

M3S Series
Super-space-saving Signal Conditioners
PC CONFIGURATOR SOFTWARE
Model: M3SCFG

Users Manual

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1. INTRODUCTION

1.1 GENERAL DESCRIPTION

The M3SCFG is used to program parameters for M3S Series Super-space-saving Signal Conditioners (referred here-under 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 M3SCFG is applicable to the following products:

Function	Model No.	Symbol	Version
Signal Transmitter	M3SXV	V	1.00
Thermocouple Transmitter	M3SXT	T	1.00
RTD Transmitter	M3SXR	R	1.00
Potentiometer Transmitter	M3SXM	M	1.00

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 M3SCFG 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 M3SCFG.

PC	IBM PC compatible
OS	Windows 7 (32 bits / 64 bits) / Windows 10 (32 bits / 64 bits) The software may not operate adequately in certain conditions.
CPU	Must meet the relevant Windows' requirements.
Memory	Must meet the relevant Windows' requirements.
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

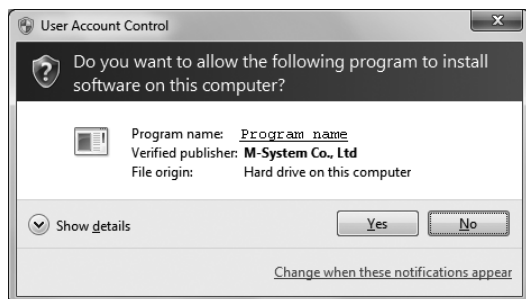
INSTALL

The program is provided as compressed archive. Decompress the archive and execute 'setup.exe' to start up the M3SCFG installer program. Follow instructions on the Windows.

The procedure for windows 7 is explained below.

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 'Continue' or 'Yes.'

Windows 7



'M3SCFG' appears instead of 'Program Name'

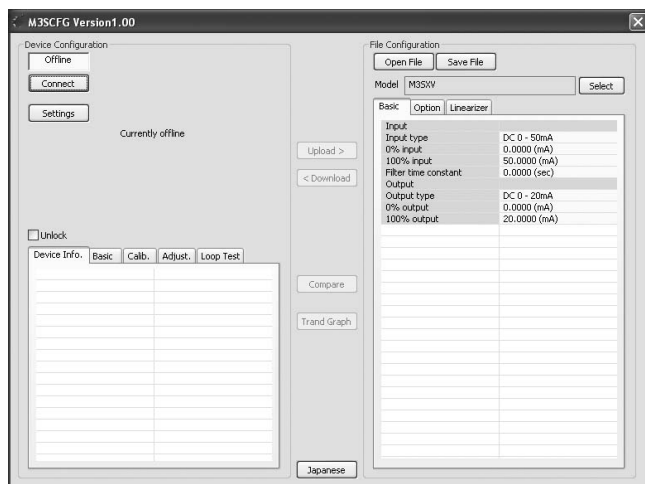
DELETE

Open Control Panel > Add/Remove Programs. Select the M3SCFG from the program list and click Delete button.

2. GETTING STARTED

2.1 STARTING THE M3SCFG

Open Program > M-SYSTEM > Configurator > M3S Series to start up the M3SCFG on the Windows PC. The following window appears on the screen.

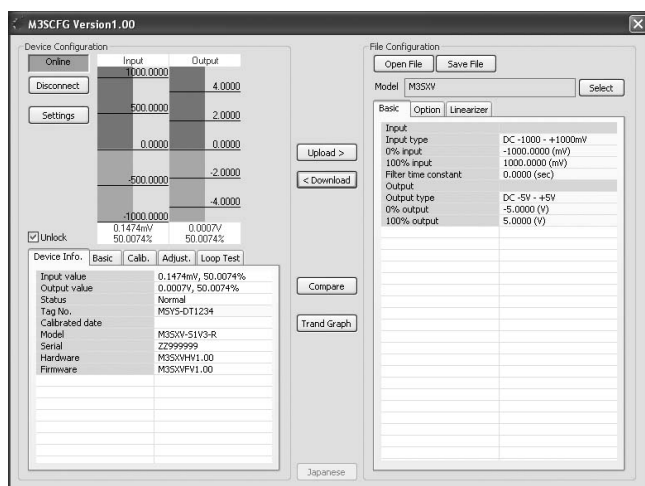


2.2 CONNECTING TO THE DEVICE

- 1) Click [Settings] button at the left top 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) Click [Connect] button and connect the device to the PC's COM port with the PC Configurator Cable.
- 4) The device's present parameters are uploaded and shown on the screen.

