HANDHELD
CALIBRATOR - TESTER

Owner's Manual

Unpacking Instructions

Remove the Packing List and verify that you have received all equipment, including the following:
Orbit Controls Model OC 502-V2 Handheld Calibrator.
Operator's Manual OC 502-V2.
If you have any questions about the shipment, please call the Orbit Controls Customer Service Department.

NOTE

When you receive the shipment, inspect the container and equipment for signs of damage. Note any evidence of rough handling in transit. Immediately report any damage to the Orbit Controls customer service, Phone +411 730 2753 or Fax +411 730 2783 and to the shipping agent.
The carrier will not honour damage claims unless all shipping material is saved for inspection. After examining and removing contents, save packing material and carton in event the reshipment is necessary.

The shipment contains:
Calibrator-Multimeter Model OC502-V2
Battery charger
Measure leads 4mm with banana and crocodile, 300 mm length
Owner's manual
Calibration certificate

INDEX

CALIBRATOR - MULTIMETER OC 502-V2

√ **Current Calibrator 0/4 - 22mA, Source-Sink**
√ **Voltage Calibrator 0-11V**
√ **Multimeter ± 2V to ± 200V DC and ± 100mA**
√ **Calibrates and Measures simultaneously**
√ **Firm steps and continuous ramps**
√ **Direct value entry via the keyboard**
√ **Rechargeable Battery**
√ **Software calibration**

Orbit Controls Model OC 502-V2 a Calibrator-Multimeter which generates currents 0/4-22mA in Source or Sink mode and Voltages 0 to 11V. External voltages ± 2V, ± 20V and ± 200VDC (firm ranges or autoranging) and currents up to ±100mA can be measured while the calibrator generates the selected output signal. Due to this simultaneous operation a response from e.g. an external transmitter under test can be measured which is signal supplied from OC502. Both, the generated calibration signal and the measured external signal are shown at the instruments LCD digital display.

OC502 can be software calibrated via the keyboard whenever required. The instrument is supplied from internal rechargeable battery which permits 4 hour uninterrupted operation. A sign BAT at the display reminds the operator to charge the battery as soon as the voltage is bellow the secure operation value.

1   FUNCTIONS

OC502-V2 can be set for following functions by using the keyboard and the digital display:

Calibrator	Current Source	0 ... 22mA
	Current Sink	0 ... 22mA
	Voltage Source	0 ... 11V

The calibrator functions are settable with three sliding switches:

ON-OFF	Power ON and OFF
SRC-I, SNK-I	Current Source 0-22mA, Current Sink 0-22mA
OUT-V, OUT-I	Voltage Output 0-11V, Current Output 0-22mA

Multimeter	Voltage Ranges	Firm ranges	± 2V, ± 20V, ± 200VDC
		Autoranging	0 ... ± 200VDC
	Current Range	Firm range	0 ... ± 100mADC

The Multimeter Functions can be set with the keys *100mA, AUTO, 2V, 20V, 200V.*

## 2   OUTPUTS and INPUTS

CALIBRATOR: Voltage and Current Output: **+ OUT -**

MULTIMETER: Voltage Input: **GND, IN-V**
                     Current Input: **GND, IN-I**

3   LCD   DISPLAY

The LCD Display is divided into 2 sections. The upper part shows the multimeter functions, the lower part shows the generated calibrator signals. A Bargraph in the middle displays the measured values as an analogue function. The left side of the display shows various statements:
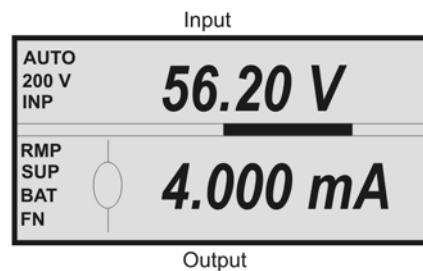
AUTO   Automatic Range selection
200V   Firm Ranges 2V, 20V, 200V, 100mA
INP   The display shows the input signal. With **FN** the following functions can be set:
              HLD   Display HOLD
              MAX   Maximum Value Hold
              MIN   Minimum Value Hold
              RST   Reset the max. and the min. values to zero
RMP   Automatic Ramp
SUP   Charger plugged, Battery is charged
BAT   Battery voltage at low level. Charge the Battery with the original charger.
FN   Function of the Calibrators   FN   Steps or Ramp
                                             NUM   Value setting with the keyboard

