

Mini-MW Series
Space-saving Dual Output Signal Conditioners

PC CONFIGURATOR SOFTWARE

Model: W2CFG

Users Manual

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1. INTRODUCTION

1.1 GENERAL DESCRIPTION

The W2CFG is used to program parameters for Mini-MW (W2) Series Space-saving Dual Output Signal Conditioners (referred hereunder as 'device'). The following major functions are available:

- Edit parameters online (connected to the device) in real time
- Edit parameters offline (not connected to the device)
- Download parameters to the device, upload parameters from the device
- Save parameters as files, read parameters from files
- Compare parameters edited on the screen with the ones stored in the device

1.2 APPLICABLE DEVICES

The W2CFG is applicable to the following products:

| Function | Model No. | Symbol | Version |
|---------------------------|-----------|----------|---------|
| RTD Transmitter | W2XR | R | 1.00 |
| Potentiometer Transmitter | W2XM | M | 1.10 |
| Thermocouple Transmitter | W2XT | T | 1.20 |
| Linearizer | W2XF | V | 1.20 |

The lowest software version applicable to each hardware model is indicated in the above table. Confirm that the software you have is compatible with the hardware you have.

The latest version of the W2CFG is downloadable at our web site if you need higher version software.

In this manual, descriptions given with the above symbols are applied only to the models those symbols are assigned to. Other descriptions with no specific symbol are applied to all models.

1.3 PC REQUIREMENTS

The following PC performance is required for adequate operation of the W2CFG.

| | |
|--------------|--|
| PC | IBM PC compatible |
| OS | Windows 7 (32-bit, 64-bit), Windows 10 (32-bit, 64-bit). The software may not operate adequately in certain conditions. |
| Network port | COM port (RS-232-C) or USB port (COM1 through COM16) |

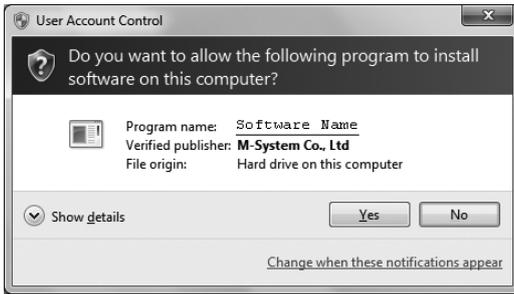
One of the following PC Configurator Cables is also required to connect the transmitter device to the PC.

| | |
|----------|-----------------------------|
| Port | PC Configurator Cable Model |
| RS-232-C | MCN-CON |
| USB | COP-US |

1.4 INSTALLING & DELETING THE PROGRAM

The program is provided as compressed archive. Decompress the archive and execute 'setup.exe' to start up the W2CFG installer program. Follow instructions on the Windows.

For Windows 7, log on as administrator but you still need to clarify your administrative right before proceeding. When User Account Control window appears, choose 'Allow.'



Note: 'W2CFG' is displayed instead of 'Software name.'

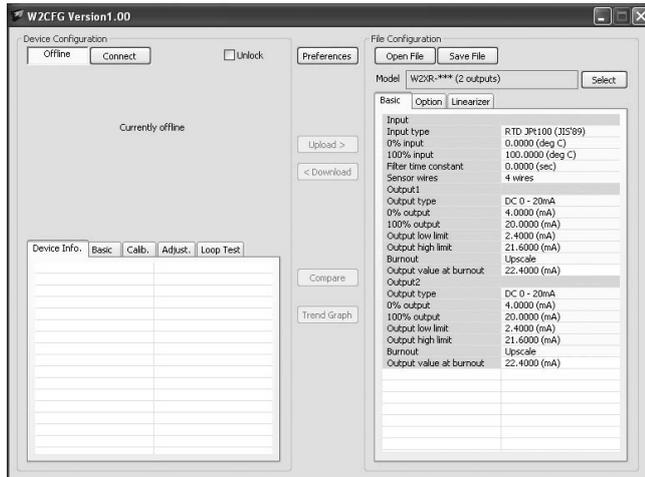
DELETE

Open Control Panel > Add/Remove Programs. Select the 'W2CFG' from the program list and click Delete button.

2. GETTING STARTED

2.1 STARTING THE W2CFG

Open Program > M-SYSTEM > Configurator > W2 Series to start up the W2CFG on the Windows PC. The following window appears on the screen.

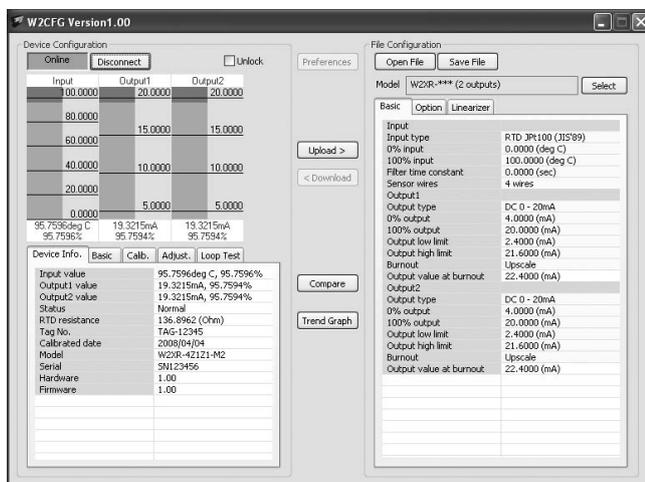


2.2 CONNECTING TO THE DEVICE

- 1) Click [Preferences] button at the top center of the screen.
- 2) Choose the COM port number to which the device is to be connected. Once one of the COM port is specified after the PC Configurator has been installed and started, you do not need to repeat the setting procedure until you want to change the COM port setting.
- 3) Connect the device to the PC's COM port with the PC Configurator Cable and click [Connect] button.
- 4) The device's present parameters are uploaded and shown on the screen.