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

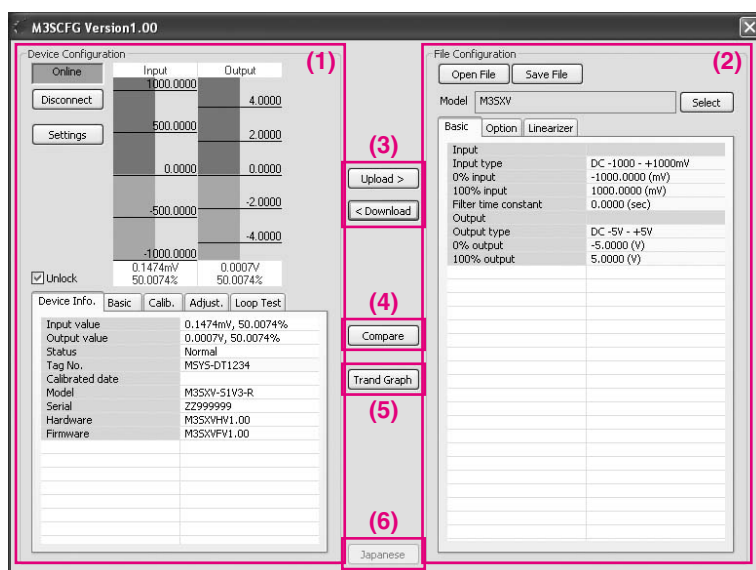
The bargraphs on the screen show real time I/O status of the device, and you can now access to the menu tabs such as Device Info, Basic, Calibration, Adjustments, and Loop Test.



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.

(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) Upload / Download

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

(4) Compare

Opens Compare window to compare edited parameters from actual setting.

(5) Trend Graph

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

(6) English / Japanese

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.

2.3.2 DEVICE INFO – DEVICE INFORMATION

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

Device Info.	Basic	Calb.	Adjust.	Loop Test
Input value	0.1474mV, 50.0074%			
Output value	0.0007V, 50.0074%			
Status	Normal			
Tag No.	MSY5-DT1234			
Calibrated date				
Model	M3SXV-51V3-R			
Serial	ZZ999999			
Hardware	M3SXVHW1.00			
Firmware	M3SXVFW1.00			

Name	Explanations
Input value	Shows the current input value in engineering unit and in percent.
Output value	Shows the current output value in engineering unit and in percent.
Status	Shows the current device status. Normal The device is operating in normal parameters. Saturation The output is saturated at -2% or at +102%. Burnout M R T The input wire is broken. Fixed output The device in the loop test mode, supplying a fixed output.
Cold junction temp. T	Shows the temperature measured at the CJC Sensor (CJM).
Terminal temperature T	Shows the emf voltage measured at the thermocouple sensor.
RTD resistance R	Shows the resistance measured at the RTD 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 up to 16 alphanumeric characters among the following: 0123456789ABCDEFGHIJKLMNOPQRSTUVWXYZ!@#\$%^&'()*~+-*^~ @`[]{};:<>?_.,/
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.

Device Info.		Basic	Calib.	Adjust.	Loop Test
Input					
Input type	TC K(CA)				
0% input	-50.0000 (deg C)				
100% input	50.0000 (deg C)				
Burnout	Upscale				
Cold junction comp.	Use C/JM				
Terminal temperature	0.0000 (deg C)				
Temperature unit	deg C				
Filter time constant	0.0000 (sec)				
Output					
Output type	DC 0 - 20mA				
0% output	0.0000 (mA)				
100% output	20.0000 (mA)				

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.