4   KEYBOARD

5 SPECIFICATIONS

CALIBRATOR   **Outputs + *OUT* -**

Current Source	Range	0 ... 22mA. Option: 0 … 110mA, see page 13: OC502-V2-100.
	Accuracy	± 0.05% from value
Current Sink	Range	0 ... 22mA @ max. 24VDC
	Accuracy	± 0.1% from value
Voltage Source	Range	0 ... 11 V
	Accuracy	± 0.05% from value
Resolution:	0 … 22.000mA and 0 … 11.000V	
Tempco:	± 25ppm/K	
Temperature Range:	Working:	-10 ºC ... +35 ºC
	Storing:	0 ... 45 ºC

MULTIMETER   **Inputs *GND, IN-V, IN-I***

Voltage:	Ranges	± 2V (1.83 MΩ), ± 20V (363 kΩ), ± 200V (333 kΩ)
IN-V:	Autoranging	± 200V DC
	Accuracy	± 0.1% from range ± 1 Digit
Current:	Range	± 100mA DC (10 Ω)
IN-I:	Accuracy	± 0.1% from range ± 1 Digit
Tara:	Tara can be activated with the keyboard.	
Filter:	Averaging filter with filtering constants 0 to 9.	
Ramp:	Increasing or decreasing ramp with selectable steps of 0.5mA/0.05V or 2.5mA/0.25V.	
Tempco:	± 25ppm/K	

> ***The calibrator output and the multimeter inputs have a common GND !***

MICROCONTROLLER
The Multimeter or the Calibrator functions can be selected with sliding switches. The values and parameters set are stored in a non-volatile memory. The instrument can be software calibrated via the keyboard.

Keyboard:	The keys have to be pressed at least for 0.5 sec in order to permit the controller to accept the command.
Rate:	1 sample per 1 sec.
Memory:	EEPROM.

SUPPLY
Battery:	Two 8,4V-170mAh rechargeable NiMH Batteries permit an uninterrupted operation of 4 hours with 20mA set at the calibrator output.
Charger:	Mains voltage 100-240V, 48-60Hz / 24V-200mA DC. Full battery charge is 12 hours.

6   CALIBRATOR - FUNCTION SELECTION

The calibrator functions are selectable with three sliding switches. The keyboard permits setting of Ramps, Steps or direct Value entry.

The Multimeter is active all the time and can be simultaneously used with the calibrator. The function is described in § 7.

The display is divided into two parts. The upper part shows the multimeter values, the lower part is assigned to the calibrator outputs 0-20mA or 0-10V. The middle part is a bargraph showing the values as analogue information.

6.1   Setting of the output current 0 - 22mA in Steps or Ramps

Sliding switch to be set to SRC-I and OUT-I.
The key *Clr* set the output current to 4mA.
The key *Up* increases the output current in 0.20 mA steps.
The key *Down* decreases the output current in 0.20 mA steps.
The key *Ramp* activates the automatic ramp. To stop the ramp, press the key again.
The key *Step* generates the current steps of 4, 8, 12, 16, 20, 22mA

6.2   Direct setting of the output current between 0 and 22mA

Sliding switch to be set to SRC-I and OUT-I.
The key *Num* activates the numeric selection.
Enter the required value with the keyboard and press *Enter*.
To erase the last entry, use the keys $\leftarrow$ and $\rightarrow$.

6.3   Setting of the voltage output 0 - 11 V in Steps or Ramps

Sliding switch to be set to OUT-V.
The key *Clr* sets the output voltage to 0 V.
The key *Up* increases the output voltage in 0.10 V steps.
The key *Down* decreases the output voltage in 0.10 V steps.
The key *Ramp* activates the automatic voltage ramp.
The key *Step* generates voltage increments 0, 2, 4, 6, 8, 10, 11V.