[Connect] button is now replaced with [Disconnect] button.

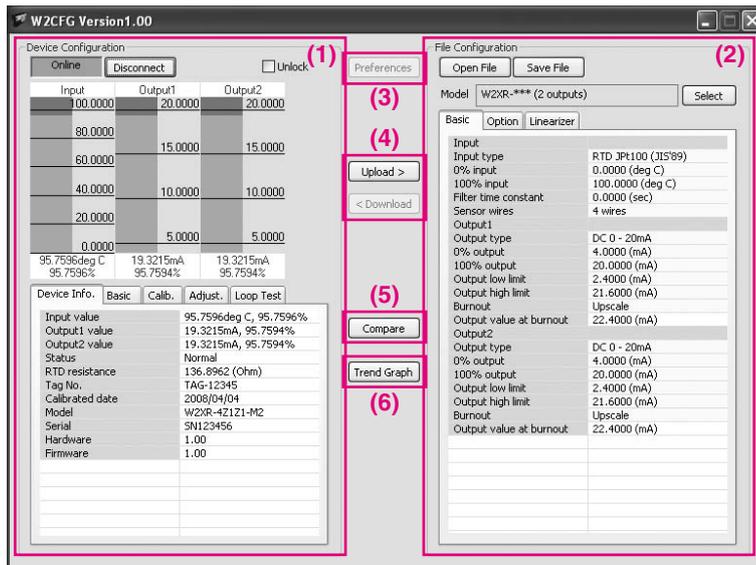
The bargraphs on the screen show real time I/O status of the device, and you can now access to the menu tabs such as Device Info, Basic, Calibration, Adjustments, and Loop Test.



When the cable is disconnected, the device info returns to blank status and the PC Configurator is ready to be connected to another device. In order to continue, just connect a new device. You do not need to click [Connect] button.

2.3 BASIC OPERATIONS

2.3.1 SCREEN COMPONENT IDENTIFICATION



(1) Device Configuration

Shows the parameters of the device presently connected online. You can edit these parameters in real time.

Three bargraphs are used to monitor the input and output levels of the device.

(2) File Configuration

Used to create and edit parameter sets on the PC. You can upload a parameter set from a device, edit it and download it to the device again.

(3) Preferences

Opens Preferences window to set up language, temperature unit, COM port, etc. used in the Configurator Software.

(4) Upload / Download

Used to read parameter setting in the device and to write one to the device.

(5) Compare

Opens Compare window to compare edited parameters from actual setting.

(6) Trend Graph

Opens Trend Graph window to show a trend graph for the connected device.

2.3.2 DEVICE INFO – DEVICE INFORMATION

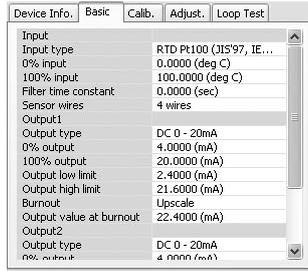
Shows the present I/O data and status, last calibration date, model number and other information.

| Device Info. | Basic | Calib. | Adjust. | Loop Test |
|-----------------|------------------------|--------|---------|-----------|
| Input value | 95.7596deg C, 95.7596% | | | |
| Output1 value | 19.3215mA, 95.7594% | | | |
| Output2 value | 19.3215mA, 95.7594% | | | |
| Status | Normal | | | |
| RTD resistance | 136.8962 (Ohm) | | | |
| Tag No. | TAG-12345 | | | |
| Calibrated date | 2008/04/04 | | | |
| Model | W2XR-4Z1Z1-M2 | | | |
| Serial | 5N123456 | | | |
| Hardware | 1.00 | | | |
| Firmware | 1.00 | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| Name | Explanations |
|-----------------|---|
| Input value | Shows the current input value in engineering unit and in percent. |
| Output 1 value | Shows the current output 1 value in engineering unit and in percent. |
| Output 2 value | Shows the current output 2 value in engineering unit and in percent. |
| Status | Shows the current device status. Normal The device is operating in normal parameters. Output limit The device outputs are at the pre-defined high or low limits. Burnout The input wire is broken. Fixed output The device in the loop test mode, supplying a fixed output. |
| RTD resistance | Shows the resistance measured at the RTD sensor. |
| TC voltage | Shows the emf measured at the thermocouple sensor. |
| CJM temperature | Shows the terminal temperature measured with CJC sensor. |
| Tag No. | Shows the device's tag name. When 'Unlock' box located above Device Info tab is checked, the tag can be modified. Enter at the maximum of 16 alphanumeric characters. |
| Calibrated date | Shows the date when the last calibration was conducted. |
| Model | Model number of the device This is the original model number at our factory. Actual model suffix codes may differ if the device setting has been changed at site. |
| Serial | Serial number of the device |
| Hardware | Hardware revision number of the device |
| Firmware | Firmware revision number of the device |

2.3.3 BASIC – BASIC SETTING

Shows basic I/O setting of the device. Parameter items on the screen may change depending upon models.



When 'Unlock' box located above Device Info tab is checked, modifiable parameters are highlighted on the light orange background. Click one of such parameters and to show a pull-down list or an edit box to modify it.

