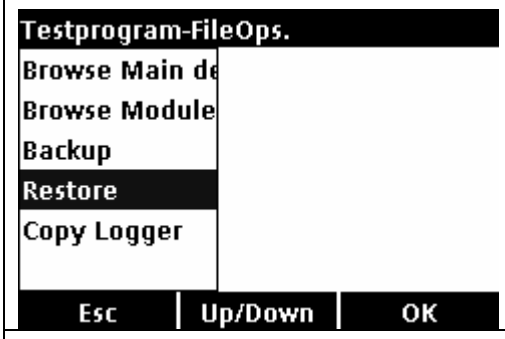
3.8.1 Backup

The menu "Backup" offers the possibility to store all measuring data, Operator ID, Sample ID, password and all adjustable data on a USB OTG Adapter (Module #7)

	• Plug in a USB OTG Adapter (Module #7) • Select “Backup” in the FileOps-Submenu • Confirm it with “OK”
	• Press “Start” to backup the instrument! • It will take up to 30 sec… ***Note:*** *Are already backup files on the module, they will be overwritten!*
	• Press “Exit” when the backup is complete ***Note:*** *If “000” files are shown then the copy process was failed.*
	• Connect the USB OTG Adapter (Module #7) with a PC. On the Module would create the folder “backup”.

3.8.2 Restore

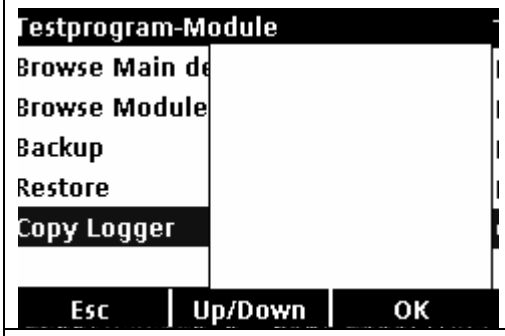
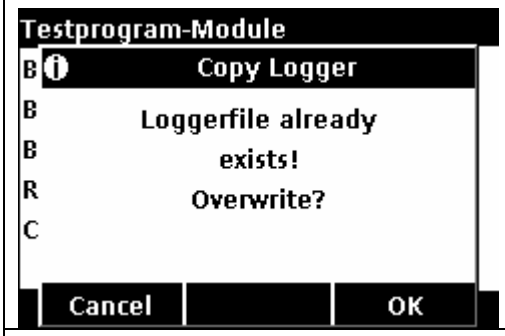
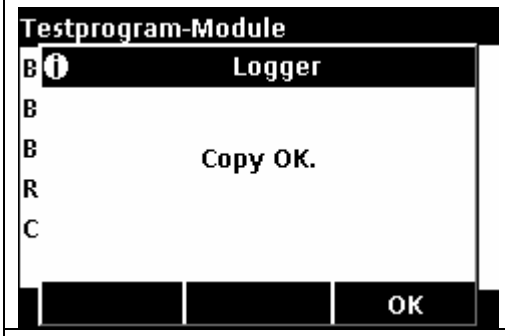
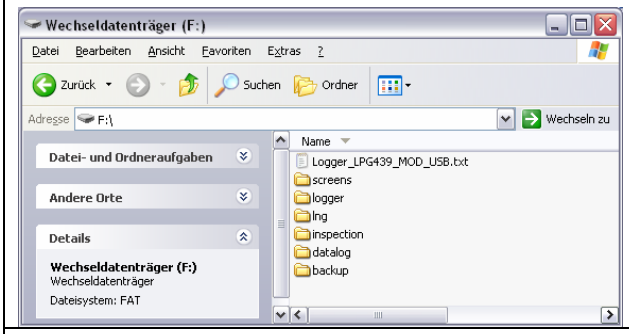
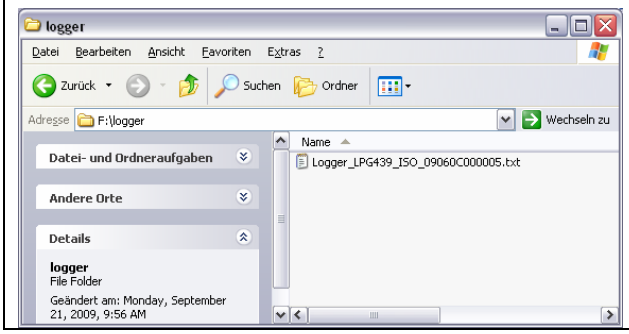
Note: *All current data on the meter will be overwritten when restoring the backup files!*

	• On the USB OTG Adapter (Module #7) must be the folder “backup” which would created by carried out the backup routine.
	• Select “Restore” in the FileOps-Submenu • Confirm it with “OK”
	• Press “Start” to restore the instrument!
	• Press “Exit” when the restore is complete • The backup is restored, now. ***Note:*** *If “000” files are shown then the copy process was failed.*

3.8.3 Copy Logger

The ‘Copy Logger’ function copies the meter’s event log to the USB modul. The event log contains the instrument history and a record of any error messages.

This function can help service personnel to identify errors more quickly, especially when it is not clear what is wrong or when customers’ are unable to provide sufficient information.

	• Select “Copy Logger” in the “Testprogram-File Ops” menu • Confirm it with “OK”
	• If the Loggerfile exists on the module, the message “Logger already exists! Overwrite?” appears. • Confirm it with “OK”
	• When the copy of the event log is on the module the message “Copy OK.” appears.
	• There are two logger files on the module, now. In the main folder of the module is “**Logger_LPG439_MOD_USB.txt**” This is the logger of the module.
	• The log of the instrument is saved on the module in the folder “logger” as a text file with the name: “**Logger_LPG439_ISO/EPA_S/N.txt**” For example: “**Logger_LPG439_ISO_09060C000005.txt**”.

Explanation of the content of the event logs:

Display	Explanation	Example
First line:	Instrument name and serial number	2100Q (is),S/N 09060C000005
Second line:	Software version	Instrument Version:,0.27
Additional lines:	Time and date of the log entry and an index number that provides more information about the entry.	2006-01-12 12:45:43,2, 2006-01-12 12:45:46,4,130,

Explanation of the index numbers of the event logs from the instrument:

Indexnumber	Explanation	
1	**Enter comments**	
2	**Start User Interface**	
3	**Start Testprogram**	
4, xxx	**Read Ratio**	
	xxx	**Explanation**
	[1]	ADC Error
	[2]	Overrange
	[3]	Underrange
	[4]	Exceeds Range Limit
	[5]	Undercuts Range Limit
	[6]	Ref Detector Signal to low
	[7]	Lid open
	[8]	Lamp error
	[9]	Low Batterie
5	**HW Reset**	
6,xxxx	**Low Batterie**	
7,xxxx	**Temperature too high**	
8	**RST: Average value**	
9	**RST: Confidence level too low**	
10	**Send Data during connecting PC**	
11,xxxx	**USB Module out of memory** xxxx freespace in Bytes	
12,xxxx	**Filesystem error**	
	xxxxx	**Explanation**
	[1]	Delete Last Reading
	[2]	Delete Datalog
	[3]	Read/Seek Error
	[4]	Store Data
	[5]	Store Reading Log
	[6]	Store VerifyCalLog
	[7]	Compress Reading Log
	[8]	Compress VerifyCalLog
	[9]	Store Calibration
	[10]	Compress Calibration History

14,xx,yyyyyyy **Communication Error, Message lost**

xx	OP Code
a	General CommandTxTask
b	PrinterCommandTask
c	FileSystemCommandTxTask
d	UartReceptionTask
A0	GET_IDENT
A1	GET_SW_VER
A2	GET_STATUS
A3	ENABLE_CHARGING
A4	SET_DATE_TIME
A5	GET_DATE_TIME
A6	BARCODE_READER
A7	SEND_TEMP
A8	BARCODE_EVENT
A9	GET_TEMP
AA	READ_POWER_STATUS
AB	SET_CHARGING_TYPE
AC	GO_TO_SLEEP_MODE
AD	SET_BATT_LOAD
AE	FORCE_CHARG
B0	CREATE_PAGE
B1	DELETE_PAGE
B2	CLEAR_PAGE
B3	SEND_PAGE
B4	GET_PIXEL
B5	PUT_PIXEL
B6	DRAW_LINE
B7	PAINT_RECT
B8	GET_PRINTER_STATUS
C0	SEND_STRING
C1	GET_BARCODE
C2	UPLOAD_STATUS
C3	SET_FW_FILENAME
C4	UPLOAD_FW
C5	F_OPEN
C6	F_CLOSE
C7	F_GET_VERSION
C8	F_INIT
C9	F_ENTER_FS
CA	F_RELEASE_FS
CB	F_FORMAT
CC	F_GET_FREE_SPACE
CD	F_MK_DIR
CE	F_CH_DIR
CF	F_RM_DIR
D0	F_GET_DRIVE
D1	F_CH_DRIVE
D2	F_GET_CWD
D3	F_GET_DCWD
D4	F_RENAME
D5	F_MOVE
D6	F_DELETE
D7	F_FILE_LENGTH

D8	F_FIND_FIRST
D9	F_FIND_NEXT
DA	F_SET_TIME_DATE
DB	F_GET_TIME_DATE
DC	F_TRUNCATE
DD	F_FLUSH
DE	F_WRITE
DF	F_READ
E0	F_SEEK
E1	F_TELL
E2	F_SET_EOF
E3	F_EOF
E4	F_REWIND
E5	F_PUTC
E6	F_GETC
E7	F_STAT
E8	F_CHECK_VOL
E9	F_GET_OEM
EA	F_SET_ATTR
EB	F_GET_ATTR
EC	F_TRUNCATE
FF	OP_OUT_OF_RANGE
yyyyyyyyyy	**Errorcode**
0x00000001	GENERAL_MAIL_BOX_OUT_OF_RANGE
0x00000002	FS_MAIL_BOX_OUT_OF_RANGE
0x00000004	PRINTER_MAIL_BOX_OUT_OF_RANGE
0x00000008	MAIL_BOX_OUT_OF_RANGE
0x00000010	SEM_GENERAL_PACKET_ACK_OUT_OF_RANGE
0x00000020	SEM_FS_PACKET_ACK_OUT_OF_RANGE
0x00000040	SEM_PRINTER_PACKET_ACK_OUT_OF_RANGE
0x00000080	SEM_RESPONSE_DATA_OUT_OF_RANGE
0x00000100	UART_TX_OUT_OF_RANGE
0x00000200	UART_TX_NOT_OWNED
0x00000400	UART_GET_STRING_ERROR
0x00000800	UART_TX_ERROR
0x00001000	GENERAL_COMMAND_Q_FULL
0x00002000	FS_COMMAND_Q_FULL
0x00004000	PRINTER_COMMAND_Q_FULL
0x00008000	SEM_PRINTER_PKT_OUT_OF_RANGE
0x00010000	GENERAL_COMMAND_Q_NOT_CREATED
0x00020000	FS_COMMAND_Q_NOT_CREATED
0x00040000	PRINTER_COMMAND_Q_NOT_CREATED
0x00100000	SEM_FS_MAIN_OUT_OF_RANGE
0x00200000	FS_NO_MESG_BLOCKS
0x00400000	FS_COMMAND_ACK_TIMEOUT
0x00800000	FS_COMMAND_NO_Q_SLOT
0x01000000	GM_SEM_ERROR
0x02000000	GM_MAILBOX_ERROR
0x04000000	GM_MAILBOX_TIMEOUT_ERROR
0x08000000	GM_QUEUE_ERROR
0x10000000	Q_OUT_OF_RANGE_CODE
0x20000000	CHECKSUM_ERROR_CODE
0x40000000	NO_MODULE_COM
0x80000000	OPCODE_OUT_OF_RANGE_CODE

15	Language	
	Error no.	**Explanation**
	[1]	Selecting failed (write to language flash block)
	[2]	Updating from Module failed

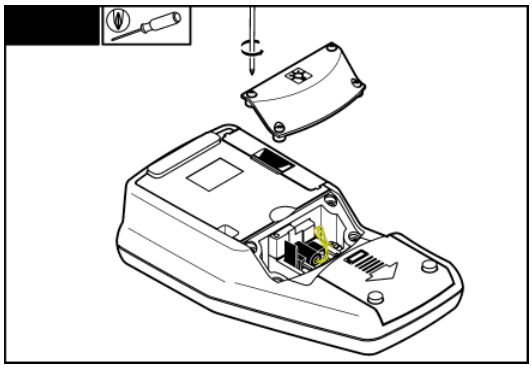
Explanation of the index numbers of the event logs from the <u>modul</u>:

Indexnumber	Explanation		
101	**Enter comments**		
102	**Reset**		
103,xxxx	**Communication Error, message lost**		
	xx	**OP Code**	
	0xA5	GET_DATE_TIME	
	0xA8	BARCODE_EVENT	
	0xA9	GET_TEMP	
	0xAA	GET_POWER_STATUS	
104,x,yyyy	**Communication Error, low layer**		
	x		
	1	UART reset	
		yyyy	**Explanation**
		0x08	Arbitration lost detected
		0x10	Overrun error
		0x20	Framing error
		0x40	Parity error
		0x...	undefined errors
	2	Packet corrupt	
		yyyy	**Explanation**
		invOC	invalid opcode
		invOcL	invalid opcode length
		invQ	invalid queue
		invCS	invalid checksum
		invPackL	invalid packet length
	3	Resource error	
		yyyy	**Explanation**
		getFS	get filesystem resource failed
		putFS	put filesystem resource failed
		getGen	get general resource failed
		putGen	put general resource failed
		getBC	get barcode resource failed
		putBC	put barcode resource failed
		getPrnt	get printer resource failed
		putPrnt	put printer resource failed
	4	Message error	
		yyyy	**Explanation**
		errFS	filesystem message error
		timeoutFS	filesystem message timeout
		gen	general message error
		bc	barcode message error
		prnt	printer message error

