

# Precision Resistance Decade OCM632

## Owner's Manual



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## 1. Basic information

Programmable Resistance Decade OCM632 is designed for manual and automated simulation of variety of resistance sensors (temperature, pressure, position, force ...). Internal design eliminates “zero resistance effect” which is typical for most resistance decades.

Resistance value is established by microcontroller calculated combination of physical resistors and is mainly suitable for direct simulation of most frequent temperature Pt and Ni sensors. Low thermal voltage relays and stable resistors are used to achieve highest accuracy and stability. The actual set values are displayed at the high resolution TFT display. OCM632 is a sophisticated instrument with its own Software Recalibration procedure which permits correction of resistors deviation without mechanical adjustments.

OCM632 is especially suitable for automatic testing lines by using RS232 or optionally IEEE488, USB and Ethernet.

## 2. Before applying power

### 2.1. *Inspecting package contents, selecting the installation location*

Basic package includes following items:

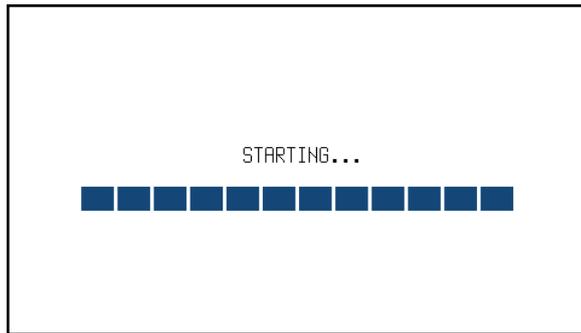
- Resistance decade OCM632
- RS232 cable
- CD demo program
- User's manual
- Calibration Report

The instrument is designed for supply from the mains 115/230VAC, 50/60 Hz. It has to be placed in laboratory environment and stabilized at the room temperature for at least one hour before applying the power.

### 2.2. *Power switch-on*

- Before connecting the instrument to the mains, check the position of the mains voltage selector located at the rear panel.
- Plug one end of the power cord into the connector located at the rear panel and connect the other end of the power cord into a wall outlet.

- Switch on the mains switch located at the rear panel.



**Figure 1 Starting Screen**

- The controller performs internal hardware checks for approx. 5 seconds.
- At the end of the test the reference settings are displayed:

Function	Resistance
Set value	1000.00 $\Omega$
Output terminals	OFF

### **2.3. Warm-up time**

The instrument works after the initial checks have been completed. The specified parameters are guaranteed after the warm up time of 10 minutes.

### **2.4. Safety precautions**

The instrument has been designed in accordance with EN 61010-1:2011. The safety is ensured by the design and by the use of specific component types.

The manufacturer is not liable for the damage caused by modification of the construction or replacement of non-original parts.

Safety symbols used on the equipment



Warning, reference to the documentation

### 3. Description

#### 3.1. Front panel

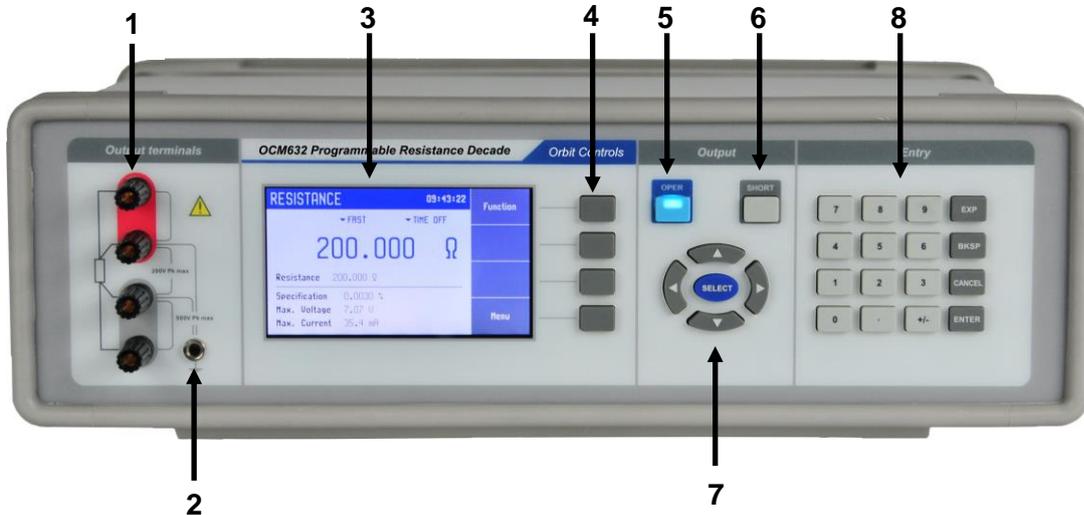


Figure 2 Front panel

The front panel contains all control keys, display and output terminals.

#### 1 Output terminals

Four output terminals permit 2, 3 or 4 wire connection. Both sides (red and grey) are floating up to 500Vp-p against the case (PE).

#### 2 Ground terminal

Central ground terminal (protective earth) is connected with the metal case of the instrument. If the instrument is not grounded, it is recommended to connect the ground terminal to the “grey” output.

#### 3 Display

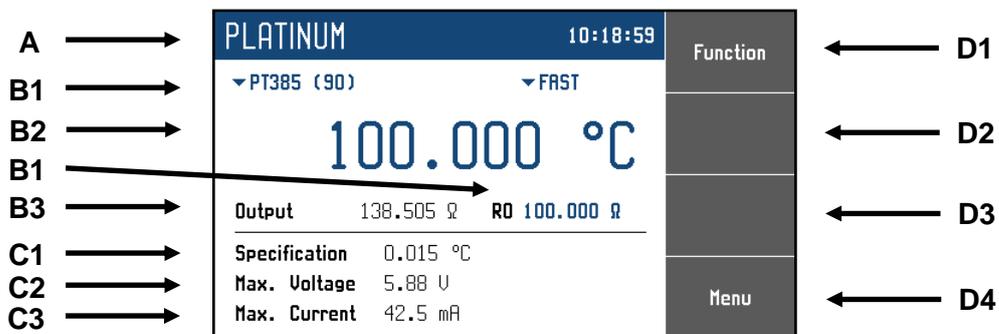


Figure 3 Display

The display is divided into four sections:

#### **A. Information line**

- Selected function (RESISTANCE, PLATINUM, ...)
- Time

#### **B. Main area**

This section displays the set values and the data related to the status:

##### *1. Auxiliary parameters*

Auxiliary parameters of actually selected function:

- Temperature standard (PT385, PT3916, ...)
- Switching mode (FAST, VIA OPEN, ...)
- R0 resistance

##### *2. Main value*

Main value of selected function is displayed with the unit. It also displays the actual position of cursors ▼▲ when the parameter is in the edit mode. The cursor can be moved with ◀▶ and the parameter changed with ▲▼.

##### *3. Output state*

Resistance value at the output terminals.

#### **C. Specification**

This display section shows the specification and limits related to the main value:

##### *1. Specification*

This section displays specification of the main value.

##### *2. Maximum voltage*

This section displays maximum allowed voltage applied to the main value.

##### *3. Maximum current*

This section displays maximum allowed current for the main value.

#### **D. Softkey Labels**

The functions of these keys change during the operation and depend on selected function and actual display mode.

### **4 Softkeys**

The functions of these keys change during the operation and depend on selected function and actual display mode.

### **5 OPER (Operate key)**

OPER key connects / disconnects the selected value at the output terminals. Connected output terminals are indicated with an LED at this key.

### **6 SHORT (Short key)**

The SHORT key (with LED) causes a short circuit of the output terminals.

## 7 Cursor keys

Two keys ◀ ▶ permit the cursor to be set to the required position at the display. At the cursor position the numeric value can be set with keys ▲ ▼.

The central SELECT key is used to select the required value, similar to the key TAB.

## 8 Numeric keyboard

With numeric keys the value can be set at the display. With ENTER the value is confirmed, with CANCEL is the entry invalid.

### Display Colors

- Red is used when the displayed value is measured. (It is not used in all versions).
- Blue is used for setting parameters or values and for their modification from the keyboard or the Main menu.
- Black is used for firm values, labels, notes, parameters which can not be modified and for other firm general information texts.
- The function of the softkeys is shown in the right part of display. If the description is not present, the softkey is not active in the selected function.

## 3.2. Rear panel

The power cord socket with the fuse and the line voltage selector 115/230V, the interface connectors RS232, LAN, USB and IEEE488 are located at the rear panel.



Figure 4 Rear panel

## 4. Operation

### 4.1. Connecting and disconnecting the output terminals

The key OPER connects (disconnects) the output terminals. Connected terminals are indicated with LED.

Disconnected output terminals can be used for “Open terminals” simulation. “Short circuit” is simulated with the key SHORT. Activated SHORT (LED is ON) causes short circuit at the output terminals.

### 4.2. Wires connection

Output resistance is available at the R output terminals in 2, 3 or 4-wire connection. Both sides (red and grey) are floating up to 500Vpk against the case (PE).

Ground terminal is connected to the metal case and to the protective earth (PE).

### 4.3. Function settings

The function can be set with the softkey „Function“. New function can be set with cursor keys ▲ ▼ or with the display softkeys. The selection will be confirmed with SELECT or „OK“ softkey.

#### Resistance

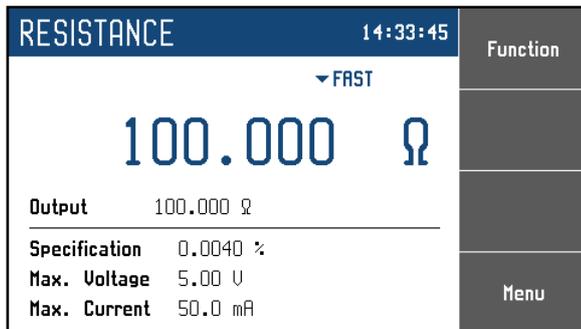
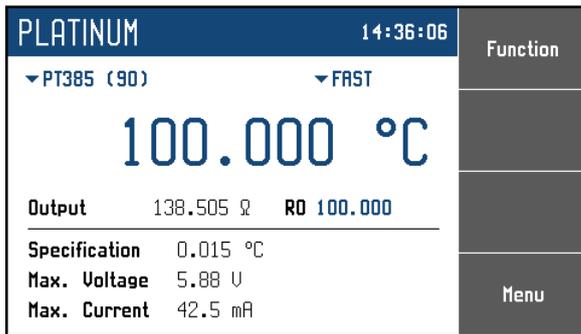


Figure 5 Resistance screen

Resistance Range setting: 1 Ω ... 1.2 MΩ  
 Switching mode: FAST, SMOOTH, VIA OPEN, VIA SHORT

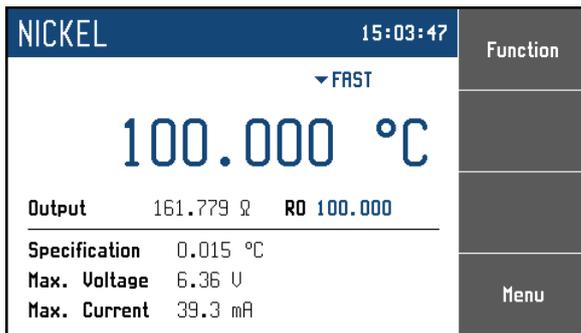
**Platinum**



**Figure 6 Platinum screen**

Temperature Range setting: -200 °C ... +850 °C (-328 °F ... 1562 °F)  
 R0 value: 10 Ω ... 20 kΩ  
 Temperature standard: PT385 (68), PT385 (90), PT3916, PT3926, PT User  
 Switching mode: FAST, SMOOTH, VIA OPEN, VIA SHORT

**Nickel**

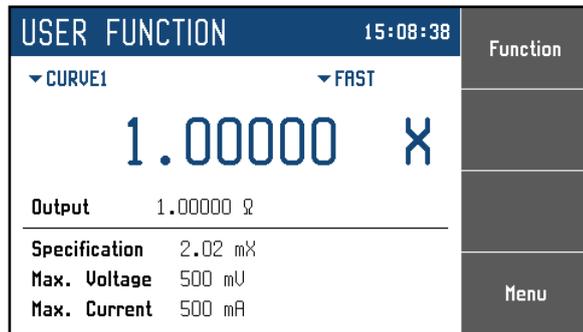


**Figure 7 Nickel screen**

Temperature Range setting: -60 °C ... +300 °C (-76 °F ... 572 °F)  
 R0 value: 10 Ω ... 20 kΩ  
 Switching mode: FAST, SMOOTH, VIA OPEN, VIA SHORT

**User function**

The user's own function is defined by a table. The points are linear interpolated. More tables (curves) can be entered.

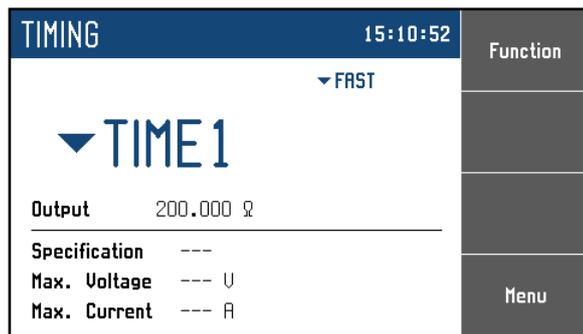


**Figure 8 User function screen**

Main value: according to the function  
 User function: set by the user  
 Switching mode: FAST, SMOOTH, VIA OPEN, VIA SHORT

**Timing**

Time-varying resistance is defined by a user's table. More time curves can be entered.



