

# Magnescale

RS-232C / Ethernet Interface Module

# **MG80-SC1 / MG80-SC2**

Read all the instructions in the manual carefully before use and strictly follow them.  
Keep the manual for future references.

Operating Manual

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## **1 Overview**

This product is an RS-232C / Ethernet interface module for measuring systems that can acquire multi-axis measurement data.

Because this product shares a common data format with existing MG10/10A products, MG10/10A users can continue to use their programming environment with just a few settings changes.

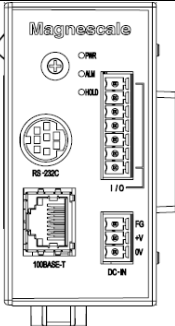
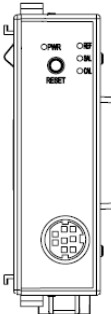



In addition, the product has a PLC link function. By establishing a PLC link connection via RS-232C or Ethernet, it is possible to send and receive data without preparing a communication program on the PLC side.

The MG80-SC can connect up to 16 MG80-CMs (counter modules).

## 2 Configuration and Connections

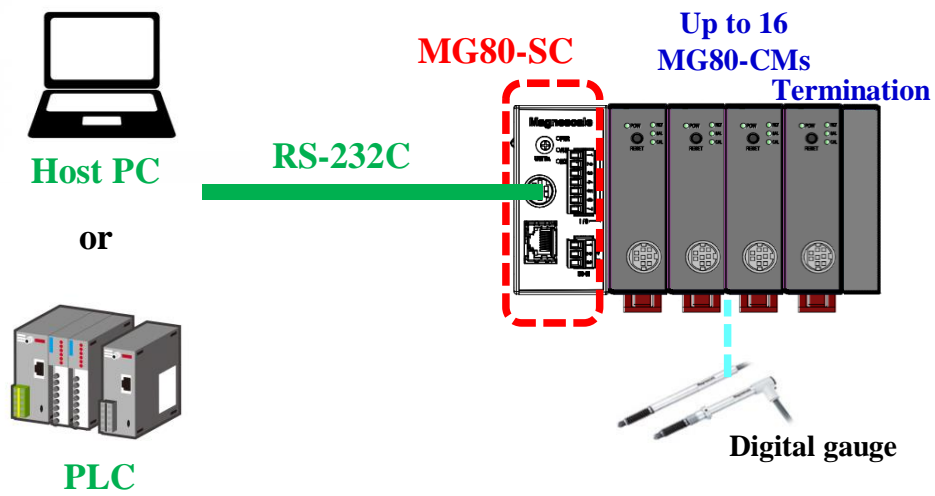
### 2.1 Equipment Used

When configuring a system using this product, the equipment to be used is listed below.

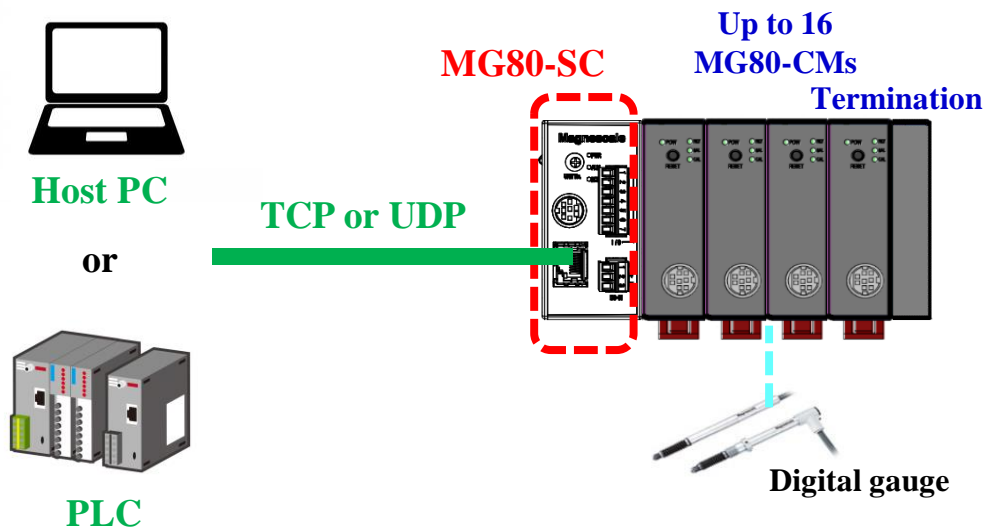
Name	Description	Image
MG80-SC	RS-232C interface unit Main module	
MG80-CM	Counter module	
DK800S series	Digital gauge DK805S/DK812S/DK830S	
DK series	Digital gauge DK10/25/50/100	
DT series (via MT13)	Digital gauge DT12/32/512	

## 2.2 System Configuration

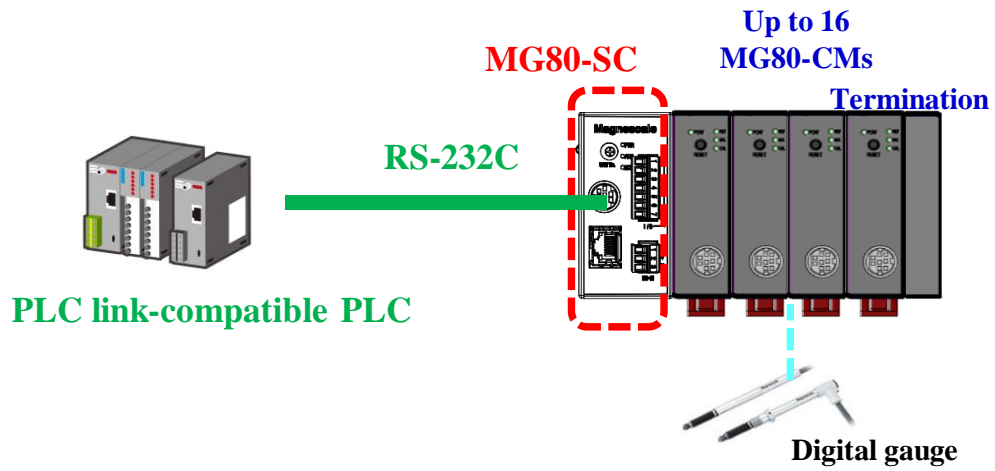
### 2.2.1 Connection Example Using Command I/F over RS-232C (MG10 Replacement)



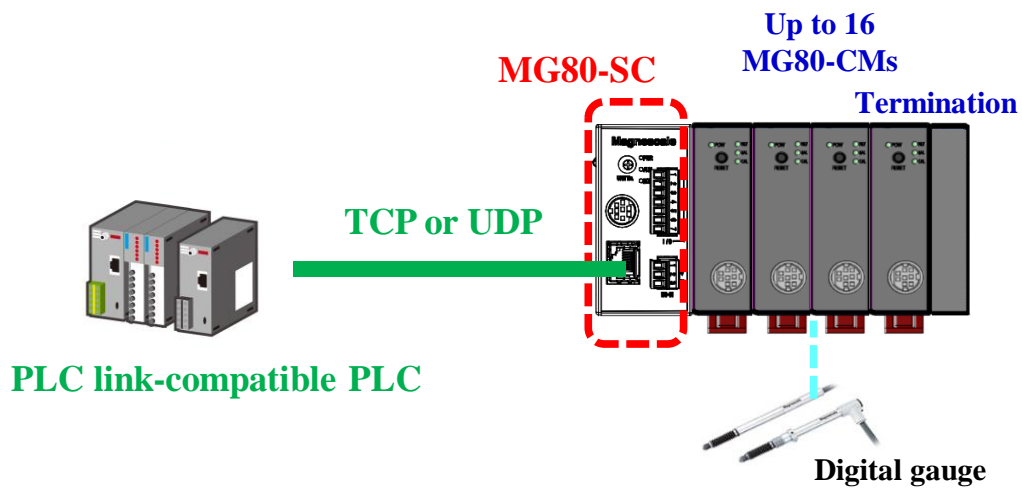
### 2.2.2 Connection Example Using Command I/F over Ethernet



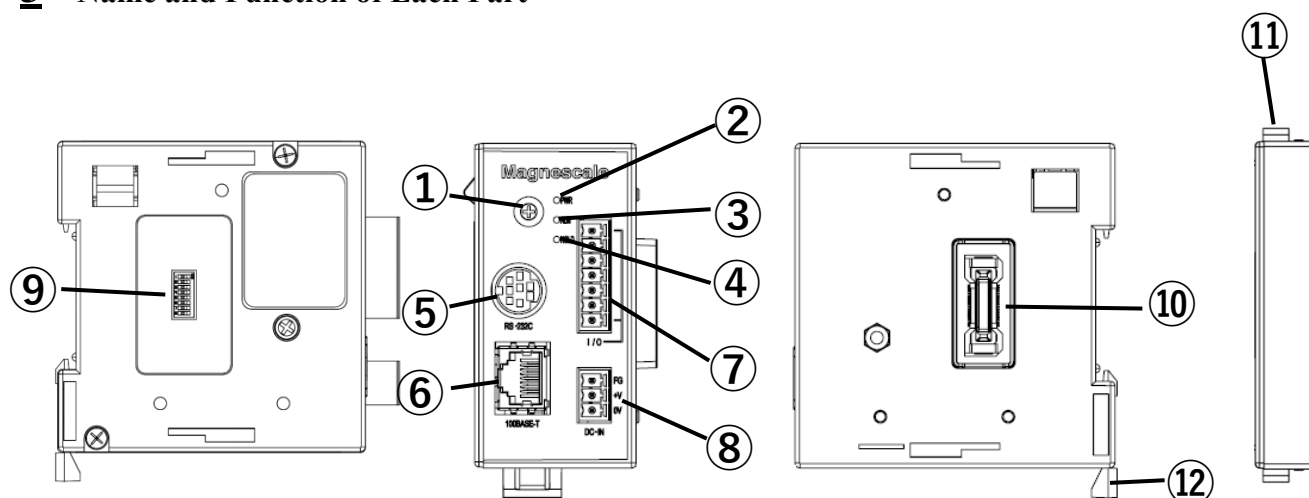
### 2.2.3 Connection Example over PLC Link (RS-232C)



### 2.2.4 Connection Example over PLC Link (Ethernet)



### 3 Name and Function of Each Part



#### ① Module number setting switch

Sets the module number. The various parameters of the MG80-SC can be configured using a user-assigned module number.