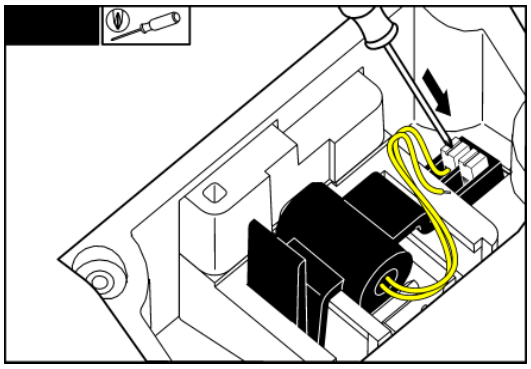
105,xxxx	**Batterie Detection**	
	xxxx	**Explanation**
	1;…V	Threshold uncertainty (BattChargeVoltage)
	2;…V	Deep Discharged (BattLoadVoltage)
106,xxxx	**Batterie Charging**	
	xxxx	**Explanation**
	1;…h	Charge timeout (ChargeTime)
	2;…c	Overtemperature (Temperature)
	3;…V	Overvoltage (BattChargeVoltage)
107,xxxx	**Memory**	
	xxxx	**Explanation**
	1;…	Flash CRC error (MemoryName)
	2;…	Filesystem CRC error (FileName)
	3; …	Filesystem access error (FileName)
	4; -	Filesystem format

4 Repairs

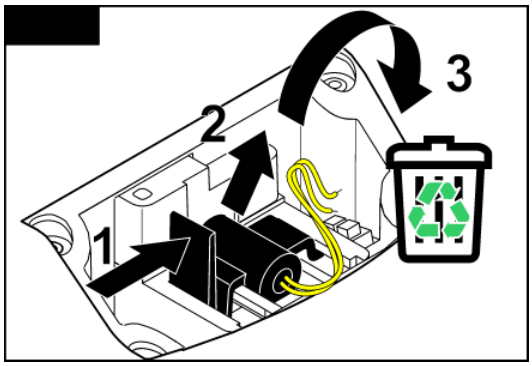
4.1 Lamp removing (only 2100Q)



1. Loosen the four screws from the lamp cover

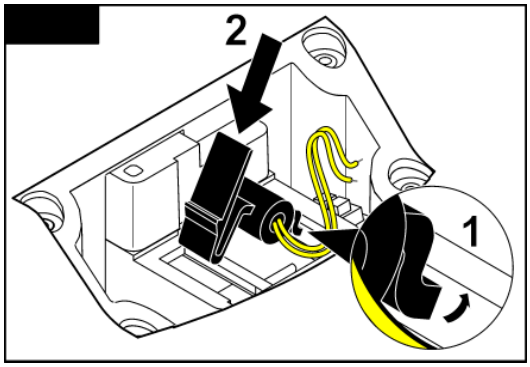


2. Plug out the wires from the lamp with pressing the noses.

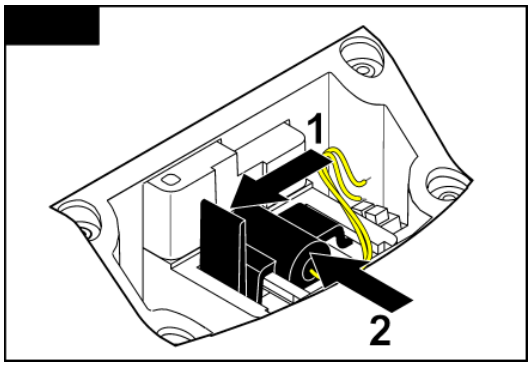


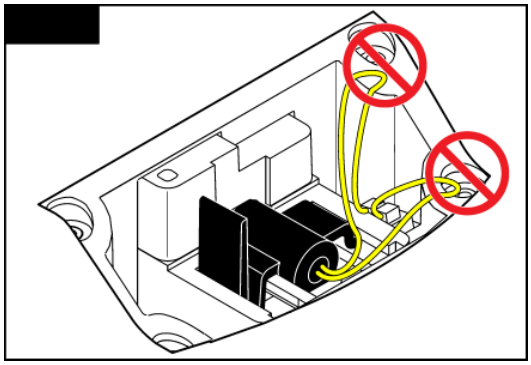
3. Remove the lamp, now.

4.2 Lamp installing (only 2100Q)

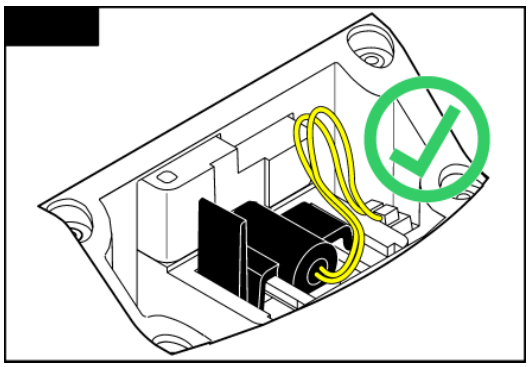


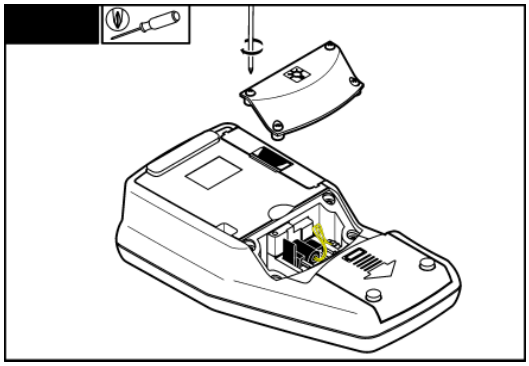
1. Plug in the Lamp





2. ***Note:*** *Don't squash the wires*





3. Replace the lamp cover

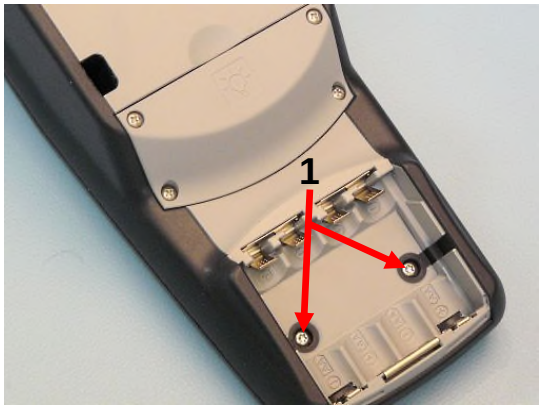
4.3 Opening the Meter

Only 2100Q:

1. Remove the Lamp (see section 4.1 Lamp removing (only 2100Q))

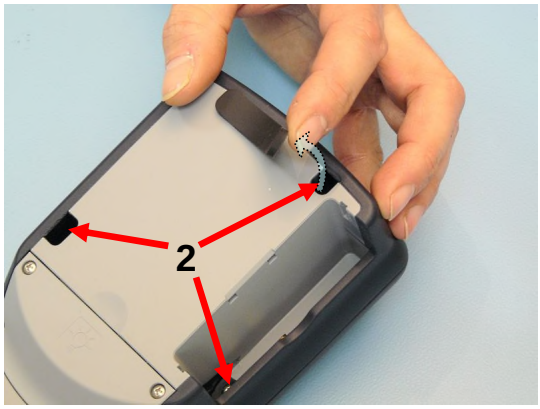
For 2100Q and 2100Q is

2. Remove the battery cover.
3. Remove the batteries, if they are installed.

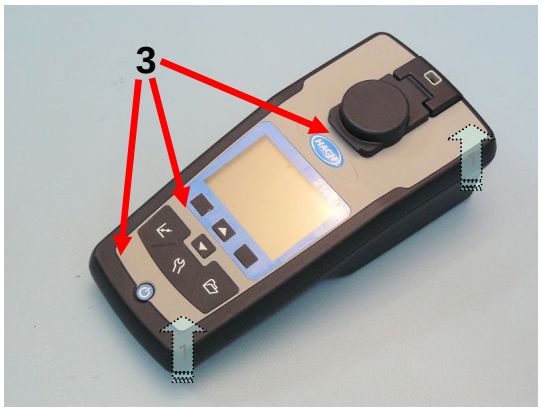


4. Loosen the two screws (1) in the battery compartment

5. Remove the module on the left side of the metere: Pull outside the noses, and pull down the module



6. Lift the right side from the large rubber foot
7. Loosen the three screws (2)



8. Lift the housing top (3) of the photometer.

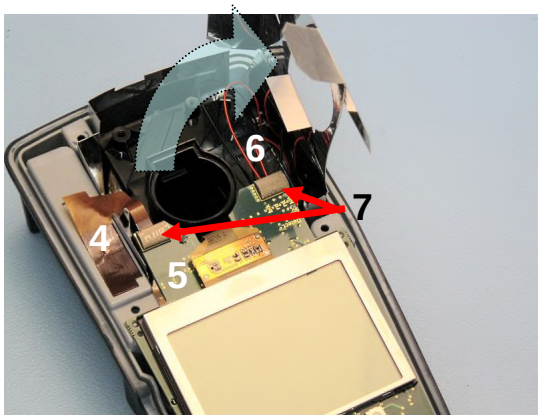
Note: *Before replace the housing check that the seal is intact.*

Return the turbidimeter to its original state by carrying out steps 1 to 8 in reverse order.

4.4 Main board with Display

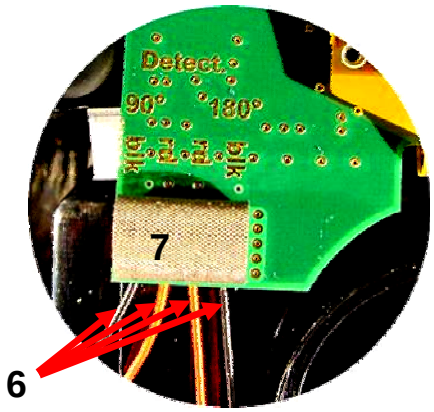
1. Open the turbidimeter (see section 4.3 Opening the Meter)

Note: *By close the turbidimeter check that the ESD shield contacts the display*



2. Fold the Cap of the ESD shield out.

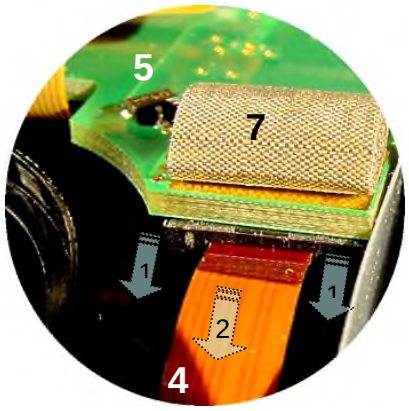
Note: *By fold the shield back, check that both conductive EMI Gaskets (7) are in place and contacts the ESD shield!*



3. Plug out the four detector wires (6) from the optical bench.

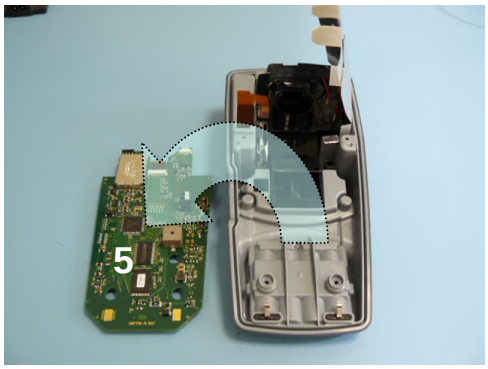
   →To determine the wires at 90° and at 180° see the picture at section 4.6 Optical Bench

Note: *By install a new main board (5) it requires definitely more forces to plug in the detector wires (6).Use a pliers to plug in!*

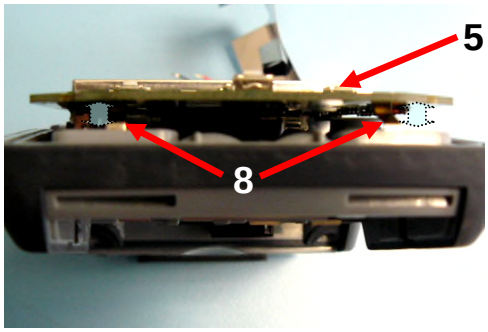


4. Disconnect the connector board (4) from the main board (5).

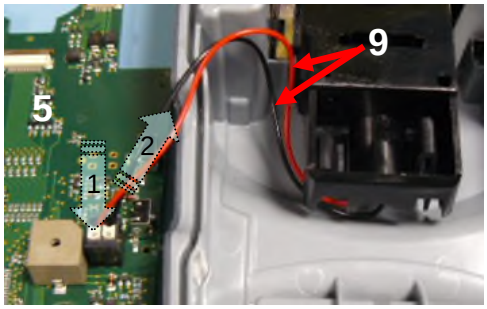
Note: *It's a zero force socket in use for the connection. At first pull the clip from the zero force socket, then pull the connector from connector board.*