Basic		Option	Linearizer
Input			
Input type	DC 0 - 50mA		
0% input	DC 0 - 50mA		
100% input	DC -1000 - +1000mV		
Filter time constant	DC -10V - +10V		
Output			
Output type	DC 0 - 20mA		
0% output	0.0000 (mA)		
100% output	20.0000 (mA)		

Figure: Pull-down list.

Basic		Option	Linearizer
Input			
Input type	DC 0 - 50mA		
0% input	0.0000 (mA)		
100% input	50.0000 (mA)		
Filter time constant	0.0000		
Output			
Output type	DC 0 - 20mA		
0% output	0.0000 (mA)		
100% output	20.0000 (mA)		

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 20mA or 1 to 5V) 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.

Device Info.		Basic	Calib.	Adjust.	Loop Test
Input Calibration					
Start Calib.					
0% Calib.					
100% Calib.		Set			
Output Calibration					
Start Calib.					
0% Calib.					
100% Calib.		Set			

Figure: Start input calibration

Device Info.		Basic	Calib.	Adjust.	Loop Test
Input Calibration					
Start Calib.					
0% Calib.		-10.0000			
100% Calib.		10.0000			
		Set			
Output Calibration					
Start Calib.					
0% Calib.					
100% Calib.		Set			

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

Device Info.		Basic	Calib.	Adjust.	Loop Test
Input Calibration					
Start Calib.					
0% Calib.		1.0005			
100% Calib.		5.0005			
		Set			
Output Calibration					
Start Calib.					
0% Calib.					
100% Calib.		Set			

Figure: Calibrated range set to 1 to 5V.

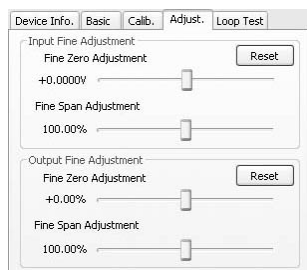
- 4) Click [Set] button to apply the calibration range to the device.

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.

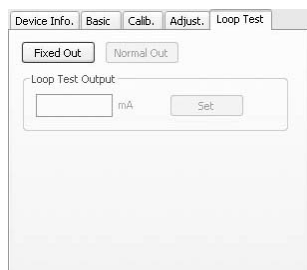
Output Fine Adjustment

- 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.

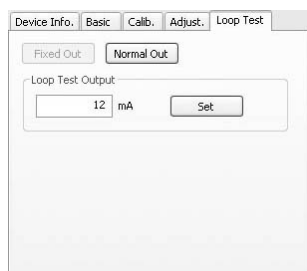
2.3.6 LOOP TEST

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.

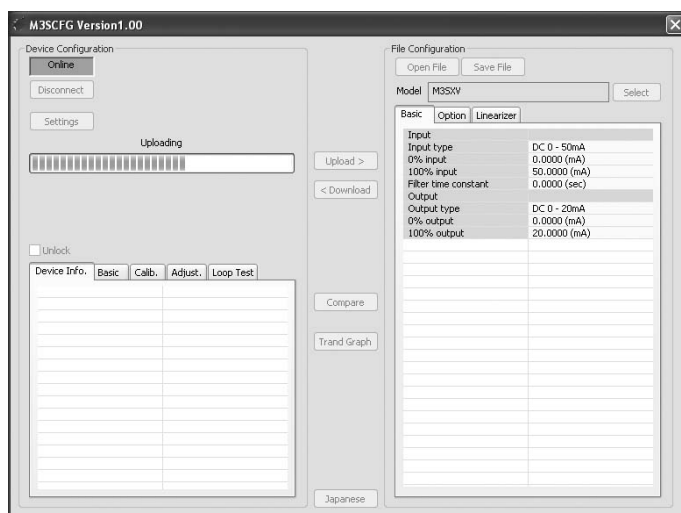
Caution !