**Figure 9 Timing screen**

Timing table: table defined by the user  
 Switching mode: FAST, SMOOTH, VIA OPEN, VIA SHORT

#### 4.4. Setting the output values

##### Edit mode

Parameters of the output can be changed in the Edit mode. Parameters in blue color can only be changed. The display can be switched into the edit mode by:

- Using the numeric button
- Using the „Sel“ button (in the middle of cursor buttons)
- Using the cursor button

The edited value is highlighted in blue background. The key SELECT permits selection of editable (blue) parameters. The Edit Mode is terminated with CANCEL.

##### Entry by using the numeric keyboard

- After the first digit is entered from the numeric keyboard, the window is displayed. The upper row shows the name of the edited parameter. By using the softkeys the new value and unit can be selected.

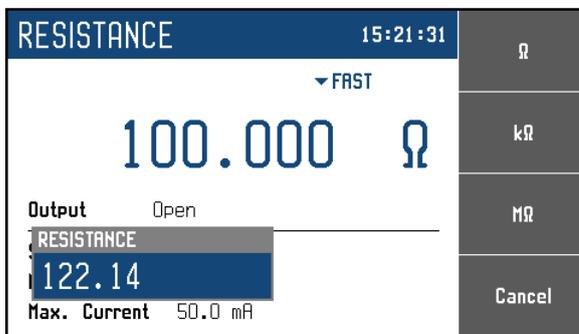


Figure 10 Numeric value entry

- Enter the value.
- Use the softkey for units or ENTER. The key ENTER sets basic units ( $\Omega$ ,  $^{\circ}\text{C}$ , ...).
- The new value is entered.
- The value is copied into the appropriate field.

##### Entry of the value by using cursor keys

- Use  $\blacktriangleleft$   $\blacktriangleright$ ,  $\blacktriangle$   $\blacktriangledown$ . The cursor points to the active digit.
- The value can be changed with  $\blacktriangle$ , the position of the active digit with  $\blacktriangleleft$ ,  $\blacktriangleright$ .
- CANCEL will be used to return to the default screen.

##### Note:

- All parameters have limits. If the entered value is outside the limits, warning message is displayed „Value too high (low)“ and the setting is not accepted.

#### 4.5. Setup Menu

The Setup Menu can be entered with the softkey „Menu“.

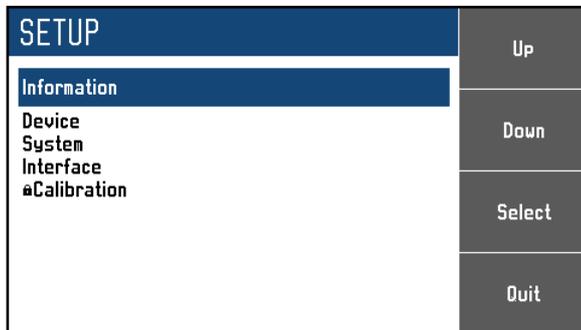


Figure 11 Setup menu

The required menu item is highlighted with cursor keys ▲ ▼ or display softkeys. Keys SELECT or „OK“ store the setting.

#### Information

*Manufacturer*

*Model*

*Serial number*

*Software version*

*Hardware version*

#### Device

Setting operational parameters:

*Temperature unit*

°C (Celsius), °F (Fahrenheit) and K (Kelvin).

#### Switching

Switching Mode during the resistance value is changed. The value R1 is changed to value R2 within a time interval T. The resistance at the output terminals can have different values during the time interval T.

**FAST**            Fastest possible switching method, T is typically 400us.

The resistance value is undefined during T.

**SMOOTH**        Smallest possible resistance change. T is typically 1ms. The resistance during

T can't be higher than max (R1, R2) and can be lower than min (R1, R2).

**VIA OPEN**      2 steps switching method. R1 is switched to OPEN and than to R2.

T is typically 1ms.

**VIA SHORT**    2 steps switching method. R1 is switched to SHORT and than to R2.

T is typically 1ms.

SHORT value is lower than min (R1, R2).

*Platinum standard*

Platinum thermometers can be simulated according to standards:

PT385 (68)	DIN, standard EN60751, temperature scale IPTS68 (A=3.90802e-3, B=-5.80195e-7, C=-4.2735e-12)
PT385 (90)	DIN, standard EN60751, temperature scale ITS90 (A=3.9083e-3, B=-5.775e-7, C=-4.18301e-12)
PT3916	Pt3916 temperature curve (A=3.9692e-3, B=-5.8495e-7, C=-4.2325e-12)
PT3926	Pt3926 temperature curve (A=3.9848e-3, B=-5.870e-7, C=-4.0e-12)
PT User	user defined temperature curve (A=3.9083e-3, B=-5.775e-7, C=-4.18301e-12). The values can be changed

*Timing*

This menu permits definition of different time dependent resistance curves. Each curve is defined by the Timing table. Each row in the table contains information about resistance value and time during which this value is applied to the output terminals. If the timing function is activated all rows are sequentially executed. User can define more timing tables with different names. Number of rows is limited to 50.

*User function curve*

This menu permits definition of different conversion curves. Each curve is defined by the table. Each table row contains information about the value of simulated function and the corresponding resistance value. The user can define more tables with different names. Typical application is definition table for simulation of non-standard resistance thermometers. Number of rows is limited to 100.

**System**

This menu position permits setting system parameters.

*Language**Backlight**Beeper volume**Keyboard beep**Time**Date***Interface**

This menu step permits setting for remote control interfaces.

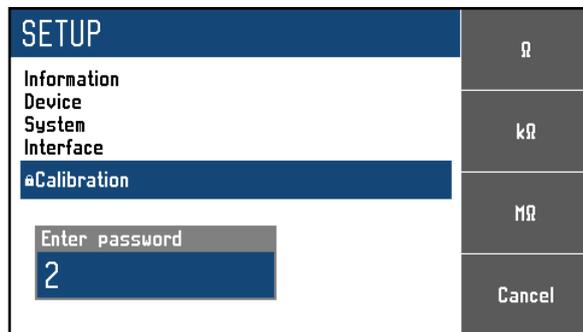
*Active bus**RS232 Baudrate**GPIB Address**LAN Settings*

Telnet protocol is used. Default setting:

DHCP	ON	
IP Address	192.168.001.100	only valid if DHCP is OFF
Subnet mask	255.255.255.000	only valid if DHCP is OFF
Default gateway	255.255.255.255	only valid if DHCP is OFF
Port number	23	
Host name	OCM632_SN620031	only valid if DHCP is ON

#### 4.6. Calibration mode

The internal resistance elements decade can be recalibrated. Access to the calibration mode is from the Setup Menu. Entry into the Calibration menu is protected by a Password.



Default factory setting is "2".  
Return to standard mode with ESC.

Figure 12 Password entry

Recalibration procedure consists of measuring of 37 basic resistances and entering their actually measured values. The calibration point can be selected with the softkeys "Previous" and "Next". Cursor keys  $\blacktriangle$ ,  $\blacktriangledown$ ,  $\blacktriangleleft$ ,  $\blacktriangleright$  can be used.

#### Calibration points OCM632

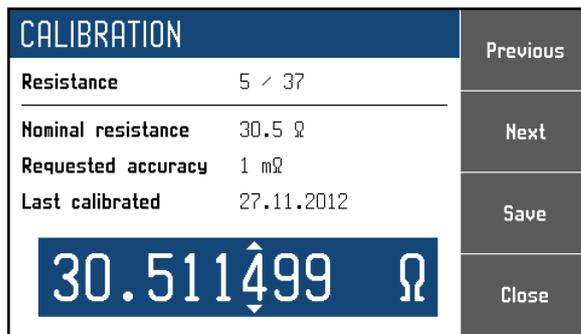
Standard	Nominal value	Required Accuracy
R1	1,95 $\Omega$	1 m $\Omega$
R2	3,88 $\Omega$	1 m $\Omega$
R3	7,73 $\Omega$	1 m $\Omega$
R4	15,4 $\Omega$	1 m $\Omega$
R5	30,5 $\Omega$	1 m $\Omega$
R6	60,4 $\Omega$	1 m $\Omega$
R7	120 $\Omega$	2 m $\Omega$
R8	237 $\Omega$	3 m $\Omega$
R9	464 $\Omega$	6 m $\Omega$
R10	909 $\Omega$	15 m $\Omega$
R11	1,78 k $\Omega$	30 m $\Omega$
R12	3,48 k $\Omega$	100 m $\Omega$
R13	6,87 k $\Omega$	250 m $\Omega$
R14	13,5 k $\Omega$	500 m $\Omega$
R15	26,6 k $\Omega$	1 $\Omega$
R16	52,2 k $\Omega$	5 $\Omega$
R17	103 k $\Omega$	10 $\Omega$
R18	202 k $\Omega$	20 $\Omega$
R19	396 k $\Omega$	40 $\Omega$
R20	778 k $\Omega$	80 $\Omega$
R21	1,54 M $\Omega$	200 $\Omega$
R22	3,03 M $\Omega$	400 $\Omega$
R23	6,0 M $\Omega$	1 k $\Omega$
R24	12 M $\Omega$	5 k $\Omega$
R25	23 M $\Omega$	50 k $\Omega$

R26	48 MΩ	200 kΩ
R27	100 MΩ	500 kΩ
R28	200 MΩ	1 MΩ
R29	2,09 kΩ	40 mΩ
R30	4,14 kΩ	80 mΩ
R31	8,18 kΩ	100 mΩ
R32	16,1 kΩ	200 mΩ
R33	34,3 kΩ	500 mΩ
R34	75,3 kΩ	1 Ω
R35	150 kΩ	4 Ω
R36	301 kΩ	10 Ω
R37	602 kΩ	20 Ω

**Table 1 OCM632 Calibration points**

The calibration consists of measuring partial resistances and entering their actual values:

- Set the first calibration point (resistance element). Use the softkeys “Previous” and “Next” to select the element.
- Measure the resistance of the selected element with high accuracy Ohm-Meter in 4-wire connection mode.



**Figure 13 Calibration point screen**

- Set the resistance with ▲▼, ◀▶ according to the Ohm-Meter reading.
- Confirm with “Save”.
- Repeat the above for all resistance elements.

## 5. Performance verification test

Verification procedure is based on measuring resistance in recommended points at the output terminals with standard multimeter.

### Required equipment

- Ohm-meter nominal accuracy 0.001% in range 1  $\Omega$  to 1.2 M $\Omega$  (type Fluke 8508A or similar)

### Settings

Switch decade to the resistance function. Connect standard multimeter to the outputs in four wire connection.

### Procedure

Use following procedure to perform parameter verification test:

1. Switch-on both instruments and let them for 1 hour stabilise in the laboratory environment at  $23\pm 2$  °C. Connect resistance decade terminals R4W to the standard ohm-meter (multimeter).
2. Case of decade should be grounded or connected to the **Lo** terminal of multimeter.
3. Check resistance value in points according to Table I.

### Maximum absolute deviations OCM632

Nominal value	OCM632 max. deviation
1 $\Omega$	2.0 m $\Omega$
2 $\Omega$	2.0 m $\Omega$
5 $\Omega$	2.1 m $\Omega$
10 $\Omega$	2.2 m $\Omega$
16 $\Omega$	2.2 m $\Omega$
20 $\Omega$	2.4 m $\Omega$
50 $\Omega$	3.0 m $\Omega$
100 $\Omega$	4.0 m $\Omega$
200 $\Omega$	6.0 m $\Omega$
500 $\Omega$	15 m $\Omega$
1 k $\Omega$	30 m $\Omega$
2 k $\Omega$	60 m $\Omega$
5 k $\Omega$	150 m $\Omega$
10 k $\Omega$	300 m $\Omega$
20 k $\Omega$	600 m $\Omega$
50 k $\Omega$	1.5 $\Omega$
100 k $\Omega$	3.0 $\Omega$
200 k $\Omega$	6.0 $\Omega$
400 k $\Omega$	20 $\Omega$
500 k $\Omega$	25 $\Omega$
1 M $\Omega$	50 $\Omega$
1.2 M $\Omega$	60 $\Omega$

**Table 2** Verification - allowed deviations

## 6. Remote control

OCM632 can be controled via RS232, GPIB, LAN and USB interface. Only one type is permitted at a time. All interfaces share the same commands with exeption of commands used for RS232, LAN and USB:

### SYSTem:LOCal

This command switches the decade into the “LOCAL” mode.

### SYSTem:REMOte

This command switches the decade into the “REMOTE” mode.

### SYSTem:RWLock

This command switches the decade into the “REMOTE” mode and locks all keys (including LOCAL key) on front panel.

**NOTE:** If device is not in the REMOTE mode all other commands will be ignored (for RS232, LAN and USB), with the exception of Compatible commands which are processed each time. GPIB interface switches OCM632 into the “REMOTE” mode automatically by opening the GPIB interface. Therefore these commands are not intended for this interface.