The MG80-SC has an IP address of 192.168.0.100 and a subnet mask of 255.255.255.0 as default values, but the settings can be changed. In the event the assigned IP address is forgotten, set the switch to 0xF to start up with the default value.

#### ② POWER lamp (PWR)

Indicates the operating status of this module.

Color	Status	Meaning
Green	Unlit	Power OFF
	Lit	Measurement in progress with power ON
	Blinking	Setup in progress with power ON

#### ③ ALARM lamp

Lights red when any counter module within the unit is in the alarm status.

Color	Status	Meaning
Red	Unlit	Normal status
	Lit	An alarm is detected in one of the modules

#### ④ HOLD lamp

Lights orange when the hold function is activated in any counter module within the unit.

Color	Status	Meaning
Orange	Unlit	None of the counter modules are in the hold state
	Lit	One of the counter modules is in the hold state
	Blinking	When the reference point is used, one of the counter modules is in the reference point wait state



⑤ RS-232C connector

This is the PC/PLC connection port.

Use a DZ252 or DZ254 communication cable (sold separately).

When connecting to a PLC, be sure to match the terminal on the PLC side.

Compliant with EIA RS232C standard

Signals : Asynchronous, start-stop system, half-duplex system

Communication speed : 2400, 9600, 19200, 38400, 57600, 115200, 230400 bps

Data length : 7 or 8 bits

Parity : None, odd or even; selectable

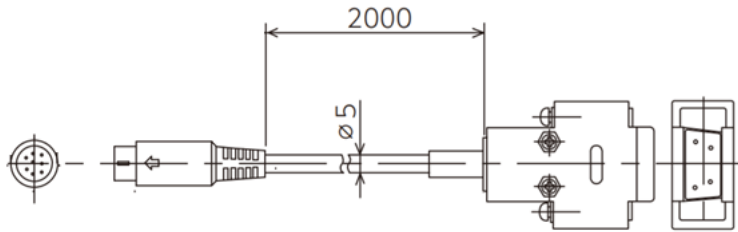
Stop bit : 1 or 2 bits

Cable length : Max. 15 meters

Flow control : Hardware flow control (RTS, CTS)

DZ252 RS-232C cable

Round 8pin male ⇔ Dsub 9pin female



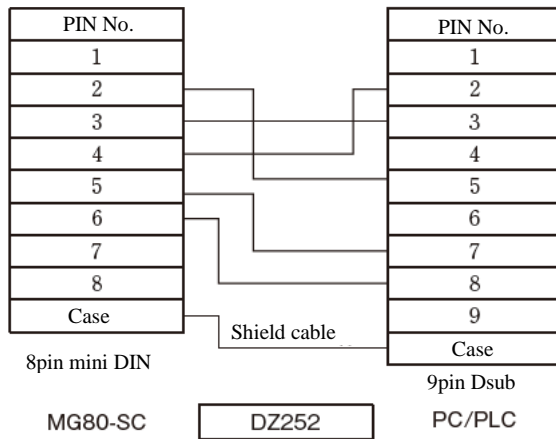
**Pin description**

Pin no.	I/O	Description
1		N.C
2		SG (Signal GND)
3	I	RXD (Receive data)
4	O	TXD (Transmit data)
5	I	CTS (Clear to send)
6	O	RTS (Request to send)
7		N.C
8		N.C

**Host unit side**

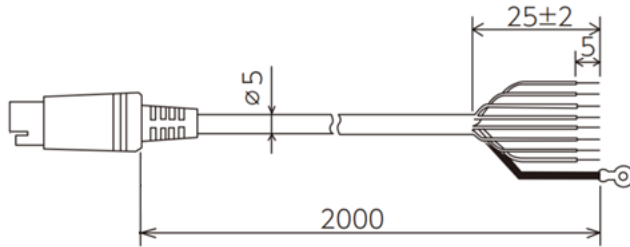
Signal
—
SG
TXD
RXD
RTS
CTS
DSR

**Connection diagram**



DZ254 RS-232C cable

Round 8pin male  $\Leftrightarrow$  bare wire



Pin no.	Cable color	Signal
1	Red	N.C
2	White	SG(0V)
3	Black	RXD
4	Yellow	TXD
5	Blue	CTS
6	Green	RTS
7	Brown	N.C
8	Gray	N.C
Case		Shield

## ⑥ Ethernet port

This is the PC/PLC connection port.

Use commercially available Ethernet communication cables.

<Communication cable>

A CAT5e or higher shielded type is recommended.

Cable length: 20 m or less

## ⑦ I/O connector

This I/O connector is used to operate all of the counter modules within the unit at once.

It has four input pins and one output pin.

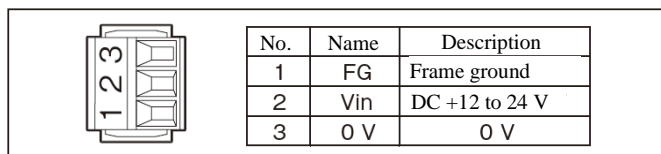
MG80-SC1: Current sink type

MG80-SC2: Current source type

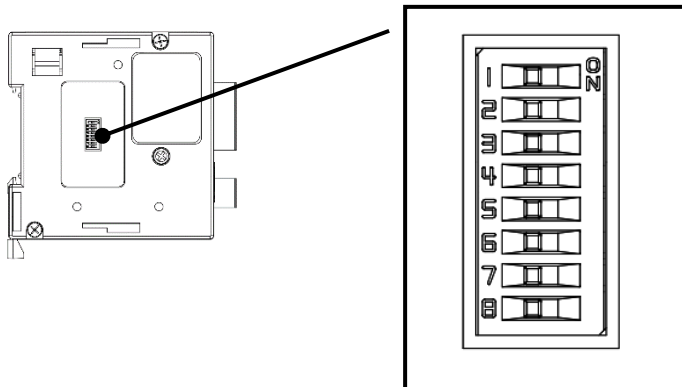
For details, refer to 6.2.9 I/O Connector.

## ⑧ Power input connector

This connector is used to supply external power. (DC +12 to 24 V)



## ⑨ RS-232C communication setting switch



Setting item	Setting contents	Switch no.							
		1	2	3	4	5	6	7	8
Delimiter setting	<i>CR+LF</i>	-	<i>OFF</i>	-	-	-	-	-	-
	CR	-	ON	-	-	-	-	-	-
Parity setting	<i>OFF</i>	-	-	<i>OFF</i>	<i>OFF</i>	-	-	-	-
	ON Even	-	-	ON	OFF	-	-	-	-
	ON Odd	-	-	ON	ON	-	-	-	-
Stop bit	<i>1bit</i>	-	-	-	-	<i>OFF</i>	-	-	-
	2bit	-	-	-	-	ON	-	-	-
Data length	<i>8bit</i>	-	-	-	-	-	<i>OFF</i>	-	-
	7bit	-	-	-	-	-	ON	-	-
Communication speed setting	2400 bps	OFF	-	-	-	-	-	OFF	OFF
	<i>9600 bps</i>	<i>OFF</i>	-	-	-	-	-	<i>ON</i>	<i>OFF</i>
	19200 bps	OFF	-	-	-	-	-	OFF	ON
	38400 bps	OFF	-	-	-	-	-	ON	ON
	57600 bps	ON	-	-	-	-	-	OFF	OFF
	115200 bps	ON	-	-	-	-	-	ON	OFF
	230400 bps	ON	-	-	-	-	-	OFF	ON

\* Italic typeface is used to indicate the factory settings.

If you are using only the Ethernet port, keep the factory settings.

## ⑩ Module connector

This is connected to the counter module.

## ⑪ Termination module

This is the termination module. Connect to the endmost position of the unit.

## ⑫ DIN rail anchoring lever

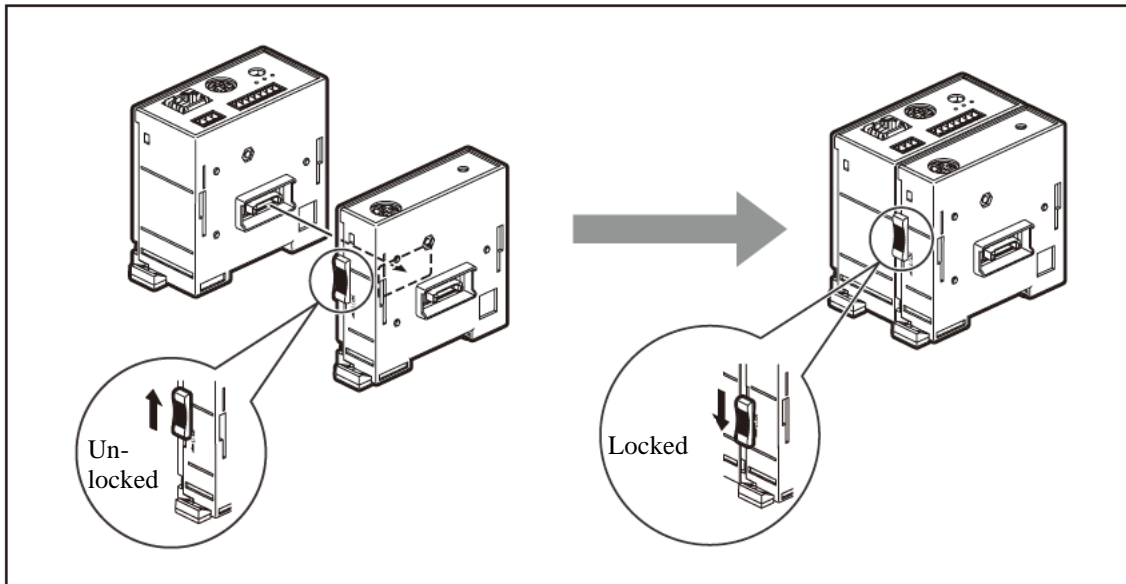
This lock mechanism secures the main unit to the DIN rails.