For example, the Input Type is selected on a pull-down list (See the example below – left). Another example for an edit box is given by Filter Time Constant (See the example below – right). Enter an appropriate value and press Enter key.

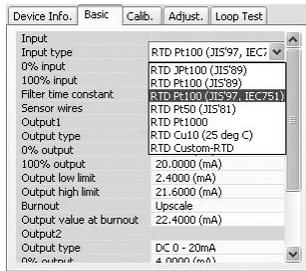


Figure: Pull-down list.

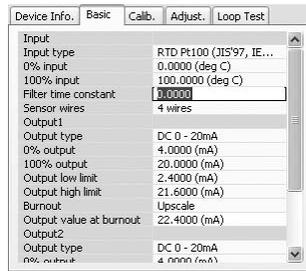


Figure: Edit box.

Model specific parameter items are explained in Section 4.

2.3.4 CALIB – CALIBRATION

The device's calibration ranges (actual input and output ranges such as 4 to 20 mA or 1 to 5 V) can be setup using a simulated input signals.

Input Calibration

- 1) Click [Start Calib.] button under Input Calibration. The maximum usable range of the selected input type is read into the value fields.
- 2) Apply a simulated 0% input signal and click [0% Calib.] button. The simulated input is read in.
- 3) Apply a simulated 100% input signal and click [100% Calib.] button. The simulated input is read in.

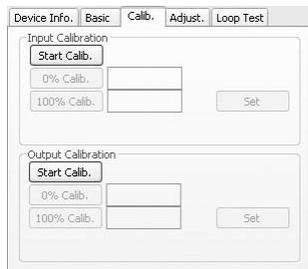


Figure: Start input calibration.

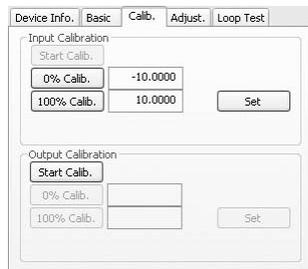


Figure: Max. usable range $\pm 10V$.

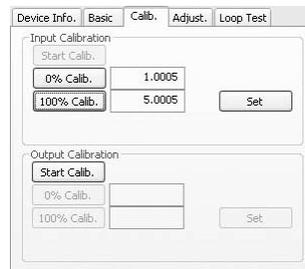


Figure: Calibrated range set to 1 to 5V.

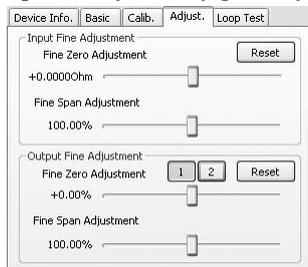
- 4) Click [Set] button to apply the calibration range to the device.

Output Calibration

- 1) Click [Start Calib.] button under Output Calibration.
- 2) Vary the simulated input signal levels until the monitored output shows a desired 0% output. Click [0% Calib.] button. The simulated output is read in.
- 3) Vary the simulated input signal levels until the monitored output shows a desired 100% output. Click [100% Calib.] button. The simulated output is read in.
- 4) Click [Set] button to apply the calibration range to the device.

2.3.5 ADJUST – FINE ADJUSTMENTS

Fine adjustments can be conducted independently for the input and the output. Zero is adjusted by offset adjustment, while Span is adjusted by gain adjustment.



Input Fine Adjustment

- 1) Apply 0% input signal.
- 2) Adjust the sliding potentiometer until the monitored input signal shows 0% input.
- 3) Apply 100% input signal.
- 4) Adjust the sliding potentiometer until the monitored input signal shows 100% input.

Output Fine Adjustment

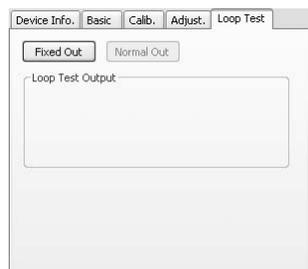
Click [1] or [2] button to switch between Output 1 and Output 2.

- 1) Apply 0% input signal.
- 2) Adjust the sliding potentiometer until the monitored output signal shows 0% output.
- 3) Apply 100% input signal.
- 4) Adjust the sliding potentiometer until the monitored output signal shows 100% output.

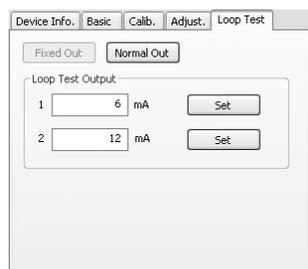
2.3.6 LOOP TEST

The device output signal can be simulated without actual input signals to conduct a loop test.

1) Click [Fixed Out] button.



2) Enter a desired output value and click [Set].



3) Click [Normal Out] button to cancel the loop test mode.

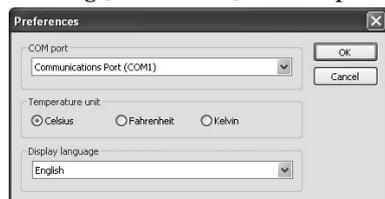
Caution !

Be sure not to forget to return the device to the normal output mode after the loop test. The loop test mode is not canceled until the power supply to the device is turned off.

2.4 PREFERENCES

General settings and preferences for the Configurator Software.

Clicking [Preferences] button opens Preferences window as shown below.



COM port

Choose one of the COM ports used to communicate with the device.

Temperature unit

Choose among the following:

Celsius

Fahrenheit

Kelvin

The device internally processes temperature in Celsius (°C), and converts the value into Fahrenheit (°F) or Absolute Temperature (K) to show on the screen.