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

2.4 READING/Writing PARAMETERS

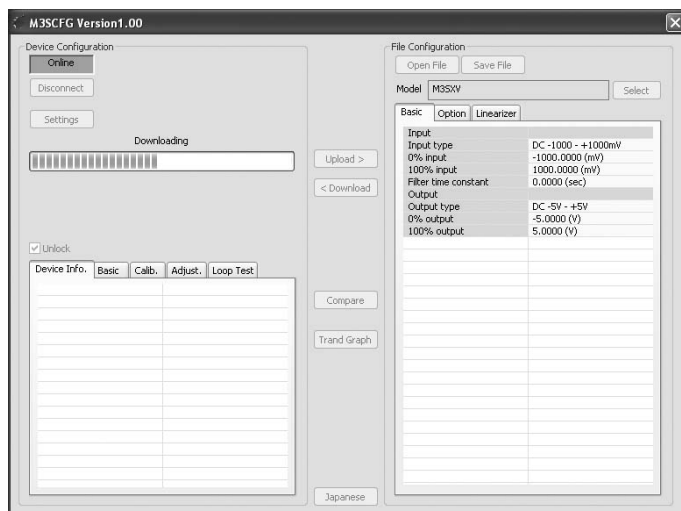
2.4.1 READING PARAMETERS FROM DEVICE (UPLOAD)

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.



2.4.2 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.



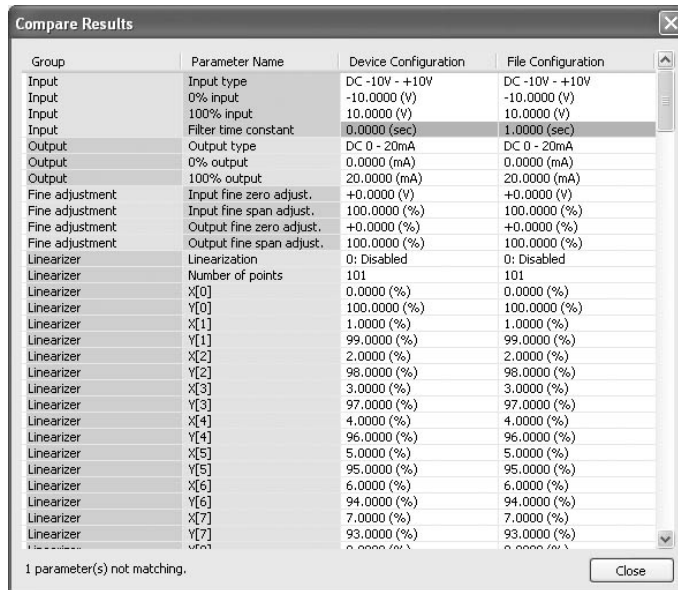
Caution !

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.

2.5 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	DC -10V ~ +10V	DC -10V ~ +10V
Input	0% input	-10.0000 (V)	-10.0000 (V)
Input	100% input	10.0000 (V)	10.0000 (V)
Input	Filter time constant	0.0000 (sec)	1.0000 (sec)
Output	Output type	DC 0 ~ 20mA	DC 0 ~ 20mA
Output	0% output	0.0000 (mA)	0.0000 (mA)
Output	100% output	20.0000 (mA)	20.0000 (mA)
Fine adjustment	Input fine zero adjust.	+0.0000 (V)	+0.0000 (V)
Fine adjustment	Input fine span adjust.	100.0000 (%)	100.0000 (%)
Fine adjustment	Output fine zero adjust.	+0.0000 (%)	+0.0000 (%)
Fine adjustment	Output fine span adjust.	100.0000 (%)	100.0000 (%)
Linearizer	Linearization	0: Disabled	0: Disabled
Linearizer	Number of points	101	101
Linearizer	X[0]	0.0000 (%)	0.0000 (%)
Linearizer	Y[0]	100.0000 (%)	100.0000 (%)
Linearizer	X[1]	1.0000 (%)	1.0000 (%)
Linearizer	Y[1]	99.0000 (%)	99.0000 (%)
Linearizer	X[2]	2.0000 (%)	2.0000 (%)
Linearizer	Y[2]	98.0000 (%)	98.0000 (%)
Linearizer	X[3]	3.0000 (%)	3.0000 (%)
Linearizer	Y[3]	97.0000 (%)	97.0000 (%)
Linearizer	X[4]	4.0000 (%)	4.0000 (%)
Linearizer	Y[4]	96.0000 (%)	96.0000 (%)
Linearizer	X[5]	5.0000 (%)	5.0000 (%)
Linearizer	Y[5]	95.0000 (%)	95.0000 (%)
Linearizer	X[6]	6.0000 (%)	6.0000 (%)
Linearizer	Y[6]	94.0000 (%)	94.0000 (%)
Linearizer	X[7]	7.0000 (%)	7.0000 (%)
Linearizer	Y[7]	93.0000 (%)	93.0000 (%)

1 parameter(s) not matching.