## 4 Installation

### 4.1 Connecting the Counter Modules

Unlock the slide locks of the counter module to be connected.

Connect the connectors of the interface module and the counter module, and return the top and bottom slide locks to the locked positions to secure the module.

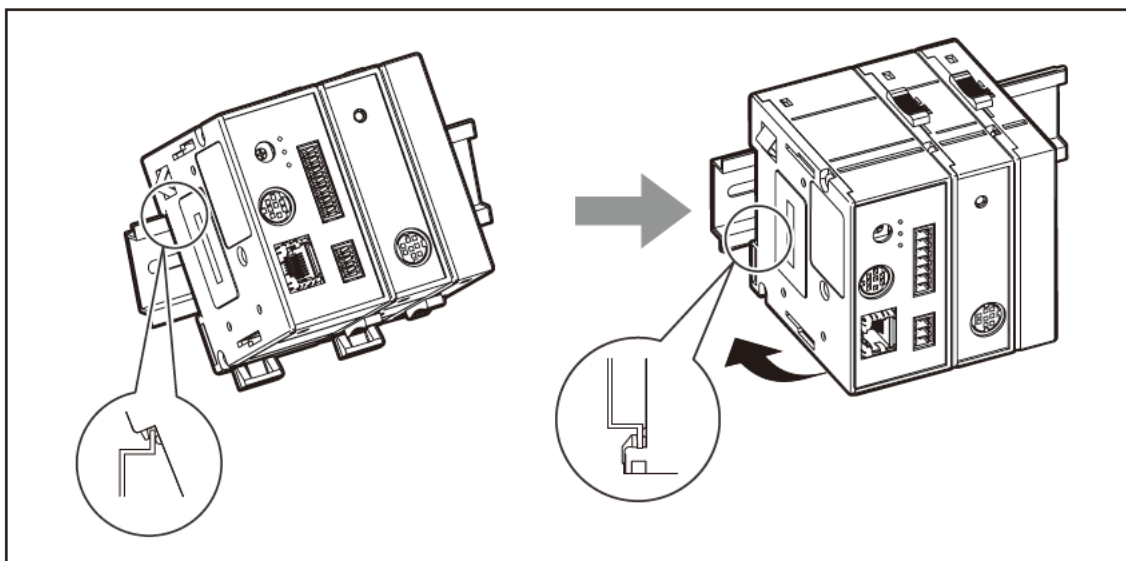


### 4.2 Installing the Unit on the DIN Rails

This product supports 35 mm wide DIN rails.

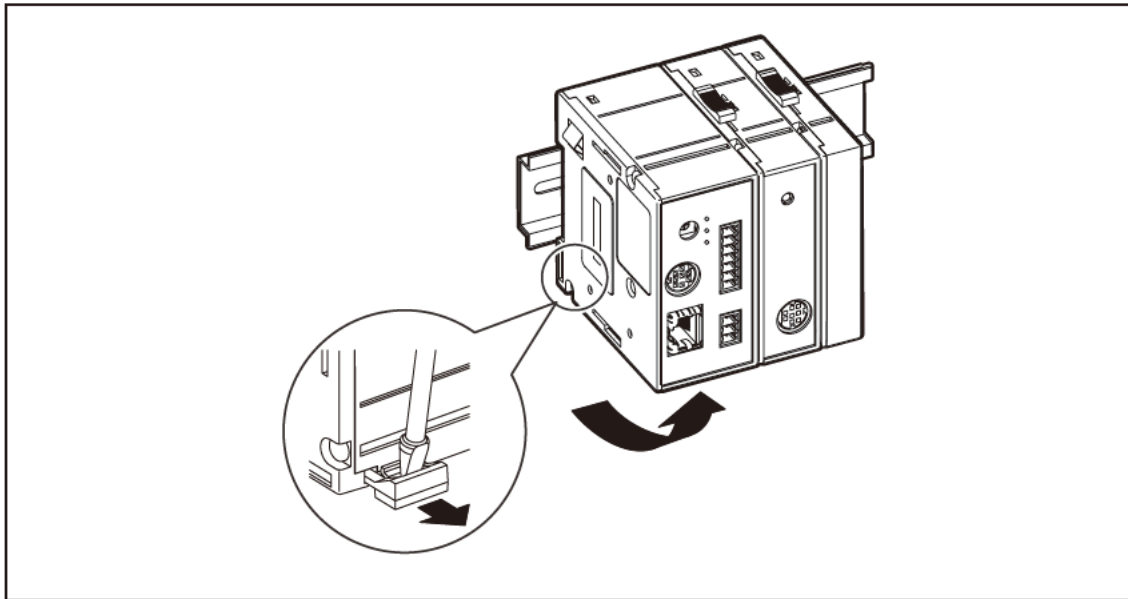
When the interface unit is shipped from the factory, the tabs on the DIN rail anchoring levers are locked.

Align the top side of the groove in the unit's rear panel with the top of the DIN rails, and install the unit by pushing it into position until a clicking sound is heard so that the bottom side of the groove fits snugly on the DIN rails.



### 4.3 Removing the Unit from the DIN Rails

While holding the unit in place so that it will not fall, pull down the DIN rail anchoring levers of all the modules until a clicking sound is heard.



## 5 Specifications

Model name	MG80-SC
Supply voltage	DC 10.8 to 26.4 V
Power consumption	2.4 W or less (not including the MG80-CM)
Maximum number of connectable modules	MG80-CM: 16 modules* <sup>1</sup>
Power input socket	Terminal block×1 (3-pin)
Interface connector	RS-232C 8P×1 RJ45×1 (shielding compatible)
Communication protocol	RS-232C (2,400 bit/s to 230,400 bit/s) Ethernet (100BASE-TX: 100 Mbit/s)
Maximum cable length	RS-232C: 15 m* <sup>2</sup> Ethernet: 20 m (CAT5e shielded type recommended* <sup>3</sup> )
Module number setting	By rotary switch
Indicator lamps	Power: Green LED×1 Alarm: Red LED×1 Hold: Orange LED×1
Operating temperature/humidity range	0 to +50°C (no condensation)
Storage temperature/humidity range	-20 to +60°C (20 to 90% RH)
Mass	Approx. 130 g
Mounting method	DIN rail

\*1 Up to 16 MG80-CM can be connected to each MG80-SC.

\*2 Use a DZ252 or DZ254 RS-232C communication cable (sold separately).

\*3 The customer must provide the Ethernet communication cables.



## 6 Functions

### 6.1 Definition of Terms

Term	Definition
Current value	The value currently measured
Maximum (MAX) value	The maximum measured value
Minimum (MIN) value	The minimum measured value
Peak-to-peak (P-P) value	The value obtained by subtracting the minimum value from the maximum value
Output value mode	Current value mode, maximum (MAX) value mode, minimum (MIN) value mode and peak-to-peak (P-P) mode
Measured value	A general term covering the current values, maximum values, minimum values and peak-to-peak values
Peak value	A general term covering maximum values, minimum values and peak-to-peak values (held in the main module)
Go/No Go judgment output	The result obtained by comparing the upper and lower limits of the comparator with the measured value
PLC link	Allows the unit to read and write PLC memory devices

### 6.2 Details of Functions

#### 6.2.1 Peak-hold

The MG80-SC holds the peak values at all times.

The peak values are checked by switching among the output value modes.

The start function makes it possible to restart measurement from an optional position.

#### 6.2.2 Preset

##### When the reference point is not used

When the preset value recall is supplied, the preset value that has been set is set to the current value.

##### When the reference point is used

In this case, the function uses the master preset value (refer to section 6.2.3).

When the master value is supplied as the preset value input after the reference point has been loaded for the first time, the distance from the master value (preset value) to the reference point is calculated, and the reference point offset value is generated internally and stored.

After the reference point has been loaded for the second and subsequent times, the reference point offset value is automatically loaded, which means that the preset value need not be input for the second and subsequent times.

### 6.2.3 Reference Point

#### When the reference point is not used

After the power is turned on, the measuring state is established automatically. (Incremental operation)

#### When the reference point is used

After the power is turned on, the unit automatically enters the reference point signal input wait status. Once the reference point is passed, the reference point position changes to 0 or the measurement from the offset value.

Incremental operation continues until the reference point is passed.

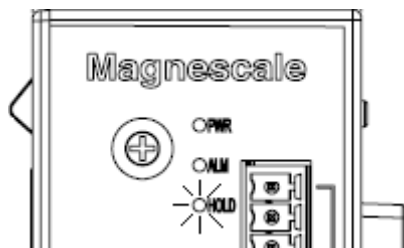
#### Note

This can be used only when using a measuring unit with a reference point.

[How to set the reference point]

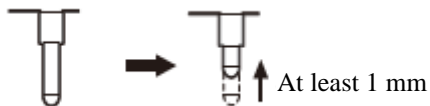
1. Turn on the power.

The HOLD LED blinks if there is a module that has been configured to use the reference point.

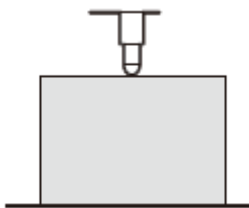


2. Push the spindle of the measuring unit 1 mm or more, and retract it.

When this is done for all the modules that have been configured to use the reference point, the HOLD LED will turn off.



3. Align the measuring unit with the master object to be measured.



4. Input the master value as the preset value using the setting commands.

Transmit the SETUP command, P command, then the CLOSE command, in this order. The reference point offset value is stored in the counter module.

Once this value is set, the master value can be relocated after the power is next turned on when the spindle of the measuring unit is pushed 1 mm or more.

To set the reference point again, clear the reference point offset value using the setting command (LCLR command), and proceed again from step 1.

### 6.2.4 Reset

This function resets all the measured values to zero regardless of whether the preset value is set.

#### Note

- The reference point setting is also canceled when the reference point is being used. Set the reference point again.
- If a reset is supplied while the reference point is being set, the reference point setting is canceled at that time.

### 6.2.5 Start

Resets the peak value.