This means certain Fahrenheit values cannot be set and displayed exactly down to the limit of fractions.

When you enter a value in Fahrenheit, fractions of values converted into Celsius are rounded to four (4) decimal places before it is internally processed, then converted again into Fahrenheit to be displayed on the screen, its result's fractions rounded again.

For example:

Entering 96 [°F] is converted internally into $(96 - 32) / 1.8 = 35.5555\dots$, rounded to 35.5556. Then it is converted again into $35.5556 \times 1.8 + 32 = 96.00008$, rounded to 96.0001 [°F] on the screen.

Display language

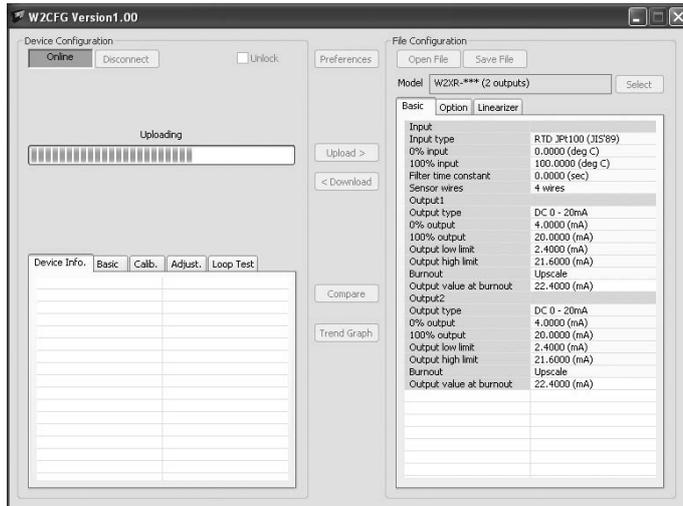
Switches the display language. Clicking the button switches between English and Japanese.

The program starts up in English mode as initial state when the OS is other than Japanese version. You can switch to Japanese only when the OS supports Japanese language.

2.5 READING/Writing PARAMETERS

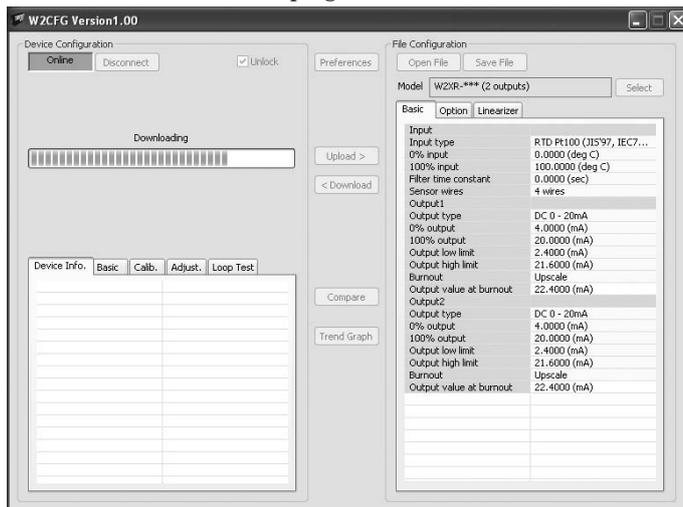
2.5.1 READING PARAMETERS FROM DEVICE (UPLOAD)

Confirm the device connection (cable and software link) and click [Upload] to start reading parameters stored in the connected device. A progress bar is indicated on the screen and when the uploading is complete, the parameters are shown on File Configuration field.



2.5.2 WRITING PARAMETERS TO DEVICE (DOWNLOAD)

Confirm the device connection (cable and software link) and click [Download] to start writing parameters edited on the screen to the connected device. A progress bar is indicated on the screen until the downloading is complete.



Caution !

DO NOT turn off the power supply to the device or disconnect the cable while downloading. The device setting may not be complete as expected.

2.6 COMPARING PARAMETERS

Parameters presently edited on the screen and those stored in the connected device can be compared side by side. Edited parameters could be from a file if you open one in advance, or another device if you uploaded one in advance.

Clicking [Compare] button starts reading parameters from the connected device. Parameters are compared and listed on the screen side by side. The rows showing differences between two sets of parameters are highlighted in red background. The total number of non-matching cases is mentioned at the bottom.