### 6.1. RS232 Interface

Equipment required:

- OCM632
- Personal Computer (or other controlling device) with RS232 port (USB-to-RS232 converter is also possible)
- 9-pin D-SUB, 3-wire direct (1:1) male/female RS232 cable

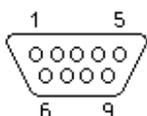
The RS232 has to be selected in the system menu (*SETUP->Interface->Active bus*). There is only one RS232 setting accesible from the system menu under *SETUP->Interface* path:

RS232 Baudrate: 1200, 2400, 4800, 9600, 19200, 38400, 57600 or 115200

Other RS232 parameters are firm:

Number of data bits	8
Number of stop bits	1
Parity	None
Handshake (XON/XOFF)	Off

RS232 connection



Pin	Label	I/O	Description
2	TXD	output	Transmitter
3	RXD	input	Receiver
5	GND	-	Ground

Figure 14 RS232 9 pin D-SUB MALE connector

Cable between the Decade and the Computer (configuration 1:1)

Computer	D-Sub 1	D-Sub 2	OCM632
Receiver	2	2	Transmitter
Transmitter	3	3	Receiver
Ground	5	5	Ground

**Table 3 RS232 cable connection**

### 6.2. GPIB Interface (option)

Equipment required:

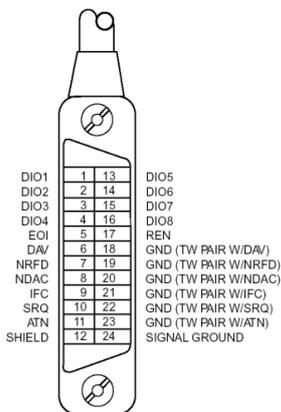
- OCM632 with LAN, USB, IEEE488 option
- Personal Computer (or other controlling device) with GPIB interface
- GPIB cable

The GPIB interface has to be selected in the system menu (*SETUP->Interface->Active bus*). Only one GPIB setting is accesible from the system menu under *SETUP->Interface* path:

GPIB Address: 1 to 31

The instrument performs following functions based on IEEE488 bus commands:

#### SH1, AH1, T5, L3, RL1, DC1



The instrument also recognizes following general commands:

DCL Device Clear - resets the instrument to its basic state

SDC Selected Device Clear - resets the instrument to its basic state

GTL Go To Local - switches the remote control off

LLO Local Lock Out - switches the local control off, the instrument cannot be controlled from the front panel

The commands are identical with commands RS-232.

**Figure 15 IEEE488 connector**

### 6.3. LAN Interface (option)

LAN Interface allows communication with the Decade by using the Telnet protocol.

Equipment required:

- OCM632 with LAN, USB, IEEE488 bus option
- Personal Computer (or other controlling device) with LAN interface
- LAN cable

The LAN interface has to be selected in the system menu (*SETUP->Interface->Active bus*). Following LAN settings are accessible in the system menu under *SETUP->Interface->LAN Settings* path. Default values:

DHCP	ON	
IP Address	192.168.001.100	only valid if DHCP is OFF
Subnet mask	255.255.255.000	only valid if DHCP is OFF
Default gateway	255.255.255.255	only valid if DHCP is OFF
Port number	23	
Host name	OCM632_SN620031	only valid if DHCP is ON

If DHCP (Dynamic Host Configuration Protocol) is enabled, the IP Address and all necessary settings are done automatically. The connection in Telnet protocol is via "Host name" and "Port number". Otherwise the IP address, Subnest Mask and Default Gateway have to be properly set. In this case the connection is performed via "IP Address" and "Port number".

Connection to the decade by using the Microsoft Telnet terminal with enabled DHCP option:

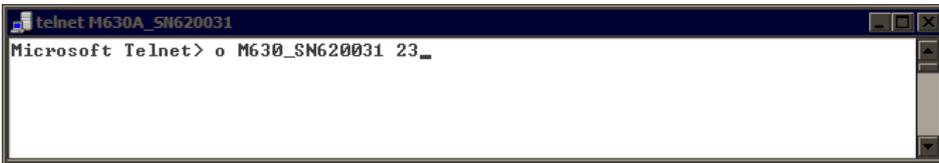


Figure 16 LAN connection 1

With successful connection following window opens:

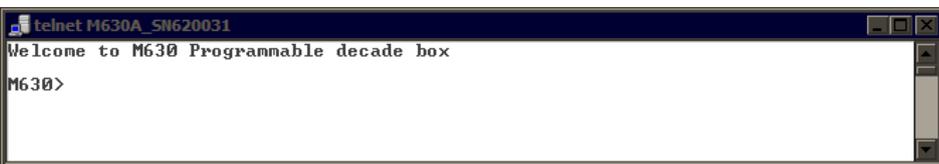


Figure 17 LAN connection 2

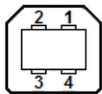
#### 6.4. USB Interface (option)

Equipment required:

- OCM632 decade with LAN, USB, IEEE488
- Personal Computer (or other controlling device) with USB interface (USB type A)
- Standard USB A-B cable

The USB interface has to be selected in the system menu (*SETUP->Interface->Active bus*). There is no USB setting necessary.

The communication is via USB type B connector.



Pin	Label	Description
1	+5V	Power supply
2	DATA-	Data signal -
3	DATA+	Data signal +
4	GND	Ground

**Figure 18 USB Terminal**

The communication from user control program is via standard RS232. Following settings are required at the PC:

Baudrate	9600 Bd
Data bits	8
Stop bits	1
Parity	None

The COM has to be selected. After connection to the PC the virtual COM appears in *System Control Panel* of Microsoft Windows OS. The COM is labeled "USB Serial Port (COMxx)".

## 6.5. Command syntax

The commands described in this chapter can be used for all interface types.

All commands listed in this chapter are explained in two columns:

KEYWORD and PARAMETERS.

KEYWORD includes the name of the command. Each command includes one or more keywords. If a keyword is in brackets ( [ ] ), it is not mandatory. Non-mandatory commands are used only to achieve compatibility with language standard SCPI.

Capitals designate the abbreviated form of the commands; extended form is written in lowercase.

Command parameters are in brackets (<>); each parameter is separated by a comma. Parameters in brackets ( [ ] ) are not mandatory. Line ( | ) means “or” and is used to separate several alternative parameters.

Semicolon ‘;’ is used to separate more commands written on one line.

E.g. :RES 100;:OUTP ON

### Terminators

For GPIB interface each command line must end with <lf>. The decade returns also <lf>. For non GPIB interfaces <cr>, <lf> or <crlf> can be used for termination. The decade returns <crlf>. The decade performs all commands written on one line after the terminator. Without terminator, the program line will not be executed.

### Description of abbreviations

<DNPD> = Decimal Numeric Program Data, this format is used to express decimal number with or without the exponent.

<CPD> = Character Program Data. Usually, it represents a group of alternative character parameters. E.g. {SERial|GPIB|USB|LAN}.

<SPD> = String Program Data (quoted string). This type of parameter is similar to CPD, but allows transmission of more ISO characters.

<BOOL> = Boolean Program Data. This type of parameter has only two states 0 and 1. Parameter can take form of integer value (0 or 1), or character alias (ON or OFF). Device always returns integer value (0 or 1).

<UNIT> = unit parameter works in conjunction with DNPD parameter and specifies unit of DNPD (numeric) value. Unit must be selected from predefined ones. If UNIT part is omitted, default one is used. Query always returns actual unit.

? = A flag indicating a request for the value of the parameter specified by the command. No other parameter than the question mark can be used.

(?) = A flag indicating a request for the parameter specified by the command. This command permits a value to be set as well as requested.

<cr> = carriage return. ASCII code 13. This code executes the program line.

<lf> = line feed. ASCII code 10. This code executes the program line.

## 6.6. SCPI Command Tree

This chapter summarizes all public SCPI commands supported by device in alphabetic order.

```

:CALibration
  :RESistance
    :AMPLitude(?) <DNPd>
    :SElect(?) <DNPd>
  :SECure
    :PASSword(?) <DNPd>
    :EXIT
:DISPlay
  :ANNotation
    :CLOCK
      :DATE
        :FORMat(?) {MDYS|MDYA|DMYS|DMYO|DMYA|YMDS|YMDO}
        [:STATe] (?) {ON|OFF|1|0}
    :BRIGHtness(?) <DNPd>
    :LANGuage(?) {ENGLish}
:OUTPut
  :SHORt(?) {ON|OFF|1|0}
  [:STATe] (?) {ON|OFF|1|0}
  :SWITChing(?) {FAST|SMOoth|OPEN|SHORt}
[:SOURce]
  :NICKel
    [:AMPLitude] (?) <DNPd>[{CEL|FAR|K}]
    :ZRESistance(?) <DNPd>[OHM]
  :PLATinum
    [:AMPLitude] (?) <DNPd>[{CEL|FAR|K}]
    :COEFFicient(?) <DNPd>,<DNPd>,<DNPd>
    :STANdard(?) {PT385A|PT385B|PT3916|PT3926|USER}
    :ZRESistance(?) <DNPd>[OHM]
  :RESistance
    [:AMPLitude] (?) <DNPd>[OHM]
  :TIMing
    :PAPPend <SPD>
    :PCOunt? <DNPd>
    :PRESet<IND_PRESET>
      :NAME(?) <SPD>
      :PDElete
      :RAPPend <SPD>
      :RCOunt? <DNPd>
      :ROW<IND_ROW>
        :AMPLitude(?) <SPD>
      :RDElete
    :SElect(?) <DNPd>
:UFUNction
  [:AMPLitude] (?) <DNPd>
  :CURVe
    :SElect(?) <DNPd>
    :PAPPend <SPD>
    :PCOunt? <DNPd>
    :PRESet<IND_PRESET>
      :NAME(?) <SPD>
      :PDElete
      :RAPPend <SPD>
      :RCOunt? <DNPd>
      :ROW<IND_ROW>
        :AMPLitude(?) <SPD>

```

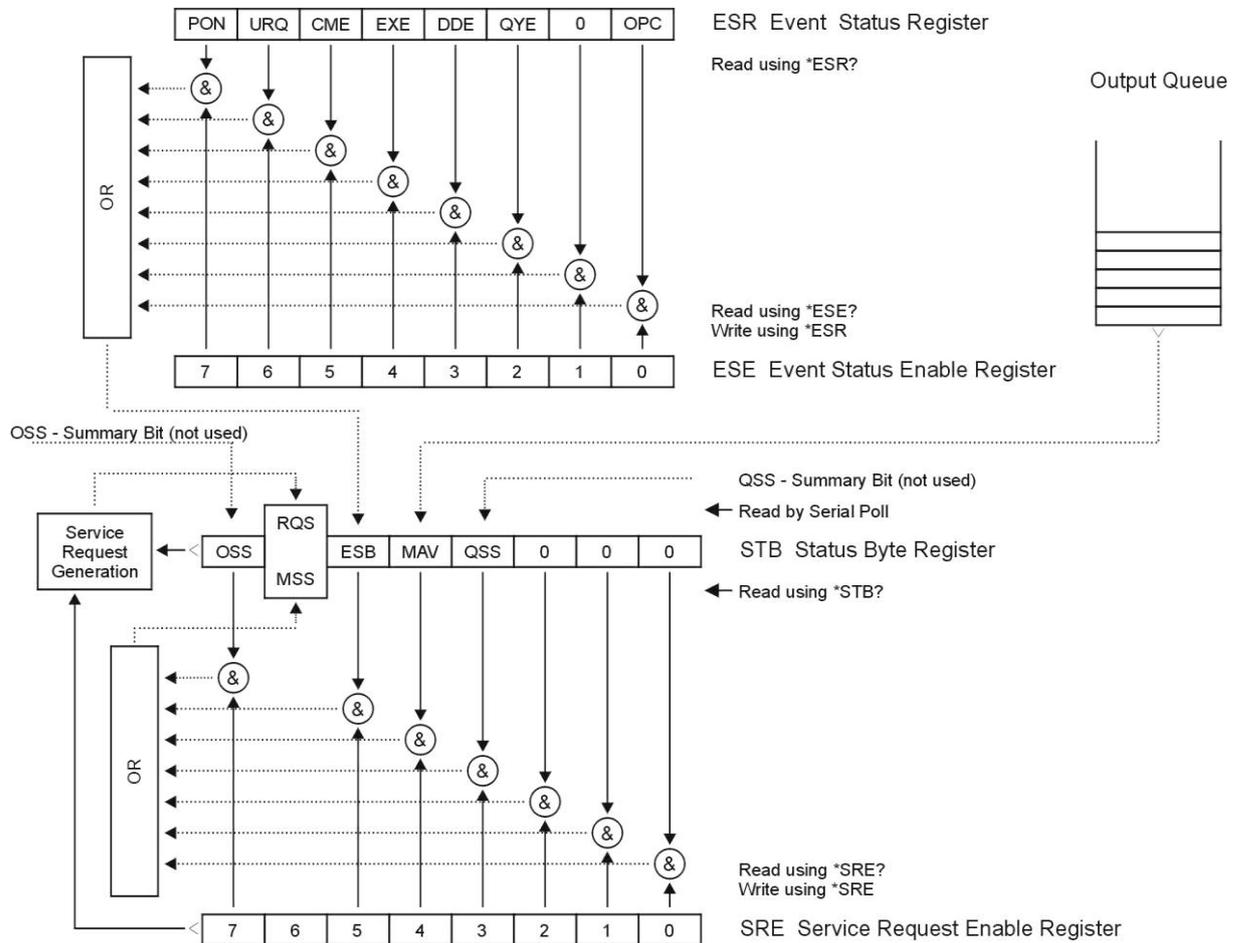
```

:RDElete
:UNIT(?) <SPD>
:STATus
:OPERation
:CONDition(?) <DNPD>
:ENABle(?) <DNPD>
[:EVENT]? <DNPD>
:NTRansition(?) <DNPD>
:PTRansition(?) <DNPD>
:QUEStionable
:CONDition(?) <DNPD>
:ENABle(?) <DNPD>
[:EVENT]? <DNPD>
:NTRansition(?) <DNPD>
:PTRansition(?) <DNPD>
:SYSTem
:BEEPer
:STATe(?) {ON|OFF|1|0}
:VOLume(?) <DNPD>
:COMMunicate
:BUS(?) {SERial|GPIB|USB|LAN}
:GPIB
:ADDRess(?) <DNPD>
:LAN
:ADDRess(?) <CPD>
:MASK(?) <CPD>
:GATE(?) <CPD>
:PORT(?) <DNPD>
:HOST(?) <CPD>
:DHCP(?) {ON|OFF|1|0}
:REStart
:SERial
:BAUD(?) {1200|2400|4800|9600|19200|38400|57600|115200}
:DATE(?) <DNPD>,<DNPD>,<DNPD>
:ERRor
[:NEXT]? <CPD>
:KEY(?) <DNPD>
:LOCal
:PRESet
:REMote
:RWLock
:TIME(?) <DNPD>,<DNPD>,<DNPD>
:VERSion? <CPD>
:UNIT
:TEMPerature(?) {CEL|FAR|K}
*CLS
*ESE(?)
*ESR?
*IDN?
*OPC(?)
*OPT?
*RST
*SRE(?)
*STB?
*TST?
*WAI