Measured value	Change in value
Current value	Remains unchanged
Maximum value	Sets the current value
Minimum value	Sets the current value
Peak-to-peak (P-P) value	Sets the value obtained by subtracting the minimum value (zero) from the maximum value

### 6.2.6 Go/No Go Judgment (Comparator)

This function judges “go” or “no go” for the measured values in the output value mode that is set. The Go/No Go judgment results are added to the data and output by RS-232C or Ethernet.

The comparator values set the upper and lower limits. Up to four sets of comparator values can be set, and the set of values used can be switched partway through the measurement.

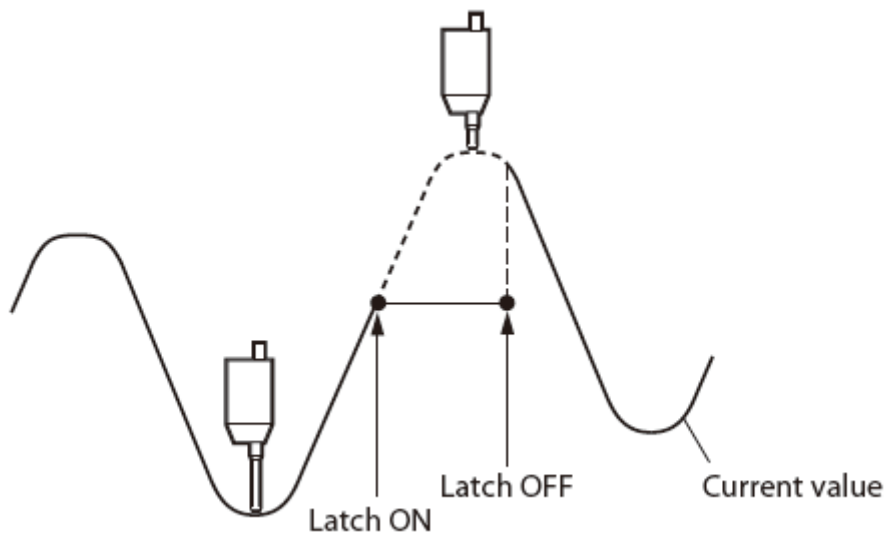
Measured value	Judgment	Judgment output
Upper limit < measured value	Upper limit NG	U
Lower limit $\leq$ measured value $\leq$ upper limit	GO	G
Measured value < lower limit	Lower limit NG	L

### 6.2.7 Hold

The MG80-SC has two types of hold functions: latch and pause. They cannot be used at the same time.

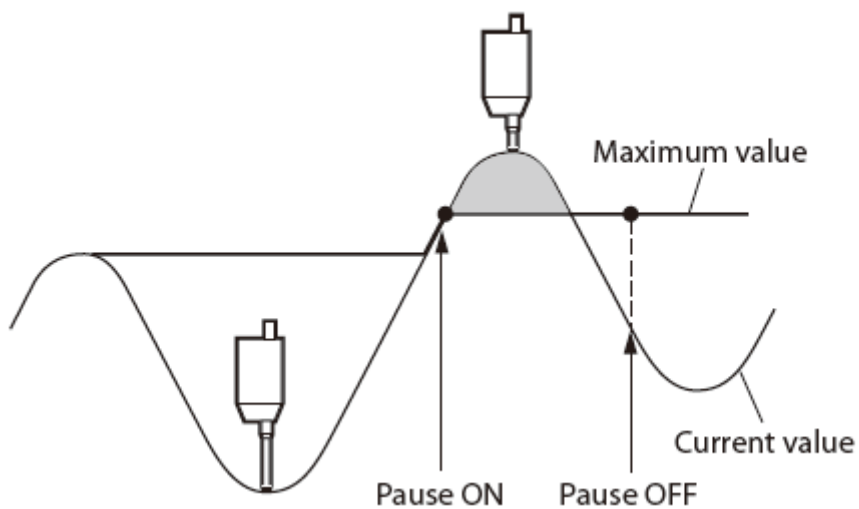
#### Latch

In the current value mode, this function holds output data and comparator output for that value. When latched, the current value will stop updating, so the peak value will also stop updating.



#### Pause

This function holds the peak value. Even if the current value exceeds the peak value, the peak value will not change.



### 6.2.8 Measurement Data Output

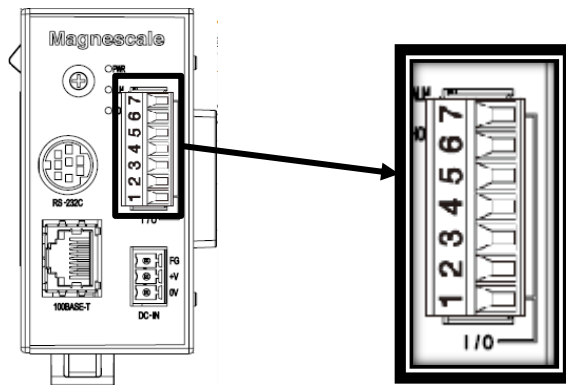
The measurement data is output to RS-232C based on the timing of the RS trigger input or the internal periodic timer. It is not output during parameter setup.

The timing of the measurement data output should take into account the RS-232C baud rate. If the next trigger occurs during the measurement data output, incorrect data may be output.

### 6.2.9 I/O Connector

In addition to the RS-232C command, data can be output and the operations performed through the I/O connector.

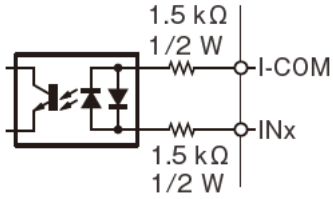
#### I/O Connector Pin Assignment



No.	I/O	Function name	Description
1	I	Reset input	All the measurement axes are reset.
2	I	RS-232C trigger input	The measurement data of all the axes is latched and the data is output.
3	I	Pause input	While the input signal is supplied, pause all measurement axes.
4	I	Start/latch input	When the start function is selected as the input setting: the peak value updating starts on all measurement axes as soon as the input signal is supplied; when the latch function is selected: while the input signal is supplied, latch all measurement axes. Set the function by the STTERM command.
5	—	Input Common	Input signal common pin
6	O	Alarm	Output when an alarm occurs in the system.
7	—	Output Common	Output signal common pin

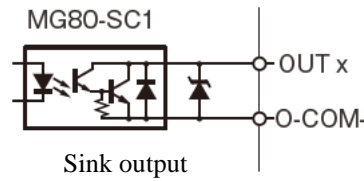
Input/Output Circuits

- Input equivalent circuit  
(common to MG80-SC1/SC2)  
ON voltage: 10.8 V or higher  
OFF voltage: 2 V or less

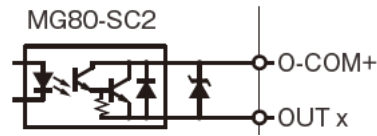


Sink/source input

- Output equivalent circuit  
Maximum load voltage: DC 48 V  
Maximum load current: DC 9 mA



Sink output



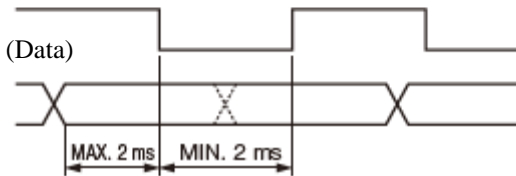
Source output

Signal Timing

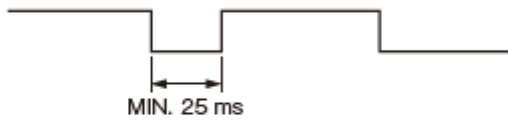
Reset input, start input



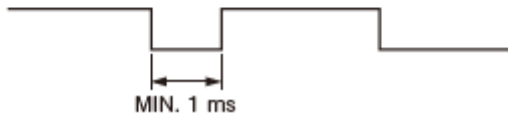
Latch input, pause input



RS trigger input (low-speed mode)



RS trigger input (high-speed mode)



**Note**

The input interval varies with the number of the counter modules used or the RS-232C communication speed. Be sure to input signals after data acquisition is finished.

### 6.2.10 PLC Link Function

The PLC link function allows the MG80-SC to read and write the PLC's memory and allows the PLC to operate the MG80-SC and obtain measurement data without the need to prepare a communication program on the PLC side.

In order for the MG80-SC to read and write the memory of the PLC, the PLC must support one of the following communication protocols.

PLC manufacturer	Connection method	Communication protocol
Mitsubishi Electric Corporation	RS-232C	MC protocol 1C frame format 4
	RS-232C	MC protocol 3C frame format 4
	TCP/UDP	MC protocol 1E frame
	TCP/UDP	MC protocol 3E frame
OMRON Corporation	RS-232C	C-mode Commands
	TCP/UDP	FINS Commands
Keyence Corporation	RS-232C	KV Host Link Mode
	TCP/UDP	Host-link

The MG80-SC provides arbitrary access to the starting addresses of three types of data area: the control flag area, the setup parameter area, and the measurement data area.

### Control flag area

This memory area enables control by the corresponding operation commands. The data structure is shown below.

Each bit corresponds to a counter module ID.

Offset	Data name	Operation command
0x0000	Update parameter	
0x0001	Reset	①②RES
0x0002	Recall preset	①②RCL
0x0003	Start	①②STA
0x0004	Load reference point	①②L
0x0005	Pause	①②PAU
0x0006	Latch	①②LCH
0x0007	Request measurement data	R
0x0008	Update parameter complete	
0x0009	Reset complete	
0x000A	Recall preset complete	
0x000B	Start complete	
0x000C	Load reference point complete	
0x000D	Transmit measurement data complete	

1. About the operations update parameter, reset, recall preset, start, and load reference point

The operation sequence is as follows.

Each has a control flag and a corresponding completion flag. When the PLC turns the control flag ON, the MG80-SC reads the flag and executes the corresponding operation. When the operation is completed, the completion bit is written back.

The PLC checks the completion bit and turns off the control flag. The MG80-SC checks the control flag and turns off the completion flag.

2. The operation sequence for requesting measurement data is the same as above.

For measurement data requests, if any bit is set to ON, the MG80-SC writes the measurement data of all connected counter modules.

3. When the bit is turned ON for the corresponding hold function (pause or latch),

the hold function is enabled.



### Setup parameter area

By turning the parameter update flag ON, the setup parameters can be loaded into this memory area of the MG80-SC. The data structure is shown below. There are setup parameters for each measurement axis number (counter module ID).