5. Remove the main board (5) with display



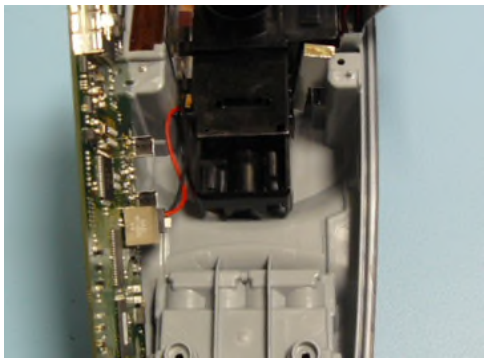
Note: *By install the main board (5) both battery contacts (8) should be have enough springiness (min: 1.5 mm distance)!*



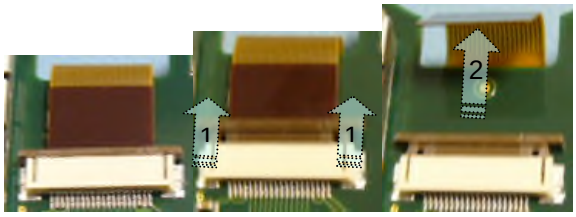
Only 2100Q is:

Disconnect the LED:

6. Press the noise, and Pull the LED – wire



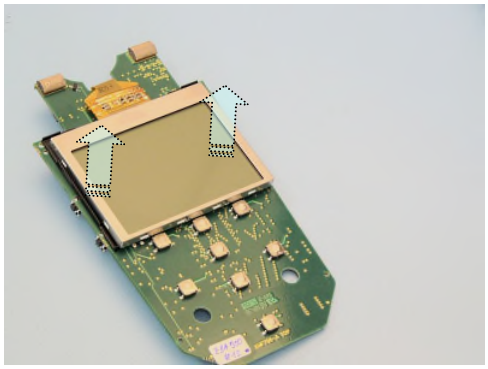
Note: *By install the main board (5) the LED wires (9) should be have there place left from the optical bench!*



For 2100Q and 2100Q is

7. Disconnect the display.

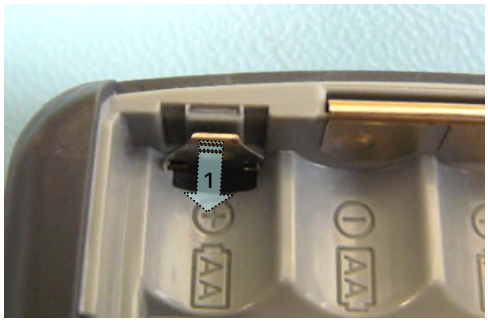
Note: *It's a zero force socket in use for the connection. At first pull the clip from the zero force socket, then pull the display - connector.*



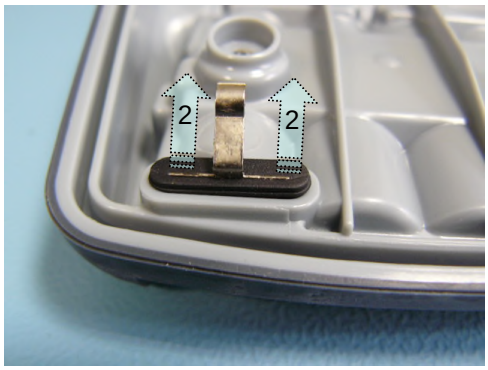
8. Now, you can lift the display from the main board

Return the turbidimeter to its original state by carrying out steps 1 to 8 in reverse order.

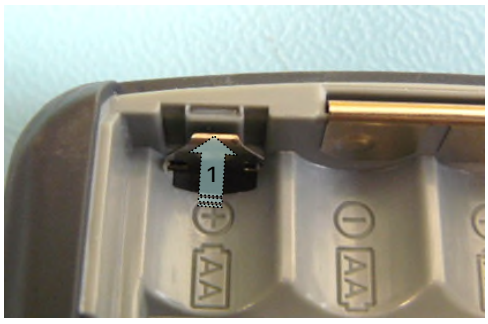
4.5 Battery contacts



1. Open the turbidimeter (see section 4.3 Opening the Meter.
2. Remove the main board with display (see section 4.4 Main board with Display)
3. Pull the battery contact in the battery compartment.

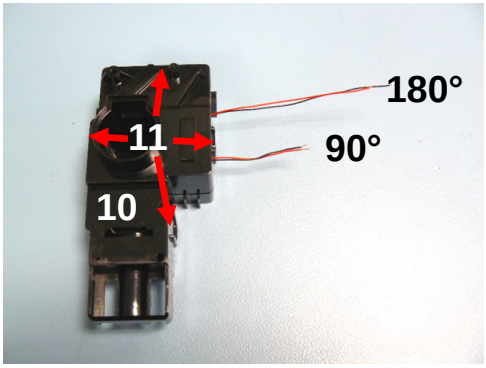


4. Turn the housing
5. Lift the battery contact out of the housing

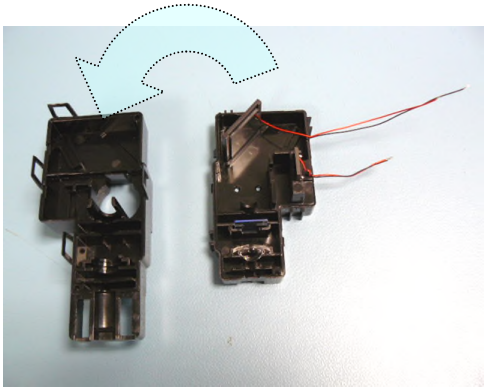


Note: *While inserts the contact press it outside*

4.6 Optical Bench



1. Open the turbidimeter (see section 4.3 Opening the Meter.
2. Remove the main board with display (see section 4.4 Main board with Display)
3. Remove the Optical Bench (10)
4. Gently release the 4 latches (11)

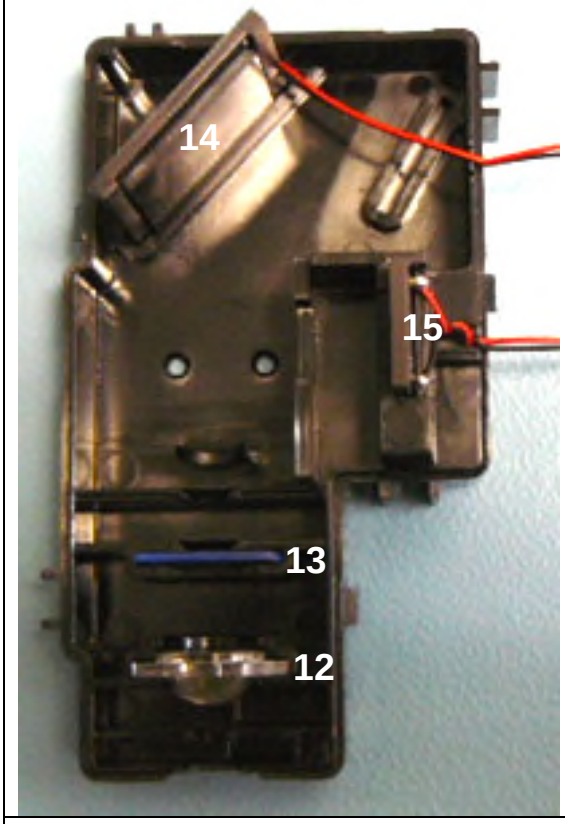


5. Lift the top of the optical bench

Note: By replacing the top *don't squash the wires*

Return the turbidimeter to its original state by carrying out steps 1 to 5 in reverse order.

4.7 Location of component in beam path



12 – Lens

13 – Light filter **only 2100Q**

14 – Detector 180° with NG filter

15 – Detector 90°

Cleaning the components:

Note: *Cleaning with ethanol,* alcohol, or similarities*, only the light filter (13)(only 2100Q) and the NG filter from the 180° detector(14)!*

Method 1: Cleaning with air: Settled dust can be blown off with a rubber bellows or an oil-free air gun or ionization gun.

Method 2: Cotton swabs: Dust particles can be carefully removed from small parts with a cotton swab if cleaning with air does not succeed

5 Inspection

5.1 General

After a component has been replaced, the service inspection must always be carried out (see section 5.5 Service Inspection (after repair))

Otherwise, in case of cleaning the components only, the calibration with StablCal Full Range Mode in the User Interface is sufficient (see section 5.4 Calibration).

Note**: For more information about StablCal follow the instruction manual "STABLCAL Stabilized Formazin Turbidity Standards For Use With Any Turbidimeter" **DOC022.98.00646

5.2 Inspection procedure

What?	How?
Check the housing for damage and/or soiling.	Visual check
Clean the components of the optical bench:	See sections 4.6 Optical Bench and 4.7 Location of component in beam path
Calibration	See sections 5.3 Apply silicone oil to a sample cell and 5.4 Calibration

5.3 Apply silicone oil to a sample cell

5.3.1 General

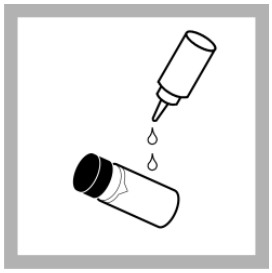
Sample cells and caps must be extremely clean and free from significant scratches. Apply a thin coating of silicone oil on the outside of the sample cells to mask minor imperfections and scratches that may contribute to light scattering.

***Note:** Use only the provided silicone oil. This silicone oil has the same refractive index as the sample cell glass.*

5.3.2 Aids

Order no.	Description
4707600	Oiling Cloth
126936	Silicone Oil

5.3.3 Description



To coat the cell with a thin layer of oil apply a small bead of silicone oil from the top to the bottom of the cell.

Use the provided oiling cloth to spread the oil uniformly. Wipe off the excess so that only a thin coat of oil is left. The sample cell should be almost dry with little or no visible oil.

Note: *Store the oiling cloth in a plastic storage bag to keep the cloth clean.*

5.4 Calibration

Note: At http://app.hach.com/coaweb/customer_coa_request.asp are the "Certificate of Analysis" of the StablCal vials downloadable.

5.4.1 Aids

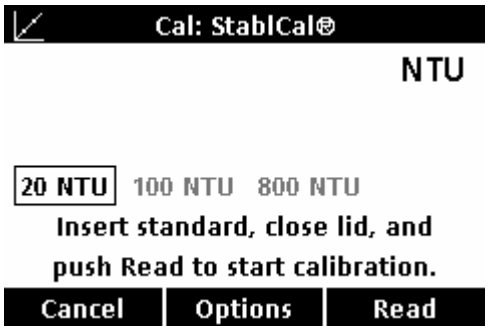
Order no.	Description
LZV803 or 1938004 or 4x LZM195	Power supply or 4 AA Alkaline batteries
2659405	StablCal Set 0.1,20,100,800 NTU sealed vials
2961701	10 NTU Verification Standard

5.4.2 Description

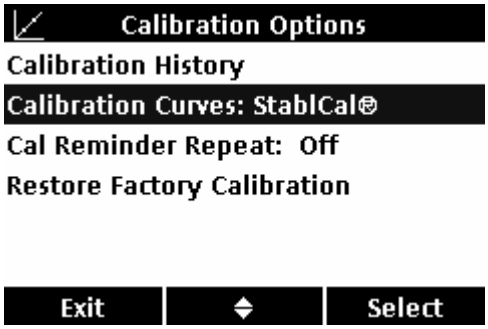
Power

1 - Push the **ON/OFF** key to turn on the meter.

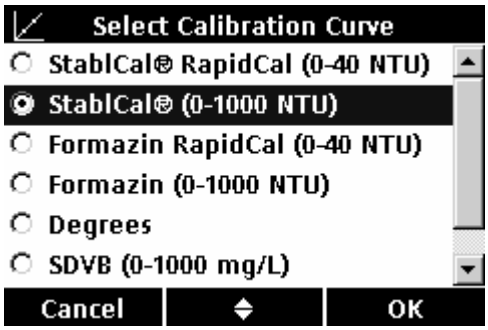
2 - Push the **Calibration** key to enter the Calibration mode.



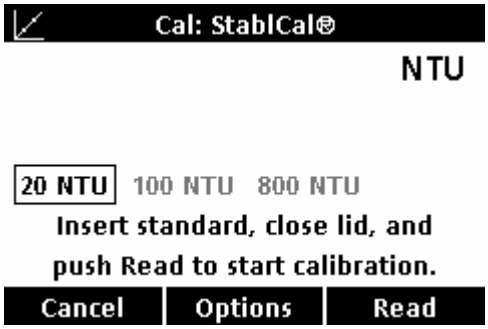
3 - Push **Options**



4 - Chose **Calibration Curves**
5 - Push **Select**



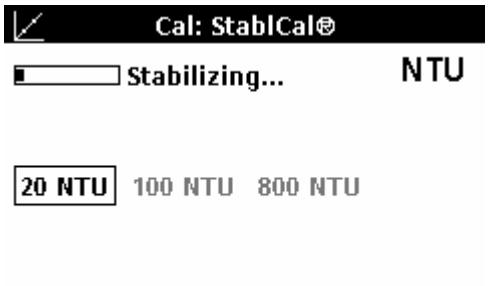
6 - Chose **StableCal®(0-1000 NTU)**
7 - Push **OK**



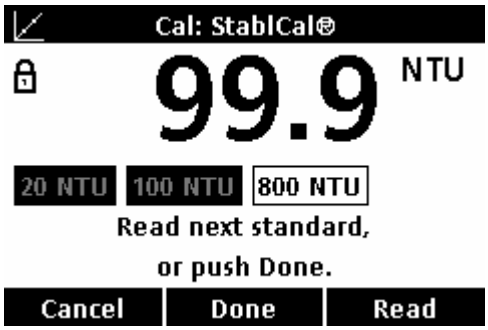
8 - Follow the instructions on the display.