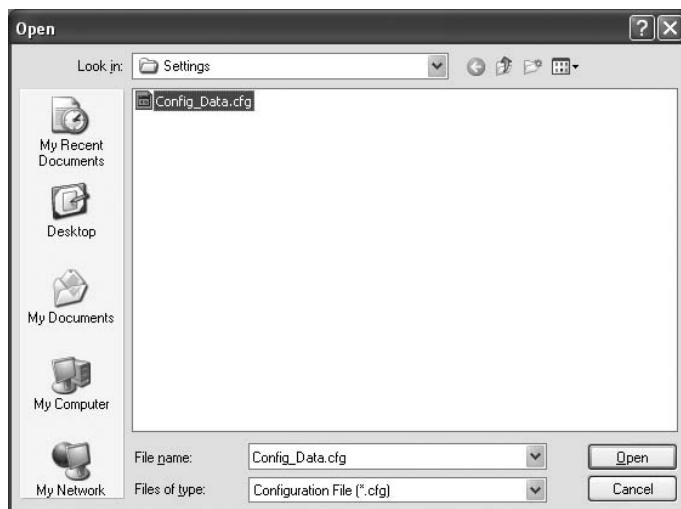
Close

2.6 FILES

2.6.1 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.

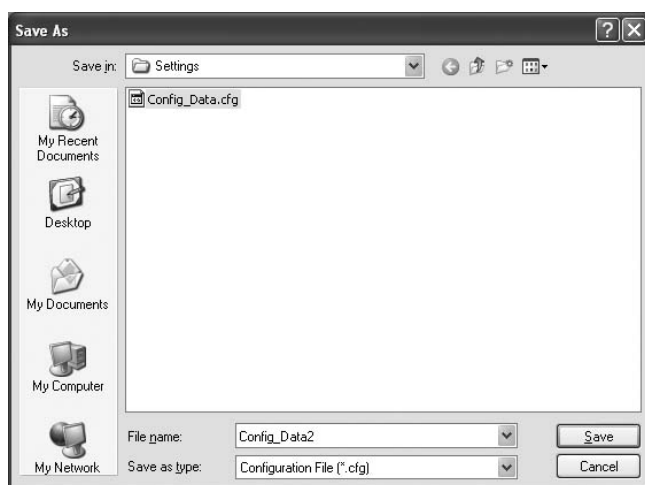
In order to download the parameters to the connected device, click [Download] button.



2.6.2 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.



2.6.3 OFFLINE OPERATION

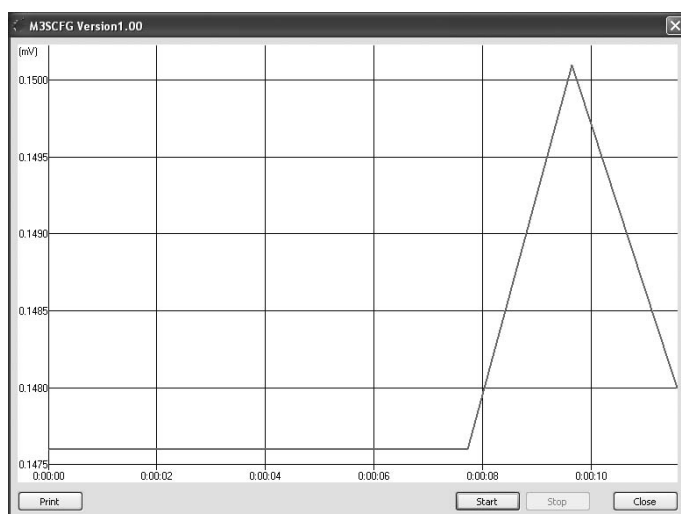
The parameters under File Configuration on the right side of the window can be edited freely regardless of the status of the connection or the connected device.