Offset	Data name	Operation command
0x0000	Preset (low order)	①②P=XXX
0x0001	Preset (high order)	
0x0002	Comparator lower limit (set 1 low order)	①②CL1=XXX
0x0003	Comparator lower limit (set 1 high order)	
0x0004	Comparator upper limit (set 1 low order)	①②CH1=XXX
0x0005	Comparator upper limit (set 1 high order)	
0x0006	Comparator lower limit (set 2 low order)	①②CL2=XXX
0x0007	Comparator lower limit (set 2 high order)	
0x0008	Comparator upper limit (set 2 low order)	①②CH2=XXX
0x0009	Comparator upper limit (set 2 high order)	
0x000A	Comparator lower limit (set 3 low order)	①②CL3=XXX
0x000B	Comparator lower limit (set 3 high order)	
0x000C	Comparator upper limit (set 3 low order)	①②CH3=XXX
0x000D	Comparator upper limit (set 3 high order)	
0x000E	Comparator lower limit (set 4 low order)	①②CL4=XXX
0x000F	Comparator lower limit (set 4 high order)	
0x0010	Comparator upper limit (set 4 low order)	①②CH4=XXX
0x0011	Comparator upper limit (set 4 high order)	
0x0012	Comparator group number	①②SCN=X
0x0013	Output value mode	①②MODE=X

The preset comparator upper/lower limits are treated as a single data item for two PLC devices. When setting the data, use little endian format.

In addition, the value to be set is a count value whose last digit conforms to the input resolution. For example, if the input resolution is 5  $\mu\text{m}$ , the 1's place corresponds to 1  $\mu\text{m}$  and the values that can be set are multiples of 5.

Set the data according to the following table of possible settings.

Resolution	mm setting unit	mm/25.4 setting unit
<b>0.1<math>\mu\text{m}</math></b>	0.1 $\mu\text{m}$ unit	0.00001 mm/25.4 unit
<b>0.5<math>\mu\text{m}</math></b>	0.1 $\mu\text{m}$ unit (last digit must be a 5 or 0)	0.00001 mm/25.4 unit (multiple of 2)
<b>1<math>\mu\text{m}</math></b>	1 $\mu\text{m}$ unit	0.0001 mm/25.4 unit
<b>5<math>\mu\text{m}</math></b>	1 $\mu\text{m}$ unit (last digit must be a 5 or 0)	0.0001 mm/25.4 unit (multiple of 2)
<b>10<math>\mu\text{m}</math></b>	10 $\mu\text{m}$ unit	1 (0.001 mm/25.4 unit)

#### Measurement data area

When the measurement data request flag is set to ON, the MG80-SC writes measurement data to the following memory area.

Offset	Data name
0x0000	Measurement data 0 (low order)
0x0001	Measurement data 0 (high order)
0x0002	Measurement data 1 (low order)
0x0003	Measurement data 1 (high order)
:	:
0x001E	Measurement data 15 (low order)
0x001F	Measurement data 15 (high order)
0x0020	Comparator result 1
0x0021	Comparator result 2
:	:
0x002F	Comparator result 16

For a module that has an alarm, 0xA5A5A5A5 is stored in the measurement data and 0x000F is stored in the comparator result.

## 7 Settings

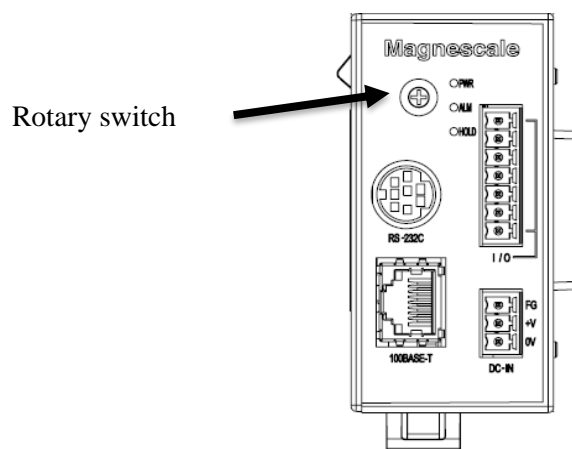
### 7.1 When Upgrading from the MG10/MG10A

First, set the resolution and polarity for each counter module. There are two ways to configure the settings: by using the setting application for Windows PC or by using commands. Use whichever method is most convenient.

### 7.2 Module Number Setting

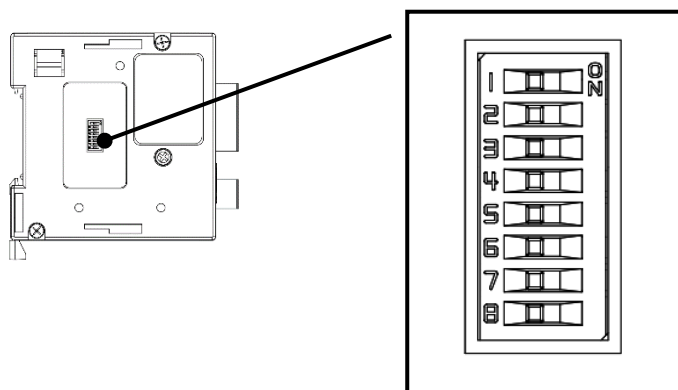
Use a screwdriver or other tool to align the direction of the arrow on the module number setting switch with the number to be set.

Setting range: 0 to F



### 7.3 Serial Port Setting (when Using RS-232C)

Set the RS-232C communication settings using the DIP switches on the side of the main module.



## 7.4 Using the Setting Application to Configure the Settings

### 7.4.1 Download the Setting Application

1. Visit the Magescale website at [www.magescale.com](http://www.magescale.com) and select “Digital Gauge Products.”  
Download the setting application from “Setting application for Windows PC.”
2. Save the file to the desired location on the PC and extract it with decompression software.

### 7.4.2 Connect

1. Prepare the “Setting application for Windows PC.”

Place the downloaded "MG80-SC\_SettingTool.exe" file in the desired location.

2. Set the IP address on the PC where “Setting application for Windows PC" is installed.

Set the IP address of the PC so that it is on the same network as the IP address of the MG80-SC.

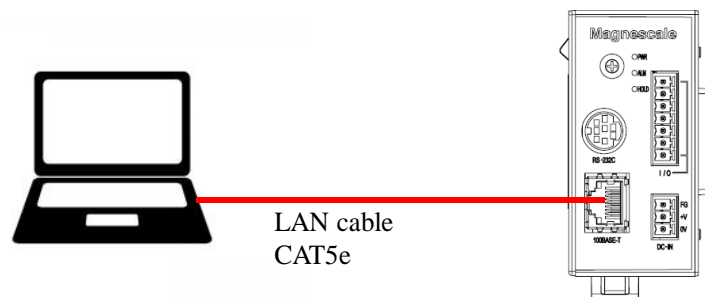
Example: MG80-SC with IP address 192.168.0.100 and subnet 255.255.255.0

IP address : 192.168.0.xxx \*

Subnet mask : 255.255.255.0

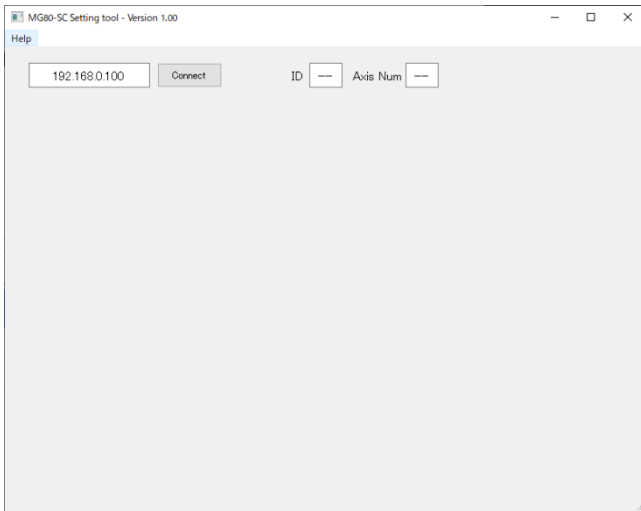
\* Do not set xxx to the same address as another connected device.

3. Establish the connection as shown below.



### 7.4.3 How to Configure the Settings

Start “MG80-SC\_SettingTool.exe” on the PC on which the “Setting application for Windows PC” is installed. When the program starts, the following window will appear.



Follow the steps below to connect.

① Enter the IP address of the MG80-SC to connect to.

\* If the module number setting switch of the MG80-SC is set to 0xF, the IP address is 192.168.0.100.



② Press the [Connect] button.



③ Once connected, parameter setting is possible.

MG80-SC Setting tool - Version 1.00

Help

192.168.0.100 Disconnect ID 1 Axis Num 16 Unit mm

Measure Setting

Ref. Point Setting

PLC Link Setting

Measure Monitor

Resolution 0.1 μm  Minus  Ref. use

Comp. Set	Meas. Mode	Preset
1	REAL	0
2		
3		
4		

0

Comp. High 0 0 0 0

Comp. Low 0 0 0 0

Resolution 0.1 μm  Minus  Ref. use

Comp. Set	Meas. Mode	Preset
1	REAL	0
2		
3		
4		

1

Comp. High 0 0 0 0

Comp. Low 0 0 0 0

<< >>

RS-232C Setting

Separator SPACE Output trigger Low-Speed Trg.