Note: *Gently invert each standard before inserting.*

9 - Insert the the 20 NTU StablCal Standard and close the lid.

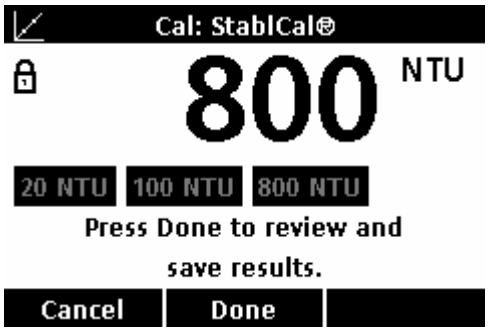


10 - Push **Read**. The display shows Stabilizing... and then displays the result.

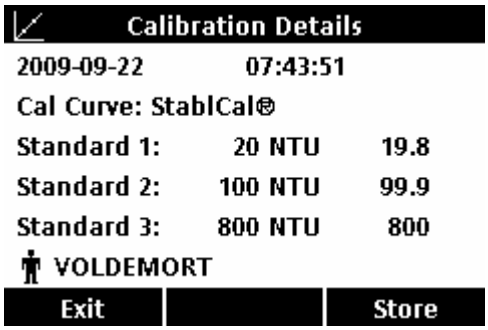


11 - Repeat Step 9 and 10 with the 100 NTU and 800 NTU StablCal Standard.

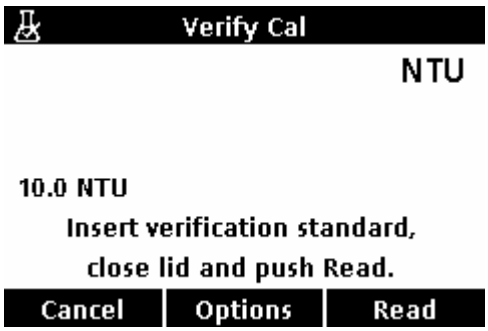
Note: *Gently invert each standard before inserting.*



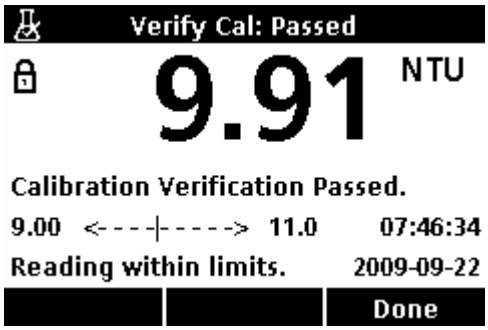
12 - Push **Done** to review the calibration details.



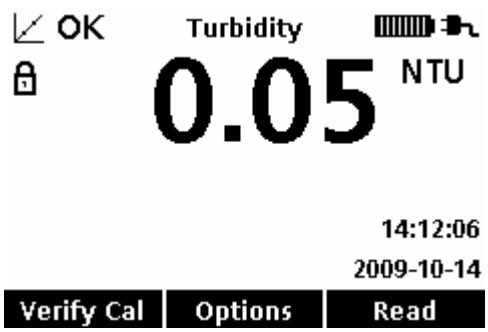
13 - Push **Store** to save the results.
14 - Upon a successful calibration, the turbidimeter automatically turns into the Verify Cal mode.



15 - Insert the 10.0 NTU verification standard and close the lid.
16 - Push **Read**. The display shows “Stabilizing...”



17 - The display shows the result and tolerance range. It should be written in the Service Inspection Protocol!
18 - Push **Done**



19 - Insert the StablCal < 0.1 NTU standart
20 - Push Read
21 - The display shows the result. It should be written in the Service Inspection Protocol!

5.5 Service Inspection (after repair)

After a component has been replaced, this service inspection must always be carried out.

Update the instrument software, if it necessary (see section 3.1.2 Instrument update).

Note: At http://app.hach.com/coaweb/customer_coa_request.asp are the “Certificate of Analysis” of the StablCal vials downloadable.

5.5.1 Aids

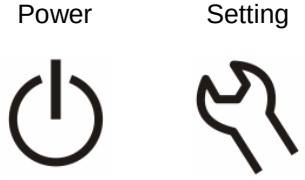
Order no.	Description
1938004 or 4x LZM195	4 AA Alkaline batteries
LZV813	USB OTG Adapter (Module #7)
2659405	StablCal Set 0.1,20,100,800 NTU sealed vials
2961701	10 NTU Verification Standard
2971401	1 NTU Gelex vial

5.5.2 Description

The following description explains the tests which have to be done during the Service Inspection of LPG439 devices. The Service Inspection is split in two parts: Hardware Check and Adjust-Calibration.

Hardware Check tests:

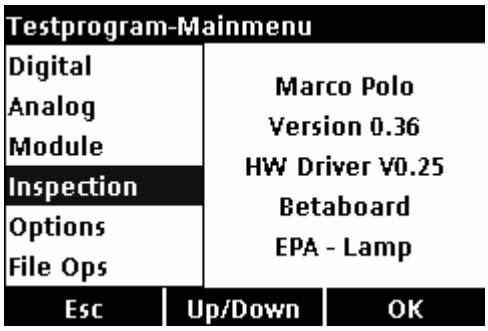
These tests will check all general hardware parts. Each test is described with ID (header to identify the test), typical value (verification parameter) and description how the test software perform the test.



Plug in the USB OTG Adapter (Module #7) with Power supply.
Install 4 alkaline or rechargeable NiMH batteries, also.

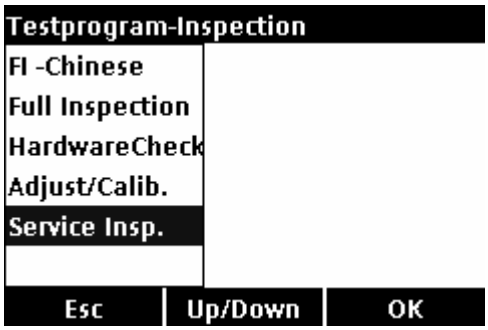
Switch on the instrument with pressing continually the “setting” button and a short press on the “power” button.

You are in the **“Testprogram-Mainmenu”,** now.



Testprogram-Mainmenu

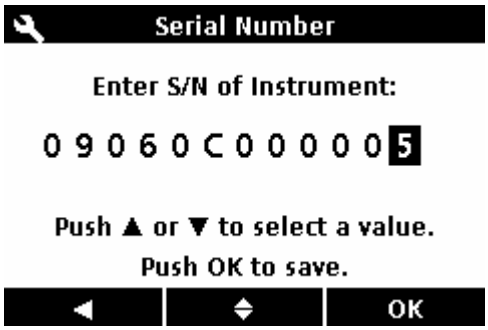
Choose the menu point “Inspection” and confirm this with “OK”.



Inspection Menu

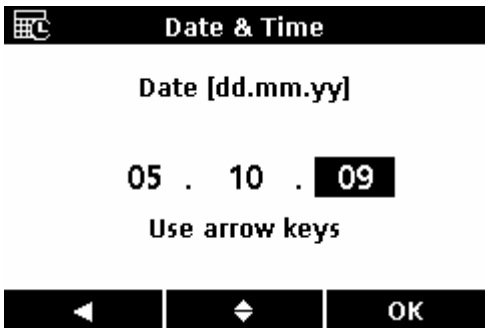
Choose the menu point “Service Insp.” and confirm this with “OK”.

Now, the service inspection routine starts!



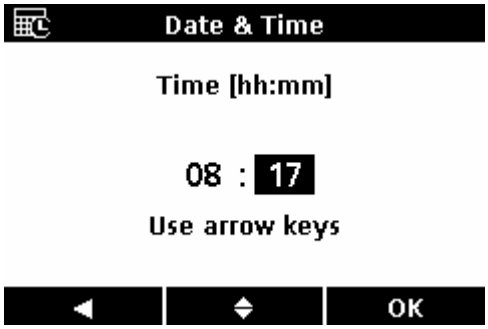
Serial Number

If it necessary, change the serial number.
Confirm the serial number with “OK”



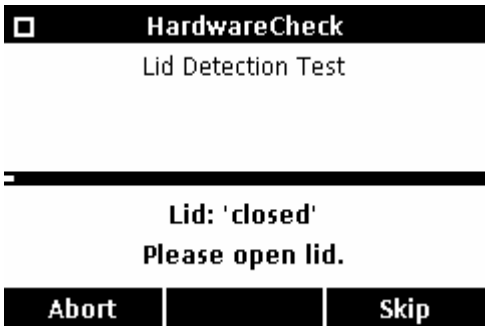
Date

Corrects the date (format dd.mm.yy), if it necessary, and confirms with “**OK**”. “**OK**” is available when the courser is by “**yy**”



Time

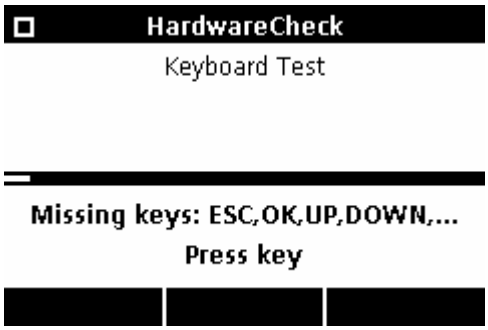
Corrects the time (format 24h hh:mm), if necessary. And confirm with “**OK**”



Lid Detection Test

Please open lid and then close lid again.

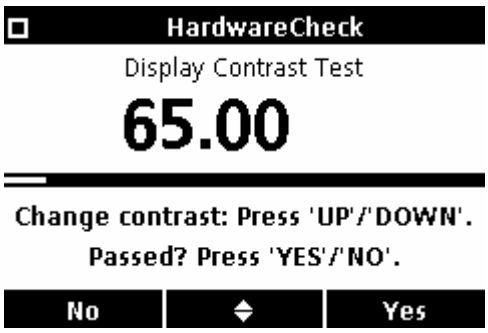
***Description**: Cover-LID will be tested by detecting the magnet onto Hall-Sensor at mainboard. Two different detection states are possible: 'closed' or 'open'*



Keyboard Test

Please press all keys once a time.

***Description:** keys will be tested by the operator. Each key has to be pressed once.*

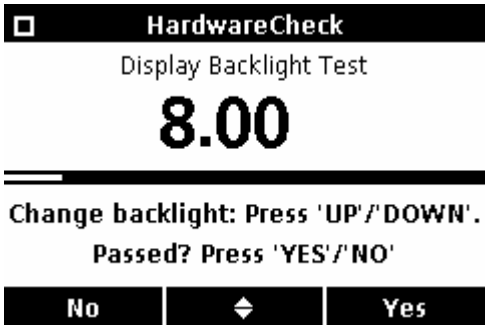


Display Contrast Test (Typical-Value: 65)

Please press the up/down button, if the contrast is change. It has to be changeable.

Please select a good contrast and then press "YES".

***Description:** LCD-Display contrast regulation will be checked by the operator. Operator adjusts best contrast by using the Up/Down pushbutton.*

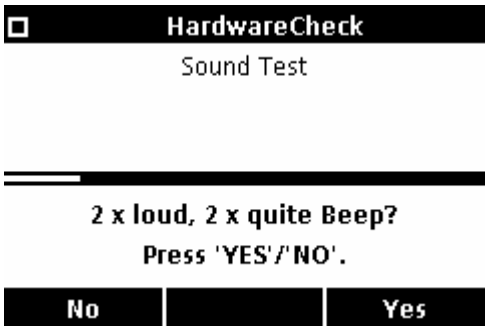


Display Backlight Test (Typical-Value: 8)

Please press the up/down button, if the backlight is change. It has to be changeable.

Please select a good backlight illumination and then press "**YES**".

***Description:** LCD-Backlight will be checked by the operator. Operator checks if the Backlight can be set Bright/Dark by using the Up/Down pushbutton.*

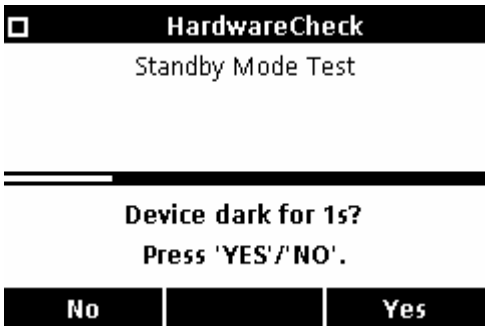


Sound Test

If you heard 2x loud and 2x quite beeps, please press button **YES**.

If you heard no beeps please press **NO**.

Description: *Speaker will be checked by the operator. Operator has to listen to the Beep-Signal from instrument with two different loudness (volume 100% and volume 40%) values.*

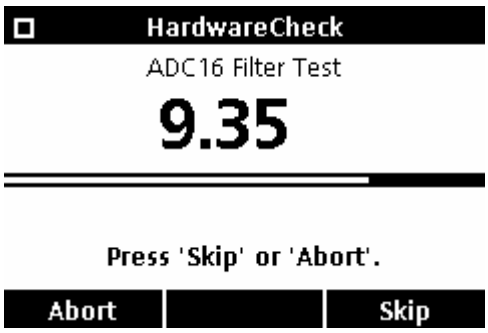


Standby Mode Test

If the backlight of the device was for 1 s dark, please press button **YES**.