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.

2.7 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 range of the M3SXV is to be configured to 4 to 20 mA_{dc} and output range to 1 to 5 V_{dc} in the below example.

3.1 CONNECTING TO THE DEVICE

Start up the M3SCFG software. Choose 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 RANGE

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

DC 0 - 50mA

DC -1000 - +1000mV

DC -10 - +10V

For 4-20 mA input, choose the input type 'DC 0 - 50mA.'

- 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 (4.0000). Use the same engineering unit as for the type.
- 3) Click [100% input] field. Enter the scaled 100% input value (20.0000).

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 V_{dc} 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 M3SXV 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 2.4.1), edit the file and then download the new setting (See 2.4.2).

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

4. PARAMETER DETAILS

4.1 BASIC SETTING

4.1.1 INPUT TYPE

Selectable input types depend upon model numbers.

Symbol	Selection	Applicable Models
V	DC 0 - 50mA DC -1000 - +1000mV DC -10 - +10V	M3SXV, all suffix codes
T	TC (PR) TC K (CA) TC E (CRC) TC J (IC) TC T (CC) TC B (RH) TC R TC S TC N TC Custom TC	M3SXT, all suffix codes except the input code 0 M3SXT, all suffix codes
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	M3SXR, all suffix codes except the input codes 7, 0 M3SXR, the input code 7 M3SXR, all suffix codes
M	POT 0 - 5kOhm POT 0 - 2.5kOhm POT 0 - 1.2kOhm POT 0 - 600Ohm POT 0 - 300Ohm POT 0 - 100Ohm	M3XSM, all suffix codes

4.1.2 0% INPUT, 100% INPUT

Calibrated (scaled) input range. Unit depends upon the models.

4.1.3 BURNOUT T R M

Specifies either the output should go upscale (+102%) or downscale (-2%) in case that a burnout is detected. Choose among the following:

None
Upscale
Downscale

4.1.4 SENSOR WIRES R

Choose either 2 wires, 3 wires or 4 wires.

4.1.5 TEMPERATURE UNIT T R

Choose among the following:

deg C
deg F
K

The device internally processes temperature in Celsius, 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.

4.1.6 COLD JUNCTION COMPENSATION T

Specifies either the CJC sensor (model: CJM) incorporated to the device is used to measure the cold junction temperature or a preset fixed terminal temperature is used for cold junction compensation.

4.1.7 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.

4.1.8 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
M3SXV, M3SXM, M3SXR, M3SXT	1.20

4.1.9 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.

4.1.10 0% OUTPUT, 100% OUTPUT

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

4.2 OPTIONS

4.2.1 FINE INPUT ADJUSTMENTS

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

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

Unit depends upon the input type. Adjustable ranges for Input Zero Fine Adj. are as follows:

Symbol	Input type	Unit	Adjustable range
V	DC 0 - 50mA	mA	-7.5 to 7.5
	DC -1000 - +1000mV	mV	-300 to 300
	DC -10 - +10V	V	-3 to 3
T	Thermocouple	mV	-15 to 15
R	RTD	Ω	-40 to 40
M	Potentiometer	%	-15 to 15

Adjustable range for Input Span Fine Adj. is 85 to 115%.

4.2.2 FINE OUTPUT ADJUSTMENTS

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

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

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

4.3 LINEARIZER

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

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

4.3.1 USER TABLE V M

Linearization

Choose among the following:

- 0 : Disable
- 1 : Enable

With '0 : Disable' selected, the output % is proportional to the input %.

With '1 : Enable' selected, the input % is converted into the output % according to a user specified table.

Number of points

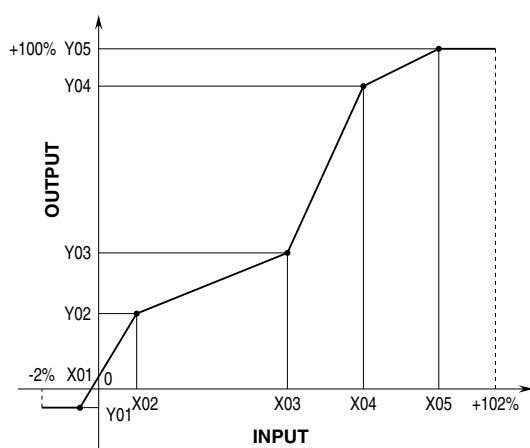
Specify the number of calibration points in the linearization table (2 through 101).