Data format Mode 3

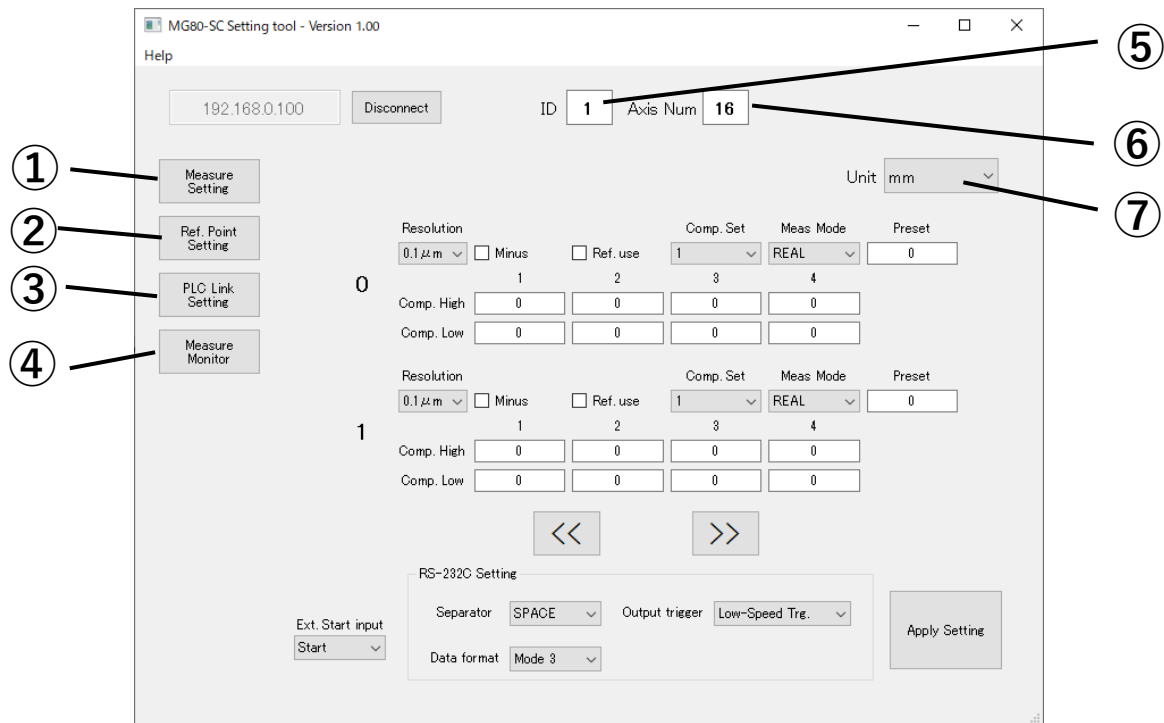
Ext. Start input Start

Apply Setting

\* If the connection fails, turn off the power of the MG80-SC, exit the setting application, and start over from the beginning.

## 7.4.4 Setting the Measurement Parameters

### (1) Common areas

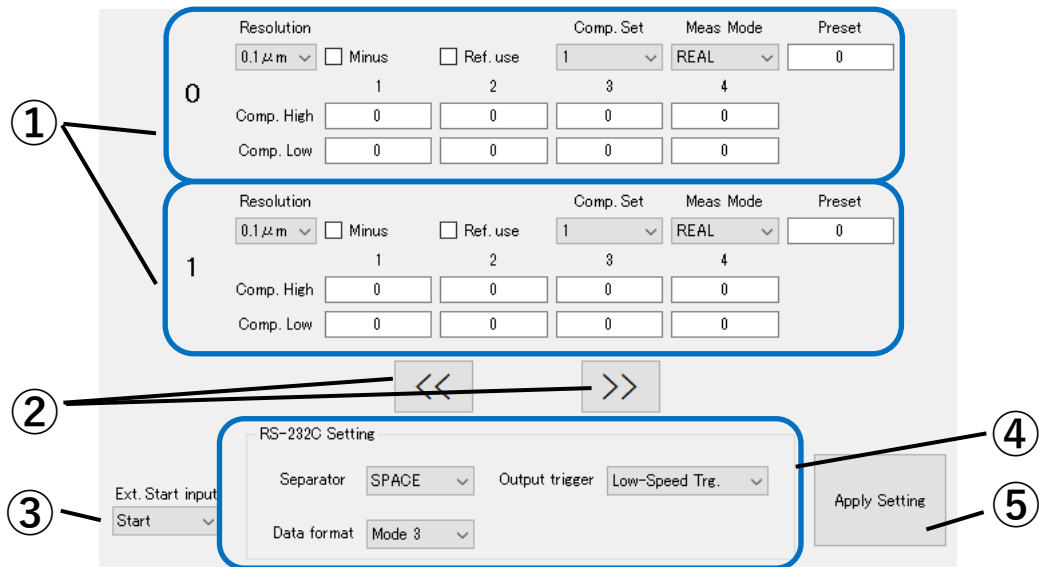


- ① Transitions to the Measure Setting window.
- ② Transitions to the Reference Point Setting window.
- ③ Transitions to the PLC Link Setting window.
- ④ Transitions to the Measure Monitor window.
- ⑤ Indicates the module number of the connected MG80-SC.
- ⑥ Indicates the number of connected axes.
- ⑦ Specifies the measurement unit from the following options.

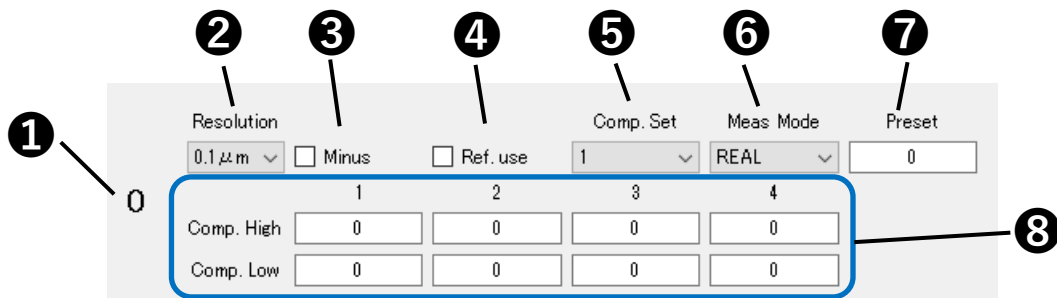
- mm
- mm/25.4 (inch)

To use this setting, refer to the description of the Version Display screen.

## (2) Measure Setting window



## ① Setting area for each axis



- ① Indicates the axis number (counter module ID).
- ② Specifies the input resolution setting from the following options.
  - 0.1 $\mu$ m
  - 0.5 $\mu$ m
  - 1 $\mu$ m
  - 5 $\mu$ m
  - 10 $\mu$ m
- ③ Specifies the direction (input polarity) of the measuring unit. When this is selected, the direction is reversed.
- ④ Specifies whether or not to use the reference point function.
  - When this is selected, the reference point function is used.
- ⑤ Specifies the comparator group number from 1 to 4.
- ⑥ Specifies the measurement data mode from the following options.
  - REAL: Current value
  - MAX: Maximum value
  - MIN: Minimum value
  - P-P: Peak-to-peak value



- ⑦ Specifies the preset value.
- ⑧ Specifies the upper and lower limits for each comparator group.
- ② Navigates forward and backward through the measurement parameter areas for each axis.
- ③ Specifies the setting of the external start function from the following options.
  - Start
  - Latch
- ④ RS-232C settings

RS-232C Setting

Separator: SPACE

Output trigger: Low-Speed Trg.

Data format: Mode 3

- Separator
 

Specifies the separator between values in the measurement data output from the following options.

  - Space
  - CR+LF
- Output trigger
 

Specifies the measurement data output mode from the following options.

  - External trigger (low-speed mode)
  - External trigger (high-speed mode)
  - Internal timer (0.2 seconds)
  - Internal timer (0.5 seconds)
  - Internal timer (1.0 seconds)
  - Internal timer (5.0 seconds)
  - Internal timer (10 seconds)
  - Internal timer (30 seconds)
  - Internal timer (60 seconds)
  - Internal timer (300 seconds)
- Data format
 

Specifies the measurement data output format from the following options.

  - Mode 1
  - Mode 2
  - Mode 3

For details on each mode, refer to section 8.1.

- ⑤ Sends the settings made on the Measure Setting window to the MG80-SC.

If the reference point setting is changed, the power must be turned off and on again.

\* Do not turn off the power of the MG80-SC while saving the settings.

## (3) Reference Point Setting screen

①	②	③	④	⑤
0	MasterValue	Apply	Clear	MasterOffset
1	MasterValue	Apply	Clear	MasterOffset
2	MasterValue	Apply	Clear	MasterOffset
3	MasterValue	Apply	Clear	MasterOffset
4	MasterValue	Apply	Clear	MasterOffset
5	MasterValue	Apply	Clear	MasterOffset
6	MasterValue	Apply	Clear	MasterOffset
7	MasterValue	Apply	Clear	MasterOffset
8	MasterValue	Apply	Clear	MasterOffset
9	MasterValue	Apply	Clear	MasterOffset
A	MasterValue	Apply	Clear	MasterOffset
B	MasterValue	Apply	Clear	MasterOffset
C	MasterValue	Apply	Clear	MasterOffset
D	MasterValue	Apply	Clear	MasterOffset
E	MasterValue	Apply	Clear	MasterOffset
F	MasterValue	Apply	Clear	MasterOffset

- ① Indicates the axis number (counter module ID) corresponding to each row.
- ② Specifies the master value. Enabled only when the reference point function is used.
- ③ Applies the master value of the corresponding axis. Enabled only when the reference point function is used.  
If the reference point setting is changed, the power must be turned off and on again.  
Do not turn off the power of the MG80-SC while saving the settings.
- ④ Clears the saved master value. Enabled only when the reference point function is used.  
Do not turn off the power of the MG80-SC while saving the settings.
- ⑤ Indicates the master offset value read from the MG80-SC.

## (4) PLC Link Setting screen

The screenshot shows the PLC Link Setting screen with the following fields and controls:

- 1**: Module IP Address (192.168.0.100)
- 2**: Subnet mask (255.255.255.0)
- Use PLC-Link
- 3**: PLC IP Address (192.168.0.10)
- 4**: PLC Ether port (50000)
- 4**: Protocol (1C Frame, ASCII, RS-232C)
- 5**: Ctrl Frag Address (100)
- 6**: Parameter Address (300, 320, 340, 360, 380, 400, 420, 440, 460, 480, 500, 520, 540, 560, 580, 600)
- 7**: MeasData Address (120)
- 8**: FINS SA1/DA1/DNA (100, 96, 0)
- 9**: Cmode UnitNo. (0)
- 10**: Apply Setting button

To apply the settings made on this screen, it is necessary to turn the power of the MG80-SC off and then on again.