| Group | Parameter Name | Device Configuration | File Configuration |
|-----------------|---------------------------|---------------------------|---------------------------|
| Input | Input type | RTD Pt100 (JIS'97, IEC... | RTD Pt100 (JIS'97, IEC... |
| Input | 0% input | 0.0000 (deg C) | 0.0000 (deg C) |
| Input | 100% input | 100.0000 (deg C) | 100.0000 (deg C) |
| Input | Filter time constant | 0.0000 (sec) | 1.0000 (sec) |
| Input | Sensor wires | 4 wires | 4 wires |
| Output1 | Output type | DC 0 - 20mA | DC 0 - 20mA |
| Output1 | 0% output | 4.0000 (mA) | 4.0000 (mA) |
| Output1 | 100% output | 20.0000 (mA) | 20.0000 (mA) |
| Output1 | Output low limit | 2.4000 (mA) | 2.4000 (mA) |
| Output1 | Output high limit | 21.6000 (mA) | 21.6000 (mA) |
| Output1 | Burnout | Upscale | Upscale |
| Output1 | Output value at burnout | 22.4000 (mA) | 22.4000 (mA) |
| Output2 | Output type | DC 0 - 20mA | DC 0 - 20mA |
| Output2 | 0% output | 4.0000 (mA) | 4.0000 (mA) |
| Output2 | 100% output | 20.0000 (mA) | 20.0000 (mA) |
| Output2 | Output low limit | 2.4000 (mA) | 2.4000 (mA) |
| Output2 | Output high limit | 21.6000 (mA) | 21.6000 (mA) |
| Output2 | Burnout | Upscale | Upscale |
| Output2 | Output value at burnout | 22.4000 (mA) | 22.4000 (mA) |
| Fine adjustment | Input fine zero adjust. | +0.0000 (Ohm) | +0.0000 (Ohm) |
| Fine adjustment | Input fine span adjust. | 100.0000 (%) | 100.0000 (%) |
| Fine adjustment | Output1 fine zero adjust. | +0.0000 (%) | +0.0000 (%) |
| Fine adjustment | Output1 fine span adjust. | 100.0000 (%) | 100.0000 (%) |
| Fine adjustment | Output2 fine zero adjust. | +0.0000 (%) | +0.0000 (%) |
| Fine adjustment | Output2 fine span adjust. | 100.0000 (%) | 100.0000 (%) |
| Custom RTD | Custom RTD type | Table | Table |
| Custom RTD | Coefficient R0 | 0 | 0 |
| Custom RTD | Coefficient A | 0 | 0 |
| Custom RTD | Coefficient B | 0 | 0 |
| Custom RTD | Coefficient C | 0 | 0 |

1 parameter(s) not matching.

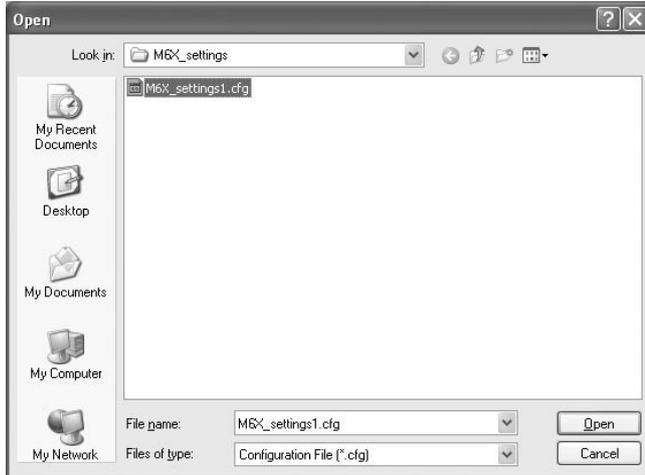
Close

2.7 FILES

2.7.1 READING PARAMETERS SAVED AS FILE

Clicking [Open File] calls up the Windows-standard Open dialog box. Select a parameter file to show a stored parameter setting.

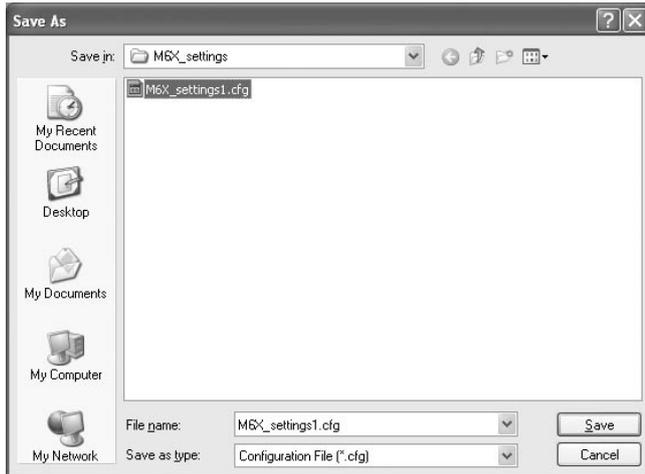
In order to download the parameters to the connected device, click [Download] button.



2.7.2 SAVING PARAMETERS IN A FILE

Clicking [Save File] calls up the Windows-standard Save As dialog box. Enter a desired file name to File Name field and click [Save] to store a parameter setting.

In order to save the parameters of the connected device, click [Upload] first and then save them as a file.



2.7.3 OFFLINE OPERATION

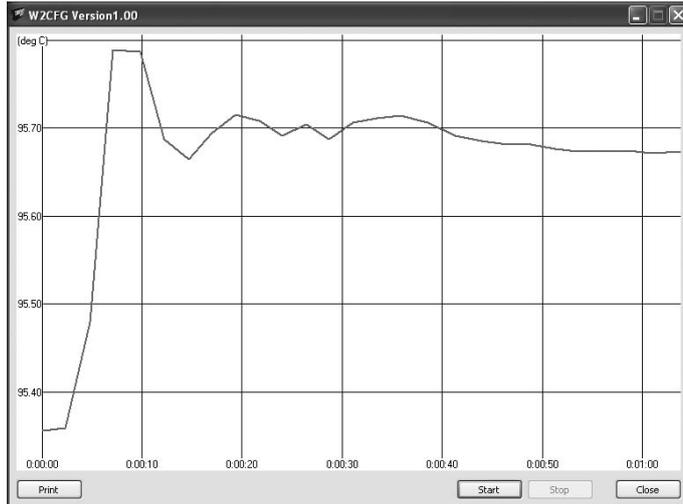
The parameters under File Configuration on the right side of the window can be edited freely regardless of the status of the connection or the connected device.

With a device connected online, only the parameters under Basic tab under Device Configuration can be edited in real time. In the offline state, all parameters under File Configuration including Linearizer and Option setting can be edited.