If the backlight was not switched off for 1 s, please press **NO**.

Description: *StandBy-mode of instrument will be checked by operator. Operator has to check if backlight is switched 'OFF' for 1 second. This Stand-by-Mode is used to save power consumption.*



Automatically Test

RTC-, Flash-, Modul-Connect-, ADC10-.ADC16- and RTC-Alarm-Test.

These tests will checked automatically and only if there is a failure the inspection will stopped and an error message will be show in the display.

Descriptions:

RAM:
RAM will be tested by executing write/read test on several addresses at SRAM on mainboard. Checksum will be calculated.

Flash:
Flash will be tested by executing write/read test on several addresses at Flash-IC on mainboard. Checksum will be calculated.

ModulConnect:
Connection to module port will be tested by sending an identification command to module via serial interface. Used port is P8 at mainboard connected to module board with contact board (XMF802).

Temperature_C: *(Typical-Value 23)*
Temperature sensor on mainboard will be tested by reading the voltage set by NTC and calculate the temperature.

BattPowerNoLoad_V: *(Typical-Value 6)*
Battery power supply will be tested by reading voltage at battery input port on mainboard (P6/P7).
Remark: *Take care that battery contacts will establish reliable connection to mainboard.*

BattPowerLocalLoad_V*:* *(Typical-Value 0.16)*
Battery power supply will be tested by reading voltage at battery input port on mainboard (P6/P7). The battery port will be loaded with 600mA current by the local load resistor placed of the mainboard.
Remark: *Take care that battery contacts will establish reliable connection to mainboard.*

BattPowerModulLoad_V: *(Typical-Value 0.13)*
Battery power supply will be tested by reading voltage at battery input port on mainboard (P6/P7). The mainboard sends command via serial port to

module to load battery. The battery port will be loaded with 300mA current by the external load resistor placed at the module board via port (P6) to module board.

> ***Remark:*** *Take care that battery contacts will establish reliable connection to mainboard. Take care that contact board is connected to LZV813 and mainboard*

ExternalPower_V: *(Typical-Value 9)*
External power supply will be tested by reading the voltage at external power port connected to LZV813 (P8).

AnalogPowerOffPos_V: *(Typical-Value 0)*
Analog power supply (5V DC/DC regulator) will be tested by reading the voltage at DC/DC-Regulator output. -> Power 'OFF' Value

AnalogPowerOffNeg_V: *(Typical-Value 0)*
Analog power supply (-0.7V linear regulator) will be tested by reading the voltage at linear regulator output. ->Power 'OFF' Value

AnalogPowerOnPos_V: *(Typical-Value 5)*
Analog power supply (5V DC/DC regulator) will be tested by reading the voltage at DC/DC-Regulator output. ->Power 'ON' Value

AnalogPowerOnNeg_V: *(Typical-Value -0.65)*
Analog power supply (-0.7V linear regulator) will be tested by reading the voltage at linear regulator output. ->Power 'ON' Value

LampOff180Deg_V: *(Typical-Value 0)*
180 degree detector value will be tested by reading the output voltage of preamplifier. ->Lamp 'OFF' value is tested for checking if no straylight is occurred.

LampOff90DegPoti0_V: *(Typical-Value 0)*
90 degree detector value will be tested by reading the output voltage of preamplifier. ->Lamp 'OFF' value is tested for checking if no straylight is occurred.

LampOn180Deg_V: *(Typical-Value 2.45)*
180 degree detector value will be tested by setting a lamp beam to detector and reading the output voltage of preamplifier. -> Lamp 'ON' value

LampOn90DegPoti0_V: *(Typical-Value 0.13)*
90 degree detector value will be tested by setting a straylight lamp beam to detector and reading the output voltage of preamplifier. -> Lamp 'ON' value with maximum gain (Potentiometer is set to '0').

LampOn90DegFilterPoti0_V: *(Typical-Value 1.3)*
90 degree detector value for very low signal will be tested by setting a lamp beam to detector and reading the output voltage of active filter amplifier (10 times higher than the output voltage of preamplifier). -> Lamp 'ON' value with maximum gain (Potentiometer is set to '0').

LampOn90DegPoti99_V: *(Typical-Value 0.001)*
90 degree detector value will be tested by setting a lamp beam to detector and reading the output voltage of preamplifier. -> Lamp 'ON' value with minimum gain (Potentiometer is set to '99').

LampOnOffDiff_V: *(Typical-Value 2.6)*
Lamp *will be tested by* ***calculated*** *difference value between* ***LampOn-Value*** *and* ***LampOFF-Value****. Channel* ***180 degree*** *has 1st rank. Channel* ***90 degree*** *has 2nd rank. The calculated difference value shall identify that Lamp/IrLED has been switched ON/OFF.*

180DegOnOffDiff_V: *(Typical-Value 2.6)*
180 degree detector *will be tested by* ***calculated*** *difference value between LampOn-Value and LampOFF-Value. The calculated difference value shall identify that 180 degree detector has been plugged to the mainboard.*

90DegOnOffDiff_V: *(Typical-Value 0.13)*
90 degree detector *will be tested by* ***calculated*** *difference value between LampOn-Value and LampOFF-Value. The calculated difference value shall identify that 90 degree detector has been plugged to the mainboard.*

90DegPoti0Poti99Diff_V: *(Typical-Value 0.13)*
Calculated *difference value 90 degree-detector for* ***minimum gain***

(potentiometer set to 99) *and* ***maximum gain (potentiometer set to 0)****. The calculated difference value shall identify that the electronic potentiometer for 90 degree detector was able to set to minimum and maximum.*

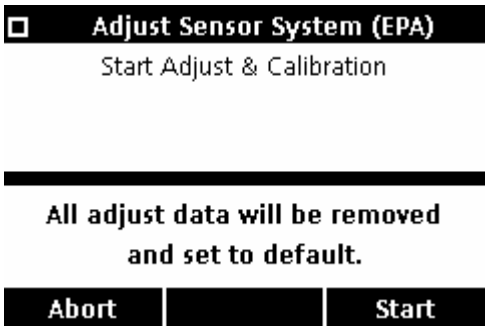
90DegFilterVoltQuot: *(Typical-Value 10)*
Calculated *quotient between* ***90 degree-preamplifier*** *value and* ***90 degree active filter amplifier*** *value. The quotient value shall identify that the 2nd-stage active filter amplifier for 90 degree detector has correct gain.*

RtcTimer:
RTC timer at mainboard has been set in the beginning of Hardware-Check. Now it will be checked if the timer is showing an ongoing time step. Check is with the following Date/Time: '02-06-2009 11:30:00' plus the process time of Hardware-Check. (at least < 1 second)

RtcAlarm:
RTC alarm timer at mainboard is been set to current time plus 2 seconds. It will be checked if the alarm interrupt has been occurred after 2 seconds.

Adjust-Calibration tests:

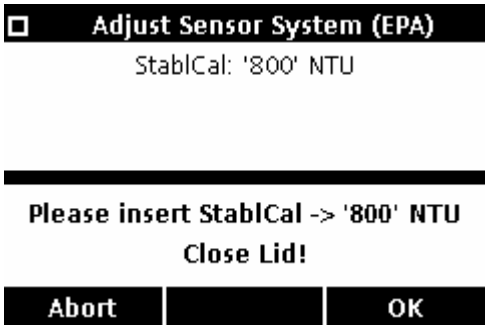
These tests will adjust and calibrate the analog system (beam path, detector, preamplifier, analog digital converter…) of the LPG439 instrument. . Each test is described with ID (header to identify the test), typical value (verification parameter) and description how the test software perform the test.



Adjust Sensor System (EPA) /(ISO)

Press "**Start**" to continues with the Adjust & Calibration routine

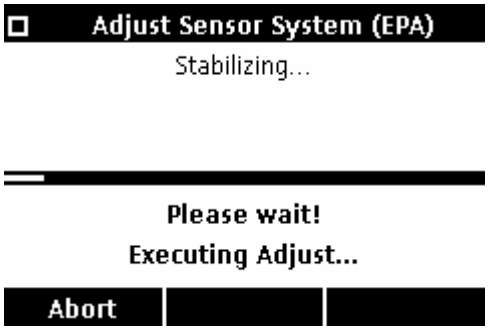
800 NTU StablCal vial



Adjust Sensor System (EPA) /(ISO)

Please move the vial '800 NTU' and then insert the vial '800 NTU' in the right direction and close the lid.

By closing the lid, the Adjust starts automatically.



Adjust Sensor System (EPA) /(ISO)

Please wait, don't open the lid!

Descriptions:

800NtuAdjPotiL090Deg_V *(Typical-Value 2.5)*
Potentiometer adjustment for 90 degree preamplifier gain (level 0): Potentiometer will be set step by step to higher gain until the measured value at 90 degree preamplifier shows the required value. -> Adjusted voltage value for Level 0. / Adjust vial 800NTU StablCal

800NtuAdjPotiL0 *(Typical-Value 60)*
Potentiometer adjustment for 90 degree preamplifier gain (level 0): -> Adjusted potentiometer value for Level 0. (0…99)

800NtuDarkL0180Deg_mV *(Typical-Value 0.0)*
Dark reading for 180 degree detector. Dark reading value is been measured with Lamp switched 'OFF' and includes straylight of beam path; electrical

noise of detector and electrical offset of preamplifier. The dark value will be stored as part of calibration values.

800NtuDarkL090Deg_mV *(Typical-Value 0.0)*
Dark reading for 90 degree detector, gain setting for Level 0. Dark reading value is been measured with Lamp switched 'OFF' and includes straylight of beam path; electrical noise of detector and electrical offset of preamplifier. The dark value will be stored as part of calibration values.

800NtuCal180Deg_V *(Typical-Value 0.240)*
Reading for 800 NTU test vial at 180 degree detector. Represents the light beam intensity at 180 degree detector for high turbidity values.

Remark: *This value is not adjusted and will be influenced by components like Lamp/IrLED; blue filter; neutral filter, detector sensitivity and the beam path in general.*

800NtuCal90Deg_V *(Typical-Value 2.5)*
Reading for 800 NTU test vial at 90 degree detector preamplifier. Represents the light beam intensity at 90 degree detector for high turbidity values. This value is been adjusted with potentiometer gain.

Remark: *This value will be influenced by components like Lamp/IrLED, blue filter, detector sensitivity and the beam path in general.*

800NtuCalRatio *(Typical-Value 450 (Lamp))*
(Typical-Value 275 (IR-LED))
Calculated *ratio of 180 degree detector value and 90 degree detector value for 800 NTU test vial. Represents the calculated ratio of light beam intensity at 90 degree detector and 180 degree detector.*

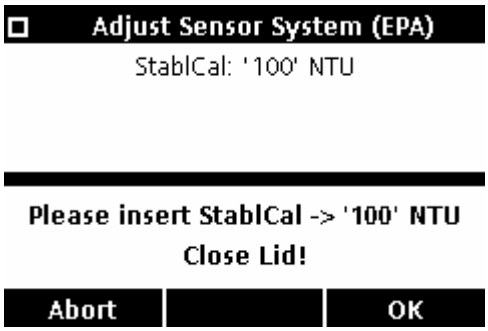
Remark: *This value will be influenced by components like Lamp/IrLED, blue filter, neutral filter, detector sensitivity and the beam path in general.*

800NtuCalTurb_NTU *(Typical-Value 800)*
Calculated *turbidity of current ratio reading. Turbidity is calculated using the default coefficients and can be different for each instrument.*

800NtuCalTurbMinMaxRange_NTU *(Typical-Value 3)*
Calculated *difference between maximum value and minimum value of 12 single turbidity readings. Represents the stability of 800 NTU StablCal vial and instrument reading.*

Remark: *This parameter is highly influenced by the performance of shaking the StablCal vial.*

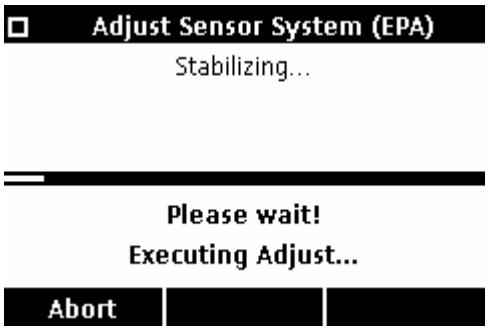
100 NTU StablCal vial



Adjust Sensor System (EPA) /(ISO)

Please move the vial '100 NTU' and then insert the vial '100 NTU' in the right direction and close the lid.

By closing the lid, the Adjust starts automatically



Adjust Sensor System (EPA) /(ISO)

Please wait, don't open the lid!