- ① Specifies the IP address and subnet mask of the MG80-SC. The format is a dot-delimited 4-digit format, wherein each digit is in the range 0 to 255.
- ② Specifies whether or not to use the PLC link. When this is selected, the PLC link is used.
- ③ Specifies the IP address and port number of the PLC to be connected when using the PLC link via Ethernet connection.
- ④ Specifies the communication protocol to be used by the PLC link.

Check the available protocols for the PLC and select one of the following combinations:

PLC communication specifications		MG80-SC settings		
PLC manufacturer	Communication protocol	Protocol	Binary/ASCII	Connection method
Mitsubishi Electric Corporation MC protocol	1C frame format 4	1C Frame	ASCII	RS-232C
	3C frame format 4	3C Frame	ASCII	RS-232C
	1E frame	1E Frame	ASCII/Binary	TCP/UDP
	3E frame	3E Frame	ASCII/Binary	TCP/UDP
	3E frame (for iQ-R series)	3E Frame for iQ-R	ASCII/Binary	TCP/UDP
OMRON Corporation	C-mode Commands	C mode command	ASCII	RS-232C
	FINS Commands	FINS command	Binary	TCP/UDP
Keyence Corporation	KV Host Link Mode	KV command	ASCII	RS-232C
	Host-link	KV command	ASCII	TCP/UDP

- ⑤ Specifies the starting address on the device assigned to the control flag by the PLC link\*.  
Refer to the data structure of the control flag to ensure that the area does not overlap with other areas.
- ⑥ Specifies the starting addresses on the device assigned to the setup parameters by the PLC link\*.  
The setup parameters are set for each axis number (counter module ID).  
Refer to the data structure to ensure that the area does not overlap with other areas.
- ⑦ Specifies the starting address on the device assigned to the measurement data by the PLC link\*.  
Refer to the data structure of the measurement data to ensure that the area does not overlap with other areas.

\* The PLC link assigns the data exchanged with the MG80-SC to the PLC device.

Mitsubishi Electric Corporation PLC: Data register (D)

OMRON Corporation PLC : Data Memory (DM)

Keyence Corporation PLC : Data Memory (DM)

- ⑧ Specifies the settings when “FINS command” is selected in ④.
- SA1: Source FINS node address  
For UDP, set the node address of the MG80-SC.  
Specify the low-order byte of the IP address of the MG80-SC.  
For TCP, no setting is required.
  - DA1: Destination FINS node address  
For UDP, set the node address of the PLC.  
For TCP, no setting is required.
  - DNA: Destination FINS network address  
Specify the network address of the PLC and MG80-SC.  
The PLC and MG80-SC must be on the same network.  
If there is only one network on the PLC side, it is usually set to 0.
- ⑨ Specifies the settings when “C mode command” is selected in ④.  
Specify the Unit No. of the connection destination.
- ⑩ Sends the settings made on the PLC Link Setting window to the MG80-SC.  
If the reference point setting is changed, the power must be turned off and on again.  
Do not turn off the power of the MG80-SC while saving the settings.  
After sending the settings, press the [Disconnect] button and [Connect] button to reconnect to the MG80-SC and make sure that the set values are applied correctly.

## (5) Measure Monitor screen

①	②	③	④
0	+0.0000	REAL	●
1	+0.0000	REAL	●
2	+0.0000	REAL	●
3	+0.0001	REAL	▲
4	+0.0000	REAL	●
5	+0.0000	REAL	●
6	+0.0000	REAL	●
7	+0.0000	REAL	●
8	+0.0001	REAL	▲
9	+0.0003	REAL	▲
A	-0.0066	REAL	▼
B	+0.0000	REAL	●
C	-0.0004	REAL	▼
D	+0.0001	REAL	▲
E	+0.0000	REAL	●
F	+0.0000	REAL	●

① Indicates the axis number (counter module ID) corresponding to each row.

② Indicates the measurement data. If there is an error, "Error" is displayed.

③ Indicates the measurement mode of the measured value.

- REAL: Current value
- MAX: Maximum value
- MIN: Minimum value
- P-P: Peak-to-peak value

④ Indicates the comparator result as follows.

Upper limit < measured value: ▲

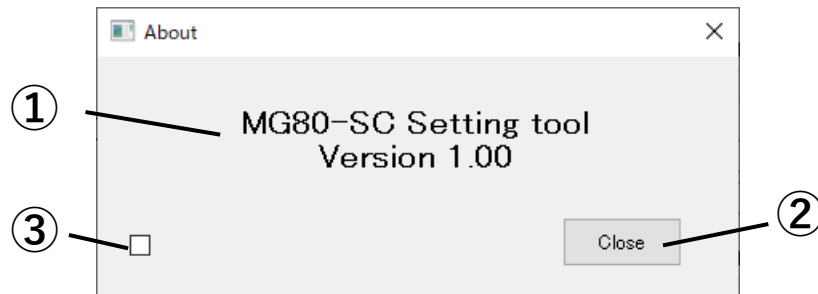
Lower limit ≤ measured value ≤ upper limit: ●

Measured value < lower limit: ▼

Error occurred: ×

(6) Version Display screen

Select [Help] > [About] from the menu bar to display the Version Display screen.



① Indicates the software name and version.

② Closes the screen.

③ Enables the measurement unit switching function. It is necessary to restart the application for the setting to take effect.

## 7.5 Using Commands to Configure the Settings

### 7.5.1 Preparation

Configuration by command can be done via RS-232C or Ethernet connection. Prepare the following items.

No.	Product	Preparation
1	PC, PLC, etc.	Prepare a device that can send and receive commands via RS-232C or Ethernet. RS-232C: Use serial communication terminal software. Ethernet: Software that can send and receive commands via TCP/IP is required. Send the commands to TCP/IP port 24000 on the MG80-SC.
2	Communication cable	RS-232C: Use a DZ252 communication cable (sold separately). Ethernet: LAN cable (CAT5e shielded type recommended)

### 7.5.2 Connect

1. Connect via RS-232C or Ethernet.

For Ethernet, set the IP address on the PC used for configuring the settings. Set the IP address of the PC so that it is on the same network as the IP address of the MG80-SC.

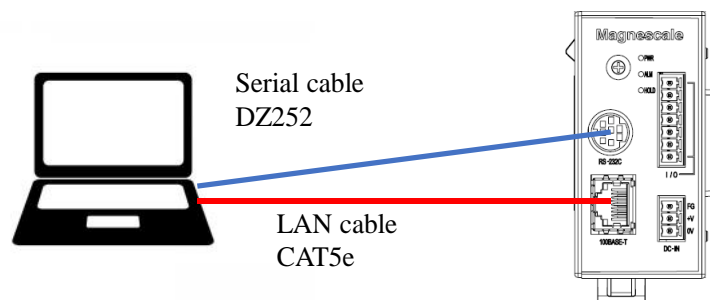
Example: MG80-SC with IP address 192.168.0.100 and subnet 255.255.255.0

IP address : 192.168.0.xxx \*

Subnet mask: 255.255.255.0

\* Do not set xxx to the same address as another connected device.

2. Establish the connection as shown below.



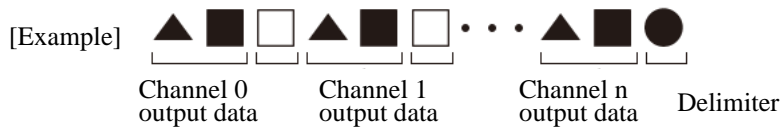
### 7.5.3 How to Configure the Settings

Use the setup commands that are listed in section 8.

If you use the PLC link setup commands described in section 8.6, use the Ethernet interface.

## 8 Commands

### 8.1 Communication Data Output Format



#### ▲ Header:

5 bytes (this differs depending on communication mode)

Byte 1: Leading character Module number 0 to F

Byte 2: 2nd character Counter module ID 0 to F

Byte 3: 3rd character Mode Current value mode : N

Maximum value mode : A

Minimum value mode : I

Peak-to-peak value mode: P

Byte 4: 4th character Unit M (mm)

Byte 5: 5th character

Comparator judgment value Upper limit NG : U

Within range : G

Lower limit NG : L

When an alarm has occurred: E

#### ■ Numerical value:

Fixed at 8 bytes: + or – sign followed by the data (including decimal point)

[Example 1] For a resolution of 0.1  $\mu\text{m}$

“–99.9999” to “+99.9999”

[Example 2] For a resolution of 10  $\mu\text{m}$

“–9999.99” to “+9999.99”

[Example 3] In the event of an overflow, the count continues but the leading character changes to “F.”

“–99.9999” → “–F0.0000” → “–F0.0001”

[Example 4] When an alarm has occurred, “Error” appears

(“ ”, “ ”, “E”, “I”, “I”, “O”, “I”, “ ”)

#### □ Data separation character:

1 byte “ ” (space) or 2 bytes “CR” + “LF”

Select using either the setting application for Windows PC or the command (factory setting: space).



- Delimiter:

2 bytes “CR” + “LF” or 1 byte “CR”

Select using communication setting switch No. 2.

OFF : “CR” + “LF” (factory setting)

ON : “CR”

Added only for RS-232C. Ethernet does not have a delimiter for transmission and reception.

### Communication modes

There are three modes each with a different header output.

#### Mode 1: Normal data output

Header consisting of 2 bytes (module number + counter module ID)

[Example] “00-09.9999”

#### Mode 2: Data output with measuring mode information added

Header consisting of 4 bytes (module number + counter module ID + mode + unit)

[Example] “00NM-09.9999”

#### Mode 3: Data output with measuring mode and Go/No Go judgment result information added

Header consisting of 5 bytes

(module number + counter module ID + mode + unit + comparator judgment value)

[Example] “00NMG-09.9999”

## 8.2 How to Specify the Module Number and Counter Module ID

In the lists of commands, ① indicates the module number and ② indicates the counter module ID.

The module number in ① is the setting value of the rotary switch on the front of the MG80-SC. If \* is specified in ①, the setting is applied regardless of the rotary switch setting value.

The counter module ID in ② is the ID of the MG80-CM counter module connected to the stacking connector of the MG80-SC main module. It is specified in hexadecimal format, from 0 to 15, in order starting from the main module.