6.4   Direct setting of the output voltage value between 0 and 11 Volts

Sliding switch to be set to OUT-V.
The key *Num* activates the numeric selection.
Enter the required value with the keyboard and press *Enter*.
To erase the entry, use the keys $\leftarrow$ and $\rightarrow$.

6.5   Selection of the display function

With the key FN the following display functions can be set:

INP   The multimeter display follows the input signal
HLD   The display stops - HOLD
MAX   The display shows the maximum value
MIN   The display shows the minimum value
RST   The max. and the min. values are reset

Eingang

AUTO
200 V
INP

56.20 V

RMP
SUP
BAT
FN

4.000 mA

Ausgang
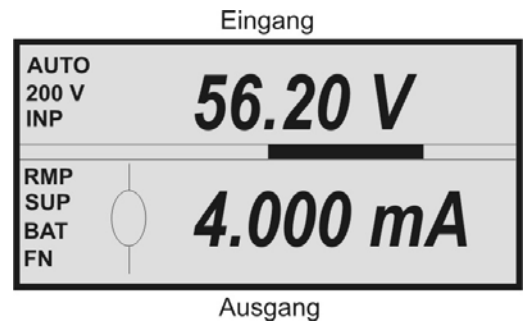
7   MULTIMETER - FUNCTION SELECTION

The multimeter is active all the time and can simultaneously be used with the calibrator.

> *The calibrator output and the multimeter inputs have a common GND !*

The upper part of the display shows the values and parameters of the multimeter:

AUTO   Autoranging ± 2 ... ± 200VDC, settable with the key **Auto**.
FIX   Firm voltage ranges ± 2V, ± 20V, ± 200V DC, settable with **Auto**.
             Firm current range ± 100mA DC, settable with **100mA**.

With the key **FN** following mode of operation can be set:

INP   The display shows the input signal
HLD   HOLD the display
MAX   The display shows the maximum value
MIN   The display shows the minimum value
RST   The max. and the min. values are reset

8   CALIBRATOR - FUNCTION SELECTION

With the key **MENU** following mode of operation can be set:

TARA SELECT   Tare the input signal reading to zero
FILTER DEGREE   Averaging filter with constants 0-9.
RAMP SELECT   Starts one of following ramps:
                 1   Increasing ramp with steps of 0.5mA and 0.25V
                 2   Increasing ramp with steps of 0.1mA and 0.05V
                 3   Decreasing ramp with steps of -0.1mA and -0.05V
                 4   Decreasing ramp with steps of -0.5mA and -0.25V
GRAPHICS   Graphic expression of the last 128 measured points in the voltage or current mode
                 of measurement.

The key **Esc** switches the function into measuring mode.

9   SOFTWARE CALIBRATION

The voltage and the current ranges of the multimeter and the output signals of the calibrator can be precisely calibrated by using the keyboard. The calibration menu can be opened with the key *Set*.

```
┌─────────────────────────────────┐
│  1   Out  4 .. 20 mA   0 .. 10 V │
│  2   Input   i   0..100mA        │
│  3   Input   u   0..2V           │
│  4   Input   u   0..20V          │
│  5   Input   u   0..200V         │
│  6   Hardware                    │
└─────────────────────────────────┘
```

A full calibration of all 5 ranges or selected ranges only can be approached. A five digit multimeter 10VDC and 20mADC will be used as well as a Voltage/Current calibrator 100mA, 2V, 20V and 200VDC.

1:        Calibrator Outputs
2-5:   Multimeter Inputs
6:        Hardware Configuration

To close the calibration menu press the key **Esc**.

9.1 CALIBRATION of the OUTPUTS

9.1.1 Current Output 4-20mA
Outputs + OUT - with connected mA-Meter.
Sliding switch OUT-I.
Press *1*. The display shows:

```
┌─────────────────────┐    ┌─────────────────────┐
│   OUTPUT  4 mA       │    │   OUTPUT  4 mA       │
│        0            │    │        7412          │
└─────────────────────┘    └─────────────────────┘
```

With the keys *Up* or *Down* appears the calibration constant 0. To change it, enter 7 with UP or DOWN. After this set the constant with the keyboard. The 4.000 mA output current is set. Fine corrections can be entered with UP or DOWN. Press **Enter** to save the point. The display confirms with *EEPROM*.