Descriptions:

100NtuCal180Deg_V *Typical-Value 1.750*
Reading for 100 NTU test vial at 180 degree detector. Represents the light beam intensity at 180 degree detector for medium turbidity values.
Remark: *This value is not adjusted and will be influenced by components like Lamp/IrLED; blue filter; neutral filter, detector sensitivity and the beam path in general.*

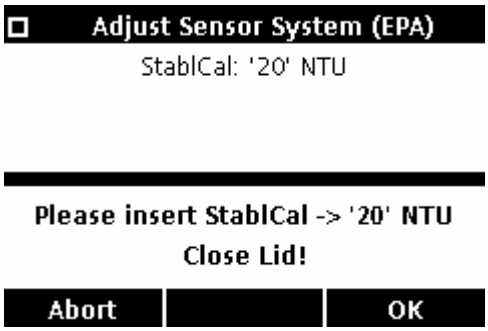
100NtuCal90Deg_V *Typical-Value 0.42*
Reading for 100 NTU test vial at 90 degree detector preamplifier. Represents the light beam intensity at 90 degree detector for medium turbidity values.
Remark: *This value will be influenced by components like Lamp/IrLED; blue filter, detector sensitivity and the beam path in general.*

100NtuCalRatio *Typical-Value 10.5 (Lamp)*
Typical-Value 6.6 (IR-LED)
Calculated *ratio of 180 degree detector value and 90 degree detector value for 100 NTU test vial. Represents calculated ratio of light beam intensity at 90 degree detector and 180 degree detector.*
Remark: *This value will be influenced by components like Lamp/IrLED; blue filter; neutral filter, detector sensitivity and the beam path in general.*

100NtuCalTurb_NTU *Typical-Value 100*
Calculated *turbidity of current ratio reading. Turbidity is calculated using the default coefficients and can be different for each instrument.*

100NtuCalTurbMinMaxRange_NTU *Typical-Value 0.26*
Calculated *difference between maximum value and minimum value of 12 single turbidity readings. Represents the stability of 100 NTU StablCal vial and instrument reading.*
Remark: *This parameter is highly influenced by the performance of shaking the StablCal vial.*

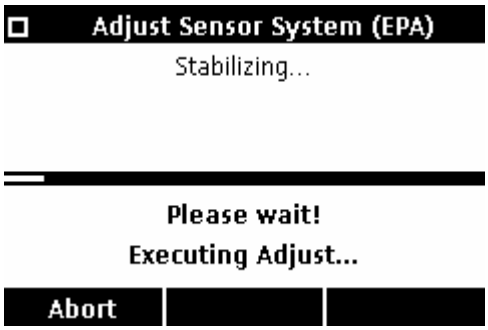
20 NTU StablCal vial



Adjust Sensor System (EPA) /(ISO)

Please move the vial '20 NTU' and then insert the vial '20 NTU' in the right direction and close the lid.

By closing the lid, the Adjust starts automatically



Adjust Sensor System (EPA) /(ISO)

Please wait, don't open the lid!

Descriptions:

20NtuAdjPotiL190Deg_V *(Typical-Value 1.5)*
Potentiometer adjustment for 90 degree preamplifier gain (level 1): Potentiometer will be set step by step to higher gain until the measured value at 90 degree preamplifier shows the required value. -> Adjusted voltage value for Level 1. / Adjust vial 20 NTU StablCal

20NtuAdjPotiL1 *(Typical-Value 3)*
Potentiometer adjustment for 90 degree preamplifier gain (level 1): -> Adjusted potentiometer value for Level 1. (0…99)

20NtuAdjMinVoltL090Deg_V *(Typical-Value 0.092)*
Reading the threshold voltage (minimum value) for 90 degree detector in Level-0 mode. This adjusted threshold voltage is been stored in instrument hardware adjust file.

> ***Remark:*** *The threshold voltage is needed to select best gain value for the 90 degree detector (automatic mode). If the reading voltage of 90 degree detector (set to Level 0 gain) is below this threshold voltage then the analog system switch to Level 1 gain.*

Factor-Adjust (Level 0 to Level 1).
The adjustment is needed for linear consistency during the switch from level 0 to level 1 gain. Adjust is been executed by performing 14 average readings (each with calculated ratio from 90 degree detector value and 180 degree detector value) for both gain level and calculating the correction factor.

The following IDs represent the values of both detector readings for low gain (level 0) and higher gain (level 1).

20NtuAdjL1Low180Deg_V *(Typical-Value 2.2)*
Factor Adjust (90 degree detector preamplifier) Level 0 to Level 1: Value of 180 Degree detector as reference for low gain measurement (level 0). Reading is been calculated by 14 times average read.

20NtuAdjL1Low90Deg_V *(Typical-Value 0.083)*
Factor Adjust (90 degree detector preamplifier) Level 0 to Level 1: Value of 90 degree detector with low gain measurement (level 0). Reading is been calculated by 14 times average read.

20NtuAdjL1High180Deg_V *(Typical-Value 2.2)*
Factor Adjust (90 degree detector preamplifier) Level 0 to Level 1: Value of 180 degree detector as reference for higher gain measurement (level 1). Reading is been calculated by 14 times average read.

20NtuAdjL1High90Deg_V *(Typical-Value 1.74)*
Factor Adjust (90 degree detector preamplifier) Level 0 to Level 1: Value of 90 degree detector with higher gain (level 1). Reading is been calculated by 14 times average read.

20NtuAdjL1Factor *(Typical-Value 1.0)*
Factor Adjust (90 degree detector preamplifier) Level 0 to Level 1: The

*correction factor value will be **calculated** with average values of **low gain (level 0) RATIO** values and **higher gain (level 1) RATIO** values. The correction factor is based to level 0 ratio values. Factor will be stored in hardware adjust file.*

20NtuAdjL1Offset_V *(Typical-Value 0.0)*
Factor Adjust (90 degree detector preamplifier) Level 0 to Level 1: Offset is set to Zero (0.000)

20NtuDarkL190Deg_mV *(Typical-Value 0.0)*
Dark reading for 90 degree detector, gain setting for Level 1. Dark reading value is been measured with Lamp switched 'OFF' and includes straylight of beam path; electrical noise of detector and electrical offset of preamplifier. The dark value will be stored as part of calibration values.

20NtuCal180Deg_V *(Typical-Value 2.3)*
*Reading for 20 NTU test vial at 180 degree detector. Represents the light beam intensity at 180 degree detector for low turbidity values. **Remark:** This value is not adjusted and will be influenced by components like Lamp/IrLED; blue filter; neutral filter, detector sensitivity and the beam path in general.*

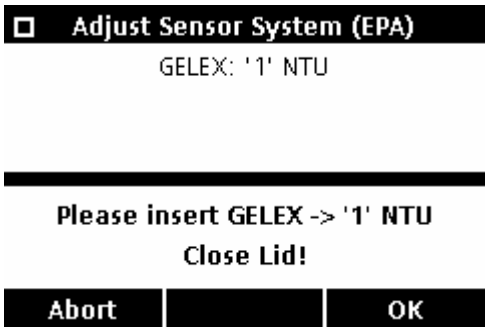
20NtuCal90Deg_V *(Typical-Value 1.75)*
*Reading for 20 NTU test vial at 90 degree detector preamplifier. Represents the light beam intensity at 90 degree detector for low turbidity values. This value is been adjusted with potentiometer gain. **Remark:** This value will be influenced by components like Lamp/IrLED; blue filter; detector sensitivity and the beam path in general.*

20NtuCalRatio *Typical-Value 1.6 (Lamp) / Typical-Value 1.06 (IR-LED)*
***Calculated** ratio of 180 degree detector value and 90 degree detector value for 20 NTU test vial. Represents calculated ratio of light beam intensity at 90 degree detector and 180 degree detector.*
***Remark:** This value will be influenced by components like Lamp/IrLED; blue filter; neutral filter, detector sensitivity and the beam path in general.*

20NtuCalTurb_NTU *(Typical-Value 20)*
***Calculated** turbidity of current ratio reading. Turbidity is calculated using the default coefficients and can be different for each instrument.*

20NtuCalTurbMinMaxRange_NTU *(Typical-Value 0.15)*
***Calculated** difference between maximum value and minimum value of 12 single turbidity readings. Represents the stability of 20 NTU StablCal vial and instrument reading.*
***Remark:** This parameter is highly influenced by the performance of shaking the StablCal vial.*

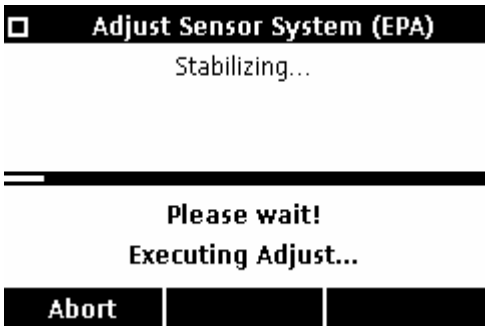
1 NTU GELEX vial



Adjust Sensor System (EPA) /(ISO)

Please insert the Gelex vial '1 NTU' in the right direction and close the lid.

By closing the lid, the Adjust starts automatically



Adjust Sensor System (EPA) /(ISO)

Please wait, don't open the lid!

Descriptions:

1NtuAdjPotiL290Deg_V *Typical-Value 1.5*
Potentiometer adjustment for 90 degree preamplifier gain (level 2): Potentiometer will be set step by step to higher gain until the measured value at 90 degree preamplifier shows the required value. -> Adjusted voltage value for Level 2. / Adjust vial 1 NTU GELEX.

1NtuAdjPotiL2 *Typical-Value 1*
Potentiometer adjustment for 90 degree preamplifier gain (level 2): -> Adjusted potentiometer value for Level 2. (0…99)

1NtuAdjMinVoltL190Deg_V *Typical-Value 0.135*
Reading the threshold voltage (minimum value) for 90 degree detector in Level-1 mode. This adjusted threshold voltage is been stored in instrument hardware adjust file.

> ***Remark:*** *The threshold voltage is needed to select best gain value for the 90 degree detector (automatic mode). If the reading voltage of 90 degree detector (set to Level 1 gain) is below this threshold voltage then the analog system switch to Level 2 gain and the reading channel is active filter amplifier.*

Start of Factor-Adjust (Level 1 to Level 2).
The adjustment is needed for linear consistency during the switch from level 1 to level 2 gain. This adjustment is performed in two stages: linear regression stage and ratio correction stage.

*First stage adjust (linear regression) is been executed by performing a two point linear regression measurement (x1,y1 vs. x2,y2). Used channel is **90 degree detector only**. 1st reading (7 times average reading with high gain) 90 degree preamplifier and 90 degree active filter amplifier (x1,y1). 2nd reading (7 times average reading with lower gain) 90 degree preamplifier and 90 degree active filter amplifier (x2,y2). Than calculating the factor and offset by using linear regression formula: Factor = (y1 - y2) / (x1 - x2); Offset = (x2*y1 - x1*y2)/(y1-y2). Cause of calculating the correction factor only with 90 degree detector values, there is no drift correction yet. So it is needed to perform second stage adjustment…*

*Second stage adjust (ratio correction) is been executed by performing 7 average readings (each with calculated **ratio** from 90 degree detector value and 180 degree detector value) for both gain level and calculating the correction factor.*

The following IDs represent the value of both detector readings for lower gain (level 1) and high gain (level 2).
-> First stage adjust

1NtuAdjL2High90Deg_V *Typical-Value 0.190*
Factor Adjust (90 degree detector preamplifier and active filter amplifier) Level 1 to Level 2: High value reading for 90 degree detector preamplifier. Reading is been executed by 7 times average read. ***-> x1***

1NtuAdjL2High90DegFilter_V *Typical-Value 1.88*
Factor Adjust (90 degree detector preamplifier and active filter amplifier) Level 1 to Level 2: High value reading for 90 degree detector active filter amplifier. Reading is been executed by 7 times average read. ***-> y1***

1NtuAdjL2Low90Deg_V *Typical-Value 0.075*
Factor Adjust (90 degree detector preamplifier and active filter amplifier) Level 1 to Level 2: Low value reading for 90 degree detector preamplifier. Reading is been executed by 7 times average read. ***-> x2***

1NtuAdjL2Low90DegFilter_V *Typical-Value 0.760*
Factor Adjust (90 degree detector preamplifier and active filter amplifier) Level 1 to Level 2: Low value reading for 90 degree detector active filter amplifier. Reading is been executed by 7 times average read. ***-> y2***

The following IDs represent the value of both turbidity (ratio) readings for lower gain (level 1) and high gain (level 2).
-> Second stage adjust

1NtuAdjL2TurbL1_NTU *Typical-Value 1.0*
Factor Adjust (90 degree detector preamplifier and active filter amplifier) Level 1 to Level 2: Turbidity (Ratio) reading for Level 1. Reading is been executed by 7 times average read.

1NtuAdjL2TurbL2_NTU *Typical-Value 1.0*
Factor Adjust (90 degree detector preamplifier and active filter amplifier) Level 1 to Level 2: Turbidity (Ratio) reading for Level 2. Reading is been executed by 7 times average read.

1NtuAdjL2TurbFactor *Typical-Value 1.0*
Factor Adjust (90 degree detector preamplifier and active filter amplifier) Level 1 to Level 2: Turbidity (Ratio) correction factor value will be ***calculated*** *with the two values of Turbidity reading. This correction factor is needed because of the missing drift correction during 1st stage factor adjustment.*

1NtuAdjL2Factor *Typical-Value 0.1*
Factor Adjust (90 degree detector preamplifier and active filter amplifier) Level 1 to Level 2: Factor value will be ***calculated*** *with low and high value of 90 degree detector preamplifier and active filter amplifier reading and corrected by the two values of turbidity reading (turbidity factor). Level 2 adjust factor will be stored in hardware adjust file.*

1NtuAdjL2Offset_V *Typical-Value 0.000*
Factor Adjust (90 degree detector preamplifier and active filter amplifier) Level 1 to Level 2: Offset value will be ***calculated*** *with low and high value of 90 degree detector preamplifier and active filter amplifier reading. Level 2 adjust offset will be stored in hardware adjust file.*

-> End of Factor-Adjust (Level 1 to Level 2).