If you want to modify setting for the connected device, first upload the parameters from the device, edit them and then download them to the device.

2.8 TREND GRAPH

Input signal to the device can be monitored on a trend graph. The trend is recorded and displayed in 1 second intervals.



Click [Start] to start recording and displaying in real time.

Click [Stop] to stop monitoring, and the recorded trend graph can be studied more closely by scrolling and enlarging the screen:

| Mouse | Screen |
|-----------------------------------|--|
| Press left mouse button and drag | Scrolls the screen to all directions. |
| Press right mouse button and drag | Forms an area on the screen to enlarge and fit it to the full-screen area when the mouse button is released. |
| Double-click left mouse button | Display range is reduced by half (trend curve is zoomed in). |
| Double-click right mouse button | Display range is doubled (trend curve is zoomed out). |

[Print] is available only when the monitoring is stopped by [Stop] button.

Click [Print] to print the trend graph presently displayed on the screen.

3. HOW TO SETUP I/O (EXAMPLE)

Basic input/output range setting is as in the following.

The input of the W2XR is to be configured to Pt 100 (JIS '97, IEC), 0 to 100°C and output range to 1 to 5 Vdc in the below example.

3.1 CONNECTING TO THE DEVICE

Start up the W2CFG software. Confirm the COM port to which the device is connected and click [Connect]. Present parameter setting is uploaded and displayed under Device Configuration on the screen. Check 'Unlock' box so that you can now change the parameters.

3.2 INPUT TYPE & RANGE

1) Click [Input type] field. Choose an input type adequate for the desired range from the list below.

RTD JPt 100 (JIS '89)
RTD Pt 100 (JIS '89)
RTD Pt 100 (JIS '97, IEC)
RTD Pt 50 (JIS '81)
RTD Pt 1000
RTD Cu 10 (25 degC)
RTD Custom RTD

Choose the input type 'RTD Pt 100 (JIS '97, IEC).'

2) Click [0% input] field. The input range is automatically set to the full-scale of the selected input type. Enter the scaled 0% input value (0.0000).

3) Click [100% input] field. Enter the scaled 100% input value (100.0000).

3.3 OUTPUT RANGE

1) Click [Output type] field. Choose an output type adequate for the desired range from the list below.

DC 0 – 20mA
DC -5 – +5V
DC -10 – +10V

For 1 – 5 Vdc input, choose the input type 'DC -10 – +10V.'

2) Click [0% output] field. The output range is automatically set to the full-scale of the selected output type. Enter the scaled 0% output value (1.0000). Use the same engineering unit as for the type.

3) Click [100% output] field. Enter the scaled 100% output value (5.0000).

3.4 OTHER SETTING

The W2XR has more variety of functions than explained in the previous sections, including filter time constant setting and linearizations. Basic procedure is mostly the same as the above example.

Linearizer and Option setting must be edited offline. Upload the present setting to the PC (See 2.5.1), edit the file and then download the new setting (See 2.5.2).

For detailed explanations, please refer to Section 4. PARAMETER DETAILS.

4. PARAMETER DETAILS

4.1 BASIC SETTING – INPUT

4.1.1 INPUT TYPE

Choose among the following sensor types:

| Symbol | Selection |
|--------------|---------------------------|
| R | RTD JPt 100 (JIS '89) |
| | RTD Pt 100 (JIS '89) |
| | RTD Pt 100 (JIS '97, IEC) |
| | RTD Pt 50 (JIS '81) |
| | RTD Cu 10 (25 deg C) |
| | RTD Pt 1000 |
| | RTD Custom RTD |
| M | POT 0 – 10 kOhm |
| | POT 0 – 3.5 kOhm |
| | POT 0 – 1.5 kOhm |
| | POT 0 – 600 Ohm |
| | POT 0 – 300 Ohm |
| | POT 0 – 150 Ohm |
| | POT 0 – 75 Ohm |
| T | TC (PR) |
| | TC K (CA) |
| | TC E (CRC) |
| | TC J (IC) |
| | TC T (CC) |
| | TC B (RH) |
| | TC R |
| | TC S |
| | TC C (WRe5-26) |
| | TC N |
| | TC U |
| | TC L |
| | TC Platinel II |
| TC Custom TC | |
| V | 0 – 50 mA DC |
| | -1000 – 1000 mV DC |
| | -10 – 10 V DC |

4.1.2 0% INPUT, 100% INPUT

Calibrated (scaled) input range.

4.1.3 FILTER TIME CONSTANT

First order lag filter. Time constant, time required for an step input to track and reach approx. 63% of the full-scale, is selectable from 0.5 to 30 seconds. No filter is applied when set to 0.

4.1.4 SENSOR WIRES **R**

Choose either 2 wires, 3 wires or 4 wires.

4.1.5 COLD JUNCTION COMPENSATION **T**

Specifies either the CJC sensor incorporated to the device is used to measure the cold junction temperature or a preset fixed terminal temperature, 0°C (32°F) is used for cold junction compensation.

4.1.6 RESPONSE TIME **V**

Specifies either standard or fast response time.

4.1.7 RESPONSE CHARACTERISTICS

Choose input response characteristic among the following:

Standard

Normal response of signal conditioners. For normal input signal, the fluctuation in the output is small and the output stabilizes. On the other hand, the output may not respond to small variation in the input signal.

High sensitivity

The response time to very small variation in input signal will be short. On the other hand, the fluctuation in the output may be large for normal input signal.