Press   **Menu**. The display changes to:
With the keys *Up* or *Down* set the output current to 20.000 mA.
Press **Enter** to save the point.

With **Esc** returns the display to calibration menu.

```
┌─────────────────────┐
│   OUTPUT  20 mA      │
│        36200         │
└─────────────────────┘
```

9.1.2 Voltage Output 0-10V
Outputs + OUT - with a connected voltmeter.
Sliding switch in position OUT-V.

Press **2**. The display shows:
Set the output voltage to 2V with the keys *Up* or
Down and save with **Enter**.
Set the output voltage to 10V with the keys *Up* or *Down* and save with **Enter**.

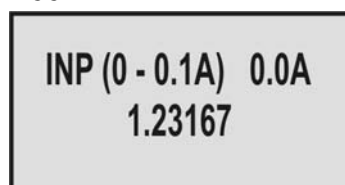With **Esc** returns the display to calibration menu.

```
OUTPUT  2 V
    7165
```

```
OUTPUT  10 V
    34766
```

9.2 MULTIMETER CALIBRATION
9.2.1 Current Input 0-100mA
Inputs GND and IN-I supplied from external current calibrator 100mA.
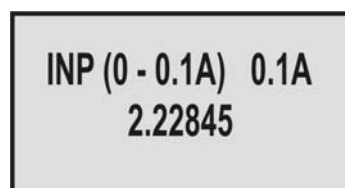
Press 2*.* The display shows:
Short the inputs. Press **Enter** to store the zero input.

```
INP (0 - 0.1A)  0.0A
     1.23167
```

Press **Menu**. The display changes to:
Apply 100mA from external calibrator.
Press **Enter** to store the 100mA full range input.

```
INP (0 - 0.1A)  0.1A
     2.22845
```

9.2.2 Voltage Input 2VDC
Inputs GND and IN-V supplied from external voltage calibrator 2VDC.

Press **3**. The display shows:
Short the inputs. Press **Enter** to store the zero input.

```
INP (0 - 2 V)  0 V
     1.23282
```

Press **Menu**. The display changes to:
Apply 2VDC from external calibrator.
Press **Enter** to store the 2V full range input.
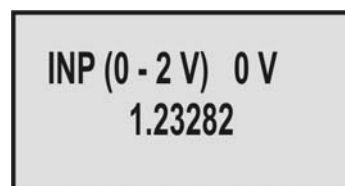
```
INP (0 - 2 V)  2 V
     2.41458
```

9.2.3 Voltage Input 20VDC
Inputs GND and IN-V supplied from external voltage calibrator 20VDC.

Press **4.** The display shows:
Short the inputs. Press **Enter** to store the zero input.

```
INP (0 - 20 V)  0 V
            1.23189
```

Press **Menu**. The display changes to:
Apply 20VDC from external calibrator.
Press **Enter** to store the 20V full range input.

```
INP (0 - 20 V)  20 V
            2.32273
```

9.2.4 Voltage input 200VDC
Inputs GND and IN-V supplied from external voltage calibrator 200VDC.
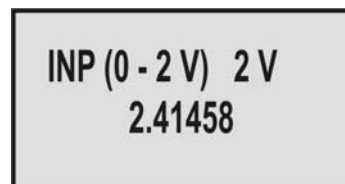
Press **5.** The display shows:
Short the inputs. Press **Enter** to store the zero input.

```
INP (0 - 200 V)  0 V
            1.23179
```

Press **Menu**. The display changes to:
Apply 200VDC from external calibrator.
Press **Enter** to store the 200V full range input.

```
INP (0 - 200 V) 200 V
            2.42249
```

Press **Esc** to exit the calibration mode. The instrument is calibrated.

NOTE

Do not approach the calibration when the sign **BAT** at the display is illuminated.
Charge the battery first.