```

### 6.7. Standard Status Data Structures

The resistance decade meets standard protocol according to the standard IEEE488.2. The protocol can be used for checking of error and status behavior. It enables single-wire transmitting of SRQ command. The conditions on which SRQ signal (local control request) is sent can be set with parameters \*STB?, \*SRE?, \*SRE, \*ESR?, \*ESE?, \*ESE a \*CLS.



Status Register Overview

Figure 19 Status register overview

Status data structure contains following registers:

- STB – Status Byte Register
- SRE – Service Request Enable Register
- ESR – Event Status Register
- ESE – Event Status Enable Register
- Output Queue

#### STB Status Byte Register

STB is main register where information from other status registers and from output queue is collected. Value of STB register is reset after switching on the device or after sending command \*CLS. This command reset the STB register except bit MAV, which remains set when the output queue is not empty. STB register value can be read via serial message or through general query \*STB?.

Bit configuration of Status Byte Register:

- OSS Operation Summary Status, bit 7. SCPI-defined. The OSS bit is set to 1 when the data in the OSR (Operation Status Register) contains one or more enabled bits which are true.
- RQS Request Service, bit 6. The bit is read as a part of status byte only when serial message is sent.
- MSS Master Summary Status, bit 6. The MSS bit is set to 1 whenever bits ESB or MAV are 1 and enabled (1) in the SRE. This bit can be read using the \*STB? command. Its value is derived from STB and SRE status.
- ESB Event Summary Bit, bit 5. His value is derived from STB and SRE status. The ESB bit is set to 1 when one or more enabled ESR bits are set to 1.
- MAV Message Available, bit 4. The MAV bit is set to 1 whenever data is available in the IEEE488 Output Queue (the response on query is ready).
- QSS Questionable Summary Status, bit 3. SCPI-defined. The QSS bit is set to 1 when the data in the QSR (Questionable Status Register) contains one or more enabled bits which are true.

### **SRE Service Request Enable Register**

The Service Request Enable Register suppresses or allows the STB bits. “0” value of a SRE bit means, that the bit does not influence value of MSS bit. Value of any unmasked STB bit results in setting of the MSS bit to the level “1” . SRE bit 6 is not influenced and its value is “0”. The SRE register value can be set via the command \*SRE followed by mask register value (0 – 191). The register can be read with the command \*SRE?. The register is automatically resets after switching the decade box on. The register is not reset by the command \*CLS.

### **ESR Event Status Register**

Every bit of the EventStatusRegister corresponds to one event. Bit is set when the event is changed and it remains set also when the event passed. The ESR is cleared when the power is turned on (except bit PON which is set), and every time it is read via command \*ESR? Or cleared with \*CLS.

Bit configuration of Event Status Register:

- PON Power On, bit 7. This event bit indicates that an off-to-on transition has occurred in the device’s power supply.
- URQ User Request, bit 6. Bit is not used and it is always “0”.
- CME Command Error, bit 5. This event bit indicates that an incorrectly formed command or query has been detected by the instrument.
- EXE Execution Error, bit 4. This event bit indicates that the received command cannot be executed, owing to the device state or the command parameter being out of limits.
- DDE Device Dependent Error, bit 3. This event bit indicates that an error has occurred which is neither a Command Error, a Query Error, nor an Execution Error. A Device-specific Error is any executed device operation that did not properly complete due to some condition, such as overload.
- QYE Query Error, bit 2. The bit is set if the decade box is addressed as talker and output queue is empty or if control unit did not pick up response before sending next query.
- OPC Operation Complete, bit 0. This event bit is generated in response to the \*OPC command. It indicates that the device has completed all selected pending operations.

### **ESE Event Status Enable Register**

The Event Status Enable Register allows one or more events in the Event Status Register to be reflected in the ESB summary-message bit. This register is defined for 8 bits, each corresponding to the bits in the Event Status Register. The Event Status Enable Register is read with the common query \*ESE?. Data is returned as a binary-weighted value. The Event Status Enable Register is written to by the common command, \*ESE. Sending the \*ESE

common command followed by a zero clears the ESE. The Event Status Enable Register is cleared upon power-on.

It suppresses or allows bits in ESR register. Value „0“ of a bit of ESE register suppresses influence of appropriate bit of ESR register on value of sum bit of ESB status register. Setting of any unmask bit of ESR register results in setting of ESB status register. ESE register value can be modified by command \*ESE followed by value of mask register (integer in range 0-255). Reading of the register can be performed with command \*ESE?. The register is automatically reset after switching on. The register will not be reseted with \*CLS.

### **Operation Status Register**

Not used in the decade.

### **Questionable Status Register**

Not used in the Decade.

### **Output Queue**

The Output Queue stores response messages until they are read from control unit. If there is at minimum one sign in the output queue, MAV register (message available) is set. The Output Queue is cleared upon power-on and after reading all signs from the output queue.

### **Error Queue**

The Error Queue stores error messages. They are placed in a “first in - first out” queue. The queue is read by using the query command “SYSTem:ERRor?” to obtain a code number and error message. The query “SYSTem:ERRor?” can be used to read errors in the queue until it is empty, when the message “0, No Error” will be returned.

## **6.8. SCPI Standard Commands**

This chapter describes standard SCPI commands.

### **\*IDN?**

Syntax:

\*IDN?

Description:

This command returns the identification of the manufacturer, model, serial number and firmware revision.

Parameters:

<CPD> manufacturer  
 <CPD> model  
 <DNPD> serial number  
 <DNPD> frimware version

Remarks:

Overlapped command

Example:

\*IDN? Response: ORBIT,OCM632,620151,1.00

**\*OPC**

Syntax:

`*OPC`

Description:

This command sets the OPC bit in the ESR (Event Status Register) when all pending operations are complete.

Parameters:

None

Remarks:

Overlapped command

Example:

`*OPC`**\*OPC?**

Syntax:

`*OPC?`

Description:

This command returns "1" to the output queue after all pending operations inside decade box are complete.

Parameters:

`<DNPD>` always returns 1

Remarks:

Sequential command

Example:

`*OPC? Response: 1`**\*OPT?**

Syntax:

`*OPT?`

Description:

This command return the instrument's hardware fitment. The only parameter returns presence of GPIB/LAN/USB interface.

Parameters:

`<DNPD>` 0 – extended interface not present, 1 – extended interface

present

Remarks:

Overlapped command

Example:

`*OPT? Response: 1`**\*WAI**

Syntax:

`*WAI`

Description:

Prevents the instrument from executing any further commands or queries until all previous remote commands have been executed.

Parameters:

None

Remarks:

Sequential command

Example:

`*WAI`

**\*RST**

Syntax:

`*RST`

Description:

This command resets the device to its initial status.

Parameters:

None

Remarks:

Sequential command

Example:

`*RST`**\*TST?**

Syntax:

`*TST?`

Description:

This command launches internal self-test and returns result.

Parameters:

`<DNPD>`            0 – test passed, 1 – test failed

Remarks:

Sequential command

Example:

`*TST? Response: 0`**\*STB?**

Syntax:

`*STB?`

Description:

This query returns content of register STB, which carries the MSS bit status.

Parameters:

`<DNPD>`            Status byte register, Range 0 ... 255

Remarks:

Overlapped command

Example:

`*STB? Response: 0`**\*SRE**

Syntax:

`*SRE``*SRE?`

Description:

This command allows set condition of the Service Request Enable register. Since bit 6 is not used, the maximum value is 191.

Parameters:

`<DNPD>`            Service Request Enable register

Remarks:

Overlapped command

Example:

`*SRE 2``*SRE? Response: 2`

**\*ESR?**

Syntax:

`*ESR?`

Description:

This query returns the contents of the Event Status Register and clears the register.

Parameters:

`<DNPD>`            Event Status Register

Remarks:

Overlapped command

Example:

`*ESR? Response: 0`**\*ESE**

Syntax:

`*ESE``*ESE?`

Description:

This command programs the Event Status Enable register bits.

Parameters:

`<DNPD>`            Event Status Enable register, Range 0 ... 255

Remarks:

Overlapped command

Example:

`*ESE 2``*ESE? Response: 2`**\*CLS**

Syntax:

`*CLS`

Description:

This command clears all status data structures in the device i.e. Event Status Register, Status Byte Register except the MAV bit, Operation Status Register, Questionable Status Register. Also error queue is cleared. Output queue is unaffected.

Parameters:

None

Remarks:

Overlapped command

Example:

`*CLS`

## 6.9. SCPI Commands

This chapter describes all public SCPI commands in detailed form. The commands are in alphabetic order.

### **:CALibration:RESistance:AMPLitude**

Syntax:

```
:CALibration:RESistance:AMPLitude <DNPD>
:CALibration:RESistance:AMPLitude?
```

Description:

This command sets calibration value of particular internal resistance standard at output terminals including all parasitic resistances inside decade box.

Parameters:

<DNPD> Standard resistance value in Ohms. Ranges and default values varies in accordance to selected resistance etalon (see table "Calibration points OCM632).

Remarks:

This command requires "Calibration" access  
Overlapped command  
Value is not affected by reset

Example:

```
CAL:RES:AMPL 1.944
CAL:RES:AMPL? Response: 1.944000E+00
```

### **:CALibration:RESistance:SElect**

Syntax:

```
:CALibration:RESistance:SElect <DNPD>
:CALibration:RESistance:SElect?
```

Description:

This command enters calibration mode and selects internal resistance standard for calibration. Output terminals are automatically switched-on.

Parameters:

<DNPD> Range 0 ... Max. Resistance Count -1, zero based index of resistance standard

Remarks:

This command requires "Calibration" access  
Overlapped command

Example:

```
CAL:RES:SEL 0
CAL:RES:SEL? Response: 0
```

### **:CALibration:SECure:PASSword**

Syntax:

```
:CALibration:SECure:PASSword <DNPD>
```

Description:

This command validates entered password and enables calibration access if verification is successful. Acces is invalidated after reset or if CAL:SEC:EXIT command is issued. Calibration password can be changed from decade system menu *SETUP->Calibration->Change password*.

Parameters:

<DNPD> Range 0 ... 4294967295 (default 0)

Remarks:

Overlapped command

Example:

```
CAL:SEC:PASS 0
```

**:CALibration:SECure:EXIT**

Syntax:

:CALibration:SECure:EXIT

Description:

This command exits calibration mode and access.

Parameters:

None

Remarks:

Overlapped command

Example:

CAL:SEC:EXIT

**:DISPlay:ANNotation:CLOCK:DATE:FORMat**

Syntax:

:DISPlay:ANNotation:CLOCK:DATE:FORMat <CPD>

:DISPlay:ANNotation:CLOCK:DATE:FORMat?

Description:

This command sets format of date displayed on device screen.

Parameters:

<CPD> {MDYS|MDYA|DMYS|DMYO|DMYA|YMDS|YMDO} (default MDYS)

- MDYS M/D/Y format (M-month, D-day, Y-year)
- MDYA M-D-Y format
- DMYS D/M/Y format
- DMYO D.M.Y format
- DMYA D-M-Y format
- YMDS Y/M/D format
- YMDO Y.M.D format

Remarks:

Overlapped command  
Value is not affected by reset

Example:

DISP:ANN:CLOC:DATE:FORM MDYS  
DISP:ANN:CLOC:DATE:FORM? Response: MDYS

**:DISPlay:ANNotation:CLOCK[:STATe]**

Syntax:

:DISPlay:ANNotation:CLOCK[:STATe] <BOOL>

:DISPlay:ANNotation:CLOCK[:STATe]?