Module number	Counter module ID	Meaning
0 to F	0 to F	Refers to the specified counter module ID of the specified module number
0 to F	*	Refers to all counter modules with the specified module number
*	*	Refers to all counter modules of the local module number
*	0 to F	Refers to the specified counter module of the local module number

In reference commands (commands ending in ?), if "\*" is specified in ②, no response will be made. It is necessary to specify an individual counter module.

Note that commands for counter modules that do not exist are ignored.

## 8.3 Setup Commands

Write/Read	Description																		
SETUP Command format	Start parameter setup. SETUP Starts parameter setup.																		
RSL= / RSL= Command/Return format	Input resolution ①②RSL=③ ③= 1: 0.1μm 2: 0.5μm 3: 1μm 4: 5μm 5: 10μm																		
POL= / POL=? Command/Return format	Input polarity ①②POL=③ ③= 0: Push-in direction is positive (+) 1: Push-in direction is negative (-)																		
MODE= / MODE=? Command/Return format	Measured value mode ①②MODE=③ ③= 0: Current value (REAL) mode 1: Maximum value (MAX) mode 2: Minimum value (MIN) mode 3: Peak-to-peak value (P-P) mode																		
P= / P=? Command/Return format	Preset value ①②P=③ ③= The value differs depending on the measurement unit and input resolution. <table border="1"> <thead> <tr> <th>Resolution</th> <th>mm unit</th> <th>mm/25.4 unit</th> </tr> </thead> <tbody> <tr> <td>0.1μm</td> <td>-99.9999 to 99.9999</td> <td>-9.99999 to 9.99999</td> </tr> <tr> <td>0.5μm</td> <td>-99.9995 to 99.9995</td> <td>-9.99998 to 9.99998</td> </tr> <tr> <td>1μm</td> <td>-999.999 to 999.999</td> <td>-99.9999 to 99.9999</td> </tr> <tr> <td>5μm</td> <td>-999.995 to 999.995</td> <td>-99.9998 to 99.9998</td> </tr> <tr> <td>10μm</td> <td>-9999.99 to 9999.99</td> <td>-999.999 to 999.999</td> </tr> </tbody> </table>	Resolution	mm unit	mm/25.4 unit	0.1μm	-99.9999 to 99.9999	-9.99999 to 9.99999	0.5μm	-99.9995 to 99.9995	-9.99998 to 9.99998	1μm	-999.999 to 999.999	-99.9999 to 99.9999	5μm	-999.995 to 999.995	-99.9998 to 99.9998	10μm	-9999.99 to 9999.99	-999.999 to 999.999
Resolution	mm unit	mm/25.4 unit																	
0.1μm	-99.9999 to 99.9999	-9.99999 to 9.99999																	
0.5μm	-99.9995 to 99.9995	-9.99998 to 9.99998																	
1μm	-999.999 to 999.999	-99.9999 to 99.9999																	
5μm	-999.995 to 999.995	-99.9998 to 99.9998																	
10μm	-9999.99 to 9999.99	-999.999 to 999.999																	
CH= / CH=? CL= / CL=? Command/Return format	Comparator upper limit Comparator lower limit ①②CH③=④ ①②CL③=④ ③= Comparator group number ④= The value differs depending on the measurement unit and input resolution. <b>Note</b> When changing the setting values, be certain after changes have been made that the upper limit value is greater than or equal to the lower limit value.																		

Write/Read	Description
SCN= / SCN=? Command/Return format	Comparator group number ①②SCN=③ ③= 1 to 4 (group number)
REF= / REF=? Command/Return format	Reference point setting ①②REF=③ ③= 0: Reference point function OFF 1: Reference point function ON
LCLR Command/Return format	Clear the reference point setting (reference point offset value). ①②LCLR Note: Use the LCLR command only when the reference point usage setting is ON.
STTERM= / STTERM=? Command/Return format	Select the external start input function. ①STTERM=③ ③= 0: START function 1: HOLD (LATCH) function
RSSEP= / RSSEP=? Command/Return format	Select the transfer data separator. ①RSFORM=③ ③= 0: Space 1: Newline (CR+LF)
RSFORM= / RSFORM=? Command/Return format	Select the RS-232C output data format. ①RSTRG=③ ③= 0: Mode 1 1: Mode 2 2: Mode 3
RSTRG= / RSTRG=? Command/Return format	Select the RS-232C trigger or internal timer. ①RSTRG=③ ③= 0: External trigger (low-speed mode) *Mechanical contact, etc. 1: External trigger (high-speed mode) *Transistor, etc. 2: Internal timer 0.2 s 3: Internal timer 0.5 s 4: Internal timer 1.0 s 5: Internal timer 5.0 s 6: Internal timer 10 s 7: Internal timer 30 s 8: Internal timer 60 s 9: Internal timer 300 s
SCALE= / SCALE=? Command/Return format	Set the scale unit (mm or inch). ①SCALE=③ ③= 0: mm 1: mm/25.4
CLOSE Command format	Close the parameter setup. CLOSE Close the parameter setup and store the setup data.

## 8.4 Operation Commands

Command	Description
P-P Command format	Switch to the peak-to-peak value mode. ①②P-P
MAX Command format	Switch to the maximum value mode. ①②MAX
MIN Command format	Switch to the minimum value mode. ①②MIN
REAL Command format	Switch to the current value mode. ①②REAL
RCL Command format	Recall preset value. ①②RCL
MODE= / MODE=?	Refer to the setup commands. When executed as an operation command, it is not recorded in ROM.
P= / P=?	Refer to the setup commands. When executed as an operation command, it is not recorded in ROM.
CH= / CH=? CL= / CL=?	Refer to the setup commands. When executed as an operation command, it is not recorded in ROM.
RES Command format	Reset (zero reset/reference point setting cancel). ①②RES
START Command format	Start (peak value reset). ①②START
PAU Command format	Pause (peak value update stop). ①②PAU③ ③= ON: Peak value update stop OFF: Peak value update stop cancel
LCH Command format	Latch (set the current value data latching). ①②LCH③ ③= ON: Current value output data latch stop OFF: Current value output data latch stop cancel
L Command format	Load reference point ①②L
R Command format	Read the data of all the channels. R
R Command format	Read the data of specific channels. ①②r

## 8.5 Read Commands

Command	Description
LO=? Command format Return format	Load the reference point offset value. ①②LO=? ①②LO=③ (③=The value differs depending on the measurement unit and input resolution.)
VER=? Command format Return format	Read the software version. ①VER=? ①VER=③ (③=Byte 1: major version; Byte 2: minor version)

## 8.6 PLC Link Setup Commands (Ethernet Only)

Command	Description
NIP= / NIP=? Command/Return format	IP address of MG80-SC NIP=(3) (3) = IP address in IPv4 format (e.g. 192.168.0.100)
NMS= / NMS=? Command/Return format	Subnet mask of MG80-SC NMS=(3) (3) = Subnet mask in IPv4 format (e.g. 255.255.255.0)
LPN=(3) / LPN=? Command/Return format	Port number to be used by the PLC link LPN=(3) (3) = 0 to 65535 (24000 is prohibited)
LMD=(3) / LMD=? Command/Return format	PLC link use mode LMD=(3) (3) = 0: Do not use PLC link 1: Use PLC link
LPC1= / LPC1=? Command/Return format	PLC link protocol 1 (protocol) LPC1=(3) (3) = 0: MC protocol/1C frame format 4 1: MC protocol/3C frame format 4 2: MC protocol/1E frame 3: MC protocol/3E frame (Q/L) 4: MC protocol/3E frame (iQ-R) 5: C mode command 6: FINS command 7: Upper link
LPC2= / LPC2=? Command/Return format	PLC link protocol 2 (format) LPC2=(3) (3) = 0: ASCII 1: Binary
LPC3= / LPC3=? Command/Return format	PLC link protocol 3 (interface) LPC3=(3) (3) = 0: RS-232C 1: TCP/IP 2: UDP/IP
RIP=(3) / RIP=? Command/Return format	PLC side IP address RIP=(3) (3) = IP address in IPv4 format (e.g. 192.168.0.100)

Command	Description
FLA= / FLA=? Command/Return format	Starting address of control flag area FLA=(3) (3)= Unsigned integer up to 8 digits
PRA= / PRA=? Command/Return format	Starting address of setup parameter area (2)PRA=(3) (3)= Unsigned integer up to 8 digits
MDA= / MDA=? Command/Return format	Starting address of measurement data area MDA=(3) (3)= Unsigned integer up to 8 digits
FINSDNA= / FINSDNA=? Command/Return format	FINS command parameter (DNA) FINSDNA=(3) (3)= 0: Own network 1 to 127: Destination network address <b>Note</b> Set this when using the FINS command.
FINSDA1= / FINSDA1=? Command/Return format	FINS command parameter (DA1) FINSDA1=(3) (3)= 1 to 254 <b>Note</b> Set this when using the FINS command (UDP).
FINSSA1= / FINSSA1=? Command/Return format	FINS command parameter (SA1) FINSSA1=(3) (3)= 1 to 254 <b>Note</b> Set this when using the FINS command (UDP).
CMUNITNO= / CMUNITNO=? Command/Return format	C mode command parameter (unit number) CMUNITNO=(3) (3)= 0 to 31 <b>Note</b> Set this when using the C mode command.



## 9 Troubleshooting

If trouble is suspected, check out the following points before requesting servicing.

① No power.

- Has the power connector been inserted all the way in?
- Is the correct voltage (+12 V to +24 V) being supplied?
- Is the power connector wired correctly?
- Does the power source have a sufficient capacity (W)?

② No communication.

- Has the RS-232C or Ethernet connector been inserted all the way in?
- Are the same communication settings used for both the host unit and MG80-SC?
- Is the cable too long?
- Are any cables carrying heavy currents from motors or other devices positioned near the communication cable?

③ Problem in the count reading.

- Has the count value overflowed?
- Is the alarm lamp on the MG80-SC lit?

④ Count reading does not change.

- Is it latched or paused?
- Is the peak value mode set?
- Is the communication working correctly?
- Are the measuring sensors connected to the counter modules?
- Are the data request commands being output correctly?

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