High sensitivity is available with the versions shown below or later. For the models not shown in the table, high sensitivity is available with all versions.

| MODEL | VERSION |
|-------|---------|
| W2XM | 1.10 |
| W2XR | 1.10 |

4.2 BASIC SETTING – OUTPUT 1 & 2

The W2 series devices provide two isolated outputs. The following parameters are independently selectable for each output.

4.2.1 LINEARIZER M V

The output can be either proportional to the input (Linear) or calibrated using a segment characteristics defined in the user table (User table):

Linear
User table

4.2.2 OUTPUT TYPE

Choose among the following:

DC 0 – 20mA
DC -5 – +5V
DC -10 – +10V

Caution !

The DIP switches on the device must be appropriately set to the selected output type. If both settings do not match, the device output may be an unexpected one.

4.2.3 0% OUTPUT, 100% OUTPUT

Calibrated (scaled) output range. Unit depends upon the output type.

4.2.4 OUTPUT LOW LIMIT, OUTPUT HIGH LIMIT

The output does not go above the preset high limit or below the preset low limit. The burnout setting prevails these limit settings.

The low limit is selectable within -15 to 0% of the calibrated output range, while the high limit is within 100 to 115%. For example, with 4 to 20 mA output range, the low limit is selectable between 1.6 mA ($= (20 - 4) \times (-0.15) + 4$) and 4 mA, and the high limit is selectable between 20 mA and 22.4 mA ($= (20 - 4) \times 1.15 + 4$).

Both limits are automatically reset to their default values, i.e. -10% of the calibrated output range for the low limit and 110% of the range for the high limit, whenever the output range is calibrated to a new one. Confirm and re-set these values when you have changed the output range.

4.2.5 BURNOUT

Specifies the device's output behaviour in case that a wire breakdown is detected. Choose among the following:

None : No burnout detection
Downscale : The device outputs -15% of the output range.
Upscale : The device outputs 115% of the output range.
Specific value : The device outputs a pre-defined value.

| <u>Output type</u> | <u>Selectable range</u> |
|--------------------|-------------------------|
| DC 0 – 20mA | -3 to +23 mAdc |
| DC -5 – +5V | -6.5 to +6.5 Vdc |
| DC -10 – +10V | -13 to +13 Vdc |

4.3 OPTIONS

4.3.1 FINE INPUT ADJUSTMENTS

The following equation is applied to finely adjust the input signal.

$$\text{Adjusted value} = \text{Input} \times \text{Input Span Fine Adj.} + \text{Input Zero Fine Adj.}$$

Adjustable range for Input Zero Fine Adj. is shown below, Span Fine Adj. is 85 to 115%.

| Symbol | Unit | Range |
|----------|----------|--------------|
| R | Ω | -40 to +40 |
| M | % | -15 to +15 |
| T | mV | -5 to +5 |
| V | mV | -7.5 to +7.5 |
| | mV | -150 to +150 |
| | V | -1.5 to +1.5 |

Note: Since the input range is limited, the input value may not be measured correctly due to the adjustment. E.g. in case that Input Range is 0 to 50 mA as 0 to 100%, Input Zero Fine Adj. is -7.5 mA, and Input Span Fine Adj. is 85%.

4.3.2 FINE OUTPUT ADJUSTMENTS

The following equation is applied to adjust the output signal finely.

$$\text{Adjusted value} = \text{Output} \times \text{Output Span Fine Adj.} + \text{Output Zero Fine Adj.}$$

Adjustable range for Output Zero Fine Adj. is -2 to 2%, Span Fine Adj. is 98 to 102%.

These adjustments are independently applicable to Output 1 and Output 2.

Note: Since the output range is limited, the output signal may not be output correctly due to the adjustment. E.g. in case that Output Range is 0 to 20 mA as 0 to 100%, Output Zero Fine Adj. is +15%, and Output Span Fine Adj. is 115%.

4.4 LINEARIZER

Different types of linearization are used depending upon models as shown below:

| Symbol | Input type | Linearizer |
|------------|---------------|---|
| M V | Potentiometer | User Table Specified by a segment linearization table with calibration points defined with multiple sets of input (X) and output (Y) values. |
| R | RTD | Custom RTD Calibration points defined with a starting point, calibration step and calibration points. A resistance value is given to each point. |
| T | Custom TC | Calibration points defined with a starting point, calibration step and calibration points. An emf value is given to each point. |

4.4.1 USERTABLE M V

Linearization

Number of points

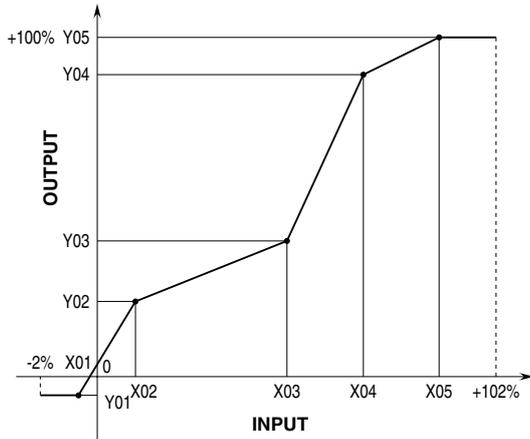
Specify the number of calibration points in the linearization table (2 through 101).

X[0], Y[0] ... X[100], Y[100]

Enter pairs of X (input %) and Y (output %) within the range of -15 to 115% of the full-scale. Arrange in order from the smallest X value. Non-specified Xs and Ys, i.e. the range between two calibration points are approximated by a linear line.

When the input value is out of the defined range, the closest Y value is applied.