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

Enter pairs of X (input %) and Y (output %) within the range of -2 to 102% 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 -2% or higher than +102%, -2% and +102% is output respectively.



4.3.2 CUSTOM TC 'I'

Custom TC start

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

Custom TC step

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

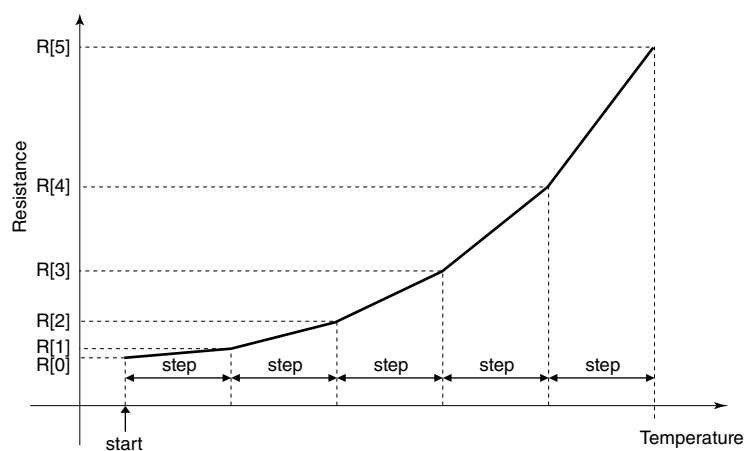
Custom TC points

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

V[0] through V[299]

Specify the resistance values 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 order or in consecutive, descending order. Mixing ascending and descending orders is not possible.



4.3.3 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.

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

$$r [\Omega] = R_0 \times (1 + A \times t + B \times t^2) \quad (t [^{\circ}\text{C}] \geq 0)$$

$$r [\Omega] = R_0 \times (1 + A \times t + B \times t^2 - 100 \times C \times t^3 + C \times t^4) \quad (t [^{\circ}\text{C}] < 0)$$

Resistance range depends upon model suffix codes. For Table type calibration, resistance values are checked when the data is downloaded. However, for CVD formula, no checking is performed.

Range 0 to 500Ω: Suffix codes 1, 3, 4, 5 and 9

Range 0 to 5kΩ: Suffix code 7

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.

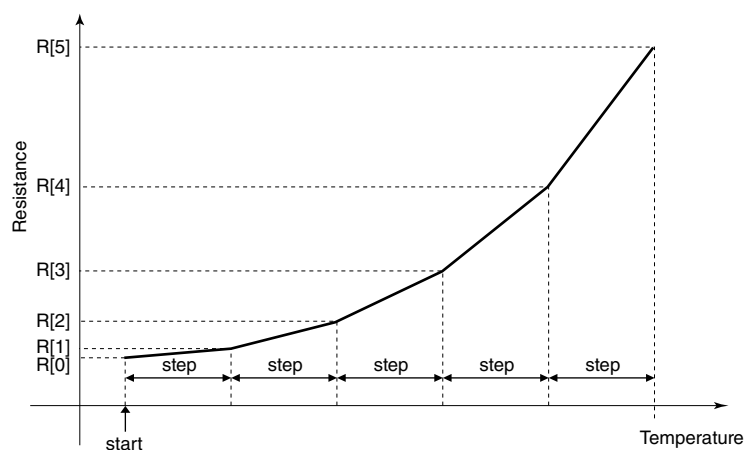
Custom RTD points

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.



APPENDIX - 1. CUSTOM TC/RTD FORMAT

TC/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 TC/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 mV (TC) or ohms (RTD). Max. 4 decimal places. Up to 300 points can be specified.

APPENDIX - 2. 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 */  
{  
    -2.000,    -2.000  
    0.000,     1.000  
    50.000,    49.000  
    102.000,   102.000  
}
```

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.