1NtuDarkL290Deg_mV *Typical-Value 0.0*
Dark reading for 90 degree detector, gain setting for Level 2. Dark reading value is been measured with Lamp switched 'OFF' and includes straylight of beam path; electrical noise of detector; electrical offset of preamplifier and electrical offset of active filter amplifier. The dark value will be stored as part of calibration values.

1NtuRead180Deg_V *Typical-Value 2.9*
Reading for 1 NTU test vial at 180 degree detector. Represents the light beam intensity at 180 degree detector for very low turbidity values.
> ***Remark:*** *This value is not adjusted and will be changed by components like Lamp/IrLED; blue filter; neutral filter, detector sensitivity and the beam path in general.*

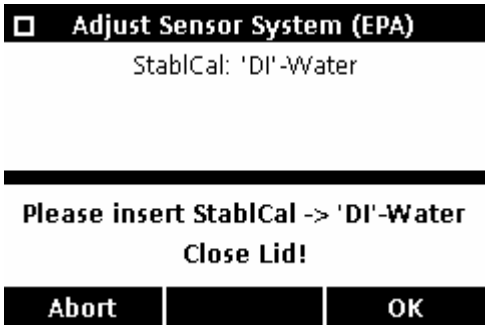
1NtuRead90Deg_V *Typical-Value 1.9*
Reading for 1 NTU test vial at 90 degree detector active filter amplifier. Represents the light beam intensity at 90 degree detector for very low turbidity values.
> ***Remark:*** *This value is been adjusted with potentiometer gain and will be influenced by components like Lamp/IrLED; blue filter; neutral filter, detector sensitivity and the beam path in general.*

1NtuReadRatio *Typical-Value 0.084 (Lamp) / Typical-Value 0.054 (IR-LED)*
Calculated *ratio of 180 degree detector value and 90 degree detector value for 1 NTU test vial. Represents calculated ratio of light beam intensity at 90 degree detector and 180 degree detector.*
> ***Remark:*** *This value will be influenced by components like Lamp/IrLED; blue filter; neutral filter, detector sensitivity and the beam path in general.*

1NtuReadTurb_NTU *Typical-Value 1.14*
Calculated *turbidity of current ratio reading. Turbidity is calculated using the factory calibrated coefficients and shall be read regarding nominal value.*
> ***Remark:*** *Keep in mind that GELEX vial shows different turbidity values for different instruments.*

1NtuReadTurbMinMaxRange_NTU *Typical-Value 0.003*
Calculated *difference between maximum value and minimum value of 12 single turbidity readings. Represents the stability of instrument reading.*

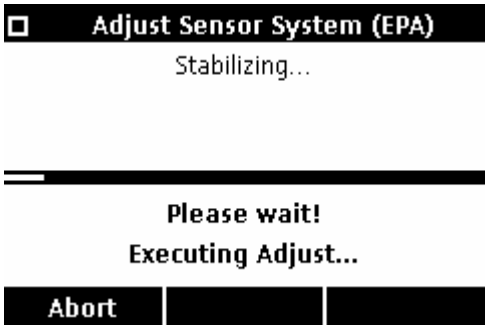
< 0.1 NTU StablCal vial / Dilution-Water vial



Adjust Sensor System (EPA) /(ISO)

Please insert the vial 'DI water' or "StablCal: <0.1 NTU", it's the same, in the right direction and close the lid.

CAUTION: Don't move the vial!



Adjust Sensor System (EPA) /(ISO)

Please wait, don't open the lid!

The value for the "StablCal: <0.1 NTU" is displayed, now. It should be written in the Service Inspection Protocol!

Descriptions:

WaterNtuRead180Deg_V *Typical-Value 2.36*
Reading for Dilution Water 'DI' vial at 180 degree detector. Represents the light beam intensity at 180 degree detector for very low turbidity values.
Remark: *This value is not adjusted and will be influenced by components like Lamp/IrLED; blue filter; neutral filter, detector sensitivity and the beam path in general.*

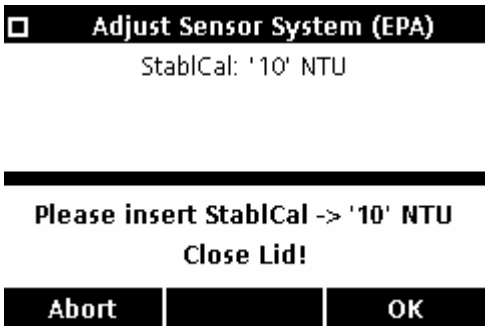
WaterNtuRead90Deg_V *Typical-Value 0.041*
Reading for Dilution Water 'DI' test vial at 90 degree detector active filter amplifier. Represents the light beam intensity at 90 degree detector for very low turbidity values.
Remark: *This value will be influenced by components like Lamp/IrLED; blue filter; detector sensitivity and the beam path in general.*

WaterNtuReadRatio *Typical-Value 0.002*
(Lamp) / 0.002 (IR-LED)
Calculated *ratio of 180 degree detector value and 90 degree detector value for Dilution Water 'DI' test vial. Represents calculated ratio of light beam intensity at 90 degree detector and 180 degree detector.*
Remark: *This value will be influenced by components like Lamp/IrLED; blue filter; neutral filter, detector sensitivity and the beam path in general.*

WaterNtuReadTurb_NTU *Typical-Value 0.030*
Calculated *turbidity of current ratio reading. Turbidity is calculated using the factory calibrated coefficients and shall be read regarding nominal value.*
Remark: *Please note that the 'DI' StablCal vial shall not be shaken before any reading!*

WaterNtuReadTurbMinMaxRange_NTU *Typical-Value 0.002*
Calculated *difference between maximum value and minimum value of 12 single turbidity readings. Represents the stability of Dilution Water 'DI' StablCal vial and instrument reading.*
Remark: *Please note that the 'DI' StablCal vial shall not be shaken before any reading!*

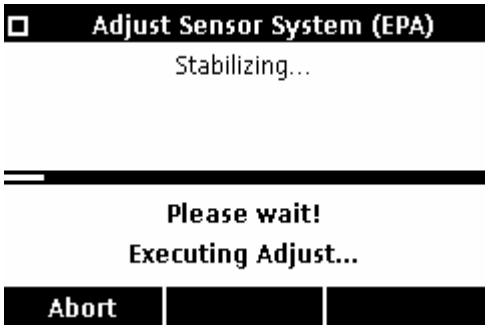
10 NTU StablCal vial



Adjust Sensor System (EPA) /(ISO)

Please move the vial '10 NTU' and then insert the vial '10 NTU' in the right direction and close the lid.

By closing the lid, the Adjust starts automatically



Adjust Sensor System (EPA) /(ISO)

Please wait, don't open the lid!

The value for the "10 NTU StablCal" is displayed, now. It should be written in the Service Inspection Protocol!

Descriptions:

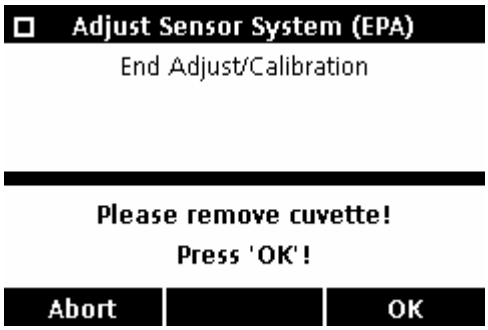
10NtuRead180Deg_V *Typical-Value 2.3*
Reading for 10 NTU test vial at 180 degree detector. Represents the light beam intensity at 180 degree detector for low turbidity values.
Remark: *This value is not adjusted and will be changed by components like Lamp/IrLED; blue filter; neutral filter, detector sensitivity and the beam path in general.*

10NtuRead90Deg_V *Typical-Value 0.88*
Reading for 10 NTU test vial at 90 degree detector preamplifier. Represents the light beam intensity at 90 degree detector for low turbidity values.
Remark: *This value will be influenced by components like Lamp/IrLED; blue filter; detector sensitivity and the beam path in general.*

10NtuReadRatio *Typical-Value 0.77 (Lamp) / Typical-Value 0.53 (IR-LED)*
Calculated *ratio of 180 degree detector value and 90 degree detector value for 10 NTU test vial. Represents calculated ratio of light beam intensity at 90 degree detector and 180 degree detector.*
Remark: *This value will be influenced by components like Lamp/IrLED; blue filter; neutral filter, detector sensitivity and the beam path in general.*

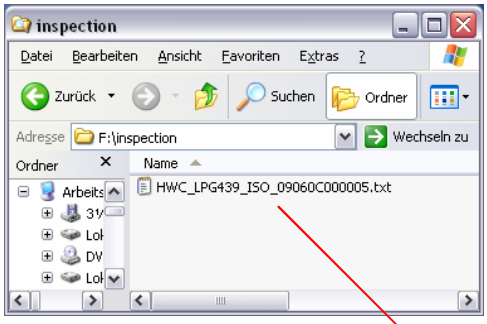
10NtuReadTurb_NTU *Typical-Value 10*
Calculated *turbidity of current ratio reading. Turbidity is calculated using the factory calibrated coefficients and shall be read regarding nominal value.*
Remark: *This parameter is highly influenced by the performance of shaking the StablCal vial.*

10NtuReadTurbMinMaxRange_NTU *Typical-Value 0.448*
Calculated *difference between maximum value and minimum value of 12 single turbidity readings. Represents the stability of 10 NTU StablCal vial and instrument reading.*
Remark: *This parameter is highly influenced by the performance of shaking the StablCal vial.*



Adjust Sensor System (EPA) /(ISO)

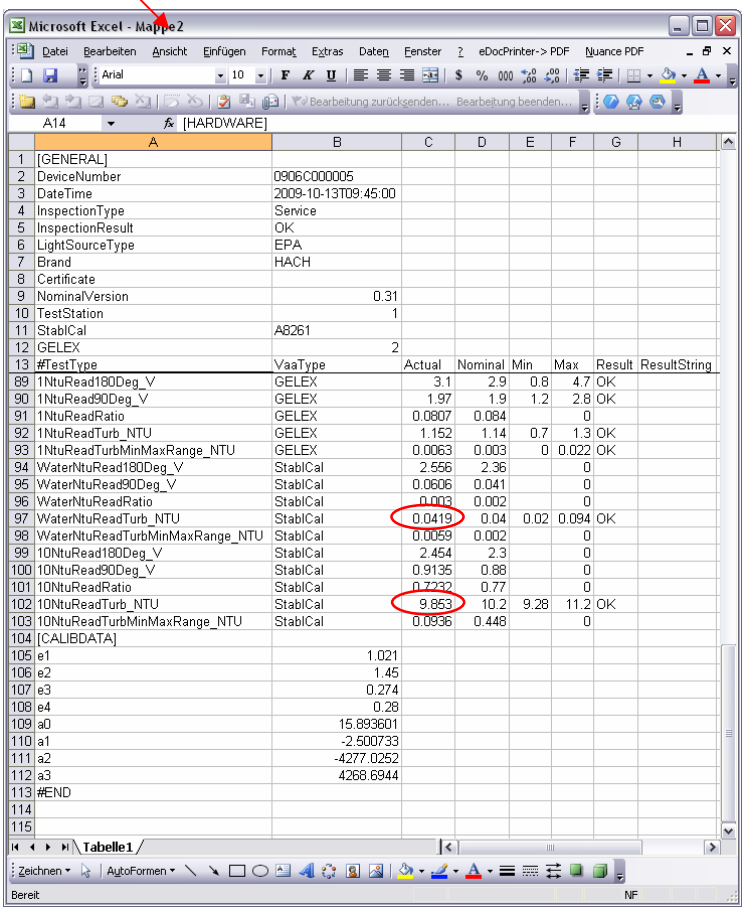
The inspection is finished, please press "**OK**".



Evaluation

Connect the USB OTG Adapter (Module #7) with a PC. On the Module would created a folder "inspection" with the result in a *.txt file. It can be opening with MS Excel, for example, and it including the both values for the Service Inspection Protocol.

Note: *Within the filename is the S/N of the checked device. At a second inspection of the same device the file will be replaced*.