9.2.5 Logo

A customized Logo which appears after the instrument is switched-on can be factory set upon demand. Contact the manufacturer for more information

9.2.6 Hardware

This menu step contains the setting of the output configuration 12 bit or 16 bit signal resolution and 20mA or 100mA output current. The Option 100mA has to be ordered at the manufacturer.

```
Hardware config.
1 .. DAC   12 bit        [   ]
2 .. DAC   16 bit        [ x ]
3 .. Out    0 .. 20 mA   [ x ]
4 .. Out    0 .. 100 mA  [   ]

[ Enter ]  to save !
```

The factory setting is 16 bit. When 12 bit resolution is activated, the display resolution of the output signals is limited to two decimal points.

ATTENTION

When wrongly calibrated by entering of not valid values, warning appears at the display „Calibration Error". The display changes automatically to the corresponding calibration point marked with *err.*

---

10   TARA

The Tara is active in the multimeter function and can be used for DC-V and DC-I measurements to set the display to zero. The entire measuring range has to be taken into consideration when the Tara is activated in order not to overrange the meter.
The Tara is activated with the key **Menu**. The display shows:

```
TARA SELECT

1 .. Tara   reset
2 .. Tara   input

Tara 0.000 V
```

With the key 1 the Tara is deactivated.
The key 2 activates the Tara and the Tara value is shown at the lowest display row. The key **Esc** closes the Tara setting.

11   FILTER

An averaging Filter is active in the multimeter function. The filter constant (number of measurements) can be set from 0 to 9. By selecting 0 the filter is deactivated. The filter function is activated after the key **Menu** is pressed twice. The display shows:
With the key 0 is the filter off.
With the key 1-9 the required constant is selected. The key **Esc** closes the Filter function.

```
FILTER DEGREE

0          filter  OFF
1 .. 9   filter  ON

Select 0
```
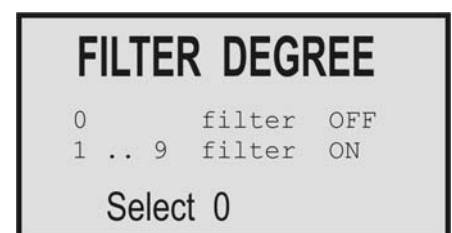
12 RAMPS
The Ramp function will be opened with **Menu**. The display shows:

1   Increasing ramp with steps of 0.5mA and 0.25V
2   Increasing ramp with steps of 0.1mA and 0.05V
3   Decreasing ramp with steps of -0.1mA und -0.05V
4   Decreasing ramp with steps of -0.5mA und -0.25V

```
RAMP SELECT I
1.. Up Step  +0.5 mA
2.. Up Step  +0.1 mA
3.. Up Step  -0.1 mA
4.. Up Step  -0.5 mA
    Select   2
```

Current or Voltage Ramp is automatically generated with the selection of the switch OUT-I or OUT-V.

```
RAMP SELECT U
1.. Up Step  +0.25 V
2.. Up Step  +0.05 V
3.. Up Step  -0.05 V
4.. Up Step  -0.25 V
    Select   2
```

13 GRAPHICS
The last 128 measurements of the input voltage or current are automatically memorized and can be shown at the display. The Graphic Mode will be opened with **Menu** and confirmed with **Enter**.

```
GRAPHICS MODE

ENT .. graphics  ON
```
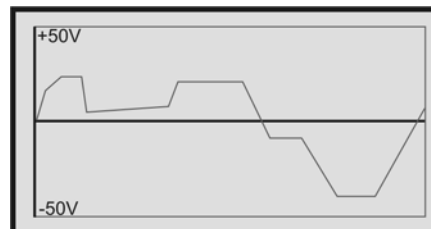
14 HANDHELD CALIBRATOR – MULTIMETER OC502-V2-100

√ **Current Calibrator 0/4 - 110mA, Source, Sink**
√ **Multimeter ± 2V to ± 200V DC and ± 100mA**
√ **Calibrates and Measures simultaneously**
√ **Firm steps and continuous ramps**
√ **Direct value entry via the keyboard**
√ **Rechargeable Battery**
√ **Software calibration**

Orbit Controls Model OC 502-V2-100 is a Calibrator-Multimeter for generation of 0/4 - 110mA in Source and Sink mode and Voltages between 0 to 11V.