When the calibrated output value is lower than -15% or higher than +115%, -15% and +115% is output respectively.



4.4.2 CUSTOM RTD R

Custom RTD type

Choose either Table or CVD Coefficient (Callendar-Van Dusen approximation formula).

For Table type calibration, temperature and resistance values are described in a table format, and the input resistance value is converted into temperature referring to it.

Maximum possible resistance input is of 8 kΩ. For Table type calibration, resistance values are checked when the data is downloaded. However, for CVD formula, no checking is performed.

For Callendar-Van Dusen approximation formula, the CVD coefficients R0, A, B, and C in the following equation are specified.

$$r [\Omega] = R0 \times (1 + A \times t + B \times t^2) \quad (t [^{\circ}\text{C}] \geq 0)$$

$$r [\Omega] = R0 \times (1 + A \times t + B \times t^2 - 100 \times C \times t^3 + C \times t^4) \quad (t [^{\circ}\text{C}] < 0)$$

Coefficient R0, A, B, C

Specify Coefficients in Callendar-Van Dusen formula.

Custom RTD start

Specify the minimum temperature value from -300 to 1000°C.

Custom RTD step

Specify the temperature step in which the resistance values are given in the table, from 1 to 50°C.

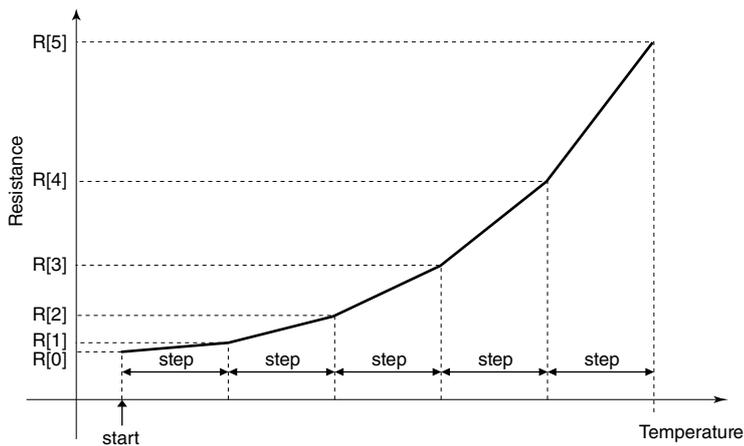
Custom RTD points

Specify how many calibration points are given in the table, from 2 to 300 points.

R[0] through R[299]

Specify the resistance values for each calibration point in the temperature range which is determined by Custom RTD start, step and points.

Start at R[0], in consecutive, ascending order for RTDs or in consecutive, descending order for thermistors. Mixing ascending and descending orders is not possible.

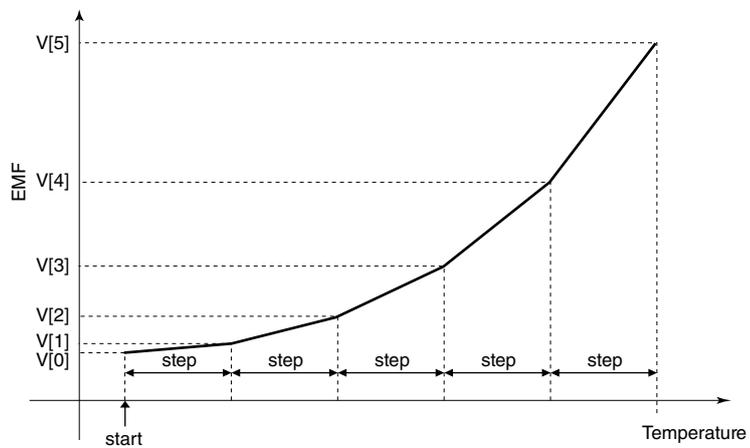


4.4.3 CUSTOM TC T

V[0] through V[299]

Specifies the emf value (mV) for each calibration point in the temperature range which is determined by Custom TC start, step and points.

Start at V[0], in consecutive ascending or descending order. Mixing ascending and descending order is not possible.



APPENDIX - 1. USER TABLE FORMAT

Linearization data is saved in .text format with components as indicated below. This table can be imported as a predetermined linearization table.

```
/* User linearization table comment */
{
    -15.000,    -15.000
     0.000,     1.000
    50.000,    49.000
   115.000,   115.000
}
```

The row starting with '/' is recognized as a comment.

The bracket '{' in the second row indicates the beginning of the table, while the '}' in the last row indicated the end.

Each row contains Xn and Yn represented in %, paired and separated by comma.

Data must be arranged in order from the smallest Xn.

Max. 101 pairs of 'Xn, Yn' can be described.

APPENDIX - 2. CUSTOM RTD FORMAT

RTD table data can be stored in a simple text format, created by Windows application software such as 'note pad.' This table can be imported as a predetermined linearization table.

User-specific RTD data are defined in .text format with components as indicated below.

```
/* Custom table comment */

Minimum Temperature = 0.0000
Step = 1
{
    100.0000
    100.3900
    100.7800
    101.1700
    101.5600
}
```

The row starting with '/' is recognized as a comment.

The bracket '{' in the second row indicates the beginning of the table, while the '}' in the last row indicated the end.

Define the minimum temperature value in Celsius at Minimum Temperature, from -300 to 1000°C.

Specify the Temperature Step used in the table, from 1°C to 50°C.

°F or K cannot be used to define a custom table.

Describe the characteristics data within { }. Data must be entered in ohms. Max. 4 decimal places. Up to 300 points can be specified.