Description:

This command enables/disables showing actual time in title on device screen

Parameters:

<BOOL> {ON|OFF|1|0} (default 1)

- ON actual time is shown
- OFF actual time is hidden
- 1 same as ON
- 0 same as OFF

Remarks:

Overlapped command  
Value is not affected by reset

Example:

DISP:ANN:CLOC ON  
DISP:ANN:CLOC? Response: 1

**:DISPlay:BRIGhtness**

Syntax:

```
:DISPlay:BRIGhtness <DNPD>
:DISPlay:BRIGhtness?
```

Description:

This command sets brightness of device display.

Parameters:

<DNPD>            Range 0.0 ... 1.0 (default 1.0), 0.0 – Min, 1.0 – Max brightness

Remarks:

Overlapped command  
Value is not affected by reset

Example:

```
DISP:BRIG 1.0
DISP:BRIG? Response: 1.000000E+00
```

**:DISPlay:LANGuage**

Syntax:

```
:DISPlay:LANGuage <CPD>
:DISPlay:LANGuage?
```

Description:

This command sets language that is used on device display.

Parameters:

<CPD>            {ENGLish} (default ENGL)  
                  ·ENGLish            english version

Remarks:

Overlapped command  
Value is not affected by reset

Example:

```
DISP:LANG ENGL
DISP:LANG? Response: ENGL
```

**:OUTPut:SHORT**

Syntax:

```
:OUTPut:SHORT <BOOL>
:OUTPut:SHORT?
```

Description:

This command turns on short function. "Short" is activated only if output terminals are switched on (see OUTP:STAT command).

Parameters:

<BOOL>            {ON|OFF|1|0} (default 0)  
                  ·ON                    short is set if output is on  
                  ·OFF                  resistance is set if output is on  
                  ·1                    same as ON  
                  ·0                    same as OFF

Remarks:

Overlapped command  
Value is set to default after reset

Example:

```
OUTP:SHOR ON
OUTP ON
OUTP:SHOR? Response: 1
```

**:OUTPut[:STATe]**

Syntax:

:OUTPut[:STATe] <BOOL>  
 :OUTPut[:STATe]?

Description:

This command switches ON/OFF output terminals. This command operates in conjunction with OUTP:SHOR command:

OUTP:STAT	OUTP:SHOR	Output terminals
OFF	OFF	Open
OFF	ON	Open
ON	OFF	Resistance
ON	ON	Short

**Table 4 OUTPut command structure**

Parameters:

<BOOL> {ON|OFF|1|0} (default 0)  
 .ON output terminals are switched on  
 .OFF output terminals are switched off  
 .1 same as ON  
 .0 same as OFF

Remarks: Overlapped command  
 Value is set to default after reset

Example:

OUTP ON  
 OUTP? Response: 1

**:OUTPut:SWITChing**

Syntax:

:OUTPut:SWITChing <CPD>  
 :OUTPut:SWITChing?

Description:

If output amplitude is changed and output terminals are already switched on, some glitches appear at output terminals. This setting allows selecting a method how new resistance at output terminals is achieved.

Parameters:

<CPD> {FAST|SMOoth|OPEN|SHORT} (default FAST)  
 .FAST new resistance is set as fast as possible  
 .SMOoth new resistance is set with minimal ouput changes  
 .OPEN open function is activated before new resistance is set  
 .SHORT short function is activated before new resistance is set

Remarks: Overlapped command  
 Value is not affected by reset

Example:

OUTP:SWIT FAST  
 OUTP:SWIT? Response: FAST

**[:SOURce]:NICKel[:AMPLitude]**

Syntax:

[:SOURce]:NICKel[:AMPLitude] <DNPD>[<UNIT>]  
 [:SOURce]:NICKel[:AMPLitude]?

Description:

This command sets temperature in Nickel mode. Node SOUR:NICK also selects "NICKEL" function if not already selected. If unit parameter is part of temperature, new unit is set.

## Parameters:

<DNPD> temperature at Nickel function. Range of temperature is dependent on selected unit and decade model (see specification). Default value is 100.0 °C.

<UNIT> {CEL|FAR|K}

- CEL degrees of Celsius
- FAR degrees of Fahrenheit
- K Kelvin

## Remarks:

Overlapped command  
Value is set to default after reset

## Example:

NICK 100.0  
NICK? Response: 1.000000E+02 CEL

**[:SOURce]:NICKel:ZRESistance**

## Syntax:

[:SOURce]:NICKel:ZRESistance <DNPD>[<UNIT>]  
[:SOURce]:NICKel:ZRESistance?

## Description:

This command sets resistance at 0 °C for Nickel function.

## Parameters:

<DNPD> Range 10.0 ... 10000.0 (default 100.0). Range is affected by capabilities of concrete model (see specification)

<UNIT> {OHM}

- OHM

## Remarks:

Overlapped command  
Value is not affected by reset

## Example:

NICK:ZRES 100.0  
NICK:ZRES? Response: 1.000000E+02 OHM

**[:SOURce]:PLATinum[:AMPLitude]**

## Syntax:

[:SOURce]:PLATinum[:AMPLitude] <DNPD>[<UNIT>]  
[:SOURce]:PLATinum[:AMPLitude]?

## Description:

This command sets temperature in Platinum mode. Node SOUR:PLAT also selects "PLATINUM" function if not already selected. If unit parameter is part of temperature, new unit is set.

## Parameters:

<DNPD> temperature at Platinum function. Range of temperature is dependent on selected unit and decade model (see specification). Default value is 100.0 °C.

<UNIT> {CEL|FAR|K}

- CEL degrees of Celsius
- FAR degrees of Fahrenheit
- K Kelvin

## Remarks:

Overlapped command  
Value is set to default after reset

## Example:

PLAT 100.0  
PLAT? Response: 1.000000E+02 CEL

**[[:SOURce]:PLATinum:COEFFicient**

Syntax:

```
[[:SOURce]:PLATinum:COEFFicient <DNPD>,<DNPD>,<DNPD>
[:SOURce]:PLATinum:COEFFicient?
```

Description:

This command allows to define Coefficients (A, B, C) used for “User” Platinum standard scale.

Parameters:

```
<DNPD>      Range 3.0e-3 ... 5.0e-3 (default 3.9083e-3), Coefficient A
<DNPD>      Range -7.0e-7 ... -5.0e-7 (default -5.775e-7), Coefficient B
<DNPD>      Range -5.0e-12 ... -3.0e-12 (default -4.18301e-12), Coefficient
              C
```

Remarks:

Overlapped command  
Value is not affected by reset

Example:

```
PLAT:COEF 3.9083e-3,-5.775e-7,-4.18301e-12
PLAT:COEF? Response: 3.908300E-03,-5.775000E-07,-4.183010E-12
```

**[[:SOURce]:PLATinum:STANdard**

Syntax:

```
[[:SOURce]:PLATinum:STANdard <CPD>
[:SOURce]:PLATinum:STANdard?
```

Description:

This command selects Platinum temperature standard.

Parameters:

```
<CPD>      {PT385A|PT385B|PT3916|PT3926|USER} (default PT385A)
  .PT385A   Pt385 (68) standard
  .PT385B   Pt385 (90) standard
  .PT3916   Pt3916 standard
  .PT3926   Pt3926 standard
  .USER     User (see PLAT:COEF command)
```

Remarks:

Overlapped command  
Value is not affected by reset

Example:

```
PLAT:STAN PT385A
PLAT:STAN? Response: PT385A
```

**[[:SOURce]:PLATinum:ZRESistance**

Syntax:

```
[[:SOURce]:PLATinum:ZRESistance <DNPD>[<UNIT>]
[:SOURce]:PLATinum:ZRESistance?
```

Description:

This command sets resistance at 0 °C for Platinum function.

Parameters:

```
<DNPD>      Range 10.0 ... 10000.0 (default 100.0). Range is affected by
              capabilities of concrete model (see specification).
<UNIT>      {OHM}
              .OHM
```

Remarks:

Overlapped command  
Value is not affected by reset

Example:

```
PLAT:ZRES 100.0
PLAT:ZRES? Response: 1.000000E+02 OHM
```

### **[[:SOURce]:RESistance[:AMPLitude]**

Syntax:

```
[[:SOURce]:RESistance[:AMPLitude] <DNPD>[<UNIT>]
[:SOURce]:RESistance[:AMPLitude]?
```

Description:

This command sets amplitude in Resistance mode. Node SOUR:RES also selects "RESISTANCE" function if not already selected. Optional unit can be enclosed.

Parameters:

```
<DNPD>      Range 1.0 ... 1.2e6, default 100.0
<UNIT>      {OHM}
             .OHM
```

Remarks: Overlapped command

Value is set to default after reset

Example:

```
RES 100.0
RES? Response: 1.000000E+02 OHM
```

### **[[:SOURce]:TIMing:PAPPend**

Syntax:

```
[[:SOURce]:TIMing:PAPPend <SPD>
```

Description:

This command appends new preset into timing function. The new appended preset has empty timing table and new records should be also appended (see TIM:PRES<index>:RAPP). The new preset has its own index and can be obtained by TIM:PCO command.

Parameters:

```
<SPD>      Quoted preset name. Upper alpha, lower alpha, digits and
             spaces are allowable. Maximum string size is 10 characters.
```

Remarks:

Overlapped command

Example:

```
TIM:PAPP "TIME2"
```

### **[[:SOURce]:TIMing:PCOunt?**

Syntax:

```
[[:SOURce]:TIMing:PCOunt?
```

Description:

This command retrieves actual number of timing presets. This number represents maximum index used in preset commands.

Parameters:

```
<DNPD>      Integer value representing preset count
```

Remarks:

Overlapped command

Example:

```
TIM:PCO? Response: 1
```

**[[:SOURce]:TIMing:PRESet<IND\_PRESET>:NAME**

Syntax:

```
[[:SOURce]:TIMing:PRESet<IND_PRESET>:NAME <SPD>
[:SOURce]:TIMing:PRESet<IND_PRESET>:NAME?
```

Description:

This command allows reading and changing preset name. The preset must exist before its name is changed or read.

Parameters:

```
<IND_PRESET> Range 1 ... Preset count (1 - if omitted)
<SPD>         Quoted preset name. Upper alpha, lower alpha, digits and
              spaces are allowable. Maximum string size is 10 characters.
```

Remarks:

Overlapped command

Example:

```
TIM:PRES2:NAME "TIME 1s"
TIM:PRES2:NAME? Response: "TIME 1s"
```

**[[:SOURce]:TIMing:PRESet<IND\_PRESET>:PDELete**

Syntax:

```
[[:SOURce]:TIMing:PRESet<IND_PRESET>:PDELete
```

Description:

This command allows deleting existing preset. The preset will be deleted including particular timing table.

Parameters:

```
<IND_PRESET> Range 1 ... Preset count (1 - if omitted)
```

Remarks:

Overlapped command

Example:

```
TIM:PRES1:PDEL
```

**[[:SOURce]:TIMing:PRESet<IND\_PRESET>:RAPPend**

Syntax:

```
[[:SOURce]:TIMing:PRESet<IND_PRESET>:RAPPend <SPD>
```

Description:

This command appends new record at the end of timing table.

Parameters:

```
<IND_PRESET> Range 1 ... 255 (1 - if omitted)
<SPD>         Quoted string representing amplitude. The amplitude consists
              of two float numeric fields separated by comma. The first one
              represents timing interval in seconds and the second one
              amplitude in Ohms.
```

Remarks:

Overlapped command

Example:

```
TIM:PRES1:RAPP "0.5,220.0"
```

**[[:SOURce]:TIMing:PRESet<IND\_PRESET>:RCOunt?**

Syntax:

```
[[:SOURce]:TIMing:PRESet<IND_PRESET>:RCOunt?
```

Description:

This commands returns actual number of records in timing table.

Parameters:

```
<IND_PRESET> Range 1 ... Preset count (1 - if omitted)
<DNPD>       Integer value representing number of records
```

## Remarks:

Overlapped command

## Example:

TIM:PRES1:RCO? Response: 6

**[[:SOURce]:TIMing:PRESet<IND\_PRESET>:ROW<IND\_ROW>:AMPLitude**

## Syntax:

[[:SOURce]:TIMing:PRESet<IND\_PRESET>:ROW<IND\_ROW>:AMPLitude  
<SPD>

[[:SOURce]:TIMing:PRESet<IND\_PRESET>:ROW<IND\_ROW>:AMPLitude?

## Description:

This command sets / retrieves selected row in timing table.

## Parameters:

<IND\_PRESET> Range 1 ... Preset count (1 - if omitted)

<IND\_ROW> Range 1 ... Row count (1 - if omitted)

<SPD> Quoted string representing amplitude. The amplitude consists of two float numeric fields separated by comma. The first one represents timing interval in seconds and the second one amplitude in Ohms.

## Remarks:

Overlapped command

## Example:

TIM:PRES2:ROW1:AMPL "0.5,220.0"

TIM:PRES2:ROW1:AMPL? Response: " 5.000000E-01,2.200000E+02"

**[[:SOURce]:TIMing:PRESet<IND\_PRESET>:ROW<IND\_ROW>:RDElete**

## Syntax:

[[:SOURce]:TIMing:PRESet<IND\_PRESET>:ROW<IND\_ROW>:RDElete

## Description:

This command deletes row from timing table.