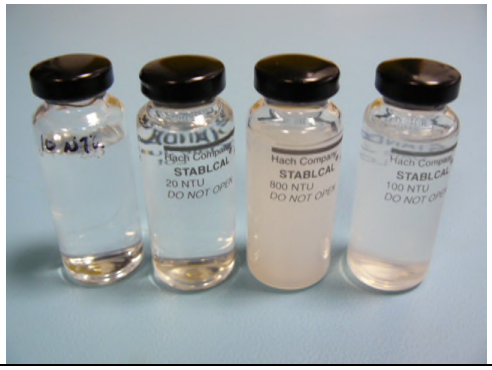


6 Spare parts

6.1 Overview and assignment

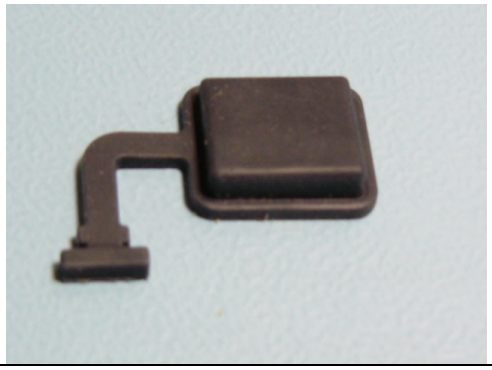
Order no.	LPG439.01.00002 2100Q	LPG439.01.00012 2100Q is	Description
2961701	X	X	10 NTU Verification Standard
2684801	X	X	StablCal 20 NTU Standard
2684901	X	X	StablCal 100 NTU Standard
2660501	X	X	StablCal 800 NTU Standard
2971205	X	X	StablCal ampule calibration kit, 2100Q
2971210	X	X	StablCal 100mL calibration kit, 2100Q
2971200	X	X	StablCal 500mL calibration kit, 2100Q
1938004 or 4x LZM195	X	X	4 AA Alkaline batteries
4707600	X	X	Oiling Cloth
126936	X	X	Silicone Oil
2434706	X	X	1inch sample cell (10ml) w/cap (Turb) pkg/6
LZV797	X	X	Blank Module
2971500	X	X	Carrying Case, 2100Q, ASSY
2684701	X	X	<0.1 NTU StablCal Ampule
LZV824	X	X	Module Cover
LZV825	X	X	Connector Cover, USB+Power Module
LZV826	X	X	Connector Cover, Power Module
4653900	X		Lamp assy 2100P
LZV827	X	X	Cap,2100Q,ASSY
LZV821	X	X	Rubber Foot, 2100Q, Set
LZV822	X		Lamp Cover, 2100Q, ASSY
LZV823	X		Battery Cover, 2100Q, Set
YAB110	X		Main Board EPA
YAB111		X	Main Board ISO
LZV828	X	X	Display Set
LZV829	X		Enclosure Bottom EPA
LZV830		X	Enclosure Bottom ISO
LZV831	X		Enclosure Top EPA, ASSY
LZV832		X	Enclosure Top ISO, ASSY
LZV833	X		Optic EPA, ASSY
LZV834		X	Optic ISO, ASSY
LZV835	X	X	ESD Shield
LZV836	X	X	Service Kit, 2100Q
LZV837		X	LED Lamp 2100Q ISO, ASSY
2971401	X	X	1 NTU Gelex vial

6.2 Pictures

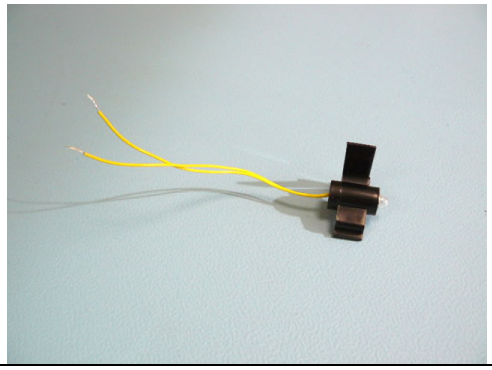
10 NTU Verification Standard Order No.: 2961701 	StablCal 20 NTU Standard Order No.: 2684801 
StablCal 100 NTU Standard Order No.: 2684901 	StablCal 800 NTU Standard Order No.: 2660501 
StablCal ampule calibration kit, 2100Q Order No.: 2971205 	StablCal 100mL calibration kit, 2100Q Order No.: 2971210 
StablCal 500mL calibration kit, 2100Q Order No.: 2971200	4 AA Alkaline batteries Order No.: 1938004 or 4x LZM195 

Oiling Cloth Order No.: 4707600 	Silicone Oil Order No.: 126936 
1inch sample cell (10ml) w/cap (Turb) pkg/6 Order No.: 2434706 	Blank Module Order No.: LZV797 
Carrying Case, 2100Q, ASSY Order No.: 2971500 	<0.1 NTU StablCal Ampule Order No.: 2684701 
Module Cover Order No.: LZV824 	Connector Cover, USB+Power Module Order No.: LZV825 

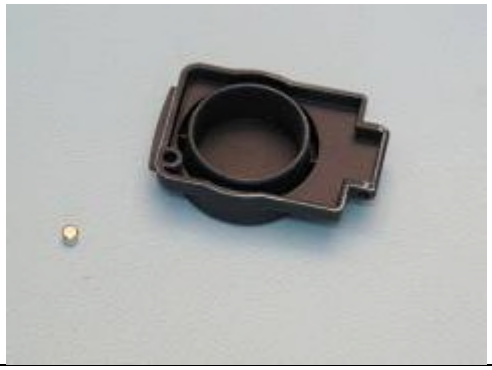
Connector Cover, Power Module
Order No.: LZV826



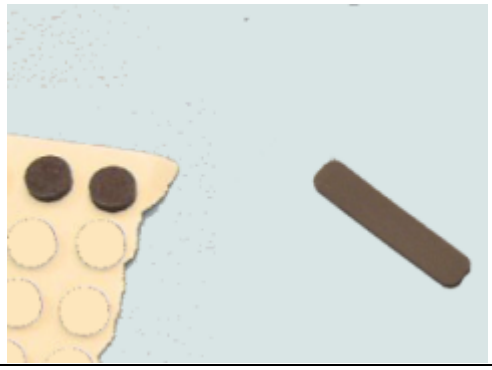
Lamp assy 2100P
Order No.: 4653900



Cap,2100Q,ASSY
Order No.: LZV827

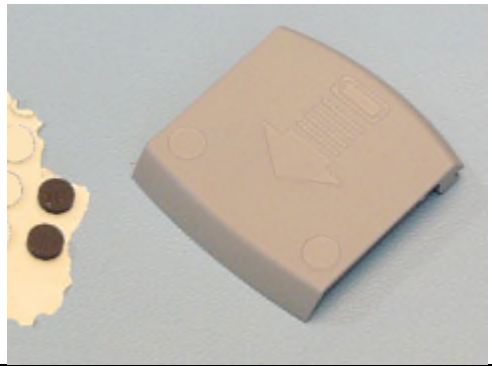


Rubber Foot, 2100Q, Set
Order No.: LZV821

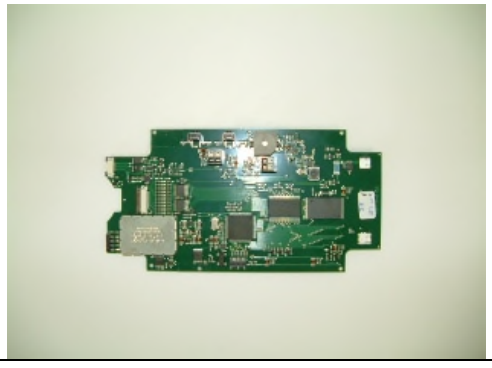


Lamp Cover, 2100Q, ASSY
LZV822

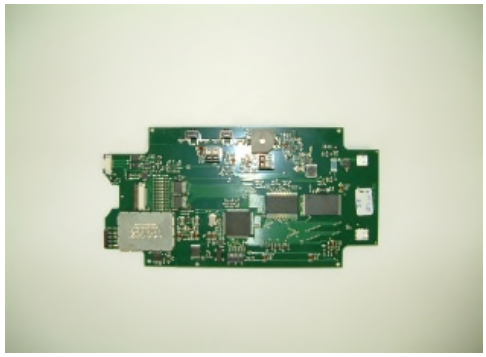
Battery Cover, 2100Q, Set
LZV823

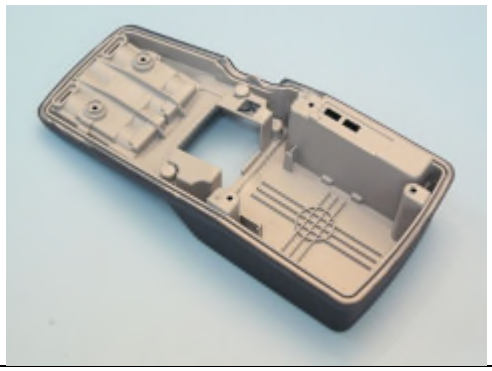
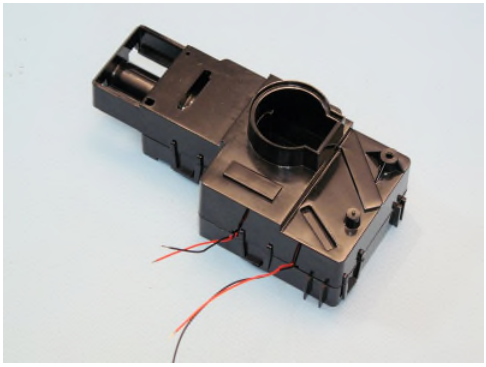
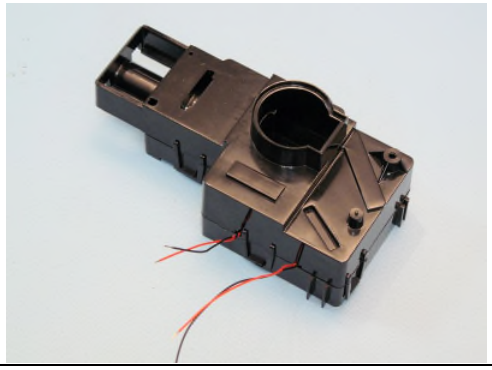
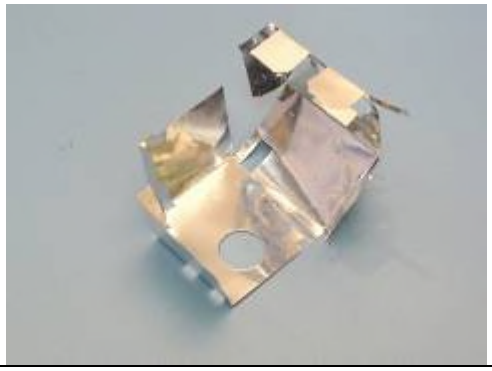


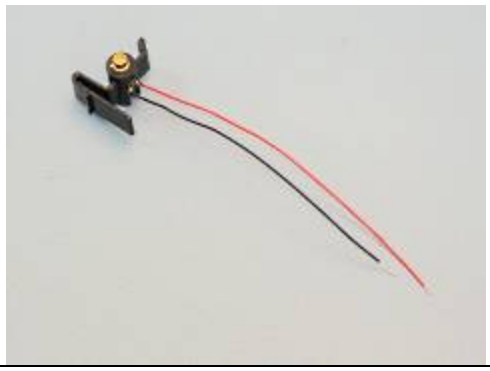
Main Board EPA
Order No.: YAB110



Main Board ISO
Order No.: YAB111



Display Set Order No.: LZV828 	Enclosure Bottom EPA Order No.: LZV829 
Enclosure Bottom ISO Order No.: LZV830 	Enclosure Top EPA, ASSY Order No.: LZV831 
Enclosure Top ISO, ASSY Order No.: LZV832 	Optic EPA, ASSY Order No.: LZV833 
Optic ISO, ASSY Order No.: LZV834 	ESD Shield Order No.: LZV835 

Service Kit, 2100Q Order No.: LZV836 	LED Lamp 2100Q ISO, ASSY Order No.: LZV837 
1 NTU Gelex vial Order No.: 2971401 	

7 Test aids and devices

7.1 Hardware

Aids for calibration

Order no.	Description
LZV803 or 1938004 or 4x LZM195	Power supply or 4 AA Alkaline batteries
2659405	StablCal Set 0.1,20,100,800 NTU sealed vials
2961701	10 NTU Verification Standard
4707600	Oiling Cloth
126936	Silicone Oil

Aids for service inspection

Order no.	Description
1938004 or 4x LZM195	4 AA Alkaline batteries
LZV813	USB OTG Adapter (Module #7)
2659405	StablCal Set 0.1,20,100,800 NTU sealed vials
2961701	10 NTU Verification Standard
2971401	1 NTU Gelex vial
4707600	Oiling Cloth
126936	Silicone Oil

Maintenance and Servicing Report

Hach Lange GmbH

Dear customer,

Our certification according to DIN EN ISO 9001:2000 (Hach Lange GmbH) makes sure that all our equipment meets the requirements of these norms during the development, production and customer service.
We have fixed within our quality management system that our test resources can be traced back by national standards, there where it is possible. Therefore your Hach Lange calibration certificate, supported by this protocol, provides the necessary documentation and audit trail for the control of your measuring and testing equipment.

Instrument-Name: 2100Q (is) Instrument-Type: LPG439 Serial-No.: _____

Hardware Check

Keys	□ ok	Power-Module (optional)	□ ok
Display	□ ok	USB-Module (optional)	□ ok
Lid-Recognition	□ ok		

Calibration

StabCal Set 26594-05 Lot No. _____ Exp. Date: _____

Calibration with 20, 100, 800 NTU	Result	□ ok

Verification

StabCal <0.1 NTU 26847-01 Lot No. _____ Exp. Date: _____

Nominal value	Tolerance	Actual value	Result
<0,1 NTU	-	NTU	□ ok

StabCal 10 NTU 29617-01 Lot No. _____ Exp. Date: _____

Nominal value	Tolerance	Actual value	Result
10 NTU	± 9% (9,1 – 10,9 NTU)	NTU	□ ok

The 2100Q (is) is within specification and has passed calibration.

Suggested next calibration:

Date : Service Technician: Signature:_____