External voltages ± 2V, ± 20V and ± 200VDC (firm ranges or autoranging) and currents up to ±100mA can be measured while the calibrator generates the selected output signal. Due to this simultaneous operation a response from e.g. an external transmitter under test can be measured which is signal supplied from OC502-V2-100. Both, the generated calibration signal and the measured external signal are shown at the instruments LCD digital display

OC502-V2-100 can be software calibrated via the keyboard whenever required. The instrument is supplied from internal rechargeable battery which permits 4 hour uninterrupted operation. A sign BAT at the display reminds the operator to charge the battery as soon as the voltage is bellow the secure operation value.

The instrument is supplied from internal battery and permits an uninterrupted operation of 4 hours with the output current between 0 and 20mA. For higher output currents up to 100mA the calibrator has to be connected to the charger. When the sign BAT at the display is illuminated, the battery has to be charged.

SPECIFICATIONS
CALIBRATOR OC502-V2-100   **Outputs +** *OUT* **-**

Current Source	Range	0 ... 110mA
	Accuracy	± 0.1% from range
Current Sink	Range	0 ... 110mA @ max. 24VDC
	Accuracy	± 0.1% from range
Voltage Source	Range	0 ... 11 V
	Accuracy	± 0.1% from range
Tempco:	± 25ppm/K	
Temperature:	Working:	+20 ºC ... +25 ºC
	Storing:	0 ... 45 ºC

For other parameters and setting see the previous pages.

CALIBRATION CERTIFICATE

EUT: Model OC 502-V2 Calibrator   Serial Number: ………………………

Instruments used for calibration
Multifunction Calibrator OCM 130   SN: 150341
5 ½ digit Multimeter HP 34401A   SN: 3145A11814
Ambient temperature 23°C ± 2°C.

CALIBRATOR   Max. inaccuracy: ± 0.05% from value

VOLTAGE OUTPUT		CURRENT SOURCE		CURRENT SINK	
Display	**Output**	**Display**	**Output**	**Display**	Output
0.000 V		0.000 mA		0.000 mA	
2.000 V		4.000 mA		4.000 mA	
4.000 V		8.000 mA		8.000 mA	
6.000 V		12.000 mA		12.000 mA	
8.000 V		16.000 mA		16.000 mA	
10.000 V		20.000 mA		20.000 mA	

MULTIMETER   Max. inaccuracy: ± 0.1% from value ± 1 digit

SPANNUNGSEINGANG						STROMEINGANG	
2V DC		**20V DC**		**200V DC**		**100 mA DC**	
Input	**Display**	**Input**	**Display**	**Input**	**Display**	**Input**	**Display**
0.000 V		0.000 V		0.000 V		0.000 mA	
0.500 V		5.000 V		50.000 V		25.000 mA	
1.000 V		10.000 V		100.000 V		50.000 mA	
1.500 V		15.000 V		150.000 V		75.000 mA	
2.000 V		20.000 V		200.000 V		100.000 mA	

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www.orbitcontrols.ch

Technician: …………………………

QC: …………………………………..

Date: …………………………………

Dear Customer,

Thank you for ordering the hand held Calibrator-Multimeter OC 502-V2.

The instrument has been carefully checked in all operation modes and finally precisely calibrated. The calibration sheet is enclosed.

WARRANTY
The instrument has 12 month warranty for all parts and labour involved with the repair. The warranty does not apply to damaged, overloaded or modified instruments or instruments with broken seal at the rear cover.

PLEASE NOTE
The instrument is supplied from internal rechargeable NiMH battery. Please make sure that the battery is correctly charged from the enclosed battery charger as soon as the **BAT** sign at the display is illuminated. The time for the full charge is 12 hours.

We will be pleased to answer all your questions not only to this instrument but also to all our calibrators and measuring equipment. Please call our customer service or write to us

info@orbitcontrols.ch

Thank you.

Orbit Controls AG
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