## Parameters:

<IND\_PRESET> Range 1 ... Preset count (1 - if omitted)

<IND\_ROW> Range 1 ... Row count (1 - if omitted)

## Remarks:

Overlapped command

## Example:

TIM:PRES2:ROW1:RDEL

**[[:SOURce]:TIMing:SElect**

## Syntax:

[[:SOURce]:TIMing:SElect <DNPD>

[[:SOURce]:TIMing:SElect?

## Description:

This command selects timing preset. Selected preset is the preset that is shown on device display and has no effect on other SOUR:TIM commands.

## Parameters:

<DNPD> Range 0 ... Preset count-1 (default 0)

## Remarks:

Overlapped command

Value is not affected by reset

## Example:

TIM:SEL 0

TIM:SEL? Response: 0

**[[:SOURce]:UFUNction[:AMPLitude]**

Syntax:

```
[[:SOURce]:UFUNction[:AMPLitude] <DNPD>
[:SOURce]:UFUNction[:AMPLitude]?
```

Description:

This command sets amplitude in USER FUNCTION mode. Node SOUR:UFUN also selects "USER FUNCTION" function if not already selected.

Parameters:

<DNPD> Range depends on translation curve, default value is 1.0 or minimal value that can be set

Remarks:

Overlapped command  
Value is set to default after reset

Example:

```
UFUN 1.0
UFUN? Response: 1.000000E+00
```

**[[:SOURce]:UFUNction:CURVe:SElect**

Syntax:

```
[[:SOURce]:UFUNction:CURVe:SElect <DNPD>
[:SOURce]:UFUNction:CURVe:SElect?
```

Description:

This command selects curve preset in User function mode.

Parameters:

<DNPD> Range 0 ... Curve preset count-1 (default 0)

Remarks:

Overlapped command  
Value is not affected by reset

Example:

```
UFUN:CURV:SEL 1
UFUN:CURV:SEL? Response: 1
```

**[[:SOURce]:UFUNction:CURVe:PAPPend**

Syntax:

```
[[:SOURce]:UFUNction:CURVe:PAPPend <SPD>
```

Description:

This command appends new curve preset into User function. The new appended preset has empty curve table and new records should be also appended (see UFUN:CURV:PRES<index>:RAPP). The new preset has its own index and can be obtained by UFUN:CURV:PCO command.

Parameters:

<SPD> Quoted curve preset name. Upper alpha, lower alpha, digits and spaces are allowable. Maximum string size is 10 characters.

Remarks:

Overlapped command

Example:

```
UFUN:CURV:PAPP "CURVE 2"
```

**[[:SOURce]:UFUNction:CURVe:PCOunt?**

Syntax:

```
[[:SOURce]:UFUNction:CURVe:PCOunt?
```

Description:

This command retrieves actual number of user function presets. This number represents maximum index used in preset commands.

## Parameters:

<DNPD> Integer value representing number of preset count

## Remarks:

Overlapped command

## Example:

UFUN:CURV:PCO? Response: 1

**[[:SOURce]:UFUNction:CURVe:PRESet<IND\_PRESET>:NAME**

## Syntax:

[[:SOURce]:UFUNction:CURVe:PRESet<IND\_PRESET>:NAME <SPD>

[[:SOURce]:UFUNction:CURVe:PRESet<IND\_PRESET>:NAME?

## Description:

This command allows reading and changing preset name. The preset must exist before its name is changed or read.

## Parameters:

<IND\_PRESET> Range 1 ... Curve preset count (1 - if omitted)

<SPD> Quoted preset name. Upper alpha, lower alpha, digits and spaces are allowable. Maximum string size is 10 characters.

## Remarks:

Overlapped command

## Example:

UFUN:CURV:PRES2:NAME "CURVE 2"

UFUN:CURV:PRES2:NAME? Response: "CURVE 2"

**[[:SOURce]:UFUNction:CURVe:PRESet<IND\_PRESET>:PDELe**

## Syntax:

[[:SOURce]:UFUNction:CURVe:PRESet<IND\_PRESET>:PDELe

## Description:

This command allows deleting existing preset. The preset will be deleted including particular curve table.

## Parameters:

<IND\_PRESET> Range 1 ... Curve preset count (1 - if omitted)

## Remarks:

Overlapped command

Example: UFUN:CURV:PRES1:PDEL

**[[:SOURce]:UFUNction:CURVe:PRESet<IND\_PRESET>:RAPPend**

## Syntax:

[[:SOURce]:UFUNction:CURVe:PRESet<IND\_PRESET>:RAPPend <SPD>

## Description:

## Parameters:

<IND\_PRESET> Range 1 ... Curve preset count (1 - if omitted)

<SPD> Quoted string representing amplitude. The amplitude consists of two float numeric fields separated by comma. The first one represents amplitude in "User Function" units and the second one amplitude in Ohms.

## Remarks:

Overlapped command

Example: UFUN:CURV:PRES1:RAPP "10.6,220.0"

**[[:SOURce]:UFUNction:CURVe:PRESet<IND\_PRESET>:RCOunt?**

Syntax:

[:SOURce]:UFUNction:CURVe:PRESet&lt;IND\_PRESET&gt;:RCOunt?

Description:

This commands returns actual number of records in curve table.

Parameters:

&lt;IND\_PRESET&gt; Range 1 ... Curve preset count (1 - if omitted)

&lt;DNPd&gt; Integer value representing number of records for particular curve table

Remarks:

Overlapped command

Example: UFUN:CURV:PRES1:RCO? Response: 2

**[[:SOURce]:UFUNction:CURVe:PRESet<IND\_PRESET>:ROW<IND\_ROW>:AMPLitude**

Syntax:

[:SOURce]:UFUNction:CURVe:PRESet&lt;IND\_PRESET&gt;:ROW&lt;IND\_ROW&gt;:AMPLitude &lt;SPD&gt;

[:SOURce]:UFUNction:CURVe:PRESet&lt;IND\_PRESET&gt;:ROW&lt;IND\_ROW&gt;:AMPLitude?

Description:

This command sets / retrieves selected row in curve table.

Parameters:

&lt;IND\_PRESET&gt; Range 1 ... 255 (1 - if omitted)

&lt;IND\_ROW&gt; Range 1 ... 255 (1 - if omitted)

&lt;SPD&gt; Quoted string representing amplitude. The amplitude consists of two float numeric fields separated by comma. The first one represents amplitude in "User Function" units and the second one amplitude in Ohms.

Remarks:

Overlapped command

Example:

UFUN:CURV:PRES1:ROW1:AMPL "10.6,220.0"

UFUN:CURV:PRES1:ROW1:AMPL? Response: "1.060000E+01,2.200000E+2"

**[[:SOURce]:UFUNction:CURVe:PRESet<IND\_PRESET>:ROW<IND\_ROW>:RDElete**

Syntax:

[:SOURce]:UFUNction:CURVe:PRESet&lt;IND\_PRESET&gt;:ROW&lt;IND\_ROW&gt;:RDElete

Description:

This command deletes row from curve table.

Parameters:

&lt;IND\_PRESET&gt; Range 1 ... Curve preset count (1 - if omitted)

&lt;IND\_ROW&gt; Range 1 ... Row count (1 - if omitted)

Remarks:

Overlapped command

Example:

UFUN:CURV:PRES1:ROW1:RDEL

**[[:SOURce]:UFUNction:CURVe:PRESet<IND\_PRESET>:UNIT**

Syntax:

[:SOURce]:UFUNction:CURVe:PRESet&lt;IND\_PRESET&gt;:UNIT &lt;SPD&gt;

[:SOURce]:UFUNction:CURVe:PRESet&lt;IND\_PRESET&gt;:UNIT?

Description:

Parameters:

&lt;IND\_PRESET&gt; Range 1 ... Curve presetcount (1 - if omitted)

&lt;SPD&gt; Quoted user function unit. Upper alpha, lower alpha, digits and spaces are allowable. Maximum string size is 4 characters.

Remarks:

Overlapped command

Example:

UFUN:CURV:PRES1:UNIT "N"

UFUN:CURV:PRES1:UNIT? Response: "N"

**:STATus:OPERation:CONDition**

Syntax:

:STATus:OPERation:CONDition?

Description:

This query returns the content of Operational Condition register. It is a decimal value which corresponds to the binary-weighted sum of all bits in the register. Register is not cleared after this query. The response to the query therefore represents an instantaneous 'Snapshot' of the register state, at the time that the query was accepted.

Parameters:

&lt;DNPD&gt; Operational Condition register

Remarks:

Overlapped command

Example:

STAT:OPER:COND? Response: 2

**:STATus:OPERation:ENABLE**

Syntax:

:STATus:OPERation:ENABLE &lt;DNPD&gt;

:STATus:OPERation:ENABLE?

Description:

This command enables bits in the Operational Data Enable register. Selected bits are summarized at bit 7 (OSS) of the IEEE488.2 Status Byte register.

Parameters:

&lt;DNPD&gt; Operational Data Enable register

Remarks:

Overlapped command

Example:

STAT:OPER:ENAB 2

STAT:OPER:ENAB? Response: 2

**:STATus:OPERation[:EVENT]?**

Syntax:

:STATus:OPERation[:EVENT]?

Description:

This query returns the content of Operational Data Event register. It is a decimal value which corresponds to the binary-weighted sum of all bits set in the register. Register is cleared after this query.

Parameters:

<DNPD> Operational Data Event register

Remarks:

Overlapped command

Example:

STAT:OPER? Response: 0

**:STATus:OPERation:NTRansition**

Syntax:

:STATus:OPERation:NTRansition <DNPD>

:STATus:OPERation:NTRansition?

Description:

This command allows set Operation Negative Transition Register. It is a decimal value which corresponds to the binary-weighted sum of all bits set in the register. Setting a bit in the negative transition filter shall cause a 1 to 0 transition in the corresponding bit of the associated condition register to cause a 1 to be written in the associated bit of the corresponding event register.

Parameters:

<DNPD> Operation Negative Transition Register, Range 0... 32767

Remarks:

Overlapped command

Example:

STAT:OPER:NTR 2  
STAT:OPER:NTR? Response: 2

**:STATus:OPERation:PTRansition**

Syntax:

:STATus:OPERation:PTRansition <DNPD>

:STATus:OPERation:PTRansition?

Description:

This command allows set Operation Positive Transition Register. It is a decimal value which corresponds to the binary-weighted sum of all bits set in the register. Setting a bit in the positive transition filter shall cause a 0 to 1 transition in the corresponding bit of the associated condition register to cause a 1 to be written in the associated bit of the corresponding event register.

Parameters:

<DNPD> Operation Positive Transition Register, Range 0 ... 32767

Remarks:

Overlapped command

Example:

STAT:OPER:PTR 1.0  
STAT:OPER:PTR? Response: 1.000000E+00

**:STATus:QUEStionable:CONDition**

Syntax:

:STATus:QUEStionable:CONDition?

Description:

This query returns the content of Questionable Condition register. It is a decimal value which corresponds to the binary-weighted sum of all bits in the register. Register is not cleared after this query. The response to the query therefore represents an instantaneous 'Snapshot' of the register state, at the time that the query was accepted.

Parameters:

&lt;DNPD&gt; Questionable Condition register

Remarks:

Overlapped command

Example:

STAT:QUES:COND? Response: 2

**:STATus:QUEStionable:ENABLE**

Syntax:

:STATus:QUEStionable:ENABLE &lt;DNPD&gt;

:STATus:QUEStionable:ENABLE?

Description:

This command enables bits in the Questionable Data Enable register. Selected bits are summarized at bit 3 (QSS) of the IEEE488.2 Status Byte register.

Parameters:

&lt;DNPD&gt; Questionable Data Enable register

Remarks:

Overlapped command

Example:

STAT:QUES:ENAB 2

STAT:QUES:ENAB? Response: 2

**:STATus:QUEStionable[:EVENT]?**

Syntax:

:STATus:QUEStionable[:EVENT]?

Description:

This query returns the content of Questionable Data Event register. It is a decimal value which corresponds to the binary-weighted sum of all bits set in the register. Register is cleared after this query.

Parameters:

&lt;DNPD&gt; Questionable Data Event register

Remarks:

Overlapped command

Example:

STAT:QUES? Response: 0

**:STATus:QUEStionable:NTRansition**

Syntax:

:STATus:QUEStionable:NTRansition <DNPD>  
 :STATus:QUEStionable:NTRansition?

Description:

This command allows set Questionable Negative Transition Register. It is a decimal value which corresponds to the binary-weighted sum of all bits set in the register. Setting a bit in the negative transition filter shall cause a 1 to 0 transition in the corresponding bit of the associated condition register to cause a 1 to be written in the associated bit of the corresponding event register.

Parameters:

<DNPD> Questionable Negative Transition Register, Range 0... 32767

Remarks:

Overlapped command

Example:

STAT:QUES:NTR 2  
 STAT:QUES:NTR? Response: 2

**:STATus:QUEStionable:PTRansition**

Syntax:

:STATus:QUEStionable:PTRansition <DNPD>  
 :STATus:QUEStionable:PTRansition?

Description:

This command allows set Questionable Positive Transition Register. It is a decimal value which corresponds to the binary-weighted sum of all bits set in the register. Setting a bit in the positive transition filter shall cause a 0 to 1 transition in the corresponding bit of the associated condition register to cause a 1 to be written in the associated bit of the corresponding event register.

Parameters:

<DNPD> Questionable Positive Transition Register, Range 0... 32767

Remarks:

Overlapped command

Example:

STAT:QUES:PTR 2  
 STAT:QUES:PTR? Response: 2

**:SYSTem:BEEPer:STATe**

Syntax:

:SYSTem:BEEPer:STATe <BOOL>  
 :SYSTem:BEEPer:STATe?

Description:

This command sets state of device beeper.

Parameters:

<BOOL> {ON|OFF|1|0} (default 1)  
 .ON device system beeper is enabled  
 .OFF device system beeper is disabled  
 .1 same as ON  
 .0 same as OFF

Remarks:

Overlapped command  
 Value is not affected by reset

Example:

SYST:BEEP:STAT ON  
 SYST:BEEP:STAT? Response: 1

**:SYSTem:BEEPer:VOLume**

## Syntax:

```
:SYSTem:BEEPer:VOLume <DNPD>
:SYSTem:BEEPer:VOLume?
```

## Description:

This command sets the system device beeper volume.

## Parameters:

<DNPD>            Range 0.0 ... 1.0 (Max. volume) (default 0.2)

## Remarks:

Overlapped command  
Value is not affected by reset

## Example:

```
SYST:BEEP:VOL 0.2
SYST:BEEP:VOL? Response: 2.000000E-01
```

**:SYSTem:COMMunicate:BUS**

## Syntax:

```
:SYSTem:COMMunicate:BUS <CPD>
:SYSTem:COMMunicate:BUS?
```

## Description:

This command selects communication interface.

## Parameters:

<CPD>            {SERial|GPIB|USB|LAN} (default SER)  
 ·SERial        RS232 interface  
 ·GPIB            GPIB interface  
 ·USB            USB interface  
 ·LAN            LAN interface

## Remarks:

Sequential command  
Value is not affected by reset

## Example:

```
SYST:COMM:BUS SER
SYST:COMM:BUS? Response: SER
```

**:SYSTem:COMMunicate:GPIB:ADDRess**

## Syntax:

```
:SYSTem:COMMunicate:GPIB:ADDRess <DNPD>
:SYSTem:COMMunicate:GPIB:ADDRess?
```

## Description:

This commands allows set communication GPIB address

## Parameters:

<DNPD>            Range 1 ... 31 (default 2)

## Remarks:

Overlapped command  
Value is not affected by reset

## Example:

```
SYST:COMM:GPIB:ADDR 2
SYST:COMM:GPIB:ADDR? Response: 2
```

**:SYSTem:COMMunicate:LAN:ADDRess**

Syntax:

:SYSTem:COMMunicate:LAN:ADDRess <CPD>  
 :SYSTem:COMMunicate:LAN:ADDRess?

Description:

This command allows to change IP address if DHCP is switched off. Interface must be restarted to take effect (see SYST:COMM:REST command).

Parameters:

<CPD>                    Range    000.000.000.000    ...    255.255.255.255    (default  
 192.168.001.100)

Remarks:

Overlapped command  
 Value is not affected by reset

Example:

SYST:COMM:LAN:ADDR 192.168.001.100  
 SYST:COMM:LAN:ADDR? Response: 192.168.001.100

**:SYSTem:COMMunicate:LAN:MASK**

Syntax:

:SYSTem:COMMunicate:LAN:MASK <CPD>  
 :SYSTem:COMMunicate:LAN:MASK?

Description:

This command allows to change subnet mask if DHCP is switched off. Interface must be restarted to take effect (see SYST:COMM:REST command).

Parameters:

<CPD>                    Range    000.000.000.000    ...    255.255.255.255    (default  
 255.255.255.000)

Remarks:

Overlapped command  
 Value is not affected by reset

Example:

SYST:COMM:LAN:MASK 255.255.255.000  
 SYST:COMM:LAN:MASK? Response: 255.255.255.000

**:SYSTem:COMMunicate:LAN:GATE**

Syntax:

:SYSTem:COMMunicate:LAN:GATE <CPD>  
 :SYSTem:COMMunicate:LAN:GATE?

Description:

This command allows to change default gateway if DHCP is switched off. Interface must be restarted to take effect (see SYST:COMM:REST command).

Parameters:

<CPD>                    Range    000.000.000.000    ...    255.255.255.255    (default  
 255.255.255.255)

Remarks:

Overlapped command  
 Value is not affected by reset

Example:

SYST:COMM:LAN:GATE 255.255.255.255  
 SYST:COMM:LAN:GATE? Response: 255.255.255.255

**:SYSTem:COMMunicate:LAN:PORT**

## Syntax:

```
:SYSTem:COMMunicate:LAN:PORT <DNPD>
:SYSTem:COMMunicate:LAN:PORT?
```

## Description:

This command allows to change port number. Interface must be restarted to take effect (see SYST:COMM:REST command).

## Parameters:

```
<DNPD>          Range 0 ... 9999 (default 23)
```

## Remarks:

Overlapped command  
Value is not affected by reset

## Example:

```
SYST:COMM:LAN:PORT 23
SYST:COMM:LAN:PORT? Response: 23
```

**:SYSTem:COMMunicate:LAN:HOST**

## Syntax:

```
:SYSTem:COMMunicate:LAN:HOST <CPD>
:SYSTem:COMMunicate:LAN:HOST?
```

## Description:

This command allows to change host name if DHCP is switched on. Interface must be restarted to take effect (see SYST:COMM:REST command).

## Parameters:

```
<CPD>          Upper alpha, lower alpha, digits, underscores and spaces are
                allowable. Maximum string size is 14 characters.
```

## Remarks:

Overlapped command  
Value is not affected by reset

## Example:

```
SYST:COMM:LAN:HOST OCM632_SNXXXXXX
SYST:COMM:LAN:HOST? Response: OCM632_SNXXXXXX
```

**:SYSTem:COMMunicate:LAN:DHCP**

## Syntax:

```
:SYSTem:COMMunicate:LAN:DHCP <BOOL>
:SYSTem:COMMunicate:LAN:DHCP?
```

## Description:

This command allows switch On/Off DHCP.

## Parameters:

```
<BOOL>          {ON|OFF|1|0} (default 1)
                .ON          DHCP is On
                .OFF         DHCP is Off
                .1           same as ON
                .0           same as OFF
```

## Remarks:

Overlapped command  
Value is not affected by reset

## Example:

```
SYST:COMM:LAN:DHCP ON
SYST:COMM:LAN:DHCP? Response: 1
```

**:SYSTem:COMMunicate:REStart**

Syntax:

:SYSTem:COMMunicate:REStart

Description:

This command will restart communication interface. It will take several seconds. During this period device will not respond to any commands. Restart is needed for all LAN setting changes.

Parameters:

None

Remarks:

Overlapped command

Example:

SYST:COMM:REST

**:SYSTem:COMMunicate:SERial:BAUD**

Syntax:

:SYSTem:COMMunicate:SERial:BAUD <CPD>

:SYSTem:COMMunicate:SERial:BAUD?

Description:

This command allows changing RS232 transfer rate.

Parameters:

<CPD>	{1200 2400 4800 9600 19200 38400 57600 115200}	(default 9600)
.1200	1200 Bd	
.2400	2400 Bd	
.4800	4800 Bd	
.9600	9600 Bd	
.19200	19200 Bd	
.38400	38400 Bd	
.57600	57600 Bd	
.115200	115200 Bd	

Remarks:

Overlapped command

Value is not affected by reset

Example:

SYST:COMM:SER:BAUD 9600

SYST:COMM:SER:BAUD? Response: 9600

**:SYSTem:DATE**

Syntax:

:SYSTem:DATE <DNPD>,<DNPD>,<DNPD>

:SYSTem:DATE?

Description:

This commands allows to change system device date.

Parameters:

<DNPD>	Year, Range 2000 ... 2063
<DNPD>	Month, Range 1 ... 12
<DNPD>	Day, Range 1 ... 31

Remarks:

Overlapped command

Example:

SYST:DATE 2012,12,31

SYST:DATE? Response: 2012,12,31

**:SYSTem:ERRor[:NEXT]?**

Syntax:

:SYSTem:ERRor[:NEXT]?

Description:

This command reads SCPI error (maximum 32) that occurred at first. If number of SCPI errors exceed 32, error -350 "Queue overflow" is returned. For all available error codes and messages see "SCPI Error codes" table. Error queue is cleared by reading all errors or by issuing \*CLS command.

Parameters:

<DNPD>            Error code  
<SPD>            Quoted error message

Remarks:

Overlapped command

Example:

SYST:ERR? Response: -300,"Device error"

**:SYSTem:KEY**

Syntax:

:SYSTem:KEY &lt;DNPD&gt;

:SYSTem:KEY?

Description:

This command allows send key code to the device the same way the user can press keys on front panel. Query returns last pressed key.

Key	Code
KEY_0	12
KEY_1	11
KEY_2	15
KEY_3	19
KEY_4	10
KEY_5	14
KEY_6	18
KEY_7	9
KEY_8	13
KEY_9	17
KEY_SELECT	25
KEY_ENTER	24
KEY_CANCEL	23
KEY_UP	2
KEY_DOWN	1
KEY_LEFT	3
KEY_RIGHT	4
KEY_EXPONENT	21
KEY_BACKSPACE	22
KEY_POINT	16
KEY_USER_1	5
KEY_USER_2	6
KEY_USER_3	7
KEY_USER_4	8
KEY_SIGN	20
KEY_OPER	26
KEY_STBY	27

Table 5 Keyboard codes

## Parameters:

<DNPD> Key code. For particular key codes see table above.

## Remarks:

Overlapped command

## Example:

SYST:KEY 12

SYST:KEY? Response: 12

**:SYSTem:LOCal**

## Syntax:

:SYSTem:LOCal

## Description:

This command places device in the LOCAL mode and unlocks all keys on front panel of the device. The Command is valid only for RS232, LAN and USB interfaces. The device will not respond to commands in LOCAL mode.

## Parameters:

None

## Remarks:

Overlapped command

## Example:

SYST:LOC

**:SYSTem:PRESet**

## Syntax:

:SYSTem:PRESet

## Description:

This command will preset all device settings. These settings are the same as the RESET ones.

## Parameters:

None

## Remarks:

Overlapped command

## Example:

SYST:PRES

**:SYSTem:REMote**

## Syntax:

:SYSTem:REMote

## Description:

This command places device in the REMOTE mode and locks all keys but LOCAL key. The Command is valid only for RS232, LAN and USB interfaces. The device will not respond to any other command until is in REMOTE mode.

## Parameters:

None

## Remarks:

Overlapped command

## Example:

SYST:REM

**:SYSTem:RWLock**

## Syntax:

:SYSTem:RWLock

## Description:

This command places device in the REMOTE mode and locks all keys including LOCAL key. The Command is valid only for RS232, LAN, USB interfaces. The device will not respond to any other command until is in REMOTE mode.

## Parameters:

None

## Remarks:

Overlapped command

## Example:

SYST:RWL

**:SYSTem:TIME**

## Syntax:

:SYSTem:TIME &lt;DNPD&gt;,&lt;DNPD&gt;,&lt;DNPD&gt;

:SYSTem:TIME?

## Description:

This commands allows set system device time (RTC).

## Parameters:

&lt;DNPD&gt; Hours, Range 0 ... 23

&lt;DNPD&gt; Minutes, Range 0 ... 59

&lt;DNPD&gt; Seconds, Range 0 ... 59

## Remarks:

Overlapped command

## Example:

SYST:TIME 10,45,15

SYST:TIME? Response: 10,45,15

**:SYSTem:VERSion?**

## Syntax:

:SYSTem:VERSion?

## Description:

This query retrieves version of implemented SCPI language

## Parameters:

&lt;CPD&gt; SCPI language version

## Remarks:

Overlapped command

## Example:

SYST:VERS? Response: 1999.0

**:UNIT:TEMPerature**

## Syntax:

:UNIT:TEMPerature &lt;CPD&gt;

:UNIT:TEMPerature?

## Description:

This function allows to set unit for all temperature functions (Platinum, Nickel).

## Parameters:

&lt;CPD&gt; {CEL|FAR|K} (default CEL)

·CEL degrees of Celsius

·FAR degrees of Fahrenheit

·K Kelvin

## Remarks:

Overlapped command

Value is not affected by reset

## Example:

UNIT:TEMP CEL

UNIT:TEMP? Response: CEL

**6.10. SCPI Error codes**

The Decade distinguishes following SCPI error codes. These codes are reported on the display screen or can be read by SYST:ERR? Command.

<b>Error</b>	<b>Message</b>
-100	"Command error"
-101	"Invalid character"
-102	"Syntax error"
-103	"Invalid separator"
-104	"Data type error"
-105	"GET not allowed"
-108	"Parameter not allowed"
-109	"Missing parameter"
-112	"Program mnemonic too long"
-113	"Undefined header"
-114	"Header suffix out of range"
-120	"Numeric data error"
-121	"Invalid character in number"
-130	"Suffix error"
-141	"Invalid character data"
-144	"Character data too long"
-151	"Invalid string data"
-161	"Invalid block data"
-203	"Command protected"
-220	"Parameter error"
-222	"Data out of range"
-283	"Illegal variable name"
-350	"Queue overflow"
-400	"Query error"
-410	"Query INTERRUPTED"
-420	"Query UNTERMINATED"
-430	"Query DEADLOCKED"
-440	"Query UNTERMINATED after indefinite response"
514	"Command not allowed with GPIB"

**Table 6 SCPI error codes**

### 6.11. Compatible Commands

Decade box also responds to “Old style” command syntax to provide compatibility with previous decade box models.

#### **Value setting / reading**

##### **A (?) <DNPD>**

The command sets resistance value (resistance function) or temperature value (temperature sensor simulating function).

<DNPD>

It represents resistance value in Ohm or simulated temperature in selected temperature unit. When temperature parameter is used, both negative and positive values are acceptable. For resistance parameter positive value only is acceptable. Limit values are shown in chapter “Technical data”.

In case of control, the decade confirms correct setting with string „Ok<cr><lf>”.

In case of query, OCM632 returns set resistance/temperature value in the same format as it is on the display (number of decimal places). For example value -120 °C is returned as -120.000<cr><lf>. Positive numbers are sent without polarity sign.

#### **Example :**

Command „A123.564 <cr>” sets temperature 123.564 °C if decade is in temperature simulation function and 123.564 Ω if decade is in resistance function.

If query „A?<cr>” is sent, decade returns response in format „123.564<cr><lf>”.

#### **Decade function setting**

##### **F <CPD> { 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | S | O }**

Following function can be set:

- 0 resistance mode
- 1 Pt385 (68) temperature sensor simulation
- 2 Pt385 (90) temperature sensor simulation
- 3 Pt3916 temperature sensor simulation
- 4 Ni temperature sensor simulation
- 5 User platinum temperature sensor simulation
- 6 Pt3926 temperature sensor simulation
- 7 User function simulation
- S Short
- O Open

OCM632 confirms execution with string „Ok<cr><lf>”.

#### **Example :**

„F1<cr>” sets Pt100 sensor simulation.

**I/D (device identification)****\*IDN?**

Response contains name of manufacturer, model type number, serial number, firmware version

**Example :**

If query „\*IDN?<cr>” is sent, decade returns response:  
„ORBIT,OCM632,622351,1.2 <cr><lf>“.

**R0 setting / reading****R (?) <DNPD>**

Command sets resistance value R0 at temperature 0 °C. Set value R0 is valid for all types of simulated temperature sensors.

<DNPD>

It represents resistance value R0 in Ω. Limits are shown in chapter Technical data. OCM632 confirms execution with string „Ok<cr><lf>”. In case of query OCM632 returns set value in Ω.

**Example :**

„R100<cr>” sets value R0 to 100 Ω (Pt100, Ni100).

After query „R?<cr>” decade returns string „100<cr><lf>”.

**Temperature unit setting****U <CPD> { 0 | 1 | 2 }**

Command sets used temperature unit.

- 0 sets degree Celsia °C
- 1 sets degree Fahrenheita °F
- 2 sets Kelvin unit K

OCM632 confirms execution with string „Ok<cr><lf>”.

**Example :**

„U0<cr>” sets °C as temperature unit.

**Status reading****V?**

OCM632 returns device status in form „FxUx<cr><lf>”. On positions of signs „x” there are values corresponding to the actual status of decade.

**Example :**

After query „V?<cr>” decade returns for example string „F2U0<cr><lf>”, which means Pt (90), °C actual setting.

Correctly executed command is confirmed with string "Ok<cr><lf>. When correct query is received OCM632 returns response in above described format. All commands must contain sign <cr> or <lf> at the end. Both small and large letters can be used.

## 6.12. Demo program

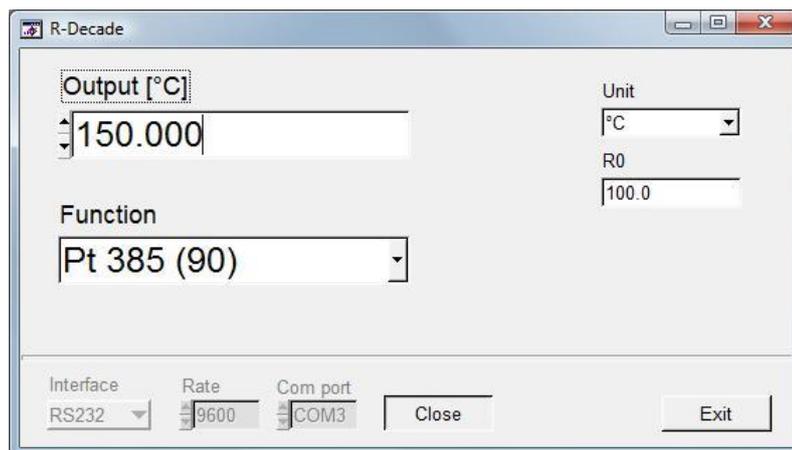
A simple operating program is supplied with the decade in order to provide easy operation of the instrument from the computer, and to check the RS-232 line (GPIB, USB bus) of the instrument. The installation CD ROM contains the communication program. The function and the value can be set. For GPIB connection this Demo Program requires properly configured National Instruments IEEE488 card.

### Installing the program

Insert the CD into the CD ROM drive. Wait for autorun and select “Software installation” and “R DECADE” or start direct „install\freeware\R\_Decade\en\setup.exe“. When SETUP.EXE is started, the installation program asks for the destination directory (pre-defined is R Decade) and executes the actual installation. The UNINST.EXE program is also copied into the selected directory for alternative delete of the directory from the system.

### Program description

When “R decade” program is started, following control panel is displayed:



**Figure 20 Resistance decade application software**

All communication parameters (Interface, Rate, COM port or GPIB address) have to be set before applying the key Open (Close). For RS232 the serial port number (Com port) and the Baud Rate have to be set. For GPIB only the address has to be set. After pressing “Open”, the program checks if the instrument is connected. When connected correctly, the appropriate control windows are activated. The output can be set by typing the required value into the window “Output” or with mouse by activating arrows up or down.

The program can be terminated with “Exit”.

## 7. Maintenance

This chapter explains how to perform the routine maintenance to keep the device in optimal operating condition:

- Fuse replacing
- External surface cleaning

### 7.1. Fuse replacing

The fuse is located in the mains connector at the rear panel. Replace it as follows:

- Switch off the power
- Remove the power cord from the mains connector at the rear panel.
- Insert the blade of a flat screwdriver into the opening cut in the mains voltage selector and pull out the fuse holder.
- Remove the fuse and replace it with new one of the same rating.

### 7.2. External surface cleaning

Clean the case and front panel keys by using a soft cloth slightly dampened with water or a non-abrasive mild cleaning solution that is not harmful to plastics.

## 8. Module 19" (version OCM632-Vxx1x)

Option: 19" front panel 3HE.



Figure 21 Module 19" rack, front panel

## 9. Specifications

<b>Resistance range</b>	1 $\Omega$ ... 1 M $\Omega$ SHORT, OPEN terminals
<b>Pt sensor temperature simulation</b>	-200.000 $^{\circ}\text{C}$ ... 850.000 $^{\circ}\text{C}$ (-328 $^{\circ}\text{F}$ ... 1562 $^{\circ}\text{F}$ )
<b>Ni sensor temperature simulation</b>	-60.000 $^{\circ}\text{C}$ ... 300.000 $^{\circ}\text{C}$ (-76 $^{\circ}\text{F}$ ... 572 $^{\circ}\text{F}$ )
<b>Type of temperature sensors</b>	Pt10 ... Pt20000, Ni10 ... Ni20000
<b>Resolution</b>	from 0.01 m $\Omega$
<b>Pt temperature standards</b>	IEC 751 (1,3850 for IPTS68) (A=3.90802e-3, B=-5.80195e-7, C=-4.2735e-12) IEC 751 (1,3851 for ITS90) (A=3.9083e-3, B=-5.775e-7, C=-4.18301e-12) 1,3916 (A=3.9692e-3, B=-5.8495e-7, C=-4.2325e-12) 1,3926 (A=3.9848e-3, B=-5.870e-7, C=-4.0e-12)
<b>Ni temperature standards</b>	DIN 43760 (6180) (A=5.485e-3, B=6.65e-6, C=2.805e-11, D=-2e-17)
<b>Temperature coefficient</b>	< 1 ppm/ $^{\circ}\text{C}$
<b>Maximal dissipation power</b>	0.25 W
<b>Maximal current</b>	0.5 A
<b>Maximal voltage</b>	200 Vpk
<b>Reaction time *</b>	6 ms
<b>Terminals</b>	instrument terminals diameter 4mm, gold plated
<b>Interface</b>	RS232 (optionally IEEE488, USB, Ethernet)
<b>Power supply</b>	115/230 Vac, 45...65 Hz, 15VA
<b>Reference temperature</b>	+20 $^{\circ}\text{C}$ ... +26 $^{\circ}\text{C}$
<b>Working temperature</b>	+5 $^{\circ}\text{C}$ ... +40 $^{\circ}\text{C}$
<b>Storing temperature</b>	-10 $^{\circ}\text{C}$ ... +50 $^{\circ}\text{C}$
<b>Housing</b>	metal case
<b>Dimensions</b>	W 390 mm, H 128 mm, D 310 mm
<b>Weight</b>	5.2 kg
<b>Isolation resistance</b>	> 2 G $\Omega$ @ 500V DC, (output terminals and housing)

\* *Reaction time means time interval between setting the value from front panel or receiving command from remote control and settling the value at the output terminals. The value is valid for FAST switching mode.*

**Note:** *Only the data shown with tolerance or with band of limits are tested. All other values have informative character.*

**Accuracy**

The specified accuracies are valid after 10 minutes warm up in a laboratory environment and temperature  $23 \pm 3^\circ\text{C}$ .

Uncertainties include long-term stability, temperature coefficient, linearity, load and line regulation and traceability of factory to National Calibration Standards. Accuracies in % are related to the set value. Specified accuracies are valid for one year.

**OCM632 Resistance accuracy**

Range / Resolution	Accuracy
1.000 00 $\Omega$ - 2.000 00 $\Omega$	0.002 % + 2 m $\Omega$
2.000 1 $\Omega$ - 20.000 0 $\Omega$	
20.001 $\Omega$ - 200.000 $\Omega$	
200.01 $\Omega$ - 2000.00 $\Omega$	0.003 %
2.000 1 k $\Omega$ - 20.000 0 k $\Omega$	
20.001 k $\Omega$ - 200.000 k $\Omega$	
200.01 k $\Omega$ - 1200.00 k $\Omega$	0.005 %

Table 7 OCM632 Resistance accuracy

**OCM632 Pt Simulation accuracy**

Temperature	Accuracy Pt10 ... Pt99	Accuracy Pt100 ... Pt20000
-200.000...0.000 $^\circ\text{C}$	0.05 $^\circ\text{C}$	0.01 $^\circ\text{C}$
0.001...200.000 $^\circ\text{C}$	0.06 $^\circ\text{C}$	0.015 $^\circ\text{C}$
200.001...500.000 $^\circ\text{C}$	0.08 $^\circ\text{C}$	0.03 $^\circ\text{C}$
500.001...850.000 $^\circ\text{C}$	0.1 $^\circ\text{C}$	0.04 $^\circ\text{C}$

Table 8 OCM632 Pt simulation accuracy

**OCM632 Ni Simulation accuracy**

Range	Accuracy Ni10 ... Ni99	Accuracy Ni100 ... Ni2000
-60.000 ... 300.000	0.05 $^\circ\text{C}$	0.01 $^\circ\text{C}$

Table 9 OCM632 Ni simulation accuracy

**OCM632 Frequency response**

R	AC/DC		
	100 Hz	1 kHz	10 kHz
1 $\Omega$	0.01 %	0.02 %	0.2 %
10 $\Omega$	0.01 %	0.01 %	0.04 %
100 $\Omega$	0.01 %	0.05 %	0.5 %
1 k $\Omega$	0.05 %	0.5 %	5 %
10 k $\Omega$	0.5 %	5 %	
100 k $\Omega$	5 %		

Table 10 OCM632 Frequency Response

**Short and Open**

When **Short** is selected, the output resistance is lower than 60 m $\Omega$ . Maximum allowed current is 500 mA.

When **Open** is selected, the output resistance is higher than 1 G $\Omega$ . Maximum allowed voltage is 200 Vp-p.

**Note:** The resistance values in range 1  $\Omega$  - 1.2 M $\Omega$  are calibrated absolutely. Resistance value is not defined against SHORT position. Short and Open positions are intended only for functional checking of instruments under test.

## 10. Ordering information – Options

**OCM632-V1xxx** - RS232  
**OCM632-V2xxx** RS232, LAN, USB, IEEE488

*Housing*

**OCM632-Vxx0x** - table version  
**OCM632-Vxx1x** - module 19", 3HE

Example of order:

OCM632-V2010  
Programmable decade 1 $\Omega$  - 1.2M $\Omega$ , RS232, LAN, USB, IEEE488, 19" front

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